Before the
FEDERAL COMMUNICATIONS COMMISSION
Washington, DC 20554

In the Matter of	)	
	)	
Expanding the Economic and Innovation Opportunities of Spectrum Through Incentive Auctions	)))	GN Docket No. 12-268

To: The Commission

PETITION FOR RECONSIDERATION OF GE HEALTHCARE

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Pursuant to Section 1.429 of the Federal Communications Commission's ("Commission's" or "FCC's") rules, GE Healthcare ("GEHC")[1] respectfully submits this Petition for Reconsideration of the Commission's *Report and Order* in the above-captioned proceeding ("*Incentive Auction R&O*").[2]

I. INTRODUCTION AND SUMMARY

The Commission has long recognized the importance of Wireless Medical Telemetry Service ("WMTS") to patient care and the critical need to protect its "safety-of-life" operations from harmful interference.[3] As an important safety-of-life service, WMTS cannot tolerate even small or episodic incidents of interference. GEHC's Technical Analysis was filed in this proceeding to provide the Commission with sound technical support for reaffirming its decision, only six years ago, to prohibit unlicensed operations in Channel 37 and address the operations of

[1] GEHC is a unit of General Electric Company and provides a broad range of products and services that enable healthcare providers to better diagnose and treat diseases and medical conditions, including products and services that incorporate wireless technology.

[2] *Expanding the Economic and Innovation Opportunities of Spectrum Through Incentive Auctions*, Report and Order, 29 FCC Rcd 6567 (2014) ("*Incentive Auction R&O*").

[3] *See, e.g.*, *Incentive Auction R&O* ¶ 275.

new adjacent band 600 MHz base stations that could reasonably cause harmful interference to WMTS operations. The assumptions contained in GEHC's Technical Analysis reflected "real world" conditions, rather than the "worst case" scenarios used to determine the separation distances needed to prevent harmful interference.

The Commission's decisions in the *Incentive Auction R&O* to adopt a band plan that allows only base station or broadcast television operations in the vicinity of Channel 37 and establish a guard band between 600 MHz base station operations on either side of Channel 37 will help to protect WMTS' critical operations from harmful interference. However, the *Incentive Auction R&O* contains a number of material errors that largely eviscerate the benefits of those protections and make WMTS operations extremely susceptible to harmful co-channel and adjacent channel interference.

First, the Commission's arbitrary and capricious decision to allow unlicensed devices to operate in Channel 37 creates a significant risk of co-channel interference. Despite overwhelming record evidence and prior Commission precedent to the contrary, the Commission announced in the *Incentive Auction R&O* that it will permit unlicensed operations in Channel 37. Its principal justification for that policy reversal was that geo-location database techniques are now being used to support unlicensed operations in the TV white spaces and its belief that in a future proceeding it will be able to develop technical standards to permit spectrum sharing between the licensed incumbents and unlicensed users in Channel 37. This is not sufficient under the Administrative Procedure Act ("APA").

Second, the Commission's Technical Analysis contains a number of material errors which create an unacceptable level of risk of interference to WMTS operations from nearby 600 MHz base stations. In particular, the Commission misinterpreted GEHC's proposed field

strength values in its calculations for interference due to overload and out-of-band emissions ("OOBE"), and also incorrectly converted the field strength values to power. GEHC herein identifies the errors in the Commission's calculations and, in so doing, demonstrates the need for significantly increased 600 MHz base station transmitter to WMTS separation distance and/or more stringent emission limits to avoid WMTS desensitization.

Third, the Commission ignored key concerns that allowing additional TV stations to be repacked into Channels 36 and 38 will reduce WMTS spectrum capacity and increase hospital costs. In the proceeding record, GEHC clearly substantiated the need for additional protections to ensure that WMTS operators are not forced to bear the costs of a *de facto* relocation without the opportunity for reimbursement. In particular, if the auction clears 84 MHz of spectrum or less, WMTS operators will be faced with an increased number of TV stations repacked into Channels 36 and 38. The repacking will likely lead to a different combination of TV stations operating on these channels than is the case today, which will strand the investments already made by some WMTS operators to harden their systems and require others to abandon some or all of channel 37 or incur the significance expense of hardening for the first time their WMTS systems to prevent harmful interference. The Commission did not address GEHC's request to pack fewer TV stations into Channels 36 and 38 to help minimize the expense WMTS operators might have to incur without the possibility of reimbursement.

To remedy these concerns, GEHC respectfully requests that the Commission prohibit the use of unlicensed devices in Channel 37 until technical rules are developed that fully protect WMTS. Additional protections, such as base station coordination and/or more stringent emissions limits, should also be adopted to ensure that WMTS operations are fully protected

from 600 MHz operations. Lastly, the Commission should focus on options that minimize the number of DTV stations assigned to Channels 36 and 38 during the repacking process.

II. THE COMMISSION'S DECISION TO ALLOW UNLICENSED DEVICES TO OPERATE IN CHANNEL 37 WAS ARBITRARY AND CAPRICIOUS AND CREATES A SIGNIFICANT RISK OF CO-CHANNEL INTERFERENCE

The Commission's decision to allow unlicensed operations in Channel 37 was contrary to existing precedent and arbitrary and capricious. As a result, the Commission failed to meet the APA's requirements when it decided to allow unlicensed operations in Channel 37.

A. The Commission's Decision to Allow Unlicensed Devices to Operate in Channel 37 Was Arbitrary and Capricious and is Ripe for Review.

As an initial matter, the APA affords interested parties the opportunity to challenge announcements of changes in agency policies and rules, such as the Commission's announcement that unlicensed operations will now be allowed in Channel 37.[4] In the *Incentive Auction R&O*, the Commission revised Section 15.707(a) of its rules to permit unlicensed operations in the 600 MHz band, including in Channel 37, subject to the adoption of technical rules in a separate proceeding.[5] Except in limited circumstances, interested parties are required to exhaust their administrative remedies before seeking judicial review of an agency action, and courts generally prefer to review the application of an agency policy rather than a policy statement.[6] The Commission's decision to permit unlicensed operations in Channel 37 is both a

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[4] 5 U.S.C. §§ 552(a)(1)(D), (E); 553(d)(2) (requiring agencies to published their "general policy or their interpretations of general applicability" in the Federal Register); *see Spanish Int'l Broad. Co. v. FCC*, 385 F.2d 615, 626 (D.C. Cir. 1967) (stating an interested party is required to first pursue relief at the FCC even if it may be futile).

[5] *Incentive Auction R&O* ¶ 275 & Appendix A (adding Section 15.707(a)(2) to the Commission's rules, which states that "TVBDs may operate on frequencies in the 600 MHz Band as defined in part 27 of this chapter in areas where 600 MHz Band licensees have not commenced operations").

[6] *See Spanish Int'l Broad.* at 626 (citing *Red River Broad. Co. v. FCC,* 98 F.2d 282, 288, cert. denied 305 U.S. 625 (1938) ("appellant should have sought its remedies and awaited the action of the Commission. It cannot be heard to complain in this court that there was danger of refusal when it made no effort to do so.").

policy change and a rule change. Therefore, GEHC's request that the Commission reconsider its decision to permit unlicensed operations in Chanel 37 is appropriate and ripe for review.

Just six years ago, the Commission expressly declined to allow unlicensed devices to operate in Channel 37 in order to protect incumbent operations like WMTS from harmful interference.[7] In the *Second TV White Spaces Order*, the Commission "reaffirmed" its decision "not to allow TVBDs to operate on [C]hannel 37" and adopted "strict out-of-band emissions limits for TVBDs operating on [C]hannels 36 and 38" to protect WMTS operations.[8] In the *Incentive Auction R&O*, the Commission declined to relocate WMTS from Channel 37 because the relocations costs would exceed $300,000,000, which indicates that WMTS systems are widely deployed, expensive to replace, and highly valued by hospitals to perform life critical functions.[9] If hospitals did not value WMTS systems so highly, the relocation cost would be less because there would be fewer deployed WMTS systems to replace. Accordingly, it is in the public interest for the Commission to continue to protect WMTS operations in Channel 37 from harmful interference.

The Commission's decision to change course and permit unlicensed operations in Channel 37 without adopting technical rules to protect WMTS operations is not supported by the record in this proceeding,[10] is internally inconsistent, and, therefore, is arbitrary and capricious

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[7] *See Unlicensed Operation in the TV Broadcast Bands; Additional Spectrum for Unlicensed Devices Below 900 MHz and in the 3 GHz Band*, Second Report and Order, 23 FCC Rcd 16807 ¶ 155 (2008) ("*Second TV White Spaces Order*").

[8] *Id.*

[9] *Incentive Auction R&O* ¶ 287.

[10] *FCC v. Fox Television Stations, Inc.*, 556 U.S. 502, 515 (2009) ("An agency may not . . . depart from a prior policy *sub silentio* or simply disregard rules that are still on the books.").

under the APA.[11] An agency action to change its policy is arbitrary and capricious if the agency does not adequately explain its reasons, [12] the agency abuses its discretion, or the agency's action is "otherwise not in accordance with law."[13] Without weighing the importance of WMTS' safety-of-life operations against the Commission's "goal of promoting innovation in new unlicensed devices" or conducting a technical analysis to establish technical rules for unlicensed operations in Channel 37,[14] the Commission simply reversed course and decided to permit unlicensed operations in Channel 37 based on its limited "experience" with the use of TV white space geo-location databases.[15]

B. The Commission Consistently Prohibits Co-Channel Operation of Unlicensed Devices Until After Technical Standards are Developed to Prevent Harmful Interference.

Prior to the *Incentive Auction R&O*, the Commission had consistently refused to allow co-channel operation of unlicensed devices in spectrum set aside for use by authorized services (*e.g.*, WMTS)[16] until <u>after</u> technical standards had been developed that the Commission believed would prevent harmful interference.[17] Earlier this year, for instance, the Commission declined to allow outdoor U-NII operations in the U-NII-2B or U-NII-4 bands and explained that it was not

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[11] *See Air Line Pilots Assn. v. U.S. Dept. of Transp.,* 3 F.3d 449, 453 (D.C. Cir. 1993) (remanding agency decision because it was internally inconsistent, arbitrary, and capricious); *Gen. Chem. Corp. v. United States*, 817 F.2d 844, 846 (D.C. Cir. 1987) (finding agency action arbitrary and capricious because it was "internally inconsistent and inadequately explained").

[12] *National Cable & Telecommunications Ass'n v. Brand X Internet Servs.*, 545 U.S. 967, 981 (2005).

[13] 5 U.S.C. § 706(2)(A); *see National Ass'n of Regulatory Util. Comm'r. v. Interstate Commerce Commission,* 41 F.3d 721, 726–27 (D.C. Cir. 1994).

[14] *Incentive Auction R&O* ¶ 276.

[15] *Id.* ¶¶ 274-75, 277.

[16] 47 C.F.R. § 15.205(a) (listing the restricted bands of operation where unlicensed operations are prohibited).

[17] *See, e.g.*, Letter from Ari Fitzgerald, Counsel, GE Healthcare, to Marlene H. Dortch, Secretary, FCC, GN Docket No. 12-268, at 10-11 (filed May 1, 2014) (providing an overview of the First-UNII, Second U-NII, Third U-NII, and Ultra-Wideband proceedings).

addressing those bands "[d]ue to the ongoing [technical] analyses."[18] The Commission also allowed outdoor use of the U-NII-1 band only after technical rules were developed to protect incumbent authorized services.[19]

In the *Incentive Auction R&O*, the Commission failed to explain its departure from precedent or how harmful interference to WMTS operations from unlicensed devices will be avoided, thus violating the APA. Commission actions must be based on well-reasoned decision-making.[20] GEHC and other WMTS equipment manufacturers and users submitted significant evidence in the proceeding record demonstrating that WMTS use is growing[21] and that, in the absence of FCC protections, hospitals will be unable to cost-effectively modify their WMTS operations to avoid harmful interference.[22] The Commission even acknowledged these issues in the *Incentive Auction R&O.*[23] It did not, however, address them when determining that unlicensed operations in Channel 37 would "make additional spectrum available for unlicensed devices" to address the fact that "repurposing [TV] spectrum for wireless services will reduce the number of channels available for TVWS use."[24] Although the Commission indicated that WMTS locations could be added to existing TV white spaces databases and "could then be protected by establishing minimum distance separations, as is done to protect other fixed

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[18] *Revision of Part 15 of the Commission's Rules to Permit Unlicensed National Information Infrastructure (U-NII) Devices in the 5 GHz Band*, First Report and Order, 29 FCC Rcd 4127 ¶ 10 (2014).

[19] *See id.* ¶ 34.

[20] *See* 5 U.S.C. § 553(c) (requiring an agency to consider the "relevant matter presented" during the rulemaking comment period and incorporate into its adopted rule a "concise general statement" of the "basis and purpose" for adopting the final rule). *See also* S. Rep. No. 752, 79th Cong., 1st Sess. 39 (1945) (clarifying that a basis and purpose statement must "enable the public to obtain a general idea of the purpose of, and a statement of the basis justification for, the rules").

[21] GEHC Reply Comments, GN Docket No. 12-268 at 6-7 (filed Mar. 12, 2013).

[22] *Id.* at 8.

[23] *Incentive Auction R&O* ¶¶ 286-87.

[24] *Id.* ¶ 276.

operations, such as TV stations, wireless microphones, and receive sites,"[25] it did not take into account the safety-of-life nature of WMTS, its high susceptibility to degradation from interference, the very limited nature of TVBD operations to date,[26] and the myriad ways in which WMTS differs from the TV band services that are currently subject to TVBD spectrum sharing.

The Commission not only failed to show how its limited experience with geo-location databases or the record evidence in this proceeding supports its decision,[27] it also failed to explain how its decision could be squared with the objective of preventing harmful interference to WMTS. In fact, the Commission tacitly admitted that the threat to WMTS operations would remain by conditioning unlicensed operations in Channel 37 on the development of additional technical standards.[28] Although it is widely understood that geographic exclusion zones will be needed to protect WMTS operations in Channel 37 from interference from unlicensed devices, there is no agreed upon size for those exclusion zones. Further, the Commission has not conducted any analysis to determine how much geographic area (especially in densely populated areas, where many hospitals are located) will be available for unlicensed Channel 37 use outside the exclusion zones. Such an analysis might very well reveal that the amount of area available for unlicensed use in Channel 37 is so low and the interference and security risks are so high that it is not worth allowing unlicensed operations in Channel 37. In sum, the Commission has not

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[25] *Id.*

[26] *See, e.g.*, Letter from Ari Q. Fitzgerald, Counsel, GE Healthcare, to Marlene H. Dortch, Secretary, FCC, WT Docket No. 12-238 at 2 (filed Apr. 21, 2014) (GEHC Apr. 21 Ex Parte) (noting that "only a handful of TV White Space devices, all of which are fixed devices that rely upon professional installation for manual configuration of location coordinates (as opposed to the personal-portable devices proposed by Broadcom), are currently FCC certified, with relatively few actual deployments").

[27] *Incentive Auction R&O* ¶ 276.

[28] *Id.* ¶ 274.

adequately explained the "changed circumstances" that warrant its departure from existing precedent and practice.

The Commission's decision to allow unlicensed operations in Channel 37 ignores enormous risks. WMTS systems cannot easily tolerate interference, and just one instance of it could prove catastrophic to a hospital and its patients.[29] The geo-location database concept is nascent and remains largely untested, and the Commission has only limited experience using it in any context.[30] Serious concerns exist regarding both the reliability and security of the handful of databases that have been certified thus far, as well as the device-database access protocols and the devices themselves.[31] Consequently, there is a significant cyber-security concern that the database or devices that operate in the TV bands could malfunction or be hacked to operate where they are not supposed to, potentially causing life-threatening interference to WMTS systems.[32] If this were to occur, WMTS systems would be afforded no protection from compromised unlicensed devices, and large sections of a hospital's WMTS system could become non-functional, risking the health and safety of the hospital's patients. In addition, the PCAST Report suggests that even a robust and secure geo-location database scheme may not be capable of protecting critical operations.[33] Therefore, GEHC's requests that the Commission reverse its

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[29] GEHC Comments, GN Docket No. 12-268 at 21 (filed on Jan. 25, 2013).

[30] *See, e.g.*, GEHC Apr. 21 Ex Parte at 2.

[31] *See, e.g.*, *id*.

[32] *See, e.g.*, President's Council of Advisors on Science and Technology, *Report to the President: Realizing the Full Potential of Government-Held Spectrum to Spur Economic Growth*, at 103 (2012) ("PCAST Report), *available at* http://www.whitehouse.gov/administration/eop/ostp/pcast/docsreports; Mobile Future, *Complexities of Spectrum Sharing: How to Move Forward*, at 6, 15-16, 18-19 (2014), *available at* http://www.rysavy.com/Articles/2014-04-Spectrum-Sharing-Complexities.pdf.

[33] *See* PCAST Report at 102 ("In bands where it is necessary to ensure that a malfunctioning device causing interference can be located, unlicensed devices could be required to register *or to incorporate the capability to receive and switch off a frequency immediately in response to a narrow-band signal beacon*[,] such as during an emergency when a Federal primary or other public safety user requires preemption of a band.") (emphasis added).

decision to allow unlicensed operations in Channel 37 until it conducts and completes a rulemaking to craft technical rules to protect WMTS operations and determine whether, under such rules, a sufficient amount of geographic area would actually be open to unlicensed Channel 37 operations to justify the risk such operations would pose for WMTS operations.

III. THE COMMISSION'S TECHNICAL ANALYSIS CONTAINS A NUMBER OF MATERIAL ERRORS LEADING TO FLAWED RULES THAT AFFORD INADEQUATE PROTECTION AND WILL FAIL TO PREVENT INTERFERENCE TO WMTS OPERATIONS

The Commission's technical analysis of the potential for interference to WMTS operations from new licensed 600 MHz operations contains three material errors. First, the technical analysis inappropriately applies the protection criteria provided by GEHC at the input to the receiver, rather than "at the perimeter of a registered WMTS facility," as specified in the record. Second, the Commission's analysis incorrectly converts field strength to received power. Third, although recognizing that WMTS systems are Distributed Antenna Systems ("DAS") with active antennas, the technical analysis fails to consider interference aggregation from multiple WMTS antennas.

A. The Commission's Technical Analysis Inappropriately Applied the Protection Criteria Provided by GEHC.

In its technical analysis, the Commission applied the protection criteria provided by GEHC at the input to the receiver, rather than "at the perimeter of a registered WMTS facility," as specified in the record.[34] This was an incorrect application of GEHC's proposed values for field strength and resulted in the double-counting of building penetration losses and filter rejection.[35] These losses had already been factored into the proposed field strength values that

[34] *See Incentive Auction R&O* ¶ 722 n.2029; Technical Appendix at Fig. 20, ¶¶ 97-100.

[35] The double counting of building penetration losses applies to both the overload analysis and the OOBE analysis while the double counting of filter rejection applies only to the overload analysis.

GEHC calculated and proposed in its January 2013 Comments. The Commission wisely chose to use them in its analysis; however, the Commission assumed that they represented the target interference power that the receiver can tolerate, when in fact they were very clearly intended to be field strength limits as measured *outside* the WMTS facility at its perimeter. Although in several instances, the text and charts in the *Incentive Auction R&O* and Technical Appendix clearly state that these values are "WMTS Protection Criteria at the perimeter of a facility,"[36] the FCC's calculations include building losses and filter rejection which, by definition, can only apply *inside* the facility. That is, proper calculations of the path loss required to meet the field strength limits should be independent of the characteristics of the facility and WMTS system within, because the limits already account for the characteristics of same. As such, the proper path loss calculations should not include building losses and filter rejection. By including these losses in its calculations, the Commission effectively counted them twice, leading to much higher power levels outside the facility, much less required path loss, and much shorter separation distances than are actually required to adequately protect WMTS systems.

B. The Commission Incorrectly Converted Field Strength to Effective Isotropic Radiated Power ("EIRP") Rather than Received Power.

In the Technical Appendix, the Commission provided a formula for converting "WMTS field strength protection criteria to maximum allowable EIRP levels in dBm/100 kHz."[37] The specified formula was stated as follows:

$$\text{EIRP (dBm/100 kHz)} = \text{E(dB}\mu\text{V/m/100 kHz)} + 20\log10(d) - 104.8$$

[36] *Incentive Auction R&O* ¶ 722 n.2029; Technical Appendix at Fig. 20, ¶ 97 ("GEHC specifies protection criteria that limiting the field strength as measured at the perimeter of a health care facility"), ¶¶ 98-100.

[37] *Incentive Auction R&O*, Technical Appendix at ¶ 98.

The Commission then assumed "a standard three meter measurement distance" for d and simplified the formula to:

EIRP (dBm/100 kHz) = E(dBμV/m/100 kHz) – 95.3

As shown in the formulas above, the Commission was calculating EIRP from field strength using a formula typically used in radio frequency measurement labs for this purpose. In such case, a radiating element and measurement device are placed three meters apart, and the measured field strength is converted to the transmitting antenna's EIRP using this formula. Unfortunately, this is not the correct formula to use for the purpose of converting field strength at the perimeter of a WMTS facility to the received power level at that point. Numerous sources are available that show how the proper formula is derived, but for brevity it is stated as:

E(dBμV /m/100 kHz) = P (dBm/100 kHz) + 77.2dB + 20log(f ,MHz) - G (dB)[38]

Rearranging this equation and substituting 55.7 for the frequency factor (*i.e.*, 20log[611 MHz]) and 0 dB for the antenna gain yields:

P (dBm/100 kHz) = E(dBμV /m/100 kHz) - 77.2dB - 55.7dB

Or

P (dBm/100 kHz) = E(dBμV /m/100 kHz) – **132.9 dB**

Recall that the formula used by the Commission was:

EIRP (dBm/100 kHz) = E(dBμV/m/100 kHz) – **95.3 dB**

[38] Semtech, *Calculating Radiated Power and Field Strength for Conducted Power Measurements* (2007), *available at* http://www.semtech.com/images/promo/Semtech_ACS_Rad_Pwr_Field_Strength.pdf.

Note that the difference between the two conversion factors is 132.9 – 95.3 = 37.6 dB. As one would expect, this is equal to Free Space Loss over the assumed measurement distance of three meters.[39]

This error caused the Commission to incorrectly interpret the WMTS protection criteria proposed by GEHC as 37.6 dB more powerful than they were intended, which again resulted in less path loss required and thus much smaller separation distances.

C. The Commission's Technical Analysis Failed to Consider WMTS Aggregation.

Although recognizing that WMTS systems are DAS systems with active antennas, the Commission's technical analysis failed to consider interference aggregation from multiple WMTS antennas. WMTS sensitivity to interference is exacerbated by the fact that wireless medical telemetry units are DAS systems, which employ hundreds of antennas located throughout the healthcare facility.[40] Although this design allows single WMTS systems to provide seamless coverage across hundreds of thousands of square feet, it also renders them "susceptible to reciprocal mixing of signals."[41] Additionally, a single source of interference could cripple the entire system, resulting in the loss of monitoring to all patients, regardless of their location within the healthcare facility.[42] This in turn makes identifying the interfering source extremely arduous and difficult.[43] In its original analysis, GEHC had assumed that 10 WMTS antennas could aggregate, resulting in a 10 dB aggregation adjustment. However, after further review, GEHC has determined that this scenario is unlikely because it assumes the

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[39] The Free Space Loss equation is 20log(F, MHz) + 20log(d, m) – 27.55. Substituting F = 611 MHz and d = 3 meters gives 55.72 + 9.54 – 27.55 = 37.71 dB. The 0.1 dB difference is due to rounding.

[40] GEHC Comments at 11.

[41] Philips Healthcare Comments, GN Docket No. 12-268 at 5 (filed on Jan. 25, 2013).

[42] GEHC Comments at 23.

[43] *Id.* at 34.

received signal phase will be simultaneously constructive at all 10 dominant receive antennas. Based on this, GEHC suggests that aggregation based on two antennas (resulting in an aggregation adjustment of 3 dB) represents a more accurate estimate of actual WMTS operations.[44]

D. Correction of the Commission's Errors Reveals Much Greater Calculated Separation Distances and Thus a Much Greater Possibility of Interference to WMTS Absent Additional Protections.

GEHC acknowledges that the Commission took the right step in adopting a three megahertz guard band and limiting 600 MHz adjacent channel operations to downlink only. However, when the Commission's errors are appropriately corrected, the results of the revised interference analysis clearly demonstrate that additional technical measures are needed to fully protect WMTS systems from potentially life-threatening interference.

The Commission's errors led it to rely solely on a three megahertz guard band to protect WMTS operations from 600 MHz base stations.[45] However, a revised analysis shows that such a guard band alone will not be nearly sufficient to prevent harmful interference from 600 MHz operations to WMTS operations in all cases. The revised calculations indicate that, under current fundamental and out-of-band emission limits, greater separation distances are needed to protect WMTS operations or, alternatively, that base stations near WMTS facilities will require more stringent limits on power and out-of-band emissions.

In addition, the Commission made a few less significant errors that also contributed to its incorrect conclusions. For example, the Commission's power level

[44] It is important to note that GEHC's analysis was intended only to illustrate examples of typical scenarios under which that interference could occur and *not* as an absolute worst-case analysis. Other factors could also vary from those used in the GEHC analysis – in particular building penetration loss could be less than 20dB offsetting the effect of the revised aggregation assumption.

[45] *See Incentive Auction R&O* ¶ 290.

assumptions in its overload analysis were incorrect. Specifically, the Commission assumed a five megahertz channel but only attributed that portion of the power in Channel 36 (or Channel 38) to the interfering power, effectively ignoring that portion of the power in Channel 35 (or Channel 39).[46] This partial power was also integrated across the entire six megahertz of Channel 36 (or Channel 38) to derive a power spectral density in the adjacent DTV channel. This is not the proper way to attribute power for the purposes of calculating overload interference, and the Commission's analysis is further skewed as a result.

To more effectively guard against interference, the Commission should supplement the three megahertz guard band with the adoption in Part 27 of rules specifying revised field strength values at the perimeter of WMTS facilities that all 600 MHz licensees must meet. Alternatively, the Commission could require all 600 MHz operators to coordinate with WMTS facilities all base stations located within, at the very least, 2.5 kilometers of WMTS operations.

IV. THE COMMISSION IGNORED KEY CONCERNS THAT ALLOWING ADDITIONAL TV STATIONS TO BE REPACKED INTO CHANNELS 36 AND 38 WILL REDUCE WMTS SPECTRUM CAPACITY AND INCREASE HOSPITAL COSTS

If the Incentive Auction clears less than 84 megahertz of spectrum, the Commission will not implement guard bands between Channel 37 and adjacent channel television operations.[47] However, the auction and subsequent repacking may significantly increase the number of DTV assignments in channels 36 and 38 relative to the number of stations assigned to those channels today. The Commission inexplicably failed to recognize the costs and operational impacts hospitals will have to incur to mitigate the additional interference from a potentially large number of new adjacent band DTV stations.

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[46] This method is unrealistic because it inherently assumes that power outside Channel 36 (or Channel 38) either does not exist or the receiver's filter perfectly rejects this portion of the power.

[47] *See id.* ¶ 291.

A. If Additional DTV Stations are Repacked into Channels 36 and 38, Hospitals May Need to Create De Facto Guard Bands to Protect Their WMTS Operations from Harmful Interference.

Although the Commission acknowledged that assigning additional television stations to Channels 36 and 38 during the repacking process could reduce the amount of spectrum available for WMTS operations, it did not address the issue.[48] These channels likely will be used more extensively for DTV stations after the repacking process, which may require many more hospitals to incorporate *de facto* guard bands within their Channel 37 assignments.[49] For instance, Philips Healthcare and the WMTS Coalition estimate that 20 percent of the WMTS band is unusable for hospitals located near a DTV station.[50]

The Commission incorrectly assumed that WMTS operations have to date been adequately protected from interference due to DTV operations. In fact, healthcare facilities have not been fully protected by the Commission's rules from DTV stations that transmit on an adjacent channel, and have been forced to take costly measures to protect their WMTS operations from undesirable broadcast signals.[51]

Today, hospitals with WMTS systems that are located near a DTV broadcast facility are generally discrete and known, as are the precautions that healthcare facilities may take to secure additional protection from broadcast emissions. However, if substantially more DTV stations were repacked into Channels 36 and 38, the number of WMTS facilities that could experience

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[48] *See id*.

[49] *See, e.g*., GEHC Reply Comments at 27.

[50] *See id*.

[51] GEHC Comments at 20 n. 54 (stating "the SAW filters typically used in WMTS systems have relatively limited rejection of transmission from Channels 36 and 38, but that WMTS systems may be further 'hardened' to employ alternative filtering in the DAS design, together with the use of passive antennas and discrete low noise amplifiers, but at a significantly higher cost and consumption of bandwidth in Channel 37").

interference from DTV operations will increase, and consequently the amount of usable spectrum in Channel 37 available to these facilities for WMTS will decrease.

The broadcaster community has explicitly acknowledged the likelihood that repacked television stations will cause harmful interference to WMTS users in the 600 MHz band. For example, the National Association of Broadcasters ("NAB") identified "expenses associated with possible medical telemetry interference notifications" as among the potential costs of repacking broadcast operations in the 600 MHz band.[52] Notably, the NAB did not attempt to deny the possibility of such heightened interference, but simply assumed it would be required to give notice to healthcare facilities using WMTS systems.

B. The Commission Ignored WMTS Operator and Equipment Manufacturer Concerns that the Repacking of Additional DTV Stations into Channels 36 and 38 will Cause Hospitals to Incur Additional Costs to Protect Their WMTS Operations from Harmful Interference.

In the *Incentive Auction R&O*, the Commission ignored the significant costs that hospitals may have to incur to adapt to any influx of new adjacent band television stations.[53] As GEHC and others have pointed out, a band plan and repacking strategy that materially increases the number of television stations in Channels 36 and 38 would significantly increase hospitals' costs to attenuate nearby signals.[54] For example, many hospitals will have to purchase and install stronger filtering mechanisms to attenuate DTV station signals, which would further impair the healthcare community's ability to use wireless medical telemetry facilities.[55] While the cost of taking these measures to date has been significant, it has not been insurmountable

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[52] NAB Comments, GN Docket No. 12-268, Appendix A at ii (filed on Jan. 25, 2013).

[53] *See Incentive Auction R&O* ¶ 291.

[54] *See, e.g.*, GEHC Reply Comments at 26-27; Verizon Comments, GN Docket No. 12-268 at 11 (filed on Jan. 25, 2013); WMTS Coalition Comments, GN Docket No. 12-268 at 26-27 (filed on Jan. 25, 2013).

[55] *See, e.g.,* GEHC Reply Comments at 27.

because the DTV presence in Channel 36 and 38 is relatively discrete and manageable, and because the commencement of new DTV station operations occurs infrequently. However, a significant number of new DTV interference cases may be created as a result of the repacking if less than 84 megahertz is repurposed following the auction, and this could result in significant and potentially unmanageable expenses and sacrifices of system capacity for many WMTS operators.

Moreover, interference issues will likely shift—leaving some currently hardened WMTS facilities unnecessarily hardened, and others that will require hardening for the first time. GEHC therefore reiterates its request that the Commission refrain from repacking additional DTV stations in the spectrum surrounding Channel 37. Consistent with the Commission's prior statements acknowledging the critical role played by WMTS systems,[56] there is a real and significant need to minimize DTV repacking in Channels 36 and 38.

V. CONCLUSION

GEHC appreciates the Commission's efforts thus far to protect WMTS operations, but more protections are needed to ensure that WMTS systems will not suffer harmful interference as a result of changes in the 600 MHz band. The Commission inexplicably and contrary to the overwhelming evidence in this proceeding announced that unlicensed operations would be permitted on Channel 37. Consistent with prior precedents, the Commission should reverse that decision and instead initiate a proceeding to determine if technical rules can be adopted to permit sharing. At the end of the proceeding, the record may show that the exclusion zones needed to protect WMTS operations will make the availability of Channel 37 spectrum for unlicensed use too remote to justify the risk of harmful interference.

[56] *Incentive Auction R&O* ¶¶ 275, 281.

Due to the significant flaws in the Commission's technical analysis, it should also reconsider its decision to rely solely on a three megahertz guard band to protect Channel 37 operations from 600 MHz base station operations. Correcting the errors in the Commission's overload and OOBE analyses clearly demonstrates that a three megahertz guard band alone is not sufficient to protect WMTS, and that additional protections—such as base station coordination and/or more stringent emissions limits—are needed.

Hospitals incur significant costs and operational constraints to mitigate interference from nearby DTV stations operating in Channels 36 and 38. The Commission should also reconsider its decision to allow additional DTV stations to be repacked into Channels 36 and 38 and focus on options that would minimize the number of DTV stations utilizing Channels 36 and 38 after repacking is complete.

Respectfully submitted,

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