Remarks of FCC Commissioner Michael O'Rielly
before the Brooklyn 5G Summit 2019
April 25, 2019

Thank you, Chris, for that very kind introduction. Let me begin my remarks by extending my deepest appreciation to the summit's sponsoring hosts, Nokia and NYU WIRELESS Research Center, with a special thanks to Dr. Rappaport for his dogged dedication that makes this annual event such a success. I also want to highlight the great work of the Federal Communications Commission's (FCC) engineers. Not only do they manage to make seemingly impossible tasks and requests doable and solvable, but they also arm Commissioners with the technical spectrum knowledge we need to greatly improve our overall policymaking.

Part of the benefit of being an FCC Commissioner is being invited to participate in different events throughout our great nation. With only so much travel permitted by my wife, today's event lured me to New York because of its extremely impressive roster of attendees, all with the intent of exploring the depths and technical intricacies of the topic at hand. This isn't the typical forum where a few buzzwords, like AI or blockchain or VR, are thrown around and then everyone heads to the cocktail hour; instead it's a premiere event designed to intellectually challenge all involved. I am honored to share the same stage with some of the brightest technological minds in business and academia.

The Big Picture

When I consider what 5G may eventually mean for our society both at home and around the globe, I am reminded of a quote attributed to American sociologist Daniel Bell, "Technology, like art, is a soaring exercise of the human imagination." That simple statement defines the doorstep on which we stand today. 5G wireless technology — if properly implemented and given the requisite resources — is likely to alleviate a number of longstanding societal ills and, along the way, generate countless innovations that revolutionize the way humans work, play, communicate, and interact. To put a finer point on it, 5G has the capability to dramatically alter existing business models, create new ones never imagined, and generate improvements in consumer welfare far greater than ever seen before. I will try not to be guilty of overhyping its possibilities, but it is not too difficult to imagine a future where 5G has a positive impact on so many areas of our lives.

At the same time, we should consider tempering certain expectations with a bit of realism, at least in the earliest stages of deployment. Consider the headline-grabbing business cases discussed publicly so far— services and features like remote surgery and autonomous cars. These will require serious leaps of faith by consumers before widespread implementation can occur. Instead, we might be wise to focus our attention on those slightly more modest, but still revolutionary, advances that are likely to have immediate impact in business manufacturing and services — consider this an opportunity for wireless automation on a whole new scale. The improved speed, lower latency, and greater capacity resulting from 5G are a perfect fit to disrupt every stage of the business cycle, from labor, to supply chain, to production, to delivery. It will also have a lead role in creating so-called "Smart Cities." Without abandoning the vision of a futuristic, fully automated world, we would be warranted to adjust our horizontal sights to include an eye for uses that are about to be deployed sooner, making it easier to put in place the proper regulatory framework that allows for a long, steady runway of advancements far into the future.

On that note and as previously referenced, the future success of 5G is dependent, first, on those in the right positions — be it the private wireless sector, their financial backers, or those of us in government — ensuring ample resources are available for it to flourish. From a regulator's perspective, this includes clearing and reallocating spectrum, especially in the mid bands, where the technology can operate. Second, it also means addressing any challenges posed by both foreign governments and providers who may have malicious intent. Let me walk you through my views on both aspects.

Mid-Band Spectrum Supply & Demand

Although high-band spectrum holds out great promise for 5G and future communications services, and thanks to Dr. Rappaport who has been so helpful in expanding the Commission's vision of its upper spectrum limits, especially above 95 GHz, the U.S. government needs to be equally focused on providing the wireless sector with much needed mid-band spectrum for 5G networks. This effort has garnered much attention over the past few weeks. Many of the critiques of the Commission's efforts are a tad ironic, though, especially the ones coming from people who did everything they could to stymie improvements to the 3.5 GHz band. But, as someone who has been yelling from the rooftops about the need for mid-band spectrum for the past three years or so, I would like to offer a hearty welcome to the late arrivers to the party and I'm certainly looking forward to hearing their constructive ideas. So, let's talk about where we are with the mid bands right now.

While the facts clearly show the U.S. leading the world in allocating and auctioning millimeter waves, our actions in the mid bands haven't been on par. Compare that the Commission recently finished the 28 GHz auction, ended the clock phase of the 24 GHz auction last week, and is moving on to the assignment round. These auctions will result in a total of 1550 megahertz of millimeter wave spectrum being made available for 5G nationwide, but so far, the only sure thing we have in the mid bands is 3.5 GHz.

And trust me, I do not want to minimize the importance of the 3.5 GHz band. I completed, at the Chairman's request, the effort to revisit the priority access licenses, or PALs, and adopt technical changes to make the spectrum more attractive for 5G networks. I continue to push for completion of the systems that will protect the incumbent Navy radar systems and enable the sharing paradigm envisioned for the band. I am proud of my efforts, especially since there were many interested parties with many divergent views, and we got through it without a single court challenge. This is almost unheard of at the FCC these days. But even as we're approaching the day when this spectrum will be fully available for 5G networks, we are talking about 70 megahertz of PALs – with any one entity only able to acquire 40 megahertz – and 80 megahertz of unlicensed-like, or GAA, spectrum. This is the equivalent of merely a 5G building block when multiple providers are craving a minimum of 100 megahertz channels. Basically, this supply is nowhere close to meeting demand.

Our concerns should be heightened with the recent announcement that the 37, 39, and 47 GHz auction, which are the millimeter waves industry is clamoring for, will not even start until this December. This delayed auction has a domino effect. It is fair to conclude that if this auction is pushed back to December, then the 3.5 GHz auction has no chance of starting any earlier than the second quarter of 2020.

Simply put, the Commission must make procedural changes to enable auctions to be held closer together and ideally even simultaneously. It cannot take months on end to upscale, reconfigure, and test our software between each auction. This is inexcusable. In the meantime, the Commission must

announce the start date for the 3.5 GHz auction so that everyone is at least on notice as to when these mid-band licenses will be available.

Next on my personal priority list is the 3.7 to 4.2 GHz band, or C-band, which must be a vital component of any mid-band strategy. Industry stakeholders have discussed different options, including the market-based approach that could repurpose 200 megahertz of spectrum relatively quickly while ensuring the incumbents will be accommodated. Hopefully, the satellite incumbents who are willing to surrender their spectrum rights will be able to find a way to increase the amount to be reallocated to 300 or more megahertz, but perfect cannot be allowed to be the enemy of good. It seems like some opponents of the market-based approach want all 500 megahertz or at least 500 megahertz in urban areas, while still somehow accommodating the various broadcast and cable operators whose programming is delivered using the spectrum. This seems farfetched – to nearly impossible – given the realities and equities at stake. Instead, we must be willing to adopt a plan that gets mid-band spectrum into providers' hands as soon as possible with the appropriate protections. To facilitate this, the Commission needs to finalize its review and wrap up this proceeding in the next few months. In other words, no more dawdling.

In addition to CBRS and C-band, we need to tee-up even more mid bands for review, recognizing that doing so will likely cause some friction with existing federal government users. I accept the fate that the Commission cannot unilaterally dictate the reallocation of spectrum used by federal government agencies. However, we must expect greater attention to this issue and quicker action by these agencies – who are inconveniently parked in prime 5G bands – in order to meet our country's demand for more commercial spectrum. And, there are steps that can be taken by federal agencies in the near term to rectify the shortfall.

In particular, I believe that NTIA and DOD must immediately make the 3.45 to 3.55 GHz band available for commercial use. This 100-megahertz block can be combined with spectrum at 3.5 and 3.7 to 4.2 GHz to create the large channel sizes that are required for true 5G services. The original schedule dictated that this spectrum would be made available for commercial use quickly, but NTIA and DOD mistakenly shifted course and opted for an unnecessary feasibility study. Anyone who's been around the federal government long knows that this type of maneuver is designed to circumvent the underlying policy directive. This unnecessary study should be concluded as soon as possible, and these frequencies reallocated for commercial use.

Moreover, I call on our federal agencies to immediately initiate feasibility studies that are actually needed for the frequencies between 3.1 to 3.45 GHz. This spectrum is being used for "shipborne, land-based, and aeronautical mobile radar systems." While we have a general idea of what they are being used for, the particulars regarding exactly how, where, and what amount of spectrum is being used at any time are outdated, incomplete, and ultimately unhelpful. Perhaps the entire band may not be suitable for commercial use, but studies should be initiated, in this instance, to ensure that this spectrum is being used efficiently and determine whether some, or all, of the 350 megahertz can support commercial use.

As an aside while I am discussing these DOD frequencies, I want to make clear that this spectrum should be repurposed for private sector use, not some sort of public-private or government-owned nationwide wholesale network. Some have suggested that frequencies in this range could be used as part of some convoluted scheme. While many of us were hopeful that the President's recent comments on the topic would put an end to these efforts, ideas in Washington rarely die, and this one seems to have more lives

than the proverbial cat. There are too many reasons why such a proposal is completely flawed, but I will spare you that discussion today and reiterate my strong opposition to any nationalized 5G network.

As long as I am discussing specific bands that deserve attention, it seems appropriate to throw another band into the mix. The 7.125 to 8.5 GHz band, which is primarily used by the government for fixed wireless systems, should also be studied to see if it can accommodate commercial operations. This idea of introducing non-federal uses into this band has been raised by others. Some have asserted, in an FCC proceeding, that it is possible to relocate fixed commercial users currently in the 6 GHz band to these frequencies. Additionally, some international organizations have been promoting this spectrum for globally harmonized mobile use. These are ideas that the U.S. should be exploring and NTIA should be studying.

While it is not the focus of my discussion today, the Commission is also discussing mid-band spectrum for unlicensed use, such as the 5.9 and 6 GHz bands, so that wide channel blocks are available to meet the speed, capacity, and latency expectations demanded of next-generation Wi-Fi and other unlicensed uses. I will save this discussion for another day.

International Complications & Pitfalls

With your indulgence, let me turn the conversation to a major communications issue raging in D.C. and elsewhere: the appropriate reaction to foreign providers and nation states who are engaged in attempts to monopolize the development and deployment of 5G. If we accept as a given that a certain communist nation is trying to ensure its dominant global position in 5G, then we collectively need to understand the underlying motives driving this effort, the techniques being used to achieve it, its overall ramifications, and how best to respond.

I assert that there are at least four fundamental concerns with the Chinese companies' approach to 5G. The first can charitably be referred to as the use of unfair advantages that arise from companies headquartered in a non-market economy competing with capitalist-minded providers. As currently structured, no Chinese communications company can be considered a fully distinct and separate entity from the Chinese government. Consider that Jack Ma, "CEO" of Alibaba and the most successful Chinese company head, is a ranking official in the Communist Party. Being a member of the state party in China, however, is much more than simply a voter registration or perhaps a reflection of one's preferences for one party or another. In China, party affiliation signals a much closer alignment with the powers that be and is virtually a prerequisite to accessing the levers of power – both politically and economically. It would be naive to think that Chinese companies can ignore or dismiss out of hand any "advice" they receive from their government. The state, therefore, ultimately gets to steer, in one form or another, every big company decision, and perhaps most importantly, can directly use its resources to greatly subsidize its providers. The state can also block foreign competitors from serving within China itself. From subsidized labor and low-cost loans, to unlimited operating capital, to everything in between, Chinese wireless providers have access to these government-sponsored advantages to lockdown their domestic market, expand their reach internationally, and gobble market share in each country they enter. In the long-run, the only solution, as I see it, is for global trade policy to be revised to take a harder line in accounting for companies from non-market economies.

Second, Chinese attempts to use international multi-stakeholder organizations to skew standards in their favor, which I have discussed previously, continue to be extremely problematic. The most recent example is the inexplicable Chinese objection raised to a proposed change to the 5G standards

introduced by the U.S. and other Western wireless providers and manufacturers. This objection could endanger a core principle – that 5G needs low-, mid-, and high- band spectrum. Specifically, the positive change sought would allow carrier aggregation of millimeter wave and paired sub-6 GHz spectrum using new dynamic spectrum sharing technology, which enables paired 4G spectrum also to be used for 5G without having to empty the band of 4G users. While it wouldn't replace the need for more mid-band spectrum for 5G than is currently available in the U.S., it would greatly accelerate the 5G roll out and would give consumers an early taste of the benefits of 5G. Sounds great, right? According to the objectors, this new technology is just happening too fast. It appears that they just can't keep up. That's an unacceptable position to take and a backward-looking approach. As the world heads into the next phase of 5G, we must embrace and foster technological innovation, not slow it down to meet some politburo's dictated timeline.

Third, Chinese government involvement and interference in 5G development not only affects wireless providers but also the global manufacturing sector as well. For years, Chinese manufacturers have been obtaining market share internationally by exporting equipment that is not interoperable with other equipment brands, meaning that once a wireless provider or country invests in this equipment they are beholden to that Chinese manufacturer. This practice is more common than you may think. By providing below cost equipment, throwing cheap labor at service projects, and improving their equipment through stealing intellectual property, Chinese manufacturers have been able to win contracts throughout the world. One impact of this has been to devalue and shrink the number of communications equipment manufacturers. Where there once were many diverse competing companies, there are now three to four, depending on how you count. Chinese manufacturing prowess, built upon unfair advantages, continues to place an inordinate amount of pressure on other communications manufacturers and risks a further reduction in supply and ultimately market concentration. This is a scary prospect considering the national security implications, which gets me to my last point.

Fourth and finally, the close relationship between Chinese companies and the state puts the national security of every rival country at risk. As Chinese equipment becomes more engrained in any given provider's network and as Chinese providers become more of a fixture in a nation's communications marketplace, it appears as though the Chinese government has the potential to access information that touches that equipment or is carried on that network. In our modern society, data and Internet networks are the core infrastructure for determining economic, diplomatic, and military might, and therefore are battlefields that will define our future. As a nation, we have an obligation to protect U.S. communications networks from foreign governments bent on accessing them to harm our citizens. Until this threat can be properly contained, we must strongly consider whether Chinese-related service offerings and equipment are unacceptable inputs for our communications networks.

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I'll stop there and turn to the question and answering portion of my presentation. Before doing so, I must reiterate my appreciation for being included in this wonderful summit. I only wish I was able to join you for yesterday's program.