Before the
FEDERAL COMMUNICATIONS COMMISSION
Washington, DC 20554

In the Matter of	)	
	)	
Use of Spectrum Bands Above 24 GHz For Mobile Radio Services	)	GN Docket No. 14-177
	)	

COMMENTS OF THE
TELECOMMUNICATIONS INDUSTRY ASSOCIATION

The Telecommunications Industry Association ("TIA")[1] hereby submits these comments in response to the Commission's *Fourth Further Notice of Proposed Rulemaking* ("*Fourth FNPRM*")[2] in the above-captioned proceeding. These comments also respond to closely-related band plan issues raised in the *Third Further Notice of Proposed Rulemaking* ("*Third FNPRM*")[3] that is currently pending in this proceeding. TIA commends the Commission for its efforts to begin auctioning more millimeter-wave spectrum in the near term, but the Commission should ensure that its band plans are sufficiently forward-looking. Meanwhile, TIA broadly supports the Commission's efforts to use creative approaches to reduce encumbrances in the 39 GHz band.

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[1] TIA is the leading trade association for the information and communications technology ("ICT") industry, representing companies that manufacture or supply the products and services used in global communications across all technology platforms. TIA represents its members on the full range of policy issues affecting the ICT industry and forges consensus on industry standards.

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

[3] Third Report and Order, Memorandum Opinion and Order, and Third Further Notice of Proposed Rulemaking, *Use of Spectrum Bands Above 24 GHz For Mobile Radio Services*, et al., GN Docket No. 14-177, rel. June 8, 2018, FCC 18-73 ["Third FNPRM"].

I. The Commission Should Retain and Adopt More Block Sizes of 200 MHz or Larger.

To date, the Commission has adopted a variety of different block sizes in the millimeter-wave bands as follows:

Table 1 – Current UMFUS Band Plans

Band	Frequencies	Bandwidth	Band Plan	Commission Action
24 GHz (L)	24.25-24.45 GHz	200 MHz	2 x 100 MHz	*Second Report and Order*
24 GHz (U)	24.75-25.25 GHz	200 MHz	5 x 100 MHz	*Second Report and Order*
28 GHz	27.5-28.35 GHz	850 MHz	2 x 425 MHz	*Report and Order*
37 GHz (L)	37.0-37.6 GHz	600 MHz	6 x 100 MHz	*Third Report and Order*
37 GHz (U)	37.6-38.6 GHz	1000 MHz	5 x 200 MHz	*Report and Order*
39 GHz	38.6-40.0 GHz	1400 MHz	7 x 200 MHz	*Report and Order*
47 GHz	47.2-48.2 GHz	1000 MHz	5 x 200 MHz	*Second Report and Order*

In the *Third FNPRM*, the Commission proposes to license the 42 GHz band (42.0-42.5 GHz) as five 100 MHz blocks.[4] It further proposes to license the 26 GHz band (25.25-27.5 GHz) as eleven 200 MHz blocks plus one 50 MHz block, with the caveat that the 26 GHz band plan seems like a tentative placeholder that can only be discerned from the actual proposed rule text.[5] Finally, in the *Fourth FNPRM* the Commission proposes to modify the upper 37 GHz, 39 GHz, and 47 GHz band plans from 200 MHz blocks to 100 MHz blocks.[6] Combined, these proposals would yield the following result if adopted:

Table 2 – FCC-Proposed UMFUS Band Plans

Band	Frequencies	Bandwidth	Band Plan	Action or Proposal
24 GHz (L)	24.25-24.45 GHz	200 MHz	2 x 100 MHz	*Second Report and Order*
24 GHz (U)	24.75-25.25 GHz	200 MHz	5 x 100 MHz	*Second Report and Order*
26 GHz	25.25-27.5 GHz	2250 MHz	11 x 200 MHz 1 x 50 MHz	*Third FNPRM*
28 GHz	27.5-28.35 GHz	850 MHz	2 x 425 MHz	*Report and Order*
37 GHz (L)	37.0-37.6 GHz	600 MHz	6 x 100 MHz	*Third Report and Order*

[4] Third FNPRM ¶ 57.

[5] *See* Third FNPRM at Appendix C (proposing new 47 C.F.R. § 30.4(b) that would define eleven 200 MHz blocks and one 50 MHz block for the 25.25-27.5 GHz band); Third FNPRM ¶¶ 90-91 (discussing the issue but not explaining the specific proposal in the rule text).

[6] Fourth FNPRM ¶¶ 9-13.

37 GHz (U)	37.6-38.6 GHz	1000 MHz	10 x 100 MHz	*Fourth FNPRM*
39 GHz	38.6-40.0 GHz	1400 MHz	14 x 100 MHz	*Fourth FNPRM*
42 GHz	42.0-42.5 GHz	500 MHz	5 x 100 MHz	*Third FNPRM*
47 GHz	47.2-48.2 GHz	1000 MHz	10 x 100 MHz	*Fourth FNPRM*

While not every UMFUS band is created equal, the Commission's actions to date and its more recent proposals can be summarized according to block size as follows:

Table 3 – Summary of UMFUS Band Plans by Block Size

Block Size	**Current Rules**				**Proposed Rules**			
	Blocks	Pct.	Bandwidth	Pct.	Blocks	Pct.	Bandwidth	Pct.
50 MHz	0	0%	0 MHz	0%	1	2%	50 MHz	1%
100 MHz	13	41%	1300 MHz	23%	52	79%	5200 MHz	63%
200 MHz	17	53%	3400 MHz	61%	11	17%	2200 MHz	27%
425 MHz	2	6%	850 MHz	15%	2	3%	850 MHz	10%
TOTAL	32		5550 MHz		66		8300 MHz	

As seen above, the Commission's current proposals would shift the UMFUS bands much further toward 100 MHz block sizes. And to reiterate, those few 200 MHz blocks that would remain after the Commission's most recent proposal would result entirely from licensing the 26 GHz band – a plan that the Commission does not enthusiastically endorse in the *Third FNPRM* but is only apparent from examining the placeholder rule text.

A. The Trend Toward 100 MHz Block Sizes Does Not Facilitate Currently-Envisioned or Future Technological Developments.

Notwithstanding the Commission's recent success in clearing or repacking incumbents through incentive auctions, it is generally far more difficult to aggregate spectrum blocks *post facto* than to avoid partitioning it at all. While the 3GPP specifications include 100 MHz channels as an option, those same specifications also explicitly provide for channel bandwidths of 200 MHz and 400 MHz as well.[7] Moreover, the specifications envision aggregation of

[7] *See* 3GPP Release 15: 3GPP TS 38.101-2 V15.1.0 (2018-03), Section 5.3.5, *available at* http://www.3gpp.org/ftp//Specs/archive/38_series/38.101-2/38101-2-f10.zip (last checked Sep. 12, 2018).

contiguous channel blocks of up to 800 MHz and potentially even higher levels.[8] Meanwhile, assembling large, contiguous 800 MHz channels in the future would be very difficult for any interested party if the Commission auctions the spectrum in 100 MHz blocks.

In addition, previous experience shows that technologies initially contemplated for a specified channel size are often extended in later years to encompass larger channel sizes. For example, the IEEE 802.11 family of standards commonly used for Wi-Fi began in the late 1990s with channel sizes of 20 MHz or 22 MHz, the 802.11*n* standard added 40 MHz channels in the late 2000s, and the 802.11*ac* standard has more recently enabled 80 MHz and 160 MHz channels.[9] While the technological advances in the 802.11 standards over two decades have enabled significant consumer benefits, the growth in channel sizes over time has occasionally led to potential conflicts, such as in the 5.9 GHz band where some seek to enable another 160-MHz block for 802.11*ac*.

The Commission should use some foresight to prevent that problem here by not limiting itself to 100 MHz blocks across most or all of the UMFUS bands. It may be true that 100 MHz building blocks are "consistent" with one of the channel size options included in the newly-emerging 5G standards,[10] but that is not the full story. Instead, the Commission should be guided by its recognition that in the short term, "the necessity of combining smaller channels to achieve the requisite scale could involve transaction costs that might eventually be passed on to

[8] *See id.* at Sections 5.3A.4, 5.5A.1.

[9] *See* Wikipedia, *IEEE 802.11*, https://en.wikipedia.org/wiki/IEEE_802.11#Protocol (visited Sept. 12, 2018) (table showing release dates and bandwidths of different 802.11 variants).

[10] Fourth FNPRM ¶ 10; *see also* Second Report and Order, *Use of Spectrum Bands Above 24 GHz For Mobile Radio Services*, GN Docket No. 14-177, et al., rel. Nov. 22, 2017, FCC 17-152, at ¶ 35 ["Second R&O"].

consumers,"[11] and in the long term, fragmented spectrum could unnecessarily inhibit technological growth.

B. Larger Block Sizes Will Still Provide Ample Opportunities for Competitive Entrants.

The Commission's progressive shift toward 100 MHz blocks appears to be significantly motivated by a non-technical factor – the understandable desire to ensure adequate opportunities for competitive entry. For example, in the *Second Report and Order* the Commission cited T-Mobile's argument that a 200/250/250 MHz band plan for the 24 GHz band would "limit the number of potential entrants to the band."[12] And in the *Fourth FNPRM*, the Commission has expressed particular interest in how larger block sizes would "further [its] goal of making contiguous spectrum blocks available *for both incumbents and new entrants*."[13]

While the various UMFUS bands are not completely interchangeable, the issue must be considered in light of the many bands that have already been opened or are being considered in the *Third FNPRM*. As summarized in Table 3 above, the Commission has already allocated 32 blocks of UMFUS spectrum totaling 5500 MHz, establishing a rough balance between 100 MHz blocks (13) and 200 MHz blocks (17) as well as two 425 MHz blocks in the 28 GHz band. This is a much larger number of blocks when compared to most spectrum auctions, such as the recent AWS-3 auction where only *four* paired blocks were made available in the 1755-1780 / 2155-2180 MHz bands.[14]

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[11] Third FNPRM ¶ 91.

[12] Second R&O ¶ 33 (citing T-Mobile Comments at 10).

[13] Fourth FNPRM ¶ 13 (emphasis added).

[14] *See* FCC, *AWS-3 Band Plans*, http://wireless.fcc.gov/services/aws/data/AWS3bandplan.pdf (visited Sep. 12, 2018).

Competition policy should of much greater concern when there are only four spectrum blocks available compared to 32. Although the various UMFUS blocks will not be auctioned simultaneously, the large number of blocks being made available across the various bands will ensure that every potential entrant has a fair opportunity to access a significant amount of spectrum without needing to atomize every band into 100 MHz fragments. Indeed, if the Commission adopts its proposal to allocate an additional 2750 MHz of spectrum for UMFUS in the 26 GHz band (2250 MHz) and the 42 GHz band (500 MHz), the total number of UMFUS blocks will eventually be significantly greater than 32. The Commission therefore has no need to establish 100 MHz block sizes simply to ensure adequate opportunities for participation; those opportunities already exist through the large numbers of blocks being made available.

C. TIA Proposals and the Record Support Larger Block Sizes.

There is significant support in the record for retaining block sizes of 200 MHz or larger. For example, TIA has previously urged the Commission to establish band plans in units of 200 MHz or greater multiples – except in certain smaller bands where specific factors make 100 MHz blocks appropriate – and we proposed band plans that included some blocks of 400 MHz and 800 MHz.[15] AT&T has previously urged that the upper 24 GHz block be auctioned as two 250-MHz blocks, but indicated that a 100/200/200 plan would be acceptable;[16] similar logic could easily apply to the 42 GHz band currently under consideration. Nokia has previously endorsed using six 500 MHz blocks for the 47.2-50.2 GHz band.[17] And while the Commission has relied on Qualcomm's statement that emerging standards are being built on "100 MHz

[15] Comments of the Telecommunications Industry Association, filed Sep. 30, 2016 in GN Docket No. 14-177, at 6 ["TIA 2016 FNPRM Comments"].

[16] Second Report and Order ¶ 32 (citing AT&T 2016 Reply Comments at 12).

[17] Second Report and Order ¶ 58 (citing Nokia Comments at 9).

building blocks,"[18] Qualcomm itself has observed that millimeter-wave operations in general are "best supported by wide contiguous blocks of spectrum that are *at least* 200 MHz wide."[19] With this in mind, TIA urges the Commission to proceed as follows:

26 GHz. Should the Commission adopt its proposal to establish UMFUS rules in the 26 GHz band, the large bandwidth of 2250 MHz from 25.25-27.5 GHz would present a significant opportunity to establish larger block sizes. Rather than dividing the band into eleven 200 MHz blocks and one 50 MHz block, the Commission should establish one 800 MHz block, two 400 MHz blocks, and three 200 MHz blocks. The remaining 50 MHz could be treated as an unusual small block since the 3GPP standard also contemplates that block size, or the Commission could consider splitting the "extra" 50 MHz between the two 400 MHz blocks to yield two (slightly) irregular 425 MHz blocks that would possibly aggregate well with the 425 MHz blocks in the upper adjacent band from 27.5-28.25 GHz, as follows:[20]

Table 4 – Possible Band Plan for 24-28 GHz

Band	**Block sizes**
24.75-25.25 GHz (existing)	100 MHz 100 MHz 100 MHz 100 MHz 100 MHz
25.25-27.5 GHz (proposed)	200 MHz 200 MHz 200 MHz 800 MHz

[18] Second Report and Order ¶ 33 (citing Comments of Qualcomm Incorporated, filed Sep. 30, 2016 in GN Docket No. 14-177, at 7 ["Qualcomm 2016 Comments"])

[19] Qualcomm 2016 Comments at 7-8.

[20] To the extent that STRAPS services cannot co-exist with UMFUS in the same band, larger block sizes might also potentially facilitate the use of a creative auction mechanism that would decide between the services in one of the larger blocks. *See* Comments of the Telecommunications Industry Association, filed Sep. 10, 2018 in GN Docket No. 14-177, at 6 ["TIA Third FNPRM Comments"].

	425 MHz 425 MHz
27.5-28.35 GHz (existing)	425 MHz 425 MHz

37 & 39 GHz. The Commission should retain the 200 MHz blocks for the upper 37 GHz and 39 GHz bands to the greatest extent possible. Even if the Commission concludes that creating some 100 MHz channels would aid in repacking the 39 GHz incumbents,[21] it seems very unlikely that all 1400 MHz of the band would be implicated after the re-pack. For example, perhaps two 100 MHz blocks can be established at the upped edge of the 39 GHz band to facilitate repacking incumbents while six 200 MHz blocks are retained at the lower end adjacent to the upper 37 GHz band. Alternatively, four 100 MHz channels could be established at the upper end and five 200 MHz blocks at the lower end.

Note that TIA has previously endorsed using six 100 MHz blocks for the lower 37 GHz band due to the federal sharing issues.[22] While the upper 37 GHz and 39 GHz blocks could potentially be combined for auction, the federal sharing issues likely make the lower 37 GHz block sufficiently distinct that maintaining consistency between those blocks and the lower 37 GHz band for auction purposes is not relevant.

42 GHz. The Commission should allocate the spectrum as follows: 42.0-42.2 GHz (200 MHz), 42.2-42.4 GHz (200 MHz), and 42.4-42.5 GHz (100 MHz). If the Commission eventually determines it to be necessary, the top 100 MHz may be subject to more stringent operating rules to protect adjacent radio astronomy operations in the 42.5-43.5 GHz bands.[23]

[21] Fourth FNPRM ¶ 9.

[22] TIA 2016 FNPRM Comments at 10.

[23] *See id.* at 11.

However, if radio astronomy protections eventually require 200 MHz of protection, the Commission may wish to place the 100 MHz block at the bottom of the band.

47.2-48.2 GHz. TIA has previously proposed licensing this block as one 800 MHz block plus one 200 MHz, when considered alongside the 48.2-50.2 GHz blocks.[24] However, since that time the Commission has focused on the 47.2-48.2 GHz segment for UMFUS while reserving the upper segment for FSS and other purposes. In light of this decision, the Commission should consider the benefits of establishing at least one 400 MHz block, if not two, and using 200 MHz blocks for the remainder.

D. Auctions and Other Procedures Should Facilitate Aggregation of Contiguous Spectrum.

Regardless of block size, the Commission's procedures should facilitate spectrum aggregation to the extent possible. While the problem of maximizing contiguous spectrum in a nationwide auction may appear complex, it is perhaps not unlike the repacking problem that the Commission addressed in designing the voluntary incentive auction. Spectrum swaps to improve contiguity, either after or perhaps even during an ongoing auction, could potentially result in a better outcome for all auction participants. Moreover, secondary market procedures should be streamlined to allow winning bidders to aggregate contiguous spectrum as easily as possible.

II. The Commission Can and Should Take Steps to Reduce Encumbrances in the 39 GHz Band.

TIA is broadly supportive of the Commission's efforts to optimize the 39 GHz band in a manner that maximizes spectrum efficiency. We applaud the Commission's creativity in considering ideas such as an incentive auction to clear or repack incumbents, building on the Commission's demonstrated success with the voluntary incentive auction of television broadcast

[24] *Id.* at 13.

spectrum. The broadcast incentive auction and prior efforts related to federal spectrum transitions have demonstrated that economic-based solutions are often an effective means of achieving spectrum relocations with win-win outcomes for all (or nearly all) parties.

Furthermore, TIA generally agrees that the Commission has sufficient legal authority to conduct an incentive auction in the 39 GHz band for the purpose of maximizing spectrum efficiency, including by clearing and/or repacking incumbents. We look forward to reviewing the record on this issue in further detail.

III. Conclusion

The Commission's band plans for the UMFUS bands should be considered holistically and with an eye to the future. The trend toward 100 MHz blocks poses some risks, and at this early stage of 5G development the Commission would be better-served by creating a variety of larger block sizes. Meanwhile, TIA appreciates the Commission's forward-thinking work to make various millimeter-wave bands ready for auction, including its willingness to use recently-proven tools such as an incentive auction to clear or repack incumbents from the 39 GHz band.

Respectfully submitted,

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