
Before the
Federal Communications Commission
Washington, D.C. 20554

In the Matter of) GN Docket No. 14-177
) IB Docket No. 15-256
Use of Spectrum Bands Above 24 GHz for) RM-11664
Mobile Radio Services, *et al.*) WT Docket No. 10-112
) IB Docket No. 97-95

To: The Commission

REPLY COMMENTS OF ERICSSON

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EXECUTIVE SUMMARY

The initial comments in response to the Above 24 GHz Notice of Proposed Rulemaking establish a strong record for the Commission to move quickly to an order in this proceeding, enabling U.S. innovation and investment to flourish in the race for 5G. In response to the initial comments, Ericsson points out:

- The record supports creating a new Upper Microwave Flexible Use Service for the provision of mobile and fixed service in the 28 GHz, 39 GHz, and 37 GHz millimeter-wave bands. The UMFUS is in the best interests of the United States as the nations across the globe seek to lead on 5G.
- The record supports an exclusive-use licensing approach in these bands, which will promote innovation and investment. It would not be prudent to place the United States' 5G plans on an unproven, multi-tiered spectrum access construct grounded in the yet-to-be tested 3.5 GHz framework.
- The record supports using BTAs and EAs for licensing these bands, rather than counties as the *NPRM* suggests, or even smaller areas, which would undermine incentives to invest based on an overly narrow view of the potential use cases.
- The record calls for the Commission to refrain from adopting a hybrid licensing approach in the 37 GHz band, which would be burdensome to administer, provide inadequate certainty regarding interference, and depress investment.
- The record supports coexistence between terrestrial and satellite operations through market-based mechanisms, including reliance by satellite licensees on terrestrial licenses obtained at auction or in the secondary market, or privately negotiated agreements.
- The record supports establishing flexible, light-touch technical rules, limited to those needed to prevent interference. The comments also call for an increase in the base station EIRP limit and creation of an additional class of station between base and mobile stations.
- The Commission should adopt a balanced approach to the 64-71 GHz band, with room for both unlicensed and licensed use.
- There is extensive support for considering other bands to ensure U.S. leadership in 5G, including bands between 3 and 28 GHz.
- The record also confirms the need for a further notice of proposed rulemaking to examine other bands for 5G services, including bands at lower frequencies.
- The Commission should support voluntary and collaborative cyber risk management practices to address 5G security issues.

With these actions, the Commission can promptly adopt rules of the road that will unleash 5G innovation and investment in the United States and enable the nation to maintain leadership in mobile broadband and seize the mantle on 5G.

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REPLY COMMENTS OF ERICSSON

Ericsson hereby replies to the initial comments filed in response to the Commission’s *Notice of Proposed Rulemaking* concerning the Use of Spectrum Bands Above 24 GHz for Mobile Radio Services.¹

I. THE RECORD STRONGLY SUPPORTS ESTABLISHING THE UMFUS IN THE 28 GHz, 39 GHz, AND 37 GHz MILLIMETER WAVE BANDS

The record demonstrates extremely broad support for creating a new Upper Microwave Flexible Use Service (“UMFUS”) in the 28 GHz, 39 GHz, and 37 GHz bands as identified in the *NPRM*, providing the flexibility to offer terrestrial mobile and/or fixed services in these millimeter-wave (“mmW”) bands.² Establishing rules for the flexible use of the 28 GHz, 39

¹ *Use of Spectrum Bands Above 24 GHz for Mobile Radio Services*, GN Docket No. 14–177 *et al.*, *Notice of Proposed Rulemaking*, 30 FCC Rcd 11878 (2015) (*NPRM*).

² See Comments of 4G Americas at 3-4; Comments of Cisco at 4-5; Comments of Comsearch at 3; Comments of Consumer Technology Association (“CTA”) at 10; Comments of CTIA at 14; Comments of Facebook at 2-3; Comments of FiberTower at 3; Comments of Fixed Wireless Communications Coalition (“FWCC”) at 3-4; Comments of Information Industry Council (“ITI”) at 4; Comments of Intel at 3, 7-8, 13; Comments of Mobile Future at 10; Comments of Nokia at 4, 15-16; Comments of PCIA–The Wireless Infrastructure Association (“PCIA”) at 10; Comments of Qualcomm at 6-12; Comments of Samsung at 11; Comments of Skyriver at 3; Comments of Straight Path at 5; Comments of Telecommunications Industry Association (“TIA”) at 6-7; Comments of T-Mobile USA at 9; Comments of Verizon at 2, 5-6; Comments of XO at 8.

GHz, and 37 GHz bands will create a platform for innovation in 5G services that will permit the United States to move forward as a world leader in the next generation of mobile service. As 4G Americas—now known as 5G Americas—stated, “it would benefit marketplace developments if the FCC were to expeditiously make these proposed frequencies available for 5G Moving to a *Report and Order* in the near term will reduce investment risk and uncertainty in the U.S.”³

It is in the United States’ national interest for the FCC to move ahead with these bands, thereby creating opportunities for the U.S. to lead the world on 5G. As a general matter, Ericsson is a great supporter of globally harmonized spectrum, but harmonization should not be viewed as dogma to be pursued at all costs. With regard to the 28 GHz band in particular, regardless of the outcome of the 2015 World Radiocommunication Conference (“WRC–15”), spectrum from this general range very likely will be used for 5G around the world, as Japan and Korea appear to be pressing ahead to use frequencies in this range for their Olympic Game deployments.⁴ To the extent that different parts of the world use different band plans within this range, equipment manufacturers can develop radios covering frequencies in the vicinity, tunable to different sub-bands by region. Thus, it would be foolhardy for the United States to sit back and refrain from action at 28 GHz because it was not included in the WRC–15 list of bands to be studied for future 5G services.⁵ As Cisco noted, both Chairman Wheeler and Commissioner

³ Comments of 4G Americas at 3 (footnote omitted).

⁴ See Cheon Tai-Un, *5G Mobile to Be Commercialized for the World’s First Time by 2020*, Korea IT Times, July 15, 2014, <http://www.koreaitimes.com/story/38950/5g-mobile-be-commercialized-worlds-first-time-2020>; NTT Docomo Press Release, *DOCOMO Successfully Conducts 5G Trials in Actual-use Environments—Trials carried out with Nokia Networks, Samsung, Ericsson, Fujitsu and Huawei* (Nov. 26, 2015), https://www.nttdocomo.co.jp/english/info/media_center/pr/2015/1126_00.html.

⁵ See Comments of Boeing at 6-9; see also Comments of Avanti at 5 (arguing that proceeding with 28 GHz without broad international support will risk delaying the rollout of 5G in the United States).

Rosenworcel have maintained that “the United States should not be deterred in its efforts to promote the 28 GHz band for mobile use, as the rest of the world will likely see the benefits of the 28 GHz band once the United States moves forward.”⁶ Commissioner O’Rielly has likewise strongly supported proceeding apace with the 28 GHz allocation in the United States despite the WRC–15 failure to include study of the band.⁷ Similarly, the Commission should not delay from acting on the 39 GHz and 37 GHz bands because the ITU is considering these bands for new satellite services, as some have argued.⁸

Ericsson and the vast majority of commenters thus ask the Commission to act promptly to establish UMFUS in the mmW bands to ensure that the United States maintains its leadership role in 5G development and deployment.

II. THERE IS BROAD SUPPORT FOR AN EXCLUSIVE-USE LICENSING FRAMEWORK IN THE UMFUS BANDS

The record reflects widespread support for the Commission to adopt an exclusive-licensing approach in the 28 GHz, 39 GHz, and 37 GHz UMFUS bands.⁹ CTIA noted that “a flexible, exclusive-use licensing framework . . . will serve the public interest by promoting

⁶ Comments of Cisco at 4, *citing* Statement of Chairman Tom Wheeler, Presentation on the outcomes of WRC–15 (Dec. 17, 2015); Statement of Commissioner Jessica Rosenworcel, International Bureau Presentation on WRC–15 (Dec. 17, 2015).

⁷ See Blog Post by Commissioner O’Rielly, 2015 World Radiocommunication Conference: A Troubling Direction (Jan. 15, 2016), <https://www.fcc.gov/news-events/blog/2016/01/15/2015-world-radiocommunication-conference-troubling-direction>.

⁸ See Comments of Boeing at 6-9.

⁹ See Comments of 4G Americas at 3-4; Comments of Cisco at 5; Comments of CTA at 10; Comments of CTIA at 11; Comments of EchoStar Satellite, Hughes Network Systems, and Alta Wireless (“EchoStar”) at 14-15; Comments of PCIA at 10; Comments of Qualcomm at 6-7; Comments of Straight Path at 14, 16; Comments of TIA at 15; Comments of T-Mobile USA at 9; Comments of Verizon at 2, 5-6; Comments of XO at 18; *see also* Comments of Federated Wireless at 17 (supporting licensed wide-area use generally and hybrid approach at 37 GHz).

innovation and investment in millimeter wave technologies and services.”¹⁰ Moreover, as Qualcomm observed, “licensing these bands on an exclusive basis will allow licensees to provide a very high quality of service and outstanding user experience. . . . In sum, exclusive use licensing assigns rights in a way that maximizes the utility of the spectrum, minimizes the potential for interference among co- and adjacent-channel users, and allows flexibility for licensees to meet the needs of end users.”¹¹

A. The Commission Should Reject Calls for a Multi-Tiered Spectrum Access Regime in mmW Bands

The Commission should reject the suggestion made by a handful of commenters in favor of a multi-tiered spectrum access approach involving licensed operations and unlicensed use on an opportunistic basis, similar to the approach the Commission adopted for the 3.5 GHz band.¹² The 3.5 GHz framework is an innovative model that will need time to mature and the United States should be circumspect in instituting untested sharing requirements on a nascent 5G technology, especially in the mmW bands. Significant investments are going to be necessary to develop mobile technologies in the mmW bands, to deploy network facilities and mmW capabilities in end-user devices (smartphone and Internet of Things (“IoT”) equipment, for example), and to establish the services and applications that will deliver 5G-based offerings to American consumers and businesses. An untested regulatory regime to support the sharing of spectrum by a licensee on an opportunistic basis may result in uncertainty that discourages

¹⁰ Comments of CTIA at 12.

¹¹ Comments of Qualcomm at 9.

¹² See Comments of OTI/PK at 7-24; Comments of Google at 4. While OTI/PK describes its approach as three-tiered, it principally discusses only two tiers: Priority Access Licensees and General Authorized Access. The third tier apparently refers to “incumbent NASA and other Federal receiving earth stations, as well as military sites, and [possibly] . . . radio astronomy sites in the band just below 37 GHz.” Comments of OTI/PK at 20.

investment on the scale that will be necessary. The United States should not be staking its 5G future on a still-theoretical construct.

B. Larger License Areas Are Necessary to Offer the Flexibility Needed for Varying 5G Use Cases

The record shows extensive support for using larger, rather than smaller, licensed area sizes, and in particular for use of the BTAs and EAs that are currently used for the 28 GHz and 39 GHz bands.¹³ This will promote consistency with the incumbent terrestrial use of these bands and provide licensees with a service area roughly commensurate with a metropolitan market, while adoption of disaggregation and partitioning policies will facilitate service in smaller areas and allow for additional opportunities for others to access spectrum. The Commission’s proposal to use counties for licensing, on the other hand, drew virtually no support, and was widely criticized. For example, AT&T pointed out that 5G applications such as “[s]mart grids, telemedicine, smart cities, connected cars, and the IoT [Internet of Things] will not be confined by small and arbitrary county boundaries,” but instead “will permeate large geographic areas and consumers will expect a seamless and reliable user experience.”¹⁴ Many commenters pointed out the difficulty of interference coordination based on county lines, the administrative burdens associated with verifying buildout across more than 3,000 counties, and the inconsistent size and use of counties from state to state.¹⁵

¹³ See Comments of 4G Americas at 5-9; Comments of AT&T at 4, 17-19; Comments of Cisco at 11; Comments of CTA at 11; Comments of FWCC at 4-5; Comments of ITI at 4; Comments of Intel at 4, 8-9; Comments of Mobile Future at 13; Comments of Nokia at 4, 18-19; Comments of Qualcomm at 7; Comments of Skyriver at 7; Comments of Straight Path at 18; Comments of TIA at 22-23; Comments of Verizon at 3, 10-13; Comments of XO at 20.

¹⁴ Comments of AT&T at 18.

¹⁵ See, e.g., Comments of AT&T at 18-19; Comments of Interisle Consulting Group at 2-3; Comments of Mobile Future at 13.

The suggestion by a handful of commenters to license via census tracts or census block groups would undermine incentives to invest in licensed spectrum and, in any event, rests on an overly narrow view of 5G use cases.¹⁶ The Commission should not limit the potential of 5G to a single use case based on small cells in densely populated areas. 5G will likely be widely used in many other deployment scenarios in addition to urban microcells, potentially including somewhat larger areas where more favorable path loss permits such applications. Licensees should have the flexibility to take advantage of 5G in mmW spectrum to address a variety of use cases in all areas, and a census tract or block approach—again, modeled after the 3.5 GHz band—will unduly restrict the flexibility of the spectrum.

C. The Commission Should Not Adopt the Proposed Hybrid Licensing Scheme in the 37 GHz Band

Finally, the comments reflect widespread opposition to the Commission’s proposal for “hybrid” licensing in the 37 GHz band. As commenters noted, this approach would be burdensome to administer, would provide inadequate certainty regarding interference, and thus would depress investment in the band and interfere with 5G deployment.¹⁷ Although there was some expression of support for licensed-by-rule local-area spectrum access,¹⁸ no commenter offered evidence to substantiate demand for premises-based access. Further, those few

¹⁶ Comments of OTI/PK at 21-23, 26-27.

¹⁷ See Comments of 4G Americas at 14; Comments of AT&T at 16; Comments of CTA at 10-11; Comments of CTIA at 11, 15-17; Comments of EchoStar at 31-32; Comments of High Tech Spectrum Coalition (“HTSC”) at 5; Comments of ITI at 5; Comments of Intel at 13-14. Comments of Mobile Future at 11; Comments of National Cable and Telecommunications Association (“NCTA”) at 14-17; Comments of Nokia at 4, 16-17; Comments of PCIA at 10-11; Comments of Qualcomm at 9; Comments of Samsung at 13; Comments of TIA at 18; T-Mobile USA at 12; Comments of Verizon at 6-9, 13.

¹⁸ See Comments of Facebook at 3; Comments of Federated Wireless at 17; Comments of Huawei at 17-19; Comments of Cisco at 7-8; *see also* Comments of Rockwell Automation at 2.

commenters that supported the licensed-by-rule approach for use both indoors and in outdoor areas adjacent to buildings acknowledged that interference protection questions and ambiguity would exist.¹⁹ Finally, the licensed-by-rule proposal would prevent the benefits of aggregating the 37 GHz and 39 GHz bands into a single contiguous 3 GHz band.²⁰ The 37 GHz band, especially in combination with the 39 GHz band, offers too much potential to risk undermining its attractiveness by imposing a vague, untested model.

III. THE FCC SHOULD PURSUE A MARKET-BASED SOLUTION TO SATELLITE SHARING

There is broad support for allowing Fixed Satellite Service (“FSS”) licensees, through market mechanisms, to obtain co-primary status for their gateway earth stations, including the acquisition of UMFUS licenses either at auction or on the secondary market, or by obtaining protected spectrum use rights through leases or protection rights through privately negotiated agreements with terrestrial primary licensees.²¹

The record suggests that such market-based solutions are reasonably achievable for the existing set of gateway earth stations, given that there are a limited number of such stations in an even more limited number of locations. According to EchoStar:

Across the entire United States, FSS operators have only deployed 43 gateway earth stations in [the 28 GHz] band and sought authority for only one more. In all, these facilities are located in only 36 of the nation’s 3,143 counties. About half of those earth

¹⁹ See Comments of Huawei at 17-19; Comments of Rockwell Automation at 2.

²⁰ Comments of Nokia at 4, 16-17.

²¹ See Comments of Cisco at 5-6; Comments of CTA at 16-17; Comments of CTIA at 14, 31-32; Comments of FiberTower at 6-7; Comments of ITI at 6; Comments of Mobile Future at 14; Comments of Nokia at 5, 24-25; Comments of Samsung at 22; Comments of Straight Path at 38; Comments of XO at 34; *see also* Comments of Intel at 6.

stations (or proposed earth stations) are located within the service area of an active LMDS licensee.²²

EchoStar adds that these gateways “tend to be located in less densely populated rural and suburban areas, not in the urban areas where UMFU mobile operations are contemplated.”²³

Moreover, according to EchoStar, the potential for harmful interference from gateways to 5G base stations is limited, because gateway transmissions are directed toward satellites, and thus “these gateways are likely to affect 5G systems only within a radius of from 60 to 170 meters.”²⁴

ViaSat similarly claims that coordination would involve a radius of about only 160 meters around a gateway earth station.²⁵ And EchoStar further notes that in the 39 GHz band, where the FSS allocation is only for space-to-earth transmissions and the earth stations therefore are (and will remain) receive-only, there is “no concern that FSS operations in the band will cause harmful interference to fixed or mobile terrestrial systems.”²⁶

In short, if the representations described above are accurate (*i.e.*, the potential for harmful interference to 5G systems is limited to small areas, 5G coexistence with existing gateway earth stations should be capable of resolution through private agreements or other market-based solutions. It is imperative, however, that such determinations—including determining the size of the area that must be considered in any assessment of the risk of interference to 5G operations—be made in the private negotiation context, which can take into account the UMFUS licensee’s current and future plans for a variety of use cases, potentially including wide area mobile service, and provide appropriate protection levels while maintaining flexibility. As 5G operations are

²² Comments of EchoStar at 19-20.

²³ *Id.* at 20.

²⁴ *Id.*

²⁵ Comments of ViaSat at 16.

²⁶ Comments of EchoStar at 28.

developing, any satellite provider assessment at this point is premature and unnecessary, and the Commission should leave the parties to reach private agreements.

Commission policy can create further incentives for agreement. In particular, the Commission should allow an UMFUS licensee that grants spectrum or protection rights to an FSS earth station, either through leasing or private agreement, to count that FSS operation as part of its showing under any performance requirements. This would contribute to a win-win solution: FSS operators could gain co-primary status rights, particularly if they seek to locate in more rural areas; and UMFUS licensees could use a gateway earth station lease or protection agreement to help meet any performance requirement.

Finally, like others, Ericsson remains opposed to the introduction of FSS fixed user equipment in the UMFUS bands. Allowing such deployment would subject terrestrial primary services to greater complexity due to the need for a Spectrum Access System (“SAS”) or other similar mechanism to achieve co-existence, and would reduce spectrum availability and reliability for UMFUS. As Cisco and other opponents note, an SAS for managing such operations has yet to be assessed in operations in the 3.5 GHz band, counseling against reliance on such an approach at this time.²⁷

IV. COMMENTERS CALL FOR FLEXIBLE, LIMITED TECHNICAL RULES THAT FIT THE UMFUS BANDS

For technical rules, the Commission should adopt the lightest-touch rules that are consistent with the prevention of harmful interference. Minimal technical rules, including those related to power levels and out-of-band emissions (“OOBE”) limits, will help establish a platform for innovation in the mmW bands. There is much that is unknown, and much to learn,

²⁷ Comments of Cisco at 9; Comments of CTIA at 33; Comments of Samsung at 22; Comments of Verizon at 4-5, 22-26.

but the United States must seize the opportunity to lead the world and allow industry to resolve any remaining technical uncertainties pertaining to system design for 5G through innovation and entrepreneurship. Primarily, power levels and OOB limits are sufficient to enable the Commission to move forward and foster innovation. To the extent necessary, the rules can be revised over time in light of experience, instead of attempting to address all potential issues at the start. At this point, limits on radiated power and OOB will provide sufficient certainty for innovation to flourish without regulatory musings getting in the way.

In this connection, Ericsson's initial comments detailed why the base station EIRP limit should be raised from 62 dBm to 82 dBm over a 100 MHz measurement range—namely that the required use of a 100 MHz measurement window reduces the total EIRP by 20 dB compared to other mobile bands using a 1 MHz range.²⁸ Many other commenters came to a similar conclusion—that the Commission's proposed radiated power limit was way too low.²⁹ The Commission should take the opportunity to revisit its EIRP limits for the 28 GHz, 39 GHz, and 37 GHz bands based on these expert technical inputs. Ericsson and others also urged the Commission to create an intermediate category of station, with an EIRP limit greater than a mobile but lower than a base station, which could function as a hub or other intermediate device.³⁰

²⁸ Comments of Ericsson at 12-13.

²⁹ See Comments of CTA at 16; Comments of CTIA at 28-30; Comments of Nokia at 26-27; Comments of Samsung at 18; Comments of TIA at 32; Comments of Verizon at 16-17; Comments of XO at 26.

³⁰ See Comments of Ericsson at 13; Comments of Nokia at 26-27; Comments of Qualcomm at 16; Comments of Samsung at 19; Comments of Verizon at 16-17.

V. THE FCC SHOULD TAKE A BALANCED APPROACH TO 64-71 GHZ

Like Ericsson, many commenters proposed that the Commission take a balanced approach to the 64-71 GHz band, allowing the lower portion to be joined with the existing 57-64 GHz band for unlicensed use, and designating the upper portion for exclusively licensed use.³¹ This is a band that contains a very large amount of spectrum that could foster a broad array of innovation. There are many unknowns about the best or most likely uses of this band, and the best course of action is to let many different flowers bloom—allow the development and deployment of both licensed and unlicensed models. The *NPRM* proposed vastly more mmW spectrum for unlicensed than for licensed use (14 GHz vs. 3.85 GHz), but Ericsson concurs with other commenters that the amounts “should be more balanced.”³² T-Mobile, for example, asserted the need for a more balanced approach between unlicensed and licensed, and also cited the fact that a licensed allocation here would “assist the development of the unlicensed portion of the band by promoting a common equipment ecosystem across the entire band.”³³

In this respect, Ericsson’s advice to the Commission must be reiterated. Adding 2 GHz of unlicensed allocation to the existing ISM band 57-64 GHz, will increase the total amount of spectrum for unlicensed users to 9 GHz. Including 66-71 GHz, the licensed offering will then be 8.85 GHz of spectrum, and on par with the unlicensed allocation. Indeed, all vendors are free to employ both licensed and unlicensed spectrum in their products; subsequently, so are operators

³¹ Comments of Ericsson at 19-20 (64-66 GHz for unlicensed, 66-71 GHz for licensed); *see also* Comments of AT&T at 17 (grant exclusive use licenses in at least a portion of the band); Comments of CTIA at 17 (64-66 GHz for unlicensed, 66-71 GHz for licensed); Comments of Mobile Future at 17 (64-66 GHz for unlicensed, 66-71 GHz for licensed); Comments of Nokia at 17-18 (64-66 GHz for unlicensed, 66-71 GHz for licensed); Comments of T-Mobile USA at 14-15 (64-66 GHz for unlicensed, 66-71 GHz for licensed); Comments of Verizon at 13 (a substantial portion for unlicensed, but remainder for licensed).

³² Comments of Nokia at 17.

³³ Comments of T-Mobile USA at 14-15.

in their service offerings. This will offer spectrum under different access models that can be used as a means to offer various levels of quality of service and accessibility, and thus improve the user experience of a broadband service offering. The innovation carried out by the mobile industry in expansion to the 5 GHz band is a glimpse of the impact licensed and unlicensed spectrum can have on expansion of capacity. The Commission's adherence to technology neutrality and its foresight in encouraging innovation makes all technologies more capable in the long run. The proximity of such a large licensed band to the proposed unlicensed band makes the arrangement all the more powerful.

VI. THE FCC MUST LOOK BEYOND THE BANDS IDENTIFIED HERE TO ENSURE THE U.S. CAN SUCCEED AT 5G

There is considerable support in the record for considering bands from 3-30 GHz as well as higher bands. For example, the High Tech Spectrum Coalition has asked the Commission to examine bands below 6 GHz.³⁴ T-Mobile advocates consideration of the bands designated by CITEL for consideration at WRC-15, including those in the 23-27 MHz region.³⁵ The Global VSAT Forum, Mobile Future, and Samsung have recommended consideration of spectrum from the 24-27 GHz region.³⁶ Ericsson urges the Commission to consider these proposals.

At the same time, we note that a number of commenters have made specific proposals for the E-Band at 71-76 GHz and 81-86 GHz.³⁷ While the Commission should, of course, consider all bands, in the *NPRM* the Commission already declined to include these bands because of the difficulty of coordinating mobile and fixed usage and the need to protect federal earth stations

³⁴ Comments of HTSC at 4.

³⁵ Comments of T-Mobile USA at 6.

³⁶ Comments of Global VSAT Forum ("GVF") at 4; Comments of Mobile Future at 9.

³⁷ See, e.g., Comments of GigaNets at 2; Comments of Huawei at 4, 7-8, 19-22; Comments of Nokia at 3-4, 12-13.

and radio astronomy locations.³⁸ However, it would be appropriate to study potential flexible use of this band in the future, but this should not prevent the Commission from continuing its efforts concerning use of the E Band for backhaul.

VII. 5G SECURITY CAN BE BEST ADDRESSED BY STANDARDIZATION BODIES AND THROUGH VOLUNTARY, COLLABORATIVE INDUSTRY EFFORTS

The NPRM sought comment “to better understand the security of future mmW band networks” because of the security aspect of services that will be using these bands.³⁹ Ericsson encourages the Commission to continue to support voluntary and collaborative cyber risk management practices.⁴⁰ The following information is provided to add to the Commission’s holistic understanding of 5G in the mmW bands, but Ericsson shares CTIA’s view that that the Commission should defer addressing issues of security or equipment design in this proceeding.⁴¹

The *NPRM* sought comment on confidentiality and integrity for mmW networks.⁴² To safeguard *confidentiality*, Ericsson strongly supports the use of standardized, publicly evaluated cryptographic data protection algorithms, wherever in the network encryption is employed. Because we are seeing an increasing use of transport layer security, such as over Hypertext Transfer Protocol (“HTTP”) within a connection encrypted by Transport Layer Security (“TLS”) for Internet data traffic, some question if there needs to be any encryption of the data plane for

³⁸ *NPRM*, 30 FCC Rcd at 11906 ¶ 87.

³⁹ *NPRM*, 30 FCC Rcd at 11952 ¶ 260.

⁴⁰ *See, e.g.*, Remarks of Admiral Simpson at the WTA – Advocates for Rural Broadband Spring Meeting Cybersecurity Panel (May 5, 2015), http://transition.fcc.gov/pshs/docs/speeches/DGS_WTA_051515.pdf (FCC has taken a “collaborative approach to cybersecurity, working in partnership with private-sector stakeholders” and the Commission is “using voluntary mechanisms to implement cyber risk management practices based on the 2014 NIST Cybersecurity Framework[.]”).

⁴¹ *See* CTIA comments at 34.

⁴² *NPRM*, 30 FCC Rcd at 11953 ¶¶ 262-63.

5G radio access. Ericsson believes that 5G standardization can provide a generic baseline of data protection (encryption and integrity) for the data plane, thereby adding security for mmW networks by not relying solely on the potential use of higher layer protection. This is already being considered in IoT enhancements for 2.5G standards. Standardization can also provide for encryption of the signaling plane, which carries sensitive data such as user identifiers.

Finally, 5G standards will continue to incorporate *integrity* protection of the signaling control plane, which is already provided for in 3G and 4G standards. Without integrity protection, denial-of-service and downgrade attacks would be relatively simple.

The *NPRM* additionally sought comment about what should be considered to ensure the *availability* of networks using the mmW bands.⁴³ Availability is one of the most important aspects for using 5G as critical infrastructure and companies will need the flexibility to address this in as many ways as possible.

The main challenge is that networks can no longer assume all end-user devices are trustworthy, and therefore changes in the radio protocol design will be considered to address this. Companies may provide 5G radio access using a device gateway architecture, in which connections of many devices would be aggregated at a gateway device. We anticipate this will be a common choice because very low cost devices will probably support other radio technologies, such as Bluetooth or ZigBee. In such cases, security functionality may be proxied by the gateway. Companies could also utilize network slicing to confine attacks to limited portions of the network.

⁴³ *Id.* at 11953 ¶ 264.

Finally, the *NPRM* seeks comment about the extent to which existing and previous wireless protocols would be similar to or differ from what is needed for the mmW bands.⁴⁴ Ericsson believes that the security design principles of previous cellular standards, such as the ability to provide an encrypted connectivity service, still apply. The migration from 3G to 4G and the concomitant placing of more data plane functionality at the network edge has also led to valuable insights that can be reused in 5G standards, such as requirements on secure environments in access points and backhaul security. Similarly, the wealth of experience protecting IP-based networks against attacks will likely be reused as design principles for 5G.

A new aspect of the 5G security design will be the need to take into account possible security requirements coming from non-telecom usage of the 5G networks. It is important that different sectors, as well as academia, cooperate in research and standardization to address the broad new uses of 5G networks.

Security issues are an important matter, and the Commission should support the voluntary and collaborative engagement that is already occurring.

⁴⁴ *Id.* at 11953 ¶ 265.

VIII. CONCLUSION

Accordingly, the Commission should act promptly in this proceeding.

Respectfully submitted,

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