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March 24, 2015

Ex Parte

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

Re: Expanding the Economic and Innovation Opportunities of Spectrum Through Incentive Auctions; Amendment of Part 15 of the Commission's Rules for Unlicensed Operations in the Television Bands, Repurposed 600 MHz Band, 600 MHz Guard Bands and Duplex Gap, and Channel 37, and Amendment of Part 74 of the Commission's Rules for Low Power Auxiliary Stations in the Repurposed 600 MHz Band and 600 MHz Duplex Gap, GN Docket No. 12-268, ET Docket No. 14-165

Dear Ms. Dortch:

On March 20, 2015, Aparna Sridhar, Alan Norman (via telephone), Andy Lee (via telephone), and Don Breslin (via telephone) of Google Inc., Paul Caritj of Harris, Wiltshire & Grannis LLP, and I met with Julius Knapp, Chief, Office of Engineering and Technology; Geraldine Matise, Hugh Van Tuyl, and Serey Thai of the Office of Engineering and Technology; Chris Helzer, Paul Murray, and John Leibovitz of the Wireless Telecommunications Bureau; and Gary Epstein, Howard Symons, and Lawrence Chu (via telephone) of the Incentive Auction Task Force.

As shown in the attached presentation, we discussed that the record supports the FCC's proposal to permit personal/portable unlicensed operations in a 6 MHz channel of the duplex gap between licensed uplink and downlink operations in the 600 MHz band, in guard bands, and in channel 37. Google demonstrated that Qualcomm and CTIA's oppositions to the FCC's proposals are unpersuasive because they depend on analyses that (1) assume unjustifiable receiver-sensitivity levels, (2) fail to account for expected attenuation, (3) arbitrarily handicap LTE performance to suggest they are more susceptible to interference than real devices, (4) use flawed test conditions, and (5) depend upon indefensibly broad definitions of "interference." These errors combine to render the Qualcomm and CTIA analyses unreliable. We also discussed Qualcomm's and CTIA's inappropriate propagation assumptions, including their erroneous use of a 1-meter separation distance. Commission precedent makes clear that it is appropriate to assume 2 meters of separation.[1]

[1] *See, e.g., Service Rules for Advanced Wireless Services H Block—Implementing Section 6401 of the Middle Class Tax Relief and Job Creation Act of 2012 Related to the 1915-1920 MHz*

We also discussed the record's support for permitting Mode 1 and 2 unlicensed operations in channel 37 at 40 mW. Google demonstrated that GE Healthcare's analysis of a mock wireless medical telemetry service (WMTS) system failed to properly test coexistence between WMTS and unlicensed devices, and that the Commission should adopt its proposed separation distances as defaults, but permit parties to customize distances on a site-by-site basis as needed.

Finally, Google discussed that the record supports FCC action to adopt proposed improvements to TVWS technical rules immediately. These improvements include permitting unlicensed operations in channels 14-20, allowing fixed devices to operate on channels adjacent to incumbents, and replacing the 50-meter location requirement with a device-capability-based location-accuracy mandate.[2] There is no need to delay adoption of these improvements until the auction.

Pursuant to the FCC's rules, I have filed a copy of this notice electronically in the above-referenced proceedings. If you require any additional information please contact the undersigned.

Sincerely,

Paul Margie
Counsel for Google Inc.

Encl.

cc: meeting participants

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and 1995-2000 MHz Bands, Report and Order, FCC 13-88, 28 FCC Rcd. 9483, ¶ 142 (2013) (reviewing Commission precedent).

[2] Ofcom recently adopted the latter two changes—allowing unlicensed operation on adjacent channels and treating location accuracy as a parameter provided to the database—in its statement authorizing use of television white spaces. *See* OFCOM, *Implementing TV White Spaces*, Statement (Feb. 12, 2015), *available at* http://stakeholders.ofcom.org.uk/binaries/consultations/white-space-coexistence/statement/tvws-statement.pdf.

Supporting Unlicensed Innovation in the 600 MHz Band

The Record Supports the FCC's Proposed Duplex Gap and Guard Band Technical Rules

- The FCC proposed to permit 40 mW operation in a 6 MHz channel in the duplex gap and guard bands of at least 9 MHz.

- Analyses by Broadcom, Microsoft, and Google demonstrate that the FCC could allow higher power and/or less spectral separation from LTE downlink without causing harmful interference.

- Qualcomm and CTIA's analyses are flawed and do not undermine the Commission's proposals or the analyses provided by Broadcom, Microsoft, and Google.

Qualcomm's Errors Render its Filing Unreliable

- Qualcomm improperly defined "interference" as the reduction of a receiver's ability to receive a signal only 1 dB stronger than its reference sensitivity ("REFSENS+1")—but Qualcomm's prior submissions assumed a more appropriate REFSENS+6 (and even CTIA assumes REFSENS+6).
- Qualcomm's assumptions make its results unreliable.
  - Assumed only 1 meter separation.
  - Ignored body loss, polarization mismatch loss, and shadowing loss due to obstructions.
  - Arbitrarily handicapped LTE performance by 3 dB to account for "variability."
- Merely correcting these errors yields a maximum TVWS power of nearly 40 mW under Qualcomm's own inappropriate definition of "interference."

CTIA's Analysis is Also Flawed and Unreliable

- CTIA failed to account for many sources of attenuation: assumed a separation distance of 1 meter, ignored antenna loss, and omitted shadowing loss. The combined effect of just these errors: CTIA underestimates the applicable unlicensed power limit by at least 18 dB.

- CTIA defined "interference" using an unrealistically low sensitivity baseline.
  - Measured receiver sensitivity while the handset was transmitting at only 0 dB.
  - This is unsupportable: handset would be simultaneously transmitting near maximum power, elevating the receiver noise floor, and drowning out the impact on receiver sensitivity that CTIA measured from TVWS.
  - This artificially low reference sensitivity explains why CTIA argues that LTE could tolerate far less in-band interference than the -98.5 dB level used by Broadcom and Qualcomm, and the -95.5 dB level used by the FCC.

- CTIA tested receiver performance using flawed test conditions: used additive white Gaussian noise to simulate TVWS OOBE at a fixed power across the LTE band, instead of rolling off like real OOBE.

The Record Supports Mode 1 and 2 Unlicensed Operations in Channel 37 at 40 mW

- The FCC's proposed WMTS separation distances are overprotective in most cases, but could be appropriate defaults.
- The rules should allow parties to customize default separation distances on a site-by-site basis.
  - Expand where unbroken line-of-sight requires larger separation.
  - Reduce where there is no line-of-sight.
- GEHC's Channel 37 analysis is flawed.
  - Considered a single unrepresentative facility using results-driven test.
  - Signals from mock "victim transmitters" were received at a lower power than operational WMTS transmitters at the same site.
  - Assumed every TVWS device would have line-of-sight.

FCC Action on Improvements to the White Space Rules Need Not Wait Until the Auction

- The record overwhelmingly supports the Commission's proposal to permit unlicensed operations in Channels 14-20.

- The FCC should base location requirements on device capability rather than adopting an inflexible 50-meter mandate; this rule would protect incumbents equally well while permitting technical flexibility.

- The Commission should adopt these and its other white space proposals now—there is no need to wait until the incentive auction is complete.