Testimony of

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on

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Chairman Wicker, Ranking Member Cantwell, and members of the Committee, on behalf of CTIA and the U.S. wireless industry, thank you for the opportunity to testify today.

CTIA applauds this Committee's bipartisan focus on advancing U.S. spectrum policy, and securing U.S. global leadership in the mobile marketplace. From the perspective of the wireless industry, it is fitting that your first hearing in the 116th Congress is discussing 5G and what it means for our country, our economy, and American consumers.

The good news is thanks to significant policymaker and industry collaboration in the past year the United States is well-positioned for success. To deliver on the full promises of 5G, we need to redouble our national efforts to promote 5G-friendly policies. The main building block required is spectrum and we need more of it – specifically mid-band spectrum – to maintain our global leadership role in wireless.

5G is Being Deployed Right Now

Thanks in large part to the leadership of this Committee and ongoing efforts at the FCC, the first American 5G deployments are happening today. American network and technology companies are investing aggressively to ensure that equipment, handsets, and devices are ready for American innovators and consumers to leverage the power of the new 5G platform.

Since I last testified before this Committee in July, CTIA's members have taken significant steps forward. All national carriers have announced 5G deployment plans. The rollout of the next generation of wireless is occurring right now in 10 states in places like Harrison County, Mississippi, Atlanta, Raleigh, Indianapolis, and Sacramento. 5G will

be coming this year to Nashville, Oklahoma City, Phoenix, Kansas City, Houston, and D.C., among dozens of other cities.

Additionally, 5G devices and equipment are being introduced alongside the 5G network, including mobile device chipsets for mobile devices and connected cars, advanced laptops, and VR and AR equipment. Qualcomm announced that over 30 new 5G devices will be introduced in 2019, while Intel has plans to make a 5G wireless modem chip available in the second half of this year. These advanced chip-sets are key to 5G speeds and connectivity. Sprint, AT&T, and Verizon announced their upcoming Samsung 5G phone, which will offer dual-connectivity for both 4G and 5G networks, and T-Mobile confirmed it rolled out 5G network equipment in 30 cities, including New York, Los Angeles, Las Vegas and Dallas.

U.S. wireless providers will invest some $275 billion in 5G-related networks—creating three million new jobs and adding $500 billion to our economy, according to Accenture. As you can imagine, the U.S. is not the only country to recognize the transformational impact of 5G. There is international consensus: the nations that lead on 5G will capture millions of new jobs and billions in economic growth.

5G Will Usher in a More Secure Era of Technological Innovation

5G is the next generation of wireless, and these new networks will offer speeds up to 100 times faster, enable 100 times the number of devices, and be five times more responsive than today's 4G networks. 5G will be more than just fast, it will also be the most secure generation of wireless service.

Today's 4G LTE networks have the most advanced security features to date, and 5G will further improve upon them. As 5G networks start to be deployed, wireless providers

are leveraging new and advanced measures—after years of research, investment, and contributions to standards bodies—to secure the networks. The Federal Communications Commission's (FCC) September 2018 Communications Security, Reliability and Interoperability Council (CSRIC) report highlights the security advances and innovations offered by 5G. The wireless industry is committed to working with Congress and the Department of Homeland Security to ensure a secure platform for tomorrow's innovation.

The Positive Impact of 5G on Other Industries

Coupling 5G capabilities and security, I'm excited by the possibilities offered by 5G to drive transformational improvements in health care, agriculture, education, transportation, and nearly every industry in America.

From making healthcare more accessible and making us more energy efficient to expanding the ways we educate our children, 5G will revolutionize how we live our lives. The promise to add connectivity to smart communities will be powered by 5G.

As we start to see new 5G networks and devices launch, there is a growing list of companies and industries investing in their 5G future. Let me share with you some recent examples where we are already seeing 5G solutions be put into practice:

Rush University Medical Center in Chicago is creating the first 5G-enabled hospital in the U.S, where 5G will support telemedicine, smart scheduling, and enhanced patient care through artificial intelligence and augmented reality training sessions for doctors. Dr. Shafiq Rab of Rush Hospital has said, "We strongly believe 5G is a game-changing technology that when fully implemented will help us … provide the highest quality patient and staff experience." Jeremy Marut, the hospital's chief enterprise architect explained,

"5G will give us the speed, the low latency as well as the ability to connect many more devices."

Samsung announced their 5G "Innovation Zone" in Austin, Texas, a testbed to provide a real-world understanding of how 5G can impact manufacturing and help create Smart Factories. Some of the new technologies they are exploring include 4K video as a sensor to improve plant security and detection response, industry IoT sensors to monitor for environmental and equipment conditions, AR and VR for employee training, and enhanced location services for plant safety.

Verizon launched the Verizon 5G EdTech Challenge, a nationwide challenge calling for enterprise organizations, start-ups, research groups, and universities to create education solutions that leverage 5G connectivity to solve for challenges in under-resourced middle schools throughout the U.S. Dr. Ken Perlin is developing ChalkTalk, a 5G augmented reality learning tool that renders multimedia objects in 3D.

5G is fundamentally changing our entertainment experiences. For instance, AT&T Stadium, home of the Dallas Cowboys, will offer fans mobile 5G services with faster speeds and potential services like AR and VR to enhance the fan experience, while Walt Disney Studios is exploring the possibilities of 5G connectivity for media and entertainment at Disney's StudioLab. "We see 5G changing everything about how media is produced and consumed," says Walt Disney Studios chief technology officer Jamie Voris.

As we get closer to fully autonomous vehicles, 5G will be a key ingredient. Ford announced its plans to connect every new vehicle sold in the U.S. to 5G which will allow vehicles to send and receive information about their surroundings. This real-time interactivity will ease congestion and boost the safety of drivers on the road.

The city of Peachtree Corners, Georgia is also taking advantage of 5G by building a 1.5 mile intelligent vehicle test track within a 500-acre technology park where new intelligent mobility technologies can be tested. "Creating an environment for developing smart mobility technology will be a tremendous asset for our city…Our young city is living up to its 'innovative and remarkable' tagline as future intelligent mobility technologies are developed here in Peachtree Corners," says Mayor Mike Mason.

More broadly, 5G promises to unlock the promise of smart cities. Accenture has projected benefits of $160 billion. Specifically, Accenture's Managing Director Tejas Rao concluded that "5G-powered smart city solutions applied to the management of vehicle traffic and electrical grids alone could produce an estimate of $160 billion in benefits and savings for local communities and their residents. These 5G attributes will enable cities to reduce commute times, improve public safety, and generate significant smart-grid efficiencies."

The exciting news is that we are beginning to see cities adopt these solutions. Recently, Las Vegas officials started an innovative partnership to test a smart lighting solution aimed at improving public safety and enhancing energy efficiency. By outfitting existing streetlights with routers and connecting them to existing wireless networks, the city can monitor energy usage and outages in real time. This saves money and gets the lights repaired more quickly after an outage, helping with public safety. The platform can also be used to monitor air quality and temperature.

These are all just a sample of the initial investments in 5G from the past few weeks and we are just scratching the surface as to how 5G will make our lives better and safer.

5G Spectrum Policy Is Key to U.S Leadership

Although I am pleased to report on these positive 5G developments across the U.S., we cannot take our foot off the accelerator. To fully realize the technological breakthroughs we are talking about, we need more spectrum, and we need it as soon as possible.

CTIA commends this Committee, the FCC, and the Administration for the ongoing work in identifying and repurposing spectrum for 5G. With your support, the wireless industry has invested hundreds of billions of dollars in private capital in acquiring and building out spectrum.

But the need for additional spectrum remains pressing. A predictable pipeline of spectrum will do much to advance U.S. 5G interests, and help us match the efforts foreign governments are taking to allocate spectrum for 5G services. This Committee, the FCC, and the Administration have identified all the right bands. Now we need to finish the job fast.

The future of 5G is going to require a mix of spectrum, including low-, mid-, and high-band spectrum. Low-band offers robust spectrum waves that travel long distances, high-band spectrum has big capacity but travels short distances, while mid-band is a nice complement of both capacity and coverage. To offer 5G across all areas of our country, we need a healthy mix of all three.

CTIA commends Chairman Pai and the FCC Commissioners for their commitment to promoting American leadership in 5G and the significant steps taken to address our nation's lack of access to high-band spectrum. The FCC recently completed its first successful auction of high-band spectrum, the 28 GHz band, and Chairman Pai has announced the auction of four additional high-bands of spectrum by the end of this year. Additionally, Congress and the FCC are to be applauded for pushing low-band spectrum

into the marketplace through the broadcast incentive auction, and last year, Congress directed the FCC to identify 30 MHz of low-band spectrum for wireless services by 2022.

Mid-band Spectrum is Key. Where the U.S. needs to make quick progress in the near term is on mid-band spectrum. Policymakers and industry worldwide have coalesced around the importance of mid-band spectrum, which basically refers to fact that this spectrum is located in the middle of the frequency bands currently in use for mobile services, roughly 3 to 24 GHz.

Mid-band spectrum will be a workhorse band for 5G – it represents the "sweet spot" of spectrum innovation. That's because it leverages both capacity and coverage opportunities – meaning it can handle the increased traffic that 5G will bring, and this spectrum travels distances, which is helpful in more rural settings. Mid-band spectrum has great potential to facilitate the deployment of 5G services because it will accommodate the wide bandwidths necessary to facilitate the faster connections and low latency that 5G technology promises.

For this reason, freeing up mid-band spectrum will create a positive impact on the economy. Analysis Group recently estimated the economic impact of U.S. policymakers freeing up mid-band spectrum. Its key finding: 400 MHz of mid-band spectrum will drive $274 billion in GDP and 1.33 million new jobs. This report underscores what we already know: that Congressional directives to auction spectrum have significant positive economic and societal benefits.

Because this mid-band spectrum is critical to 5G and economic development, other nations are moving quickly to allocate its use to wireless services. A study last year found the U.S. 6th among countries in mid-band spectrum allocations. Japan, South Korea, Spain, and the United Kingdom have all auctioned or assigned mid-band

spectrum since April 2018. Several other countries, including Australia, Germany, and Japan, have confirmed that mid-band spectrum will be assigned by June 2019. Recently, China announced that its three existing state-owned operators will receive a total of 460 MHz of mid-band spectrum for 5G.

The U.S. is making progress on mid-band, and Chairman Pai deserves credit for working hard to catch up with foreign governments. The FCC recently finalized rules for the 3.5 GHz band for mobile broadband, which will result in 70 MHz of licensed spectrum to be auctioned soon. We also welcome the FCC's proceeding to evaluate repurposing up to 500 MHz of mid-band spectrum between 3.7 and 4.2 GHz, known as the "C-Band." And last year, under the leadership of NTIA Administrator Redl, the Commerce Department initiated a review of the 3.45 GHz band, which is another critical piece of mid-band spectrum that could open new possibilities for 5G services in the U.S.

There is real bipartisan support behind swift U.S. action on mid-band spectrum. Commissioner O'Rielly noted it became apparent that "the world was eyeing mid-band spectrum as a component for 5G deployment. Thus, it became vital for the United States to have available a serious mid-band play to complement our spectrum work in the low and high bands." Commissioner Jessica Rosenworcel also said it well in her statement supporting the FCC's inquiry into opening more mid-band spectrum: "[W]e need to get started. Right here, right now."

This forward momentum is critically important, but we need to continue to press for additional action. The reality is wireless carriers in many countries have access to mid-band spectrum, and U.S. operators do not today. In December 2018, Analysys Mason released a report focused on mid-band spectrum plans in key foreign countries for 5G. It

found that by the end of 2020, an average of nearly 300 MHz of mid-band spectrum will be available *per country*. The FCC's 3.5 GHz item will open up 70 MHz of licensed mid-band spectrum, but to lead the world in 5G, the U.S. focus needs to be on securing *hundreds of megahertz* of mid-band spectrum. We have the right policy proposals, now we need to focus on following through and getting assets in the hands of our innovators swiftly with a clear schedule of auctions. The best available option is the 3.7 GHz band of spectrum under current FCC review.

Key Congressional Role in 5G Spectrum Policy

Congress has the ability to shape U.S. spectrum policy and take the steps we need to deliver on the full promise of 5G. This Committee should also be fully apprised on key efforts internationally and in the Administration to advance U.S. spectrum interests.

AIRWAVES. Last year CTIA strongly supported the Advancing Innovation and Reinvigorating Widespread Access to Viable Electromagnetic Spectrum ("AIRWAVES") Act, which establishes a much-needed pipeline of future spectrum auctions critical to U.S. global leadership in 5G. During the 115th Congress, the bill – authored by Senators Gardner and Hassan - enjoyed broad bipartisan backing in both the Senate and the House and attracted widespread praise from a diverse array of organizations, including the Consumer Technology Association, Connected Nation, the African American Mayors Association, and Public Knowledge.

Critically, the AIRWAVES Act set a timeline for auctioning a series of key low-, mid-, and high-band frequencies over the next five years. By recognizing that we need different types of spectrum to unlock the full complement of 5G services, the AIRWAVES Act identifies our core challenge: the lack of access to sufficient mid-band spectrum.

AIRWAVES remedies the mid-band deficit by providing access to the same spectrum bands that are being made available throughout Asia and Europe. By matching up our mid-band spectrum with global bands, we unlock economies of scale and reduce the costs—and time— to deploy.

Congressional deadlines, like those in AIRWAVES, have always been an essential tool to enable U.S. spectrum leadership by ensuring timely access to new spectrum. This five-year auction schedule will allow wireless providers to plan and build their 5G networks to maximize efficiency and robustness.

CTIA is hopeful that an updated version of the AIRWAVES Act will find its way into law in the 116th Congress. Passing the AIRWAVES Act is the most important step this Committee can take to ensure that our nation has the spectrum resources it needs to move full speed ahead with our 5G deployments and ensure American leadership. We stand ready to assist in any way we can towards that goal.

Other Key Legislation. Last Congress we strongly supported the Supplementing the Pipeline for Efficient Control of The Resources for Users Making New Opportunities for Wireless ("SPECTRUM NOW") Act, introduced by Sens. Wicker, Schatz, Udall, and Moran. This bipartisan legislation helps government agencies more efficiently and effectively manage spectrum resources. SPECTRUM NOW allows use of the approximately $8 billion in existing Spectrum Relocation Fund monies to support research into the feasibility of federal spectrum users either relocating or sharing spectrum with non-federal users. We are hopeful this legislation will be reintroduced and move forward in this new Congress.

National Spectrum Strategy. Last October, the Administration issued a Presidential Memorandum and is currently developing a comprehensive National

Spectrum Strategy. CTIA strongly supports this effort and appreciates the recognition that spectrum impacts our "economic, national security, science, safety, and other Federal mission goals now and in the future" and that the "[n]ation requires a balanced, forward-looking, flexible, and sustainable approach to spectrum management."

This Presidential Memorandum indicates the urgency – shared by the U.S. wireless industry – that spectrum should be quickly identified and made available to ensure our 5G leadership. Many nations are vying to lead on 5G, and the U.S. cannot wait. These are all important steps, and we urge the FCC and the Administration to commit to a clear auction schedule as soon as practicable. Congressional support and encouragement for a proactive, 5G-centric spectrum strategy would be beneficial, and would be strongly bolstered by passage of an updated AIRWAVES Act.

World Radio Conference. Maintaining U.S. leadership in wireless will also require that its actions on the international stage support 5G leadership here at home. As the U.S. government prepares for the upcoming 2019 World Radio Conference, the overarching goal should be to ensure that our efforts are directed at promoting 5G deployment across the U.S. Specifically, Congress should encourage the Administration to ensure that its positions reinforce our 5G leadership and do not undermine access to critical spectrum bands that have already been identified for 5G use in the U.S.

Deploying the Wireless Infrastructure to Leverage 5G Spectrum

5G services will require much denser networks to utilize new spectrum assets. To handle growing mobile data demands and unlock new 5G applications, wireless providers will need to install hundreds of thousands of small cells – small antennae the size of backpacks – in the next few years. Estimates have projected we will need over 800,000

small cells by 2026. To put that into perspective, our industry has over 150,000 cell towers in operation today, built over 35 years. Those installations are ongoing right now bolstered by reforms by 21 states and the FCC to modernize siting rules to reflect the needs of tomorrow's wireless networks as opposed to 200-foot cell towers. The FCC and the states have provided updated guidance to cities' approval processes for small cell applications. We thank Communications and Technology Subcommittee Chairman Thune and Ranking Member Schatz for their joint effort last Congress to develop the STREAMLINE Small Cell Deployment Act which included many process reforms similar to those adopted by the FCC in its recent decisions. We also appreciate efforts by Chairman Wicker and Senator Cortez Masto for their leadership on the SPEED ACT, and Senator Moran for his work on the RAPID Act.

Delivering Mobile Broadband to More Americans

I'm proud of our industry's commitment to building mobile service across America, driven by over $226 billion investment in our networks since 2010 alone. Just since December 2016, we were able to cover more than 318,000 additional rural consumers with LTE services. Nevertheless, there are communities across the country that still do not have access to the benefits of wireless, and we need Congress's and the FCC's help to ensure these unserved areas get connected.

One of the most promising proposals for reaching more Americans is the "rural dividend" provision included in the AIRWAVES Act. That provision sets aside 10 percent of the proceeds from new spectrum auctions for deployment of wireless networks in rural America. If this provision had been in place during the AWS-3 and broadcast incentive auctions, the rural dividend would have made available an additional $6 billion to build

out wireless in rural America and unserved communities. CTIA urges this provision to be included in a new AIRWAVES Act.

This Committee has also placed renewed focus on the role the FCC and Administration can play in expanding access to broadband services. The FCC's Mobility Fund will provide nearly $500 million in annual support, which can also provide much-needed universal service funding dedicated to wireless coverage across the country. Additionally, ensuring that broadband mapping is accurate will help better inform broadband infrastructure planning.

The wireless industry also wants to see the promise of 5G realized in underserved communities, including communities of color. The Brookings Institution recently released a report authored by Dr. Nicol Tuner Lee that examined the connection between 5G, the Internet of Things, and communities of color.

With 54.9 percent of households now being wireless-only homes, in her paper Dr. Turner Lee notes that "for communities of color…5G represents increased economic opportunity through improved access to social services, such as health care, education, transportation, energy, and employment." Dr. Turner Lee advocates that a robust supply of low-, mid- and high-band spectrum is required to broaden capacity and coverage in all communities to "promote both ubiquity and some level of digital equity for marginalized populations and their communities."

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Thank you for the opportunity to testify today. CTIA looks forward to working with you to promote 5G deployment and urges swift reintroduction and adoption of the AIRWAVES Act.