territorial waters and U.S. territories and possessions, and would also apply to AESs on any U.S.-registered aircraft operating in international airspace, subject to the licensing authority of other administrations while the aircraft is flying within the airspace of a foreign country.

Authorizing the operations of transmit-receive Ku-band AESs aboard U.S.-registered aircraft flying outside the United States is fully consistent with the Commission's jurisdiction under the Communications Act of 1934, as amended, and with general principles of international law. Section 301(e) of the Communications Act, with a limited exception not relevant here, grants the Commission jurisdiction to license the operation of radio stations "upon any vessel or aircraft of the United States."[54] The Commission's jurisdiction over aircraft of the United States under Section 301(e) is in no way limited by the geographic location of the aircraft.

In addition to the plain language and legislative history of Section 301(e), this conclusion is consistent with longstanding Commission precedent involving the exercise of substantive jurisdiction over and licensing of satellite earth stations operating beyond the twelve-mile

[54] *See* 47 U.S.C. § 301(e). The limited exception, set forth in Section 303(t) of the Act, does not constrain the substantive jurisdiction of the Commission over radio stations aboard U.S. aircraft, but rather authorizes the Commission to enter into agreements with foreign governments by which it shall recognize radio station and operator licenses issued to foreign aircraft operators that utilize U.S.-registered aircraft. *See* 47 U.S.C. § 303(t). The Commission also has the explicit authority to license "any other mobile stations within the jurisdiction of the United States." 47 U.S.C. § 301(f).

territorial limit of the United States.[55] Similarly, in the non-satellite context, the Commission routinely authorizes radio equipment on U.S. aircraft for both domestic and international use.[56]

The licensing of AMSS operations aboard U.S. aircraft while in international airspace is also consistent with general principles of international law. In this connection, the Convention on International Civil Aviation ("Chicago Convention"), to which the United States is a Signatory, explicitly recognizes that "appropriate authorities" of the nation in which an aircraft is registered retain licensing authority over radio stations aboard that aircraft even when located above the territory of foreign nation, provided such aircraft's radio stations are operated in accordance with the regulations of that foreign nation.[57] Thus, the Commission plainly has jurisdiction to authorize Ku-band AESs operating on U.S.-registered aircraft flying outside the United States, and the Commission's AMSS rules clearly would apply to such operations.

V. PUBLIC INTEREST BENEFITS OF KU-BAND AMSS SYSTEMS

Adoption of the proposed AMSS secondary allocation and licensing and service rules will result in substantial public interest benefits to the U.S. flying public. Indeed, the

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[55] *E.g., AMSC Subsidiary Corp.*, 10 FCC Rcd. 10924 (1995) (granting modification of blanket earth station license for 200,000 mobile earth terminals to operate throughout the United States and in U.S. coastal waters up to 200 miles offshore, the service area of the associated U.S.-licensed MSS satellite); *Aeronautical Radio, Inc., et al., Petition for Waiver of 87.147 and 87.187 of the Commission's Rules*, 5 FCC Rcd. 3038 (1998) (granting a waiver of the Commission's rules to permit commercial airlines to operate aircraft earth stations internationally for communications using Inmarsat).

[56] *See* 47 C.F.R. Part 87; *see also Amendment of Parts 21 and 74 of the Commission's Rules with Regard to Licensing in the Multipoint Distribution Service and in the Instructional Television Fixed Service for the Gulf of Mexico, Notice of Proposed Rulemaking*, FCC 02-101 (released May 3, 2002) (proposing licensing of MDS and ITFS spectrum in the Gulf of Mexico).

[57] *See* Convention on International Civil Aviation (signed Dec. 7, 1944) ("*Chicago Convention*") at Art. 30 (Aircraft radio equipment). While Annex 10 to the *Chicago Convention* primarily relates to safety and non-public correspondence communications, Article 30 by its terms is not so limited.

International Bureau recently cited WRC-03's allocation of spectrum for "broadband-in-flight, which provides high-speed Internet access to airline passengers," as a principal success of the U.S. Delegation in expanding choices for U.S. consumers.[58]

The requested AMSS allocation and service rules will afford Ku-band AMSS licensees, such as Boeing, the regulatory certainty necessary to fully implement their systems and to provide a broad range of advanced broadband satellite services to passengers and crew members aboard commercial, corporate and U.S. government aircraft. This, in turn, would enhance competition and accelerate the benefits of this innovative new service to consumers in the United States and around the world.

As described in Boeing's various AES applications, commercial and corporate passengers will enjoy the convenience of such services as high-speed Internet access and interactive entertainment options, and crew members will obtain access to broadband capabilities that would enhance the efficiency of aircraft operations through real-time equipment and supply information, weather updates, security monitoring and other applications. U.S. government personnel and decision makers will have access to real-time broadband communications services aboard government aircraft, enabling them to communicate more effectively and make timely and informed decisions affecting national security, foreign policy and other important U.S. Government matters.[59]

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[58] FCC News Release, *International Bureau Reports on Success of the 2003 World Radiocommunication Conference* (rel. July 10, 2003).

[59] *See* Application of the Boeing Company for Blanket Authority to Operate up to Eight Hundred Technically Identical Transmit and Receive Mobile Earth Stations Aboard Aircraft in the 11.7-12.2 and 14.0-14.5 GHz Frequency Bands, File No. SES-LIC-20001204-02300 (filed Dec. 4, 2000, supplemented Jan. 10, 2001); *see also* Reflector Antenna AES Application.

The proposed rules also will permit more efficient use of the radio spectrum. As discussed herein, AMSS systems can operate in the 14-14.5 GHz uplink band and 11.7-12.2 GHz downlink band without causing harmful interference to other allocated services. Furthermore, the requested regulatory changes, which will facilitate the provision of innovative AMSS services, are consistent with the Commission's recent Spectrum Policy Task Force recommendations concerning increased flexibility in the use of spectrum.[60] Specifically, the requested allocation will facilitate the provision of new and innovative AMSS services in spectrum that generally has been reserved for traditional FSS usage. Additionally, the technical characteristics of AMSS operations and the secondary nature of the allocation will ensure that primary users of the band are protected from harmful interference, while other incumbent secondary users are fully accommodated.

Finally, the United States has been a leading proponent of Ku-band AMSS services and it can maintain its leadership position on such technology issues by promptly implementing the decisions reached at WRC-03 with respect to this important new service.

VI. CONCLUSION

For all of the foregoing reasons, Boeing respectfully requests that the Commission initiate a rulemaking proceeding promptly to amend the U.S. Table of Frequency Allocations to include a secondary AMSS allocation in the 14-14.5 GHz band, and to adopt licensing rules for Ku-band AMSS operations as set forth herein.

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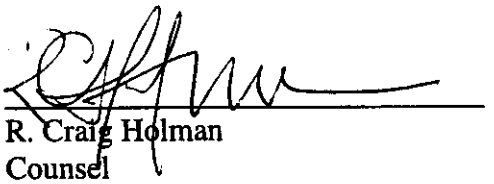
[60] *See* Spectrum Policy Task Force Report, ET Docket 02-135 (Nov. 2002) at 15-22.

Respectfully submitted,

The Boeing Company



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Dated: July 21, 2003

RECOMMENDATION ITU-R M.1643*

Technical and operational requirements for aircraft earth stations of aeronautical mobile-satellite service including those using fixed-satellite service network transponders in the band 14-14.5 GHz (Earth-to-space)

(2003)

Summary

This Recommendation provides the technical and operational requirements for aircraft earth stations (AES) of aeronautical mobile-satellite service (AMSS), including those using SFS network transponders operating in the band 14-14.5 GHz (Earth-to-space), that should be used by administrations as a technical guideline for: establishing conformance requirements for AES and facilitating their licensing, for worldwide use.

The ITU Radiocommunication Assembly,

considering

a) that various technically and operationally different aeronautical mobile-satellite service (AMSS) networks have been designed to commence operation in the near future;

b) that these planned AMSS networks may provide access to a variety of broadband communication applications (Internet, email, internal corporate networks) to and from aircraft on a global basis;

c) that the aircraft earth station (AES) will operate on national and international airlines around the world;

d) that circulation of AES is usually a subject of a number of national and international rules and regulations including satisfactory conformance to a mutually agreed technical standard and operational requirements;

e) that there is a need for identifying the technical and operational requirements for the conformance testing of AES;

f) that the identification of technical and operational requirements for AES would provide a common technical basis for facilitating conformance testing of AES by various national and international authorities and the development of mutual recognition arrangements for conformance of AES;

g) that the technical and operational requirements need to achieve an acceptable balance between radio equipment complexity and the need for effective use of the radio-frequency,

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*NOTE - The Arab Group represented at RA-03, and Canada reserve their position on this Recommendation and are not ready to accept any repercussions with respect to WRC-03 Agenda Item 1.11.

considering also

a) that in the frequency band 14-14.5 GHz there are allocations to the FSS (Earth-to-space), radionavigation, fixed and mobile (except aeronautical mobile) services on a primary basis; that secondary services allocated in the band 14-14.5 GHz or in parts of the band include mobile-satellite (except aeronautical mobile-satellite) service (Earth-to-space), space research service, radio astronomy service, and radionavigation-satellite service;

b) that there is a requirement to fully protect all primary services and pre-existing systems of secondary services in the band 14-14.5 GHz;

c) that results of the studies conducted in accordance with Resolution 216 (Rev.WRC-2000) showed the feasibility of using the band 14-14.5 GHz by AMSS (Earth-to-space) on a secondary basis under certain conditions and arrangements[1];

d) that the identification by ITU-R of technical and operational requirements for AES operating in the band 14-14.5 GHz could assist administrations to prevent harmful and/or unacceptable interference to other services;

e) that technical and operational characteristics should be continuously and accurately measurable and controllable,

recommends

1 that the technical and operational requirements[1] for aircraft earth stations of AMSS networks operating in the band 14-14.5 GHz given in Annexes 1 and 2 be used by administrations as a guideline for:

a) establishing conformance requirements for AES;

b) facilitating AES operations.

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[1] The characteristics of the typical aircraft earth stations need to fulfil the requirements described in this Recommendation and, further, need to be within the envelope of those initially published in the International Frequency Information Circular (BR IFIC) relating to the corresponding FSS network. In the case that the characteristics are outside of the envelope of those in the initial publication, the required coordination of such an aircraft earth station needs to be effected in accordance with the current provisions of the Radio Regulations (RR) and a modified Rule of Procedure as contained in § 2 of the Rules of Procedure relating to RR No. 11.32, as appropriate.

Annex 1

Technical and operational requirements for AES of AMSS networks in the band 14-14.5 GHz (Earth-to-space)

Part A

Essential requirements related to the protection of FSS networks

1 AMSS networks should be coordinated and operated in such a manner that the aggregate off-axis e.i.r.p. levels produced by all co-frequency AES within AMSS networks are no greater than the interference levels that have been published and coordinated for the specific and/or typical earth station(s) pertaining to FSS networks where FSS transponders are used.

2 The design, coordination and operation of an AES should, at least, account for the following factors which could vary the aggregate off-axis e.i.r.p. levels generated by the AES:

2.1 mispointing of AES antennas. Where applicable, this includes, at least, effects caused by bias and latency of their pointing systems, tracking error of closed loop tracking systems, misalignment between transmit and receive apertures for systems that use separate apertures, and misalignment between transmit and receive feeds for systems that use combined apertures;

2.2 variations in the antenna pattern of AES. Where applicable, this includes, at least, effects caused by manufacturing tolerances, ageing of the antenna and environmental effects. AMSS networks using certain types of AES antennas, such as phased arrays, should account for variation in antenna pattern with scan angles (elevation and azimuth). Networks using phased arrays should also account for element phase error, amplitude error and failure rate;

2.3 variations in the transmit e.i.r.p. from AES. Where applicable, this includes, at least, effects caused by measurement error, control error and latency for closed loop power control systems. Network control and monitoring centres (NCMCs) that calculate the e.i.r.p. of AES based on the received signal need to take into account error sources and latency in this calculation. NCMCs that calculate the e.i.r.p. of AES based on input power must account for measurement error and reporting latency.

3 AES that use closed loop tracking of the satellite signal need to employ an algorithm that is resistant to capturing and tracking adjacent satellite signals. AES must immediately inhibit transmission when they detect that unintended satellite tracking has happened or is about to happen.

4 AES should be subject to the monitoring and control by an NCMC or equivalent facility. AES must be able to receive at least "enable transmission" and "disable transmission" commands from the NCMC. AES must automatically cease transmissions immediately on receiving any

"parameter change" command, which may cause harmful interference during the change, until it receives an "enable transmission" command from its NCMC. In addition, it should be possible for the NCMC to monitor the operation of an AES to determine if it is malfunctioning.

5 AES need also to be self-monitoring and, should a fault which can cause harmful interference to FSS networks be detected, the AES must automatically mute its transmissions.

Part B

Essential requirements related to the protection of the fixed service

In the 14-14.5 GHz frequency band as used by fixed service networks, within line-of-sight of the territory of an administration where fixed service networks are operating in this band, the maximum pfd produced at the surface of the Earth by emissions from a single AES, of an AMSS network should not exceed:

$-132 + 0.5 \cdot \theta$	dB(W/(m^2 · MHz))	for	$\theta \leq 40°$
-112	dB(W/(m^2 · MHz))	for	$40 < \theta \leq 90°$

where θ is the angle of arrival of the radio-frequency wave (degrees above the horizontal).

NOTE 1 – The aforementioned limits relate to the pfd and angles of arrival that would be obtained under free-space propagation conditions.

NOTE 2 – An e.i.r.p. mask can be derived from the aforementioned pfd mask by applying the method given in Annex 2 of this Recommendation. Simplification of the resulting e.i.r.p. mask could also be considered.

Part C

Essential requirements related to sharing with the radio astronomy service

In order to protect the radio astronomy in the band 14.47-14.5 GHz, AMSS earth stations should comply with both following measures:

AMSS channels in the 14.47-14.5 GHz band

- AMSS stations do not transmit in the 14.47-14.5 GHz band within line-of-sight of radio astronomy stations operating within this band;

  or,

- if an AMSS operator intends to operate co-frequency within the visibility of the radio astronomy station, a specific agreement with the radio astronomy station will be needed to ensure that AMSS AES will meet the requirements of Recommendations ITU-R RA.769 and ITU-R RA.1513 within the 14.47-14.5 GHz band during observations. Where practicable, this may include advance information to AMSS operators regarding observation schedules.

AMSS channels in the 14-14.47 GHz band

All AES transmitters on channels in the 14-14.47 GHz band within line-of-sight of radio astronomy stations during radio astronomy observations have emissions in the band 14.47-14.5 GHz such that they meet the levels and percentage of data loss given in Recommendations ITU-R RA.769 and ITU-R RA.1513. Results from studies show that the

following AES pfd levels (dB(W/(m^2 · 150 kHz))) in the band 14.47-14.5 GHz are sufficient, with some margin, to meet the radio astronomy pfd levels in Recommendation ITU-R RA.769 and the percentage of data loss given in Recommendation ITU-R RA.1513, i.e.:

$-190 + 0.5 \cdot \theta$	dB(W/(m^2 · 150 kHz))	for	$\theta \leq 10°$
-185	dB(W/(m^2 · 150 kHz))	for	$10° < \theta \leq 90°$

where θ is the angle of arrival of the radio-frequency wave (degrees above the horizontal).

Such AES pfd levels in the band 14.47-14.5 GHz may be achieved by the AMSS operators through a combination of reduced AES signal power, sharp filtering, maintaining adequate frequency separation, or better AES antenna performance.

Part D

Essential requirements related to sharing with the space research service

Coordination agreements should be developed between AMSS and space research systems based on controlling the emissions levels of the AES in the frequency band used by the SRS systems, and, in severe cases, may require cessation of AES emissions on frequencies used by the SRS system when operating in the vicinity of the space research earth station. Specifics of the agreements will vary based on the characteristics of the individual SRS sites and the AMSS networks.

Annex 2

Derivation of a lower hemisphere e.i.r.p. mask from a pfd mask

In testing AMSS equipment to determine if it meets a given pfd mask, such as the one in Annex 1, Part B, it may be useful to determine an equivalent e.i.r.p. mask that can be used for testing purposes.

The pfd mask, pfd(θ) where θ is the angle of arrival (elevation angle) at the Earth's surface, can be used to mathematically determine an e.i.r.p. mask, e.i.r.p.(γ, H) where γ is the angle below the local horizontal plane and H is the altitude of the aircraft. This conversion proceeds in two steps. First, γ is converted to an equivalent angle of arrival, θ. Then the length of the propagation path for angle of arrival θ is determined and used to calculate the spreading loss for the path and the resulting e.i.r.p.

Step 1: Calculation of an angle of arrival in degrees, θ, from γ and H:

$$\theta = \arccos((R_e + H)\cos(\gamma)/R_e)$$

where:

θ: angle of arrival

R_e: earth radius (6 378 km)

H: altitude of the aircraft (km)

γ: angle below horizontal.

NOTE 1 – If the argument of the arccos function is greater than 1, the propagation path in the direction of the angle γ does not intersect the Earth. In this case, which occurs for values of γ of about 3.5° or less, a value for θ does not exist and so there is no defined value for the pfd mask.

Step 2: Calculation of the e.i.r.p. value from the defined pfd(θ):

$$d = (R_e^2 + (R_e + H)^2 - 2\,R_e(R_e + H)\cos(\gamma - \theta))^{1/2}$$

$$\text{e.i.r.p.}(\gamma, H) = \text{pfd}(\theta) + 10\log_{10}(4\,\pi\,d^2) + 60$$

where:

d: distance between the AES and the considered point on the Earth's surface (km)

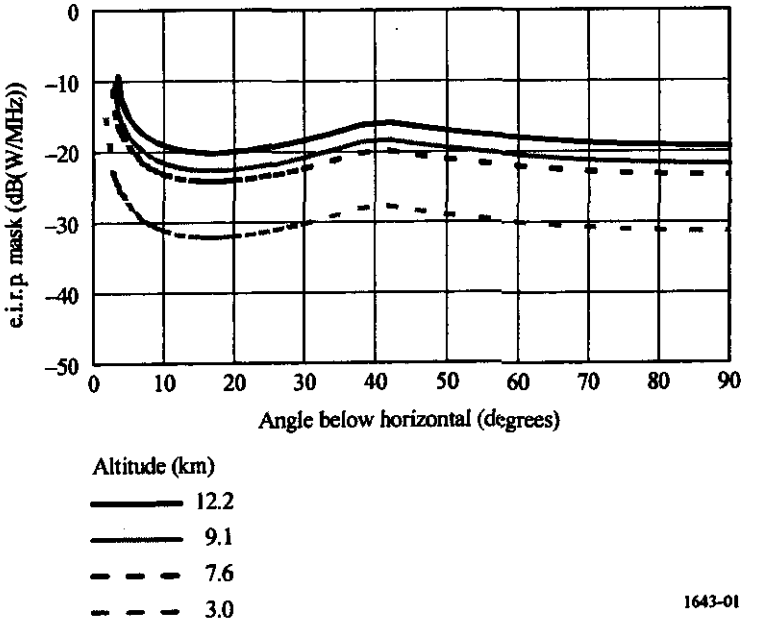
pfd(θ): (dB(W/(m^2 · MHz)))

e.i.r.p.: (dB(W/MHz)).

The graph in Fig. 1 shows this function for various aircraft altitudes based on the pfd mask provided in Annex 1, Part B of this Recommendation.

FIGURE 1

e.i.r.p. mask derived from pfd mask



New § 25.216

§25.216 Operating and licensing conditions for earth station networks in the 12/14 GHz aeronautical mobile-satellite service.

(a) Each applicant for a blanket aircraft earth station (AES) license in the 12/14 GHz aeronautical mobile-satellite service shall demonstrate that its AES transmissions will not cause unacceptable interference to authorized FSS networks operating in the 14.0-14.5 GHz band (Earth-to-space).

(1) For communications with FSS space stations that have not coordinated higher values with adjacent space stations, AES transmit off-axis EIRP spectral density along the GSO arc for co-polarized signals shall not exceed the following values:

Angle off-axis	Maximum EIRP in any 4 kHz band
$1.0° \leq \theta \leq 7.0°$	$15 - 25 \log \theta$ dBW
$7.0° < \theta \leq 9.2°$	-6 dBW
$9.2° < \theta \leq 48°$	$18 - 25 \log \theta$ dBW
$\theta > 48°$	-24 dBW

(2) The values given in paragraph (a)(1) of this section may be exceeded by 3 dB for values of $\theta > 10°$, provided that the total angular range over which this occurs does not exceed 20° when measured along both sides of the GSO arc.

(3) For communications with FSS space stations that have coordinated higher values with adjacent space stations, AES transmit off-axis EIRP spectral density along the GSO arc for co-polarized signals shall not exceed the values coordinated for the space station.

(4) Each applicant for AES license(s) that proposes transmit EIRP densities in excess of those specified in paragraphs (a)(1) and (a)(2) of this section shall submit link budget analyses of the operations proposed along with a detailed written explanation of how each uplink carrier density figure is derived. Applicants also shall submit a narrative summary which must indicate whether there are margin shortfalls in any of the current baseline services as a result of the addition of the applicant's high power service, and if so, how the applicant intends to resolve those margin shortfalls. Applicants shall certify that all potentially affected parties (i.e., those GSO FSS satellite networks that are 2, 4 and 6 degrees apart) acknowledge and do not object to the use of the applicant's higher power density.

(5) Licensees authorized pursuant to subparagraphs (a)(3) and (a)(4) of this section shall bear the burden of coordinating with any future applicants or licensees whose proposed compliant co-frequency operations, as defined by paragraph (a) of Section 25.134 and subparagraphs (a)(1) and (a)(2) of this section, is potentially or actually adversely affected by the operation of the non-compliant licensee. If no good faith agreement can be reached, however, the non-compliant licensee shall reduce its

power density levels to those compliant with subparagraphs (a)(1) and (a)(2) of this section.

(b) Each applicant for a blanket AES license in the 12/14 GHz aeronautical mobile-satellite service shall design and operate its network in accordance with the following requirements:

(1) AES networks shall account for the following factors, to the extent applicable, which could vary the aggregate off-axis EIRP levels generated by an AES:

(i) Mispointing of AES antennas. This includes, at a minimum, effects caused by bias and latency of pointing systems, tracking error of closed loop tracking systems, misalignment between transmit and receive apertures for systems that use separate apertures, and misalignment between transmit and receive feeds for systems that use combined apertures;

(ii) Variations in AES antenna patterns. This includes, at a minimum, effects caused by manufacturing tolerances, aging of the antenna and environmental effects. AMSS systems using certain types of AES antennas, such as phased arrays, should account for variation in antenna pattern with scan angles (elevation and azimuth). AMSS systems using phased arrays should also account for element phase error, amplitude error and failure rate;

(iii) Variations in the transmit EIRP from an AES. This includes, at a minimum, effects caused by measurement error, control error and latency for closed loop power control systems. Calculations of EIRP based on the signal received by the satellite should account for error sources and latency in this calculation, and calculations of EIRP based on AES input power should account for measurement error and reporting latency.

(2) AES networks shall:

(i) be self-monitoring, and shall automatically mute its transmissions in the event of a fault which can cause harmful interference to FSS networks;

(ii) if using closed loop tracking of the satellite signal, employ an algorithm that is resistant to capturing and tracking adjacent satellite signals, and immediately inhibit transmission in the event of unintended satellite tracking;

(iii) be subject to the monitoring and control by a ground-based Network Control and Monitoring Center (NCMC) or equivalent facility;

(iv) be able to receive at least "enable transmission" and "disable transmission" commands from the NCMC, and should cease transmission immediately on receiving any "parameter change" command which may cause harmful interference

during the change, until receipt of an "enable transmission" command from its NCMC; and

(v) be monitored by the NCMC in a way that permits the NCMC to determine if the AES is malfunctioning.

(c) Each aeronautical mobile-satellite service AES operator shall not commence operations in the 14.0-14.5 GHz band until such operations have been coordinated successfully with authorized U.S. Government stations through the National Telecommunications and Information Administration (NTIA) Frequency Assignment Committee of the Interdepartment Radio Advisory Committee (IRAC).

(1) AES operators shall avoid causing harmful interference to authorized U.S. Government radio astronomy stations during observations in the 14.47-14.5 GHz band, and shall control the in-band emissions levels of all AESs operating in line-of-sight of each radio astronomy station during such observations. To the extent practicable, U.S. Government radio astronomy stations shall provide advance information to AES operators regarding observation schedules. The protection of Very Long Baseline Array (VLBA) stations may require a different level of protection than other radio astronomy stations. The radio astronomy stations to be protected include:

Observatory	**Latitude** (DMS)	**Longitude** (DMS)
National Astronomy and Ionosphere Center (NAIC) site:		
Arecibo, PR	18 20 46	66 45 11
National Radio Astronomy Observatory (NRAO) sites:		
Green Bank Telescope, WV	38 25 59	79 50 24
Very Large Array, Socorro, NM	34 04 43	107 37 04
VLBA sites:		
St. Croix, VI	17 45 31	64 35 03
Hancock, NH	42 56 01	71 59 12
N. Liberty, IA	41 46 17	91 34 26
Ft. Davis, TX	30 38 06	103 56 39
Los Alamos, NM	35 46 30	106 14 42
Pie Town, NM	34 18 04	108 07 07
Kitt Peak, AZ	31 57 22	111 36 42
Owens Valley, CA	37 13 54	118 16 34
Brewster, WA	48 07 53	119 40 55
Mauna Kea, HI	19 48 16	155 27 29

(2) AES operators shall avoid causing harmful interference to authorized U.S. Government space research stations operating in the 13.4-14.2 GHz band.

(3) The details of individual coordination agreements, including specific protection levels, will vary based on the characteristics of U.S. Government station and the AES network. The coordination agreements may require AES operators to reduce AES signal power levels, add sharp filtering, cease transmissions, improve AES antenna performance, or implement other measures to protect U.S. Government operations.

(d) No AES associated with an authorized 12/14 GHz aeronautical mobile-satellite service operator shall transmit to a space station unless first authorized by the AES blanket licensee or by a service vendor authorized by that licensee, and the specific transmission is conducted in accordance with the operating protocol specified by the space station operator.

(e) Any non-U.S. licensed AES associated with an authorized 12/14 GHz aeronautical mobile-satellite service operator will be deemed, when communicating in U.S. airspace, to be temporarily associated with and licensed to the AES operator or service vendor holding a blanket earth station license awarded pursuant to this section. The U.S. AES licensee shall, for this temporary period, assume the same licensee responsibility for the AES as if the AES were regularly licensed to it.

(f) An AES applicant shall provide for each AES antenna type, a series of radiation patterns measured on a calibrated antenna range and, as a minimum, shall be made at the bottom, middle, and top frequencies of the 14.0-14.5 GHz band or, if the AES will operate only in a portion of the 14.0-14.5 GHz band, at the bottom, middle, and top frequencies of the sub-band in which the AES will operate. The radiation patterns should include:

(1) Co-polarized patterns for each of the two orthogonal senses of polarizations in two orthogonal planes of the antenna.

(i) In the azimuth plane, plus and minus 7 degrees and plus and minus 180 degrees.

(ii) In the elevation plane, zero to 45 degrees.

(2) Main beam gain.

(g) AES Ku-band receive antennas shall not be afforded protection from adjacent satellite interference or other co-frequency operations and AES receive operations will be authorized on an unprotected, non-harmful interference basis only. For purposes of monitoring receive antenna performance and susceptibility to interference, a 12/14 GHz aeronautical mobile-satellite service AES applicant shall provide, for each AES type, the

antenna performance plots specified in paragraph (f) for the 11.7-12.2 GHz band, as well as other bands in which the AES receiver is designed to operate.

(h) A 12/14 GHz aeronautical mobile-satellite service AES licensee applying to renew its license must include on FCC Form 312-R the number of AESs constructed at the time of renewal.

New § 25.132(h)

25.132 (h) This section shall not apply to 12/14 GHz aeronautical mobile-satellite service AES applicants seeking authority to operate pursuant to Section 25.216.