

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	)	

**COMMENTS OF SIRIUS XM RADIO INC.**

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## SUMMARY

On behalf of itself and its over 34 million Satellite Digital Audio Radio Service (“SDARS”) customers, Sirius XM urges the Commission to ensure that introduction of unlicensed devices in the 5.925-7.125 GHz (“6 GHz”) band will not come at the expense of existing licensees that supply essential and desired communications services. Sirius XM requires ongoing, reliable access to 6 GHz frequencies in order to operate its business, since the only spectrum it can use for SDARS feeder links lies in the range that the Notice proposes for sharing with unlicensed devices, designated as the “U-NII-8” band. Sirius XM also receives third party programming via conventional C-band satellites that use uplink spectrum in the “U-NII-5” band and will rely on a portion of that band for telemetry, tracking and command during the phase following launch of its next-generation satellites.

Protecting SDARS quality and availability serves key public interest objectives. The Sirius XM network delivers not only music, news, sports, and entertainment programming, but also emergency alerts and weather information that can be critical to listener safety in natural disasters. Sirius XM also serves maritime and airborne users beyond the reach of land-based services, and SDARS can continue operating when terrestrial networks are disrupted.

Sirius XM has invested billions of dollars to build and maintain facilities and provide the highest possible service quality, but it faces a very challenging interference environment. As a result, it has no available margin for additional interference from new unlicensed operations. Because SDARS spacecraft receive beams are extremely large, transmissions from devices anywhere in the contiguous U.S. would contribute to the aggregate interference reaching listeners’ satellite antennas. Moreover, unlicensed operations historically have proven to be very difficult for the Commission to police once devices are in the hands of consumers, providing

further incentive for the Commission to exercise extreme caution before allowing consumer devices to use these bands.

To maintain the integrity of SDARS feeder links, the Commission must adopt and enforce the power limits and indoor-only restriction that the Notice proposed for the U-NII-8 frequencies. The Commission must prohibit deployment in vehicles or on drones, and users must be fully advised of these policies. To reinforce the ban on outdoor use, the Commission should require devices to incorporate a cut-off based on GPS signal detection. In addition to these measures designed to prevent harmful aggregate interference, the Commission should adopt a backstop approach whereby further manufacture and sale of U-NII-8 band devices would be banned if the interference-to-noise ratio at any of the SDARS satellite receivers reaches -23 dB. Imposing this limit should not affect the legitimate interests of unlicensed device proponents, which have assured the Commission that such devices will not be deployed in numbers sufficient to trigger harmful interference to satellite reception.

In the U-NII-5 band, the Commission should set limits on device pointing towards the geostationary arc and impose power constraints to protect satellite uplink operations. A backstop approach should be used in this band as well to address the potential for harmful aggregate interference. The Notice proposes to employ automated frequency coordination in this segment of the 6 GHz band, and coordinators should cease authorizing use of any frequency channel in which the protection threshold has been reached.

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**COMMENTS OF SIRIUS XM RADIO INC.**

Sirius XM Radio Inc. (“Sirius XM”) submits these comments in response to the Notice of Proposed Rulemaking in the above-captioned proceeding (“Notice”), which seeks input on rules that would allow new unlicensed operations in the 5.925-7.125 GHz (“6 GHz”) band.<sup>1</sup> The 6 GHz band is essential for Sirius XM’s provision of Satellite Digital Audio Radio Service (“SDARS”) to tens of millions of subscribers and other users. The Commission must establish a regulatory framework that ensures that the proliferation of unlicensed devices does not disrupt these valuable incumbent operations.

**I. INTRODUCTION AND BACKGROUND**

The proposals in the Notice are intended to achieve a delicate and difficult balance – promoting “new opportunities for unlicensed use” in the 6 GHz band, while ensuring “that licensed services operating in the band continue to thrive.”<sup>2</sup> Sirius XM provides one of the many “licensed services” that use this spectrum, and the satellite radio service it provides depends on continued, protected access to 6 GHz frequencies. Specifically, two segments in this range are critical to Sirius XM’s provision of SDARS to over 34 million subscribers and over 100 million

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

<sup>2</sup> *Id.* at ¶ 1.

vehicles equipped with satellite radios. The 7.025-7.075 GHz spectrum is the sole available feeder link spectrum used to transmit programming to all SDARS users.<sup>3</sup> In addition, a portion of that programming is distributed over conventional C-band satellites that have uplinks in the 5.945-6.425 GHz band, and Sirius XM will also use conventional C-band for telemetry, tracking and command (“TT&C”) during the orbit-raising phase following launch of its next-generation spacecraft. Ensuring that these frequencies remain free from harmful interference is essential to Sirius XM’s continued ability to use spectrum it purchased at auction to bring a full range of audio programming, including music, news, sports, weather, traffic, and emergency information, to listeners nationwide and to safely manage its satellites.

Given the vital role that 6 GHz frequencies play in the continued operation of its SDARS network, Sirius XM has participated at every stage of this proceeding,<sup>4</sup> highlighting the interference risk of allowing unlicensed consumer devices scattered throughout the nationwide receive beams of SDARS satellites. Other satellite interests have raised similar concerns about the impact of aggregate interference on fixed-satellite service (“FSS”) networks.<sup>5</sup>

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<sup>3</sup> See *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, 5807, ¶ 129 (1997) (“SDARS Order”) (“The satellite DARS systems cannot operate without sufficient feeder link spectrum. We therefore will permit satellite DARS feeder link networks in the FSS frequency bands 7025-7075 MHz and 6725-7025 MHz (101° W.L. orbital location only), consistent with the requirements identified in the current applications.”) Since no SDARS satellites operate at the 101° orbital location, the only spectrum available to SDARS for feeder links is 7.025-7.075 MHz.

<sup>4</sup> See, e.g., Comments of Sirius XM Radio Inc., GN Docket No. 17-183, filed Oct. 2, 2017 (“Sirius XM NOI Comments”); *Ex Parte* Filing of Sirius XM, GN Docket No. 17-183, filed June 22, 2018 (“Sirius XM June Submission”); *Ex Parte* Filing of Sirius XM, ET Docket No. 18-295 & GN Docket No. 17-183, filed Oct. 16, 2018.

<sup>5</sup> See, e.g., Comments of the Satellite Industry Association, GN Docket No. 17-183, filed Oct. 2, 2017 at 41-44; *Ex Parte* Filing of SES Americom, Inc. and Intelsat Corporation, GN Docket No. 17-183, filed Feb. 23, 2018.

If the Commission proceeds with its proposals to permit unlicensed operations in the 6 GHz band, it must ensure that the services provided by SDARS and other incumbent satellite services are protected from interference and are not otherwise impaired. Sirius XM has invested heavily in measures to maximize its system's performance but, despite these efforts, Sirius XM currently experiences significant interference affecting the quality and availability of the SDARS signal received by many of its customers. Unlicensed devices would create additional noise at the SDARS space station receiving antennas which, aggregating with interference caused from terrestrial sources, would degrade the integrity of the programming reception of the satellite radio service. Similarly, interference affecting conventional C-band uplinks could compromise those programming streams and threaten Sirius XM's ability to safely control its new space stations immediately following launch.

To minimize these risks, the Commission must put rules in place that not only limit the risk of harmful aggregate interference but also allow prompt redress if such interference does occur. Sirius XM strongly supports proposals in the Notice to restrict unlicensed deployment in the "U-NII-8" band that includes the SDARS feeder link spectrum to indoor installations at relatively low power levels<sup>6</sup> and to employ automated frequency coordination ("AFC") to manage unlicensed deployment in conventional C-band uplink frequencies designated as the "U-NII-5" band.<sup>7</sup> However, relying on measures intended to prevent interference from occurring does not provide sufficient assurance that incumbent services will be adequately protected, given the impossibility of accurately predicting how many 6 GHz unlicensed devices will be deployed,

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<sup>6</sup> Notice at ¶ 66.

<sup>7</sup> *Id.* at ¶¶ 55-58.

how intensively such devices will be used, and the difficulties of implementing remedies if such interference does occur.

To safeguard SDARS operations, in addition to imposing limits on the power levels and location of devices that would be permitted to use 6 GHz spectrum, the Commission must mandate design restrictions for these devices and implement backstop protections to prevent further deployment of unlicensed devices in the SDARS uplink frequency band if specified interference thresholds are exceeded. Specifically, the Commission should define protection criteria in the SDARS feeder link and conventional C-band uplink spectrum that would trigger a cut-off of further device deployment. This approach will allow the Commission to fulfill its goal of ensuring that the introduction of new unlicensed operations does not impair the quality and reliability of licensed services such as Sirius XM that currently serve tens of millions of paying subscribers.

## **II. SDARS CONTINUITY AND RELIABILITY ARE CRITICAL TO THE PUBLIC INTEREST**

Protecting Sirius XM's ability to maintain a high level of service quality and continuity promotes important public interest objectives. Sirius XM uses spectrum purchased at auction to offer hundreds of channels of music, entertainment, news, and sports programming, including channels offered in languages other than English, as well as channels providing emergency information, local weather, and traffic information.<sup>8</sup> Sirius XM satellites provide coverage of the

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<sup>8</sup> See *Amendment of Part 27 of the Commission's Rules to Govern the Operation of Wireless Communications Services in the 2.3 GHz Band*, Report and Order and Second Report and Order, WT Docket No. 07-293 *et al.*, 25 FCC Rcd 11710, 11715-16, ¶¶ 7-10 (2010) ("WCS and SDARS Order"); *Applications for Consent to the Transfer of Control of Licenses, XM Satellite Radio Holdings Inc., Transferor, to Sirius Satellite Radio Inc., Transferee*, Memorandum Opinion and Order and Report and Order, MB Docket No. 07-57, 23 FCC Rcd 12348, 12351, ¶ 2, 12353-58, ¶¶ 8-19 (2008).



contiguous United States (“CONUS”) and parts of Alaska and Canada, communicating with radios in cars, trucks, boats, aircraft, and homes, as well as portable SDARS devices.<sup>9</sup>

The scope of Sirius XM’s SDARS operations allows maritime and aviation customers to receive service when their travels take them beyond the reach of traditional terrestrial radio networks. Moreover, natural disasters and power outages that may disable terrestrial networks are unlikely to affect the satellite-based Sirius XM service. As a result, Sirius XM serves as an essential source of time-sensitive weather forecasts, news reports, and other potentially life-saving information during emergency situations when reliable reception is especially critical.

For example, Sirius XM routinely makes The Weather Channel available free-to-air for anyone with a satellite radio (regardless of whether the radio is subscribed to Sirius XM) during hurricanes and tropical storms.<sup>10</sup> As a result, even when power outages disable the operations of terrestrial television and radio stations, those with access to an SDARS receiver in their vehicles or a self-powered aftermarket satellite radio can still receive up-to-date information regarding the paths of these dangerous storms.

Sirius XM also participates actively in the Emergency Alert System (“EAS”) that the Commission administers in conjunction with the Federal Emergency Management Agency (“FEMA”) and the National Weather Service. Sirius XM transmits national alerts directly to SDARS subscribers and is a designated Primary Entry Point (“PEP”) station,<sup>11</sup> partnering with FEMA to provide a backup mechanism to distribute EAS alerts to PEP stations and others,

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<sup>9</sup> WCS and SDARS Order, 25 FCC Rcd at 11716, ¶10.

<sup>10</sup> See, e.g., <http://blog.siriusxm.com/get-live-hurricane-florence-updates-from-the-weather-channel-on-siriusxm/>; <http://blog.siriusxm.com/2017/08/25/hear-the-weather-channel-on-siriusxm-during-hurricane-harvey/>; <http://blog.siriusxm.com/2017/09/07/listen-to-the-weather-channel-on-siriusxm-during-hurricane-irma/>.

<sup>11</sup> See *Strengthening the Emergency Alert System (EAS): Lessons Learned from the Nationwide EAS Test*, EB Docket No. 04-296 (PSHSB rel. Apr. 14, 2013) at 10 n.21.

including state emergency operations centers. In this capacity, Sirius XM designed and supplied more than one hundred EAS receivers for installation at PEP stations and state emergency communications centers across the country. In a recent letter, FEMA recognized Sirius XM as a “valued partner . . . for distribution of national-level EAS messages,” citing to FEMA’s relationship with Sirius XM dating back to August 2005.<sup>12</sup>

In short, preserving the integrity of the SDARS network is not simply a matter of protecting the continued ability of Sirius XM subscribers to receive the programming service they have purchased. The broader role of Sirius XM in the nation’s communications infrastructure means that uninterrupted access to the SDARS signal can be vital to the safety of life and property during natural disasters and other emergencies and for travelers outside the bounds of terrestrial-based networks.

### **III. INTRODUCING UNLICENSED DEVICES IN 6 GHz SPECTRUM PRESENTS SIGNIFICANT CHALLENGES FOR SDARS OPERATIONS**

SDARS is highly vulnerable to interference, with no available margin to absorb increases in the noise level. Programming distributed by Sirius XM satellites travels from feeder link earth stations on the ground up to geostationary orbit (“GSO”) satellites and then is relayed to subscribers’ radios in customer vehicles or homes, a round trip of more than 46,000 miles. During this circuit, the signal is already subjected to significant interference from co-frequency and adjacent channel users of the uplink spectrum in the 6 GHz band and the downlink spectrum in the 2.3 GHz band. Unlike FSS operations that employ large, high-gain antennas, “Sirius XM must deliver a continuous, reliable signal to consumer-grade mobile terminals with very low gain antennas traveling through a variety of diverse and changing propagation scenarios, ranging from

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<sup>12</sup> See Attachment A to *Ex Parte* Filing of Sirius XM, EB Docket No. 04-296 *et al.*, filed Nov. 5, 2018.

the jam-packed thoroughfares of urban canyons to foliage-covered rural roads to highways traversing open plains.”<sup>13</sup> In this difficult interference environment, Sirius XM must meet the service quality expectations of SDARS listeners, who understandably demand extremely high reliability for their subscription dollars.

In the face of these challenges, Sirius XM has invested significant resources to preserve the integrity of its service. Sirius XM has explained that its network design employs a range of interference mitigation techniques including:

satellite spatial diversity, satellite time diversity, satellite frequency diversity, transmission data interleaving, and deployment of terrestrial repeaters in core urban areas to increase signal reliability. In addition, Sirius XM has enhanced its system’s performance over time by launching more powerful satellites, using transmitting beams shaped by 30-foot diameter satellite antennas, improving subscriber radio sensitivity, and optimizing the use and location of the terrestrial repeaters in its network.<sup>14</sup>

Despite these efforts, interference has had an increasingly disruptive effect on SDARS operations. The primary sources of this interference to the licensed Sirius XM downlink spectrum at 2320-2345 MHz are emissions from Wireless Communications Service (“WCS”) operations at 2305-2320 MHz and 2345-2360 MHz, and 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.<sup>15</sup> Because these are all licensed services, Sirius XM has generally been able to identify the sources of interference and address them with the responsible operator.<sup>16</sup> On the uplink side, SDARS signals receive interference from other

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<sup>13</sup> Sirius XM June Submission, Attachment at 5.

<sup>14</sup> *Id.*, Attachment at 6.

<sup>15</sup> *See id.*, Attachment at 6.

<sup>16</sup> In addition, SiriusXM is also combating interference from an increasing number of consumer devices illegally operating in and around the SDARS band. *See* further discussion in Section IV.A., below.

operations in the 6 GHz band, including terrestrial Fixed Service microwave links, television Broadcast Auxiliary Service, Cable Television Relay Service, and Local Television Transmission Service, all of which are also licensed services.<sup>17</sup> Sirius XM understands that these services plan to increase the number of transmitters in the future.

Interference from existing licensed operations has left Sirius XM with no margin to tolerate additional contributions to the noise environment. The proposals in the Notice to introduce billions of unlicensed transmitting devices in the 6 GHz uplink frequencies raise substantial concerns for two reasons.

First, as Sirius XM has shown, SDARS spacecraft have wide receive beams that cover all of CONUS.<sup>18</sup> Unlicensed devices deployed anywhere within these broad areas will contribute to the aggregate interference received at the space station antenna. The received interference power flux density is also amplified by the satellite antenna's gain – by a factor of 800 over much of the United States.<sup>19</sup> Moreover, the overall impact is additive, such that the potential for interference is high, given the staggering quantity of devices that could be deployed in the band. The Notice cites projections that a single category of unlicensed equipment – smart home devices – will number more than 1 billion in the U.S. by 2023 and that there will be more than 15 billion short-range Internet of things (“IoT”) devices by 2022.<sup>20</sup> In contrast, proponents of unlicensed use understate the likelihood of interference by assuming a far lower number of unlicensed devices that will be in use.<sup>21</sup> The Commission's predictions of skyrocketing demand for unlicensed

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<sup>17</sup> *Id.*, Attachment at 6-7.

<sup>18</sup> *Id.*, Attachment at 7-9.

<sup>19</sup> *Id.*, Attachment at 7.

<sup>20</sup> Notice at ¶ 7.

<sup>21</sup> 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,

devices fuel Sirius XM's concern that the unlicensed community's assurances are unrealistic and that interference thresholds needed to protect SDARS could quickly be exceeded as unlicensed deployment mushrooms.

Second, unlike the Commission licensees with which Sirius XM currently can discuss interference issues as they arise, unlicensed usage presents the prospect of vast numbers of devices in the hands of end users whose identities and locations will be unknown. In such a scenario, Sirius XM will have no means to seek redress if aggregate interference from unlicensed operations causes disruption to the multi-billion dollar SDARS network that serves tens of millions of subscribers.

The Commission has acknowledged that SDARS is highly sensitive to interference and has adopted rules to reduce the risk of interference from the neighboring WCS band. Among other things, those rules encourage the use of coordination agreements, adopt a unique definition of interference to SDARS, impose strict limits on the technical operations of WCS licensees, establish procedures for measuring and resolving interference, impose information sharing requirements, and place a duty on the parties to cooperate to identify and avoid interference.<sup>22</sup> Implementing these requirements is a significant undertaking, requiring the constant diligence and focus of two experienced Commission licensees – Sirius XM and AT&T – each of which has recognized the challenges and committed the time of multiple employees and substantial corporate resources to the effort for the long-term future. This process simply is not adaptable to a scenario where billions of unlicensed devices are potentially contributing to the creation of harmful interference. The Commission cannot reasonably expect interference will be avoided

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filed Jan. 25, 2018 (“RKF Report”) at 11 (assuming only roughly 1 billion 6 GHz capable unlicensed devices will be deployed).

<sup>22</sup> See, e.g., 47 C.F.R. §§ 27.50, 27.53, 27.64, and 27.72.

where the risk is caused by unlicensed consumer devices whose users are unfamiliar with the Commission's requirements, unable to develop formal coordination agreements, and incapable of addressing and resolving technical concerns when they arise.

Nor are these merely theoretical concerns. Globalstar has described in detail its experience in the U-NII-1 band, highlighting the problems that can arise when unlicensed devices proliferate in satellite spectrum and demonstrating the difficulty of efforts to rein in interference once it begins.<sup>23</sup> Specifically, Globalstar explained that within a few years after the Commission changed its rules to allow outdoor deployment of devices and higher power levels in U-NII-1 spectrum, Globalstar found increases in the noise floor at its satellite receivers that were *double* what U-NII proponents had predicted would be the maximum interference levels resulting from these devices.<sup>24</sup> Because the U-NII-1 rules did not provide a specific mechanism to address this interference threat, Globalstar petitioned the Commission to reopen that proceeding to develop additional protections to preserve the availability and reliability of its licensed satellite operations. That petition remains pending, with the detrimental effects of the rising noise level apparently continuing unabated.

Proposals to allow unlicensed operations in the U-NII-8 band used for SDARS uplinks and the U-NII-5 FSS uplink and TT&C spectrum trigger the same aggregate interference issues that have already been seen in the U-NII-1 band. The Commission must learn from this history and establish measures from the outset to curtail the risk of harmful interference to SDARS with

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<sup>23</sup> Globalstar, Inc. Petition for Notice of Inquiry, RM-11808, May 21, 2018 (“Globalstar Petition”), available at: <https://ecfsapi.fcc.gov/file/1052171263995/Globalstar%20Petition%20for%20Notice%20of%20Inquiry%20filed%20052118.pdf>.

<sup>24</sup> *Id.* at 2 & n.7.

further mechanisms to ensure that any significant interference that does occur can be promptly and effectively addressed.

#### **IV. UNLICENSED USE OF THE U-NII-8 BAND MUST BE SUBJECT TO STRICT LIMITS TO PROTECT SDARS**

In order to protect SDARS operations, the Commission must implement a comprehensive approach to interference management in the U-NII-8 band, 6.875-7.125 GHz, which encompasses the 7.025-7.075 GHz segment Sirius XM uses for its feeder links. The Commission has recognized that SDARS “feeder link networks are essential to deliver service to the end user” and that “ample contiguous spectrum is necessary to implement a viable [SDARS] system.”<sup>25</sup> The active satellites and in-orbit spare spacecraft in Sirius XM’s deployed fleet, as well as the next-generation replacement spacecraft currently under construction, are all designed to use only the feeder link spectrum currently authorized by the Commission, with their utility therefore depending entirely on the spectrum’s continued availability and reliability. To prevent disruptive interference in these frequencies and significant harm to the SDARS service, the Commission should take a two-pronged approach, implementing policies designed to decrease the interference threat while at the same time adopting further protections as a backstop in case the power and location restrictions prove ineffective for preventing harmful interference from these devices.

##### **A. The Commission Should Allow Only Indoor, Low-Power Devices**

Sirius XM strongly supports the Notice’s proposal to restrict unlicensed operations in the U-NII-8 band to indoor use and limit permissible power levels.<sup>26</sup> The Commission observes that “building attenuation and clutter losses for transmissions originating from indoor devices” can

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<sup>25</sup> See SDARS Order, 12 FCC Rcd at 5806, ¶ 127 (1997).

<sup>26</sup> Notice at ¶ 59.

decrease the likelihood that incumbent services would experience harmful interference, although other factors, including the number and density of unlicensed deployment and the protection criteria for licensed operations, also play a meaningful role.<sup>27</sup>

The Notice observes that Sirius XM’s technical analysis showing the likelihood that its satellites would experience harmful interference from unlicensed devices “was premised on outdoor operations at high power levels.”<sup>28</sup> Assuming adoption of the restrictions on the U-NII-8 band proposed in the Notice, the Commission suggests that 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.”<sup>29</sup>

Sirius XM agrees that constraining unlicensed device power levels and limiting deployment to indoor environments would materially decrease the potential for harmful aggregate interference in the SDARS feeder link spectrum. To rely on this ameliorating effect, however, the Commission must adopt and effectively enforce these constraints.

In particular, the Commission must reject any outdoor or high-power use by unlicensed devices in the SDARS feeder link band. Although the Notice proposes to limit unlicensed operations in the U-NII-8 band to indoor, low-power devices, the Commission also invites comment on the feasibility of permitting unlicensed operations in the band under the framework proposed for the U-NII-5 and U-NII-7 segments, which would thereby allow outdoor usage and higher power levels.<sup>30</sup> The Notice also asks whether even “higher power operations could be

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<sup>27</sup> *Id.*

<sup>28</sup> *Id.* at ¶ 66 & n.148, *citing* Sirius XM June Submission at 9.

<sup>29</sup> Notice at ¶ 66.

<sup>30</sup> *Id.* at ¶ 74.



permitted in rural and underserved areas under certain conditions,” at least in the U-NII-5 and U-NII-7 bands where AFC will be employed.<sup>31</sup>

Under no circumstances should the Commission open the door to higher power or to outdoor operations in the U-NII-8 band. As discussed above, the Notice’s prediction that the risk of harmful aggregate interference to SDARS feeder link reception would be low is expressly premised on the limited power and indoor-only restrictions proposed for the U-NII-8 segment. Accordingly, the answer to the Commission’s question whether its “tentative conclusions regarding protections of satellite services in the U-NII-6 and U-NII-8 bands [would] be undermined by permitting high power unlicensed operations in these bands”<sup>32</sup> is a clear and unequivocal yes.

Allowing higher power levels only in certain areas would not cure the problem. Regardless of how the Commission defines a “rural or unserved area,” raising the permissible power levels for unlicensed operations in the U-NII-8 band would nullify a critical factor limiting the risk of interference to SDARS feeder links. Moreover, because the receive antennas on SDARS spacecraft can “see” all of CONUS, relaxing the restrictions on unlicensed operations in rural or underserved areas would threaten SDARS service everywhere.

For the same reasons, Sirius XM strongly supports the Commission’s 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.<sup>33</sup> As the Notice observes, the Commission’s proposed rules for the U-NII-8 band “rely on the signal attenuation due to indoor operation to prevent interference,” but vehicles would provide significantly less attenuation than a building

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<sup>31</sup> *Id.* at ¶ 79.

<sup>32</sup> *Id.* at ¶ 75.

<sup>33</sup> *Id.* at ¶¶ 84-85.

would.<sup>34</sup> Devices aboard airplanes would be particularly problematic “because the longer line-of-sight distances from devices at typical aircraft altitude could result in interference over a wide area.”<sup>35</sup> The risk of interference would be still worse for drones or other unmanned aircraft, which would have little or no attenuating effect on transmissions, justifying the Commission’s proposal to totally ban any 6 GHz device – base station or user terminal – aboard such airborne systems.<sup>36</sup>

Of course, power limits and specifications regarding where unlicensed devices can be employed will be effective only if users adhere to them. To increase the prospects for compliance, the Commission should adopt its proposal requiring entities marketing unlicensed devices to notify customers of restrictions on the use of the equipment, including the indoor-only limitation and the prohibition on use of the devices on aircraft.<sup>37</sup> Warnings regarding these restrictions should be incorporated into device labels as well as the documentation supplied to the end user. Such information requirements are a necessary tool to promote compliance with Commission rules.<sup>38</sup>

Clearly, however, instruction alone will not suffice to prevent unlicensed operations that violate Commission policies, as unlicensed devices have often been used – either intentionally or unintentionally – in ways that can create harmful interference that then is extremely difficult to

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<sup>34</sup> *Id.* at ¶ 84.

<sup>35</sup> *Id.*

<sup>36</sup> *Id.* at ¶ 85.

<sup>37</sup> *Id.* at ¶ 91.

<sup>38</sup> However, the Commission’s willingness to waive its notice requirements in the context of consumer equipment pre-installed in automobiles highlights the inherent limitations of relying on user documentation as a mechanism to ensure a device’s proper use. *See* letters to Audi, Kathrein, and Porsche waiving the consumer labeling requirements of Section 20.21(f)(1) of the Commission’s rules, available at: <https://www.fcc.gov/wireless/bureau-divisions/mobility-division/signal-boosters/signal-boosters-vehicles-waivers>.

redress.<sup>39</sup> The Commission has grappled with this issue in other spectrum used for U-NII applications, conducting a multi-year investigation of interference caused to federal weather radar systems in the U-NII-2C band. The Commission determined that the source was devices certified for operation in the adjacent U-NII-3 band: users had illegally modified the devices to transmit in the U-NII-2C band and operated the devices “at high power levels in elevated locations,” triggering the interference.<sup>40</sup> The Commission must therefore expect – and take preemptive steps to address – the likelihood that a subset of consumers will modify devices to operate in ways the rules do not allow. The increasingly global equipment market exponentially increases the difficulty of enforcing U.S. limits on unlicensed operations. For example, Sirius XM has itself discovered a significant number of consumer devices designed to transmit in the 2.3 GHz SDARS downlink band – spectrum explicitly prohibited for use by consumer devices under Section 15.205(a) of the Commission’s rules – which are currently in operation and are causing interference to Sirius XM’s subscribers in many parts of the country. In some cases, these devices may have been designed for operations outside the United States where frequency allocations are different, but they are nonetheless being marketed, sold, and used domestically in contravention of FCC requirements. The devices Sirius XM has found likely represent only a fraction of the illegal devices currently used in the 2.3 GHz band, highlighting the significant challenges the Commission faces in any effort to combat interference caused by consumer devices.

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<sup>39</sup> For example, mass-marketed vehicle radar detectors caused significant interference to Ku-band FSS operations, and although the Commission imposed new emission limits going forward, it took no steps addressing interfering devices already in the hands of consumers. *See Review of Part 15 and other Parts of the Commission’s Rules*, First Report and Order, 17 FCC Rcd 14063, 14067-69, ¶¶ 10-15 (2012).

<sup>40</sup> *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).

Given this history, the Commission cannot assume that consumers into whose hands unlicensed devices capable of operating in the U-NII-8 band will be placed will use those devices only in conformance with applicable rules, even if those rules require that consumers receive documentation advising them of the relevant use limitations. Instead, the Commission must reinforce the notification procedure, along with adopting other measures designed to bolster compliance.

First, to ensure against any outdoor transmissions in the U-NII-8 frequencies, the Commission should require not only that access points be directly connected to a power source but should also specify the inclusion of a cut-off when a Global Positioning System (“GPS”) signal is detected<sup>41</sup> and should also require that unlicensed devices in this band be constructed without weather-proofing. Mandating a direct power connection would not prevent a user from placing a U-NII-8 device on a patio, rooftop deck, or other outdoor environment equipped with electrical outlets; a GPS signal detection trigger coupled with the lack of any exterior protections would more reliably preclude such outdoor deployments. As the Commission acknowledges, using a GPS-based standard would also tend to discourage the placement of access points at indoor locations on upper floors or close to windows, where the devices would be more likely to create harmful interference.<sup>42</sup>

Second, the Commission should implement measures to minimize the risk that devices will be impermissibly modified or used (either intentionally or inadvertently) in a manner circumventing applicable restrictions. For example, transmitters and their antennas should be part of an integrated package, and operational parameters such as antenna directivity, frequency

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<sup>41</sup> Notice at ¶ 71.

<sup>42</sup> *Id.*

assignment, and transmitter power should not be adjustable by the user. Instead, the 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.

Adopting consistent, effective, and enforceable limitations on the location and power levels of U-NII-8 unlicensed devices as outlined above are essential to limit the threat of disruptive interference to licensed SDARS operations.

## **B. The Commission Should Also Adopt a Backstop Mechanism**

Sirius XM is concerned that even with these measures, intensive deployment of unlicensed devices in the quantities discussed in the Notice might nonetheless over time lead to harmful aggregate interference that would compromise SDARS service quality. To address this risk, the Commission should also implement a backstop approach similar to what Globalstar has requested for the U-NII-1 frequencies.<sup>43</sup>

Specifically, the Commission should define the maximum aggregate increase in the satellite uplink noise floor that unlicensed devices operating in the U-NII-8 band may cause. We request that the Commission impose an interference to noise ratio at the SDARS satellite receiver of -23 dB. This value is based on the -21.9 dB ratio proposed by unlicensed device proponents in the RKF Report for protection of satellite receive operations,<sup>44</sup> with an additional margin of -1.1 dB to account for factors including interference from licensed services, measurement error, and delay in implementing backstop measures. If monitoring the noise environment indicates that this threshold is being approached, the Commission would then prohibit the

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<sup>43</sup> See Globalstar Petition at 25.

<sup>44</sup> See RKF Report at 4.

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. The margin built into the allowable interference threshold would establish a cushion permitting the sale of any devices that have already been produced with minimal risk of violating the protection criteria.

Employing such a backstop would not harm the legitimate interests of unlicensed service proponents. Indeed, if their predictions are correct that unlicensed devices will not proliferate to the point that they trigger harmful interference,<sup>45</sup> then the backstop measures will never have to be invoked. Moreover, even if the backstop is implemented, unlicensed use of the SDARS feeder link frequencies could still continue without disruption; unlicensed users would simply need to rely on other frequencies for further growth. Future deployment numbers, density, and other critical factors such as peak usage and duty cycles are inherently challenging to forecast in advance. In these circumstances, the availability of a backstop mechanism would provide additional certainty to Sirius XM and its SDARS subscribers that the Commission will step in as needed to make good on its commitment to protect them if interference from unlicensed usage reaches critical levels.

## **V. PROTECTIONS ARE NECESSARY TO PREVENT INTERFERENCE IN THE U-NII-5 FREQUENCIES**

The Commission must also implement measures to ameliorate the potential for disruptive interference in the U-NII-5 band used for conventional C-band FSS uplinks and for TT&C during post-launch maneuvers for the next-generation Sirius XM spacecraft. As Sirius XM has explained, it distributes third-party audio content over C-band FSS networks including news programming from CNN, Bloomberg, Fox, MSNBC, NPR, and others, live coverage of

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<sup>45</sup> *See id.* at 11, 13.

professional and college sports such as football, baseball, NASCAR, basketball, hockey, and soccer, as well as weather updates on The Weather Channel.<sup>46</sup> Sirius XM will also rely on conventional C-band frequencies to provide TT&C immediately following launch of its SXM-7 and SXM-8 spacecraft in order to avoid the interference issues that occurred during prior launches.<sup>47</sup> Increased noise introduced into C-band transmissions from unlicensed devices could compromise SDARS service quality or even impair Sirius XM's ability to safely control its satellite during orbit-raising maneuvers after launch.

To protect the integrity of C-band uplink signals, the Commission should restrict devices using U-NII-5 spectrum from pointing towards the geostationary arc<sup>48</sup> and should impose power limits to reduce the risk of harmful aggregate interference.<sup>49</sup> Proponents of 6 GHz unlicensed operations have recognized that such provisions are appropriate to constrain the possibility of disruptive interference.<sup>50</sup> Moreover, contrary to claims by some terrestrial parties, Globalstar's experience in the U-NII-1 band does not support extending the U-NII-1 rules to 6 GHz spectrum.<sup>51</sup> Instead, as the Notice acknowledges, the Globalstar Petition suggests that relying on pointing restrictions and power limits is not adequate to prevent harmful aggregate interference from outdoor U-NII operations.<sup>52</sup>

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<sup>46</sup> See Sirius XM NOI Comments at 5.

<sup>47</sup> See *id.* at 6-7.

<sup>48</sup> See Notice at ¶ 56.

<sup>49</sup> *Id.* at ¶ 57.

<sup>50</sup> See *id.* at ¶ 56 & n.132, citing *Ex Parte* Filing of Apple Inc., *et al.*, GN Docket No. 17-183, filed June 12, 2018 at 4-5. See also RKF Report at 27 (listing interference mitigation measures including a mask that limits radiated power above a certain elevation angle).

<sup>51</sup> See Notice at ¶ 55 & n.129, citing Wi-Fi Alliance Reply Comments, GN Docket No. 17-183, filed November 15, 2017 at 20.

<sup>52</sup> See Notice at ¶ 55 & n.131. The Commission observes that the Globalstar satellites are in a non-geostationary orbit that is much closer to the earth than conventional C-band GSO spacecraft, significantly decreasing the distance traveled by the unlicensed emissions of concern in the U-NII-1 band as compared to those in the U-NII-5 band. See *id.* at ¶ 56. But the Commission recognizes that the longer

The Commission should also decline to permit unlicensed operations at higher power levels in the U-NII-5 band in rural or unserved areas. Like SDARS spacecraft, FSS satellites also have wide receive beams, meaning that emissions from devices wherever they are located within CONUS contribute to the aggregate interference experienced at the antenna onboard the satellite. As a result, high-powered unlicensed transmissions that occur in rural or underserved areas – however those areas are defined – would affect operations of all FSS spacecraft.

The Notice seeks input on “methods that could be used to monitor aggregate interference to satellite receivers and potential remediation techniques in the event that such aggregate interference reaches levels that would require action.”<sup>53</sup> Sirius XM urges the Commission to adopt a backstop procedure similar to the one described above for the U-NII-8 band to ensure that aggregate interference levels in the U-NII-5 band do not reach harmful levels. Assuming the Commission adopts its proposal to rely on automated frequency coordination in the U-NII-5 spectrum, the AFC mechanism could be used to implement the backstop. Specifically, if the noise increase in a particular radio frequency channel of the band approaches the threshold defined by the Commission to protect C-band FSS uplinks, AFC providers nationwide would be required to cease authorizing any new unlicensed operations in that channel. As with the U-NII-8 band, employing a backstop approach in the U-NII-5 band would not affect any legitimate interests of unlicensed use proponents, since the backstop would be triggered only if their predictions that unlicensed device operation would not trigger harmful aggregate interference prove to be misplaced.

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distance traveled also means that the wanted conventional C-band uplink signal is weaker when it arrives at the space station antenna and therefore more vulnerable to interference. *Id.*

<sup>53</sup> *Id.* at ¶ 57.



## **VI. CONCLUSION**

Sirius XM has invested billions of dollars to design and launch satellites, acquire programming, build a company that employs thousands of Americans, and create an entirely new communications service of satellite radio serving tens of millions of paying subscribers. Sirius XM committed these resources with the reasonable expectation that it could operate within its licensed spectrum in a stable and predictable environment free from unexpected interference. The Commission must ensure that any deployment of new unlicensed services does not endanger that investment or impede Sirius XM's ability to continue providing quality service to its customers.

Respectfully submitted,

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/s/ James S. Blitz

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