

**Before the
FEDERAL COMMUNICATIONS COMMISSION
Washington, DC 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
)	

**OPPOSITION AND COMMENTS OF MSTV AND NAB TO
PETITIONS FOR RECONSIDERATION AND CLARIFICATION**

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SUMMARY

In evaluating the Petitions for Reconsideration and Petitions for Clarification before it, the Commission should be guided by the goal it articulated in the *Second Report & Order*: that its rules should provide for the use of TV band devices “without disrupting the incumbent television and other authorized services that operate in the TV bands.” Decisions made in this proceeding will have real-world consequences for the public’s access to local television, cable, and direct broadcast satellite services, as well as on the use of wireless microphones and other equipment for the production of news, entertainment, and sports programming.

First, MSTV and NAB urge the Commission to reject requests by parties like Motorola and the Public Interest Spectrum Coalition (“PISC”) to increase power levels or otherwise expand the operating parameters of fixed and personal/portable TVBDs. Adoption of these proposals would create new “loss areas” precluding viewers’ access to local television and other licensed services. In fact, as the Society of Broadcast Engineers (“SBE”), National Cable & Telecommunications Association (“NCTA”), and Richard A. Rudman and Dane E. Ericksen (“RR/DE”) explain, power limits adopted for personal/portable devices are *already* inadequate to protect television and cable service. SBE also documents how the current parameters fail to protect mobile broadcast services, which soon will be delivered to consumers in many television markets. Certainly, the Commission should not exacerbate these flaws through adoption of the even higher power levels advocated by Motorola and others.

Second, the record makes clear that the creation of a comprehensive, accurate, and secure database will be essential to the protection of viewers and other parties that rely on licensed services in the television broadcast bands. The rules adopted for the database, however,

leave much to chance. Petitioners like Adaptrum, DIRECTV/DISH, and SBE offer a number of suggestions that would improve the database's ability to protect consumers: the database should include all relevant cable and satellite headends; TVBDs should check the database no less than once per hour, if not more often; and the Commission should ensure that communications between the database and TVBDs are secure and authenticable.

Third, the petitions underscore the failure of sensing as a means of preventing operation by TVBDs on occupied channels. MSTV and NAB accordingly urge the Commission to reject the proposal of PISC to rush "sensing-only" devices to market without even the modicum of additional scrutiny announced by the Commission in the *Second Report & Order*. Moreover, evidence put forth by SBE shows that the -114 dBm level adopted for geolocation-plus-sensing devices will fail to protect licensed services, and particularly will endanger itinerant wireless microphones used to cover breaking news and other on-the-scene events for the public.

In sum, the various petitions for reconsideration present the Commission with a clear choice between, on the one hand, efficient but prudent spectrum management, and, on the other hand, permissive policies that disregard destructive, harmful interference to licensed services. MSTV and NAB respectfully request that the Commission reject the latter course in favor of the public and its access to local television, cable and satellite programming, as well as the wireless microphone operations that make much of that programming possible.

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**OPPOSITION AND COMMENTS OF MSTV AND NAB TO
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The Association for Maximum Service Television, Inc. (“MSTV”) and National Association of Broadcasters (“NAB”) file this Opposition and Comments to the Petitions for Reconsideration and Clarification filed in the above-referenced proceedings. MSTV and NAB provide this information and analysis to aid the Commission in achieving a goal that it stated clearly in the *Second Report and Order*: that its rules should provide for the use of TV band devices (“TVBDs”) “without disrupting the incumbent television and other authorized services that operate in the TV bands.”¹

The Commission should reject petitions, such as those filed by Motorola, Dell/Microsoft, Adaptrum, and the Public Interest Spectrum Coalition (“PISC”), that request increased power levels and other expansions in the operating parameters for TVBDs. Adoption of such proposals would allow TVBDs to create “loss areas,” leaving affected viewers without access to their local over-the-air television services, disrupting cable television services and direct broadcast satellite services, and precluding the use of wireless microphones and other

¹ *Second Report and Order and Memorandum Opinion and Order*, ET Docket Nos. 04-186 and 02-380, 23 FCC Rcd 16807 (rel. Nov. 14, 2008), at ¶ 2 (“*Second Report and Order*”).

equipment for the production of news, entertainment, and sports programming. In fact, as petitions filed by the National Cable & Telecommunications Association (“NCTA”), Shure Inc. (“Shure”), Richard A. Rudman and Dane E. Ericksen (“RR/DE”), and the Society of Broadcast Engineers (“SBE”) identify, the rules adopted in the *Second Report and Order* are already insufficient to protect incumbent services and their benefits to consumers.

Each of the petitions for reconsideration addresses one or more of three principal areas: (1) the rules defining the power levels and other operating parameters for TV band devices; (2) the rules governing the establishment, use, and ongoing management of a database of protected radio services, which is the principal method of preventing unlawful operation of TVBDs on occupied television channels; and (3) the issues surrounding use of “spectrum sensing,” notwithstanding the general conclusion that sensing technology is not ready for prime time. With respect to each of these areas, the various petitions for reconsideration present the Commission with a clear choice between, on the one hand, efficient but prudent spectrum management, and, on the other hand, permissive policies that disregard destructive, harmful interference to digital television and other existing services and the public that relies on them.

I. THE PETITIONS POINT OUT MULTIPLE FLAWS IN THE CURRENT OPERATING PARAMETERS FOR TVBDs, WHICH WOULD BE EXACERBATED BY PROPOSED POWER INCREASES.

A. Petitioners Highlight the Importance of Adopting the Right Power Levels for TVBD Operation, Particularly for Adjacent Channel Operation.

Many of the petitions address the maximum power levels at which personal/portable and fixed TVBDs should be allowed to operate, including on adjacent channels. The power level of a TVBD is, of course, a key determinant in its interference potential. The rules adopted by the Commission would, in many cases, allow devices to operate at power levels that would overwhelm television, wireless microphone, and cable and DBS head-

end reception; certainly, the Commission should reject the even higher power levels suggested by some parties in petitions for reconsideration.

First, MSTV and NAB agree with SBE, the Community Broadcasters Association (“CBA”) and RR/DE that if personal/portable devices operate at 40 mW on channels adjacent to over-the-air television broadcasts, viewers will experience widespread interference. Adjacent channel operation raises significant concerns of harmful interference. The Commission’s own tests showed that “[t]he performance of the devices was observed to degrade substantially and at increasing levels as the level of the signals on adjacent channels was raised,”² and the Commission indicated that it sought to calculate a power level for adjacent channel operation of a TVBD that would not create an “undue risk of interference.”³ However, flaws in the methodology used by the Commission led it to adopt a level that surely will allow destructive interference and prevent many viewers from receiving over-the-air television signals. Consumers only recently successfully concluded (or will conclude) their own transition to digital television and should not have the benefits of that transition jeopardized by harmful interference.

Specifically, as SBE documents, in arriving at the adjacent channel power level the Commission relied upon the wrong D/U ratio (-33 dB), rather than the standard of protection (-26 dB and -28 dB for upper and lower adjacent channels) that it expressly stated that it intended to use.⁴ The FCC also made other erroneous assumptions that do not reflect real-world conditions. These include assumptions that consumers will have antennas with unusually high levels of discrimination and that an interfering device within as many as 16 meters (52 feet) from

² *Id.* at ¶ 82.

³ *Id.* at ¶ 176.

⁴ *See* SBE Petition at 5-6.

a consumer will be within that consumer's control. The practical effect of these errors is to assume that ordinary viewers will be able to receive a broadcast signal if a device in the neighborhood operates on an adjacent channel at 40 mW; in fact, the unlicensed device could turn the entire neighborhood into a digital "loss area" the moment it turns on.

Second, MSTV and NAB agree with SBE that the power levels and other operating parameters for TVBDs will fail to protect consumers' reception of new mobile television services. Mobile broadcast television will soon be a reality; this summer, five stations in Washington, DC will begin tests of service. As the *New York Times* reported last month, already 70 stations in 28 markets plan to broadcast in the mobile DTV format by the end of 2009.⁵ But by adopting power levels designed to "protect" reception only when the device is at least 16 meters from a television receiver, the Commission has put the public's future access to mobile broadcasts at risk. This approach deviates substantially from the Commission's traditional approach with respect to the protection of mobile services. For example, the Commission assumed an interference distance of two meters for Advanced Wireless Services. It simply is not realistic to expect consumers to benefit from mobile broadcast services if TVBDs are permitted to interfere with mobile receivers as far away as 16 meters. If the Commission is to achieve its acknowledged obligation to ensure that "future primary use of the band by broadcasters be protected,"⁶ it would need to determine an appropriate power level to protect consumers' reception of mobile broadcast services at distances of two meters. To do so, it would need to re-compute and properly model the separation distance at one or two meters and

⁵ See Saul Hansel, *Free TV Broadcasting Comes to Mobile Gadgets*, *New York Times*, April 20, 2009, at <http://bits.blogs.nytimes.com/2009/04/20/free-tv-broadcasting-comes-to-mobile-gadgets/?hp>

⁶ *Second Report & Order* at ¶ 50.

recalculate the permitted adjacent channel power of TVBDs in any market where mobile broadcasts are launched, or prohibit adjacent channel use in those markets.

Third, several petitions note the Commission's failure to consider analog LPTV and translator operations in setting the sensing level for personal/portable TVBDs. For example, the Community Broadcasters Association ("CBA") correctly points out that "the protections adopted by the Commission appear to be based on assumed reception of LPTV stations only by digital receivers, when in fact the vast majority of those stations continue to transmit analog signals, [and] are under no deadline to transition to digital operations."⁷ In a similar vein, SBE notes that analog LPTV and translator stations will continue broadcasting in analog "now and for some time to come" and suggests that the Commission "either (1) require an effective date for WSDs that tracks the termination of all analog services or (2) prohibit both co- and adjacent-channel operation of personal/portable devices within the service contours of LPTV stations and TV translators."⁸

Fourth, given the lack of protection afforded by the current, 40 mW adjacent channel power level, MSTV and NAB oppose proposals to allow even higher power levels, particularly for adjacent channel operation.⁹ These proposals have no basis in science, and would leave yet more viewers without access to television, cable or satellite service.

⁷ See CBA Petition at 1.

⁸ See SBE Petition at 12.

⁹ In support of its position, Adaptrum cites to a 1979 decision in which the FCC set the unintended emission limits for personal computers. Yet as Adaptrum notes, in that decision the FCC assumed that the home computing device was at least 10 meters from the receiver, whereas in this proceeding the FCC has assumed a distance of 16 meters. Accordingly, reference to the proceeding cited by Adaptrum supports an offsetting *decrease* of power for adjacent channel operation from the present, 40 mW level.

Motorola, for example, suggests an extraordinarily high-power operation of 4 *Watts* for personal/portable devices mounted on vehicles. Other than merely speculating that these devices will not interfere with television because the vehicles that use them will (for some reason) stay far away from television receivers, cable wiring and microphones, Motorola offers no justification for this proposal. The Commission also should reject the proposals of Adaptrum, Motorola, and PISC that the Commission allow personal/portable devices to transmit at power levels in excess of 100 mW beyond the first adjacent channel. In the FCC's tests of DTV receivers, results for N+2 and N-2 operation at higher power levels were as bad or worse than the results for adjacent channel operation. These requests for higher power ignore the fact that a nearby personal/portable device operating on *any* channel will put a television receiver in a strong signal situation, thereby reducing the D/U ratio — and increasing the likelihood of interference — on all channels. Evidence put forth by NCTA demonstrates that operation at even the current, 100 mW level “will interfere with cable television viewing, especially in adjoining housing units, and could adversely impact cable modem Internet access and other cable services in the home.”¹⁰ Unlike PISC and Adaptrum, NCTA submits the results of extensive field tests, and based on those results urges that no personal/portable TVBD device be allowed to operate at levels in excess of 50 mW.

Finally, MSTV and NAB oppose proposals to relax restrictions on high-powered fixed devices. The Commission should deny the petitions of Motorola and Adaptrum to allow fixed devices, which will operate at power levels as high as 4W, to operate on adjacent channels. The mere fact that adjacent channel operation may create more “spectrum availability” for fixed

¹⁰ NCTA Petition at 3.

devices, as Motorola argues, is no reason to allow such access.¹¹ As the Commission concluded, “adjacent channel interference from a fixed TVBD could occur almost anywhere within a station’s service area.”¹² Relatedly, MSTV and NAB agree with the FCC decision to limit the fixed devices power to a maximum of 4 watts, and urge the Commission to reject the proposal by WISPA and PISC for an increase in the maximum authorized power. In its decision to limit the power to 4 watts, the Commission correctly balanced the interest of the new wireless Internet service providers to adequately reach their customers, while protecting TV viewers, wireless microphone operations, and cable head-ends from destructive interference. As mentioned above, in the FCC’s tests of DTV receivers, results for N+2 and N-2 operation (and beyond) were as bad as or worse than the results for adjacent channel operation when tested at higher power levels. Requests for higher power ignore the fact that in nearby homes and neighborhoods, operation of an unlicensed device on *any* channel will put a television receiver in a strong signal situation, thereby reducing the D/U ratio — and increasing the likelihood of interference — on all channels. Moreover, the risk of increased interference to cable head-ends and cable customers’ premises is real if such a proposal is adopted. The Commission should not consider such a proposal until it has gained real-world experience with 4 watt fixed operations.

B. MSTV and NAB Support the Commission’s Efforts to Limit Harmful Out-of-Band Emissions from TVBDs.

The *Second Report & Order* recognizes the risk that emissions from an unlicensed device outside that device’s channel of operation pose to reception of television signals. As the Commission notes, “[o]ut-of-band emissions constitute co-channel interference in a first adjacent

¹¹ Motorola Petition at 20.

¹² *Second Report & Order* at ¶ 172.

channel that cannot be addressed by receiver selectivity.”¹³ MSTV and NAB accordingly support the Commission’s decision to require that the undesirable emissions limits for TVBDs be at least 55 dB below the highest average power in the 6 MHz channels adjacent to the 6 MHz channel in which the device is operating.

Whether this emission limit will protect licensed services, however, depends upon two key criteria: first, that the emissions are measured relative to the maximum allowable power in the entire 6 MHz channel, and second, that all TVBD emissions have a minimum bandwidth of at least 4.5 MHz, or comply with a maximum power spectral density (“PSD”) limit in a narrower bandwidth. These two criteria were used by the Commission when conducting DTV receiver and unlicensed device interference testing,¹⁴ which testing appears to be the basis for the out-of-band emissions limit adopted by the Commission. MSTV and NAB accordingly oppose the petitions of WiFi Alliance and Motorola, which ask the Commission to “clarify” and relax the out-of band emissions limit by proposing a measurement procedure that specifies the power as an expression of total in-band power without specifying a minimum bandwidth or maximum power flux density. Measuring the emission limit as proposed by Motorola and the WiFi Alliance would result in an increase in the out-of-band energy, and thus would increase

¹³ *Second Report and Order* at ¶ 177.

¹⁴ The White Space Coalition recommended an out-of-band emissions mask requiring emissions to be 55 dB below the highest average power in the band, as measured in 500 kHz segments, at the edges of the channel on which the device is operating. *See Second Report and Order* at ¶ 234. *See also* Reply Comments of Dell, Google, HP, Intel, Microsoft, and Philips, at 6 and Fig. 1 (March 2, 2007) (describing -55 dB proposal). Indeed, the Adaptrum device tested in Phase II testing had even stricter out-of-band emission limits. *See Evaluation of the Performance of Prototype TV-Band White Spaces Devices: Phase II*, FCC/OET 08-TR-1005, at 22-23 (rel. Oct. 15, 2008). All of the FCC interference testing was done assuming that only a single interfering signal was present in any six megahertz channel. A minimum bandwidth requirement of 4.5 MHz will ensure that this tested condition is maintained.

destructive interference to DTV receivers. Accordingly, the Commission should reject these petitioners' requests for relaxation of measurement criteria, which would undermine protection for licensed services and the consumers who rely on them.

C. The Commission Should Reject Calls to Eliminate Prudent Limits on the Maximum Height Above Average Terrain for a TVBD's Transmit Antenna.

MSTV and NAB support the Commission's decision to specify the maximum antenna height for a fixed device. As the *Second Report & Order* observes, "the height of a TV band device's transmit antenna can significantly affect the distance at which interference could occur to licensed services in the TV bands."¹⁵

However, MSTV and NAB agree with IEEE 802 and SBE that the Commission erred in expressing the maximum height limit only in terms of average ground level ("AGL"). These parties appropriately urge the Commission to also express the antenna height for fixed base stations in Height Above Average Terrain ("HAAT"). Expression of maximum antenna height in terms of AGL alone "would considerably underestimate the required separation distance and compromise the protection of the TV service in some situations and would unnecessarily limit fixed base station coverage area in other situations."¹⁶ By expressing the antenna height requirement in HAAT, while maintaining a separate antenna height limit (*e.g.*, 100 meters) based on AGL, the Commission will avoid arbitrary results and better protect the viewing public.

In formulating the table of separation distances based upon a HAAT limit, the Commission should reject proposals of Motorola, IEEE 802 and WISPA to narrow, artificially,

¹⁵ *Second Report & Order* at ¶ 226.

¹⁶ IEEE at 3, ¶ 11.

the required distance separations. These proposals incorrectly assume that television receivers will have additional interference rejection capabilities due to factors such as cross polarization of the desired and undesired signals. In fact, the signals will not travel neatly in different polarizations; as they travel across the ground they will hit objects such as foliage and buildings and thus become distorted. Similarly, IEEE 802's assumption that the television receiving antenna will be pointed in the opposite direction from the TVBD transmission is faulty. Often, a consumer will point the antenna at a side angle to receive close-in stations that are transmitting in different directions. In contrast to the unrealistic assumptions that promoted by these parties, MSTV and NAB note that fixed TVBDs could operate safely if distances are calculated using FCC F(50,10) for HAAT of 10 meters or more, while also taking into account the different DTV contour field strengths for low VHF, High VHF, and UHF.

II. THE PETITIONS SUGGEST CHANGES TO THE RULES THAT ARE NECESSARY FOR THE DATABASE TO SERVE ITS ROLE AS THE PRINCIPAL METHOD FOR PREVENTING UNLAWFUL OPERATION OF TVBDs ON OCCUPIED CHANNELS.

The underlying principle of the *Second Report and Order*, and indeed this entire proceeding, is that unlicensed devices should operate only if they are “able to determine whether a TV channel or portion of a TV channel is unused before it transmits.”¹⁷ Following the outright failure of sensing technologies in testing, the Commission correctly concluded that use of a geolocation/database method must be the principal means by which TVBDs avoid unlawful operation on occupied television channels. The challenge now for the Commission is to ensure that the rules governing the establishment, maintenance, and use of that database serve that purpose.

¹⁷ *Second Report and Order* at ¶ 33.

The petitions address three areas critical to the proper functioning of the database: first, the content of the database; second, the frequency of communication between devices and the database; and third, the reliable and secure administration of the database. Adoption of the right rules with respect to each of these areas is critical if the Commission is to achieve the safe introduction of new devices into the broadcast spectrum.

A. Content of the Database: Headend Facilities Have Not Been Sufficiently Protected.

The content of the database is important; if a given service is left out, that service will not be protected and thus will be subject to frequent interruptions from co-channel unlicensed device operations. As NCTA and DIRECTV/DISH point out, the *Second Report & Order* overlooks the need to protect all of the headend facilities that allow cable and DBS subscribers to receive their broadcast television signals. Specifically, as DIRECTV and DISH explain in their joint filing, the rules adopted in the *Second Report & Order* did not allow headend facilities operated by direct broadcast satellite (“DBS”) providers to register in the database.¹⁸ This appears to have been an inadvertent oversight, but unless corrected it will endanger millions of viewers who subscribe to local-into-local service from DIRECTV or DISH.

Moreover, as NCTA, DIRECTV and DISH point out, the *Second Report & Order* assumes incorrectly that registrations of headends inside a station’s contour would be “unnecessary.” These petitioners explain that, in fact (1) a TVBD operating on an adjacent channel outside of a station’s contour can cause interference at distances of up to 490 meters from the headend, and (2) without the ability to register, headends located near a station’s

¹⁸ See DIRECTV and DISH Petition at 1-2.

protected contour boundary will be at risk of interference.¹⁹ If a single headend receives interference from an unlicensed device, thousands of subscribers can lose access to a station's signal and the local programming it provides.

In light of the importance of headend reception, the Commission should deny the Dell/Microsoft request to exclude registration of headends that are not "local" signals for copyright purposes. Particularly in rural areas, many headends are located outside of a station's contour, and help to serve households that rely on the local news and other programming provided by that station. MSTV and NAB dispute the suggestion of Dell and Microsoft that these headends should be required to use fiber and other potentially expensive forms of alternative delivery. It is often because those other methods are not available, or are not economic, that over-the-air reception is used at these cable headends.

B. If TVBDs Check the Database Only Once per Day, They Will Fail to Protect Many Wireless Microphone Operations.

Unlicensed TVBDs will avoid occupied channels only if they have checked the database for the most up-to-date information concerning use by incumbent services. MSTV and NAB agree with IEEE 802 and Shure that the long interval adopted in the *Second Report & Order* — allowing devices to check the database as infrequently as once every 24 hours, and to continue operating for up to 48 hours after losing access to the database — will not protect licensed services, especially itinerant wireless microphone operations.²⁰

¹⁹ NCTA Petition at 16.

²⁰ The Commission did not require that the database include time availability along with the available channel information. As a result, the database could respond to a TVBD's request for a channel with one that may be available at the time of the request but which will be used for licensed operation at a venue event a few hours later. Since the TVBD does not have to re-contact the database for 24 hours, or even 48 hours if access is lost, the TVBD device would operate on that occupied channel and cause destructive interference to the wireless microphones.

Shure explains that “[m]ost itinerant wireless microphone incumbents cannot predict their spectrum needs or precise location 24 hours in advance.” This unpredictability of use is particularly acute in newsgathering, as breaking news events — like fires, child abductions, and other emergencies, to name just a few — arise without notice. If an unlicensed device checks the database at 9 a.m. and determines that a given channel is “available,” and news crews begin operation on that channel at noon to cover a breaking news story, the wireless microphone equipment will fail. IEEE 802 explains that allowing TVBDs to check the database only once per day could lead to “uncontrollable interference.” If the Commission were to require that devices access and check frequency availability in real-time or near real-time, these mishaps would be far less likely to occur.

C. To Serve Its Role in Safeguarding Licensed Services, the Database Must be Reliable and Secure.

The success or failure of the database will affect millions of Americans; the Commission accordingly has an interest in ensuring that it is administered effectively and professionally at all times. The *Second Report & Order*, however, leaves much to chance.

First, MSTV and NAB agree with SBE that the database is more likely to succeed if there is a single database manager; accordingly, the Commission should reject calls from PISC that it certify more than one database administrator. The presence of multiple databases will complicate efforts to verify the accuracy of database information, and impose greater burdens on licensed services registering for the database. A single database administrator would also be consistent with Commission precedent: a single entity, Neustar, serves as the North American Numbering Plan Administrator (“NANPA”); a single entity, the United Telecom Council, operates a database of Access Broadband Over Powerline (“BPL”) operations to assist licensed users in tracking down causes of harmful interference; and the American Society for Healthcare

Engineering of the American Hospital Association (“ASHE/AHA”) maintains a database of all wireless medical telemetry service (“WMTS”) transmitters.

Second, SBE’s concerns about a “reliable” administrator are exacerbated by the Commission’s delegation of significant powers to the third-party, database administrator. Most notably, the *Second Report & Order* provides that only *after* entities are selected to administer the database, the administrators “will need to agree on a specific protocol and data format requirement so that manufacturers can build standard devices that can work with any of the databases and each database can easily transmit and receive data from each other database.”²¹ The FCC’s new rules would allow the third-party database administrator(s) to develop whatever protocols they wish, and the FCC has retained no authority to approve those protocols. Read literally, the *Second Report & Order* suggests that database administrators could adopt faulty protocols that fail to reliably communicate channel-occupancy information to devices; so long as a device is manufactured to use that protocol, it would be eligible for certification and distribution to the public. This delegation of authority to the approved database administrators is unprecedented; as Adaptrum states with respect to another aspect of the Commission’s rules, while the FCC has incorporated third-party standards in the past, “in all such cases those standards [were] established prior to the issuance of specific technical rules.”²² In other words, when the Commission relies upon a third party’s technical standards, it independently evaluates those standards and incorporates them into the rules. Here, the Commission is allowing a private party, or parties, to create protocols, the use of which will presumably be a pre-condition to

²¹ *Second Report & Order* at ¶ 222.

²² Adaptrum Petition at 8.

device certification — and the Commission apparently has no say over those protocols and has provided no opportunity for the public and other affected parties to comment on these protocols.

Third, as SBE also notes, “Communications between the device and the database manager and communications between devices must be secure, protected and validated to prevent illegal operation on occupied channels.”²³ The *Second Report & Order*, however, imposes no requirements for security of the database or the communications between the database and devices. This omission leaves the database open to hackers to falsely list certain channels as “available” for unlicensed device operations. Similarly, lack of any requirement to encrypt and authenticate communications between the device and authorized database raises the specter of rogue databases that send false information on channel availability to devices.

MSTV and NAB agree with the sentiments of Key Bridge Global LLC that “[a] critical security flaw exists in the TV Band System as described [in the rules], where malicious operators could hijack a legitimate database administrator’s identity via man-in-the-middle attacks (colloquially called a phishing attack), issue false channel assignments and deliberately cause incumbent interference.”²⁴ Security and authenticity are well-developed concepts in the world of information technology, and it would be a mistake for the Commission to overlook them as it refines its rules for the database.

Security concerns are especially pronounced with respect to devices operating as “clients” to other devices. By definition, these devices will not access the database to determine channel availability; they will rely solely on information obtained — or believed to be obtained — from a fixed device or personal/portable device operating in Mode II. Unless

²³ SBE Petition at 22.

²⁴ Key Bridge Global LLC Petition at 3.

communications to “master” devices and the database are secure and valid, there is great risk that these devices will disrupt reception of local television services as well as wireless microphone communications. At a minimum, a requirement that devices operating in client mode transmit a unique identifier could minimize these risks, by creating a mechanism for attempting to locate bad devices.

III. THE PETITIONS UNDERSCORE THE FAILURE OF SENSING.

The petitions underscore the accuracy of the Commission’s conclusion that “spectrum sensing, as currently presented in our measurement studies of prototype devices, is not sufficient by itself to enable unlicensed devices to reliably determine the TV channels that are available for use at a location.”²⁵ In light of the failure of sensing, the record strongly suggests that (1) the -114 dBm sensing level, particularly without measurement standards, will not protect primary television operations and wireless microphones, and (2) devices relying on sensing only should not be permitted in the broadcast spectrum until it is proven that the technology works in real-world environments.

A. The Petitions Show That the -114 dBm Sensing Level Will Allow TVBDs to Interfere with Reception of Local Television Signals and Wireless Microphones.

The record shows that devices sensing at the -114 dBm sensing level will interfere with the public’s reception of free, over-the-air television service and with operations supporting such service (including wireless microphones). Petitions such as those filed by Shure, SBE, CBA, and RR/DE correctly propose enhancement of the -114 dBm sensing level, clarification of how the sensing level is to be measured, and supplementation of protection for wireless microphones.

²⁵ *Second Report & Order* at ¶ 71.

First, as SBE explains, there is no basis in the record for the -114 dBm sensing level.²⁶ OET's own field measurements in 2008 suggest that a sensing value of -122 dBm would be more appropriate.²⁷ As SBE noted, a -114 sensing level will not protect television services because the Commission's "field measurements showed that the signal level difference between a modest outdoor television antenna and TVBD antennas can be up to 34 dB;" "adjusting these results for an antenna based on the DTV planning factors, these data yield a sensing value of -122 dBm, not -114 dBm."²⁸ Indeed, a sensing level of -116 dBm, which would be somewhat more protective than a -114 dBm level, was proposed by IEEE 802.22. However, that level assumed that the sensing antenna would be located outdoors and at a height of 30 feet, an assumption not valid for personal portable devices (which may be operated indoors, at a lower height, and subject to other "real world" factors like signal absorption by the body).²⁹

An enhanced sensing level would protect not only incumbent television operations but also weaker microphone signals. A device tuned to sense to a level of -114 dBm will, by definition, fail to detect weaker microphone signals that would, but for co-channel interference from an unlicensed device, be fully usable by wireless microphones. Indeed, the OET's own 2007 report on the Performance of Prototype TV-Band White Space Devices ("Phase I Report") confirmed the inadequacy of a -114 dBm threshold detection level; in that Report, OET found that devices sensing at the -114 dBm level "do not consistently sense or detect . . . wireless microphone signals." MSTV and NAB also agree with SBE's suggestion that

²⁶ See SBE Petition at 17-18.

²⁷ See *id.* at 18.

²⁸ See *id.*

²⁹ See *id.*

the Commission take note of the U.K. proposals for white space use, which would require a more stringent sensing detection level of -126 dBm for wireless microphone protection.³⁰

Further, the RR/DE petition shows that the -114 dBm sensing level fails to take into account VHF television operations. RR/DE point out that the -114 dBm sensing level adopted by the Commission was based on a calculation using a 41 dBu (UHF) DTV threshold, and does not account for the 36 dBu threshold applicable to high-band VHF DTV stations or the 28 dBu threshold applicable to low-band VHF DTV stations.³¹ These figures would result in a sensing threshold of -119 dBm and -127 dBm, respectively, and are certainly relevant considering that the Commission has decided to allow white space operation on the VHF channels.³²

Second, Shure and SBE document another fatal flaw in the sensing approach adopted by the *Second Report & Order*: “there is no requirement with respect to how [the] sensing level is measured.”³³ MSTV and NAB agree that the lack of any guidance as to the procedures for measuring the strength of a signal renders the sensing requirement “meaningless.”³⁴ In the case of spectrum sensing, measurement procedures have major impacts on the quantity being measured; a signal that may be measured at -120 dBm (and thus not

³⁰ *See id.* at 24.

³¹ *See* RR/DE Petition at 9.

³² *See id.*

³³ *See* SBE Petition at 18. *See also* Shure Petition at 10 (noting that the sensing requirement must be “meaningful” and that devices should be able to satisfy the sensing requirement “in real-world environments with strong interfering signals”). MSTV and NAB also agree with Shure’s proposed tightening of behavioral standards, such as a requirement that unlicensed devices recheck channels for protected transmissions every 10 seconds instead of every 60 seconds. *See id.* at 12-13.

³⁴ *See* SBE Petition at 18.

protected) using one procedure can be measured at -76 dBm (and thus protected) using another procedure.³⁵ In fact, in the Commission's testing, the sensing level of devices varied by more than 60 to 70 dB in the case of a strong adjacent channel versus a 'clean' laboratory signal. These values are measured in dB (a logarithmic scale); thus 60 dB represents a magnitude-1,000,000 difference in terms of signal power. This failure to specify measurement procedures is at odds with Commission precedent. In the *5 GHz UNII* decision, which authorized the use of spectrum sensing in another context, the Commission expressly required devices to sense the licensed service "in accordance with the specified measurement procedures."³⁶

Third, the *Second Report & Order* acknowledges that "the geo-location/database method is not suitable for identifying channel occupancy by devices such as wireless microphones that operate on an intermittent, occasional, or one-time basis at locations not identified in the database."³⁷ Thus, roving wireless microphone operations, such as those used by broadcasters for critical newsgathering activities, must be protected by some other means. While MSTV and NAB agree with the Commission that the database/geolocation approach does not address the need to protect these important uses of wireless microphones, the purported method for protecting these wireless microphones – spectrum sensing at a level of -114 dBm – provides inadequate protection to wireless microphones. MSTV and NAB therefore agree with

³⁵ The impact of measurement procedures on the actual sensing level detected distinguishes spectrum sensing from other measurement exercises. By analogy, automotive fuel efficiency is measured under standardized conditions simulating real-world conditions (*e.g.*, with certain requirements and assumptions regarding speed and temperature); an automaker could not claim that it measured very good fuel efficiency if its test involved coasting the car down a steep incline.

³⁶ See *Revision of Parts 2 and 15 of the Commission's Rules to Permit Unlicensed National Information Infrastructure (U-NII) Devices in the 5 GHz band*, Order, ET Docket No. 03-122, RM-10371, 20 FCC Rcd 4883, at ¶ 7 (2005).

³⁷ *Second Report & Order* at ¶ 93.

SBE and Motorola that if the Commission's rules are to protect wireless microphones, the Commission must, at a minimum, expand the current set-aside of two channels in 13 markets to all markets, and ideally, set aside additional "safe harbor" channels for use by wireless microphones.³⁸ The Commission could balance the need to protect primary operations with the desire to expand the white space footprint by providing several additional nationwide safe harbor channels and then, over time, reducing the number of set-asides as wireless microphone operators phase in new, digital equipment permitting more spectrally efficient operations. Certainly, the Commission should reject outright the requests of PISC to reduce the spectrum available for safe use by wireless microphones.³⁹

B. There Is No Predicate For Authorizing Sensing-Only Devices.

The well-documented defects with sensing technology will primarily harm wireless microphones. But if the Commission allows sensing-only devices into the market, all licensed services and the public that relies on them will be in peril. MSTV and NAB agree with SBE that authorizing devices that rely only on sensing is a "slippery slope" at best.⁴⁰ Given that spectrum sensing will not be able to protect incumbent television operations and their viewers from interfering unlicensed white space devices, there is no predicate for authorizing sensing-

³⁸ See SBE Petition at 17 (urging the Commission to make the safe harbors available nationwide and to provide more than just two safe harbor channels). See also Motorola Petition 2 (urging the Commission to "extend its decision to identify two television channels for wireless microphone use in 13 markets to nationwide"). MSTV and NAB do not agree, however, with Motorola's suggestion that the Commission permit unlicensed personal/portable devices to operate in the bands below 512 MHz.

³⁹ See PISC Petition at 17 (proposing that the Commission eliminate the set-aside of two channels in 13 markets) and 25-26 (proposing personal/portable device operation in channels below 21).

⁴⁰ See SBE Petition at 20.

only devices. Moreover, there is no technical justification for the “fast track” approach recommended by some petitioners.

As SBE points out, the Commission has conceded that spectrum sensing is not a mature technology, as the tested devices were unable to “reliably determine the TV channels that are available for use at a location.”⁴¹ Sensing failure was particularly acute in real-world conditions that will be present when consumers use the unlicensed devices. While prototype devices were “generally” able to detect the presence of television and wireless microphone signals under “clean” conditions, sensing performance degraded to “unsatisfactory” levels when test signals included real-world effects such as multipath and other fading effects and signals on other channels.⁴² Thus, MSTV and NAB agree with SBE that sensing technology “does not work and cannot be relied upon to provide adequate interference protection.”⁴³

If the Commission does proceed with authorizing sensing-only devices, as Shure points out, it must “get[] it right” before mass-marketed devices are sold to consumers.⁴⁴ Testing procedures should be “subject to full notice and comment rule making,”⁴⁵ and the Commission should thus reject PISC’s proposal for streamlined testing procedures.⁴⁶ Only a deliberate and transparent process will ensure that the tests entail the substantive and technical rigor necessary to protect licensed services. It would be irresponsible to the public to authorize any sensing-only device before measuring sensing performance under real-world conditions (not just “clean”

⁴¹ *Id.* at 15, citing *Second Report and Order* at ¶ 71.

⁴² *See Second Report and Order* at ¶ 82.

⁴³ *See* SBE Petition at 15.

⁴⁴ *See* Shure Petition at 2.

⁴⁵ *See* SBE Petition at 20.

⁴⁶ *See* PISC Petition at 4 (urging the Commission to eliminate and consolidate public notice requirements to avoid the “burden and delay” of public comment periods).

laboratory conditions), or before making a comprehensive and extensive evaluation of devices in multiple cities and environments and based upon the full range of licensed services to be protected, including mobile broadcasts.

CONCLUSION

For the foregoing reasons, MSTV and NAB respectfully request that the Commission reject the petitions for reconsideration seeking to increase power levels of TVBDs, permit increased out-of-band emissions from TVBDs, eliminate sensible height restrictions on fixed TVBDs, deny protection to cable and DBS headends, and facilitate introduction of devices relying only on demonstrably ineffective “sensing” concepts. In addition, MSTV and NAB direct the Commission’s attention to certain other petitions highlighting flaws in the rules of the *Second Report and Order* that, if left in place, will allow TVBDs to interfere with consumers’ reception of television and cable services as well as the continued use of wireless production equipment.

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CERTIFICATE OF SERVICE

I, Kathryn Bowers, a secretary at the law firm of Covington & Burling LLP, do hereby certify that on this 8th day of May, 2009, I caused a copy of the foregoing "Opposition and Comments of MSTV and NAB to Petitions for Reconsideration and Clarification" to be sent via first-class U.S. Mail, postage prepaid, to the following:

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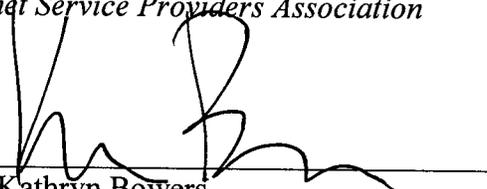
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