Shannon

NARRATIVE STATEMENT

Lynk Global, INC.
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EXPERIMENTAL LICENSE APPLICATION
NARRATIVE STATEMENT

(1) Applicant Information.

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[redacted]

(2) Description of why experimental authorization is needed.

Lynk Global, Inc. ("Lynk") seeks experimental authority to access and test the performance of ground equipment with Lynk's satellite *Shannon* to be launched in June 2021.

Lynk is developing a cellular-based smallsat communications network that will provide global GSM and LTE cellular services [redacted] using Low Earth Orbit ("LEO") satellites. Initially, there is the need to perform testing on prototype satellite equipment, which will provide important information regarding the performance of links and capabilities of network/system control.

This application seeks authorization to perform a series of very short tests via a free-flying payload in various locations throughout the United States [redacted] Testing will be limited to specific spectrum ranges, specialized equipment, and specified power densities. A typical pass over a test site will only last about 2 minutes and only recur approximately twice per day.

(3) Description of the operation to be conducted and its purpose.

Lynk respectfully requests an experimental license for testing SMS Person-to-Person, Cellular Broadcast, or IP data telecommunications traffic with Lynk's free-flying satellite, *Shannon*. Lynk can conduct these technology operations separately or together. Testing will start with separate technologies and over time move to a combined testing scenario.

All proposed operations will be conducted on a non-interference basis. Time-based stored commands will turn on the transmitter for communications tests. At all other times, the default state of the payload's transmitter is OFF. Using the GPS position and velocity of the satellite, Lynk can predict the satellite's trajectory to forecast overpasses of testing sites, which enables Lynk to limit the payload's transmissions to licensed frequencies during its overpass of a testing site.

Cellular Testing:

Lynk seeks blanket experimental authority to test and validate the performance characteristics of various commercially available mobile cellular phones and modules communicating with *Shannon* in various locations throughout the United States [redacted]

Testing will utilize the free-flying payload as a "cell tower in orbit" on only one GSM duplex carrier or any one LTE duplex carrier block at any given time. In all cases of terrestrial frequency use, Lynk is or will be partnered with the licensed owner of the requested terrestrial spectrum and will use frequency blocks and bands explicitly with their knowledge, permission, and participation.

[redacted]

TT&C Operations in L-band:

Lynk seeks experimental authority to transmit from *Shannon* to GlobalStar's HIBLEO-4 constellation via on-board GlobalStar simplex and duplex transmitter modules for TT&C

TT&C Operations in S-band:

For TT&C communications in the S-band, Lynk requests experimental authorization to transmit via a SatLab duplex transceiver module and Lynk's custom module at specific locations listed herein from *Shannon*.

The SatLab module and Lynk's custom module are affixed to the spacecraft and designed for identical operations. These modules offer higher data rate T&C delivery , which is desirable for uploading code scripts and downloading large log files. The S-band modules can be turned off for coordination activities with other S-band users, and if necessary, commanded off via GlobalStar T&C, which can use time-based commands to disable the S-band modules or to activate a kill switch in the Lynk spacecraft consequently terminating power to the S-band modules. Lynk's separate custom antennas will be used to transmit RF from either the SatLab module or Lynk's custom module.

The SatLab module and Lynk's custom S-band modules will communicate between the Lynk spacecraft and ground stations using third-party commercially licensed TT&C ground stations already approved for similar use. The service providers of these licensed ground stations maintain global shared networks, including domestic and international ground stations. The only change from SatLab's currently licensed operations with other small satellite operators will be the requested S-Band frequency. Lynk requests in the immediate application for authorization to cover the space-to-Earth transmissions.

(4) Timing of proposed operation.

Lynk requests authorization for 24 months starting June 1, 2021.

(5) Class(es) of station (fixed, mobile, fixed & mobile) and call sign of station (if applicable).

The earth stations will operate in a fixed and mobile mode, and the space station will operate in non-geostationary orbit at 500 km.

(6) Description of the location(s) and, if applicable, geographical coordinates of the proposed operation.

Location	Latitude	Longitude	Proposed Operation
United States and its Territories	N/A	N/A	824.2-848.8 MHz 869.2-893.8 MHz
[redacted] USA	[redacted]	[redacted]	2260 MHz / 2080 MHz
[redacted] USA	[redacted]	[redacted]	2260 MHz / 2080 MHz
[redacted] USA	[redacted]	[redacted]	2260 MHz / 2080 MHz
[redacted] Ireland	[redacted]	[redacted]	2260 MHz / 2080 MHz
[redacted] Italy	[redacted]	[redacted]	2260 MHz / 2080 MHz
[redacted] New Zealand	[redacted]	[redacted]	2260 MHz / 2080 MHz

(7) Transmit equipment to be used.

# of Units	Equipment	Manufacturer	Model
2+	Off-the-shelf Cellular Devices (ground)	Various	Various
1	Cellular Power Amp (space station)	Lynk	Custom
1	Cellular Antenna (space station)	Lynk	Custom
1	Duplex Modem (space station)	GlobalStar	EyeStar-D2E
1	Simplex Modem (space station)	GlobalStar	EyeStar-S3
1	SRS Transceiver (space station)	SatLab	SRS-3
1	S-band Patch Antenna (space station)	Lynk	Custom
1	S-band TT&C Transceiver (space station)	Lynk	Custom

(8) Frequencies.

Operations		Uplink	Downlink
Cellular Testing		824.2 - 848.8 MHz	869.2 - 893.8 MHz
TT&C	S-band	2079.6625 - 2080.3375 MHz	2259.6625 - 2260.3375 MHz
	GlobalStar (Simplex)	1613.75 - 1616.25 MHz	N/A
	GlobalStar (Duplex)	1615.65 - 1616.88 MHz	

(9) Maximum effective radiated power (ERP) or equivalent isotropically radiated power (EIRP).
See below, Question (13).

(10) Emission designator.
See below, Question (13).

(11) Overall height of antenna structure above the ground.
Ground stations are less than six meters above ground; not applicable to space station.

(12) Orbital Debris Mitigation.
The *Shannon* satellite is designed to eliminate the potential, to the extent possible, of creating orbital debris. The spacecraft contains no deployables. Lynk provides in a separate exhibit an orbital debris analysis.

(13) Supplemental Technical Information.

Cellular Testing		
Parameters	**GSM protocol**	**LTE protocol**
Lynk Uplink (Earth-to-space) Transmitter		
Frequencies	824.2 - 848.8 MHz	
Transmit/Receive Bandwidth	200 kHz	180 kHz
Emission Designator	200KG7W	180KG7W
Antenna Height	~1.5 m	~1.5 m
[redacted]		
Output Power	2 W	0.2 W
Module with antenna	[redacted]	
ERP	39.85 dBm 9.66 W	29.85 dBm 0.97 W
Standard mobile phone or module	[redacted]	
ERP	29.85 dBm 0.97 W	19.85 dBm 0.1 W
Frequency Tolerance	0.00001%	
Modulating Signal	Digital on/off quantized	
Lynk Downlink (space-to-Earth) Transmitter		
Frequencies	869.2 - 893.8 MHz	
Altitude	500 km	
Eccentricity	Circular	
Inclination	97°	
Antenna Type	Phased array antenna	
[redacted]		
Output Power	30 W	
[redacted]		
ERP [redacted]	61.62 dBm / 1452.11 W	
[redacted]		
Emission Designator	200KG7W	1M08G7W / 2M70G7W / 4M50G7W / 9M00G7W
Frequency Tolerance	0.00001%	
Modulating Signal	Digital on/off quantized	
[redacted]		

TT&C Operations				
Parameters	Space Station		Earth Station	
	Tx	Rx	Tx	Rx
S-band TT&C				
Frequencies*	2259.6625 - 2260.3375 MHz	2079.6625 - 2080.3375 MHz	2079.6625 - 2080.3375 MHz	2259.6625 - 2260.3375 MHz
Output Power	0.904 W	-	10.7 W	-
ERP at 2260 MHz	3.22 dBW 2.1 W	-	40.85 dBW 12171.7 W	-
Fixed / Mobile	Mobile		Fixed	
Frequency Tolerance	0.00001%			
Emission Designator	563KG1D (SatLab) 675KG1D (Lynk)**			
Modulating Signal	Digital on/off quantized			
GlobalStar TT&C (Simplex)				
Frequencies	1613.75 - 1616.25 MHz	N/A ***		
ERP	0.19 W			
Output Power	0.0794 W			
Emission Designator	2M50G1D			
Modulating Signal	BPSK			
Frequency Tolerance	0.001%			
GlobalStar TT&C (Duplex)				
Frequencies	1615.65 - 1616.88 MHz	N/A ***		
ERP	2.09 W			
Output Power	0.794 W			
Emission Designator	1M23G1W			
Modulating Signal	QPSK			
Frequency Tolerance	0.0005%			

* A factory default is programmed into the SatLab SRS-3 that can result in a reset of frequencies, but Lynk has taken the precaution of reprogramming the reset to the operating, requested frequencies.

** The modulated signal occupies slightly more bandwidth with the Lynk QPSK signal by an additional 56 KHz on each side of the carrier center frequency.

*** GlobalStar will seek experimental authorization for these operations.