APPLICATION FOR SPECIAL TEMPORARY AUTHORITY

Panasonic Avionics Corporation ("Panasonic"), licensee of the "eXConnect" Ku-band aeronautical mobile-satellite system ("AMSS") system, hereby requests a grant of experimental special temporary authority ("STA") to access the AMAZONAS-2 satellite for U.S.-registered aircraft operating within the continental United States ("CONUS"). Panasonic currently holds experimental authority[1] to operate the Panasonic phased array ("Aura LE") terminal in support of the development and initial introduction of its Global Communications Suite ("GCS") in-flight connectivity offering within CONUS.

As described below, Panasonic requests grant of the proposed STA at the earliest practicable time to address certain technical issues being experienced by a U.S. airline customer. The proposed operations are consistent with the coordinated parameters of the satellite, the Commission's two-degree spacing rules and the rules and policies recently adopted for Ku-band[2] earth stations aboard aircraft ("ESAAs").[3] Consistent with its existing experimental license, Panasonic requests authority for operation of 10 Aura LE terminals

[1] *See* ELS File No. 0281-EX-PL-2010, Call Sign WF2XMD (granted July 12, 2011). Panasonic subsequently modified this authorization to confirm compliance with ITU regulations and other applicable regulatory requirements; *see also* ELS File No. 0143-EX-ML-2012 (granted August 21, 2012) ("Experimental License").

[2] Typically, operations in the conventional Ku-band occur from 14.0 to 14.5 GHz. However, Panasonic's current experimental license specifies operations from 14.0 to 14.47 GHz, and a change to those frequencies is not sought in this submission.

[3] *See Revisions to Parts 2 and 25 of the Commission's Rules to Govern the Use of Earth Stations Aboard Aircraft Communicating with Fixed-Satellite Service Geostationary-Orbit Space Stations Operating in the 10.95-11.2 GHz, 11.45-11.7 GHz, 11.7-12.2 GHz and 14.0-14.5 GHz Frequency Bands; Service Rules and Procedures to Govern the Use of Aeronautical Mobile Satellite Service Earth Stations in Frequency Bands Allocated to the Fixed Satellite Service,* IB Docket Nos. 12-376 & 05-20, Notice of Proposed Rulemaking and Report and Order, FCC 12-161 (rel. Dec. 28, 2012) ("ESAA Order").

onboard U.S.-registered aircraft located within CONUS through July 1, 2013. For the reasons described herein, grant of the proposed STA would strongly serve the public interest.

I. DESCRIPTION OF EXPERIMENTAL OPERATIONS

Panasonic is currently authorized to operate twenty (20) Ku-band aircraft earth stations, including ten (10) Aura LE terminals, with four satellite points of communication: Horizons 1, T-14R, Galaxy 17 and Galaxy 19. Panasonic is currently operating with only two of these satellites: Galaxy 17 and T-14R. Due to certain integration issues associated with initial operations onboard a U.S. airline customer, Panasonic requires the ability to access the AMAZONAS-2 satellite to address the unexpected initial operational issues currently being experienced with CONUS flights.

Panasonic will conduct eXConnect operations onboard AMAZONAS-2 consistent with its existing experimental authority[4] and incorporates by reference the technical information submitted in that proceeding. This information, as well as more detailed technical data filed in connection with Panasonic's pending modification application for full commercial authority to operate the subject antenna,[5] confirms that operation of the Aura LE terminal will be conducted on a non-interference basis. In addition to the technical information included in this submission, Panasonic similarly incorporates by reference the technical information submitted in that proceeding. Other than access to the additional satellite point of communication proposed

[4] *See generally* Experimental License.

[5] *See* Application of Panasonic Avionics Corporation To Modify AMSS License To Permit Operation of Up to 2000 Technically Identical Aeronautical Mobile-Satellite Service ("AMSS") Aircraft Earth Stations ("AESs") in the 14.0-14.5 GHz and 10.7-12.75 GHz Frequency Bands, Call Sign E100089, File No. SES-MFS-20120913-00818, filed Sept. 13, 2012 ("Modification Application"), at Technical Appendix.

herein, Panasonic seeks no other operational or technical changes to its existing experimental authority.

Initial operations with the AMAZONAS-2 satellite will involve single beam coverage and evaluation of a number of performance objectives, including: (i) geographic mapping and automated shut-off; (ii) reliability of data link; (iii) two-way data link performance and coverage; (iv) receive-only video link performance and coverage; (v) antenna performance; (vi) Doppler correction; and (vi) network management and operation. In addition, once parallel authority is granted for operations outside CONUS, Panasonic will evaluate iDirect automatic beam switching and hand-off performance.

The Aura LE terminal will operate in a dedicated manner under close control of Panasonic's network control personnel. In addition, Panasonic will conduct initial flight operations 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 Commission rules.[6]

II. SATELLITE POINT OF COMMUNICATION – AMAZONAS-2

Panasonic seeks authority for the Aura LE terminal to communicate with the AMAZONAS-2 satellite at 61°W. Panasonic is already authorized to communicate with Telstar 14R at 63°W and Galaxy 17 at 91°W, as well as two other satellites, for CONUS operations. Because Panasonic does not actually utilize the two other satellites identified in its experimental license, the instant STA request constitutes a "substitution" of one of those satellites. In

[6] Panasonic has executed coordination agreements with both the National Science Foundation and NASA to protection U.S. government stations from potential interference. *See* Call Sign E100089, File No. SES-LIC-20100805-00992 (Attachment to Application Narrative and Section 1.65 Letter dated Feb. 1, 2011).

addition, because Panasonic is presently operating with the adjacent Telstar 14R satellite under experimental authority, the Commission can be assured that operations with AMAZONAS-2 in this region of the orbital arc for CONUS operations can be similarly conducted without interference.

As described in the attached Technical Appendix, the parameters within which Panasonic will access the North America beam of AMAZONAS- 2 are consistent with those already authorized for communications within CONUS in Panasonic's existing experimental license. Thus, grant of the instant STA request would not increase the potential for interference from Panasonic's interim experimental operations.

The eXConnect gateway earth station for operations with AMAZONAS-2 is located in Brewster, WA. Operation of the Aura LE terminals is monitored and controlled from the Panasonic Mission Control Center ("MCC") in Lake Forest, CA on a 24 hours per day, 7 days per week basis. The MCC makes use of the iDirect's Network Management System ("NMS") to provide complete control and visibility to all components of the eXConnect network. The NMS system has the capability of shutting down any component in the system that is malfunctioning. Contact information for the MCC is as follows:

Panasonic Mission Control Center
26200 Enterprise Way
Lake Forest, CA 92630
Phone: 425-415-9800 or 877-627-2300 (toll free)
Fax: 425-482-3515
Email: mcc@panasonic.aero

To the extent that any adjacent satellite operator or other user of the Ku-band experiences unacceptable interference from Panasonic's experimental operations, Panasonic will cease terminal transmissions immediately.[7]

Panasonic would also note that the AMAZONAS-2 satellite has been authorized to access the U.S. market by inclusion in the FCC's Permitted Space Station List[8] and the FCC recently concluded that it should extend ALSAT authority to Ku-band aeronautical terminals – like the Aura LE – that operate in compliance with its two-degree spacing policies.[9] However, ALSAT authority may not be available under an experimental STA. Thus, in support of its experimental STA application, Panasonic will submit a confirmation from the operator of the AMAZONAS-2 satellite that the proposed operations are consistent with its coordination agreements with potentially affected operators.[10]

The Aura LE terminal has operated with satellites around the world – including the Telstar 14R and Galaxy 17 satellite for operations within CONUS at the same power levels proposed for AMAZONAS-2 – without a single reported case of interference. This track record of non-interfering operations within CONUS and beyond further establishes that authority for the proposed operations can be granted expeditiously as requested herein.

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[7] *See* 47 C.F.R. § 5.111(a)(2).

[8] Call Sign S2793, File No. SAT-PPL-20100506-00093, grant-stamped Dec. 21, 2010; *see* also File Nos. SAT-APL-20101209-00257 and SAT-PPL-20090806-00081, grant-stamped Oct. 15, 2009.

[9] *See* ESAA Order at ¶112.

[10] Panasonic has been informed that the satellite operator letter will be finalized shortly and will supplement the instant experimental STA request as soon as the letter is available.

III. LIMITED MARKET STUDIES

Currently pending before the Commission are a blanket earth station license modification application[11] and associated STA request[12] by which Panasonic seeks commercial authority to operate the Aura LE terminal with the eXConnect system. During the pendency of these applications, Panasonic seeks to maintain authority to conduct limited market studies pursuant to the Commission's Rules.[13]

Panasonic's agreements with U.S. airline customers require certain flight testing and trials of the eXConnect system before commencing full commercial operations. Among other things, these airlines seek to test market and collect commercial and operational data regarding eXConnect system capabilities. For its part, Panasonic uses the limited market studies to demonstrate the potential applications and performance of its terminals, and to collect engineering and operational data regarding these uses.

Panasonic therefore seeks to maintain limited market study authority that will permit it (and its U.S. airline customers) to evaluate the commercial viability and usage characteristics of its system. Through the market studies, Panasonic seeks to obtain further information regarding the frequency and duration of use, data rates achieved to and from aircraft and aggregate data rates achieved in the network. Panasonic also seeks to validate the network's performance by collecting data relating to quality of service, including bit error rates, latency and possible degradation of service at the edge of service contours.

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[11] *See* Modification Application.

[12] *See* Call Sign E100089, File No. SES-STA-20120913-00820, filed Sept. 13, 2012 ("STA Request").

[13] *See* 47 C.F.R. § 5.3(j), *see also* 47 C.F.R. § 5.93.

The Commission has previously permitted limited market studies in the context of experimental Ku-band AMSS operations.[14] In addition, Panasonic's existing experimental license includes limited market study authority. Panasonic does not seek to extend the period or scope of its existing authority, but rather seeks to ensure such authority is available for communications with AMAZONAS-2 for U.S.-registered aircraft. Furthermore, consistent with the Commission's rules, Panasonic will inform its customers that its in-flight connectivity operations are being conducted only on a temporary basis under experimental authority.

IV. CONCLUSION

Panasonic requests authority to communicate with the AMAZONAS-2 satellite at the earliest practicable time, but does not otherwise seek to change the scope or duration of its existing experimental authority. Grant of the instant STA request will allow Panasonic the ability to address pressing implementation issues and further develop the eXConnect system for U.S.-registered aircraft operating within CONUS. Panasonic respectfully requests that the Commission expeditiously grant the requested STA in order to facilitate the continued implementation of in-flight connectivity offerings to passengers and crews onboard U.S.-registered aircraft.

[14] *See, e.g.*, ARINC Experimental Authorization, Call Sign WC2XPE, File No. 0029-EX-ML-2004.

ATTACHMENT 1

TECHNICAL APPENDIX

I. OVERVIEW OF AURA LE OPERATIONS

The Aura LE was developed to optimize performance of the eXConnect System. It is a dual-panel, mechanically steered antenna designed for installation and operation onboard aircraft. The Aura LE has been certified for aviation safety and currently is in operation onboard dozens of aircraft, including a small number of U.S.-registered aircraft. The antenna also complies with the provisions governing Ku-band AMSS operations embodied in Recommendation ITU-R M.1643, as well as U.S. and international rules and policies governing such operations. Consistent with Commission policy and precedent, interference will be avoided by controlling the off-axis EIRP spectral density emissions along the GSO arc to protect adjacent FSS satellites, and by coordination, frequency avoidance and/or exclusion zones with respect to other users of the Ku-band.

A. Antenna Pointing

Pointing for the Aura LE is accomplished via mechanical steering of the antenna and uses the aircraft attitude data (*i.e.*, yaw, roll, pitch and heading vector), together with location of the terminal (latitude, longitude, and altitude) to calculate the command vectors. This data, available from the ARINC 429 bus, is used in conjunction with the satellite coordinates to yield continuously updated steering commands for the antenna elevation, azimuth, and polarization. A local inertial sensor package placed on the antenna base plate itself provides high rate antenna attitude sensing, which compensates for possible aircraft inertial navigation system ("INS") errors caused by airframe deformation and data latency.

The pointing error of the Aura LE will be less than 0.2 degrees 3-sigma.[15] Pointing error will be monitored and emissions will be inhibited within 100 milliseconds if the pointing error ever exceeds 0.35 degrees. Panasonic has taken a conservative approach in setting the off-axis value for muting transmission and including Aura LE pointing offset and skew in setting maximum permissible transmit powers and skew angles such that even if mispointed 0.35 degrees (the point at which the antenna automatically mutes transmissions), the Aura LE will not exceed permissible off-axis EIRP spectral density levels.

B. Off-Axis EIRP Levels

Control of off-axis EIRP spectral density is essential to protect adjacent satellites operating in the Ku-band. Panasonic will control the off-axis EIRP spectral density generated by a single terminal so that it is no greater than is accepted for other Ku-band terminals operating with FSS satellites. This is consistent with FCC licensing conditions in the AMSS context, as well as the Commission's newly adopted Ku-band earth stations aboard aircraft ("ESAA") rules. To the extent that any adjacent satellite operator experiences harmful interference from Aura LE terminal operations, Panasonic will cease terminal transmissions immediately.

An example off-axis EIRP spectral density plot is shown in Figures 1 and 2, below. Panasonic has taken the conservative approach of including the Aura LE's maximum pointing offset and skew angles in setting maximum transmit power levels. Thus, the terminal's off-axis EIRP spectral density remains well below the U.S. off-axis EIRP spectral density limit (the two-

[15] Operational and test flight data confirms these conclusions regarding pointing accuracy. Indeed, in a recent assessment, there were no instances above 10,000 feet where the measured error exceeded 0.2 degrees peak (excluding beam switches, of course, which involve antenna repointing to a new satellite while muted). Our analysis shows that the standard deviation (1-sigma) for pointing error is 0.02 degrees, so the 3-sigma value is only 0.06 degrees during standard flight operations. Factoring in on-ground and take-off/landing modes, the 3-sigma value is well under 0.15 degrees.

degree spacing limit) for the main lobe, shown in the solid red line (using the analogous limits in Section 25.222), even at maximum pointing offset.[16]

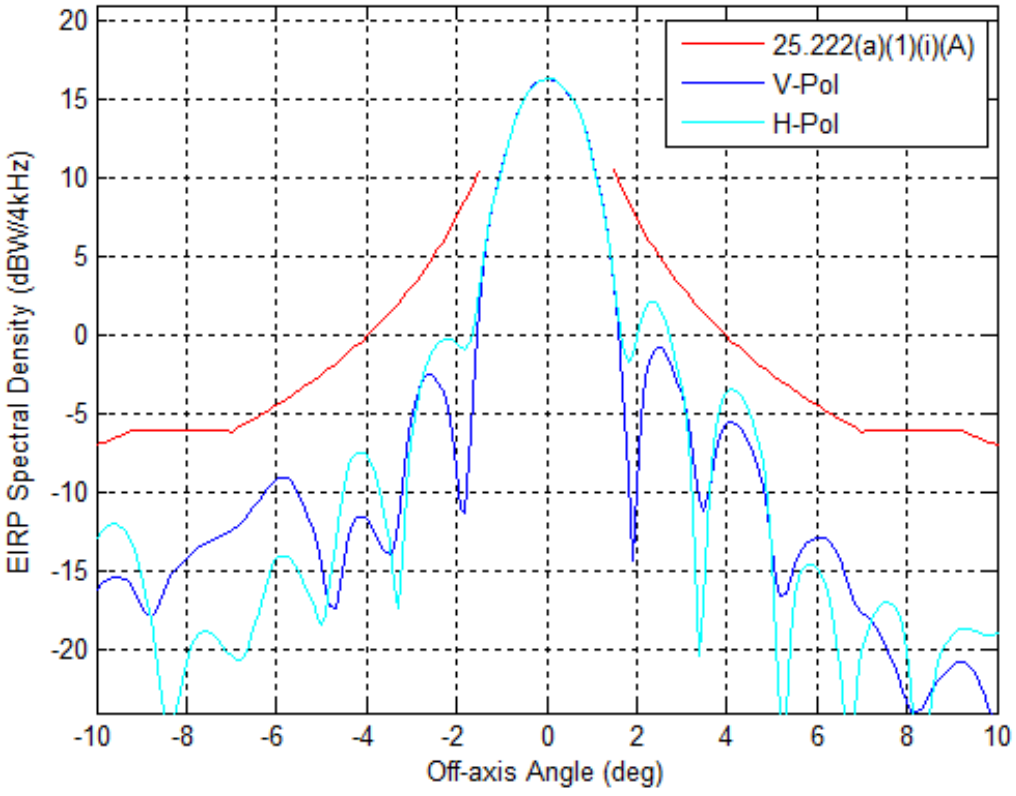

Figure 1. Maximum Off-axis EIRP Spectral Density of the Aura LE Antenna (0º-10º Off-Axis)

[16] The minor excursion in Figure 2 is consistent with the Commission's rules. *See* 47 C.F.R. § 25 222(a)(1)(i)(A).

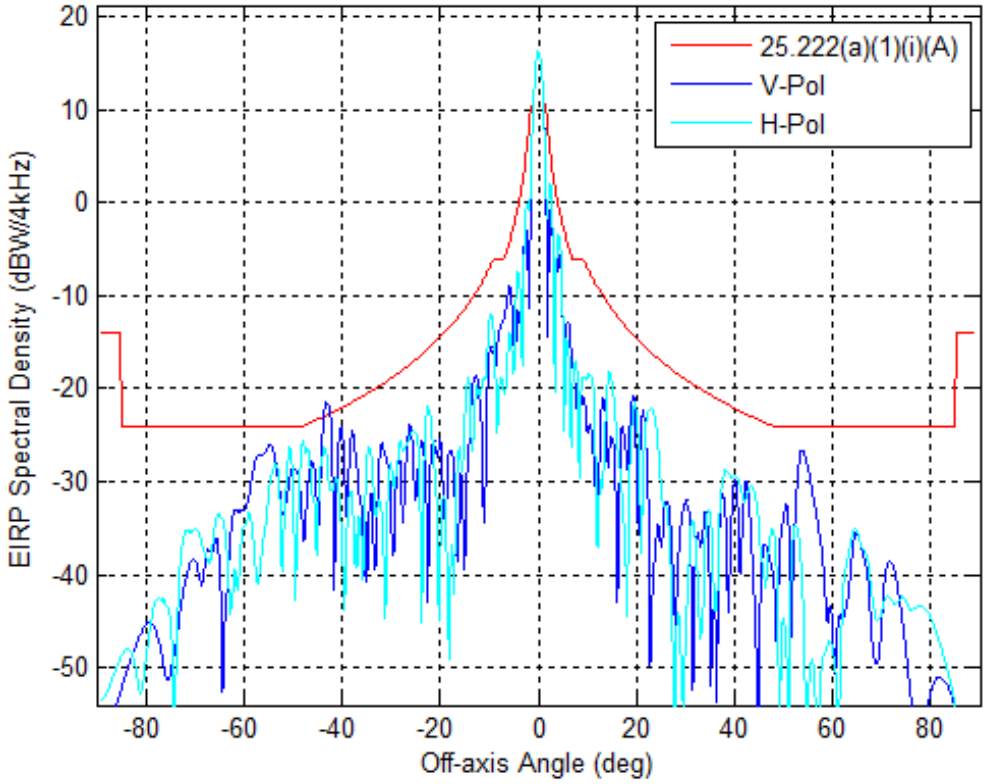

Figure 2. Maximum Off-axis EIRP Spectral Density of the Aura LE Antenna (0º-90º Off-Axis)

It should be emphasized that the example in Figures 1 and 2 is an extreme case: worst-case power, edge of coverage, worst-case skew, etc. (14.25 GHz, 35ºskew angle, 45º elevation angle in San Diego, CA), and reaching the limits in this way will only occur very rarely if at all.

Panasonic proposes to operate the Aura LE terminal with the AMAZONAS-2 satellite using the following emission designators 500KG7D and 9M00G7D, which reflect the typical emissions included in Panasonic's Modification Application currently pending before the

Commission. Although these emission designators differ somewhat from those included in the existing experimental license, they are within the authorized power and power spectral densities and they are consistent with the Commission's two-degree spacing rules. Panasonic would also note that, consistent with its existing experimental license, it has incorporated the maximum transmit ERP of 38.5 kW in this STA request. However, from a practical standpoint the Aura LE antenna actually will transmit at lower ERP levels.

II. LINK BUDGETS

Forward and return link budgets detailing operation of the Aura LE terminals with the AMAZONAS-2 satellite are shown below:

AMAZONAS-2

Forward Link Budget

eXConnect Terminal

Site	Brewster	
Antenna Type	EMS Revised Noise Temperature	
Lat	47.5	deg
Lon	-120.4	deg
EIRP max	42.5	dBW
G/T	10.0	dB/K

Satellite

Name	Amazonas-2	
Transponder	0.0	
Longitude	-61.0	deg

Hub Earth Station

Site	Brewster_6.3m	
Lat	48.1	deg
Lon	-119.8	deg
EIRP max	80.0	dBW
G/T	35.0	dB/K

Signal

Waveform	DVB-S2	
Modulation	QPSK	
Bits per symbol	2	
Spread Factor	1	
Coding Rate	0.89	
Overhead Rate	0.95	
Channel Spacing	1.20	
Spectral Efficiency (Rate/Noise BW)	1.69	bps/Hz
Data Rate	5.06E+07	bps
Information Rate (Data + Overhead)	5.33E+07	bps
Symbol Rate	3.00E+07	Hz
Chip Rate (Noise Bandwidth)	3.00E+07	Hz
Occupied Bandwidth	3.60E+07	Hz
Power Equivalent Bandwidth	3.60E+07	Hz
C/N Threshold	6.6	dB

Return Link Budget

eXConnect Terminal

Site	Brewster	
Antenna Type	EMS Revised Noise Temperature	
Lat	47.5	deg
Lon	-120.4	deg
EIRP max	42.5	dBW
G/T	10.0	dB/K

Satellite

Name	Amazonas-2	
Transponder	0.0	
Longitude	-61.0	deg

Hub Earth Station

Site	Brewster_6.3m	
Lat	48.1	deg
Lon	-119.8	deg
EIRP max	80.0	dBW
G/T	35.0	dB/K

Signal

Waveform	iDirectRL-SF4	
Modulation	BPSK	
Bits per symbol	1	
Spread Factor	4	
Coding Rate	0.43	
Overhead Rate	0.68	
Channel Spacing	1.20	
Spectral Efficiency (Rate/Noise BW)	0.07	bps/Hz
Data Rate	4.85E+05	bps
Information Rate (Data + Overhead)	7.18E+05	bps
Symbol Rate	1.67E+06	Hz
Chip Rate (Noise Bandwidth)	6.66E+06	Hz
Occupied Bandwidth	7.99E+06	Hz
Power Equivalent Bandwidth	4.77E+05	Hz
C/N Threshold	-5.0	dB

Uplink

Frequency	14.250	GHz
Power Control Mode	Automatic Uplink Power Control	
Back off	12.3	dB
EIRP Spectral Density	29.0	dBW/4kHz
Slant Range	40405	km
Space Loss, Ls	207.7	dB
Pointing Loss, Lpnt	0.0	dB
Atmosphere / Weather Loss, La	2.6	dB
Radome, Lr	0.0	dB
Transponder G/T @ Hub	4.0	dB/K
Thermal Noise, C/No	90.1	dBHz
Intra-System Interference, C/Io ISI	1000.0	dBHz
Adj. Satellite Interference, C/Io ASI	99.2	dBHz
Cross-Pol Interference, C/Io XP	196.9	dBHz
C/(No+Io)	89.6	dBHz

Satellite

Flux Density	-98.0	dBW/m2
SFD @ Hub	-96.0	dBW/m2
Small Signal Gain (IBO/OBO)	1.0	dB
OBO	1.0	dB

Uplink

Frequency	14.144	GHz
Power Control Mode	Automatic Uplink Power Control	
Back off	0.0	dB
EIRP Spectral Density	10.3	dBW/4kHz
Slant Range	40419	km
Space Loss, Ls	207.6	dB
Pointing Loss, Lpnt	0.1	dB
Atmosphere / Weather Loss, La	0.0	dB
Radome, Lr	0.0	dB
Transponder G/T @ Terminal	4.0	dB/K
Thermal Noise, C/No	67.4	dBHz
Intra-System Interference, C/Io ISI	1000.0	dBHz
Adj. Satellite Interference, C/Io ASI	76.5	dBHz
Cross-Pol Interference, C/Io XP	173.7	dBHz
C/(No+Io)	66.9	dBHz

Satellite

Flux Density	-120.8	dBW/m2
SFD @ Terminal	-96.0	dBW/m2
Small Signal Gain (IBO/OBO)	3.0	dB
OBO	21.8	dB

Downlink

Frequency	11.950	GHz
Transponder Sat. EIRP @ Beam Peak	54.5	dBW
Transponder Sat. EIRP @ Terminal	53.0	dBW
DL PSD Limit	15.0	dBW/4kHz
DL PSD @ Beam Peak	14.8	dBW/4kHz
Carrier EIRP @ Beam Peak	53.5	dBW
Carrier EIRP @ Terminal	52.0	dBW
Slant Range	40419	km
Space Loss, Ls	206.1	dB
Pointing Loss, Lpnt	0.1	dB
Atmosphere / Weather Loss, La	0.0	dB
Radome, Lr	0.0	dB
PCMA Loss	0.0	dB
Thermal Noise, C/No	84.4	dBHz
Intermod. Interference, C/IMo	175.6	dBHz
Intra-System Interference, C/Io ISI	1000.0	dBHz
Adj. Satellite Interference, C/Io ASI	91.6	dBHz
Cross-Pol Interference, C/Io XP	183.8	dBHz
C/(No+Io)	83.6	dBHz

End to End

End to End C/(No+Io)	82.7	dBHz
Implementation Loss	1.0	dB
End to End C/N w/ Imp Loss	6.9	dB
Link Margin	0.3	dB

Downlink

Frequency	11.844	GHz
Transponder Sat. EIRP @ Beam Peak	54.5	dBW
Transponder Sat. EIRP @ Hub	53.0	dBW
DL PSD Limit	15.0	dBW/4kHz
DL PSD @ Beam Peak	0.5	dBW/4kHz
Carrier EIRP @ Beam Peak	32.8	dBW
Carrier EIRP @ Hub	31.2	dBW
Slant Range	40405	km
Space Loss, Ls	206.0	dB
Pointing Loss, Lpnt	0.0	dB
Atmosphere / Weather Loss, La	3.0	dB
Radome, Lr	0.0	dB
PCMA Loss	0.0	dB
Thermal Noise, C/No	85.7	dBHz
Intermod. Interference, C/IMo	156.8	dBHz
Intra-System Interference, C/Io ISI	1000.0	dBHz
Adj. Satellite Interference, C/Io ASI	94.9	dBHz
Cross-Pol Interference, C/Io XP	163.0	dBHz
C/(No+Io)	85.2422	dBHz

End to End

End to End C/(No+Io)	66.8	dBHz
Implementation Loss	0.0	dB
End to End C/N w/ Imp Loss	-1.4	dB
Link Margin	3.6	dB

III. COVERAGE AREA

AMAZONAS-2 is a Brazilian-licensed satellite located at 61°W. The relevant service area for this satellite is CONUS only, using the North America beam depicted below:

AMAZONAS-2

IV. RADIATION HAZARD INFORMATION

This report provides an analysis of 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 dependent on the situation in which the exposure takes place and/or the status of the individuals who are subject to the exposure:

- General Population/**Uncontrolled** Environment and
- **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
- 1 milliwatt per square centimeter (**1 mW/cm^2**) averaged over any 30 minute period in an **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

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

= 9.2 meters

Where **D** is the width of the panel (0.88 meters)

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

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

=6.8 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 fuselage top with the main beam pointed toward the sky at a minimum elevation angle of 10 degrees 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.

In normal operation, the transmitter is turned off or muted below 10,000 feet altitude. Clearly the general public will not be able to be in the path of a transmitting antenna.

On the ground, operation of the transmitter may be required for maintenance or testing. A manual override switch will allow ground personnel to enable the transmitter when the altitude is below 10,000 feet. This is a controlled environment. Personnel must be trained in the safe operation of the transmitter.

Additionally, 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)

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

$= 22$ m

$S_{ff} = P_{EIRP} /(4$

$=1.0$ 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.

Maximum far field exposure to humans would be due to a sidelobe which is at least 15 dB below the main beam. 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 the near to the far field.

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		34.7 in	0.88 m
Height		6.6 in	0.17 m
Surface Area			0.148 m^2
Frequency			14250 MHz
Wavelength			0.0211 m
(Lambda) Transmit Power	P_{SSPA}		10 W
Transmit Power Antenna Gain	G_{PEIRP}		10 dBW 38 dBi 48 dBW
Near Field (Azimuth)			
Boundary	D^2/(4 lambda)		**9.2** m
Power Density	Pssp.4./A		**6.8** mW/CM^2
Far Field (Azimuth)			
Boundary	$0.6D^2$/lambda		22 m
Power Density	$P_{EIRP}/(4piR^2)$		1.0 mW/cm^2
Side Lobe Level			-15 dB
Power Density	$P_{EIRP}/(4piR^2)$		**0.032 m** W/CM^2
Transition Region (Azimuth) Safe Distance			**13** m
Power Density	linear interpolation		**5.0** mW/CM^2
Far Field (Elevation)			
Boundary	$0.6D^2$/lambda		**0.8** m
Power Density	$P_{EIRP}/(4piR^2)$		782.7 mW/cm^2
Elevation Side Lobe Level			-15 dB
Power Density	$P_{EIRP}/(4piR^2)$		24.8 mW/CM^2
Safe Distance - Main beam			
Safe Distance			22.0 m
Power Density	$P_{EIRF}./(4piR^2)$		1.0 m W/CM^2
Safe Distance			10 m
Power Density	$P_{EIRP}/(4piR^2)$		5.0 mW/Crn^2
Safe Distance - in Sidelobe			
Safe Distance Power Density	$P_{EIRF}./(4piR^2)$		**1.8** m **5.0** mW/CM^2
Safe Distance			**4** m
Power Density	$P_{EIRP}/(4piR^2)$		**1.0** mW/Crn^2

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Conclusions

The worse-case radiation hazards exist along the main beam axis. In the case of the maintenance, it is highly unlikely that the antenna axis will be aligned with any uncontrolled area since maintenance will be carefully monitored and limited in time and transmit operations will only be conducted with a clear field of view towards the serving satellite. In this case, the safety radius where the General Population/Uncontrolled Exposure limits are satisfied is 4 meters.

Commissioning and testing of the Aura LE antenna will only be conducted by trained personnel in a controlled environment. By maintaining a safety radius of 22 meters during transmit operations, it can be guaranteed that the General Population/Uncontrolled Exposure limits will not be exceeded under any test conditions.

Panasonic shall take all reasonable and customary measures to prevent human exposure to harmful non-ionizing radiation exceeding the maximum permissible exposure limits in Section 1.1310 of the Commission's rules, 47 C.F.R. § 1.1310. The exterior surface of the antenna shall be prominently marked with a warning of the potential for exposure to high levels of radiofrequency energy.