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Ex Parte

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

Re: Office of Engineering & Technology and Wireless Telecommunications Bureau Seek Information on Current Trends in LTE-U and LAA Technology, ET Docket No. 15-105

Dear Ms. Dortch,

On July 23, 2015, Qualcomm filed an *ex parte* letter asserting that FCC filings concerning LTE-U and LAA by a wide group of commenters, including Microsoft, Broadcom, Ruckus, Aruba, Google, Cisco, and the National Cable & Telecommunications Association (NCTA), were "misleading or outright incorrect."[1] With this letter, NCTA not only responds to Qualcomm's extraordinary claims, but also reiterates the need for an open and collaborative process to resolve widespread and serious concerns about the potential impact of LTE-U and LAA on Wi-Fi consumers.

Wi-Fi supporters have made four key points in their filings with the FCC:

1. LTE-U and LAA advocates have avoided meaningful collaboration, through the established IEEE standards-setting process or otherwise;

2. LTE-U and LAA advocates have failed to disclose critical details about the technologies' sharing approaches and which mechanisms will be mandatory;

3. The few sharing mechanisms actually disclosed would not adequately protect Wi-Fi consumers; and

4. Even if the 3GPP process eventually results in adequate protections being adopted for LAA in Europe and elsewhere, there is no guarantee that such mechanisms

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[1] Letter from Dean R. Brenner, Senior Vice President, Government Affairs, Qualcomm Incorporated, to Marlene H. Dortch, Secretary, FCC, at 1, ET Docket No. 15-105 (filed July 23, 2015) (Qualcomm Letter).

will ever be deployed in the United States, given the carriers' announced plans for non-standard deployment of LTE-U in this country rather than LAA.

Qualcomm's attacks fail to refute any of these points. In Qualcomm's through-the-looking-glass world, PowerPoint presentations and unilateral pronouncements amount to collaboration, and sharing mechanisms that can be unilaterally scaled back or turned off constitute a fair and equitable approach. NCTA is nevertheless confident that a truly collaborative process toward effective sharing is achievable and can yield solutions that will allow LTE technologies to operate fairly in unlicensed bands. But this process will require Qualcomm and others to recognize the shortsightedness of their ongoing efforts to downplay the serious concerns of consumers and the unlicensed community, and to recognize that the so-called "sharing solutions" suggested to date are incomplete and insufficient. Below, NCTA responds to Qualcomm's specific allegations and reiterates our increasing concern that the company's current approach risks undermining the performance of millions of consumer devices.

LTE-U and LAA advocates have avoided meaningful collaboration, through the established IEEE standards-setting process for unlicensed technologies or otherwise.

Qualcomm asserts that it has "worked, and is continuing to work, with the entire wireless industry directly and via industry bodies to ensure that LTE Unlicensed coexists well with Wi-Fi."[2] Unfortunately, IEEE and the unlicensed community disagree.

- The fact that Qualcomm has held a handful of meetings, exchanged letters, or made presentations at trade shows does not constitute true coordination in the development of sharing solutions, and is no substitute for the time-tested IEEE process. As evidence of its supposed collaboration, Qualcomm describes a mere three multiparty presentations on LTE-U/LAA and an invitation to IEEE to attend a powerless 3GPP session (which, surprisingly, is scheduled *after* the 3GPP meeting where many substantive decisions will have been made).[3] Presentations and post-decision listening sessions do not replace the time-tested and inclusive IEEE process. In all of the examples Qualcomm provides, no significant collaborative technology development work on LTE-U has occurred. This is simply not real and effective coordination.

- IEEE and 3GPP also exchanged a series of liaison statements. These consist largely of letters from IEEE pointing out flaws in 3GPP's studies, followed by response letters from 3GPP in which they disregard IEEE's recommendations.[4] This is why

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2 *Id*. at 1.

3 *See id*. at 1-3.

4 For example, IEEE recommended that 3GPP "consider delay intolerant traffic and video distribution as mandatory traffic models," "consider a wide range of load and device densities… 50 to 200 devices per 802.11 AP radio," and "consider both airtime consumption and throughput as performance metrics." These recommendations were made by the IEEE to ensure the robustness of LAA coexistence under real-world conditions, but 3GPP has declined to incorporate them in its coexistence evaluations. Letter from Paul Nikolich, Chairman, IEEE 802 LAN/MAN Standards Committee, to Dino Flore, TSG RAN Chair,

IEEE itself has stated that there has been "no coordination between 3GPP and IEEE 802 on LAA"[5] and "no coordination between IEEE 802 and any standards body associated with LTE-U."[6]

LTE-U and LAA proponents have failed to disclose critical details about the technologies' sharing approaches and which of these mechanisms will be mandatory.

Qualcomm states that "claims by NCTA and others that LTE-U's and LAA's coexistence features are vague and undefined are false."[7] The absence of critical details about LTE-U and LAA, however, led the FCC itself to seek answers in its recent PN—and the record filed in response refutes Qualcomm's assertion.[8]

- For example, LTE-U proponents assert that they will protect Wi-Fi consumers by occupying the least-used Wi-Fi channel and then by using a duty cycling approach.[9] The record shows that this approach is not only fundamentally flawed,[10] but that it depends crucially on numerous undisclosed technical details. How will an LTE-U system select a channel in urban environments where *every* channel is heavily utilized by Wi-Fi and potentially other LTE-U cells? Once it has selected a channel, exactly how will an LTE-U system determine the proportion of airtime to allocate to itself? What, if anything, will be done to ensure that operators do not configure this behavior to allocate the maximum amount of airtime to themselves?

- As for LAA—which is irrelevant if carriers deploy LTE-U in the United States[11]—proponents indicated only that LAA is "anticipated" to include some manner of

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3GPP, and Satoshi Nagata, RAN WG 1 Chairman, 3GPP, App. 2 at 5 (Mar. 13, 2015), *available at* http://www.ieee802.org/Communications/15_03/802-to- 3GPP-liaison-cover-letter-w-appendices-18March-2015.pdf.

5 Letter from Paul Nikolich, Chairman, IEEE 802 LAN/MAN Standards Committee, to Marlene H. Dortch, Secretary, Fed. Commc'ns Comm'n, at 1, ET Docket No. 15-105 (filed June 8, 2015) (IEEE Comments).

6 *Id*.

7 Qualcomm Letter at 2.

8 *See* Reply Comments of the National Cable & Telecommunications Association at 8-12, ET Docket No. 15-105 (filed June 26, 2015) (NCTA Reply Comments).

9 *See id*.

10 *See* Comments of the National Cable & Telecommunications Association at 18, ET Docket No. 15-105 (filed June 11, 2015) (NCTA Comments). *See also,* Comments of Aruba Networks at 1, ET Docket No. 15-105 (filed June 11, 2015); Comments of Cablevision Systems Corporation at 14-17, ET Docket No. 15-105 (filed June 11, 2015); Comments of the Dynamic Spectrum Alliance at 3-4, ET Docket No. 15-105 (filed June 11, 2015); Comments of Google Inc. at 1, ET Docket No. 15-105 (filed June 11, 2015) (Google Comments); IEEE Comments at 1; Comments of Ruckus Wireless, Inc. at 1, ET Docket No. 15-105 (filed June 11, 2015)

11 *See* NCTA Reply Comments at 8-12.

listen-before-talk functionality.[12] But proponents fail to provide important details such as the required "listening" sensitivity or whether this functionality will be accompanied by exponential back-off.[13] These details make a dramatic difference in LAA's ability to share effectively.[14] LAA proponents also do not reveal if operators will be able to "dial down" mechanisms to improve performance at the cost of coexistence. Tellingly, LAA proponents acknowledged that it was impossible to fully explain LAA's coexistence features because "the different LTE-U and LTE-LAA coexistence techniques are still being designed and analyzed."[15]

The few sharing mechanisms actually disclosed would inadequately protect Wi-Fi consumers.

Qualcomm asserts that "Qualcomm, in the case of LTE-U, has conducted comprehensive testing in the laboratory and in the field, demonstrating that LTE-U has no adverse impact on Wi-Fi, and in many cases actually improves throughput for nearby Wi-Fi users. The same is true for LAA."[16] Here, again, the unlicensed community disagrees.

- Qualcomm ignores the extensive technical work performed by CableLabs, Broadcom, Google and others already detailed in the record of this proceeding[17] which shows that, as IEEE has found, LTE-U "does not use appropriate sharing mechanisms to ensure coexistence with IEEE 802.11 family of standards"[18] and that the necessary technical rules are not yet in place to ensure that LAA will share fairly with Wi-Fi.

- Qualcomm's tests rely on very specific parameters that do not represent the real-world situations where Wi-Fi degradation is most likely.[19] For example, these tests evaluate only the impact of LTE-U and LAA when user densities are lower than the IEEE recommendation. Moreover, since the 3GPP LAA specification is not yet complete, it is impossible to know if Qualcomm's tests assumed features in its demonstrations that correspond to the actual features that will be included in the specification.

Qualcomm also claims that LTE-U will coexist fairly with Wi-Fi by employing a "listen-before-talk type technique to find vacant channels or the least occupied channel." But this

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12 *See, e.g.*, Comments of Huawei Technologies, Inc. (USA) and Huawei Technologies Co., Ltd. at 9-11, ET Docket No. 15-105 (filed June 11, 2015).

13 *See, e.g., id.* at 7-8 (noting that exponential back-off is only "one candidate for variation of the contention window").

14 *See* Comments of Broadcom Corporation at 4, ET Docket No. 15-105 (filed June 11, 2015) (Broadcom Comments).

15 Comments of AT&T Services Inc. at 5, ET Docket No. 15-105 (filed June 11, 2015).

16 Qualcomm Letter at 3-4.

17 *See* Broadcom Comments at 4-5; Google Comments at Attachment A; NCTA Comments at 18-22.

18 IEEE Comments at 1.

19 *See* NCTA Reply Comments at 14.

mechanism bears no resemblance to listen-before-talk techniques as that term is ordinarily understood.

- The type of listen-before-talk proposed by Qualcomm might more aptly be named "listen-but-talk-anyway." Listen-before-talk, as it is implemented by Wi-Fi, involves monitoring the channel to make sure that no other device is transmitting before sending data. By contrast, Qualcomm proposes that LTE-U will sense spectrum for activity, but will not use this information to wait before transmitting if it determines that the channel is busy. LTE-U will only use this information to select a channel—but once that channel is selected, LTE-U will not hesitate before transmitting on top of other signals.

- Moreover, LTE-U employs a duty cycling mechanism called "CSAT," which as Google and others have shown,[20] is likely to interrupt Wi-Fi transmissions mid-stream. LTE-U proponents also do not explain whether or how multiple LTE-U operators will coordinate to avoid squeezing out Wi-Fi consumers. These points have been made by many in the unlicensed community, including by the IEEE, which has recommended against the adoption of duty-cycling approaches such as CSAT.[21] Indeed, even 3GPP has rejected CSAT as a coexistence approach by noting that a true listen-before-talk scheme is "vital."[22]

Qualcomm further states that "CableLabs was at the 3GPP meeting in mid-June where 3GPP decided that LAA will incorporate Category 4 LBT. Nevertheless, NCTA's reply comments filed after that meeting state that the 'LAA standard currently being considered by 3GPP requires no meaningful coexistence mechanisms' and that '3GPP is considering several different coexistence mechanisms for LAA, but [] it has not committed to include any of these in its standard.' These statements are untrue."[23] In fact, the 3GPP technical working group has merely *recommended* that LAA include Category 4 listen-before-talk, and has also noted that it wishes to enable "sufficient configurability." Thus, even if Category 4 LBT could provide sufficient protection, it is not currently in place for LAA (and is irrelevant for LTE-U and thus for American consumers unless carriers use LAA in the United States). And even if adopted, Category 4 listen-before-talk discussed to date in 3GPP may provide such a wide loophole through its allowance for 'sufficient configurability' as to eviscerate the very comfort it purports to provide. And to be clear, Category 4 LBT is not in the LTE-U specification and is therefore irrelevant to concerns about near-term deployment of non-standard LTE-U in the United States.

- 3GPP has therefore not yet decided to require Category 4 listen-before-talk, and has not even begun the work needed to flesh out technical details.

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20 *See supra* n. 10.

21 *See* IEEE Comments at 1.

22 3GPP TR 36.889 V13.0.0, *3rd Generation Partnership Project; Technical Specification Group Radio Access Network; Study on Licensed-Assisted Access to Unlicensed Spectrum; (Release 13)* at 37, 43 (June 2015), *available at* http://www.3gpp.org/DynaReport/36889.htm.

23 Qualcomm Letter at 2.

- Indeed, it is ironic that Qualcomm would point to 3GPP's consideration of Category 4 listen-before-talk as being effective coexistence, given that Qualcomm's LTE-U approach in the U.S. has rejected this approach in favor of the even less effective CSAT duty cycling approach. *So Qualcomm now appears to be pointing to a coexistence mechanism that it will not make available to American consumers as a reason for the FCC to find that American consumers will be protected*.

Finally, Qualcomm asserts that "LTE-U's coexistence specifications prevent it from transmitting for more than 50 milliseconds, and LTE-U transmissions will include periods of 'off-time' of at least 1 millisecond at a time to support spectrum sharing with latency-sensitive Wi-Fi applications."[24] But Qualcomm's claims fail to provide crucial details of how the mechanism would operate, as NCTA has already explained;[25] and Qualcomm's contention is plainly incorrect.

- The latest version of the LTE-U Forum's specification does not contain any mandate that prevents carriers from transmitting for more than 50 milliseconds or that requires LTE-U transmissions to include periods of off time of at least 1 millisecond. The specification notes several test cases where LTE-U should be configured to 50 millisecond periods, but these do not appear to be mandatory pass/fail features of vendor or operator implementation. In fact, Qualcomm's assertions pertaining to coexistence specifications are also in direct conflict with other members of the LTE-U Forum.[26] Qualcomm's assurances toward LTE-U sharing mechanisms are therefore clearly unreliable.

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As discussed above, the record is clear that: (1) LTE-U and LAA advocates have not engaged in meaningful collaboration; (2) LTE-U and LAA advocates have failed to disclose critical details about their technologies' approaches to sharing, and, in particular, have not explained which coexistence features will be mandatory; (3) the few sharing mechanisms actually disclosed would not adequately protect Wi-Fi consumers; and (4) even if the 3GPP process eventually results in adequate protection mechanisms being adopted for Europe and elsewhere, there is no guarantee that such mechanisms will ever be deployed in the United States, given the announced plans for non-standard deployment of LTE-U rather than LAA.

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[24] *Id.*

[25] NCTA Reply Comments at 11.

[26] *See* Ericsson, LTEU Coexistence, presentation at the May 28, 2015 LTE-U Forum Workshop. *available at* http://www.lteuforum.org/uploads/3/5/6/8/3568127/lte-u_coexistence_mechanism_ericsson_may_28_2015.pdf (noting that the 'on' duration of Ericsson's CSAT duty cycle may range up to 150 milliseconds).

Putting aside Qualcomm's heated rhetoric, its July 23 letter does make one important contribution to the FCC's record. It lays bare the fundamental disagreements regarding the adoption and sufficiency of its proposed sharing mechanisms to date, and it underscores the need for a truly collaborative process that will address these issues fairly among interested stakeholders and produce mutually beneficial solutions. We appreciate the Commission's attention to these issues in light of the enormous consumer impact at stake, and believe that the Commission can continue to play a constructive role in narrowing points of contention and promoting new strategies to promote fair sharing and avoid consumer dislocation.

Sincerely,

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cc:

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