

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

In the Matter of )  
)  
Use of Spectrum Bands Above 24 GHz For ) GN Docket No. 14-177  
Mobile Radio Services )  
)  
Establishing a More Flexible Framework to ) IB Docket No. 15-256  
Facilitate Satellite Operations in the 27.5-28.35 )  
GHz and 37.5-40 GHz Bands )  
)  
Petition for Rulemaking of the Fixed Wireless ) RM-11664  
Communications Coalition to Create Service )  
Rules for the 42-43.5 GHz Band )  
)  
Amendment of Parts 1, 22, 24, 27, 74, 80, 90, ) WT Docket No. 10-112  
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 )

To: The Commission

**COMMENTS OF  
THE BOEING COMPANY**

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## SUMMARY

As a world leader in the design and manufacture of aircraft, satellites and space systems, The Boeing Company (“Boeing”) has substantial experience in developing and deploying state-of-the-art aerospace technology and reliable, high-speed communications systems. This proceeding examines the use of higher frequency bands above 24 GHz for mobile and other uses, including considerations affecting the future of satellite services and in-flight communications. Boeing supports the Commission’s overarching goal of facilitating more efficient and intensive use of higher frequency bands. The Commission should not, however, pursue expansion of 5G terrestrial services at the expense of other critical services, including satellite communications systems.

In particular, the Commission should ensure that any identification of spectrum for 5G technologies protects the growth of existing and near-term satellite communications services. Next-generation satellite communications systems are able to use scarce spectrum resources in the most efficient and effective manner, while providing innovative and universally available broadband and “on the move” services that are highly beneficial to consumers. To this end, the Commission should reconsider its apparent decision to authorize 5G mobile operations in the 27.5-28.35 GHz Ka-band (“28 GHz band”). Instead, the Commission should expand the authority of satellite services to operate in this spectrum on a primary basis. The Commission should also refrain from introducing 5G technologies in the 37-38.6 GHz (“37 GHz band”) and the 38.6-40 GHz band (“39 GHz band”) until the international community has completed the studies called for by the 2015 World Radiocommunication Conference on the potential use of the 37 and 39 GHz bands for satellite, 5G terrestrial, or a combination of both services.

The Commission should adopt its longstanding proposal to authorize fixed satellite service (“FSS”) operations in the 42.0-42.5 GHz band. This band is contiguous with an existing FSS allocation and could be used effectively and efficiently for this purpose. FSS is also well prepared to protect adjacent radioastronomy operations, such as through the use of spot beams to selectively transmit to limited geographic areas.

The Commission can also make the most of limited spectrum by extending its rules for the FSS to permit the use of transmit/receive terminals on mobile platforms in the 28 GHz band. Aeronautical and other “on the move” satellite communications systems operating in the Ku-band, designed by Boeing and others, have already demonstrated their “extreme precision and reliability” that the Commission appropriately expects. Thus, there are no technological barriers to such expanded use of the Ka-band.

Boeing also supports expanding the spectrum that is available for Part 15 unlicensed operations. Permitting Part 15 operations in the 64-71 GHz band by non-federal users will provide more opportunities for the development and marketing of industrial and consumer equipment that utilize unlicensed wireless communications for function and user control. Likewise, authorizing Part 15 operations in the 57-71 GHz band on board aircraft can benefit airline passengers and aircraft operators while continuing to protect radio astronomy services.

Each of these measures will promote the Commission’s goal of facilitating more efficient and intensive use of higher frequency bands, while ensuring that future 5G terrestrial services do not interfere or impair the operation or growth of critical satellite communications services.

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	)	
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 □

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 (“*Notice*”) examining the use of higher frequency bands for next-generation wireless services, including mobile, satellite and other uses.<sup>1</sup> Boeing supports the Commission’s initiative of addressing proactively the need for more efficient and intensive use of higher frequency bands for a variety of consumer broadband services. In addition, as a member of the Satellite Industry Association and the Global VSAT Forum ,

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<sup>1</sup> Use of Spectrum Bands Above 24 GHz For Mobile Radio Services, et al., GN Docket No. 14-177, *Notice of Proposed Rulemaking*, FCC 15-138 (Oct. 23, 2015) (“*Notice*”).

Boeing supports the comments of these organizations on this *Notice* related to the importance of ensuring the availability of spectrum resources for existing and future satellite services.

Boeing is a global leader in the design and manufacture of commercial and military aircraft, satellites and space systems, and related information and communications systems. Now in its 100<sup>th</sup> year of operation, Boeing employs more than 160,000 people across the United States and in 70 countries, and is a leading U.S. exporter with total revenue in 2015 of more than \$96 billion. Boeing provides the comments below based on its substantial experience in design, manufacturing and implementation of advanced ground, aeronautical and space communications systems and subsystems for a range of commercial and government users.

In particular, Boeing urges the Commission to reconsider its apparent assumption that 5G terrestrial services present the most efficient and beneficial use of the 27.5-28.35 GHz band (“28 GHz band”). The international satellite industry is already demonstrating in other regions of the world that this spectrum can be best used for new generations of innovative direct-to-user and “on the move” satellites communications services that can be provided on a very cost-effective and spectrally efficient basis. As the world’s largest manufacturer of commercial satellites, Boeing recognizes that the satellite manufacturing industry in the United States must remain the leader in deploying new satellite communications technologies in these higher frequency bands in order to maintain its competitive edge in the challenging commercial satellite market space. Boeing supports allocating the 42.0-42.5 GHz band to the fixed-satellite service (“FSS”). Boeing also supports extending the Commission’s approach to facilitate mobility and other broadband applications in FSS bands, including Earth Stations Aboard Aircraft (“ESAA”), in the 28 GHz band.

At the same time, Boeing supports the expansion of unlicensed Part 15 operations in the 64-71 GHz band, as well as the authorization for Part 15 operations on board aircraft in the 57-71 GHz band. As the premier manufacturer of commercial jetliners with nearly 12,000 aircraft in service worldwide, Boeing is now producing the next generation of commercial aircraft, including the Boeing 787 Dreamliner, the 737MAX, the 777X and the 747-8 Intercontinental, which include the use of wireless communications and composite materials to achieve a new benchmark in fuel efficiency and noise reduction while enhancing passenger comfort, connectivity, and convenience. Expanding unlicensed wireless operations in higher bands will further enhance the performance and communications capabilities of – and the manufacture of – next-generation commercial aircraft.

**I. NECESSARY EXPANSION OF 5G SPECTRUM SHOULD NOT COME AT THE EXPENSE OF EXISTING AND FUTURE SATELLITE OPERATIONS**

Throughout its extensive aerospace and manufacturing operations, Boeing is a heavy user of spectrum across multiples services, from satellite to business radio to fixed and mobile wireless. Boeing recognizes that, although a great deal of spectrum is already available for mobile wireless applications, the need for spectrum is constantly growing as 5G technologies are developed. At the same time, the Commission must ensure that any 5G designations will provide protection for existing satellite services and future growth of the satellite industry in order to foster the availability of new and innovative satellite-delivered communication services to consumers including mobile broadband services.

Satellite services, including both FSS and mobile-satellite service (“MSS”), fill a critical, unique role in the national and global telecommunications infrastructure. There is simply no replacement for the reach, seamless coverage, reliability, and flexibility of satellite services. For this reason, satellite is the technology of necessity for operations in remote areas, for “on the

move” operations onboard land vehicles, ships, and aircraft, and for public safety, military, and disaster relief, as well as the spectrally-efficient delivery of programming content to worldwide audiences.

It would be most unfortunate if, in its haste to lay the groundwork for development of future broadband services in the United States, the FCC took action in this proceeding that had the unintended consequence of thwarting broadband services being provided today via satellite and prevented the implementation of innovative new satellite-delivered broadband services now in development. The Commission should instead refrain from identifying spectrum for 5G that would cause interference to existing satellite operations, or would preclude growth of these critical, unique, and highly efficient satellites services.

In particular, Boeing notes that the satellite industry is making extensive use of the Ka-band for both geostationary (“GSO”) and non-geostationary (“NGSO”) satellite systems, and is developing new satellite networks that will utilize the V-band and the W-band to provide a next generation of broadband satellite communications services. Not only can these new satellite systems deliver broadband communications capabilities to small user terminals using these higher frequency bands, but they are also very spectrally efficient because multiple satellite systems can operate co-frequency using orbital separation and geographic diversity techniques.

**A. The Commission Should Benefit Consumers by Expanding the Availability of the 28 GHz Band for Highly Innovative Satellite Communications Services**

Boeing urges the Commission to reconsider its apparent decision to authorize 5G mobile operations in the 27.5-28.35 GHz band (“28 GHz band”). The Ka-band is now a core satellite band, supporting GSO, NGSO, and MSS feeder link satellite communications that are used for numerous important services, including direct-to-consumer broadband. Broadband satellite networks operating in the Ka-band have demonstrated the capability to fulfill the needs of unique

and much underserved market segments, such as providing two-way broadband to remote areas and to moving platforms, such as ships, aircraft, buses and trains. Ka-band satellite networks are also being used with tremendous success for direct-to-user broadband services that contribute greatly to the Commission's goal of facilitating universal availability of broadband connectivity.

In highlighting the tremendous capabilities of Ka-band satellites, Boeing acknowledges that, in the United States, satellite use of the 28 GHz band is designated as secondary to the Local Multipoint Distribution Service ("LMDS")<sup>2</sup> and, as a result, the band is generally being used by the satellite industry only for fixed earth stations operating as gateways or for feeder links.

In contrast, if the satellite industry were provided the regulatory certainty needed to make substantially greater use of the 28 GHz band, an abundance of new satellite communications services could be introduced in this spectrum, including broadband, "on the move," and other innovative and consumer applications. Greater satellite use of the 28 GHz band would also ensure that this spectrum benefits from a highly efficient intra-service spectrum sharing regime. The satellite industry is unmatched in its ability to share scarce spectrum resources among multiple competing satellite networks and systems. Through the use of the Commission's two-degree GSO spacing policy and employing angular separation for NGSO systems, countless independent and competitive satellite network operators can use the same spectrum to provide highly beneficial services in competition with each other, and with other communications technologies. Thus, a Commission decision to permit primary use of the 28 GHz by the satellite communications industry would greatly enhance the use of this spectrum to the significant benefit of consumers.

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<sup>2</sup> 47 C.F.R. § 25.202(a)(1) n.2.

In contrast, if the Commission elects to move forward with the creation of the proposed “Upper Microwave Flexible Use Service” (“UMFUS”), the risk of interference to innovative satellite services operating in the 28 GHz band would be prohibitive because satellite terminals would be subject to interference from “any form of fixed or mobile service.”<sup>3</sup> Further, an auction approach would preclude the use of the 28 GHz band for broadband satellite services because satellite networks operate over very wide geographic regions covering multiple countries and share scarce spectrum resources on an intra-service basis (rather than controlling spectrum exclusively in a geographic area as is the case for licensed terrestrial mobile services). Thus, imposition of the Commission’s UMFUS approach would not only cause interference to existing, widely-used Ka-band satellite services, but would also cripple new investment in such services by undermining the regulatory certainty necessary for continued technological innovation that makes the Ka-band an optimal resource for direct-to-user broadband satellite communications.

The need to preserve the Ka-band for increasingly important broadband and direct-to-user satellite services is the reason why Administrations reached global consensus at the 2015 World Radiocommunication Conference (“WRC-15”) to exclude the 28 GHz band from studies on future 5G services. Rather than resist this global consensus, consumers in the United States would ultimately be better served if the Commission recognized the benefits that could be achieved by opening the 28 GHz band for next generation satellite services and focus on other spectrum bands as more suitable – and globally available – for 5G terrestrial services. Only in this way would the Commission achieve its principal goal of identifying spectrum for 5G services that is harmonized and ubiquitously available throughout the world.

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<sup>3</sup> *Notice*, ¶ 93.

**B. The Commission Should Await the Completion of ITU Studies Before Designating the 37 GHz and 39 GHz Bands for Use by 5G Terrestrial Mobile Services**

It is premature for the Commission to identify all or a significant portion of the 37-38.6 GHz (“37 GHz band”) and the 38.6-40 GHz band (“39 GHz band”) for 5G terrestrial mobile communications. Although the Commission’s principal designation for FSS in the V-band is at 40-42 GHz, the Commission has adopted various provisions to enable FSS networks to use the 37.5-40 GHz band (encompassing most of the 37 and 39 GHz bands) on a shared basis with fixed service (“FS”) networks.<sup>4</sup>

The satellite industry has been designing and testing new space communications systems in reliance on the existing U.S. and international rules for FSS use of the 37 and 39 GHz bands and will soon seek authority to launch new satellite networks using this spectrum. WRC-15 recently confirmed the promise of satellite services in higher bands such as 37 and 39 GHz, particularly the value of these bands for the spectrally-efficient delivery of broadband services.<sup>5</sup> WRC-15 adopted a resolution calling for studies to facilitate implementation of new NGSO FSS systems, along with advanced GSO FSS networks, in these FSS downlink bands and associated uplink bands.<sup>6</sup> The U.S. delegation to WRC-15 was a leading advocate for these measures.

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<sup>4</sup> See 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, *Second Report and Order*, FCC 03-296, 18 FCC Rcd 25428 (Dec. 5, 2003) (“*V-band Second Report and Order*”).

<sup>5</sup> Resolution 161 (WRC-15) “Studies relating to spectrum needs and possible allocation of the frequency band 37.5-39.5 GHz to the fixed-satellite service” at a), b), c).

<sup>6</sup> *Id.*, Resolution 159 (WRC-15) “Studies of technical, operations issues and regulatory provisions for non-geostationary fixed-satellite services satellite systems in the frequency bands 37.5-39.5 GHz (space-to-Earth), 39.5-42.5 GHz (space-to-Earth), 47.2-50.2 GHz (Earth-to-space) and 50.4-51.4 GHz (Earth-to-space).”

Granted, the ITU is also studying the potential use of the 37-40.5 GHz band for 5G terrestrial services.<sup>7</sup> These ITU studies will almost certainly conclude that, given the fact that the 37 and 39 GHz bands are FSS downlink bands, the introduction of ubiquitously deployed terrestrial 5G base station and user device transmitters would effectively sanitize the bands and preclude any FSS deployment (for either gateway or user terminal operations). Further, as Boeing explained above with respect to the 28 GHz band, an auction approach would preclude the use of the 37 and 39 GHz bands for broadband satellite services given their wide geographic coverage and would effectively ignore the inherent intra-service sharing capabilities of these advanced FSS systems.

Given the potential harms to broadband FSS network deployment in the 37 and 39 GHz bands, and the fact that the ITU has just initiated studies on the optimal use of this spectrum for satellite, terrestrial 5G, or a combination of both, ample justification exists for the Commission to refrain from making any firm decisions about the best use of this spectrum in the United States until the ITU study processes have been substantially completed in advance of the 2019 World Radiocommunication Conference. Otherwise, the Commission will likely be forced to expend significant administrative and industry resources later revising its plan for the 37 and 39 GHz bands, just as the Commission was forced to do with respect to this V-band spectrum following the completion of the ITU World Radiocommunication Conferences in 2000 and 2003.<sup>8</sup> The more judicious approach would be to await the outcome of the ITU study processes – studies the

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<sup>7</sup> Resolution 238 (WRC-15) “Studies on frequency-related matters for International Mobile Telecommunications identification including possible additional allocations to the mobile services on a primary basis in portion(s) of the frequency range between 24.25 and 86 GHz for the future development of International Mobile Telecommunications for 2020 and beyond.”

<sup>8</sup> See *V-band Second Report and Order*, ¶ 1 (acknowledging that the Commission was updating its spectrum designations for both FSS and terrestrial fixed and mobile services in the 36.0-51.4 GHz band to reflect decisions made at WRC-2000 and WRC-2003).

United States will activity contribute to – and make spectrum identification decisions based on the carefully deliberated conclusions of the international community.

**C. The Commission Should Allocate the 42.0–42.5 GHz V-Band to the FSS**

Boeing urges the Commission to move forward with its longstanding proposal to authorize FSS in the 42.0–42.5 GHz band.<sup>9</sup> As the *Notice* acknowledges, although some 5G advocates suggest this spectrum should be examined for possible mobile use, others note that it is “of ‘no current interest’ because it is only a single 500 MHz block.”<sup>10</sup> Further, there is no ITU proposal for further study of this band for mobile use. Ubiquitous 5G deployment is also incompatible with the need to protect radioastronomy sites in the immediately adjacent band. These factors make the 42.0-42.5 GHz band a poor candidate for 5G mobile service.

In contrast, this band particularly is appropriate for use with FSS networks. First, the band is contiguous with an existing FSS allocation at 40-42 GHz, substantially increasing the value of the otherwise smaller block. The ability to utilize more spectrum on each spacecraft would reduce the cost of satellite broadband service to customers,<sup>11</sup> and make the most of the spectrum re-use capabilities of FSS operations. FSS operators are also better prepared than terrestrial mobile operators to protect radioastronomy operations in the largely co-extensive RAS allocation at 42.5-43.5 GHz.<sup>12</sup> Unlike terrestrial mobile, which is likely to be ubiquitously deployed, FSS systems can use spot beams to selectively transmit to discrete geographic areas, a difference that the Commission acknowledged in 2010 when it first proposed an FSS allocation

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<sup>9</sup> *Notice*, ¶ 77.

<sup>10</sup> *Id.*

<sup>11</sup> Comments of ViaSat, Inc., IB Docket No. 97-95, at 4 (Jan. 6, 2011).

<sup>12</sup> *Id.*, ¶ 78.

in this band.<sup>13</sup> Similarly, FSS gateway station locations can be selected to ensure adequate geographic separation from sensitive RAS sites.<sup>14</sup> Thus, FSS operations can make effective and efficient use of the 42.0-42.5 GHz band without being unduly constrained by – or representing a risk of interference to – radioastronomy operations.

**D. FSS Rules for Mobile Platforms Should Be Extended to FSS Operations in the 28 GHz Band**

Boeing strongly supports the Commission’s proposal to apply the existing FSS rules for mobile platforms, including ESAA, to FSS operations in the 28 GHz band.<sup>15</sup> Boeing pioneered the development of in-flight wireless broadband services to commercial airlines and U.S. government aircraft. As the Commission notes, the technology and applications of satellite communications on moving platforms has advanced rapidly and proactive regulatory action will help ensure continued innovation.<sup>16</sup> Mobile satellite mobility applications operating in the Ku-band, designed by Boeing and others, have already demonstrated the “extreme precision and reliability” that the Commission appropriately expects from similar devices that would operate in the Ka-band.<sup>17</sup>

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<sup>13</sup> 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, *Third Notice of Proposed Rulemaking*, FCC 10-186, ¶ 18 (Oct. 29, 2010) (“*V-Band Third NPRM*”); *see also* Comments of SIA, Docket No. 97-95, at 5 (Jan. 6, 2011).

<sup>14</sup> Comments of Telesat Canada, IB Docket No. 97-95, at 1 (Jan. 6, 2011).

<sup>15</sup> *Notice*, ¶ 159.

<sup>16</sup> *Id.*

<sup>17</sup> *Id.*

There is no technological barrier to such expanded use of the Ka-band. Indeed, the ITU has already considered the operation of earth stations in motion (“ESIMs”) in the 29.5-30.0 GHz band and found no technological reason why they cannot operate successfully using the same interference mitigation procedures and requirements already employed for operations in the Ku-band.<sup>18</sup> Accordingly, Boeing urges the Commission to open the 28 GHz band to FSS operations on mobile platforms. The same considerations also support the introduction of mobility application in higher FSS bands.

## **II. THE COMMISSION SHOULD EXPAND UNLICENSED OPERATIONS IN HIGHER FREQUENCY BANDS**

As the Commission has frequently recognized, unlicensed spectrum bands have provided tremendous greenfield opportunities for the development of new technologies and communications services that have greatly benefited both consumers and enterprise users of wireless technologies. Boeing therefore strongly supports each of the Commission’s proposals for the expansion of unlicensed opportunities in higher frequency bands.

### **A. Part 15 unlicensed operations should be permitted in the 64-71 GHz band**

Boeing joins with Ericsson, IEEE 802, InterDigital, Qualcomm, SiBeam, the Wi-Fi Alliance, and others in supporting the Commission’s proposal to authorize operations in the 64-71 GHz band under Part 15 of the Commission’s rules.<sup>19</sup> As each of these commenters indicates, adding new spectrum will increase the flexibility and capacity of unlicensed operations, which have become a critical tool for industry as well as end users.

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<sup>18</sup> Resolution 156 (WRC-15) “Use of the frequency bands 19.7-20.2 GHz and 29.5-30.0 GHz by earth stations in motion communicating with geostationary space stations in the fixed-satellite service.”

<sup>19</sup> *Notice*, ¶ 56.

For Boeing, like other major manufacturers, unlicensed wireless spectrum is a scarce and increasingly overtaxed resource. 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 utilize effectively the entire available unlicensed spectrum.

For instance, Boeing's Everett, Washington site is the largest manufacturing building in the world, enclosing 472 million cubic feet of space across 98.3 acres. The new 777X airplane program, which will feature many new wireless factory automation systems, adds another 250 million cubic feet of space for manufacturing on 40 acres. Within these facilities, thousands of aerospace employees support aircraft fabrication and production, 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, many of which require reliable access to unlicensed spectrum. Today, however, existing operations have consumed nearly all available unlicensed spectrum at the Everett site. For continued operation and future advanced manufacturing growth, Boeing facilities and others like them depend on access to increasing amounts of unlicensed spectrum. Boeing therefore urges the Commission to move forward expediently with opening the 64-71 GHz band to unlicensed use.<sup>20</sup>

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<sup>20</sup> In expressing support for Part 15 unlicensed operations in the 64-71 GHz band, Boeing observes that a primary allocation exists in the 66-71 GHz portion of the band for MSS. Although the Commission has not adopted any provisions in Part 25 of its rules authorizing MSS in the 66-71 GHz band, Boeing is investigating its potential use for such services and will communicate further with the Commission as its investigations in this regard develop.

## **B. Part 15 Operations in the 57-71 GHz Band Should be Permitted Onboard Aircraft**

Boeing agrees that the time has come to reconsider the precautionary prohibition of unlicensed transmissions in the 57-71 GHz band onboard aircraft.<sup>21</sup> Boeing has more than a decade of experience in designing, testing, and operating in-flight wireless communications components that are currently in use daily on Boeing aircraft serving U.S. government and airline customers worldwide. The low power level of onboard wireless communications devices, combined with the substantial attenuation of aircraft skin and free space losses provide a high degree of assurance that use of the 57-71 GHz band on aircraft would be imperceptible to radioastronomy stations.

As Boeing has noted in previous proceedings, the skin of modern aircraft provides a high degree of shielding, substantially reducing or effectively eliminating emissions from low-power devices used within the aircraft cabin.<sup>22</sup> Such attenuation is a natural result of aircraft fuselage construction materials, and is also intentionally enhanced to shield aircraft systems, such as on the Boeing 787 Dreamliner. Studies by the ITU have confirmed that modern aircraft can be expected to provide 35 dB of fuselage attenuation,<sup>23</sup> which includes 10 dB of attenuation to in-cabin signals above 1 GHz even under worst-case viewing angles, and up to 45 dB of attenuation

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<sup>21</sup> Notice, ¶¶ 304-306

<sup>22</sup> Comments of The Boeing Company, Expanding Access to Mobile Wireless Services Onboard Aircraft, WT Docket No. 13-301, at 4-5 (Feb. 14, 2014).

<sup>23</sup> See Compatibility analysis between wireless avionic intra-communication systems and systems in the existing services in the frequency band 4 200-4 400 MHz, Report ITU-R M.2319, Annex 1, Table A-1.4 (Nov. 2014).

for other viewing angles and non-cabin or other highly shielded areas.<sup>24</sup> These estimates are consistent with the results from Boeing’s own testing.

Given these facts, there would be no apparent benefit to limiting such devices to operation within a particular subset of this band, as considered in the *Notice*.<sup>25</sup> The substantial attenuation, free space losses, and low power levels provide adequate protection for radioastronomy stations operating throughout the 57-71 GHz band. Thus, Boeing recommends that the Commission delete the Section 15.255(a)(1) prohibition on the operation of equipment 57-64 GHz band equipment onboard aircraft.

### **III. CONCLUSION**

Boeing supports the Commission’s overarching goal of facilitating more efficient and intensive use of higher frequency bands. The Commission, however, should refrain from designating spectrum for 5G terrestrial services in spectrum that could be more effectively utilized for the growth of existing and near-term satellite communications services, including innovative satellite broadband and “on the move” services that are highly beneficial to consumers. Adopting the Commission’s longstanding proposal to authorize FSS operations in the 42.0-42.5 GHz band would make intensive use of a block that is not well suited to 5G, while taking advantage of the capabilities of FSS to protect radioastronomy operations. The Commission should also extend the existing FSS rules for mobile platforms, including ESAA, to operations in the 28 GHz band, which would be consistent with the “extreme precision and reliability” already demonstrated by existing mobile platforms in the Ku-band.

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<sup>24</sup> See Technical characteristics and spectrum requirements of Wireless Avionics Intra-Communications systems to support their safe operation, Working Party 5B, Report ITU-R M.2283-0 at 22, Table 5; see also Annex 3 (Dec. 23, 2013).

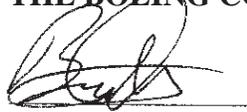
<sup>25</sup> *Notice*, ¶ 306.

Boeing further supports expanding Part 15 operation into the 64-71 GHz band in order to provide more critical unlicensed spectrum for consumers and manufacturers, and authorizing Part 15 operations in the 57-71 GHz band onboard aircraft, which can benefit end users and aircraft operators without increasing the risk of interference to radio astronomy. These measures will promote the Commission's goal of facilitating more efficient and intensive use of higher frequency bands and the development and provision of new communications services for the benefit of consumers.

Respectfully submitted,

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