

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

In the Matter of)
)
The Boeing Company, Application for Authority) File No. SAT-AMD-20170301-00030
to Launch and Operate a Non-Geostationary Low)
Earth Orbit Satellite System in the Fixed Satellite)
Service)

OPPOSITION OF T-MOBILE USA, INC.

T-Mobile USA, Inc. (“T-Mobile”)^{1/} submits this opposition to The Boeing Company’s (“Boeing”) amendment to its application for authority to launch and operate a non-geostationary satellite orbit (“NGSO”) fixed satellite service (“FSS”) system operating in low Earth orbit in the 37.5-42.5 GHz, 47.2-50.2 GHz and 50.4-52.4 GHz bands.^{2/} The Amendment, along with the pending Application,^{3/} should be rejected, as they are contrary to the rules the Commission adopted in the *Spectrum Frontiers* proceeding and pre-judge decisions that the Commission is likely to make in that proceeding.^{4/}

^{1/} T-Mobile USA, Inc. is a wholly-owned subsidiary of T-Mobile US, Inc., a publicly traded company.

^{2/} The Boeing Company, Amendment to Application for Authority to Launch and Operate a Non-Geostationary Low Earth Orbit Satellite System in the Fixed Satellite Service, IBFS File No. SAT-LOA-20160622-00058 (filed Mar. 1, 2017) (“Amendment”); *see also Policy Branch Information, Satellite Space Applications Accepted for Filing*, Public Notice, Report No. SAT-01238 (rel. May 19, 2017) (“Public Notice”).

^{3/} The Boeing Company, Application for Authority to Launch and Operate a Non-Geostationary Low Earth Orbit Satellite System in the Fixed Satellite Service, IBFS File No. SAT-LOA-20160622-00058 (filed June 22, 2016) (“Application”); *see also Satellite Policy Branch Information, Boeing Application Accepted for Filing in Part, IBFS File No. SAT-LOA-20160622-00058, Cut-Off Established for Additional NGSO-Like Satellite Applications or Petitions for Operations in the 37.5-40.0 GHz, 40.0-42.0 GHz, 47.2-50.2 GHz, and 50.4-51.4 GHz Bands*, Public Notice, DA 16-1244 (rel. Nov. 1, 2016).

^{4/} *See Use of Spectrum Bands Above 24 GHz For Mobile Radio Services, et al.*, Report and Order and Further Notice of Proposed Rulemaking, 31 FCC Rcd. 8014 (rel. July 14, 2016) (subparts referred to respectively as the “*Report and Order*” and the “*FNPRM*”).

I. INTRODUCTION AND SUMMARY

As T-Mobile has previously detailed, consumers' increasing use of data-intensive applications, such as video and Internet access, is creating mounting demand for mobile network capacity.^{5/} In light of this growing demand, and as the “[millimeter wave] bands could be particularly useful in supporting very high capacity networks in areas that require such capacity,”^{6/} the Commission made spectrum available in the bands above 24 GHz for fixed and mobile terrestrial use in the *Spectrum Frontiers* proceeding. As T-Mobile made clear in its Opposition to Boeing's original Application,^{7/} Boeing's request is inconsistent with rules adopted in the *Spectrum Frontiers* proceeding, and it pre-judges the Commission's proposals in the ongoing *FNPRM* phase of that proceeding. The Amendment does not resolve these issues. In fact, Boeing's additional arguments regarding the power flux density (“PFD”) limits applicable to FSS operating in the 37.5-40.0 GHz band only further highlight the extent to which Boeing asks the Commission to make spectrum allocation and technical determinations contrary to the goals of the *Spectrum Frontiers* proceeding and without the benefit of the proceeding's robust record. The Commission should reject the Application as amended, or at the least, defer consideration until the *Spectrum Frontiers* proceeding has concluded.

^{5/} See CISCO, CISCO VISUAL NETWORKING INDEX: GLOBAL MOBILE DATA TRAFFIC FORECAST UPDATE, 2015–2020 WHITE PAPER, at 26 (2016), <http://www.cisco.com/c/en/us/solutions/collateral/service-provider/visual-networking-index-vni/mobile-white-paper-c11-520862.pdf> (“Because mobile video content has much higher bit rates than other mobile content types, mobile video will generate much of the mobile traffic growth through 2020.”).

^{6/} *FNPRM* ¶ 7.

^{7/} Opposition of T-Mobile USA, Inc., File No. SAT-LOA-20160622-00058, at 4-9 (filed Dec. 1, 2016).

II. THE AMENDMENT IS CONTRARY TO THE *SPECTRUM FRONTIERS REPORT AND ORDER* AND PREJUDGES OUTSTANDING ISSUES IN THE *FNPRM*

The Application requests use of the 37.5-40 GHz and 40-42.5 GHz bands for space-to-earth communications, and the 47.2-50.2 GHz and 50.4-52.4 GHz bands for earth-to-space communications.^{8/} In the Amendment, Boeing proposes to lower the orbit location of its NGSO system and it seeks authority to operate during rain fade events using PFD levels up to -105 dBW/m²/MHz in the 37.5-40 GHz band.

A. The Application and Amendment Are Inconsistent with *Report and Order*, Particularly With Respect to PFD Limits in the 37.5-40 GHz Band.

In the *Report and Order*, the Commission adopted rules intended to increase terrestrial use of the 37.5-40 GHz band to facilitate 5G mobile wireless technologies.^{9/} Specifically, the Commission designated the band for terrestrial operations on a primary basis, and it limited the satellite use of the band.^{10/} The Commission also continued to limit satellites' PFD levels, noting that the record did not demonstrate that "authorizing satellites to operate [during rain storms] at the higher PFD of -105 dBW/m²/MHz would be consistent with terrestrial use of the 37.5-40 GHz band."^{11/}

Yet, in its Amendment, Boeing asks the Commission to allow just that – satellite use of the 37.5-40 GHz band using PFD levels of up to -105 dBW/m²/MHz during rain fade events^{12/} – an issue that the Amendment and Boeing's filings in the *Spectrum Frontiers* proceeding

^{8/} The Commission deferred consideration of Boeing's request to operate in the 42-42.5 GHz and 51.4-52.4 GHz bands.

^{9/} See *Report and Order* ¶¶ 73-124.

^{10/} *Id.* ¶¶ 73-124. The Commission did not seek further comment in the *FNPRM* on the primary designation of the band for terrestrial use.

^{11/} *Id.* ¶ 497.

^{12/} Amendment at 4.

acknowledge is still under consideration in that proceeding.^{13/} T-Mobile strongly opposes higher satellite PFD limits in the 37.6-38.6 GHz band, which is ideally suited to support new 5G entrants.^{14/} And as the Commission stated in the *FNPRM*, “the burden is on FSS interests to show that the higher PFD level is consistent with terrestrial use.”^{15/} Boeing, however, has not met that burden either in the Application or the Amendment.

Boeing argues that the higher PFD limit would not result in harmful interference to UMFUS.^{16/} But Boeing’s argument is negated by considerable contrary evidence in the record of the *Spectrum Frontiers* proceeding which demonstrates that an increase in PFD, even to account for rain fade events, would cause interference that would inhibit UMFUS in the band.^{17/} In particular, Straight Path’s recently filed technical analysis details why an increase in PFD, even

^{13/} Amendment at 4; Letter from Bruce A. Olcott, Counsel to The Boeing Company, to Marlene H. Dortch, Secretary, FCC, GN Docket No. 14-177 *et al.*, at 2 (filed May 15, 2017) (urging the Commission to “complete its studies to define the conditions under which individual satellites are permitted to increase their transmit PFD levels . . . to compensate for rain fade”).

^{14/} As T-Mobile has observed, because of incumbent use of the millimeter wave bands that the Commission made available in the *Spectrum Frontiers Report and Order*, there is limited opportunity for new entrants. The 37.6-38.6 GHz band represents that opportunity because there are no incumbent licensees in that spectrum.

^{15/} *FNPRM* ¶ 499.

^{16/} Amendment at 4.

^{17/} See, e.g., Letter from David Jonas, President and CEO, Straight Path Communications, Inc., and Jerry Pi, Chief Technology Officer, Straight Path Communications, Inc., to Marlene H. Dortch, Secretary, FCC, GN Docket No. 14-177 *et al.*, at 2 (filed May 17, 2017) (“Increased satellite PFD on the ground means increased harmful interference to UMFUS. . . . Straight Path therefore strongly opposes any proposal to further increase this limit. To the contrary, the Commission should consider lowering this limit to avoid significant degradation to 5G users.”) (“Straight Path *Ex Parte*”); Reply Comments of CTIA GN Docket No. 14-177 *et al.*, at 13-14 (filed Oct. 31, 2016) (“There is no logical reason for the Commission to permit modifications to existing satellite service limitations. In particular, satellite proponents have not persuasively shown that increases in the power flux density . . . or removal of the prohibition on satellite end-user equipment in the 37.5-40 GHz band would have no adverse effect on terrestrial wireless operations.”); Reply Comments of T-Mobile USA, Inc., GN Docket No. 14-177 *et al.*, at 14-15 (filed Oct. 31, 2016); Comments of FiberTower Spectrum Holdings, LLC, GN Dkt. No. 14-177, *et al.*, at 4-5 (filed Sept. 30, 2016) (“The ultra-low latency requirements and the relative brittleness of digital signals in the mmW bands, combined with the need to densely deploy terrestrial mmW services for both backhaul and broadband access, leave no room for increased satellite power levels or increased satellite earth stations/terminals outside of the existing rule structure [in the 39 GHz band]. . . . In fact, UMFUS operations may require more robust protections from FSS interference than those currently in place.”).

to account for rain fade, is highly problematic. The technical analysis finds that allowing higher PFD limits in the band “will allow strong satellite interferences that can frequently blind the 5G base station receivers, making it impossible to provide reliable 5G user experience and coverage in the 37/39 GHz band.”^{18/} Moreover, as Straight Path explained, “due to the large size of satellite spot beams, satellite transmitters cannot contain the power increase to only the proximity of the intended ground stations affected by rain fade events” and “[a]reas within the same satellite spot beam that experience less or no rain will see increased satellite PFD, causing greater interference to UMFUS devices in these areas.”^{19/} Operations at higher PFD limits will therefore “result in unacceptable service degradation and jeopardize the economic viability of 5G services.”^{20/} Therefore, Boeing’s request is contrary to the Commission’s goal of facilitating the development of 5G in the millimeter wave bands.

The Commission should at least wait until it adopts rules responsive to the *FNPRM* before it acts on the amended Application. Because the higher PFD limit is currently under consideration in the *FNPRM*,^{21/} a determination on Boeing’s PFD proposals would be premature until such time as the Commission addresses this issue in the *Spectrum Frontiers* proceeding. Moreover, processing the amended Application at this time would be a waste of Commission resources and would pre-judge the outcome of the *Spectrum Frontiers* proceeding, allowing Boeing to circumvent the pending rulemaking proceeding before the Commission decides, with the aid of a complete record, whether an increase to the PFD limit is consistent with the public interest.

^{18/} Straight Path *Ex Parte* at 10.

^{19/} *Id.* at 11.

^{20/} *Id.* at 7.

^{21/} *Id.*; see *FNPRM* ¶¶ 497-499.

B. The Amended Application Still Presents Issues Nearly Identical to Those Presented in the *Spectrum Frontiers* Proceeding.

Boeing’s amended Application also continues to pre-judge many of the Commission’s proposals in the *FNPRM* with regard to the 40-42.5 GHz, 47.2-50.2 GHz, and 50.4-52.4 GHz bands.

40-42.5 GHz. In response to the *FNPRM* – in which the Commission proposed to authorize fixed and mobile operations in the 42 GHz band under the Part 30 rules – numerous parties have urged the Commission to consider combining the 42 GHz band with the 40-42 GHz band (and the 42-42.5 GHz band on which the Commission is deferring consideration) to create a larger block of spectrum for UMFUS use.^{22/} The satellite industry already has access to significant amounts of spectrum and the public interest simply does not support additional spectrum for satellite use – the opportunity cost of withholding the spectrum from terrestrial wireless use is too high given the comparative number of consumers that can be served by either service.^{23/} For these reasons, the Commission should not grant Boeing’s requests regarding the 40-42.5 GHz band until after it makes a decision regarding the future use of the band in the *Spectrum Frontiers* proceeding.

^{22/} See, e.g., Comments of CTIA, GN Docket No. 14-177, *et al.*, at 13 (filed Sept. 30, 2016) (“[T]he Commission should consider reallocating the entire 40-42.5 GHz band for mobile uses rather than focusing solely on the 42-42.5 GHz band.”); Comments of Ericsson, GN Docket No. 14-177, *et al.*, at 11 (filed Sept. 30, 2016) (“Ericsson also recommends expanding the 42.0–42.5 GHz band, to include the 40.0–42.0 GHz band and the 42.5–43.5 GHz band for a 3.5-GHz-wide band spanning 40.0–43.5 GHz[.]”); Comments of Huawei Technologies, Inc. (USA) and Huawei Technologies Co., Ltd., GN Docket No. 14-177, *et al.*, at 6 (filed Sept. 30, 2016) (“Huawei would recommend, however, for the proposed 42 GHz band that the Commission extend the applicable frequency bands from 42-42.5 GHz to 40-42.5 GHz band for UMFUS.”); Comments of Straight Path Communications Inc., GN Docket No. 14-177, *et al.*, at 5-6 (filed Sept. 30, 2016) (“Straight Path . . . urges the Commission to authorize mobile operations in the 40-42 GHz band.”).

^{23/} See, e.g., Reply Comments of T-Mobile USA, Inc., GN Docket No. 14-177 *et al.*, at 13 (filed Oct. 31, 2016).

47.2-50.2 GHz. There are no currently authorized FSS operations in the 47.2-50.2 GHz band, although there is an earth-to-space satellite allocation.^{24/} There are also primary non-federal fixed and mobile allocations throughout the 47.2-50.2 GHz band, and while there are currently no service rules for terrestrial operations, the Commission has proposed to authorize fixed and mobile operations under the Part 30 rules in the *FNPRM*.^{25/} As its comments in response to the *FNPRM* make clear, Boeing's proposed use of this band directly conflicts with the Commission's proposal to allow terrestrial mobile use of the band on a primary basis, and in fact, what little UMFUS sharing Boeing states it would consider would restrict UMFUS to secondary operations at indoor locations only.^{26/} Boeing's proposed use of the 47.2-50.2 GHz band therefore directly implicates outstanding issues regarding FSS use of this spectrum in the *FNPRM*.

As T-Mobile has noted,^{27/} Boeing's Application also implicates sharing with federal users and protection of passive Earth Exploration Satellite Services and Radioastronomy Service^{28/} – issues similarly under consideration in the *FNPRM*.^{29/} Grant of Boeing's Application would pre-judge each of the those issues, eliminating options before they can be fully considered.

Accordingly, the Commission should postpone consideration of Boeing's requested use of the band until the questions in the *FNPRM* are resolved.

50.4-52.4 GHz. In the *FNPRM*, the Commission proposed to authorize fixed and mobile terrestrial operations in this band under the Part 30 rules – in fact, the Commission's proposal

^{24/} See *FNPRM* ¶ 411.

^{25/} See *id.* ¶ 410.

^{26/} Comments of Boeing, GN Docket No. 14-177 *et al.*, at 15-16 (filed Oct. 31, 2016) (“Boeing *FNPRM* Comments”).

^{27/} Opposition of T-Mobile USA, Inc., File No. SAT-LOA-20160622-00058, at 11 (filed Dec. 1, 2016).

^{28/} See Application at 94-97.

^{29/} See *FNPRM* ¶¶ 416.

includes authorizing terrestrial operations in the spectrum up to 52.6 GHz.^{30/} As T-Mobile has explained,^{31/} Boeing’s original proposal for use of the 50.4-52.4 GHz band (the Commission has deferred consideration of Boeing’s request for use of the 51.4-52.4 GHz band) would severely curtail possibilities for terrestrial mobile operations,^{32/} and the other issues raised by Boeing’s Application – such as sharing with federal users^{33/} – are also being considered in the *FNPRM*.^{34/} Grant of Boeing’s Application would therefore pre-judge the Commission’s proposal for use of the 50.4-52.4 GHz band.

III. CONCLUSIONS

The Commission has taken important steps to make more millimeter wave spectrum available for terrestrial mobile use through the *Spectrum Frontiers Report and Order* and *FNPRM*. Boeing’s amended Application, however, does not align with the rules the Commission has already adopted and pre-judge issues the Commission has not yet resolved. Accordingly, the Commission should, at a minimum delay considering the amended Application pending resolution of these issues in the context of the *Spectrum Frontiers* proceeding.

^{30/} See *id.* ¶ 420.

^{31/} Opposition of T-Mobile USA, Inc., File No. SAT-LOA-20160622-00058, at 12 (filed Dec. 1, 2016).

^{32/} See Boeing *FNPRM* Comments at 13 (“Boeing’s NGSO FSS system therefore needs access to the entire 47 GHz band (47.2-50.2 GHz) and to the entire 50.4-52.4 portion of the 50 GHz band to operate transmitting gateways.”).

^{33/} See Application at 97.

^{34/} See *FNPRM* ¶ 422.

Respectfully submitted,

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CERTIFICATE OF SERVICE

I, Radhika Bhat, hereby certify that on June 19, 2017, a copy of the foregoing Opposition of T-Mobile USA, Inc. was served by first-class mail, postage paid, on each of the following:

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