

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

In the Matter of)	
)	
O3b Limited)	File No. SAT-AMD-20161115-00116
)	
Amendment to Application to Modify)	
U.S. Market Access Grant for the)	
O3b Medium Earth Orbit Satellite System)	
)	

COMMENTS OF SPACE NORWAY AS

Jostein Rønneberg
Director and Chief Executive Officer
SPACE NORWAY AS

OF COUNSEL:
Phillip L. Spector
Lafayette Greenfield
Milbank, Tweed, Hadley & McCloy LLP
1850 K Street NW, Suite 1100
Washington, DC 20006
(202) 835-7540

June 26, 2017

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COMMENTS OF SPACE NORWAY AS

I. INTRODUCTION

Space Norway AS (“Space Norway”) respectfully submits these comments with regard to the petition (the “Petition”) of O3b Limited (the “Petitioner”) to provide services to the United States via its proposed satellite system.¹ The proposed system involves the use of satellites in non-geostationary orbit (“NGSO”), and specifically in medium Earth orbit (“MEO”).

On May 26, 2017, the Federal Communications Commission (“FCC” or the “Commission”) issued Public Notice DA 17-425² (the “FCC Notice”), announcing that the Commission had accepted the Petition for filing. In this regard, the Commission asked interested parties to submit comments or petitions to deny no later than June 26, 2017.

¹ *O3b Limited, Amendment to Application to Modify U.S. Market Access Grant for the O3b Medium Earth Orbit Satellite System*, IBFS File No. SAT-AMD-20161115-00116 (filed Nov. 15, 2016).

² *See Public Notice DA 17-524*, Report No. SPB-271 at 2 (May 26, 2017).

Space Norway does not oppose the FCC's granting the Petition, so long as the Petitioner is required to comply with the interference-avoidance approach that Space Norway proposed in its comments in a related rulemaking proceeding.³ For reasons explained in those comments and summarized below, the Commission should require MEO NGSO systems to implement mechanisms to avoid in-line interference with highly elliptical orbit ("HEO") NGSO systems with only one active satellite.

II. DISCUSSION

NGSO systems using space stations in HEO, particularly those like Space Norway's Arctic Satellite Broadband Mission ("ASBM") which have high angle of inclination (63.4°), high eccentricity (0.55), and only one active satellite, are easily distinguishable from other types of NGSO systems, such as MEO systems comparable to the Petitioner's system and low Earth orbit ("LEO") systems. The ASBM would be more similar to a geostationary orbit ("GSO") system than to other NGSO constellations because of various factors. Specifically, the ASBM: (i) would have a single active satellite that is quasi-stationary in its active phase (dwells around its apogee for eight hours); (ii) would be similar to a GSO satellite from a LEO/MEO interference perspective; (iii) would have a wide coverage area comparable to a GSO satellite; (iv) is inherently compatible with GSO networks through its orbital inclination and coverage area; (v) would be compatible with GSO user terminals; and (vi) would require the same type and level of protection as afforded to GSO user terminals. In addition, the ASBM would provide "quasi-GSO" coverage at northern latitudes, including providing vital communications services for unserved and underserved remote areas of the Arctic (including those in Alaska).

³ See *Comments of Space Norway AS*, IB Docket 16-408, at 9-12 (filed Feb. 27, 2017).

Because the beams of the ASBM’s satellite would be wide and would have a considerable footprint in the Arctic region, the ASBM’s operations would be affected by lower altitude NGSO satellites, such as the Petitioner’s satellites. As a result of the distance between the Earth and the ASBM’s satellites, particularly during ASBM’s active phase around apogee, multiple simultaneous in-line interference events would almost certainly occur – in the absence of techniques to avoid interference – between the ASBM system’s beams and the beams of a LEO/MEO system that has numerous satellites in multiple planes. Thus, if no mechanism for avoidance of in-line interference between HEO and LEO/MEO systems were adopted, both Space Norway and Petitioner would be forced to limit their operations to their respective selected “home base” spectrum,⁴ which would unavoidably and unnecessarily constrain the amount of spectrum available to both systems to provide their proposed communications services to the public.

A HEO system such as the ASBM, with only one operational satellite (except during a brief hand-over), cannot implement the commonly proposed techniques to avoid in-line interference, such as satellite diversity and progressive pitch. By contrast, it is relatively easy for LEO/MEO systems, such as the Petitioner’s system, to apply in-line interference avoidance techniques used both to protect GSO networks (NGSO systems are required to implement such techniques pursuant to Article 22 of the Radio Regulations of the International Telecommunication Union (the “RR”) to protect GSO operations)⁵ and to co-exist with other

⁴ See 47 CFR § 25.157.

⁵ The ASBM system would also protect GSO systems from interference. See *Space Norway AS, Petition for a Declaratory Ruling Granting Access to the U.S. Market for the Arctic Satellite Broadband Mission*, IBFS File No. SAT-PDR-20161115-00111 at 5 (filed Nov. 15, 2016).

NGSO systems in order to avoid in-line interference events, such as those that would otherwise occur between the ASBM system and the Petitioner's.

Spectrum sharing between ASBM and LEO/MEO systems would require the same protection levels and mechanisms as GSO networks are afforded through the equivalent power flux density limits ("EPFD Limits") in RR Article 22. Specifically, ASBM would require that the EPFD Limits defined for a 1.2 meter antenna in Table 22-1A of the RR be applied for a single continuous 250 MHz band segment in Ku-band and that the EPFD Limits defined for a 90 centimeter antenna in Table 22-1C be applied for a single continuous 500 MHz band segment in Ka-band.

Thus, Space Norway believes that it is in the public interest for the responsibility for in-line interference avoidance between the Petitioner's system and the ASBM system to be placed on the Petitioner, to be implemented through application of EPFD Limits to limited band segments in Ku- (250 MHz) and Ka-band (500 MHz). The Petitioner will need to implement mechanisms for the avoidance of NGSO in-line interference and GSO interference in any event, and it is in the Petitioner's interest not to restrict its operations to a relatively small amount of "home base" spectrum. The proposed approach would be the most beneficial for both LEO/MEO and HEO systems, and would ensure the efficient use of space spectrum resources. Under this approach, both the ASBM system and the Petitioner's system would be able to use all of the spectrum requested by each system, and the operations of each system would not be restricted by band segmentation.

III. CONCLUSION

For the foregoing reasons, Space Norway respectfully requests that the Commission include in any grant of the Petition a condition requiring the Petitioner to implement mechanisms to avoid in-line interference with HEO NGSO systems, such as the ASBM system.

Respectfully submitted,

SPACE NORWAY AS

/s/ Jostein Rønneberg

By: _____
Jostein Rønneberg
Director and Chief Executive Officer
SPACE NORWAY AS

June 26, 2017

OF COUNSEL:

Phillip L. Spector
Lafayette Greenfield
Milbank, Tweed, Hadley & McCloy LLP
1850 K Street NW, Suite 1100
Washington, DC 20006
(202) 835-7540

CERTIFICATE OF SERVICE

I, Jostein Rønneberg, hereby certify that on this 26th day of June, 2017, I caused to be served a true copy of the foregoing “Comments of Space Norway AS,” by electronic mail upon the following:

Karis A. Hastings
Satcom Law LLC
Email: karis@satcomlaw.com

/s/ Jostein Rønneberg

Jostein Rønneberg
Director and Chief Executive Officer
SPACE NORWAY AS