# USN earth station testing support for Metop-A, B, and C at Alaska

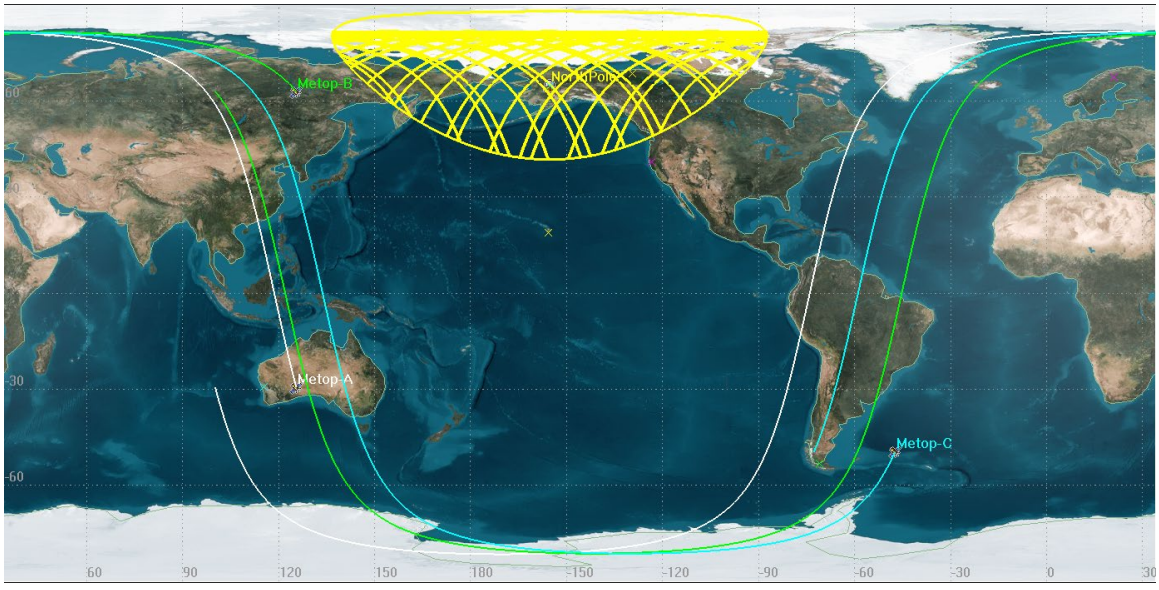
The Metop spacecraft family has been in orbit for many years and is supported by NOAA in collaboration. Eumetsat has contacted USN to provide support for testing and future compatibility with the Metop-SG series to be launched in 2023/2024. USN is requesting a 60 day STA to support the Metop series compatibility testing for validation of future missions support including supporting the deorbit of Metop-a in Q4-2021 of which subsequent authorization will be sought. The Metop spacecraft will be supported by the USN Alaska ground station using a downlink frequency = 2230.000 MHz and uplink = 2053.458 MHz, and has been fully coordinated by Comsearch.

The first day of support for this STA would be May 15, 2021. The first opportunities of TT&C support are shown below. It is expected that only a single pass will be conducted each day of the duration of the STA.

**METOP-A**
**1 29499U 06044A 21082.54605826 .00000014 00000-0 25654-4 0 9997**
**2 29499 98.4842 125.1976 0001381 120.7643 42.3167 14.21501829748530**

**METOP-B**
**1 38771U 12049A 21082.52274392 .00000003 00000-0 21183-4 0 9991**
**2 38771 98.6895 143.7745 0000350 248.0800 250.1749 14.21500955441665**

**METOP-C**
**1 43689U 18087A 21082.46300440 -.00000003 00000-0 18729-4 0 9993**
**2 43689 98.6966 144.1559 0001368 254.4112 105.6915 14.21494228123237**




**USN Alaska coverage Metop-ABC typical day**

**USN Alaska possible passes for Metop-A 15 May 2021 UTC**

| Pass | Start Time (UTCG) | Stop Time (UTCG) |
|---|---|---|
| 1 | 15 May 2021 00:53:57 | 15 May 2021 01:03:01 |
| 2 | 15 May 2021 02:31:43 | 15 May 2021 02:42:21 |
| 3 | 15 May 2021 04:09:59 | 15 May 2021 04:22:27 |
| 4 | 15 May 2021 05:49:57 | 15 May 2021 06:02:45 |
| 5 | 15 May 2021 07:32:27 | 15 May 2021 07:42:47 |
| 6 | 15 May 2021 16:15:21 | 15 May 2021 16:20:38 |
| 7 | 15 May 2021 17:54:19 | 15 May 2021 18:05:55 |
| 8 | 15 May 2021 19:34:30 | 15 May 2021 19:47:27 |
| 9 | 15 May 2021 21:14:47 | 15 May 2021 21:26:45 |
| 10 | 15 May 2021 22:54:42 | 15 May 2021 23:04:41 |

**USN Alaska possible passes for Metop-B 15 May 2021 UTC**

| | | |
|---|---|---|
| 1 | 15 May 2021 00:30:08 | 15 May 2021 00:39:56 |
| 2 | 15 May 2021 02:08:52 | 15 May 2021 02:18:01 |
| 3 | 15 May 2021 03:46:40 | 15 May 2021 03:57:16 |
| 4 | 15 May 2021 05:24:54 | 15 May 2021 05:37:19 |
| 5 | 15 May 2021 07:04:45 | 15 May 2021 07:17:35 |
| 6 | 15 May 2021 08:47:07 | 15 May 2021 08:57:36 |
| 7 | 15 May 2021 17:30:41 | 15 May 2021 17:34:43 |
| 8 | 15 May 2021 19:09:14 | 15 May 2021 19:20:34 |
| 9 | 15 May 2021 20:49:22 | 15 May 2021 21:02:17 |
| 10 | 15 May 2021 22:29:37 | 15 May 2021 22:41:42 |

**USN Alaska possible passes for Metop-C 15 May 2021 UTC**

| | | |
|---|---|---|
| 1 | 15 May 2021 01:23:20 | 15 May 2021 01:32:29 |
| 2 | 15 May 2021 03:01:26 | 15 May 2021 03:11:10 |
| 3 | 15 May 2021 04:39:17 | 15 May 2021 04:50:55 |
| 4 | 15 May 2021 06:18:16 | 15 May 2021 06:31:09 |
| 5 | 15 May 2021 07:59:20 | 15 May 2021 08:11:22 |
| 6 | 15 May 2021 09:43:39 | 15 May 2021 09:50:46 |
| 7 | 15 May 2021 18:23:08 | 15 May 2021 18:32:20 |
| 8 | 15 May 2021 20:02:57 | 15 May 2021 20:15:30 |
| 9 | 15 May 2021 21:43:13 | 15 May 2021 21:55:54 |
| 10 | 15 May 2021 23:23:21 | 15 May 2021 23:34:27 |

**Flux Density impinging on the ground in Alaska from Metop-ABC**

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 Metop-ABC is -1.40 dBW. The altitude (and thus the closest distance to earth during an overhead pass) is = 590 Km.

Converting -1.40 dBW to scalar watts = 0.724 watts transmitted at 2253.500 MHz

Therefor:

$$\boldsymbol{Flux\ density = 0.724 \div (4\,\pi * 590{,}000\ meters^2)}$$

**Flux density = 1.655 x $10^{-13}$ Watts/meter$^2$**
Or
**Flux density = 1.655 x $10^{-14}$ 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 Metop-A, B, and C Satellites.[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 test compatibility with USN's Alaska earth station for TT&C only of Metop-A, B, and C, 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 orbital checkout 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 to conduct testing support for Metop-A, B, and C. Thus, any information sought by Section 25.114 that is not relevant to the spacecraft testing – 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 Metop-A, B, and C satellites, nor is USN in contractual privity with that operator. Rather, USN has contracted with Swedish Space Corporation, Solona Sweden (SSC) to support the checkout portion in S-Band of the Metop-A, B, and C satellites.

As evidenced by the Comsearch report attached to this request, USN has coordinated the checkout of the Metop-A, B, and C satellites 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 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 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 compatibility testing. 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 60 days of testing support of the Metop-A, B, and C satellites.

It is USN's understanding that Metop-A, B, and C is licensed by European Space Agency. Metop-A, B, and C are also supported in the US by NOAA by collaborative agreement. 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 Metop-A, B, and C satellites using its U.S. earth station for a period of 60 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 checkout support of the Metop-A, B, and C satellites. 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