

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

Promoting Spectrum Access for Wireless Microphone Operations)	GN Docket No. 14-166
)	
)	
Expanding the Economic and Innovation Opportunities of Spectrum through Incentive Auctions)	GN Docket No. 12-268
)	

To: The Commission

**COMMENTS OF THE SOCIETY OF BROADCAST ENGINEERS,
INCORPORATED**

The Society of Broadcast Engineers, Incorporated (“SBE”)¹ hereby respectfully submits its Comments in response to the Commission’s *Notice of Proposed Rulemaking* in the above-captioned proceeding.² The Notice seeks to address the long term needs of wireless microphone users. As the Notice specifies, among many ubiquitous applications throughout the United States, wireless microphones and related low power wireless devices play an important role in enabling broadcasters and other video and audio production professionals to serve consumers and broadcast audiences, including real-time coverage of breaking news and broadcasting of live sports and entertainment events. In a series of orders establishing repeatedly modified and increasingly constrictive band plans for the UHF television allocations, the Commission has serially, in a very short period of time, substantially reduced the available spectrum for UHF wireless microphones in the UHF television band. Given this, it is highly appropriate and timely

¹ SBE is the national association of broadcast engineers and technical communications professionals, with more than 5,000 members worldwide.

² *Notice of Proposed Rulemaking*, FCC 14-145, 29 FCC Rcd. 12343, 79 Fed. Reg. 69387 and 69730 (released September 30, 2014) (the “*Notice*”). By *Order*, DA 14-1801 dated December 10, 2014, the Chief, Office of Engineering and Technology under delegated authority extended the comment date in this proceeding to February 4, 2015. Therefore, these comments are timely filed.

that the Commission explore replacement (i.e. additional) spectrum allocations for wireless microphones, wireless intercoms and low power broadcast auxiliary devices, before the shortage of spectrum for these applications becomes acute. In the best interests of the public, which relies heavily on the ability of broadcasters and video production companies to provide audio and video coverage of major news, sports and other events in real time, including on-the-scene coverage of emergencies and disasters, the Commission must reasonably accommodate ongoing wireless microphone and low-power auxiliary operations³, both in the residual UHF television bands and elsewhere in bands that provide equivalent functionality over short paths. To do otherwise will substantially disrupt the beneficial broadcast services to the public as they are now being provided which the viewing public expects, and on which they depend. For the reasons set forth herein, SBE supports the domestic allocation of a wide variety of additional bands for low power broadcast auxiliary service licensees. For its comments, SBE states as follows:

I. The Commission, in a Series of Inconsistent Regulatory Changes, Has in Short Order Disaccommodated Broadcast Wireless Microphones and Low Power Auxiliary Devices Critical to Providing Breaking News, Emergency and Disaster Relief Information, and Sports and Entertainment Programming that the Public Needs and Expects.

1. Recent rulemaking proceedings, starting with the Commission's effort to implement commercial and public safety broadband and interoperable narrowband public safety facilities in the band 698-806 MHz, have heretofore, separately and cumulatively, had an exceptionally significant adverse effect on the availability of spectrum for wireless microphones (WMs), low power auxiliary service (LPAS) devices, and wireless intercom systems. Without any practical opportunity thus far to adapt to each incremental regulatory change, the Commission has repeatedly altered the plan for WMs entirely, and in the process has eliminated all certainty about

³ Low power auxiliary stations are short-path transmit devices. They are, in addition to wireless microphones and wireless intercoms, used for purposes such as cue and control communications, and synchronization of TV camera signals. 47 C.F.R. § 74.801 *et seq.*

the near-term and long-term ability to conduct broadcast, cablecast or satellite broadcasts of urgent news, sports and entertainment programming, due to a completely inadequate amount of residual UHF spectrum for these devices. This is true even though broadcasters and program producers have had access to the UHF TV bands for this purpose only since 1987.⁴ Since that time, use of WMs and LPAS has skyrocketed, due to the ever-increasing expectations of the public for enhanced broadcast coverage of news, emergency situations and sports and event coverage.

2. On January 14, 2010, a scant twenty-five years after UHF wireless microphones were first authorized in the UHF TV bands, the Commission adopted a *Report and Order and Further Notice of Proposed Rule Making (Wireless Microphone R&O/FNPRM)* addressing the rules for wireless microphones and other low power auxiliary devices that operate in the TV bands.⁵ In that proceeding, the Commission prohibited the manufacture, import, sale, lease, offer for sale or lease, or shipment of wireless microphones and other low power auxiliary stations intended for use in the so-called “700 MHz” Band (TV channels 52-69, 698-806 MHz) in the United States. It was required that all LPAS facilities, including WMs cease operations in the 700 MHz band no later than June 12, 2010. The Commission acknowledged that WMs are used for important functions, and noted that many WMs were being operated by (non-broadcast) entities and persons ineligible for a Part 74 license. Therefore, along with the migration of full-power TV stations, Class A TV stations, TV translators, TV boosters and Low-power TV stations to available channels below 698 MHz (the “core TV channels”) LPAS facilities and WMs had to

⁴ See generally Review of Subpart H, Part 74 of the Commission’s Rules, Low Power Auxiliary Stations, MM Docket No. 86-12, *First Report and Order*, 2 FCC Rcd 345 (1987). That 1987 Report and Order recognized the growing use of wireless microphones for broadcast and production purposes. Access to the UHF TV bands was permitted in order to alleviate overcrowding of the limited TV channels previously available for WMs in major cities. Licensed WMs were permitted at channels 14-69 (470-806 MHz except channel 37, 608-614 MHz) as well as on lower VHF TV channels 2-6 (54-72 MHz and 78-88 MHz bands) on a secondary basis.

⁵ See *Report and Order and Further Notice of Proposed Rule Making* in WT Docket Nos. 08-166 and 08-167 and ET Docket No. 10-24, 25 FCC Rcd 643 (2010).

migrate downward as well.”⁶ This greatly reduced the number of channels available for WM and LPAS operation, and the downward migration was completed less than five years ago. A very large number of WMs were operating in the 700 MHz band and that equipment had to be modified or replaced with equipment that was not capable of operation above 698 MHz. Broadcasters and program production companies, at *great* expense, bought new equipment that operated below 698 MHz but not above that frequency. That equipment of course has a long service life and an extended amortization schedule.

3. Meanwhile, at the low end of the UHF TV band, channels 14-20 (470-512 MHz) are used in eleven major markets in the United States⁷ for important land mobile radio communications. That band is fully deployed for that purpose in those markets and no LPAS or WM operation is permitted there. There is a plethora of additional uses made of the UHF television broadcast band. As noted in the *Second Memorandum Opinion and Order* in the White Spaces Docket⁸ at ¶ 8:

In addition, medical telemetry equipment is permitted to operate on an unlicensed basis on any vacant TV channel in the range of channels 7-46, and unlicensed remote control devices are allowed to operate on any TV channel above 70 MHz (*i.e.*, above channel 4), except for channel 37. TV channel 37 (608-614 MHz) is allocated for radio astronomy and the wireless medical telemetry service (WMTS) and is not used for TV broadcasting. The Offshore Radiotelephone Service uses channels 15-17 in certain regions along the Gulf of Mexico...

(footnotes omitted)

The compression of all of these uses into the band 512-698 MHz, plus the Commission’s recent addition of TV White Spaces Devices (TVBDs) to the mix and the accommodation (essentially

⁶ *i.e.* to TV channels 2-51, excluding channel 37.

⁷ This spectrum is used to support critical public safety communications and provide regional interoperability among first responders. The markets are Boston, Chicago, Dallas, Houston, Los Angeles, Miami, New York, Philadelphia, Pittsburgh, San Francisco, and Washington, D.C.

⁸ *Unlicensed Operation in the TV Broadcast Bands*, ET Docket No. 04-186, *Additional Spectrum for Unlicensed Devices Below 900 MHz and in the 3 GHz Band*, ET Docket No. 02-380, *Second Memorandum Opinion and Order*, 25 FCC Rcd 18661 (2010) (the White Spaces Docket). *See also Unlicensed Operation in the TV Broadcast Bands*, ET Docket No. 04-186, *Third Memorandum Opinion and Order*, 27 FCC Rcd 3692 (2012).

legalization) of unlicensed WM users in that same spectrum has made frequency coordination of WMs and LPAS by SBE frequency coordinators exceptionally difficult, despite real-time channel sharing procedures developed and utilized by SBE frequency coordinators. The concept of “TV White Spaces”, long a misnomer (because there never really were any) became, after the 2010 White Spaces proceeding, a most inaccurate label indeed.

4. Yet, the Commission did, as recently as September of 2010, provide some short-lived protection for WMs and LPAS. In the *Second Memorandum Opinion and Order* in the White Spaces Docket, at ¶ 29, the Commission stated that it “continue[s] to recognize that wireless microphones are currently used in many different venues where people gather for events large and small and many consumers and businesses have come to rely on these devices.” Specifically for the purpose of accommodating WMs after the reallocation of the 700 MHz band, the Commission noted that it had previously limited use of TV channels 2 and 5-20 to communications between fixed TVBDs, and it had also previously reserved two channels in the range 14-51 in the markets where PLMRS and CMRS systems operate “to make sure that frequencies are available for wireless microphones.”⁹ Importantly, the Commission held in September of 2010 that it was “...*expanding the reservation of two channels in the range 14-51 to all markets nationwide as suggested by several petitioners. This will provide frequencies where a limited but substantial number of wireless microphones can be operated on any basis without the potential for interference from TV bands devices. It will also ensure that frequencies are available everywhere for licensed wireless microphones used on a roving basis to operate without risk of receiving harmful interference from [White Space Devices].*”¹⁰ The Commission

⁹ See *Second Report and Order*, 23 FCC Rcd 16860 (2009) at ¶ 151. With regard to channels 2 and 5-20, the Commission stated that restricting use of channels 2 and 5-20 to communications by fixed devices with other fixed devices would limit the number of TVBDs that could potentially conflict with wireless microphone use.

¹⁰ *Second Memorandum Opinion and Order*, 25 FCC Rcd 18661 at 18674 (2010).

also provided for a nominal separation distance between TVBDs and sites of venues and events where large numbers of unlicensed wireless microphones are used by permitting such sites to be registered in the TV bands databases. It noted that, at any particular location, a number of TV channels would not be available for TVBDs due to the application of the various interference protection requirements under the rules. Therefore, the Commission concluded, “a significant amount of spectrum will be available on which wireless microphones can be operated as they have in the past without concern for interference from TVBDs. We believe that this spectrum will provide sufficient frequencies to support wireless microphone operations at the great majority of events.” Because of these accommodations, and specifically because of the reservation of the two channels per market for WM and LPAS operation,¹¹ broadcasters and video/audio production companies were confident that they could continue to conduct ENG and event production activities as necessary. Broadcasters therefore, since late 2010, invested heavily in wireless microphones that would operate near TV channel 37 and in the remainder of the UHF band up to 698 MHz because of the location and continued availability of the reserved channels.

5. The Commission’s short-lived accommodation for WMs in the TV White Spaces Docket was of course no panacea. As the Commission later acknowledged,¹² there is at any

¹¹ See, 47 C.F.R. §15.707(a) (prohibiting white space devices on the first channel above and the first channel below channel 37 that are available, or if a channel is not available above and below channel 37, prohibiting white space devices on the first two channels nearest to channel 37).

¹² A good primer on WM and LPAS use of UHF television broadcast bands was provided at paragraph 223 of *See Expanding the Economic and Innovation Opportunities of Spectrum Through Incentive Auctions*, Notice of Proposed Rulemaking, GN Docket No. 12-268 (released October 2, 2012) (“*Incentive Auctions NPRM*”), the Commission stated that:

Licensed LPAS may operate on vacant channels allocated to television broadcasting. In the UHF band, co-channel LPAS operations must be separated by a distance of at least 113 kilometers (70 miles) from the television station. Unlicensed wireless microphones are permitted similar types of operations on this unused spectrum. Wireless microphones operate in a relatively narrow bandwidth and often are technically capable of choosing different frequencies among multiple vacant channels available for operation. Many wireless microphones are used regularly and predictably (*e.g.*, at television studios, movie studio lots, or major sporting events facilities), but at times the location of their operation changes (*e.g.*, covering news events in different places. The nature of wireless

given news or entertainment event the need for more than 100 WMs and LPAS devices.¹³

Because, in a given broadcast market there are many unlicensed WMs as well as licensed WMs, and because the Commission has not limited the reserved channels in a given market to only licensed WMs, not all of the two reserved channels can be used in any given market.

Notwithstanding, the Commission in September of 2010 refused to provide any additional spectrum for WMs, saying that:

We disagree with those who argue that more spectrum should be reserved for wireless microphones. We observe that wireless microphones generally have operated very inefficiently, perhaps in part due to the luxury of having access to a wealth of spectrum. While there may be users that believe they need access to more spectrum to accommodate more wireless microphones, we find that any such needs must be accommodated through improvements in spectrum efficiency.¹⁴

microphones and their use is such that they operate for relatively short intervals at different times, and the specific frequencies they use for operation often change, even when used at one location. Theatrical and sports productions and other major events often use more than 100 wireless microphones, which in certain locations could use most if not all of the UHF channels available to them in the television bands.

¹³ At the largest sporting events and at political conventions, there are typically more than 200 WMs and LPAS devices in use, often simultaneously. For example, at a recent Formula One automobile race in Texas, held at a venue well away from the metropolitan area of Austin, Texas, there was an acute shortage of WM spectrum and more than 170 WMs were in use *at any given time*, due to the presence of non-U.S. broadcasters and video producers, as well as national and local broadcast and video production entities. At the NFL Super Bowl® each year, and during political conventions, extraordinary efforts are made to accommodate the more than 250 WMs necessary to provide coverage of these events that the public expects, using a series of television broadcast channels. Event frequency coordinators are required at these events to make sure that the most efficient use is made of the limited amount of spectrum available now for WMs in real time. Should anything less than the current amount of WM spectrum be available in the near term, given the equipment now in the field, the public *will be* deprived of the ability to have these events brought to them as they are now.

¹⁴ SBE took issue with the Commission's claim that WM operation is presently "inefficient". The bandwidths used in the current generation of WMs, wireless intercoms and LPAS devices have been necessary for transmission of broadcast quality audio. Theater and church use of WMs has necessitated high quality audio. It will be at least fifteen if not twenty years before the current generation of WM equipment is retired and universally replaced by a next generation of equipment. Taking a cue from the Land Mobile Radio Service (which is in the midst of a two-part, multiple-decade narrowbanding conversion in the VHF and UHF land mobile radio bands from 25 kHz technology to 12.5 kHz and, later, 6.25 kHz technology), it is necessary to plan for and to allow a reasonable transition to more narrowband WM technology over a period of years. Also as noted above, broadcasters, in reliance on the Commission's recent, and yet recently scrapped plan for the availability of the two reserved channels for WMs in each market, made large expenditures for equipment that will function adequately for a period of many years. Recently-purchased equipment owned and use daily by broadcasters and other WM users should not be rendered obsolete where it was acquired as the result of reliance on a very recent rulemaking proceeding.

It is true that, because of the need for broadcast-quality audio for broadcast applications, and for use of WMs in theatrical productions, WMs have historically required almost 200 kilohertz of occupied bandwidth. While subsequent generations of WMs may have narrower bandwidths, this equipment is not now universally available, nor is it suitable for all broadcast and program production applications. Manufacturers of LPAS devices have a very substantial investment in research and development of the current generation of WMs. Broadcast licensees (and video and audio producers) have a substantial investment in purchased equipment with a very long usable life. There is a large base of embedded equipment which has very recently been acquired by broadcasters in reliance on the continuation of the availability of the accommodations created in the White Spaces Docket, premised on the promise of the two reserved channels.

6. However, all that changed in the *Incentive Auctions* proceeding. In the *Incentive Auctions NPRM*, the Commission recognized that the proposal to auction and repack the UHF TV bands “may reduce the spectrum available in the TV bands” for secondary use by licensed and unlicensed wireless microphones and LPAS systems. It acknowledged that the auction and repacking process would as well reduce the spectrum available for unlicensed white space devices.¹⁵ SBE comments in that proceeding urged that a minimum of 24 MHz of spectrum should be available for WMs in each market. This number could be reduced over time, SBE stated, as narrowband WM technology evolves, but despite the fact that a few manufacturers may have narrower bandwidth WMs available now, it would be completely unreasonable for the Commission to mandate a short-term narrowband conversion of WM technology. SBE suggested that the Commission, by virtue of the radical changes proposed in that proceeding which abandoned the minimal accommodations adopted in the 2010 White Spaces proceeding, created

¹⁵ *Incentive Auctions NPRM*, at ¶¶ 221-239.

in effect a “bait and switch” situation in less than two years. Broadcasters’ and video production companies’ substantial investments in current generation equipment in reliance on the availability of the two reserved channels was threatened. Worst of all, licensed broadcasters and video production entities would be rendered unable to provide interference-free service to the viewers that expect the same and receive it now. Allowing WMs, LPAS devices and TV White Space Devices to operate in guard bands is seriously inadequate and insufficient. It offers television broadcasters no ability at all to cover breaking news events in real time. *It is critical for broadcasters that there be at least two reserved channels, totaling at least 12 MHz, exclusively for WM operation.* What happens at a breaking news event is that multiple broadcast entities converge on the same geographic area. Some are local, some are not. Each entity requires at the very least two WM channels (one for the WM and one for the IFB). One broadcast entity may have several reporters on site, necessitating several channels. At the same time, there is a need for the foreseeable future to have available for video production of news, sports and entertainment events -- regardless of the means of multicasting those events to the viewing public -- at least a total of 24 MHz of spectrum for LPAS and WMs. This would provide a total of 120 channels¹⁶ for WM operation.

7. In June of last year, the axe fell again on *broadcast* WMs and LPAS systems as the result of the planned auction of the 600 MHz band. In the *Incentive Auctions Report and Order*¹⁷, the Commission took the following actions: (1) It eliminated the two channels now reserved for wireless microphones, and created but one, to be shared between wireless microphones and TVBDs; (2) It allowed WMs and LPAS devices to operate in the “duplex gap”, an 11 MHz

¹⁶ Not all of those channels could be used at once in any given venue due to adjacent-channel interference; the number of usable channels in a 24 MHz band or bands would likely be more on the order of 60 with current technology.

¹⁷ *Expanding the Economic and Innovation Opportunities of Spectrum Through Incentive Auctions*, GN Docket No. 12-268, *Report and Order*, 29 FCC Rcd 6567, 6704 ¶ 316 (2014) (*Incentive Auction R&O*)

segment between base and mobile frequencies (but of that, the Commission set aside 6 MHz for TV White Space Devices and only 4 MHz for licensed WMs); it permitted *unlicensed* WMs to use a guard band between 7 to 11 MHz wide that will separate TV from wireless operations; and permitted WMs to operate in closer geographic proximity to a TV station using the same channel; or even closer, if they coordinate with the TV station. In a separate proceeding, the Commission further expanded the pool of Part 74 eligibles for WMs to include venues and professional sound companies that routinely use 50 or more wireless microphones as an integral part of the major productions or events. This expanded pool of eligibles, coupled with sharing with TVBDs in the one UHF television channel to be available for WMs, and the clear warning that LPAS and WMs will eventually¹⁸ be required to cease operating in the 600 MHz spectrum “repurposed” for wireless broadband, stands to preclude LPAS and WM operations and the beneficial services that they enable, which the public expects and deserves, and which it receives now.

II. Replacement Spectrum for Wireless Microphones Displaced from the UHF Television Bands in a Variety of new Bands is Critically Necessary.

8. In the *Incentive Auction R&O* the Commission acknowledged that the reduction of available UHF band spectrum will require many LPAS and WM users and licensees to make changes in the spectrum that they access and the equipment they use.¹⁹ To facilitate wireless microphone users’ ability to make these adjustments, the Commission provided that users could continue to utilize the UHF television spectrum repurposed for wireless services for a some period of time while moving to alternative spectrum. The decision in the Incentive Auction proceeding was, however, placing the cart far before the horse. Not only was there no spectrum

¹⁸ The Commission stated that it would “allow wireless microphone users to continue to operate [at 600 MHz] for 39 months following the incentive auction in order to facilitate their transition to other spectrum.” However, to the present time there is no “other spectrum” in which to transition.

¹⁹ See *Incentive Auction R&O*, 29 FCC Rcd at 6696-6704 ¶¶ 299-315.

to which broadcasters and program producers could move; the Commission had no idea what the timetable would be for equipment manufacturers to make new equipment available for this 39-month transition in whatever replacement spectrum might be made available.

9. That said, the Commission has in the *Notice* in the instant proceeding listed a series of candidate bands which might be made available, and listed as well some different technologies which might be used for short range and low power audio transmissions. Initially, at Paragraph 72 of the Notice, the Commission notes the reorganization of the current VHF/UHF television bands (channels 2-51, except channel 37) after the incentive auction. As a result of this auction, the amount of spectrum allocated for television broadcasting will be reduced and repacked; some will be designated for 600 MHz guard bands (including the duplex gap), and other portions will be auctioned to wireless services. The Notice acknowledges that this will “affect” WMs and asks for comment on the effect of these actions relative to the use of residual VHF and UHF spectrum for WMs. In the experience of SBE’s frequency coordinators and as SBE has stated repeatedly in the recent past, it is necessary to have a minimum of 24 MHz of spectrum in the UHF television bands available for WM and LPAS operation in each market for routine news, sports and entertainment program production. Additional spectrum must be made available on at least a short-term basis for major events such as the political conventions, major sporting events, and entertainment events. Since the Commission has made available only 4 MHz per guard band, and has indicated that LPAS and WMs and TVBDs must share a single channel near Channel 37 where possible, it is apparent that there is not going to be sufficient UHF television spectrum for WMs looking forward. It is urged that this decision be revisited and that the Commission reinstate the specific reservation of two UHF-TV channels for LPAS and WMs near Channel 37.

10. A series of other replacement bands are suggested in the *Notice*. Some, such as 26.100-26.480 MHz and the VHF and UHF Remote Pickup (RPU) bands at 161.625-161.775 MHz, 450-451 MHz and 455-456 MHz which are already available for licensed LPAS use on a regulatory basis, are unavailable as a practical matter due to limited bandwidth, existing use and the required antenna size. These are not suitable as reaccommodation spectrum for broadcast ENG or sports or entertainment production, and *under no circumstances should unlicensed WMs be permitted to operate in the RPU bands*. Those segments are heavily used by radio broadcasters for remote broadcasts and require protection from the undisciplined, non-technical users of unlicensed WMs.

11. At paragraph 123 of the Notice, the Commission asks about use of the FM broadcast band at 88-108 MHz for WMs. While some unlicensed, low-power Part 15 WMs have been manufactured for this band, the potential for interference to FM radio broadcast reception in major markets is far too high to permit this to proliferate. There is no room in the FM broadcast band that WMs can operate generally without fear of interference to FM broadcast reception.

12. The band 169-172 MHz is a government allocation primarily, though Part 90 eligibles can be licensed on one or more of 8 discrete channels in that segment for WMs up to 50 mW with relatively narrow bandwidths. This VHF spectrum is not useful as replacement spectrum for licensed LPAS or WM use because of the lack of sufficient spectrum for the purpose. Coordination in real time would be difficult relative to Federal operations in any case. The Government Master Frequency List is not a public document, and broadcasters' LPAS and WM needs are itinerant and mobile.

13. The bands 944-952 MHz, 941-944 MHz and 952-960 MHz are a different story. The frequency ranges are sufficiently large as to provide a good option for displaced licensed

broadcast and licensed LPAS uses. Because the band 944-952 MHz is heavily occupied by fixed, Part 74 Aural Studio to Transmitter links (STL) and fixed Aural Intercity Relay Links (ICR), as well as for Part 74 WMs (in an 8 megahertz segment of that band), broadcasters and broadcast network entities and LPAS licensees could be permitted to make greater use of this band *on a coordinated basis*, and as well the bands 941-944 MHz and 952-960 MHz. SBE would strongly oppose, however, any use of the band 944-952 MHz by entities other than broadcasters and other Part 74 LPAS eligibles, and SBE frequency coordination would have to be mandatory in order to avoid interference to aural STLs and ICRs. Operation by Part 74 licensees in the 941-944 MHz and 952-960 MHz bands, also on a coordinated basis, would potentially enable licensed wireless microphone users access to up to nineteen megahertz of spectrum across the 941-960 MHz spectrum. As a practical matter, given the private and common carrier operational fixed service uses at 941-944 MHz and the MAS operation in the 952-960 MHz bands, the real availability of spectrum would be far less than 19 megahertz in any given market, but this is nevertheless an option that should be made available to broadcasters and other Part 74 LPAS eligible exclusively. The real-time coordination requirement with Part 74 volunteer local market coordinators is key to successful sharing of this spectrum.

14. The Notice also discusses the 902-928 MHz, 2400-2483.5 MHz and the 5 GHz bands. In SBE's view, none of these bands is suitable for broadcast quality or production quality audio due to the unpredictable and generally high levels of noise in these bands from military radars, Part 15 and Part 18 devices, and from licensed services such as Multilateration Location Monitoring Service stations and the Amateur Radio Service.²⁰ In addition, at 5 GHz, there are U-

²⁰ The Amateur Radio Service makes extensive use of the band 5725-5850 MHz and especially the weak receive signal/high transmitter power segment around 5760 MHz. See, <http://www.arrl.org/band-plan>. That segment, and that band is especially unsuitable for WM operation due to the unpredictability of both WM and itinerant and mobile Amateur Radio operation and the difficulty of coordination of the two uses.

NII and vehicle-to-roadside and other applications, current and planned. The Commission might consider authorizing unlicensed, Part-15 compliant WM operations in portions of these bands, however.

15. SBE also recommends making the band 1920-1930 MHz available for electronic news gathering (ENG), professional broadcast and professional program production WM use. Unlicensed Personal Communications Service (UPCS) devices operating pursuant to Part 15 rules for asynchronous and isochronous PCS are the occupants of this band now, and are required to employ an LBT protocol. This circumstance offers opportunities for broadcast and professional production use of this band for WMs which, due to the relatively low duty cycles employed in any given location would be compatible sharing partners.

16. The Notice, beginning at Paragraph 175, discusses options for making available the band 1435-1525 MHz band (1.4 GHz) for certain classes of WM user. SBE does not favor this option and urges that WMs not be permitted in this band. Should the Commission proceed with it nevertheless, its use for WMs should be limited to professional production companies only. Because the band is allocated for aeronautical mobile telemetry (AMT) operations and coordinated for such purpose by the Aerospace and Flight Test Radio Coordinating Council (AFTRCC), there is limited availability in this band for other purposes. As the Commission has accurately noted, broadcasters and professional production companies who are in need of spectrum for video transmission channels for televised sporting events, political conventions and other major entertainment often must obtain Special Temporary Authority (STA) to operate wide bandwidth video equipment in this band on a short-term basis. The need for these additional video channels is due to acute spectrum shortages for TV Pickup and video relay in many areas due to overloading of the BAS/CARS/LTTS bands at 2025-2110 MHz and 2450-2483.5 MHz.

But for the AFTRCC coordinated, “secondary market” STA use of the 1.4 GHz band, video production of these major events would not be possible. While as discussed herein, there are dire shortages of WM spectrum that also stand to frustrate professional program producers, the shortages of COFDM video spectrum at events such as NFL football, NASCAR racing, PGA golf tournaments, political conventions and other similar events stand to preclude access by the viewing public as well. For this reason, SBE recommends *against* the allocation of the 1.4 GHz band for LPAS or WM use. Should the Commission nevertheless decide to make this band available on a secondary, licensed basis, SBE urges that the Commission limit WM use in this band as proposed at Paragraph 177 of the Notice:

Because of the importance of ensuring that the AMT systems are protected against harmful interference, and given that most wireless microphone operations can be accommodated within other spectrum, we propose that use of this band be limited to licensed professional users at specified locations and times, and include specified safeguards designed to protect AMT use of the band...Limiting the licensing for these types of applications, which are typically associated with specific locations, should make sharing of the spectrum manageable. Although we would authorize such use on a secondary basis, in this instance we believe that frequency coordination with federal and non-federal users is critical and is consistent with the practice that already has been used for special temporary authority in this band, although on a more limited basis...

17. SBE makes no comment with respect to the potential use of the 3550-3650 MHz band. It is noted that this band is under consideration in the National Broadband Plan for possible broadband reallocation, and there is no benefit to broadcasters or professional production companies in a limited term allocation for WMs or other LPAS use. Should that band not be subject to broadband reallocation, then it would have some suitability for LPAS and WM use.

18. A *good* option for replacement spectrum is to make available for LPAS licensees, again on a coordinated basis, a single 25-MHz bandwidth channel within the band 6875-7125 MHz (the “7 GHz Band”). This band is currently available for fixed, mobile and itinerant TV BAS, CARS and LTTS operations (and for fixed Part 101 wireless backhaul outside of BAS

areas of operation). While the band is heavily used for fixed and mobile BAS, and while mixing fixed or mobile video channels with wireless microphones is complicated, the specification of one of the ten, 25 MHz-wide channels in this band for LPAS and WM operation by BAS, CARS and LTTS eligibles only. LPAS and WM operation should use only one channel, preferably the same one in each market, so as to avoid mixing WM use with microwave backhaul services, BAS, CARS and LTTS mobile TV pickup station operations. The allowing of WMs in this band should have no effect on fixed wireless backhaul operations, which are authorized only in areas where BAS and CARS television pickup operations are not licensed.²¹ The channel selected for WM operation in the 7 GHz Band should not be one of those two, 25 megahertz channels in the middle of the band (channels at 6975-6700 MHz and 6700-7025 MHz) that are reserved nationwide specifically for BAS and CARS to accommodate TV pickup stations covering events that occur outside the license areas of local BAS and CARS operations.

III. Other Issues

19. At Paragraph 104 of the Notice, the Commission asks how best to provide notice to WM users that a large portion of the UHF spectrum that is currently used and available for wireless microphone operations may no longer be available following the incentive auction, and how to provide notice of the requirements for operating in the 600 MHz Band during the transition period and the need to exit the band by the end of the transition, and any information on alternative spectrum that is currently available for wireless microphone operations. This is a very good question. Bluntly speaking, in SBE's extensive, daily experience, unlicensed WM users are not particularly rule-compliant. There are, in large portions of the country, regularly operating 700 MHz WMs in the hands of unlicensed groups and individuals. These people have

²¹ Fixed Service stations are not allowed to locate their paths within the service areas of any previously licensed co-channel TV pickup stations.

no routine need to consult the Commission's database or participate in SBE's frequency coordination program. Even though responsible manufacturers have, post-point-of-sale, contacted customers to make them aware of regulatory changes affecting WMs including the need to vacate the 698-806 MHz band, there is a significant communication problem with this non-technical group of WM users. Again in SBE's experience, a major enforcement problem relative to unlicensed WM users exists, which does *not* apply to broadcasters and major program producers who, as a group, are scrupulously rule-compliant. SBE recommends that the Commission step up its enforcement efforts with respect to illegal WM use in the 700 MHz band with the goal of creating some deterrence in the unlicensed WM community. It is important to do this prior to the time that unlicensed users will be expected to vacate the 600 MHz band. It has in the past fallen almost exclusively on manufacturers of WMs to bring regulatory changes to the attention of unlicensed WM users and they have done a good job overall. The National Association of Broadcasters, SBE and the National Cable and Telecommunications Association have and surely will continue to provide regulatory updates to BAS, CARS and LTTS licensees and all LPAS eligibles, most of whom are quite sensitive to Commission actions anyway. That is not an issue.

20. Finally, with respect to the questions asked at Paragraphs 205-207 of the *Notice* pertaining to the potential use of ultra-wideband (UWB) technology for WMs, SBE would strongly suggest that the Commission's UWB rules are currently prohibitively conservative and do not permit any commercial deployment of an UWB WM. This technology has tremendous potential for frequency re-use by such periodic-use devices as WMs and LPAS devices, but the UWB rules, developed 15 years ago (according to what the Commission has repeatedly characterized as a "very conservative" policy due to NTIA's fear of interference to United States

Government operations in the Part 15 restricted bands) have never been updated. Because of the failure of the Commission over the past fifteen years to enact rules which actually encourage the use of UWB communication devices, there is no point in discussing the use of this technology for short-term reaccommodation of displaced UHF TV narrowband WMs. Though the Commission claims that “Operating pursuant to the technical rules set forth in Part 15, UWB devices can use spectrum occupied by existing radio services without causing harmful interference, thereby permitting scarce spectrum resources to be used more efficiently”²² the Current Part 15, Subpart F rules do not permit the use of any frequency hopped UWB devices at all. In fact, because the rules are confusing and restrictive, it is not clear that even pulsed UWB communications devices are compliant with the Rules. For example, Section 15.503(d) of the Rules governing the operation of UWB devices contains the requirement that UWB devices meet a fractional bandwidth minimum of 0.20 or 500 megahertz “at any point in time.” This requirement, that the minimum bandwidth must be met “at all times,” precludes the use of essentially all modulation schemes, except a continuous-wave signal of at least 500 MHz bandwidth. Pulsed emissions, frequency-hopping emissions, swept frequency (*e.g.*, FMCW), and stepped frequency systems are all precluded by this requirement, if the requirement is strictly construed. Furthermore, as the Notice in this proceeding acknowledges, WMs operating under these rules would be required to operate pursuant to the UWB rules for communications systems, which permit operations in the 3.1-10.6 GHz band, but the only operation permitted is indoors. There is *no good reason* why UWB communications devices should be limited to indoor operation or hand-held peer-to-peer communications. At the power levels permitted for UWB devices and with a 500 MHz minimum bandwidth, the power spectral density is so low that

²² See Revision of Part 15 of the Commission’s Rules Regarding Ultra-Wideband Transmission Systems, ET Docket No. 98-153, *Report and Order*, 17 FCC Rcd 7435 (2002).

WMs using this technology would have virtually no interference potential relative to other radio services, government or non-government. It is urged that the Commission's rules governing UWB devices, and especially UWB communication devices, be updated (as the Commission promised to do fifteen years ago when it developed its UWB rules, but never did) so as to encourage manufacturers to develop communications products using this technology, and to permit more than just indoor operation. As of now, due to substantial overregulation, there is no practical opportunity for the use of UWB technology for WMs in the band 3.1-10.6 GHz.

IV. Conclusion

21. The Commission has changed the rules repeatedly regarding WMs in a series of proceedings in a very short period of time. It is respectfully suggested that this reflects an incomplete understanding or a lack of appreciation of the importance of LPAS devices and WMs in news, sports and entertainment programming to the viewing public. Regardless of the means by which they obtain this programming, whether by satellite, cable, or over-the-air broadcast, the public expects to see and hear on-scene breaking news, and they expect to be inside of NASCAR race vehicles with a view and audio from inside the race car. Wireless microphones put people in the car with their favorite driver. They are put on the scene of a major emergency and they are told and shown what is happening as it happens. They have the details of a political convention just as though they were there in person. People expect this sophistication in program production and news broadcasts because they have gotten used to this high level of video and audio coverage of events of all types. The public can't have this taken away from them. It is submitted that this is an important thing to preserve, notwithstanding the Commission's single-minded goal to obtain auction revenues from broadband providers.

22. The Commission is to be congratulated for recognizing that some replacement spectrum is necessary. SBE urges that at least 12 MHz of reserved UHF TV spectrum be

protected for licensed LPAS operation at all times. Ideally, 24 MHz should be made available *in toto* in the UHF TV bands. However, in any case, replacement spectrum should be made available for licensed LPAS use, especially in the UPCS band at 1920-1930 MHz and especially in one, 25 megahertz bandwidth channel at 6875-7125 MHz. In both cases, the Commission should restrict access to Part 74 licensees only and only on a coordinated basis using SBE local market coordinators.

Accordingly, SBE respectfully urges that the Commission make replacement spectrum available for Low Power Auxiliary Devices and Wireless Microphones and Wireless Intercoms as per the comments herein.

Respectfully submitted,

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