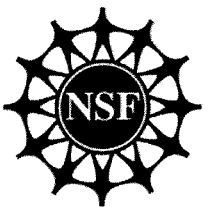

TECHNICAL OPERATIONAL COORDINATION AGREEMENT FOR THE JOINT USAGE OF THE BAND 14.0 - 14.5 GHz BETWEEN THE NATIONAL SCIENCE FOUNDATION AND LAND MOBILE SATELLITE SERVICE EARTH STATIONS (LMSS) OPERATED BY RAYSAT, INC.

Version 1.0

May 25, 2006

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Radio Astronomy observations are conducted in the 14.47-14.5 GHz band in the USA at a number of Radio Astronomy sites. RaySat, Inc. ("RaySat") desires to operate a network of in-motion Land Mobile Satellite Service stations in the continental United States only, which will operate in the 14.0 to 14.5 GHz transmit and the 11.7 to 12.2 GHz receive band. The present agreement is intended to facilitate operation of the RaySat system, without causing interference to Radio Astronomy stations.

1. General Information

1.1 The band 14.47 to 14.5 GHz is allocated to the radio astronomy service on a secondary basis.

1.2 The band 14.0 – 14.5 GHz is allocated in the United States to the Land Mobile Satellite Service ("LMSS") on a secondary basis, provided that LMSS stations include special protection to radio astronomy stations that observe in this band.

1.3 RaySat plans to file an application with the FCC to operate up to four thousand (4,000) technically identical transmit/receive in-motion satellite earth stations to operate in the 11.7 – 12.2 and 14.0 – 14.5 GHz frequency bands.

1.4 This agreement document has been developed to govern the use of all RaySat in-motion stations operating in CONUS to ensure the protection of radio astronomy stations operations in the 14.47 to 14.5 band.

1.5 The Electromagnetic Spectrum Unit of the National Science Foundation (NSF) has the authority to negotiate and sign this agreement for the radio astronomy sites listed in Section 2.1, and RaySat has the authority to negotiate and sign this agreement on behalf of itself.

2. List of NSF supported Radio Astronomy observatories observing or planning to observe in the band 14.47 - 14.5 GHz within the US and its territories

2.1 The following is a list of ten radio astronomy sites supported by NSF that are included in this agreement. Two of these sites, Green Bank, WV and Socorro, NM, require more stringent levels of protection, while the remaining eight sites, which are associated with

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the Very Long Baseline Array (VLBA), require less stringent protection. See section 3.1 below.

Name	Latitude	Longitude	Type
Green Bank, WV	38.4331	-79.8397	SINGLE DISH
Socorro, NM	34.0789	-107.6183	INTERFEROMETER
Brewster, WA	48.1311	-119.6833	VLBA
Owens Valley, CA	37.2317	-118.2769	VLBA
Kitt Peak, AZ	31.9564	-111.6125	VLBA
Pie Town, NM	34.3011	-108.1192	VLBA
Los Alamos, NM	35.775	-106.2456	VLBA
Fort Davis, TX	30.635	-103.9447	VLBA
North Liberty, IA	41.7714	-91.5742	VLBA
Hancock, NH	42.9336	-71.9866	VLBA

This list of stations is subject to change. NSF shall give RaySat no less than 2 months advance notice of changes in the status of existing sites, or of any additional radio astronomy site being brought into use in the 14.47 - 14.5 GHz band. In case of any change to this list of stations, either party may reopen this agreement to address issues arising in connection with such change.

3. Technical Operational Coordination Agreement

NSF and RaySat agree to the following:

3.1 The purpose of this agreement is to provide protection to the radio astronomy sites listed in Section 2.1 in the 14.47 - 14.5 GHz band to the following aggregate pfd levels within that band:

- -221 dB(W/m^2/Hz) for the Green Bank and Socorro sites
- -189 dB(W/m^2/Hz) for the eight CONUS VLBA sites

3.2 This agreement shall be reviewed on an annual basis by all parties signing this document beginning within one year after RaySat has informed NSF of the start of service in CONUS under an operational license. The purpose of this review is to assess the effectiveness of this agreement as well as to update as applicable this or successor operational coordination agreements.

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

RaySat agrees to:

3.4 Prevent transmissions from any LMSS that would exceed the threshold given in Section 3.1 above. Based on RaySat technical parameters and operational characteristics agreed to during direct RaySat/NSF coordination discussions, RaySat will achieve this by ensuring that the RaySat terminals will not operate within an exclusion zone around the radio astronomy sites listed in Section 2.1 The agreed upon separation distances for each NSF type are shown below:

Green Bank, WV (GBT).....	160 km
Socorro, NM (VLA).....	160 km
Seven Very Long Baseline Array (VLBA) Sites	
Other Than Hancock, NH	50 km
VLBA Site at Hancock, NH.....	25 km*

Until such time as RaySat terminals are able to coordinate based on both time and location, the terminals will not operate when within the given separation distances of the observatories. In the future, if RaySat terminals add the ability to coordinate based on time, restrictions on use will only apply when the terminals are within the specified separation distances and the observatory is scheduled to be observing in this band.

*The 25 km exclusion zone for the Hancock, NH VLBA site is based up the need to protect this site from RaySat stations operating outside of the Boston Metropolitan Area, recognizing that the noise floor within the Boston Metropolitan Area is significantly higher than the noise floor in the surrounding areas.

NSF agrees to:

3.5 Maintain an observation schedule for the band 14.47 - 14.5 GHz for the sites listed in Section 2.1 and make this schedule available upon request to the designated RaySat point-of-contact listed in Section 5.2, upon notification that RaySat terminals have achieved the capability of coordinating frequency use based upon time.

3.6 Provide, through NRAO, full access to RaySat representatives to data on interference that may be collected during observations that fall within the scope of this agreement.

4. Assignment and Termination

4.1 This agreement shall be binding upon the parties hereto and their respective successors and assigns.

4.2 This agreement may be terminated by the written mutual agreement of the parties, upon 6 months notice.

5 Points of Contact

5.1 Points of contact concerning this agreement.

Name: Dr. Tomas E. Gergely	Name: Ilan Kaplan
Organization: National Science Foundation	Organization: RaySat, Inc.
Title: Electromagnetic Spectrum Manager	Title: VP, Product Management & Business Development
Address: 4201 Wilson Boulevard, Room 1030	Address: RaySat, Inc. 8460-D Tyco Road
City State Zip: Arlington VA 22230	City State Zip: Vienna, VA 22182
Phone: (703) 292-4896	Phone: (703) 584-3770
Fax: (703) 292-9034	Fax: (703) 584-3775
E-mail: esm@nsf.gov	E-mail: ilan@raysat.com

5.2 Contacts concerning the notification of radio astronomy observation schedules:

Dr. Harvey Liszt	Name: Daniel DiFonzo
Title: Director, Spectrum Management	Title: Chief Technical Officer
Organization: NRAO	Organization: RaySat, Inc.
Address: NRAO 520 Edgemont Road Charlottesville, VA 22903-2475	Address: RaySat, Inc. 8460-D Tyco Road
Phone 434.296.0344	Phone: (703) 584-3770
Fax: 434.296.0278	Fax: (703) 584-3775
E-mail: hliszt@nrao.edu	E-mail: dan@raysat.com

6 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. It may be executed in one or more counterparts, each of which will be deemed an original and all of which together will constitute one and the same instrument.

For the National Science Foundation	For RaySat, Inc.
By: _____	By: _____
Name: Dr. Tomas Gergely	Name: Ilan Kaplan
Title: Electromagnetic Spectrum Manager	Title: VP, Product Management & Business Development
Date: _____	Date: 05/31/06

Technical Annex

This annex shows the calculations upon which the coordination distances were based. The operating parameters of the RaySat terminals and technical data upon which the calculations are based are as follows:

	In-Band		Out-of-Band	
Transmit Power	-18	dBW	-18	dBW
Transmit Reference BW	4000	Hz	4000	Hz
Transmit PSD	-54	dB(W/Hz)	-54	dB(W/Hz)
OOB Supression	0	dB	-70	dB
Antenna Horizon Gain	-10	dB	-10	dB
In-Band EIRP	-64	dB(W/Hz)	-134	dB(W/Hz)
Green Bank, VLA Objective	-221	dB(W/m^2/Hz)	-221	dB(W/m^2/Hz)
Wavelength @ 14.5 GHz	0.02	m	0.02	m
Isotropic Collecting Area	3.4E-05	m^2	3.4E-05	m^2
Isotropic Collecting Area	-44.7	dB(m^2)	-44.7	dB(m^2)
Green Bank, VLA Objective	-265.7	dB(W/Hz)	-265.7	dB(W/Hz)
Required Prop Loss to meet GB/VLA Obj	-201.7	dB	-131.7	dB
VLBA Objective	-189	dB(W/m^2/Hz)	-189	dB(W/m^2/Hz)
VLBA Objective	-233.7	dB(W/Hz)	-233.7	dB(W/Hz)
Required Prop Loss to meet VLBA Obj	-169.7	dB	-99.7	dB

Based upon the required propagation loss to meet in-band and out-of-band objectives, the following page summarizes the coordination distances required based upon various propagation scenarios using the ITS irregular terrain model.

Frequency 14.5 GHz

ITM AREA MODE PROPAGATION SIMULATIONS FOR THE GREEN BANK TELESCOPE

Input Parameters					Environmental Parameters					Statistical Parameters			Distance to Meet Green Bank Propagation Loss Requirements (Green=FSL; Red=ITM)	
Antenna Heights (m)			Site Criteria					Conduc Gnd			Reliability			
Tx	Rx	Pol	Tx	Rx	dH (m)	Surf Refr (N)	Epsilon Gnd	S/m	Climate	Mode of Variability	%	Confidence	In-Band (202 dB)	OOB (132 dB)
2	139.6	V	Random	Random	10	301	15	0.001	Continental Temperate	Mobile	1	50	218.8	?
2	139.6	H	Random	Random	10	301	15	0.001	Continental Temperate	Mobile	1	50	218.8	?
2	139.6	V	Random	Very Careful	10	301	15	0.001	Continental Temperate	Mobile	1	50	218.8	?
2	139.6	V	Careful	Very Careful	10	301	15	0.001	Continental Temperate	Mobile	1	50	221.8	?
2	139.6	V	Very Careful	Very Careful	10	301	15	0.001	Continental Temperate	Mobile	1	50	223.5	?
2	139.6	V	Careful	Careful	10	301	15	0.001	Continental Temperate	Mobile	1	50	221.8	?
2	139.6	V	Careful	Careful	90	301	15	0.001	Continental Temperate	Mobile	1	50	214.4	?
2	139.6	V	Careful	Careful	200	301	15	0.001	Continental Temperate	Mobile	1	50	147.6	?
2	139.6	V	Careful	Careful	200	301	15	0.001	Continental Temperate	Single	1	50	47.8	?
2	139.6	V	Careful	Careful	90	301	15	0.001	Continental Temperate	Single	1	50	68	?
2	139.6	V	Careful	Careful	90	301	15	0.001	Continental Temperate	Individual	1	50	143.2	?
2	139.6	V	Careful	Careful	200	301	15	0.001	Continental Temperate	Individual	1	50	64.9	?
2	139.6	V	Careful	Careful	200	301	15	0.001	Continental Temperate	Mobile	50	50	47.8	?
2	139.6	V	Careful	Careful	200	301	15	0.001	Continental Temperate	Mobile	99	50	28	?
2	139.6	V	Careful	Careful	90	301	15	0.001	Continental Temperate	Mobile	1	90	214.4	?

ITM AREA MODE PROPAGATION SIMULATIONS FOR THE VERY LARGE ARRAY

Input Parameters					Environmental Parameters					Statistical Parameters			Distance to Meet Very Large Array Propagation Loss Requirements (Green=FSL; Red=ITM)	
Antenna Heights (m)			Site Criteria					Conduc Gnd			Reliability			
Tx	Rx	Pol	Tx	Rx	dH (m)	Surf Refr (N)	Epsilon Gnd	S/m	Climate	Mode of Variability	%	Confidence	In-Band (202 dB)	OOB (132 dB)
2	40	V	Careful	Careful	30	301	15	0.001	Continental Temperate	Mobile	1	50	203.4	?
2	40	V	Careful	Careful	10	301	15	0.001	Continental Temperate	Mobile	1	50	203.4	?
2	40	V	Careful	Careful	90	301	15	0.001	Continental Temperate	Mobile	1	50	195.9	?

ITM AREA MODE PROPAGATION SIMULATIONS FOR THE VLBA SITES

Input Parameters					Environmental Parameters					Statistical Parameters			Distance to Meet Very Large Array Propagation Loss Requirements (Green=FSL; Red=ITM)	
Antenna Heights (m)			Site Criteria					Conduc Gnd			Reliability			
Tx	Rx	Pol	Tx	Rx	dH (m)	Surf Refr (N)	Epsilon Gnd	S/m	Climate	Mode of Variability	%	Confidence	In-Band (170 dB)	OOB (100 dB)
2	40	V	Careful	Careful	0	301	15	0.001	Continental Temperate	Mobile	1	50	44.1 (?)	0.2
2	40	V	Careful	Careful	0	301	15	0.001	Mar Temp Over Sea	Mobile	1	50	44.8 (?)	0.2
2	40	V	Careful	Careful	30	301	15	0.001	Continental Temperate	Mobile	1	50	60.7	0.2
2	40	V	Careful	Careful	90	301	15	0.001	Continental Temperate	Mobile	1	50	50.6	0.2