

Congress of the United States
House of Representatives
Washington, DC 20515-4608

February 12, 2016

Received & Inspected
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FCC Mail Room

Tom Wheeler
Chairman, Federal Communications Commission
445 12th Street SW
Washington, DC 20554

Dear Chairman Wheeler:

I received the following proposal to auction a new block of TDD spectrum below 5GHz that would be reserved exclusively for Massive MIMO from a constituent, Tom Marzetta. Tom was a classmate of mine at Gonzaga College High School from 1964-1968, where he was already a very smart individual. He was the originator of Massive MIMO and Group Leader of Large Scale Antenna Systems at Bell Labs. I would like your thoughts on his following proposal:

“The following represents my personal scientific perspective, and does not necessarily reflect the views of either Alcatel-Lucent or of any other party.

Spectrum below 5 GHz will always be the most valuable because of its resilience to blockage and obstructions, ability to function under high mobility conditions, and effective building penetration. Massive MIMO is the only wireless technology that can fully exploit the potential of these frequencies. In its ultimate deployment it could improve spectral efficiency by a factor of fifty or more over fourth-generation (4G) technology.

My perception is that the development of Massive MIMO in the United States is proceeding at a disappointingly slow pace. Two reasons for this are:

- There is no compatibility between Massive MIMO in its large-scale embodiment and today's 4G equipment. Service providers are naturally reluctant to consign their costly 4G infrastructure investments to early retirement.
- Massive MIMO, deployed on a large scale, favors TDD operation rather than FDD operation. (A technicality: TDD – time division duplex – utilizes the same band of frequencies over disjoint time intervals for downlink and uplink transmissions, while FDD - frequency division duplex – utilizes two disjoint frequency bands for downlink and uplink transmissions.) Spectrum is licensed for either FDD or TDD. With the exception of Sprint, the major US service providers including AT&T, T-Mobile, and Verizon have only FDD licenses.

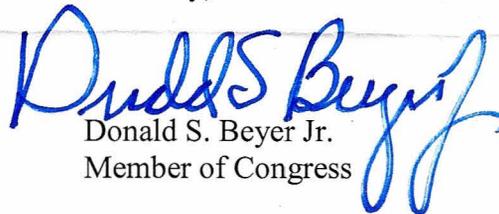
It appears to me that FCC could greatly accelerate the development and deployment of Massive MIMO. I propose an auction of a new block of below 5GHz TDD spectrum that would be

reserved exclusively for Massive MIMO. This extraordinary initiative (extraordinary because FCC typically does not specify the technical details of how spectrum is to be used) would revitalize the telecommunications industry, it would stimulate commerce by enabling a new generation of applications requiring order-of-magnitude higher wireless throughputs, and indirectly it would benefit US defense, since the armed forces prefer to use commercial communications technology where possible.

Best regards,
Tom Marzetta”

Thanks Tom, for considering Tom’s input. I am no expert on this issue, but I am happy to pass along Tom’s ideas.

Sincerely,



Donald S. Beyer Jr.
Member of Congress



OFFICE OF
THE CHAIRMAN

FEDERAL COMMUNICATIONS COMMISSION
WASHINGTON

June 14, 2016

The Honorable Don Beyer
U.S. House of Representatives
431 Cannon House Office Building
Washington, D.C. 20515

Dear Congressman Beyer:

Thank you for your letter concerning your interest in Mr. Marzetta's massive multiple-input and multiple output, or "MIMO." As you know, MIMO is a method for multiplying the capacity of a radio link using multiple transmit and receive antennas. MIMO has become an essential element of wireless communications, including Wi-Fi.

As your letter correctly notes, spectrum below 5 GHz will always be the most valuable because of its resilience to blockage and obstructions, ability to function under high mobility conditions and effective building penetration. MIMO potentially could exploit these frequencies and improve spectral efficiency. It is important to note, however, that the Commission assigns spectrum on a technology-neutral basis, based on the idea that the marketplace and consumers will drive the deployment of the most efficient and cost-effective equipment.

At the same time, part of our mission is to encourage technological development and innovation, which is why the Commission adopted a Spectrum Frontiers Notice of Proposed Rulemaking (NPRM) last year. On March 10, 2016, as part of our consideration of that NPRM, we held a workshop and demonstration of 5G equipment. Participants displayed a broad array of devices, including technology utilizing MIMO. Several interest parties also have provided information concerning MIMO's importance for the Spectrum Frontiers NPRM record.

We welcome referrals of congressional constituents with special expertise and encourage them to participate directly in the NPRM process. In addition, given your special interest and the information that you have conveyed, we will place your letter in the record of the proceeding and consider it as part of the Commission's review.

I appreciate your interest in this matter. Please let me know if I can be of any further assistance.

Sincerely,

A handwritten signature in blue ink, appearing to read "Tom Wheeler", written over a horizontal line.

Tom Wheeler