

**Before the
FEDERAL COMMUNICATIONS COMMISSION
Washington, D.C. 20554**

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| <i>In the Matter of</i> |) | |
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| WORLDVU SATELLITES LIMITED |) | IBFS File No. SAT-LOI-20170301-00031 |
| |) | |
| Petition for Declaratory Ruling |) | |
| Granting Access to the U.S. Market |) | |
| for the OneWeb V-band System |) | |
| |) | |

REPLY OF SPACE EXPLORATION HOLDINGS, LLC

Space Exploration Holdings, LLC (“SpaceX”) hereby replies to the response filed by WorldVu Satellites Limited (“OneWeb”) in the above referenced proceeding.¹ In its initial comments, SpaceX raised several concerns about the completeness of the information OneWeb provided in its application, its plans for limiting orbital debris and safe de-orbiting of satellites, and the potential for its system to cause interference to other non-geostationary orbit (“NGSO”) satellite systems.² As discussed below, OneWeb’s response ignored or failed to address these important issues. Unless and until OneWeb provides more complete responses, the Commission should either defer consideration of its application or condition any grant appropriately.

For example, SpaceX noted that OneWeb’s application provides no information on the critical issue of orbital debris mitigation.³ Ironically, OneWeb asserts that it is “an industry leader

¹ See Consolidated Response of WorldVu Satellites Limited, IBFS File No. SAT-LOI-20170301-00031 (July 27, 2017) (“OneWeb Response”).

² See Comments of Space Exploration Holdings, LLC, IBFS File Nos. SAT-LOA-20161115-00117, *et al.* (July 17, 2017) (“SpaceX Comments”).

³ See SpaceX Comments at 3.

on issues of debris mitigation and orbital safety,”⁴ yet argues that it need not provide any information related to these issues for its proposed V-band operations because its licensing administration, the United Kingdom, provides adequate oversight on such matters. To defend this posture, OneWeb points to the Commission’s grant of its application for market access using its Ku/Ka-band constellation, which was conditioned on OneWeb remaining subject to U.K. oversight.⁵

OneWeb glosses over the fact that in order to secure that Ku/Ka-band authorization, the company actually did provide technical and operational information to respond to many of the Commission’s orbital debris filing requirements and similar concerns raised by SpaceX. Far from concluding that OneWeb need not submit this important information, the Commission instead found that OneWeb’s actual submission of such technical information mooted those issues.⁶ But OneWeb has not provided similar information with respect to the V-band constellation at issue in this proceeding. As noted in SpaceX’s comments, the Commission has requested similar additional information on a range of orbital debris mitigation topics from other non-U.S. licensed systems seeking access to the U.S. market.⁷ OneWeb states that it is willing to respond to a similar request.⁸ Given the many differences between OneWeb’s Ku/Ka-band NGSO system and its proposed V-band system, and in the interests of consistent treatment of similarly-situated applicants and building the technical and operational record necessary on the critical issue of space

⁴ OneWeb Response at 8.

⁵ *See id.* at 7.

⁶ *See WorldVu Satellites Limited*, 32 FCC Rcd. 5366, ¶ 4 n.12 (2017).

⁷ *See* SpaceX Comments at 3 and n.6.

⁸ *See* OneWeb Response at 7-8.

safety, the Commission should require that OneWeb submit the same sort of detailed orbital debris mitigation information it has sought from other applicants in this processing round and that OneWeb itself provided with respect to its Ku/Ka-band system.

OneWeb also claims that it has provided a description of its NGSO system – composed of 720 low-Earth orbit (“LEO”) and 1,280 medium-Earth orbit (“MEO”) satellites – that is “complete, accurate, and sufficient for the Commission and any interested parties to evaluate.”⁹ Yet OneWeb did not respond to several issues raised by SpaceX. For example, SpaceX questioned why OneWeb would use advanced steerable beams on its V-band payload to improve spectral efficiency and sharing capabilities but not employ them on the Ku/Ka-band payload on the same satellite bus.¹⁰ OneWeb simply ignored this issue. SpaceX also noted that OneWeb’s has publicly announced plan to launch 2,000 LEO satellites in addition to the 720 LEO satellites discussed in its application, and questioned the operational and safety implications of this much larger constellation.¹¹ Again, OneWeb ignored these issues entirely, and did not even acknowledge its own public statements about future expansion of its NGSO system. At a minimum, the Commission should make clear that any authorization it may grant for OneWeb’s V-band NGSO system as applied for in this proceeding would not extend to any future expansion satellites, and specify the additional regulatory steps and technical showings that OneWeb would be required to undertake in order to secure authority to use any additional expansion satellites to provide service in the U.S.

⁹ OneWeb Response at 6.

¹⁰ See SpaceX Comments at 4-5.

¹¹ See *id.* at 4.

SpaceX also questioned the relationship between the 720 LEO satellites to be launched as OneWeb’s first-generation Ku/Ka-band constellation and the 720 LEO satellites in the second-generation V-band constellation, including how OneWeb intends to cycle through the former to deploy the latter. In response, OneWeb explained that its deployment would be an iterative process that would not require rapid turnover from first-generation to second-generation spacecraft.¹² However, given that each spacecraft has a design life of 10 years and the Commission’s rules require deployment of all V-band satellites in OneWeb’s proposed constellation within six years of licensing, SpaceX continues to question how OneWeb sees sufficient time for “iterative” deployment. Moreover, given that OneWeb expects to begin deployment of its V-band constellation no earlier than 2020,¹³ it would need to launch and operate all 2,000 satellites in three years or less – an average of over 55 satellites per month for 36 straight months. OneWeb did not explain how it plans to achieve this proposed deployment on such a compressed schedule.

SpaceX raised concerns that OneWeb’s plan to locate only four gateway earth stations in the U.S. would require its satellites to operate gateway beams at low elevation angles, resulting in significant spreading of those beams and thus increasing the number of in-line events with other NGSO systems.¹⁴ In response, OneWeb does not deny that using fewer gateways would require operation at lower elevation angles. Instead, it first asserts that low elevation angles do not necessarily result in “a significantly larger *beam footprint* (as beam size could be kept constant).”¹⁵ This response directly contradicts OneWeb’s application, which specifically confirms that the area

¹² See OneWeb Response at 5-6.

¹³ See IBFS File No. SAT-LOI-20170301-00031, Legal Narrative at 7 (Mar. 1, 2017) (“OneWeb Application”).

¹⁴ See SpaceX Comments at 5-6.

¹⁵ OneWeb Response at 10 (emphasis in original).

covered on the surface of the earth by its beams – the most relevant metric for predicting in-line interference – will *not* be held constant, but instead will become highly elongated at low elevation angles.¹⁶ OneWeb offers no explanation for this evident discrepancy. OneWeb also argues that its operations at low elevation angles will not cause additional in-line events with other NGSO systems that use higher elevation angles. It acknowledges, though, that the many NGSO operators that have proposed to use minimum elevation angles similar to OneWeb’s would have to accept the “wide geographic spread at their gateway earth stations” as a fact to be addressed through coordination or band splitting.¹⁷ Given that “up to ten or in some cases more [OneWeb] gateway earth station antennas will be collocated at a gateway site,”¹⁸ the number of in-line events those operators can expect to experience would be substantial.

SpaceX also noted that, because OneWeb’s MEO footprint is far larger than its total active service area at any given time, other NGSO operators will not have insight to where within that footprint OneWeb is actually operating unless OneWeb provides the operational steering angles of its beams.¹⁹ Without OneWeb sharing this information, other NGSO operators would be required to split the spectrum or take other measures to ensure they do not cause or experience in-line interference, even though (unbeknownst to them) no such interference would actually have occurred. Not only would such an outcome unnecessarily waste valuable spectrum to the detriment of all NGSO systems and the larger public interest, it also sets up a dangerous and inequitable assumption on OneWeb’s part that it would be able to impose the consequences of its system

¹⁶ OneWeb Application, Technical Narrative at 19-23.

¹⁷ OneWeb Response at 10.

¹⁸ OneWeb Application, Technical Narrative at 6.

¹⁹ *See* SpaceX Comments at 8-9.

design decisions and less than optimal operational parameters onto other NGSO operators, who would bear the burden of mitigating interference that may not even exist. In order to address both the interoperation and inequity issues, SpaceX proposed that the Commission require OneWeb to provide real-time beam pointing information for its MEO satellites.

In response, OneWeb asserts that “data sharing is not possible for any NGSO operator that plans to use steerable beams to service ubiquitously-deployed user terminals or a large number of earth stations at undefined locations.”²⁰ It is surprising that a company that intends to launch several thousand satellites equipped with steerable beams nonetheless lacks the capability to determine where these beams are pointed at a given time, or is somehow unable to share this information – constituting no more than a few megabytes of data – with others. But, in any event, OneWeb does not plan to use V-band spectrum to provide a “ubiquitous” service, but rather for “narrowly focusing additional, high capacity spectrum . . . in small, high traffic density locations such as large metropolitan areas or geographic concentrations of bandwidth-intensive customers.”²¹ If, indeed, such locations are so limited in number and so defined in location,²² OneWeb’s own description of its system significantly undercuts its objection to data sharing. In the alternative, OneWeb asserts that data sharing “would remove the necessary incentive for operators to fully cooperate to adopt interference mitigation measures during bilateral coordination.”²³ To the contrary, SpaceX believes that sharing beam pointing information would provide a mechanism to facilitate such cooperation and enable all affected NGSO systems to

²⁰ OneWeb Response at 11.

²¹ OneWeb Application, Legal Narrative at 6-7.

²² To the extent OneWeb contemplates providing service to earth stations on moving platforms, the Commission currently has no procedure for licensing such a service.

²³ OneWeb Response at 12.

identify false in-line events and thereby avoid wasting valuable spectrum. By imposing a mechanism that will allow both NGSO systems to avoid band splitting, the Commission will enable greater spectrum efficiency and more robust broadband service for American customers.

* * *

As demonstrated above, the “response” filed by OneWeb fails to respond to important issues material to its pending V-band NGSO application. The Commission should request additional information before acting on that application, and impose appropriate conditions in any authorization ultimately granted to address ongoing operational concerns.

Respectfully submitted,

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CERTIFICATE OF SERVICE

I hereby certify that, on this 7th day of August, 2017, a copy of the foregoing pleading was served via U.S. mail upon:

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