

**Before the
Federal Communications Commission
Washington, D.C. 20554**

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

**REPLY COMMENTS OF
THE NATIONAL ASSOCIATION OF BROADCASTERS**

March 18, 2019

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I. INTRODUCTION AND SUMMARY

The National Association of Broadcasters (NAB)¹ hereby replies to comments submitted in response to the Commission’s Notice of Proposed Rulemaking concerning unlicensed operations in the 6 GHz band.² While NAB supports the Commission’s efforts to expand opportunities for spectrum use, including expanded opportunities for unlicensed use of the 6 GHz band, no commenter has proposed an effective mechanism for protecting important broadcast auxiliary services (BAS) operations in the 6425-6525 MHz (U-NII-6) and 6875-7125 MHz (U-NII-8) bands.

Instead, to the extent they address the issue at all, most commenters assume that the Commission’s proposal to protect BAS operations by limiting unlicensed use to low-power,

¹ The National Association of Broadcasters (NAB) is the nonprofit trade association that advocates on behalf of free local radio and television stations and broadcast networks before Congress, the Federal Communications Commission and other federal agencies, and the courts.

² *Unlicensed Use of the 6 GHz Band; Expanding Flexible Use of the 3.7 to 4.2 GHz Band*, Notice of Proposed Rulemaking, ET Docket No. 18-295, GN Docket No. 17-183, FCC 18-147 (Oct. 24, 2018) (NPRM).

indoor operation will prove adequate. It will not. First, many BAS operations themselves are low-power and indoors. As a result, uncoordinated unlicensed use of the U-NII-6 and U-NII-8 bands risks crippling interference to licensed BAS services. Second, even BAS uses that are not themselves low-power indoor operations may still receive harmful interference from low-power unlicensed operations in the band because BAS links may traverse long distances and have very high RF visibility.

Because the Commission's proposals to protect BAS operations are inadequate, and because no party has proposed protections that will work, the Commission cannot reasonably allow unlicensed use of the U-NII-6 and U-NII-8 bands at this time. We urge the Commission to move forward with an order allowing unlicensed operations in the U-NII-5 and U-NII-7 bands to the extent incumbent users can be protected from interference and to consider unlicensed use of the U-NII-6 and U-NII-8 bands in a separate proceeding only if there are technical solutions available that can reliably protect BAS operations.

II. THE COMMISSION SHOULD NOT ALLOW UNLICENSED USE OF THE U-NII-6 AND U-NII-8 BANDS BASED ON THE RECORD OF THIS PROCEEDING

A. Supporters of Unlicensed Operations in These Bands Largely Assume Away the Challenges of Protecting BAS Operations

In its initial comments, NAB explained the important role that BAS services play in providing live coverage of breaking news, special events and sports. Programmers cannot provide the coverage to which viewers are accustomed without reliable access to spectrum. Unfortunately, no party has proposed technical solutions that will safeguard BAS uses that rely on spectrum in the U-NII-6 and U-NII-8 bands.

Many commenters who address BAS operations in the U-NII-6 and U-NII-8 bands simply assume without discussion that the Commission's proposal to restrict unlicensed use of the bands to low-power indoor operations will protect BAS users. For example, the Wi-Fi

Alliance argues that the Commission should permit low-power indoor operation without automatic frequency coordination (AFC) in the U-NII-5 and U-NII-7 bands on the theory that low-power indoor devices “will protect incumbent operations in these sub-bands in the same way that they will protect incumbents in the U-NII-6 and U-NII-8 bands.”³ Qualcomm, a collection of public interest groups and Broadcom similarly argue that the Commission should permit low-power indoor operations in other bands, assuming that such restrictions will work to protect incumbents in the U-NII-6 and U-NII-8 bands.⁴

One commenter even suggested expanding on the NPRM’s proposals by allowing uncoordinated short-range communications using power levels up to +14 dBm (25 milliwatts).⁵ As NAB discussed in its initial comments, battery operated electronic news gathering (ENG) equipment operates at similar power levels and use of short-range U-NII devices in the same bands will cause massive interference. For example, at NBA and NCAA basketball games, battery-powered cameras use this spectrum to contribute courtside player interviews and court-level game coverage to networks and stations. These cameras typically use transmitters operating with less than 250 milliwatts transmitting from courtside to receiving antennas located near the press boxes or in the building rafters.

³ Comments of Wi-Fi Alliance at 11, ET Docket No. 18-295, GN Docket No. 17-183 (Feb. 15, 2019).

⁴ See Comments of Qualcomm Incorporated at 9-10, ET Docket No. 18-295, GN Docket No. 17-183 (Feb. 15, 2019); Comments of Open Technology Institute at New America, American Library Association, Consumer Federation of America, COSN – Consortium for School Networking, Public Knowledge, Access Humboldt at 17, ET Docket No. 18-295, GN Docket No. 17-183 (Feb. 15, 2019); Comments of Broadcom Inc. at 5-6, ET Docket No. 18-295, GN Docket No. 17-183 (Feb. 15, 2019).

⁵ Comments of Apple Inc., Broadcom Inc., Cisco Systems Inc., Facebook, Inc., Google LLC, Hewlett Packard Enterprise, Intel Corporation, Qualcomm Incorporated, and Ruckus Networks, an Arris Company at 35-39, ET Docket No. 18-295, GN Docket No. 17-183 (Feb. 15, 2019).

In short, many commenters appear to fundamentally misapprehend the nature of BAS operations, which themselves are frequently low-power and indoors, and thus assume away the question of how to protect these operations.

Further, in its initial comments, NAB pointed out that the Commission's proposals to ensure that unlicensed operations in the U-NII-6 and U-NII-8 bands were confined to indoor use – even if such a restriction would protect BAS operations – were ineffective and would not serve to prevent unlicensed use outdoors or near outdoors. Remarkably, at least one commenter found the FCC's proposal to require a connection to a power outlet to ensure indoor-only operation overly burdensome and suggested that, rather than require a connection to a power outlet, the Commission should instead consider “indoor use only” labeling as a means of confining unlicensed use.⁶ This is a wholly unserious suggestion. The Commission certainly cannot rely on end-user compliance with labels to protect licensed operations in the band.

If there were a way to confine unlicensed operations in the U-NII-6 and U-NII-8 bands to indoor operations in private residences – rather than public venues where indoor BAS users most commonly operate – that would help alleviate potential interference to low-power indoor BAS users. No commenter has proposed such a solution. But even if unlicensed operations could be confined to private residences and indoors this still would not protect outdoor BAS operations. As NAB described in its initial comments, television pick-up stations used for electronic newsgathering frequently traverse lengthy transmission paths over both residential and commercial districts. Because such a BAS signal will be weak at the receiver, even low-

⁶ Comments of Wi-Fi Alliance at 19.

power indoor Wi-Fi operations near the BAS receiver could easily cause interference to these links.

Finally, the Wi-Fi Alliance mischaracterizes certain aspects of BAS operations in the U-NII-6 and U-NII-8 bands in an attempt to minimize the potential difficulties associated with allowing unlicensed operations in those bands. The Wi-Fi Alliance claims that “Part 74 licenses are included in the ULS database so they can be protected by an AFC.”⁷ This is definitely not the case for BAS stations operating pursuant to Section 74.24 of the Commission’s rules, which does not require a specific license.⁸ Thus, the Wi-Fi Alliance’s claim that there are “only a few” LPAS licenses in the 6 GHz band grossly understates broadcasters’ and other programmers’ use of the band.⁹

B. Proximity to 5 GHz U-NII Spectrum Does Not Justify Incompatible Operations in the 6 GHz Band

A number of commenters note that the 6 GHz band has virtually identical propagation properties to the existing 5 GHz U-NII spectrum and suggest that proximity to the 5 GHz band justifies expansion of U-NII into the 6 GHz band.¹⁰ This overlooks the critical distinction that none of the existing 5 GHz bands that include U-NII (Part 15) service rules have a mobile allocation. This is because the FCC has historically recognized the fundamental incompatibility of unlicensed use in spectrum where mobile allocations exist. The U-NII-6 and U-NII-8 bands, unlike the 5 GHz bands, include mobile allocations and service rules.

⁷ *Id.* at 31.

⁸ 47 C.F.R. § 74.24.

⁹ Comments of Wi-Fi Alliance at 31.

¹⁰ *See, e.g., id.* at 8-9.

Spectrum sharing between fixed links and unlicensed systems is possible only because the locations of the fixed transmitters and receivers can be precisely known and because these fixed links are carefully engineered to tolerate some level of interference. Similarly, sharing between certain radar systems and unlicensed systems is possible either because the locations of the radar transmitters are precisely known or because the radar transmitters are high-power and have high visibility, leading to a correspondingly high probability of detection by unlicensed devices.

Neither of these conditions applies where mobile and unlicensed operations must coexist. Mobile systems may operate with little or no margin for interference and may operate at low power and near the ground, with a correspondingly low probability of detection. NAB agrees with commenters that there is no assurance that unlicensed devices operating indoors will not interfere with microwave services, regardless of whether the proposed power level is further reduced.¹¹ The rules that govern the introduction of new unlicensed devices in this band should not leave interference protection of microwave services, including mobile and portable BAS systems, to chance. Nothing in the record of this proceeding warrants upending the FCC's traditional recognition that uncoordinated unlicensed operations are fundamentally incompatible with mobile operations.

C. Mobile Service Receive and Transmit Antennas Are Different From Fixed Service Antennas and Cannot Be Reliably Protected Using an AFC Approach

DSA states that, “[b]ecause [fixed service] receivers typically operate at significant heights, even the tiny percentage of RLAN devices that may operate outdoors or indoors at

¹¹ Comments of Comsearch at 3-4, ET Docket No. 18-295, GN Docket No. 17-183 (Feb. 15, 2019).

high elevation are exceedingly unlikely to deliver signals to FS receivers at angles and received-power levels that would overcome the antennas' rejection rates."¹² NAB agrees that a majority of fixed-links utilize conventional dish antennas at both ends and that the elevation pattern of those antennas tends to reject interference that is more than a few degrees off-axis from the main beam of the antenna.

Crucially, however, this is not the case for mobile and portable transmitters and receive antennas. Portable systems used both indoors and outdoors frequently use omni-directional antennas. Omni-directional antennas offer essentially no suppression of off-axis interference sources. These antennas are necessary because, in newsgathering, the transmitter (often attached to a shoulder-carried camera) may be in motion. A directional receiving antenna would require constant, impractical repositioning to keep the transmitter in view.

Further, in the case of the central receive sites which are fed by ENG vehicles, antennas are commonly somewhat directional in the azimuth plane but less so in the elevation plane. While ENG receive antennas can rotate in the azimuth plane, meaning they can point in any compass direction, they have no capability to point toward the truck along the corresponding depression angle, meaning they cannot point up or down. To compensate, most ENG receive antennas use a cosecant-squared antenna pattern in the elevation plane. That type of elevation-plane antenna pattern allows an ENG truck to move along a given azimuth – from far away to nearby – without needing to tilt the receive antenna downward.

Consider the following example. Suppose an ENG truck is located 50 miles due north of the central receive site. Ideally, the receive antenna would be pointed along an azimuth of

¹² Comments of Dynamic Spectrum Alliance at 8, ET Docket No. 18-295, GN Docket No. 17-183 (Feb. 15, 2019).

zero degrees and at a depression angle of perhaps 0.5 degrees below the horizontal.¹³ Now suppose the ENG truck is instead located just two miles north of the central receive site. While the azimuth remains zero degrees, the depression angle increases to 5.4 degrees below the horizontal. A cosecant-squared antenna pattern allows the receive antenna to receive the signal without having to tilt downward.

This design affords mechanical simplicity at the cost of interference rejection. Because BAS uses are coordinated in real-time among stations in a given market, that reduced interference rejection does not currently raise concerns. However, uncoordinated unlicensed devices operating co-channel with BAS will cause interference because antennas with cosecant-squared elevation patterns have much less discrimination from interference sources along a given azimuth. The difference between conventional and cosecant-squared antennas is illustrated below:

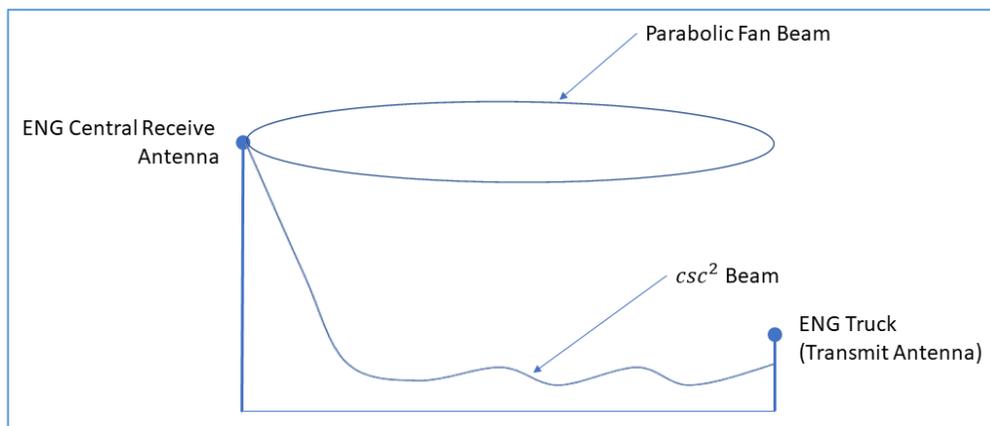


Figure 1: A cosecant-squared antenna elevation pattern is commonly employed at the ENG central receiver to enhance coverage from ENG transmitters near the receiver site (*i.e.*, at steep angles below the horizontal). When compared with a conventional parabolic fan-beam (symmetrical) pattern, the use of a cosecant-squared pattern greatly intensifies the amplitude of sources (including interference sources) located near the receive site.

¹³ These examples assume the central receive antenna is at a height of 1000 feet above the ENG truck's transmitting antenna.

Further, DSA's assumption that ultra-high-performance (UHX) antennas, offering better interference rejection, are common in fixed service systems is unjustified. UHX antennas include a number of features, such as precision machining, exotic materials, asymmetrical narrow-band feeds, shrouding, the use of absorptive materials and the use of enclosures (radomes), all of which are intended specifically to reduce side-lobe responses from the antenna at the penalty of greater weight, wind-load, and cost. Such antennas are extremely expensive and cumbersome and are used only in the most frequency-congested areas where there is simply no alternative. The Commission should not assume their use in considering the potential for interference to fixed service systems.

III. THE USE OF DATABASES AND SENSING FOR REAL-TIME COORDINATION IS UNRELIABLE

As discussed in its initial comments, NAB opposes any unlicensed use in the 6 GHz sub-bands with mobile allocations. With regard to the portions of the U-NII-8 band where mobile operations are authorized, NAB notes that the FCC enabled FS operations in the U-NII-8 band by geographically restricting them only to locations where mobile operations are not authorized. NAB endorses this approach with regard to unlicensed operations in the U-NII-8 band. Unlicensed operations must not be permitted in the geographic areas and sub-bands where mobile operations are authorized.

While NAB's comments in this proceeding have focused on the U-NII-6 and U-NII-8 bands, and on mobile operations in particular, given NAB's extensive experience with the Television White Spaces program and the database that serves as the foundation for that program, we also take the opportunity to respond to comments supporting the use of databases and sensing approaches in other portions of the 6 GHz band.

The Dynamic Spectrum Alliance (DSA) claims that “the use of databases to coordinate more intensive and efficient spectrum sharing has emerged as a critical regulatory tool.”¹⁴ In fact, the record to date in the TV White Space (TVWS) proceeding has demonstrated database protection to be a deeply flawed tool. While NAB takes no position on the lower 6 GHz band (U-NII-5, below 6425 MHz), we generally support the concerns and recommendations of CTIA, Comsearch, Sony, NSMA and others with regard to sharing in the 6 GHz sub-bands where there is no mobile allocation.¹⁵ All unlicensed devices should use a coordination system to avoid interference with incumbent users. The coordination system must control transmissions by unlicensed devices that are co- or adjacent frequency to a microwave receiver.

Furthermore, any coordination system must be based on accurate database information and a conservative predictive method. Rules allowing for the introduction of new services in the 6 GHz band must not place the burden on microwave licensees to monitor and track down sources of interference, and registration for protection in an AFC database should be simple and at no cost to the registering party.

In particular, any AFC system the Commission considers in the 6 GHz band should:

- ensure that AFC providers are qualified and selected in a systematic way that is subject to public scrutiny;
- provide a means AFCs and others to verify independently data concerning incumbent uses;
- require frequent rechecks by U-NII device users with an AFC to ensure channel availability remains valid;

¹⁴ Comments of Dynamic Spectrum Alliance at 3.

¹⁵ See Comments of Comsearch at 14-15; Comments of CTIA at 17-21, ET Docket No. 18-295, GN Docket No. 17-183 (Feb. 15, 2019); Comments of Sony Electronics at 3-7, ET Docket No. 18-295, GN Docket No. 17-183 (Feb. 15, 2019); Comments of the National Spectrum Management Association at 10-12, ET Docket No. 18-295, GN Docket No. 17-183 (Feb. 15, 2019).

- mandate registration of access points, including “hotspots,” whether indoors or outdoors, including sufficient information so that interference sources can be rapidly and reliably identified, and
- require a meaningful and robust enforcement mechanism.

While NAB believes that a proper database system can help facilitate spectrum sharing to protect fixed service incumbents, the Commission should apply the lessons learned through previous database experiments. The Commission should not rely on professional installation alone to ensure the accuracy of information included in a database. While NAB generally is less concerned about manual entry of height information, the geographic coordinates of the access point should be automatically determined by GPS or a similarly reliable method except in the most unusual circumstances.

The Commission should also reject DSA’s suggestion that AFCs need not communicate with one another. In the case of TVWS, the Commission authorized a number of database providers, all of which were required to communicate with each other and share certain data. Although some aspects of the TVWS database system are flawed, this inter-communication between providers simplified and streamlined the process to register a protected facility since only a single registration was required. If AFCs do not communicate with one another, what would be the mechanism for modifying the database of protected facilities? It is unreasonable to require entities to register with multiple AFCs for protection or to monitor multiple databases for errors. Synchronization between all AFCs appears to be the only way of ensuring that each gives the same result concerning channel availability.

Finally, as a general matter, the Commission should not adopt rules that place the burden on incumbent fixed service licensees to mitigate interference from U-NII devices after interference has occurred. Microwave operators (including those licensed under Parts 74, 78, and 101 of the Commission’s Rules) are the primary service licensees. It is the responsibility

of unlicensed users not to cause interference. Fixed service licensees will not be in a position to locate and identify sources of interference, contact responsible parties, and assure that interference has been mitigated. Instead, the Commission should adopt rules that will minimize the potential for interference and place the burden on unlicensed devices to cease interference where it occurs.

IV. CONCLUSION

The Commission's proposals for protecting BAS operations in the U-NII-6 and U-NII-8 bands are plainly insufficient. Limiting unlicensed operations in these bands to low-power and indoor-only use will do nothing to protect many BAS operations that are themselves low-power and indoors. Further, unlicensed use of these bands can easily disrupt fixed service BAS links travelling across significant distances. No commenter has proposed a workable solution. In the absence of a technically viable method for preventing harmful interference, the Commission should not permit unlicensed operations in the U-NII-6 and U-NII-8 bands in this proceeding. If a reasonable and reliable means of preventing interference develops, the Commission can consider unlicensed operations in these bands at a later date.

Respectfully submitted,

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