FEDERAL COMMUNICATIONS COMMISSION
WASHINGTON

OFFICE OF
THE CHAIRMAN

June 11, 2019

The Honorable Maria Cantwell
Ranking Member
Committee on Commerce, Science, and Transportation
United States Senate
425 Hart Senate Office Building
Washington, D.C. 20510

Dear Senator Cantwell:

Thank you for your letter regarding the Commission's recently completed 24 GHz auction (Auction 102). Auction 102 concluded on May 28, with 29 bidders winning 2,904 licenses and raising $2,022,676,752 in net bids for the Treasury. The auction made available 700 megahertz of spectrum in the 24.25–24.45 GHz and 24.75–25.25 GHz bands for commercial 5G services and applications. I agree with you that "[l]eadership in 5G networks and devices is undoubtedly critical to our economic and national security." Prompt use of this spectrum is in turn critical for United States leadership in the deployment of 5G, and the Commission therefore intends to issue licenses to Auction 102 winners as soon as possible consistent with our normal processes.

The service rules for the 24 GHz band were coordinated with our federal partners and have been public for a long time. The FCC proposed to open up the 24 GHz band for mobile terrestrial use during the Obama Administration, in 2016. We then adopted the service rules for the 24 GHz band in 2017. In developing these rules, we followed the standard interagency coordination process, which involved all relevant agencies with equities in the matter. On May 17, 2018, in my written testimony before the Senate Appropriations Committee's Subcommittee on Financial Services and General Government Operations, I indicated that we planned to move ahead with auctioning the 24 GHz band in fiscal year 2019. And then, on August 3, 2018, the Commission adopted the final procedures for Auction 102.

In our interagency coordination process, other federal agencies did not object to expanding the existing permissible use of the 24.25–24.45 GHz and 24.75–25.25 GHz bands for 5G service—neither for wide-area fixed wireless broadband service nor mobile service. Noting that the international community would be seeking harmonization of 5G spectrum at the upcoming World Radiocommunication Conference 2019 (WRC-19), the FCC stated that once international studies were completed, interested parties could propose revisions to the Commission's rules as necessary for the protection of weather satellites operating in the 23.6–24 GHz band. This approach was coordinated and agreed upon with our counterparts in the federal

government to ensure a transparent process and a legal foundation if the Commission adopted different limits following WRC-19. But federal agencies did not suggest that commercial deployment in the 24 GHz band would need to await resolution of the question of protection limits at WRC-19 (or subsequent domestic rulemakings implementing that resolution).[1]

Based on the record compiled in a notice-and-comment rulemaking, the Commission also concluded that its rules would protect weather satellites in the 23.6–24 GHz band from harmful interference. The 2017 *Spectrum Frontiers* decision adopted the same standard emission limit of -13 dBm/MHz (or -20 dBW/200 MHz, in International Telecommunications Union, or ITU, terms) that the FCC and the federal government have historically, with rare exceptions, applied for the protection of services operating in adjacent bands. This limit has been successful in controlling interference and avoiding protracted and costly analyses to evaluate potential interference to every radio service, which would inevitably delay the introduction of new services. Indeed, the federal government and private sector have deployed nearly 40,000 high-powered fixed microwave links in the 21.2–23.6 GHz band, immediately below and actually adjacent to the 23.6–24 GHz passive band, at the same emission limit the FCC adopted for 5G operations. No interference has ever been reported. Moreover, these fixed microwave links are directly adjacent to the passive band, whereas the portion of the 24 GHz band to be used for 5G (24.25–24.45 GHz and 24.75–25.25 GHz) is separated by a 250 MHz guard band.

In short, the Commission's decisions with respect to spectrum have been and will continue to be based on sound science and engineering rather than exaggerated and unverified last-minute assertions.

I agree with you that the United States must base our international advocacy at the upcoming WRC-19 on studies that withstand scrutiny. More than a dozen studies have been submitted internationally looking towards WRC-19. The studies submitted by weather satellite interests have proposed the most extreme protections while other studies justify far less necessary interference protections.

Unfortunately, the emission limits most recently advanced by the Department of Commerce's National Oceanic and Atmospheric Administration (NOAA) and the National Aeronautics and Space Administration (NASA) are based on an unvalidated and badly flawed study. (The conclusions in the report you reference make clear that they are also dependent on that same flawed and unvalidated study.) For example, international guidance provides for analyses based on the adaptive array antennas expected to be used in this spectrum. These adaptive array antennas (beamforming) are one of the innovations that make mobile 5G in millimeter-wave bands possible—and significantly reduce the impact of commercial 5G

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operations on passive weather satellites. And yet, NOAA has rejected considering such antennas in its study.

There are many other problems with the study; here are just a few. It assumes base stations and respective user equipment are transmitting at the same time, which is impossible under Time Division Duplex (TDD) systems. It overestimates both the quantity of and power from base stations and user equipment. It does not reflect the 250 MHz guard band between 5G services and the passive services. It does not adequately take into account the effects of buildings and trees that would block potentially interfering signals. And the wireless deployment scenarios the study uses are not consistent with any reasonable expectation of how 24 GHz band spectrum will actually be used. These and other flaws exist despite international guidance that any study methodology should include appropriate and reasonable input parameters.

Just as importantly, the most recent study has not been vetted through any public process, including through the ITU processes other studies have gone through. Indeed, NOAA shielded the study from a thorough review by FCC staff until May 10, 2019, when NASA finally provided the code for review after repeated requests by NTIA and FCC for the underlying study simulation. This allowed the FCC to undertake an informed and detailed analysis of the study for the first time only one month ago.

Such input from stakeholders, including the technical experts with the Commission, is critical for a study to be validated. FCC review has already revealed the substantial impact of the study's known flaws. And this review process is especially important since NOAA's prior study on this issue was withdrawn and abandoned by NTIA earlier this year due to flaws uncovered by the FCC and industry participants.

You have asked for a timeline of our preparations regarding the protections for passive weather satellites in the 24 GHz band for WRC-19, including the reconciliation process. By way of background, the FCC coordinates with the private sector to solicit input for U.S. proposals, and NTIA coordinates with federal government agencies to solicit their input. The FCC has established an advisory committee for this purpose, called the WRC Advisory Committee (WAC), and the NTIA coordinates through the Radio Conference Subcommittee (RCS). When these processes result in different positions on an issue, the issue goes to "reconciliation," a process in which the State Department makes a final decision—effectively, casts a deciding vote—if the FCC and NTIA are unable to resolve their differences. Every effort is made during reconciliation to find a compromise that is acceptable to all interests. This reconciliation process is also used to resolve differences concerning U.S. contributions to the ITU-R Study Group meetings and other related international meetings that lay the groundwork for decisions at the WRC.

My staff have provided the following timeline:

- July 2016: FCC issues *Spectrum Frontiers* Report and Order establishing the first rules for services like 5G in the world. This order first establishes the out-of-band emission

limit for 5G operations operating in these frequency ranges. The item also seeks comments on additional bands for fixed and mobile use, including the 24 GHz band.

- September 2017 and January 2018: NOAA proposes an initial study on interference protections for submission by the United States to ITU-R Task Group 5/1. The FCC and some U.S. industry representatives raise numerous technical concerns about the study.
- November 2017: FCC issues its second *Spectrum Frontiers* Report and Order making millimeter wave spectrum available in a number of bands, including 24 GHz, for 5G wireless, Internet of Things, and other advanced spectrum-based services based on industry feedback and coordination with federal stakeholders.
- March 2018: Federal agencies host a meeting with the FCC and industry to discuss their concerns about this NOAA study. NTIA begins to evaluate the NOAA study and also voices some concerns.
- November 2018: Federal agencies host another meeting with the FCC and industry representatives to discuss concerns with this NOAA study. NTIA continues to evaluate the NOAA study and makes revisions which result in less restrictive emission limits.
- December 2018: After reviewing the NTIA revisions to the study, the FCC provides six high-level concerns to NTIA to be addressed before the study is finalized for submission to the ITU.
- February 2019: NTIA and the FCC attempt to reconcile a U.S. Proposal on emission limits in the 24 GHz band for two upcoming meetings—the ITU's Conference Preparatory Meeting (CPM) in March 2019, which develops "methods" or options to be considered at the WRC to solve each agenda item, and the Americas regional meeting in April 2019 (in addition to country proposals, ITU geographic regions develop regional proposals for consideration at the WRC). The State Department develops talking points for the CPM to endorse the U.S. domestic limits (based on the FCC's longstanding protection limits) as a viable option internationally and confirms the decision to submit a U.S. Proposal to the Americas regional meeting.
- February 2019: NTIA informs FCC staff that they are no longer working to revise NOAA's initial study and that now NASA is conducting a new study. This was a very odd development to occur this late in the process. At the Conference Preparatory Meeting, the FCC received a document summarizing a new study, but not the actual study. The NASA study was described as applicable to several of the frequency bands under study for 5G by the ITU, suggesting that the protections in the study would apply to nearly all the bands contemplated for 5G use in the United States. The summary was accompanied by several questions from NTIA for the FCC and industry to answer about the validity of some of the input parameters.

- March 1, 2019: The Commerce Department and NASA send a letter to Chairman Pai inviting him to a meeting on March 11 to discuss relitigating the question of interference protections for the passive band at 23.6–24.0 GHz. Chairman Pai responds on March 8, observing in part that the U.S. position on this issue has already been formed, notwithstanding other agencies' ongoing lobbying of foreign delegations and entities to undermine this position.
- March 11, 2019: FCC staff attends the meeting with Commerce, NASA, and the National Space Council. At the start of the meeting, FCC staff is given a copy of yet another new study purporting to show a need for dramatically more stringent required emissions limits, this time only for the 24 GHz band. It is marked pre-decisional and "not for distribution." I understand that the study still has not yet been made available for review by private sector stakeholders, as was the case for the NOAA study that had been under consideration for two years.
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- October 2019: Start of WRC-19. As part of the U.S. delegation to the WRC, the FCC will provide technical support and expertise to the negotiations, ensuring that international decisions provide the necessary flexibility for the United States to continue to lead the world in 5G development without causing undo harm to our international partners.

Your letter also asks for the Commission's public interest analysis regarding the FCC's emissions limits, as well as a broad range of material and information, much of which is readily available in the public record of the proceeding. We have a transparent rulemaking process and maintain documents in our online Electronic Comment Filing System. Also, each auction has its individual webpage; in this case, that page is located at https://www.fcc.gov/auction/102. And generally speaking, our 5G efforts are detailed on our website dedicated to the FCC's 5G FAST plan, https://www.fcc.gov/5G. I have directed my staff to assist yours in accessing this material online for review and to provide any other assistance that you need related to the Commission's spectrum work.

Notably, this type of debate about appropriate emissions limits and efficient use of spectrum to provide for new services is one that typifies many of our spectrum proceedings. Advocacy is often characterized by claims of harmful interference by incumbents—and riddled with a parade of horribles that have no basis in reality. So it is unsurprising that we have not yet found any credible evidence or validated study showing that existing limits will insufficiently protect weather-sensing satellites. In contrast, adopting the limits suggested by the Department of Commerce would undeniably render the 24 GHz band unusable for 5G.

The FCC looks forward to advancing U.S. positions for the WRC-19 that will advance U.S. leadership in 5G and protect passive weather services in the 24 GHz band. Based on the ongoing work of the Commission's spectrum engineering experts, we do not need to choose between 5G and critical weather forecasting tools. Sound and sober engineering analyses lead us to the firm belief that the United States can have both.

Please let me know if I can be of any further assistance.

Sincerely,

Ajit V. Pai

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