Lockheed Martin Corporation
2121 Crystal Drive #100 Arlington, VA 22202
Telephone (703) 413-5970 Facsimile (703) 413-5908
E-mail: jennifer.warren@lmco.com

LOCKHEED MARTIN

Jennifer Warren
Vice President, Technology Policy & Regulation
Trade & Regulatory Affairs

July 7, 2016

SUBMITTED VIA ECFS

Marlene H. Dortch, Secretary
Federal Communications Commission
445 Twelfth Street, S.W.
Washington, DC 20054

RE: Oral *Ex Parte* Presentation of Lockheed Martin Corporation, Use of Spectrum Bands Above 24 GHz for Mobile Radio Services, et al.; GN Docket No. 14-177, IB Docket Nos. 15-256 & 97-95, RM-11664, and WT Docket No. 10-112

Dear Ms. Dortch:

Today the undersigned met with Brendan Carr, Legal Advisor, Wireless, Public Safety, and International to Commissioner Pai. We discussed several key points expressed in Lockheed Martin's June 24 *ex parte* submission (attached hereto) into the above-referenced dockets as they relate to proposals to introduce Upper Microwave Flexible Use Service transmitters into the 27.5-28.35 GHz band and the 37.5-38.6 GHz and 38.6-40 GHz bands.

Please address any questions regarding this submission to me.

Respectfully yours,

/s/ Jennifer A. Warren

Jennifer A. Warren

Attachment

cc: Brendan Carr

Lockheed Martin Corporation
2121 Crystal Drive #100 Arlington, VA 22202
Telephone (703) 413-5970 Facsimile (703) 413-5908
E-mail: jennifer.warren@lmco.com

Jennifer Warren
Vice President, Technology Policy & Regulation
Trade & Regulatory Affairs

June 24, 2016

SUBMITTED VIA ECFS

Marlene H. Dortch, Secretary
Federal Communications Commission
445 Twelfth Street, S.W.
Washington, DC 20054

RE: Ex Parte Presentation of Lockheed Martin Corporation, Use of Spectrum Bands Above 24 GHz for Mobile Radio Services, et al., GN Docket No. 14-177

Dear Ms. Dortch:

Lockheed Martin Corporation ("Lockheed Martin") writes here to supplement the record of the above-referenced proceeding on two aspects of the ongoing debate over whether, and if so how, to introduce Upper Microwave Flexible Use Service ("UMFUS") transmitters into the bands allocated for fixed-satellite service ("FSS") use in the 27.5-28.35 GHz band (the "28 GHz band"), and in the 37.5-38.6 GHz and 38.6-40 GHz bands ("the 37/39 GHz bands"). These points are of particular interest to Lockheed Martin and its customers. On other issues in this proceeding – including transmission in the 28 GHz band by FSS user terminals, whether individually-licensed FSS earth stations should be afforded co-primary status at 28 GHz – Lockheed Martin has informed and shares the views expressed by the Satellite Industry Association ("SIA") in SIA's comments and ex parte filings. For all the reasons provided below, Lockheed Martin strongly urges the Commission to take due account of the material it supplies in this Letter in its forthcoming initial Report and Order in GN Docket No. 14-177.

With respect first to the 28 GHz band, Lockheed Martin demonstrates that the international implications of aggregate interference from UMFUS to FSS satellite receivers – in particular, the treaty obligations of the United States under the International Radio Regulations – have not been adequately addressed in this proceeding. To the limited extent that the aggregate UMFUS interference issue has been discussed, there is no agreement or even convergence in the record either on the criteria to be used to assess the problem or on the ability of UMFUS to protect FSS space station receivers. As the aggregate interference threat UMFUS poses to FSS space station receivers includes FSS space station receivers that are not licensed by the United States, proper resolution of the U.S. treaty obligations entails the whole of the U.S. Government, not just the Commission, and poses a formidable challenge to the achievement of regulatory certainty through any redesignation of the 28 GHz band for UMFUS use in the United States. At the very least, any Commission action favoring UMFUS in the 28 GHz band must be made conditional upon successful resolution of the aggregate interference issue.

Second, Lockheed Martin emphasizes that the technical record regarding potential mobile service use of the 37/39 GHz bands is not sufficiently developed at this juncture to enable any decision to be made in the forthcoming Report and Order. The "soft segmentation" approach to licensing of the international FSS downlink allocation at 37.5-42.5 GHz some 15 years ago left the 37/39 GHz bands primarily available for an avidly-sought terrestrial use (point-to-multipoint fixed service) that largely failed to develop to the anticipated scale. In recent years, there has been substantial planning for satellite use of the entire downlink range (including the 37/39 GHz bands), and high-throughput satellites are under development under the conditions put in place by the Commission. The 37/39 GHz bands, which are used by FSS earth station receivers vulnerable to interference from UMFUS emissions, present a different scenario that is not subject to the same sharing considerations as the FSS uplink band at 28 GHz. The record of the instant proceeding is simply incomplete when it comes to meaningful consideration of sharing and compatibility issues at 37/39 GHz among all interested services by Federal and non-Federal users. The incompleteness of the record means that the Commission, in order to achieve the balanced solution it seeks, should reserve the entirety of the decisions on this band for the next phase of the proceeding. The Commission needs to have a complete technical record upon which to base rules on sharing and compatibility in the 37/39 GHz-band.

Lockheed Martin, of course, has a direct interest in this proceeding. Among other roles, Lockheed Martin is a manufacturer of commercial satellite systems and networks. Both sets of bands are in current use by several existing satellite systems/networks and multiple satellite operators, and there are other satellites and systems under construction or in various phases of planning for construction around the world. A failure to address properly the issue of aggregate harmful interference to FSS satellites, or to make a decision on protection of the reception of FSS transmissions based on a complete technical record, will pose a significant risk to existing and future operators and users of the FSS.

Aggregate Interference Issues in the 28 GHz Band

Much of the attention on the 28 GHz band in this proceeding has been on the ability of transmitting FSS earth stations to utilize the band in the presence of UMFUS terrestrial stations. With respect to non-Federal stations, this is an issue that is within the competence of the Commission. The issue of potential harmful interference to FSS satellite receivers visible from the United States from aggregate emissions from UMFUS transmitters, however, is a matter that raises treaty compliance issues that requires the whole of the United States Government to assess and resolve.

Any FSS satellite that serves countries in the Americas in the 28 GHz band is vulnerable to harmful interference from aggregate UMFUS emissions emanating from the United States. The impact of this harmful interference inevitably extends beyond the immediate bands subject to the UMFUS proceeding, as the 28 GHz band FSS frequencies are often used for "gateway"-type applications that are themselves critical to the provision of satellite services to users in other frequency bands.

As of today, there are unresolved disputes in the record over what level of interference is harmful, but the fact of the vulnerability is not at issue. Many, if not most, of the FSS satellites in this situation in the 28 GHz band, whether serving the United States and/or other countries in the Americas, are using frequency assignments that have been notified and recorded under the relevant provisions of the International Radio Regulations of the International Telecommunication Union ("ITU") by administrations other than the United States. It is the treaty obligation of the

United States, with ultimate responsibility internationally falling to the Department of State, to ensure that recorded frequency assignments of other countries are taken into account when making U.S. assignments, and if harmful interference to the reception of any stations whose assignment is operating in accordance with the Radio Regulations is actually caused by the use of a U.S. frequency assignment not in conformity with the Radio Regulations, "the station using the latter frequency must, upon receipt of advice thereof, immediately eliminate this harmful interference." ITU Radio Regulations, Nos. 8.3 and 8.5.

No matter the ability of the Commission to address purely domestic and non-Federal aspects of the potential redesignation of spectrum in the 28 GHz band in its forthcoming initial Report and Order, this proceeding has significant implications for the Executive Branch: allowing UMFUS to produce aggregate emission levels that cause harmful interference to FSS satellite receivers not licensed by the United States, but that are entitled to protection under the treaty obligations of the United States, implicates the Executive Branch as the branch of U.S. Government to whom foreign governments would presumably turn when seeking redress. It is unclear how the United States will be able to ensure its ability to observe its treaty obligation to ensure the protection of recorded frequency assignments of FSS networks licensed outside the United States that are using the 28 GHz band. Thus, if emissions from unrecorded or later-recorded UMFUS transmitters in the United States cause harmful interference to FSS receiving space stations, once the notifying administrations for those space stations inform the United States of the interference, the United States is treaty bound to "immediately eliminate this harmful interference."

While the need to address aggregate interference has been raised in this proceeding, there is no agreement or even convergence in the record either on the criteria to be used to assess the problem or on the ability of UMFUS to protect FSS space station receivers. The fundamental assumptions provided in the various submissions do not provide a good technical basis for establishing rules that will strike the proper balance sought between FSS and terrestrial users of the spectrum. Elements of the analyses and methodologies used in some of the few presentations on this issue from the terrestrial side lack transparency and thus replicability. This deficiency is further complicated by the fact that established international protection criteria for the FSS are contested by the UMFUS interests and activity/loading factors assumed for UMFUS are unsubstantiated. On the FSS side, impact assessments have been operator-specific, and thus lack a helpful imprimatur for the FSS as a whole. Issues of FSS receiver and antenna side-lobe sensitivity and path loss remain important areas of technical debate, as does the impact of aggregate interference at various FSS elevation angles above five degrees.

Lockheed Martin maintains that the combination of the importance of the aggregate interference issue to satisfaction of the United States' international obligations under the ITU Radio Regulations, and the inchoate state of the technical work on development of a consensus agreement on protection of FSS space station receivers leads to only one outcome should the Commission proceed with UMFUS designation in the 28 GHz band in its forthcoming Report and Order: The entire UMFUS action must be conditioned upon successful resolution of the aggregate interference issue from both a technical and a regulatory standpoint, most likely in the form of a maximum EIRP density level for UMFUS transmitters. It may be the only way to avoid what must be an unintended consequence – greater rights of non-U.S.-licensed FSS satellite operators to protection than those ultimately afforded to U.S.-licensed FSS satellite operators, creating potential incentives to seek offshore licensing. At the very least, the Commission must explain how the United States' treaty obligations are satisfied by its action.

From a regulatory standpoint, Lockheed Martin urges the Commission to develop a mechanism through rulemaking that ensures that all implicated UMFUS system operators collaboratively adhere to the aggregate emission mechanism for UMFUS. That mechanism can be something simple, such as a per-UMFUS transmitter limit on EIRP density, or a more complex approach involving multiple operators dynamically allocating interference among themselves. Whatever the approach, Lockheed Martin recognizes that the technical protection must be determined before the regulatory mechanism can be developed. If the Commission were to issue rules enabling UMFUS without such a regulatory mechanism in place, it would be prioritizing UMFUS over both currently operating FSS systems and networks, as well as over any other FSS systems and networks under construction or development.

Lockheed Martin emphasizes that the prospect of aggregate interference from UMFUS transmitters causing harmful interference to FSS space stations is the one thing on which all parties teeing up the issue so far agree. Until the limit on aggregate emissions from UMFUS into FSS space stations is determined, and a regulatory mechanism for ensuring effective compliance with that limit is developed, the Commission should condition any regulatory action authorizing introduction of UMFUS in the 28 GHz band on final and successful resolution of the aggregate interference issue. The failure to so condition UMFUS pending the development of valid aggregate protection criteria for FSS space stations would leave the United States Government susceptible to assertions from countries around the world that the United States has failed to abide by its treaty obligations under the ITU Radio Regulations. No matter how eager the Commission is to move forward with some kind of redesignation of the 28 GHz band to allow UMFUS systems, the Commission simply should not act without making meaningful and effective provision for future resolution of the aggregate harmful interference issue.

Prematurity of Action for UMFUS in the 39 GHz Band

In its forthcoming initial Report and Order in this proceeding, the Commission should defer to the next phase any decision on UMFUS access to the 37/39 GHz bands. The Commission's Notice of Proposed Rule Making ("NPRM") in this proceeding was focused on finding increased ways to allow emerging FSS use of the Q/V-band frequency range to be reflected in the updated regulatory environment the Commission envisioned for the 37/39 GHz bands. The Commission invited comment on access to the bands by satellite user earth stations and sought a refreshed record on the conditions under which satellites could increase their power to overcome atmospheric propagation on the downlink path – one of the last remaining issues from the Commission's implementation of the soft-segmentation approach to sharing and compatibility between FSS (space-to-Earth) and terrestrial fixed service operations in the 37.5-42.5 GHz range following in the wake of the 2000 World Radiocommunication Conference. In the 37/39 GHz bands, the terrestrial stations are protected by the power flux-density limits imposed on satellites in the ITU processes and treaty text; the issue here is how to protect FSS receiving earth stations from terrestrial-based harmful interference.

In response to the NPRM, the record of this proceeding reflects significant evidence of satellite-industry planning and testing for the deployment of satellite systems and networks that will offer broadband services over high-throughput satellites in the 37/39 GHz bands. What is not reflected in the record at this critical juncture is evidence of meaningful and mature spectrum sharing and compatibility analyses and methodologies that will be adequate to govern shared use of the band by FSS earth station receivers and UMFUS operations going forward. It certainly is not sufficient, as some terrestrial interests have advocated, for the Commission to move forward with a UMFUS-only approach based on the claim that the satellite industry has made little or no use of the 37/39

GHz bands when the NPRM itself seeks to alleviate the regulatory restrictions that made satellite use of the 37/39 GHz bands effectively impossible for the last 15 years.

In the case of the entire Q/V-band FSS range, the state of the technological art and the advancing needs of satellite users for more broadband services over high-throughput satellites are converging at a point beyond the threshold of economic viability. In other words, satellite use of the Q/V band, including the 37/39 GHz bands, is economically and technologically viable, and is indeed happening.

There is no question about whether regulatory provisions to govern the shared use of the 37/39 GHz bands by UMFUS and FSS space-to-Earth transmissions are needed. They most certainly are. The only question is whether the Commission should attempt, on the basis of an incomplete record, to impose regulatory provisions that will precipitously impact the development of one service or the other. Lockheed Martin strongly urges the Commission to develop the technical record more fully to seize the promise of an opportunity in the 37/39 GHz band to secure a balanced compromise on regulation that will provide both the FSS and the UMFUS the opportunity to grow and thrive. More time is needed for the technical record to be developed to a maturity level that shows the path forward, and for this reason, Lockheed Martin has joined with others in the satellite industry urging the Commission to seek further comment before adopting definitive regulatory provisions for the 37/39 GHz band.

* * *

Lockheed Martin, on the basis of its foregoing assessment of the state of the Commission's record and capabilities regarding harmful interference to FSS satellite receivers in the 28 GHz band from aggregate UMFUS emissions, and sharing/compatibility demonstrations regarding interference to FSS earth stations in the 37/39 GHz band, urges the Commission to take the proposed actions in its forthcoming Report and Order. Lockheed Martin also urges the Commission to either condition authorization to UMFUS transmissions in the 28 GHz band upon resolution of the aggregate interference issue, or otherwise provide clarity on how the U.S. will be able to meet its ITU treaty obligations as a result of FCC actions. At 37/39 GHz, it is clear, despite some UMFUS protestations, that the technical record is simply not mature enough to provide a balanced consideration of sharing/compatibility issues. Extending this aspect of the proceeding to the next phase of this proceeding is the only appropriate course.

Respectfully yours,

/s/ Jennifer A. Warren

Jennifer A. Warren