Before the
FEDERAL COMMUNICATIONS COMMISSION
Washington, DC 20554

In the Matter of		
Application of Panasonic Avionics Corporation for Authority to Operate Up to 15 Technically Identical Aeronautical Mobile-Satellite Service ("AMSS") Aircraft Earth Stations ("AESs") in the 14.0-14.4 GHz and 11.7-12.2 GHz Frequency Bands	)	File No.

APPLICATION FOR BLANKET
AES OPERATING AUTHORITY

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Regulatory Compliance Index

FCC Rule/ ITU-R Rec.	Application/Exhibit Section and Page No.
2.106	Sec. IV. (Waiver Requested) at 9-10
25.132(b)	Sec. V.A.; B at 11-13; Technical Appendix, Appendix B at 15-19
25.134(b) & (g)	Sec. IV at 9-10; Technical Appendix, Appendix A at 14*
25.202(f)	Sec. V.B at 13; Technical Appendix 2.5.3 at 6
25.209(a)	Sec. V at 11-14; Technical Appendix 2.2 at 2-4
25.209(b)	Technical Appendix, Appendix B at 15-19
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25.212(c) & (e)	Secs. III.B.1, V at 6-7, 11-13; Technical Appendix 2.2 at 2-4*
25.220(c) &(e)	Sec. III.B.2 at 7-8; Technical Appendix 2.3 at 4-5*
25.222 and 25.226	Secs V.A,C, VI.A at 12-16; Technical Appendix 2.2.3 at 4
25.271(c)	Sec. V.C at 13; Technical Appendix 2.6 at 6-9
M.1643, Part A	Secs. III.B.1, V, VI.A,B at 6-7, 11-16; Tech. App. 3.1.1.1, 3.1.2 at 10-12*
M.1643, Part B	Sec. VI.C at 17
M.1643, Part C	Sec. VI.D at 17, Technical Appendix 3.1.4 at 13
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* Additional appendices evidencing coordination agreements with other spectrum users in the band are filed as attachments to this application to demonstrate compliance with these requirements.

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APPLICATION FOR BLANKET
AES OPERATING AUTHORITY

Panasonic Avionics Corporation ("Panasonic") hereby submits this application for blanket license authority to operate up to fifteen (15) Aeronautical Mobile-Satellite Service ("AMSS") aircraft earth stations ("AESs") in the conventional Ku-band (transmitting in 14.0-14.4 GHz and receiving in 11.7-12.2 GHz) to provide in-flight broadband services to passengers and flight crews aboard foreign commercial aircraft with Panasonic's global eXConnect aeronautical broadband system. Panasonic also seeks a waiver of the U.S. Table of Frequency Allocations to permit operations in the 11.7-12.2 GHz band.

I. INTRODUCTION

As a leading provider of in-flight entertainment ("IFE") systems, Panasonic has developed the eXConnect Ku-band AMSS system to provide satellite-based broadband connectivity to commercial aircraft. The eXConnect System will provide broadband Internet access, real-time video content and other services aboard aircraft in flight. Passengers may use these services for entertainment and to enhance productivity. These services will also be

available to the crew and will enable a range of airline operational and administrative applications, allowing airlines to operate more effectively and efficiently.

The eXConnect System will provide service using Ku-band Fixed-Satellite Service ("FSS") satellites under an existing domestic and international secondary allocation to the Mobile-Satellite Service ("MSS") in the 14.0-14.5 GHz band.[1] Adjacent FSS satellites will be protected from harmful interference by limiting the off-axis EIRP spectral density along the geostationary arc to no more than the levels permitted for routinely licensed Ku-band VSAT and other Ku-band mobile terminals (i.e., earth stations onboard vessels ("ESVs") and vehicle-mounted earth stations ("VMESs")).[2] eXConnect will also protect radio astronomy and space research services operating in the Ku-band by limiting emissions in the vicinity of these stations and, when necessary, automatically inhibiting emissions. The technical aspects of the eXConnect System are discussed generally below and in greater detail in the Technical Appendix included as Attachment 1.

This application requests authority to operate one of two eXConnect AES types - the MELCO AES antenna - that is currently installed onboard Lufthansa commercial aircraft.[3] Grant of the requested license will serve the public interest by ensuring that the increase in consumer demand for in-flight broadband access is met with affordable and reliable broadband communication services. Panasonic seeks to operate throughout the United States, including U.S. territories and possessions, subject to rules and conditions designed to protect other services in

[1] *See* Table of Allocations, 47 C.F.R. § 2.106.

[2] *See* e.g., 47 C.F.R. §§ 25.222(a)(1) and 25.226(a)(1)(i)(A).

[3] Although Panasonic intends to request authority to operate a second AES - the Aura LE antenna - testing of that antenna remains ongoing. Panasonic will request authority to operate the Aura LE antenna once it has completed scheduled testing.

the band. The Commission has previously granted blanket license authority to other Ku-band AMSS network operators, including Row 44, ViaSat, ARINC and Boeing.[4] Moreover, the Commission has granted authority to operate the very same AES antenna that is the subject of this application.[5] Panasonic urges the Commission to grant it similar operating authority at the earliest practicable time.

II. BACKGROUND

Panasonic seeks to add satellite-based, broadband connectivity to its next-generation IFE system. Panasonic plans to introduce the eXConnect System using a Ku-band AMSS terminal that has already been authorized by the Commission (the MELCO AES antenna), which is presently installed on commercial aircraft operated by Lufthansa Airlines.[6] This AES terminal

[4] *See Row 44, Inc. Application for Authority to Operate Up to 1,000 Technically Identical Aeronautical Mobile Satellite Service Transmit/Receive Earth Stations Aboard Commercial and Private Aircraft,* Order and Authorization, DA 09-1752 (2009) ("Row 44 AMSS Order") (Call Sign E080100) (File No. SES-LIC-20080508-00570); *ViaSat Inc., Application for Blanket Authority for Operation of Up to 1,000 Technically Identical Ku-Band Aircraft Earth Stations in the United States and Over Territorial Waters,* Order and Authorization, DA 07-4674 (2007) (Call Sign E050318) (File No. SES-LIC-20051028-01494); *ARINC Incorporated, Application for Blanket Authority for Operation of up to One Thousand Technically Identical Ku-Band Transmit/Receive Airborne Mobile Stations Aboard Aircraft Operating in the United States and Adjacent Waters*, Order and Authorization, DA 05-1016 (2005) (Call Sign E030205) (File No. SES-LIC-20030910-01261); and *The Boeing Company Application for Blanket Authority To Operate up to Eight Hundred Technically Identical Receive-Only Mobile Earth Stations Aboard Aircraft in the 11.7-12.2 GHz Frequency Band*, Order and Authorization, DA 01-658 (2001) ("Boeing AMSS Order") (Call Sign E000723) (File No. SES-LIC-20001204-02300).

[5] *See* The Boeing Company, Call Sign E000723, File No. SES-MOD-20030512-00639 and Panasonic, Call Sign WD9XQT, ELS File No. 0339-EX-ST-2009 (2010).

[6] *See* Boeing AMSS Order *supra* note 4, Call Sign E000723, File No. SES-MOD-20030512-00639.

previously operated without interference on a commercial basis, and has more recently operated without interference during flight trials pursuant to FCC experimental authority.[7]

The performance characteristics of the MELCO AES antenna have been coordinated by Panasonic's satellite service providers and are well-understood by satellite operators – and by the Commission in granting experimental authority – to be fully consistent with the Commission's 2º-spacing policies and analogous (although not directly applicable) Ku-band ESV and VMES rules.

Grant of the instant application is consistent with prior AMSS licensing precedent and would strongly serve the public interest by enhancing competition in aeronautical connectivity and strengthening U.S. leadership in such advanced communications services. In its most recent AMSS licensing decision, the Commission granted Row 44 authority to operate its Ku-band AMSS network based on the technical demonstration submitted in the application proceeding and the consent of potentially affected operators (via confirmation of coordination).[8] Because Panasonic provides a similar technical demonstration and satellite operator coordination of the proposed AMSS operations, the Commission should also grant Panasonic's application.

III. TECHNICAL DESCRIPTION

A. Overview of eXConnect Operations

The eXConnect System consists of up to fifteen (15) MELCO AES antennas, leased satellite capacity on commercial Ku-band FSS satellites, redundant U.S.-based network operations centers ("NOCs") and a gateway earth station facility. The MELCO AES antenna is a

[7] *See* ELS File No. 0339-EX-ST-2009 (Call Sign WD9XQT).

[8] *See* Row 44 AMSS Order *supra* note 4. Panasonic acknowledges the operating conditions set forth in the Row 44 Order and will accept similar conditions in connection with grant of the instant application.

mechanically-steered Cassegrain antenna with an elliptical profile to be compatible with installation on an aircraft. The MELCO AES antenna has been installed on more than 100 passenger aircraft and has a proven history of performance and reliability. This antenna has been previously licensed by the Commission for AMSS service in the United States and by other countries around the world.

Commercial FSS satellite capacity has been leased on the Galaxy 17 and Esrela do Sul (hereinafter referred to as Telstar 14) satellites, which have provided service for similar Ku-band AMSS applications. Panasonic has obtained affidavits from the operators of these satellites demonstrating that the technical parameters of the proposed AMSS operations have been coordinated with other satellite operators within +/- 6 degrees from the serving satellites,[9] just as they were when the MELCO AES antenna previously operated on a commercial basis.

The system will be operated pursuant to Panasonic's direction and control from redundant NOCs in Lake Forest, California and Miramar, Florida. As discussed more fully herein and in the attached Technical Appendix, interference to other users of the Ku-band will be avoided by controlling the off-axis EIRP spectral density emissions of the terminal along the GSO arc to protect adjacent FSS satellites, and by frequency avoidance and/or exclusion zones with respect to radio astronomy and space research sites.

B. eXConnect System Components

The eXConnect System consists of a network of eXConnect AES terminals (the "AES Segment"), leased satellite capacity on commercial Ku-band FSS satellites (the "Space Segment") and iDirect hub earth stations and network management functionality (the "Ground Segment"). The eXConnect System will be implemented using iDirect network technology that has been

[9] *See* Technical Appendix, Attachment B.

used for a wide range of Ku-band FSS networks, including mobile VSAT applications such as ESVs. The use of proven AES terminal equipment and network technology, along with proven control and monitoring protocols, minimizes the risk of potential interference.

1. eXConnect AES Segment

The MELCO AES antenna was developed by Mitsubishi Electronics Company for the Connexion by Boeing AMSS system. It is a mechanically-steered Cassegrain antenna with an elliptical profile designed to be compatible with installation and operation onboard an aircraft. The MELCO antenna was previously examined by the Commission and authorized in experimental Call Sign WC2XVE and commercial blanket license Call Sign E000723.[10] The basic characteristics of the MELCO antenna are summarized in Table 1.

Table 1. MELCO Antenna Characteristics[11]

Characteristic	MELCO Reflector
Frequency	Tx: 14.0 GHz to 14.4 GHz Rx: 11.7 GHz to 12.2 GHz
Aperture Size	25.6" X 7.7"
Maximum EIRP	47.2 dBW
Receive G/T	8.0 dB/K @ 11.2 to 11.7 GHz
Tracking Rate	40 deg/sec in Azimuth 25 deg/sec in Elevation
Az Pointing Accuracy	0.25 deg 1-sigma
Antenna Patterns	*See* Technical Appendix

The MELCO AES is fully compliant with the technical provisions governing Ku-band AMSS operations embodied in Recommendation ITU-R M.1643, and national rules and policies governing such operations.

[10] *See* File No. 0002-EX-ML-2004; File No. SES-MOD-20030512-00639.

[11] The MELCO antenna will operate at less than peak input power and maximum transmit EIRP to comply with the Commission's two-degree spacing policies. See FCC Form 312.

The MELCO AES antenna is paired with a broadband controller ("BC"), which contains the modem and control functionality of the AES terminal. The modem will include a DVB-S2 demodulator and iDirect D-TDMA modulator. The BC includes the ability to inhibit transmissions as a function of location and skew angle, control transmit power and select the serving satellite as a function of location.[12] 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. The BC also will select the serving satellite based on preloaded maps.

Additional technical information regarding the eXConnect AES segment, including its ability to control off-axis EIRP spectral density to that of a routinely licensed VSAT terminal as contemplated by the Commission's rules and policies governing mobile VSAT operations, is set forth in Section V below, and in the attached Technical Appendix. Panasonic also incorporates by reference the technical information previously provided on the MELCO AES antenna in the prior commercial license proceeding, including the Condition 5948 compliance report, upon which the Commission previously granted authority for the antenna to operate. *See* Call Sign E000723, File No. SES-MOD-20030512-00639.

2. eXConnect Space Segment

The eXConnect System uses leased transponder capacity on existing commercial Ku-band FSS satellites. eXConnect may use whole or partial transponders and be operated with single saturated carriers (forward link only) in a transponder or with multiple carriers. Forward and return links may be operated in the same or different transponders.

[12] The ability to inhibit transmission by location (based on maps loaded onto the BC) is designed to protect radio astronomy and space research in the Ku-band, and to ensure that the terminal does not operate in geographic areas where Panasonic does not have authority to transmit. The ability to inhibit transmission as a function of skew angle and control transmit power is designed to control the off-axis EIRP spectral density projected along the GSO arc.

The satellite points of communication for eXConnect System operations include the Telstar 14 satellite at 63º W.L. and the Galaxy 17 satellite at 91º W.L. The operators of these satellites (Telesat and Intelsat, respectively) have substantial experience in Ku-band mobile operations, including AMSS applications, and have coordinated eXConnect operational parameters with potentially affected networks.[13] Panasonic certifies that eXConnect System operation on these satellites will conform with the coordinated uplink off-axis EIRP spectral density limitations and downlink power spectral density limits for these satellites, including those set forth in any future coordination agreements.

3. eXConnect Ground Segment

The eXConnect System will utilize a licensed gateway earth station located in Holmdel, New Jersey, an iDirect hub at this location, and the interface to the Internet and other content sources. This gateway earth station is separately licensed by the Commission and not part of this application.

The eXConnect System will be monitored and controlled from two NOCs (a Panasonic NOC in Lake Forest, California, and a second NOC operated by Maritime Telecommunications Network ("MTN") in Miramar, Florida) on a 24/7 basis. The NOCs will make use of the iDirect's Network Management System (NMS) to provide complete control and visibility to all components of the eXConnect network. The iDirect NMS is among the most widely deployed NMS systems for VSATs in the world. iDirect NMS applications allow the operator to configure the network, commission terminals, and monitor the network in real time and for historical trends. The NMS system will have the capability of shutting down any component in the system, including an individual AES, that is malfunctioning.

[13] *See* Technical Appendix, Attachment B.

The points of contact for eXConnect operations include the Panasonic NOC:

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
Phone: 425-415-9800 or 877-627-2300 (US Domestic Toll-free)
Fax: (425) 482-3515.
NOC email address: MCC@panasonic.aero
Address:
Panasonic Avionics Corporation
Attn: Network Operating Center
26200 Enterprise Way
Lake Forest, CA 92630 USA

as well as the MTN NOC:

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

IV. WAIVER REQUESTS

A. Section 2.106 Waiver

Pursuant to Section 1.3 of the Commission's Rules, Panasonic respectfully requests a waiver of Section 2.106 of the Commission's Rules, 47 C.F.R. § 2.106, the U.S. Table of Frequency Allocations, to permit its AMSS operations in the 11.7-12.2 GHz band on a non-interference, non-protected basis. The U.S. Table of Allocations does not currently include any domestic allocation for AMSS in the 11.7-12.2 GHz band.

Good cause exists to grant such a waiver. The Commission has previously granted such a waiver to permit Boeing, ARINC, ViaSat, and Row 44 to use the 11.7-12.2 GHz band for AMSS downlink transmissions consistent with the coordinated parameters of their serving satellites.[14]

[14] *See* e.g., Row 44 AMSS Order, ¶ 33.

Moreover, Panasonic agrees to accept any interference from authorized users in this band. Under these circumstances and consistent with past precedent, the Commission should grant Panasonic's request for a waiver to permit AMSS operations in the 11.7-12.2 GHz downlink band.

B. Other Waivers

Like other AMSS system applicants, Panasonic submits this application in the absence of service rules governing Ku-band AMSS system operations. The Commission's Ku-band AMSS licensing precedent spans nearly a decade, during which period the Commission's rules have been modified significantly - particularly since the MELCO AES antenna was first authorized to operate commercially in 2003.

Panasonic has examined analogous mobile VSAT rules, other rules provisions and AMSS licensing orders adopted by the Commission during the past decade, and has included a full legal and technical demonstration establishing that its proposed AMSS operations are consistent with Commission rules and policies. However, to the extent the Commission concludes that any potentially applicable rule or policy may not be fully satisfied, Panasonic respectfully requests a waiver in the unique circumstances of this case. For example, Section 25.132 of the Rules suggests that supporting antenna gain patterns should cover a broader range of angles than was submitted previously or is presently available. Although the Commission has previously authorized the operation of the MELCO AES antenna with this level of data and the AESs are already installed and operating on Lufthansa commercial aircraft, it may conclude a waiver of this provision is necessary.

If any question exists with respect to the data concerning the technical performance of the MELCO AES antenna, Panasonic notes that it proposes to operate a small number of these antennas that were previously authorized to operate with the Connexion by Boeing system

onboard Lufthansa commercial aircraft. These AES antennas operated without interference for years and the inclusion of next-generation modulation and control technologies (e.g., adding iDirect D-TDMA with spreading, which eliminates the complexities associated with aggregation) makes the eXConnect System more straightforward to operate – and more robust – than its predecessor.

Not only has the Commission previously concluded that the MELCO AES antenna satisfies applicable rules and policies, but German regulatory authorities have twice concluded (during original licensing and more recent licensing for Panasonic) that the antenna can operate consistent with domestic and international requirements governing Ku-band AMSS operations. These conclusions are confirmed by interference-free flight test operations of the MELCO antenna over the past several months. In addition, Panasonic has included coordination affidavits in this application that confirm that the proposed operations are consistent with the coordinated parameters of its serving satellites, each of which has previously supported Ku-band AMSS operations. Given these unique circumstances, there is ample ground for the Commission to waive any other rules or policies necessary to authorize the Ku-band AMSS operations proposed herein.

V. MELCO AES ANTENNA PERFORMANCE

The operating characteristics of the MELCO AES antenna are well-known to the Commission to be consistent with U.S. and international requirements governing Ku-band AMSS operations.[15] A detailed technical description of the MELCO AES antenna and eXConnect control functionality are set forth in the attached Technical Appendix. Panasonic highlights certain AES operating characteristics in the discussion below.

[15] *See* Call Sign E000723, File No. SES-MOD-20030512-00639.

A. Antenna Pointing

Pointing for the MELCO AES antenna 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 MELCO AES antenna will be less than 0.25 degrees 1-sigma, which was consistent with interference-free operations under the FCC's prior authorization for this antenna. Pointing error will be monitored and emissions will be inhibited if the pointing error ever exceeds 0.5 degrees.

The pointing control characteristics of the MELCO AES antenna are consistent with interference-free operations pursuant to prior Commission commercial authority and present experimental authority. In this connection, Panasonic would note that there are no specific pointing accuracy requirements applicable to Ku-band AMSS operations, and the Commission has moved away from specified pointing accuracy levels in its ESV and VMES rules.[16] Moreover, Panasonic has taken a conservative approach and included the MELCO AES pointing accuracy value in setting maximum permissible transmit powers and skew angles such that even

[16] Pursuant to the FCC's recent order regarding proposed revisions to Section 25.222, the terminal may be mispointed in excess of 0.2 degrees under certain conditions. *Cf. Procedures to Govern the Use of Satellite Earth Stations on Board Vessels in the 5925-6425 MHz/3700-4200 MHz Band and 14.0-14.5 GHz/11.7-12.2 GHz Bands*, IB Docket No. 02-10, Order on Reconsideration, FCC 09-63, ¶¶ 23-26 (July 31, 2009). The Commission's new VMES rules also permit mispointing in excess of 0.2 degrees under certain conditions. *See* 47 C.F.R. § 25.226(a)(1)(ii).

if mispointed 0.25 degrees, the MELCO AES off-axis EIRP spectral density levels will not exceed that of a perfectly pointed AES operating at maximum permissible power.

B. Antenna Patterns and Out of Band Emissions

Antenna patterns for the MELCO AES are included in the attached Technical Appendix. The antenna patterns are elevation independent. 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. Transmit patterns are at 14.00 GHz. Receive patterns are at 11.2 GHz.

The MELCO AES antenna complies with the out of band emissions limitations in 47 C.F.R. §25.202(f).

C. Antenna Control

The attached Technical Appendix includes detailed information on other AES antenna control characteristics, including: (i) satellite access techniques; (ii) AES commissioning and log-in; (iii) automatic beam selection; (iv) return link power and frequency control; and (v) fault management. With respect to the last issue, the MELCO AES antenna ceases transmission in the event of the following conditions:

- loss of ARINC-429 data from the aircraft's inertial reference system ("IRS");
- invalid status message from the IRS;
- loss of the AES's 10 MHz reference signal;
- antenna pointing error exceeds 0.5 degrees, where the antenna ceases transmission within 100 ms and will not resume transmission until the pointing error is within 0.2 degrees; or
- any critical fault detected by the AES.

Furthermore, any event that results in the loss of modem lock to the AES downlink will cause the modem to cease all transmission.

These operating characteristics previously have been found to be consistent with commercial licensing in the United States and around the world. The Commission can rely on its past precedent and the additional technical information provided herein to similarly grant Panasonic's license application.

D. Link Budgets

Edge of coverage link budgets for the MELCO AES antenna forward and return links are shown in the attached Technical Appendix. As shown by the link budgets, the MELCO AES antennas are able to close the links with positive margin.

VI. PROTECTION OF OTHER CO-FREQUENCY SPECTRUM USERS

The FCC has not yet established service rules applicable to Ku-band AMSS operations, but interference considerations are analogous to those that currently apply to ESVs set forth in 47 C.F.R. § 25.222 and VMES set forth in 47 C.F.R. § 25.226.

A. Protection of GSO FSS Systems

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. This is consistent with past FCC licensing conditions in the AMSS context, as well as the Commission's ESV and VMES rules. Because they employ D-TDMA, multiple MELCO AES terminals do not operate on a co-frequency basis and management of aggregate emissions is not required.

To the extent that any adjacent satellite operator experiences harmful interference from Panasonic's operations, Panasonic will cease terminal transmissions immediately. In addition, if another co-frequency, co-coverage GSO FSS satellite commences operation at a location within six degrees of one of Panasonic's serving satellites, Panasonic will cease operation absent a

coordination agreement or demonstrate that it will not cause harmful interference to the new satellite.

The Commission's off axis EIRP spectral density limits are defined by Section 25.218(f)(1), where N = 1 for TDMA, and included in analogous ESV and VMES provisions. The off-axis EIRP spectral density generated by a conforming terminal must 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	$85° < \Theta \leq 180°$

The MELCO AES antenna will limit off-axis EIRP spectral density to no more than this level by:

- Selecting appropriate signal bandwidths and spread factors;
- Limiting the input power to the antenna as a function of skew angle and elevation angle;
- Inhibiting transmissions when the skew angle and/or elevation angle exceed specified thresholds;
- Controlling pointing error to less than 0.25 degrees; and
- Inhibiting transmissions within 100 ms when the pointing error exceeds a threshold of 0.5 degrees, and resuming transmissions when pointing accuracy is within 0.2 degrees.

Specific transmit power, bandwidth and skew angle thresholds will be selected based on the desired terminal transmission rates, coverage area, and satellite performance.

An example of off-axis EIRP control is shown in Figure 1, below. Panasonic has taken the conservative approach of including the MELCO AES antenna's nominal pointing accuracy in its off-axis EIRP spectral density calculations. Thus, the terminal's 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:

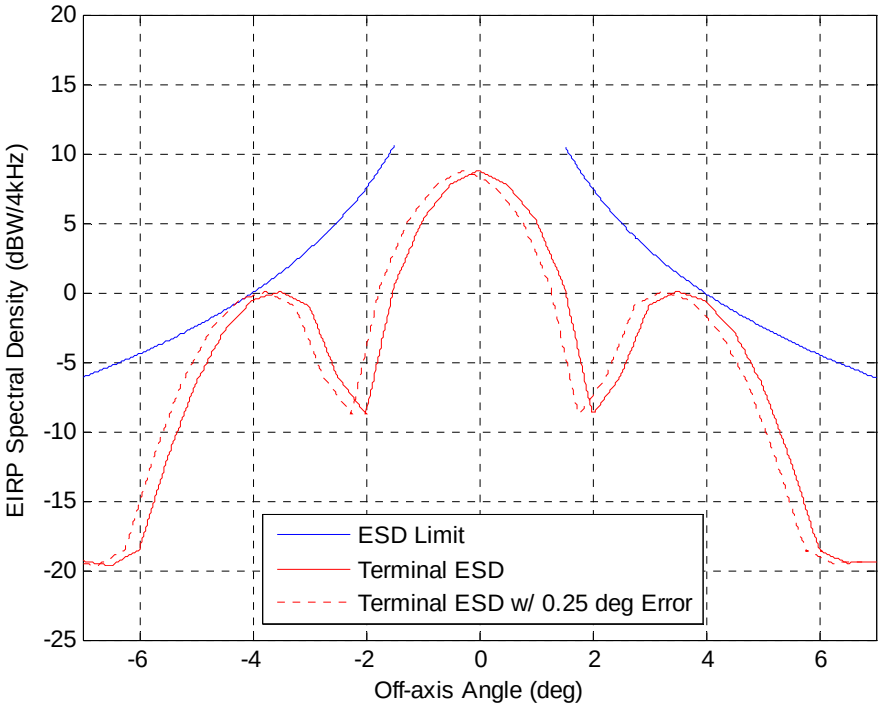

Figure 1. Maximum Off-axis EIRP Spectral Density of the MELCO Antenna

It should be emphasized that the example in Figure 1 is an extreme case: worst-case power (edge of coverage), worst-case skew, etc., and reaching the limits in this way will only occur very rarely and briefly (if at all).

B. Protection of Potential NGSO FSS Systems

The MELCO AES antenna exceeds the off-axis EIRP spectral density values set forth in the Commission's rules in directions away from the geostationary arc. The separate off-axis EIRP spectral density mask in Section 25.218(f)(1) was intended to protect Ku-band NGSO FSS systems. However, no systems of this type are presently planned or are operating. Panasonic will enter into a coordination arrangement with any future Ku-band NGSO FSS system to protect such system from interference from eXConnect AES transmissions.

C. Protection of Terrestrial Radio Services

Panasonic has examined current spectrum use in the 14.0-14.4 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. To the extent that secondary fixed service uses are identified in this band that require protection, Panasonic will limit emissions to the levels stated in Recommendation ITU-R M.1643 at locations where protection is required.

D. Protection of the Radio Astronomy Service

For purposes of protecting radio astronomy sites, consistent with Recommendation ITU-R M.1643, Part C, Panasonic has agreed to limit aggregate power flux density ("pfd") in the 14.47-14.5 GHz band 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)

Panasonic has completed a coordination agreement with the National Science Foundation obligating Panasonic to limit aggregate pfd to the specified levels.[17]

E. Protection of Space Research Service

Panasonic 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 operations conducted at Guam; White Sands, New Mexico; and, when it becomes operational, Blossom Point, Maryland. Panasonic is actively engaged in discussions with NASA to develop an appropriate coordination agreement regarding the protection of these current and

[17] *See* Technical Appendix, Attachment C. This coordination agreement is principally designed to cover future operation of Panasonic's other AES antenna because the MELCO antenna has a notch filter at 14.4 GHz, above which it does not transmit.

future TDRSS sites, and will submit the final coordination agreement to the Commission once executed.

In the meantime, Panasonic agrees not to operate MELCO AES antennas within the 14.0-14.2 GHz band within line of site of NASA TDRSS facilities. This approach is consistent with analogous provisions of the Commission's ESV and VMES rules.[18]

F. Downlink Transmissions in the 11.7-12.2 GHz Band

As discussed in Section IV, Panasonic seeks a waiver of the allocation table to permit the MELCO AES antenna to receive transmissions in the FSS space-to-earth band at 11.7-12.2 GHz. All downlink transmissions to Panasonic's AES terminals will operate within the space station authorizations and coordinated limits for downlink EIRP spectral density of the Galaxy 17 and Telstar 14 satellites, as agreed by the operators of adjacent satellites within +/- 6 degrees.

Panasonic will accept interference from lawful operation of any station in the 11.7-12.2 GHz band in accordance with the U.S. Table of Frequency Allocations, 47 C.F.R. § 2.106. In addition, Panasonic will immediately terminate eXConnect operations upon notification that such operations are not permitted under the terms of a coordination agreement with, or are causing harmful interference to, any lawfully operating radio system in the 11.7-12.2 GHz band in conformance with the U.S. Table of Frequency Allocations.

VII. OTHER ISSUES

Panasonic has reviewed recent AMSS licensing precedent and other Commission rules and policies, and submits the following additional information in support of its blanket AES application.

[18] *See* 47 C.F.R. §§ 25.222(d) and 25.226(c).

A. Record Collection and Retention

For one (1) year, Panasonic will maintain records of the following data for each operating AES: location (latitude, longitude, altitude); aircraft attitude (pitch, yaw, roll); transmit frequency and occupied bandwidth; data rate; EIRP and target satellite. The data will be recorded at intervals of no more than two (2) minutes while an AES is transmitting and no more than every thirty (30) seconds when aircraft roll angle is greater than ten (10) degrees. Panasonic will also maintain records of instances when AES pointing error exceeds 0.25 degrees, which it will make available to the Commission or FSS system operator within twenty-four (24) hours of receiving such a request.

B. Network Security

Panasonic is engaged in active discussions with U.S. law enforcement officials regarding lawful interception ("LI") and network security functionality to be deployed in the eXConnect System. Panasonic has engaged a CALEA-compliant equipment vendor to implement its LI solution, which will be in place before the commencement of commercial operations. In addition, Panasonic is implementing additional functionality subject to final agreement with U.S. law enforcement.

C. Ground Operations and RF Safety

Panasonic seeks to operate the MELCO AES antenna intermittently while on the ground for maintenance, commissioning and other purposes. This AES antenna was previously authorized for ground operations.[19] Panasonic will not operate the AES while aircraft are on the ground unless appropriate safety protocols are in place to ensure that persons having access to

[19] *See* Panasonic, Call Sign WD9XQT, ELS File No. 0339-EX-ST-2009 (2010).

areas within 22.0 meters of the AES are not exposed to RF energy in excess of the maximum permissible limits specified in 47 C.F.R. Section 1.1310.[20]

Panasonic will take all reasonable and customary measures to prevent human exposure to harmful non-ionizing radiation exceeding the maximum permissible exposure limits, including prominently marking the exterior surface of the AES with a warning of the potential for exposure to high levels of radiofrequency energy. A radiation hazard analysis of the MELCO antenna is provided as Attachment A to the Technical Appendix.

D. Compliance with Recommendation ITU-R M.1643

Like their previously authorized operations, MELCO AES antenna operations with the eXConnect system are fully compliant with the international technical provisions governing Ku-band AMSS operations embodied in Recommendation ITU-R M.1643. In particular, the MELCO AES antenna employs a tracking algorithm that is resistant to capturing and tracking adjacent satellite signals and is capable of inhibiting its own transmission in the event it detects unintended satellite tracking.

As described herein, the MELCO AES antenna is also monitored and controlled by a ground-based NOC, which monitors operation of each AES to determine if it is malfunctioning. The MELCO AES self-monitors and automatically ceases transmission on detecting an operational fault that could cause harmful interference to an FSS network. The MELCO AES antenna is also able to receive "enable transmission" and "disable transmission" commands from the NOC, and will cease transmission immediately after receiving a "parameter change" command from the NOC.

[20] *See* Experimental License Call Sign WD9XQT, Special Condition 4.

E. Compliance with Future AMSS Service Rules

Panasonic acknowledges and accepts that any authorization granted by the Commission will be conditioned upon compliance with any additional conditions or requirements concerning operation of its AMSS system adopted in the Commission's pending Ku-band AMSS rulemaking proceeding.[21]

F. Non-Common Carrier Operations and Proposed Use

Panasonic intends to operate the eXConnect System solely on a non-common carrier basis for airline operational purposes and passenger use. Panasonic will not use the eXConnect System to provide air traffic control or other safety-of-life communications.

G. DISCO II Statement

No effective competitive opportunities are required in this instance (47 C.F.R. § 25.137(a)) because the Telstar 14 satellite at 63° W.L., operated by a licensed Brazilian subsidiary of Telesat in a Brazilian orbital slot, has been added to the FCC's Permitted Space Station List.[22]

H. Section 304 Statement

In accordance with Section 304 of the Communications Act of 1934, 47 U.S.C. § 304 Panasonic hereby waives any claim to the use of any particular frequency or of the electromagnetic spectrum because of previous use of the same, whether by license or otherwise.

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[21] *Service Procedures and Rules to Govern the Use of Aeronautical Mobile Satellite Service Earth Stations in Frequency Bands Allocated to the Fixed Satellite Service*, IB Docket No. 05-20, Notice of Proposed Rulemaking, FCC 05-14 (2005).

[22] *See* Loral Skynet do Brasil, File No. SAT-PDR-20021010-00196 (DA 03-4095, Sat. Div. 2003); Permitted Space Station List (http://www.fcc.gov/ib/sd/se/permitted.html, viewed Aug. 1, 2010). *See also* Notification of Change of Ownership of Permitted List Satellite Estrela do Sul 1 to Telesat Holdings Inc. from Telesat Brasil Capacidade de Satelites Ltda. (f/k/a Loral Skynet do Brasil Ltda.), File No. SAT-PPL-20071127-00163.

VIII. CONCLUSION

Grant of this AMSS application and associated waiver requests will serve the public interest, convenience and necessity by allowing Panasonic to provide in-flight broadband services to passengers and crews aboard commercial aircraft, and enabling an additional competitor in the aeronautical broadband market. The Commission has authorized numerous other Ku-band AMSS providers under conditions similar to those contemplated herein and has previously authorized operation of the subject MELCO AES antenna. Thus, there is ample precedent for granting the requested authority at the earliest practicable time.

Technical Certificate

I, Paul Sarraffe, hereby certify that I am the technically qualified person responsible for the preparation of the technical discussion contained in the Panasonic Application for AES Operating Authority and the Technical Appendix, that I am familiar with Part 25 of the Commission's Rules (47 C.F.R. Part 25), and that I have either prepared or reviewed the technical information submitted in this application and found it to be complete and accurate to the best of my knowledge and belief.

By: Paul Sarraffe

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August 5, 2010