

**Before the
FEDERAL COMMUNICATIONS COMMISSION
Washington, D.C. 20554**

In the Matter of)	
)	
Expanding Flexible Use of the 3.7 to 4.2 GHz Band)	GN Docket No. 18-122
)	
Petition for Rulemaking to Amend and Modernize)	RM-11791
Parts 25 and 101 of the Commission’s Rules to)	
Authorize and Facilitate the Deployment of)	
Licensed Point-to-Multipoint Fixed Wireless)	
Broadband Service in the 3.7-4.2 GHz Band)	
)	
Fixed Wireless Communications Coalition, Inc.,)	RM-11778
Request for Modified Coordination Procedures in)	
Band Shared Between the Fixed Service and the)	
Fixed Satellite Service)	

COMMENTS OF LOCKHEED MARTIN CORPORATION

I. INTRODUCTION AND SUMMARY

Lockheed Martin Corporation (“Lockheed Martin”) hereby provides comments in response to the *Public Notice* in the above-referenced proceeding in which the Wireless Telecommunications Bureau, International Bureau, Office of Engineering and Technology, and Office of Economics and Analytics of the Federal Communications Commission (“FCC” or “Commission”) “invite interested parties to supplement the record to address issues raised by commenters in response to the Commission’s July 2018 Notice of Proposed Rulemaking in GN Docket No. 18-122 (*Notice*)”¹ on the 3700-4200 MHz band (C-band).

¹ Wireless Telecommunications Bureau, International Bureau, Office of Engineering and Technology, and Office of Economics and Analytics invite interested parties to supplement the record to address issues raised by commenters in response to the Commission’s July 2018 Notice of Proposed Rulemaking in GN Docket No. 18-122, at 1 (rel. July 19, 2019) (“*Public Notice*”).

Lockheed Martin is most certainly an interested party, and provided comments in an early phase of this proceeding last year.² Lockheed Martin is a manufacturer of satellite systems operating or planning to operate around the world in a variety of services and frequency ranges – including the fixed-satellite service (“FSS”) in the C-band frequency range at 3.7-4.2 GHz that is the subject of Commission proposals in this proceeding. In Carpentersville, New Jersey, Lockheed Martin operates a fixed-satellite service earth station that provides Telemetry, Tracking, and Commanding (TT&C). Lockheed Martin is also a developer and manufacturer of a wide range of advanced systems, payloads, and platforms that operate or are planned for operation at various altitudes and in various frequency bands.

In the *Public Notice*, the Commission references AT&T’s May 23, 2019 *ex parte* submission³ in response to an *ex parte* submission from the C-Band Alliance (“CBA”)⁴ that proposes a “Transition Implementation Process.” The CBA Transition Implementation Process includes refinement for clearing 200 MHz (with a 20 MHz guard band) to support 5G deployment at the bottom of the 3700-4200 MHz band. The CBA also indicates that continued access to the entire 500 MHz (3700-4200 MHz band) is needed, as satellite operators use the full 500 MHz of C-Band to downlink international satellite services that would continue to operate in the lower 200 MHz and also need to downlink in the continental United States (“CONUS”) for a variety of uses, such as monitoring international feeds from a CONUS Gateway teleport. CBA further proposes

² See Comments of Lockheed Martin Corporation, GN Docket No. 18-122 (filed October 29, 2018) (“Lockheed Martin Comments”).

³ Letter from Henry G. Hultquist, Vice President, Federal Regulatory, AT&T Services, Inc. to Marlene Dortch, Secretary, FCC, GN Docket No. 18-122 (filed May 23, 2019) (“AT&T Counterproposal”).

⁴ Letter from Jennifer D. Hindin, Counsel for the C-Band Alliance, to Marlene Dortch, Secretary, FCC, GN Docket No. 18-122 (filed Apr. 9, 2019).

to centralize these downlinks at CBA member teleports, and CBA member companies have agreed to consolidate their TT&C and Gateway sites into no more than four CBA member sites. Each site would be surrounded by a 150 kilometer coordination zone.

In its response to the CBA process proposal, AT&T proposes that the Commission permit 5G to be deployed in the C-Band free of coordination obligations, and questions the 150 km coordination threshold. Specifically, AT&T questions CBA's proposal that all earth stations be protected down to a 5 degree look angle and towards all GSO satellite positions, and calls for the record of this proceeding to be "supplemented with additional detail on whether all stations really need access to all orbital slots, and whether repacking prioritizations could be implemented in a way that potentially allows more terrestrial use on a geography-specific basis without undue constraints on future FSS flexibility."⁵

In its *Public Notice*, the Commission also seeks comment on a recent proposal from ACA Connects to remove at least 370 MHz at the lower end of the 3700-4200 MHz band from satellite use and refarm it for 5G terrestrial services.⁶ ACA Connects makes no mention of telemetry operations or protection of existing FSS operations in the refarmed portion of the band; it proposes instead to replace those satellite links with fiber optic links.

Lockheed Martin re-interjects at this juncture, because it is not clear that any of the new proposals – *i.e.*, the proposals and counterproposals from the CBA, AT&T, or the ACA Connects Coalition – address the specific concern Lockheed Martin raised in its initial comments. There, Lockheed Martin emphasized that the Commission must ensure the protection of C-band telemetry

⁵ AT&T Counterproposal, at 5.

⁶ *Public Notice*, at 1-2 (citing Letter from ACA Connects, CCA, and Charter, to Marlene H. Dortch, Secretary, FCC, GN Docket No. 18-122 (filed July 2, 2019) ("ACA Connects Coalition Proposal").

operations, launch and early-orbit operations, satellite services critical to aviation, and adjacent-band satellite operations.⁷ It reiterates here that any segmentation approach under consideration for the lower portion of the 3.7-4.2 GHz band – whether it is 100 MHz, 200 MHz or even 370 MHz taken away from FSS and handed over to 5G proponents – must have an important caveat that ensures protection of these operations.

II. DISCUSSION

Satellite operators are required by the Commission’s rules to situate their TT&C links at or near the edges of their service link bands. This requirement is designed to facilitate inter-satellite coordination under the two-degree spacing policy by making sure that sensitive telemetry links relaying critical information regarding the satellite to operators are not spread throughout the 500 MHz.⁸ Many FSS networks around the world have telemetry links within approximately 30 MHz (*i.e.*, within the area typically considered to be at the band edge) of the 3700 MHz boundary, and others have their TT&C carriers located within 30 MHz of the 4200 MHz boundary. It is generally one end or the other, and not both, and these capabilities are hardwired; an operating satellite has no ability to relocate its telemetry carriers to another portion of the band or to another band.

⁷ See Lockheed Martin Comments, GN Docket No. 18-122, at 7-10. Lockheed Martin also raised other more general points about the absence of any requirements justification for a reallocation of the primary C-band FSS downlink spectrum, and the international ramifications of its proposed action. Lockheed Martin stands by those comments and urges the Commission to heed or accommodate them if it moves forward in this proceeding but does not specifically reiterate them here.

⁸ 47 C.F.R. § 25.202(g)(1) (TT&C signals “may be transmitted in frequencies within the assigned bands that are not at a band edge only if the transmissions cause no greater interference and require no greater protection from harmful interference than the communications traffic on the satellite network or have been coordinated with operators of authorized co-frequency space stations at orbital locations within six degrees of the assigned orbital location”).

Telemetry links at the 3700 MHz band edge are also used during Launch and Early Orbit (“LEOP”) operations. As the satellites are generally not in a geostationary orbit during this period, which can run for several months after launch depending on the type of propulsion used on the spacecraft, there has to be full-azimuth capability (*i.e.*, operation at all azimuths and at elevation angles down to 5 degrees) for the earth stations operating as part of the LEOP network for the given launch.⁹ This is a response to AT&T’s question on the need for low-elevation angle/multi-azimuth earth stations. Lockheed Martin notes that its LEOP earth station also provides emergency support when a satellite is tumbling or contact with the satellite has been lost.¹⁰ These could be U.S. satellites or other non-U.S. satellites on an emergency basis.

Whether on permanent CONUS-serving satellites or on satellites undergoing LEOP operations, telemetry links at around 3700 MHz are critical links. If they receive interference at a level that prevents their functioning (whether harmful or unacceptable), and wireless broadband systems located within the vicinity of a telemetry receive station would unquestionably cause harmful interference, control of the satellite could be lost. In its Notice of Proposed Rulemaking

⁹ Lockheed Martin’s Carpentersville, NJ earth station complex (Call Sign E7541) is routinely operated as part of a global network for LEOP operations for GSO satellites in several frequency ranges, but the number of overall LEOP earth stations is quite small. The Commission has granted more than 50 special temporary authorizations to Lockheed Martin over the last decade to use the Carpentersville earth station complex to support LEOP for satellites that may, following completion of orbit-raising maneuvers and in-orbit testing, be located in orbital positions from which service will not be provided to CONUS. In some cases, Lockheed Martin needs to operate Carpentersville earth stations for as long as six months to assist with electronic orbit raising. Some of Lockheed Martin’s customers are U.S.-licensed satellites, while others are neither U.S.-licensed nor plan to serve the United States.

¹⁰ Lockheed Martin provided crucial support, for example, to locate and regain control of the EchoStar 3 satellite in July 2017, subject to issuance of an emergency special temporary authority (FCC File No. SES-STA-20170727-00823). Indeed, Lockheed Martin’s satellite tracking capabilities were key to the fulfillment of this mission, but also the availability of its earth station.

in GN Docket No. 18-122, the Commission recognized that protection would need to be provided to TT&C links for the lifetime of any satellite network.¹¹

There has to be an absolute prohibition on the provision of wireless broadband services that can interfere with band-edge telemetry signals at 3700 MHz, including for LEOP use. For on-station satellite networks, these protections – whether in the form of absolute prohibitions or exclusion zones with significant separation distances – must be full-time and permanent. For LEOP protection and satellite recovery operations, there is a periodicity – *i.e.*, protection only has to be provided during the operations, and the question becomes whether any and all 5G systems can be designed with the capability to respect this type of intermittent operation. There also are a limited number of earth stations that operate as part of global LEOP networks, and these are located primarily on or near the east and west coasts of CONUS and in the Hawaiian Islands. These protections need to also include those situations when Lockheed Martin is requested to provide technical and operational support to active spacecraft over the mission life. The specific protection requirements, and whether those requirements can be met with limits, exclusion zones, or otherwise depend on a number of factors – including the interfering system deployment and technical characteristics (such as e.i.r.p. density limits and base station beam downtilt). The protection criteria for FSS telemetry receive links in the 3.7-4.2 GHz range are found in the publications of the International Telecommunication Union (“ITU”).¹²

¹¹ See *NPRM* in GN Docket No. 18-122, FCC 18-92, at 60 (¶ 180). In the Public Notice, the Commission takes a much softer stance in its questioning; mentioning TT&C only one time in a general inquiry. *Public Notice*, at 5.

¹² See, *e.g.*, ITU-R Recommendation S.1432-1, Apportionment of the allowable error performance degradations to fixed-satellite service (FSS) hypothetical reference digital paths arising from time invariant interference for systems operating below 30 GHz (2006).

Lockheed Martin is of the view that in addition to the number of sites selected for regular TT&C operations (whether it is the sites of four CBA members or more than that), an additional number of sites are needed to support LEOP and emergency support.

The questions of protection, and of the need for protection, of FSS receive earth station operations in the 3700-4200 MHz band is broader than CBA presents, and is considerably more complicated than either AT&T or ACA Connection recognizes. LEOP and other telemetry operations of the type offered by Lockheed Martin's Carpentersville, NJ earth station complex in bands including 3700-4200 MHz must be protected – regardless of whether the number of regular TT&C earth stations protected under the CBA proposal is four or fourteen. The Commission cannot abandon protection for these links for in-orbit satellites or for satellites being launched to use C-band in other regions of the world. Global LEOP networks are required for these purposes, and this means that simple sounding, one-size-fits-all proposals to address a shift in spectrum-use priorities in the United States from FSS to mobile broadband are not the solution the Commission seeks.

III. CONCLUSION

In light of the foregoing, Lockheed Martin Corporation urges the Commission to ensure that the additional uses of the C-Band including those that support Launch and Early Orbit Operations, such as our Carpentersville earth station, are categorically protected as it considers action in its proceeding for *Expanding Flexible Use of the 3.7 to 4.2 GHz Band*.

Respectfully submitted,

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