

WorldVu Satellites Limited
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Exhibit A: Narrative Statement

WorldVu Satellites Limited (“OneWeb”) seeks authority from the Federal Communications Commission (the “Commission”) to operate up to 400,000 fixed dual parabolic user terminals (“User Terminals”) under a blanket license to communicate with the OneWeb non-geostationary orbit, fixed-satellite service (“NGSO FSS”) system. In accordance with the terms of OneWeb’s grant of U.S. market access, these User Terminals will operate in the 10.7-12.7 GHz band (downlink) and the 14.0-14.5 GHz band (uplink). Grant of the instant application will serve the public interest, convenience, and necessity. For the reasons set forth herein, OneWeb respectfully requests the expeditious grant of the instant application.

I. Introduction and Overview of Proposed Operations

The OneWeb NGSO FSS system is authorized to access the U.S. market in the 10.7-12.7 GHz and 14.0-14.5 GHz frequencies.¹ OneWeb successfully launched its first six production satellites into low-earth orbit on February 27, 2019, with additional launches planned for later this year.² OneWeb has already sought authority for four Ka-band gateway earth station facilities

¹ See *WorldVu Satellites Limited, Petition for a Declaratory Ruling Granting Access to the U.S. Market for the OneWeb NGSO FSS System*, Order and Declaratory Ruling, 32 FCC Rcd 5366 (2017) (“OneWeb Market Access Grant”). OneWeb also incorporates by reference the OneWeb Market Access grant to demonstrate compliance with the requirements of Section 25.137 of the Commission’s rules for earth station applicants proposing to communicate with non-U.S.-licensed space stations. In addition, OneWeb certifies that it has complied with all applicable Commission requirements for non-U.S.-licensed systems to operate in the United States. See 47 C.F.R. § 25.137(a), (d).

² See, e.g., Jackie Wattles, *OneWeb Launches First Batch of Internet Satellites*, CNN (Feb. 28, 2019, 7:02 PM), <https://www.cnn.com/2019/02/27/tech/oneweb-internet-satellite-launch/index.html>.

located in the United States,³ and recently inaugurated a state-of-the-art satellite manufacturing facility in Florida that, in the words of Chairman Pai, promises to do “for the satellite industry what Henry Ford did for cars.”⁴

Authorization to operate the User Terminals across the United States represents a critical step forward in OneWeb’s operational deployment. Authorization for ubiquitous user terminal deployment will enable the most efficient provision of OneWeb’s high-speed, low-latency satellite connectivity service to the U.S. consumer. Such authorization is essential to OneWeb’s efforts to expedite the deployment of its satellite-based connectivity service to those U.S. consumers who currently have no or limited access to broadband due to the lack of terrestrial networks in rural and remote locations.

II. Compatibility with Existing Ku-band Allocations and Spectrum Sharing Regulations

The 10.7-12.7 and 14.0-14.5 GHz bands are allocated to the FSS on a primary or co-primary basis, and the Commission’s rules permit blanket licensing of NGSO FSS earth stations in these bands.⁵ OneWeb’s Market Access Grant permits OneWeb to access these frequencies subject to certain conditions.⁶ As a general matter, OneWeb will operate the User Terminals in a

³ See IBFS File Nos. SES-LIC-20180604-01082 (filed Jun. 4, 2018); SES-LIC-20180727-02075 (filed Jul. 27, 2018); SES-LIC-20180727-02076 (filed Jul. 27, 2018); SES-LIC-20190422-00538 (filed Apr. 22, 2019).

⁴ See Jeff Foust, *OneWeb Satellites inaugurates Florida factory*, SPACENEWS (Jul. 22, 2019), <https://spacenews.com/oneweb-satellites-inaugurates-florida-factory/>; see also *Remarks of Chairman Pai at the Opening of OneWeb Satellites’ Production Facility*, FCC (Jul. 22, 2019), <https://docs.fcc.gov/public/attachments/DOC-358604A1.pdf>.

⁵ See 47 C.F.R. § 2.106; see also 47 C.F.R. § 25.115(f)(2).

⁶ OneWeb Market Access Grant at ¶¶ 23(a)-(e); 24(a)-(b).

manner consistent with these current allocations and regulations concerning Ku-band earth stations. In particular, OneWeb certifies or already has certified it will comply with the following restrictions:

- ***Equivalent Power Flux-Density Requirements (“EPFD”)***. To protect geostationary satellite operations in these bands, OneWeb has already certified it will satisfy all applicable obligations under Article 22 and Resolution 76 of the International Telecommunication Union’s (“ITU”) Radio Regulations, currently codified by reference in the Commission’s rules.⁷ As the Commission has noted, “[a]ny NGSO FSS system operating in compliance with these limits is considered as having fulfilled its obligation under Article 22 of the ITU Radio Regulations not to cause unacceptable interference to any GSO network.”⁸
- ***Power-Flux Density Requirements (“PFD”)***. OneWeb has certified it will satisfy all applicable obligations under Article 21 of the ITU Radio Regulations and the corresponding PFD limits set forth in Section 25.208 of the Commission’s rules in these bands.⁹
- ***Coordination with Radio Astronomy Service***. OneWeb will also coordinate with the radio astronomy service and observatories, where applicable, prior to commencing operations.¹⁰

⁷ See *id.* at ¶ 23(b)-(e); see also 47 C.F.R. §§ 25.115(f)(1), 25.146(a)(2) (requiring NGSO FSS earth station applications to contain the required certification regarding EPFD compliance). To clarify the slight discrepancy between the relevant conditions on the OneWeb Market Access Grant and the Commission’s EPFD certification requirement, OneWeb respectfully submitted an EPFD and PFD certification letter earlier this year. See Letter from Brian D. Weimer, Counsel to WorldVu Satellites Limited, to Marlene H. Dortch, Secretary, FCC, IBFS File No. 20160428-00041 (Mar. 14, 2019) (“EPFD/PFD Certification Letter”).

⁸ See *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, 7820 at ¶ 32 (2017) (“NGSO Order”).

⁹ See EPFD/PFD Certification Letter.

¹⁰ See 47 C.F.R. § 2.106, nn. US113, US131, US211, US342; see also OneWeb Market Access Grant at ¶ 24(a)-(b).

OneWeb will otherwise comply with the applicable conditions contained in the OneWeb Market Access Grant and the Commission’s Part 25 rules.¹¹

III. Grant of the Instant Application Will Serve the Public Interest

Grant of the instant application will authorize deployment of the end-user component of the OneWeb system and expedite deployment of OneWeb’s satellite connectivity service to U.S. consumers. OneWeb received U.S. market access in June 2017 and began applying for Ka-band gateway earth stations in 2018.¹² Obtaining authority for User Terminal operations is the critical next step as OneWeb prepares to commence commercial service in the United States and abroad.

In the OneWeb Market Access Grant, the Commission noted that by granting market access to OneWeb, it was “advanc[ing] [its] mandate ‘to make available, so far as possible, to all the people of the United States . . . rapid, efficient, Nation-wide, and world-wide’ communication services.”¹³ By granting OneWeb authority to operate User Terminals in the United States, the Commission will unlock the ability of the OneWeb system to provide next-generation connectivity service to U.S. consumers on a nationwide basis, including many unserved and underserved locations.

Granting OneWeb authority to operate the User Terminals in the United States is consistent with the Commission’s “fundamental approach: [to] encourage the private sector to

¹¹ See OneWeb Market Access Grant, ¶¶ 23-25. Additionally, OneWeb hereby certifies that it is planning to use a contention protocol, and such contention protocol usage will be reasonable. See 47 C.F.R. § 25.115(i).

¹² See *supra* nn. 1, 3.

¹³ OneWeb Market Access Grant, at ¶ 1.

invest and innovate and allow market forces to deliver value to American consumers.”¹⁴ As

OneWeb has emphasized and the Commission has recognized, NGSO-provisioned connectivity will be a critical component of efforts to bridge the digital divide in the United States.¹⁵

OneWeb in particular will be able to provide innovative services and applications to markets that previously were not possible.¹⁶ The expeditious grant of the instant application will contribute to closing the digital divide and allow OneWeb to provide innovative connectivity where terrestrial providers cannot.

¹⁴ See *Statement of Chairman Ajit Pai, FCC Boosts Satellite Broadband Connectivity & Competition*, FCC (Nov. 15, 2018).

¹⁵ See Jeffrey Hill, *FCC Chairman Wants to Cultivate Innovation in Space*, VIA SATELLITE (Feb. 2019), <https://www.satellitetoday.com/government-military/2019/01/22/fcc-chairman-wants-to-cultivate-innovation-in-space/> (Chairman Pai stating he is “bullish” about satellite systems being the best solution to bridging the digital divide in the United States).

¹⁶ See Mark Holmes, *Greg Wyler, The Definitive 2018 Interview*, VIA SATELLITE (Dec. 2018), <http://interactive.satellitetoday.com/via/december-2018/greg-wyler-the-definitive-2018-interview/> (OneWeb will work to ensure that “emergency response vehicles are outfitted appropriately so that they can maintain continuous, low latency connectivity” that “can continue after a hurricane and an emergency”).

IV. Conclusion

For the foregoing reasons, OneWeb respectfully requests authority to operate the User Terminals in the United States.

Respectfully submitted,

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APPENDIX A

As a supplement to the information contained in the Schedule B attached to the Form 312, OneWeb provides the following additional technical information:

- For entry cell E49, the appropriate input unit is dBW/4 kHz.

APPENDIX B: RADIATION HAZARD REPORTS

In accordance with OET Bulletin 65, this Radiation Hazard Report measured radiation exposure levels in seven zones for two cases—general population and occupational—at the closest point to the uncontrolled area of any testing location and measured at the lowest elevation angle of any testing location. The radiation levels calculated for each zone in Section I(B) and Section II(B) are derived from the respective calculations made in Section I(A) and Section II(A). The results in Section I(C) for OneWeb’s 12 dB/K Dual Parabolic antenna and Section II(C) for OneWeb’s 15 dB/K Dual Parabolic antenna illustrate any radiation hazard that may exist for the general public and/or occupationally will be mitigated by a protective layer covering the antenna.

I. Intellian 12 dB/K Dual Parabolic Antenna

A. Defined & Calculated Variables for OET Bulletin 65

Variables	Value	Unit	OET 65 Calculated Variables	Formula	Value	Unit
$D =$ Aperture Diameter	0.75	Meters	$\lambda =$ Wavelength	c/F	0.0210	Meters
$d =$ Subreflector Diameter	0.085	Meters	$P_1 =$ Total Antenna Input Power	$P * p$	1.15	Watts
$\eta =$ Aperture Efficiency	70%	Percentage	$A =$ Area of reflector	$\pi(D/2)^2$	0.44179	Meters ²
FCC Designation	Ku	Band	$a =$ area of sub-reflector	$\pi(d/2)^2$	0.00567	Meters ²
$F =$ Frequency	14250	MHz	$G =$ Antenna Gain	$G = 4\pi\eta A/\lambda^2$	8780.28545	Linear
$P =$ Transmitter Power Watts	1.15	Watts	Antenna Gain dB	$10\log_{10}(G)$	39.44	dBi
$p =$ Number of Transmitters	1	#	$R_{nf} =$ Near-Field Region	$R_{nf} = D^2/4\lambda$	6.68	Meters
$R_{ua} =$ Closest Point to Uncontrolled Area	0.38	Meters	Transition Region	$>R_{nf} < R_{ff}$	6.68	>Meters
$R_{ua} =$ Elevation angle at closest point	37	Degrees			16.04	<Meters
					16.04	Meters
			$R_{ff} =$ Far-Field Region	$R_{ff} = 0.6D^2/\lambda$	12.1	Meters AGL

B. Radiation Levels in Each Zone

Radiation Analysis Zone		Formula	Level	Value	Exposure Limits Met	
					General Public	Occupational
					<1mW/cm ²	<5mW/cm ²
1	Power Sub-reflector	$4P_I/a$	81.064	mW/cm ²	No	No
2	Antenna Surface	$4P_I/A$	1.041	mW/cm ²	No	Yes
3	Main Reflector Ground	P_I/A	0.260	mW/cm ²	Yes	Yes
4	$S_{nf} =$ Near-Field Power Density	$4\eta(P_I/A)$	0.729	mW/cm ²	Yes	Yes
5	Transition Max Power Density	$S_{nf} * R_{nf}/R_{nf}$	0.729	mW/cm ²	Yes	Yes
6	Far-Field Max Power Density	$P_I * G/4\pi R^2$	0.312	mW/cm ²	Yes	Yes
7	Off-axis Near Field	Snf-20dB	0.00729	mW/cm ²	Yes	Yes

C. Results

OneWeb's 12 dB/K Dual Parabolic antenna creates no general population nor occupational radiation hazard. Zones 3 through 7 create no radiation hazard concerns because the radiation levels are below the acceptable exposure limits. Although Zone 1 (Power Sub-reflector) exceeds the acceptable general population and occupational radiation exposure limits and Zone 2 (Antenna Surface) exceeds the acceptable general population radiation exposure limits, there remains no radiation hazard concern because these zones are contained within a protective radome. Accordingly, there is no risk of radiation exposure beyond the acceptable limits.

II. Intellian 15 dB/K Dual Parabolic Antenna

A. Defined & Calculated Variables for OET Bulletin 65

Variables	Value	Unit	OET 65 Calculated Variables	Formula	Value	Unit
$D =$ Aperture Diameter	1.0	Meters	$\lambda =$ Wavelength	c/F	0.0210	Meters
$d =$ Subreflector Diameter	0.085	Meters	$P_1 =$ Total Antenna Input Power	$P * p$	0.58	Watts
$\eta =$ Aperture Efficiency	70%	Percentage	$A =$ Area of reflector	$\pi(D/2)^2$	0.78540	Meters ²
FCC Designation	Ku	Band	$a =$ area of sub-reflector	$\pi(d/2)^2$	0.00567	Meters ²
$F =$ Frequency	14250	MHz	$G =$ Antenna Gain	$G =$ $4\pi\eta A/\lambda^2$	15609.3963	Linear
$P =$ Transmitter Power Watts	0.58	Watts	Antenna Gain dB	$10\log_{10}(G)$	41.93	dBi
$p =$ Number of Transmitters	1	#	$R_{nf} =$ Near-Field Region	$R_{nf} = D^2/4\lambda$	11.88	Meters
$R_{ua} =$ Closest Point to Uncontrolled Area	0.52	Meters	Transition Region	$>R_{nf} < R_{ff}$	11.88	>Meters
$R_{ua} =$ Elevation angle at closest point	37	Degrees			28.52	<Meters
			$R_{ff} =$ Far-Field Region	$R_{ff} =$ $0.6D^2/\lambda$	28.52	Meters
					21.5	Meters AGL

B. Radiation Levels in Each Zone

Radiation Analysis Zone		Formula	Level	Value	Exposure Limits Met	
					General Public	Occupational
					<1mW/cm ²	<5mW/cm ²
1	Power Sub-reflector	$4P_I/a$	40.885	mW/cm ²	No	No
2	Antenna Surface	$4P_I/A$	0.295	mW/cm ²	Yes	Yes
3	Main Reflector Ground	P_I/A	0.074	mW/cm ²	Yes	Yes
4	$S_{nf} =$ Near-Field Power Density	$4\eta(P_I/A)$	0.207	mW/cm ²	Yes	Yes
5	Transition Max Power Density	$S_{nf} * R_{nf}/R_{nf}$	0.207	mW/cm ²	Yes	Yes
6	Far-Field Max Power Density	$P_I * G/4\pi R^2$	0.089	mW/cm ²	Yes	Yes
7	Off-axis Near Field	Snf-20dB	0.00207	mW/cm ²	Yes	Yes

C. Results

OneWeb's 15 dB/K Dual Parabolic antenna creates no general population nor occupational radiation hazard. Zones 2 through 7 create no radiation hazard concerns because the radiation levels are below the acceptable exposure limits. Although Zone 1 (Power Sub-reflector) exceeds the acceptable general population and occupational radiation exposure limits, there remains no radiation hazard concern because this zone is contained within a protective radome. Accordingly, there is no risk of radiation exposure beyond the acceptable limits.

APPENDIX C: ANTENNA PERFORMANCE STANDARDS

OneWeb respectfully submits that the Commission’s antenna performance standards contained in Section 25.209 of the Commission’s rules are not applicable to NGSO user terminals.¹⁷ Section 25.209 currently contains performance standards for gateway earth stations in the Ku-band, but no such corresponding provision for user terminals.¹⁸

In developing the original regulatory framework for NGSO FSS systems, the Commission explicitly declined to “specify an NGSO FSS customer premises earth station reference antenna pattern.”¹⁹ The NGSO Order similarly declined to adopt any antenna performance standard for NGSO user terminals, noting that it was “premature to adopt any additional technical limitations to promote sharing among NGSO FSS systems.”²⁰

Accordingly, the antenna performance standard currently contained in the Commission’s rules are inapplicable to OneWeb’s request for authority to operate the User Terminals in the United States.²¹

¹⁷ See 47 C.F.R. § 25.209.

¹⁸ See *id.* at § 25.209(h) (specifying performance standards for Ku-band gateway antennas). As a result, the requirements in Section 25.132 requiring FSS applications to include certifications of the results of a series of radiation pattern tests is similarly inapplicable. See 47 C.F.R. § 25.132(a)(1).

¹⁹ *Amendment of Parts 2 and 25 of the Commission's Rules to Permit Operation of NGSO FSS Systems Co-Frequency with GSO and Terrestrial Systems in the Ku-Band Frequency Range*, 16 FCC Rcd. 4096, 4187 at ¶ 240 (2000)

²⁰ NGSO Order, at ¶ 55.

²¹ OneWeb notes that other NGSO FSS applicants have taken a similar approach when seeking authority for Ku-band user terminals in the United States. See, e.g., SpaceX Services, Application for Blanket Licensed Earth Stations, IBFS File No. SES-LIC-20190211-00151 (filed Feb. 1, 2019).