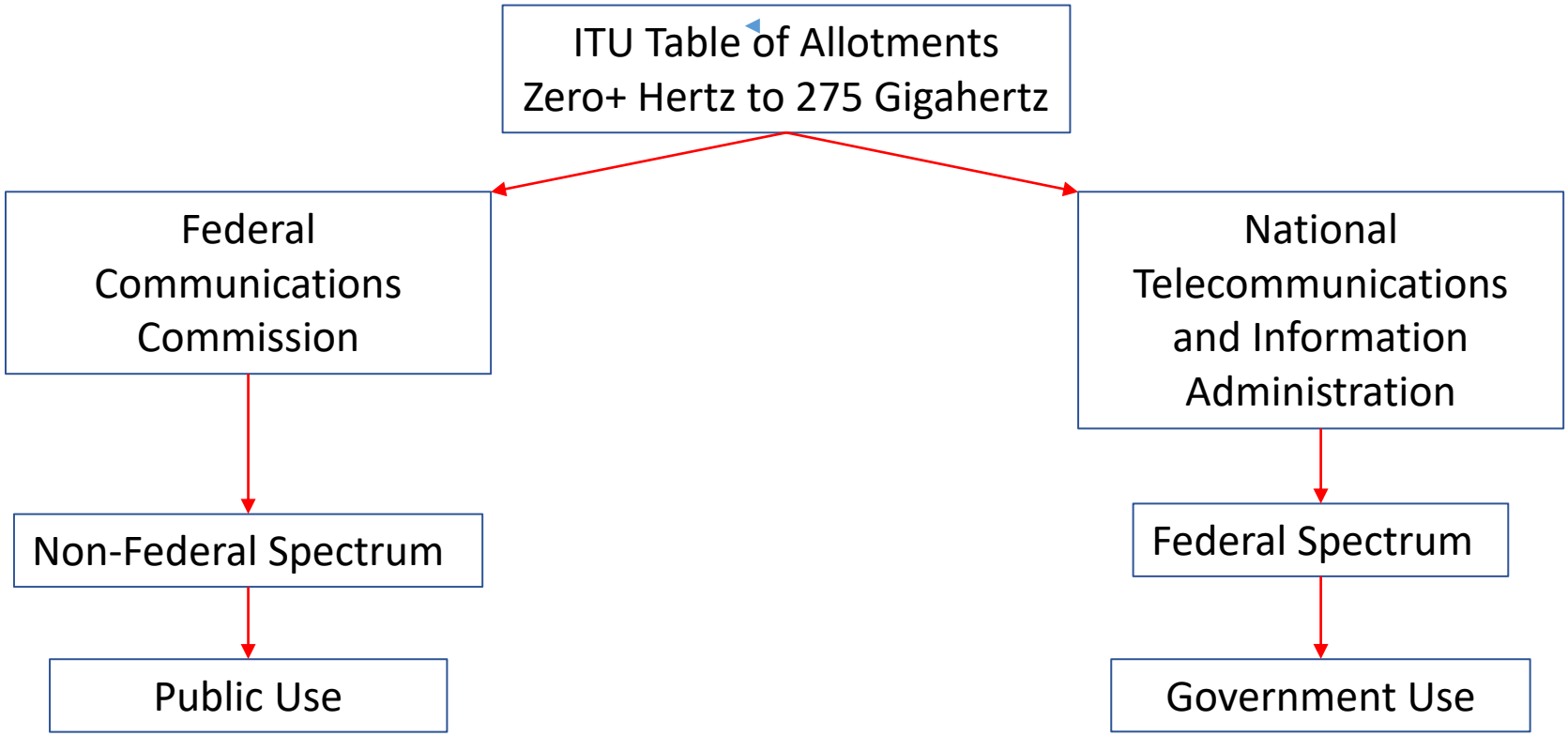
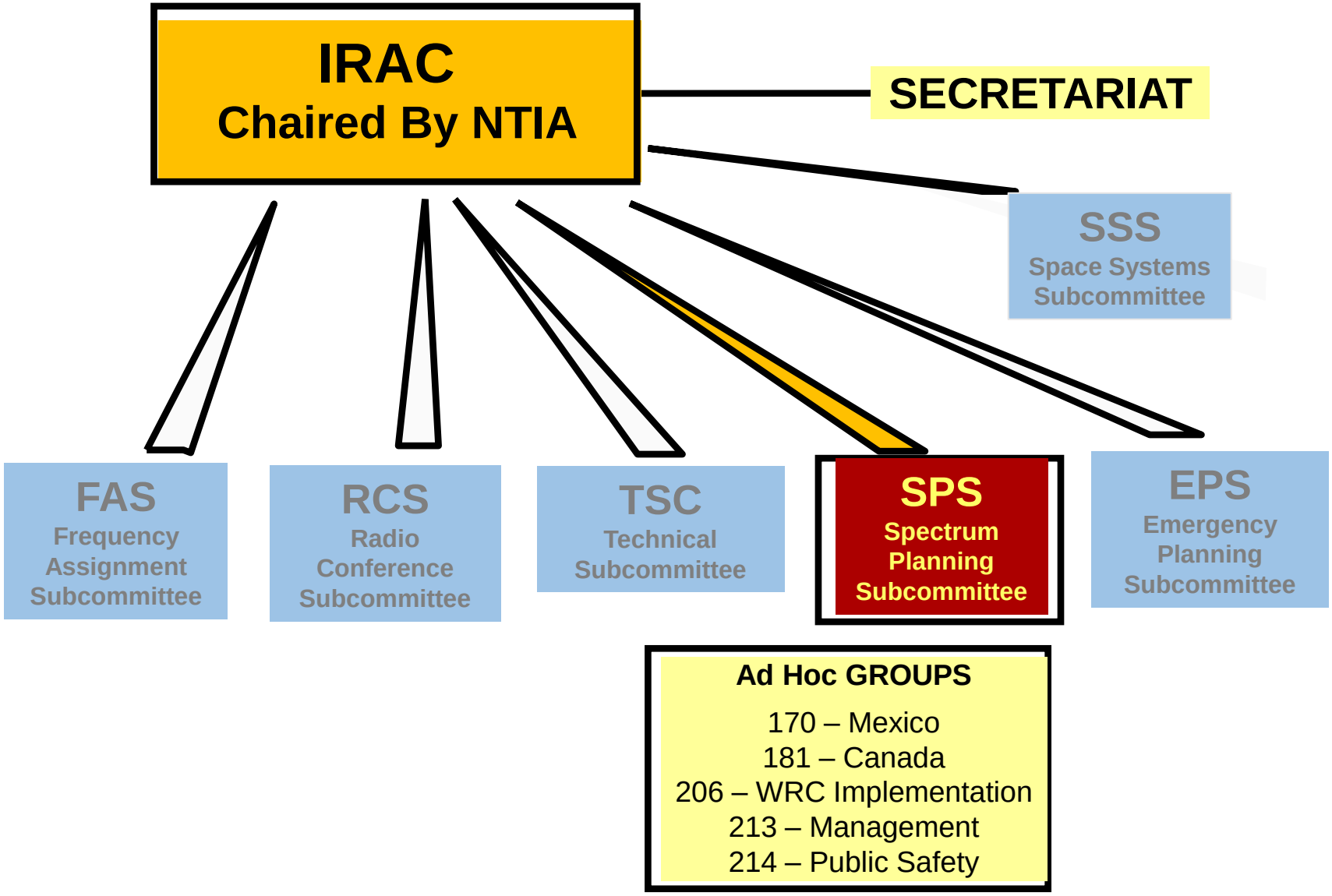
The System Review Process

Bob Denny
Deputy Chief SSD and SPS Chair
Office of Spectrum Management

June 27, 2022

SPECTRUM ARRANGEMENT IN THE UNITED STATES OF AMERICA




IRAC
Chaired By NTIA
SECRETARIAT
SSS
Space Systems
Subcommittee
FAS
Frequency
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Subcommittee
RCS
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Conference
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TSC
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SPS
Spectrum
Planning
Subcommittee
EPS
Emergency
Planning
Subcommittee
Ad Hoc GROUPS
170 – Mexico
181 – Canada
206 – WRC Implementation
213 – Management
214 – Public Safety

SYSTEM REQUEST FOR SPECTRUM SUPPORT

- An agency representative submits the request in writing to the SPS Secretary.
- The request consists of a cover letter and an Equipment Location Certification Information Database record containing the system characteristics.
- The cover letter summarizes the purpose of the request.
- The Equipment Location Certification Information Database or *EL-CID* record contains system characteristics such as frequency, emission type, power, station class, location, and other system-specific data.

FOR AGENDA SPS-25374/1

National Aeronautics and Space Administration
Spectrum Management Office
Cleveland, OH 44135-3191

Reply to
Attn of: Space Communications and Navigation

24 January 2022

Mr. Robert Denny
Chairman, Spectrum Planning Subcommittee
National Telecommunications and Information Administration
U.S. Department of Commerce
14th and Constitution Avenue NW
Washington, DC 20230

SUBJECT: NASA Request for Certification of Spectrum Support – **Lunar LTE Demonstration – STAGE 2**

On behalf of NASA, the enclosed information is provided in response to the requirements in Chapter 10 of the NTIA Manual of Regulations and Procedures for Federal Frequency Management and is provided for the purpose of obtaining a Stage 2 (Experimental) certification for NASA's Lunar LTE Demonstration. It should be noted that due to the short duration and experimental nature of this demonstration, this system will not advance beyond Stage 2.

The Lunar LTE Demonstration is a collaboration between NASA and Nokia to demonstrate the first end-to-end LTE wireless proximity network on the surface of Moon between a lunar lander, a lunar rover, and a miniature robotic hopper. The lunar lander will carry the LTE Base Transceiver Station (BTS) while the rover and the hopper will carry the LTE User Equipment (UE) and communicate with the BTS. This technology demonstration will provide measurements of radio frequency coverage, propagation, and LTE data transmissions in the lunar environment. The Lunar LTE Demonstration is expected to launch in December 2022 and operate for approximately 12 days at distances of up to about 12 km.

The Lunar LTE Demonstration will use data rates up to 50 Mbps on the UE to BTS link and 150 Mbps on the BTS to UE link. The LTE BTS will transmit using a center frequency of 1842.5 MHz with a nominal bandwidth of 20 MHz and receive using a center frequency of 1747.5 MHz. The LTE UE will receive at 1842.5 MHz and transmit at 1747.5 MHz with a nominal bandwidth of 20 MHz. This space use of terrestrial mobile frequencies is not in accordance with the Table of Allocations and NASA will operate the demonstration in accordance with Section 8.2.40 of the NTIA Manual on a non-interference basis. The supplemental information demonstrates that there is not risk of interference to terrestrial users.

Due to the short duration and experimental nature of this demonstration, NASA will be submitting a waiver request from international filing to the SSS in the near future in accordance with Section 3.3.1.2 of the NTIA Manual.

This system will not be used for National Security/Emergency Preparedness (NS/EP).

Should you have any questions, please contact me at 216-433-3469 or via e-mail at jezuzek@nasa.gov or my Alternates, Bryan Rhodes at 216-433-2473 or via e-mail at bryan.a.rhodes@nasa.gov, and Mike Evans at 216-433-3505 or via e-mail at michael.a.evans-1@nasa.gov.

Excerpt from Cover Letter

CLASSIFICATION UNCLASSIFIED | Page: 3

FULL RECORD PRINT FOR: Lunar LTE Demonstration

SELECTED FREQUENCIES

1842.5 MHz
1747.5 MHz

System Name (Nomenclature)	Stage
Lunar LTE Demonstration	2 – Experimental
Agency	**NTIA Certified**
NASA - National Aeronautics and Space Administration	
Overall Security	
UNCLASSIFIED	

GEOGRAPHIC AREAS FOR STAGE 2

Unknown
LocationType :

GEOGRAPHIC AREAS FOR STAGE: 3

Unknown
LocationType :

GEOGRAPHIC AREAS FOR STAGE: 4

Unknown
LocationType :

Control Numbers:	Predefined Trunking?

SYSTEM INFORMATION

System Description:

The Lunar LTE Demonstration is a collaboration between NASA and Nokia to demonstrate an end-to-end LTE network and provide RF propagation measurements on the surface of Moon. The LTE base transceiver station (BTS) will be placed on the lunar lander, while the LTE user equipment (UE) will be deployed on the lunar rover and a miniature lunar hopper.

System Relationship and Essentiality:

The Lunar LTE Demonstration will provide measurements of RF coverage, propagation effects in the lunar environment, and LTE data rate vs. distance performance. It may foster development of commercial space capabilities which benefit future lunar missions.

TARGET DATES

System Activation: 12 / 01 / 2022 System Termination: 12 / 27 / 2022 System Approval: 05 / 30 / 2022

CLASSIFICATION UNCLASSIFIED

Excerpt from EL-CID File

SYSTEM REVIEW

- Procedure used by the SPS to evaluate the compliance of a new system, or changes to an existing system.
- System review is conducted by the Systems Review Branch or *SRB*.
- Before acceptance, the request is evaluated by the Data Quality Control Committee of the SPS to verify that the request contains complete system characteristics.
- The SRB engineer uses the contents of the cover letter and EL-CID file to process the system request and produce a Preliminary Assessment or *PA*.
- The PA is presented at the monthly SPS meeting for approval, approval with changes, or disapproval by the SPS members.
- In the case of a non-compliant system, the SRB engineer prepares a Data Advisory Notice or *DAN*, and the request is returned to the agency.

FOR AGENDA

Ref. SPS-25374/1

UNITED STATES DEPARTMENT OF COMMERCE
National Telecommunications and Information Administration
Washington D.C. 20230

DATE: April 14, 2022

TO: Jermane Patterson
Secretary, Spectrum Planning Subcommittee (SPS)

FROM: Mr. Ben Tadesse Binyam Tadesse Binyam Tadesse 2022.06.02 12:51:39 -04'00'
Chief, Spectrum Services Division (SSD)

Dr. F. Ayhan Sakarya FATMA AYHAN SAKARYA Digitally signed by FATMA AYHAN SAKARYA Date: 2022.06.02 11:22:35 -04'00'
Assessment Author, Chief, Systems Review Branch (SRB)

SUBJECT: NTIA Preliminary Assessment of the NASA Lunar LTE Demonstration, Stage 2

INTRODUCTION

This memorandum delineates the results of the NTIA preliminary assessment of the NASA request for Stage 2 (Experimental) of the Lunar Long-Term Evolution (LTE) Demonstration. The Lunar LTE Demonstration is a collaboration between NASA and Nokia to demonstrate an end-to-end LTE network and provide RF propagation measurements on the surface of Moon. NASA will place the LTE base transceiver station (BTS) on the lunar lander, while the LTE user equipment (UE) will be deployed on the lunar rover and a miniature lunar hopper. NASA plans to activate the system on December 1st, 2022, and terminate the experimental testing on December 27th, 2022, for a total of 12-day experimentation. NASA intends to conduct experimental testing in accordance with Section 8.2.40 of the NTIA Manual.

The Lunar LTE system will operate at the frequencies 1842.5MHz and 1747.5MHz in the Space Research service with the station class symbol EH as summarized on Table 1. The estimated cost of the system is $14,100,000 per unit, and NASA plans to procure 1 unit.

References to the NTIA Manual are for the January 2021 Edition. Spectrum support issues and certification are discussed hereinafter

TECHNICAL & OPERATING CHARACTERISTICS SUMMARY

Table 1: NASA Lunar LTE Demonstration Spectrum Requirements

Frequencies (MHz)	Emissions	Mean Power (W)	Services/ Station Classes (Stage 2)	Transmit Location (Lunar Surface)	Receive Location (Lunar Surface)
1842.5	4M50G7D 9M00G7D 13M5G7D 18M0G7D	4	Space Research/EH*	Lunar Lander LTE BTS**	Lunar Rover LTE UE***
					Lunar Hopper LTE UE
1747.5		1.25		Lunar Rover LTE UE	Lunar Lander LTE BTS
				Lunar Hopper LTE UE	

*The appropriate station class for this is XT (Experimental Testing Station) per 8.2.40 of the NTIA Manual.
**BTS: Base Transceiver Station
***UE: User Equipment

FINDINGS

Table 2: Preliminary Assessment Findings

NASA – LUNAR LTE Demonstration Assessment Summary (Stage 2)		
ISSUES	**FINDINGS**	**REMARKS**
Data Adequacy	Y ☒ N ☐ Adequate per Chapter 10, Section 10.8 of the NTIA Manual for Stage 2 request.	NASA submitted the 24 January 2022 dated request to the 818th meeting of the SPS.
Allocation Conformance	**Allocation Band(s):** 1710-1761 MHz Federal Space Research service usage Y ☐ N ☒ Primary ☐ Secondary ☐ Not Allocated 1780-1850 MHz Federal Space Research service usage Y ☐ N ☒ Primary ☐ Secondary ☐ Not Allocated	Federal Table of Frequency Allocations: Section 4.1.3 of the NTIA Manual. The Space Research Service is not allocated in the bands of interest. However, the policy in Section 8.2.40 of the NTIA Manual allows NASA to conduct space research developmental services on noninterference basis in federal and non-federal bands.

Excerpts from PA

EQUIPMENT CERTIFICATION

- If a request and PA are approved by the SPS, the SRB engineer prepares an Equipment Certification or *cert* and sends it to the SPS Chair.
- The SPS Chair reviews the cert for consistency with the SPS members' approval, the rules contained in the NTIA Manual, and other conventions.
- The SPS Chair recommends a conforming cert for NTIA approval by the Deputy Assistant Administrator by signing the cert.
- The DAA reviews the cert, and if they agree with the cert's specifications and recommendations, they approve the system by signing the cert.
- The DAA can add NTIA's conditions of issuance before signing the cert, or they can place a hold on the final acceptance of the cert to allow NTIA more time for review.
- Once the SPS Chair and DAA sign and date the cert, it is forwarded to the SPS Secretary who publishes it in the IRAC database for all agencies to see.
- The system is approved!

FOR AGENDA 25560/1

FORM NTIA-44 (3/91)	U.S. DEPARTMENT OF COMMERCE NATIONAL TELECOMMUNICATIONS AND INFORMATION ADMINISTRATION	Classification	Control Number
	CERTIFICATION OF SPECTRUM SUPPORT	UNCLASSIFIED	

Recipient Agency	System	Stage of Review
NASA	Lunar LTE Demonstration	2 – Experimental

Section 1: OPERATING CHARACTERISTICS FOR WHICH SUPPORT IS CERTIFIED

Frequency (MHz)	Emission	Mean Power (W)	Station Class (Stage 2)	Transmit Location	Receive Location
1842.5	4M50G7D 9M00G7D 13M5G7D 18M0G7D	4	XT	Space (Lunar Lander)	Space (Lunar Rover/Hopper)
1747.5		1.25		Space (Lunar Rover / Lunar Hopper)	Space (Lunar Lander)

Section 2: SOURCE DOCUMENTS

Docket Number	Description of Document	Dated
SPS-25374/1	NASA Request for Stage 2 System Review NTIA Preliminary Assessment	January 24, 2022 April 14, 2022

Section 3: SPECTRUM PLANNING SUBCOMMITTEE (SPS) RECOMMENDATIONS

The SPS reviewed this system under the provisions of Chapter 10 of the NTIA Manual, noting that NASA requested the Station class EH, and recommends that:

1. NTIA certify Stage 2 spectrum support for the Lunar LTE Demonstration, as specified in Section 1.
2. NASA be aware that operations of this system using the center frequencies 1747.25 MHz and 1842.5 MHz in the space research service are to be conducted on an unprotected, noninterference basis in accordance with Section 8.2.40 of the NTIA Manual.
3. NASA protect personnel from non-ionizing radiation levels that exceed generally accepted exposure criteria.

Name/Title of Recommending Official	Signature	Date
Robert W. Denny SPS Chairperson		

Section 4: NTIA CERTIFICATION

As a result of the Federal Communication Commission's AWS-3 auction that concluded in January 2015, the band 1780-1850 MHz will become more congested because some of the current operations within the band 1755-1780 MHz will be relocating to the band 1780-1850 MHz. NASA may not be able to coordinate successfully new frequency assignments in the band 1780-1850 MHz at some locations

The Office of Spectrum Management concurs with the SPS recommendations in Section 3.

This office certifies Stage 2 spectrum support for this system.

Name/Title of Recommending Official	Signature	Date
Steven A. Molina Deputy Associate Administrator		

Special Handling	Classification	Distribution
	UNCLASSIFIED	IRAC, SPS, FAS

Draft Cert

FREQUENCY ASSIGNMENT – THE NEXT STEP

- An equipment certification is not a license or an authorization to operate the system.
- The equipment certification approves the equipment for use in the United States of America and its possessions.
- Before beginning operation, a frequency assignment must be obtained from the Frequency Assignment Branch.

Robert W. Denny
Deputy Chief and SPS Chair
Spectrum Services Division
Office of Spectrum Management
NTIA
1401 Constitution Ave., N.W.
Washington, DC 20230
rdenny@ntia.gov

Website: NTIA.DOC.GOV

Twitter: @NTIAgov

Facebook: Facebook.com/NTIAgov