

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

EXPERIMENTAL
(Nature of Service)

WF2XTG
(Call Sign)

XT MO
(Class of Station)

0432-EX-CR-2019
(File Number)

NAME The BOEING Company

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(i) of the Commission's Rules

Station Locations

(1) MOBILE: MOBILE: CONUS, Alaska, Hawaii, U.S Territories

Frequency Information

MOBILE: MOBILE: CONUS, Alaska, Hawaii, U.S Territories

Frequency	Station Class	Emission Designator	Authorized Power	Frequency Tolerance (+/-)
14000-14500 MHz	MO	6M75G7D 11M9G7D 20M0G7D 24M3G7D 29M5G7D 29M5G7D 32M4G7D 3M40G7D	24 kW (ERP)	
14000-14500 MHz	MO	6M75G7D 11M9G7D 20M0G7D 24M3G7D	26 kW (ERP)	

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

**FEDERAL
COMMUNICATIONS
COMMISSION**



Frequency Information

MOBILE: MOBILE: CONUS, Alaska, Hawaii, U.S Territories

Frequency	Station Class	Emission Designator	Authorized Power	Frequency Tolerance (+/-)
14000-14500 MHz	MO	29M5G7D 29M5G7D 32M4G7D 3M40G7D	26 kW (ERP)	
14000-14500 MHz	MO	6M75G7D 11M9G7D 20M0G7D 24M3G7D 29M5G7D 29M5G7D 32M4G7D 3M40G7D	7.2 kW (ERP)	

Special Conditions:

- (1) In lieu of frequency tolerance, the occupied bandwidth of the emission shall not extend beyond the band limits set forth above.
- (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) The station identification requirements of Section 5.115 of the Commission's Rules are waived.
- (4) Operations shall not use a frequency below 14.2 GHz when within radio line of sight (455 km) of NASA earth stations in White Sands, NM, Blossom Point, MD or Guam, Guam.
- (5) The designated point-of-contact to terminate the systems if having interference occurs is Gary Lantz, 443-273-5871.
- (6) No transmissions are permitted between 14.47 GHz - 14.5 GHz within 125 km of Mauna Kea, HI (at latitude 19° 48' N, longitude 155° 28' W).
- (7) National Science Foundation (NSF) requests that licensee:
 - 1) Coordinate operation at the Taunton, MA site with the National Radio Astronomy Observatory's VLBA site at Hancock, NH. (POC Mr. Dan Mertely at Socorro, NM, Phone: 505- 835-7027 and e-mail: dmertely@nrao.edu).
 - 2) Coordinate operation at the Fredericksburg, VA site with Wes Sizemore at Green Bank. (Phone: 304-456-2107, e-mail: wsizemor@nrao.edu).

Special Conditions:

- (8) Note that if, during the term of this authorization, NASA seeks to provide protection to a future TDRSS site that has been coordinated through the National Telecommunications and Information Administration (NTIA) Interdepartment Radio Advisory Committee (IRAC) Frequency Assignment Subcommittee process, NTIA will notify the Commission that the site is nearing operational status. Upon notice from the Commission, licensee must cease operations in the 14.0-14.2 GHz band within 125 km of the new TDRSS site until The Boeing Company has coordinated with the new site. After coordination, operations will then again be permitted in the 14.0-14.2 GHz band within 125 km of the new TDRSS site, subject to any operational constraints developed in the coordination process.
- (9) Subject to coordination with the Western Area Frequency Coordinator located at the Navy Pacific Missile Test Center, Pt. Mugu, Cal., prior to use within a 322 kilometer radius of Pt. Mugu or in California south of Latitude 37° 30' North.
- (10) No transmissions are permitted between 14.0 GHz and 14.2 GHz within 125 km of White Sands, NM (latitude: 32° 20' 59" N, longitude 106° 36' 31" W and latitude: 32° 32' 40" N, longitude 106° 36' 48" W) and of NASA TDRSS facilities on Guam (latitude: 13° 36' 55" N, longitude 144° 51' 22" W).
- (11) Prior to operating in the 14.47-14.5 GHz frequency band, in the listed locations, The Boeing Company will coordinate with the National Academy of Sciences (NSF) and notify the Commission of the results of that coordination:
Within 45 km of the radio observatory on St. Croix, Virgin Islands (latitude 17° 46' N, longitude 64° 35' W);
Within 90 km of the Arecibo Observatory on Puerto Rico (latitude 18° 20' 46" N, longitude 66° 45' 11" W); and
Within 160 km of the radio observatories listed in US203 as observing in the 14.47-14.5 GHz band.
- (12) No transmissions are permitted in the 14.00 - 14.2 GHz band within 125 km of Blossom Point, MD (latitude: 38° 25' 44" N, longitude 77° 05' 20" W).
- (13) Prior to activation, the applicant must coordinate with NASA White Sands, NM; NASA Blossom Pt, MD and NASA Guam, GAM.
Operation is subject to prior coordinate with White Sands Missile Range (WSMR) and Reston Arsenal.
- (14) Operation is subject to immediate cessation, if it causes harmful interference to Health and Human Service (HHS) Medical operations.
- (15) Operation within 100 miles of NASA Dryden Flight Research Center (355630N 1175312W) is subject to prior coordination with NASA: Rich Rood at 661-276-2138.
- (16) NASA requires notification and coordination with GSFC Spectrum Office prior to any operation within 125 km of any NASA Center or earth stations (e.g., White Sands, NM, Guam, and Blossom Point, MD). POC is NASA/GSFC SPECTRUM MANAGER, SCOTT GALBRAITH AT 301.286.5089, VINCENT.S.GALBRAITH@NASA.GOV."

Special Conditions:

- (17) Licensee is authorized to operate a L3 Daytron FSS-4180-LP and a L3 Daytron FSS-4180-LC (COTM) Ku-band antennas to conduct tests on the ground in the mobile mode (GES) and flight over the air (ESAA) using the 14.0-14.5 GHz frequency band. The operations are subject to the following conditions:
- a. Earth station Locations:
The GES platforms will primarily operate within the Pacific Northwest Region of the U.S., including international airspace along the Pacific Northwest Coast.
The ESAA will conduct flight operations within CONUS, Alaska, Hawaii, U.S. held territories, and the Pacific Northwest Region of the U.S., including international airspace.
- b. POINTS OF COMMUNICATION: ALSAT (Ku-band Geostationary-satellite orbit (GSO) Satellites) in the Permitted Space Station list.
- c. Operations must be in compliance with the applicable ESAAs requirements set forth in Section 25.227 of the Commission's Rules, including the off-axis EIRP power spectral density ("PSD") standards (the "off-axis mask") set forth in Section 25.227(a).
- d. The input power spectral density into the antenna must not exceed -14 dBW/4 kHz, as set forth in Section 25.212(c)(2).
- e. ESAA in aircraft on the ground must not transmit at elevation angles less than three degrees. There is no minimum angle of antenna elevation for ESAA while airborne.
- f. Operations authorized pursuant to this license are operations by U.S.-registered aircraft anywhere within the coverage area/ Ku frequency band operated by ALSAT for the Ku-band satellites in the Permitted Space Station list. Authorization for operations by U.S.-registered aircraft outside U.S. territory, pursuant to this license, does not constitute a grant of access to the market in the United States under the Commission's DISCO II policies.
- g. Stations authorized herein must not be used to provide air traffic control.
- h. Operation in the territory or airspace of any country other than the United States must be in compliance with the applicable laws, regulations, and licensing procedures of that country, as well as with the conditions of this authorization.
- i. The licensee shall comply with any pertinent limits established by the International Telecommunication Union to protect other services allocated internationally.
- j. When operating in international airspace within line-of-sight of the territory of a foreign administration where Fixed Service networks have a primary allocation in the 14.0-14.5 GHz band, an ESAA must not produce ground-level power flux density (pfd) in such territory in excess of the following values unless the foreign administration has imposed other conditions for protecting its FS stations:
- 132 + 0.5 x THETA dB(W/(m² MHz)) for THETA ≤ 40° ;
-112dB(W/(m² MHz)) for 40° < THETA ≤ 90°.

Specific

Where: THETA is the angle of arrival of the radio-frequency wave in degrees above the horizontal, and the aforementioned limits relate to the pfd and angles of arrival that would be obtained under free space propagation conditions.

k. The stations are authorized, on a non-protected and non-harmful interference basis, to transmit to the geostationary-orbit space station using the 14.0-14.5 GHz frequency band that are authorized by the Commissions. 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.

l. Operations granted in this license are limited by existing and future coordination agreements between the ALSAT (authorized Ku-band GSO Satellites) in the Permitted Space Station list and other satellite operators.

m. 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 and must file a copy of the agreement with the Commission within 30 days of execution. 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).

n. 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.

o. 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, 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.

p. 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" N, longitude 66°45'11" W) 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.

q. The licensee shall not operate in the vicinity of radio observatories of Radio

Specific 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).

- (18) Operations of the authorized ESAA stations must be in compliance with the following additional conditions:
- a. Licensee's ESAA stations 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 stations 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.
- (19) This authorization is without prejudice to any determination that the Commission may make regarding pending or future experimental satellite earth station applications.