

**Before the  
FEDERAL COMMUNICATIONS COMMISSION  
Washington, D.C. 20554**

In the Matter of	)	
	)	
Use of Spectrum Bands Above 24 GHz For Mobile Radio Services	)	GN Docket No. 14-177
	)	
Establishing a More Flexible Framework to Facilitate Satellite Operations in the 27.5-28.35 GHz and 37.5-40 GHz Bands	)	IB Docket No. 15-256
	)	
Petition for Rulemaking of the Fixed Wireless Communications Coalition to Create Service Rules for the 42-43.5 GHz Band	)	RM-11664
	)	
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	)	RM-10-112
	)	
Allocation and Designation of Spectrum for Fixed-Satellite Services in the 37.5-38.5 GHz, 40.5-41.5 GHz and 48.2-50.2 GHz Frequency Bands; Allocation of Spectrum to Upgrade Fixed and Mobile Allocations in the 40.5-42.5 GHz Frequency Band; Allocation of Spectrum in the 46.9-47.0 GHz Frequency Band for Wireless Services; and Allocation of Spectrum in the 37.0- 38.0 GHz and 40.0-40.5 GHz for Government Operations	)	IB Docket No. 97-95

**REPLY COMMENTS OF VERIZON**

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February 26, 2016

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## INTRODUCTION

Verizon has committed to be the first to develop and deploy 5G technology to serve U.S. consumers, just as it was the first to invest billions to forge the U.S. global leadership position in 4G LTE. This proceeding has spawned an overwhelming consensus among virtually every communications provider and manufacturer of network equipment about the key steps the Commission should take to create the regulatory certainty and operational flexibility needed to support large investments in emerging technologies. By acting promptly to take those steps, the Commission can unleash innovation and spur competition to deploy next-generation operations in the promising millimeter wave (“mmW”) bands.

Continued U.S. leadership in advanced communications requires Commission action. Other countries have publicly backed their industries’ efforts to catch up to us on 4G, and to surpass us with 5G. Seizing the opportunities presented here will help the United States retain its global leadership and usher in a new era of consumer benefits. There is no reason for delay. No party has identified a valid reason for the Commission to waver on its commitment to promptly repurpose the four bands the Notice identifies as priorities,<sup>1</sup> while it continues to work separately to quickly identify even more spectrum to make available for 5G. The Commission should reject requests to drop the 28 GHz band as one of the priority bands. And it should reject calls to delay this proceeding to wait for future studies or to know the precise features of 5G technology.

The Commission should not overcomplicate and slow down this proceeding by attempting to develop and implement new untested sharing rules or auction procedures. The

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<sup>1</sup> *Use of Spectrum Bands Above 24 GHz For Mobile Radio Services*, GN Docket No. 14-177, Notice of Proposed Rulemaking, FCC 15-138, 30 FCC Rcd 11878 (2015) (“Notice”).

Commission’s overall spectrum strategy should continue to incorporate a diversity of spectrum paradigms and regulatory innovations. This year, the Commission will hold the world’s first-ever incentive auction, and will implement in the 3.5 GHz band the most sophisticated spectrum sharing regime ever developed (which will be coupled with a new auction mechanism and a licensing model involving very small license areas). But in this proceeding, in order to quickly make available the initial swaths of mmW spectrum for immediate 5G innovation and investment, the FCC should embrace tested, proven models for both the licensed and the unlicensed spectrum. Rather than import innovations still being tested for other spectrum bands, here the Commission should leverage its expertise and experience in holding successful auctions that assign traditional licenses supporting large-scale investment and innovation.

The Commission also should not let the coexistence issues raised by the satellite industry derail or slow down its goal of quick action. There are a finite number of earth stations in the 28 GHz band. Although those satellite operations are secondary, Verizon would support reasonable proposals to ensure those investments are not stranded. The Commission should not, however, subsidize future satellite services at the expense of terrestrial mobile services, either by expanding the types of operations authorized in these frequencies or by granting future earth stations free upgrades to “primary” status.

**I. THE RECORD SUPPORTS THE USE OF PROVEN LICENSING MODELS THAT WILL PROVIDE FLEXIBILITY AND CERTAINTY.**

**A. The Record Confirms the Wisdom of the Commission’s Flexible-Use and Auction Proposals for 28 GHz and 39 GHz Spectrum.**

Numerous parties support the Commission’s proposal to grant flexible-use rights to existing licensees in the 28 GHz and 39 GHz bands, and to auction the remainder of those bands

under the same flexible-use regime.<sup>2</sup> By promptly implementing its proposal, the Commission can immediately set the stage for investment and innovation.

A few satellite operators assert that either the FCC should not make the 28 GHz band available for 5G operations or that it should make 5G operations secondary to satellite operations. They claim that the failure of last year’s World Radiocommunication Conference (“WRC”) to identify the 28 GHz band for study as a mobile band supports its case.<sup>3</sup> But the Commission has already correctly rejected that argument, noting that other countries and international equipment vendors are focusing on 28 GHz for mobile use even if the WRC has not kept pace.<sup>4</sup> A lack of consensus among the delegates to WRC must not deny U.S. consumers the benefits of 5G technology in this attractive spectrum. The countries supporting mobile use in the band include South Korea, Japan, Sweden, Finland, and Singapore—technology powerhouses with their sights set on 5G. This Commission should not delay repurposing the 28 GHz band while its counterparts in these countries support *their* industries’ efforts to develop mobile technologies for the band.

**B. Commenters Support Applying a Traditional Licensing Framework to the 37 GHz Band, and Unifying It with the 39 GHz Band.**

Most of the parties that address licensing issues in the 37 GHz band support a traditional framework rather than the complex “hybrid” proposal that would create separate bundles of

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<sup>2</sup> See AT&T Comments at 11-14; 4G Americas Comments at 3-4; Cisco Comments at 5; CTA Comments at 10; CTIA Comments at 11; Echostar Comments at 14-15; Ericsson Comments at 5-6; Intel Comments at 3, 7-8; Mobile Future Comments at 10; Nokia Comments at 4, 15-16; PCIA Comments at 10; Qualcomm Comments at 6-7; Samsung Comments at 11; Skyriver Comments at 3-7; Straight Path Comments at 5; TIA Comments at 6-7; T-Mobile Comments at 9; Verizon Comments at 2, 5-6; XO Comments at 8.

<sup>3</sup> See O3b Comments at 15-16; Boeing Comments at 6; EMEA Satellite Operators Association Comments at 7-8.

<sup>4</sup> Notice, ¶ 32.

indoor and outdoor rights and then attempt to auction the “outdoor-only” rights. The record confirms that a more traditional licensing approach would maximize the usefulness of this spectrum,<sup>5</sup> and that combining the 37 GHz band with the 39 GHz band would facilitate the creation of highly-attractive wideband licenses in a 3,000 MHz swath of contiguous spectrum subject to the same rules.<sup>6</sup>

The few parties supporting the hybrid proposal<sup>7</sup> fail to address many key unknowns about how such a regime might work. None, for example, offers ideas on how to delineate the borders between the different licensees’ operations. None explains how the Commission could efficiently resolve the disputes that would arise if the Commission gifts valuable spectrum rights to a newly-defined class of property owners. Federated Wireless claims that the hybrid model “will not complicate operations in the band” because “[t]here are a variety of ways to effect coordination, including through use of a Spectrum Access System.”<sup>8</sup> But Spectrum Access Systems (SAS) are not a proven vehicle for managing granular interference issues among multiple commercial operators sharing the same spectrum, much less managing between indoor and outdoor uses. And the proposal poses unaddressed legal ambiguities, such as how to define “outside” for every type of structure in every part of the country, and whether (and if so how)

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<sup>5</sup> See, e.g., AT&T Comments at 15; 4G Americas Comments at 14; CTA Comments at 10-11; CTIA Comments at 11, 15-17; Ericsson Comments at 7-8; HTSC Comments at 5; Intel Comments at 13-14; ITI Comments at 5; Mobile Future Comments at 11; Nokia Comments at 4, 16-17; PCIA Comments at 10-11; Qualcomm Comments at 6-7; Samsung Comments at 11; Straight Path Comments at 5; TIA Comments at 18-19; T-Mobile Comments at 13; Verizon Comments at 6-7.

<sup>6</sup> See, e.g., AT&T Comments at 16; T-Mobile Comments at 13; Verizon Comments at 6-8.

<sup>7</sup> Federated Wireless Comments at 16-18; & Open Technology Institute of American and Public Knowledge (“OTI & PK”) Comments at 13-24.

<sup>8</sup> Federated Wireless Comments at 18.

property owners may transfer their spectrum rights to others. These complexities will likely doom the hybrid proposal and delay use of the 37 GHz band for the foreseeable future.

Rockwell Automation supports an alternative solution that would likewise destroy the Commission's ability to create a highly attractive, unified 37-39 GHz band. It confirms that creating separate bundles of indoor and outdoor rights would not work but supports the Commission's alternative proposal of dividing the 37 GHz band into blocks, some of which would be assigned to property owners and others auctioned.<sup>9</sup> But as Verizon explained before, no one has demonstrated the need for a license-by-rule framework in the first place. If the Commission is intent on experimenting with granting property owners dedicated rights to build proprietary networks it should do so elsewhere (e.g., in the 64-71 GHz band), rather than putting at risk the spectrum so central to making quick progress on 5G.<sup>10</sup>

**C. There Is Widespread Support for Licenses with Tried and True Terms, Sizes, and Other Features.**

The record supports the Commission's proposals to assign licenses with reasonably long terms (10 years or more) and renewal expectancies.<sup>11</sup> Experience has shown that these features will provide the certainty that supports and encourages large investments by operators.<sup>12</sup>

There is also strong support for the Commission's proposal to promote productive use of spectrum by conditioning renewal on meeting performance requirements.<sup>13</sup> As demonstrated in

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<sup>9</sup> Rockwell Automation Comments at 2-3

<sup>10</sup> Verizon Comments at 13.

<sup>11</sup> *See, e.g.*, AT&T Comments at 4, 20; CTIA Comments at 22-23; Cisco Comments at 10; HTSC Comments at 4; Intel Comments at 23; Mobile Future Comments at 13-14; Nokia Comments at 5, 19; Qualcomm Comments at 11-12; TIA Comments at 25; XO Comments at 22.

<sup>12</sup> *See, e.g.*, Verizon Comments at 2-3.

other bands, performance requirements ensure that spectrum is put to productive use.<sup>14</sup> A few parties want to experiment with alternative techniques to promote efficient spectrum use, such as imposing “use it or share it” rules,<sup>15</sup> requiring licensees to pay periodic royalties on their spectrum,<sup>16</sup> or authorizing “opportunistic” use of licensed bands.<sup>17</sup> Those concepts should be explored in the right contexts, not with the 28 GHz and 37-39 GHz bands crucial to launching 5G. The Commission should promptly get these initial swaths of mmW spectrum into the hands of operators prepared to invest and innovate; that means embracing known, proven licensing models, including the use of performance requirements to ensure productive use of spectrum. Although the Commission should keep an open mind for other mmW bands to be repurposed in the future, right now, complex sharing models would take substantial time to develop and would create an unacceptable level of uncertainty that would deter large investments.

The record also confirms that reasonably-sized service areas will promote investment and innovation. Parties explained the benefits—including increased certainty for licensees and reduced administrative burdens—of establishing service areas larger than the county sizes proposed in the Notice.<sup>18</sup> Even parties that do not support larger license areas confirm that

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<sup>13</sup> 4G Americas Comments at 9-11; AT&T Comments at 22-23; CTIA Comments at 23-26; FiberTower Comments at 10; Intel Comments at 20-23; Mobile Future Comments at 15-16; Nokia Comments at 5, 19-20; Qualcomm Comments at 12; Straight Path Comments at 38; TIA Comments at 25.

<sup>14</sup> *See, e.g.*, Verizon Comments at 18-20.

<sup>15</sup> *See, e.g.*, Facebook Comments at 6-7; Federated Wireless Comments at 20; OTI & PK Comments, *passim*.

<sup>16</sup> Fixed Wireless Communications Coalition (“FWCC”) Comments at 7-8.

<sup>17</sup> NCTA Comments at 9; Google Comments at 4.

<sup>18</sup> *See, e.g.*, 4G Americas Comments at 5-9; AT&T Comments at 4, 17-19; Cisco Comments at 11-12; CTA Comments at 11-12; Ericsson Comments at 9-10; FWCC Comments at 4-5; ITI Comments at 4; Intel Comments at 4; Mobile Future Comments at 13; Nokia Comments at 4, 18-19; Qualcomm Comments at 7-9; Skyriver Comments at 7-9; Straight Path Comments at 17-19; TIA Comments at 22-23; T-Mobile Comments at 9-10; Verizon Comments at 3, 10-13; XO Comments at 20.

county-sized areas are not well suited for mobile deployments.<sup>19</sup> The Commission should instead issue reasonably-sized licenses (EA or BTA sizes) in the 28 GHz band and the 37-39 GHz band based on license sizes that already exist in those bands.

Parties agree that a few areas warrant departing from the approaches the Commission has historically used for other spectrum bands. Numerous commenters agree with Verizon that the band plans for mmW spectrum should feature wide channels (at least 200 MHz each) because mmW technologies will use substantial amounts of spectrum for low-latency and high-speed applications.<sup>20</sup> And there is strong agreement among mobile operators and mobile equipment vendors that, to avoid precluding future use cases, the technical rules should authorize higher power levels<sup>21</sup> and permit Time Division Duplexing operations.<sup>22</sup>

**D. The Commission Should Help Stimulate 5G Development and Deployment By Acting Quickly in this Proceeding and By Rejecting Calls To Wait for 5G to Develop Before Finalizing Rules.**

The Commission should not wait to see what 5G technology looks like before issuing technical and service rules to stimulate use of the mmW bands. It should promptly issue comprehensive rules, including flexible technical rules that incorporate the minimal power level

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<sup>19</sup> *See, e.g.*, Interisle Comments at 2-3 (explaining that counties are “uniquely unsuited to licensing”).

<sup>20</sup> 4G Americas Comments at 14-15; AT&T Comments at 12, 14; CTA Comments at 12; CTIA Comments at 21-22; Ericsson Comments at 9; Huawei Comments at 5-6, 19; Intel Comments at 4; Nokia Comments at 5, 20-24; Qualcomm Comments at 11; Samsung Comments at 14; Straight Path Comments at 22-23; TIA Comments at 30; Verizon Comments at 4, 7. At the same time T-Mobile correctly explains that the preference for larger block sizes should not deter the Commission from repurposing mmW spectrum that can only be repurposed in smaller blocks. *See* T-Mobile Comments at 7-8.

<sup>21</sup> CTA Comments at 16; CTIA Comments at 29-30; Ericsson Comments at 12-13; FiberTower Comments at 10-11; Nokia Comments at 25-26; Qualcomm Comments at 15-16; Samsung Comments at 18-19; Verizon Comments at 16-17.

<sup>22</sup> 4G Americas Comments at 11-14; Cisco Comments at 9-10; CTIA Comments at 27-29; Ericsson Comments at 9; Intel Comments at 12; Nokia Comments at 6, 25-26; Qualcomm Comments at 15-16; Samsung Comments at 17; Straight Path Comments at 23-24, 40; TIA Comments at 31; Verizon Comments at 17; XO Comments at 24.

and emission limits necessary to establish basic rules of the road to avoid interference. As 5G technology evolves, the Commission can revise its technical rules as necessary. That is what the Commission did with the 1900 MHz band it identified for 2G—personal communications services (PCS). In 1993, standards groups were in the midst of addressing technical standards for PCS, both domestically and internationally.<sup>23</sup> The Commission noted this ongoing work, as well as experimental licensees developing information on mobile service in the PCS band, but went ahead and adopted minimal technical rules for the design of PCS systems. With PCS at a “nascent stage,” the Commission “provide[d] the maximum flexibility in technical standards so as to allow the new service to develop in the most rapid, economically feasible, diverse manner.”<sup>24</sup> It adopted power and height limits, but declined to establish a single air interface or digital compatibility standard.<sup>25</sup> The FCC subsequently revised the out-of-band emission limit as technology advanced.<sup>26</sup>

Later, because licensees of PCS and the newer Advanced Wireless Service (“AWS”) were using these bands for third generation—3G—services, the Commission supplemented the radiated power rules with a power spectrum density model, among other steps, to enable systems using wideband emissions for both PCS and AWS.<sup>27</sup> And since then, many licensees have begun

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<sup>23</sup> *Amendment of the Commission's Rules to Establish New Personal Communications Services*, Second Report and Order, 8 FCC Rcd 7700, 7755 ¶¶ 135, 138 (1993).

<sup>24</sup> *Id.* at 7755 ¶¶ 137, 136.

<sup>25</sup> *Id.* ¶ 137; *see also See also Implementation of Sections 3(n) and 332 of the Communications Act*, et al., Third Report and Order, 9 FCC Rcd 7988 at 8069-8070 ¶¶ 165-168 (1994).

<sup>26</sup> *Year 2000 Biennial Regulatory Review – Amendment of Part 22 of the Commission's Rules to Modify or Eliminate Outdated Rules Affecting the Cellular Radiotelephone Service and Other Commercial Mobile Radio Services*, Report and Order, 17 FCC Rcd 18401, 18425-26 ¶¶ 45-46 (2002).

<sup>27</sup> *See Biennial Regulatory Review – Amendment of Parts 1, 22, 24, 27 and 90 to Streamline and Harmonize Various Rules Affecting Wireless Radio Services*, Third Report and Order, 23 FCC Rcd 5319 (2008).

offering 4G services in these bands. The FCC did not specifically plan for these advances in technology in 1993 when it first adopted its PCS rules, but anticipated these changes by adopting simple and flexible technical rules. These modifications demonstrate that the Commission can adopt technical rules at the very early stage of new technologies and then modify those rules if necessary as technologies develop. The Commission should take the same approach here.

## **II. FLEXIBILITY TO TRANSFER, SHARE, AND ACQUIRE mmW SPECTRUM WILL HELP EXPEDITE 5G DEPLOYMENT.**

As confirmed by numerous parties, the Commission’s proposals to permit licensees to transfer their licenses on the secondary market, and to permit partitioning and disaggregation, will benefit consumers and ensure that spectrum is put to its highest and best use.<sup>28</sup> No party opposes those proposals.

The record also confirms that the Commission should not establish spectrum aggregation limits for mmW spectrum, or include mmW spectrum at this time in the “screen” used to evaluate operators’ spectrum holdings. As Verizon and others explained, those types of rules would risk quashing innovation and investment in these incipient technologies.<sup>29</sup> No party proposes establishing aggregation limits, or including mmW spectrum in the screen, and the Commission should not do so.

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<sup>28</sup> *See, e.g.*, Cisco Comments at 11; CTA Comments at 14-15; Ericsson Comments at 6; FiberTower Comments at 8-9; HTSC Comments at 4-5; Intel Comments at 25; Mobile Future Comments at 16; Nokia Comments at 5, 24; Qualcomm Comments at 8; TIA Comments at 31; Verizon Comments at 13-14; XO Comments at 23.

<sup>29</sup> Verizon Comments at 14-15; Ericsson Comments at 6; HTSC Comments at 5; Mobile Future Comments at 15; TIA Comments at 28; XO Comments at 18-20.

### III. THE COMMISSION CAN PROTECT EXISTING SATELLITE EARTH STATIONS WHILE SUPPORTING 5G TECHNOLOGY.

The Commission should address satellite operators' concerns about their investments in the 28 GHz band. But it should do so pragmatically. Satellite operators are concerned that if earth stations transmit uplink signals to satellite operations that interfere with future mobile terrestrial operations, mobile operators may require them to modify or cease those secondary uplink operations. But they note that the limited number of earth stations is unlikely to cause significant interference to terrestrial mobile operations in most instances.<sup>30</sup> Verizon thus supports rules that give existing earth station operators assurances they can continue their present operations without requiring them to make changes to avoid interference with new mobile uses.

Future satellite operations at 28 GHz, however, raise different considerations. Satellite operators will not use mmW spectrum efficiently if the Commission simply gifts them spectrum rights vis-à-vis other users. The Commission should thus reject requests to *expand* operations in the 28 GHz band to include movable operations and satellite user terminals.<sup>31</sup> There is other spectrum (e.g., Ku Band, V-Band, and 17/24 BSS spectrum 17.3-17.7 GHz and 24.75-25.25 GHz) where satellite operators can deploy such equipment. And although it should continue to permit future gateway earth stations in the 28 GHz band to operate on a secondary basis, the Commission should not obligate primary terrestrial licensees to accommodate them. If future earth station operators want higher quality of service assurances than can be achieved as secondary operators, they should use other bands where they already have primary status. Or

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<sup>30</sup> See, e.g., Echostar Comments at 17; AT&T Comments at 12-13.

<sup>31</sup> See, e.g., Inmarsat Comments at 8-9; Boeing Comments at 10-11.

they can use the 28 GHz band under the Commission’s proposed market-based mechanism, which was widely supported in the record.

In considering satellite-related issues, the Commission should also keep in mind that earth station owners have no basis to reasonably expect that the Commission would protect their investments from terrestrial mobile services. Although Fixed Satellite Services (FSS) have a co-primary allocation, the service rules make FSS *secondary* to Local Multipoint Distribution Service (LMDS)—a fact that most of the satellite industry acknowledges.<sup>32</sup> ViaSat claims that satellite earth stations have priority over mobile services in the 28 GHz band<sup>33</sup>; but that claim misstates the law. When the Commission established LMDS, it designated the new service as having licensing priority over FSS in the 28 GHz band and made clear that satellite systems could not claim protection from interference from LMDS.<sup>34</sup> And the priority service designation was not limited to fixed services. The Commission specifically envisioned allowing mobile operations, noting that doing so “would be consistent with our goal of providing LMDS licensees with maximum flexibility in designing their systems.”<sup>35</sup>

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<sup>32</sup> See, e.g., SIA Comments at 11.

<sup>33</sup> See ViaSat Comments at 11-12.

<sup>34</sup> *Rulemaking to Amend Parts 1, 2, 21, and 25 of the Commission’s Rules to Redesignate the 27.5-29.5 GHz Frequency Band, to Reallocate the 29.5-30.0 GHz Frequency Band, to Establish Rules and Policies for Local Multipoint Distribution Service and for Fixed Satellite Services*, First Report and Order, 11 FCC Rcd 19005, 19024 ¶¶ 42-44, 48 (1996) (“28 GHz First Report and Order”) (“If proponents of FSS systems implement gateways in this part of the band, it will be on a non-interference basis to LMDS, and accordingly these systems will not be able to claim protection against harmful interference from LMDS operators.”).

<sup>35</sup> *Rulemaking to Amend Parts 1, 2, 21, and 25 of the Commission’s Rules to Redesignate the 27.5-29.5 GHz Frequency Band, to Reallocate the 29.5-30.0 GHz Frequency Band, to Establish Rules and Policies for Local Multipoint Distribution Service and for Fixed Satellite Services*, Second Report and Order, Order on Reconsideration, and Fifth Notice of Proposed Rulemaking, 12 FCC Rcd 12545, 12637 ¶ 207 (1997).

