Hogan Lovells US LLP
Columbia Square
555 Thirteenth Street, NW
Washington, DC 20004
T +1 202 637 5600
F +1 202 637 5910
www.hoganlovells.com

Ari. Q. Fitzgerald
Partner
D +1 202 637 5423
Ari.Fitzgerald@hoganlovells.com

March 23, 2015

Marlene H. Dortch, Secretary
Federal Communications Commission
445 12th Street, SW
Room TWA325
Washington, DC 20554

Re: ET Docket No. 14-165, *Amendment of Part 15 of the Commission's Rules for Unlicensed Operations in the Television Bands, Repurposed 600 MHz Band, 600 MHz Guard Bands and Duplex Gap, and Channel 37*

GN Docket No. 12-268, *Expanding the Economic and Innovation Opportunities of Spectrum Through Incentive Auctions*

Dear Ms. Dortch:

On March 19, 2015, the following individuals held five meetings with Federal Communications Commission ("Commission" or "FCC") officials to discuss issues raised in the above-referenced proceedings: Matthew Grubis, Chief Engineer for Communications and Informatics, GE Healthcare; Orrin Marcella, Manager of Government Relations, GE Healthcare Americas; Matthew Pekarske, Principal Wireless Engineer, GE Healthcare; Tim Cooney of Wilkinson Barker Knauer LLP, Counsel to the WMTS Coalition; Tom Peters of Hogan Lovells US LLP; and Ari Fitzgerald of Hogan Lovells US LLP, Counsel to GE Healthcare.

The first meeting was held with: Julius Knapp, Chief, Office of Engineering and Technology ("OET"); Paul Murray, Associate Chief, OET; Geraldine Matise, Deputy Chief, Policy and Rules Division, OET; Chris Helzer, Chief Engineer, Wireless Telecommunications Bureau; Aspasia Paroutsas, Chief, Spectrum Policy Branch, OET; Gary Epstein, Chair, Incentive Auction Task Force ("IATF"); Howard Symons, Vice Chair, IATF; Lawrence Chu, Special Adviser, Office of Strategic Planning & Policy Analysis; Hugh Van Tuyl, Senior Electronics Engineer, OET; and Serey Thai, Engineer, OET.[1] The second meeting was held with Priscilla

[1] Mr. Cooney and Mr. Marcella only attended the first FCC meeting mentioned above. They did not attend the four subsequent meetings.

Hogan Lovells US LLP is a limited liability partnership registered in the District of Columbia. "Hogan Lovells" is an international legal practice that includes Hogan Lovells US LLP and Hogan Lovells International LLP, with offices in: Alicante Amsterdam Baltimore Beijing Brussels Caracas Colorado Springs Denver Dubai Dusseldorf Frankfurt Hamburg Hanoi Ho Chi Minh City Hong Kong Houston Johannesburg London Los Angeles Luxembourg Madrid Mexico City Miami Milan Monterrey Moscow Munich New York Northern Virginia Paris Philadelphia Rio de Janeiro Rome San Francisco São Paulo Shanghai Silicon Valley Singapore Tokyo Ulaanbaatar Warsaw Washington DC Associated offices: Budapest Jakarta Jeddah Riyadh Zagreb. For more information see www.hoganlovells.com

Argeris, Legal Advisor to Commissioner Jessica Rosenworcel. The third meeting was held with Renee Gregory, Legal Advisor to Chairman Tom Wheeler. The fourth meeting was held with Brendan Carr, Legal Advisor to Commissioner Ajit Pai. The fifth meeting was held with Erin McGrath, Legal Advisor to Commissioner Michael O'Reilly.

At each meeting, the parties discussed the attached slide presentation,[2] the attached summary of GE Healthcare's field tests at Inova Mount Vernon hospital,[3] and why the Commission should:

- Correct the calculations used to derive, and accordingly enlarge, the separation distances proposed in the *Part 15 NPRM* to protect Wireless Medical Telemetry Service ("WMTS") operations on Channel 37 from harmful interference;[4]

- Require geolocation databases to consider hospital and unlicensed device heights when calculating "location;"

- Initially allow only fixed unlicensed devices to operate in Channel 37 once technical standards are developed that are shown to fully protect WMTS;

- Require manufacturers of geolocation database software and unlicensed devices to follow rigorous quality assurance standards throughout the relevant product life cycles; and

- Establish and require unlicensed device manufacturers to comply with a comprehensive system of quality regulations that span device life cycles.

Consistent with Section 1.206(b)(2) of the Commission's rules, please associate this letter with the above-referenced dockets.

Respectfully submitted,

/s/ Ari Q. Fitzgerald
Ari Q. Fitzgerald

Attachments

cc: Renee Gregory

---

[2] *See* Appendix A.

[3] *See* Appendix B; *see also* Comments of GE Healthcare, ET Docket No. 14-165, GN Docket No. 12-268, at Appendix A (filed Feb. 4, 2014).

[4] *See Amendment of Part 15 of the Commission's Rules for Unlicensed Operations in the Television Bands, Repurposed 600 MHz Band, 600 MHz Guard Bands and Duplex Gap, and Channel 37 et al.*, Notice of Proposed Rulemaking, 29 FCC Rcd 12248, ¶¶ 109-15 (2014) ("*Part 15 NPRM*").

Priscilla Argeris
Brendan Carr
Erin McGrath
Julius Knapp
Gary Epstein
Howard Symons
Paul Murray
Geraldine Matise
Chris Helzer
Aspasia Paroutsas
Lawrence Chu
Hugh Van Tuyl
Serey Thai

APPENDIX A

Impact of Unlicensed Operations on WMTS Use in TV Channel 37

Presentation to the FCC

March 19, 2015

ET Docket No. 14-165
GN Docket No. 12-268

imagination at work

Agenda

1. FCC's Proposed Separation Distances
2. GEHC's Field Tests
3. Interference's Impact on WMTS
4. A More Nuanced Approach
5. Database Dependability
6. Personal-Portable Devices
7. Proposed Solutions

The Proposed Separation Distances Are Insufficient to Protect WMTS

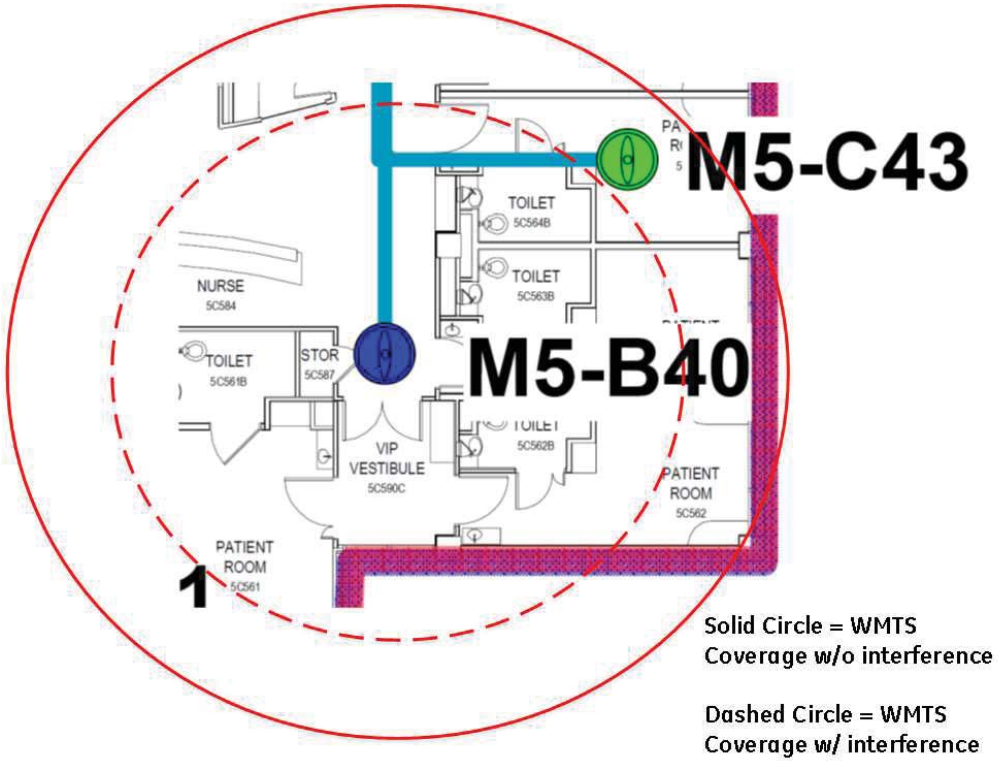
- A mathematical error has caused the FCC to assume that WMTS facilities can tolerate 17.8 dB more interference than they actually can.
  - The *Incentive Auction R&O* states: 20 mV/m/MHz = 20,000 μV/m/MHz = 2,000 μV/m/100kHz = 66 dBμV/m/100 kHz.
  - However, the proper way to scale to one tenth the bandwidth in the linear domain is to divide by the square root of 10, which yields a field strength of 6,324.6 μV/m/100 kHz and the correct value of 76 dBμV/m/100 kHz.
  - The FCC appears to have made the same error in the *Part 15 NPRM*.
- The TM 91-1 model and the F(50,50) curves used by the FCC are both inappropriate for calculating separation distances between Part 15 transmitters and WMTS facilities; free space (Longley-Rice model) propagation should be assumed instead.
- If corrections are made, standard separation distances between WMTS facilities and 4 watt Part 15 transmitters would be much greater.

GEHC Field Tests Confirm that WMTS Will Not Be Protected from Harmful Interference Under the NPRM Proposal

- Path loss between the test location and hospital approached free space loss and did not match the TM 91-1 model or the F(50,50) curves.
- In some cases, the interfering signal needed to be reduced by up to 9 dB to avoid electrocardiogram ("ECG") waveform dropout or completely missing arrhythmia events.
- Interference effects would have been even more severe if:
  - Multiple interferers were simulated;
  - WMTS transmitters were positioned at the outer limit of the WMTS coverage area;
  - The test equipment had supported the FCC's proposed allowable antenna height; or
  - Antenna diversity had been disabled.

How Interference Impacts WMTS Coverage

- WMTS sites are designed to operate without interference.
- When interference is present, it raises the noise floor.
- In turn, the raised noise floor reduces WMTS coverage.



imagination at work

A More Nuanced Interference Mitigation Approach May Be Appropriate in Some Cases

- An interference mitigation approach that considers specific device-to-site propagation (such as terrain and building features) could help to better tailor separation distances in some instances.
- Default separation distances based on free-space calculations should otherwise apply.
- Any expenses incurred through a more nuanced approach by WMTS operators or a WMTS coordinator should be reimbursable.

Serious Concerns Remain About the Geo-location Databases' Dependability

- Separation distances, no matter how large, will not be effective unless dependably enforced.
- Beyond just the databases, overall system complexity and dependence on device software creates many vulnerabilities and failure opportunities.
- Software is inherently unreliable without rigorous assurance mechanisms throughout the lifecycle.
- The FCC's existing device certification regime is inadequate to assure reliable and secure operation of critical functionality in device software – devices can be expected to both be hacked and simply malfunction to inappropriately operate on Channel 37.

Unlicensed Personal-Portable Devices Should Not Be Allowed in Channel 37

- The FCC has limited experience using geolocation databases with unlicensed fixed devices and no experience whatsoever using them with personal-portable devices. Currently, only nine devices, all fixed, from only six manufacturers are certified to operate in the U.S.
- Given the amount of people who pass through hospitals each day, unlicensed personal-portable devices would inevitably be brought into hospitals and near WMTS systems with regularity.
- Neither technology solutions nor other means are currently available to mitigate the additional risk posed by personal-portable devices.

Ways to Mitigate the Risk of Harmful Interference

- Correct the separation distances:
  1. Fix the 17.8 dB mathematical error; and
  2. Use the free-space (Longley-Rice) path loss model to account for line-of-sight scenarios.
- Require geolocation databases to consider hospital and unlicensed device heights when calculating "location."
- Once technical standards are developed that are shown to fully protect WMTS, initially allow only fixed unlicensed devices to operate in Channel 37.

Ways to Mitigate the Risk of Harmful Interference (cont'd)

- Require manufacturers of geolocation database software and unlicensed devices to follow rigorous quality assurance standards (*e.g.*, IEC 62304) throughout product life cycles.
- Establish and require unlicensed device manufacturers to comply with a comprehensive system of quality regulations that span the device life cycle (similar to those used for medical devices), including:
    - Preproduction design controls;
    - Supplier controls;
    - Production and process controls;
    - Servicing and installation controls;
    - Corrective and preventative actions;
    - Post market surveillance;
    - Device traceability;
    - Recalls and field corrections; and
    - Compliance audits.

APPENDIX B

1. EXECUTIVE SUMMARY

Test results[1] at Inova Mount Vernon Hospital show that significant harmful interference can be caused to existing WMTS systems from even a single unlicensed device operating in UHF channel 37 with power level, separation distance and height consistent with the proposed rules set forth in the FCC's Part 15 NPRM.

2. GOALS

The primary goals of this testing were to: (i) determine whether harmful interference is possible using parameters proposed by the FCC; (ii) validate path loss models used for WMTS protection; and (iii) avoid interfering with existing WMTS users.

3. SETUP

The hospital has six stories of WMTS coverage through a 200 antenna WMTS Distributed Antenna System ("DAS"). WMTS antennas are frequently located in windowed patient rooms on any given floor. The WMTS DAS was performing per specification. Four WMTS transmitters were placed at different locations in the hospital with received signal levels above the specified receive sensitivity. A Clinical Information Center ("CIC") was set up to display ECG telemetry waveforms from the WMTS transmitters. An interfering signal was used to generate potential interference with the WMTS transmitters on a WMTS DAS and was placed at multiple locations outside of the hospital.

4. RESULTS

Test results at multiple test locations surrounding the hospital show the following:

- The interfering signal had to be reduced 3 dB to 9 dB (e.g. 50% to 88% power reduction respectively) to avoid interfering with the WMTS DAS, causing ECG waveform dropout (see **Figure 1**), causing delays to alarm generation or, worse, completely missing arrhythmia events.

Figure 1: ECG Waveform Dropout due to Interfering Signal

- Path loss between the test location and hospital approaches free space loss and does not match the TM 91-1 model or the F(50,50) propagation curves used by the FCC in the Part 15 NPRM.
- The interfering signal was measured out of specification on the WMTS DAS, which could result in costly and invasive infrastructure changes, reduced WMTS coverage, or unusable WMTS systems.

5. UNTESTED CONDITIONS THAT WOULD LIKELY INCREASE ECG DROPOUT

- Only a single interferer was simulated.
- WMTS transmitters were not positioned at the true outer limit of the WMTS coverage area.
- Interfering antennas at most test locations could have been up to 20-25 meters higher according to FCC rules based on antenna height above average terrain (HAAT).
- Antenna diversity (i.e. WMTS DAS field redundancy) was not disabled.

[1] For more details, please refer to Appendix A in Comments of GE Healthcare (Feb. 4, 2015) ("GEHC Comments").