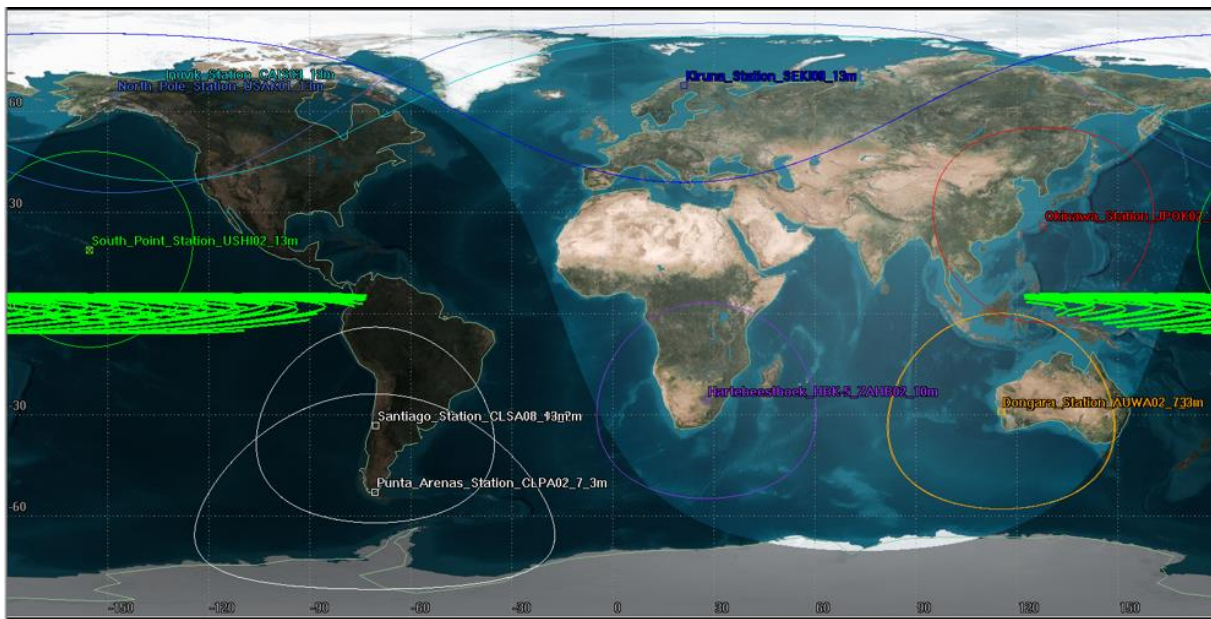


USN LEOP Support for H2SAT from Hawaii

H2SAT is a LEOP mission of OHB Germany. This spacecraft will explore and verify technical and scientific information of payload and platform technologies including high-performance multi-stage plasma thrusters for station keeping, multi-beam antenna, broadband telecommunications to provide high data rates for mobile users, and sensor acquisition.

Planned support from SSC is for a period of 30 days as it moves towards the GEO belt.



H2SAT typical coverage from Hawaii

The below analysis covers all possible visibilities from USN Hawaii. It is expected that a total of 45 passes from the below visibilities will be supported over 30 days.

	Downlink	Uplink
H2SAT	2285.973 MHz	2105 MHz

H2SAT

```
1 0U 2022000A 22347.87500000 0.00001625 00000+0 40347-3 0 12
2 0 6.0249 219.1059 7285108 177.9089 6.1302 2.27920488 17
```

H2SAT Possible Passes

Access	Start Time (UTCG)	Stop Time (UTCG)	Duration (sec)
1	1 Feb 2023 10:28:31.508	1 Feb 2023 20:27:10.527	35919.019
2	2 Feb 2023 07:26:19.413	2 Feb 2023 07:41:29.150	909.737
3	2 Feb 2023 11:12:51.382	2 Feb 2023 17:04:02.770	21071.388
4	2 Feb 2023 19:09:43.759	2 Feb 2023 22:28:51.429	11947.670
5	3 Feb 2023 04:14:47.238	3 Feb 2023 04:18:31.959	224.720
6	3 Feb 2023 15:23:42.599	4 Feb 2023 01:18:10.414	35667.816
7	4 Feb 2023 12:12:40.007	4 Feb 2023 22:13:28.289	36048.283
8	5 Feb 2023 09:08:05.310	5 Feb 2023 19:02:17.758	35652.447
9	6 Feb 2023 12:15:43.645	6 Feb 2023 15:14:18.096	10714.451

10	6 Feb 2023 17:21:31.200	6 Feb 2023 23:41:00.582	22769.381
11	7 Feb 2023 02:30:22.368	7 Feb 2023 03:00:15.480	1793.112
12	7 Feb 2023 13:58:43.151	7 Feb 2023 23:57:24.347	35921.196
13	8 Feb 2023 10:51:05.262	8 Feb 2023 20:50:56.650	35991.389
14	9 Feb 2023 07:47:54.558	9 Feb 2023 08:28:38.702	2444.144
15	9 Feb 2023 10:06:19.111	9 Feb 2023 17:33:29.384	26830.273
16	10 Feb 2023 15:49:14.725	11 Feb 2023 01:39:58.656	35443.931
17	11 Feb 2023 12:35:23.370	11 Feb 2023 22:35:56.217	36032.847
18	12 Feb 2023 09:29:55.255	12 Feb 2023 19:26:46.212	35810.957
19	13 Feb 2023 11:17:26.595	13 Feb 2023 15:55:35.468	16688.873
20	13 Feb 2023 17:53:43.928	13 Feb 2023 22:43:01.025	17357.097
21	14 Feb 2023 03:07:59.572	14 Feb 2023 03:20:58.565	778.993
22	14 Feb 2023 14:22:13.039	15 Feb 2023 00:19:00.701	35807.662
23	15 Feb 2023 11:12:56.237	15 Feb 2023 21:13:26.170	36029.933
24	16 Feb 2023 08:08:56.228	16 Feb 2023 17:59:35.023	35438.796
25	17 Feb 2023 16:15:07.822	18 Feb 2023 02:00:41.333	35133.511
26	18 Feb 2023 12:57:23.186	18 Feb 2023 22:57:07.915	35984.729
27	19 Feb 2023 09:50:45.656	19 Feb 2023 19:49:19.031	35913.375
28	20 Feb 2023 06:48:19.389	20 Feb 2023 07:05:35.889	1036.500
29	20 Feb 2023 10:23:32.080	20 Feb 2023 16:26:27.138	21775.057
30	20 Feb 2023 18:32:24.282	20 Feb 2023 21:45:51.284	11607.003
31	21 Feb 2023 14:45:04.089	22 Feb 2023 00:39:13.338	35649.249
32	22 Feb 2023 11:33:40.947	22 Feb 2023 21:34:20.978	36040.032
33	23 Feb 2023 08:28:52.740	23 Feb 2023 18:23:02.700	35649.960
34	24 Feb 2023 11:28:43.534	24 Feb 2023 14:36:11.352	11247.818
35	24 Feb 2023 16:41:37.931	24 Feb 2023 22:58:41.939	22624.008
36	25 Feb 2023 01:52:58.782	25 Feb 2023 02:20:01.504	1622.722
37	25 Feb 2023 13:18:35.878	25 Feb 2023 23:17:09.212	35913.334
38	26 Feb 2023 10:10:44.884	26 Feb 2023 20:10:28.263	35983.379
39	27 Feb 2023 07:07:24.042	27 Feb 2023 07:52:43.015	2718.973
40	27 Feb 2023 09:16:45.042	27 Feb 2023 16:52:45.960	27360.919
41	28 Feb 2023 15:07:50.550	1 Mar 2023 00:58:30.326	35439.776
42	1 Mar 2023 11:53:48.749	1 Mar 2023 21:54:12.621	36023.871
43	2 Mar 2023 08:48:05.511	2 Mar 2023 18:44:40.005	35794.494
44	3 Mar 2023 10:33:58.685	3 Mar 2023 15:12:46.933	16728.249
45	3 Mar 2023 17:10:19.892	3 Mar 2023 22:04:13.892	17634.000

Flux Density impinging on the ground in Hawaii from H2SAT

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 nominal EIRP of the H2SAT spacecraft is -2.5 dBW. The closest distance to earth during an overhead pass is = 35,786 km.

Converting -2.5 dBW to scalar watts = 0.562 watts transmitted at 2285.973 MHz.

Therefore:

$$flux\ density = 0.562 / (4\pi 35786000^2)$$

$$Flux\ density = 3.492 \times 10^{-17} \text{ Watts/meter}^2$$

Or

Flux density = 3.492×10^{-18} mW/cm²

Inclination: 0 degrees

Apogee: 35786 km

Perigee: 35786 km

Number of Orbital Planes: 1

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 H2SAT 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 provide LEOP support TT&C for the H2SAT 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 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. The US public interest is supported by the sharing of collected data with the OHB Germany program.

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 H2SAT. 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 H2SAT satellite, nor is USN in contractual privity with that operator. Rather, USN has contracted with Swedish Space Corporation, Solna Sweden (SSC) to LEOP support in S-Band of the H2SAT 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 satellite systems have effective competitive opportunities to provide analogous services” in other countries. Here, there is no commercial service being provided by the satellite; USN is providing LEOP support. 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 critical support of the H2SAT satellite.

It is USN’s understanding that H2SAT is licensed under the published name “H2M-TNG-0.5E” by the country of Germany. H2SAT is spacecraft meant to serve Germany, with data shared in preparation for telecommunication efficiency by the US. 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 H2SAT 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. 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 H2SAT 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

⁷ Previously approved STA's for Universal Space Network SES-STA-20020725-01174; SES-STA-20021112-02008; SES-STA-20040315-00475; SES-STA-20220512-00477

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: LEOP support for H2SAT.

Start Date: 1 February 2023

End Date: 3 March 2023

Site Location: Naalehu, HI

Latitude: 19 deg 00' 50.3" N (NAD-83)
Longitude: 155 deg 39' 46.6" W (NAD-83)

Transmit frequency: 2105 MHz
Polarization: R, L
Antenna manufacturer: Datron
Antenna Size in meter: 13m
Antenna model: 1453
Antenna Gain Transmit: 46.3 dBi @ 2105 MHz

<u>Frequency Band</u> (MHz)	<u>Emissions</u>	<u>Max.EIRP</u> (dBW)	<u>Max.EIRP Density</u> (dBW/4KHz)
2104.5-2105.5	1M20G9D	68	43.228
2285.473-2286.473	1M20G9D	68	43.228

Satellite: H2SAT