

USN TT&C Routine Support for Sentinels 2C from Alaska

Sentinel is a mission of the European Space Agency which measures ocean currents in cooperation with the USA. This request is for a 180 day STA to commence on Jan. 1st 2027 supporting TTC and payload data downlink of the Sentinel 2C satellite. This is a continuation of SES-STA-20260205-00550. The Sentinel 2C is to fly tandem with Sentinel 2A during LEOP and commissioning phase. When Sentinel 2C commissioning phase is completed then Sentinel 2A is to be retired and replaced with Sentinel 2C. Sentinel-1, -2 and -3, each consist of three satellites A, B & C (current + planned).

On Jan. 30th 2023, a long-term license application was submitted (SES-LIC-20230130-00146) for Sentinel 1,2,3 A&B which covers even Sentinel 2C. Sentinel-2C will replace Sentinel-2A. Please see email dated Nov. 28th 2024.

A new frequency coordination report will be delivered as soon as it is ready.

S/C	Downlink (MHz)	Uplink (MHz)
Sentinal-2C	2253.00-2255.2 8025-8330, center frequencies at 8095 & 8260 MHz & emission- designator 140MG1D---	2075.266-2076.034

Flux Density impinging on the ground in Alaska from Sentinels-2C

The Flux density is calculated as: $flux\ density = EIRP / (4\pi RSE^2)$

where RSE is the distance from spacecraft to the ground, and EIRP is the Effective Isotropic Radiated Power of the spacecraft.

Data from the spacecraft vendor indicates that the max. EIRP of the Sentinel-2C spacecraft is $18 + 2.5 = 20.5$ dBW for S-band and $15.5 + 9 = 24.5$ dBW for X-band and the closest distance to earth (perigee) during an overhead pass is 777.8 km.

Converting 20.5 dBW and 24.5 dBW to scalar Watts = 112.2 and 281.8 Watts respectively transmitted at 2254.100 MHz and 8095 MHz respectively. Therefor:

Flux density = 1.47×10^{-11} Watts/meter² for S-band and 3.7×10^{-11} for X-band
Or

Flux density = 1.47×10^{-12} mW/cm² for S-band and 3.7×10^{-12} for X-band

Parameter	SENTINEL-1	SENTINEL-2	SENTINEL-3
Ranging tone (TT&C links)	100 kHz to 448 kHz	100 kHz to 1500 kHz	448 kHz
Local Time Ascending Node, LTAN (Right Ascension of Ascending Node,	18:00	10:30 (LTDN)	10:00 (LTDN)
Orbit at epoch date	01.01.2018 18:00 UTCG	01.01.2018 10:30 UTCG	01.01.2018 10:00 UTCG
RAAN	11.10	78.3	70.7
Apogee (km)	701.2	794.4	808.1
Perigee (km)	684.5	777.8	791.5
Argument of Perigee	0	0	90
Mean Anomaly	359.9/179.9	179.9/359.9	359.9/179.9
Mean Inclination	98.19	98.62	98.65
Peak Gain (dB)	-2.2/6.3	-2.2/6.3	-2.5/6.6
Range of satellite arc E/W limit	63,84	62,41	62,03
G/T at Max. Gain Point	-37,42	-35,02	-31,6

Exhibit C
PETITION FOR WAIVER OF SECTION 25.137 AND 25.114 AND OF
THE U.S. TABLE OF FREQUENCY ALLOCATIONS

I. TO THE EXTENT THEY APPLY, GOOD CAUSE EXISTS FOR A WAIVER OF CERTAIN PORTIONS OF SECTIONS 25.137 AND 25.114

Universal Space Network, Inc. (USN) is provided limited legal and technical information for the Sentinel 2C Satellite.¹ Pursuant to Section 25.137 of the Federal Communications Commission's ("Commission" or "FCC") rules, the same technical information required by Section 25.114 for U.S.-licensed space station, and certain legal information, must be submitted by earth station applicants "requesting authority to operate with a non-U.S. licensed space station to serve the United States..."² USN seeks authority to support critical events for the Sentinel 2C spacecraft, and not commercial service to the United States, and thus believes that Section 25.137 does not apply.

To the extent the Commission determines, however, that USN's request for authority to provide critical spacecraft risk mitigation support on a special temporary basis is a request to serve the United States with a non-U.S.-licensed satellites, USN respectfully requests a waiver of Sections 25.137 and 25.114 of the Commission's rules, to the extent that USN has not herein provided the information required by these rules.³ The Commission may grant a waiver for good cause shown.⁴ A waiver is therefore appropriate if special circumstances warrant a deviation from the general rule, and such a deviation will serve the public interest. The US public interest is supported by the sharing of collected data with the United States government.

In this case, good cause for a waiver of portions of Section 25.114 exists. USN seeks authority to conduct data collection testing support for Sentinel 2C. Thus, any information sought by Section 25.114 that is not relevant to the critical support – e.g., antenna patterns, energy and propulsion and orbital debris - USN does not have. In addition, USN would not easily be able to obtain such information because USN is not the operator of the Sentinel 2C satellite, nor is USN in contractual privity with that operator. Rather, USN has contracted with Swedish Space Corporation, Solna Sweden (SSC) to support the mission in S and X-Band of the Sentinel 2C satellite.

¹ FCC Form 312 Section B

² 47 C.F.R. § 25.137(a)

³ 47 C.F.R. §§25.137 and 25.114

⁴ 47 C.F.R. §1.3

Because it is not relevant to the service for which USN seeks authorization, and because obtaining the information would be a hardship, USN seeks a waiver of all the technical and legal information required by Section 25.114, to the extent it is not provided herein. As noted above, USN has provided the required information to the extent that it is relevant to the testing service for which USN seeks authorization.

Good cause also exists to waive portions of Section 25.137, to the extent the information required is not herein provided. Section 25.137 is designed to ensure that “U.S.-licensed satellites systems have effective competitive opportunities to provide analogous services” in other countries. Here, there is no commercial service being provided by the satellites; USN is providing receive only data collection while the satellites are in a non-geostationary orbit. Thus, the purpose of the information required by Section 25.137 is not implicated here. For example, Section 25.137(d) requires earth station applicants requesting authority to operate with a non-U.S.-licensed space station that is not in orbit and operating to post a bond.⁵ The purpose in having to post a bond – i.e., to prevent warehousing of orbital locations by operators seeking to serve the United States – would not be served by requiring USN to post a bond to conduct the 180-day critical support of the Sentinel 2C satellite.

It is USN’s understanding that Sentinel 2C is licensed by the European Space Agency of France. Sentinel 2C are spacecraft meant to serve France, with data shared with the US. Thus, the purpose of Section 25.137 – to ensure that U.S. satellites operators enjoy “effective competitive opportunities” to serve foreign markets and to prevent warehousing of orbital locations service the United States – will not be undermined by grant of this waiver request.

Finally, USN notes that it expects to communicate with the Sentinel 2C satellite using its U.S. earth station for a period of 180 days. Requiring USN to obtain technical and legal information from an unrelated party, where there is no risk of interference. Given these particular facts, the waiver sought herein is appropriate.

II. GOOD CAUSE EXISTS FOR A WAIVER OF THE UNITED STATES TABLE OF FREQUENCY ALLOCATIONS

USN further requests a waiver of the United States Table of Frequency Allocations (“U.S. Table”) as described in section 2.106 of the rules for the frequency bands 2025 – 2110 MHz (Earth-to-Space) and 2200 – 2290 MHz (Space-to-Earth).⁶ Section footnotes allow for non-federal Government use of these bands in the United States on a case-by-case non-interference basis. Such use by USN necessitates a waiver of the U.S. Table.

Good cause exists to grant USN a limited waiver of the U.S. Table to allow critical support for the Sentinel 2C satellite. In considering request for case-by-case spectrum uses, the Commission has indicated that it would generally grant such waivers “where there is little potential for interference into any service authorized under the Table of Frequency Allocations and when the case-by-case operator accepts any interference from authorized services.”⁷ USN will coordinate with other parties operating communication systems in compliance with the Table of Frequency Allocations to ensure that no harmful interference is caused. USN seeks to operate only pursuant to special temporary authorization and thus agrees to accept any

interference from authorized services. In summary, USN's operation on a non-interference, non-protected basis support waiver of the U.S. Table.

⁵ 47 C.F.R. §25.137(d)(4)

⁶ 47 C.F.R. §2.106

With respect to Space Launch Services

Pursuant to Section 1.3 of the Commission's rules (47 CFR § 1.3), USN respectfully requests a waiver of certain provisions of Part 25 and Part 26 of the Commission's rules to permit the licensing and operation of a satellite earth station using the 2025–2110 MHz and 2200–2290 MHz frequency bands for Part 25, telemetry, tracking, and command (TTC) operations of its low Earth orbit (LEO) satellite constellation.

Under 47 CFR § 1.3, the Commission may waive its rules for good cause shown. USN submits that:

The proposed earth station will support Sentinel-2C TT&C routine and payload data downlink support, which cannot be accommodated in other bands due to technical/operational constraints. Besides these bands have been used in all previous STA applications for this spacecraft, they are also technically suitable due to their propagation characteristics and compatibility with existing ground infrastructure.

These bands have been partially reallocated to space launch services under Part 26.

As per 47 CFR § 25 section 2.106, this application would not comply without a waiver due to limitations on non-federal use or non-space launch service in these bands which currently restrict or limit the use of the referenced bands due to the reallocation referenced above.

USN believe this is in the public interest, technically feasible, non-disruptive to existing services, improves and supporting scientific research.

It is also consistent with the FCC's goals of promoting innovation, efficient use of spectrum and being in line with FCC orders and rulemakings that support flexible use of these bands (e.g., the FCC's 2023 Report and Order on commercial space launch operations 1).

This request is also consistent with prior FCC-authorized STAs, including:

- Lynk Global, Inc. (File No. SES-STA-20220512-00477), which was granted temporary authority for TT&C in both bands;
- Space Telecommunications, Inc. (CTC-0 CubeSat, File Number: 1082-EX-ST-2024) which was granted temporary authority for TT&C in both bands.
- Geometric Energy Corporation, which received STA for TT&C in these bands for a lunar mission via a UK-based earth station

These precedents demonstrate the FCC's established practice of granting temporary, coordinated use of these bands for TT&C under appropriate conditions.

USN request a waiver to permit temporary earth station operations and continued use of the referenced bands for Part 25 TT&C satellite communications. A waiver is necessary due to the relocation of these bands.

**Summary of Technical Information
For Coordination with
NTIA/FAS/IRAC**

Applicant: Universal Space Network, Inc.

File No.: _____

Call Sign: No Call Sign

Special Temporary Authority ("STA")

Purpose of operation: TT&C Routine & Payload Data

~~Download~~ Support for Sentinel 2C

Start Date: 1 Jan 2027

End Date: 30 June 2027

Location: North Pole, AK

Latitude: 64 deg 48' 15.268" N

Longitude: (NAD-83) 147 deg 30' 00.771"
W (NAD-83)

Transmit frequency: 2.0756504 GHz

Polarization: R/L

Antenna manufacturer: Datron

Antenna Size in meter: 13m

Antenna model: 1453

Antenna Gain Transmit: X 46.3 dBi @ 2.0756504 GHz

Frequency Band MHz	Emissions	Max EIRP per carrier dBW	Max. EIRP Density (dBW/4KHz)
2075.2664-2076.0344	768KG2D--	62.5	39.7

Satellite: Sentinel 2C