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November 12, 2019

**Ex Parte Notice**

Marlene Dortch  
Secretary  
Federal Communications Commission  
445 12<sup>th</sup> Street, SW  
Washington, DC 20554

**Re: Expanding Flexible Use of the 3.7 to 4.2 GHz Band - GN Docket No. 18-122**

Dear Ms. Dortch:

On November 7, 2019, Qualcomm had a teleconference with members of the FCC’s Office of Economics and Analytics, Office of Engineering and Technology, and Wireless Telecommunications Bureau during which we presented the attached slide deck detailing our Out-Of-Band Emissions (“OOBE”) proposal for new flexible use licensees to protect the repacked Fixed Satellite Service (“FSS”) receivers in the upper portion of the C Band. Qualcomm was represented on the call by Dean Brenner, John Forrester, Brian Jones, Pushp Trikha, and the undersigned, and the FCC staff on the call were Kenneth Baker, Bahman Badipour, Peter Daronco, Thomas Derenge, Kamran Etemad, Michael Ha, Susannah Larson, Giulia McHenry, Robert Pavlak, Matthew Pearl, and Janet Young.

Qualcomm presented its technical analysis for how the Commission could accomplish the twin goals in the C Band proceeding with the respect to the OOBE limit for User Equipment (“UE”), *i.e.*, protecting FSS receivers from harmful interference while ensuring that 5G service on the newly available spectrum will be robust and satisfy consumer expectations. Qualcomm noted that substantial power back-off for UE transmissions is necessary in order to meet the OOBE limits that currently apply above the 3.5 GHz CBRS band — particularly for wideband channels that 5G uses — and explained why the FCC should not impose these same limits on UEs that operate in the new C-Band flexible use band. Imposing less stringent OOBE limits on mobile devices that use the new C-Band will ensure robust 5G services while providing adequate protection of FSS receivers.

We observed that the C-Band Alliance worked for many months with filter manufacturers to develop a 5G rejection filter with much-improved performance over the filtering on which the FCC’s CBRS rules are based.<sup>1</sup> The CBA explained that all C-band FSS receive antennas will require new filters to block emissions from new terrestrial 5G transmitters operating in the

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<sup>1</sup> See CBA Reply Comments (Aug 14, 2019) at 17-18.

cleared portion of the C-band and that it will oversee the installation of new filters in all C-Band receive antennas operating in CONUS and registered with the FCC.<sup>2</sup>

During the teleconference, Qualcomm recommended that the Commission adopt the following OOB mask for C-Band UEs: -13 dBm/MHz from band edge to 20 MHz above the edge, -25 dBm/MHz beyond 20 MHz where the UE is communicating with a base station located within one kilometer of an FSS receiver, and -13 dBm/MHz everywhere else.<sup>3</sup> Whether the UE would apply the -13/-25 dBm/MHz stepped mask or the flat -13 dBm/MHz mask would be controlled by network signaling from the base station. Notably, this proposal ensures that device and base station manufacturers can use the existing n77 band already specified in 3GPP global 5G standards.

Qualcomm explained the details of the simulations it conducted using Visualyse PRO to assess the interference impact at various OOB levels. Qualcomm plotted the exclusion contours for an FSS receiver operating with a worst-case elevation angle of 10° and a more common elevation angle of 45° needed to protect the receiver from OOB from mobile base stations and UEs, as shown on slides 8 through 12. These are conservative plots and show worst case FSS receiver elevation of 10° (and a more typical 45° elevation angle) with the UE pointing directly at the FSS receiver and without any terrain shadowing. Qualcomm explained that base stations could be located outside of the affected area contour, while UEs could implement the -13/-25 dBm/MHz stepped mask when they are communicating with a base station sited within range of the FSS receiver. Qualcomm noted that the exclusion contour would be reduced were the FCC to set a minimum operational elevation angle of 20° for FSS receivers as recommended by Ericsson.<sup>4</sup>

Qualcomm also performed a Monte Carlo simulation based on a 3-kilometer service radius for a base station with 100,000 test points for a UE. Slide 14 provides the technical details behind the Monte Carlo simulation. Slide 15 shows that the probability a UE would cause the I/N of an FSS receiver to be greater than -10 dB and 0 dB for an OOB level of -25 dBm/MHz is vanishingly small, *i.e.*, 0.039% and 0.002% respectively, and is slightly greater, but well below 1%, for an OOB level of -13 dBm/MHz. The likelihood of a UE whose OOB are compliant with the proposed stepped mask would cause harmful interference to an FSS receiver is virtually nonexistent.

In addition, we explained via Slide 18 that the power back-off needed at the UE to meet the -13/-25 dBm/MHz stepped mask would not be any greater than what is needed to comply with

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<sup>2</sup> See C-Band Alliance *Ex Parte* Filing (Nov. 8, 2019) Att. at 3, 5. The new FSS receiver filters will help prevent blocking from 5G UEs.

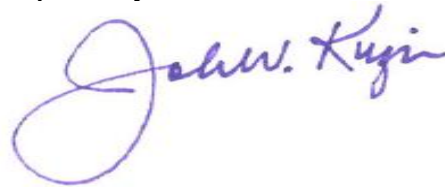
<sup>3</sup> It may be possible to permit the flat -13 dBm/MHz OOB limit well within a kilometer of a base station where, for example, the base station employs sectors that serve UEs known to be out of interference range of any FSS receivers.

<sup>4</sup> See Ericsson Comments (Oct. 23, 2019) at 3-6. See also AT&T *Ex Parte* letter (Oct. 22, 2018) at 2 (assuming 20° or greater elevation angle for FSS receivers). Qualcomm also supports AT&T's recommendation that occasional use FSS applications, which include temporary fixed operations from cultural, political, or sporting venues, be confined to the uppermost portion of the remaining C-Band FSS spectrum, away from the lowermost edge that will be adjacent to new flexible use licensees. See *id.* at 7-8.

the 3GPP specification for a 20 MHz channel at the upper edge of the new C-Band flexible use allocation. Consequently, we made clear that the FCC allocation of 20 MHz blocks of flexible use C-Band spectrum coupled with the agency's adoption of the proposed stepped mask for UEs located within range of a base station and -13 dBm/MHz elsewhere would allow the FCC to offer spectrum blocks of generally equivalent value.

Finally, Qualcomm reiterated its strong support of the Commission's efforts to open as much 3.7 to 4.2 GHz mid-band spectrum as possible for licensed mobile use in conjunction with other adjacent mid-band spectrum, including the CBRS band and new spectrum just below the CBRS band.<sup>5</sup> The Commission's efforts to open the 3.7 GHz band, which already is allocated for mobile use in other countries, is crucial to the success of 5G in the U.S.

Respectfully submitted,



John W. Kuzin  
Vice President and Regulatory Counsel

Att.

cc (w/ Att.): FCC meeting participants

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<sup>5</sup> See, e.g., Qualcomm Comments (Oct. 29, 2018) and Qualcomm Reply Comments (Dec. 11, 2018).