Request for Experimental License

Iridium Satellite LLC ("Iridium") seeks an experimental license for an eighteen (18) month period, beginning February 1, 2024, to add four experimental CubeSats known as PY4 to be operated by the National Aeronautics and Space Administration ("NASA") as points of communication for Iridium's low earth orbit constellation authorized under Part 25 of the Commission's Rules.

Iridium is seeking an experimental license for these operations because its Part 25 space station license does not cover space-to-space communications.[1] To satisfy launch integrator requirements, Iridium respectfully requests that grant of this experimental license be issued no later than December 15, 2023.[2]

The anticipated duration of the PY4 CubeSats is 6-10 months. Iridium is seeking an 18-month experimental license term to cover the possibility of launch or other delays.

PY4 is a swarm of four (4) identical 1.5U CubeSats that will be used to demonstrate spacecraft-to- spacecraft ranging, on-orbit relative navigation, and coordinated simultaneous multi-purpose radiation measurement. All four spacecraft will be deployed from the same dispenser, two at a time with a delay sufficient to avoid contact.

Each of the four NASA spacecraft will utilize a single Iridium 9603 modem to transmit data to the space stations in Iridium's "Big LEO" constellation. Iridium seeks authority to transmit in the reverse direction, from its Big LEO constellation to the modems on the PY4 space stations. NASA has separately requested authority from the National Telecommunications and Information Administration ("NTIA") to operate the satellites and received a certification of spectrum support which is attached hereto.[3]

PY4 spacecraft are built using commercial off-the-shelf components, based on the open-source PyCubed avionics framework. PyCubed is an opensource, radiation-tested CubeSat avionics platform that integrates power, computing, communication, and

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[1] Iridium's constellation is licensed under Call sign S2110 and is comprised of 66 satellites, any one of which may be used as part of the experiment at any point in time.

[2] The launch vehicle integrator requires proof of authorization well in advance of launch as a condition of including the satellites in the launch vehicle.

[3] Note that the 1616-1626 MHz frequencies in the attached SPS-26141/1 are incorrect and should reflect the Iridium frequencies of 1618.725 – 1626.5 MHz. NASA is seeking a corrected certification document from NTIA which is expected to be issued in the next several weeks.

attitude determination and control functionality into a single low-cost module programmable entirely in the programming language Python.

The technical characteristics of these transmissions will be identical to the technical characteristics of Iridium's already-licensed Part 25 space station transmissions in the 1618.725–1626.5 MHz band. Accordingly, no operating parameters other than effective radiated power and emission designator are provided in the form that this exhibit accompanies. The only change from Iridium's Part 25 licensed operations is to add NASA's four satellites as points of communication.

FORM NTIA-44 (3/91)	U.S. DEPARTMENT OF COMMERCE NATIONAL TELECOMMUNICATIONS AND INFORMATION ADMINISTRATION	Classification	Control Number
	CERTIFICATION OF SPECTRUM SUPPORT	**UNCLASSIFIED**	Doc:45531/1 SPS-26141/1

Recipient Agency	System	Stage of Review
NASA	**PY4 CubeSats**	2 – Experimental

Section 1: OPERATING CHARACTERISTICS FOR WHICH SUPPORT IS CERTIFIED

Frequency (MHz)	Emissions	Mean Power (W)	Station Class	Transmit Locations	Receive Locations
915.6	500KF1D	0.5	XT	Space (PY4 CubeSat)	Space (PY4 CubeSat)
					Mountain View, CA Pittsburg, PA
		50		Mountain View, CA Pittsburg, PA	Space (PY4 CubeSat)
915.6 (Receive)		Not Applicable	Not Applicable	US&P	
1575.42 (Receive)	24M0G1D			Space (GPS Satellite)	
1616-1626	41K7Q7D	1.6	XT	Space (PY4 CubeSat)	Space (Iridium Satellite)
1616-1626 (Receive)		Not Applicable	Not Applicable	Space (Iridium Satellite)	Space (PY4 CubeSat)
2402	1M63F1D	0.0178	XT	Space (PY4 CubeSat)	Space (PY4 CubeSat)

Section 2: SOURCE DOCUMENTS

Docket Number	Description of Document	Dated
SPS-25938/1	NASA Request for Stage 2 System Review	February 21, 2023
SPS-26102/1	NTIA Preliminary Assessment	May 30, 2023

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 to operate the PY4 CubeSats in the space research service with station class symbols of EH and TH; this system uses the earth stations worldwide for operations at the uplink frequency 915.6 MHz (receive only); operation on the frequency 915.6 MHz utilizes the LoRa transceiver previously developed for nano-sat self-identification; this system operates with federal and non-federal space stations (GPS and Iridium Satellite Systems); the operation of this mission a short duration (less than a year) and that it will not proceed beyond Stage 2, and recommends that:

1. NTIA certify Stage 2 spectrum support for the PY4 CubeSats as specified in Section 1.

FORM NTIA-44 (3/91)	Classification	System
CONTINUATION PAGE	**UNCLASSIFIED**	**PY4 CubeSats**

Section 3: SPECTRUM PLANNING SUBCOMMITTEE (SPS) RECOMMENDATIONS (Cont'd)

2. NASA be aware that:
   a. this system operating within the bands 902-928 MHz and 2400-2500 MHz must accept harmful interference which may be caused by industrial, scientific and medical (ISM) applications, in accordance with Footnote 5.150 to the National Table of Frequency Allocations;
   b. operations of this system at the frequencies 915.6 MHz and 2402 MHz and in the frequency range 1616-1626 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;
   c. coordination with Iridium is required for use of the frequency range 1616-1626.5 MHz and that operation of this system is contingent upon Iridium successfully obtaining authorization/license from the FCC;
   d. coordination with authorized users is required for operations of this system in the frequency band 1616-1626 MHz to preclude potential interference to duly authorized federal and non-federal users of the band 1613.8-1626.5 MHz;
   e. in the band 2400-2417 MHz, federal operations may be authorized on a non-interference basis to authorized non-Federal operations and shall not constrain non-Federal operations in accordance with Footnote G122 to the National Table of Frequency Allocations;
   f. operations of this system in the frequency band 1616-1626 MHz are compatible with existing and planned systems within the band 1559-1626.5 MHz, in accordance with Footnote US208 to the National Table of Frequency Allocations;
   g. operation of this system complies with the policy specified in Section 8.2.17 of the NTIA Manual regarding use and control of the cubesats; and
   h. the earth station at Pittsburg, PA (Carnegie Mellon University) is subject to regulation and direct control by NASA.

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	Robert W. Denny	

Section 4: NTIA CERTIFICATION

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 Certifying Official	Signature	Date
Steven A. Molina Deputy Associate Administrator	Steve Molina	

Distribution	Classification	Page Number
IRAC, SPS, FAS	**UNCLASSIFIED**	2 of 2