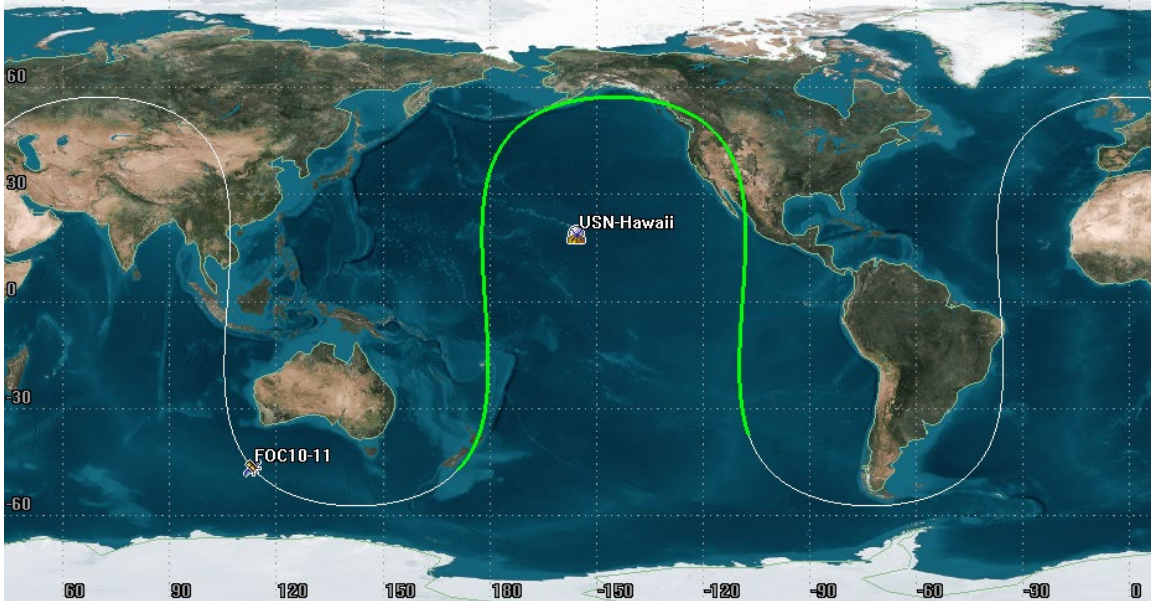


# Pre-LEOP test campaign for the LEOP support of Galileo Constellation Launch Flight #12 from USN’s Hawaii ground station

Galileo Flight #12 will launch on or about March 30<sup>th</sup>, 2022. The launch will continue to build the “Full Operational Capability” in their operation of the Galileo navigation constellation for the EU. USN has been requested to assist with a test campaign to calibrate the Hawaiian earth station ranging capability in preparation for the F12 launch. Testing will use on orbit Galileo spacecraft GSAT103 and GSAT104 for a requested period of 30 days beginning on or about February 1, 2022.

The spacecraft(s) are a Medium Earth Orbiting (MEO) spacecraft in a high mid-latitude orbit (56 degrees) with a near circular orbit of altitude of 23400 Km. This orbit allows a nominal 1 visibility over the USN Hawaii station every day. Each spacecraft contact is on the order of 1 to 16 hours.



GSAT103 and GSAT104 nominal orbit and Hawaii coverage

The below analysis covers all possible visibilities from USN Hawaii, it is expected that a total of 10 pass from the below visibilities will be supported over 30 days.

	Downlink	Uplink
GSAT103	2215.811 MHz	2040.399 MHz
GSAT104	2221.956 MHz	2046.051 MHz

GSAT0103

1 38857U 12055A 21325.05392370 .00000076 00000+0 00000+0 0 9997  
2 38857 55.0810 147.4302 0001483 226.7082 133.3134 1.70473828 56555

### GSAT103 possible passes

Access	Start Time (UTCG)	Stop Time (UTCG)
1	1 Feb 2022 22:12:17	2 Feb 2022 04:40:00
2	2 Feb 2022 06:02:47	2 Feb 2022 13:08:52
3	3 Feb 2022 10:55:48	3 Feb 2022 22:08:27
4	4 Feb 2022 19:44:12	5 Feb 2022 03:27:10
5	5 Feb 2022 05:40:33	5 Feb 2022 10:48:34
6	6 Feb 2022 08:53:19	6 Feb 2022 19:24:36
7	7 Feb 2022 15:58:32	8 Feb 2022 01:37:07
8	8 Feb 2022 06:18:16	8 Feb 2022 08:08:53
9	8 Feb 2022 23:53:24	9 Feb 2022 03:54:41
10	9 Feb 2022 06:59:12	9 Feb 2022 15:12:47
11	10 Feb 2022 12:34:20	10 Feb 2022 23:38:18
12	11 Feb 2022 21:31:56	12 Feb 2022 03:59:43
13	12 Feb 2022 05:22:23	12 Feb 2022 12:28:29
14	13 Feb 2022 10:15:25	13 Feb 2022 21:28:03
15	14 Feb 2022 19:03:48	15 Feb 2022 02:46:44
16	15 Feb 2022 05:00:10	15 Feb 2022 10:08:10
17	16 Feb 2022 08:12:57	16 Feb 2022 18:44:08
18	17 Feb 2022 15:18:10	18 Feb 2022 00:56:42
19	18 Feb 2022 05:37:50	18 Feb 2022 07:28:36
20	18 Feb 2022 23:13:01	19 Feb 2022 03:14:15
21	19 Feb 2022 06:18:55	19 Feb 2022 14:32:27
22	20 Feb 2022 11:54:02	20 Feb 2022 22:57:58
23	21 Feb 2022 20:51:38	22 Feb 2022 03:19:17
24	22 Feb 2022 04:42:06	22 Feb 2022 11:48:11
25	23 Feb 2022 09:35:06	23 Feb 2022 20:47:44
26	24 Feb 2022 18:23:28	25 Feb 2022 02:06:23
27	25 Feb 2022 04:19:44	25 Feb 2022 09:27:48
28	26 Feb 2022 07:32:33	26 Feb 2022 18:03:45
29	27 Feb 2022 14:37:44	28 Feb 2022 00:16:17
30	28 Feb 2022 04:57:27	28 Feb 2022 06:48:09
31	28 Feb 2022 22:32:35	1 Mar 2022 02:33:56
32	1 Mar 2022 05:38:29	1 Mar 2022 13:51:55

GSAT0104

1 38858U 12055B 21325.02437613 .00000076 00000+0 00000+0 0 9995  
2 38858 55.0812 147.4325 0001591 122.7342 237.3153 1.70474131 56551

### GSAT104 possible passes

Access	Start Time (UTCG)	Stop Time (UTCG)
1	1 Feb 2022 21:06:20	2 Feb 2022 04:19:15
2	2 Feb 2022 05:47:11	2 Feb 2022 12:03:26
3	3 Feb 2022 09:58:39	3 Feb 2022 20:59:05
4	4 Feb 2022 18:15:47	5 Feb 2022 02:38:57
5	5 Feb 2022 05:57:11	5 Feb 2022 09:40:56
6	6 Feb 2022 01:20:20	6 Feb 2022 03:39:08
7	6 Feb 2022 08:00:39	6 Feb 2022 17:21:54
8	7 Feb 2022 14:05:01	8 Feb 2022 00:44:02
9	8 Feb 2022 22:46:47	9 Feb 2022 04:09:25
10	9 Feb 2022 06:11:49	9 Feb 2022 13:48:56
11	10 Feb 2022 11:26:56	10 Feb 2022 22:40:25
12	11 Feb 2022 20:25:56	12 Feb 2022 03:38:51
13	12 Feb 2022 05:06:46	12 Feb 2022 11:23:01
14	13 Feb 2022 09:18:13	13 Feb 2022 20:18:39
15	14 Feb 2022 17:35:19	15 Feb 2022 01:58:29
16	15 Feb 2022 05:16:48	15 Feb 2022 09:00:30
17	16 Feb 2022 00:39:50	16 Feb 2022 02:58:46
18	16 Feb 2022 07:20:15	16 Feb 2022 16:41:24
19	17 Feb 2022 13:24:34	18 Feb 2022 00:03:36
20	18 Feb 2022 22:06:23	19 Feb 2022 03:28:56
21	19 Feb 2022 05:31:33	19 Feb 2022 13:08:33
22	20 Feb 2022 10:46:34	20 Feb 2022 22:00:04
23	21 Feb 2022 19:45:37	22 Feb 2022 02:58:25
24	22 Feb 2022 04:26:26	22 Feb 2022 10:42:41
25	23 Feb 2022 08:37:52	23 Feb 2022 19:38:14
26	24 Feb 2022 16:54:57	25 Feb 2022 01:18:06
27	25 Feb 2022 04:36:23	25 Feb 2022 08:20:06
28	25 Feb 2022 23:59:26	26 Feb 2022 02:18:22
29	26 Feb 2022 06:39:49	26 Feb 2022 16:00:56
30	27 Feb 2022 12:44:06	27 Feb 2022 23:23:09
31	28 Feb 2022 21:25:54	1 Mar 2022 02:48:32
32	1 Mar 2022 04:51:06	1 Mar 2022 12:28:03

## Flux Density impinging on the ground in Hawaii from Galileo GSAT103 and GSAT104

The Flux density is calculated as:

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

Where **Rse** is the distance from spacecraft to the ground

Where **EIRP** is the Effective Isotropic Radiated Power of the spacecraft

Data from the spacecraft vendor indicates that the nominal EIRP of each GSAT spacecraft is -1.10 dBW. Being a near circular orbit, the altitude (and thus the closest distance to earth during an overhead pass) is = 23,400 Km.

Converting -1.10 dBW to scalar watts = 0.776 watts transmitted at 2221.9 MHz

Therefor:

$$\text{Flux density} = 0.776 \div (4 \pi * 23,400,000 \text{ meters}^2)$$

$$\text{Flux density} = 1.127 \times 10^{-16} \text{ Watts/meter}^2$$

Or

$$\text{Flux density} = 1.127 \times 10^{-17} \text{ mW/cm}^2$$

**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 GALILEO (GSAT103 and GSAT104), the first and second spacecraft of the “Full Operational Capability” series Satellites.<sup>1</sup> 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...”<sup>2</sup> USN seeks authority to support the needed tracking campaign pre-LEOP testing for the future launch of the Galileo F12 spacecrafts, 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 pre-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.<sup>3</sup> The Commission may grant a waiver for good cause shown.<sup>4</sup> 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 pre-LEOP testing support using GALILEO (GSAT103 and GSAT104). 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 GALILEO (GSAT103 and GSAT104) satellites, nor is USN in contractual privity with that operator. Rather, USN has contracted with Swedish Space Corporation, Solna Sweden (SSC) to support pre-LEOP testing in S-Band of the satellite prior to the F12 launch.

As evidenced by the Comsearch report attached to this request, USN has coordinated the pre-LEOP using GALILEO (GSAT103 and GSAT104) satellites with potentially affected terrestrial operators. Moreover, as with any STA, USN will conduct the pre-LEOP on an unprotected, non-interference basis to government operations.

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<sup>1</sup> FCC Form 312 Section B

<sup>2</sup> 47 C.F.R. § 25.137(a)

<sup>3</sup> 47 C.F.R. §§25.137 and 25.114

<sup>4</sup> 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 pre-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 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.<sup>5</sup> 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 30 days of pre-LEOP testing using GALILEO (GSAT103 and GSAT104) satellites.

It is USN’s understanding that GALILEO (GSAT103 and GSAT104) is licensed by ESA (European Space Agency). GALILEO (GSAT103 and GSAT104) are the third and fourth spacecraft of the European navigation constellation. The spacecraft family is primarily meant to serve the EU. 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 GALILEO (GSAT103 and GSAT104) 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 the operation will cease within 30 days would pose undue hardship without serving underlying policy objectives. Given these particular facts, the waiver sought herein is appropriate.

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<sup>5</sup> 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).<sup>6</sup> 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 pre-LEOP testing using GALILEO (GSAT103 and GSAT104) satellites. 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."<sup>7</sup> 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.

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<sup>6</sup> 47 C.F.R. §2.106

<sup>7</sup> Previously approved STA's for Universal Space Network SES-STA-20020725-01174; SES-STA-20021112-02008; SES-STA-20040315-00475