Before the
FEDERAL COMMUNICATIONS COMMISSION
Washington, DC 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

COMMENTS OF THE SATELLITE INDUSTRY ASSOCIATION ON LICENSING MODELS AND TECHNICAL REQUIREMENTS IN THE 3550-3650 MHz BAND

The Satellite Industry Association ("SIA")[1] hereby responds to the Commission's request for comments on licensing models and technical requirements in the above-captioned proceeding.[2] SIA has been active in this proceeding to ensure that if the Commission decides to allow introduction of terrestrial small cell operations in the 3550-3650 MHz band ("3.5 GHz band"), it acts to ensure that existing and future primary fixed-satellite service ("FSS") networks are protected from unacceptable interference.[3] The Notice does not substantively address such sharing concerns,[4] but the licensing framework and technical parameters for small cell operations discussed in the Notice are directly relevant to the potential for interference to satellite operations. SIA's limited comments here focus on these matters.

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[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 more than fifteen 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. Additional information about SIA can be found at http://www.sia.org.

[2] *Commission Seeks Comment on Licensing Models and Technical Requirements in the 3550-3650 MHz Band*, GN Docket No. 12-354, FCC 13-144 (rel. Nov. 1, 2013) ("Notice").

[3] *See* Comments of the Satellite Industry Association, GN Docket No. 12-354, filed Feb. 20, 2013 ("SIA Comments"); Reply Comments of the Satellite Industry Association, GN Docket No. 12-354, filed Apr. 5, 2013 ("SIA Reply Comments"); SIA Written *Ex Parte* Presentation, GN Docket No. 12-354, filed Aug. 20, 2013 ("SIA August *Ex Parte*").

[4] *See* Notice at ¶ 3 ("This Public Notice does not discuss issues related to shared operations with incumbent federal and Fixed Satellite System (FSS) users, potential out-of-band interference issues, or any potential geographic restrictions on commercial use of the 3.5 GHz Band.").

I. SMALL CELL POLICIES MUST PROVIDE FLEXIBILITY FOR FUTURE SATELLITE OPERATIONS

As a threshold matter, SIA is concerned that the Commission appears to have unjustifiably prejudged questions relating to future satellite operations in the 3.5 GHz band. Specifically, the Notice suggests that only grandfathered earth stations will be entitled to protection from interference caused by new small cell services in the band.[5] The record before the Commission, however, does not demonstrate that preventing deployment of new earth stations is either necessary or in the public interest.

In particular, the Commission's proposals for new terrestrial operations in this band assume that the spectrum's propagation characteristics and small cells' relatively low power will allow the new systems to operate on a secondary basis without causing unacceptable interference to primary satellite operations or radar systems.[6] If the Commission succeeds in developing a framework that allows such co-existence, that framework should be fully capable of accommodating future earth station deployment. By definition, the dynamic spectrum management approach relying on the spectrum access system ("SAS") database contemplated by the Commission[7] will be adaptable to changes in the acceptable parameters of operation. Future primary FSS deployments can simply be factored into the SAS system and taken into account when deciding whether secondary spectrum use by small cells is feasible without creating unacceptable interference.

In contrast, precluding future satellite operations would have the effect of re-allocating the 3.5 GHz band, and the Commission has not proposed such a reallocation or sought comment on its advisability. Permanently blocking new earth stations in this spectrum would harm satellite

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[5] *See id.* at ¶ 6 (describing the Incumbent Access tier of systems users entitled to interference protection as including "grandfathered FSS users currently operating in the 3.5 GHz Band").

[6] *See Amendment of the Commission's Rules with Regard to Commercial Operations in the 3550-3650 MHz Band*, Notice of Proposed Rulemaking and Order, GN Docket No. 12-354, FCC 12-148 (rel. Dec. 12, 2012) ("NPRM") at ¶ 21 (the band's "limited propagation – especially in combination with low-power operation – should allow disparate radio systems to operate in closer proximity").

[7] *Id.* at ¶ 7.

operators and customers by stranding the significant investment in FSS capacity in this band, consisting of more than sixty satellites, fifteen of which are U.S.-licensed.[8] Such an extreme step certainly could not be justified here, especially given the uncertainty regarding whether significant demand will exist for small cell uses of 3.5 GHz spectrum under the conditions being developed in this proceeding. Wireless interests have made clear that access to spectrum above 3 GHz that is not available for exclusive licensing is not a priority for them.[9] In light of that lukewarm expressed interest, the Commission should not block the continued growth and expansion of primary FSS networks.

II. LICENSING RULES FOR SMALL CELLS MUST INCORPORATE PROTECTIONS FOR PRIMARY FSS OPERATIONS

The Notice seeks comment on several specific proposals for licensing of small cell networks.[10] SIA takes no position with respect to the details of the licensing structure, provided that the rules incorporate measures to ensure that primary FSS networks – including future earth stations – are protected from unacceptable interference.

A. PALs Should Not Be Issued in Areas Surrounding FSS Earth Stations

In the modified framework set forth in the Notice, the Commission proposes to retain the concept of a Priority Access tier of users whose rights are subordinate to incumbents but superior to the General Authorized Access ("GAA") tier.[11] Under this approach, Priority Access Licenses ("PALs") would be issued to qualified applicants, with auctions to be used if mutually exclusive applications are submitted for the same spectrum, geographic area, and time frame.[12]

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[8] *See* SIA Comments, Appendix 1 (satellites operating in all or parts of the 3.5 GHz band).

[9] *See* SIA Reply Comments at 9-13 & nn.37 & 40.

[10] Notice at ¶¶ 10-40.

[11] *Id.* at ¶ 6.

[12] *Id.* at ¶¶ 12-27.

SIA expresses no view on this licensing mechanism but emphasizes that the Commission cannot grant "priority" access to spectrum in areas where primary FSS operations would be adversely affected. Doing so would invite the possibility of conflict between "priority" users of the 3.5 GHz band and incumbent users that must be protected from interference. The Commission should avoid any possibility of a Priority Access Licensee being unable to use spectrum that it has paid for at auction because its operations are too close to a primary FSS earth station. This means the Commission will have to define zones surrounding earth station sites where no PALs would be issued. Based on the record to date, SIA proposes a 150-km radius for these areas as a starting point, given the absence of definitive technical characteristics and projected deployment density for small cells.

The NPRM in this proceeding sought comment on a baseline 150 km separation distance, noting that this distance was adopted to protect earth stations in the adjacent 3650-3700 MHz spectrum (the "3.65 GHz" band).[13] This is certainly the right starting point if PAL operations are limited to the same parameters as the services in the adjacent 3.65 GHz band. If PAL operations at higher EIRP densities are allowed, then the protection zone would need to be expanded, and vice-versa if PAL parameters are more restrictive.

In its comments and reply comments, SIA supported use of the 150-km radius, noting that calculating separation distances more definitively was impossible without detailed information regarding small cells' operational parameters (especially the maximum allowable EIRP density), which are needed to determine single-entry interference levels, and their deployment characteristics, which are required to calculate aggregate interference effects.[14] SIA subsequently submitted a technical analysis that showed a range of separation distances – from tens of kilometers to several hundred kilometers – that would be required to protect primary FSS earth stations from single

[13] NPRM at ¶ 124.

[14] SIA Comments at 13-15; SIA Reply Comments at 14-17.

interferers, depending upon on the allowed EIRP densities, antenna orientations and terrain differences.[15]

The entire area within the defined zone (whether it is 150 km or a different size based on final small cell technical parameters) should be unavailable for PALs. Commission rules allow primary FSS earth stations to change pointing and use any frequency within the 3600-3650 MHz range at any time. As a result, in this portion of the 3.5 GHz band the Commission cannot purport to offer "priority" rights to secondary users anywhere within these zones. Furthermore, the Commission should make clear that construction of new primary FSS earth stations, which should be permitted as discussed above, may require modification or termination of small cell operations, even if a PAL has been issued.

B. The Proposal for Localized Critical Access Raises Significant Questions

The Notice also seeks comment on whether critical access users such as hospitals should be eligible to receive authorizations for a specific building or facility.[16] SIA has substantial concerns about this concept, over and above its concerns about the Priority Access tier.

First, the Commission has previously found that it is inappropriate to rely on secondary spectrum allocations to meet the needs of critical access users. Specifically, in ruling on a request by the Utilities Telecom Council and Winchester Cator, the Commission rejected a proposal to introduce services to support critical infrastructure on a secondary basis in a band where FSS systems are primary.[17] A key concern expressed by the Commission was the possibility that critical infrastructure services would receive disruptive interference that could be prevented only by

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[15] SIA August *Ex Parte,* Attachment at 4 & Table 3.

[16] Notice at ¶¶ 36-40.

[17] *Utilities Telecom Council and Winchester Cator, LLC, Petition for Rulemaking to Establish Rules Governing Critical Infrastructure Industry Fixed Service Operations in the 14.0-14.5 GHz Band*, Order, 28 FCC Rcd 7051 (OET, WTB and IB 2013).

imposing unacceptable burdens on primary FSS networks.[18] The Commission also observed that other spectrum was available on a primary basis that would better ensure the high quality of service appropriate for critical infrastructure systems' needs.[19]

Second, the interference prevention measures contemplated for localized services will be effective only if they are practically enforceable. For example, the Notice states that operations of these local networks would be limited to indoor use.[20] However, the Commission does not describe any measures to ensure that users do not violate this restriction. Requiring buildings to employ physical radiofrequency shielding will not be meaningful if a user can circumvent the effects of the shielding by simply walking outside with a transmitting device.

Given these concerns, SIA opposes permitting localized critical access use within the 150-km areas surrounding primary FSS earth stations. Furthermore, as with PALs, the Commission should make it clear that local critical infrastructure users of the 3.5 GHz band would have to accommodate new primary FSS earth stations in the band.

III. THE SAS DATABASE MUST HAVE ROBUST AND PROVEN CAPABILITIES AND SECURITY

The Notice anticipates that the planned SAS database will dynamically assign 3.5 GHz spectrum in a manner that prevents unacceptable interference to protected services.[21] However, as SIA and others have observed[22] and as the Notice acknowledges,[23] this would be possible only if the SAS has highly advanced features. The technology needed to implement such a database has not

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[18] *Id.* at 7054-7055, ¶ 10. Although here the potential interference will more likely be from (rather than into) secondary users, the end result would be the same should interference occur – *i.e.*, the secondary "critical" user would be required to cease operating.

[19] *Id.* at 7055-7056, ¶ 11.

[20] Notice at ¶ 38.

[21] *Id.* at ¶¶ 30-32.

[22] *See* SIA Reply Comments at 19-20 & nn.72 & 73.

[23] Notice at ¶ 32.

yet been developed, and will need to be thoroughly tested and verified prior to deployment.[24] In addition, the Commission must ensure that both the database itself and the interactions between the database and terrestrial terminals are highly secure.

In order to perform its expected function, the SAS database must have all the information necessary to prevent GAA users[25] from interfering with primary FSS networks. In particular, for each small cell transmitter, the SAS must have accurate, updated information on: (1) location; (2) maximum EIRP density; (3) antenna height above ground and above mean sea level; (4) antenna beam tilt, if any; and (5) validated off-axis antenna gain patterns. In addition, for each satellite earth station, the SAS must contain data regarding: (1) location; (2) antenna diameter; (3) antenna gain; (4) antenna height above ground and above mean sea level; (5) off-axis gain pattern of the receiving antenna if the antenna does not comply with Section 25.209; and (6) G/T of the earth station. The database will also need to contain a detailed propagation model, including terrain information.

The SAS must then be able to interpret this data to determine whether and under what parameters a small cell transmitter can be permitted to operate without creating unacceptable interference to higher priority users. Robust protection criteria must be developed and incorporated into the SAS to enable the database to make frequency assignment decisions. Based on this data, the SAS will need the ability to calculate the aggregate interference environment into each earth station from existing small cells and determine whether permitting transmissions by any additional small cell will cause the FSS protection criteria to be exceeded.[26]

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[24] *See* SIA Reply Comments at 16-17.

[25] SIA assumes that Priority Access use would be authorized under PALs, not through the SAS, and would be excluded from operation in the vicinity of earth stations, as discussed above.

[26] Issues relating to out-of-band interference are not addressed here (*see* Notice at ¶ 3), but ultimately the SAS will need to be equipped to enforce out-of-band interference limits as well.

The SAS must also be able to reassign frequencies for one or more small cells operating near a specific earth station if either the satellite operator serving that earth station or the earth station operator notifies the SAS that it suspects small cell transmissions are causing unacceptable interference. To do so, the SAS must be able to promptly accept good faith reports regarding interference into a specific earth station, pending resolution of the report. The SAS can restore small cell operating frequencies to their original values if it later determines that the interference is not due to small cell transmissions.

The record before the Commission also makes clear that security of the database system is of paramount importance.[27] The SAS database itself must be equipped with enforceable information security and integrity measures. Equally critical is ensuring the data security and integrity for the devices. In particular, the terminals must be protected from modifications by either the user or a third party, such as attempts to jail-break or hack the device's operational system. In addition, measures must be employed to prevent SAS spoofing – sending fake information to the SAS from the device or vice-versa.

IV. TECHNICAL STANDARDS MUST ENSURE PROTECTION OF EARTH STATIONS

The Notice also seeks additional comment on technical specifications for small cells in the 3.5 GHz band.[28] SIA strongly agrees that defining the specific terms pursuant to which small cells would be permitted to operate is essential in order to properly determine the constraints necessary to prevent unacceptable interference to primary FSS networks. Baseline technical standards to prevent interference to FSS are needed for both the Priority Access and GAA tiers.

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[27] *See* SIA Reply Comments at 19-20 & n.76.

[28] Notice at ¶¶ 42-50.

SIA has repeatedly emphasized that information on maximum EIRP density levels for small cell transmissions is needed to establish protection criteria for FSS.[29] Although a number of parties have suggested various maximum absolute power levels, they have not indicated what the minimum bandwidth would be, making it impossible to determine maximum EIRP density.[30]

As noted above, SIA has calculated the required separation distance to prevent unacceptable interference into primary FSS earth stations for a variety of EIRP density levels.[31] The results vary widely depending on the EIRP density level of the small cell transmitter and other factors, including the relative orientation of transmitter and receiver, the intervening terrain, and the interference criteria used. Not surprisingly, the calculated separation distances are lower for small cells transmitting at lower EIRP densities. Thus, a concrete understanding of the maximum EIRP density levels at which 3.5 GHz small cells will transmit is needed to further evaluate the parameters for ensuring protection of primary FSS operations.

Another important missing element in the discussions so far is the impact of aggregate interference. Although there is agreement that assessment of aggregate interference levels is critical,[32] SIA's prior study did not take into account aggregate interference[33] because assessing such interference requires an understanding of the deployment characteristics of small cells. To date, neither the Commission nor the parties have provided information regarding the likely numbers and density of small cell deployment. As a result, SIA is unable to meaningfully predict the levels of aggregate interference that could be expected. This information is necessary to

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[29] *See* SIA Comments at 14; SIA Reply Comments at 15.

[30] *See* SIA Reply Comments at 15 n.54. Both the Notice and a Google ex parte filing reference a 10 MHz bandwidth, but do not expressly identify it as a minimum bandwidth, making it impossible to calculate the maximum EIRP density. *See* Notice at ¶ 17; Google *Ex Parte* Presentation, GN Docket No. 12-354, filed Sept. 3, 2013, Declaration of P. Marshall at 8.

[31] SIA August *Ex Parte,* Attachment at 4 & Table 3.

[32] *See* SIA Reply Comments at 14 n.51.

[33] *Id.* at 2.

conclusively establish FSS protection criteria. The expectation seems to be that small cell deployment will be more extensive than deployments in the adjacent 3.65 GHz band, so experience in the adjacent band with aggregate effects may provide only limited guidance.

SIA endorses the Commission's suggestion that one or more multi-stakeholder groups be convened to further explore technical standards and interference protection criteria, as suggested in the Notice.[34] Robust participation by the satellite industry will be essential to the success of such efforts, and SIA and its members stand ready to join the discussions.

V. CONCLUSION

For the reasons expressed in the prior SIA comments and herein, SIA urges the Commission to ensure that licensing and technical policies developed to allow introduction of small cells in the 3.5 GHz band are designed to prevent primary satellite services from being harmed or constrained.

Respectfully submitted,

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[34] Notice at ¶ 50.