Before the

United States Senate

Committee on Commerce, Science, & Transportation

Hearing on

"The Race to 5G: Exploring Spectrum Needs to Maintain US Global Leadership"

Testimony of

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Chairman Thune, Ranking Member Nelson, and Members of the Committee, my name is Dean Brenner, and I'm here today on behalf of Qualcomm, a company that's an American success story. Qualcomm was founded in a San Diego living room. It grew rapidly as cell phones began to take off, and today, working out of our larger headquarters still in San Diego, Qualcomm is the world's leading supplier of chips for smartphones and other wireless devices and the world's leading inventor and licensor of new wireless technologies. The technologies we develop, most especially 5G, and the chips we design, all depend on one key input controlled by the government: spectrum.

As this Committee has recognized most recently in the MOBILE NOW Act, enabling a steady stream of new spectrum across the board—low, mid, and high band; and, licensed, unlicensed, and shared—is essential for the rapid, broad roll-out of 5G. We're working on 5G at a feverish pace to use each sliver of spectrum to deliver the kind of wireless connectivity you can only dream about today—speeds that are more than a hundred times faster, latency as low as a millisecond-- but it all comes back to that steady stream of new spectrum. So, let me thank this Committee for leading the way to enact the MOBILE NOW Act and for taking spectrum policy a step further in the AIRWAVES Act.

Let me give a status report on 5G, but I'll start with an update on 4G LTE. Our latest 4G chips deliver peak speeds of two gigabits per second. We achieve that speed not just because we support over 1,000 different spectrum combinations, and we use other LTE enhancements. In addition, we now use both licensed and unlicensed spectrum for 4G. In 2016, the FCC approved the first small cells with our chips which use a new technology called Licensed Assisted Access or LAA. LAA uses 5 GHz unlicensed spectrum, where and when it's available, in addition to licensed spectrum. LAA enabled Gigabit LTE and later this year will enable LTE to reach the two-gigabit mark. Operators in the US and around the world are racing to deploy this great new technology. We see Gigabit-plus LTE as the foundation for 5G.

Likewise, 4G-based small cell deployments are occurring today around the country even in advance of 5G. 4G and 5G small cell deployments will be broader and less expensive if regulations keep pace with technology. That's why we support the STREAMLINE Small Cell Deployment Act introduced by Chairman Thune and Senator Schatz.

Turning to 5G, we're on track to deliver chips that support 5G in both sub-6 GHz and millimeter wave spectrum in time to enable 5G data-only devices to launch before the end of 2018 and for the first 5G smartphones to launch in the first half of 2019. That's a tremendous undertaking for Qualcomm and our partners working with these new technologies. Different operators in the US and around the world will begin providing 5G using different spectrum bands, so it's very important that our chips and related components support as many bands as possible. In sub-6 GHz bands, 5G will have relatively wide coverage. In millimeter wave bands, 5G will cover smaller, dense areas, but using a larger amount of spectrum and our advanced antenna technologies, millimeter wave-based 5G will deliver much faster connectivity than is possible in lower bands.

We're excited by the recent FCC announcements establishing a schedule for this year and next for spectrum auctions in millimeter wave bands. We applaud the recent FCC and NTIA initiatives to free up more mid band spectrum in bands that other countries and regions have targeted. We also hope that that the FCC will soon finish up its rules for the CBRS, 3.5 GHz band. Enabling a steady stream of new spectrum for 5G requires progress on all these fronts in parallel.

Finally, we're developing versions of 5G built from the ground up for unlicensed and shared spectrum. One version will be a 5G-based LAA. Another will use new spectrum sharing techniques to deliver a user experience that will be much better than is possible today in any unlicensed band and will not require any licensed spectrum at all, enabling 5G for factories, warehouses, and many other industrial uses. These technologies are well suited for the 6 GHz band which Chairman Thune urged FCC Chairman Pai to allocate in a June 29th letter.

Executing on this 5G spectrum road map, working in conjunction with so many industry partners, and with Congress, the Administration, and the FCC, is crucial for American leadership. It requires close collaboration between all parts of the government and the wireless industry.

5G has the potential to transform every industry, driving productivity gains and economic growth and enabling 5G to be used for all the things that today require wired broadband. By 2035, we estimate that 5G could produce over $12 trillion worth of goods and services. With the stakes so

high, spectrum policy has never been so important, which is why I'm so pleased to be here today and to work with all of you.

Thank you. I look forward to answering your questions.