Before the
FEDERAL COMMUNICATIONS COMMISSION
Washington, DC 20554

In the Matter of	)	
	)	
Use of Spectrum Above 24 GHz for Mobile Radio Services	)	GN Docket No. 14-177
	)	
Amendment of Parts 1, 22, 24, 27, 74, 80, 90, 95, and 101 to Establish Uniform License Renewal, Discontinuance of Operation, and Geographic Partitioning and Spectrum Disaggregation Rules And Policies for Certain Wireless Radio Services	)	WT Docket No. 10-112

COMMENTS OF UNITED STATES CELLULAR CORPORATION

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TABLE OF CONTENTS

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United States Cellular Corporation ("USCC") submits these comments in response to the Third Further Notice of Proposed Rulemaking released June 8, 2018 in the above-captioned proceedings.[1] USCC commends the Commission for its continued work to make millimeter wave ("mmW") spectrum available for future Upper Microwave Flexible Use Service ("UMFUS") operations, including next-generation 5G services. As discussed herein, USCC believes that the next important step in this process is for the Commission to authorize terrestrial fixed and mobile services in both the 25.25-27.5 GHz ("26 GHz") and 42-42.5 GHz ("42 GHz") bands on an exclusive-use, geographic area basis. Further, USCC urges the Commission to take several actions to ensure that carriers of all sizes have an opportunity to use this spectrum to deploy 5G mobile broadband networks, including in rural and other underserved areas.

[1] *See Use of Spectrum Bands Above 24 GHz for Mobile Radio Services*, Third Report and Order, Memorandum Opinion and Order, and Third Further Notice of Proposed Rulemaking, GN Docket No. 14-177, FCC 18-73 (rel. June 8, 2018) ("*Notice*"). All comments and reply comments cited herein were filed in the above-referenced dockets.

I. INTRODUCTION & SUMMARY

As Chairman Pai notes, "[i]n order to bring 5G, the next generation of wireless connectivity, to American consumers," the Commission has "to make available the spectrum necessary for new services to flourish."[2] Fortunately, the 26 GHz and 42 GHz bands provide an opportunity to make available another 2.75 gigahertz of mmW spectrum to help meet the nation's current spectrum crunch and facilitate the future deployment of 5G networks to all Americans. As detailed below, several attributes of the 26 GHz and 42 GHz bands make this spectrum particularly well-suited to facilitating the deployment of next-generation 5G services. For instance, authorizing flexible use terrestrial operations in these bands would harmonize the allocations for this spectrum with the broad international efforts that already are underway, which will lead to lower equipment costs as a result of greater economies of scale and permit more timely network deployments. In addition, because both bands are within a "tuning range" that also includes existing UMFUS bands, equipment already under development for those existing bands can be utilized in the 26 GHz and 42 GHz bands, which will lead to faster device availability and even greater economies of scale.

Given these beneficial attributes of the 26 GHz and 42 GHz bands, USCC urges the Commission to maximize the potential of this spectrum by authorizing terrestrial fixed and mobile services in both bands on an exclusive-use, geographic area basis under the UMFUS rules. Among other reasons, service providers cannot confidently invest in developing innovative new technologies and building out extensive networks without the stability and predictability that arises only from exclusive-use, geographic area licensing. USCC also urges the Commission to take several actions with respect to these bands that will both ensure the

[2] *Id.* (Statement of Chairman Ajit Pai).

efficient use of this spectrum and provide bidders of all sizes with a reasonable opportunity to deploy 5G networks in these bands. Such actions include band plans consisting of unpaired 100 megahertz blocks, license areas based on Partial Economic Areas ("PEAs"), requirements that mobile and transportable devices be operable across each "tuning range" that encompasses the 26 GHz or 42 GHz band to the extent that UMFUS bands fall within each such tuning range, and an *ex ante* spectrum aggregation limit prohibiting a single entity from acquiring through auction more than one-half of the spectrum in either of these bands.

II. THE COMMISSION SHOULD LICENSE THE 26 GHz AND 42 GHz BANDS ON AN EXCLUSIVE-USE BASIS UNDER THE UMFUS RULES

USCC joins a large number of previous commenters in this proceeding in urging the Commission to authorize terrestrial fixed and mobile services in both the 26 GHz band[3] and the 42 GHz band[4] on an exclusive-use, geographic area basis under the UMFUS rules. As the Commission recognizes in the Notice, and as the Commission previously found when it authorized UMFUS operations in other mmW bands, geographic area licensing "will foster innovation and investment and thereby spur deployment."[5] Particularly with respect to the mmW bands, where significant research and development has taken place and still must take

[3] *See, e.g.*, Comments of CTIA, p. 9 (Jan. 23, 2018) ("CTIA Second FNPRM Comments"); Comments of Ericsson, p. 10 (Sept. 30, 2016) ("Ericsson FNPRM Comments"); Comments of Nokia, p. 6 (Jan. 23, 2018).

[4] *See, e.g.*, CTIA Second FNPRM Comments at 6; Comments of T-Mobile USA, Inc., p. 15 (Sept. 30, 2016) ("T-Mobile FNPRM Comments"); Ericsson FNPRM Comments at 12; Comments of AT&T Services, Inc., pp. 4-5 (Jan. 23, 2018); Comments of Qualcomm Incorporated, p. 9 (Sept. 30, 2016); Reply Comment of Intel Corporation, p. 6 (Oct. 31, 2016) ("Intel FNPRM Reply Comments"); Comments of the Telecommunications Industry Association, p. 11 (Sept. 30, 2016); Comments of the Consumer Technology Association f/k/a/ The Consumer Electronics Association, p. 3 (Sept. 20, 2016); Comments of Samsung Electronics America, Inc. and Samsung Research America, p. 3 (Sept. 30, 2016) ("Samsung FNPRM Comments").

[5] *Notice* at ¶ 89; *see also Use of Spectrum Bands Above 24 GHz for Mobile Radio Services*, Report and Order and Further Notice of Proposed Rulemaking, 31 FCC Rcd 8014, 8028, 8046 (2016) ("*mmW Order & FNPRM*"); *Use of Spectrum Bands Above 24 GHz For Mobile Radio Services*, Second Report and Order, Second Further Notice of Proposed Rulemaking, Order on Reconsideration, and Memorandum Opinion and Order, 32 FCC Rcd 10988, 11004 (2017) ("*mmW Second Order & Second FNPRM*")

place prior to the deployment of 5G services in all the bands, it is crucial to provide the stability and predictability that arises only from exclusive-use, geographic area licensing. As CTIA has explained, prospective service providers require this level of certainty "to confidently invest in developing novel network infrastructure, end-user devices, and other millimeter wave technologies."[6] In addition, because geographic area licensing "provide[s] licensees with the flexibility to provide a variety of services,"[7] it clearly is the best approach here given the potential for these bands to eventually support a wide variety of innovative new services.

Certain characteristics of both of these bands make them particularly well-suited to facilitating the deployment of next-generation 5G services, and thus, make these bands critical additions to the pool of existing UMFUS bands. For instance, the 26 GHz band, when combined with the adjacent 24 GHz and 28 GHz bands, would create almost four gigahertz of nearly-contiguous spectrum. This is particularly significant given that all three of these bands fall within the same 24.25-29.5 GHz "tuning range" (*i.e.*, the "range of frequencies over which radio equipment was envisaged to be capable of operating").[8] As Intel has explained, this means that equipment under development for any one of these bands can also be utilized in the other bands "without requiring entirely new development efforts."[9] Thus, because the 24 GHz and 28 GHz bands will be fully licensed in the near future, "there is likely to be early availability of a 5G

[6] Comments of CTIA, p. 9 (Sept. 30, 2016); *see* T-Mobile FNPRM Comments at 20 ("[E]xclusive licensing encourages greater investment and innovation by providing carriers with much needed certainty."); Comments of AT&T, p. 11 (Sept. 30, 2016) ("Exclusive use licensing is a key way to give investors the confidence to proceed with investing in deployment of 5G networks.").

[7] *mmW Order & FNPRM*, 31 FCC Rcd at 8028.

[8] Ericsson FNPRM Comments at 10, 4.

[9] Intel FNPRM Reply Comments at 3.

ecosystem for [the 26 GHz] band with good economy of scale, lowering the cost of deployment and speeding initiation of service."[10]

In addition, because the 26 GHz band has few existing encumbrances, it largely is available for new UMFUS operations. Specifically, because Federal use of the 26 GHz band is limited, the protection zones around incumbent Federal operations "would affect only small percentages of the overall U.S. population."[11] Given the current availability of this band, USCC agrees with T-Mobile that the Commission should not add Federal fixed and mobile allocations to this band as this "would unnecessarily limit necessary commercial access to this band," as well as be "contrary to the stated goals of Congress, which has taken action to encourage federal users to vacate spectrum in order to make more spectrum available for commercial use."[12]

Ensuring the 26 GHz band remains largely available for commercial use is particularly important because the superior propagation characteristics of spectrum bands below 30 GHz make serving less densely populated areas more economical, which is especially important for service providers, like USCC, that focus their deployment efforts outside of major metropolitan areas. In this respect, USCC notes that, if the Commission declines to license the 26 GHz band on a geographic area basis and work to keep this spectrum largely free of encumbrances, many small and rural service providers may be unable to acquire the below-30 GHz spectrum they will need to provide 5G service to their rural customers. Currently, a total of only 1.55 gigahertz of spectrum below 30 GHz has been designated for UMFUS operations, and 850 megahertz of this spectrum – the 28 GHz band (27.5-28.35 GHz) –will be difficult for small and regional carriers to acquire given the significant number of incumbent Local Multipoint Distribution Service

[10] Ericsson FNPRM Comments at 10.

[11] *Notice* at ¶¶ 83-84.

[12] T-Mobile FNPRM Comments at 15.

licenses in the 28 GHz that were automatically converted to UMFUS licenses, as well as the fact that this band consists of only two large blocks of 425 megahertz each that may be prohibitively expensive for smaller bidders.

The 42 GHz band provides an opportunity to make an additional 500 megahertz of largely unencumbered spectrum available for licensed UMFUS operations. Significantly, the 42 GHz band falls within the same tuning range as the 37 GHz and 39 GHz bands, which Intel has explained "would likely allow expeditious product support and economies of scale for the 42 GHz band."[13] Moreover, although some have expressed concern regarding possible interference to Radio Astronomy Service operations in the adjacent 42.5-43.5 GHz band, as the Commission notes, commenters "generally agree that there are various effective means to protect RAS, including use of exclusion zones, coordination zones, and aggregate emissions limits – particularly since RAS sites are generally in remote locations."[14]

Given the benefits and feasibility of UMFUS operations in the 42 GHz band on an exclusive-use basis, USCC urges the Commission not to permit unlicensed or other operations to share this band. As the Commission noted in declining to authorize unlicensed use in the 24 GHz band, there is "a benefit to harmonizing the regulatory environment of nearby bands as much as possible."[15] More specifically, the Commission explained how adopting the same licensing scheme for the 24 GHz band that it did for the 28 GHz band "would facilitate deployment by making it easier to incorporate spectrum from both bands into the same network," while "[c]hanging to unlicensed use could delay development and deployment significantly."[16]

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[13] Intel FNPRM Reply Comments at 6; *see* Samsung FNPRM Comments at 5.

[14] *Notice* at ¶ 56.

[15] *mmW Second Order & Second FNPRM*, 32 FCC Rcd at 10998.

[16] *Id.* at 10998-99.

The same reasoning applies to the 42 GHz band given that, like the 24 GHz and 28 GHz bands, the 42 GHz band falls within the same tuning range as existing UMFUS bands.

Licensing the 26 GHz and 42 GHz bands under the UMFUS rules also would advance the public interest because these actions would harmonize the allocations for these bands with the broad international efforts that already are underway. Specifically, the European Conference of Postal and Telecommunications Administrations (CEPT) has prioritized making the 24.25-27.5 GHz band available for 5G services throughout Europe, at least eight non-European nations are preparing to authorize terrestrial mobile services in this band, and the band has become a leading candidate for 5G services leading up to the World Radiocommunication Conference 2019 (WRC-19).[17] Likewise, the International Telecommunication Union has identified the entire 37-42.5 GHz band as a candidate to study for mobile services.[18] The Commission should not allow the U.S. to be left out of these efforts and the significant benefits attendant to these efforts. As the Commission has found with respect to other spectrum bands, international harmonization of the 26 GHz and 42 GHz bands "will enhance international roaming, create economies of scale that lowers device costs, speed deployment, and reduce interference potential near international borders."[19]

USCC further urges the Commission to license both the 26 GHz band and the 42 GHz band using 100 megahertz blocks. As the Commission notes, "most millimeter-wave mobile design work is being built around 100-megahertz building blocks,"[20] and block sizes no larger than 100 megahertz are needed to "allow for a sufficient acquisition of spectrum by smaller

[17] *See Notice* at ¶¶ 75-76.

[18] *See id.* at ¶ 49.

[19] *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, 4630-31 (2014).

[20] *Notice* at ¶ 90.

users…"[21] Moreover, while a 100 megahertz channel "will be sufficient for a licensee to provide the type of high rate data services, and other innovative uses and applications, contemplated for this spectrum," the UMFUS rules will permit larger entities desiring additional bandwidth to aggregate multiple blocks to create wider channels.[22] Licensing these bands on the basis of 100 megahertz blocks also would be consistent with the Commission's approach to other mmW bands. Specifically, the Commission already has decided to license the 24 GHz and Lower 37 GHz bands using 100 megahertz blocks, and it recently proposed to also license the Upper 37 GHz, 39 GHz, and 47 GHz bands using 100 megahertz blocks.[23] As the Commission recently explained, having bands in the same service with different block sizes can "create strategic challenges and impede bidding flexibility should the Commission auction the [ ] bands together."[24] That reasoning applies equally to the 26 GHz and 42 GHz bands.

USCC also urges the Commission to license both the 26 GHz band and the 42 GHz band on the basis of PEAs, as this would "strike[] an appropriate balance between facilitating access to spectrum by both large and small providers and simplifying frequency coordination, while incentivizing investment in, and rapid deployment of, new technologies."[25] Larger license areas effectively would preclude most small and regional carriers from acquiring licenses for these bands because larger license areas encompass far more geography than the areas served by these carriers, forcing them to acquire spectrum rights for unwanted areas – often, high-priced urban areas – in order to obtain rights for their existing, often rural-focused service areas. Large

[21] *Id.* at ¶ 28.

[22] *Id.*

[23] *See Use of Spectrum Bands Above 24 GHz For Mobile Radio Services*, Fourth Further Notice of Proposed Rulemaking, GN Docket No. 14-177, FCC 18-110, ¶ 2 (rel. Aug. 3, 2018).

[24] *Id.* at ¶ 11.

[25] *mmW Second Order & Second FNPRM*, 32 FCC Rcd at 11004.

carriers of course also would benefit from being able to better target their spectrum acquisitions, and those seeking expansive footprints in these bands could aggregate PEAs into larger license areas. Another benefit of licensing the 26 GHz and 42 GHz bands on the basis of PEAs is the consistency this would create with the 24 GHz, Upper 37 GHz, 39 GHz, and 47 GHz bands.[26] PEA-based licensing, therefore, would advance the Commission's goal "to harmonize the regulatory environment of the various mmW bands as much as possible, in order to encourage and streamline development of equipment and deployment of services in these bands."[27]

III. THE COMMISSION SHOULD REQUIRE DEVICE OPERABILITY ACROSS EACH "TUNING RANGE" THAT ENCOMPASSES THE 26 GHz BAND OR THE 42 GHz BAND

In order to maximize the potential of the 26 GHz and 42 GHz bands to promote competition and the deployment of 5G networks in rural and other underserved areas, USCC strongly urges the Commission to require that mobile and transportable devices be operable across each "tuning range" that encompasses the 26 GHz or 42 GHz band to the extent that UMFUS bands fall within each such tuning range. The relevant tuning ranges are 24.25-29.5 GHz and 37-43.5 GHz.[28] Thus, USCC specifically proposes the following requirements:

> Mobile and transportable stations that operate on any portion of either the 24.25-24.45 GHz band or the 24.75-28.35 GHz band must be capable of operating on all frequencies within both of those bands.
>
> Mobile and transportable stations that operate on any portion of either the 37-40 GHz band or the 42-42.5 GHz band must be capable of operating on all frequencies within both of those bands.

[26] Of the five UMFUS bands that the Commission already has decided to license on an exclusive-use, geographic area basis, only the 28 GHz band will not be licensed on the basis of PEAs, and the Commission's decision to adopt a different license area size for the 28 GHz band was due to factors unrelated to the 26 GHz and 42 GHz bands. Specifically, as the Commission notes, it "decided to license the 28 GHz band by counties, primarily because the band was already licensed by Basic Trading Areas (BTAs), which could not readily be reformed into either EAs or PEAs." *Notice* at ¶ 88.

[27] *mmW Second Order & Second FNPRM*, 32 FCC Rcd at 10998.

[28] *See* Ericsson FNPRM Comments at 10, 12.

As the Commission notes, equipment manufacturers previously discussed the feasibility of both of these proposals, explaining that they "can readily integrate" the 26 GHz into a tuning range that includes both the 24 GHz and 28 GHz bands.[29] Likewise, the Commission notes how manufacturers explained "that authorizing UMFUS expansion in the 42 GHz band would place it within the 'tuning range' of radio equipment designed for the 37-40 GHz bands…"[30] Like the UMFUS operability requirements previously adopted by the Commission, USCC's proposed requirements would *not* require that every device be compatible with all possible air interfaces that may be used in these frequency ranges. Rather, the rule would simply require that, with each air interface used by a given device to operate in one of these frequency ranges, the device must be capable of operating across the entire frequency range.

The reasons why the Commission "historically has sought to promote greater operability of equipment"[31] are manifold. For instance, the Commission has explained how operability requirements "support competition by ensuring a robust device ecosystem throughout the band,"[32] as well as by "allow[ing] both smaller and larger service providers to benefit from economies of scale…"[33] These benefits of device operability are particularly important for small and regional carriers, which lack the considerable leverage *vis-à-vis* equipment manufacturers enjoyed by the nationwide carriers as a result of their volume purchases. Due to this leverage, if "boutique" band classes develop for mmW bands, manufacturers would initially, and perhaps

[29] *See Notice* at ¶ 77 (citing Comments of Nokia, pp. 6-7 (Sept. 30, 2016); Intel FNPRM Reply Comments at 4); *see also* Ericsson FNPRM Comments at 10.

[30] *Notice* at ¶ 49 (citing Intel FNPRM Reply Comments at 4; Samsung FNPRM Comments at 5); *see also* Ericsson FNPRM Comments at 12.

[31] *mmW Second Order & Second FNPRM*, 32 FCC Rcd at 11022.

[32] *Notice* at ¶ 13.

[33] *mmW Order & FNPRM*, 31 FCC Rcd at 8125.

exclusively, focus on the needs of the largest carriers. As a result, at a minimum, smaller carriers would experience significant delays in gaining initial access to equipment, and thereafter likely would continue to face higher equipment costs and delayed access to the latest devices.

These crucial benefits of a band-specific operability requirement would be greatly magnified under USCC's proposals because each requirement would encompass bands that have already been authorized for UMFUS operations. For instance, the Commission notes the accelerated "availability of equipment in newly authorized bands that share a tuning range with early-deployed bands."[34] At the same time, equipment manufacturers would benefit due to the "manufacturing economies [achieved] by covering several bands with a single radio…"[35] Notably, these benefits would accrue not only for the 26 GHz and 42 GHz bands, but also for the other UMFUS bands included in USCC's proposed requirements – in particular, the 24 GHz and 37 GHz bands, for which device development is not nearly as far along as it is for the 28 GHz and 39 GHz bands. USCC further notes that both the 24 GHz and 26 GHz bands already are defined in 3GPP standards as a single band, n258, meaning 3GPP-compliant devices already must include all but 850 megahertz of the frequencies USCC proposes to include within the operability requirement encompassing the 26 GHz band.

Finally, USCC stresses the need for the Commission to adopt operability requirements for the 26 GHz and 42 GHz bands at this time, rather than assume that the industry's standards-setting process will give rise to a fully operable device ecosystem. As the Commission noted in adopting an interoperability requirement for the 600 MHz band, the experience of both the industry and the Commission with regard to "deployment in the Lower 700 MHz Band

[34] *Notice* at ¶ 77.

[35] *Id.*

highlights the need for clear *ex ante* interoperability rules to promote rapid deployment…, *particularly in rural areas*."[36]

IV. THE COMMISSION SHOULD ADOPT *EX ANTE* SPECTRUM AGGREGATION LIMITS FOR THE 26 GHz AND 42 GHz BANDS

USCC urges the Commission to apply an *ex ante* aggregation limit to the acquisition of spectrum in the 26 GHz and 42 GHz bands through auction. USCC specifically urges the Commission to prohibit a single entity from acquiring more than one-half of the spectrum in either of these bands. Absent adequate spectrum aggregation policies, the largest carriers will have both the means and motivation to prevent small and regional carriers from acquiring the mmW band spectrum they need to serve as a competitive balance and to ensure that those living in rural and other underserved areas also have an opportunity to benefit from innovative 5G services. In other words, adequate spectrum aggregation policies are needed in order to sufficiently promote both competition and the efficient use of this spectrum, as well as to prevent an excessive concentration of this spectrum in the hands of a few already-dominant carriers.[37]

If the Commission is not inclined to adopt an *ex ante* aggregation limit for the 26 GHz and 42 GHz bands at this time, USCC urges the Commission to refrain from making any decision regarding this issue at this time, and to instead revisit the issue when it seeks comment on specific auction procedures for these bands. By then, the auctions for UMFUS licenses in the 24 GHz and 28 GHz bands, and perhaps other mmW bands, presumably will have concluded,

[36] *Expanding the Economic and Innovation Opportunities of Spectrum Through Incentive Auctions*, Report and Order, 29 FCC Rcd 6567, 6868-69 (2014) (emphasis added).

[37] *See mmW Order & FNPRM*, 31 FCC Rcd at 8081 ("[M]obile spectrum holdings policies [ ] will promote competition in the future, including competition in the development of 5G services, as well as promote the efficient use of mmW spectrum, and avoid an excessive concentration of licenses.").

providing additional, highly-relevant information regarding whether stronger safeguards are needed to prevent an excessive concentration of UMFUS licenses.

Although the far better course would be to adopt a pre-auction spectrum aggregation limit for the 26 GHz and 42 GHz bands,[38] if the Commission nevertheless declines to take this action, USCC urges the Commission to make explicit that it will subject applications for initial licenses for these bands to the same post-auction review that it adopted for the other licensed UMFUS bands. Although this appears to be the Commission's intent,[39] USCC believes the Commission should clarify that all future licensed UMFUS bands will be subject to this *ex post* review process. Finally, USCC supports the Commission's proposal to include the 26 GHz and 42 GHz bands in the mmW spectrum threshold for reviewing proposed secondary market transactions.[40]

V. CONCLUSION

For the reasons discussed above, USCC urges the Commission to adopt exclusive-use, geographic area licensing for the 26 GHz and 42 GHz bands in furtherance of its ongoing efforts to ensure sufficient spectrum resources will be available to meet consumers' exponential data demands as myriad 5G services become a reality. Further, in order to protect and promote competition, and to ensure 5G networks also are deployed in rural and other underserved areas, USCC urges the Commission to adopt broad operability requirements encompassing the 26 GHz and 42 GHz bands and to apply *ex ante* spectrum aggregation limits to these bands.

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[38] *See Policies Regarding Mobile Spectrum Holdings Expanding the Econ. & Innovation Opportunities of Spectrum Through Incentive Auctions*, Report and Order, 29 FCC Rcd 6133, 6192 (2014) ("[A]pplying the limit *ex ante* would provide greater certainty and efficiency in the process of licensing through competitive bidding…").

[39] *See Notice* at n. 293.

[40] *See id.* at ¶ 96.

Respectfully submitted,

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