

**United States of America  
FEDERAL COMMUNICATIONS COMMISSION  
EXPERIMENTAL  
RADIO STATION CONSTRUCTION PERMIT  
AND LICENSE**

EXPERIMENTAL

(Nature of Service)

WK2XLJ

(Call Sign)

XC FX MO

(Class of Station)

0515-EX-CN-2019

(File Number)

NAME Space Exploration Technologies Corp.

Subject to the provisions of the Communications Act of 1934, subsequent acts, and treaties, and all regulations heretofore or hereafter made by this Commission, and further subject to the conditions and requirements set forth in this license, the licensee hereof is hereby authorized to use and operate the radio transmitting facilities hereinafter described for radio communications in accordance with the program of experimentation described by the licensee in its application for license.

Operation: In accordance with Sec. 5.3(c) of the Commission's Rules

Station Locations

- (1) Redmond (KING), WA - NL 47-41-37; WL 122-01-59
- (2) Redmond (KING), WA - NL 47-41-39; WL 122-01-58
- (3) Hurlburt Field (OKALOOSA), FL - NL 30-25-41; WL 86-41-37
- (4) MOBILE: Hurlburt Field, FL: Airborne max alt 35,000 ft AGL, within 1000 km, centered around NL 30-25-41; WL 86-41-37
- (5) Hurlburt Field (OKALOOSA), FL - NL 30-25-41; WL 86-41-37
- (6) Lewis-McChord Field (PIERCE), WA - NL 47-05-13; WL 122-35-00
- (7) MOBILE: Lewis-McChord Field, WA: Airborne max alt 35,000 ft AGL, within 1000 km, centered around NL 47-05-13; WL 122-35-00
- (8) MOBILE: Mountain Home AFB, ID: Airborne max alt 35,000 ft AGL, centered around NL 43-02-40; WL 115-51-43
- (9) Mountain Home AFB (ELMORE), ID - NL 43-02-40; WL 115-51-43
- (10) Mountain Home AFB (ELMORE), ID - NL 43-02-40; WL 115-51-43
- (11) Harrisburg AFB (DAUPHIN), PA - NL 40-11-34; WL 76-44-43
- (12) MOBILE: Harrisburg AFB, PA: Airborne max alt 35,000 ft AGL, centered around NL 40-11-34; WL 76-44-43
- (13) Greenville (MERCER), PA - NL 41-26-01; WL 80-19-59
- (14) Cape Canaveral (BREVARD), FL - NL 28-29-24; WL 80-34-48

This authorization effective August 26, 2019 and  
will expire 3:00 A.M. EST September 01, 2021

**FEDERAL  
COMMUNICATIONS  
COMMISSION**



## Frequency Information

Redmond (KING), WA - NL 47-41-37; WL 122-01-59

Frequency	Station Class	Emission Designator	Authorized Power	Frequency Tolerance (+/-)
14000-14500 MHz	FX	240MD7W	4.579 kW (ERP)	0.001 %

Redmond (KING), WA - NL 47-41-39; WL 122-01-58

Frequency	Station Class	Emission Designator	Authorized Power	Frequency Tolerance (+/-)
14000-14500 MHz	FX	240MD7W	134.586 kW (ERP)	0.001 %

Hurlburt Field (OKALOOSA), FL - NL 30-25-41; WL 86-41-37

Frequency	Station Class	Emission Designator	Authorized Power	Frequency Tolerance (+/-)
14000-14500 MHz	FX	240MD7W	134.586 kW (ERP)	0.001 %

MOBILE: Hurlburt Field, FL: Airborne max alt 35,000 ft AGL, within 1000 km, centered around NL 30-25-41; WL 86-41-37

Frequency	Station Class	Emission Designator	Authorized Power	Frequency Tolerance (+/-)
14000-14500 MHz	MO	240MD7N	4.579 kW (ERP)	0.001 %

## Frequency Information

Hurlburt Field (OKALOOSA), FL - NL 30-25-41; WL 86-41-37

Frequency	Station Class	Emission Designator	Authorized Power	Frequency Tolerance (+/-)
14000-14500 MHz	FX	240MD7W	4.579 kW (ERP)	0.001 %

Lewis-McChord Field (PIERCE), WA - NL 47-05-13; WL 122-35-00

Frequency	Station Class	Emission Designator	Authorized Power	Frequency Tolerance (+/-)
14000-14500 MHz	FX	240MD7W	4.579 kW (ERP)	0.001 %

MOBILE: Lewis-McChord Field, WA: Airborne max alt 35,000 ft AGL, within 1000 km, centered around NL 47-05-13; WL 122-35-00

Frequency	Station Class	Emission Designator	Authorized Power	Frequency Tolerance (+/-)
14000-14500 MHz	FX	240MD7W	4.579 kW (ERP)	0.001 %

MOBILE: Mountain Home AFB, ID: Airborne max alt 35,000 ft AGL, centered around NL 43-02-40; WL 115-51-43

Frequency	Station Class	Emission Designator	Authorized Power	Frequency Tolerance (+/-)
14000-14500 MHz	MO	240MD7W	4.579 kW (ERP)	0.001 %

## Frequency Information

Mountain Home AFB (ELMORE), ID - NL 43-02-40; WL 115-51-43

Frequency	Station Class	Emission Designator	Authorized Power	Frequency Tolerance (+/-)
14000-14500 MHz	MO	240MD7W	4.579 kW (ERP)	0.001 %

Mountain Home AFB (ELMORE), ID - NL 43-02-40; WL 115-51-43

Frequency	Station Class	Emission Designator	Authorized Power	Frequency Tolerance (+/-)
14000-14500 MHz	FX	240MD7W	134.586 kW (ERP)	0.001 %

Harrisburg AFB (DAUPHIN), PA - NL 40-11-34; WL 76-44-43

Frequency	Station Class	Emission Designator	Authorized Power	Frequency Tolerance (+/-)
14000-14500 MHz	FX	240MD7W	4.579 kW (ERP)	0.001 %

MOBILE: Harrisburg AFB, PA: Airborne max alt 35,000 ft AGL, centered around NL 40-11-34; WL 76-44-43

Frequency	Station Class	Emission Designator	Authorized Power	Frequency Tolerance (+/-)
14000-14500 MHz	FX	240MD7W	4.579 kW (ERP)	0.001 %

Frequency Information

Greenville (MERCER), PA - NL 41-26-01; WL 80-19-59

Frequency	Station Class	Emission Designator	Authorized Power	Frequency Tolerance (+/-)
14000-14500 MHz	FX	240MD7W	134.586 kW (ERP)	0.001 %

Cape Canaveral (BREVARD), FL - NL 28-29-24; WL 80-34-48

Frequency	Station Class	Emission Designator	Authorized Power	Frequency Tolerance (+/-)
14000-14500 MHz	FX	240MD7W	134.586 kW (ERP)	0.001 %

Special Conditions:

- (1) The station identification requirements of Section 5.115 of the Commission's Rules are waived.
- (2) Licensee should be aware that other stations may be licensed on these frequencies and if any interference occurs, the licensee of this authorization will be subject to immediate shut down.
- (3) This authorization is issued for the express purpose of conducting experimental operations described in the related application and required by US Air Force contract no. FA8650-19-9-9320. The use of this radio station in any other manner or for any other purpose will constitute a violation of the privileges herein authorized. Except as subsequently authorized by the Commission, this radio station shall not be operated after the expiration date of the contract designated in the related application and enumerated above.
- (4) The designated point-of-contact to terminate transmissions if interference occurs is Kristi Key  
 Phone Number: 3109708116  
 E-Mail Address: kristina.key@spacex.com
- (5) POINT OF COMMUNICATION: Space Exploration Technologies Corp. ("SpaceX")'s Ku-band non-geostationary- orbit (NGSO) satellites.
- (6) Licensee is authorized to operate 2 units of Ball Aerospace Corp. and 2 units of Cobham 1.0m Ku-band gateway antennas using the 14.0-14.5 GHz (E-s) frequency band to conduct on-the-ground tests (fixed mode) and airborne antenna on board aircraft (ESAA).

**Special Conditions:**

- (7) The fixed and ESAA stations are authorized to conduct tests using the 14.0-14.5 GHz frequency band. The operations are subject to the following conditions:
- a. Operations in the 14.0-14.5 GHz frequency band must be in compliance with the equivalent power flux-density limit (-160 dBW/m<sup>2</sup>/40 kHz) of 47 CFR § 25.208(k) and Article 22.5D of the ITU Radio Regulations.
  - b. The authorized stations must not transmit signals until SpaceX's NGSO satellites in view at an elevation angle of at least 40 degrees. Operations in the Ku-band must maintain +12° of avoidance angle (exclusion zone) with the GSO arc at all times. As the earth station is tracking SpaceX's NGSO satellites, it must not radiate within + 12° of the GSO arc. For the Cobham antenna (gain of 40.1 dBi, power into antenna of 2.88W, and emission of 240MD7W), the maximum EIRP density radiated towards a victim GSO satellite at any point on the GSO arc must not exceed -8.03 dBW/40 KHz. For the Ball Aerospace Corp. antenna (gain of 36.7 dBi, power into antenna of 2.88W, and emission of 240MD7W), the maximum EIRP density radiated towards a victim GSO satellite at any point on the GSO arc must not exceed -11.43 dBW/40 KHz.
  - c. The stations are authorized, on a non-protected and non-harmful interference basis, to transmit to the non-geostationary-orbit space stations using the 14.0-14.5 GHz frequency band that are authorized by the Commission. The stations authorized herein must immediately terminate operations upon notification that such operation is causing harmful interference to any other radio system lawfully operating in the 14.0-14.5 GHz frequency band. The stations authorized herein cannot claim protection from harmful interference from any radio system lawfully operating in the 14.0-14.5 frequency band.
  - d. Operations granted in this license are limited by existing and future coordination agreements between the SpaceX's NGSO satellites and other satellite operators.
  - e. In the 14.47-14.5 GHz band, operations are subject to footnote US342 to the U.S. Table of Frequency Allocations, 47 CFR § 2.106, and all practicable steps must be taken to protect the radio astronomy service from harmful interference.
  - f. The licensee shall not operate in the band 14.0-14.2 GHz within 125 km of the NASA TDRSS facilities on: Guam(latitude 13°36'55" N, longitude 144°51'22" E); White Sands, New Mexico (latitude 32°20'59" N, longitude 106°36'31" W and latitude 32°32'40" N, longitude 106°36'48" W); Blossom Point, Maryland (latitude 38° 25' 44" N.L. longitude 77° 05' 02" W.L.) unless and until it enters into an agreement with NASA that NTIA has approved. The licensee must conform its operations to the terms of any coordination agreement with NASA.
  - g. The licensee shall not operate in the band 14.47-14.50 GHz within (a) 45 km of the radio observatory on St. Croix, Virgin Islands (located at latitude 17°46 N, longitude 64°35 W); (b) 125 km of the radio observatory on Mauna Kea, Hawaii (located at latitude 19°48 N, longitude 155°28 W); and (c) 90 km of the Arecibo Observatory on Puerto Rico(located at latitude 18°20'46 W, longitude 66°45'11 N) unless and until the licensee enters into an agreement with the National Science Foundation that has been approved by NTIA. The licensee must conform its operations to the terms of any coordination agreement with the National Science Foundation.

## Speci:

- h. The licensee shall not operate in the vicinity of radio observatories of Radio Astronomy Service (RAS) in the band 14.47-14.50 GHz unless and until the licensee enters into an agreement with the National Science Foundation that has been approved by NTIA. The licensee must conform its operations to the terms of any coordination agreement with the National Science Foundation. The appropriate NSF contact point to initiate coordination is Electromagnetic Spectrum Manager, NSF, 4201 Wilson Blvd., Suite 1045, Arlington, VA 22203, fax 703-292-9034, e-mail esm@nsf.gov. See also a list of each applicable RAS site, its location, and the applicable coordination zone on Table-1: Applicable RAS Facilities and Associated Coordination Distances, 47 C.F.R. 25.226(d)(2).
- (8) Operations of the authorized ESAA stations must be in compliance with the following additional conditions:

a. Licensee's ESAA must employ a tracking algorithm that is resistant to capturing and tracking adjacent satellite signals, and each station must be capable of inhibiting its own transmission in the event it detects unintended satellite tracking.

b. Licensee's ESAA must be monitored and controlled by a ground-based network control and monitoring center. Such stations must be able to receive "enable transmission" and "disable transmission" commands from the network control center and must cease transmission immediately after receiving a "parameter change" command until receiving an "enable transmission" command from the network control center. The network control center must monitor operation of each earth station to determine if it is malfunctioning, and each earth station must self-monitor and automatically cease transmission on detecting an operational fault that could cause harmful interference to a fixed satellite service network.

c. Licensee must maintain a point of contact available 24 hours per day, seven days per week, with the authority and ability to terminate operations authorized herein, for discussing interference concerns with other licensees, and must submit a letter to be included in its license file with the name and telephone number of the point of contact prior to commencing operation.