

**Before the  
FEDERAL COMMUNICATIONS COMMISSION  
Washington, DC 20554**

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

**REPLY COMMENTS OF GE HEALTHCARE**

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**I. INTRODUCTION AND SUMMARY**

GE Healthcare (“GEHC”) submits these reply comments in response to the Notice of Proposed Rulemaking (“NPRM”) issued by the Federal Communications Commission (“Commission”) in the above captioned proceeding.<sup>1</sup> The fate of the protected services operating in television channel 37 is among the most critical issues the Commission must resolve before it can proceed with conducting the incentive auction. Given the essential function of those services, including the Wireless Medical Telemetry Service (“WMTS”), it is critical that the regulations adopted in this proceeding adequately protect those services from nearby transmissions. The profound shift in 600 MHz band usage that will follow the reverse and forward auctions will create a heightened risk of interference to Channel 37 WMTS operations. If not properly addressed, new uses of the band could cripple thousands of WMTS systems and jeopardize patient safety throughout the United States.

The record developed in the opening round offers the Commission a clear framework for addressing WMTS operations in Channel 37. First, there is widespread agreement that the

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<sup>1</sup> Expanding the Economic and Innovation Opportunities of Spectrum Through Incentive Auctions, *Notice of Proposed Rulemaking*, WT Docket No. 12-268, FCC 12-118 (rel. Oct. 2, 2012) (“NPRM”).

Commission should not relocate incumbent Channel 37 WMTS users to another frequency band. Given the significant financial and non-financial costs of doing so, it is inconceivable that the Commission would be able to relocate WMTS operations within the \$300 million limit designated by Congress. But even if those costs were manageable within the statutory limit, it is highly unlikely that the Commission would be able to find alternative frequencies that adequately replaces the current spectrum between 608-614 MHz, which uniquely satisfies existing medical telemetry demands. The few commenters that support relocation have failed to address how the Commission could overcome the significant cost, operational, technical, and spectrum-related hurdles to doing so, but have instead conjectured that a forced migration could somehow benefit the 600 MHz band without clearly articulating the nature or scope of those benefits. Such claims belie reason and practical realities.

Second, the only reliable evidence submitted into the record demonstrates that authorized unlicensed devices, wireless microphones, and low power auxiliary service (“LPAS”) stations in Channel 37 would materially disrupt WMTS operations in the band. Proponents of a 600 MHz band plan that would allow these transmissions in Channel 37 have not offered any basis for unraveling the Commission’s 2006 decision to prohibit unlicensed devices from operating in Channel 37. A database/geolocation regime would prove far too impractical to implement, and inadequate to protect WMTS operations in Channel 37 from unlicensed devices, wireless microphones, and LPAS stations. Likewise, an interference protection regime that relies upon geographic separation and/or spectrum sensing would not properly insulate WMTS operations from harmful, co-channel interference.

Finally, the initial round of comments demonstrates the need for rules that adequately protect WMTS operations from broadcast and mobile transmissions near Channel 37. The

Commission can ensure that the shifting 600 MHz landscape does not disrupt the Channel 37 WMTS ecosystem by taking at least three actions. First, the Commission should adopt a band plan that places mobile uplink operations in the spectrum immediately adjacent to the Lower 700 MHz band, as far from Channel 37 as possible. If that is not possible, the Commission should, at a minimum, adopt stringent emissions limits for mobile devices authorized to transmit near Channel 37. Second, the Commission should minimize the number of DTV broadcast stations repacked in Channels 36 and 38, by, for example, prioritizing lower band spectrum for this purpose and placing mobile base stations in the spectrum closest to Channel 37. Third, the Commission should adopt strict coordination requirements and absolute field strength limits for mobile base stations authorized to transmit near Channel 37. As a number of commenters have proposed band plan designs that incorporate the first two of these recommended actions, the Commission need only add mobile base station coordination requirements and field strength limits to protect WMTS users.

Given the importance of WMTS systems to the delivery of healthcare throughout the country, the Commission should reject requests to designate WMTS systems as secondary to *any* service that replaces broadcast operations near Channel 37. The extant circumstances are materially different from those present when the Commission adopted rules requiring WMTS systems to accept interference from DTV broadcasters. Moreover, the present radio frequency landscape would make it exceedingly more difficult for WMTS users to effectively manage nearby mobile signals or a more cluttered TV broadcaster environment. Absent strong measures to protect incumbent WMTS systems in Channel 37, the healthcare community would have to incur hundreds of millions of dollars to ensure the continued viability of their current medical

telemetry devices, creating an onerous financial burden on an industry that is already facing unprecedented budgetary and regulatory challenges.

## **II. THE RECORD REFLECTS NEAR UNIVERSAL AGREEMENT THAT THE COMMISSION SHOULD NOT RELOCATE INCUMBENT OPERATIONS IN CHANNEL 37**

With few exceptions, commenters agree that Channel 37 operations – including WMTS systems authorized to operate in that spectrum – should remain undisturbed and not be relocated in this proceeding to another frequency band.<sup>2</sup> The record offers the following three reasons why this should be the case, as discussed further below:

1. WMTS systems are essential to the U.S. healthcare industry, providing hospitals and medical professionals with an invaluable, safety-of-life technology that enhances patient welfare. Upsetting the WMTS ecosystem would not only threaten the safety of patients, but also the operational efficiency and workflow of healthcare institutions that rely heavily upon their WMTS installations.
2. The costs of migrating existing Channel 37 operations to another frequency band would be well over \$300 million, the amount Congress designated for that purpose.
3. There are no alternative frequencies that could adequately replace the current allocation between 608-614 MHz, which is uniquely suited to support current medical telemetry technologies and demands.

Uprooting WMTS operations in Channel 37 in the face of these realities would flout the public interest and ignore the near universal consensus that doing so would be inappropriate.

As noted by the WMTS Coalition, wireless medical telemetry systems have proven vital to “the provision of quality health care in the nation’s hospitals,” are “heavily utilized in many sectors of hospitals, large and small, and are critical to improving patient health and safety.”<sup>3</sup>

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<sup>2</sup> See, e.g., Alcatel-Lucent Comments at 4; AT&T Comments at 39; National Radio Astronomy Observatory Comments at 3; National Academy of Sciences’ Committee on Radio Frequencies Comments at 6; Philips Healthcare Comments at 1-2; T-Mobile Comments at 9 n.14, 12; Universities Space Research Association Comments at 1; Whitespace Alliance Comments at 27; WMTS Coalition Comments at 2.

<sup>3</sup> WMTS Coalition Comments at 10.

These systems have also been ubiquitously deployed throughout the country, and are used on an around the clock basis as a vital part of healthcare operations. The WMTS Coalition estimates that more than 200,000 devices currently operate in Channel 37 – a figure substantially greater than the number of devices registered with ASHE.<sup>4</sup> GEHC has alone sold more than 100,000 devices, representing over 100 million square feet of WMTS antenna and access point-based wireless infrastructure, across more than 1,300 hospitals.<sup>5</sup> These statistics demonstrate that “the creation of the WMTS and the allocation of Channel 37 on a primary basis for WMTS . . . has been a resounding success,” and a forced relocation of these users “would significantly stress the nation’s health care industry.”<sup>6</sup> In urging the Commission to refrain from relocating the Radio Astronomy Service (“RAS”) and WMTS out of the 600 MHz band, the Computer & Communications Industry Association emphasized that the “relocation process is arduous and disruptive, and would be particularly out of step with the Commission’s recent commitment to aiding the provision of healthcare through the use of broadband services.”<sup>7</sup>

The record also confirms that the cost of relocating incumbent services from Channel 37 would be far greater than the \$300 million designated for that purpose in the Spectrum Act. As AT&T noted, “it would likely be cost-prohibitive to relocate wireless medical telemetry devices from Channel 37 and that, therefore, the channel will likely remain unavailable for assignment to mobile broadband providers. . . . It would be challenging to relocate this large installed base of wireless medical telemetry devices that currently use Channel 37.”<sup>8</sup> T-Mobile likewise noted

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<sup>4</sup> *Id.* at 11.

<sup>5</sup> GEHC Comments at 6.

<sup>6</sup> WMTS Coalition Comments at 12.

<sup>7</sup> CCIA Comments at 13.

<sup>8</sup> AT&T Comments at 39.

that the Commission’s own analysis indicates that it would be “cost prohibitive to relocate incumbent services from TV Channel 37.”<sup>9</sup>

WMTS stakeholders participating in this proceeding have substantiated the burdens, both financial and non-financial, of relocating Channel 37 users. Indeed, the mere replacement cost associated with current WMTS systems would far exceed \$300 million, even before accounting for the substantial intangible and other monetary costs of a forced WMTS migration. As GEHC explained in its initial comments, due to technical design limitations and the Commission’s rules, a change in the permitted frequency range would require the *full replacement* of existing wireless medical telemetry systems – including devices, antennas, cabling, and access points.<sup>10</sup> Other commenters agree. The WMTS Coalition noted that a “significant percentage of system components, i.e., transmitters, receivers, antenna, would have to be replaced without regard to which new frequencies were allocated to WMTS licensees.”<sup>11</sup> Likewise, Philips Healthcare, a manufacturer of WMTS systems, explained that “[r]elocating current WMTS devices to nearby channels (such as channel 32) is not feasible because fixed filtering designed into WMTS channel 37 systems prevent their being easily retuned to other spectrum.”<sup>12</sup> At an average price of between \$6,000 and \$10,000 per device – the consensus replacement cost estimate among members of the WMTS community – the aggregate equipment-related costs for WMTS would amount to nearly \$2 billion, nearly seven times the amount designated by Congress for all Channel 37 incumbents.<sup>13</sup> Coupled with the other costs that hospitals would incur to acquire new WMTS systems – including administrative, engineering, and installation costs – there is no

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<sup>9</sup> T-Mobile Comments at 9 n.14 (citing *NPRM* ¶¶ 200-214).

<sup>10</sup> GEHC Comments at 9-10.

<sup>11</sup> WMTS Coalition Comments at 13 n.26.

<sup>12</sup> Philips Healthcare Comments at 2.

<sup>13</sup> WMTS Coalition Comments at 13; GEHC Comments at 10.

conceivable way for the Commission to relocate WMTS users on Channel 37 within the monetary limits specified by Congress.

But the WMTS-related expenses are just part of the total cost of relocating existing Channel 37 operations. Modifying RAS receivers would likewise require millions of dollars in additional investment. As the National Academy of Sciences' Committee on Radio Frequencies ("CORF") noted, by retaining the existing Channel 37 allocation, the Commission would avoid the obligation to reimburse the RAS community for the sizeable expenses "associated with refitting RAS receivers (as well as WMTS equipment)."<sup>14</sup>

Even if incumbent Channel 37 operations could be relocated for less than \$300 million, there are no viable alternative frequencies that could support WMTS devices to the same extent as 608-614 MHz. The other frequencies allocated for WMTS use are inadequate, despite speculation to the contrary by some commenters.<sup>15</sup> As noted by Philips Healthcare, the WMTS bands at 1395-1400 MHz and 1427-1432 MHz "have insufficient capacity to accommodate the needs of many larger hospitals and hospitals in dense urban areas."<sup>16</sup> The WMTS Coalition agreed, noting that "the capacity to manufacture and market 1.4 GHz equipment is limited" and "many hospitals currently employ both Channel 37 and 1.4 MHz equipment, much of which is operating near or at capacity."<sup>17</sup>

Additionally, the unique status and characteristics of Channel 37 make it ideal for WMTS applications. As noted by the WMTS Coalition, unlike Channel 37, most other bands in the

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<sup>14</sup> CORF Comments at 6.

<sup>15</sup> See WISPA Comments at 14-15 (urging the Commission to "consider whether the 1395-1400 MHz and 1427-1432 MHz bands . . . can accommodate the WMTS devices registered for use on Channel 37").

<sup>16</sup> Philips Healthcare Comments at 2.

<sup>17</sup> WMTS Coalition Comments at 16.

UHF spectrum do not restrict the operation of intentional radiators under Part 15.<sup>18</sup> Thus, moving WMTS systems to another part of the UHF band could “subject WMTS to interference from a plethora of existing Part 15 devices, as well as devices licensed under Part 74 that might be brought into the hospital environment.”<sup>19</sup> Channel 37 also offers value that spectrum above 1 GHz cannot provide. For example, as Philips Healthcare explained, fetal/obstetric monitoring, which “must be done through water,” can only be performed in spectrum below 1 GHz because of the attenuation by water of radio signals above 1 GHz.<sup>20</sup> GEHC agrees that access to some spectrum below 1 GHz will continue to be necessary for wireless medical telemetry equipment. As such, unless the Commission can promptly locate alternative spectrum for WMTS that is at least as valuable as the Channel 37 spectrum, relocating WMTS operations out of the current allocation would have a permanent, adverse effect on healthcare patient monitoring. Given the congestion that exists in the spectrum below 1 GHz, it is highly unlikely that the Commission will be able to identify viable alternative frequencies that could accommodate WMTS, and the NPRM notably did not propose any bands that might be suitable for WMTS and RAS.

For these reasons, the Commission should reject claims that the WMTS frequency allocations above 1 GHz would be sufficient for those medical telemetry systems operating in Channel 37. Likewise, the Commission should disregard the suggestion that patient monitoring of the type delivered on Channel 37 could occur in the 2.3 GHz frequencies designated for Medical Body Area Networks (“MBANs”).<sup>21</sup> Unlike Channel 37 WMTS operations, MBAN operations may occur only on a secondary, coordinated basis, and receive no protection from interference caused by primary aeronautical mobile telemetry or amateur radio users. The

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<sup>18</sup> *Id.* at 17.

<sup>19</sup> *Id.*

<sup>20</sup> Philips Healthcare Comments at 3.

<sup>21</sup> *See* PISC Comments at 32.

MBAN rules also allow for only very short-range transmissions in most of the band and seriously constrain network topology in a manner incompatible with many telemetry uses. The MBAN service is therefore poorly suited for the wireless medical telemetry operations that currently occur on Channel 37.

Parties that expressed support for relocating Channel 37 operations have failed to address how the Commission could overcome the aforementioned cost, operational, technical, and spectrum-related hurdles. They have instead simply conjectured that relocation would somehow benefit the 600 MHz band without clearly articulating the nature or scope of those benefits – and whether or how those benefits would exceed the countervailing costs. For example, the Public Interest Spectrum Coalition (“PISC”), one of the few advocates for displacing Channel 37 operations, concedes that it “is not able to offer any technical insight into the appropriate time frame and process for relocation of WMTS operations off of channel 37.”<sup>22</sup> Despite this limitation, PISC hypothesizes, without support, that a five-year period to transition medical telemetry devices out of the 600 MHz band would be sufficiently “generous” to reduce the cost and potential disruption to the healthcare community. This unsubstantiated conclusion should be rejected, particularly in view of the fact that most WMTS systems have a useful life of up to twenty years – four times longer than the five-year transition period PISC speculates would somehow shrink the estimated \$2 billion replacement cost (ignoring the other tangible and intangible costs of a forced migration) by 85%, to a value under the \$300 million statutory threshold.<sup>23</sup> Even if no further WMTS systems were deployed on Channel 37 and the Commission ignored the other financial and non-financial burdens of a mandatory Channel 37 displacement, simple math using straight-line depreciation illustrates that a transition period of at

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<sup>22</sup> *Id.* at 30.

<sup>23</sup> *Id.* at 31.

least 17 years would be necessary for the \$2 billion replacement cost to fall to \$300 million. At best, PISC's proposal manifests a fundamental misunderstanding of, and disregard for, the draconian consequences of displacing WMTS from Channel 37.

For similarly compelling reasons, the Commission should refrain from instituting a freeze on Channel 37 registrations.<sup>24</sup> Contrary to the claims of the few parties that support the idea,<sup>25</sup> a freeze would be inconsistent with Commission precedent and policy. Although the Commission has implemented a freeze in limited instances,<sup>26</sup> it has never done so to prevent the delivery of critical healthcare services. Moreover, when it has instituted a freeze, it has established adequate safeguards to protect the *status quo*, for example, by creating categorical and case-by-case exceptions to allow licensees to circumvent the freeze under certain conditions. Even a temporary freeze on Channel 37 WMTS registrations would have a disastrous impact on healthcare facilities and their patients. As noted in the record, thousands of hospitals employ wireless medical telemetry devices to monitor their patients, and are increasing their use of WMTS to improve the quality and efficiency of their healthcare services. By prohibiting existing users from acquiring and registering additional medical telemetry devices, and prohibiting new users from first-time WMTS installations, the Commission would throttle one of the most important, emerging technologies used by hospitals to improve patient care.

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<sup>24</sup> *NPRM* ¶ 213.

<sup>25</sup> See PISC Comments at 31; WISPA Comments at 16.

<sup>26</sup> See, e.g., Amendment of the Commission's Rules with Regard to Commercial Operations in the 3550-3650 MHz Band, GN Docket No. 12-354, *Notice of Proposed Rulemaking and Order*, FCC 12-148 (rel. Dec. 12, 2012) (imposing a freeze on new earth stations in the 3600-3650 MHz band); Wireless Telecommunications Bureau and Public Safety and Homeland Security Bureau Suspend the Acceptance and Processing of Certain Part 22 and 90 Applications for 470-512 MHz (T-Band Spectrum), *Public Notice*, DA 12-643 (rel. Apr. 26, 2012); General Freeze on the Filing and Processing of Applications for Channel 51 Effective Immediately and Sixty (60) Day Amendment Window for Pending Channel 51 Low Power Television, TV Translator and Class A Applications, *Public Notice*, DA 11-1428 (rel. Aug. 22, 2011).

Moreover, freezing the registration of WMTS systems that are currently operating but not yet registered would prevent the Commission from ascertaining the actual number of Channel 37 WMTS systems currently in operation, to the detriment of the public. As noted by the WMTS Coalition, many WMTS systems are not yet registered and “ASHE and the Coalition members continue their efforts to encourage all hospitals employing wireless medical telemetry systems to register with the WMTS database.”<sup>27</sup> A freeze would halt these efforts and frustrate the Commission’s ability to conduct the reverse and forward auction with a clear understanding of the Channel 37 landscape. Finally, given the profound adverse effect that a freeze on Channel 37 WMTS registrations would have, such an action would constitute a “substantive” decision for which notice and comment is required under the Administrative Procedure Act.<sup>28</sup> As such, any freeze of Channel 37 WMTS registrations would require a separate rulemaking proceeding. The Wireless Internet Service Providers Association (“WISPA”), one of the few parties to endorse a freeze, acknowledges the need for such a separate proceeding.<sup>29</sup>

Finally, relocating Channel 37 WMTS incumbents would frustrate the Commission’s ability to implement most of the alternative 600 MHz band plan proposals that have garnered significant record support in this proceeding. As described below, GEHC supports these proposals to the extent they would place mobile uplink spectrum far from Channel 37 (adjacent to the Lower 700 MHz band uplink spectrum), establish guard bands and/or other measures to ensure the protection of Channel 37 incumbents, and increase the likelihood that only mobile downlink operations would be in close proximity to Channel 37. In most of the alternative band plan proposals, Channel 37 would serve as a natural gap between broadcast and wireless

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<sup>27</sup> WMTS Coalition Comments at 11.

<sup>28</sup> See 5 U.S.C. § 553.

<sup>29</sup> See WISPA Comments at 14.

operations in the 600 MHz band. For example, Alcatel-Lucent identifies Channel 37, “on which incumbent radio astronomy and medical telemetry services may continue,” as a “natural break” in the 600 MHz band.<sup>30</sup> Similarly, AT&T’s proposed band plan would employ Channel 37 to divide downlink operations above Channel 37 and downlink and/or broadcast operations below Channel 37 (depending on how many TV channels were cleared in a given market).<sup>31</sup> T-Mobile’s proposal similarly employs Channel 37 as a fulcrum between paired spectrum above 614 MHz and unpaired spectrum (or broadcast spectrum) below 608 MHz.<sup>32</sup> Verizon, in proposing a band plan that would place paired spectrum above Channel 37 with a supplemental downlink allocation and/or repacked broadcasters below Channel 37, noted that its proposal “avoids the need to relocate the numerous operations that currently use the spectrum designated as Channel 37.”<sup>33</sup> Under each of these band plan designs, Channel 37 would serve as a very useful demarcation point between an “Upper” 600 MHz band and a “Lower” 600 MHz band, provided that the Commission adopted additional regulations to ensure the operations on either side of Channel 37 (and within Channel 37) did not jeopardize the operation of life-critical medical telemetry systems. In view of this consideration, relocating WMTS operations in Channel 37 would not only be impractical and unnecessary (for the reasons above), it would actually thwart the development of a viable band plan, discourage participation in the reverse and forward auctions, and create a number of ill-advised auction design complications.

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<sup>30</sup> Alcatel-Lucent Comments at 4.

<sup>31</sup> See AT&T Comments at 32.

<sup>32</sup> See T-Mobile Comments at 5.

<sup>33</sup> Verizon Comments at 14-15.

### **III. THE RECORD CONFIRMS THAT AUTHORIZING OTHER WIRELESS OPERATIONS IN CHANNEL 37 WOULD CAUSE IRREPARABLE HARM TO WMTS SYSTEMS, TO THE DETRIMENT OF HEALTHCARE FACILITIES AND PATIENTS ALIKE**

The few commenters that support the authorization of unlicensed devices, wireless microphones, and/or LPAS stations in Channel 37 have failed to provide any substantive reasoning or analysis concerning the feasibility of that proposal.<sup>34</sup> By contrast, WMTS stakeholders have submitted indisputable evidence establishing how and why additional wireless transmissions in Channel 37 would have a deleterious effect on wireless medical monitoring systems. As Philips Healthcare explained, it would be a certainty that “patients and hospital visitors bringing uncontrolled co-channel transmitting devices into close proximity to wireless monitors would disrupt wireless monitor transmissions.”<sup>35</sup> As such, permitting unlicensed devices in Channel 37 “would be extremely inadvisable” and “border on the reckless.”<sup>36</sup> The WMTS Coalition similarly cautioned against permitting unlicensed device operations between 608-614 MHz “[g]iven the potential impact on patient safety that could result if interference is created from an unlicensed device that may find its way into a hospital.”<sup>37</sup> GEHC agrees with the WMTS Coalition that three conditions, all of which are unlikely to be satisfied, must be met if unlicensed devices are to be permitted in Channel 37: (i) the protection zones must be large enough to ensure that interference will not affect any WMTS deployments, (ii) the mitigation techniques used by unlicensed devices to avoid operating in the protection zones must be 100% reliable, and (iii) a reliable, practical, and accurate process of frequency coordination to enforce

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<sup>34</sup> See, e.g., Motorola Mobility Comments at 14-15; PISC Comments at 27; Verizon Comments at 20; Whitespace Alliance Comments at 27-28; WISPA Comments at 15; IEEE 802 Comments at 3; Shure Comments at 17-18; Society of Broadcast Engineers Comments at 12.

<sup>35</sup> Philips Healthcare Comments at 4.

<sup>36</sup> *Id.*

<sup>37</sup> WMTS Coalition Comments at 20-21.

those protection zones must be established.<sup>38</sup> These conditions would be equally necessary if wireless microphones or LPAS were permitted in Channel 37.<sup>39</sup>

Proponents of these additional wireless transmissions in Channel 37 have failed to show how allowing them would serve the public interest, and have provided no rationale for the Commission to unravel its 2006 decision – just six years ago – to prohibit unlicensed devices from operating in Channel 37.<sup>40</sup> In fact, some commenters have unwittingly validated the benefits afforded by the licensed WMTS regime in Channel 37. For example, in their joint filing, Google and Microsoft cited “hospital and healthcare connectivity” as one of the principal gains to follow from unlicensed operations.<sup>41</sup> While it is true that unlicensed devices have helped improve hospital operations and patient care, they are not capable of offering all of the benefits derived from *licensed* medical telemetry devices. Indeed, it would make no sense to replace the existing regulatory landscape – in which patient monitoring systems receive considerable interference protection – with a more complicated framework where medical monitoring systems would receive no protection.<sup>42</sup> Even Boeing, which expressed support for opening Channel 37 to unlicensed devices, has been a staunch advocate for Commission rules and policies that afford adequate protections to licensed users, noting within the last few years that carefully tailored coordination regimes can be ineffective at protecting licensed incumbents

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<sup>38</sup> WMTS Coalition Comments at 21; *see also* CORF Comments at 9 (noting that if TV band devices are permitted on Channel 37, the Commission must establish appropriate protection areas).

<sup>39</sup> *NPRM* ¶ 226.

<sup>40</sup> *See* GEHC Comments at 31 (*citing* Unlicensed Operation in the TV Broadcast Bands, Additional Spectrum for Unlicensed Devices Below 900 MHz and in the 3 GHz Band, *First Report and Order and Further Notice of Proposed Rule Making*, 21 FCC Rcd 12266, 12267 ¶ 2 (2006); 47 C.F.R. § 15.707(a)).

<sup>41</sup> Google-Microsoft Comments at 11.

<sup>42</sup> Google and Microsoft also urge the Commission to allow unlicensed television band devices (“TVBDs”) to operate in Channels 36 and 38, where Part 74 wireless microphones are currently allowed to operate. *Id.* at 51-52. If the Commission allows unlicensed TVBDs to operate in Channels 36 and 38, it should, at a minimum, ensure that such devices continue complying with the spectrum mask developed to protect Channel 37 WMTS operations set forth in Section 15.709(c)(4) of its rules. *See* GEHC Comments at 26-27.

from *licensed* entrants – let alone from unlicensed consumer devices.<sup>43</sup> Accordingly, a backwards course of action that would expose licensed medical telemetry devices to harmful interference within Channel 37 (at best), or relegate wireless medical telemetry to an unlicensed service (at worst), would not only defy reason, but also contradict the Commission’s decision in 2000 to allocate spectrum for WMTS specifically “to protect the public safety by providing spectrum where medical telemetry equipment can operate without interference.”<sup>44</sup>

Similarly, there is no evidence in the record explaining how allowing wireless microphones or LPAS stations in Channel 37 would serve the public interest. Even if the current spectrum environment does not meet the needs of wireless microphone users in urban areas, forcing WMTS and RAS users to relocate or operate on a secondary basis to those operations would be extremely irrational. In particular, granting wireless microphones “priority access” to Channel 37, as proposed by Shure, would create far more problems than it would solve, by displacing wireless medical technologies serving a safety-of-life function with devices that serve a far less important role. Moreover, Channel 37 would be inadequate to support wireless microphones and LPAS devices. The Society of Broadcast Engineers has urged the Commission to dedicate “at least 12 MHz, exclusively for [wireless microphone] usage.”<sup>45</sup> With hundreds of thousands of entrenched WMTS users (in addition to the RAS licensees), Channel 37 does not come close to meeting the requirements necessary to host wireless microphone and LPAS stations.

The record further confirms that a database/geolocation regime would be inadequate to protect WMTS operations on Channel 37 from unlicensed devices, wireless microphones, and

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<sup>43</sup> See Boeing Comments, ET Docket No. 08-59.

<sup>44</sup> Amendment of Parts 2 and 95 of the Commission’s Rules to Create a Wireless Medical Telemetry Service, *Report and Order*, 15 FCC Rcd 11206, 11211 ¶ 11 (2000) (“*WMTS Report and Order*”).

<sup>45</sup> Society of Broadcast Engineers Comments at 12.

LPAS stations. Some commenters have suggested that such devices might co-exist in Channel 37 if RAS and WMTS licensees were required “to register with white space database providers in the areas where they are operating so that their operations can be protected.”<sup>46</sup> But a geolocation-based management tool would be unworkable for several reasons. First, monitoring all WMTS locations would be a far more arduous task than tracking broadcast towers. As the WMTS Coalition noted, in contrast to the relatively static (and dwindling) number of TV stations, “the number of WMTS deployments has been growing.”<sup>47</sup> Tracking the thousands of Channel 37 WMTS deployments would be profoundly complex and costly. Moreover, identifying the precise location of each WMTS system would be far more complicated than identifying a fixed broadcast tower site. As the WMTS Coalition explained, “the registered geographic coordinates [of a WMTS system] are not necessarily the locations of the actual deployments”<sup>48</sup> Rather, WMTS equipment can reside in any number of locations within a healthcare campus. Additionally, the location information is not routinely updated or maintained in real time.<sup>49</sup> The frequent expansion of WMTS systems into new areas of a hospital – and relocations of existing systems to other parts of the healthcare facility – further renders a geolocation database solution unsuitable.<sup>50</sup>

For the same reasons, a geographic separation requirement would be ineffective at protecting WMTS operations in Channel 37 from interference from unlicensed devices, wireless microphones, and LPAS operations.<sup>51</sup> As the WMTS Coalition explained, given the inability to

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<sup>46</sup> Whitespace Alliance Comments at 27; *see also* WISPA Comments at 15; IEEE 802 Comments at 3; Shure Comments at 17.

<sup>47</sup> WMTS Coalition Comments at 21-22.

<sup>48</sup> *Id.* at 22.

<sup>49</sup> *Id.*

<sup>50</sup> *Id.*

<sup>51</sup> *See* CORF Comments at 9; Whitespace Alliance Comments at 28.

precisely determine where WMTS systems are located, the margin of error necessary for an effective geographic separation requirement would further increase the necessary size of protection zones as to make unlicensed devices effectively unusable in many parts of the country.<sup>52</sup> Moreover, a regulatory framework that relies upon RAS/WMTS protection zones with incumbent consent, as proposed by the WISPA, would be exceedingly difficult to administer, requiring the Commission to not only identify the most appropriate geographic separation requirements, but also establish a highly accurate and specific geolocation database, in effect compounding the complexities described above.

Finally, spectrum sensing technologies are not nearly developed enough to offer a practical solution for co-channel sharing on Channel 37. As noted by the WMTS Coalition, because unlicensed devices could “transmit at higher power levels than the very low-power WMTS devices that are currently installed . . . the potential for interference on a co-channel basis would extend for a much larger distance from the hospital than any spectrum sensing technology could likely detect.”<sup>53</sup> The Commission has recently agreed, concluding just a few years ago that sensing technologies were not sufficiently developed to protect wireless microphones.<sup>54</sup> Consequently, a cognitive radio solution would still be unable to prevent interference that is “intolerable in a health care facility.”<sup>55</sup>

Although WMTS operations do share Channel 37 with the RAS, as CORF has noted, “the WMTS and the RAS . . . have been good spectral neighbors for each other.”<sup>56</sup> Additionally,

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<sup>52</sup> WMTS Coalition Comments at 23.

<sup>53</sup> *Id.*

<sup>54</sup> 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 and Memorandum Opinion and Order*, 23 FCC Rcd 16807, 16876 ¶ 198 (2008).

<sup>55</sup> WMTS Coalition Comments at 24.

<sup>56</sup> CORF Comments at 6; see also Universities Space Research Association Comments at 6.

RAS licensees are a known and discrete universe. By contrast, the number of unlicensed devices that will be in circulation is likely to be in the millions. Even a highly effective interference mechanism, such as one that is 99.99% effective, would result in thousands of cases of WMTS interference, creating an unprecedented risk to patient safety.<sup>57</sup> Rather than upset the Channel 37 ecosystem by introducing additional wireless devices with uncertain benefits and substantial interference risks, the Commission should act promptly in this proceeding to clarify that no additional services will be permitted in Channel 37 other than WMTS and RAS.

#### **IV. MORE ROBUST MEASURES ARE NECESSARY THAN THOSE PROPOSED BY THE COMMISSION TO PROTECT CHANNEL 37 WMTS OPERATIONS FROM HARMFUL INTERFERENCE**

Given the near universal agreement that Channel 37 operations should not be forced to migrate to another frequency band, the Commission should focus its efforts on determining how best to protect those operations from interference in the post-auction 600 MHz environment. The initial round of comments underscores the need for rules and procedures that will adequately protect WMTS operations in Channel 37. As Motorola Mobility noted, medical devices operating between 608-614 MHz “will find the operating environment far more severe as they become sandwiched between advanced mobile networks and high-powered broadcast facilities.”<sup>58</sup> The WMTS Coalition confirmed that “changes made in adjacent channel allocations . . . almost certainly will . . . impact the use of Channel 37 for WMTS licensees.”<sup>59</sup> Indeed, WMTS systems are not immune to interfering signals. WMTS sensitivity to interference is exacerbated by the fact that wireless medical telemetry units feature distributed antenna systems (“DAS”), which employ hundreds of antennas located throughout the healthcare

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<sup>57</sup> See GEHC Comments at 34.

<sup>58</sup> Motorola Mobility Comments at 12.

<sup>59</sup> WMTS Coalition Comments at 24.

facility.<sup>60</sup> Although this design allows a single WMTS system to provide seamless coverage across hundreds of thousands of square feet, it also renders them “susceptible to reciprocal mixing of signals.”<sup>61</sup> Accordingly, as Philips Healthcare has explained, “the noise floor in channel 37 will increase from reciprocal mixing signals from LTE or other types of transmissions on adjacent channels.”<sup>62</sup> 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.<sup>63</sup> This in turn makes identifying the interfering source extremely arduous and difficult.<sup>64</sup>

While GEHC (among others) agrees that the reshuffling of the 600 MHz spectrum in this proceeding could have a material adverse effect on incumbent Channel 37 users, it disagrees with Motorola’s proposed solution – to remove incumbent users from Channel 37. As noted above, nearly all commenters urge against that course of action: the costs of relocating incumbent Channel 37 users would dwarf the \$300 million designated for that purpose in the Spectrum Act, there are no clear frequency bands in which WMTS operations could be relocated, and a forced relocation would jeopardize patient safety throughout the United States, with immeasurable negative consequences. The Commission should instead ensure that the shifting 600 MHz landscape does not disturb the Channel 37 ecosystem by adopting more robust measures to curtail the risk of harmful interference from three potential sources: mobile handsets, mobile base stations, and repacked DTV stations. Specifically, the Commission should:

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<sup>60</sup> GEHC Comments at 11.

<sup>61</sup> Philips Healthcare Comments at 5.

<sup>62</sup> *Id.* at 5.

<sup>63</sup> GEHC Comments at 23.

<sup>64</sup> *Id.* at 34.

1. Designate mobile uplink operations for spectrum immediately adjacent to the Lower 700 MHz, as far from Channel 37 as possible, or, at a minimum, adopt stringent emissions limits for mobile devices authorized near Channel 37;
2. Minimize the number of DTV stations repacked in Channels 36 and 38;
3. Impose coordination requirements and absolute field strength limits for mobile base stations authorized to transmit near Channel 37.

A number of commenters have proposed alternative band plans that would achieve these first two objectives. Thus, if the Commission adopts any of those band plans, it need only adopt mobile base station coordination requirements and field strength limits to effectively protect WMTS users.

The critical, safety-of-life function that wireless medical telemetry technologies play would clearly justify robust rules to insulate WMTS systems in Channel 37 from harmful interference. Although the Commission has not required DTV stations to protect WMTS systems, it *has* found the WMTS to serve an important societal role that warrants priority protection in Channel 37.<sup>65</sup> Contrary to AT&T's misguided assertion, Channel 37 licensees are not "secondary users" who must accept interference from any adjacent transmissions.<sup>66</sup> Rather, WMTS operations between 608-614 MHz are subject only to coordination requirements with existing radio astronomy observatories and need only accept adjacent band interference from full-power Part 73 TV broadcasters on Channels 36 and 38. There is no theoretical or practical reason why WMTS users should accept interference from any other users in the spectrum adjacent to Channel 37 following the incentive auction. Indeed, the current circumstances differ materially from those present when the Commission first allocated Channel 37 for the WMTS in

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<sup>65</sup> See *WMTS Report and Order*, 15 FCC Rcd at 11206 ¶ 1; Amendment of the Commission's Rules to Provide Spectrum for the Operation of Medical Body Area Networks, *First Report and Order and Further Notice of Proposed Rulemaking*, 27 FCC Rcd 6422, 6427 ¶ 8 (2012).

<sup>66</sup> AT&T Comments, Exhibit A at 28.

2000. At that time, TV broadcasters were already operating in Channels 36 and 38 and the policy of granting priority protection to first-in-time users had reasonable application. By contrast, there are no Part 27 mobile operations in the 600 MHz band at this time. As such, the Commission has a clear opportunity to craft regulations for the 600 MHz band that minimize the interference exposure to medical facilities and provide *ex ante* clarity to commercial mobile operators that prevail in the forward auction. Moreover, medical telemetry technology has evolved based on current adjacent band uses. As the WMTS Coalition explained in its comments, WMTS equipment manufacturers have produced medical telemetry equipment that is specifically designed to manage the existing local DTV environment in Channels 36 and 38.<sup>67</sup> The operational landscape surrounding Channel 37 after the incentive auction will be so different from the current environment that most of the WMTS equipment designed for use in Channel 37 will offer insufficient protection from the mobile handsets, base stations, and repacked DTV stations that could operate in or near Channels 36 and 38. As noted above, WMTS systems designed for Channel 37 will need to be completely *replaced* if adjacent channel signals are too strong. In essence, this proceeding is likely to produce a paradigm shift that, absent rules that fully protect WMTS incumbents, could render obsolete most WMTS equipment designed for Channel 37. As GEHC stated in its opening round comments, this “would be tantamount to a forced relocation of WMTS operations out of Channel 37, and give rise to the same industry-wide costs” as a mandatory migration.<sup>68</sup> Accordingly, a strong regulatory regime to protect the WMTS allocation in Channel 37 will be as important to the healthcare industry as the Commission’s decision not to relocate the WMTS to other spectrum.

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<sup>67</sup> See WMTS Coalition Comments at 26-27.

<sup>68</sup> GEHC Comments at 28.

**A. Designate Mobile Uplink Spectrum Immediately Adjacent to Channel 51 or Adopt Stringent Emissions Limits for Mobile Devices Near Channel 37**

Transmissions from mobile devices pose the greatest risk of interference to WMTS systems in Channel 37. Under the Commission’s lead band plan proposal, channels for the uplink band would begin at Channel 51, but could occur as low as Channel 38.<sup>69</sup> Consequently, if enough spectrum clears in a market, it is possible that millions of mobile devices would begin transmitting in spectrum near or adjacent to Channel 37.

The record reflects the disastrous effect of nearby mobile transmit operations would have on WMTS operations in Channel 37. Even though mobile devices operate at a lower power than mobile base stations and DTV broadcast towers – each of which will pose other unique challenges to Channel 37 WMTS operations (as described below) – their ubiquity and likelihood of operation *inside* healthcare facilities would cause the in-hospital field strength of mobile handsets to be far greater than the field strength of DTV broadcast facilities. As GEHC noted in the initial round, the fundamental emissions received from a Part 27 portable device transmitting at only one meter separation from a WMTS system antenna would exceed the estimated adjacent channel blocking threshold for WMTS systems by more than 44 dB.<sup>70</sup> Signals of that level could cause blocking interference to WMTS systems even if the handsets were transmitting several channels away from Channel 37.<sup>71</sup> As such, mobile handsets transmitting anywhere near Channel 37 would have a ruinous effect on wireless medical telemetry systems.

To avoid this scenario, the Commission should adopt a band plan that ensures uplink operations remain as far away from Channel 37 as possible. As noted by Philips Healthcare, “keeping the uplink above TV channel 41 should” adequately protect WMTS operations in

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<sup>69</sup> *NPRM* ¶¶ 126, 191.

<sup>70</sup> *See* GEHC Comments at 25-26.

<sup>71</sup> *Id.*

Channel 37.<sup>72</sup> Similarly, the WMTS Coalition has asked the Commission to “restrict[] all mobile uplink transmissions to bands well removed from Channel 37.”<sup>73</sup> The record is replete with band plan proposals that incorporate this feature. In fact, most of the national wireless carriers have urged the Commission to adopt a band plan that would place all paired allocations in the spectrum above Channel 37, characterized by (i) paired uplink operations immediately adjacent to the 700 MHz band, starting at Channel 51 and extending downward for 20-35 MHz; (ii) a duplex gap of 10 MHz; (iii) paired downlink spectrum moving downward from the duplex gap; and (iv) a guard band of at least 4 MHz on the upper edge of Channel 37.<sup>74</sup> These proposals are superior to the Commission’s lead band plan proposal because they would ensure that mobile uplink transmissions not interfere with WMTS systems in Channel 37. This consideration should be central to the Commission’s determination of which band plan to adopt, in addition to the other factors cited by the wireless carriers in favor of these alternative band plan options (such as, for example, the network engineering and handset antenna constraints associated with the Commission’s lead proposal).

If the Commission nevertheless adopts a band plan that results in a mobile uplink – either paired or TDD – allocation in close proximity to Channel 37, it should, *at a minimum*, impose an emissions mask that is at least as stringent as the mask currently applicable to unlicensed devices operating between 602-620 MHz,<sup>75</sup> codified in Section 15.709(c)(4) of the Commission’s rules.<sup>76</sup> This proposal has received universal support from the WMTS community.<sup>77</sup> As GEHC explained in its comments, that mask, adopted by the Commission in 2008, was the product of

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<sup>72</sup> Philips Healthcare Comments at 6.

<sup>73</sup> WMTS Coalition Comments at 29.

<sup>74</sup> *See, e.g.*, T-Mobile Comments; AT&T Comments; Verizon Comments; Qualcomm Comments.

<sup>75</sup> *See* GEHC Comments at 26-27.

<sup>76</sup> 47 C.F.R. § 15.709(c)(4).

<sup>77</sup> *See* WMTS Coalition Comments at 29.

diligent collaboration between the WMTS community and the most ardent advocates of unlicensed devices and is critical to protecting WMTS receivers from the fundamental and spurious emissions of unlicensed devices in Channels 36 and 38.<sup>78</sup> As the Commission has already found those emissions standards adequate and necessary to protect WMTS users, the Commission should have no reservations about applying them to mobile handsets that may transmit near Channel 37 following the 600 MHz forward auction.

**B. Minimize the Number of DTV Stations Repacked in Channels 36 and 38**

DTV stations relocated to Channels 36 and 38 will pose the second greatest threat to WMTS systems in Channel 37. 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.<sup>79</sup> Notably, NAB did not attempt to deny the possibility of such heightened interference, but simply assumed broadcasters would be required to give notice to healthcare facilities using WMTS systems. But an elevated risk of interference to WMTS operations need not be assumed as inevitable. Given the critical, safety-of-life function WMTS systems play, a better course of action would be to adopt measures that avoid interference in the first place.

GEHC therefore reiterates its request that the Commission refrain from repacking additional DTV stations in the spectrum surrounding Channel 37. There is simply no need to prioritize DTV repacking in Channels 36 and 38, as some commenters have suggested. Verizon has proposed that, in low-clearing scenarios (in which less than 84 MHz of broadcast spectrum

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<sup>78</sup> GEHC Comments at 27.

<sup>79</sup> NAB Comments, Appendix A at ii.

clears in a market), the Commission could relocate DTV operations in Channels 36 and 38 in each case *without any guard band* separating the relocated DTV stations from Channel 37.<sup>80</sup> That proposal underscores, however, the rampant misunderstanding of the extent to which the Commission’s existing regulatory framework has allowed DTV operations to impair Channel 37 WMTS systems. To mitigate the interference challenges caused by nearby DTV stations, healthcare facilities have been required to take costly measures, incorporating stronger filtering mechanisms and, in some cases, implementing a *de facto* guard band within Channel 37 – cannibalizing the frequencies available for actual WMTS use. Philips Healthcare noted that hospitals located near a DTV station “typically find that more than 20 percent of the WMTS band is unusable.”<sup>81</sup> The WMTS Coalition agreed.<sup>82</sup>

While the costs incurred by WMTS users to manage DTV interference have not been overwhelming, increasing the number of DTV stations located around Channel 37 – without adopting any concomitant protective measures – would further impair the healthcare community’s ability to use wireless medical telemetry facilities. As the WMTS Coalition explained, “today there are fewer than 80 DTV stations nationwide transmitting on channels adjacent to Channel 37,” and “fewer than 20 DMAs in which the use of Channel 37 is constrained by DTV operations on both sides.”<sup>83</sup> However, a band plan that materially increases the prevalence of repacked DTV stations in Channels 36 and 38 would significantly raise the number of hospitals that must incur costs to attenuate nearby broadcast signals and/or sacrifice system capacity upon which they already rely.<sup>84</sup>

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<sup>80</sup> See Verizon Comments at 11.

<sup>81</sup> Philips Healthcare Comments at 4.

<sup>82</sup> WMTS Coalition Comments at 26-27.

<sup>83</sup> *Id.* at 26.

<sup>84</sup> See *id.* at 27.

Accordingly, GEHC urges the Commission to refrain from adopting any proposal that would further cluster DTV stations in Channels 36 and 38, in low-clearing scenarios or otherwise. One way the Commission could do this is to prioritize the repacking of DTV stations starting at 470 MHz and moving upward. Alternatively, the Commission could create single-channel guard bands on either side of Channel 37, in which no broadcast operations would be allowed. Either (or both) of these measures would spare the healthcare community from spending millions of dollars to attenuate unwanted broadcast signals. And these measures are attainable, imposing no significant administrative or operational costs. Between 470 and 602 MHz, the Commission would have 22 channels in which to place relocated broadcast stations, which should be more than enough in even the most populated markets. While the enormous threat to patient safety that would follow from a concentrated relocation of broadcasters in Channels 36 and 38 should alone justify measures to protect incumbent Channel 37 WMTS systems, there is simply no reason why the spectrum in those two channels should be essential to the Commission's repacking plan. A band plan that maximizes the amount of downlink spectrum around Channel 37 – with rigorous coordination requirements and field strength limits – would better serve the public interest.

**C. Impose Coordination Requirements and Absolute Field Strength Limits for Mobile Base Stations Located Around Channel 37**

In light of the significant interference risks that mobile uplink and DTV signals would create for wireless medical telemetry equipment operating in Channel 37, WMTS stakeholders have expressed a strong preference for a 600 MHz band plan that would maximize the likelihood of mobile downlink operations being situated near Channel 37 in most clearing scenarios (for example, paired downlink spectrum above Channel 37 and supplemental downlink spectrum below Channel 37). However, the record demonstrates that mobile base stations operating near

Channel 37 will also pose a material risk of interference to WMTS devices unless the Commission adopts more stringent protective measures – specifically, a coordination requirement and absolute field strength limits greater than those proposed in the NPRM.

A few commenters have assumed that the Commission’s proposed power limits and band plan configuration will adequately protect incumbent Channel 37 operations from mobile base stations. For example, CTIA stated, without offering any evidence to confirm its position, that because “the power levels presented by TV stations (up to 1 megawatt) greatly exceed the transmit levels from both downlink and uplink commercial wireless operations, CTIA does not believe that there should be a need for a guard band between 600 MHz operations and Channel 37 incumbents.”<sup>85</sup> Likewise, Verizon noted, without support, that “the proposed out-of-band emissions limit for 600 MHz will protect any Channel 37 services that require protection from flexible use operations,”<sup>86</sup> while AT&T acknowledged the real potential for interference to occur under the proposed rules<sup>87</sup> but surmised that WMTS users could simply “move to the other bands designated for WMTS” or design their equipment to provide adequate protection from adjacent channel interference.<sup>88</sup>

As noted above, these assertions manifest a fundamental misunderstanding of how WMTS systems are designed and used in practice, as well as the sizeable operational hurdles that nearby DTV broadcasters have created for healthcare facilities. WMTS stakeholders in this proceeding universally agree that the Commission’s failure to require DTV broadcasters to

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<sup>85</sup> CTIA Comments at 27.

<sup>86</sup> Verizon Comments at 57.

<sup>87</sup> AT&T Comments, Exhibit A at 28 (stating “there is potential for mobile broadband services in adjacent frequencies to interfere with Channel 37 devices”).

<sup>88</sup> *Id.* at 39-40. T-Mobile has also hypothesized that the 4 MHz guard band on the upper edge of Channel 37 may not be necessary if the 10 MHz duplex gap can be reduced to 9 MHz, in which case the 4 MHz guard band could be converted into an additional 5 MHz block of downlink only spectrum immediately adjacent to Channel 37. *See* T-Mobile Comments at 11 n.15. However, it offers no support for this view.

protect wireless medical telemetry systems has stymied WMTS operations. Philips Healthcare explained that, because Channel 37 is not adequately protected from broadcast signals, a WMTS system is “highly compromised when next to one or more DTV broadcast stations.”<sup>89</sup> Many healthcare facilities have therefore had to take costly measures to protect their WMTS systems from undesirable broadcast interference.<sup>90</sup> As the WMTS Coalition concluded, “[t]he fact that those hospitals currently located in close proximity to DTV stations operating on either Channel 36 or 38 have not complained of interference is a matter of good engineering, or the acceptance of smaller useable bandwidth. The NPRM is simply misguided in suggesting that this circumstance indicates the effectiveness of DTV OOB limits to protect WMTS systems”<sup>91</sup> once mobile operations are allowed in the band.

At least AT&T concedes that the extent to which adjacent channel mobile base station operations can co-exist with WMTS operations on Channel 37 is unclear, urging the Commission “to study the issue to confirm there are no significant interference issues that would undermine the value of mobile spectrum located next to Channel 37.”<sup>92</sup> But the WMTS community, including GEHC, has already conducted sufficient analysis – in addition to gaining years of experience trying to accommodate television stations in Channels 36 and 38 – to conclude that far more stringent protection criteria is necessary if medical telemetry systems on Channel 37 are to properly function in an environment of ubiquitous mobile broadband transmissions. The 600 MHz reallocation is certain to spawn far more mobile base stations and antenna structures than the number of DTV transmitters currently in operation.<sup>93</sup> As a result, the in-hospital field

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<sup>89</sup> Philips Healthcare Comments at 4.

<sup>90</sup> GEHC Comments at 20; WMTS Coalition Comments at 26-27.

<sup>91</sup> WMTS Coalition Comments at 27.

<sup>92</sup> AT&T Comments at 40.

<sup>93</sup> See WMTS Coalition Comments at 27-28.

strength of fundamental and spurious emissions will be significantly higher in more areas than the undesirable signals from nearby DTV stations experienced by WMTS users today. GEHC's analysis confirms that rural base stations located closer than approximately 1.4 kilometers from a WMTS system and non-rural base stations located closer than approximately 1 kilometer from a WMTS system could cause debilitating blocking interference to non-hardened WMTS systems.<sup>94</sup> Similarly, a Part 27 base station located closer than 0.55 kilometers to a WMTS facility could produce OOB co-channel interference that results in significant desensitization to WMTS receivers.<sup>95</sup> In light of these considerations, GEHC agrees with the WMTS Coalition that the Commission's proposed OOB limits would be inadequate to protect WMTS receivers from "harmful interference through both co-channel and blocking mechanisms."<sup>96</sup>

The Commission can adopt two mechanisms to minimize the risk of mobile downlink operations interfering with WMTS systems in Channel 37. First, the Commission should require wireless carriers to coordinate the construction and operation of base stations located within a certain distance of a registered WMTS system, and prohibit them from doing so until the affected healthcare facility provides its written consent.<sup>97</sup> Second, to reduce the potential for blocking and co-channel interference to Channel 37 devices, the Commission should impose a limit on the maximum allowable field strength of Part 27 base station fundamental emissions in Channel 36 and 38 and OOBs in Channel 37. GEHC reiterates its proposal that the Commission limit fundamental emissions in Channels 36 and 38 to 20 mV/m/MHz (*i.e.*, 86 dBuV/m/MHz), as

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<sup>94</sup> GEHC Comments at 23.

<sup>95</sup> *Id.*

<sup>96</sup> WMTS Coalition Comments at 28.

<sup>97</sup> GEHC Comments at 24.

measured at the perimeter of a registered WMTS facility, and impose a limit of 10 uV/m/100 kHz (*i.e.*, 20 dBuV/m/100 kHz) for Part 27 OOB within Channel 37.<sup>98</sup>

The Commission can also consider other interference-mitigating proposals in the record. For example, Philips Healthcare has urged the Commission to adopt geographic separation criteria to avoid interference from “high power downlink stations.”<sup>99</sup> Specifically, for a typical LTE station, “a separation distance of 500 meters would be sufficient for protection if the downlink is outside” Channel 37.<sup>100</sup> Some commenters appear to recognize the need for such measures. For example, T-Mobile has suggested the Commission adopt “reasonable filter designs and service rules,” which could include coordination and OOB filtering at mobile base stations. GEHC agrees that these measures, when adopted in conjunction with a band plan that places mobile downlink spectrum near Channel 37 and uplink spectrum far from Channel 37, could minimize the need for guard bands and promote the coexistence of mobile broadband services and WMTS operations in the 600 MHz band. However, failure to adopt more protective measures than those currently proposed will inequitably harm incumbent WMTS operators. As the WMTS Coalition explained, hospitals would be forced to reduce their use of Channel 37 WMTS systems or increase the use of alternate, more costly, and less efficient technologies deployed throughout the same hospital campus to preserve the same signal coverage and capacity. Both of these results would impose enormous costs on the healthcare industry.<sup>101</sup> In some cases, the observed interference could cripple a hospital’s monitoring systems, seriously jeopardizing patient welfare.<sup>102</sup>

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<sup>98</sup> *Id.* at 24.

<sup>99</sup> Philips Healthcare Comments at 5.

<sup>100</sup> *Id.*

<sup>101</sup> WMTS Coalition Comments at 28-29.

<sup>102</sup> *Id.* at 29.

## V. CONCLUSION

GEHC appreciates the continued opportunity to assist the Commission in resolving the issues related to Channel 37, and is confident that, with diligence and reasoned analysis, this proceeding will yield a regulatory framework that not only harnesses the promise of the 600 MHz band for mobile broadband and repacked broadcast operations, but also preserves the unparalleled value provided by medical telemetry systems operating in Channel 37. It is imperative that WMTS operations not be compromised by short-sighted rules that underestimate the difficulties and costs of relocating the incumbent Channel 37 services and the extent to which nearby mobile and/or broadcast operations can cripple patient monitoring systems in Channel 37. The measures proposed above offer a viable roadmap for protecting wireless medical telemetry operations in Channel 37, enhancing the value of the 600 MHz band, preserving the flexible use opportunities offered by the relinquished spectrum, and increasing participation in the reverse and forward auctions.

Respectfully submitted,

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