

**Before the  
Federal Communications Commission  
Washington, DC 20554**

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|-------------------------------------------------|---|--------------------------|
| In the Matter of                                | ) |                          |
|                                                 | ) | Call Sign(s):            |
| Varda Space Industries, Inc.                    | ) |                          |
|                                                 | ) |                          |
| Application for Authority to Launch and Operate | ) | File No. 1426-EX-ST-2026 |
| the WSERIES10 Non-Geostationary Orbit Satellite | ) |                          |
|                                                 | ) |                          |

**APPLICATION FOR LICENSE OF VARDA SPACE INDUSTRIES, INC.  
AND WSERIES10 SPACECRAFT**

Varda Space Industries, Inc. (“**Varda**”), in accordance with Part 5 of the Federal Communications Commission’s (“**Commission**”) rules, hereby files this application requesting Special Temporary Authority for Varda’s WSERIES10 Non-Geostationary Orbit (“**NGSO**”) satellite for its mission to perform a technology demo of expanded WSERIES spacecraft capacity in low Earth orbit, scheduled to launch no earlier than February 2027.

Consistent with the information required by the Commission’s Rules, Varda has also provided a completed Technical Narrative, Orbital Debris Assessment Report (“**ODAR**”) and International Telecommunication Union (“**ITU**”) supporting documents. Varda specifically seeks authorization for use of the Space Operations Service’s 2025 MHz to 2110 MHz and 2200 MHz to 2290 MHz Band, as well as the Earth Exploration Satellite Service’s 8025-8400 MHz Band and the Mobile-Satellite Service’s 1610 to 1626.5 MHz Band on an experimental basis.

## **1 INTRODUCTION**

### **1.1 Varda Background**

Varda is a California based corporation creating the first free-flying orbital manufacturing facilities with reentry capabilities. Microgravity found in low Earth Orbit (“**LEO**”) has many advantages for manufacturing. For instance, it makes it possible to precisely control the crystallization process of pharmaceutical compounds during manufacturing, thereby creating valuable products that cannot be created on Earth’s surface. To complete the logistics chain needed for orbital manufacturing, Varda builds economical spacecraft, each of which is comprised of a satellite bus (the “**Varda Bus**”) and its associated reentry capsule (the “**W-Series Capsule**”) (the Varda Bus and the W-Series Capsule for this mission are collectively referred to as the “**W-Series Spacecraft**” or “**Spacecraft**”) to enable consistent access to microgravity for manufacturing purposes. Built entirely by Varda, the W-Series Spacecraft is specifically designed for manufacturing and return of materials in microgravity. The WSERIES10 Spacecraft mission

(referred to herein as the “mission”) is the seventh flight of the W-Series spacecraft. Varda’s W-Series Capsules are designed for a variety of uses, including both commercial and government missions, and serve as an ideal platform for manufacturing products in the microgravity environment of LEO. The capsules also allow for study of hypersonic flows and subjecting test components to hypersonic environments during reentry, as well as other experiments or processes a customer would like to undertake or test in microgravity and then return to Earth.

Varda’s primary commercial business is manufacturing products that require sustained microgravity. The success of this business hinges on Varda’s ability to bring raw resources to orbital manufacturing facilities and then deliver manufactured materials to markets on Earth at low cost and high cadence. To that end, Varda utilizes Space Exploration Technologies Corp. (“**SpaceX**”) “rideshare” launches to Low Earth Orbits. To support these manufacturing capabilities, Varda has developed its new W-Series spacecraft that provides power, handles communication, and station keeping for the WSERIES10 Spacecraft. At the end of that manufacturing process, the WSERIES10 Spacecraft deorbits, the W-Series Capsule separates from the W-Series spacecraft for a controlled terrestrial landing under parachute at one of Varda’s contracted landing sites, and the W-Series spacecraft demises in the atmosphere upon reentry.

As a secondary line of business, Varda provides access to low-cost, frequent, flight testing to various U.S. Government partners to accelerate the advancement of hypersonic technologies and capabilities.

## **1.2 Frequency Plan**

### **1.2.1 S Band Uplink**

Varda requests use of the Space Operations Service’s 2025 MHz to 2110 MHz Band (“**Uplink**”). The 2025-2110 MHz frequency band is currently allocated to Space Operations and Earth-Exploration Satellites Services, Fixed, Mobile and Space Research in all ITU regions on a primary basis. For United States applicants however, Space Operations and EESS services are limited to federal operators and use by commercial operators is subject to conditions as may be applied on a case-by-case basis (only Fixed and Mobile are allocated to non-Federal users).<sup>1</sup> Further conditions state that any use may not cause harmful interference to authorized operations. To the extent necessary, Varda requests access to the 2025-2110 MHz band for Earth-to-Space operations, as such use is consistent with previous use of the Band by other services, and will be subject to 47 CFR § 2.106, Footnote US347, specifically complying with the requirement that “[s]uch transmissions shall not cause harmful interference to Federal and non-Federal stations operating in accordance with the Table of Frequency Allocations.”

### **1.2.2 S Band Downlink**

Varda also requests use of the Space Operations Service’s 2200 MHz to 2290 MHz Band (“**Downlink**”). The 2200-2290 MHz frequency band is allocated to Space Operations and Earth-Exploration Satellites Services, Fixed, Mobile and Space Research in all ITU regions on a primary basis. For United States applicants however, operations are limited to federal operators and use by commercial operators is not allocated. As Varda is a non-Federal user intending to operate its downlink in a manner similar to other Space Operations users, use of this band is compatible with current and future users. Further, as discussed in the Technical Narrative, Varda’s proposed

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<sup>1</sup> See 47 CFR 2.106, Footnote US347

operations in this application will not preclude any other users in any way, making clear its ability to share spectrum with all other users of the band without causing harmful interference, and conforms to all applicable regulations set forth by all stakeholder agencies.

### **1.2.3 X Band Downlink**

Varda also requests use of the Earth Explorations Satellite Service's 8025 MHz to 8400 MHz Band ("X Band"). The 8025-8400 MHz frequency band is allocated to Earth-Exploration Satellites Services ("EESS"), Fixed, Fixed-Satellite and Mobile in all ITU regions on a primary basis. For United States applicants however, operations are limited to federal operators and use by commercial operators is subject to 47 CFR § 2.106, Footnote US258 which states "[i]n the bands 8025-8400 MHz and 25.5-27 GHz, the Earth exploration-satellite service (space-to-Earth) is allocated on a primary basis for non-Federal use. Authorizations are subject to a case-by-case electromagnetic compatibility analysis". As Varda is a non-Federal user intending to operate its downlink in a manner similar to EESS operations, use of this band is compatible with current and future users. Further, as discussed in previous sections and in the Technical Narrative, Varda's proposed operations in this Application will not preclude any other users in any way, makes clear its ability to share spectrum with all other users of the band without causing harmful interference, and conforms to all applicable regulations set forth by all stakeholder agencies. Use of this band will be in accordance with ITU Section 4.4 operations.

### **1.2.4 L Band Inter-Satellite Link**

Varda requests use of the Mobile-Satellite Service's 1610 to 1626.5 MHz Band, via use of the Iridium network of spacecraft.<sup>2</sup> This link is currently allocated for Space to Earth communications on a secondary basis. Varda requests access to this band, in coordination with Iridium Satellite LLC, to support reentry operations of the Spacecraft's W-Series Capsule.

## **1.3 Launch Schedule**

The WSERIES10 mission is scheduled to launch on SpaceX's Transporter 19 rideshare mission, launching no earlier than February 1<sup>st</sup>, 2027.

## **2 GRANT OF THIS APPLICATION WILL SERVE THE PUBLIC INTEREST**

It is in the public interest for the Commission to approve this application for the WSERIES10 Spacecraft. Expansion of Varda's microgravity platform offers direct access to pharmaceutical processing in the microgravity of low Earth orbit, which will lead to expanding breakthroughs in technology and patient experience that are currently unavailable through terrestrial manufacturing. For example, microgravity offers the ability to crystallize pharmaceutical compounds in an environment free of natural convection and sedimentation, providing a path to formulating small molecules and biologics that traditional terrestrial manufacturing processes simply cannot address. The resulting tunable particle size distributions, more ordered crystals and novel forms can lead to improved bioavailability, extended shelf-life and innovative routes of administration for a variety of pharmaceuticals. These new pharmaceuticals will greatly transform the way that health care providers treat a wide variety of ailments, solely based on the ability to manufacture these forms

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<sup>2</sup> Specifically, the HIBLEO-2 system (FCC Callsign S2110)

in microgravity. By granting this application, Varda is able to expand upon its current capacity of the WSERIES spacecraft, enabling further advancements in the in-space manufacturing sector.

### **3 ADDITIONAL MATTERS**

#### **3.1 Eligibility and Operational Requirements**

##### **3.1.1 System Eligibility**

The WSERIES10 Spacecraft is eligible for Special Temporary Authority under Part 5 of Title 47 of the Code of Federal Regulations. As this spacecraft is the first flight of Varda's updated spacecraft and capsule design with the aim of providing a platform with enhanced capabilities to manufacture pharmaceuticals in space, Special Temporary Authority is the correct license for testing and demonstrating the spacecraft on-orbit by Varda, with the goal of successful demonstrations leading to follow-on missions that will eventually be licensed under Part 25 once proven.

##### **3.1.2 Special provisions for satellite systems (47 CFR § 5.64)**

Pursuant to 47 CFR §5.64, the Spacecraft conforms to all provisions set forth for satellite systems certification:

(a) Varda certifies that construction is entirely at the applicant's risk and does not entitle the applicant to any assurances that its proposed experiment will be subsequently approved or regular services subsequently authorized. Varda requests to use this notice, along with all further documentation submitted with this application as formal notice to the Commission of Varda's plans to construct at its own risk.

(b) Varda submits the following information as requested by Section 5.64 (and found in other documents or attachments as referenced):

(1) Varda has assessed and eliminated any amount of debris released in a planned manner during normal operations. By design, the spacecraft will release no operational debris. More detail can be found in Section 3 of the attached Orbital Debris Assessment Report.

(2) Varda has assessed and limited the probability that the spacecraft will become a source of debris by collision with small debris or meteoroids that would cause loss of control and prevent disposal. More detail can be found in Section 5 of the attached Orbital Debris Assessment Report.

(3) Varda has assessed and limited the probability during and after completion of mission operations, of accidental explosions or of release of liquids that will persist in droplet form. No debris will be generated in an accidental explosion resulting from the conversion of energy sources on board the spacecraft into energy that fragments the spacecraft. More detail can be found in Section 4 of the attached Orbital Debris Assessment Report.

(4A) Varda has assessed and limited the probability of the Spacecraft becoming a source of debris by collisions with large debris or other operational space stations. The probability of a collision between the Spacecraft and any other large object (10 centimeters or larger) during the lifetime of the Spacecraft is less than the required 0.001 as calculated using

current NASA Debris Assessment Software (“DAS”) version 3.2.6. More detail can be found in Section 5 of the attached Orbital Debris Assessment Report.

(4B) Varda has assessed and limited the probability of the spacecraft becoming a collision risk by coordinating with the 18th Space Defense Squadron, the federal organization responsible for space situational awareness. Regular collision avoidance (“COLA”) screening is done in conjunction with the spacecraft to ensure it will not collide with other stations on orbit, and all necessary actions to avoid collisions will be taken by Varda upon notice from the 18th Space Defense Squadron.

(4C) The spacecraft is designed to operate at 500 km and above (consistent with SpaceX Transporter mission launch profiles) and will stay above all inhabitable spacecraft during all on-orbit operations. At the end of the mission, a post mission disposal maneuver is done to deorbit the spacecraft, which will then transit through the orbits that are used by inhabitable spacecraft, including the International Space Station. Varda follows the process outlined in the 18th Space Defense Squadrons “Handbook for Operators v1.7”, in the section titled “How to Submit Maneuver Notifications”, to alert 18th SDS and other operators of any planned maneuvers, especially deorbit maneuvers, in order to provide up to date information in order to accurately calculate collision risks. Varda also coordinates with NASA Trajectory Operations and Planning Officer (TOPO) to inform NASA about any maneuvers that will cross inhabitable space station orbits. Any maneuvers that pose a risk to inhabitable spacecraft are reevaluated and replanned to avoid any potential conjunctions.

(4D) The spacecraft will keep to within 100 meters of the intended orbit altitude.

(4E) Varda certifies that upon receipt of a space situational awareness conjunction warning, Varda, as the operator, will review and take all possible steps (with respect to the spacecraft’s state at the time of the event) to assess the collision risk and will mitigate the collision risk if necessary, following the guidance provided in the 18th Space Defense Squadrons “Handbook for Operators v1.7”, with possible steps including (but not limited to) ephemeris sharing with other operators to determine detailed risk assessments and possible orbit raising maneuvers in event the risk is deemed too high.

(5) The spacecraft meets all trackability requirements due to having a size much greater than 10 cm in its smallest dimension. The WSERIES10 Spacecraft will be registered with the 18th Space Control Squadron (or successor entity) prior to launch. The spacecraft will be actively tracked by the 18th Space Defense Squadron, along with active tracking via GPS telemetry onboard the spacecraft itself being sent to Varda operators to confirm position on orbit. Varda plans to share data with the 18th Space Control Squadron (or successor entity) during the mission, with the procedure used for sharing and updating information as outlined in the 18th Space Defense Squadrons “Handbook for Operators v1.7”.

(6) The spacecraft will not perform any proximity operations, thus no debris generation will result from proximity operations.

(7) The spacecraft is designed to be disposed of by direct, controlled reentry into the atmosphere. Nominally, the spacecraft will proceed along an atmospheric demise trajectory

upon completion of the last burn that is used to release the return capsule along its return trajectory back to Earth. Calculations have been done to ensure that the probability of success of the chosen disposal method will be 0.9 or greater. More detail can be found in Section 6 of the attached Orbital Debris Assessment Report.

In the off nominal worst case where the spacecraft is not responsive upon separation from the launch vehicle and is not able to perform any mission or post mission functions, the risk to human casualty is calculated as better than the requirement of 1:10,000. More detail can be found in Section 7 of the attached Orbital Debris Assessment Report.

### **3.1.3 License Period (47 CFR § 5.61)**

Varda requests a license period of 6 months, starting February 1<sup>st</sup>, 2027, consistent with the maximum allowable time for a Special Temporary Authority. While the nominal mission duration is ninety (90) days from launch, six months is requested to cover unforeseen launch delays, such as common weather delays and the like from Varda's launch provider, in order to not have to burden the Commission every time the launch is delayed. If requested, Varda will gladly inform the Commission of the end of the mission in order to ensure the license period is as short as is necessary.

### **3.1.4 Non-Interference Criterion (47 CFR § 5.84)**

The WSERIES10 Spacecraft can be commanded by command originating from the ground to immediately cease transmissions and Varda will have the capability to eliminate harmful interference when required under the terms of this license or other applicable regulations.

### **3.2 ITU Cost Recovery**

Varda is aware that, per actions taken at the 1998 Plenipotentiary Conference and as modified by the ITU Council in 2005, the ITU charges processing fees for satellite network filings to prevent "warehousing" of spectrum. Therefore, all applicants are responsible for all fees charged by the ITU regarding their application. Varda is aware of this requirement and accepts responsibility to pay all ITU cost recovery fees associated with this application. Such fees and invoices may be sent to the contact representative listed in this.

## **4 REQUEST FOR WAIVER**

Varda respectfully requests waiver of the frequency allocation regulations along with this application. The Commission may waive any of its rules if there is "good cause" to do so.<sup>3</sup> Waiver is also appropriate where "special circumstances warrant a deviation from the general rule" and "such deviation will serve the public interest" better than strict adherence to the rule.<sup>4</sup> Previously, the Commission has granted a waiver of its rules if the requested relief would not undermine the objective of the rule in question and would otherwise serve the public interest.<sup>5</sup> The Commission may also consider potential hardship, equity, or policy implementation factors as part of its review.<sup>6</sup>

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<sup>3</sup> 47 C.F.R. § 1.3.

<sup>4</sup> Northeast Cellular Telephone Co. v. FCC, 897 F.2d 1164, 1166 (D.C. Cir. 1990) (Northeast Cellular).

<sup>5</sup> See WAIT Radio v. FCC, 418 F.2d 1153, 1159 (D.C. Cir. 1969) (WAIT Radio) and See Northeast Cellular, 897 F.2d at 1166.

<sup>6</sup> See WAIT Radio, 418 F.2d at 1159

It is with this background that Varda is requesting waiver of 47 C.F.R. § 2.106 (Table of Frequency Allocations) for this application to permit the use of Space Operations Service's 2025 MHz to 2110 MHz Band, Space Operations Service's 2200 MHz to 2290 MHz Band, Earth Explorations Satellite Service's 8025 MHz to 8400 MHz Band and Mobile-Satellite Service's 1610 to 1626.5 MHz Band.

The proposed usage of each of these bands are on a non-conforming, but non-interfering, basis inside the United States. In the Space Operations Service's 2025 MHz to 2110 MHz Band, and Space Operations Service's 2200 MHz to 2290 MHz Band, the international frequency allocation tables provide allocations consistent with Varda's use of the bands. Waiver is requested to allow use of the bands as a non-Federal user, whereas currently only Federal users have allocations. Waiver of the Earth Explorations Satellite Service's 8025 MHz to 8400 MHz Band is requested based on the need for expanded bandwidth to adequately complete the experiments on board the spacecraft in a timely manner and is consistent with the ITU's Section 4.4 provisions. Waiver of the Mobile-Satellite Service's 1610 to 1626.5 MHz Band is requested for Space-to-Space operations of the link in order to accurately track the W-Series Capsule during deorbit operations, consistent with previous waivers and uses for Varda missions.

## **5 OTHER MATTERS**

### **5.1 Previous Varda Licenses**

Varda has been granted Part 5 Special Temporary Authorities ("STA") for the first nine missions previously. This mission will be the first grant for Varda's updated spacecraft and capsule design with the aim of providing a platform with enhanced capabilities to manufacture pharmaceuticals in space.

## **6 CONCLUSION**

This Application, along with all attached documentation and databases containing appropriate diagrams and details, outlines Varda's WSERIES10 Spacecraft mission and provides the necessary information to review compatibility of the system with other current (and future) users. Varda specifically seeks authorization for use of the Space Operations Service's 2025 MHz to 2110 MHz and 2200 MHz to 2290 MHz Band, as well as the Earth Exploration Satellite Service's 8025-8400 MHz Band and Mobile-Satellite Service's 1610 to 1626.5 MHz Band on an experimental basis, in accordance with Part 5 of the Commission's rules.

Respectfully submitted,

Daniel Czerwonka

/s/

Varda Space Industries, Inc.