

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

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

COMMENTS OF SIRIUS XM RADIO INC.

Of Counsel:
Karis A. Hastings
SatCom Law LLC
1317 F Street, N.W., Suite 400
Washington, D.C. 20004

James S. Blitz
Vice President, Regulatory Counsel
Sirius XM Radio Inc.
1500 Eckington Place, N.E.
Washington, D.C. 20002

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Sirius XM Radio Inc. (“Sirius XM”) submits these comments in response to the Notice of Inquiry in the above-captioned proceeding, which seeks input on the feasibility of increased terrestrial use of spectrum in the 3.7-24 GHz range.¹ The NOI focuses on three specific segments within this range – the conventional C-band frequencies, 3.7-4.2 GHz and 5.945-6.425 GHz, and the adjacent 6.425-7.125 GHz band – each of which Sirius XM uses in support of its Satellite Digital Audio Radio Service (“SDARS”) operations. As discussed below, the Commission should consider allowing new terrestrial operations in these bands only if the proponents of those services clearly demonstrate that Sirius XM’s ability to continue providing high quality service to its tens of millions of customers will not be adversely affected. Efforts to promote terrestrial broadband deployment and use should respect the legitimate expectations of incumbent service providers that they can rely on spectrum licensed to them by the Commission to operate their networks in a stable and predictable interference environment.

I. INTRODUCTION AND SUMMARY

The NOI requests comment on whether, consistent with existing uses of the frequencies, additional terrestrial services can be introduced into spectrum in the 3.7-24 GHz range. In particular, the NOI states that terrestrial wireless interests are seeking additional frequencies for

¹ *Expanding Flexible Use in Mid-Band Spectrum Between 3.7 and 24 GHz*, Notice of Inquiry, GN Docket No. 17-183 (rel. Aug. 3, 2017) (the “NOI”).

wireless broadband services, especially in areas unserved or underserved by existing networks.²

The Commission asks about the potential to accommodate such services in the 3.7-4.2 GHz, 5.945-6.425 GHz, and 6.425-7.125 GHz bands. The Commission acknowledges that these frequencies are actively used for satellite and terrestrial services today,³ but fails to even mention Sirius XM's extensive reliance on one of those bands, namely its operation of satellite feeder links in the 7.025-7.075 GHz band.

In fact, Sirius XM uses all three of these band segments to provide SDARS to over 32 million U.S. consumers. Ensuring that these frequencies remain available and free from unacceptable interference is essential to Sirius XM's continued ability to bring a full range of audio programming, including music, news, sports, weather, and traffic, to listeners nationwide. SDARS signals also play a critical public safety role during natural disasters and emergencies when terrestrial communications networks may be unavailable. Specifically, Sirius XM uses its network to disseminate emergency alerts and to make available critical weather information, not just to subscribers, but to over 100 million SDARS receivers.

In considering any introduction of new terrestrial uses in these bands, the Commission must exercise extreme caution to ensure that SDARS reception by millions of paying customers is not impaired. Sirius XM's uplinks and satellites rely on spectrum the Commission specifically directed the company to use for its feeder link operations. If the Commission now allows sharing in this band, the uplink signal could be disrupted by terrestrial transmissions close to the uplink earth station or if significant numbers of transmitters contribute to increased aggregate interference levels at the space station antenna. Moreover, earth stations receiving in the C-band

² *Id.*, ¶ 1, ¶ 6.

³ *See, e.g., id.*, ¶ 8.

downlink spectrum are highly vulnerable to terrestrial interference, given signal attenuation that occurs over the long distance traveled from the satellite to the ground station.

In its understandable quest to increase the spectrum available for terrestrial wireless broadband networks, the Commission must not endanger the quality and reliability of existing services to U.S. consumers. Commission licensees, such as Sirius XM, who have heavily invested in C-band facilities and services in building their businesses have the right to expect their services will be protected from new terrestrial services to deploy in these bands. Accordingly, the Commission must not add any terrestrial service options in C-band spectrum absent clear evidence that those services are compatible with existing uses of the frequencies.

II. SIRIUS XM RELIES ON C-BAND SPECTRUM FOR ESSENTIAL ELEMENTS OF ITS NATIONWIDE SDARS OPERATIONS

The C-band frequency segments discussed in the NOI play vital roles in Sirius XM's SDARS operations. Sirius XM needs continued reliable access to these frequencies, without the risk of unacceptable interference, to maintain its high-quality service to customers.

A. SDARS Uplinks in the 7.025-7.075 GHz Band

When the Commission designated the 7.025-7.075 GHz band as feeder link spectrum for SDARS operations two decades ago, it emphasized that “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.”⁴ SDARS feeder links have co-primary status in this spectrum with terrestrial uses of the band, such as broadcast auxiliary service operations.⁵

⁴ 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, 5806, ¶ 127 (1997).

⁵ *Id.* at 5809, ¶ 134.

The NOI's recital of incumbent operations in the broader 6.425-7.125 GHz band segment, however, does not even acknowledge that the 7.025-7.075 GHz frequencies have been designated as the only available SDARS feeder link spectrum and are actively used by the Sirius XM.⁶ This omission is highly concerning to Sirius XM given the critical operational use of this feeder link spectrum to uplink all SDARS programming to its satellites for delivery to over 32 million American subscribers.

Specifically, both the current spacecraft in the Sirius XM fleet and the next-generation SDARS satellites are limited to use of the 7.025-7.075 GHz feeder link spectrum, and these frequencies cannot be changed. On the ground, Sirius XM's feeder link facilities consist of multiple uplink antennas at three sites. These antennas send audio programming to Sirius XM's fleet of SDARS satellites, which are positioned at widely separated locations across the orbital arc. As with the space stations, the ground stations are licensed for and were built to transmit only in the 7.025-7.075 GHz feeder link spectrum. Even if alternative feeder link spectrum were made available for future SDARS satellites, Sirius XM would incur significant costs to deploy new earth station facilities capable of using that spectrum.

Some of Sirius XM's satellite uplinks transmit from highly urbanized areas with congested frequency environments – such as in the NoMa neighborhood of Washington, DC – where additional spectrum usage would add substantially to the interference threat. Other Sirius XM uplinks are located in rapidly developing areas with increasing congestion. In any case, few options are available for relocating uplinks in the event of interference that would be caused by allowing shared use of this band.

⁶ See NOI, ¶ 33.

Any significant risk of interference to the feeder links that transmit programming to Sirius XM satellites for delivery to its customers is unacceptable. Sirius XM has invested heavily in facilities and technology to provide reliable, high-quality service to customers, and disrupting uplink transmission to the SDARS satellites would significantly harm that service. To avoid such harm, any future Commission consideration of potential new services in the 6.425-7.125 GHz band must recognize the need to protect SDARS feeder links using the 7.025-7.075 GHz segment. The Commission cannot make informed judgments about the feasibility of introducing new uses of spectrum without accounting for all existing uses, including SDARS feeder link operations, and taking steps to ensure that those operations are not disrupted.

B. Audio Programming Downlinks in the 3.7-4.2 GHz Band

Sirius XM receives third-party audio content from multiple sources for retransmission over the Sirius XM SDARS network, all of which is delivered over C-band fixed-satellite service (“FSS”) spacecraft downlinking in the 3.7-4.2 GHz band. Programming received by C-band includes, for example, news programming from Fox, CNN, MSNBC, NPR, and others, live coverage of professional and college sports such as football, baseball, NASCAR, basketball, hockey, and soccer, as well as weather updates on The Weather Channel (as discussed further below).

Sirius XM uses C-band receive antennas at four sites in the U.S. to access this array of audio programming. One of the sites is a licensed C-band transmit-receive earth station.⁷ The remaining antennas are receive-only facilities, and consistent with Commission rules, these antennas operate on an unregistered basis.⁸

⁷ Call Sign E060276, File No. SES-MFS-20100824-01076, granted Nov. 9, 2010.

⁸ See 47 C.F.R. § 25.131.

Each of these sites is equipped with antennas capable of seeing multiple satellites in order to simultaneously receive all the programming channels. Space station capacity for the channels is selected by the content distributor, so Sirius XM has no control over the satellites or transponders used. The Sirius XM earth stations require access to the full 3.7-4.2 GHz C-band downlink bandwidth and the ability to communicate with satellites across a range of the orbital arc in order to receive the complete range of programming channels demanded by our customers.

C. Orbit-Raising TT&C in the Conventional C-band

The next generation of Sirius XM satellites, SXM-7 and 8, will use carriers at the edges of the conventional C-band for telemetry, tracking and command (“TT&C”) during the orbit-raising phase following launch. During that phase, when the satellite circumnavigates the globe, Sirius XM needs to be able to reliably send commands and receive telemetry signals in order to ensure the safe transit of the satellite.

Prior Sirius XM satellites relied solely for TT&C on the S-band SDARS downlink spectrum at 2.32-2.45 GHz and the 7.025-7.075 GHz uplink spectrum. However, Sirius XM experienced significant interference from S-band terrestrial systems during orbit raising of previous satellites, putting them at risk by impairing Sirius XM’s ability to reliably receive telemetry information regarding the position of the satellites. Since Sirius XM’s most recent launch in 2013, deployment of terrestrial systems using S-band spectrum has increased, suggesting that interference issues could be even worse for future launches.

To avoid these challenges with its next-generation spacecraft, Sirius XM plans to use conventional C-band spectrum for TT&C during this relatively brief but critical orbit-raising period. In addition to minimizing the chance of interference, relying on C-band spectrum offers

the added benefit of greatly increasing the number of earth stations around the globe that would be capable of supporting the orbit-raising process for SXM-7 and 8.

III. PREVENTING DISRUPTION OF SIRIUS XM'S USE OF C-BAND SPECTRUM IS CRITICAL TO THE PUBLIC INTEREST

Protecting Sirius XM's ability to maintain a high level of service quality and continuity serves important public interest objectives. In addition to carrying music, sports, talk, and other entertainment programming, Sirius XM delivers timely news and weather information. As a satellite service available across North America, the Sirius XM service can be received even in remote areas unserved or underserved by terrestrial networks. Moreover, natural disasters and power outages that may impair operation of terrestrial networks are unlikely to affect the satellite-based Sirius XM service. During emergency situations when reliable reception is especially critical, Sirius XM therefore serves as an essential source of time-sensitive weather forecasts, news reports, and other potentially life-saving information.

For example, Sirius XM recently made The Weather Channel available free-to-air for anyone with a satellite radio receiver (regardless of subscriber status) during hurricanes Harvey and Irma.⁹ Both these storms resulted in significant power outages and knocked many terrestrial television and radio stations off the air.¹⁰ Even if they lost electricity in their homes, however, residents enduring these emergencies having access to an SDARS receiver in their vehicles could still receive up-to-date information regarding the forecast paths of these dangerous storms.

⁹ See <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/>.

¹⁰ See, e.g., Communications Status Report for Areas Impacted by Hurricane Irma (PSHSB, Sept. 11, 2017) (listing 8 television stations and 26 radio stations out of service).

Sirius XM is also an active participant in the Emergency Alert System (“EAS”) administered by the Commission in conjunction with the Federal Emergency Management Agency (“FEMA”) and the National Weather Service. In addition to transmitting national alerts directly to satellite radio subscribers, Sirius XM also serves as one of a limited number of non-broadcast entities designated as Primary Entry Point (“PEP”) stations,¹¹ partnering with FEMA to provide a backup mechanism for distributing EAS alerts to PEP stations and others, including state emergency operations centers. Under this arrangement, Sirius XM designed and provided more than one hundred EAS receivers to be installed at PEP stations and state emergency communications centers across the country.

Interference to the SDARS uplink would undermine Sirius XM’s ability to continue providing these vital public safety services. As discussed above, the 7.025-7.075 GHz band is used to transmit all of Sirius XM’s programming to its fleet of SDARS satellites. Degrading those transmissions would impair service quality system-wide, affecting not just the programming content received by millions of subscribers, but also Sirius XM’s delivery of weather information and EAS alerts.

Moreover, The Weather Channel is one of the many programming services Sirius XM receives using the 3.7-4.2 GHz C-band downlink frequencies. Any interruption to its C-band reception of this information would have compromised Sirius XM’s ability to deliver essential information to listeners affected by the recent hurricanes.

Reliable access to C-band spectrum will also be important to Sirius XM’s ability to ensure the safe transit of its future spacecraft during orbit raising maneuvers. As discussed

¹¹ 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.

above, Sirius XM chose to move to C-band frequencies for this TT&C function to avoid interference which has created risks to its satellites in the past. If C-band signals are subject to increased interference, the benefits of this change will be lost.

IV. TERRESTRIAL SHARING WITH C-BAND SATELLITE OPERATIONS PRESENTS SIGNIFICANT TECHNICAL CHALLENGES

The danger that new C-band terrestrial services will interfere with existing SDARS operations relying on access to this spectrum is significant. The Commission will need to proceed with extreme care to avoid disrupting the services enjoyed by tens of millions of SDARS subscribers and others.

Sirius XM is concerned that terrestrial devices using the SDARS feeder link frequencies or band-edge conventional C-band uplink frequencies used for TT&C could impair the integrity of Sirius XM's operations. Sirius XM takes care in siting its feeder link antennas to ensure a low noise environment, as a terrestrial transmitter in close proximity to an uplink antenna could introduce errors into the uplink signal to the satellite. Because Sirius XM has a very small number of uplink signals, each originating at a single feeder link location, errors introduced into the signal from terrestrial interference can severely harm the entire service.

In addition, as the NOI recognizes, aggregate interference to receivers onboard spacecraft could disrupt satellite operations.¹² Specifically, proliferation of a large number of terrestrial transmitters within a satellite's broad uplink beam could result in unacceptable levels of interference being received at the satellite's antenna.

The Commission's ability to manage these potential interference issues in C-band uplink spectrum will be further minimized if it permits unlicensed consumer devices in the band, as

¹² See NOI, ¶ 29.

contemplated in the NOI.¹³ Such an approach would make it virtually impossible to ensure that devices with significant interference potential are not used near Sirius XM feeder link earth stations.

Moreover, if aggregate interference from large numbers of unlicensed consumer devices becomes a problem, the Commission would have few options to remedy the situation. The satellite industry – and the Commission – have specific experience with the problems created when consumer devices interfere with satellite service. For example, Ku-band VSAT network operators suffered significant interference caused by mass-marketed radar detectors. The Commission addressed the problem only by imposing new emission limits going forward, but it took no action regarding interfering devices already in the hands of consumers.¹⁴

Potential interference to the C-band downlink frequencies at 3.7-4.2 GHz is also a serious concern. Receive dishes used by Sirius XM and other operators in this band must be highly sensitive given signal attenuation that occurs between a geostationary satellite and a ground station. As a result, a nearby terrestrial transmission can easily overwhelm satellite signal reception. Such interference can be prevented only if the terrestrial transmitters' power levels are constrained, and adequate separation distances to the earth station receiver are maintained.

Sirius XM's ability to receive C-band downlink signals must be protected across the full frequency range and for a broad segment of the orbital arc. As discussed above, Sirius XM has no control over which satellites and transponder assignments are used to deliver the content channels carried over its SDARS system and must instead have the flexibility to receive the programming using the space segment specified by the content provider.

¹³ *See id.*

¹⁴ *See Review of Part 15 and other Parts of the Commission's Rules*, First Report and Order, 17 FCC Rcd 14063 (2012) at 14067-69, ¶¶ 10-15.

Enforcing requirements designed to prevent interference to satellite operations in C-band downlink spectrum will be difficult if not impossible. One obstacle is that many C-band receive-only earth station antennas, including several of the Sirius XM dishes, operate on an unregistered basis. Because the IBFS licensing database contains no information regarding the location and technical parameters of these facilities, the Commission has no practical way to institute required exclusion zones protecting these antennas. As with the uplink frequencies, implementation difficulties will be exacerbated if the Commission allows unlicensed devices to operate in this spectrum, without any feasible way to prevent such devices from operating in close proximity to Sirius XM's receive earth stations.

The burden must be on proponents of new terrestrial services to conclusively show that these challenges can be overcome. In reliance on its licenses from the Commission, 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. Sirius XM committed these resources with the reasonable expectation that it would operate in a stable and predictable interference environment, free from unexpected interference. The Commission must ensure that any deployment of new services does not endanger that investment or impede Sirius XM's ability to provide quality service to its customers.

V. CONCLUSION

For the foregoing reasons, the Commission can consider introduction of new terrestrial services in C-band spectrum only after a clear demonstration that such services will not result in harmful interference to operations of Sirius XM and other incumbent C-band users. Efforts to promote terrestrial broadband deployment and use should not come at the expense of service providers like Sirius XM that are operating pursuant to Commission licenses and providing valuable services.

Respectfully submitted,

Sirius XM Radio Inc.

Of Counsel:
Karis A. Hastings
SatCom Law LLC
1317 F Street, N.W., Suite 400
Washington, D.C. 20004

/s/ James S. Blitz
James S. Blitz
Vice President, Regulatory Counsel
1500 Eckington Place, N.E.
Washington, D.C. 20002

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