

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 Between 3.7 and 24 GHz)	GN Docket No. 17-183
)	

To: The Commission
Via: ECFS

**EX PARTE STATEMENT OF THE SOCIETY OF BROADCAST
ENGINEERS, INCORPORATED**

The Society of Broadcast Engineers, Incorporated (“SBE”) by counsel and pursuant to Section 1.1206 of the Commission’s Rules (47 C.F.R. §1.1206) hereby respectfully submits this *Ex Parte* Statement in the captioned proceeding, relative to the *Notice of Proposed Rule Making*, FCC 18-147, 83 Fed. Reg. 64506 *et seq.*, released October 24, 2018 (the “*Notice*”). The *Notice* seeks comment on, among other things, a proposal to permit high-power, unlicensed broadband devices to operate indoors in the so-called U-NII-6 and U-NII-8 bands, i.e. 6425-6525 MHz and 6875-7125 MHz.¹ SBE timely filed comments in this proceeding on February 15, 2019, raising grave concerns about the compatibility of these unlicensed Wi-Fi devices, operating at the parameters proposed, with incumbent Part 74 broadcast auxiliary (BAS) stations; Part 101 Local Television Transmission Service (LTTS) licensees; and Part 78 Cable Television Relay Service (CARS) licensees (hereinafter “incumbent broadcast licensees”). Since that time,

¹ Broadcasters, video producers, cablecasters and other active mobile users make very substantial use of the band 6425-6525 MHz (the “6.5 GHz BAS band”) and mobile and fixed users are active daily in the band 6875-7125 MHz (the “7 GHz BAS band”) in all television markets in the United States.

counterproposals to the Commission's *Notice* have been filed by commercial broadband carriers who suggest reallocation of one or both of the U-NII-6 and U-NII-8 bands for auction to commercial broadband providers. There are also numerous *ex parte* submissions by those supportive of the proposal to allow high-power Wi-Fi in these two bands, and in the entirety of the band under study, 5925-7125 MHz. SBE would note the practical and technical difficulties in making the bands 6425-6525 MHz and 6875-7125 MHz, or either of them, available for unlicensed, high-power Wi-Fi without automatic frequency control and meaningful, enforceable technical limitations on these devices, and the logistical and practical difficulties in relocating displaced broadcast auxiliary facilities, should the Commission consider the counterproposals in this proceeding of the commercial broadband providers.

1. In its Comments in this proceeding, SBE argued that the Commission does not have sufficient information about the potential aggregate effect of the proposed, unlicensed broadband devices on the incumbent users in the U-NII-6 and U-NII-8 bands and that the interference potential should be firmly determined by compatibility studies in advance of any decision in this proceeding. The risk of preclusive interference to ongoing video production and broadcast electronic news gathering in those bands is far too high to proceed without some definitive studies. The 6.5 GHz BAS band is very heavily used by broadcasters on a mobile basis, daily, in virtually *all broadcast markets* for electronic news gathering, and for various aspects of event video production. It is used for a number of other purposes, including portable camera relays to "jumbotron" screens for major sporting events at stadiums and arenas, and at musical concerts at large venues, indoors and outdoors. It is used for video relay to production trucks at news events and sporting events such as televised sailing regattas, and it is also used for multi-hop mobile relay of video signals from the location of newsworthy events to either a satellite news truck, a

fixed receive site or a temporary relay site. The use of this band is unpredictable due to the location of breaking news events and the paths, and path lengths, vary hourly. It is exceptionally difficult to coordinate use of this band with other terrestrial uses (though SBE's private-sector frequency coordination program has been most successful in maximizing efficient uses of both bands through time-domain sharing and an established home channel plan in most markets). BAS, CARS and LTTS use of this band is not limited to metropolitan areas. It is used for terrestrial video relay from remote, rural locations for electronic news gathering. There are also aeronautical mobile applications in connection with electronic newsgathering or video production operations from helicopters, but the primary use of the band is for terrestrial video relay from mobile RF cameras. There are additional terrestrial uses of the band, including as noted above video relay to video screens at large event venues, short-range video relay for video production at automobile racing, sailboat racing, political conventions and golf events, to name just a few. The National Football League and the NFL Network use the band for an in-stadium, low-power, player tracking system at all stadiums as a component of its video production operations during all televised games. These production venues are in urban, suburban, exurban and rural markets and there is no predictable pattern for geographic area of BAS, CARS or LTTS deployment, indoors or outdoors. Nor can the ENG uses of the band be planned in advance. And the locations of receive sites, some of which are indoors, and some being temporary, are entirely unpredictable and itinerant. They cannot be sensed by an unlicensed mobile device before that device transmits.

2. With respect to the 7 GHz BAS band, fixed and mobile BAS, LTTS and CARS stations are in active daily use in virtually *all* television markets, and the band is used for both

fixed and mobile applications, at indoor and outdoor venues.² BAS licensees actively and intensively use the 7 GHz bands in all markets. That band is used for fixed BAS purposes, which is functionally similar to fixed, point-to-point OFS stations, but it is also still used extensively for mobile, TV pickup operation for ENG by grandfathered mobile licensees, in lieu of the terribly overcrowded 2025-2110 MHz (“2 GHz”)³ band and the 2450-2483.5 MHz (“2.5 GHz”) band. Both 2 GHz and 2.5 GHz are used for longer path length BAS TV-pickup type operations, but the 2.5 GHz band is not usable in many markets due to interference from Part 15 high-power unlicensed devices and Part 18 ISM devices.⁴ The 2 GHz band is severely overcrowded in most markets, and the migration into that band of Department of Defense applications, both terrestrial and aeronautical mobile, has resulted, over time, in a migration upward by broadcast mobile operations to the 6.5 and 7 GHz bands. There is at 7 GHz both mobile and temporary fixed TV pickup operation and there are fixed, temporary relay stations in use for events and electronic news gathering (ENG) operations. BAS fixed facilities and receive sites for temporary fixed facilities are so designated in the Commission’s database, but temporary receive sites do not

² These applications include television pickup, television studio-to-transmitter links, television relay stations, and CARS stations.

³ Now, the overcrowded 2 GHz band is increasingly shared on a co-channel basis with certain facilities of the Department of Defense, putting even more pressure on and an upward migration of broadcast ENG operations to the 6.5 and 7 GHz BAS bands. See, the *Report and Order* in ET Docket No. 13-185, released March 31, 2014 (FCC 14-31, 29 FCC Rcd. 4610). That Report and Order added primary Federal fixed and mobile service allocations to the 2025-2110 MHz band; limited Federal use of the allocation to military use; specified coordination requirements for such operations in accordance with a Memorandum of Understanding between Federal and non-Federal fixed and mobile operations; and provided interference protection and priority to the specified non-Federal fixed and mobile operations in the band. It also added footnote US92. The purpose of this allocation was to accommodate the auction of the AWS-3 band at 1755 - 1780 MHz.

⁴ There are numerous incumbent services in the 2450-2500 MHz band. These services include Part 74 Broadcast Auxiliary Service (BAS); Parts 90 and 101 fixed and mobile service stations (2450-2483.5 MHz), including Local Television Transmission Service which operates ubiquitously from temporary fixed locations; MSS stations (2483.5-2500 MHz for satellite-to-user downlinks); Part 27 Broadband Radio Service (2496-2500 MHz); and grandfathered Part 74 BAS and Parts 90 and 101 fixed and mobile stations (2483.5-2500 MHz). In addition, Part 18 of the Commission’s rules authorizes unlicensed industrial, scientific, and medical (ISM) devices to operate in the 2400-2500 MHz band. Finally, Part 15 devices operate up to 2483.5 MHz. Noteworthy among these are Bluetooth devices which operate between 2400 and 2480 MHz. There is also a plethora of Federal government assignments in the band 2450-2495 MHz. It is very difficult to use the 2.5 GHz BAS band for video production or ENG due to the exceptionally high noise levels in the band due to Part 15 and Part 18 emitters in all but the most rural areas.

appear at all. Only relatively recently has the Commission (at SBE's request) reconfigured its ULS database to allow the registration by BAS licensees of fixed receive sites for TV pickup stations. While these receive sites can now be registered in the database, not all broadcast licensees have completed such registration. That process is ongoing. Therefore, any assumptions that the Commission may have made about the relative occupancy of the 7 GHz band -- in reliance on the ULS database -- are based on inaccurate data. Furthermore, temporary fixed receive sites near news events or any large-scale televised event for relay to fixed receive sites are not going to be found anywhere except in the SBE market coordinator's database, which is updated in real time. Those receive sites would be invisible to mobile broadband devices. They are also invisible to the Commission. The *Notice* in this proceeding states, at paragraph 74, that only 2% of the BAS operation at 7 GHz is mobile. *That is an assumption that is contrary to SBE's experience in coordinating Part 74, 76 and 101 facilities in this band.* There is an exceptionally large amount of mobile operation that is done regularly pursuant to Section 74.24 of the Commission's Rules, which permits temporary, short-term BAS operation precisely to accommodate ENG operation; and also to permit changes in BAS facilities which need to be implemented immediately. In large markets, the band is several licensees deep on each channel at 7 GHz for real-time ENG operations due to overcrowding of the 2 GHz and 2.5 GHz bands. While the 7 GHz BAS band is now limited (as far as new applicants go) to fixed, point-to-point operation, there are large numbers of incumbent mobile licensees, especially broadcast networks and video production entities who were licensed for mobile operation and who are able to, and do, use the band for mobile ENG and mobile and temporary fixed operation. Since there is not a limit on the number of transmitters that can be deployed through one licensee entity, the number

of active transmitters in this band exponentially exceeds the number of issued and outstanding licenses.

3. In both the 6.5 and 7 GHz bands and in the entirety of 5.925-7.125 GHz, there are Ultra-Wideband (UWB) devices operating pursuant to Part 15, Subpart F. These devices, authorized principally by Section 15.250, include UWB wireless microphones in use for video and audio production by broadcasters. The Commission has made inadequate provision for narrower-bandwidth wireless microphones after the auction of the 700 and 600 MHz bands and the resultant TV band repacking in the 470-608 MHz band. One solution for broadcast-quality wireless microphones is the use of UWB devices operating in the U-NII bands. Overlay of wireless broadband devices in the segment will doubtless interfere with these products and reduce their reliability for broadcast use, though UWB devices will not interfere with the RLAN Wi-Fi devices proposed.

4. SBE argued in its comments in this proceeding that there are numerous obstacles to the addition of unlicensed broadband devices in the 6.5 and 7 GHz bands: (1) The proposed power level is far too high for indoor applications. (2) There is a complete absence of any duty cycle limitation in the proposed rules. (3) There are insufficient out-of-band emission limits proposed. (4) There is no possibility that unlicensed broadband mobile devices can sense a temporary receive location in a stadium or other indoor location. (5) Nor is the proposed indoor application limitation for U-NII-6 and U-NII-8 devices enforceable at all. The bottom line with any unlicensed device is that if unauthorized deployment or unauthorized device configuration cannot be addressed prior to the point of sale, the rule is not enforceable at all *post hoc*. Finally, (5) the Notice in this proceeding assumes that there is no difference in interference potential to incumbent services from a single unlicensed broadband device in the band, and the aggregate

interference potential from millions of these devices. The Commission has no idea at all what the RF noise floor is in the 5.925-7.125 GHz band, in *any* environment.

5. Just as the Commission proceeded cautiously initially in the authorization of UWB devices under Part 15, the Commission should proceed cautiously now in authorizing unlicensed mobile broadband devices in the 6 GHz band until compatibility studies are prepared and fairly evaluated; until experience is gained from limited testing; and until the interference potential is known. Otherwise, individually and in the aggregate, the devices may (and SBE believes that they will) negatively impact the overall electromagnetic noise environment in a band critical to broadcast ENG and video production throughout the United States.

6. Fortunately, a good start at interference studies has been commenced by the National Association of Broadcasters (NAB), having retained Alion Science and Technology, a well-respected engineering firm, to ascertain and substantiate the likelihood and extent of potential interference to electronic news gathering systems from proposed 6 GHz RLAN transmitters. Alion's Radio Frequency (RF), Electromagnetic, and Spectrum Engineering Directorate (RESED) prepared its RESED-20-002 report in October of 2019. Alion performed EMI analyses for selected representative scenarios, including central ENG receive sites, ENG mobile truck locations, and an interior ENG receiver location. Each of these ENG deployments was assumed to be in the proximity of the proposed 6 GHz RLAN Wi-Fi transmitters. San Diego, CA, Washington, D.C., and Prince George's (P.G.) County, Maryland were chosen as representative sites. The indoor scenario consisted of an ENG receiver and RLAN Wi-Fi transmitters in the Chamber of the US House of Representatives (a typical deployment of RF cameras). The Alion analyses predicted harmful RLAN interference to each of the ENG system deployment use cases. The study concluded that such interference could potentially result in degradation *or complete*

loss of ENG video signals. For the ENG central receive sites near San Diego, CA and Washington, D.C. there were many cases of significant, continuous or near-continuous interference. This occurred most frequently for an RLAN activity factor of 10%, but also occurred for a low activity factor of 0.44%. The ENG central receive sites, given their typically high antenna heights, were line-of-sight (LOS) to many RLANs resulting in the high undesired signal levels as well as a high incidence of interference. Because mobile BAS operates at unpredictable locations (because all ENG and even many planned events require news coverage at unpredictable locations and times, and use unpredictable paths, indoors and outdoors) those BAS station receive sites will suffer interference from the mobile broadband facilities and there will be no good way to address it in real time.

7. For the ENG truck deployment cases investigated, the number of RLAN LOS links (and subsequently the probability of interference) was dependent upon the relationship between the RLAN antenna heights, the ENG antenna heights, and the heights of the surrounding buildings. Significant intermittent EMI was predicted for an activity factor of 10% and an ENG truck antenna height of 15 meters. Less interference was predicted for the low activity factor of 0.44% and lower ENG truck antenna height of 1.5 m, but even in these cases the interference threshold was still exceeded. LOS blockage was greater in Washington, D.C. than in P.G. County, and thus the rate of EMI incidents increased for the PG Country ENG truck deployment. The interior analysis, based upon a single interior receiver on the balcony of the chamber of the U.S. House of Representatives, found interference occurred when the activity factor and the on-tune circumstances coincided to increase the possibility of EMI. It bears reiteration in connection with this study that there is no duty cycle limitation for unlicensed RLAN Wi-Fi proposed in the instant Notice.

8. NAB notes in an Ex Parte letter filed in this proceeding December 5, 2019 that the methodology of the Alion study used conservative, rather than worst-case test conditions, and that this study definitively concludes that the “no harm” conclusions of the RLAN advocates (based largely on the flawed study prepared earlier by RKF) are not credible at all.

9. Based on the foregoing and in light of NAB’s submission of the determinative Alion Study, SBE reiterates several proposals contained in its comments in this proceeding: First of all, the Commission would be in full compliance with its legislative obligations if it made available 5925-6100 MHz for unlicensed mobile broadband. This more than satisfies the 100 MHz unlicensed requirement and the 55 MHz unlicensed requirement of the MOBILE NOW Act, and it obviates the adverse interaction between BAS, LTTS and CARS operation at 6425-6525 MHz and 6875-7125 MHz. Failing that, the Commission should proceed with great caution with respect to the proposed power level and other operating parameters of RLAN systems as well. Lower power contributes to frequency re-use and added compatibility. The proposed limit of 250 milliwatts for access points in the 6.5 and 7 GHz bands is far too high. Moreover, there should be a duty cycle upper limit of 0.5% over a period of one second. The 0.5% limit was the assumption made in the RKF study and it was a key element of the conclusions reached in that study. If the Commission is going to rely on the RKF study for any purpose whatsoever, it is obligated to utilize the limited duty cycle proposed in that study. Finally, the out-of-band emission mask proposed in the Notice is unacceptably lax. The Notice proposal for an OOB limit is -27 dBm/MHz. For comparison purposes, the intentional emitter limit for UWB devices in this same band is -41.3dBm/MHz. SBE suggests that an OOB limit that would be achievable and reasonable in the 6 GHz band is -61 dBm/MHz. That limit would encourage spectrum efficiency and maximize frequency re-use. Finally, indoor operation of these devices calls for a more

reliable means of ensuring against interference to receive locations than is proposed in the Notice. SBE suggests the use of registered beacon fence devices for this purpose. These would allow commercial users to transmit a signal that informs access points in their fence area, so that they will not transmit or allow transmission. This is especially urgent in football and other sports stadiums, performance arenas, and other areas to preclude interference to ongoing entertainment productions and video production at indoor news events. A registered beacon device transmits via already used control frequencies. The technology must be required in 6 GHz unlicensed mobile broadband devices to prevent them from transmitting if the beacon signal is received. There is no other reliable method of protecting the RF environment inside event forums for incumbent uses, especially broadcast ENG. The Commission's longstanding policy with respect to Part 15 devices is that it will not authorize such if there is a significant potential for interference to either licensed radio services in allocated bands, or to pre-existing, incumbent unlicensed devices and systems operating in accordance with the Part 15 rules. Here, the interference potential to ENG and other BAS, LTTS or CARS receive locations is unacceptably high and until further experience is gained, the deployment of unlicensed mobile broadband systems should be substantially limited.

Therefore, given the foregoing, the Society of Broadcast Engineers again respectfully

requests that the Commission refrain from authorizing unlicensed mobile broadband devices or access points in the 6425-6525 MHz band or the 6875-7125 MHz band at this time.

Respectfully submitted,

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