

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

In the Matter of)	
)	
Unlicensed Use of the 6 GHz Band)	ET Docket No. 18-295
)	
Expanding Flexible Use in Mid-Band Spectrum)	GN Docket No. 17-183
Between 3.7 and 24 GHz)	

REPLY COMMENTS OF SIRIUS XM RADIO INC.

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Sirius XM Radio Inc. (“Sirius XM”) submits this reply to the comments of other parties in response to the Notice of Proposed Rulemaking in the above-captioned proceeding (“Notice”) proposing to allow new unlicensed operations to share use of the 5.925-7.125 GHz (“6 GHz”) band.¹ In its initial comments,² Sirius XM explained that the 6 GHz band is critical to its ability to provide Satellite Digital Audio Radio Service (“SDARS”) to tens of millions of subscribers and urged the Commission to adopt rules protecting these licensed operations from interference that will be caused by widespread consumer use of unlicensed devices in this band. Filings by proponents of unlicensed operations do nothing to allay Sirius XM’s concerns regarding this interference threat. Accordingly, if the Commission authorizes unlicensed use of the 6 GHz band, it must impose and enforce measures to limit the power levels and operating locations of unlicensed devices as well as implement a backstop mechanism designed to prevent further degradation of SDARS operations if these preemptive measures fail to sufficiently constrain aggregate interference at satellite receive antennas.

¹ *Unlicensed Use of the 6 GHz Band*, Notice of Proposed Rulemaking, ET Docket No. 18-295 *et al.* (rel. Oct. 24, 2018).

² Comments of Sirius XM Radio Inc., ET Docket No. 18-295 *et al.*, filed Feb. 15, 201 (“Sirius XM Comments”). Unless otherwise indicated, all citations in this document that do not specify a date or docket number are to comments filed on February 15, 2019 in response to the Notice in ET Docket No. 18-295 *et al.*

I. INTRODUCTION AND SUMMARY

As Sirius XM explained in its Comments, two portions of the 6 GHz band are essential to Sirius XM's provision of SDARS to over 34 million subscribers and over 100 million vehicles equipped with satellite radios. Most significantly, the 7.025-7.075 GHz band constitutes the only feeder link spectrum that can be used to deliver programming to satellites serving SDARS users. The Commission licensed this spectrum for SDARS use in 1997,³ and since that time, every SDARS satellite has been designed to receive programming using only this band. SDARS ground facilities also receive programming using conventional C-band fixed-satellite service ("FSS") spectrum in the 5.945-6.425 GHz band, and next-generation Sirius XM satellites will also use frequencies in this segment to perform telemetry, tracking and command ("TT&C") during orbit-raising following their launch.⁴

Protected access to 6 GHz frequencies is therefore essential for Sirius XM to continue providing SDARS to listeners in the contiguous United States ("CONUS") and parts of Alaska and Canada and to safely manage its satellites. Sirius XM uses spectrum it purchased at auction to supply a wide variety of audio programming, including music, news, sports, weather, traffic, and foreign language offerings, to radios installed in cars, trucks, boats, aircraft, and homes, as well as portable SDARS devices. Importantly, Sirius XM satellites also play a key role in distributing emergency alerts and providing information that can be vital to the safety of life and property during natural disasters and other emergencies and for travelers beyond the range of terrestrial-based networks.⁵ Sirius XM provides all of its services in a very challenging spectrum environment in which it receives interference from numerous sources, including licensed uses of

³ *Id.* at 2 & n.3.

⁴ *Id.* at 2.

⁵ *Id.* at 5-6.

its band and adjacent bands, intermodulation caused by transmissions from other nearby spectrum, and consumer devices operating illegally within and near the SDARS band. All of these sources increasingly aggregate to create unwanted noise in the satellite radio band. No margin exists for allowing further transmissions since they will disrupt service to Sirius XM listeners.

No party in this proceeding disputes the fact that under explicit Commission policies, unlicensed equipment must operate “on a non-interference basis – that is, it shall not cause, nor claim protection from, harmful interference vis-à-vis allocated radio services and authorized users.”⁶ Yet proponents of unlicensed uses of the 6 GHz band seek relaxation of operational constraints the Commission proposed in the Notice, requesting changes that would fundamentally conflict with this core regulatory obligation. The Commission must reject these pleas and implement comprehensive safeguards to preserve critical licensed satellite and terrestrial uses of the 6 GHz band.

Specifically, as the Notice proposed,⁷ the Commission should limit use of the 6.875-7.125 GHz “U-NII-8 band” to indoor devices operating with relatively low power levels. Because unlicensed proponents themselves claim the demand for this proposed service is almost exclusively for indoor operations, there is no rationale for sanctioning outdoor use of the U-NII-8 frequencies. Unlicensed use in vehicles and unmanned aircraft – which provide even less transmission attenuation than a building – should likewise be prohibited in this spectrum. To ensure U-NII-8 devices comply with the indoor-only restriction, the Commission must also take additional steps: requiring a direct power connection and use of an integrated antenna in such

⁶ Notice at n.39, *citing* 47 C.F.R § 15.5(b)-(c).

⁷ Notice at ¶ 66.

devices, specifying that equipment in this band should not be weatherproof and should be delivered to the user in a default state that complies with applicable rules, and adopting its proposal for a transmission cut-off based on Global Positioning System (“GPS”) signal detection.

Moreover, given the impossibility of accurately determining in advance whether unlicensed device proliferation will threaten the reliability of licensed services, the Commission should also adopt a backstop approach for both the U-NII-8 band and the 5.945-6.425 GHz “U-NII-5” C-band uplink frequencies. Specifically, in the event the technical limitations are ineffective to prevent harmful interference, the Commission should set protection criteria for these bands that would trigger a cut-off of further unlicensed device deployment. This approach will allow the Commission to fulfill its stated goal of enabling “new opportunities for unlicensed use” in the 6 GHz band, while ensuring “that licensed services operating in the band continue to thrive.”⁸

II. THE RISK OF HARMFUL INTERFERENCE TO SDARS FROM UNLICENSED DEVICES IS SIGNIFICANT

The Sirius XM Comments explain that the unique characteristics of SDARS make it highly vulnerable to interference, with no available margin to absorb noise level increases due to unlicensed operations in feeder link spectrum.⁹ Like C-band FSS networks, Sirius XM relies on spacecraft in geostationary orbit (“GSO”) whose receive beams “see” interference from devices deployed anywhere in CONUS and whose signal strength is attenuated by distance and subject to interference in both the uplink and downlink spectrum. Yet unlike FSS operations that employ large, high-gain antennas, Sirius XM faces the challenges of delivering an uninterrupted signal to

⁸ *Id.* at ¶ 1.

⁹ Sirius XM Comments at 6-11.

small consumer terminals moving through a broad range of environments that can significantly impair propagation reception characteristics.

Sirius XM invests substantial resources to improving each element of its network in an attempt to overcome these difficulties, using a wide variety of tools to enhance service quality and reliability. Nevertheless, interference is a real, constant, and rapidly growing concern.

SDARS downlinks are adversely affected by adjacent band effects from Wireless Communications Service operations at 2305-2320 MHz and 2345-2360 MHz as well as by third order intermodulation products from transmissions in the Advanced Wireless Service band at 2110-2155 MHz and the Personal Communications Service band at 1850-1990 MHz. On the uplink side, Sirius XM experiences interference from other licensed users in the 6 GHz band, including terrestrial Fixed Service microwave links, television Broadcast Auxiliary Service (“BAS”), Cable Television Relay Service, and Local Television Transmission Services. With the buildout of spectrum the Commission has already licensed and the expected densification of wireless networks, Sirius XM expects a substantial worsening of the interference environment impacting its service over the next few years.

In contrast to the concrete evidence that Sirius XM has presented to the Commission – in this and other proceedings – regarding the degradation of its signal due to ongoing interference, no party supporting unlicensed operations in the 6 GHz band has provided any analysis of the potential effects of such operations on the Sirius XM network. Assertions in the record that unlicensed deployment does not pose a threat to SDARS are wholly unsupported and are not based on reality.

Unlicensed proponents cite calculations of the impact of unlicensed emissions on FSS, but these analyses are substantively flawed and do not reflect the SDARS interference

environment. As FSS operators have pointed out, the predicted effects of unlicensed device proliferation presented in the RKF Study submitted by the “RLAN Group”¹⁰ will vary significantly based on assumptions regarding parameters such as unlicensed device duty cycles and total deployment numbers that are impossible to accurately forecast over the long term.¹¹ Moreover, the RKF Study’s projections go no further than 2025, while GSO satellites whose typical lifespans are 15 years or more will operate well past that horizon, facing interference from unlicensed devices whose numbers are expected to rapidly grow.¹²

More importantly, however, these analyses of anticipated effects on FSS do not reflect the unique characteristics of SDARS. The Wi-Fi Alliance’s claim that SDARS is less likely to experience interference from terrestrial unlicensed use than FSS satellites is based on a fundamental factual falsity concerning the Sirius XM fleet.¹³ Although the mechanism for interference to conventional C-band FSS spacecraft and SDARS satellites is the same – harmful effects of the aggregated signals from a potentially unlimited number of unlicensed devices received at antennas onboard the GSO satellites – FSS and SDARS use different uplink and downlink frequencies and have differing susceptibility to increased noise. Attempting to extrapolate results based on FSS operating scenarios to the SDARS environment is therefore invalid. The licensed services that currently share the SDARS uplink and downlink spectrum –

¹⁰ See Frequency Sharing for Radio Local Area Networks in the 6 GHz Band, prepared by RKF Engineering Services, LLC, Attachment to *Ex Parte* Filing of Apple Inc. *et al.*, GN Docket No. 17-183, filed Jan. 25, 2018 (“RKF Report”).

¹¹ Intelsat and SES Comments at 6-7.

¹² *Id.* at 7.

¹³ Wi-Fi Alliance Comments at 36 (alleging that Sirius XM satellites “operate in a highly elliptical orbit, even further away when orbiting over the continental United States” than GSO spacecraft). In fact, all Sirius XM’s satellites operate in a circular GSO orbit. Although the legacy Sirius fleet did at one time have a non-geostationary orbit component, those satellites were retired several years ago.

as well as unauthorized consumer use of the band – contribute existing interference that affects Sirius XM’s ability to provide a reliable signal to subscribers, and adding emissions from unlicensed devices expected to number in the billions poses a substantial threat to SDARS service quality.

Experience in other satellite bands reinforces Sirius XM’s concerns regarding the threat from unlicensed devices. Just last year Globalstar reported that proliferation of unlicensed devices in the U-NII-1 band had caused an increase in the noise floor double that of the maximum long-term predictions of U-NII proponents.¹⁴ Because no framework was in place to redress its concerns, Globalstar asked the Commission to reopen the U-NII-1 proceeding to adopt additional protections to safeguard Globalstar’s service to customers. The Commission has apparently taken no action on Globalstar’s request.¹⁵

The record provides other instances of consumer devices causing interference to authorized services, both satellite and terrestrial, including cases of customers impermissibly altering or misusing equipment and manufacturers selling noncompliant devices. For example, mass-marketed vehicle radar detectors caused disruptive interference to Ku-band satellite services over a period of years.¹⁶ The National Association of Broadcasters observes that licensed BAS use of channels 8 and 9 has been rendered “practically impossible” due to “ubiquitous and uncoordinated use of these channels by unlicensed Wi-Fi devices, mostly used

¹⁴ Globalstar, Inc. Petition for Notice of Inquiry, RM-11808, May 21, 2018 (“Globalstar Petition”) at 2 & n.7.

¹⁵ The most recent activity in response to the Globalstar Petition dates from last October, when Globalstar met with Commission staff to reiterate the evidence it has collected regarding noise floor increases in the U-NII-1 band and to highlight the imminent danger that unlicensed uses would degrade the scope and quality of Globalstar’s services. *See Ex Parte* Filing of Globalstar, Inc., RM-11808, filed Oct. 11, 2018.

¹⁶ Sirius XM Comments at 15 n.39, *citing Review of Part 15 and other Parts of the Commission’s Rules*, First Report and Order, 17 FCC Rcd 14063, 14067-69, ¶¶ 10-15 (2002).

indoors.”¹⁷ Illegal user modifications to devices designed for operation in the U-NII-3 band were found to be the cause of persistent interference to federal weather radar systems in the adjacent U-NII-2C band.¹⁸ In addition, Sirius XM has itself discovered that consumer devices designed to operate in the SDARS downlink spectrum that is prohibited for use under Commission rules are causing interference to reception by Sirius XM subscribers.¹⁹

These examples prove the falsity of the unsupported assertion that unlicensed devices “have a lengthy and successful track record of sharing with existing users, including highly sensitive government users.”²⁰ In order to ensure that licensed SDARS operations do not fall victim to similar harm, the Commission needs to establish a regulatory framework that both decreases the risk that interference will occur and provides an effective mechanism to remedy it, if it does.

III. THE COMMISSION MUST BOLSTER, NOT RELAX, PROPOSED PROTECTIONS FOR SDARS FEEDER LINKS IN THE U-NII-8 BAND

The Commission has recognized that SDARS “feeder link networks are essential to deliver service to the end user,”²¹ and protecting these critical operations requires a comprehensive and enforceable set of limitations on unlicensed device use of the U-NII-8 band,

¹⁷ National Association of Broadcasters (“NAB”) Comments at 15.

¹⁸ Sirius XM Comments at 15 & n.40, *citing Revision of Part 15 of the Commission’s Rules to Permit Unlicensed National Information Infrastructure (U-NII) Devices in the 5 GHz Band*, First Report and Order, 29 FCC Rcd 4127, 4131, ¶ 12 (2014). *See also* Engineers for the Integrity of Broadcast Auxiliary Services Spectrum (“EIBASS”) Comments at 6 (noting that the Commission’s website includes a list of 49 enforcement actions involving interference to federal weather radars).

¹⁹ Sirius XM Comments at 15.

²⁰ Comments of Apple Inc. *et al.* (“RLAN Group Comments”) at 11.

²¹ *Establishment of Rules and Policies for the Digital Audio Radio Satellite Service in the 2310-2360 MHz Frequency Band*, IB Docket No. 95-91, Report and Order, Memorandum Opinion and Order, and Further Notice of Proposed Rulemaking, 12 FCC Rcd 5754, 5806 (1997).

which encompasses the 7.025-7.075 GHz SDARS feeder link frequencies. Sirius XM's Comments expressed its strong support for the Commission's proposal to restrict unlicensed operations in the U-NII-8 band to indoor use with limited power levels in order to reduce the risk of harmful interference to SDARS. Requests by some parties to allow outdoor or higher power operations in this spectrum are unwarranted and must be rejected. Instead, the Commission should adopt rules designed to maximize compliance with restrictions on unlicensed use of U-NII-8 frequencies.

Commenters suggesting the Commission should consider permitting outdoor operations in part or all of the U-NII-8 band at either standard power²² or "very low power,"²³ provide no valid rationale for making yet more unlicensed spectrum available for outdoor use. Proponents of unlicensed operations such as the RLAN Group have repeatedly insisted that only a very small percentage of U-NII usage will be outdoors, claiming that a 2% outdoor ratio is "conservative."²⁴ Under the Notice's proposals, more than enough spectrum will be made available to meet this projected 2% of demand, as outdoor deployment would be permitted in both the U-NII-5 and U-NII-7 bands, representing 850 MHz or nearly 71% of the 1,200 MHz total 6 GHz spectrum. Accordingly, based on claims of the unlicensed proponents themselves, no possible justification exists for permitting outdoor operations in the U-NII-8 band as well.

²² See, e.g., Broadcom Comments at 3; Microsoft Comments at 13; Computing Technology Industry Association ("CompTIA") Comments at 2; Nokia Comments at 5; Qualcomm Comments at 11; Wi-Fi Alliance Comments at 33.

²³ See, e.g., Broadcom Comments at 2; Facebook Comments at 5-6; RLAN Group Comments at 35.

²⁴ See RKF Report at 14; *Ex Parte* Filing of Apple Inc. *et al.*, GN Docket No. 17-183, filed Aug. 16, 2018 at 2-4. See also RLAN Group Comments at B-4 (the "vast majority" of unlicensed RLAN operations are indoors); Cisco Comments at 2 (describing high demand for indoor unlicensed uses).

Moreover, the Commission’s tentative finding that unlicensed use will not interfere with SDARS and other licensed services in the U-NII-8 band relies on the indoor-only and low power restrictions proposed.²⁵ Commenters confirm this view. Globalstar, for example, “strongly supports the Commission’s proposed U-NII-8 prohibition against unlicensed operations at outdoor locations,” explaining that the threat of harmful interference to Globalstar’s feeder downlink transmissions and to incumbent BAS operations would be much higher if the Commission were to permit outdoor unlicensed use.²⁶

Suggestions that the Commission increase permissible power levels in the U-NII-8 band²⁷ must also be rejected. As discussed above, there is no demonstrated need to make more spectrum available for outdoor use, and no commenter shows that higher power limits are needed for unlicensed operations indoors.

Consistent with the indoor restriction for the U-NII-8 band, the Commission should adopt its proposal to prohibit deployment of unlicensed access points in moving vehicles, such as trains, cars, and aircraft, and to ban all unlicensed devices in unmanned aircraft, as such environments do not offer adequate attenuation of the interfering signal to protect incumbent licensed operations.²⁸ Parties objecting to these limitations rely on the notion that the Automated Frequency Coordination (“AFC”) system will be able to engage in complicated calculations to

²⁵ See Notice at ¶ 66 (due to “the low power and low probability that an indoor unlicensed device will have a direct line of sight” to SDARS satellites, “the risk of causing harmful interference to these satellites is low”); ¶ 61 (restricting unlicensed devices to low power, indoor use is expected to protect terrestrial mobile operations in the U-NII-6 and 8 bands from harmful interference).

²⁶ Globalstar Comments at 13. See also NAB Comments at 9-12 (describing risks to BAS operations even with the indoor-only restriction).

²⁷ Charter Comments at 3 (suggesting across-the-board power level increases); CompTIA Comments at 2 (standard power operations should be considered in the U-NII-8 band under AFC control); GE Healthcare Comments at 7-8.

²⁸ Notice at ¶¶ 84-85.

manage potential interference by predicting the path of the vehicle and comparing it against the locations of licensed 6 GHz facilities.²⁹ Even assuming that such a complex AFC system could be cost-effectively deployed,³⁰ this framework cannot be applied to unlicensed uses in the U-NII-8 band, which are not proposed to be under AFC control and which could not feasibly be coordinated with terrestrial mobile operations in this band segment.

As the Sirius XM Comments explain, adopting appropriate restrictions to protect incumbent licensed services in the U-NII-8 band is only the first necessary step; the Commission must also implement measures to ensure that those restrictions are effective and cannot easily be evaded once unlicensed devices are in consumers' hands.³¹ Unlicensed device documentation must include prominent notifications regarding usage constraints, including the indoor-only limitation for U-NII-8 devices.³² Other commenters share Sirius XM's concern that notification by itself cannot be relied on to prevent unauthorized use of devices, as it assumes that consumers will read and comply with the notification.³³ For this reason Southern Company emphasizes that while consumer notifications are advisable, they cannot "substitute, in whole or in part, for mandatory design elements needed to prevent [the] risk of interference."³⁴

²⁹ See Apple Comments at 1-2; Broadcom Comments at 46; Hewlett Packard Enterprise Comments at 25-27; RLAN Group Comments at 53.

³⁰ Several parties question how an AFC could effectively prevent unlicensed operations in moving vehicles from creating interference to terrestrial fixed services. See, e.g., Southern Company Comments at 18-19; APCO International Comments at 18; Fixed Wireless Communications Coalition, Inc. ("FWCC") Comments at 34.

³¹ Sirius XM Comments at 14-17.

³² *Id.* at 14 & n.37, citing Notice at ¶ 91.

³³ See, e.g., Texas New Mexico Power Co. Comments at 1-2; Southern Company Comments at 5, 21-22.

³⁴ Southern Company Comments at 21.

For U-NII-8 devices, these essential design elements should include requirements for direct connection to a fixed, in-building AC mains power source, use of an integrated antenna, employment of a GPS signal reception cut-off to inhibit device transmissions, and provision of devices that are compliant out-of-the box, as well as a prohibition on weatherproofing. Many of these factors are supported by unlicensed device proponents as well as by incumbent licensees. The Wi-Fi Alliance, for example, observes that the Commission could issue device certification guidelines requiring that devices subject to an indoor-only restriction “operate only when connected to a main power supply, preventing use in a battery-powered mode that would facilitate unauthorized outdoor operations.”³⁵ Similarly, there is broad agreement that mandating the antenna be integrated into the unlicensed device and banning “connectorized” antennas is appropriate to limit the ability to circumvent indoor-only limitations.³⁶

Because these limitations would not prevent a consumer from placing a U-NII-8 device on a patio, rooftop deck, or other outdoor environment equipped with electrical outlets,³⁷ the Commission should also require use of a GPS signal detection trigger to inhibit device transmissions and specify that devices may not be designed to include exterior environmental protections. As the Notice observes, a GPS reception cut-off would provide more comprehensive interference protection by deterring not only outdoor use but also indoor placements at locations on upper floors or near windows where emissions are more likely to

³⁵ Wi-Fi Alliance Comments at 18-19. *See also* Boeing Comments at 7; Hewlett Packard Enterprise Comments at 21; RLAN Group Comments at 32.

³⁶ *See, e.g.*, RLAN Group Comments at 32 (“prohibiting connectorized antennas on [low power indoor] devices, for which there would rarely be any legitimate need” would limit the possibility of such devices being used outdoors); Hewlett Packard Enterprise Comments at 21; Tucson Electric Comments at 23.

³⁷ *See* Sirius XM Comments at 16; NAB Comments at 12.

propagate farther and reach incumbent licensees' receivers.³⁸ Objections from unlicensed device proponents regarding the costs of incorporating a GPS trigger and concerns that "false positive" cut-offs could lead to consumer confusion³⁹ are speculative and unpersuasive. Since the Commission's Rules prohibit unlicensed devices from causing interference, the developers of those devices are obligated to shoulder the necessary costs of ensuring such devices function in a compliant manner. Consumer documentation can provide guidance to users regarding the need to relocate an access point to a more interior location in the event the GPS cut-off is preventing consistent operation.

The comments also support requiring indoor devices to be designed without protections against weather effects. For example, Boeing suggests approaches such as "placing open air vents on the upper casing of U-NII devices and using casing materials and control panels that clearly are not resistant to rain or other outdoor conditions."⁴⁰

Finally, the Commission must guard against intentional or unintentional user alteration of devices in ways that would violate applicable transmission power limits and placement restrictions. As Sirius XM has noted, this means that "devices' default operational settings should be compliant with all Commission requirements straight out of the box – without regard to whether the user thoroughly reviews and obeys the instruction manual."⁴¹ Properties that are necessary to ensure a device's operations meet Commission standards, including antenna

³⁸ Notice at ¶ 71.

³⁹ See Boeing Comments at 7; Hewlett Packard Enterprise Comments at 21-22.

⁴⁰ Boeing Comments at 7; *see also* Wi-Fi Alliance Comments at 18 (indoor-only devices should "not be designed to be weather-proof").

⁴¹ Sirius XM Comments at 17.

directivity, frequency assignment, and transmitter power, should be set at the factory without any adjustment possible by the user.⁴²

Even with these protections, a determined user may well find ways to circumvent the Commission's requirements,⁴³ but this possibility does not undermine the need for imposing the requirements. Given the value provided by SDARS and other incumbent licensed services using the U-NII-8 band and the risk of damaging interference, the Commission must take all reasonable steps to prevent harm caused by deployment of unlicensed devices in this spectrum.

IV. THE RECORD SUPPORTS THE NEED FOR BACKSTOP MEASURES TO PROTECT SATELLITE OPERATIONS IN THE U-NII-8 AND U-NII-5 BANDS

Precisely because any provisions to protect licensed satellite services in the 6 GHz spectrum are fallible, the Commission should also implement a framework to counteract interference if it occurs. Specifically, for both the SDARS feeder link spectrum in the U-NII-8 band and FSS C-band uplinks in the U-NII-5 band, the Commission should put a backstop provision in place that, if triggered, would prevent further unlimited growth of aggregate interference to space station receivers.

The need for such safeguards is apparent, as the record makes clear that relying on predictions and assumptions regarding the threat of harmful aggregate interference is insufficient to protect satellite operations. For example, the Notice recognizes that although indoor-only rules may decrease the chance for interference to incumbents based on building attenuation effects, other factors including total numbers and deployment density of unlicensed devices and the protection requirements for licensed operations also are relevant to these risks.⁴⁴

⁴² *Id.* at 16-17.

⁴³ *See, e.g.*, EIBASS Comments at 5; Globalstar Comments at 13.

⁴⁴ Notice at ¶ 61.

Commenters agree, noting that full compliance with indoor requirements in the U-NII-8 band is unlikely,⁴⁵ and the attenuation provided by structures can vary widely.⁴⁶ Similarly, factors such as the duty cycles of unlicensed operations have a significant effect on potential harmful interference, and simply employing an average assumed duty cycle, as the RKF Report does, can mask the true interference threat.⁴⁷

To further constrain the possibility of harmful interference to SDARS feeder links and C-band FSS uplinks, the Commission should apply a backstop procedure in both the U-NII-8 and U-NII-5 bands, as proposed in the Sirius XM Comments⁴⁸ and similar to what Globalstar has requested for the U-NII-1 frequencies.⁴⁹ For the U-NII-8 band, the Commission should impose an interference-to-noise ratio at the SDARS satellite receiver of -23 dB, reflecting the ratio specified in the RKF Report for satellite service protection with a modest additional margin to account for factors including interference from licensed services, measurement error, and delay in implementing backstop measures. If measurement of the noise environment by the service

⁴⁵ See, e.g., Globalstar Comments at 13 (“even under the Commission’s proposed indoor restriction, a significant amount of outdoor unlicensed operations at U-NII-8 would be inevitable”).

⁴⁶ See, e.g., NAB Comments at 11 (noting, for example, that “common glass window panes installed ubiquitously throughout the U.S. offer practically no attenuation at 6 GHz”).

⁴⁷ See Intelsat and SES Comments at 7 (highlighting the substantial impact of duty cycle assumptions on predicted interference and noting that European studies are premised on a duty cycle of 1.97%, whereas the RKF Report used duty cycles of 0.11% to 0.44% for high activity devices); NAB Comments at 6-7 (discussing the invalid results produced by the RKF Report’s reliance on average duty cycle values).

A number of parties suggest that the Commission prescribe a maximum duty cycle for unlicensed devices operating in the 6 GHz band (see, e.g., SBE Comments at 11; Ultra Wide Band Alliance Comments at 1), and Sirius XM would support adoption of a duty cycle requirement as well. If the Commission chooses not to employ such a limit, however, it must at least take steps to avoid adverse consequences to licensed incumbent services if optimistic predictions regarding low duty cycles for unlicensed devices prove to be inaccurate.

⁴⁸ Sirius XM Comments at 17-20.

⁴⁹ See Globalstar Petition at 25.

operator indicates that this threshold is being approached, the Commission would then bar manufacture, importation, and sale of additional unlicensed devices that can operate in the SDARS feeder link portion of the U-NII-8 band, 7.025-7.075 GHz.

For the U-NII-5 band, the Commission should set the backstop trigger based on the protection criteria identified by FSS operators.⁵⁰ The AFC system proposed to be used in the U-NII-5 band could be employed to implement this backstop, by requiring that AFCs cease authorizing new unlicensed operations in any U-NII-5 channel in which the defined trigger level has been exceeded.⁵¹

As Sirius XM has explained, employing a backstop approach would provide a necessary protective effect without impairing the legitimate interests of unlicensed device proponents.⁵² If these parties' predictions that aggregate interference will never threaten the reliability and quality of satellite services prove to be well-founded, then the backstop will never be triggered. Unlicensed operations will be constrained only in the event these projections prove to be incorrect, making it necessary to prevent further unlicensed deployment that would compromise satellite service integrity.

⁵⁰ See Intelsat and SES Comments at 2, 10-12 (specifying a limit on aggregate power at the satellite receiver of -142 dBW in the U-NII-5 and U-NII-7 bands in order to achieve an interference-to-noise ratio of -13.5 db).

⁵¹ Sirius XM Comments at 20.

⁵² See *id.* at 18, 20.

V. CONCLUSION

For the reasons set forth herein and in the Sirius XM Comments, the Commission must implement rules and procedures that ensure any introduction of unlicensed devices in the 6 GHz band does not compromise the quality of valuable licensed services in this spectrum.

Respectfully submitted,

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