

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	)	
	)	
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**

The Boeing Company (“Boeing”) provides these comments in response to the Commission’s Third Further Notice of Proposed Rulemaking (“*Third Further Notice*”) in its Spectrum Frontiers proceeding.

Throughout this proceeding, Boeing has sought to impress upon the Commission the critical importance of providing broadband satellite systems with robust access to spectrum resources in the V-band in order to enable them to implement truly global solutions to the increasingly severe broadband digital divide. Only satellites can consistently provide very high data rate broadband services to consumers in all locations, including in the very most rural and remote portions of the United States and the world. The Commission recently acknowledged the irreplaceable capabilities of broadband satellite services in its draft order on Earth Stations in Motion (“ESIM”), observing that satellite networks “enable the provision of very high data rate

broadband communications, navigation, situational awareness, and other services to mobile platforms that often cannot be served using other communications technologies.”<sup>1</sup>

Broadband satellite systems have long demonstrated their capabilities to serve consumers both in mobile and fixed locations using millimeter wave (“mmW”) spectrum resources in the Ka-band. Robust access to mmW frequencies in the V-band is additionally necessary in order to provide much faster data rates to increasingly larger populations in all locations.

Boeing is one of a number of companies that have requested Commission authority to launch and operate a non-geostationary satellite orbit (“NGSO”) satellite system operating in the fixed satellite service (“FSS”) to provide broadband communications services on a global basis. Boeing’s still pending application, file number SAT-LOA-20170301-00028, seeks to operate an NGSO system that would serve end users using 2 GHz of paired spectrum resources in the 40.0-42.0 GHz (space-to-Earth) and the 48.2-50.2 GHz (Earth-to-space) bands.

To support these end user communications, Boeing’s NGSO system requires access to at least 2 GHz of paired spectrum for individually licensed feeder link earth stations. Boeing intends to operate the space-to-Earth portion of these feeder links in the 37.5-40.0 GHz band. Boeing will additionally require access to both the 47.2-48.2 GHz *and* the 50.4-51.4 GHz (“50 GHz”) band for the Earth-to-space portion of these feeder links. Therefore, it is critically important for the Commission to provide access for individually licensed earth stations in the 50 GHz band pursuant to conditions that are no more restrictive than those that the Commission has already adopted for the 37.5-40.0 GHz and the 47.2-48.2 GHz bands. Further, given the unique propagation characteristics of frequencies in the 50 GHz range, ample justification exists

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<sup>1</sup> Amendment of Parts 2 and 25 of the Commission’s Rules to Facilitate the Use of Earth Stations in Motion Communicating with Geostationary Orbit Space Stations in Frequency Bands Allocated to the Fixed Satellite Service, IB Docket No. 17-95, *Draft Report and Order and Further Notice of Proposed Rulemaking*, FCC-CIRC1809-08, ¶ 2 (Rel. Sept. 15, 2018).

to adopt less stringent numeric limits for individually licensed earth stations in the 50 GHz band than were previously adopted for lower mmW frequencies.

**I. V-BAND SATELLITE OPERATORS NEED THE ABILITY TO OPERATE GREATER NUMBERS OF INDIVIDUALLY LICENSED EARTH STATIONS IN THE 50 GHZ BAND**

As noted above, Boeing is proposing to operate its NGSO satellite system using the 40.0-42.0 GHz band for downlink (space-to-Earth) communications to ubiquitously deploy end user terminals throughout the United States and the world. As the Commission is aware, consumers of nearly all digital broadband services receive vastly more data than they transmit. Therefore, the downlink communications path is the most heavily used transmission link in a broadband satellite network.

To support downlink transmissions to end users, all satellite operators require at least matching (if not greater) access to frequency resources for uplink (Earth-to-space) communications from individually licensed feeder link earth stations up to the satellites and then down to end users. The Commission previously made available the 47.2-48.2 GHz band for these uplink transmission links, but with very significant restrictions on the numbers and placement of earth station facilities.<sup>2</sup> Therefore, significantly more spectrum is needed for the operation of uplink transmission links from individually licensed feeder link earth stations, with less stringent restrictions on the numbers of such earth stations and their geographic placement.

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<sup>2</sup> Although the 48.2-50.2 GHz band is technically also available for individually licensed earth stations, all of this spectrum will be needed for the uplink transmission path of blanket licensed end user satellite terminals.

As a partial step to address this imbalance, Boeing petitioned the Commission to create a co-primary allocation for FSS in the 51.4-52.4 GHz band, which is adjacent to the co-primary FSS allocation that already exists in the 50.4-51.4 GHz band.<sup>3</sup> Boeing's petition remains pending before the Commission and, although the *Third Further Notice* acknowledges Boeing's petition, it expressly refrains from seeking comment on this proposal.<sup>4</sup>

As a second step to correct this imbalance, Boeing's proposed NGSO system will employ inter-satellite links (both between the satellites within Boeing's constellation and with other satellite systems) in order to allow greater flexibility in the geographic placement of individually licensed feeder link earth stations and to potentially reduce the number of feeder link earth stations that will be required. Even employing these measures, however, Boeing's NGSO system will still need to operate substantial numbers of individually licensed feeder link earth stations in the V-band, necessitating the coordination of their placement with licensees in the Upper Microwave Flexible Use Service ("UMFUS") and with the operators of other satellite systems operating in the V-band in a manner consistent with the Commission's multi-layered restrictions on earth station placement.

To ease the burdens on the placement of individually licensed earth stations to support V-band satellite systems, the Commission should adopt less stringent numeric limits for earth stations operating uplink transmissions in the 50 GHz band. Specifically, the Commission might retain

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<sup>3</sup> See Petition of The Boeing Company for Allocation and Authorization of Additional Spectrum for the Fixed-Satellite Service in the 50.4-51.4 GHz and 51.4-52.4 GHz Bands, RM-11773, at 5-9 (June 22, 2016).

<sup>4</sup> *Third Further Notice*, ¶ 94 n.290.

the restrictions on affected populations that are maintained in Section 25.136(d)(ii) of the rules,<sup>5</sup> but refrain from imposing the arguably redundant restriction of three earth stations per county and 15 earth stations per PEA. Such less stringent limits would be appropriate given the fact that signal propagation distances are much shorter in the 50 GHz band as compared to lower frequencies. Thus, satellite system operators may be able to locate greater numbers of earth stations in many counties and PEAs without exceeding the affected population limits.

## **II. NGSO FSS EARTH STATIONS CAN EASILY SHARE THE 50 GHZ BAND WITH UMFUS LICENSEES SYSTEMS USING MUCH LESS RESTRICTIVE SITING REQUIREMENTS**

Spectrum sharing between UMFUS licensees and individually licensed earth stations will not be difficult in the 50 GHz band, particularly if satellite operators locate their earth stations primarily outside of populated communities. The propagation capabilities of transmissions in the 50 GHz range are very limited, meaning incidental side lobe emissions in the areas around satellite earth stations will dissipate quickly, particularly in the presence of natural or artificial shielding such as foliage. Thus, any exclusion zone created by a satellite earth station will be very small.

In making this recommendation, Boeing observes that satellite feeder link earth stations will be very similar to UMFUS base stations in that they will transmit very narrow directed beams. Unlike UMFUS base stations, satellite earth stations will always transmit upward toward satellites. In addition, mitigation measures can be employed to minimize the sharing impact between satellite earth stations and UMFUS systems. Further, UMFUS user devices will be able to continue to operate within close range of satellite feeder link earth stations simply by switching to frequency ranges outside the 50 GHz band. All or most UMFUS end user terminals will be able to transmit

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<sup>5</sup> This provision limits affected populations to 0.1% in the most populous Partial Economic Areas (PEAs”), 2,250 people in mid-range PEAs, and 3.75% in the most rural PEAs.

on multiple bands, likely including legacy cellular bands, to address numerous situations in which UMFUS user terminals will be able to receive UMFUS signals using the 50 GHz band, but will not be able to close a return link back to the serving base station due to such factors as building attenuation, foliage, rain fade or countless other factors.

At the same time, it appears unlikely that UMFUS licensees will seek to use the 50 GHz band for the operation of wide area networks, further reducing the potential for conflict with individually licensed earth stations, particularly those situated primarily in rural areas. Therefore, the adoption of less burdensome restrictions on satellite earth station placement will greatly increase the efficient use of the 50 GHz band, to the benefit of all consumers. Coupled with this, the Commission should further its public interest mandate by concurrently adopting an FSS allocation in the adjacent 51.4-52.4 GHz band in order to enable intensive and highly efficient use of these mmW frequencies to provide very high data rate services to all Americans.

### **III. CONCLUSION**

The Commission should continue to ensure that sufficient mmW spectrum resources are available to accommodate all communications technologies, including broadband satellite networks that can provide truly ubiquitous services to all Americans regardless of their location. Specifically, the Commission should adopt less restrictive conditions on the placement of individually licensed feeder link earth stations in the 50 GHz band. The Commission should also make the adjacent 51.4-52.4 GHz band available for individually licensed earth stations as well.

The Commission's public interest obligation to ensure that broadband services are made equally available to all Americans compels this result.

Respectfully submitted,

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