

O3B NON-GEOSTATIONARY SATELLITE SYSTEM

ATTACHMENT A

Technical Information related to O3b's Thirty-Ship Waiver Request

A.1 Scope

O3b seeks a waiver of the United States Table of Frequency Allocations and the Commission's Ka-band Plan in connection with the testing, demonstration, and commercial operations of maritime earth stations on up to thirty additional foreign-flagged ships (the "Thirty-Ship Waiver Request"). This Attachment A provides technical information related to O3b's waiver request.

There are several elements to the technical showing that is associated with O3b's waiver request. The Schedule B that is filed with the waiver request provides the technical parameters for O3b's maritime earth stations. The Schedule S O3b filed previously, which is hereby incorporated by reference, provides the technical parameters for O3b's space stations.¹ This Attachment A provides additional technical information concerning the operations proposed in the Thirty-Ship Waiver Request and demonstrates that the proposed operations will protect other services.

A.2 Frequency Ranges for O3b's Thirty-Ship Waiver Service

The O3b Thirty-Ship Waiver service will operate only within the following frequency ranges, which are a sub-set of those included in the Schedule S:

- Uplink: 27.6-28.4 GHz
- Downlink: 17.8-18.6 GHz

¹ A Schedule S for the O3b non-geostationary satellite system originally was filed with the Commission as part of the license application for the Hawaii earth station. See O3b's Hawaii application, FCC File No. SES-LIC-20100723-00952. A modified version of the Schedule S was provided to the Commission as part of O3b's response to FCC questions concerning O3b's Blanket Maritime Application, FCC File No. SES-LIC-20130528-00455. See O3b's Response to FCC Questions, October 25, 2013. O3b then filed a Schedule S with its Petition for Declaratory Ruling ("PDR"), FCC File No. SAT-LOI-20141029-00118. References in this filing to "Schedule S" are to this Schedule S, which contains all necessary information concerning the O3b satellite system, provided with the PDR filing.

O3b operates a non-geostationary orbit (“NGSO”) fixed-satellite service (“FSS”) system. Under the FCC’s detailed band plan relating to Ka-band services in the United States, the frequency ranges shown above are allocated as follows:

- (i) in the 27.6-28.35 GHz uplink band, local multipoint distribution service (“LMDS”) systems are primary and FSS systems are secondary;
- (ii) in the 28.35-28.4 GHz uplink band, GSO FSS systems are primary and NGSO FSS systems are secondary;
- (iii) in the 17.8-18.3 GHz band, Fixed Service (“FS”) systems are primary and NGSO FSS systems are non-conforming; and
- (iv) in the 18.3-18.6 GHz band, GSO FSS systems are primary and NGSO FSS systems are non-conforming.²

A.3 Scope of Thirty-Ship Waiver Request

The foreign-flagged ships that are the subject of this waiver request will operate on maritime routes for cruise ships whose routes include ports along the U.S. east and Gulf coasts. Throughout this area the Thirty-Ship Waiver terminals will communicate with O3b’s Texas gateway and O3b’s gateway in Peru.

O3b seeks a waiver from the Commission only for operations in or near U.S. waters (i) along the U.S. east coast, (ii) in the Gulf of Mexico, and (iii) surrounding Puerto Rico and the U.S. Virgin Islands. The area served by the ships in U.S. territorial waters is at latitudes north of 13°N. O3b will not operate the Thirty-Ship Waiver service with an elevation angle from the ship to the corresponding O3b satellite of less than 10°.

A.4 Predicted Space Station Antenna Gain

In its Schedule S, which is incorporated by reference in this filing, O3b has provided satellite antenna relative gain information, as requested by the Commission, in the form of mathematical equations that bound the gain as a function of the off-axis angle from the boresight of the antenna.

² *In the Matter of Rulemaking to Amend Parts 1, 2, 21, and 25 of the Commission's Rules to Redesignate the 27.5-29.5 GHz Frequency Band, to Reallocate the 29.5-30.0 GHz Frequency Band, to Establish Rules and Policies for Local Multipoint Distribution Service and for Fixed Satellite Services*, 11 FCC Rcd. 19005, ¶¶57-58 and 78 (1996). See also *In the Matter of Redesignation of the 17.7-19.7 GHz Frequency Band, Blanket Licensing of Satellite Earth Stations in the 17.7-20.2 GHz and 27.5-30.0 GHz Frequency Bands, and the Allocation of Additional Spectrum in the 17.3-17.8 GHz and 24.75-25.25 GHz Frequency Bands for Broadcast Satellite-Service Use*, 15 FCC Rcd 13430, ¶¶ 28 and 34 (2000).

A.5 Maximum Downlink PFD Levels

The maximum downlink Power Flux Density (“PFD”) level for the O3b service to the Thirty-Ship Waiver terminals is $-127 \text{ dBW/m}^2/\text{MHz}$ which is significantly below the maximum values given in the O3b Schedule S.³ That is because these terminals are of sufficient size and performance that the necessary link performance can be obtained without resorting to the maximum PFD levels given in the Schedule S. This maximum downlink PFD level of $-127 \text{ dBW/m}^2/\text{MHz}$ is also used as the basis of the EPFD↓ analysis presented later in this document. The link budgets provided in Section A.10 are also consistent with this maximum downlink PFD level.

A.6 Thirty-Ship Waiver Terminal Characteristics

The O3b Thirty-Ship Waiver service will employ the same 2.2 meter antenna diameter terminals that were described in O3b’s Blanket Maritime Application, and approved in O3b’s Blanket Maritime License.⁴ Service data rates of up to approximately 600 Mbps can be achieved with these terminals. The terminals are fully stabilized to account for movement of the ship as well as the movement of the O3b satellite in its orbit. A typical ship installation will employ two such antennas, with two being required to accomplish handover between the setting and rising O3b satellites. Some ships will have a third antenna that will be used as backup and to avoid blockage problems due to the superstructure of those ships. Each antenna is enclosed within a radome to protect it from the marine environment.

The antennas and their associated control system will ensure that they maintain a stabilization tracking accuracy of better than 0.2 degrees under specified ship motion conditions. The internal controller software continuously monitors the instantaneous antenna tracking error and will cease transmissions within 100ms if an unexpected event occurs that causes the tracking error to exceed 0.5 degrees. Transmissions will not restart until the tracking error, relative to the target O3b satellite, is less than 0.2 degrees.

³ The O3b Schedule S includes a maximum downlink PFD level of $-117.77 \text{ dBW/m}^2/\text{MHz}$ (at 25° elevation).

⁴ See O3b Blanket Maritime Application, FCC File No. SES-LIC-20130528-00455, Attachment A to Legal Narrative, Section A.6 (“ESV Terminal Characteristics”), beginning at 15, and, following, Annex 1 (“ESV Antenna Radiation Patterns”), Annex 2 (“ESV Terminal Manufacturer’s Declaration”), Annex 3 (“Radiation Hazard Study”), Annex 4 (“Interference Analysis Related to Foreign Fixed Services”), Annex 5 (“Representative Link Budgets for the O3b ESV Service”); see also October 25, 2013 Response to FCC Questions, Question No. 13, beginning at 11, and First Attachment (“Measured 30 GHz Band Antenna Performance Data”) and Fourth Attachment (“Revised 2.2-m Radiation Hazard Study”) thereto. The O3b maritime terminals were described as “ESVs” in the Blanket Maritime Application; however, O3b now more appropriately refers to these terminals as maritime earth stations.

The Thirty-Ship Waiver power density levels on uplink and downlink are no higher than the levels that have been previously reported to the Commission.⁵ Therefore these terminals present no new technical issues in terms of potential interference with respect to other NGSO satellite networks.

In O3b's previous Blanket Maritime Application it was demonstrated that the uplink off-axis EIRP density from the transmitting maritime earth station antennas was less than the masks given in §25.138(a) which relate to blanket licensing of GSO FSS transmitting earth stations. The same is true also for the Thirty-Ship Waiver antennas that are the subject of this waiver request, but with even more margin relative to §25.138(a) because of the lower power spectral density ("PSD") for these terminals.⁶ Annex 1 contains the manufacturer's declaration concerning the consistency of the off-axis EIRP density with §25.138.

In October 2013, O3b supplemented its Blanket Maritime Application with the latest measured data relating to the transmit gain patterns of the maritime earth station antennas.⁷ This included the measured off-axis antenna transmit gain for the 2.2 meter⁸ maritime earth stations antennas that will be used for the Thirty-Ship Waiver service. This same transmit antenna gain data for the 2.2m maritime earth station antennas has been included again with this waiver request as Annex 2.

The Thirty-Ship Waiver transmit antenna radiation patterns comply with Sections 25.209(a) and (b) of the Commission's rules. For that reason, O3B has responded "yes" to item B9 of Schedule B.

Section 25.209(c) of the rules states that FSS receive earth stations are protected from radio interference caused by other space stations only to the extent that harmful interference would not

⁵ See O3b's Hawaii application, FCC File No. SES-LIC-20100723-00952, Attachment A to Narrative, Section A.6 ("TT&C Characteristics") at 17-18, and Section A.10 ("Interference Analyses") beginning at 21; *see also* O3b's Manassas, Virginia application, FCC File Nos. SES-LIC-20130618-00516, Legal Narrative at 4-7, and SES-AMD-20131122-01187, November 22, 2013 Response to FCC Questions, Question No. 2 at 1-2.

⁶ The previous Blanket Maritime Application used a maximum PSD level at the input of the antenna of -12 dBW/40kHz compared to the maximum PSD at the input of the antenna used in this Thirty-Ship Waiver service of -21 dBW/40kHz under clear-sky conditions or up to -15 dBW/40kHz when uplink power control is implemented under rain-fade conditions.

⁷ See October 25, 2013 Response to FCC Questions, First Attachment ("Measured 30 GHz Band Antenna Performance Data").

⁸ The off-axis antenna transmit gain for the 2.2 meter antenna was provided as follows:

- at frequencies of 27.55 GHz, 28.3 GHz and 29.15 GHz;
- in both LHCP and RHCP polarizations;
- co-polar as a function of azimuth from -180° to +180° in 1° increments and -10° to +10° in 0.1° increments;
- co-polar as a function of elevation from -30° to +30° in 0.5° increments and -10° to +10° in 0.1° increments;
- cross-polar as a function of azimuth from -10° to +10° in 0.1° increments.

be expected to be caused to an earth station employing an antenna conforming to the patterns specified in Sections 25.209(a) and (b). O3b's proposed operations are consistent with this provision. O3b is not seeking interference protection for these maritime earth station terminals vis-à-vis transmissions from GSO FSS space stations, and O3b is not seeking interference protection for these maritime earth station terminals vis-à-vis transmissions from NGSO FSS space stations, should there be any in the future, beyond that provided by the antenna mask of Sections 25.209(a) and (b).

The maritime earth stations will employ a tracking algorithm that is resistant to capturing and tracking adjacent satellite signals, and will be capable of inhibiting its own transmission in the event it detects unintended satellite tracking.

The maritime earth stations will be monitored and controlled by a ground-based network control and monitoring center. Such stations will be able to receive "enable transmission" and "disable transmission" commands from the network control center and will cease transmission immediately after receiving a "parameter change" command until receiving an "enable transmission" command from the network control center. The network control center will monitor operation of each earth station to determine if it is malfunctioning, and each maritime earth station will self-monitor and automatically cease transmission within 100 milliseconds of detecting an operational fault that could cause harmful interference.

O3b will maintain the following records for each of the maritime earth stations: a record of the ship location (*i.e.*, latitude and longitude), transmit frequency, channel bandwidth, and satellite used. These records will be time annotated and maintained for a period of not less than one year. Records will be obtained at time intervals of no greater than every 20 minutes while the earth station is transmitting. O3b will make this data available on request to a coordinator, fixed system operator, fixed satellite system operator, or the Commission within 24 hours of the request.

Additional technical characteristics of the Thirty-Ship Waiver terminals are also provided in the accompanying FCC Form 312 Schedule B.

A radiation hazard study report for the Thirty-Ship Waiver antennas is provided as Annex 3.

A.7 Interference Protection for GSO Networks

The internationally recognized standard for interference protection of GSO satellite networks from NGSO satellite systems is quantified in Article 22 of the ITU Radio Regulations.⁹ Specifically,

⁹ In the existing FCC rules there are no defined levels of interference protection for non-GSO satellite systems into GSO satellite networks operating in the Ka-band. Nevertheless, O3b believes that the levels of interference

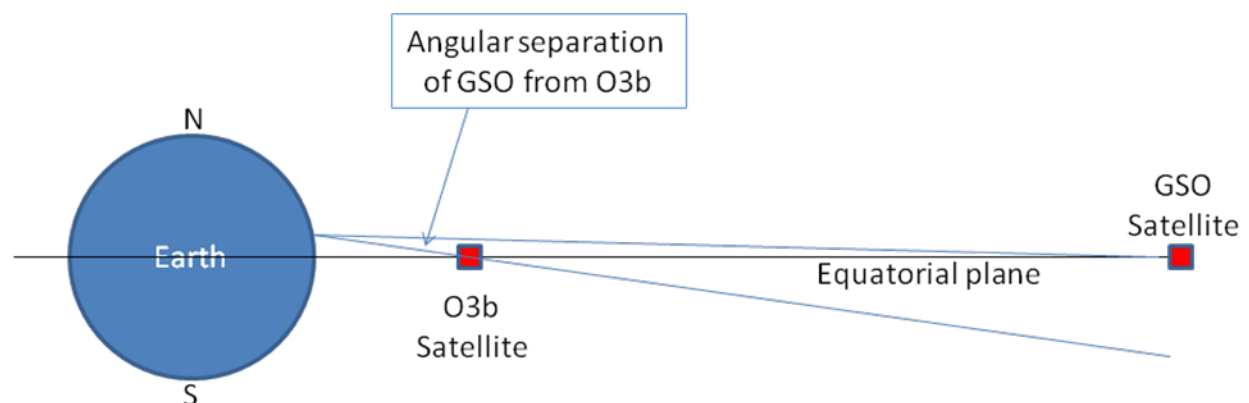
No. 22.5C defines Equivalent Power Flux Density (“EPFD”) limits for the downlink transmissions from an NGSO satellite system in certain frequency ranges that must be met in order to avoid unacceptable interference to GSO satellite networks. Similarly, No. 22.5D defines corresponding EPFD limits applicable to the uplinks from an NGSO satellite system. The frequency ranges where these EPFD limits apply, and in which O3b operates, are:

- Uplink: 27.6-28.4 GHz
- Downlink: 17.8-18.6 GHz

The frequency ranges used for the Thirty-Ship Waiver service fall within the above mentioned frequency ranges where EPFD limits apply.

Compliance with the EPFD limits for the Thirty-Ship Waiver service is demonstrated as follows. These maritime earth station terminals will not operate at latitudes south of 13°N, and will operate at these latitudes at sufficiently low satellite downlink PFD and transmit maritime earth station terminal PSD that compliance with the EPFD limits is assured. Operation at no less than this minimum latitude ensures a certain separation angle between the GSO and O3b orbits as viewed from the earth stations thereby preventing unacceptable uplink interference to GSO satellites. This angular separation effect as a function of latitude is illustrated in Figure A.7-1 below where the off-axis angle, θ , becomes larger as the latitude of the Earth location increases (either North or South of the equator):

Figure A.7-1: Inherent angular separation geometry of the O3b orbit relative to the GSO orbit for earth locations away from the equator



protection being proposed here, which are consistent with the EPFD limits in the ITU Radio Regulations, should be sufficient to ensure there is no unacceptable interference into GSO satellite networks.

This inherent angular separation also protects the O3b system from interference from GSO satellite networks at latitudes away from the equator.

For the particular case of the minimum latitude used for the Thirty-Ship Waiver service, which is 13°, the minimum separation angle θ , as viewed from the surface of the Earth, varies from 5.0° to 7.5° depending on the difference in longitude between that Earth location and the O3b satellite or the GSO satellite. The lower value (5.0°) applies to the case where either the O3b satellite or the GSO satellite is at a low elevation angle (10°) as viewed from the Earth location where the EPFD is being assessed.¹⁰ The higher value (7.5°) applies when either the O3b satellite or the GSO satellite is at the highest elevation angle (e.g., 80°, in the case of the GSO) as viewed from the Earth location. The analyses presented below of the EPFD levels resulting from the operation of the Thirty-Ship Waiver service assume the worst-case minimum separation angle of 5.0° corresponding to the low elevation situation. This separation angle applies to both the off-axis angle for the transmitting Thirty-Ship Waiver terminal towards the GSO orbit as well as the off-axis angle of a GSO receiving earth station towards the O3b orbit.

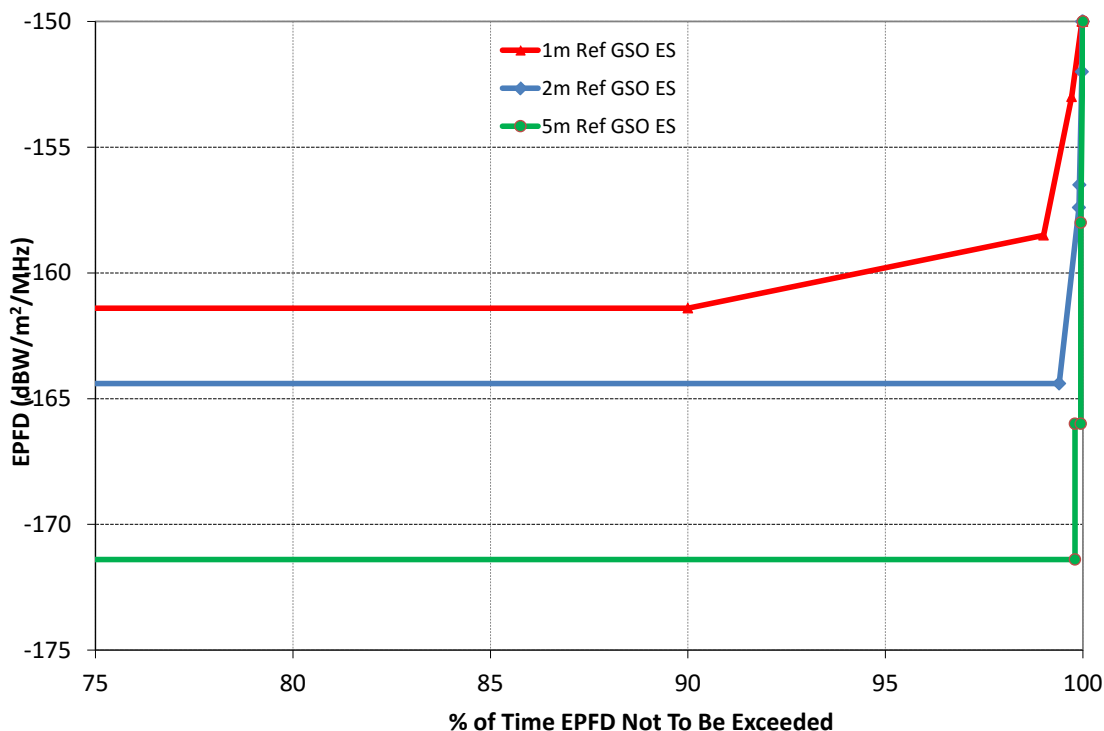
A.7.1 Compliance with EPFD↓ Limits

The downlink EPFD limits (“EPFD↓”) are defined in terms of various EPFD levels that must not be exceeded for certain percentages of time – they are in essence statistical limits. These masks permit higher levels of EPFD↓ for shorter periods of time. The EPFD↓ limits that apply to the 17.8-18.6 GHz band are plotted in Figure A.7-2 below.¹¹ They consist of three different EPFD↓ masks, each of which applies to a particular reference GSO earth station antenna size: 1 meter, 2 meters and 5 meters.

¹⁰ It is exceedingly unlikely that a GSO satellite would be providing Ka-band service at such a low elevation angle as 10° for these low latitude regions. For example, for a GSO satellite to be at an elevation angle of 10° or lower would require the corresponding GSO satellite to be located east of 10°E (i.e., well over Europe) or to the west of 130°W (i.e., well into the Pacific region). Ka-band service from such extreme satellite positions is unlikely.

¹¹ See Table 22-1B in Article 22.5C of the ITU Radio Regulations. The EPFD↓ values not to be exceeded for lower percentages of time are the same as the values shown in Figure A.7-2 for 75% of the time.

Figure A.7-2: EPFD↓ limits applicable to the 17.8-18.6 GHz band



In order to fully evaluate the statistics of the EPFD↓ resulting from the Thirty-Ship Waiver operation, a time domain simulation would be required. However, absolute compliance with these statistical limits can also be demonstrated using a much simpler worst-case analysis approach. This has the advantage that the results can more easily be replicated by others without having to resort to time domain simulation software. This simplified worst-case approach does not involve any approximation and it can be used to demonstrate compliance with the EPFD↓ limits with 100% certainty.

The simplified approach is to calculate the worst case EPFD↓ levels produced by the Thirty-Ship Waiver Request for the three sizes of reference antenna that are required in the definition of the EPFD↓ limits, and compare them to the most stringent long term values from the EPFD↓ masks (i.e., -161.4 dBW/m²/MHz for the 1 meter reference antenna, -164.4 dBW/m²/MHz for the 2 meter reference antenna, and -171.4 dBW/m²/MHz for the 5 meter reference antenna). This will ensure that the actual EPFD↓ always falls below all applicable EPFD↓ limits.

Table A.7-1 below presents the results using this approach. The maximum O3b satellite downlink EIRP level that will be used for the Thirty-Ship Waiver service is 45.5 dBW per 216 MHz

channel.¹² The path length and hence spreading loss from the O3b satellite to the GSO receiving earth station is based on the 10 degree elevation angle assumed for the GSO receiving earth station.¹³ The resulting PFD at the Earth's surface is then converted to EPFD↓ using the off-axis discrimination of the GSO receiving antenna prescribed in ITU-R Recommendation S.1428.1. The resulting worst-case EPFD↓ levels all fall below the most stringent EPFD↓ levels from the three masks with margins ranging from 0.93 dB to 5.6 dB. In practice the actual EPFD↓ levels will fall below the EPFD↓ masks by more than these margins because of the worst-case nature of this analysis approach.

**Table A.7-1: Calculation of worst-case EPFD↓ levels
produced by the Thirty-Ship Waiver service**

GSO Reference Earth Station Antenna Diameter			Units	Comments
1m	2m	5m		
45.5	45.5	45.5	dBW	Maximum O3b satellite EIRP used for this service
216	216	216	MHz	Occupied carrier bandwidth
22.16	22.16	22.16	dBW/MHz	Maximum O3b satellite EIRP density
152.5	152.5	152.5	dB	Spreading loss from O3b satellite to Earth's surface (for 10° minimum elevation)
-130.3	-130.3	-130.3	dBW/m ² /MHz	Resulting maximum PFD at Earth's surface
43.50	50.22	58.18	dBi	Peak Gain of GSO Ref ES for EPFD assessment
5.0	5.0	5.0	deg	Minimum off-axis angle at 13°N latitude (for 10° minimum elevation)
11.52	11.52	11.52	dBi	Off-axis gain of GSO Ref ES based on ITU Recommendation S.1428-1
31.98	38.70	46.66	dBi	Off-axis discrimination of GSO Ref ES
-162.33	-169.05	-177.00	dBW/m ² /MHz	Maximum EPFD↓ due to O3b satellite downlink
-161.4	-164.4	-171.4	dBW/m ² /MHz	Most stringent EPFD↓ limit
0.93	4.65	5.60	dB	Margin to most stringent EPFD↓ limit

A.7.2 Compliance with EPFD↑ Limits

The uplink EPFD limits (“EPFD↑”) in the ITU Radio Regulations are defined in a simpler manner than the EPFD↓ limits as they are not statistical in nature – instead a level of aggregate EPFD↑ is stated which must never be exceeded. The EPFD↑ limit that applies to the 27.5-28.6 GHz band is given as an aggregate PFD level of -162 dBW/m²/40kHz at the GSO.¹⁴ The aggregate nature of

¹² This value is below the maximum value given in the Schedule S for the O3b satellite system.

¹³ This is the worst-case situation because it gives rise to the smallest off-axis angle for the given latitude of the earth station. For higher elevation angles, the reduced path length is more than offset by the increased off-axis angle.

¹⁴ See Table 22-2 in Article 22.5D of the ITU Radio Regulations.

the EPFD $\uparrow$ limit is taken into account by defining a reference GSO satellite receive beam that can be pointed to any part of the visible Earth's surface.¹⁵

Table A.7-2 below presents the single-entry EPFD $\uparrow$ results for the transmissions from the Thirty-Ship Waiver terminal. The maximum maritime earth station terminal transmit EIRP level that will be used for the Thirty-Ship maritime earth station Waiver service is 67.9 dBW.¹⁶ This maximum level will only be used under rain-fade conditions using the uplink power control ("UPC") system in the maritime earth station terminal. Under clear-sky conditions the maximum uplink EIRP level will be up to 6 dB less than this maximum value (i.e., equivalent of 61.9 dBW in a 24 MHz bandwidth, which is the minimum bandwidth used for these transmissions). This clear-sky level is used for the EPFD $\uparrow$ calculation below because the UPC will not increase the interference to the closest GSO satellite because the rain attenuation that causes the UPC to increase the transmit power level will also attenuate the interfering signal to the GSO satellite.

In the calculation in Table A.7-2 below the PSD of the maritime earth station terminal is derived using the peak gain of the antenna and then the PFD at the GSO is calculated using the actual antenna gain at the worst-case off-axis angle of 5° and a conservative spreading loss to the GSO of 162 dB. For a single entry interferor the PFD is equal to the EPFD $\uparrow$. The resulting worst-case EPFD $\uparrow$ level falls below the EPFD $\uparrow$ limit value with a margin of 8.4 dB. This allows ample margin for any small aggregation effects taking into account the factors discussed further below in this regard.

¹⁵ The GSO satellite reference antenna applicable to the ITU's EPFD $\uparrow$ limit in the 27.5-28.6 GHz band has a -3 dB beamwidth of 1.55° and side lobes according to ITU-R Recommendation S.672-4 with the relative level of the first side lobe set to -10 dB.

¹⁶ This value is consistent with the Schedule B submitted with this application and with the Schedule S for the O3b satellite system.

**Table A.7-2: Calculation of worst-case single-entry EPFD $\uparrow$ level
produced by the transmitting Thirty-Ship Waiver terminal**

Value 2.2m Terminal	Units	Comments
67.9	dBW	Maximum ship terminal Tx EIRP (with UPC implemented under rain-fade conditions)
61.9	dBW	Maximum ship terminal Tx EIRP (clear-sky)
52.5	dBi	Ship terminal peak Tx antenna gain
9.4	dBW	Maximum ship terminal Tx power to antenna (clear-sky)
24	MHz	Occupied carrier bandwidth (minimum)
-18.4	dBW/40kHz	Maximum PSD into ship terminal antenna (clear-sky)
5.0	deg	Minimum off-axis angle at 13°N latitude (for 10° minimum elevation)
10	dBi	Off-axis gain of ship terminal antenna
162	dB	Assumed spreading loss from ship terminal to GSO orbit
-170.4	dBW/m ² /40kHz	Resulting maximum EPFD at GSO orbit from ship terminal (clear-sky or rain-fade conditions)
-162	dBW/m ² /40kHz	EPFD $\uparrow$ limit
8.4	dB	Margin to EPFD $\uparrow$ limit (single-entry)

In Table A.7-3 below we calculate the EPFD $\uparrow$ levels produced by the Vernon, TX gateway earth station, so this can also be taken into account when considering the overall aggregate EPFD $\uparrow$ levels. The starting point for this analysis is the maximum input power spectral density to the gateway earth station antenna, which is -14.9 dBW/40kHz.¹⁷ The resulting EPFD $\uparrow$ level produced by the Vernon, TX gateway is significantly less than that produced in the worst-case by a Thirty-Ship Waiver terminal operating at 13°N, because of the higher latitude (34°N) of Vernon, TX.

¹⁷ See O3b's Hawaii application, FCC File No. SES-LIC-20100723-00952, Attachment A to Narrative, Section A.10-1 of the O3b Hawaii gateway earth station application. See also O3b's Vernon, TX application, FCC File No. SES-LIC-20130124-00089, p. 6-8. The Vernon, TX gateway earth station application states that the transmission parameters are identical to those of the Hawaii gateway earth station.

Table A.7-3: Calculation of worst-case single-entry EPFD $\uparrow$ level produced by the transmitting Vernon, TX gateway earth station

Vernon GW	Units	Comments
-14.9	dBW/40kHz	Maximum PSD into Vernon, TX GW ES antenna
13.6	deg	Minimum off-axis angle at 34°N latitude (Vernon, TX) (for 10° minimum elevation to O3b)
3.7	dBi	Off-axis gain of Vernon, TX GW antenna (25.209)
162	dB	Assumed spreading loss from Vernon, TX GW to GSO orbit
-173.2	dBW/m ² /40kHz	Resulting max. EPFD at GSO orbit from Vernon, TX GW ES (clear-sky)
-162	dBW/m ² /40kHz	EPFD $\uparrow$ limit
11.2	dB	Margin to EPFD $\uparrow$ limit (single-entry)

The EPFD $\uparrow$ analysis given in Table A.7-2 above calculates the single-entry worst-case EPFD $\uparrow$ caused by a single transmitting Thirty-Ship Waiver terminal, for the 2.2m maritime terminals, and separately, in Table A.7-3, the worst-case EPFD $\uparrow$ caused by the transmitting Vernon, TX gateway earth station. These two earth stations (ship terminal and gateway) are the only ones that can transmit on the same frequency and in the same polarization to the same O3b satellite. They are also the only earth stations that could contribute significantly to the aggregate EPFD $\uparrow$ level, for the following reasons:

- The O3b satellites are spaced sufficiently far apart relative to the minimum angular spacing assumed from the GSO (which is 5°) that the EPFD $\uparrow$ level will be dominated by the transmissions to a single O3b satellite.
- There is no spatial frequency re-use between multiple users (i.e., maritime earth stations, etc.) within a single O3b satellite. This means that different maritime earth station terminals, even on different ships that may be close to or geographically remote from each other, will not be transmitting at the same frequency and in the same polarization to the same O3b satellite.
- Spatial frequency re-use on the same O3b satellite occurs only between the user beam/terminal and the gateway beam/station.

Therefore, a very worst-case analysis is to derive the aggregate EPFD $\uparrow$ level by adding the worst-case EPFD $\uparrow$ contributions from the Thirty-Ship Waiver maritime terminal to that of the Vernon, TX gateway. This would result in an aggregate EPFD $\uparrow$ level of -168.5 dBW/m²/40kHz. The resulting margin relative to the aggregate EPFD $\uparrow$ limit (-162 dBW/m²/40kHz) is still 6.5 dB. This analysis assumes the beam peak of the GSO reference antenna beam is pointed simultaneously

towards both of these transmitting earth stations, while they are transmitting on the same frequency and same polarization, which cannot in fact be the case for the reasons mentioned above. Therefore compliance with the EPFD_↑ limits is assured.

A.7.3 Compliance with EPFD_{is} Limits

The EPFD_(is) limits in Article 22.5F of the ITU Radio Regulations are intended to protect frequency ranges that are allocated bi-directionally (i.e., for both uplinks and downlink) in the ITU Radio Regulations. In Ka-band, such allocations exist in the 17.8-18.4 GHz band, where a receiving satellite might experience interference from the unintended emissions of a transmitting satellite. O3b's compliance with the EPFD_(is) limits in Article 22.5F of the ITU Radio Regulations was demonstrated in its Petition for Declaratory Ruling, which is hereby incorporated by reference.¹⁸ The analysis presented there showed compliance when the maximum O3b satellite EIRP density levels are significantly higher than those proposed in this application.

A.8 Protection of US Terrestrial Licensees

As explained below, O3b is able to avoid harmful interference to FS stations in the frequencies for which O3b herein seeks a waiver.

A.8.1 Terrestrial Licensees in the 17.8-18.3 GHz Band

This frequency band is allocated on a primary basis to FS, and there is no secondary allocation for NGSO FSS in the band.

O3b's proposed non-conforming use of the 17.8-18.3 GHz frequency band for downlink operations will not cause harmful interference to FS operations in the same band. O3b's downlink transmissions present no issue for these FS stations, because O3b complies with all applicable FCC and ITU downlink Power Flux Density limits. These limits are prescribed by the ITU for the protection of terrestrial services in this band. In addition, as a non-conforming user, O3b will accept interference from FS operations in the band.

A.8.2 Terrestrial Licensees in the 27.6-28.35 GHz Band

The 27.6-28.35 GHz uplink band is allocated to the LMDS on a primary basis. FSS operations are allocated on a secondary basis in the same band. Accordingly, O3b's proposed operations in this band must not cause harmful interference to primary LMDS stations.

¹⁸ See Petition for Declaratory Ruling of O3b Limited, October 29, 2014, Annex 2.

The Comsearch coordination reports in Annex 5 demonstrate that O3b can operate its maritime earth station terminals on a secondary basis in this band at the ports along the U.S. east coast, at the ports in the Gulf of Mexico, and in the waters surrounding Puerto Rico and the U.S. Virgin Islands, without causing harmful interference to LMDS licensees. Comsearch sent a coordination notice to all existing and proposed terrestrial licensees in the band that are within applicable coordination distances.

Only one response was received from any of the incumbent licensees. O3b is coordinating with this licensee to ensure that its operations suffer no harmful interference as a result of O3b maritime operations. Once coordination with this operator is complete, which is expected imminently, O3b will file the outstanding Comsearch reports with the Commission. This is consistent with the Commission's rules as O3b expects to complete coordination shortly after submitting this application.

Because there will be no interference to LMDS stations from operations in the U.S. east coast and Gulf of Mexico ports mentioned above (and in Annex 5), there should be no interference to LMDS while the ships are in-route between these ports, either. The relevant factors here are the following:

1. The substantial distance from the ship in-route to the coastline, which in many cases is beyond the horizon;
2. The pointing direction of the maritime terminal antenna.

Distance to LMDS Receiver

Figure A.8.2-1 below shows the true GPS coordinates of an O3b maritime customer vessel during an April 2015 voyage along the U.S. east coast, which is typical of the route that these vessels take. The vessel travelled from the Port at Cape Liberty in New Jersey to Port Canaveral in Florida before continuing on to Caribbean ports further from the U.S. east coast.

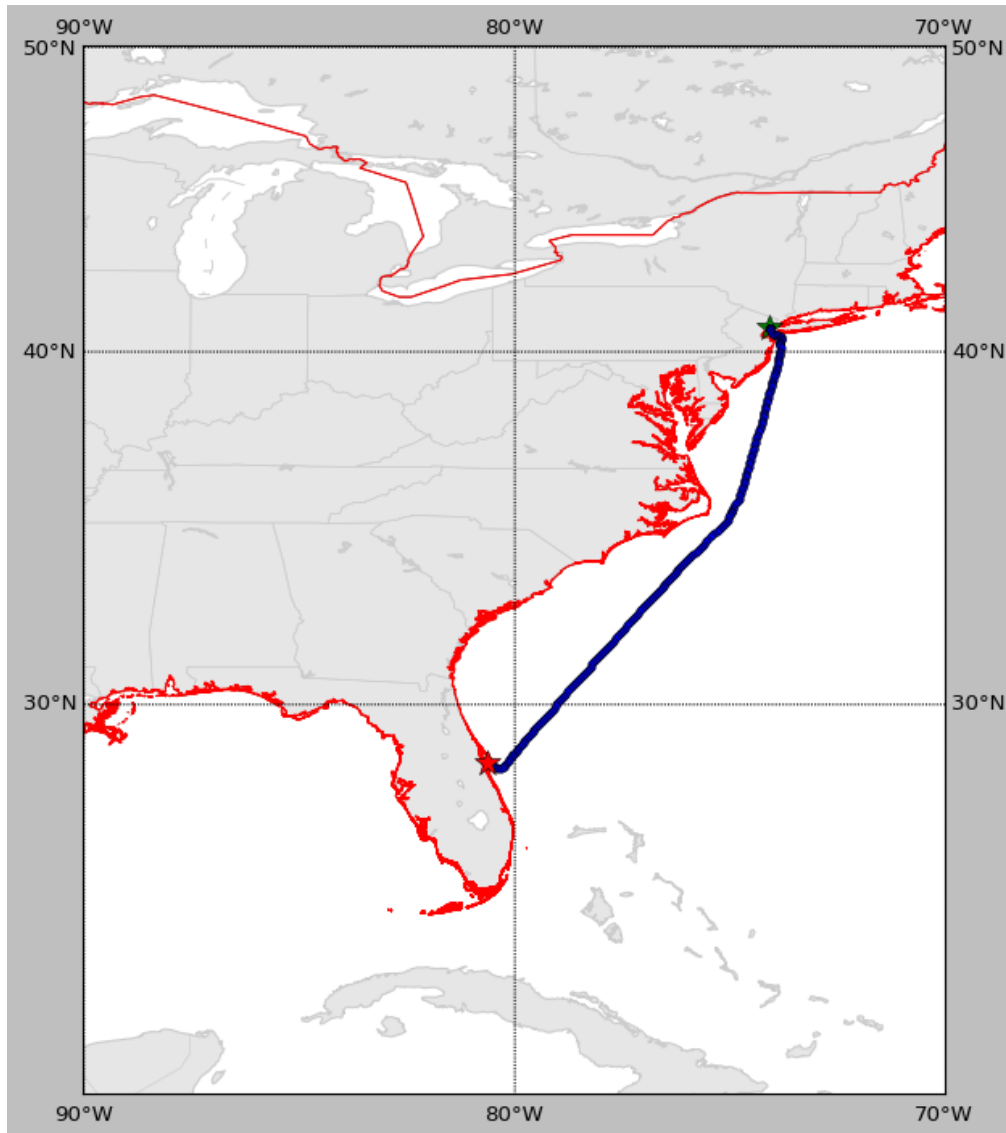


Figure A.8.2-1. Vessel voyage from Port at Cape Liberty (New Jersey) to Port Canaveral (Florida)

Using U.S. coastline data, the closest distance to the U.S. coast was calculated at every point during the vessel's trip. Aside from the departure from Cape Liberty, including the surrounding NY and NJ area, and the approach to Port Canaveral, the vessel was never closer than 46.88 km from the U.S. coast, as shown in Figure A.8.2-2 below.

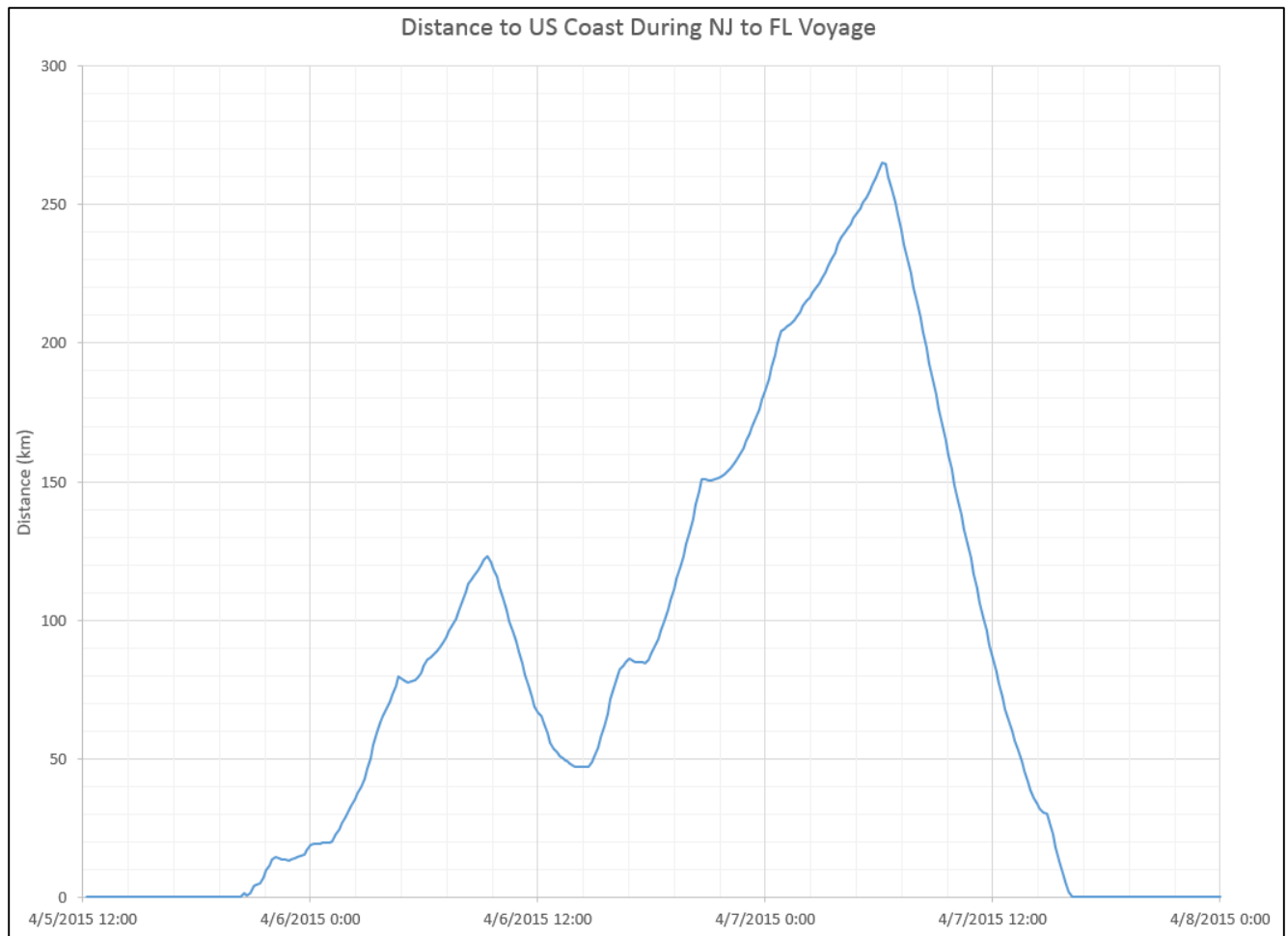


Figure A.8.2-2. Closest Distance to US coastline During Sample Maritime Voyage in April 2015

The distance to the horizon (in km) from an observer close to the Earth's surface can be approximated by the equation:

$$d = 3.57 \cdot \sqrt{h}$$

where h is the height above ground level in meters.

Using this equation, the distance to the horizon from the top of a representative O3b maritime customer vessel ship is about 19.6 km, based on the O3b terminal being 30 meters above sea level. Assuming a victim LMDS receiver was also 30 meters (approximately 100 ft) above sea level then its horizon distance would also be 19.6 km. This means there is a line of sight between an O3b ship terminal and an LMDS terminal at the same height above sea level only up to a distance of $2 \times 19.6 \text{ km} = 39.2 \text{ km}$. Beyond this distance the line between these two points is obstructed by the Earth. This simplistic assessment does not rule out the possibility of interference occurring,

particularly if the LMDS receiver is located at higher than 100 ft above sea level. However, it puts in perspective the distance data shown in Figure A.8.2-2 above.

Direction of LMDS Receiver relative to Ship Terminal Pointing Direction

Given that the O3b satellites operate in an equatorial orbit, the antennas on board a customer's ship in the northern hemisphere will almost always be pointing generally in a southerly direction. The further north the ship is located the more the ship terminal points towards the south. For example, at 35°N the range of azimuth angles the ship terminal will point to are approximately 60° either side of due south. With this in mind it can be seen from Figure A.8.2-1 above that the ship terminal will almost always be pointing several tens of degrees away in azimuth from the nearest point on the US coastline and this will provide significant angular discrimination which will protect the LMDS receivers that are the most closely spaced from the ship. The exception to this is as the ship approaches the port in Florida, but that situation has been addressed by the Comsearch coordination activities.

The pointing direction of the ship terminal also plays a role in mitigating potential interference issues for O3b maritime operations in the Gulf of Mexico. When ships using the O3b service are operating in the Gulf, the coastline will generally be in the near-opposite azimuth direction from where the terminal is pointing. This significantly reduces the likelihood of any interference to coastal LMDS receivers from O3b maritime terminals operating in the Gulf of Mexico.

A.9 Foreign Terrestrial Services

Downlink

The O3b system complies with all applicable FCC and ITU Power Flux Density ("PFD") limits for the satellite downlink, which are designed to protect the terrestrial Fixed Service ("FS") from downlink interference from the satellite transmissions. There may be licensed terrestrial services in these bands in other countries within or close to the area covered by this waiver request. Demonstration of O3b's compliance with the FCC Power Flux Density ("PFD") limits of §25.208(c) (which are the same as the ITU PFD limits) was provided to the Commission as part of its Petition for Declaratory Ruling, using the data provided in the O3b Schedule S. That demonstration is equally valid for the downlink transmissions to the Thirty-Ship Waiver terminals.

Uplink

When a Thirty-Ship Waiver ship is in proximity to foreign countries (e.g., in the Caribbean) there may be terrestrial fixed service stations in those countries that need to be taken into account. This matter was thoroughly addressed in O3b's Blanket Maritime Application, the relevant part of which is incorporated here by reference, and in the case of the Thirty-Ship Waiver service O3b intends to protect foreign terrestrial fixed service stations based on the same analysis and

procedures as were described in the Blanket Maritime Application, the Three-Ship Waiver Request and the Six-Ship Waiver Request.¹⁹

O3b therefore intends to operate its Thirty-Ship Waiver terminals consistent with the ITU procedures that apply to ESVs in other frequency bands.²⁰ O3b will liaise with the regulatory authorities of countries whose territory is within 100 km of the ship on which an O3b Thirty-Ship Waiver terminal is operating, and will comply with all applicable laws and regulations in those countries. O3b already is employing these procedures successfully with the maritime earth stations on several foreign-flagged ships for which the Commission has granted waivers of the Allocation Table and Ka-band Plan.²¹

This Thirty-Ship Waiver Request is limited to operations by foreign-flagged ships when the ships are located in or near U.S. waters along the U.S. east coast, in the Gulf of Mexico, and surrounding Puerto Rico and the U.S. Virgin Islands. There are only limited circumstances in which a foreign-flagged ship that is operating under the proposed waiver would need to take into account terrestrial fixed service stations that are located in other countries. Subject to two exceptions, other countries are significantly more than 100 km from the areas in or near U.S. waters that O3b proposes to serve in accordance with the Thirty-Ship Waiver Request. The first exception is the Bahamas, which is the administration that is responsible for authorizing maritime earth station operations on many of the ships that will operate under the Thirty-Ship Waiver Request. The other exception is the British Virgin Islands, which are adjacent to the U.S. Virgin Islands and associated U.S. waters. O3b has already liaised with the authorities in the British Virgin Islands concerning its maritime earth station operations on ships registered by the Bahamas. O3b will further engage authorities in the event that ships registered by other nations pass within 100 km of the Bahamas or the British Virgin Islands.

A.10 Link Budgets for the Thirty-Ship Waiver Service

New representative link budgets are provided in Annex 4 for the Thirty-Ship Waiver service.

¹⁹ See O3b's Blanket Maritime Application, FCC File No. SES-LIC-20130528-00455, Technical Narrative at Section A.10 and Annex 4; O3b's Three-Ship Waiver Request, FCC File No. SES-MS-20140318-00150, Technical Narrative at Section A.9; O3b's Six-Ship Waiver Request, FCC File No. SES-MS-20150206-00066, Technical Narrative at Section A.9. Although the previous O3b maritime authorizations did not cover the full range of frequencies requested in the Thirty-Ship Waiver service, the conclusions from the analyses were independent of the exact frequency of operation of the service and therefore apply equally to the Thirty-Ship Waiver service.

²⁰ ITU-R Recommendation 37 (WRC-03).

²¹ See O3b's Blanket Maritime Application, FCC File No. SES-LIC-20130528-00455; O3b's Three-Ship Waiver Request, FCC File No. SES-MS-20140318-00150; O3b's Six-Ship Waiver Request, FCC File No. SES-MS-20150206-00066.

A.11 Coordination with U.S. Government Satellite Networks and Earth Stations

O3b has completed all necessary ITU coordination with U.S. government satellite networks operating in Ka-band, including GSO and non-GSO, as well as their associated specific earth stations filed under 9.7A and 9.7B of the ITU Radio Regulations through other administrations. The maritime earth station terminals that are the subject of this waiver request are covered by this ITU coordination because they neither cause nor receive additional interference compared to the earth stations included in O3b's ITU filings.²² O3b has also completed coordination, according to US footnote 334 of the FCC table of frequency allocations, with the US government, and this US334 coordination agreement specifically provides for additional O3b earth stations operating in U.S. territory. Furthermore, the nature of the technical conditions agreed to in that coordination, which relate only to O3b's satellite downlink transmissions, are such that they are not affected by the location or other characteristics of the O3b transmitting earth stations. This waiver request is therefore consistent with the existing US334 coordination agreement.

²² See also Section A.6 of this waiver request for more details of the O3b maritime earth station technical characteristics.

**CERTIFICATION OF PERSON RESPONSIBLE FOR PREPARING
ENGINEERING INFORMATION**

I hereby certify that I am the technically qualified person responsible for preparation of the engineering information contained in this waiver request, that I am familiar with Part 25 of the Commission's rules, that I have either prepared or reviewed the engineering information submitted in this waiver request and that it is complete and accurate to the best of my knowledge and belief.

_____/s/____

Richard J. Barnett, PhD, BSc
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Suite 501
Silver Spring, MD 20910
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October 21, 2015

Annex 1: Thirty-Ship Waiver Terminal Manufacturer's Declaration

The following four pages provide the Thirty-Ship Waiver terminals manufacturer's declaration concerning their compliance with the FCC's off-axis EIRP density levels in §25.138 for the stated PSD level of -11.58 dBW/40kHz. Note that the maximum PSD level to be used for the Thirty-Ship Waiver service is 10.4 dB below this stated level under clear-sky conditions, and 4.4 dB below this level under rain-faded conditions where uplink power control is used, so compliance with §25.138 is assured.



DECLARATION OF ORBIT COMMUNICATION LTD

Model "AL-7103-Ka OrSat" (Ka-band)

At this stage, the analysis done is based on simulations/computations of the antenna

I, Guy Naym, Director R&D Satcom Systems, hereby declare, that the following statements are true and correct:

1. Orbit Communication Ltd. Designs, develops and manufactures marine stabilized antenna systems for satellite communications at sea.
2. The Model "AL-7103-Ka" (Ka-band) meets the shape of the off-axis EIRP spectral density mask provided for in 47 CFR Section 25.138.
3. Anyone using the Model "AL-7103-Ka" (Ka-band) antenna will comply with U.S. Federal Communications Commission (FCC) off-axis EIRP spectral density limits provided that, the transmit power density at the antenna input is kept below (-11.76 dBW/40KHz (0.067 Watts/40KHz) of occupied bandwidth (limited at 29.1 GHz by the Az. X-Pol).
4. Orbit Communication Ltd "AL-7103-Ka" (Ka-band) Marine Stabilized System will maintain a stabilization tracking accuracy of better than 0.2 degrees under specified ship motion conditions. The internal controller software continuously monitor the instantaneous antenna tracking error and will cease the Tx of the BUC within 100ms (using M&C of the BUC) if an unexpected even occurs that causes the tracking error to exceed 0.5 degrees. Transmissions will not restart until the tracking error is less than 0.2 degrees of the target satellite.

COMMUNICATION WITHOUT BOUNDARIES

Orbit Communication Ltd. RD Hatzoran St. P.O.B. 8657, Netanya 42504, Israel, Tel: +(972) 9 892 2777, Fax: +(972) 9 885 5944 www.orbit-cs.com



5. Orbit Communication Ltd maintains all relevant test & analyzed data, which is available upon request.

Executed on November 13, 2012

Guy Naym

A handwritten signature in blue ink, appearing to be "Guy Naym".

Director R&D SatCom Systems
Orbit Communication Ltd

COMMUNICATION WITHOUT BOUNDARIES

Orbit Communication Ltd. 80 Hatzoran St. P.O.B. 8657, Netanya 42504, Israel, Tel: +(972) 9 892 2777, Fax: +(972) 9 885 5944 www.orbit-cs.com

A2-3



DECLARATION OF ORBIT COMMUNICATION LTD

Model "AL-7107-Ka OrBand" (Ka-band)

(At this stage, the analysis done is based on simulations / computations of the antenna)

I, Guy Naym, Director R&D Satcom Systems, hereby declare, that the following statements are true and correct:

1. Orbit Communication Ltd. Designs, develops and manufactures marine stabilized antenna systems for satellite communications at sea.
2. The Model "AL-7107-Ka" (Ka-band) meets the shape of the off-axis EIRP spectral density mask provided for in 47 CFR Section 25.138.
3. Anyone using the Model "AL-7107-Ka" (Ka-band) antenna will comply with U.S. Federal Communications Commission (FCC) off-axis EIRP spectral density limits provided that, the transmit power density at the antenna input is kept below -11.58 dBW/40KHz (0.07 Watts/40KHz) of occupied bandwidth (limited at 29.1 GHz by Az, Co-pol).
4. Orbit Communication Ltd "AL-7107-Ka" (Ka-band) Marine Stabilized System will maintain a stabilization tracking accuracy of better than 0.2 degrees under specified ship motion conditions. The internal controller software continuously monitor the instantaneous antenna tracking error and will cease the Tx of the BUC within 100ms (using M&C of the BUC) if an unexpected even occurs that causes the tracking error to exceed 0.5 degrees. Transmissions will not restart until the tracking error is less than 0.2 degrees of the target satellite.



5. Orbit Communication Ltd maintains all relevant test & analyzed data, which is available upon request.

Executed on December 13, 2012

Guy Naym

A handwritten signature in blue ink, appearing to be "Guy Naym", written over a faint horizontal line.

Director R&D SatCom Systems
Orbit Communication Ltd

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Annex 2: Thirty-Ship Waiver Terminal Transmit Antenna Gain Data

(see following 90 pages)

Orbit Communication Systems Ltd.
AL-7107-Ka, 2.15 m Antenna, Pattern Data Table
Co-pol Azimuth LHCP, -180° to +180° @ 1.0° increment

27.55 GHz Antenna Pattern in Co-pol Az LHCP

Angle	Gain	Mask	Over Mask
Degrees	dBi	dBi	dB
-179.0	-20.9	0.0	-20.9
-178.0	-26.7	0.0	-26.7
-177.0	-26.5	0.0	-26.5
-176.0	-18.2	0.0	-18.2
-175.0	-20.9	0.0	-20.9
-174.0	-21.1	0.0	-21.1
-173.0	-23.3	0.0	-23.3
-172.0	-25.7	0.0	-25.7
-171.0	-22.9	0.0	-22.9
-170.0	-24.2	0.0	-24.2
-169.0	-22.5	0.0	-22.5
-168.0	-21.9	0.0	-21.9
-167.0	-27.9	0.0	-27.9
-166.0	-26.2	0.0	-26.2
-165.0	-19.5	0.0	-19.5
-164.0	-18.2	0.0	-18.2
-163.0	-21.6	0.0	-21.6
-162.0	-27.5	0.0	-27.5
-161.0	-25.5	0.0	-25.5
-160.0	-24.3	0.0	-24.3
-159.0	-17.4	0.0	-17.4
-158.0	-20.6	0.0	-20.6
-157.0	-18.7	0.0	-18.7
-156.0	-17.8	0.0	-17.8
-155.0	-26.4	0.0	-26.4
-154.0	-17.1	0.0	-17.1
-153.0	-22.6	0.0	-22.6
-152.0	-19.3	0.0	-19.3
-151.0	-14.8	0.0	-14.8
-150.0	-18.1	0.0	-18.1
-149.0	-16.6	0.0	-16.6
-148.0	-22.1	0.0	-22.1
-147.0	-24.1	0.0	-24.1
-146.0	-15.1	0.0	-15.1
-145.0	-18.9	0.0	-18.9
-144.0	-16.7	0.0	-16.7
-143.0	-14.5	0.0	-14.5
-142.0	-14.8	0.0	-14.8
-141.0	-14.2	0.0	-14.2
-140.0	-19.3	0.0	-19.3
-139.0	-16.6	0.0	-16.6
-138.0	-13.8	0.0	-13.8
-137.0	-24.9	0.0	-24.9
-136.0	-17.6	0.0	-17.6
-135.0	-15.6	0.0	-15.6
-134.0	-19.6	0.0	-19.6
-133.0	-19.4	0.0	-19.4
-132.0	-17.1	0.0	-17.1
-131.0	-18.8	0.0	-18.8
-130.0	-18.5	0.0	-18.5
-129.0	-14.9	0.0	-14.9
-128.0	-16.7	0.0	-16.7
-127.0	-21.7	0.0	-21.7
-126.0	-16.7	0.0	-16.7
-125.0	-15.8	0.0	-15.8
-124.0	-15.7	0.0	-15.7
-123.0	-19.9	0.0	-19.9
-122.0	-19.6	0.0	-19.6
-121.0	-17.4	0.0	-17.4
-120.0	-21.6	0.0	-21.6

27.55 GHz Antenna Pattern in Co-pol Az LHCP

Angle	Gain	Mask	Over Mask
Degrees	dBi	dBi	dB
0.0	52.1		
1.0	17.2		
2.0	11.5	21.5	-10.0
3.0	3.6	17.1	-13.4
4.0	5.9	13.9	-8.1
5.0	-2.8	11.5	-14.3
6.0	-0.4	9.5	-10.0
7.0	3.3	7.9	-4.6
8.0	-2.5	8.0	-10.5
9.0	-5.5	8.0	-13.5
10.0	-13.8	7.0	-20.8
11.0	-7.5	6.0	-13.4
12.0	-4.9	5.0	-10.0
13.0	-15.4	4.2	-19.5
14.0	-9.2	3.3	-12.6
15.0	-5.3	2.6	-7.9
16.0	-7.2	1.9	-9.1
17.0	-7.2	1.2	-8.4
18.0	-6.8	0.6	-7.4
19.0	-5.7	0.0	-5.7
20.0	-23.1	-0.5	-22.6
21.0	-16.5	-1.1	-15.4
22.0	-6.1	-1.6	-4.5
23.0	-7.9	-2.0	-5.8
24.0	-10.1	-2.5	-7.6
25.0	-11.5	-2.9	-8.6
26.0	-12.1	-3.4	-8.7
27.0	-12.1	-3.8	-8.3
28.0	-11.4	-4.2	-7.2
29.0	-6.3	-4.6	-1.8
30.0	-6.5	-4.9	-1.6
31.0	-5.2	-5.3	0.1
32.0	-4.3	-5.6	1.4
33.0	-5.8	-6.0	0.2
34.0	-3.4	-6.3	2.9
35.0	-4.9	-6.6	1.7
36.0	-2.9	-6.9	4.0
37.0	-3.0	-7.2	4.2
38.0	-6.1	-7.5	1.4
39.0	-5.1	-7.8	2.7
40.0	-7.4	-8.1	0.7
41.0	-8.9	-8.3	-0.5
42.0	-9.3	-8.6	-0.7
43.0	-12.5	-8.8	-3.7
44.0	-10.4	-9.1	-1.3
45.0	-11.0	-9.3	-1.7
46.0	-5.2	-9.6	4.4
47.0	-9.5	-9.8	0.3
48.0	-8.9	-10.0	1.2
49.0	-13.7	-10.0	-3.7
50.0	-14.0	-10.0	-4.0
51.0	-9.4	-10.0	0.6
52.0	-7.4	-10.0	2.6
53.0	-7.9	-10.0	2.1
54.0	-8.9	-10.0	1.1
55.0	-13.3	-10.0	-3.3
56.0	-14.7	-10.0	-4.7
57.0	-11.3	-10.0	-1.3
58.0	-11.6	-10.0	-1.6
59.0	-11.8	-10.0	-1.8

Orbit Communication Systems Ltd.
AL-7107-Ka, 2.15 m Antenna, Pattern Data Table
Co-pol Azimuth LHCP, -180° to +180° @ 1.0° increment

-119.0	-20.4	0.0	-20.4
-118.0	-26.4	0.0	-26.4
-117.0	-20.8	0.0	-20.8
-116.0	-18.3	0.0	-18.3
-115.0	-18.6	0.0	-18.6
-114.0	-20.2	0.0	-20.2
-113.0	-19.3	0.0	-19.3
-112.0	-20.9	0.0	-20.9
-111.0	-20.2	0.0	-20.2
-110.0	-19.0	0.0	-19.0
-109.0	-14.5	0.0	-14.5
-108.0	-20.8	0.0	-20.8
-107.0	-21.5	0.0	-21.5
-106.0	-19.2	0.0	-19.2
-105.0	-18.4	0.0	-18.4
-104.0	-18.0	0.0	-18.0
-103.0	-21.0	0.0	-21.0
-102.0	-24.7	0.0	-24.7
-101.0	-15.1	0.0	-15.1
-100.0	-18.9	0.0	-18.9
-99.0	-26.4	0.0	-26.4
-98.0	-14.1	0.0	-14.1
-97.0	-13.6	0.0	-13.6
-96.0	-12.9	0.0	-12.9
-95.0	-16.6	0.0	-16.6
-94.0	-17.7	0.0	-17.7
-93.0	-17.7	0.0	-17.7
-92.0	-12.0	0.0	-12.0
-91.0	-14.7	0.0	-14.7
-90.0	-16.2	0.0	-16.2
-89.0	-13.8	0.0	-13.8
-88.0	-18.2	0.0	-18.2
-87.0	-13.4	0.0	-13.4
-86.0	-12.2	0.0	-12.2
-85.0	-12.3	-10.0	-2.3
-84.0	-16.9	-10.0	-6.9
-83.0	-19.5	-10.0	-9.5
-82.0	-15.3	-10.0	-5.3
-81.0	-12.5	-10.0	-2.5
-80.0	-10.7	-10.0	-0.7
-79.0	-11.3	-10.0	-1.3
-78.0	-10.5	-10.0	-0.5
-77.0	-11.5	-10.0	-1.5
-76.0	-12.6	-10.0	-2.6
-75.0	-11.3	-10.0	-1.3
-74.0	-10.8	-10.0	-0.8
-73.0	-8.3	-10.0	1.7
-72.0	-8.2	-10.0	1.8
-71.0	-8.7	-10.0	1.3
-70.0	-7.8	-10.0	2.2
-69.0	-6.9	-10.0	3.1
-68.0	-5.8	-10.0	4.2
-67.0	-6.2	-10.0	3.8
-66.0	-5.3	-10.0	4.7
-65.0	-8.9	-10.0	1.1
-64.0	-8.1	-10.0	1.9
-63.0	-8.5	-10.0	1.5
-62.0	-9.6	-10.0	0.4
-61.0	-7.2	-10.0	2.8
-60.0	-10.1	-10.0	-0.1
-59.0	-10.8	-10.0	-0.8
-58.0	-10.1	-10.0	-0.1
-57.0	-11.1	-10.0	-1.1

60.0	-16.5	-10.0	-6.5
61.0	-17.9	-10.0	-7.9
62.0	-15.2	-10.0	-5.2
63.0	-13.0	-10.0	-3.0
64.0	-17.3	-10.0	-7.3
65.0	-19.7	-10.0	-9.7
66.0	-11.2	-10.0	-1.2
67.0	-17.3	-10.0	-7.3
68.0	-14.5	-10.0	-4.5
69.0	-14.8	-10.0	-4.8
70.0	-13.2	-10.0	-3.2
71.0	-16.2	-10.0	-6.2
72.0	-19.1	-10.0	-9.1
73.0	-13.4	-10.0	-3.4
74.0	-19.3	-10.0	-9.3
75.0	-25.5	-10.0	-15.5
76.0	-16.4	-10.0	-6.4
77.0	-16.4	-10.0	-6.4
78.0	-21.0	-10.0	-11.0
79.0	-22.0	-10.0	-12.0
80.0	-24.3	-10.0	-14.3
81.0	-20.9	-10.0	-10.9
82.0	-26.0	-10.0	-16.0
83.0	-18.1	-10.0	-8.1
84.0	-24.0	-10.0	-14.0
85.0	-25.7	-10.0	-15.7
86.0	-21.1	0.0	-21.1
87.0	-22.6	0.0	-22.6
88.0	-19.0	0.0	-19.0
89.0	-20.0	0.0	-20.0
90.0	-23.1	0.0	-23.1
91.0	-20.8	0.0	-20.8
92.0	-21.3	0.0	-21.3
93.0	-19.9	0.0	-19.9
94.0	-22.3	0.0	-22.3
95.0	-23.9	0.0	-23.9
96.0	-25.8	0.0	-25.8
97.0	-26.1	0.0	-26.1
98.0	-19.2	0.0	-19.2
99.0	-25.3	0.0	-25.3
100.0	-17.6	0.0	-17.6
101.0	-17.5	0.0	-17.5
102.0	-24.6	0.0	-24.6
103.0	-27.6	0.0	-27.6
104.0	-27.9	0.0	-27.9
105.0	-20.0	0.0	-20.0
106.0	-23.9	0.0	-23.9
107.0	-25.1	0.0	-25.1
108.0	-21.1	0.0	-21.1
109.0	-21.3	0.0	-21.3
110.0	-27.9	0.0	-27.9
111.0	-21.3	0.0	-21.3
112.0	-22.8	0.0	-22.8
113.0	-15.5	0.0	-15.5
114.0	-21.9	0.0	-21.9
115.0	-20.5	0.0	-20.5
116.0	-18.7	0.0	-18.7
117.0	-18.2	0.0	-18.2
118.0	-21.3	0.0	-21.3
119.0	-16.7	0.0	-16.7
120.0	-27.9	0.0	-27.9
121.0	-21.5	0.0	-21.5
122.0	-17.6	0.0	-17.6

Orbit Communication Systems Ltd.
AL-7107-Ka, 2.15 m Antenna, Pattern Data Table
Co-pol Azimuth LHCP, -180° to +180° @ 1.0° increment

-56.0	-9.1	-10.0	0.9
-55.0	-13.6	-10.0	-3.6
-54.0	-11.4	-10.0	-1.4
-53.0	-14.3	-10.0	-4.3
-52.0	-13.3	-10.0	-3.3
-51.0	-18.3	-10.0	-8.3
-50.0	-12.7	-10.0	-2.7
-49.0	-15.6	-10.0	-5.6
-48.0	-15.3	-10.0	-5.3
-47.0	-19.3	-9.8	-9.5
-46.0	-13.8	-9.6	-4.2
-45.0	-17.5	-9.3	-8.1
-44.0	-23.2	-9.1	-14.1
-43.0	-22.2	-8.8	-13.4
-42.0	-22.2	-8.6	-13.6
-41.0	-20.6	-8.3	-12.3
-40.0	-15.6	-8.1	-7.6
-39.0	-22.7	-7.8	-14.9
-38.0	-16.5	-7.5	-9.0
-37.0	-15.8	-7.2	-8.6
-36.0	-19.3	-6.9	-12.3
-35.0	-18.5	-6.6	-11.9
-34.0	-22.3	-6.3	-16.0
-33.0	-20.6	-6.0	-14.7
-32.0	-23.6	-5.6	-18.0
-31.0	-18.1	-5.3	-12.9
-30.0	-15.0	-4.9	-10.1
-29.0	-18.0	-4.6	-13.4
-28.0	-16.6	-4.2	-12.4
-27.0	-17.3	-3.8	-13.5
-26.0	-17.3	-3.4	-13.9
-25.0	-20.0	-2.9	-17.0
-24.0	-17.3	-2.5	-14.8
-23.0	-15.7	-2.0	-13.7
-22.0	-15.4	-1.6	-13.8
-21.0	-16.3	-1.1	-15.2
-20.0	-18.9	-0.5	-18.4
-19.0	-12.6	0.0	-12.7
-18.0	-18.1	0.6	-18.7
-17.0	-14.3	1.2	-15.5
-16.0	-17.5	1.9	-19.4
-15.0	-17.7	2.6	-20.3
-14.0	-25.8	3.3	-29.1
-13.0	-6.8	4.2	-11.0
-12.0	-4.1	5.0	-9.2
-11.0	-7.6	6.0	-13.6
-10.0	-5.5	7.0	-12.5
-9.0	-3.5	8.0	-11.5
-8.0	-4.1	8.0	-12.1
-7.0	1.8	7.9	-6.1
-6.0	-10.6	9.5	-20.2
-5.0	2.7	11.5	-8.9
-4.0	5.3	13.9	-8.7
-3.0	8.9	17.1	-8.2
-2.0	11.7	21.5	-9.8
-1.0	21.0		
0.0	52.1		

123.0	-20.4	0.0	-20.4
124.0	-21.7	0.0	-21.7
125.0	-25.7	0.0	-25.7
126.0	-24.9	0.0	-24.9
127.0	-19.6	0.0	-19.6
128.0	-27.9	0.0	-27.9
129.0	-25.8	0.0	-25.8
130.0	-22.0	0.0	-22.0
131.0	-20.6	0.0	-20.6
132.0	-21.8	0.0	-21.8
133.0	-24.8	0.0	-24.8
134.0	-23.8	0.0	-23.8
135.0	-23.4	0.0	-23.4
136.0	-23.1	0.0	-23.1
137.0	-21.8	0.0	-21.8
138.0	-19.0	0.0	-19.0
139.0	-23.1	0.0	-23.1
140.0	-23.6	0.0	-23.6
141.0	-21.1	0.0	-21.1
142.0	-26.3	0.0	-26.3
143.0	-18.5	0.0	-18.5
144.0	-27.9	0.0	-27.9
145.0	-21.1	0.0	-21.1
146.0	-23.5	0.0	-23.5
147.0	-19.7	0.0	-19.7
148.0	-24.1	0.0	-24.1
149.0	-23.3	0.0	-23.3
150.0	-22.0	0.0	-22.0
151.0	-27.9	0.0	-27.9
152.0	-23.3	0.0	-23.3
153.0	-21.9	0.0	-21.9
154.0	-23.1	0.0	-23.1
155.0	-17.8	0.0	-17.8
156.0	-27.9	0.0	-27.9
157.0	-27.0	0.0	-27.0
158.0	-23.3	0.0	-23.3
159.0	-27.2	0.0	-27.2
160.0	-14.9	0.0	-14.9
161.0	-22.5	0.0	-22.5
162.0	-22.3	0.0	-22.3
163.0	-19.8	0.0	-19.8
164.0	-16.6	0.0	-16.6
165.0	-20.0	0.0	-20.0
166.0	-22.5	0.0	-22.5
167.0	-21.2	0.0	-21.2
168.0	-24.4	0.0	-24.4
169.0	-27.3	0.0	-27.3
170.0	-20.9	0.0	-20.9
171.0	-21.2	0.0	-21.2
172.0	-27.9	0.0	-27.9
173.0	-20.3	0.0	-20.3
174.0	-19.1	0.0	-19.1
175.0	-27.9	0.0	-27.9
176.0	-24.3	0.0	-24.3
177.0	-20.9	0.0	-20.9
178.0	-24.6	0.0	-24.6
179.0	-19.3	0.0	-19.3

Orbit Communication Systems Ltd.

AL AL-7107-Ka, 2.15 m Antenna, Pattern Data Table
Co-pol Azimuth LHCP, -10° to +10° @ 0.1° increment

27.55 GHz Antenna Pattern in Co-pol Az LHCP

Angle	Gain	Mask	Over Mask
Degrees	dBi	dBi	dB
-10.0	-5.5	7.0	-12.5
-9.9	-2.7	7.1	-9.8
-9.8	-1.9	7.2	-9.1
-9.7	-2.3	7.3	-9.6
-9.6	-3.4	7.4	-10.9
-9.5	-7.4	7.6	-15.0
-9.4	-12.0	7.7	-19.7
-9.3	-7.2	7.8	-14.9
-9.2	-3.0	8.0	-11.0
-9.1	-2.7	8.0	-10.7
-9.0	-3.5	8.0	-11.5
-8.9	-5.9	8.0	-13.9
-8.8	-4.3	8.0	-12.3
-8.7	-2.8	8.0	-10.8
-8.6	-2.5	8.0	-10.5
-8.5	-4.0	8.0	-12.0
-8.4	-6.4	8.0	-14.4
-8.3	-5.4	8.0	-13.4
-8.2	-2.3	8.0	-10.3
-8.1	-0.7	8.0	-8.7
-8.0	-4.1	8.0	-12.1
-7.9	-13.6	8.0	-21.6
-7.8	-11.4	8.0	-19.4
-7.7	-5.4	8.0	-13.4
-7.6	-3.3	8.0	-11.3
-7.5	-2.8	8.0	-10.8
-7.4	-5.8	8.0	-13.8
-7.3	-0.4	8.0	-8.4
-7.2	2.1	8.0	-5.9
-7.1	2.3	8.0	-5.7
-7.0	1.8	7.9	-6.1
-6.9	3.5	8.0	-4.6
-6.8	4.7	8.2	-3.5
-6.7	4.0	8.3	-4.4
-6.6	3.5	8.5	-5.0
-6.5	2.0	8.7	-6.7
-6.4	-2.2	8.8	-11.1
-6.3	-8.2	9.0	-17.2
-6.2	-3.4	9.2	-12.6
-6.1	-2.3	9.4	-11.7
-6.0	-10.6	9.5	-20.2
-5.9	-2.3	9.7	-12.0
-5.8	2.0	9.9	-8.0
-5.7	0.1	10.1	-10.0
-5.6	-15.2	10.3	-25.5
-5.5	-2.1	10.5	-12.6
-5.4	0.5	10.7	-10.2
-5.3	-2.9	10.9	-13.8
-5.2	-0.4	11.1	-11.5
-5.1	2.5	11.3	-8.8
-5.0	2.7	11.5	-8.9
-4.9	2.0	11.7	-9.7
-4.8	2.3	12.0	-9.7
-4.7	3.1	12.2	-9.1
-4.6	2.1	12.4	-10.4
-4.5	-0.8	12.7	-13.5
-4.4	-4.1	12.9	-17.0
-4.3	-2.3	13.2	-15.5
-4.2	1.8	13.4	-11.6
-4.1	4.1	13.7	-9.6

27.55 GHz Antenna Pattern in Co-pol Az LHCP

Angle	Gain	Mask	Over Mask
Degrees	dBi	dBi	dB
0.0	52.1		
0.1	51.5		
0.2	49.3		
0.3	45.4		
0.4	40.0		
0.5	34.1		
0.6	27.7		
0.7	26.5		
0.8	28.4		
0.9	26.9		
1.0	17.2		
1.1	18.3		
1.2	21.0		
1.3	17.0		
1.4	9.5		
1.5	11.5	24.6	-13.1
1.6	11.8	23.9	-12.1
1.7	15.9	23.2	-7.4
1.8	17.6	22.6	-5.0
1.9	16.0	22.0	-6.0
2.0	11.5	21.5	-10.0
2.1	5.0	20.9	-16.0
2.2	-2.4	20.4	-22.8
2.3	3.1	20.0	-16.9
2.4	4.5	19.5	-15.0
2.5	3.5	19.1	-15.6
2.6	3.0	18.6	-15.6
2.7	0.0	18.2	-18.2
2.8	-1.5	17.8	-19.3
2.9	3.2	17.4	-14.2
3.0	3.6	17.1	-13.4
3.1	6.1	16.7	-10.6
3.2	8.7	16.4	-7.7
3.3	8.2	16.0	-7.9
3.4	2.7	15.7	-13.0
3.5	-9.8	15.4	-25.2
3.6	-1.7	15.1	-16.8
3.7	-15.1	14.8	-29.9
3.8	3.8	14.5	-10.7
3.9	7.5	14.2	-6.7
4.0	5.9	13.9	-8.1
4.1	0.5	13.7	-13.2
4.2	-3.8	13.4	-17.3
4.3	-0.4	13.2	-13.5
4.4	0.6	12.9	-12.3
4.5	-0.2	12.7	-12.9
4.6	-1.1	12.4	-13.5
4.7	-0.4	12.2	-12.6
4.8	0.3	12.0	-11.6
4.9	-0.5	11.7	-12.2
5.0	-2.8	11.5	-14.3
5.1	-7.4	11.3	-18.7
5.2	-12.3	11.1	-23.4
5.3	-7.4	10.9	-18.3
5.4	-6.5	10.7	-17.2
5.5	-12.7	10.5	-23.2
5.6	-4.9	10.3	-15.2
5.7	0.5	10.1	-9.6
5.8	1.6	9.9	-8.3
5.9	1.3	9.7	-8.4

Orbit Communication Systems Ltd.

AL AL-7107-Ka, 2.15 m Antenna, Pattern Data Table
Co-pol Azimuth LHCP, -10° to +10° @ 0.1° increment

-4.0	5.3	13.9	-8.7
-3.9	8.3	14.2	-5.9
-3.8	10.2	14.5	-4.3
-3.7	8.1	14.8	-6.7
-3.6	-3.7	15.1	-18.8
-3.5	0.3	15.4	-15.1
-3.4	0.8	15.7	-15.0
-3.3	3.2	16.0	-12.9
-3.2	8.3	16.4	-8.0
-3.1	8.4	16.7	-8.3
-3.0	8.9	17.1	-8.2
-2.9	11.4	17.4	-6.0
-2.8	11.7	17.8	-6.1
-2.7	8.7	18.2	-9.5
-2.6	3.7	18.6	-14.9
-2.5	0.6	19.1	-18.5
-2.4	5.5	19.5	-14.0
-2.3	7.7	20.0	-12.2
-2.2	5.0	20.4	-15.5
-2.1	6.0	20.9	-15.0
-2.0	11.7	21.5	-9.8
-1.9	11.6	22.0	-10.4
-1.8	10.1	22.6	-12.5
-1.7	8.1	23.2	-15.1
-1.6	-0.9	23.9	-24.8
-1.5	12.8	24.6	-11.8
-1.4	18.1		
-1.3	20.0		
-1.2	22.0		
-1.1	22.9		
-1.0	21.0		
-0.9	13.3		
-0.8	11.8		
-0.7	11.6		
-0.6	22.9		
-0.5	33.0		
-0.4	40.6		
-0.3	46.2		
-0.2	49.7		
-0.1	51.6		
0.0	52.1		

6.0	-0.4	9.5	-10.0
6.1	-8.4	9.4	-17.7
6.2	-12.9	9.2	-22.1
6.3	-4.6	9.0	-13.6
6.4	-3.7	8.8	-12.6
6.5	-6.6	8.7	-15.3
6.6	-4.0	8.5	-12.5
6.7	-3.4	8.3	-11.8
6.8	-0.1	8.2	-8.3
6.9	2.6	8.0	-5.4
7.0	3.3	7.9	-4.6
7.1	3.4	8.0	-4.6
7.2	2.9	8.0	-5.1
7.3	-0.1	8.0	-8.1
7.4	-9.9	8.0	-17.9
7.5	-3.9	8.0	-11.9
7.6	-0.8	8.0	-8.8
7.7	-2.3	8.0	-10.3
7.8	-6.9	8.0	-14.9
7.9	-4.7	8.0	-12.7
8.0	-2.5	8.0	-10.5
8.1	0.2	8.0	-7.8
8.2	1.1	8.0	-6.9
8.3	-0.5	8.0	-8.5
8.4	-2.3	8.0	-10.3
8.5	-3.3	8.0	-11.3
8.6	-5.3	8.0	-13.3
8.7	-8.0	8.0	-16.0
8.8	-5.6	8.0	-13.6
8.9	-3.9	8.0	-11.9
9.0	-5.5	8.0	-13.5
9.1	-9.4	8.0	-17.4
9.2	-12.0	8.0	-20.0
9.3	-9.3	7.8	-17.1
9.4	-4.0	7.7	-11.7
9.5	-3.6	7.6	-11.2
9.6	-5.2	7.4	-12.6
9.7	-14.3	7.3	-21.7
9.8	-8.1	7.2	-15.3
9.9	-9.3	7.1	-16.4
10.0	-13.8	7.0	-20.8

Orbit Communication Systems Ltd.

AL-7107-Ka, 2.15 m Antenna, Pattern Data Table
Co-pol Elevation LHCP, -30° to +30° @ 0.5° increment

27.55 GHz Antenna Pattern in Co-pol EI LHCP

Angle Degrees	Gain dBi	Mask dBi	Over Mask dB
-30.0	-7.7	-4.9	-2.8
-29.5	-10.1	-4.7	-5.3
-29.0	-11.7	-4.6	-7.1
-28.5	-11.5	-4.4	-7.1
-28.0	-10.6	-4.2	-6.5
-27.5	-12.3	-4.0	-8.3
-27.0	-7.9	-3.8	-4.2
-26.5	-9.9	-3.6	-6.3
-26.0	-18.1	-3.4	-14.8
-25.5	-14.0	-3.2	-10.8
-25.0	-16.3	-2.9	-13.4
-24.5	-8.9	-2.7	-6.2
-24.0	-10.4	-2.5	-7.9
-23.5	-8.1	-2.3	-5.8
-23.0	-14.6	-2.0	-12.5
-22.5	-7.0	-1.8	-5.2
-22.0	-5.5	-1.6	-4.0
-21.5	-6.2	-1.3	-4.9
-21.0	-16.3	-1.1	-15.2
-20.5	-8.9	-0.8	-8.1
-20.0	-3.3	-0.5	-2.8
-19.5	0.2	-0.3	0.4
-19.0	1.4	0.0	1.4
-18.5	-2.0	0.3	-2.3
-18.0	-3.3	0.6	-4.0
-17.5	-19.1	0.9	-20.0
-17.0	-23.4	1.2	-24.6
-16.5	-14.1	1.6	-15.6
-16.0	-12.5	1.9	-14.4
-15.5	-8.0	2.2	-10.2
-15.0	-21.1	2.6	-23.7
-14.5	-7.3	3.0	-10.2
-14.0	-15.0	3.3	-18.3
-13.5	-10.9	3.7	-14.7
-13.0	-8.5	4.2	-12.6
-12.5	-11.0	4.6	-15.6
-12.0	-7.1	5.0	-12.1
-11.5	-19.4	5.5	-24.9
-11.0	-7.7	6.0	-13.7
-10.5	-10.5	6.5	-17.0
-10.0	-7.4	7.0	-14.4
-9.5	-18.5	7.6	-26.0
-9.0	-11.2	8.1	-19.4
-8.5	-2.5	8.8	-11.2
-8.0	-8.2	9.4	-17.6
-7.5	-2.7	10.1	-12.8
-7.0	-4.8	10.9	-15.7
-6.5	-1.7	11.7	-13.4
-6.0	-4.8	12.5	-17.3
-5.5	-10.7	13.5	-24.2
-5.0	4.5	14.5	-10.0
-4.5	4.3	15.7	-11.4
-4.0	-7.1	16.9	-24.0
-3.5	3.3	18.4	-15.1
-3.0	11.3	20.1	-8.8
-2.5	12.5		
-2.0	7.4		
-1.5	14.8		
-1.0	20.6		
-0.5	36.4		
0.0	52.1		

27.55 GHz Antenna Pattern in Co-pol EI LHCP

Angle Degrees	Gain dBi	Mask dBi	Over Mask dB
0.0	52.1		
0.5	37.5		
1.0	18.1		
1.5	8.1		
2.0	7.4		
2.5	10.0		
3.0	-5.1	20.1	-25.1
3.5	13.9	18.4	-4.5
4.0	11.3	16.9	-5.7
4.5	4.3	15.7	-11.4
5.0	7.0	14.5	-7.6
5.5	-9.1	13.5	-22.5
6.0	-2.0	12.5	-14.5
6.5	0.4	11.7	-11.3
7.0	1.4	10.9	-9.5
7.5	-6.3	10.1	-16.4
8.0	-8.1	9.4	-17.5
8.5	-14.4	8.8	-23.2
9.0	-9.8	8.1	-18.0
9.5	-3.8	7.6	-11.4
10.0	-7.2	7.0	-14.2
10.5	-5.0	6.5	-11.5
11.0	-3.1	6.0	-9.1
11.5	-2.1	5.5	-7.6
12.0	-1.4	5.0	-6.5
12.5	-2.1	4.6	-6.7
13.0	-9.0	4.2	-13.1
13.5	-10.8	3.7	-14.5
14.0	-13.5	3.3	-16.8
14.5	-9.4	3.0	-12.3
15.0	-12.9	2.6	-15.5
15.5	-11.6	2.2	-13.8
16.0	-22.1	1.9	-24.0
16.5	-14.3	1.6	-15.9
17.0	-19.8	1.2	-21.1
17.5	-19.9	0.9	-20.8
18.0	-21.5	0.6	-22.1
18.5	-10.7	0.3	-11.0
19.0	-10.7	0.0	-10.7
19.5	-17.7	-0.3	-17.4
20.0	-27.3	-0.5	-26.8
20.5	-19.3	-0.8	-18.5
21.0	-15.4	-1.1	-14.3
21.5	-15.5	-1.3	-14.2
22.0	-13.1	-1.6	-11.6
22.5	-17.6	-1.8	-15.8
23.0	-27.5	-2.0	-25.4
23.5	-22.0	-2.3	-19.7
24.0	-22.0	-2.5	-19.5
24.5	-25.2	-2.7	-22.4
25.0	-13.5	-2.9	-10.5
25.5	-17.5	-3.2	-14.3
26.0	-16.0	-3.4	-12.7
26.5	-18.1	-3.6	-14.6
27.0	-14.1	-3.8	-10.3
27.5	-23.1	-4.0	-19.1
28.0	-20.7	-4.2	-16.5
28.5	-22.3	-4.4	-17.9
29.0	-26.0	-4.6	-21.4
29.5	-18.3	-4.7	-13.6
30.0	-15.8	-4.9	-10.9

Orbit Communication Systems Ltd.
AL-7107-Ka, 2.15 m Antenna, Pattern Data Table
Co-pol Elevation LHCP, -10° to +10° @ 0.1° increment

27.55 GHz Antenna Pattern in Co-pol EI LHCP

Angle	Gain	Mask	Over Mask
Degrees	dBi	dBi	dB
-10.0	-7.4	7.0	-14.4
-9.9	-5.2	7.1	-12.3
-9.8	-3.2	7.2	-10.4
-9.7	-3.9	7.3	-11.2
-9.6	-16.0	7.4	-23.5
-9.5	-18.5	7.6	-26.0
-9.4	-9.5	7.7	-17.2
-9.3	-6.1	7.8	-13.9
-9.2	-6.2	7.9	-14.1
-9.1	-8.1	8.0	-16.1
-9.0	-11.2	8.1	-19.4
-8.9	-8.5	8.3	-16.8
-8.8	-8.4	8.4	-16.8
-8.7	-16.2	8.5	-24.7
-8.6	-8.6	8.6	-17.2
-8.5	-2.5	8.8	-11.2
-8.4	-1.0	8.9	-9.9
-8.3	-0.1	9.0	-9.1
-8.2	-0.2	9.2	-9.4
-8.1	-1.6	9.3	-10.9
-8.0	-8.2	9.4	-17.6
-7.9	-20.8	9.6	-30.4
-7.8	-11.8	9.7	-21.5
-7.7	-7.2	9.8	-17.1
-7.6	-4.9	10.0	-14.8
-7.5	-2.7	10.1	-12.8
-7.4	-0.9	10.3	-11.2
-7.3	0.1	10.4	-10.4
-7.2	-1.5	10.6	-12.1
-7.1	-8.1	10.7	-18.8
-7.0	-4.8	10.9	-15.7
-6.9	-6.2	11.0	-17.2
-6.8	-10.0	11.2	-21.2
-6.7	-5.3	11.3	-16.6
-6.6	-2.0	11.5	-13.5
-6.5	-1.7	11.7	-13.4
-6.4	-0.7	11.8	-12.6
-6.3	0.6	12.0	-11.4
-6.2	-0.7	12.2	-12.9
-6.1	-3.8	12.4	-16.1
-6.0	-4.8	12.5	-17.3
-5.9	-7.6	12.7	-20.3
-5.8	-10.2	12.9	-23.1
-5.7	-9.4	13.1	-22.5
-5.6	-10.4	13.3	-23.7
-5.5	-10.7	13.5	-24.2
-5.4	-3.1	13.7	-16.8
-5.3	1.4	13.9	-12.5
-5.2	3.1	14.1	-11.0
-5.1	4.3	14.3	-10.0
-5.0	4.5	14.5	-10.0
-4.9	5.1	14.7	-9.7
-4.8	4.6	15.0	-10.3
-4.7	1.0	15.2	-14.2
-4.6	-5.9	15.4	-21.3
-4.5	4.3	15.7	-11.4
-4.4	8.2	15.9	-7.7
-4.3	9.5	16.2	-6.7
-4.2	8.4	16.4	-8.0
-4.1	4.6	16.7	-12.1

27.55 GHz Antenna Pattern in Co-pol EI LHCP

Angle	Gain	Mask	Over Mask
Degrees	dBi	dBi	dB
0.0	52.1		
0.1	51.4		
0.2	49.1		
0.3	45.3		
0.4	40.9		
0.5	37.5		
0.6	33.3		
0.7	25.1		
0.8	8.3		
0.9	15.5		
1.0	18.1		
1.1	20.4		
1.2	18.9		
1.3	11.4		
1.4	9.6		
1.5	8.1		
1.6	12.9		
1.7	15.5		
1.8	14.8		
1.9	10.5		
2.0	7.4		
2.1	8.5		
2.2	12.2		
2.3	13.7		
2.4	12.9		
2.5	10.0		
2.6	5.9		
2.7	-6.7		
2.8	2.4		
2.9	3.9		
3.0	-5.1	20.1	-25.1
3.1	0.0	19.7	-19.7
3.2	0.8	19.4	-18.5
3.3	5.6	19.0	-13.5
3.4	11.4	18.7	-7.3
3.5	13.9	18.4	-4.5
3.6	13.3	18.1	-4.8
3.7	9.7	17.8	-8.1
3.8	7.9	17.5	-9.6
3.9	10.3	17.2	-6.9
4.0	11.3	16.9	-5.7
4.1	9.9	16.7	-6.8
4.2	8.4	16.4	-8.0
4.3	8.3	16.2	-7.8
4.4	7.8	15.9	-8.1
4.5	4.3	15.7	-11.4
4.6	1.3	15.4	-14.1
4.7	1.3	15.2	-13.9
4.8	3.0	15.0	-12.0
4.9	4.9	14.7	-9.9
5.0	7.0	14.5	-7.6
5.1	8.5	14.3	-5.8
5.2	9.2	14.1	-4.9
5.3	7.4	13.9	-6.5
5.4	1.9	13.7	-11.8
5.5	-9.1	13.5	-22.5
5.6	-1.9	13.3	-15.2
5.7	-3.2	13.1	-16.3
5.8	-2.1	12.9	-15.0
5.9	-0.8	12.7	-13.6

Orbit Communication Systems Ltd.
AL-7107-Ka, 2.15 m Antenna, Pattern Data Table
Co-pol Elevation LHCP, -10° to +10° @ 0.1° increment

-4.0	-7.1	16.9	-24.0
-3.9	6.5	17.2	-10.7
-3.8	9.5	17.5	-8.0
-3.7	9.6	17.8	-8.2
-3.6	7.2	18.1	-10.9
-3.5	3.3	18.4	-15.1
-3.4	-6.4	18.7	-25.2
-3.3	-5.5	19.0	-24.5
-3.2	-9.3	19.4	-28.6
-3.1	4.1	19.7	-15.6
-3.0	11.3	20.1	-8.8
-2.9	13.2		
-2.8	12.3		
-2.7	9.7		
-2.6	10.4		
-2.5	12.5		
-2.4	14.0		
-2.3	14.4		
-2.2	13.2		
-2.1	10.6		
-2.0	7.4		
-1.9	2.6		
-1.8	4.5		
-1.7	11.7		
-1.6	14.6		
-1.5	14.8		
-1.4	12.8		
-1.3	19.3		
-1.2	22.9		
-1.1	22.9		
-1.0	20.6		
-0.9	21.8		
-0.8	25.2		
-0.7	29.7		
-0.6	33.4		
-0.5	36.4		
-0.4	41.2		
-0.3	46.4		
-0.2	49.9		
-0.1	51.7		
0.0	52.1		

6.0	-2.0	12.5	-14.5
6.1	-9.6	12.4	-21.9
6.2	-3.8	12.2	-16.0
6.3	0.8	12.0	-11.2
6.4	0.9	11.8	-10.9
6.5	0.4	11.7	-11.3
6.6	-0.1	11.5	-11.6
6.7	1.7	11.3	-9.7
6.8	3.9	11.2	-7.3
6.9	4.0	11.0	-7.0
7.0	1.4	10.9	-9.5
7.1	-7.7	10.7	-18.5
7.2	-13.2	10.6	-23.8
7.3	-7.6	10.4	-18.0
7.4	-10.2	10.3	-20.5
7.5	-6.3	10.1	-16.4
7.6	-7.4	10.0	-17.3
7.7	-5.3	9.8	-15.2
7.8	-5.1	9.7	-14.8
7.9	-7.2	9.6	-16.8
8.0	-8.1	9.4	-17.5
8.1	-14.1	9.3	-23.4
8.2	-21.8	9.2	-31.0
8.3	-11.8	9.0	-20.9
8.4	-10.6	8.9	-19.5
8.5	-14.4	8.8	-23.2
8.6	-5.7	8.6	-14.3
8.7	-5.2	8.5	-13.8
8.8	-4.5	8.4	-12.9
8.9	-7.6	8.3	-15.8
9.0	-9.8	8.1	-18.0
9.1	-6.9	8.0	-14.9
9.2	-7.9	7.9	-15.8
9.3	-14.8	7.8	-22.6
9.4	-9.2	7.7	-16.8
9.5	-3.8	7.6	-11.4
9.6	-1.7	7.4	-9.1
9.7	-0.7	7.3	-8.0
9.8	-1.1	7.2	-8.3
9.9	-3.1	7.1	-10.2
10.0	-7.2	7.0	-14.2

Orbit Communication Systems Ltd.
AL-7107-Ka, 2.15 m Antenna, Pattern Data Table
X-pol Azimuth LHCP, -10° to +10° @ 0.1° increment

27.55 GHz Antenna Pattern in X-pol Az LHCP

Angle	Gain	Mask	Over Mask
Degrees	dBi	dBi	dB
-10.0	-5.5	-2.0	-3.5
-9.9	-6.1	-2.0	-4.1
-9.8	-10.9	-2.0	-8.9
-9.7	-7.3	-2.0	-5.3
-9.6	-5.9	-2.0	-3.9
-9.5	-6.2	-2.0	-4.2
-9.4	-7.6	-2.0	-5.6
-9.3	-8.9	-2.0	-6.9
-9.2	-9.1	-2.0	-7.1
-9.1	-11.5	-2.0	-9.5
-9.0	-12.7	-2.0	-10.7
-8.9	-16.5	-2.0	-14.5
-8.8	-9.2	-2.0	-7.2
-8.7	-7.0	-2.0	-5.0
-8.6	-6.5	-2.0	-4.5
-8.5	-5.5	-2.0	-3.5
-8.4	-5.3	-2.0	-3.3
-8.3	-7.4	-2.0	-5.4
-8.2	-7.1	-2.0	-5.1
-8.1	-5.8	-2.0	-3.8
-8.0	-2.3	-2.0	-0.3
-7.9	-3.1	-2.0	-1.1
-7.8	-3.9	-2.0	-1.9
-7.7	-7.0	-2.0	-5.0
-7.6	-12.5	-2.0	-10.5
-7.5	-5.4	-2.0	-3.4
-7.4	-2.5	-2.0	-0.5
-7.3	-0.8	-2.0	1.2
-7.2	-2.9	-2.0	-0.9
-7.1	-6.5	-2.0	-4.5
-7.0	-17.8	-2.1	-15.7
-6.9	-14.8	-2.0	-12.8
-6.8	-8.8	-1.8	-7.0
-6.7	-4.3	-1.7	-2.6
-6.6	-2.2	-1.5	-0.7
-6.5	-3.4	-1.3	-2.0
-6.4	-3.5	-1.2	-2.3
-6.3	-2.8	-1.0	-1.8
-6.2	-1.3	-0.8	-0.4
-6.1	-1.5	-0.6	-0.9
-6.0	-3.1	-0.5	-2.6
-5.9	-7.9	-0.3	-7.6
-5.8	-3.9	-0.1	-3.8
-5.7	-1.8	0.1	-1.9
-5.6	-0.4	0.3	-0.7
-5.5	-0.3	0.5	-0.8
-5.4	-4.5	0.7	-5.2
-5.3	-9.8	0.9	-10.7
-5.2	-18.0	1.1	-19.1
-5.1	-11.0	1.3	-12.3
-5.0	-5.0	1.5	-6.5
-4.9	-5.0	1.7	-6.8
-4.8	-9.3	2.0	-11.2
-4.7	-14.5	2.2	-16.7
-4.6	-8.0	2.4	-10.4
-4.5	-7.9	2.7	-10.6
-4.4	-9.6	2.9	-12.5
-4.3	-3.7	3.2	-6.9
-4.2	-0.4	3.4	-3.9
-4.1	-1.0	3.7	-4.7

27.55 GHz Antenna Pattern in X-pol Az LHCP

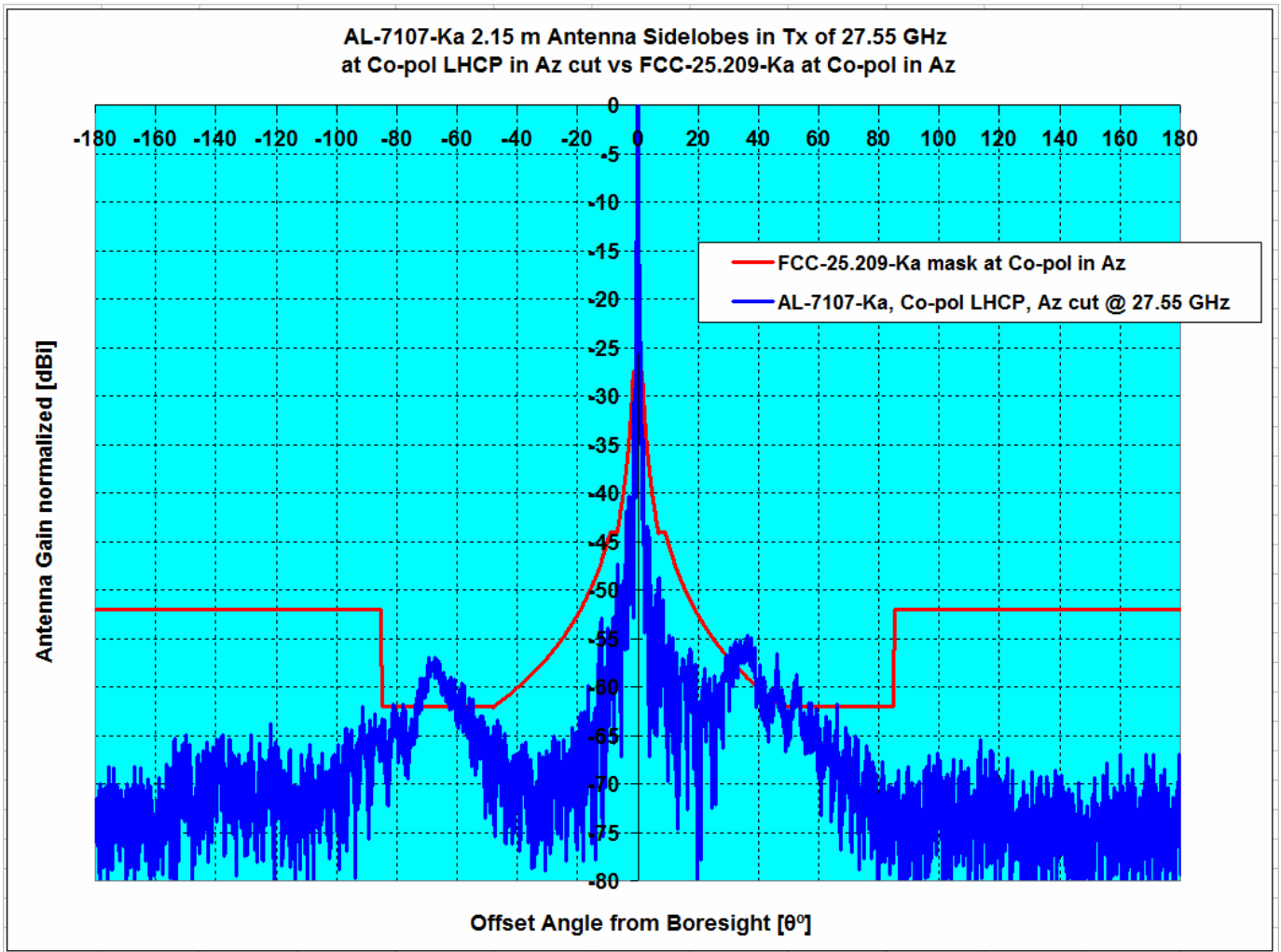
Angle	Gain	Mask	Over Mask
Degrees	dBi	dBi	dB
0.0	22.5		
0.1	23.4		
0.2	25.1		
0.3	25.9		
0.4	25.2		
0.5	22.9		
0.6	16.7		
0.7	0.6		
0.8	8.6		
0.9	13.4		
1.0	14.4		
1.1	11.5		
1.2	-2.5		
1.3	6.1		
1.4	9.2		
1.5	6.5		
1.6	1.6		
1.7	4.3		
1.8	4.4	12.6	-8.2
1.9	-1.1	12.0	-13.2
2.0	-6.2	11.5	-17.7
2.1	-10.1	10.9	-21.0
2.2	-6.5	10.4	-16.9
2.3	-1.4	10.0	-11.4
2.4	-1.8	9.5	-11.3
2.5	-5.7	9.1	-14.8
2.6	-12.7	8.6	-21.3
2.7	-12.6	8.2	-20.8
2.8	-10.4	7.8	-18.2
2.9	-12.6	7.4	-20.0
3.0	-19.9	7.1	-27.0
3.1	-13.8	6.7	-20.5
3.2	-15.8	6.4	-22.2
3.3	-14.4	6.0	-20.5
3.4	-8.0	5.7	-13.7
3.5	-11.9	5.4	-17.3
3.6	-18.5	5.1	-23.6
3.7	-10.7	4.8	-15.5
3.8	-4.9	4.5	-9.4
3.9	-8.3	4.2	-12.5
4.0	-27.9	3.9	-31.9
4.1	-9.6	3.7	-13.3
4.2	-7.6	3.4	-11.1
4.3	-10.3	3.2	-13.4
4.4	-15.2	2.9	-18.1
4.5	-16.7	2.7	-19.4
4.6	-20.5	2.4	-23.0
4.7	-11.9	2.2	-14.1
4.8	-16.7	2.0	-18.7
4.9	-14.6	1.7	-16.4
5.0	-11.9	1.5	-13.5
5.1	-11.3	1.3	-12.6
5.2	-16.3	1.1	-17.4
5.3	-10.8	0.9	-11.7
5.4	-9.1	0.7	-9.7
5.5	-12.0	0.5	-12.5
5.6	-13.0	0.3	-13.3
5.7	-7.7	0.1	-7.8
5.8	-7.6	-0.1	-7.5
5.9	-9.2	-0.3	-8.9

Orbit Communication Systems Ltd.
AL-7107-Ka, 2.15 m Antenna, Pattern Data Table
X-pol Azimuth LHCP, -10° to +10° @ 0.1° increment

-4.0	-2.3	3.9	-6.3
-3.9	-4.6	4.2	-8.8
-3.8	0.6	4.5	-3.9
-3.7	2.0	4.8	-2.8
-3.6	1.2	5.1	-3.9
-3.5	-0.7	5.4	-6.1
-3.4	-3.2	5.7	-8.9
-3.3	-4.5	6.0	-10.5
-3.2	-6.9	6.4	-13.2
-3.1	-12.8	6.7	-19.6
-3.0	-9.6	7.1	-16.7
-2.9	-2.9	7.4	-10.3
-2.8	-2.5	7.8	-10.3
-2.7	-6.0	8.2	-14.2
-2.6	-5.5	8.6	-14.2
-2.5	-5.5	9.1	-14.5
-2.4	-7.3	9.5	-16.8
-2.3	-1.4	10.0	-11.3
-2.2	-0.4	10.4	-10.9
-2.1	-5.2	10.9	-16.1
-2.0	-4.0	11.5	-15.5
-1.9	-4.3	12.0	-16.3
-1.8	-4.5	12.6	-17.1
-1.7	-1.1		
-1.6	0.1		
-1.5	2.9		
-1.4	4.0		
-1.3	1.3		
-1.2	4.8		
-1.1	9.3		
-1.0	10.6		
-0.9	10.6		
-0.8	4.5		
-0.7	14.0		
-0.6	22.9		
-0.5	27.1		
-0.4	28.7		
-0.3	28.3		
-0.2	26.8		
-0.1	24.0		
0.0	22.5		

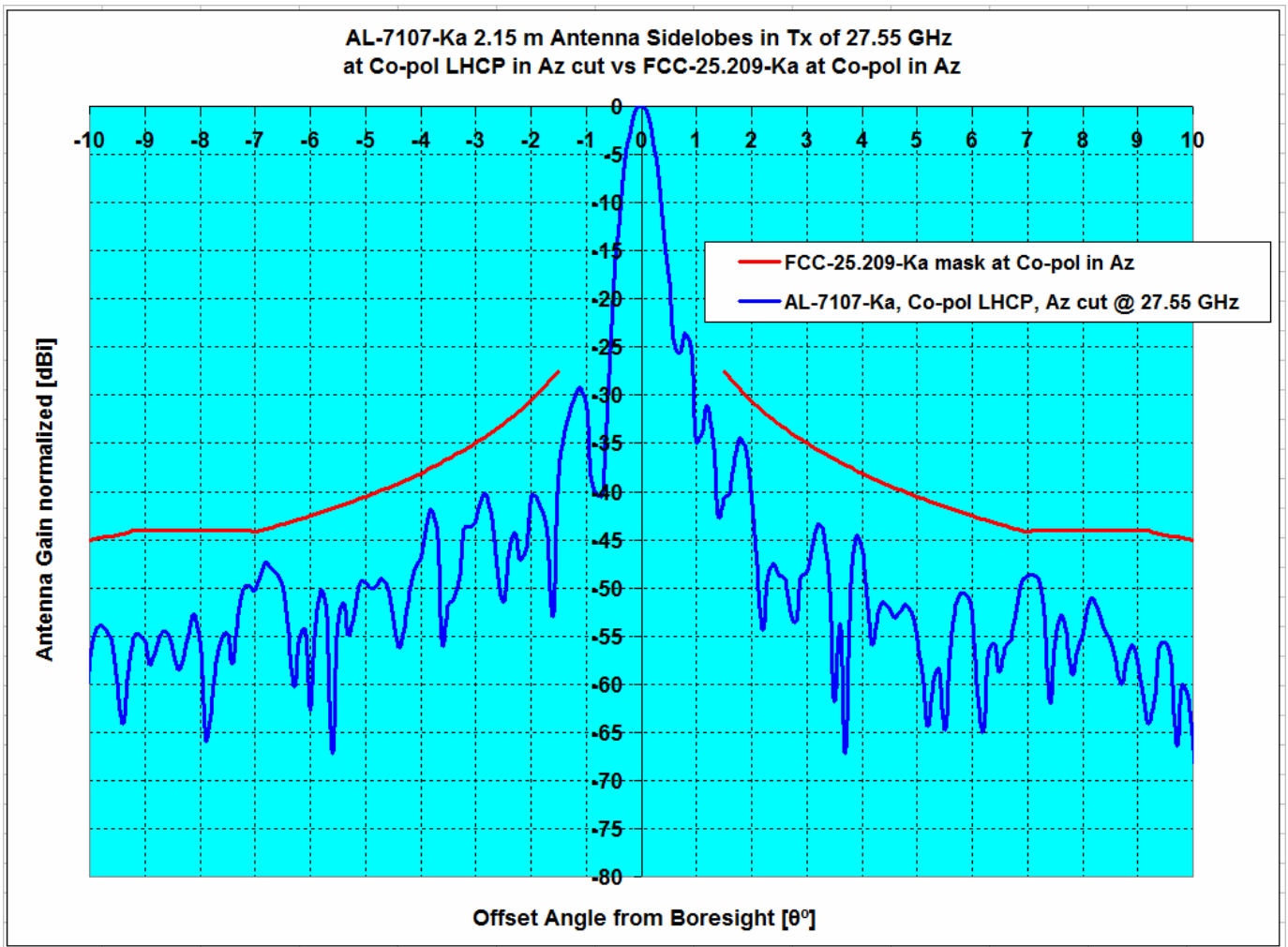
6.0	-17.3	-0.5	-16.8
6.1	-24.0	-0.6	-23.3
6.2	-11.3	-0.8	-10.5
6.3	-6.8	-1.0	-5.9
6.4	-8.9	-1.2	-7.7
6.5	-8.2	-1.3	-6.8
6.6	-7.2	-1.5	-5.7
6.7	-5.3	-1.7	-3.7
6.8	-5.4	-1.8	-3.6
6.9	-6.0	-2.0	-4.0
7.0	-8.9	-2.1	-6.8
7.1	-7.2	-2.0	-5.2
7.2	-9.3	-2.0	-7.3
7.3	-12.0	-2.0	-10.0
7.4	-12.2	-2.0	-10.2
7.5	-11.8	-2.0	-9.8
7.6	-8.7	-2.0	-6.7
7.7	-5.7	-2.0	-3.7
7.8	-5.7	-2.0	-3.7
7.9	-7.2	-2.0	-5.2
8.0	-6.5	-2.0	-4.5
8.1	-5.3	-2.0	-3.3
8.2	-6.4	-2.0	-4.4
8.3	-8.3	-2.0	-6.3
8.4	-8.2	-2.0	-6.2
8.5	-8.3	-2.0	-6.3
8.6	-9.7	-2.0	-7.7
8.7	-12.1	-2.0	-10.1
8.8	-11.7	-2.0	-9.7
8.9	-13.8	-2.0	-11.8
9.0	-19.1	-2.0	-17.1
9.1	-21.8	-2.0	-19.8
9.2	-17.2	-2.0	-15.2
9.3	-13.4	-2.0	-11.4
9.4	-13.2	-2.0	-11.2
9.5	-8.4	-2.0	-6.4
9.6	-7.6	-2.0	-5.6
9.7	-6.6	-2.0	-4.6
9.8	-9.8	-2.0	-7.8
9.9	-15.0	-2.0	-13.0
10.0	-11.3	-2.0	-9.3

Orbit Communication Systems Ltd.
AL-7107-Ka, 2.15 m Antenna, Pattern, Co-pol, Azimuth LHCP



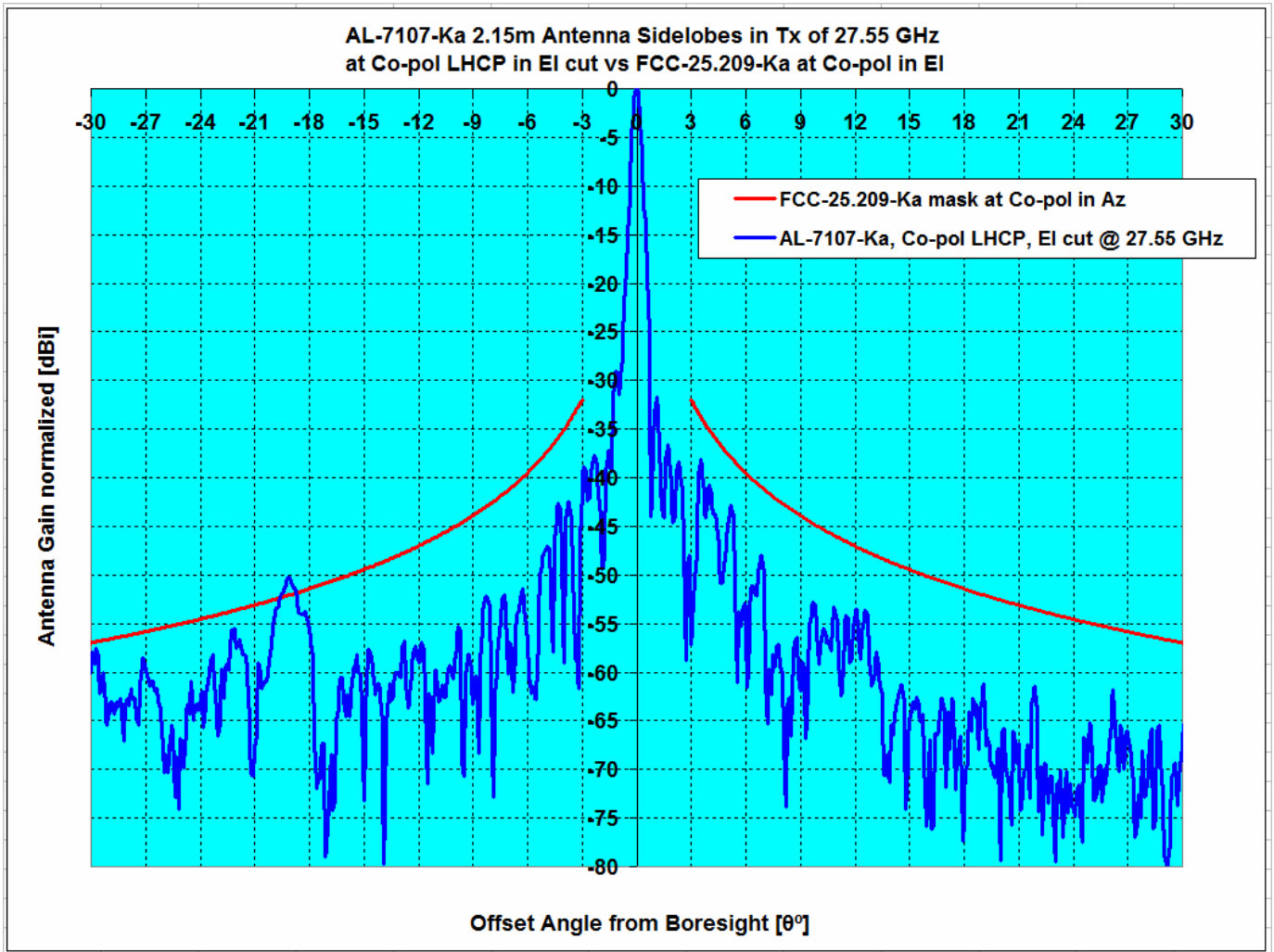
Description	Plane, CirP	Frequency	Ant. Gain	Peak Excursions dB		Over Mask %	
Pattern Rule vs Antenna System	Type	GHz	dBi	$1.5^{\circ} \leq \theta \leq 7^{\circ}$	$7^{\circ} \leq \theta \leq 180^{\circ}$	$1.5^{\circ} \leq \theta \leq 7^{\circ}$	$7^{\circ} \leq \theta \leq 180^{\circ}$
FCC-25.209-Ka, Co-pol Az, vs AL-7107-Ka	Az , LHCP	27.55	52.06	-3.48	5.11	0.00%	8.04%

Orbit Communication Systems Ltd.
AL-7107-Ka, 2.15 m Antenna, Pattern, Co-pol, Azimuth LHCP



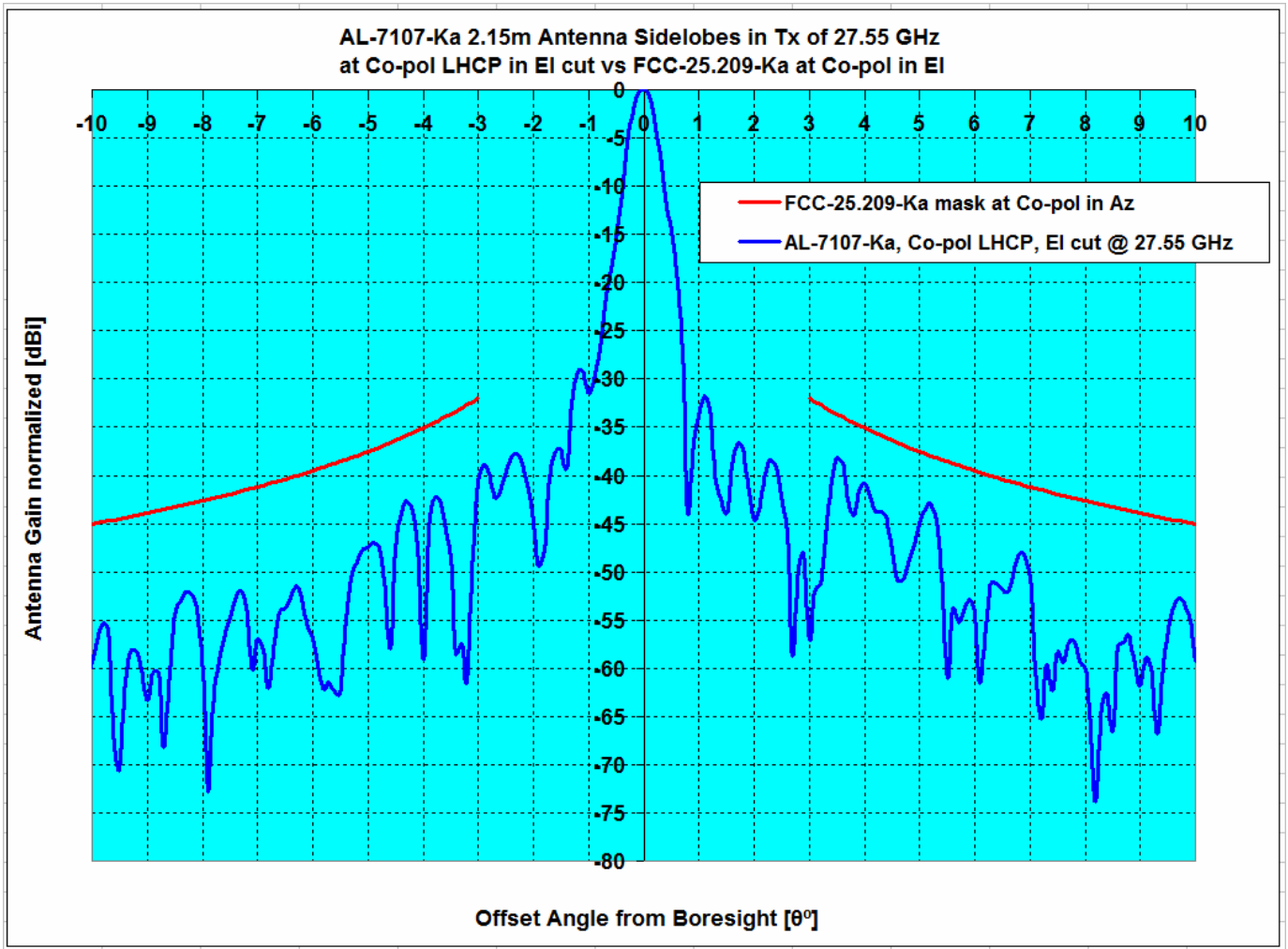
Description	Plane, CirP	Frequency	Ant. Gain	Peak Excursions dB		Over Mask %	
				1.5°≤θ≤7°	7°≤θ≤180°	1.5°≤θ≤7°	7°≤θ≤180°
Pattern Rule vs Antenna System	Type	GHz	dBi				
FCC-25.209-Ka, Co-pol Az, vs AL-7107-Ka	Az , LHCP	27.55	52.06	-3.48	5.11	0.00%	8.04%

Orbit Communication Systems Ltd.
AL-7107-Ka, 2.15 m Antenna, Pattern, Co-pol, Elevation LHCP

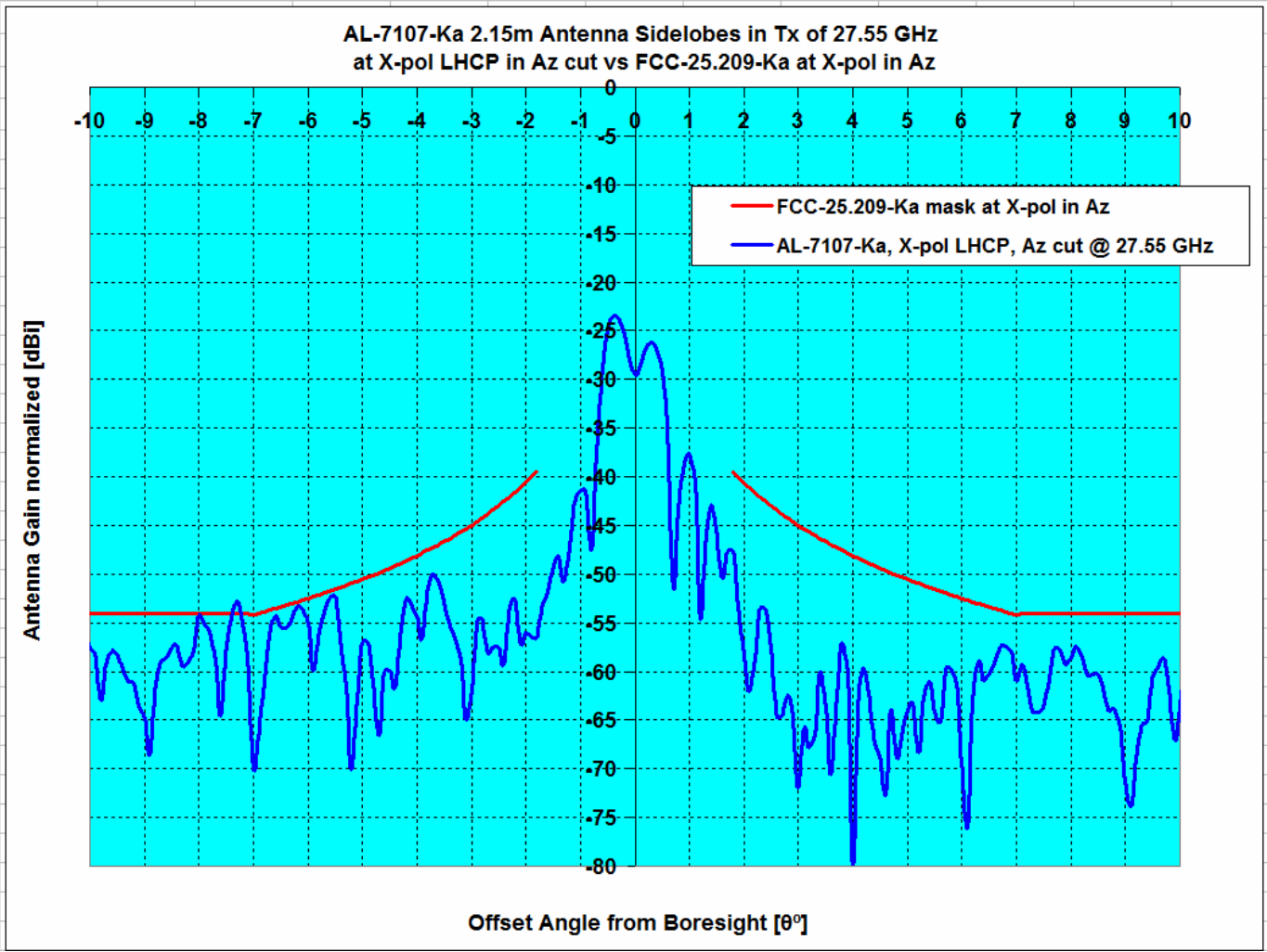


Description	Plane, CirP	Frequency	Ant. Gain	Peak Excursions dB		Over Mask %	
				3°≤θ≤7°	7°≤θ≤30°	3°≤θ≤7°	7°≤θ≤30°
Pattern Rule vs Antenna System	Type	GHz	dBi				
FCC-25.209-Ka, Co-pol EI, vs AL-7107-Ka	EI , LHCP	27.55	52.06	-4.46	1.83	0.00%	1.66%

Orbit Communication Systems Ltd.
AL-7107-Ka, 2.15 m Antenna, Pattern, Co-pol, Elevation LHCP



Description	Plane, CirP	Frequency	Ant. Gain	Peak Excursions dB		Over Mask %	
				3°≤θ≤7°	7°≤θ≤30°	3°≤θ≤7°	7°≤θ≤30°
Pattern Rule vs Antenna System	Type	GHz	dBi				
FCC-25.209-Ka, Co-pol EI, vs AL-7107-Ka	EI , LHCP	27.55	52.06	-4.46	1.83	0.00%	1.66%



Description	Plane, CirP	Frequency	Ant. Gain	Peak Excursions dB		Over Mask %	
Pattern Rule vs Antenna System	Type	GHz	dBi	1.8°≤θ≤7°	1.8°≤θ≤9.2°	1.8°≤θ≤7°	1.8°≤θ≤9.2°
FCC-25.209-Ka, X-pol Az, vs AL-7107-Ka	Az , LHCP	27.55	52.06	-0.44	1.22	0.00%	0.60%

Orbit Communication Systems Ltd.
AL-7107-Ka, 2.15 m Antenna, Pattern Data Table
Co-pol Azimuth RHCP, -180° to +180° @ 1.0° increment

27.55 GHz Antenna Pattern in Co-pol Az RHCP

Angle	Gain	Mask	Over Mask
Degrees	dBi	dBi	dB
-179.0	-20.9	0.0	-20.9
-178.0	-26.7	0.0	-26.7
-177.0	-26.5	0.0	-26.5
-176.0	-18.2	0.0	-18.2
-175.0	-20.9	0.0	-20.9
-174.0	-21.1	0.0	-21.1
-173.0	-23.3	0.0	-23.3
-172.0	-25.7	0.0	-25.7
-171.0	-22.9	0.0	-22.9
-170.0	-24.2	0.0	-24.2
-169.0	-22.5	0.0	-22.5
-168.0	-21.9	0.0	-21.9
-167.0	-27.9	0.0	-27.9
-166.0	-26.2	0.0	-26.2
-165.0	-19.5	0.0	-19.5
-164.0	-18.2	0.0	-18.2
-163.0	-21.6	0.0	-21.6
-162.0	-27.5	0.0	-27.5
-161.0	-25.5	0.0	-25.5
-160.0	-24.3	0.0	-24.3
-159.0	-17.4	0.0	-17.4
-158.0	-20.6	0.0	-20.6
-157.0	-18.7	0.0	-18.7
-156.0	-17.8	0.0	-17.8
-155.0	-26.4	0.0	-26.4
-154.0	-17.1	0.0	-17.1
-153.0	-22.6	0.0	-22.6
-152.0	-19.3	0.0	-19.3
-151.0	-14.8	0.0	-14.8
-150.0	-18.1	0.0	-18.1
-149.0	-16.6	0.0	-16.6
-148.0	-22.1	0.0	-22.1
-147.0	-24.1	0.0	-24.1
-146.0	-15.1	0.0	-15.1
-145.0	-18.9	0.0	-18.9
-144.0	-16.7	0.0	-16.7
-143.0	-14.5	0.0	-14.5
-142.0	-14.8	0.0	-14.8
-141.0	-14.2	0.0	-14.2
-140.0	-19.3	0.0	-19.3
-139.0	-16.6	0.0	-16.6
-138.0	-13.8	0.0	-13.8
-137.0	-24.9	0.0	-24.9
-136.0	-17.6	0.0	-17.6
-135.0	-15.6	0.0	-15.6
-134.0	-19.6	0.0	-19.6
-133.0	-19.4	0.0	-19.4
-132.0	-17.1	0.0	-17.1
-131.0	-18.8	0.0	-18.8
-130.0	-18.5	0.0	-18.5
-129.0	-14.9	0.0	-14.9
-128.0	-16.7	0.0	-16.7
-127.0	-21.7	0.0	-21.7
-126.0	-16.7	0.0	-16.7
-125.0	-15.8	0.0	-15.8
-124.0	-15.7	0.0	-15.7
-123.0	-19.9	0.0	-19.9
-122.0	-19.6	0.0	-19.6

27.55 GHz Antenna Pattern in Co-pol Az RHCP

Angle	Gain	Mask	Over Mask
Degrees	dBi	dBi	dB
0.0	52.1		
1.0	17.2		
2.0	11.5	21.5	-10.0
3.0	3.6	17.1	-13.4
4.0	5.9	13.9	-8.1
5.0	-2.8	11.5	-14.3
6.0	-0.4	9.5	-10.0
7.0	3.3	7.9	-4.6
8.0	-2.5	8.0	-10.5
9.0	-5.5	8.0	-13.5
10.0	-13.8	7.0	-20.8
11.0	-7.5	6.0	-13.4
12.0	-4.9	5.0	-10.0
13.0	-15.4	4.2	-19.5
14.0	-9.2	3.3	-12.6
15.0	-5.3	2.6	-7.9
16.0	-7.2	1.9	-9.1
17.0	-7.2	1.2	-8.4
18.0	-6.8	0.6	-7.4
19.0	-5.7	0.0	-5.7
20.0	-23.1	-0.5	-22.6
21.0	-16.5	-1.1	-15.4
22.0	-6.1	-1.6	-4.5
23.0	-7.9	-2.0	-5.8
24.0	-10.1	-2.5	-7.6
25.0	-11.5	-2.9	-8.6
26.0	-12.1	-3.4	-8.7
27.0	-12.1	-3.8	-8.3
28.0	-11.4	-4.2	-7.2
29.0	-6.3	-4.6	-1.8
30.0	-6.5	-4.9	-1.6
31.0	-5.2	-5.3	0.1
32.0	-4.3	-5.6	1.4
33.0	-5.8	-6.0	0.2
34.0	-3.4	-6.3	2.9
35.0	-4.9	-6.6	1.7
36.0	-2.9	-6.9	4.0
37.0	-3.0	-7.2	4.2
38.0	-6.1	-7.5	1.4
39.0	-5.1	-7.8	2.7
40.0	-7.4	-8.1	0.7
41.0	-8.9	-8.3	-0.5
42.0	-9.3	-8.6	-0.7
43.0	-12.5	-8.8	-3.7
44.0	-10.4	-9.1	-1.3
45.0	-11.0	-9.3	-1.7
46.0	-5.2	-9.6	4.4
47.0	-9.5	-9.8	0.3
48.0	-8.9	-10.0	1.2
49.0	-13.7	-10.0	-3.7
50.0	-14.0	-10.0	-4.0
51.0	-9.4	-10.0	0.6
52.0	-7.4	-10.0	2.6
53.0	-7.9	-10.0	2.1
54.0	-8.9	-10.0	1.1
55.0	-13.3	-10.0	-3.3
56.0	-14.7	-10.0	-4.7
57.0	-11.3	-10.0	-1.3

Orbit Communication Systems Ltd.
AL-7107-Ka, 2.15 m Antenna, Pattern Data Table
Co-pol Azimuth RHCP, -180° to +180° @ 1.0° increment

-121.0	-17.4	0.0	-17.4
-120.0	-21.6	0.0	-21.6
-119.0	-20.4	0.0	-20.4
-118.0	-26.4	0.0	-26.4
-117.0	-20.8	0.0	-20.8
-116.0	-18.3	0.0	-18.3
-115.0	-18.6	0.0	-18.6
-114.0	-20.2	0.0	-20.2
-113.0	-19.3	0.0	-19.3
-112.0	-20.9	0.0	-20.9
-111.0	-20.2	0.0	-20.2
-110.0	-19.0	0.0	-19.0
-109.0	-14.5	0.0	-14.5
-108.0	-20.8	0.0	-20.8
-107.0	-21.5	0.0	-21.5
-106.0	-19.2	0.0	-19.2
-105.0	-18.4	0.0	-18.4
-104.0	-18.0	0.0	-18.0
-103.0	-21.0	0.0	-21.0
-102.0	-24.7	0.0	-24.7
-101.0	-15.1	0.0	-15.1
-100.0	-18.9	0.0	-18.9
-99.0	-26.4	0.0	-26.4
-98.0	-14.1	0.0	-14.1
-97.0	-13.6	0.0	-13.6
-96.0	-12.9	0.0	-12.9
-95.0	-16.6	0.0	-16.6
-94.0	-17.7	0.0	-17.7
-93.0	-17.7	0.0	-17.7
-92.0	-12.0	0.0	-12.0
-91.0	-14.7	0.0	-14.7
-90.0	-16.2	0.0	-16.2
-89.0	-13.8	0.0	-13.8
-88.0	-18.2	0.0	-18.2
-87.0	-13.4	0.0	-13.4
-86.0	-12.2	0.0	-12.2
-85.0	-12.3	-10.0	-2.3
-84.0	-16.9	-10.0	-6.9
-83.0	-19.5	-10.0	-9.5
-82.0	-15.3	-10.0	-5.3
-81.0	-12.5	-10.0	-2.5
-80.0	-10.7	-10.0	-0.7
-79.0	-11.3	-10.0	-1.3
-78.0	-10.5	-10.0	-0.5
-77.0	-11.5	-10.0	-1.5
-76.0	-12.6	-10.0	-2.6
-75.0	-11.3	-10.0	-1.3
-74.0	-10.8	-10.0	-0.8
-73.0	-8.3	-10.0	1.7
-72.0	-8.2	-10.0	1.8
-71.0	-8.7	-10.0	1.3
-70.0	-7.8	-10.0	2.2
-69.0	-6.9	-10.0	3.1
-68.0	-5.8	-10.0	4.2
-67.0	-6.2	-10.0	3.8
-66.0	-5.3	-10.0	4.7
-65.0	-8.9	-10.0	1.1
-64.0	-8.1	-10.0	1.9
-63.0	-8.5	-10.0	1.5
-62.0	-9.6	-10.0	0.4
-61.0	-7.2	-10.0	2.8
-60.0	-10.1	-10.0	-0.1
-59.0	-10.8	-10.0	-0.8

58.0	-11.6	-10.0	-1.6
59.0	-11.8	-10.0	-1.8
60.0	-16.5	-10.0	-6.5
61.0	-17.9	-10.0	-7.9
62.0	-15.2	-10.0	-5.2
63.0	-13.0	-10.0	-3.0
64.0	-17.3	-10.0	-7.3
65.0	-19.7	-10.0	-9.7
66.0	-11.2	-10.0	-1.2
67.0	-17.3	-10.0	-7.3
68.0	-14.5	-10.0	-4.5
69.0	-14.8	-10.0	-4.8
70.0	-13.2	-10.0	-3.2
71.0	-16.2	-10.0	-6.2
72.0	-19.1	-10.0	-9.1
73.0	-13.4	-10.0	-3.4
74.0	-19.3	-10.0	-9.3
75.0	-25.5	-10.0	-15.5
76.0	-16.4	-10.0	-6.4
77.0	-16.4	-10.0	-6.4
78.0	-21.0	-10.0	-11.0
79.0	-22.0	-10.0	-12.0
80.0	-24.3	-10.0	-14.3
81.0	-20.9	-10.0	-10.9
82.0	-26.0	-10.0	-16.0
83.0	-18.1	-10.0	-8.1
84.0	-24.0	-10.0	-14.0
85.0	-25.7	-10.0	-15.7
86.0	-21.1	0.0	-21.1
87.0	-22.6	0.0	-22.6
88.0	-19.0	0.0	-19.0
89.0	-20.0	0.0	-20.0
90.0	-23.1	0.0	-23.1
91.0	-20.8	0.0	-20.8
92.0	-21.3	0.0	-21.3
93.0	-19.9	0.0	-19.9
94.0	-22.3	0.0	-22.3
95.0	-23.9	0.0	-23.9
96.0	-25.8	0.0	-25.8
97.0	-26.1	0.0	-26.1
98.0	-19.2	0.0	-19.2
99.0	-25.3	0.0	-25.3
100.0	-17.6	0.0	-17.6
101.0	-17.5	0.0	-17.5
102.0	-24.6	0.0	-24.6
103.0	-27.6	0.0	-27.6
104.0	-27.9	0.0	-27.9
105.0	-20.0	0.0	-20.0
106.0	-23.9	0.0	-23.9
107.0	-25.1	0.0	-25.1
108.0	-21.1	0.0	-21.1
109.0	-21.3	0.0	-21.3
110.0	-27.9	0.0	-27.9
111.0	-21.3	0.0	-21.3
112.0	-22.8	0.0	-22.8
113.0	-15.5	0.0	-15.5
114.0	-21.9	0.0	-21.9
115.0	-20.5	0.0	-20.5
116.0	-18.7	0.0	-18.7
117.0	-18.2	0.0	-18.2
118.0	-21.3	0.0	-21.3
119.0	-16.7	0.0	-16.7
120.0	-27.9	0.0	-27.9

Orbit Communication Systems Ltd.
AL-7107-Ka, 2.15 m Antenna, Pattern Data Table
Co-pol Azimuth RHCP, -180° to +180° @ 1.0° increment

-58.0	-10.1	-10.0	-0.1
-57.0	-11.1	-10.0	-1.1
-56.0	-9.1	-10.0	0.9
-55.0	-13.6	-10.0	-3.6
-54.0	-11.4	-10.0	-1.4
-53.0	-14.3	-10.0	-4.3
-52.0	-13.3	-10.0	-3.3
-51.0	-18.3	-10.0	-8.3
-50.0	-12.7	-10.0	-2.7
-49.0	-15.6	-10.0	-5.6
-48.0	-15.3	-10.0	-5.3
-47.0	-19.3	-9.8	-9.5
-46.0	-13.8	-9.6	-4.2
-45.0	-17.5	-9.3	-8.1
-44.0	-23.2	-9.1	-14.1
-43.0	-22.2	-8.8	-13.4
-42.0	-22.2	-8.6	-13.6
-41.0	-20.6	-8.3	-12.3
-40.0	-15.6	-8.1	-7.6
-39.0	-22.7	-7.8	-14.9
-38.0	-16.5	-7.5	-9.0
-37.0	-15.8	-7.2	-8.6
-36.0	-19.3	-6.9	-12.3
-35.0	-18.5	-6.6	-11.9
-34.0	-22.3	-6.3	-16.0
-33.0	-20.6	-6.0	-14.7
-32.0	-23.6	-5.6	-18.0
-31.0	-18.1	-5.3	-12.9
-30.0	-15.0	-4.9	-10.1
-29.0	-18.0	-4.6	-13.4
-28.0	-16.6	-4.2	-12.4
-27.0	-17.3	-3.8	-13.5
-26.0	-17.3	-3.4	-13.9
-25.0	-20.0	-2.9	-17.0
-24.0	-17.3	-2.5	-14.8
-23.0	-15.7	-2.0	-13.7
-22.0	-15.4	-1.6	-13.8
-21.0	-16.3	-1.1	-15.2
-20.0	-18.9	-0.5	-18.4
-19.0	-12.6	0.0	-12.7
-18.0	-18.1	0.6	-18.7
-17.0	-14.3	1.2	-15.5
-16.0	-17.5	1.9	-19.4
-15.0	-17.7	2.6	-20.3
-14.0	-25.8	3.3	-29.1
-13.0	-6.8	4.2	-11.0
-12.0	-4.1	5.0	-9.2
-11.0	-7.6	6.0	-13.6
-10.0	-5.5	7.0	-12.5
-9.0	-3.5	8.0	-11.5
-8.0	-4.1	8.0	-12.1
-7.0	1.8	7.9	-6.1
-6.0	-10.6	9.5	-20.2
-5.0	2.7	11.5	-8.9
-4.0	5.3	13.9	-8.7
-3.0	8.9	17.1	-8.2
-2.0	11.7	21.5	-9.8
-1.0	21.0		
0.0	52.1		

121.0	-21.5	0.0	-21.5
122.0	-17.6	0.0	-17.6
123.0	-20.4	0.0	-20.4
124.0	-21.7	0.0	-21.7
125.0	-25.7	0.0	-25.7
126.0	-24.9	0.0	-24.9
127.0	-19.6	0.0	-19.6
128.0	-27.9	0.0	-27.9
129.0	-25.8	0.0	-25.8
130.0	-22.0	0.0	-22.0
131.0	-20.6	0.0	-20.6
132.0	-21.8	0.0	-21.8
133.0	-24.8	0.0	-24.8
134.0	-23.8	0.0	-23.8
135.0	-23.4	0.0	-23.4
136.0	-23.1	0.0	-23.1
137.0	-21.8	0.0	-21.8
138.0	-19.0	0.0	-19.0
139.0	-23.1	0.0	-23.1
140.0	-23.6	0.0	-23.6
141.0	-21.1	0.0	-21.1
142.0	-26.3	0.0	-26.3
143.0	-18.5	0.0	-18.5
144.0	-27.9	0.0	-27.9
145.0	-21.1	0.0	-21.1
146.0	-23.5	0.0	-23.5
147.0	-19.7	0.0	-19.7
148.0	-24.1	0.0	-24.1
149.0	-23.3	0.0	-23.3
150.0	-22.0	0.0	-22.0
151.0	-27.9	0.0	-27.9
152.0	-23.3	0.0	-23.3
153.0	-21.9	0.0	-21.9
154.0	-23.1	0.0	-23.1
155.0	-17.8	0.0	-17.8
156.0	-27.9	0.0	-27.9
157.0	-27.0	0.0	-27.0
158.0	-23.3	0.0	-23.3
159.0	-27.2	0.0	-27.2
160.0	-14.9	0.0	-14.9
161.0	-22.5	0.0	-22.5
162.0	-22.3	0.0	-22.3
163.0	-19.8	0.0	-19.8
164.0	-16.6	0.0	-16.6
165.0	-20.0	0.0	-20.0
166.0	-22.5	0.0	-22.5
167.0	-21.2	0.0	-21.2
168.0	-24.4	0.0	-24.4
169.0	-27.3	0.0	-27.3
170.0	-20.9	0.0	-20.9
171.0	-21.2	0.0	-21.2
172.0	-27.9	0.0	-27.9
173.0	-20.3	0.0	-20.3
174.0	-19.1	0.0	-19.1
175.0	-27.9	0.0	-27.9
176.0	-24.3	0.0	-24.3
177.0	-20.9	0.0	-20.9
178.0	-24.6	0.0	-24.6
179.0	-19.3	0.0	-19.3

Orbit Communication Systems Ltd.

AL AL-7107-Ka, 2.15 m Antenna, Pattern Data Table
Co-pol Azimuth RHCP, -10° to +10° @ 0.1° increment

27.55 GHz Antenna Pattern in Co-pol Az RHCP

Angle	Gain	Mask	Over Mask
Degrees	dBi	dBi	dB
-10.0	-2.9	7.0	-9.9
-9.9	-2.7	7.1	-9.8
-9.8	-2.1	7.2	-9.3
-9.7	-6.0	7.3	-13.3
-9.6	-8.3	7.4	-15.7
-9.5	-6.8	7.6	-14.4
-9.4	-14.7	7.7	-22.4
-9.3	-6.0	7.8	-13.8
-9.2	-3.8	8.0	-11.8
-9.1	-4.8	8.0	-12.8
-9.0	-10.7	8.0	-18.7
-8.9	-24.0	8.0	-32.0
-8.8	-19.9	8.0	-27.9
-8.7	-13.1	8.0	-21.1
-8.6	-13.2	8.0	-21.2
-8.5	-16.3	8.0	-24.3
-8.4	-11.2	8.0	-19.2
-8.3	-6.2	8.0	-14.2
-8.2	-2.1	8.0	-10.1
-8.1	-1.1	8.0	-9.1
-8.0	-3.6	8.0	-11.6
-7.9	-7.5	8.0	-15.5
-7.8	-2.4	8.0	-10.4
-7.7	0.1	8.0	-7.9
-7.6	1.4	8.0	-6.6
-7.5	-0.3	8.0	-8.3
-7.4	-7.4	8.0	-15.4
-7.3	-6.5	8.0	-14.5
-7.2	-0.8	8.0	-8.8
-7.1	0.1	8.0	-7.9
-7.0	0.2	7.9	-7.7
-6.9	2.9	8.0	-5.1
-6.8	3.8	8.2	-4.3
-6.7	3.3	8.3	-5.0
-6.6	1.5	8.5	-7.0
-6.5	-0.3	8.7	-8.9
-6.4	-0.4	8.8	-9.3
-6.3	-3.9	9.0	-12.9
-6.2	-11.2	9.2	-20.4
-6.1	-12.6	9.4	-21.9
-6.0	-3.2	9.5	-12.7
-5.9	1.1	9.7	-8.6
-5.8	1.8	9.9	-8.1
-5.7	-3.2	10.1	-13.3
-5.6	-4.1	10.3	-14.4
-5.5	1.9	10.5	-8.6
-5.4	2.5	10.7	-8.2
-5.3	-4.2	10.9	-15.1
-5.2	-4.5	11.1	-15.6
-5.1	1.1	11.3	-10.2
-5.0	2.1	11.5	-9.4
-4.9	2.4	11.7	-9.3
-4.8	2.8	12.0	-9.2
-4.7	3.7	12.2	-8.5
-4.6	3.9	12.4	-8.6
-4.5	2.7	12.7	-9.9
-4.4	1.1	12.9	-11.8
-4.3	0.5	13.2	-12.7
-4.2	2.6	13.4	-10.8
-4.1	3.9	13.7	-9.8

27.55 GHz Antenna Pattern in Co-pol Az RHCP

Angle	Gain	Mask	Over Mask
Degrees	dBi	dBi	dB
0.0	52.0		
0.1	51.3		
0.2	49.0		
0.3	44.7		
0.4	38.8		
0.5	32.1		
0.6	26.0		
0.7	27.0		
0.8	28.5		
0.9	25.7		
1.0	17.7		
1.1	16.9		
1.2	19.7		
1.3	14.8		
1.4	5.7		
1.5	9.9	24.6	-14.7
1.6	10.5	23.9	-13.4
1.7	15.7	23.2	-7.5
1.8	16.4	22.6	-6.2
1.9	14.3	22.0	-7.8
2.0	7.4	21.5	-14.0
2.1	3.9	20.9	-17.1
2.2	0.1	20.4	-20.4
2.3	-3.9	20.0	-23.9
2.4	1.8	19.5	-17.7
2.5	3.1	19.1	-15.9
2.6	3.7	18.6	-14.9
2.7	2.3	18.2	-15.9
2.8	1.0	17.8	-16.8
2.9	2.4	17.4	-15.0
3.0	3.7	17.1	-13.4
3.1	7.2	16.7	-9.5
3.2	9.0	16.4	-7.4
3.3	8.4	16.0	-7.6
3.4	2.8	15.7	-12.9
3.5	-9.1	15.4	-24.5
3.6	-3.9	15.1	-19.0
3.7	-4.2	14.8	-19.0
3.8	4.2	14.5	-10.3
3.9	7.3	14.2	-6.9
4.0	5.9	13.9	-8.1
4.1	-0.4	13.7	-14.0
4.2	-2.7	13.4	-16.1
4.3	1.2	13.2	-11.9
4.4	0.2	12.9	-12.8
4.5	-1.8	12.7	-14.5
4.6	-2.3	12.4	-14.7
4.7	0.2	12.2	-12.0
4.8	1.2	12.0	-10.8
4.9	0.7	11.7	-11.0
5.0	-1.8	11.5	-13.3
5.1	-10.5	11.3	-21.8
5.2	-14.5	11.1	-25.6
5.3	-6.9	10.9	-17.8
5.4	-9.7	10.7	-20.4
5.5	-11.1	10.5	-21.6
5.6	-4.5	10.3	-14.8
5.7	-1.3	10.1	-11.4
5.8	0.8	9.9	-9.1
5.9	0.5	9.7	-9.3

Orbit Communication Systems Ltd.

AL AL-7107-Ka, 2.15 m Antenna, Pattern Data Table
Co-pol Azimuth RHCP, -10° to +10° @ 0.1° increment

-4.0	5.9	13.9	-8.1
-3.9	8.7	14.2	-5.5
-3.8	9.3	14.5	-5.2
-3.7	6.5	14.8	-8.3
-3.6	-2.3	15.1	-17.4
-3.5	0.8	15.4	-14.6
-3.4	2.6	15.7	-13.1
-3.3	3.9	16.0	-12.2
-3.2	8.1	16.4	-8.2
-3.1	8.9	16.7	-7.8
-3.0	9.1	17.1	-7.9
-2.9	11.6	17.4	-5.9
-2.8	11.5	17.8	-6.3
-2.7	9.1	18.2	-9.1
-2.6	1.7	18.6	-16.9
-2.5	-9.9	19.1	-29.0
-2.4	2.5	19.5	-17.0
-2.3	5.9	20.0	-14.0
-2.2	3.2	20.4	-17.2
-2.1	1.2	20.9	-19.7
-2.0	10.2	21.5	-11.3
-1.9	10.9	22.0	-11.1
-1.8	10.6	22.6	-12.0
-1.7	9.7	23.2	-13.5
-1.6	4.7	23.9	-19.2
-1.5	10.9	24.6	-13.7
-1.4	16.9		
-1.3	19.0		
-1.2	20.5		
-1.1	20.8		
-1.0	17.6		
-0.9	16.4		
-0.8	19.9		
-0.7	20.1		
-0.6	26.0		
-0.5	34.9		
-0.4	41.8		
-0.3	46.8		
-0.2	50.1		
-0.1	51.7		
0.0	52.0		

6.0	-2.3	9.5	-11.9
6.1	-12.6	9.4	-22.0
6.2	-8.1	9.2	-17.3
6.3	-5.1	9.0	-14.1
6.4	-3.2	8.8	-12.0
6.5	-1.7	8.7	-10.4
6.6	-4.0	8.5	-12.5
6.7	-2.4	8.3	-10.7
6.8	0.4	8.2	-7.8
6.9	3.3	8.0	-4.7
7.0	3.9	7.9	-4.0
7.1	3.9	8.0	-4.1
7.2	2.5	8.0	-5.5
7.3	-2.0	8.0	-10.0
7.4	-8.4	8.0	-16.4
7.5	-2.9	8.0	-10.9
7.6	-1.2	8.0	-9.2
7.7	-3.3	8.0	-11.3
7.8	-12.9	8.0	-20.9
7.9	-4.0	8.0	-12.0
8.0	0.0	8.0	-8.0
8.1	1.1	8.0	-6.9
8.2	0.3	8.0	-7.7
8.3	-2.2	8.0	-10.2
8.4	-5.8	8.0	-13.8
8.5	-7.2	8.0	-15.2
8.6	-4.7	8.0	-12.7
8.7	-6.7	8.0	-14.7
8.8	-4.9	8.0	-12.9
8.9	-2.8	8.0	-10.8
9.0	-2.8	8.0	-10.8
9.1	-6.1	8.0	-14.1
9.2	-13.9	8.0	-21.9
9.3	-10.9	7.8	-18.7
9.4	-5.2	7.7	-12.9
9.5	-4.5	7.6	-12.1
9.6	-10.9	7.4	-18.3
9.7	-16.2	7.3	-23.5
9.8	-7.3	7.2	-14.5
9.9	-5.5	7.1	-12.6
10.0	-8.4	7.0	-15.4

Orbit Communication Systems Ltd.
AL-7107-Ka, 2.15 m Antenna, Pattern Data Table
Co-pol Elevation RHCP, -30° to +30° @ 0.5° increment

27.55 GHz Antenna Pattern in Co-pol EI RHCP

Angle Degrees	Gain dBi	Mask dBi	Over Mask dB
-30.0	-7.7	-4.9	-2.8
-29.5	-10.1	-4.7	-5.3
-29.0	-11.7	-4.6	-7.1
-28.5	-11.5	-4.4	-7.1
-28.0	-10.6	-4.2	-6.5
-27.5	-12.3	-4.0	-8.3
-27.0	-7.9	-3.8	-4.2
-26.5	-9.9	-3.6	-6.3
-26.0	-18.1	-3.4	-14.8
-25.5	-14.0	-3.2	-10.8
-25.0	-16.3	-2.9	-13.4
-24.5	-8.9	-2.7	-6.2
-24.0	-10.4	-2.5	-7.9
-23.5	-8.1	-2.3	-5.8
-23.0	-14.6	-2.0	-12.5
-22.5	-7.0	-1.8	-5.2
-22.0	-5.5	-1.6	-4.0
-21.5	-6.2	-1.3	-4.9
-21.0	-16.3	-1.1	-15.2
-20.5	-8.9	-0.8	-8.1
-20.0	-3.3	-0.5	-2.8
-19.5	0.2	-0.3	0.4
-19.0	1.4	0.0	1.4
-18.5	-2.0	0.3	-2.3
-18.0	-3.3	0.6	-4.0
-17.5	-19.1	0.9	-20.0
-17.0	-23.4	1.2	-24.6
-16.5	-14.1	1.6	-15.6
-16.0	-12.5	1.9	-14.4
-15.5	-8.0	2.2	-10.2
-15.0	-21.1	2.6	-23.7
-14.5	-7.3	3.0	-10.2
-14.0	-15.0	3.3	-18.3
-13.5	-10.9	3.7	-14.7
-13.0	-8.5	4.2	-12.6
-12.5	-11.0	4.6	-15.6
-12.0	-7.1	5.0	-12.1
-11.5	-19.4	5.5	-24.9
-11.0	-7.7	6.0	-13.7
-10.5	-10.5	6.5	-17.0
-10.0	-7.4	7.0	-14.4
-9.5	-18.5	7.6	-26.0
-9.0	-11.2	8.1	-19.4
-8.5	-2.5	8.8	-11.2
-8.0	-8.2	9.4	-17.6
-7.5	-2.7	10.1	-12.8
-7.0	-4.8	10.9	-15.7
-6.5	-1.7	11.7	-13.4
-6.0	-4.8	12.5	-17.3
-5.5	-10.7	13.5	-24.2
-5.0	4.5	14.5	-10.0
-4.5	4.3	15.7	-11.4
-4.0	-7.1	16.9	-24.0
-3.5	3.3	18.4	-15.1
-3.0	11.3	20.1	-8.8
-2.5	12.5		
-2.0	7.4		
-1.5	14.8		
-1.0	20.6		
-0.5	36.4		
0.0	52.1		

27.55 GHz Antenna Pattern in Co-pol EI RHCP

Angle Degrees	Gain dBi	Mask dBi	Over Mask dB
0.0	52.1		
0.5	37.5		
1.0	18.1		
1.5	8.1		
2.0	7.4		
2.5	10.0		
3.0	-5.1	20.1	-25.1
3.5	13.9	18.4	-4.5
4.0	11.3	16.9	-5.7
4.5	4.3	15.7	-11.4
5.0	7.0	14.5	-7.6
5.5	-9.1	13.5	-22.5
6.0	-2.0	12.5	-14.5
6.5	0.4	11.7	-11.3
7.0	1.4	10.9	-9.5
7.5	-6.3	10.1	-16.4
8.0	-8.1	9.4	-17.5
8.5	-14.4	8.8	-23.2
9.0	-9.8	8.1	-18.0
9.5	-3.8	7.6	-11.4
10.0	-7.2	7.0	-14.2
10.5	-5.0	6.5	-11.5
11.0	-3.1	6.0	-9.1
11.5	-2.1	5.5	-7.6
12.0	-1.4	5.0	-6.5
12.5	-2.1	4.6	-6.7
13.0	-9.0	4.2	-13.1
13.5	-10.8	3.7	-14.5
14.0	-13.5	3.3	-16.8
14.5	-9.4	3.0	-12.3
15.0	-12.9	2.6	-15.5
15.5	-11.6	2.2	-13.8
16.0	-22.1	1.9	-24.0
16.5	-14.3	1.6	-15.9
17.0	-19.8	1.2	-21.1
17.5	-19.9	0.9	-20.8
18.0	-21.5	0.6	-22.1
18.5	-10.7	0.3	-11.0
19.0	-10.7	0.0	-10.7
19.5	-17.7	-0.3	-17.4
20.0	-27.3	-0.5	-26.8
20.5	-19.3	-0.8	-18.5
21.0	-15.4	-1.1	-14.3
21.5	-15.5	-1.3	-14.2
22.0	-13.1	-1.6	-11.6
22.5	-17.6	-1.8	-15.8
23.0	-27.5	-2.0	-25.4
23.5	-22.0	-2.3	-19.7
24.0	-22.0	-2.5	-19.5
24.5	-25.2	-2.7	-22.4
25.0	-13.5	-2.9	-10.5
25.5	-17.5	-3.2	-14.3
26.0	-16.0	-3.4	-12.7
26.5	-18.1	-3.6	-14.6
27.0	-14.1	-3.8	-10.3
27.5	-23.1	-4.0	-19.1
28.0	-20.7	-4.2	-16.5
28.5	-22.3	-4.4	-17.9
29.0	-26.0	-4.6	-21.4
29.5	-18.3	-4.7	-13.6
30.0	-15.8	-4.9	-10.9

Orbit Communication Systems Ltd.
AL-7107-Ka, 2.15 m Antenna, Pattern Data Table
Co-pol Elevation RHCP, -10° to +10° @ 0.1° increment

27.55 GHz Antenna Pattern in Co-pol EI RHCP

Angle	Gain	Mask	Over Mask
Degrees	dBi	dBi	dB
-10.0	-3.4	7.0	-10.4
-9.9	-1.4	7.1	-8.5
-9.8	-0.5	7.2	-7.7
-9.7	-3.0	7.3	-10.3
-9.6	-6.4	7.4	-13.9
-9.5	-13.5	7.6	-21.1
-9.4	-11.8	7.7	-19.5
-9.3	-9.4	7.8	-17.2
-9.2	-9.8	7.9	-17.7
-9.1	-11.4	8.0	-19.4
-9.0	-5.8	8.1	-14.0
-8.9	-3.0	8.3	-11.3
-8.8	-4.3	8.4	-12.7
-8.7	-6.5	8.5	-15.1
-8.6	-9.7	8.6	-18.3
-8.5	-5.5	8.8	-14.3
-8.4	-3.9	8.9	-12.8
-8.3	-3.6	9.0	-12.7
-8.2	-4.8	9.2	-13.9
-8.1	-6.9	9.3	-16.2
-8.0	-10.3	9.4	-19.7
-7.9	-9.7	9.6	-19.3
-7.8	-13.4	9.7	-23.1
-7.7	-13.0	9.8	-22.8
-7.6	-8.3	10.0	-18.2
-7.5	-4.2	10.1	-14.3
-7.4	-1.1	10.3	-11.4
-7.3	-1.1	10.4	-11.5
-7.2	-3.6	10.6	-14.2
-7.1	-10.5	10.7	-21.2
-7.0	-3.8	10.9	-14.7
-6.9	-1.1	11.0	-12.2
-6.8	-6.5	11.2	-17.7
-6.7	-3.8	11.3	-15.2
-6.6	-2.8	11.5	-14.3
-6.5	-2.0	11.7	-13.7
-6.4	-0.2	11.8	-12.0
-6.3	1.5	12.0	-10.5
-6.2	0.3	12.2	-11.9
-6.1	-1.7	12.4	-14.1
-6.0	-3.7	12.5	-16.3
-5.9	-4.3	12.7	-17.1
-5.8	-5.8	12.9	-18.7
-5.7	-4.4	13.1	-17.5
-5.6	-7.1	13.3	-20.4
-5.5	-7.5	13.5	-21.0
-5.4	-4.6	13.7	-18.3
-5.3	0.2	13.9	-13.7
-5.2	2.5	14.1	-11.6
-5.1	3.6	14.3	-10.7
-5.0	3.9	14.5	-10.6
-4.9	4.8	14.7	-9.9
-4.8	4.7	15.0	-10.3
-4.7	1.1	15.2	-14.1
-4.6	-9.1	15.4	-24.5
-4.5	4.1	15.7	-11.6
-4.4	8.3	15.9	-7.6
-4.3	9.1	16.2	-7.1
-4.2	8.6	16.4	-7.8
-4.1	4.1	16.7	-12.6

27.55 GHz Antenna Pattern in Co-pol EI RHCP

Angle	Gain	Mask	Over Mask
Degrees	dBi	dBi	dB
0.0	52.0		
0.1	51.3		
0.2	49.1		
0.3	45.4		
0.4	41.3		
0.5	37.9		
0.6	33.8		
0.7	24.7		
0.8	11.9		
0.9	19.3		
1.0	21.1		
1.1	22.6		
1.2	20.8		
1.3	12.7		
1.4	8.4		
1.5	9.1		
1.6	12.7		
1.7	16.7		
1.8	16.5		
1.9	12.2		
2.0	9.5		
2.1	9.3		
2.2	11.3		
2.3	13.6		
2.4	13.0		
2.5	10.6		
2.6	8.7		
2.7	4.2		
2.8	-2.9		
2.9	4.7		
3.0	2.6	20.1	-17.5
3.1	-5.6	19.7	-25.3
3.2	3.9	19.4	-15.5
3.3	3.4	19.0	-15.6
3.4	9.3	18.7	-9.4
3.5	13.2	18.4	-5.2
3.6	13.6	18.1	-4.5
3.7	11.7	17.8	-6.1
3.8	7.4	17.5	-10.1
3.9	9.4	17.2	-7.8
4.0	12.3	16.9	-4.7
4.1	12.0	16.7	-4.7
4.2	10.3	16.4	-6.1
4.3	8.6	16.2	-7.6
4.4	7.9	15.9	-8.0
4.5	5.9	15.7	-9.7
4.6	3.4	15.4	-12.0
4.7	3.1	15.2	-12.1
4.8	4.8	15.0	-10.2
4.9	4.8	14.7	-10.0
5.0	5.6	14.5	-8.9
5.1	7.0	14.3	-7.3
5.2	8.0	14.1	-6.1
5.3	7.9	13.9	-6.0
5.4	4.1	13.7	-9.6
5.5	-6.3	13.5	-19.8
5.6	-6.8	13.3	-20.1
5.7	-4.7	13.1	-17.8
5.8	-3.8	12.9	-16.7
5.9	-1.1	12.7	-13.9

Orbit Communication Systems Ltd.
AL-7107-Ka, 2.15 m Antenna, Pattern Data Table
Co-pol Elevation RHCP, -10° to +10° @ 0.1° increment

-4.0	-2.6	16.9	-19.5
-3.9	7.7	17.2	-9.5
-3.8	9.9	17.5	-7.6
-3.7	9.7	17.8	-8.1
-3.6	7.9	18.1	-10.2
-3.5	4.9	18.4	-13.5
-3.4	-6.5	18.7	-25.2
-3.3	-0.8	19.0	-19.8
-3.2	-3.2	19.4	-22.5
-3.1	3.1	19.7	-16.6
-3.0	11.2	20.1	-8.8
-2.9	13.3		
-2.8	13.0		
-2.7	10.3		
-2.6	10.3		
-2.5	12.9		
-2.4	13.9		
-2.3	14.1		
-2.2	11.9		
-2.1	9.4		
-2.0	7.4		
-1.9	6.0		
-1.8	6.2		
-1.7	12.3		
-1.6	15.9		
-1.5	16.4		
-1.4	14.5		
-1.3	18.9		
-1.2	23.2		
-1.1	23.7		
-1.0	21.1		
-0.9	20.3		
-0.8	24.8		
-0.7	28.8		
-0.6	32.8		
-0.5	35.8		
-0.4	40.3		
-0.3	45.9		
-0.2	49.8		
-0.1	51.7		
0.0	52.0		

6.0	-2.3	12.5	-14.8
6.1	-3.9	12.4	-16.3
6.2	-1.4	12.2	-13.6
6.3	1.4	12.0	-10.6
6.4	1.5	11.8	-10.3
6.5	2.3	11.7	-9.4
6.6	1.7	11.5	-9.8
6.7	2.5	11.3	-8.9
6.8	4.3	11.2	-6.8
6.9	4.9	11.0	-6.1
7.0	3.4	10.9	-7.5
7.1	-2.8	10.7	-13.5
7.2	-11.8	10.6	-22.4
7.3	-12.0	10.4	-22.4
7.4	-8.4	10.3	-18.7
7.5	-5.0	10.1	-15.1
7.6	-3.9	10.0	-13.8
7.7	-4.6	9.8	-14.4
7.8	-5.2	9.7	-14.9
7.9	-7.5	9.6	-17.1
8.0	-4.3	9.4	-13.7
8.1	-2.9	9.3	-12.2
8.2	-7.4	9.2	-16.6
8.3	-12.0	9.0	-21.0
8.4	-6.8	8.9	-15.7
8.5	-5.5	8.8	-14.2
8.6	-7.0	8.6	-15.7
8.7	-9.0	8.5	-17.5
8.8	-12.3	8.4	-20.6
8.9	-13.9	8.3	-22.1
9.0	-14.1	8.1	-22.3
9.1	-13.8	8.0	-21.8
9.2	-8.7	7.9	-16.6
9.3	-10.0	7.8	-17.8
9.4	-24.4	7.7	-32.0
9.5	-10.5	7.6	-18.0
9.6	-5.1	7.4	-12.5
9.7	-1.6	7.3	-9.0
9.8	-1.1	7.2	-8.3
9.9	-1.8	7.1	-8.9
10.0	-3.4	7.0	-10.4

Orbit Communication Systems Ltd.
AL-7107-Ka, 2.15 m Antenna, Pattern Data Table
X-pol Azimuth RHCP, -10° to +10° @ 0.1° increment

27.55 GHz Antenna Pattern in X-pol Az RHCP

Angle	Gain	Mask	Over Mask
Degrees	dBi	dBi	dB
-10.0	-7.5	-2.0	-5.5
-9.9	-10.8	-2.0	-8.8
-9.8	-12.5	-2.0	-10.5
-9.7	-17.0	-2.0	-15.0
-9.6	-15.1	-2.0	-13.1
-9.5	-16.9	-2.0	-14.9
-9.4	-14.4	-2.0	-12.4
-9.3	-11.3	-2.0	-9.3
-9.2	-10.0	-2.0	-8.0
-9.1	-6.8	-2.0	-4.8
-9.0	-6.3	-2.0	-4.3
-8.9	-7.0	-2.0	-5.0
-8.8	-8.6	-2.0	-6.6
-8.7	-12.8	-2.0	-10.8
-8.6	-18.3	-2.0	-16.3
-8.5	-16.7	-2.0	-14.7
-8.4	-23.6	-2.0	-21.6
-8.3	-17.1	-2.0	-15.1
-8.2	-12.3	-2.0	-10.3
-8.1	-8.8	-2.0	-6.8
-8.0	-6.7	-2.0	-4.7
-7.9	-7.9	-2.0	-5.9
-7.8	-7.6	-2.0	-5.6
-7.7	-7.2	-2.0	-5.2
-7.6	-6.6	-2.0	-4.6
-7.5	-6.7	-2.0	-4.7
-7.4	-6.3	-2.0	-4.3
-7.3	-4.3	-2.0	-2.3
-7.2	-4.9	-2.0	-2.9
-7.1	-6.0	-2.0	-4.0
-7.0	-7.6	-2.1	-5.5
-6.9	-6.7	-2.0	-4.7
-6.8	-6.1	-1.8	-4.3
-6.7	-7.5	-1.7	-5.9
-6.6	-8.8	-1.5	-7.3
-6.5	-7.3	-1.3	-5.9
-6.4	-5.3	-1.2	-4.2
-6.3	-3.7	-1.0	-2.7
-6.2	-5.4	-0.8	-4.6
-6.1	-7.7	-0.6	-7.1
-6.0	-11.9	-0.5	-11.4
-5.9	-5.2	-0.3	-4.9
-5.8	-3.4	-0.1	-3.3
-5.7	-5.3	0.1	-5.4
-5.6	-11.3	0.3	-11.6
-5.5	-8.2	0.5	-8.7
-5.4	-6.9	0.7	-7.6
-5.3	-8.6	0.9	-9.5
-5.2	-16.6	1.1	-17.7
-5.1	-15.9	1.3	-17.2
-5.0	-8.2	1.5	-9.7
-4.9	-8.2	1.7	-9.9
-4.8	-12.2	2.0	-14.1
-4.7	-11.8	2.2	-14.0
-4.6	-8.2	2.4	-10.6
-4.5	-8.2	2.7	-10.9
-4.4	-9.6	2.9	-12.5
-4.3	-14.6	3.2	-17.8
-4.2	-15.3	3.4	-18.7
-4.1	-5.6	3.7	-9.3

27.55 GHz Antenna Pattern in X-pol Az RHCP

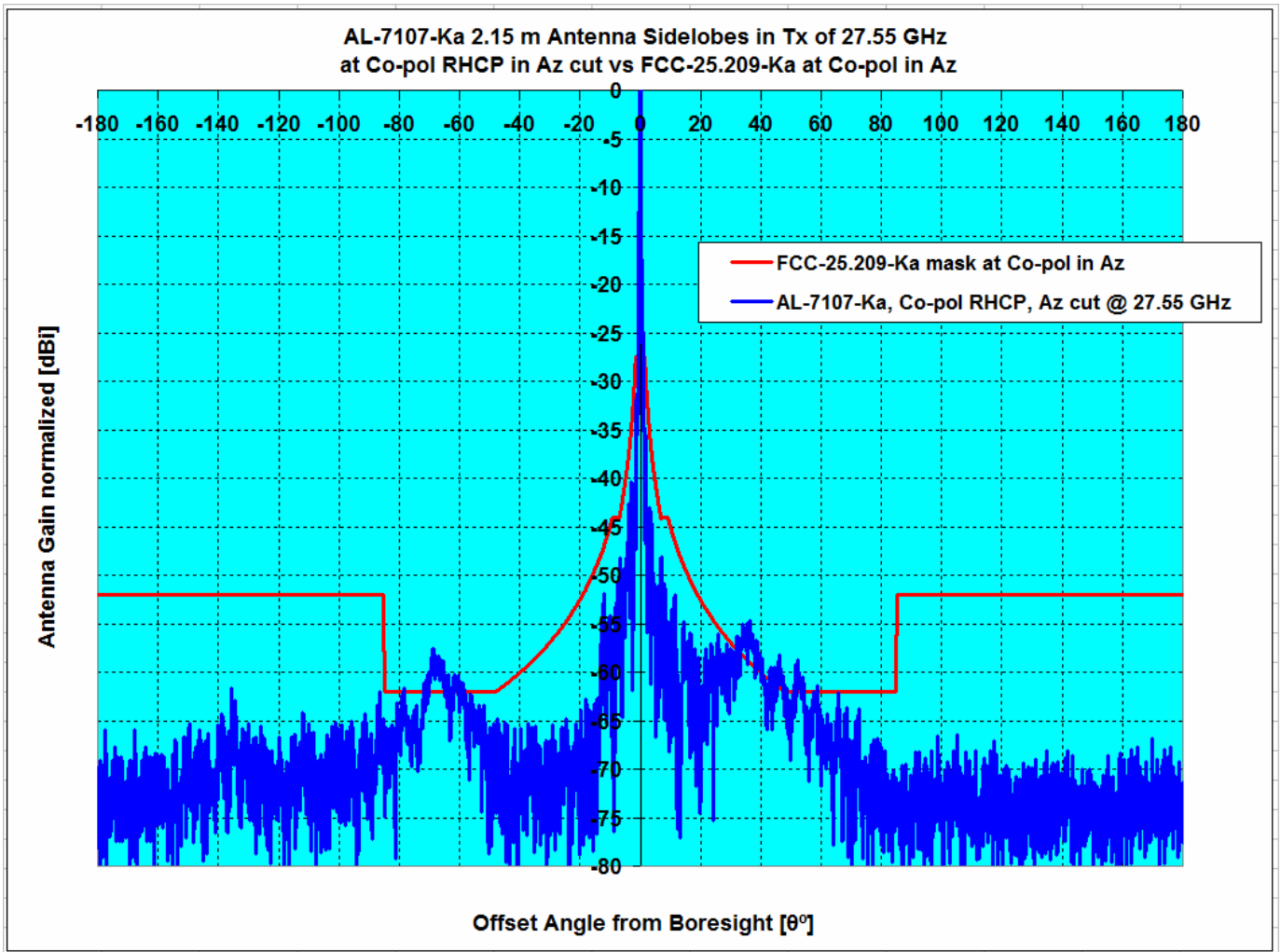
Angle	Gain	Mask	Over Mask
Degrees	dBi	dBi	dB
0.0	20.3		
0.1	18.8		
0.2	9.9		
0.3	22.2		
0.4	25.1		
0.5	25.2		
0.6	22.3		
0.7	15.0		
0.8	2.0		
0.9	1.8		
1.0	6.9		
1.1	10.7		
1.2	10.9		
1.3	6.8		
1.4	1.6		
1.5	4.0		
1.6	1.8		
1.7	-3.6		
1.8	-3.2	12.6	-15.8
1.9	-0.1	12.0	-12.2
2.0	0.6	11.5	-10.9
2.1	0.0	10.9	-10.9
2.2	-7.1	10.4	-17.5
2.3	-12.0	10.0	-22.0
2.4	-4.2	9.5	-13.7
2.5	-3.3	9.1	-12.4
2.6	-5.4	8.6	-14.1
2.7	-13.2	8.2	-21.4
2.8	-3.2	7.8	-11.0
2.9	-0.4	7.4	-7.9
3.0	-2.3	7.1	-9.3
3.1	-8.6	6.7	-15.3
3.2	-9.9	6.4	-16.3
3.3	-7.8	6.0	-13.9
3.4	-14.7	5.7	-20.4
3.5	-9.0	5.4	-14.4
3.6	-4.8	5.1	-9.9
3.7	-8.9	4.8	-13.7
3.8	-16.2	4.5	-20.7
3.9	-9.4	4.2	-13.6
4.0	-7.6	3.9	-11.6
4.1	-9.7	3.7	-13.3
4.2	-10.0	3.4	-13.4
4.3	-9.7	3.2	-12.8
4.4	-8.6	2.9	-11.6
4.5	-8.4	2.7	-11.1
4.6	-7.8	2.4	-10.2
4.7	-5.6	2.2	-7.8
4.8	-4.8	2.0	-6.8
4.9	-8.8	1.7	-10.5
5.0	-18.5	1.5	-20.1
5.1	-23.8	1.3	-25.1
5.2	-17.5	1.1	-18.6
5.3	-11.1	0.9	-12.0
5.4	-7.9	0.7	-8.6
5.5	-7.3	0.5	-7.8
5.6	-7.3	0.3	-7.6
5.7	-4.7	0.1	-4.8
5.8	-3.5	-0.1	-3.4
5.9	-7.4	-0.3	-7.1

Orbit Communication Systems Ltd.
AL-7107-Ka, 2.15 m Antenna, Pattern Data Table
X-pol Azimuth RHCP, -10° to +10° @ 0.1° increment

-4.0	-3.7	3.9	-7.7
-3.9	-5.3	4.2	-9.5
-3.8	-8.3	4.5	-12.8
-3.7	-2.1	4.8	-6.9
-3.6	-1.0	5.1	-6.1
-3.5	-1.9	5.4	-7.3
-3.4	-6.9	5.7	-12.6
-3.3	-4.4	6.0	-10.4
-3.2	-1.3	6.4	-7.7
-3.1	-4.7	6.7	-11.4
-3.0	-15.0	7.1	-22.1
-2.9	-6.9	7.4	-14.3
-2.8	-10.5	7.8	-18.3
-2.7	-8.6	8.2	-16.8
-2.6	-3.4	8.6	-12.1
-2.5	-3.7	9.1	-12.7
-2.4	-3.6	9.5	-13.1
-2.3	0.9	10.0	-9.1
-2.2	2.0	10.4	-8.5
-2.1	1.6	10.9	-9.3
-2.0	1.6	11.5	-9.9
-1.9	-5.5	12.0	-17.6
-1.8	-2.5	12.6	-15.1
-1.7	4.6		
-1.6	5.8		
-1.5	7.3		
-1.4	10.5		
-1.3	9.8		
-1.2	5.8		
-1.1	11.3		
-1.0	15.3		
-0.9	16.1		
-0.8	16.5		
-0.7	19.7		
-0.6	23.8		
-0.5	26.5		
-0.4	27.2		
-0.3	26.1		
-0.2	21.4		
-0.1	15.8		
0.0	20.3		

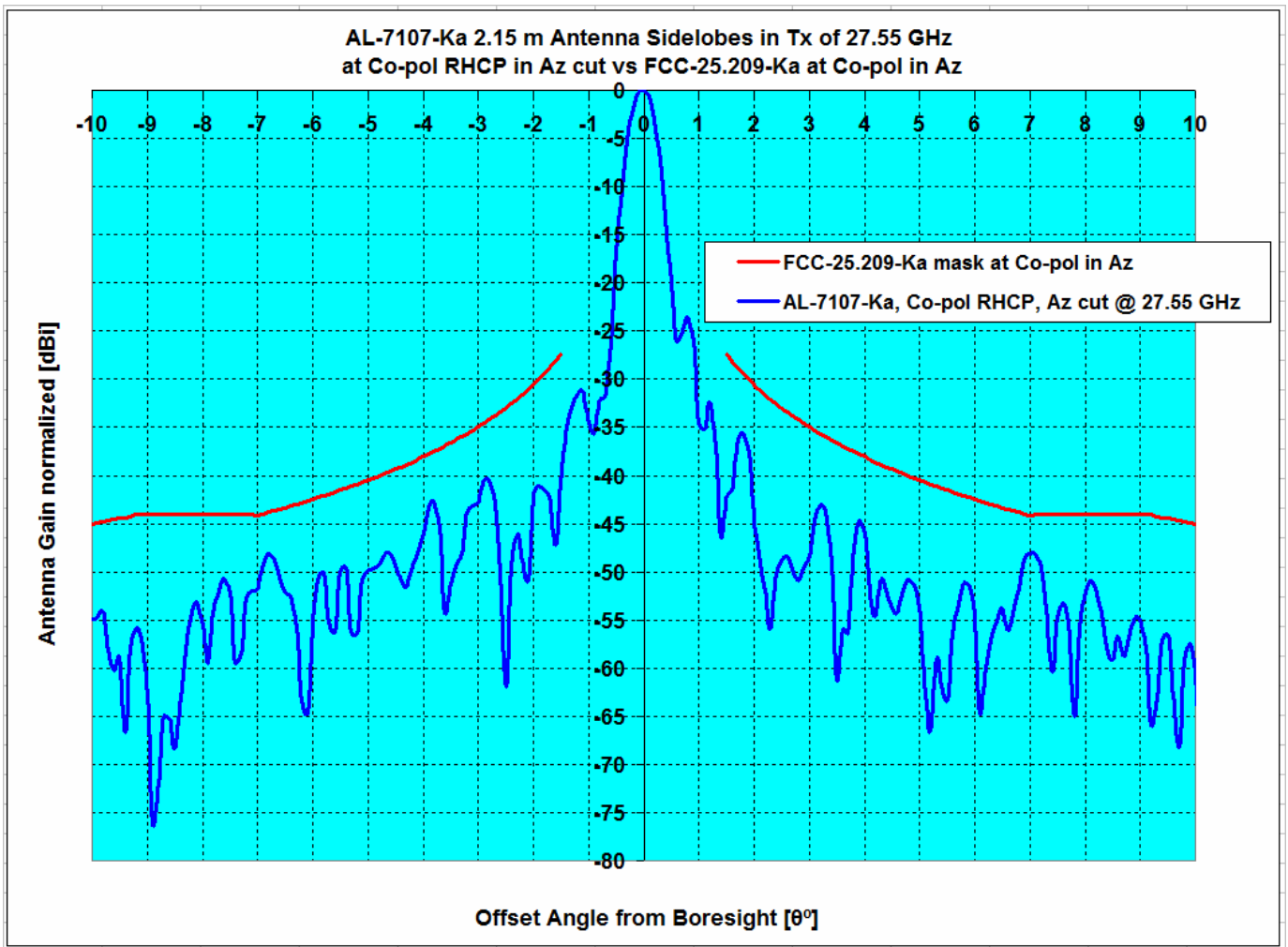
6.0	-8.9	-0.5	-8.4
6.1	-11.4	-0.6	-10.8
6.2	-15.9	-0.8	-15.1
6.3	-18.3	-1.0	-17.4
6.4	-15.0	-1.2	-13.8
6.5	-14.3	-1.3	-12.9
6.6	-9.6	-1.5	-8.1
6.7	-7.4	-1.7	-5.8
6.8	-7.8	-1.8	-6.0
6.9	-10.7	-2.0	-8.7
7.0	-11.6	-2.1	-9.5
7.1	-13.1	-2.0	-11.1
7.2	-20.8	-2.0	-18.8
7.3	-17.3	-2.0	-15.3
7.4	-16.6	-2.0	-14.6
7.5	-17.2	-2.0	-15.2
7.6	-10.0	-2.0	-8.0
7.7	-8.6	-2.0	-6.6
7.8	-10.9	-2.0	-8.9
7.9	-14.2	-2.0	-12.2
8.0	-15.8	-2.0	-13.8
8.1	-17.5	-2.0	-15.5
8.2	-19.2	-2.0	-17.2
8.3	-17.6	-2.0	-15.6
8.4	-13.7	-2.0	-11.7
8.5	-18.4	-2.0	-16.4
8.6	-25.2	-2.0	-23.2
8.7	-13.8	-2.0	-11.8
8.8	-15.0	-2.0	-13.0
8.9	-8.7	-2.0	-6.7
9.0	-6.3	-2.0	-4.3
9.1	-5.3	-2.0	-3.3
9.2	-6.9	-2.0	-4.9
9.3	-7.0	-2.0	-5.0
9.4	-10.6	-2.0	-8.6
9.5	-6.7	-2.0	-4.7
9.6	-5.5	-2.0	-3.5
9.7	-4.5	-2.0	-2.5
9.8	-5.9	-2.0	-3.9
9.9	-11.6	-2.0	-9.6
10.0	-12.6	-2.0	-10.6

Orbit Communication Systems Ltd.
AL-7107-Ka, 2.15 m Antenna, Pattern, Co-pol, Azimuth RHCP



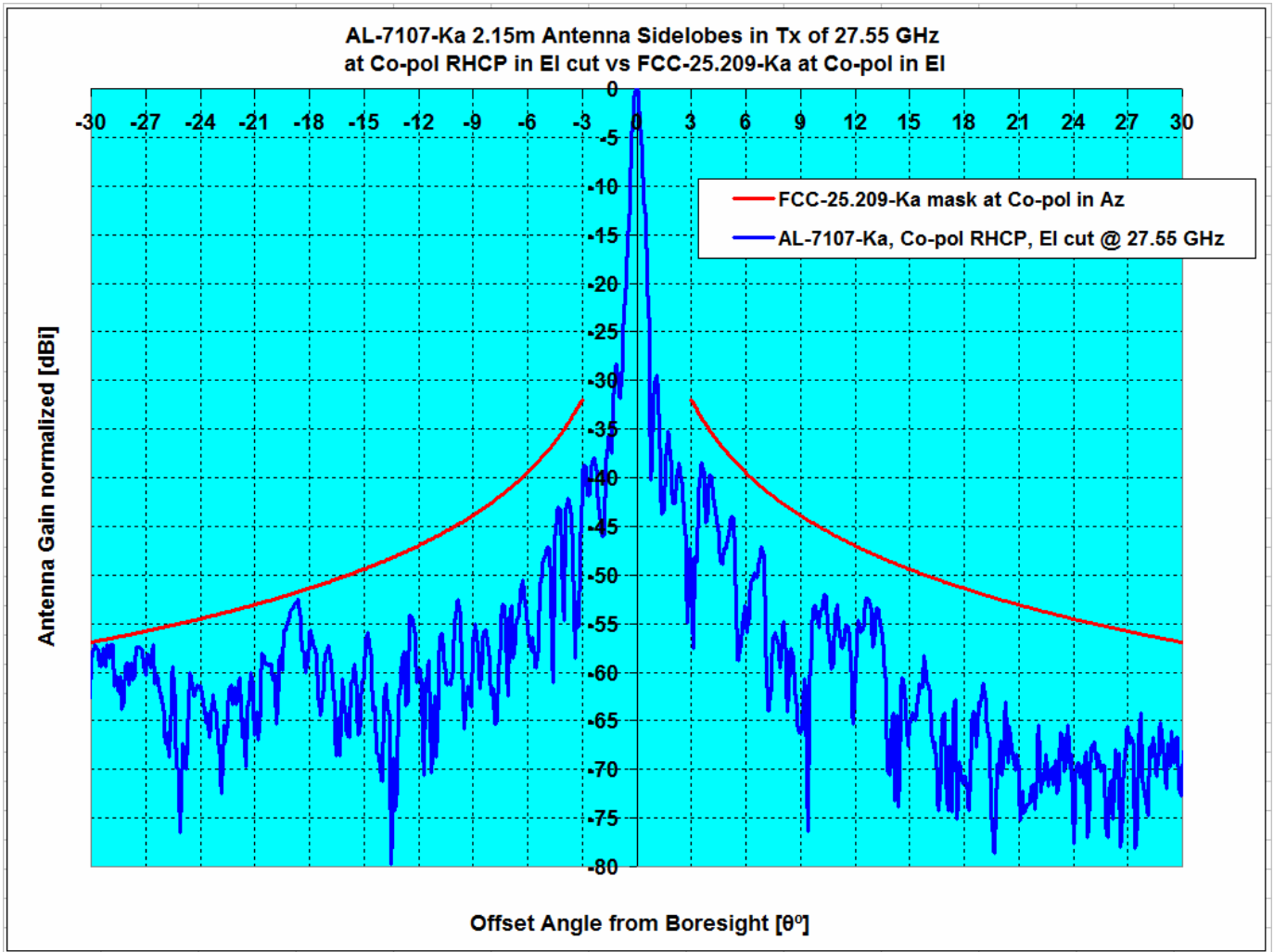
Description	Plane, CirP	Frequency	Ant. Gain	Peak Excursions dB		Over Mask %	
				1.5°≤θ≤7°	7°≤θ≤180°	1.5°≤θ≤7°	7°≤θ≤180°
Pattern Rule vs Antenna System	Type	GHz	dBi				
FCC-25.209-Ka, Co-pol Az, vs AL-7107-Ka	Az , RHCP	27.55	52.02	-3.99	4.44	0.00%	6.55%

Orbit Communication Systems Ltd.
AL-7107-Ka, 2.15 m Antenna, Pattern, Co-pol, Azimuth RHCP



Description	Plane, CirP	Frequency	Ant. Gain	Peak Excursions dB		Over Mask %	
				1.5°≤θ≤7°	7°≤θ≤180°	1.5°≤θ≤7°	7°≤θ≤180°
Pattern Rule vs Antenna System	Type	GHz	dBi				
FCC-25.209-Ka, Co-pol Az, vs AL-7107-Ka	Az , RHCP	27.55	52.02	-3.99	4.44	0.00%	6.55%

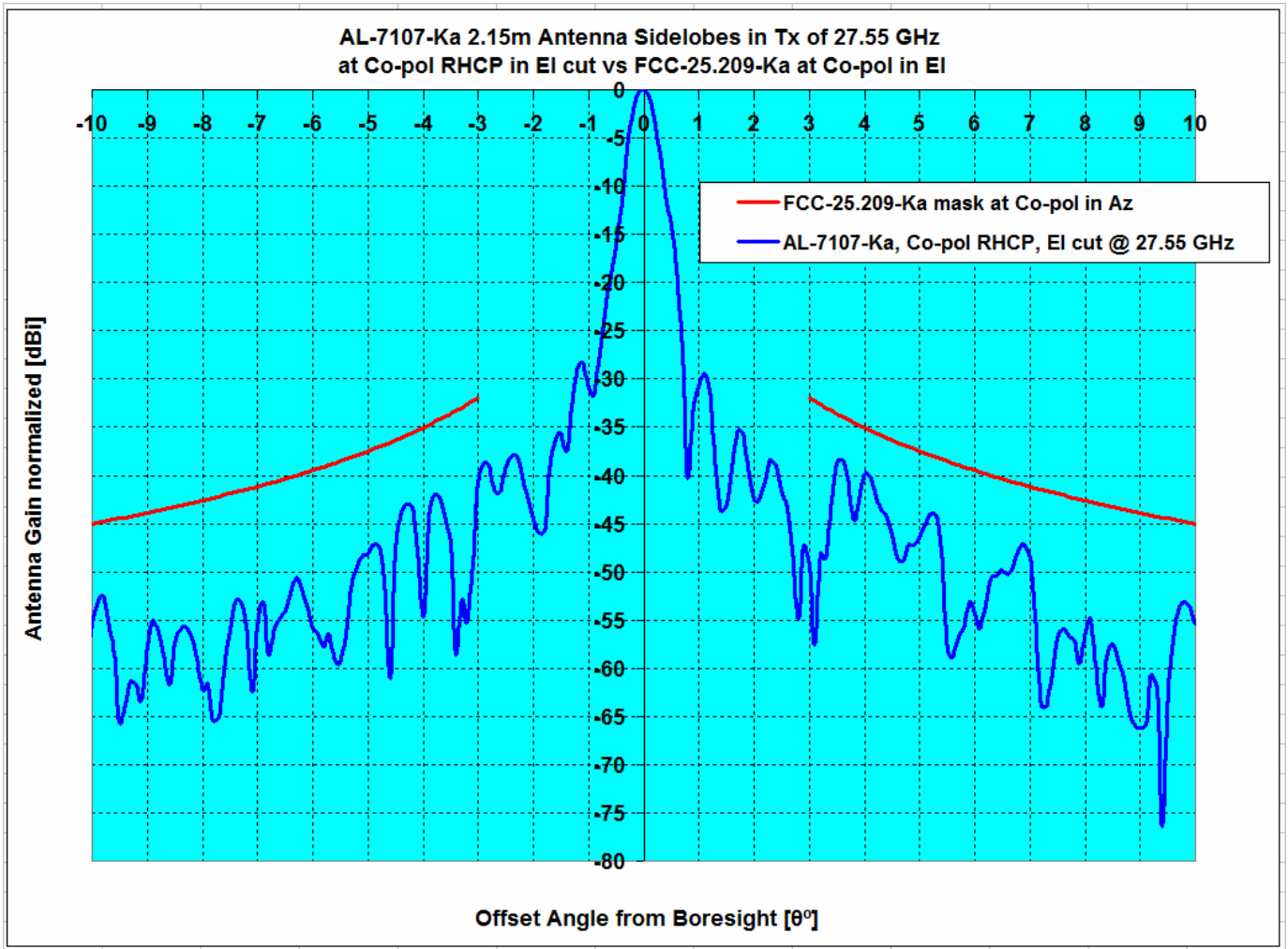
Orbit Communication Systems Ltd.
AL-7107-Ka, 2.15 m Antenna, Pattern, Co-pol, Elevation RHCP



Description	Plane, CirP	Frequency	Ant. Gain	Peak Excursions dB		Over Mask %	
				3°≤θ≤7°	7°≤θ≤30°	3°≤θ≤7°	7°≤θ≤30°
Pattern Rule vs Antenna System	Type	GHz	dBi				
FCC-25.209-Ka, Co-pol EI, vs AL-7107-Ka	EI , RHCP	27.55	52.02	-4.53	-0.33	0.00%	0.00%

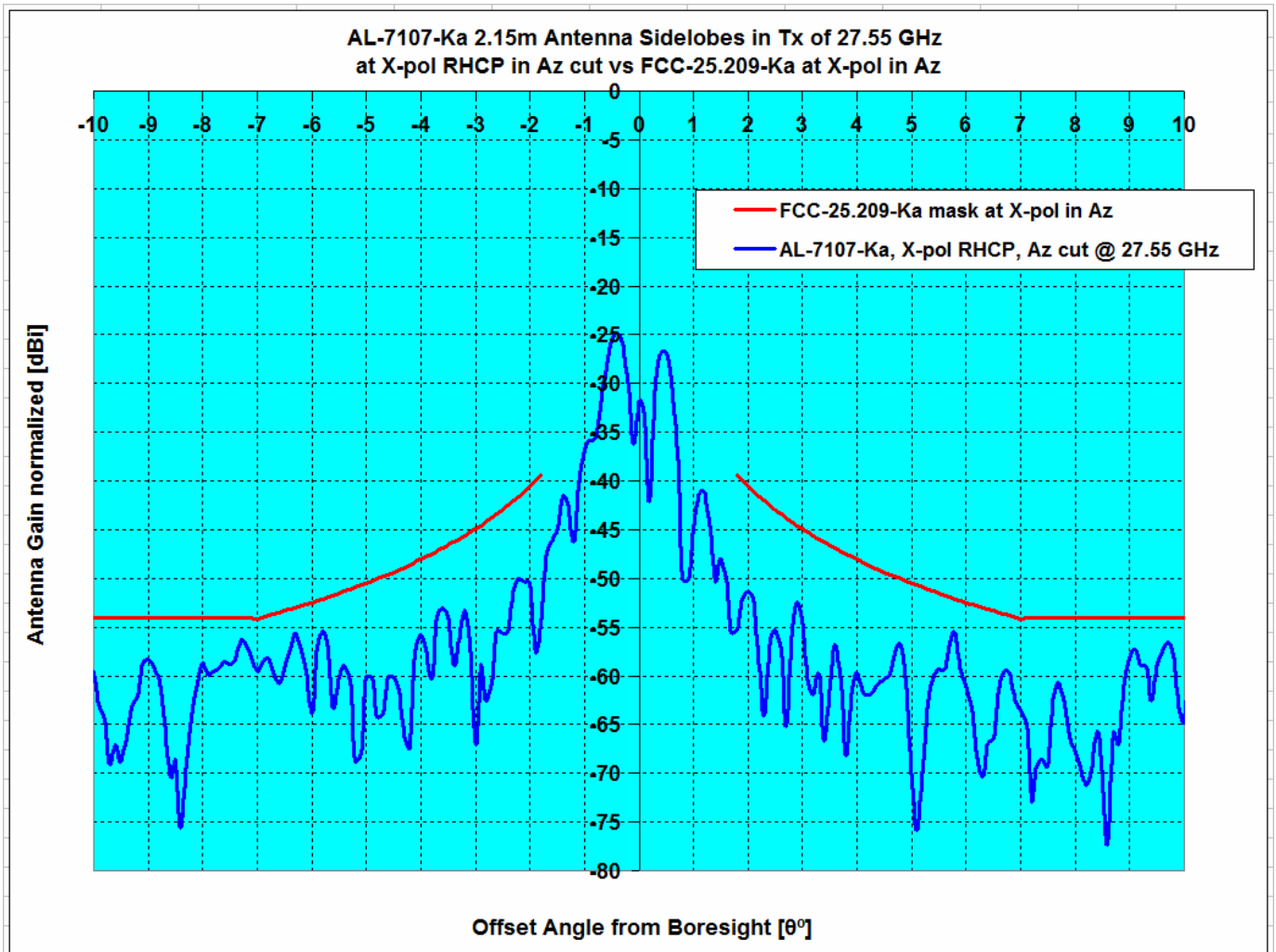
Orbit Communication Systems Ltd.

AL-7107-Ka, 2.15 m Antenna, Pattern, Co-pol, Elevation RHCP



Description	Plane, CirP	Frequency	Ant. Gain	Peak Excursions dB		Over Mask %	
				3°≤θ≤7°	7°≤θ≤30°	3°≤θ≤7°	7°≤θ≤30°
Pattern Rule vs Antenna System	Type	GHz	dBi				
FCC-25.209-Ka, Co-pol EI, vs AL-7107-Ka	EI , RHCP	27.55	52.02	-4.53	-0.33	0.00%	0.00%

Orbit Communication Systems Ltd.
AL-7107-Ka, 2.15 m Antenna, Pattern, X-pol, Azimuth RHCP



Description	Plane, CirP	Frequency	Ant. Gain	Peak Excursions dB		Over Mask %	
Pattern Rule vs Antenna System	Type	GHz	dBi	1.8°≤θ≤7°	1.8°≤θ≤9.2°	1.8°≤θ≤7°	1.8°≤θ≤9.2°
FCC-25.209-Ka, X-pol Az, vs AL-7107-Ka	Az , RHCP	27.55	52.02	-2.70	-2.32	0.00%	0.00%

Orbit Communication Systems Ltd.
AL-7107-Ka, 2.15 m Antenna, Pattern Data Table
Co-pol Azimuth LHCP, -180° to +180° @ 1.0° increment

28.30 GHz Antenna Pattern in Co-pol Az LHCP

Angle	Gain	Mask	Over Mask
Degrees	dBi	dBi	dB
-179.0	-23.3	0.0	-23.3
-178.0	-25.3	0.0	-25.3
-177.0	-18.7	0.0	-18.7
-176.0	-27.6	0.0	-27.6
-175.0	-18.5	0.0	-18.5
-174.0	-27.5	0.0	-27.5
-173.0	-21.8	0.0	-21.8
-172.0	-24.4	0.0	-24.4
-171.0	-18.7	0.0	-18.7
-170.0	-27.6	0.0	-27.6
-169.0	-25.5	0.0	-25.5
-168.0	-19.5	0.0	-19.5
-167.0	-20.6	0.0	-20.6
-166.0	-20.1	0.0	-20.1
-165.0	-25.7	0.0	-25.7
-164.0	-27.6	0.0	-27.6
-163.0	-26.7	0.0	-26.7
-162.0	-22.4	0.0	-22.4
-161.0	-22.7	0.0	-22.7
-160.0	-22.7	0.0	-22.7
-159.0	-25.5	0.0	-25.5
-158.0	-22.9	0.0	-22.9
-157.0	-27.6	0.0	-27.6
-156.0	-23.9	0.0	-23.9
-155.0	-16.8	0.0	-16.8
-154.0	-23.9	0.0	-23.9
-153.0	-26.7	0.0	-26.7
-152.0	-18.6	0.0	-18.6
-151.0	-14.8	0.0	-14.8
-150.0	-13.9	0.0	-13.9
-149.0	-15.8	0.0	-15.8
-148.0	-27.6	0.0	-27.6
-147.0	-18.7	0.0	-18.7
-146.0	-17.5	0.0	-17.5
-145.0	-21.6	0.0	-21.6
-144.0	-17.3	0.0	-17.3
-143.0	-18.9	0.0	-18.9
-142.0	-16.5	0.0	-16.5
-141.0	-12.3	0.0	-12.3
-140.0	-15.7	0.0	-15.7
-139.0	-22.2	0.0	-22.2
-138.0	-24.1	0.0	-24.1
-137.0	-17.5	0.0	-17.5
-136.0	-20.8	0.0	-20.8
-135.0	-20.9	0.0	-20.9
-134.0	-25.3	0.0	-25.3
-133.0	-25.5	0.0	-25.5
-132.0	-27.6	0.0	-27.6
-131.0	-27.6	0.0	-27.6
-130.0	-23.4	0.0	-23.4
-129.0	-19.0	0.0	-19.0
-128.0	-27.6	0.0	-27.6
-127.0	-23.5	0.0	-23.5
-126.0	-18.5	0.0	-18.5
-125.0	-27.6	0.0	-27.6
-124.0	-18.9	0.0	-18.9
-123.0	-27.0	0.0	-27.0
-122.0	-16.5	0.0	-16.5
-121.0	-20.3	0.0	-20.3
-120.0	-23.3	0.0	-23.3

28.30 GHz Antenna Pattern in Co-pol Az LHCP

Angle	Gain	Mask	Over Mask
Degrees	dBi	dBi	dB
0.0	52.4		
1.0	17.1		
2.0	10.6	21.5	-10.9
3.0	0.4	17.1	-16.6
4.0	-7.9	13.9	-21.8
5.0	-1.2	11.5	-12.7
6.0	-10.1	9.5	-19.6
7.0	0.0	7.9	-7.9
8.0	-2.9	8.0	-10.9
9.0	-10.0	8.0	-18.0
10.0	-3.5	7.0	-10.5
11.0	-1.5	6.0	-7.5
12.0	-3.5	5.0	-8.5
13.0	-5.5	4.2	-9.7
14.0	-13.6	3.3	-17.0
15.0	-8.0	2.6	-10.6
16.0	-16.4	1.9	-18.3
17.0	-26.4	1.2	-27.6
18.0	-14.3	0.6	-14.9
19.0	-8.3	0.0	-8.3
20.0	-16.9	-0.5	-16.4
21.0	-18.1	-1.1	-17.1
22.0	-5.9	-1.6	-4.3
23.0	-8.0	-2.0	-6.0
24.0	-10.2	-2.5	-7.7
25.0	-14.9	-2.9	-12.0
26.0	-8.9	-3.4	-5.5
27.0	-7.3	-3.8	-3.5
28.0	-8.6	-4.2	-4.4
29.0	-7.5	-4.6	-2.9
30.0	-8.4	-4.9	-3.4
31.0	-6.4	-5.3	-1.1
32.0	-5.4	-5.6	0.2
33.0	-3.9	-6.0	2.1
34.0	-5.5	-6.3	0.8
35.0	-8.1	-6.6	-1.5
36.0	-4.5	-6.9	2.4
37.0	-7.6	-7.2	-0.4
38.0	-5.0	-7.5	2.5
39.0	-7.1	-7.8	0.7
40.0	-8.0	-8.1	0.1
41.0	-10.5	-8.3	-2.2
42.0	-9.4	-8.6	-0.9
43.0	-11.2	-8.8	-2.3
44.0	-10.3	-9.1	-1.2
45.0	-8.9	-9.3	0.4
46.0	-6.7	-9.6	2.8
47.0	-9.2	-9.8	0.6
48.0	-15.2	-10.0	-5.1
49.0	-13.9	-10.0	-3.9
50.0	-12.6	-10.0	-2.6
51.0	-10.9	-10.0	-0.9
52.0	-10.3	-10.0	-0.3
53.0	-13.6	-10.0	-3.6
54.0	-14.2	-10.0	-4.2
55.0	-22.1	-10.0	-12.1
56.0	-17.3	-10.0	-7.3
57.0	-15.4	-10.0	-5.4
58.0	-15.6	-10.0	-5.6
59.0	-19.4	-10.0	-9.4

Orbit Communication Systems Ltd.
AL-7107-Ka, 2.15 m Antenna, Pattern Data Table
Co-pol Azimuth LHCP, -180° to +180° @ 1.0° increment

-119.0	-20.2	0.0	-20.2
-118.0	-22.4	0.0	-22.4
-117.0	-21.3	0.0	-21.3
-116.0	-22.3	0.0	-22.3
-115.0	-20.2	0.0	-20.2
-114.0	-19.3	0.0	-19.3
-113.0	-27.3	0.0	-27.3
-112.0	-25.8	0.0	-25.8
-111.0	-16.7	0.0	-16.7
-110.0	-19.2	0.0	-19.2
-109.0	-18.1	0.0	-18.1
-108.0	-14.4	0.0	-14.4
-107.0	-22.5	0.0	-22.5
-106.0	-26.4	0.0	-26.4
-105.0	-22.3	0.0	-22.3
-104.0	-22.2	0.0	-22.2
-103.0	-23.8	0.0	-23.8
-102.0	-22.4	0.0	-22.4
-101.0	-27.3	0.0	-27.3
-100.0	-16.1	0.0	-16.1
-99.0	-15.0	0.0	-15.0
-98.0	-17.8	0.0	-17.8
-97.0	-19.5	0.0	-19.5
-96.0	-11.1	0.0	-11.1
-95.0	-14.1	0.0	-14.1
-94.0	-17.9	0.0	-17.9
-93.0	-19.2	0.0	-19.2
-92.0	-15.9	0.0	-15.9
-91.0	-14.9	0.0	-14.9
-90.0	-14.9	0.0	-14.9
-89.0	-15.3	0.0	-15.3
-88.0	-20.4	0.0	-20.4
-87.0	-13.3	0.0	-13.3
-86.0	-14.4	0.0	-14.4
-85.0	-14.4	-10.0	-4.4
-84.0	-15.1	-10.0	-5.1
-83.0	-14.6	-10.0	-4.6
-82.0	-13.1	-10.0	-3.1
-81.0	-16.5	-10.0	-6.5
-80.0	-10.3	-10.0	-0.3
-79.0	-10.0	-10.0	0.0
-78.0	-9.9	-10.0	0.1
-77.0	-12.9	-10.0	-2.9
-76.0	-12.9	-10.0	-2.9
-75.0	-11.4	-10.0	-1.4
-74.0	-11.7	-10.0	-1.7
-73.0	-11.0	-10.0	-1.0
-72.0	-8.9	-10.0	1.1
-71.0	-8.3	-10.0	1.7
-70.0	-6.4	-10.0	3.6
-69.0	-6.4	-10.0	3.6
-68.0	-4.3	-10.0	5.7
-67.0	-6.6	-10.0	3.4
-66.0	-6.1	-10.0	3.9
-65.0	-7.0	-10.0	3.0
-64.0	-7.3	-10.0	2.7
-63.0	-8.4	-10.0	1.6
-62.0	-9.1	-10.0	0.9
-61.0	-9.8	-10.0	0.2
-60.0	-8.9	-10.0	1.1
-59.0	-10.2	-10.0	-0.2
-58.0	-11.1	-10.0	-1.1
-57.0	-14.7	-10.0	-4.7

60.0	-17.8	-10.0	-7.8
61.0	-26.4	-10.0	-16.4
62.0	-20.4	-10.0	-10.4
63.0	-12.8	-10.0	-2.8
64.0	-19.5	-10.0	-9.5
65.0	-12.2	-10.0	-2.2
66.0	-20.0	-10.0	-10.0
67.0	-18.8	-10.0	-8.8
68.0	-25.8	-10.0	-15.8
69.0	-16.0	-10.0	-6.0
70.0	-24.6	-10.0	-14.6
71.0	-25.0	-10.0	-15.0
72.0	-23.0	-10.0	-13.0
73.0	-15.9	-10.0	-5.9
74.0	-20.0	-10.0	-10.0
75.0	-19.5	-10.0	-9.5
76.0	-21.6	-10.0	-11.6
77.0	-20.9	-10.0	-10.9
78.0	-27.6	-10.0	-17.6
79.0	-23.2	-10.0	-13.2
80.0	-27.0	-10.0	-17.0
81.0	-26.4	-10.0	-16.4
82.0	-22.3	-10.0	-12.3
83.0	-27.5	-10.0	-17.5
84.0	-22.5	-10.0	-12.5
85.0	-27.6	-10.0	-17.6
86.0	-18.4	0.0	-18.4
87.0	-25.3	0.0	-25.3
88.0	-23.9	0.0	-23.9
89.0	-27.6	0.0	-27.6
90.0	-23.1	0.0	-23.1
91.0	-22.6	0.0	-22.6
92.0	-25.5	0.0	-25.5
93.0	-27.6	0.0	-27.6
94.0	-27.6	0.0	-27.6
95.0	-21.9	0.0	-21.9
96.0	-20.2	0.0	-20.2
97.0	-21.6	0.0	-21.6
98.0	-19.0	0.0	-19.0
99.0	-23.9	0.0	-23.9
100.0	-27.2	0.0	-27.2
101.0	-22.1	0.0	-22.1
102.0	-18.8	0.0	-18.8
103.0	-23.2	0.0	-23.2
104.0	-27.6	0.0	-27.6
105.0	-27.6	0.0	-27.6
106.0	-27.6	0.0	-27.6
107.0	-21.8	0.0	-21.8
108.0	-21.0	0.0	-21.0
109.0	-23.5	0.0	-23.5
110.0	-27.6	0.0	-27.6
111.0	-20.2	0.0	-20.2
112.0	-27.6	0.0	-27.6
113.0	-27.6	0.0	-27.6
114.0	-21.8	0.0	-21.8
115.0	-21.3	0.0	-21.3
116.0	-24.5	0.0	-24.5
117.0	-25.8	0.0	-25.8
118.0	-23.8	0.0	-23.8
119.0	-22.4	0.0	-22.4
120.0	-23.4	0.0	-23.4
121.0	-20.5	0.0	-20.5
122.0	-26.9	0.0	-26.9

Orbit Communication Systems Ltd.
AL-7107-Ka, 2.15 m Antenna, Pattern Data Table
Co-pol Azimuth LHCP, -180° to +180° @ 1.0° increment

-56.0	-15.3	-10.0	-5.3
-55.0	-14.7	-10.0	-4.7
-54.0	-16.3	-10.0	-6.3
-53.0	-14.3	-10.0	-4.3
-52.0	-18.2	-10.0	-8.2
-51.0	-15.7	-10.0	-5.7
-50.0	-18.2	-10.0	-8.2
-49.0	-14.3	-10.0	-4.3
-48.0	-14.6	-10.0	-4.6
-47.0	-20.8	-9.8	-11.0
-46.0	-17.9	-9.6	-8.3
-45.0	-19.1	-9.3	-9.8
-44.0	-16.5	-9.1	-7.5
-43.0	-17.2	-8.8	-8.3
-42.0	-16.8	-8.6	-8.2
-41.0	-10.7	-8.3	-2.4
-40.0	-27.6	-8.1	-19.5
-39.0	-17.2	-7.8	-9.4
-38.0	-16.3	-7.5	-8.8
-37.0	-20.2	-7.2	-13.0
-36.0	-15.6	-6.9	-8.7
-35.0	-22.8	-6.6	-16.2
-34.0	-18.4	-6.3	-12.1
-33.0	-25.3	-6.0	-19.3
-32.0	-16.2	-5.6	-10.5
-31.0	-16.0	-5.3	-10.8
-30.0	-20.2	-4.9	-15.2
-29.0	-20.2	-4.6	-15.7
-28.0	-19.2	-4.2	-15.1
-27.0	-21.7	-3.8	-17.9
-26.0	-11.8	-3.4	-8.4
-25.0	-18.8	-2.9	-15.9
-24.0	-17.6	-2.5	-15.1
-23.0	-19.8	-2.0	-17.7
-22.0	-17.5	-1.6	-15.9
-21.0	-22.7	-1.1	-21.6
-20.0	-24.2	-0.5	-23.7
-19.0	-17.9	0.0	-17.9
-18.0	-17.0	0.6	-17.6
-17.0	-14.6	1.2	-15.8
-16.0	-24.2	1.9	-26.1
-15.0	-27.6	2.6	-30.2
-14.0	-10.3	3.3	-13.6
-13.0	-14.8	4.2	-19.0
-12.0	-7.3	5.0	-12.3
-11.0	-10.9	6.0	-16.9
-10.0	-7.9	7.0	-14.9
-9.0	-17.0	8.0	-25.0
-8.0	-11.4	8.0	-19.4
-7.0	-0.8	7.9	-8.7
-6.0	-1.1	9.5	-10.7
-5.0	5.0	11.5	-6.6
-4.0	9.5	13.9	-4.5
-3.0	4.9	17.1	-12.1
-2.0	12.5	21.5	-9.0
-1.0	20.8		
0.0	52.4		

123.0	-21.4	0.0	-21.4
124.0	-27.6	0.0	-27.6
125.0	-21.1	0.0	-21.1
126.0	-27.6	0.0	-27.6
127.0	-27.6	0.0	-27.6
128.0	-27.6	0.0	-27.6
129.0	-23.1	0.0	-23.1
130.0	-23.0	0.0	-23.0
131.0	-19.2	0.0	-19.2
132.0	-27.6	0.0	-27.6
133.0	-25.8	0.0	-25.8
134.0	-26.2	0.0	-26.2
135.0	-22.5	0.0	-22.5
136.0	-22.1	0.0	-22.1
137.0	-25.2	0.0	-25.2
138.0	-22.2	0.0	-22.2
139.0	-27.6	0.0	-27.6
140.0	-24.7	0.0	-24.7
141.0	-24.0	0.0	-24.0
142.0	-27.2	0.0	-27.2
143.0	-26.3	0.0	-26.3
144.0	-23.6	0.0	-23.6
145.0	-26.1	0.0	-26.1
146.0	-27.6	0.0	-27.6
147.0	-27.6	0.0	-27.6
148.0	-26.3	0.0	-26.3
149.0	-23.5	0.0	-23.5
150.0	-25.5	0.0	-25.5
151.0	-27.6	0.0	-27.6
152.0	-27.6	0.0	-27.6
153.0	-22.1	0.0	-22.1
154.0	-27.6	0.0	-27.6
155.0	-27.6	0.0	-27.6
156.0	-26.4	0.0	-26.4
157.0	-27.6	0.0	-27.6
158.0	-27.6	0.0	-27.6
159.0	-23.9	0.0	-23.9
160.0	-22.1	0.0	-22.1
161.0	-19.4	0.0	-19.4
162.0	-18.4	0.0	-18.4
163.0	-25.6	0.0	-25.6
164.0	-20.1	0.0	-20.1
165.0	-23.4	0.0	-23.4
166.0	-21.0	0.0	-21.0
167.0	-27.6	0.0	-27.6
168.0	-22.7	0.0	-22.7
169.0	-23.9	0.0	-23.9
170.0	-18.5	0.0	-18.5
171.0	-22.5	0.0	-22.5
172.0	-23.6	0.0	-23.6
173.0	-22.5	0.0	-22.5
174.0	-27.6	0.0	-27.6
175.0	-27.6	0.0	-27.6
176.0	-27.2	0.0	-27.2
177.0	-27.2	0.0	-27.2
178.0	-23.6	0.0	-23.6
179.0	-23.9	0.0	-23.9

Orbit Communication Systems Ltd.

AL AL-7107-Ka, 2.15 m Antenna, Pattern Data Table
Co-pol Azimuth LHCP, -10° to +10° @ 0.1° increment

28.30 GHz Antenna Pattern in Co-pol Az LHCP

Angle	Gain	Mask	Over Mask
Degrees	dBi	dBi	dB
-10.0	-7.9	7.0	-14.9
-9.9	-7.5	7.1	-14.6
-9.8	-7.3	7.2	-14.5
-9.7	-6.2	7.3	-13.6
-9.6	-10.2	7.4	-17.7
-9.5	-7.7	7.6	-15.3
-9.4	-3.9	7.7	-11.6
-9.3	-1.9	7.8	-9.7
-9.2	-2.5	8.0	-10.5
-9.1	-6.7	8.0	-14.7
-9.0	-17.0	8.0	-25.0
-8.9	-11.6	8.0	-19.6
-8.8	-13.7	8.0	-21.7
-8.7	-15.7	8.0	-23.7
-8.6	-14.7	8.0	-22.7
-8.5	-15.2	8.0	-23.2
-8.4	-14.5	8.0	-22.5
-8.3	-27.6	8.0	-35.6
-8.2	-15.5	8.0	-23.5
-8.1	-13.2	8.0	-21.2
-8.0	-11.4	8.0	-19.4
-7.9	-5.7	8.0	-13.7
-7.8	-4.5	8.0	-12.5
-7.7	-4.8	8.0	-12.8
-7.6	-4.4	8.0	-12.4
-7.5	-5.4	8.0	-13.4
-7.4	-4.0	8.0	-12.0
-7.3	-1.9	8.0	-9.9
-7.2	-5.1	8.0	-13.1
-7.1	-10.7	8.0	-18.7
-7.0	-0.8	7.9	-8.7
-6.9	1.4	8.0	-6.6
-6.8	2.7	8.2	-5.5
-6.7	4.1	8.3	-4.2
-6.6	4.3	8.5	-4.2
-6.5	2.5	8.7	-6.1
-6.4	-0.1	8.8	-9.0
-6.3	-1.7	9.0	-10.7
-6.2	0.4	9.2	-8.8
-6.1	1.4	9.4	-8.0
-6.0	-1.1	9.5	-10.7
-5.9	-0.8	9.7	-10.5
-5.8	0.9	9.9	-9.0
-5.7	0.3	10.1	-9.8
-5.6	-5.1	10.3	-15.4
-5.5	-5.4	10.5	-15.9
-5.4	2.2	10.7	-8.5
-5.3	2.3	10.9	-8.6
-5.2	-5.1	11.1	-16.2
-5.1	-0.3	11.3	-11.6
-5.0	5.0	11.5	-6.6
-4.9	5.3	11.7	-6.4
-4.8	1.6	12.0	-10.3
-4.7	-2.7	12.2	-14.9
-4.6	4.3	12.4	-8.1
-4.5	6.4	12.7	-6.3
-4.4	4.7	12.9	-8.3
-4.3	0.3	13.2	-12.9
-4.2	-5.9	13.4	-19.3
-4.1	1.0	13.7	-12.7

28.30 GHz Antenna Pattern in Co-pol Az LHCP

Angle	Gain	Mask	Over Mask
Degrees	dBi	dBi	dB
0.0	52.4		
0.1	51.9		
0.2	49.6		
0.3	45.6		
0.4	40.0		
0.5	34.3		
0.6	28.3		
0.7	29.1		
0.8	30.4		
0.9	27.7		
1.0	17.1		
1.1	19.1		
1.2	19.7		
1.3	14.1		
1.4	10.6		
1.5	10.4	24.6	-14.2
1.6	12.5	23.9	-11.4
1.7	16.5	23.2	-6.7
1.8	16.4	22.6	-6.3
1.9	13.5	22.0	-8.6
2.0	10.6	21.5	-10.9
2.1	5.3	20.9	-15.7
2.2	-3.7	20.4	-24.2
2.3	7.1	20.0	-12.8
2.4	8.6	19.5	-10.9
2.5	7.4	19.1	-11.7
2.6	4.7	18.6	-13.9
2.7	-1.5	18.2	-19.8
2.8	-9.7	17.8	-27.5
2.9	-2.4	17.4	-19.9
3.0	0.4	17.1	-16.6
3.1	4.8	16.7	-11.9
3.2	5.2	16.4	-11.2
3.3	2.7	16.0	-13.3
3.4	0.3	15.7	-15.4
3.5	-4.6	15.4	-20.0
3.6	-1.8	15.1	-16.9
3.7	5.0	14.8	-9.8
3.8	5.1	14.5	-9.4
3.9	0.1	14.2	-14.1
4.0	-7.9	13.9	-21.8
4.1	-2.9	13.7	-16.5
4.2	-5.2	13.4	-18.6
4.3	0.5	13.2	-12.7
4.4	2.8	12.9	-10.2
4.5	4.0	12.7	-8.7
4.6	4.5	12.4	-7.9
4.7	3.2	12.2	-9.0
4.8	-6.3	12.0	-18.3
4.9	-4.0	11.7	-15.7
5.0	-1.2	11.5	-12.7
5.1	-6.6	11.3	-17.9
5.2	-2.6	11.1	-13.7
5.3	-0.6	10.9	-11.5
5.4	-4.5	10.7	-15.2
5.5	-5.2	10.5	-15.7
5.6	0.1	10.3	-10.2
5.7	1.1	10.1	-9.1
5.8	1.4	9.9	-8.5
5.9	-1.1	9.7	-10.8

Orbit Communication Systems Ltd.

AL AL-7107-Ka, 2.15 m Antenna, Pattern Data Table
Co-pol Azimuth LHCP, -10° to +10° @ 0.1° increment

-4.0	9.5	13.9	-4.5
-3.9	12.0	14.2	-2.2
-3.8	10.5	14.5	-4.0
-3.7	0.9	14.8	-13.9
-3.6	7.0	15.1	-8.1
-3.5	10.2	15.4	-5.2
-3.4	8.9	15.7	-6.8
-3.3	4.9	16.0	-11.2
-3.2	7.7	16.4	-8.6
-3.1	8.8	16.7	-7.9
-3.0	4.9	17.1	-12.1
-2.9	6.6	17.4	-10.9
-2.8	9.6	17.8	-8.2
-2.7	8.5	18.2	-9.7
-2.6	1.6	18.6	-17.0
-2.5	-4.6	19.1	-23.7
-2.4	-0.9	19.5	-20.4
-2.3	6.5	20.0	-13.5
-2.2	7.1	20.4	-13.4
-2.1	7.4	20.9	-13.6
-2.0	12.5	21.5	-9.0
-1.9	12.9	22.0	-9.2
-1.8	7.2	22.6	-15.4
-1.7	8.8	23.2	-14.4
-1.6	9.7	23.9	-14.2
-1.5	4.7	24.6	-19.9
-1.4	17.3		
-1.3	19.9		
-1.2	20.4		
-1.1	21.2		
-1.0	20.8		
-0.9	16.1		
-0.8	11.8		
-0.7	10.5		
-0.6	18.5		
-0.5	30.7		
-0.4	39.7		
-0.3	45.8		
-0.2	49.9		
-0.1	51.9		
0.0	52.4		

6.0	-10.1	9.5	-19.6
6.1	-3.1	9.4	-12.5
6.2	-0.2	9.2	-9.3
6.3	0.3	9.0	-8.7
6.4	2.0	8.8	-6.8
6.5	2.0	8.7	-6.7
6.6	0.6	8.5	-7.9
6.7	-0.4	8.3	-8.7
6.8	0.7	8.2	-7.5
6.9	1.3	8.0	-6.7
7.0	0.0	7.9	-7.9
7.1	-2.4	8.0	-10.4
7.2	-10.1	8.0	-18.1
7.3	-6.8	8.0	-14.8
7.4	-1.8	8.0	-9.8
7.5	-1.8	8.0	-9.8
7.6	-4.5	8.0	-12.5
7.7	-6.0	8.0	-14.0
7.8	-6.1	8.0	-14.1
7.9	-3.7	8.0	-11.7
8.0	-2.9	8.0	-10.9
8.1	-5.1	8.0	-13.1
8.2	-9.7	8.0	-17.7
8.3	-4.4	8.0	-12.4
8.4	-6.2	8.0	-14.2
8.5	-6.3	8.0	-14.3
8.6	-6.4	8.0	-14.4
8.7	-4.5	8.0	-12.5
8.8	-5.4	8.0	-13.4
8.9	-7.9	8.0	-15.9
9.0	-10.0	8.0	-18.0
9.1	-7.4	8.0	-15.4
9.2	-5.8	8.0	-13.8
9.3	-4.6	7.8	-12.4
9.4	-6.5	7.7	-14.2
9.5	-12.0	7.6	-19.6
9.6	-9.3	7.4	-16.8
9.7	-4.9	7.3	-12.3
9.8	-3.7	7.2	-11.0
9.9	-3.3	7.1	-10.4
10.0	-3.5	7.0	-10.5

Orbit Communication Systems Ltd.
AL-7107-Ka, 2.15 m Antenna, Pattern Data Table
Co-pol Elevation LHCP, -30° to +30° @ 0.5° increment

28.30 GHz Antenna Pattern in Co-pol EI LHCP

Angle	Gain	Mask	Over Mask
Degrees	dBi	dBi	dB
-30.0	-8.9	-4.9	-4.0
-29.5	-8.2	-4.7	-3.5
-29.0	-11.1	-4.6	-6.6
-28.5	-9.4	-4.4	-5.1
-28.0	-10.5	-4.2	-6.4
-27.5	-11.4	-4.0	-7.4
-27.0	-14.6	-3.8	-10.8
-26.5	-11.7	-3.6	-8.2
-26.0	-13.1	-3.4	-9.7
-25.5	-11.1	-3.2	-7.9
-25.0	-7.1	-2.9	-4.1
-24.5	-6.9	-2.7	-4.2
-24.0	-6.2	-2.5	-3.7
-23.5	-16.4	-2.3	-14.1
-23.0	-19.0	-2.0	-17.0
-22.5	-9.0	-1.8	-7.2
-22.0	-5.7	-1.6	-4.1
-21.5	-5.0	-1.3	-3.7
-21.0	-13.8	-1.1	-12.7
-20.5	-5.7	-0.8	-4.9
-20.0	-6.0	-0.5	-5.5
-19.5	-1.6	-0.3	-1.3
-19.0	-1.6	0.0	-1.6
-18.5	-2.8	0.3	-3.1
-18.0	-14.4	0.6	-15.0
-17.5	-23.5	0.9	-24.4
-17.0	-15.1	1.2	-16.4
-16.5	-14.3	1.6	-15.9
-16.0	-18.3	1.9	-20.2
-15.5	-13.5	2.2	-15.8
-15.0	-9.1	2.6	-11.7
-14.5	-17.0	3.0	-19.9
-14.0	-2.1	3.3	-5.4
-13.5	-6.7	3.7	-10.5
-13.0	-9.7	4.2	-13.9
-12.5	-11.8	4.6	-16.4
-12.0	-6.5	5.0	-11.5
-11.5	-6.0	5.5	-11.5
-11.0	-13.0	6.0	-19.0
-10.5	-10.3	6.5	-16.8
-10.0	-6.5	7.0	-13.5
-9.5	-6.6	7.6	-14.2
-9.0	-2.8	8.1	-10.9
-8.5	-8.5	8.8	-17.2
-8.0	-2.4	9.4	-11.8
-7.5	-10.0	10.1	-20.2
-7.0	-2.0	10.9	-12.9
-6.5	-5.7	11.7	-17.4
-6.0	-1.1	12.5	-13.7
-5.5	-1.6	13.5	-15.1
-5.0	1.5	14.5	-13.1
-4.5	1.5	15.7	-14.2
-4.0	2.9	16.9	-14.0
-3.5	4.7	18.4	-13.7
-3.0	10.6		
-2.5	9.4		
-2.0	8.1		
-1.5	17.9		
-1.0	21.1		
-0.5	35.7		
0.0	52.4		

28.30 GHz Antenna Pattern in Co-pol EI LHCP

Angle	Gain	Mask	Over Mask
Degrees	dBi	dBi	dB
0.0	52.4		
0.5	38.0		
1.0	16.8		
1.5	9.7		
2.0	5.4		
2.5	10.1		
3.0	7.5		
3.5	8.5	18.4	-9.9
4.0	13.0	16.9	-4.0
4.5	-1.0	15.7	-16.6
5.0	7.3	14.5	-7.2
5.5	-12.4	13.5	-25.9
6.0	-1.8	12.5	-14.4
6.5	0.9	11.7	-10.8
7.0	-1.8	10.9	-12.7
7.5	-12.0	10.1	-22.1
8.0	-14.6	9.4	-24.0
8.5	-1.5	8.8	-10.3
9.0	-2.8	8.1	-11.0
9.5	-9.7	7.6	-17.3
10.0	-0.2	7.0	-7.2
10.5	-4.7	6.5	-11.1
11.0	-8.1	6.0	-14.1
11.5	-13.2	5.5	-18.6
12.0	-13.1	5.0	-18.1
12.5	-5.9	4.6	-10.5
13.0	-4.3	4.2	-8.4
13.5	-8.9	3.7	-12.6
14.0	-17.5	3.3	-20.8
14.5	-12.7	3.0	-15.7
15.0	-12.0	2.6	-14.6
15.5	-15.1	2.2	-17.4
16.0	-18.5	1.9	-20.3
16.5	-16.7	1.6	-18.2
17.0	-15.4	1.2	-16.7
17.5	-22.5	0.9	-23.5
18.0	-13.5	0.6	-14.1
18.5	-17.0	0.3	-17.3
19.0	-12.1	0.0	-12.1
19.5	-12.8	-0.3	-12.6
20.0	-18.1	-0.5	-17.6
20.5	-12.0	-0.8	-11.2
21.0	-26.3	-1.1	-25.3
21.5	-26.9	-1.3	-25.6
22.0	-18.6	-1.6	-17.1
22.5	-12.9	-1.8	-11.1
23.0	-16.0	-2.0	-14.0
23.5	-15.0	-2.3	-12.7
24.0	-21.6	-2.5	-19.1
24.5	-19.9	-2.7	-17.2
25.0	-15.4	-2.9	-12.4
25.5	-19.2	-3.2	-16.1
26.0	-27.6	-3.4	-24.2
26.5	-19.8	-3.6	-16.2
27.0	-20.5	-3.8	-16.7
27.5	-15.7	-4.0	-11.7
28.0	-14.3	-4.2	-10.1
28.5	-17.6	-4.4	-13.2
29.0	-17.5	-4.6	-13.0
29.5	-15.3	-4.7	-10.6
30.0	-24.6	-4.9	-19.7

Orbit Communication Systems Ltd.
AL-7107-Ka, 2.15 m Antenna, Pattern Data Table
Co-pol Elevation LHCP, -10° to +10° @ 0.1° increment

28.30 GHz Antenna Pattern in Co-pol EI LHCP

Angle	Gain	Mask	Over Mask
Degrees	dBi	dBi	dB
-10.0	-6.5	7.0	-13.5
-9.9	-5.3	7.1	-12.4
-9.8	-7.3	7.2	-14.5
-9.7	-12.0	7.3	-19.3
-9.6	-7.5	7.4	-15.0
-9.5	-6.6	7.6	-14.2
-9.4	-10.3	7.7	-18.0
-9.3	-12.4	7.8	-20.2
-9.2	-5.1	7.9	-13.0
-9.1	-2.8	8.0	-10.8
-9.0	-2.8	8.1	-10.9
-8.9	-5.3	8.3	-13.6
-8.8	-14.1	8.4	-22.5
-8.7	-9.5	8.5	-18.0
-8.6	-5.6	8.6	-14.3
-8.5	-8.5	8.8	-17.2
-8.4	-6.1	8.9	-15.0
-8.3	-3.3	9.0	-12.3
-8.2	-1.8	9.2	-10.9
-8.1	-1.4	9.3	-10.7
-8.0	-2.4	9.4	-11.8
-7.9	-4.4	9.6	-14.0
-7.8	-10.6	9.7	-20.3
-7.7	-12.2	9.8	-22.1
-7.6	-12.1	10.0	-22.1
-7.5	-10.0	10.1	-20.2
-7.4	-4.2	10.3	-14.4
-7.3	-0.7	10.4	-11.1
-7.2	1.7	10.6	-8.8
-7.1	1.9	10.7	-8.9
-7.0	-2.0	10.9	-12.9
-6.9	-14.1	11.0	-25.2
-6.8	-0.9	11.2	-12.1
-6.7	-0.4	11.3	-11.8
-6.6	-4.8	11.5	-16.3
-6.5	-5.7	11.7	-17.4
-6.4	-2.0	11.8	-13.8
-6.3	-1.0	12.0	-13.1
-6.2	0.0	12.2	-12.2
-6.1	-0.6	12.4	-13.0
-6.0	-1.1	12.5	-13.7
-5.9	0.3	12.7	-12.4
-5.8	1.5	12.9	-11.4
-5.7	0.3	13.1	-12.8
-5.6	-0.9	13.3	-14.2
-5.5	-1.6	13.5	-15.1
-5.4	-4.1	13.7	-17.8
-5.3	0.1	13.9	-13.8
-5.2	3.6	14.1	-10.5
-5.1	3.5	14.3	-10.8
-5.0	1.5	14.5	-13.1
-4.9	-0.7	14.7	-15.4
-4.8	-0.4	15.0	-15.4
-4.7	1.2	15.2	-14.0
-4.6	2.0	15.4	-13.5
-4.5	1.5	15.7	-14.2
-4.4	3.1	15.9	-12.8
-4.3	5.7	16.2	-10.4
-4.2	7.0	16.4	-9.4
-4.1	6.3	16.7	-10.3

28.30 GHz Antenna Pattern in Co-pol EI LHCP

Angle	Gain	Mask	Over Mask
Degrees	dBi	dBi	dB
0.0	52.4		
0.1	51.7		
0.2	49.3		
0.3	45.2		
0.4	40.9		
0.5	38.0		
0.6	33.6		
0.7	24.4		
0.8	16.4		
0.9	17.4		
1.0	16.8		
1.1	19.0		
1.2	16.6		
1.3	7.2		
1.4	9.1		
1.5	9.7		
1.6	14.0		
1.7	14.6		
1.8	10.6		
1.9	6.2		
2.0	5.4		
2.1	6.5		
2.2	10.9		
2.3	11.6		
2.4	10.9		
2.5	10.1		
2.6	7.0		
2.7	-3.3		
2.8	-9.3		
2.9	-2.2		
3.0	7.5		
3.1	9.7		
3.2	7.5		
3.3	1.4		
3.4	4.6		
3.5	8.5	18.4	-9.9
3.6	9.7	18.1	-8.4
3.7	9.0	17.8	-8.8
3.8	9.2	17.5	-8.3
3.9	12.3	17.2	-4.9
4.0	13.0	16.9	-4.0
4.1	12.7	16.7	-4.0
4.2	12.9	16.4	-3.5
4.3	12.6	16.2	-3.6
4.4	9.1	15.9	-6.9
4.5	-1.0	15.7	-16.6
4.6	-7.0	15.4	-22.4
4.7	-1.9	15.2	-17.1
4.8	4.2	15.0	-10.8
4.9	6.8	14.7	-8.0
5.0	7.3	14.5	-7.2
5.1	6.7	14.3	-7.6
5.2	4.8	14.1	-9.3
5.3	1.3	13.9	-12.6
5.4	-1.9	13.7	-15.6
5.5	-12.4	13.5	-25.9
5.6	-5.0	13.3	-18.3
5.7	0.0	13.1	-13.1
5.8	-1.3	12.9	-14.3
5.9	-6.0	12.7	-18.7

Orbit Communication Systems Ltd.
AL-7107-Ka, 2.15 m Antenna, Pattern Data Table
Co-pol Elevation LHCP, -10° to +10° @ 0.1° increment

-4.0	2.9	16.9	-14.0
-3.9	-1.8	17.2	-19.0
-3.8	5.8	17.5	-11.7
-3.7	7.7	17.8	-10.1
-3.6	7.0	18.1	-11.0
-3.5	4.7	18.4	-13.7
-3.4	0.9		
-3.3	0.6		
-3.2	0.5		
-3.1	1.5		
-3.0	10.6		
-2.9	14.0		
-2.8	14.1		
-2.7	12.0		
-2.6	8.0		
-2.5	9.4		
-2.4	10.8		
-2.3	12.3		
-2.2	12.8		
-2.1	11.1		
-2.0	8.1		
-1.9	7.1		
-1.8	5.3		
-1.7	8.7		
-1.6	15.0		
-1.5	17.9		
-1.4	16.7		
-1.3	15.9		
-1.2	21.3		
-1.1	22.6		
-1.0	21.1		
-0.9	22.1		
-0.8	25.1		
-0.7	29.3		
-0.6	33.2		
-0.5	35.7		
-0.4	40.4		
-0.3	46.0		
-0.2	49.9		
-0.1	52.0		
0.0	52.4		

6.0	-1.8	12.5	-14.4
6.1	-1.0	12.4	-13.4
6.2	-1.6	12.2	-13.8
6.3	-2.7	12.0	-14.7
6.4	-2.0	11.8	-13.8
6.5	0.9	11.7	-10.8
6.6	3.8	11.5	-7.7
6.7	3.5	11.3	-7.9
6.8	2.2	11.2	-9.0
6.9	-0.5	11.0	-11.5
7.0	-1.8	10.9	-12.7
7.1	-6.2	10.7	-16.9
7.2	-2.1	10.6	-12.7
7.3	1.2	10.4	-9.3
7.4	-0.4	10.3	-10.6
7.5	-12.0	10.1	-22.1
7.6	-7.3	10.0	-17.3
7.7	-5.2	9.8	-15.1
7.8	-10.2	9.7	-19.9
7.9	-22.4	9.6	-31.9
8.0	-14.6	9.4	-24.0
8.1	-12.6	9.3	-21.9
8.2	-8.3	9.2	-17.5
8.3	-6.0	9.0	-15.0
8.4	-2.6	8.9	-11.5
8.5	-1.5	8.8	-10.3
8.6	-4.8	8.6	-13.4
8.7	-4.8	8.5	-13.3
8.8	-4.6	8.4	-13.0
8.9	-2.5	8.3	-10.8
9.0	-2.8	8.1	-11.0
9.1	-7.6	8.0	-15.6
9.2	-11.6	7.9	-19.5
9.3	-9.0	7.8	-16.8
9.4	-8.8	7.7	-16.5
9.5	-9.7	7.6	-17.3
9.6	-18.5	7.4	-25.9
9.7	-5.2	7.3	-12.5
9.8	-2.0	7.2	-9.2
9.9	0.0	7.1	-7.1
10.0	-0.2	7.0	-7.2

Orbit Communication Systems Ltd.
AL-7107-Ka, 2.15 m Antenna, Pattern Data Table
X-pol Azimuth LHCP, -10° to +10° @ 0.1° increment

28.30 GHz Antenna Pattern in X-pol Az LHCP

Angle	Gain	Mask	Over Mask
Degrees	dBi	dBi	dB
-10.0	-15.9	-2.0	-13.9
-9.9	-15.9	-2.0	-13.9
-9.8	-14.2	-2.0	-12.2
-9.7	-15.2	-2.0	-13.2
-9.6	-15.9	-2.0	-13.9
-9.5	-14.2	-2.0	-12.2
-9.4	-13.6	-2.0	-11.6
-9.3	-12.0	-2.0	-10.0
-9.2	-10.0	-2.0	-8.0
-9.1	-6.9	-2.0	-4.9
-9.0	-5.1	-2.0	-3.1
-8.9	-4.4	-2.0	-2.4
-8.8	-5.7	-2.0	-3.7
-8.7	-7.2	-2.0	-5.2
-8.6	-9.3	-2.0	-7.3
-8.5	-8.9	-2.0	-6.9
-8.4	-7.8	-2.0	-5.8
-8.3	-7.1	-2.0	-5.1
-8.2	-9.5	-2.0	-7.5
-8.1	-11.9	-2.0	-9.9
-8.0	-11.6	-2.0	-9.6
-7.9	-9.8	-2.0	-7.8
-7.8	-8.4	-2.0	-6.4
-7.7	-9.4	-2.0	-7.4
-7.6	-12.9	-2.0	-10.9
-7.5	-10.3	-2.0	-8.3
-7.4	-6.0	-2.0	-4.0
-7.3	-4.1	-2.0	-2.1
-7.2	-5.1	-2.0	-3.1
-7.1	-5.0	-2.0	-3.0
-7.0	-3.3	-2.1	-1.1
-6.9	-0.9	-2.0	1.0
-6.8	-0.7	-1.8	1.1
-6.7	-2.7	-1.7	-1.1
-6.6	-9.5	-1.5	-8.1
-6.5	-7.1	-1.3	-5.8
-6.4	-6.9	-1.2	-5.7
-6.3	-11.1	-1.0	-10.1
-6.2	-15.5	-0.8	-14.7
-6.1	-11.7	-0.6	-11.0
-6.0	-12.3	-0.5	-11.8
-5.9	-11.9	-0.3	-11.6
-5.8	-9.1	-0.1	-9.1
-5.7	-8.2	0.1	-8.3
-5.6	-13.6	0.3	-13.9
-5.5	-21.4	0.5	-21.9
-5.4	-10.1	0.7	-10.8
-5.3	-4.1	0.9	-5.0
-5.2	-2.2	1.1	-3.3
-5.1	-2.2	1.3	-3.6
-5.0	-8.1	1.5	-9.6
-4.9	-7.5	1.7	-9.3
-4.8	-2.9	2.0	-4.9
-4.7	-3.6	2.2	-5.8
-4.6	-10.3	2.4	-12.8
-4.5	-11.7	2.7	-14.4
-4.4	-13.9	2.9	-16.8
-4.3	-3.8	3.2	-7.0
-4.2	-0.2	3.4	-3.7
-4.1	-0.8	3.7	-4.5

28.30 GHz Antenna Pattern in X-pol Az LHCP

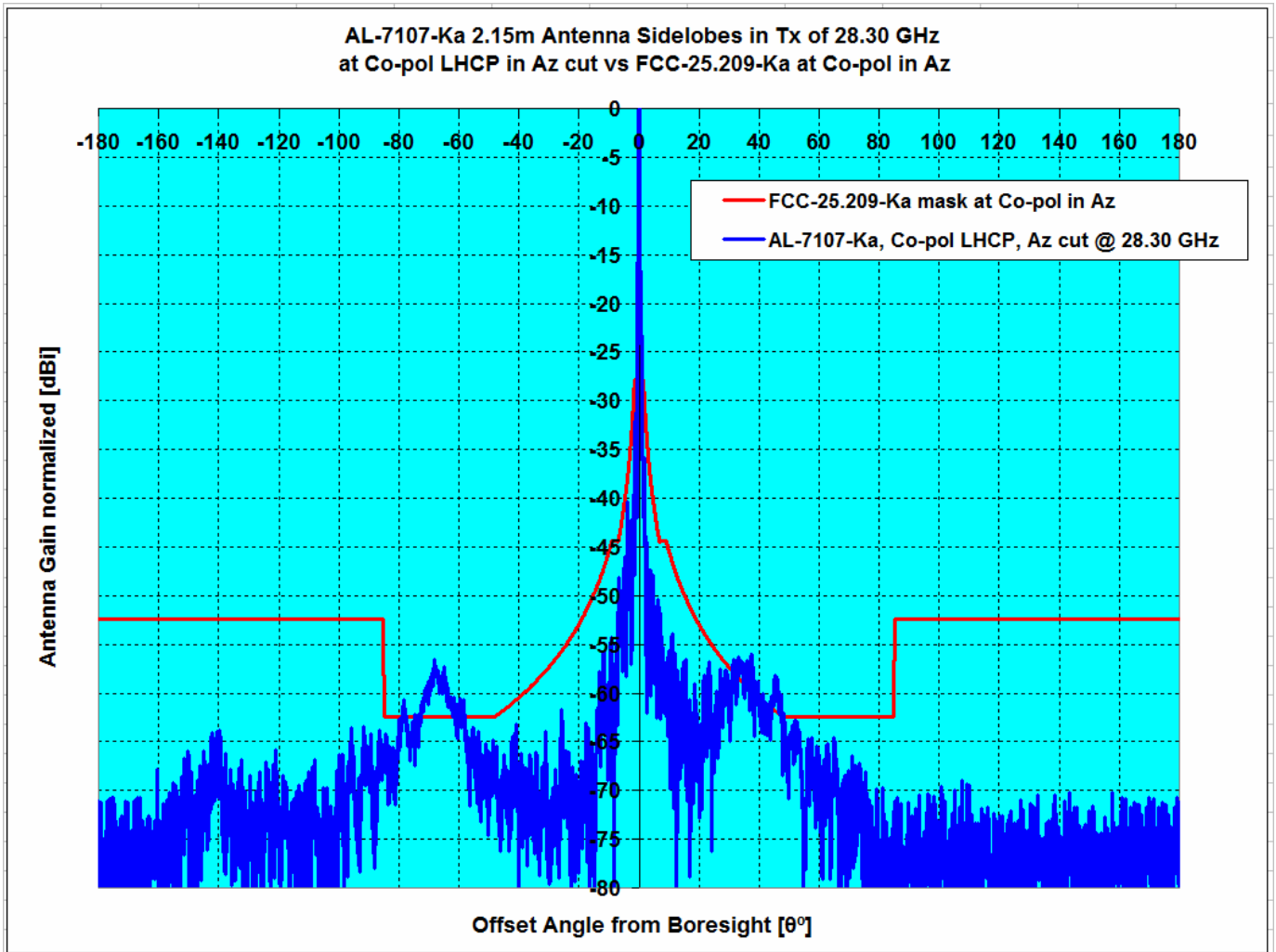
Angle	Gain	Mask	Over Mask
Degrees	dBi	dBi	dB
0.0	17.6		
0.1	16.5		
0.2	22.3		
0.3	25.9		
0.4	26.5		
0.5	24.6		
0.6	21.0		
0.7	11.6		
0.8	9.1		
0.9	14.4		
1.0	15.9		
1.1	14.5		
1.2	8.8		
1.3	5.2		
1.4	6.4		
1.5	5.0		
1.6	5.7		
1.7	6.6		
1.8	4.6	12.6	-8.0
1.9	-1.0	12.0	-13.0
2.0	-6.4	11.5	-17.8
2.1	-3.9	10.9	-14.9
2.2	-0.6	10.4	-11.1
2.3	-1.2	10.0	-11.1
2.4	-5.3	9.5	-14.8
2.5	-5.9	9.1	-14.9
2.6	-5.6	8.6	-14.3
2.7	-6.7	8.2	-14.9
2.8	-4.5	7.8	-12.3
2.9	-5.3	7.4	-12.7
3.0	-8.9	7.1	-16.0
3.1	-5.7	6.7	-12.4
3.2	-6.1	6.4	-12.4
3.3	-8.7	6.0	-14.7
3.4	-7.1	5.7	-12.8
3.5	-8.1	5.4	-13.5
3.6	-9.6	5.1	-14.7
3.7	-3.0	4.8	-7.8
3.8	-4.3	4.5	-8.8
3.9	-12.7	4.2	-16.9
4.0	-13.7	3.9	-17.7
4.1	-7.5	3.7	-11.2
4.2	-10.3	3.4	-13.7
4.3	-14.6	3.2	-17.7
4.4	-9.5	2.9	-12.4
4.5	-9.7	2.7	-12.4
4.6	-9.2	2.4	-11.6
4.7	-7.6	2.2	-9.8
4.8	-7.8	2.0	-9.8
4.9	-8.2	1.7	-9.9
5.0	-7.3	1.5	-8.8
5.1	-10.2	1.3	-11.5
5.2	-12.6	1.1	-13.7
5.3	-13.1	0.9	-14.0
5.4	-14.1	0.7	-14.8
5.5	-11.9	0.5	-12.4
5.6	-10.6	0.3	-10.9
5.7	-10.7	0.1	-10.8
5.8	-10.0	-0.1	-9.9
5.9	-9.7	-0.3	-9.4

Orbit Communication Systems Ltd.
AL-7107-Ka, 2.15 m Antenna, Pattern Data Table
X-pol Azimuth LHCP, -10° to +10° @ 0.1° increment

-4.0	-7.2	3.9	-11.1
-3.9	-10.8	4.2	-15.0
-3.8	-5.1	4.5	-9.6
-3.7	-4.8	4.8	-9.6
-3.6	-3.7	5.1	-8.8
-3.5	-2.1	5.4	-7.5
-3.4	-2.7	5.7	-8.4
-3.3	-6.1	6.0	-12.2
-3.2	-6.2	6.4	-12.6
-3.1	-0.7	6.7	-7.4
-3.0	-2.1	7.1	-9.1
-2.9	-11.9	7.4	-19.4
-2.8	-7.9	7.8	-15.7
-2.7	-5.8	8.2	-14.0
-2.6	-8.0	8.6	-16.6
-2.5	-7.8	9.1	-16.8
-2.4	-12.0	9.5	-21.5
-2.3	-9.2	10.0	-19.2
-2.2	-3.7	10.4	-14.1
-2.1	-7.8	10.9	-18.7
-2.0	-6.2	11.5	-17.7
-1.9	-3.6	12.0	-15.7
-1.8	-9.9	12.6	-22.5
-1.7	2.3		
-1.6	6.1		
-1.5	6.4		
-1.4	5.5		
-1.3	5.5		
-1.2	9.1		
-1.1	12.7		
-1.0	15.1		
-0.9	14.9		
-0.8	8.5		
-0.7	15.8		
-0.6	24.9		
-0.5	29.3		
-0.4	31.0		
-0.3	30.5		
-0.2	28.6		
-0.1	23.9		
0.0	17.6		

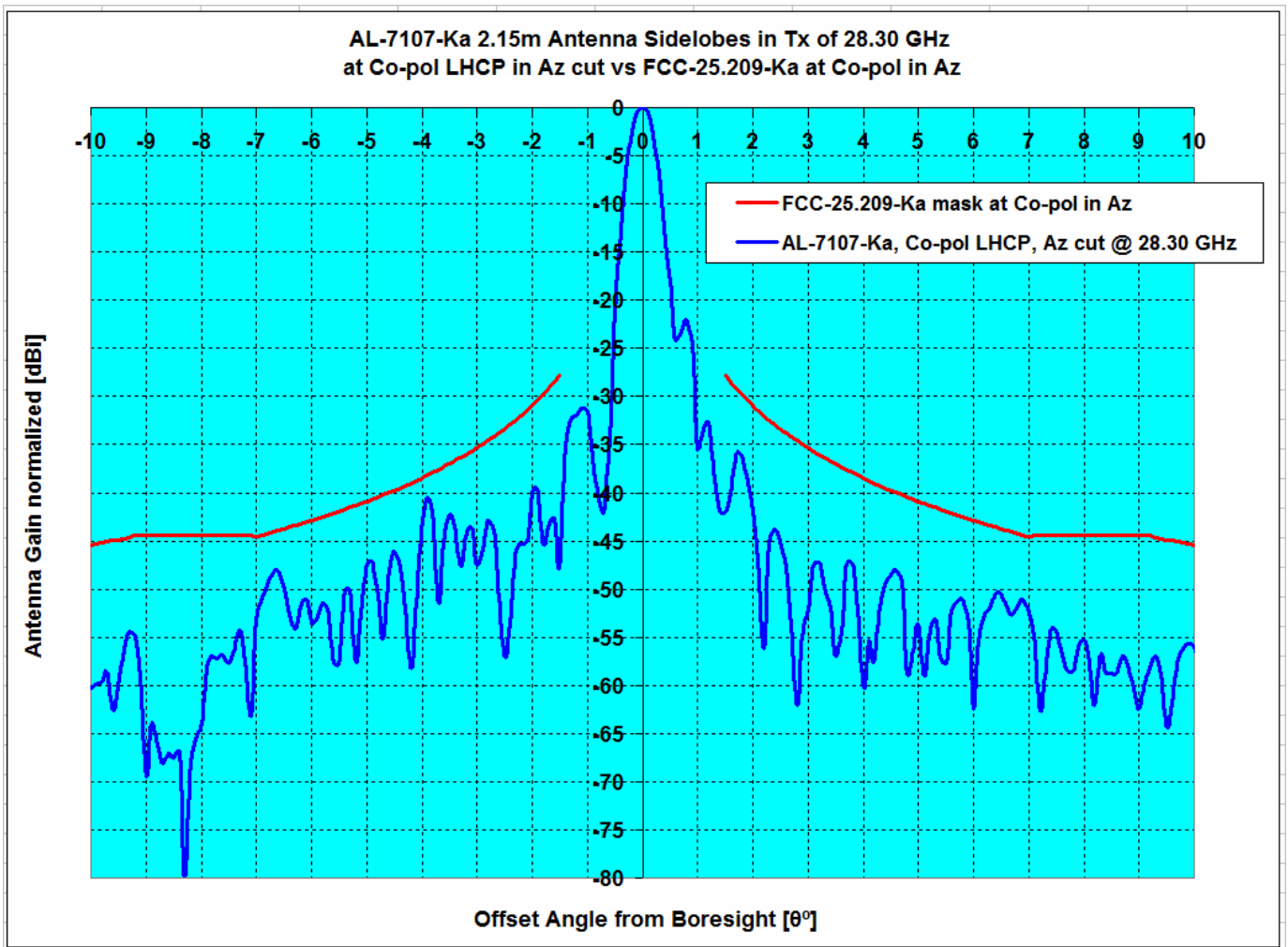
6.0	-11.5	-0.5	-11.0
6.1	-13.7	-0.6	-13.0
6.2	-11.1	-0.8	-10.3
6.3	-8.8	-1.0	-7.9
6.4	-9.2	-1.2	-8.0
6.5	-13.6	-1.3	-12.3
6.6	-17.9	-1.5	-16.4
6.7	-20.2	-1.7	-18.5
6.8	-18.2	-1.8	-16.4
6.9	-18.3	-2.0	-16.3
7.0	-12.0	-2.1	-9.8
7.1	-8.4	-2.0	-6.4
7.2	-8.3	-2.0	-6.3
7.3	-8.1	-2.0	-6.1
7.4	-12.2	-2.0	-10.2
7.5	-13.0	-2.0	-11.0
7.6	-13.6	-2.0	-11.6
7.7	-17.3	-2.0	-15.3
7.8	-18.7	-2.0	-16.7
7.9	-8.7	-2.0	-6.7
8.0	-6.2	-2.0	-4.2
8.1	-7.1	-2.0	-5.1
8.2	-10.4	-2.0	-8.4
8.3	-11.8	-2.0	-9.8
8.4	-12.6	-2.0	-10.6
8.5	-12.7	-2.0	-10.7
8.6	-11.7	-2.0	-9.7
8.7	-16.3	-2.0	-14.3
8.8	-11.0	-2.0	-9.0
8.9	-7.4	-2.0	-5.4
9.0	-7.6	-2.0	-5.6
9.1	-9.7	-2.0	-7.7
9.2	-14.1	-2.0	-12.1
9.3	-18.5	-2.0	-16.5
9.4	-17.1	-2.0	-15.1
9.5	-15.4	-2.0	-13.4
9.6	-14.7	-2.0	-12.7
9.7	-14.3	-2.0	-12.3
9.8	-13.7	-2.0	-11.7
9.9	-17.6	-2.0	-15.6
10.0	-26.1	-2.0	-24.1

Orbit Communication Systems Ltd.
AL-7107-Ka, 2.15 m Antenna, Pattern, Co-pol, Azimuth LHCP



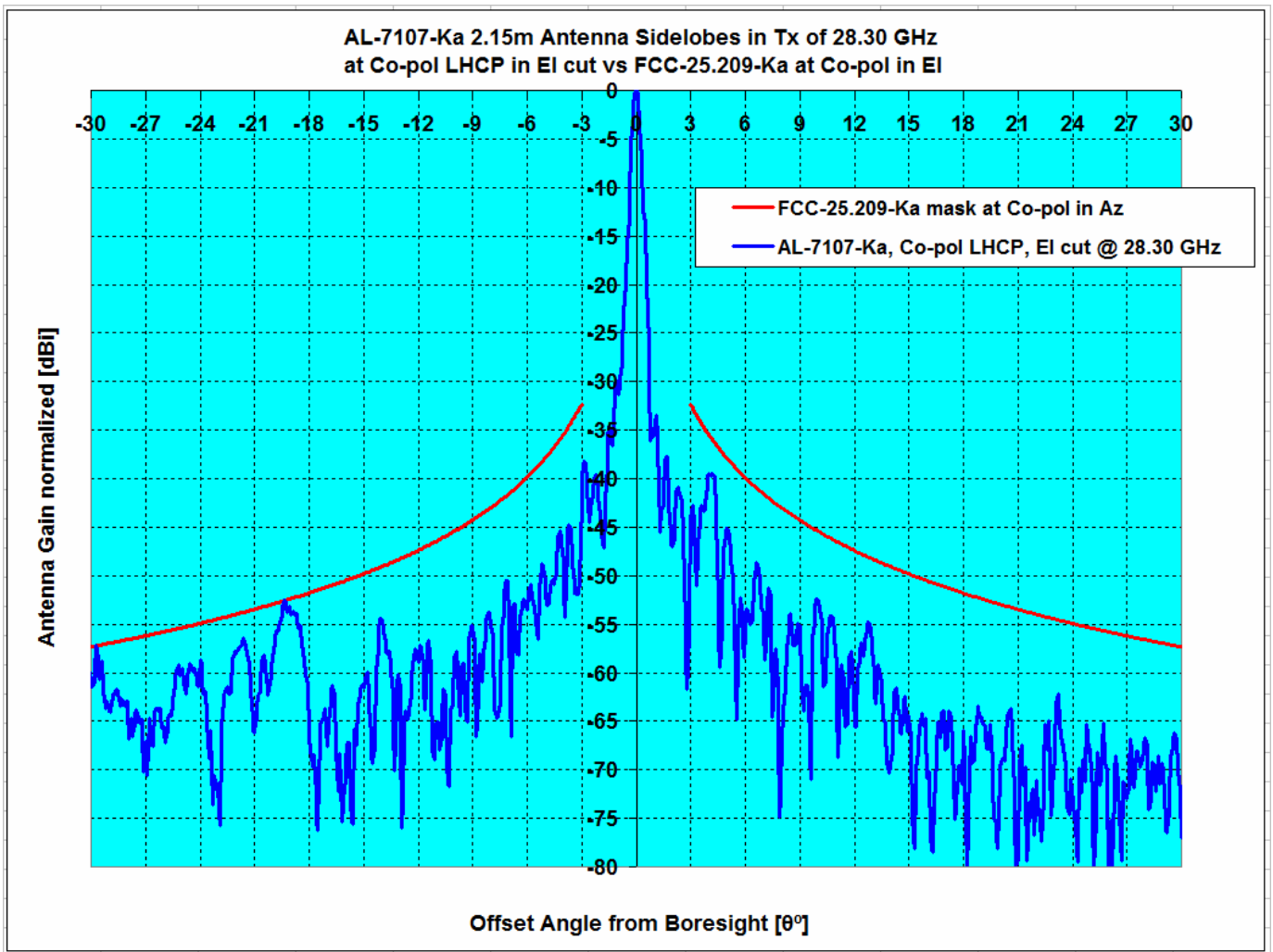
Description	Plane, CirP	Frequency	Ant. Gain	Peak Excursions dB		Over Mask %	
Pattern Rule vs Antenna System	Type	GHz	dBi	1.5°≤θ≤7°	7°≤θ≤180°	1.5°≤θ≤7°	7°≤θ≤180°
FCC-25.209-Ka, Co-pol Az, vs AL-7107-Ka	Az , LHCP	28.30	52.43	-2.23	5.85	0.00%	6.94%

Orbit Communication Systems Ltd.
AL-7107-Ka, 2.15 m Antenna, Pattern, Co-pol, Azimuth LHCP



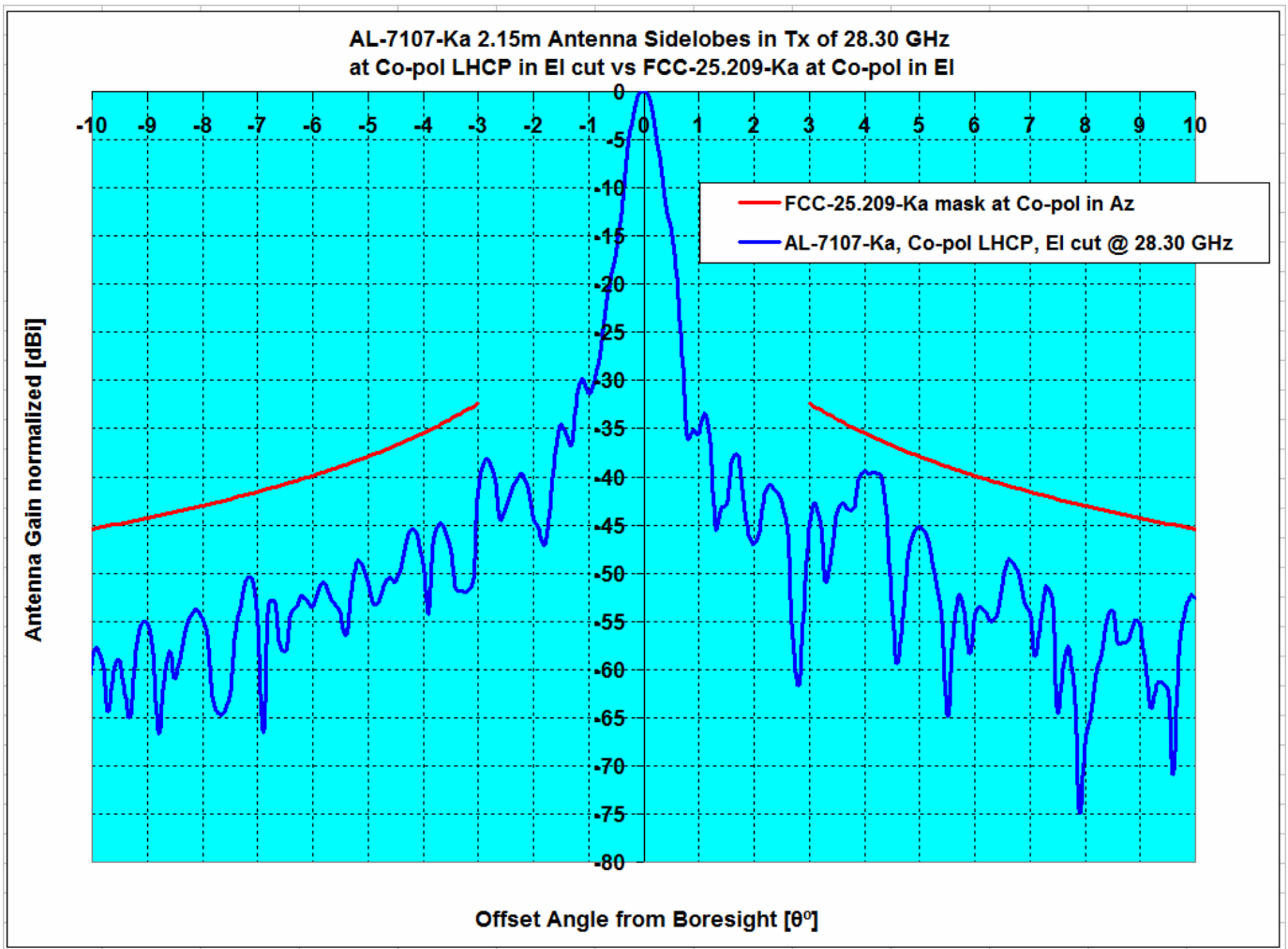
Description	Plane, CirP	Frequency	Ant. Gain	Peak Excursions dB		Over Mask %	
				1.5°≤θ≤7°	7°≤θ≤180°	1.5°≤θ≤7°	7°≤θ≤180°
Pattern Rule vs Antenna System	Type	GHz	dBi				
FCC-25.209-Ka, Co-pol Az, vs AL-7107-Ka	Az , LHCP	28.30	52.43	-2.23	5.85	0.00%	6.94%

Orbit Communication Systems Ltd.
AL-7107-Ka, 2.15 m Antenna, Pattern, Co-pol, Elevation LHCP

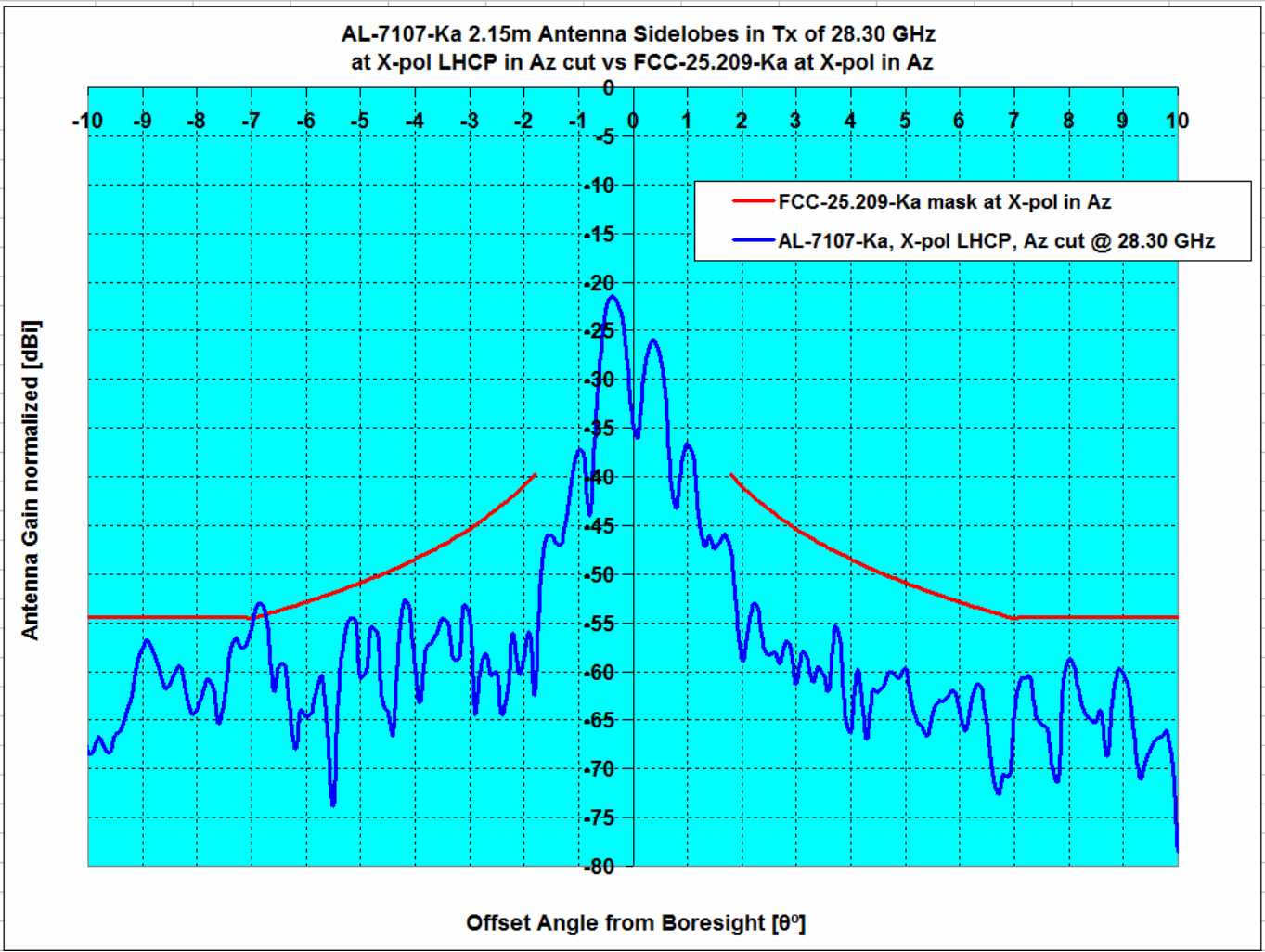


Description	Plane, CirP	Frequency	Ant. Gain	Peak Excursions dB		Over Mask %	
				3°≤θ≤7°	7°≤θ≤30°	3°≤θ≤7°	7°≤θ≤30°
Pattern Rule vs Antenna System	Type	GHz	dBi				
FCC-25.209-Ka, Co-pol EI, vs AL-7107-Ka	EI , LHCP	28.30	52.43	-3.53	0.07	0.00%	0.18%

Orbit Communication Systems Ltd.
AL-7107-Ka, 2.15 m Antenna, Pattern, Co-pol, Elevation LHCP



Description	Plane, CirP	Frequency	Ant. Gain	Peak Excursions dB		Over Mask %	
				3°≤θ≤7°	7°≤θ≤30°	3°≤θ≤7°	7°≤θ≤30°
Pattern Rule vs Antenna System	Type	GHz	dBi				
FCC-25.209-Ka, Co-pol EI, vs AL-7107-Ka	EI , LHCP	28.30	52.43	-3.53	0.07	0.00%	0.18%



Description	Plane, CirP	Frequency	Ant. Gain	Peak Excursions dB		Over Mask %	
Pattern Rule vs Antenna System	Type	GHz	dBi	1.8°≤θ≤7°	1.8°≤θ≤9.2°	1.8°≤θ≤7°	1.8°≤θ≤9.2°
FCC-25.209-Ka, X-pol Az, vs AL-7107-Ka	Az , LHCP	28.30	52.43	1.06	1.06	1.89%	1.20%

Orbit Communication Systems Ltd.
AL-7107-Ka, 2.15 m Antenna, Pattern Data Table
Co-pol Azimuth RHCP, -180° to +180° @ 1.0° increment

28.30 GHz Antenna Pattern in Co-pol Az RHCP

Angle	Gain	Mask	Over Mask
Degrees	dBi	dBi	dB
-179.0	-23.3	0.0	-23.3
-178.0	-25.3	0.0	-25.3
-177.0	-18.7	0.0	-18.7
-176.0	-27.6	0.0	-27.6
-175.0	-18.5	0.0	-18.5
-174.0	-27.5	0.0	-27.5
-173.0	-21.8	0.0	-21.8
-172.0	-24.4	0.0	-24.4
-171.0	-18.7	0.0	-18.7
-170.0	-27.6	0.0	-27.6
-169.0	-25.5	0.0	-25.5
-168.0	-19.5	0.0	-19.5
-167.0	-20.6	0.0	-20.6
-166.0	-20.1	0.0	-20.1
-165.0	-25.7	0.0	-25.7
-164.0	-27.6	0.0	-27.6
-163.0	-26.7	0.0	-26.7
-162.0	-22.4	0.0	-22.4
-161.0	-22.7	0.0	-22.7
-160.0	-22.7	0.0	-22.7
-159.0	-25.5	0.0	-25.5
-158.0	-22.9	0.0	-22.9
-157.0	-27.6	0.0	-27.6
-156.0	-23.9	0.0	-23.9
-155.0	-16.8	0.0	-16.8
-154.0	-23.9	0.0	-23.9
-153.0	-26.7	0.0	-26.7
-152.0	-18.6	0.0	-18.6
-151.0	-14.8	0.0	-14.8
-150.0	-13.9	0.0	-13.9
-149.0	-15.8	0.0	-15.8
-148.0	-27.6	0.0	-27.6
-147.0	-18.7	0.0	-18.7
-146.0	-17.5	0.0	-17.5
-145.0	-21.6	0.0	-21.6
-144.0	-17.3	0.0	-17.3
-143.0	-18.9	0.0	-18.9
-142.0	-16.5	0.0	-16.5
-141.0	-12.3	0.0	-12.3
-140.0	-15.7	0.0	-15.7
-139.0	-22.2	0.0	-22.2
-138.0	-24.1	0.0	-24.1
-137.0	-17.5	0.0	-17.5
-136.0	-20.8	0.0	-20.8
-135.0	-20.9	0.0	-20.9
-134.0	-25.3	0.0	-25.3
-133.0	-25.5	0.0	-25.5
-132.0	-27.6	0.0	-27.6
-131.0	-27.6	0.0	-27.6
-130.0	-23.4	0.0	-23.4
-129.0	-19.0	0.0	-19.0
-128.0	-27.6	0.0	-27.6
-127.0	-23.5	0.0	-23.5
-126.0	-18.5	0.0	-18.5
-125.0	-27.6	0.0	-27.6
-124.0	-18.9	0.0	-18.9
-123.0	-27.0	0.0	-27.0
-122.0	-16.5	0.0	-16.5
-121.0	-20.3	0.0	-20.3
-120.0	-23.3	0.0	-23.3

28.30 GHz Antenna Pattern in Co-pol Az RHCP

Angle	Gain	Mask	Over Mask
Degrees	dBi	dBi	dB
0.0	52.4		
1.0	17.1		
2.0	10.6	21.5	-10.9
3.0	0.4	17.1	-16.6
4.0	-7.9	13.9	-21.8
5.0	-1.2	11.5	-12.7
6.0	-10.1	9.5	-19.6
7.0	0.0	7.9	-7.9
8.0	-2.9	8.0	-10.9
9.0	-10.0	8.0	-18.0
10.0	-3.5	7.0	-10.5
11.0	-1.5	6.0	-7.5
12.0	-3.5	5.0	-8.5
13.0	-5.5	4.2	-9.7
14.0	-13.6	3.3	-17.0
15.0	-8.0	2.6	-10.6
16.0	-16.4	1.9	-18.3
17.0	-26.4	1.2	-27.6
18.0	-14.3	0.6	-14.9
19.0	-8.3	0.0	-8.3
20.0	-16.9	-0.5	-16.4
21.0	-18.1	-1.1	-17.1
22.0	-5.9	-1.6	-4.3
23.0	-8.0	-2.0	-6.0
24.0	-10.2	-2.5	-7.7
25.0	-14.9	-2.9	-12.0
26.0	-8.9	-3.4	-5.5
27.0	-7.3	-3.8	-3.5
28.0	-8.6	-4.2	-4.4
29.0	-7.5	-4.6	-2.9
30.0	-8.4	-4.9	-3.4
31.0	-6.4	-5.3	-1.1
32.0	-5.4	-5.6	0.2
33.0	-3.9	-6.0	2.1
34.0	-5.5	-6.3	0.8
35.0	-8.1	-6.6	-1.5
36.0	-4.5	-6.9	2.4
37.0	-7.6	-7.2	-0.4
38.0	-5.0	-7.5	2.5
39.0	-7.1	-7.8	0.7
40.0	-8.0	-8.1	0.1
41.0	-10.5	-8.3	-2.2
42.0	-9.4	-8.6	-0.9
43.0	-11.2	-8.8	-2.3
44.0	-10.3	-9.1	-1.2
45.0	-8.9	-9.3	0.4
46.0	-6.7	-9.6	2.8
47.0	-9.2	-9.8	0.6
48.0	-15.2	-10.0	-5.1
49.0	-13.9	-10.0	-3.9
50.0	-12.6	-10.0	-2.6
51.0	-10.9	-10.0	-0.9
52.0	-10.3	-10.0	-0.3
53.0	-13.6	-10.0	-3.6
54.0	-14.2	-10.0	-4.2
55.0	-22.1	-10.0	-12.1
56.0	-17.3	-10.0	-7.3
57.0	-15.4	-10.0	-5.4
58.0	-15.6	-10.0	-5.6
59.0	-19.4	-10.0	-9.4

Orbit Communication Systems Ltd.
AL-7107-Ka, 2.15 m Antenna, Pattern Data Table
Co-pol Azimuth RHCP, -180° to +180° @ 1.0° increment

-119.0	-20.2	0.0	-20.2
-118.0	-22.4	0.0	-22.4
-117.0	-21.3	0.0	-21.3
-116.0	-22.3	0.0	-22.3
-115.0	-20.2	0.0	-20.2
-114.0	-19.3	0.0	-19.3
-113.0	-27.3	0.0	-27.3
-112.0	-25.8	0.0	-25.8
-111.0	-16.7	0.0	-16.7
-110.0	-19.2	0.0	-19.2
-109.0	-18.1	0.0	-18.1
-108.0	-14.4	0.0	-14.4
-107.0	-22.5	0.0	-22.5
-106.0	-26.4	0.0	-26.4
-105.0	-22.3	0.0	-22.3
-104.0	-22.2	0.0	-22.2
-103.0	-23.8	0.0	-23.8
-102.0	-22.4	0.0	-22.4
-101.0	-27.3	0.0	-27.3
-100.0	-16.1	0.0	-16.1
-99.0	-15.0	0.0	-15.0
-98.0	-17.8	0.0	-17.8
-97.0	-19.5	0.0	-19.5
-96.0	-11.1	0.0	-11.1
-95.0	-14.1	0.0	-14.1
-94.0	-17.9	0.0	-17.9
-93.0	-19.2	0.0	-19.2
-92.0	-15.9	0.0	-15.9
-91.0	-14.9	0.0	-14.9
-90.0	-14.9	0.0	-14.9
-89.0	-15.3	0.0	-15.3
-88.0	-20.4	0.0	-20.4
-87.0	-13.3	0.0	-13.3
-86.0	-14.4	0.0	-14.4
-85.0	-14.4	-10.0	-4.4
-84.0	-15.1	-10.0	-5.1
-83.0	-14.6	-10.0	-4.6
-82.0	-13.1	-10.0	-3.1
-81.0	-16.5	-10.0	-6.5
-80.0	-10.3	-10.0	-0.3
-79.0	-10.0	-10.0	0.0
-78.0	-9.9	-10.0	0.1
-77.0	-12.9	-10.0	-2.9
-76.0	-12.9	-10.0	-2.9
-75.0	-11.4	-10.0	-1.4
-74.0	-11.7	-10.0	-1.7
-73.0	-11.0	-10.0	-1.0
-72.0	-8.9	-10.0	1.1
-71.0	-8.3	-10.0	1.7
-70.0	-6.4	-10.0	3.6
-69.0	-6.4	-10.0	3.6
-68.0	-4.3	-10.0	5.7
-67.0	-6.6	-10.0	3.4
-66.0	-6.1	-10.0	3.9
-65.0	-7.0	-10.0	3.0
-64.0	-7.3	-10.0	2.7
-63.0	-8.4	-10.0	1.6
-62.0	-9.1	-10.0	0.9
-61.0	-9.8	-10.0	0.2
-60.0	-8.9	-10.0	1.1
-59.0	-10.2	-10.0	-0.2
-58.0	-11.1	-10.0	-1.1
-57.0	-14.7	-10.0	-4.7

60.0	-17.8	-10.0	-7.8
61.0	-26.4	-10.0	-16.4
62.0	-20.4	-10.0	-10.4
63.0	-12.8	-10.0	-2.8
64.0	-19.5	-10.0	-9.5
65.0	-12.2	-10.0	-2.2
66.0	-20.0	-10.0	-10.0
67.0	-18.8	-10.0	-8.8
68.0	-25.8	-10.0	-15.8
69.0	-16.0	-10.0	-6.0
70.0	-24.6	-10.0	-14.6
71.0	-25.0	-10.0	-15.0
72.0	-23.0	-10.0	-13.0
73.0	-15.9	-10.0	-5.9
74.0	-20.0	-10.0	-10.0
75.0	-19.5	-10.0	-9.5
76.0	-21.6	-10.0	-11.6
77.0	-20.9	-10.0	-10.9
78.0	-27.6	-10.0	-17.6
79.0	-23.2	-10.0	-13.2
80.0	-27.0	-10.0	-17.0
81.0	-26.4	-10.0	-16.4
82.0	-22.3	-10.0	-12.3
83.0	-27.5	-10.0	-17.5
84.0	-22.5	-10.0	-12.5
85.0	-27.6	-10.0	-17.6
86.0	-18.4	0.0	-18.4
87.0	-25.3	0.0	-25.3
88.0	-23.9	0.0	-23.9
89.0	-27.6	0.0	-27.6
90.0	-23.1	0.0	-23.1
91.0	-22.6	0.0	-22.6
92.0	-25.5	0.0	-25.5
93.0	-27.6	0.0	-27.6
94.0	-27.6	0.0	-27.6
95.0	-21.9	0.0	-21.9
96.0	-20.2	0.0	-20.2
97.0	-21.6	0.0	-21.6
98.0	-19.0	0.0	-19.0
99.0	-23.9	0.0	-23.9
100.0	-27.2	0.0	-27.2
101.0	-22.1	0.0	-22.1
102.0	-18.8	0.0	-18.8
103.0	-23.2	0.0	-23.2
104.0	-27.6	0.0	-27.6
105.0	-27.6	0.0	-27.6
106.0	-27.6	0.0	-27.6
107.0	-21.8	0.0	-21.8
108.0	-21.0	0.0	-21.0
109.0	-23.5	0.0	-23.5
110.0	-27.6	0.0	-27.6
111.0	-20.2	0.0	-20.2
112.0	-27.6	0.0	-27.6
113.0	-27.6	0.0	-27.6
114.0	-21.8	0.0	-21.8
115.0	-21.3	0.0	-21.3
116.0	-24.5	0.0	-24.5
117.0	-25.8	0.0	-25.8
118.0	-23.8	0.0	-23.8
119.0	-22.4	0.0	-22.4
120.0	-23.4	0.0	-23.4
121.0	-20.5	0.0	-20.5
122.0	-26.9	0.0	-26.9

Orbit Communication Systems Ltd.
AL-7107-Ka, 2.15 m Antenna, Pattern Data Table
Co-pol Azimuth RHCP, -180° to +180° @ 1.0° increment

-56.0	-15.3	-10.0	-5.3
-55.0	-14.7	-10.0	-4.7
-54.0	-16.3	-10.0	-6.3
-53.0	-14.3	-10.0	-4.3
-52.0	-18.2	-10.0	-8.2
-51.0	-15.7	-10.0	-5.7
-50.0	-18.2	-10.0	-8.2
-49.0	-14.3	-10.0	-4.3
-48.0	-14.6	-10.0	-4.6
-47.0	-20.8	-9.8	-11.0
-46.0	-17.9	-9.6	-8.3
-45.0	-19.1	-9.3	-9.8
-44.0	-16.5	-9.1	-7.5
-43.0	-17.2	-8.8	-8.3
-42.0	-16.8	-8.6	-8.2
-41.0	-10.7	-8.3	-2.4
-40.0	-27.6	-8.1	-19.5
-39.0	-17.2	-7.8	-9.4
-38.0	-16.3	-7.5	-8.8
-37.0	-20.2	-7.2	-13.0
-36.0	-15.6	-6.9	-8.7
-35.0	-22.8	-6.6	-16.2
-34.0	-18.4	-6.3	-12.1
-33.0	-25.3	-6.0	-19.3
-32.0	-16.2	-5.6	-10.5
-31.0	-16.0	-5.3	-10.8
-30.0	-20.2	-4.9	-15.2
-29.0	-20.2	-4.6	-15.7
-28.0	-19.2	-4.2	-15.1
-27.0	-21.7	-3.8	-17.9
-26.0	-11.8	-3.4	-8.4
-25.0	-18.8	-2.9	-15.9
-24.0	-17.6	-2.5	-15.1
-23.0	-19.8	-2.0	-17.7
-22.0	-17.5	-1.6	-15.9
-21.0	-22.7	-1.1	-21.6
-20.0	-24.2	-0.5	-23.7
-19.0	-17.9	0.0	-17.9
-18.0	-17.0	0.6	-17.6
-17.0	-14.6	1.2	-15.8
-16.0	-24.2	1.9	-26.1
-15.0	-27.6	2.6	-30.2
-14.0	-10.3	3.3	-13.6
-13.0	-14.8	4.2	-19.0
-12.0	-7.3	5.0	-12.3
-11.0	-10.9	6.0	-16.9
-10.0	-7.9	7.0	-14.9
-9.0	-17.0	8.0	-25.0
-8.0	-11.4	8.0	-19.4
-7.0	-0.8	7.9	-8.7
-6.0	-1.1	9.5	-10.7
-5.0	5.0	11.5	-6.6
-4.0	9.5	13.9	-4.5
-3.0	4.9	17.1	-12.1
-2.0	12.5	21.5	-9.0
-1.0	20.8		
0.0	52.4		

123.0	-21.4	0.0	-21.4
124.0	-27.6	0.0	-27.6
125.0	-21.1	0.0	-21.1
126.0	-27.6	0.0	-27.6
127.0	-27.6	0.0	-27.6
128.0	-27.6	0.0	-27.6
129.0	-23.1	0.0	-23.1
130.0	-23.0	0.0	-23.0
131.0	-19.2	0.0	-19.2
132.0	-27.6	0.0	-27.6
133.0	-25.8	0.0	-25.8
134.0	-26.2	0.0	-26.2
135.0	-22.5	0.0	-22.5
136.0	-22.1	0.0	-22.1
137.0	-25.2	0.0	-25.2
138.0	-22.2	0.0	-22.2
139.0	-27.6	0.0	-27.6
140.0	-24.7	0.0	-24.7
141.0	-24.0	0.0	-24.0
142.0	-27.2	0.0	-27.2
143.0	-26.3	0.0	-26.3
144.0	-23.6	0.0	-23.6
145.0	-26.1	0.0	-26.1
146.0	-27.6	0.0	-27.6
147.0	-27.6	0.0	-27.6
148.0	-26.3	0.0	-26.3
149.0	-23.5	0.0	-23.5
150.0	-25.5	0.0	-25.5
151.0	-27.6	0.0	-27.6
152.0	-27.6	0.0	-27.6
153.0	-22.1	0.0	-22.1
154.0	-27.6	0.0	-27.6
155.0	-27.6	0.0	-27.6
156.0	-26.4	0.0	-26.4
157.0	-27.6	0.0	-27.6
158.0	-27.6	0.0	-27.6
159.0	-23.9	0.0	-23.9
160.0	-22.1	0.0	-22.1
161.0	-19.4	0.0	-19.4
162.0	-18.4	0.0	-18.4
163.0	-25.6	0.0	-25.6
164.0	-20.1	0.0	-20.1
165.0	-23.4	0.0	-23.4
166.0	-21.0	0.0	-21.0
167.0	-27.6	0.0	-27.6
168.0	-22.7	0.0	-22.7
169.0	-23.9	0.0	-23.9
170.0	-18.5	0.0	-18.5
171.0	-22.5	0.0	-22.5
172.0	-23.6	0.0	-23.6
173.0	-22.5	0.0	-22.5
174.0	-27.6	0.0	-27.6
175.0	-27.6	0.0	-27.6
176.0	-27.2	0.0	-27.2
177.0	-27.2	0.0	-27.2
178.0	-23.6	0.0	-23.6
179.0	-23.9	0.0	-23.9

Orbit Communication Systems Ltd.

AL AL-7107-Ka, 2.15 m Antenna, Pattern Data Table
Co-pol Azimuth RHCP, -10° to +10° @ 0.1° increment

28.30 GHz Antenna Pattern in Co-pol Az RHCP

Angle	Gain	Mask	Over Mask
Degrees	dBi	dBi	dB
-10.0	-7.6	7.0	-14.6
-9.9	-5.8	7.1	-12.9
-9.8	-5.4	7.2	-12.6
-9.7	-5.6	7.3	-12.9
-9.6	-7.9	7.4	-15.3
-9.5	-7.5	7.6	-15.0
-9.4	-4.7	7.7	-12.4
-9.3	-3.2	7.8	-11.0
-9.2	-3.7	8.0	-11.7
-9.1	-11.3	8.0	-19.3
-9.0	-7.9	8.0	-15.9
-8.9	-4.8	8.0	-12.8
-8.8	-4.8	8.0	-12.8
-8.7	-7.1	8.0	-15.1
-8.6	-7.1	8.0	-15.1
-8.5	-3.9	8.0	-11.9
-8.4	-3.3	8.0	-11.3
-8.3	-3.7	8.0	-11.7
-8.2	-3.1	8.0	-11.1
-8.1	-4.1	8.0	-12.1
-8.0	-4.5	8.0	-12.5
-7.9	-6.3	8.0	-14.3
-7.8	-6.2	8.0	-14.2
-7.7	-4.6	8.0	-12.6
-7.6	-3.4	8.0	-11.4
-7.5	-6.4	8.0	-14.4
-7.4	-9.0	8.0	-17.0
-7.3	-4.0	8.0	-12.0
-7.2	-9.0	8.0	-17.0
-7.1	-5.1	8.0	-13.1
-7.0	2.0	7.9	-5.9
-6.9	4.7	8.0	-3.4
-6.8	5.7	8.2	-2.5
-6.7	6.2	8.3	-2.1
-6.6	5.1	8.5	-3.4
-6.5	3.3	8.7	-5.4
-6.4	-0.5	8.8	-9.4
-6.3	-3.3	9.0	-12.3
-6.2	-0.9	9.2	-10.1
-6.1	-1.0	9.4	-10.4
-6.0	-4.3	9.5	-13.8
-5.9	-3.7	9.7	-13.5
-5.8	-1.3	9.9	-11.2
-5.7	-1.0	10.1	-11.1
-5.6	-5.5	10.3	-15.8
-5.5	-7.3	10.5	-17.8
-5.4	-1.1	10.7	-11.8
-5.3	-1.2	10.9	-12.1
-5.2	-4.1	11.1	-15.2
-5.1	2.4	11.3	-8.9
-5.0	3.7	11.5	-7.8
-4.9	1.0	11.7	-10.8
-4.8	-5.1	12.0	-17.1
-4.7	-1.6	12.2	-13.8
-4.6	4.5	12.4	-8.0
-4.5	6.5	12.7	-6.2
-4.4	4.6	12.9	-8.3
-4.3	-3.9	13.2	-17.1
-4.2	-6.0	13.4	-19.4
-4.1	5.3	13.7	-8.4

28.30 GHz Antenna Pattern in Co-pol Az RHCP

Angle	Gain	Mask	Over Mask
Degrees	dBi	dBi	dB
0.0	52.5		
0.1	51.7		
0.2	49.0		
0.3	44.4		
0.4	38.4		
0.5	32.9		
0.6	27.8		
0.7	28.5		
0.8	29.2		
0.9	25.2		
1.0	9.5		
1.1	19.5		
1.2	19.3		
1.3	9.4		
1.4	9.2		
1.5	7.1	24.6	-17.5
1.6	12.4	23.9	-11.5
1.7	16.2	23.2	-7.0
1.8	15.0	22.6	-7.6
1.9	10.9	22.0	-11.1
2.0	10.9	21.5	-10.6
2.1	9.4	20.9	-11.6
2.2	2.6	20.4	-17.9
2.3	6.0	20.0	-13.9
2.4	7.7	19.5	-11.8
2.5	7.9	19.1	-11.1
2.6	6.9	18.6	-11.7
2.7	1.3	18.2	-16.9
2.8	-2.8	17.8	-20.6
2.9	-0.8	17.4	-18.2
3.0	2.0	17.1	-15.0
3.1	5.6	16.7	-11.1
3.2	6.0	16.4	-10.4
3.3	2.8	16.0	-13.3
3.4	-0.4	15.7	-16.1
3.5	-7.4	15.4	-22.8
3.6	0.9	15.1	-14.2
3.7	4.8	14.8	-10.0
3.8	4.0	14.5	-10.5
3.9	-5.4	14.2	-19.6
4.0	-7.8	13.9	-21.8
4.1	-3.9	13.7	-17.6
4.2	-5.9	13.4	-19.4
4.3	1.3	13.2	-11.9
4.4	3.7	12.9	-9.2
4.5	4.8	12.7	-7.9
4.6	5.3	12.4	-7.1
4.7	2.7	12.2	-9.5
4.8	-6.1	12.0	-18.1
4.9	-5.5	11.7	-17.2
5.0	-4.7	11.5	-16.3
5.1	-5.9	11.3	-17.2
5.2	-1.6	11.1	-12.7
5.3	-2.5	10.9	-13.4
5.4	-9.1	10.7	-19.8
5.5	-4.3	10.5	-14.8
5.6	0.9	10.3	-9.4
5.7	1.5	10.1	-8.6
5.8	0.8	9.9	-9.1
5.9	-2.0	9.7	-11.7

Orbit Communication Systems Ltd.

AL AL-7107-Ka, 2.15 m Antenna, Pattern Data Table
Co-pol Azimuth RHCP, -10° to +10° @ 0.1° increment

-4.0	10.4	13.9	-3.5
-3.9	11.5	14.2	-2.7
-3.8	9.6	14.5	-4.9
-3.7	0.5	14.8	-14.3
-3.6	7.7	15.1	-7.4
-3.5	9.9	15.4	-5.5
-3.4	7.7	15.7	-8.0
-3.3	2.3	16.0	-13.7
-3.2	7.0	16.4	-9.4
-3.1	7.9	16.7	-8.8
-3.0	6.8	17.1	-10.3
-2.9	9.1	17.4	-8.3
-2.8	10.4	17.8	-7.4
-2.7	8.1	18.2	-10.2
-2.6	-2.0	18.6	-20.6
-2.5	-4.2	19.1	-23.3
-2.4	-2.6	19.5	-22.1
-2.3	4.6	20.0	-15.3
-2.2	5.7	20.4	-14.8
-2.1	8.7	20.9	-12.2
-2.0	12.3	21.5	-9.1
-1.9	12.1	22.0	-9.9
-1.8	6.3	22.6	-16.3
-1.7	9.8	23.2	-13.4
-1.6	10.3	23.9	-13.6
-1.5	4.3	24.6	-20.3
-1.4	15.9		
-1.3	18.2		
-1.2	18.6		
-1.1	19.3		
-1.0	18.1		
-0.9	17.6		
-0.8	21.2		
-0.7	20.3		
-0.6	21.9		
-0.5	33.9		
-0.4	41.4		
-0.3	47.0		
-0.2	50.5		
-0.1	52.2		
0.0	52.5		

6.0	-9.2	9.5	-18.7
6.1	-3.5	9.4	-12.9
6.2	0.9	9.2	-8.3
6.3	1.4	9.0	-7.6
6.4	1.9	8.8	-7.0
6.5	0.8	8.7	-7.8
6.6	-0.7	8.5	-9.2
6.7	-0.8	8.3	-9.1
6.8	0.1	8.2	-8.1
6.9	0.5	8.0	-7.5
7.0	-0.4	7.9	-8.3
7.1	-3.0	8.0	-11.0
7.2	-13.3	8.0	-21.3
7.3	-8.3	8.0	-16.3
7.4	-4.0	8.0	-12.0
7.5	-4.6	8.0	-12.6
7.6	-6.5	8.0	-14.5
7.7	-4.5	8.0	-12.5
7.8	-2.2	8.0	-10.2
7.9	-1.5	8.0	-9.5
8.0	-1.8	8.0	-9.8
8.1	-3.8	8.0	-11.8
8.2	-11.1	8.0	-19.1
8.3	-7.2	8.0	-15.2
8.4	-4.4	8.0	-12.4
8.5	-4.2	8.0	-12.2
8.6	-5.0	8.0	-13.0
8.7	-5.0	8.0	-13.0
8.8	-6.4	8.0	-14.4
8.9	-7.9	8.0	-15.9
9.0	-9.1	8.0	-17.1
9.1	-9.8	8.0	-17.8
9.2	-10.7	8.0	-18.7
9.3	-17.4	7.8	-25.2
9.4	-14.6	7.7	-22.3
9.5	-6.6	7.6	-14.2
9.6	-5.1	7.4	-12.6
9.7	-4.8	7.3	-12.1
9.8	-5.0	7.2	-12.2
9.9	-5.4	7.1	-12.5
10.0	-5.8	7.0	-12.8

Orbit Communication Systems Ltd.
AL-7107-Ka, 2.15 m Antenna, Pattern Data Table
Co-pol Elevation RHCP, -30° to +30° @ 0.5° increment

28.30 GHz Antenna Pattern in Co-pol EI RHCP

Angle	Gain	Mask	Over Mask
Degrees	dBi	dBi	dB
-30.0	-8.9	-4.9	-4.0
-29.5	-8.2	-4.7	-3.5
-29.0	-11.1	-4.6	-6.6
-28.5	-9.4	-4.4	-5.1
-28.0	-10.5	-4.2	-6.4
-27.5	-11.4	-4.0	-7.4
-27.0	-14.6	-3.8	-10.8
-26.5	-11.7	-3.6	-8.2
-26.0	-13.1	-3.4	-9.7
-25.5	-11.1	-3.2	-7.9
-25.0	-7.1	-2.9	-4.1
-24.5	-6.9	-2.7	-4.2
-24.0	-6.2	-2.5	-3.7
-23.5	-16.4	-2.3	-14.1
-23.0	-19.0	-2.0	-17.0
-22.5	-9.0	-1.8	-7.2
-22.0	-5.7	-1.6	-4.1
-21.5	-5.0	-1.3	-3.7
-21.0	-13.8	-1.1	-12.7
-20.5	-5.7	-0.8	-4.9
-20.0	-6.0	-0.5	-5.5
-19.5	-1.6	-0.3	-1.3
-19.0	-1.6	0.0	-1.6
-18.5	-2.8	0.3	-3.1
-18.0	-14.4	0.6	-15.0
-17.5	-23.5	0.9	-24.4
-17.0	-15.1	1.2	-16.4
-16.5	-14.3	1.6	-15.9
-16.0	-18.3	1.9	-20.2
-15.5	-13.5	2.2	-15.8
-15.0	-9.1	2.6	-11.7
-14.5	-17.0	3.0	-19.9
-14.0	-2.1	3.3	-5.4
-13.5	-6.7	3.7	-10.5
-13.0	-9.7	4.2	-13.9
-12.5	-11.8	4.6	-16.4
-12.0	-6.5	5.0	-11.5
-11.5	-6.0	5.5	-11.5
-11.0	-13.0	6.0	-19.0
-10.5	-10.3	6.5	-16.8
-10.0	-6.5	7.0	-13.5
-9.5	-6.6	7.6	-14.2
-9.0	-2.8	8.1	-10.9
-8.5	-8.5	8.8	-17.2
-8.0	-2.4	9.4	-11.8
-7.5	-10.0	10.1	-20.2
-7.0	-2.0	10.9	-12.9
-6.5	-5.7	11.7	-17.4
-6.0	-1.1	12.5	-13.7
-5.5	-1.6	13.5	-15.1
-5.0	1.5	14.5	-13.1
-4.5	1.5	15.7	-14.2
-4.0	2.9	16.9	-14.0
-3.5	4.7	18.4	-13.7
-3.0	10.6		
-2.5	9.4		
-2.0	8.1		
-1.5	17.9		
-1.0	21.1		
-0.5	35.7		
0.0	52.4		

28.30 GHz Antenna Pattern in Co-pol EI RHCP

Angle	Gain	Mask	Over Mask
Degrees	dBi	dBi	dB
0.0	52.4		
0.5	38.0		
1.0	16.8		
1.5	9.7		
2.0	5.4		
2.5	10.1		
3.0	7.5		
3.5	8.5	18.4	-9.9
4.0	13.0	16.9	-4.0
4.5	-1.0	15.7	-16.6
5.0	7.3	14.5	-7.2
5.5	-12.4	13.5	-25.9
6.0	-1.8	12.5	-14.4
6.5	0.9	11.7	-10.8
7.0	-1.8	10.9	-12.7
7.5	-12.0	10.1	-22.1
8.0	-14.6	9.4	-24.0
8.5	-1.5	8.8	-10.3
9.0	-2.8	8.1	-11.0
9.5	-9.7	7.6	-17.3
10.0	-0.2	7.0	-7.2
10.5	-4.7	6.5	-11.1
11.0	-8.1	6.0	-14.1
11.5	-13.2	5.5	-18.6
12.0	-13.1	5.0	-18.1
12.5	-5.9	4.6	-10.5
13.0	-4.3	4.2	-8.4
13.5	-8.9	3.7	-12.6
14.0	-17.5	3.3	-20.8
14.5	-12.7	3.0	-15.7
15.0	-12.0	2.6	-14.6
15.5	-15.1	2.2	-17.4
16.0	-18.5	1.9	-20.3
16.5	-16.7	1.6	-18.2
17.0	-15.4	1.2	-16.7
17.5	-22.5	0.9	-23.5
18.0	-13.5	0.6	-14.1
18.5	-17.0	0.3	-17.3
19.0	-12.1	0.0	-12.1
19.5	-12.8	-0.3	-12.6
20.0	-18.1	-0.5	-17.6
20.5	-12.0	-0.8	-11.2
21.0	-26.3	-1.1	-25.3
21.5	-26.9	-1.3	-25.6
22.0	-18.6	-1.6	-17.1
22.5	-12.9	-1.8	-11.1
23.0	-16.0	-2.0	-14.0
23.5	-15.0	-2.3	-12.7
24.0	-21.6	-2.5	-19.1
24.5	-19.9	-2.7	-17.2
25.0	-15.4	-2.9	-12.4
25.5	-19.2	-3.2	-16.1
26.0	-27.6	-3.4	-24.2
26.5	-19.8	-3.6	-16.2
27.0	-20.5	-3.8	-16.7
27.5	-15.7	-4.0	-11.7
28.0	-14.3	-4.2	-10.1
28.5	-17.6	-4.4	-13.2
29.0	-17.5	-4.6	-13.0
29.5	-15.3	-4.7	-10.6
30.0	-24.6	-4.9	-19.7

Orbit Communication Systems Ltd.
AL-7107-Ka, 2.15 m Antenna, Pattern Data Table
Co-pol Elevation RHCP, -10° to +10° @ 0.1° increment

28.30 GHz Antenna Pattern in Co-pol EI RHCP

Angle	Gain	Mask	Over Mask
Degrees	dBi	dBi	dB
-10.0	-13.2	7.0	-20.2
-9.9	-9.8	7.1	-16.9
-9.8	-7.0	7.2	-14.2
-9.7	-5.9	7.3	-13.2
-9.6	-5.0	7.4	-12.5
-9.5	-4.2	7.6	-11.8
-9.4	-4.6	7.7	-12.3
-9.3	-9.3	7.8	-17.1
-9.2	-12.8	7.9	-20.7
-9.1	-7.4	8.0	-15.4
-9.0	-3.0	8.1	-11.2
-8.9	-3.0	8.3	-11.3
-8.8	-5.9	8.4	-14.3
-8.7	-11.7	8.5	-20.2
-8.6	-8.2	8.6	-16.8
-8.5	-12.3	8.8	-21.1
-8.4	-17.1	8.9	-26.0
-8.3	-10.0	9.0	-19.1
-8.2	-4.8	9.2	-13.9
-8.1	-2.5	9.3	-11.8
-8.0	-3.1	9.4	-12.5
-7.9	-6.0	9.6	-15.6
-7.8	-15.5	9.7	-25.2
-7.7	-7.6	9.8	-17.5
-7.6	-5.6	10.0	-15.6
-7.5	-9.0	10.1	-19.2
-7.4	-17.5	10.3	-27.7
-7.3	-5.6	10.4	-16.0
-7.2	-1.2	10.6	-11.7
-7.1	0.8	10.7	-9.9
-7.0	0.0	10.9	-10.9
-6.9	-11.1	11.0	-22.1
-6.8	-1.7	11.2	-12.9
-6.7	1.8	11.3	-9.5
-6.6	-0.8	11.5	-12.4
-6.5	-7.3	11.7	-19.0
-6.4	-4.8	11.8	-16.6
-6.3	-3.0	12.0	-15.0
-6.2	-1.1	12.2	-13.2
-6.1	-0.5	12.4	-12.9
-6.0	-0.7	12.5	-13.2
-5.9	-0.5	12.7	-13.2
-5.8	0.8	12.9	-12.1
-5.7	-1.2	13.1	-14.3
-5.6	-2.5	13.3	-15.8
-5.5	-0.3	13.5	-13.8
-5.4	-2.6	13.7	-16.3
-5.3	-0.7	13.9	-14.6
-5.2	3.1	14.1	-11.0
-5.1	4.1	14.3	-10.2
-5.0	2.0	14.5	-12.5
-4.9	-1.1	14.7	-15.9
-4.8	-2.8	15.0	-17.7
-4.7	-0.2	15.2	-15.4
-4.6	0.9	15.4	-14.5
-4.5	1.2	15.7	-14.5
-4.4	1.3	15.9	-14.7
-4.3	2.6	16.2	-13.5
-4.2	4.7	16.4	-11.7
-4.1	4.7	16.7	-11.9

28.30 GHz Antenna Pattern in Co-pol EI RHCP

Angle	Gain	Mask	Over Mask
Degrees	dBi	dBi	dB
0.0	52.5		
0.1	51.7		
0.2	49.0		
0.3	44.5		
0.4	40.8		
0.5	37.4		
0.6	32.0		
0.7	15.3		
0.8	21.5		
0.9	20.7		
1.0	19.8		
1.1	20.0		
1.2	15.5		
1.3	4.7		
1.4	10.1		
1.5	9.2		
1.6	14.0		
1.7	14.5		
1.8	12.1		
1.9	8.2		
2.0	6.5		
2.1	8.3		
2.2	10.1		
2.3	9.6		
2.4	10.0		
2.5	10.1		
2.6	6.9		
2.7	0.1		
2.8	-11.8		
2.9	1.8		
3.0	6.7		
3.1	6.2		
3.2	3.7		
3.3	6.9		
3.4	7.8		
3.5	9.6	18.4	-8.8
3.6	9.7	18.1	-8.4
3.7	8.8	17.8	-9.0
3.8	11.3	17.5	-6.2
3.9	13.5	17.2	-3.8
4.0	13.3	16.9	-3.7
4.1	12.3	16.7	-4.4
4.2	12.4	16.4	-4.0
4.3	10.5	16.2	-5.6
4.4	2.9	15.9	-13.0
4.5	-9.0	15.7	-24.7
4.6	1.6	15.4	-13.8
4.7	5.1	15.2	-10.1
4.8	6.9	15.0	-8.1
4.9	6.4	14.7	-8.4
5.0	4.9	14.5	-9.6
5.1	3.6	14.3	-10.7
5.2	0.9	14.1	-13.2
5.3	-7.8	13.9	-21.7
5.4	-10.3	13.7	-24.0
5.5	-3.6	13.5	-17.1
5.6	-3.0	13.3	-16.3
5.7	-5.1	13.1	-18.2
5.8	-5.2	12.9	-18.1
5.9	-2.3	12.7	-15.0

Orbit Communication Systems Ltd.
AL-7107-Ka, 2.15 m Antenna, Pattern Data Table
Co-pol Elevation RHCP, -10° to +10° @ 0.1° increment

-4.0	2.3	16.9	-14.7
-3.9	-1.5	17.2	-18.8
-3.8	4.2	17.5	-13.3
-3.7	6.0	17.8	-11.8
-3.6	5.0	18.1	-13.1
-3.5	3.0	18.4	-15.4
-3.4	-1.3		
-3.3	-2.7		
-3.2	-3.1		
-3.1	-3.9		
-3.0	9.3		
-2.9	13.7		
-2.8	13.8		
-2.7	11.3		
-2.6	7.7		
-2.5	10.1		
-2.4	12.4		
-2.3	13.7		
-2.2	13.8		
-2.1	11.6		
-2.0	7.8		
-1.9	6.6		
-1.8	5.2		
-1.7	8.6		
-1.6	15.4		
-1.5	17.9		
-1.4	16.7		
-1.3	16.2		
-1.2	21.8		
-1.1	22.9		
-1.0	20.1		
-0.9	21.5		
-0.8	25.3		
-0.7	29.5		
-0.6	32.8		
-0.5	35.1		
-0.4	40.2		
-0.3	46.4		
-0.2	50.2		
-0.1	52.2		
0.0	52.5		

6.0	-2.3	12.5	-14.9
6.1	-3.4	12.4	-15.7
6.2	-1.9	12.2	-14.1
6.3	-1.2	12.0	-13.3
6.4	-0.6	11.8	-12.4
6.5	0.6	11.7	-11.1
6.6	2.8	11.5	-8.7
6.7	2.5	11.3	-8.8
6.8	0.4	11.2	-10.7
6.9	-3.1	11.0	-14.2
7.0	-13.4	10.9	-24.3
7.1	-4.7	10.7	-15.5
7.2	-2.2	10.6	-12.8
7.3	-4.6	10.4	-15.0
7.4	-9.1	10.3	-19.4
7.5	-3.8	10.1	-13.9
7.6	-2.8	10.0	-12.8
7.7	-7.1	9.8	-16.9
7.8	-3.9	9.7	-13.6
7.9	-3.4	9.6	-13.0
8.0	-5.0	9.4	-14.4
8.1	-5.6	9.3	-14.9
8.2	-4.2	9.2	-13.4
8.3	-3.0	9.0	-12.0
8.4	-2.7	8.9	-11.6
8.5	-8.0	8.8	-16.8
8.6	-8.9	8.6	-17.5
8.7	-11.7	8.5	-20.2
8.8	-27.5	8.4	-35.9
8.9	-14.1	8.3	-22.4
9.0	-7.5	8.1	-15.7
9.1	-2.2	8.0	-10.2
9.2	-1.2	7.9	-9.1
9.3	-2.0	7.8	-9.8
9.4	-4.1	7.7	-11.8
9.5	-3.5	7.6	-11.1
9.6	-0.4	7.4	-7.9
9.7	1.6	7.3	-5.7
9.8	2.0	7.2	-5.3
9.9	1.1	7.1	-6.0
10.0	-0.3	7.0	-7.3

Orbit Communication Systems Ltd.
AL-7107-Ka, 2.15 m Antenna, Pattern Data Table
X-pol Azimuth RHCP, -10° to +10° @ 0.1° increment

28.30 GHz Antenna Pattern in X-pol Az RHCP

Angle	Gain	Mask	Over Mask
Degrees	dBi	dBi	dB
-10.0	-9.3	-2.0	-7.3
-9.9	-8.7	-2.0	-6.7
-9.8	-8.5	-2.0	-6.5
-9.7	-6.1	-2.0	-4.1
-9.6	-6.5	-2.0	-4.5
-9.5	-5.1	-2.0	-3.1
-9.4	-5.5	-2.0	-3.5
-9.3	-5.9	-2.0	-3.9
-9.2	-5.7	-2.0	-3.7
-9.1	-4.4	-2.0	-2.4
-9.0	-6.1	-2.0	-4.1
-8.9	-6.6	-2.0	-4.6
-8.8	-8.0	-2.0	-6.0
-8.7	-5.1	-2.0	-3.1
-8.6	-3.5	-2.0	-1.5
-8.5	-3.1	-2.0	-1.1
-8.4	-3.8	-2.0	-1.8
-8.3	-4.8	-2.0	-2.8
-8.2	-3.9	-2.0	-1.9
-8.1	-4.3	-2.0	-2.3
-8.0	-6.6	-2.0	-4.6
-7.9	-10.0	-2.0	-8.0
-7.8	-8.3	-2.0	-6.3
-7.7	-5.9	-2.0	-3.9
-7.6	-5.4	-2.0	-3.4
-7.5	-4.7	-2.0	-2.7
-7.4	-2.1	-2.0	-0.1
-7.3	-1.2	-2.0	0.8
-7.2	-1.8	-2.0	0.2
-7.1	-4.0	-2.0	-2.0
-7.0	-5.1	-2.1	-3.0
-6.9	-4.6	-2.0	-2.7
-6.8	-3.8	-1.8	-2.0
-6.7	-3.2	-1.7	-1.6
-6.6	-4.2	-1.5	-2.8
-6.5	-8.1	-1.3	-6.8
-6.4	-15.0	-1.2	-13.9
-6.3	-13.3	-1.0	-12.3
-6.2	-17.2	-0.8	-16.4
-6.1	-13.1	-0.6	-12.4
-6.0	-6.4	-0.5	-5.9
-5.9	-4.5	-0.3	-4.2
-5.8	-6.7	-0.1	-6.6
-5.7	-17.8	0.1	-17.9
-5.6	-7.0	0.3	-7.3
-5.5	-5.0	0.5	-5.5
-5.4	-6.0	0.7	-6.7
-5.3	-11.0	0.9	-11.8
-5.2	-4.7	1.1	-5.8
-5.1	-1.6	1.3	-3.0
-5.0	-1.7	1.5	-3.2
-4.9	-3.9	1.7	-5.6
-4.8	-23.8	2.0	-25.8
-4.7	-4.9	2.2	-7.1
-4.6	-2.5	2.4	-4.9
-4.5	-4.3	2.7	-7.0
-4.4	-2.8	2.9	-5.7
-4.3	-1.8	3.2	-4.9
-4.2	-6.6	3.4	-10.0
-4.1	-5.2	3.7	-8.8

28.30 GHz Antenna Pattern in X-pol Az RHCP

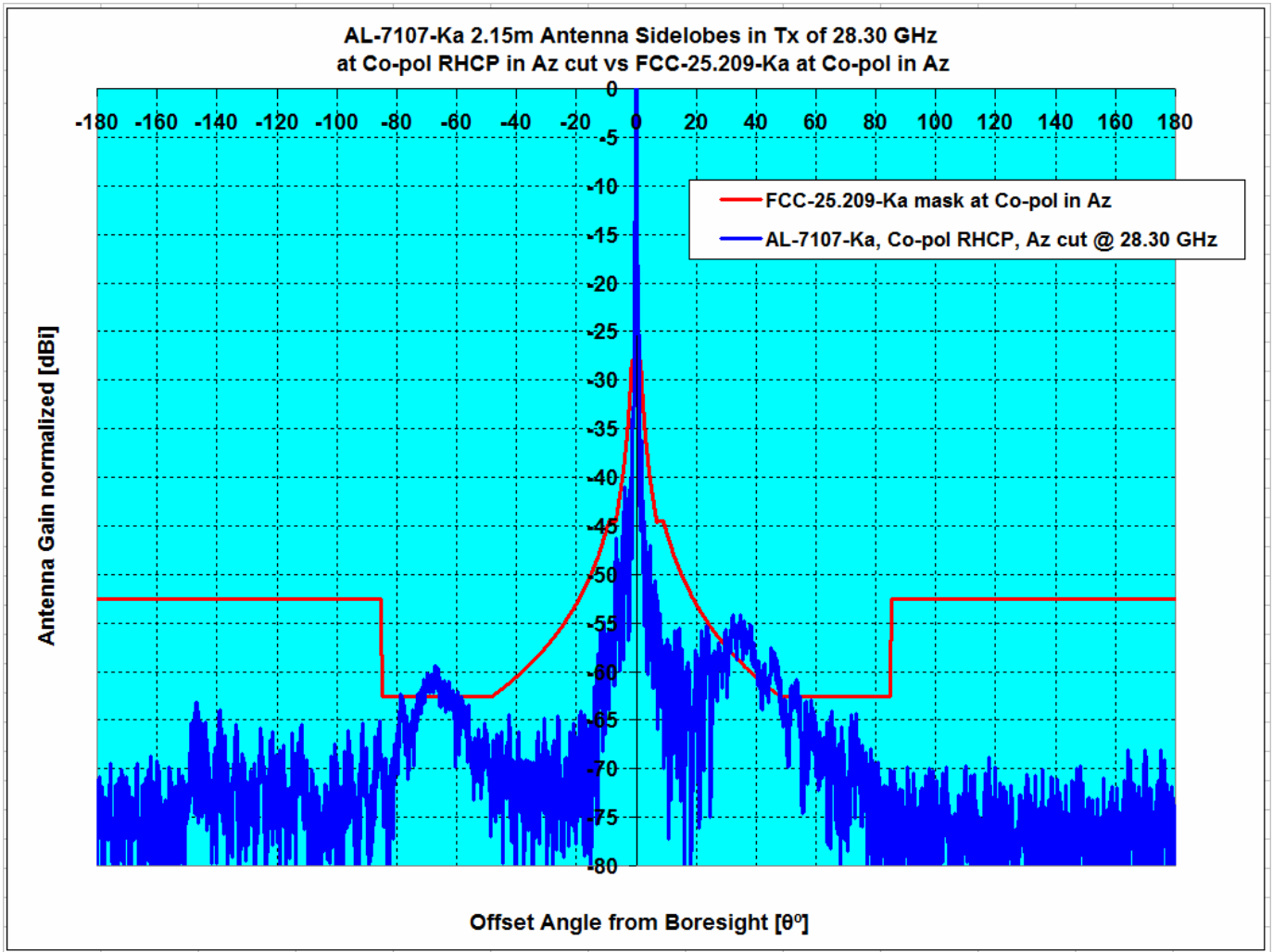
Angle	Gain	Mask	Over Mask
Degrees	dBi	dBi	dB
0.0	27.6		
0.1	26.8		
0.2	28.6		
0.3	30.1		
0.4	29.6		
0.5	27.3		
0.6	21.9		
0.7	13.7		
0.8	4.1		
0.9	9.6		
1.0	14.8		
1.1	14.1		
1.2	7.5		
1.3	2.3		
1.4	7.3		
1.5	6.0		
1.6	2.0		
1.7	0.4		
1.8	-5.0	12.6	-17.6
1.9	-14.1	12.0	-26.1
2.0	-6.6	11.5	-18.1
2.1	-5.6	10.9	-16.5
2.2	-10.6	10.4	-21.1
2.3	-10.5	10.0	-20.4
2.4	-3.6	9.5	-13.1
2.5	-3.5	9.1	-12.5
2.6	-7.4	8.6	-16.0
2.7	-0.5	8.2	-8.8
2.8	0.7	7.8	-7.1
2.9	-0.6	7.4	-8.1
3.0	-7.4	7.1	-14.5
3.1	-10.7	6.7	-17.4
3.2	-10.9	6.4	-17.3
3.3	-16.5	6.0	-22.5
3.4	-8.2	5.7	-14.0
3.5	-10.0	5.4	-15.4
3.6	-11.0	5.1	-16.1
3.7	-9.5	4.8	-14.2
3.8	-12.1	4.5	-16.6
3.9	-9.7	4.2	-14.0
4.0	-6.8	3.9	-10.7
4.1	-7.3	3.7	-11.0
4.2	-10.3	3.4	-13.7
4.3	-10.7	3.2	-13.9
4.4	-11.3	2.9	-14.2
4.5	-9.8	2.7	-12.5
4.6	-5.9	2.4	-8.3
4.7	-7.0	2.2	-9.2
4.8	-11.5	2.0	-13.5
4.9	-14.1	1.7	-15.8
5.0	-12.7	1.5	-14.2
5.1	-10.1	1.3	-11.4
5.2	-11.4	1.1	-12.5
5.3	-12.0	0.9	-12.9
5.4	-6.1	0.7	-6.8
5.5	-5.3	0.5	-5.8
5.6	-6.1	0.3	-6.4
5.7	-11.5	0.1	-11.6
5.8	-12.9	-0.1	-12.8
5.9	-14.1	-0.3	-13.8

Orbit Communication Systems Ltd.
AL-7107-Ka, 2.15 m Antenna, Pattern Data Table
X-pol Azimuth RHCP, -10° to +10° @ 0.1° increment

-4.0	1.1	3.9	-2.8
-3.9	1.1	4.2	-3.1
-3.8	-3.0	4.5	-7.6
-3.7	-3.1	4.8	-7.9
-3.6	-2.0	5.1	-7.1
-3.5	-5.7	5.4	-11.1
-3.4	-7.8	5.7	-13.5
-3.3	-5.6	6.0	-11.7
-3.2	-9.8	6.4	-16.2
-3.1	-9.4	6.7	-16.1
-3.0	-3.0	7.1	-10.0
-2.9	-2.9	7.4	-10.4
-2.8	-5.3	7.8	-13.1
-2.7	-5.9	8.2	-14.1
-2.6	-4.4	8.6	-13.0
-2.5	-7.0	9.1	-16.0
-2.4	-3.0	9.5	-12.5
-2.3	1.5	10.0	-8.5
-2.2	2.5	10.4	-8.0
-2.1	3.9	10.9	-7.0
-2.0	2.9	11.5	-8.6
-1.9	-8.9	12.0	-20.9
-1.8	4.3	12.6	-8.3
-1.7	8.1		
-1.6	8.9		
-1.5	9.8		
-1.4	9.9		
-1.3	5.5		
-1.2	8.0		
-1.1	13.9		
-1.0	14.8		
-0.9	14.7		
-0.8	19.2		
-0.7	24.2		
-0.6	26.9		
-0.5	28.3		
-0.4	27.5		
-0.3	22.3		
-0.2	21.8		
-0.1	26.9		
0.0	27.6		

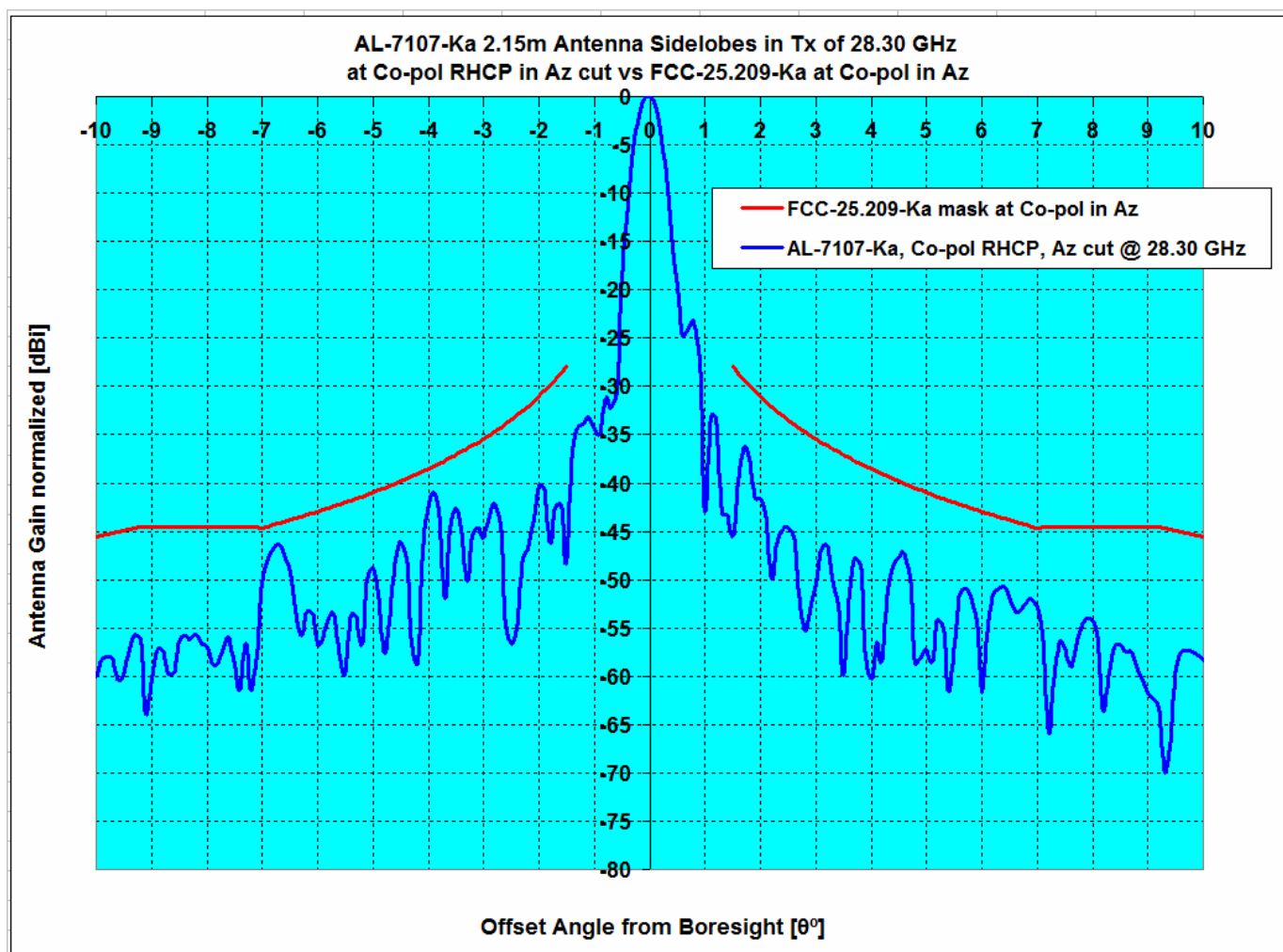
6.0	-18.3	-0.5	-17.9
6.1	-17.1	-0.6	-16.4
6.2	-18.1	-0.8	-17.3
6.3	-13.9	-1.0	-12.9
6.4	-8.8	-1.2	-7.6
6.5	-8.2	-1.3	-6.9
6.6	-9.3	-1.5	-7.8
6.7	-8.8	-1.7	-7.1
6.8	-7.5	-1.8	-5.7
6.9	-6.2	-2.0	-4.2
7.0	-7.3	-2.1	-5.1
7.1	-9.2	-2.0	-7.2
7.2	-10.4	-2.0	-8.4
7.3	-12.8	-2.0	-10.8
7.4	-14.5	-2.0	-12.5
7.5	-11.3	-2.0	-9.3
7.6	-8.7	-2.0	-6.7
7.7	-6.6	-2.0	-4.6
7.8	-5.0	-2.0	-3.0
7.9	-5.3	-2.0	-3.3
8.0	-6.1	-2.0	-4.1
8.1	-6.8	-2.0	-4.8
8.2	-8.3	-2.0	-6.3
8.3	-11.3	-2.0	-9.3
8.4	-12.9	-2.0	-10.9
8.5	-12.3	-2.0	-10.3
8.6	-10.0	-2.0	-8.0
8.7	-6.7	-2.0	-4.7
8.8	-5.6	-2.0	-3.6
8.9	-9.5	-2.0	-7.5
9.0	-9.6	-2.0	-7.6
9.1	-8.7	-2.0	-6.7
9.2	-9.6	-2.0	-7.6
9.3	-10.6	-2.0	-8.6
9.4	-11.9	-2.0	-9.9
9.5	-14.4	-2.0	-12.4
9.6	-13.1	-2.0	-11.1
9.7	-8.2	-2.0	-6.2
9.8	-9.6	-2.0	-7.6
9.9	-22.1	-2.0	-20.1
10.0	-10.8	-2.0	-8.8

Orbit Communication Systems Ltd.
AL-7107-Ka, 2.15 m Antenna, Pattern, Co-pol, Azimuth RHCP



Description	Plane, CirP	Frequency	Ant. Gain	Peak Excursions dB		Over Mask %	
				1.5°≤θ≤7°	7°≤θ≤180°	1.5°≤θ≤7°	7°≤θ≤180°
Pattern Rule vs Antenna System	Type	GHz	dBi				
FCC-25.209-Ka, Co-pol Az, vs AL-7107-Ka	Az , RHCP	28.30	52.51	-2.13	4.92	0.00%	7.22%

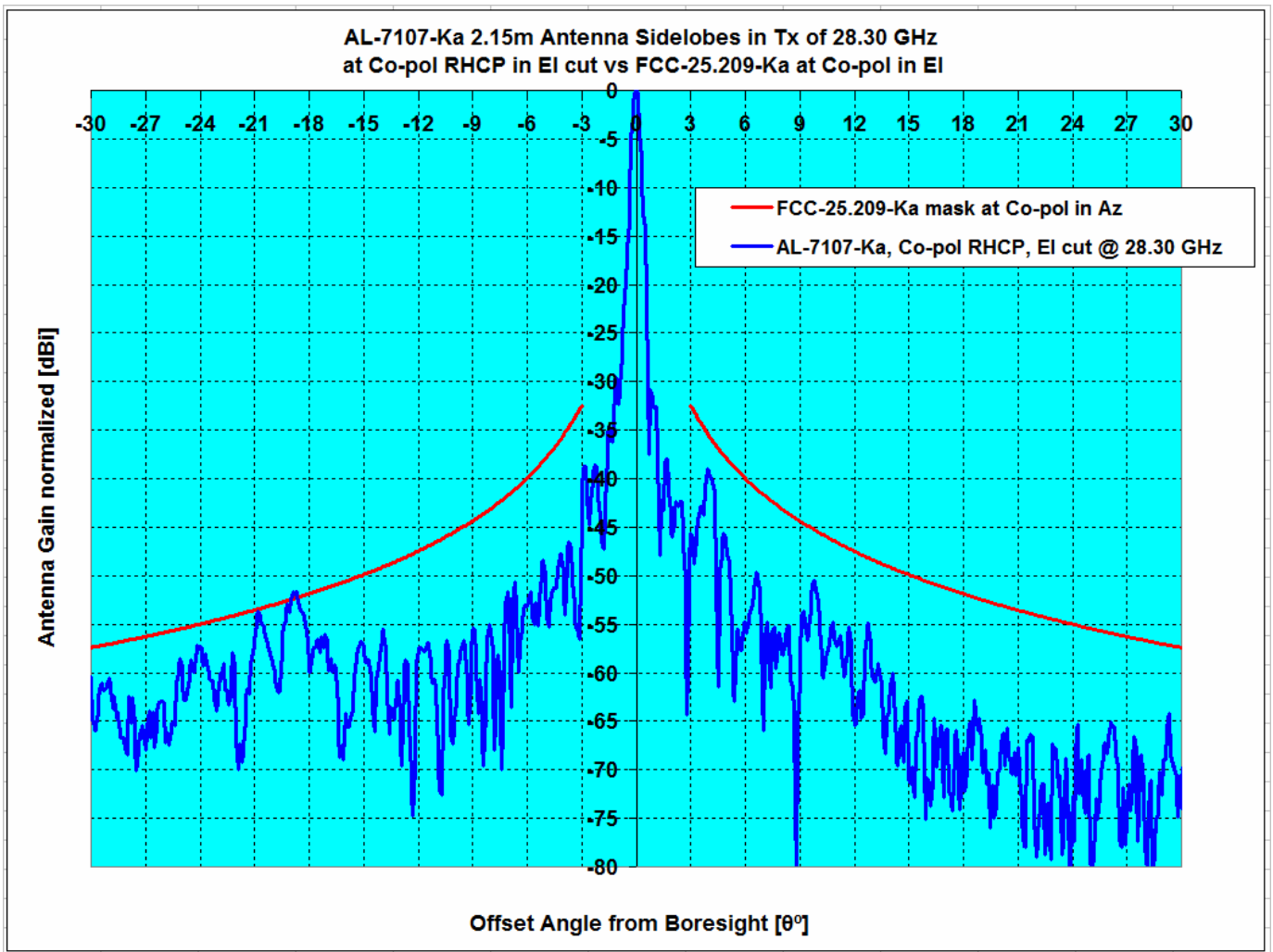
Orbit Communication Systems Ltd.
AL-7107-Ka, 2.15 m Antenna, Pattern, Co-pol, Azimuth RHCP



Description	Plane, CirP	Frequency	Ant. Gain	Peak Excursions dB		Over Mask %	
				1.5°≤θ≤7°	7°≤θ≤180°	1.5°≤θ≤7°	7°≤θ≤180°
Pattern Rule vs Antenna System	Type	GHz	dBi				
FCC-25.209-Ka, Co-pol Az, vs AL-7107-Ka	Az , RHCP	28.30	52.51	-2.13	4.92	0.00%	7.22%

Orbit Communication Systems Ltd.

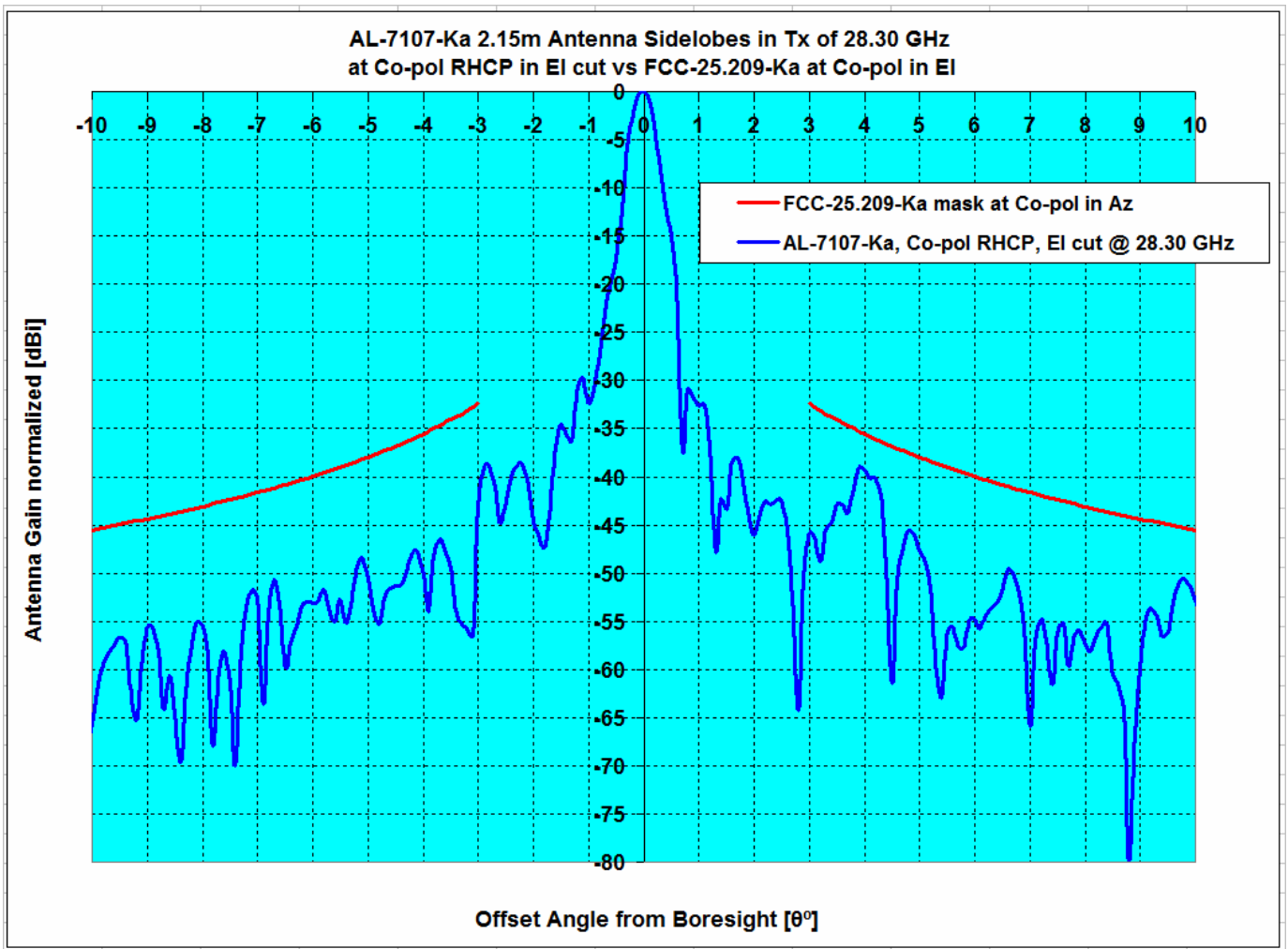
AL-7107-Ka, 2.15 m Antenna, Pattern, Co-pol, Elevation RHCP



Description	Plane, CirP	Frequency	Ant. Gain	Peak Excursions dB		Over Mask %	
Pattern Rule vs Antenna System	Type	GHz	dBi	3°≤θ≤7°	7°≤θ≤30°	3°≤θ≤7°	7°≤θ≤30°
FCC-25.209-Ka, Co-pol EI, vs AL-7107-Ka	EI , RHCP	28.30	52.51	-3.67	0.77	0.00%	0.55%

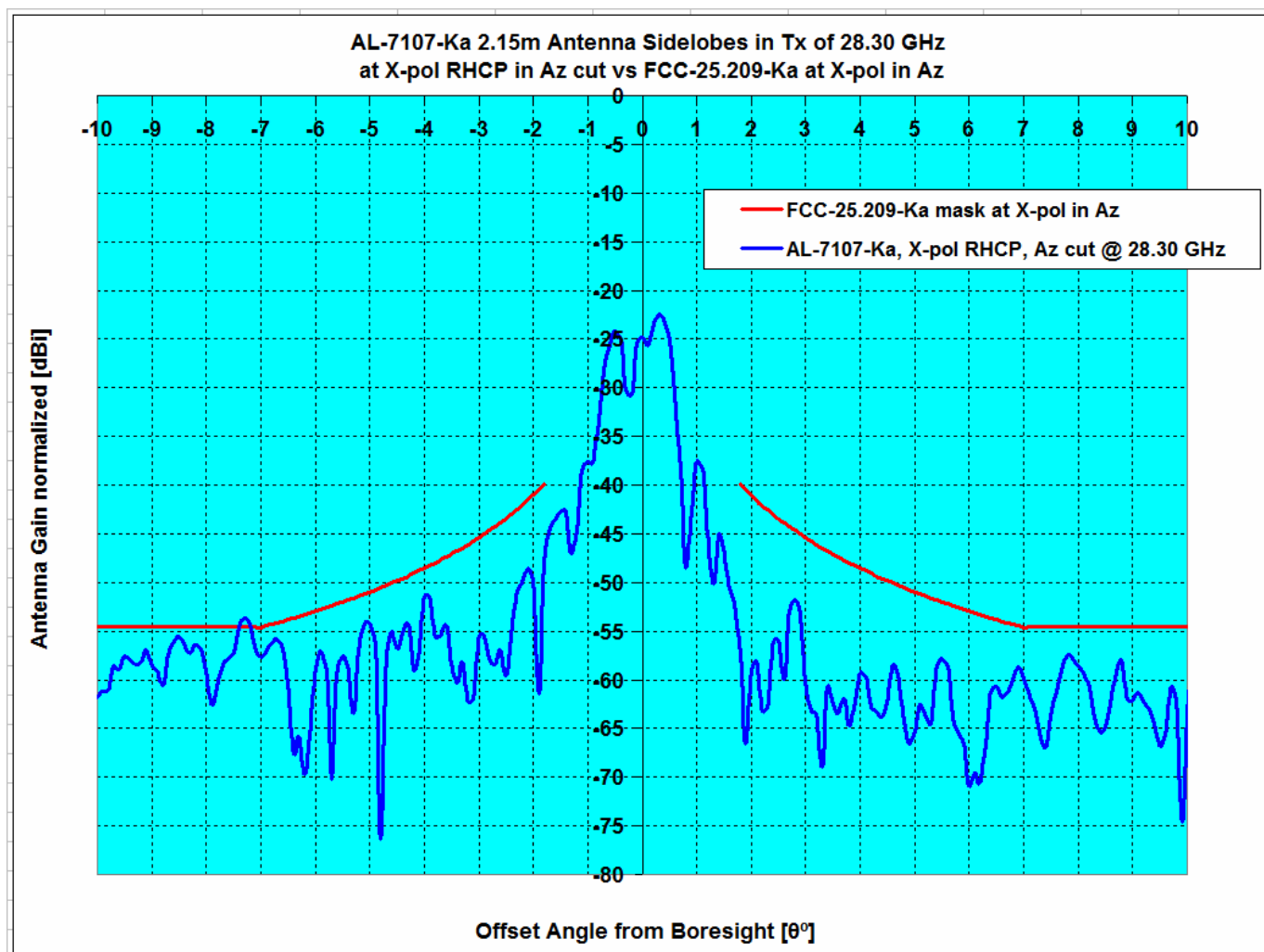
Orbit Communication Systems Ltd.

AL-7107-Ka, 2.15 m Antenna, Pattern, Co-pol, Elevation RHCP



Description	Plane, CirP	Frequency	Ant. Gain	Peak Excursions dB		Over Mask %	
				3°≤θ≤7°	7°≤θ≤30°	3°≤θ≤7°	7°≤θ≤30°
Pattern Rule vs Antenna System	Type	GHz	dBi				
FCC-25.209-Ka, Co-pol EI, vs AL-7107-Ka	EI , RHCP	28.30	52.51	-3.67	0.77	0.00%	0.55%

Orbit Communication Systems Ltd.
AL-7107-Ka, 2.15 m Antenna, Pattern, X-pol, Azimuth RHCP



Description	Plane, CirP	Frequency	Ant. Gain	Peak Excursions dB		Over Mask %	
Pattern Rule vs Antenna System	Type	GHz	dBi	1.8°≤θ≤7°	1.8°≤θ≤9.2°	1.8°≤θ≤7°	1.8°≤θ≤9.2°
FCC-25.209-Ka, X-pol Az, vs AL-7107-Ka	Az , RHCP	28.30	52.51	-1.58	0.81	0.00%	1.20%

Orbit Communication Systems Ltd.
AL-7107-Ka, 2.15 m Antenna, Pattern Data Table
Co-pol Azimuth LHCP, -180° to +180° @ 1.0° increment

29.15 GHz Antenna Pattern in Co-pol Az LHCP

Angle	Gain	Mask	Over Mask
Degrees	dBi	dBi	dB
-179.0	-25.9	0.0	-25.9
-178.0	-18.2	0.0	-18.2
-177.0	-20.5	0.0	-20.5
-176.0	-25.0	0.0	-25.0
-175.0	-27.4	0.0	-27.4
-174.0	-27.4	0.0	-27.4
-173.0	-26.9	0.0	-26.9
-172.0	-27.4	0.0	-27.4
-171.0	-23.9	0.0	-23.9
-170.0	-25.9	0.0	-25.9
-169.0	-18.2	0.0	-18.2
-168.0	-20.5	0.0	-20.5
-167.0	-25.0	0.0	-25.0
-166.0	-27.4	0.0	-27.4
-165.0	-27.4	0.0	-27.4
-164.0	-26.9	0.0	-26.9
-163.0	-27.4	0.0	-27.4
-162.0	-19.4	0.0	-19.4
-161.0	-20.8	0.0	-20.8
-160.0	-27.0	0.0	-27.0
-159.0	-26.0	0.0	-26.0
-158.0	-27.4	0.0	-27.4
-157.0	-19.8	0.0	-19.8
-156.0	-27.4	0.0	-27.4
-155.0	-27.4	0.0	-27.4
-154.0	-20.7	0.0	-20.7
-153.0	-22.6	0.0	-22.6
-152.0	-15.2	0.0	-15.2
-151.0	-19.3	0.0	-19.3
-150.0	-17.7	0.0	-17.7
-149.0	-27.4	0.0	-27.4
-148.0	-25.8	0.0	-25.8
-147.0	-24.5	0.0	-24.5
-146.0	-15.8	0.0	-15.8
-145.0	-15.5	0.0	-15.5
-144.0	-20.2	0.0	-20.2
-143.0	-20.2	0.0	-20.2
-142.0	-21.6	0.0	-21.6
-141.0	-20.2	0.0	-20.2
-140.0	-16.0	0.0	-16.0
-139.0	-20.2	0.0	-20.2
-138.0	-20.6	0.0	-20.6
-137.0	-20.5	0.0	-20.5
-136.0	-23.7	0.0	-23.7
-135.0	-15.0	0.0	-15.0
-134.0	-15.9	0.0	-15.9
-133.0	-27.4	0.0	-27.4
-132.0	-25.2	0.0	-25.2
-131.0	-22.1	0.0	-22.1
-130.0	-16.0	0.0	-16.0
-129.0	-16.1	0.0	-16.1
-128.0	-18.9	0.0	-18.9
-127.0	-15.9	0.0	-15.9
-126.0	-15.0	0.0	-15.0
-125.0	-22.5	0.0	-22.5
-124.0	-19.5	0.0	-19.5
-123.0	-20.8	0.0	-20.8
-122.0	-25.3	0.0	-25.3
-121.0	-20.6	0.0	-20.6
-120.0	-26.0	0.0	-26.0

29.15 GHz Antenna Pattern in Co-pol Az LHCP

Angle	Gain	Mask	Over Mask
Degrees	dBi	dBi	dB
0.0	52.6		
1.0	15.7		
2.0	10.0	21.5	-11.5
3.0	9.1	17.1	-8.0
4.0	-4.1	13.9	-18.1
5.0	-10.4	11.5	-21.9
6.0	0.3	9.5	-9.2
7.0	-14.1	7.9	-21.9
8.0	-5.4	8.0	-13.4
9.0	-3.3	8.0	-11.3
10.0	-5.3	7.0	-12.3
11.0	-15.6	6.0	-21.5
12.0	-3.1	5.0	-8.1
13.0	-6.7	4.2	-10.9
14.0	-12.7	3.3	-16.0
15.0	-17.4	2.6	-20.0
16.0	-23.4	1.9	-25.3
17.0	-16.6	1.2	-17.9
18.0	-14.4	0.6	-15.0
19.0	-19.6	0.0	-19.6
20.0	-10.9	-0.5	-10.3
21.0	-15.4	-1.1	-14.3
22.0	-4.5	-1.6	-3.0
23.0	-3.7	-2.0	-1.7
24.0	-5.9	-2.5	-3.4
25.0	-11.3	-2.9	-8.3
26.0	-7.7	-3.4	-4.3
27.0	-7.5	-3.8	-3.7
28.0	-13.5	-4.2	-9.3
29.0	-8.8	-4.6	-4.3
30.0	-7.2	-4.9	-2.3
31.0	-5.8	-5.3	-0.5
32.0	-9.8	-5.6	-4.2
33.0	-5.0	-6.0	0.9
34.0	-10.9	-6.3	-4.6
35.0	-9.4	-6.6	-2.8
36.0	-5.1	-6.9	1.9
37.0	-6.4	-7.2	0.8
38.0	-9.6	-7.5	-2.1
39.0	-9.4	-7.8	-1.6
40.0	-9.6	-8.1	-1.5
41.0	-12.3	-8.3	-4.0
42.0	-11.1	-8.6	-2.5
43.0	-11.7	-8.8	-2.9
44.0	-9.0	-9.1	0.1
45.0	-9.2	-9.3	0.1
46.0	-9.5	-9.6	0.1
47.0	-7.6	-9.8	2.2
48.0	-14.1	-10.0	-4.1
49.0	-10.6	-10.0	-0.6
50.0	-13.3	-10.0	-3.3
51.0	-21.6	-10.0	-11.6
52.0	-16.7	-10.0	-6.7
53.0	-14.1	-10.0	-4.1
54.0	-16.3	-10.0	-6.3
55.0	-19.5	-10.0	-9.5
56.0	-26.5	-10.0	-16.5
57.0	-23.2	-10.0	-13.2
58.0	-19.6	-10.0	-9.6
59.0	-25.0	-10.0	-15.0

Orbit Communication Systems Ltd.
AL-7107-Ka, 2.15 m Antenna, Pattern Data Table
Co-pol Azimuth LHCP, -180° to +180° @ 1.0° increment

-119.0	-26.2	0.0	-26.2
-118.0	-24.0	0.0	-24.0
-117.0	-26.3	0.0	-26.3
-116.0	-22.1	0.0	-22.1
-115.0	-27.4	0.0	-27.4
-114.0	-22.4	0.0	-22.4
-113.0	-17.6	0.0	-17.6
-112.0	-19.9	0.0	-19.9
-111.0	-17.4	0.0	-17.4
-110.0	-17.3	0.0	-17.3
-109.0	-27.4	0.0	-27.4
-108.0	-24.7	0.0	-24.7
-107.0	-25.2	0.0	-25.2
-106.0	-20.2	0.0	-20.2
-105.0	-20.5	0.0	-20.5
-104.0	-19.9	0.0	-19.9
-103.0	-20.1	0.0	-20.1
-102.0	-16.2	0.0	-16.2
-101.0	-23.3	0.0	-23.3
-100.0	-17.0	0.0	-17.0
-99.0	-20.0	0.0	-20.0
-98.0	-27.4	0.0	-27.4
-97.0	-23.7	0.0	-23.7
-96.0	-27.4	0.0	-27.4
-95.0	-19.7	0.0	-19.7
-94.0	-19.6	0.0	-19.6
-93.0	-22.6	0.0	-22.6
-92.0	-20.0	0.0	-20.0
-91.0	-18.8	0.0	-18.8
-90.0	-21.7	0.0	-21.7
-89.0	-27.2	0.0	-27.2
-88.0	-18.7	0.0	-18.7
-87.0	-15.9	0.0	-15.9
-86.0	-13.3	0.0	-13.3
-85.0	-13.3	-10.0	-3.3
-84.0	-15.3	-10.0	-5.3
-83.0	-20.2	-10.0	-10.2
-82.0	-20.2	-10.0	-10.2
-81.0	-12.7	-10.0	-2.7
-80.0	-12.8	-10.0	-2.8
-79.0	-10.3	-10.0	-0.3
-78.0	-9.3	-10.0	0.7
-77.0	-16.7	-10.0	-6.7
-76.0	-14.2	-10.0	-4.2
-75.0	-14.6	-10.0	-4.6
-74.0	-10.9	-10.0	-0.9
-73.0	-10.2	-10.0	-0.2
-72.0	-6.9	-10.0	3.1
-71.0	-6.7	-10.0	3.3
-70.0	-5.8	-10.0	4.2
-69.0	-6.8	-10.0	3.2
-68.0	-4.7	-10.0	5.3
-67.0	-4.6	-10.0	5.4
-66.0	-5.1	-10.0	4.9
-65.0	-6.4	-10.0	3.6
-64.0	-4.8	-10.0	5.2
-63.0	-6.9	-10.0	3.1
-62.0	-7.4	-10.0	2.6
-61.0	-9.4	-10.0	0.6
-60.0	-10.4	-10.0	-0.4
-59.0	-11.1	-10.0	-1.1
-58.0	-11.5	-10.0	-1.5
-57.0	-15.0	-10.0	-5.0

60.0	-22.4	-10.0	-12.4
61.0	-25.4	-10.0	-15.4
62.0	-24.5	-10.0	-14.5
63.0	-27.4	-10.0	-17.4
64.0	-18.1	-10.0	-8.1
65.0	-19.8	-10.0	-9.8
66.0	-27.4	-10.0	-17.4
67.0	-19.9	-10.0	-9.9
68.0	-25.1	-10.0	-15.1
69.0	-21.3	-10.0	-11.3
70.0	-20.3	-10.0	-10.3
71.0	-19.9	-10.0	-9.9
72.0	-16.1	-10.0	-6.1
73.0	-15.1	-10.0	-5.1
74.0	-17.3	-10.0	-7.3
75.0	-17.4	-10.0	-7.4
76.0	-19.9	-10.0	-9.9
77.0	-27.4	-10.0	-17.4
78.0	-20.4	-10.0	-10.4
79.0	-27.4	-10.0	-17.4
80.0	-21.5	-10.0	-11.5
81.0	-22.2	-10.0	-12.2
82.0	-23.5	-10.0	-13.5
83.0	-23.1	-10.0	-13.1
84.0	-26.5	-10.0	-16.5
85.0	-27.4	-10.0	-17.4
86.0	-25.4	0.0	-25.4
87.0	-21.5	0.0	-21.5
88.0	-19.6	0.0	-19.6
89.0	-25.7	0.0	-25.7
90.0	-18.6	0.0	-18.6
91.0	-25.0	0.0	-25.0
92.0	-26.8	0.0	-26.8
93.0	-27.4	0.0	-27.4
94.0	-18.2	0.0	-18.2
95.0	-25.1	0.0	-25.1
96.0	-22.6	0.0	-22.6
97.0	-24.3	0.0	-24.3
98.0	-25.3	0.0	-25.3
99.0	-27.3	0.0	-27.3
100.0	-19.9	0.0	-19.9
101.0	-21.8	0.0	-21.8
102.0	-24.4	0.0	-24.4
103.0	-22.8	0.0	-22.8
104.0	-22.2	0.0	-22.2
105.0	-19.6	0.0	-19.6
106.0	-24.5	0.0	-24.5
107.0	-23.1	0.0	-23.1
108.0	-23.4	0.0	-23.4
109.0	-24.9	0.0	-24.9
110.0	-23.0	0.0	-23.0
111.0	-24.6	0.0	-24.6
112.0	-19.7	0.0	-19.7
113.0	-24.1	0.0	-24.1
114.0	-25.2	0.0	-25.2
115.0	-22.9	0.0	-22.9
116.0	-23.2	0.0	-23.2
117.0	-27.1	0.0	-27.1
118.0	-25.0	0.0	-25.0
119.0	-27.0	0.0	-27.0
120.0	-27.4	0.0	-27.4
121.0	-26.7	0.0	-26.7
122.0	-21.1	0.0	-21.1

Orbit Communication Systems Ltd.
AL-7107-Ka, 2.15 m Antenna, Pattern Data Table
Co-pol Azimuth LHCP, -180° to +180° @ 1.0° increment

-56.0	-15.1	-10.0	-5.1
-55.0	-14.6	-10.0	-4.6
-54.0	-15.9	-10.0	-5.9
-53.0	-11.4	-10.0	-1.4
-52.0	-11.8	-10.0	-1.8
-51.0	-15.5	-10.0	-5.5
-50.0	-15.8	-10.0	-5.8
-49.0	-16.5	-10.0	-6.5
-48.0	-20.7	-10.0	-10.7
-47.0	-27.4	-9.8	-17.6
-46.0	-14.0	-9.6	-4.4
-45.0	-15.7	-9.3	-6.4
-44.0	-12.7	-9.1	-3.6
-43.0	-18.4	-8.8	-9.6
-42.0	-16.2	-8.6	-7.6
-41.0	-17.4	-8.3	-9.0
-40.0	-16.9	-8.1	-8.9
-39.0	-22.9	-7.8	-15.1
-38.0	-22.0	-7.5	-14.5
-37.0	-18.9	-7.2	-11.7
-36.0	-14.3	-6.9	-7.4
-35.0	-18.4	-6.6	-11.8
-34.0	-15.6	-6.3	-9.3
-33.0	-16.2	-6.0	-10.2
-32.0	-17.3	-5.6	-11.6
-31.0	-19.6	-5.3	-14.3
-30.0	-14.8	-4.9	-9.9
-29.0	-18.2	-4.6	-13.7
-28.0	-19.4	-4.2	-15.2
-27.0	-21.4	-3.8	-17.6
-26.0	-21.2	-3.4	-17.8
-25.0	-10.8	-2.9	-7.8
-24.0	-19.7	-2.5	-17.2
-23.0	-18.1	-2.0	-16.1
-22.0	-19.3	-1.6	-17.8
-21.0	-19.3	-1.1	-18.2
-20.0	-18.0	-0.5	-17.5
-19.0	-20.8	0.0	-20.8
-18.0	-19.2	0.6	-19.8
-17.0	-18.9	1.2	-20.2
-16.0	-8.8	1.9	-10.7
-15.0	-22.5	2.6	-25.1
-14.0	-12.8	3.3	-16.2
-13.0	-10.9	4.2	-15.1
-12.0	-12.0	5.0	-17.1
-11.0	-6.4	6.0	-12.4
-10.0	-3.1	7.0	-10.1
-9.0	-8.1	8.0	-16.1
-8.0	-7.7	8.0	-15.7
-7.0	-2.7	7.9	-10.5
-6.0	0.8	9.5	-8.8
-5.0	-8.5	11.5	-20.0
-4.0	-5.6	13.9	-19.6
-3.0	7.9	17.1	-9.2
-2.0	4.7	21.5	-16.7
-1.0	17.2		
0.0	52.6		

123.0	-25.5	0.0	-25.5
124.0	-22.2	0.0	-22.2
125.0	-19.5	0.0	-19.5
126.0	-27.4	0.0	-27.4
127.0	-24.9	0.0	-24.9
128.0	-21.7	0.0	-21.7
129.0	-25.5	0.0	-25.5
130.0	-21.6	0.0	-21.6
131.0	-26.1	0.0	-26.1
132.0	-27.4	0.0	-27.4
133.0	-27.4	0.0	-27.4
134.0	-25.8	0.0	-25.8
135.0	-27.1	0.0	-27.1
136.0	-26.9	0.0	-26.9
137.0	-27.4	0.0	-27.4
138.0	-21.9	0.0	-21.9
139.0	-24.9	0.0	-24.9
140.0	-22.5	0.0	-22.5
141.0	-20.8	0.0	-20.8
142.0	-27.4	0.0	-27.4
143.0	-25.8	0.0	-25.8
144.0	-27.4	0.0	-27.4
145.0	-27.4	0.0	-27.4
146.0	-24.8	0.0	-24.8
147.0	-23.5	0.0	-23.5
148.0	-27.4	0.0	-27.4
149.0	-23.6	0.0	-23.6
150.0	-23.9	0.0	-23.9
151.0	-27.1	0.0	-27.1
152.0	-26.7	0.0	-26.7
153.0	-22.1	0.0	-22.1
154.0	-27.4	0.0	-27.4
155.0	-18.6	0.0	-18.6
156.0	-27.4	0.0	-27.4
157.0	-27.4	0.0	-27.4
158.0	-27.4	0.0	-27.4
159.0	-25.5	0.0	-25.5
160.0	-25.5	0.0	-25.5
161.0	-20.0	0.0	-20.0
162.0	-26.2	0.0	-26.2
163.0	-20.2	0.0	-20.2
164.0	-24.1	0.0	-24.1
165.0	-27.4	0.0	-27.4
166.0	-24.5	0.0	-24.5
167.0	-27.4	0.0	-27.4
168.0	-27.4	0.0	-27.4
169.0	-27.4	0.0	-27.4
170.0	-27.0	0.0	-27.0
171.0	-26.5	0.0	-26.5
172.0	-27.4	0.0	-27.4
173.0	-27.4	0.0	-27.4
174.0	-22.7	0.0	-22.7
175.0	-24.8	0.0	-24.8
176.0	-23.7	0.0	-23.7
177.0	-27.4	0.0	-27.4
178.0	-27.4	0.0	-27.4
179.0	-23.9	0.0	-23.9

Orbit Communication Systems Ltd.

AL AL-7107-Ka, 2.15 m Antenna, Pattern Data Table
Co-pol Azimuth LHCP, -10° to +10° @ 0.1° increment

29.15 GHz Antenna Pattern in Co-pol Az LHCP

Angle	Gain	Mask	Over Mask
Degrees	dBi	dBi	dB
-10.0	-3.1	7.0	-10.1
-9.9	-1.1	7.1	-8.2
-9.8	0.0	7.2	-7.2
-9.7	-0.9	7.3	-8.2
-9.6	-3.1	7.4	-10.6
-9.5	-5.3	7.6	-12.9
-9.4	-4.9	7.7	-12.6
-9.3	-3.9	7.8	-11.7
-9.2	-7.4	8.0	-15.4
-9.1	-21.4	8.0	-29.4
-9.0	-8.1	8.0	-16.1
-8.9	-10.1	8.0	-18.1
-8.8	-15.8	8.0	-23.8
-8.7	-13.9	8.0	-21.9
-8.6	-12.0	8.0	-20.0
-8.5	-10.7	8.0	-18.7
-8.4	-11.6	8.0	-19.6
-8.3	-22.0	8.0	-30.0
-8.2	-11.0	8.0	-19.0
-8.1	-8.0	8.0	-16.0
-8.0	-7.7	8.0	-15.7
-7.9	-5.5	8.0	-13.5
-7.8	-4.3	8.0	-12.3
-7.7	-1.4	8.0	-9.4
-7.6	-0.2	8.0	-8.2
-7.5	-1.4	8.0	-9.4
-7.4	-1.9	8.0	-9.9
-7.3	0.6	8.0	-7.4
-7.2	1.2	8.0	-6.8
-7.1	0.6	8.0	-7.4
-7.0	-2.7	7.9	-10.5
-6.9	1.6	8.0	-6.5
-6.8	4.5	8.2	-3.7
-6.7	4.1	8.3	-4.2
-6.6	0.3	8.5	-8.2
-6.5	-0.8	8.7	-9.4
-6.4	1.1	8.8	-7.7
-6.3	2.0	9.0	-7.0
-6.2	2.1	9.2	-7.1
-6.1	1.7	9.4	-7.7
-6.0	0.8	9.5	-8.8
-5.9	-4.8	9.7	-14.5
-5.8	-9.4	9.9	-19.4
-5.7	-9.5	10.1	-19.6
-5.6	-11.1	10.3	-21.4
-5.5	-4.8	10.5	-15.3
-5.4	-6.1	10.7	-16.8
-5.3	-11.4	10.9	-22.3
-5.2	-0.5	11.1	-11.6
-5.1	0.5	11.3	-10.8
-5.0	-8.5	11.5	-20.0
-4.9	0.6	11.7	-11.1
-4.8	3.9	12.0	-8.1
-4.7	3.7	12.2	-8.5
-4.6	-0.2	12.4	-12.7
-4.5	2.0	12.7	-10.7
-4.4	6.2	12.9	-6.7
-4.3	6.8	13.2	-6.4
-4.2	3.1	13.4	-10.3
-4.1	-6.1	13.7	-19.8

29.15 GHz Antenna Pattern in Co-pol Az LHCP

Angle	Gain	Mask	Over Mask
Degrees	dBi	dBi	dB
0.0	52.6		
0.1	52.1		
0.2	49.8		
0.3	45.8		
0.4	41.1		
0.5	36.3		
0.6	30.2		
0.7	30.3		
0.8	30.7		
0.9	27.6		
1.0	15.7		
1.1	16.3		
1.2	13.9		
1.3	11.0		
1.4	16.1		
1.5	15.6	24.6	-9.0
1.6	17.2	23.9	-6.7
1.7	17.8	23.2	-5.4
1.8	15.5	22.6	-7.1
1.9	11.3	22.0	-10.7
2.0	10.0	21.5	-11.5
2.1	3.6	20.9	-17.4
2.2	1.7	20.4	-18.7
2.3	6.1	20.0	-13.9
2.4	5.7	19.5	-13.8
2.5	5.5	19.1	-13.5
2.6	2.4	18.6	-16.2
2.7	-0.1	18.2	-18.3
2.8	5.3	17.8	-12.5
2.9	7.2	17.4	-10.2
3.0	9.1	17.1	-8.0
3.1	9.3	16.7	-7.4
3.2	5.0	16.4	-11.4
3.3	-8.7	16.0	-24.8
3.4	-5.4	15.7	-21.1
3.5	-8.2	15.4	-23.6
3.6	4.0	15.1	-11.1
3.7	6.1	14.8	-8.7
3.8	3.6	14.5	-10.9
3.9	-6.5	14.2	-20.8
4.0	-4.1	13.9	-18.1
4.1	0.1	13.7	-13.6
4.2	2.2	13.4	-11.2
4.3	1.7	13.2	-11.4
4.4	0.7	12.9	-12.2
4.5	-1.2	12.7	-13.8
4.6	-4.5	12.4	-17.0
4.7	-4.3	12.2	-16.5
4.8	-2.6	12.0	-14.5
4.9	-7.5	11.7	-19.3
5.0	-10.4	11.5	-21.9
5.1	-4.9	11.3	-16.2
5.2	-5.1	11.1	-16.2
5.3	0.3	10.9	-10.6
5.4	3.7	10.7	-7.0
5.5	2.2	10.5	-8.3
5.6	-1.1	10.3	-11.4
5.7	-5.4	10.1	-15.5
5.8	-6.4	9.9	-16.3
5.9	-2.4	9.7	-12.1

Orbit Communication Systems Ltd.

AL AL-7107-Ka, 2.15 m Antenna, Pattern Data Table
Co-pol Azimuth LHCP, -10° to +10° @ 0.1° increment

-4.0	-5.6	13.9	-19.6
-3.9	6.4	14.2	-7.8
-3.8	11.2	14.5	-3.3
-3.7	11.7	14.8	-3.1
-3.6	8.0	15.1	-7.1
-3.5	-3.3	15.4	-18.7
-3.4	6.3	15.7	-9.4
-3.3	7.0	16.0	-9.0
-3.2	5.1	16.4	-11.2
-3.1	6.4	16.7	-10.3
-3.0	7.9	17.1	-9.2
-2.9	6.3	17.4	-11.1
-2.8	9.1	17.8	-8.7
-2.7	11.5	18.2	-6.7
-2.6	10.4	18.6	-8.3
-2.5	5.3	19.1	-13.8
-2.4	-2.4	19.5	-21.9
-2.3	-3.5	20.0	-23.5
-2.2	4.1	20.4	-16.4
-2.1	2.6	20.9	-18.3
-2.0	4.7	21.5	-16.7
-1.9	10.5	22.0	-11.5
-1.8	9.6	22.6	-13.0
-1.7	3.7	23.2	-19.6
-1.6	4.3	23.9	-19.6
-1.5	3.1	24.6	-21.5
-1.4	15.0		
-1.3	18.8		
-1.2	19.0		
-1.1	19.0		
-1.0	17.2		
-0.9	11.0		
-0.8	15.9		
-0.7	14.0		
-0.6	23.0		
-0.5	32.8		
-0.4	39.9		
-0.3	45.8		
-0.2	49.9		
-0.1	52.1		
0.0	52.6		

6.0	0.3	9.5	-9.2
6.1	-0.4	9.4	-9.7
6.2	1.4	9.2	-7.8
6.3	0.7	9.0	-8.3
6.4	1.7	8.8	-7.2
6.5	3.3	8.7	-5.4
6.6	4.2	8.5	-4.3
6.7	3.2	8.3	-5.2
6.8	1.1	8.2	-7.1
6.9	-3.6	8.0	-11.6
7.0	-14.1	7.9	-21.9
7.1	-2.0	8.0	-10.0
7.2	-1.5	8.0	-9.5
7.3	-3.8	8.0	-11.8
7.4	-8.8	8.0	-16.8
7.5	-6.5	8.0	-14.5
7.6	-4.2	8.0	-12.2
7.7	-1.8	8.0	-9.8
7.8	-3.3	8.0	-11.3
7.9	-6.4	8.0	-14.4
8.0	-5.4	8.0	-13.4
8.1	-2.0	8.0	-10.0
8.2	-2.9	8.0	-10.9
8.3	-2.0	8.0	-10.0
8.4	-2.3	8.0	-10.3
8.5	-5.0	8.0	-13.0
8.6	-11.5	8.0	-19.5
8.7	-15.8	8.0	-23.8
8.8	-13.6	8.0	-21.6
8.9	-4.8	8.0	-12.8
9.0	-3.3	8.0	-11.3
9.1	-3.1	8.0	-11.1
9.2	-6.1	8.0	-14.1
9.3	-3.4	7.8	-11.1
9.4	-1.0	7.7	-8.6
9.5	-1.4	7.6	-8.9
9.6	-1.7	7.4	-9.2
9.7	-6.2	7.3	-13.6
9.8	-12.8	7.2	-20.0
9.9	-14.5	7.1	-21.6
10.0	-5.3	7.0	-12.3

Orbit Communication Systems Ltd.
AL-7107-Ka, 2.15 m Antenna, Pattern Data Table
Co-pol Elevation LHCP, -30° to +30° @ 0.5° increment

29.15 GHz Antenna Pattern in Co-pol EI LHCP

Angle	Gain	Mask	Over Mask
Degrees	dBi	dBi	dB
-30.0	-7.6	-4.9	-2.7
-29.5	-9.3	-4.7	-4.5
-29.0	-9.0	-4.6	-4.5
-28.5	-7.4	-4.4	-3.1
-28.0	-9.3	-4.2	-5.1
-27.5	-13.4	-4.0	-9.4
-27.0	-12.8	-3.8	-9.1
-26.5	-12.4	-3.6	-8.8
-26.0	-7.6	-3.4	-4.2
-25.5	-7.8	-3.2	-4.7
-25.0	-13.4	-2.9	-10.4
-24.5	-5.6	-2.7	-2.8
-24.0	-8.2	-2.5	-5.7
-23.5	-14.3	-2.3	-12.0
-23.0	-14.6	-2.0	-12.5
-22.5	-18.2	-1.8	-16.4
-22.0	-16.2	-1.6	-14.6
-21.5	-6.2	-1.3	-4.9
-21.0	-6.2	-1.1	-5.1
-20.5	-6.1	-0.8	-5.3
-20.0	-2.2	-0.5	-1.7
-19.5	-0.5	-0.3	-0.3
-19.0	-0.5	0.0	-0.5
-18.5	-2.6	0.3	-2.9
-18.0	-5.4	0.6	-6.0
-17.5	-12.2	0.9	-13.1
-17.0	-11.4	1.2	-12.6
-16.5	-11.3	1.6	-12.8
-16.0	-19.4	1.9	-21.3
-15.5	-11.4	2.2	-13.6
-15.0	-4.8	2.6	-7.4
-14.5	-10.5	3.0	-13.5
-14.0	-4.3	3.3	-7.7
-13.5	-9.2	3.7	-12.9
-13.0	-6.5	4.2	-10.6
-12.5	-4.3	4.6	-8.9
-12.0	-15.5	5.0	-20.5
-11.5	-5.2	5.5	-10.7
-11.0	-6.8	6.0	-12.8
-10.5	-6.6	6.5	-13.1
-10.0	-9.6	7.0	-16.6
-9.5	-4.5	7.6	-12.1
-9.0	-5.3	8.1	-13.4
-8.5	-10.2	8.8	-19.0
-8.0	-2.9	9.4	-12.4
-7.5	-7.3	10.1	-17.4
-7.0	1.0	10.9	-9.8
-6.5	1.0	11.7	-10.7
-6.0	1.3	12.5	-11.2
-5.5	-0.8	13.5	-14.3
-5.0	3.8	14.5	-10.7
-4.5	4.6	15.7	-11.0
-4.0	10.0	16.9	-6.9
-3.5	8.8	18.4	-9.6
-3.0	-1.5		
-2.5	11.3		
-2.0	11.7		
-1.5	18.8		
-1.0	22.6		
-0.5	34.4		
0.0	52.6		

29.15 GHz Antenna Pattern in Co-pol EI LHCP

Angle	Gain	Mask	Over Mask
Degrees	dBi	dBi	dB
0.0	52.6		
0.5	37.1		
1.0	18.1		
1.5	10.2		
2.0	10.3		
2.5	6.9		
3.0	1.1		
3.5	12.4	18.4	-6.0
4.0	14.0	16.9	-2.9
4.5	2.9	15.7	-12.8
5.0	10.3	14.5	-4.3
5.5	2.8	13.5	-10.7
6.0	-3.4	12.5	-16.0
6.5	2.4	11.7	-9.3
7.0	-4.1	10.9	-15.0
7.5	-11.7	10.1	-21.8
8.0	-7.8	9.4	-17.2
8.5	-7.8	8.8	-16.5
9.0	-7.6	8.1	-15.7
9.5	-5.3	7.6	-12.9
10.0	1.0	7.0	-6.0
10.5	-8.9	6.5	-15.3
11.0	-5.1	6.0	-11.0
11.5	-6.7	5.5	-12.1
12.0	-10.0	5.0	-15.0
12.5	-2.5	4.6	-7.1
13.0	-3.9	4.2	-8.1
13.5	-8.1	3.7	-11.8
14.0	-19.9	3.3	-23.2
14.5	-14.1	3.0	-17.0
15.0	-12.9	2.6	-15.5
15.5	-23.7	2.2	-25.9
16.0	-25.9	1.9	-27.8
16.5	-11.2	1.6	-12.8
17.0	-14.8	1.2	-16.1
17.5	-15.9	0.9	-16.8
18.0	-12.5	0.6	-13.2
18.5	-11.1	0.3	-11.4
19.0	-26.4	0.0	-26.5
19.5	-10.5	-0.3	-10.3
20.0	-15.3	-0.5	-14.8
20.5	-15.6	-0.8	-14.8
21.0	-14.4	-1.1	-13.4
21.5	-16.2	-1.3	-14.8
22.0	-16.7	-1.6	-15.2
22.5	-14.3	-1.8	-12.5
23.0	-18.5	-2.0	-16.4
23.5	-15.9	-2.3	-13.6
24.0	-20.1	-2.5	-17.6
24.5	-26.6	-2.7	-23.9
25.0	-22.3	-2.9	-19.3
25.5	-20.3	-3.2	-17.2
26.0	-21.3	-3.4	-17.9
26.5	-18.1	-3.6	-14.5
27.0	-19.6	-3.8	-15.8
27.5	-20.4	-4.0	-16.4
28.0	-22.4	-4.2	-18.3
28.5	-23.5	-4.4	-19.2
29.0	-22.5	-4.6	-17.9
29.5	-21.3	-4.7	-16.5
30.0	-18.5	-4.9	-13.6

Orbit Communication Systems Ltd.
AL-7107-Ka, 2.15 m Antenna, Pattern Data Table
Co-pol Elevation LHCP, -10° to +10° @ 0.1° increment

29.15 GHz Antenna Pattern in Co-pol EI LHCP

Angle	Gain	Mask	Over Mask
Degrees	dBi	dBi	dB
-10.0	-9.6	7.0	-16.6
-9.9	-17.7	7.1	-24.8
-9.8	-11.4	7.2	-18.6
-9.7	-3.5	7.3	-10.8
-9.6	-2.1	7.4	-9.5
-9.5	-4.5	7.6	-12.1
-9.4	-10.7	7.7	-18.4
-9.3	-12.1	7.8	-19.9
-9.2	-9.6	7.9	-17.5
-9.1	-10.0	8.0	-18.0
-9.0	-5.3	8.1	-13.4
-8.9	-3.8	8.3	-12.1
-8.8	-2.5	8.4	-10.9
-8.7	-2.0	8.5	-10.5
-8.6	-3.3	8.6	-11.9
-8.5	-10.2	8.8	-19.0
-8.4	-8.5	8.9	-17.4
-8.3	-7.6	9.0	-16.6
-8.2	-5.2	9.2	-14.4
-8.1	-4.4	9.3	-13.7
-8.0	-2.9	9.4	-12.4
-7.9	-2.1	9.6	-11.6
-7.8	-1.8	9.7	-11.5
-7.7	-2.6	9.8	-12.4
-7.6	-5.3	10.0	-15.3
-7.5	-7.3	10.1	-17.4
-7.4	-7.0	10.3	-17.2
-7.3	-8.7	10.4	-19.1
-7.2	-12.2	10.6	-22.8
-7.1	-4.4	10.7	-15.2
-7.0	1.0	10.9	-9.8
-6.9	2.1	11.0	-8.9
-6.8	-0.1	11.2	-11.3
-6.7	-7.6	11.3	-18.9
-6.6	0.9	11.5	-10.6
-6.5	1.0	11.7	-10.7
-6.4	-1.6	11.8	-13.4
-6.3	-7.1	12.0	-19.1
-6.2	-2.5	12.2	-14.7
-6.1	-0.2	12.4	-12.5
-6.0	1.3	12.5	-11.2
-5.9	-0.1	12.7	-12.9
-5.8	-2.4	12.9	-15.3
-5.7	0.6	13.1	-12.5
-5.6	1.5	13.3	-11.8
-5.5	-0.8	13.5	-14.3
-5.4	-4.5	13.7	-18.2
-5.3	-6.0	13.9	-19.9
-5.2	-6.5	14.1	-20.6
-5.1	0.6	14.3	-13.7
-5.0	3.8	14.5	-10.7
-4.9	3.7	14.7	-11.0
-4.8	4.1	15.0	-10.8
-4.7	4.6	15.2	-10.6
-4.6	5.7	15.4	-9.7
-4.5	4.6	15.7	-11.0
-4.4	-1.7	15.9	-17.6
-4.3	3.0	16.2	-13.2
-4.2	8.4	16.4	-8.0
-4.1	10.1	16.7	-6.6

29.15 GHz Antenna Pattern in Co-pol EI LHCP

Angle	Gain	Mask	Over Mask
Degrees	dBi	dBi	dB
0.0	52.6		
0.1	51.8		
0.2	49.1		
0.3	44.3		
0.4	39.7		
0.5	37.1		
0.6	32.5		
0.7	22.0		
0.8	10.3		
0.9	6.1		
1.0	18.1		
1.1	19.5		
1.2	12.7		
1.3	9.6		
1.4	11.9		
1.5	10.2		
1.6	13.7		
1.7	13.7		
1.8	11.3		
1.9	10.3		
2.0	10.3		
2.1	12.7		
2.2	13.9		
2.3	12.6		
2.4	9.6		
2.5	6.9		
2.6	0.5		
2.7	-7.7		
2.8	-1.3		
2.9	3.1		
3.0	1.1		
3.1	0.5		
3.2	9.8		
3.3	12.5		
3.4	13.5		
3.5	12.4	18.4	-6.0
3.6	10.5	18.1	-7.6
3.7	11.3	17.8	-6.5
3.8	13.0	17.5	-4.5
3.9	13.5	17.2	-3.7
4.0	14.0	16.9	-2.9
4.1	13.7	16.7	-3.0
4.2	12.4	16.4	-4.0
4.3	8.2	16.2	-8.0
4.4	2.3	15.9	-13.6
4.5	2.9	15.7	-12.8
4.6	4.6	15.4	-10.8
4.7	6.3	15.2	-8.9
4.8	7.5	15.0	-7.5
4.9	9.7	14.7	-5.0
5.0	10.3	14.5	-4.3
5.1	8.1	14.3	-6.2
5.2	1.7	14.1	-12.4
5.3	-2.9	13.9	-16.8
5.4	2.9	13.7	-10.8
5.5	2.8	13.5	-10.7
5.6	-1.2	13.3	-14.5
5.7	-5.2	13.1	-18.3
5.8	-3.3	12.9	-16.2
5.9	-1.1	12.7	-13.9

Orbit Communication Systems Ltd.
AL-7107-Ka, 2.15 m Antenna, Pattern Data Table
Co-pol Elevation LHCP, -10° to +10° @ 0.1° increment

-4.0	10.0	16.9	-6.9
-3.9	6.3	17.2	-10.9
-3.8	-10.6	17.5	-28.1
-3.7	6.6	17.8	-11.2
-3.6	9.2	18.1	-8.9
-3.5	8.8	18.4	-9.6
-3.4	7.1		
-3.3	1.2		
-3.2	-4.8		
-3.1	3.4		
-3.0	-1.5		
-2.9	9.3		
-2.8	14.5		
-2.7	15.4		
-2.6	13.3		
-2.5	11.3		
-2.4	12.8		
-2.3	13.8		
-2.2	13.9		
-2.1	13.2		
-2.0	11.7		
-1.9	9.8		
-1.8	7.7		
-1.7	11.8		
-1.6	15.8		
-1.5	18.8		
-1.4	18.3		
-1.3	13.1		
-1.2	20.5		
-1.1	23.5		
-1.0	22.6		
-0.9	21.9		
-0.8	25.1		
-0.7	27.9		
-0.6	31.9		
-0.5	34.4		
-0.4	39.2		
-0.3	45.7		
-0.2	50.0		
-0.1	52.2		
0.0	52.6		

6.0	-3.4	12.5	-16.0
6.1	-9.0	12.4	-21.4
6.2	-8.7	12.2	-20.9
6.3	-4.5	12.0	-16.5
6.4	0.8	11.8	-11.0
6.5	2.4	11.7	-9.3
6.6	1.9	11.5	-9.6
6.7	-0.2	11.3	-11.5
6.8	-2.0	11.2	-13.2
6.9	-6.0	11.0	-17.1
7.0	-4.1	10.9	-15.0
7.1	-0.8	10.7	-11.5
7.2	-1.0	10.6	-11.6
7.3	-2.8	10.4	-13.2
7.4	-3.9	10.3	-14.2
7.5	-11.7	10.1	-21.8
7.6	-5.7	10.0	-15.7
7.7	-1.5	9.8	-11.4
7.8	-1.8	9.7	-11.5
7.9	-3.7	9.6	-13.3
8.0	-7.8	9.4	-17.2
8.1	-10.5	9.3	-19.8
8.2	-27.1	9.2	-36.3
8.3	-10.9	9.0	-19.9
8.4	-5.2	8.9	-14.1
8.5	-7.8	8.8	-16.5
8.6	-12.7	8.6	-21.4
8.7	-9.5	8.5	-18.0
8.8	-8.7	8.4	-17.1
8.9	-7.6	8.3	-15.9
9.0	-7.6	8.1	-15.7
9.1	-12.3	8.0	-20.3
9.2	-16.6	7.9	-24.5
9.3	-20.1	7.8	-27.9
9.4	-10.2	7.7	-17.8
9.5	-5.3	7.6	-12.9
9.6	-2.7	7.4	-10.1
9.7	-0.2	7.3	-7.5
9.8	1.6	7.2	-5.7
9.9	2.1	7.1	-5.0
10.0	1.0	7.0	-6.0

Orbit Communication Systems Ltd.
AL-7107-Ka, 2.15 m Antenna, Pattern Data Table
X-pol Azimuth LHCP, -10° to +10° @ 0.1° increment

29.15 GHz Antenna Pattern in X-pol Az LHCP

Angle	Gain	Mask	Over Mask
Degrees	dBi	dBi	dB
-10.0	-10.4	-2.0	-8.4
-9.9	-9.1	-2.0	-7.1
-9.8	-11.5	-2.0	-9.5
-9.7	-11.2	-2.0	-9.2
-9.6	-10.6	-2.0	-8.6
-9.5	-8.6	-2.0	-6.6
-9.4	-9.9	-2.0	-7.9
-9.3	-8.2	-2.0	-6.2
-9.2	-7.5	-2.0	-5.5
-9.1	-5.4	-2.0	-3.4
-9.0	-6.6	-2.0	-4.6
-8.9	-6.9	-2.0	-4.9
-8.8	-8.2	-2.0	-6.2
-8.7	-11.3	-2.0	-9.3
-8.6	-14.3	-2.0	-12.3
-8.5	-10.0	-2.0	-8.0
-8.4	-8.8	-2.0	-6.8
-8.3	-12.3	-2.0	-10.3
-8.2	-15.4	-2.0	-13.4
-8.1	-18.6	-2.0	-16.6
-8.0	-16.6	-2.0	-14.6
-7.9	-16.9	-2.0	-14.9
-7.8	-20.4	-2.0	-18.4
-7.7	-17.4	-2.0	-15.4
-7.6	-11.9	-2.0	-9.9
-7.5	-9.7	-2.0	-7.7
-7.4	-10.0	-2.0	-8.0
-7.3	-12.4	-2.0	-10.4
-7.2	-6.7	-2.0	-4.7
-7.1	-2.1	-2.0	-0.1
-7.0	-0.2	-2.1	1.9
-6.9	-0.8	-2.0	1.2
-6.8	-3.2	-1.8	-1.4
-6.7	-8.4	-1.7	-6.8
-6.6	-11.1	-1.5	-9.6
-6.5	-10.6	-1.3	-9.3
-6.4	-9.6	-1.2	-8.5
-6.3	-18.9	-1.0	-17.9
-6.2	-15.4	-0.8	-14.6
-6.1	-11.1	-0.6	-10.5
-6.0	-11.2	-0.5	-10.8
-5.9	-17.2	-0.3	-17.0
-5.8	-22.1	-0.1	-22.0
-5.7	-16.6	0.1	-16.7
-5.6	-9.7	0.3	-10.0
-5.5	-5.5	0.5	-6.0
-5.4	-2.7	0.7	-3.4
-5.3	-1.1	0.9	-2.0
-5.2	-3.2	1.1	-4.3
-5.1	-16.4	1.3	-17.7
-5.0	-5.2	1.5	-6.7
-4.9	-1.5	1.7	-3.3
-4.8	-3.9	2.0	-5.9
-4.7	-9.9	2.2	-12.1
-4.6	-5.1	2.4	-7.6
-4.5	-3.6	2.7	-6.2
-4.4	-6.0	2.9	-8.9
-4.3	-8.2	3.2	-11.3
-4.2	-6.3	3.4	-9.7
-4.1	-2.4	3.7	-6.1

29.15 GHz Antenna Pattern in X-pol Az LHCP

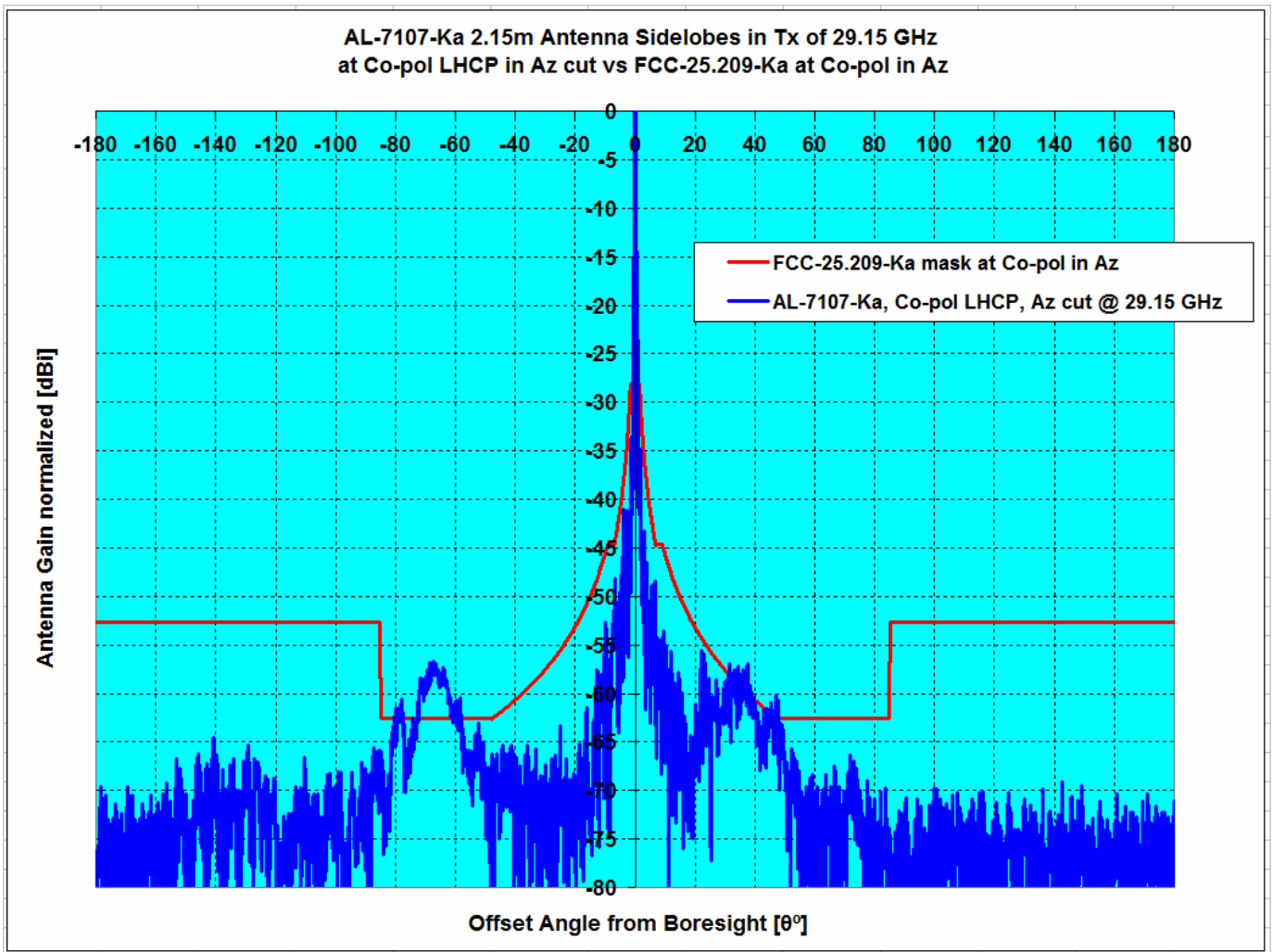
Angle	Gain	Mask	Over Mask
Degrees	dBi	dBi	dB
0.0	23.4		
0.1	20.7		
0.2	24.2		
0.3	28.3		
0.4	29.1		
0.5	28.1		
0.6	24.4		
0.7	17.2		
0.8	1.4		
0.9	10.6		
1.0	14.3		
1.1	14.1		
1.2	12.7		
1.3	13.1		
1.4	12.9		
1.5	11.1		
1.6	7.5		
1.7	5.6		
1.8	3.2	12.6	-9.4
1.9	0.6	12.0	-11.5
2.0	-0.1	11.5	-11.5
2.1	1.3	10.9	-9.7
2.2	2.3	10.4	-8.2
2.3	0.8	10.0	-9.1
2.4	-2.4	9.5	-11.9
2.5	-7.9	9.1	-16.9
2.6	-6.7	8.6	-15.3
2.7	-3.6	8.2	-11.8
2.8	-5.5	7.8	-13.3
2.9	-8.3	7.4	-15.7
3.0	-4.3	7.1	-11.4
3.1	-6.3	6.7	-13.0
3.2	-8.8	6.4	-15.2
3.3	-7.8	6.0	-13.9
3.4	-6.4	5.7	-12.1
3.5	-5.9	5.4	-11.3
3.6	-2.8	5.1	-7.9
3.7	-4.1	4.8	-8.9
3.8	-8.8	4.5	-13.3
3.9	-6.5	4.2	-10.7
4.0	-4.4	3.9	-8.3
4.1	-7.6	3.7	-11.3
4.2	-12.4	3.4	-15.8
4.3	-10.9	3.2	-14.0
4.4	-11.2	2.9	-14.1
4.5	-9.0	2.7	-11.7
4.6	-5.9	2.4	-8.3
4.7	-6.2	2.2	-8.4
4.8	-7.9	2.0	-9.9
4.9	-9.3	1.7	-11.0
5.0	-7.5	1.5	-9.0
5.1	-8.9	1.3	-10.2
5.2	-9.5	1.1	-10.6
5.3	-14.1	0.9	-15.0
5.4	-21.2	0.7	-21.9
5.5	-10.5	0.5	-11.0
5.6	-8.1	0.3	-8.4
5.7	-12.3	0.1	-12.5
5.8	-12.7	-0.1	-12.6
5.9	-11.6	-0.3	-11.3

Orbit Communication Systems Ltd.
AL-7107-Ka, 2.15 m Antenna, Pattern Data Table
X-pol Azimuth LHCP, -10° to +10° @ 0.1° increment

-4.0	-3.3	3.9	-7.3
-3.9	-7.5	4.2	-11.7
-3.8	-13.7	4.5	-18.2
-3.7	-22.0	4.8	-26.8
-3.6	-8.9	5.1	-14.0
-3.5	-4.1	5.4	-9.5
-3.4	-1.8	5.7	-7.5
-3.3	-0.9	6.0	-6.9
-3.2	-4.4	6.4	-10.8
-3.1	-12.1	6.7	-18.8
-3.0	-5.9	7.1	-13.0
-2.9	-5.1	7.4	-12.6
-2.8	-6.9	7.8	-14.8
-2.7	-14.4	8.2	-22.6
-2.6	-9.1	8.6	-17.7
-2.5	-4.8	9.1	-13.9
-2.4	-5.5	9.5	-15.0
-2.3	-22.3	10.0	-32.3
-2.2	-11.2	10.4	-21.6
-2.1	-10.6	10.9	-21.5
-2.0	-5.6	11.5	-17.0
-1.9	-1.6	12.0	-13.7
-1.8	-2.8	12.6	-15.5
-1.7	2.7		
-1.6	7.4		
-1.5	9.8		
-1.4	11.1		
-1.3	11.8		
-1.2	12.2		
-1.1	12.9		
-1.0	13.5		
-0.9	13.5		
-0.8	10.7		
-0.7	14.4		
-0.6	23.9		
-0.5	28.6		
-0.4	30.3		
-0.3	30.1		
-0.2	27.9		
-0.1	24.5		
0.0	23.4		

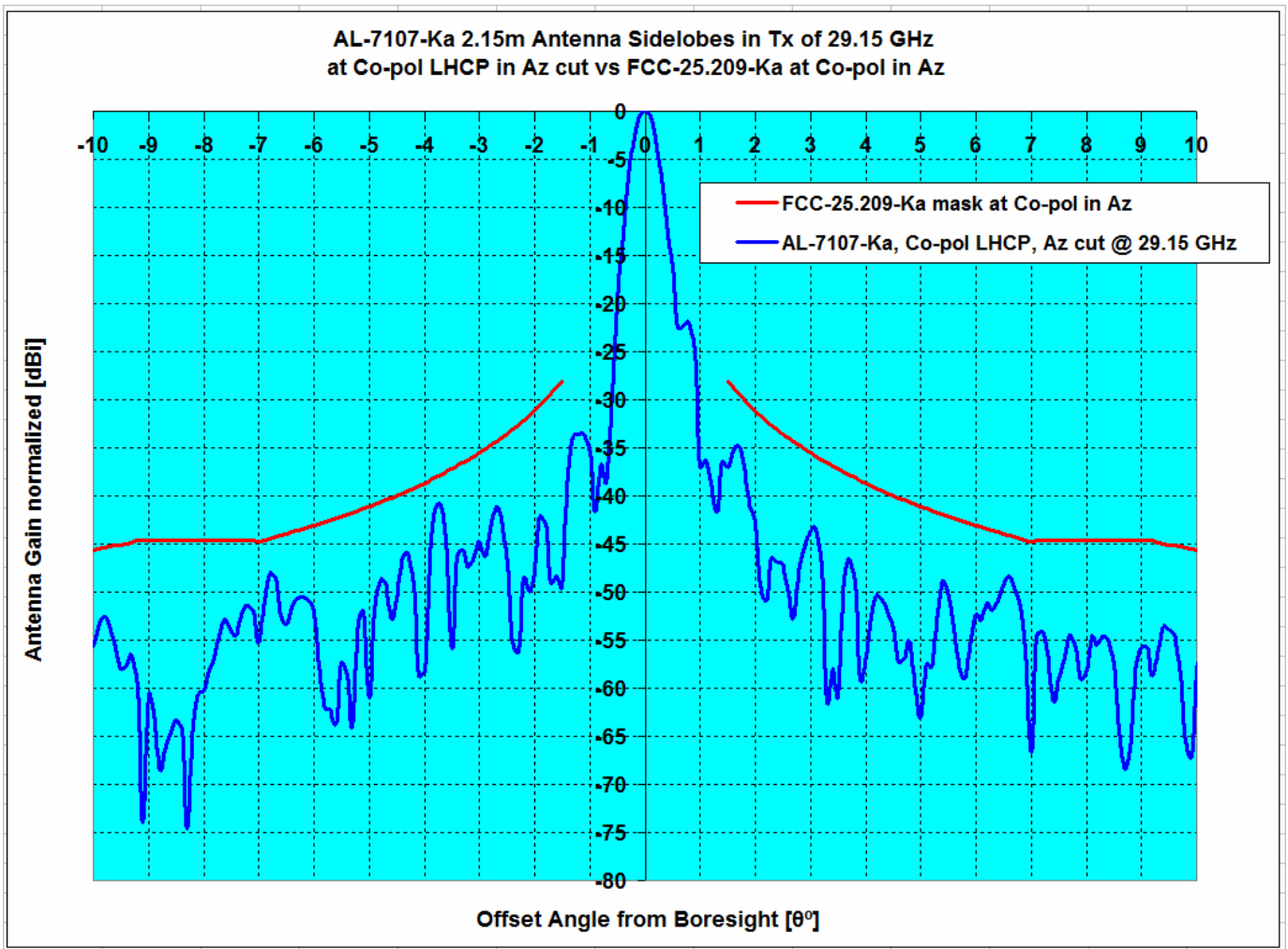
6.0	-12.1	-0.5	-11.6
6.1	-13.2	-0.6	-12.5
6.2	-16.7	-0.8	-15.9
6.3	-22.3	-1.0	-21.3
6.4	-14.3	-1.2	-13.1
6.5	-13.3	-1.3	-11.9
6.6	-14.7	-1.5	-13.2
6.7	-8.5	-1.7	-6.8
6.8	-5.3	-1.8	-3.5
6.9	-5.2	-2.0	-3.3
7.0	-7.0	-2.1	-4.9
7.1	-11.6	-2.0	-9.6
7.2	-12.8	-2.0	-10.8
7.3	-13.2	-2.0	-11.2
7.4	-13.2	-2.0	-11.2
7.5	-15.0	-2.0	-13.0
7.6	-16.4	-2.0	-14.4
7.7	-11.0	-2.0	-9.0
7.8	-13.0	-2.0	-11.0
7.9	-14.6	-2.0	-12.6
8.0	-19.7	-2.0	-17.7
8.1	-19.4	-2.0	-17.4
8.2	-15.2	-2.0	-13.2
8.3	-15.8	-2.0	-13.8
8.4	-14.0	-2.0	-12.0
8.5	-12.8	-2.0	-10.8
8.6	-11.0	-2.0	-9.0
8.7	-12.2	-2.0	-10.2
8.8	-16.4	-2.0	-14.4
8.9	-17.8	-2.0	-15.8
9.0	-21.4	-2.0	-19.4
9.1	-16.9	-2.0	-14.9
9.2	-17.7	-2.0	-15.7
9.3	-16.1	-2.0	-14.1
9.4	-20.0	-2.0	-18.0
9.5	-24.9	-2.0	-22.9
9.6	-24.1	-2.0	-22.1
9.7	-13.0	-2.0	-11.0
9.8	-10.5	-2.0	-8.5
9.9	-8.9	-2.0	-6.9
10.0	-9.6	-2.0	-7.6

Orbit Communication Systems Ltd.
AL-7107-Ka, 2.15 m Antenna, Pattern, Co-pol, Azimuth LHCP



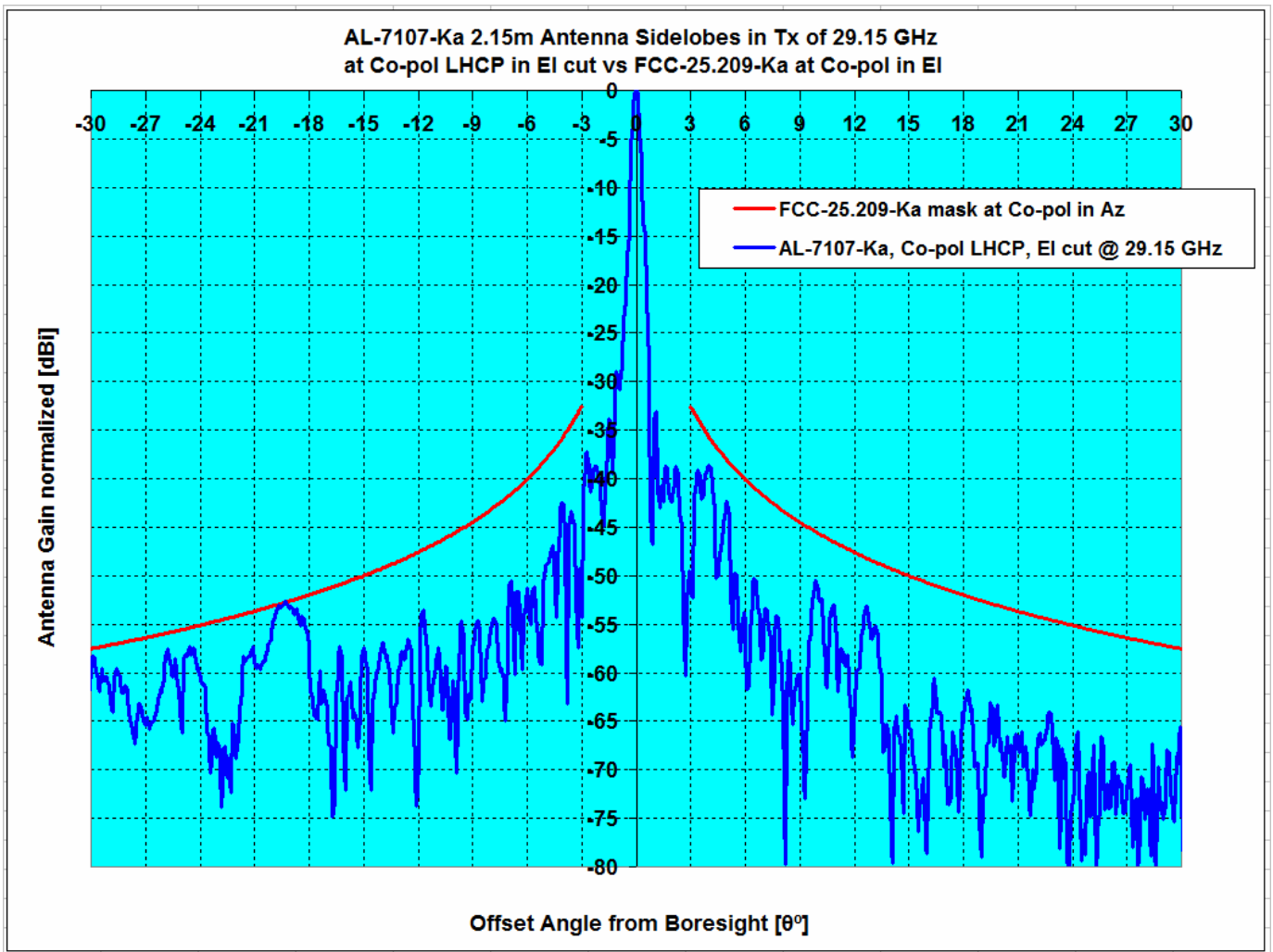
Description	Plane, CirP	Frequency	Ant. Gain	Peak Excursions dB		Over Mask %	
Pattern Rule vs Antenna System	Type	GHz	dBi	1.5°≤θ≤7°	7°≤θ≤180°	1.5°≤θ≤7°	7°≤θ≤180°
FCC-25.209-Ka, Co-pol Az, vs AL-7107-Ka	Az , LHCP	29.15	52.63	-3.12	5.91	0.00%	5.71%

Orbit Communication Systems Ltd.
AL-7107-Ka, 2.15 m Antenna, Pattern, Co-pol, Azimuth LHCP



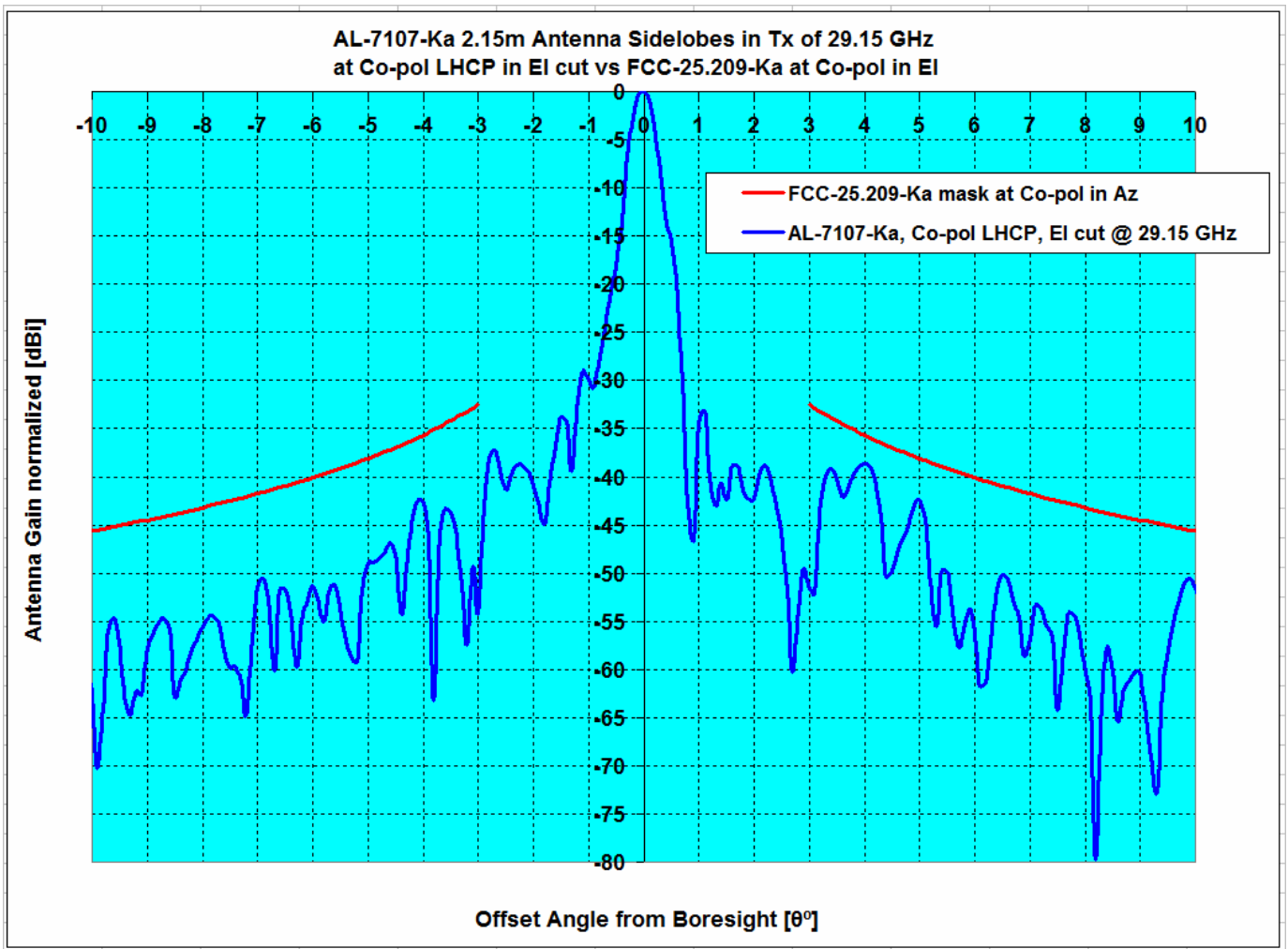
Description	Plane, CirP	Frequency	Ant. Gain	Peak Excursions dB		Over Mask %	
				1.5°≤θ≤7°	7°≤θ≤180°	1.5°≤θ≤7°	7°≤θ≤180°
Pattern Rule vs Antenna System	Type	GHz	dBi				
FCC-25.209-Ka, Co-pol Az, vs AL-7107-Ka	Az , LHCP	29.15	52.63	-3.12	5.91	0.00%	5.71%

Orbit Communication Systems Ltd.
AL-7107-Ka, 2.15 m Antenna, Pattern, Co-pol, Elevation LHCP

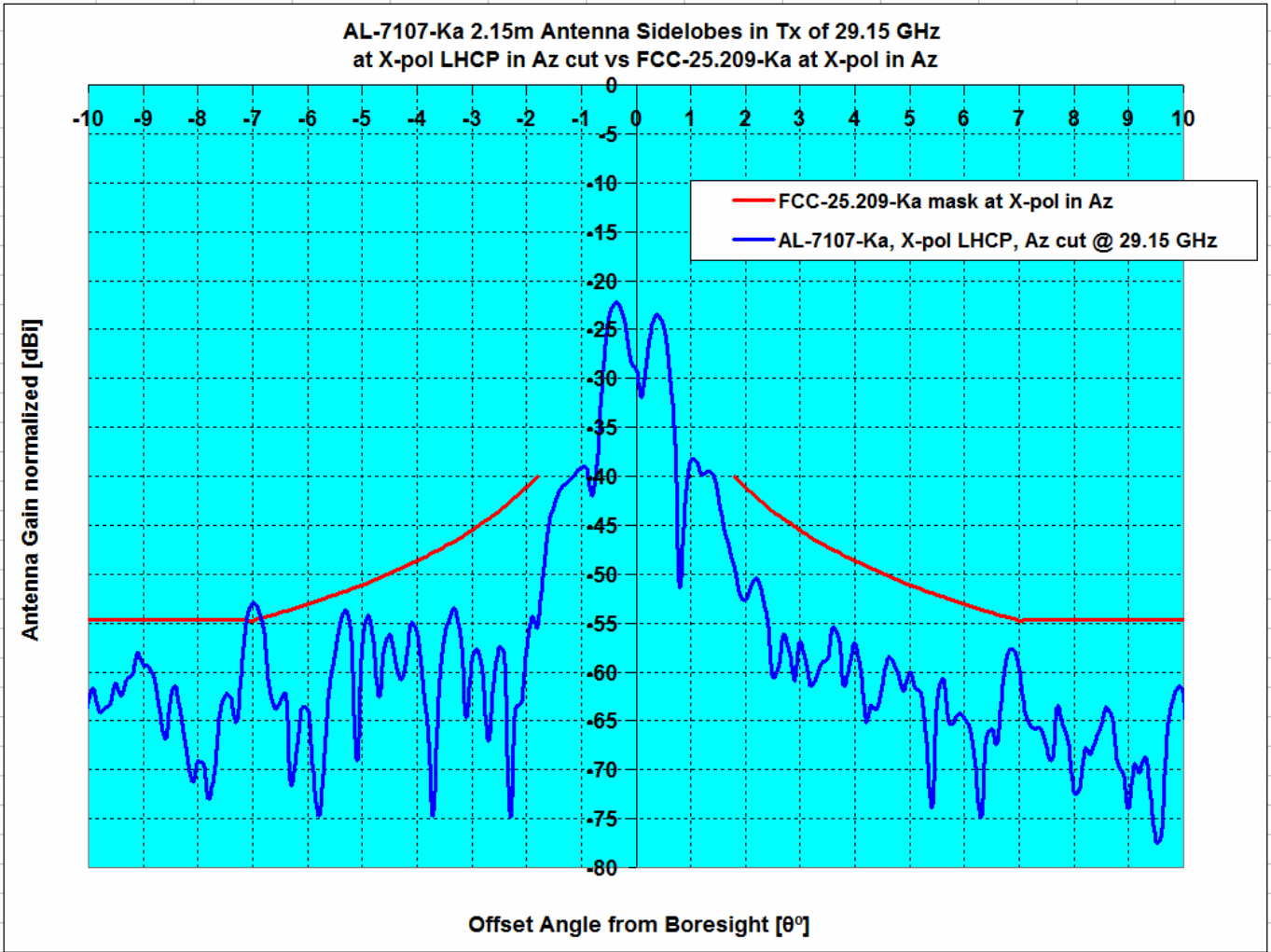


Description	Plane, CirP	Frequency	Ant. Gain	Peak Excursions dB		Over Mask %	
				3°≤θ≤7°	7°≤θ≤30°	3°≤θ≤7°	7°≤θ≤30°
Pattern Rule vs Antenna System	Type	GHz	dBi				
FCC-25.209-Ka, Co-pol EI, vs AL-7107-Ka	EI , LHCP	29.15	52.63	-2.92	0.16	0.00%	0.37%

Orbit Communication Systems Ltd.
AL-7107-Ka, 2.15 m Antenna, Pattern, Co-pol, Elevation LHCP



Description	Plane, CirP	Frequency	Ant. Gain	Peak Excursions dB		Over Mask %	
				3°≤θ≤7°	7°≤θ≤30°	3°≤θ≤7°	7°≤θ≤30°
Pattern Rule vs Antenna System	Type	GHz	dBi				
FCC-25.209-Ka, Co-pol EI, vs AL-7107-Ka	EI , LHCP	29.15	52.63	-2.92	0.16	0.00%	0.37%



Description	Plane, CirP	Frequency	Ant. Gain	Peak Excursions dB		Over Mask %	
Pattern Rule vs Antenna System	Type	GHz	dBi	1.8°≤θ≤7°	1.8°≤θ≤9.2°	1.8°≤θ≤7°	1.8°≤θ≤9.2°
FCC-25.209-Ka, X-pol Az, vs AL-7107-Ka	Az , LHCP	29.15	52.63	1.89	1.89	1.89%	1.20%

Orbit Communication Systems Ltd.
AL-7107-Ka, 2.15 m Antenna, Pattern Data Table
Co-pol Azimuth RHCP, -180° to +180° @ 1.0° increment

29.15 GHz Antenna Pattern in Co-pol Az RHCP

Angle	Gain	Mask	Over Mask
Degrees	dBi	dBi	dB
-179.0	-25.9	0.0	-25.9
-178.0	-18.2	0.0	-18.2
-177.0	-20.5	0.0	-20.5
-176.0	-25.0	0.0	-25.0
-175.0	-27.4	0.0	-27.4
-174.0	-27.4	0.0	-27.4
-173.0	-26.9	0.0	-26.9
-172.0	-27.4	0.0	-27.4
-171.0	-23.9	0.0	-23.9
-170.0	-25.9	0.0	-25.9
-169.0	-18.2	0.0	-18.2
-168.0	-20.5	0.0	-20.5
-167.0	-25.0	0.0	-25.0
-166.0	-27.4	0.0	-27.4
-165.0	-27.4	0.0	-27.4
-164.0	-26.9	0.0	-26.9
-163.0	-27.4	0.0	-27.4
-162.0	-19.4	0.0	-19.4
-161.0	-20.8	0.0	-20.8
-160.0	-27.0	0.0	-27.0
-159.0	-26.0	0.0	-26.0
-158.0	-27.4	0.0	-27.4
-157.0	-19.8	0.0	-19.8
-156.0	-27.4	0.0	-27.4
-155.0	-27.4	0.0	-27.4
-154.0	-20.7	0.0	-20.7
-153.0	-22.6	0.0	-22.6
-152.0	-15.2	0.0	-15.2
-151.0	-19.3	0.0	-19.3
-150.0	-17.7	0.0	-17.7
-149.0	-27.4	0.0	-27.4
-148.0	-25.8	0.0	-25.8
-147.0	-24.5	0.0	-24.5
-146.0	-15.8	0.0	-15.8
-145.0	-15.5	0.0	-15.5
-144.0	-20.2	0.0	-20.2
-143.0	-20.2	0.0	-20.2
-142.0	-21.6	0.0	-21.6
-141.0	-20.2	0.0	-20.2
-140.0	-16.0	0.0	-16.0
-139.0	-20.2	0.0	-20.2
-138.0	-20.6	0.0	-20.6
-137.0	-20.5	0.0	-20.5
-136.0	-23.7	0.0	-23.7
-135.0	-15.0	0.0	-15.0
-134.0	-15.9	0.0	-15.9
-133.0	-27.4	0.0	-27.4
-132.0	-25.2	0.0	-25.2
-131.0	-22.1	0.0	-22.1
-130.0	-16.0	0.0	-16.0
-129.0	-16.1	0.0	-16.1
-128.0	-18.9	0.0	-18.9
-127.0	-15.9	0.0	-15.9
-126.0	-15.0	0.0	-15.0
-125.0	-22.5	0.0	-22.5
-124.0	-19.5	0.0	-19.5
-123.0	-20.8	0.0	-20.8
-122.0	-25.3	0.0	-25.3
-121.0	-20.6	0.0	-20.6
-120.0	-26.0	0.0	-26.0

29.15 GHz Antenna Pattern in Co-pol Az RHCP

Angle	Gain	Mask	Over Mask
Degrees	dBi	dBi	dB
0.0	52.6		
1.0	15.7		
2.0	10.0	21.5	-11.5
3.0	9.1	17.1	-8.0
4.0	-4.1	13.9	-18.1
5.0	-10.4	11.5	-21.9
6.0	0.3	9.5	-9.2
7.0	-14.1	7.9	-21.9
8.0	-5.4	8.0	-13.4
9.0	-3.3	8.0	-11.3
10.0	-5.3	7.0	-12.3
11.0	-15.6	6.0	-21.5
12.0	-3.1	5.0	-8.1
13.0	-6.7	4.2	-10.9
14.0	-12.7	3.3	-16.0
15.0	-17.4	2.6	-20.0
16.0	-23.4	1.9	-25.3
17.0	-16.6	1.2	-17.9
18.0	-14.4	0.6	-15.0
19.0	-19.6	0.0	-19.6
20.0	-10.9	-0.5	-10.3
21.0	-15.4	-1.1	-14.3
22.0	-4.5	-1.6	-3.0
23.0	-3.7	-2.0	-1.7
24.0	-5.9	-2.5	-3.4
25.0	-11.3	-2.9	-8.3
26.0	-7.7	-3.4	-4.3
27.0	-7.5	-3.8	-3.7
28.0	-13.5	-4.2	-9.3
29.0	-8.8	-4.6	-4.3
30.0	-7.2	-4.9	-2.3
31.0	-5.8	-5.3	-0.5
32.0	-9.8	-5.6	-4.2
33.0	-5.0	-6.0	0.9
34.0	-10.9	-6.3	-4.6
35.0	-9.4	-6.6	-2.8
36.0	-5.1	-6.9	1.9
37.0	-6.4	-7.2	0.8
38.0	-9.6	-7.5	-2.1
39.0	-9.4	-7.8	-1.6
40.0	-9.6	-8.1	-1.5
41.0	-12.3	-8.3	-4.0
42.0	-11.1	-8.6	-2.5
43.0	-11.7	-8.8	-2.9
44.0	-9.0	-9.1	0.1
45.0	-9.2	-9.3	0.1
46.0	-9.5	-9.6	0.1
47.0	-7.6	-9.8	2.2
48.0	-14.1	-10.0	-4.1
49.0	-10.6	-10.0	-0.6
50.0	-13.3	-10.0	-3.3
51.0	-21.6	-10.0	-11.6
52.0	-16.7	-10.0	-6.7
53.0	-14.1	-10.0	-4.1
54.0	-16.3	-10.0	-6.3
55.0	-19.5	-10.0	-9.5
56.0	-26.5	-10.0	-16.5
57.0	-23.2	-10.0	-13.2
58.0	-19.6	-10.0	-9.6
59.0	-25.0	-10.0	-15.0

Orbit Communication Systems Ltd.
AL-7107-Ka, 2.15 m Antenna, Pattern Data Table
Co-pol Azimuth RHCP, -180° to +180° @ 1.0° increment

-119.0	-26.2	0.0	-26.2
-118.0	-24.0	0.0	-24.0
-117.0	-26.3	0.0	-26.3
-116.0	-22.1	0.0	-22.1
-115.0	-27.4	0.0	-27.4
-114.0	-22.4	0.0	-22.4
-113.0	-17.6	0.0	-17.6
-112.0	-19.9	0.0	-19.9
-111.0	-17.4	0.0	-17.4
-110.0	-17.3	0.0	-17.3
-109.0	-27.4	0.0	-27.4
-108.0	-24.7	0.0	-24.7
-107.0	-25.2	0.0	-25.2
-106.0	-20.2	0.0	-20.2
-105.0	-20.5	0.0	-20.5
-104.0	-19.9	0.0	-19.9
-103.0	-20.1	0.0	-20.1
-102.0	-16.2	0.0	-16.2
-101.0	-23.3	0.0	-23.3
-100.0	-17.0	0.0	-17.0
-99.0	-20.0	0.0	-20.0
-98.0	-27.4	0.0	-27.4
-97.0	-23.7	0.0	-23.7
-96.0	-27.4	0.0	-27.4
-95.0	-19.7	0.0	-19.7
-94.0	-19.6	0.0	-19.6
-93.0	-22.6	0.0	-22.6
-92.0	-20.0	0.0	-20.0
-91.0	-18.8	0.0	-18.8
-90.0	-21.7	0.0	-21.7
-89.0	-27.2	0.0	-27.2
-88.0	-18.7	0.0	-18.7
-87.0	-15.9	0.0	-15.9
-86.0	-13.3	0.0	-13.3
-85.0	-13.3	-10.0	-3.3
-84.0	-15.3	-10.0	-5.3
-83.0	-20.2	-10.0	-10.2
-82.0	-20.2	-10.0	-10.2
-81.0	-12.7	-10.0	-2.7
-80.0	-12.8	-10.0	-2.8
-79.0	-10.3	-10.0	-0.3
-78.0	-9.3	-10.0	0.7
-77.0	-16.7	-10.0	-6.7
-76.0	-14.2	-10.0	-4.2
-75.0	-14.6	-10.0	-4.6
-74.0	-10.9	-10.0	-0.9
-73.0	-10.2	-10.0	-0.2
-72.0	-6.9	-10.0	3.1
-71.0	-6.7	-10.0	3.3
-70.0	-5.8	-10.0	4.2
-69.0	-6.8	-10.0	3.2
-68.0	-4.7	-10.0	5.3
-67.0	-4.6	-10.0	5.4
-66.0	-5.1	-10.0	4.9
-65.0	-6.4	-10.0	3.6
-64.0	-4.8	-10.0	5.2
-63.0	-6.9	-10.0	3.1
-62.0	-7.4	-10.0	2.6
-61.0	-9.4	-10.0	0.6
-60.0	-10.4	-10.0	-0.4
-59.0	-11.1	-10.0	-1.1
-58.0	-11.5	-10.0	-1.5
-57.0	-15.0	-10.0	-5.0

60.0	-22.4	-10.0	-12.4
61.0	-25.4	-10.0	-15.4
62.0	-24.5	-10.0	-14.5
63.0	-27.4	-10.0	-17.4
64.0	-18.1	-10.0	-8.1
65.0	-19.8	-10.0	-9.8
66.0	-27.4	-10.0	-17.4
67.0	-19.9	-10.0	-9.9
68.0	-25.1	-10.0	-15.1
69.0	-21.3	-10.0	-11.3
70.0	-20.3	-10.0	-10.3
71.0	-19.9	-10.0	-9.9
72.0	-16.1	-10.0	-6.1
73.0	-15.1	-10.0	-5.1
74.0	-17.3	-10.0	-7.3
75.0	-17.4	-10.0	-7.4
76.0	-19.9	-10.0	-9.9
77.0	-27.4	-10.0	-17.4
78.0	-20.4	-10.0	-10.4
79.0	-27.4	-10.0	-17.4
80.0	-21.5	-10.0	-11.5
81.0	-22.2	-10.0	-12.2
82.0	-23.5	-10.0	-13.5
83.0	-23.1	-10.0	-13.1
84.0	-26.5	-10.0	-16.5
85.0	-27.4	-10.0	-17.4
86.0	-25.4	0.0	-25.4
87.0	-21.5	0.0	-21.5
88.0	-19.6	0.0	-19.6
89.0	-25.7	0.0	-25.7
90.0	-18.6	0.0	-18.6
91.0	-25.0	0.0	-25.0
92.0	-26.8	0.0	-26.8
93.0	-27.4	0.0	-27.4
94.0	-18.2	0.0	-18.2
95.0	-25.1	0.0	-25.1
96.0	-22.6	0.0	-22.6
97.0	-24.3	0.0	-24.3
98.0	-25.3	0.0	-25.3
99.0	-27.3	0.0	-27.3
100.0	-19.9	0.0	-19.9
101.0	-21.8	0.0	-21.8
102.0	-24.4	0.0	-24.4
103.0	-22.8	0.0	-22.8
104.0	-22.2	0.0	-22.2
105.0	-19.6	0.0	-19.6
106.0	-24.5	0.0	-24.5
107.0	-23.1	0.0	-23.1
108.0	-23.4	0.0	-23.4
109.0	-24.9	0.0	-24.9
110.0	-23.0	0.0	-23.0
111.0	-24.6	0.0	-24.6
112.0	-19.7	0.0	-19.7
113.0	-24.1	0.0	-24.1
114.0	-25.2	0.0	-25.2
115.0	-22.9	0.0	-22.9
116.0	-23.2	0.0	-23.2
117.0	-27.1	0.0	-27.1
118.0	-25.0	0.0	-25.0
119.0	-27.0	0.0	-27.0
120.0	-27.4	0.0	-27.4
121.0	-26.7	0.0	-26.7
122.0	-21.1	0.0	-21.1

Orbit Communication Systems Ltd.
AL-7107-Ka, 2.15 m Antenna, Pattern Data Table
Co-pol Azimuth RHCP, -180° to +180° @ 1.0° increment

-56.0	-15.1	-10.0	-5.1
-55.0	-14.6	-10.0	-4.6
-54.0	-15.9	-10.0	-5.9
-53.0	-11.4	-10.0	-1.4
-52.0	-11.8	-10.0	-1.8
-51.0	-15.5	-10.0	-5.5
-50.0	-15.8	-10.0	-5.8
-49.0	-16.5	-10.0	-6.5
-48.0	-20.7	-10.0	-10.7
-47.0	-27.4	-9.8	-17.6
-46.0	-14.0	-9.6	-4.4
-45.0	-15.7	-9.3	-6.4
-44.0	-12.7	-9.1	-3.6
-43.0	-18.4	-8.8	-9.6
-42.0	-16.2	-8.6	-7.6
-41.0	-17.4	-8.3	-9.0
-40.0	-16.9	-8.1	-8.9
-39.0	-22.9	-7.8	-15.1
-38.0	-22.0	-7.5	-14.5
-37.0	-18.9	-7.2	-11.7
-36.0	-14.3	-6.9	-7.4
-35.0	-18.4	-6.6	-11.8
-34.0	-15.6	-6.3	-9.3
-33.0	-16.2	-6.0	-10.2
-32.0	-17.3	-5.6	-11.6
-31.0	-19.6	-5.3	-14.3
-30.0	-14.8	-4.9	-9.9
-29.0	-18.2	-4.6	-13.7
-28.0	-19.4	-4.2	-15.2
-27.0	-21.4	-3.8	-17.6
-26.0	-21.2	-3.4	-17.8
-25.0	-10.8	-2.9	-7.8
-24.0	-19.7	-2.5	-17.2
-23.0	-18.1	-2.0	-16.1
-22.0	-19.3	-1.6	-17.8
-21.0	-19.3	-1.1	-18.2
-20.0	-18.0	-0.5	-17.5
-19.0	-20.8	0.0	-20.8
-18.0	-19.2	0.6	-19.8
-17.0	-18.9	1.2	-20.2
-16.0	-8.8	1.9	-10.7
-15.0	-22.5	2.6	-25.1
-14.0	-12.8	3.3	-16.2
-13.0	-10.9	4.2	-15.1
-12.0	-12.0	5.0	-17.1
-11.0	-6.4	6.0	-12.4
-10.0	-3.1	7.0	-10.1
-9.0	-8.1	8.0	-16.1
-8.0	-7.7	8.0	-15.7
-7.0	-2.7	7.9	-10.5
-6.0	0.8	9.5	-8.8
-5.0	-8.5	11.5	-20.0
-4.0	-5.6	13.9	-19.6
-3.0	7.9	17.1	-9.2
-2.0	4.7	21.5	-16.7
-1.0	17.2		
0.0	52.6		

123.0	-25.5	0.0	-25.5
124.0	-22.2	0.0	-22.2
125.0	-19.5	0.0	-19.5
126.0	-27.4	0.0	-27.4
127.0	-24.9	0.0	-24.9
128.0	-21.7	0.0	-21.7
129.0	-25.5	0.0	-25.5
130.0	-21.6	0.0	-21.6
131.0	-26.1	0.0	-26.1
132.0	-27.4	0.0	-27.4
133.0	-27.4	0.0	-27.4
134.0	-25.8	0.0	-25.8
135.0	-27.1	0.0	-27.1
136.0	-26.9	0.0	-26.9
137.0	-27.4	0.0	-27.4
138.0	-21.9	0.0	-21.9
139.0	-24.9	0.0	-24.9
140.0	-22.5	0.0	-22.5
141.0	-20.8	0.0	-20.8
142.0	-27.4	0.0	-27.4
143.0	-25.8	0.0	-25.8
144.0	-27.4	0.0	-27.4
145.0	-27.4	0.0	-27.4
146.0	-24.8	0.0	-24.8
147.0	-23.5	0.0	-23.5
148.0	-27.4	0.0	-27.4
149.0	-23.6	0.0	-23.6
150.0	-23.9	0.0	-23.9
151.0	-27.1	0.0	-27.1
152.0	-26.7	0.0	-26.7
153.0	-22.1	0.0	-22.1
154.0	-27.4	0.0	-27.4
155.0	-18.6	0.0	-18.6
156.0	-27.4	0.0	-27.4
157.0	-27.4	0.0	-27.4
158.0	-27.4	0.0	-27.4
159.0	-25.5	0.0	-25.5
160.0	-25.5	0.0	-25.5
161.0	-20.0	0.0	-20.0
162.0	-26.2	0.0	-26.2
163.0	-20.2	0.0	-20.2
164.0	-24.1	0.0	-24.1
165.0	-27.4	0.0	-27.4
166.0	-24.5	0.0	-24.5
167.0	-27.4	0.0	-27.4
168.0	-27.4	0.0	-27.4
169.0	-27.4	0.0	-27.4
170.0	-27.0	0.0	-27.0
171.0	-26.5	0.0	-26.5
172.0	-27.4	0.0	-27.4
173.0	-27.4	0.0	-27.4
174.0	-22.7	0.0	-22.7
175.0	-24.8	0.0	-24.8
176.0	-23.7	0.0	-23.7
177.0	-27.4	0.0	-27.4
178.0	-27.4	0.0	-27.4
179.0	-23.9	0.0	-23.9

Orbit Communication Systems Ltd.

AL AL-7107-Ka, 2.15 m Antenna, Pattern Data Table
Co-pol Azimuth RHCP, -10° to +10° @ 0.1° increment

29.15 GHz Antenna Pattern in Co-pol Az RHCP

Angle	Gain	Mask	Over Mask
Degrees	dBi	dBi	dB
-10.0	-0.6	7.0	-7.6
-9.9	0.3	7.1	-6.8
-9.8	0.3	7.2	-6.9
-9.7	-0.9	7.3	-8.3
-9.6	-2.9	7.4	-10.3
-9.5	-4.9	7.6	-12.5
-9.4	-5.2	7.7	-12.9
-9.3	-7.7	7.8	-15.5
-9.2	-14.0	8.0	-22.0
-9.1	-9.9	8.0	-17.9
-9.0	-5.1	8.0	-13.1
-8.9	-4.5	8.0	-12.5
-8.8	-8.0	8.0	-16.0
-8.7	-14.3	8.0	-22.3
-8.6	-10.8	8.0	-18.8
-8.5	-5.9	8.0	-13.9
-8.4	-4.6	8.0	-12.6
-8.3	-7.4	8.0	-15.4
-8.2	-8.6	8.0	-16.6
-8.1	-9.0	8.0	-17.0
-8.0	-8.1	8.0	-16.1
-7.9	-5.5	8.0	-13.5
-7.8	-1.8	8.0	-9.8
-7.7	0.2	8.0	-7.8
-7.6	0.9	8.0	-7.1
-7.5	0.5	8.0	-7.5
-7.4	1.0	8.0	-7.0
-7.3	1.8	8.0	-6.2
-7.2	0.6	8.0	-7.4
-7.1	-4.9	8.0	-12.9
-7.0	-7.0	7.9	-14.9
-6.9	2.9	8.0	-5.1
-6.8	4.5	8.2	-3.6
-6.7	3.3	8.3	-5.1
-6.6	-1.4	8.5	-9.9
-6.5	1.7	8.7	-7.0
-6.4	3.5	8.8	-5.3
-6.3	3.9	9.0	-5.2
-6.2	3.8	9.2	-5.4
-6.1	3.7	9.4	-5.7
-6.0	2.4	9.5	-7.1
-5.9	-2.3	9.7	-12.1
-5.8	-12.0	9.9	-21.9
-5.7	-11.6	10.1	-21.7
-5.6	-14.6	10.3	-24.9
-5.5	-11.1	10.5	-21.6
-5.4	-14.2	10.7	-24.9
-5.3	-1.1	10.9	-12.0
-5.2	1.1	11.1	-10.0
-5.1	-1.5	11.3	-12.8
-5.0	-3.2	11.5	-14.7
-4.9	3.2	11.7	-8.5
-4.8	4.4	12.0	-7.6
-4.7	1.6	12.2	-10.6
-4.6	-5.3	12.4	-17.8
-4.5	0.6	12.7	-12.0
-4.4	6.2	12.9	-6.7
-4.3	7.0	13.2	-6.1
-4.2	2.6	13.4	-10.8
-4.1	-15.4	13.7	-29.1

29.15 GHz Antenna Pattern in Co-pol Az RHCP

Angle	Gain	Mask	Over Mask
Degrees	dBi	dBi	dB
0.0	52.8		
0.1	52.1		
0.2	49.5		
0.3	45.1		
0.4	40.0		
0.5	35.5		
0.6	29.5		
0.7	29.6		
0.8	30.4		
0.9	27.5		
1.0	16.6		
1.1	17.2		
1.2	13.8		
1.3	11.1		
1.4	16.2		
1.5	14.7	24.6	-9.9
1.6	16.2	23.9	-7.7
1.7	17.9	23.2	-5.4
1.8	15.7	22.6	-6.9
1.9	10.4	22.0	-11.6
2.0	9.5	21.5	-12.0
2.1	5.3	20.9	-15.6
2.2	1.1	20.4	-19.3
2.3	4.7	20.0	-15.3
2.4	6.2	19.5	-13.3
2.5	7.4	19.1	-11.7
2.6	5.2	18.6	-13.4
2.7	0.1	18.2	-18.1
2.8	5.1	17.8	-12.7
2.9	7.0	17.4	-10.4
3.0	9.4	17.1	-7.7
3.1	9.7	16.7	-7.0
3.2	7.8	16.4	-8.6
3.3	-0.1	16.0	-16.2
3.4	-15.6	15.7	-31.3
3.5	-4.3	15.4	-19.7
3.6	2.9	15.1	-12.2
3.7	4.4	14.8	-10.4
3.8	2.0	14.5	-12.5
3.9	-6.2	14.2	-20.5
4.0	-7.7	13.9	-21.6
4.1	-1.3	13.7	-15.0
4.2	2.6	13.4	-10.8
4.3	3.0	13.2	-10.1
4.4	2.7	12.9	-10.2
4.5	1.9	12.7	-10.8
4.6	-0.8	12.4	-13.2
4.7	-9.6	12.2	-21.8
4.8	-4.0	12.0	-16.0
4.9	-7.7	11.7	-19.4
5.0	-8.2	11.5	-19.7
5.1	-3.4	11.3	-14.7
5.2	-5.4	11.1	-16.5
5.3	-3.8	10.9	-14.7
5.4	0.5	10.7	-10.2
5.5	1.5	10.5	-9.0
5.6	-0.4	10.3	-10.7
5.7	-4.5	10.1	-14.6
5.8	-12.0	9.9	-21.9
5.9	-4.9	9.7	-14.6

Orbit Communication Systems Ltd.

AL AL-7107-Ka, 2.15 m Antenna, Pattern Data Table
Co-pol Azimuth RHCP, -10° to +10° @ 0.1° increment

-4.0	0.7	13.9	-13.2
-3.9	7.8	14.2	-6.5
-3.8	11.0	14.5	-3.5
-3.7	11.0	14.8	-3.8
-3.6	6.6	15.1	-8.5
-3.5	0.4	15.4	-15.0
-3.4	5.7	15.7	-10.0
-3.3	5.0	16.0	-11.0
-3.2	0.5	16.4	-15.8
-3.1	5.9	16.7	-10.8
-3.0	7.1	17.1	-10.0
-2.9	7.6	17.4	-9.8
-2.8	11.6	17.8	-6.2
-2.7	13.1	18.2	-5.1
-2.6	11.1	18.6	-7.5
-2.5	5.0	19.1	-14.0
-2.4	-2.4	19.5	-21.9
-2.3	0.2	20.0	-19.8
-2.2	4.2	20.4	-16.3
-2.1	1.1	20.9	-19.8
-2.0	6.1	21.5	-15.4
-1.9	11.3	22.0	-10.7
-1.8	9.9	22.6	-12.7
-1.7	3.5	23.2	-19.7
-1.6	6.7	23.9	-17.2
-1.5	4.8	24.6	-19.8
-1.4	14.5		
-1.3	19.0		
-1.2	19.5		
-1.1	18.9		
-1.0	16.0		
-0.9	6.8		
-0.8	18.4		
-0.7	18.4		
-0.6	19.7		
-0.5	32.4		
-0.4	40.3		
-0.3	46.3		
-0.2	50.3		
-0.1	52.3		
0.0	52.8		

6.0	-0.5	9.5	-10.1
6.1	0.9	9.4	-8.5
6.2	2.2	9.2	-7.0
6.3	1.8	9.0	-7.2
6.4	0.2	8.8	-8.7
6.5	1.2	8.7	-7.5
6.6	3.2	8.5	-5.3
6.7	2.6	8.3	-5.8
6.8	0.6	8.2	-7.6
6.9	-3.0	8.0	-11.1
7.0	-14.4	7.9	-22.3
7.1	-4.2	8.0	-12.2
7.2	-1.5	8.0	-9.5
7.3	-3.0	8.0	-11.0
7.4	-6.5	8.0	-14.5
7.5	-5.2	8.0	-13.2
7.6	-4.1	8.0	-12.1
7.7	-1.8	8.0	-9.8
7.8	-3.3	8.0	-11.3
7.9	-6.7	8.0	-14.7
8.0	-13.7	8.0	-21.7
8.1	-5.8	8.0	-13.8
8.2	-6.5	8.0	-14.5
8.3	-5.4	8.0	-13.4
8.4	-4.3	8.0	-12.3
8.5	-6.0	8.0	-14.0
8.6	-11.0	8.0	-19.0
8.7	-20.2	8.0	-28.2
8.8	-15.9	8.0	-23.9
8.9	-8.1	8.0	-16.1
9.0	-5.2	8.0	-13.2
9.1	-8.4	8.0	-16.4
9.2	-10.2	8.0	-18.2
9.3	-6.5	7.8	-14.3
9.4	-3.6	7.7	-11.3
9.5	-3.7	7.6	-11.3
9.6	-4.8	7.4	-12.2
9.7	-6.5	7.3	-13.8
9.8	-9.0	7.2	-16.2
9.9	-11.9	7.1	-19.0
10.0	-7.7	7.0	-14.7

Orbit Communication Systems Ltd.
AL-7107-Ka, 2.15 m Antenna, Pattern Data Table
Co-pol Elevation RHCP, -30° to +30° @ 0.5° increment

29.15 GHz Antenna Pattern in Co-pol EI RHCP

Angle	Gain	Mask	Over Mask
Degrees	dBi	dBi	dB
-30.0	-7.6	-4.9	-2.7
-29.5	-9.3	-4.7	-4.5
-29.0	-9.0	-4.6	-4.5
-28.5	-7.4	-4.4	-3.1
-28.0	-9.3	-4.2	-5.1
-27.5	-13.4	-4.0	-9.4
-27.0	-12.8	-3.8	-9.1
-26.5	-12.4	-3.6	-8.8
-26.0	-7.6	-3.4	-4.2
-25.5	-7.8	-3.2	-4.7
-25.0	-13.4	-2.9	-10.4
-24.5	-5.6	-2.7	-2.8
-24.0	-8.2	-2.5	-5.7
-23.5	-14.3	-2.3	-12.0
-23.0	-14.6	-2.0	-12.5
-22.5	-18.2	-1.8	-16.4
-22.0	-16.2	-1.6	-14.6
-21.5	-6.2	-1.3	-4.9
-21.0	-6.2	-1.1	-5.1
-20.5	-6.1	-0.8	-5.3
-20.0	-2.2	-0.5	-1.7
-19.5	-0.5	-0.3	-0.3
-19.0	-0.5	0.0	-0.5
-18.5	-2.6	0.3	-2.9
-18.0	-5.4	0.6	-6.0
-17.5	-12.2	0.9	-13.1
-17.0	-11.4	1.2	-12.6
-16.5	-11.3	1.6	-12.8
-16.0	-19.4	1.9	-21.3
-15.5	-11.4	2.2	-13.6
-15.0	-4.8	2.6	-7.4
-14.5	-10.5	3.0	-13.5
-14.0	-4.3	3.3	-7.7
-13.5	-9.2	3.7	-12.9
-13.0	-6.5	4.2	-10.6
-12.5	-4.3	4.6	-8.9
-12.0	-15.5	5.0	-20.5
-11.5	-5.2	5.5	-10.7
-11.0	-6.8	6.0	-12.8
-10.5	-6.6	6.5	-13.1
-10.0	-9.6	7.0	-16.6
-9.5	-4.5	7.6	-12.1
-9.0	-5.3	8.1	-13.4
-8.5	-10.2	8.8	-19.0
-8.0	-2.9	9.4	-12.4
-7.5	-7.3	10.1	-17.4
-7.0	1.0	10.9	-9.8
-6.5	1.0	11.7	-10.7
-6.0	1.3	12.5	-11.2
-5.5	-0.8	13.5	-14.3
-5.0	3.8	14.5	-10.7
-4.5	4.6	15.7	-11.0
-4.0	10.0	16.9	-6.9
-3.5	8.8	18.4	-9.6
-3.0	-1.5		
-2.5	11.3		
-2.0	11.7		
-1.5	18.8		
-1.0	22.6		
-0.5	34.4		
0.0	52.6		

29.15 GHz Antenna Pattern in Co-pol EI RHCP

Angle	Gain	Mask	Over Mask
Degrees	dBi	dBi	dB
0.0	52.6		
0.5	37.1		
1.0	18.1		
1.5	10.2		
2.0	10.3		
2.5	6.9		
3.0	1.1		
3.5	12.4	18.4	-6.0
4.0	14.0	16.9	-2.9
4.5	2.9	15.7	-12.8
5.0	10.3	14.5	-4.3
5.5	2.8	13.5	-10.7
6.0	-3.4	12.5	-16.0
6.5	2.4	11.7	-9.3
7.0	-4.1	10.9	-15.0
7.5	-11.7	10.1	-21.8
8.0	-7.8	9.4	-17.2
8.5	-7.8	8.8	-16.5
9.0	-7.6	8.1	-15.7
9.5	-5.3	7.6	-12.9
10.0	1.0	7.0	-6.0
10.5	-8.9	6.5	-15.3
11.0	-5.1	6.0	-11.0
11.5	-6.7	5.5	-12.1
12.0	-10.0	5.0	-15.0
12.5	-2.5	4.6	-7.1
13.0	-3.9	4.2	-8.1
13.5	-8.1	3.7	-11.8
14.0	-19.9	3.3	-23.2
14.5	-14.1	3.0	-17.0
15.0	-12.9	2.6	-15.5
15.5	-23.7	2.2	-25.9
16.0	-25.9	1.9	-27.8
16.5	-11.2	1.6	-12.8
17.0	-14.8	1.2	-16.1
17.5	-15.9	0.9	-16.8
18.0	-12.5	0.6	-13.2
18.5	-11.1	0.3	-11.4
19.0	-26.4	0.0	-26.5
19.5	-10.5	-0.3	-10.3
20.0	-15.3	-0.5	-14.8
20.5	-15.6	-0.8	-14.8
21.0	-14.4	-1.1	-13.4
21.5	-16.2	-1.3	-14.8
22.0	-16.7	-1.6	-15.2
22.5	-14.3	-1.8	-12.5
23.0	-18.5	-2.0	-16.4
23.5	-15.9	-2.3	-13.6
24.0	-20.1	-2.5	-17.6
24.5	-26.6	-2.7	-23.9
25.0	-22.3	-2.9	-19.3
25.5	-20.3	-3.2	-17.2
26.0	-21.3	-3.4	-17.9
26.5	-18.1	-3.6	-14.5
27.0	-19.6	-3.8	-15.8
27.5	-20.4	-4.0	-16.4
28.0	-22.4	-4.2	-18.3
28.5	-23.5	-4.4	-19.2
29.0	-22.5	-4.6	-17.9
29.5	-21.3	-4.7	-16.5
30.0	-18.5	-4.9	-13.6

Orbit Communication Systems Ltd.
AL-7107-Ka, 2.15 m Antenna, Pattern Data Table
Co-pol Elevation RHCP, -10° to +10° @ 0.1° increment

29.15 GHz Antenna Pattern in Co-pol EI RHCP

Angle	Gain	Mask	Over Mask
Degrees	dBi	dBi	dB
-10.0	-3.3	7.0	-10.3
-9.9	-4.4	7.1	-11.5
-9.8	-3.0	7.2	-10.2
-9.7	-0.4	7.3	-7.7
-9.6	0.3	7.4	-7.2
-9.5	-3.4	7.6	-11.0
-9.4	-10.7	7.7	-18.4
-9.3	-6.7	7.8	-14.5
-9.2	-7.8	7.9	-15.7
-9.1	-18.8	8.0	-26.9
-9.0	-7.4	8.1	-15.5
-8.9	-6.0	8.3	-14.3
-8.8	-8.7	8.4	-17.1
-8.7	-1.9	8.5	-10.4
-8.6	0.3	8.6	-8.4
-8.5	-1.6	8.8	-10.3
-8.4	-9.7	8.9	-18.6
-8.3	-18.5	9.0	-27.6
-8.2	-13.1	9.2	-22.3
-8.1	-11.2	9.3	-20.4
-8.0	-6.3	9.4	-15.7
-7.9	-4.0	9.6	-13.6
-7.8	-1.9	9.7	-11.6
-7.7	-1.2	9.8	-11.0
-7.6	-4.6	10.0	-14.6
-7.5	-16.5	10.1	-26.6
-7.4	-13.3	10.3	-23.5
-7.3	-14.6	10.4	-25.0
-7.2	-18.3	10.6	-28.9
-7.1	-8.4	10.7	-19.1
-7.0	-1.1	10.9	-12.0
-6.9	1.7	11.0	-9.3
-6.8	0.6	11.2	-10.6
-6.7	-2.9	11.3	-14.2
-6.6	-0.3	11.5	-11.8
-6.5	1.4	11.7	-10.3
-6.4	-0.8	11.8	-12.7
-6.3	-7.1	12.0	-19.2
-6.2	-4.2	12.2	-16.3
-6.1	-1.9	12.4	-14.3
-6.0	0.3	12.5	-12.3
-5.9	0.8	12.7	-12.0
-5.8	-2.4	12.9	-15.3
-5.7	-1.2	13.1	-14.3
-5.6	0.9	13.3	-12.4
-5.5	-1.2	13.5	-14.6
-5.4	-6.9	13.7	-20.6
-5.3	-5.7	13.9	-19.6
-5.2	-4.6	14.1	-18.7
-5.1	-0.9	14.3	-15.2
-5.0	1.8	14.5	-12.8
-4.9	2.9	14.7	-11.8
-4.8	1.8	15.0	-13.2
-4.7	2.1	15.2	-13.1
-4.6	3.9	15.4	-11.5
-4.5	3.3	15.7	-12.3
-4.4	-0.5	15.9	-16.4
-4.3	2.1	16.2	-14.0
-4.2	7.1	16.4	-9.3
-4.1	8.9	16.7	-7.8

29.15 GHz Antenna Pattern in Co-pol EI RHCP

Angle	Gain	Mask	Over Mask
Degrees	dBi	dBi	dB
0.0	52.8		
0.1	52.0		
0.2	49.4		
0.3	44.9		
0.4	40.5		
0.5	37.4		
0.6	32.8		
0.7	20.2		
0.8	20.0		
0.9	17.8		
1.0	15.9		
1.1	18.4		
1.2	13.8		
1.3	6.6		
1.4	9.9		
1.5	6.3		
1.6	12.1		
1.7	12.2		
1.8	10.0		
1.9	11.6		
2.0	12.6		
2.1	13.7		
2.2	14.1		
2.3	13.3		
2.4	12.1		
2.5	8.9		
2.6	0.2		
2.7	-0.8		
2.8	-1.3		
2.9	-2.3		
3.0	0.1		
3.1	-0.3		
3.2	8.4		
3.3	11.8		
3.4	12.3		
3.5	11.0	18.4	-7.4
3.6	9.2	18.1	-8.9
3.7	11.0	17.8	-6.8
3.8	13.0	17.5	-4.5
3.9	13.2	17.2	-4.0
4.0	13.0	16.9	-3.9
4.1	12.3	16.7	-4.3
4.2	9.3	16.4	-7.1
4.3	1.3	16.2	-14.9
4.4	2.1	15.9	-13.9
4.5	3.2	15.7	-12.4
4.6	4.4	15.4	-11.1
4.7	5.5	15.2	-9.7
4.8	6.1	15.0	-8.9
4.9	9.0	14.7	-5.7
5.0	9.5	14.5	-5.0
5.1	7.3	14.3	-7.0
5.2	-1.8	14.1	-15.9
5.3	-5.5	13.9	-19.4
5.4	-1.0	13.7	-14.6
5.5	-3.5	13.5	-16.9
5.6	-6.9	13.3	-20.2
5.7	-11.7	13.1	-24.8
5.8	-6.6	12.9	-19.5
5.9	-6.7	12.7	-19.4

Orbit Communication Systems Ltd.
AL-7107-Ka, 2.15 m Antenna, Pattern Data Table
Co-pol Elevation RHCP, -10° to +10° @ 0.1° increment

-4.0	8.6	16.9	-8.3
-3.9	5.5	17.2	-11.7
-3.8	-10.7	17.5	-28.2
-3.7	4.8	17.8	-13.0
-3.6	8.2	18.1	-9.8
-3.5	8.0	18.4	-10.4
-3.4	6.7		
-3.3	2.0		
-3.2	-7.6		
-3.1	4.0		
-3.0	0.9		
-2.9	6.5		
-2.8	13.5		
-2.7	14.7		
-2.6	12.7		
-2.5	10.2		
-2.4	13.5		
-2.3	14.5		
-2.2	14.4		
-2.1	13.6		
-2.0	10.8		
-1.9	7.1		
-1.8	5.9		
-1.7	9.3		
-1.6	16.0		
-1.5	19.4		
-1.4	19.7		
-1.3	13.8		
-1.2	17.5		
-1.1	22.7		
-1.0	22.5		
-0.9	20.9		
-0.8	24.4		
-0.7	28.0		
-0.6	31.0		
-0.5	32.7		
-0.4	38.2		
-0.3	45.4		
-0.2	50.0		
-0.1	52.3		
0.0	52.8		

6.0	-11.2	12.5	-23.7
6.1	-11.2	12.4	-23.5
6.2	-9.0	12.2	-21.2
6.3	-2.4	12.0	-14.4
6.4	1.3	11.8	-10.6
6.5	2.0	11.7	-9.6
6.6	0.3	11.5	-11.2
6.7	-1.8	11.3	-13.1
6.8	-4.7	11.2	-15.8
6.9	-10.5	11.0	-21.5
7.0	-3.9	10.9	-14.8
7.1	-0.2	10.7	-10.9
7.2	0.0	10.6	-10.5
7.3	-1.1	10.4	-11.5
7.4	-4.5	10.3	-14.8
7.5	-14.5	10.1	-24.7
7.6	-4.3	10.0	-14.3
7.7	-2.1	9.8	-11.9
7.8	-1.6	9.7	-11.3
7.9	-2.3	9.6	-11.9
8.0	-4.1	9.4	-13.5
8.1	-8.0	9.3	-17.3
8.2	-7.7	9.2	-16.8
8.3	-4.6	9.0	-13.7
8.4	-5.7	8.9	-14.6
8.5	-9.0	8.8	-17.8
8.6	-7.2	8.6	-15.8
8.7	-5.2	8.5	-13.8
8.8	-6.9	8.4	-15.3
8.9	-9.5	8.3	-17.8
9.0	-13.3	8.1	-21.5
9.1	-13.3	8.0	-21.3
9.2	-8.8	7.9	-16.7
9.3	-9.2	7.8	-17.0
9.4	-7.8	7.7	-15.5
9.5	-2.8	7.6	-10.3
9.6	0.3	7.4	-7.1
9.7	2.8	7.3	-4.5
9.8	3.2	7.2	-4.1
9.9	3.2	7.1	-3.9
10.0	0.6	7.0	-6.4

Orbit Communication Systems Ltd.
AL-7107-Ka, 2.15 m Antenna, Pattern Data Table
X-pol Azimuth RHCP, -10° to +10° @ 0.1° increment

29.15 GHz Antenna Pattern in X-pol Az RHCP

Angle	Gain	Mask	Over Mask
Degrees	dBi	dBi	dB
-10.0	-8.3	-2.0	-6.3
-9.9	-9.1	-2.0	-7.1
-9.8	-8.2	-2.0	-6.2
-9.7	-7.6	-2.0	-5.6
-9.6	-6.4	-2.0	-4.4
-9.5	-5.9	-2.0	-3.9
-9.4	-4.5	-2.0	-2.5
-9.3	-4.0	-2.0	-2.0
-9.2	-4.4	-2.0	-2.4
-9.1	-6.7	-2.0	-4.7
-9.0	-9.4	-2.0	-7.4
-8.9	-12.6	-2.0	-10.6
-8.8	-13.0	-2.0	-11.0
-8.7	-12.2	-2.0	-10.2
-8.6	-12.6	-2.0	-10.6
-8.5	-11.1	-2.0	-9.1
-8.4	-8.3	-2.0	-6.3
-8.3	-5.8	-2.0	-3.8
-8.2	-6.4	-2.0	-4.4
-8.1	-8.6	-2.0	-6.6
-8.0	-13.5	-2.0	-11.5
-7.9	-10.7	-2.0	-8.7
-7.8	-8.3	-2.0	-6.3
-7.7	-6.8	-2.0	-4.8
-7.6	-9.2	-2.0	-7.2
-7.5	-8.0	-2.0	-6.0
-7.4	-4.0	-2.0	-2.0
-7.3	-2.8	-2.0	-0.8
-7.2	-3.7	-2.0	-1.7
-7.1	-1.7	-2.0	0.3
-7.0	-0.7	-2.1	1.4
-6.9	-0.6	-2.0	1.4
-6.8	-2.2	-1.8	-0.4
-6.7	-4.6	-1.7	-2.9
-6.6	-4.2	-1.5	-2.7
-6.5	-1.7	-1.3	-0.4
-6.4	-1.5	-1.2	-0.4
-6.3	-3.9	-1.0	-2.9
-6.2	-9.4	-0.8	-8.6
-6.1	-21.5	-0.6	-20.8
-6.0	-14.5	-0.5	-14.1
-5.9	-15.6	-0.3	-15.3
-5.8	-10.2	-0.1	-10.1
-5.7	-7.3	0.1	-7.4
-5.6	-5.6	0.3	-5.9
-5.5	-11.7	0.5	-12.2
-5.4	-17.1	0.7	-17.8
-5.3	-8.1	0.9	-9.0
-5.2	-6.5	1.1	-7.6
-5.1	-15.0	1.3	-16.3
-5.0	-6.9	1.5	-8.4
-4.9	-1.8	1.7	-3.5
-4.8	-0.6	2.0	-2.6
-4.7	-2.2	2.2	-4.4
-4.6	-10.8	2.4	-13.2
-4.5	-15.9	2.7	-18.6
-4.4	-6.1	2.9	-9.0
-4.3	0.2	3.2	-3.0
-4.2	2.9	3.4	-0.6
-4.1	2.5	3.7	-1.2

29.15 GHz Antenna Pattern in X-pol Az RHCP

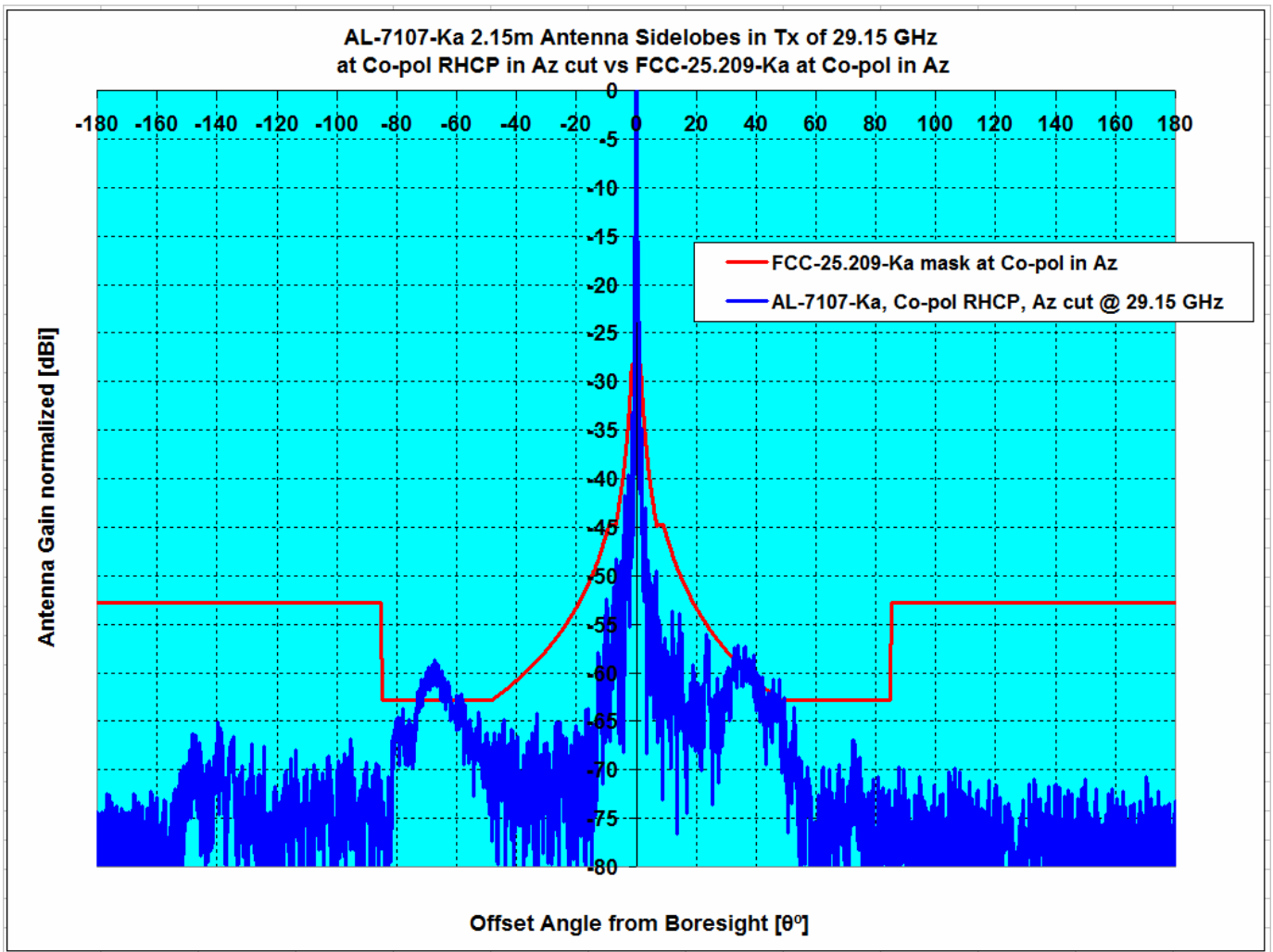
Angle	Gain	Mask	Over Mask
Degrees	dBi	dBi	dB
0.0	27.0		
0.1	25.2		
0.2	30.7		
0.3	32.9		
0.4	32.9		
0.5	30.6		
0.6	25.6		
0.7	19.5		
0.8	12.4		
0.9	2.2		
1.0	12.6		
1.1	12.2		
1.2	6.8		
1.3	7.0		
1.4	8.4		
1.5	8.4		
1.6	7.1		
1.7	2.9		
1.8	-9.5	12.6	-22.1
1.9	-8.6	12.0	-20.6
2.0	-10.9	11.5	-22.4
2.1	-5.3	10.9	-16.2
2.2	-3.0	10.4	-13.4
2.3	-1.9	10.0	-11.9
2.4	-2.3	9.5	-11.8
2.5	-4.0	9.1	-13.0
2.6	-1.5	8.6	-10.2
2.7	1.5	8.2	-6.7
2.8	2.1	7.8	-5.8
2.9	-1.4	7.4	-8.8
3.0	-6.7	7.1	-13.8
3.1	-6.6	6.7	-13.3
3.2	-9.0	6.4	-15.4
3.3	-15.3	6.0	-21.3
3.4	-26.9	5.7	-32.6
3.5	-16.8	5.4	-22.2
3.6	-18.3	5.1	-23.4
3.7	-11.1	4.8	-15.9
3.8	-12.2	4.5	-16.7
3.9	-22.3	4.2	-26.5
4.0	-8.7	3.9	-12.6
4.1	-3.5	3.7	-7.1
4.2	-4.9	3.4	-8.3
4.3	-5.8	3.2	-8.9
4.4	-4.7	2.9	-7.6
4.5	-4.6	2.7	-7.3
4.6	-10.0	2.4	-12.4
4.7	-17.0	2.2	-19.2
4.8	-17.3	2.0	-19.3
4.9	-16.0	1.7	-17.8
5.0	-13.1	1.5	-14.6
5.1	-11.2	1.3	-12.5
5.2	-10.8	1.1	-11.9
5.3	-5.5	0.9	-6.4
5.4	-4.1	0.7	-4.8
5.5	-5.9	0.5	-6.4
5.6	-9.5	0.3	-9.8
5.7	-15.7	0.1	-15.8
5.8	-21.3	-0.1	-21.2
5.9	-15.3	-0.3	-15.0

Orbit Communication Systems Ltd.
AL-7107-Ka, 2.15 m Antenna, Pattern Data Table
X-pol Azimuth RHCP, -10° to +10° @ 0.1° increment

-4.0	-2.4	3.9	-6.4
-3.9	-9.7	4.2	-14.0
-3.8	-1.3	4.5	-5.8
-3.7	-1.5	4.8	-6.3
-3.6	-8.4	5.1	-13.5
-3.5	-8.4	5.4	-13.8
-3.4	-8.8	5.7	-14.5
-3.3	-25.0	6.0	-31.0
-3.2	-7.7	6.4	-14.1
-3.1	-8.3	6.7	-15.0
-3.0	-20.3	7.1	-27.3
-2.9	-4.5	7.4	-12.0
-2.8	-2.2	7.8	-10.0
-2.7	-5.8	8.2	-14.0
-2.6	-21.5	8.6	-30.1
-2.5	-11.9	9.1	-21.0
-2.4	-1.9	9.5	-11.4
-2.3	3.4	10.0	-6.6
-2.2	4.5	10.4	-6.0
-2.1	3.6	10.9	-7.3
-2.0	1.2	11.5	-10.3
-1.9	-8.5	12.0	-20.5
-1.8	2.8	12.6	-9.9
-1.7	8.9		
-1.6	11.0		
-1.5	11.5		
-1.4	11.1		
-1.3	7.3		
-1.2	7.7		
-1.1	14.0		
-1.0	16.0		
-0.9	17.1		
-0.8	20.5		
-0.7	25.0		
-0.6	28.2		
-0.5	29.2		
-0.4	27.3		
-0.3	17.7		
-0.2	25.0		
-0.1	28.3		
0.0	27.0		

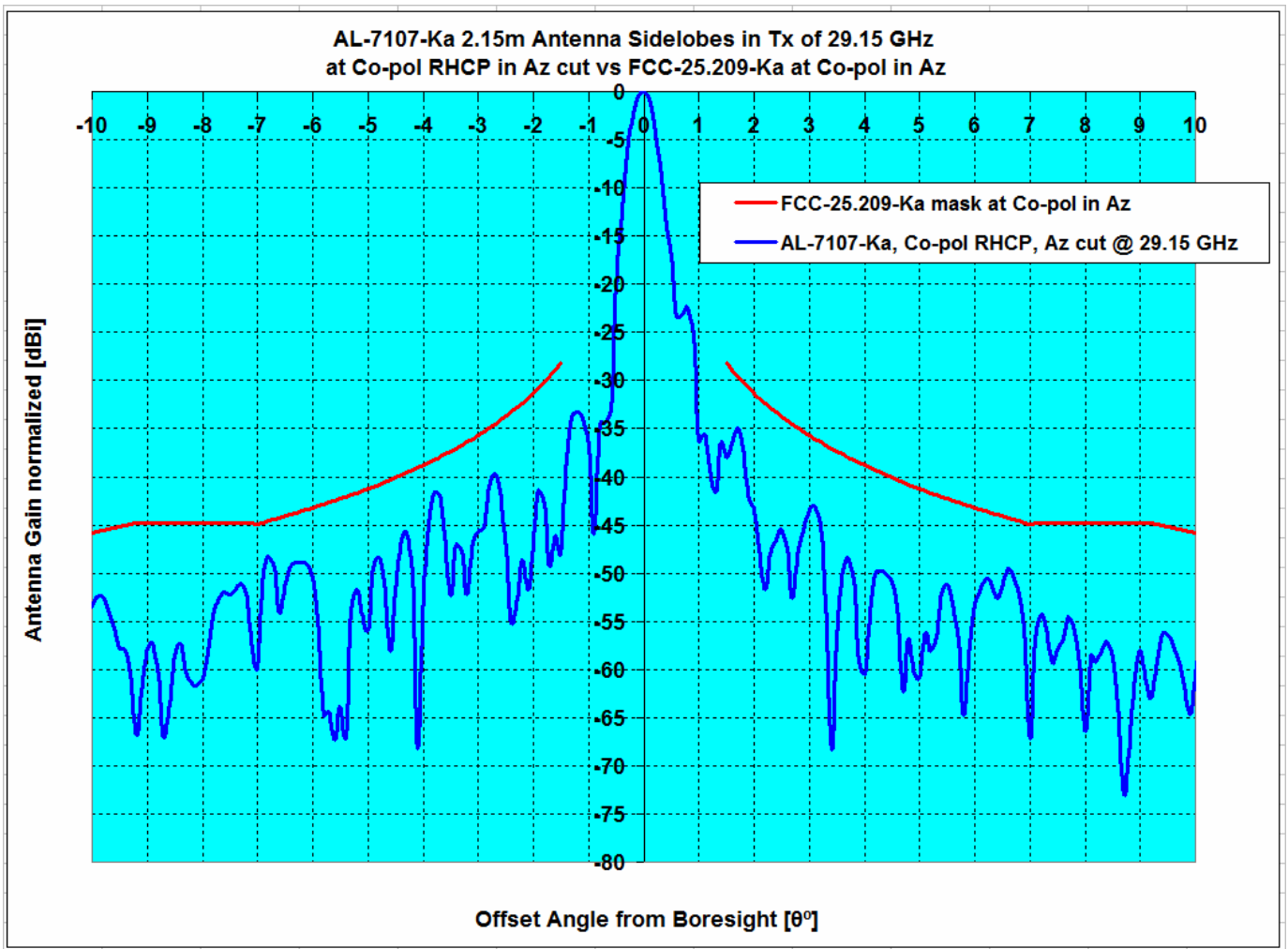
6.0	-13.5	-0.5	-13.0
6.1	-10.5	-0.6	-9.9
6.2	-7.2	-0.8	-6.4
6.3	-7.2	-1.0	-6.2
6.4	-8.3	-1.2	-7.1
6.5	-6.8	-1.3	-5.5
6.6	-4.7	-1.5	-3.2
6.7	-4.1	-1.7	-2.5
6.8	-4.3	-1.8	-2.5
6.9	-7.2	-2.0	-5.2
7.0	-10.1	-2.1	-8.0
7.1	-15.4	-2.0	-13.4
7.2	-17.5	-2.0	-15.5
7.3	-25.5	-2.0	-23.5
7.4	-22.7	-2.0	-20.7
7.5	-14.2	-2.0	-12.2
7.6	-9.4	-2.0	-7.4
7.7	-8.8	-2.0	-6.8
7.8	-14.8	-2.0	-12.8
7.9	-17.2	-2.0	-15.2
8.0	-9.8	-2.0	-7.8
8.1	-11.2	-2.0	-9.2
8.2	-14.2	-2.0	-12.2
8.3	-17.6	-2.0	-15.6
8.4	-14.6	-2.0	-12.6
8.5	-11.6	-2.0	-9.6
8.6	-11.2	-2.0	-9.2
8.7	-11.6	-2.0	-9.6
8.8	-12.0	-2.0	-10.0
8.9	-10.5	-2.0	-8.5
9.0	-9.7	-2.0	-7.7
9.1	-13.5	-2.0	-11.5
9.2	-10.9	-2.0	-8.9
9.3	-11.3	-2.0	-9.3
9.4	-13.4	-2.0	-11.4
9.5	-21.7	-2.0	-19.7
9.6	-23.6	-2.0	-21.6
9.7	-22.0	-2.0	-20.0
9.8	-19.0	-2.0	-17.0
9.9	-12.0	-2.0	-10.0
10.0	-11.9	-2.0	-9.9

Orbit Communication Systems Ltd.
AL-7107-Ka, 2.15 m Antenna, Pattern, Co-pol, Azimuth RHCP



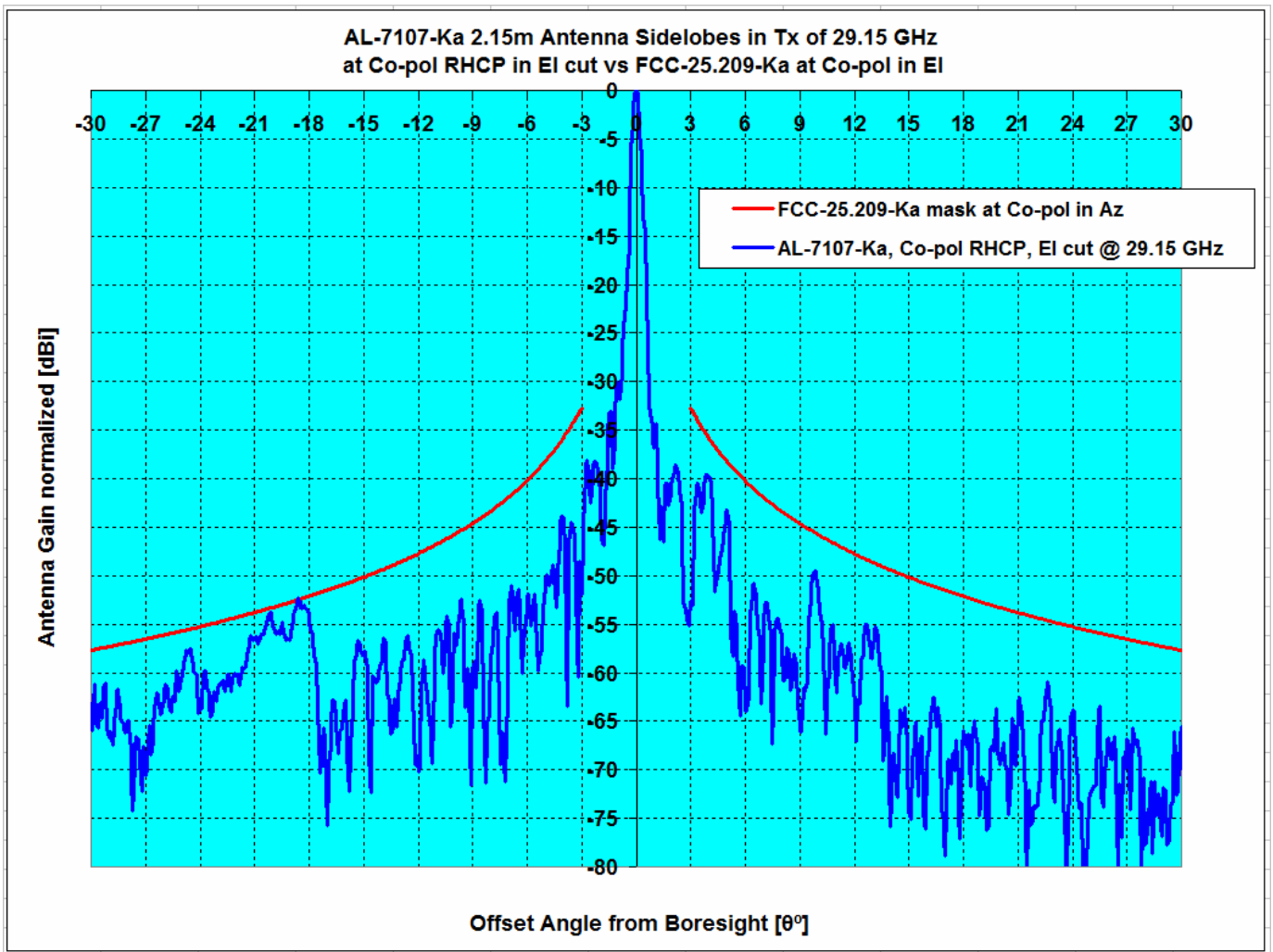
Description	Plane, CirP	Frequency	Ant. Gain	Peak Excursions dB		Over Mask %	
				1.5°≤θ≤7°	7°≤θ≤180°	1.5°≤θ≤7°	7°≤θ≤180°
Pattern Rule vs Antenna System	Type	GHz	dBi				
FCC-25.209-Ka, Co-pol Az, vs AL-7107-Ka	Az , RHCP	29.15	52.77	-3.52	4.12	0.00%	4.65%

Orbit Communication Systems Ltd.
AL-7107-Ka, 2.15 m Antenna, Pattern, Co-pol, Azimuth RHCP



Description	Plane, CirP	Frequency	Ant. Gain	Peak Excursions dB		Over Mask %	
				1.5°≤θ≤7°	7°≤θ≤180°	1.5°≤θ≤7°	7°≤θ≤180°
Pattern Rule vs Antenna System	Type	GHz	dBi				
FCC-25.209-Ka, Co-pol Az, vs AL-7107-Ka	Az , RHCP	29.15	52.77	-3.52	4.12	0.00%	4.65%

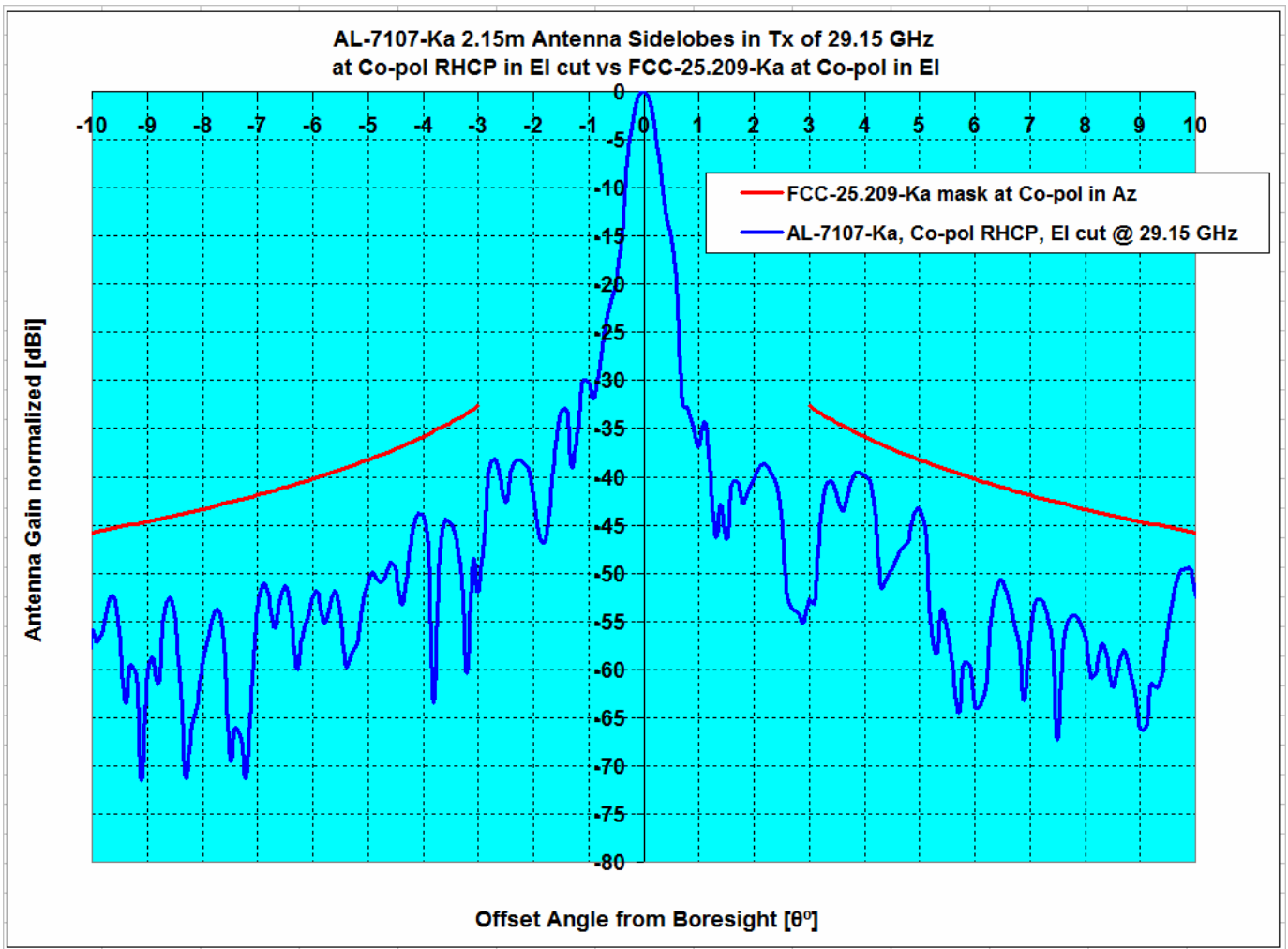
Orbit Communication Systems Ltd.
AL-7107-Ka, 2.15 m Antenna, Pattern, Co-pol, Elevation RHCP



Description	Plane, CirP	Frequency	Ant. Gain	Peak Excursions dB		Over Mask %	
				3°≤θ≤7°	7°≤θ≤30°	3°≤θ≤7°	7°≤θ≤30°
Pattern Rule vs Antenna System	Type	GHz	dBi				
FCC-25.209-Ka, Co-pol EI, vs AL-7107-Ka	EI , RHCP	29.15	52.77	-3.94	0.16	0.00%	0.18%

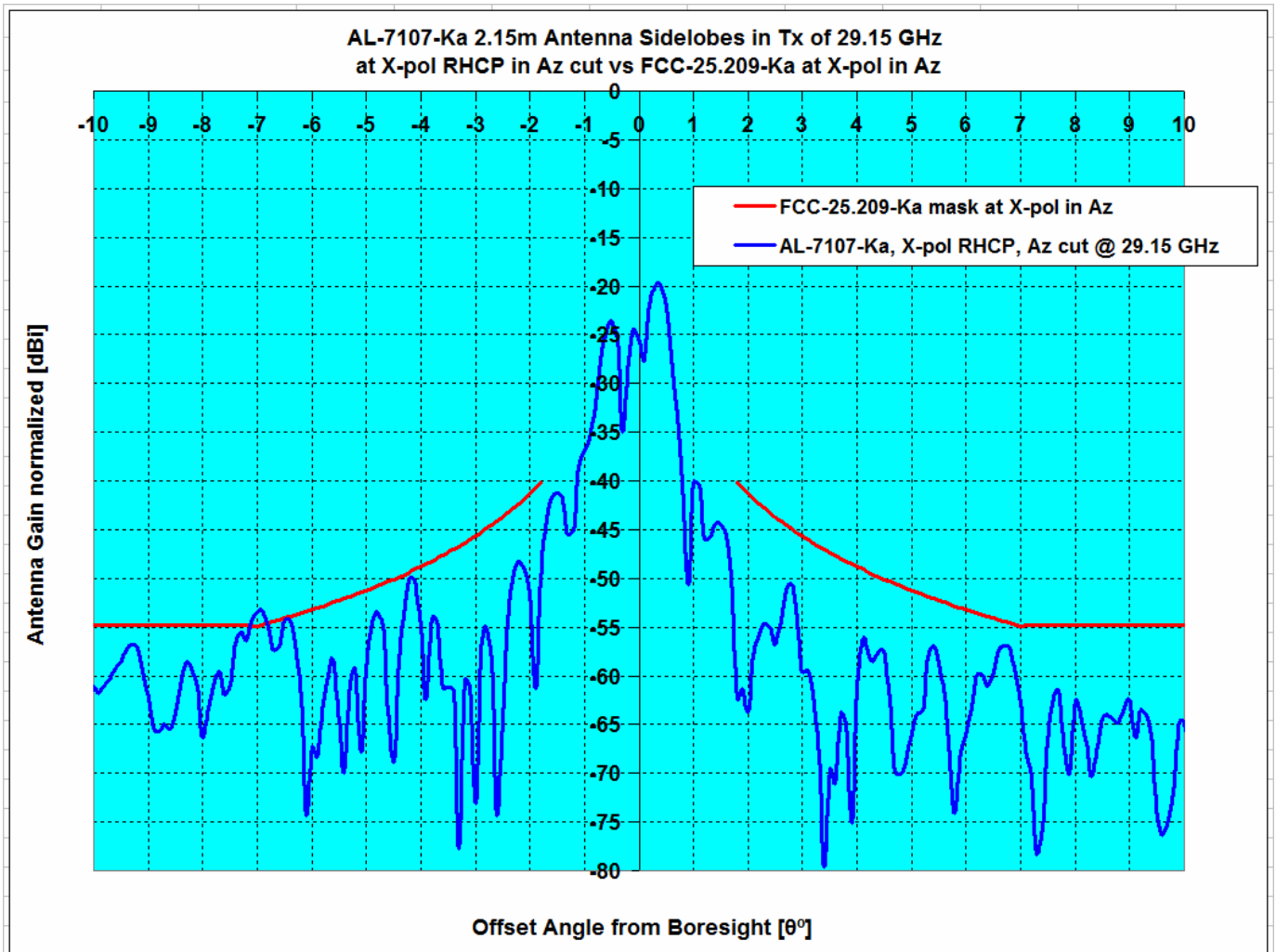
Orbit Communication Systems Ltd.

AL-7107-Ka, 2.15 m Antenna, Pattern, Co-pol, Elevation RHCP



Description	Plane, CirP	Frequency	Ant. Gain	Peak Excursions dB		Over Mask %	
Pattern Rule vs Antenna System	Type	GHz	dBi	$3^\circ \leq \theta \leq 7^\circ$	$7^\circ \leq \theta \leq 30^\circ$	$3^\circ \leq \theta \leq 7^\circ$	$7^\circ \leq \theta \leq 30^\circ$
FCC-25.209-Ka, Co-pol EI, vs AL-7107-Ka	EI, RHCP	29.15	52.77	-3.94	0.16	0.00%	0.18%

Orbit Communication Systems Ltd.
AL-7107-Ka, 2.15 m Antenna, Pattern, X-pol, Azimuth RHCP



Description	Plane, CirP	Frequency	Ant. Gain	Peak Excursions dB		Over Mask %	
Pattern Rule vs Antenna System	Type	GHz	dBi	1.8°≤θ≤7°	1.8°≤θ≤9.2°	1.8°≤θ≤7°	1.8°≤θ≤9.2°
FCC-25.209-Ka, X-pol Az, vs AL-7107-Ka	Az , RHCP	29.15	52.77	1.40	1.40	1.89%	1.81%

Annex 3: Radiation Hazard Study

The following pages provide the radiation hazard study results for the Thirty-Ship Waiver 2.2 meter terminals.

Radiation Hazard Study

The study in this section analyzes the potential RF human exposure levels caused by the Electro Magnetic (EM) fields of an Orbit AL-7107-Ka, 2.2 m antenna, "OceanTrx7" operating with a maximum power at the flange of 40 Watts. The mathematical analysis performed below complies with the methods described in the FCC Office of Engineering and Technology (OET) Bulletin No. 65 (1985 rev. 1997) R&O 96-3 26 in "Evaluating Compliance with FCC Guidelines for Human Exposure to RF EM Fields, OET Bulletin 65 (Edition 97-01), Supplement B, FCC Office of Engineering & Technology, November 1997".

Maximum Permissible Exposure

There are two separate levels of exposure limits. The first applies to persons in the general population who are in an uncontrolled environment. The second applies to trained personnel in a controlled environment. According to 47 C.F.R. § 1.1310, the Maximum Permissible Exposure (MPE) limits for frequencies above 1.5 GHz are as follows:

- General Population / Uncontrolled Exposure: 1.0 mW/cm²
- Occupational / Controlled Exposure: 5.0 mW/cm²

The purpose of this study is to determine the power flux density levels for the earth station under study as compared with the MPE limits. This comparison is done in each of the following regions:

1. Far-field region
2. Near-field region
3. Transition region
4. The region between the feed and the antenna surface
5. The main reflector region
6. The region between the antenna edge and the ground

Input Parameters

The following input parameters were used in the calculations:

<u>Input Parameter</u>	<u>Value</u>	<u>Unit</u>	<u>Symbol</u>
Antenna Diameter	2.15	m	D
Antenna Transmit Gain	52.5	dBi	G
Transmit Frequency	28,300.0	MHz	f
Antenna Feed Flange Diameter	8.0	cm	d
Power Input to the Antenna	40.0	Watts	P

Calculated Parameters

The following values were calculated using the above input parameters and the corresponding formula:

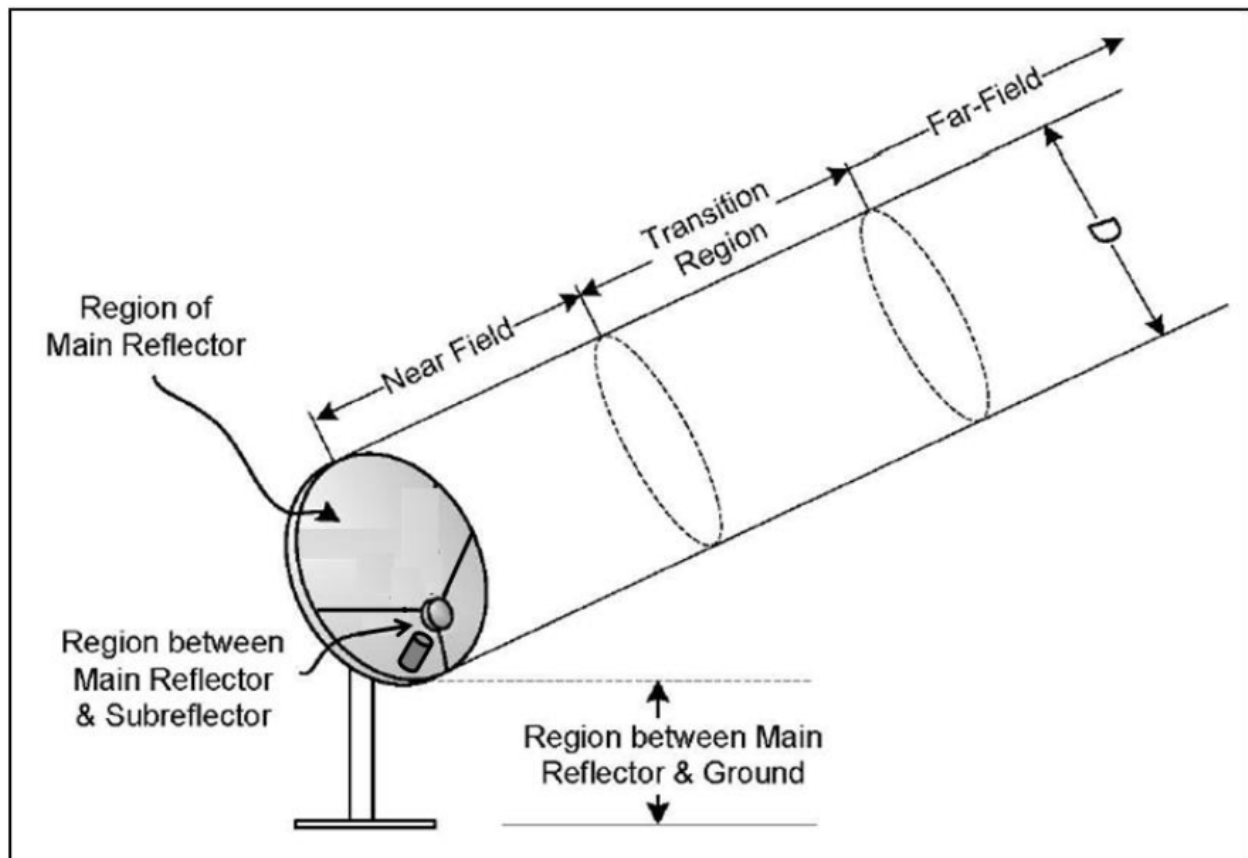
Aperture Efficiency

The aperture efficiency (η) of the antenna is the ratio of the effective aperture area (derived from the peak gain) to the physical aperture area. For the input parameters given above this is calculated to be 43.8 %.

Behavior of EM Fields as a Function of Distance

The behavior of the characteristics of EM fields varies depending on the distance from the radiating antenna. These characteristics are analyzed in three primary regions: the near-field region, the far-field region and the transition region. Of interest also are the region between the antenna main reflector and the subreflector, the region of the main reflector area and the region between the main reflector and ground. These various regions of interest are shown in Figure 1 below.

Figure 1. Electro-Magnetic Fields as a Function of Distance



For parabolic aperture antennas with circular cross sections, such as the antenna under study, the near-field, far-field and transition region distances are calculated as follows:

Radiation Hazard Study - Orbit AL-7107-Ka, 2.2 m Antenna

<u>Calculated Parameter</u>	<u>Value</u>	<u>Unit</u>	<u>Symbol</u>	<u>Formula</u>
Near-Field Distance	109.0	m	R_{nf}	$D^2/(4\lambda)$
Distance to Far-Field	261.6	m	R_{ff}	$0.6D^2/\lambda$
Distance of Transition Region	109.0	m	R_t	$R_t = R_{nf}$

The distance in the transition region is between the near and far fields. Thus, $R_{nf} \leq R_t \leq R_{ff}$. However, the power density in the transition region will not exceed the power density in the near-field. Therefore, for purposes of the present analysis, the distance of the transition region can equate the distance to the near-field.

Power Flux Density Calculations

The power flux density is considered to be at a maximum through the entire length of the near-field. This region is contained within a cylindrical volume with a diameter, D , equal to the diameter of the antenna. In the transition region and the far-field, the power density decreases inversely with the square of the distance. The following equations are used to calculate power density in these regions:

<u>Calculated Parameter</u>	<u>Value</u>	<u>Unit</u>	<u>Symbol</u>	<u>Formula</u>
Power Density in the Near-Field	1.93	mW/cm ²	S_{nf}	$16\eta P/(\pi D^2)$
Power Density in the Far-Field	0.83	mW/cm ²	S_{ff}	$gP/(4\pi R_{ff}^2)$
Power Density in the Transition Region	1.93	mW/cm ²	S_t	$S_{nf} \times R_{nf}/R_t$

The region between the main reflector and the subreflector is confined to within a conical shape defined by the feed assembly. The most common feed assemblies are waveguide flanges. This energy is determined as follows using the area of the feed aperture:

<u>Calculated Parameter</u>	<u>Value</u>	<u>Unit</u>	<u>Symbol</u>	<u>Formula</u>
Power Density at the Feed Flange	3183.1	mW/cm ²	S_{fa}	$4P/A$

The power density in the main reflector is determined similarly to the power density at the feed flange, except that the area of the main reflector is used.

<u>Calculated Parameter</u>	<u>Value</u>	<u>Unit</u>	<u>Symbol</u>	<u>Formula</u>
Power Density at the Main Reflector	4.41	mW/cm ²	$S_{surface}$	$4P/A$

The power density between the reflector and ground, assuming uniform illumination of the reflector surface, is calculated as follows:

<u>Calculated Parameter</u>	<u>Value</u>	<u>Unit</u>	<u>Symbol</u>	<u>Formula</u>
Power Density between Reflector and Gnd	1.10	mW/cm ²	$S_{surface}$	P/A

Summary of Calculations

Table 1 below summarizes the calculated power flux density values for each region. In a controlled environment, the only regions that exceed FCC limitations are the regions between the main reflector and the sub-reflector as well as the main reflector region. These regions are only accessible by trained technicians who, as a matter of procedure, turn off transmit power before performing any work in these areas.

Table 1. Power Flux Density for Each Region

<u>Calculated Parameter</u>	<u>Unit</u>	<u>Exposure Limit</u>	<u>Exposure Limit</u>
Power Densities	mW/cm²	Uncontrolled Environment ≤ 1 mW/cm²	Controlled Environment ≤ 5 mW/cm²
Far Field Calculation	0.83	Satisfies FCC MPE	Satisfies FCC MPE
Near Field Calculation	1.93	Exceeds limitations	Satisfies FCC MPE
Transition Region	1.93	Exceeds limitations	Satisfies FCC MPE
Region between Main & Subreflector	3183.1	Exceeds limitations	Exceeds limitations
Main Reflector Region	4.41	Exceeds limitations	Satisfies FCC MPE
Region between Main & Reflector & Gnd	1.10	Exceeds limitations	Satisfies FCC MPE

In conclusion, the results show that the antenna, in a controlled environment, and under the proper mitigation procedures, meets the guidelines specified in § 1.1310 of the Regulations.

Safe Installation of Maritime Terminals on Vessels

O3b's 2.2-meter maritime antennas, each of which will be encased in a radome, will be positioned in the upper reaches of the maritime vessels on which they are installed. Installing maritime antennas high up is a necessity, to avoid signal blockage from the ships' superstructure. The photo below is representative of installation locations O3b might use.

O3b's maritime antennas will be located in restricted areas whose access is limited to the ship's crew. Crew members will be instructed that only trained technicians may access the maritime antennas. Procedures will be in place requiring that transmit power be turned off, which can be done remotely below deck, before work on any maritime antenna is performed.

The procedures described above - installing the maritime terminals in elevated and isolated locations, restricting access to those locations, and requiring that maritime transmitters be turned off remotely before work is performed - will mitigate potential radiation hazards to personnel in controlled and uncontrolled environments.



Annex 4: Representative Link Budgets for the O3b Thirty-Ship Waiver Request Service

This annex contains example link budgets for the O3b Thirty-Ship Waiver Request service.

Two groups of link budgets are provided corresponding to the Thirty-Ship Waiver terminal being either at the southern or northern ends of the service area. The first group is with the ship located at 13.1 °N / 60°W (300°E). For each group of link budgets there are four sets of link budgets for the various combinations of Forward and Return directions and the two extreme examples of carrier bandwidth (24 MHz and 216 MHz). Within each set of link budgets there are three separate link budgets: clear sky, uplink rain fade and downlink rain fade.

The first set of link budgets below show the forward link for this southern latitude example with a 24 MHz bandwidth carrier transmitted up from the Lima, Peru gateway and received by the Thirty-Ship Waiver terminal. It supports 16APSK rate 9/10 in clear sky and 16APSK rate 3/4 under rain fade conditions. This provides a data throughput of 71 MBits/s under clear-sky and 59 MBits/s under either uplink or downlink rain fade conditions. The downlink EIRP density is consistent with the maximum level used in the demonstration of compliance with the EPFD↓ limits provided in Section A.7.1. Under more severe rain fade conditions there is an additional 14 dB of margin before the adaptive coding reduces to the QPSK rate ¼ level.

The second set of link budgets below show the return link for this southern latitude example with a 24 MHz bandwidth carrier transmitted up from the Thirty-Ship Waiver terminal and received by the Lima, Peru gateway. It supports 16APSK rate 9/10 in clear sky and 16APSK rate 5/6 under rain fade conditions. This provides a data throughput of 71 MBits/s under clear-sky and 65 MBits/s under either uplink or downlink rain fade conditions. The transmit EIRP and hence the transmit PSD density are consistent with the maximum levels used in the demonstration of compliance with the EPFD↑ limits provided in Section A.7.2. The use of uplink power control will not result in any additional interference to GSO satellite networks than the clear sky case because the propagation path to the GSO would be equally affected by the rain fade. In addition, under more severe rain fade conditions there is an additional 15.4 dB of margin before the adaptive coding reduces to the QPSK rate ¼ level.

The third set of link budgets below shows a forward link wideband carrier transmitted up from the Lima, Peru gateway and received by the Thirty-Ship Waiver terminal, supporting 16APSK rate 9/10 in clear sky and 16APSK rate 3/4 under rain fade conditions. This provides a data throughput of 640 MBits/s under clear sky conditions and 532 MBits/s under either uplink or downlink rain fade conditions. The downlink EIRP density is consistent with the maximum level used in the demonstration of compliance with the EPFD↓ limits provided in Section A.7.1. Under more severe rain fade conditions there is an additional 14 dB of margin before the adaptive coding reduces to the QPSK rate ¼ level.

The fourth set of link budgets below show the return link for this southern latitude example with a 49 MHz bandwidth carrier transmitted up from the Thirty-Ship Waiver terminal and received by the Lima, Peru gateway. It supports 16APSK rate 2/3 in clear sky and 8PSK rate 6/10 under rain fade conditions. This provides a data throughput of 473 MBits/s under both clear-sky and 319 MBits/s under either uplink or downlink rain fade conditions. The transmit EIRP and hence the transmit PSD density are consistent with the maximum levels used in the demonstration of compliance with the EPFD $\uparrow$ limits provided in Section A.7.2. The use of uplink power control will not result in any additional interference to GSO satellite networks than the clear sky case because the propagation path to the GSO would be equally affected by the rain fade. In addition, under more severe rain fade conditions there is an additional 9.1 dB of margin before the adaptive coding reduces to the QPSK rate $\frac{1}{4}$ level.

Maritime Terminal located at 13.1 degrees north

**Link budgets for 24 MHz bandwidth carrier in Forward direction from Lima, Peru
gateway to ship
(clear sky, rain faded uplink, rain faded downlink)**

O3b Networks Link Analysis - Tier 2 Service for			
ECM Link Budget Rpt - 10/06/2015		Tier 2	Tier 2
Parameters	Unit	Clear Sky	
Ground parameters		Telco	Teleport
Location		Bridgetown/Barbados	Lima/Peru
Latitude	(deg)	13.10	-12.29
Longitude (East)	(deg)	300.38	283.15
E/S Range to SV	(km)	8486.02	8438.06
E/S Elevation to SV	(deg)	62.54	64.14
E/S Altitude	(m)	9.00	13.00
SV Beam Identifier	(#)	TBD	
Telco Offset to Beam Center	(km)	0.00	
Modulation Parameters		Forward	
Enter Receiver	Type	MEOLink	
Percentage of Bandwidth	(%)	11%	
Allocated Bandwidth	(MHz)	24.0000	
Channel Symbol Rate	(Msps)	20.0000	
Channel Modulation Type		16APSK	
Channel FEC Rate		0.89802	
Channel Throughput	(Mbps)	71.1303	

Uplink		Forward
E/S Carrier Frequencies	(MHz)	28,280.0000
E/S Tx HPA Power Level	(W)	500.0
E/S Tx OBO	(dB)	-13.0
E/S Tx Antenna Gain (7.3m)	(dBi)	65.4
E/S Tx EIRP	(dBW)	60.3
E/S Tx RF Link Availability	(%)	Clear
E/S Tx Spreading Loss	(dB)	-149.6
Satellite		Forward
SV Rx G/T	(dB/K)	5.4
SV Tx OBO	(dB)	-13.3
SV Tx EIRP Per Channel/Carrier	dBW	35.7
Downlink		Forward
E/S Rx Carrier Frequency	(MHz)	18,480.0000
E/S Rx RF Link Availability	(%)	Clear
E/S Rx Antenna Gain (2.2m)	(dBi)	47.8
E/S Rx Effective G/T	(dB/K)	24.4
Total Link		Forward
Carrier/Noise Bandwidth	(dB)	13.0
Carrier/Noise Uplink	(dB)	20.5
Carrier/Noise Downlink	(dB)	18.4
Carrier/Intermodulation Im (C/Im)	(dB)	30.0
(C/N)- Total Actual (Es/No)	(dB)	15.6
(C/N)-Total Required	(dB)	14.2
(Eb/No)-Total Actual	(dB)	10.0
(Eb/No)-Total Required	(dB)	8.6
Excess Margin	(dB)	1.4
Fade Margin	(dB)	17.8

O3b Networks Link Analysis			
ECM Link Budget Rpt - 10/06/2015		Tier 2	Tier 2
Parameters	Unit	Rain Up	
Ground parameters		Telco	Teleport
Location		Bridgetown/Barbados	Lima/Peru
Latitude	(deg)	13.10	-12.29
Longitude (East)	(deg)	300.38	283.15
E/S Range to SV	(km)	8486.02	8438.06
E/S Elevation to SV	(deg)	62.54	64.14
E/S Altitude	(m)	9.00	13.00
SV Beam Identifier	(#)	TBD	
Telco Offset to Beam Center	(km)	0.00	
Modulation Parameters		Forward	
Enter Receiver	Type	MEOLink	
Percentage of Bandwidth	(%)	11%	
Allocated Bandwidth	(MHz)	24.0000	
Channel Symbol Rate	(Msps)	20.0000	
Channel Modulation Type		16APSK	
Channel FEC Rate		0.74704	
Channel Throughput	(Mbps)	59.1715	
Uplink		Forward	
E/S Carrier Frequencies	(MHz)	28,280.0000	
E/S Tx HPA Power Level	(W)	500.0	
E/S Tx OBO	(dB)	-4.0	
E/S Tx Antenna Gain (7.3m)	(dBi)	65.39	
E/S Tx EIRP	(dBW)	69.35	
E/S Tx RF Link Availability	(%)	99.967%	
E/S Tx Spreading Loss	(dB)	-149.6	
Satellite		Forward	

SV Rx G/T	(dB/K)	5.4
SV Tx OBO	(dB)	-13.3
SV Tx EIRP Per Channel/Carrier	dBW	35.7
Downlink		Forward
E/S Rx Carrier Frequency	(MHz)	18,480.0000
E/S Rx RF Link Availability	(%)	Clear
E/S Rx Antenna Gain (2.2m)	(dBi)	47.8
E/S Rx Effective G/T	(dB/K)	24.4
Total Link		Forward
Carrier/Noise Bandwidth	(dB)	13.0
Carrier/Noise Uplink	(dB)	13.7
Carrier/Noise Downlink	(dB)	18.4
Carrier/Intermodulation Im (C/Im)	(dB)	30.0
(C/N)- Total Actual (Es/No)	(dB)	11.8
(C/N)-Total Required	(dB)	11.3
(Eb/No)-Total Actual	(dB)	7.0
(Eb/No)-Total Required	(dB)	6.5
Excess Margin	(dB)	0.49
Fade Margin	(dB)	14.0

O3b Networks Link Analysis			
ECM Link Budget Rpt - 10/06/2015		Tier 2	Tier 2
Parameters	Unit	Rain Dn	
Ground parameters		Teleport	Telco
Location		Bridgetown/Barbados	Lima/Peru
Latitude	(deg)	13.10	-12.29
Longitude (East)	(deg)	300.38	283.15
E/S Range to SV	(km)	8486.02	8438.06

E/S Elevation to SV	(deg)	62.54	64.14
E/S Altitude	(m)	9.00	13.00
SV Beam Identifier	(#)	TBD	
Telco Offset to Beam Center	(km)	0.00	
Modulation Parameters		Forward	
Enter Receiver	Type	MEOLink	
Percentage of Bandwidth	(%)	11.11%	
Allocated Bandwidth	(MHz)	24.0000	
Channel Symbol Rate	(Msps)	20.0000	
Channel Modulation Type		16APSK	
Channel FEC Rate		0.75	
Channel Throughput	(Mbps)	59.17	
Uplink		Forward	
E/S Carrier Frequencies	(MHz)	28,280.0000	
E/S Tx HPA Power Level	(W)	500.0	
E/S Tx OBO	(dB)	-13.0	
E/S Tx Antenna Gain (7.3m)	(dBi)	65.39	
E/S Tx EIRP	(dBW)	60.35	
E/S Tx RF Link Availability	(%)	Clear	
E/S Tx Spreading Loss	(dB)	-149.6	
Satellite		Forward	
SV Rx G/T	(dB/K)	5.35	
SV Tx OBO	(dB)	-13.35	
SV Tx EIRP Per Channel/Carrier	dBW	35.66	
Downlink		Forward	
E/S Rx Carrier Frequency	(MHz)	18,480.0000	
E/S Rx RF Link Availability	(%)	98.930%	
E/S Rx Antenna Gain (2.2m)	(dBi)	47.83	
E/S Rx Effective G/T	(dB/K)	22.15	
Total Link		Forward	

Carrier/Noise Bandwidth	(dB)	13.0
Carrier/Noise Uplink	(dB)	20.55
Carrier/Noise Downlink	(dB)	12.76
Carrier/Intermodulation Im (C/Im)	(dB)	30.00
(C/N)- Total Actual (Es/No)	(dB)	11.78
(C/N)-Total Required	(dB)	11.28
(Eb/No)-Total Actual	(dB)	7.03
(Eb/No)-Total Required	(dB)	6.53
Excess Margin	(dB)	0.50
Fade Margin	(dB)	14.0

**Link budgets for 24 MHz bandwidth carrier in Return direction from ship to Lima, Peru
gateway
(clear sky, rain faded uplink, rain faded downlink)**

O3b Networks Link Analysis - Tier 2 Service for			
ECM Link Budget Rpt - 10/06/2015		Tier 2	Tier 2
Parameters	Unit	Clear Sky	
Ground parameters		Telco	Teleport
Location		Lima/Peru	Bridgetown/Barbados
Latitude	(deg)	-12.29	13.10
Longitude (East)	(deg)	283.15	300.38
E/S Range to SV	(km)	8438.06	8486.02
E/S Elevation to SV	(deg)	64.14	62.54
E/S Altitude	(m)	13.00	9.00
SV Beam Identifier	(#)	TBD	
Telco Offset to Beam Center	(km)	0.36	
Modulation Parameters		Return	
Enter Receiver	Type	MEOLink	
Percentage of Bandwidth	(%)	11%	
Allocated Bandwidth	(MHz)	24.0000	
Channel Symbol Rate	(Msps)	20.0000	
Channel Modulation Type		16APSK	
Channel FEC Rate		0.89802	
Channel Throughput	(Mbps)	71.1303	
Uplink		Return	
E/S Carrier Frequencies	(MHz)	28,280.0000	

E/S Tx HPA Power Level	(W)	40.0
E/S Tx OBO	(dB)	-11.0
E/S Tx Antenna Gain (2.2m)	(dBi)	52.1
E/S Tx EIRP	(dBW)	56.4
E/S Tx RF Link Availability	(%)	Clear
E/S Tx Spreading Loss	(dB)	-149.5
Satellite		Return
SV Rx G/T	(dB/K)	5.4
SV Tx OBO	(dB)	-22.4
SV Tx EIRP Per Channel/Carrier	dBW	26.3
Downlink		Return
E/S Rx Carrier Frequency	(MHz)	18,480.0000
E/S Rx RF Link Availability	(%)	Clear
E/S Rx Antenna Gain (7.3m)	(dBi)	62.0
E/S Rx Effective G/T	(dB/K)	40.5
Total Link		Return
Carrier/Noise Bandwidth	(dB)	13.0
Carrier/Noise Uplink	(dB)	16.1
Carrier/Noise Downlink	(dB)	25.2
Carrier/Intermodulation Im (C/Im)	(dB)	25.0
(C/N)- Total Actual (Es/No)	(dB)	14.1
(C/N)-Total Required	(dB)	14.2
(Eb/No)-Total Actual	(dB)	8.5
(Eb/No)-Total Required	(dB)	8.6
Excess Margin	(dB)	-0.1
Fade Margin	(dB)	16.3

O3b Networks Link Analysis

ECM Link Budget Rpt - 10/06/2015		Tier 2	Tier 2
Parameters	Unit	Rain Up	
Ground parameters		Telco	Teleport
Location		Lima/Peru	Bridgetown/Barbados
Latitude	(deg)	-12.29	13.10
Longitude (East)	(deg)	283.15	300.38
E/S Range to SV	(km)	8438.06	8486.02
E/S Elevation to SV	(deg)	64.14	62.54
E/S Altitude	(m)	13.00	9.00
SV Beam Identifier	(#)	TBD	
Telco Offset to Beam Center	(km)	0.36	
Modulation Parameters		Return	
Enter Receiver	Type	MEOLink	
Percentage of Bandwidth	(%)	11%	
Allocated Bandwidth	(MHz)	24.0000	
Channel Symbol Rate	(Msps)	20.0000	
Channel Modulation Type		16APSK	
Channel FEC Rate		0.83086	
Channel Throughput	(Mbps)	65.8107	
Uplink		Return	
E/S Carrier Frequencies	(MHz)	28,280.0000	
E/S Tx HPA Power Level	(W)	40.0	
E/S Tx OBO	(dB)	-2.0	
E/S Tx Antenna Gain (2.2m)	(dBi)	52.11	
E/S Tx EIRP	(dBW)	65.44	
E/S Tx RF Link Availability	(%)	99.173%	
E/S Tx Spreading Loss	(dB)	-149.5	
Satellite		Return	
SV Rx G/T	(dB/K)	5.4	
SV Tx OBO	(dB)	-23.3	

SV Tx EIRP Per Channel/Carrier	dBW	25.4
Downlink		Return
E/S Rx Carrier Frequency	(MHz)	18,480.0000
E/S Rx RF Link Availability	(%)	Clear
E/S Rx Antenna Gain (7.3m)	(dBi)	62.0
E/S Rx Effective G/T	(dB/K)	40.5
Total Link		Return
Carrier/Noise Bandwidth	(dB)	13.0
Carrier/Noise Uplink	(dB)	15.2
Carrier/Noise Downlink	(dB)	24.4
Carrier/Intermodulation Im (C/Im)	(dB)	24.1
(C/N)- Total Actual (Es/No)	(dB)	13.2
(C/N)-Total Required	(dB)	12.7
(Eb/No)-Total Actual	(dB)	8.0
(Eb/No)-Total Required	(dB)	7.5
Excess Margin	(dB)	0.50
Fade Margin	(dB)	15.4

O3b Networks Link Analysis		
ECM Link Budget Rpt - 10/06/2015	Tier 2	Tier 2
Parameters	Unit	Rain Dn
Ground parameters	Teleport	Telco
Location	Lima/Peru	Bridgetown/Barbados
Latitude	(deg)	-12.29
Longitude (East)	(deg)	13.10
E/S Range to SV	(km)	283.15
E/S Elevation to SV	(deg)	300.38
E/S Altitude	(m)	8438.06
		8486.02
		64.14
		62.54
		13.00
		9.00

SV Beam Identifier	(#)	TBD
Telco Offset to Beam Center	(km)	0.36
Modulation Parameters		Return
Enter Receiver	Type	MEOLink
Percentage of Bandwidth	(%)	11.11%
Allocated Bandwidth	(MHz)	24.0000
Channel Symbol Rate	(Msps)	20.0000
Channel Modulation Type		16APSK
Channel FEC Rate		0.83
Channel Throughput	(Mbps)	65.81
Uplink		Return
E/S Carrier Frequencies	(MHz)	28,280.0000
E/S Tx HPA Power Level	(W)	40.0
E/S Tx OBO	(dB)	-11.0
E/S Tx Antenna Gain (2.2m)	(dBi)	52.11
E/S Tx EIRP	(dBW)	56.44
E/S Tx RF Link Availability	(%)	Clear
E/S Tx Spreading Loss	(dB)	-149.5
Satellite		Return
SV Rx G/T	(dB/K)	5.40
SV Tx OBO	(dB)	-22.38
SV Tx EIRP Per Channel/Carrier	dBW	26.32
Downlink		Return
E/S Rx Carrier Frequency	(MHz)	18,480.0000
E/S Rx RF Link Availability	(%)	99.772%
E/S Rx Antenna Gain (7.3m)	(dBi)	62.04
E/S Rx Effective G/T	(dB/K)	37.53
Total Link		Return
Carrier/Noise Bandwidth	(dB)	13.0
Carrier/Noise Uplink	(dB)	16.12

Carrier/Noise Downlink	(dB)	19.31
Carrier/Intermodulation Im (C/Im)	(dB)	24.96
(C/N)- Total Actual (Es/No)	(dB)	13.19
(C/N)-Total Required	(dB)	12.69
(Eb/No)-Total Actual	(dB)	7.97
(Eb/No)-Total Required	(dB)	7.47
Excess Margin	(dB)	0.50
Fade Margin	(dB)	15.4

**Link budgets for 216 MHz bandwidth carrier in Forward direction from Lima, Peru
gateway to ship**

(clear sky, rain faded uplink, rain faded downlink)

O3b Networks Link Analysis - Tier 2 Service for			
ECM Link Budget Rpt - 10/06/2015		Tier 2	Tier 2
Parameters	Unit	Clear Sky	
Ground parameters		Telco	Teleport
Location		Bridgetown/Barbados	Lima/Peru
Latitude	(deg)	13.10	-12.29
Longitude (East)	(deg)	300.38	283.15
E/S Range to SV	(km)	8486.02	8438.06
E/S Elevation to SV	(deg)	62.54	64.14
E/S Altitude	(m)	9.00	13.00
SV Beam Identifier	(#)	TBD	
Telco Offset to Beam Center	(km)	0.00	
Modulation Parameters		Forward	
Enter Receiver	Type	MEOLink	
Percentage of Bandwidth	(%)	100%	
Allocated Bandwidth	(MHz)	216.0000	
Channel Symbol Rate	(Msps)	180.0000	
Channel Modulation Type		16APSK	
Channel FEC Rate		0.89802	
Channel Throughput	(Mbps)	640.1727	
Uplink		Forward	
E/S Carrier Frequencies	(MHz)	28,280.0000	
E/S Tx HPA Power Level	(W)	500.0	

E/S Tx OBO	(dB)	-13.0
E/S Tx Antenna Gain (7.3m)	(dBi)	65.4
E/S Tx EIRP	(dBW)	69.9
E/S Tx RF Link Availability	(%)	Clear
E/S Tx Spreading Loss	(dB)	-149.6
Satellite		Forward
SV Rx G/T	(dB/K)	5.4
SV Tx OBO	(dB)	-3.8
SV Tx EIRP Per Channel/Carrier	dBW	45.2
Downlink		Forward
E/S Rx Carrier Frequency	(MHz)	18,480.0000
E/S Rx RF Link Availability	(%)	Clear
E/S Rx Antenna Gain (2.2m)	(dBi)	47.8
E/S Rx Effective G/T	(dB/K)	24.4
Total Link		Forward
Carrier/Noise Bandwidth	(dB)	22.6
Carrier/Noise Uplink	(dB)	20.6
Carrier/Noise Downlink	(dB)	18.5
Carrier/Intermodulation Im (C/Im)	(dB)	30.0
(C/N)- Total Actual (Es/No)	(dB)	15.6
(C/N)-Total Required	(dB)	14.2
(Eb/No)-Total Actual	(dB)	10.0
(Eb/No)-Total Required	(dB)	8.6
Excess Margin	(dB)	1.4
Fade Margin	(dB)	17.8

O3b Networks Link Analysis

ECM Link Budget Rpt - 10/06/2015

Tier 2

Tier 2

Parameters	Unit	Rain Up	
Ground parameters		Telco	Teleport
Location		Bridgetown/Barbados	Lima/Peru
Latitude	(deg)	13.10	-12.29
Longitude (East)	(deg)	300.38	283.15
E/S Range to SV	(km)	8486.02	8438.06
E/S Elevation to SV	(deg)	62.54	64.14
E/S Altitude	(m)	9.00	13.00
SV Beam Identifier	(#)	TBD	
Telco Offset to Beam Center	(km)	0.00	
Modulation Parameters		Forward	
Enter Receiver	Type	MEOLink	
Percentage of Bandwidth	(%)	100%	
Allocated Bandwidth	(MHz)	216.0000	
Channel Symbol Rate	(Msps)	180.0000	
Channel Modulation Type		16APSK	
Channel FEC Rate		0.74704	
Channel Throughput	(Mbps)	532.5434	
Uplink		Forward	
E/S Carrier Frequencies	(MHz)	28,280.0000	
E/S Tx HPA Power Level	(W)	500.0	
E/S Tx OBO	(dB)	-4.0	
E/S Tx Antenna Gain (7.3m)	(dBi)	65.39	
E/S Tx EIRP	(dBW)	78.89	
E/S Tx RF Link Availability	(%)	99.967%	
E/S Tx Spreading Loss	(dB)	-149.6	
Satellite		Forward	
SV Rx G/T	(dB/K)	5.4	
SV Tx OBO	(dB)	-3.8	
SV Tx EIRP Per Channel/Carrier	dBW	45.2	

Downlink		Forward
E/S Rx Carrier Frequency	(MHz)	18,480.0000
E/S Rx RF Link Availability	(%)	Clear
E/S Rx Antenna Gain (2.2m)	(dBi)	47.8
E/S Rx Effective G/T	(dB/K)	24.4
Total Link		Forward
Carrier/Noise Bandwidth	(dB)	22.6
Carrier/Noise Uplink	(dB)	13.7
Carrier/Noise Downlink	(dB)	18.5
Carrier/Intermodulation Im (C/Im)	(dB)	30.0
(C/N)- Total Actual (Es/No)	(dB)	11.8
(C/N)-Total Required	(dB)	11.3
(Eb/No)-Total Actual	(dB)	7.0
(Eb/No)-Total Required	(dB)	6.5
Excess Margin	(dB)	0.49
Fade Margin	(dB)	14.0

O3b Networks Link Analysis		
ECM Link Budget Rpt - 10/06/2015	Tier 2	Tier 2
Parameters	Unit	Rain Dn
Ground parameters	Telco	Teleport
Location	Bridgetown/Barbados	Lima/Peru
Latitude	13.10	-12.29
Longitude (East)	300.38	283.15
E/S Range to SV	8486.02	8438.06
E/S Elevation to SV	62.54	64.14
E/S Altitude	9.00	13.00
SV Beam Identifier	TBD	

Telco Offset to Beam Center	(km)	0.00
Modulation Parameters		Forward
Enter Receiver	Type	MEOLink
Percentage of Bandwidth	(%)	100.00%
Allocated Bandwidth	(MHz)	216.0000
Channel Symbol Rate	(Msps)	180.0000
Channel Modulation Type		16APSK
Channel FEC Rate		0.75
Channel Throughput	(Mbps)	532.54
Uplink		Forward
E/S Carrier Frequencies	(MHz)	28,280.0000
E/S Tx HPA Power Level	(W)	500.0
E/S Tx OBO	(dB)	-13.0
E/S Tx Antenna Gain (7.3m)	(dBi)	65.39
E/S Tx EIRP	(dBW)	69.89
E/S Tx RF Link Availability	(%)	Clear
E/S Tx Spreading Loss	(dB)	-149.6
Satellite		Forward
SV Rx G/T	(dB/K)	5.35
SV Tx OBO	(dB)	-3.80
SV Tx EIRP Per Channel/Carrier	dBW	45.21
Downlink		Forward
E/S Rx Carrier Frequency	(MHz)	18,480.0000
E/S Rx RFF Link Availability	(%)	98.932%
E/S Rx Antenna Gain (2.2m)	(dBi)	47.83
E/S Rx Effective G/T	(dB/K)	22.14
Total Link		Forward
Carrier/Noise Bandwidth	(dB)	22.6
Carrier/Noise Uplink	(dB)	20.55
Carrier/Noise Downlink	(dB)	12.76

Carrier/Intermodulation Im (C/Im)	(dB)	30.00
(C/N)- Total Actual (Es/No)	(dB)	11.78
(C/N)-Total Required	(dB)	11.28
(Eb/No)-Total Actual	(dB)	7.03
(Eb/No)-Total Required	(dB)	6.53
Excess Margin	(dB)	0.50
Fade Margin	(dB)	14.0

**Link budgets for 216 MHz bandwidth carrier in Return direction from ship to Lima, Peru
gateway**

(clear sky, rain faded uplink, rain faded downlink)

O3b Networks Link Analysis - Tier 2 Service for			
ECM Link Budget Rpt - 10/06/2015		Tier 2	Tier 2
Parameters	Unit	Clear Sky	
Ground parameters		Teleport	Telco
Location		Lima/Peru	Bridgetown/Barbados
Latitude	(deg)	-12.29	13.10
Longitude (East)	(deg)	283.15	300.38
E/S Range to SV	(km)	8438.06	8486.02
E/S Elevation to SV	(deg)	64.14	62.54
E/S Altitude	(m)	13.00	9.00
SV Beam Identifier	(#)	TBD	
Telco Offset to Beam Center	(km)	0.36	
Modulation Parameters		Return	
Enter Receiver	Type	MEOLink	
Percentage of Bandwidth	(%)	100%	
Allocated Bandwidth	(MHz)	216.0000	
Channel Symbol Rate	(Msps)	180.0000	
Channel Modulation Type		16APSK	
Channel FEC Rate		0.66420	
Channel Throughput	(Mbps)	473.4891	
Uplink		Return	
E/S Carrier Frequencies	(MHz)	28,280.0000	
E/S Tx HPA Power Level	(W)	40.0	

E/S Tx OBO	(dB)	-5.0
E/S Tx Antenna Gain (2.2m)	(dBi)	52.1
E/S Tx EIRP	(dBW)	62.4
E/S Tx RF Link Availability	(%)	Clear
E/S Tx Spreading Loss	(dB)	-149.5
Satellite		Return
SV Rx G/T	(dB/K)	5.4
SV Tx OBO	(dB)	-13.4
SV Tx EIRP Per Channel/Carrier	dBW	35.3
Downlink		Return
E/S Rx Carrier Frequency	(MHz)	18,480.0000
E/S Rx RF Link Availability	(%)	Clear
E/S Rx Antenna Gain (7.3m)	(dBi)	62.0
E/S Rx Effective G/T	(dB/K)	40.5
Total Link		Return
Carrier/Noise Bandwidth	(dB)	22.6
Carrier/Noise Uplink	(dB)	12.6
Carrier/Noise Downlink	(dB)	24.7
Carrier/Intermodulation Im (C/Im)	(dB)	24.4
(C/N)- Total Actual (Es/No)	(dB)	11.2
(C/N)-Total Required	(dB)	10.1
(Eb/No)-Total Actual	(dB)	7.0
(Eb/No)-Total Required	(dB)	5.8
Excess Margin	(dB)	1.1
Fade Margin	(dB)	13.4

O3b Networks Link Analysis		
ECM Link Budget Rpt - 10/06/2015	Tier 2	Tier 2

Parameters	Unit	Rain Up	
Ground parameters		Teleport	Telco
Location		Lima/Peru	Bridgetown/Barbados
Latitude	(deg)	-12.29	13.10
Longitude (East)	(deg)	283.15	300.38
E/S Range to SV	(km)	8438.06	8486.02
E/S Elevation to SV	(deg)	64.14	62.54
E/S Altitude	(m)	13.00	9.00
SV Beam Identifier	(#)	TBD	
Telco Offset to Beam Center	(km)	0.36	
Modulation Parameters		Return	
Enter Receiver	Type	MEOLink	
Percentage of Bandwidth	(%)	100%	
Allocated Bandwidth	(MHz)	216.0000	
Channel Symbol Rate	(Msps)	180.0000	
Channel Modulation Type		8PSK	
Channel FEC Rate		0.59704	
Channel Throughput	(Mbps)	319.2095	
Uplink		Return	
E/S Carrier Frequencies	(MHz)	28,280.0000	
E/S Tx HPA Power Level	(W)	40.0	
E/S Tx OBO	(dB)	-2.0	
E/S Tx Antenna Gain (2.2m)	(dBi)	52.11	
E/S Tx EIRP	(dBW)	65.44	
E/S Tx RF Link Availability	(%)	98.763%	
E/S Tx Spreading Loss	(dB)	-149.5	
Satellite		Return	
SV Rx G/T	(dB/K)	5.4	
SV Tx OBO	(dB)	-17.7	
SV Tx EIRP Per Channel/Carrier	dBW	31.0	

Downlink		Return
E/S Rx Carrier Frequency	(MHz)	18,480.0000
E/S Rx RF Link Availability	(%)	Clear
E/S Rx Antenna Gain (7.3m)	(dBi)	62.0
E/S Rx Effective G/T	(dB/K)	40.5
Total Link		Return
Carrier/Noise Bandwidth	(dB)	22.6
Carrier/Noise Uplink	(dB)	8.3
Carrier/Noise Downlink	(dB)	20.4
Carrier/Intermodulation Im (C/Im)	(dB)	20.1
(C/N)- Total Actual (Es/No)	(dB)	6.9
(C/N)-Total Required	(dB)	6.4
(Eb/No)-Total Actual	(dB)	4.3
(Eb/No)-Total Required	(dB)	3.9
Excess Margin	(dB)	0.50
Fade Margin	(dB)	9.1

O3b Networks Link Analysis			
ECM Link Budget Rpt - 10/06/2015		Tier 2	Tier 2
Parameters	Unit	Rain Dn	
Ground parameters		Teleport	Telco
Location		Lima/Peru	Bridgetown/Barbados
Latitude	(deg)	-12.29	13.10
Longitude (East)	(deg)	283.15	300.38
E/S Range to SV	(km)	8438.06	8486.02
E/S Elevation to SV	(deg)	64.14	62.54
E/S Altitude	(m)	13.00	9.00
SV Beam Identifier	(#)	TBD	

Telco Offset to Beam Center	(km)	0.36
Modulation Parameters		Return
Enter Receiver	Type	MEOLink
Percentage of Bandwidth	(%)	100.00%
Allocated Bandwidth	(MHz)	216.0000
Channel Symbol Rate	(Msps)	180.0000
Channel Modulation Type		8PSK
Channel FEC Rate		0.60
Channel Throughput	(Mbps)	319.21
Uplink		Return
E/S Carrier Frequencies	(MHz)	28,280.0000
E/S Tx HPA Power Level	(W)	40.0
E/S Tx OBO	(dB)	-5.0
E/S Tx Antenna Gain (2.2m)	(dBi)	52.11
E/S Tx EIRP	(dBW)	62.44
E/S Tx RF Link Availability	(%)	Clear
E/S Tx Spreading Loss	(dB)	-149.5
Satellite		Return
SV Rx G/T	(dB/K)	5.40
SV Tx OBO	(dB)	-13.38
SV Tx EIRP Per Channel/Carrier	dBW	35.32
Downlink		Return
E/S Rx Carrier Frequency	(MHz)	18,480.0000
E/S Rx RF Link Availability	(%)	99.995%
E/S Rx Antenna Gain (7.3m)	(dBi)	62.04
E/S Rx Effective G/T	(dB/K)	36.00
Total Link		Return
Carrier/Noise Bandwidth	(dB)	22.6
Carrier/Noise Uplink	(dB)	12.58
Carrier/Noise Downlink	(dB)	8.77

Carrier/Intermodulation Im (C/Im)	(dB)	24.42
(C/N)- Total Actual (Es/No)	(dB)	6.88
(C/N)-Total Required	(dB)	6.38
(Eb/No)-Total Actual	(dB)	4.35
(Eb/No)-Total Required	(dB)	3.85
Excess Margin	(dB)	0.50
Fade Margin	(dB)	9.1

The next group of link budgets below are for the example with the ship at the more northerly latitude of 40°N / 74°W (286°E).

The first set of link budgets below, with the ship at a more northerly latitude, shows a forward link a 24 MHz bandwidth carrier transmitted up from the Lima, Peru gateway and received by the Thirty-Ship Waiver terminal. It supports 16APSK rate 8/9 under clear sky conditions and 8PSK rate $\frac{3}{4}$ under rain fade conditions. This provides a data throughput of 70 MBits/s under clear-sky and 44 MBits/s under either uplink or downlink rain fade conditions. The downlink EIRP density is consistent with the maximum level used in the demonstration of compliance with the EPFD $\downarrow$ limits provided in Section A.7.1. Under more severe rain fade conditions there is an additional 11.2 dB of margin before the adaptive coding reduces to the QPSK rate $\frac{1}{4}$ level.

The second set of link budgets below show the return link for this northern latitude example with a 24 MHz bandwidth carrier transmitted up from the Thirty-Ship Waiver terminal and received by the Lima, Peru gateway. It supports 16APSK rate 5/6 under clear sky conditions and 8PSK rate 5/6 under rain fade conditions. This provides a data throughput of 65 MBits/s under clear-sky and 65 MBits/s under either uplink or downlink rain fade conditions. The transmit EIRP and hence the transmit PSD density are consistent with the maximum levels used in the demonstration of compliance with the EPFD $\uparrow$ limits provided in Section A.7.2. The use of uplink power control will not result in any additional interference to GSO satellite networks than the clear sky case because the propagation path to the GSO would be equally affected by the rain fade. In addition, under more severe rain fade conditions there is an additional 15.4 dB of margin before the adaptive coding reduces to the QPSK rate $\frac{1}{4}$ level.

The third set of link budgets below show the forward link for the more northern location with a wideband carrier transmitted up from the Lima, Peru gateway and received by the Thirty-Ship Waiver terminal, supporting 16APSK rate 5/6 under clear sky conditions and 8PSK rate $\frac{3}{4}$ under rain fade conditions. This provides a data throughput of 592 MBits/s under clear sky conditions and 399 MBits/s under either uplink or downlink rain fade conditions. The downlink EIRP density is consistent with the maximum level used in the demonstration of compliance with the EPFD $\downarrow$ limits provided in Section A.7.1. Under more severe rain fade conditions there is an additional 11.2 dB of margin before the adaptive coding reduces to the QPSK rate $\frac{1}{4}$ level.

The fourth set of link budgets below show the return link for this location with a 49 MHz bandwidth carrier transmitted up from the Thirty-Ship Waiver terminal and received by the Lima, Peru gateway. It supports 16APSK rate 2/3 under clear sky conditions and QPSK rate 5/6 under rain fade conditions. This provides a data throughput of 473 MBits/s under clear-sky conditions and 296 MBits/s under either uplink or downlink rain fade conditions. The transmit EIRP and hence the transmit PSD density are consistent with the maximum levels used in the demonstration of compliance with the EPFD $\uparrow$ limits provided in Section A.7.2. The use of uplink power control will not result in any additional interference to GSO satellite networks than the clear sky case

because the propagation path to the GSO would be equally affected by the rain fade. In addition, under more severe rain fade conditions there is an additional 8 dB of margin before the adaptive coding reduces to the QPSK rate $\frac{1}{4}$ level.

Maritime Terminal located at Port Liberty, NJ

**Link budgets for 24 MHz bandwidth carrier in Forward direction from Lima, Peru
gateway to ship
(clear sky, rain faded uplink, rain faded downlink)**

O3b Networks Link Analysis - Tier 2 Service for			
ECM Link Budget Rpt - 10/06/2015		Tier 2	Tier 2
Parameters	Unit	Clear Sky	
Ground parameters		Teleport	Telco
Location		Port Liberty/U.S.A.	Lima/Peru
Latitude	(deg)	40.68	-12.29
Longitude (East)	(deg)	-74.07	283.15
E/S Range to SV	(km)	10487.32	8438.06
E/S Elevation to SV	(deg)	25.81	64.14
E/S Altitude	(m)	0.00	13.00
SV Beam Identifier	(#)	TBD	
Telco Offset to Beam Center	(km)	0.00	
Modulation Parameters		Forward	
Enter Receiver	Type	MEOLink	
Percentage of Bandwidth	(%)	11%	
Allocated Bandwidth	(MHz)	24.0000	
Channel Symbol Rate	(Msps)	20.0000	
Channel Modulation Type		16APSK	
Channel FEC Rate		0.88691	

Channel Throughput	(Mbps)	70.2503
Uplink		Forward
E/S Carrier Frequencies	(MHz)	28,280.0000
E/S Tx HPA Power Level	(W)	500.0
E/S Tx OBO	(dB)	-13.0
E/S Tx Antenna Gain (7.3m)	(dBi)	65.4
E/S Tx EIRP	(dBW)	60.3
E/S Tx RF Link Availability	(%)	Clear
E/S Tx Spreading Loss	(dB)	-151.4
Satellite		Forward
SV Rx G/T	(dB/K)	5.4
SV Tx OBO	(dB)	-13.3
SV Tx EIRP Per Channel/Carrier	dBW	35.7
Downlink		Forward
E/S Rx Carrier Frequency	(MHz)	18,480.0000
E/S Rx RF Link Availability	(%)	Clear
E/S Rx Antenna Gain (2.2m)	(dBi)	47.8
E/S Rx Effective G/T	(dB/K)	24.4
Total Link		Forward
Carrier/Noise Bandwidth	(dB)	13.0
Carrier/Noise Uplink	(dB)	20.5
Carrier/Noise Downlink	(dB)	16.4
Carrier/Intermodulation Im (C/Im)	(dB)	30.0
(C/N)- Total Actual (Es/No)	(dB)	14.4
(C/N)-Total Required	(dB)	14.0
(Eb/No)-Total Actual	(dB)	8.9
(Eb/No)-Total Required	(dB)	8.5
Excess Margin	(dB)	0.4
Fade Margin	(dB)	16.7

O3b Networks Link Analysis			
ECM Link Budget Rpt - 10/06/2015		Tier 2	Tier 2
Parameters	Unit	Rain Up	
Ground parameters		Teleport	Telco
Location		Port Liberty/U.S.A.	Lima/Peru
Latitude	(deg)	40.68	-12.29
Longitude (East)	(deg)	-74.07	283.15
E/S Range to SV	(km)	10487.32	8438.06
E/S Elevation to SV	(deg)	25.81	64.14
E/S Altitude	(m)	0.00	13.00
SV Beam Identifier	(#)	TBD	
Telco Offset to Beam Center	(km)	0.00	
Modulation Parameters		Forward	
Enter Receiver	Type	MEOLink	
Percentage of Bandwidth	(%)	11%	
Allocated Bandwidth	(MHz)	24.0000	
Channel Symbol Rate	(Msps)	20.0000	
Channel Modulation Type		8PSK	
Channel FEC Rate		0.74704	
Channel Throughput	(Mbps)	44.3786	
Uplink		Forward	
E/S Carrier Frequencies	(MHz)	28,280.0000	
E/S Tx HPA Power Level	(W)	500.0	
E/S Tx OBO	(dB)	-4.0	
E/S Tx Antenna Gain (7.3m)	(dBi)	65.39	
E/S Tx EIRP	(dBW)	69.35	
E/S Tx RF Link Availability	(%)	99.982%	
E/S Tx Spreading Loss	(dB)	-151.4	
Satellite		Forward	

SV Rx G/T	(dB/K)	5.4
SV Tx OBO	(dB)	-13.3
SV Tx EIRP Per Channel/Carrier	dBW	35.7
Downlink		Forward
E/S Rx Carrier Frequency	(MHz)	18,480.0000
E/S Rx RF Link Availability	(%)	Clear
E/S Rx Antenna Gain (2.2m)	(dBi)	47.8
E/S Rx Effective G/T	(dB/K)	24.4
Total Link		Forward
Carrier/Noise Bandwidth	(dB)	13.0
Carrier/Noise Uplink	(dB)	10.6
Carrier/Noise Downlink	(dB)	16.4
Carrier/Intermodulation Im (C/Im)	(dB)	30.0
(C/N)- Total Actual (Es/No)	(dB)	9.0
(C/N)-Total Required	(dB)	8.5
(Eb/No)-Total Actual	(dB)	5.5
(Eb/No)-Total Required	(dB)	5.0
Excess Margin	(dB)	0.49
Fade Margin	(dB)	11.2

O3b Networks Link Analysis			
ECM Link Budget Rpt - 10/06/2015		Tier 2	Tier 2
Parameters	Unit	Rain Dn	
Ground parameters		Telco	Telco
Location		Port Liberty/U.S.A.	Lima/Peru
Latitude	(deg)	40.68	-12.29
Longitude (East)	(deg)	-74.07	283.15
E/S Range to SV	(km)	10487.32	8438.06

E/S Elevation to SV	(deg)	25.81	64.14
E/S Altitude	(m)	0.00	13.00
SV Beam Identifier	(#)	TBD	
Telco Offset to Beam Center	(km)	0.00	
Modulation Parameters		Forward	
Enter Receiver	Type	MEOLink	
Percentage of Bandwidth	(%)	11.11%	
Allocated Bandwidth	(MHz)	24.0000	
Channel Symbol Rate	(Msps)	20.0000	
Channel Modulation Type		8PSK	
Channel FEC Rate		0.75	
Channel Throughput	(Mbps)	44.38	
Uplink		Forward	
E/S Carrier Frequencies	(MHz)	28,280.0000	
E/S Tx HPA Power Level	(W)	500.0	
E/S Tx OBO	(dB)	-13.0	
E/S Tx Antenna Gain (7.3m)	(dBi)	65.39	
E/S Tx EIRP	(dBW)	60.35	
E/S Tx RF Link Availability	(%)	Clear	
E/S Tx Spreading Loss	(dB)	-151.4	
Satellite		Forward	
SV Rx G/T	(dB/K)	5.35	
SV Tx OBO	(dB)	-13.35	
SV Tx EIRP Per Channel/Carrier	dBW	35.73	
Downlink		Forward	
E/S Rx Carrier Frequency	(MHz)	18,480.0000	
E/S Rx RF Link Availability	(%)	99.467%	
E/S Rx Antenna Gain (2.2m)	(dBi)	47.83	
E/S Rx Effective G/T	(dB/K)	21.86	
Total Link		Forward	

Carrier/Noise Bandwidth	(dB)	13.0
Carrier/Noise Uplink	(dB)	20.55
Carrier/Noise Downlink	(dB)	9.47
Carrier/Intermodulation Im (C/Im)	(dB)	30.00
(C/N)- Total Actual (Es/No)	(dB)	8.99
(C/N)-Total Required	(dB)	8.48
(Eb/No)-Total Actual	(dB)	5.49
(Eb/No)-Total Required	(dB)	4.98
Excess Margin	(dB)	0.51
Fade Margin	(dB)	11.2

**Link budgets for 24 MHz bandwidth carrier in Return direction from ship to Lima, Peru
gateway
(clear sky, rain faded uplink, rain faded downlink)**

O3b Networks Link Analysis - Tier 2 Service for			
ECM Link Budget Rpt - 10/06/2015		Tier 2	Tier 2
Parameters	Unit	Clear Sky	
Ground parameters		Teleport	Telco
Location		Lima/Peru	Port Liberty/U.S.A.
Latitude	(deg)	-12.29	40.68
Longitude (East)	(deg)	283.15	-74.07
E/S Range to SV	(km)	8438.06	10487.32
E/S Elevation to SV	(deg)	64.14	25.81
E/S Altitude	(m)	13.00	0.00
SV Beam Identifier	(#)	TBD	
Telco Offset to Beam Center	(km)	0.11	
Modulation Parameters		Return	
Enter Receiver	Type	MEOLink	
Percentage of Bandwidth	(%)	11%	
Allocated Bandwidth	(MHz)	24.0000	
Channel Symbol Rate	(Msps)	20.0000	
Channel Modulation Type		16APSK	
Channel FEC Rate		0.83086	
Channel Throughput	(Mbps)	65.8107	
Uplink		Return	
E/S Carrier Frequencies	(MHz)	28,280.0000	

E/S Tx HPA Power Level	(W)	40.0
E/S Tx OBO	(dB)	-9.0
E/S Tx Antenna Gain (2.2m)	(dBi)	52.1
E/S Tx EIRP	(dBW)	58.4
E/S Tx RF Link Availability	(%)	Clear
E/S Tx Spreading Loss	(dB)	-149.5
Satellite		Return
SV Rx G/T	(dB/K)	5.8
SV Tx OBO	(dB)	-22.6
SV Tx EIRP Per Channel/Carrier	dBW	26.1
Downlink		Return
E/S Rx Carrier Frequency	(MHz)	18,480.0000
E/S Rx RF Link Availability	(%)	Clear
E/S Rx Antenna Gain (7.3m)	(dBi)	62.0
E/S Rx Effective G/T	(dB/K)	40.5
Total Link		Return
Carrier/Noise Bandwidth	(dB)	13.0
Carrier/Noise Uplink	(dB)	15.9
Carrier/Noise Downlink	(dB)	25.0
Carrier/Intermodulation Im (C/Im)	(dB)	24.7
(C/N)- Total Actual (Es/No)	(dB)	14.1
(C/N)-Total Required	(dB)	12.7
(Eb/No)-Total Actual	(dB)	8.9
(Eb/No)-Total Required	(dB)	7.5
Excess Margin	(dB)	1.5
Fade Margin	(dB)	16.4

O3b Networks Link Analysis

ECM Link Budget Rpt - 10/06/2015		Tier 2	Tier 2
Parameters	Unit	Rain Up	
Ground parameters		Teleport	Telco
Location		Lima/Peru	Port Liberty/U.S.A.
Latitude	(deg)	-12.29	40.68
Longitude (East)	(deg)	283.15	-74.07
E/S Range to SV	(km)	8438.06	10487.32
E/S Elevation to SV	(deg)	64.14	25.81
E/S Altitude	(m)	13.00	0.00
SV Beam Identifier	(#)	TBD	
Telco Offset to Beam Center	(km)	0.11	
Modulation Parameters		Return	
Enter Receiver	Type	MEOLink	
Percentage of Bandwidth	(%)	11%	
Allocated Bandwidth	(MHz)	24.0000	
Channel Symbol Rate	(Msps)	20.0000	
Channel Modulation Type		16APSK	
Channel FEC Rate		0.83086	
Channel Throughput	(Mbps)	65.8107	
Uplink		Return	
E/S Carrier Frequencies	(MHz)	28,280.0000	
E/S Tx HPA Power Level	(W)	40.0	
E/S Tx OBO	(dB)	-2.0	
E/S Tx Antenna Gain (2.2m)	(dBi)	52.11	
E/S Tx EIRP	(dBW)	65.44	
E/S Tx RF Link Availability	(%)	99.303%	
E/S Tx Spreading Loss	(dB)	-149.5	
Satellite		Return	
SV Rx G/T	(dB/K)	5.8	
SV Tx OBO	(dB)	-23.6	

SV Tx EIRP Per Channel/Carrier	dBW	25.1
Downlink		Return
E/S Rx Carrier Frequency	(MHz)	18,480.0000
E/S Rx RF Link Availability	(%)	Clear
E/S Rx Antenna Gain (7.3m)	(dBi)	62.0
E/S Rx Effective G/T	(dB/K)	40.5
Total Link		Return
Carrier/Noise Bandwidth	(dB)	13.0
Carrier/Noise Uplink	(dB)	14.9
Carrier/Noise Downlink	(dB)	24.1
Carrier/Intermodulation Im (C/Im)	(dB)	23.8
(C/N)- Total Actual (Es/No)	(dB)	13.2
(C/N)-Total Required	(dB)	12.7
(Eb/No)-Total Actual	(dB)	8.0
(Eb/No)-Total Required	(dB)	7.5
Excess Margin	(dB)	0.50
Fade Margin	(dB)	15.4

O3b Networks Link Analysis			
ECM Link Budget Rpt - 10/06/2015		Tier 2	Tier 2
Parameters	Unit	Rain Dn	
Ground parameters		Telco	Telco
Location		Lima/Peru	Port Liberty/U.S.A.
Latitude	(deg)	-12.29	40.68
Longitude (East)	(deg)	283.15	-74.07
E/S Range to SV	(km)	8438.06	10487.32
E/S Elevation to SV	(deg)	64.14	25.81
E/S Altitude	(m)	13.00	0.00

SV Beam Identifier	(#)	TBD
Telco Offset to Beam Center	(km)	0.11
Modulation Parameters		Return
Enter Receiver	Type	MEOLink
Percentage of Bandwidth	(%)	11.11%
Allocated Bandwidth	(MHz)	24.0000
Channel Symbol Rate	(Msps)	20.0000
Channel Modulation Type		16APSK
Channel FEC Rate		0.83
Channel Throughput	(Mbps)	65.81
Uplink		Return
E/S Carrier Frequencies	(MHz)	28,280.0000
E/S Tx HPA Power Level	(W)	40.0
E/S Tx OBO	(dB)	-9.0
E/S Tx Antenna Gain (2.2m)	(dBi)	52.11
E/S Tx EIRP	(dBW)	58.44
E/S Tx RF Link Availability	(%)	Clear
E/S Tx Spreading Loss	(dB)	-149.5
Satellite		Return
SV Rx G/T	(dB/K)	5.79
SV Tx OBO	(dB)	-22.61
SV Tx EIRP Per Channel/Carrier	dBW	26.09
Downlink		Return
E/S Rx Carrier Frequency	(MHz)	18,480.0000
E/S Rx RF Link Availability	(%)	99.783%
E/S Rx Antenna Gain (7.3m)	(dBi)	62.04
E/S Rx Effective G/T	(dB/K)	37.49
Total Link		Return
Carrier/Noise Bandwidth	(dB)	13.0
Carrier/Noise Uplink	(dB)	15.89

Carrier/Noise Downlink	(dB)	18.97
Carrier/Intermodulation Im (C/Im)	(dB)	24.73
(C/N)- Total Actual (Es/No)	(dB)	13.18
(C/N)-Total Required	(dB)	12.69
(Eb/No)-Total Actual	(dB)	7.96
(Eb/No)-Total Required	(dB)	7.47
Excess Margin	(dB)	0.49
Fade Margin	(dB)	15.4

Link budgets for 216 MHz bandwidth carrier in Forward direction from Lima, Peru
gateway to ship
(clear sky, rain faded uplink, rain faded downlink)

O3b Networks Link Analysis - Tier 2 Service for			
ECM Link Budget Rpt - 10/06/2015		Tier 2	Tier 2
Parameters	Unit	Clear Sky	
Ground parameters		Teleport	Telco
Location		Port Liberty/U.S.A.	Lima/Peru
Latitude	(deg)	40.68	-12.29
Longitude (East)	(deg)	-74.07	283.15
E/S Range to SV	(km)	10487.32	8438.06
E/S Elevation to SV	(deg)	25.81	64.14
E/S Altitude	(m)	0.00	13.00
SV Beam Identifier	(#)	TBD	
Telco Offset to Beam Center	(km)	0.00	
Modulation Parameters		Forward	
Enter Receiver	Type	MEOLink	
Percentage of Bandwidth	(%)	100%	
Allocated Bandwidth	(MHz)	216.0000	
Channel Symbol Rate	(Msps)	180.0000	
Channel Modulation Type		16APSK	
Channel FEC Rate		0.83086	
Channel Throughput	(Mbps)	592.2962	
Uplink		Forward	
E/S Carrier Frequencies	(MHz)	28,280.0000	
E/S Tx HPA Power Level	(W)	500.0	

E/S Tx OBO	(dB)	-13.0
E/S Tx Antenna Gain (7.3m)	(dBi)	65.4
E/S Tx EIRP	(dBW)	69.9
E/S Tx RF Link Availability	(%)	Clear
E/S Tx Spreading Loss	(dB)	-151.4
Satellite		Forward
SV Rx G/T	(dB/K)	5.4
SV Tx OBO	(dB)	-3.8
SV Tx EIRP Per Channel/Carrier	dBW	45.3
Downlink		Forward
E/S Rx Carrier Frequency	(MHz)	18,480.0000
E/S Rx RF Link Availability	(%)	Clear
E/S Rx Antenna Gain (2.2m)	(dBi)	47.8
E/S Rx Effective G/T	(dB/K)	24.4
Total Link		Forward
Carrier/Noise Bandwidth	(dB)	22.6
Carrier/Noise Uplink	(dB)	20.6
Carrier/Noise Downlink	(dB)	16.4
Carrier/Intermodulation Im (C/Im)	(dB)	30.0
(C/N)- Total Actual (Es/No)	(dB)	14.4
(C/N)-Total Required	(dB)	12.7
(Eb/No)-Total Actual	(dB)	9.2
(Eb/No)-Total Required	(dB)	7.5
Excess Margin	(dB)	1.7
Fade Margin	(dB)	16.7

O3b Networks Link Analysis		
ECM Link Budget Rpt - 10/06/2015	Tier 2	Tier 2

Parameters	Unit	Rain Up	
Ground parameters		Teleport	Telco
Location		Port Liberty/U.S.A.	Lima/Peru
Latitude	(deg)	40.68	-12.29
Longitude (East)	(deg)	-74.07	283.15
E/S Range to SV	(km)	10487.32	8438.06
E/S Elevation to SV	(deg)	25.81	64.14
E/S Altitude	(m)	0.00	13.00
SV Beam Identifier	(#)	TBD	
Telco Offset to Beam Center	(km)	0.00	
Modulation Parameters		Forward	
Enter Receiver	Type	MEOLink	
Percentage of Bandwidth	(%)	100%	
Allocated Bandwidth	(MHz)	216.0000	
Channel Symbol Rate	(Msps)	180.0000	
Channel Modulation Type		8PSK	
Channel FEC Rate		0.74704	
Channel Throughput	(Mbps)	399.4075	
Uplink		Forward	
E/S Carrier Frequencies	(MHz)	28,280.0000	
E/S Tx HPA Power Level	(W)	500.0	
E/S Tx OBO	(dB)	-4.0	
E/S Tx Antenna Gain (7.3m)	(dBi)	65.39	
E/S Tx EIRP	(dBW)	78.89	
E/S Tx RF Link Availability	(%)	99.982%	
E/S Tx Spreading Loss	(dB)	-151.4	
Satellite		Forward	
SV Rx G/T	(dB/K)	5.4	
SV Tx OBO	(dB)	-3.8	
SV Tx EIRP Per Channel/Carrier	dBW	45.3	

Downlink		Forward
E/S Rx Carrier Frequency	(MHz)	18,480.0000
E/S Rx RF Link Availability	(%)	Clear
E/S Rx Antenna Gain (2.2m)	(dBi)	47.8
E/S Rx Effective G/T	(dB/K)	24.4
Total Link		Forward
Carrier/Noise Bandwidth	(dB)	22.6
Carrier/Noise Uplink	(dB)	10.6
Carrier/Noise Downlink	(dB)	16.4
Carrier/Intermodulation Im (C/Im)	(dB)	30.0
(C/N)- Total Actual (Es/No)	(dB)	9.0
(C/N)-Total Required	(dB)	8.5
(Eb/No)-Total Actual	(dB)	5.5
(Eb/No)-Total Required	(dB)	5.0
Excess Margin	(dB)	0.49
Fade Margin	(dB)	11.2

O3b Networks Link Analysis			
ECM Link Budget Rpt - 10/06/2015		Tier 2	Tier 2
Parameters	Unit	Rain Dn	
Ground parameters		Telco	Telco
Location		Port Liberty/U.S.A.	Lima/Peru
Latitude	(deg)	40.68	-12.29
Longitude (East)	(deg)	-74.07	283.15
E/S Range to SV	(km)	10487.32	8438.06
E/S Elevation to SV	(deg)	25.81	64.14
E/S Altitude	(m)	0.00	13.00
SV Beam Identifier	(#)	TBD	

Telco Offset to Beam Center	(km)	0.00
Modulation Parameters		Forward
Enter Receiver	Type	MEOLink
Percentage of Bandwidth	(%)	100.00%
Allocated Bandwidth	(MHz)	216.0000
Channel Symbol Rate	(Msps)	180.0000
Channel Modulation Type		8PSK
Channel FEC Rate		0.75
Channel Throughput	(Mbps)	399.41
Uplink		Forward
E/S Carrier Frequencies	(MHz)	28,280.0000
E/S Tx HPA Power Level	(W)	500.0
E/S Tx OBO	(dB)	-13.0
E/S Tx Antenna Gain (7.3m)	(dBi)	65.39
E/S Tx EIRP	(dBW)	69.89
E/S Tx RF Link Availability	(%)	Clear
E/S Tx Spreading Loss	(dB)	-151.4
Satellite		Forward
SV Rx G/T	(dB/K)	5.35
SV Tx OBO	(dB)	-3.80
SV Tx EIRP Per Channel/Carrier	dBW	45.28
Downlink		Forward
E/S Rx Carrier Frequency	(MHz)	18,480.0000
E/S Rx RF Link Availability	(%)	99.468%
E/S Rx Antenna Gain (2.2m)	(dBi)	47.83
E/S Rx Effective G/T	(dB/K)	21.86
Total Link		Forward
Carrier/Noise Bandwidth	(dB)	22.6
Carrier/Noise Uplink	(dB)	20.55
Carrier/Noise Downlink	(dB)	9.47

Carrier/Intermodulation Im (C/Im)	(dB)	30.00
(C/N)- Total Actual (Es/No)	(dB)	8.99
(C/N)-Total Required	(dB)	8.48
(Eb/No)-Total Actual	(dB)	5.49
(Eb/No)-Total Required	(dB)	4.98
Excess Margin	(dB)	0.51
Fade Margin	(dB)	11.2

Link budgets for 216 MHz bandwidth carrier in Return direction from Lima, Peru
gateway to ship
(clear sky, rain faded uplink, rain faded downlink)

O3b Networks Link Analysis - Tier 2 Service for			
ECM Link Budget Rpt - 10/06/2015		Tier 2	Tier 2
Parameters	Unit	Clear Sky	
Ground parameters		Teleport	Telco
Location		Lima/Peru	Port Liberty/U.S.A.
Latitude	(deg)	-12.29	40.68
Longitude (East)	(deg)	283.15	-74.07
E/S Range to SV	(km)	8438.06	10487.32
E/S Elevation to SV	(deg)	64.14	25.81
E/S Altitude	(m)	13.00	0.00
SV Beam Identifier	(#)	TBD	
Telco Offset to Beam Center	(km)	0.11	
Modulation Parameters		Return	
Enter Receiver	Type	MEOLink	
Percentage of Bandwidth	(%)	100%	
Allocated Bandwidth	(MHz)	216.0000	
Channel Symbol Rate	(Msps)	180.0000	
Channel Modulation Type		16APSK	
Channel FEC Rate		0.66420	
Channel Throughput	(Mbps)	473.4891	
Uplink		Return	
E/S Carrier Frequencies	(MHz)	28,280.0000	
E/S Tx HPA Power Level	(W)	40.0	

E/S Tx OBO	(dB)	-3.0
E/S Tx Antenna Gain (2.2m)	(dBi)	52.1
E/S Tx EIRP	(dBW)	64.4
E/S Tx RF Link Availability	(%)	Clear
E/S Tx Spreading Loss	(dB)	-149.5
Satellite		Return
SV Rx G/T	(dB/K)	5.8
SV Tx OBO	(dB)	-13.6
SV Tx EIRP Per Channel/Carrier	dBW	35.1
Downlink		Return
E/S Rx Carrier Frequency	(MHz)	18,480.0000
E/S Rx RF Link Availability	(%)	Clear
E/S Rx Antenna Gain (7.3m)	(dBi)	62.0
E/S Rx Effective G/T	(dB/K)	40.5
Total Link		Return
Carrier/Noise Bandwidth	(dB)	22.6
Carrier/Noise Uplink	(dB)	12.3
Carrier/Noise Downlink	(dB)	24.5
Carrier/Intermodulation Im (C/Im)	(dB)	24.2
(C/N)- Total Actual (Es/No)	(dB)	11.3
(C/N)-Total Required	(dB)	10.1
(Eb/No)-Total Actual	(dB)	7.1
(Eb/No)-Total Required	(dB)	5.8
Excess Margin	(dB)	1.2
Fade Margin	(dB)	13.6

O3b Networks Link Analysis		
ECM Link Budget Rpt - 10/06/2015	Tier 2	Tier 2

Parameters		Unit	Rain Up	
Ground parameters			Teleport	Telco
Location			Lima/Peru	Port Liberty/U.S.A.
Latitude		(deg)	-12.29	40.68
Longitude (East)		(deg)	283.15	-74.07
E/S Range to SV		(km)	8438.06	10487.32
E/S Elevation to SV		(deg)	64.14	25.81
E/S Altitude		(m)	13.00	0.00
SV Beam Identifier		(#)	TBD	
Telco Offset to Beam Center		(km)	0.11	
Modulation Parameters			Return	
Enter Receiver		Type	MEOLink	
Percentage of Bandwidth		(%)	100%	
Allocated Bandwidth		(MHz)	216.0000	
Channel Symbol Rate		(Msps)	180.0000	
Channel Modulation Type			QPSK	
Channel FEC Rate			0.83086	
Channel Throughput		(Mbps)	296.1481	
Uplink			Return	
E/S Carrier Frequencies		(MHz)	28,280.0000	
E/S Tx HPA Power Level		(W)	40.0	
E/S Tx OBO		(dB)	-2.0	
E/S Tx Antenna Gain (2.2m)		(dBi)	52.11	
E/S Tx EIRP		(dBW)	65.44	
E/S Tx RF Link Availability		(%)	98.944%	
E/S Tx Spreading Loss		(dB)	-149.5	
Satellite			Return	
SV Rx G/T		(dB/K)	5.8	
SV Tx OBO		(dB)	-19.0	
SV Tx EIRP Per Channel/Carrier		dBW	29.7	

Downlink		Return
E/S Rx Carrier Frequency	(MHz)	18,480.0000
E/S Rx RF Link Availability	(%)	Clear
E/S Rx Antenna Gain (7.3m)	(dBi)	62.0
E/S Rx Effective G/T	(dB/K)	40.5
Total Link		Return
Carrier/Noise Bandwidth	(dB)	22.6
Carrier/Noise Uplink	(dB)	7.0
Carrier/Noise Downlink	(dB)	19.1
Carrier/Intermodulation Im (C/Im)	(dB)	18.8
(C/N)- Total Actual (Es/No)	(dB)	6.0
(C/N)-Total Required	(dB)	5.5
(Eb/No)-Total Actual	(dB)	3.8
(Eb/No)-Total Required	(dB)	3.3
Excess Margin	(dB)	0.50
Fade Margin	(dB)	8.2

O3b Networks Link Analysis			
ECM Link Budget Rpt - 10/06/2015		Tier 2	Tier 2
Parameters	Unit	Rain Dn	
Ground parameters		Telco	Telco
Location		Lima/Peru	Port Liberty/U.S.A.
Latitude	(deg)	-12.29	40.68
Longitude (East)	(deg)	283.15	-74.07
E/S Range to SV	(km)	8438.06	10487.32
E/S Elevation to SV	(deg)	64.14	25.81
E/S Altitude	(m)	13.00	0.00
SV Beam Identifier	(#)	TBD	

Telco Offset to Beam Center	(km)	0.11
Modulation Parameters		Return
Enter Receiver	Type	MEOLink
Percentage of Bandwidth	(%)	100.00%
Allocated Bandwidth	(MHz)	216.0000
Channel Symbol Rate	(Msps)	180.0000
Channel Modulation Type		QPSK
Channel FEC Rate		0.83
Channel Throughput	(Mbps)	296.15
Uplink		Return
E/S Carrier Frequencies	(MHz)	28,280.0000
E/S Tx HPA Power Level	(W)	40.0
E/S Tx OBO	(dB)	-3.0
E/S Tx Antenna Gain (2.2m)	(dBi)	52.11
E/S Tx EIRP	(dBW)	64.44
E/S Tx RF Link Availability	(%)	Clear
E/S Tx Spreading Loss	(dB)	-149.5
Satellite		Return
SV Rx G/T	(dB/K)	5.79
SV Tx OBO	(dB)	-13.61
SV Tx EIRP Per Channel/Carrier	dBW	35.09
Downlink		Return
E/S Rx Carrier Frequency	(MHz)	18,480.0000
E/S Rx RF Link Availability	(%)	99.997%
E/S Rx Antenna Gain (7.3m)	(dBi)	62.04
E/S Rx Effective G/T	(dB/K)	35.95
Total Link		Return
Carrier/Noise Bandwidth	(dB)	22.6
Carrier/Noise Uplink	(dB)	12.35
Carrier/Noise Downlink	(dB)	7.40

Carrier/Intermodulation Im (C/Im)	(dB)	24.19
(C/N)- Total Actual (Es/No)	(dB)	5.99
(C/N)-Total Required	(dB)	5.49
(Eb/No)-Total Actual	(dB)	3.78
(Eb/No)-Total Required	(dB)	3.28
Excess Margin	(dB)	0.50
Fade Margin	(dB)	8.2

Annex 5: Comsearch Reports

The 27.6-28.35 GHz uplink band is allocated to the LMDS on a primary basis. FSS operations are allocated on a secondary basis in the same band. Accordingly, O3b's proposed operations in this band must not cause harmful interference to primary LMDS stations.

The Comsearch coordination reports demonstrate that O3b can operate its maritime earth station terminals on a secondary basis in this band at the ports along the U.S. east coast, at the ports in the Gulf of Mexico, and in the waters surrounding Puerto Rico and the U.S. Virgin Islands, without causing harmful interference to LMDS licensees. Comsearch sent a coordination notice to all existing and proposed terrestrial licensees in the band that are within applicable coordination distances.

Only one response was received from any of the incumbent licensees. O3b is coordinating with this licensee to ensure that its operations suffer no harmful interference as a result of O3b maritime operations. Once coordination with this operator is complete, which is expected imminently, O3b will file the outstanding Comsearch reports with the Commission. This is consistent with the Commission's rules as O3b expects to complete coordination shortly after submitting this application.

Ka-Band Earth Station – Bar Harbor, ME

Frequency Coordination Report

28 GHz



Prepared on Behalf of
O3b Networks USA, LLC

September 16, 2015



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1. Summary of Results

On behalf of O3b Networks, Comsearch performed a coordination notice for all existing and proposed terrestrial licenses within the coordination contours of their proposed Ka-Band Earth Stations on Vessels (ESV) in Bar Harbor, Maine, which will transmit at 28 GHz¹. Prior-notification letters were sent to the licensees and a copy of the notification data is provided in section four of this report. The earth station coordination was finalized on September 15, 2015.

No objections were received from any of the incumbent 28 GHz licensees.

2. 28 GHz Common Carrier and LTTS Coordination

In accordance with FCC Rules and Regulations, the Ka-Band ESV system in Bar Harbor, Maine was prior-coordinated by Comsearch. A notification letter and datasheets for this system were sent to the following 28 GHz common carrier fixed microwave licensee on August 13, 2015. This licensee is authorized to operate temporary fixed operations from 27.5 to 29.5 GHz on a nationwide basis.

Licensee	Authorized Geographic Area
Verizon	Continental US

A notification letter and datasheets for the Ka-Band ESV system in Bar Harbor, Maine were also sent to the following 28 GHz local television transmission licensee on August 13, 2015. This licensee is authorized to operate temporary fixed operations from 27.5 to 29.5 GHz on a nationwide basis.

Licensee	Authorized Geographic Area
Information Super Station, LLC	Continental US

No objections were received from the common carrier or local television transmission service incumbents.

¹ The proposed ESV system will operate in the 27.6 – 28.35 GHz portion of the Ka-Band.

3. 28 GHz LMDS Coordination

The proposed ESV system will operate on frequencies that overlap Block A of the LMDS service. The total frequency allocation for Block A of the LMDS spectrum appears below.

Block A: 27.500-28.350 GHz
 29.100-29.250 GHz
 31.075-31.225 GHz

Since no active LMDS licensees were found within the coordination contour of the ESV system, no LMDS coordination was needed.



4. Earth Station Coordination Data

This section presents the data pertinent to the proposed Ka-Band ESV system in Bar Harbor, Maine. This data was circulated to all incumbent licensees in the shared 28 GHz frequency ranges.

COMSEARCH**Earth Station Data Sheet**

19700 Janelia Farm Boulevard, Ashburn, VA 20147
 (703)726-5662 <http://www.comsearch.com>

Date: 08/03/2015
 Job Number: <PCNJobCode>

Administrative Information

Status ENGINEER PROPOSAL
 Call Sign <PCNCallSign>
 Licensee Code O3BNET
 Licensee Name O3b Networks USA, LLC.

Site Information**BAR HARBOR, ME**

Venue Name
 Latitude (NAD 83) 44° 23' 31.3" N
 Longitude (NAD 83) 68° 12' 13.8" W
 Climate Zone B
 Rain Zone 2
 Ground Elevation (AMSL) 0.0 m / 0.0 ft

Link Information

Satellite Type Medium Earth Orbit
 Mode TO - Transmit-Only
 Modulation Digital
 Minimum Elevation Angle 10.0°
 Azimuth Range 0.0° to 360°
 Antenna Centerline (AGL) 15.54 m / 51.0 ft

Antenna Information**Transmit - FCC32**

Manufacturer Orbit
 Model 1.2 Meter
 Gain / Diameter 48.0 dBi / 1.2 m
 3-dB / 15-dB Beamwidth 0.60° / 1.40°

Max Available RF Power (dBW/4 kHz) -17.1
 (dBW/MHz) 6.9

Maximum EIRP (dBW/4 kHz) 30.9
 (dBW/MHz) 54.9

Interference Objectives: Long Term -151.0 dBW/4 kHz 20%
 Short Term -128.0 dBW/4 kHz 0.0025%

Frequency Information**Transmit 28.0 GHz**

Emission / Frequency Range (MHz) 12M0G7D - 216MG7D / 27600.0 - 28350.0

Max Great Circle Coordination Distance 133.3 km / 82.8 mi
 Precipitation Scatter Contour Radius 100.0 km / 62.1 mi

COMSEARCH**Earth Station Data Sheet**

19700 Janelia Farm Boulevard, Ashburn, VA 20147
 (703)726-5662 <http://www.comsearch.com>

Coordination Values**BAR HARBOR, ME**

Licensee Name O3b Networks USA, LLC.
 Latitude (NAD 83) 44° 23' 31.3" N
 Longitude (NAD 83) 68° 12' 13.8" W
 Ground Elevation (AMSL) 0.0 m / 0.0 ft
 Antenna Centerline (AGL) 15.54 m / 51.0 ft
 Antenna Model Orbit 1.2 Meter
 Antenna Mode Transmit 28.0 GHz
 Interference Objectives: Long Term -151.0 dBW/4 kHz 20%
 Short Term -128.0 dBW/4 kHz 0.0025%
 Max Available RF Power -17.1 (dBW/4 kHz)

Azimuth (°)	Horizon Elevation (°)	Antenna Discrimination (°)	Transmit 28.0 GHz	
			Horizon Gain (dBi)	Coordination Distance (km)
0	0.00	105.52	-10.00	100.00
5	0.00	100.56	-10.00	100.00
10	0.00	95.59	-10.00	100.00
15	0.00	90.63	-10.00	100.00
20	0.00	85.66	-10.00	100.00
25	0.00	80.70	-10.00	100.00
30	0.00	75.73	-10.00	100.00
35	0.00	70.77	-10.00	100.00
40	0.00	65.81	-10.00	100.00
45	0.00	60.85	-10.00	100.00
50	0.00	55.90	-10.00	100.00
55	0.00	50.96	-10.00	100.00
60	0.00	46.02	-10.00	100.00
65	0.00	41.09	-9.41	100.00
70	0.00	36.18	-8.18	100.00
75	0.00	31.30	-6.81	100.00
80	0.00	26.45	-5.30	100.00
85	0.00	21.66	-3.54	109.40
90	0.00	16.99	-1.46	114.00
95	0.00	12.57	0.92	116.50
100	0.00	8.78	3.42	131.00
105	0.00	6.78	6.61	100.00
110	0.00	8.03	7.93	100.30
115	0.00	11.53	5.37	133.30
120	0.00	15.84	2.89	129.50
125	0.00	20.47	0.72	123.20
130	0.00	25.23	-1.02	117.80
135	0.00	30.07	-2.46	113.10
140	0.00	34.94	-3.65	109.00
145	0.00	39.85	-4.66	105.50
150	0.00	44.77	-5.35	100.00
155	0.00	49.71	-5.97	100.00
160	0.00	54.65	-6.42	100.00
165	0.00	59.60	-6.64	100.00
170	0.00	64.56	-6.40	100.00
175	0.00	69.52	-6.99	100.00
180	0.00	74.48	-7.27	100.00
185	0.00	79.44	-6.97	100.00

COMSEARCH**Earth Station Data Sheet**

19700 Janelia Farm Boulevard, Ashburn, VA 20147
 (703)726-5662 <http://www.comsearch.com>

Coordination Values**BAR HARBOR, ME**

Licensee Name O3b Networks USA, LLC.
 Latitude (NAD 83) 44° 23' 31.3" N
 Longitude (NAD 83) 68° 12' 13.8" W
 Ground Elevation (AMSL) 0.0 m / 0.0 ft
 Antenna Centerline (AGL) 15.54 m / 51.0 ft
 Antenna Model Orbit 1.2 Meter
 Antenna Mode Transmit 28.0 GHz
 Interference Objectives: Long Term -151.0 dBW/4 kHz 20%
 Short Term -128.0 dBW/4 kHz 0.0025%
 Max Available RF Power -17.1 (dBW/4 kHz)

Azimuth (°)	Horizon Elevation (°)	Antenna Discrimination (°)	Transmit 28.0 GHz	
			Horizon Gain (dBi)	Coordination Distance (km)
190	0.00	84.41	-6.23	100.00
195	0.00	89.37	-5.71	100.00
200	0.00	94.34	-5.08	100.00
205	0.00	99.30	-4.54	100.00
210	0.00	104.27	-4.01	100.00
215	0.00	109.23	-3.31	100.00
220	0.00	114.19	-2.32	100.00
225	0.00	119.15	-1.09	100.00
230	0.00	124.10	0.36	100.00
235	0.00	129.04	1.87	100.00
240	0.00	133.98	4.04	100.00
245	0.00	138.91	7.14	100.00
250	0.00	143.82	10.14	100.00
255	0.00	148.70	8.83	100.00
260	0.00	153.55	4.82	100.00
265	0.00	158.34	1.37	100.00
270	0.00	163.01	-1.27	100.00
275	0.00	167.43	-3.47	100.00
280	0.00	171.22	-5.30	100.00
285	0.00	173.22	-6.87	100.00
290	0.00	171.97	-8.24	100.00
295	0.00	168.47	-9.46	100.00
300	0.00	164.16	-10.00	100.00
305	0.00	159.53	-10.00	100.00
310	0.00	154.77	-10.00	100.00
315	0.00	149.93	-10.00	100.00
320	0.00	145.06	-10.00	100.00
325	0.00	140.15	-10.00	100.00
330	0.00	135.23	-10.00	100.00
335	0.00	130.29	-10.00	100.00
340	0.00	125.35	-10.00	100.00
345	0.00	120.40	-10.00	100.00
350	0.00	115.44	-10.00	100.00
355	0.00	110.48	-10.00	100.00

COMSEARCH**Earth Station Data Sheet**

19700 Janelia Farm Boulevard, Ashburn, VA 20147
 (703)726-5662 <http://www.comsearch.com>

Date: 08/03/2015
 Job Number: <PCNJobCode>

Administrative Information

Status ENGINEER PROPOSAL
 Call Sign <PCNCallSign>
 Licensee Code O3BNET
 Licensee Name O3b Networks USA, LLC.

Site Information**BAR HARBOR, ME**

Venue Name
 Latitude (NAD 83) 44° 23' 31.3" N
 Longitude (NAD 83) 68° 12' 13.8" W
 Climate Zone B
 Rain Zone 2
 Ground Elevation (AMSL) 0.0 m / 0.0 ft

Link Information

Satellite Type Medium Earth Orbit
 Mode TO - Transmit-Only
 Modulation Digital
 Minimum Elevation Angle 10.0°
 Azimuth Range 0.0° to 360°
 Antenna Centerline (AGL) 15.54 m / 51.0 ft

Antenna Information**Transmit - FCC32**

Manufacturer Orbit
 Model 2.2 Meter
 Gain / Diameter 52.5 dBi / 2.2 m
 3-dB / 15-dB Beamwidth 0.14° / 0.32°

Max Available RF Power (dBW/4 kHz) -22.1
 (dBW/MHz) 1.9

Maximum EIRP (dBW/4 kHz) 30.4
 (dBW/MHz) 54.4

Interference Objectives: Long Term -151.0 dBW/4 kHz 20%
 Short Term -128.0 dBW/4 kHz 0.0025%

Frequency Information**Transmit 28.0 GHz**

Emission / Frequency Range (MHz) 12M0G7D - 216MG7D / 27600.0 - 28350.0

Max Great Circle Coordination Distance 133.3 km / 82.8 mi
 Precipitation Scatter Contour Radius 100.0 km / 62.1 mi

COMSEARCH**Earth Station Data Sheet**

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Coordination Values**BAR HARBOR, ME**

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 Longitude (NAD 83) 68° 12' 13.8" W
 Ground Elevation (AMSL) 0.0 m / 0.0 ft
 Antenna Centerline (AGL) 15.54 m / 51.0 ft
 Antenna Model Orbit 2.2 Meter
 Antenna Mode Transmit 28.0 GHz
 Interference Objectives: Long Term -151.0 dBW/4 kHz 20%
 Short Term -128.0 dBW/4 kHz 0.0025%
 Max Available RF Power -22.1 (dBW/4 kHz)

Azimuth (°)	Horizon Elevation (°)	Antenna Discrimination (°)	Transmit 28.0 GHz	
			Horizon Gain (dBi)	Coordination Distance (km)
0	0.00	105.52	-10.00	100.00
5	0.00	100.56	-10.00	100.00
10	0.00	95.59	-10.00	100.00
15	0.00	90.63	-10.00	100.00
20	0.00	85.66	-10.00	100.00
25	0.00	80.70	-10.00	100.00
30	0.00	75.73	-10.00	100.00
35	0.00	70.77	-10.00	100.00
40	0.00	65.81	-10.00	100.00
45	0.00	60.85	-10.00	100.00
50	0.00	55.90	-10.00	100.00
55	0.00	50.96	-10.00	100.00
60	0.00	46.02	-10.00	100.00
65	0.00	41.09	-9.41	100.00
70	0.00	36.18	-8.18	100.00
75	0.00	31.30	-6.81	100.00
80	0.00	26.45	-5.30	100.00
85	0.00	21.66	-3.54	109.40
90	0.00	16.99	-1.46	114.00
95	0.00	12.57	0.92	116.50
100	0.00	8.78	3.42	131.00
105	0.00	6.78	6.61	100.00
110	0.00	8.03	7.93	100.30
115	0.00	11.53	5.37	133.30
120	0.00	15.84	2.89	129.50
125	0.00	20.47	0.72	123.20
130	0.00	25.23	-1.02	117.80
135	0.00	30.07	-2.46	113.10
140	0.00	34.94	-3.65	109.00
145	0.00	39.85	-4.66	105.50
150	0.00	44.77	-5.35	100.00
155	0.00	49.71	-5.97	100.00
160	0.00	54.65	-6.42	100.00
165	0.00	59.60	-6.64	100.00
170	0.00	64.56	-6.40	100.00
175	0.00	69.52	-6.99	100.00
180	0.00	74.48	-7.27	100.00
185	0.00	79.44	-6.97	100.00

COMSEARCH**Earth Station Data Sheet**

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 Ground Elevation (AMSL) 0.0 m / 0.0 ft
 Antenna Centerline (AGL) 15.54 m / 51.0 ft
 Antenna Model Orbit 2.2 Meter
 Antenna Mode Transmit 28.0 GHz
 Interference Objectives: Long Term -151.0 dBW/4 kHz 20%
 Short Term -128.0 dBW/4 kHz 0.0025%
 Max Available RF Power -22.1 (dBW/4 kHz)

Azimuth (°)	Horizon Elevation (°)	Antenna Discrimination (°)	Transmit 28.0 GHz	
			Horizon Gain (dBi)	Coordination Distance (km)
190	0.00	84.41	-6.23	100.00
195	0.00	89.37	-5.71	100.00
200	0.00	94.34	-5.08	100.00
205	0.00	99.30	-4.54	100.00
210	0.00	104.27	-4.01	100.00
215	0.00	109.23	-3.31	100.00
220	0.00	114.19	-2.32	100.00
225	0.00	119.15	-1.09	100.00
230	0.00	124.10	0.36	100.00
235	0.00	129.04	1.87	100.00
240	0.00	133.98	4.04	100.00
245	0.00	138.91	7.14	100.00
250	0.00	143.82	10.14	100.00
255	0.00	148.70	8.83	100.00
260	0.00	153.55	4.82	100.00
265	0.00	158.34	1.37	100.00
270	0.00	163.01	-1.27	100.00
275	0.00	167.43	-3.47	100.00
280	0.00	171.22	-5.30	100.00
285	0.00	173.22	-6.87	100.00
290	0.00	171.97	-8.24	100.00
295	0.00	168.47	-9.46	100.00
300	0.00	164.16	-10.00	100.00
305	0.00	159.53	-10.00	100.00
310	0.00	154.77	-10.00	100.00
315	0.00	149.93	-10.00	100.00
320	0.00	145.06	-10.00	100.00
325	0.00	140.15	-10.00	100.00
330	0.00	135.23	-10.00	100.00
335	0.00	130.29	-10.00	100.00
340	0.00	125.35	-10.00	100.00
345	0.00	120.40	-10.00	100.00
350	0.00	115.44	-10.00	100.00
355	0.00	110.48	-10.00	100.00



5. Contact Information

For questions or information regarding the 28 GHz Frequency Coordination Report, please contact:

Contact person:	Joanna Lynch
Title:	Manager, Spectrum & Data Solutions
Company:	Comsearch
Address:	19700 Janelia Farm Blvd., Ashburn, VA 20147
Telephone:	703-726-5711
Fax:	703-726-5599
Email:	jlynch@comsearch.com
Web site:	www.comsearch.com

Ka-Band Earth Station – Boston, MA

Frequency Coordination Report

28 GHz



Prepared on Behalf of
O3b Networks USA, LLC

September 16, 2015



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1. Summary of Results

On behalf of O3b Networks, Comsearch performed a coordination notice for all existing and proposed terrestrial licenses within the coordination contours of their proposed Ka-Band Earth Stations on Vessels (ESV) in Boston, Massachusetts, which will transmit at 28 GHz¹. Prior-notification letters were sent to the licensees and a copy of the notification data is provided in section four of this report. The earth station coordination was finalized on September 15, 2015.

No objections were received from any of the incumbent 28 GHz licensees. Our notification to the LMDS incumbents was performed under the assumption that the ESV system would be operating on a secondary basis to LMDS Block A operations and a contact at O3b Networks has been provided in case any concerns may arise in the future.

2. 28 GHz Common Carrier and LTTS Coordination

In accordance with FCC Rules and Regulations, the Ka-Band ESV system in Boston, Massachusetts was prior-coordinated by Comsearch. A notification letter and datasheets for this system were sent to the following 28 GHz common carrier fixed microwave licensee on August 13, 2015. This licensee is authorized to operate temporary fixed operations from 27.5 to 29.5 GHz on a nationwide basis.

Licensee	Authorized Geographic Area
Verizon	Continental US

A notification letter and datasheets for the Ka-Band ESV system in Boston, Massachusetts were also sent to the following 28 GHz local television transmission licensee on August 13, 2015. This licensee is authorized to operate temporary fixed operations from 27.5 to 29.5 GHz on a nationwide basis.

Licensee	Authorized Geographic Area
Information Super Station, LLC	Continental US

No objections were received from the common carrier or local television transmission service incumbents.

¹ The proposed ESV system will operate in the 27.6 – 28.35 GHz portion of the Ka-Band.

3. 28 GHz LMDS Coordination

A Notification letter was sent to the following 28 GHz LMDS licensees on August 13, 2015. The proposed earth station will operate on frequencies that overlap Block A of the LMDS service. The total frequency allocation for Block A of the LMDS spectrum appears below.

Block A: 27.500-28.350 GHz
29.100-29.250 GHz
31.075-31.225 GHz

Licensee	Market	Market Name
Nextlink/XO	BTA051 ²	Boston, MA
T-Mobile ³	BTA051	Boston, MA
Nextlink/XO	BTA184	Hartford, CT
T-Mobile ⁴	BTA184	Hartford, CT
Nextlink/XO	BTA274	Manchester-Nashua-Concord, NH
Nextlink/XO	BTA321	New York, NY
T-Mobile ⁵	BTA321	New York, NY
Nextlink/XO	BTA364	Providence-Pawtucket, RI-New Bedford-Fall River, MA
T-Mobile ⁶	BTA364	Providence-Pawtucket, RI-New Bedford-Fall River, MA
Nextlink/XO	BTA427	Springfield-Holyoke, MA
T-Mobile ⁷	BTA427	Springfield-Holyoke, MA
Nextlink/XO	BTA480	Worcester-Fitchburg-Leominster, MA
T-Mobile ⁸	BTA480	Worcester-Fitchburg-Leominster, MA

No objections were received from the LMDS incumbents.

² The proposed ESV system will be located inside BTA051.

³ T-Mobile has acquired spectrum from Nextlink/XO in the Boston, MA Basic Trading Area (BTA).

⁴ T-Mobile has acquired spectrum from Nextlink/XO in the Hartford, CT BTA.

⁵ T-Mobile has acquired spectrum from Nextlink/XO in the New York, NY BTA.

⁶ T-Mobile has acquired spectrum from Nextlink/XO in the Providence-Pawtucket-New Bedford-Fall River BTA.

⁷ T-Mobile has acquired spectrum from Nextlink/XO in the Springfield-Holyoke, MA BTA.

⁸ T-Mobile has acquired spectrum from Nextlink/XO in the Worcester-Fitchburg-Leominster, MA BTA.

4. Earth Station Coordination Data

This section presents the data pertinent to the proposed Ka-Band ESV system in Boston, Massachusetts. This data was circulated to all incumbent licensees in the shared 28 GHz frequency ranges.

COMSEARCH**Earth Station Data Sheet**

19700 Janelia Farm Boulevard, Ashburn, VA 20147
 (703)726-5662 <http://www.comsearch.com>

Date: 08/03/2015
 Job Number: <PCNJobCode>

Administrative Information

Status ENGINEER PROPOSAL
 Call Sign <PCNCallSign>
 Licensee Code O3BNET
 Licensee Name O3b Networks USA, LLC.

Site Information**BOSTON, MA**

Venue Name
 Latitude (NAD 83) 42° 20' 37.2" N
 Longitude (NAD 83) 71° 1' 52.2" W
 Climate Zone B
 Rain Zone 2
 Ground Elevation (AMSL) 0.0 m / 0.0 ft

Link Information

Satellite Type Medium Earth Orbit
 Mode TO - Transmit-Only
 Modulation Digital
 Minimum Elevation Angle 10.0°
 Azimuth Range 0.0° to 360°
 Antenna Centerline (AGL) 15.54 m / 51.0 ft

Antenna Information**Transmit - FCC32**

Manufacturer Orbit
 Model 1.2 Meter
 Gain / Diameter 48.0 dBi / 1.2 m
 3-dB / 15-dB Beamwidth 0.60° / 1.40°

Max Available RF Power (dBW/4 kHz) -17.1
 (dBW/MHz) 6.9

Maximum EIRP (dBW/4 kHz) 30.9
 (dBW/MHz) 54.9

Interference Objectives: Long Term -151.0 dBW/4 kHz 20%
 Short Term -128.0 dBW/4 kHz 0.0025%

Frequency Information**Transmit 28.0 GHz**

Emission / Frequency Range (MHz) 12M0G7D - 216MG7D / 27600.0 - 28350.0

Max Great Circle Coordination Distance 136.4 km / 84.7 mi
 Precipitation Scatter Contour Radius 100.0 km / 62.1 mi

COMSEARCH**Earth Station Data Sheet**

19700 Janelia Farm Boulevard, Ashburn, VA 20147
 (703)726-5662 <http://www.comsearch.com>

Coordination Values**BOSTON, MA**

Licensee Name O3b Networks USA, LLC.
 Latitude (NAD 83) 42° 20' 37.2" N
 Longitude (NAD 83) 71° 1' 52.2" W
 Ground Elevation (AMSL) 0.0 m / 0.0 ft
 Antenna Centerline (AGL) 15.54 m / 51.0 ft
 Antenna Model Orbit 1.2 Meter
 Antenna Mode Transmit 28.0 GHz
 Interference Objectives: Long Term -151.0 dBW/4 kHz 20%
 Short Term -128.0 dBW/4 kHz 0.0025%
 Max Available RF Power -17.1 (dBW/4 kHz)

Azimuth (°)	Horizon Elevation (°)	Antenna Discrimination (°)	Transmit 28.0 GHz	
			Horizon Gain (dBi)	Coordination Distance (km)
0	0.00	102.98	-10.00	100.00
5	0.00	98.00	-10.00	100.00
10	0.00	93.03	-10.00	100.00
15	0.00	88.05	-10.00	100.00
20	0.00	83.07	-10.00	100.00
25	0.00	78.09	-10.00	100.00
30	0.00	73.11	-10.00	100.00
35	0.00	68.13	-10.00	100.00
40	0.00	63.16	-10.00	100.00
45	0.00	58.19	-10.00	100.00
50	0.00	53.22	-10.00	100.00
55	0.00	48.25	-10.00	100.00
60	0.00	43.29	-10.00	100.00
65	0.00	38.34	-9.12	100.00
70	0.00	33.40	-7.87	100.00
75	0.00	28.48	-6.46	100.00
80	0.00	23.59	-4.87	104.70
85	0.00	18.76	-3.06	111.10
90	0.00	14.03	-0.96	118.00
95	0.00	9.59	1.45	125.40
100	0.00	6.05	4.04	132.70
105	0.00	5.59	6.17	135.50
110	0.00	8.71	6.48	136.40
115	0.00	13.04	4.70	134.50
120	0.00	17.73	2.17	127.50
125	0.00	22.55	0.06	121.20
130	0.00	27.43	-1.65	115.70
135	0.00	32.34	-3.07	111.00
140	0.00	37.28	-4.26	106.90
145	0.00	42.23	-5.26	100.10
150	0.00	47.19	-6.10	100.00
155	0.00	52.15	-6.80	100.00
160	0.00	57.12	-7.36	100.00
165	0.00	62.09	-7.79	100.00
170	0.00	67.06	-8.10	100.00
175	0.00	72.04	-8.29	100.00
180	0.00	77.02	-8.35	100.00
185	0.00	82.00	-8.29	100.00

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19700 Janelia Farm Boulevard, Ashburn, VA 20147
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Coordination Values**BOSTON, MA**

Licensee Name O3b Networks USA, LLC.
 Latitude (NAD 83) 42° 20' 37.2" N
 Longitude (NAD 83) 71° 1' 52.2" W
 Ground Elevation (AMSL) 0.0 m / 0.0 ft
 Antenna Centerline (AGL) 15.54 m / 51.0 ft
 Antenna Model Orbit 1.2 Meter
 Antenna Mode Transmit 28.0 GHz
 Interference Objectives: Long Term -151.0 dBW/4 kHz 20%
 Short Term -128.0 dBW/4 kHz 0.0025%
 Max Available RF Power -17.1 (dBW/4 kHz)

Azimuth (°)	Horizon Elevation (°)	Antenna Discrimination (°)	Transmit 28.0 GHz	
			Horizon Gain (dBi)	Coordination Distance (km)
190	0.00	86.97	-8.04	100.00
195	0.00	91.95	-7.79	100.00
200	0.00	96.93	-7.36	100.00
205	0.00	101.91	-6.80	100.00
210	0.00	106.89	-6.10	100.00
215	0.00	111.87	-5.26	100.00
220	0.00	116.84	-4.15	100.00
225	0.00	121.81	-2.75	100.00
230	0.00	126.78	-1.47	100.00
235	0.00	131.75	0.19	111.00
240	0.00	136.71	2.29	125.70
245	0.00	141.66	4.69	134.40
250	0.00	146.60	6.45	136.30
255	0.00	151.52	6.54	117.60
260	0.00	156.41	3.98	132.60
265	0.00	161.24	1.41	125.30
270	0.00	165.97	-0.99	117.90
275	0.00	170.41	-3.08	111.00
280	0.00	173.95	-4.90	104.60
285	0.00	174.41	-6.48	100.00
290	0.00	171.29	-7.88	100.00
295	0.00	166.96	-9.14	100.00
300	0.00	162.27	-10.00	100.00
305	0.00	157.45	-10.00	100.00
310	0.00	152.57	-10.00	100.00
315	0.00	147.66	-10.00	100.00
320	0.00	142.72	-10.00	100.00
325	0.00	137.77	-10.00	100.00
330	0.00	132.81	-10.00	100.00
335	0.00	127.85	-10.00	100.00
340	0.00	122.88	-10.00	100.00
345	0.00	117.91	-10.00	100.00
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Link Information

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 Mode TO - Transmit-Only
 Modulation Digital
 Minimum Elevation Angle 10.0°
 Azimuth Range 0.0° to 360°
 Antenna Centerline (AGL) 15.54 m / 51.0 ft

Antenna Information**Transmit - FCC32**

Manufacturer Orbit
 Model 2.2 Meter
 Gain / Diameter 52.5 dBi / 2.2 m
 3-dB / 15-dB Beamwidth 0.14° / 0.32°

Max Available RF Power (dBW/4 kHz) -22.1
 (dBW/MHz) 1.9

Maximum EIRP (dBW/4 kHz) 30.4
 (dBW/MHz) 54.4

Interference Objectives: Long Term -151.0 dBW/4 kHz 20%
 Short Term -128.0 dBW/4 kHz 0.0025%

Frequency Information**Transmit 28.0 GHz**

Emission / Frequency Range (MHz) 12M0G7D - 216MG7D / 27600.0 - 28350.0

Max Great Circle Coordination Distance 136.4 km / 84.7 mi
 Precipitation Scatter Contour Radius 100.0 km / 62.1 mi

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 Max Available RF Power -22.1 (dBW/4 kHz)

Azimuth (°)	Horizon Elevation (°)	Antenna Discrimination (°)	Transmit 28.0 GHz	
			Horizon Gain (dBi)	Coordination Distance (km)
0	0.00	102.98	-10.00	100.00
5	0.00	98.00	-10.00	100.00
10	0.00	93.03	-10.00	100.00
15	0.00	88.05	-10.00	100.00
20	0.00	83.07	-10.00	100.00
25	0.00	78.09	-10.00	100.00
30	0.00	73.11	-10.00	100.00
35	0.00	68.13	-10.00	100.00
40	0.00	63.16	-10.00	100.00
45	0.00	58.19	-10.00	100.00
50	0.00	53.22	-10.00	100.00
55	0.00	48.25	-10.00	100.00
60	0.00	43.29	-10.00	100.00
65	0.00	38.34	-9.12	100.00
70	0.00	33.40	-7.87	100.00
75	0.00	28.48	-6.46	100.00
80	0.00	23.59	-4.87	104.70
85	0.00	18.76	-3.06	111.10
90	0.00	14.03	-0.96	118.00
95	0.00	9.59	1.45	125.40
100	0.00	6.05	4.04	132.70
105	0.00	5.59	6.17	135.50
110	0.00	8.71	6.48	136.40
115	0.00	13.04	4.70	134.50
120	0.00	17.73	2.17	127.50
125	0.00	22.55	0.06	121.20
130	0.00	27.43	-1.65	115.70
135	0.00	32.34	-3.07	111.00
140	0.00	37.28	-4.26	106.90
145	0.00	42.23	-5.26	100.10
150	0.00	47.19	-6.10	100.00
155	0.00	52.15	-6.80	100.00
160	0.00	57.12	-7.36	100.00
165	0.00	62.09	-7.79	100.00
170	0.00	67.06	-8.10	100.00
175	0.00	72.04	-8.29	100.00
180	0.00	77.02	-8.35	100.00
185	0.00	82.00	-8.29	100.00

COMSEARCH**Earth Station Data Sheet**

19700 Janelia Farm Boulevard, Ashburn, VA 20147
 (703)726-5662 <http://www.comsearch.com>

Coordination Values**BOSTON, MA**

Licensee Name O3b Networks USA, LLC.
 Latitude (NAD 83) 42° 20' 37.2" N
 Longitude (NAD 83) 71° 1' 52.2" W
 Ground Elevation (AMSL) 0.0 m / 0.0 ft
 Antenna Centerline (AGL) 15.54 m / 51.0 ft
 Antenna Model Orbit 2.2 Meter
 Antenna Mode Transmit 28.0 GHz
 Interference Objectives: Long Term -151.0 dBW/4 kHz 20%
 Short Term -128.0 dBW/4 kHz 0.0025%
 Max Available RF Power -22.1 (dBW/4 kHz)

Azimuth (°)	Horizon Elevation (°)	Antenna Discrimination (°)	Transmit 28.0 GHz	
			Horizon Gain (dBi)	Coordination Distance (km)
190	0.00	86.97	-8.04	100.00
195	0.00	91.95	-7.79	100.00
200	0.00	96.93	-7.36	100.00
205	0.00	101.91	-6.80	100.00
210	0.00	106.89	-6.10	100.00
215	0.00	111.87	-5.26	100.10
220	0.00	116.84	-4.15	100.00
225	0.00	121.81	-2.75	100.00
230	0.00	126.78	-1.47	100.00
235	0.00	131.75	0.19	111.00
240	0.00	136.71	2.29	125.70
245	0.00	141.66	4.69	134.40
250	0.00	146.60	6.45	136.30
255	0.00	151.52	6.54	117.60
260	0.00	156.41	3.98	132.60
265	0.00	161.24	1.41	125.30
270	0.00	165.97	-0.99	117.90
275	0.00	170.41	-3.08	111.00
280	0.00	173.95	-4.90	104.60
285	0.00	174.41	-6.48	100.00
290	0.00	171.29	-7.88	100.00
295	0.00	166.96	-9.14	100.00
300	0.00	162.27	-10.00	100.00
305	0.00	157.45	-10.00	100.00
310	0.00	152.57	-10.00	100.00
315	0.00	147.66	-10.00	100.00
320	0.00	142.72	-10.00	100.00
325	0.00	137.77	-10.00	100.00
330	0.00	132.81	-10.00	100.00
335	0.00	127.85	-10.00	100.00
340	0.00	122.88	-10.00	100.00
345	0.00	117.91	-10.00	100.00
350	0.00	112.94	-10.00	100.00
355	0.00	107.96	-10.00	100.00



5. Contact Information

For questions or information regarding the 28 GHz Frequency Coordination Report, please contact:

Contact person:	Joanna Lynch
Title:	Manager, Spectrum & Data Solutions
Company:	Comsearch
Address:	19700 Janelia Farm Blvd., Ashburn, VA 20147
Telephone:	703-726-5711
Fax:	703-726-5599
Email:	jlynch@comsearch.com
Web site:	www.comsearch.com

Ka-Band Earth Station – Charleston, SC

Frequency Coordination Report

28 GHz



Prepared on Behalf of
O3b Networks USA, LLC

September 16, 2015



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1. Summary of Results

On behalf of O3b Networks, Comsearch performed a coordination notice for all existing and proposed terrestrial licenses within the coordination contours of their proposed Ka-Band Earth Stations on Vessels (ESV) in Charleston, South Carolina, which will transmit at 28 GHz¹. Prior-notification letters were sent to the licensees and a copy of the notification data is provided in section four of this report. The earth station coordination was finalized on September 15, 2015.

No objections were received from any of the incumbent 28 GHz licensees. Our notification to the LMDS incumbents was performed under the assumption that the ESV system would be operating on a secondary basis to LMDS Block A operations and a contact at O3b Networks has been provided in case any concerns may arise in the future.

2. 28 GHz Common Carrier and LTTS Coordination

In accordance with FCC Rules and Regulations, the Ka-Band ESV system in Charleston, South Carolina was prior-coordinated by Comsearch. A notification letter and datasheets for this system were sent to the following 28 GHz common carrier fixed microwave licensees on August 13, 2015. These licensees are authorized to operate temporary fixed operations from 27.5 to 29.5 GHz within specified geographic areas.

Licensee	Authorized Geographic Area
AT&T	Statewide: AL, FL, GA, KY, LA, MS, NC, SC, and TN
Verizon	Continental US

A notification letter and datasheets for the Ka-Band ESV system in Charleston, South Carolina were also sent to the following 28 GHz local television transmission licensee on August 13, 2015. This licensee is authorized to operate temporary fixed operations from 27.5 to 29.5 GHz on a nationwide basis.

Licensee	Authorized Geographic Area
Information Super Station, LLC	Continental US

No objections were received from the common carrier or local television transmission service incumbents.

¹ The proposed ESV system will operate in the 27.6 – 28.35 GHz portion of the Ka-Band.

3. 28 GHz LMDS Coordination

A Notification letter was sent to the following 28 GHz LMDS licensees on August 13, 2015. The proposed earth station will operate on frequencies that overlap Block A of the LMDS service. The total frequency allocation for Block A of the LMDS spectrum appears below.

Block A: 27.500-28.350 GHz
29.100-29.250 GHz
31.075-31.225 GHz

Licensee	Market	Market Name
BroadBand One of the Southeast	BTA026	Augusta, GA
Nextlink/XO	BTA091	Columbia, SC
Horry Telephone Cooperative	BTA312	Myrtle Beach, SC
BroadBand One of the Southeast	BTA410	Savannah, GA

No objections were received from the LMDS incumbents.



4. Earth Station Coordination Data

This section presents the data pertinent to the proposed Ka-Band ESV system in Charleston, South Carolina. This data was circulated to all incumbent licensees in the shared 28 GHz frequency ranges.

COMSEARCH

Earth Station Data Sheet

19700 Janelia Farm Boulevard, Ashburn, VA 20147
(703)726-5662 <http://www.comsearch.com>

Date: 08/04/2015
Job Number: <PCNJobCode>

Administrative Information

Status: ENGINEER PROPOSAL
Call Sign: <PCNCallSign>
Licensee Code: O3BNET
Licensee Name: O3b Networks USA, LLC.

Site Information

CHARLESTON, SC
Venue Name
Latitude (NAD 83): 32° 47' 12.7" N
Longitude (NAD 83): 79° 55' 43.2" W
Climate Zone: B
Rain Zone: 1
Ground Elevation (AMSL): 0.0 m / 0.0 ft

Link Information

Satellite Type: Medium Earth Orbit
Mode: TO - Transmit-Only
Modulation: Digital
Minimum Elevation Angle: 10.0°
Azimuth Range: 0.0° to 360°
Antenna Centerline (AGL): 15.54 m / 51.0 ft

Antenna Information

Transmit - FCC32
Manufacturer: Orbit
Model: 1.2 Meter
Gain / Diameter: 48.0 dBi / 1.2 m
3-dB / 15-dB Beamwidth: 0.60° / 1.40°

Max Available RF Power (dBW/4 kHz): -17.1
(dBW/MHz): 6.9

Maximum EIRP (dBW/4 kHz): 30.9
(dBW/MHz): 54.9

Interference Objectives: Long Term: -151.0 dBW/4 kHz 20%
Short Term: -128.0 dBW/4 kHz 0.0025%

Frequency Information

Transmit 28.0 GHz
Emission / Frequency Range (MHz): 12M0G7D - 216MG7D / 27600.0 - 28350.0

Max Great Circle Coordination Distance: 135.6 km / 84.2 mi
Precipitation Scatter Contour Radius: 100.0 km / 62.1 mi

COMSEARCH**Earth Station Data Sheet**

19700 Janelia Farm Boulevard, Ashburn, VA 20147
(703)726-5662 <http://www.comsearch.com>

Coordination Values**CHARLESTON, SC**

Licensee Name O3b Networks USA, LLC.
 Latitude (NAD 83) 32° 47' 12.7" N
 Longitude (NAD 83) 79° 55' 43.2" W
 Ground Elevation (AMSL) 0.0 m / 0.0 ft
 Antenna Centerline (AGL) 15.54 m / 51.0 ft
 Antenna Model Orbit 1.2 Meter
 Antenna Mode Transmit 28.0 GHz
 Interference Objectives: Long Term -151.0 dBW/4 kHz 20%
 Short Term -128.0 dBW/4 kHz 0.0025%
 Max Available RF Power -17.1 (dBW/4 kHz)

Azimuth (°)	Horizon Elevation (°)	Antenna Discrimination (°)	Transmit 28.0 GHz	
			Horizon Gain (dBi)	Coordination Distance (km)
0	0.00	95.50	-10.00	100.00
5	0.00	90.50	-10.00	100.00
10	0.00	85.50	-10.00	100.00
15	0.00	80.50	-10.00	100.00
20	0.00	75.50	-10.00	100.00
25	0.00	70.50	-10.00	100.00
30	0.00	65.50	-10.00	100.00
35	0.00	60.50	-10.00	100.00
40	0.00	55.50	-10.00	100.00
45	0.00	50.50	-10.00	100.00
50	0.00	45.50	-10.00	100.00
55	0.00	40.50	-10.00	100.00
60	0.00	35.50	-9.10	100.00
65	0.00	30.50	-7.84	100.00
70	0.00	25.50	-6.44	100.00
75	0.00	20.50	-4.86	104.80
80	0.00	15.50	-3.05	111.10
85	0.00	10.50	-0.97	117.90
90	0.00	5.50	1.39	125.20
95	0.00	0.55	3.89	132.30
100	0.00	4.51	5.87	134.70
105	0.00	9.51	6.09	135.30
110	0.00	14.51	4.35	133.50
115	0.00	19.51	1.88	126.60
120	0.00	24.51	-0.50	119.40
125	0.00	29.50	-2.45	113.10
130	0.00	34.50	-4.07	107.50
135	0.00	39.50	-5.44	100.00
140	0.00	44.50	-6.61	100.00
145	0.00	49.50	-7.61	100.00
150	0.00	54.50	-8.47	100.00
155	0.00	59.50	-9.19	100.00
160	0.00	64.50	-9.79	100.00
165	0.00	69.50	-10.00	100.00
170	0.00	74.50	-10.00	100.00
175	0.00	79.50	-10.00	100.00
180	0.00	84.50	-10.00	100.00
185	0.00	89.50	-10.00	100.00

COMSEARCH**Earth Station Data Sheet**

19700 Janelia Farm Boulevard, Ashburn, VA 20147
 (703)726-5662 <http://www.comsearch.com>

Coordination Values**CHARLESTON, SC**

Licensee Name O3b Networks USA, LLC.
 Latitude (NAD 83) 32° 47' 12.7" N
 Longitude (NAD 83) 79° 55' 43.2" W
 Ground Elevation (AMSL) 0.0 m / 0.0 ft
 Antenna Centerline (AGL) 15.54 m / 51.0 ft
 Antenna Model Orbit 1.2 Meter
 Antenna Mode Transmit 28.0 GHz
 Interference Objectives: Long Term -151.0 dBW/4 kHz 20%
 Short Term -128.0 dBW/4 kHz 0.0025%
 Max Available RF Power -17.1 (dBW/4 kHz)

Azimuth (°)	Horizon Elevation (°)	Antenna Discrimination (°)	Transmit 28.0 GHz	
			Horizon Gain (dBi)	Coordination Distance (km)
190	0.00	94.50	-10.00	100.00
195	0.00	99.50	-10.00	100.00
200	0.00	104.50	-9.79	100.00
205	0.00	109.50	-9.19	100.00
210	0.00	114.50	-8.47	100.00
215	0.00	119.50	-7.61	100.00
220	0.00	124.50	-6.61	100.00
225	0.00	129.50	-5.44	100.00
230	0.00	134.50	-4.08	107.50
235	0.00	139.50	-2.45	113.10
240	0.00	144.50	-0.50	119.40
245	0.00	149.50	1.89	126.70
250	0.00	154.50	4.40	133.70
255	0.00	159.50	6.19	135.60
260	0.00	164.50	6.01	135.10
265	0.00	169.50	4.01	132.60
270	0.00	174.50	1.48	125.50
275	0.00	179.45	-0.90	118.20
280	0.00	175.49	-2.99	111.30
285	0.00	170.49	-4.81	104.90
290	0.00	165.49	-6.41	100.00
295	0.00	160.49	-7.81	100.00
300	0.00	155.49	-9.07	100.00
305	0.00	150.50	-10.00	100.00
310	0.00	145.50	-10.00	100.00
315	0.00	140.50	-10.00	100.00
320	0.00	135.50	-10.00	100.00
325	0.00	130.50	-10.00	100.00
330	0.00	125.50	-10.00	100.00
335	0.00	120.50	-10.00	100.00
340	0.00	115.50	-10.00	100.00
345	0.00	110.50	-10.00	100.00
350	0.00	105.50	-10.00	100.00
355	0.00	100.50	-10.00	100.00

COMSEARCH

Earth Station Data Sheet

19700 Janelia Farm Boulevard, Ashburn, VA 20147
(703)726-5662 <http://www.comsearch.com>

Date: 08/04/2015
Job Number: <PCNJobCode>

Administrative Information

Status ENGINEER PROPOSAL
Call Sign <PCNCallSign>
Licensee Code O3BNET
Licensee Name O3b Networks USA, LLC.

Site Information CHARLESTON, SC

Venue Name
Latitude (NAD 83) 32° 47' 12.7" N
Longitude (NAD 83) 79° 55' 43.2" W
Climate Zone B
Rain Zone 1
Ground Elevation (AMSL) 0.0 m / 0.0 ft

Link Information

Satellite Type Medium Earth Orbit
Mode TO - Transmit-Only
Modulation Digital
Minimum Elevation Angle 10.0°
Azimuth Range 0.0° to 360°
Antenna Centerline (AGL) 15.54 m / 51.0 ft

Antenna Information Transmit - FCC32

Manufacturer Orbit
Model 2.2 Meter
Gain / Diameter 52.5 dBi / 2.2 m
3-dB / 15-dB Beamwidth 0.14° / 0.32°

Max Available RF Power (dBW/4 kHz) -22.1
(dBW/MHz) 1.9

Maximum EIRP (dBW/4 kHz) 30.4
(dBW/MHz) 54.4

Interference Objectives: Long Term -151.0 dBW/4 kHz 20%
Short Term -128.0 dBW/4 kHz 0.0025%

Frequency Information Transmit 28.0 GHz

Emission / Frequency Range (MHz) 12M0G7D - 216MG7D / 27600.0 - 28350.0

Max Great Circle Coordination Distance 135.6 km / 84.2 mi
Precipitation Scatter Contour Radius 100.0 km / 62.1 mi

COMSEARCH**Earth Station Data Sheet**

19700 Janelia Farm Boulevard, Ashburn, VA 20147
(703)726-5662 <http://www.comsearch.com>

Coordination Values**CHARLESTON, SC**

Licensee Name O3b Networks USA, LLC.
 Latitude (NAD 83) 32° 47' 12.7" N
 Longitude (NAD 83) 79° 55' 43.2" W
 Ground Elevation (AMSL) 0.0 m / 0.0 ft
 Antenna Centerline (AGL) 15.54 m / 51.0 ft
 Antenna Model Orbit 2.2 Meter
 Antenna Mode Transmit 28.0 GHz
 Interference Objectives: Long Term -151.0 dBW/4 kHz 20%
 Short Term -128.0 dBW/4 kHz 0.0025%
 Max Available RF Power -22.1 (dBW/4 kHz)

Azimuth (°)	Horizon Elevation (°)	Antenna Discrimination (°)	Transmit 28.0 GHz	
			Horizon Gain (dBi)	Coordination Distance (km)
0	0.00	95.50	-10.00	100.00
5	0.00	90.50	-10.00	100.00
10	0.00	85.50	-10.00	100.00
15	0.00	80.50	-10.00	100.00
20	0.00	75.50	-10.00	100.00
25	0.00	70.50	-10.00	100.00
30	0.00	65.50	-10.00	100.00
35	0.00	60.50	-10.00	100.00
40	0.00	55.50	-10.00	100.00
45	0.00	50.50	-10.00	100.00
50	0.00	45.50	-10.00	100.00
55	0.00	40.50	-10.00	100.00
60	0.00	35.50	-9.10	100.00
65	0.00	30.50	-7.84	100.00
70	0.00	25.50	-6.44	100.00
75	0.00	20.50	-4.86	104.80
80	0.00	15.50	-3.05	111.10
85	0.00	10.50	-0.97	117.90
90	0.00	5.50	1.39	125.20
95	0.00	0.55	3.89	132.30
100	0.00	4.51	5.87	134.70
105	0.00	9.51	6.09	135.30
110	0.00	14.51	4.35	133.50
115	0.00	19.51	1.88	126.60
120	0.00	24.51	-0.50	119.40
125	0.00	29.50	-2.45	113.10
130	0.00	34.50	-4.07	107.50
135	0.00	39.50	-5.44	100.00
140	0.00	44.50	-6.61	100.00
145	0.00	49.50	-7.61	100.00
150	0.00	54.50	-8.47	100.00
155	0.00	59.50	-9.19	100.00
160	0.00	64.50	-9.79	100.00
165	0.00	69.50	-10.00	100.00
170	0.00	74.50	-10.00	100.00
175	0.00	79.50	-10.00	100.00
180	0.00	84.50	-10.00	100.00
185	0.00	89.50	-10.00	100.00

COMSEARCH**Earth Station Data Sheet**

19700 Janelia Farm Boulevard, Ashburn, VA 20147
 (703)726-5662 <http://www.comsearch.com>

Coordination Values**CHARLESTON, SC**

Licensee Name O3b Networks USA, LLC.
 Latitude (NAD 83) 32° 47' 12.7" N
 Longitude (NAD 83) 79° 55' 43.2" W
 Ground Elevation (AMSL) 0.0 m / 0.0 ft
 Antenna Centerline (AGL) 15.54 m / 51.0 ft
 Antenna Model Orbit 2.2 Meter
 Antenna Mode Transmit 28.0 GHz
 Interference Objectives: Long Term -151.0 dBW/4 kHz 20%
 Short Term -128.0 dBW/4 kHz 0.0025%
 Max Available RF Power -22.1 (dBW/4 kHz)

Azimuth (°)	Horizon Elevation (°)	Antenna Discrimination (°)	Transmit 28.0 GHz	
			Horizon Gain (dBi)	Coordination Distance (km)
190	0.00	94.50	-10.00	100.00
195	0.00	99.50	-10.00	100.00
200	0.00	104.50	-9.79	100.00
205	0.00	109.50	-9.19	100.00
210	0.00	114.50	-8.47	100.00
215	0.00	119.50	-7.61	100.00
220	0.00	124.50	-6.61	100.00
225	0.00	129.50	-5.44	100.00
230	0.00	134.50	-4.08	107.50
235	0.00	139.50	-2.45	113.10
240	0.00	144.50	-0.50	119.40
245	0.00	149.50	1.89	126.70
250	0.00	154.50	4.40	133.70
255	0.00	159.50	6.19	135.60
260	0.00	164.50	6.01	135.10
265	0.00	169.50	4.01	132.60
270	0.00	174.50	1.48	125.50
275	0.00	179.45	-0.90	118.20
280	0.00	175.49	-2.99	111.30
285	0.00	170.49	-4.81	104.90
290	0.00	165.49	-6.41	100.00
295	0.00	160.49	-7.81	100.00
300	0.00	155.49	-9.07	100.00
305	0.00	150.50	-10.00	100.00
310	0.00	145.50	-10.00	100.00
315	0.00	140.50	-10.00	100.00
320	0.00	135.50	-10.00	100.00
325	0.00	130.50	-10.00	100.00
330	0.00	125.50	-10.00	100.00
335	0.00	120.50	-10.00	100.00
340	0.00	115.50	-10.00	100.00
345	0.00	110.50	-10.00	100.00
350	0.00	105.50	-10.00	100.00
355	0.00	100.50	-10.00	100.00

5. Contact Information

For questions or information regarding the 28 GHz Frequency Coordination Report, please contact:

Contact person:	Joanna Lynch
Title:	Manager, Spectrum & Data Solutions
Company:	Comsearch
Address:	19700 Janelia Farm Blvd., Ashburn, VA 20147
Telephone:	703-726-5711
Fax:	703-726-5599
Email:	jlynch@comsearch.com
Web site:	www.comsearch.com

Ka-Band Earth Station – Ft. Lauderdale, FL

Frequency Coordination Report

28 GHz



Prepared on Behalf of
O3b Networks USA, LLC

September 16, 2015



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1. Summary of Results

On behalf of O3b Networks, Comsearch performed a coordination notice for all existing and proposed terrestrial licenses within the coordination contours of their proposed Ka-Band Earth Stations on Vessels (ESV) in Ft. Lauderdale, Florida, which will transmit at 28 GHz¹. Prior-notification letters were sent to the licensees and a copy of the notification data is provided in section four of this report. The earth station coordination was finalized on September 15, 2015.

No objections were received from any of the incumbent 28 GHz licensees. Our notification to the LMDS incumbents was performed under the assumption that the ESV system would be operating on a secondary basis to LMDS Block A operations and a contact at O3b Networks has been provided in case any concerns may arise in the future.

2. 28 GHz Common Carrier and LTTS Coordination

In accordance with FCC Rules and Regulations, the Ka-Band ESV system in Ft. Lauderdale, Florida was prior-coordinated by Comsearch. A notification letter and datasheets for this system were sent to the following 28 GHz common carrier fixed microwave licensees on August 13, 2015. These licensees are authorized to operate temporary fixed operations from 27.5 to 29.5 GHz within specified geographic areas.

Licensee	Authorized Geographic Area
AT&T	Statewide: AL, FL, GA, KY, LA, MS, NC, SC, and TN
Verizon	Continental US

A notification letter and datasheets for the Ka-Band ESV system in Ft. Lauderdale, Florida were also sent to the following 28 GHz local television transmission licensee on August 13, 2015. This licensee is authorized to operate temporary fixed operations from 27.5 to 29.5 GHz on a nationwide basis.

Licensee	Authorized Geographic Area
Information Super Station, LLC	Continental US

No objections were received from the common carrier or local television transmission service incumbents.

¹ The proposed ESV system will operate in the 27.6 – 28.35 GHz portion of the Ka-Band.

3. 28 GHz LMDS Coordination

A Notification letter was sent to the following 28 GHz LMDS licensees on August 13, 2015. The proposed earth station will operate on frequencies that overlap Block A of the LMDS service. The total frequency allocation for Block A of the LMDS spectrum appears below.

Block A: 27.500-28.350 GHz
29.100-29.250 GHz
31.075-31.225 GHz

Licensee	Market	Market Name
Nextlink/XO	BTA293 ²	Miami-Ft. Lauderdale, FL
T-Mobile ³	BTA293	Miami-Ft. Lauderdale, FL
Nextlink/XO	BTA469	West Palm Beach-Boca Raton, FL
T-Mobile ⁴	BTA469	West Palm Beach-Boca Raton, FL

No objections were received from the LMDS incumbents.

² The proposed ESV system will be located inside BTA293.

³ T-Mobile has acquired spectrum from Nextlink/XO in the Miami-Ft. Lauderdale, FL Basic Trading Area (BTA).

⁴ T-Mobile has acquired spectrum from Nextlink/XO in the West Palm Beach-Boca Raton, FL BTA.

4. Earth Station Coordination Data

This section presents the data pertinent to the proposed Ka-Band ESV system in Ft. Lauderdale, Florida. This data was circulated to all incumbent licensees in the shared 28 GHz frequency ranges.

COMSEARCH**Earth Station Data Sheet**

19700 Janelia Farm Boulevard, Ashburn, VA 20147
 (703)726-5662 <http://www.comsearch.com>

Date: 08/04/2015
 Job Number: <PCNJobCode>

Administrative Information

Status ENGINEER PROPOSAL
 Call Sign <PCNCallSign>
 Licensee Code O3BNET
 Licensee Name O3b Networks USA, LLC.

Site Information FT LAUDERDALE, FL

Venue Name
 Latitude (NAD 83) 26° 5' 9.6" N
 Longitude (NAD 83) 80° 6' 52.2" W
 Climate Zone B
 Rain Zone 1
 Ground Elevation (AMSL) 0.0 m / 0.0 ft

Link Information

Satellite Type Medium Earth Orbit
 Mode TO - Transmit-Only
 Modulation Digital
 Minimum Elevation Angle 10.0°
 Azimuth Range 0.0° to 360°
 Antenna Centerline (AGL) 15.54 m / 51.0 ft

Antenna Information Transmit - FCC32

Manufacturer Orbit
 Model 1.2 Meter
 Gain / Diameter 48.0 dBi / 1.2 m
 3-dB / 15-dB Beamwidth 0.60° / 1.40°

Max Available RF Power (dBW/4 kHz) -17.1
 (dBW/MHz) 6.9

Maximum EIRP (dBW/4 kHz) 30.9
 (dBW/MHz) 54.9

Interference Objectives: Long Term -151.0 dBW/4 kHz 20%
 Short Term -128.0 dBW/4 kHz 0.0025%

Frequency Information Transmit 28.0 GHz

Emission / Frequency Range (MHz) 12M0G7D - 216MG7D / 27600.0 - 28350.0

Max Great Circle Coordination Distance 137.5 km / 85.4 mi
 Precipitation Scatter Contour Radius 100.0 km / 62.1 mi

COMSEARCH**Earth Station Data Sheet**

19700 Janelia Farm Boulevard, Ashburn, VA 20147
 (703)726-5662 <http://www.comsearch.com>

Coordination Values**FT LAUDERDAL, FL**

Licensee Name O3b Networks USA, LLC.
 Latitude (NAD 83) 26° 5' 9.6" N
 Longitude (NAD 83) 80° 6' 52.2" W
 Ground Elevation (AMSL) 0.0 m / 0.0 ft
 Antenna Centerline (AGL) 15.54 m / 51.0 ft
 Antenna Model Orbit 1.2 Meter
 Antenna Mode Transmit 28.0 GHz
 Interference Objectives: Long Term -151.0 dBW/4 kHz 20%
 Short Term -128.0 dBW/4 kHz 0.0025%
 Max Available RF Power -17.1 (dBW/4 kHz)

Azimuth (°)	Horizon Elevation (°)	Antenna Discrimination (°)	Transmit 28.0 GHz	
			Horizon Gain (dBi)	Coordination Distance (km)
0	0.00	94.38	-10.00	100.00
5	0.00	89.38	-10.00	100.00
10	0.00	84.38	-10.00	100.00
15	0.00	79.38	-10.00	100.00
20	0.00	74.38	-10.00	100.00
25	0.00	69.38	-10.00	100.00
30	0.00	64.38	-10.00	100.00
35	0.00	59.38	-10.00	100.00
40	0.00	54.38	-10.00	100.00
45	0.00	49.38	-10.00	100.00
50	0.00	44.38	-10.00	100.00
55	0.00	39.38	-9.43	100.00
60	0.00	34.38	-8.21	100.00
65	0.00	29.38	-6.85	100.00
70	0.00	24.38	-5.31	100.00
75	0.00	19.38	-3.54	109.40
80	0.00	14.39	-1.51	116.20
85	0.00	9.39	0.84	123.60
90	0.00	4.39	3.46	131.10
95	0.00	0.64	5.90	134.80
100	0.00	5.62	6.87	137.50
105	0.00	10.62	5.50	133.70
110	0.00	15.62	2.95	129.70
115	0.00	20.62	0.37	122.10
120	0.00	25.62	-1.91	114.90
125	0.00	30.62	-3.79	108.50
130	0.00	35.62	-5.37	100.00
135	0.00	40.62	-6.71	100.00
140	0.00	45.62	-7.88	100.00
145	0.00	50.62	-8.90	100.00
150	0.00	55.62	-9.78	100.00
155	0.00	60.62	-10.00	100.00
160	0.00	65.62	-10.00	100.00
165	0.00	70.62	-10.00	100.00
170	0.00	75.62	-10.00	100.00
175	0.00	80.62	-10.00	100.00
180	0.00	85.62	-10.00	100.00
185	0.00	90.62	-10.00	100.00

COMSEARCH**Earth Station Data Sheet**

19700 Janelia Farm Boulevard, Ashburn, VA 20147
 (703)726-5662 <http://www.comsearch.com>

Coordination Values	FT LAUDERDAL, FL
Licensee Name	O3b Networks USA, LLC.
Latitude (NAD 83)	26° 5' 9.6" N
Longitude (NAD 83)	80° 6' 52.2" W
Ground Elevation (AMSL)	0.0 m / 0.0 ft
Antenna Centerline (AGL)	15.54 m / 51.0 ft
Antenna Model	Orbit 1.2 Meter
Antenna Mode	Transmit 28.0 GHz
Interference Objectives: Long Term	-151.0 dBW/4 kHz 20%
Short Term	-128.0 dBW/4 kHz 0.0025%
Max Available RF Power	-17.1 (dBW/4 kHz)

Azimuth (°)	Horizon Elevation (°)	Antenna Discrimination (°)	Horizon Gain (dBi)	Transmit 28.0 GHz Coordination Distance (km)
190	0.00	95.62	-10.00	100.00
195	0.00	100.62	-10.00	100.00
200	0.00	105.62	-10.00	100.00
205	0.00	110.62	-10.00	100.00
210	0.00	115.62	-9.78	100.00
215	0.00	120.62	-8.90	100.00
220	0.00	125.62	-7.88	100.00
225	0.00	130.62	-6.71	100.00
230	0.00	135.62	-5.37	100.00
235	0.00	140.62	-3.79	100.00
240	0.00	145.62	-1.91	108.50
245	0.00	150.62	0.36	114.90
250	0.00	155.62	2.90	122.10
255	0.00	160.62	5.37	129.60
260	0.00	165.62	6.65	133.30
265	0.00	170.61	5.67	136.80
270	0.00	175.61	3.28	134.10
275	0.00	179.36	0.71	130.60
280	0.00	174.38	-1.61	123.20
285	0.00	169.38	-3.62	115.90
290	0.00	164.38	-5.36	109.10
295	0.00	159.38	-6.90	100.00
300	0.00	154.38	-8.25	100.00
305	0.00	149.38	-9.47	100.00
310	0.00	144.38	-10.00	100.00
315	0.00	139.38	-10.00	100.00
320	0.00	134.38	-10.00	100.00
325	0.00	129.38	-10.00	100.00
330	0.00	124.38	-10.00	100.00
335	0.00	119.38	-10.00	100.00
340	0.00	114.38	-10.00	100.00
345	0.00	109.38	-10.00	100.00
350	0.00	104.38	-10.00	100.00
355	0.00	99.38	-10.00	100.00

COMSEARCH**Earth Station Data Sheet**

19700 Janelia Farm Boulevard, Ashburn, VA 20147
 (703)726-5662 <http://www.comsearch.com>

Date: 08/04/2015
 Job Number: <PCNJobCode>

Administrative Information

Status ENGINEER PROPOSAL
 Call Sign <PCNCallSign>
 Licensee Code O3BNET
 Licensee Name O3b Networks USA, LLC.

Site Information FT LAUDERDALE, FL

Venue Name
 Latitude (NAD 83) 26° 5' 9.6" N
 Longitude (NAD 83) 80° 6' 52.2" W
 Climate Zone B
 Rain Zone 1
 Ground Elevation (AMSL) 0.0 m / 0.0 ft

Link Information

Satellite Type Medium Earth Orbit
 Mode TO - Transmit-Only
 Modulation Digital
 Minimum Elevation Angle 10.0°
 Azimuth Range 0.0° to 360°
 Antenna Centerline (AGL) 15.54 m / 51.0 ft

Antenna Information Transmit - FCC32

Manufacturer Orbit
 Model 2.2 Meter
 Gain / Diameter 52.5 dBi / 2.2 m
 3-dB / 15-dB Beamwidth 0.14° / 0.32°

Max Available RF Power (dBW/4 kHz) -22.1
 (dBW/MHz) 1.9

Maximum EIRP (dBW/4 kHz) 30.4
 (dBW/MHz) 54.4

Interference Objectives: Long Term -151.0 dBW/4 kHz 20%
 Short Term -128.0 dBW/4 kHz 0.0025%

Frequency Information Transmit 28.0 GHz

Emission / Frequency Range (MHz) 12M0G7D - 216MG7D / 27600.0 - 28350.0

Max Great Circle Coordination Distance 137.5 km / 85.4 mi
 Precipitation Scatter Contour Radius 100.0 km / 62.1 mi

COMSEARCH**Earth Station Data Sheet**

19700 Janelia Farm Boulevard, Ashburn, VA 20147
 (703)726-5662 <http://www.comsearch.com>

Coordination Values**FT LAUDERDAL, FL**

Licensee Name O3b Networks USA, LLC.
 Latitude (NAD 83) 26° 5' 9.6" N
 Longitude (NAD 83) 80° 6' 52.2" W
 Ground Elevation (AMSL) 0.0 m / 0.0 ft
 Antenna Centerline (AGL) 15.54 m / 51.0 ft
 Antenna Model Orbit 2.2 Meter
 Antenna Mode Transmit 28.0 GHz
 Interference Objectives: Long Term -151.0 dBW/4 kHz 20%
 Short Term -128.0 dBW/4 kHz 0.0025%
 Max Available RF Power -22.1 (dBW/4 kHz)

Azimuth (°)	Horizon Elevation (°)	Antenna Discrimination (°)	Transmit 28.0 GHz	
			Horizon Gain (dBi)	Coordination Distance (km)
0	0.00	94.38	-10.00	100.00
5	0.00	89.38	-10.00	100.00
10	0.00	84.38	-10.00	100.00
15	0.00	79.38	-10.00	100.00
20	0.00	74.38	-10.00	100.00
25	0.00	69.38	-10.00	100.00
30	0.00	64.38	-10.00	100.00
35	0.00	59.38	-10.00	100.00
40	0.00	54.38	-10.00	100.00
45	0.00	49.38	-10.00	100.00
50	0.00	44.38	-10.00	100.00
55	0.00	39.38	-9.43	100.00
60	0.00	34.38	-8.21	100.00
65	0.00	29.38	-6.85	100.00
70	0.00	24.38	-5.31	100.00
75	0.00	19.38	-3.54	109.40
80	0.00	14.39	-1.51	116.20
85	0.00	9.39	0.84	123.60
90	0.00	4.39	3.46	131.10
95	0.00	0.64	5.90	134.80
100	0.00	5.62	6.87	137.50
105	0.00	10.62	5.50	133.70
110	0.00	15.62	2.95	129.70
115	0.00	20.62	0.37	122.10
120	0.00	25.62	-1.91	114.90
125	0.00	30.62	-3.79	108.50
130	0.00	35.62	-5.37	100.00
135	0.00	40.62	-6.71	100.00
140	0.00	45.62	-7.88	100.00
145	0.00	50.62	-8.90	100.00
150	0.00	55.62	-9.78	100.00
155	0.00	60.62	-10.00	100.00
160	0.00	65.62	-10.00	100.00
165	0.00	70.62	-10.00	100.00
170	0.00	75.62	-10.00	100.00
175	0.00	80.62	-10.00	100.00
180	0.00	85.62	-10.00	100.00
185	0.00	90.62	-10.00	100.00

COMSEARCH**Earth Station Data Sheet**

19700 Janelia Farm Boulevard, Ashburn, VA 20147
 (703)726-5662 <http://www.comsearch.com>

Coordination Values**FT LAUDERDAL, FL**

Licensee Name O3b Networks USA, LLC.
 Latitude (NAD 83) 26° 5' 9.6" N
 Longitude (NAD 83) 80° 6' 52.2" W
 Ground Elevation (AMSL) 0.0 m / 0.0 ft
 Antenna Centerline (AGL) 15.54 m / 51.0 ft
 Antenna Model Orbit 2.2 Meter
 Antenna Mode Transmit 28.0 GHz
 Interference Objectives: Long Term -151.0 dBW/4 kHz 20%
 Short Term -128.0 dBW/4 kHz 0.0025%
 Max Available RF Power -22.1 (dBW/4 kHz)

Azimuth (°)	Horizon Elevation (°)	Antenna Discrimination (°)	Transmit 28.0 GHz	
			Horizon Gain (dBi)	Coordination Distance (km)
190	0.00	95.62	-10.00	100.00
195	0.00	100.62	-10.00	100.00
200	0.00	105.62	-10.00	100.00
205	0.00	110.62	-10.00	100.00
210	0.00	115.62	-9.78	100.00
215	0.00	120.62	-8.90	100.00
220	0.00	125.62	-7.88	100.00
225	0.00	130.62	-6.71	100.00
230	0.00	135.62	-5.37	100.00
235	0.00	140.62	-3.79	108.50
240	0.00	145.62	-1.91	114.90
245	0.00	150.62	0.36	122.10
250	0.00	155.62	2.90	129.60
255	0.00	160.62	5.37	133.30
260	0.00	165.62	6.65	136.80
265	0.00	170.61	5.67	134.10
270	0.00	175.61	3.28	130.60
275	0.00	179.36	0.71	123.20
280	0.00	174.38	-1.61	115.90
285	0.00	169.38	-3.62	109.10
290	0.00	164.38	-5.36	100.00
295	0.00	159.38	-6.90	100.00
300	0.00	154.38	-8.25	100.00
305	0.00	149.38	-9.47	100.00
310	0.00	144.38	-10.00	100.00
315	0.00	139.38	-10.00	100.00
320	0.00	134.38	-10.00	100.00
325	0.00	129.38	-10.00	100.00
330	0.00	124.38	-10.00	100.00
335	0.00	119.38	-10.00	100.00
340	0.00	114.38	-10.00	100.00
345	0.00	109.38	-10.00	100.00
350	0.00	104.38	-10.00	100.00
355	0.00	99.38	-10.00	100.00



5. Contact Information

For questions or information regarding the 28 GHz Frequency Coordination Report, please contact:

Contact person:	Joanna Lynch
Title:	Manager, Spectrum & Data Solutions
Company:	Comsearch
Address:	19700 Janelia Farm Blvd., Ashburn, VA 20147
Telephone:	703-726-5711
Fax:	703-726-5599
Email:	jlynch@comsearch.com
Web site:	www.comsearch.com

Ka-Band Earth Station – Galveston, TX

Frequency Coordination Report

28 GHz



Prepared on Behalf of
O3b Networks USA, LLC

September 16, 2015



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1. Summary of Results

On behalf of O3b Networks, Comsearch performed a coordination notice for all existing and proposed terrestrial licenses within the coordination contours of their proposed Ka-Band Earth Stations on Vessels (ESV) in Galveston, Texas, which will transmit at 28 GHz¹. Prior-notification letters were sent to the licensees and a copy of the notification data is provided in section four of this report. The earth station coordination was finalized on September 15, 2015.

No objections were received from any of the incumbent 28 GHz licensees. Our notification to the LMDS incumbents was performed under the assumption that the ESV system would be operating on a secondary basis to LMDS Block A operations and a contact at O3b Networks has been provided in case any concerns may arise in the future.

2. 28 GHz Common Carrier and LTTS Coordination

In accordance with FCC Rules and Regulations, the Ka-Band ESV system in Galveston, Texas was prior-coordinated by Comsearch. A notification letter and datasheets for this system were sent to the following 28 GHz common carrier fixed microwave licensees on August 13, 2015. These licensees are authorized to operate temporary fixed operations from 27.5 to 29.5 GHz within specified geographic areas.

Licensee	Authorized Geographic Area
AT&T	Statewide: AL, FL, GA, KY, LA, MS, NC, SC, and TN
Verizon	Continental US

A notification letter and datasheets for the Ka-Band ESV system in Galveston, Texas were also sent to the following 28 GHz local television transmission licensee on August 13, 2015. This licensee is authorized to operate temporary fixed operations from 27.5 to 29.5 GHz on a nationwide basis.

Licensee	Authorized Geographic Area
Information Super Station, LLC	Continental US

No objections were received from the common carrier or local television transmission service incumbents.

¹ The proposed ESV system will operate in the 27.6 – 28.35 GHz portion of the Ka-Band.

3. 28 GHz LMDS Coordination

A Notification letter was sent to the following 28 GHz LMDS licensees on August 13, 2015. The proposed earth station will operate on frequencies that overlap Block A of the LMDS service. The total frequency allocation for Block A of the LMDS spectrum appears below.

Block A: 27.500-28.350 GHz
29.100-29.250 GHz
31.075-31.225 GHz

Licensee	Market	Market Name
LMDS Louisiana	BTA034	Beaumont-Port Arthur, TX
LMDS Louisiana	BTA238	Lake Charles, LA
Nextlink/XO	BTA196 ²	Houston, TX

No objections were received from the LMDS incumbents.

² The proposed ESV system will be located inside BTA196.



4. Earth Station Coordination Data

This section presents the data pertinent to the proposed Ka-Band ESV system in Galveston, Texas. This data was circulated to all incumbent licensees in the shared 28 GHz frequency ranges.

COMSEARCH**Earth Station Data Sheet**

19700 Janelia Farm Boulevard, Ashburn, VA 20147
 (703)726-5662 <http://www.comsearch.com>

Date: 08/04/2015
 Job Number: <PCNJobCode>

Administrative Information

Status ENGINEER PROPOSAL
 Call Sign <PCNCallSign>
 Licensee Code O3BNET
 Licensee Name O3b Networks USA, LLC.

Site Information GALVESTON, TX

Venue Name
 Latitude (NAD 83) 29° 18' 28.7" N
 Longitude (NAD 83) 94° 47' 59.2" W
 Climate Zone B
 Rain Zone 2
 Ground Elevation (AMSL) 0.0 m / 0.0 ft

Link Information

Satellite Type Medium Earth Orbit
 Mode TO - Transmit-Only
 Modulation Digital
 Minimum Elevation Angle 10.0°
 Azimuth Range 0.0° to 360°
 Antenna Centerline (AGL) 15.54 m / 51.0 ft

Antenna Information Transmit - FCC32

Manufacturer Orbit
 Model 1.2 Meter
 Gain / Diameter 48.0 dBi / 1.2 m
 3-dB / 15-dB Beamwidth 0.60° / 1.40°

Max Available RF Power (dBW/4 kHz) -17.1
 (dBW/MHz) 6.9

Maximum EIRP (dBW/4 kHz) 30.9
 (dBW/MHz) 54.9

Interference Objectives: Long Term -151.0 dBW/4 kHz 20%
 Short Term -128.0 dBW/4 kHz 0.0025%

Frequency Information Transmit 28.0 GHz

Emission / Frequency Range (MHz) 12M0G7D - 216MG7D / 27600.0 - 28350.0

Max Great Circle Coordination Distance 136.6 km / 84.9 mi
 Precipitation Scatter Contour Radius 100.0 km / 62.1 mi

COMSEARCH**Earth Station Data Sheet**

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Coordination Values**GALVESTON, TX**

Licensee Name O3b Networks USA, LLC.
 Latitude (NAD 83) 29° 18' 28.7" N
 Longitude (NAD 83) 94° 47' 59.2" W
 Ground Elevation (AMSL) 0.0 m / 0.0 ft
 Antenna Centerline (AGL) 15.54 m / 51.0 ft
 Antenna Model Orbit 1.2 Meter
 Antenna Mode Transmit 28.0 GHz
 Interference Objectives: Long Term -151.0 dBW/4 kHz 20%
 Short Term -128.0 dBW/4 kHz 0.0025%
 Max Available RF Power -17.1 (dBW/4 kHz)

Azimuth (°)	Horizon Elevation (°)	Antenna Discrimination (°)	Transmit 28.0 GHz	
			Horizon Gain (dBi)	Coordination Distance (km)
0	0.00	87.71	-10.00	100.00
5	0.00	82.83	-10.00	100.00
10	0.00	77.95	-10.00	100.00
15	0.00	73.08	-10.00	100.00
20	0.00	68.22	-10.00	100.00
25	0.00	63.37	-10.00	100.00
30	0.00	58.53	-10.00	100.00
35	0.00	53.71	-10.00	100.00
40	0.00	48.91	-10.00	100.00
45	0.00	44.14	-10.00	100.00
50	0.00	39.42	-10.00	100.00
55	0.00	34.77	-9.86	100.00
60	0.00	30.20	-8.69	100.00
65	0.00	25.79	-7.39	100.00
70	0.00	21.61	-5.93	100.00
75	0.00	17.83	-4.27	106.80
80	0.00	14.77	-2.38	113.30
85	0.00	12.94	-0.20	120.40
90	0.00	12.88	2.24	127.70
95	0.00	14.62	4.67	134.40
100	0.00	17.62	6.20	135.60
105	0.00	21.37	5.67	134.10
110	0.00	25.53	3.54	131.30
115	0.00	29.94	1.04	124.20
120	0.00	34.49	-1.27	117.00
125	0.00	39.14	-3.18	110.60
130	0.00	43.86	-4.78	105.00
135	0.00	48.62	-6.14	100.00
140	0.00	53.42	-7.31	100.00
145	0.00	58.24	-8.31	100.00
150	0.00	63.08	-9.18	100.00
155	0.00	67.93	-9.92	100.00
160	0.00	72.79	-10.00	100.00
165	0.00	77.66	-10.00	100.00
170	0.00	82.54	-10.00	100.00
175	0.00	87.42	-10.00	100.00
180	0.00	92.29	-10.00	100.00
185	0.00	97.17	-10.00	100.00

COMSEARCH**Earth Station Data Sheet**

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Coordination Values**GALVESTON, TX**

Licensee Name O3b Networks USA, LLC.
 Latitude (NAD 83) 29° 18' 28.7" N
 Longitude (NAD 83) 94° 47' 59.2" W
 Ground Elevation (AMSL) 0.0 m / 0.0 ft
 Antenna Centerline (AGL) 15.54 m / 51.0 ft
 Antenna Model Orbit 1.2 Meter
 Antenna Mode Transmit 28.0 GHz
 Interference Objectives: Long Term -151.0 dBW/4 kHz 20%
 Short Term -128.0 dBW/4 kHz 0.0025%
 Max Available RF Power -17.1 (dBW/4 kHz)

Azimuth (°)	Horizon Elevation (°)	Antenna Discrimination (°)	Transmit 28.0 GHz	
			Horizon Gain (dBi)	Coordination Distance (km)
190	0.00	102.05	-10.00	100.00
195	0.00	106.92	-10.00	100.00
200	0.00	111.78	-10.00	100.00
205	0.00	116.63	-9.92	100.00
210	0.00	121.47	-9.18	100.00
215	0.00	126.29	-8.31	100.00
220	0.00	131.09	-7.31	100.00
225	0.00	135.86	-6.14	100.00
230	0.00	140.58	-4.78	105.00
235	0.00	145.23	-3.19	110.60
240	0.00	149.80	-1.27	117.00
245	0.00	154.21	1.06	124.20
250	0.00	158.39	3.64	131.60
255	0.00	162.17	5.92	134.80
260	0.00	165.23	6.58	136.60
265	0.00	167.06	5.04	132.50
270	0.00	167.12	2.52	128.50
275	0.00	165.38	0.01	121.00
280	0.00	162.38	-2.22	113.90
285	0.00	158.63	-4.15	107.30
290	0.00	154.47	-5.83	100.00
295	0.00	150.06	-7.30	100.00
300	0.00	145.51	-8.62	100.00
305	0.00	140.86	-9.80	100.00
310	0.00	136.14	-10.00	100.00
315	0.00	131.38	-10.00	100.00
320	0.00	126.58	-10.00	100.00
325	0.00	121.76	-10.00	100.00
330	0.00	116.92	-10.00	100.00
335	0.00	112.07	-10.00	100.00
340	0.00	107.21	-10.00	100.00
345	0.00	102.34	-10.00	100.00
350	0.00	97.46	-10.00	100.00
355	0.00	92.58	-10.00	100.00

COMSEARCH**Earth Station Data Sheet**

19700 Janelia Farm Boulevard, Ashburn, VA 20147
 (703)726-5662 <http://www.comsearch.com>

Date: 08/04/2015
 Job Number: <PCNJobCode>

Administrative Information

Status ENGINEER PROPOSAL
 Call Sign <PCNCallSign>
 Licensee Code O3BNET
 Licensee Name O3b Networks USA, LLC.

Site Information GALVESTON, TX

Venue Name
 Latitude (NAD 83) 29° 18' 28.7" N
 Longitude (NAD 83) 94° 47' 59.2" W
 Climate Zone B
 Rain Zone 2
 Ground Elevation (AMSL) 0.0 m / 0.0 ft

Link Information

Satellite Type Medium Earth Orbit
 Mode TO - Transmit-Only
 Modulation Digital
 Minimum Elevation Angle 10.0°
 Azimuth Range 0.0° to 360°
 Antenna Centerline (AGL) 15.54 m / 51.0 ft

Antenna Information Transmit - FCC32

Manufacturer Orbit
 Model 2.2 Meter
 Gain / Diameter 52.5 dBi / 2.2 m
 3-dB / 15-dB Beamwidth 0.14° / 0.32°

Max Available RF Power (dBW/4 kHz) -22.1
 (dBW/MHz) 1.9

Maximum EIRP (dBW/4 kHz) 30.4
 (dBW/MHz) 54.4

Interference Objectives: Long Term -151.0 dBW/4 kHz 20%
 Short Term -128.0 dBW/4 kHz 0.0025%

Frequency Information Transmit 28.0 GHz

Emission / Frequency Range (MHz) 12M0G7D - 216MG7D / 27600.0 - 28350.0

Max Great Circle Coordination Distance 136.6 km / 84.9 mi
 Precipitation Scatter Contour Radius 100.0 km / 62.1 mi

COMSEARCH**Earth Station Data Sheet**

19700 Janelia Farm Boulevard, Ashburn, VA 20147
 (703)726-5662 <http://www.comsearch.com>

Coordination Values**GALVESTON, TX**

Licensee Name O3b Networks USA, LLC.
 Latitude (NAD 83) 29° 18' 28.7" N
 Longitude (NAD 83) 94° 47' 59.2" W
 Ground Elevation (AMSL) 0.0 m / 0.0 ft
 Antenna Centerline (AGL) 15.54 m / 51.0 ft
 Antenna Model Orbit 2.2 Meter
 Antenna Mode Transmit 28.0 GHz
 Interference Objectives: Long Term -151.0 dBW/4 kHz 20%
 Short Term -128.0 dBW/4 kHz 0.0025%
 Max Available RF Power -22.1 (dBW/4 kHz)

Azimuth (°)	Horizon Elevation (°)	Antenna Discrimination (°)	Transmit 28.0 GHz	
			Horizon Gain (dBi)	Coordination Distance (km)
0	0.00	87.71	-10.00	100.00
5	0.00	82.83	-10.00	100.00
10	0.00	77.95	-10.00	100.00
15	0.00	73.08	-10.00	100.00
20	0.00	68.22	-10.00	100.00
25	0.00	63.37	-10.00	100.00
30	0.00	58.53	-10.00	100.00
35	0.00	53.71	-10.00	100.00
40	0.00	48.91	-10.00	100.00
45	0.00	44.14	-10.00	100.00
50	0.00	39.42	-10.00	100.00
55	0.00	34.77	-9.86	100.00
60	0.00	30.20	-8.69	100.00
65	0.00	25.79	-7.39	100.00
70	0.00	21.61	-5.93	100.00
75	0.00	17.83	-4.27	106.80
80	0.00	14.77	-2.38	113.30
85	0.00	12.94	-0.20	120.40
90	0.00	12.88	2.24	127.70
95	0.00	14.62	4.67	134.40
100	0.00	17.62	6.20	135.60
105	0.00	21.37	5.67	134.10
110	0.00	25.53	3.54	131.30
115	0.00	29.94	1.04	124.20
120	0.00	34.49	-1.27	117.00
125	0.00	39.14	-3.18	110.60
130	0.00	43.86	-4.78	105.00
135	0.00	48.62	-6.14	100.00
140	0.00	53.42	-7.31	100.00
145	0.00	58.24	-8.31	100.00
150	0.00	63.08	-9.18	100.00
155	0.00	67.93	-9.92	100.00
160	0.00	72.79	-10.00	100.00
165	0.00	77.66	-10.00	100.00
170	0.00	82.54	-10.00	100.00
175	0.00	87.42	-10.00	100.00
180	0.00	92.29	-10.00	100.00
185	0.00	97.17	-10.00	100.00

COMSEARCH**Earth Station Data Sheet**

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 (703)726-5662 <http://www.comsearch.com>

Coordination Values**GALVESTON, TX**

Licensee Name O3b Networks USA, LLC.
 Latitude (NAD 83) 29° 18' 28.7" N
 Longitude (NAD 83) 94° 47' 59.2" W
 Ground Elevation (AMSL) 0.0 m / 0.0 ft
 Antenna Centerline (AGL) 15.54 m / 51.0 ft
 Antenna Model Orbit 2.2 Meter
 Antenna Mode Transmit 28.0 GHz
 Interference Objectives: Long Term -151.0 dBW/4 kHz 20%
 Short Term -128.0 dBW/4 kHz 0.0025%
 Max Available RF Power -22.1 (dBW/4 kHz)

Azimuth (°)	Horizon Elevation (°)	Antenna Discrimination (°)	Transmit 28.0 GHz	
			Horizon Gain (dBi)	Coordination Distance (km)
190	0.00	102.05	-10.00	100.00
195	0.00	106.92	-10.00	100.00
200	0.00	111.78	-10.00	100.00
205	0.00	116.63	-9.92	100.00
210	0.00	121.47	-9.18	100.00
215	0.00	126.29	-8.31	100.00
220	0.00	131.09	-7.31	100.00
225	0.00	135.86	-6.14	100.00
230	0.00	140.58	-4.78	105.00
235	0.00	145.23	-3.19	110.60
240	0.00	149.80	-1.27	117.00
245	0.00	154.21	1.06	124.20
250	0.00	158.39	3.64	131.60
255	0.00	162.17	5.92	134.80
260	0.00	165.23	6.58	136.60
265	0.00	167.06	5.04	132.50
270	0.00	167.12	2.52	128.50
275	0.00	165.38	0.01	121.00
280	0.00	162.38	-2.22	113.90
285	0.00	158.63	-4.15	107.30
290	0.00	154.47	-5.83	100.00
295	0.00	150.06	-7.30	100.00
300	0.00	145.51	-8.62	100.00
305	0.00	140.86	-9.80	100.00
310	0.00	136.14	-10.00	100.00
315	0.00	131.38	-10.00	100.00
320	0.00	126.58	-10.00	100.00
325	0.00	121.76	-10.00	100.00
330	0.00	116.92	-10.00	100.00
335	0.00	112.07	-10.00	100.00
340	0.00	107.21	-10.00	100.00
345	0.00	102.34	-10.00	100.00
350	0.00	97.46	-10.00	100.00
355	0.00	92.58	-10.00	100.00

5. Contact Information

For questions or information regarding the 28 GHz Frequency Coordination Report, please contact:

Contact person:	Joanna Lynch
Title:	Manager, Spectrum & Data Solutions
Company:	Comsearch
Address:	19700 Janelia Farm Blvd., Ashburn, VA 20147
Telephone:	703-726-5711
Fax:	703-726-5599
Email:	jlynch@comsearch.com
Web site:	www.comsearch.com

Ka-Band Earth Station – Key West, FL

Frequency Coordination Report

28 GHz



Prepared on Behalf of
O3b Networks USA, LLC

September 16, 2015



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1. Summary of Results

On behalf of O3b Networks, Comsearch performed a coordination notice for all existing and proposed terrestrial licenses within the coordination contours of their proposed Ka-Band Earth Stations on Vessels (ESV) in Key West, Florida, which will transmit at 28 GHz¹. Prior-notification letters were sent to the licensees and a copy of the notification data is provided in section four of this report. The earth station coordination was finalized on September 15, 2015.

No objections were received from any of the incumbent 28 GHz licensees. Our notification to the LMDS incumbents was performed under the assumption that the ESV system would be operating on a secondary basis to LMDS Block A operations and a contact at O3b Networks has been provided in case any concerns may arise in the future.

2. 28 GHz Common Carrier and LTTS Coordination

In accordance with FCC Rules and Regulations, the Ka-Band ESV system in Key West, Florida was prior-coordinated by Comsearch. A notification letter and datasheets for this system were sent to the following 28 GHz common carrier fixed microwave licensees on August 13, 2015. These licensees are authorized to operate temporary fixed operations from 27.5 to 29.5 GHz within specified geographic areas.

Licensee	Authorized Geographic Area
AT&T	Statewide: AL, FL, GA, KY, LA, MS, NC, SC, and TN
Verizon	Continental US

A notification letter and datasheets for the Ka-Band ESV system in Key West, Florida were also sent to the following 28 GHz local television transmission licensee on August 13, 2015. This licensee is authorized to operate temporary fixed operations from 27.5 to 29.5 GHz on a nationwide basis.

Licensee	Authorized Geographic Area
Information Super Station, LLC	Continental US

No objections were received from the common carrier or local television transmission service incumbents.

¹ The proposed ESV system will operate in the 27.6 – 28.35 GHz portion of the Ka-Band.

3. 28 GHz LMDS Coordination

A Notification letter was sent to the following 28 GHz LMDS licensees on August 13, 2015. The proposed earth station will operate on frequencies that overlap Block A of the LMDS service. The total frequency allocation for Block A of the LMDS spectrum appears below.

Block A: 27.500-28.350 GHz
29.100-29.250 GHz
31.075-31.225 GHz

Licensee	Market	Market Name
Nextlink/XO	BTA293 ²	Miami-Ft. Lauderdale, FL
T-Mobile ³	BTA293	Miami-Ft. Lauderdale, FL

No objections were received from the LMDS incumbents.

² The proposed ESV system will be located inside BTA293.

³ T-Mobile has acquired spectrum from Nextlink/XO in the Miami-Ft. Lauderdale, FL Basic Trading Area (BTA).



4. Earth Station Coordination Data

This section presents the data pertinent to the proposed Ka-Band ESV system in Key West, Florida. This data was circulated to all incumbent licensees in the shared 28 GHz frequency ranges.

COMSEARCH**Earth Station Data Sheet**

19700 Janelia Farm Boulevard, Ashburn, VA 20147
 (703)726-5662 <http://www.comsearch.com>

Date: 08/04/2015
 Job Number: <PCNJobCode>

Administrative Information

Status ENGINEER PROPOSAL
 Call Sign <PCNCallSign>
 Licensee Code O3BNET
 Licensee Name O3b Networks USA, LLC.

Site Information**KEY WEST, FL**

Venue Name
 Latitude (NAD 83) 24° 33' 35.9" N
 Longitude (NAD 83) 81° 48' 24.1" W
 Climate Zone B
 Rain Zone 1
 Ground Elevation (AMSL) 0.0 m / 0.0 ft

Link Information

Satellite Type Medium Earth Orbit
 Mode TO - Transmit-Only
 Modulation Digital
 Minimum Elevation Angle 10.0°
 Azimuth Range 0.0° to 360°
 Antenna Centerline (AGL) 15.54 m / 51.0 ft

Antenna Information**Transmit - FCC32**

Manufacturer Orbit
 Model 1.2 Meter
 Gain / Diameter 48.0 dBi / 1.2 m
 3-dB / 15-dB Beamwidth 0.60° / 1.40°

Max Available RF Power (dBW/4 kHz) -17.1
 (dBW/MHz) 6.9

Maximum EIRP (dBW/4 kHz) 30.9
 (dBW/MHz) 54.9

Interference Objectives: Long Term -151.0 dBW/4 kHz 20%
 Short Term -128.0 dBW/4 kHz 0.0025%

Frequency Information**Transmit 28.0 GHz**

Emission / Frequency Range (MHz) 12M0G7D - 216MG7D / 27600.0 - 28350.0

Max Great Circle Coordination Distance 136.8 km / 85.0 mi
 Precipitation Scatter Contour Radius 100.0 km / 62.1 mi

COMSEARCH**Earth Station Data Sheet**

19700 Janelia Farm Boulevard, Ashburn, VA 20147
 (703)726-5662 <http://www.comsearch.com>

Coordination Values**KEY WEST, FL**

Licensee Name O3b Networks USA, LLC.
 Latitude (NAD 83) 24° 33' 35.9" N
 Longitude (NAD 83) 81° 48' 24.1" W
 Ground Elevation (AMSL) 0.0 m / 0.0 ft
 Antenna Centerline (AGL) 15.54 m / 51.0 ft
 Antenna Model Orbit 1.2 Meter
 Antenna Mode Transmit 28.0 GHz
 Interference Objectives: Long Term -151.0 dBW/4 kHz 20%
 Short Term -128.0 dBW/4 kHz 0.0025%
 Max Available RF Power -17.1 (dBW/4 kHz)

Azimuth (°)	Horizon Elevation (°)	Antenna Discrimination (°)	Transmit 28.0 GHz	
			Horizon Gain (dBi)	Coordination Distance (km)
0	0.00	93.43	-10.00	100.00
5	0.00	88.43	-10.00	100.00
10	0.00	83.43	-10.00	100.00
15	0.00	78.43	-10.00	100.00
20	0.00	73.43	-10.00	100.00
25	0.00	68.43	-10.00	100.00
30	0.00	63.43	-10.00	100.00
35	0.00	58.44	-10.00	100.00
40	0.00	53.44	-10.00	100.00
45	0.00	48.44	-10.00	100.00
50	0.00	43.44	-10.00	100.00
55	0.00	38.44	-9.37	100.00
60	0.00	33.45	-8.15	100.00
65	0.00	28.45	-6.78	100.00
70	0.00	23.46	-5.24	100.10
75	0.00	18.47	-3.49	109.60
80	0.00	13.48	-1.47	116.30
85	0.00	8.52	0.83	123.50
90	0.00	3.65	3.34	130.80
95	0.00	2.01	5.56	133.80
100	0.00	6.69	6.28	135.80
105	0.00	11.64	4.90	135.00
110	0.00	16.62	2.49	128.40
115	0.00	21.61	0.02	121.10
120	0.00	26.60	-2.18	114.00
125	0.00	31.60	-4.05	107.60
130	0.00	36.59	-5.62	100.00
135	0.00	41.59	-6.97	100.00
140	0.00	46.59	-8.13	100.00
145	0.00	51.58	-9.15	100.00
150	0.00	56.58	-10.00	100.00
155	0.00	61.58	-10.00	100.00
160	0.00	66.58	-10.00	100.00
165	0.00	71.58	-10.00	100.00
170	0.00	76.58	-10.00	100.00
175	0.00	81.58	-10.00	100.00
180	0.00	86.57	-10.00	100.00
185	0.00	91.57	-10.00	100.00

COMSEARCH**Earth Station Data Sheet**

19700 Janelia Farm Boulevard, Ashburn, VA 20147
 (703)726-5662 <http://www.comsearch.com>

Coordination Values**KEY WEST, FL**

Licensee Name O3b Networks USA, LLC.
 Latitude (NAD 83) 24° 33' 35.9" N
 Longitude (NAD 83) 81° 48' 24.1" W
 Ground Elevation (AMSL) 0.0 m / 0.0 ft
 Antenna Centerline (AGL) 15.54 m / 51.0 ft
 Antenna Model Orbit 1.2 Meter
 Antenna Mode Transmit 28.0 GHz
 Interference Objectives: Long Term -151.0 dBW/4 kHz 20%
 Short Term -128.0 dBW/4 kHz 0.0025%
 Max Available RF Power -17.1 (dBW/4 kHz)

Azimuth (°)	Horizon Elevation (°)	Antenna Discrimination (°)	Transmit 28.0 GHz	
			Horizon Gain (dBi)	Coordination Distance (km)
190	0.00	96.57	-10.00	100.00
195	0.00	101.57	-10.00	100.00
200	0.00	106.57	-10.00	100.00
205	0.00	111.57	-10.00	100.00
210	0.00	116.57	-10.00	100.00
215	0.00	121.56	-9.15	100.00
220	0.00	126.56	-8.13	100.00
225	0.00	131.56	-6.97	100.00
230	0.00	136.56	-5.62	100.00
235	0.00	141.56	-4.05	107.60
240	0.00	146.55	-2.18	114.00
245	0.00	151.55	0.05	121.10
250	0.00	156.54	2.57	128.60
255	0.00	161.53	5.10	132.60
260	0.00	166.52	6.64	136.80
265	0.00	171.48	5.94	134.90
270	0.00	176.35	3.64	131.60
275	0.00	177.99	1.05	124.20
280	0.00	173.31	-1.31	116.80
285	0.00	168.36	-3.36	110.00
290	0.00	163.38	-5.14	100.50
295	0.00	158.39	-6.70	100.00
300	0.00	153.40	-8.08	100.00
305	0.00	148.40	-9.31	100.00
310	0.00	143.41	-10.00	100.00
315	0.00	138.41	-10.00	100.00
320	0.00	133.41	-10.00	100.00
325	0.00	128.42	-10.00	100.00
330	0.00	123.42	-10.00	100.00
335	0.00	118.42	-10.00	100.00
340	0.00	113.42	-10.00	100.00
345	0.00	108.42	-10.00	100.00
350	0.00	103.42	-10.00	100.00
355	0.00	98.42	-10.00	100.00

COMSEARCH**Earth Station Data Sheet**

19700 Janelia Farm Boulevard, Ashburn, VA 20147
 (703)726-5662 <http://www.comsearch.com>

Date: 08/04/2015
 Job Number: <PCNJobCode>

Administrative Information

Status ENGINEER PROPOSAL
 Call Sign <PCNCallSign>
 Licensee Code O3BNET
 Licensee Name O3b Networks USA, LLC.

Site Information**KEY WEST, FL**

Venue Name
 Latitude (NAD 83) 24° 33' 35.9" N
 Longitude (NAD 83) 81° 48' 24.1" W
 Climate Zone B
 Rain Zone 1
 Ground Elevation (AMSL) 0.0 m / 0.0 ft

Link Information

Satellite Type Medium Earth Orbit
 Mode TO - Transmit-Only
 Modulation Digital
 Minimum Elevation Angle 10.0°
 Azimuth Range 0.0° to 360°
 Antenna Centerline (AGL) 15.54 m / 51.0 ft

Antenna Information**Transmit - FCC32**

Manufacturer Orbit
 Model 2.2 Meter
 Gain / Diameter 52.5 dBi / 2.2 m
 3-dB / 15-dB Beamwidth 0.14° / 0.32°

Max Available RF Power (dBW/4 kHz) -22.1
 (dBW/MHz) 1.9

Maximum EIRP (dBW/4 kHz) 30.4
 (dBW/MHz) 54.4

Interference Objectives: Long Term -151.0 dBW/4 kHz 20%
 Short Term -128.0 dBW/4 kHz 0.0025%

Frequency Information**Transmit 28.0 GHz**

Emission / Frequency Range (MHz) 12M0G7D - 216MG7D / 27600.0 - 28350.0

Max Great Circle Coordination Distance 136.8 km / 85.0 mi
 Precipitation Scatter Contour Radius 100.0 km / 62.1 mi

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Coordination Values**KEY WEST, FL**

Licensee Name O3b Networks USA, LLC.
 Latitude (NAD 83) 24° 33' 35.9" N
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 Ground Elevation (AMSL) 0.0 m / 0.0 ft
 Antenna Centerline (AGL) 15.54 m / 51.0 ft
 Antenna Model Orbit 2.2 Meter
 Antenna Mode Transmit 28.0 GHz
 Interference Objectives: Long Term -151.0 dBW/4 kHz 20%
 Short Term -128.0 dBW/4 kHz 0.0025%
 Max Available RF Power -22.1 (dBW/4 kHz)

Azimuth (°)	Horizon Elevation (°)	Antenna Discrimination (°)	Transmit 28.0 GHz	
			Horizon Gain (dBi)	Coordination Distance (km)
0	0.00	93.43	-10.00	100.00
5	0.00	88.43	-10.00	100.00
10	0.00	83.43	-10.00	100.00
15	0.00	78.43	-10.00	100.00
20	0.00	73.43	-10.00	100.00
25	0.00	68.43	-10.00	100.00
30	0.00	63.43	-10.00	100.00
35	0.00	58.44	-10.00	100.00
40	0.00	53.44	-10.00	100.00
45	0.00	48.44	-10.00	100.00
50	0.00	43.44	-10.00	100.00
55	0.00	38.44	-9.37	100.00
60	0.00	33.45	-8.15	100.00
65	0.00	28.45	-6.78	100.00
70	0.00	23.46	-5.24	100.10
75	0.00	18.47	-3.49	109.60
80	0.00	13.48	-1.47	116.30
85	0.00	8.52	0.83	123.50
90	0.00	3.65	3.34	130.80
95	0.00	2.01	5.56	133.80
100	0.00	6.69	6.28	135.80
105	0.00	11.64	4.90	135.00
110	0.00	16.62	2.49	128.40
115	0.00	21.61	0.02	121.10
120	0.00	26.60	-2.18	114.00
125	0.00	31.60	-4.05	100.00
130	0.00	36.59	-5.62	107.60
135	0.00	41.59	-6.97	100.00
140	0.00	46.59	-8.13	100.00
145	0.00	51.58	-9.15	100.00
150	0.00	56.58	-10.00	100.00
155	0.00	61.58	-10.00	100.00
160	0.00	66.58	-10.00	100.00
165	0.00	71.58	-10.00	100.00
170	0.00	76.58	-10.00	100.00
175	0.00	81.58	-10.00	100.00
180	0.00	86.57	-10.00	100.00
185	0.00	91.57	-10.00	100.00

COMSEARCH**Earth Station Data Sheet**

19700 Janelia Farm Boulevard, Ashburn, VA 20147
 (703)726-5662 <http://www.comsearch.com>

Coordination Values**KEY WEST, FL**

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 Latitude (NAD 83) 24° 33' 35.9" N
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 Ground Elevation (AMSL) 0.0 m / 0.0 ft
 Antenna Centerline (AGL) 15.54 m / 51.0 ft
 Antenna Model Orbit 2.2 Meter
 Antenna Mode Transmit 28.0 GHz
 Interference Objectives: Long Term -151.0 dBW/4 kHz 20%
 Short Term -128.0 dBW/4 kHz 0.0025%
 Max Available RF Power -22.1 (dBW/4 kHz)

Azimuth (°)	Horizon Elevation (°)	Antenna Discrimination (°)	Transmit 28.0 GHz	
			Horizon Gain (dBi)	Coordination Distance (km)
190	0.00	96.57	-10.00	100.00
195	0.00	101.57	-10.00	100.00
200	0.00	106.57	-10.00	100.00
205	0.00	111.57	-10.00	100.00
210	0.00	116.57	-10.00	100.00
215	0.00	121.56	-9.15	100.00
220	0.00	126.56	-8.13	100.00
225	0.00	131.56	-6.97	100.00
230	0.00	136.56	-5.62	100.00
235	0.00	141.56	-4.05	107.60
240	0.00	146.55	-2.18	114.00
245	0.00	151.55	0.05	121.10
250	0.00	156.54	2.57	128.60
255	0.00	161.53	5.10	132.60
260	0.00	166.52	6.64	136.80
265	0.00	171.48	5.94	134.90
270	0.00	176.35	3.64	131.60
275	0.00	177.99	1.05	124.20
280	0.00	173.31	-1.31	116.80
285	0.00	168.36	-3.36	110.00
290	0.00	163.38	-5.14	100.50
295	0.00	158.39	-6.70	100.00
300	0.00	153.40	-8.08	100.00
305	0.00	148.40	-9.31	100.00
310	0.00	143.41	-10.00	100.00
315	0.00	138.41	-10.00	100.00
320	0.00	133.41	-10.00	100.00
325	0.00	128.42	-10.00	100.00
330	0.00	123.42	-10.00	100.00
335	0.00	118.42	-10.00	100.00
340	0.00	113.42	-10.00	100.00
345	0.00	108.42	-10.00	100.00
350	0.00	103.42	-10.00	100.00
355	0.00	98.42	-10.00	100.00



5. Contact Information

For questions or information regarding the 28 GHz Frequency Coordination Report, please contact:

Contact person:	Joanna Lynch
Title:	Manager, Spectrum & Data Solutions
Company:	Comsearch
Address:	19700 Janelia Farm Blvd., Ashburn, VA 20147
Telephone:	703-726-5711
Fax:	703-726-5599
Email:	jlynch@comsearch.com
Web site:	www.comsearch.com

Ka-Band Earth Station – Miami, FL

Frequency Coordination Report

28 GHz



Prepared on Behalf of
O3b Networks USA, LLC

September 16, 2015



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1. Summary of Results

On behalf of O3b Networks, Comsearch performed a coordination notice for all existing and proposed terrestrial licenses within the coordination contours of their proposed Ka-Band Earth Stations on Vessels (ESV) in Miami, Florida, which will transmit at 28 GHz¹. Prior-notification letters were sent to the licensees and a copy of the notification data is provided in section four of this report. The earth station coordination was finalized on September 15, 2015.

No objections were received from any of the incumbent 28 GHz licensees. Our notification to the LMDS incumbents was performed under the assumption that the ESV system would be operating on a secondary basis to LMDS Block A operations and a contact at O3b Networks has been provided in case any concerns may arise in the future.

2. 28 GHz Common Carrier and LTTS Coordination

In accordance with FCC Rules and Regulations, the Ka-Band ESV system in Miami, Florida was prior-coordinated by Comsearch. A notification letter and datasheets for this system were sent to the following 28 GHz common carrier fixed microwave licensees on August 13, 2015. These licensees are authorized to operate temporary fixed operations from 27.5 to 29.5 GHz within specified geographic areas.

Licensee	Authorized Geographic Area
AT&T	Statewide: AL, FL, GA, KY, LA, MS, NC, SC, and TN
Verizon	Continental US

A notification letter and datasheets for the Ka-Band ESV system in Miami, Florida were also sent to the following 28 GHz local television transmission licensee on August 13, 2015. This licensee is authorized to operate temporary fixed operations from 27.5 to 29.5 GHz on a nationwide basis.

Licensee	Authorized Geographic Area
Information Super Station, LLC	Continental US

No objections were received from the common carrier or local television transmission service incumbents.

¹ The proposed ESV system will operate in the 27.6 – 28.35 GHz portion of the Ka-Band.

3. 28 GHz LMDS Coordination

A Notification letter was sent to the following 28 GHz LMDS licensees on August 13, 2015. The proposed earth station will operate on frequencies that overlap Block A of the LMDS service. The total frequency allocation for Block A of the LMDS spectrum appears below.

Block A: 27.500-28.350 GHz
29.100-29.250 GHz
31.075-31.225 GHz

Licensee	Market	Market Name
Nextlink/XO	BTA293 ²	Miami-Ft. Lauderdale, FL
T-Mobile ³	BTA293	Miami-Ft. Lauderdale, FL
Nextlink/XO	BTA469	West Palm Beach-Boca Raton, FL
T-Mobile ⁴	BTA469	West Palm Beach-Boca Raton, FL

No objections were received from the LMDS incumbents.

² The proposed ESV system will be located inside BTA293.

³ T-Mobile has acquired spectrum from Nextlink/XO in the Miami-Ft. Lauderdale, FL Basic Trading Area (BTA).

⁴ T-Mobile has acquired spectrum from Nextlink/XO in the West Palm Beach-Boca Raton, FL BTA.

4. Earth Station Coordination Data

This section presents the data pertinent to the proposed Ka-Band ESV system in Miami, Florida. This data was circulated to all incumbent licensees in the shared 28 GHz frequency ranges.

COMSEARCH**Earth Station Data Sheet**

19700 Janelia Farm Boulevard, Ashburn, VA 20147
 (703)726-5662 <http://www.comsearch.com>

Date: 08/04/2015
 Job Number: <PCNJobCode>

Administrative Information

Status ENGINEER PROPOSAL
 Call Sign <PCNCallSign>
 Licensee Code O3BNET
 Licensee Name O3b Networks USA, LLC.

Site Information**MIAMI, FL**

Venue Name
 Latitude (NAD 83) 25° 46' 43.5" N
 Longitude (NAD 83) 80° 10' 40.4" W
 Climate Zone B
 Rain Zone 1
 Ground Elevation (AMSL) 0.0 m / 0.0 ft

Link Information

Satellite Type Medium Earth Orbit
 Mode TO - Transmit-Only
 Modulation Digital
 Minimum Elevation Angle 10.0°
 Azimuth Range 0.0° to 360°
 Antenna Centerline (AGL) 15.54 m / 51.0 ft

Antenna Information**Transmit - FCC32**

Manufacturer Orbit
 Model 1.2 Meter
 Gain / Diameter 48.0 dBi / 1.2 m
 3-dB / 15-dB Beamwidth 0.60° / 1.40°

Max Available RF Power (dBW/4 kHz) -17.1
 (dBW/MHz) 6.9

Maximum EIRP (dBW/4 kHz) 30.9
 (dBW/MHz) 54.9

Interference Objectives: Long Term -151.0 dBW/4 kHz 20%
 Short Term -128.0 dBW/4 kHz 0.0025%

Frequency Information**Transmit 28.0 GHz**

Emission / Frequency Range (MHz) 12M0G7D - 216MG7D / 27600.0 - 28350.0

Max Great Circle Coordination Distance 137.4 km / 85.4 mi
 Precipitation Scatter Contour Radius 100.0 km / 62.1 mi

COMSEARCH**Earth Station Data Sheet**

19700 Janelia Farm Boulevard, Ashburn, VA 20147
 (703)726-5662 <http://www.comsearch.com>

Coordination Values**MIAMI, FL**

Licensee Name O3b Networks USA, LLC.
 Latitude (NAD 83) 25° 46' 43.5" N
 Longitude (NAD 83) 80° 10' 40.4" W
 Ground Elevation (AMSL) 0.0 m / 0.0 ft
 Antenna Centerline (AGL) 15.54 m / 51.0 ft
 Antenna Model Orbit 1.2 Meter
 Antenna Mode Transmit 28.0 GHz
 Interference Objectives: Long Term -151.0 dBW/4 kHz 20%
 Short Term -128.0 dBW/4 kHz 0.0025%
 Max Available RF Power -17.1 (dBW/4 kHz)

Azimuth (°)	Horizon Elevation (°)	Antenna Discrimination (°)	Transmit 28.0 GHz	
			Horizon Gain (dBi)	Coordination Distance (km)
0	0.00	94.31	-10.00	100.00
5	0.00	89.31	-10.00	100.00
10	0.00	84.31	-10.00	100.00
15	0.00	79.31	-10.00	100.00
20	0.00	74.31	-10.00	100.00
25	0.00	69.31	-10.00	100.00
30	0.00	64.31	-10.00	100.00
35	0.00	59.31	-10.00	100.00
40	0.00	54.31	-10.00	100.00
45	0.00	49.31	-10.00	100.00
50	0.00	44.31	-10.00	100.00
55	0.00	39.31	-9.40	100.00
60	0.00	34.31	-8.18	100.00
65	0.00	29.31	-6.81	100.00
70	0.00	24.31	-5.26	100.10
75	0.00	19.31	-3.49	109.60
80	0.00	14.31	-1.45	116.40
85	0.00	9.31	0.91	123.80
90	0.00	4.31	3.53	131.30
95	0.00	0.71	5.95	134.90
100	0.00	5.69	6.87	137.40
105	0.00	10.69	5.44	133.50
110	0.00	15.69	2.88	129.50
115	0.00	20.69	0.31	121.90
120	0.00	25.69	-1.96	114.70
125	0.00	30.69	-3.84	108.30
130	0.00	35.69	-5.42	100.00
135	0.00	40.69	-6.77	100.00
140	0.00	45.69	-7.93	100.00
145	0.00	50.69	-8.95	100.00
150	0.00	55.69	-9.83	100.00
155	0.00	60.69	-10.00	100.00
160	0.00	65.69	-10.00	100.00
165	0.00	70.69	-10.00	100.00
170	0.00	75.69	-10.00	100.00
175	0.00	80.69	-10.00	100.00
180	0.00	85.69	-10.00	100.00
185	0.00	90.69	-10.00	100.00

COMSEARCH**Earth Station Data Sheet**

19700 Janelia Farm Boulevard, Ashburn, VA 20147
 (703)726-5662 <http://www.comsearch.com>

Coordination Values**MIAMI, FL**

Licensee Name O3b Networks USA, LLC.
 Latitude (NAD 83) 25° 46' 43.5" N
 Longitude (NAD 83) 80° 10' 40.4" W
 Ground Elevation (AMSL) 0.0 m / 0.0 ft
 Antenna Centerline (AGL) 15.54 m / 51.0 ft
 Antenna Model Orbit 1.2 Meter
 Antenna Mode Transmit 28.0 GHz
 Interference Objectives: Long Term -151.0 dBW/4 kHz 20%
 Short Term -128.0 dBW/4 kHz 0.0025%
 Max Available RF Power -17.1 (dBW/4 kHz)

Azimuth (°)	Horizon Elevation (°)	Antenna Discrimination (°)	Transmit 28.0 GHz	
			Horizon Gain (dBi)	Coordination Distance (km)
190	0.00	95.69	-10.00	100.00
195	0.00	100.69	-10.00	100.00
200	0.00	105.69	-10.00	100.00
205	0.00	110.69	-10.00	100.00
210	0.00	115.69	-9.83	100.00
215	0.00	120.69	-8.95	100.00
220	0.00	125.69	-7.93	100.00
225	0.00	130.69	-6.77	100.00
230	0.00	135.69	-5.42	100.00
235	0.00	140.69	-3.84	108.30
240	0.00	145.69	-1.96	114.70
245	0.00	150.69	0.29	121.90
250	0.00	155.69	2.81	129.30
255	0.00	160.69	5.25	133.00
260	0.00	165.69	6.53	136.50
265	0.00	170.69	5.60	134.00
270	0.00	175.69	3.26	130.60
275	0.00	179.29	0.71	123.20
280	0.00	174.31	-1.60	115.90
285	0.00	169.31	-3.61	109.20
290	0.00	164.31	-5.35	100.00
295	0.00	159.31	-6.88	100.00
300	0.00	154.31	-8.24	100.00
305	0.00	149.31	-9.45	100.00
310	0.00	144.31	-10.00	100.00
315	0.00	139.31	-10.00	100.00
320	0.00	134.31	-10.00	100.00
325	0.00	129.31	-10.00	100.00
330	0.00	124.31	-10.00	100.00
335	0.00	119.31	-10.00	100.00
340	0.00	114.31	-10.00	100.00
345	0.00	109.31	-10.00	100.00
350	0.00	104.31	-10.00	100.00
355	0.00	99.31	-10.00	100.00

COMSEARCH
Earth Station Data Sheet
 19700 Janelia Farm Boulevard, Ashburn, VA 20147
 (703)726-5662 <http://www.comsearch.com>

Date: 08/04/2015
 Job Number: <PCNJobCode>

Administrative Information

Status ENGINEER PROPOSAL
 Call Sign <PCNCallSign>
 Licensee Code O3BNET
 Licensee Name O3b Networks USA, LLC.

Site Information
MIAMI, FL

Venue Name
 Latitude (NAD 83) 25° 46' 43.5" N
 Longitude (NAD 83) 80° 10' 40.4" W
 Climate Zone B
 Rain Zone 1
 Ground Elevation (AMSL) 0.0 m / 0.0 ft

Link Information

Satellite Type Medium Earth Orbit
 Mode TO - Transmit-Only
 Modulation Digital
 Minimum Elevation Angle 10.0°
 Azimuth Range 0.0° to 360°
 Antenna Centerline (AGL) 15.54 m / 51.0 ft

Antenna Information
Transmit - FCC32

Manufacturer Orbit
 Model 2.2 meter
 Gain / Diameter 52.5 dBi / 2.2 m
 3-dB / 15-dB Beamwidth 0.14° / 0.32°

Max Available RF Power (dBW/4 kHz) -22.1
 (dBW/MHz) 1.9

Maximum EIRP (dBW/4 kHz) 30.4
 (dBW/MHz) 54.4

Interference Objectives: Long Term -151.0 dBW/4 kHz 20%
 Short Term -128.0 dBW/4 kHz 0.0025%

Frequency Information
Transmit 28.0 GHz

Emission / Frequency Range (MHz) 12M0G7D - 216MG7D / 27600.0 - 28350.0

Max Great Circle Coordination Distance 137.4 km / 85.4 mi
 Precipitation Scatter Contour Radius 100.0 km / 62.1 mi

COMSEARCH**Earth Station Data Sheet**

19700 Janelia Farm Boulevard, Ashburn, VA 20147
 (703)726-5662 <http://www.comsearch.com>

Coordination Values**MIAMI, FL**

Licensee Name O3b Networks USA, LLC.
 Latitude (NAD 83) 25° 46' 43.5" N
 Longitude (NAD 83) 80° 10' 40.4" W
 Ground Elevation (AMSL) 0.0 m / 0.0 ft
 Antenna Centerline (AGL) 15.54 m / 51.0 ft
 Antenna Model Orbit 2.2 Meter
 Antenna Mode Transmit 28.0 GHz
 Interference Objectives: Long Term -151.0 dBW/4 kHz 20%
 Short Term -128.0 dBW/4 kHz 0.0025%
 Max Available RF Power -22.1 (dBW/4 kHz)

Azimuth (°)	Horizon Elevation (°)	Antenna Discrimination (°)	Transmit 28.0 GHz	
			Horizon Gain (dBi)	Coordination Distance (km)
0	0.00	94.31	-10.00	100.00
5	0.00	89.31	-10.00	100.00
10	0.00	84.31	-10.00	100.00
15	0.00	79.31	-10.00	100.00
20	0.00	74.31	-10.00	100.00
25	0.00	69.31	-10.00	100.00
30	0.00	64.31	-10.00	100.00
35	0.00	59.31	-10.00	100.00
40	0.00	54.31	-10.00	100.00
45	0.00	49.31	-10.00	100.00
50	0.00	44.31	-10.00	100.00
55	0.00	39.31	-9.40	100.00
60	0.00	34.31	-8.18	100.00
65	0.00	29.31	-6.81	100.00
70	0.00	24.31	-5.26	100.10
75	0.00	19.31	-3.49	109.60
80	0.00	14.31	-1.45	116.40
85	0.00	9.31	0.91	123.80
90	0.00	4.31	3.53	131.30
95	0.00	0.71	5.95	134.90
100	0.00	5.69	6.87	137.40
105	0.00	10.69	5.44	133.50
110	0.00	15.69	2.88	129.50
115	0.00	20.69	0.31	121.90
120	0.00	25.69	-1.96	114.70
125	0.00	30.69	-3.84	108.30
130	0.00	35.69	-5.42	100.00
135	0.00	40.69	-6.77	100.00
140	0.00	45.69	-7.93	100.00
145	0.00	50.69	-8.95	100.00
150	0.00	55.69	-9.83	100.00
155	0.00	60.69	-10.00	100.00
160	0.00	65.69	-10.00	100.00
165	0.00	70.69	-10.00	100.00
170	0.00	75.69	-10.00	100.00
175	0.00	80.69	-10.00	100.00
180	0.00	85.69	-10.00	100.00
185	0.00	90.69	-10.00	100.00

COMSEARCH**Earth Station Data Sheet**

19700 Janelia Farm Boulevard, Ashburn, VA 20147
 (703)726-5662 <http://www.comsearch.com>

Coordination Values**MIAMI, FL**

Licensee Name O3b Networks USA, LLC.
 Latitude (NAD 83) 25° 46' 43.5" N
 Longitude (NAD 83) 80° 10' 40.4" W
 Ground Elevation (AMSL) 0.0 m / 0.0 ft
 Antenna Centerline (AGL) 15.54 m / 51.0 ft
 Antenna Model Orbit 2.2 Meter
 Antenna Mode Transmit 28.0 GHz
 Interference Objectives: Long Term -151.0 dBW/4 kHz 20%
 Short Term -128.0 dBW/4 kHz 0.0025%
 Max Available RF Power -22.1 (dBW/4 kHz)

Azimuth (°)	Horizon Elevation (°)	Antenna Discrimination (°)	Transmit 28.0 GHz	
			Horizon Gain (dBi)	Coordination Distance (km)
190	0.00	95.69	-10.00	100.00
195	0.00	100.69	-10.00	100.00
200	0.00	105.69	-10.00	100.00
205	0.00	110.69	-10.00	100.00
210	0.00	115.69	-9.83	100.00
215	0.00	120.69	-8.95	100.00
220	0.00	125.69	-7.93	100.00
225	0.00	130.69	-6.77	100.00
230	0.00	135.69	-5.42	100.00
235	0.00	140.69	-3.84	108.30
240	0.00	145.69	-1.96	114.70
245	0.00	150.69	0.29	121.90
250	0.00	155.69	2.81	129.30
255	0.00	160.69	5.25	133.00
260	0.00	165.69	6.53	136.50
265	0.00	170.69	5.60	134.00
270	0.00	175.69	3.26	130.60
275	0.00	179.29	0.71	123.20
280	0.00	174.31	-1.60	115.90
285	0.00	169.31	-3.61	109.20
290	0.00	164.31	-5.35	100.00
295	0.00	159.31	-6.88	100.00
300	0.00	154.31	-8.24	100.00
305	0.00	149.31	-9.45	100.00
310	0.00	144.31	-10.00	100.00
315	0.00	139.31	-10.00	100.00
320	0.00	134.31	-10.00	100.00
325	0.00	129.31	-10.00	100.00
330	0.00	124.31	-10.00	100.00
335	0.00	119.31	-10.00	100.00
340	0.00	114.31	-10.00	100.00
345	0.00	109.31	-10.00	100.00
350	0.00	104.31	-10.00	100.00
355	0.00	99.31	-10.00	100.00



5. Contact Information

For questions or information regarding the 28 GHz Frequency Coordination Report, please contact:

Contact person:	Joanna Lynch
Title:	Manager, Spectrum & Data Solutions
Company:	Comsearch
Address:	19700 Janelia Farm Blvd., Ashburn, VA 20147
Telephone:	703-726-5711
Fax:	703-726-5599
Email:	jlynch@comsearch.com
Web site:	www.comsearch.com

Ka-Band Earth Station – New Orleans, LA

Frequency Coordination Report

28 GHz



Prepared on Behalf of
O3b Networks USA, LLC

September 16, 2015



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5.	Contact Information	- 10 -

1. Summary of Results

On behalf of O3b Networks, Comsearch performed a coordination notice for all existing and proposed terrestrial licenses within the coordination contours of their proposed Ka-Band Earth Stations on Vessels (ESV) in New Orleans, Louisiana, which will transmit at 28 GHz¹. Prior-notification letters were sent to the licensees and a copy of the notification data is provided in section four of this report. The earth station coordination was finalized on September 15, 2015.

No objections were received from any of the incumbent 28 GHz licensees. Our notification to the LMDS incumbents was performed under the assumption that the ESV system would be operating on a secondary basis to LMDS Block A operations and a contact at O3b Networks has been provided in case any concerns may arise in the future.

2. 28 GHz Common Carrier and LTTS Coordination

In accordance with FCC Rules and Regulations, the Ka-Band ESV system in New Orleans, Louisiana was prior-coordinated by Comsearch. A notification letter and datasheets for this system were sent to the following 28 GHz common carrier fixed microwave licensees on August 13, 2015. These licensees are authorized to operate temporary fixed operations from 27.5 to 29.5 GHz within specified geographic areas.

Licensee	Authorized Geographic Area
AT&T	Statewide: AL, FL, GA, KY, LA, MS, NC, SC, and TN
Verizon	Continental US

A notification letter and datasheets for the Ka-Band ESV system in New Orleans, Louisiana were also sent to the following 28 GHz local television transmission licensee on August 13, 2015. This licensee is authorized to operate temporary fixed operations from 27.5 to 29.5 GHz on a nationwide basis.

Licensee	Authorized Geographic Area
Information Super Station, LLC	Continental US

No objections were received from the common carrier or local television transmission service incumbents.

¹ The proposed ESV system will operate in the 27.6 – 28.35 GHz portion of the Ka-Band.

3. 28 GHz LMDS Coordination

A Notification letter was sent to the following 28 GHz LMDS licensees on August 13, 2015. The proposed earth station will operate on frequencies that overlap Block A of the LMDS service. The total frequency allocation for Block A of the LMDS spectrum appears below.

Block A: 27.500-28.350 GHz
29.100-29.250 GHz
31.075-31.225 GHz

Licensee	Market	Market Name
Telepak Networks	BTA042	Biloxi-Gulfport-Pascagoula, MS
Telepak Networks	BTA186	Hattiesburg, MS
Louisiana Competitive Telecommunications	BTA236	Lafayette-New Iberia, LA
Telepak Networks	BTA269	McComb-Brookhaven, MS
Straight Path Spectrum	BTA320 ²	New Orleans, LA

No objections were received from the LMDS incumbents.

² The proposed ESV system will be located inside BTA320.



4. Earth Station Coordination Data

This section presents the data pertinent to the proposed Ka-Band ESV system in New Orleans, Louisiana. This data was circulated to all incumbent licensees in the shared 28 GHz frequency ranges.

COMSEARCH**Earth Station Data Sheet**

19700 Janelia Farm Boulevard, Ashburn, VA 20147
 (703)726-5662 <http://www.comsearch.com>

Date: 08/03/2015
 Job Number: <PCNJobCode>

Administrative Information

Status ENGINEER PROPOSAL
 Call Sign <PCNCallSign>
 Licensee Code O3BNET
 Licensee Name O3b Networks USA, LLC.

Site Information NEW ORLEANS, LA

Venue Name
 Latitude (NAD 83) 29° 56' 49.7" N
 Longitude (NAD 83) 90° 3' 46.2" W
 Climate Zone B
 Rain Zone 1
 Ground Elevation (AMSL) 0.0 m / 0.0 ft

Link Information

Satellite Type Medium Earth Orbit
 Mode TO - Transmit-Only
 Modulation Digital
 Minimum Elevation Angle 10.0°
 Azimuth Range 0.0° to 360°
 Antenna Centerline (AGL) 15.54 m / 51.0 ft

Antenna Information Transmit - FCC32

Manufacturer Orbit
 Model 1.2 Meter
 Gain / Diameter 48.0 dBi / 1.2 m
 3-dB / 15-dB Beamwidth 0.60° / 1.40°

Max Available RF Power (dBW/4 kHz) -17.1
 (dBW/MHz) 6.9

Maximum EIRP (dBW/4 kHz) 30.9
 (dBW/MHz) 54.9

Interference Objectives: Long Term -151.0 dBW/4 kHz 20%
 Short Term -128.0 dBW/4 kHz 0.0025%

Frequency Information Transmit 28.0 GHz

Emission / Frequency Range (MHz) 12M0G7D - 216MG7D / 27600.0 - 28350.0

Max Great Circle Coordination Distance 136.6 km / 84.9 mi
 Precipitation Scatter Contour Radius 100.0 km / 62.1 mi

COMSEARCH**Earth Station Data Sheet**

19700 Janelia Farm Boulevard, Ashburn, VA 20147
 (703)726-5662 <http://www.comsearch.com>

Coordination Values**NEW ORLEANS, LA**

Licensee Name O3b Networks USA, LLC.
 Latitude (NAD 83) 29° 56' 49.7" N
 Longitude (NAD 83) 90° 3' 46.2" W
 Ground Elevation (AMSL) 0.0 m / 0.0 ft
 Antenna Centerline (AGL) 15.54 m / 51.0 ft
 Antenna Model Orbit 1.2 Meter
 Antenna Mode Transmit 28.0 GHz
 Interference Objectives: Long Term -151.0 dBW/4 kHz 20%
 Short Term -128.0 dBW/4 kHz 0.0025%
 Max Available RF Power -17.1 (dBW/4 kHz)

Azimuth (°)	Horizon Elevation (°)	Antenna Discrimination (°)	Transmit 28.0 GHz	
			Horizon Gain (dBi)	Coordination Distance (km)
0	0.00	89.97	-10.00	100.00
5	0.00	85.03	-10.00	100.00
10	0.00	80.09	-10.00	100.00
15	0.00	75.15	-10.00	100.00
20	0.00	70.21	-10.00	100.00
25	0.00	65.28	-10.00	100.00
30	0.00	60.35	-10.00	100.00
35	0.00	55.43	-10.00	100.00
40	0.00	50.52	-10.00	100.00
45	0.00	45.62	-10.00	100.00
50	0.00	40.74	-10.00	100.00
55	0.00	35.89	-9.86	100.00
60	0.00	31.08	-8.69	100.00
65	0.00	26.34	-7.38	100.00
70	0.00	21.69	-5.92	100.00
75	0.00	17.24	-4.25	106.90
80	0.00	13.17	-2.34	113.50
85	0.00	9.97	-0.13	120.60
90	0.00	8.65	2.37	128.10
95	0.00	10.00	4.91	135.00
100	0.00	13.22	6.55	136.60
105	0.00	17.29	6.02	135.10
110	0.00	21.75	3.80	132.00
115	0.00	26.39	1.21	124.70
120	0.00	31.14	-1.14	117.40
125	0.00	35.95	-3.06	111.00
130	0.00	40.80	-4.66	105.50
135	0.00	45.68	-6.02	100.00
140	0.00	50.57	-7.18	100.00
145	0.00	55.48	-8.19	100.00
150	0.00	60.40	-9.06	100.00
155	0.00	65.33	-9.79	100.00
160	0.00	70.27	-10.00	100.00
165	0.00	75.20	-10.00	100.00
170	0.00	80.14	-10.00	100.00
175	0.00	85.09	-10.00	100.00
180	0.00	90.03	-10.00	100.00
185	0.00	94.97	-10.00	100.00

COMSEARCH**Earth Station Data Sheet**

19700 Janelia Farm Boulevard, Ashburn, VA 20147
 (703)726-5662 <http://www.comsearch.com>

Coordination Values**NEW ORLEANS, LA**

Licensee Name O3b Networks USA, LLC.
 Latitude (NAD 83) 29° 56' 49.7" N
 Longitude (NAD 83) 90° 3' 46.2" W
 Ground Elevation (AMSL) 0.0 m / 0.0 ft
 Antenna Centerline (AGL) 15.54 m / 51.0 ft
 Antenna Model Orbit 1.2 Meter
 Antenna Mode Transmit 28.0 GHz
 Interference Objectives: Long Term -151.0 dBW/4 kHz 20%
 Short Term -128.0 dBW/4 kHz 0.0025%
 Max Available RF Power -17.1 (dBW/4 kHz)

Azimuth (°)	Horizon Elevation (°)	Antenna Discrimination (°)	Transmit 28.0 GHz	
			Horizon Gain (dBi)	Coordination Distance (km)
190	0.00	99.91	-10.00	100.00
195	0.00	104.85	-10.00	100.00
200	0.00	109.79	-10.00	100.00
205	0.00	114.72	-9.79	100.00
210	0.00	119.65	-9.06	100.00
215	0.00	124.57	-8.19	100.00
220	0.00	129.48	-7.18	100.00
225	0.00	134.38	-6.02	100.00
230	0.00	139.26	-4.66	105.50
235	0.00	144.11	-3.06	111.00
240	0.00	148.92	-1.14	117.40
245	0.00	153.66	1.20	124.70
250	0.00	158.31	3.77	132.00
255	0.00	162.76	5.94	134.90
260	0.00	166.83	6.43	136.20
265	0.00	170.03	4.80	134.70
270	0.00	171.35	2.28	127.80
275	0.00	170.00	-0.19	120.40
280	0.00	166.78	-2.39	113.30
285	0.00	162.71	-4.29	106.80
290	0.00	158.25	-5.95	100.00
295	0.00	153.61	-7.41	100.00
300	0.00	148.86	-8.71	100.00
305	0.00	144.05	-9.88	100.00
310	0.00	139.20	-10.00	100.00
315	0.00	134.32	-10.00	100.00
320	0.00	129.43	-10.00	100.00
325	0.00	124.52	-10.00	100.00
330	0.00	119.60	-10.00	100.00
335	0.00	114.67	-10.00	100.00
340	0.00	109.73	-10.00	100.00
345	0.00	104.80	-10.00	100.00
350	0.00	99.86	-10.00	100.00
355	0.00	94.91	-10.00	100.00

COMSEARCH**Earth Station Data Sheet**

19700 Janelia Farm Boulevard, Ashburn, VA 20147
 (703)726-5662 <http://www.comsearch.com>

Date: 08/03/2015
 Job Number: <PCNJobCode>

Administrative Information

Status ENGINEER PROPOSAL
 Call Sign <PCNCallSign>
 Licensee Code O3BNET
 Licensee Name O3b Networks USA, LLC.

Site Information**NEW ORLEANS, LA**

Venue Name
 Latitude (NAD 83) 29° 56' 49.7" N
 Longitude (NAD 83) 90° 3' 46.2" W
 Climate Zone B
 Rain Zone 1
 Ground Elevation (AMSL) 0.0 m / 0.0 ft

Link Information

Satellite Type Medium Earth Orbit
 Mode TO - Transmit-Only
 Modulation Digital
 Minimum Elevation Angle 10.0°
 Azimuth Range 0.0° to 360°
 Antenna Centerline (AGL) 15.54 m / 51.0 ft

Antenna Information**Transmit - FCC32**

Manufacturer Orbit
 Model 2.2 Meter
 Gain / Diameter 52.5 dBi / 2.2 m
 3-dB / 15-dB Beamwidth 0.14° / 0.32°

Max Available RF Power (dBW/4 kHz) -22.1
 (dBW/MHz) 1.9

Maximum EIRP (dBW/4 kHz) 30.4
 (dBW/MHz) 54.4

Interference Objectives: Long Term -151.0 dBW/4 kHz 20%
 Short Term -128.0 dBW/4 kHz 0.0025%

Frequency Information**Transmit 28.0 GHz**

Emission / Frequency Range (MHz) 12M0G7D - 216MG7D / 27600.0 - 28350.0

Max Great Circle Coordination Distance 136.6 km / 84.9 mi
 Precipitation Scatter Contour Radius 100.0 km / 62.1 mi

COMSEARCH**Earth Station Data Sheet**

19700 Janelia Farm Boulevard, Ashburn, VA 20147
(703)726-5662 <http://www.comsearch.com>

Coordination Values**NEW ORLEANS, LA**

Licensee Name O3b Networks USA, LLC.
 Latitude (NAD 83) 29° 56' 49.7" N
 Longitude (NAD 83) 90° 3' 46.2" W
 Ground Elevation (AMSL) 0.0 m / 0.0 ft
 Antenna Centerline (AGL) 15.54 m / 51.0 ft
 Antenna Model Orbit 2.2 Meter
 Antenna Mode Transmit 28.0 GHz
 Interference Objectives: Long Term -151.0 dBW/4 kHz 20%
 Short Term -128.0 dBW/4 kHz 0.0025%
 Max Available RF Power -22.1 (dBW/4 kHz)

Azimuth (°)	Horizon Elevation (°)	Antenna Discrimination (°)	Transmit 28.0 GHz	
			Horizon Gain (dBi)	Coordination Distance (km)
0	0.00	89.97	-10.00	100.00
5	0.00	85.03	-10.00	100.00
10	0.00	80.09	-10.00	100.00
15	0.00	75.15	-10.00	100.00
20	0.00	70.21	-10.00	100.00
25	0.00	65.28	-10.00	100.00
30	0.00	60.35	-10.00	100.00
35	0.00	55.43	-10.00	100.00
40	0.00	50.52	-10.00	100.00
45	0.00	45.62	-10.00	100.00
50	0.00	40.74	-10.00	100.00
55	0.00	35.89	-9.86	100.00
60	0.00	31.08	-8.69	100.00
65	0.00	26.34	-7.38	100.00
70	0.00	21.69	-5.92	100.00
75	0.00	17.24	-4.25	106.90
80	0.00	13.17	-2.34	113.50
85	0.00	9.97	-0.13	120.60
90	0.00	8.65	2.37	128.10
95	0.00	10.00	4.91	135.00
100	0.00	13.22	6.55	136.60
105	0.00	17.29	6.02	135.10
110	0.00	21.75	3.80	132.00
115	0.00	26.39	1.21	124.70
120	0.00	31.14	-1.14	117.40
125	0.00	35.95	-3.06	111.00
130	0.00	40.80	-4.66	105.50
135	0.00	45.68	-6.02	100.00
140	0.00	50.57	-7.18	100.00
145	0.00	55.48	-8.19	100.00
150	0.00	60.40	-9.06	100.00
155	0.00	65.33	-9.79	100.00
160	0.00	70.27	-10.00	100.00
165	0.00	75.20	-10.00	100.00
170	0.00	80.14	-10.00	100.00
175	0.00	85.09	-10.00	100.00
180	0.00	90.03	-10.00	100.00
185	0.00	94.97	-10.00	100.00

COMSEARCH**Earth Station Data Sheet**

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 (703)726-5662 <http://www.comsearch.com>

Coordination Values**NEW ORLEANS, LA**

Licensee Name O3b Networks USA, LLC.
 Latitude (NAD 83) 29° 56' 49.7" N
 Longitude (NAD 83) 90° 3' 46.2" W
 Ground Elevation (AMSL) 0.0 m / 0.0 ft
 Antenna Centerline (AGL) 15.54 m / 51.0 ft
 Antenna Model Orbit 2.2 Meter
 Antenna Mode Transmit 28.0 GHz
 Interference Objectives: Long Term -151.0 dBW/4 kHz 20%
 Short Term -128.0 dBW/4 kHz 0.0025%
 Max Available RF Power -22.1 (dBW/4 kHz)

Azimuth (°)	Horizon Elevation (°)	Antenna Discrimination (°)	Transmit 28.0 GHz	
			Horizon Gain (dBi)	Coordination Distance (km)
190	0.00	99.91	-10.00	100.00
195	0.00	104.85	-10.00	100.00
200	0.00	109.79	-10.00	100.00
205	0.00	114.72	-9.79	100.00
210	0.00	119.65	-9.06	100.00
215	0.00	124.57	-8.19	100.00
220	0.00	129.48	-7.18	100.00
225	0.00	134.38	-6.02	100.00
230	0.00	139.26	-4.66	105.50
235	0.00	144.11	-3.06	111.00
240	0.00	148.92	-1.14	117.40
245	0.00	153.66	1.20	124.70
250	0.00	158.31	3.77	132.00
255	0.00	162.76	5.94	134.90
260	0.00	166.83	6.43	136.20
265	0.00	170.03	4.80	134.70
270	0.00	171.35	2.28	127.80
275	0.00	170.00	-0.19	120.40
280	0.00	166.78	-2.39	113.30
285	0.00	162.71	-4.29	106.80
290	0.00	158.25	-5.95	100.00
295	0.00	153.61	-7.41	100.00
300	0.00	148.86	-8.71	100.00
305	0.00	144.05	-9.88	100.00
310	0.00	139.20	-10.00	100.00
315	0.00	134.32	-10.00	100.00
320	0.00	129.43	-10.00	100.00
325	0.00	124.52	-10.00	100.00
330	0.00	119.60	-10.00	100.00
335	0.00	114.67	-10.00	100.00
340	0.00	109.73	-10.00	100.00
345	0.00	104.80	-10.00	100.00
350	0.00	99.86	-10.00	100.00
355	0.00	94.91	-10.00	100.00

5. Contact Information

For questions or information regarding the 28 GHz Frequency Coordination Report, please contact:

Contact person:	Joanna Lynch
Title:	Manager, Spectrum & Data Solutions
Company:	Comsearch
Address:	19700 Janelia Farm Blvd., Ashburn, VA 20147
Telephone:	703-726-5711
Fax:	703-726-5599
Email:	jlynch@comsearch.com
Web site:	www.comsearch.com

Ka-Band Earth Station – Port Canaveral, FL

Frequency Coordination Report

28 GHz



Prepared on Behalf of
O3b Networks USA, LLC

September 16, 2015



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1. Summary of Results

On behalf of O3b Networks, Comsearch performed a coordination notice for all existing and proposed terrestrial licenses within the coordination contours of their proposed Ka-Band Earth Stations on Vessels (ESV) in Port Canaveral, Florida, which will transmit at 28 GHz¹. Prior-notification letters were sent to the licensees and a copy of the notification data is provided in section four of this report. The earth station coordination was finalized on September 15, 2015.

No objections were received from any of the incumbent 28 GHz licensees. Our notification to the LMDS incumbents was performed under the assumption that the ESV system would be operating on a secondary basis to LMDS Block A operations and a contact at O3b Networks has been provided in case any concerns may arise in the future.

2. 28 GHz Common Carrier and LTTS Coordination

In accordance with FCC Rules and Regulations, the Ka-Band ESV system in Port Canaveral, Florida was prior-coordinated by Comsearch. A notification letter and datasheets for this system were sent to the following 28 GHz common carrier fixed microwave licensees on August 13, 2015. These licensees are authorized to operate temporary fixed operations from 27.5 to 29.5 GHz within specified geographic areas.

Licensee	Authorized Geographic Area
AT&T	Statewide: AL, FL, GA, KY, LA, MS, NC, SC, and TN
Verizon	Continental US

A notification letter and datasheets for the Ka-Band ESV system in Port Canaveral, Florida were also sent to the following 28 GHz local television transmission licensee on August 13, 2015. This licensee is authorized to operate temporary fixed operations from 27.5 to 29.5 GHz on a nationwide basis.

Licensee	Authorized Geographic Area
Information Super Station, LLC	Continental US

No objections were received from the common carrier or local television transmission service incumbents.

¹ The proposed ESV system will operate in the 27.6 – 28.35 GHz portion of the Ka-Band.

3. 28 GHz LMDS Coordination

A Notification letter was sent to the following 28 GHz LMDS licensees on August 13, 2015. The proposed earth station will operate on frequencies that overlap Block A of the LMDS service. The total frequency allocation for Block A of the LMDS spectrum appears below.

Block A: 27.500-28.350 GHz
29.100-29.250 GHz
31.075-31.225 GHz

Licensee	Market	Market Name
Nextlink/XO	BTA212	Jacksonville, FL
T-Mobile ²	BTA212	Jacksonville, FL
Wireless Distribution Services	BTA239	Lakeland-Winter Haven, FL
Rainier Connect	BTA326	Ocala, FL
Straight Path Spectrum	BTA336	Orlando, FL
T-Mobile ³	BTA336	Orlando, FL
Nextlink/XO	BTA440	Tampa-St. Petersburg-Clearwater, FL
T-Mobile ⁴	BTA440	Tampa-St. Petersburg-Clearwater, FL
Nextlink/XO	BTA469	West Palm Beach-Boca Raton, FL
T-Mobile ⁵	BTA469	West Palm Beach-Boca Raton, FL

No objections were received from the LMDS incumbents.

² T-Mobile has acquired spectrum from Nextlink/XO in the Jacksonville, FL Basic Trading Area (BTA).

³ T-Mobile has acquired spectrum from Straight Path in the Orlando, FL BTA.

⁴ T-Mobile has acquired spectrum from Nextlink/XO in the Tampa-St. Petersburg-Clearwater, FL BTA.

⁵ T-Mobile has acquired spectrum from Nextlink/XO in the West Palm Beach-Boca Raton, FL BTA.

4. Earth Station Coordination Data

This section presents the data pertinent to the proposed Ka-Band ESV system in Port Canaveral, Florida. This data was circulated to all incumbent licensees in the shared 28 GHz frequency ranges.

COMSEARCH**Earth Station Data Sheet**

19700 Janelia Farm Boulevard, Ashburn, VA 20147
 (703)726-5662 <http://www.comsearch.com>

Date: 08/04/2015
 Job Number: <PCNJobCode>

Administrative Information

Status ENGINEER PROPOSAL
 Call Sign <PCNCallSign>
 Licensee Code O3BNET
 Licensee Name O3b Networks USA, LLC.

Site Information**PORT CANAVERAL, FL**

Venue Name
 Latitude (NAD 83) 28° 24' 40.2" N
 Longitude (NAD 83) 80° 37' 42.5" W
 Climate Zone B
 Rain Zone 1
 Ground Elevation (AMSL) 0.0 m / 0.0 ft

Link Information

Satellite Type Medium Earth Orbit
 Mode TO - Transmit-Only
 Modulation Digital
 Minimum Elevation Angle 10.0°
 Azimuth Range 0.0° to 360°
 Antenna Centerline (AGL) 15.54 m / 51.0 ft

Antenna Information**Transmit - FCC32**

Manufacturer Orbit
 Model 1.2 Meter
 Gain / Diameter 48.0 dBi / 1.2 m
 3-dB / 15-dB Beamwidth 0.60° / 1.40°

Max Available RF Power (dBW/4 kHz) -17.1
 (dBW/MHz) 6.9

Maximum EIRP (dBW/4 kHz) 30.9
 (dBW/MHz) 54.9

Interference Objectives: Long Term -151.0 dBW/4 kHz 20%
 Short Term -128.0 dBW/4 kHz 0.0025%

Frequency Information**Transmit 28.0 GHz**

Emission / Frequency Range (MHz) 12M0G7D - 216MG7D / 27600.0 - 28350.0

Max Great Circle Coordination Distance 137.4 km / 85.4 mi
 Precipitation Scatter Contour Radius 100.0 km / 62.1 mi

COMSEARCH**Earth Station Data Sheet**

19700 Janelia Farm Boulevard, Ashburn, VA 20147
 (703)726-5662 <http://www.comsearch.com>

Coordination Values**PORT CANAVER, FL**

Licensee Name O3b Networks USA, LLC.
 Latitude (NAD 83) 28° 24' 40.2" N
 Longitude (NAD 83) 80° 37' 42.5" W
 Ground Elevation (AMSL) 0.0 m / 0.0 ft
 Antenna Centerline (AGL) 15.54 m / 51.0 ft
 Antenna Model Orbit 1.2 Meter
 Antenna Mode Transmit 28.0 GHz
 Interference Objectives: Long Term -151.0 dBW/4 kHz 20%
 Short Term -128.0 dBW/4 kHz 0.0025%
 Max Available RF Power -17.1 (dBW/4 kHz)

Azimuth (°)	Horizon Elevation (°)	Antenna Discrimination (°)	Transmit 28.0 GHz	
			Horizon Gain (dBi)	Coordination Distance (km)
0	0.00	94.49	-10.00	100.00
5	0.00	89.49	-10.00	100.00
10	0.00	84.49	-10.00	100.00
15	0.00	79.49	-10.00	100.00
20	0.00	74.49	-10.00	100.00
25	0.00	69.49	-10.00	100.00
30	0.00	64.49	-10.00	100.00
35	0.00	59.49	-10.00	100.00
40	0.00	54.49	-10.00	100.00
45	0.00	49.49	-10.00	100.00
50	0.00	44.49	-10.00	100.00
55	0.00	39.49	-9.67	100.00
60	0.00	34.49	-8.47	100.00
65	0.00	29.50	-7.14	100.00
70	0.00	24.50	-5.64	100.00
75	0.00	19.50	-3.93	108.00
80	0.00	14.50	-1.96	114.70
85	0.00	9.50	0.33	122.00
90	0.00	4.52	2.90	129.60
95	0.00	0.69	5.45	133.50
100	0.00	5.53	6.84	137.40
105	0.00	10.52	5.91	134.80
110	0.00	15.51	3.49	131.20
115	0.00	20.51	0.87	123.70
120	0.00	25.51	-1.46	116.40
125	0.00	30.51	-3.36	110.00
130	0.00	35.51	-4.95	104.40
135	0.00	40.51	-6.31	100.00
140	0.00	45.51	-7.47	100.00
145	0.00	50.51	-8.48	100.00
150	0.00	55.51	-9.35	100.00
155	0.00	60.51	-10.00	100.00
160	0.00	65.51	-10.00	100.00
165	0.00	70.51	-10.00	100.00
170	0.00	75.51	-10.00	100.00
175	0.00	80.51	-10.00	100.00
180	0.00	85.51	-10.00	100.00
185	0.00	90.51	-10.00	100.00

COMSEARCH**Earth Station Data Sheet**

19700 Janelia Farm Boulevard, Ashburn, VA 20147
 (703)726-5662 <http://www.comsearch.com>

Coordination Values**PORT CANAVER, FL**

Licensee Name O3b Networks USA, LLC.
 Latitude (NAD 83) 28° 24' 40.2" N
 Longitude (NAD 83) 80° 37' 42.5" W
 Ground Elevation (AMSL) 0.0 m / 0.0 ft
 Antenna Centerline (AGL) 15.54 m / 51.0 ft
 Antenna Model Orbit 1.2 Meter
 Antenna Mode Transmit 28.0 GHz
 Interference Objectives: Long Term -151.0 dBW/4 kHz 20%
 Short Term -128.0 dBW/4 kHz 0.0025%
 Max Available RF Power -17.1 (dBW/4 kHz)

Azimuth (°)	Horizon Elevation (°)	Antenna Discrimination (°)	Transmit 28.0 GHz	
			Horizon Gain (dBi)	Coordination Distance (km)
190	0.00	95.51	-10.00	100.00
195	0.00	100.51	-10.00	100.00
200	0.00	105.51	-10.00	100.00
205	0.00	110.51	-10.00	100.00
210	0.00	115.51	-9.35	100.00
215	0.00	120.51	-8.48	100.00
220	0.00	125.51	-7.47	100.00
225	0.00	130.51	-6.31	100.00
230	0.00	135.51	-4.95	104.40
235	0.00	140.51	-3.36	110.00
240	0.00	145.51	-1.45	116.40
245	0.00	150.50	0.86	123.60
250	0.00	155.50	3.43	131.00
255	0.00	160.50	5.76	134.40
260	0.00	165.50	6.59	136.70
265	0.00	170.50	5.20	132.90
270	0.00	175.48	2.71	129.00
275	0.00	179.31	0.19	121.60
280	0.00	174.47	-2.06	114.40
285	0.00	169.48	-4.01	107.80
290	0.00	164.49	-5.70	100.00
295	0.00	159.49	-7.20	100.00
300	0.00	154.49	-8.52	100.00
305	0.00	149.49	-9.71	100.00
310	0.00	144.49	-10.00	100.00
315	0.00	139.49	-10.00	100.00
320	0.00	134.49	-10.00	100.00
325	0.00	129.49	-10.00	100.00
330	0.00	124.49	-10.00	100.00
335	0.00	119.49	-10.00	100.00
340	0.00	114.49	-10.00	100.00
345	0.00	109.49	-10.00	100.00
350	0.00	104.49	-10.00	100.00
355	0.00	99.49	-10.00	100.00

COMSEARCH**Earth Station Data Sheet**

19700 Janelia Farm Boulevard, Ashburn, VA 20147
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Date: 08/04/2015
 Job Number: <PCNJobCode>

Administrative Information

Status ENGINEER PROPOSAL
 Call Sign <PCNCallSign>
 Licensee Code O3BNET
 Licensee Name O3b Networks USA, LLC.

Site Information**PORT CANAVERAL, FL**

Venue Name
 Latitude (NAD 83) 28° 24' 40.2" N
 Longitude (NAD 83) 80° 37' 42.5" W
 Climate Zone B
 Rain Zone 1
 Ground Elevation (AMSL) 0.0 m / 0.0 ft

Link Information

Satellite Type Medium Earth Orbit
 Mode TO - Transmit-Only
 Modulation Digital
 Minimum Elevation Angle 10.0°
 Azimuth Range 0.0° to 360°
 Antenna Centerline (AGL) 15.54 m / 51.0 ft

Antenna Information**Transmit - FCC32**

Manufacturer Orbit
 Model 2.2 Meter
 Gain / Diameter 52.5 dBi / 2.2 m
 3-dB / 15-dB Beamwidth 0.14° / 0.32°

Max Available RF Power (dBW/4 kHz) -22.1
 (dBW/MHz) 1.9

Maximum EIRP (dBW/4 kHz) 30.4
 (dBW/MHz) 54.4

Interference Objectives: Long Term -151.0 dBW/4 kHz 20%
 Short Term -128.0 dBW/4 kHz 0.0025%

Frequency Information**Transmit 28.0 GHz**

Emission / Frequency Range (MHz) 12M0G7D - 216MG7D / 27600.0 - 28350.0

Max Great Circle Coordination Distance 136.7 km / 84.9 mi
 Precipitation Scatter Contour Radius 100.0 km / 62.1 mi

COMSEARCH**Earth Station Data Sheet**

19700 Janelia Farm Boulevard, Ashburn, VA 20147
 (703)726-5662 <http://www.comsearch.com>

Coordination Values**PORT CANAVER, FL**

Licensee Name O3b Networks USA, LLC.
 Latitude (NAD 83) 28° 24' 40.2" N
 Longitude (NAD 83) 80° 37' 42.5" W
 Ground Elevation (AMSL) 0.0 m / 0.0 ft
 Antenna Centerline (AGL) 15.54 m / 51.0 ft
 Antenna Model Orbit 2.2 Meter
 Antenna Mode Transmit 28.0 GHz
 Interference Objectives: Long Term -151.0 dBW/4 kHz 20%
 Short Term -128.0 dBW/4 kHz 0.0025%
 Max Available RF Power -22.1 (dBW/4 kHz)

Azimuth (°)	Horizon Elevation (°)	Antenna Discrimination (°)	Transmit 28.0 GHz	
			Horizon Gain (dBi)	Coordination Distance (km)
0	0.00	94.49	-10.00	100.00
5	0.00	89.49	-10.00	100.00
10	0.00	84.49	-10.00	100.00
15	0.00	79.49	-10.00	100.00
20	0.00	74.49	-10.00	100.00
25	0.00	69.49	-10.00	100.00
30	0.00	64.49	-10.00	100.00
35	0.00	59.49	-10.00	100.00
40	0.00	54.49	-10.00	100.00
45	0.00	49.49	-10.00	100.00
50	0.00	44.49	-10.00	100.00
55	0.00	39.49	-9.67	100.00
60	0.00	34.49	-8.47	100.00
65	0.00	29.50	-7.14	100.00
70	0.00	24.50	-5.64	100.00
75	0.00	19.50	-3.93	100.00
80	0.00	14.50	-1.96	100.00
85	0.00	9.50	0.33	100.00
90	0.00	4.52	2.90	100.00
95	0.00	0.69	5.45	100.00
100	0.00	5.53	6.84	100.00
105	0.00	10.52	5.91	100.00
110	0.00	15.51	3.49	100.00
115	0.00	20.51	0.87	100.00
120	0.00	25.51	-1.46	100.00
125	0.00	30.51	-3.36	100.00
130	0.00	35.51	-4.95	100.00
135	0.00	40.51	-6.31	100.00
140	0.00	45.51	-7.47	100.00
145	0.00	50.51	-8.48	100.00
150	0.00	55.51	-9.35	100.00
155	0.00	60.51	-10.00	100.00
160	0.00	65.51	-10.00	100.00
165	0.00	70.51	-10.00	100.00
170	0.00	75.51	-10.00	100.00
175	0.00	80.51	-10.00	100.00
180	0.00	85.51	-10.00	100.00
185	0.00	90.51	-10.00	100.00

COMSEARCH**Earth Station Data Sheet**

19700 Janelia Farm Boulevard, Ashburn, VA 20147
 (703)726-5662 <http://www.comsearch.com>

Coordination Values**PORT CANAVER, FL**

Licensee Name O3b Networks USA, LLC.
 Latitude (NAD 83) 28° 24' 40.2" N
 Longitude (NAD 83) 80° 37' 42.5" W
 Ground Elevation (AMSL) 0.0 m / 0.0 ft
 Antenna Centerline (AGL) 15.54 m / 51.0 ft
 Antenna Model Orbit 2.2 Meter
 Antenna Mode Transmit 28.0 GHz
 Interference Objectives: Long Term -151.0 dBW/4 kHz 20%
 Short Term -128.0 dBW/4 kHz 0.0025%
 Max Available RF Power -22.1 (dBW/4 kHz)

Azimuth (°)	Horizon Elevation (°)	Antenna Discrimination (°)	Transmit 28.0 GHz	
			Horizon Gain (dBi)	Coordination Distance (km)
190	0.00	95.51	-10.00	100.00
195	0.00	100.51	-10.00	100.00
200	0.00	105.51	-10.00	100.00
205	0.00	110.51	-10.00	100.00
210	0.00	115.51	-9.35	100.00
215	0.00	120.51	-8.48	100.00
220	0.00	125.51	-7.47	100.00
225	0.00	130.51	-6.31	100.00
230	0.00	135.51	-4.95	104.40
235	0.00	140.51	-3.36	110.00
240	0.00	145.51	-1.45	116.40
245	0.00	150.50	0.86	123.60
250	0.00	155.50	3.43	131.00
255	0.00	160.50	5.76	134.40
260	0.00	165.50	6.59	136.70
265	0.00	170.50	5.20	132.90
270	0.00	175.48	2.71	129.00
275	0.00	179.31	0.19	121.60
280	0.00	174.47	-2.06	114.40
285	0.00	169.48	-4.01	107.80
290	0.00	164.49	-5.70	100.00
295	0.00	159.49	-7.20	100.00
300	0.00	154.49	-8.52	100.00
305	0.00	149.49	-9.71	100.00
310	0.00	144.49	-10.00	100.00
315	0.00	139.49	-10.00	100.00
320	0.00	134.49	-10.00	100.00
325	0.00	129.49	-10.00	100.00
330	0.00	124.49	-10.00	100.00
335	0.00	119.49	-10.00	100.00
340	0.00	114.49	-10.00	100.00
345	0.00	109.49	-10.00	100.00
350	0.00	104.49	-10.00	100.00
355	0.00	99.49	-10.00	100.00

5. Contact Information

For questions or information regarding the 28 GHz Frequency Coordination Report, please contact:

Contact person:	Joanna Lynch
Title:	Manager, Spectrum & Data Solutions
Company:	Comsearch
Address:	19700 Janelia Farm Blvd., Ashburn, VA 20147
Telephone:	703-726-5711
Fax:	703-726-5599
Email:	jlynch@comsearch.com
Web site:	www.comsearch.com

Ka-Band Earth Station – Portland, ME

Frequency Coordination Report

28 GHz



Prepared on Behalf of
O3b Networks USA, LLC

September 16, 2015



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1. Summary of Results

On behalf of O3b Networks, Comsearch performed a coordination notice for all existing and proposed terrestrial licenses within the coordination contours of their proposed Ka-Band Earth Stations on Vessels (ESV) in Portland, Maine, which will transmit at 28 GHz¹. Prior-notification letters were sent to the licensees and a copy of the notification data is provided in section four of this report. The earth station coordination was finalized on September 15, 2015.

No objections were received from any of the incumbent 28 GHz licensees.

2. 28 GHz Common Carrier and LTTS Coordination

In accordance with FCC Rules and Regulations, the Ka-Band ESV system in Portland, Maine was prior-coordinated by Comsearch. A notification letter and datasheets for this system were sent to the following 28 GHz common carrier fixed microwave licensee on August 13, 2015. This licensee is authorized to operate temporary fixed operations from 27.5 to 29.5 GHz on a nationwide basis.

Licensee	Authorized Geographic Area
Verizon	Continental US

A notification letter and datasheets for the Ka-Band ESV system in Portland, Maine were also sent to the following 28 GHz local television transmission licensee on August 13, 2015. This licensee is authorized to operate temporary fixed operations from 27.5 to 29.5 GHz on a nationwide basis.

Licensee	Authorized Geographic Area
Information Super Station, LLC	Continental US

No objections were received from the common carrier or local television transmission service incumbents.

¹ The proposed ESV system will operate in the 27.6 – 28.35 GHz portion of the Ka-Band.

3. 28 GHz LMDS Coordination

The proposed ESV system will operate on frequencies that overlap Block A of the LMDS service. The total frequency allocation for Block A of the LMDS spectrum appears below.

Block A: 27.500-28.350 GHz
 29.100-29.250 GHz
 31.075-31.225 GHz

Since no active LMDS licensees were found within the coordination contour of the ESV system, no LMDS coordination was needed.



4. Earth Station Coordination Data

This section presents the data pertinent to the proposed Ka-Band ESV system in Portland, Maine. This data was circulated to all incumbent licensees in the shared 28 GHz frequency ranges.

COMSEARCH**Earth Station Data Sheet**

19700 Janelia Farm Boulevard, Ashburn, VA 20147
 (703)726-5662 <http://www.comsearch.com>

Date: 08/03/2015
 Job Number: <PCNJobCode>

Administrative Information

Status ENGINEER PROPOSAL
 Call Sign <PCNCallSign>
 Licensee Code O3BNET
 Licensee Name O3b Networks USA, LLC.

Site Information**PORTLAND, ME**

Venue Name
 Latitude (NAD 83) 44° 23' 31.3" N
 Longitude (NAD 83) 68° 12' 13.8" W
 Climate Zone B
 Rain Zone 2
 Ground Elevation (AMSL) 0.0 m / 0.0 ft

Link Information

Satellite Type Medium Earth Orbit
 Mode TO - Transmit-Only
 Modulation Digital
 Minimum Elevation Angle 10.0°
 Azimuth Range 0.0° to 360°
 Antenna Centerline (AGL) 15.54 m / 51.0 ft

Antenna Information**Transmit - FCC32**

Manufacturer Orbit
 Model 1.2 Meter
 Gain / Diameter 48.0 dBi / 1.2 m
 3-dB / 15-dB Beamwidth 0.60° / 1.40°

Max Available RF Power (dBW/4 kHz) -17.1
 (dBW/MHz) 6.9

Maximum EIRP (dBW/4 kHz) 30.9
 (dBW/MHz) 54.9

Interference Objectives: Long Term -151.0 dBW/4 kHz 20%
 Short Term -128.0 dBW/4 kHz 0.0025%

Frequency Information**Transmit 28.0 GHz**

Emission / Frequency Range (MHz) 12M0G7D - 216MG7D / 27600.0 - 28350.0

Max Great Circle Coordination Distance 134.7 km / 83.7 mi
 Precipitation Scatter Contour Radius 100.0 km / 62.1 mi

COMSEARCH**Earth Station Data Sheet**

19700 Janelia Farm Boulevard, Ashburn, VA 20147
 (703)726-5662 <http://www.comsearch.com>

Coordination Values**PORTLAND, ME**

Licensee Name O3b Networks USA, LLC.
 Latitude (NAD 83) 44° 23' 31.3" N
 Longitude (NAD 83) 68° 12' 13.8" W
 Ground Elevation (AMSL) 0.0 m / 0.0 ft
 Antenna Centerline (AGL) 15.54 m / 51.0 ft
 Antenna Model Orbit 1.2 Meter
 Antenna Mode Transmit 28.0 GHz
 Interference Objectives: Long Term -151.0 dBW/4 kHz 20%
 Short Term -128.0 dBW/4 kHz 0.0025%
 Max Available RF Power -17.1 (dBW/4 kHz)

Azimuth (°)	Horizon Elevation (°)	Antenna Discrimination (°)	Transmit 28.0 GHz	
			Horizon Gain (dBi)	Coordination Distance (km)
0	0.00	105.52	-10.00	100.00
5	0.00	100.56	-10.00	100.00
10	0.00	95.59	-10.00	100.00
15	0.00	90.63	-10.00	100.00
20	0.00	85.66	-10.00	100.00
25	0.00	80.70	-10.00	100.00
30	0.00	75.73	-10.00	100.00
35	0.00	70.77	-10.00	100.00
40	0.00	65.81	-10.00	100.00
45	0.00	60.85	-10.00	100.00
50	0.00	55.90	-10.00	100.00
55	0.00	50.96	-10.00	100.00
60	0.00	46.02	-10.00	100.00
65	0.00	41.09	-9.82	100.00
70	0.00	36.18	-8.65	100.00
75	0.00	31.30	-7.36	100.00
80	0.00	26.45	-5.94	100.00
85	0.00	21.66	-4.31	106.70
90	0.00	16.99	-2.41	110.70
95	0.00	12.57	-0.28	112.50
100	0.00	8.78	1.92	126.80
105	0.00	6.78	4.75	100.00
110	0.00	8.03	6.37	100.00
115	0.00	11.53	4.78	134.70
120	0.00	15.84	2.87	129.50
125	0.00	20.47	0.72	123.20
130	0.00	25.23	-1.02	117.80
135	0.00	30.07	-2.46	113.10
140	0.00	34.94	-3.65	109.00
145	0.00	39.85	-4.66	105.50
150	0.00	44.77	-5.35	100.00
155	0.00	49.71	-5.97	100.00
160	0.00	54.65	-6.42	100.00
165	0.00	59.60	-6.64	100.00
170	0.00	64.56	-6.40	100.00
175	0.00	69.52	-6.99	100.00
180	0.00	74.48	-7.27	100.00
185	0.00	79.44	-6.97	100.00

COMSEARCH**Earth Station Data Sheet**

19700 Janelia Farm Boulevard, Ashburn, VA 20147
 (703)726-5662 <http://www.comsearch.com>

Coordination Values**PORTLAND, ME**

Licensee Name O3b Networks USA, LLC.
 Latitude (NAD 83) 44° 23' 31.3" N
 Longitude (NAD 83) 68° 12' 13.8" W
 Ground Elevation (AMSL) 0.0 m / 0.0 ft
 Antenna Centerline (AGL) 15.54 m / 51.0 ft
 Antenna Model Orbit 1.2 Meter
 Antenna Mode Transmit 28.0 GHz
 Interference Objectives: Long Term -151.0 dBW/4 kHz 20%
 Short Term -128.0 dBW/4 kHz 0.0025%
 Max Available RF Power -17.1 (dBW/4 kHz)

Azimuth (°)	Horizon Elevation (°)	Antenna Discrimination (°)	Transmit 28.0 GHz	
			Horizon Gain (dBi)	Coordination Distance (km)
190	0.00	84.41	-6.23	100.00
195	0.00	89.37	-5.71	100.00
200	0.00	94.34	-5.08	100.00
205	0.00	99.30	-4.54	100.00
210	0.00	104.27	-4.01	100.00
215	0.00	109.23	-3.31	100.00
220	0.00	114.19	-2.32	100.00
225	0.00	119.15	-1.09	100.00
230	0.00	124.10	0.36	100.00
235	0.00	129.04	1.87	100.00
240	0.00	133.98	4.04	100.00
245	0.00	138.91	7.30	100.00
250	0.00	143.82	12.61	100.90
255	0.00	148.70	13.55	110.30
260	0.00	153.55	7.99	100.00
265	0.00	158.34	3.50	100.00
270	0.00	163.01	0.31	100.00
275	0.00	167.43	-2.23	100.00
280	0.00	171.22	-4.29	100.00
285	0.00	173.22	-6.02	100.00
290	0.00	171.97	-7.52	100.00
295	0.00	168.47	-8.83	100.00
300	0.00	164.16	-10.00	100.00
305	0.00	159.53	-10.00	100.00
310	0.00	154.77	-10.00	100.00
315	0.00	149.93	-10.00	100.00
320	0.00	145.06	-10.00	100.00
325	0.00	140.15	-10.00	100.00
330	0.00	135.23	-10.00	100.00
335	0.00	130.29	-10.00	100.00
340	0.00	125.35	-10.00	100.00
345	0.00	120.40	-10.00	100.00
350	0.00	115.44	-10.00	100.00
355	0.00	110.48	-10.00	100.00

COMSEARCH**Earth Station Data Sheet**

19700 Janelia Farm Boulevard, Ashburn, VA 20147
 (703)726-5662 <http://www.comsearch.com>

Date: 08/03/2015
 Job Number: <PCNJobCode>

Administrative Information

Status ENGINEER PROPOSAL
 Call Sign <PCNCallSign>
 Licensee Code O3BNET
 Licensee Name O3b Networks USA, LLC.

Site Information**PORTLAND, ME**

Venue Name
 Latitude (NAD 83) 44° 23' 31.3" N
 Longitude (NAD 83) 68° 12' 13.8" W
 Climate Zone B
 Rain Zone 2
 Ground Elevation (AMSL) 0.0 m / 0.0 ft

Link Information

Satellite Type Medium Earth Orbit
 Mode TO - Transmit-Only
 Modulation Digital
 Minimum Elevation Angle 10.0°
 Azimuth Range 0.0° to 360°
 Antenna Centerline (AGL) 15.54 m / 51.0 ft

Antenna Information**Transmit - FCC32**

Manufacturer Orbit
 Model 2.2 Meter
 Gain / Diameter 52.5 dBi / 2.2 m
 3-dB / 15-dB Beamwidth 0.14° / 0.32°

Max Available RF Power (dBW/4 kHz) -22.1
 (dBW/MHz) 1.9

Maximum EIRP (dBW/4 kHz) 30.4
 (dBW/MHz) 54.4

Interference Objectives: Long Term -151.0 dBW/4 kHz 20%
 Short Term -128.0 dBW/4 kHz 0.0025%

Frequency Information**Transmit 28.0 GHz**

Emission / Frequency Range (MHz) 12M0G7D - 216MG7D / 27600.0 - 28350.0

Max Great Circle Coordination Distance 134.7 km / 83.7 mi
 Precipitation Scatter Contour Radius 100.0 km / 62.1 mi

COMSEARCH**Earth Station Data Sheet**

19700 Janelia Farm Boulevard, Ashburn, VA 20147
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Coordination Values**PORTLAND, ME**

Licensee Name O3b Networks USA, LLC.
 Latitude (NAD 83) 44° 23' 31.3" N
 Longitude (NAD 83) 68° 12' 13.8" W
 Ground Elevation (AMSL) 0.0 m / 0.0 ft
 Antenna Centerline (AGL) 15.54 m / 51.0 ft
 Antenna Model Orbit 2.2 meter
 Antenna Mode Transmit 28.0 GHz
 Interference Objectives: Long Term -151.0 dBW/4 kHz 20%
 Short Term -128.0 dBW/4 kHz 0.0025%
 Max Available RF Power -22.1 (dBW/4 kHz)

Azimuth (°)	Horizon Elevation (°)	Antenna Discrimination (°)	Transmit 28.0 GHz	
			Horizon Gain (dBi)	Coordination Distance (km)
0	0.00	105.52	-10.00	100.00
5	0.00	100.56	-10.00	100.00
10	0.00	95.59	-10.00	100.00
15	0.00	90.63	-10.00	100.00
20	0.00	85.66	-10.00	100.00
25	0.00	80.70	-10.00	100.00
30	0.00	75.73	-10.00	100.00
35	0.00	70.77	-10.00	100.00
40	0.00	65.81	-10.00	100.00
45	0.00	60.85	-10.00	100.00
50	0.00	55.90	-10.00	100.00
55	0.00	50.96	-10.00	100.00
60	0.00	46.02	-10.00	100.00
65	0.00	41.09	-9.82	100.00
70	0.00	36.18	-8.65	100.00
75	0.00	31.30	-7.36	100.00
80	0.00	26.45	-5.94	100.00
85	0.00	21.66	-4.31	106.70
90	0.00	16.99	-2.41	110.70
95	0.00	12.57	-0.28	112.50
100	0.00	8.78	1.92	126.80
105	0.00	6.78	4.75	100.00
110	0.00	8.03	6.37	100.00
115	0.00	11.53	4.78	134.70
120	0.00	15.84	2.87	129.50
125	0.00	20.47	0.72	123.20
130	0.00	25.23	-1.02	117.80
135	0.00	30.07	-2.46	113.10
140	0.00	34.94	-3.65	109.00
145	0.00	39.85	-4.66	105.50
150	0.00	44.77	-5.35	100.00
155	0.00	49.71	-5.97	100.00
160	0.00	54.65	-6.42	100.00
165	0.00	59.60	-6.64	100.00
170	0.00	64.56	-6.40	100.00
175	0.00	69.52	-6.99	100.00
180	0.00	74.48	-7.27	100.00
185	0.00	79.44	-6.97	100.00

COMSEARCH**Earth Station Data Sheet**

19700 Janelia Farm Boulevard, Ashburn, VA 20147
 (703)726-5662 <http://www.comsearch.com>

Coordination Values**PORTLAND, ME**

Licensee Name O3b Networks USA, LLC.
 Latitude (NAD 83) 44° 23' 31.3" N
 Longitude (NAD 83) 68° 12' 13.8" W
 Ground Elevation (AMSL) 0.0 m / 0.0 ft
 Antenna Centerline (AGL) 15.54 m / 51.0 ft
 Antenna Model Orbit 2.2 meter
 Antenna Mode Transmit 28.0 GHz
 Interference Objectives: Long Term -151.0 dBW/4 kHz 20%
 Short Term -128.0 dBW/4 kHz 0.0025%
 Max Available RF Power -22.1 (dBW/4 kHz)

Azimuth (°)	Horizon Elevation (°)	Antenna Discrimination (°)	Transmit 28.0 GHz	
			Horizon Gain (dBi)	Coordination Distance (km)
190	0.00	84.41	-6.23	100.00
195	0.00	89.37	-5.71	100.00
200	0.00	94.34	-5.08	100.00
205	0.00	99.30	-4.54	100.00
210	0.00	104.27	-4.01	100.00
215	0.00	109.23	-3.31	100.00
220	0.00	114.19	-2.32	100.00
225	0.00	119.15	-1.09	100.00
230	0.00	124.10	0.36	100.00
235	0.00	129.04	1.87	100.00
240	0.00	133.98	4.04	100.00
245	0.00	138.91	7.30	100.00
250	0.00	143.82	12.61	100.90
255	0.00	148.70	13.55	110.30
260	0.00	153.55	7.99	100.00
265	0.00	158.34	3.50	100.00
270	0.00	163.01	0.31	100.00
275	0.00	167.43	-2.23	100.00
280	0.00	171.22	-4.29	100.00
285	0.00	173.22	-6.02	100.00
290	0.00	171.97	-7.52	100.00
295	0.00	168.47	-8.83	100.00
300	0.00	164.16	-10.00	100.00
305	0.00	159.53	-10.00	100.00
310	0.00	154.77	-10.00	100.00
315	0.00	149.93	-10.00	100.00
320	0.00	145.06	-10.00	100.00
325	0.00	140.15	-10.00	100.00
330	0.00	135.23	-10.00	100.00
335	0.00	130.29	-10.00	100.00
340	0.00	125.35	-10.00	100.00
345	0.00	120.40	-10.00	100.00
350	0.00	115.44	-10.00	100.00
355	0.00	110.48	-10.00	100.00



5. Contact Information

For questions or information regarding the 28 GHz Frequency Coordination Report, please contact:

Contact person:	Joanna Lynch
Title:	Manager, Spectrum & Data Solutions
Company:	Comsearch
Address:	19700 Janelia Farm Blvd., Ashburn, VA 20147
Telephone:	703-726-5711
Fax:	703-726-5599
Email:	jlynch@comsearch.com
Web site:	www.comsearch.com

Ka-Band Earth Station – Rockland, ME

Frequency Coordination Report

28 GHz



Prepared on Behalf of
O3b Networks USA, LLC

September 16, 2015



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1. Summary of Results

On behalf of O3b Networks, Comsearch performed a coordination notice for all existing and proposed terrestrial licenses within the coordination contours of their proposed Ka-Band Earth Stations on Vessels (ESV) in Rockland, Maine, which will transmit at 28 GHz¹. Prior-notification letters were sent to the licensees and a copy of the notification data is provided in section four of this report. The earth station coordination was finalized on September 15, 2015.

No objections were received from any of the incumbent 28 GHz licensees.

2. 28 GHz Common Carrier and LTTS Coordination

In accordance with FCC Rules and Regulations, the Ka-Band ESV system in Rockland, Maine was prior-coordinated by Comsearch. A notification letter and datasheets for this system were sent to the following 28 GHz common carrier fixed microwave licensee on August 13, 2015. This licensee is authorized to operate temporary fixed operations from 27.5 to 29.5 GHz on a nationwide basis.

Licensee	Authorized Geographic Area
Verizon	Continental US

A notification letter and datasheets for the Ka-Band ESV system in Rockland, Maine were also sent to the following 28 GHz local television transmission licensee on August 13, 2015. This licensee is authorized to operate temporary fixed operations from 27.5 to 29.5 GHz on a nationwide basis.

Licensee	Authorized Geographic Area
Information Super Station, LLC	Continental US

No objections were received from the common carrier or local television transmission service incumbents.

¹ The proposed ESV system will operate in the 27.6 – 28.35 GHz portion of the Ka-Band.

3. 28 GHz LMDS Coordination

The proposed ESV system will operate on frequencies that overlap Block A of the LMDS service. The total frequency allocation for Block A of the LMDS spectrum appears below.

Block A: 27.500-28.350 GHz
 29.100-29.250 GHz
 31.075-31.225 GHz

Since no active LMDS licensees were found within the coordination contour of the ESV system, no LMDS coordination was needed.



4. Earth Station Coordination Data

This section presents the data pertinent to the proposed Ka-Band ESV system in Rockland, Maine. This data was circulated to all incumbent licensees in the shared 28 GHz frequency ranges.

COMSEARCH**Earth Station Data Sheet**

19700 Janelia Farm Boulevard, Ashburn, VA 20147
 (703)726-5662 <http://www.comsearch.com>

Date: 08/03/2015
 Job Number: <PCNJobCode>

Administrative Information

Status ENGINEER PROPOSAL
 Call Sign <PCNCallSign>
 Licensee Code O3BNET
 Licensee Name O3b Networks USA, LLC.

Site Information **ROCKLAND, ME**

Venue Name
 Latitude (NAD 83) 44° 6' 25.1" N
 Longitude (NAD 83) 69° 6' 28.3" W
 Climate Zone B
 Rain Zone 2
 Ground Elevation (AMSL) 0.0 m / 0.0 ft

Link Information

Satellite Type Medium Earth Orbit
 Mode TO - Transmit-Only
 Modulation Digital
 Minimum Elevation Angle 10.0°
 Azimuth Range 0.0° to 360°
 Antenna Centerline (AGL) 15.54 m / 51.0 ft

Antenna Information **Transmit - FCC32**

Manufacturer Orbit
 Model 1.2 Meter
 Gain / Diameter 48.0 dBi / 1.2 m
 3-dB / 15-dB Beamwidth 0.60° / 1.40°

Max Available RF Power (dBW/4 kHz) -17.1
 (dBW/MHz) 6.9

Maximum EIRP (dBW/4 kHz) 30.9
 (dBW/MHz) 54.9

Interference Objectives: Long Term -151.0 dBW/4 kHz 20%
 Short Term -128.0 dBW/4 kHz 0.0025%

Frequency Information **Transmit 28.0 GHz**

Emission / Frequency Range (MHz) 12M0G7D - 216MG7D / 27600.0 - 28350.0

Max Great Circle Coordination Distance 135.1 km / 83.9 mi
 Precipitation Scatter Contour Radius 100.0 km / 62.1 mi

COMSEARCH**Earth Station Data Sheet**

19700 Janelia Farm Boulevard, Ashburn, VA 20147
(703)726-5662 <http://www.comsearch.com>

Coordination Values**ROCKLAND, ME**

Licensee Name O3b Networks USA, LLC.
 Latitude (NAD 83) 44° 6' 25.1" N
 Longitude (NAD 83) 69° 6' 28.3" W
 Ground Elevation (AMSL) 0.0 m / 0.0 ft
 Antenna Centerline (AGL) 15.54 m / 51.0 ft
 Antenna Model Orbit 1.2 Meter
 Antenna Mode Transmit 28.0 GHz
 Interference Objectives: Long Term -151.0 dBW/4 kHz 20%
 Short Term -128.0 dBW/4 kHz 0.0025%
 Max Available RF Power -17.1 (dBW/4 kHz)

Azimuth (°)	Horizon Elevation (°)	Antenna Discrimination (°)	Transmit 28.0 GHz	
			Horizon Gain (dBi)	Coordination Distance (km)
0	0.00	104.79	-10.00	100.00
5	0.00	99.82	-10.00	100.00
10	0.00	94.85	-10.00	100.00
15	0.00	89.88	-10.00	100.00
20	0.00	84.91	-10.00	100.00
25	0.00	79.94	-10.00	100.00
30	0.00	74.97	-10.00	100.00
35	0.00	70.00	-10.00	100.00
40	0.00	65.04	-10.00	100.00
45	0.00	60.07	-10.00	100.00
50	0.00	55.11	-10.00	100.00
55	0.00	50.16	-10.00	100.00
60	0.00	45.21	-10.00	100.00
65	0.00	40.28	-9.63	100.00
70	0.00	35.36	-8.44	100.00
75	0.00	30.46	-7.12	100.00
80	0.00	25.59	-5.63	100.00
85	0.00	20.78	-3.95	108.00
90	0.00	16.09	-2.02	114.50
95	0.00	11.64	0.17	121.50
100	0.00	7.88	2.57	128.60
105	0.00	6.19	4.80	134.70
110	0.00	8.03	5.87	134.70
115	0.00	11.85	4.96	135.10
120	0.00	16.31	2.78	129.20
125	0.00	21.01	0.81	100.00
130	0.00	25.82	-0.85	100.00
135	0.00	30.69	-2.33	100.00
140	0.00	35.59	-3.62	100.00
145	0.00	40.51	-4.66	100.00
150	0.00	45.45	-5.53	100.00
155	0.00	50.40	-6.20	100.00
160	0.00	55.35	-6.84	100.00
165	0.00	60.31	-7.27	100.00
170	0.00	65.27	-7.52	100.00
175	0.00	70.24	-7.70	100.00
180	0.00	75.21	-7.71	100.00
185	0.00	80.18	-7.63	100.00

COMSEARCH**Earth Station Data Sheet**

19700 Janelia Farm Boulevard, Ashburn, VA 20147
(703)726-5662 <http://www.comsearch.com>

Coordination Values**ROCKLAND, ME**

Licensee Name O3b Networks USA, LLC.
Latitude (NAD 83) 44° 6' 25.1" N
Longitude (NAD 83) 69° 6' 28.3" W
Ground Elevation (AMSL) 0.0 m / 0.0 ft
Antenna Centerline (AGL) 15.54 m / 51.0 ft
Antenna Model Orbit 1.2 Meter
Antenna Mode Transmit 28.0 GHz
Interference Objectives: Long Term -151.0 dBW/4 kHz 20%
Short Term -128.0 dBW/4 kHz 0.0025%
Max Available RF Power -17.1 (dBW/4 kHz)

Azimuth (°)	Horizon Elevation (°)	Antenna Discrimination (°)	Transmit 28.0 GHz	
			Horizon Gain (dBi)	Coordination Distance (km)
190	0.00	85.15	-7.32	100.00
195	0.00	90.12	-7.10	100.00
200	0.00	95.09	-6.70	100.00
205	0.00	100.06	-6.20	100.00
210	0.00	105.03	-5.50	100.00
215	0.00	110.00	-4.68	100.00
220	0.00	114.96	-3.63	100.00
225	0.00	119.93	-2.36	100.00
230	0.00	124.89	-0.97	100.00
235	0.00	129.84	0.75	117.60
240	0.00	134.79	2.94	122.10
245	0.00	139.72	5.55	112.90
250	0.00	144.64	6.95	112.00
255	0.00	149.54	5.95	106.80
260	0.00	154.41	3.54	100.00
265	0.00	159.22	0.89	100.00
270	0.00	163.91	-1.46	100.00
275	0.00	168.36	-3.49	100.00
280	0.00	172.12	-5.25	100.00
285	0.00	173.81	-6.81	100.00
290	0.00	171.97	-8.19	100.00
295	0.00	168.15	-9.42	100.00
300	0.00	163.69	-10.00	100.00
305	0.00	158.99	-10.00	100.00
310	0.00	154.18	-10.00	100.00
315	0.00	149.31	-10.00	100.00
320	0.00	144.41	-10.00	100.00
325	0.00	139.49	-10.00	100.00
330	0.00	134.55	-10.00	100.00
335	0.00	129.60	-10.00	100.00
340	0.00	124.65	-10.00	100.00
345	0.00	119.69	-10.00	100.00
350	0.00	114.73	-10.00	100.00
355	0.00	109.76	-10.00	100.00

COMSEARCH**Earth Station Data Sheet**

19700 Janelia Farm Boulevard, Ashburn, VA 20147
 (703)726-5662 <http://www.comsearch.com>

Date: 08/03/2015
 Job Number: <PCNJobCode>

Administrative Information

Status ENGINEER PROPOSAL
 Call Sign <PCNCallSign>
 Licensee Code O3BNET
 Licensee Name O3b Networks USA, LLC.

Site Information **ROCKLAND, ME**

Venue Name
 Latitude (NAD 83) 44° 6' 25.1" N
 Longitude (NAD 83) 69° 6' 28.3" W
 Climate Zone B
 Rain Zone 2
 Ground Elevation (AMSL) 0.0 m / 0.0 ft

Link Information

Satellite Type Medium Earth Orbit
 Mode TO - Transmit-Only
 Modulation Digital
 Minimum Elevation Angle 10.0°
 Azimuth Range 0.0° to 360°
 Antenna Centerline (AGL) 15.54 m / 51.0 ft

Antenna Information **Transmit - FCC32**

Manufacturer Orbit
 Model 2.2 Meter
 Gain / Diameter 52.5 dBi / 2.2 m
 3-dB / 15-dB Beamwidth 0.14° / 0.32°

Max Available RF Power (dBW/4 kHz) -22.1
 (dBW/MHz) 1.9

Maximum EIRP (dBW/4 kHz) 30.4
 (dBW/MHz) 54.4

Interference Objectives: Long Term -151.0 dBW/4 kHz 20%
 Short Term -128.0 dBW/4 kHz 0.0025%

Frequency Information **Transmit 28.0 GHz**

Emission / Frequency Range (MHz) 12M0G7D - 216MG7D / 27600.0 - 28350.0

Max Great Circle Coordination Distance 135.1 km / 83.9 mi
 Precipitation Scatter Contour Radius 100.0 km / 62.1 mi

COMSEARCH**Earth Station Data Sheet**

19700 Janelia Farm Boulevard, Ashburn, VA 20147
 (703)726-5662 <http://www.comsearch.com>

Coordination Values**ROCKLAND, ME**

Licensee Name O3b Networks USA, LLC.
 Latitude (NAD 83) 44° 6' 25.1" N
 Longitude (NAD 83) 69° 6' 28.3" W
 Ground Elevation (AMSL) 0.0 m / 0.0 ft
 Antenna Centerline (AGL) 15.54 m / 51.0 ft
 Antenna Model Orbit 2.2 Meter
 Antenna Mode Transmit 28.0 GHz
 Interference Objectives: Long Term -151.0 dBW/4 kHz 20%
 Short Term -128.0 dBW/4 kHz 0.0025%
 Max Available RF Power -22.1 (dBW/4 kHz)

Azimuth (°)	Horizon Elevation (°)	Antenna Discrimination (°)	Transmit 28.0 GHz	
			Horizon Gain (dBi)	Coordination Distance (km)
0	0.00	104.79	-10.00	100.00
5	0.00	99.82	-10.00	100.00
10	0.00	94.85	-10.00	100.00
15	0.00	89.88	-10.00	100.00
20	0.00	84.91	-10.00	100.00
25	0.00	79.94	-10.00	100.00
30	0.00	74.97	-10.00	100.00
35	0.00	70.00	-10.00	100.00
40	0.00	65.04	-10.00	100.00
45	0.00	60.07	-10.00	100.00
50	0.00	55.11	-10.00	100.00
55	0.00	50.16	-10.00	100.00
60	0.00	45.21	-10.00	100.00
65	0.00	40.28	-9.63	100.00
70	0.00	35.36	-8.44	100.00
75	0.00	30.46	-7.12	100.00
80	0.00	25.59	-5.63	100.00
85	0.00	20.78	-3.95	108.00
90	0.00	16.09	-2.02	114.50
95	0.00	11.64	0.17	121.50
100	0.00	7.88	2.57	128.60
105	0.00	6.19	4.80	134.70
110	0.00	8.03	5.87	134.70
115	0.00	11.85	4.96	135.10
120	0.00	16.31	2.78	129.20
125	0.00	21.01	0.81	100.00
130	0.00	25.82	-0.85	100.00
135	0.00	30.69	-2.33	100.00
140	0.00	35.59	-3.62	100.00
145	0.00	40.51	-4.66	100.00
150	0.00	45.45	-5.53	100.00
155	0.00	50.40	-6.20	100.00
160	0.00	55.35	-6.84	100.00
165	0.00	60.31	-7.27	100.00
170	0.00	65.27	-7.52	100.00
175	0.00	70.24	-7.70	100.00
180	0.00	75.21	-7.71	100.00
185	0.00	80.18	-7.63	100.00

COMSEARCH**Earth Station Data Sheet**

19700 Janelia Farm Boulevard, Ashburn, VA 20147
 (703)726-5662 <http://www.comsearch.com>

Coordination Values**ROCKLAND, ME**

Licensee Name O3b Networks USA, LLC.
 Latitude (NAD 83) 44° 6' 25.1" N
 Longitude (NAD 83) 69° 6' 28.3" W
 Ground Elevation (AMSL) 0.0 m / 0.0 ft
 Antenna Centerline (AGL) 15.54 m / 51.0 ft
 Antenna Model Orbit 2.2 Meter
 Antenna Mode Transmit 28.0 GHz
 Interference Objectives: Long Term -151.0 dBW/4 kHz 20%
 Short Term -128.0 dBW/4 kHz 0.0025%
 Max Available RF Power -22.1 (dBW/4 kHz)

Azimuth (°)	Horizon Elevation (°)	Antenna Discrimination (°)	Transmit 28.0 GHz	
			Horizon Gain (dBi)	Coordination Distance (km)
190	0.00	85.15	-7.32	100.00
195	0.00	90.12	-7.10	100.00
200	0.00	95.09	-6.71	100.00
205	0.00	100.06	-6.20	100.00
210	0.00	105.03	-5.50	100.00
215	0.00	110.00	-4.68	100.00
220	0.00	114.96	-3.63	100.00
225	0.00	119.93	-2.36	100.00
230	0.00	124.89	-0.97	100.00
235	0.00	129.84	0.75	117.60
240	0.00	134.79	2.94	122.10
245	0.00	139.72	5.55	112.90
250	0.00	144.64	6.95	112.00
255	0.00	149.54	5.95	106.80
260	0.00	154.41	3.54	100.00
265	0.00	159.22	0.89	100.00
270	0.00	163.91	-1.46	100.00
275	0.00	168.36	-3.49	100.00
280	0.00	172.12	-5.25	100.00
285	0.00	173.81	-6.81	100.00
290	0.00	171.97	-8.19	100.00
295	0.00	168.15	-9.42	100.00
300	0.00	163.69	-10.00	100.00
305	0.00	158.99	-10.00	100.00
310	0.00	154.18	-10.00	100.00
315	0.00	149.31	-10.00	100.00
320	0.00	144.41	-10.00	100.00
325	0.00	139.49	-10.00	100.00
330	0.00	134.55	-10.00	100.00
335	0.00	129.60	-10.00	100.00
340	0.00	124.65	-10.00	100.00
345	0.00	119.69	-10.00	100.00
350	0.00	114.73	-10.00	100.00
355	0.00	109.76	-10.00	100.00

5. Contact Information

For questions or information regarding the 28 GHz Frequency Coordination Report, please contact:

Contact person:	Joanna Lynch
Title:	Manager, Spectrum & Data Solutions
Company:	Comsearch
Address:	19700 Janelia Farm Blvd., Ashburn, VA 20147
Telephone:	703-726-5711
Fax:	703-726-5599
Email:	jlynch@comsearch.com
Web site:	www.comsearch.com

Ka-Band Earth Station – San Juan, PR

Frequency Coordination Report

28 GHz



Prepared on Behalf of
O3b Networks USA, LLC

September 16, 2015



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4.	Earth Station Coordination Data	- 3 -
5.	Contact Information	- 10 -

1. Summary of Results

On behalf of O3b Networks, Comsearch performed a coordination notice for all existing and proposed terrestrial licenses within the coordination contours of their proposed Ka-Band Earth Stations on Vessels (ESV) in San Juan, Puerto Rico, which will transmit at 28 GHz¹. Prior-notification letters were sent to the licensees and a copy of the notification data is provided in section four of this report. The earth station coordination was finalized on September 15, 2015.

No objections were received from any of the incumbent 28 GHz licensees. Our notification to the LMDS incumbents was performed under the assumption that the ESV system would be operating on a secondary basis to LMDS Block A operations and a contact at O3b Networks has been provided in case any concerns may arise in the future.

2. 28 GHz Common Carrier and LTTS Coordination

In accordance with FCC Rules and Regulations, the Ka-Band ESV system in San Juan, Puerto Rico was prior-coordinated by Comsearch. A notification letter and datasheets for this system were sent to the following 28 GHz common carrier fixed microwave licensee on August 13, 2015. This licensee is authorized to operate temporary fixed operations from 27.5 to 29.5 GHz on a nationwide basis.

Licensee	Authorized Geographic Area
Verizon	Continental US

A notification letter and datasheets for the Ka-Band ESV system in San Juan, Puerto Rico were also sent to the following 28 GHz local television transmission licensee on August 13, 2015. This licensee is authorized to operate temporary fixed operations from 27.5 to 29.5 GHz on a nationwide basis.

Licensee	Authorized Geographic Area
Information Super Station, LLC	Continental US

No objections were received from the common carrier or local television transmission service incumbents.

¹ The proposed ESV system will operate in the 27.6 – 28.35 GHz portion of the Ka-Band.

3. 28 GHz LMDS Coordination

A Notification letter was sent to the following 28 GHz LMDS licensees on August 13, 2015. The proposed earth station will operate on frequencies that overlap Block A of the LMDS service. The total frequency allocation for Block A of the LMDS spectrum appears below.

Block A: 27.500-28.350 GHz
29.100-29.250 GHz
31.075-31.225 GHz

Licensee	Market	Market Name
Lightspeed PR LP	BTA488 ²	San Juan, PR
Lightspeed PR LP	BTA489	Mayaguez-Aguadilla-Ponce, PR

No objections were received from the LMDS incumbents.

² The proposed ESV system will be located inside BTA488.



4. Earth Station Coordination Data

This section presents the data pertinent to the proposed Ka-Band ESV system in San Juan, Puerto Rico. This data was circulated to all incumbent licensees in the shared 28 GHz frequency ranges.

COMSEARCH**Earth Station Data Sheet**

19700 Janelia Farm Boulevard, Ashburn, VA 20147
 (703)726-5662 <http://www.comsearch.com>

Date: 08/04/2015
 Job Number: <PCNJobCode>

Administrative Information

Status ENGINEER PROPOSAL
 Call Sign <PCNCallSign>
 Licensee Code O3BNET
 Licensee Name O3b Networks USA, LLC.

Site Information SAN JUAN, PR

Venue Name
 Latitude (NAD 83) 18° 27' 32.4" N
 Longitude (NAD 83) 66° 5' 51.7" W
 Climate Zone B
 Rain Zone 1
 Ground Elevation (AMSL) 0.0 m / 0.0 ft

Link Information

Satellite Type Medium Earth Orbit
 Mode TO - Transmit-Only
 Modulation Digital
 Minimum Elevation Angle 10.0°
 Azimuth Range 0.0° to 360°
 Antenna Centerline (AGL) 15.54 m / 51.0 ft

Antenna Information Transmit - FCC32

Manufacturer Orbit
 Model 1.2 Meter
 Gain / Diameter 48.0 dBi / 1.2 m
 3-dB / 15-dB Beamwidth 0.60° / 1.40°

Max Available RF Power (dBW/4 kHz) -17.1
 (dBW/MHz) 6.9

Maximum EIRP (dBW/4 kHz) 30.9
 (dBW/MHz) 54.9

Interference Objectives: Long Term -151.0 dBW/4 kHz 20%
 Short Term -128.0 dBW/4 kHz 0.0025%

Frequency Information Transmit 28.0 GHz

Emission / Frequency Range (MHz) 12M0G7D - 216MG7D / 27600.0 - 28350.0

Max Great Circle Coordination Distance 136.1 km / 84.6 mi
 Precipitation Scatter Contour Radius 100.0 km / 62.1 mi

COMSEARCH**Earth Station Data Sheet**

19700 Janelia Farm Boulevard, Ashburn, VA 20147
 (703)726-5662 <http://www.comsearch.com>

Coordination Values**SAN JUAN, PR**

Licensee Name O3b Networks USA, LLC.
 Latitude (NAD 83) 18° 27' 32.4" N
 Longitude (NAD 83) 66° 5' 51.7" W
 Ground Elevation (AMSL) 0.0 m / 0.0 ft
 Antenna Centerline (AGL) 15.54 m / 51.0 ft
 Antenna Model Orbit 1.2 Meter
 Antenna Mode Transmit 28.0 GHz
 Interference Objectives: Long Term -151.0 dBW/4 kHz 20%
 Short Term -128.0 dBW/4 kHz 0.0025%
 Max Available RF Power -17.1 (dBW/4 kHz)

Azimuth (°)	Horizon Elevation (°)	Antenna Discrimination (°)	Transmit 28.0 GHz	
			Horizon Gain (dBi)	Coordination Distance (km)
0	0.00	97.75	-10.00	100.00
5	0.00	92.90	-10.00	100.00
10	0.00	88.05	-10.00	100.00
15	0.00	83.20	-10.00	100.00
20	0.00	78.36	-10.00	100.00
25	0.00	73.52	-10.00	100.00
30	0.00	68.69	-10.00	100.00
35	0.00	63.88	-10.00	100.00
40	0.00	59.07	-10.00	100.00
45	0.00	54.29	-10.00	100.00
50	0.00	49.54	-10.00	100.00
55	0.00	44.83	-9.29	100.00
60	0.00	40.17	-8.10	100.00
65	0.00	35.59	-6.78	100.00
70	0.00	31.11	-5.32	100.00
75	0.00	26.80	-3.70	108.80
80	0.00	22.75	-1.93	114.80
85	0.00	19.13	-0.04	120.90
90	0.00	16.23	1.74	126.20
95	0.00	14.48	2.98	129.80
100	0.00	14.31	3.11	130.20
105	0.00	15.78	2.05	127.10
110	0.00	18.50	0.32	122.00
115	0.00	22.00	-1.50	114.50
120	0.00	25.99	-3.37	110.00
125	0.00	30.25	-5.02	100.90
130	0.00	34.70	-6.51	100.00
135	0.00	39.26	-7.84	100.00
140	0.00	43.91	-9.01	100.00
145	0.00	48.61	-10.00	100.00
150	0.00	53.36	-10.00	100.00
155	0.00	58.13	-10.00	100.00
160	0.00	62.93	-10.00	100.00
165	0.00	67.75	-10.00	100.00
170	0.00	72.58	-10.00	100.00
175	0.00	77.41	-10.00	100.00
180	0.00	82.25	-10.00	100.00
185	0.00	87.10	-10.00	100.00

COMSEARCH**Earth Station Data Sheet**

19700 Janelia Farm Boulevard, Ashburn, VA 20147
 (703)726-5662 <http://www.comsearch.com>

Coordination Values**SAN JUAN, PR**

Licensee Name O3b Networks USA, LLC.
 Latitude (NAD 83) 18° 27' 32.4" N
 Longitude (NAD 83) 66° 5' 51.7" W
 Ground Elevation (AMSL) 0.0 m / 0.0 ft
 Antenna Centerline (AGL) 15.54 m / 51.0 ft
 Antenna Model Orbit 1.2 Meter
 Antenna Mode Transmit 28.0 GHz
 Interference Objectives: Long Term -151.0 dBW/4 kHz 20%
 Short Term -128.0 dBW/4 kHz 0.0025%
 Max Available RF Power -17.1 (dBW/4 kHz)

Azimuth (°)	Horizon Elevation (°)	Antenna Discrimination (°)	Transmit 28.0 GHz	
			Horizon Gain (dBi)	Coordination Distance (km)
190	0.00	91.95	-10.00	100.00
195	0.00	96.80	-10.00	100.00
200	0.00	101.64	-10.00	100.00
205	0.00	106.48	-10.00	100.00
210	0.00	111.31	-10.00	100.00
215	0.00	116.13	-10.00	100.00
220	0.00	120.93	-8.96	100.00
225	0.00	125.71	-7.84	100.00
230	0.00	130.46	-6.51	100.00
235	0.00	135.17	-4.96	104.40
240	0.00	139.83	-3.17	110.70
245	0.00	144.41	-1.09	117.50
250	0.00	148.89	1.28	124.90
255	0.00	153.20	3.83	132.10
260	0.00	157.25	5.97	134.90
265	0.00	160.87	6.38	136.10
270	0.00	163.77	4.70	134.50
275	0.00	165.52	2.18	127.50
280	0.00	165.69	-0.28	120.10
285	0.00	164.22	-2.46	113.10
290	0.00	161.50	-4.30	100.00
295	0.00	158.00	-5.96	100.00
300	0.00	154.01	-7.44	100.00
305	0.00	149.75	-8.73	100.00
310	0.00	145.30	-9.91	100.00
315	0.00	140.74	-10.00	100.00
320	0.00	136.09	-10.00	100.00
325	0.00	131.39	-10.00	100.00
330	0.00	126.64	-10.00	100.00
335	0.00	121.87	-10.00	100.00
340	0.00	117.07	-10.00	100.00
345	0.00	112.25	-10.00	100.00
350	0.00	107.42	-10.00	100.00
355	0.00	102.59	-10.00	100.00

COMSEARCH**Earth Station Data Sheet**

19700 Janelia Farm Boulevard, Ashburn, VA 20147
 (703)726-5662 <http://www.comsearch.com>

Date: 08/04/2015
 Job Number: <PCNJobCode>

Administrative Information

Status ENGINEER PROPOSAL
 Call Sign <PCNCallSign>
 Licensee Code O3BNET
 Licensee Name O3b Networks USA, LLC.

Site Information SAN JUAN, PR

Venue Name
 Latitude (NAD 83) 18° 27' 32.4" N
 Longitude (NAD 83) 66° 5' 51.7" W
 Climate Zone B
 Rain Zone 1
 Ground Elevation (AMSL) 0.0 m / 0.0 ft

Link Information

Satellite Type Medium Earth Orbit
 Mode TO - Transmit-Only
 Modulation Digital
 Minimum Elevation Angle 10.0°
 Azimuth Range 0.0° to 360°
 Antenna Centerline (AGL) 15.54 m / 51.0 ft

Antenna Information Transmit - FCC32

Manufacturer Orbit
 Model 2.2 Meter
 Gain / Diameter 52.5 dBi / 2.2 m
 3-dB / 15-dB Beamwidth 0.14° / 0.32°

Max Available RF Power (dBW/4 kHz) -22.1
 (dBW/MHz) 1.9

Maximum EIRP (dBW/4 kHz) 30.4
 (dBW/MHz) 54.4

Interference Objectives: Long Term -151.0 dBW/4 kHz 20%
 Short Term -128.0 dBW/4 kHz 0.0025%

Frequency Information Transmit 28.0 GHz

Emission / Frequency Range (MHz) 12M0G7D - 216MG7D / 27600.0 - 28350.0

Max Great Circle Coordination Distance 136.1 km / 84.6 mi
 Precipitation Scatter Contour Radius 100.0 km / 62.1 mi

COMSEARCH**Earth Station Data Sheet**

19700 Janelia Farm Boulevard, Ashburn, VA 20147
(703)726-5662 <http://www.comsearch.com>

Coordination Values**SAN JUAN, PR**

Licensee Name O3b Networks USA, LLC.
 Latitude (NAD 83) 18° 27' 32.4" N
 Longitude (NAD 83) 66° 5' 51.7" W
 Ground Elevation (AMSL) 0.0 m / 0.0 ft
 Antenna Centerline (AGL) 15.54 m / 51.0 ft
 Antenna Model Orbit 2.2 Meter
 Antenna Mode Transmit 28.0 GHz
 Interference Objectives: Long Term -151.0 dBW/4 kHz 20%
 Short Term -128.0 dBW/4 kHz 0.0025%
 Max Available RF Power -22.1 (dBW/4 kHz)

Azimuth (°)	Horizon Elevation (°)	Antenna Discrimination (°)	Transmit 28.0 GHz	
			Horizon Gain (dBi)	Coordination Distance (km)
0	0.00	97.75	-10.00	100.00
5	0.00	92.90	-10.00	100.00
10	0.00	88.05	-10.00	100.00
15	0.00	83.20	-10.00	100.00
20	0.00	78.36	-10.00	100.00
25	0.00	73.52	-10.00	100.00
30	0.00	68.69	-10.00	100.00
35	0.00	63.88	-10.00	100.00
40	0.00	59.07	-10.00	100.00
45	0.00	54.29	-10.00	100.00
50	0.00	49.54	-10.00	100.00
55	0.00	44.83	-9.29	100.00
60	0.00	40.17	-8.10	100.00
65	0.00	35.59	-6.78	100.00
70	0.00	31.11	-5.32	100.00
75	0.00	26.80	-3.70	108.80
80	0.00	22.75	-1.93	114.80
85	0.00	19.13	-0.04	120.90
90	0.00	16.23	1.74	126.20
95	0.00	14.48	2.98	129.80
100	0.00	14.31	3.11	130.20
105	0.00	15.78	2.05	127.10
110	0.00	18.50	0.32	122.00
115	0.00	22.00	-1.50	114.50
120	0.00	25.99	-3.37	110.00
125	0.00	30.25	-5.02	100.90
130	0.00	34.70	-6.51	100.00
135	0.00	39.26	-7.84	100.00
140	0.00	43.91	-9.01	100.00
145	0.00	48.61	-10.00	100.00
150	0.00	53.36	-10.00	100.00
155	0.00	58.13	-10.00	100.00
160	0.00	62.93	-10.00	100.00
165	0.00	67.75	-10.00	100.00
170	0.00	72.58	-10.00	100.00
175	0.00	77.41	-10.00	100.00
180	0.00	82.25	-10.00	100.00
185	0.00	87.10	-10.00	100.00

COMSEARCH**Earth Station Data Sheet**

19700 Janelia Farm Boulevard, Ashburn, VA 20147
 (703)726-5662 <http://www.comsearch.com>

Coordination Values**SAN JUAN, PR**

Licensee Name O3b Networks USA, LLC.
 Latitude (NAD 83) 18° 27' 32.4" N
 Longitude (NAD 83) 66° 5' 51.7" W
 Ground Elevation (AMSL) 0.0 m / 0.0 ft
 Antenna Centerline (AGL) 15.54 m / 51.0 ft
 Antenna Model Orbit 2.2 Meter
 Antenna Mode Transmit 28.0 GHz
 Interference Objectives: Long Term -151.0 dBW/4 kHz 20%
 Short Term -128.0 dBW/4 kHz 0.0025%
 Max Available RF Power -22.1 (dBW/4 kHz)

Azimuth (°)	Horizon Elevation (°)	Antenna Discrimination (°)	Transmit 28.0 GHz	
			Horizon Gain (dBi)	Coordination Distance (km)
190	0.00	91.95	-10.00	100.00
195	0.00	96.80	-10.00	100.00
200	0.00	101.64	-10.00	100.00
205	0.00	106.48	-10.00	100.00
210	0.00	111.31	-10.00	100.00
215	0.00	116.13	-10.00	100.00
220	0.00	120.93	-8.96	100.00
225	0.00	125.71	-7.84	100.00
230	0.00	130.46	-6.51	100.00
235	0.00	135.17	-4.96	104.40
240	0.00	139.83	-3.17	110.70
245	0.00	144.41	-1.09	124.90
250	0.00	148.89	1.28	132.10
255	0.00	153.20	3.83	134.90
260	0.00	157.25	5.97	136.10
265	0.00	160.87	6.38	134.50
270	0.00	163.77	4.70	127.50
275	0.00	165.52	2.18	120.10
280	0.00	165.69	-0.28	113.10
285	0.00	164.22	-2.46	100.00
290	0.00	161.50	-4.30	100.00
295	0.00	158.00	-5.96	100.00
300	0.00	154.01	-7.44	100.00
305	0.00	149.75	-8.73	100.00
310	0.00	145.30	-9.91	100.00
315	0.00	140.74	-10.00	100.00
320	0.00	136.09	-10.00	100.00
325	0.00	131.39	-10.00	100.00
330	0.00	126.64	-10.00	100.00
335	0.00	121.87	-10.00	100.00
340	0.00	117.07	-10.00	100.00
345	0.00	112.25	-10.00	100.00
350	0.00	107.42	-10.00	100.00
355	0.00	102.59	-10.00	100.00



5. Contact Information

For questions or information regarding the 28 GHz Frequency Coordination Report, please contact:

Contact person:	Joanna Lynch
Title:	Manager, Spectrum & Data Solutions
Company:	Comsearch
Address:	19700 Janelia Farm Blvd., Ashburn, VA 20147
Telephone:	703-726-5711
Fax:	703-726-5599
Email:	jlynch@comsearch.com
Web site:	www.comsearch.com

Ka-Band Earth Station – Tampa, FL

Frequency Coordination Report

28 GHz



Prepared on Behalf of
O3b Networks USA, LLC

September 16, 2015



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1. Summary of Results

On behalf of O3b Networks, Comsearch performed a coordination notice for all existing and proposed terrestrial licenses within the coordination contours of their proposed Ka-Band Earth Stations on Vessels (ESV) in Tampa, Florida, which will transmit at 28 GHz¹. Prior-notification letters were sent to the licensees and a copy of the notification data is provided in section four of this report. The earth station coordination was finalized on September 15, 2015.

No objections were received from any of the incumbent 28 GHz licensees. Our notification to the LMDS incumbents was performed under the assumption that the ESV system would be operating on a secondary basis to LMDS Block A operations and a contact at O3b Networks has been provided in case any concerns may arise in the future.

2. 28 GHz Common Carrier and LTTS Coordination

In accordance with FCC Rules and Regulations, the Ka-Band ESV system in Tampa, Florida was prior-coordinated by Comsearch. A notification letter and datasheets for this system were sent to the following 28 GHz common carrier fixed microwave licensees on August 13, 2015. These licensees are authorized to operate temporary fixed operations from 27.5 to 29.5 GHz within specified geographic areas.

Licensee	Authorized Geographic Area
AT&T	Statewide: AL, FL, GA, KY, LA, MS, NC, SC, and TN
Verizon	Continental US

A notification letter and datasheets for the Ka-Band ESV system in Tampa, Florida were also sent to the following 28 GHz local television transmission licensee on August 13, 2015. This licensee is authorized to operate temporary fixed operations from 27.5 to 29.5 GHz on a nationwide basis.

Licensee	Authorized Geographic Area
Information Super Station, LLC	Continental US

No objections were received from the common carrier or local television transmission service incumbents.

¹ The proposed ESV system will operate in the 27.6 – 28.35 GHz portion of the Ka-Band.

3. 28 GHz LMDS Coordination

A Notification letter was sent to the following 28 GHz LMDS licensees on August 13, 2015. The proposed earth station will operate on frequencies that overlap Block A of the LMDS service. The total frequency allocation for Block A of the LMDS spectrum appears below.

Block A: 27.500-28.350 GHz
29.100-29.250 GHz
31.075-31.225 GHz

Licensee	Market	Market Name
Wireless Distribution Services	BTA159	Gainesville, FL
Wireless Distribution Services	BTA239	Lakeland-Winter Haven, FL
Rainier Connect	BTA326	Ocala, FL
Straight Path Spectrum	BTA336	Orlando, FL
T-Mobile ²	BTA336	Orlando, FL
Nextlink/XO	BTA440 ³	Tampa-St. Petersburg-Clearwater, FL
T-Mobile ⁴	BTA440	Tampa-St. Petersburg-Clearwater, FL
Nextlink/XO	BTA469	West Palm Beach-Boca Raton, FL
T-Mobile ⁵	BTA469	West Palm Beach-Boca Raton, FL

No objections were received from the LMDS incumbents.

² T-Mobile has acquired spectrum from Straight Path in the Orlando, FL Basic Trading Area (BTA).

³ The proposed ESV system will be located inside BTA440.

⁴ T-Mobile has acquired spectrum from Nextlink/XO in the Tampa-St. Petersburg-Clearwater, FL BTA.

⁵ T-Mobile has acquired spectrum from Nextlink/XO in the West Palm Beach-Boca Raton, FL BTA



4. Earth Station Coordination Data

This section presents the data pertinent to the proposed Ka-Band ESV system in Tampa, Florida. This data was circulated to all incumbent licensees in the shared 28 GHz frequency ranges.

COMSEARCH
Earth Station Data Sheet
 19700 Janelia Farm Boulevard, Ashburn, VA 20147
 (703)726-5662 <http://www.comsearch.com>

Date: 08/04/2015
 Job Number: <PCNJobCode>

Administrative Information

Status ENGINEER PROPOSAL
 Call Sign <PCNCallSign>
 Licensee Code O3BNET
 Licensee Name O3b Networks USA, LLC.

Site Information
TAMPA, FL

Venue Name
 Latitude (NAD 83) 27° 56' 43.7" N
 Longitude (NAD 83) 82° 26' 44.6" W
 Climate Zone B
 Rain Zone 1
 Ground Elevation (AMSL) 0.0 m / 0.0 ft

Link Information

Satellite Type Medium Earth Orbit
 Mode TO - Transmit-Only
 Modulation Digital
 Minimum Elevation Angle 10.0°
 Azimuth Range 0.0° to 360°
 Antenna Centerline (AGL) 15.54 m / 51.0 ft

Antenna Information
Transmit - FCC32

Manufacturer Orbit
 Model 1.2 Meter
 Gain / Diameter 48.0 dBi / 1.2 m
 3-dB / 15-dB Beamwidth 0.60° / 1.40°

Max Available RF Power (dBW/4 kHz) -17.1
 (dBW/MHz) 6.9

Maximum EIRP (dBW/4 kHz) 30.9
 (dBW/MHz) 54.9

Interference Objectives: Long Term -151.0 dBW/4 kHz 20%
 Short Term -128.0 dBW/4 kHz 0.0025%

Frequency Information
Transmit 28.0 GHz

Emission / Frequency Range (MHz) 12M0G7D - 216MG7D / 27600.0 - 28350.0

Max Great Circle Coordination Distance 136.9 km / 85.1 mi
 Precipitation Scatter Contour Radius 100.0 km / 62.1 mi

COMSEARCH**Earth Station Data Sheet**

19700 Janelia Farm Boulevard, Ashburn, VA 20147
 (703)726-5662 <http://www.comsearch.com>

Coordination Values**TAMPA, FL**

Licensee Name O3b Networks USA, LLC.
 Latitude (NAD 83) 27° 56' 43.7" N
 Longitude (NAD 83) 82° 26' 44.6" W
 Ground Elevation (AMSL) 0.0 m / 0.0 ft
 Antenna Centerline (AGL) 15.54 m / 51.0 ft
 Antenna Model Orbit 1.2 Meter
 Antenna Mode Transmit 28.0 GHz
 Interference Objectives: Long Term -151.0 dBW/4 kHz 20%
 Short Term -128.0 dBW/4 kHz 0.0025%
 Max Available RF Power -17.1 (dBW/4 kHz)

Azimuth (°)	Horizon Elevation (°)	Antenna Discrimination (°)	Transmit 28.0 GHz	
			Horizon Gain (dBi)	Coordination Distance (km)
0	0.00	93.56	-10.00	100.00
5	0.00	88.56	-10.00	100.00
10	0.00	83.56	-10.00	100.00
15	0.00	78.57	-10.00	100.00
20	0.00	73.57	-10.00	100.00
25	0.00	68.57	-10.00	100.00
30	0.00	63.58	-10.00	100.00
35	0.00	58.58	-10.00	100.00
40	0.00	53.58	-10.00	100.00
45	0.00	48.59	-10.00	100.00
50	0.00	43.60	-10.00	100.00
55	0.00	38.60	-9.66	100.00
60	0.00	33.61	-8.47	100.00
65	0.00	28.62	-7.14	100.00
70	0.00	23.64	-5.64	100.00
75	0.00	18.66	-3.94	108.00
80	0.00	13.71	-1.98	114.70
85	0.00	8.79	0.28	121.80
90	0.00	4.09	2.80	129.30
95	0.00	2.48	5.27	133.10
100	0.00	6.75	6.58	136.60
105	0.00	11.62	5.66	134.10
110	0.00	16.56	3.31	130.70
115	0.00	21.53	0.75	123.30
120	0.00	26.51	-1.55	116.10
125	0.00	31.50	-3.45	109.70
130	0.00	36.49	-5.04	100.90
135	0.00	41.48	-6.39	100.00
140	0.00	46.48	-7.56	100.00
145	0.00	51.47	-8.57	100.00
150	0.00	56.47	-9.44	100.00
155	0.00	61.46	-10.00	100.00
160	0.00	66.46	-10.00	100.00
165	0.00	71.45	-10.00	100.00
170	0.00	76.45	-10.00	100.00
175	0.00	81.45	-10.00	100.00
180	0.00	86.44	-10.00	100.00
185	0.00	91.44	-10.00	100.00

COMSEARCH**Earth Station Data Sheet**

19700 Janelia Farm Boulevard, Ashburn, VA 20147
 (703)726-5662 <http://www.comsearch.com>

Coordination Values**TAMPA, FL**

Licensee Name O3b Networks USA, LLC.
 Latitude (NAD 83) 27° 56' 43.7" N
 Longitude (NAD 83) 82° 26' 44.6" W
 Ground Elevation (AMSL) 0.0 m / 0.0 ft
 Antenna Centerline (AGL) 15.54 m / 51.0 ft
 Antenna Model Orbit 1.2 Meter
 Antenna Mode Transmit 28.0 GHz
 Interference Objectives: Long Term -151.0 dBW/4 kHz 20%
 Short Term -128.0 dBW/4 kHz 0.0025%
 Max Available RF Power -17.1 (dBW/4 kHz)

Azimuth (°)	Horizon Elevation (°)	Antenna Discrimination (°)	Transmit 28.0 GHz	
			Horizon Gain (dBi)	Coordination Distance (km)
190	0.00	96.44	-10.00	100.00
195	0.00	101.43	-10.00	100.00
200	0.00	106.43	-10.00	100.00
205	0.00	111.43	-10.00	100.00
210	0.00	116.42	-9.44	100.00
215	0.00	121.42	-8.57	100.00
220	0.00	126.42	-7.56	100.00
225	0.00	131.41	-6.39	100.00
230	0.00	136.40	-5.04	100.90
235	0.00	141.40	-3.45	108.70
240	0.00	146.39	-1.55	116.10
245	0.00	151.38	0.76	123.30
250	0.00	156.36	3.34	130.80
255	0.00	161.34	5.73	134.30
260	0.00	166.29	6.68	136.90
265	0.00	171.21	5.37	133.30
270	0.00	175.91	2.88	129.50
275	0.00	177.52	0.33	122.00
280	0.00	173.25	-1.94	114.80
285	0.00	168.38	-3.91	108.10
290	0.00	163.44	-5.62	100.00
295	0.00	158.47	-7.12	100.00
300	0.00	153.49	-8.45	100.00
305	0.00	148.50	-9.65	100.00
310	0.00	143.51	-10.00	100.00
315	0.00	138.52	-10.00	100.00
320	0.00	133.52	-10.00	100.00
325	0.00	128.53	-10.00	100.00
330	0.00	123.53	-10.00	100.00
335	0.00	118.54	-10.00	100.00
340	0.00	113.54	-10.00	100.00
345	0.00	108.55	-10.00	100.00
350	0.00	103.55	-10.00	100.00
355	0.00	98.55	-10.00	100.00

COMSEARCH**Earth Station Data Sheet**

19700 Janelia Farm Boulevard, Ashburn, VA 20147
 (703)726-5662 <http://www.comsearch.com>

Date: 08/04/2015
 Job Number: <PCNJobCode>

Administrative Information

Status ENGINEER PROPOSAL
 Call Sign <PCNCallSign>
 Licensee Code O3BNET
 Licensee Name O3b Networks USA, LLC.

Site Information**TAMPA, FL**

Venue Name
 Latitude (NAD 83) 27° 56' 43.7" N
 Longitude (NAD 83) 82° 26' 44.6" W
 Climate Zone B
 Rain Zone 1
 Ground Elevation (AMSL) 0.0 m / 0.0 ft

Link Information

Satellite Type Medium Earth Orbit
 Mode TO - Transmit-Only
 Modulation Digital
 Minimum Elevation Angle 10.0°
 Azimuth Range 0.0° to 360°
 Antenna Centerline (AGL) 15.54 m / 51.0 ft

Antenna Information**Transmit - FCC32**

Manufacturer Orbit
 Model 2.2 Meter
 Gain / Diameter 52.5 dBi / 2.2 m
 3-dB / 15-dB Beamwidth 0.14° / 0.32°

Max Available RF Power (dBW/4 kHz) -22.1
 (dBW/MHz) 1.9

Maximum EIRP (dBW/4 kHz) 30.4
 (dBW/MHz) 54.4

Interference Objectives: Long Term -151.0 dBW/4 kHz 20%
 Short Term -128.0 dBW/4 kHz 0.0025%

Frequency Information**Transmit 28.0 GHz**

Emission / Frequency Range (MHz) 12M0G7D - 216MG7D / 27600.0 - 28350.0

Max Great Circle Coordination Distance 136.9 km / 85.1 mi
 Precipitation Scatter Contour Radius 100.0 km / 62.1 mi

Coordination Values		TAMPA, FL		
Licensee Name		O3b Networks USA, LLC.		
Latitude (NAD 83)		27° 56' 43.7" N		
Longitude (NAD 83)		82° 26' 44.6" W		
Ground Elevation (AMSL)		0.0 m / 0.0 ft		
Antenna Centerline (AGL)		15.54 m / 51.0 ft		
Antenna Model		Orbit 2.2 meter		
Antenna Mode		Transmit 28.0 GHz		
Interference Objectives: Long Term		-151.0 dBW/4 kHz	20%	
Short Term		-128.0 dBW/4 kHz	0.0025%	
Max Available RF Power		-22.1 (dBW/4 kHz)		
		Transmit 28.0 GHz		
	Horizon	Antenna	Horizon	Coordination
Azimuth (°)	Elevation (°)	Discrimination (°)	Gain (dBi)	Distance (km)
0	0.00	93.56	-10.00	100.00
5	0.00	88.56	-10.00	100.00
10	0.00	83.56	-10.00	100.00
15	0.00	78.57	-10.00	100.00
20	0.00	73.57	-10.00	100.00
25	0.00	68.57	-10.00	100.00
30	0.00	63.58	-10.00	100.00
35	0.00	58.58	-10.00	100.00
40	0.00	53.58	-10.00	100.00
45	0.00	48.59	-10.00	100.00
50	0.00	43.60	-10.00	100.00
55	0.00	38.60	-9.66	100.00
60	0.00	33.61	-8.47	100.00
65	0.00	28.62	-7.14	100.00
70	0.00	23.64	-5.64	100.00
75	0.00	18.66	-3.94	108.00
80	0.00	13.71	-1.98	114.70
85	0.00	8.79	0.28	121.80
90	0.00	4.09	2.80	129.30
95	0.00	2.48	5.27	133.10
100	0.00	6.75	6.58	136.60
105	0.00	11.62	5.66	134.10
110	0.00	16.56	3.31	130.70
115	0.00	21.53	0.75	123.30
120	0.00	26.51	-1.55	116.10
125	0.00	31.50	-3.45	109.70
130	0.00	36.49	-5.04	100.90
135	0.00	41.48	-6.39	100.00
140	0.00	46.48	-7.56	100.00
145	0.00	51.47	-857.00	100.00
150	0.00	56.47	-9.44	100.00
155	0.00	61.46	-10.00	100.00
160	0.00	66.46	-10.00	100.00
165	0.00	71.45	-10.00	100.00
170	0.00	76.45	-10.00	100.00
175	0.00	81.45	-10.00	100.00
180	0.00	86.44	-10.00	100.00
185	0.00	91.44	-10.00	100.00

COMSEARCH**Earth Station Data Sheet**

19700 Janelia Farm Boulevard, Ashburn, VA 20147
 (703)726-5662 <http://www.comsearch.com>

Coordination Values**TAMPA, FL**

Licensee Name O3b Networks USA, LLC.
 Latitude (NAD 83) 27° 56' 43.7" N
 Longitude (NAD 83) 82° 26' 44.6" W
 Ground Elevation (AMSL) 0.0 m / 0.0 ft
 Antenna Centerline (AGL) 15.54 m / 51.0 ft
 Antenna Model Orbit 2.2 meter
 Antenna Mode Transmit 28.0 GHz
 Interference Objectives: Long Term -151.0 dBW/4 kHz 20%
 Short Term -128.0 dBW/4 kHz 0.0025%
 Max Available RF Power -22.1 (dBW/4 kHz)

Azimuth (°)	Horizon Elevation (°)	Antenna Discrimination (°)	Transmit 28.0 GHz	
			Horizon Gain (dBi)	Coordination Distance (km)
190	0.00	96.44	-10.00	100.00
195	0.00	101.43	-10.00	100.00
200	0.00	106.43	-10.00	100.00
205	0.00	111.43	-10.00	100.00
210	0.00	116.42	-9.44	100.00
215	0.00	121.42	-8.57	100.00
220	0.00	126.42	-7.56	100.00
225	0.00	131.41	-6.39	100.00
230	0.00	136.40	-5.04	100.90
235	0.00	141.40	-3.45	109.70
240	0.00	146.39	-1.55	116.10
245	0.00	151.38	0.76	123.30
250	0.00	156.36	3.34	130.80
255	0.00	161.34	5.73	134.30
260	0.00	166.29	6.68	136.90
265	0.00	171.21	5.37	133.30
270	0.00	175.91	2.88	129.50
275	0.00	177.52	0.33	122.00
280	0.00	173.25	-1.94	114.80
285	0.00	168.38	-3.91	108.10
290	0.00	163.44	-5.62	100.00
295	0.00	158.47	-7.12	100.00
300	0.00	153.49	-8.45	100.00
305	0.00	148.50	-9.65	100.00
310	0.00	143.51	-10.00	100.00
315	0.00	138.52	-10.00	100.00
320	0.00	133.52	-10.00	100.00
325	0.00	128.53	-10.00	100.00
330	0.00	123.53	-10.00	100.00
335	0.00	118.54	-10.00	100.00
340	0.00	113.54	-10.00	100.00
345	0.00	108.55	-10.00	100.00
350	0.00	103.55	-10.00	100.00
355	0.00	98.55	-10.00	100.00



5. Contact Information

For questions or information regarding the 28 GHz Frequency Coordination Report, please contact:

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