

**Before the
FEDERAL COMMUNICATIONS COMMISSION
Washington, DC 20554**

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

COMMENTS OF COMPETITIVE CARRIERS ASSOCIATION

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Competitive Carriers Association (“CCA”) submits these comments in response to the *Public Notice* released by the Federal Communications Commission (“FCC” or “Commission”) in the above-captioned proceeding, which seeks information on current policy and technical trends related to LTE-Unlicensed (“LTE-U”) and Licensed Assisted Access (“LAA”), and techniques that can be implemented to share spectrum with existing unlicensed operations (“*Public Notice*”).¹ CCA urges the FCC to encourage the development and flexible utilization of LTE-U, LAA and similar technologies on unlicensed spectrum and to be mindful of access to these new technologies by all carriers, large and small, to increase spectrum capacity and alleviate the continued spectrum crunch.

INTRODUCTION AND SUMMARY

CCA is the nation’s leading association for competitive wireless providers and stakeholders across the United States. CCA’s membership includes more than 100 competitive wireless providers ranging from small, rural carriers serving fewer than 5,000 customers to

¹ *Engineering and Technology and Wireless Telecommunications Bureau Seek Information on Current Trends in LTE-U and LAA Technology*, ET Docket No. 15-105, Public Notice, DA 15-516 (rel. May 5, 2015) (“*Public Notice*”).

regional and national providers serving millions of customers. CCA also represents approximately 200 associate members consisting of small businesses, vendors, and suppliers that serve carriers of all sizes.

As is constantly reflected in CCA's advocacy, competitive carriers are in need of more spectrum to effectively compete in the marketplace by providing their consumers with faster speeds and ubiquitous service, especially low-band spectrum. Consumer demand is insatiable – consumers want the fastest, most reliable networks and new devices and technologies, such as wearables. The tremendous growth in demand for wireless data services has resulted in a looming spectrum crunch. This leaves competitive carriers at a severe disadvantage when it comes to serving their customers. In a rapidly-consolidating wireless industry, with limited spectrum resources, CCA's members are interested in exploring novel pathways towards new spectrum opportunities. Accordingly, CCA welcomes the questions posed by the *Public Notice* on developing LTE-U and LAA technologies and their future in the wireless industry.

To that end, the Commission should help to foster an environment where these technologies can develop to ease the spectrum crunch. In parallel, the FCC and industry stakeholders should take additional steps to explore flexible spectrum opportunities in an effort to alleviate the effects of the rampant consolidation in the wireless industry by the two largest carriers and the skyrocketing costs of scarce spectrum resources. LTE-U and LAA are a few of the technologies that are being developed to create additional opportunities for wireless carriers to gain more spectral capacity and the fast, reliable LTE service consumers have come to expect, while still being a good neighbor to other unlicensed operations, such as Wi-Fi. The FCC should encourage the development of these new technologies and afford flexibility to wireless providers

and manufacturers alike – as well as help facilitate a market for devices to ensure all carriers have a meaningful opportunity to access such devices.

DISCUSSION

I. LTE VARIATIONS FOR UNLICENSED SPECTRUM USE

The *Public Notice* references a number of developing technologies for potential unlicensed use and seeks comment on their current state of development and technical characteristics.² In this section, CCA provides a brief overview of such technologies:³

a. LTE-Unlicensed (“LTE-U”)

LTE-U is a version of commercial wireless LTE-unlicensed technology that enables mobile operators to offload data traffic onto unlicensed frequencies, using a licensed LTE channel as a primary, anchor channel for signaling. The LTE-U Forum was formed to define LTE-U.⁴ LTE-U likely will be the first version of unlicensed LTE technology to be made available in the United States for commercial deployment because (i) it requires few modifications from licensed LTE; and (ii) specifications for LTE-U implementation have already been developed by the LTE-U Forum independently of global standards body organizations such as 3GPP.⁵ LTE-U does not interfere with or impact Wi-Fi performance through its “duty cycle”

² *Id.* at 2.

³ CCA’s comments generally focus on LTE-U and LAA, but this section also briefly discusses Wi-Fi offloading and Wi-Fi Boost technology.

⁴ The LTE-U Forum consists of Verizon, Alcatel-Lucent, Ericsson, Qualcomm Technologies, and Samsung, and has published several documents on the technical aspects of LTE-U including coexistence specifications and standards. LTE-U Forum Documents, <http://www.lteuforum.org/documents.html> (last visited June 10, 2015); *see also* MONICA PAOLINI, SENZA FILI CONSULTING, LTE UNLICENSED AND WI-FI: MOVING BEYOND COEXISTENCE 7 (2015) (*hereinafter* “SENZA FILI WHITE PAPER”), *available at*: http://content.rcrwireless.com/Analyst_Angle_LTE_Report.

⁵ SENZA FILI WHITE PAPER at 12; *see also* LTE-U Forum Documents, <http://www.lteuforum.org/documents.html> (last visited June 10, 2015).

methodology,⁶ and will provide service comparable to licensed LTE service.⁷ LTE-U may only be used in markets where listen-before-talk (“LBT”) mechanisms are not required (such as the U.S.) because it cannot support such services.⁸

b. Licensed Assisted Access (“LAA”)

LAA is another type of LTE-unlicensed technology that “allows unlicensed spectrum to be aggregated with licensed spectrum to enhance the capacity of carrier systems”⁹ during uplink and downlink. LAA differs from LTE-U in that it will support LBT mechanisms, which will make it more consistent with regulatory requirements across the world.¹⁰ Because it is considered a “globally harmonized” solution, LAA is poised to become a worldwide standard, and 3GPP is in the process of developing these standards for LTE Release 13.¹¹ This means, however, that any deployment of LAA will take longer than LTE-U because the standardization

⁶ LTE-U will identify and use channels that Wi-Fi does not use. If there are no free channels, and sharing must occur, LTE-U uses “adaptive duty cycles” in which it only transmits during part of the cycle. This leaves the remaining cycle for Wi-Fi use. SENZA FILI WHITE PAPER at 12.

⁷ *Id.*

⁸ China, Korea, India, and the United States are the only markets where LBT is not required. See Qualcomm, LTE-U: LTE Advanced in unlicensed spectrum, <https://www.qualcomm.com/invention/technologies/lte/unlicensed> (last visited June 10, 2015). LBT requires that “devices listen to see if there is Wi-Fi activity on a channel, and if there is, they do not transmit.” Phil Goldstein, *AT&T in no hurry to test and deploy LTE-Unlicensed*, FIERCEWIRELESS (Apr. 1, 2015), <http://www.fiercewireless.com/tech/story/att-no-hurry-test-and-deploy-lte-unlicensed/2015-04-01>.

⁹ Letter from Steve Sharkey, Chief Engineering and Technology Policy, T-Mobile, to Marlene H. Dortch, Secretary, FCC, WT Docket No. 12-354, Att. at 6 (Mar. 13, 2015) (“*T-Mobile March 13, 2015 Ex Parte*”).

¹⁰ See Qualcomm, R13 LAA (Licensed-Assisted Access): Meets global regulations and Wi-Fi coexistence, <https://www.qualcomm.com/invention/research/projects/lte-unlicensed/r13-laa-licensed-assisted-access> (last visited June 10, 2015).

¹¹ *Id.*

work is not yet complete.¹² Finalization of a LAA work item is expected by 3GPP in March 2016.¹³

c. LTE and Wi-Fi Aggregation (“LWA”)

LTE and Wi-Fi Aggregation (“LWA”) enables operators to integrate Wi-Fi and cellular traffic. This technology allows downlink traffic to be carried over Wi-Fi and uplink traffic to be carried over LTE.¹⁴ Wi-Fi Boost, developed by Alcatel-Lucent, is one example of LWA technology (though it will also work with 3G as well as 4G).¹⁵ Wi-Fi Boost purportedly provides a “tenfold increase in the user’s uplink at cell edge” and “improves performance reliability when Wi-Fi is congested or not available.”¹⁶ One advantage of LWA is that it does not require new infrastructure or devices. It simply requires a software upgrade or new Wi-Fi access point and an OS update.¹⁷ The downside to LWA is that it does not match the performance benefits of LTE-U.¹⁸ Alcatel-Lucent expects Wi-Fi Boost to be commercially available later this year.¹⁹

¹² SENZA FILI WHITE PAPER at 7.

¹³ 3GPP, News Release, 3GPP & Unlicensed Spectrum (Jan. 2015), http://www.3gpp.org/news-events/3gpp-news/1660-laa_ieee.

¹⁴ SENZA FILI WHITE PAPER at 23.

¹⁵ Alcatel-Lucent, Press Release, Alcatel-Lucent combines the best of Wi-Fi and LTE to enhance mobile performance and offer a consistent high-quality subscriber experience (Mar. 2, 2015) [*hereinafter* “Alcatel-Lucent Release”] <https://www.alcatel-lucent.com/press/2015/alcatel-lucent-combines-best-wi-fir-and-lte-enhance-mobile-performance-and-offer-consistent-high>.

¹⁶ SENZA FILI WHITE PAPER at 29.

¹⁷ *Id.*

¹⁸ However, it may be difficult to accurately measure these benefits. *Id.*

¹⁹ Alcatel-Lucent Release.

II. CURRENT SPECTRUM RESOURCES ARE SIGNIFICANTLY LIMITED FOR COMPETITIVE CARRIERS

As the Commission has recognized, spectrum is a key input for competitive carriers and is “the lifeblood of the wireless industry.”²⁰ Spectrum, however, is also a limited resource, and most of the available spectrum for mobile wireless services “has already been put to use or will be put to use in the near future.”²¹ With mobile data traffic expected to increase “nearly ten fold between 2014 and 2019,”²² and with consumers watching more and more content on their mobile devices,²³ potential opportunities to make more spectrum available should be fully explored. While CCA is supportive of many of the recent efforts by Congress, the Commission and the administration to unleash additional spectrum for commercial wireless use, wireless carriers continue to find themselves in the midst of a well-documented spectrum crunch, especially with respect to low-band spectrum.²⁴ Access to low-band spectrum, also known as “beachfront spectrum,” is becoming increasingly important to wireless carriers because it “possess[es] distinct propagation advantages for network deployment, particularly in rural areas and

²⁰ *Application of AT&T Inc. and Qualcomm Incorporated for Consent to Assign Licenses and Authorizations*, Order, 26 FCC Rcd. 17589 ¶ 30 (2011).

²¹ SIGNALS RESEARCH GROUP, *THE PROSPECT OF LTE AND WI-FI SHARING UNLICENSED SPECTRUM, GOOD FENCES MAKE GOOD NEIGHBORS 4* (2015) [*hereinafter* “SIGNALS WHITE PAPER”] *available at*: http://signalsresearch.com/Docs/LTE%20U%20SRG_whitepaper_Feb%202015.pdf.

²² *Id.*

²³ *See* INTERACTIVE ADVERTISING BUREAU, *MOBILE VIDEO USAGE: A GLOBAL PERSPECTIVE 2* (June 8, 2015), *available at* http://www.iab.net/media/file/IAB_Mobile_Video_Usage_FINAL.pdf.

²⁴ “Spectrum Crunch,” FCC Encyclopedia, <http://www.fcc.gov/encyclopedia/spectrum-crunch> (last visited June 10, 2015) (noting that “detailed analysis by Commission staff and industry experts reveals that, despite significant investment in networks and advances in wireless efficiency, demand for mobile broadband service is likely to outstrip spectrum capacity in the near-term”).

indoors.”²⁵ This spectrum is critical to ensure that consumers have competitive alternatives for high-quality, affordable, wireless broadband services.²⁶ Unfortunately, these resources have become “particularly concentrated,”²⁷ with Verizon and AT&T controlling 73 percent of all low-band spectrum and rising.²⁸

At the same time, and in large part due to the spectrum crunch, the wireless industry is rapidly consolidating. Acquisitions by the two largest carriers of smaller rivals²⁹ and their disproportionate success in the recent AWS-3 auction³⁰ continue to strengthen AT&T and Verizon’s control of vital spectrum inputs, to the detriment of competitive carriers, consumers and the public interest. To effectively compete with the Twin Bells – and continue to provide cutting edge service plans to consumers – competitive carriers need access to spectrum that can

²⁵ *Policies Regarding Mobile Spectrum Holdings, Expanding the Economic and Innovation Opportunities of Spectrum Through Incentive Auctions*, WT Docket No. 12-269; Docket No. 12-268, Report and Order, 29 FCC Rcd 6133 ¶ 48 (2014) (“*Mobile Spectrum Holdings R&O*”).

²⁶ *Id.* ¶ 3.

²⁷ *Id.* ¶ 283.

²⁸ *Id.* ¶ 46.

²⁹ See, e.g., *Applications of Cricket License Company, LLC, et al., Leap Wireless International, Inc., and AT&T, Inc. for Consent to Transfer of Control of Authorizations*, Memorandum Opinion and Order, 29 FCC Rcd 2735 (2014); *Applications of AT&T Inc. and Atlantic Tele-Net Network, Inc. (For Consent to Transfer Control of and Assign Licenses and Authorizations)*, Memorandum Opinion and Order, 28 FCC Rcd 13670 (2013); *Applications of Cellco Partnership d/b/a Verizon Wireless and SpectrumCo LLC and Cox TMI, LLC for Consent to Assign AWS-1 Licenses*, Memorandum Opinion and Order and Declaratory Ruling, 27 FCC Rcd 10698 (2012); see also *AT&T Mobility Spectrum LLC and Club 42CM Limited Partnership Seek FCC Consent to the Assignment of Two Lower 700 MHz B Block Licenses in California*, WT Docket No. 14-145, Public Notice, 29 FCC Rcd 10525 (WTB 2014).

³⁰ See Peter Cramton and Pacharasut Sujarittanonta, BIDDING AND PRICES IN THE AWS-3 AUCTION (May 2015), attached to *Ex Parte* Letter from Rebecca Murphy Thompson, General Counsel, CCA to Marlene H. Dortch, Secretary, FCC, GN Docket No. 12-268, WT Docket No. 12-269, AU Docket No. 14-252 (filed May 20, 2015); see also Phil Goldstein, *AWS-3 Auction Results: AT&T leads with \$18.2B, Verizon at \$10.4B, Dish at \$10B and T-Mobile at \$1.8B*, FIERCEWIRELESS (Jan. 30, 2015), <http://www.fiercewireless.com/story/aws-3-auction-results-att-leads-182b-verizon-104bdish-10b-and-t-mobile-18b/2015-01-30>.

be utilized for mobile wireless use.³¹ Thus, competitive carriers are interested in any developing technologies that would assist them in providing competitive services to consumers. Indeed, the recent significant availability of unlicensed spectrum in the 5 GHz and 3.5 GHz bands may be important resources for spectrum-starved competitive carriers, and as a result, deploying technologies to effectively utilize this spectrum is crucial for these carriers.

III. UTILIZATION OF LTE-U, LAA AND OTHER UNLICENSED TECHNOLOGIES MAY HELP ALLEVIATE THE SPECTRUM CRUNCH FOR THE WIRELESS INDUSTRY

Accordingly, CCA's members have a keen interest in additional mobile wireless spectrum opportunities, whether through making new spectrum available for commercial mobile use, or through developing new operations that allow existing spectrum to be used more efficiently. Developing technologies, such as LTE-U and LAA, may be able to achieve both, and CCA encourages the Commission to foster the development of these technologies and further explore their potential use with unlicensed spectrum.

Recently, competitive carriers have been exploring the use of unlicensed spectrum in their operations. Specifically, CCA members often offload cellular traffic onto Wi-Fi networks to reduce their increasingly-congested mobile networks.³² Providers have found that this approach is a cost-effective means that allows operators to increase capacity by using available resources, but lacks the performance benefits of LTE services.³³ Therefore, implementing LTE-

³¹ See Comments of Competitive Carriers Association, AU Docket No. 14-252, GN Docket No. 12-268 at 28-29 (filed Feb. 20, 2015); Reply Comments of Competitive Carriers Association, AU Docket No. 14-252, GN Docket No. 12-268 at 14-15 (filed Mar. 13, 2015); see also *Ex Parte* Letter from Atlantic Tele-Network, Inc., et al. to The Hon. Tom Wheeler, Chairman, FCC, GN Docket No. 12-268, WT Docket No. 12-269 at 2 (filed Apr. 22, 2015).

³² Jack Schofield, *Most mobile data will soon be offloaded to Wi-Fi networks, says Juniper Research*, ZDNET (June 12, 2013), <http://www.zdnet.com/article/most-mobile-data-will-soon-be-offloaded-to-wi-fi-networks-says-juniper-research/>.

³³ SENZA FILI WHITE PAPER at 5.

U and LAA technologies within unlicensed bands should come as a “natural extension”³⁴ of these efforts. A benefit of LTE-U (and LAA for that matter) is that providers will get the best of both worlds: the spectral efficiency of LTE services (i.e. “better link performance, medium access control, mobility management, and excellent coverage”) and access to available unlicensed spectrum.³⁵ Indeed, with up to 500 MHz of spectrum available for unlicensed services in the 5 GHz band,³⁶ implementation of LTE-U in the near term would “[go] a long way toward addressing the looming capacity crunch.”³⁷ The integration of existing unlicensed and LTE networks would also offer providers “the opportunity to minimize cost, maximize network resources, and improve the user experience.”³⁸

In addition to these attributes, the combination of LTE-U and LAA will result in other benefits, including higher peak and average data speeds to mobile devices as well as reduced packet latencies.³⁹ Moreover, LAA has proved to be “a better neighbor” to Wi-Fi, permitting “similar, not superior access” to unlicensed spectrum.⁴⁰ As T-Mobile has previously explained,

³⁴ *Id.*

³⁵ LTE-U FORUM, LTE-U TECHNICAL REPORT: COEXISTENCE STUDY FOR LTE-U SDL v1.0 (Feb. 2015) [*hereinafter* “LTE-U FORUM TECHNICAL REPORT”], *available at*: http://www.lteforum.org/uploads/3/5/6/8/3568127/lte-u_forum_lte-u_technical_report_v1.0.pdf.

³⁶ Due to the significant amount of potentially available spectrum on the 5 GHz band, much of the industry has focused on this band for LTE-U deployment. Other opportunities may also exist for unlicensed use in the 3.5 GHz band and 2.4 GHz band, and should be further explored by standards-developing groups, the FCC, and the wireless industry. In particular, to the extent IEEE elects to forego inclusion of 3.5 GHz spectrum into 802.11 Wi-Fi standards, the Commission should consider whether additional portions of this band should be utilized for other unlicensed uses, such as LTE-U or LAA.

³⁷ SIGNALS WHITE PAPER at 2, 5.

³⁸ *Id.* at 5.

³⁹ *T-Mobile March 13, 2015 Ex Parte*, Att. at 6.

⁴⁰ Letter from Steve Sharkey, Chief Engineering and Technology Policy, T-Mobile, to Marlene H. Dortch, Secretary, FCC, WT Docket No. 12-354, 1 (Apr. 9, 2015).

LAA has features that are incorporated to specifically enhance sharing of spectrum, including, but not limited to, support of LBT mechanisms, selection of the “cleanest” channels based on Wi-Fi and LTE measurements, energy measurement techniques and the ability to deactivate particular small cells when not in use.⁴¹

While both LTE-U and LAA may require new handsets or device software, Qualcomm has developed a new chipset solution that will support LTE-U in the 5 GHz band and anticipates that it will be made commercially available later this year.⁴² T-Mobile has also stated that it plans to begin LTE-U trials in the 5 GHz band this year using small cells from Alcatel-Lucent that are enabled with chipsets from Qualcomm.⁴³ Verizon announced that it plans to deploy LTE-U technology in the 5 GHz *and* 3.5 GHz bands starting in 2016.⁴⁴ It is clear that mobile wireless providers are ready for the next step, and the FCC should only continue to encourage this innovation and development and allow spectrum-constrained wireless providers to increase their capacity in the short-term, helping to alleviate the pressure of the spectrum crunch.

Accordingly, CCA urges the Commission to foster the development of LTE-U, LAA, or any other technologies that have the potential to promote the role that unlicensed spectrum may play in increasing capacity to alleviate the spectrum crunch. In doing so, flexibility should be afforded to providers as some technologies may be ready to be deployed earlier than others (i.e., LTE-U, Wi-Fi boost) and thus, the utilization of such technologies should not be delayed while

⁴¹ *T-Mobile March 13, 2015 Ex Parte*, Att. at 7.

⁴² SENZA FILI WHITE PAPER at 47.

⁴³ Phil Goldstein, *AT&T in no hurry to test and deploy LTE-Unlicensed*, FIERCEWIRELESS (Apr. 1, 2015), <http://www.fiercewireless.com/tech/story/att-no-hurry-test-and-deploy-lte-unlicensed/2015-04-01>.

⁴⁴ *Id.*

standards for other technologies are still being developed.⁴⁵ The FCC should foster the advancement of all viable, trusted technologies regardless of the stages of development and the spectrum utilized.

Furthermore, the Commission historically has adopted rules that are “technologically neutral”⁴⁶ and therefore should not take any actions that would hinder developments or limit capabilities in unlicensed bands or mandate certain protocols, such as LBT. The Commission should also not devote unnecessary resources to promoting standalone LTE-U. Rather, the Commission should use this docket to guide flexible uses of unlicensed spectrum, without prejudging or limiting such uses. Recognizing the promise of these new technologies, one area where the Commission must be vigilant, though, is in ensuring that dominant carriers do not abuse their position to push that a particular band is selected for carrier aggregation with unlicensed spectrum used to deploy LTE-U, LAA or other technologies. When monitoring how specifications for LTE-U, LAA or other technologies develop, the Commission must ensure robust and equitable access to these new technologies and not allow others to set specifications that favor development and availability of devices for one particular band or carrier to the exclusion of other carriers. The Commission must continue to prevent fragmentation of bands, like what happened in the 700 MHz band. Additionally, CCA cautions the Commission to be wary of specifications that do not include competitive-carrier input.

However, merely increasing spectrum opportunities for deployment may be meaningless without also providing the right vehicles to utilize these opportunities. With all the hard work concerning the development of these spectrum opportunities, the Commission must also recognize that all carriers should have meaningful access to the latest mobile devices and

⁴⁵ LAA will likely not be ready to deploy until 2016. *Id.*

⁴⁶ *Public Notice* at 2.

chipsets that may be necessary for these new technologies. Accordingly, CCA recommends the Commission also explore in this docket the impact that these technologies may have on the availability, cost and form-factor of devices, and ways to help competitive carriers have access to such devices on a meaningful timeframe.

CONCLUSION

For the foregoing reasons, CCA requests that the Commission continue to encourage the development of LTE-U and LAA technologies, as well as the use of unlicensed spectrum for mobile services, to alleviate the spectrum crunch faced by the wireless industry.

Respectfully submitted,

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