HWG | HARRIS, WILTSHIRE & GRANNIS LLP

March 26, 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 24, 2015, Christopher Szymanski and Vinko Erceg of Broadcom Corporation, Paul Caritj of Harris, Wiltshire & Grannis, and I spoke with Ira Keltz, Hugh Van Tuyl, and Serey Thai of the Office of Engineering and Technology, Paul Murray and John Liebovitz of the Wireless Telecommunications Bureau, as well as Gary Epstein, Howard Symons, and A.J. Glusman of the Incentive Auction Task Force.

As shown in the attached presentation, we discussed the record's strong support for permitting personal/portable operations in 6 MHz channels within the duplex gap and guard bands at power levels greater than the Commission's proposed 40 mW. We also acknowledged that the Commission's current proposals would allow the use of these bands by unlicensed devices. We then noted the flaws in Qualcomm's and CTIA's submissions opposing the Commission's proposed rules. We explained how both assumed an incorrect separation distance and ignored likely sources of attenuation. We also pointed out that the tests described in Qualcomm's and CTIA's submissions were inconsistent and used unrealistic conditions.

We then turned to the importance of the Commission's adopting more flexible location accuracy requirements that take into account the actual location accuracy capabilities of devices instead of imposing a uniform 50-meter accuracy mandate. This more flexible approach would provide no less interference protection to incumbents while permitting device manufacturers to align a device's location accuracy with its price, purpose, and design. Similarly, we argued that the Commission should adopt rules that permit greater flexibility in how the database system accommodates portable devices. The Commission should permit devices to leverage their capabilities instead of requiring all devices to re-check the database every 60 seconds. A fixed, 60-second re-check interval is unnecessary to protect incumbents, would decrease devices' battery life, and would increase costs to consumers.

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

Sincerely,

Scott Blake Harris
Counsel for Broadcom Corporation

Encl.

cc: meeting participants

UNLICENSED DEVICE OPERATION IN GUARD BAND(S) AND DUPLEX GAP AND LOCATION ACCURACY REQUIREMENTS IN 600 MHZ

ET DOCKETS 14-165 AND 12-268

March 24, 2015

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OVERVIEW

- Our work, supported by both mathematical analysis and real-world testing, clearly indicates that unlicensed white-space devices can safely coexist with incumbents in the 600 MHz guard band and duplex gap.
- In fact, the analysis shows that the Commission's proposed limits on operations in these bands are unnecessarily restrictive.
- Our assumptions are clearly displayed and we tested the most popular smart phones in America.
- The CTIA and Qualcomm submissions are unreliable because they rely on unjustifiable assumptions, fail to reveal key information, use incorrect separation distances, and use a results-driven definition of harmful interference based on unrealistic receiver sensitivity.
- Broadcom also offered alternatives to the Commission's costly and unnecessarily rigid location accuracy requirements.

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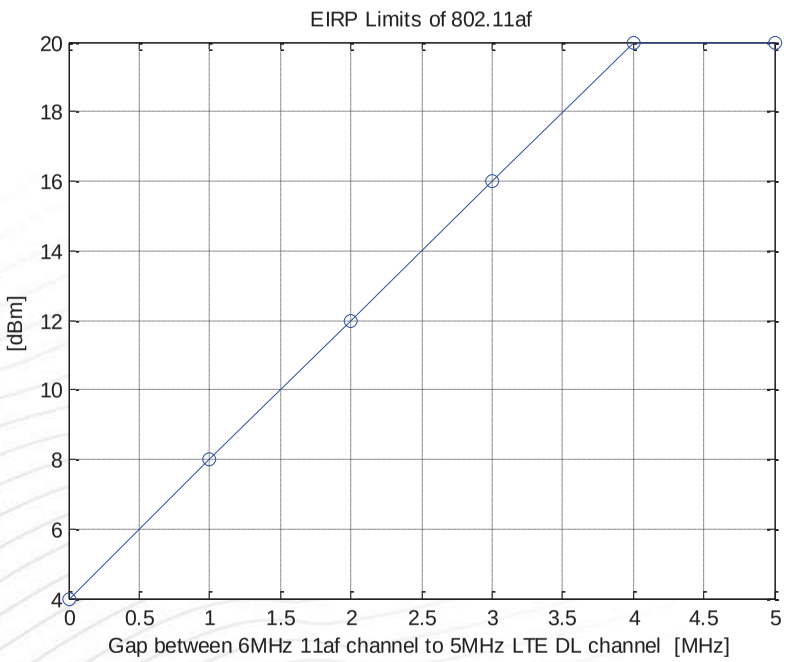
SUMMARY OF BROADCOM ANALYSIS

- **Based on Broadcom's July 18th, 2014 filing, allowed power grows with gap to LTE channel**
  - Above 4MHz separation, 802.11af based Wi-Fi can safely operate at 100 mW
  - At 3MHz separation, 802.11af based Wi-Fi can safely operate at 40 mW
  - At 1MHz separation, 802.11af based Wi-Fi can safely operate at 9 mW



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RESULTING GUARD BAND AND DUPLEX GAP POWER LEVELS

- **802.11af based Wi-Fi can operate in the guard band without causing harmful interference to LTE with the following transmit power:**
  - In a 11 MHz guard band, unlicensed devices can safely operate at 100 mW
  - In a 9 MHz guard band, unlicensed devices can safely operate at 40 mW
  - In a 7 MHz guard band, unlicensed devices can safely operate at 9 mW

- **802.11af based Wi-Fi can operate in the Duplex Gap at 4MHz separation and at 100mW**
  - The FCC placement of the 6MHz unlicensed channel 5MHz away from LTE is unnecessary given a power limit of only 40mW
  - Moving the 6MHz channel 1MHz away from LTE UL can reduce interference from LTE UL to the unlicensed channel making it more commercially viable while still avoiding interference to LTE DL given a power level of 40mW only.

- **Detailed analysis of out of band emission, blocking performance and intermodulation issues (specific to the Duplex Gap) provided in our filing February 2015 and the referenced filing therein.**

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QUALCOMM'S AND CTIA'S FILINGS ARE QUESTIONABLE

- **Testing methodology**
  - 3GPP blocking testing is defined at LTE UE signal level 6dB above REFSENS (-97dBm for LTE Band 12). Interference power raised until 95% of max Tput is reached. Both CTIA and QCOM deviated from that procedure in their testing. Furthermore, the UE power needs to be set at maximum level (23dBm) - CTIA inconsistently sets it sometimes at 0dBm and sometimes at 23dBm.
  - Qualcomm used some testing assumptions inconsistent with its own previous filings.
- **Propagation losses**
  - Qualcomm's analysis is flawed
    - Assumed only 1 meter separation
      - Separation should be at least 2 meters based on precedence and typical uses
    - Ignored: body loss, polarization mismatch loss, and shadowing loss due to obstructions
    - Incorrect Duplexer attenuation assumption and calculation (see Broadcom's analysis in its July 18th , 2014 filing)
  - CTIA's Analysis flawed
    - CTIA failed to account for many sources of attenuation:
      - Assumed a separation distance of 1 meter
      - Ignored antenna loss
      - Omitted shadowing loss

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LOCATION ACCURACY: FLEXIBLE BUT EQUALLY PROTECTIVE

- **The Commission should consider an alternative approach to location accuracy requirements**
  - The FCC's location accuracy proposal of 50 meters is not achievable in many indoor locations using current geo-location technologies.
  - The FCC should instead allow a more flexible requirement that is based on devices reporting their own location accuracy any time they contact the database.
    - Location accuracy may change over different locations.
    - The database can account for location accuracy in determining the available channels.
  - Devices with more accurate location capabilities would thereby receive access to more locations than devices with less accurate location capabilities.
  - This will provide exactly the same level of protection to incumbents, but allow manufacturers to align each device's capabilities to the device's price, purpose, and design.

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LOCATION ACCURACY: FLEXIBLE BUT EQUALLY PROTECTIVE; CON'T

- **The Commission should eliminate its proposed requirement that unlicensed devices determine their locations once every 60 seconds.**
- **This requirement is not needed to protect incumbents, will severely compromise the battery life of unlicensed devices, and will increase costs to consumers.**
- **Instead, the FCC should:**
  - Permit a device to use its built-in motion sensors (such as accelerometers) to determine whether the device has moved at all and, if so, to determine its speed of motion.
    - If a device determines that it is not moving, there is obviously no reason for it to re-check the database to take into account its potentially changed location. The same is true of fixed devices that draw their power from a wall outlet.
    - For devices in motion, the device can incorporate its speed into the location accuracy provided to the database to determine its permissible channels of operation, in lieu of re-checking every 60 seconds.

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Thank You