

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

In the Matter of)	
)	
Unlicensed Operation in the)	
TV Broadcast Bands)	ET Docket No. 04-186
)	
)	
Additional Spectrum for Unlicensed)	
Devices Below 900 MHz and in the)	ET Docket No. 02-380
3 GHz Band)	

EX PARTE COMMENTS OF SHURE INCORPORATED

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SUMMARY

To date, there is, still, no convincing empirical evidence that unlicensed portable devices can operate in the unassigned TV channels without causing significant interference to incumbent services, including wireless microphones. None of the arguments and reworked proposals recently submitted by portable device proponents adequately addresses the need to protect wireless microphone operations. The Commission must therefore reject recent arguments that it should take a leap of faith, not currently supported by the record, and proceed immediately to adopt rules that allow unlicensed portable devices in the TV bands. The stakes are too high to rely on promises to develop solutions in the future -- interference caused by portable devices will jeopardize vital wireless microphone operations in broadcast, news, sports, music, theater, religious and many other productions nationwide. Therefore, it is critical that the Commission maintain its focus on verifying technology claims and ensuring that promises of future innovations do not substitute for real solutions today.

To that end, Shure urges the Commission to scrutinize and test any *new* set of technology solutions being offered, such as the disabling beacon proposal recently submitted by Motorola and supported by Google. This proposal is particularly troubling because it wrongly requires incumbent users to shoulder the burden for interference protection from new devices. It is not a reasonable solution to offer up a plan that completely shifts that burden away from the companies proposing to introduce new interfering devices and squarely onto incumbent users and services.

Further, Motorola's beacons are still on the drawing board and given the risk of devastating interference to existing wireless microphone operations, proponents of this beacon system should submit a device(s) for laboratory and field testing and proposed white space

devices should be tested for their ability to reliably detect and respond to such a beacon. Even at this preliminary stage, it is clear that Motorola's beacons suffer from many technical hurdles that have not yet been addressed. Most obvious is the fact that the proposed beacon relies on spectrum sensing technology, the very technology currently under test and which, to date, has not been shown to work. Moreover, Motorola's beacon plan is not a practical interference protection solution for the vast majority of wireless microphones. Motorola's plan incorporates a set of cumbersome operational requirements that wastes spectrum and that make it wholly unfit for use by a significant portion of wireless microphone users, including, for example, news teams covering breaking news or sporting events.

Shure supports identifying sufficient channels that will be kept clear from white space device interference. However, Google's "safe harbor" proposal covering channels 36-38 provides little protection to wireless microphones because it involves channels that are either unavailable under the Commission's rules to wireless microphone use (channel 37) or are already significantly populated by DTV stations throughout the country.

Put simply, the case has not been made to move forward with any of the portable white space proposals at this time. Instead, the Commission should refocus its attention to examining fixed service proposals that protect wireless microphones and DTV from interference by keeping channels adjacent to DTV stations clear of new white space device transmissions. Fixed services present fewer interference issues than portable devices and this adjacent channel plan will create a truly safe harbor for wireless microphone operations, as well as provide critical protection to DTV operations. This approach represents an important potential opportunity to achieve the Commission's goal of facilitating deployment of new services in the television frequencies, especially rural broadband services, while protecting existing services.

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EX PARTE COMMENTS OF SHURE INCORPORATED

Shure Incorporated (“Shure”), by its undersigned counsel, hereby respectfully submits these *ex parte* Comments to address various wireless microphone issues raised by recent filings in this proceeding. The companies that are urgently pressing the Commission to allow unlicensed portable devices to operate in the unassigned TV channels have recently unleashed a volley of arguments and reworked proposals in an effort to convince the Commission to proceed immediately to adopt rules that permit unlicensed portable devices in the TV bands absent technical data to validate such actions. Unfortunately, none of these arguments and proposals adequately addresses the need to protect incumbent services including especially wireless microphone operations. Wireless microphones are vital to broadcast, news, sports, music, theater, religious and many other productions and it is critical that the Commission maintain its focus on verifying technology claims made in this proceeding and ensuring that promises of future innovations do not substitute for real solutions today. If portable device advocates cannot fully protect these uses, the Commission should be prepared to rule that it cannot justify adopting rules permitting portable devices in the television frequencies at this time.

The Commission should be applauded for launching the difficult yet very important open laboratory testing program and for its continued efforts to address complex interference issues raised by proposals to allow unlicensed portable devices in the TV bands. This testing is a limited, but essential, step in determining whether spectrum sensing technology will protect incumbent spectrum users if new portable devices are allowed to operate on TV frequencies.¹ Without convincing empirical data proving the proposed technology solution, the Commission should not allow portable devices to operate in the television frequencies.

With that in mind, Shure urges the Commission to refocus its attention on evaluating proposals for fixed services use, rather than portable use, of the unassigned TV channels. Among other operational requirements, it is also important to identify sufficient spectrum in which wireless microphones can continue to operate free from white space device interference. Given that assigned TV channels vary from location to location throughout the country, Shure submits that the most effective way to designate interference-free spectrum is to specify that channels adjacent to DTV stations, as well as certain channels in rural areas, are off limits to new white space device operations.² This “adjacent channel plan” will not only create a truly safe harbor for wireless microphone operations, it will provide critical protection to DTV operations from interference caused by white space devices operating in channels adjacent to DTV stations.³

¹ Other elements of dynamic frequency selection also need to be tested and demonstrated in both laboratory and field environments. See “Shure Presentation: FCC Test Plan for White Space Device (WSD) Interaction with Wireless Microphones” *attached to* Letter from Catherine Wang, Counsel to Shure Incorporated, to Marlene H. Dortch, Secretary, FCC, ET Docket No. 04-186, at 5 (Nov. 12, 2007) (outlining IEEE DFS parameters that should be tested prior to drafting rules).

² Shure recommends that at a minimum four (4) UHF and 2 (two) VHF channels be designated in each rural area as channels in which white space devices may not operate.

³ See “TV White Spaces Unlicensed Devices; Threat to the DTV Transition and Our Digital Future” *attached to* Letter from David K. Rehr, President, National Association of Broadcasters, and David Donovan, President, Association for Maximum Service Television, to Kevin J. Martin, Chairman, FCC, ET Docket No. 04-186, at 9 (Sep. 10, 2007) (stating that FCC data demonstrates that “operating on the next adjacent channel causes interference in a zone equal to 80-97% of a TV station’s service area.”).

This approach would enable the Commission to foster new uses of TV spectrum to provide rural broadband services while protecting existing services from interference.

I. The Commission Should Not Be Distracted by Efforts to Downplay the Role of Spectrum Sensing Tests

The White Spaces Coalition and other portable device proponents are, evidently, eager to get the Commission to agree that the use of unlicensed devices in the “white spaces” is a foregone conclusion. What was just a few months ago championed by Microsoft as a testing process that would “confirm that [the Coalition’s] proposal will protect broadcasters and wireless microphones,”⁴ is now, it appears from recent white space device proponent statements, just a minor fact-finding mission⁵ on the order of a momentary detour on the road that in their view should lead inexorably to one result: Commission rules allowing unlicensed portable devices to operate in the television bands. To the contrary, the tests of spectrum sensing technology are important in assessing claims that spectrum sensing is “proven technology” and can “guarantee” protection to incumbent users.⁶ The adoption of rules allowing portable devices into the TV

⁴ Letter from Scott Blake Harris, Outside Counsel to the White Spaces Coalition, to Marlene H. Dortch, Secretary, FCC, ET Docket No. 04-186, at 1 (Mar. 7, 2007).

⁵ See, e.g., Letter from Edmond J. Thomas, Advisor to the White Spaces Coalition, to Marlene H. Dortch, Secretary, FCC, ET Docket No. 04-186, at 1 (Feb. 28, 2008) (asserting that Commission’s testing process is merely a “data gathering effort to obtain information helpful to Commission’s efforts in determining appropriate operating parameters for white space devices); see also Letter from Edmond J. Thomas, Advisor to Microsoft Corp. and Philips Electronics North America Corp., to Marlene H. Dortch, Secretary, FCC, ET Docket No. 04-186, at 1 (Mar. 21, 2008) (asserting that the testing effort was intended only to “collect data in support of the Commission rulemaking”); Wireless Innovation Alliance, Press Release, “FCC Testing on Microsoft “White Spaces’ Prototype Successful,” (Feb. 11, 2008) (“The FCC will use results from the various devices to learn which technologies work better than others, which will help it set the ‘rules of the road’ for later testing and certification of consumer-grade devices”).

⁶ See, e.g., Reply Comments of Dell Inc., Google, Inc., The Hewlett-Packard Co., Intel Corp., Microsoft Corp., and Philips Electronics North America Corp., ET Docket No. 04-186, at 5 (Mar. 2, 2007) (“Coalition Reply Comments”) (incumbents will be guaranteed protection).

bands cannot be considered a *fait accompli* if the Commission is to live up to its stated obligation and commitment to protect existing services.⁷

Shure also takes issue with pressure on the Commission to overlook poor testing results on the theory that these are issues that will be worked out in the product commercialization and FCC certification process to come *after*, it is argued, the Commission adopts rules allowing portable devices to flood into the television frequencies.⁸ This suggestion ignores the fact that the Commission's certification process is designed to determine whether equipment is manufactured in accordance with the Commission's Rules and is not a process by which faulty interference protection methods that may already be reflected in the rules can be reconsidered and corrected. As such, this view puts the "cart before the horse" and is really only a promise to develop a solution sometime in the future.

Representations that wireless microphone operations will be protected are not supported by the prototype devices submitted to the Commission. As described by the manufacturers, Motorola's and Adaptrum's devices have no ability to sense or otherwise protect wireless microphone operations.⁹ Microsoft and Philips submitted devices with claims that they will "amply protect incumbent licensees from harmful interference."¹⁰ As of this date, all of the submitted Microsoft devices have shut down due to unexplained technical failures.¹¹

⁷ *Unlicensed Operation in the TV Broadcast Bands*, First Report and Order and Further Notice of Proposed Rulemaking, ET Docket No. 04-186, FCC 06-156, at 2 (rel. Oct. 18, 2006) ("Further Notice") (goal of proceeding is to introduce new technology in television band without creating interference for incumbents).

⁸ *See, e.g.*, Letter from Edmond J. Thomas, Advisor to the White Spaces Coalition, to Marlene H. Dortch, Secretary, FCC, ET Docket No. 04-186, at 1 (Feb. 28, 2008) (stating that "prior to being made available in the marketplace, the Commission will thoroughly evaluate the products in its certification process to determine that they will not interfere and will comply with the final operating parameters established by the Commission").

⁹ The Motorola and Adaptrum devices were built to sense ATSC and NTSC television signals.

¹⁰ Letter from Edmond J. Thomas, Advisor to the White Spaces Coalition, to Marlene H. Dortch, Secretary, FCC, ET Docket No. 04-186, at 1 (Jan. 18, 2008).

¹¹ *See* S. Lawson, *Another Microsoft Wireless Prototype Fails*, IDG News Service, March 29, 2008, <http://www.pcworld.com/article/id,143963/article> (last visited April 23, 2008) (noting that Microsoft's final

We recognize that the Commission staff is in the process of analyzing test data and possibly conducting further tests (and for that purpose, Shure has suggested additional laboratory and field testing procedures with wireless microphones that would help ensure that the Commission's examination is accurate and complete.) Although the Commission's process is not yet complete, Shure's observations of the laboratory tests, to date, reveal that neither device has been able to demonstrate acceptable sensing performance in the laboratory with respect to wireless microphone signals. Further, neither device has yet demonstrated wireless microphone sensing capability in actual or simulated real-world situations in which a DTV signal is present on the TV channel adjacent to the microphone signal. Although the testing process has not been completed, given the record to date, there is certainly no basis for taking the leap of faith urged by the white space device proponents that assumes spectrum sensing devices will protect incumbent services from interference.

Despite the efforts to downplay the testing process, it is important that the Commission remain focused on the empirical process of examining the reality of claimed "guaranteed" interference protection. Given the complexity of interference problems raised by white space proposals and the importance of the news, sports, music, theater, religious, educational and other productions at stake, if the proposed interference protections fall short, then the Commission must recognize that the case has not been made to move forward with the portable white space proposals at this time. Moreover, any *new* set of technology solutions offered to resolve interference concerns must be examined in laboratory and field tests before the FCC can develop rules that permit white space devices to operate in television spectrum.

prototype had "stopped working and been taken out of the process"). I2R submitted a device that failed before OET could perform tests.

II. Proposals for Disabling Beacons Will Not Adequately Protect Incumbent Operations and Will Not Serve the Public Interest

Both Motorola and Google have outlined a disabling beacon transmitter concept that they claim will protect wireless microphones.¹² It is noteworthy that neither Motorola nor Google proposes a plan to avoid operations on channels adjacent to TV operations -- channels that could be used to protect wireless microphones, as well as DTV, from harmful interference. Even though Motorola's plan does not protect wireless microphones or DTV by keeping adjacent channels clear of new potentially interfering devices, Motorola's plan provides generous protection of public safety and commercial mobile services by prohibiting new devices from operating on channels adjacent to PLMRS and CMRS in an extensive protection area (134 km for co-channels and 131 km for adjacent channels).¹³ The absence of a broader adjacent channel plan to protect wireless microphones and DTV is a significant flaw in Motorola's plan that must be addressed.

In its March 21, 2008 *ex parte* filing, Google promotes its "No Risk: Enhanced Spectrum Protection Proposal"¹⁴ but does not put forth any detail beyond a brief mention of the disabling beacon system that it is now pressing the Commission to adopt as the principal means of protecting wireless microphone operations.¹⁵ Wireless microphone users have already made

¹² See "Recommendations on Cognitive Radio (CR) Operations in TV White Spaces (TVWS)" attached to Letter from Steve B. Sharkey, Director, Spectrum and Standards Strategy, Motorola, Inc., to Marlene H. Dortch, Secretary, FCC, ET Docket No. 04-186 (Oct. 18, 2007) ("Motorola Whitepaper"); see also "Unlicensed Operation in the TV Bands: Recommended Rules, Field Testing of TV White Space Devices Using Database Techniques, Response to MSTV Comments," attached to Letter from Steve B. Sharkey, Director, Spectrum and Standards Strategy, Motorola, Inc., to Marlene H. Dortch, Secretary, FCC, ET Docket No. 04-186 (Mar. 28, 2008) ("Motorola Rules Proposal"); Letter from Richard S. Whitt, Washington Telecom and Media Counsel, Google Inc., to Marlene H. Dortch, Secretary, FCC, ET Docket No. 04-186 (Mar. 21, 2008) ("Google Proposal").

¹³ See "Draft recommended TVWS Rules - 3/28/08" attached to Motorola Rules Proposal, at 9 ("Motorola Draft Rules").

¹⁴ Google Proposal, at 2.

¹⁵ Google also "suggests" a "safe harbor" of three channels clear of white space devices on which wireless microphones may operate and spectrum sensing as a back up protection. See Google Proposal, at 3. As discussed below, these two elements would provide virtually no protection for wireless microphones.

clear that the proposal authored by Google will not provide needed protection to wireless microphones.¹⁶ In the absence of a fleshed-out plan from Google, we address our additional remarks regarding the proposed beacon system to the specific approach outlined by Motorola.¹⁷

For wireless microphone protection, Motorola suggests that a combination of a disabling beacon and spectrum sensing will provide sufficient protection for wireless microphone users.¹⁸ Motorola would have the Commission believe that its beacon and spectrum sensing plan is a comprehensive approach that should satisfy the obligation to protect incumbent users. However, neither the proposed beacon nor the backup spectrum sensing adds up to reliable protection for wireless microphones.

Shure identifies below some of the major issues raised by Motorola's beacon proposal:

A. Motorola's Beacon Proposal Wrongly Burdens Incumbent Users.

Motorola's beacon proposal is grounded on the faulty premise that it is the incumbent users and services that must shoulder the burden of finding, developing, purchasing, installing, providing security for, and troubleshooting interference protection solutions -- as well as living with the consequences of inadequate interference protection without recourse -- made necessary

¹⁶ See Ex Parte Comments of MLB, NASCAR, NBA, NCAA, NFL, NHL, the PGA TOUR, and ESPN as members of the SPORTS TECHNOLOGY ALLIANCE, ET Docket No. 04-186, at 3 (dated May 1, 2008) (the major sports leagues stated that Google's attempt to "strap[] together several deficient proposals under a new name, simply does not add up to a solution"); see also Kevin Bogardus, "Google's Spectrum Proposal Runs Into Trouble," The Hill, March 25, 2008, <http://thehill.com/business--lobby/googles-spectrum-proposal-runs-into-opposition-2008-03-25.html> (last visited May 5, 2008) (the Grand Old Opry called Google's beacon proposal "speculative" based on "unproven and untested" technology); Robin Berger, "Google Proposes White Space Plan," TV Technology, April 9, 2008, <http://www.tvtechnology.com/pages/s.0082/t.12654> (last visited May 5, 2008) (the Broadway League described the proposal as "inadequate").

¹⁷ See Motorola Whitepaper, at 29-34; see also Motorola Rules Proposal, at 3-9; Motorola Draft Rules, at 7, 10.

¹⁸ Motorola's plan also proposes reduced power for certain devices but enables Class A portable devices to operate at higher powers up to 4 Watts as long as they communicate with a Class A master station device. In the absence of reliable interference protection mechanisms, Class A devices will cause significant interference to wireless microphones. For DTV transmissions, Motorola proposes to employ geolocation technology as the primary protection. See, e.g., Motorola Rules Proposal, at 3-5.

by portable white spaces devices. While we support the exploration of solutions, including, in particular, adjacent channel plans, for the difficult interference issues raised by the proposals to allow additional uses of the television spectrum, it is not a reasonable solution to offer a plan that completely shifts that burden away from the manufacturers of interfering devices and squarely onto the incumbent users and services.¹⁹

B. Motorola's Beacons Are Still On The Drawing Board and Must be Tested.

The Commission must recognize that the disabling beacon that Motorola proposes in its draft rules is just a concept -- beacons do not exist today, have not been manufactured, and have not been tested by the FCC. Motorola is apparently interested in using the beacon technology to protect the public safety sector,²⁰ but no company has announced plans to develop a spectrum sensing beacon to be used in any other context. Shure urges the Commission to apply to the Motorola disabling beacon proposal the same commitment to examine and test technology it has applied to other proposed technology solutions being proffered to resolve the complex interference problems raised by white spaces proposals. Given the highly-problematic real-world consequences of interference to existing wireless microphone operations, proponents of a beacon system should submit a device(s) for laboratory and field testing and proposed white space devices should be tested for their ability to reliably detect and respond to such a beacon.

¹⁹ Portable device proponents suggest that the beacon is a simple, inexpensive solution but it is more likely that the proposed beacon, if it were ever implemented, would be a custom-built device and not a low-cost, mass marketed retail item. In rough order of magnitude, Shure believes that it is more likely that equipment price would approach \$1000 per beacon transmitter rather than the \$10 price tag bandied about in the press. See, e.g., W. David Gardner, "Google Wants FCC To Consider 'White Space' Spectrum For Handset Broadband," InformationWeek, March 24, 2008, <http://www.informationweek.com/story/showarticle.jhtml?articleID+206905388> (last visited April 23, 2008) Since each TV channel that needs protection would require a separate beacon and antenna under Motorola's proposal, costs for this system could quickly skyrocket.

²⁰ See Motorola Whitepaper, at 33 (noting that the IEEE 802.22.1 beacon supports tiered prioritization, and "public safety (incident scene) use of TVWS could be given high priority").

C. **Even in Concept, Motorola's Beacons Suffer from Many Technical Hurdles That Have Not Yet Been Addressed.**

Even though no beacons are actually manufactured today, it is clear that the plans for such devices suffer from a host of significant unresolved technical problems. Shure outlines just a few of these issues below:

1. **Motorola's beacon relies on spectrum sensing, which has not been shown to work.** The proposed beacon system relies on white space device spectrum sensing capability -- the very technology that is under test at the Commission's laboratory. As such, the proposed beacons are subject to the same complex technical difficulties that the Commission and white space device proponents are encountering in trying to determine whether spectrum sensing devices can reliably detect and avoid wireless microphone transmissions. If devices that rely on spectrum sensing cannot detect a wireless microphone, as discussed above, there is no basis to conclude that they would detect a beacon (assuming that they are required to "listen" for a beacon in the first place). This is especially the case for consumer personal/portable devices which are likely to have low gain antennas, making them highly susceptible to attenuation. The sensing capabilities of these devices will fluctuate dramatically based on environment, and may degrade quickly just by moving the device a few feet within a room.

The detection problem is exacerbated where a beacon is operating on a vacant TV channel that is adjacent to a DTV signal, which is where they would most likely be used. The presence of a high-powered DTV signal makes "sensing" a beacon an ineffective interference avoidance technique in adjacent channels, where the overlapping DTV emissions "blind" even sophisticated sensing devices. In this environment, where an

unlicensed device cannot accurately sense wireless microphones because it is overwhelmed by the nearby DTV signal, it is highly likely that a beacon will also remain undetectable and offer no protection.²¹

For all these reasons, the additional proposal by Motorola and Google to require white space device spectrum sensing capabilities as back-up protection does not enhance their wireless microphone protection plan. It is worth noting that Motorola itself displays little confidence in a spectrum sensing solution as it specifically recommends that channels 14-21, which is where many land mobile and public safety operations are located, should be off limits to portable white space devices which rely on spectrum sensing to protect incumbents.²²

2. **Proposed sensing levels are inadequate.** In its spectrum sensing proposal, Motorola admits that spectrum sensing is “technically challenging” and only references the IEEE 802.22 sensing levels, but does not provide specific sensing thresholds for the Class B devices in its proposed rules. Instead, Motorola states, “[w]e will further evaluate the sensing levels for Class B devices operating at 10mW” under its spectrum “sensing provisions” section. Furthermore, it is also alarming to note that Motorola does not submit a sensing threshold for their proposed beacon solution. Motorola only states that TV band devices “. . . must be designed with provisions to detect a disabling beacon conforming to

²¹ See “Shure Presentation: FCC - OET White Spaces Testing” *attached to* Letter from Catherine Wang, Counsel to Shure Incorporated, to Marlene H. Dortch, Secretary, FCC, ET Docket No. 04-186, at 8 (Mar. 14, 2008) (describing how unlicensed device prototypes have failed to detect wireless microphones during OET tests in channels adjacent to both weak and strong DTV signals).

²² See Motorola Whitepaper, at iii (stating that personal/portables “should not [be] allowed to operate on channels 14-20 to provide protection for land mobile systems used by public safety and enterprise operations due to difficulty of sensing non-broadcast signals in a mobile environment”).

the IEEE 802.22.1 standard.”²³ Without specifying the beacon sensing threshold, no incumbent protection will be provided if the portable devices are not mandated to detect the beacon at a minimum level of performance. Additionally, the IEEE 802.22 standard Motorola refers to also fails to provide incumbent protection via its own beacon standard, IEEE 802.22.1. As drafted, there is nothing in the base IEEE 802.22 standard that requires an 802.22-compliant unlicensed (license-exempt) device to detect the IEEE 802.22.1 beacon, nor does it specify what action the unlicensed device would be required to take to avoid incumbent interference if it did detect the beacon. These common shortfalls in Motorola’s proposal and the IEEE 802.22 standard further demonstrate that the proposed beacon-plus-spectrum-sensing approach will not guarantee protection to TV band incumbents from unlicensed device interference.

3. Motorola’s proposed beacon wastes spectrum. Motorola’s beacon proposal (referring to the IEEE 802.22.1 standard) wastes significant valuable spectrum in circumstances in which, ironically, the sole purpose of the beacon is to supposedly to achieve greater spectrum use. Motorola’s proposal requires that a separate beacon transmitter be established in each TV channel to be protected.²⁴ According to the IEEE 802.22.1 standard, each beacon will require a “keep out” zone of at least 750 kHz in the TV channel it is using. This represents a reduction in capacity of 2-3 wireless microphone channels per TV channel, which is very significant.

²³ See Motorola Draft Recommended TVWS Rules – 3/28/08 at §15.707(i) (reference to IEEE 802.22.1 standard).

²⁴ Motorola’s proposal is based on IEEE’s draft standards for 802.22 published in September 2007, which provide for a beacon enabled with a single RF transmitter capable of simultaneously occupying and protecting one individual television broadcast channel. See Motorola Whitepaper, at 29-34.

4. **Hidden node problems are not addressed.** Motorola's plan does not contain any requirement for white space devices to employ network sensing, *i.e.*, to communicate with each other to gain a more accurate sensing picture of the surrounding radiofrequency environment, which is critical to prevent "hidden node" problems. Even when functioning optimally, unlicensed devices sensing in isolation will frequently fail to detect a nearby beacon whose signal has been attenuated (*i.e.*, "hidden") behind natural or manmade obstructions such as a wall, body or car. Employing network sensing reduces the likelihood of a "hidden" beacon going undetected by ensuring that unlicensed devices communicate with each other about their immediate environment before transmitting.

5. **The proposed beacon will produce significant intermodulation interference causing missed beacon detection and making implementation impractical.** Motorola's proposal requires the beacon to operate at the same frequency in each TV channel, which Shure submits will cause intermodulation products to be created on those same frequencies in neighboring TV channels. This, in turn, would pose an interference threat to wireless microphones and DTV as the intermodulation products will be created in the unlicensed device receiver thereby causing missed detection of the primary beacon signal. As a result, in circumstances where multiple beacons are used, interference from intermodulation will render many additional frequencies unusable, resulting in a further loss of useable spectrum.

6. **Proposed operational rules make the beacon unworkable in most wireless microphone situations.** In order to be effective, beacons will need to operate at the maximum power level permissible under Part 74 rules. However, operating multiple high

power beacon transmitters near wireless microphone receivers will significantly degrade their operation. It will be necessary for the wireless microphone system to be separated by up to a hundred feet in some cases from the beacon transmitter(s) to reduce interference to an acceptable level. Users will need to find a place to install, secure and operate all of the necessary beacon transmitters -- a prospect that will be an extreme burden in the many already crowded venues in which wireless microphones are used. In many uses, this requirement renders a beacon system impractical as a meaningful interference protection system.

Further, Motorola's proposed operational parameters undermine the essential function of wireless microphones. In particular, Motorola defines the in-service monitoring time as 10 seconds (not 2 seconds or less as recommended by Shure). This means that after detecting a licensed wireless microphone, the device has an additional 10 seconds (the Channel Move Time) to vacate an occupied channel. As a result, from the time a microphone is switched on, the user will be required to wait 20 seconds or more before the microphone would be usable. This 20 second delay is unacceptable to wireless microphone users and is completely inconsistent with the essential function of wireless microphones to provide crystal clear, real-time audio transmissions.

D. Motorola's Beacon Plan Is Not a Practical Interference Protection Solution for the Vast Majority of Wireless Microphones.

A closer examination of the beacon that Motorola proposes reveals that it is an impractical solution for most wireless microphones. Motorola envisions a system that would require wireless microphone users in advance of seeking beacon protection to first enter into a database their wireless microphone identifying information including FCC license and call sign, channels used, service, status, city, state, country, file number, docket, facility ID, power levels,

reserved time of use, etc. Users would then be required to enter their beacon data in the database prior to commencing operation. Beacon data required to be input would presumably include FCC license information, geographic coordinates, desired protection radius, receiver height of the protected device, priority of the protected device, estimated time that protection is required, indoor/outdoor operation and a description of sub-channel maps (inter-beacon network), channels in use, and channel sub-groupings.²⁵ As proposed, one beacon transmitter would be required for each TV channel, requiring database entries for each. If a user did not have time to enter all data, wait for authentication, or did not have access to the required data, that user simply will not have access to whatever interference protection a beacon may provide. Further, Motorola specifies that the database would be presumed valid for use for *three full days* after the last download and *one full day* after loss of connection from the base station -- thus if a wireless microphone came on the air during this time period, it would receive *no protection*.

This cumbersome data entry requirement is wholly unfit for use by, for example, news teams covering breaking news stories. Roving news teams are often in the field with only minutes to deploy their cameras, wireless microphones and complementary equipment. These teams do not have time to deploy a separate RF transmitter that requires authentication from a central database before receiving interference protection for their wireless microphones. Moreover, a news team might be required to move to three or four locations quickly. Under Motorola's scheme, they would have to repeat this impractical step every time they redeployed. There are scores of other situations where wireless microphones are used in which this database entry model simply does not work. As a practical matter, Motorola's proposed beacon is not a realistic way to protect wireless microphones.

²⁵ See Motorola Whitepaper, at 30.

III. Google's "Safe Harbor" is Not Safe At All

Shure supports identifying sufficient channels that will be kept clear from white space device interference. Google suggests that the Commission can assure protection to wireless microphone operations by designating Channels 36 through 38 as channels off limits to white space devices. However, this proposal offers little protection for wireless microphones because these channels are not available for wireless microphone use. Channel 37 (608-614 MHz) is authorized for Wireless Medical Telemetry Service and Radio Astronomy on a co-primary basis²⁶ for both Federal and non-Federal government use. The Commission has already announced that it will exclude low power devices from operating on Channel 37 to protect these services²⁷ and wireless microphones are already precluded by rule from operating on Channel 37.²⁸

Additionally, Channels 36 and 38 are occupied by many television transmitters today, leaving little useful spectrum flexibility for wireless microphone use. As illustrated by the recent Report and Order establishing final DTV channels for permanent use after the DTV transition,²⁹ the FCC has granted authorization for operation on Channel 36 to forty-four digital television stations and thirty-five digital television stations have been authorized for operation on Channel 38.³⁰ Several of those digital stations operating on Channel 36 or 38 are located in major urban

²⁶ 47 C.F.R. § 95.1101; 47 C.F.R. § 2.106.

²⁷ See Further Notice, at ¶ 2, (stating that "to minimize the risk of interference to certain authorized services in the TV bands, we will not permit operation of TV band devices on TV channel 37 that is used by radio astronomy and wireless medical telemetry services..").

²⁸ See 47 C.F.R. 74.802 (channel 37 (i.e., 608-614 MHz) is not an assignable frequency for low power broadcast auxiliary stations); see also 47 C.F.R. 73.603 (which prohibits broadcast operations on channel 37 to protect radio astronomy stations from unwanted emissions).

²⁹ See *Advanced Television Systems and Their Impact on the Existing Television Broadcast Service*, Memorandum Opinion and Order on Reconsideration of the Seventh Report and Order and Eighth Report and Order, FCC 08-72 (rel. Mar. 6, 2008) ("DTV Report and Order").

³⁰ See Appendix B, DTV Table of Allotments, to DTV Report and Order.

markets such as Los Angeles, CA, Washington, DC, Dallas, TX, Seattle, WA and Baltimore, MD.³¹ A quick review of the FCC's station database also demonstrates that there are approximately 200 analog TV translator, low power and Class A television stations currently licensed to operate on Channels 36 or 38, many of which will continue to operate after the DTV transition.³²

The small amount of spectrum that would be available in Google's "safe harbor" falls far short of a workable wireless microphone interference solution. As shown in the graph attached in Exhibit I, it is difficult to designate "safe harbor" channels that identify sufficient nationwide spectrum free from white space device interference due to the different TV assignments in every market. The attached graph illustrates that under Google's "safe harbor" proposal, based on post-2009 DTV assignments,³³ there are no unoccupied TV channels in many major markets including:

New York	Nashville
Chicago	Cincinnati
Philadelphia	
San Francisco	
Houston	

³¹ See DTV Report and Order, at p. 5, 9, 44, 50, and 22. Stations KNBC(TV), Los Angeles, CA, WTTG(TV), Washington, DC and KDFI(TV), Dallas, TX will operate on digital Channel 36. Stations WMAR-TV, Baltimore, MD and KOMO-TV, Seattle, WA will operate on digital Channel 38.

³² See Broadcast Radio and Television Electronic Filing System (CDBS) at FCC website, http://svartifoss2.fcc.gov/prod/cdbs/pubacc/prod/cdbs_pa.htm (last visited on April 18, 2008).

³³ See DTV Report and Order, at 68-91.

Under the proposal, only one open channel is available for wireless microphone use in many other markets, including:

Dallas	Denver
Washington, DC	Sacramento
Tampa	Pittsburgh
Seattle	Baltimore
Cleveland	
Miami	

Based on Google’s plan to center safe harbor frequencies around channel 37, a minimum of 16 “safe harbor” TV channels (+/-8 channels centered on Channel 37) are required to identify just two (2) unoccupied TV channels in Philadelphia, the most congested market. In fact, the actual spectrum congestion is worse than what is depicted on the graph since it reflects only full power DTV stations in a post-DTV transition environment within a 70-mile contour³⁴ and does not account for the presence of low power television, Class A, translator and other television facilities. As discussed below, Shure submits that a better approach to identifying sufficient “safe harbor” channels is to specify that channels adjacent to DTV stations, as well as certain channels in rural areas, are off limits to new white space device operations.

IV. The Commission Should Focus on Fixed Service Proposals that Keep Adjacent Channels Clear of New Devices

Shure recommends that the Commission turn its attention to evaluating the prospects of new fixed services in the TV band rather than mobile or portable operations.³⁵ In addition to other safeguards that the Commission should continue to consider, any new device permitted in the TV bands must be prohibited from operating on channels adjacent to all DTV stations within

³⁴ For UHF frequencies, Part 74 requires a distance of 70 miles for microphone to TV separation.

³⁵ The Commission has recognized that “it is easier to protect incumbent operations in the TV bands, including wireless microphones, when devices are limited to fixed operation.” Further Notice at ¶ 17 (emphasis added).

their protected contours as a means of protecting wireless microphones and DTV stations.³⁶ (Wireless microphones have a long history of operating in adjacent channels without causing interference to existing signals as a result of the careful and extensive efforts of wireless microphone users to pre-coordinate their frequency use around the DTV signals.) This adjacent channel plan is the most effective means of identifying spectrum free from white space device interference given the variability from location to location of television spectrum in use. In addition, because there are far fewer DTV stations operating in rural areas, we recommend that certain TV channels in each rural market be designated as off limits to white space devices.³⁷ These “rural reserve” channels would ensure that wireless microphones users in rural areas can rely on these “clear” channels for interference free operation.

In this regard, the Commission should give serious consideration to the fixed service/adjacent channel protection proposal submitted by FiberTower Corporation and the Rural Telecommunications Group, Inc. and supported by Sprint Nextel Corporation and T-Mobile USA, Inc.³⁸ Shure believes that with appropriate power limits, this fixed/adjacent channel approach could go far toward providing much needed protection to wireless microphone services. This approach represents an important potential opportunity to achieve the

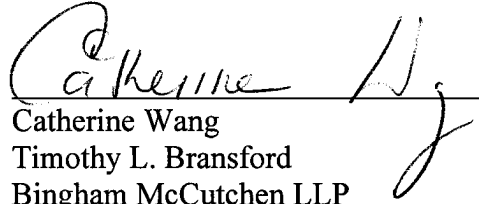
³⁶ All DTV stations should be entitled to interference protection within their protected contours, not just full power stations.

³⁷ Shure recommends that at a minimum four (4) UHF and 2 (two) VHF channels be designated in each rural area as channels in which white space devices may not operate.

³⁸ See “Optimizing the TV Bands White Spaces: A Licensed, Fixed-Use Model for Interference-Free Television and Increased Broadband Deployment in Rural and Urban Areas,” Ex Parte filing by FiberTower Corporation and the Rural Telecommunications Group, Inc., ET Docket No. 04-186 (Oct. 2, 2007).

Commission's goal of facilitating deployment of new services in the television frequencies, especially rural broadband services, while protecting existing services.

Respectfully submitted,

A handwritten signature in cursive script, appearing to read "Catherine Wang", written over a horizontal line.

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EXHIBIT

SAFE HARBOR Analysis (2 TV Channels CH. 36,38 within a 70 mile contour)

