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

In the Matter of	)	
	)	
Amendment of the Commission's Rules with Regard to Commercial Operations in the 3550-3650 MHz Band	)	GN Docket No. 12-354

REPLY COMMENTS OF THE SATELLITE INDUSTRY ASSOCIATION

The Satellite Industry Association ("SIA")[1] submits these reply comments in the above-captioned proceeding adopting service rules for new terrestrial use of the 3550-3700 MHz band ("3.5 GHz band").[2] SIA agrees with many other commenters in this proceeding that it is paramount that the 3.5 GHz band rules protect Fixed Satellite Service ("FSS") earth station operations. The Federal Communications Commission ("Commission" or "FCC") can achieve this objective by using appropriate calculation methodology, propagation modeling, and Interference Protection Criteria ("IPC"). SIA urges the Commission to reject proposals that

[1] SIA is a U.S.-based trade association providing worldwide representation of the leading satellite operators, service providers, manufacturers, launch services providers, and ground equipment suppliers. Since its creation twenty years ago, SIA has advocated for the unified voice of the U.S. satellite industry on policy, regulatory, and legislative issues affecting the satellite business. For more information, visit www.sia.org. SIA Executive Members include: The Boeing Company; The DIRECTV Group; EchoStar Corporation; Harris CapRock Communications; Intelsat S.A.; Iridium Communications Inc.; Kratos Defense & Security Solutions; LightSquared; Lockheed Martin Corporation; Northrop Grumman Corporation; SES Americom, Inc.; SSL; and ViaSat, Inc. SIA Associate Members include: ABS US Corp.; Airbus DS SatCom Government, Inc.; Artel, LLC; Cisco; Comtech EF Data Corp.; DRS Technologies, Inc.; Eutelsat America Corp.; Glowlink Communications Technology, Inc.; Hughes; iDirect Government Technologies; Inmarsat, Inc.; Kymeta Corporation; Marshall Communications Corporation.; MTN Government; O3b Limited; OneWeb; Orbital ATK; Panasonic Avionics Corporation; Row 44, Inc.; TeleCommunication Systems, Inc.; Telesat Canada; TrustComm, Inc.; Ultisat, Inc.; Vencore Inc.; and XTAR, LLC.

[2] *Amendment of the Commission's Rules with Regard to Commercial Operations in the 3550-3650 MHz Band*, GN Docket No. 12-354, Report and Order and Second Further Notice of Proposed Rulemaking, FCC 15-47 (rel. Apr. 21, 2015) ("*Second FNPRM*").

would place new obligations on FSS operators. Instead, the FCC should focus on technological solutions that will prevent disruption of services relied on by FSS earth station customers.

I. THE NEW RULES MUST PROTECT INCUMBENT FSS EARTH STATION OPERATIONS.

As a threshold matter, SIA reiterates the importance of protecting FSS earth station operations. Even strong advocates of introducing terrestrial 3.5 GHz services have recognized that interference prevention is an essential element of any new regulatory framework. CTIA, for example, warned in another context that the "Commission must not lose sight of the fact that interference is the enemy of the efficient use of spectrum."[3] New users of the 3.5 GHz band must neither disrupt FSS services nor confer greater burdens on FSS operators. The Commission should adhere to these principles and adopt rules that fully protect FSS networks.

To that end, the FCC should reject suggestions that seek to limit the level of protection that FSS earth stations receive from Citizens Broadband Radio Service Devices ("CBSDs"). For example, to the extent that Microsoft Corporation advocates for only the level of FSS protection that is "technically necessary,"[4] SIA underscores that it is "technically necessary" for FSS antennas to continue to operate to the full extent permitted under existing licenses and Part 25 regulations. As SIA previously explained, satellite operators require the flexibility currently permitted under the rules so that they may track and operate across the geostationary satellite arc, especially during satellite redeployments and launch and early orbit phase ("LEOP") activities.[5]

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[3] *See* Comments of CTIA, Unlicensed Operation in the TV Broadcast Bands; Additional Spectrum for Unlicensed Devices Below 900 MHz and in the 3 GHz Band, ET Docket Nos. 04-186 & 02-380 at 2 (filed Jan. 31, 2007).

[4] *See* Comments of Microsoft Corporation, GN Docket No. 12-354 at 6 (filed July 15, 2015) ("Microsoft Comments").

[5] Comments of SIA, GN Docket No. 12-354 at 2 (filed July 15, 2015) ("SIA Comments").

In addition to ensuring that FSS operations are fully protected, the FCC should reject new requirements that would make operation in the 3.5 GHz band by incumbent FSS providers more cumbersome. For example, the FCC should not, as Google proposes, implement a protection regime that requires FSS providers continually to provide updated technical parameters in order to receive protection from CBSD services.[6] In contrasting the rights conferred by Priority Access Licenses ("PALs") vs. General Authorized Access ("GAA"), CTIA notes that "a definition of use defined by real-time opportunistic access based in engineering concepts undermines the certainty and transparency necessary for providers to participate at auction, invest in PALs, and deploy their networks."[7] The same holds true for the rights of FSS vs. all CBSDs. The Commission must not give CBSDs operational flexibility that limits FSS operators' ability to continue to make robust use of their sunk investment in 3.5 GHz facilities.

Finally, SIA reiterates that the FCC must have an effective enforcement mechanism that requires any interference to be resolved immediately, before FSS customers are harmed. This approach would be consistent with how the FCC has treated interference in other proceedings.[8]

II. IN-BAND PROTECTION OF FSS EARTH STATIONS

A. Calculation Methodology

As SIA explained in its opening comments, Appendix D includes some useful elements for conducting co-existence analyses and calculating exclusion distances for CBSDs with respect

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6 *See, e.g.,* Comments of Google Inc., GN Docket No. 12-354 at 24 (filed July 15, 2015) ("Google Comments") (advocating for protection zones which take into account "real-world factors").

7 *See* Comments of CTIA, GN Docket No. 12-354 at 5 (filed July 15, 2015).

8 *See* Letter from Krista L. Witanowski, CTIA, to Marlene H. Dortch, FCC, Expanding the Economic and Innovation Opportunities of Spectrum Through Incentive Auctions (GN Docket No. 12-268) at 2-3 (filed Jul 23, 2015) (urging the Commission, "[a]s it has done in the past," to take steps to prevent harmful interference to licensed operations and establish procedures to facilitate immediate resolution of interference complaints).

to individual FSS earth stations, but the Appendix D methodology is not sufficient to adequately protect FSS services from CBSD operations.[9] SIA consequently objects to Google's suggested calculation methodology for predicting interference and disagrees with the use of Appendix D distance calculations for calculating protection zones.[10] As SIA previously noted, any calculation methodology must include additional parameters that are not considered in Appendix D but are critical to the separation analysis, including the equivalent isotropically radiated power ("EIRP") of the interfering in-band signal; the elevation profile from the earth station to the small-cell location of the interfering in-band signal; the terrain profile for the specific location; the time variability of propagation path loss; and the earth station receiver noise temperature.[11]

B. Propagation Modeling

The record supports SIA's arguments regarding the importance of using a single, properly vetted propagation model. Both AT&T and RadioSoft/LS telcom emphasized the need for uniformity and consistency in propagation modeling.[12] As AT&T articulated, using uniform models will (i) ensure that each Spectrum Access System ("SAS") will produce the same set of results for interference prediction and will therefore enforce the same minimum separation distances to protect incumbents; (ii) simplify SAS administration by reducing the frequency with which SASs need to communicate with each other; and (iii) prevent discriminatory and unfair sharing of spectrum among users served by different SASs.[13]

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9 SIA Comments at 2-3.

10 *See* Google Comments at 21-23.

11 SIA Comments at 3.

12 *See* Comments of AT&T, GN Docket No. 12-354 at 7 (filed July 15, 2015) ("AT&T Comments"); Comments of RadioSoft, Inc. and LS telcom, AG, GN Docket No. 12-354 at 1 (filed July 15, 2015) ("RadioSoft/LS telcom Comments").

13 AT&T Comments at 7.

Commenters that suggested that the FCC should establish a baseline propagation model and allow providers to differentiate from these models fail to acknowledge the operational problems that will result.[14] First, as discussed in more detail below, there are serious concerns about using non-vetted models. Second, even if subsequent models are properly vetted, allowing differentiation would create operational inconsistencies and disparate levels of protection. Such an approach would encourage CBSDs to use the SAS with the most favorable model – *i.e.*, to forum shop. As AT&T's comments pointed out, these disparities would result in different protection zones and unfair sharing of spectrum.[15]

To ensure reliable propagation modeling and consistent SAS operation, the FCC should use ITU-R P.452-15 for propagation modeling. SIA explained in its comments that ITU-R P. 452-15 is an advantageous model because it is specifically designed to solve the type of interference problem being considered in this proceeding – *i.e.*, interference prediction for stations on the surface of the Earth.[16] Both RadioSoft and Google also support the use of ITU-R P.452-15.[17] The Commission, however, should reject RadioSoft/LS telcom's suggestions to use P.530, which is invalid as an interference model. ITU-R P. 530 is a model for design of terrestrial systems, and propagation models used in this proceeding should be based on interference modelling.

If the Commission decides to utilize a model other than ITU-R P.452-15, that model must first be properly vetted. Permitting the use of non-vetted models could lead to inaccuracies in

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14 *See* Comments of Dynamic Spectrum Alliance, GN Docket No. 12-354 at 4 (filed July 15, 2015) ("DSA Comments"); Google Comments at 26.

15 AT&T Comments at 7.

16 SIA Comments at 4.

17 RadioSoft/LS telcom Comments at 2; Google Comments at 26 (suggesting that P.452 could serve as a baseline or "safe harbor" propagation model for Google's differentiation approach).

the modeling and inadvertently result in interference to FSS operators. Both AT&T and Google support appropriate vetting of different models in their comments.[18] SIA underscores with respect to Google's comments, however, that it is crucial that the model be vetted by ITU SG3 or an appropriate scientific body such as NTIA's Boulder Institute for Telecommunications Studies ("ITS").[19]

Finally, SIA agrees with iPosi's assertion that any propagation model must measure how high the interference is, rather than how often some level is exceeded.[20] To adequately protect FSS incumbents, the prescribed level of interference cannot be exceeded.

C. Interference Protection Criteria

SIA supports the adoption of protection criteria that use worst-case assumptions instead of real-time conditions. In contrast, several commenters urged the FCC to rely on "real world conditions" or "actual deployment" conditions, instead of relying on "worst-case assumptions" and establishing default protection zones.[21] This is a misguided approach because it would be difficult to achieve, unduly burden FSS operators, and raise significant confidentiality concerns.

Any "real world" interference protection system would be challenging to implement because such a system would require design, development, installation, testing, and maintenance of carrier monitoring hardware and software and communications links among the earth stations and the SAS network. Moreover, it would impose substantial burdens on FSS operators, who

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[18] AT&T Comments at 8; Google Comments at 28.

[19] *See* Google Comments at 28 (stating that propagation models should by vetted by "the Commission, NTIA, or an appropriate expert organization such as ITU Study Group 3").

[20] Comments of iPosi, Inc., GN Docket No. 12-354 at 12 (filed July 15, 2015) ("iPosi Comments").

[21] *See* DSA Comments at 3-4; Google Comments at 1, 24; Comments of the Information Technology Industry Council, GN Docket No. 12-354 at 5 (filed July 15, 2015) ("ITI Comments"); Comments of the Wi-Fi Alliance, GN Docket No. 12-354 at 5 (filed July 15, 2015).

would have to report changes every time they occur. The system would need to have carrier-specific information such as frequencies, bandwidths, and carrier-to-noise ratios, but this information is highly commercially sensitive, and operators should not be required to share it unless confidentiality absolutely can be assured. Given the multitude of difficulties with the "real world" approach, some worst case assumptions, like elevation angle, are needed in order to ensure full utilization by the incumbent users and protection of primary incumbent operations.

SIA also recommends that the protection criteria should consider relevant and appropriate factors such as those proposed by the Information Technology Industry Council ("ITI"): propagation, terrain, earth station pointing angles, and transmitter characteristics.[22] iPosi similarly advocates for taking into account key propagation parameters such as antenna gain in the direction of the small cell, including elevation and the noise figure.[23] SIA reiterates, however, that FSS earth stations must not be required to provide real-time pointing information to the SAS, as this information can change often, particularly with respect to antennas used to track and command spacecraft. In addition, SIA underscores that all key propagation effects must be taken into account, including diffraction, ducting, and multi-path.

As SIA explained in its comments, IPC should be based on limiting the increase of an earth station receiver's noise floor to 6%, equal to an I/N of -12 dB. Google's proposal to use a baseline interference protection criterion of 6% * 142.8 K, or 8.6 K, is insufficient.[24] The noise temperature of a typical FSS earth station described by SIA in previous filings based on ITU criteria is 110 K, so the baseline protection criteria should be 6% of 110 K, or 6.6 K. Furthermore, contrary to RadioSoft/LS telcom's assertion, IPC should not be based on

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22 ITI Comments at 5.

23 iPosi Comments at 11.

24 *See* Google Comments at 23.

C/(I+N).[25] The desired signal level at the FSS receiver should not be a part of the calculation. This would require the FSS to report signal level changes every time they occur, which would be unduly burdensome and has not been proposed in this proceeding.

Finally, the protection criteria proposed by SIA and others for use in this proceeding are based on an ITU Recommendation, studied and adopted by the ITU group concerned with FSS operations.[26] The Commission should not revisit and override protection criteria for international services, as Google proposes in its comments, because this should be a function of the ITU.[27]

D. Aggregate Effects

As the comments in this proceeding demonstrate, it is important that the Commission protect for aggregate effects.[28] SIA disagrees with iPosi's suggestion to use a harm threshold approach.[29] Harm threshold is defined as measuring the receiver performance degradation. This would require FSS licensees to report changes in carrier and noise levels every time they occur, which would place unnecessary burdens on FSS operators. To the extent iPosi is suggesting use of C/(I+N) in calculating potential interference, SIA disagrees because it would be extremely burdensome on FSS operators to continually report received signal and noise levels, plus frequencies, and bandwidths .[30] There is no way to continually report this information to the SAS because earth stations will not be directly linked to the SAS on a real-time basis.

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25 RadioSoft/LS telcom Comments at 2.

26 SIA Comments at 5.

27 *See* Google Comments at 23.

28 *See* Google Comments at 25 ("[R]egardless of how the Commission chooses to protect for aggregate effects, it is important for the Commission to do so."); ITIC Comments at 5.

29 iPosi Comments at 10-11.

30 *Id.* at 10.

E. Interference Resolution

SIA reiterates that SASs should be required to prioritize FSS protection and swiftly resolve interference, and agrees with AT&T that: (i) the Commission should ensure that an appropriate and effective mechanism for elimination of actual interference to FSS facilities exists and can be invoked rapidly by FSS licensees; and (ii) in the event that a PAL or GAA user is causing interference to a grandfathered FSS facility, even if the user is operating in full conformance with the 3.5 GHz rules, the FSS licensee can and should have the ability to interact with the SAS to determine the source of—and impose operating restrictions to eliminate—the harmful interference.[31]

F. End User Devices

SIA agrees with Rajant's proposal to allow CBSD users to provide the geographic coordinates of any industrial (non-consumer) deployments, including the farthest possible point of any End User Device, to the SAS.[32] This would help the SAS more accurately determine interference potential.

III. OUT-OF-BAND PROTECTION OF FSS EARTH STATIONS

As noted in SIA's comments, IPC for protection from OOBE should be based on 1% noise floor criterion for out-of-band, equivalent to I/N of -20dB, established by ITU-R Recommendation S.1432. SIA thus opposes iPosi's suggestion that the aggregate OOBE should be 6 dB below the FSS noise floor as measured from the FSS station.[33] That criterion would translate into a harmful 25% increase in noise temperature, thereby degrading the performance of the earth station. SIA also opposes Google's suggestion to limit noise increases to less than 8.6 K for out-of-band because that increase is equivalent to a 6% noise increase for an earth

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31 *See* AT&T Comments at 8.

32 Comments of Rajant Corporation, GN Docket No. 12-354 at 7-8 (filed July 15, 2015).

33 *See* iPosi Comments at 11.

station with a 142.8K noise temperature, which also would degrade the performance of the earth station.[34] As noted in II.C above, a more appropriate assumed noise temperature is 110 K. Also, a 1% increase in noise temperature is the appropriate limit for OOBE. The OOBE criteria adopted by the Commission already provide less protection than the criteria proposed in the Further NPRM, which necessitates a significant increase in protection distances.[35]

IV. CONCLUSION

For the reasons established above, SIA respectfully requests that the Commission adopt SIA's proposals in this proceeding.

Respectfully submitted,

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[34] *See* Google Comments at 23.

[35] *See* Petition for Reconsideration of the Satellite Industry Association, GN Docket No. 12-354, at 3-5 and Technical Annex (filed Jul. 23, 2015).