



Kimberly M. Baum
Vice President Spectrum Management & Development, Americas

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

30 September 2016

Subject: Engineering Certification of SES Americom, Inc. for the AMC-1 Satellite

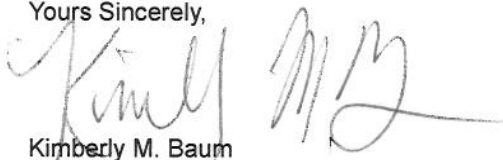
To whom it may concern,

This letter confirms that SES is aware that Global Eagle Entertainment, Inc. ("GEE"), licensed by the Federal Communications Commission ("FCC") as Row 44, Inc., is seeking FCC authority to operate an additional transmit/receive remote terminal in conjunction with its blanket authorization to operate technically identical Ku-band Earth Stations Aboard Aircraft ("ESAA") pursuant to ITU RR 5.504A and Section 25.227 of the Commission's rules (Call Sign E080100). Row 44 seeks authority for GEE's new ESAA terminals to communicate with the AMC-1 satellite at 129.15° W.L., under the current ESAA rules, including Section 25.227.

Based upon the contents of the applications (we understand that Row 44 will seek both an experimental license and the modification of its ESAA license) and the representations made to SES by GEE concerning how it will operate on AMC-1 according to its letter dated September 28, 2016:

- SES certifies that it has completed coordination as required under the FCC's rules and that the power density levels specified by GEE are consistent with any existing coordination agreements to which SES is a party with adjacent satellite operators within +/- 6 degrees of orbital separation from AMC-1.
- If the FCC authorizes the operations proposed by GEE, SES will include the power density levels specified by GEE in all future satellite network coordination with other operators of satellites adjacent to AMC-1.

Yours Sincerely,



Kimberly M. Baum



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

20 October 2016

Subject: Engineering Certification of EchoStar Satellite Operating Corporation ("Echostar") for the AMC-2 Satellite

To whom it may concern,

This letter confirms that EchoStar is aware that Global Eagle Entertainment, Inc. ("GEE"), licensed by the Federal Communications Commission ("FCC") as Row 44, Inc., is seeking FCC authority to operate an additional transmit/receive remote terminal in conjunction with its blanket authorization to operate technically identical Ku-band Earth Stations Aboard Aircraft ("ESAA") pursuant to ITU RR 5.504A and Section 25.227 of the Commission's rules (Call Sign E080100). Row 44 seeks authority for GEE's new ESAA terminals to communicate with the AMC-2 satellite at 85° W.L., under the current ESAA rules, including Section 25.227¹.

Based upon the contents of the applications (we understand that Row 44 will seek both an experimental license and the modification of its ESAA license) and the representations made to SES by GEE concerning how it will operate on AMC-2 according to its letter dated September 28, 2016:

- EchoStar certifies that it has completed coordination as required under the FCC's rules and that the power density levels specified by GEE are consistent with any existing coordination agreements to which EchoStar is a party with adjacent satellite operators within +/- 6 degrees of orbital separation from AMC-2.
- If the FCC authorizes the operations proposed by GEE, EchoStar will include the power density levels specified by GEE in all future satellite network coordination with other operators of satellites adjacent to AMC-2.

Yours Sincerely,

Pat Amodio
Director, Spectrum Development
EchoStar Satellite Operating Corporation

¹ 47 C.F.R. § 25.227.



Kimberly M. Baum
Vice President Spectrum Management & Development, Americas

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

13 January 2017

Subject: Engineering Certification of SES Americom, Inc. for the AMC-3 Satellite

To whom it may concern,

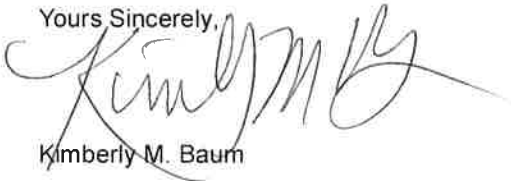
This letter confirms that SES is aware that Global Eagle Entertainment, Inc. ("GEE"), licensed by the Federal Communications Commission ("FCC") as Row 44, Inc., has filed an application seeking special temporary authority ("STA") in connection with its blanket authorization from the FCC to operate Ku-band Earth Stations Aboard Aircraft ("ESAA") transmit/receive terminals (Call Sign E080100) pursuant to ITU RR 5.504A and Section 25.227 of the Commission's rules, on domestic and international flights. The STA request seeks authority for GEE's ESAA terminals to communicate with the AMC-3 satellite at 72° W.L., under the current ESAA rules, including Section 25.227.

Based upon the contents of the STA request and the representations made to SES by GEE for its TECOM SAA Antenna concerning how it will operate on AMC-3 according to its letter dated January 13, 2017:

- SES certifies that it has completed coordination as required under the FCC's rules and that the power density levels specified by GEE are consistent with any existing coordination agreements to which SES is a party with adjacent satellite operators within +/- 6 degrees of orbital separation from AMC-3.
- If the FCC authorizes the operations proposed by GEE, SES will include the power density levels specified by GEE in all future satellite network coordination with other operators of satellites adjacent to AMC-3.

Please let us know if additional information is required.

Yours Sincerely,



Kimberly M. Baum



Kimberly M. Baum
Vice President Spectrum Management & Development, Americas

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

13 January 2017

Subject: Engineering Certification of SES Americom, Inc. for the AMC-3 Satellite

To whom it may concern,

This letter confirms that SES is aware that Global Eagle Entertainment, Inc. ("GEE"), licensed by the Federal Communications Commission ("FCC") as Row 44, Inc., has filed an application seeking special temporary authority ("STA") in connection with its blanket authorization from the FCC to operate Ku-band Earth Stations Aboard Aircraft ("ESAA") transmit/receive terminals (Call Sign E080100) pursuant to ITU RR 5.504A and Section 25.227 of the Commission's rules, on domestic and international flights. The STA request seeks authority for GEE's ESAA terminals to communicate with the AMC-3 satellite at 72° W.L., under the current ESAA rules, including Section 25.227.

Based upon the contents of the STA request and the representations made to SES by GEE for its QEST GSAA Antenna concerning how it will operate on AMC-3 according to its letter dated January 13, 2017:

- SES certifies that it has completed coordination as required under the FCC's rules and that the power density levels specified by GEE are consistent with any existing coordination agreements to which SES is a party with adjacent satellite operators within +/- 6 degrees of orbital separation from AMC-3.
- If the FCC authorizes the operations proposed by GEE, SES will include the power density levels specified by GEE in all future satellite network coordination with other operators of satellites adjacent to AMC-3.

Please let us know if additional information is required.

Yours Sincerely,



Kimberly M. Baum



Kimberly M. Baum
Vice President Spectrum Management & Development, Americas

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

5 October 2016

Subject: Engineering Certification of SES Americom, Inc. for the AMC-9 Satellite

To whom it may concern,

This letter confirms that SES is aware that Global Eagle Entertainment, Inc. ("GEE"), licensed by the Federal Communications Commission ("FCC") as Row 44, Inc., is seeking FCC authority to operate an additional transmit/receive remote terminal in conjunction with its blanket authorization to operate technically identical Ku-band Earth Stations Aboard Aircraft ("ESAA") pursuant to ITU RR 5.504A and Section 25.227 of the Commission's rules (Call Sign E080100). Row 44 seeks authority for GEE's new ESAA terminals to communicate with the AMC-9 satellite at 83° W.L., under the current ESAA rules, including Section 25.227.

Based upon the contents of the applications (we understand that Row 44 will seek both an experimental license and the modification of its ESAA license) and the representations made to SES by GEE concerning how it will operate on AMC-9 according to its letter dated October 5, 2016:

- SES certifies that it has completed coordination as required under the FCC's rules and that the power density levels specified by GEE are consistent with any existing coordination agreements to which SES is a party with adjacent satellite operators within +/- 6 degrees of orbital separation from AMC-9.
- If the FCC authorizes the operations proposed by GEE, SES will include the power density levels specified by GEE in all future satellite network coordination with other operators of satellites adjacent to AMC-9.

SES has also reviewed the discussion in the applications regarding the off-axis EIRP density of Row 44 antennas communicating with AMC-9 in directions other than along the GSO plane. SES is of the view that the non-compliant emissions would not create interference to Ku-band geostationary satellites.

Yours Sincerely,



Kimberly M. Baum



Kimberly M. Baum
Vice President Spectrum Management & Development, Americas

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

30 September 2016

Subject: Engineering Certification of SES Americom, Inc. for the SES-1 Satellite

To whom it may concern,

This letter confirms that SES is aware that Global Eagle Entertainment, Inc. ("GEE"), licensed by the Federal Communications Commission ("FCC") as Row 44, Inc., is seeking FCC authority to operate an additional transmit/receive remote terminal in conjunction with its blanket authorization to operate technically identical Ku-band Earth Stations Aboard Aircraft ("ESAA") pursuant to ITU RR 5.504A and Section 25.227 of the Commission's rules (Call Sign E080100). Row 44 seeks authority for GEE's new ESAA terminals to communicate with the SES-1 satellite at 101° W.L., under the current ESAA rules, including Section 25.227.

Based upon the contents of the applications (we understand that Row 44 will seek both an experimental license and the modification of its ESAA license) and the representations made to SES by GEE concerning how it will operate on SES-1 according to its letter dated September 28, 2016:

- SES certifies that it has completed coordination as required under the FCC's rules and that the power density levels specified by GEE are consistent with any existing coordination agreements to which SES is a party with adjacent satellite operators within +/- 6 degrees of orbital separation from SES-1.
- If the FCC authorizes the operations proposed by GEE, SES will include the power density levels specified by GEE in all future satellite network coordination with other operators of satellites adjacent to SES-1.

Yours Sincerely,

Kimberly M. Baum

November 1, 2016

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

Re: Engineering Certification of Intelsat for IS-29e Satellite

To Whom It May Concern:

This letter confirms that Intelsat is aware that Global Eagle Entertainment, Inc. ("GEE") is planning to seek a modification to its blanket authorization (the "Modification Application") from the Federal Communications Commission ("FCC") to operate two types of Ku band transmit/receive earth stations aboard aircraft ("ESAA's"), Call Sign E080100. Among other changes, the Modification Application will seek authority for GEE's ESAA terminals to communicate with the IS-29e satellite at 50° WL. under the current ESAA rules including Section 25.227.

Based upon the representations made to Intelsat by GEE concerning the contents of its Modification Application:

- INTELSAT acknowledges that the proposed operation of the GEE ESAA terminals has the potential to create harmful interference to satellite networks adjacent to IS-29e that may be unacceptable.
- Intelsat certifies that the proposed use of the ESAA transmit/receive terminals at the power density levels specified by GEE are consistent with existing coordination agreements to which INTELSAT is a party with all adjacent satellite operators within +/- 6 degrees of orbital separation from IS-29e.
- If the FCC authorizes the operations proposed by GEE, Intelsat will include the power density levels specified by GEE in all future satellite network coordination with other operators of satellites adjacent to IS-29e.

Sincerely,



Armand Kadrichu
Senior Technical Advisor, Spectrum Strategy



7900 Tysons One Place, McLean, VA 22102-5972
T +1 703-559-7525 M +1 202-445-4377
armand.kadrichu@intelsat.com



Ciudad de México, April 27th, 2016.
DARI.2016.059

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

Re: Engineering Certification with respect to E115WB at 114.9° W.L. (Ku4 Beam Coverage)

To Whom It May Concern:

This letter certifies that Satélites Mexicanos S.A. de CV dba Eutelsat Americas ("EAS") understands that Global Eagle Entertainment, Inc. ("GEE") is seeking to modify its existing Federal Communications Commission ("FCC") blanket authorization (Call Sign E080100) for operation of Ku-band Earth Stations Aboard Aircraft ("ESAA") as an application of the fixed-satellite service ("FSS") and consistent with ITU RR 5.504A. GEE is seeking to modify its FCC authorization to add satellites as additional points of communication, including the E115WB satellite at 114.9° West Longitude and under Ku4 Beam coverage.

EAS further understands that GEE's primary transmit/receive antenna is a steerable antenna manufactured by TECOM designed to provide bi-directional broadband services to aircraft in flight. The antenna is identified by the model number Ku-Stream 1000. It supports reception and transmission in the 11.70-12.2 GHz /14.05-14.47 GHz bands covered by GEE's existing FCC License. The antenna is an independent linear polarized array equivalent to a 0.62 meter parabolic antenna with a transmit gain of 28.8 dBi at 14.25 GHz and a receive gain of 31.1 dBi at 11.75 GHz. The antenna operates under gimbaled motor control to orient the antenna in azimuth, elevation and polarization and achieves a ± 0.2 degree pointing accuracy during active tracking of the intended satellite. The antenna complies with Section 25.209 of the FCC's Rules with respect to the off-axis co-polarization gain in the plane of the geostationary satellite orbit and to the off-axis cross polarization gain using the parameters of GEE's existing FCC license, under which it will continue to operate for all flights within U.S. airspace. Outside the continental United States, GEE will operate at higher skew angles to maximize coverage,

operating in conformity with European Telecommunications Standards Institute European Standard (EN) 302 186, Satellite Earth Stations and Systems (SES); Harmonized EN for satellite mobile Aircraft Earth Stations (AESs) operating in the 11/12/14 GHz frequency bands covering essential requirements under article 3.2 of the Radio & Telecommunications Terminal Equipment Directive.

The actual skew angle is constantly monitored by the antenna control system, and the aircraft transmitter will be muted in the event that a skew angle of $\pm 35^\circ$ is exceeded. When communicating with E115WB, GEE will operate its antenna within the 14.05-14.47 GHz FSS uplink band and the 11.7-12.2 GHz FSS downlink band transmitting with a maximum equivalent isotropically radiated power (EIRP) of 38.8 dBW up to a 512 kbps carrier. GEE will maintain the return uplink EIRP level and the off-axis EIRP spectral density, by tight control of system operation that includes:

- 1) Maintaining pointing error to be ≤ 0.2 degrees, relative to the intended satellite;
- 2) Fault detection that terminates transmissions when out of tolerance conditions (including the antenna pointing error) are detected; and
- 3) Continuous monitoring/oversight by ground network operations center (NOC).

EAS acknowledges that the use of the above referenced transmit/receive antenna by GEE has the potential to receive harmful interference from adjacent satellite networks that may be unacceptable. The EIRP levels set forth above for the proposed system, installed and operated in accordance with the above conditions, are within the levels coordinated with the adjacent satellite operators and should not cause unacceptable interference into adjacent satellites operating in accordance with FCC's two-degree spacing policy. If the FCC authorizes the operations proposed by GEE in its application, EAS will include the antenna, as described above, in all future satellite network coordinations with other adjacent satellite operators. GEE shall comply with all such coordination agreements reached by the satellite operators.

In order to prevent unacceptable interference into adjacent satellites, EAS has been informed, and GEE acknowledges, that the antennas will be installed and operated in accordance with the above conditions and the terms of its FCC License. In particular, the proposed antenna will operate in compliance with the Commission's two-degree spacing requirements, including the pointing accuracy and shutdown requirements of Section 25.227(a) of the Commission's Rules that apply to ESAA. See 47 C.F.R. § 25.227(a).



Moreover, GEE agrees that it will accept interference from transmissions to adjacent satellites in the 14.0-14.5 GHz band to the degree to which harmful interference would not be expected to be caused to an earth station employing an antenna conforming in all respects to the reference patterns defined in Section 25.209 of the FCC's rules. If the use of this antenna should cause unacceptable interference into other systems in this band, GEE has agreed that it will terminate transmissions immediately upon notice from the affected parties.

Based on GEE's commitment to the operating conditions stated above, satellites operating at two-degree spacing or more should not experience unacceptable interference as a result of the modification of GEE's Ku-band ESAA blanket FCC License as outlined here to include E115WB at 114.9° W.L. as an additional point of communication.

Sincerely,



Hector Fortis
Director of Regulatory and International Affairs
Satélites Mexicanos Sa de CV

Acceptance by GEE, Inc.:

GEE affirms that the information provided to EAS and reflected in this coordination letter is true and accurate to the best of GEE's knowledge, information and belief, and that it shall comply with all relevant coordination agreements, as provided herein.

Aditya Chatterjee
Chief Technical Officer
GEE, Inc.



**A Coordination Agreement
Between the National Aeronautics and Space Administration
(hereinafter "NASA")
and Row 44, Incorporated (hereinafter "Row 44")
for Operation of the Row AMSS
in the 14.05 – 14.47 GHz-Band**

Row 44 seeks to license and operate aeronautical mobile-satellite stations (AMSS) over the Continental United States (CONUS) on a secondary basis in the 14.05 to 14.47 GHz FSS band. The AMSS terminals are part of the Row 44 communications system aboard general aviation and commercial aircraft using transponders in the Geostationary Satellite Orbit (GSO) arc. This Coordination Agreement has been prepared in compliance with the rules of the Federal Communications Commission (FCC) and the recommendations of the member states of the International Telecommunication Union (ITU) following the World Radio Communication Conference WRC-03.

1. Overview

The 14.0 – 14.5 GHz-band has been allocated to the mobile-satellite service, now including aeronautical mobile-satellite service, on a secondary basis, provided that Airborne Earth Stations (AES) include specific protection to the Space Research Services (SRS) earth stations and to the Tracking and Data Relay Satellite System (TDRSS) within the 13.40 – 14.4 GHz-band

Row 44 has filed an application for license authorization to operate up to 1000 technically identical AES units in the 14.05 – 14.47 GHz-band.

The Row 44 AESs receive from, and transmit to, the same GSO satellite transponder under control of a Ground Earth Station (GES) and Network Operations Center (NOC). They, and the terrestrial network to which they are connected, comprise the Row 44 system.

This Coordination Agreement has been prepared to ensure that operation of the Row 44 AESs conform to FCC requirements for protection of the SRS Network.

Row 44 has the authority to negotiate and sign this Coordination Agreement for their AMSS system and NASA has the authority to negotiate and sign this agreement for the TDRSS and SRS Network sites listed in Section 3.1.

2. AUTHORITY

NASA concludes this agreement pursuant to 42 USC §2473 © (5) and (6) and section 203 © (5) of the National Aeronautics and Space Act of 1958 as amended, in addition to the Manual of Regulations and Procedures for Federal Radio Frequency Management (National Telecommunications & Information Administration Redbook), May 2003 Edition, May 2008 Revision.

3. Space Research Services Earth Stations

TDRSS Earth Station Sites:

Table 1 provides a list of TDRSS earth stations sites requiring interference protection. The White Sands and Guam sites are currently operational. The Blossom Point, MD site is planned for operation in about 2.5 to 3 years. Also provided are the TDRSS satellite orbital locations currently supported by each earth station site.

Earth Station Site	Latitude (D,M,S)	Longitude (D,M,S)	TDRSS Satellite Degrees East Long.*
<u>Continental United States</u>			
White Sands, New Mexico	N32 30' 18.686"	W106 36' 37.153"	-174
Antenna Size – 18.3 meter			-171
Antenna Gain – 66.4 dBi			-150
Elevation – 1456 m			-79
			-62
			-49
			-47
			-41
Blossom Point, MD			-12
N382544/W770502			-41
Antenna Size - 16.5-20 m			-47
Maximum Antenna Gain -66.7			-49
dBi			-62
Elevation - 0 meter			-79
<u>United States Territory¹</u>			
Guam	N13 36' 0"	E144 54' 0"	85
Antenna Size – 11 meter			89
Antenna Gain – 61.9 dBi			-171/-174

¹ Should Row 44 extend operations outside of CONUS, it shall provide the same protection to NASA's TDRSS Earth Stations sites around the world (such as Guam) as will be provided to the other Station sites covered by this Agreement.

Table 1. Existing TDRSS Earth Station Sites

* Ephemeris data on existing TDRSS spacecraft indicated in Table 1 may be found at the following Web sites:

a. http://fdi.gsfc.nasa.gov/prod_center_pc_frame_page.htm

Select Retrieve Other Products

Select Retrieve 2-line Element Sets (Celestial BBS)

Under NORAD Two-Line Element Sets. Select Current Data

Select Tracking and Data Relay Satellite System (TDRSS)

b. Obtain the NORAD orbital elements directly at:

<http://celestrak.com/NORAD/elements/>

choose Tracking and Data Relay Satellite System (TDRSS)

Additional TDRSS Earth Station Sites:

NASA shall provide Row 44 at least two months written notice of when the Blossom Point, MD earth station is about to become operational. Protection of this site must be provided by its planned operational date of use.

NASA may unilaterally add additional TDRSS earth station sites to the list in Table 1 above. NASA will notify Row 44 as soon as it knows that a new earth station is being planned and has the coordinates of the newly planned site.

Earth Site Protection Limits:

The TDRSS protection limits are listed in the Table 2 below.

Frequency Band	Interference Threshold Limit Measured at Antenna Output	Reference Percentage of Time
13.40 – 14.00 GHz	-176 dBW/ kHz	Never to be Exceeded
14.00 – 14.05 GHz	-146 dBW/ MHz	Never to be Exceeded
14.05 – 14.40 GHz	-100 dBW	Never to be Exceeded

Table 2. TDRSS Protection Limits

For interference calculations, the TDRSS spacecraft can have an inclination angle up to 15 degrees. In calculating the interference threshold levels in Table 2, the antenna patterns in Figure 1 below should be used. The antenna pattern for the Blossom Point site will be similar to the WSC pattern in Figure 1.

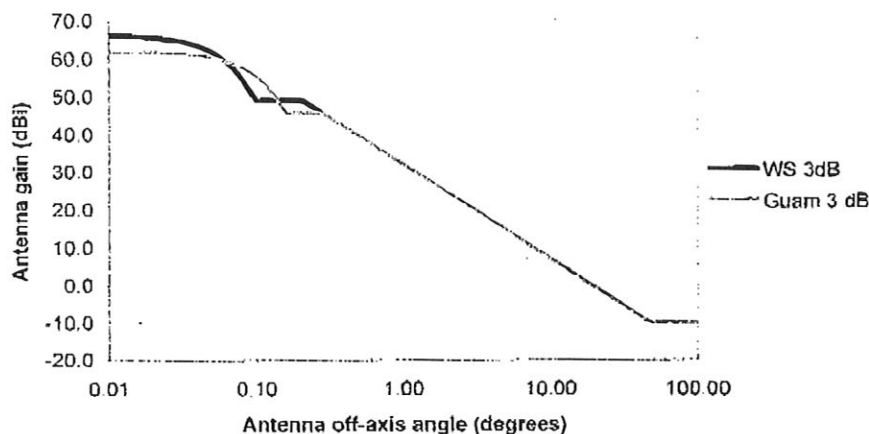


Figure 1. TDRSS Earth Station Antenna Gain Patterns

Note: This antenna pattern is calculated using Annex III of Appendix 8 of the ITU Radio Regulations, with the following modifications:

$$G_1 = 5 + 15 \log(D/\lambda)$$

$$\phi_r = 12.02 (D/\lambda)^{0.6}$$

Where Gmax and D are given in Table 1.

4. Operational Coordination Agreement

NASA and Row 44 agree to the following:

- a. The purpose of this Coordination Agreement is to provide protection to the TDRSS earth station sites listed in Table 1 and any future TDRSS earth station sites.
- b. The level of protection afforded to the sites in Table 1, and any future TDRSS earth station sites which NASA adds to Table 1 pursuant to Section 3.2 of this Agreement, shall be equal to or greater than the Interference Threshold Limits shown in Table 2.

4.1 This Coordination Agreement may be reviewed periodically by the signatories to the agreement following commencement of service by Row 44 under an operational license from the FCC. The purpose of the review is to assess the effectiveness of this agreement and update this, or subordinate operational agreements, as appropriate.

4.2 Each party shall inform the other party in a timely manner of changes in the points of contact as defined in Section 5.

4.3 FINANCIAL OBLIGATIONS: Each party shall be responsible for funding its own responsibilities under this Agreement. No provision of this Agreement shall be interpreted to require obligation of funds in violation of the Anti-Deficiency Act 31 U.S.C § 1341.

Row 44 agrees to:

4.4 Monitor, control and cease transmissions from any AES that would exceed the thresholds given in Table 2 within line-of-sight of the sites listed in Table 1.

4.5 Monitor, control and cease transmissions from any AES that would exceed the thresholds given in the Table 2 within line-of-sight of such additional sites as NASA may require.

4.6 Respond expeditiously to a NASA request for protection of the sites listed in Section 3.1. or additions thereto as provided for in Section 3.2. in accordance with the threshold limits of Section 3.3.

4.7 Respond expeditiously to a NASA request to isolate a source of interference to a TDRSS earth station suspected to be from an AES.

4.8 Provide a central point of contact (on a 24 hour, 7 day basis) for interference resolution and other contact.

NASA agrees to:

4.9 Maintain an open dialog with Row 44 concerning any perceived breach of interference thresholds that may be attributable to an AES that is not in compliance with this Coordination Agreement.

4.10 Provide timely notification to Row 44 of changes or additions to TDRSS earth station sites, TDRSS spacecraft orbital positions or interference thresholds listed in this Coordination Agreement.

5. Assignment and Termination

5.1 This Coordination Agreement shall be binding upon the parties hereto and their respective successors and assigns.

5.2 This Coordination Agreement may be terminated by either party upon 6 months written notice to the other.

5.3 CONTINUING OBLIGATIONS: The obligation of Row 44 to protect the NASA TDRSS earth stations from interference as described in this agreement will survive termination or expiration of this Agreement.

6. Points of Contact

6.1 Points of contact concerning this Coordination Agreement:

Name: Ronald Carbery
Title: Acting Director NASA Spectrum Policy
Organization: NASA
Address: NASA Headquarters
300 E Street SW
Washington D.C. 20546-0001
Telephone: (202) 358-4808
Facsimile: (202) 358-2865
e-mail: Ron.Carbery@nasa.gov

Name: John Guidon
Title: CEO
Organization: Row 44
Address: Row 44, Inc.
31280 Oak Crest Drive
Westlake Village, CA 91341
Telephone: (818) 706-3111
Facsimile: (818) 706-9431
e-mail: jguidon@row44.com

5.1 Points of contact for technical concerns related to this Coordination Agreement:

Name: Roger D. Porter
Title: Goddard Spectrum Manager
Organization: NASA
Address: Goddard Space Flight Center
Mission Services Program Office
Greenbelt, MD 20771
Telephone: (301) 286-5089
Facsimile: (301) 286-1724
e-mail: Roger.D.Porter@nasa.gov

Name: James Costello
Title: VP, Engineering
Organization: Row 44
Address: Row 44, Inc
31280 Oak Crest Drive
Suite 5
Westlake Village, CA 91341
Telephone: (480) 390-1075
Facsimile: (818) 706-9431
e-mail: jcostello@row44.com

6. Signatures

This Coordination Agreement is being made in good faith by both parties and is effective on the date on of final signature.

For: The National Aeronautics and Space
Administration:

By: *Badri A. Younes*

Name: Badri Younes

Title: Associate Assistant Administrator
For Space Communications and
Navigation (SCAN)

Date: *May 21, 2008*

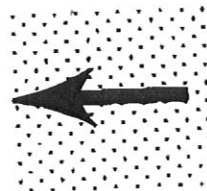
For: Row 44, Incorporated:

By: *John LaValle*

Name: John LaValle

Title: Chief Operating Officer

Date: 19 May 2008



**A Coordination Agreement
Between the National Science Foundation (“NSF”) and
Row 44 Inc. (“Row44”) for Operation of the
Row 44 AMSS and Radio Astronomy Sites
Jointly Sharing the 14.0-14.5 GHz Band**

Row 44 is applying for a license to operate an aeronautical mobile satellite service (AMSS) over North America including the Continental United States (CONUS), Canada and Mexico in the 14.0-14.5 GHz Fixed Satellite Service (FSS) band. The AMSS terminals will be installed aboard commercial aircraft and operate with transponders in the Geostationary Satellite Orbit (GSO) arc. This coordination agreement and the pending Federal Communications Commission (FCC) license comply with FCC Part 25 rules and the recommendations of the International Telecommunication Union (ITU) as a product of the World Radiocommunication Conference WRC-03.

1.0 Overview

- 1.1 The band 14.47-14.5 GHz is used by the radio astronomy service in accordance with footnotes US342 to the U.S. Table of Frequency Allocations
- 1.2 The band 14.0-14.5 GHz has been allocated to mobile satellite service including the aeronautical mobile satellite service (AMSS) on a secondary basis with the provision that government services including the radio astronomy service in the 14.47-14.50 GHz band be protected from interference from the AMSS service.
- 1.3 Row 44 applied and was granted a special temporary authority (STA) on December 11, 2007 for fixed station testing. Row 44 plans to submit a license application to the FCC for AMSS operation in the 14.0-14.5 GHz band to allow service aboard commercial aircraft flying in North America.
- 1.4 The AMSS service will allow aircraft earth stations (AES) to transmit and receive information from a ground earth station (GES) via a transponder in the Geostationary Satellite Orbit (GSO) arc under the control of a ground-based network operation center (NOC). The terrestrial network will utilize Hughes Network Systems HX150 licensed ground terminals with Call Signs E940460 and E00016.
- 1.5 This Coordination Agreement ensures that the Row 44 AMSS system complies with both Part 25 FCC requirements and ITU recommendations for radio astronomy protection.
- 1.6 Negotiation and signatures of this agreement are to be executed by Row 44 and the Electromagnetic Spectrum Management Unit of the NSF for the Radio Astronomy sites identified in Section 2.1.

2.0 National Science Foundation Radio Astronomy Observatories

2.1 Radio Astronomy Site Listing

The Radio Astronomy sites under NSF support and listed in Table 2-1 make measurements in the 14.47-14.50 GHz band. These sites, including sites associated with

the Very Long Baseline Array (VLBA), are to be protected during their operation in accordance with the description provided in Section 3.

Table 2-1 Current Radio Astronomy Sites

Observatory	Latitude (D,M,S)	Longitude (D,M,S)
<u>National Astronomy and Ionosphere Center (NAIC) site:</u>		
Arecibo, PR.....	18 20 39	66 45 10
<u>National Radio Astronomy Observatory (NRAO) sites:</u>		
Green Bank Telescope, WV.....	38 25 59	79 50 23
Very Large Array, Socorro, NM.....	34 04 44	107 37 06
<u>VLBA sites:</u>		
St. Croix, VI	17 45 24	64 35 01
Hancock, NH	42 56 01	71 59 11
N. Liberty, IA.....	41 46 17	91 34 27
Ft. Davis, TX.....	30 38 06	103 56 41
Los Alamos, NM.....	35 46 30	106 14 44
Pie Town, NM.....	34 18 04	108 07 09
Kitt Peak, AZ	31 57 23	111 36 45
Owens Valley, CA.....	37 13 54	118 16 37
Brewster, WA.....	48 07 52	119 41 00
Mauna Kea, HI	19 48 05	155 27 20

2.2 Additional Radio Astronomy Sites

NSF may add new radio astronomy sites to the list given in Table 2-1. In this case NSF shall give Row 44 at least 2 months notice of modifications to existing sites, or the inclusion of any additional Radio Astronomy sites to operate in the 14.47 - 14.5 GHz band.

3.0 Operational Coordination Agreement

NSF and Row 44 agree to the following stipulations:

- 3.1 To provide protection to the Radio Astronomy sites listed in Table 2-1 during their operational period, the following aggregate power flux densities (pfd) in the 14.47-14.50 GHz band shall be no greater than:

- a) -221 dB(W/m²/Hz) for the Arecibo, Green Bank and Socorro sites
- b) -189 dB(W/m²/Hz) for the ten VLBA sites
- 3.2 Within a year following initiation of the licensed Row 44 AMSS service, authorized NSF and Row 44 personnel shall periodically review the terms of this Coordination Agreement. If required, modifications of this Coordination Agreement will be negotiated and instituted.
- 3.3 Any changes in the points of contact given in Section 5 shall be identified and reported by the respective party in a reasonable period.

Row 44 agrees to the following stipulations:

- 3.4 Row 44 will respond promptly to any NSF request for protection as described above for interference occurring at any site listed in Table 2-1.

NSF agrees to the following stipulations:

- 3.5 Provide Row 44 points of contact given in Section 5 a current schedule of Radio Astronomy measurements to be conducted in the 14.47-14.5 GHz band for the sites identified in Table 2-1.
- 3.6 Via the National Astronomy and Ionosphere Center (NAIC) and the National Radio Astronomy Observatory (NRAO) provide Row 44 points of contact given in Section 5 any data that is not in accordance with the provisions in this Coordination Agreement.

4.0 Termination Conditions

- 4.1 This Coordination Agreement shall be binding for Row 44 and NSF.
- 4.2 Either party providing a written notice of six months may execute termination of this Coordination Agreement.

5.0 Points of Contact

5.1 Points of contact for this Coordination Agreement are:

Name: Dr. Andrew W.Clegg	Name: James Costello
Organization: National Science Foundation	Organization: Row 44
Title: Program Director, Electromagnetic Spectrum Management Unit	Title: Vice President, Engineering
Address: 4201 Wilson Boulevard,	Address: 31280 Oak Crest Drive, Suite 5

Room 1045	
City State Zip: Arlington VA 22230	City State Zip: Westlake Village, CA 91361
Phone: (703) 292-4892	Phone: 818.706.3111
Fax: (703) 292-9034	Fax: 818.706.9431
E-mail: esm@nsf.gov	E-mail: jbcostello@ROW44.com

5.2 Points of contact for Radio Astronomy observation schedules are:

Dr. Harvey Liszt	Name: Dr. Murray Lewis
Title: Director, Spectrum Management	Title: Spectrum Manager
Organization: NRAO	Organization: National Astronomy and Ionosphere Center
Address: 520 Edgemont Rd Charlottesville VA 22903	Address: Arecibo Observatory HC3 Box 53995 Arecibo PR 00612
Phone: 434-296-0344	Phone: 787-878-2612
Fax: 434-296-0278	Fax: 787-878-1861
E-mail: hlist@nrao.edu	E-mail: prcz@naic.edu

6.0 Signatures

This Agreement is being made in good faith by both parties and is effective on the date on which the last party signs it.

For the National Science Foundation

By: Al W Clegg

Name: Dr. Andrew W. Clegg
Title: Program Director, Electromagnetic
Spectrum Management Unit

Date: 5/6/08

For Row 44

By: [Signature]

Name: JOHN GUIDON
Title: CEO

Date: 4-18-08
Title: Director of Contracts

Date: _____