

Before the
FEDERAL COMMUNICATIONS COMMISSION
Washington, DC 20554

In the Matter of)
)
Allocation and Service Rules for the 1675 –) WT Docket No. 19-116
1680 MHz Band)

To: The Commission

**COMMENTS OF
THE BOEING COMPANY**

The Boeing Company (“Boeing”) provides these comments on the Commission’s Notice of Proposed Rulemaking (“*NPRM*”) on making the 1675-1680 MHz band available for flexible wireless services on a shared based with incumbent federal and non-federal users of this spectrum.

As the Commission is aware, Boeing is a heavy user of spectrum resources, which Boeing employs in the design, manufacture, test and operation of aircraft, defense, and aerospace systems. Boeing also uses experimental authorizations issued by the Commission for the development and operation of autonomous vehicles, including unmanned aircraft and maritime vessels. As a result, Boeing consistently holds more experimental authorizations than any other company.

When suitable, Boeing also employs broadband fixed and mobile communications systems made available by commercial providers. Boeing is therefore supportive of the Commission’s efforts to identify additional frequency bands that can be used for wireless services, including on a shared basis with incumbent users. A major focus of the *NPRM* is the potential use by Ligado of the 1675-1680 MHz band for the development of a nationwide broadband wireless network. Boeing manufactured satellites for Ligado and supports Ligado’s efforts to identify frequency resources and spectrum sharing conditions that would permit the operation of an additional mobile network in the United States.

The Commission's *NPRM* on potential sharing in the 1675-1680 MHz band addresses a number of issues that are critical to Boeing. Boeing therefore stresses in these comments that proposals for shared use of the 1675-1680 MHz band must protect both federal and non-federal users of this spectrum, including entities that receive critical weather data from federal satellites to support forecasting, aviation safety, disaster response and other purposes. The Commission should also refrain from addressing the future use of the 1675-1680 MHz band in isolation, instead recognizing its relevance to Ligado and considering its shared use in this context. Finally, the Commission should ensure that any commercial use of the 1675-1680 MHz band does not impede excessively the continued use of this spectrum for experimental research and test operations.

I. THE COMMISSION NEEDS TO ADEQUATELY ADDRESS THE SIGNIFICANT CONCERNS EXPRESSED BY NON-FEDERAL USERS OF FEDERAL WEATHER SATELLITES

The *NPRM* acknowledges that portions of the 1675-1680 MHz band are used by the FAA, NASA, NOAA, the National Weather Service, the Department of Defense, the Department of Interior and the Department of Agriculture to receive real-time data downlinks from NOAA's Geostationary Operational Environmental Satellites ("GOES") that include weather and hydrological (*i.e.*, flooding) information.¹ The *NPRM* identifies these federal earth station locations and seeks comment on the methods that can be used, such as protection zones, to ensure that these important facilities do not experience harmful interference resulting from wireless mobile operations.²

¹ See *NPRM*, ¶¶ 8-9.

² See *id.*, ¶ 17.

The *NPRM* additionally acknowledges that many non-federal entities operate unregistered receive-only earth stations for the reception of GOES weather and flooding data, including users in the aviation industry, state and local governments, and in shipping for environmental monitoring, operational planning, and disaster preparedness.³ Appropriately, the *NPRM* observes that “these users should continue to have access to this data, and we seek comment on how best to achieve this goal.”⁴

As a preliminary point, the Commission should not pursue an approach that is premised on the possibility that these critical weather services will be retired. The *NPRM* notes that the GOES-N satellite is currently scheduled to operate until at least 2025 and the GOES-R satellite until at least 2036. These two spacecraft, however, are only the most recent in a long series of weather satellites that were first brought into operation in 1975. Boeing constructed nearly half the GOES satellites, including the most recently retired spacecraft. The technical capabilities of these satellites (and their resulting spectrum needs for data downlinks) continue to increase commensurate with the critical need for this data to forecast and monitor increasingly variable weather and flooding conditions.

Second, numerous users of GOES data have explained that the Internet does not ensure real-time reception of GOES data (which is critical for weather forecasting and disaster response).⁵

³ See *id.*, ¶¶ 16 and 19.

⁴ *Id.*, ¶ 19.

⁵ See *Letter from National Weather Association, AccuWeather, and related organizations*, GN Docket No. 19-116, RM-11681, at 2 (May 2, 2019); *Letter from World Meteorological Organization*, ET Docket No. 10-123, Annex 2 at 3 (June 28, 2010) (“*WMO Comments*”); *Letter from Michael A. Comberiate, NASA Goddard Space Flight Center*, ET Docket 10-123, at 2 (June 9, 2010); *Letter from European Organisation for the Exploitation of Meteorological Satellites*, ET Docket 10-123, at 3 (June 25, 2010) (“*EUMETSAT Comments*”).

The Internet's speed and reliability can also be inconsistent during major weather events when terrestrial networks often experience outages and excessive use.⁶

Although the Internet's throughput capacity has continued to improve, its tendency to be disabled or saturated during major weather events has not changed. Further, GOES data files continue to increase substantially in size (and quality), offsetting gains in network throughput. Given the critical importance of ensuring that this data remains available to both federal and non-federal users on a real time basis, the Commission should not consider the transmission of this data by terrestrial means to be a viable alternative, at least not for the foreseeable future.

Instead, any measure that is considered to permit sharing in the 1675-1680 MHz band must employ techniques that adequately protect both federal and non-federal GOES receivers and ensures that their reception of weather and other critical data is not impaired as a result of harmful interference. As the Commission is aware, the reliable reception of signals from geostationary satellites is relatively challenging given the significant altitude of such satellites (more than 22 thousand miles). Therefore, any protection zones that are designed to prevent harmful interference to satellite reception may need to be substantial in size. The Commission must thoroughly consider and resolve these issues before commercial wireless services can be introduced into the 1675-1680 MHz frequency band.

⁶ See *Letter from David Grimes, Meteorological Service of Canada, to Marlene H. Dortch, FCC Secretary*, WT Docket No. 19-116, at 1-2 (May 1, 2019); *WMO Comments*, Annex 2 at 3; *EUMETSAT Comments* at 3.

II. THE CONSIDERATION OF THE 1675-1680 MHZ BAND FOR WIRELESS SERVICES SHOULD BE MADE TOGETHER WITH THE COMMISSION'S CONSIDERATION OF LIGADO'S OVERALL L-BAND PROPOSAL

The *NPRM* proposes to make the 1675-1680 MHz band available as a single 5 megahertz block, suggesting it would provide “entry opportunities for small and rural providers.”⁷ As the *NPRM* acknowledges, however, a petition for rulemaking addressing the 1675-1680 MHz band was originally filed by Lightsquared,⁸ and Ligado controls the immediately adjacent 1670-1675 MHz band.⁹ Further, the wireless industry contends that mid-band spectrum can be used efficiently for broadband networks only if it is made available in large blocks.¹⁰

Given these factors, any consideration of the use of the 1675-1680 MHz band for wireless services should be made in concert with the Commission's consideration of Ligado's overall proposal to permit terrestrial wireless services in a total of 40 MHz of spectrum that includes the 1526-1536 MHz and 1660-1680 MHz bands for downlinks and the 1627.5-1637.5 MHz and the 1646.5-1656.5 MHz bands for uplinks.¹¹ Ligado recently made this same point, arguing that it

⁷ *NPRM*, ¶ 24.

⁸ *See Petition for Rulemaking Filed*, RM No. 11681, Public Notice, Report No. 2967 (CGB Nov. 9, 2012) (seeking public comment on a petition for rulemaking that was filed by LightSquared Subsidiary LLC on November 2, 2012).

⁹ *See NPRM*, ¶ 10, n. 37.

¹⁰ *A National Spectrum Strategy for 5G*, CTIA, included as an attachment to Letter from Scott K. Bergmann, Senior Vice President, Regulatory Affairs, CTIA, to Marlene H. Dortch, Secretary, Federal Communications Commission, GN Docket No. 18-122, at 11 (April 3, 2019).

¹¹ *See Comment Sought to Update the Record on Ligado's Request that the Commission Initiate a Rulemaking to Allocate the 1675-1680 MHz Band for Terrestrial Mobile Use Shared with Federal Use*, RM-11681, Public Notice, 31 FCC Rcd. 3813 (OET, IB, WTB, Apr. 22, 2016).

would be unable to participate “robustly” in a 1675-1680 MHz band auction unless its proposal to operate its terrestrial network in the other 35 megahertz of L-band spectrum has been approved.¹²

As Boeing explained repeatedly in comments filed with the Commission in 2011, 2016 and most recently in July 2018, Ligado’s proposed operations in the 1526-1545 MHz and 1627.5-1673.5 MHz bands will both partially overlap with existing Inmarsat L-band operations.¹³ Interference that may result from these operations likely can be addressed only through the retrofitting or replacement of Inmarsat transceivers installed on the world’s fleet of commercial aircraft with newer transceiver models and stronger filtering. The replacement process in the aviation industry, however, will necessitate work on tens of thousands of in-service aircraft and will entail significant time, resources, and expense to be certified and completed. Therefore, the manner in which these expenses will be reimbursed should be clarified and resolved prior to the conclusion of this proceeding and also prior to taking further action on Ligado’s proposal.

The Commission should not disregard this important issue by treating its proposed reallocation of the 1675-1680 MHz band as a discrete issue. Instead, the use of this band for terrestrial wireless services must be considered together with the other important issues that must be resolved in order to advance Ligado’s overarching proposal. In taking this position, Boeing does not believe the Commission must hold this proceeding in abeyance. Boeing is aware that the Commission’s investigation of the 1675-1680 MHz band as a candidate for broadband services has continued for many years. Nevertheless, the adoption of final rules for the commercial use

¹² See *Letter from Gerard J. Waldron, Counsel to Ligado Networks LLC, to Marlene H. Dortch, Secretary, Federal Communications Commission*, WT Docket 19-116, at 1-2 (June 14, 2019).

¹³ Comments of The Boeing Company, IB Docket Nos. 12-340 and 11-109, at 3-4 (July 9, 2018); Comments of The Boeing Company, IB Docket Nos. 12-340 and 11-109, at 2 (May 23, 2016); Comments of The Boeing Company, IB Docket No. 11-109, at 7-8 (Aug. 9, 2011).

of the 1675-1680 MHz band should be completed together with the resolution of all other issues relevant to Ligado's proposal to provide broadband wireless services in several L-band frequencies.

III. IF THE 1675-1680 MHZ BAND IS MADE AVAILABLE FOR WIRELESS SERVICES, THE COMMISSION MUST ENSURE THAT LICENSEES USING THIS SPECTRUM WILL COOPERATE WITH CRITICALLY IMPORTANT EXPERIMENTAL TESTING IN THESE FREQUENCIES

As Boeing has previously noted in prior proceedings, wireless licensees are not always cooperative in the coordination of spectrum for experimental operations.¹⁴ Although it has been several years since Boeing raised these concerns, the difficulties in coordinating experimental authorizations have not abated and, in isolated situations, have become much worse.

The Commission's rules do not expressly obligate its licensees to cooperate in the coordination of experimental licenses. Instead, the Commission has indicated only that, when an experimental license is conditioned on the completion of coordination with an incumbent licensee, the Commission "expect[s] that all parties will cooperate to work in good faith to expeditiously resolve any concerns."¹⁵ This expectation of good faith cooperation, however, does not always exist in practice. Boeing therefore urges the Commission to expressly condition any grant of authorizations for the commercial use of the 1675-1680 MHz band on good faith cooperation in the coordination of licensed spectrum for experimental use.

¹⁴ See, e.g., *Letter from Bruce A. Olcott, Counsel to The Boeing Company, to Marlene H. Dortch, Secretary, Federal Communications Commission*, ET Docket Nos. 10-236 and 06-155 at 2-3 (Jan. 24, 2013) (noting some licensees require monetary payments for coordination approval); *Letter from Bruce A. Olcott, Counsel to The Boeing Company, to Marlene H. Dortch, Secretary, Federal Communications Commission*, ET Docket Nos. 10-236 and 06-155 at 1-2 (Nov. 15, 2011) (noting the significant difficulties in securing coordination approval from some FCC license).

¹⁵ See, e.g., *Promoting Expanded Opportunities for Radio Experimentation and Market Trials under Part 5 of the Commission's Rules and Streamlining Other Related Rules*, ET Docket No. 10-236, *Report and Order*, FCC 13-15, ¶ 81 (2013).

The 1675-1680 MHz band is used by Boeing and others for important experimentation and access to this spectrum must be preserved. For example, Boeing and others are authorized to conduct pre-launch testing of GOES satellites in this spectrum range. As Boeing noted previously in these comments, NOAA is expected to eventually issue contracts for the construction of additional GOES satellites, which Boeing will actively seek to support.

Boeing is also required by the FAA and DoD to conduct High Intensity Radiated Field (“HIRF”) testing on each new model of aircraft, which entails the transmission toward the aircraft of electromagnetic energy at relatively high power levels using a wide range of frequency bands in order to ensure that the aircraft systems are not disrupted by RF radiation. The 1675-1680 MHz band is necessarily included in these tests, along with other frequencies that are already used for commercial wireless services.

Boeing also uses the 1675-1680 MHz band for communications involving in-flight tests of aircraft manufactured for the U.S. government, and for the development of wireless communications equipment for both commercial and governmental use. In each case, Boeing undertakes significant efforts to ensure that its test operations produce minimal RF emissions into free space, such as conducting experiments indoors when possible, or employing shielding. Boeing also cooperates with FCC licensees in demonstrating that its experimental operations will not produce appreciable interference to their commercial services. Despite these measures, Boeing continues to experience significant difficulties securing coordination approvals from certain FCC licensees. These difficulties have occasionally involved FCC licensees that are not yet using their authorized spectrum and therefore could not experience harmful interference from Boeing’s experimental operations. Therefore, the Commission should expressly condition the grant of any authorizations for commercial use of the 1675-1680 MHz band on the good faith

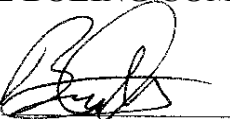
cooperation and agreement by licensees in the coordination of their licensed spectrum for important experimental purposes.

IV. CONCLUSION

Boeing supports the Commission's efforts to make the 1675-1680 MHz band available for commercial wireless services on a shared basis with existing federal and non-federal users. Boeing also supports Ligado's proposal to identify sufficient spectrum and sharing arrangements to enable the launch of an additional wireless network in the United States. As noted in these comments, however, the Commission must ensure the continued protection of federal and non-federal earth stations used to receive GOES weather and hydrological data. Further, the Commission should consider the use of the 1675-1680 MHz band concurrently with its resolution of other issues related to Ligado's broadband wireless proposal. Finally, the Commission should condition any commercial authorization in the 1675-1680 MHz band on providing cooperation in the coordination of experimental operations in these frequencies.

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