

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

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

REPLY COMMENTS OF THE ASSOCIATION OF AMERICAN RAILROADS

The Association of American Railroads (“AAR”) hereby submits these reply comments in response to the Notice of Inquiry (“NOI”) released by the Federal Communications Commission (“FCC” or “Commission”) in the above-captioned proceeding.¹ The NOI seeks comment on the potential for flexible wireless broadband use in the 5.925-6.425 GHz band (“Lower 6 GHz Band”) and the 6.425-7.125 GHz band (“Upper 6 GHz Band”) (collectively, the “6 GHz Band”).

Like many other commenters,² AAR does not believe that the 6 GHz Band should be made available for unlicensed use or licensed mobile broadband services. Utilities, public safety organizations, and other critical infrastructure industries, including railroads, rely on the 6 GHz Band for a number of vital communications systems. It is infeasible and potentially dangerous for the band to be allocated for unlicensed use. These systems have very high availability requirements which create minimal tolerance for interference, and interference mitigating techniques have not been demonstrated to be capable of protecting incumbent fixed microwave

¹ *Expanding Flexible Use in Mid-Band Spectrum Between 3.7 and 24 GHz*, Notice of Inquiry, 32 FCC Rcd 6373 (2017) (“NOI”).

² *See, e.g.,* Comments of Fixed Wireless Communications Coalition, GN Docket No. 17-183, at 6 (filed Oct. 2, 2017) (“FWCC Comments”).

users. Relocation of incumbent 6 GHz Band operations is also untenable given the lack of alternative bands that have comparable signal propagation characteristics.

While AAR and its members support the Commission's goal of identifying underutilized bands that can be allocated for flexible use, the 6 GHz Band is not one of these bands.

I. VITAL RAILROAD COMMUNICATIONS SYSTEMS DEPEND ON THE 6 GHz BAND

AAR is a voluntary non-profit membership organization whose freight railroad members operate 83 percent of the line-haul mileage, employ 95 percent of the workers, and account for 97 percent of the freight revenues of all railroads in the United States.³ AAR's members also include certain passenger railroads that operate intercity passenger trains and provide commuter rail service. Radio communications systems are a vital component of the railroad industry's operations, and much of the radio use by the rail industry is for safety-related purposes.

Railroads rely on private fixed microwave systems that operate in the 6 GHz Band to ensure the safe passage of trains across the United States. For example, Union Pacific Railroad uses a 6 GHz Band microwave system that spans from the Mississippi River to California and from the Texas border to the Canadian border. BNSF Railway ("BNSF") operates several hundred 6 GHz Band point-to-point microwave stations located throughout the BNSF territory, spanning hundreds of miles, stretching from areas such as Fargo, North Dakota to Havre, Montana and Galesburg, Illinois to Lincoln, Nebraska. These microwave systems serve as critical backbones for the transport of railroad communications, including dispatch radio traffic, centralized train control systems, positive train control, phone systems, and crew train orders.

In addition, these microwave systems carry potentially life-saving information regarding train signals and remote switching of tracks and routing of trains through rights-of-way, depots,

³ Additional information on AAR is available at <https://www.aar.org/>.

and freight yards.⁴ These communications also relay critical telemetry data from trackside defect detectors located throughout the rail network. For example, information about damaged rails, overheated wheel bearings, dragging equipment, and rock slides is automatically transmitted from these detectors via mobile radio links to crew members, who can then take the necessary actions to prevent derailments, and via fixed microwave links to dispatchers in distant locations. These 6 GHz Band microwave systems also are vital to coordination of operations among the different railroads.

Moreover, these railroad communications systems need to be extremely reliable and are typically designed to ensure availabilities of greater than 99.999%. Because modern microwave systems, such as the ones used by railroads, require clear channels to transmit large amounts of data, even a small amount of interference will negatively impact the microwave system, degrading the radio link or causing it to fail completely. Such interference could disrupt, delay, or otherwise impact the safe operations of railroads.

II. THE 6 GHZ BAND IS ILL-SUITED FOR SPECTRUM SHARING

The NOI seeks comment on the potential for additional flexible wireless broadband use in the Lower 6 GHz Band.⁵ The NOI also seeks comment on the potential for mobile or unlicensed use in the Upper 6 GHz Band. More specifically, the Commission seeks comment on the suitability of designating the 6 GHz Band for Unlicensed National Information Infrastructure (“U-NII”) use or unlicensed operations under other provisions of the FCC’s Part 15 rules.

⁴ *Study of Spectrum Use by Energy, Water and Railroad Service Providers*, Comments of the Association of American Railroads, NTIA Docket No. 010327080-1080-01, ¶ 6 (2001); *see also* Letter from Mitchell Lazarus, Counsel for the Fixed Wireless Communications Coalition, to Marlene H. Dortch, Secretary, FCC, IB Docket No. 02-10, at 3 (filed Nov. 19, 2004).

⁵ NOI ¶ 26.

Incumbent operators in the 6 GHz Band currently use carefully engineered point-to-point microwave networks of high gain, highly directional antennas, and current frequency coordination techniques allow links to operate without interference at extremely high levels of reliability, even when two links use the same frequency.⁶ Unlicensed devices can cause harmful interference to these networks even when transmitting at very low power or from very far distances. As AT&T explained, “while microwave beams are narrow, the area within the boresight of the antenna is typically very large, given the length of the links—the surface area where potential interferers could be covers many square miles.”⁷ Indeed, an unlicensed device transmitting at 10 dBm would need to be at least 5.5 miles from a microwave receiver to avoid causing interference.⁸ And a Wi-Fi device operating at maximum power could cause interference from a distance of up to 110 miles in front of a microwave receiver.⁹

It would be difficult for incumbent Fixed Service microwave operators to prevent or resolve cases of harmful interference caused by unlicensed devices. Microwave operators cannot monitor links for interference¹⁰ because short-term interference is often indistinguishable from atmospheric fading and both degrade the performance of the link due to adaptive modulation.¹¹ Even if interference could be detected, neither identifying nor locating an interfering mobile

⁶ FWCC Comments at 4 (“The need for near-perfect reliability leaves no room for disruptions due to interference from other services. The frequency coordination techniques used by the FS (and the FSS [Fixed Satellite Service], in shared bands) result in essentially zero interference.”).

⁷ Comments of AT&T Services, Inc., GN Docket No. 17-183, at 16 (filed Oct. 2, 2017) (“AT&T Comments”).

⁸ FWCC Comments at 10-11.

⁹ *Id.*

¹⁰ Comments of the National Spectrum Management Association, GN Docket No. 17-183, at 11 (filed Oct. 2, 2017).

¹¹ *Id.*

station would be feasible.¹² As Duke Energy explained, the process of resolving even a single instance of interference can take days or weeks of searching for unwanted frequencies with antennas and spectrum analyzers in an effort to triangulate the source of the interference. The associated costs can easily run into the tens of thousands of dollars.¹³

Commenters who support unlicensed use claim that unlicensed devices will be able to mitigate against interference. A number of approaches have been suggested, including antenna restrictions, indoor-only functionality, geo-location databases, reduced power limits, and dynamic frequency selection.¹⁴ Other commenters were less optimistic about proposed mitigation techniques.¹⁵

AAR agrees that the proposed mitigation approaches are unlikely to protect incumbent operations from harmful interference and urges caution. The principal concern with any of these approaches is that the aggregate interference caused by multiple unlicensed devices can rise above the noise floor of microwave receivers and cause harmful interference.¹⁶ AAR raised this and related issues last year when it requested that Higher Ground's petition for a waiver to operate up to 50,000 mobile earth terminals in the Lower 6 GHz Band be denied due to a lack of technical data demonstrating that such operations could protect incumbent Fixed Service

¹² *Id.*

¹³ Comments of Duke Energy Corporation, Docket No. 17-183, at 3-4 (filed Oct. 2, 2017) ("Duke Energy Comments").

¹⁴ Comments of IEEE 802, GN Docket No. 17-183, at 5 (filed Oct. 2, 2017); Comments of Wi-Fi Alliance, GN Docket No. 17-183, at 9-11 (filed Oct. 2, 2017).

¹⁵ See Reply Comments of IEEE Broadcast Technology Society, GN Docket No. 17-183, at 3-5 (filed Nov. 2, 2017); see also Comments of the Association of Public-Safety Communications Officials-International, Inc., GN Docket No. 17-183, at ii-iv (filed Oct. 2, 2017).

¹⁶ See Comments of the Utilities Technology Council and the Edison Electric Institute, GN Docket No. 17-183, at 12 (filed Oct. 2, 2017) ("UTC Comments"); see also Duke Energy Comments at 3.

operators.¹⁷ Instead, the FCC’s International Bureau, Wireless Telecommunications Bureau, and Office of Engineering and Technology granted Higher Ground’s request without first developing a record that would have allowed them to adequately assess the risk of interference to incumbent microwave operators.¹⁸ The technical issues raised by incumbent microwave licensees relating to Higher Ground’s proposed interference mitigation techniques represent a microcosm of the issues the Commission must address to adequately protect 6 GHz Band incumbent operators from harmful interference.

III. RELOCATION OF 6 GHZ BAND INCUMBENTS IS NOT FEASIBLE

AAR and its members agree with the large number of commenters who stated that relocation of incumbent licensees is not feasible.¹⁹ The 6 GHz Band is heavily populated with fixed microwave incumbents.²⁰ There are approximately 28,000 fixed microwave links in the Lower 6 GHz Band and approximately 23,000 in the Upper 6 GHz Band.²¹ The 11 GHz band (10.7-11.7 GHz) is the likely target for relocation, but its propagation characteristics are less suitable for long-haul microwave transmission due to the shorter path lengths and rain fade.²² To compensate for these limitations, any relocation of incumbent 6 GHz Band operations would require additional sites to be built at great expense.²³

¹⁷ *Ex Parte* Letter from Michele C. Farquhar, Counsel, AAR, to Marlene H. Dortch, Secretary, FCC, IBFS File No.: SES-LIC-20150616-00357 (filed Dec. 22, 2016) at 1.

¹⁸ *See Higher Ground LLC Application for Blanket Earth Station License*, Order and Authorization, 32 FCC Rcd 728 (2017).

¹⁹ *See* UTC Comments at 8; AT&T Comments at 12-13; FWCC Comments at 2; Comments of Tucson Electric Power Company, GN Docket No. 17-183, at 8-9 (filed Oct. 2, 2017) (“TEP Comments”).

²⁰ *See* UTC Comments at 7.

²¹ *Id.* at 2-3.

²² *See* AT&T Comments at 14-15; FWCC Comments at 13.

²³ AT&T Comments at 15 (“The average distance of a 6 GHz microwave link, for example, is approximately 30 km—twice the average distance of an 11 GHz microwave link.”).

Additionally, it may be difficult for the 11 GHz band to accommodate relocated 6 GHz Band microwave licensees. The 11 GHz band is already crowded, and usage of the band is growing quickly.²⁴ The same is also true of the 6 GHz Band.²⁵ Incumbent operators in the 6 GHz Band increasingly require additional bandwidth to support the modernization of critical systems, such as Smart Grid initiatives²⁶ and Positive Train Control. Moreover, if fixed incumbents in the 3.7-4.2 GHz band were to be relocated, they would likely be placed in – and even further crowd – the 6 GHz Band.

IV. CONCLUSION

AAR and its members support the Commission's efforts to improve flexibility, efficiency, and access in 6 GHz Band, but achieving these goals should not impair the band's substantial incumbent operations. Critical infrastructure industries, utilities, and public safety organizations rely on the 6 GHz Band. These systems are vital to the missions they serve. Given the significant threat of harmful interference to these incumbent systems, the FCC should not designate either segment of the 6 GHz Band for unlicensed use or licensed mobile broadband services.

Kathryn D. Kirmayer
Timothy J. Strafford
ASSOCIATION OF AMERICAN RAILROADS
425 Third Street, S.W.
Suite 1000
Washington, DC 20024

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/s/ Michele C. Farquhar
Michele C. Farquhar
Wesley B. Platt
HOGAN LOVELLS US LLP
555 Thirteenth Street, N.W.
Washington, DC 20004
Phone: (202) 637-5663

*Counsel to the Association of American
Railroads*

²⁴ FWCC Comments at 13.

²⁵ TEP Comments at 9-10.

²⁶ Duke Energy Comments at 4-5.