

**Before The
Federal Communications Commission
Washington DC 20554**

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In the Matter Of)	
)	
A National Broadband Plan for Our Future)	GN Docket No. 09-51
)	
_____)	

REPLY COMMENTS OF QUALCOMM INCORPORATED

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SUMMARY

The large number of opening filings in this proceeding, made by such a wide variety of public and private stakeholders, is a testament to the vitally important role that broadband, and particularly mobile broadband, can play for all Americans, no matter where they live or their income level. Qualcomm looks forward to working with the Commission and all parties on the development of a national broadband plan that continues our country on a path toward universal mobile broadband coverage and universal mobile broadband adoption. In that vein, Qualcomm submits these reply comments to address three topics.

First, many commenters agree with Qualcomm that more licensed spectrum, to be made available via auctions, is necessary to fuel the burgeoning growth in demand for mobile broadband. Unlicensed spectrum can be used for low power, local area coverage within a home, but ubiquitous mobile broadband coverage in wide areas requires licensed spectrum. New spectrum bands are not at the Commission's fingertips. The same interagency process, with Congressional direction and support, by which the spectrum now known as the PCS and AWS-1 bands were identified, reallocated from federal government to private use, and then cleared of incumbents, should begin again as soon as possible.

But, while this multi-year or even decade-long process occurs, the nation cannot stand still. In the meantime, one solution for faster mobile broadband is the deployment of LTE-based networks in the recently auctioned 700 MHz and AWS-1 bands. But, it will also take time for those new networks to be built from coast to coast. There are other interim solutions which do not require new spectrum or new networks. Thus, as explained in Qualcomm's opening comments, with just a software upgrade, an existing mobile broadband network in existing spectrum can be upgraded to EV-DO Revision B or HSPA +, enabling data speeds that are

orders of magnitude faster than today's mobile broadband networks. These upgraded 3G networks are as spectrally efficient as LTE networks.

Likewise, as Qualcomm announced just a few weeks ago, by using uplink interference cancellation technology, a UMTS-based network's data throughput and capacity can be increased by 60 percent, voice capacity by 45 percent, and a user experience that is similar to LTE when delivered in a similar channel bandwidth.¹ Similar gains in capacity, throughput, and user experience can be attained by using uplink interference cancellation in EV-DO-based networks. No new spectrum is required to achieve these throughput and capacity gains and improved user experience.

Second, Qualcomm and other commenters agree that federal funds from the stimulus legislation and also from existing federal programs, including the Lifeline and LinkUp programs, the E-rate program, and the universal service fund, should be spent with the clear goal of achieving universal mobile broadband coverage and universal mobile broadband adoption. Comprehensive universal service reform is a mammoth undertaking, which will likely take significant time to implement fully. But, in the meantime, as Qualcomm, TracFone, and others urged in this proceeding and in the universal service proceeding, the Lifeline and LinkUp programs could be quickly modified to provide subsidies for a new generation of mobile broadband devices. Moreover, as Qualcomm and others stated in recent filings concerning the 2010 E-rate Eligible Services List, the E-rate program should support mobile broadband equipment, such as 3G USB sticks or PC cards, 3G routers, and other 3G devices, as well as mobile broadband service and applications. Making that quick fix to the E-rate program would

¹ See "ZTE and Qualcomm Collaborate to Boost UMTS System Performance," July 5, 2009, http://www.qualcomm.com/news/releases/2009/090705_ZTE_Qualcomm_Collaborate.html.

allow schools all over the country to use the wide variety of wireless internet-based education applications, which will dramatically improve education.

Third, the Commission should adhere to its highly successful policy of technology neutrality in wireless. Without any legal or factual support whatsoever, one commenter urged the Commission to prefer royalty-free standards for broadband and asked the Commission to become involved in intellectual property licensing issues.² The commenter does not even explain how the Commission could possibly have jurisdiction to veer into these matters, which it has never addressed in the mobile context. The commenter does not present a single fact that would justify Commission involvement in wireless standards or wireless intellectual property licensing. For its part, Qualcomm licenses its technology to over 160 equipment and device manufacturers. Licensing revenue supports billions of dollars spent each year on research and development, yielding more innovations, which are then brought to market in products made by licensees in a never-ending virtuous cycle. Simply put, there is no legal or policy basis for the Commission to spend any time on a rant against the American system of innovation.

Qualcomm applauds the Commission's efforts to date and the Commission's plans to conduct a thorough and exhaustive process over the next eight months with an unprecedented degree of public participation in developing a national broadband plan around which our entire nation can coalesce.

² See Comments of Rob Glidden (filed June 8, 2009).

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REPLY COMMENTS OF QUALCOMM INCORPORATED

QUALCOMM Incorporated (“Qualcomm”), by its attorneys, hereby submits these Reply Comments in response to the Commission’s Notice of Inquiry, FCC 09-51, released April 8, 2009, which sought input for development of a national broadband plan, which the Commission is required to deliver to Congress by February 10, 2010, pursuant to the American Reinvestment and Recovery Act of 2009 (“ARRA”), Pub. L. No. 111-5.

I. More Licensed Spectrum Should Be Made Available Through Auctions to Meet the Strong Demand for Mobile Broadband

A. The Consensus That More Licensed Spectrum Is Needed

A broad cross-section of commenters agree that licensed spectrum is essential for mobile Broadband for it “is the mother’s milk of mobile broadband.” Qualcomm Comments at Page 15. As T-Mobile USA put it, “(s)pectrum is the most critical input to ensuring that mobile broadband is a successful platform for U.S. consumers.” T-Mobile USA Comments at Page 13. Ericsson wrote that “(l)icensed spectrum is indispensable.” Ericsson Comments at Page 18. And, AT&T called licensed spectrum “essential.” AT&T Comments at Page 137.

Further, commenters agreed that more licensed spectrum should be made available to fuel the growth in mobile broadband. Verizon and Verizon Wireless wrote:

Verizon Wireless believes it is vitally important for the federal government to identify spectrum bands that can be reallocated for future broadband use. Any policy or strategy to promote broadband access should acknowledge the need for more spectrum in order to meet the growing demand for wireless broadband.

Comments of Verizon & Verizon Wireless at Page 68.

Similarly, CTIA argued that the Commission should “identify additional spectrum for reallocation to licensed commercial use to accommodate wireless broadband demand that is rapidly outstripping the capacity available on wireless broadband networks.” CTIA Comments at Page 3. T-Mobile urged the Commission “to develop a program under which the Commission and NTIA would work cooperatively to identify, reallocate, and auction 200 MHz of new spectrum for commercial use.” T-Mobile Comments at Page 13. Likewise, the Consumer Electronics Association called for an allocation of 200 MHz of spectrum for broadband, citing the “undeniable consumer thirst for broadband,” which will “only increase as as mobile devices are used as media platforms and become further integrated as instruments of commerce.”

Consumer Electronics Association Comments at Page 7.

AT&T did not specify an amount of new spectrum, but asked that the Commission reaffirm that auctions are the best, fairest and most non-discriminatory and efficient way of allocating new spectrum. AT&T Comments at Page 137. There was widespread agreement among the entire wireless industry, wireless carriers and wireless vendors alike, on all of these points.

B. Unlicensed Spectrum Cannot Be Used for Wide Area Mobile Broadband

Nevertheless, some parties did persist in contending that unlicensed spectrum could be used to provide wide area mobile broadband service. For example, the New America Foundation claimed that unlicensed TV White Space spectrum could be used to provide broadband in rural

areas. New America Foundation Comments at Pages 37-38. In the TV White Space proceeding, however, Qualcomm submitted a study which showed that a licensed transmitter could cover an area twenty times larger than the area covered by an unlicensed transmitter. See Charles L. Jackson, “Unlicensed TV White Space Cannot Provide Substantial Rural Broadband Access,” Ex Parte Filing in Dockets 04-186 & 02-380, filed October 22, 2008 at Pg. 3. There is no question that it is far more economically viable and technically efficient to use licensed spectrum, not unlicensed spectrum, to provide wide area coverage.

Indeed, since unlicensed operations are, by definition, subject to the acceptance of interference, it would relegate rural areas to a much poorer quality of service to use unlicensed spectrum for mobile broadband than is enjoyed in urban and suburban areas, where licensed spectrum is used. As Ericsson explained in its opening filing in this proceeding, “unlicensed cannot ensure coverage over wide areas, data speeds, or a particular quality of service. This can only be truly achieved via licensed spectrum.” Ericsson Comments at Page 18. In fact, since spectrum is used less intensively in rural areas due to the lower population density, larger bandwidth in the licensed bands can be used to support higher peak data rates in mobile broadband networks at little to no additional cost.

Moreover, as Verizon and Verizon Wireless pointed out, once spectrum is allocated to unlicensed use, it is highly unlikely that the Commission could ever repurpose the spectrum for a licensed use, no matter how inefficient the unlicensed allocation might turn out to be. Verizon & Verizon Wireless Comments at Pages 74 to 75. Verizon and Verizon Wireless note that the Commission has not evaluated the extent to which existing unlicensed allocations are even used today. Id. Thus, even for practical reasons, the Commission should not allocate spectrum for unlicensed use without a careful assessment of the economic and technical efficiencies and the

comparative gain to consumer welfare and economic growth that would come from licensing the spectrum via flexible use licenses. See Verizon & Verizon Wireless Comments at Page 71.

The New America Foundation also asked the Commission to reopen proceedings which were closed several years ago on spectrum underlays—the notion that unlicensed operations can occur within a licensed band without causing interference to the incumbent licensed networks. New America Foundation Comments at Pages 34 to 37. The Commission should decline this invitation. As AT&T wrote:

Before wireless providers can invest millions or billions of dollars to build out wireless broadband networks, they must be secure in the knowledge that their spectrum licenses are truly exclusive, unless different terms were established *at the time of the initial license agreement*. Licensees who have made substantial investments for the right to use spectrum should not be subject, after the fact, to overlays, underlays, easements, or other sharing with licensed or unlicensed users. Unanticipated and compelled sharing of this sort increases burdens for licensees enormously, forcing them to be constantly on guard against interference threats, especially as technology continuously changes. And it drains resources that should be spent on broadband deployment, as carriers instead focus on administering and enforcing sharing arrangements. Uncertainty concerning present and future sharing obligations also deters new investment, since coordination requirements could impose new burdens or require system or equipment reconfiguration at any time.

AT&T Comments at Page 135.

Furthermore, there is simply no technical support for the notion that unlicensed operations can co-exist in the same spectrum band with licensed operations without causing interference. The facts are clear: to provide universal mobile broadband into the next decade, additional licensed spectrum needs to be made available.

C. Measures to Improve Mobile Broadband in Existing Spectrum

Past experience demonstrates that the process of identifying, reallocating, and clearing new spectrum bands will take several years if not longer to complete. See Verizon & Verizon Wireless Comments at Page 69 (“Past actions to repurpose spectrum managed by NTIA from federal to commercial use have required many years.”). In the meantime, mobile broadband network data speeds and capacity must improve in existing spectrum to meet the burgeoning demand. Certainly, the construction of new LTE-based networks in the recently freed-up 700 MHz spectrum, once completed, will offer dramatic improvements in this regard. However, past experience also demonstrates that it will also take several years, if not longer, for LTE networks to be operating throughout the entire nation, from coast to coast.

While new spectrum is being reallocated and while new LTE networks are being constructed, technology is available to improve mobile broadband to a large degree in existing spectrum bands and without construction of a new network. Accordingly, as Qualcomm discussed in its opening comments, the next software upgrades to EV-DO and HSPA will result in dramatically faster data rates. EV-DO Revision B enables the aggregation of three EV-DO carriers in one 5 MHz channel. In its Phase I, EV-DO Rev. B will support downloads at a peak rate of 9.3 megabits per second (“Mbps”) and eventually, in Phase II, at 14.7 Mbps, while supporting uploads at up to 5.4 Mbps. This technology will undergo an additional upgrade, now known as DO Advanced, which, if implemented with four carriers, will support downloads of up to 34.4 Mbps and uploads of 12.4 Mbps. Likewise, the initial version of the technology known as HSPA + (also called HSPA Evolved—HSPA Release 7) will support peak downloads of 28 Mbps and uploads of 11 Mbps. Future releases of HSPA, Releases 8 and 9, will increase the peak downlink speeds, first to 42 Mbps and then to 84 Mbps. These 3G upgrades do not require

new spectrum or new network construction and offer similar spectral efficiency as LTE. In addition, interference cancellation (“IC”) is a technique that can be incorporated in all 3G-based networks to significantly improve the voice and data capacity without requiring new spectrum or a new network. IC can be applied to both downlink (forward link) and uplink (reverse link). The downlink IC is standard independent and implemented in the handset (user device) and uplink IC is implemented in the base station. For 3G CDMA based technologies, such as HSPA and EV-DO, interference at the receiver limits the system capacity where each user represents interference to other users. Interference cancellation is a mechanism to cancel this interference from other users, thereby increasing the capacity. As Qualcomm explained recently, a UMTS-based network’s data throughput and capacity can be increased by 60 percent, voice capacity by 45 percent, and a user experience that is similar to LTE when delivered in a similar channel bandwidth.³ Similar gains in capacity, throughput, and user experience can be attained by using uplink interference cancellation in EV-DO-based networks.

Using interference cancellation, the air link of an CDMA system can reach the theoretical limit. In fact, air links of all wireless technologies are approaching the theoretical limit, and IC is one of the major enhancements that bridge the performance gap between CDMA and OFDMA based technologies. As an example, an HSPA+ network with advanced receivers, IC and handset equalizer, provides similar spectral efficiency as LTE in the same amount of spectrum and for the same number of antennas. Significant future improvements to wireless networks (CDMA or OFDMA) will therefore come from optimizing the networks and the topology—such

³ See “ZTE and Qualcomm Collaborate to Boost UMTS System Performance,” July 5, 2009, http://www.qualcomm.com/news/releases/2009/090705_ZTE_Qualcomm_Collaborate.html. See also a prior announcement on this same topic from Qualcomm and Huawei—“Qualcomm and Huawei to Cooperate on Advanced UMTS Node B Receiver Technology,” Feb. 4, 2008, http://www.qualcomm.com/news/releases/2008/080204_Qualcomm_and_Huawei_to_Cooperate.html.

as adding femtocells—and not from the air interface technology. User data rates and system capacity can be increased significantly by bringing the transmitter closer to the users, e.g., adding picocells and femtocells. As an example, introducing femtocells with proper interference management can increase user data rates more than 10 times—significantly more than air link improvements can provide since the air link is approaching the theoretical limit.

II. Quickly Implemented Changes to the Lifeline, LinkUp, & E-rate Programs Should Be Made to Increase Mobile Broadband Adoption

Many commenters discussed the need for comprehensive reform of the universal service program to convert it into a broadband program. See, e.g., Verizon & Verizon Wireless Comments at Pages 112 to 118; AT&T Comments at Pages 83 to 88; Telecommunications Industry Association Comments at Pages 23 to 24; Benton Foundation Comments at Page 43; One Economy Comments at Page 22 to 23. Comprehensive reform of the universal service program has been under consideration for many years now, and as demonstrated by the sheer length of the Commission's 430-page Order on Remand and Report and Order and Further Notice of Proposed Rule Making of November 2008, adoption and full implementation of such comprehensive reform, while certainly necessary, is a gargantuan undertaking and will not occur overnight. In the meantime, there are at least two measures which could be taken relatively quickly to increase mobile broadband adoption.

In the first place, as Qualcomm and several other commenters urged and as originally proposed by TracFone, the Commission could expand the existing Lifeline and LinkUp programs to provide subsidies for mobile broadband devices for low income Americans. See Qualcomm Comments at Pages 18 to 19; TracFone Comments at Page 8; One Economy Comments at Page 22. Others propose that Lifeline and LinkUp be used for broadband service, AT&T Comments at Page 48; Benton Foundation Comments at Pages 56 to 58, but of course,

without subsidies for mobile broadband-enabled device, a subsidy for mobile broadband service is not sufficient for many low income Americans. In Qualcomm's opening comments, Qualcomm discussed three initiatives it has under way to drive mobile broadband into a wide variety of mobile computing devices, which should, likewise, drive mobile broadband adoption to new heights among all Americans. Qualcomm Comments at Pages 2 to 5. These initiatives include: 1) smartbooks-- a new generation of smartbooks coming to market, which will provide always-on mobile broadband connections similar to mobile phones with everyday computing functionality in sub-compact, ultra-thin, and highly portable devices; 2) Kayak—a low cost PC alternative designed to provide wireless broadband access in homes even by using a TV set as the monitor; and, 3) Gobi—a global mobile broadband and GPS embedded solution for notebook computers. Id. In short, many different mobile broadband-embedded devices are on the market today; there are more to come; and, the LifeLine and LinkUp programs, with their existing administrative infrastructure, should be used to ensure that low income Americans have access to these devices as they become prevalent in so many facets of modern American life.

Another relatively quick step which could be taken to increase mobile broadband adoption involves the E-rate program. Again, several commenters discussed measures to revamp that program. See, e.g., AT&T Comments at Pages 88 to 91; Benton Foundation at Pages 45 to 50; One Economy Comments at Page 23. Comprehensive changes to convert the E-rate program into a full blown broadband program should be made, but once again, will take time to implement in full. In the interim, as Verizon Wireless, Sprint, Qualcomm, and the San Diego Independent School District all urged in recent filings, the Commission could change the 2010 Eligible Services List to ensure that equipment used to gain wireless internet access, including 3G USB dongles and PC cards, 3G routers, and other wireless internet remote access devices are

eligible for E-rate support. See Verizon Wireless and Sprint Comments filed in Docket 02-6 on June 19, 2009 and Qualcomm and San Diego Independent School District Reply Comments filed in Docket 02-6 on June 30, 2009. Likewise, in publishing the final 2010 Eligible Services List, the Commission could confirm that wireless internet services and applications are eligible for E-rate support. *Id.* See also AT&T Comments filed in Docket 02-6 on June 19, 2009. Making these changes now to the Eligible Services List would be a modest, but important step toward providing our nation's schools with the ability to improve education dramatically through innovative uses of mobile broadband.

III. The Commission Should Continue Its Highly Successful Policy of Technology Neutrality, and There Is No Legal or Policy Basis for the Commission to Become Involved in Intellectual Property Licensing in the Mobile Broadband Area

As Qualcomm urged in its Opening Comments, the Commission should adhere to its highly successful policy of technology neutrality, a policy which the Commission itself has found has played a large role in establishing the conditions for a highly vibrant, competitive wireless market in the United States. See Qualcomm Comments at Page 21; Eleventh Report, Annual Report and Analysis of Competitive Market Conditions with Respect to Commercial Mobile Services, WT Docket No, 06-17, 21 FCC Rcd 10947, 2006 FCC LEXIS 5275, *136 to 137 (2006). Other commenters agreed expressly, and no commenter provided any basis for the Commission to dictate any particular mobile broadband standard in the National Broadband Plan. See Telecommunications Industry Association Comments at Page 18 (stating that policy of technology neutrality has resulted in American wireless market that is the envy of the world); AT&T Comments at Page 19 (advocating technology neutral definition of broadband); CTIA Comments at Page 27 (stating that "CTIA strongly believes that technology neutrality is a necessary part of any broadband plan.").

Out of the 8,532 documents filed in this proceeding to date, only one advocates that the Commission jettison its decades-old policy of technology neutrality, become involved in intellectual property licensing as it relates to broadband, and establish a preference for royalty-free standards, all without offering any legal basis or factual evidence to support these requests. See Comments of Rob Glidden. Qualcomm respectfully submits that the Commission should not waste any of its precious time and other resources on these baseless requests. The facts are that as the Commission has itself found, the competition in wireless standards and technologies, conducted on a neutral basis without any Commission preferences, has directly lead to a vibrant and competitive wireless market. See, e.g., Eleventh Report, supra. Over 95% of the United States population is covered by at least one mobile broadband network based on existing standards; more than half of the United States population is covered by at least two such networks; and these statistics are literally increasing every day as mobile broadband networks continue to be expanded by numerous carriers. See Bringing Broadband to Rural America, Report on a Rural Broadband Strategy, released May 22, 2009, at Pgs. 12-13.

For its part, as noted in its opening comments, Qualcomm broadly licenses its technology to over 160 wireless equipment and device manufacturers, a veritable who's who of the worldwide wireless industry. See Qualcomm Comments at Page 12. At last count, 111 companies have manufactured at least one CDMA2000 device, and more than 169 companies have manufactured at least one WCDMA or HSPA device, spanning all price points and covering a plethora of form factors and device types. The evidence is that the American system of innovation, whereby innovators get patents for their inventions, can earn revenues by licensing their inventions, and then can use the revenues to fund further research to develop new inventions is working quite well. Glidden's Comments, much of which are devoted to the

market for DTV sets, offers no legal or policy basis whatsoever for the Commission to become involved in any way in intellectual property licensing as it affects mobile broadband or wireless generally.

IV. Conclusion

Wherefore, Qualcomm respectfully requests that the Commission formulate a national broadband plan in accordance with Qualcomm's comments herein.

Respectfully submitted,

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