

**Before the
FEDERAL COMMUNICATIONS COMMISSION
Washington, D.C. 20554**

In the Matter of

Amendment of Part 15 of the Commission's Rules for Unlicensed Operations in the Television Bands, Repurposed 600 MHz Band, 600 MHz Guard Bands and Duplex Gap, and Channel 37, and

ET Docket No. 14-165

Amendment of Part 74 of the Commission's Rules for Low Power Auxiliary Stations in the Repurposed 600 MHz Band and 600 MHz Duplex Gap

GN Docket No. 12-268

Expanding the Economic and Innovation Opportunities of Spectrum Through Incentive Auctions

**RESPONSE AND OPPOSITION TO PETITIONS FOR
RECONSIDERATION OF MICROSOFT CORPORATION**

Paula Boyd
Director, Government Relations
and Regulatory Affairs

Michael Daum
Technology Policy Strategist

MICROSOFT CORPORATION
901 K Street NW, 11th Floor
Washington, DC 20001

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I. INTRODUCTION AND SUMMARY

Microsoft appreciates the Commission's goal of establishing technical rules for the operation of white-space devices ("WSDs") in the repurposed 600 MHz band and remaining television bands to advance unlicensed innovation. While the rules contained in the Part 15 Order will permit WSD operations, they are overly cautious in a number of respects that will significantly hamper consumer services in this band. In particular, Microsoft agrees with other commenters that the Commission can better serve its goals by reconsidering its decision to require the white-space database system to 'push' channel availability information to WSDs in response to new reservations by wireless microphones. This mandate, which was not properly raised in the Notice of Proposed Rulemaking, and which received no substantive discussion on the record, is not technologically feasible without substantially increasing costs for consumers—precisely the outcome the Commission sought to avoid in making the 'push' rule.

The record also makes it clear that the Commission should reject petitions for reconsideration filed by the National Association of Broadcasters ("NAB"), the WMTS Coalition, GE Healthcare ("GEHC") and others. These petitions seek—almost exclusively—to either reopen debate on technical matters that were the subject of substantial record comment and thorough consideration by the Commission, or present new arguments that could and should have been raised a year ago. These arguments therefore are not properly raised in a petition for reconsideration. Moreover, these filings frequently mischaracterize the record in this proceeding and the Commission's own reasoning in considering that record. Accordingly, NAB, the WMTS Coalition, and GEHC fall far short of establishing that the Commission has committed any error warranting reconsideration.

II. WMTS INTERESTS' ARGUMENTS ARE SUBSTANTIVELY AND PROCEDURALLY FLAWED

WMTS interests present a variety of objections to the Commission's analysis of unlicensed operations in channel 37 and adjacent channels. Most of these arguments are procedurally improper—WMTS interests, in most cases, simply restate technical claims that the Commission has carefully considered. As a result of these repetitious arguments, WMTS interests' petitions substantially exceed the Commission's page limit requirements.¹ The Commission is within its power to reject WMTS interests' petitions for this reason alone.

When they are not repeating old arguments the Commission has thoroughly evaluated, WMTS interests introduce new claims that should have been raised long ago as part of the notice and comment rulemaking process. Either way, these arguments are not appropriately raised in a petition for reconsideration under the Commission's rules, and therefore are untimely and procedurally barred.² Finally, if the Commission chooses not to reject these arguments out of hand on procedural grounds, it should reject them on their merits.

A. DTV/WSD Separation Distances are not Properly Compared to WMTS/WSD Separation Distances

GEHC argues that the mere fact that the Commission has imposed larger separation distances for WSDs relative to broadcast television contours than it has relative to WMTS facilities suggests that the Commission has “erred dramatically” in its analysis.³ But this apples-to-oranges comparison shows nothing of the sort.

¹ 47 C.F.R. § 1.429(d) (limiting the length of petitions for reconsideration to 25 pages). The WMTS Coalition Petition is 38 pages long, and the GEHC Petition is 44 pages long, not including cover pages, tables of contents, executive summaries, or attached exhibits.

² 47 C.F.R. § 1.429.

³ Petition for Reconsideration of GE Healthcare at 12-14, ET Docket No. 14-165 and GN Docket No. 12-268 (filed Dec. 23, 2015) (“GEHC Petition”).

Most fundamentally, WMTS and DTV are different services with different characteristics affecting separation-distance analyses. In the absence of any substantive analysis by GEHC to establish that WMTS and DTV are similar in any relevant way, this fact alone renders GEHC's argument unpersuasive. In fact, there are several reasons why it is reasonable for DTV separation distances to be greater than WMTS separation distances.

First, DTV separation distances are measured relative to the outer limits of DTV coverage contours. This means that, by definition, the received DTV signal at this point will be faint, and relatively susceptible to interference. This is different from the Commission's approach to WMTS separation contours in several important respects. First, unlike DTV, there are no WMTS receivers to be protected *at* the WMTS site perimeter. The WMTS site perimeter will typically trace the outer boundary of a building. Thus, WMTS receivers will be separated from this outer perimeter by at least an exterior wall. Second, while protected DTV receivers located at the outer edge of the coverage area will, by definition, receive the DTV signal only faintly and over a great distance, WMTS receivers will often be in the very same room, or at least on the same floor as the WMTS transmitter, making them far less susceptible to interference, especially interference originating outside the building.

In short, the differences between the separation distances used to protect DTV and those used to protect WMTS reflect the significant differences between these two services. The DTV separation therefore lends no support to WMTS interests' already-rejected technical arguments. Indeed, as many commenters have shown,⁴ the Commission's WMTS separation distances are greatly overprotective.

⁴ See, e.g., Google Inc. Petition for Reconsideration at 11-14, ET Docket No. 14-165 and GN Docket No. 12-268 (filed Dec. 23, 2015) ("Google Petition for Reconsideration"); Petition for Reconsideration and Clarification of Microsoft Corporation at 2-15, ET Docket No. 14-

B. The Commission Properly Considered WMTS Receiver and WSD Heights

The Commission correctly observed that a large number of WMTS receivers are at or below the 10 meter elevation that the Commission used in its analysis of interference between WMTS and nearby WSDs.⁵ GEHC’s own summary of WMTS system heights in the ASHE database supports this conclusion.⁶ GEHC and the WMTS Coalition, however, contend that the Commission misinterpreted the data, and argue that the data establishes that some WMTS systems are installed at heights greater than 10 meters.⁷ The petitioners are mistaken.

The Commission interpreted the data cited by WMTS interests properly, and the fact that a small number of systems are above 10 meters—which the Commission has explicitly acknowledged⁸—does not suggest otherwise. Indeed, if one properly assumes, as the Commission did, that WMTS receivers are distributed across all of the floors of a hospital, and not concentrated at the top, as GEHC seems to have assumed,⁹ GEHC’s own data confirms the

165 and GN Docket No. 12-268 (filed Dec. 23, 2015); Reply Comments of Google Inc. at 12-17, ET Docket No. 14-165 and GN Docket No. 12-268 (filed Feb. 25, 2015) (“Google Reply Comments”); Reply Comments of Microsoft Corporation at 16-28, ET Docket No. 14-165 and GN Docket No. 12-268 (filed Feb. 25, 2015) (“Microsoft Reply Comments”); Comments of Broadcom Corporation at 21-27, ET Docket No. 14-165 and GN Docket No. 12-268 (filed Feb. 4, 2015); Comments of Google Inc. at 18-35, ET Docket No. 14-165 and GN Docket No. 12-268 (filed Feb. 4, 2015) (“Google Comments”); Comments of Microsoft Corporation at 14-27, ET Docket No. 14-165 and GN Docket No. 12-268 (filed Feb. 4, 2015) (“Microsoft Comments”).

⁵ *Amendment of Part 15 of the Commission’s Rules for Unlicensed Operations in the Television Bands, Repurposed 600 MHz Band, 600 MHz Guard Bands and Duplex Gap, and Channel 37*, Report and Order, FCC 15-99, 30 FCC Rcd. 9551, 9638-39 ¶ 210 (“Part 15 Order”).

⁶ Comments of GE Healthcare at 21-22, ET Docket No. 14-165 and GN Docket No. 12-268 (filed Feb. 4, 2015) (“GEHC Comments”).

⁷ GEHC Petition at 7-8; Petition for Reconsideration of the WMTS Coalition at 11-13, ET Docket No. 14-165 and GN Docket No. 12-268 (filed Dec. 23, 2015) (“WMTS Coalition Petition”).

⁸ Part 15 Order ¶ 210.

⁹ GEHC Comments at 21.

Commission's conclusion. The large majority of facilities are between one and five stories tall, meaning that most WMTS systems are installed at or below the third floor, or 10 meters.¹⁰

Although a small number of hospitals are taller than five floors, there are so few of these hospitals that they do not meaningfully alter this analysis. And as the Commission observed, greater height will actually result in *greater* protection for WSDs in many situations. First, the Commission properly concluded that taller hospitals will tend to be located in more urban areas.¹¹ Urban areas present a more cluttered propagation environment and, accordingly, a reduced likelihood of interference. GEHC and the WMTS Coalition claim that *some* taller hospitals are located in areas with fewer obstructions.¹² But this is plainly insufficient to contradict the Commission's general, and well-founded, conclusion that taller buildings tend to be located in more urban areas. In addition, the Commission correctly observed that, beyond a certain threshold height, the walls of the WMTS facility themselves will play a greater and greater role in protecting the WMTS system from interference.¹³

The WMTS Coalition and GEHC also take issue with the Commission's conclusions regarding likely *transmitter* heights. But these arguments are equally meritless. A personal/portable WSD differs fundamentally from a fixed WSD: the latter is often mast-mounted while the former, by definition, is not. Therefore, the height of a personal/portable device is typically the height of the device when held: no more than 3 meters. The only way a personal/portable device will typically reach heights greater than 3 meters is when it is carried by

¹⁰ For a five-floor hospital a majority, 3/5 of the floors are at or below 10 meters. For hospitals with fewer floors, the percentage that are at or below 10 meters increases. Seventy-five percent of the hospitals described in GEHC's are five floors or less.

¹¹ Part 15 Order ¶ 210.

¹² GEHC Petition at 8.

¹³ Part 15 Order ¶ 210.

a person *inside a structure*. And in this case, building loss will more than offset any additional signal propagation that would have come from increased elevation. Although GEHC describes a handful of situations where this building loss may be somewhat reduced, these situations will be unusual at best, and in none of them would this attenuation be eliminated entirely. The reason for this is simple: building codes and common sense both prevent architects and builders from erecting tall structures where nothing stands between a building occupant and a likely fatal drop to the street below.

Thus, contrary to the arguments of WMTS interests, the Commission's analysis properly took into account WMTS and WSD elevations. In fact, the Commission took into account not just the most typical interference scenarios, but built into its analysis a number of worst-case assumptions,¹⁴ resulting in separation distances that are significantly overprotective.

C. The Commission Has Carefully Considered and Properly Rejected WMTS Interests' Arguments about the Applicability of TM 91-1

As they have several times before, GEHC and the WMTS Coalition make various claims that the Commission's decision to use the TM 91-1 propagation model to analyze interference between WSDs and WMTS was improper.¹⁵ The Commission, over several pages of careful technical analysis, thoroughly considered, and rejected, these arguments.¹⁶ Indeed, the use of TM

¹⁴ For example, according to GEHC's summary of the data available in the ASHE database, the average WMTS system is deployed almost a full floor *lower* than the three-floor, or 10 meter, height that the Commission assumed.

¹⁵ See GEHC Petition at 21-22; WMTS Coalition Petition at 8-10. See also Letter from Ari Q. Fitzgerald, Counsel to GE Healthcare, Hogan Lovells US LLP, to Marlene H. Dortch, Secretary, FCC, at Appendix A at 3, ET Docket No. 14-165 and GN Docket No. 12-268 (filed Mar. 23, 2015); Reply Comments of GE Healthcare at 4-5, ET Docket No. 14-165 and GN Docket No. 12-268 (filed Feb. 25, 2015); GEHC Comments at 10-21; Initial Comments of the WMTS Coalition at 15-16, ET Docket No. 14-165 and GN Docket No. 12-268 (filed Feb. 4, 2015).

¹⁶ Part 15 Order ¶¶ 203-208.

91-1 is hardly new to this proceeding: the Commission has used TM 91-1 to model interference in prior white-space proceedings as well.¹⁷ Because WMTS interests merely re-argue matters that the Commission has thoroughly considered and decided, these claims are not properly raised in a petition for reconsideration and should be disregarded.¹⁸

Furthermore, these arguments fail substantively, falling far short of demonstrating that the Commission should reverse course on the use of the TM 91-1 model despite having relied on it in this and prior white-space proceedings. WMTS interests contend that their interference demonstrations at a handful of carefully-selected hospitals show that TM 91-1 will underprotect WMTS operations. But the record establishes that these locations are unrepresentative, and were likely chosen to highlight the unusual case of a tall hospital in an open, suburban setting.¹⁹ A propagation model is designed to approximate the actual expected propagation loss over a large number of cases. It will inevitably serve as a more accurate predictor in some cases than others. Thus, a proper empirical evaluation of a model's fitness would require a very large number of scientifically controlled measurements under a variety of scenarios—not a few unrepresentative sites intentionally chosen in an attempt to undermine the model.

Importantly, even in GEHC's chosen locations, “[i]n most cases, the predicted path loss from the TM-91-1 model compared favorably with the measured path loss.”²⁰ Thus, far from showing that TM 91-1 would systematically overestimate the real-world propagation loss,

¹⁷ See, e.g., *Unlicensed Operation in the TV Broadcast Bands; Additional Spectrum for Unlicensed Devices Below 900 MHz and in the 3 GHz Band*, Third Memorandum Opinion and Order, FCC 12-36, 27 FCC Rcd. 3692, 3698-99 ¶ 16 (2012).

¹⁸ 47 C.F.R. § 1.429(1)(3).

¹⁹ See Google Reply Comments at 13-16; Microsoft Reply Comments at 20-23.

²⁰ Part 15 Order ¶ 206 n.523.

WMTS interests' own demonstration results confirm that the Commission's separation distances for operations in channel 37 are actually *overprotective*.²¹

D. The Commission Properly Considered the Likely Effect of a Single WSD on WMTS Systems

WMTS interests also argue that the Commission improperly considered the possibility of aggregated interference from WSDs either because multiple WSDs could transmit simultaneously, or because the distributed antenna system used by some WMTS systems could amplify a single WSD's transmissions.²² Again, however, WMTS interests have raised these issues repeatedly earlier in this proceeding, and the Commission has properly considered and rejected these arguments.

The record makes clear why WMTS interests' concerns are unfounded.²³ First, WMTS interests have not explained why a distributed antenna system will amplify distant WSD signals more than they will amplify the desired WMTS signals originating within the facility. It is highly unlikely that a WSD will ever have line of sight to a single component antenna of a distributed antenna system, let alone multiple antennas, as would be required for the system to amplify a full-power WSD signal. These antennas are typically located within the hospital and, even in the unusual case where an antenna is installed in the exterior wall, the odds are slim that one, let alone more than one, of these walls will be facing a given WSD. Meanwhile, it will be common for WMTS antenna systems to aggregate desired signals originating in close proximity to the antennas, within the facility itself.

²¹ *Id.*

²² GEHC Petition at 23-25; WMTS Coalition Petition at 11.

²³ *See* Letter from Aparna Sridhar, Counsel, Google Inc., to Marlene H. Dortch, Secretary, FCC, at 10-11, ET Docket No. 14-165 and GN Docket No. 12-268 (filed May 22, 2015) (“Google Letter”).

Likewise, it is highly unlikely that a WMTS receiver will receive signals from multiple WSDs simultaneously at sufficient power levels to cause harmful interference. First, as the Commission has explained, there are several factors that will greatly attenuate received WSD signals in all but the rarest situations.²⁴ The vast majority of WSD transmissions will come nowhere close to causing harmful interference to a WMTS receiver. If the odds are low that any single transmission will come remotely close to causing harmful interference, then the odds are lower still that two such events will happen simultaneously. In fact, the record demonstrates that the IEEE 802.11 protocol that will be used by most WSDs includes a ‘politeness’ mechanism that deliberately times transmissions to avoid any two devices’ transmitting at the same time.²⁵ WSD device manufacturers will typically have a strong incentive to ensure that WSDs behave in this way, since simultaneous transmissions will tend to cause far more interference to other WSDs than WMTS systems.

E. GEHC’s Proposal to Have an IRB Oversee WMTS Testing Is Untimely and a Transparent Attempt to Forestall TVWS Deployments

GEHC has introduced, for the first time in this proceeding and in a petition for reconsideration, a new proposal that the Commission establish an institutional review board ostensibly to ensure patient safety during the testing and deployment of WSDs in channel 37.²⁶ Like GEHC’s other arguments, this proposal is both meritless and conspicuously disregards the Commission’s procedural rules.

GEHC had a duty to present arguments such as this during the notice and comment process, and prior to the Commission’s decision. Thus, to the extent that a petition for

²⁴ See Part 15 Order ¶¶ 200-211.

²⁵ See Google Letter at 10-11.

²⁶ See GEHC Petition at 43-44.

consideration “[r]el[ies] on facts or arguments which have not previously been presented to the Commission” the petition “plainly do[es] not warrant consideration.”²⁷ GEHC’s belated proposal to form an institutional review board long after the Commission has reached its decision, and without providing opportunity for others to comment, is inappropriate under these rules.

Indeed, GEHC’s delay undermines its professed concern that, despite the Commission’s highly protective rules issued after exacting review of the technical record, even trial WSD deployments will somehow compromise patient safety. And curiously, although GEHC argues that the Commission should form an institutional review board to review WSD testing by *others*, GEHC’s descriptions of its own tests in hospitals in Alexandria, VA; Franklin, WI, and Menomonee Falls, WI give no indication that it convened an institutional review board to oversee this work.

The explanation for this discrepancy is simple: no such review is actually necessary. At issue in this proceeding is the important, but entirely familiar question of whether RF energy from devices operating under an identified set of rules would cause harmful interference with WMTS systems. The Commission is well equipped to conduct this analysis, as it has done countless times in the past—including prior proceedings relating to WMTS.²⁸ This is why, in the

²⁷ 47 C.F.R. 1.429(l). Section 1.429(l) makes an exception for arguments that rely on changed circumstances, facts that were reasonably unknown to the petitioner, or where the Commission determines that the public interest would be served by consideration of these otherwise-barred arguments. But GEHC makes no argument that these exceptions apply here.

²⁸ See, e.g., *Amendment of Part 90 of the Commission's Rules*, Second Report and Order and Second Further Notice of Proposed Rulemaking, FCC 10-36, 25 FCC Rcd. 2479 (2010); *Investigation of the Spectrum Requirements for Advanced Medical Technologies*, Report and Order, FCC 09-23, 24 FCC Rcd. 3474 (2009); *Amendments to Parts I, 2, 27 and 90 of the Commission's Rules to License Services in the 216-220 MHz, 1390-1395 MHz, 1427-1429 MHz, 1429-1432 MHz, 1432-1435 MHz, 1670-1675 MHz, and 2385-2390 MHz Government Transfer Bands*, Report and Order, FCC 02-152, 17 FCC Rcd. 9980 (2002).

numerous past proceedings where the Commission has considered this and similar issues, it has not once formed the sort of institutional review board that GEHC proposes for the first time here.

The WMTS industry and individual WMTS sites are, of course, free to form their own boards to oversee their own use of WMTS. But for the Commission itself to form such a body would needlessly cede the Commission's regulatory authority to an outside body, a body which will have little to contribute to the substantive RF interference analyses in this proceeding.

F. WMTS Interests' Database Reliability Arguments Are Meritless and Improperly Raised in Petitions for Reconsideration

Repeating their own previously expressed arguments, and adopting claims previously presented by NAB, WMTS interests also argue that white-space databases are not sufficiently reliable to protect WMTS from co-channel, personal/portable devices.²⁹ But, yet again, the Commission should dismiss this argument both on procedural grounds and on the merits.

Like most of the other arguments repeated by WMTS interests in their petitions for reconsideration, the Commission has already considered arguments that databases are not sufficiently reliable to protect WMTS, and found them meritless.³⁰ Because the Commission has already considered this argument, it cannot properly be raised once again in a petition for reconsideration.³¹ Moreover, this argument is particularly inappropriate here because the FCC has initiated a separate proceeding specifically to address NAB's petition on this issue.³²

²⁹ GEHC Petition at 36-43; WMTS Coalition Petition at 29-33.

³⁰ Part 15 Order ¶ 194 n.490.

³¹ 47 C.F.R. § 1.429(1)(3).

³² *See Amendment of Part 15 of the Commission's Rules for Unlicensed White Space Devices*, Notice of Proposed Rulemaking and Order, FCC 16-23 (rel. Feb. 26, 2016).

Even if this were not the case, there are no substantiated database “reliability concerns” that need to be addressed, as Microsoft has already explained.³³ Not one instance of interference has yet been identified and associated with inaccurate database information or a database malfunction. Instead, in an attempt to muddy the water, opponents of unlicensed white-space operations have identified only cases where test data or other outdated information has conservatively been retained in the database for longer than necessary.

WMTS interests have also maintained that database reliability could be improved by mandating that WSDs incorporate security and anti-tampering features. But they overlook the fact that the Commission has already made rules to guarantee the integrity of WSD software.³⁴ The Commission has properly concluded that these rules are “adequate to ensure security of the white space access system.”³⁵ The FCC should therefore deny this request as unnecessary.

G. The Commission’s Waiver Process Already Favors WMTS

Finally, the WMTS Coalition objects that the Commission’s waiver process for tailoring separation distances to specific WMTS facilities improperly places the burden on WMTS facility operators to protect themselves from interference by waiver.³⁶ But this is merely another articulation of their already-rejected arguments that the Commission’s rules do not adequately protect WMTS facilities.

The Commission’s waiver process permits *both* WMTS and unlicensed operators to seek waivers to modify the WMTS protection area for a given WMTS facility. WMTS facilities may

³³ See Letter from Paula Boyd, Director, Government and Regulatory Affairs, Microsoft Corporation, and Michael Daum, Technology Policy Strategist, Regulatory Affairs, Microsoft Corporation, to Marlene H. Dortch, Secretary, FCC, RM-11745 (filed May 1, 2015).

³⁴ See 47 C.F.R. § 15.709.

³⁵ Part 15 Order ¶ 194 n.490.

³⁶ See WMTS Coalition Petition at 22-25.

seek waivers if they are able to make a substantiated showing that they are receiving harmful interference from a WSD, and WSD operators may seek a waiver if they believe a given facility has been overprotected.³⁷ Thus, because the Commission has adopted rules that substantially overprotect the large majority of WMTS licensees, it is WSD operators, not WMTS, that will bear the burden of showing that the WMTS separation distances should be changed. This is precisely the outcome that the WMTS Coalition seeks: that “TVWS device operators. . . establish through the waiver process that the unique characteristics of any given WMTS system operation or external environment will allow operation of TWVS devices in certain locations.”³⁸

Therefore, the WMTS Coalition’s argument need only be considered to the extent that the Commission’s WMTS separation distances are, in fact, underprotective. But the Commission has already concluded otherwise and, as Microsoft has shown, WMTS interests’ arguments to this effect are themselves both procedurally improper and without merit. And even in the unlikely event that a WMTS facility must use the waiver process, the Commission has taken care to make the waiver process as streamlined as possible for WMTS operators.³⁹ This small burden on WMTS is a small price to pay for making a significant amount of unlicensed spectrum available to consumers, especially in dense, urban markets where the risk of interference is lowest and the spectrum will be most valuable.

III. THE COMMISSION SHOULD REVISE ITS RULES TO IMPLEMENT DATABASE RECHECK REQUIREMENTS VIA FAST POLLING ON A SUBSET OF CHANNELS RATHER THAN A ‘PUSH’ MANDATE

The Commission should reconsider its rule mandating the use of database ‘push’ technology to notify WSDs when a channel is reserved by wireless microphones used for

³⁷ Part 15 Order ¶ 217.

³⁸ WMTS Coalition Petition at 23.

³⁹ See Part 15 Order ¶¶ 217, 217 n.554.

electronic newsgathering (“ENG”). As the Commission correctly recognized, requiring WSDs to ‘pull’ channel availability information from the database every 20 minutes would significantly and unnecessarily increase costs for consumers.⁴⁰ However, the Commission failed to provide parties with the necessary notice that it was also considering requiring databases to ‘push’ notifications of changing channel availability and, as a result, imposed this mandate without any substantial evidence that it was workable and consistent with the Commission’s goals. Indeed, the record now makes clear that a ‘push’ requirement will *not* be feasible,⁴¹ because it does not take into account important limitations imposed by many users’ network environments and other technical considerations. The Commission should address this issue by adopting Google’s proposal to implement a “fast-polling” requirement only on certain channels.

A. The Decision to Require Database ‘Push’ Notifications Was Procedurally Improper

Microsoft agrees with Google that the Commission’s decision to require the database to communicate updated channel availability information to WSDs via database ‘push’ was procedurally flawed.⁴² It is a fundamental tenet of agency decision-making that the Commission must “adequately frame the subjects for discussion” before making a rule.⁴³ Yet the NPRM did not seek comment on implementing a ‘push’ requirement at all. Rather, only two commenters mentioned ‘push’ requirements, and only in the most cursory fashion.⁴⁴

⁴⁰ *Id.* ¶ 273.

⁴¹ See Google Petition for Reconsideration at 7-8; Comments of the White Space Database Administrator Group, GN Docket No. 12-268 (filed Dec. 22, 2015).

⁴² Google Petition for Reconsideration at 7-8.

⁴³ *Omnipoint Corp. v. F.C.C.*, 78 F.3d 620, 631 (D.C. Cir. 1996) (quoting *Connecticut Light and Power Co. v. Nuclear Regulatory Commission*, 673 F.2d 525, 533 (D.C. Cir. 1982)).

⁴⁴ Comments of WhiteSpace Alliance at 7, 25, ET Docket No. 14-165 and GN Docket No. 12-268 (filed Feb. 4, 2015); Comments of the Wireless Internet Service Providers Association at iv, 21-22, ET Docket No. 14-165 and GN Docket No. 12-268 (filed Feb. 4, 2015).

The Commission may not “pull a surprise switcheroo on regulated entities”⁴⁵ by adopting a database ‘push’ requirement after seeking comment only on the technical details of a ‘pull’ requirement.⁴⁶ The result here demonstrates why this must be so: because the Commission did not inform parties that it was considering a ‘push’ requirement, the relevant stakeholders and industry experts were not able to alert the Commission to the serious flaws in this approach until after the rule had already been made.

The fact that a small number of commenters raised the possibility of a database ‘push’ rule is no substitute for agency notice. “[A]mbiguous comments and weak signals from the agency [give] petitioners no . . . opportunity to anticipate and criticize the rules or to offer alternatives.”⁴⁷ In the absence of any indication that it is seriously considering a proposal raised in passing by commenters, courts have therefore rejected the idea that the public itself can provide adequate notice of agency action.⁴⁸

In addition, the Commission may only act upon “substantial evidence” and must “articulate a rational connection between the facts found and the choice made.”⁴⁹ Here, however, the record upon which the Commission based its decision contained no discussion of the technical feasibility of database ‘push’ notifications. It is likely because of this inadequate record that the Commission’s decision does not address the significant technical issues that make database ‘push’ unworkable. Thus, given the absence of any substantial evidence to suggest that

⁴⁵ *Environmental Integrity Project v. E.P.A.*, 425 F.3d 992, 996 (D.C. Cir. 2005).

⁴⁶ *See, e.g., Int'l Union, United Mine Workers of Am. v. Mine Safety & Health Admin.*, 407 F.3d 1250, 1261 (D.C. Cir. 2005) (concluding that an agency could not impose a maximum air velocity for ventilation systems after having proposed only a minimum air velocity).

⁴⁷ *Id.* (quoting *Shell Oil Co. v. E.P.A.*, 950 F.2d 741, 751 (D.C. Cir. 1991)).

⁴⁸ *Id.*

⁴⁹ *Rural Cellular Ass'n v. F.C.C.*, 588 F.3d 1095, 1105 (D.C. Cir. 2009) (internal quotation marks omitted).

a database ‘push’ approach was technically feasible, the Commission’s decision to mandate such a technology was arbitrary.⁵⁰

B. The Database ‘Push’ Rule is Technologically Infeasible and Contrary to the Commission’s Own Stated Policy Goals

The Commission’s new rules sought to avoid the “unnecessar[y] burden” on database administrators and white-space-device users that would have been imposed by the 20-minute database re-check interval that the Commission had proposed.⁵¹ As commenters confirmed, 20-minute database re-checks would have greatly increased the costs of operating a white-space database and reduced the battery life of portable WSDs, increasing costs and reducing value to consumers.⁵² To avoid this outcome, the Commission instead concluded that the database itself could ‘push’ updates to WSDs without requiring WSDs to request updated information.⁵³

In theory, this might have solved the problems posed by frequent database queries by scaling the burden on database operators according to the actual frequency of ENG reservations, avoiding the deluge of unnecessary queries that would result from a blanket 20-minute re-check interval. But the realities of most end-user networks will prevent this approach from working as intended. These networks typically do not permit unsolicited incoming Internet traffic to reach devices on the local network. This is both a ubiquitous network security technique and a side-effect of the most common strategy, called “Network Address Translation,” for coping with the fact that the number of Internet-connected devices greatly outnumber the available IP

⁵⁰ *Id.*

⁵¹ Part 15 Order ¶ 273.

⁵² *See* Google Comments at 47-48; Microsoft Comments at 49.

⁵³ Part 15 Order ¶ 273.

addresses.⁵⁴ Therefore, in most environments, it will not be possible for the white-space database to simply ‘push’ messages to WSDs with updated channel information.

There are ways of working around this limitation, but these techniques would be either technically identical to high-frequency database ‘pull’ or would be even more costly to implement. As Google has explained, when a system gives the appearance of server-originated ‘push’ notifications, this functionality is often actually accomplished through periodic, behind-the-scenes ‘pull’ requests.⁵⁵ In the case of channel-availability updates for WSDs, such an implementation would be technically identical to the approach that the Commission has rejected.⁵⁶ Another option would be to maintain a persistent connection between the device and database. However, to be reliable, maintaining such a connection also requires nearly constant exchange of small amounts of data to prevent intermediate firewalls and routers from closing the connection, and to ensure that broken connections can be detected and promptly reestablished.⁵⁷ Such an implementation would likely place similar or even greater resource demands on white-space-database operators and cause no less WSD power consumption than the unworkable 20-minute polling interval.⁵⁸

Fortunately, there is substantial support in the record for an alternative approach: the Commission should adopt a rule that requires a 20-minute database re-check interval for WSDs

⁵⁴ In essence, under NAT, the router connecting the local network to the wider Internet speaks for all the devices on the local network using a single, common IP address. Under this approach, the router is able to properly deliver traffic to its destination when it is sent as a response to a request originating inside the local network, but cannot determine the proper recipient of a message originating from outside the network.

⁵⁵ See Google Petition for Reconsideration at Attachment A, Declaration of Andy Lee ¶¶ 7-8.

⁵⁶ See Part 15 Order ¶ 273.

⁵⁷ See Google Petition for Reconsideration at Attachment A, Declaration of Andy Lee ¶¶ 9-18.

⁵⁸ *Id.*

operating only on certain channels.⁵⁹ Doing so would lessen the impact on WSD battery life and limit the resources needed to operate white-space databases by enabling WSDs to avoid these channels whenever possible. In many cases, reduced utilization of these designated channels would also benefit unlicensed wireless microphone operators by reducing the overall noise in these channels even without a channel reservation.

Although the Commission has expressed certain reservations about this approach,⁶⁰ these concerns are unfounded. First, the Commission observed that it would not be possible to “determine until after the post-auction transition period which vacant channels will be available for wireless microphones and white space devices in any given area.”⁶¹ However, this objection overlooks a key aspect of the proposal: instead of identifying one or two specific channels in each area (which would be an unworkable approach due to geographic and temporal variation in the available channels), parties have proposed that the Commission articulate a simple set of *rules* for identifying the designated channels in any given location.⁶² For example, the Commission could require WSDs to more frequently re-check the database for updated channel availability when operating on the first two vacant channels in the UHF band. This way, both WSDs and wireless microphone operators could easily identify the designated channels in any given location at any given time, based solely on information from the white-space database.

⁵⁹ See Google Petition for Reconsideration at 8-11; Google Comments at 47-51; Comments of Anant Sahai at 3, ET Docket No. 14-165 and GN Docket No. 12-268 (filed Dec. 10, 2014); see also Letter from Russell H. Fox, Counsel to Wi-Fi Alliance, Mintz Levin, Cohn, Ferris, Glovsky and Popeo, P.C., to Marlene H. Dortch, Secretary, FCC, at 4, ET Docket No. 14-165 (filed Apr. 14, 2015).

⁶⁰ See Part 15 Order ¶ 277.

⁶¹ *Id.*

⁶² See Google Comments at 47-51.

The Commission also cited NAB’s claim that news crews traveling from distant areas would not have “equipment that operates on channels different from those specified for ‘fast polling’ in a particular area.”⁶³ But variability in the channels available for wireless microphone users is a basic feature of operation in the television bands *in any case*. News crews travelling from distant areas to cover breaking news must already be prepared for the possibility that the channel they use for wireless microphones in their home market might be occupied by a television broadcaster at their destination. Therefore, the proposal to designate certain channels for more frequent database re-checks imposes no additional burden on wireless microphone operators.

Adopting this approach would also resolve the serious procedural infirmities of the Commission’s database ‘push’ requirement. Most importantly, the “fast-polling” channel proposal is simply a version of the high-frequency ‘pull’ proposal discussed in the NPRM—it seeks to, in effect, adopt this proposal for a limited set of channels. It therefore would clearly satisfy the Commission’s obligation to give proper notice.⁶⁴ Similarly, because this approach was discussed in detail on the record, there is more than sufficient record support for the Commission to reconsider its database ‘push’ rule in favor of designating a limited number of channels in each market as “fast-polling” channels.⁶⁵

IV. THE FCC PROPERLY CONSIDERED AND SET LOCATION ACCURACY RULES THAT WILL PROVIDE SUFFICIENT PROTECTION TO LICENSEES

The Commission rightly concluded in the Part 15 Order that allowing WSDs to operate with location accuracy below +/- 50 meters would facilitate further growth of the unlicensed

⁶³ Reply Comments of the National Association of Broadcasters at 7, ET Docket No. 14-165 and GN Docket No. 12-268 (filed Feb. 25, 2015).

⁶⁴ *See Omnipoint Corp.*, 78 F.3d at 631.

⁶⁵ *See supra* note 59.

ecosystem and promote innovation without reducing, in any way, protection for licensees.⁶⁶ NAB now argues for the first time, however, that the Commission should instead impose a +/- 100 meter location accuracy requirement.⁶⁷ This argument is meritless, and cannot properly be raised for the first time in a petition for reconsideration.

As a threshold matter, this argument is untimely and procedurally barred. NAB had ample opportunity to make this argument during the comment period, including in response to detailed analysis from multiple parties in this proceeding explaining why there was no need for the Commission to impose any such requirement.⁶⁸ The Commission typically will not consider “[a] petition for reconsideration which relies on facts or arguments which have not previously been presented to the Commission.”⁶⁹

Even if the Commission were to consider the merits of NAB’s arguments, however, it would not warrant reconsideration. NAB presents the example of a WSD capable only of determining its location as “somewhere in Kansas.”⁷⁰ This, of course, would not resemble any real WSD location report, since the rules require a WSD to report its GPS coordinates and a

⁶⁶ Part 15 Order ¶¶ 77-78.

⁶⁷ Petition for Reconsideration of the National Association of Broadcasters at 7-9, ET Docket No. 14-165 and GN Docket No. 12-268 (filed Dec. 23, 2015) (“NAB Petition”).

⁶⁸ *See, e.g.*, Response of xG Technology, Inc. to Notice of Proposed Rulemaking at 6, ET Docket No. 14-165 and GN Docket No. 12-268 (filed Feb. 6, 2015); Comments of the Dynamic Spectrum Alliance at 2-4, ET Docket No. 14-165 and GN Docket No. 12-268 (filed Feb. 4, 2015); Google Comments at 37-39; Microsoft Comments at 40-41; Comments of Wi-Fi Alliance at 9-11, ET Docket No. 14-165 and GN Docket No. 12-268 (filed Feb. 4, 2015); Comments of Spectrum Bridge, Inc. at 6, ET Docket No. 14-165 and GN Docket No. 12-268 (filed Feb. 2, 2015).

⁶⁹ 47 C.F.R. § 1.429(b).

⁷⁰ NAB Petition at 8.

numerical margin of error.⁷¹ But presumably NAB means to suggest, for example, that a WSD might report location information that is only accurate to within several hundred kilometers.

Even in this situation, the Commission's rules would incorporate this degree of uncertainty into the applicable separation distances, ensuring that the WSD operates at least as far from protected licensees than devices with more accurate location capabilities.⁷² Indeed, the Commission's rules make the improbable, worst-case assumption that a WSD is at the closest point to a protected licensee possible given its degree of location accuracy. This means that the increased separation distance will cause a WSD with less accurate location capabilities to typically operate at a greater distance from a protected licensee compared to a WSD with more accurate geolocation. This more than offsets purported objections that devices with very low location accuracy would be difficult to locate to remediate harmful interference.⁷³

Moreover, the use—or even the existence—of a device fitting NAB's description is extremely improbable. Because the FCC rules account for a device's location accuracy margin when calculating applicable separation distance, such devices would find it very difficult to identify permissible channels of operation. Thus, device manufacturers have a strong incentive to provide far more tailored geographic requests because there would likely be no demand for devices whose operations were so severely limited by inaccurate location reporting.

Fortunately, the Commission need not, and should not, attempt to impose any such threshold. The Commission's rules already provide more than enough protection to protect licensees in any event. And any arbitrary, maximum location accuracy threshold imposed by the Commission, on the basis of virtually no relevant factual record, would run the risk of

⁷¹ Part 15 Order ¶ 78.

⁷² *Id.*

⁷³ NAB Petition at 8.

inadvertently imposing too strict a standard, precluding unforeseen, but potentially valuable new applications. Instead, the Commission should allow innovators, and the market itself, to identify the location accuracy technologies that make the most sense for real WSD use cases.

Finally, NAB maintains that the Commission has not made rules that “ensure that devices can actually meet” the new location accuracy requirements⁷⁴ and proposes that “[t]he FCC should also require that a manufacturer seeking equipment authorization for a white space device submit results of such testing to the Commission.”⁷⁵ But this assertion overlooks the Commission’s decision to require manufacturers to “provide details regarding the technologies used by the device to determine its location and how, in the case of technologies other than GPS, the location uncertainty is calculated with a 95% confidence level.”⁷⁶ Indeed, the Commission specifically explained that “as part of the certification process, we will test to ensure that [location accuracy] parameters are correctly transmitted to the databases.”⁷⁷ And while the Part 15 Order does not specify a precise test procedure, there is no reason for it to do so: development of such a certification procedure is the sort of project customarily, and properly, delegated to the Office of Engineering and Technology.⁷⁸ It is certainly *not* properly raised for the first time in a petition for reconsideration.⁷⁹

⁷⁴ *Id.*

⁷⁵ *Id.*

⁷⁶ Part 15 Order ¶ 78.

⁷⁷ *Id.*

⁷⁸ *See* 47 C.F.R. § 0.241(b).

⁷⁹ 47 C.F.R. § 1.429(b).

V. THE COMMISSION PROPERLY CONSIDERED AND CORRECTLY DECIDED TO ENABLE ADJACENT-CHANNEL FIXED OPERATION WITHIN TV CONTOURS

NAB also seeks to undo the Commission’s carefully reasoned decision to permit low-power WSDs to operate within the contours of television broadcasters on adjacent channels.⁸⁰ However, the Commission has already considered and rejected the arguments that NAB raises. These claims therefore “plainly do not warrant consideration by the Commission.”⁸¹

NAB maintains that the Commission incorrectly concluded that limiting antenna heights to 10 meters for WSDs operating within a television contour would help to reduce interference from WSDs to television receivers.⁸² The Commission discussed precisely this issue—the role of antenna height in preventing harmful interference—in detail in its Part 15 Order.⁸³ NAB’s disagreement with the Commission’s analysis is not a ground for reconsideration.

Even if this were not the case, NAB’s arguments are simply incorrect. NAB argues that limiting receive height to 10 meters will not reduce interference because 10 meters is the same height that OET-69 assumed for television receive antennas.⁸⁴ Thus, NAB argues, the vertical directionality of these receive antennas will not reduce interference.⁸⁵ But the fact that the Commission chose the same height for the WSD height limit as OET-69 assumed for receive antenna height does not mean that, in reality, all or even a significant number of WSD and television receive antennas will operate at heights of exactly 10 meters. If WSD antenna height is limited to 10 meters, most WSDs will likely operate at heights below this absolute maximum height. Likewise, the fact that OET-69 assumes heights of 10 meters for television receive

⁸⁰ NAB Petition at 10-14.

⁸¹ 47 C.F.R. § 1.429(l).

⁸² NAB Petition at 11-12.

⁸³ See Part 15 Order ¶¶ 30-31.

⁸⁴ NAB Petition at 11-12.

⁸⁵ *Id.*

antennas is an assumption in a mathematical model—it cannot, does not, and was never intended to precisely represent the height of every television receive antenna in the United States. Thus, the Commission rightly concluded that a given WSD transmitter and television receive antenna will rarely be exactly the same exact height, and therefore the vertical directionality of television receive antennas will reduce received WSD signal strength.⁸⁶

As the Commission also explained, it is even less likely that a given WSD transmitter and television receive antenna will operate at the same height *and* be pointed at one another over a short separation distance.⁸⁷ Because a WSD can only operate at the maximum 40 mW radiated power provided in the Commission’s rules with a highly directional antenna, the likely misalignment of WSD and television receive antennas in the horizontal plane will further reduce the likelihood of harmful interference.⁸⁸

NAB’s objection that “a number of TVWS devices have been approved with omni-directional antennas”⁸⁹ therefore misses the point—while omni-directional antennas are permissible under the Commission’s new rules, they can operate outdoors only at reduced power levels. “[T]he maximum EIRP for all fixed devices regardless of its radiated power is obtained only when using an antenna with at least a 6 dBi gain.”⁹⁰ Thus, NAB’s own rough interference analysis, which purports to establish a necessary separation distance of 160 meters, implausibly assumes the following: (1) a WSD transmitter and television receiver operating at the same height; (2) pointed directly at one another; and (3) without any objects between them. And this is to say nothing of other factors that the Commission considered, but that NAB does not discuss,

⁸⁶ Part 15 Order ¶ 31.

⁸⁷ *Id.*

⁸⁸ *Id.*

⁸⁹ NAB Petition at 12.

⁹⁰ Part 15 Order ¶ 31 n.56.

such as the significant power-level disparity required for adjacent-channel interference to a television receiver, the likelihood of antenna polarization diversity, and transmit power control requirements for WSDs.⁹¹ Each of these factors would further reduce the likelihood of interference in the real world.

VI. CONCLUSION

In order to make the white spaces a viable option for unlicensed operations, the Commission should (1) reconsider its infeasible database re-check ‘push’ requirement, and (2) reject the substantively and procedurally unsound arguments of NAB and WMTS interests. Doing so will advance the Commission’s goal of expanding broadband Internet access and enabling other innovative unlicensed spectrum uses while protecting incumbent licensees from harmful interference.

Respectfully submitted,

/s/ Paula Boyd

Paula Boyd

*Director, Government Relations and
Regulatory Affairs*

Michael Daum

Technology Policy Strategist

MICROSOFT CORPORATION
901 K Street NW, 11th Floor
Washington, DC 20001
(202) 263-5900

⁹¹ *Id.* ¶ 31.

CERTIFICATE OF SERVICE

I, Jessica Parent, do hereby certify that on this 29th day of February, 2016, I caused a copy of the foregoing Response and Opposition to Petitions for Reconsideration to be served by postage pre-paid mail on the following:

Ari Q. Fitzgerald
Tom Peters
Wesley Platt
Hogan Lovells US LLP
555 Thirteenth Street, NW
Washington, DC 20004
Counsel for GE Healthcare

Lawrence J. Movshin
Timothy J. Cooney
Wilkinson Barker Knauer, LLP
1800 M Street, NW Suite 800N
Washington, DC 20036
Counsel to WMTS Coalition

Neal Seidl
Matthew Pekarske
GE Healthcare
8200 W. Tower Avenue
Milwaukee, WI 53223

Dale Woodin
Executive Director
The American Society for Healthcare
Engineering of the American Hospital
Association
155 North Wacker Drive, Suite 400
Chicago, IL 60606

Rick Kaplan
Patrick McFadden
National Association of Broadcasters
1771 N Street, NW
Washington, DC 20036

/s/ Jessica Parent_____