

**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	)	WT Docket No. 10-112
	)	
Allocation and Designation of Spectrum 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
	)	

**5G AMERICAS OPPOSITION TO PETITIONS FOR RECONSIDERATION**

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## **I. Introduction and Summary**

5G Americas, the voice for 5G and LTE in the Americas, applauds the Commission's efforts to make additional spectrum available in the millimeter wave ("mmW") bands for flexible use.<sup>1</sup> Access to the millimeter wave bands will be vital to meet the high-capacity requirements and small cell deployments inherent to the fifth generation ("5G") of wireless technology, particularly for high-speed enhanced mobile broadband and applications requiring low-latency and high-reliability.

Because of the importance of allocating and adopting rules for flexible use of these mmW bands, 5G Americas opposes certain Petitions for Reconsideration of the *Report and Order* submitted by certain satellite providers.<sup>2</sup> As representative for the Western Hemisphere in the biennial Global 5G Event, also attended by representatives from Asia and Europe, 5G Americas is in a strong position to understand what action is necessary to facilitate deployment of "5G", to be standardized by the global initiative of 3GPP.

## **II. The Core Goal of *Spectrum Frontiers* is to Ensure the Nation's Future in 5G**

As the Commission stated in its *Report and Order*, it created service rules in the mmW band to secure the Nation's future in the next generational evolution of wireless technology – fifth generation, or "5G". The Commission noted that recent technological breakthroughs have newly enabled advanced mobile services in these bands.<sup>3</sup> The decisions the Commission took to

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<sup>1</sup> See *Use of Spectrum Bands Above 24 GHz for Mobile Radio Services*, GN Docket No. 14-177, et al., Report and Order and Further Notice of Proposed Rulemaking, FCC 16-89 (rel. July 14, 2016) ("*Report and Order*" or "*Further Notice*").

<sup>2</sup> See e.g., Petition for Reconsideration of The Boeing Company, GN Docket No. 14-177, et al. (filed Dec. 14, 2016); Petition for Partial Reconsideration of ViaSat, Inc., GN Docket No. 14-177, et al. (filed Dec. 14, 2016); Joint Petition for Reconsideration of EchoStar Satellite Operation Corporation, Hughes Network Systems, LLC, and Inmarsat, Inc., GN Docket No. 14-177, et al. (filed Dec. 14, 2016).

<sup>3</sup> *Report and Order* at ¶ 1.

allocate the bands to mobile services – terrestrial services - were intended to “help ensure continued American leadership in wireless broadband,”<sup>4</sup> despite what some of the satellite industry proponents argue in their *Petitions for Reconsideration*.

By petitioning the Commission to reconsider its decisions to allocate the bands to mobile and to allow flexible terrestrial use and limit the number of permissible Earth stations in the bands, the satellite Petitioners<sup>5</sup> appear to misconstrue the basic motivation of the Commission in its *Report and Order*.

Demand for mobile broadband is clearly growing dramatically, whereas the same cannot be said for satellite services.<sup>6</sup> The number of mobile subscribers in the United States dwarf satellite subscribers.<sup>7</sup> There are approximately 325 Million terrestrial mobile users in U.S. alone, compared to less than 2 Million satellite customers globally.<sup>8</sup> So too does the expected growth of mobile broadband data demand dwarf demand for satellite broadband in U.S.<sup>9</sup> The *Report and Order* granted satellite providers enhanced access to the 37.6-40 GHz band. The satellite

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<sup>4</sup> *Id.* at ¶ 3.

<sup>5</sup> By “satellite Petitioners,” 5G Americas means the Satellite Industry Association, Echostar, Inmarsat, O3b, ViaSat, and Boeing, or a subset of such Petitioners, as listed supra in note 2.

<sup>6</sup> *Report and Order* at ¶ 7 (“Many commenters point to the increasing demand for data from consumers using an ever wider variety of devices.”).

<sup>7</sup> See 2016 State of the Satellite Industry Report at 2, Satellite Industry Association (2016), available at <http://www.sia.org/wp-content/uploads/2016/06/SSIR16-Pdf-Copy-for-Website-Compressed.pdf>.

<sup>8</sup> *Id.* See also *Broadband Portal, Total Fixed and Wireless Broadband Subscriptions by Country*, Organisation for Economic Co-operation and Development (Aug. 2016) (data available in a downloadable chart), available at [www.oecd.org/sti/broadband/oecdbroadbandportal.htm](http://www.oecd.org/sti/broadband/oecdbroadbandportal.htm).

<sup>9</sup> See White Paper, *The Zettabyte Era – Trends and Analysis*, Cisco Communications (June 2, 2016), available at <http://www.cisco.com/c/en/us/solutions/collateral/service-provider/visual-networking-index-vni/vni-hyperconnectivity-wp.html> (“Cisco White Paper”).

Petitioners have not demonstrated a need for more spectrum beyond that which was granted in July.

The satellite Petitioners in effect ask for approximately 10 GHz of spectrum, with no demonstration that they would be able to deliver services at 5G speeds. 5G Americas believes it is not good public policy to allocate such a substantial amount of spectrum on a co-primary basis to providers that can only deliver services at speeds that are two generations behind. Such a reconsideration of the Commission's decision would not ensure our Nation's 5G future, but would in fact threaten it, and threaten the U.S. leadership in wireless broadband.

### **III. The Petitions for Reconsideration are Aided by Changed Circumstances or Previously Unknown Facts**

The Commission's Rules disfavor reconsideration of decisions that have been well-supported on the record.<sup>10</sup> The satellite Petitioners repeat many of the arguments raised during the rulemaking, prior to the adoption of the *Report and Order*. The Commission's Rules provide that:

*a Petition for Reconsideration which relies on facts or arguments which have not previously been presented to the Commission will be granted only where*

- (1) The facts or arguments relied on relate to events which have occurred or circumstances which have changed since the last opportunity to present such matters to the Commission;*
- (2) The facts or arguments relied on were unknown to petitioner until after his last opportunity to present them to the Commission, and he could not through the exercise of ordinary diligence have learned of the facts or arguments in question prior to such opportunity; or*
- (3) The Commission determines that consideration of the facts or arguments relied on is required in the public interest.*<sup>11</sup>

The basic market facts of the relative demand for mobile broadband and satellite services, and consequent spectrum requirements, were known to the satellite Petitioners during the course of the proceeding and have not changed. Few of the satellite Petitioners raise new facts not

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<sup>10</sup> 47 C.F.R. § 1.429.

<sup>11</sup> *Id.* at § 1.429(b).

previously considered by the Commission, and accordingly, should be dismissed or denied by the Commission.<sup>12</sup>

For instance, the satellite Petitioners request the Commission to reconsider its decision on maintaining the secondary status of Fixed Satellite Services (FSS) in the 28 GHz band in its Rules. But the regulatory status of FSS was thoroughly discussed during the “robust public record”<sup>13</sup> of the proceeding, with many of the satellite commenters requesting a revision in classification to be co-primary. Meanwhile, several members of the mobile industry noted on the record that they and others around the world were pursuing 5G demonstrations and developing equipment for the 28 GHz band. The Commission rejected this well-briefed request to reclassify the status of FSS in the 28 GHz band, so there is no need to “clarify” this settled matter. If there are any changed circumstances or new facts since July of last year, they rather support the Commission denying reconsideration, since many more 5G trials at 28 GHz have been announced.<sup>14</sup>

Another example of the proper denial or dismissal of the satellite Petitions for Reconsideration is their request for additional spectrum in the 42-42.5 GHz band for satellite

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<sup>12</sup> *Id.* at § 1.429(1).

<sup>13</sup> *Report and Order* at ¶ 1.

<sup>14</sup> *See e.g.*, Press Release, *Samsung to Collaborate with T-Mobile on 5G Mobile Network Technology Demonstrations and Trials*, Samsung Electronics America (Sept. 8, 2016), available at <https://news.samsung.com/global/samsung-to-collaborate-with-t-mobile-on-5g-mobile-network-technology-demonstrations-and-trials>; Press Release, *AT&T Launches First 5G Business Customer Trial with Intel and Ericsson*, AT&T (Dec. 5, 2016), available at [http://about.att.com/story/att\\_launches\\_first\\_5g\\_business\\_customer\\_trial\\_with\\_intel\\_and\\_ericsson.html](http://about.att.com/story/att_launches_first_5g_business_customer_trial_with_intel_and_ericsson.html); Press Release, *Qualcomm, Ericsson and AT&T announce collaboration on 5G New Radio trials intended to accelerate wide-scale 5G deployments*, Qualcomm Incorporated (Jan. 3, 2017), available at <https://www.qualcomm.com/news/releases/2017/01/03/qualcomm-ericsson-and-att-announce-collaboration-5g-new-radio-trials>.

downlink (space-to-Earth). The satellite Petitioners claim a lack of interest by the mobile industry for this spectrum in the record for the *Report and Order*,<sup>15</sup> but the full band was not open for comment until the *Further Notice*, in response to which the mobile industry commented in favor of making this spectrum available for mobile use.<sup>16</sup> Accordingly, the Petitioner's argument for reconsideration fails, and the Commission should maintain its well-considered decision not to permit FSS use of this band. It would appear that the satellite Petitioners are attempting to bootstrap their Petitions for Reconsideration to reverse an earlier finding in the V Band Proceeding denying the satellite industry co-primary status in the 42-42.5 GHz band.

Another example of not presenting new arguments meriting reconsideration is the satellite Petitioners' request that they be allowed to deploy more Earth stations per license area than the *Report and Order* permits.<sup>17</sup> The Petitioners' arguments are a backdoor to achieving a *de facto* co-primary status, which was already considered and rejected by the Commission. More significantly, such additional antennas could undermine the success of Upper mmW Flexible Use services ("UMFUS") in the considered bands. Given the clear demand for mobile broadband, granting additional antennas to grandfathered Earth station sites is not consistent with the long-

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<sup>15</sup> See e.g., Petition for Partial Reconsideration of ViaSat, Inc. at 5-6, GN Docket No. 14-177, et al.

<sup>16</sup> See e.g., Reply Comments of T-Mobile USA, Inc. at 10, GN Docket No. 14-177, et al. (filed Oct. 31, 2016); Reply Comments of AT&T at 7, GN Docket No. 14-177, et al. (filed Oct. 31, 2016); Reply Comments of Qualcomm Incorporated at 3, GN Docket No. 14-177, et al. (filed Oct. 31, 2016); Reply Comments of Samsung Electronics America, Inc. and Samsung Research America at 4, GN Docket No. 14-177, et al. (filed Oct. 31, 2016).

<sup>17</sup> See e.g., Petition for Reconsideration of The Boeing Company at 23-25, GN Docket No. 14-177, et al.; Petition for Partial Reconsideration of ViaSat, Inc. at 6-7, GN Docket No. 14-177, et al.; Petition for Reconsideration of SES Americom, Inc. and O3B Limited at 9, GN Docket No. 14-177, et al.

term Commission policy of efficiently allocating spectrum in a manner that best meets public demand for beneficial services.<sup>18</sup>

The satellite Petitioners' renewed request for a cumbersome database for each UMFUS base station is another example of a petition for reconsideration that should be denied or dismissed. This database request was deliberated on during the proceeding, and existing coordination procedures are sufficient for informing satellite operators of relevant details on terrestrial deployments to protect any satellite operations from harmful interference. Moreover, the satellite proposal raises competition concerns, given the competitive sensitivity to UMFUS licensees of disclosing deployment details such as the actual number of devices in a particular license area. Given that the Commission made a well-considered decision to limit the number of Earth stations to three per county or Partial Economic Area, the existing coordination procedures available to satellite licensees will not be burdensome. The existing Commission database requires licensees to provide a Point of Contact. Satellite operators seeking to coordinate with UMFUS licensees for their three Earth stations can simply look up the UMFUS Point of Contact in the Commission's database. No new coordination construct and associated costs need be created.

Yet another example of the Petitioners' meritless reconsideration request is their petition proposing that the transmit power of UMFUS equipment be reduced from the Commission's decided level of 75 dBm down to 62 dBm. But the level of 75 dBm was the compromise power, after a robust debate on the record of the proceeding. The satellite Petitioners provide no new information that 75 dBm was erroneous, threatens harmful interference, or any other justification that would merit a reconsidered reduction to 62 dBm.

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<sup>18</sup> See, e.g., *Report and Order* at ¶ 1.

The satellite Petitioners also request that the Commission mandate beamforming and power control by UMFUS equipment. Such mandates are completely unnecessary and add regulatory burdens for no justifiable reason. More importantly, the end goal of protecting Fixed satellite Earth stations will be achieved without specifying the precise UMFUS network configuration. The Commission generally eschews such prescriptive technology mandates, and should avoid that approach in this instance.

Finally, the satellite Petitioners request the Commission to reconsider its decision not to impose power limits based on the potential for skyward interference from the aggregate of UMFUS devices.<sup>19</sup> The Commission stated in the *Report and Order* that the satellite commenters had failed to establish that harmful interference was likely to occur due to aggregate UMFUS emissions. Contrary to the standard for successful Petitions for Reconsideration, the satellite Petitioners fail to advance any changed circumstances or new information or facts unknown at the time of the development of this robust public record that merit reconsidering the Commission's decision. Nor do they advance any winning arguments that the public interest would be served by further limiting UMFUS power in the absence of demonstrated harmful interference.

In one instance satellite Petitioners do in fact advance a new argument, relative to the International Telecommunications Union's Radio Regulations, although these Radio Regulations were certainly in place during the Commission's deliberations on these mmW bands over the last several years.<sup>20</sup> In particular, the Satellite Industry Association raises a new argument on the

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<sup>19</sup> See e.g., Petition for Reconsideration of The Satellite Industry Association at 13, GN Docket No. 14-177, et al., (filed Dec. 14, 2016); Petition for Reconsideration of SES Americom, Inc. and O3B Limited at 19, GN Docket No. 14-177, et al.

<sup>20</sup> Petition for Reconsideration of The Satellite Industry Association at 13, GN Docket No. 14-177, et al.

applicability of the International Telecommunication Union’s Radiocommunication Sector (ITU-R) coordination rules under the Radio Regulations’ Article 21.5,<sup>21</sup> but unfortunately, offers an inaccurate interpretation of that Regulation. First we note that Article 21.6, also referenced by SIA, is not applicable to the 39 GHz band, since Table 21-2 of that Article ends at 29.5 GHz. Article 21.6 applies where space stations have equal rights with mobile services. With respect to the 28 GHz band, these rules do not apply to U.S. licensed satellite systems, since in the United States, satellite is not co-primary with mobile services, so does not have rights equal to mobile systems in the band.

With respect to satellite systems licensed by other Members of the ITU, SIA, in its Petition, claims there is “potential for interference into FSS satellite receivers of non-U.S. satellite networks” and proposes “that UMFUS stations be limited to a maximum transmit power level of 10 dBW (40 dBm) per station in accordance with No. 21.5 of the ITU Radio Regulations.”<sup>22</sup> The ITU Radio Regulations requires Members to protect against *harmful* interference to other Members’ systems that operate in accordance with the Regulations.<sup>23</sup> In the United States, FSS has only secondary status. Non-U.S. licensed satellite systems have no regulatory status in the United States. The Radio Regulations require that U.S. licensees do not cause harmful interference to systems operating across our borders in compliance with the Regulations, such as of FSS licensees licensed by Canada, Mexico, or Caribbean regulators. The Radio Regulations do not require Members such as the United States to reduce the power of its own licensees in the face of unsubstantiated claims of *potential interference* to systems outside

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<sup>21</sup> *Id.*

<sup>22</sup> *Id.*

<sup>23</sup> ITU Radio Regulation 0.4 (“All stations, whatever their purpose, must be established and operated in such a manner as not to cause harmful interference to the radio services or communications of other Members or of recognized operating agencies...”).

the U.S. In the unlikely event that neighboring countries raise concerns of harmful interference as UMFUS are deployed in the U.S., the Commission may consider additional operating conditions for UMFUS along the border area, as it has done with other mobile services. There is no need to require reduced UMFUS functionality throughout the entire country, in the face of no proven likelihood of harmful interference to Earth stations licensed outside the U.S.

5G Americas agrees with the Commission’s conclusion that the record did not demonstrate that there is a risk of interference to satellites from aggregate interference caused by UMFUS stations.<sup>24</sup> 5G Americas notes that Article 21.5 applies to the power delivered by a transmitter to the antenna of a station in the mobile service, while SIA confuses that with the Commission’s Rules on maximum EIRP. Article 1.161 of the Radio Regulations defines EIRP in terms of antenna gain.<sup>25</sup> Therefore, the U.S. rules regarding EIRP are consistent with Article 21.5, which does not take antenna gain into account.

Articles 21.2 and 21.3 of the Radio Regulations are relevant here as well.<sup>26</sup> These Regulations specify a maximum EIRP of 55 dBW (85 dBm) for stations in the mobile service, which is a higher limit than the Commission’s Rules, which are referenced to 100 MHz bandwidth. Even when the plausible extremes of channel bandwidth are factored in, the Commission’s rules already provide more protection to other services such as Fixed satellite than required by the Radio Regulations. Thus, SIA’s petition is meritless and should be denied. Incidentally, the Radio Regulations also provide that Members “shall endeavor to apply the latest

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<sup>24</sup> *Report and Order* at ¶ 61.

<sup>25</sup> ITU Radio Regulation No. 1.161 (defining “*equivalent isotropically radiated power (EIRP)*”: “The product of the power supplied to the antenna and the antenna gain in a given direction relative to an isotropic antenna (*absolute or isotropic gain*)”).

<sup>26</sup> *See* ITU Radio Regulations 21.2, 21.3.

technical advances as soon as possible”<sup>27</sup> and that radio frequencies “must be used rationally, efficiently and economically.”<sup>28</sup> The Commission’s purpose for undertaking *Spectrum Frontiers* in the first place, and its specific decisions in the *Report and Order*, are consistent with these global goals.

The Commission noted in the *Report and Order* that “[m]omentum continues to build for developing technologies that can leverage mmW bands, including for so-called 5G services” and that the “at least 40 experimental authorizations for tests of technologies that are related to so-called 5G services” issued by the Commission are “but some of the current and ongoing work on 5G technologies across the world”.<sup>29</sup> For all the above reasons, the Satellite Industry Association’s Petition for Reconsideration to apply additional power constraints on UMFUS not required by the ITU Radio Regulations should be dismissed or denied.

#### **IV. The Satellite Petitioners’ Requests are Contrary to Commission Policy and Against the Public Interest**

The Commission undertook the *Spectrum Frontiers* proceeding to unlock the potential of the mmW bands “for mobile and other operations in a way that meets the need for flexible access to spectrum to improve bandwidth in constrained geographies.”<sup>30</sup> The *Report and Order* noted that the discussion on a fifth generation of wireless technology include a wide variety of ideas and technological developments, including the use of mmW band for mobile use and other high-bandwidth uses.<sup>31</sup> The Commission determined that “[m]oving quickly to make this spectrum available in the near term will best enable potential users, technology developers, and innovators

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<sup>27</sup> ITU Radio Regulation 0.2.

<sup>28</sup> ITU Radio Regulation 0.3.

<sup>29</sup> *Report and Order* at ¶ 15.

<sup>30</sup> *Id.* at ¶ 6.

<sup>31</sup> *Id.* at ¶ 7.

to have relative certainty about the spectrum structure in the mmW bands for these new uses.”<sup>32</sup>

In contrast to the Commission’s stated goals, the joint petition from SES Americom and O3b requests that all UMFUS licenses be delayed until aggregate interference limits are set.

As noted above, the Commission has found that aggregate interference from UMFUS devices should not be a concern, but has directed the International Bureau to open a docket – in effect a data repository <sup>33</sup> – into which data on potential interference to satellite systems can be submitted. The Commission, however, was clear that 5G deployment should move forward. In fact, the Commission’s Order expressly contemplates populating this docket “as UMFU services are deployed.”<sup>34</sup> This process was not contemplated by the Commission to delay the licensing of UMFUS in the decided bands, particularly. In light of the many experimental trials the Commission has authorized, including by several of our members, 5G Americas is confident that there will be ample information for this data-driven proceeding.

In its request for protection criteria to be applied in establishing power limits on UMFUS, several of the satellite Petitioners referenced ITU-R Recommendation S.1432-1.<sup>35</sup> However, Recommendation S.1432-1 was not adopted by the ITU to provide protection criteria for Fixed Satellite to mitigate against interference from mobile stations. Rather, as the Commission notes in the *Report and Order*, Recommendation S.1432-1 provides a coordination threshold for FSS systems to coordinate among each other.<sup>36</sup> Moreover, S.1432-1 applies to FSS coordination for

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<sup>32</sup> *Id.*

<sup>33</sup> *Id.* at ¶ 69.

<sup>34</sup> *Id.*

<sup>35</sup> *See e.g.*, SES Americom, noted at *Report and Order* at ¶ 289.

<sup>36</sup> *Id.* at ¶ 292.

FSS systems below 30 GHz, so it is not even applicable to the other bands for which the Commission adopted UMFUS rules on, such as the 37 and 39 GHz bands, or to the additional bands above 30 GHz under consideration in the *Further Notice of Proposed Rulemaking*. In any event, the appropriate protection criteria for Mobile/FSS sharing in the mmW bands is still under discussion at the ITU-R. There currently is no global consensus on appropriate power limits on mobile services in the mmW bands that may be shared with Fixed Satellite Systems.

Accordingly, the Commission should dismiss or deny Petitioners' requests to delay the licensing of these beneficial 5G services.

Likewise, the Commission should dismiss or deny satellite Petitioners' requests to impose operational technical mandates such as those proposed on beamforming, antenna downtilt, and Transmit Power Control.<sup>37</sup> Such mandates are contrary to the public interest in access to beneficial 5G services and U.S. mobile technological leadership. These prescriptive performance mandates (e.g. beamforming; prohibiting omni-directional antennas) are unnecessary, are contrary to Commission precedent, and would harm innovation.<sup>38</sup> The Commission need not, and should not, define the design of UMFUS equipment including mandates dictating equipment deployment configurations. Such dictates could freeze any development, contrary to the Commission's goals of facilitating U.S. innovation in 5G.

Moreover, these techniques will be used and upgraded by the mobile industry as necessary to

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<sup>37</sup> See, e.g., Petition for Reconsideration of The Boeing Company at 10-12, GN Docket No. 14-177, et al.; see also Petition for Reconsideration of SES/O3b at 22-24.

<sup>38</sup> One of the goals of *Spectrum Frontiers* was to enable innovators early access to the bands above 24 GHz. See, e.g., *Report and Order* at ¶ 7; see also Comments of Ericsson at 18, GN Docket No. 14-177, et al. (filed Sept. 30, 2016).

limit self-interference and provide coverage – they do not need to be mandated by the Commission.<sup>39</sup>

The mobile industry has an interest in conforming to 3GPP standards on these techniques, which are still under development, to achieve economies of scale beneficial to U.S. consumers. Mandates now would undermine that global development, possibly making the United States a technology island, increasing costs to U.S. consumers. As the Commission knows, such over-burdensome, unnecessary regulation will harm investment and undermine our Nation’s potential to lead in 5G globally.

The satellite Petitioners also request the Commission reconsider the .1% population metric,<sup>40</sup> arguing that revising that metric will allow satellite to better serve transient populations in rural areas. 5G Americas does not have a view on the viability of the multiple satellite positions on the appropriate metric, but if the Commission does reconsider the percentage, 5G Americas urges that whatever reconsidered metric may be adopted does not substantively restrict the use of the spectrum for terrestrial services.

## **V. Conclusion**

Increased access by satellite service providers to bands decided in the *Report and Order* should not be reconsidered. Such a reversal is not warranted and would also be inconsistent with

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<sup>39</sup> See White Paper, *LTE and 5G Technologies Enabling the Internet of Things*, 5G Americas (Dec. 2016) (noting continual evolution of aspects of 3GPP Releases to improve self-interference cancellation, power efficiency, etc.).

<sup>40</sup> See e.g., Joint Petition for Reconsideration of EchoStar Satellite Operating Corporation, Hughes Network Systems, LLC, and Inmarsat Inc. at 15-20, GN Docket No. 14-177, et al.; Petition for Reconsideration of The Boeing Company at 23-25, GN Docket No. 14-177, et al.; Petition for Reconsideration of SES Americom, Inc. and OB3 Limited at 5-9, GN Docket No. 14-177, et al.

the record of the proceeding, as well as contrary to the public interest, and established policy of allocating spectral resources in the most efficient manner, consistent with clear public demand.

Respectfully submitted,

A handwritten signature in black ink that reads "Chris Pearson". The signature is written in a cursive style with a large, prominent "C" and "P".

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