

National Academies of Sciences, Engineering, and Medicine Report on Ligado Networks and the Interference Debate

September 23, 2022

On April 19, 2020, the Federal Communications Commission (FCC) [approved](#) an application by Ligado Networks, a U.S. telecommunications company, to deploy a terrestrial network within the United States using specific segments of [L-Band spectrum](#)—spectrum typically used for satellite services. Federal agencies including the [Departments of Defense \(DOD\)](#), [Homeland Security](#), and [Transportation](#) and several Members of the [House](#) and [Senate](#) Armed Services committees objected to the decision. They contend “loud” signals from Ligado’s terrestrial transmitters will overpower the reception of “soft” signals from Global Positioning System (GPS) satellites and other [mobile satellite services](#) (MSS), potentially impacting DOD operations near Ligado transmitters in the United States. This was discussed during a May 2020 Senate Armed Services Committee [hearing](#). Some [Members of Congress](#), [GPS experts](#), [GPS device manufacturers](#), [the aviation industry](#), [weather organizations](#), and others also opposed the decision due to interference concerns. The FCC [asserts](#) that its decision, which required Ligado to mitigate interference, would enhance U.S. leadership in advanced wireless services and had support from many Members of Congress and Trump Administration officials.

National Telecommunications and Information Administration (NTIA) Petitions

On May 22, 2020, NTIA filed one [petition](#) with the FCC on behalf of the executive branch to stay the order and another [petition](#) to reconsider the decision. On January 19, 2021, the FCC [declined](#) to stay the order.

Congress Mandates Review of FCC Decision

The William M. (Mac) Thornberry National Defense Authorization Act for Fiscal Year 2021 (P.L. 116-283) required, among other things, that DOD enter into an agreement with the National Academies of Sciences, Engineering, and Medicine (NASEM) to conduct an independent technical review of the FCC’s decision and to assess its impact on DOD operations.

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NASEM Report

On September 9, 2022, NASEM released its [report](#). NASEM [found](#) “most commercially produced general navigation, timing, cellular, or certified aviation GPS receivers will not experience significant harmful interference from Ligado emissions,” but also that “some high-precision receivers, used for applications such as farming, [geodesy](#), and surveying and sold before about 2012, can be vulnerable to significant harmful interference.” It also found certain MSS receivers provided by Iridium Communications Inc. for DOD and others would experience harmful interference, under certain conditions.

In P.L. 116-283, Congress directed NASEM to compare two approaches used by the FCC to evaluate interference—one based on a signal-to-noise interference protection criterion and the other based on device-by-device measurement of GPS position error—to determine if they effectively mitigate interference risk. NASEM found neither approach effective. It concluded that interference evaluation is complex, noting multiple non-quantifiable definitions of harmful interference; lack of consensus about which definitions to use; and that interference varies by device type and use.

According to NASEM, neither evaluation approach provides an “engineerable, predictable standard that new entrants can readily use to evaluate impact.” In the absence of definitive receiver standards, “a new applicant for emissions in an adjacent channel will have great difficulty in determining the emitter power levels and stand-off distances that will be guaranteed not to cause Harmful Interference to [existing] GPS receivers. A GPS receiver designer will be unable to design a receiver that will be guaranteed to tolerate unknown potential future allowed levels of adjacent-band power.” NASEM also found “all GPS receiver manufacturers could field new designs that could coexist with the authorized Ligado signals and achieve good performance even if their existing designs cannot.” NASEM recommends the FCC work with industry to develop receiver standards and with NTIA to resolve spectrum issues, conduct joint studies and testing, define receiver performance standards, and set adoption timelines.

Responses to NASEM Report

DOD, NTIA, and Ligado released separate statements indicating the report validated their previous positions.

DOD issued a [statement](#) that NASEM’s findings supported its testing approach, confirmed Ligado emissions could harmfully interfere with DOD’s high-precision GPS receivers and mobile satellite services, and concluded that FCC mitigation measures were “impractical, cost prohibitive, and possibly ineffective.” The NTIA issued a similar [statement](#) and suggested that the FCC reconsider its decision.

Ligado Networks [noted](#) that NASEM found most GPS receivers will not experience harmful interference. It stated “a small percentage of very old and poorly designed GPS devices may require upgrading,” and said it is ready to assist agencies with outdated devices. In a September 12, 2022, [letter](#) to the FCC, Ligado announced it is not moving forward on its trial deployment in order to work with NTIA on the issue.

Considerations for Congress

As demand for mobile data increases, so do the possibility of spectrum disputes, including between the FCC and NTIA. Congress designated the FCC as the lead agency in allocating spectrum. Former FCC Chairman Ajit Pai [argued](#) the FCC has “put the U.S. on a path to lead the world in wireless innovation for many years to come.” Meanwhile, some FCC decisions have raised [interference concerns](#) for federal agencies and NTIA, which manages federal spectrum use. Bills have been introduced in the 117th Congress ([H.R. 2501](#), [S. 1472](#)) that would require the agencies to coordinate on spectrum decisions, which the FCC and NTIA have started to do under their new [Spectrum Coordination Initiative](#).

Another area of potential congressional interest may be FCC and NTIA efforts to improve receiver performance. In April 2022, the FCC issued a [Notice of Inquiry](#) examining receiver performance for nonfederal uses. The FCC typically focuses its rules on transmitters, but acknowledges receiver performance also drives spectrum decisions. Some [industry organizations](#) oppose fixed federal standards, saying flexibility fuels innovation. NTIA submitted [comments](#) on its efforts to improve receiver performance to protect federal functions.

Adoption of receiver standards could improve certainty for new entrants and expand spectrum use. New standards may require entities, including federal agencies, to replace older receivers with new, higher-performing receivers, which may impose costs.

Congress may be interested in monitoring the [National Spectrum Strategy](#), and whether NTIA and FCC are working to build consensus on future spectrum needs and interference standards.

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