

Before the  
**FEDERAL COMMUNICATIONS COMMISSION**  
Washington, DC 20554

In the Matter of	)	
	)	
Spectrum Horizons	)	ET Docket No. 18-21
	)	
Battelle Memorial Institute Petition for	)	RM-11713
Rulemaking to Adopt Fixed Service Rules in	)	(Terminated)
the 102-109.5 GHz Band	)	
	)	
Request for Waiver of ZenFi Networks, Inc. and	)	WT Docket No. 15-245
Geneva Communications LLC	)	(Terminated)
	)	
James Edwin Whedbee Petition for Rulemaking	)	RM-11795
to Allow Unlicensed Operation in the 95-1,000	)	
GHz Band	)	

To: The Commission

**COMMENTS OF  
THE BOEING COMPANY**

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## **SUMMARY**

In seeking to promote innovation, development and commercial spectrum use in the bands above 95 GHz, the Commission should remain focused on two important considerations. First, some of these frequency bands are already used to support critically-important satellite sensing and passive monitoring services, much of the data from which is necessary to ensure the accuracy of inclement weather forecast models used by aviation, industry, and multiple levels of government for logistics and public safety. The Notice of Proposed Rulemaking (“NPRM”) correctly acknowledges that these essential spectrum uses must be fully protected.

Second, the bands between 95 and 275 GHz likely present the last remaining green field opportunities for at least a generation of researchers and technologies involved in wireless innovation and development. Therefore, although the Commission should make significant portions of the bands above 95 GHz available for the expansion of existing communications services, the Commission should preserve even larger portions of this spectrum to ensure its future availability for wireless applications and services that are beyond our current expectations.

### **Fixed Services**

Boeing generally supports the Commission’s proposal to make available for fixed services (“FS”) up to 36 GHz of spectrum that is not shared with satellite communications services. The service rules for FS in this 36 GHz of spectrum could be based on the FS rules for the 70 and 80 GHz bands as long as they adequately protect co-frequency passive and satellite sensing services. No reason exists, however, to introduce FS into any portion of the 66.2 GHz of spectrum above 95 GHz that is shared with the service or feeder links for satellite communications services. FS operators already have significant spectrum capacity available to them in the 70 and 80 GHz bands

and, with the addition of up to 36 GHz of spectrum above 95 GHz, will have sufficient opportunities for growth and development for the foreseeable future.

### **Mobile Services**

It would be inappropriate for the Commission to authorize mobile services in any portion of the bands above 95 GHz, particularly those that are shared with satellite communications services. The FCC just concluded in its Spectrum Frontiers proceeding that mobile services do not need access (and may be unable to share with FS) in the 70 and 80 GHz bands. These same conclusions apply with even greater weight in the bands above 95 GHz.

### **Satellite Services**

The Commission should refrain from imposing in the bands above 95 GHz its satellite earth station siting restrictions that were adopted in the Spectrum Frontiers proceeding for the 28 and 37/39 GHz bands. These burdensome restrictions on individually-licensed earth stations were expressly rationalized on an assumption that protection would be needed for wide area mobile networks that might use these frequency bands. In contrast, the Commission's NPRM acknowledges that the bands above 95 GHz can only support very short range communications involving relatively controlled operating conditions, making earth station siting restrictions unnecessary. Such siting restrictions are also unnecessary to protect FS links in shared bands, which have long used site-by-site coordination to share spectrum with satellite services.

Although the Commission should refrain from imposing burdensome rules on individually-licensed satellite earth stations, the Commission should also set aside large portions of spectrum above 95 GHz for the operation of ubiquitously deployed satellite end user terminals. For example, the Commission should identify at least seven gigahertz of spectrum between 209-226

GHz as primarily available for satellite end user terminal uplink operations on a paired basis with the existing primary satellite downlink allocation in the 123-130 GHz band.

### **Unlicensed Services**

Boeing supports the Commission's proposal to identify spectrum above 95 GHz for unlicensed services, but questions whether the NPRM has identified sufficient spectrum for this expanding service. The proposal to make a little more than 15 GHz of spectrum above 95 GHz available for unlicensed use represents less than 10 percent of the frequency bands addressed in this proceeding. Manufacturers such as Boeing face a critical need for additional unlicensed spectrum capacity on its factory floors and within the aircraft that it manufactures. Wireless service providers are also offloading increasing amounts of data transport to unlicensed networks. The Commission should therefore focus on additional frequency bands above 95 GHz for unlicensed use. For example, the 116-112 GHz band may be available if passive services in these frequencies can be adequately protected. The Commission should also consider whether portions of the 36 GHz of spectrum identified for FS should also be made available on an unlicensed basis.

### **Experimental Services**

Boeing is the single largest user of experimental radio licenses issued by the Commission. Boeing actively encourages the Commission to continually streamline and improve its administrative processes for granting experimental licenses, while ensuring the Commission's statutory obligation to actively manage the use of scarce spectrum resources. To this end, Boeing urges the Commission to make certain improvements to its existing types of experimental licenses, rather than create a new experimental license service for the bands above 95 GHz.

For example, eligibility rules for the Commission's Program and Conventional experimental licenses could be made more flexible as long as license applicants continue to

demonstrate adequately to Commission staff that they are qualified to conduct wireless experimentation. The Commission could also lengthen its license terms for all types of experimental licenses, while potentially using midterm reporting requirements to ensure that adequate supervision is maintained.

Boeing questions, however, whether it would be appropriate to permit for-profit sales of experimental devices to consumers during product development and marketing trials. The Commission's existing rules provide adequate flexibility to permit licensees to make experimental wireless devices available to third parties, while ensuring that the operations of such devices remain under the realistic supervision and control of licensees and the Commission.

Boeing also opposes allowing experimental licensees to produce and sell an unlimited number of experimental devices to third parties. The Commission's existing rules already permit experimental license applicants to identify the number of experimental devices that will be needed for product development and marketing trials, subject to the review and approval of the Commission staff. No reason exists to remove the Commission staff from this approval process, particularly if experimental licensees are permitted to sell the devices they produce for a profit.

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To: The Commission

**COMMENTS OF  
THE BOEING COMPANY**

The Boeing Company (“Boeing”) provides these comments in response to the Commission’s Notice of Proposed Rulemaking (“NPRM”) addressing the use of frequency bands above 95 GHz for experimentation, innovation, and commercial applications.<sup>1</sup> As a global leader in the design and manufacture of aircraft and aerospace systems, Boeing employs a very wide range of wireless systems – including systems operating in millimeter wave (“mmW”) spectrum – for research and development, for worker safety and automated manufacturing, for aircraft flight testing, and incorporated within the operational systems of each aircraft, defense system, and space vehicle manufactured by Boeing. Because of this critical dependency on spectrum resources, Boeing holds more Office of Engineering and Technology (“OET”) experimental licenses than

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<sup>1</sup> In the Matter of Spectrum Horizons, *et al.*, ET Docket No. 18-21, *Notice of Proposed Rulemaking*, FCC 18-17 (Feb. 28, 2018) (“*NPRM*”).

any other company and also employs additional spectrum resources on behalf of federal agencies under NTIA frequency assignments to, among other things, test and certify wireless communications systems installed in the commercial and governmental aircraft and satellites it manufactures at sites throughout the United States.

Boeing routinely provides comment to the Commission on rulemakings and public notices intended to improve the Commission's regulatory processes (such as its experimental licensing rules) and to optimize its management of scarce spectrum resources to facilitate the growth of new licensed and unlicensed communications services, while ensuring the safe and reliable operation of existing spectrum uses supporting public safety, inclement weather forecasting, disaster relief, aircraft navigation and landing systems, flight testing, radar, precision location, and satellite broadband and video distribution, and other important services.

Consistent with these goals, Boeing generally supports the Commission's initiatives involving frequency assignments above 95 GHz, but urges caution to ensure that any actions that are taken by the Commission in this proceeding do not threaten the integrity of critical spectrum uses that already employ spectrum above 95 GHz. The Commission should also ensure that its actions do not impede the development of new communications services that will require access to frequency bands above 95 GHz, but may not fit neatly within the Commission's current service and regulatory classifications. Although the Commission should make available large portions of spectrum above 95 GHz for near term innovation and development, the Commission should also continue to conserve even larger portions of this spectrum, protecting it for green field opportunities involving future generations of researchers, scientists, technologists, and entrepreneurs.



**I. AS THE NPRM APPROPRIATELY ACKNOWLEDGES, SOME OF THE BANDS ABOVE 95 GHZ ARE ALREADY USED FOR CRITICALLY IMPORTANT SATELLITE SERVICES THAT MUST BE PROTECTED**

The NPRM acknowledges that important passive satellite services are already operating in frequency bands above 95 GHz. As the NPRM explains, “[b]ecause of the importance of the passive services, any rules adopted by the Commission must ensure their continued protection from harmful interference, including that from adjacent bands.”<sup>2</sup>

Some of these passive operations are for pure research, but other applications provide critically important data that is used on a continuous basis to protect public safety and property. For example, according to data published by the World Metrological Organization (“WMO”),<sup>3</sup> there are currently seven U.S. Earth Exploration Satellite Service (“EESS”) missions maintained by NASA and NOAA, and an additional four missions maintained by ESA and EUMETSAT, that employ spectrum above 95 GHz. These EESS missions collect atmospheric data that is incorporated into various weather models that are used by the National Weather Service, along with airlines, major industry, national and local governments and other organizations to ascertain future weather conditions and to plan appropriately.

The NPRM repeatedly affirms that these passive services must be protected,<sup>4</sup> but the NPRM also acknowledges that we have not yet identified the appropriate interference modeling tools that will be needed to ensure that this protection is adequately achieved.<sup>5</sup> Thus, the NPRM seeks comment on the appropriate methodology for modelling interference to the EESS and other

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<sup>2</sup> *Id.*, ¶ 42.

<sup>3</sup> See <http://www.wmo-sat.info/oscar/> (last visited April 26, 2018).

<sup>4</sup> See *NPRM*, ¶ 4.

<sup>5</sup> See *id.*, ¶ 45.

passive services, including considerations involving atmospheric attenuation in the various bands above 95 GHz, and environmental propagation, such as the impact of foliage and building clutter.<sup>6</sup>

These issues must be resolved before service rules are adopted by the Commission and commercial services deployed in the bands above 95 GHz, particularly in those bands that are shared with or adjacent to passive allocations. For example, the NPRM requests comment on a number of questions regarding whether it would be appropriate to adopt technical requirements for fixed services (“FS”) in the bands above 95 GHz that are more permissive than the rules that currently exist for FS operations in the 70 and 80 GHz bands.<sup>7</sup> Boeing submits that it would not be appropriate to address such questions until the threshold issues regarding the appropriate means to model interference into passive services in these frequency bands have been resolved to the satisfaction of the critical interests involved.

## **II. BOEING SUPPORTS MAKING ADDITIONAL SPECTRUM AVAILABLE FOR FIXED SERVICES IN CERTAIN BANDS ABOVE 95 GHZ WITH APPROPRIATE PROTECTIONS AND RESERVATIONS FOR EXISTING AND FUTURE SATELLITE SERVICES**

Boeing recognizes the significant public interest benefits that can be achieved through the development and operation of FS links that would be able to transport very large amounts of data at extremely high speeds using spectrum above 95 GHz. Such FS networks could be used for 5G backhaul and other services, such as real-time video streaming between multiple locations of complex activities involving design, manufacturing, scientific research and medicine. For this

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<sup>6</sup> *See id.*

<sup>7</sup> *See id.*, ¶¶ 33-38.

reason, Boeing supports the eventual adoption of service rules for FS in the 36 GHz of spectrum identified in the NPRM<sup>8</sup> that is not shared with satellite communications services.<sup>9</sup>

Boeing also concurs that the rules for FS in the identified 36 GHz of spectrum potentially could be based on the FS rules for the 70 and 80 GHz bands.<sup>10</sup> As noted above, however, caution must be exercised to ensure that FS transmissions do not endanger the critical operations of passive services operating in the same or adjacent frequencies. Consistent with this, the Commission should not relax the operational rules for FS in these frequency bands absent the completion of technical studies showing that such changes in the rules would not increase interference into other existing and anticipated co-primary uses of these frequencies.<sup>11</sup> The Commission should also refrain from authorizing point-to-multipoint services in the bands above 95 GHz until there is some indication of a need for such services using this spectrum.<sup>12</sup> Point-to-multipoint services are already authorized in lower spectrum bands (such as the Local Multiple Distribution Service at 28 GHz) and are largely unused for such services.

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<sup>8</sup> *Id.*, ¶ 31. These frequency bands include the 95-100 GHz, 102-109.5 GHz, 111.8-114.25 GHz, 122.25-123 GHz, 130-134 GHz, 141-148.5 GHz, 151.5-158.5 GHz, 174.5-174.8 GHz, 231.5-232 GHz, and 240-241 GHz bands.

<sup>9</sup> Although some of the 36 GHz of spectrum (5.05 GHz) is shared with the inter-satellite service (“ISS”), *see id.*, ¶ 49, sharing between FS and ISS in these high frequency bands should not be a problem.

<sup>10</sup> *See id.*, ¶¶ 31-33.

<sup>11</sup> *See id.*, ¶¶ 34-38.

<sup>12</sup> *See id.*, ¶ 38.

**A. The Commission Should Refrain from Authorizing FS in any of the 66.2 GHz of Spectrum That is Shared With Satellite Communications Services**

In light of the Commission’s proposal to make 36 GHz of spectrum available for FS in the bands above 95 GHz, it would not be appropriate to introduce FS into any portion of the 66.2 GHz of spectrum that is shared with the service or feeder links for the fixed satellite service (“FSS”) or the mobile satellite service (“MSS”).<sup>13</sup> FS operators have not yet begun using the initial 36 GHz and therefore do not need access to the additional 66.2 GHz. In fact, the FS industry is only lightly using its existing millimeter wave allocations in the 71-76 and 81-86 GHz bands.<sup>14</sup> Further, the initial 36 GHz of spectrum available for FS above 95 GHz is spread throughout the 95-275 GHz range (and primarily at the lower end of the range) providing sufficient opportunities for innovative new FS applications without any need for access to the remaining 66.2 GHz.

If the FCC concludes, however, that FS does need access to a portion of the 66.2 GHz of shared spectrum, the issue of sharing with satellites should be addressed in an identical manner as the FCC did with respect to the 70 and 80 GHz bands. Specifically, in that proceeding, the FCC simply placed FS operators on notice that “future operations of satellite and satellite earth stations

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<sup>13</sup> See *id.*, ¶ 38.

<sup>14</sup> As the FCC explained in its first Spectrum Frontiers Order and FNPRM, “the [71-76 and 81-86 GHz] bands are relatively lightly used both in terms of the number of registered sites (especially on a large geographic scale) and with respect to the quantity of spectrum available” and “the great majority of existing links in the bands are concentrated in just a few localities.” In the Matter of Use of Spectrum Bands Above 24 GHz For Mobile Radio Services, *et al.*, GN Docket No. 14-177, *Report and Order and Further Notice of Proposed Rulemaking*, FCC 16-89, ¶ 432 (Jul. 14, 2016) (“*Spectrum Frontiers Order*”).

could be permitted in the 71-76 GHz and 81-86 GHz bands” on a shared basis with existing services.<sup>15</sup> The same approach would be adequate and appropriate for the bands above 95 GHz.

**B. The Commission Should Not Authorize Mobile Services in the Bands Above 95 GHz**

The Commission should refrain at this time from authorizing mobile services in any portion of the bands above 95 GHz, particularly those that are shared with satellite communications services.<sup>16</sup> The FCC just compiled a substantial record in the Spectrum Frontiers proceeding that supported the FCC’s conclusion to refrain from authorizing mobile use in the 70 and 80 GHz bands due to the uncertainties surrounding the use of such high frequencies for mobile services and the inability for mobile services to protect FS operations that will be needed to support terrestrial 5G backhaul.<sup>17</sup> These same conclusions are fully applicable to the bands above 95 GHz. Instead, if the Commission believes it is necessary to identify spectrum above 95 GHz for mobile experimentation, the bands should be limited to discrete frequency segments that implicate few sharing concerns, such as in portions of the 102-109.5 GHz, 111.8-114.25 GHz, 130-134 GHz, or the 151.5-158.5 GHz bands.

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<sup>15</sup> In the Matter of Allocations and Service Rules for the 71-76 GHz, 81-86 GHz and 92-95 GHz Bands, WT Docket No. 02-146, *Report and Order*, FCC 03-248, ¶ 63 (Nov. 4, 2003) (“70/80/90 GHz Order”).

<sup>16</sup> *NPRM*, ¶ 41.

<sup>17</sup> In the Matter of Use of Spectrum Bands Above 24 GHz For Mobile Radio Services, *et al.*, GN Docket No. 14-177, *Second Report and Order, Second Further Notice of Proposed Rulemaking, Order on Reconsideration, and Memorandum Opinion and Order*, FCC 17-152, ¶¶ 198-200 (Nov. 22, 2017) (“*Spectrum Frontiers Second Order*”) (observing that commenting parties “initially raised considerable doubt about the advisability and desirability of introducing mobile services into the 70/80/90 GHz bands in the near future” and there is little consensus among the proponents of mobile use as to how to coexist with fixed links”).

**C. The Commission Should Not Impose Inappropriate and Unnecessary Restrictions on Satellite Earth Stations in the Bands Above 95 GHz**

There is no justification for the Commission to impose in the bands above 95 GHz its recently adopted restrictions regarding the geographic placement of individually-licensed satellite earth stations.<sup>18</sup> The earth station siting restrictions that were adopted in the Spectrum Frontiers proceeding for the 28 and 37/39 GHz bands were premised on an assumption that wide area mobile 5G networks would operate in these frequencies.<sup>19</sup> Regardless of whether that assumption was valid for the 28 and 37/39 GHz bands, it clearly is not a valid assumption with respect to the bands above 95 GHz. The propagation characteristics in these bands are very short range,<sup>20</sup> and any mobile use of the bands above 95 GHz will necessarily involve very short range devices operating in relatively controlled environments. Thus, significant restrictions on the placement of satellite earth stations will not be necessary even in shared bands where mobile services may be authorized.

Earth station siting restrictions would also not be justified by the potential operation of FS in portions of the 66.2 GHz of frequencies that are shared between FS and FSS or MSS. As the Commission acknowledges, FS and FSS networks have been able to share spectrum successfully in other frequency bands (such as the 10.7-11.7 GHz and the 12.7-13.25 GHz bands) using a site-by-site coordination approach<sup>21</sup> and should be able to do so as well in the bands above 95 GHz. Instead, the most appropriate approach is the one employed in the 70 and 80 GHz bands, which –

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<sup>18</sup> See *NPRM*, ¶ 46.

<sup>19</sup> See *Spectrum Frontiers Second Order*, ¶ 130 (explaining that “[t]he wide bandwidths that are available to terrestrial services in the 28 GHz and 37.5-40 GHz bands will support vital new terrestrial services on roads, railroads, and mass transit routes, and at ports, major event venues, homes and offices”).

<sup>20</sup> *NPRM*, ¶ 22.

<sup>21</sup> See *id.*, ¶ 39.

as noted above – was simply to place FS operators on notice that the bands with shared satellite allocations may be used on a co-primary basis by satellite services in the future.

**D. The NPRM Neglects to Identify Necessary Spectrum Allocations Above 95 GHz for the Operation of Satellite End User Terminals**

The same technological developments that are enabling the use of much higher frequency bands for terrestrial-based communications services are also applicable to satellite services. As a result, broadband satellite networks will require preferential access to a significant amount of spectrum above 95 GHz for Earth-to-space uplink communications to support ubiquitously placed satellite end user terminals. This spectrum should be identified on a paired basis with the existing primary downlink allocation for FSS and MSS in the 123-130 GHz band, which is not shared with FS or mobile services.

For example, at least 7 GHz of spectrum could be identified within the lower portion of the existing primary FSS allocation between 209-226 GHz as primarily intended for satellite end user terminal uplink operations. Although it may be possible to share the uplink portion of this satellite spectrum with FS, such sharing considerations do not need to be resolved during this proceeding. Instead, the Commission should identify all or a portion of the 209-226 as primary available for satellite services that will be developed in the future. Such action will ensure that the expansive and uninterrupted geographic coverage capabilities of satellite services will be able to bring the future broadband applications and services that will be developed using the frequency bands above 95 GHz to all consumers regardless of where they are located.

**III. THE COMMISSION SHOULD IDENTIFY ADDITIONAL SPECTRUM IN THE BANDS ABOVE 95 GHZ FOR UNLICENSED USE**

The NPRM acknowledges the need to identify spectrum that can be made available for unlicensed operations above 95 GHz. As the Commission has recently observed, unlicensed

spectrum has become extremely important to “encourage the development of new and innovative unlicensed applications” and also to “alleviate spectrum congestion from carrier licensed networks by enabling mobile data off-loading through Wi-Fi and other unlicensed connections.”<sup>22</sup> Given the importance of these measures, Boeing questions whether the NPRM’s proposal to make 15.2 GHz of spectrum above 95 GHz available for unlicensed use is sufficient. Such an identification would make less than 10 percent of the frequency bands between 95 and 275 GHz available for unlicensed innovation and operation.

Like others manufacturers, Boeing is attempting to meet a critical need for additional unlicensed spectrum capacity on its factory floors and within the aircraft that it manufactures. Boeing’s manufacturing facilities employ modern tooling and fabrication machines that rely on wireless data links to receive instructions, report status, and communicate among themselves. The increases in efficiency made possible through these improvements in communications and control is driving still greater adoption.

In some Boeing locations, current operations effectively use the entire available unlicensed spectrum. For instance, Boeing’s Everett, Washington site is the largest manufacturing building in the world, accommodating thousands of aerospace employees to support aircraft fabrication, production and assembly, product development, aviation safety and security and airplane certifications for the 747, 767, 777, and the 787 airplanes. Each of these tasks employs machines and data systems that require reliable access to unlicensed spectrum. Today, however, existing operations have practically exhausted the available unlicensed spectrum at the Everett site. Boeing is therefore exploring the use of unlicensed data communications systems in mmW frequency bands in order to provide increased capacity and transmission speed.

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<sup>22</sup> *Spectrum Frontiers Second Order*, ¶ 157; see also *Spectrum Frontiers Order*, ¶¶ 125-26.



Boeing is also exploring the use of mmW spectrum for very short range communications links involving large amounts of data onboard aircraft. The passenger cabin of large commercial aircraft is quickly becoming the most congested wireless operational environment in the world, with hundreds of seated passengers using personal wireless devices to simultaneously access video and internet content using the same inflight wireless network.

The aircraft infrastructure is also exponentially increasing its consumption of wireless spectrum capacity for aircraft operations. With each new aircraft model that Boeing develops, Boeing is greatly increasing the number of small wireless sensors inside the airframe in order to monitor structural integrity, system status, and to collection data for flight operations. As the NPRM suggests, Boeing is also exploring the potential capabilities of chip-to-chip communications,<sup>23</sup> which is a very attractive application for the aerospace industry in order to increase processing power, while helping to eliminate circuitry weight and installation complexity.

Consistent with these developments, the Commission should consider permitting unlicensed use in additional frequency bands above 95 GHz, such as the 116-122 GHz band, which could successfully be employed on a shared basis with the inter-satellite service and may also be able to share with the passive services that are allocated in this spectrum.<sup>24</sup> The Commission should also consider the use of other spectrum allocations for unlicensed operations, such as certain of the 36 GHz of spectrum that is identified in the NPRM for FS. The fixed and mobile allocations in these bands could be used to support fixed and mobile unlicensed devices, while still leaving sufficient spectrum for traditional licensed FS links.

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<sup>23</sup> See NPRM, ¶ 13.

<sup>24</sup> See *id.*, ¶ 57.

In identifying additional spectrum for unlicensed devices above 95 GHz, the Commission should strive to ensure that such spectrum is not immediately adjacent to passive bands where RF emissions are barred pursuant to Footnote US246 in order to protect passive monitoring services. Although unlicensed operations may be able to operate adjacent to these restricted frequencies in some circumstances (such as inside buildings), the proximity to passive bands may prevent their use onboard aircraft, satellites, or other aerospace systems. Thus, additional unlicensed spectrum should be identified in the bands above 95 GHz that is not shared with passive or satellite services in order to permit their deployment and use on aircraft, satellites, or other aerospace systems to support operational, monitoring, and entertainment distribution systems.

#### **IV. RATHER THAN CREATE A NEW TYPE OF EXPERIMENTAL LICENSE, THE COMMISSION SHOULD MAKE APPROPRIATE CHANGES TO ITS EXISTING EXPERIMENTAL LICENSE RULES**

Boeing acknowledges that considerable experimentation and innovation will be necessary to develop new applications and services that successfully employ frequency bands above 95 GHz. Boeing questions, however, whether the creation of a new type of experimental radio license is actually needed to encourage such innovation. Instead, the Commission should consider whether improvements may be appropriate with respect to its rules and procedures for the Commission's existing classes of experimental licenses.

With Boeing's active encouragement, the Commission created several new types of experimental licenses in recent years, including Program, Medical Testing, and Compliance Testing experimental licenses.<sup>25</sup> These new classes are in addition to the Commission's existing

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<sup>25</sup> See 47 C.F.R. § 5.54.

experimental license types, include Conventional experimental licenses, Broadcast experimental licenses, and grants of Special Temporary Authority.<sup>26</sup>

Based on the Commission's experimental licensing records, however, it would appear that the Conventional experimental license is still the preferred authorization vehicle for most experimental applicants. For example, during the twelve months ending April 1, 2018, OET received applications for 499 Conventional experimental licenses, 35 Program experimental licenses, nine Compliance experimental licenses, and just three Medical experimental licenses (two of which were denied). Therefore, the Commission probably should exercise some reluctance before creating any more types of experimental licenses in the foreseeable future.

The NPRM observes that only thirteen experimental licenses have been granted by OET for bands above 95 GHz. As the holder of one of those licenses, Boeing believes that the Conventional experimental licensing process continues to be adequate for securing authorizations for operations above 95 GHz and the creation of a new type of licensing process would not have prompted Boeing (or anyone else) to secure any additional experimental licenses. Simply put – although overly burdensome regulations can discourage innovation, very permissive regulations are unlikely to prompt innovation that was not already contemplated by the party.

Instead, in order to adequately encourage innovation in wireless technologies – including in the bands above 95 GHz – Boeing suggests that the Commission take the following measures. First, the Commission should exercise increased diligence in ensuring that the OET Experimental Licensing Branch is maintained at its full staffing levels. Significant fluctuations in the number of processing engineers within the FCC's Experimental License Branch can have very noticeable impacts on the length of time required to secure Commission approval for experimental operations.

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<sup>26</sup> *See id.*

Second, the Commission should ensure that the rules for its existing experimental licenses are as flexible as possible, recognizing the Commission’s statutory obligation to manage the use of spectrum resources and to ensure that licensed services are protected adequately from harmful interference. To this end, Boeing believes that some (but not all) of the proposals in the NPRM for the newly proposed “Spectrum Horizons Experimental Radio License” may be suitably applied to existing types of experimental licenses.

**A. Boeing Concurs With the Commission’s Proposal to Relax its Eligibility Requirements for Experimental Licenses**

The Commission’s rules currently restrict the grant of experimental licenses “only to persons qualified” to conduct such experiments, “including testing laboratories recognized by the Commission for radio frequency device testing.”<sup>27</sup> The Commission also imposes additional qualification requirements on applicants for several of its new experimental license services, such as restricting the grant of Program experimental licenses to accredited research colleges and laboratories, health care institutes, and radio equipment manufacturers.<sup>28</sup>

Boeing questions whether these latter restrictions are necessary. Instead, rather than create a new experimental license type for frequency bands above 95 GHz, the Commission should reduce its eligibility restrictions for Program experimental licenses in order to permit a broader range of applicants to secure such authorizations.

The Commission’s application review process for experimental licenses – in which OET engineers review and approve the technical showing for each application – effectively ensures that only qualified parties (*i.e.*, those who are sufficiently competent to prepare a credible technical

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<sup>27</sup> 47 C.F.R. § 5.51.

<sup>28</sup> 47 C.F.R. § 5.302.

showing) are granted experimental licenses. Therefore, a relaxation of the eligibility requirements should not create a risk that unqualified parties may secure experimental authorizations.

**B. Boeing Also Concurs With the Commission's Proposal to Extend the License Term for Experimental Authorizations**

The Commission's experimental licensing rules authorize the grant of experimental authorizations for relatively brief periods, ranging from one year for Broadcast experimental licenses and two years for most Conventional experimental licenses, to five years for Program, Medical Testing and Compliance Testing experimental licenses.<sup>29</sup> The Commission has previously acknowledged that the relatively brief license terms for some of these experimental licenses "can be cumbersome for applicants who wish to pursue ongoing research and can significantly delay the introduction of new technologies and services into the marketplace."<sup>30</sup> Unfortunately, the Commission has not taken action to resolve this problem by extending the license term for all types of experimental authorizations.

In raising this issue, Boeing acknowledges that OET retains authority to grant Conventional experimental licenses for periods of five years if justification for a longer license term is presented by the applicant.<sup>31</sup> In addition, the Commission routinely and expeditiously grants renewals of existing experimental licenses. Nevertheless, it would be significantly less burdensome (both for

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<sup>29</sup> 47 C.F.R. § 5.71.

<sup>30</sup> Promoting Expanded Opportunities for Radio Experimentation and Market Trials under Part 5 of the Commission's Rules and Streamlining Other Related Rules, ET Docket No. 10-236, 2006 Biennial Review of Telecommunications Regulations – Part 2 Administered by the Office of Engineering and Technology, ET Docket No. 06-155, *Report and Order*, FCC 13-15, ¶ 8 (2013).

<sup>31</sup> 47 C.F.R. § 5.721(a)(1).

experimental licensees and the Commission staff) if an option was created for applicants to request the grant of longer license terms for all types of experimental authorizations.

In proposing that the Commission permit applicants to request longer license periods, Boeing is not necessarily endorsing the proposal in the NPRM for an experimental license period of up to ten years.<sup>32</sup> A full decade seems like an excessively long time during which no communications might take place between an experimental licensee and its regulators within the Commission. Instead, an experimental license term of seven or eight years may be more appropriate in most cases. Further, the Commission should reaffirm its existing requirement that some form of confidential progress report, however brief, be filed with the Commission at the midway point of a seven, eight or ten year experimental licensing term.<sup>33</sup> In this way, the Commission can maximize the flexibility for experimental licensees, while maintaining its supervisory role over the experimental use of scarce spectrum resources.

**C. Permitting the Third Party Sale of Experimental Wireless Devices Would Adversely Impact the Commission's Ability to Ensure Such Devices are Properly Controlled**

Although the NPRM identifies several unique characteristics for its proposed Spectrum Horizons Experimental Radio License, by far the most significant change would be allowing the sale of wireless devices that are produced and tested pursuant to an experimental authorization.<sup>34</sup> Boeing has significant concerns about this proposal.

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<sup>32</sup> See NPRM, ¶ 79.

<sup>33</sup> See 47 C.F.R. § 5.73.

<sup>34</sup> See NPRM, ¶ 74.

Boeing frequently agrees to test new technologies and wireless devices produced by third parties to determine if they could be commercialized and incorporated into Boeing's aerospace products and services. In undertaking these experiments, Boeing's Global Spectrum Management team is careful to ensure that all such test operations are conducted in a manner that is compliant with the Commission's rules and the conditions of the relevant experimental license. Boeing is uncertain, however, whether all companies (and individual entrepreneurs) are routinely as careful in their management and control of experimental wireless technologies.

The sale of an experimental wireless device by the experimental licensee to a third party would invariably prevent either the licensee or the Commission from maintaining even minimal supervision and control over the device and its operations. Once sold, the device could be subject to further modifications, or subsequent sales to unsuspecting parties. Although the NPRM proposes that purchasers must receive a written disclosure that the device is experimental,<sup>35</sup> such disclosure may be inadequate to convey a clear understanding to the purchaser that the device has not received formal FCC approval, and may not be safe or reliable. Instead, the current approach of requiring the holder of the experimental license to retain ownership of the device<sup>36</sup> (effectively "loaning" or "leasing"<sup>37</sup> it to the recipient) ensures that the proper level of control is maintained and that the device can be retrieved and its emissions suspended in the event that harmful interference is detected.

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<sup>35</sup> A written disclosure requirement already exists in the Commission's rules for experimental equipment that is provided to third parties on a non-sold basis. *See* 47 C.F.R. §5.601(b).

<sup>36</sup> *See* 47 C.F.R. §5.601(a) and 5.602(d) (requiring that, unless otherwise approved by the Commission, all transmitting and/or receiving equipment used in the study shall be owned by the licensee).

<sup>37</sup> *See* 47 C.F.R. §5.602(d)(2).

**D. No Need Exists to Change the Commission's Experimental Rules Regarding the Number of Experimental Devices that are Produced by a Licensee**

The second major change proposed in the NPRM is permitting experimental licensee to decide just how many experimental devices should be sold in a marketing trial.<sup>38</sup> In considering this change, it should be emphasized that the FCC's rules already permit experimental licensees to identify the number of experimental devices that they would like to use in a marketing trial, but OET must approve the proposed number as a condition to the grant of the experimental license.<sup>39</sup> Thus, the NPRM proposal appears only to remove the FCC's Experimental Licensing Branch from its supervisory role in this decisional process.

The NPRM speculates that, even in the absence of OET supervision, experimental licensees will have adequate incentive to limit the number of experimental devices that they market in order to limit their financial risk.<sup>40</sup> This incentive is lost, however, if the licensee is permitted to sell experimental devices for a profit, rather than just loan them to market trial participants. Instead, experimental licensees will have every incentive to produce as many experimental devices as they can profitably sell to third parties.

The problem will be made even worse if the Commission adopts its NPRM proposal to lengthen the term for Spectrum Horizon experimental licenses to ten years. Most models of wireless devices today have complete product life cycles of less than ten years (from the date of their first development to suspension of sales). Thus, allowing experimental licensees to produce

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<sup>38</sup> See *NPRM*, ¶ 74.

<sup>39</sup> See 47 C.F.R. § 5.601(d) and 5.602(f) (indicating that the size and scope of product development or marketing trial experiment is subject to such limitations as the Commission may establish on a case-by-case basis).

<sup>40</sup> See *NPRM*, ¶ 75.



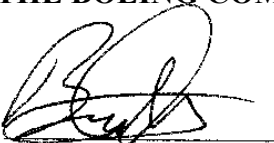
and sell for a profit an unlimited number of experimental devices over a period of ten years could easily result in repeated “market trials” that are never converted into formally certified and licensed products under other sections of the Commission’s rules. Such a result would arguably remove the Commission from its statutory obligation to effectively manage the use of scarce spectrum resources and also prevent the Commission from ensuring that harmful interference does not result into critically-important licensed services.

## **V. CONCLUSION**

Boeing appreciates the initiative of the Commission in exploring spectrum opportunities in the bands above 95 GHz. In facilitating these opportunities, the Commission should ensure the protection of satellite sensing and passive services already using portions of this spectrum, while identifying sufficient capacity for satellite communications and unlicensed services that will be developed to operate in these frequencies. The Commission should also seek to encourage experimental innovation in wireless technologies by identifying improvements and suitable opportunities for additional flexibility in its existing experimental licensing rules rather than try to introduce a new band-specific experimental radio license service.

Respectfully submitted,

**THE BOEING COMPANY**

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