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July 1, 2016

Ms. Marlene H. Dortch
Secretary
Federal Communications Commission
445 12th Street, S.W.
Washington, D.C. 20554

Re: IB Docket No. 11-109; IBFS File Nos. SES-MOD-20151231-00981, SAT-MOD-20151231-00090, and SAT-MOD-20151231-00091

Dear Ms. Dortch:

One June 29, 2016, Reed Hundt and the undersigned, representing Ligado Networks LLC ("Ligado"), met with Charles Mathias, Joyce Jones, and Jane Lee (intern) of the Wireless Telecommunications Bureau; Jennifer Tatel of the Office of General Counsel; Michael Ha and Paul Murray of the Office of Engineering and Technology; and Bob Nelson of the International Bureau.

The purpose of the meeting was to review the state of the record with respect to Ligado's pending Modification Applications in the above-referenced proceedings. The Public Notice on the Modification Applications[1] has successfully sparked a productive airing of key stakeholders' views. Ligado explained that the completion of the comment cycle has brought clarity on the four key issues, and that the record on each of these issues supports grant of the Modification Applications.

First, Ligado has demonstrated that its proposed deployment is compatible with existing GPS operations as implemented by leading device manufacturers.[2] During the meeting, Ligado explained that it has continued its efforts to assuage any remaining concerns among manufacturers of high-precision devices through co-existence agreements, similar to the agreements Ligado reached with Deere & Company, Garmin International, and Trimble. Most

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[1] *Comment Sought on Ligado's Modification Applications*, IB Docket Nos. 11-109 & 12-340, DA 16-442, at 8 (April 22, 2016) ("Public Notice").

[2] *See* Further Reply Comments of Ligado Networks LLC, IB Docket No. 11-109, at 3-5 (filed June 21, 2016).

recently, Ligado reached a co-existence agreement with NovAtel, which resolves concerns raised by that manufacturer and one of its customers, both of whom now support grant of the Modification Applications.[3]

Second, several parties emphasized the importance of ensuring Ligado's proposed deployment does not adversely impact aviation operations. Ligado agrees completely that the safety of aviation operations should be fully protected. Ligado noted that the principle of FCC deference to the standard setting process for aviation equipment at the FAA has drawn inquiries in comments that can and will be answered by both Ligado and the Commission. The Modification Applications offer comprehensive protection for aviation interests, as Ligado further explained in its June 6 Reply Comments, and discussions with the FAA are ongoing.[4]

Third, certain parties expressed concerns about the potential effect of Ligado's proposed deployment on L-band services provided by Inmarsat and Iridium. In the meeting, Ligado noted that, as Inmarsat explained in its Reply Comments, "Inmarsat and Ligado have negotiated an inter-operator Cooperation Agreement that paves the way for Ligado to develop its L-band ATC network while allowing Inmarsat to continue providing services and innovating in the L-Band," and accordingly "Inmarsat supports grant of the Modification Applications."[5] Discussions with Iridium continue, and both parties are committed to finding a mutually acceptable solution.

Finally, some parties continue to assert that the Commission should treat a 1 dB degradation in a GPS receiver's carrier-to-noise density ratio (C/N_0) as *per se* harmful interference. In the meeting, Ligado noted that, although advocates for this standard assert that the 1 dB metric is "accepted" and easier to measure than key performance indicators ("KPIs"), no party has presented any empirical, technical evidence in the record demonstrating that a 1 dB decrease in C/N_0 has any user-perceptible effect on GPS receivers' performance. In fact, the evidence in the record is to the contrary.[6] Without evidence establishing that a 1 dB decrease in C/N_0, on its own, reliably predicts a perceptible degradation in the ability of the receiver to perform as users expect, the Commission cannot conclude that such a 1 dB decrease constitutes *harmful* interference. Ligado noted that there is no dispute in the record that GPS receivers can

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[3] Letter from Doug Smith, Ligado Networks LLC, and Michael Ritter, NovAtel Inc., to Marlene H. Dortch, FCC Secretary, IB Docket No. 11-109 *et al.* (filed June 28, 2016); Letter from Ken Mooyman, President, Leica Geosystems Inc., to Marlene H. Dortch, FCC Secretary, IB Docket No. 11-109 *et al.* (filed June 29, 2016).

[4] *See* Reply Comments of Ligado Networks LLC, IB Docket No. 11-109, at 4-8 (filed June 6, 2016) ("Ligado Reply").

[5] Inmarsat Inc. Reply Comments, IB Docket Nos. 11-109 & 12-340, at 1-2 (filed June 21, 2016).

[6] *See, e.g.*, Ligado Reply at Attachment B.

be (or already have been) designed at little or no cost to operate to preclude actual harm from LTE transmissions at the proposed power limits.

Although Garmin attempts to draw a connection in its substituted Reply Comments submitted earlier this week[7] between a 1 dB decrease in C/N_0 and harmful interference, its arguments are unavailing. In particular, one of Garmin's predominant concerns appears to be that KPIs are more difficult to measure than 1 dB. Even if this argument were true, it is irrelevant to the question of whether a 1 dB decrease in C/N_0 causes harmful interference. And in making its argument, Garmin misinterprets Mark Sturza's white paper on the 1 dB standard. For example, the "wide variety of environmental factors" that affect GPS systems would not make measuring KPIs difficult.[8] Just as C/N_0 degradation is measured in isolation of these factors, KPIs would be measured in the same way. Moreover, the very thesis of the Sturza white paper is that 1 dB reductions can be caused by a variety of factors, including changes in antenna orientation, changes in satellite location in the sky, the position of trees and buildings, ionospheric scintillation — the list goes on. These reductions happen randomly during normal GPS operations in the total absence of adjacent band LTE without impacting consumers.[9] That is why 1 dB is not a useful metric, but examining position error answers the critical question of whether the device is performing as it should be with LTE in an adjacent band. Using 1 dB would come at a substantial opportunity cost to U.S. GDP without producing any corresponding benefit in position accuracy for GPS devices.

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[7] *See* Reply Comments of Garmin International, Inc., IB Docket No. 12-340 *et al.*, at 3-9 (filed June 28, 2016). As Garmin notes in the cover letter accompanying its revised Reply Comments, the revised comments should be considered "in lieu of the reply comments that [Garmin] submitted on June 21, 2016."

[8] *Id.* at 6.

[9] *See* Ligado Reply at Attachment B at 3-6.

Please direct any questions to the undersigned.

Sincerely,

/s/ Gerard J. Waldron
Gerard J. Waldron
Michael Beder

Counsel to Ligado Networks LLC

cc: Mr. Paul Murray
Mr. Michael Ha
Mr. Charles Mathias
Ms. Joyce Jones
Ms. Jennifer Tatel
Mr. Robert Nelson
Ms. Jane Lee