COMMISSIONER SIMINGTON PARTICIPATES IN FIRESIDE CHAT WITH COOLEY
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Thank you, Commissioner McDowell, for that kind introduction.

Today I'm going to talk a little bit about receiver standards, and why I think they're important.

So, what's a receiver, what's a standard, and who cares?

A receiver is just an antenna connected to some piece of electronics kit that, through the application of various methods of tuning, filtering, amplification, and demodulation, pulls a desired RF signal into a device for use in operations, and rejects undesired RF signals. Every wireless device in the world has a receiver, which means that there are tens of billions of receivers in the world. A typical modern cell phone might have six or more transceivers and a dozen antennas, covering such functions as cellular services, GPS, Wi-Fi, FM radio, near-field communication, and Bluetooth.

Not all receivers are the same. There are different wireless standards and protocols. There are different spectrum bands with different operating specifications. There are different applications to which receivers are specified. There are different tolerances for noise. There are receivers, like GPS receivers, that have to pull in signals so weak that it's at the attowatt scale. To give some context on that, imagine for a moment that the earth was flat and perfectly dark, and you're standing in New York. Now imagine one light bulb is on in Beijing. That's what a GPS receiver has to hear.

Receivers power the way we get information. The way we relate to loved ones. The way we watch movies and listen to music. And, increasingly, they influence how we control traffic. Control commercial and industrial applications. Control critical infrastructure. As we build greater automation into our lives, we are coming to rely, more than ever, on the wireless transmission of information.

And we are poised to charge headlong into a sea change in wireless operations. Part of the promise of 5G is moving more and more applications off of wired connections and onto wireless ones. Connections that, traditionally, we have considered to be critical infrastructure, and service from which we have expected more than the "best efforts" commercial standard. And we are going to have to rely on the adequacy of the services, and the devices powering those new wireless applications to meet the service levels we've grown to expect from wired transmission.

What's more, we will see more common platforms, more private or specialized "slices" of large public networks, and greater device flexibility. Low-latency, high-bandwidth, low-power, high-security systems promise to revolutionize industry, medicine, and public safety.

Okay. So receivers are important, not that that was ever really in doubt. But, you know, it seems like things are pretty much okay right now. I pick up my phone and it makes a call. I open Google Maps and it tells me where I am to within a few feet. The traffic lights are working. You know. Who cares?

Well, let's return back to the metaphor of the dark night. We're back in New York, and we're looking off across our metaphorical flat earth toward Beijing for that single light bulb. And that's our operating environment.

But now, someone starts a bonfire near Lake George. A supernova explodes in the sky. Someone's headlights turn on in Belize. And so on. All of a sudden, our operating environment has more light in it. So, you know, we do what we can. We shield our eyes a little bit and train our gaze out over the Western

horizon. But another light just came on in Shanghai. And so on. It's starting to get a little bit tough to figure out what it is we're supposed to be seeing.

Here's the thing: 5G mid-band isn't like a mostly dark night sky in a mostly dark earth. It's like a rave.

We are going to be cramming a lot of wireless operation into a relatively small chunk of desirable spectrum. Even with 4G, data consumption has had hockey-stick growth, and 5G promises to take this to a new level, with more data, more applications, use cases beyond commercial mobility, and vital systems relying on wireless data. So we're not looking for a lone point of light on the horizon, we're looking for one particular laser beam cutting through the fog and so on.

What I'm not worried about are the major operators in mid-band. I'm not worried about the major unlicensed users in 6 GHz. I'm also not worried about the major consumer device manufacturers—the Apples and Googles of the world. They're the club kids, you know? They've been to plenty of raves, they know the deal. They're fine.

What I'm worried about are the lower-volume device manufacturers that are making commercial or industrial edge devices that are operating, for the first time, in a spectrally dense environment. Torturing the analogy, these are the introverts who, like, came to the rave with their friends, but it's really not their thing. They are just sort of hugging the wall and waiting until they can leave.

I worry about the quality of the receivers in those devices. I worry about how secure they are. I worry about how well they reject interference. I worry about how well they filter and how susceptible they are to spurious emissions and intermodulation interference.

But it is precisely because these are relatively less expensive devices, with less sophisticated receivers, that they will be attractive to cash-strapped municipalities looking to migrate previously-wired services to wireless, or build out new wireless networks. And if we premise our transition to a wireless future on moving critical services to cheap devices made to relatively low specs, we chance a foot fault at just the moment that we're poised to deliver on the promise of 5G.

So much is at stake—AI, "Internet of Things", public health and safety, commercial and municipal operations, and so on. All of it is endangered when we have failures that cost money, or worse, lives, that flow from usage of cheap edge devices that are not suited to purpose. We must not let that happen.

So how do ensure the success of a wireless transition led by 5G? Well, there's a few things we have to get right. I think there's a whole security piece, which I hope to touch on a bit in the Q&A, that, for inexpensive wireless devices, may be just as important. But tabling that for the moment and focusing on receiver standards: receivers in devices operating in congested mid-band spectrum have to be good. They have to know when the bass is going to drop.

One way to ensure this is through the widespread adoption of receiver standards for devices operating in that spectrum, which may mean higher cost to develop, market, and ultimately to purchase wireless devices. And, just to level set: a standard is just a set of specifications that a device must meet in order to be marketed for its purpose. Of course, there are cons to standards that require receivers to be of higher quality—especially greater expense to both manufacturers and end users. However maybe those costs also won't materialize. Maybe efficiencies in new receiver technologies will nullify those costs. And there is also a cost to retaining the present system.

Further, there are also pros which, I believe, are poised to vastly outstrip the cons on a dollar-for-dollar basis. So, just as a for instance, municipalities will not continue to use critical but inexpensive devices

when there are instances, sometimes tragic, of failures of those devices. They will be forced to upgrade. So at a first cut, avoiding even the option of a cheap, but likelier-to-fail, device is a cost savings, to say nothing of the direct costs associated with the device failure itself. A malfunctioning traffic signal is no small thing.

Beyond that, however, there is a diffuse savings: better receivers mean tighter operation. Less concern over interference from the perspective of emitters. An operating environment that is more congenial to pushing data transmission right up to the very edges of band allocations and service areas. In a phrase: greater spectral efficiency. And at a cost of $80B for C-Band, operators need to get every dollar that they can out of their spectrum.

Lastly, for as rivalrous as our relationship is with China, it is undeniable that we still rely on Chinese manufacturers for a fair amount of our technology, including for cheap edge devices. Might not receiver standards squeeze Chinese manufacturers? There is, after all, a whole-of-government approach to onshoring high-quality technology manufacturing. Wouldn't requirements for better receivers have a protective effect on those efforts?

Okay. Suppose you agree with the emerging scenario as I've laid it out. So what's the solution? Regulatory diktat? No, of course not—I've been misunderstood on this a few times, so let me set the record straight. What I'm not saying is that the optimal solution is that the FCC step in and regulate receivers. While I think it is available to the FCC to do so, I would question the wisdom of such an approach. For one thing, industry typically knows a little better than we do how their devices are made.

So, fine. Perhaps industry needs to get together and make it happen. But then—and we've already encountered this a bit—there's a heckler's veto. Some part of industry that, for whatever reason, is unconcerned about the systemic upside when their marginal cost is increased. And while that's fair from their perspective as a manufacturer or operator, it isn't from the perspective of the American people.

That is what the Commission can do. We don't want to set standards, but we can. And the mere existence of that possibility ought to serve as a forcing function to industry. Our standards may not be as effective as those that industry sets for itself, so come to us with a solution.

But, and let's be clear: a solution will be needed. We can do it now, when folks have runway to think about it, or we can do it when mid-band is fully lit up and in heavy use and a few scenarios illustrating the mid-band crunch inevitably emerge. And I suspect that not only will our wireless transition be needlessly hamstrung, but that industry will wind up wishing it had reached an accord at an earlier moment.

We're still in that relatively dark and quiet night, so let's start planning now before the party starts.

Thanks again for the invitation and looking forward to taking some questions.