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June 17, 2008

Via Electronic Filing

Marlene H. Dortch, Secretary
Federal Communications Commission
445 12th Street, SW
Washington, DC 20554

Re: Unlicensed Operation in the TV Broadcast Bands, ET Docket No. 04-186

Dear Ms. Dortch:

The White Spaces Coalition[1] is committed to bringing consumers powerful and innovative wireless technologies. These technologies will support education, public safety, entertainment applications, and much more. Because of the advantageous properties of white spaces spectrum, white spaces devices will serve as a foundation for future innovations that we can only imagine. In the years to come, the Federal Communications Commission will be proud of enabling these new devices, and will consider the development of white spaces devices to be as important for consumers and the economy as was the development of Wi-Fi.

As we have repeatedly said, however, we are also committed to protecting incumbent operators. Indeed, many of our core products, from digital televisions to Media Center PCs, use over-the-air television signals. We fully understand that in bringing consumers new spectrum-based technologies, the Commission must balance the vast benefits of innovation with the legitimate concerns of incumbents.

Our Coalition continues to believe that the best way to achieve this balance is for the Commission simply to require that personal/portable white spaces devices use spectrum sensing technology to detect and protect existing uses of the TV broadcast bands. We recognize, however, that the Commission has a difficult task when analyzing new technologies, and that adopting rules which include more protection for incumbents than is technically necessary may allow the Commission to open up the white spaces more quickly.

Therefore, in a spirit of compromise, our Coalition will now support rules that will provide additional protection to legal wireless microphone operations. Specifically, as outlined below, the Coalition will support a requirement that all white spaces devices include, in addition to

[1] The White Spaces Coalition's members include Dell, Inc., Google, Inc., Hewlett-Packard Co., Microsoft Corp., Palm, Inc., Philips Electronics North America Corp., and TDK Corp.

spectrum sensing capability, the ability to recognize a wireless microphone protection beacon and to avoid the TV channel in which the microphone is operating whenever they encounter such a beacon.

This beacon compromise is consistent with Shure, Inc.'s proposal to protect wireless microphones using beacons expressed earlier in this proceeding.[2] As Shure has explained to the Commission, it "conducted dynamic 'real world' tests of wireless microphone operation in the presence of co-channel interference."[3] This testing led Shure to propose that, to mitigate potential interference, the Commission should:

(1) Identify two VHF TV channels and four UHF TV channels to be exempt from unlicensed device operations; [4]

(2) Require unlicensed devices to employ spectrum sensing/dynamic frequency selection techniques in a distributed, cognitive fashion; [5] and

(3) Implement a beacon system.[6]

This three-part proposal is strikingly similar to the compromise now supported by the Coalition.

(1) Coalition members do not plan to use white spaces spectrum below channels 21 to ensure protection for public safety operations in channels 14-20, effectively reserving channels for wireless microphone operations as desired by Shure;

(2) The Coalition supports spectrum sensing/dynamic frequency selection, as did Shure; and

(3) Now, the Coalition will support a beacon system to provide additional protection to wireless microphones, as did Shure in the third part of its three-part protection proposal.

While the Coalition's beacon proposal is different in its details, it is similar in structure and in level of protection to that of Shure's proposal. Shure, in response to Motorola and Google, seems to have backtracked on its support of beacons,[7] but there can be no doubt that when combined with available spectrum in channels below channel 21 and the use of spectrum

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2 *See generally* Comments of Shure, Inc., ET Docket Nos. 04-186 and 02-380 (filed Nov. 30, 2004) ("Shure NPRM Comments").

3 Shure NPRM Comments at ii.

4 *Id.*

5 *Id.*

6 *Id.*

7 *See* Ex Parte Comments of Shure, Inc., ET Docket Nos. 04-186 and 02-380 (May 6, 2008) ("Shure Ex Parte").

sensing/dynamic frequency selection, the Coalition's proposal represents a very protective system for wireless microphones, as repeatedly sought by Shure.

The Wireless Microphone Protection Beacon and Spectrum Sensing: Belt-and-Suspenders Protection for Incumbent Operations

The Coalition is committed to protecting incumbent wireless microphone operations and has been since it was formed. As we have often said in this proceeding, we believe that wireless microphones can be fully and efficiently protected by a requirement that all white spaces devices sense wireless microphone signals and avoid occupied channels. But in order to aid the Commission in moving more quickly to final rules, we are now proposing a beacon approach to provide wireless microphone operators with additional protection.

For the beacon approach to work, however, it is critical that the requirement be defined correctly. An improperly defined beacon requirement could result in less than optimal protection for wireless microphones, or, alternatively, large geographic areas being unnecessarily excluded from operation by white spaces devices and additional costs for consumers. We therefore propose that the Commission adopt only those operating requirements necessary to protect legal wireless microphone operations adequately and not require a protection beacon with superfluous bells and whistles. Regulations should simply be specific enough to provide manufacturers with an easily recognizable beacon and also guarantee that all protection beacons exhibit the same distinctive signal characteristics to make them easy to detect.

The Coalition companies' engineers are continuing to study beacon approaches to protect wireless microphone operations, and here offer one set of beacon parameters that will protect wireless microphone operations without the need to mandate particular technologies. The key properties of the Coalition approach are a beacon signal transmitted at a power of 16 dBm centered in the middle of the TV channel in which the microphone to be protected is operating. The Coalition will support FCC rules that adopt a beacon design with these properties and may offer additional refinements in the future:

1) The total beacon power level should be +16 dBm;

2) The transmitted sequence should be the ATSC PN511 sequence plus an additional zero at the end, to make the signal DC-free and a power-of-two (namely 512) in length;

3) The modulation scheme should be DSBSC with a residual carrier similar to the ATSC signal (*i.e.*, if the signal consists of +1 and -1, the pilot is an additional +0.25 at baseband, before modulation);

4) The beacon chip rate and nominal bandwidth should be 100 KHz;

5) The carrier frequency should be exactly in the middle of the 6 MHz channel being protected;

6) The accuracy of the frequency reference should be better than +/- 10 ppm; and

7) Both the chip rate and carrier frequency should be locked, derived from the same frequency reference.

We also propose that the Commission adopt rules that account for the different spectral environments presented by different white spaces transmission power levels. The Commission should adopt rules that require white spaces devices transmitting at 4 W to give wireless microphone deployments a wider berth to maximize protection. The "protective bubble" established by beacons need, of course, not be as large for very low-power white spaces devices. The Commission should recognize this by setting the beacon detection threshold for the white spaces device relative to the device's transmitting power. For example, the rules should establish a 1 dB for 1 dB correlation between the beacon detection level and the device's transmit power, which would require a device proposing to transmit at 36 dBm to detect the same beacon at a level 26 dB lower than a device proposing to transmit at 10 dBm. By implementing this approach, the Commission can provide wireless microphones with a very generous protective bubble, but not deny white spaces devices the ability to operate in needlessly large geographic areas.

This is a belt-and-suspenders approach to protecting wireless microphone operations because it includes both sensing/dynamic frequency selection *and* beacons. It gives Part 74 license holders strong and adequate protection at *no cost and without the need for any change to their equipment* because every white spaces device must still be able to sense and avoid wireless microphone signals even when a wireless microphone does not employ a beacon. In addition, if a wireless microphone operator desires even greater protection, that operator, at modest cost, can include a protection beacon in their system with the assurance that every white spaces device will also have the capability to detect and avoid the protection beacon. Because all wireless microphone operators – even those operating without a Part 74 license – are protected through white spaces devices' sense-and-avoid technology, Shure's argument that white spaces operation will somehow require wireless microphone manufacturers to cross-subsidize broadband customers is simply not true. Each microphone will receive this protection without cost to the operator.

Even if a Part 74 license holder chooses to integrate a second level of protection through a beacon, the cost will be quite small. Shure's estimate of equipment prices approaching $1,000 per beacon[8] is wildly inaccurate. Preliminary designs lead Coalition engineers to estimate the cost of even an elective purchase of a stand alone beacon for an existing user looking to add a second layer of protection for an entire 6 MHz channel will be only $40 to $50 and, in large quantities, could be in the range of $10 – a tiny fraction of the total system cost of the wireless

[8] *See* Shure Ex Parte at 8 n. 19

microphone systems of Part 74 users. An integrated beacon, which will be built into new devices, should cost as little as $10 – and even this increase is an optional one only for those users that want two levels of protection. Clearly, Shure's outrageous estimate is just a scare tactic.[9]

Additionally, the Commission's final white spaces rules presumably will require beacons to operate effectively in channels adjacent to high power TV signals. White spaces device manufacturers will therefore comply with this rule and will build beacon detection technologies that detect and protect Part 74 wireless microphones in these channels. Each device type will undergo rigorous Commission type certification testing to ensure that this is the case. Any device that fails to detect and protect a beacon in these adjacent channels will fail type certification and never reach consumers. The Commission should therefore reject Shure's draconian, unsupported and inefficient demand to bar all white spaces operation in every channel adjacent to a TV signal. This would unnecessarily and drastically reduce usable frequencies, and is an attempt by Shure to reserve spectrum for the private use of its customers. It also demonstrates Shure's distrust of Commission certification testing, and misunderstanding of the current round of data gathering, which as Chairman Martin has explained, is "not testing a consumer product" but rather is "testing prototype devices to help [the Commission] set the rules at the beginning."[10] The efficient answer is that if white spaces devices are unable to meet the adjacent channel rules that the Commission sets after this testing, they will not be allowed to operate – but the Commission should not support Shure's call for a blanket prohibition that assumes that devices will not comply before type certification has even begun.

Lawful Uses of Wireless Microphones and Protection Beacons

It has long been an open secret that most wireless microphone use is unlawful. Thus, the Coalition also proposes that the Commission limit sales or other distribution of beacons only to legitimate Part 74 license holders. The Coalition proposes that the beacon be considered a "controlled device" and that operation should be licensed.[11] But a licensing requirement alone will not stop unauthorized individuals from acquiring beacons any more than this requirement has stopped numerous unauthorized individuals from purchasing the huge number of illegal wireless microphones that are in use today. Indeed, as Shure itself has observed, if the Commission authorizes a beacon approach, it is likely that beacons will be incorporated into wireless microphone systems themselves.[12] Accordingly, beacons must be made available only

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[9] Note that a wireless microphone composed of a wireless microphone and a base station receiver can be purchased retail on the internet for as low as $30 dollars (*see, e.g.*, http://www.cheapdjgear.us/ProductDetails.asp?ProductCode=DKW-3). Since an entire microphone system can be purchased for $30, the Coalition estimate of $40 to $50 dollars for a stand-alone beacon is more than reasonable and Shure's $1000 dollar estimate does not withstand scrutiny.

[10] *See* Molly Peterson, *Google, Microsoft Fight to Take TV White Space for Beyond Wi-Fi*, Bloomberg.com, June 2, 2008, http://www.bloomberg.com/apps/news?pid=20601127&sid=asZMcmQU6s24&refer=law.

[11] *Cf.* D. Gurney et al., Motorola Whitepaper: Recommendations on Cognitive Radio (CR) Operations in TV White Spaces (TVWS), ET Docket No. 04-186 at 31 (filed Oct. 18, 2007).

[12] *See, e.g.*, Shure NPRM Comments at 26.

to purchasers presenting a valid Part 74 license, and the Commission should impose significant penalties on illegal sale and/or use of beacons.

One of the odder aspects of this proceeding is that some of those most vociferous in wanting to protect the use of wireless microphones are using the devices unlawfully. We recognize, however, that some wireless microphone operations that are currently unauthorized are nevertheless in the public interest. *As a further part of our effort to find an acceptable compromise in this proceeding, the Coalition therefore proposes that the Commission address the issue of substantial illegal wireless microphone use in the TV bands by enlarging the Part 74 authorization for wireless microphones. It should include churches, Broadway, and other organizations for which the Commission determines the use of wireless microphones is in the public interest.* We also support an amnesty for past unlawful uses of those devices whose future use will be lawful.

Beacons: What to Avoid

As valuable as the beacon approach can be for providing additional protection for wireless microphones, like any idea it can be destructive if implemented poorly. For example, some have suggested incorporating the unapproved draft 802.22.1 into a protection beacon mandate. Such a technology specific mandate would be a disaster. Instead, the Commission should mandate the specific beacon detection capabilities that it determines are necessary to protect incumbent operations and then allow device manufacturers to determine how technologically to achieve these capabilities. The experience of the spread spectrum rules at 2.4 GHz is instructive in this regard. There, the Commission did not mandate the 802.11 standard. Rather, with general spread spectrum rules in place, 802.11 became widely—though not exclusively—adopted by industry. We propose that the Commission follow a similar approach when adopting the protection beacon. The Commission should not try to mandate specific hardware designs or guess which of the many moving parts of the draft 802.22.1 proposal will actually be approved by IEEE or which the marketplace will ultimately adopt.

Moreover, the draft 802.22.1 proposal specifies detailed encryption algorithms and includes superfluous requirements regarding the ability to read information in the modulated beacon tone that is not related to detecting and protecting wireless microphones. These requirements are beyond the scope of this proceeding and adopting the 802.22.1 draft proposal would require device manufacturers to build these capabilities into all products, increasing costs to consumers without improving protection to wireless microphone operations in the slightest. Therefore, the Commission's protection beacon rules should solely mandate the specific beacon parameters that will appropriately protect wireless microphones, such as those we have suggested above.

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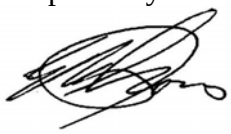
We continue to believe that the Commission can impose spectrum sensing requirements for all personal/portable white spaces devices with confidence that incumbent operations will be

protected. Recognizing, however, the Commission's challenge when creating rules for new technologies, and in a spirit of compromise, we now propose that the Commission provide additional protection to wireless microphone operators by authorizing the use of protection beacons as outlined herein.

We hope that this compromise will enable the Commission to adopt balanced white spaces operational rules more quickly, so that we can bring these exciting devices to the American public.

Respectfully submitted,



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cc: Julius Knapp, Chief, Office of Engineering and Technology