

Before the
 Federal Communications Commission
 Washington, D.C. 20554

In the Matter of)	
)	
WorldVu Satellites Limited, Debtor-in-Possession,)	IBFS File Nos. SAT-LOI-20170301-00031
Petition for Declaratory Ruling Granting Access to)	
the U.S. Market for the OneWeb Non-)	Call Sign S2994
Geostationary Satellite Orbit Fixed-Satellite)	
Service V-Band System)	

ORDER AND DECLARATORY RULING

Adopted: August 24, 2020

Released: August 26, 2020

By the Commission:

I. INTRODUCTION

1. In this Order and Declaratory Ruling, we grant in part and dismiss in part the petition of WorldVu Satellites Limited, debtor-in-possession,¹ d/b/a OneWeb, to access the U.S. market using a proposed 2,000-satellite non-geostationary-satellite orbit (NGSO) broadband constellation.² We grant market access in the 37.5-42 GHz (space-to-Earth), 47.2-50.2 GHz (Earth-to-space), and 50.4-51.4 GHz (Earth-to-space) frequency bands, subject to sharing conditions and other requirements. This grant will offer OneWeb greater opportunities to deliver satellite-based broadband services to the public.

II. BACKGROUND

2. *Processing Round and Petition.* On November 1, 2016, a processing round was announced for “NGSO-like” satellite system applications in the 37.5-42 GHz, 47.2-50.2 GHz, and 50.4-51.4 GHz bands, in response to an earlier application in these bands by The Boeing Company.³ On March 1, 2017, OneWeb filed the instant petition as part of that processing round. OneWeb proposes to add a V-band payload to the 720 satellite Ku/Ka-band constellation previously approved by the Commission⁴ and proposes 1,280 additional V-band satellites operating at a nominal altitude of 8,500 km. The OneWeb constellation will be authorized by the United Kingdom. OneWeb requests market

¹ See IBFS File No. SAT-MPL-20200406-00031 (requesting Commission consent to the “*pro forma* assignment and transfer of control of OneWeb in connection with OneWeb’s recent Chapter 11 bankruptcy filing”) (granted Apr. 10, 2020).

² *WorldVu Satellites Limited Petition for Declaratory Ruling Granting Access to the U.S. Market for the OneWeb Non-Geostationary Satellite Orbit Fixed-Satellite Service V-Band System*, IBFS File No.SAT-LOI-20170301-00031 (filed Mar. 1, 2017) (OneWeb Petition).

³ *Boeing Application Accepted for Filing in Part, Cut-Off Established for Additional NGSO-Like Satellite Applications for Operations in the 37.5-40.0 GHz, 40.0-42.0 GHz, 47.2-50.2 GHz and 50.4-51.4 GHz Bands*, Public Notice, DA 16-1244 (IB 2016).

⁴ In 2017, the Commission granted OneWeb’s request for U.S. market access for a 720-NGSO satellite constellation operating in the 10.7-12.7 GHz, 14-14.5 GHz, 17.8-18.6 GHz, 18.8-19.3 GHz, 27.5-29.1 GHz, and 29.5-30 GHz bands. *WorldVu Satellites Limited, Petition for Declaratory Ruling Granting Access to the U.S. Market for the OneWeb NGSO FSS System*, Order and Declaratory Ruling, 32 FCC Rcd 5366 (2017).

access in the 37.5-43.5 GHz, 47.2-50.2 GHz, and 50.4-51.4 GHz bands, and several waivers of the Commission's rules associated with its proposed operations. The additional spectrum bands and satellites proposed in the OneWeb Petition would build upon OneWeb's Ku/Ka-band Market Access Grant. Such additional capacity would enhance OneWeb's ability to offer its proposed broadband services in the United States.

3. *Public Notice and Comments.* OneWeb's request to operate in the 37.5-42 GHz, 47.2-50.2 GHz, and 50.4-51.4 GHz bands was placed on public notice on June 16, 2017.⁵ Several satellite operators commented on the OneWeb Petition. Some of these comments reflected positions taken during a then-ongoing rulemaking concerning NGSO fixed-satellite service (FSS) systems. Other comments were specific to the OneWeb Petition.

4. *Subsequent Rulemakings.* In September 2017, following the close of the comment cycles in this proceeding, the Commission adopted the *NGSO FSS R&O*, updating several rules and policies governing NGSO FSS systems.⁶ The Order adopted, among other things, spectrum sharing rules and a more flexible milestone schedule for NGSO systems.⁷

5. In November 2017, the Commission adopted the *Spectrum Frontiers Second Report and Order, Second Further Notice of Proposed Rulemaking, Order on Reconsideration, and Memorandum Opinion and Order*,⁸ which, among other things, made or affirmed determinations that the 40-42 GHz and 48.2-50.2 GHz bands will be reserved for FSS use,⁹ while limiting satellite operations to communications with individually licensed earth stations in the 37.5-40.0 GHz and 47.2-48.2 GHz bands.¹⁰ The Commission also affirmed the existing Power Flux Density (PFD) limit applicable to satellite operations in the 37.5-40.0 GHz band.¹¹ More recently, the Commission adopted rules permitting licensing of individual FSS earth stations in the 50.4-51.4 GHz band using criteria identical to those applicable in the 24.75-25.25 GHz band.

⁵ *Policy Branch Information, Satellite Space Applications Accepted for Filing*, Public Notice, Report No. SAT-01245 (IB 2017). The International Bureau did not accept for filing OneWeb's request for market access in the 42-43.5 GHz band because there is no domestic allocation for satellite services in this frequency band. See 47 CFR § 2.106. Accordingly, this aspect of OneWeb's request is no longer before the agency, and we consequently do not address it in this Order.

⁶ *Update to Parts 2 and 25 Concerning Non-Geostationary, Fixed-Satellite Service Systems and Related Matters*, Report and Order and Further Notice of Proposed Rulemaking, 32 FCC Rcd 7809 (2017) (*NGSO FSS R&O*).

⁷ Most of these rule changes went into effect on January 17, 2018. See 82 Fed. Reg. 59972 (Dec. 18, 2017). The amendments to sections 25.114, 25.115, 25.146, and 25.164, contained new and modified information collection requirements that required approval by the Office of Management and Budget (OMB) under the Paperwork Reduction Act, and these amendments therefore did not become effective until May 31, 2018. See *Updates Concerning Non-Geostationary, Fixed-Satellite Service Systems and Related Matters*, 83 Fed. Reg. 22391 (May 15, 2018) (announcing OMB approval of information collection requirements and setting effective date for rule amendments containing those requirements).

⁸ *Use of Spectrum Bands Above 24 GHz for Mobile Radio Services et. al.*, Second Report and Order, Second Further Notice of Proposed Rulemaking, Order on Reconsideration, and Memorandum Opinion and Order, 32 FCC Rcd 10988 (2017). When citing to the *Second Report and Order* portion of the document, we will refer to the *Second R&O*, when citing to the *Second Further Notice of Proposed Rulemaking* portion of the document, we will refer to the *Second FNPRM*, and when citing to the *Memorandum Opinion and Order* portion of the document, we will refer to the *MO&O*.

⁹ *Spectrum Frontiers MO&O*, 32 FCC Rcd at 11050-51, paras. 189, 192.

¹⁰ *Spectrum Frontiers Second R&O and MO&O*, 32 FCC Rcd at 11005, 11061, paras. 55, 220.

¹¹ *Spectrum Frontiers MO&O*, 32 FCC Rcd at 11058-60, paras 214-16.

III. DISCUSSION

6. After review of the record, we conclude that granting OneWeb access to the U.S. market for its proposed V-band satellite system would increase competition for the broadband services proposed to be provided by such systems to American consumers, particularly in underserved areas, offer a greater likelihood that such a large system is able to fulfill its ambitions and deploy the proposed services, and thereby serve the public interest, subject to the requirements and conditions specified herein.¹² We address the various outstanding issues raised by commenters on the Petition. We also address OneWeb's waiver requests. Where appropriate, we defer matters of general applicability to ongoing or potential future rulemakings. And we note that where rules are modified as a result of the *Spectrum Frontiers* proceeding, the *NGSO FSS* proceeding, or in other relevant proceedings, OneWeb's FSS operations will be subject to those modified rules.

7. *Request for FSS Operations in the 37.5-40 GHz Band (space-to-Earth).* The 37.5-40.0 GHz band is currently allocated to the terrestrial fixed and mobile services on a primary basis.¹³ While this band is also allocated to the FSS (space-to-Earth) on a primary basis, part 25 of the Commission's rules limits all FSS operations in the band to communications with individually licensed earth stations.¹⁴ Part 25 further states that earth stations in this band must not be ubiquitously deployed and must not be used to serve individual consumers.¹⁵ In addition, in this band earth station operations in the FSS are prohibited from claiming interference protection from stations in the fixed and mobile services, except that a limited number of individually licensed earth stations authorized under section 25.136 of the Commission's rules may operate without providing any additional interference protection to stations in the Upper Microwave Flexible Use Service (UMFUS).¹⁶ Part 25 also includes PFD limits applicable to operations in the 37.5-40.0 GHz band.¹⁷ Section 25.208(r) includes limits for NGSO operations both under assumed free space conditions¹⁸ and during periods when the FSS system raises power to compensate for rain-fade conditions at the earth station.¹⁹ We grant OneWeb's request for market access in the 37.5-40 GHz band because the broadband services it proposes to provide would benefit American consumers, conditioned upon the protection of other services in this band in accordance with the Commission's rules (as they may be amended) and the Table of Frequency Allocations, including FCC mechanisms for sharing with Upper Microwave Flexible Use Service (UMFUS).

¹² SES and O3b requested that the Commission include in any OneWeb authorization standard operating conditions and specifically, several of the same grant conditions included on O3b's initial market access. See SES and O3b Comments at 6-7. To the extent that the OneWeb Petition raises the same concerns as other authorized NGSO FSS systems, we impose substantially identical conditions on OneWeb as we did in those orders, including O3b's recent grant, which also included V-band frequencies. In addition, since O3b's initial market access grant, the Commission has adopted revisions to its rules and policies governing NGSO FSS systems. The conditions herein are consistent with these rule changes.

¹³ U.S. Table of Frequency Allocations, 47 CFR § 2.106.

¹⁴ 47 CFR § 25.202(a)(1)(ii).

¹⁵ *Id.*

¹⁶ 47 CFR § 2.106, footnote NG63. Section 25.136 specifies processes for earth station applicants in the 37.5-40 GHz band and includes procedures to enable sharing with UMFUS licensees. 47 CFR § 25.136.

¹⁷ 47 CFR § 25.208(r). In implementing its soft segmentation plan for the V-band, the Commission adopted these limits alongside the limitations on FSS earth station operations, in order to accommodate high density fixed service in the 37.5-40 GHz band and FSS in the 40-42 GHz band. *Allocation and Designation of Spectrum for Fixed-Satellite Services in the 37.5-38.5 GHz, 40.5-41.5 GHz, and 48.2-50.2 GHz Frequency Bands, et. al.*, Second Report and Order, 18 FCC Rcd 25428, 25439-40, paras. 23-24 (2003) (*V-band Second R&O*).

¹⁸ 47 CFR § 25.208(r)(1).

¹⁹ 47 CFR § 25.208(r)(2). See *V-band Second R&O*, 18 FCC Rcd at 25440-41, paras. 28-29.

8. *Request for FSS Operations in the 40-42 GHz Band (space-to-Earth).* In the *Spectrum Frontiers* proceeding, the Commission reserved the 40-42 GHz band for FSS use.²⁰ OneWeb's proposed use of the 40-42 GHz band is consistent with the Commission's rules and the Table of Frequency allocation and access to this spectrum in the United States would allow OneWeb to provide greater broadband capacity to meet growing demand.²¹ We therefore grant OneWeb's request for market access in this band as conditioned below.

9. *Request for FSS Operations in the 47.2-50.2 GHz Band (Earth-to-space).* The 47.2-48.2 GHz portion of the V-band is currently allocated in the U.S. Table of Allocations for FSS, fixed service, and mobile service, limited to non-Federal stations, and the 48.2-50.2 GHz portion is allocated for these same services for both Federal and non-Federal stations.²² In the *Spectrum Frontiers Second R&O*, the Commission decided to limit operations to individually-licensed earth stations in the 47.2-48.2 GHz portion of the band, which will also be authorized for terrestrial UMFUS operations,²³ and it declined to provide any mechanism for blanket-licensed earth stations in that band.²⁴ In addition, earth station operations in the FSS in the 47.2-48.2 GHz band must not cause interference to stations in the fixed and mobile services, except that a limited number of individually licensed earth stations authorized under section 25.136 of the Commission's rules may be authorized to operate without providing any additional interference protection to stations in the UMFUS.²⁵ In the *Spectrum Frontiers Second Report and Order*, the Commission indicated that the 48.2-50.2 GHz portion of the band will be reserved for FSS use, including for deployment of blanket-licensed earth stations.²⁶ In order to protect UMFUS operations while allowing OneWeb to provide broadband services in the United States, we grant OneWeb's request for market access in the 47.2-50.2 GHz band, subject to the rules adopted in the *Spectrum Frontiers* proceeding.

10. *Unwanted Emissions in the 50.2-50.4 GHz Band.* In November of last year, the World Radiocommunication Conference 2019 (WRC-19) revised the limits on unwanted emission power into the 50.2-50.4 GHz band, used by the earth exploration-satellite service (passive), from earth stations operating with NGSO FSS satellite systems in the adjacent 49.7-50.2 GHz and 50.4-50.9 GHz bands. The new limits, contained in Resolution 750, are equal to or more stringent than the unwanted emissions limits previously adopted by the Commission and set forth in footnote US156 to the U.S. Table of Frequency Allocations. In prior NGSO grants for this band, we conditioned approval on compliance

²⁰ *Spectrum Frontiers MO&O*, 32 FCC Rcd at 11051, para. 192.

²¹ U.S. Table of Frequency Allocations, 47 CFR § 2.106.

²² Historically, the 47.2-50.2 GHz band has been subject to a band plan for sharing between wireless services and FSS. In 1998, as part of the V-band plan, the Commission designated the lower segment of the band, 47.2-48.2 GHz, for wireless services use, and the upper 48.2-50.2 GHz segment for FSS use. *Allocation and Designation of Spectrum for Fixed-Satellite Services in the 37.5-38.5 GHz, 40.5-41.5 GHz and 48.2-50.2 GHz Frequency Bands, et. al.*, First Report and Order, 13 FCC Rcd 24649, 24651, para. 2 (1998) (*V-band First R&O*). In 2003, the Commission noted that it was preserving the 47.2-48.2 GHz FSS uplink allocation for gateway operations, pairing with downlink operations in the 37.5-40.0 GHz band. *V-band Second R&O*, 18 FCC Rcd at 25457, para. 67. The upper 48.2-50.2 GHz (Earth-to-space) portion of the band is identified in international footnote 5.516B for use by high-density applications in the FSS in ITU Region 2. International Table of Frequency Allocations, 47 CFR § 2.106, footnote 5.516B.

²³ *Spectrum Frontiers Second R&O*, 32 FCC Rcd at 11005-6, paras. 54-56.

²⁴ *Id.* at 11006, para. 55. The Commission also noted that it was making 2 gigahertz of spectrum available for satellite end user devices in the adjacent 48.2-50.2 GHz band, where it refrained from adopting service rules for terrestrial mobile service providers. *Id.* at 11005-6, paras. 54-56.

²⁵ Section 25.136 specifies processes for earth station applicants in the 47.2-48.2 GHz band and includes procedures to enable sharing with UMFUS. 47 CFR § 25.136(d).

²⁶ *Spectrum Frontiers MO&O*, 32 FCC Rcd at 11050, para. 189.

with future WRC-19 limits²⁷ -- we now condition grant of the instant application on the WRC-19 limits that were adopted upon their entry into force on January 1, 2021.

11. *Request for FSS Operations in the 50.4-51.4 GHz Band.* In the *V-band First Report and Order*, the Commission designated the 50.4-51.4 GHz segment for use by fixed and mobile services.²⁸ In the *Spectrum Frontiers Fifth Report and Order*, the Commission authorized licensing of individual FSS earth stations in the 50.4-51.4 GHz band, applying the licensing criteria adopted by the Commission for the 24.75-25.25 GHz band—that is, applying the permitted aggregate population limits within the specified earth station power flux density contour on a per-county basis and adopting constraints on the number of permitted earth stations on both a per county and a per partial economic area basis.²⁹ Accordingly, we grant OneWeb’s request for market access in the 50.4-51.4 GHz band, subject to the limitations imposed by section 25.136 of the Commission’s rules, as modified by the *Spectrum Frontiers Fifth Report and Order*.

12. *Sharing with GSO FSS systems.* The Commission does not currently have service rules relevant to sharing between NGSO and GSO FSS systems in the frequency bands requested in the Petition. There are currently no FCC-licensed GSO FSS systems operating in the bands OneWeb has requested, although one GSO satellite application was recently granted.³⁰ ViaSat requested that grant be conditioned on compliance with No. 22.2 of the ITU Radio Regulations and the results of international coordination until the Commission adopts specific limits to protect GSO systems from interference by NGSO systems in the V-band.³¹ SES and O3b requested that the Commission defer action on NGSO V-band applications until adequate sharing mechanisms are in place to avoid interference to GSO systems.³² Hughes requested that the Commission condition any grant of the OneWeb Petition upon compliance with any applicable equivalent power flux density (EPFD) or technical limits that may be adopted by the Commission or ITU in the future, and that the Commission consider applying interim or default EPFD limits comparable to those in Article 22 of the ITU Radio Regulations.³³

²⁷ See, e.g., *O3b Limited, Request for Modification of U.S. Market Access for O3b Limited's Non-Geostationary Satellite Orbit System in the Fixed-Satellite Service and in the Mobile-Satellite Service*, Order and Declaratory Ruling, 33 FCC Rcd 5508, 5519-20, para. 30 (2018) (*O3b Order*); *Audacy Corporation, Application for Authority to Launch and Operate a Non-Geostationary Medium Earth Orbit Satellite System in the Fixed- and Inter-Satellite Services*, Order and Authorization, 33 FCC Rcd 5554, 5562, para. 20 (2018) (*Audacy Order*).

²⁸ *V-Band First Report and Order*, 13 FCC Rcd at 24651, para. 2 (jointly referring to fixed and mobile services as “wireless service”).

²⁹ *Use of Spectrum Bands Above 24 GHz for Mobile Radio Services*, Fifth Report and Order, 34 FCC Rcd 2556, 2560-61, paras. 10-12 (2019) (*Spectrum Frontiers Fifth Report and Order*).

³⁰ Hughes Network Systems, LLC was authorized to launch and operate a GSO satellite that includes operations in the 40-42 GHz (space-to-Earth) and 47.2-50.2 GHz (Earth-to-space) bands. Hughes Network Systems, IBFS File Nos. SAT-LOA-20170621-00092 and SAT-AMD-20170908-00128 (granted in part and deferred in part Mar. 20, 2018). In the March 20, 2018 grant, the Satellite Policy Branch deferred consideration of Hughes’s request for operations in the 50.4-51.4 GHz band, *id.*, but recently granted the request. See IBFS File No. SAT-MOD-20190212-00011 (granted June 13, 2019).

³¹ ViaSat Comments at 5-7. ITU Radio Regulation No. 22.2 states that NGSO systems shall not cause unacceptable interference to, and shall not claim protection from, GSO FSS and broadcasting-satellite service (BSS) networks operating in accordance with the Radio Regulations. ITU R.R. No. 22.2.

³² SES and O3b Comments at 3-5.

³³ Hughes Comments at 2. In connection with this request, Hughes generally proposes that the Commission initiate a rulemaking to adopt NGSO/GSO sharing criteria and band-specific service rules for the 37.5-42.0 GHz, 47.2-50.2 GHz, and 50.4-51.4 GHz bands. *Id.* at 1. It further requests that the Commission conduct an independent assessment of the appropriate single-entry and aggregate EPFD limits for these frequency bands. *Id.* at 2. For the reasons set forth above, we have concluded that initiation of such a rulemaking and independent assessment is unwarranted and unnecessary, particularly in light of the adoption in the *NGSO FSS R&O* of section 25.289 of the

(continued....)

13. In the *NGSO FSS R&O*, the Commission adopted a new rule in section 25.289 requiring that, unless otherwise provided in the rules, an NGSO system licensee must not cause unacceptable interference to, or claim protection from, a GSO FSS or Broadcasting-Satellite Service (BSS) network.³⁴ Section 25.289 applies to this grant, and this fact is reiterated in the conditions below. Article 22 of the ITU Radio Regulations contains provisions to ensure compatibility of NGSO FSS operations with GSO networks.³⁵ However, we recognize that within the 37.5 GHz to 51.4 GHz range there are currently no ITU EPFD limits or specific coordination mechanisms for NGSO FSS systems. Accordingly, OneWeb's grant will be subject to modification to bring it into conformance with any rules or policies adopted by the Commission in the future. Therefore, if relevant EPFD limits or other procedures are adopted by the Commission, or to the extent applicable, by the ITU in the future, OneWeb's operations subject to this grant of U.S. market access must comply with those limits or procedures. We believe that these conditions adequately address the concerns raised by the commenters about spectrum sharing among GSO and NGSO systems. Additionally, given the initiation of studies at the ITU of technical and operational issues and regulatory provisions related to sharing between NGSO and GSO systems,³⁶ we decline the request by Hughes to develop our own interim or default EPFD limits for the OneWeb system. Because of the global nature of most NGSO systems, we find it is more appropriate for these limits to be developed internationally.

14. *Other Comments.* Space Exploration Holdings, LLC (SpaceX), raises several points specific to the OneWeb Petition. First, SpaceX argues that OneWeb should explain in greater detail its deployment plans.³⁷ Specifically, SpaceX asks us to require OneWeb to detail how it intends to deploy in both the Ku/Ka and V-bands, whether it will have to replace an initial wave of Ku/Ka-band satellites with a new generation of V-band equipped satellites, and if so, how it intends to manage the significant coordination, collision avoidance, and disposal management challenges that such a rapid turn-over would require. SpaceX also believes that OneWeb should explain how it intends to deploy a total of 2,000 V-band LEO/MEO satellites within the six-year deployment window. Although we address below issues related to orbital debris, we decline to require such additional information. Whether market access is granted for satellites with only V-band payloads or with Ku/Ka-band payloads as well does not affect the interference analyses relied upon for this grant. Further, we have not typically requested detailed information as to how a satellite operator intends to launch its proposed constellation within the required milestone period. For this, we have a bond requirement. More generally, the information provided by OneWeb is sufficient and consistent with what has been received from other applicants.

15. Second, SpaceX argues that the OneWeb system would be more spectrally efficient if it used a greater number of gateway earth stations in the United States.³⁸ We take no action in this respect because the Commission's sharing rules for NGSO FSS systems are contained in section 25.261, and they do not include any requirement on the minimum number of gateway earth stations. The *NGSO FSS R&O* did consider the introduction of additional measures to facilitate sharing (more specifically, equivalent isotropically radiated power limits, on-axis and off-axis and/or incentives to more spectrally efficient systems).³⁹ However, the *R&O* concluded that "it is premature to adopt any additional technical

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Commission's rules (which post-dated the filing of the Hughes Comments) and the conditions we are placing on this grant of market access.

³⁴ 47 CFR § 25.289.

³⁵ See generally ITU R.R. Article 22, section II.

³⁶ ITU-R Resolution 159 (WRC-15).

³⁷ SpaceX Comments at 2-3. SpaceX also suggests that the Commission ask OneWeb to address certain questions regarding its approved, Ku/Ka-band constellation; however, that grant is not under reconsideration here. *Id.* at 4-5.

³⁸ *Id.* at 5-8.

³⁹ *NGSO FSS R&O*, 32 FCC Rcd at 7827 para. 55.

limitations to promote sharing among NGSO FSS systems.”⁴⁰ In particular, no minimum number of gateway earth stations in the United States was mandated. Similarly, while we will require compliance with the sharing requirements in section 25.261, including a good-faith coordination obligation, in addition to the sharing of ephemeris data under section 25.146(e), we do not require the additional beam pointing information SpaceX seeks from the OneWeb system because this is precisely the kind of data that operators are expected to exchange during coordination. In the event that a party is unwilling to do so, the other party can bring this behavior to the attention of the Commission, which may intervene to enforce the coordination condition and aid the parties to find a solution.⁴¹

16. *Orbital Debris Mitigation.* SpaceX is concerned about the lack of detailed information in the application with respect to OneWeb’s plans to mitigate orbital debris, in particular for the 1,280 MEO satellites.⁴² An applicant for a space station market access grant must submit a description of the design and operational strategies that it will use to mitigate orbital debris, including a statement detailing post-mission disposal plans for space stations at the end of their operating life, unless the petitioner demonstrates that debris mitigation plans for the space station for which U.S. market access is requested are subject to direct and effective regulatory oversight by the national licensing authority.⁴³ OneWeb states that its orbital debris mitigation plan is subject to direct and effective regulatory oversight by the United Kingdom’s regulatory authorities, including particularly the U.K. Space Agency. OneWeb does not offer additional information as to whether it has submitted debris mitigation plans to the U.K. Space Agency concerning the satellites that are the subject of this application.⁴⁴ It is therefore unclear whether the deployment and debris mitigation plans it proposes have benefitted from review by the U.K. Space Agency, and what criteria will be applied to evaluate those plans. OneWeb states that it will provide additional information upon request.⁴⁵ We have included a condition in this Order designed to ensure the Commission can confirm the suitability of OneWeb’s orbital debris plan and to improve transparency with respect to other operators. Specifically, OneWeb must submit within six months following this grant, a description of its debris mitigation plans and must also submit a copy of any debris mitigation plans submitted to the United Kingdom, and a description of the criteria used by the United Kingdom in evaluating debris mitigation plans for MEO operations. This grant is conditioned upon a favorable finding, based upon the information to be submitted, that OneWeb’s debris mitigation plans are suitable under FCC rules, or that those plans are subject to direct and effective regulation by the United Kingdom.

17. With respect to SpaceX’s comments concerning MEO operations, the prevailing practice for satellite systems operating in circular MEO orbits is to dispose of satellites in a stable circular orbit above the operational altitude. However, other strategies, such as selection of unstable disposal orbits that exploit natural forces in order to avoid concentration of disposed satellites at particular circular orbital altitudes have also been proposed as feasible disposal solutions,⁴⁶ and the recently revised U.S. Government Orbital Debris Mitigation Standard Practices outlines multiple options for disposal of MEO

⁴⁰ *Id.*

⁴¹ *Id.* at para. 48.

⁴² SpaceX Comments at 3-4.

⁴³ 47 CFR § 25.114(d)(14)(v).

⁴⁴ OneWeb Consolidated Opposition at 23-24 (filed August 27, 2018). It is our understanding that the U.K. Space Agency has to date reviewed OneWeb activities on a launch-by-launch basis.

⁴⁵ *Id.*

⁴⁶ *See, e.g.,* Constellation and “Graveyard” Collision Risk for Several MEO Disposal Strategies, Alan B. Jenkin and John P. McVey, in the Proceedings of the 5th European Conference on Space Debris, Darmstadt, Germany 30 March – 2 April 2009, (ESA SP-672, July 2009), available at: <https://conference.sdo.esoc.esa.int/proceedings/sdc5/paper/90/SDC5-paper90.pdf>.

satellites.⁴⁷ Given the large number of satellites involved in OneWeb's proposed MEO deployment, there is some potential that use of the prevailing strategy could result in concentration of satellites in a "graveyard" region and relatively large collision risks, with negative effects on other orbits. We therefore expect that OneWeb either has analyzed or will analyze this risk and available options for mitigation. The conditions adopted will ensure that OneWeb's debris mitigation plans for its proposed MEO deployment are fully reviewed prior to deployment.

18. OneWeb will be subject to the same orbital debris mitigation conditions as other NGSO systems, including a requirement that it coordinate its physical operations with space stations of NGSO systems operating at similar orbital altitudes.⁴⁸ To the extent that OneWeb and other NGSO operators fail to come to an agreement regarding physical coordination, the Commission may intervene as appropriate. We also note that the Commission recently released a Report and Order comprehensively updating its orbital debris rules and initiating a related Further Notice of Proposed Rulemaking.⁴⁹ The OneWeb V-Band system will be subject to any applicable rules adopted in this proceeding.

19. *Radio Astronomy.* The transmission of out-of-band signals into allocated radio astronomy bands can cause interference to radio astronomy observations, especially for transmissions pointed directly to the radio astronomy site. Radio astronomy has a primary allocation in the 42.5-43.5 GHz band.⁵⁰ OneWeb is urged to take all practicable steps to ensure that out-of-band signals of its space station transmissions in the 40.5-42 GHz band protect radio astronomy operations in the 42.5-43.5 GHz band.⁵¹ In the bands in question, the relevant sites are the Green Bank Telescope, the Very Long Baseline Array, and the Very Large Array.⁵²

20. For the Earth-to-space operations in the 48.94-49.04 GHz band, OneWeb is again urged to take all practicable steps to protect spectral line observations conducted in the radio astronomy service in this frequency band.⁵³

21. The National Telecommunication and Information Administration (NTIA) also requests that OneWeb should be made aware that radio astronomy as a service frequently makes use of observations (passive) in bands not allocated to the radio astronomy service. NTIA states that this practice is a result of scientifically valuable signals being subject to the Doppler Effect and shifted in frequency outside radio astronomy-allocated bands. NTIA provided the National Science Foundation Spectrum Management Unit (esm@nsf.gov) as a point of contact to assist with coordination and information on radio astronomy sites.

22. *Waiver Standard.* OneWeb seeks waivers of several of the Commission's rules. Generally, the Commission may waive any rule for good cause shown.⁵⁴ Waiver is appropriate where the particular facts make strict compliance inconsistent with the public interest.⁵⁵ In making this determination, we may take into account considerations of hardship, equity, or more effective

⁴⁷U.S. Government Orbital Debris Mitigation Standard Practices November 2019 Update, pp 5-6, available at https://orbitaldebris.jsc.nasa.gov/library/usg_orbital_debris_mitigation_standard_practices_november_2019.pdf.

⁴⁸ See, e.g., *Telesat Ka-band Order*, 32 FCC Rcd at 9675, para. 29c.

⁴⁹ *Mitigation of Orbital Debris in the New Space Age*, Report and Order and Further Notice of Proposed Rulemaking, IB Docket No. 18-313, 35 FCC Rcd 4156 (2020).

⁵⁰ See 47 CFR § 2.106.

⁵¹ See 47 CFR § 2.106, footnote US211.

⁵² See 47 CFR § 2.106, footnote US131, for locations of these radio astronomy observatories.

⁵³ See 47 CFR § 2.106, footnote US342.

⁵⁴ 47 CFR § 1.3.

⁵⁵ *Northeast Cellular Tel. Co. v. FCC*, 897 F.2d 1164, 1166 (D.C. Cir. 1990).

implementation of overall policy on an individual basis.⁵⁶ Waiver is therefore appropriate if special circumstances warrant a deviation from the general rule, such deviation will serve the public interest, and the waiver does not undermine the validity of the general rule.⁵⁷

23. *Request for FSS Operations in the 50.4-51.4 GHz Band and Associated Waivers.* OneWeb requests access to the U.S. market in the 50.4-51.4 GHz band.⁵⁸ This band is allocated for FSS uplinks in the U.S. Table of Frequency Allocations, but at the time OneWeb filed its Petition the 50.4-51.4 GHz band was not listed among the available frequencies for FSS in section 25.202(a)(1) of the rules. OneWeb requested a waiver of the section 25.202(a)(1) list of available frequencies for FSS. The Commission has since removed the list of frequencies in section 25.202(a)(1) as unnecessary,⁵⁹ thereby eliminating this barrier against applying for FSS use of the frequencies in the 50.4-51.4 GHz band. Accordingly, OneWeb's request for a waiver of section 25.202(a)(1) is dismissed as moot.

24. *Sharing with NGSO Systems and Waiver of Band-Splitting Procedure.* Until recently, section 25.157(e) of the Commission's rules provided that "available spectrum" be "divided equally" among the applications granted as the result of a processing round.⁶⁰ This rule presumed that NGSO operators could not use the same frequencies without causing harmful interference to each other, and therefore must be assigned discrete segments of the requested band. OneWeb requests a waiver of section 25.157(e), stating that its system can share spectrum with other NGSO FSS systems.⁶¹ In the *NGSO FSS R&O*, the Commission adopted rule changes that apply a spectrum sharing mechanism to all authorized NGSO FSS systems that include a condition of grant requiring compliance with section 25.261.⁶² As in other NGSO FSS authorizations, we include such a condition requiring OneWeb to comply with the spectrum sharing requirements specified in section 25.261 with respect to any other NGSO system licensed or granted U.S. market access pursuant to the processing round in which OneWeb participated for all operations within the United States.⁶³ Accordingly, OneWeb's request for waiver of section 25.157(e) is no longer needed and is dismissed as moot.

25. *Section 25.156(d)(5) Waiver.* OneWeb requests a waiver of section 25.156(d)(5) of the Commission's rules.⁶⁴ At the time OneWeb filed its Petition, section 25.156(d)(5) stated that in frequency bands where the Commission has not adopted band specific service rules it will not consider applications for NGSO-like operation after it has granted an application for GSO-like operation, and vice-versa, unless and until the Commission establishes NGSO/GSO sharing criteria for that frequency band.⁶⁵ The Commission eliminated section 25.156(d)(5) in the *NGSO FSS R&O*⁶⁶ and this rule change is now in effect. Consequently, OneWeb's request for a waiver of this requirement is dismissed as moot.

⁵⁶ *WAIT Radio v. FCC*, 418 F.2d 1153, 1159 (D.C. Cir. 1969), *cert. denied*, 409 U.S. 1027 (1972); *Northeast Cellular*, 897 F.2d at 1166.

⁵⁷ *NetworkIP, LLC v. FCC*, 548 F.3d 116, 125-28 (D.C. Cir. 2008); *Northeast Cellular*, 897 F.2d at 1166; *WAIT Radio*, 418 F.2d at 1158.

⁵⁸ SpaceX supports OneWeb's waiver request regarding operations in the 50.4-51.4 GHz band. SpaceX Comments at 5.

⁵⁹ *NGSO FSS R&O*, 32 FCC Rcd at 7817-18, para. 27.

⁶⁰ 47 CFR § 25.157(e).

⁶¹ OneWeb Petition at 28-30.

⁶² *NGSO FSS R&O*, 32 FCC Rcd at 7825-26, paras. 48-50.

⁶³ 47 CFR § 25.261. *See also Audacy Order*, 33 FCC Rcd at 5573, para. 42; *O3b Order*, 33 FCC Rcd at 5527, para. 51.

⁶⁴ OneWeb Petition at 26-27.

⁶⁵ 47 CFR § 25.156(d)(5).

26. *Section 25.112 Waiver Request.* OneWeb also requests waiver of the application acceptability requirements in section 25.112 out of an abundance of caution.⁶⁷ After review of the OneWeb Petition and technical exhibits, we find that it satisfies the acceptability standards in section 25.112, and therefore OneWeb's request for waiver is dismissed as moot.

27. *Section 25.156(d)(4) Waiver Request.* OneWeb requests a waiver of section 25.156(d)(4) of the Commission's rules.⁶⁸ Section 25.156(d)(4) provides that the Commission will consider applications for authority to operate feeder links separately from applications to provide service.⁶⁹ However, OneWeb's V-band constellation is an FSS system and by definition does not have feeder links,⁷⁰ making waiver of section 25.156(d)(4) unnecessary. We therefore dismiss OneWeb's request as moot.

28. *Request for Waivers of Sections 25.210(i) and 25.217(b)(1).* OneWeb also requests, out of an abundance of caution, waiver of a part of the default service rules that now cross-references a cross-polarization isolation requirement for Direct Broadcast Satellites. Section 25.217(b)(1) provides default service rules for NGSO applicants where frequency-band-specific service rules are not yet in place. When those default service rules were adopted in 2003, they required compliance with a 30 dB cross-polarization isolation requirement in section 25.210(i) generally applicable to the FSS.⁷¹ Later, section 25.210(i) was revised to add a separate, 25 dB cross-polarization isolation requirement applicable only to DBS operations. In 2015, the Commission concluded that the 30 dB FSS cross-polarization isolation requirement was no longer necessary and repealed it for all FSS. Inadvertently, however, the default service rules in 25.217(b)(1) were not updated, leaving the cross-reference to 25.210(i), which now only contains the DBS-specific 25 dB cross-polarization isolation requirement. The requirement of the current section 25.210(i), which applies to DBS operations, was never intended to be applied, by cross-reference, as a default service rule for FSS operations. In these circumstances, and for the foregoing reasons, we grant these waiver requests.

IV. ORDERING CLAUSES

29. Accordingly, IT IS ORDERED, that the Letter of Intent filed by WorldVu Satellites Limited, debtor-in-possession, d/b/a OneWeb, IS GRANTED IN PART AND DISMISSED IN PART, pursuant to section 303(r) of the Communications Act of 1934, as amended, 47 U.S.C. § 303(r), and section 25.137(c) of the Federal Communication Commission's rules, 47 CFR § 25.137(c), as set forth below.

30. IT IS FURTHER ORDERED that any future grant of earth station licenses for operations with the OneWeb system will be subject to the following conditions:

- a. Communications between U.S.-licensed earth stations and OneWeb space stations must comport with all existing and future space station coordination agreements reached between the United Kingdom and other administrations, including all coordination agreements reached between the United Kingdom and the United States. In the absence of a coordination

(Continued from previous page) _____

⁶⁶ *NGSO FSS R&O*, 32 FCC Rcd at 7821-22, para. 39.

⁶⁷ OneWeb Petition at 25.

⁶⁸ *Id.* at 28 n.76.

⁶⁹ 47 CFR § 25.156(d)(4).

⁷⁰ 47 CFR § 25.103 (defining a feeder link as a "radio link from a fixed earth station at a given location to a space station, or vice versa, conveying information for a space radiocommunication service other than the Fixed-Satellite Service").

⁷¹ *Amendment of the Commission's Space Station Licensing Rules and Policies*, First Report and Order, 18 FCC Rcd 10760, 10903, Appx. C (2003).

agreement, such communications must comport with applicable provisions of the ITU Radio Regulations.

- b. Operations in the 37.5-40.0 GHz band must comply with the power flux density limits in 25.208(r) and are unprotected with respect to the non-federal fixed and mobile services, except as authorized pursuant to 47 CFR § 25.136.
- c. Operations in the 37.5-40.0 GHz band are authorized up to the power flux-density limits in 47 CFR § 25.208(r)(1). These limits cannot be exceeded even during rain fade.
- d. Operations in the 37.5-38.0 GHz and 40.0-40.5 GHz bands must be successfully coordinated with Federal Space Research Service (SRS) facilities, pursuant to Recommendation ITU-R SA.1396, "Protection Criteria for the Space Research Service in the 37-38 GHz and 40.0-40.5 GHz Bands."
- e. Operations in the 37.5-42 GHz band (space-to-Earth) must not cause unacceptable interference to, or claim protection from, a GSO FSS or Broadcasting-Satellite Service network. These operations have to comply with ITU Radio Regulations Nos, 22.5L and 22.5M, when these provisions become effective.
- f. Operations in the 40-42 GHz band are authorized up to the power-flux density limits in 47 CFR § 25.208(s) and (t).
- g. In accordance with footnote US211 to 47 CFR § 2.106, OneWeb is urged to take all practicable steps to protect radio astronomy observations in the adjacent bands from harmful interference from its operations in the 40.5-42 GHz band.
- h. Operations in the 47.2-48.2 GHz and the 50.4-51.4 GHz band must provide interference protection to the fixed and mobile services, except as authorized pursuant to 47 CFR § 25.136.
- i. Operations in the 47.2-50.2 GHz and 50.4-51.4 GHz bands (Earth-to-space) must not cause unacceptable interference to, or claim protection from, a GSO FSS or Broadcasting-Satellite Service network. These operations have to comply with ITU Radio Regulations Nos, 22.5L and 22.5M, when these provisions become effective.
- j. Any future grant of earth station licenses for operations with the OneWeb system will be subject to the following condition: in the 48.94-49.04 GHz band, operations must be coordinated with radio astronomy stations operating on a co-primary basis in this band.
- k. In accordance with footnote US342 to 47 CFR § 2.106, OneWeb is urged to take all practicable steps to protect radio astronomy observations from harmful interference from its operations in the 48.94-49.04 GHz band.
- l. Earth station emissions into the 50.2-50.4 GHz band must comport with the limits contained in ITU-R Resolution 750 (REV. WRC-19) upon its entry into force on January 1, 2021.
- m. Operations must comply with the spectrum sharing procedures among NGSO FSS space stations specified in 47 CFR § 25.261 with respect to any NGSO system licensed or granted U.S. market access pursuant to the processing round initiated in Public Notice, DA 16-1244. Spectrum sharing between OneWeb's operations and operations of NGSO systems licensed or granted U.S. market access, where OneWeb's operations do not include communications to or from U.S. territory, are governed only by the ITU Radio Regulations and are not subject to section 25.261.

- n. OneWeb must comply with the sharing of ephemeris data procedures described in section 25.146 of the Commission's rules, 47 CFR § 25.146(e).⁷²
- o. OneWeb must submit, within six months following this grant, a description of its debris mitigation plans. OneWeb must also submit in the International Bureau Filing System a copy of any debris mitigation plans submitted to the United Kingdom, and a description of the criteria used by the United Kingdom in evaluating debris mitigation plans for Medium Earth Orbit operations. This grant is conditioned upon a favorable finding, based upon the information to be submitted, that OneWeb's debris mitigation plans are suitable under FCC rules, or that those plans are subject to direct and effective regulatory oversight by the United Kingdom.
- p. OneWeb must coordinate physical operations of spacecraft with any operator using similar orbits, for the purpose of eliminating collision risk and minimizing operational impacts. The orbital parameters specified in this grant are subject to change based on such coordination.

31. IT IS FURTHER ORDERED that this grant of U.S. market access and any earth station licenses granted in the future are subject to modification to bring them into conformance with any rules or policies adopted by the Commission in the future.

32. IT IS FURTHER ORDERED that this grant of U.S. market access does not address the provision of any Direct-to-Home (DTH) service, Direct Broadcast Satellite (DBS) Service⁷³ or Digital Audio Radio Service (DARS) to, from, or within the United States.

33. IT IS FURTHER ORDERED that this grant is subject to the following requirements:

- a. OneWeb must post a surety bond in satisfaction of 47 CFR §§ 25.165(a)(1) & (b) no later than **September 26, 2020**, and thereafter maintain on file a surety bond requiring payment in the event of a default in an amount, at minimum, determined according to the formula set forth in 47 CFR § 25.165(a)(1); and
- b. OneWeb must launch 50 percent of the maximum number of proposed space stations, place them in the assigned orbits, and operate them in accordance with this grant of U.S. market access no later than **August 26, 2026**, and must launch the remaining space stations necessary to complete its authorized service constellation, place them in their assigned orbits, and operate them in accordance with the grant of U.S. market access no later than **August 26, 2029**. 47 CFR § 25.164(b).

Failure to post and maintain a surety bond will render this grant of U.S. market access null and void automatically, without further Commission action. Failure to meet the milestone requirements of 47 CFR § 25.164(b) may result in OneWeb's authorization being reduced to the number of satellites in use at the milestone date. Failure to comply with the milestone requirements of 47 CFR § 25.164(b)(1) will also result in forfeiture of OneWeb's surety bond. By **September 10, 2026**, OneWeb must either demonstrate compliance with this milestone requirement or notify the Commission in writing that the requirement was not met. 47 CFR § 25.164(f).

34. IT IS FURTHER ORDERED that the request for waivers of 47 CFR §§ 25.210(i) and 25.217(b)(1), ARE GRANTED.

⁷² In the *NGSO FSS R&O*, we extended the requirement for NGSO FSS operators to share ephemeris data to all frequency bands in which NGSO FSS systems operate. See *NGSO FSS R&O*, 32 FCC Rcd at 7815-16, 7826, 7828, paras. 18, 20, 52, 58, and n.131.

⁷³ With respect to DBS and DTH, this paragraph excludes from the scope of the grant those services specified in 47 CFR § 25.701(a)(1)-(5).

35. IT IS FURTHER ORDERED that the request for waivers of 47 CFR §§ 25.112, 25.156(d)(4), 25.156(d)(5), 25.157(e), and 25.202(a)(1), ARE DISMISSED AS MOOT.

FEDERAL COMMUNICATIONS COMMISSION

Marlene H. Dortch
Secretary