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

In the Matter of	)	
	)	
Space Exploration Holdings, LLC	)	IBFS File No. SAT-MOD-20190830-00087
	)	Call Signs S2983 and S3018
Request for Modification of the Authorization for the SpaceX NGSO Satellite System	)	

PETITION TO DEFER OF SES AMERICOM, INC. AND O3B LIMITED

SES Americom, Inc. and its affiliate O3b Limited (collectively, "SES"), request that the Commission defer consideration of the above-captioned application of Space Exploration Holdings, LLC ("SpaceX") to modify its license for a Ku/Ka-band non-geostationary orbit ("NGSO") fixed-satellite service ("FSS") system by adjusting the orbital spacing.[1] SES has a strong interest in the Application, as SES entities operate both NGSO and geostationary orbit ("GSO") FSS networks that use these bands.

Before acting on the Application, the Commission must ensure that the operational changes SpaceX proposes will not impose new burdens on other NGSO and GSO operators. In particular, to protect the operations of dozens of Ku- and Ka-band GSO satellites, the Commission must require SpaceX to provide additional information in support of its claims regarding compliance with equivalent power flux-density ("EPFD") limits set by the International Telecommunication Union ("ITU"). Changed circumstances also mandate a reassessment of whether SpaceX should be permitted to continue to deploy spacecraft pending ITU review of SpaceX's EPFD filings. In addition, SpaceX must be required to adjust its proposed operations as necessary to avoid increased interference to other NGSO systems such as

[1] *See Space Exploration Holdings, LLC*, File No. SAT-MOD-20190830-00087 ("Application"); *Space Exploration Holdings, LLC*, 34 FCC Rcd 2526 (IB 2019) ("*SpaceX Modification*").

O3b's, and SpaceX should be required to accept any increased interference to its system stemming from its voluntary changes to the system originally authorized by the Commission.

I. ADDITIONAL INFORMATION IS NEEDED TO PERMIT PARTIES TO EVALUATE SPACEX'S COMPLIANCE WITH EPFD LIMITS

The Commission must take steps to ensure the integrity of GSO systems operated by SES and others by mandating that SpaceX make a more robust showing regarding the EPFD characteristics of its system. SES recognizes that in the *SpaceX Modification* decision, the International Bureau determined that SpaceX need not await the completion of ITU review of its system's EPFD levels, but a reassessment of that finding is needed in light of intervening events.

The original license granted for the SpaceX NGSO system specified that:

> Prior to initiation of service, SpaceX must receive a favorable or "qualified favorable" finding in accordance with Resolution 85 (WRC-03) with respect to its compliance with applicable equivalent power flux-density limits in Article 22 of the ITU Radio Regulations.[2]

Section 25.146 of the Commission's rules imposes the same requirement.[3]

When SpaceX later in 2018 sought authority to place 1,584 of its authorized satellites in a lower orbit of 550 kilometers and make other changes, it also requested a waiver of this obligation. SpaceX argued that due to a backlog, the ITU was unlikely to complete its EPFD compliance review before SpaceX would be ready to begin operations, and adhering to the condition would therefore delay SpaceX's ability to initiate service to customers.[4]

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[2] *Space Exploration Holdings, LLC*, 33 FCC Rcd 3391, 3407 (2018) ("*SpaceX Authorization*").

[3] 47 C.F.R. § 25.146(c).

[4] *Space Exploration Holdings, LLC*, File No. SAT-MOD-20190830-00087 ("2018 Application"), Waiver Requests at 3-4.

In its comments on the 2018 Application, SES took no position on this waiver request provided that any relief from the ITU review requirement was temporary only, with SpaceX assuming the risk that it would have to cease operations if the ITU issued an unfavorable finding.[5] Other parties urged the Commission to deny the waiver, observing that because the Commission had decided not to perform its own review of EPFD compliance, the ITU's evaluation was the only safeguard in place to protect GSO systems from disruptive interference.[6] OneWeb emphasized that allowing SpaceX operations to commence before ITU review was completed also created uncertainty for other NGSO systems, which are required to collectively meet aggregate EPFD limits.[7]

The *SpaceX Modification* granted by the International Bureau allowed SpaceX to proceed with deployment pending an ITU finding regarding compliance with relevant EPFD levels but specified that such relief was conferred at SpaceX's own risk, subject to a requirement that SpaceX modify its operations as necessary if the ultimate ITU finding was unfavorable.[8] In addition, the Bureau instructed SpaceX to cooperate with other NGSO operators to ensure that the aggregate EPFD limits for protection of GSO networks are met.[9]

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[5] Comments of SES Americom, Inc. and O3b Limited, File No. SAT-MOD-20181108-00083, filed Feb. 8, 2019, at 5.

[6] Reply of EchoStar Satellite Operating Corporation, Hughes Network Systems, LLC, and Intelsat License LLC, File No. SAT-MOD-20181108-00083, filed Mar. 5, 2019.

[7] Petition to Deny of WorldVu Satellites Limited, File No. SAT-MOD-20181108-00083, filed Feb. 8, 2019 (the "OneWeb Petition") at 23-27; Reply of WorldVu Satellites Limited, File No. SAT-MOD-20181108-00083, filed Mar. 5, 2019, at 9-12.

[8] *SpaceX Modification,* 34 FCC Rcd at 2538, ¶ 32(n).

[9] *Id.,* ¶ 32(o).

The instant Application appears to assume that no further waiver of the Commission's rules is required to allow SpaceX to implement yet more changes to its system without awaiting ITU review of its EPFD compliance.[10] SpaceX certifies that it will comply with the ITU's EPFD limits, as required by Section 25.146(a)(2) of the Commission's rules,[11] and the Application includes a few graphs that purport to demonstrate that the SpaceX system with the proposed changes will comply with ITU EPFD limits.[12] But SpaceX makes no mention of the ITU finding mandated by Section 25.146(c).

The Commission must require more before it decides whether SpaceX can continue to deploy satellites based on an ever-evolving system design that has not been evaluated by the ITU for EPFD compliance. As noted above, SES did not object to the waiver SpaceX requested in the 2018 Modification, but at the time, SES anticipated that any delay before the ITU determined whether the SpaceX system as it was being deployed conformed to international EPFD limits would be only a few months. Because of subsequent SpaceX actions, that expectation has proven to be misplaced.

First, SpaceX has continued to alter its system design, rendering ITU evaluations of prior configurations moot and requiring the ITU review to begin anew each time. Because SpaceX keeps moving the goalposts, SES and other GSO operators have no assurance that there will be a definitive ITU finding any time in the near future on the SpaceX system as it is actually being operated.

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[10] The only waivers requested in the Application concern departures from the Schedule S information requirements. *See* Application, Waiver Requests.

[11] Application, Attachment A at 4, *citing* 47 C.F.R. § 25.146(a)(2).

[12] Application, Attachment A, Annex 2.

Second, and even more concerning, according to ITU records, SpaceX has submitted a total of twenty ITU filings – all with an October 7, 2019, registry date – to be evaluated in connection with its NGSO system. On its face, this suggests that SpaceX is attempting to evade the single-entry EPFD limits for its satellite network by dividing the network into multiple parts and asking the ITU to evaluate them separately. Leaving aside the propriety of this approach, the simultaneous submission of so many filings will drastically slow down the ITU's review process. SpaceX complained of delay due to a backlog in originally seeking relief from the regulatory obligation to obtain an ITU finding prior to commencing operations, but now SpaceX has single-handedly created its own twenty-filing backlog. Assuming it takes the ITU two to four months on average to review each filing, even if it started immediately, the ITU would not complete its findings regarding the whole set of SpaceX filings until some time between early 2023 and the middle of 2026.

Yet even that completion schedule may well be optimistic. For example, it assumes the ITU's evaluation software remains in place – but at an ITU meeting earlier this year, SpaceX submitted an extensive set of proposals to alter that software.[13] Moreover, if SpaceX continues to revise its system configuration, the evaluation process would have to start again from square one following each change.

Such a lengthy delay in determining EPFD compliance would create an untenable situation for GSO networks and nullify the purpose of the Commission's rule relying on ITU assessments to protect GSO operations. Over this years-long time span, SES and other GSO

[13] *See* ITU-R WP4A Contribution 904, Draft revision of Recommendation ITU-R S.1503-3: Further improvements to model capabilities of advanced NGSO FSS satellite systems below 30 GHz, available at: https://www.itu.int/md/meetingdoc.asp?lang=en&parent=R15-WP4A-C-0904.

operators and their customers would have no avenue to determine whether SpaceX's burgeoning NGSO constellation was meeting international limits on interfering emissions.

Similarly, this outcome would make it impossible for O3b and other NGSO operators to meet their obligations to cooperate in order to collectively meet aggregate EPFD limits. As OneWeb has observed, the absence of ITU review prevents NGSO networks from determining whether SpaceX is generating EPFD levels that represent more than its proportionate share of the aggregate cap.[14]

In short, the Bureau's decision in the *SpaceX Modification* to allow SpaceX to proceed with satellite deployments while an ITU validation of its EPFD compliance was pending has paved the way for unforeseen consequences that threaten critical GSO networks and create substantial uncertainty for other NGSO operators. Fully protecting GSO operations would require the Commission to reinstate the requirement included in the original *SpaceX Authorization* and codified in Section 25.146(c) that SpaceX await the completion of ITU review before initiating service. Only this measure would remove the incentive for SpaceX to keep making changes that push the completion of ITU review further and further into the future.

At a minimum, however, before it can consider the Application the Commission must ensure that interested parties have an opportunity to make their own assessments of the EPFD levels the SpaceX network would generate. Specifically, the Commission should instruct SpaceX to make publicly available the PFD masks, EIRP masks, and inter-satellite masks for the SpaceX ITU filings that should necessarily represent one NGSO system and allow at least a 30-day period after the files have been supplied for parties to review the data and submit supplemental comments to the Commission. Even with this documentation, the ability of SES and others to

[14] *See* OneWeb Petition at 24-25.

adequately analyze the SpaceX EPFD compliance will be limited given the complexity of the constellation, the phased roll-out of satellites, and the open issues regarding validation software. But having access to the information is at least preferable to SES having to trust that its services to millions of end users will be protected based solely on SpaceX's unsupported promise of EPFD compliance pending ITU findings that are years away.

II. SPACEX MUST NOT BE PERMITTED TO WORSEN THE INTERFERENCE ENVIRONMENT FOR OTHER NGSO NETWORKS

A critical factor in determining whether the SpaceX Application can be considered in isolation without triggering a new processing round is whether the proposed changes would adversely affect other authorized spectrum users. As the Commission explained in its decision authorizing the prior set of changes to the SpaceX NGSO constellation:

> focus[ing] on the public interest in avoiding radiofrequency interference is consistent with the purpose of the Commission's processing round procedure, which is designed to establish the interference environment in which participants in the processing round could operate their systems. If a modification would worsen the interference environment, that would be a strong indication that grant of the modification would not be in the public interest.[15]

The Commission has recognized that changes to the interference environment can occur in two ways: if the modification creates additional interference into other NGSO systems or increases the susceptibility of the applicant's network to interference from other NGSO systems.[16] If a modification affects either of these two factors, the appropriate Commission

[15] *SpaceX Modification*, 34 FCC Rcd at 2529, ¶ 9 (footnotes omitted). *See also Ex Parte* Filing of Space Exploration Holdings, File Nos. SAT-MOD-20180319-00022, SAT-AMD-20180104-00004, & SAT-LOA-20190704-00057, filed July 15, 2019, at 3 (modification applications "that add potential interference are to be considered in a new NGSO processing round") (footnote omitted).

[16] *See SpaceX Modification*, 34 FCC Rcd at 2531-32, ¶¶ 12-15.

approach is to begin a new processing round to consider the proposed changes and any other timely filed requests for new or modified operations in the relevant spectrum.

Because the Application does not provide sufficient assurances regarding either of these two essential elements, the Commission must impose conditions on any grant to protect the interests of O3b and other participants in the Ku/Ka-band NGSO processing round that closed in November of 2016. SpaceX alleges that its "proposed modification will not increase interference to any other NGSO system operating in the bands used by Starlink satellites,"[17] but SpaceX's own analysis shows that in some scenarios, the proposed changes would result in slightly higher levels of interference to the O3b network.[18] SpaceX dismisses these impacts as "negligible,"[19] but O3b rather than SpaceX is the proper entity to determine the acceptability of any increased interference to the O3b network.

More critically, SpaceX fails to provide any discussion of whether the proposed changes would alter the interference environment by increasing the susceptibility of the SpaceX network to interference from other NGSO systems. As a result of this omission, the Commission is unable to perform the analysis described in the *SpaceX Modification* decision:

> We must examine not only the potential for increased interference to other NGSO FSS systems as a result of SpaceX's modified operations, but also whether SpaceX's own system may become more susceptible to interference from other NGSO FSS systems, which would change the operating environment.[20]

Thus, the Application on its face does not provide the required evidence that grant would not shift to O3b or other NGSO operators the interference consequences of the voluntary changes

[17] Application, Attachment A, Annex 1 at A1-1.

[18] *See id*., Annex 1 at A1-19 to A1-26.

[19] *See id*., Narrative at 7.

[20] *SpaceX Modification*, 34 FCC Rcd at 2531, ¶ 14.

SpaceX seeks to make in its constellation. The appropriate approach to resolve these matters – both any increased interference to the O3b NGSO network and any increased SpaceX vulnerability to interference from O3b's operations – is through coordination between the parties.

Pending the outcome of such coordination, the Commission must preserve the interference environment for O3b and other NGSO networks by imposing conditions on any grant of the Application. Specifically, SpaceX must be required to: (1) alter its proposed operations to eliminate any increase in interference to other NGSO systems resulting from the changes sought in the Application and (2) accept any additional interference from other NGSO networks due to SpaceX's multiple revisions of the constellation design the Commission approved in the *SpaceX Authorization*.

Making these obligations explicit will minimize the risk that the Commission's expectations will be misinterpreted or ignored. For example, in the *SpaceX Modification* decision, the International Bureau discussed ways that SpaceX could mitigate the risk that at the lowered orbital altitude it was seeking for a portion of its fleet, SpaceX would receive additional interference from other NGSO systems.[21] Yet the ordering clauses did not obligate SpaceX to take any such steps, leaving open the possibility that SpaceX would instead impermissibly attempt to shift to other operators the responsibility to counteract the effects of the modified SpaceX system's greater susceptibility to interference.[22] The Commission must avoid these

[21] *See id.* at 2531-32, ¶ 15 (noting that keeping the transmit power of SpaceX earth stations unchanged "would allow the SpaceX transmissions to be received in the presence of stronger signals of other NGSO FSS systems").

[22] The magnitude of such a shift could be substantial. For example, SpaceX's decision to lower the altitude of a portion of its fleet to 550 kilometers from the originally authorized range of 1,110-1,325 kilometers results in a path loss decrease of 6 to 8 dB. Consequently, if the same

issues by instructing SpaceX that its rights to protection from interference are defined by the characteristics of the originally authorized SpaceX fleet.

III. CONCLUSION

For the foregoing reasons, the Commission should defer consideration of the Application pending submission of additional information regarding EPFD compliance and take steps to ensure that the changes SpaceX proposes do not threaten GSO service continuity or impose new burdens on other NGSO operators.

Respectfully submitted,

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SpaceX satellite design was used, the spacecraft would be 6 to 8 db more sensitive to interference from O3b and other NGSO uplink transmissions due to the altitude change alone. The Commission must make clear to SpaceX that during coordination it cannot expect O3b and other NGSO operators to reduce their uplink emissions by 6 to 8 dB in order to accommodate SpaceX's voluntary decision to lower the altitude of these satellites.

CERTIFICATE OF SERVICE

I hereby certify that on this 15th day of October, 2019, I caused to be served a true copy of the foregoing "Petition to Defer of SES Americom, Inc. and O3b Limited" by first class mail, postage prepaid, upon the following:

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