

**Before the
FEDERAL COMMUNICATIONS COMMISSION
Washington, DC 20554**

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

**REPLY COMMENTS OF
NATIONAL PUBLIC RADIO, INC.**

Introduction

National Public Radio, Inc. (“NPR”) hereby submits its reply comments in response to the initial comments on the *Notice of Inquiry* in the above-captioned proceeding, which inquires about authorizing additional terrestrial uses of spectrum bands between 3.7 and 24 GHz for fixed or mobile wireless broadband services.¹ As NPR explained in its initial comments, authorizing additional terrestrial use of the spectrum between 3.7 and 4.2 GHz (“C-band”), and particularly mobile wireless broadband services, threatens the satellite downlinks that distribute public radio programming on which tens of millions of listeners throughout the United States have now come to rely.² NPR has similar concerns about its corresponding uplink frequencies from 5.925 to 6.425 GHz. We believe and urge the Commission to accept that current users of C-band frequencies covered by this NOI must retain primacy of their use and that additional uses of these vital C-

¹ *In the Matter of Expanding Flexible Use in Mid-Band Spectrum Between 3.7 and 24 GHz, Notice of Inquiry*, 32 FCC Rcd. 3673, at 6378, 6380, 6381 (2017) [hereinafter “*Notice of Inquiry*”].

² Comments of National Public Radio, Inc., GN Docket No. 17-183, at 10-12 (filed Oct 2, 2017) [hereinafter “NPR Comments”]. Unless otherwise indicated, all citations to comments are to comments filed in this proceeding in response to the *Notice of Inquiry*.

band frequencies be permitted only if the absolute integrity of these current uses is protected and assured.

NPR manages the Public Radio Satellite System (PRSS), a nation-wide network of satellite interconnected uplink and downlink earth stations.³ The PRSS is the backbone by which producers, including NPR and American Public Media, distributors, such as Public Radio International, and almost 1300 interconnected, independently owned and licensed, local public radio stations transmit and receive programming for over-the-air broadcast.⁴ Eighty percent of this content is “live”, which requires the highest levels of reliability. Public radio stations, in turn, reach 95 percent of the U.S. population and broadcast programming to more than 41 million public radio listeners across the country.⁵

NPR’s initial comments also noted Congress’s longstanding and significant financial support of the PRSS as well as Congress’s recent initial appropriation of funds to begin a ten year upgrade to the PRSS. This activity, with improved satellite transponder efficiency, ground system refurbishment, and related project support, is based and dependent on the very C-band frequencies under consideration for shared use by the Commission.⁶

The PRSS depends on satellite distribution for a number of reasons described in NPR’s initial comments.⁷ The most important of these are satellite’s cost-effectiveness, its ability to distribute live programming, and its reach to stations across the continent and beyond, including

³ *Id.* at 3.

⁴ *Id.* at 4

⁵ *Id.*

⁶ *Id.* at 5.

⁷ *Id.* at 7.

in Alaska, Hawaii, the Caribbean and US territories in the South Pacific and elsewhere. NPR uses this opportunity to reiterate its concern that opening C-band spectrum to mobile broadband use would threaten the public's access to public radio programming, including *Morning Edition*, *All Things Considered*, *Marketplace*, and *Fresh Air*. Among other things, NPR wishes to respond in particular to suggestions that spectrum sharing, spectrum shielding and filtering, and/or current fiber-based alternatives could avoid or remediate the harm. It is worth noting that our concerns are echoed by other commenters, including the Satellite Industry Association ("SIA"), which "represent[s] the leading global satellite operators, service providers, manufacturers, launch services providers, and ground equipment suppliers; and, since 1995, SIA has been the unified voice of the satellite industry on policy, regulatory, and legislative issues affecting the commercial satellite industry."⁸

Sharing Spectrum Is Unworkable

Many of the comments filed by wireless broadband advocates gloss over an irreducible fact: sharing C-band spectrum in a way that preserves incumbent uses like the public radio system is simply not possible with current technology.⁹ There is no panacea for the interference created by wireless mobile devices, whose roaming, dynamic signals cannot be coordinated with the fixed, low-power downlinks on which public radio stations depend. Instead, opening up the PRSS's C-band frequencies for sharing by wireless broadband devices will result in widespread interference that will disrupt public radio broadcasts and could destroy the PRSS as a reliable, cost-effective means of program distribution across the nation.

⁸ www.sia.org.

⁹ See Comments of Qualcomm Incorporated at 3; Comments of Microsoft Corporation at 4.

As an example, consider the uplinks and downlinks that connect NPR's headquarters on North Capitol Street in downtown Washington D.C. with the PRSS: If mobile wireless devices were permitted to operate in the same frequencies as these earth stations, then, suddenly, every cell phone in every car driving down this major thoroughfare would have the potential to disrupt the entire public radio system by interfering with the PRSS uplinks. This scenario would replicate itself on a smaller scale near every other public radio uplink and downlink site across the country.¹⁰ For this reason, any plan to protect incumbent uses of C-band spectrum would likely require prohibiting spectrum sharing between incompatible uses: low-power satellite downlinks and roaming, ubiquitous sources of interference like mobile broadband devices.

Shielding and Filtering Cannot Prevent Harmful Interference

Potential disruption to the PRSS is not limited to devices on precisely the same frequency. Any transmitter that operates on nearby frequencies poses interference disruptions to public radio downlinks and uplinks. While some commenters propose shielding and filtering as solutions,¹¹ shielding and filtering are old, inflexible technologies whose benefits are limited. Shielding can be effective in limited circumstances to remediate interference between two fixed devices, but there is currently no shielding technology that could provide the kind of dynamic, all-encompassing protection that would be required to protect against interference from mobile devices.¹²

¹⁰ Interference in PRSS's uplink frequencies would degrade signals by introducing phase-noise on the outbound carrier that could cause lost data packets being transmitted. Interference of the downlink frequencies would result in problems receiving programming, which would translate to dead air.

¹¹ *See, e.g.,* Comments of T-Mobile USA, Inc. at 24; Comments of Verizon at 15.

¹² *See* Comments of the Satellite Industry Association at 34-41.

Similarly, filtering can be useful to block out interfering signals within a certain range, but it reduces the effectiveness of the downlink signals it protects, and it does not create the kind of clear, interference-free transmission zone that is essential to public radio's programming distribution needs. Moreover, unless mobile devices are required to operate within spectrum blocks more strictly than is currently the case, filters would be ineffective against emissions that fall within the frequency range of the earth station downlink. And even if mobile devices were manufactured to generally keep their emissions more narrowly within allowable frequencies, it seems highly unlikely that, among the millions of devices manufactured by multiple factories and companies, there would not be some number of errant devices that emit on frequencies within the band protected for satellite. Appropriate mask emission limits and geographic separation based on a conservative estimate of path-loss between the interfering devices and the earth station might afford sufficient protection to the downlink earth stations, but those measures would completely undermine the utility of a terrestrial mobile broadband service. Neither shielding nor filtering, then, can provide a reliable solution to the interference to C-band downlink earth stations caused by mobile devices.

**Current Fiber-based Alternatives for Public Radio Distribution
Are Cost-Prohibitive and Not Effective**

As NPR explained in its initial comments, the PRSS's satellite-based distribution system is the most efficient and cost-effective means of distributing programming across the 1,278 public radio stations and 41 million Americans that rely on it, a conclusion verified by independent analysis.¹³ Some commenters have suggested substituting fiber-based systems as an

¹³ Cognizant Technology Solutions, *Interconnection for Public Radio: Optimizing Success: Key Findings and Recommendations* at 3 (June 2016) (report to the Corporation for Public Broadcasting).

interference-free alternative to satellite,¹⁴ but moving the entire PRSS to a fiber-based network is infeasible at this time. The PRSS does use fiber where appropriate and cost-effective, including links between major cities such as Washington and Philadelphia. However, NPR has studied the possibility of switching to a fiber-based public radio network and ultimately rejected it for several reasons.

First, building a fiber-based network would be significantly more expensive than maintaining and upgrading the current satellite-based distribution system. An independent consultant hired by NPR to analyze this question concluded that rebuilding the PRSS with fiber would cost a minimum of \$160 million, or three times the current cost of system upgrades approved by Congress for a satellite-based network. Importantly, this 300% cost escalation is only for places that are currently reachable by fiber. This raises the second problem: fiber cannot currently reach a significant number of public radio stations serving rural areas of the country. Service to unserved and underserved audiences, particularly in rural areas, is a hallmark of the public broadcasting system. Third, the ongoing cost of maintaining a fiber-based network would be significantly higher than the current costs to maintain the PRSS.

Finally, NPR has a responsibility to ensure that the PRSS uses the most cost-effective system possible to deliver public radio content. That responsibility derives from the Congressional appropriations that have paid for the capital assets of the PRSS. In addition, public radio stations are the ultimate beneficiaries of the system and they are mission-oriented non-profit organizations or governmental entities operating with limited resources. Resources allocated to the additional cost of program distribution would necessarily limit public radio's ability to serve the public in other ways. Refitting every public radio station with the capacity to

¹⁴ See Comments of Verizon at 18; Comments of the Broadband Access Coalition at 2.

send and receive transmissions by fiber would be expensive, time-consuming, and wasteful when satellite currently provides an excellent platform that is tailor-made for national and regional distribution of live content.

Some commenters suggest that fiber could be a more limited solution to the interference associated with opening the C-band to wireless broadband devices. By linking urban fiber networks with satellite earth stations outside the perimeter of the most densely populated areas, they propose, one could avoid the greatest concentration of interfering devices and place the relocated dishes in clear air.¹⁵ NPR is not convinced. Once again, one must remember that the wireless broadband devices contemplated in this proceeding are, by their very nature, mobile. Thus, while using terrestrial links for public radio in urban areas could address interference concerns from wireless devices in those locations, it would do nothing to reduce interference once those devices entered the territory of satellite-reliant public radio stations outside the urban areas.

Moreover, even if such a scheme were made to work for some satellite-based program distribution networks, it would be wholly inadequate for public radio's needs. In providing the first significant federal funding for the PRSS in 1988, Congress identified several notable attributes of a satellite interconnection system that had already "proven to be a tremendous success."¹⁶ Among other things, satellite interconnection "[e]nables public broadcasting to interconnect new stations quickly and easily" and it "[i]ncreases diversity and local autonomy through distribution of time zone feeds and simultaneous transmission of programs from diverse

¹⁵ See, e.g., Comments of Verizon at 18.

¹⁶ S. Rep. 444, 100th Cong., 2d Sess. 5 (1988).

sources, enabling each station to decide which programs to use and when to use them.”¹⁷ While a hybrid satellite/fiber system might be engineered to replicate the capabilities of the current PRSS, building such a system would be far too costly based on today’s technology.

The Intelsat/Intel Proposal Should Be Explored with Caution

Among the initial comments filed in this proceeding, Intelsat and Intel offered an approach theoretically founded on a market-based idea for allocating portions of the C-band spectrum for either satellite or terrestrial wireless broadband use.¹⁸ While the proposal properly recognizes the need to protect incumbent C-band users from interference, NPR is not convinced the contemplated protections are adequate to guard the public radio system from interference. As explained above, shielding and filtering, in very controlled and limited circumstances, can lessen but not prevent harmful interference, particularly considering any general use of C-band spectrum by mobile wireless devices. The Intelsat/Intel proposal also only hints at the mechanics of how this envisioned market-based system idea work. Finally, the Intelsat/Intel proposal would reduce the significant benefits associated with full-band, full-arc licensing which, as NPR recounted in its initial comments,¹⁹ proved essential to NPR’s ability to overcome a catastrophic satellite failure.

In short, the system described by Intelsat and Intel may be worth exploring, and NPR is willing to work with the Commission in so doing, but NPR urges the Commission to retain current C-band users as primary and to continue to ensure our operations without interference.

¹⁷ *Id.*

¹⁸ *Id.*

¹⁹ NPR Comments at 10-12.

Conclusion

For these reasons, and as demonstrated above and in NPR's initial comments, NPR urges the Commission to proceed carefully before authorizing any additional terrestrial use of the C-band spectrum that could disrupt the PRSS and the public's access to public radio programming.

Respectfully submitted,

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