

**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/m<sup>2</sup>/Hz) for the Arecibo, Green Bank and Socorro sites
- b) -189 dB(W/m<sup>2</sup>/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: <a href="mailto:esm@nsf.gov">esm@nsf.gov</a>	E-mail: <a href="mailto:jbcostello@ROW44.com">jbcostello@ROW44.com</a>

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: <a href="mailto:hlistz@nrao.edu">hlistz@nrao.edu</a>	E-mail: <a href="mailto:prcz@naic.edu">prcz@naic.edu</a>

