

**REMARKS OF
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Good morning. It's an honor to be here at the 5th Annual Americas Spectrum Management Conference. Thank you to Forum Global for inviting me to kick off this event. More importantly, thank you for the platform you provide for policy debates on spectrum and so many other important issues—not just here in the United States, but in Europe, and worldwide.

Today I want to talk about the future.

I believe the future belongs to the connected.

I bet many of you here agree. But the power of connectivity was not always so clear—even to some of those who were in the thick of it.

Take one of my predecessors at the Federal Communications Commission. Tunis Augustus Macdonough Craven, or T.A.M. Craven as he was better known, may have had the best name of any communications regulator anywhere, ever. But more importantly, he was a decorated Navy veteran. He was first appointed to the Commission by President Franklin D. Roosevelt and later rejoined the agency at the request of President Dwight D. Eisenhower. He had an extraordinary career in military intelligence and was a well-regarded engineer. But he may be best known for his assertion in 1961 that “There is practically no chance communications space satellites will be used to provide better telephone, telegraph, television, or radio service inside the United States.”

Needless to say, he got that wrong. Because a mere four years later the first communications satellite went into service. It has since been joined by thousands and thousands of others that help keep us connected every day—navigating traffic, predicting weather, facilitating commerce and offering a range of voice, video, and data services.

But it is not just the public sector that has failed to see the future of connectivity. The private sector has missed the mark, too. Consider this. In the 1980's AT&T asked McKinsey & Company to forecast how many cellular phones would be in the use in the world by the year 2000. Their prediction? 900,000. That was a little shy of the more than 100 million cellular phones in use worldwide at the turn of the millennium. And for the record, that number now exceeds 7 billion.

So what can we learn from this? For starters, predicting where connectivity will take us is a difficult business. Even smart people can get it wrong—really, really wrong. Technology is dynamic and evolves fast, use cases emerge that are hard to anticipate, and only a fool would predict with any certainty what the connected future holds.

Today I want to do a little bit of it anyway. Because I think wherever connectivity takes us, spectrum will play a formidable role. Though our airwaves are invisible, they are the most powerful infrastructure we have—and where we will build the future of civic and commercial life.

So I want to start by talking about spectrum policy in the immediate future—or the next several months. Then I want to talk about spectrum policy in the near future—or the next several years.

The Immediate Future: Incentive Auction

First up, the immediate future. Mark your calendar. Because two months from now the Federal Communications Commission will hold the world's first spectrum incentive auction. You've probably heard about it, but if not, let me give you the broad strokes.

Today, our 600 MHz band is used for broadcasting. We have a long tradition of local broadcasting in this country and we believe it deserves a bright future. But at the same time, every one of us knows that there has been an explosion of mobile devices. They are in our palms, pockets, and purses—they are with us always. We are using more of them, in more ways, more of the time than ever before. All of this use has escalated the demand for more flexible-use spectrum for mobile broadband.

So we are providing broadcasters with a choice. If they want to stay in the business of broadcasting, they can stay. But if they want to get out of the broadcasting business, we are going to give them an opportunity. They can return their airwaves to the Commission. And in turn, we will take their old licenses and re-auction them for new mobile broadband use. To sweeten the pot, we will pay them for the return of these licenses—hence the “incentive” in incentive auction.

This is an elegant idea. But it's complicated. Implementing it is not for the timid or faint of heart. We have an army of engineers, economists, and lawyers charging ahead to make it all work. There are three essential parts.

First, we will have a reverse auction, which will determine the price at which broadcasters will voluntarily relinquish their licenses.

Second, we will have a forward auction, which will determine the price companies are willing to pay for flexible-use wireless licenses.

Third, we will have the repacking process. This involves reorganizing channels used by the remaining broadcast television stations in order to ensure contiguous blocks of cleared spectrum for mobile broadband use.

Here's where we stand in the three-part process. Right now we have applications from broadcasters who want to participate in the reverse auction. Next week we will have applications from wireless providers and other entities that wish to bid in the forward auction. So while a lot

of work looms, the pieces are slowly but surely coming together—in time for an official auction start of March 29.

So stay tuned. Because this auction matters beyond just our borders. That's because this auction is bold—and totally unprecedented. But if we get it right—and I believe we will—we will have a template that can be used worldwide for the repurposing of spectrum for mobile broadband use.

That's what I predict. So again, stay tuned.

The Near Future: 5G

Next, I want to talk about the near future, a few years from now, and the possibilities of fifth generation wireless technology, or 5G.

Today, the bulk of our fourth generation or 4G wireless networks are built on spectrum frequencies from 600 MHz to 3 GHz. This is our current sweet spot for mobile communications.

But the 5G future will look different—very different. We are still going to need low-band spectrum to power the wireless revolution. But we will need to bust through our old 3 GHz ceiling and create new possibilities for millimeter wave spectrum—in the airwaves at 24 GHz and above. This is spectrum that is way, way up there. Or as I like to describe it, these are the airwaves that take us to infinity and beyond.

But with stratospheric frequencies there are propagation challenges. While these super-high signals carry a significant amount of data, they do not go far. But we can turn this limitation into a strength by combining these frequencies with small cells packed close together, densifying our networks at a lower cost. This, in turn, can mean service that reaches further into buildings at faster speeds than ever before. This is especially useful in urban corridors and fast-growing areas with the greatest traffic demands.

It won't be simple to put these bands to use. But the Commission has already taken an important first step with a rulemaking late last year proposing action in the 28, 37, 39, and 64-71 GHz bands. Plus we have committed to seek comment on more millimeter wave bands in the future.

Now identifying spectrum like this is a start. But to really make this effort work will require innovations in high-order multiple input, multiple output antennas. We will need new beam forming technologies. Because along with dense networks of small cells, these innovations can help us overcome the propagation challenges of this high-band spectrum. In addition, to make millimeter wave work we will need large, contiguous channel allocations of 200 megahertz or more.

On top of that, the potential for this spectrum will be greater if we can harmonize our work globally, which will enhance economies of scale. Work on this front has already begun. At the World Radio Conference in Geneva late last year, a wide range of frequencies were identified for study for 5G use.

This is good. But now let me contradict myself and what I just said about global efforts. Because I believe there are some places where I predict the United States will need to go it alone.

First, the 28 GHz band. In the rulemaking late last year, we proposed to authorize mobile use in this band along with a flexible approach to integrate existing satellite users. We chose this band in large part because the availability of 850 megahertz of contiguous spectrum makes it ideal for exploring new millimeter wave uses. Unfortunately, at the World Radio Conference in Geneva this band was left off the table. It was not included in the study list for 5G spectrum. But because the 28 GHz band has a global mobile allocation I think the United States should continue to explore this spectrum frontier. There is no need to wait. Plus, tests in this band are already underway in South Korea and Japan. So I don't think this is the time to hold back. I think we need to move ahead—on our own—and have a framework in place for the 28 GHz band by the end of the year.

Second, the 64-71 GHz band. The Commission also featured this band in its rulemaking late last year. We identified it as prime spectrum for unlicensed use. This is important, because good spectrum policy requires both licensed and unlicensed airwaves. This is true in low-band spectrum and mid-band spectrum—and also true here in high-band spectrum.

In our rulemaking we proposed to significantly expand existing unlicensed operations in the 57-64 GHz band with the 64-71 GHz band. That would double the amount of spectrum available for unlicensed use in millimeter wave bands. Our timing is good, because WiGig services using the lower portion of this spectrum are around the bend and this band is the perfect place for high-band unlicensed to grow. But at the World Radio Conference a significant slice of these airwaves were designated for licensed—rather than unlicensed—study. That's unfortunate. But here, too, I think the United States should keep the course and continue to pursue unlicensed opportunities in this band.

So to recap, I have predicted that the Commission's upcoming spectrum incentive auction will be a success.

I have predicted that millimeter wave spectrum will be a big part of 5G multi-radio access technology networks.

I think I'm right. But that's the thing. Because I bet everyone who has ever made any kind of technology prediction is confident they can see the future with total clarity.

After all it was David Pogue of *The New York Times* who when asked about Apple coming out with a mobile phone dismissively said "probably never." In 2006. That's the year before it was introduced. And it was Steve Ballmer of Microsoft who confidently said there's no chance that it would get "any significant market share."

But think about how that smartphone and so many others like it have remade our lives. Think about how they have changed our world. In fact, the smartphone everyone in this room has close at hand has more computing power in it than the National Aeronautics and Space Administration had when it sent astronauts to the moon. That's extraordinary. And extraordinary things are bound to come with the next generation of wireless services. We are on

the cusp of cars that drive themselves, streets that can be safer, commute times that can be cut, emergency services that are more effective, healthcare that is more personalized, and more capability across the board because we are more connected. I predict all of this can come with the next generation of wireless services—if we get our spectrum policies right. And that strikes me as worth the effort.

Thank you.