



JUL 1 2014

Mr. Julius Knapp
Chief, Office of Engineering and Technology
Federal Communications Commission
445 12th Street, SW
Washington, DC 20554

RE: LightSquared Subsidiary LLC (IB Docket Nos. 11-109 and 12-340; IBFS File Nos. SAT-MOD-20120928-00160, -00161, SAT-MOD-20101118-00239, SES-MOD-20121001-00872; RM-11681; WT Docket No. 12-327)

Dear Mr. Knapp:

For consideration in the above-referenced pending proceeding before the Federal Communications Commission (FCC), the National Telecommunications and Information Administration (NTIA) forwards for inclusion in the record the enclosed letter from the Department of Transportation (DOT).¹ This letter expresses DOT's continuing concerns relating to the proposal by LightSquared Subsidiary LLC (LightSquared) to operate terrestrial wireless handsets in the 1626.5-1660.5 MHz band and the potential impact on the Global Positioning System (GPS).²

Since receiving the *DOT Letter* and additional input from the Department of Defense (DOD), DOT, and other federal agency members of the Interdepartment Radio Advisory Committee (IRAC), NTIA engineers have been working with FCC staff and the IRAC members to address each of the important technical issues that the agencies have raised, especially with regard to harmful interference caused to GPS receivers by out-of-band emissions from terrestrial wireless handsets. NTIA has convened several meetings with the agencies in an attempt to narrow the specific issues and discussed alternative analytical methods that could help resolve them. Unfortunately, the agencies are not in complete agreement that the *Uplink Assessment* has adequately addressed these issues to support a recommendation to NTIA and the FCC.

Moreover, as the *DOT Letter* notes, several private sector organizations have expressed similar concerns with respect to potential harmful interference to GPS from LightSquared's proposed terrestrial handset operations and that the *Uplink Assessment's* analyses are insufficient

¹ Letter from John D. Porcari, Deputy Secretary of Transportation, to Lawrence E. Strickling, Assistant Secretary for Communications and Information (Sept. 18, 2013) (*DOT Letter*) (enclosed).

² See LightSquared Assessment of Uplinks in the 1626.5-1660.5 MHz band, attached to Ex Parte Presentation Filing, IB Docket No. 11-109; DA 12-1863, IB Docket No. 12-340; IBFS File Nos. SAT-MOD-20101118-00239; SAT-MOD-20120928-00160; SAT-MOD-20120928-00161; SES-MOD-20121001-00872; RM-11681; WT Docket No. 12-327 (July 15, 2013) (*Uplink Assessment*).

to allay those concerns.³ If, consistent with NTIA's previous inputs in this proceeding, the FCC is inclined to authorize terrestrial-only handsets in the 1626.5-1660.5 MHz band as part of the licensee's modified system approach, we urge the FCC to carefully consider the issues raised by DOT along with the record developed in this proceeding.⁴ NTIA agrees with DOT that the FCC should seek to ensure that LightSquared's handset proposal is adequately supported by data and a full understanding of the potential impacts on GPS receivers.

If you have any questions, please do not hesitate to contact me or Mr. Edward Drocella (edrocella@ntia.doc.gov; 202-482-2608) of my staff.

Sincerely,



Karl B. Nebbia
Associate Administrator
Office of Spectrum Management

Enclosure

³ See DOT Letter at 5-6, citing Comments of the General Aviation Manufacturers Association in IB Docket 12-340 *et al.*, filed Sept. 6, 2013, in response to *Public Notice*, Comments Sought on LightSquared Subsidiary LLC *Ex Parte* Filing, DA 13-1717 (Aug. 7, 2013), and Comments of the GPS Innovation Alliance in IB Docket 12-340 *et al.*, filed Sept. 6, 2013. See also Comments of Greenwood Telecommunications Consultants LLC in IB Docket No. 12-340 *et al.*, filed Sept. 6, 2013.

⁴ See Letter from Lawrence E. Strickling, Assistant Secretary for Communications and Information, U.S. Dept. of Commerce, to Julius Genachowski, Chairman, FCC (Feb. 14, 2012).



THE DEPUTY SECRETARY OF TRANSPORTATION
WASHINGTON DC 20590

September 18, 2013

Lawrence E. Strickling
Assistant Secretary for Communications and Information
and Administrator, National Telecommunications and
Information Administration
U.S. Department of Commerce
1401 Constitution Avenue, NW
Washington, DC 20230

**Re: LightSquared Subsidiary LLC *Ex Parte* Filing
Federal Communications Commission Public Notice DA 13-1717
IB Docket Nos. 12-340 *et al.***

Dear Assistant Secretary Strickling:

On August 7, 2013, the Federal Communications Commission (FCC or the Commission) released the above-referenced Public Notice, seeking comment on the issues raised in a presentation made to FCC by LightSquared Subsidiary LLC (LightSquared). I write to express the continuing concerns of the United States Department of Transportation (Department) relating to this proceeding and to LightSquared's proposal. I ask the National Telecommunications and Information Administration (NTIA) to carefully consider these concerns and to share them with FCC at the earliest opportunity.

The Public Notice focuses upon "the potential operations of LightSquared's terrestrial wireless handsets in the 1626.5-1660.5 MHz Mobile Satellite Service (MSS) uplink portion of the L-band." (Pub. Notice at 1.) LightSquared has provided the Commission with information about "the potential interaction of LightSquared's terrestrial wireless devices with GPS devices used for general location/navigation, high precision and aviation services." (*Id.*) LightSquared has told the Commission that this additional information is intended to answer "questions raised by several government agencies" about the deployment of LightSquared's network. (*Id.*)

The Public Notice involves one component of LightSquared's revised business plans, put before the Commission through various submissions and presentations over the past year. *See, e.g.,* FCC Public Notice DA 12-1863, IB Docket No. 12-340, *Federal Communications Commission Invites Comment On LightSquared Request To Modify Its ATC Authorization* (Nov. 16, 2012) (seeking comment on LightSquared's proposals). LightSquared revised its business plans after FCC vacated the conditional approval it had granted to the company for a high-powered network of terrestrial base stations. *See* FCC Public Notice No. DA 12-214, IB Docket No. 11-109,

International Bureau Invites Comment on NTIA Letter Regarding LightSquared Conditional Waiver (Feb. 15, 2012). As you know, FCC took that action based in substantial part upon the conclusions reached by NTIA and its Interdepartment Radio Advisory Committee (IRAC) member agencies, *i.e.*, that LightSquared's network would cause unacceptable interference with the Global Positioning System (GPS), including general/ personal navigation and certified aviation receivers, and that there was no practical way to mitigate those interference issues. *See* Letter from Assistant Secretary Lawrence E. Strickling to Chairman Julius Genachowski (Feb. 14, 2012).

As the lead civilian Agency within the U.S. Government on issues relating to GPS, DOT remains critically entrusted with ensuring that GPS service remains available, and protected from harmful interference, for the benefit of the nation. Among its many roles in GPS issues, the Department co-chairs the National Executive Committee for Space-Based Positioning, Navigation, and Timing (EXCOM) and its subordinate bodies. In that capacity, the Department has taken a lead role over the past several years in working with other Federal agencies to evaluate LightSquared's proposals in connection with the deployment of a broadband network, and to determine the potential harm to critical GPS operations used for safety, security, and other purposes.

DOT recognizes the Government's stake in making spectrum available for broadband capabilities, and for ensuring that spectrum, a scarce resource, is used efficiently. Toward that end, DOT invested significant resources over the past few years in working with LightSquared to examine whether and how its operations could be accommodated without undue harm to GPS. DOT is in the initial stages of conducting a GPS adjacent band compatibility assessment to derive adjacent band power limits, as a function of offset frequency, necessary to ensure reliable operation of existing and evolving space-based Positioning, Navigation, and Timing (PNT) services. DOT believes it is critical to continue to ensure reliable GPS services for public safety, homeland security, economic and scientific interests. Thus, in the Department's view, NTIA and FCC should seek to ensure that LightSquared's proposals are adequately supported by data, and should not be in haste to support or approve any such proposal without a full understanding of the potential impacts.

Several months ago, the Department wrote to NTIA to express concerns about LightSquared's revised business model, including possible effects upon GPS. *See* Letter from Michael Richmond and James Arnold to Edward M. Davison (Dec. 31, 2012). We reiterate those concerns here. To the Department's knowledge, NTIA has not directed any interagency effort to analyze or test LightSquared's current proposal, nor has DOT undertaken any such endeavor. Of course, continuing stress upon Agency budgets makes such efforts even more challenging than in the past. However, the Department wishes to bring to your attention the following concerns, based upon its review and present understanding of the issues raised in FCC's Public Notice. These concerns include the number of LightSquared handsets that might operate in the 1626.5-1660.5 MHz band, as well as certain assumptions made in the LightSquared analysis. These assumptions include the proximity under which a LightSquared handset and GPS receiver might operate, as well as the need to consider worst-case aviation analysis parameters.

Handset Terminal Density. The handset out-of-band emission levels into the 1559-1610 MHz band were negotiated between LightSquared and the U.S. GPS Industry Council in 2002 for an assumed Ancillary Terrestrial Component (ATC). As noted in FCC 08-094, ATC operations are expected in rural and remote areas throughout the United States where terrestrial-based services are unavailable, and in urban areas only when terrestrial-based services are unavailable or overloaded. As became clear in late 2010 with FCC SAT-MOD-2010118-00239, these ATC assumptions, especially in terms of terminal density, do not reflect LightSquared's mobile broadband proposal in either the 2010 or the current iteration.

The number of terrestrial-only handsets is expected to be orders of magnitude greater than existing MSS devices (METs). The METs are not normally operated in highly populated areas, and due to the higher "air time" costs for METs, the average percentage of time that a terrestrial-only device is active would be expected to be much higher than that for a MET. The potential higher density of transmitting LightSquared handsets in the 1626.5-1660.5 MHz band have a greater potential to cause interference to GPS receivers. Because of this, and because of the close proximity to the GPS L1 frequency band, careful consideration must be given to the potential for harmful interference, not only from out of band emissions (OOBE), but from GPS receiver overload effects.

Lack of LightSquared Handset Test Data. LightSquared's handsets were not sufficiently evaluated during the National Space-Based PNT Systems Engineering Forum (NPEF) testing and analysis conducted in 2011. Because no LightSquared handsets were available for testing, the White Sands Missile Range (WSMR) staff used a signal structure provided by LightSquared. The NPEF, in its analysis, decided not to release the data derived from use of this signal structure because there were many questions that could not be answered. For example, the handset out OOBE filter (high-performance lab filter) used in NPEF testing was best-case, but the performance of actual production filters may be expected to be much worse due to size and cost constraints, and to degrade over time, significantly changing performance. LightSquared is now relying on this data in Section 1.1.2 of the *LightSquared Assessment of Uplinks in the 1626.5-1660.5 MHz Band (LightSquared Uplink Assessment)*, but significant questions remain. A thorough analysis should be completed before any concurrence with the LightSquared analysis might be provided.

LightSquared's current analysis indicates that 10 percent of general location and navigation (GLN) and high precision GPS receivers could experience a 1-dB signal-to-noise degradation due to LightSquared user device operations for the scenarios evaluated (Sections 1.1.1.2 and 1.1.2 of the *LightSquared Uplink Assessment*). These results are cause for concern, as both the International Telecommunications Union (ITU) and NTIA use a 1-dB signal-to-noise degradation as a maximum tolerable GPS interference criterion.

LightSquared Handset Analysis Assumptions. For GLN and high precision receiver applications, LightSquared assumed in its analysis that there will be no more than one LightSquared handset transmitting within one meter of a GPS receiver. These assumptions need further evaluation to ensure adequate protection for surface transportation and high precision users.

Analysis of LightSquared Handsets in Vehicle Scenarios. The type and location of a Long Term Evolution (LTE) handset devices in a vehicle, and the location of the vehicle's GPS antenna, are critical to any analysis. Given the short ranges, any effects of propagation, attenuation, and other factors are extremely difficult to model. While a one-meter separation is assumed, LightSquared handsets realistically could be operating within a 10-30 cm range of a GPS device. There also is the possibility that multiple users will be in the vehicle at the same time, all using LTE handsets, as well as relying on GPS for crash detection and avoidance systems. Given the possibility that a vehicle has one or more users in the vehicle using handsets, an assumption of two to four LTE handsets operating simultaneously is more reasonable. This will affect the duty cycle experienced by GPS receivers. While LightSquared did examine up to four simultaneous users in a vehicle, it assumed none of them were closer than one meter from the GPS antenna.

As vehicles advance into the Intelligent Transportation Systems (ITS) era, GPS receivers for location and timing are expected to become more ubiquitous. For Dedicated Short Range Communications (DSRC), the current baseline technology for ITS safety applications, the current plan is to use GPS for timing as well as vehicle location. For a fully integrated device, this may be a common Global Navigation Satellite System (GNSS) receiver integrated into the roof, into a side mirror or into the trunk hood. For non-integrated devices, there may be multiple GNSS receivers satisfying multiple applications. As LightSquared cites in Section 1.3 of the *LightSquared Uplink Assessment*, it did not have data to evaluate GNSS systems that use signals from multiple satellite navigation constellations (e.g., GLONASS), and any potential impacts to these GNSS receivers should be analyzed.

Also, interference may be caused by full transmit power from the handsets in cases that the LightSquared analysis has not considered. These include rural and obstructed signal use cases such as canyons, deep forests, or other areas. From an ITS perspective, these are critical operational areas where GNSS is relied upon.

Analysis of LightSquared Handsets in Aviation Scenarios. The analysis in Section 1.2.1 of the *Uplink Assessment (Users Inside Aircraft)* uses only NASA path loss measurements for a 737-200 aircraft and does not include measurements discussed in same reference (RTCA DO-235B, Appendix E) made by Delta Airlines on a 737-800 aircraft, which resulted in 14 dB less path loss and a greater potential for interference. In addition, the path loss measurement approach used by NASA appears to account for both transmit and receive antenna gains. The additional 3 dB reduction for those gains appear to be double-counted and may result in the RTCA limits being exceeded. Extending the result for the 737-800 to all aircraft models and configurations has not been justified because an airframe-by-airframe analysis is required for any emitter.

If handset use is precluded during flight, this could impact pre-flight checkout of GPS. The Federal Aviation Administration (FAA), an operating administration of DOT, is concerned with safety and regularity of flight. As a result, interference that results in aircraft delays (e.g., due to inability to ensure proper functioning of avionics) is of concern to the FAA.

The approach used in the analysis in Sections 1.2.2 (Aircraft in Flight/Users on the Ground) and Section 1.2.3 (Aircraft at Gate/Users Nearby) of the *LightSquared Uplink Assessment* is not consistent with aviation worst-case analysis. The analysis “assumes a dB-for-dB reduction of OOB power spectral density (PSD) with fundamental transmitter power.” This is not consistent with the LightSquared-proposed out of OOB PSD limits of a fixed -95 dBW/MHz. In order for that assumption to be used in the analysis, the LightSquared OOB PSD regulation needs to be changed, and codified by the FCC, to be a dBc (*i.e.*, dB down with respect to peak carrier) limit.

The use of “average power” and “maximum users” may not result in the same interference level as one transmitter operating at maximum power. This is why the Commerce Spectrum Management Advisory Committee (CSMAC) analysis used terminal powers randomly drawn from the power cumulative distribution function.

In the Aircraft In-Flight/Users On-Ground Scenario, the LightSquared assumption that “a GPS receive antenna coupling loss of 3 dB is booked for elevation angles lower than 45 degrees relative to the horizon” needs to be investigated. Airborne antenna standards (e.g., RTCA DO-301) only require that maximum antenna gain decrease by 0.5 dB from elevation angles above 75 degrees to an elevation angle of 10 degrees. Aviation analysis in RTCA DO-327 (*Assessment of the LightSquared Ancillary Terrestrial Component Radio Frequency Interference Impact on GNSS L1 Band Airborne Receiver Operations*) also needs to be revisited, taking into account the new LightSquared assumptions and addressing the low-altitude safety-of-life terrain awareness and warning system applications that were extensively evaluated with LightSquared under their original business proposal.

As a result of a discussion concerning these areas between the Department and LightSquared, LightSquared provided additional information on September 12th. While that information should be taken into account during any future NTIA/FCC study, it is not, in itself, sufficient to conclude there will not be any interference in service.

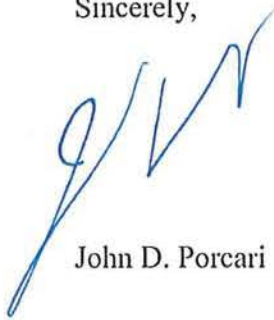
Satellite Communications Scenario. Finally, the impact upon satellite communications (including aviation satellite safety communications) has not been addressed. At a recent meeting of a joint task group of the Radiocommunication Sector of the ITU, one satellite communications provider concluded that “co-frequency sharing between MSS uplinks and mobile is not possible in the same geographic area. Furthermore, interference from such mobile service systems may cause harmful interference to any visible satellite operating in the same band” (*International Telecommunication Union Radiocommunication Sector Study Groups Document 4-5-6-7/240-E*).

Summary. In light of these concerns, the Department questions whether the Commission has the necessary and sufficient information before it to approve the handset proposal at issue in the Public Notice. Again, to the Department’s knowledge, there has not been any robust interagency effort to examine or test LightSquared’s proposal, to probe the underlying assumptions, or to consider feasible alternatives. Furthermore, at least with respect to potential GPS interference, the Department notes that this is not solely a government concern, but one in which a variety of individuals and organizations, including many in the private sector, have a stake. For example, the General Aviation Manufacturers Association and the GPS Innovation Alliance filed comments at the opening stage, arguing that LightSquared’s proposed terrestrial handsets could cause

harmful interference to GPS, and that LightSquared's technical analyses are insufficient to allay those concerns. *See* Comments of the General Aviation Manufacturers Association and the GPS Innovation Alliance at i and j (both filed Sept. 6, 2013).

The Department appreciates the opportunity to express its views in this matter. As always, we stand ready to work with NTIA and other interested Agencies to examine the issues in the Public Notice and to help reach an informed decision on the best course of action.

Sincerely,

A handwritten signature in blue ink, appearing to read 'John D. Porcari', written in a cursive style.

John D. Porcari