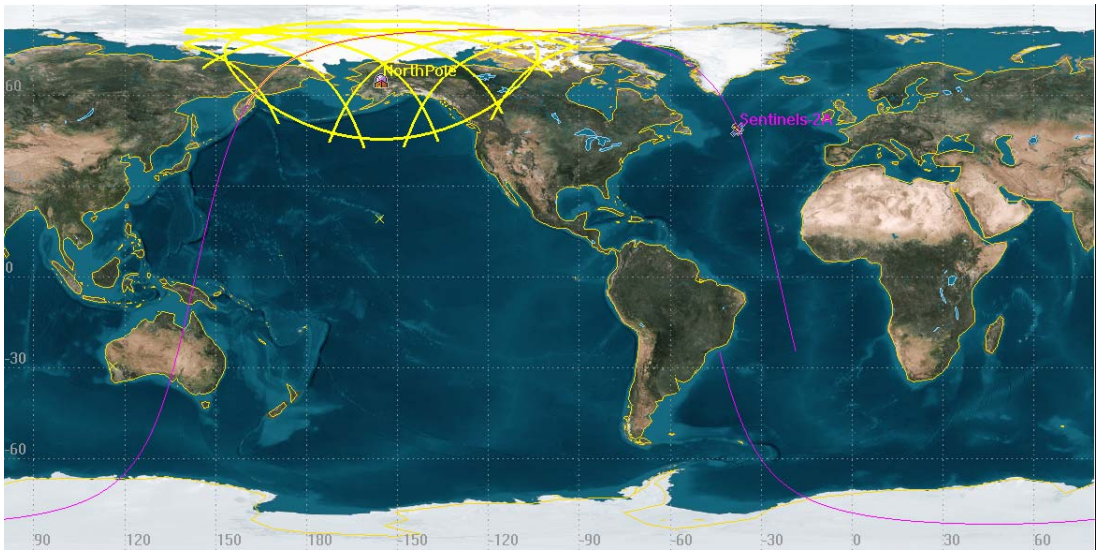
USN PRE-LEOP support for SEOSAT from Alaska

SEOSAT is a first generation earth observation satellite owned by Spain and launched by ESA to serve the European Union. SEOSAT will be launched from the Kourou space center in May of 2020. ESA is requesting ground station testing using the on-orbit Sentinels-2A spacecraft for ranging calibration. This test campaign will begin on March 18th and end on April 17th, 2020. The Sentinels-2A spacecraft will be supported by the USN Alaska ground station using a downlink frequency = 2254.009 MHz and uplink = 2075.650 MHz, and has been fully coordinated by Comsearch.

The Pre-LEOP support is scheduled to be conducted for 4 weeks with 1 or 2 (total of about 8 passes) supports each week for ranging calibration at the USN tracking station in Alaska. A typical day of support is shown below.

SENT2A
1 40697U 15028A 20055.50000000 .00000000 00000+0 00000+0 0 00123
2 40697 98.5702 131.3490 0001080 98.0922 328.0762 14.30809785244169



USN Alaska coverage of Sentinels-2A (typical coverage each day) Pre-LEOP March 2020

USN Alaska possible passes for Falconeye-2 7 March – 13 March 2020 UTC

Pass	Start Time (UTCG)	Stop Time (UTCG)
1	18 Mar 2020 00:30:37	18 Mar 2020 00:41:07
2	18 Mar 2020 02:09:27	18 Mar 2020 02:18:13
3	18 Mar 2020 03:47:04	18 Mar 2020 03:56:08
4	18 Mar 2020 05:24:12	18 Mar 2020 05:35:11
5	18 Mar 2020 07:02:18	18 Mar 2020 07:14:46
6	18 Mar 2020 08:42:22	18 Mar 2020 08:54:22
7	18 Mar 2020 10:25:23	18 Mar 2020 10:33:21
8	18 Mar 2020 19:02:45	18 Mar 2020 19:10:14
9	18 Mar 2020 20:41:37	18 Mar 2020 20:53:31
10	18 Mar 2020 22:21:13	18 Mar 2020 22:33:44

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

The Flux density is calculated as:

$$\boldsymbol{Flux\ density = EIRP \div (4\,\pi\, Rse^2)}$$

Where $\boldsymbol{Rse}$ is the distance from spacecraft to the ground.
Where $\boldsymbol{EIRP}$ is the Effective Isotropic Radiated Power of the Spacecraft.

Data from the spacecraft vendor indicates that the maximum EIRP of Sentinels-2A is -8.83 dBW. The altitude (and thus the closest distance to earth during an overhead pass) is = 692 Km.

Converting -8.83 dBW to scalar watts = 0.130 watts transmitted at 2254.099 MHz

Therefor:

$$\boldsymbol{Flux\ density = 0.13 \div (4\,\pi * 692{,}000\ meters^2)}$$

Flux density = 2.160 x 10^{-14} Watts/meter^2
Or
Flux density = 2.160 x 10^{-15} mW/cm^2

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 Falconeye-2 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 the Launch and Early Orbit (LEOP) and backup support of Falconeye-2, 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 LEOP on a special temporary basis is a request to serve the United States with a non-U.S-licensed satellite, 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.

In this case, good cause for a waiver of portions of Section 25.114 exists. USN seeks authority only to conduct LEOP support for Falconeye-2. Thus, any information sought by Section 25.114 that is not relevant to the LEOP – 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 Falconeye-2 satellite, nor is USN in contractual privity with that operator. Rather, USN has contracted with Swedish Space Corporation, Solona Sweden (SSC) to support the LEOP portion in S-Band of the Falconeye-2 satellite.

As evidenced by the Comsearch report attached to this request, USN has coordinated the LEOP of the Falconeye-2 satellite with potentially affected terrestrial operators. Moreover, as with any STA, USN will conduct the test on an unprotected, non-interference basis to government operations.

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[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 LEOP 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 satellite systems have effective competitive opportunities to provide analogous services" in other countries. Here, there is no service being provided by the satellite; USN is providing TT&C while the satellite is on the way to it's low earth 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 underlying 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 in order to conduct the 30 days of LEOP and backup support (7 days of LEOP, followed by 23 days of backup) of the Falconeye-2 satellite.

It is USN's understanding that Falconeye-2 is licensed by UAE Space Agency. Falconeye-2 is the second of the series spacecraft meant to serve the UAE. Thus, the purpose of Section 25.137 – to ensure that U.S. satellite 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 Falconeye-2 satellite using its U.S. earth station for a period of 30 days. Requiring USN to obtain technical and legal information from an unrelated party, where there is no risk of interference and would pose undue hardship without serving underlying policy objectives. Given these particular facts, the waiver sought herein is appropriate.

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[5] 47 C.F.R. §25.137(d)(4)

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 LEOP support of the Falconeye-2 satellite. In considering request for case-by-case spectrum uses, the Commission has indicated that is 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.

[6] 47 C.F.R. §2.106

[7] Previously approved STA's for Universal Space Network SES-STA-20020725-01174; SES-STA-20021112-02008; SES-STA-20040315-00475