

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

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In the Matter of)	
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Umbra Lab, Inc.,)	File No.: SAT-LOA-2021_____ - _____
)	
Application for Authority to Launch and)	Call Sign: _____
Operate a Non-Geostationary Satellite)	
Orbit System in the Earth Exploration-)	
Satellite Service)	

APPLICATION

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APPLICATION

Umbra Lab, Inc. (“Umbra”) requests authority to launch and operate a constellation of six (6) synthetic aperture radar (“SAR”) microsatellites in low-Earth, non-geostationary orbit (“NGSO”) for provision of Earth-Exploration Satellite Service (“Umbra SAR Constellation”). This application is submitted under the Commission’s streamlined licensing procedures governing small satellites.¹ A completed Form 312, Schedule S, Technical Attachment, orbital debris assessment report (“ODAR”), ITU cost-recovery letter, and this narrative are included with this application.

I. BACKGROUND AND SYSTEM DESCRIPTION

Umbra is a Delaware corporation headquartered in Santa Barbara, California. Umbra was founded in 2015 with the goal to provide space-based commercial remote sensing services, using SAR for defense, intelligence and analytics customers. Umbra has developed proprietary

¹ 47 CFR § 25.122; *see also Streamlining Licensing Procedures for Small Satellites*, IB Docket No. 18-86, Report and Order, 34 FCC Rcd 13077 (2019) (“SmallSat R&O”).

technology, including its patented foldable antenna², which enables unique capabilities. With the help of its SAR microsattellites, Umbra will provide on-demand, high-quality, and high-resolution SAR imagery, that is affordable and easy to access via an integrated web platform, to government and commercial customers. Umbra has raised \$32 million in venture equity.

Umbra has been awarded a Phase I Small Business Innovation Research grant through the U.S. Air Force and has several other grants pending with U.S. government agencies. Furthermore, various additional U.S. government agencies have demonstrated interest in securing contracts with Umbra. These U.S. government, as well as commercial customers desire to procure Umbra's spaceborne SAR imagery and, consequently, Umbra seeks to promptly commence commercial operations. Umbra was granted a NOAA license for the deployment of its Umbra SAR commercial remote sensing system in 2018.

The Commission has granted Umbra an authorization to launch and operate Umbra-2001, a demonstration satellite for the Umbra SAR constellation, which is anticipated to be launched in 2021 from the continental United States. Umbra requests that this demonstration satellite be included as part of the grant of this application.³ The second satellite, Umbra-02, is planned to launch in 2021. The remaining satellites will be launched in 2022. The satellites in the Umbra SAR Constellation will have virtually the same radiofrequency and orbital characteristics.⁴ To enable Umbra's commercial operations by Q4 2021, Umbra respectfully requests that the Commission grants this authorization request expeditiously.

² U.S. Patent No. 10,847,893 issued on November 24, 2020.

³ See, e.g., Stamp Grant, Capella Space Corp., IBFS File No. SAT-LOA-20200914-00108 (granted Dec. 17, 2020).

⁴ All satellites in the Umbra SAR Constellation will be materially the same with respect to relevant FCC technical parameters, e.g., radio frequency and orbital debris, but there may be differences in manufacturers and in components over time.

A. Space Segment

The space segment consists of a constellation of six (6) ESPA class satellites. The deployed satellite features a large circular reflector which serves as the primary SAR payload antenna. The reflector has a high compaction factor when stowed and a high power/aperture ratio when deployed. The satellite mass at launch is less than 100 kg and includes a propulsion system used for orbit maintenance and collision avoidance, which employs water as the propellant.

B. Orbital Information

The Umbra satellites described in this application are expected to be inserted into orbit between 500 km to 575 km altitude at an inclination of $97.5^\circ \pm 2$. The Umbra satellites will then maneuver to the desired orbital state and operate at an altitude between 500 km to 610 km, nominally 583 km. During the mission life, Umbra may relocate its satellites within this orbital altitude range to reach the desired orbital state and to accommodate requests from customers.⁵

Umbra intends to make use of so-called “rideshare” launch opportunities offered by launch providers such as SpaceX, which can result in multiple potential LEO orbits for its small satellites. The information below summarizes the nominal orbital parameters. Umbra will inform the Commission if it anticipates any material changes to these characteristics.

⁵ See, e.g., Stamp Grant, Capella Space Corp., IBFS File No. SAT-LOA-20200914-00108 (granted Dec. 17, 2020) (granting applicant authority to operate within the 525 ± 50 km range).

Table 1. Orbital Parameters*

Satellite number	1	2	3	4	5	6
Orbital Plane Number	Plane 1	Plane 2	Plane 3	Plane 3	Plane 4	Plane 4
Satellite name	UMBRA-2001	UMBRA-02	UMBRA-03	UMBRA-04	UMBRA-05	UMBRA-06
Tx Duty Cycle S-Band (in view)	96%	96%	96%	96%	96%	96%
Tx Duty Cycle X-Band (in view)	100%	100%	100%	100%	100%	100%
Operating Alt. Range (km)⁶	555 ± 55 km	555 ± 55 km	555 ± 55 km	555 ± 55 km	555 ± 55 km	555 ± 55 km
Inclination (degree)	97.5 ± 2	97.5 ± 2	97.5 ± 2	97.5 ± 2	97.5 ± 2	97.5 ± 2
Eccentricity	0.0	0.0	0.0	0.0	0.0	0.0
Sun Sync	Yes	Yes	Yes	Yes	Yes	Yes
LTAN (RAAN)	10:30 (157.5deg)	11:18 (169.5deg)	15:18 (229.5deg)	18:30 (277.5deg)	19:18 (289.5deg)	22:30 (337.5deg)
Launch Date	Q22021	Q42021	Q22022	Q22022	Q42022	Q42022
Mean Anomaly (deg)	0	180	180	0	180	0
Active Service Arc	Full Orbit	Full Orbit	Full Orbit	Full Orbit	Full Orbit	Full Orbit
Orbital Period (sec)	5734 ±67	5734 ±67	5734 ±67	5734 ±67	5734 ±67	5734 ±67

*The information in this table is based on Umbra’s current knowledge of future rideshare opportunities.

C. Spectrum

Umbra requests authority to use the frequencies listed in Table 3 below for its communication links.

Table 2. Frequencies of Operation

<u>Link Name</u>	<u>Band (MHz)</u>	<u>Center Frequency (MHz)⁷</u>	<u>Bandwidth (MHz)</u>
Mission Data Downlink	8025-8400	8150	250
EESS (Active) Band 1	9200-10400	9800	1200
EESS (Active) Band 2	9300-9900	9600	600
TT&C Downlink	2200-2290	2254	0.1
TT&C Uplink	2025 – 2110	2080	0.1

⁶ As discussed in the ODAR, Umbra will seek launches that insert its satellites into orbital altitudes between 500 to 575 km at an inclination of 97.5° ± 2.

⁷ The proposed center frequencies specified in the table are subject to coordination with federal operators and other users and accordingly may change.

Umbra's system is designed to avoid any harmful interference with other satellite systems including other EESS systems and protected terrestrial systems. Transmissions will meet all applicable power flux-density ("PFD") and other coexistence requirements even in a worst-case configuration. See Technical Attachment, Section 5. Despite the on-demand nature of Umbra's service its payload and sensing transmission occurs at relatively low duty cycle further minimizing the probability of a worst-case geometric configuration while these systems are active. Further, a Geographic Exclusion Zone ("GEZ") capability is available to further avoid any possible interference issues as needed.

D. Ground Segment

A ground segment consisting of commercial ground stations provided by Kongsberg Satellite Services ("KSAT") and Amazon Web Services ("AWS") Ground Stations, for both payload and TT&C communications. In addition to the appreciable cost incentive, utilizing KSAT and AWS offers an innovative and highly efficient means of acquiring, storing, and processing downlinked data. KSAT and AWS have obtained or are in the process of updating, as necessary, the authorizations from regulators in its respective jurisdictions for communications with the Umbra system. The ground station locations are included in the Technical Attachment of this application. *See* Technical Attachment, Section 2.4.

Mission control of Umbra SAR satellites will be located at Umbra's headquarters in Santa Barbara, California with a mobile backup. In accordance with its NOAA license, Umbra maintains a 24/7/365 operations hotline and on-call staff, which are able act upon any interference-related requests. Constellation monitoring is constant via automated and human systems allowing for quick reaction in response to technical or regulatory questions or concerns.

E. Launch Schedule

Umbra-2001 (ELS File No. 0424-EX-CN-2020) is scheduled to be launched in Q2 of 2021. Umbra-02 is anticipated for a rideshare launch in Q4 2021 from the continental United States. Additional launches of the Umbra SAR Constellation satellites are expected to take place sequentially thereafter to build out the constellation up to the six (6) satellites proposed for this grant.

II. SMALL SATELLITE CERTIFICATIONS

Consistent with the requirements for streamlined treatment under Section 25.122, Umbra hereby certifies that the space stations to be operated under the requested license meet the following criteria:⁸

1. The space stations will operate only in non-geostationary orbit.
2. The total in-orbit lifetime for any individual space station will be six years or less.
3. The space stations will be deployed at an orbital altitude of 600 km or below.⁹ Additionally, the space stations will maintain a propulsion system and have the ability to make collision avoidance and deorbit maneuvers using propulsion.¹⁰
4. Each space station will be identifiable by a unique signal-based telemetry marker distinguishing it from other space stations or space objects.
5. The space stations will release no operational debris.
6. Umbra has assessed and limited the probability of accidental explosions, including those resulting from the conversion of energy sources on board the space stations into energy that fragments the spacecraft.

⁸ The Commission recently added criteria for orbital debris mitigation. *See Mitigation of Orbital Debris in the New Space Age*, IB Docket No. 18-313, Report and Order and Further Notice of Proposed Rulemaking, 35 FCC Rcd 4156 (2020) (Appendix A). Although not yet effective, Umbra will comply with the new requirements, as detailed in this section.

⁹ As noted earlier, the Umbra satellites will be deployed at altitudes below 575 km.

¹⁰ Although 47 CFR § 25.122 requires only that proposed space stations be deployed at an orbital altitude of 600 km or below or be capable of making collision avoidance and deorbit maneuvers using propulsion to be qualified for the requirements for streamlined processing under the Commission's small-satellite rules, Umbra satellites will satisfy both of these two alternative requirements.

7. The probability of a collision between each space station and any other large object (10 centimeters or larger) during the orbital lifetime of the space station is 0.001 or less as calculated using current NASA software or other higher fidelity model.

8. The space stations will be disposed of post-mission through atmospheric re-entry. The probability of human casualty from portions of the spacecraft surviving re-entry and reaching the surface of the Earth is zero as calculated using current NASA software or other higher fidelity models.

9. Operation of the space stations will be compatible with existing operations in the authorized frequency bands. Operations will not materially constrain future space station entrants from using the authorized frequency bands.

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

11. Each space station is 10 cm or larger in its smallest dimension.

12. Each space station will have a mass of 180 kg or less, including any propellant.

13. The probability that any individual space station will become a source of debris by collision with small debris or meteoroids that would cause loss of control and prevent disposal is 0.01 (1 in 100) or less.¹¹

14. Upon receipt of a space situational awareness conjunction warning, the licensee or operator will review and take all possible steps to assess the collision risk, and will mitigate the collision risk if necessary. As appropriate, steps to assess and mitigate the collision risk should include, but are not limited to: contacting the operator of any active spacecraft involved in such a warning; sharing ephemeris data and other appropriate operational information with any such operator; and modifying space station attitude and/or operations.¹²

III. SPECTRUM USE AND SHARING CAPABILITIES

The Commission has categorically exempted systems operating under the streamlined rules from the Part 25 processing round and default service requirements. In short, small satellite systems eligible for streamlined processing are “designed to serve [their] purpose within a limited, relatively short period of time [and] have more limited frequency use characteristics than

¹¹ See *supra* note 8

¹² See *supra* note 8

more traditional operations licensed under part 25.”¹³ In lieu of the processing round rules, the Commission requires applicants to “(a) certify that operations of its satellites will not interfere with those of existing operators, (b) certify that it will not materially constrain future operators from using the assigned frequency band(s), and (c) provide a brief narrative description illustrating the methods by which both current and future operators will not be materially constrained.”¹⁴ In the *SmallSat R&O*, the Commission provided examples of types of systems that would meet this requirement, including EESS systems.¹⁵

Umbra certifies that the operations of its satellites will not interfere with those of existing operators and that it will not materially constrain future operators from using the requested frequency bands. Umbra is committed to ensuring equitable sharing among all licensed co-frequency spectrum users. Umbra satellites will operate in all frequency bands used in a manner that will avoid harmful interference. Umbra plans to pre-coordinate spectrum use with relevant federal operators to assure that critical services are not impacted by the operation of the Umbra system. Furthermore, Umbra met with NOAA, NASA, USAF and other federal operators on July 24, 2020 as part of the NTIA pre-coordination for the experimental application and successfully pre-coordinated such experimental application. Umbra also participated in pre-coordination meetings with relevant federal operators on August 24, 2020 and March 26, 2021. A more detailed discussion of compliance with all requirements for the avoidance of harmful interference is contained in the Technical Attachment.

¹³ *SmallSat R&O* ¶ 80.

¹⁴ *Id.* ¶ 81.

¹⁵ *Id.* ¶ 8 n.223.

A. Communications and Telemetry, Tracking, and Command Links

Spectrum sharing in the proposed EESS frequencies, S-band and X-band, will be possible because the Umbra satellites and satellites in other similar systems transmit/receive only in short periods of time while visible to a receiving/transmitting Earth station. For harmful interference to occur, satellites belonging to the different systems would have to be visible to the Earth station and transmitting or receiving using the same frequencies at the exact same time. In such an unlikely event, the resulting inline interference could be avoided by coordinating the satellite transmissions so that they do not occur simultaneously. This frequency coordination can be managed by the commercial operator(s) that control(s) the Earth stations. Additionally, orbital parameters can also be adjusted such that phasing of the contacts can be offset over time. The satellite is equipped with a propulsion system which will allow additional maneuverability and phasing throughout their life. Accordingly, there is no mutual exclusivity between Umbra satellites and other NGSO EESS systems using the same frequency bands.

1. X-Band Downlink (8025-8400 MHz)

This band is allocated to EESS on a primary basis on a case-by-case basis.¹⁶ As discussed above, Umbra's constellation is an EESS system, and accordingly, use of this band is consistent with the U.S. Table of Frequency Allocations. Umbra will coordinate with Federal and non-Federal operators in this band. The interference analysis for this band is provided in the Technical Attachment.

2. S-Band TT&C Uplink (2025-2110 MHz)

This band is allocated on a primary basis across all ITU regions to EESS subject to conditions as may be applied on a case-by-case basis and the limitation that any use may not

¹⁶ See 47 CFR § 2.106 n.US258.

cause harmful interference to authorized Federal and non-Federal operations.¹⁷ As discussed above, the Umbra constellation is an EESS system, and accordingly, use of this band is consistent with the U.S. Table of Frequency Allocations. Umbra will coordinate with Federal and non-Federal operators in this band. Our ground stations are detailed in the Technical Attachment.

3. S-Band TT&C Downlink (2200-2290 MHz)

This band is allocated to Space Operations (space-to-Earth) and EESS (space-to-Earth) on a co-primary basis across all ITU regions. In the U.S., this band is allocated only for Federal use.¹⁸ The S-band transmitter would be used only to communicate with non-U.S. ground stations. Accordingly, use of this band is consistent with the U.S. Table of Frequency Allocations.¹⁹ Umbra will coordinate such use with all Federal operators prior to use.

As described in the table below, the Umbra S-Band TT&C Downlink will operate within the 2200-2290 MHz band with a maximum EIRP of -8.5 dBW in a 100 kHz channel centered at 2254 MHz and using RHCP polarization.²⁰

Table 4. TT&C downlink characteristics

Frequency Ranges	2253.95 – 2254.05 MHz
Bandwidth	100 kHz
Center Frequency	2254 MHz
EIRP	-8.5 dBW (maximum)
Polarization	RHCP

¹⁷ See *id.* § 2.106 n.US347.

¹⁸ See *id.* § 2.106 nn.5.392, US303.

¹⁹ See *id.* § 2.106. To the extent necessary, Umbra requests waiver of the U.S. Table of Frequency Allocations to permit the proposed transmissions to non-U.S. ground stations.

²⁰ This is a representative channel. The use of this frequency band is subject to coordination with federal operators and the specific channel may change as a result of that coordination.

The 2200-2290 MHz band is allocated for Federal use for EESS (Earth-to-space) subject to such conditions as may be applied on a case-by-case basis. Further, transmissions from the satellites operating in this band shall not cause harmful interference to federal and non-federal stations operating in accordance with the U.S. Table of Frequency Allocations.

Umbra selected this band after a review of alternatives due to operational needs, available hardware, and compatibility with third-party commercial Earth station operators. Interference between the satellite and other systems is unlikely because EESS systems operating in the 2200-2290 MHz band normally transmit only in short periods of time while visible from the dedicated receiving Earth stations (typically less than 10 minutes for a single pass). Further, the Earth station beam required to intercept the transmitted signal is highly directive. Further, the satellite will only utilize 100 kHz of bandwidth. Additionally, the satellite will be configured so as not to exceed the PFD limit for non-federal space stations.²¹

B. X-Band Radar (9200-10400 MHz)

The Umbra SAR system generates brief pulses using a very high directivity antenna – thus minimizing both the active time as well as the affected areas on the ground. Umbra plans to utilize two alternative frequency channels for its SAR payload. Operation at these frequencies was previously granted for UMBRA-2001 by the Commission under ELS file no. 0424-EX-CN-2020.

As described in the table below, the Umbra X-Band Radar beam will have a maximum EIRP of 78.6 dBW utilizing one of two alternative frequencies spanning 600 MHz and 1200 MHz respectively. The SAR utilizes linear polarization and can operate at HH or VV.

²¹ See Technical Attachment, Section 5.

Table 5. SAR transmission characteristics

Frequency Range	9200-10400 MHz
Bandwidth	600 MHz 1200 MHz
Center Frequency	9600MHz 9800 MHz
EIRP	≤ 80 dBW
Polarization	HH, VV

The first frequency is used for low bandwidth imaging and utilizes the 9300-9900 MHz band for SAR imaging under an Earth Exploration-Satellite Service (active) allocation. In the United States, this band is allocated for non-federal EESS (active) use on a secondary basis and for federal EESS (active) on a primary basis, in each case subject to certain conditions.²² Internationally, the band is allocated for EESS (active) on a primary basis, subject to certain conditions.²³ This frequency band is currently being used by other similar SAR systems, including the German TerraSAR-X satellite, the Italian COSMO-SkyMed system, the Finnish ICEYE satellites, and others in China and India.

The second frequency channel is for high-bandwidth SAR imaging applications and utilizes the wider 9200-10400 MHz band. The additional frequencies (9200-9300 MHz,²⁴ 9900-10000 MHz,²⁵ and 10000-10400 MHz²⁶) were allocated internationally to EESS (active) by the

²² See, e.g., 47 CFR § 2.106 nn.5.427, US476A.

²³ See, e.g., ITU Radio Regulations § 5-103 nn.5.427, 5.475A, 5.475B, US476A.

²⁴ Both the ITU and the U.S. Table of Frequency Allocations (Non-Federal) allocate use of this band to Maritime Radionavigation (primary) and Radiolocation (secondary). 47 CFR § 2.106.

²⁵ Both the ITU and the U.S. Table of Frequency Allocations (Non-Federal) allocate use of this band to Radiolocation. 47 CFR § 2.106.

²⁶ Both the ITU and the U.S. Table of Frequency Allocations (Non-Federal) allocate use of this band to Radiolocation. 47 CFR § 2.106.

ITU in WRC-15, subject to certain conditions.²⁷ The FCC, however, has not adopted this allocation in the U.S. Table of Frequency Allocations.²⁸ This frequency band is currently being used by other similar SAR systems, such as the Italian COSMO-Skymed Second Generation system.

As explained below and in the Technical Attachment, Umbra's use of the above X-band frequencies is consistent with the international allocation and will not cause harmful interference to other authorized operations. Furthermore, Umbra will coordinate with federal and other operators to ensure that Umbra SAR operations do not interfere with systems of these operators.

IV. WAIVER REQUESTS

The Commission may waive any of its rules if there is "good cause" to do so. In general, waiver is appropriate if (1) special circumstances warrant a deviation from the general rule; and (2) such deviation would better serve the public interest than would strict adherence to the rule. Generally, the Commission will grant a waiver of its rules in a particular case if the relief requested would not undermine the policy objective of the rule in question and would otherwise serve the public interest.²⁹ Umbra submits that good cause exists to waive the following rules.

A. U.S. Table of Frequency Allocations

Umbra requests waiver of the U.S. Table of Frequency Allocations to permit use of the following bands for EESS (active): 9200-9300 MHz, 9900-10000 MHz, and 10000-10400 MHz. With respect to each band, the ITU allocated the frequencies for EESS (active) on a primary

²⁷ See, e.g., Final Acts WRC-15, World Radiocommunication Conference, Geneva, 2015 (adding notes 5.474A, 5.474B, 5.474C, 5.474D).

²⁸ See *infra* Section IV (requesting waiver of the U.S. Table of Frequency Allocations for use of these frequencies for EESS (active)).

²⁹ See *WAIT Radio v. FCC*, 418 F.2d 1153, 1157 (D.C. Cir. 1969).

basis through actions taken in WRC-15 and Umbra seeks to provide an EESS (active) service.³⁰ The FCC, however, has not yet adopted these international allocations.

The Umbra satellites comply with these international requirements and will not cause harmful interference to other authorized operations.³¹ Further, Umbra will coordinate operations in this band to further minimize potential interference. For these reasons, Umbra submits that the waiver is justified.

B. Schedule S Requirements

Umbra requests a limited waiver of Section 25.114(c) of the Commission's rules, which requires certain information to be filed in the Schedule S. As explained below, Umbra was unable to accurately enter certain information because of limitations in the Schedule S software and, accordingly, requests a waiver of the rule.

Umbra's TT&C transmitter has a maximum transmit EIRP of -8.4 dBW. However the Schedule S data field will not accept a number less than zero. Umbra entered zero to satisfy the Schedule S form requirement.

Umbra's SAR transmitter does not image under 10 degrees. However, the Schedule S data field requires a maximum power flux density value for the 0-5 degrees and 5-10 degrees fields. Umbra entered -200 and -92 dBW/m²/4 kHz band, respectively, in the Schedule S.

Umbra's SAR transmitter is capable of both vertical (V) and horizontal (H) polarization. However, the Schedule data field allows only one entry. Umbra entered "V," which is the nominal operation.

³⁰ See, e.g., Final Acts WRC-15, World Radiocommunication Conference, Geneva, 2015 (adding notes 5.474A, 5.474B, 5.474C, 5.474D).

³¹ See Technical Attachment, Sections 5.5 and 5.6.

V. GRANT OF THE APPLICATION IS IN THE PUBLIC INTEREST

The public interest would be served by grant of Umbra's application to operate its planned constellation of SAR satellites. Umbra's satellites will significantly increase the available supply of high fidelity, timely SAR data for applications as diverse as climate science, precision agriculture, property and casualty insurance, search and rescue, and national defense, to name a few.

Demand for SAR imagery has historically been tightly coupled to defense spending domestically and abroad, and Umbra anticipates military intelligence gathering will be a foundational application for data produced from the constellation from the onset. Umbra data, which will be able to achieve the highest spatial resolution available on the commercial market in certain modes, will help meet significant U.S. government demand for national security missions, including maritime surveillance, disaster response, asset monitoring and foundational feature mapping. However, the broader implication of a favorable decision by the Commission to grant Umbra's application to operate its planned constellation is a commercial one. Umbra's SAR Constellation unique characteristics enable two key commercial advantages: (1) SAR can image targets during the day or at night and in clear or cloud-obscured conditions; and (2) despite a small form factor, certain Umbra SAR inference methods can achieve state of the art spatial resolutions at sub-25 cm scale.

The combination of superior collection reliability and groundbreaking spatial resolution of Umbra SAR Constellation will provide Umbra's customers with access to extremely high fidelity, high-revisit rate collections at exceedingly affordable rates. Umbra's SAR products will stimulate development of a competitive SAR marketplace, driving pricing efficiency and attracting increased research and development investment in analytical methods for extracting pertinent information from SAR data over time.

A swift approval by the Commission would serve the public interest by further accelerating the growth of this domestic commercial SAR industry. If the U.S. does not authorize domestic businesses to use these frequencies, foreign companies will fill the void in the global commercial market to the detriment of U.S. economic and national security interests. Without a competitive market for SAR data, not only will national security demand for high-resolution SAR data continue to outstrip available commercial supply, but the many beneficial downstream applications of SAR data will develop more slowly than they would otherwise. The sooner the U.S. can foster a healthy commercial SAR ecosystem, the sooner the value of this data will be manifested by companies, non-profits, researchers, and government agencies working on important applications for SAR data like rapid flood delineation during major storm events, crop cycle monitoring for global food security forecasting, and dark vessel identification related to human rights violations. Grant of Umbra application by October 2021 will allow the company to launch its second satellite in Q4 2021, which will provide substantial benefit to the varied types of government and commercial customers identified above. Accordingly, expeditious grant is in the public interest.

VI. OTHER MATTERS

A. Related FCC authorizations

Umbra was issued an experimental radio authorization under Call Sign WL2XBR on February 9, 2021.³² This license will be used in the deployment and operation of Umbra's first satellite, Umbra-2001, which is expected to be launched in Q2 2021. This license was obtained with the intent to operate Umbra's first spacecraft on an experimental basis prior to obtaining a commercial license and starting commercial service under the small satellite licensing process.

³² See OET ELS File No. 0424-EX-CN-2020.

Additionally, Umbra has been engaged in a testing program of SAR technology using aircraft mounted sensors flying at altitudes of up to 10,000 feet at several locations in the contiguous United States.

B. NOAA authorization

Umbra holds a NOAA license to operate a private remote sensing space system.³³ The NOAA license permits Umbra to operate the private constellation of up to twelve (12) SAR satellites subject to the conditions and terms of the license. At a later date, Umbra may seek FCC authorization to deploy additional satellites.

C. ITU compliance

Pursuant to 47 C.F.R. § 25.111 for space systems, Umbra understands that the Commission will submit filings to the ITU on behalf of Umbra pursuant to international obligations for the coordination and registration of space network systems. Umbra is preparing such information and agrees to provide the Commission in a timely manner the appropriate electronic files for submission to the ITU. Attached to this application is Umbra's ITU cost-recovery letter.

³³ See generally <https://www.nesdis.noaa.gov/CRSRA/noaaLicensees.html> (last visited March 25, 2021).

VII. CONCLUSION

For the reasons stated above, Umbra requests that the Commission expeditiously grant the application.

Respectfully submitted,

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