

## USN TT&C support for Deimos-2 from Alaska

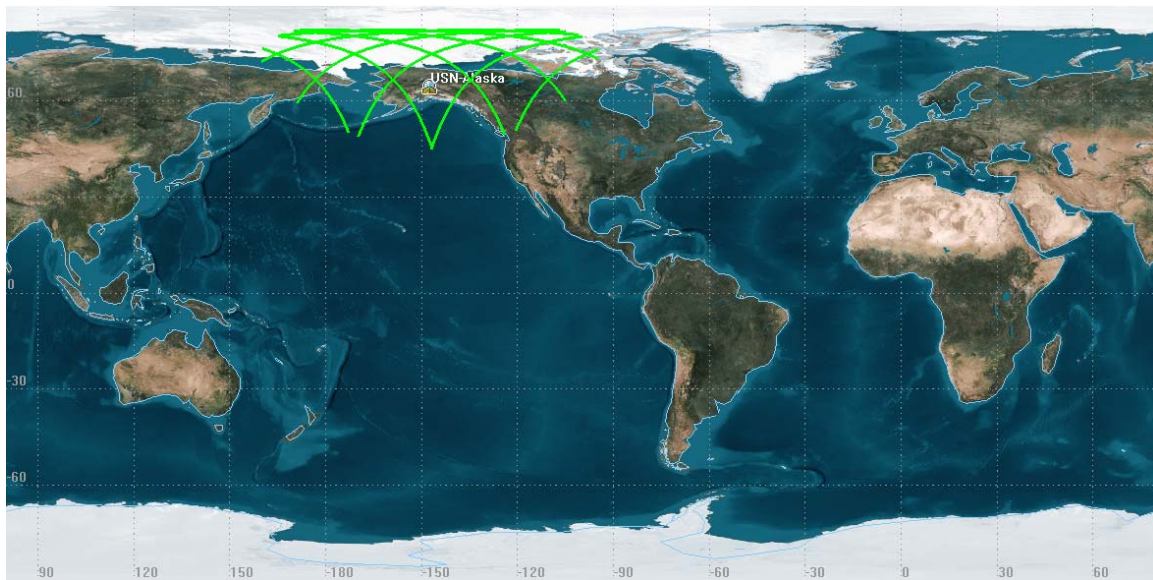
Deimos-2 is the second in a series of earth observation satellites owned by Elecnor of Spain. Deimos-2 was launched from the Yasnny Cosmodrome on June 19<sup>th</sup>, 2014. The Deimos-2 while still owned by Elecnor has been purchased by Urthecast of Canada. Urthecast is pursuing ground station support licenses in Canada for Deimos-2 and is requesting support from USN's Alaska ground station until Canada grants such licenses. The uplink = 2032.600 MHz, and has been fully coordinated by Comsearch. The Spacecraft has four downlinks using selectable frequencies shown in the table below.

Telemetry Downlink Frequencies:
2224.000 MHz
2228.000 MHz
2234.000 MHz
8090.000 MHz

The Alaska support is expected to be one pass per day as backup, but could consist of several if needed starting on or about May 22<sup>nd</sup>, 2017. The duration of this support is currently unknown and thus additional licensing request may be considered. All visible passes will not be supported, but for planning purposes a typical day of passes are shown below.

### DEIMOS-2

1 40013U 14033D 17112.85168849 .00000058 00000-0 13097-4 0 9997  
2 40013 97.8878 17.4711 0002235 108.8889 251.2586 14.84848856153994



USN Alaska coverage of Deimos-2 on 22-23 May 2017

## USN Alaska possible passes for Deimos-2 on 22 May 2017 UTC

Pass	Start Time (UTCG)	Stop Time (UTCG)
1	22 May 2017 07:39:42	22 May 2017 07:47:00
2	22 May 2017 09:15:13	22 May 2017 09:25:37
3	22 May 2017 10:51:20	22 May 2017 11:01:34
4	22 May 2017 12:27:32	22 May 2017 12:35:43
5	22 May 2017 14:03:19	22 May 2017 14:09:00
6	22 May 2017 15:37:39	22 May 2017 15:43:14
7	22 May 2017 17:10:56	22 May 2017 17:18:58
8	22 May 2017 18:45:01	22 May 2017 18:55:10
9	22 May 2017 20:20:52	22 May 2017 20:31:18
10	22 May 2017 21:59:18	22 May 2017 22:06:53

## Flux Density impinging on the ground in Alaska from Deimos-2 (2224, 2228, and 2234 MHz)

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 maximum EIRP of Deimos-2 is -8.00 dBW. The altitude (and thus the closest distance to earth during an overhead pass) is = 600 Km.

Converting -8.00 dBW to scalar watts = 0.158 watts transmitted at 2228.0 MHz

Therefore:

$$\text{Flux density} = 0.158 \div (4 \pi * 600,000 \text{ meters}^2)$$

$$\text{Flux density} = 3.492 \times 10^{-14} \text{ Watts/meter}^2$$

Or

$$\text{Flux density} = 3.492 \times 10^{-15} \text{ mW/cm}^2$$

## Flux Density impinging on the ground in Alaska from Deimos-2 (8090 MHz)

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 maximum EIRP of Deimos-2 is 13.49 dBW. The altitude (and thus the closest distance to earth during an overhead pass) is = 600 Km.

Converting 13.49 dBW to scalar watts = 22.33 watts transmitted at 8090.0 MHz

Therefore:

$$\text{Flux density} = 22.33 \div (4 \pi * 600,000 \text{ meters}^2)$$

$$\text{Flux density} = 4.937 \times 10^{-12} \text{ Watts/meter}^2$$

Or

$$\text{Flux density} = 4.937 \times 10^{-13} \text{ mW/cm}^2$$

**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 Deimos-2, second in a series of earth observation satellites owned by Elecnor of Spain.<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 Telemetry, Tracking, and Control ("TT&C") during the transition of the ground support from Spain to Canada. Deimos-2 was purchased from Elecnor by Urthecast of Canada and is in the process of application for ground support licensing to operate in Canada. USN will support as backup and contingency until such Canadian licensing has been granted 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 backup 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 backup support for Deimos-2. Thus, any information sought by Section 25.114 that is not relevant to the backup – 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 Deimos-2 satellites, nor is USN in contractual privity with that operator. Rather, USN has contracted with Swedish Space Corporation, Solona Sweden (SSC) to support the mission during its transition.

As evidenced by the Comsearch report attached to this request, USN has coordinated the backup of the Deimos-2 satellites with potentially affected terrestrial operators. Moreover, as with any STA, USN will conduct the backup 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 backup 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 being transitioned from Spain to Canada. 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 the backup support of the Deimos-2 satellite.

It is USN’s understanding that Deimos-2 is licensed by Spain (Elecnor). Deimos-2 is the second in the series of earth observation satellites. The spacecraft family is primarily meant to serve the EU and Canada. 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 Deimos-2 satellite using its U.S. earth station for backup and contingency for a temporary amount of time while appropriate ground support licensing can be granted in Canada. Requiring USN to obtain technical and legal information from an unrelated party, where there is no risk of interference 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 backup of the Deimos-2 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."<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