

**BEFORE THE
FEDERAL COMMUNICATIONS COMMISSION
Washington D.C. 20554**

In the Matter of)	
)	
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
)	

PETITION FOR RECONSIDERATION

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SUMMARY

Shure supports the Commission's overall goal and efforts to protect incumbent operations while finding ways for new services to use unused spectrum. Whether the Commission's new "white spaces" rules successfully protect incumbent operations, including particularly wireless microphone operations, in this challenging spectrum environment is a matter determined by the specific details of the FCC's rules and whether the rules provide sufficient protection when actually implemented in real world environments. It is critical that the FCC's technical and operational rules -- including pre-certification testing rules -- "get it right" before mass produced equipment is pushed into the market.

Toward that end, Shure seeks reconsideration of the rules that permit hybrid geolocation/sensing devices to be certified under ordinary equipment certification procedures suited to devices employing mature technologies. Instead, the Commission should adopt rigorous and transparent certification procedures that are more appropriate for evaluating the nascent sensing technology to be incorporated in hybrid devices. The Commission should also reconsider its decision to permit portable devices to operate on first adjacent channels or modify its rules to strengthen protection for wireless microphone operations by reducing the permissible power level for TV band device ("TVBD") operations on adjacent channels.

In order to prevent devastating interference to wireless microphones, Shure urges modification of several technical and behavioral rules:

- TVBDs must demonstrate that they maintain sensitivity to the -114 dBm level in the presence of strong signals on adjacent channels, a common scenario in real world operations
- In-service monitoring requirements should be revised to require rechecks every 10 seconds
- A 60 minute non-occupancy period should be adopted for TVBDs

- High power fixed TVBDs should be required to avoid a 2 kilometer protected zone around wireless microphones
- Geolocation databases should synchronize at least once an hour
- TVBDs should be required to access the database and confirm frequency availability in real-time or near real-time
- The period of time that TVBDs may continue operating after losing contact with the database should be reduced from 24 to 4 hours

Finally, the Commission should make clear that TVBD manufacturers, TVBD users and database administrators may not pick and choose which wireless microphone operations to protect from TVBD interference based on microphone application, power level, license status or any other characteristic. To do otherwise would abrogate the Commission's commitment in this proceeding to protect incumbents and harm an important and vital technology critical to many sectors contrary to the public interest.

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PETITION FOR RECONSIDERATION

Shure Incorporated (“Shure”), by its undersigned counsel and pursuant to Section 1.429 of the Commission’s Rules, 47 C.F.R. § 1.429, hereby respectfully submits this Petition for Reconsideration of the Commission’s Second Report and Order in the above-captioned docket released on November 14, 2008 (“Order”).

I. Introduction

In the Order in this proceeding, the Commission established a substantial set of rules intended to establish a way forward for the Commission to meet two important policy goals: to authorize new uses of unused TV band spectrum thereby allowing for the growth of wireless broadband and other innovative services, while protecting important and diverse incumbent spectrum users from interference arising from such new uses. As a leading global manufacturer of Part 74 low power auxiliary wireless microphone devices in the United States, Shure has participated in all phases of this proceeding. Throughout the proceeding, Shure has contributed analysis and comments regarding the various technology proposals submitted to the Commission, offered alternative proposals, and provided recommendations on rule changes

based on Shure’s extensive, practical real-world experience in radiofrequency operations in the TV bands. Shure applauds the Commission’s effort to generate technical data to guide the development of the rules. Shure also appreciates the openness of the Commission’s procedures and welcomes even greater transparency in the process as the Commission refines the “white spaces” rules.¹

Whether the Commission’s Rules effectively protect incumbent operations in this challenging spectrum environment is a matter of the specific details of the FCC’s requirements and whether the rules actually provide sufficient protection when implemented in real-world environments. It is critical that the FCC’s technical and operational rules “get it right” before mass produced equipment is pushed into the market. For that purpose, Shure herein seeks reconsideration of several specific technical and operational rules, as well as rules that define the certification process that applies to new TV band devices (“TVBD”). Shure requests these changes in order to minimize the considerable risk that wireless microphone operations will experience interference from TVBDs introduced under these new rules.

II. The FCC Must Incorporate Rigorous and Transparent Testing in the Hybrid Device Certification Process

The Commission’s order rightly imposes rigorous certification procedures for some sensing devices to ensure that TVBDs introduced in the market in the future will, in fact, effectively protect incumbents from interference.² However, the Order wrongly allows other

¹ “[T]here are actions we must take now to make the FCC more transparent, open and useful to the stakeholders that we serve.” Acting Chairman Michael Copps, Remarks to the Federal Communications Commission Staff (Jan. 26, 2009), <http://www.fcc.gov/commissioners/copps/statements2009.html> (last visited Mar. 18, 2009).

² Sensing-only devices are required to undergo a certification process open to the public at the FCC lab demonstrating “with an extremely high degree of confidence that they will not cause harmful interference to incumbent radio services.” *Unlicensed Operation in the TV Broadcast Bands; Additional Spectrum for Unlicensed*

sensing devices -- namely, hybrid devices -- to enter the market without any protective evaluation procedures and thereby puts incumbents at risk for significant interference from TVBDs. The Commission should correct this oversight and close this loophole by mandating rigorous and transparent certification testing procedures for all sensing devices.

A. Enhanced Certification Procedures Are Necessary to Ensure that Spectrum Sensing Will Protect Incumbents

In the Order, the Commission concluded that spectrum sensing is promising technology, but recognized that it is not sufficiently developed to be the principal means of interference protection for incumbents. The Commission's observations in this regard were clear: the sensing testing conducted by OET engineers on prototypes produced, at best, mixed results; the devices were able to detect the signals of incumbent services under certain conditions but were not able to do so under other conditions.³ Test results were not sufficient to "fully validate the performance of the technology and develop standards that would ensure a high degree of confidence that devices relying on sensing alone would not interfere."⁴ The FCC concluded that spectrum sensing, "as currently presented in our measurement studies . . . *is not sufficient by itself to enable unlicensed devices to reliably determine the TV channels that are available for use at a location.*"⁵ The Commission observed that the devices examined by OET were "not able to sense with a high degree of accuracy both TV and wireless microphone performance in different real-world environments where signals are subject to different levels and forms of

Devices Below 900 MHz and in the 3 GHz Band, Second Report and Order and Memorandum Opinion and Order, FCC 08-260 at ¶ 258 (2009) ("*Second Report & Order*").

³ For example, the Commission observed that "it does not appear that the [prototype TVBDs] were designed to cope with certain real-world conditions such as strong adjacent channel signals or the challenges of operating in noisy environments." *Second Report & Order* at ¶ 257.

⁴ *Id.*

⁵ *Id.* at ¶ 71 (emphasis added).

fading, multipath and other degradations.”⁶ According to the Order, sensing performance “degraded to levels we consider *unsatisfactory* when the test signals included multipath and other fading effects and when signals were present on other channels.”⁷ Based on the demonstrated inability of the technology to perform reliably under real-world conditions, the Commission concluded that a heightened degree of scrutiny is warranted prior to distribution of devices that rely on spectrum sensing for interference protection. For that purpose, the Order establishes a transparent and rigorous “proof of performance” evaluation process that sensing equipment must undergo to obtain certification in order to ensure that incumbent services are not subject to interference.⁸

Shure agrees with the Commission’s conclusion and strongly supports rules that impose rigorous testing -- open to public observation and participation -- of spectrum sensing devices being offered for distribution. However, the Commission erred in failing to mandate comparable rigorous and transparent evaluation procedures for spectrum sensing features that will be incorporated in hybrid geolocation/spectrum sensing devices.⁹

B. The Rules Should be Revised to Apply Enhanced Certification Procedures to Hybrid Devices

Comparable evaluation procedures specified in Section 15.717 should apply to the sensing features of hybrid devices because even where hybrid geolocation/sensing devices are in use, spectrum sensing will be the sole source of protection against TVBD interference for a

⁶ *Id.* at ¶ 82.

⁷ *Id.* (emphasis added). The Commission recognized that the presence of stronger signals on adjacent channels are a “normal part of the signal conditions” in the environment and that devices have to be able to perform reliably when such conditions are present. *Id.*

⁸ *See, e.g., id.* at ¶¶ 7, 257 and 258.

⁹ The Commission rules require that all equipment -- even equipment capable of accessing the geolocation database -- incorporate spectrum sensing features. *Id.* at ¶ 1.

significant subset of wireless microphone operations.¹⁰ In particular, itinerant microphones, used extensively by broadcasters, movie productions, and others will be forced to rely on the spectrum sensing capabilities of TVBDs, rather than the geolocation database system, as their *only* protection from harmful co-channel interference from TVBDs.¹¹ Itinerant microphones, by definition, are mobile and cannot be accurately registered in advance in the geolocation database because the user cannot anticipate where the microphone will be deployed.¹² Electronic news gathering (“ENG”) teams, for example, rushing to cover breaking news and provide up to the minute reporting demanded by the public, will not know the exact coordinates of where they will position microphones until after they reach their destination.

In addition, spectrum sensing features in hybrid devices will be important even to wireless microphone users who have registered in the database. Under the Commission’s Rules, hybrid devices can operate for up to 48 hours without obtaining up to date information from the database.¹³ During this period, microphones that have been moved and reregistered will be required to rely solely on the effectiveness of a TVBD’s spectrum sensing to protect them from interference. This would occur in situations where microphones must be operated in locations that were not known at the time they were originally registered in the database.

¹⁰ See, e.g., 47 C.F.R. § 15.717(a)(2) which requires certification for sensing-only devices to be open to public comment.

¹¹ See *Second Report & Order* at ¶ 125 (“while we are establishing provisions to ensure that channels are available for operation of wireless microphones, a sensing capability provides at least some means to detect such devices that may be operating on an itinerant basis on virtually any channel”).

¹² See, e.g., Comments of Radio-Television News Directors Association (“RTNDA”) at p. 1, ET Docket No. 04-186 (filed Oct. 27, 2008) (noting that a “geolocation regime provides scant interference protection to roaming electronic journalists who use wireless microphones to report live, newsworthy events that might occur near an unlicensed device”).

¹³ See 47 C.F.R. § 15.711(i)-(iii). Under the time periods prescribed in the rules, TVBDs are required to check only once daily for continued channel availability. If a TVBD is unable to establish contact, it must cease operation by 11:59 p.m. the *following* day. Together, these rules allow a TVBD to operate without updated information for a nearly full 48 hour period.

The lack of strengthened evaluation procedures for hybrid devices creates a significant and unwarranted exception to the safety measures needed to protect incumbent devices. The sound engineering and public interest reasons that underlie the Commission's firm commitment to imposing enhanced certification measures for sensing only devices are equally relevant to hybrid devices that, for all practical purposes, offer spectrum sensing as the only means of protecting against TVBD interference in several significant wireless microphone use case scenarios.

The Commission should reconsider this omission and require more rigorous and transparent certification testing for hybrid devices. This process should incorporate behavioral tests based on the Order's specific operational parameters. Certification tests must reflect real-world environments, including particularly, tests that demonstrate TBVD performance in the presence of strong DTV signals. Shure outlines at Attachment A the minimum test parameters essential for evaluating the efficacy of spectrum sensing features incorporated in hybrid devices.¹⁴ The Commission should adopt these procedures as a part of the certification testing to which hybrid devices will be subject.

Such procedures should be transparent to the public, including providing the public an opportunity to comment on the test process and any changes that are made during the course of the test.¹⁵ The public should be permitted to observe the testing for the first few devices. The Commission should also solicit public input on the test reports and conclusions drawn therefrom. Transparency and accountability are essential. This process is too important and the stakes for

¹⁴ Attachment A provides certification tests for hybrid devices necessary to evaluate sensing and behavioral standards. These tests are modeled after Shure recommendations that were implemented by OET engineers in 2008 laboratory and field tests.

¹⁵ See *Second Report & Order* at ¶ 260. To promote transparency the Commission will seek public comment on sensing-only TVBD test procedures and make the certification process open to the public. Public comment will be sought on the tests results of sensing-only TVBDs submitted to the Commission for certification as well.

incumbent spectrum users are too high to allow *ad hoc* development of the equipment evaluation procedures or to permit the process to be completed behind closed doors without the necessary transparency to the public.

III. TVBD First Adjacent Channel Operations Will Harm Incumbents and Should be Prohibited or Limited

The Commission should reconsider Section 15.709 to the extent that it permits personal/portable TVBDs to transmit on channels adjacent to TV broadcasts above channel 21.¹⁶ A critical sub-segment of the broader wireless microphone user community -- itinerant microphone users -- routinely operate on 6 MHz channels immediately adjacent to channels in which TV broadcasts. The Commission's tests and the extensive record in this proceeding reflect that one very significant and still unresolved weakness of spectrum sensing technology is the inability to sense signals in a channel when a strong or even moderate TV signal is present in an adjacent channel. During OET tests *no* TVBD prototype reliably sensed wireless microphones operating on channels adjacent to real or simulated TV broadcasts. The prototype submitted by Microsoft failed to detect wireless microphone signals in the presence of strong or moderate TV broadcasts.¹⁷ The prototypes submitted by Phillips and i2r never accurately sensed the ambient environment and failed to generate any meaningful test data.¹⁸ Although the

¹⁶ See 47 C.F.R. § 15.709(a)(2).

¹⁷ During laboratory tests Microsoft prototypes failed to identify microphones signals with strong (-28 dBm) or moderate (-53 dBm) simulated DTV signals n +/- 1 from the channel being scanned. Both Microsoft prototypes malfunctioned and were withdrawn prior to the start of field testing. Shure representatives observed the aforementioned laboratory tests; *see also* Evaluation of the Performance of Prototype TV-Band White Space Devices Phase II, Technical Research Branch Laboratory Division Office of Engineering and Technology, Federal Communications Commission, OET Report FCC/OET 08-TR-1005 at pp. 19-22 (Oct. 15, 2008) ("*Phase II Report*").

¹⁸ Unless isolated in an anechoic chamber, Philips' prototype wrongly identified every UHF channel as occupied regardless of whether or not there was a detectable signal on the scanned frequency. i2r's prototype generated false positive and false negative scans at random during scans of the ambient RF environment during most tests; Shure representatives observed the Phillips and i2r prototypes exhibit this behavior during all laboratory tests and at all field test sites; *See also Phase II Report* at pp. 22.

Motorola prototype was not permitted to participate in wireless microphone tests, it failed to reliably detect simulated DTV signals in adjacent channels, which indicates that it also has a serious problem identifying incumbent users occupying adjacent channels.¹⁹ Based on OET's test results the Commission itself correctly concluded that TVBD prototypes could not "reliably detect [] microphone signals" on adjacent channels.²⁰

In light of the record evidence that sensing failed to perform adequately in adjacent channels, the Commission should reconsider its rule permitting personal/portable TVBDs to transmit on adjacent channels. If unlicensed operations are allowed on adjacent channels the inability of sensing technology to offer meaningful protection will result in harmful co-channel interference for microphones trampled by oblivious personal/portable TVBDs, even if the TVBD properly checked for available frequencies in the geolocation database before transmitting. At the onset of this proceeding the Commission committed to protect all incumbent users of TV band spectrum from harmful interference created by potential new entrants.²¹ Moreover, Commission Rules strictly prohibit Part 15 radiators from creating harmful interference.²² Knowing that in many instances wireless microphones occupy adjacent channels, and also knowing that spectrum sensing offers no reliable protection for wireless microphones on these channels, the Commission should prohibit personal/portable TVBD use of the first adjacent

¹⁹ Motorola's prototype lost approximately 40 dB of sensitivity when it scanned an adjacent channel n +/- 1 next to a -28 dBm signal simulating a relatively strong DTV broadcast; Shure representatives observed the Motorola prototype consistently exhibit this behavior even after a 32 dB attenuator was incorporated between the TVBD's antenna and RF input; *see also Phase II Report* at pp. 19-22.

²⁰ *Second Report & Order* at ¶ 30.

²¹ *See Unlicensed Operation in the TV Broadcast Bands; Additional Spectrum for Unlicensed Devices Below 900 MHz and in the 3 GHz Band*, Notice of Proposed Rulemaking, ET Docket Nos. 04-186, 02-380, FCC 04-113, at ¶ 2 (2004) ("*NPRM*").

²² *See* 47 C.F.R. § 15.5.

channel to uphold its commitment to protect incumbents and to avoid an irreconcilable conflict with its longstanding rule that prohibits Part 15 radiators from creating interference.

If the Commission nevertheless decides to retain the rule permitting personal/portable adjacent channel operations above channel 21, Shure urges the Commission to reduce the permissible output of personal/portable TVBD transmitters on these channels as a means of reducing the likelihood that interference from TVBDs will occur. The record gathered in this proceeding, to date, does not support personal/portable operations on adjacent channels with 40 mW of EIRP. Incumbent wireless microphones occupying the same spectrum operate with far less output. The average wireless microphone, taking into account the typical attenuation of the signal from the user's body, has less than 10 mW of EIRP.²³ A commensurate reduction in the EIRP of personal/portable TVBDs to 10 mW will offer some protection to higher priority wireless microphones on adjacent channels.²⁴

IV. Meaningful Protection for Wireless Microphones Requires Toughened Behavioral Standards and Sensing

The sensing and behavioral standards adopted for TVBDs in Section 15.711 fall short of providing the meaningful protections that must be implemented to prevent unlicensed operations from creating harmful interference for wireless microphone users.²⁵ While Shure does not

²³ See Ex Parte Comments of Shure Incorporated, ET Docket No. 04-186 (filed Sep. 17, 2007). Part 74 permits wireless microphones have a maximum of 250 mW of output power, but most microphone equipment is designed to operate with far less. This design choice is not manufacturer specific and is dictated by fundamental engineering decisions to achieve far greater frequency reuses, reduce battery requirements, etc. The low power design common to wireless microphone equipment is key to making efficient use of spectrum and responding to user demand for flexible and convenient equipment design. For these reasons and in the interest of promoting sound spectrum management policies, it is no solution to force the wireless microphone industry to simply build and operate to maximum allowable powers. On the other hand, some applications do require operation at the maximum permitted power level; e.g., outdoor sporting events and on-location filming.

²⁴ Other incumbent users of TV Band radiofrequencies have proposed adjacent power levels as low as 5 mW. See, e.g., Comments of Association of Maximum Service Television, Inc. ("MSTV") at p. 7, ET Docket No. 04-186 (filed Oct. 1, 2008).

²⁵ See 47 C.F.R. § 15.711(c)(1)-(7).

oppose a -114 dBm sensing threshold, recently completed OET tests demonstrate that the Commission must go further to ensure that the -114 dBm threshold is in fact meaningful protection once TVBDs are operating in real world environments. In particular, the rules should require TVBDs to satisfy this threshold while scanning for higher priority incumbents in real-world environments with strong interfering signals. The Commission must strengthen its rules to prevent devices from entering the stream of commerce that meet the -114 dBm sensing threshold in a sterile, laboratory environment, but otherwise lack sensing functionality in the real world. Further, the behavioral standards adopted by the Commission also allow an interfering TVBD an excessive amount of time to react and vacate a channel once it senses a higher priority incumbent. Toughening both sensing and behavioral obligations will greatly reduce the likelihood of incidents where TVBDs create harmful interference for incumbent spectrum users and minimize the harm when such incidents do occur.

A. Toughened Sensing Threshold Will Better Protect Incumbents Without Burdening TVBD Manufacturers

The Commission should be aware that other regulatory agencies evaluating the need to protect wireless microphones from TVBD co-channel interference have deemed a -114 dBm sensing threshold altogether inadequate. In the United Kingdom, Ofcom recently concluded that TVBDs required a sensing threshold of at least -126 dBm.²⁶ Ofcom's conclusion that a -126 dBm sensing threshold is required to protect wireless microphones was based on rigorous modeling of microphone use scenarios.²⁷ While Shure does not oppose the Commission's -114 dBm sensing threshold, additional obligations need to be incorporated to ensure that TVBDs do

²⁶ Ofcom, *Digital Dividend: Cognitive Access, Consultation on License-Exempting Cognitive Devices Using Interleaved Spectrum*, at p. 23 (2009) (“*Cognitive Access Consultation*”).

²⁷ Ofcom engineers conducted “detailed measurement and modeling work across a range of venues including a TV production studio, a concert arena and a West End Theatre. This involved 3D modeling of the venue and computer prediction of signal levels via ray-tracing, couple with measurements to validate a subset of the modeled results.” *Cognitive Access Consultation* at p. 23.

not become desensitized when operating in the real world and scan their environment accurately in the presence of other signals.

The performance of prototype TVBDs during OET laboratory and field tests demonstrated that a sensing standard that fails to specify the environmental conditions under which a sensitivity threshold must be satisfied offers no real protection. To ensure that TVBDs meet their obligation to sense incumbent signals, the Commission should clarify in Section 15.711(c) that TVBDs must satisfy the -114 dBm sensing threshold while operating in the presence of strong interfering signals on adjacent channels.

Tests conducted by OET revealed that TVBD manufacturers can build devices that are somewhat effective at detecting incumbent television and wireless microphones signals at the -114 dBm threshold, but only in very controlled conditions in an isolated laboratory environment without interfering signals. In real-world environments, TVBDs were overwhelmed by the mix of ambient RF signals. The Commission Phase II Test Report noted that TVBD prototypes under test in environments with more than one signal present lost up to a full 74 dB of sensitivity.²⁸ The problem was so severe that during the final battery of OET tests Philips and Motorola engineers were granted FCC permission to employ attenuators designed to prevent the ambient RF from overwhelming their TVBDs, although the modification failed to markedly improve the performance of the device in either case.²⁹

To prevent the proliferation of TVBDs with sensors that pass laboratory tests but fail to offer any meaningful protection in the real world, the Commission should modify its sensing

²⁸ See *Phase II Test Report* at p. 26.

²⁹ For example, Philips was permitted to incorporate a 6 dB attenuator between the antenna and RF input of its TVBD prototype at Field Test Site #3 (Ellicott City) and Field Test Site #5 (FCC Headquarters); Motorola was permitted to incorporate a 32 dB attenuator between the antenna and RF input of its prototype TVBD for every test from May 14, 2008 forward.

standard to require a TVBD to maintain sensitivity to a level of -114 dBm while in the presence of strong interfering signals. Specifically, Shure urges the Commission to modify Section 15.711(c) to require all TVBDs to accurately detect the presence of incumbent microphone signals at threshold levels of -114 dBm while in the presence of interfering signals +/- one (1) channel that reach -20 dBm.³⁰ Under a modified Section 15.711(c), a TVBD that fails to maintain sensing accuracy to -114 dBm in the presence of such interfering signals would not comply with the Commission's Rules, and would not be permitted to operate in the broadcast TV bands.

B. Toughened Behavioral Standards Must Be Implemented To Mitigate Interference Events

The behavioral standards specified in Section 15.711(c) by the Commission fall short of establishing a framework that minimizes interference events when a higher priority wireless microphone initiates a co-channel transmission on frequencies in use by a TVBD. Shure urges the introduction of tougher standards to ensure wireless microphones are minimally affected when inevitable conflicts between microphones and TVBDs occur.

In-service monitoring of an operating channel must be more frequent to avoid prolonged disruptions to wireless microphones. Under the existing rules, a TVBD only needs to recheck the channel in use for incumbent transmissions every 60 seconds.³¹ This extended gap between scans of the channel in use presents the opportunity for a TVBD to interrupt a wireless microphone for a full minute, assuming it properly identifies the microphone the first time it rechecks the channel. Shure asks the Commission to require TVBDs to recheck the channel in

³⁰ An interfering signal at -20 dBm accurately reflects the routine signal strength of a broadcast television station measured in an urban area, and does not exceed the strength of signals observed during OET field tests which reached levels of up to -16 dBm (observed at Field Test Site #2).

³¹ See 47 C.F.R. 15.711(c)(4).

use every 10 seconds in order to prevent catastrophic and prolonged incidents of co-channel interference.³²

The Commission erred in not requiring a non-occupancy period in Section 15.711(c) for channels deemed to be in use by higher priority incumbents.³³ Failing to adopt a non-occupancy period will result in TVBDs in crowded RF environments (*e.g.*, major sporting events) constantly rechecking channels to determine their availability. This behavior dramatically increases the probability that a TVBD will transmit on an occupied channel mistakenly identified as vacant during a momentary pause in the incumbent's transmission or during a short period of time where the incumbent is shielded. When this type of co-channel interference occurs, it may be 60 seconds or longer under the current rules before the TVBD detects and vacates the channel. Implementing the 60 minute non-occupancy period in IEEE's dynamic frequency selection ("DFS") parameters as previously proposed by Shure will prevent constant spectrum contention battles that result in unintended disruptions of incumbent service.³⁴

V. A Two Kilometer Protective Zone for Fixed Devices is Required to Offer Meaningful Protection

The power levels approved for fixed TVBDs are disproportionate to the interference protections implemented for incumbent wireless microphone users. The need to provide meaningful protection for wireless microphone users requires the Commission to reconsider Section 15.712(f) and modestly increase the protective zone around microphones to a radius of two (2) kilometers for fixed TVBD operations.

³² Recognizing the severity of this potential problem Ofcom recently proposed a one (1) second recheck obligation for TVBDs in the United Kingdom. Ofcom found scenarios where wireless use could change in just a few seconds resulting in a channel suddenly coming into use by a higher priority user. *See Cognitive Access Consultation* at p. 37.

³³ *See Second Report & Order* at ¶ 246.

³⁴ *See Ex Parte Comments of Shure Incorporated, ET Docket No. 04-186* (filed Nov. 12, 2007).

Maintaining proportionality between the protective zone around wireless microphones and the interference range of high powered fixed TVBDs remains the *only* way to offer meaningful protection to the incumbent, absent a reduction in power. Nevertheless, the record collected in this proceeding demonstrates that the interference range for a fixed TVBD with four (4) Watts of EIRP extends for many kilometers and is hugely disproportionate to a registered wireless microphone's one (1) kilometer protective zone.³⁵ To restore a reasonable level of proportionality between the protection entitled to wireless microphones and the interference range of fixed TVBDs, Shure urges the Commission to extend the protective zone specified in Section 15.712(f) around registered microphones to two (2) kilometers.³⁶ Extending the protective zone will help eliminate the majority of interference events where a fixed TVBD far beyond sensing range inadvertently transmits on the same channel as a registered, higher priority microphone. Further, extending the protective zone around registered microphones to two (2) kilometers is also unlikely to restrict the operation of fixed TVBDs, which will largely operate in rural and semi-rural areas where there is a surplus of unused spectrum.

VI. Modifications Are Required Before the Geolocation Database Will Effectively Protect Incumbents

While Shure applauds the implementation of a geolocation database as the primary interference protection mechanism for incumbent users of broadcast television frequencies, the Commission erred in its decision to require TVBDs to communicate with the database and verify

³⁵ Given that fixed TVBDs must register in the geolocation database and identify their location, and because they cannot operate on adjacent channels, the wireless microphone user community will be able to predict and largely avoid the frequencies where co-channel interference with this type of TVBD is likely to occur. Consequently, Shure does not believe that absolute proportionality is required between the interference range of a fixed TVBD and the protective zone around a registered wireless microphone.

³⁶ See 47 C.F.R. § 15.712(f).

the availability of unoccupied frequencies only once every 24 hours.³⁷ Most itinerant wireless microphone incumbents cannot predict their spectrum needs or precise location 24 hours in advance. For example, at many high-profile news events multiple ENG teams may deploy in close proximity to each other and require several clean channels to support their information gathering operations. Other wireless microphone users also routinely deploy on short notice and require clean channels immediately.³⁸ A database that only updates once every 24 hours offers no protection to these incumbents.

To minimize the harmful effect of TVBD interference on incumbent wireless microphones that have registered but are not yet reflected in the geolocation database, Shure urges the Commission to modify Section 15.715(k) to require database administrators to synchronize at least every hour and modify Section 15.711(b) to require TVBDs to access and check frequency availability in real-time, near real-time or at a minimum once every hour. Given the nominal amount of information collected by a database administrator, there should be no objection to making registration information collected from wireless microphone incumbents available to TVBDs and other database administrators more frequently. For years search engines and other web-based portals have collected and disseminated vast amounts of information in near real-time. Database administrators should reasonably be expected to meet a comparable standard.

Shure also asks that the Commission reduce the 48 hour window specified in Section 15.711(b) that must expire after a TVBD's last communication with the geolocation database

³⁷ See 47 C.F.R. § 15.711(i)-(ii).

³⁸ Law enforcement applications, outdoor festivals, parades, golf tournaments, marathons and a variety of other events/applications involve wireless microphone use where the exact deployment of the microphone may be unknown until the user arrives on site.

before discontinuing transmissions.³⁹ As discussed in greater detail above, the spectrum needs of incumbent wireless microphones are highly variable and can change on a hourly basis. TVBDs that rely on the geolocation database must be just as dynamic to avoid creating harmful interference. Moreover, allowing up to two (2) full days between rechecks of spectrum availability actually creates a dangerous disincentive for TVBD users to communicate with the database. Reducing the window of time to four (4) hours allows a TVBD to continue transmitting during a short-term loss of connectivity to the database, but prevents a lengthy incident of harmful interference to a higher priority incumbent if database access is not restored or is intentionally prevented.

VII. The FCC Must Confirm that All Wireless Microphones Will be Protected From Interference

The FCC erred in failing to make clear that TVBD devices must protect all wireless microphones from interference. TVBD manufacturers, TVBD users and geolocation database administrators must not be permitted to pick and choose which class of wireless microphone incumbents will receive interference protection or in any way adjust the level of protection accorded to microphone users in a way that is not specifically identified in the Commission's rules. In particular, the Commission should clarify that these entities may not disregard protection for microphones based on the use application of the microphone (for example, protecting a news crew's use of wireless microphones but not wireless microphones used at a music concert, or vice versa), the power levels used by the microphone (for instance, protecting a microphone operating at the maximum 250 mw operations as opposed to 10-20 mw, or vice versa), or FCC license status (for example, protecting wireless microphone users that provide

³⁹ See 47 C.F.R. § 15.711(iii), which requires a TVBD that "fails to contact the TV bands database during any given.... until 11:59 PM of the following day" to discontinue transmissions if contact with the database is not reestablished.

FCC license information but not those who do not provide such information or who, in the judgment of the TVBD manufacturer, user or database administrator, are not eligible for a wireless microphone license). The Commission should clarify that TVBD makers and others eager to lay claim over spectrum for prospective new operations cannot be permitted to limit unilaterally the protections that are accorded to wireless microphone operations once TVBD are distributed en masse.

Respectfully submitted,

/s/

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ATTACHMENT A

MINIMUM CERTIFICATION TEST PARAMETERS TO CONFIRM TVBD ACCURACY DETECTING AND AVOIDING PART 74 WIRELESS MICROPHONES

Test Series 1 - Evaluation of Hybrid TVBD Sensitivity to Part 74 Signals

Overview:

Confirm that the TVBD under test successfully detects Part 74 wireless microphones to a defined level of accuracy (e.g., 95%) in real-world conditions. A successful test requires the sensing logic in the TVBD to correctly identify the channel under test as occupied when wireless microphone signals are present at or above -114 dBm, and vacant when the channel is not in use by a Part 74 microphone.

Test Configuration:

- Sensitivity measurements should be carried out on at least two TV channels within the tuning range of the equipment under test; preferably near the lower and upper ends of the tuning range.
- Within each TV channel above, tests must be conducted with a single wireless microphone with its center frequency tuned at low channel (+0.2 MHz from bottom edge), mid channel (+3.0 MHz from bottom edge), and high channel (+5.8 MHz from bottom edge) frequencies

At a minimum, sensitivity tests must be performed in each of the following configurations:

1. Only wireless microphone signals present
 2. Wireless microphones, plus one DTV signal at N+1
 3. Wireless microphones, plus one DTV signal at N-1
 4. Wireless microphones, plus two DTV signals at N+1 and N-1
 5. Wireless microphones, plus two DTV signals at N+1 and N+2
 6. Wireless microphones, plus two DTV signals at N-1 and N-2
- For each of the configurations involving DTV signals in combination with wireless microphones, the level of the DTV signals must be varied from -75 dBm (simulating a weak but usable DTV signal) up to -20 dBm (simulating a very strong DTV signal, such as would be present at an outdoor venue near a TV transmitter).

Test Series 2 - Evaluation of Hybrid TVBD Behavior When Part 74 Signals Are Detected

Overview:

Confirm that the TVBD under test takes corrective action within an appropriate time limit when Part 74 signals are detected.

Test Configuration:

1. Configure a pair of TVBDs to operate normally (e.g., exchanging data) in the desired test TV channel; e.g., channel N.
2. Turn on a Part 74 wireless microphone transmitter and receiver system in the same TV channel N.
3. Confirm that each TVBD is able to sense the presence of the wireless microphone transmitter (i.e., the system employs network sensing)
4. Observe the TVBD system behavior. Within the "Channel Move Time" (2 sec) after the Part 74 system is turned on, the White Space Devices should cease transmission completely.
5. Repeat the test for each of the configurations described above with DTV signals present

The following parameters for detection and interference avoidance must be satisfied:

Parameter for Detection and Interference Avoidance	Value
Channel Availability Check Time	30 sec
Non-Occupancy Period	60 minutes
Channel Recheck Time (In-service monitoring)	10 sec
Channel Move Time	2 sec
*Network Sensing	2 sec

*Network Sensing Test Configuration:

Configure a pair of TV band devices for normal operation (e.g., exchanging data). Verify that whenever an on-channel wireless microphone signal is present at or above -114 dBm at the input of either TVBD, both devices vacate the channel within the channel move time period. This may be accomplished, for example, by conducting the attenuated wireless microphone signal into the input of the TVBD under test through a passive combiner, along with the received signal from

the other TVBD. The TVBD link may be radiated or conducted, so long as there is enough isolation to ensure that the wireless microphone signal is above the -114 dBm detection threshold of only one TVBD at a time in order to confirm that the devices will vacate the channel if either one detects the microphone.