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**
	)	
	)	
Second Report and Order and Memorandum Opinion and Order	)	**FCC 08-260**

PETITION FOR RECONSIDERATION
OF
THE PUBLIC INTEREST SPECTRUM COALITION

On behalf of the Public Interest Spectrum Coalition (PISC)[1] and the Champaign Urbana Wireless Network ("Petitioners"), the Media Access Project and the New America Foundation submit the following *Petition for Reconsideration* of the *Second Report and Order and Memorandum Opinion and Order* in the above captioned proceeding.[2]

Petitioners applaud the Commission for its dedicated and determined work on this proceeding over a six-year period since the original Notice of Inquiry emerged from the Spectrum Policy Task Force process in late 2002. Indeed, as a nonprofit coalition that has filed literally dozens of comments, reply comments, *ex partes* and engineering studies

[1] PISC is an unincorporated *ad hoc* coalition of non-profit organizations with a membership consisting of the following, in alphabetical order: The CUWiN Foundation (CUWIN), Common Cause, Consumer Federation of America (CFA), Consumers Union (CU), EDUCAUSE, Free Press (FP), Media Access Project (MAP), the New America Foundation (NAF), the Open Source Wireless Coalition (OSWC), Public Knowledge (PK), and U.S. PIRG.

[2] *Second Report and Order and Memorandum Opinion and Order,* FCC 04-260, adopted Nov. 4, 2008 (hereinafter *Second R&O/MO&O).* Rules adopted in this proceeding were published in the Federal Register Feb. 17, 2009. *See* 74 Fed. Reg. 7314 (Feb. 17, 2009). This petition is filed pursuant to Section 1.429(d).

in the record of this proceeding since 2002, Petitioners appreciate firsthand the scrupulously fair and detailed process that was led by the staff of the Commission's Office of Engineering and Technology over that six-year period.

In its effort to address the objections of those opposed to any use of the broadcast white spaces, the Commission has adopted rules that impose needless costs on the new TV broadcast devices (TVBDs). Certainly the Commission has a responsibility to protect licensees from harmful interference. Where it can meet this statutory obligation in ways that maximize the utility of the new technology, it should do so. Accordingly, PISC file this *Petition for Reconsideration* to facilitate the expeditious development and deployment of devices authorized in the Order under review.

SUMMARY

PISC recommends the Commission reconsider the following aspects of its *Second Report and Order and Memorandum Opinion and Order.*

First, the Commission should reconsider requiring TVBDs relying on the geolocate/database method to sense wireless microphones and not transmit on channels where they are detected. Sensing is not necessary when TVBDs are required to have regular access to the TV bands database. If the Commission requires sensing for wireless microphones, it should reconsider the beacon approach, which would be more accurate, voluntary for licensees and a better balance of compliance burdens.

Second, the Commission should reconsider the unitary power limit on fixed and mobile TVBDs operating on channels separated 12 MHz or more from a DTV signal frequency. This limitation is clearly contrary to promoting more affordable wireless broad deployment in rural areas where Wireless Internet Service Providers (WISPs)

could use this fallow white space spectrum to operate at power levels substantially above 4 watts EIRP – and do so without any risk of harmful interference to TV reception in areas where there are four, five, six or even more consecutive unassigned and available TV white space channels.

Third, the Commission should reconsider and clarify that it will certify one or more nonprofit database administrators; not preclude the separation of the data repository and device query service functions; and require that the database provide estimated signal strength data by channel and location. We recommend further:

- The Commission should clarify that all information compiled in the TV bands database repository be *fully transparent to the general public online and a matter of public record*.
- We urge a preference for a nonprofit database as most likely to maintain a fair and reasonable fee structure. At a minimum, the Commission should ensure that to the extent feasible, fees are limited to modest, one-time charges that can easily be incorporated into the retail price of the device.
- The Commission should reconsider and clarify that the TV band database will be capable of reporting not only queried channel availability, but also estimated *signal strength data* on adjacent and surrounding channels.
- The Commission should clarify that the database administrator(s) are permitted to compile and provide information concerning the status of other frequencies, in addition to the TV band frequencies.

Fourth, the Commission should reconsider the reservation of two additional UHF channels above 21 for intermittent wireless microphone users in markets with PLMRS/CMRS operations.

Fifth, the Commission should reconsider the overly burdensome process the order imposes on the certification of TVBDs relying on spectrum sensing and the maximum EIRP of these devices. Specifically we recommend the Commission:

- Eliminate the public notice requirement for proposed test procedures and methodologies for each submitted device and instead develop a set of standardized test procedures and methodologies for certifying all TVBDs that rely on spectrum sensing.
- Rather than impose the unnecessary burden and delay of separate public comment on the application and the results of the test report, the Commission should streamline the process and combine the two public notice requirements.
- Reconsider the maximum EIRP for TVBDs that rely on spectrum sensing. It would be more logical and better serve the public interest to allow the devices to be certified to operate at transmit powers above 50 mW if they prove the device can do so without causing harmful interference.

Sixth, the Commission should reconsider protecting low-power TV based on the service contours of full-power TV. To address any concerns with regard to specific situations that may arise, the Commission could create a process wherein LPTV, Class A, translators, and booster stations receive expanded protection in the database, but only by demonstrating to the Commission the number of viewers outside the currently protected

signal contours that would be harmed by the potential interference from TVBDs to be granted the extended contour protection.

Seventh, the Commission should reconsider limiting fixed TVBDs on channels 5-20 to communication with other fixed devices and permit controlled client devices.

Finally, the Commission should eliminate any "professional installer" classification, and allow anyone to enter the coordinates for fixed devices without the need for internal geolocation capabilities.

ARGUMENT

I. THE COMMISSION SHOULD RECONSIDER REQUIRING TVBDS RELYING ON THE GEOLOCATE/DATABASE METHOD TO SENSE WIRELESS MICROPHONES AND NOT TRANSMIT ON CHANNELS WHERE THEY ARE DETECTED.

Petitioners, along with other proponents of opening the TV white space for unlicensed use, supported both the geolocation/database method and sensing alone as an *alternative* and independently sufficient means by which a TVBD could avoid harmful interference to licensed services on the band. In what the Commission itself characterized as "an abundance of caution," the Order requires that TVBDs employ both methods, while relying primarily for the time being on a certified TV bands database to check the availability of channels for use at the TVBD's reported geolocational coordinates on a regular basis (at least each 24 hours). However, even if the database reports a channel is available use on a particular day at a particular location, both fixed and mobile TVBDs are required to employ spectrum sensing capability. A TVBD can continue to use a channel clear in the database if it senses a television signal on the

frequency – but cannot use the channel if it senses what could possibly be a wireless microphone transmission at levels as low as -114 dBm over the entire 6 MHz channel.[3] The Commission should reconsider requiring either fixed or mobile TVBDs that rely on the geolocation/database method to also sense wireless microphones.

A. The database and the exclusion of portable devices from Channels 2-20 provide adequate protection for licensed wireless microphones.

Spectrum sensing for wireless microphones is unnecessary when they can register their existence in the geolocation database. The Commission states "restricting unlicensed personal/portable devices from operation on channels 2-20 and adjacent channels used by TV and providing for registration of sites that use wireless microphones in the database, will ensure that wireless microphones are able to operate without receiving interference from unlicensed TV band devices."[4] We concur with the Commission's assessment and believe that this additional protection for wireless microphones offers extensive protection for their use.

A personal/portable television white space device (TVBD) that has geolocation awareness and relies on the TV bands database for permission to operate on a clear channel at a particular location and time makes the sensing of wireless microphones, or any other signal, redundant, unnecessary and unduly burdensome. While sensing by TVBDs can offer useful information to cognitive radios about the spectral environment, to the extent a device is required to rely on the TV bands database for permission to transmit, it is unnecessary and undermines the utility of the band to require that less reliable sensing data should override the information in the database.

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[3] *See Second R&O/MO&O*, at ¶ 93, 125.
[4] *Id*. at ¶ 98.

The Commission has already concluded that a geolocation database is more protective than sensing at a -114 dBm sensing threshold, stating in the Order that "given that the geo-location and database access approach provides a reliable means for protecting TV service, we believe that it is not critical that the sensing function be capable of detecting signals below the -114 dBm level."[5] Listing all eligible wireless microphones in the database would ensure that this heightened level of protection is available to all licensed users. The Commission states that since wireless microphones can be registered to operate throughout a specific geographic area and "may operate anywhere in that area and choose a frequency from multiple vacant channels available for operation" that "it is not practical to require that the locations of wireless microphones that are used in this manner be included in the database."[6] This disregards numerous geolocation applications and mash-ups that clearly demonstrate the viability and usability of various real-time mapping information. Registering the geolocation of a wireless microphone can be both quickly and easily accomplished. Even on relatively short notice, licensed operators of Part 74 devices are able under the Order to block off a particular venue at any particular time for a radius of 1 kilometer.

The geolocate/database permission requirement that currently governs access by *all* TVBDs is sufficient protection for any licensed service. At -114 dBm in particular, the chance of registering "false positives" is so high that in many major urban and suburban areas there could be few if any channels left available for use, an outcome that could virtually destroy the economic and communication value of the entire TV white space regime since there would not be reliable national markets for equipment or

[5] *Id* .at ¶ 125.
[6] *Id.* at ¶ 93.

services. Indeed, although it was just 10 days before adoption of the Order, the cognitive radio research and development firm that was a longtime prime contractor for DARPA's NeXt-Generation dynamic spectrum program filed a study, led by CEO Mark McHenry, showing the intolerable level of false positives that result from sensing for such low-power devices at a too-sensitive sensing threshold.[7] High false positive rates undermine the effective use of empty TV bands and reduce the potential spectrum use efficiencies that TVBD technologies make possible. As the FCC concluded: "Geolocation methods such as GPS can accurately determine the location of an unlicensed device and a database system can compare that information to the location and service areas of fixed transmitters used by broadcast television and other licensed services. Once the distances between an unlicensed device and protected transmitters/service contours are established, adequate and reliable protection can be provided by applying standardized protection criteria."[8]

Finally, it should be noted that the Commission has no responsibility to protect illegal uses of wireless microphones. As of July 2008, there were fewer than 1,000 wireless microphone operators licensed under Part 74 for legal use of the TV white space – but as many as 500,000 wireless microphone devices operating illegally across the TV band, including in the 700 MHz spectrum that had already been reallocated for public safety and licensed commercial use. To the extent that the Commission imposes additional sensing burdens to protect unauthorized users otherwise ineligible for explicit protection, it compromises the underlying concepts of its rules. To impose expensive limitations on authorized devices to protect radio pirates using Part 74 devices without a

[7] *See* Shared Spectrum, "Using Joint Detection to Allow Safe Operation of Television Band 'White Space' Devices," study filed *ex parte* in ET Docket 04-186, October 24, 2008.
[8] *See Second R&O/MO&O* at ¶ 98.

license stands the very purpose of interference mitigation – to protected authorized licensed use – on its head.

B. If the Commission requires sensing for wireless microphones, it should reconsider the beacon approach, which would be more accurate, voluntary for licensees and a better balance of burdens.

The Commission's conclusion in that beaconing technologies are an "additional and unnecessary cost on licensees"[9] ignores the fact that the cost to deploy a wireless microphone beacon is marginal. The technologies necessary to mimic a DTV signal are both straightforward and easy to implement; hardware manufacturers have estimated that a beaconing device would cost under $50. Given their ease of deployment and low cost, beacons are a viable technological solution that provides additional protection to venues that feel they need it. It would more properly balance the burden between the relatively small number of licensed microphone operators and the potentially far larger number of citizens who could communicate more freely and cost-effectively if the TV white space channels were made available to the greatest possible extent.

C. TVBDs should not be required to notify the consumer that a TV signal is detected outside its protected contour.

Notifying consumers that a TV signal outside of its protective contour is available is unnecessary, potentially confusing and likely to deter productive use of the band. Only a tiny percentage of consumers are aware of which service areas they are in. Requiring that TVBDs report when "the device is not within the service areas of any TV stations that use that channel,"[10] but senses the channel as occupied is a requirement that is potentially very confusing for consumers. Given that there is very little positive impact

[9] *Id.* at ¶ 98.
[10] *Id.* at ¶ 92.

of providing this information to consumers, a mandate to provide this feedback seems unwarranted.

II. THE COMMISSION SHOULD RECONSIDER THE UNITARY POWER LIMIT ON FIXED AND MOBILE TVBDS OPERATING ON CHANNELS SEPARATED 12 MHZ OR MORE FROM A DTV SIGNAL FREQUENCY.

The Order imposes an across-the-board power limit on both fixed and mobile devices regardless of channel separation from an incumbent licensee. The maximum power for a fixed TVBD is one watt (or 4 watts EIRP with a maximum antenna gain of 6 dBi)[11] and for a personal/portable device it is 100 mW (assuming a maximum antenna gain of 0 dBi).[12] Although each of these power limits is *reduced* with respect to operation on a channel immediately adjacent to a television station or other licensee, users are prohibited from transmitting at an *increased* power level where there are two or more empty channels between the TVBD and a licensed service.

This limitation needlessly burdens the clear Congressional and public interest in promoting more affordable wireless broadband deployment in rural areas where commercial and non-commercial Wireless Internet Service Providers (WISPs) could use this fallow white space spectrum to operate at power levels substantially above 4 watts EIRP – and do so without any risk of harmful interference to TV reception in areas where there are four, five, six or even more consecutive unassigned and available TV white space channels.

For example, in the media market surrounding Pierre, South Dakota, there are no licensed TV stations above channel 39. A rural WISP could potentially operate a high-capacity and higher-power broadband service while maintaining a buffer of three or four

[11] *Id.* at ¶ 105.
[12] *Id.* at ¶ 127.

empty channels (18-24 MHz guard band) between its service and any licensed incumbent service.

Indeed, the Order acknowledges "that there are advantages, such as reduced infrastructure costs and increased range, to operation of unlicensed TVBDs at even higher power levels." Yet, although recognizing the advantages of variable power limits, the Commission declined at this time to permit fixed TVBDs to operate at power levels greater than 4 watts EIRP regardless of proximity to incumbent services – and instead opts to "further explore in a separate Notice of Inquiry whether higher powered unlicensed operation might be accommodated in the TV white spaces in rural areas."[13] The two reasons offered for not permitting variable power above 4 watts EIRP for fixed devices arise from the same undue caution with regard to possible risks of interference. But while the Commission must guard against reasonable risks of harmful interference, it should strike a proper balance that furthers the goal of encouraging broadband deployment.

The second rationale offered is conclusory: "we find it prudent to take a more cautious approach in setting power limits to minimize the risk of interference to authorized users of the TV bands."[14] While prudence is certainly laudable, it should be based on scientific fact rather than the unsupported fears of incumbents. The Commission has determined that the TV bands database will be a reliable means of identifying and operating in a channel immediately adjacent to a television station, or at even higher power with a one channel separation (n+1). The same database can therefore reliably report that a TVBD can operate with a n+2, or n+4, or even greater separation

[13] *Id.* at ¶ 106.
[14] *Id.*

from a licensed service in certain geographic locations – and hence can operate at a higher power level without any increased risk of harmful interference.

For the same reason, the Commission should also permit mobile devices to operate at higher and variable power when separation distances permit. The uniform 100 mW limit on mobile devices is set at a level that is certain to avoid interference assuming a one-channel separation distance. However, since the risk of harmful interference varies with the separation distance, mobile TVBDs that rely on geolocation/database lookup should be able to receive an authorization – at a particular location and time – to operate above 100 mW if there is an available channel that is n+2, n+3 or even further separated from a channel in use by a licensed service. We urge the Commission not to delay this issue by side-tracking it into an NOI, but rather to reconsider this one-size-fits-all power level limit and define a variable power limit based directly on a proxy for harmful interference.

III. THE COMMISSION SHOULD RECONSIDER AND CLARIFY THAT IF FEASIBLE IT WILL CERTIFY ONE OR MORE NONPROFIT DATABASE ADMINISTRATORS; NOT PRECLUDE THE SEPARATION OF THE DATA REPOSITORY AND DEVICE QUERY SERVICE FUNCTIONS; AND REQUIRE THAT THE DATABASE PROVIDE ESTIMATED SIGNAL STRENGTH DATA BY CHANNEL AND LOCATION.

The Commission determined that it "could select multiple database administrators that could offer services on a competitive basis" and that "[t]he database(s) will be privately owned and operated services . . .".[15] The Order also permits database administrators "to charge fees for registration of fixed devices and the provision of lists of available channels to fixed devices and personal/portable devices."[16] Although the

[15] *Id.* at ¶ 205.
[16] *Id.*

Order uses language that suggests a preference for multiple and competing third-party database administrators, the Commission should clarify that it will certify qualified and competing database administrators and/or service providers both initially and in the future upon application. While multiple and possibly competing databases operated for a fee by third-party providers is most likely to yield an accurate and cost-efficient service for consumers and users of unlicensed TVBDs – as well as to protect licensed incumbents from harmful interference –the Commission should further clarify and reconsider, as necessary, the following operational characteristics of the TV bands database system.

A. The Commission should clarify that it will also recognize and certify entities that specialize in one of the multiple functions involved in the overall process of communicating available channel information online to TVBDs.

Although the Order describes the role of a "database administrator" as if it is a unitary function, we request that the Commission clarify that it will also recognize and certify entities that specialize in one of the multiple functions involved in the overall process of communicating available channel information online to TVBDs from a continually updated repository of data on all of the frequencies and geographic locations approved for possible use. There are, for example, at least two different functions or roles related to the successful operation of a TV band database system that could be undertaken by various combinations of different and sometimes competing entities:

- A **Repository Service**, responsible for creating, updating and maintaining an accurate database and providing an interface for online queries;
- A **Query Service**, responsible for providing available channel information, based on data in the repository, to various classes of authorized TVBDs.

In addition, the registration of fixed TVBDs could conceivably be performed by a specialized entity, or as part of the service provided by the Repository and/or Query service. The Commission should clarify that it will not require, as a condition for certification, that a database service provider perform all of these functions. The expertise involved could be quite distinct. Moreover, if the repository service is not meeting the specific needs of certain categories of future TVBD users – in some cases for applications that cannot even be foreseen at the moment – a complementary or a competing Query Service provider should be permitted to operate and meet that need. In any case, the Commission should clarify that the data maintained by any entity authorized to provide the Repository Service must be made available by standard IP interface to any other authorized service or user.

B. The Commission should clarify that all information compiled in the TV bands database repository *be fully transparent to the general public online and a matter of public record.*

As a condition of certification, any entity, whether non-profit or for-profit, that seeks authorization to be a Repository Service must make the complete database searchable by the general public online. The collection of data comprising the database must not be allowed to become proprietary, for a number of reasons. Among these are that the public – and particularly both frequency band users and incumbents – should not be inhibited in their ability to inspect the accuracy of the database and to notify the administrator and/or FCC concerning inaccuracies. Transparency will prove to be the most potent disinfectant for flawed or out-of-data information. Moreover, the information itself, as mandated by the Order, is nearly all FCC public licensing data gathered at public expense, since it is pieced together by the administrator from FCC

sources or under the FCC's mandate by TVBD users and consumers. Indeed, the Commission acknowledges that "[a] TV bands database will obtain much of the information on licensed use of the television bands . . . from the existing Commission databases."[17] While the Commission should certainly authorize the Repository Service to recoup its costs via fees, it should explicitly prevent any incentive for a database administrator to horde a proprietary set of data on the occupancy and use of TV band channels, or of any frequency added to the database by FCC Order in the future.

C. We request that the Commission reconsider and clarify that its preference would be for a private but nonprofit service.

Inasmuch as the Order states an assumption that the "database(s) will be a privately owned and operated service,"[18] the Commission should clarify that its preference would be for a ***private but nonprofit*** service that will deliver the lowest possible cost to TVBD sellers and consumers. It is entirely possible that a consortium of firms and others with an interest in maximizing access, communication and innovative use of the unlicensed white space frequencies will at some point create a *nonprofit* entity with a mission to not only encourage access and efficient use of the band, but at the lowest possible cost to consumers of TVBDs. The Commission properly determined that "providing for the authorization of more than one party to operate a TV bands database"[19] will further the public interest more than a monopoly provider, to the extent that the Commission is selecting among providers, we urge a preference for a nonprofit database as most likely to maintain a fair and reasonable fee structure. At a minimum, the Commission should ensure that to the extent feasible, fees are limited to modest, one-

[17] *Id.* at ¶ 223.
[18] *Id.* at ¶ 204.
[19] *Id.* at ¶ 221.

time charges that can easily be incorporated into the retail price of the device. The Commission should seek to avoid a situation where TVBD access to the band is contingent on purchasing a recurring subscription service from the database administrator.

D. The Commission should reconsider and clarify that the TV band database will be capable of reporting not only queried channel availability, but also estimated signal strength data on adjacent and surrounding channels.

While the Order appears to require that the TV bands database will contain information from which this could be derived with respect to television station incumbents,[20] Commission should make the availability of this data explicit and mandatory with respect to any protected service, to the extent feasible. Cognitive radio devices will increasingly be capable of hopping between available TV channels – and increments of those channels – based on a combination of their own transmit requirements and on information about which appear most clear and likely to avoid interference with licensed incumbents in a particular locale. The availability of a channel at a location should not be a simple "yes" or "no" proposition in a world of rapidly improving cognitive radio capability. More detailed information about the estimated power of the transmitters licensed to use adjacent and other nearby channels could create a profile of the spectral "neighborhood" that permits TVBDs to use the white space more intensively and with less risk of inadvertent interference to licensed services or to other TVBDs.

Finally, although this is not addressed in the Order, the Commission should clarify that the database administrator(s) are permitted to compile and provide

[20] *Id.* at ¶ 213.

information concerning the status of other frequencies, in addition to the TV band frequencies, that could be lawfully used by the public, or by specific parties (such as potential lessees), including frequencies that the Commission may determine should be added to the database in the future.

IV. THE COMMISSION SHOULD RECONSIDER THE RESERVATION OF TWO ADDITIONAL CHANNELS ABOVE 21 FOR WIRELESS MICROPHONES IN MARKETS WITH PLMRS/CMRS OPERATIONS.

The order requires the reservation of two additional channels above 21 for wireless microphones in 13 metropolitan areas with PLMRS/CMRS operations.[21] This requirement is needlessly wasteful since the Commission already provides wireless microphone users with more than enough spectrum and protection by excluding personal portable devices from Channels 5-20. Considering the relatively small number of licensed wireless microphone uses (fewer than 1,000 Part 74 licensees as of mid-2008), their power levels, periodic use and the control they typically have over their performance venues, even prohibiting other low-power mobile devices from three or four channels to keep them clear for wireless microphones would be an enormous waste of spectrum capacity on an aggregate, national basis. The notion that this scattering of legal, low-power users needs to exclude all other consumers and innovation from fully 16 channels (96 MHz of bandwidth) in order to operate is not supported by the record nor in the public interest.

The Commission stated in the *Second R&O/MO&O*: "We believe that our decision to prohibit personal/portable TVBDs from operation on channels below channel 21 will generally ensure that an adequate number of UHF channels are available for

[21] *Id.* at ¶ 157.

interference free operation of these important itinerant wireless microphone uses. However, the number of UHF channels available will be more restricted in markets where there are PLMRS/CMRS operations in addition to TV and other authorized uses."[22] Although, we agree with the Commission that there is somewhat less UHF spectrum available for legal wireless microphone operation in the 13 metro markets where there are PLMRS/CMRS incumbents, blocking-off valuable channels exclusively for very intermittent wireless microphone users such as electronic news gathering is a highly inefficient use of the spectrum. Such wireless microphones would operate on a sporadic basis and over a very limited geographic range. Thus it is unnecessary and wasteful to preclude usage by personal portable devices for an entire metropolitan area, particularly when the Commission is also requiring personal/portable devices to use both the geolocate/database method and sensing to detect and avoid wireless microphones. As the Commission, itself, acknowledged: "We do not find it desirable to reserve channels for wireless microphone use in all markets. Such an approach would restrict the availability of spectrum for TVBDs and we see no reason to restrict TVBD operations on frequencies at locations and times where there are no microphone operations."[23]

In addition, the allocation of UHF spectrum solely for wireless microphone use would severely cut the amount of usable spectrum for personal portable devices in the 13 metro areas with PLMRS/CMRS operations, where the TV band is already crowded and a number of full-power TV stations will be migrating out of VHF and into channels 21 – 51 after the DTV transition. In a highly crowded market such as New York City, where usable spectrum for personal portable devices is already substantially limited, excluding

[22] *Id.* at ¶ 157.
[23] *Id.* at ¶ 200.

two additional channels could make such devices unworkable in the largest market in the U.S. In addition, by granting two exclusive channels wireless microphone users, the Commission is moving secondary users en masse (whether legal or illegal) to primary user status in the band. This would reward the wireless microphone industry with exclusive and lucrative spectrum rights in the TV band, despite evidence that many manufacturers have been marketing wireless microphone to unauthorized users.[24] The Commission has been more than accommodating to wireless microphone users. Granting exclusive use of valuable UHF channels to wireless microphones is inefficient and wasteful use of spectrum that could otherwise provide millions of Americans living in PLMRS/CMRS markets with access to innovative new wireless technology and devices.

V. THE COMMISSION SHOULD RECONSIDER THE OVERLY BURDENSOME PROCESS THE ORDER IMPOSES ON THE CERTIFICATION OF TVBDS RELYING ON SPECTRUM SENSING AND THE MAXIMUM EIRP OF THESE DEVICES.

A. The Commission should reconsider the requirement to place proposed test procedures and methodologies for certifying a submitted device on public notice.

The Order requires public notice of proposed test procedures and methodologies for certifying each new TVBD relying on spectrum sensing.[25] This requirement introduces substantial uncertainty into the certification process, allowing for the development of arbitrary and unpredictable test procedures and methodologies for each submitted device – creating ever-shifting standards and requirements for sensing-only TVBDs. The current rules as written do not provide adequate information for device manufacturers to design and build a compliant device and absolutely no means to pre-test or evaluate the ability of their device to pass the Commission's certification process. The

[24] *See* PISC, "Informal Complaint and Petition of the Public Interest Spectrum Coalition," July 16, 2008.
[25] *See Second R&O/MO&O*, at ¶ 260.

Commission currently provides few specifics regarding the interference avoidance requirements of these devices, only noting that devices "must demonstrate with an extremely high degree of confidence that they will not cause harmful interference to incumbent radio services"[26] and that a sensing threshold of -114 dBm "may or may not be the appropriate sensing threshold for these sensing only devices.[27]

Given such regulatory ambiguity and uncertainty, it is unlikely that device manufacturers will invest tens of millions of dollars to research and develop a market-ready device[28] without having any confidence the device will meet the Commission's yet-to-be-determined certification requirements and tests. By developing the technical requirements after the device has been submitted, the Commission is reversing the research and development process for manufacturers. Rather the Commission needs to establish the specific interference avoidance requirements and test procedures upfront and allow manufacturers to build devices to meet those requirements.

We believe the Commission has sufficient information from the record to develop standardized test procedures and methodologies for certifying all TVBDs that rely on spectrum sensing. Extensive public comment on test procedures and methodologies has already occurred during the Commission's testing of prototype TVBDs; and the testing process itself should provide the Commission with ample data to inform the development of standardized test procedures and methodologies. However, the Commission offered that prototype devices were not "designed to cope with certain real-world conditions such as strong adjacent channel signals or the challenges of operating in noisy environments"

[26] *Id.* at ¶ 258.
[27] *Id.* at ¶ 261.
[28] *Id. at* ¶ 259, "The pre-production sample device must be identical to the device expected to be marketed."

and "[t]his made it particularly difficult to fully validate the performance of the technology and develop standards."[29]

If the Commission feels the record is insufficient, we recommend the Commission put out a single public notice on a set of standardized test procedures and methodologies for certifying all TVBDs that rely on spectrum sensing. This will satisfy the Commission's desire for transparency and public input, while establishing a process to develop specific standards and interference avoidance requirements for all sensing-only devices. The Commission has done this previously in the 5470 – 5725 MHz band, developing and publishing specific test procedures to the satisfaction of industry groups and the Pentagon for wireless devices utilizing dynamic frequency selection (DFS) to avoid interference with incumbent military radar users.[30] By establishing the test procedures and methodologies upfront, the Commission will provide the appropriate incentive for device manufacturers to develop sensing-only TVBDs, facilitate continued technological innovation in cognitive radio technology, and support multiple approaches for efficiently sharing unused spectrum in the TV band.

B. The Commission should reconsider the two public notice requirements for certifying a sensing-only device.

The Commission should eliminate the overly burdensome requirement for a separate public notice of a device application.[31] Public notice of an application is a highly unusual step that is not required for standard device certification under 47 CFR 2, subpart J. As the Commission's own experiences in this proceeding have shown, opponents of TVBDs have not hesitated to politicize the technical testing process.

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[29] *Id.* at ¶ 257.
[30] *See* "Appendix," Memorandum Opinion and Order, FCC 03-122, adopted June 29, 2006, http://hraunfoss.fcc.gov/edocs_public/attachmatch/FCC-06-96A1.pdf.
[31] *See Second R&O/MO&O*, at ¶ 260.

Although the Commission's cautious approach in approving sensing-only TVBDs and desire for public input and transparency is understandable, it should not provide opponents of new technologies with the opportunity to further delay deployment without any basis in engineering.

Rather than impose the unnecessary burden and delay of separate public comment on the application and the results of the test report, the Commission should streamline the process and combine the two public notice requirements. This would allow public comment on the application and results from the testing process under a single public notice, giving parties with genuine concerns the opportunity to comment and introduce any contrary evidence. By combining these steps, the Commission can ensure transparency and engineering rigor without imposing unnecessary delay.

C. The Commission should reconsider increasing the maximum EIRP for TVBDs that rely on spectrum sensing.

The Commission decided to limit the maximum of EIRP of sensing-only devices to 50 mW "out-of-an abundance of caution with regard to their interference potential."[32] However, such a one-size-fits-all approach is unnecessarily limiting for future devices as sensing technology will continue to improve and advance. As the Commission recognized, "cognitive radio technology, including sensing, is in its nascent stage of development for commercial applications."[33] Therefore, a more reasonable approach, striking a better balance between the need to protect licensees from harmful interference while simultaneously enhancing the deployment of new wireless technologies, would be to determine the power levels of sensing-only devices based on their demonstrated performance. Given the rigorous, costly, and transparent testing and certification process

[32] *Id.* at ¶ 258.
[33] *Id.* at ¶ 257.

of sensing-only devices, it would be more logical and better serve the public interest to allow the devices to be certified to operate at transmit powers above 50 mW if they prove the device can do so without causing harmful interference. Rather than a one-size-fits-all approach the Commission should consider varying the interference avoidance requirements depending on the transmit power of a device. A device operating at 50mW would need to detect radio signals over a much smaller area than a device operating at 250mW. This empirically based standard setting would establish the appropriate incentives for device manufacturers to continue to improve and advance sensing technology.

At a minimum, it seems reasonable for the Commission to increase the maximum EIRP to at least 100 mW, in line with EIRP of database controlled personal/portable devices that are not required to meet the very strict "proof of performance" standard. In addition, the Commission is requiring that all TVBDs incorporate transmit power control, meaning that sensing-only devices would under most circumstances operate at power levels below 100 mW. [34] Also, it is important to note the Commission has authorized wireless microphones, that are wholly incapable of detecting incumbent radio services and that are also operated in large numbers by unlicensed users,[35] to operate at five times the power level of sensing-only devices or a maximum power level of 250 mW in the UHF band. [36]

Additionally, the current maximum EIRP limit of 50 mW is insufficient for spreading connectivity beyond a single room and therefore would be inadequate for ad-hoc mesh networking devices that could be utilized for establishing communications in

[34] *Id.* at ¶ 232
[35] *See* "Informal Complaint and Petition of the Public Interest Spectrum Coalition."
[36] *See* 47 CFR 74.861(e).

disaster areas, where Internet connectivity is not available. Such ad hoc wireless networks proved to be essential in providing desperately needed communications in disaster areas such as New Orleans after Hurricane Katrina[37] and would substantially benefit from the superior propagation characteristics of the TV band. This would also encourage the development networking and communication devices that provide non-internet connectivity such as next-generation digital wireless microphones utilizing spectrum sensing technology.[38]

VI. THE COMMISSION SHOULD RECONSIDER PROTECTING LOW-POWER TV BASED ON THE SERVICE CONTOURS OF FULL-POWER TV.

The Commission provided that it was extending the same level of protection to low power services as full-power because it did not "wish for viewers who rely on low power TV services to lose service as a result of interference from unlicensed TV band devices."[39] However, in its current form, this blanket protection regime would preclude the usage of valuable spectrum for expanding broadband access – something potentially of great benefit to all residents of these underserved areas – for the benefit of a very small minority of over-the-air (OTA) viewers actually capable of receiving low-power TV signals outside their limited service contours. The Commission should consider the cost/benefit of this proposal and the impact on the overall community, not just the subset of OTA viewers in a local area that may be able to receive low-power services.

As the Commission has noted, "TV receive antennas used in weak signal areas near the edge of a protected contour need to be high gain, and therefore highly

[37] *See* "Comments Jeff Allen of the Community Wireless Emergency Response Initiative," Federal Communications Commission, available at http://www.fcc.gov/pshs/docs/advisory/hkip/GSpeakers060306/ACT1054.pdf.
[38] *See* CSMG, "Potential for more efficient spectrum use by wireless microphones," Ofcom, November 4, 2008, available at http://www.ofcom.org.uk/radiocomms/ddr/documents/wirelessmics.pdf.
[39] *See Second R&O/MO&O* at ¶ 165.

directional, mounted on high masts and aimed toward the TV station being received."[40] As a consequence, in rural or exurban areas only a small number of viewers with these antennas are going to be able to receive low-power broadcasts outside their service contours. Therefore the number of viewers relying on low-power services outside the low-power protected contour would be quite low and the overall community would benefit greater from utilizing the open television spectrum for much needed wireless broadband connectivity.

To address any concerns with regard to specific situations that may arise, the Commission could create a process wherein Low-Power TV, Class A, translators, and boosters could receive expanded protection in the database, but only by demonstrating to the Commission the number of viewers outside the currently protected signal contours that would be harmed by the potential interference from TVBDs to be granted the extended contour protection. This would allow the Commission to determine benefit to a community of extending full-power protection to a low-power TV signal, versus opening the spectrum to TVBDs. This would be a more reasonable approach than the current blanket exclusion of these areas, especially since the Commission is not extending such protections "in any other context or application,"[41] and correctly did not extend protection for full-power stations beyond their existing signal contours.

VII. THE COMMISSION SHOULD RECONSIDER LIMITING FIXED TVBDS ON CHANNELS 5-20 TO COMMUNICATION WITH OTHER FIXED DEVICES AND PERMIT CONTROLLED CLIENT DEVICES.

In the *Second R&O/MO&O* the Commission concludes that it will prohibit personal/portable devices from operating below channel 21 and "will only allow fixed

[40] *Id*. at ¶ 166.
[41] *Id.* at ¶ 166.

devices that communicate with other fixed devices to operate on channels 5-20."[42] However, although Petitioners continue to disagree with the decision to prohibit personal/portable devices on any of the channels between 5 and 20, it seems even less defensible to prohibit *fixed* TVBDs – which are allowed to operate on those channels – from communicating with mobile devices, or other fixed devices, that are under their control in a master/slave protocol. The Commission cites the "nomadic nature and expected high numbers of personal/portable devices" as posing potential interference to the PLMRS/CMRS, Offshore Radiotelephone Service and other authorized services on channels 14-20. However, given the required reliance on permission to operate from access to the geolocation database, those concerns are not relevant outside of the 13 metropolitan markets where PLMRS/CMRS is in use, or the limited number of markets and channels where the other services are in use, since the Order requires that all of those channels and locations be blocked out as unavailable in the TV bands database.

It therefore seems unnecessary and unduly burdensome to prohibit a fixed TVBD access point from controlling "slave" handsets while relying on continuous updates from the geolocation database. This would be truer still if the "master" fixed device controlling the "client" devices could set power levels on a dynamic basis that would further alleviate any concerns of interference based on the unique characteristics of the local environment. Since the "master" device's location is fixed, the spectrum environment and interference risk created by the client devices is controllable and unlikely to vary much over time; and since fixed TVBD systems are registered, it would be possible to identify and correct a flaw in a master/client network.

[42] *Id.* at ¶ 152.

VIII. THE COMMISSION SHOULD NOT CREATE A "PROFESSIONAL INSTALLER."

Although the Commission did not mandate use of a "professional installer" as urged by some commentors, the Commission did provide that a "professional installer" could enter or subsequently reenter the coordinates for a fixed device in the database.[43] All others must incorporate some geo-location ability into the device.

Nowhere, however does the Commission define "professional installer" or "professional installation." Nor does the Commission explain why this unknown entity is more trusted to read numbers from a portable GPS unit and enter them into the database than any other person reading numbers from a mobile GPS unit. At best, this requirement will create confusion over needed certification to read a mobile GPS unit with sufficient accuracy. At worst, it invites organizations to create expensive and needlessly difficult certification processes that would prove burdensome to non-commercial network operators such as those maintaining community wireless networks. It also creates the potential for confusion and delay in the equipment market, as manufacturers decide whether to create equipment "for professional installment only" without geolocation capability, or whether to incorporate geolocation capability in all equipment (which would increase cost).

The day is long gone when determining precise coordinates required any particular expertise. Today, a hand held GPS unit designed for mass consumption can provide coordinates with the precision required by the Commission's rules. The entry of these numbers in the database will allow anyone concerned with their accuracy to verify the location and require deactivation of the device if the coordinates are inaccurate. The

[43] *Id.* at ¶¶90-91. *See* also 47 C.F.R. §15.711.

Commission should therefore eliminate any "professional installer" classification, and allow anyone to enter the coordinates for fixed devices without the need for internal geolocation capabilities.

CONCLUSION

WHEREFORE, the Commission should reconsider its determinations in the *Second Report and Order* and provide the relief requested.

Respectfully Submitted,

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