NARRATIVE DESCRIPTION AND PUBLIC INTEREST STATEMENT

**On-ground and Flight Testing of the
Aura LE Aircraft Earth Station Antenna
with the eXConnect Ku-Band AMSS System**

WCA Holdings III, LLC ("Applicant"), pursuant to Section 5.61 of the Commission's rules, 47 C.F.R. § 5.61, hereby seeks experimental special temporary authorization ("STA") for on-ground and flight testing of a single aircraft earth station ("AES") antenna – an Aura LE antenna – to assist with Federal Aviation Administration ("FAA") Supplemental Type Certification ("STC") testing, as well as further testing and demonstration of the functionality of the AES with the eXConnect Ku-band Aeronautical Mobile-Satellite Service ("AMSS") system. Applicant proposes to operate the AES antenna in accordance with terms and conditions previously adopted by the Commission for operation of this antenna and seeks a six-month experimental STA commencing at the earliest practicable time.

I. INTRODUCTION

Applicant has partnered with Panasonic Avionics Corporation ("PAC"), proponent of the eXConnect System, for AES testing purposes and Applicant is purchasing the aircraft on which the Aura LE antenna will be tested. PAC presently holds experimental special temporary authority ("STA") granted in Call Sign WD9XQT (File No. 0339-EX-ST-2009), which enables flight and ground testing of the Aura LE and MELCO AES antennas.[1] PAC has also filed an blanket license application for long-term commercial authority to operate the

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[1] PAC timely filed for a two-year experimental license to permit further AES testing on different aircraft types and configurations, which resulted in automatic extension of its experimental STA authority pending FCC action on the experimental license application. *See* 47 C.F.R. § 5.61(b).

eXConnect System with the MELCO AES antenna, which is presently installed on a number of Lufthansa commercial aircraft.[2]

In connection with testing of the eXConnect System, PAC will install a single Aura LE AES antenna on the aircraft that the Applicant is purchasing for FAA STC testing, and additional testing and demonstration of antenna performance. Applicant has agreed to permit use of the aircraft it is purchasing, a Boeing Business Jet 737, as an AES "test bed" for the Aura LE terminal. Applicant will maintain ultimate control of the AES equipment onboard its aircraft and, through a contractual arrangement with PAC, will operate the equipment consistent with previously authorized terms and conditions for this antenna. Applicant anticipates that it will not need to conduct additional ground and flight testing of the Aura LE for more than six months. Therefore, extension of this experimental STA authority is not anticipated.

The eXConnect system will operate using Ku-band Fixed-Satellite Service ("FSS") satellites under an existing domestic and international secondary allocation to Mobile-Satellite Service ("MSS") in the 14.0-14.5 GHz band. Adjacent FSS satellites will be protected from harmful interference by limiting the off-axis EIRP spectral density along the GSO arc to no more than the levels permitted for routinely licensed Ku-band VSAT terminals. eXConnect will also protect radio astronomy and space research service operating in the Ku-band by limiting emissions in the vicinity of these stations, as set forth in a coordination agreement between PAC and the National Science Foundation and FCC rules to protect NASA TDRSS facilities. The technical aspects of the eXConnect system are discussed in detail in the attached Technical Appendix.[3]

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[2] *See* IBFS Submission ID: IBFS2010002460 (filed Aug. 5, 2010).

[3] *See* Exhibit 1.

There is ample precedent for granting the requested experimental STA. In particular, on December 2, 2008, the Commission granted PAC a six-month STA (Call Sign WD9XQT) to conduct ground testing of up to five (5) Aura LE AES terminals for testing and demonstration purposes.[4] The experimental STA was renewed on June 1, 2009 to permit further ground testing of the antenna. On January 7, 2010, the Commission granted PAC a six month STA to conduct ground and flight testing for demonstration purposes of up to ten (10) AESs each (up to 20 total) of two types, the Aura LE and the MELCO antennas.[5] PAC provided detailed technical information on the Aura LE antenna in its original experimental STA filings, which is hereby incorporated by reference.[6]

Applicant will operate this single AES consistent with the conditions imposed on PAC in prior experimental STA grants for this antenna.[7] Because these conditions have been previously imposed on eXConnect AESs and have resulted in interference-free flight test operations of eXConnect AES antennas, this application for authority may be granted on an expedited basis to permit FAA STC testing and other flight test operations.

II. DESCRIPTION OF PROPOSED EXPERIMENTAL OPERATIONS

Applicant seeks to conduct ground and flight testing throughout the continental United States ("CONUS") and adjacent international airspace, subject to protection of U.S. Government radio astronomy and space research service operations. Applicant recognizes

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[4] *See* ELS File No. 0544-EX-ST-2008. A copy of the authorization is attached as Exhibit 2.

[5] *See* ELS File No. 0339-EX-ST-2009.

[6] *See* ELS File No. 0544-EX-ST-2008.

[7] *See* ELS File Nos. 0544-EX-ST-2008 and 0339-EX-ST-2009.

and accepts that any experimental authority will be conditioned upon coordination with and/or protection of these co-frequency operations.[8]

The general objectives of the testing to be carried out under this experimental authority include: (i) integrating and testing the Aura LE and eXConnect network; (ii) demonstrating two-way data service from an in-flight aeronautical mobile platform; (iii) validating the predicted performance of the system; and (iv) demonstrating that the system meets the established interference requirements for Ku-band AMSS systems.

Applicant, together with PAC, will conduct flight testing only in areas that are outside exclusion zones for radio astronomy sites (during observations) and NASA TDRSS sites, and in accordance with applicable coordination agreements and FCC rules. In addition, flight tests may be conducted in international airspace (e.g., over the Atlantic or Pacific Oceans).

The following performance objectives will be examined in connection with flight testing:

- hand-off performance;
- geographic mapping and automated shut-off;
- reliability of data link;
- two-way data link performance and coverage;
- receive-only video link performance and coverage;
- antenna performance;
- Doppler correction; and
- network management and operation.

III. SATELLITES AND HUB EARTH STATIONS

The eXConnect System will utilize commercial FSS satellite capacity to conduct its experimental operations. Specifically, capacity will be leased on the Horizons 1, Galaxy 17,

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[8] *See* 47 C.F.R. § 5.111(a)(2); *see also* 47 C.F.R. §§ 25.222 and 25.226 (analogous rules governing Ku-band earth stations onboard vessels and vehicle-mounted earth stations).

and Telstar 14 satellites[9] and has been coordinated with adjacent satellite operators within +/- 6 degrees of each satellite. PAC has filed coordination affidavits from the operators of the these satellites that reflect adjacent satellite operator consent to the eXConnect System technical parameters associated with the proposed operations.[10] Communication with these satellites is essential to the experimentations to confirm that the eXConnect terminals can effectively communicate with existing satellites of various operators in diverse geographic regions to ensure efficient and interference-free operations once the antenna commences full commercial operations.[11]

The hub earth stations for the proposed experimental operations are located at Steele Valley, California (serving Horizons 1) and Holmdel, New Jersey (serving Galaxy 17 and Telstar 14). These earth stations are separately licensed as FSS earth stations and are connected to eXConnect network control facilities. Network control of eXConnect operations will be provided from a Network Operations Center in Miramar, Florida.

IV. PROTECTION OF OTHER USERS IN THE 14.0–14.5 GHZ BAND

Protection of Fixed-Satellite Service. The FCC has not yet established service rules applicable to AMSS terminal operations, but interference considerations are analogous to those that currently apply to mobile earth stations onboard vessels ("ESVs") set forth in 47

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[9] PAC authority to communicate with the Telstar 14 satellite was added post-grant with filing of the requisite coordination affidavit from the serving satellite operator. *See* Letter to Anthony Serafini dated March 11, 2010, re Panasonic Avionics Corporation, Call Sign WD9XQT, File No. 0339-EX-ST-2009; Addition of Satellite Point of Communication. Additional satellites may be added in the future, subject to applicable coordination requirements.

[10] *See* Exhibit 3.

[11] Operation only with other experimental stations would plainly not be adequate for Applicant's experimentations since Ku-band AMSS terminals must communicate using Ku-band FSS satellites. *See* 47 C.F.R. § 5.125.

C.F.R. § 25.222. The Applicant's terminal will operate in such a manner that the off-axis EIRP levels are no greater than the levels produced by routinely licensed VSAT earth stations. This is consistent with past FCC licensing conditions in the AMSS context. To the extent that any adjacent satellite operator experiences unacceptable interference from Applicant's experimental operations, Applicant will cease terminal transmissions immediately.[12]

Protection of Potential NGSO FSS Systems. Applicant acknowledges that non-geostationary orbit ("NGSO") systems are also permitted to operate in the Ku-band. However, no such systems are currently authorized or plan to operate within the period contemplated for the proposed experimental operations.

Protection of Terrestrial Radio Services. Applicant has examined current spectrum use in the 14.0-14.5 GHz band and has determined that there are no active FCC-licensed terrestrial services in this band in North America with which its proposed operations could conflict.

Protection of the Radio Astronomy Service. For purposes of protecting radio astronomy sites, consistent with Recommendation ITU-R M.1643, Part C, Applicant will limit aggregate power flux density (pfd) in the band of 14.47 GHz to 14.5 GHz as follows:

-221 dBW/m^2/Hz (for protection of Green Bank, Arecibo and Socorro)
-189 dBW/m^2/Hz (for protection all other Radio Astronomy sites)

For purposes of this experimental application, the Applicant's terminal will not operate within line-of-sight vicinity of Radio Astronomy sites and during observation periods and will comply with the coordination agreement executed between PAC and the National Science Foundation to protect radio astronomy operations.

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[12] *See* 47 C.F.R. § 5.111(a)(2).

Protection of Space Research Service. Applicant recognizes the utilization of the frequency band from 14.0-14.05 GHz and the possible use of the band from 14.05-14.2 GHz allocated to the National Aeronautics and Space Administration ("NASA") Tracking and Data Relay Satellite System ("TDRSS") for space research conducted at White Sands, New Mexico and Blossom Point, Maryland. For purposes of this experimental application, Applicant will avoid AES operation within line-of-sight vicinity of these earth stations.

Applicant understands that PAC is actively engaged in coordination discussions with NASA and will comply with the terms of any coordination agreement applicable to eXConnect operations.

VI. SUPERVISION AND CONTROL

For purposes of these experiments, the AES terminal will be operated under Applicant's ultimate supervision and control via contractual arrangements with PAC. The point of contact for the planned experimental operations is:

Primary: Will Clark, Director of Flight Operations
Office: (406) 523-1351, Mobile: (406) 370-6881
WClark@washcorp.com
Secondary: Dan Barnes - Director of Maintenance, Mobile: (406) 531-8617
dbarnes@washcorp.com
Address:
WCA Holdings III, LLC
101 International Way, Missoula MT 59808

As a back up, the points of contact for eXConnect operations are:

Primary: Philippe Lagarde; (Office) 1-425-415-9164; (Mobile) 1-425-319-3537
Secondary: Gilbert Dizon; (Office) 1-949-462-1940; (Mobile) 1-949-614-3163
MCC@panasonic.aero
Address:
Panasonic Avionics Corporation
Attn: Network Operating Center
26200 Enterprise Way
Lake Forest, CA 92630 USA

as well as:

> Primary: Edgar Estevan; (Office) +1 954 538-4110; (Mobile) +1 305 776-7795
> Secondary: Greg Hill; (Office) +1 954 538-4195; (Mobile) +1 954 376-1531
> NOC Direct Telephone: +1 954 538-4074
> NOC email address: NOC@mtnsat.com
> Address:
> MTN Satellite Communications
> Attn: Network Operating Center
> 3044 N. Commerce Parkway
> Miramar, FL 33025

These contacts will have access to all network functions, and will have the ability and authority to cease all transmissions from the terminals wherever they are located.

VII. CONCLUSION

Grant of this experimental STA will allow Applicant to help PAC develop and demonstrate the Aura LE antenna in connection with the eXConnect AMSS system. The Aura LE AES has been previously authorized to operate on an experimental basis and Applicant will comply fully with conditions imposed on such operations. There is ample precedence for granting the requested experimental authority and such grant would serve the public interest by facilitating the development of and maintaining U.S. leadership in next-generation aeronautical broadband services.

EXHIBIT 1

Technical Appendix
Technical Description of the PAC eXConnect System

WCA Holdings III, LLC ("Applicant") seeks experimental special temporary authority ("STA") for ground and flight testing of one (1) Aura LE aircraft earth station ("AES") for ground and flight testing with Panasonic Avionics Corporation's ("PAC") eXConnect Ku-band Aeronautical Mobile-Satellite Service ("AMSS") system. Applicant seeks experimental authority to operate a single Aura LE terminal with the eXConnect System for up to six months. Renewal of this authority is not anticipated. This Technical Description highlights information provided in connection with grant of PAC's experimental STA Call Sign WD9XQT, which also authorized operation of the Aura LE antenna and is hereby incorporated by reference.

1. Aura LE and the eXConnect System

The eXConnect System is a Ku-band AMSS system being developed by PAC. The Aura LE terminal is a dual-panel, mechanically steered antenna, which has been specifically designed for the aeronautical environment.

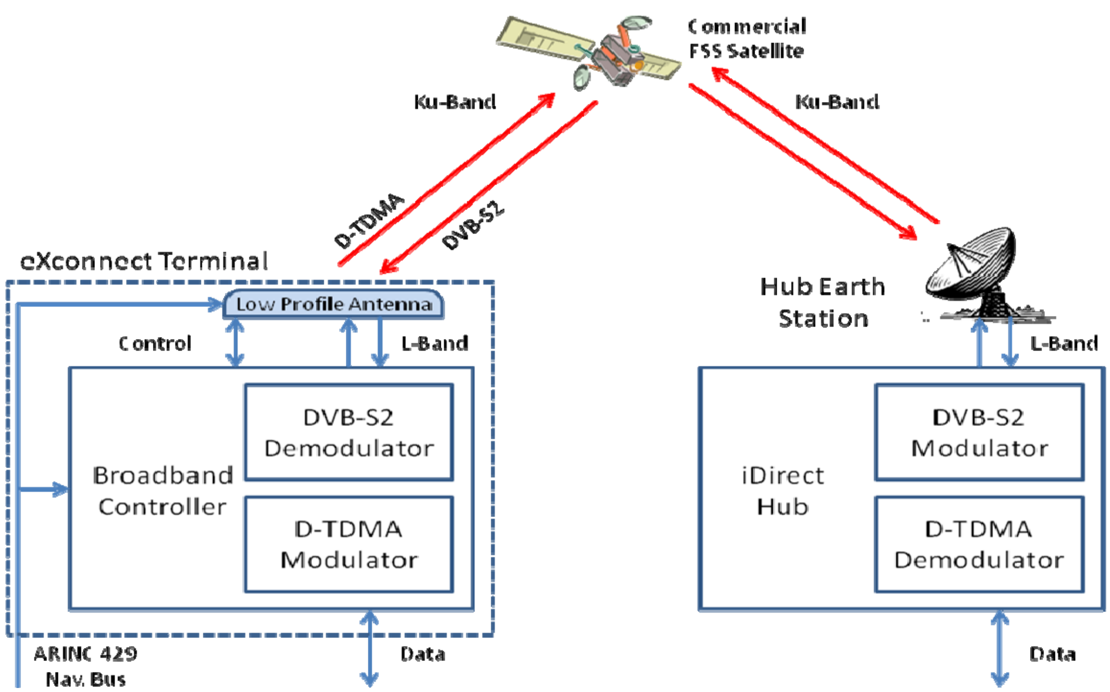

Figure 1 eXConnect System Block Diagram

As discussed below, off-axis EIRP spectral density will be controlled through the directivity of the antenna, limitations on the transmit power spectral density, control of pointing error and control of skew angle relative to the serving satellite orbital location.

The eXConnect System will be implemented using iDirect network technology. iDirect provides satellite network technology that has been used for a wide range of Ku-band FSS networks, including mobile applications such as ESVs. The use of proven network technology with proven control and monitoring protocols minimizes the risk of interference.

1.1. Forward Link

The forward link will consist of a single DVB-S2 carrier which may occupy up to a full transponder and operate in saturation. Data may be multiplexed on this carrier for multiple terminals. DVB-S2 is a widely adopted standard for digital data and video broadcasting over satellite. The DVB-S2 standard supports Adaptive Coding and Modulation (ACM) with QPSK, 8PSK, and 16APSK modulations and Low Density Parity Check Coding rates between 0.25 and 0.9. The forward link is not being licensed under this experimental application but will operate at up to 2.04 Mbps.

1.2. Return Link

The return link will use iDirect's proprietary D-TDMA. D-TDMA supports multi-frequency (MF) TDMA sharing of return link carriers, although the eXConnect terminal will be assigned to only one in-route carrier with fixed data rate, modulation and coding parameters. Frequency and time slot parameters are managed by the iDirect hub. Terminal transmit EIRP is also power controlled so that the minimum power is used to close the satellite link. D-TDMA supports BPSK, QPSK and 8PSK modulations, turbo code rates between 0.431 and 0.793, and spread spectrum factors between 1 and 16. The return link will operate at up to 1024 kbps under this experimental authority using occupied bandwidths between 160 kHz and 5.12 MHz (emissions designators 160KG7D to 5M12G7D).

1.3. Hub Earth Station

The hub earth station consists of licensed gateways located at Steele Valley, California (serving Horizons 1) and Holmdel, New Jersey (serving Galaxy 17 and Telstar 14), an iDirect hub at each location, and the interface to the Internet and other content sources. The iDirect hub will consist of a DVB-S2 modulator and an iDirect D-TDMA demodulator. Operation of the hub earth station and the network will be controlled by a network operations centers ("NOCs") in in Lake Forest , California and Miramar, Florida, although Applicant will have ultimate direction and control over its Aura LE terminal via a contractual relationship with PAC. The NOCs will maintain the ability to inhibit transmissions from any terminal in the network, including the hub and eXConnect terminal, at any time.

2. Terminal Description

2.1. Antenna

The Aura LE antenna is a mechanically steered, flat-plate AES with two transmit/receive apertures. At most elevation angles, both apertures are coherently combined to form a beam. At low elevation angles, only a single aperture is used. This allows the antenna to maintain high performance over a large range of elevation angles between 5 degrees and 90 degrees in flight (10 degrees on the ground) while maintaining a low profile for aerodynamic integration with an aircraft. The Aura LE was previously examined by the Commission and authorized in experimental STA Call Sign WD9XQT (File No. 0544-EX-ST-2008). The basic characteristics of the antenna are summarized in Table 1.[1]

Table 1. Aura LE Antenna Characteristics

Characteristic	Aura LE
Frequency	Tx: 14.0 GHz to 14.5 GHz Rx: 10.7 GHz to 12.75 GHz
Aperture Size	2 Apertures of 35" X 6" each
EIRP	42.5 dBW @ 5 deg Elevation 48.0 dBW @ 90 deg Elevation
G/T	11 dB/K @ 5 deg Elevation 14 dB/K @ 90 deg Elevation
Tracking Rate	40 deg/sec in Azimuth 25 deg/sec in Elevation
Az Pointing Accuracy	0.2 deg 1-sigma
Antenna Patterns	*See* Appendix 1

The Aura LE antenna is designed to maintain pointing towards the intended satellite through the full range of maneuvers carried out by commercial aircraft. The antenna is pointed based on aircraft position and attitude information obtained from the ARINC 429 data bus, which is standard on commercial aircraft. This information is augmented with higher rated data from an inertial sensor package that is integrated with the antenna and compensates for INS errors that result from latency and bending of the airframe between the aircraft INS unit and the antenna. The pointing accuracy of the EMS Aura LE antenna will be less than 0.2 deg 1-sigma. Pointing error will be continuously monitored and if it ever exceeds 0.5 degrees, then transmissions will be automatically inhibited within 100 ms.

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[1] A Radiation Hazard analysis for the Aura LE is included as Exhibit A.

2.2. *Broadband Controller*

The BC contains the modem and control functionality of the terminal. The modem will include a DVB-S2 demodulator and iDirect D-TDMA modulator. With respect to control functionality, the BC includes the ability to inhibit transmissions as a function of location (to protect radio astronomy and space research), inhibit transmissions as a function of skew angle and control transmit power (to protect adjacent satellites), and select the serving satellite as a function of location. Skew angle control will be enforced regardless of whether the skew angle results from the location of the aircraft with respect to the satellite or the attitude of the aircraft.

2.3. *Off Axis-EIRP Control*

Control of off-axis EIRP spectral density is essential to protect adjacent satellites operating in the Ku-band. The eXConnect system will control the off-axis EIRP spectral density generated by a single terminal so that it is no greater than is accepted for Ku-band terminals under Part 25. Terminals do not operate on a co-frequency basis so management of aggregate emissions is not required.

The Commission's off axis EIRP spectral density limits are defined by Section 25.222 and 25.226 for analogous ESV and VMES operations (*see also* Section 25.218(f)(1), where N = 1 for TDMA) and the terminal may be mispointed by up to 0.2 degrees. The effective off-axis EIRP spectral density generated by a conforming terminal is no greater than:

$15–25\log10 (\Theta + 0.2)$	dBW/4 kHz	for	$1.5° \leq \Theta \leq 7°$
$–6$	dBW/4 kHz	for	$7° < \Theta \leq 9.2°$
$18–25\log10(\Theta + 0.2)$	dBW/4 kHz	for	$9.2° < \Theta \leq 48°$
$–24$	dBW/4 kHz	for	$48° < \Theta \leq 85°$
$–14$	dBW/4 kHz	for	$85° < \Theta \leq 180°$

The eXConnect system will limit off-axis EIRP spectral density to no more than this level by: (i) limiting transmit power spectral density by controlling the transmit power of the terminal and by selecting appropriate in-route carrier bandwidths; (ii) controlling the off-axis gain of the antenna along the GSO by inhibiting transmissions when the skew angle exceeds a specified threshold; and (iii) controlling pointing error and inhibiting transmissions when the pointing error exceeds a threshold of 0.5 deg.

The specific transmit power, bandwidth and skew angle thresholds will be selected based on the desired terminal transmission rates, coverage area, and satellite performance. Higher transmit power and narrower bandwidth will result in a more restrictive skew angle threshold.

An example of off-axis EIRP control is shown in Figure 2 for the Aura LE antenna. These off-axis EIRPs are based on the specific link parameters shown in the link budget in Section 3. They represent edge of beam cases where the terminal is operating with a 3.76 MHz carrier bandwidth and a skew angle threshold of 30 degrees. The terminal off-axis EIRP spectral density, shown in the solid red line, remains well below the 25.218(f)(1) off-axis EIRP spectral density limit, shown in the solid blue line. Even with the mispointing of the terminal at the point where it automatically inhibits transmissions – 0.5 deg pointing offset – the off-axis EIRP spectral density of the terminal, shown in the dashed red line, remains well below the off-axis EIRP spectral density of a conforming FSS terminal.

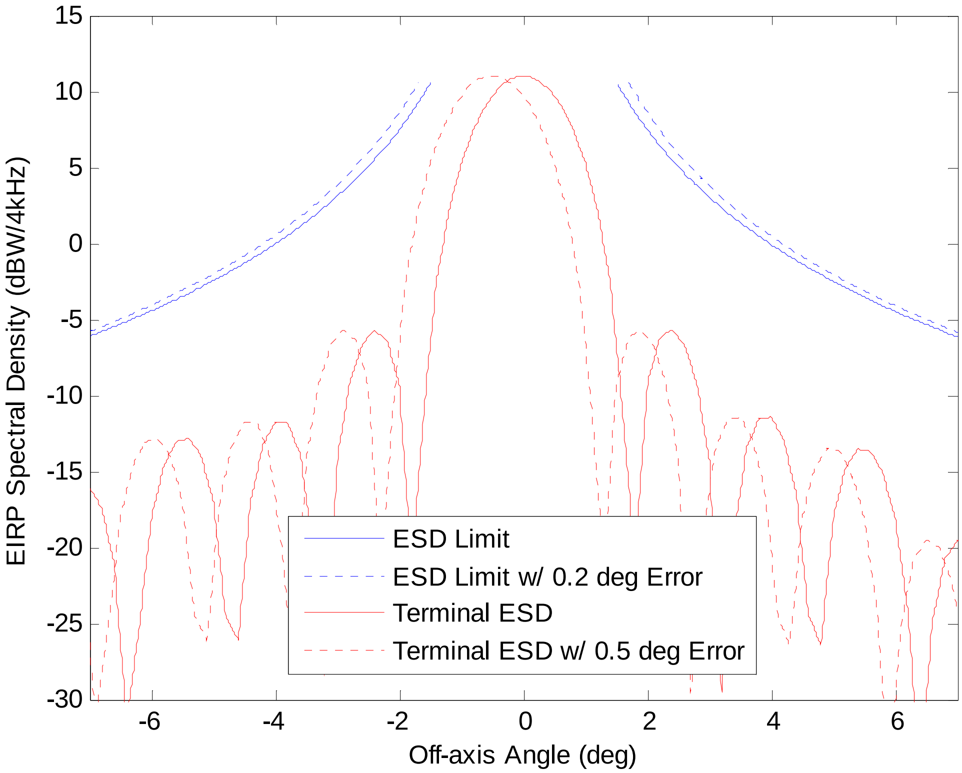

Figure 2. Maximum Off-Axis EIRP Spectral Density of the Aura LE

It should be emphasized that the example in Figure 2 is an extreme case: worst-case power (edge of coverage), worst-case skew, and worst-case pointing error. Reaching the limits in this way will only occur rarely and briefly.

3. Link Budgets

Edge of coverage link budgets for the eXConnect forward and return links are shown in Table 2 for the Aura LE and MELCO eXConnect antennas. The eXConnect network in this example is operating with a 384 kbps return link for the Aura LE antenna. As shown by the table, the terminal is able to close the link with positive link margin.

Table 2. Aura LE and MELCO Link Budgets

Forward Link Budget

	MELCO Reflector	EMS Aura LE	Unit
eXconnect Terminal			
Antenna	MELCO Reflector	EMS Aura LE	
G/T	9.3	11	dB/K
Hub Earth Station			
EIRP max	73.1	73.1	dBW
Signal			
Waveform	DVB-S2	DVB-S2	
Modulation and Coding	QPSK/0.25	QPSK/0.25	
Data Rate	2.048E+06	2.048E+06	bps
Spectral Efficiency	0.348	0.348	bps/Hz
Noise Bandwidth	5.89E+06	5.89E+06	Hz
Eb/No Threshold	2.8	2.8	dB
Uplink			
Frequency	14.25	14.25	dBW
Back off	18.1	18.1	dB
EIRP Spectral Density	23.3	23.3	dBW/4kHz
Slant Range	39000	39000	km
Space Loss, Ls	207.3	207.3	dB
ASI Degradation	0.5	0.5	dB
Transponder G/T @ Hub	2.0	2.0	dB/K
C/No	79.0	79.0	dBHz
Satellite			
Flux Density	-107.8	-107.8	dBW/m2
SFD @ Hub	-102.5	-102.5	dBW/m2
OBO	5.3	5.3	dB
Downlink			
Frequency	11.95	11.95	GHz
Transponder Sat. EIRP @ Beam Peak	50.0	50.0	dBW
Transponder Sat. EIRP @ Beam Edge	46.0	46.0	dBW
DL PSD Limit	13.0	13.0	dBW/4kHz
DL PSD @ Beam Peak	13.0	13.0	dBW/4kHz
Carrier EIRP @ Beam Peak	44.7	44.7	dBW
Carrier EIRP @ Beam Edge	40.7	40.7	dBW
Slant Range	39000	39000	km
Space Loss, Ls	205.8	205.8	dB
ASI Degradation @ 30 deg skew	4.9	1.5	dB
C/No	67.9	73.0	dBHz
End to End			
End to End C/No	67.5	72.0	dBHz
Implementation Loss	0.5	0.5	dB
End to End Eb/No	3.9	8.4	dB
Link Margin	1.1	5.6	dB

Return Link Budget

	MELCO Reflector	EMS Aura LE	Unit
eXconnect Terminal			
Antenna	MELCO Reflector	EMS Aura LE	
EIRP	42.5	42.5	dBW
Hub Earth Station			
G/T	28.1	28.1	dB/K
Signal			
Waveform	iDirect D-TDMA	iDirect D-TDMA	
Modulation and Coding	BPSK/SF4/0.43	BPSK/SF4/0.43	bps
Data Rate	3.84E+05	3.84E+05	
Spectral Efficiency	0.102	0.102	bps/Hz
Noise Bandwidth	3.76E+06	3.76E+06	Hz
Eb/No Threshold	4.6	4.6	dB
Uplink			
Frequency	14.25	14.25	dBW
Back off	0	0	dB
EIRP Spectral Density	12.8	12.8	dBW/4kHz
Slant Range	39000	39000	km
Space Loss, Ls	207.3	207.3	dB
ASI Degradation	0.5	0.5	dB
Transponder G/T @ Beam Edge	0.0	0.0	dB/K
C/No	63.3	63.3	dBHz
Satellite			
Flux Density	-120.3	-120.3	dBW/m2
SFD @ Beam Edge	-100.5	-100.5	dBW/m2
OBO	19.8	19.8	dB
Downlink			
Frequency	11.95	11.95	GHz
Transponder Sat. EIRP @ Beam Peak	50.0	50.0	dBW
Transponder Sat. EIRP @ Hub	48.0	48.0	dBW
DL PSD Limit	10.0	10.0	dBW/4kHz
DL PSD @ Beam Peak	0.4	0.4	dBW/4kHz
Carrier EIRP @ Beam Peak	30.2	30.2	dBW
Carrier EIRP @ Hub	28.2	28.2	dBW
Slant Range	39000	39000	km
Space Loss, Ls	205.8	205.8	dB
ASI Degradation	0.5	0.5	dB
C/No	78.6	78.6	dBHz
End to End			
End to End C/No	63.1	63.1	dBHz
Implementation Loss	0.5	0.5	dB
End to End Eb/No	6.8	6.8	dB
Link Margin	2.2	2.2	dB

Appendix 1 - Aura LE Gain Patterns

This appendix includes predicted transmit gain patterns for the Aura LE antenna. Because the antenna pattern for the Aura LE changes with elevation angle, patterns are included for the minimum and maximum elevation angles of the antenna: 5 deg and 90 deg. Azimuth patterns are plotted against the 25.209(a)(2) antenna pattern mask. Elevation patterns are plotted against the 25.209(a)(4) antenna pattern mask. The patterns are plotted 14.25 GHz.

A.1 Aura LE Antenna Patterns for 5 deg Elevation

A.1.1 Transmit Antenna Patterns for 5 deg Elevation

A.1.1.1 Transmit Azimuth Antenna Patterns for 5 deg Elevation

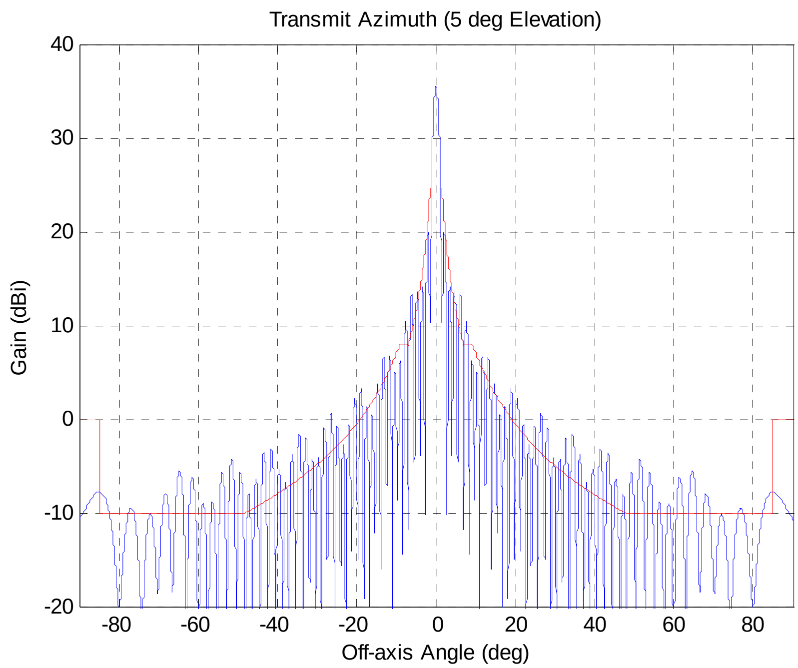

Figure A.1 Transmit Azimuth Pattern (5 deg Elevation)

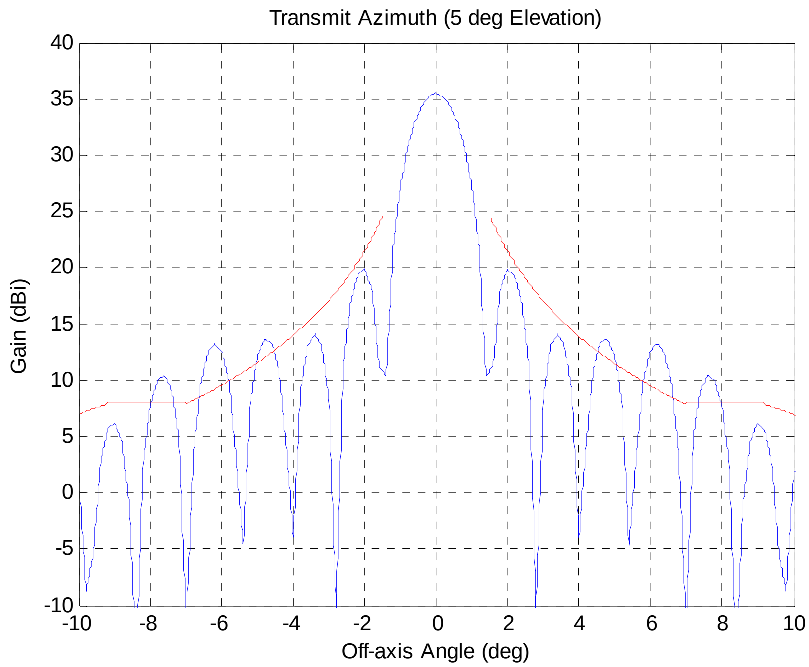

Figure A.2 Transmit Azimuth Pattern (5 deg Elevation) - Detail

A.1.1.2 Transmit Elevation Antenna Patterns for 5 deg Elevation

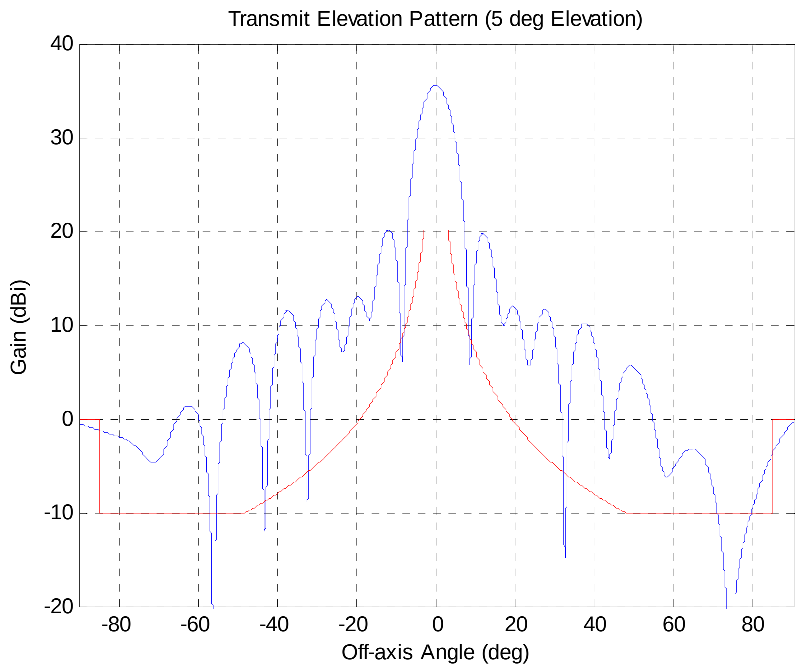

Figure A.3 Transmit Elevation Pattern (5 deg Elevation)

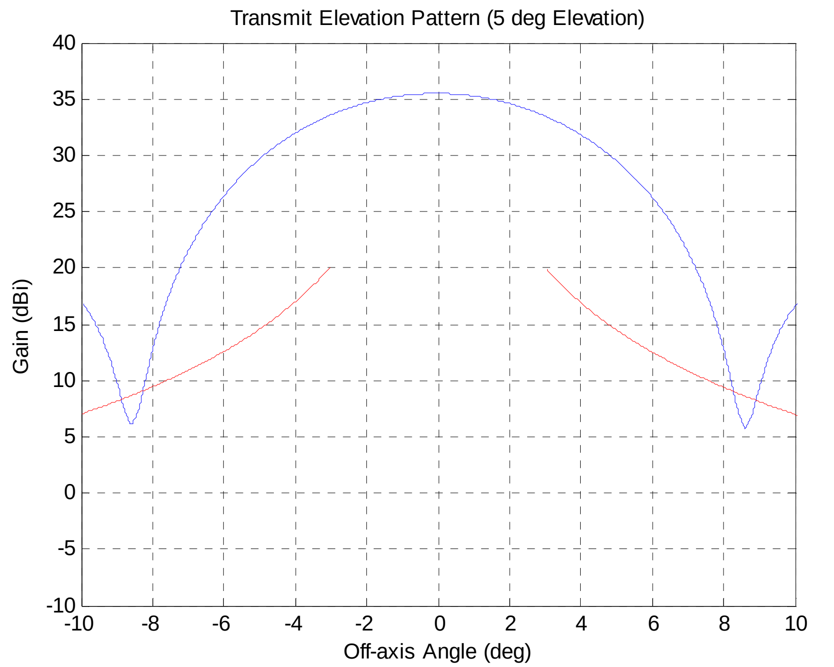

Figure A.4 Transmit Elevation Pattern (5 deg Elevation) - Detail

A.2 EMS Aura LE Antenna Patterns for 90 deg Elevation

A.2.1 Transmit Antenna Patterns for 90 deg Elevation

A.2.1.1 Transmit Azimuth Antenna Patterns for 90 deg Elevation

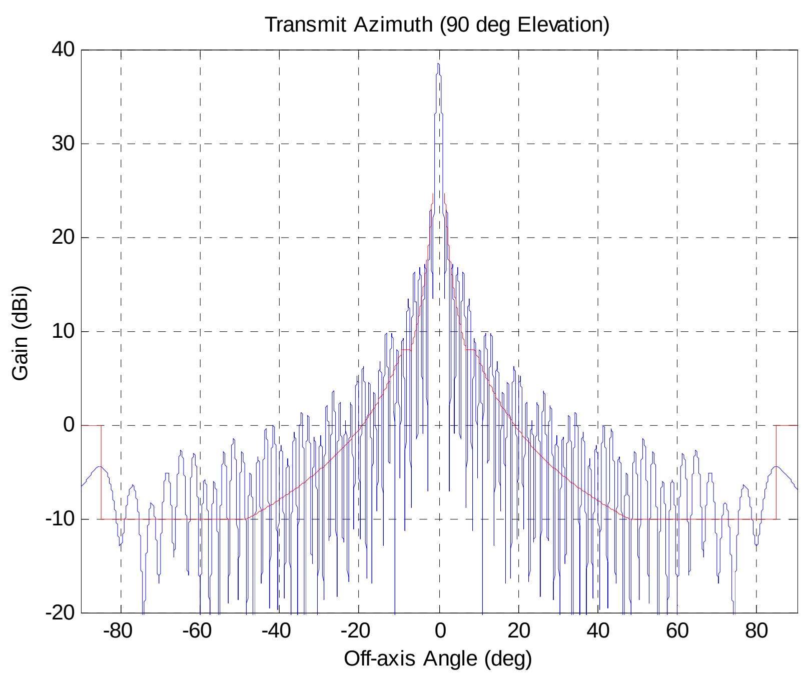

Figure A.9 Transmit Azimuth Pattern (90 deg Elevation)

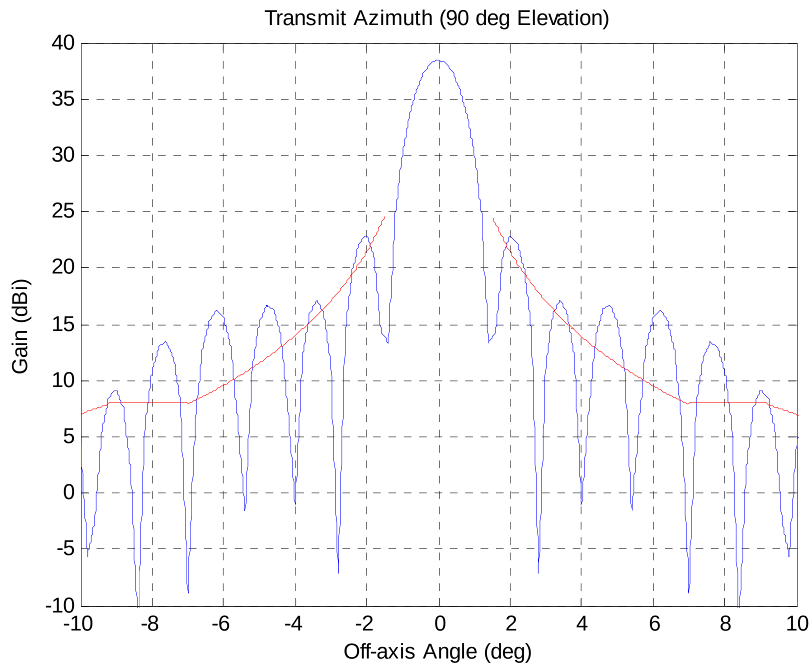

Figure A.10 Transmit Azimuth Pattern (90 deg Elevation) – Detail

A.2.1.2 Transmit Elevation Antenna Patterns for 90 deg Elevation

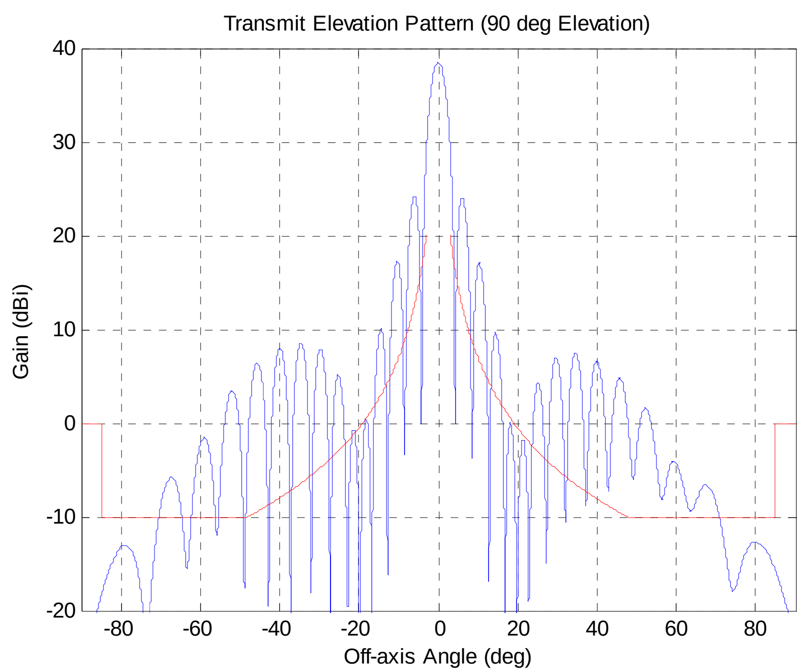

Figure A.11 Transmit Elevation Pattern (90 deg Elevation)

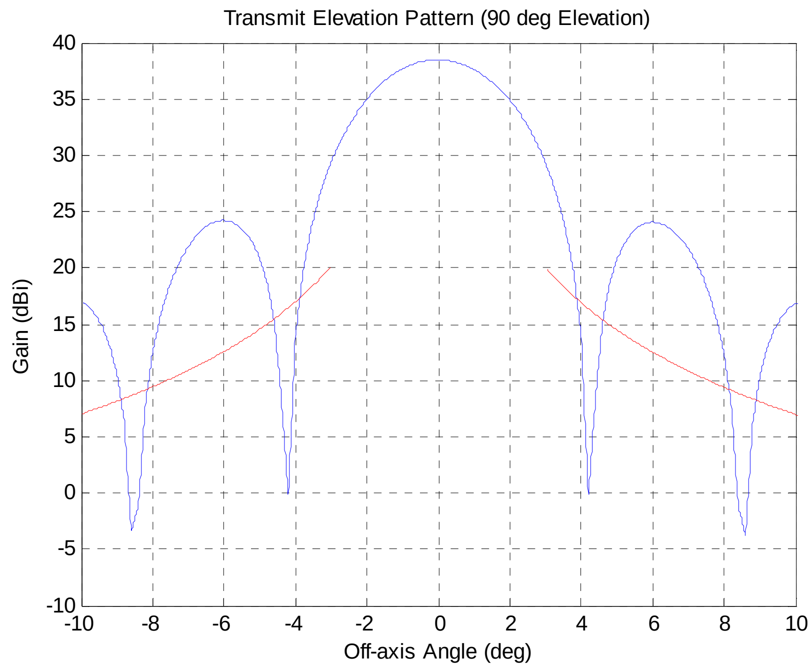

Figure A.12 Transmit Elevation Pattern (90 deg Elevation)

EXHIBIT A

Radiation Hazard Analysis for AURA LE

This report analyzes the non-ionizing radiation levels for the AURA LE antenna. This report is developed in accordance with the prediction methods contained in OET Bulletin No. 65, Evaluating Compliance with FCC Guidelines for Human Exposure to Radio Frequency Electromagnetic Fields, Edition 97-01.

Bulletin No. 65 specifies that there are two separate tiers of exposure limits that are dependant on the situation in which the exposure takes place and/or the status of the individuals who are subject to the exposure -- the General Population/ Uncontrolled Environment and the Controlled Environment, where the general population does not have access.

The maximum level of non-ionizing radiation to which individuals may be exposed is limited to a power density level of 5 milliwatts per square centimeter (5 mW/cm^2) averaged over any 6 minute period in a controlled environment, and the maximum level of non-ionizing radiation to which the general public is exposed is limited to a power density level of 1 milliwatt per square centimeter (1 mW/cm^2) averaged over any 30 minute period in a uncontrolled environment.

In the normal range of transmit powers for satellite antennas, the power densities at or around the antenna surface are expected to exceed safe levels. This area will not be accessible to the general public. Operators and technicians will receive training specifying this area as a high exposure area. Procedures will be established to ensure that all transmitters are turned off before this area may be accessed by operators, maintenance or other authorized personnel.

Near Field Exposure

The AURA LE antenna potentially exceeds MPE limits in the near field within the rectangular volume directly in front of the panels (7.0 mW/cm^2). For this calculation, it was assumed that all 10 watts from each SSPA module are uniformly distributed across the surface area of the panel. There are two SSPA modules, one for each antenna panel. This is a reasonable assumption for a flat panel waveguide fed phased array with minimal sidelobe tapering.

The extent of the near field region is defined by the following

$$R_{nf} = D^2/(4\lambda)$$

8.9 meters

Where D is the width of the panel (0.86 meters)

The maximum power density in the Near Field can be determined by the following equation:

$$S_{nf} = P_{SSPA} / A$$

$$7 \text{ mW/ cm}^2$$

Where A is the surface area of the panel and P is the power available from the SSPA.

In normal operation, this antenna is mounted on a rooftop with the main beam pointed toward the sky at a minimum elevation angle of 10 degrees when operated on the ground such that human exposure in the near field is not possible. Furthermore, normal TDMA operation uses a duty cycle of 10% or less, reducing maximum near field exposure by an order of magnitude to 0.7 mW/cm^2. Additionally, in normal operation, any blockage in the near field (human or otherwise) will cause the transmitter to be disabled within seconds as the system does not transmit unless it can receive the downlink carrier from the satellite. Therefore, prolonged exposure in the near field is not possible in normal operation.

Far Field Exposure (in main beam)

$$R_{ff} = 0.60 D^2 / \lambda$$

$$22 \text{ m}$$

$$S_{ff} = P_{EIRP} / (4 \pi R_{ff}^2)$$

$$1.0 \text{ mW/ cm}^2$$

At a distance of 22 meters, the power density of the Aura LE is 1.0 mW/cm^2, which is within the limits of General Population/Uncontrolled Exposure (MPE) even in the direction of the main beam of the antenna.

As noted previously, the antenna will be mounted on a building or vehicle rooftop with the main beam pointed to the sky at a minimum elevation angle of 10 degrees. In this case, maximum far field exposure to humans would be due to a sidelobe which is at least 15 dB below the main beam. At a distance of 22 meters, the exposure to humans would be less than 0.032 mW/cm^2.

Transition Region Exposure (in main beam)

At a distance of 13 m from the antenna, maximum exposure in the main beam is 5 mW/cm^2. This assumes that PFD decreases linearly from 7 mW/cm^2 to 1.0 mW/cm^2 in this region between the near field and far field (8.9 m to 22 m from the antenna).

Exposure to personnel located below antenna height

The antenna will be mounted at a height above personnel. In this case, the worst case exposure is due to the first elevation sidelobe at a level of -15 dB. For the AURA LE antenna, the far field distance in the elevation plane is approximately 0.8 meters. The 5 mW/cm^2 threshold is reached at a distance of 1.8 meters and the 1 mW/cm^2 threshold is reached at a distance of 4.0 m. Observing the safe radius distance noted above during transmit operations will ensure that the threshold will not be exceeded.

Table 1: Parameters Used for Determining PFD (Aura LE)

Antenna Width	34	in	0.8636	m
Antenna Height	6.5	in	0.1651	m
Antenna Surface Area			0.14258	m^2
Frequency			14250	MHz
Wavelength			0.021	m
Transmit Power			10	W
Antenna Gain			38	dBi
Antenna Gain			6309.573	
EIRP			48	dBW
Far Field Boundary (Azimuth)			22.0	m
Power Density at far field boundary (Azimuth)			1.0	mW/cm^2
Near Field Distance (Azimuth)			8.9	m
Near Field Power Density (Azimuth)			7.0	mW/cm^2
Elevation sidelobe level			-15.0	dB
Far Field Boundary (Elevation)			0.8	m
Power Density at far field boundary (Elevation)			26.3	mW/cm^2
Safe Far Field Distance (Elevation)			1.8	m
Power Density			4.9	mW/cm^2
Safe Far Field Distance (Elevation)			4.0	m
Power Density			1.0	mW/cm^2

Conclusions

The radiation hazard can be divided into two cases: above the mounting plane of the antenna and below it. Different measures will be taken in each region to ensure that the exposure limits will not be exceeded.

The worse-case radiation hazards exist exists above the mounting plane of the antenna along the main beam axis. The antenna will be mounted on a building or vehicle rooftop so access to this region can be controlled and restricted to trained personnel so this case applies to personnel commissioning and testing the antenna. Transmit operations will only be conducted with a clear field of view towards the serving satellite so that the beam does not impose on any uncontrolled areas. By maintaining a safety radius of 22 meters in the boresight direction during transmit operations in this region, it can be guaranteed that the General Population/Uncontrolled Exposure limits will not be exceeded under any test conditions.

Below the mounting plane of the antenna radiation exposure can only occur through sidelobes, which are substantially attenuated. In this case, the safety radius where the General Population/Uncontrolled Exposure limits are satisfied is 4.0 meters in the worst case direction. The antenna will be mounted in such a way that the general population cannot approach to within the safety radius when below the plane of the antenna so that the General Population/Uncontrolled Exposure limits will not be exceeded under any test conditions.

EXHIBIT 2

Anita Kartic, 26200 Enterprise Way, Lake Forest, CA 92630,

United States of America
FEDERAL COMMUNICATIONS COMMISSION
EXPERIMENTAL
SPECIAL TEMPORARY AUTHORIZATION

EXPERIMENTAL	WD9XQT
(Nature of Service)	(Call Sign)
XD MO	0544-EX-ST-2008
(Class of Station)	(File Number)

NAME Panasonic Avionics Corporation

This Special Temporary Authorization is granted upon the express condition that it may be terminated by the Commission at any time without advance notice or hearing if in its discretion the need for such action arises. Nothing contained herein shall be construed as a finding by the Commission that the authority herein granted is or will be in the public interest beyond the express terms hereof.

This Special Temporary Authorization shall not vest in the grantee any right to operate the station nor any right in the use of the frequencies designated in the authorization beyond the term hereof, nor in any other manner than authorized herein. Neither the authorization nor the right granted hereunder shall be assigned or otherwise transferred in violation of the Communications Act of 1934. This authorization is subject to the right of use of control the Government of the United States conferred by Section 706 of the Communications Act of 1934.

Special Temporary Authority is hereby granted to operate the apparatus described below:

Purpose Of Operation:

Testing and demonstrating Aura LE Ku-band transceiver terminals for purposes associated with the planned eXConnect Ku-band aeronautical mobile-satellite service (AMSS) system.

Station Locations

(1) MOBILE: 100 mile radius from test site in Lake Forest, California, within 160 km, centered around NL 38-39-55; WL 117-40-31

(2) MOBILE: 100 mile radius from test site in Bothell, Washington, within 160 km, centered around NL 47-47-40; WL 122-11-46

(3) MOBILE: 100 mile radius from test site in Herndon, Virginia, within 160 km, centered around NL 38-57-08; WL 77-25-04

(4) MOBILE: 100 mile radius from test site in Mountainside, Maryland, within 160 km, centered around NL 39-36-06; WL 77-45-46

(5) MOBILE: 100 mile radius from test site in Washington, DC, within 160 km, centered around NL 38-56-32; WL 77-03-56

(6) MOBILE: 100 mile radius from test site in Norcross, Georgia, within 160 km, centered around NL 33-58-01; WL 84-13-45

This authorization effective December 02, 2008 and will expire 3:00 A.M. EST June 01, 2009

FEDERAL COMMUNICATIONS COMMISSION

Frequency Information

MOBILE: 100 mile radius from test site in Lake Forest, California, within 160 km, centered around NL 38-39-55; WL 117-40-31

Frequency	Station Class	Emission Designator	Authorized Power	Frequency Tolerance (+/-)
14000-14470 MHz	MO	2M56G7D	38.5 kW (ERP)	

MOBILE: 100 mile radius from test site in Bothell, Washington, within 160 km, centered around NL 47-47-40; WL 122-11-46

Frequency	Station Class	Emission Designator	Authorized Power	Frequency Tolerance (+/-)
14000-14470 MHz	MO	2M56G7D	38.5 kW (ERP)	

MOBILE: 100 mile radius from test site in Herndon, Virginia, within 160 km, centered around NL 38-57-08; WL 77-25-04

Frequency	Station Class	Emission Designator	Authorized Power	Frequency Tolerance (+/-)
14000-14470 MHz	MO	2M56G7D	38.5 kW (ERP)	

MOBILE: 100 mile radius from test site in Mountainside, Maryland, within 160 km, centered around NL 39-36-06; WL 77-45-46

Frequency	Station Class	Emission Designator	Authorized Power	Frequency Tolerance (+/-)
14000-14470 MHz	MO	2M56G7D	38.5 kW (ERP)	

Frequency Information

MOBILE: 100 mile radius from test site in Washington, DC, within 160 km, centered around NL 38-56-32; WL 77-03-56

Frequency	Station Class	Emission Designator	Authorized Power	Frequency Tolerance (+/-)
14000-14402 MHz	MO	2M56G7D	38.5 kW (ERP)	
14422-14470 MHz	MO	2M56G7D	38.5 kW (ERP)	

MOBILE: 100 mile radius from test site in Norcross, Georgia, within 160 km, centered around NL 33-58-01; WL 84-13-45

Frequency	Station Class	Emission Designator	Authorized Power	Frequency Tolerance (+/-)
14000-14470 MHz	MO	2M56G7D	38.5 kW (ERP)	

Special Conditions:

(1) In lieu of frequency tolerance, the occupied bandwidth of the emission shall not extend beyond the band limits set forth above.

(2) The frequency band 14.47 GHz to 14.5 GHz shall be notched to protect Radio Astronomy Operations.

(3) The frequency 14412 MHz +/- 10 MHz shall be protected in the Washington, DC metropolitan area.

EXHIBIT 3

Robert Condurso
Director, Government and Regulatory Affairs

135 Routes 202/206
Bedminster, NJ 07921
U.S.A.
Tel: +1 (908) 698-4882
Fax: +1 (908) 719-0226
E-mail: rcondurso@telesat.com

February 8, 2010

Federal Communications Commission
International Bureau
445 12th Street, S.W.
Washington, D.C. 20554

To Whom It May Concern:

This letter certifies that Telesat Canada ("Telesat") is aware that Panasonic Avionics Corporation ("PAC") is seeking FCC authorization to access the Telstar 14 satellite at 63° WL,[1] as an authorized point of communication, for its eXConnect Ku-band aeronautical mobile-satellite service ("AMSS") system using transmit/receive antennas that are not strictly compliant with the FCC's antenna gain requirements.[2] However, as described below, Telesat believes that the terminals comply with the FCC's two-degree spacing rules by maintaining off-axis EIRP spectral density levels below those set forth in analogous Ku-band earth stations onboard vessels ("ESV") and vehicle-mounted earth stations ("VMES") rules.[3]

Telesat understands that PAC plans to operate two AMSS antenna types: (i) the MELCO antennas previously operated with the Connexion by Boeing system; and (ii) the Aura LE antenna designed specifically for the eXConnect system and manufactured by EMS Technologies. We understand that the MELCO antenna is a mechanically-steered Cassegrain antenna with an elliptical profile that was previously examined by the FCC and authorized for AMSS operations in experimental Call Sign WC2XVE (File No. 0002-EX-PL-2004) and commercial blanket license Call Sign E000723 (File No. SES-MOD-20030512-00639). We understand that the Aura LE antenna is a mechanically steered, flat-plate AES with two transmit/receive apertures that is similarly designed

[1] Telesat, through its subsidiary Telesat Brasil Capacidade de Satelites Ltda., operates the Telstar 14 satellite pursuant to a license issued by Brazil. Telstar 14 has been granted FCC authority to serve the United States.

[2] *See* 47 CFR §25.209.

[3] *See* 47 CFR §25.222.

to meet the technical requirements imposed on U.S. and international AMSS operations.[4] The basic characteristics of the MELCO and Aura LE antennas, as specified by the manufacturers, are also summarized in Table 1.

Table 1. Aura LE and MELCO Antenna Characteristics

Characteristic	EMS Aura LE	MELCO Reflector
Frequency	Tx: 14.0 GHz to 14.5 GHz Rx: 10.7 GHz to 12.75 GHz (11.7-12.2 GHz in the U.S.)	Tx: 14.0 GHz to 14.4 GHz Rx: 11.2 GHz to 12.8 GHz (11.7-12.2 GHz in the U.S.)
Aperture Size	2 Apertures of 35" X 6" each	25.6" X 7.7"
EIRP	42.5 dBW @ 5 deg Elevation 48.0 dBW @ 90 deg Elevation	47.2 dBW
G/T	11 dB/K @ 5 deg Elevation 14 dB/K @ 90 deg Elevation	8.0 dB/K @ 11.2 to 11.7GHz 9.3 dB/K @ 11.9 to 12.8GHz
Tracking Rate	40 deg/sec in Azimuth 25 deg/sec in Elevation	40 deg/sec in Azimuth 25 deg/sec in Elevation
Az Pointing Accuracy	0.2 deg 1-sigma	0.25 deg 1-sigma

Based on our review of the technical specifications and conversations with PAC, we understand that both the MELCO and Aura LE antennas are designed to maintain pointing towards the intended satellite through the full range of maneuvers carried out by commercial aircraft. The antennas are pointed based on aircraft position and attitude information obtained from the ARINC 429 data bus, which is standard on commercial aircraft. This information is augmented with higher rated data from an inertial sensor package that is integrated with the antenna and compensates for Inertial Navigation System ("INS") errors that result from latency and bending of the airframe between the aircraft INS unit and the antenna. The pointing accuracy of the MELCO reflector is 0.25 deg 1-sigma and the pointing accuracy of the EMS Aura LE antenna will be less than 0.2 deg 1-sigma. Pointing error will be continuously monitored and if it ever exceeds 0.5 degrees, then transmissions will be automatically inhibited within 100 ms.[5]

The FCC's off axis EIRP spectral density limits for analogous ESV and VMES operations are defined by Sections 25.222(a)(1) and 25.226(a)(1)(i). The effective off-axis EIRP spectral density generated by a conforming terminal will be:

$15-25\log_{10}(\Theta + 0.2)$	dBW/4 kHz	for	$1.5° \leq \Theta \leq 7°$
-6	dBW/4 kHz	for	$7° < \Theta \leq 9.2°$
$18-25\log_{10}(\Theta + 0.2)$	dBW/4 kHz	for	$9.2° < \Theta \leq 48°$
-24	dBW/4 kHz	for	$48° < \Theta \leq 85°$

[4] The Aura LE antenna's two transmit/receive apertures are coherently combined to form a single beam. At very low elevation angles, only the front aperture is used due to blockage. This allows the antenna to maintain high performance over a large range of elevation angles between 5 degrees and 90 degrees while maintaining a low profile for aerodynamic integration with an aircraft.

[5] *See* 47 C.F.R. § 25.222(a)(7) (Ku-band ESVs) and § 25.226(b)(1)(iv)(B)(Ku-band VMESs).

-14 dBW/4 kHz for $85° < \Theta \leq 180°$

where Θ is the angle in degrees from the line connecting the focal point of the antenna to the orbital location of the target satellite.

We have been advised by PAC that the eXConnect system will limit off-axis EIRP spectral density to no more than these levels through various means, including: (i) limiting transmit power spectral density by controlling the transmit power of the terminal and by selecting appropriate carrier bandwidths; (ii) controlling the off-axis gain of the antenna along the GSO by inhibiting transmissions when the skew angle exceeds a specified threshold; and (iii) controlling pointing error and inhibiting transmissions when the pointing offset exceeds a threshold of 0.5 deg. The specific transmit power, bandwidth and skew angle thresholds will be selected based on the desired terminal transmission rates, coverage area, and satellite performance.

Based on the foregoing factors and discussions with PAC, we understand that the MELCO antenna will operate at a maximum input power density at the antenna waveguide flange of -21.6 dBW /4 kHz, employing BPSK modulation; and the Aura LE antenna will operate at a maximum input power density at the antenna waveguide flange of -15.1 dBW /4 kHz, employing BPSK modulation. Even in the rare circumstance when transmitting at pointing offsets equivalent to their design tolerances, we believe that these antenna terminals are compliant with the off-axis EIRP density level requirements specified in Sections 25.222 and 25.226, or the combined effect of Sections 25.209 and 25.212(c) of the FCC's rules, at all off-axis angles up to and including 6 degrees off-axis angle. PAC has advised us that it includes antenna pointing offsets in selecting the maximum power levels defined above to ensure that the operation of these antennas, with the associated off-axis EIRP density envelope, will not cause unacceptable interference into adjacent satellites.

Based on the above advice and understandings, Telesat agrees that the use of the above antennas will not cause unacceptable interference into adjacent satellites in accordance with the FCC's two-degree spacing policy, and that these antennas will not require more protection from adjacent satellites compared to an earth station employing an antenna conforming to the FCC antenna performance standards defined in Section 25.209 of the FCC rules. PAC has represented to Telesat that the antennas will be installed in compliance with the technical, operational and performance requirements of Part 25 of the FCC rules and any requirements set forth in the licenses granted by the FCC for the above AMSS antenna system. If the use of these antennas should cause unacceptable interference into other systems, PAC has agreed that it will terminate transmission immediately upon notice from the affected parties.

Telesat further states that the maximum downlink satellite EIRP density of 13.0 dBW/4KHz, the operational level of the Ku-band AMSS network operated by PAC, is routinely used by satellite operators during frequency coordination at two-degree spacing without causing unacceptable interference to adjacent satellite operators.

Finally, Telesat confirms that the PAC Ku-band AMSS operations described above fall within the operating parameters previously coordinated with adjacent satellite operators within +/- 6 degrees of Telstar 14. Since the Telstar 14 satellite commenced commercial operations, Ku-band operations have been supported that are consistent with these coordination agreements. Telesat has no current plans to alter the coordinated operating parameters for the Telstar 14 satellite.

Sincerely,

Robert Condurso

Robert Condurso
for Telesat Canada

8 Feb 2010
Date

Acceptance by Panasonic Avionics Corporation:

PAC testifies that the information provided to Telesat Canada and reflected in this affidavit is true and accurate to the best of PAC's knowledge.

Paul Sarraffe

Paul Sarraffe
Panasonic Avionics Corporation
eXConnect Systems Engineering

9-Feb-2010
Date

Telesat

August 5, 2010

Federal Communications Commission
International Bureau
445 12th Street, S.W.
Washington, D.C. 20554

To Whom It May Concern:

This letter supplements the letter dated February 8, 2010 from Telesat Canada ("Telesat") regarding Panasonic Avionics Corporation's ("PAC") proposed Ku-band aeronautical mobile-satellite service ("AMSS") operations with the Telstar 14 satellite at 63° W.L. Telesat confirms that so long as PAC maintains FCC authority to communicate with Telstar 14, Telesat will take into account the technical parameters described in the aforementioned letter in all future satellite network coordinations for the satellite.

Sincerely,

Robert Condurso
for Telesat Canada

August 5, 2010
Date

Acceptance by Panasonic Avionics Corporation:

PAC hereby certifies that it will comply with all coordination agreements reached by Telesat for the Telstar 14 satellite.

Paul Saraffe
Panasonic Avionics Corporation
eXConnect Systems Engineering

8/5/10
Date

December 16, 2009

INTELSAT

Federal Communications Commission
International Bureau
445 12th Street, S.W.
Washington, D.C. 20554

To Whom It May Concern:

This letter certifies that Intelsat is aware that Panasonic Avionics Corporation ("PAC") is seeking FCC authorization to access Galaxy 17 at 91° WL, as an authorized point of communication, for its eXConnect Ku-band aeronautical mobile-satellite service (""AMSS") system using transmit/receive antennas that are not strictly compliant with the FCC's antenna gain requirements.[1] However, as described below, the terminals comply with the FCC's two-degree spacing rules by maintaining off-axis EIRP spectral density levels below those set forth in analogous Ku-band earth stations onboard vessels ("ESV") and vehicle-mounted earth stations ("VMES") rules.[2]

Intelsat understands that PAC plans to operate two AMSS antenna types: (i) the MELCO antennas previously operated with the Connexion by Boeing system; and (ii) the Aura LE antenna designed specifically for the eXConnect system and manufactured by EMS Technologies. The MELCO antenna is a mechanically-steered Cassegrain antenna with an elliptical profile that was previously examined by the FCC and authorized for AMSS operations in experimental Call Sign WC2XVE (File No. 0002-EX-PL-2004) and commercial blanket license Call Sign E000723 (File No. SES-MOD-20030512-00639). The Aura LE antenna is a mechanically steered, flat-plate AES with two transmit/receive apertures that is similarly designed to meet the technical requirements imposed on U.S. and international AMSS operations.[3] The basic

[1] *See* 47 CFR §25.209.

[2] *See* 47 CFR §25.222.

[3] The Aura LE antenna's two transmit/receive apertures are coherently combined to form a single beam. At very low elevation angles, only the front aperture is used due to blockage. This allows the antenna to maintain high performance over a large range of elevation angles between 5 degrees and 90 degrees while maintaining a low profile for aerodynamic integration with an aircraft.

characteristics of the MELCO and Aura LE antenna are also summarized in Table 1.

Table 1. Aura LE and MELCO Antenna Characteristics

Characteristic	EMS Aura LE	MELCO Reflector
Frequency	Tx: 14.0 GHz to 14.5 GHz Rx: 10.7 GHz to 12.75 GHz (11.7-12.2 GHz in the U.S.)	Tx: 14.0 GHz to 14.4 GHz Rx: 11.2 GHz to 12.8 GHz (11.7-12.2 GHz in the U.S.)
Aperture Size	2 Apertures of 35" X 6" each	25.6" X 7.7"
EIRP	42.5 dBW @ 5 deg Elevation 48.0 dBW @ 90 deg Elevation	47.2 dBW
G/T	11 dB/K @ 5 deg Elevation 14 dB/K @ 90 deg Elevation	8.0 dB/K @ 11.2 to 11.7GHz 9.3 dB/K @ 11.9 to 12.8GHz
Tracking Rate	40 deg/sec in Azimuth 25 deg/sec in Elevation	40 deg/sec in Azimuth 25 deg/sec in Elevation
Az Pointing Accuracy	0.2 deg 1-sigma	0.25 deg 1-sigma

Both the MELCO and Aura LE antennas are designed to maintain pointing towards the intended satellite through the full range of maneuvers carried out by commercial aircraft. The antennas are pointed based on aircraft position and attitude information obtained from the ARINC 429 data bus, which is standard on commercial aircraft. This information is augmented with higher rated data from an inertial sensor package that is integrated with the antenna and compensates for INS errors that result from latency and bending of the airframe between the aircraft INS unit and the antenna. The pointing accuracy of the MELCO reflector is 0.25 deg 1-sigma and the pointing accuracy of the EMS Aura LE antenna will be less than 0.2 deg 1-sigma. Pointing error will be continuously monitored and if it ever exceeds 0.5 degrees, then transmissions will be automatically inhibited within 100 ms.[4]

The FCC's off axis EIRP spectral density limits for analogous ESV and VMES operations are defined by Sections 25.222(a)(1) and 25.226(a)(1)(i). The effective off-axis EIRP spectral density generated by a conforming terminal will be:

$15-25\log10(\Theta + 0.2)$	dBW/4 kHz	for	$1.5° \leq \Theta \leq 7°$
-6	dBW/4 kHz	for	$7° < \Theta \leq 9.2°$
$18-25\log10(\Theta + 0.2)$	dBW/4 kHz	for	$9.2° < \Theta \leq 48°$
-24	dBW/4 kHz	for	$48° < \Theta \leq 85°$
-14	dBW/4 kHz	for	$85° < \Theta \leq 180°$

where Θ is the angle in degrees from the line connecting the focal point of the antenna to the orbital location of the target satellite.

[4] *See* 47 C.F.R. § 25.222(a)(7) (Ku-band ESVs) and § 25.226(b)(1)(iv)(B)(Ku-band VMESs).

INTELSAT

The eXConnect system will limit off-axis EIRP spectral density to no more than this level through various means, including: (i) limiting transmit power spectral density by controlling the transmit power of the terminal and by selecting appropriate carrier bandwidths; (ii) controlling the off-axis gain of the antenna along the GSO by inhibiting transmissions when the skew angle exceeds a specified threshold and(iii) controlling pointing error and inhibiting transmissions when the pointing offset exceeds a threshold of 0.5 deg. The specific transmit power, bandwidth and skew angle thresholds will be selected based on the desired terminal transmission rates, coverage area, and satellite performance.

Based on the foregoing factors, the MELCO antenna will operate at a maximum input power density at the antenna waveguide flange of -21.6 dBW /4 kHz, employing BPSK modulation; and the Aura LE antenna will operate at a maximum input power density at the antenna waveguide flange of -15.1 dBW /4 kHz, employing BPSK modulation. Even in the rare circumstance when transmitting at pointing offsets equivalent to their design tolerances, these antenna terminals are compliant with the off-axis EIRP density level requirements specified in Sections §25.222 and §25.226, or the combined effect of §25.209 and §25.212(c) of the Commission's Rules, at all off-axis angles up to and including 6 degrees off-axis angle. PAC's conservative approach of including antenna pointing offsets in selecting the maximum power levels defined above ensures that the operation of these antennas, with the associated off-axis EIRP density envelope, will not cause unacceptable interference into adjacent satellites.

The undersigned further certifies that the maximum downlink satellite EIRP density of 13.0 dBW/4KHz, operational level of the Ku-band AMSS network operated by PAC, is routinely used at 2-degree spacing without causing unacceptable interference to adjacent satellite operators.

Furthermore, in order to prevent unacceptable interference into adjacent satellites, Horizons and PAC acknowledge that the antennas will be installed in compliance with the technical, operational and performance requirements of Part 25 of the FCC Rules and any requirements set forth in the licenses granted by the FCC for the above AMSS antenna system.

Horizons and PAC confirm that the use of the above antennas will not cause unacceptable interference into adjacent satellites in accordance with the FCC's two-degree spacing policy and accept that these antennas will not require more protection from adjacent satellites compared to an earth station employing an antenna conforming to the FCC antenna performance standards defined in Section 25.209 of the FCC rules. If the use of this antenna should cause unacceptable interference into other systems, PAC has agreed that it will terminate transmission immediately upon notice from the affected parties.

Sincerely,

Jose Albuquerque

16 December 2009

INTELSAT.

Jose Albuquerque
Senior Director, Spectrum Engineering
Intelsat

Date

Acceptance by Panasonic Avionics Corporation:

PAC testifies that the information provided to Intelsat and reflected in this affidavit is true and accurate to the best of PAC's knowledge.

Paul Sarraffe

Dec. 16, 2009

Paul Sarraffe
Panasonic Avionics Corporation
eXConnect Systems Engineering

Date

Acceptance by SES Americom:

SES Americom agrees to the use of the PAC MELCO and Aura LE antennas with the above power density into the antenna flange and the uplink EIRP density level as stated in this letter, with respect to SES satellites and the associated satellite networks that are within +/- 6 degrees orbital spacing from Galaxy 17 at 91° WL.

K. Jonnalagadda

16 Dec 09

Krish Jonnalagadda
Manager, Spectrum Development
SES Americom

Date

August 2, 2010

INTELSAT.

Federal Communications Commission
International Bureau
445 12th Street, S.W.
Washington, D.C. 20554

To Whom It May Concern:

This letter supplements the letter dated December 16, 2009 from Intelsat regarding Panasonic Avionics Corporation's ("PAC") proposed Ku-band aeronautical mobile-satellite service ("AMSS") operations with the Galaxy 17 satellite at 91° W.L. Intelsat confirms that so long as PAC maintains FCC authority to communicate with Galaxy 17, Intelsat will include the technical parameters described in the aforementioned letter in all future satellite network coordinations for the satellite.

Sincerely,

Jose Albuquerque

Jose Albuquerque
for Intelsat

Date 2 August 2010

Acceptance by Panasonic Avionics Corporation:

PAC hereby certifies that it will comply with the all coordination agreements reached by Intelsat for the G-17 satellite.

Paul Sarraffe

Paul Sarraffe
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