REQUEST FOR LIMITED WAIVER OF THE COMMISSION'S REQUIREMENTS

O3b Limited ("O3b") hereby requests a limited waiver of the Commission's requirements, to the extent needed and on the terms described below, to conduct tests and demonstrations, and to provide commercial service, using Ka-band maritime earth stations on up to six foreign-flagged ships (the "Six-Ship Waiver Request"). The maritime earth stations will communicate with O3b's non-geostationary satellite orbit ("NGSO") Fixed-Satellite Service ("FSS") system.[1] To ensure timely initiation of service, O3b asks that the waiver be granted no later than April 20, 2015.

O3b has already received approval from the Commission for other maritime earth station operations:

- O3b was granted a license to operate up to one hundred 2.2m and one hundred 1.2m maritime earth stations on U.S.-flagged ships in O3b's NGSO-primary channels 4 and 5 (*i.e.,* 28.6-29.1 GHz uplink and 18.8-19.3 GHz downlink) (the "Blanket Maritime License").[2]
- O3b was granted a waiver allowing maritime earth stations to use O3b's NGSO-primary channels 4 and 5 (*i.e.,* 28.6-29.1 GHz uplink and 18.8-19.3 GHz downlink) on foreign-flagged ships in and near U.S. waters (the "Blanket Maritime Waiver").[3] [4]
- O3b was granted a waiver to operate 2.2m maritime earth stations on up to three foreign-flagged ships in the GSO-primary portion of O3b's channel 3 (*i.e.,* 28.35-28.4 GHz uplink and 18.3-18.6 GHz downlink) (the "Three-Ship Waiver").[5]

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[1] In September 2012, the Commission granted O3b a license to operate one of the gateways for this system in Haleiwa, Hawaii. *See* FCC File No. SES-LIC-20100723-00952 (granted September 25, 2012). In June 2013, the Commission granted O3b a license to operate a second gateway, which is located in Vernon, Texas. *See* FCC File No. SES-LIC-20130124-00089 (granted June 20, 2013). The Commission has granted O3b U.S. market access for its 12-satellite constellation. *See* O3b Limited, Call Sign S2935, File No. SAT-LOI-20141029-00118 (granted Jan. 22, 2015) ("O3b PDR").

[2] *See* O3b Blanket Maritime Application, File No. SES-LIC-20130528-00455 (granted May 13, 2014). As used in this filing, the term "ships" includes all types of vessels that maritime earth stations are permitted to serve.

[3] Letter from Jose Albuquerque, Chief, Satellite Division and Mark Settle, Chief, Policy and Rules Division, to Joslyn Read, O3b Limited, DA 14-637 (rel. May 13, 2014).

[4] O3b also was granted a six-month waiver to conduct tests and demonstrations using maritime earth stations on two foreign-flagged ships operated by Royal Caribbean when the ships are in or near U.S. waters (the "Six-Month Waiver"). Letter from Jose Albuquerque, Chief, Satellite Division and Mark Settle, Chief, Policy and Rules Division, to Joslyn Read, O3b Limited, DA 14-64 (rel. Jan. 22, 2014). This waiver is expired and has been superseded by the more comprehensive Blanket Maritime Waiver.

[5] O3b's Three-Ship Waiver Request, FCC File No. SES-MSC-20140318-00150 (granted September 22, 2014).

In this Six-Ship Waiver Request, O3b is requesting a waiver to conduct tests and provide service on up to six foreign-flagged ships that leave from the port of Fort Lauderdale, Florida and serve most of the Caribbean but not including all of the Gulf of Mexico. The waiver will cover operations in or near U.S. waters surrounding Fort Lauderdale, Puerto Rico and the U.S. Virgin Islands. The proposed operations are not covered by the Blanket Maritime Waiver or the Three-Ship Waiver, which involved different frequencies. This waiver request is limited to (i) frequency bands that may be used by LMDS systems on a primary basis and by FSS systems, including NGSO FSS systems such as O3b's, on a secondary basis (*i.e.,* the 27.6-28.35 GHz uplink band); and (ii) frequency bands that may be used by FS stations on a primary basis and in which NGSO FSS systems are non-conforming (*i.e.,* the 17.8-18.3 GHz downlink band). O3b demonstrates herein that it satisfies the FCC's waiver criteria because it will provide the requisite level of protection for services authorized by the Commission and it will accept interference from services authorized by the Commission.

I. Introduction

For statutory reasons, the Commission does not license maritime earth stations, including earth stations on vessels ("ESVs"), that transmit from foreign-flagged ships.[6] The Commission requires, however, that maritime earth stations on foreign-flagged ships not cause harmful interference to FCC-licensed radio stations when the foreign-flagged ships are located in U.S. waters.[7] In keeping with this requirement, O3b demonstrated in its requests for the Blanket Maritime Waiver and the Three-Ship Waiver that its maritime earth stations on foreign-flagged ships, like its maritime earth stations on U.S.-flagged ships, will protect other stations.[8]

This waiver request concerns 2.2m maritime earth stations on up to six foreign-flagged ships. Beginning April 20, 2015, O3b intends to engage in tests and demonstrations of maritime earth stations on the six ships (the "Tests"), and to provide commercial maritime service on the six ships (the "Service"). Each ship will have up to three maritime earth stations.

For a portion of the time that the Tests are conducted and the Service is provided, the ships will be located in or near U.S. waters surrounding Fort Lauderdale, Puerto Rico and the U.S. Virgin Islands. O3b is not seeking an FCC license or special temporary authorization for these operations because, as discussed above, the

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[6] "Section 306 of the Communications Act provides that the Commission does not have the authority to license radio stations, such as ESVs, on vessels registered by foreign administrations (foreign-registered vessels)." *In the Matter of Procedures to Govern the Use of Satellite Earth Stations on Board Vessels in the 5925-6425 MHz/3700-4200 MHz Bands and 14.0-14.5 GHz/11.7-12.2 GHz Bands*, 20 FCC Rcd 674, ¶ 122 (2004) (footnote omitted)("*ESV R&O*").

[7] *Id.*, ¶¶ 122-126.

[8] Blanket Maritime Application, Narrative, Sections II.E and II.F. *See also* Three-Ship Waiver Request, FCC File No. SES-MSC-20140318-00150, page 4.

Commission does not issue such authorizations for maritime earth stations that are located on foreign-flagged ships. O3b, however, arguably requires a waiver of certain Commission requirements in order for the Tests and Service to be located in or near U.S. territorial waters. Out of an abundance of caution, therefore, O3b hereby requests waivers covering operations in or near U.S. waters surrounding Fort Lauderdale, Puerto Rico and the U.S. Virgin Islands.

The waivers concern the Commission's allocation for the frequencies that will be used in connection with O3b's Tests and Service. During the Tests and Service, O3b's maritime earth stations will transmit on frequencies in the 27.6-28.35 GHz band and will receive on frequencies in the 17.8-18.3 GHz band. The Commission's Table of Allocations and Ka-band frequency plan provide that: (i) in the 27.6-28.35 GHz uplink band, local multipoint distribution service ("LMDS") systems are primary and FSS systems are secondary; and (ii) in the 17.8-18.3 GHz band, Fixed Service ("FS") systems are primary and NGSO FSS systems are non-conforming.[9] The table and frequency plan make no provision for using NGSO FSS systems to communicate in these bands with maritime earth stations.

To the extent necessary, therefore, O3b requests a waiver of the Table of Allocations and the Ka-band frequency plan. The waiver would permit O3b's NGSO FSS system to communicate with maritime earth stations on up to six foreign-flagged ships so that O3b can conduct the Tests and provide the Service when the ships are located in or near U.S. waters surrounding Fort Lauderdale, Puerto Rico and the U.S. Virgin Islands.

The Tests and Service will take place initially on the Allure of the Seas, a Bahamas-flagged cruise ship operated by Royal Caribbean. There may be Tests and Service on up to five additional Bahamas-flagged ships. The Utilities Regulation and Competition Authority of the Bahamas is the administration that is responsible for authorizing O3b to operate its maritime earth stations on these six ships, and O3b will not commence the Tests or the Service on any ship until this authority has been obtained.

II. O3b Satisfies the Commission's Waiver Criteria

In its order granting the Three-Ship Waiver, the International Bureau articulated the interference criteria the Commission applies to waiver requests associated with operating Ka-band maritime earth stations in or near U.S. waters. The Bureau stated

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[9] *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).

that the Commission will grant waivers such as these "when there is little potential for interference into any service authorized under the Table of Frequency Allocations and when the non-conforming operator accepts any interference from authorized services."[10]

O3b satisfies these interference criteria. For purposes of the Six-Ship Waiver Request, O3b agrees to accept interference from services authorized by the Commission. As demonstrated in the attached Technical Statement, moreover, the operations covered by the Six-Ship Waiver Request will not cause interference into any service authorized under the Table of Frequency Allocations. (O3b also shows, in Annex 3 of the Technical Statement, that the operations covered by the Six-Ship Waiver Request are consistent with the Commission's RF radiation limits.)

Avoidance of interference to GSO FSS systems.

There is a secondary allocation for FSS system operations in the uplink frequencies for which O3b seeks a waiver in this Six-Ship Waiver Request. Article 22 of the ITU Radio Regulations sets forth standards for interference protection of GSO satellite networks from NGSO satellite systems. These standards are in the form of Equivalent Power Flux Density ("EPFD") limits for downlink transmissions from NGSO satellite systems (No. 22.5C) and EPFD limits for uplink transmissions from NGSO satellite systems (No. 22.5D).[11]

O3b demonstrates in the Technical Statement that the operations covered by the Six-Ship Waiver Request comply with these EPFD uplink and downlink limits.[12] Accordingly, the operations covered by the Six-Ship Waiver Request will provide the requisite level of protection for GSO FSS systems operating in the requested frequencies. O3b also shows that the earth station antenna patterns for O3b's Six-Ship Waiver Request uplink transmissions conform to the antenna performance mask specified in Sections 25.209(a) and (b) of the Commission's rules.

Avoidance of interference to Fixed Service (*i.e.,* terrestrial) stations.

As discussed below, O3b is able to avoid harmful interference to FS stations in the frequencies for which O3b herein seeks a waiver. O3b also has included in the attached Technical Statement a showing relating to FS stations that are located outside the United States.

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[10] Letter from Jose Albuquerque, Chief, Satellite Division and Mark Settle, Chief, Policy and Rules Division, to Suzanne Malloy, O3b Limited, DA 14-1369 (rel. September 22, 2014).

[11] The Commission has held that compliance with the ITU's EPFD limits provides a sufficient basis for an NGSO FSS system to operate on a noninterference basis in a band in which GSO FSS systems are primary. *See contactMEO Communications, LLC,* 21 FCC Rcd 4035, 4043-4044 (IB 2006).

[12] Technical Statement, Section A.7 at 7-15.

27.6-28.35 GHz – Secondary uplink band shared with primary LMDS.

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 Commission has previously requested information from O3b regarding O3b's use of the 27.6-28.35 GHz frequencies,[13] and O3b again addresses this matter in this Six-Ship Waiver Request.

The Commission has indicated that FSS operations in these bands are limited to gateway-type operations. As O3b previously stated, the Commission's references to "gateway-type service" in the 27.5-28.35 GHz band are not intended as a requirement that earth stations in the band serve as gateway earth stations. Rather, the references to "gateway-type service" in the 27.5-28.35 GHz band reflect the Commission's expectation as to the type of services that FSS operators would be able to provide on a secondary basis, *i.e.,* services the FSS operators can provide without causing interference to LMDS stations that are primary in the 27.5-28.35 GHz band.[14] There is no requirement that earth stations serve as gateways. The Commission's rules support the above interpretation. Although the rules limit operations in some bands to gateway earth stations, the 27.5-28.35 GHz band is not among them.

The Commission's gateway-type service expectation relates to its understanding of the type of services that FSS operators would be able to provide. The Commission's findings in the Ka-band rulemaking proceeding shed light upon what qualifies as a gateway-type earth station that an FSS licensee may operate in the 27.5-28.35 GHz band. These findings show that the Commission's concern is with ubiquitous user terminals that could interfere with LMDS operations. The Commission stated, for example, that: "Gateways are earth stations generally larger than user terminals that support multiple carriers. … By their nature, they are not deployed in the same ubiquitous way as the user transceivers."[15] Similarly, the Commission stated in the Third Report and Order that: "As a practical matter, it is unlikely that FSS can operate ubiquitous terminals on an unprotected non-

[13] See O3b Bristow License Application, FCC File No. SES-LIC-20130618-00516, Letter from Joslyn Read to Marlene H. Dortch (November 22, 2013).
[14] Id.
[15] *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 and Suite 12 Group Petition for Pioneer's Preference, Third Notice of Proposed Rulemaking and Supplemental Tentative Decision,* 11 FCC Rcd 53, 60, n. 8 (1995).

interference basis to LMDS."[16]

O3b's proposed operations satisfy these standards. O3b only seeks authority to operate the Six-Ship Waiver service in waters in or near Fort Lauderdale, Puerto Rico and the U.S. Virgin Islands. O3b's Six-Ship Waiver service, therefore, is consistent with the views expressed by the Commission as to what qualifies as gateway-type.

The attached Comsearch coordination report demonstrates that O3b can operate its maritime earth station terminals on a secondary basis in this band in Fort Lauderdale, 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. No objections were received from any of the incumbent licensees.

Further, as discussed in the Technical Statement, O3b has procedures in place for addressing 27.6-28.35 GHz band FS stations in countries that are within 100 km of its maritime earth stations.[17] O3b already has implemented these procedures successfully for its maritime earth stations that are operating in accordance with the terms of the grant of the Blanket Maritime License, Blanket Maritime Waiver, and the Three-Ship Waiver.[18]

<u>17.8-18.3 GHz – Primary downlink band for licensed FS Systems.</u>

This frequency band is allocated on a primary basis to FS, and there is no secondary allocation for NGSO FSS in the band. Accordingly, O3b requests a waiver of the Ka-Band Plan and Section 2.106 of the Commission's rules to permit O3b to operate its NGSO FSS system in the 17.8-18.3 GHz band for downlink maritime earth station operations on a non-conforming, non-interference basis. As noted above, in analyzing requests for non-conforming spectrum uses, the Commission has indicated it will generally grant such waivers where there is not potential for interference into any service authorized under the Table of Frequency Allocations and when the non-conforming operator accepts any interference from allocated services.

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[16] *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, Third Report and Order*, 12 FCC Rcd 22310, 22327, ¶42 (1997). Notwithstanding its concern with ubiquitous user terminals, moreover, the Commission authorized Teledesic to provide services in the 27.5-28.35 GHz band that had ubiquitous elements. In 1997, the Commission authorized Teledesic to operate 27.5-28.35 GHz band NGSO FSS "Gigalink" terminals on a secondary basis that were to be used, among other things, "in privately owned networks and as high-rate terminals." *In the Matter of Teledesic Corporation Application for Authority to Construct, Launch, and Operate a Low Earth Orbit Satellite System in the Domestic and International Fixed Satellite Service*, 12 FCC Rcd. 3154 at ¶2156, n.6 (Chief IB 1997).

[17] Technical Statement, Section A.9 at 16-17.

[18] *Id.* at 17.

In this case, 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. As discussed in the Technical Statement, 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.[19] 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.

In light of the foregoing, a waiver of Section 2.106 of the Commission's rules and the Ka-Band Plan is warranted because no harmful interference will result to incumbent FS operations, O3b can operate satisfactorily within the 18 GHz microwave environment, and the public interest is otherwise served by permitting O3b to support its commercial operations.

Public interest analysis.

Grant of the Six-Ship Waiver Request is in the public interest. The Commission has recognized the many benefits associated with maritime earth stations. Making maritime earth stations available, it has found, "advances the Commission's goals and objectives for market-driven deployment of broadband technologies," which "are becoming a fundamental component of modern communications."[20] The Commission also determined that the "maritime market for broadband via satellite-based communications continues to expand" and that maritime earth stations make it possible to "deploy increasingly innovative broadband services … to businesses and consumers on the high seas, coastlines, and inland waterways."[21]

Grant of O3b's waiver request will advance these important objectives by enabling O3b to evaluate equipment performance and customer acceptability and to expand the supply of maritime broadband services. O3b's maritime earth station operations offer faster connectivity at lower cost and with reduced latency. O3b's maritime services will increase downward pressure on prices and foster innovation, all of which will redound to the benefit of maritime consumers and shipboard crew welfare. By any reasonable measure, therefore, grant of O3b's waiver request is in the public interest.

CALEA compliance. O3b may provide services pursuant to the Six-Ship Waiver Request that are within the scope of CALEA. Prior to initiating any service that is subject to CALEA, O3b will verify that it has CALEA-compliant network equipment. O3b has

[19] Technical Statement, Section A.9 at 16.
[20] *ESV R&O*, 20 FCC Rcd 674, ¶ 4 (2004).
[21] *Id.*

filed, pursuant to Section 1.20005 of the Commission's rules, the policies and procedures it has developed for ensuring compliance with CALEA.

CONCLUSION

Accordingly, and for good cause shown, O3b's request for a limited waiver of the Commission's requirements, commencing no later than April 20, 2015, should be granted.

Respectfully submitted,

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O3B NON-GEOSTATONARY SATELLITE SYSTEM

ATTACHMENT A
Technical Information related to
O3b's Six-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 six foreign-flagged ships (the "Six-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 Six-Ship Waiver Request and demonstrates that the proposed operations will protect other services.

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

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

- Uplink: 27.6-28.35 GHz
- Downlink: 17.8-18.3 GHz

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:

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[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"). 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.

(i) in the 27.6-28.35 GHz uplink band, local multipoint distribution service ("LMDS") systems are primary and FSS systems are secondary; and

(ii) in the 17.8-18.3 GHz band, Fixed Service ("FS") systems are primary and NGSO FSS systems are non-conforming.[2]

A.3 Scope of Six-Ship Waiver Request

The foreign-flagged ships that are the subject of this waiver request will operate on maritime routes for cruise ships that leave from the port of Fort Lauderdale, Florida and serve most of the Caribbean but not including all of the Gulf of Mexico. Throughout this area the Six-Ship Waiver terminals will communicate primarily with O3b's Texas gateway, but also with O3b's gateway in Peru acting as a back-up.

O3b seeks a waiver from the Commission only for operations in or near U.S. waters surrounding Fort Lauderdale, Puerto Rico and the U.S. Virgin Islands. The area served by the ships is at latitudes north of 13°N. O3b will not operate the Six-Ship Waiver service with an elevation angle from the ship to the corresponding O3b satellite of less than 10°, and in practice the minimum elevation angle is unlikely to be less than 15°.

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.

A.5 Maximum Downlink PFD Levels

The maximum downlink Power Flux Density ("PFD") level for the O3b service to the Six-Ship Waiver terminals is -127 dBW/m^2/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

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[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).

[3] The O3b Schedule S includes a maximum downlink PFD level of -117.77 dBW/m^2/MHz (at 25° elevation).

-127 dBW/m^2/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 Six-Ship Waiver Terminal Characteristics

The O3b Six-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 now 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 three such antennas, with two being required to accomplish handover between the setting and rising O3b satellites, and the third in hot standby mode. 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.

The Six-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

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[4] *See* O3b Blanket Maritime License, 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 properly refers to these terminals as maritime earth stations.

[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.

§25.138(a) which relate to blanket licensing of GSO FSS transmitting earth stations. The same is true also for the Six-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 meter maritime earth stations antenna that will be used for the Six-Ship Waiver service.[8] This same transmit antenna gain data for the 2.2m maritime earth station antenna has been included again with this waiver request as Annex 2.

The Six-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 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.

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[6] The previous Blanket Maritime Application used a maximum PSD level of -12 dBW/40kHz compared to the maximum PSD used in this Six-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.

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 Six-Ship Waiver terminals are also provided in the accompanying FCC Form 312 Schedule B.

A radiation hazard study report for the Six-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, 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

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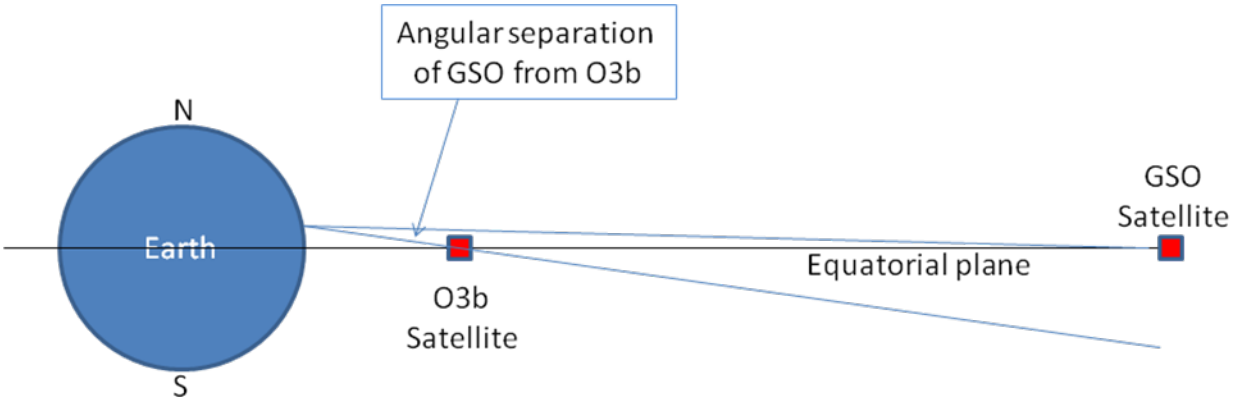
[9] In the existing FCC rules there are no defined levels of interference protection for non-GSO satellite systems into GSO satellite networks operating in the Ka-band. Nevertheless, O3b believes that the levels of interference protection being proposed here, which are consistent with the EPFD limits in the ITU Radio Regulations, should be sufficient to ensure there is no unacceptable interference into GSO satellite networks.

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

Compliance with the EPFD limits for the Six-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



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 Six-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

[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

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 Six-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 Six-Ship Waiver terminal towards the GSO orbit as well as the off-axis angle of a GSO receiving earth station towards the O3b orbit.

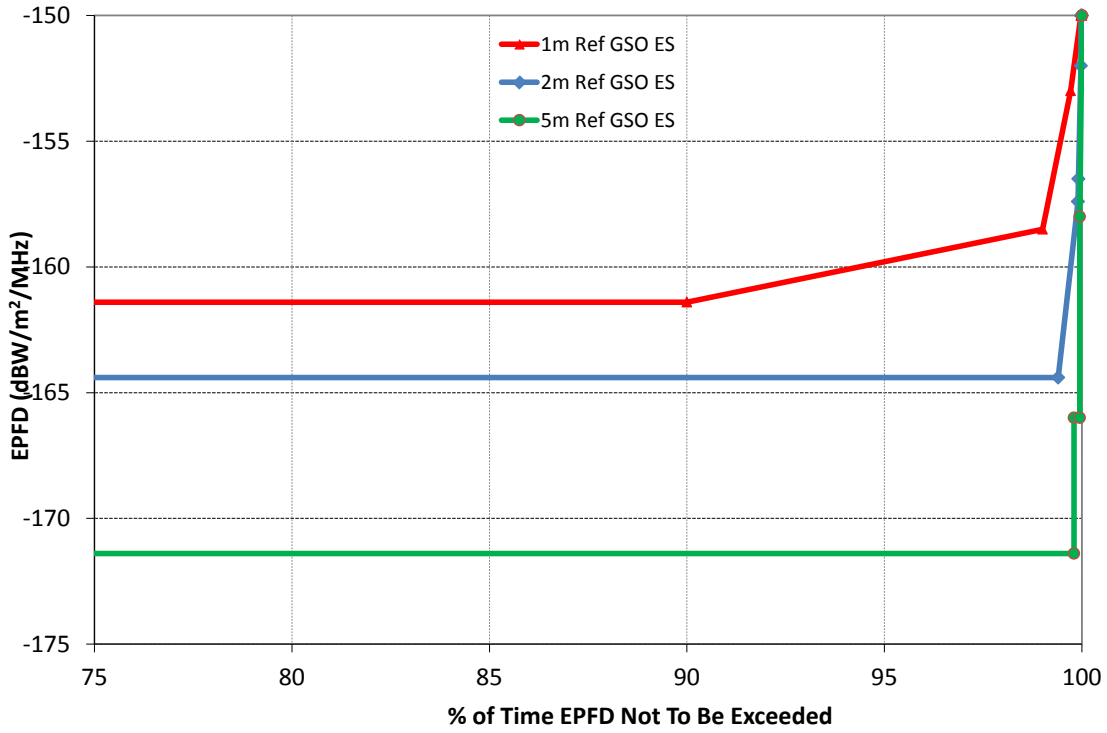
A.7.1 Compliance with EPFD↓ Limits

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.

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 Six-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 Six-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/m^2/MHz for the 1 meter reference antenna, -164.4 dBW/m^2/MHz for the 2 meter reference antenna, and -171.4 dBW/m^2/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 Six-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. 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 Six-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 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/m^2/40kHz at the GSO.[13] The aggregate nature of the

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

[13] *See* Table 22-2 in Article 22.5D of the ITU Radio Regulations.

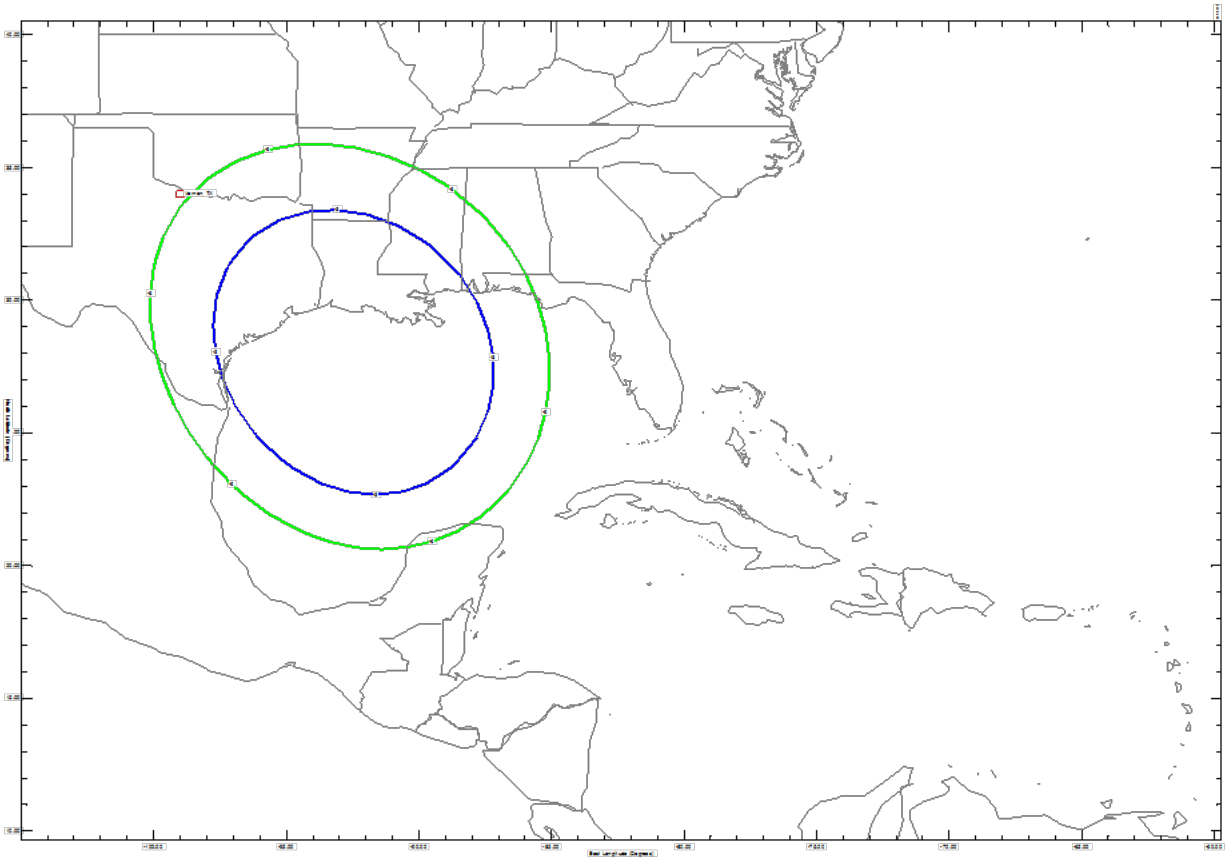
EPFD↑ limit is taken into account by defining a reference GSO satellite receive beam that can be pointed to any part of the visible Earth's surface.[14]

The EPFD↑ analysis below is based on a single-entry approach which means the worst-case EPFD↑ caused by a single transmitting Six-Ship Waiver terminal is calculated. There are good reasons why this adequately takes account of the aggregate requirement of the EPFD↑ definition, as follows:

- The O3b system only re-uses the same frequency on the same polarization with the same O3b satellite between the gateway and user beams.
- Therefore there will be no co-frequency co-polar transmissions to the same O3b satellite from more than one user (i.e., maritime earth station) terminal. 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.
- The O3b satellites are spaced sufficiently far apart that the EPFD↑ level will be dominated by the transmissions to one or other of the O3b satellites.
- The O3b user beams must be geographically separated from the co-frequency gateway beam because of the spatial frequency re-use employed in the O3b system. This requirement is met in relation to the Vernon, TX gateway for the six ships that are the subject of this waiver request and the area in which they will operate. Figure A.7-3 below shows the worst-case position for the GSO satellite reference receive spot beam contours where the beam is pointed equidistant between the area in which the six ships will operate under the requested waiver and the Vernon, TX gateway.

[14] The GSO satellite reference antenna applicable to the ITU's EPFD↑ 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.

Figure A.7-3: Worst-case GSO reference beam pointing between O3b gateway and area within which the six ships will operate



In the above case the two potential uplink interference sources to be taken into account in the EPFD↑ calculation (i.e., gateway earth station and maritime earth station terminal) would each be on the -6 dB relative gain contour of the GSO satellite receive beam, and so the aggregate EPFD↑ would be less than if the GSO reference spot beam were pointed directly towards the ships. For that case the gateway earth station would be well below the -6 dB relative gain contour of the GSO reference spot beam, and the aggregation effect would be insignificant.

Table A.7-2 below presents the single-entry EPFD↑ results for the transmissions from the Six-Ship Waiver terminal. The maximum maritime earth station terminal transmit EIRP level that will be used for the Six-Ship maritime earth station Waiver service is 67.9 dBW.[15] This maximum level

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

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 6 dB less than this maximum value (i.e., 61.9 dBW). This clear-sky level is used for the EPFD↑ calculation 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 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 antenna gain at the worst-case off-axis angle of 5° and a conservative spreading loss of 162 dB. For a single entry interferor the PFD is equal to the EPFD↑. The resulting worst-case EPFD↑ level falls below the EPFD↑ limit value with a margin of 11.6 dB. This allows ample margin for any small aggregation effects taking into account the factors discussed above in this regard.

Table A.7-2: Calculation of worst-case single-entry EPFD↑ level produced by the transmitting Six-Ship Waiver terminal

Value	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)
50	MHz	Occupied carrier bandwidth (minimum)
-21.6	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)
10.0	dBi	Off-axis gain of ship terminal antenna
162	dB	Assumed spreading loss from ship terminal to GSO orbit
-173.6	$dBW/m^2/40kHz$	Resulting maximum PFD at GSO orbit from ship terminal (clear-sky or rain-fade conditions)
-162	$dBW/m^2/40kHz$	EPFD↑ limit
11.6	dB	Margin to EPFD↑ limit (single-entry)

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.[16] 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 discussed in the Six-Ship Waiver Request, O3b is able to avoid harmful interference to FS stations in the frequencies for which O3b herein seeks a waiver.

27.6-28.35 GHz – Secondary uplink band shared with primary LMDS.

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 in Annex 5 demonstrate that O3b can operate its maritime earth station terminals on a secondary basis in this band in Fort Lauderdale, 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 of these locations. No objections were received from any of the incumbent licensees.

17.8-18.3 GHz – Primary downlink band for licensed FS Systems.

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.

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[16] See Petition for Declaratory Ruling of O3b Limited, October 29, 2014, Annex 2.

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 Six-Ship Waiver terminals.

Uplink

When a Six-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 Six-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 and the Three-Ship Waiver Request.[17]

O3b therefore intends to operate its Six-Ship Waiver terminals consistent with the ITU procedures that apply to ESVs in other frequency bands.[18] O3b will liaise with the regulatory authorities of countries whose territory is within 100 km of the ship on which an O3b Six-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 other foreign-flagged ships operating under a waiver of the Allocation Table and Ka-band Plan.[19]

This Six-Ship Waiver Request is limited to operations by foreign-flagged ships when the ships are located in or near U.S. waters surrounding Fort Lauderdale, Puerto Rico and the U.S. Virgin

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[17] *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-MSC-20140318-00150, Technical Narrative at Section A.9. Although the O3b Blanket Maritime Application related to the frequency ranges 28.6-29.1 GHz (uplink) and 18.8-19.3 GHz (downlink) and the Three-Ship Waiver Request related to the frequency ranges 28.35-28.4 GHz (uplink) and 18.3-18.6 GHz (downlink), which are slightly different from the frequency ranges for the Six-Ship Waiver service, the broad conclusions from the analysis were independent of the exact frequency of operation of the service and therefore can be applied equally to the Six-Ship Waiver service.

[18] ITU-R Recommendation 37 (WRC-03).

[19] *See* Three-Ship Waiver Request, FCC File No. SES-MSC-20140318-00150 (granted Sep. 22, 2014).

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 Six-Ship Waiver Request. The first exception is the Bahamas, which is the administration that is responsible for authorizing maritime earth station operations on all six ships that are covered by the Six-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 already is liaising with the authorities in the British Virgin Islands concerning its maritime earth station operations on ships registered by the Bahamas.

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

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

A.11 Coordination with US Government Satellite Networks and Earth Stations

O3b has completed all necessary ITU coordination with US 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.[20] 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 US 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.

[20] 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
Telecomm Strategies LLP
8737 Colesville Rd
Suite 501
Silver Spring, MD 20910
(301) 656-8969

February 6, 2015

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

The following two pages provide the Six-Ship Waiver terminal 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 Six-Ship Waiver service is 10 dB below this stated level under clear-sky conditions, and 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-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

Director R&D SatCom Systems

Orbit Communication Ltd

Orbit Communication Ltd. 8D Hatzoran St. P.O.B. 8657, Netanya 42504, Israel, Tel: +(972) 9 892 2777, Fax: +(972) 9 885 5944 www.orbit-cs.com

Annex 2: Six-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, -180º to +180º @ 1.0º 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, -180º to +180º @ 1.0º 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, -180º to +180º @ 1.0º 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, -10º to +10º @ 0.1º 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, -10º to +10º @ 0.1º 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, -30º to +30º @ 0.5º increment

27.55 GHz Antenna Pattern in Co-pol El LHCP

Angle	Gain	Mask	Over Mask
Degrees	dBi	dBi	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 El LHCP

Angle	Gain	Mask	Over Mask
Degrees	dBi	dBi	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, -10º to +10º @ 0.1º increment

27.55 GHz Antenna Pattern in Co-pol El 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 El 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, -10º to +10º @ 0.1º 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, -10º to +10º @ 0.1º 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

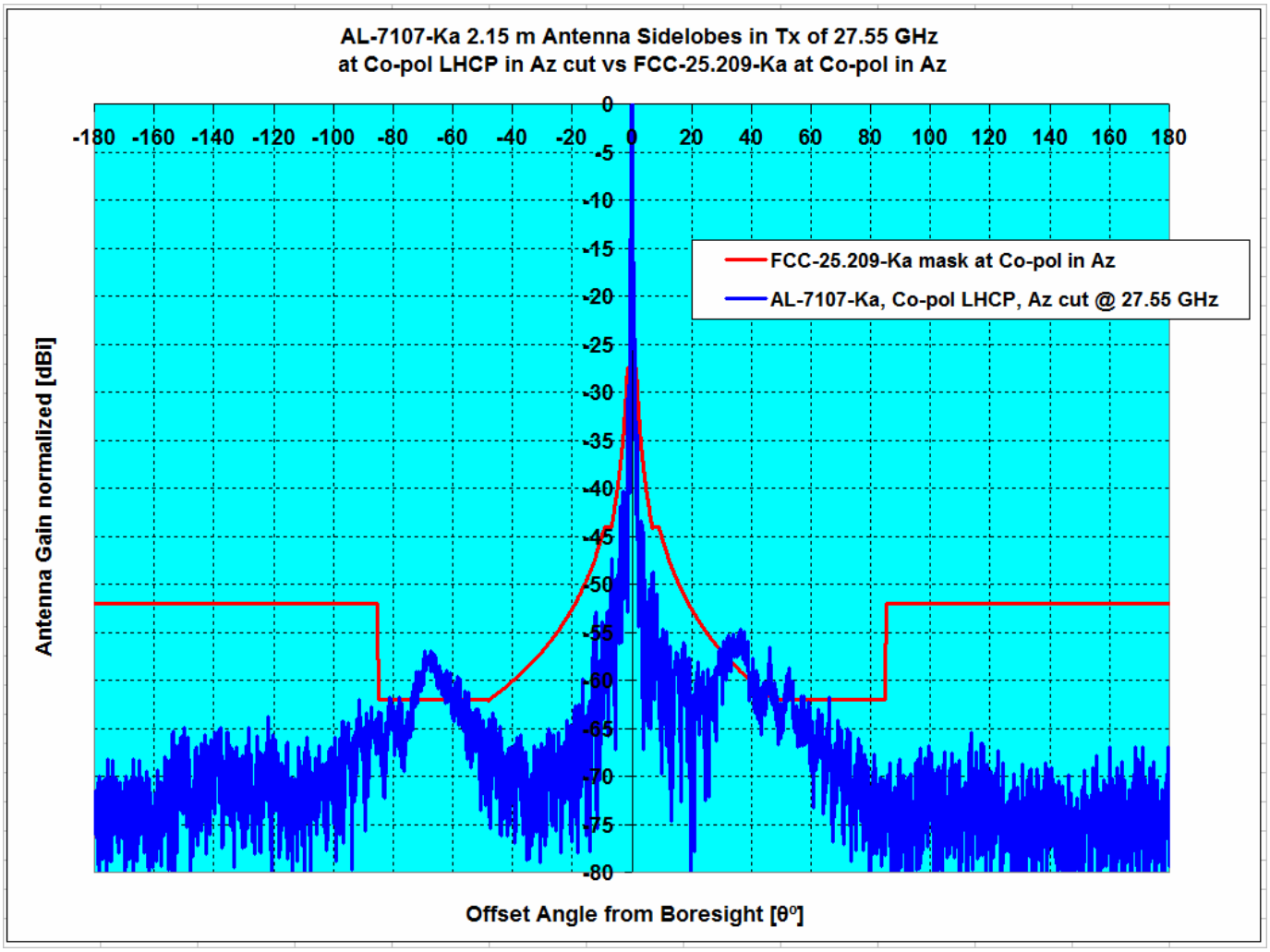
X-pol Azimuth LHCP, -10º to +10º @ 0.1º increment

-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.

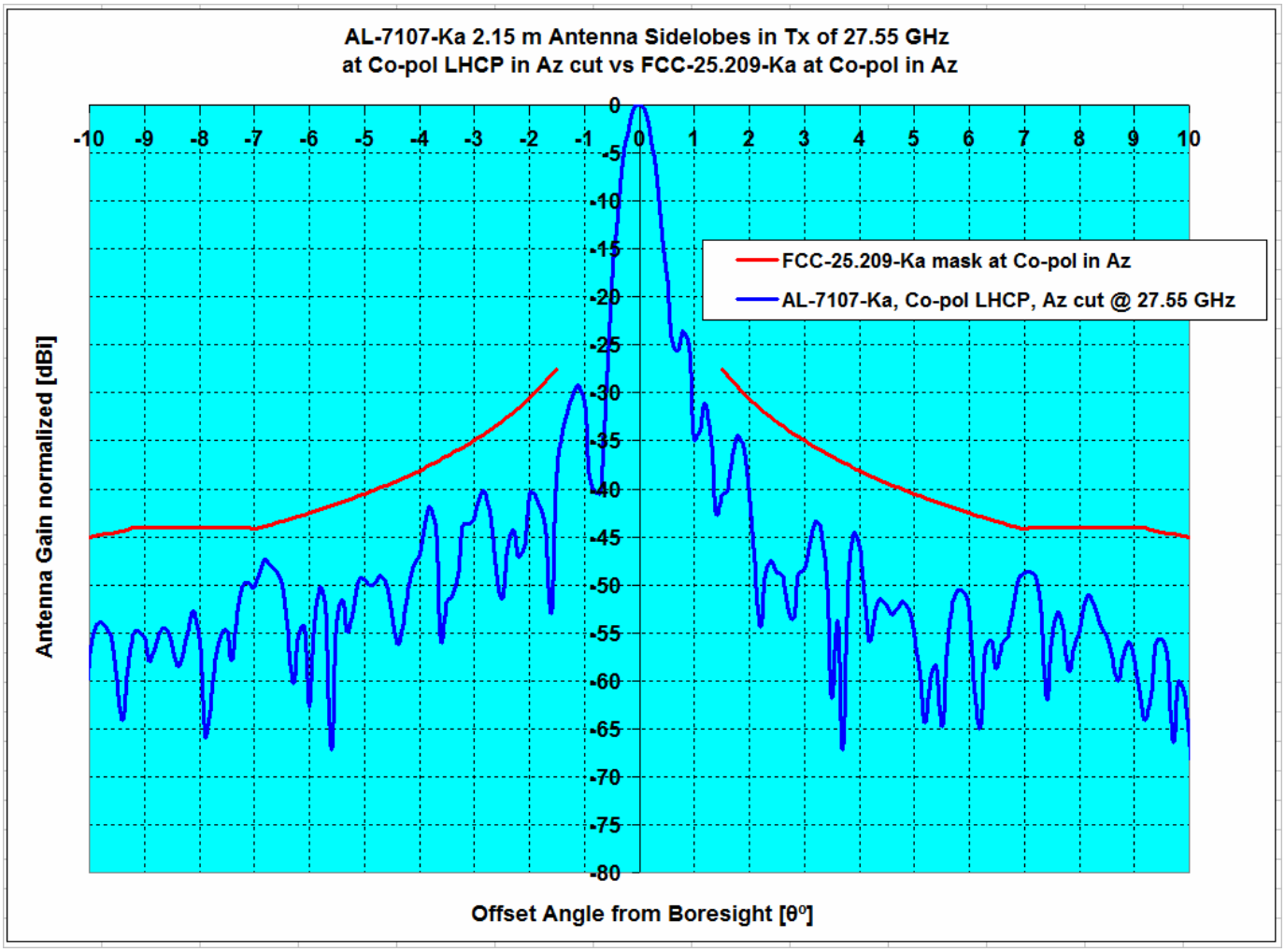
AL-7107-Ka, 2.15 m Antenna, Pattern, Co-pol, Azimuth LHCP



Description	Plane, CirP	Frequency	Ant. Gain	Peak Excursions dB		Over Mask %	
Pattern Rule vs Antenna System	Type	GHz	dBi	1.5°≤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	27.55	52.06	-3.48	5.11	0.00%	8.04%

Orbit Communication Systems Ltd.

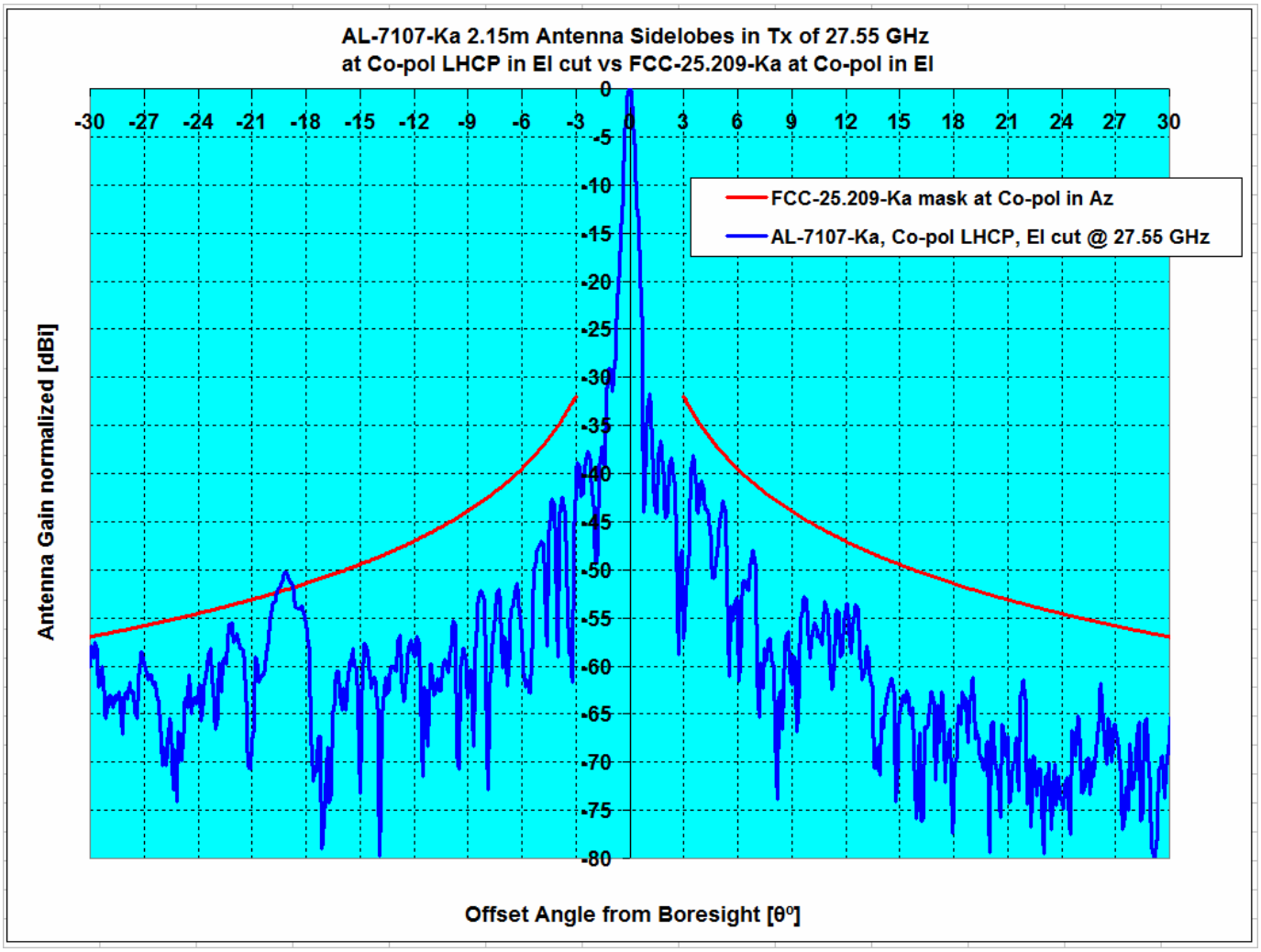
AL-7107-Ka, 2.15 m Antenna, Pattern, Co-pol, Azimuth LHCP



Description	Plane, CirP	Frequency	Ant. Gain	Peak Excursions dB		Over Mask %	
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	27.55	52.06	-3.48	5.11	0.00%	8.04%

Orbit Communication Systems Ltd.

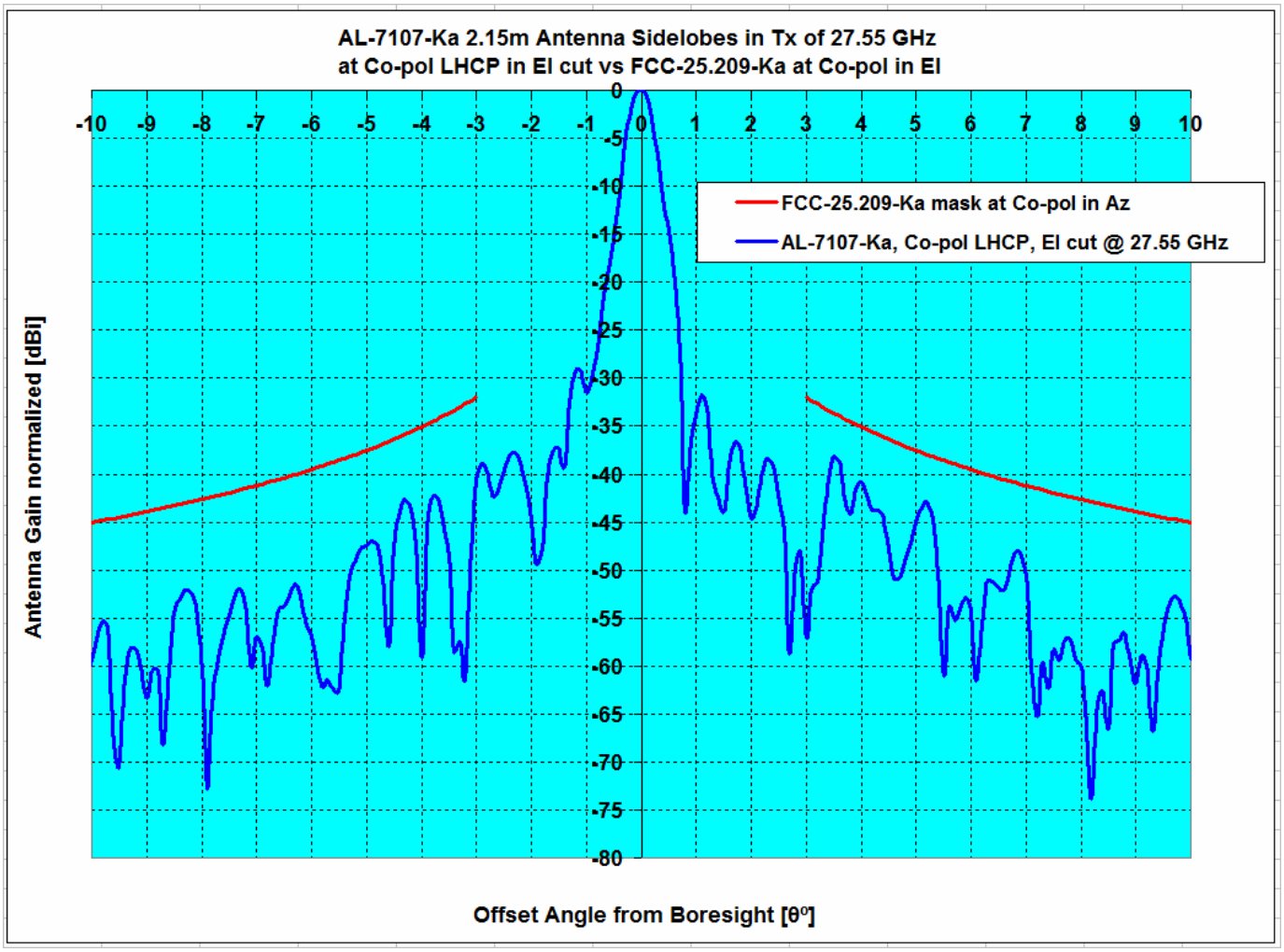
AL-7107-Ka, 2.15 m Antenna, Pattern, Co-pol, Elevation LHCP



Description	Plane, CirP	Frequency	Ant. Gain	Peak Excursions dB		Over Mask %	
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 El, vs AL-7107-Ka	El , LHCP	27.55	52.06	-4.46	1.83	0.00%	1.66%

Orbit Communication Systems Ltd.

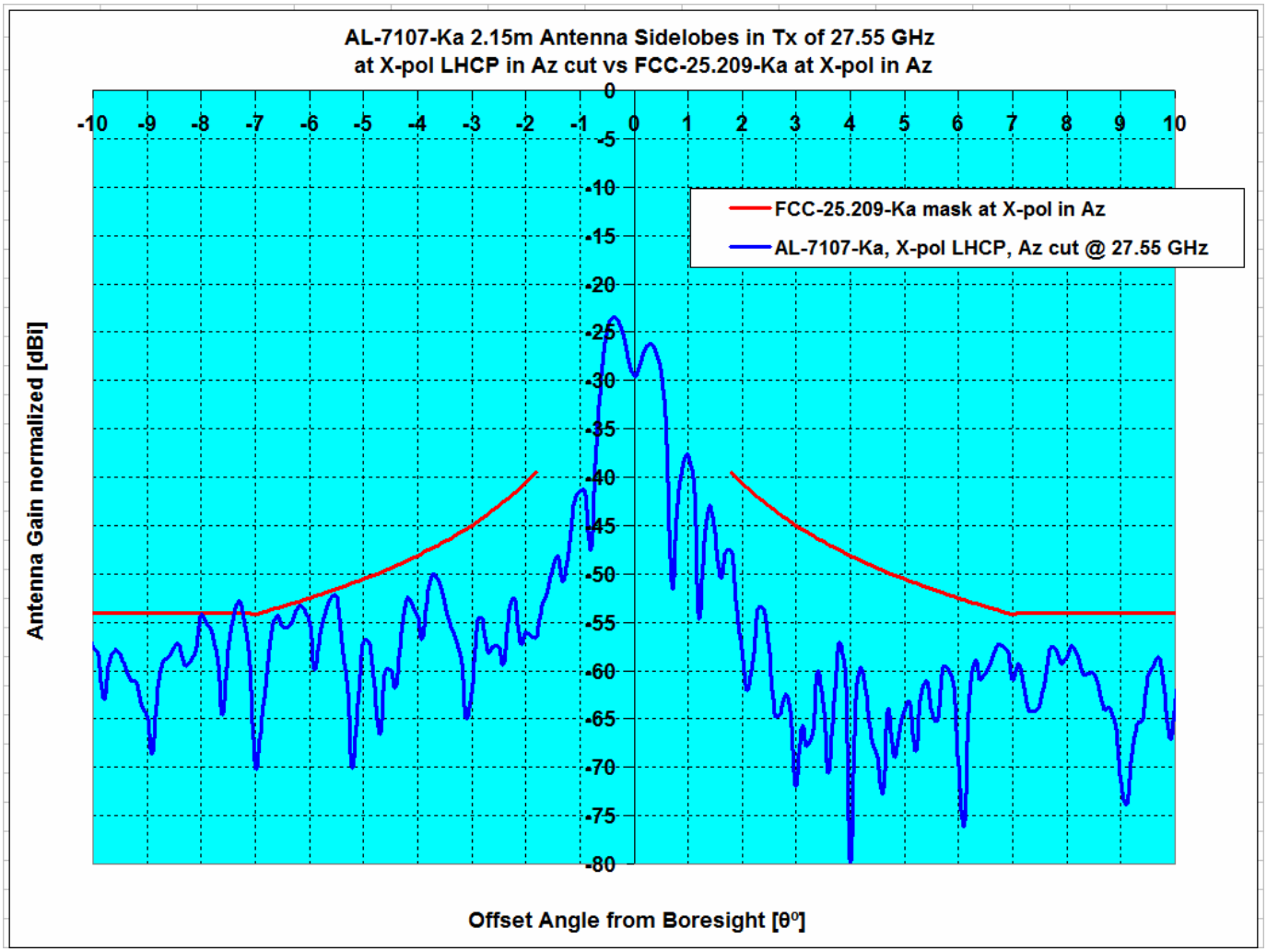
AL-7107-Ka, 2.15 m Antenna, Pattern, Co-pol, Elevation LHCP



Description	Plane, CirP	Frequency	Ant. Gain	Peak Excursions dB		Over Mask %	
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 El, vs AL-7107-Ka	El , 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, X-pol, Azimuth LHCP



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, -180º to +180º @ 1.0º 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, -180º to +180º @ 1.0º 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, -180º to +180º @ 1.0º 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, -10º to +10º @ 0.1º 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, -10º to +10º @ 0.1º 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, -30º to +30º @ 0.5º increment

27.55 GHz Antenna Pattern in Co-pol El RHCP

Angle	Gain	Mask	Over Mask
Degrees	dBi	dBi	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 El RHCP

Angle	Gain	Mask	Over Mask
Degrees	dBi	dBi	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, -10º to +10º @ 0.1º increment

27.55 GHz Antenna Pattern in Co-pol El 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 El 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, -10º to +10º @ 0.1º 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, -10º to +10º @ 0.1º 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.

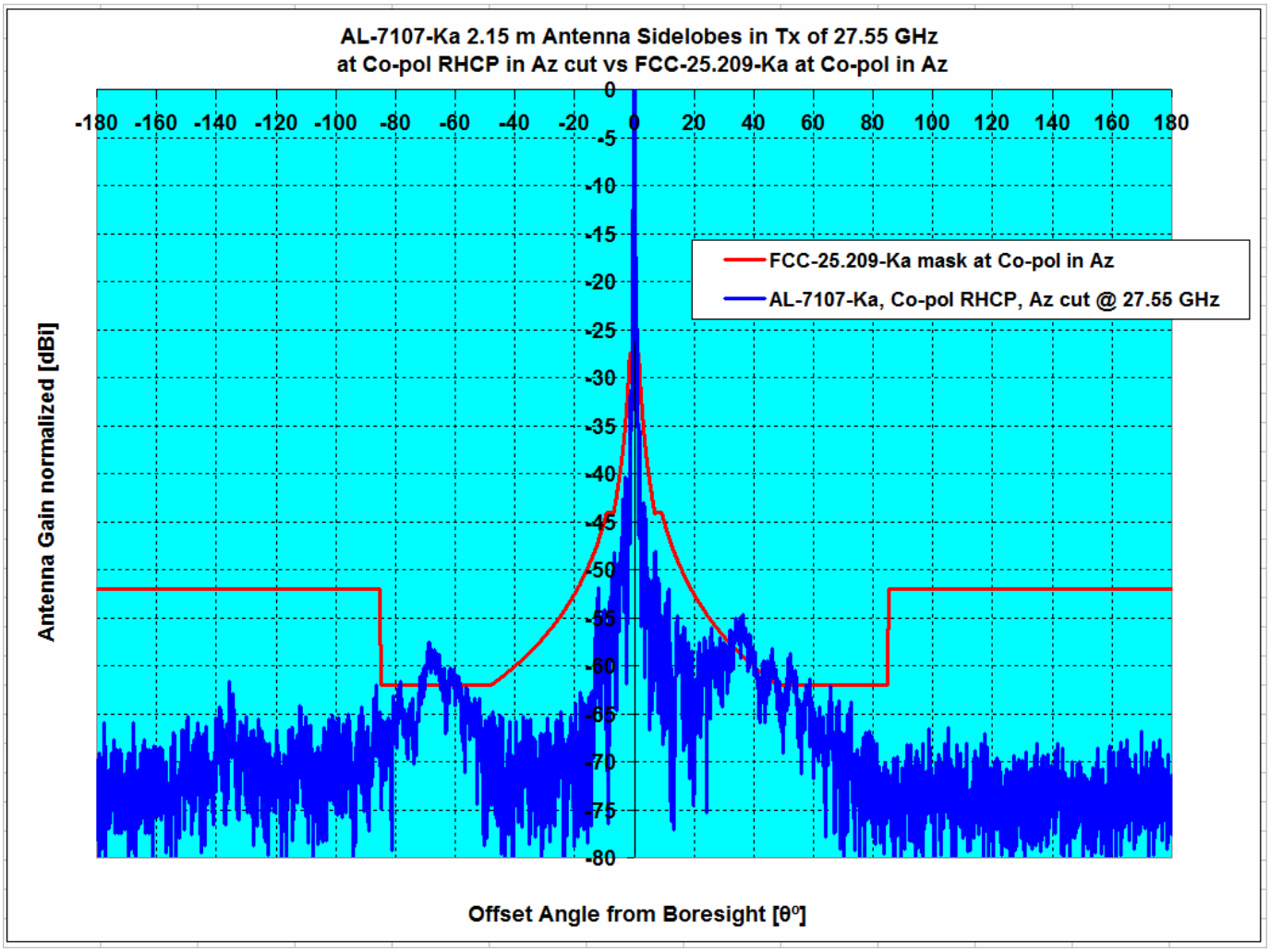
AL-7107-Ka, 2.15 m Antenna, Pattern Data Table
X-pol Azimuth RHCP, -10º to +10º @ 0.1º increment

-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.

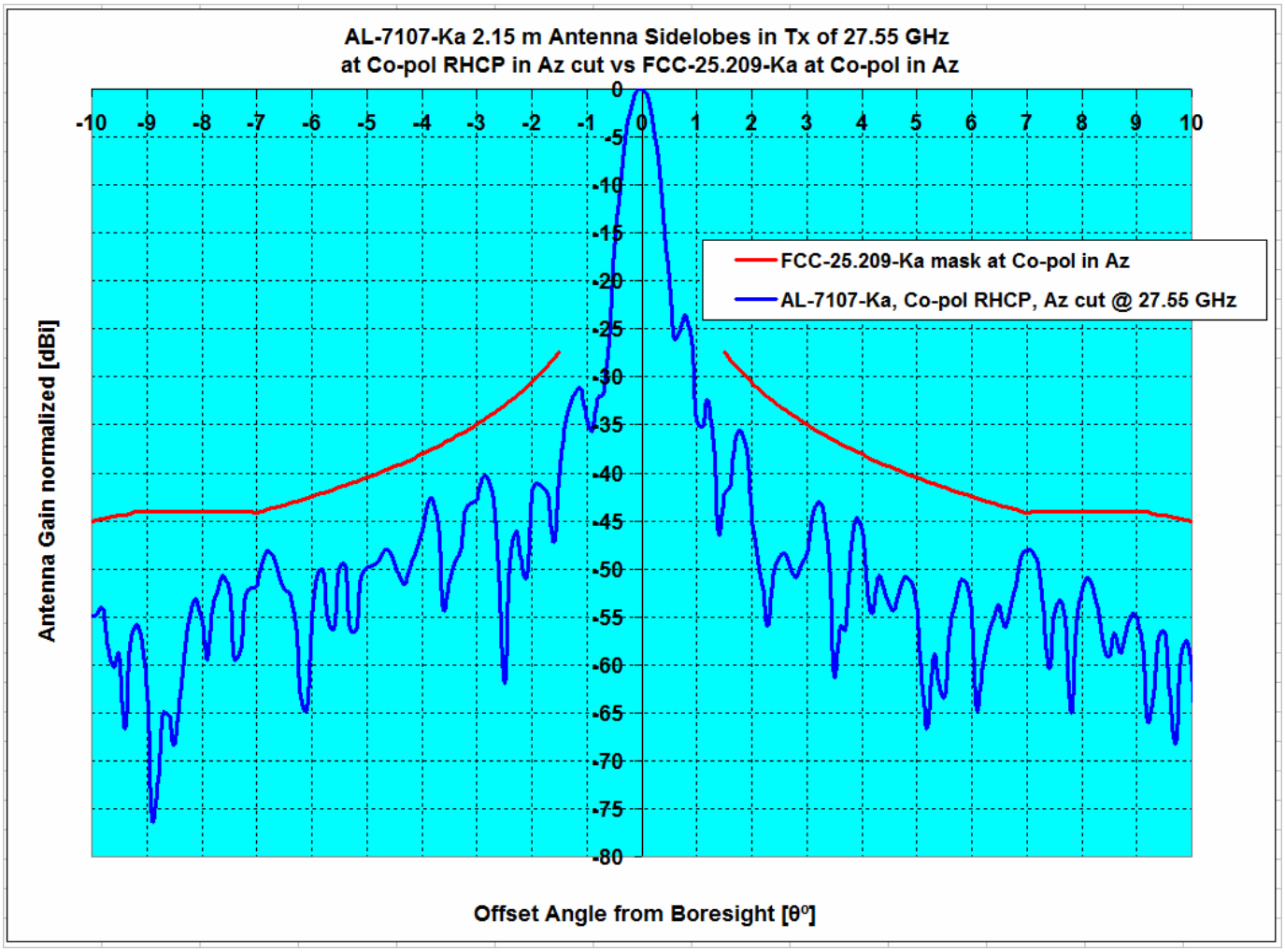
AL-7107-Ka, 2.15 m Antenna, Pattern, Co-pol, Azimuth RHCP



Description	Plane, CirP	Frequency	Ant. Gain	Peak Excursions dB		Over Mask %	
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 , RHCP	27.55	52.02	-3.99	4.44	0.00%	6.55%

Orbit Communication Systems Ltd.

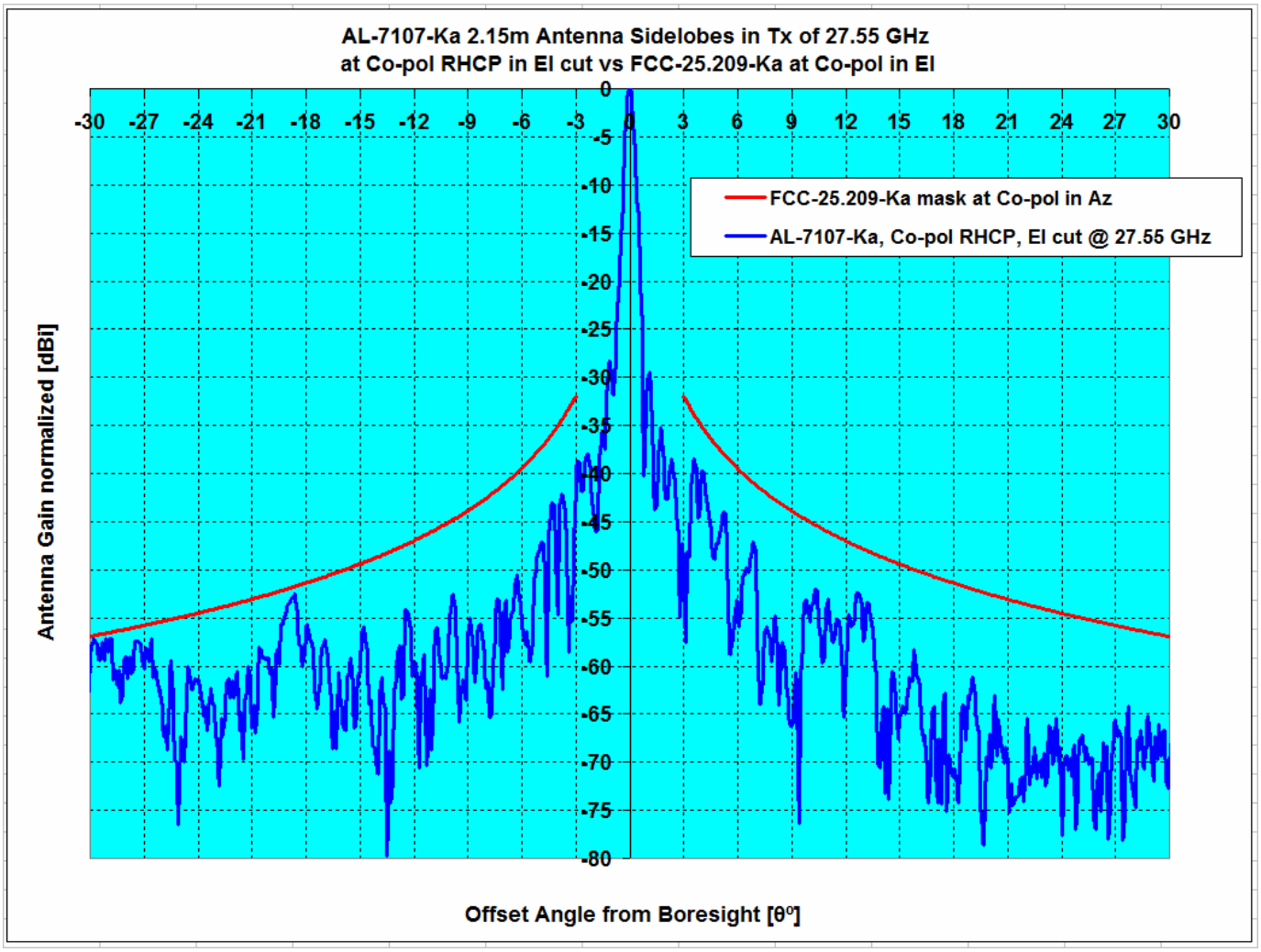
AL-7107-Ka, 2.15 m Antenna, Pattern, Co-pol, Azimuth RHCP



Description	Plane, CirP	Frequency	Ant. Gain	Peak Excursions dB		Over Mask %	
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 , RHCP	27.55	52.02	-3.99	4.44	0.00%	6.55%

Orbit Communication Systems Ltd.

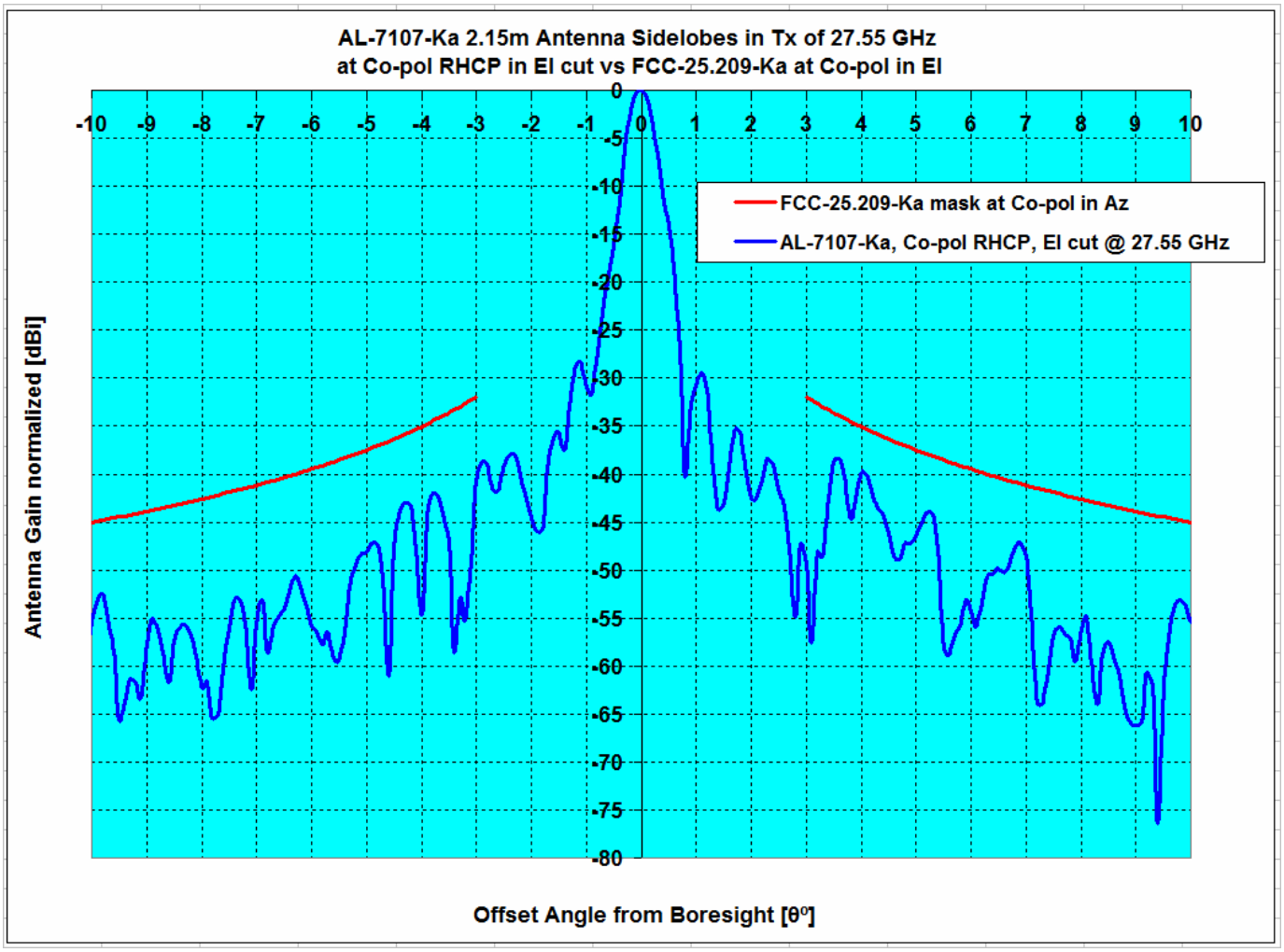
AL-7107-Ka, 2.15 m Antenna, Pattern, Co-pol, Elevation RHCP



Description	Plane, CirP	Frequency	Ant. Gain	Peak Excursions dB		Over Mask %	
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 El, vs AL-7107-Ka	El , RHCP	27.55	52.02	-4.53	-0.33	0.00%	0.00%

Orbit Communication Systems Ltd.

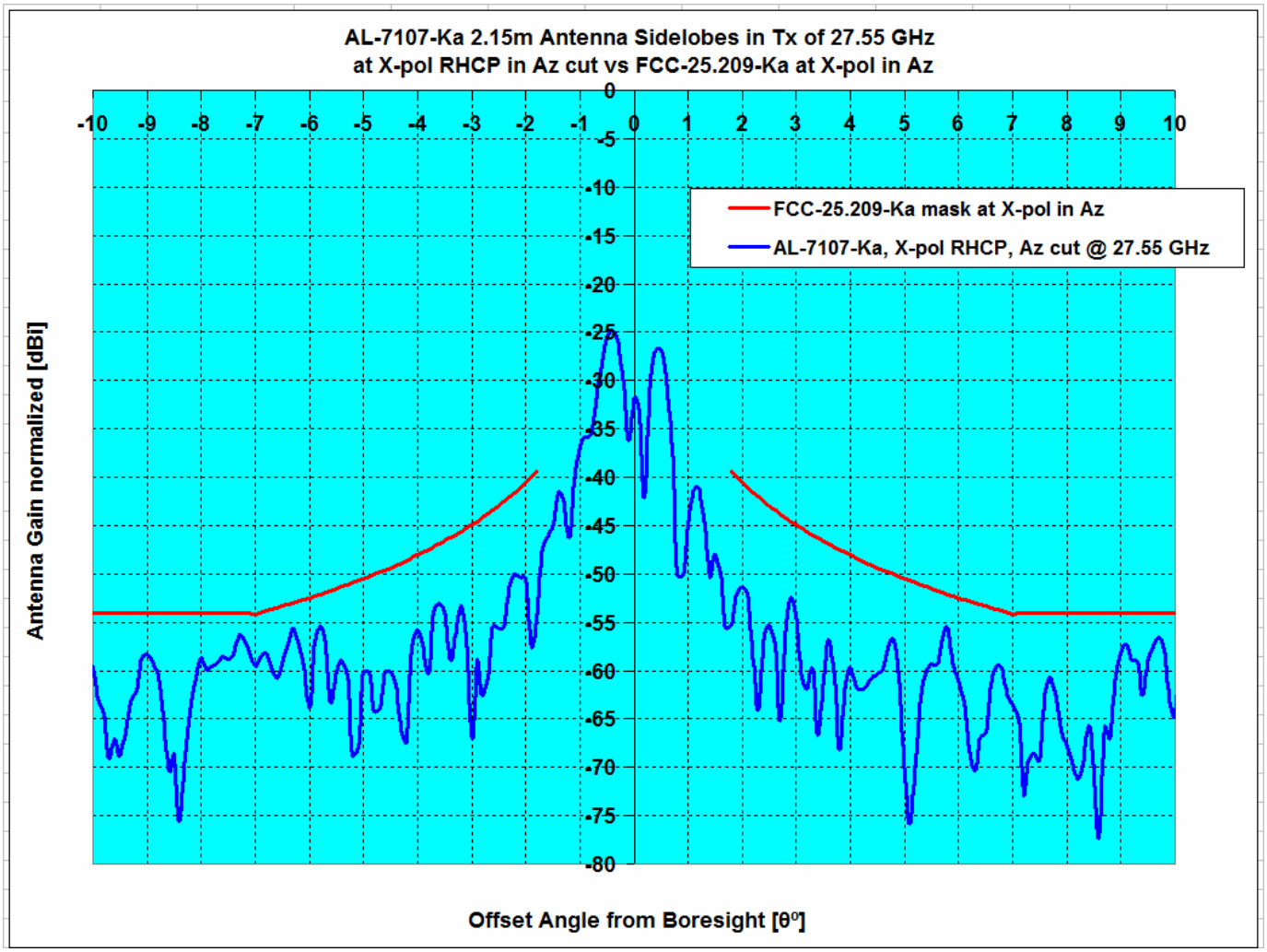
AL-7107-Ka, 2.15 m Antenna, Pattern, Co-pol, Elevation RHCP



Description	Plane, CirP	Frequency	Ant. Gain	Peak Excursions dB		Over Mask %	
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 El, vs AL-7107-Ka	El , 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, -180º to +180º @ 1.0º 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, -180º to +180º @ 1.0º 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, -180º to +180º @ 1.0º 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, -10º to +10º @ 0.1º 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, -10º to +10º @ 0.1º 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, -30º to +30º @ 0.5º increment

28.30 GHz Antenna Pattern in Co-pol El 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 El 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, -10º to +10º @ 0.1º increment

28.30 GHz Antenna Pattern in Co-pol El 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 El 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, -10º to +10º @ 0.1º 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, -10º to +10º @ 0.1º 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

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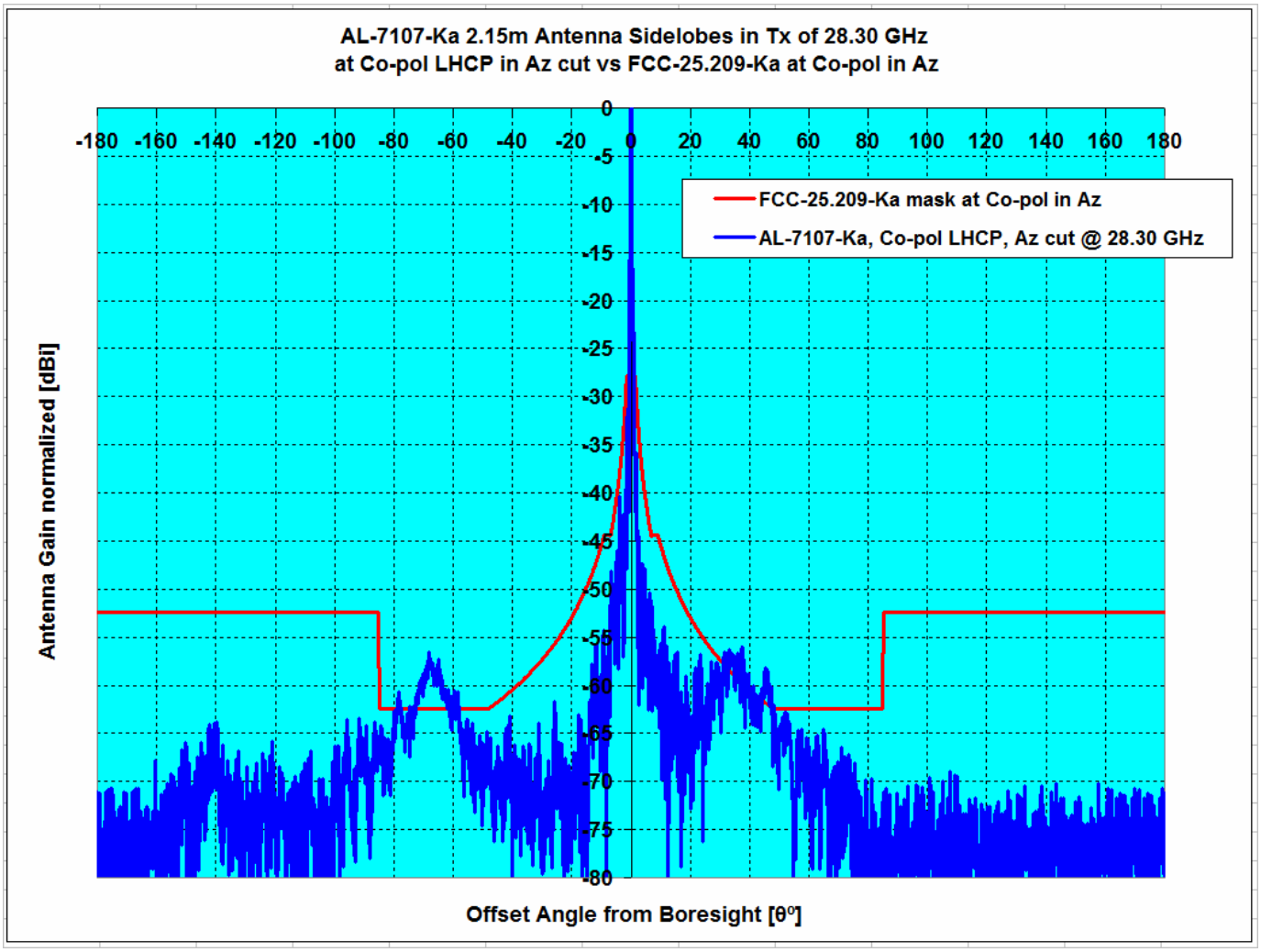
AL-7107-Ka, 2.15 m Antenna, Pattern Data Table
X-pol Azimuth LHCP, -10º to +10º @ 0.1º increment

-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.

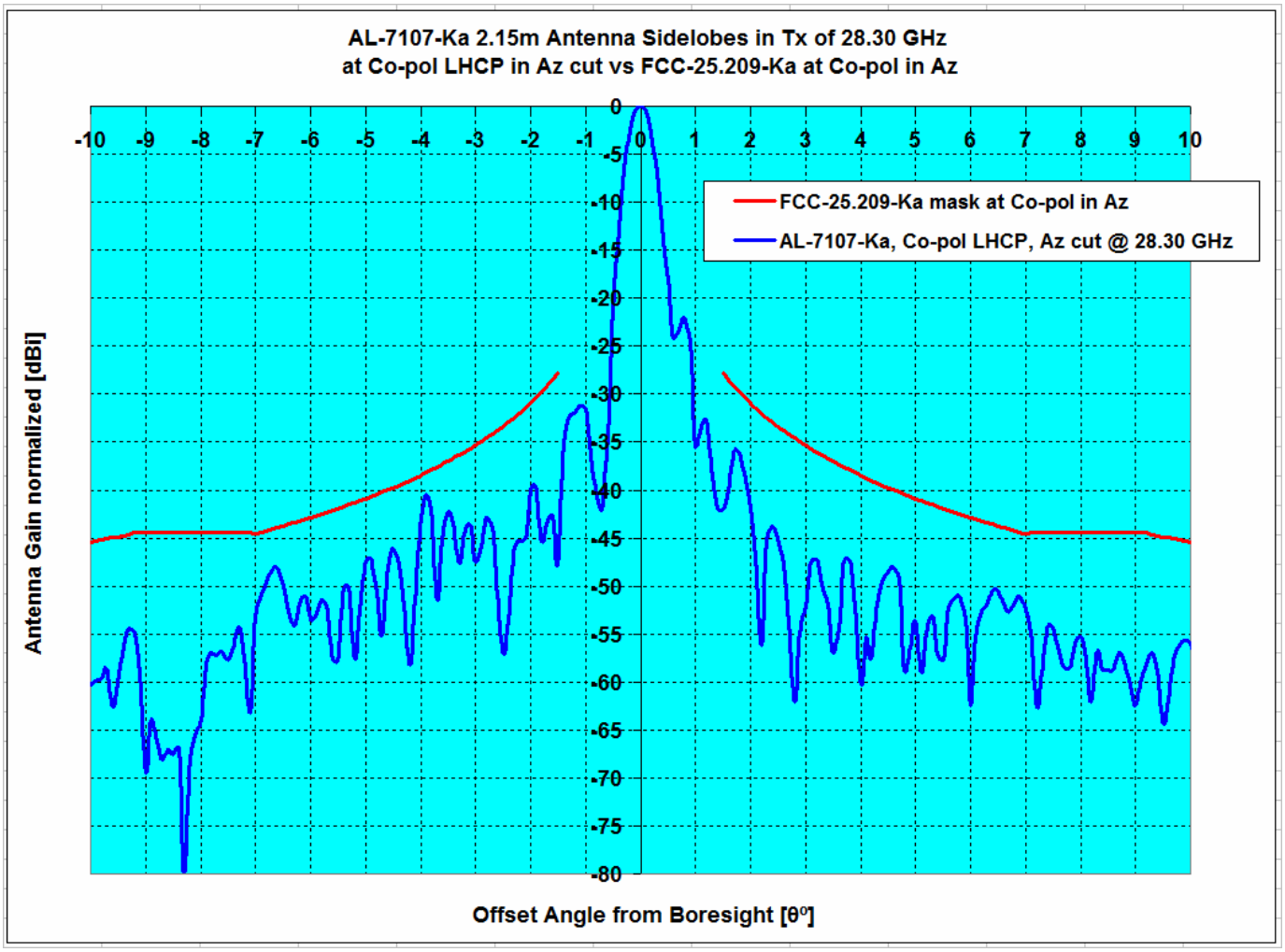
AL-7107-Ka, 2.15 m Antenna, Pattern, Co-pol, Azimuth LHCP



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.

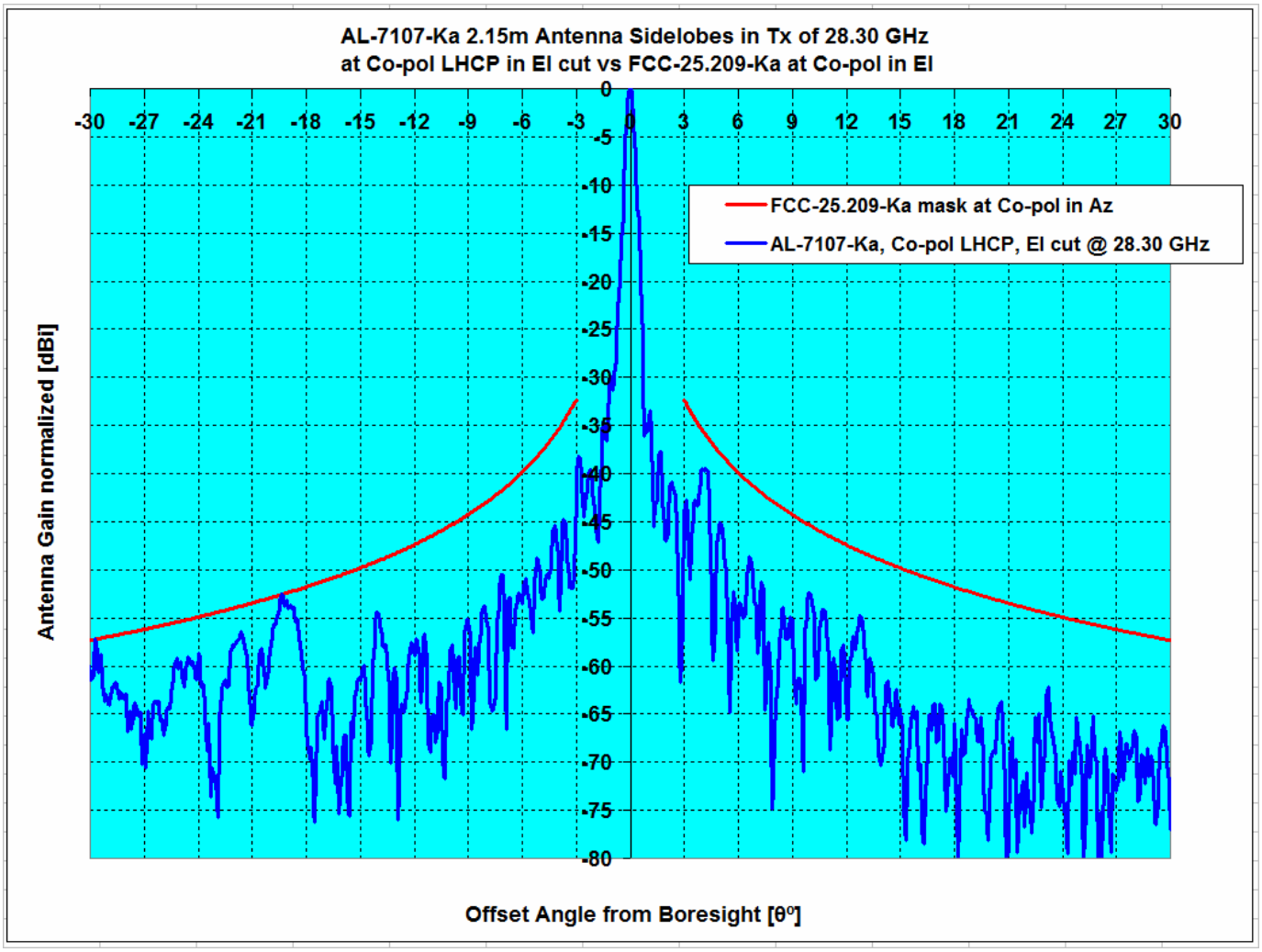
AL-7107-Ka, 2.15 m Antenna, Pattern, Co-pol, Azimuth LHCP



Description	Plane, CirP	Frequency	Ant. Gain	Peak Excursions dB		Over Mask %	
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.

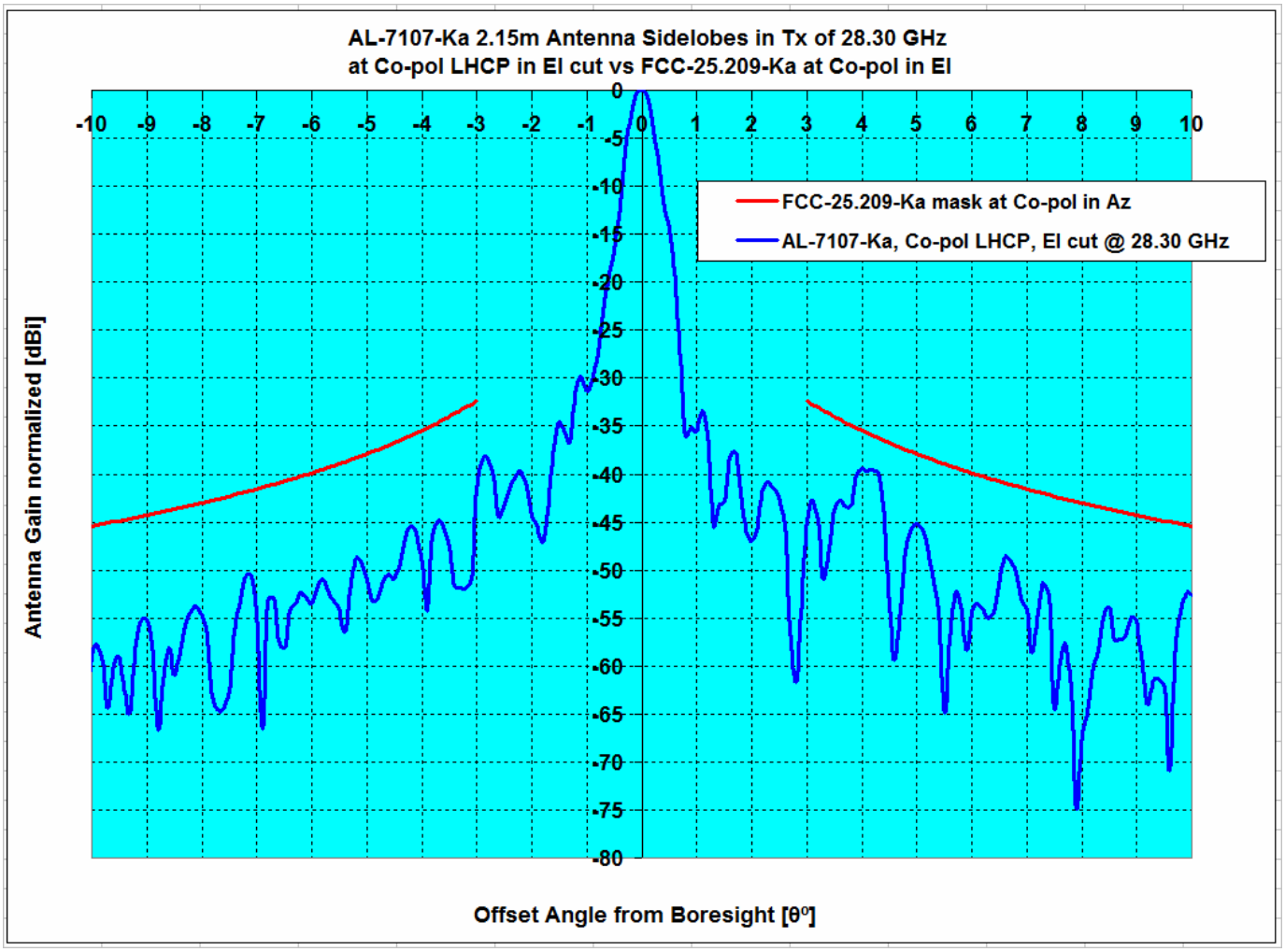
AL-7107-Ka, 2.15 m Antenna, Pattern, Co-pol, Elevation LHCP



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 El, vs AL-7107-Ka	El , LHCP	28.30	52.43	-3.53	0.07	0.00%	0.18%

Orbit Communication Systems Ltd.

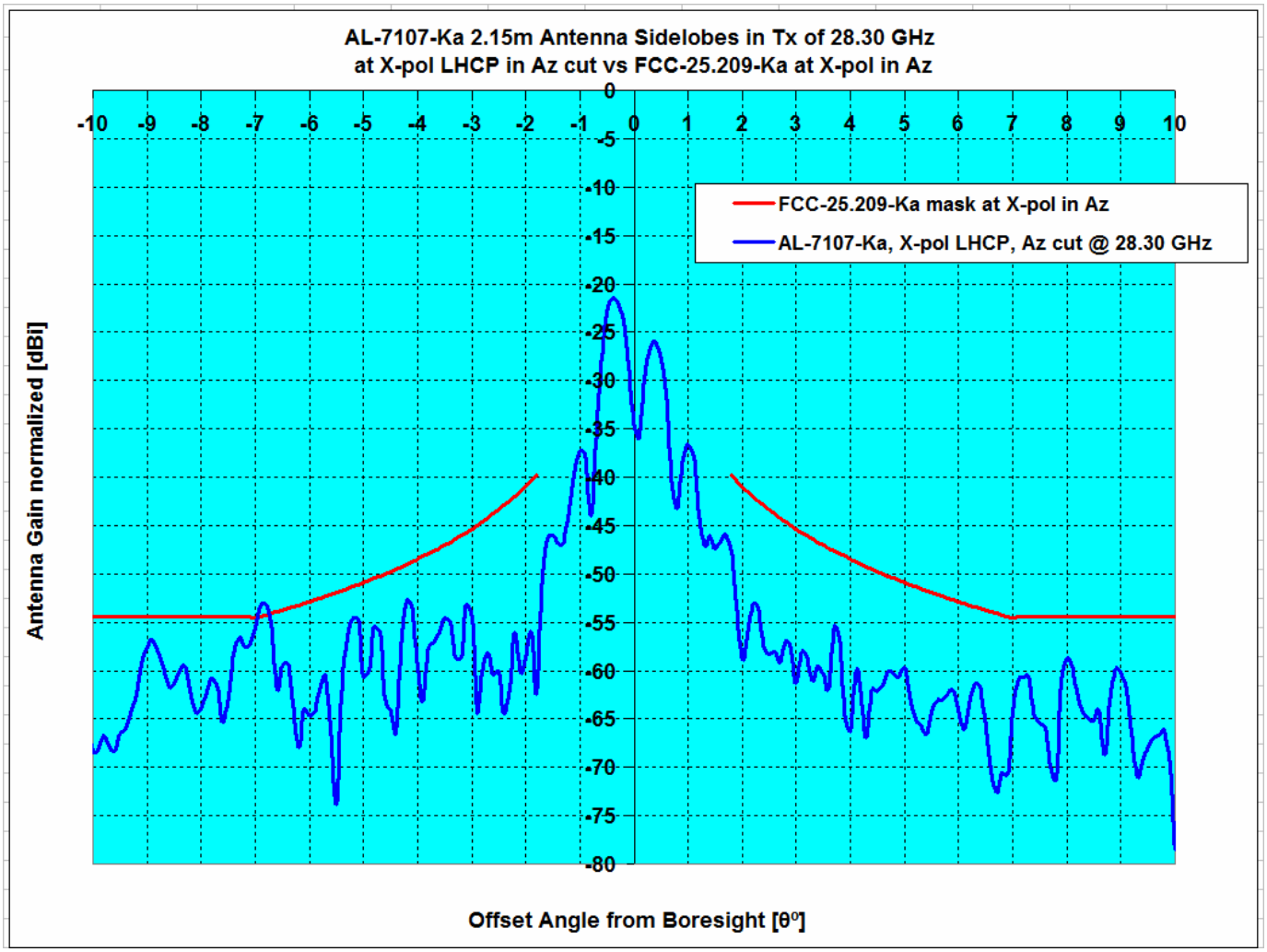
AL-7107-Ka, 2.15 m Antenna, Pattern, Co-pol, Elevation LHCP



Description	Plane, CirP	Frequency	Ant. Gain	Peak Excursions dB		Over Mask %	
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 El, vs AL-7107-Ka	El , 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, X-pol, Azimuth LHCP



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, -180º to +180º @ 1.0º 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, -180º to +180º @ 1.0º 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, -180º to +180º @ 1.0º 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, -10º to +10º @ 0.1º 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, -10º to +10º @ 0.1º 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, -30º to +30º @ 0.5º increment

28.30 GHz Antenna Pattern in Co-pol El 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 El 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, -10º to +10º @ 0.1º increment

28.30 GHz Antenna Pattern in Co-pol El 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 El 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

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AL-7107-Ka, 2.15 m Antenna, Pattern Data Table
Co-pol Elevation RHCP, -10º to +10º @ 0.1º 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, -10º to +10º @ 0.1º 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.

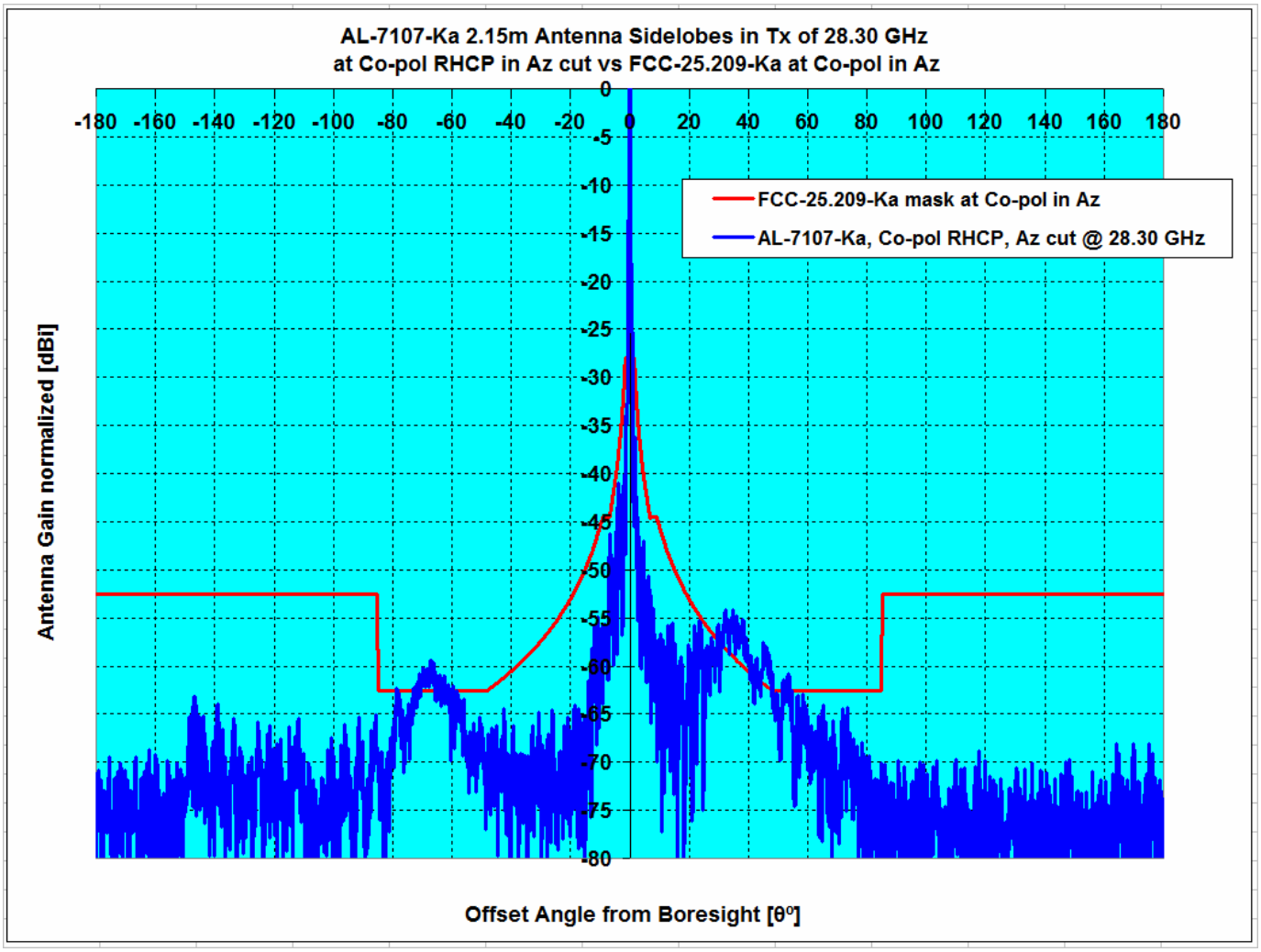
AL-7107-Ka, 2.15 m Antenna, Pattern Data Table
X-pol Azimuth RHCP, -10º to +10º @ 0.1º increment

-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.

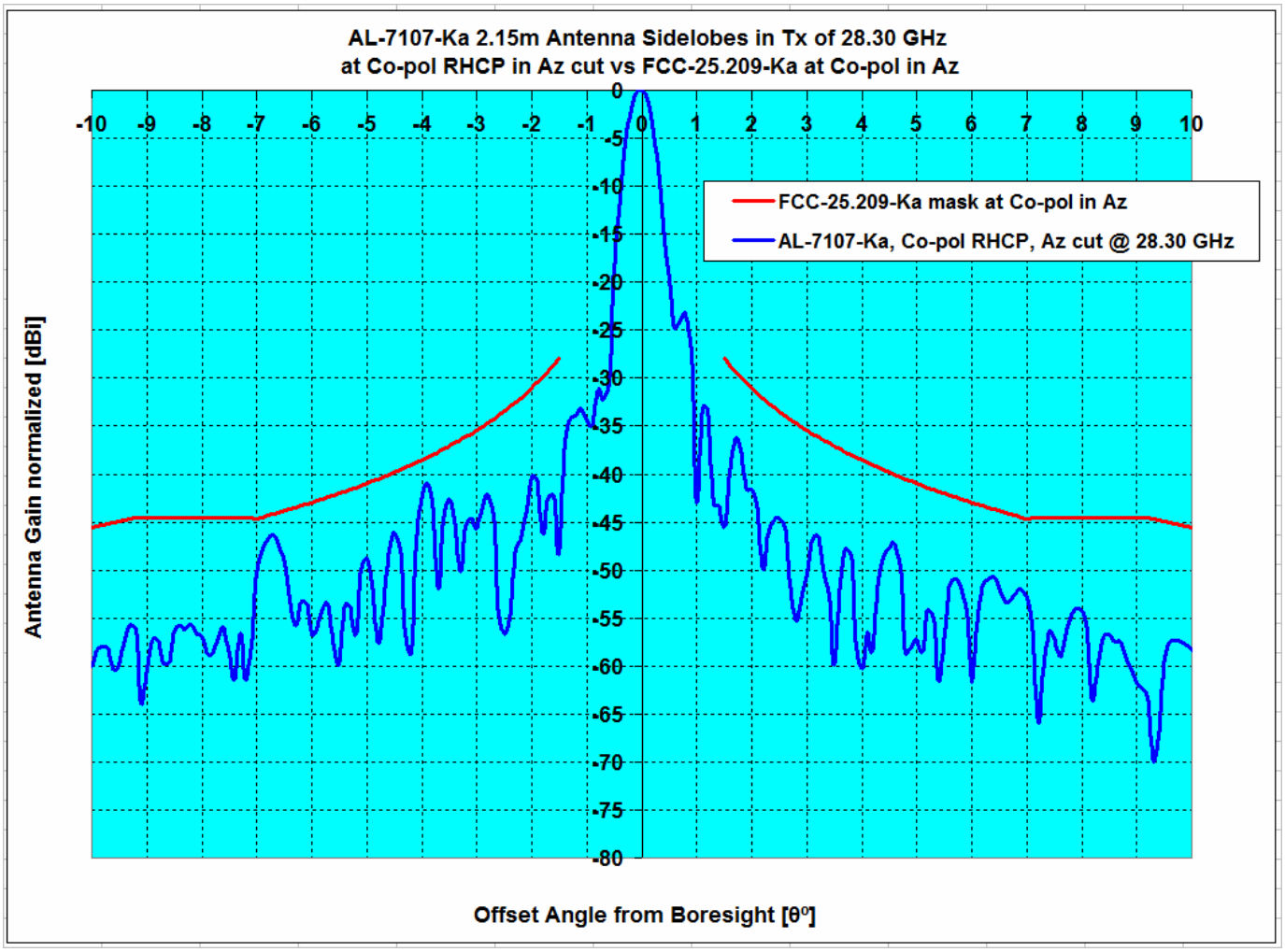
AL-7107-Ka, 2.15 m Antenna, Pattern, Co-pol, Azimuth RHCP



Description	Plane, CirP	Frequency	Ant. Gain	Peak Excursions dB		Over Mask %	
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 , RHCP	28.30	52.51	-2.13	4.92	0.00%	7.22%

Orbit Communication Systems Ltd.

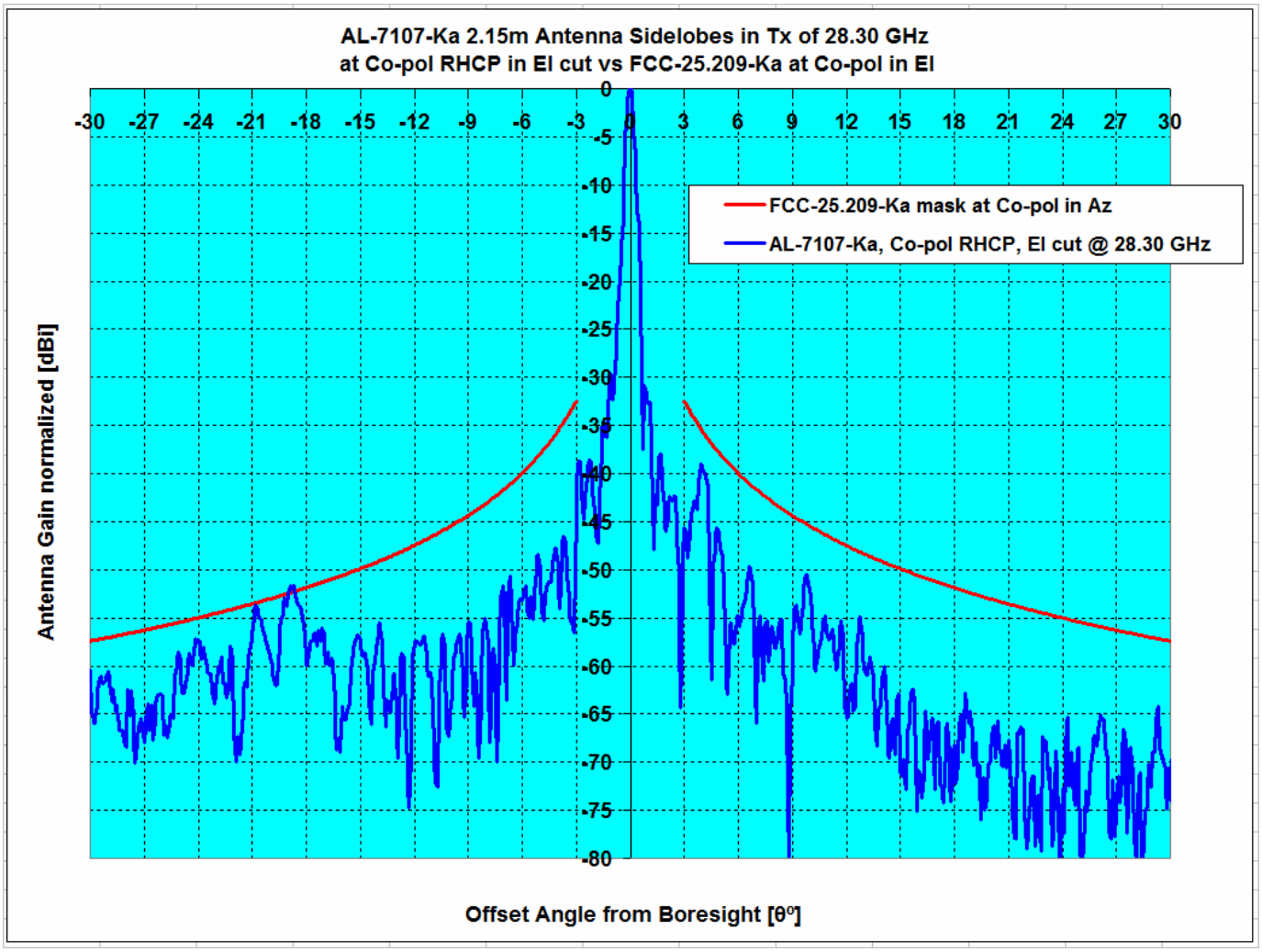
AL-7107-Ka, 2.15 m Antenna, Pattern, Co-pol, Azimuth RHCP



Description	Plane, CirP	Frequency	Ant. Gain	Peak Excursions dB		Over Mask %	
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 , RHCP	28.30	52.51	-2.13	4.92	0.00%	7.22%

Orbit Communication Systems Ltd.

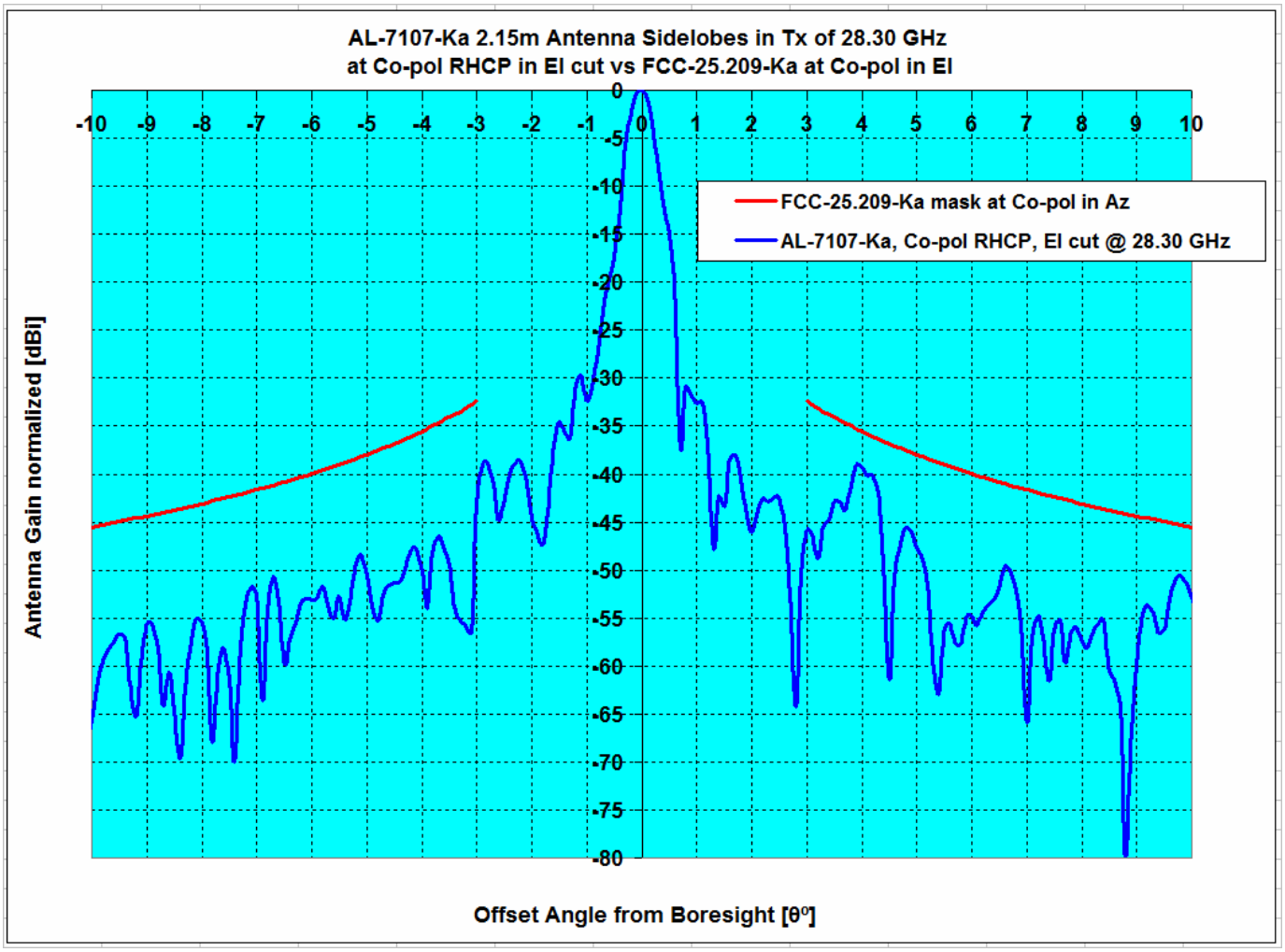
AL-7107-Ka, 2.15 m Antenna, Pattern, Co-pol, Elevation RHCP



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 El, vs AL-7107-Ka	El , RHCP	28.30	52.51	-3.67	0.77	0.00%	0.55%

Orbit Communication Systems Ltd.

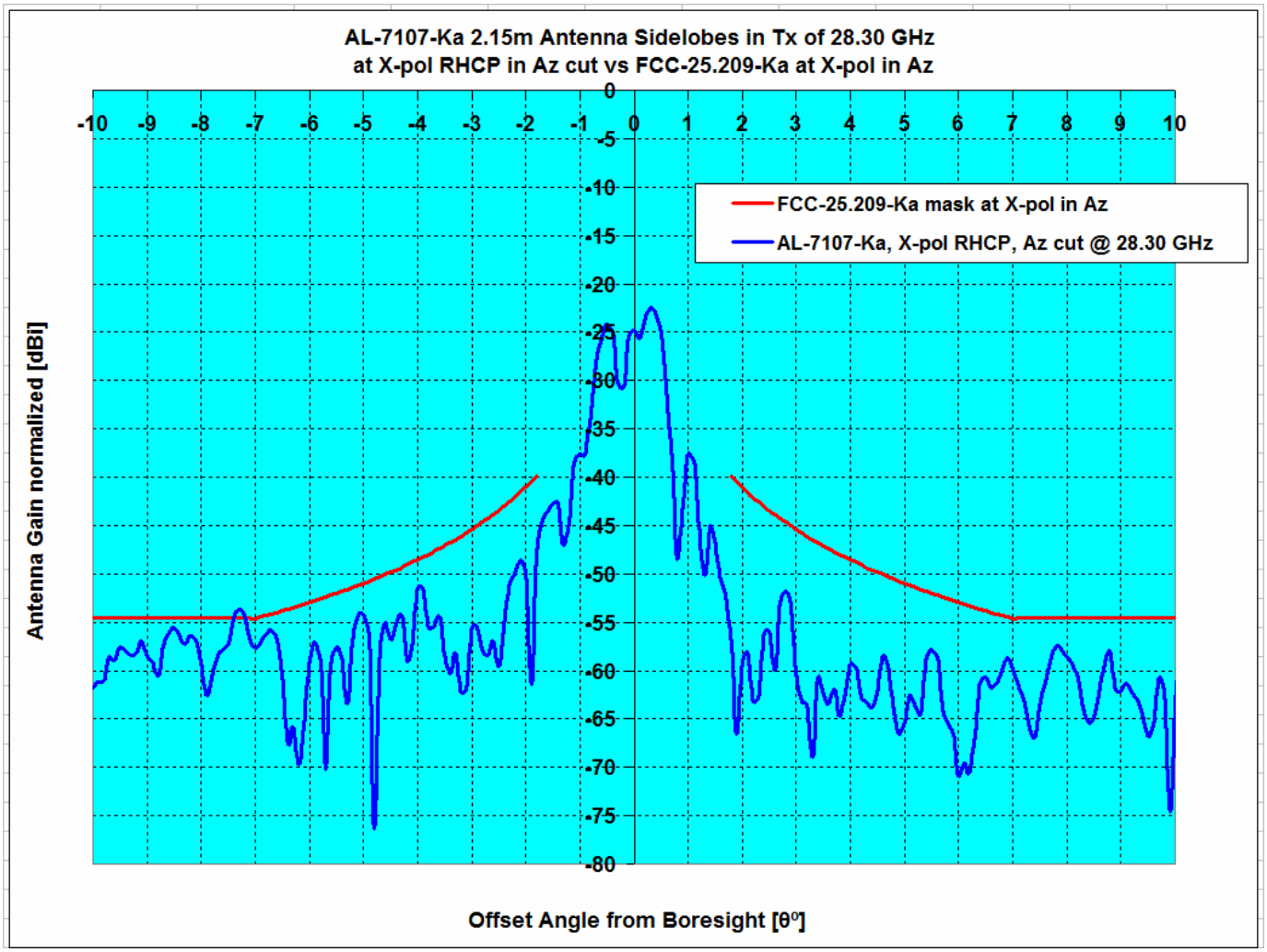
AL-7107-Ka, 2.15 m Antenna, Pattern, Co-pol, Elevation RHCP



Description	Plane, CirP	Frequency	Ant. Gain	Peak Excursions dB		Over Mask %	
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 El, vs AL-7107-Ka	El , 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, -180º to +180º @ 1.0º 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, -180º to +180º @ 1.0º 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, -180º to +180º @ 1.0º 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, -10º to +10º @ 0.1º 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, -10º to +10º @ 0.1º 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, -30º to +30º @ 0.5º increment

29.15 GHz Antenna Pattern in Co-pol El 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 El 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, -10º to +10º @ 0.1º increment

29.15 GHz Antenna Pattern in Co-pol El 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 El 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, -10º to +10º @ 0.1º 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, -10º to +10º @ 0.1º 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.

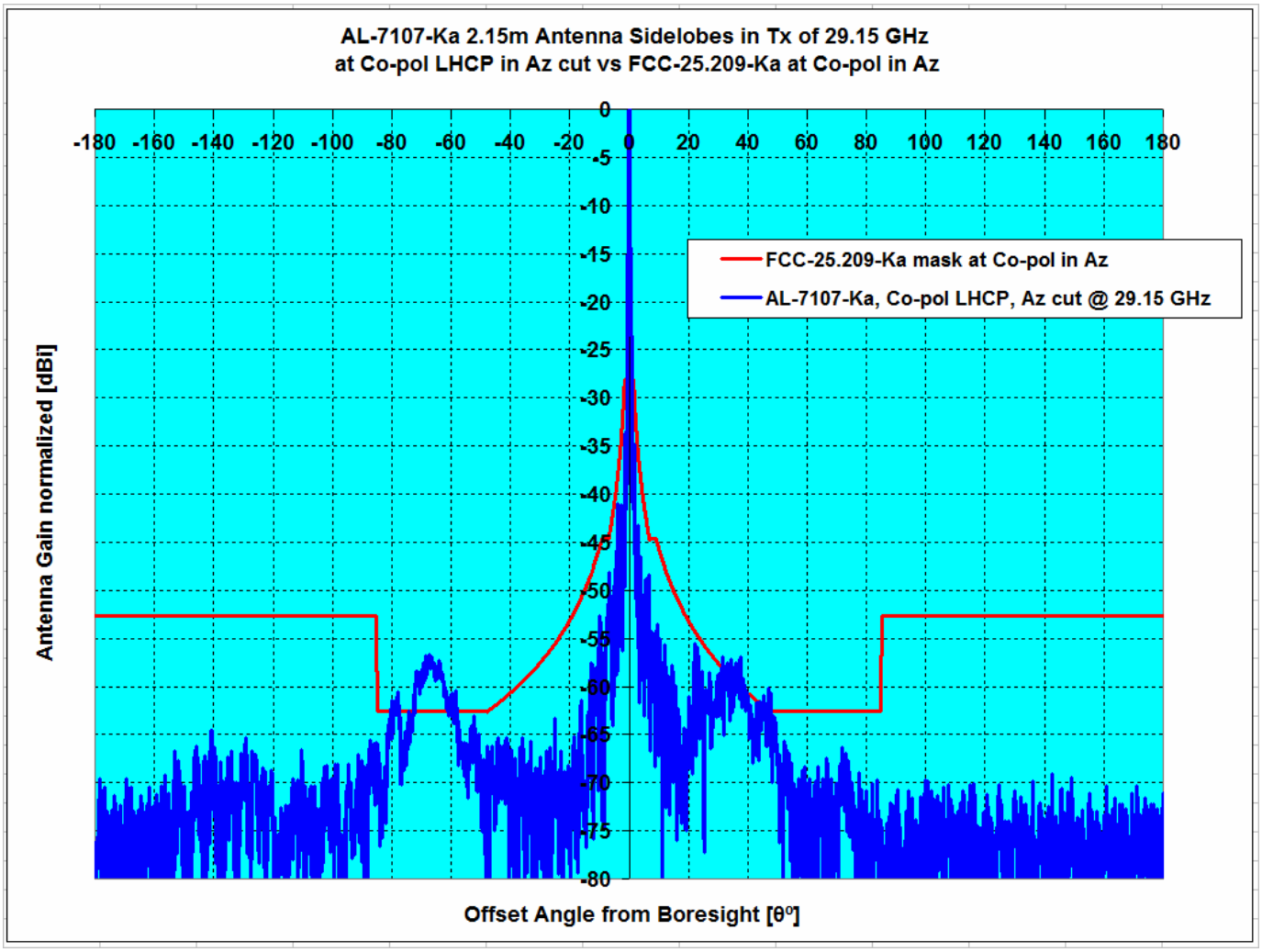
AL-7107-Ka, 2.15 m Antenna, Pattern Data Table
X-pol Azimuth LHCP, -10º to +10º @ 0.1º increment

-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.

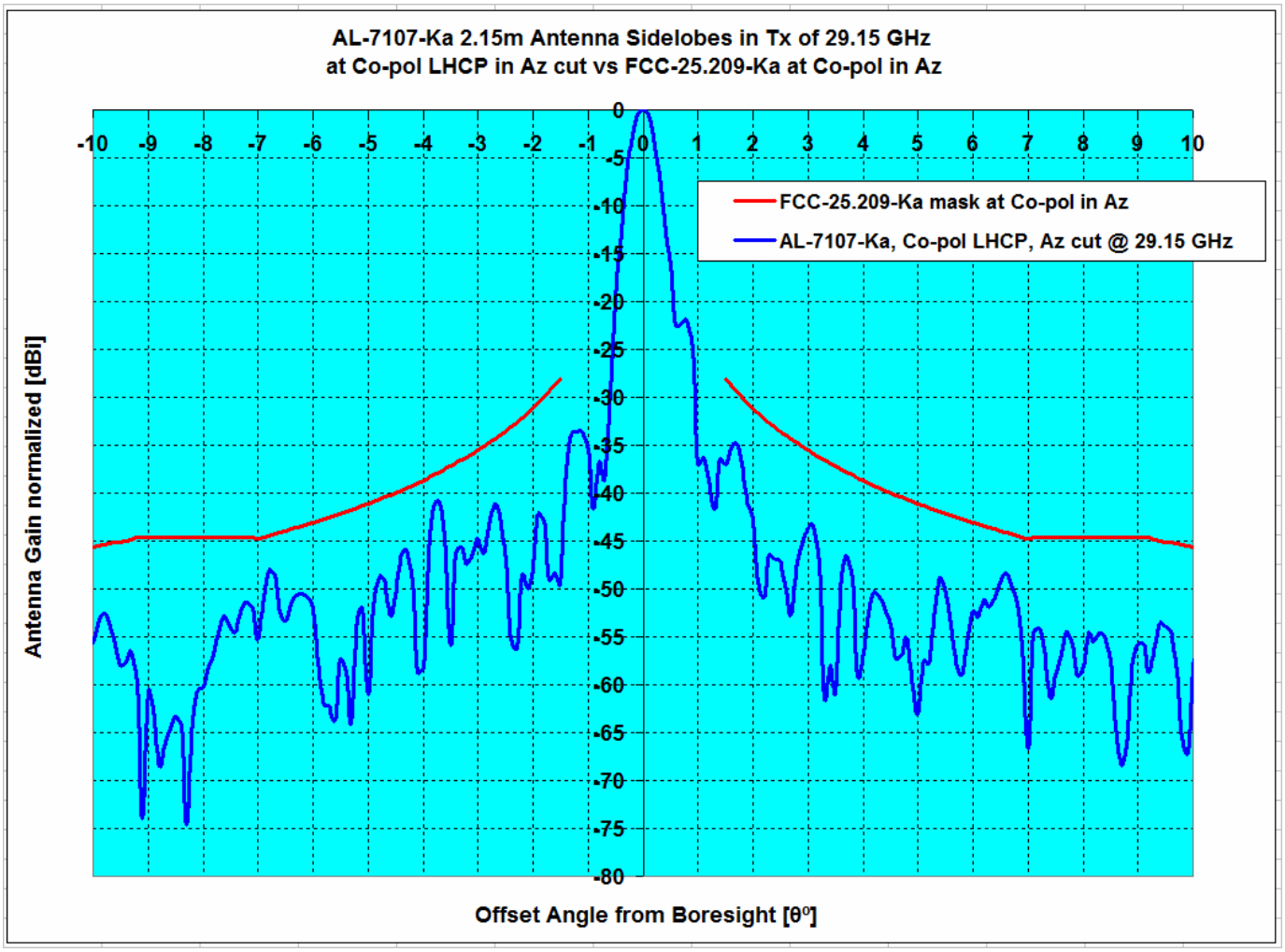
AL-7107-Ka, 2.15 m Antenna, Pattern, Co-pol, Azimuth LHCP



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.

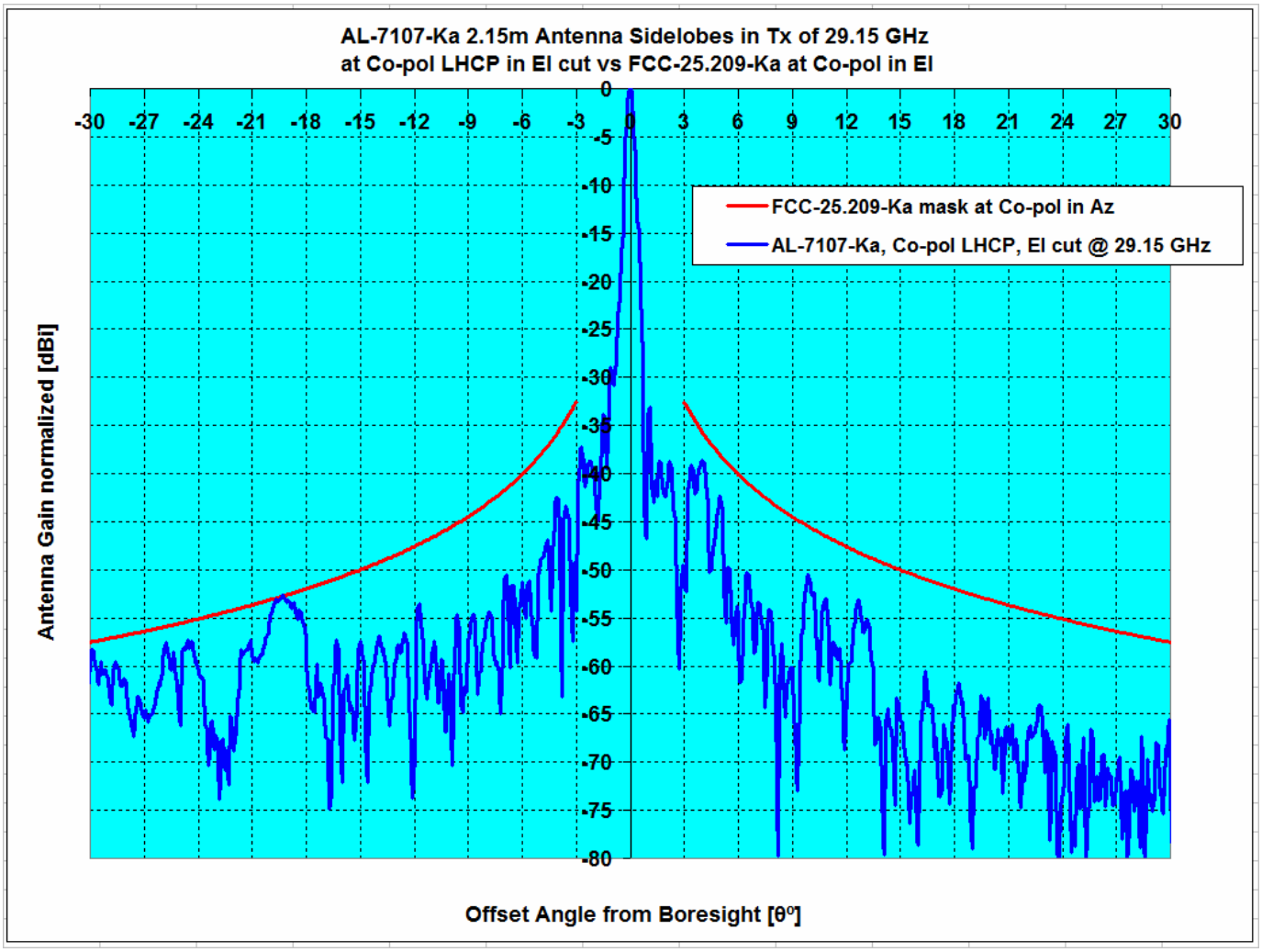
AL-7107-Ka, 2.15 m Antenna, Pattern, Co-pol, Azimuth LHCP



Description	Plane, CirP	Frequency	Ant. Gain	Peak Excursions dB		Over Mask %	
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.

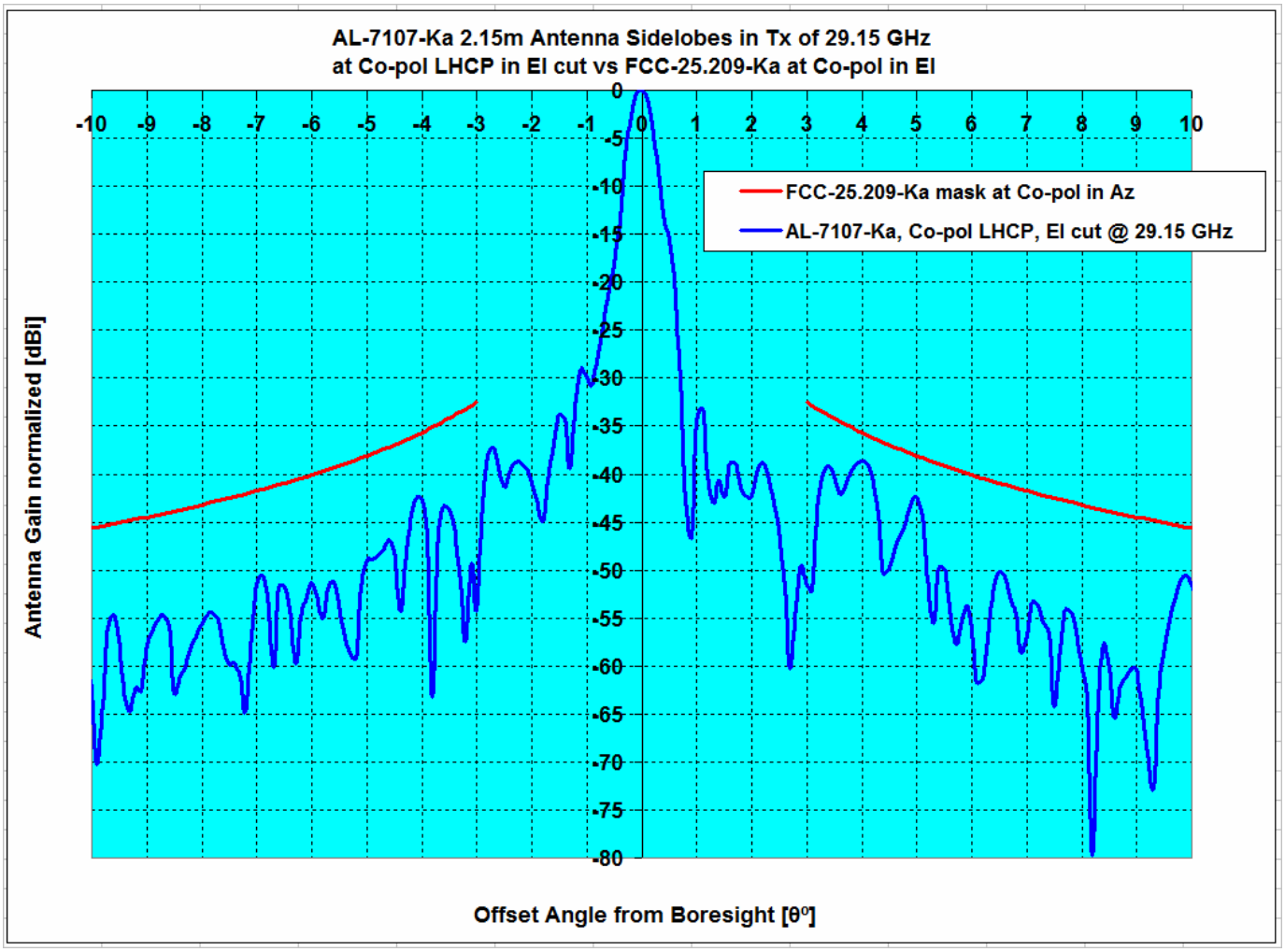
AL-7107-Ka, 2.15 m Antenna, Pattern, Co-pol, Elevation LHCP



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 El, vs AL-7107-Ka	El , LHCP	29.15	52.63	-2.92	0.16	0.00%	0.37%

Orbit Communication Systems Ltd.

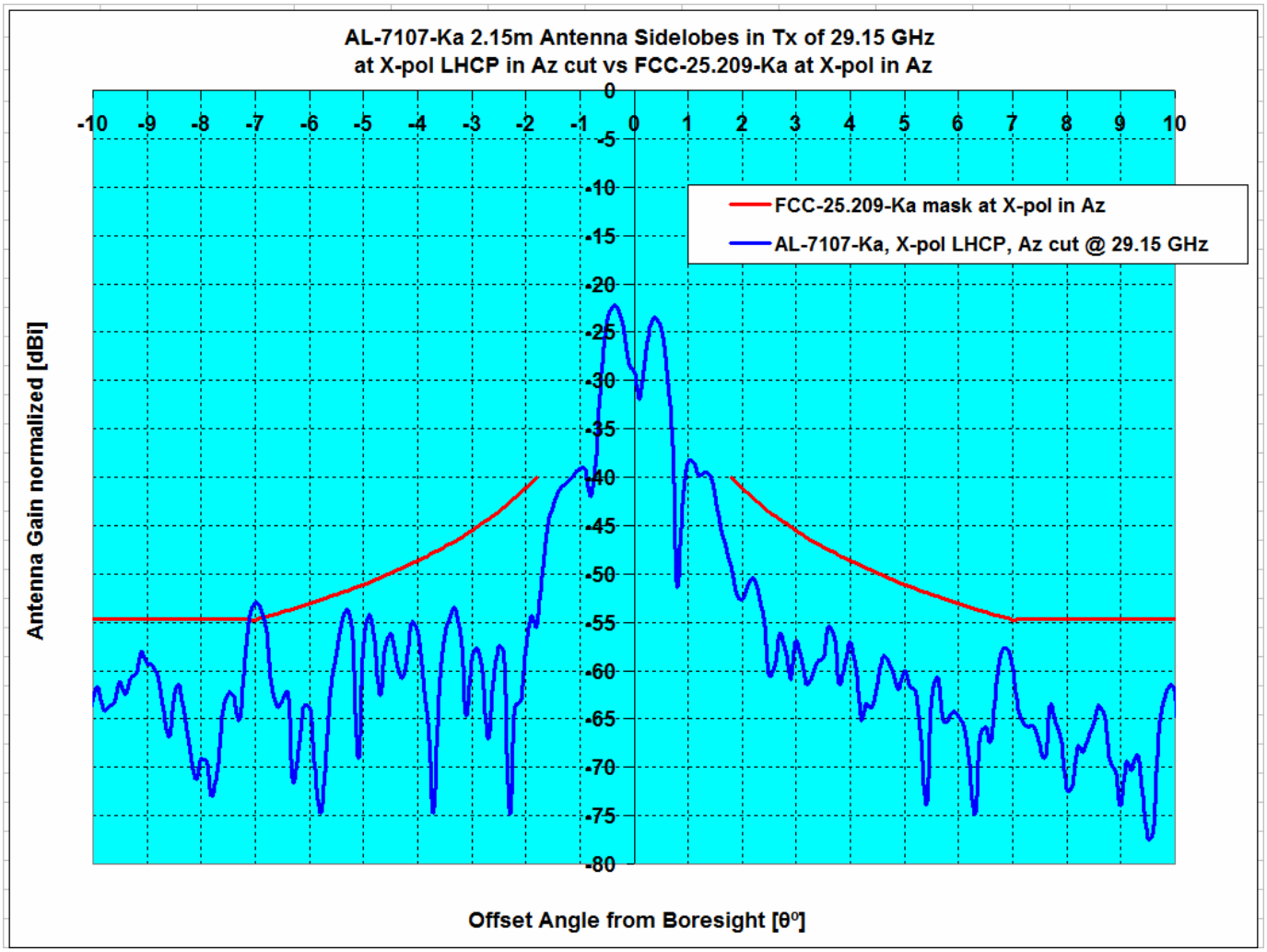
AL-7107-Ka, 2.15 m Antenna, Pattern, Co-pol, Elevation LHCP



Description	Plane, CirP	Frequency	Ant. Gain	Peak Excursions dB		Over Mask %	
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 El, vs AL-7107-Ka	El , 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, X-pol, Azimuth LHCP



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, -180º to +180º @ 1.0º 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, -180º to +180º @ 1.0º 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, -180º to +180º @ 1.0º 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, -10º to +10º @ 0.1º 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, -10º to +10º @ 0.1º 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, -30º to +30º @ 0.5º increment

29.15 GHz Antenna Pattern in Co-pol El 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 El 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, -10º to +10º @ 0.1º increment

29.15 GHz Antenna Pattern in Co-pol El 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 El 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, -10º to +10º @ 0.1º 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, -10º to +10º @ 0.1º 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.

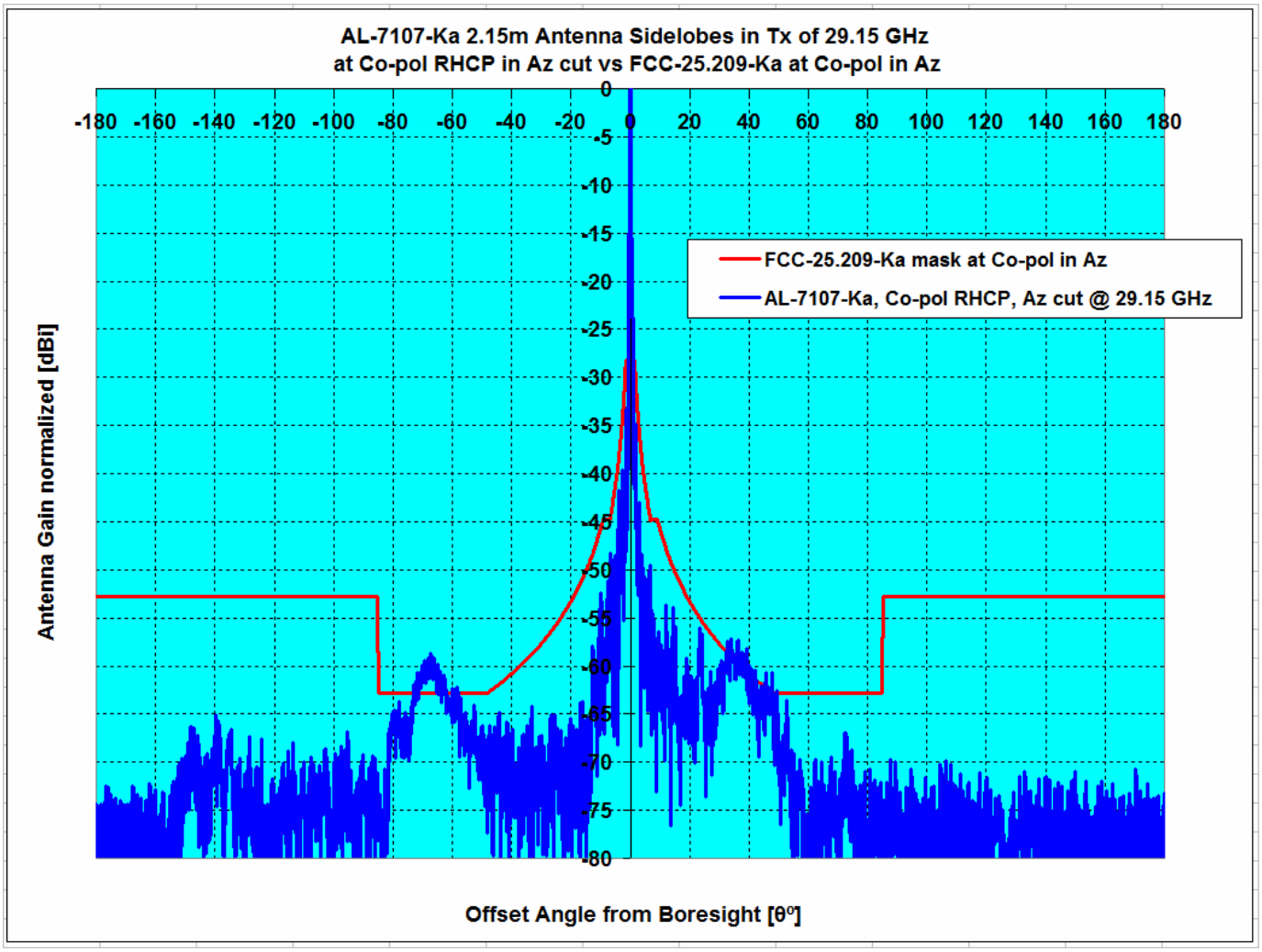
AL-7107-Ka, 2.15 m Antenna, Pattern Data Table
X-pol Azimuth RHCP, -10º to +10º @ 0.1º increment

-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.

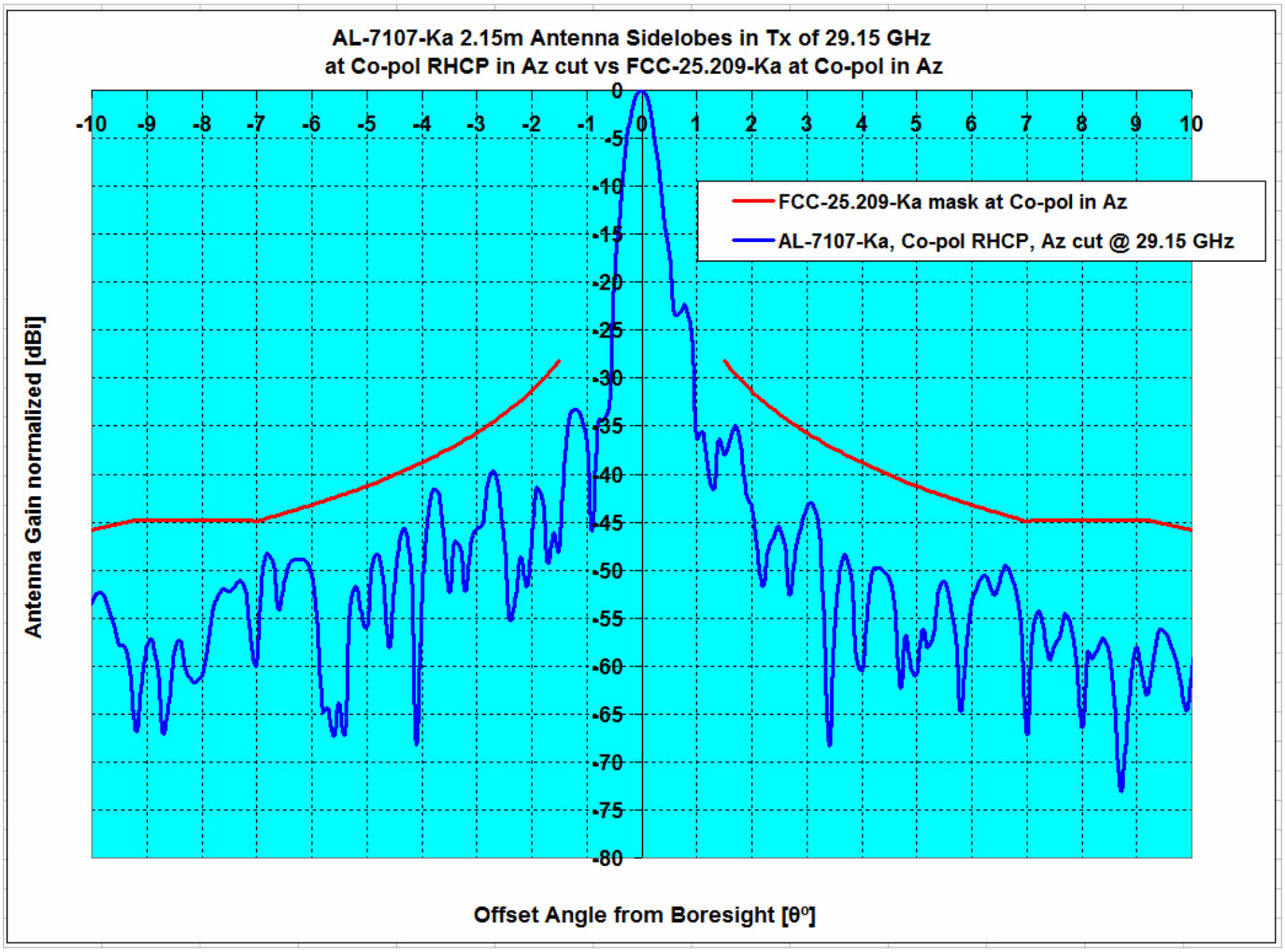
AL-7107-Ka, 2.15 m Antenna, Pattern, Co-pol, Azimuth RHCP



Description	Plane, CirP	Frequency	Ant. Gain	Peak Excursions dB		Over Mask %	
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 , RHCP	29.15	52.77	-3.52	4.12	0.00%	4.65%

Orbit Communication Systems Ltd.

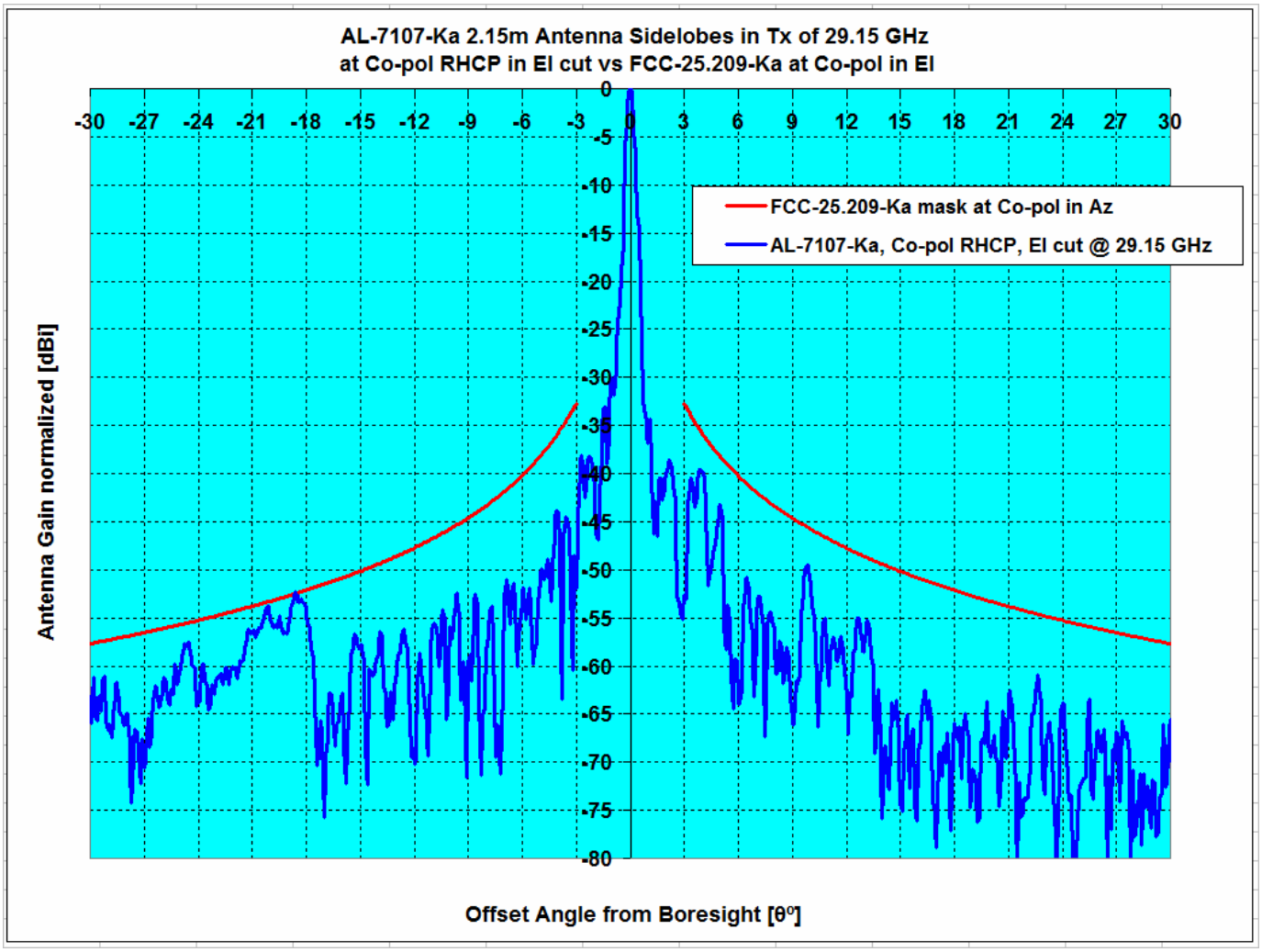
AL-7107-Ka, 2.15 m Antenna, Pattern, Co-pol, Azimuth RHCP



Description	Plane, CirP	Frequency	Ant. Gain	Peak Excursions dB		Over Mask %	
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 , RHCP	29.15	52.77	-3.52	4.12	0.00%	4.65%

Orbit Communication Systems Ltd.

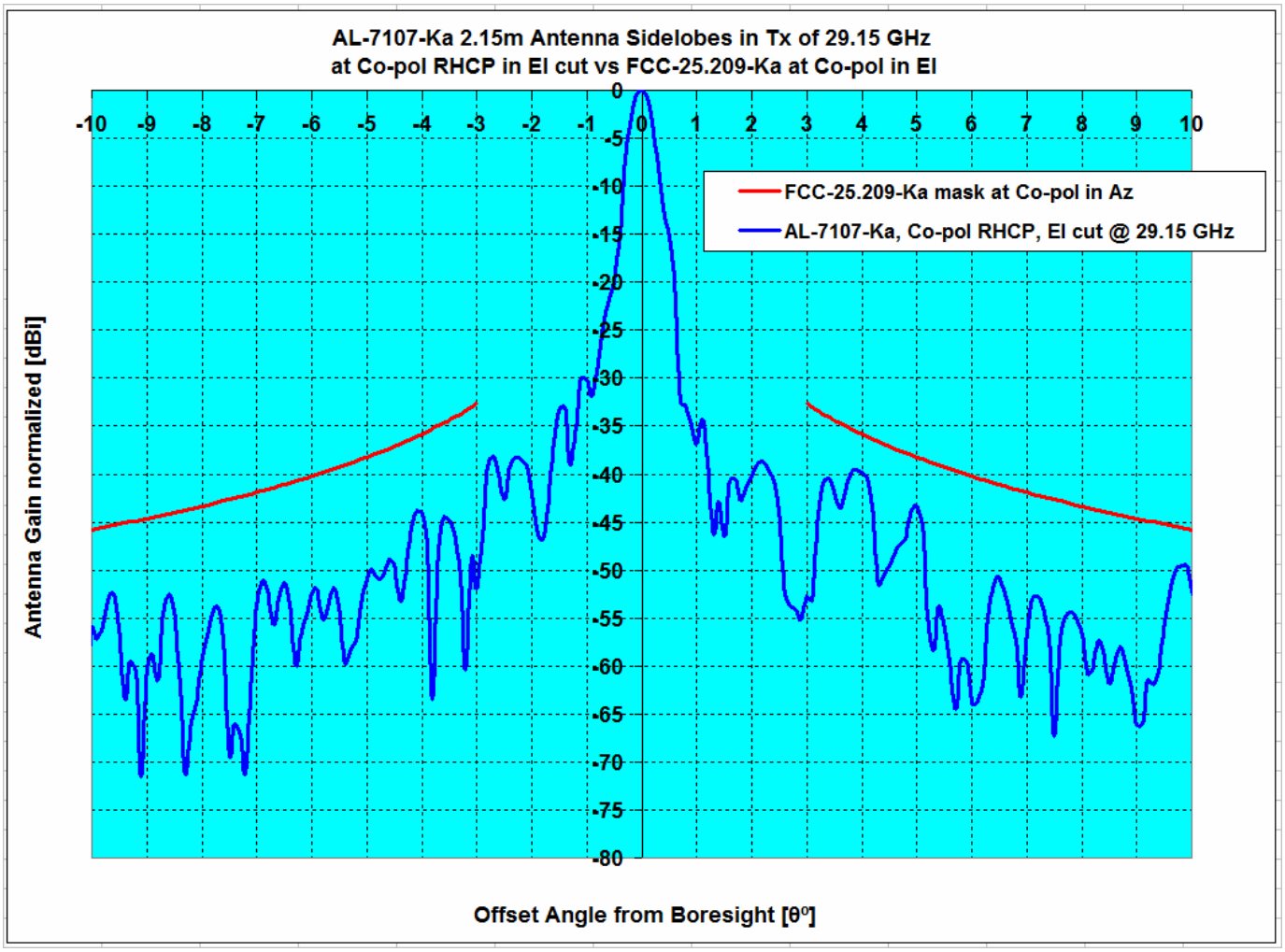
AL-7107-Ka, 2.15 m Antenna, Pattern, Co-pol, Elevation RHCP



Description	Plane, CirP	Frequency	Ant. Gain	Peak Excursions dB		Over Mask %	
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 El, vs AL-7107-Ka	El , RHCP	29.15	52.77	-3.94	0.16	0.00%	0.18%

Orbit Communication Systems Ltd.

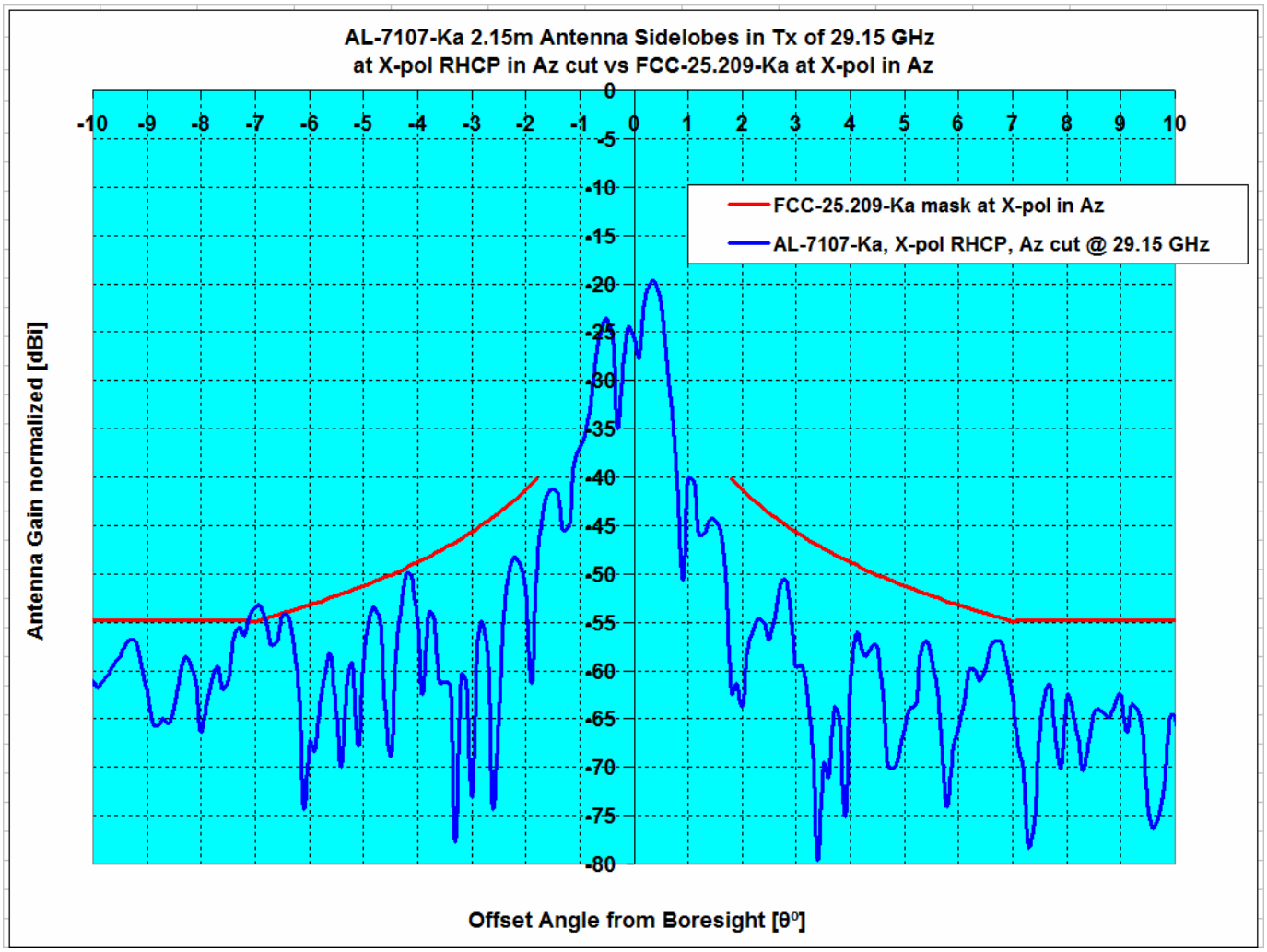
AL-7107-Ka, 2.15 m Antenna, Pattern, Co-pol, Elevation RHCP



Description	Plane, CirP	Frequency	Ant. Gain	Peak Excursions dB		Over Mask %	
Pattern Rule vs Antenna System	Type	GHz	dBi	3°≤θ≤7°	7°≤θ≤30°	3°≤θ≤7°	7°≤θ≤30°
FCC-25.209-Ka, Co-pol El, vs AL-7107-Ka	El , 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 Six-Ship Waiver 2.2 meter terminal.

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/cm^2
- Occupational / Controlled Exposure: 5.0 mW/cm^2

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:

Input Parameter	Value	Unit	Symbol
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:

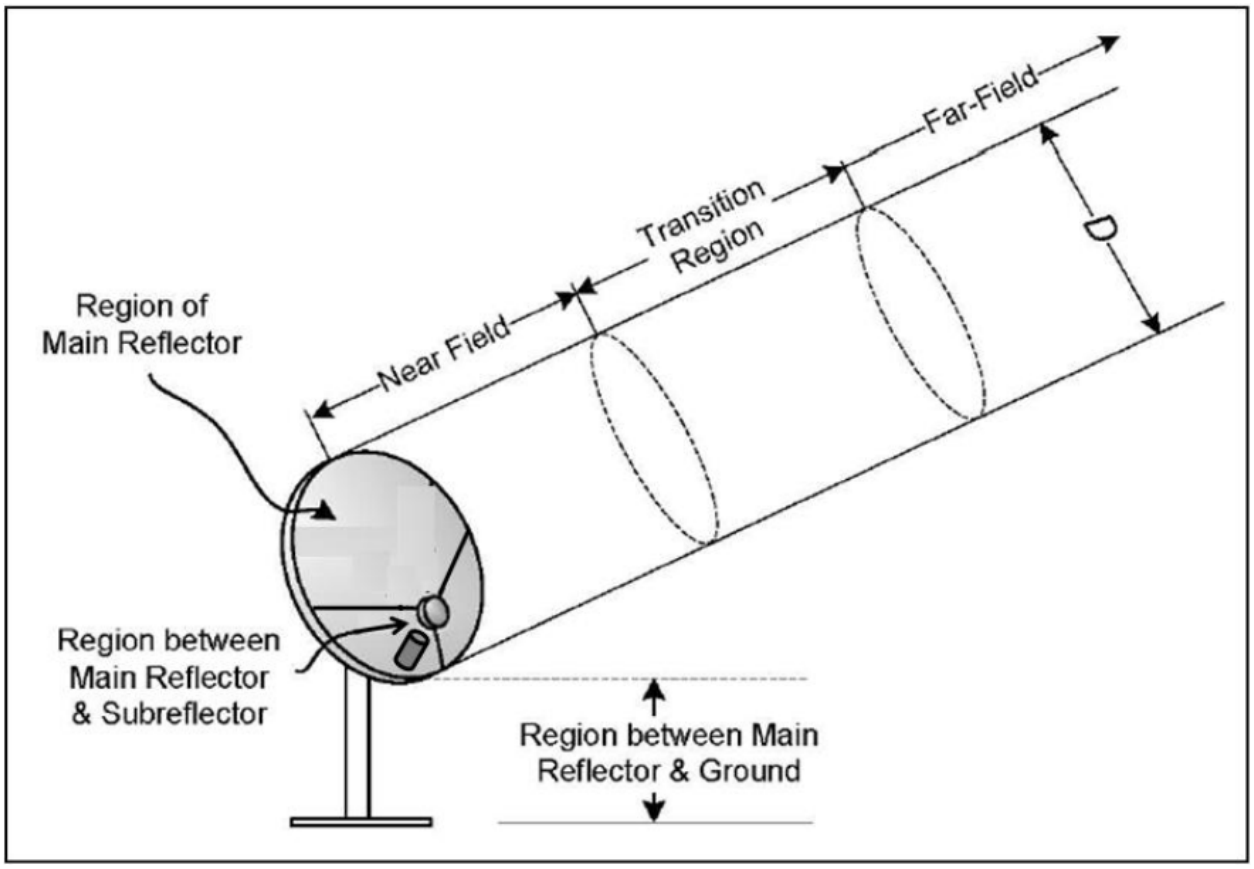
Aperture Efficiency

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:

Calculated Parameter	Value	Unit	Symbol	Formula
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:

Calculated Parameter	Value	Unit	Symbol	Formula
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:

Calculated Parameter	Value	Unit	Symbol	Formula
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.

Calculated Parameter	Value	Unit	Symbol	Formula
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:

Calculated Parameter	Value	Unit	Symbol	Formula
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

Calculated Parameter	Unit	Exposure Limit	Exposure Limit
Power Densities	mW/cm^2	Uncontrolled Environment ≤ 1 mW/cm^2	Controlled Environment ≤ 5 mW/cm^2
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 Six-Ship Waiver Request Service

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

Two groups of link budgets are provided corresponding to the Six-Ship Waiver terminal being either at the southern or northern ends of the area in which the six ships will operate. The first group is with the ship located at 15°N / 63°W (297°E) and the second with the ship at Fort Lauderdale (26.1°N / 80.3°W (279.7°E)), which is the home port of the ships. Each page of link budgets below shows the three cases of clear sky, rain faded uplink and rain faded downlink.

The first set of link budgets below, for the example with the ship at a southern latitude, shows a wideband carrier transmitted up from the Vernon, TX gateway and received by the Six-Ship Waiver terminal, supporting 16APSK rate ¾ and providing a data throughput of 532 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↓ limits provided in Section A.7.1. Under more severe rain fade conditions there is an additional 10 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 49.2 MHz bandwidth carrier transmitted up from the Six-Ship Waiver terminal and received by the Vernon, TX gateway. It supports 8PSK rate ¾ and provides a data throughput of 91 MBits/s under both clear-sky and rain-faded conditions by using uplink power control. 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 10 dB of margin before the adaptive coding reduces to the QPSK rate ¼ level.

The third set of link budgets below show the return link for this southern latitude example with a 108 MHz bandwidth carrier transmitted up from the Six-Ship Waiver terminal and received by the Vernon, TX gateway. It supports 8PSK rate ¾ under clear sky conditions and rate 2/3 under rain fade conditions. This provides a data throughput of approximately 200 MBits/s under clear-sky conditions and 177 MBits/s under rain-faded conditions by also using uplink power control. The transmit EIRP and hence the transmit PSD density are also consistent with the maximum levels used in the demonstration of compliance with the EPFD↑ limits provided in Section A.7.2. In addition, under more severe rain fade conditions there is an additional 9 dB of margin before the adaptive coding reduces to the QPSK rate ¼ level.

Link budgets for 216 MHz bandwidth carrier in forward direction from Vernon, TX gateway to ship terminal located at 15ºN / 297ºE (clear sky, rain faded uplink, rain faded downlink)

O3b Networks Link Analysis			
ECM Link Budget Rpt - 02/05/2015		Tier 2	Tier 2
Parameters	Unit	Clear Sky	
Ground parameters		Teleport	Telco
Location		RCL1/	Vernon/U.S.A.
Latitude	(deg)	15.00	34.16
Longitude (East)	(deg)	297.00	260.71
E/S Range to SV	(km)	8518.43	10793.70
E/S Elevation to SV	(deg)	61.52	22.04
E/S Altitude	(m)	0.00	0.00
SV Beam Identifier	(#)	TBD	
Telco Offset to Beam Center	(km)	0.21	
Modulation Parameters		Forward	
Enter Reciever	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)	27,760.0000	
E/S Tx HPA Power Level	(W)	500.0	
E/S Tx OBO	(dB)	-11.7	
E/S Tx Antenna Gain (7.3m)	(dB)	65.2	
E/S Tx EIRP	(dBW)	72.6	
E/S Tx RF Link Availability	(%)	Clear	
E/S Tx Spreading Loss	(dB)	-151.7	
Satellite		Forward	
SV Rx G/T	(dB/K)	5.2	
SV Tx OBO	(dB)	-3.8	
SV Tx EIRP Per Channel/Carrier	dBW	44.9	
Downlink		Forward	
E/S Rx Carrier Frequency	(MHz)	17,960.0000	
E/S Rx Rf Link Availability	(%)	Clear	
E/S Rx Antenna Gain (1.8m)	(dBi)	47.6	
E/S Rx Effective G/T	(dB/K)	24.2	
Total Link		Forward	
Carrier/Noise Bandwidth	(dB)	22.6	
Carrier/Noise Uplink	(dB)	20.2	
Carrier/Noise Downlink	(dB)	18.2	
Carrier/Intermodulation Im (C/Im)	(dB)	25.0	
(C/N)- Total Actual (Es/No)	(dB)	14.2	
(C/N)-Total Required	(dB)	11.3	
(Eb/No)-Total Actual	(dB)	9.4	
(Eb/No)-Total Required	(dB)	6.5	
Excess Margin	(dB)	**2.9**	
Fade Margin	(dB)	**16.4**	

O3b Networks Link Analysis			
ECM Link Budget Rpt - 02/05/2015		Tier 2	Tier 2
Parameters	Unit	Rain Up	
Ground parameters		Teleport	Telco
Location		RCL1/	Vernon/U.S.A.
Latitude	(deg)	15.00	34.16
Longitude (East)	(deg)	297.00	260.71
E/S Range to SV	(km)	8518.43	10793.70
E/S Elevation to SV	(deg)	61.52	22.04
E/S Altitude	(m)	0.00	0.00
SV Beam Identifier	(#)	TBD	
Telco Offset to Beam Center	(km)	0.21	
Modulation Parameters		Forward	
Enter Reciever	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)	27,760.0000	
E/S Tx HPA Power Level	(W)	500.0	
E/S Tx OBO	(dB)	-4.0	
E/S Tx Antenna Gain (7.3m)	(dB)	65.2	
E/S Tx EIRP	(dBW)	80.4	
E/S Tx RF Link Availability	(%)	99.748%	
E/S Tx Spreading Loss	(dB)	-151.7	
Satellite		Forward	
SV Rx G/T	(dB/K)	5.2	
SV Tx OBO	(dB)	-3.8	
SV Tx EIRP Per Channel/Carrier	dBW	44.9	
Downlink		Forward	
E/S Rx Carrier Frequency	(MHz)	17,960.0000	
E/S Rx Rf Link Availability	(%)	Clear	
E/S Rx Antenna Gain (1.8m)	(dBi)	47.6	
E/S Rx Effective G/T	(dB/K)	24.2	
Total Link		Forward	
Carrier/Noise Bandwidth	(dB)	22.6	
Carrier/Noise Uplink	(dB)	10.3	
Carrier/Noise Downlink	(dB)	18.2	
Carrier/Intermodulation Im (C/Im)	(dB)	21.0	
(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)	**0.5**	
Fade Margin	(dB)	**11.2**	

O3b Networks Link Analysis			
ECM Link Budget Rpt - 02/05/2015		Tier 2	Tier 2
Parameters	Unit	Rain Dn	
Ground parameters		Teleport	Telco
Location		RCL1/	Vernon/U.S.A.
Latitude	(deg)	15.00	34.16
Longitude (East)	(deg)	297.00	260.71
E/S Range to SV	(km)	8518.43	10793.70
E/S Elevation to SV	(deg)	61.52	22.04
E/S Altitude	(m)	0.00	0.00
SV Beam Identifier	(#)	TBD	
Telco Offset to Beam Center	(km)	0.21	
Modulation Parameters		Forward	
Enter Reciever	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)	27,760.0000	
E/S Tx HPA Power Level	(W)	500.0	
E/S Tx OBO	(dB)	-11.7	
E/S Tx Antenna Gain (7.3m)	(dB)	65.2	
E/S Tx EIRP	(dBW)	72.6	
E/S Tx RF Link Availability	(%)	Clear	
E/S Tx Spreading Loss	(dB)	-151.7	
Satellite		Forward	
SV Rx G/T	(dB/K)	5.2	
SV Tx OBO	(dB)	-3.8	
SV Tx EIRP Per Channel/Carrier	dBW	44.9	
Downlink		Forward	
E/S Rx Carrier Frequency	(MHz)	17,960.0000	
E/S Rx Rf Link Availability	(%)	99.535%	
E/S Rx Antenna Gain (1.8m)	(dBi)	47.6	
E/S Rx Effective G/T	(dB/K)	21.4	
Total Link		Forward	
Carrier/Noise Bandwidth	(dB)	22.6	
Carrier/Noise Uplink	(dB)	20.2	
Carrier/Noise Downlink	(dB)	9.9	
Carrier/Intermodulation Im (C/Im)	(dB)	21.0	
(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)	**0.5**	
Fade Margin	(dB)	**11.2**	

Link budgets for 49.2 MHz bandwidth carrier in return direction from ship terminal located at 15ºN / 297ºE to Vernon, TX gateway (clear sky, rain faded uplink, rain faded downlink)

O3b Networks Link Analysis			
ECM Link Budget Rpt - 02/05/2015		**Tier 2**	**Tier 2**
Parameters	Unit	**Clear Sky**	
Ground parameters		**Teleport**	**Telco**
Location		Vernon/U.S.A.	RCL1/
Latitude	(deg)	34.16	15.00
Longitude (East)	(deg)	260.71	297.00
E/S Range to SV	(km)	9972.14	11336.65
E/S Elevation to SV	(deg)	32.72	15.87
E/S Altitude	(m)	0.00	0.00
SV Beam Identifier	(#)	TBD	
Telco Offset to Beam Center	(km)	0.00	
Modulation Parameters		**Return**	
Enter Reciever	Type	MEOLink	
Percentage of Bandwidth	(%)	23%	
Allocated Bandwidth	(MHz)	49.2000	
Channel Symbol Rate	(Msps)	41.0000	
Channel Modulation Type		8PSK	
Channel FEC Rate		0.74704	
Channel Throughput	(Mbps)	90.9762	
Uplink		**Return**	
E/S Carrier Frequencies	(MHz)	27,760.0000	
E/S Tx HPA Power Level	(W)	40.0	
E/S Tx OBO	(dB)	-9.2	
E/S Tx Antenna Gain (1.8m)	(dB)	51.9	
E/S Tx EIRP	(dBW)	58.1	
E/S Tx RF Link Availability	(%)	Clear	
E/S Tx Spreading Loss	(dB)	-152.1	
Satellite		**Return**	
SV Rx G/T	(dB/K)	5.9	
SV Tx OBO	(dB)	-18.0	
SV Tx EIRP Per Channel/Carrier	dBW	31.0	
Downlink		**Return**	
E/S Rx Carrier Frequency	(MHz)	17,960.0000	
E/S Rx Rf Link Availability	(%)	Clear	
E/S Rx Antenna Gain (7.3m)	(dBi)	61.8	
E/S Rx Effective G/T	(dB/K)	40.1	
Total Link		**Return**	
Carrier/Noise Bandwidth	(dB)	16.1	
Carrier/Noise Uplink	(dB)	11.3	
Carrier/Noise Downlink	(dB)	25.0	
Carrier/Intermodulation Im (C/Im)	(dB)	25.0	
(C/N)- Total Actual (Es/No)	(dB)	10.3	
(C/N)-Total Required	(dB)	8.5	
(Eb/No)-Total Actual	(dB)	6.8	
(Eb/No)-Total Required	(dB)	5.0	
Excess Margin	(dB)	**1.8**	
Fade Margin	(dB)	**12.5**	

O3b Networks Link Analysis			
ECM Link Budget Rpt - 02/05/2015		**Tier 2**	**Tier 2**
Parameters	Unit	**Rain Up**	
Ground parameters		**Teleport**	**Telco**
Location		Vernon/U.S.A.	RCL1/
Latitude	(deg)	34.16	15.00
Longitude (East)	(deg)	260.71	297.00
E/S Range to SV	(km)	9972.14	11336.65
E/S Elevation to SV	(deg)	32.72	15.87
E/S Altitude	(m)	0.00	0.00
SV Beam Identifier	(#)	TBD	
Telco Offset to Beam Center	(km)	0.00	
Modulation Parameters		**Return**	
Enter Reciever	Type	MEOLink	
Percentage of Bandwidth	(%)	23%	
Allocated Bandwidth	(MHz)	49.2000	
Channel Symbol Rate	(Msps)	41.0000	
Channel Modulation Type		8PSK	
Channel FEC Rate		0.74704	
Channel Throughput	(Mbps)	90.9762	
Uplink		**Return**	
E/S Carrier Frequencies	(MHz)	27,760.0000	
E/S Tx HPA Power Level	(W)	40.0	
E/S Tx OBO	(dB)	-2.0	
E/S Tx Antenna Gain (1.8m)	(dB)	51.9	
E/S Tx EIRP	(dBW)	65.3	
E/S Tx RF Link Availability	(%)	97.468%	
E/S Tx Spreading Loss	(dB)	-152.1	
Satellite		**Return**	
SV Rx G/T	(dB/K)	5.9	
SV Tx OBO	(dB)	-19.3	
SV Tx EIRP Per Channel/Carrier	dBW	29.6	
Downlink		**Return**	
E/S Rx Carrier Frequency	(MHz)	17,960.0000	
E/S Rx Rf Link Availability	(%)	Clear	
E/S Rx Antenna Gain (7.3m)	(dBi)	61.8	
E/S Rx Effective G/T	(dB/K)	40.1	
Total Link		**Return**	
Carrier/Noise Bandwidth	(dB)	16.1	
Carrier/Noise Uplink	(dB)	9.9	
Carrier/Noise Downlink	(dB)	23.7	
Carrier/Intermodulation Im (C/Im)	(dB)	23.7	
(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)	**0.5**	
Fade Margin	(dB)	**11.2**	

O3b Networks Link Analysis			
ECM Link Budget Rpt - 02/05/2015		**Tier 2**	**Tier 2**
Parameters	Unit	**Rain Dn**	
Ground parameters		**Teleport**	**Telco**
Location		Vernon/U.S.A.	RCL1/
Latitude	(deg)	34.16	15.00
Longitude (East)	(deg)	260.71	297.00
E/S Range to SV	(km)	9972.14	11336.65
E/S Elevation to SV	(deg)	32.72	15.87
E/S Altitude	(m)	0.00	0.00
SV Beam Identifier	(#)	TBD	
Telco Offset to Beam Center	(km)	0.00	
Modulation Parameters		**Return**	
Enter Reciever	Type	MEOLink	
Percentage of Bandwidth	(%)	23%	
Allocated Bandwidth	(MHz)	49.2000	
Channel Symbol Rate	(Msps)	41.0000	
Channel Modulation Type		8PSK	
Channel FEC Rate		0.74704	
Channel Throughput	(Mbps)	90.9762	
Uplink		**Return**	
E/S Carrier Frequencies	(MHz)	27,760.0000	
E/S Tx HPA Power Level	(W)	40.0	
E/S Tx OBO	(dB)	-9.2	
E/S Tx Antenna Gain (1.8m)	(dB)	51.9	
E/S Tx EIRP	(dBW)	58.1	
E/S Tx RF Link Availability	(%)	Clear	
E/S Tx Spreading Loss	(dB)	-152.1	
Satellite		**Return**	
SV Rx G/T	(dB/K)	5.9	
SV Tx OBO	(dB)	-18.0	
SV Tx EIRP Per Channel/Carrier	dBW	31.0	
Downlink		**Return**	
E/S Rx Carrier Frequency	(MHz)	17,960.0000	
E/S Rx Rf Link Availability	(%)	99.825%	
E/S Rx Antenna Gain (7.3m)	(dBi)	61.8	
E/S Rx Effective G/T	(dB/K)	36.2	
Total Link		**Return**	
Carrier/Noise Bandwidth	(dB)	16.1	
Carrier/Noise Uplink	(dB)	11.3	
Carrier/Noise Downlink	(dB)	14.5	
Carrier/Intermodulation Im (C/Im)	(dB)	25.0	
(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)	**0.5**	
Fade Margin	(dB)	**11.2**	

Link budgets for 108 MHz bandwidth carrier in return direction from ship terminal located at 15ºN / 297ºE to Vernon, TX gateway (clear sky, rain faded uplink, rain faded downlink)

O3b Networks Link Analysis			
ECM Link Budget Rpt - 02/05/2015		Tier 2	Tier 2
Parameters	Unit	Clear Sky	
Ground parameters		Teleport	Telco
Location		Vernon/U.S.A.	RCL1/
Latitude	(deg)	34.16	15.00
Longitude (East)	(deg)	260.71	297.00
E/S Range to SV	(km)	9972.14	11336.65
E/S Elevation to SV	(deg)	32.72	15.87
E/S Altitude	(m)	0.00	0.00
SV Beam Identifier	(#)	TBD	
Telco Offset to Beam Center	(km)	0.00	
Modulation Parameters		Return	
Enter Reciever	Type	MEOLink	
Percentage of Bandwidth	(%)	50%	
Allocated Bandwidth	(MHz)	108.0000	
Channel Symbol Rate	(Msps)	90.0000	
Channel Modulation Type		8PSK	
Channel FEC Rate		0.74704	
Channel Throughput	(Mbps)	199.7038	
Uplink		Return	
E/S Carrier Frequencies	(MHz)	27,760.0000	
E/S Tx HPA Power Level	(W)	40.0	
E/S Tx OBO	(dB)	-6.2	
E/S Tx Antenna Gain (1.8m)	(dB)	51.9	
E/S Tx EIRP	(dBW)	61.1	
E/S Tx RF Link Availability	(%)	Clear	
E/S Tx Spreading Loss	(dB)	-152.1	
Satellite		Return	
SV Rx G/T	(dB/K)	5.9	
SV Tx OBO	(dB)	-15.0	
SV Tx EIRP Per Channel/Carrier	dBW	34.0	
Downlink		Return	
E/S Rx Carrier Frequency	(MHz)	17,960.0000	
E/S Rx Rf Link Availability	(%)	Clear	
E/S Rx Antenna Gain (7.3m)	(dBi)	61.8	
E/S Rx Effective G/T	(dB/K)	40.1	
Total Link		Return	
Carrier/Noise Bandwidth	(dB)	19.5	
Carrier/Noise Uplink	(dB)	10.9	
Carrier/Noise Downlink	(dB)	24.6	
Carrier/Intermodulation Im (C/Im)	(dB)	25.0	
(C/N)- Total Actual (Es/No)	(dB)	9.9	
(C/N)-Total Required	(dB)	8.5	
(Eb/No)-Total Actual	(dB)	6.4	
(Eb/No)-Total Required	(dB)	5.0	
Excess Margin	(dB)	**1.4**	
Fade Margin	(dB)	**12.2**	

O3b Networks Link Analysis			
ECM Link Budget Rpt - 02/05/2015		Tier 2	Tier 2
Parameters	Unit	Rain Up	
Ground parameters		Teleport	Telco
Location		Vernon/U.S.A.	RCL1/
Latitude	(deg)	34.16	15.00
Longitude (East)	(deg)	260.71	297.00
E/S Range to SV	(km)	9972.14	11336.65
E/S Elevation to SV	(deg)	32.72	15.87
E/S Altitude	(m)	0.00	0.00
SV Beam Identifier	(#)	TBD	
Telco Offset to Beam Center	(km)	0.00	
Modulation Parameters		Return	
Enter Reciever	Type	MEOLink	
Percentage of Bandwidth	(%)	50%	
Allocated Bandwidth	(MHz)	108.0000	
Channel Symbol Rate	(Msps)	90.0000	
Channel Modulation Type		8PSK	
Channel FEC Rate		0.66420	
Channel Throughput	(Mbps)	177.5584	
Uplink		Return	
E/S Carrier Frequencies	(MHz)	27,760.0000	
E/S Tx HPA Power Level	(W)	40.0	
E/S Tx OBO	(dB)	-2.0	
E/S Tx Antenna Gain (1.8m)	(dB)	51.9	
E/S Tx EIRP	(dBW)	65.3	
E/S Tx RF Link Availability	(%)	95.928%	
E/S Tx Spreading Loss	(dB)	-152.1	
Satellite		Return	
SV Rx G/T	(dB/K)	5.9	
SV Tx OBO	(dB)	-17.3	
SV Tx EIRP Per Channel/Carrier	dBW	31.7	
Downlink		Return	
E/S Rx Carrier Frequency	(MHz)	17,960.0000	
E/S Rx Rf Link Availability	(%)	Clear	
E/S Rx Antenna Gain (7.3m)	(dBi)	61.8	
E/S Rx Effective G/T	(dB/K)	40.1	
Total Link		Return	
Carrier/Noise Bandwidth	(dB)	19.5	
Carrier/Noise Uplink	(dB)	8.6	
Carrier/Noise Downlink	(dB)	22.3	
Carrier/Intermodulation Im (C/Im)	(dB)	22.7	
(C/N)- Total Actual (Es/No)	(dB)	7.7	
(C/N)-Total Required	(dB)	7.2	
(Eb/No)-Total Actual	(dB)	4.7	
(Eb/No)-Total Required	(dB)	4.2	
Excess Margin	(dB)	**0.5**	
Fade Margin	(dB)	**9.9**	

O3b Networks Link Analysis			
ECM Link Budget Rpt - 02/05/2015		Tier 2	Tier 2
Parameters	Unit	Rain Dn	
Ground parameters		Teleport	Telco
Location		Vernon/U.S.A.	RCL1/
Latitude	(deg)	34.16	15.00
Longitude (East)	(deg)	260.71	297.00
E/S Range to SV	(km)	9972.14	11336.65
E/S Elevation to SV	(deg)	32.72	15.87
E/S Altitude	(m)	0.00	0.00
SV Beam Identifier	(#)	TBD	
Telco Offset to Beam Center	(km)	0.00	
Modulation Parameters		Return	
Enter Reciever	Type	MEOLink	
Percentage of Bandwidth	(%)	50%	
Allocated Bandwidth	(MHz)	108.0000	
Channel Symbol Rate	(Msps)	90.0000	
Channel Modulation Type		8PSK	
Channel FEC Rate		0.66420	
Channel Throughput	(Mbps)	177.5584	
Uplink		Return	
E/S Carrier Frequencies	(MHz)	27,760.0000	
E/S Tx HPA Power Level	(W)	40.0	
E/S Tx OBO	(dB)	-6.2	
E/S Tx Antenna Gain (1.8m)	(dB)	51.9	
E/S Tx EIRP	(dBW)	61.1	
E/S Tx RF Link Availability	(%)	Clear	
E/S Tx Spreading Loss	(dB)	-152.1	
Satellite		Return	
SV Rx G/T	(dB/K)	5.9	
SV Tx OBO	(dB)	-15.0	
SV Tx EIRP Per Channel/Carrier	dBW	34.0	
Downlink		Return	
E/S Rx Carrier Frequency	(MHz)	17,960.0000	
E/S Rx Rf Link Availability	(%)	99.908%	
E/S Rx Antenna Gain (7.3m)	(dBi)	61.8	
E/S Rx Effective G/T	(dB/K)	35.9	
Total Link		Return	
Carrier/Noise Bandwidth	(dB)	19.5	
Carrier/Noise Uplink	(dB)	10.9	
Carrier/Noise Downlink	(dB)	11.4	
Carrier/Intermodulation Im (C/Im)	(dB)	25.0	
(C/N)- Total Actual (Es/No)	(dB)	7.7	
(C/N)-Total Required	(dB)	7.2	
(Eb/No)-Total Actual	(dB)	4.7	
(Eb/No)-Total Required	(dB)	4.2	
Excess Margin	(dB)	**0.5**	
Fade Margin	(dB)	**9.9**	

The next group of link budgets below are for the example with the ship at the more northerly latitude of Fort Lauderdale.

The first set of link budgets below show a wideband carrier transmitted up from the Vernon, TX gateway and received by the Six-Ship Waiver terminal, supporting 16APSK rate ¾ under clear-sky conditions and 8PSF rate ¾ under rain fade conditions. This provides a data throughput of 532 MBits/s in clear-sky and approximately 400 MBits/s under rain-fade conditions. The downlink EIRP density is also 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 10 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 northern latitude example with a 49.2 MHz bandwidth carrier transmitted up from the Six-Ship Waiver terminal and received by the Vernon, TX gateway. It supports 8PSK rate ¾ and provides a data throughput of 91 MBits/s under both clear-sky and rain-faded conditions by using uplink power control. 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 10 dB of margin before the adaptive coding reduces to the QPSK rate ¼ level.

The third set of link budgets below show the return link for this northern latitude example with a 108 MHz bandwidth carrier transmitted up from the Six-Ship Waiver terminal and received by the Vernon, TX gateway. It supports 8PSK rate ¾ under clear sky conditions and rate 2/3 under rain fade conditions. This provides a data throughput of approximately 200 MBits/s under clear-sky conditions and 177 MBits/s under rain-faded conditions by also using uplink power control. The transmit EIRP and hence the transmit PSD density are also consistent with the maximum levels used in the demonstration of compliance with the EPFD↑ limits provided in Section A.7.2. In addition, under more severe rain fade conditions there is an additional 9 dB of margin before the adaptive coding reduces to the QPSK rate ¼ level.

Link budgets for 216 MHz bandwidth carrier in forward direction from Vernon, TX gateway to ship terminal located at Fort Lauderdale (clear sky, rain faded uplink, rain faded downlink)

O3b Networks Link Analysis			
ECM Link Budget Rpt - 02/05/2015		Tier 2	Tier 2
Parameters	Unit	Clear Sky	
Ground parameters		Teleport	Telco
Location		RCL1/	Vernon/U.S.A.
Latitude	(deg)	26.10	34.16
Longitude (East)	(deg)	279.70	260.71
E/S Range to SV	(km)	9302.70	10793.70
E/S Elevation to SV	(deg)	43.44	22.04
E/S Altitude	(m)	0.00	0.00
SV Beam Identifier	(#)	TBD	
Telco Offset to Beam Center	(km)	0.21	
Modulation Parameters		Forward	
Enter Reciever	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)	27,760.0000	
E/S Tx HPA Power Level	(W)	500.0	
E/S Tx OBO	(dB)	-11.7	
E/S Tx Antenna Gain (7.3m)	(dB)	65.2	
E/S Tx EIRP	(dBW)	72.6	
E/S Tx RF Link Availability	(%)	Clear	
E/S Tx Spreading Loss	(dB)	-151.7	
Satellite		Forward	
SV Rx G/T	(dB/K)	5.2	
SV Tx OBO	(dB)	-3.8	
SV Tx EIRP Per Channel/Carrier	dBW	45.0	
Downlink		Forward	
E/S Rx Carrier Frequency	(MHz)	17,960.0000	
E/S Rx Rf Link Availability	(%)	Clear	
E/S Rx Antenna Gain (1.8m)	(dBi)	47.6	
E/S Rx Effective G/T	(dB/K)	24.2	
Total Link		Forward	
Carrier/Noise Bandwidth	(dB)	22.6	
Carrier/Noise Uplink	(dB)	20.2	
Carrier/Noise Downlink	(dB)	17.4	
Carrier/Intermodulation Im (C/Im)	(dB)	25.0	
(C/N)- Total Actual (Es/No)	(dB)	13.8	
(C/N)-Total Required	(dB)	11.3	
(Eb/No)-Total Actual	(dB)	9.1	
(Eb/No)-Total Required	(dB)	6.5	
Excess Margin	(dB)	**2.5**	
Fade Margin	(dB)	**16.1**	

O3b Networks Link Analysis			
ECM Link Budget Rpt - 02/05/2015		Tier 2	Tier 2
Parameters	Unit	Rain Up	
Ground parameters		Teleport	Telco
Location		RCL1/	Vernon/U.S.A.
Latitude	(deg)	26.10	34.16
Longitude (East)	(deg)	279.70	260.71
E/S Range to SV	(km)	9302.70	10793.70
E/S Elevation to SV	(deg)	43.44	22.04
E/S Altitude	(m)	0.00	0.00
SV Beam Identifier	(#)	TBD	
Telco Offset to Beam Center	(km)	0.21	
Modulation Parameters		Forward	
Enter Reciever	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)	27,760.0000	
E/S Tx HPA Power Level	(W)	500.0	
E/S Tx OBO	(dB)	-4.0	
E/S Tx Antenna Gain (7.3m)	(dB)	65.2	
E/S Tx EIRP	(dBW)	80.4	
E/S Tx RF Link Availability	(%)	99.744%	
E/S Tx Spreading Loss	(dB)	-151.7	
Satellite		Forward	
SV Rx G/T	(dB/K)	5.2	
SV Tx OBO	(dB)	-3.8	
SV Tx EIRP Per Channel/Carrier	dBW	45.0	
Downlink		Forward	
E/S Rx Carrier Frequency	(MHz)	17,960.0000	
E/S Rx Rf Link Availability	(%)	Clear	
E/S Rx Antenna Gain (1.8m)	(dBi)	47.6	
E/S Rx Effective G/T	(dB/K)	24.2	
Total Link		Forward	
Carrier/Noise Bandwidth	(dB)	22.6	
Carrier/Noise Uplink	(dB)	10.5	
Carrier/Noise Downlink	(dB)	17.4	
Carrier/Intermodulation Im (C/Im)	(dB)	21.0	
(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)	**0.5**	
Fade Margin	(dB)	**11.2**	

O3b Networks Link Analysis			
ECM Link Budget Rpt - 02/05/2015		Tier 2	Tier 2
Parameters	Unit	Rain Dn	
Ground parameters		Teleport	Telco
Location		RCL1/	Vernon/U.S.A.
Latitude	(deg)	26.10	34.16
Longitude (East)	(deg)	279.70	260.71
E/S Range to SV	(km)	9302.70	10793.70
E/S Elevation to SV	(deg)	43.44	22.04
E/S Altitude	(m)	0.00	0.00
SV Beam Identifier	(#)	TBD	
Telco Offset to Beam Center	(km)	0.21	
Modulation Parameters		Forward	
Enter Reciever	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)	27,760.0000	
E/S Tx HPA Power Level	(W)	500.0	
E/S Tx OBO	(dB)	-11.7	
E/S Tx Antenna Gain (7.3m)	(dB)	65.2	
E/S Tx EIRP	(dBW)	72.6	
E/S Tx RF Link Availability	(%)	Clear	
E/S Tx Spreading Loss	(dB)	-151.7	
Satellite		Forward	
SV Rx G/T	(dB/K)	5.2	
SV Tx OBO	(dB)	-3.8	
SV Tx EIRP Per Channel/Carrier	dBW	45.0	
Downlink		Return	
E/S Rx Carrier Frequency	(MHz)	17,960.0000	
E/S Rx Rf Link Availability	(%)	99.377%	
E/S Rx Antenna Gain (1.8m)	(dBi)	47.6	
E/S Rx Effective G/T	(dB/K)	21.5	
Total Link		Forward	
Carrier/Noise Bandwidth	(dB)	22.6	
Carrier/Noise Uplink	(dB)	20.2	
Carrier/Noise Downlink	(dB)	9.9	
Carrier/Intermodulation Im (C/Im)	(dB)	21.0	
(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)	**0.5**	
Fade Margin	(dB)	**11.2**	

Link budgets for 49.2 MHz bandwidth carrier in return direction from ship terminal located at Fort Lauderdale to Vernon, TX gateway (clear sky, rain faded uplink, rain faded downlink)

O3b Networks Link Analysis			
ECM Link Budget Rpt - 02/05/2015		Tier 2	Tier 2
Parameters	Unit	Clear Sky	
Ground parameters		Teleport	Telco
Location		Vernon/U.S.A.	RCL1/
Latitude	(deg)	34.16	26.10
Longitude (East)	(deg)	260.71	279.70
E/S Range to SV	(km)	9972.14	10288.61
E/S Elevation to SV	(deg)	32.72	28.33
E/S Altitude	(m)	0.00	0.00
SV Beam Identifier	(#)	TBD	
Telco Offset to Beam Center	(km)	0.00	
Modulation Parameters		Return	
Enter Reciever	Type	MEOLink	
Percentage of Bandwidth	(%)	23%	
Allocated Bandwidth	(MHz)	49.2000	
Channel Symbol Rate	(Msps)	41.0000	
Channel Modulation Type		8PSK	
Channel FEC Rate		0.74704	
Channel Throughput	(Mbps)	90.9762	
Uplink		Return	
E/S Carrier Frequencies	(MHz)	27,760.0000	
E/S Tx HPA Power Level	(W)	40.0	
E/S Tx OBO	(dB)	-10.7	
E/S Tx Antenna Gain (1.8m)	(dB)	51.9	
E/S Tx EIRP	(dBW)	56.6	
E/S Tx RF Link Availability	(%)	Clear	
E/S Tx Spreading Loss	(dB)	-151.2	
Satellite		Return	
SV Rx G/T	(dB/K)	5.2	
SV Tx OBO	(dB)	-18.4	
SV Tx EIRP Per Channel/Carrier	dBW	30.6	
Downlink		Return	
E/S Rx Carrier Frequency	(MHz)	17,960.0000	
E/S Rx Rf Link Availability	(%)	Clear	
E/S Rx Antenna Gain (7.3m)	(dBi)	61.8	
E/S Rx Effective G/T	(dB/K)	40.1	
Total Link		Return	
Carrier/Noise Bandwidth	(dB)	16.1	
Carrier/Noise Uplink	(dB)	10.9	
Carrier/Noise Downlink	(dB)	24.6	
Carrier/Intermodulation Im (C/Im)	(dB)	25.0	
(C/N)- Total Actual (Es/No)	(dB)	9.6	
(C/N)-Total Required	(dB)	8.5	
(Eb/No)-Total Actual	(dB)	6.1	
(Eb/No)-Total Required	(dB)	5.0	
Excess Margin	(dB)	**1.2**	
Fade Margin	(dB)	**11.9**	

O3b Networks Link Analysis			
ECM Link Budget Rpt - 02/05/2015		Tier 2	Tier 2
Parameters	Unit	Rain Up	
Ground parameters		Teleport	Telco
Location		Vernon/U.S.A.	RCL1/
Latitude	(deg)	34.16	26.10
Longitude (East)	(deg)	260.71	279.70
E/S Range to SV	(km)	9972.14	10288.61
E/S Elevation to SV	(deg)	32.72	28.33
E/S Altitude	(m)	0.00	0.00
SV Beam Identifier	(#)	TBD	
Telco Offset to Beam Center	(km)	0.00	
Modulation Parameters		Return	
Enter Reciever	Type	MEOLink	
Percentage of Bandwidth	(%)	23%	
Allocated Bandwidth	(MHz)	49.2000	
Channel Symbol Rate	(Msps)	41.0000	
Channel Modulation Type		8PSK	
Channel FEC Rate		0.74704	
Channel Throughput	(Mbps)	90.9762	
Uplink		Return	
E/S Carrier Frequencies	(MHz)	27,760.0000	
E/S Tx HPA Power Level	(W)	40.0	
E/S Tx OBO	(dB)	-2.0	
E/S Tx Antenna Gain (1.8m)	(dB)	51.9	
E/S Tx EIRP	(dBW)	65.3	
E/S Tx RF Link Availability	(%)	98.863%	
E/S Tx Spreading Loss	(dB)	-151.2	
Satellite		Return	
SV Rx G/T	(dB/K)	5.2	
SV Tx OBO	(dB)	-19.1	
SV Tx EIRP Per Channel/Carrier	dBW	29.9	
Downlink		Return	
E/S Rx Carrier Frequency	(MHz)	17,960.0000	
E/S Rx Rf Link Availability	(%)	Clear	
E/S Rx Antenna Gain (7.3m)	(dBi)	61.8	
E/S Rx Effective G/T	(dB/K)	40.1	
Total Link		Return	
Carrier/Noise Bandwidth	(dB)	16.1	
Carrier/Noise Uplink	(dB)	10.2	
Carrier/Noise Downlink	(dB)	23.9	
Carrier/Intermodulation Im (C/Im)	(dB)	24.3	
(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)	**0.5**	
Fade Margin	(dB)	**11.2**	

O3b Networks Link Analysis			
ECM Link Budget Rpt - 02/05/2015		Tier 2	Tier 2
Parameters	Unit	Rain Dn	
Ground parameters		Teleport	Telco
Location		Vernon/U.S.A.	RCL1/
Latitude	(deg)	34.16	26.10
Longitude (East)	(deg)	260.71	279.70
E/S Range to SV	(km)	9972.14	10288.61
E/S Elevation to SV	(deg)	32.72	28.33
E/S Altitude	(m)	0.00	0.00
SV Beam Identifier	(#)	TBD	
Telco Offset to Beam Center	(km)	0.00	
Modulation Parameters		Return	
Enter Reciever	Type	MEOLink	
Percentage of Bandwidth	(%)	23%	
Allocated Bandwidth	(MHz)	49.2000	
Channel Symbol Rate	(Msps)	41.0000	
Channel Modulation Type		8PSK	
Channel FEC Rate		0.74704	
Channel Throughput	(Mbps)	90.9762	
Uplink		Return	
E/S Carrier Frequencies	(MHz)	27,760.0000	
E/S Tx HPA Power Level	(W)	40.0	
E/S Tx OBO	(dB)	-10.7	
E/S Tx Antenna Gain (1.8m)	(dB)	51.9	
E/S Tx EIRP	(dBW)	56.6	
E/S Tx RF Link Availability	(%)	Clear	
E/S Tx Spreading Loss	(dB)	-151.2	
Satellite		Return	
SV Rx G/T	(dB/K)	5.2	
SV Tx OBO	(dB)	-18.4	
SV Tx EIRP Per Channel/Carrier	dBW	30.6	
Downlink		Return	
E/S Rx Carrier Frequency	(MHz)	17,960.0000	
E/S Rx Rf Link Availability	(%)	99.633%	
E/S Rx Antenna Gain (7.3m)	(dBi)	61.8	
E/S Rx Effective G/T	(dB/K)	36.7	
Total Link		Return	
Carrier/Noise Bandwidth	(dB)	16.1	
Carrier/Noise Uplink	(dB)	10.9	
Carrier/Noise Downlink	(dB)	16.7	
Carrier/Intermodulation Im (C/Im)	(dB)	25.0	
(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)	**0.5**	
Fade Margin	(dB)	**11.2**	

Link budgets for 108 MHz bandwidth carrier in return direction from ship terminal located at Fort Lauderdale to Vernon, TX gateway (clear sky, rain faded uplink, rain faded downlink)

O3b Networks Link Analysis			
ECM Link Budget Rpt - 02/05/2015		Tier 2	Tier 2
Parameters	Unit	Clear Sky	
Ground parameters		Teleport	Telco
Location		Vernon/U.S.A.	RCL1/
Latitude	(deg)	34.16	26.10
Longitude (East)	(deg)	260.71	279.70
E/S Range to SV	(km)	9972.14	10288.61
E/S Elevation to SV	(deg)	32.72	28.33
E/S Altitude	(m)	0.00	0.00
SV Beam Identifier	(#)	TBD	
Telco Offset to Beam Center	(km)	0.00	
Modulation Parameters		Return	
Enter Reciever	Type	MEOLink	
Percentage of Bandwidth	(%)	50%	
Allocated Bandwidth	(MHz)	108.0000	
Channel Symbol Rate	(Msps)	90.0000	
Channel Modulation Type		8PSK	
Channel FEC Rate		0.74704	
Channel Throughput	(Mbps)	199.7038	
Uplink		Return	
E/S Carrier Frequencies	(MHz)	27,760.0000	
E/S Tx HPA Power Level	(W)	40.0	
E/S Tx OBO	(dB)	-7.7	
E/S Tx Antenna Gain (1.8m)	(dB)	51.9	
E/S Tx EIRP	(dBW)	59.6	
E/S Tx RF Link Availability	(%)	Clear	
E/S Tx Spreading Loss	(dB)	-151.2	
Satellite		Return	
SV Rx G/T	(dB/K)	5.2	
SV Tx OBO	(dB)	-15.4	
SV Tx EIRP Per Channel/Carrier	dBW	33.6	
Downlink		Return	
E/S Rx Carrier Frequency	(MHz)	17,960.0000	
E/S Rx Rf Link Availability	(%)	Clear	
E/S Rx Antenna Gain (7.3m)	(dBi)	61.8	
E/S Rx Effective G/T	(dB/K)	40.1	
Total Link		Return	
Carrier/Noise Bandwidth	(dB)	19.5	
Carrier/Noise Uplink	(dB)	10.5	
Carrier/Noise Downlink	(dB)	24.2	
Carrier/Intermodulation Im (C/Im)	(dB)	25.0	
(C/N)- Total Actual (Es/No)	(dB)	9.3	
(C/N)-Total Required	(dB)	8.5	
(Eb/No)-Total Actual	(dB)	5.8	
(Eb/No)-Total Required	(dB)	5.0	
Excess Margin	(dB)	**0.8**	
Fade Margin	(dB)	**11.5**	

O3b Networks Link Analysis			
ECM Link Budget Rpt - 02/05/2015		Tier 2	Tier 2
Parameters	Unit	Rain Up	
Ground parameters		Teleport	Telco
Location		Vernon/U.S.A.	RCL1/
Latitude	(deg)	34.16	26.10
Longitude (East)	(deg)	260.71	279.70
E/S Range to SV	(km)	9972.14	10288.61
E/S Elevation to SV	(deg)	32.72	28.33
E/S Altitude	(m)	0.00	0.00
SV Beam Identifier	(#)	TBD	
Telco Offset to Beam Center	(km)	0.00	
Modulation Parameters		Return	
Enter Reciever	Type	MEOLink	
Percentage of Bandwidth	(%)	50%	
Allocated Bandwidth	(MHz)	108.0000	
Channel Symbol Rate	(Msps)	90.0000	
Channel Modulation Type		8PSK	
Channel FEC Rate		0.66420	
Channel Throughput	(Mbps)	177.5584	
Uplink		Return	
E/S Carrier Frequencies	(MHz)	27,760.0000	
E/S Tx HPA Power Level	(W)	40.0	
E/S Tx OBO	(dB)	-2.0	
E/S Tx Antenna Gain (1.8m)	(dB)	51.9	
E/S Tx EIRP	(dBW)	65.3	
E/S Tx RF Link Availability	(%)	98.215%	
E/S Tx Spreading Loss	(dB)	-151.2	
Satellite		Return	
SV Rx G/T	(dB/K)	5.2	
SV Tx OBO	(dB)	-17.0	
SV Tx EIRP Per Channel/Carrier	dBW	31.9	
Downlink		Return	
E/S Rx Carrier Frequency	(MHz)	17,960.0000	
E/S Rx Rf Link Availability	(%)	Clear	
E/S Rx Antenna Gain (7.3m)	(dBi)	61.8	
E/S Rx Effective G/T	(dB/K)	40.1	
Total Link		Return	
Carrier/Noise Bandwidth	(dB)	19.5	
Carrier/Noise Uplink	(dB)	8.8	
Carrier/Noise Downlink	(dB)	22.6	
Carrier/Intermodulation Im (C/Im)	(dB)	23.4	
(C/N)- Total Actual (Es/No)	(dB)	7.7	
(C/N)-Total Required	(dB)	7.2	
(Eb/No)-Total Actual	(dB)	4.7	
(Eb/No)-Total Required	(dB)	4.2	
Excess Margin	(dB)	**0.5**	
Fade Margin	(dB)	**9.9**	

O3b Networks Link Analysis			
ECM Link Budget Rpt - 02/05/2015		Tier 2	Tier 2
Parameters	Unit	Rain Dn	
Ground parameters		Teleport	Telco
Location		Vernon/U.S.A.	RCL1/
Latitude	(deg)	34.16	26.10
Longitude (East)	(deg)	260.71	279.70
E/S Range to SV	(km)	9972.14	10288.61
E/S Elevation to SV	(deg)	32.72	28.33
E/S Altitude	(m)	0.00	0.00
SV Beam Identifier	(#)	TBD	
Telco Offset to Beam Center	(km)	0.00	
Modulation Parameters		Return	
Enter Reciever	Type	MEOLink	
Percentage of Bandwidth	(%)	50%	
Allocated Bandwidth	(MHz)	108.0000	
Channel Symbol Rate	(Msps)	90.0000	
Channel Modulation Type		8PSK	
Channel FEC Rate		0.66420	
Channel Throughput	(Mbps)	177.5584	
Uplink		Return	
E/S Carrier Frequencies	(MHz)	27,760.0000	
E/S Tx HPA Power Level	(W)	40.0	
E/S Tx OBO	(dB)	-7.7	
E/S Tx Antenna Gain (1.8m)	(dB)	51.9	
E/S Tx EIRP	(dBW)	59.6	
E/S Tx RF Link Availability	(%)	Clear	
E/S Tx Spreading Loss	(dB)	-151.2	
Satellite		Return	
SV Rx G/T	(dB/K)	5.2	
SV Tx OBO	(dB)	-15.4	
SV Tx EIRP Per Channel/Carrier	dBW	33.6	
Downlink		Return	
E/S Rx Carrier Frequency	(MHz)	17,960.0000	
E/S Rx Rf Link Availability	(%)	99.868%	
E/S Rx Antenna Gain (7.3m)	(dBi)	61.8	
E/S Rx Effective G/T	(dB/K)	36.0	
Total Link		Return	
Carrier/Noise Bandwidth	(dB)	19.5	
Carrier/Noise Uplink	(dB)	10.5	
Carrier/Noise Downlink	(dB)	12.5	
Carrier/Intermodulation Im (C/Im)	(dB)	25.0	
(C/N)- Total Actual (Es/No)	(dB)	7.7	
(C/N)-Total Required	(dB)	7.2	
(Eb/No)-Total Actual	(dB)	4.7	
(Eb/No)-Total Required	(dB)	4.2	
Excess Margin	(dB)	**0.5**	
Fade Margin	(dB)	**9.9**	

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 in Fort Lauderdale, 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. No objections were received from any of the incumbent licensees.

Ka-Band Earth Station – Fort Lauderdale, FL

Frequency Coordination Report

28 GHz

Prepared on Behalf of
O3b Networks USA, LLC

December 9, 2014

COMSEARCH®
A CommScope Company

Table of Contents

1. Summary of Results

On behalf of Ob3 Networks, Comsearch performed a coordination notice for all existing and proposed terrestrial licenses within the coordination contours of their proposed Ka-Band earth station in Fort Lauderdale, Florida, which will transmit at 28 GHz[1]. 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 December 9, 2014.

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 earth station 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 earth station in Fort Lauderdale, Florida was prior-coordinated by Comsearch. A notification letter and datasheets for this earth station were sent to the following 28 GHz common carrier fixed microwave licensee on November 7, 2014. 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 earth station in Fort Lauderdale, Florida were also sent to the following 28 GHz local television transmission licensee on November 7, 2014. 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 earth station will operate in the 27.6 – 28.4 GHz portion of the Ka-Band.

3. 28 GHz LMDS Coordination

A Notification letter was sent to the following 28 GHz LMDS licensees on November 7, 2014. 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 earth station will be located inside BTA293.

[3] T-Mobile has acquired LMDS spectrum from Nextlink Wireless / XO in the Miami-Fort Lauderdale, Florida Basic Trading Area (BTA).

[4] T-Mobile has acquired LMDS spectrum from Nextlink Wireless / XO in the West Palm Beach-Boca Raton, Florida BTA.

4. Earth Station Coordination Data

This section presents the data pertinent to the proposed Ka-Band earth station in Fort 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:	11/05/2014
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' 16.3" N
Longitude (NAD 83)	80° 7' 3.3" 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		AL-7107-Ka
Gain / Diameter		52.5 dBi / 2.2 m
3-dB / 15-dB Beamwidth		0.38° / 0.90°
Max Available RF Power	(dBW/4 kHz)	-21.6
	(dBW/MHz)	2.4
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)	35M0G7D - 216MG7D / 27600.0 - 28400.0
Max Great Circle Coordination Distance	146.5 km / 91.0 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	**FT LAUDERDALE, FL**
Licensee Name	O3b Networks USA, LLC.
Latitude (NAD 83)	26° 5' 16.3" N
Longitude (NAD 83)	80° 7' 3.3" 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	-21.6 (dBW/4 kHz)

Transmit 28.0 GHz

Azimuth (°)	Horizon Elevation (°)	Antenna Discrimination (°)	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	-9.89	100.00
55	0.00	39.38	-8.69	100.00
60	0.00	34.38	-7.35	100.00
65	0.00	29.38	-5.82	100.00
70	0.00	24.38	-4.05	100.00
75	0.00	19.38	-1.94	100.00
80	0.00	14.38	0.62	108.20
85	0.00	9.38	3.88	119.00
90	0.00	4.39	8.10	131.50
95	0.00	0.64	12.62	146.50
100	0.00	5.62	12.09	139.50
105	0.00	10.62	7.41	129.60
110	0.00	15.62	3.38	117.40
115	0.00	20.62	0.40	107.50
120	0.00	25.62	-1.90	100.00
125	0.00	30.62	-3.79	100.00
130	0.00	35.62	-5.36	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	-8.89	100.00
150	0.00	55.62	-9.77	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 LAUDERDALE, FL**
Licensee Name	O3b Networks USA, LLC.
Latitude (NAD 83)	26° 5' 16.3" N
Longitude (NAD 83)	80° 7' 3.3" 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	-21.6 (dBW/4 kHz)

Transmit 28.0 GHz

Azimuth (°)	Horizon Elevation (°)	Antenna Discrimination (°)	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	-9.77	100.00
215	0.00	120.62	-8.89	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	-5.36	100.00
235	0.00	140.62	-3.79	100.00
240	0.00	145.62	-1.90	100.00
245	0.00	150.62	0.40	107.50
250	0.00	155.62	3.38	117.40
255	0.00	160.62	7.37	129.50
260	0.00	165.62	11.84	138.80
265	0.00	170.62	12.18	144.30
270	0.00	175.61	7.83	130.80
275	0.00	179.36	3.72	118.50
280	0.00	174.38	0.52	107.90
285	0.00	169.38	-2.02	100.00
290	0.00	164.38	-4.10	100.00
295	0.00	159.38	-5.87	100.00
300	0.00	154.38	-7.39	100.00
305	0.00	149.38	-8.73	100.00
310	0.00	144.38	-9.92	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 – Puerto Rico and US Virgin Islands

Frequency Coordination Report

Prepared on Behalf of
O3b Networks USA, LLC

December 9, 2014

COMSEARCH®
A CommScope Company

Table of Contents

1. Summary of Results

On behalf of Ob3 Networks, Comsearch performed a coordination notice for all existing and proposed terrestrial licenses within the coordination contours of their proposed Ka-Band earth station, which will transmit at 28 GHz[1] and be variably located in the territorial waters of Puerto Rico and the US Virgin Islands. 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 December 9, 2014.

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 earth station 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 proposed Ka-Band earth station was prior-coordinated by Comsearch. As there were no licensed 28 GHz common carrier fixed microwave or local television transmission services found outside the continental United States, no coordination was necessary.

3. 28 GHz LMDS Coordination

A Notification letter was sent to the following 28 GHz LMDS licensees on November 7, 2014. 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
2 Lightspeed	BTA488	San Juan, PR
2 Lightspeed	BTA489	Mayaguez-Aguadilla-Ponce, PR
Choice Communications	BTA491	US Virgin Islands

No objections were received from the LMDS incumbents.

[1] The proposed earth station will operate in the 27.6 – 28.4 GHz portion of the Ka-Band.

4. Earth Station Coordination Data

This section presents the data pertinent to the proposed Ka-Band earth station. 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:	11/05/2014
Job Number:	<PCNJobCode>

Administrative Information

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

Site Information — **PUERTO RICO, PR** and **USVI**

Venue Name	
Latitude (NAD 83)	18° 3' 12.5" N
Longitude (NAD 83)	65° 50' 7.4" 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		AL-7107-Ka
Gain / Diameter		52.5 dBi / 2.2 m
3-dB / 15-dB Beamwidth		0.38° / 0.90°
Max Available RF Power	(dBW/4 kHz)	-21.6
	(dBW/MHz)	2.4
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)	35M0G7D - 216MG7D / 27600.0 - 28400.0
Max Great Circle Coordination Distance	144.2 km / 89.6 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	**PUERTORICO, PR and USVI**	
Licensee Name	O3b Networks USA, LLC.	
Latitude (NAD 83)	18° 3' 12.5" N	
Longitude (NAD 83)	65° 50' 7.4" 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	-21.6 (dBW/4 kHz)	

Transmit 28.0 GHz

Azimuth (°)	Horizon Elevation (°)	Antenna Discrimination (°)	Horizon Gain (dBi)	Coordination Distance (km)
0	0.00	97.66	-10.00	100.00
5	0.00	92.83	-10.00	100.00
10	0.00	87.98	-10.00	100.00
15	0.00	83.14	-10.00	100.00
20	0.00	78.31	-10.00	100.00
25	0.00	73.48	-10.00	100.00
30	0.00	68.65	-10.00	100.00
35	0.00	63.85	-10.00	100.00
40	0.00	59.05	-10.00	100.00
45	0.00	54.28	-10.00	100.00
50	0.00	49.54	-10.00	100.00
55	0.00	44.84	-9.23	100.00
60	0.00	40.20	-8.01	100.00
65	0.00	35.63	-6.63	100.00
70	0.00	31.18	-5.15	100.00
75	0.00	26.90	-3.40	100.00
80	0.00	22.89	-1.90	100.00
85	0.00	19.32	-0.15	105.50
90	0.00	16.47	1.58	111.50
95	0.00	14.77	2.77	115.50
100	0.00	14.63	2.87	115.80
105	0.00	16.09	1.84	112.40
110	0.00	18.78	0.16	106.60
115	0.00	22.26	-1.69	100.00
120	0.00	26.21	-3.46	100.00
125	0.00	30.45	-5.09	100.00
130	0.00	34.88	-6.56	100.00
135	0.00	39.43	-7.89	100.00
140	0.00	44.06	-9.06	100.00
145	0.00	48.75	-10.00	100.00
150	0.00	53.49	-10.00	100.00
155	0.00	58.25	-10.00	100.00
160	0.00	63.04	-10.00	100.00
165	0.00	67.85	-10.00	100.00
170	0.00	72.67	-10.00	100.00
175	0.00	77.50	-10.00	100.00
180	0.00	82.34	-10.00	100.00
185	0.00	87.17	-10.00	100.00

COMSEARCH

Earth Station Data Sheet

19700 Janelia Farm Boulevard, Ashburn, VA 20147
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Coordination Values	**PUERTORICO, PR and USVI**
Licensee Name	O3b Networks USA, LLC.
Latitude (NAD 83)	18° 3' 12.5" N
Longitude (NAD 83)	65° 50' 7.4" 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	-21.6 (dBW/4 kHz)

Transmit 28.0 GHz

Azimuth (°)	Horizon Elevation (°)	Antenna Discrimination (°)	Horizon Gain (dBi)	Coordination Distance (km)
190	0.00	92.02	-10.00	100.00
195	0.00	96.86	-10.00	100.00
200	0.00	101.69	-10.00	100.00
205	0.00	106.52	-10.00	100.00
210	0.00	111.35	-10.00	100.00
215	0.00	116.15	-9.74	100.00
220	0.00	120.95	-8.63	100.00
225	0.00	125.72	-7.33	100.00
230	0.00	130.46	-5.90	100.00
235	0.00	135.16	-4.40	100.00
240	0.00	139.80	-2.71	100.00
245	0.00	144.37	-0.42	100.00
250	0.00	148.82	2.59	100.00
255	0.00	153.10	6.33	100.00
260	0.00	157.11	10.24	134.40
265	0.00	160.68	13.61	144.20
270	0.00	163.53	10.61	135.30
275	0.00	165.23	5.87	125.10
280	0.00	165.37	2.34	100.00
285	0.00	163.91	-0.62	100.00
290	0.00	161.22	-3.03	100.00
295	0.00	157.74	-4.98	100.00
300	0.00	153.79	-6.59	100.00
305	0.00	149.55	-8.01	100.00
310	0.00	145.12	-9.29	100.00
315	0.00	140.57	-10.00	100.00
320	0.00	135.94	-10.00	100.00
325	0.00	131.25	-10.00	100.00
330	0.00	126.51	-10.00	100.00
335	0.00	121.75	-10.00	100.00
340	0.00	116.96	-10.00	100.00
345	0.00	112.15	-10.00	100.00
350	0.00	107.33	-10.00	100.00
355	0.00	102.50	-10.00	100.00

5. Contact Information

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

Contact person:	Joanna Lynch
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