

**Before the
FEDERAL COMMUNICATIONS COMMISSION
Washington, DC 20554**

In the Matter of)	
)	
Unlicensed Use of the 6 GHz Band)	ET Docket No. 18-295
)	
Expanding Flexible Use in Mid-Band Spectrum Between 3.7 and 24 GHz)	GN Docket No. 17-183
)	

REPLY COMMENTS OF T-MOBILE USA, INC.

T-Mobile USA, Inc. (“T-Mobile”)¹ submits the following reply comments in response to comments on the *Notice of Proposed Rulemaking* in the above-referenced proceeding.² T-Mobile urges the Commission to recognize that additional spectrum, particularly mid-band spectrum, is needed for licensed networks. It therefore supports the comments filed by CTIA and others suggesting that the Commission should evaluate whether a portion of the spectrum in the 5.925-7.125 GHz (“6 GHz”) band can be made available for licensed use,³ including by relocating existing licensees in the band to other spectrum.

I. THE 6 GHz BAND IS NEEDED TO MEET THE GROWTH OF CARRIER NETWORKS

A. Mid-Band Capacity is Required to Meet 5G Network Requirements

Commenters point out that data usage forecasts continue to show that carrier networks will be required to handle an ever-increasing amount of traffic. Ericsson, for example, reports

¹ T-Mobile USA, Inc. is a wholly-owned subsidiary of T-Mobile US, Inc., a publicly traded company.

² See *Unlicensed Use of the 6 GHz Band; Expanding Flexible Use in Mid-Band Spectrum Between 3.7 and 24 GHz*, Notice of Proposed Rulemaking, ET Docket No. 18-295, GN Docket No. 17-183, FCC 18-147 (rel. Oct. 24, 2018).

³ See, e.g., Comments of CTIA, ET Docket No. 18-295 and GN Docket No. 17-183 (filed Feb. 15, 2019) (“CTIA Comments”); Comments of Ericsson, ET Docket No. 18-295 and GN Docket No. 17-183 (filed Feb. 15, 2019) (“Ericsson Comments”); Comments of Verizon, ET Docket No. 18-295 and GN Docket No. 17-183 (filed Feb. 15, 2019) (“Verizon Comments”).

that North America continues to have the highest monthly data traffic per smartphone – a trend that is expected to accelerate.⁴ T-Mobile similarly explained in response to the Commission’s *Notice of Inquiry* in this proceeding that the public’s demand for wireless broadband has increased dramatically over the years.⁵

This means that additional capacity for carrier networks is needed. And it is particularly important for the Commission to make more mid-band spectrum available because, as commenters agree, it has propagation characteristics (*i.e.*, wide coverage, low latency, and high reliability) that make it well-suited for mobile wireless broadband.⁶ Commenters also agree that mid-band spectrum provides the balance of capacity and coverage and wide bandwidths that are necessary for Fifth Generation wireless (“5G”) technologies.⁷ In fact, commenters correctly note that making additional mid-band spectrum available is vital for the U.S. to maintain its leadership in the race to 5G.⁸ As CTIA and others point out, the U.S. is ranked sixth out of ten countries with respect to the availability of mid-band spectrum as of the end of 2018.⁹

⁴ Ericsson Comments at 5 (adding that “[t]he global number of licensed cellular [IoT] connections is expected to reach 4.1 billion in 2024”).

⁵ See Comments of T-Mobile USA, Inc., GN Docket No. 17-186, at 4-5 (filed Oct. 2, 2018) (“T-Mobile Mid-Band NOI Comments”).

⁶ See, *e.g.*, CTIA Comments at 3; Ericsson Comments at 6; Verizon Comments at 12; *see also* T-Mobile Mid-Band NOI Comments at 7. As noted below, the millimeter wave spectrum that the Commission has made, and is expected to make, available cannot support 5G mobile operations today.

⁷ See, *e.g.*, CTIA Comments at 3; Ericsson Comments at 6; Verizon Comments at 12; *see also* T-Mobile Mid-Band NOI Comments at 3.

⁸ See Verizon Comments at 12 (“And to win the race to 5G, the United States must quickly introduce a significant amount of mid-band spectrum for flexible, exclusive-use licenses.”).

⁹ See CTIA Comments at 4 (citing David Abecassis *et al.*, *Final report for CTIA Mid-band spectrum global update*, ANALYSYS MASON (Nov. 2018), <https://api.ctia.org/wp-content/uploads/2018/12/Analysys-Mason-Mid-Band-Spectrum-Global-Update.pdf>); Ericsson Comments at 7-8; Verizon Comments at 13.

Meanwhile, other countries continue to make significant amounts of mid-band spectrum available.¹⁰

Congress took useful action to make additional spectrum available for carrier networks in 2015 by enacting the Spectrum Pipeline Act and more recently in 2018 by enacting the Consolidated Appropriations Act of 2018.¹¹ The Commission has also taken action to make low-band spectrum, which provides wide-area coverage, and high-band spectrum, which will provide massive capacity in denser environments, available for carrier networks.¹² While the Commission has similarly taken several steps to make mid-band spectrum available, commenting parties agree that those measures alone are insufficient and should be supplemented by dedicating some of the 6 GHz band for that purpose.¹³

B. Current Mid-Band Capacity is Insufficient and Uncertain

First, T-Mobile acknowledges that the Commission has made spectrum at 3.5 GHz available for mobile broadband services and has changed the rules so that they are more favorable for carrier operations.¹⁴ But, as commenters note, only 70 megahertz of that spectrum will be made available on a licensed basis, with no single entity holding more than 40 megahertz

¹⁰ See CTIA Comments at 4; Ericsson Comments at 7-8; Verizon Comments at 13.

¹¹ See Spectrum Pipeline Act of 2015, Pub. L. No. 114-74, § 1004, 129 Stat. 621 (2015); Consolidated Appropriations Act of 2018, Division P, Repack Airwaves Yielding Better Access for Users of Modern Services Act of 2018, Pub. L. No. 115-141, § 603, 132 Stat. 1080 (2018).

¹² See *Incentive Auction Closing and Channel Reassignment Public Notice; The Broadcast Television Incentive Auction Closes; Reverse Auction and Forward Auction Results Announced; Final Television Band Channel Assignments Announced; Post-Auction Deadlines Announced*, Public Notice, 32 FCC Rcd 2786 (2017); *Use of Spectrum Bands Above 24 GHz for Mobile Radio Services et al.*, Report and Order and Further Notice of Proposed Rulemaking, 31 FCC Rcd 8014 (2016).

¹³ See T-Mobile Mid-Band NOI Comments at 7; CTIA Comments at 6; Ericsson Comments at 2 (arguing that “there is *no* large swath of mid-band spectrum available for licensed macro 5G service in the U.S.”).

¹⁴ See *Promoting Investment in the 3550-3700 MHz Band*, Report and Order, GN Docket No. 17-258, FCC 18-149 (rel. Oct. 24, 2018).

of spectrum.¹⁵ And that spectrum is subject to technical constraints due to incumbent operations that will limit its utility. As CTIA and Ericsson observe, the transmit power levels for the 3.5 GHz band are “significantly lower” than in other flexible use bands due to coexistence concerns, making them well short of the levels needed for macro broadband deployment.¹⁶

Second, T-Mobile is encouraged by Assistant Secretary Redl’s recent announcement that NTIA is considering the reallocation of the 3450-3550 MHz band.¹⁷ However, it remains unclear at this time how much, if any, of that spectrum will be made available for mobile wireless broadband services.¹⁸

Third, while the Commission has initiated a proceeding proposing to make some or all of the 3.7-4.2 GHz band available for licensed terrestrial use,¹⁹ it is unclear how much of that band will ultimately be available for mobile wireless broadband.²⁰ Indeed, as Ericsson points out (based on the availability of 180 megahertz of spectrum in the 3.7-4.2 GHz band as incumbent licensees propose), “[t]his amounts to just *15 percent* of the 1,200 megahertz of spectrum the Commission is now proposing to make available for unlicensed operations in the 6 GHz band.”²¹

¹⁵ See, e.g., Ericsson Comments at 2; CTIA Comments at 6.

¹⁶ See Ericsson Comments at 9; CTIA Comments at 6; see also T-Mobile Mid-Band NOI Comments at 10-11 (“T-Mobile has demonstrated that the already-allocated 3.5 GHz band can be useful for 5G services if the Commission acts favorably on its petition for rulemaking, but there are significant limitations on use of the spectrum due to incumbent operations that will remain in the band on a primary basis.”).

¹⁷ See David J. Redl, *NTIA Identifies 3450-3550 MHz for Study as Potential Band for Wireless Broadband Use*, NTIA (Feb. 26, 2018), <https://www.ntia.doc.gov/blog/2018/ntia-identifies-3450-3550-mhz-study-potential-band-wireless-broadband-use>.

¹⁸ See also Ericsson Comments at 9 (“And, as NTIA leads a review to consider repurposing the 3.45-3.55 GHz band, it must address similar circumstances as in the 3.5 GHz band.”).

¹⁹ See *Expanding Flexible Use of the 3.7 to 4.2 GHz Band, et al.*, Order and Notice of Proposed Rulemaking, 33 FCC Rcd 6915 (2018).

²⁰ Current satellite licensees of the band have said that they can make a maximum of 180 megahertz available, far less than necessary to support the use of the band by multiple carriers.

²¹ Ericsson Comments at 8.

Based on the uncertain amount of mid-band spectrum that may be made available, the Commission must ensure that the U.S. is not left with an undersupply of spectrum that not only limits the number of providers that can use the spectrum, but also skews the balance of mid-band spectrum heavily in favor of unlicensed uses. Accordingly, the Commission must look to other sources of mid-band spectrum for licensed systems. And it must do so without the use of a complicated sharing regime such as the one adopted for the 3.5 GHz band that will impede the utility of the spectrum. As noted above, the Commission has already made a significant amount of high-band spectrum available, which is important for the deployment of 5G networks. But while that high-band spectrum can meet certain 5G deployment requirements, it is propagation-limited. That is why commenting parties agree that more mid-band spectrum is needed and that the 6 GHz band can fill in the missing piece.²² Not only does it present an important opportunity to address the deficiency in mid-band spectrum availability, but it will also allow the Commission to fulfill its Congressionally-imposed obligations to identify spectrum for mobile wireless broadband operations.

II. DESIGNATING 6 GHz SPECTRUM FOR LICENSED USE WILL OTHERWISE SERVE THE PUBLIC INTEREST

Making additional spectrum available for carrier networks will not only help satisfy documented consumer demand, it will also otherwise benefit the public interest by promoting job growth and driving economic progress. For instance, CTIA and Ericsson observe that a recent study conducted by Analysis Group determined that making 400 megahertz of licensed mid-band

²² See, e.g., CTIA Comments at 5 (stating that “while spectrum in the 3 GHz band is highly appealing and of prime interest, wireless stakeholders also view the 6 GHz band as an important opportunity for mid-band licensed spectrum”); Ericsson Comments at 10 (arguing that “rebalancing the amount of 6 GHz spectrum the Commission proposes to reserve for unlicensed use is the most effective near-term option for creating more licensed mid-band spectrum for 5G”); see also T-Mobile Mid-Band NOI Comments at 7.

spectrum between 3.45 GHz and 4.2 GHz available for 5G networks “over a seven-year period will result in \$150 billion in wireless investments, 1.3 million new jobs on a direct and spillover effect basis, and a contribution of \$274 billion to America’s [Gross Domestic Product (‘GDP’)].”²³ T-Mobile also recently explained that the benefits stemming from mobile wireless innovation are only expected to increase with the deployment of 5G wireless technologies, which are expected to add approximately \$420 billion to the nation’s annual GDP,²⁴ and that identifying new spectrum for such technologies is critical to maintaining U.S. leadership in the wireless industry and the accompanying economic growth it produces.²⁵

The use of spectrum for licensed services also promotes its use for unlicensed operations. As T-Mobile has explained, investments by parties in licensed spectrum can, for example, create a robust equipment ecosystem for both licensed *and* unlicensed operations,²⁶ expanding the range and number of devices and promoting economies of scope and scale. Therefore, designating spectrum for licensed use is vital to the success of both licensed and unlicensed users.²⁷

²³ CTIA Comments at 3-4 (citing David W. Sosa and Greg Rafert, *The Economic Impacts of Reallocating Mid-Band Spectrum to 5G in the United States*, ANALYSIS GROUP, at 1 (Feb. 2019), <https://api.ctia.org/wp-content/uploads/2019/02/The-Economic-Impacts-of-Reallocating-Mid-Band-Spectrum-to-5G-1.pdf>); Ericsson Comments at 6-7.

²⁴ See *Smart Cities: How 5G Can Help Municipalities Become Vibrant Smart Cities*, CTIA (2017), <https://www.ctia.org/docs/default-source/default-document-library/how-5g-can-help-unicipalitiesbecome-vibrant-smart-cities-accenture.pdf>.

²⁵ See T-Mobile Mid-Band NOI Comments at 5; Comments of T-Mobile, GN Docket No. 17-258 *et al.*, at 1-2 (filed Dec. 28, 2017) (“T-Mobile 3.5 GHz Comments”).

²⁶ See T-Mobile 3.5 GHz Comments at 5.

²⁷ See *id.*

While some parties argue that licensed use of the 6 GHz band could stifle unlicensed operations,²⁸ unlicensed and licensed spectrum can operate, and indeed flourish, together in the 6 GHz band. As discussed below, wireless carriers such as T-Mobile have a long history of utilizing Wi-Fi as essential components of their networks and therefore have been, and will continue to be, highly motivated to foster the successful co-existence among unlicensed and licensed technologies.²⁹

III. THE COMMISSION SHOULD THEREFORE DESIGNATE A PORTION OF THE 6 GHz BAND FOR LICENSED USE

T-Mobile has long recognized the importance and been a significant user of unlicensed spectrum. For instance, T-Mobile uses unlicensed spectrum for network offload and was one of the first carriers to offer customers cutting-edge technologies like nationwide Voice over LTE (“VoLTE”) and next-generation Wi-Fi calling.³⁰ Nevertheless, as demonstrated above, the Commission must also ensure that sufficient spectrum, particularly in the mid-band range, is available for licensed networks. As commenters suggest,³¹ the Commission can and should, in

²⁸ See, e.g., Comments of Quantenna Communications, Inc., ET Docket No. 18-295 and GN Docket No. 17-183, at 1 (filed Feb. 14, 2019).

²⁹ See Comments of T-Mobile USA, Inc., ET Docket No. 15-105, at 4 (filed June 11, 2015) (“T-Mobile LTE-U Comments”).

³⁰ See T-Mobile Mid-Band NOI Comments at 16 n.64; T-Mobile LTE-U Comments at 2-3 (discussing T-Mobile’s unlicensed technology innovations); Ericsson Press Release, *T-Mobile US Deploys Ericsson Expert Analytics* (Feb. 26, 2018), <https://www.ericsson.com/en/press-releases/2018/2/t-mobile-us-deploys-ericsson-expert-analytics> (reporting that more than 80 percent of all voice traffic at T-Mobile is carried over VoLTE and that T-Mobile has partnered with Ericsson to further improve the VoLTE customer experience). T-Mobile was also the first carrier to launch a number of other unlicensed technology innovations, including calling over Wi-Fi in 2007 with HotSpot @Home™ and worldwide Wi-Fi calling in 2014. See T-Mobile Mid-Band NOI Comments at 16 n.64.

³¹ See, e.g., CTIA Comments at 3; Ericsson Comments at 9-10.

evaluating use of the 6 GHz band, ensure that there is balance of both licensed and unlicensed spectrum in the band.

In particular, T-Mobile supports CTIA's proposal to consider licensing the upper portion of the 6 GHz band for exclusive use, flexible rights services.³² As CTIA points out, there is limited use of the 6.425-7.125 GHz band for Fixed Satellite Service ("FSS") and Fixed Service ("FS") operations.³³ And, in any case, as discussed below, those operations can be relocated. In addition, as commenters observe, there are alternative mechanisms, such as fiber and 5G technologies, as well as relocation frequencies available for incumbent Broadcast Auxiliary Service and Cable Television Relay Service licensees to provide their services.³⁴

T-Mobile has suggested, and CTIA and Ericsson agree, that the Commission and NTIA should evaluate the potential availability of the 7.125-8.4 GHz band for shared federal/non-federal use and migrate current licensees in the upper portion of the 6 GHz band to that spectrum.³⁵ The 7.125-8.4 GHz band is an ideal band for relocating federal FS incumbents because it is immediately adjacent to the 6 GHz band, and, as commenters recognize, contains allocations for the federal FS across the entire band.³⁶ Indeed, federal agencies relocating from

³² See CTIA Comments at 2, 9-10; see also Ericsson Comments at 13-16 (urging the Commission to launch a new notice of proposed rulemaking to consider repurposing the 6.525-7.125 GHz band for licensed services); Comments of Verizon, GN Docket No. 17-183, at 22 (filed Oct. 2, 2017) (agreeing that the 6.425-7.125 GHz band holds promise for flexible-use operations); T-Mobile Mid-Band NOI Comments at 17-19.

³³ See CTIA Comments at 14-15; see also T-Mobile Mid-Band NOI Comments at 18. T-Mobile has noted that its own use of microwave facilities in the 6 GHz band is limited; approximately 96 percent of its sites are connected via fiber. See T-Mobile Mid-Band NOI Comments at 18.

³⁴ See, e.g., CTIA Comments at 12; Ericsson Comments at 16; see also T-Mobile Mid-Band NOI Comments at 19; Reply Comments of T-Mobile USA, Inc., GN Docket No. 17-183, at 20 (filed Nov. 15, 2017) ("T-Mobile Mid-Band NOI Reply Comments").

³⁵ See T-Mobile Mid-Band NOI Comments at 3; CTIA Comments at 2, 10-13; Ericsson Comments at 14-15.

³⁶ See CTIA Comments at 13; T-Mobile Mid-Band NOI Reply Comments at 19-20.

AWS-3 spectrum, such as the Department of Defense, have already determined that frequencies in the 7.125-8.4 GHz band provide comparable technical characteristics that allow them to operate their fixed point-to-point microwave links and provide essential military capabilities.³⁷ Further, because non-federal FS operations are highly coordinated and have similar technical and propagation characteristics as federal FS operations, commenting parties agree that future non-federal FS licensees could easily operate in the 7.125-8.4 GHz on a co-primary basis without disrupting federal operations.³⁸

Commenters agree with T-Mobile that the Commission could move quickly on the upper portion of the 6 GHz band without delaying action on the lower portion of the band,³⁹ all while protecting incumbents. Commenters also agree that the Commission could auction the spectrum and require auction winners to be responsible for relocating incumbent licensees to comparable facilities – whether in alternative frequencies or transmission media.⁴⁰ Thus, the time is ripe for the Commission to act on this spectrum and make it available for licensed services.

³⁷ See Letter from Chuck Hagel, Secretary of Defense *et al.*, U.S. Dep't of Defense, to the Honorable John McCain, Chairman, Committee on Armed Services, U.S. Senate, at 1-2 (dated Jan. 16, 2015); *see also* *Amendment of the Commission's Rules with Regard to Commercial Operations in the 1695-1710 MHz, 1755-1780 MHz, and 2155-2180 MHz Bands*, Report and Order, 29 FCC Rcd 4610, ¶¶ 34-39 (2014); T-Mobile Mid-Band NOI Reply Comments at 19-20.

³⁸ See, e.g., CTIA Comments at 13-14; Ericsson Comments at 15; *see also* T-Mobile Mid-Band NOI Comments at 21.

³⁹ See, e.g., CTIA Comments at 10.

⁴⁰ See, e.g., *id.*; Ericsson Comments at 14; *see also* T-Mobile Mid-Band NOI Comments at 18.

IV. CONCLUSIONS

T-Mobile supports the Commission's efforts to make additional unlicensed spectrum available in the 6 GHz band. However, to satisfy the growing need for mid-band spectrum and maintain the nation's leadership in the wireless industry, the Commission should also consider designating some of the 6 GHz band for licensed use. To do so, the Commission should evaluate use of the 7.125-8.4 GHz band for shared government/non-government operations and relocate microwave systems in the 6 GHz band to that spectrum.

Respectfully submitted,

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