

ATTACHMENT 2

**A Coordination Agreement
Between the National Aeronautics and Space Administration
(hereinafter “NASA”)
and RaySat, Incorporated (hereinafter “RaySat”)
for Operation of the RaySat LMSS Terminals
in the 14.0 – 14.5 GHz-Band**

RaySat seeks to license and operate Land Mobile-Satellite Service (LMSS) terminals in the Continental United States (CONUS) on a secondary basis in the 14.0 to 14.5 GHz FSS band. The LMSS terminals are RaySat StealthRay satellite communications terminals aboard ground vehicles 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

- 1.1 In the United States, the 14.0 – 14.5 GHz-band has been allocated to the mobile-satellite service on a secondary basis, provided that Land Mobile Earth Stations (LMSS) include specific protection to the Space Research Service (SRS) earth stations and to the Tracking and Data Relay Satellite System (TDRSS) within the 13.40 – 14.05 GHz-band.
- 1.2 RaySat, Inc. is expected to file an application with the FCC for license authorization to operate up to 5,000 technically identical LMSS units in the 14.0 – 14.5 GHz transmit and 11.7 – 12.2 GHz receive bands.
- 1.3 The RaySat LMSSs are internally controlled and receive from and transmit to possibly different GSO satellite transponders without the control of a Ground Earth Station (GES) and Network Operations Center (NOC). Each individual RaySat terminal can be connected to different transponders (from different satellite providers) and each RaySat terminal has an internal global position system receiver.
- 1.4 This Coordination Agreement has been prepared to ensure that operations of the RaySat StealthRay terminals conform to FCC requirements for protection of the SRS Network.
- 1.5 RaySat, Inc. has the authority to negotiate and sign this Coordination Agreement for its StealthRay terminals, 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 (c) (5) and (6) and section 203 (c) (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, September 2005 Revisions.

3. Space Research Service Earth Stations

3.1 TDRSS Earth Station Sites

Table 1 provides a list of TDRSS Earth Stations sites currently requiring interference protection. 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
<u>United States Territory¹</u>			
Guam	N13 36' 0"	E144 54' 0"	85
Antenna Size – 11 meter			-171
Antenna Gain – 61.9 dBi			-174

Table 1. TDRSS Earth Station Sites

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

- a. http://fdf.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
- b. Obtain the NORAD orbital elements directly at:
<http://celestrak.com/NORAD/elements/>
choose Tracking and Data Relay Satellite System

¹ NASA recognizes that RaySat is currently applying only for CONUS authorization. If RaySat applies for future authorization to operate outside of CONUS RaySat and NASA shall develop an addendum to this agreement to accommodate RaySat's protection of the NASA Guam TDRS site.

3.2 Earth Station 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

In order to meet the protection limits specified in Table 2, RaySat LMSS terminal operations will be prohibited within certain zones surrounding TDRSS Earth station. The size and shape of these zones may be calculated using TDRSS and RaySat radio frequency parameters and operational characteristics which are based on direct technical coordination between NASA and RaySat. Tables 3 and 4 list the exclusion zones (where LMSS transmitters will not operate), in kilometers, that are necessary to protect the NASA TDRSS.

	Required Separation Distance (Note 1) Between RaySat Terminal and TDRSS Earth Station (RaySat Ops above 14.2 GHz) centered on N32 30' 18.686", W106 36' 37.153"	
TDRSS Earth Station	RaySat Emissions into TDRSS Earth Station Backlobe Region2	RaySat Emissions into TDRSS Earth Station Mainlobe Region2,3
White Sands	10 km (North of TDRSS earth station)	10km (South of TDRSS earth station)
<i>Note 1: TDRSS "out-of-band" criteria is -100.0 dBW</i> <i>Note 2: RaySat emissions into TDRSS Earth station backlobe region assume RaySat "mainlobe"; RaySat emissions into TDRSS Earth station mainlobe region assume RaySat "backlobes"</i> <i>Note 3: TDRSS latitude excursions resulting in less than one degree Earth station antenna elevation.</i>		

Table 3. RaySat Ops above 14.2 GHz

	Required Separation Distance (NOTE 1) Between RaySat Terminal and TDRSS Earth Station (RaySat Ops below 14.2 GHz) centered on N32 30' 18.686", W106 36' 37.153"	
TDRSS Earth Station	RaySat Emissions into TDRSS Earth Station Backlobe Region2	RaySat Emissions into TDRSS Earth Station Mainlobe Region2,3
White Sands	46 km (North of TDRSS)	73 km (South of TDRSS)
<i>Note 1: TDRSS "in-band" criteria is -146.0 dBW/MHz</i> <i>Note 2: RaySat emissions into TDRSS Earth station backlobe region assume RaySat "mainlobe"; RaySat emissions into TDRSS Earth station mainlobe region assume RaySat "backlobes"</i> <i>Note 3: TDRSS latitude excursions resulting in less than one degree Earth station antenna elevation.</i>		

Table 4. RaySat Ops below 14.2 GHz

4. Operational Coordination Agreement

NASA and RaySat agree to the following:

- a. The purpose of this Coordination Agreement is to provide protection to the TDRSS Earth Station site located at White Sands, New Mexico as listed in Table 1. Should Raysat later identify a need to operate terminals in Guam, an addendum to this document will have to be developed and coordinated to protect the TDRS Guam site.
- b. The level of protection afforded to the White Sands site identified in Table 1 shall be equal to or greater than the Interference Threshold Limits shown in Table 2, and the exclusion zones appearing in Tables 3 and 4.
- 4.1 This Coordination Agreement may be reviewed periodically by the signatories to the agreement following commencement of service by RaySat 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 6.

- 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.

RaySat agrees to:

- 4.4 Prevent transmissions from any LMSS that would exceed the thresholds given in Table 2. Based on RaySat technical parameters and operational characteristics agreed during direct RaySat/NASA coordination discussions, RaySat terminals will not operate within the distances of the White Sands TDRS site specified in Tables 3 and 4.
- 4.6 Respond expeditiously to a NASA request to isolate a source of interference to a TDRSS Earth Station suspected to be from a RaySat LMSS terminal.
- 4.7 Provide a central point of contact (on a 24 hour, 7 day basis) for interference resolution and other contact.
- 4.8 To facilitate RaySat terminal operations, on a case by case basis, within the distance separations specified in Tables 3 and 4, RaySat shall provide a written waiver request for NASA authorization of these distance constraints providing the specific terminal(s) to be used, the start/end date and time, a description of the user requirement and the closest distance separation to the White Sands site that will be needed to satisfy the user mission, and the starting and ending date of operation applicable to the waiver request. RaySat agrees to provide this request to the NASA contacts identified in section 6 at least 2 weeks prior to requested use. To expedite consideration and to ensure the request is not lost, Raysat agrees to used a method that provides tracking of the sent request and to contact the NASA point of contacts by telephone as soon as the request has been sent. RaySat will not allow terminals to transmit within the zones of exclusion specified in Tables 3 and 4 without NASA authorization, in accordance with sections 4.9 and 4.11
- 4.9 Raysat agrees to implement an internal means within its terminals, to ensure that its terminals cannot transmit within the agreed distance separations from White Sands, specified in Tables 3 and 4, unless the automated program is “overridden” using a terminal unique hardware or software “cipher key”. Raysat also agrees not to provide this cipher key to any terminal user without NASA authorization. Authorization may be requested by Raysat when requesting a waiver of the distance separations in Tables 3 and 4 using the method described in subsection 4.8.

NASA agrees to:

- 4.10 Maintain an open dialog with RaySat concerning any perceived breach of interference thresholds that may be attributable to an LMSS terminal that is not in compliance with this Coordination Agreement.

- 4.11 Provide timely notification to RaySat of changes or additions to TDRSS earth station sites, TDRSS spacecraft orbital positions or interference thresholds listed in this Coordination Agreement.
- 4.12 Consider Raysat waiver requests, on a case by case basis; to authorize the operation of individually identified RaySat terminals within a distance separation less than those established in Tables 3 and 4... NASA will endeavor to provide a response to RaySat's request within one week after receipt and review of such request from RaySat. The NASA written response will be sent, via a method that provides a tracking mechanism, to the RaySat points of contact in section 6.

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 RaySat 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: David P. Struba
Title: 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: David.Struba@nasa.gov

Name: Ilan Kaplan
Title: VP, Product Management
Organization: RaySat, Inc.
Address: RaySat, Inc.
8460-D Tyco Road
Vienna, VA 22182
Telephone: 703-584-3770
Facsimile: 703-584-3775
e-mail: ilan@raysat.com

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

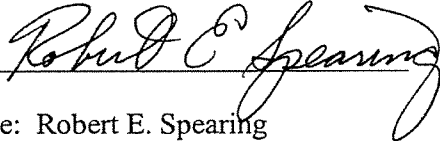
Name: Roger D. Porter
Title: Goddard Spectrum Manager
Organization: NASA
Address: Goddard Space Flight Center
Mission Services Program Office
Greenbelt, MD 20771
Telephone: (301) 286-5089
Facsimile: (301) 286-1724
e-mail: Roger.Porter@gsfc.nasa.gov

Name: Robert Yip
Title:
Organization: RaySat, Inc.
Address: RaySat Inc.
8460-D Tyco Road
Vienna, VA 22182
Telephone: 703-584-3770
Facsimile: 703-584-3775
e-mail: ryip@raysat.com

7. Signatures

This Coordination Agreement is being made in good faith by both parties and is effective on the date of final signature. The parties signing this Agreement have the necessary authority to fulfill the promises and obligations contained herein.

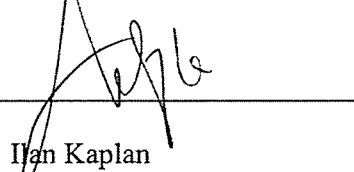
For: The National Aeronautics and Space Administration:

By: 

Name: Robert E. Spearing
Title: Associate Assistant Administrator
For Space Communications

Date: 4/13/06

For: RaySat Incorporated:

By: 

Name: Ilan Kaplan
Title: VP, Product Management

Date: 5/3/06



**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

**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.**

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

**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.**

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

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/m²/Hz) for the Green Bank and Socorro sites
 - -189 dB(W/m²/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

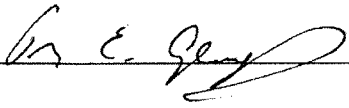
5.2 Contacts concerning the notification of radio astronomy observation schedules:

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

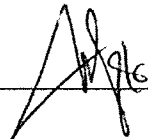
By: 

Name: Dr. Tomas Gergely

Title: Electromagnetic Spectrum Manager

Date: 6/27/06

For RaySat, Inc.

By: 

Name: Ilan Kaplan

Title: VP, Product Management & Business
Development

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		dH (m)	Surf Relr (N)	Conduc Gnd		Climate	Reliability		Confidence	In-Band (202 dB)	OOB (132 dB)
Tx	Rx	Pol	Tx			Rx	Epsilon Gnd		S/m	Mode of Variability			
2	139.6	V	Random	10	301	15	0.001	Continental Temperate	Mobile	1	50	218.8	7
2	139.6	H	Random	10	301	15	0.001	Continental Temperate	Mobile	1	50	218.8	7
2	139.6	V	Random	10	301	15	0.001	Continental Temperate	Mobile	1	50	218.8	7
2	139.6	V	Careful	10	301	15	0.001	Continental Temperate	Mobile	1	50	221.8	7
2	139.6	V	Very Careful	10	301	15	0.001	Continental Temperate	Mobile	1	50	223.5	7
2	139.6	V	Very Careful	10	301	15	0.001	Continental Temperate	Mobile	1	50	221.8	7
2	139.6	V	Careful	10	301	15	0.001	Continental Temperate	Mobile	1	50	214.4	7
2	139.6	V	Careful	90	301	15	0.001	Continental Temperate	Mobile	1	50	147.6	7
2	139.6	V	Careful	200	301	15	0.001	Continental Temperate	Mobile	1	50	47.8	7
2	139.6	V	Careful	200	301	15	0.001	Continental Temperate	Single	1	50	68	7
2	139.6	V	Careful	80	301	15	0.001	Continental Temperate	Single	1	50	143.2	7
2	139.6	V	Careful	80	301	15	0.001	Continental Temperate	Individual	1	50	84.9	7
2	139.6	V	Careful	200	301	15	0.001	Continental Temperate	Individual	1	50	47.8	7
2	139.6	V	Careful	200	301	15	0.001	Continental Temperate	Mobile	50	50	28	7
2	139.6	V	Careful	200	301	15	0.001	Continental Temperate	Mobile	99	50	214.4	7
2	139.6	V	Careful	80	301	15	0.001	Continental Temperate	Mobile	1	90		7

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		dH (m)	Surf Relr (N)	Conduc Gnd		Climate	Mode of Variability	Reliability	Confidence	In-Band [202 dB]	OOB [132 dB]
Tx	Rx	Pol	Tx			Rx	Epsilon Gnd						
2	40	V	Careful	30	301	15	0.001	Continental Temperate	Mobile	1	50	203.4	7
2	40	V	Careful	10	301	15	0.001	Continental Temperate	Mobile	1	50	203.4	7
2	40	V	Careful	80	301	15	0.001	Continental Temperate	Mobile	1	50	195.9	7

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			dH (m)	Surf Rel (N)	Conduc Gnd		Climate	Mode of Variability	Reliability		Confidence	In-Band (170 dB)	OOB (100 dB)
Tx	Rx	Pol	Tx	Rx			Epsilon Gnd	S/m			%				
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	80	301	15	0.001	Continental Temperate	Mobile	1	50	50.6	0.2	