DS Law PLLC, 1629 K St. NW Ste 300, Washington, DC 20006-1631,

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

EXPERIMENTAL	WE2XRO
(Nature of Service)	(Call Sign)
XC FX	0556-EX-CR-2021
(Class of Station)	(File Number)

NAME Northrop Grumman Systems Corporation

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) Sacramento (SACRAMENTO), CA - NL 38-40-04; WL 121-24-02

Frequency Information

Sacramento (SACRAMENTO), CA - NL 38-40-04; WL 121-24-02

Frequency	Station Class	Emission Designator	Authorized Power	Frequency Tolerance (+/-)
20-20.75 MHz	FX	N0N 42K0W7W	263 W (ERP)	
21.05 MHz	FX	N0N	263 W (ERP)	
21.35 MHz	FX	N0N	263 W (ERP)	
21.65-24.7 MHz	FX	N0N 42K0W7W	263 W (ERP)	

This authorization effective November 01, 2021 and will expire 3:00 A.M. EST November 01, 2022

FEDERAL COMMUNICATIONS COMMISSION

Frequency Information

Sacramento (SACRAMENTO), CA - NL 38-40-04; WL 121-24-02

Frequency	Station Class	Emission Designator	Authorized Power	Frequency Tolerance (+/-)
21.65-24.7 MHz	FX	15K0F3E	263 W (ERP)	
21.85-24.7 MHz	FX	N0N 15K0F3E 42K0W7W	263 W (ERP)	
25.05 MHz	FX	N0N	263 W (ERP)	
25.4-26.1 MHz	FX	N0N 42K0W7W	263 W (ERP)	
26.45 MHz	FX	N0N	263 W (ERP)	
26.63-26.8 MHz	FX	N0N 42K0W7W	263 W (ERP)	
27.15 MHz	FX	N0N	263 W (ERP)	
27.48 MHz	FX	42K0W7W	263 W (ERP)	
27.5 MHz	FX	N0N	263 W (ERP)	

Frequency Information

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Frequency	Station Class	Emission Designator	Authorized Power	Frequency Tolerance (+/-)
27.85 MHz	FX	N0N	263 W (ERP)	
28.2 MHz	FX	N0N	263 W (ERP)	
28.6 MHz	FX	N0N	263 W (ERP)	
29 MHz	FX	N0N	263 W (ERP)	
29.4 MHz	FX	N0N	263 W (ERP)	
29.8 MHz	FX	N0N	263 W (ERP)	
30.2 MHz	FX	N0N	263 W (ERP)	
30.6 MHz	FX	N0N	263 W (ERP)	
30.75 MHz	FX	42K0W7W	263 W (ERP)	
31 MHz	FX	N0N	263 W (ERP)	

Frequency Information

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Frequency	Station Class	Emission Designator	Authorized Power	Frequency Tolerance (+/-)
31.4 MHz	FX	N0N	263 W (ERP)	
31.8 MHz	FX	N0N	263 W (ERP)	
32.167-32.7 MHz	FX	N0N 15K0F3E	263 W (ERP)	
33.15 MHz	FX	N0N	263 W (ERP)	
33.6 MHz	FX	N0N	263 W (ERP)	
34.05-34.95 MHz	FX	N0N	263 W (ERP)	
35.4 MHz	FX	N0N	263 W (ERP)	
35.81 MHz	FX	42K0W7W	263 W (ERP)	
35.85 MHz	FX	N0N	263 W (ERP)	
36.85-38.85 MHz	FX	N0N 42K0W7W	263 W (ERP)	

Frequency Information

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Frequency	Station Class	Emission Designator	Authorized Power	Frequency Tolerance (+/-)
39.35 MHz	FX	N0N	263 W (ERP)	
40.01-41.55 MHz	FX	N0N 42K0W7W	263 W (ERP)	
42.1 MHz	FX	N0N	263 W (ERP)	
42.65 MHz	FX	N0N	263 W (ERP)	
43.2 MHz	FX	N0N	263 W (ERP)	
43.8 MHz	FX	N0N	263 W (ERP)	
44.4 MHz	FX	N0N	263 W (ERP)	
45 MHz	FX	N0N	263 W (ERP)	
45.06 MHz	FX	42K0W7W	263 W (ERP)	
45.6 MHz	FX	N0N	263 W (ERP)	

Frequency Information

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Frequency	Station Class	Emission Designator	Authorized Power	Frequency Tolerance (+/-)
46.2 MHz	FX	N0N	263 W (ERP)	
46.8 MHz	FX	N0N	263 W (ERP)	
47.45 MHz	FX	N0N	263 W (ERP)	
48.1 MHz	FX	N0N	263 W (ERP)	
48.75 MHz	FX	N0N	263 W (ERP)	
49.4 MHz	FX	N0N	263 W (ERP)	
49.51 MHz	FX	42K0W7W	263 W (ERP)	
50.05 MHz	FX	N0N	263 W (ERP)	
50.7 MHz	FX	N0N	263 W (ERP)	
51.4 MHz	FX	N0N	263 W (ERP)	

Frequency Information

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Frequency	Station Class	Emission Designator	Authorized Power	Frequency Tolerance (+/-)
52.8 MHz	FX	N0N	263 W (ERP)	
52.92 MHz	FX	42K0W7W	263 W (ERP)	
53.5 MHz	FX	N0N	263 W (ERP)	
122.1 MHz	FX	N0N	263 W (ERP)	
122.94 MHz	FX	42K0W7W	263 W (ERP)	
123.2 MHz	FX	15K0F3E	263 W (ERP)	
130.55 MHz	FX	N0N	263 W (ERP)	
139.5-143.435 MHz	FX	N0N	263 W (ERP)	
145.15 MHz	FX	N0N	263 W (ERP)	
147.1 MHz	FX	N0N	263 W (ERP)	

Frequency Information

Sacramento (SACRAMENTO), CA - NL 38-40-04; WL 121-24-02

Frequency	Station Class	Emission Designator	Authorized Power	Frequency Tolerance (+/-)
149.05-150.04 MHz	FX	N0N	263 W (ERP)	
151.05 MHz	FX	N0N	263 W (ERP)	
152 MHz	FX	42K0W7W	263 W (ERP)	
153.05 MHz	FX	N0N	263 W (ERP)	
155.1 MHz	FX	N0N	263 W (ERP)	
157.2 MHz	FX	N0N	263 W (ERP)	
159.3 MHz	FX	N0N	263 W (ERP)	
161.45 MHz	FX	N0N	263 W (ERP)	
161.779 MHz	FX	42K0W7W	263 W (ERP)	
163.6-221.7 MHz	FX	N0N	263 W (ERP)	

Frequency Information

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Frequency	Station Class	Emission Designator	Authorized Power	Frequency Tolerance (+/-)
409.25-449.25 MHz	FX	N0N	263 W (ERP)	
455.25 MHz	FX	N0N	263 W (ERP)	
459.889 MHz	FX	42K0W7W	263 W (ERP)	
461.35-467.55 MHz	FX	N0N	263 W (ERP)	
810.7 MHz	FX	N0N	224 W (ERP)	
821.55 MHz	FX	N0N	224 W (ERP)	
832.55 MHz	FX	N0N	224 W (ERP)	
843.7 MHz	FX	N0N	224 W (ERP)	
855 MHz	FX	N0N	224 W (ERP)	
866.45 MHz	FX	N0N	224 W (ERP)	

Frequency Information

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Frequency	Station Class	Emission Designator	Authorized Power	Frequency Tolerance (+/-)
878.05 MHz	FX	N0N	224 W (ERP)	
889.8 MHz	FX	N0N	224 W (ERP)	
901.7 MHz	FX	N0N	224 W (ERP)	
913.8-926.05 MHz	FX	N0N	224 W (ERP)	
938.45 MHz	FX	N0N	224 W (ERP)	
951.05 MHz	FX	N0N	224 W (ERP)	
1619.7 MHz	FX	N0N	224 W (ERP)	
1685.7 MHz	FX	N0N	224 W (ERP)	
1708.3 MHz	FX	N0N	224 W (ERP)	
1731.2 MHz	FX	N0N	224 W (ERP)	

Frequency Information

Sacramento (SACRAMENTO), CA - NL 38-40-04; WL 121-24-02

Frequency	Station Class	Emission Designator	Authorized Power	Frequency Tolerance (+/-)
1754.4 MHz	FX	N0N	224 W (ERP)	
1777.9-1825.85 MHz	FX	N0N	224 W (ERP)	
1850.3 MHz	FX	N0N	224 W (ERP)	
1875.1 MHz	FX	N0N	224 W (ERP)	
1900.25 MHz	FX	N0N	224 W (ERP)	
1925.7 MHz	FX	N0N	224 W (ERP)	
1951.8 MHz	FX	N0N	224 W (ERP)	
1977.65 MHz	FX	N0N	224 W (ERP)	
2004.15 MHz	FX	N0N	224 W (ERP)	
2031-2085.8 MHz	FX	N0N	224 W (ERP)	

Frequency Information

Sacramento (SACRAMENTO), CA - NL 38-40-04; WL 121-24-02

Frequency	Station Class	Emission Designator	Authorized Power	Frequency Tolerance (+/-)
2113.75 MHz	FX	N0N	224 W (ERP)	
2142.05 MHz	FX	N0N	224 W (ERP)	
2170.75 MHz	FX	N0N	224 W (ERP)	
2199.85 MHz	FX	N0N	224 W (ERP)	
2414.7 MHz	FX	N0N	224 W (ERP)	
2447.05 MHz	FX	N0N	224 W (ERP)	
2479.85 MHz	FX	N0N	224 W (ERP)	

Special Conditions:

(1) Operation in the 1850-1910 or 1930-1990 MHz band requires prior frequency coordination with 2 GHz microwave users and consent of PCS licensees to avoid interference.

(2) Operation in the 824-849 or 869-894 MHz band requires consent of local cellular licensee(s) to avoid interference.

(3) Operation in the 1695-1780 MHz, 1915-1920 MHz, 1995-2020 MHz or 2110-2200 MHz band requires consent of local Advanced Wireless Service (AWS) licensee(s) to avoid interference.

(4) Operation is subject to prior coordination with the Society of Broadcast Engineers, Inc. (SBE); ATTN: Executive Director; 9102 North Meridian Street, Suite 305; Indianapolis, IN 46260; telephone, (866) 632-4222; FAX, (317) 846-9120; e-mail, executivedir @ sbe.org; information, www.sbe.org.

Special Conditions:

(5) The station identification requirements of Section 5.115 of the Commission's Rules are waived.

(6) 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.

(7) Operation is subject to prior coordination with the local Society of Broadcast Engineers, Inc. (SBE) frequency coordinator. Consult the list at http://sbe.org/wp-content/uploads/freqcoor.pdf to find the appropriate coordinator.

(8) In lieu of frequency tolerance, the occupied bandwidth of the emission shall not extend beyond the band limits set forth above.

(9) Stop Buzzer: Gary Infantino, 916-570-4365 (Cell).

(10) Operation is subject to prior coordination with affected Fixed Microwave Service licensees in accordance with 47 CFR, Part 101.103(d).

(11) This authorization is issued for the express purpose of conducting experimental operations described in the related application and required by US Army contract W56JSR-16-D-0003. 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.

(12) Upon notification from the FCC, operation in 34.05-34.95 MHz is subject to immediate cessation, if it causes harmful interference to Coast Guard ops assignments.

(13) Upon notification from the FCC, operation in 409.25-449.25 MHz is subject to immediate cessation, if it causes harmful interference to FAA ops on 413.6 MHz.

(14) Experimental licensee must successfully secure consents from all incumbent Advanced Wireless Service licensees within 99 km radius from the proposed venue prior to accessing to the frequency range from 1708.3 MHz to 1780MHz, and from 2004.15 MHz to 2199.85 MHz.

(15) Experimental licensee must coordinate with Fixed Microwave Service licensees in the proposed venue in accordance with 47 C.F.R, Part 101.103(d) prior to operation on 951.05 MHz and 2497.85 MHz.

Special Conditions:

(16) Prior to commencing any operations in the frequencies below, the experimental licensee must obtain consent from the following within 50 miles of the contours of the testing area:

> Paging Service licensees in 35 MHz
> Paging Service licensees in 43 MHz
> Paging Service licensees in 152 MHz
> Mobile Service licensees in 152 MHz/158 MHz
> AMTS Licensee (217-218 MHz/219-220 MHz)
> Mobile Service licensees in 454 MHz/459 MHz
> General Aviation Air-Ground Service in 454 MHz/459 MHz
> SMR/ESMR licensees (809-824 MHz/854-869 MHz)
> B/ILT licensees (809-824 MHz/854-869 MHz)
> Cellular licensees (824-849 MHz/869-894 MHz)
> SMR licensees (896-901 MHz/935-940 MHz)
> B/ILT licensees (896-901 MHz/935-940 MHz)
> Narrowband PCS licensees (901-902/930-931/940-941 MHz)
> Location & Monitoring Service licensees (902-928 MHz)
> Broadband PCS licensees (1850-1910 MHz/1930-1990 MHz)

(17) Prior to commencing any operations at the 149.05-150.04 MHz, 161.45 MHz, 161.779 MHz frequency bands, experimental licensee must notify licensee of ORBCOMM License Corp. (Call signs: E940534, S2103. Mr. Walter H. Sonnenfeldt, Phone Number: 585-461-3018, E-Mail: sonnenfeldt.walter@orbcomm.com) operating in the 137-138 MHz, 148-150.05 MHz, 161-163 MHz, and 400.15-401 MHz frequency bands. The notice must include the name and contact information of the stop buzzer personnel that will be available to cease operations in the event of reported interference. The notification should include the testing parameters (specific location(s), antenna gain(s), antenna height(s), antenna orientation, EIRP, EIRP density) and day and times of each test.

(18) Prior to commencing any operations at the 149.05-150.04 MHz, 157.2 MHz, frequency band, experimental licensee must notify licensee of Swarm Technologies, Inc. (Call signs: E190490, S3041. Dr. Sophie Arlow, Phone Number: 425-753-3349, E-Mail: sophie@swarm.space) operating in the 137.025 - 138 MHz and 148.25 - 149.95 MHz, 156.5125-156.5375 MHz (DSC), 156.7625-156.7875 MHz (AIS 3), 156.8125-156.8375 MHz (AIS 4), 161.9625-161.9875 MHz (AIS 1), 162.0125-162.0375 MHz (AIS 2) frequency bands. The notice must include the name and contact information of the stop buzzer personnel that will be available to cease operations in the event of reported interference. The notification should include the testing parameters (specific location(s), antenna gain(s), antenna height(s), antenna orientation, EIRP, EIRP density) and day and times of each test.

Special Conditions:

(19) Prior to commencing any operations in the 157.2 MHz, 159.3 MHz, 161.45 MHz, 161.779 MHz frequency band, experimental licensee must notify licensee of Iridium Constellation LLC (Call sign: S2110. Ms. Maureen C McLaughlin, Phone Number: : 703-287-7518 E-Mail: : maureen.mclaughlin@iridium.com) or Name: Jennifer Hindin, Phone Number: 2027194975 E-Mail: jhindin@wileyrein.com) operating in the 156.0125-162.0375 MHz (AIS) frequency band. The notice must include the name and contact information of the stop buzzer personnel that will be available to cease operations in the event of reported interference. The notification should include the testing parameters (specific location(s), antenna gain(s), antenna height(s), antenna orientation, EIRP, EIRP density) and day and times of each test.

(20) Prior to commencing any operations in the 1619.7 MHz frequency band, experimental licensee must notify licensee of Iridium Satellite LLC (Call sign E960132, E960622, POC/Satellite: S2110. Name: Ms Maureen C. McLaughlin, Phone Number: 703-287-7518, E-Mail: maureen.mclaughlin@iridium.co) operating in the 1618.7250 - 1626.5 MHz frequency band. The notice must include the name and contact information of the stop buzzer personnel that will be available to cease operations in the event of reported interference. The notification should include the testing parameters (specific location(s), antenna gain(s), antenna height(s), antenna orientation, EIRP, EIRP density) and day and times of each test.

(21) Prior to commencing any operations in the 2004.15 MHz frequency band, experimental licensee must notify licensee of GAMMA ACQUISITION L.L.C. (Call sign E060430, POC/Satellite: S2633. Name: Ms. Allison Minea, Phone Number: 202-293-1216, E-Mail: alison.minea@dish.com) operating in the 2000-2010 MHz and 2180-2190 MHz frequency bands. The notice must include the name and contact information of the stop buzzer personnel that will be available to cease operations in the event of reported interference. The notification should include the testing parameters (specific location(s), antenna gain(s), antenna height(s), antenna orientation, EIRP, EIRP density) and day and times of each test.

(22) Prior to commencing any operations in the 2199.85 MHz frequency band, experimental licensee must notify licensee of DBSD Services Limited. (Call sign E070272, POC/Satellite: S2651. Name: Ms. Allison Minea, Phone Number: 202-293-1216, E-Mail: alison.minea@dish.com) operating in the 2010-2020 MHz and 2190-2200 MHz frequency bands. The notice must include the name and contact information of the stop buzzer personnel that will be available to cease operations in the event of reported interference. The notification should include the testing parameters (specific location(s), antenna gain(s), antenna height(s), antenna orientation, EIRP, EIRP density) and day and times of each test.