

**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 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 SAMSUNG ELECTRONICS AMERICA, INC. AND  
SAMSUNG RESEARCH AMERICA**

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**REPLY COMMENTS OF SAMSUNG ELECTRONICS AMERICA, INC. AND  
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Samsung hereby submits these reply comments in response to the Commission’s *Notice of Proposed Rulemaking* on the provision of Fifth-Generation (“5G”) mobile services in spectrum bands above 24 GHz.<sup>1</sup> 5G holds tremendous potential to support groundbreaking

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<sup>1</sup> Use of Spectrum Bands Above 24 GHz for Mobile Radio Services, *Notice of Proposed Rulemaking*, FCC 15-138 (Oct. 23, 2015) (“*NPRM*”). For purposes of these comments,

applications, enable the “Internet of Things,” and profoundly improve the way mobile services are integrated into daily life. The record developed in opening comments supports Samsung’s position that the Commission should prioritize development of the 5G ecosystem and adopt technical and service rules in the millimeter wave (“mmWave”) bands which will foster the successful evolution to 5G. Given the rapid technological evolution of 5G technologies, the Commission should act quickly in adopting a licensed regime in the 28 GHz (27.5-28.35 GHz), 37 GHz (37 to 38.6 GHz), and 39 GHz (38.6 to 40 GHz) bands to ensure that the United States remains a global leader in mobile broadband deployment.

## **I. INTRODUCTION AND SUMMARY**

The record in this proceeding illustrates that industry is ready to move forward with 5G. Industry efforts and investment to develop 5G are well underway and have already borne tremendous results.<sup>2</sup> The Commission’s leadership has the potential to advance the development and timely deployment of 5G mobile wireless services and other new offerings to consumers. To realize the vital benefits of 5G, the Commission must prioritize development of service rules for the millimeter wave bands and move quickly to a decision in this proceeding.

Participants in this proceeding have echoed Samsung’s support for licensing and technical rules for the mmWave bands designed to permit the most effective use of the spectrum. Commenters offered suggestions on how to alter the Commission’s proposed licensing, service, and technical rules to foster development and deployment of 5G services. Specifically, Samsung urges the Commission to 1) adopt a consistent licensing scheme in the 37 GHz and 39 GHz bands; 2) abandon the hybrid licensing scheme proposed for the 37 GHz band; 3) decline to

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“Samsung” refers to Samsung Electronics America, Inc. and Samsung Research America, collectively.

<sup>2</sup> Comments of Samsung, GN Docket No. 14-177 at 7-10 (filed Jan. 26, 2015) (“Samsung Comments”).

elevate protection rights for Fixed Satellite Service (“FSS”) parties; 4) decline to implement a Spectrum Access System (“SAS”) in the mmWave bands; 4) reject the *NPRM*’s “use-it-or-share-it” proposal; 5) adopt larger geographic licensing units and ten-year license terms; 6) establish reasonable and flexible performance requirements; and 7) decline to impose an interoperability requirement. With regard to technical rules, Samsung offers recommendations for power levels and out-of-band emissions limits. Finally, it remains critically important for the Commission to continue exploring additional spectrum opportunities in future proceedings. 5G will be accompanied by an exciting array of new services and technologies holding the potential to change the way people connect around the globe. Samsung asks the Commission to continue its leadership in this area and take prompt action to make the promise of 5G a reality.

**II. THE COMMISSION SHOULD MOVE FORWARD WITH DEVELOPMENT OF A REGULATORY FRAMEWORK FOR THE 28 GHZ, 37 GHZ, AND 39 GHZ BANDS.**

Commenters agreed that the Commission should take rapid action to make spectrum available for 5G networks and services. As Cisco Systems, Inc. noted, “[c]ertainly, the expected demand for 5G services warrants the adoption of new rules sooner than later,” and urged having rules in place before fall of 2016.<sup>3</sup> Further, prompt action on the *NPRM* will help position the U.S. to repeat the success of 4G deployment in 5G. Verizon acknowledged that “swift action in this proceeding is critical to whether the United States retains [its] global leadership in advanced

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<sup>3</sup> Comments of Cisco Systems, Inc., GN Docket No. 14-177, at i, 2 (filed Jan. 28, 2016) (“Cisco Comments”).

wireless communications.”<sup>4</sup> Straight Path Communications agreed, “[n]ow is the right time to develop rules governing mobility use of mmWave bands.”<sup>5</sup>

To that end, opening comments in this proceeding supported the Commission’s proposal for licensing the 28 GHz, 37 GHz, and 39 GHz bands. Commenters ranging from wireless carriers such as AT&T and Verizon to technology companies such as Ericsson, Intel, and Nokia and industry trade associations such as CTIA and the Telecommunications Industry Association, among numerous others, joined Samsung in supporting establishment of an exclusive use, flexible licensing framework in this spectrum.<sup>6</sup> Such a framework will produce myriad benefits such as giving licensees the certainty to confidently invest in new infrastructure and promotion of a robust secondary market that ensures that spectrum goes to those who most value it.<sup>7</sup>

While some commenters pushed against use of the 28 GHz for 5G services, Samsung and other commenters support the Commission’s decision to license the 28 GHz band. Commenters objected because the 28 GHz band is not going to be part of the WRC-15 study process.<sup>8</sup> Samsung and other commenters, however, support the Commission’s decision to move forward

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<sup>4</sup> Comments of Verizon, GN Docket No. 14-177, at 1 (filed Jan. 28, 2016) (“Verizon Comments”).

<sup>5</sup> Comments of Straight Path Communications Inc., GN Docket No. 14-177, at 2 (filed Jan. 27, 2016) (“Straight Path Comments”); *see also* Comments of the Information Technology Industry Council, GN Docket No. 14-177, at 3-4 (filed Jan. 27, 2016); Comments of Mobile Future, GN Docket No. 14-177, at 2-3 (filed Jan. 27, 2016) (“Mobile Future Comments”).

<sup>6</sup> Comments of Ericsson, GN Docket No. 14-177, at 5 (filed Jan. 26, 2016) (“Ericsson Comments”); Verizon Comments at 5-6; Comments of Intel Corporation, GN Docket No. 14-177, at 2 (filed Jan. 26, 2016) (“Intel Comments”); Comments of Nokia, GN Docket No. 14-77, at 9-10 (filed Jan. 27, 2016) (“Nokia Comments”); Comments of CTIA, GN Docket No. 14-177, at 6 (filed Jan. 28, 2016) (“CTIA Comments”); Comments of the Telecommunications Industry Association, GN Docket No. 14-177, at 1 (filed Jan. 27, 2016) (“TIA Comments”).

<sup>7</sup> Reply Comments of Samsung, GN Docket No. 14-177, at 20 (filed Feb. 18, 2015).

<sup>8</sup> *See, e.g.* Comments of the Global VSAT Forum, GN Docket No. 14-177, at 2 (filed Jan. 28, 2016).

with the 28 GHz band.<sup>9</sup> FCC Chairman Tom Wheeler stated his belief that, as the U.S. and other nations pursue 5G rules for the 28 GHz band, “an international consensus will develop.”<sup>10</sup> Commissioner Rosenworcel noted “[t]he race to 5G is on” and reiterated that despite the WRC’s decision, the United States should consider to explore this spectrum frontier, stating “I don’t think this is the time to hold back. I think we need to move ahead—on our own—and have a framework in place for the 28 GHz band by the end of the year.”<sup>11</sup> Commissioner O’Rielly stated that the United States would move forward in key spectrum areas such as 28 GHz “despite decisions at WRC.”<sup>12</sup> Samsung supports the Commission’s position based on the technical data and the fact that this band could be a bridge internationally to the other bands being studied for WRC-19, such as 25 and 31 GHz.<sup>13</sup>

The Commission has shown enormous support for the industry efforts and investment to develop 5G that are already well underway. Commissioner Clyburn noted that industry engineers have made advances in turning the perceived weaknesses of the frequencies above 28 GHz into strengths – and these advances will lead to 5G networks that will offer higher data

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<sup>9</sup> Samsung Comments at 10-11; Cisco Comments at 4; Nokia Comments at 10.

<sup>10</sup> FCC, Chairman Tom Wheeler’s Statement on World Telecommunication Conference 2015 (Dec. 17, 2015), *available at* [http://transition.fcc.gov/Daily\\_Releases/Daily\\_Business/2015/db1217/DOC-336917A1.pdf](http://transition.fcc.gov/Daily_Releases/Daily_Business/2015/db1217/DOC-336917A1.pdf).

<sup>11</sup> Jessica Rosenworcel Commissioner, FCC, Five Ideas for the Road to 5G, Remarks at the Leadership Forum on 5G: the Next Generation of Wireless, 1-2 (Feb. 9, 2016), *available at* [http://transition.fcc.gov/Daily\\_Releases/Daily\\_Business/2016/db0209/DOC-337655A1.pdf](http://transition.fcc.gov/Daily_Releases/Daily_Business/2016/db0209/DOC-337655A1.pdf).

<sup>12</sup> FCC, Remarks of Commissioner Michael O’Rielly to New America’s Open Technology Institute, The Road to Gigabit Wi-Fi: Can We Share the 5.9 GHz ‘Car Band’?, 3 (Jan. 12, 2016), *available at* [https://apps.fcc.gov/edocs\\_public/attachmatch/DOC-337254A1.pdf](https://apps.fcc.gov/edocs_public/attachmatch/DOC-337254A1.pdf).

<sup>13</sup> Samsung Comments at 10-11.

speeds and substantially lower latency than what commercial mobile services offer today.<sup>14</sup>

Commissioner Pai too voiced enthusiasm for the wireless industry's success in achieving 5G engineering breakthroughs that "could make a real difference to consumers."<sup>15</sup> Samsung urges the Commission to continue this momentum and move forward expeditiously with a regulatory framework for the 28 GHz, 37 GHz, and 39 GHz bands.

### **III. CERTAIN ALTERATIONS TO THE COMMISSION'S PROPOSED LICENSING AND TECHNICAL RULES WOULD BEST PROMOTE BENEFICIAL USE OF THE 28 GHZ, 37 GHZ, AND 39 GHZ SPECTRUM.**

While commenters agree with many of the Commission's proposals for the 28 GHz, 37 GHz, and 39 GHz bands, they also suggest changes that would best promote the Commission's goals of innovation, investment, and efficiency. Samsung urges the Commission to carefully consider commenters' input on the following aspects of the proposed licensing and technical rules for 5G. Enabling productive use of the 28 GHz, 37 GHz and, 39 GHz bands through the creation of flexible and reasonable rules is the first step toward unleashing the potential of 5G.

#### **A. Licensing Rules.**

*Consistent Rules for 37 and 39 GHz Bands.* Samsung's opening comments advocated for consistent licensing and service rules among the mmWave bands to permit the most effective use of the spectrum.<sup>16</sup> Numerous commenters specifically supported harmonizing the rules for the 37 GHz band with those for the 39 GHz band due to the fact that 5G networks and services will rely in part on large contiguous blocks of spectrum characterized by wide channel

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<sup>14</sup> FCC, Statement of Commissioner Mignon L. Clyburn, Use of Spectrum Bands Above 24 GHz for Mobile Radio Services, GN Docket No. 14- 177 *et al.*, available at [https://apps.fcc.gov/edocs\\_public/attachmatch/FCC-15-138A3.pdf](https://apps.fcc.gov/edocs_public/attachmatch/FCC-15-138A3.pdf).

<sup>15</sup> FCC, Remarks of FCC Commissioner Ajit Pai at 4G Americas' Technology Symposium: the Future of Mobile Broadband in the Americas LTE to 5G Network Innovation (Nov. 5, 2015), available at [https://apps.fcc.gov/edocs\\_public/attachmatch/DOC-336219A1.pdf](https://apps.fcc.gov/edocs_public/attachmatch/DOC-336219A1.pdf).

<sup>16</sup> Samsung Comments at 3,

bandwidth.<sup>17</sup> As Nokia pointed out, “[a]ggregating the adjacent 37 GHz and 39 GHz bands under a single consistent licensing framework would provide 3 GHz of contiguous spectrum that could be leveraged to provide 5G services using large blocks of spectrum.”<sup>18</sup> T-Mobile agreed, noting that harmonization of the rules in these two bands would “allow industry to develop use cases, deployment plans, and an equipment ecosystem for 5G that is interoperable across the entire 3 gigahertz” of contiguous spectrum.<sup>19</sup> Samsung urges the Commission to license the 39 GHz and 37 GHz bands under a consistent framework to help foster deployment and use of 5G.

***Hybrid Licensing in 37 GHz.*** The Commission sought comment on a “hybrid licensing scheme” in the 37 GHz band whereby “local area operating rights” would be authorized by rule to property owners and the remaining rights would be authorized via auction, licensed on a county basis.<sup>20</sup> Samsung and many other commenters strongly opposed this proposal.<sup>21</sup>

Commenters opposed the hybrid proposal because:

- It would lead to many interference problems as it is not possible to completely block signals originating indoors from traveling outdoors and vice versa.<sup>22</sup>
- “To the extent that there are 5G use cases appropriate for deployment by a property owner inside their own property, the Commission’s existing secondary market and leasing policies permit private actors to negotiate an appropriate transfer of rights that protects all parties.”<sup>23</sup>

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<sup>17</sup> See, e.g. Comments of AT&T, GN Docket No. 14-177, at 15-16 (filed Jan. 28, 2016) (“AT&T Comments”); Ericsson Comments at 8-9; Comments of Qualcomm Incorporated, GN Docket No. 14-177, at 8 (filed Jan. 27, 2016) (“Qualcomm Comments”).

<sup>18</sup> Nokia Comments at 16.

<sup>19</sup> Comments of T-Mobile USA, Inc., GN Docket No. 14-177, at 13 (filed Jan. 27, 2016) (“T-Mobile Comments”).

<sup>20</sup> *NPRM* ¶¶ 100-103.

<sup>21</sup> Samsung Comments at 13-14.

<sup>22</sup> Qualcomm Comments at 9-10.

<sup>23</sup> AT&T Comments at 16.

- “[B]y creating uncertainty for prospective geographic area licensees, the hybrid licensing approach would completely undermine the ability for licensees to attract investment to deploy the 37 GHz spectrum (and quite possibly the 39 GHz band as well).”<sup>24</sup>
- It would “create unnecessarily complications for terrestrial licensees and delay the emergence of 5G operations.”<sup>25</sup>

To avoid these issues, the Commission should extend flexible, exclusive-use licensing to the 37 GHz band and, in so doing, leverage efficiencies in the spectrum and promote investment.

***Protection Rights for FSS Parties.*** While some commenters suggested increasing the protection rights for FSS parties in the 28 GHz band,<sup>26</sup> Samsung is firm in its belief that FSS parties are adequately protected under the current rules. CTIA likewise opposes elevating the interference protection rights of FSS incumbents, noting that “existing FSS licensees were aware when they acquired their licenses that they were authorized only on a secondary basis, and that primary licensees in the band had the option of deploying mobile services.”<sup>27</sup> It would not serve the public interest to automatically grant co-primary status for FSS operations in the 28 GHz band or take other actions to grant additional protection rights for FSS parties.

Instead, many commenters voiced approval for use of a market-based approach, wherein FSS operators may participate in the auction for 28 GHz rights or enter into secondary market agreements.<sup>28</sup> Satellite operators have successfully used market-based mechanisms in the past, such as when a satellite operator purchased 100 licenses at the 39 GHz auction to be used for

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<sup>24</sup> CTIA Comments at 17.

<sup>25</sup> Verizon Comments at 4.

<sup>26</sup> *See, e.g.*, Comments of EchoStar Satellite Operating Company, Hughes Network Systems, LLC and Alta Wireless, Inc., GN Docket No. 14-177 (filed Jan. 27, 2016).

<sup>27</sup> CTIA at 31-32.

<sup>28</sup> Samsung Comments at 22; Ericsson Comments at 20-22; Cisco Comments at 6; Intel Comments at 5.

provision of fixed, mobile, and FSS.<sup>29</sup> Such market-based mechanisms will facilitate determination of the highest and best use of the spectrum in a given area.

***Sharing Mechanisms.*** The *NPRM* discussed sharing in the mmWave bands through a number of mechanisms, including use of a Spectrum Access System.<sup>30</sup> A Spectrum Access System would require terrestrial licensees to provide FSS operators with essential information needed to avoid causing interference to terrestrial operations.<sup>31</sup> Samsung opposed increased sharing via a Spectrum Access System because the concept has not yet been deployed and demonstrated to be viable in the 3.5 GHz, where it is currently being tested. The Spectrum Access System experiment at 3.5 GHz should continue in that band until SAS demonstrates its viability. Cisco and Intel, among others, shared Samsung’s belief that the Commission should not mandate any particular type of sharing mechanism until the merits of the 3.5 GHz Spectrum Access System are fully vetted.<sup>32</sup>

***Use-It-Or-Share-It.*** The record in this proceeding also evidences that commenters strongly oppose the *NPRM*’s “Use-It-Or-Share-It” proposal. The Commission proposed that portions of a license that are “unused” five years after a license grant be made available for shared use by others.<sup>33</sup> AT&T noted that imposing a “Use-It-Or-Share-It” obligation on licensees “would inject unnecessary complexity into the already arduous task of deploying 5G

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<sup>29</sup> Comments of Satellite Industry Association, GN Docket No. 14-177, at n. 20 (filed Jan. 28) (citing *TRW Inc.*, Memorandum Opinion and Order, 16 FCC Rcd. 5198, 5200 ¶ 5 (WTB 2001)).

<sup>30</sup> *NPRM* ¶ 152.

<sup>31</sup> *Id.*

<sup>32</sup> Cisco Comments at 9; Intel Comments at 22. *See also* CTIA Comments at 32-33.

<sup>33</sup> *NPRM* ¶¶ 215-17.

networks,” as even defining “unused spectrum” in nuanced scenarios would be challenging.<sup>34</sup> Verizon objected because “Use-It-Or-Share-It” runs the risk that once opportunistic operations are invited into a license’s service territory, the licensee may not be able to clear those opportunistic users when it expands its service (or when it brings online new channels to increase capacity).<sup>35</sup> In addition, such a requirement could harm investment as interested parties may be discouraged to buy spectrum if they may be asked to share it.<sup>36</sup> For these reasons, commenters agree that the Commission should not adopt a “Use-It-Or-Share-It” penalty for licensees.<sup>37</sup>

***Licensing Areas and Terms.*** The majority of commenters opposed the Commission’s proposed county-based licensing scheme for the 28 GHz, 37 GHz, and 39 GHz bands.<sup>38</sup> Instead, commenters suggested the Commission use larger areas such as Basic Trading Areas (“BTAs”), Economic Areas (“EAs”), and Partial Economic Areas (“BEAs) as the geographic licensing unit in the bands.<sup>39</sup> 4G Americas believed adopting broader larger geographic areas would best fit the type of services expected to flourish in the mmWave bands – namely, 5G applications which contemplate large licensing tracts covering densely populated areas such as vehicle-to-vehicle communications, self-backhaul, the Internet of Things, and smart grids.<sup>40</sup> In addition, county-sized licenses would increase administrative costs both for the Commission, which would need

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<sup>34</sup> AT&T Comments at 21-22.

<sup>35</sup> Verizon Comments at 21.

<sup>36</sup> Nokia Comments at 20

<sup>37</sup> Comments of the National Cable & Telecommunications Association, GN Docket No. 14-177, at 10-11 (filed Jan. 28, 2016); Intel Comments at 20-23; CTIA at 26-27.

<sup>38</sup> *NPRM ¶¶* 111-12.

<sup>39</sup> *See, e.g.*, Comments of XO Communications, LLC, GN Docket No. 14-177, at 20 (filed Jan. 28, 2016) (“XO Communications Comments”); Comments of the Consumer Technology Association, GN Docket No. 14-177, at 11-12 (filed Jan. 27, 2016); Qualcomm Comments at 8-9.

<sup>40</sup> Comments of 4G Americas, GN Docket No. 14-177, at 6 (filed Jan. 26, 2016).

to change the licenses it has already issued for 28 GHz and 39 GHz, and for operators who would have to cobble together geographically contiguous licenses to provide a viable service.<sup>41</sup> For these reasons, the Commission should use larger areas such as BTAs and EAs as the geographic licensing unit in the 28 GHz, 37 GHz, and 39 GHz bands.

Commenters backed the Commission’s proposed ten-year license terms for all licenses in the 28 GHz, 37 GHz, and 39 GHz bands.<sup>42</sup> CTIA noted that the term should be coupled with a renewal expectancy for subsequent license terms, as this approach would mirror that adopted for other mobile broadband services.<sup>43</sup> These terms are also expected to have a positive impact on investment in complex 5G technology. AT&T asserted that “[c]onsistent with the important principle of maximizing new technologies and services throughout 5G systems, ten year renewal terms and license expectancies will promote capital investments in the mmWave bands.”<sup>44</sup>

***Performance Requirements.*** The Commission proposed to apply performance requirements for the 28 GHz, 37 GHz, and 39 GHz bands at the county level.<sup>45</sup> Specifically, the Commission asserted that a single metric for performance requirements would be desirable and that population coverage is most naturally suited to encompass both mobile and fixed network topologies.<sup>46</sup> Commenters believed use of an alternative performance requirement, such as a “substantial service” requirement, should be the relevant benchmark for buildout of the millimeter wave spectrum.<sup>47</sup> T-Mobile stated that a construction-based performance requirement

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<sup>41</sup> TIA Comments at 22-24; Verizon Comments at 10-11.

<sup>42</sup> *NPRM* ¶ 121.

<sup>43</sup> CTIA Comments at 22; *see also* TIA Comments at 25-26; Intel Comments at 4.

<sup>44</sup> AT&T Comments at 20.

<sup>45</sup> *NPRM* ¶ 200.

<sup>46</sup> *Id.* ¶ 206.

<sup>47</sup> CTIA Comments at 25; AT&T Comments at 22-23.

is not appropriate for mmWave bands because this spectrum may be deployed to supplement capacity and not necessarily as a stand-alone service.<sup>48</sup> Cisco added that performance metrics that account for the availability of supporting devices and infrastructure would paint a more accurate picture of spectrum utilization in mmWave networks.<sup>49</sup> The Commission should adopt flexible and reasonable performance metrics for licensees in the mmWave bands.

***Interoperability.*** Commenters overwhelmingly opposed the Commission’s proposed interoperability requirement. The Commission proposed to require that mobile equipment operating within each millimeter wave band be interoperable using all air interfaces that the equipment utilizes on the frequencies and sought comment on Straight Path’s contention that it should be possible to achieve interoperability between different technologies, *e.g.*, switching between LTE and Wi-Fi.<sup>50</sup> Samsung reiterates that it opposes imposition of interoperability requirements between different technologies due to the heavy burden it would place on developers who cannot be sure what technologies will be developed in the mmWave bands. Commenters including Ericsson, Huawei, Qualcomm, T-Mobile, and Verizon likewise voiced staunch opposition to requiring interoperability in the mmWave bands.<sup>51</sup> The Commission’s long-established policy in favor of technology neutrality should continue to guide its policies for the future. Samsung urges the Commission to not adopt this proposal.

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<sup>48</sup> T-Mobile Comments at 18-19.

<sup>49</sup> Cisco Comments at 14.

<sup>50</sup> *NPRM* ¶ 296.

<sup>51</sup> Ericsson Comments at 17; Comments of Huawei Technologies, Inc. and Huawei Technologies Co., Ltd, GN Docket No. 14-177, at 27-28 (filed Jan. 28, 2016); Qualcomm Comments at 17-18; T-Mobile Comments at 20; Verizon Comments at 17-18.

## **B. Technical Rules.**

**Base Station Power Levels.** The Commission proposed to adopt 1640 watts (or 62 dBm) per 100 MHz of bandwidth EIRP as the maximum transmission power limit for base stations operating in the 28 GHz, 37 GHz, and 39 GHz bands.<sup>52</sup> Samsung supports base station power limits up to 75 dBm (and potentially higher).<sup>53</sup> Commenters joined Samsung in advocating for higher base station power limits.<sup>54</sup> As Verizon noted, “applying the same maximum transmission power limit used for base stations in PCS and AWS spectrum to mmWave bands would restrict power levels too much because power would likely be spread over much wider bandwidths, resulting in much lower EIRP-per-MHz levels and correspondingly lower ranges.”<sup>55</sup> CTIA concurred with Samsung that power limits proposed by the Commission are significantly less than what has been traditionally allowed in the millimeter wave bands.<sup>56</sup> The Commission should modify the base station power limits to ensure that the limits do not constrain developing technologies and use cases.

**Customer Premise Unit Power Levels.** A number of commenters urged the Commission to consider development of a power limit classification for customer premise equipment that is transportable (but not mobile).<sup>57</sup> An example of such equipment is small sites operating in a fixed environment within buildings. The mmWave bands are likely to be home to a wide range

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<sup>52</sup> *NPRM* ¶ 274.

<sup>53</sup> Samsung Comments at 18.

<sup>54</sup> *See, e.g.*, TIA Comments at 32; Comments of FiberTower Spectrum Holdings, GN Docket No. 14-177, at 10-11 (filed Jan. 27, 2016).

<sup>55</sup> Verizon Comments at 16.

<sup>56</sup> Samsung Comments at 18; CTIA Comments at 29.

<sup>57</sup> Samsung Comments at 19; Nokia Comments at 27; Ericsson Comments at 13; TIA Comments at 32; Verizon Comments at 17; CTIA Comments at 30.

of equipment – not just the traditional base station/mobile handset model – and the Commission’s rules should be designed to permit innovation to occur.

***Out-of-Band Emission Limits.*** The Commission proposed instituting a radiated emission limit of  $43+10\log(P)$  for mobile broadband systems in the mmWave bands.<sup>58</sup> Nokia and Straight Path agree that this proposed limit should be feasible while ensuring coexistence with other systems in adjacent channels.<sup>59</sup> Samsung supports the Commission proposal for out-of-band emission limits at this time and is continuing to study the availability of technical components required to comply with these limits.<sup>60</sup> Samsung may supplement the record with further information as it continues to investigate this issue.

#### **IV. ADDITIONAL SPECTRUM SHOULD BE IDENTIFIED AND ALLOCATED FOR MOBILE SERVICES IN FUTURE PROCEEDINGS.**

Samsung applauds the Commission’s efforts in this proceeding to enable use of spectrum above 24 GHz for 5G networks and services and ultimately foster creation of unparalleled mobile experiences. Adopting licensing and technical rules in the 28 GHz, 37 GHz, and 39 GHz represents a significant step toward unleashing the potential of 5G and should be a top Commission priority in the short term. Commenters noted, however, that going forward additional spectrum resources will continue to be needed for 5G.<sup>61</sup> In the next stage of rulemaking, Samsung suggests that the Commission focus efforts on enabling 5G mobile services in the 25 and 31 GHz bands (24.25-27.5 GHz and 31.8-33.4 GHz) and the LMDS B2

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<sup>58</sup> *NPRM* ¶ 286.

<sup>59</sup> Nokia Comments at 28; Straight Path Comments at 43.

<sup>60</sup> Samsung Comments at 19.

<sup>61</sup> *See, e.g.* Nokia Comments at 3-4; CTIA Comments at 7; Ericsson Comments at 25-26; Mobile Future Comments at 7-8.

band at 31.0-31.3 GHz.<sup>62</sup> The adjacency of the 24.25-27.5 GHz range to the 28 GHz band offers exciting advantages and potential for the development of global devices. The Commission should continue to aggressively pursue spectrum in other bands for mobile to meet the rapidly growing consumer demand for spectrum-dependent services.

## V. CONCLUSION

Samsung welcomes the opportunity to provide input on the Commission's proposed service rules for mobile use of certain mmWave spectrum bands. Samsung has high expectations for the potential of these bands to address spectrum demand and serve as a launch pad for 5G services. Samsung looks forward to working with the Commission to ensure that these expectations become reality.

Respectfully Submitted,

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<sup>62</sup> Samsung Comments at 15; *see also* XO Communications Comments at 15; Mobile Future Comments at 9.

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