BEFORE THE
FEDERAL COMMUNICATIONS COMMISSION
Washington D.C. 20554

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

REPLY COMMENTS OF
THE GRAND OLE OPRY AND MICROPHONE INTERESTS COALITION ("MIC)

The Grand Ole Opry and Microphone Interests Coalition ("MIC") (hereafter referred to jointly as the "Coalition"), by their undersigned counsel, hereby submit these Reply Comments in response to the Commission's Further Notice of Proposed Rulemaking ("FNPRM") released October 18, 2006, in the above-captioned matter.[1] The Coalition consists of the Grand Ole Opry, as well as, the Nation's premier audio and RF producers and engineers.[2] The members of the Coalition are involved in the production of many of the most widely watched entertainment and sporting events viewed by the American public (*e.g.*, the *Super Bowl Halftime Show*, the *79th Annual Academy Awards Presentation*, and the *American Idol* series), nearly every Broadway performance, and all of the concerts conducted at the historic venues of the Grand Ole Opry.

In its earlier Comments, the Coalition implored the Commission to honor its commitment to prevent harmful interference to wireless microphones or risk devastating and far-reaching consequences to a variety of events and productions integral to the American culture. In these

[1] *Unlicensed Operation in the TV Broadcast Bands*, First Report and Order and Further Notice of Proposed Rulemaking, ET Docket Nos. 04-186, 02-380, FCC 06-156 (released Oct. 18, 2006) ("*FNPRM*").

[2] The Microphone Interests Coalition includes: ATK Audiotek, PRG Audio; Springboard Productions; Masque Sound; Sound Associates, Inc., Ed Greene, James Stoffo, Bill Evans, and Ed Wieczorek.

Reply Comments, the Coalition (1) supports the Commission's initial decision in the FNPRM not to allow unlicensed personal/portable devices to operate in the "white spaces" at this time, (2) cautions the Commission with regard to the dangers of over-reliance on untested and unproven spectrum sensing as an interference avoidance mechanism, and (3) urges the Commission to adopt a broader and more comprehensive protection plan for wireless microphones incumbent in the "white spaces."

I. PERSONAL/PORTABLE DEVICES ARE UNSUITABLE FOR THE "WHITE SPACES" AND SHOULD BE PROHIBITED

Numerous comments echoed the Coalition's grave concerns that personal/portable devices threaten both incumbent and future uses of the "white spaces." The en masse deployment of low-end untested personal/portable devices rightly concerns a diverse group of commenters. The Coalition, however, was particularly pleased to see several proponents of unlicensed operations voicing their strong opposition to personal/portable devices.[3] Among the commenters with longstanding experience in RF engineering, consensus appears to be building that allowing unlicensed personal/portable devices into the "white spaces" without interference avoidance measures beyond spectrum sensing will render the band unusable for applications that demand a high level of reliability.[4] The Coalition was also struck by the utter lack of evidence that any prototype personal/portable device has been designed or built by the devices'

[3] *See* Comments of Wireless Internet Service Provider Association ("WISPA"), filed in ET Docket No. 04-186 on February 20, 2007, at pp. 2,3 (stating that it believes "that personal portable devices, especially in urban and suburban markets would be best left to the higher frequency bands"); Comments of Roadstar High-Speed Internet ("Roadstar"), filed in ET Docket No. 04-186 on February 21, 2007, at p. 3 (noting that it expects "massive interference" if personal/portable devices are permitted in the band).

[4] *See* Comments of QUALCOMM, Inc. ("QUALCOMM"), filed in ET Docket No. 04-186 on January 31, 2007, at p. 3 (stating that "the current record in this proceeding does not support a conclusion that mobile/portable devices can operate in the TV White Space without causing substantial interference to the presently authorized services now operating in the band"); Comments of IEEE 802.18 ("IEEE"), filed in ET Docket No. 04-186 on January 31, 2007, at p. 3 (noting that technical solutions have not yet been found that permit personal/portable devices to co-exist with incumbents in the "white spaces"); Comments of Motorola, Inc. ("Motorola"), filed in ET Docket No. 04-186 on January 31, 2007, at p. 23 (noting that personal/portable will need additional interference avoidance mechanisms beyond spectrum sensing to avoid incumbents).

proponents. Based on the serious interference threat these devices represent, and their apparent immature state of development, the Commission should stand firmly behind its initial decision and restrict unlicensed operations in the "white spaces" to fixed applications.

The Coalition agrees that the "white spaces" are an unsuitable band for uncoordinated personal/portable devices. As noted by several commenters, the propagation characteristics enjoyed by the "white spaces," which allow low powered transmissions to readily pass through walls and solid objects, actually makes the spectrum undesirable for low-powered uncoordinated activity.[5] Personal/portable devices operating in spectrum below 900 MHz will have the potential to radiate far beyond the effective range of their unlicensed counterparts in the 902-928 MHz, 2.4 GHz and 5.8 GHz bands operating at similar power levels. In fact, otherwise strong proponents of unlicensed operations in the "white spaces" believe that the introduction of uncoordinated personal/portable devices into this potent spectrum makes it far more likely that "massive interference" will be experienced throughout the band.[6] Conversely, the current incumbents within the "white spaces" avoid interfering with each other because they have refined a comprehensive coordination process over the past several decades of operation. Of course, it will be impossible to coordinate between thousands of nearby personal/portable devices that randomly select frequencies without any operator input or override capability.

The Coalition is also understandably concerned that no prototype personal/portable device has been submitted to the Commission or introduced to the public. Although the coalition

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[5] *See* WISPA, at p. 2 (stating that it believes that "it is NOT in the consumers' best interests to have personal/portable devices with propagation characteristics that would naturally allow them to pass through interior walls but also exterior ones"); Comments of Roadstar, at p. 3; Comments of Charles L. Jackson and Dorothy Robyn ("QUALCOMM Consultants"), filed in ET Docket No. 04-186 on January 31, 2007, at p. 24 (asserting that "allocation of the TV band for low-power, short-range wireless networks would be the equivalent of using land in downtown Tokyo to grow rice").

[6] WISPA, at p. 3; Roadstar, at p. 3.

led by Dell[7] (hereafter the "Dell coalition") promised to "provide the Commission with a prototype device for testing purposes so that the Commission can confirm that the unlicensed devices which the [Dell coalition] plans to market will not cause harmful interference," to date, no evidence suggests that any such device has been delivered to the Commission.[8] This rulemaking has been ongoing for several years, and the lack of an actual working personal/portable device at this late stage of the proceeding is troubling and indicative of more serious problems with the prototype program. If this prototype does not arrive in the immediate future for incorporation into the Commission's complete battery of laboratory and field tests, the Coalition urges the indefinite suspension of further debate regarding the introduction of personal/portable devices in the band.

II. SPECTRUM SENSING IS AN UNPROVEN TECHNOLOGY THAT CANNOT BE THE SOLE INTERFERENCE PROTECTION IN THE "WHITE SPACES"

Now is the time for the proponents of spectrum sensing to substantiate their claims that spectrum sensing will protect incumbent devices. As evidenced by their comments, the interested parties with significant RF engineering experience agree with the Coalition that spectrum sensing is untested and insufficient to prevent interference to incumbent operations in the "white spaces." Going forward, the proponents of spectrum sensing must demonstrate that it is ripe technology for the sub-1 GHz band. The proponents of the technology must also show that it protects incumbents that have markedly different RF signatures. Unlike the 5 GHz U-NII band, the incumbents in the "white spaces" are each unique. Moreover, the technology can only

[7] Specifically, Dell Inc., Google, Inc., The Hewlett-Packard Company, Intel Corp., Microsoft Corp., and Philips Electronics North America Corp.

[8] *See* Comments of Dell Inc., Google, Inc., The Hewlett-Packard Company, Intel Corp., Microsoft Corp., and Philips Electronics North America Corp. (the "Dell coalition"), filed in ET Docket No. 04-186 on January 31, 2007, at p. ii (stating that the Dell coalition would "provide the Commission with a prototype device for testing purposes").

be validated if testing is open and observable, and accompanied by published test results that can be readily accessed by other interested parties.

The spectrum sensing concept has been heavily hyped. Now that the Commission is on the cusp of developing final technical rules, all potentially affected parties would like to see a real demonstration of the technology. Until working prototypes of spectrum sensing devices begin to appear, the Commission should not move forward with any final technical rules that rely heavily on spectrum sensing. Motorola noted in its comments that "while promising, [spectrum sensing] has not yet been demonstrated to be sufficiently robust to be used as an exclusive means of recognizing and avoiding interference with protected incumbents in the TV band."[9] Similarly, QUALCOMM stated that "[a]t this juncture, [it] remains highly skeptical that interference from mobile devices that would operate on an unlicensed basis, as many have advocated, can truly be mitigated through spectrum sensing technology."[10] The IEEE also voiced its concerns, stating that it "believe[s] that sensing alone is insufficient to adequately and completely assure the required level of interference protection."[11] This widespread skepticism coupled with the well-documented lack of a prototype device should put the Commission on notice that spectrum sensing alone will not offer incumbents sufficient protection from interference if and when unlicensed devices begin to proliferate in the "white spaces." In short, if spectrum sensing were that easy to implement, real hardware would have been available to test already. Further, if spectrum sensing were that effective, there would be no need to protect the public safety channels between 470-512 MHz. The Commission decision not to allow spectrum sensing

[9] Motorola, at p. 23.

[10] QUALCOMM, at p. 9.

[11] IEEE, at p. 6.

devices into the public safety channels clearly signals that spectrum sensing is not a fool-proof solution to interference avoidance.

The Coalition would also like to stress that the recent introduction of Dynamic Frequency Sharing ("DFS") devices in the 5 GHz Unlicensed National Information Infrastructure ("5 GHz U-NII") bands cannot serve as an exact template for the introduction of new devices in the "white spaces."[12] There are significant differences between the sub-1 GHz "white spaces" and the 5 GHz U-NII bands. Several commenters, including the Dell coalition, have underemphasized the distinctions between the two bands, and failed to mention the lengthy testing period that was required to fine tune the rules for unlicensed operations in the 5 GHz U-NII band.[13] An extensive cooperative testing effort between private industry, the Commission, the National Telecommunications and Information Agency ("NTIA"), and the Department of Defense ("DoD") was extended on multiple occasions in the 5 GHz U-NII rulemaking because enabling DFS prototype devices to properly detect government radar facilities proved "more complex than originally envisioned."[14] The incumbent radar installations in the 5 GHz band, however, are fixed and extremely high-powered. They are also typically located in isolated settings with a quiet RF environment. Conversely, spectrum sensing devices in the "white spaces" will need to sense constantly radiating high-powered TV stations, as well as intermittently operating low-powered devices such as wireless microphones. Moreover, they will also almost certainly need to sense incumbent devices in noisy urban RF environments.

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[12] *See Revision of Parts 2 and 15 of the Commission's Rules to Permit Unlicensed National Information Infrastructure (U-NII) devices in the 5 GHz band*, Report and Order, ET Docket No. 03-122, 18 FCC Rcd 24484 (2003) ("*5 GHz Report and Order*") (opening the 5.470-5.725 MHz band to unlicensed operations).

[13] *See* Dell coalition, at p. 4.

[14] *See Revision of Parts 2 and 15 of the Commission's Rules to Permit Unlicensed National Information Infrastructure (U-NII) devices in the 5 GHz band*, Order, ET Docket No. 03-122, at ¶ 6 (2006) ("*5 GHz 2006 Delay Order*") (extending the deadline for testing cooperative testing between private industry, the Commission, NTIA and the Department of Defense for an additional 180 days after an earlier 1 year extension).

Therefore, the Coalition urges the Commission to ignore any suggestions that the 5 GHz U-NII rulemaking offers a readily adoptable blueprint for spectrum sensing in the "white spaces." It took significant time and effort to resolve the technical challenges in the 5 GHz U-NII band, and there is good reason to believe that implementing spectrum sensing in the "white spaces" will present new challenges even more difficult to overcome.

The Coalition also implores the Commission to disregard privately conducted test results during its formulation of the final technical rules if test parameters are not made publicly accessible. Unsubstantiated test results should not be allowed to "cloud" or "muddy" the final development of these rules. The Dell coalition refers to its "own testing" in its comments, but never enters its test parameters or results into the record.[15] Test results, or assertions regarding the success of a test, only create confusion if not accompanied by the data that underpins the testing. The Coalition welcomes private testing in this rulemaking, and believes that such testing could bolster the primary testing efforts ongoing at the Commission, but only if conducted in a straightforward publicly accessible manner.

III. A COMPREHENSIVE INTERFERENCE AVOIDANCE STRATEGY IS NEEDED TO PROTECT INCUMBENTS AND THE VIEWING PUBLIC

Even if spectrum sensing works as its proponents anticipate, the Coalition agrees with the various commenters that acknowledge it is only one part of a broader interference avoidance plan for wireless microphones in the "white spaces." Although several additional protective mechanisms are likely needed to protect incumbents in the "white spaces," the Coalition urges the Commission to adopt a disabling beacon system and set aside a reserve channel exclusively for wireless microphones without further delay.

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[15] *See* Dell coalition, at pp. 14, 20.

The Coalition voiced its support for a disabling beacon in its Comments, and continues to firmly believe that such a beacon will be the most effective way to protect certain high-profile events that require significant numbers of wireless microphones from interference. Furthermore, both Motorola and the IEEE have stepped forward as proponents of a beacon system to protect wireless microphones, significantly bolstering the credibility of a beacon in the established RF engineering community.[16] If such a system is not adopted, performances at the Grand Ole Opry, Broadway productions, professional football games, political conventions, widely broadcast award ceremonies, and many other high-profile events will be inadvertently threatened by unlicensed devices that fail to detect the wireless microphone transmissions critical to these events. Failing to protect such high-profile events will harm the public, and would be inexcusable given the ease of implementation and simple rules needed to regulate a beacon.

Protecting wireless microphone users during routine applications that require twenty (20) or fewer channels will require reserved spectrum exclusively for wireless microphones. Several commenters promoted restricting unlicensed device operation to a sub-band within the "white spaces" as a means of permitting wireless microphones to operate reliably without interference.[17] The Coalition supports these proposals and recommends that the Commission identify six (6) channels that will be exempt from unlicensed device operation: two (2) VHF High Band channels (7-13) and four (4) UHF channels. Alternatively, if the Commission decides to adopt the adjacent channel plan proposed by the IEEE [18] to protect TV operations, the Coalition urges the Commission to exempt six (6) channels in rural markets to enable incumbent wireless

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[16] *See* Motorola, at pp. 18-19 (stating its support for a disabling beacon); IEEE, at p. 10 (outlining IEEE's plan for a beacon compliant with Part 74 parameters).

[17] *See generally* IEEE, pp. 8-9; MSTV, at pp. 19-20.

[18] *See* IEEE, at pp. 8-9 (which state IEEE's opposition to unlicensed device operation on co-channels or adjacent channels to DTV stations).

microphone operations to access some spectrum free from unlicensed device interference where relatively few TV stations operate.

IV. WIRELESS MICROPHONES MUST RETAIN THEIR PRIORITY REGARDLESS OF THE ULTIMATE LICENSING SCHEME

The Commission has made a commitment to protect wireless microphones regardless of whether or not a licensed or unlicensed regulatory scheme is applied to the "white spaces" at the conclusion of this rulemaking. The only way to satisfy this commitment is to ensure that wireless microphones retain their priority status in the band. The new entrants in the "white spaces" must be required to engineer wireless microphones into their interference avoidance mechanisms. If new entrants are not required to engineer around and protect wireless microphones, they will not hesitate to ignore and overpower them. The broader entertainment and information industry would be crippled, and the resulting harm to the American Public would be considerable.

V. CONCLUSION

The Coalition supports the Commission's decision not to allow personal/portable devices to operate in the "white spaces," and agrees with the other RF engineering experienced commenters that such devices cannot be introduced into the band without widespread complications. The Coalition also urges the Commission to thoroughly test spectrum sensing to make sure that it is a ripe technology ready for implementation in a radically new environment unlike bands where it has previously experienced some success. In addition, the Coalition urges the Commission to adopt a comprehensive interference avoidance plan to protect wireless microphones and other "white spaces" incumbents that includes a basic disabling beacon for large events, and reserve spectrum for more routine wireless microphone operations. Finally, regardless of the licensing scheme that the Commission ultimately selects, it must protect

wireless microphones by ensuring that they retain their priority over the new devices that will eventually jointly occupy the "white spaces."

Respectfully submitted,

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