

**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 Bands)	ET Docket No. 02-380
)	

REPLY OF GOOGLE INC.

Google Inc. (“Google”), by its attorneys and pursuant to Section 1.429(g) of the Commission’s rules, 47 C.F.R. § 1.429(g), hereby replies to Oppositions to and Comments on petitions for reconsideration of the Commission’s *Second Report and Order*.¹

I. INTRODUCTION

The Oppositions and Comments respond to the scores of proposed changes to the TV White Spaces rules sought by the 17 Petitions for Reconsideration of the *Second Report and Order*. Google takes this opportunity to reply with respect to two issues in particular that have the potential to effectively halt the progress of white spaces technology. First, the Oppositions and Comments reflect widespread support for eliminating the wireless microphone sensing requirement for white spaces devices (“WSDs”) operating under the geolocation database interference protection mechanism, as well as a growing consensus that the Commission should reserve additional spectrum for use by wireless microphones. The Commission should make these well-supported changes to the original order. Second, the Oppositions and Comments

¹ *In the Matter of Unlicensed Operation in the TV Broadcast Bands*, ET Docket No. 04-186, *Second Report and Order and Memorandum Opinion and Order*, 23 FCC Rcd. 16807 (2008), 74 Fed.Reg. 7314 (Feb. 17, 2009) (“*Second Report and Order*”).

confirm that there is no record basis to consider further lowering the current fixed 40 mW adjacent channel power limit for WSDs. Google also opposes any change to the rule establishing the frequency of contact with the TV bands database.

II. SPECTRUM SENSING AS A BACKUP TO OTHER PROTECTIONS FOR WIRELESS MICROPHONES IS UNNECESSARY AND SHOULD BE ELIMINATED

On the surface, the record in this proceeding reflects strong disagreement over the Commission's adoption of spectrum sensing as a mechanism to protect wireless microphone operations. On one side of the debate are wireless microphone manufacturers and users who argue that all wireless microphones, whether licensed or unlicensed, are entitled to an equal level of protection, and that sensing is needed to protect "roving" wireless microphones whose operating parameters are not conducive to registration in the TV bands database.² On the other side are proponents, including Google, of the enormous potential that the TV White Spaces hold to provide broadband services to businesses and consumers, particularly in rural areas; these parties agree that the current spectrum sensing requirement in combination with other protections results in over-protection of wireless microphones and may well render the promise of WSDs economically unviable.³

² See, e.g., Shure Incorporated Opposition to Petitions for Reconsideration ("Shure Opposition"), at 2-6; Comments of Sennheiser Electronic Corporation ("Sennheiser Comments"), at 4; Opposition of the Coalition of Wireless Microphone Users to Petitions for Reconsideration ("CWMU Opposition"), at 4, 9.

³ See Consolidated Opposition to Petitions for Reconsideration of the Wireless Internet Service Providers Association ("WISPA Opposition"), at 2-4 (noting that WISPA, IEEE 802, Motorola, the Wi-Fi Alliance, the Public Interest Spectrum Coalition, Dell Inc., Microsoft Corporation, and Adaptrum, Inc. all have asked the Commission to eliminate the sensing requirement). See also Comments on Petitions for Reconsideration of Carlson Wireless Technologies, Inc., at 4-5 (spectrum sensing requirements and should be eliminated); Comments of the Federation of Internet Solution Providers of the Americas ("FISPA Comments"), at 2 (same).

There is no disagreement, however, on the central question of whether spectrum sensing at its current stage of development will be effective in sensing at the -114 dBm threshold. Parties agree that spectrum sensing at this time does not appear to be a reliable method of interference protection. As Motorola explains, sensing technologies are not “sufficiently mature to rely on such methods.”⁴ The Society of Broadcast Engineers (“SBE”) finds that “sensing fails to protect wireless microphone operations,”⁵ and IEEE 802 and others note that the sensing requirement “results in the sensing device often wrongly detecting the presence of wireless microphones.”⁶ Shure agrees that at this time sensing “is not sufficient by itself to enable unlicensed devices to reliably determine the TV channels that are available for use at a location.”⁷ Most significantly, the Commission and its Office of Engineering and Technology (“OET”) previously have acknowledged that sensing is a “nascent” technology that has produced unreliable results.⁸ In light of these gating questions about the ability of a WSD to perform spectrum sensing reliably at the particular threshold adopted in the *Second Report and Order*, the Commission correctly determined that a geolocation database method provides the most effective means of interference protection for licensed incumbent services.

Notwithstanding their concurrence regarding the current state of sensing technology, the most vocal proponents of retaining spectrum sensing argue that it is needed to protect certain

⁴ Motorola, Inc. Opposition to Petitions for Reconsideration (“Motorola Opposition”), at 18. *See also* Petition for Reconsideration and Clarification of Motorola, Inc. at 12-13.

⁵ SBE Petition for Reconsideration (“SBE Petition”), at 16.

⁶ IEEE 802 Petition for Reconsideration at 5-6. *See also* FISPA Comments, at 2 (FISPA “doubts ... the ability of sensing technology to perform as intended”); Carlson Comments at 5 (spectrum sensing is an “unproven technology that could under-detect and over-detect the presence of signals”).

⁷ Shure Incorporated Petition for Reconsideration (“Shure Petition”), at 3-4 (quoting *Second Report and Order* at ¶71).

⁸ *See Second Report and Order*, ¶¶ 81-83.

equipment that cannot register in the TV bands database and thus would be protected *only* by sensing. For example, Shure asserts that “[s]pectrum sensing is necessary to protect those wireless microphones operating in a manner that makes registration in the Database impractical. Many microphone operations ... are often itinerant with equipment being deployed to respond to immediate needs with little opportunity for advance planning or Database registration.”⁹

Google notes that there is virtually no record evidence of the actual number of the devices described by Shure and others. Although newsgathering is a valid example of instances when “roving” wireless microphones will be used,¹⁰ many other cited examples, such as live theater and sporting events,¹¹ are not. In fact, the times and locations of Broadway performances, “Monday Night Football,” and numerous other events are scheduled long before the event occurs, and thus can and should be entered into the database.

Notwithstanding the scant record regarding the extent of wireless microphone usage that cannot be registered, if the Commission still believes that such equipment is entitled to protection, it should adopt the recommendation of several parties to set aside additional spectrum for such use. Specifically, as Motorola¹² and SBE¹³ have proposed and MSTV/NAB now agrees,¹⁴ the Commission should expand the current set-aside of two channels in 13 metropolitan

⁹ Shure Opposition, at 6. *See also* Sennheiser Comments, at 4 (agreeing with Shure); Opposition and Comments of MSTV and NAB to Petitions for Reconsideration and Clarification (“MSTV/NAB Opposition”), at 20 (“roving wireless microphone operations ... must be protected by some means other than the geolocation database method”).

¹⁰ *See* MSTV/NAB Opposition at 20.

¹¹ *See* CWMU Opposition, at 10-11.

¹² Motorola Opposition, at 17.

¹³ SBE Petition, at 17.

¹⁴ MSTV/NAB Opposition, at 20.

markets, to include all markets in the country.¹⁵ Doing so will address the concerns of both WSD proponents, for whom the current sensing requirement will deter innovation and investment, and wireless microphone advocates, who will continue to benefit from the primary geolocation database interference protection mechanism adopted by the Commission.¹⁶

Finally, Google agrees with Motorola, the Wi-Fi Alliance, Shure, and others that the Commission must address and clarify the threshold question of eligibility for registration in the TV bands database. Several alternative solutions have been proposed.¹⁷ In the event that the Commission expands the safe harbor spectrum for wireless microphones to include all markets, Google agrees with Motorola that unregistered wireless microphones should not be eligible for

¹⁵ CWMU appears to be alone in opposing this change. According to CWMU, proponents “are seriously uninformed about the demands for Wireless Microphone facilities in modern stage and sports presentations.” CWMU Comments, at 10. But, as noted above, many if not all of the stage and sports events cited by CWMU can be registered in the TV bands database. *See also* Opposition to Petitions for Reconsideration of the Public Interest Spectrum Coalition (“PISC Opposition”), at 12-13. As CWMU defines “Wireless Microphones” (*id.* at 2) the term includes unlicensed wireless microphones; no one, including the Commission, knows the extent of illegal use of such devices.

¹⁶ As Google and many others have shown, if the Commission retains the sensing requirement for wireless microphones operating under the management of a TV bands database, there is substantial justification for granting reconsideration of the -114 dBm sensing threshold adopted in the *Second Report and Order*. Google will not re-address those arguments here, but does note that Shure is far off the mark in claiming (Shure Opposition, at 7) that Microsoft and Dell have changed their view on the appropriate threshold. Those companies and others, including Google, originally proposed a -114 dBm threshold on the assumption that sensing would be the only interference protection mechanism. With the adoption of other substantial interference protection mechanisms, the basis for the -114 dBm threshold no longer exists. Moreover, as PISC notes (PISC Opposition, at 11), Shure itself initially assumed a higher -107 dBm threshold.

¹⁷ *See* PISC Opposition, at 9 (proposing establishing a new General Wireless Microphone Service to operate on vacant UHF channels below Channel 52, with co-equal status to WSDs); Comments of the Wi-Fi Alliance to Deny the Shure Petition for Reconsideration (“Wi-Fi Alliance Comments”), at 3 (proposing that all unlicensed wireless microphones be considered Part 15 devices under the white spaces rules); Shure Opposition at 16 (proposing that all wireless microphones, regardless of use, power level, or licensed status, should be afforded protection).

protection and should migrate to the reserved channels.¹⁸ Alternatively, unregistered wireless microphones should be treated as Part 15 devices co-equal with WSDs, as proposed by the Wi-Fi Alliance.¹⁹

In sum, the extensive record and consensus that the requirement of spectrum sensing as adopted for wireless microphones will not serve its intended purpose²⁰ compel elimination of the requirement for WSDs operating under management of a geolocation database.²¹ Google concurs with WISPA that “[t]he record is clear – maintaining the sensing requirements will do a great deal of harm while offering no benefits to incumbents or wireless microphones.”²² Indeed, as Google has explained, WSDs would be prevented by rule from operating in vast areas of the country, destroying the economic viability of WSDs and defeating the Commission’s laudable goals in this proceeding.²³

III. PORTABLE WSD ADJACENT CHANNEL POWER LEVELS SHOULD NOT BE REDUCED

Google agrees with PISC and Dell/Microsoft that no legitimate basis exists in the record for the Commission to further reduce the current 40 milliwatts (mW) adjacent channel power

¹⁸ Motorola Opposition, at 20.

¹⁹ Wi-Fi Alliance Comments, at 3.

²⁰ Shure thus is flatly incorrect in claiming there is “no persuasive evidence why the Commission should now reverse” (Shure Opposition, at 5) its decision to adopt spectrum sensing as a backup to safe harbor spectrum and to other interference protection mechanisms in the rules.

²¹ In particular, the Commission should revise the first two sentences of Section 15.711(c)(1)(i) of its rules to state: “All fixed and personal/portable TVBDs must be capable of detecting ATSC digital TV and NTSC analog TV signals using analog or digital modulation methods. All fixed and personal/portable TVBDs not operating under the interference avoidance mechanisms of Section 15.711 must be capable of detecting wireless microphone signals using analog or digital modulation methods.”

²² WISPA Opposition, at 4. *See also* FISPA Comments, at 2 (“the high costs and operational burdens to purchase and install the sensing technology would be so prohibitive that WISPs would have no interest in accessing the white spaces”).

²³ *See* Opposition and Comments of Google, at 10.

limit for WSDs. The Commission, therefore, should reject the reconsideration proposals of Shure and the SBE to lower the output power limit of personal/portable WSDs operating on the adjacent channels to 10 or even 5 mW.²⁴ As Google and PISC have explained, these proposals for radical reductions in output power would render the adjacent channels completely non-viable in major U.S. markets. With the consequent loss of economies of scale, the FCC's goals for a nationwide white spaces network and significant investment in WSD technology would be rendered impossible. Unnecessary constraints on adjacent channel operation and power levels would severely constrain widespread deployment, limiting market opportunities for WSD providers in major markets and making deployment in rural areas cost-prohibitive.

The years-long record in this proceeding shows that the Commission's approach – with extensive interference protection (indeed, considerable overprotection in some cases) for all of the legitimate adjacent channel interference concerns – reflects sound and conservative engineering practices, as well as a deliberate balancing of competing goals for broadband deployment, the efficient use of the White Spaces spectrum, and the adequate protection of incumbent licensees. While it is unsurprising that various TV broadcasting interests continue to press the Commission for even more protection from any and all theoretical interference, these parties bring nothing of significance that is new at this late stage of the process. Instead, they accuse OET of basing the interference standards upon “flaws in the methodology,” and speculate that, as a consequence, “viewers will experience widespread interference” because a single WSD will “turn the entire neighborhood into a digital ‘loss area’ the moment it turns on.”²⁵ These unsupported claims are nothing more than fear-mongering.

²⁴ Shure Petition, at 7-9; SBE Petition, at 2-10

²⁵ MSTV/NAB Opposition, at 3-4.

On reconsideration, the FCC must continue to employ an appropriate and balanced Part 15 “harmful” interference standard. This standard looks to the “significant risk of harmful interference”²⁶; it is not a talisman for incumbent licensees to eradicate non-interfering Part 15 uses of the spectrum unlikely to result in a material disruption of the licensee’s service. Licensees undertaking the privilege of using the public’s spectrum have no place to re-assert “doomsday” potential interference claims about other Commission-approved uses of the spectrum not proven to inflict a material degradation of the licensee’s service.²⁷ The Part 15 policies reflect that unlicensed services serve a very critical role in our Nation’s economy and, when the Commission approves new entrant technology on a Part 15 basis as it has done in the *Second Report and Order*, it is the duty of all licensees to support the Commission’s spectrum development policies.²⁸

²⁶ *In the Matter of Amendment of Parts 15 and 90 of the Commission's Rules to Provide Additional Frequencies for Cordless Telephones, Report and Order*, 10 FCC Rcd 5622, ¶ 16 (1995) (Part 15 cordless phones pose no “significant risk of harmful interference” requiring additional interference protections for FCC licensees, even if some interference may occur under some scenarios); *id.*, ¶ 18 (use of spectrum by Part 15 devices is “compatible” with operation of TV receivers where the potential for interference is “limited” or “very low”). Part 15 defines “harmful interference” as “[a]ny emission, radiation or induction that endangers the functioning of a radio navigation service or of other safety services or seriously degrades, obstructs or repeatedly interrupts a radiocommunications service operating in accordance with this chapter.” 47 C.F.R. §15.3(m).

²⁷ *AT&T v. FCC*, 270 F.3d 959, 964 (D.C. Cir. 2001) (“Absent harmful interference, [new entrant’s] system does not trammel upon petitioners’ rights as licensees.”).

²⁸ 47 U.S.C. § 157(a) (“It shall be the policy of the United States to encourage the provision of new technologies and services to the public.”), § 303(g) (it is the Commission’s duty to “encourage the larger and more effective use of radio in the public interest.”). As with the Commission’s Part 15 BPL decisions, the public interest in “bringing broadband services to the public are sufficiently important and significant so as to outweigh the limited potential for increased harmful interference that may arise,” and thus the Commission’s decisionmaking here “weighed the public interest, convenience and necessity in adopting reasonable regulations to effectively control the harmful interference potential” of WSDs. *In the Matter of Amendment of Part 15 Regarding New Requirements and Measurement Guidelines for Access Broadband over*

The reconsideration requests of Shure and SBE raise no new legitimate concerns and must be denied. The current adjacent channel power level is one of numerous protections that must be incorporated into the design and operation of WSDs, and cannot be viewed, as Shure does, merely as an alternative to adjacent channel operation. The record is clear that the combination of interference protection mechanisms will enable viable adjacent channel operation at 40 mW.²⁹ Moreover, as Adaptrum demonstrated, “the potential for adjacent channel interference is extremely small” even where the WSD “is operating around 100 – 250 mW EIRP.”³⁰ Further, neither Shure nor SBE address the Commission’s findings that other, additional protections of the current technical rules further minimize the likelihood of actual adjacent channel interference. These protections include the stringent out-of-band emissions mask which will “decrease the interference potential of first adjacent channel” WSD signals. Further, while the FCC conservatively chose the D/U ration of -32 dB when setting the 40 MW power limit, the agency likely over-compensated because “the median adjacent channel D/U ratio for the sampled receivers was -38 dB when the desired DTV signal was near the threshold level for service.” Moreover, the horizontal polarization of nearly all outdoor TV antennas will also contribute to “reducing the level of the TVBD signal at the TV receiver.”³¹

IV. THE DAILY DATABASE CONTACT REQUIREMENT MUST BE RETAINED

In its Petition, Shure asked the Commission to require WSDs to “check frequency availability in real-time” from the TV bands database. As PISC explains, any rule that would require database administrators and users to synchronize their information within any period of

Power Line Systems, Memorandum Opinion and Order, 21 FCC Rcd. 9308, ¶ 55 (2006), *remanded in part, aff’d in part, ARRL v. FCC*, 524 F.3d 227 (D.C. Cir. 2008).

²⁹ See *Second Report and Order*, ¶¶ 171-178.

³⁰ Petition for Reconsideration of Adaptrum, Inc., at 5.

³¹ *Second R&O*, ¶ 177.

time less than daily would be “wholly unnecessary, possibly unworkable and imposes undue costs,” and likely would encourage inefficient spectrum use.³² Google joins PISC and Dell/Microsoft³³ in asking the FCC to reject Shure’s request.

V. CONCLUSION

For the reasons set forth above, the Commission should eliminate the wireless microphone spectrum sensing requirement for wireless microphones operating under the geolocation database interference protection mechanism, deny requests to further lower the fixed adjacent channel power limit, and reject all proposals to alter the TV bands database rule.

Respectfully submitted,



Richard S. Whitt, Esq.
Washington Telecom and Media Counsel

GOOGLE INC.
Public Policy Department
1101 New York Avenue NW
Second Floor
Washington, DC 20005

May 18, 2009

E. Ashton Johnston
Mark J. O’Connor
Joanna I. Georgatsos

LAMPERT, O’CONNOR & JOHNSTON, P.C.
1776 K Street NW, Suite 700
Washington, DC 20006
(202) 887-6230 tel
(202) 887-6231 fax

Counsel for Google Inc.

³² PISC Opposition, at 11-12.

³³ Consolidated Opposition to Petitions for Reconsideration of Dell Inc. and Microsoft Corp., at 6-7.

CERTIFICATE OF SERVICE

I, Sybil Anne Strimbu, certify that copies of the foregoing *Reply of Google Inc.* have been served via electronic mail (*) or first-class United States mail, postage prepaid, this 18th day of May 2009, to the following parties:

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

Matthew Rantanen
Tribal Digital Village
P.O. Box 1470
Valley Center, CA 92082

* Best Copy and Printing, Inc.
445 12th Street SW
Room CY-B402
Washington, DC 20554

Steve B. Sharkey
Robert D. Kubik
MOTOROLA, INC.
1455 Pennsylvania Avenue NW
Suite 900
Washington, DC 20004

Dr. Haiyun Tang
ADAPTRUM, INC.
1815 McCandless Drive
Milpitas, CA 95035

Neal M. Goldberg
Loretta P. Polk
25 Massachusetts Avenue NW, Suite 100
Washington, DC 20001-1431

Counsel for the National Cable & Telecommunications Association

Donald G. Everist, P.E.
COHEN, DIPPELL AND EVERIST, P.C.
1300 L Street NW
Suite 110
Washington, DC 20005-4183

Harold Feld
PUBLIC KNOWLEDGE
1875 Connecticut Avenue NW
Suite 650
Washington, DC 20009

Counsel for Public Interest Spectrum Coalition

Peter Tannenwald
FLETCHER, HEALD &
HILDRETH, P.L.C.
1300 North 17th Street
11th Floor
Arlington, VA 22209-3801

Richard A. Rudman
11054 Ventura Boulevard
Suite 700
Studio City, CA 91604

Counsel for the Community Broadcasters Association

R. Paul Margie
Edmond J. Thomas
S. Roberts Carter
HARRIS, WILTSHIRE & GRANNIS LLP
1200 18th Street NW
Washington, DC 20036

Counsel for Dell, Inc., and Microsoft Corp.

Susan Eid
Stacy R. Fuller
DIRECTV, INC.
444 N. Capitol Street NW
Suite 728
Washington, DC 20001

Linda Kinney
Brad Gillen
DISH NETWORK LLC
1233 20th Street NW
Suite 302
Washington, DC 20036

Michele C. Farquhar
Paul A. Werner
Mark W. Brennan
HOGAN & HARTSON LLP
555 13th Street NW
Washington, DC 20004

*Counsel for FiberTower Corporation; Rural
Telecommunications Group, Inc.; COMPTTEL; and
Sprint Nextel Corporation*

Michael Lynch
108 Brentwood Court
Allen, TX 75013

*On behalf of the IEEE 802 Local and Metropolitan
Area Networks Standards Committee*

Dane E. Ericksen
18755 Park Tree Lane
Sonoma, CA 95476

Catherine Wang
Timothy Bransford
BINGHAM MCCUTCHEN LLP
2020 K Street NW
Washington, DC 20006

Counsel for Shure Incorporated

Christopher D. Imlay
BOOTH, FRERET, IMLAY &
TEPPER, P.C.
14356 Cape May Road
Silver Spring, MD 20904-6011

Counsel for the Society of Broadcast Engineers, Inc.

Rich Kennedy
7305 Napier Trail
Austin, TX 78729

On behalf of the Wi-Fi Alliance

Stephen E. Coran
RINI CORAN, PC
1615 L Street NW
Suite 1325
Washington, DC 20036

*Counsel for the Wireless Internet Service Providers
Association*

Jesse M. Caulfield
KEY BRIDGE GLOBAL, LLC
8000 Towers Crescent Drive
Suite 1350
Vienna, VA 22102

James Carlson
CARLSON WIRELESS
TECHNOLOGIES, INC.
1385 8th Street
Arcata, CA 95521

Jim Hollis
FEDERATION OF INTERNET
SOLUTION PROVIDERS OF THE
AMERICAS
PO Box 2270
Matthews, NC 28106-2270

Jonathan D. Blake
Eve R. Pogoriler
COVINGTON & BURLING LLP
1201 Pennsylvania Avenue NW
Washington, DC 20004-2401

*Counsel for the Association of Maximum Service
Television, Inc.*

Mitchell Lazarus
FLETCHER, HEALD &
HILDRETH, P.L.C.
1300 North 17th Street
11th Floor
Arlington, VA 22209-3801

Counsel for Sennheiser Electronic Corporation

Robert M. Gurs
APCO INTERNATIONAL
1426 Prince Street
Alexandria, VA 22314

Robert M. Gurs
FLETCHER, HEALD & HILDRETH, P.L.C.
1300 North 17th Street, 11th Floor
Arlington, VA 22209-3801

Counsel for the County of Los Angeles California

Al Ittner
LAND MOBILE COMMUNICATIONS
COUNCIL
8484 Westpark Drive
Suite 630
McLean, VA 22102

Jane E. Mago
Jerianne Timmerman
Larry Walke
NATIONAL ASSOCIATION OF
BROADCASTERS
1771 N Street NW
Washington, DC 20036

Antoinette C. Bush
David H. Pawlik
SKADDEN, ARPS, SLATE, MEAGHER &
FLOM LLP
1440 New York Avenue NW
Washington, DC 20005

*Counsel for The Coalition of Wireless Microphone
Users*



Sybil Anne Strimbu