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LightSquared

December 12, 2011

The Honorable Ashton B. Carter
Deputy Secretary
U.S. Department of Defense
1010 Defense Pentagon
Room 3E944
Washington, DC 20301

The Honorable John D. Porcari
Deputy Secretary
U.S. Department of Transportation
1200 New Jersey Avenue, SE
Washington, DC 20590

Dear Secretaries Carter and Porcari:

As the Chairs of the National Executive Committee for Space-Based Positioning, Navigation, and Timing ("ExCom"), I write to express my profound disappointment and outrage at the events of December 9, 2011.

As you may know, last Friday afternoon, it appears that portions of internal analyses of ongoing test results were selectively leaked by a government official to a reporter at Bloomberg News. These materials relate to the testing process that was requested by the National Telecommunications and Information Administration ("NTIA") in its letter dated September 9, 2011 to ExCom. The purpose of that process is to provide further testing of the compatibility of Global Positioning System ("GPS") receivers with LightSquared's planned deployment of a terrestrial 4G LTE wireless network.

Based on Bloomberg News' reporting, it is apparent that this leak was intended to damage LightSquared's reputation, spread false information in the marketplace, and prejudice public opinion against LightSquared before a full and complete analysis of the testing results had been presented to ExCom, NTIA, or the Federal Communications Commission ("FCC"). LightSquared has suffered serious and substantial injury as a result of this leak.

By way of background, since the conclusion of the testing on November 30, 2011, we have been informed by both the NTIA and the National Coordination Office for Space-Based PNT ("National Coordination Office") that the results of the testing process were to be publicly disclosed only after ExCom had reviewed and analyzed that test data and that all participants in

that testing process were directed to hold the results of that testing confidential until that analysis had occurred. In addition, certain critical information necessary to interpret and understand this data has not yet been made available to NTIA, the National Coordination Office, or LightSquared.

Based on our review of Bloomberg News' reporting, the leak was based on an incomplete, selective, and slanted analysis of the data of the testing of general location/navigation devices. In its report, Bloomberg News reported that 75% of these devices tested may experience interference with LightSquared's network. Based on our own review of the test data, we profoundly disagree with that conclusion. To achieve that level of threshold of failure, the leaked internal analysis assumes that the power levels of LightSquared networks are *32 times greater* than the power levels at which LightSquared will actually operate.

In addition, throughout the test process, LightSquared has urged the government agencies involved to analyze the test results based on a measurement of the actual power level of LightSquared's network that will be experienced by GPS devices and not a theoretical model apparently relied upon by the leaked internal analysis. We submitted a formal proposal of this "power on the ground" standard with the FCC on December 7, 2011 (a copy of which is attached). If this "power on the ground" standard is applied to the test data, LightSquared's own analysis shows that the vast majority of general location/navigation will experience no interference from LightSquared's network. None of LightSquared's mitigation proposals were provided to Bloomberg News.

In addition, the NTIA's letter of September 9, 2011 also requested further testing of cellular devices. We also understand that the test results show that cellular devices – which represent the largest category of GPS devices in use in the United States – will experience no interference from LightSquared's network. This important result was also not provided to Bloomberg News.

Over the course of the last months, we have raised other concerns about the manner in which that testing was conducted.

- We have raised concerns that confidential information about the status and progress of the testing was being leaked to the public.
- We have raised concerns that some individuals involved in the testing process have displayed open predisposition against LightSquared. In their internal correspondence, for example, they openly discuss LightSquared's financial prospects; that LightSquared may "fold"; and that LightSquared should "warehouse" its spectrum to accommodate "most if not all of the GPS community."
- We have raised concerns about aspects of the testing protocol, including the fact that the GPS manufacturers were permitted to voluntarily submit devices for testing, which has the potential to skew the results.

The testing process requested by the NTIA is important not only to LightSquared, but also the GPS industry, GPS users, and the federal government. The analysis of those test

results should be based on a fair and rigorous technical analysis of the data and should not be prejudiced by public opinion distorted by partial and selective leaks.

Since the testing process began in September, LightSquared has worked diligently and in good faith with representatives of all the involved government agencies. We greatly appreciate the efforts, dedication, and cooperation of these individuals who brought this complex and arduous testing process to conclusion. However, the leak on December 9, 2011 – which occurred after the testing process was completed – creates for LightSquared serious doubts about the fairness and integrity of the entire process. In my 30-year business career, I have never seen a more profound breach of trust.

To ensure that the process going forward is fairly conducted, we ask that ExCom immediately issue a public statement clarifying that the information leaked on Friday, December 9, 2011 was preliminary, incomplete, and did not represent the full findings from the test results. We also ask that the Departments of Defense and Transportation refer this matter for an immediate investigation to determine the circumstances of this leak and to ensure that responsible individuals are held accountable for their actions. We ask that LightSquared be notified of the initiation and progress of this investigation.

Should you have any questions, please do not hesitate to contact me directly. I greatly appreciate your attention to this matter.

Very truly yours,

Sanjiv Ahuja /CPL

Sanjiv Ahuja
Chairman and Chief Executive Officer
LightSquared

Enclosures

cc: The Honorable Lawrence E. Strickling
Assistant Secretary for Communications and Information
National Telecommunications & Information Administration
United States Department of Commerce

Mr. Anthony Russo
Director, National Coordination Office for Space-Based PNT

Bloomberg

Falcone's LightSquared Said to Disrupt 75% of GPS in Tests

By Todd Shields - Dec 9, 2011

Philip Falcone's proposed LightSquared Inc. wireless service caused interference to 75 percent of global-positioning system receivers examined in a U.S. government test, according to a draft summary of results.

The results from testing conducted Oct. 31 to Nov. 4 show that "millions of fielded GPS units are not compatible" with the planned nationwide wholesale service, according to the draft seen by Bloomberg News.

"LightSquared signals caused harmful interference to majority of GPS receivers tested," according to the draft prepared for a meeting next week of U.S. officials reviewing the LightSquared proposal. "No additional testing is required to confirm harmful interference exists."

LightSquared, backed by $3 billion from Falcone's Harbinger Capital Partners hedge fund, faces challenges from makers of global-positioning system devices who say the service will disrupt navigation by cars, boats, tractors and planes. U.S. regulators are withholding approval as they check on claims of interference.

The Reston, Virginia-based company has proposed offering high-speed mobile Internet service to as many as 260 million people using 40,000 base stations. The service would operate on airwaves formerly reserved mainly for satellites, and near those used by GPS devices.

LightSquared is proposing to operate at a lower power than the level used during the tests, and believes that its operations would affect about 10% of devices, Martin Harriman, executive vice president, said in an interview.

'Harmful Interference'

The tests worked off an "extraordinarily conservative" threshold and didn't show the devices' performance was affected, Harriman said.

"If we're affecting the performance of the device -- my goodness, we'd like to be sure that doesn't happen," Harriman said.

The laboratory testing was performed for the National Space-Based Positioning, Navigation, and Timing (PNT) Systems Engineering Forum, an executive branch body that helps advise policy makers on issues around GPS. It found that 69 of 92, or 75 percent, of receivers tested "experienced harmful interference" at the equivalent of 100 meters (109 yards) from a LightSquared base station.

The devices tested include those used for automobile and boat navigation. The forum is to present its results on Dec. 14 in Washington.

High-Precision Receivers

The testing was requested by the National Telecommunications & Information Administration, a Commerce Department agency that oversees airwaves use. The agency is still reviewing data, Moira Vahey, a spokeswoman, said in an interview today.

The government is to test high-precision receivers, used in farm equipment and scientific instruments, next year.

Agencies participating in the testing included the Department of Defense and the Federal Aviation Administration, according to the draft summary. Companies participating included GPS makers Trimble Navigation Ltd. (TRMB) and Garmin Ltd. (GRMN), farm-gear maker Deere & Co. (DE), and General Motor Co. (GM)'s OnStar unit, according to the summary.

LightSquared is "outraged by the illegal leak of incomplete government data," Harriman said in an e-mailed statement. "This breach attempts to draw an inaccurate conclusion to negatively influence the future of LightSquared and narrowly serve the business interests of the GPS industry."

To contact the reporter on this story: Todd Shields in Washington at tshields3@bloomberg.net

To contact the editor responsible for this story: Michael Shepard at mshepard7@bloomberg.net

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December 7, 2011

Julius Knapp
Chief, Office of Engineering and Technology
Federal Communications Commission
445 Twelfth Street, SW
Washington, DC 20554

Re: FCC File No. SAT-MOD-20101118-00239; IB Docket No. 11-109

Dear Mr. Knapp,

LightSquared Subsidiary LLC ("LightSquared") hereby submits this letter to present further details regarding the "power on the ground" approach to addressing concerns of GPS receiver overload, whereby LightSquared has proposed to limit power on the ground from its terrestrial base stations.[1] As explained below, the "power on the ground" approach is intended to supplement the FCC's existing rules regarding base station EIRP limitations by providing further assurances that GPS users would not face conditions under which GPS receivers would overload, while also providing a process for calibrating and monitoring the LightSquared power level to ensure compliance.

In opposing LightSquared's planned deployment of terrestrial broadband services, the GPS industry has claimed that LightSquared's terrestrial network deployment would have more transmitters than the GPS industry had expected, and that the Commission-mandated level of network deployment would lead to greater risk of overload interference to GPS receivers.[2] While LightSquared previously has shown that its terrestrial network deployment plans, including the number of transmitters, were long anticipated by the GPS industry,[3] LightSquared

[1] *See Ex Parte* filing by LightSquared Subsidiary LLC, Sep. 7, 2011, Attachment, at 3-9; *Ex Parte* filing by LightSquared Subsidiary LLC, Sep. 27, 2011; *Ex Parte* filing by LightSquared Subsidiary LLC, Oct. 6, 2011, Attachment D; *see also* Recommendation of LightSquared Subsidiary LLC, File No. SAT-MOD-20101118-00239 and IB Docket No. 11-109 (filed Jun. 30, 2011) (LightSquared commitments re: limiting operation to lower 10 MHz and limiting maximum base station EIRP to levels approved in 2005).

[2] *See, e.g.*, Comments of John Deere & Company, IB Docket No. 11-109, at 7-9 (Aug. 1, 2011); Comments of Garmin International, Inc., IB Docket No. 11-109, at 18-22 (Aug. 1, 2011); Comments of Trimble Navigation Limited, IB Docket No. 11-109, at 5-21 (Aug. 1, 2011); Comments of The Coalition to Save Our GPS, IB Docket No. 11-109, at 32-34 (Aug. 1, 2011).

[3] *See, e.g.*, Reply Comments of LightSquared Subsidiary LLC, IB Docket No. 11-109, at 10-21 (Aug. 15, 2011).

has nevertheless proposed to limit its power on the ground when transmitting in the lower 10 MHz from 1526-1536 MHz to no more than -30 dBm until January 1, 2015, -27dBm until January 1, 2017, and -24dBm thereafter in order to provide greater certainty to GPS users and manufacturers that GPS receivers designed to look into the L-band will not experience receiver overload.

As LightSquared has demonstrated, testing done by the TWG showed that in the presence of a -30dBm LightSquared signal operating in the lower 10 MHz, all cellular phones, the vast majority of general location and navigation receivers, and narrowband timing devices performed well, and many high-precision devices that do not use an MSS augmentation signal also performed well.[4] The proposed limitations to LightSquared's power on the ground will supplement the existing restrictions on LightSquared's operation, including, as per the formula specified in Section 25.253(d)(1) of the FCC rules, LightSquared's proposal to operate with a maximum base station EIRP per sector for the single carrier at 32 dBW.

The "power on the ground" approach resolves concerns regarding power levels of LightSquared base station emissions in the lower 10 MHz, as well as disputes regarding the density of LightSquared base stations and propagation models that lead to predictions of harmful interference to GPS receivers. Moreover, this approach has been used by other policymakers to address interference concerns between adjacent spectrum users. In the United Kingdom, for example, Ofcom considered this approach in detail and adopted it as part of its spectrum liberalization initiative, using the term "spectrum usage rights" or "SURs".[5] In setting the maximum power limits on the ground, Ofcom noted that this was a superior approach because establishing such power limits, rather than the maximum power that can be transmitted, "directly controls the problem rather than indirectly or inaccurately."[6]

Measurement

In the UK, Ofcom concluded, after input from stakeholders, that modeling the power on the ground was preferable to measuring it because the latter was expensive and more complex compared to the former.[7] However, in order to provide greater certainty regarding the power on the ground of LightSquared signals and that they do not exceed levels at which most GPS receivers would overload, LightSquared proposes that in addition to RF propagation modeling, it will implement a process to conduct detailed power level measurements and make the same available to the FCC and the public at large.

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[4] *Ex Parte* filing by LightSquared Subsidiary LLC, Oct. 6, 2011, Attachment D, at 3.

[5] *See* http://stakeholders.ofcom.org.uk/consultations/sur/

[6] Ofcom Office of Communications, *Spectrum Usage Rights: A Guide Describing SURs*, at 1, ¶ 1.5 (June 4, 2008), *available at* http://stakeholders.ofcom.org.uk/spectrum/spectrum-management/spectrum-usage-rights/

[7] *Id.* at 24-26, ¶¶ 6.1-6.16.

Attachment A describes in greater detail the proposed process for measuring the LightSquared power on the ground. The process includes two phases that will be used to validate the predicted power that will be derived using commercial best practices using commercial network optimization tools. In phase one, drive testing will be performed covering a cluster of base stations in order to identify the regions where the signal powers on the ground reach their highest values — *i.e.*, hotspots within the cluster will be identified. In phase two, additional testing will be performed on the identified hot spots to determine the corrective action necessary. Any necessary corrective actions will take place within 48 hours of a cell site coming on air.

Compliance

In order to ensure compliance with the agreed to power-on-the-ground limits, LightSquared will submit an initial report, to be followed by semi-annual reports, describing the results from the above-described process. In each report, LightSquared will certify the accuracy of the measurements and will provide relevant technical details as described in Attachment A. Subsequent reports will include details regarding sites that have gone on-air during the time period covered and will provide statistics on any interference complaints received and the manner in which they were resolved.

Both initial and subsequent measurement results will be made available to the FCC and the general public, allowing all parties to monitor LightSquared's compliance with the established limits. An advantage of the power on the ground approach is that LightSquared's compliance with the established limits can be independently verified by third parties conducting their own measurements. In the event that third-party testing indicates disagreements regarding the measured power levels on the ground, LightSquared proposes that testing be conducted by a "qualified and independent" third party entity. The process for third-party testing, including assessing the independence of third-parties, could be modeled after the testing of power levels of broadcast signal intensity pursuant to SHVERA.[8]

Benefits of the Proposed Approach

It is important to emphasize that LightSquared will continue to operate under the rules that were established in 2003 through 2005, which establish maximum EIRP limits, out-of-band emission limits, and other limitations designed to protect GPS users.[9] As LightSquared has discussed in the past, these limits were established after a full notice-and-comment process, and

[8] *See* 47 U.S.C. § 339(c).

[9] Recommendation of LightSquared Subsidiary LLC, File No. SAT-MOD-20101118-00239 and IB Docket No. 11-109, at 25-27 (filed Jun. 30, 2011).

incorporate out-of-band emission limits established following an agreement between LightSquared's predecessor and the U.S. GPS Industry Council.[10] However, the proposed "power on the ground" limits will provide greater certainty to GPS users, system operators, and manufacturers that GPS receivers will not be subject to high power levels on the ground that would cause them to overload.

As Ofcom noted when it adopted SURs as part of its spectrum liberalization efforts and established maximum power-on-the-ground levels, such limits provide greater certainty to adjacent spectrum users as to the maximum levels of interference they can expect because the limits address the actual power on the ground directly rather than estimates of the power on the ground derived from a variety of indirect factors such as the transmitter power, transmitter locations, antenna height and tilt, nearby structures and terrain, all of which affect the actual power incident on nearby receivers. At the same time, establishing maximum power limits on the ground gives licensees greater flexibility to manage network parameters to achieve greater coverage while still maintaining compatibility with neighboring services. This in turn will lead to more efficient spectrum use at a time when spectrum is an increasingly scarce resource, particularly spectrum for wireless broadband services.

Thus, the power on the ground approach discussed above is a more reliable approach to addressing the concerns of GPS users and manufacturers regarding potential receiver overload. In addition, because the power levels on the ground can be independently measured, establishing such limits will provide greater transparency regarding interference complaints and will lead to more effective monitoring compliance by FCC staff as well as third parties.

Please do not hesitate to contact me with further questions.

Respectfully submitted,

/s/ Jeffrey Carlisle
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[10] *See* Letter from USGIC to FCC, FCC File Nos. SAT-MOD-20031118-00333 *et al.* (Mar. 24, 2004). In its letter, USGIC indicated that the OOBE limits that had been agreed to "ensure[] the continued utility of GPS receivers operating in the vicinity of MSV ATC stations." *Id.* .

cc: Rick Kaplan
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ATTACHMENT A

Power-on-the-Ground Implementation and Measurement

RF Design

- Industry best practices, using commercial tools, will be used for predicting on-the-ground mean signal strengths as part of the basic system design. An objective of the RF design will be to ensure that the power on the ground limit is observed at all locations in the coverage area. The RF propagation prediction tools are "tuned" to market-specific characteristics which includes morphology types (dense urban, urban, suburban and rural) as well as a database of site-specific obstacles to wave propagation.

- Best practices will be updated based on experience gained in the implementation and power optimization process.

- Perfecting the design process will result in efficient network designs and will minimize the number of post-deployment power adjustments necessary to comply with its power-on-the-ground obligations.

Power Optimization

- LightSquared will perform field test measurements to validate the power on the ground and make any necessary power adjustments within 48 hours of commencement of operation of new cell sites.

- The measurement process will involve two phases.

    - Phase-1: In the first phase, which is effectively a screening phase, drive testing will be performed with a vehicle mounted, calibrated, power-measurement apparatus described below. The drive route will cover a cluster of base stations (generally 15-25 base stations per cluster). The object is to quickly identify regions where the signal powers on the ground attain their highest values (i.e. identify the hot spots in the cluster). At least 5000 power samples will be collected in the testing of each cluster.
        - A calibrated antenna, whose gain is known in azimuth and elevation to both vertical and horizontal linearly-polarized signals. The passband of the antenna will be sufficient to cover the lower 10 MHz ATC channel, i.e. 1526 – 1536 MHz.
        - A calibrated power measurement instrument such as a commercial Scanner (used in cellular channel monitoring) or a spectrum analyzer will be used. The instrument will be capable of measuring the instantaneous received power and outputting it with some time-averaging, e.g. through video filtering in the spectrum analyzer, at the rate of at least 1 sample/second. The passband (IF bandwidth) of the power measurement apparatus will be set at 10 MHz to correspond to the bandwidth of the

LightSquared base station signal. The combination of the scanner/spectrum analyzer video bandwidth and any additional averaging performed by the apparatus shall be set so that the reported power corresponds to an approximately 1 second averaging of the instantaneous received power.

- Means for recording the true position of the vehicle, comprising reference GPS receivers with inertial navigation assistance.
- Equipment for recording the collected data and archiving.
- As the receive antenna is mounted on a vehicle, the measurements will necessarily be performed at approximately 7 – 8 feet above ground. The relatively large ground plane provided by the roof of the vehicle (typically a van) will tend to over-predict the received power relative to a hand held cellphone or a General Navigation device mounted inside a car – these results will therefore tend to err on the conservative side.
- The base stations will be configured to simulate full traffic loading.

- Phase-2: In the second phase, static power measurements will be performed in all hot spots identified the first phase. The object is to ensure that the "local mean", contrasted with spatially-narrow power peaks produced by multipath, has been properly identified. It is noteworthy that the multipath peaks in dense urban environments typically have a correlation distance of 0.18 wavelength, which at 1531 MHz is 1.3 inches [Clarke, BSTJ, July – August 1968, p. 957].
  - A minimum of 10 measurement samples will be taken, distributed approximately uniformly over a 10 meter by 10 meter area, approximately centered on the hot spot (to the extent possible).[1] Each power measurement will be performed with the receiver completely stationary and with the reported dB value of the power averaged over 2 minutes. The object of this time averaging is to remove the small fluctuations caused by movements in the environment. The mean powers (in dB) from the above mentioned 10 locations will be also be averaged.
  - The space-time, dB-averaged, power value will be used as the basis of determining if the compatibility requirement has been met. If not met, appropriate RF parameters of the relevant cell sites will be adjusted to ensure compatibility. LightSquared will reduce EIRP from individual sites as much as necessary in order to meet the power on the ground obligations.
  - In no event will a cell site EIRP ever exceed 32 dBW.

The following apply generally to both phases.

- The power shall be measured with a reference antenna meeting the following requirements:
  - Tuning: Passband of at least 1525-1610 MHz

[1] In cases where it is not practical to take fixed measurements (e.g. along interstates or busy intersections) the alternative will be to drive test the area several times from different directions at the minimum allowable speed.

- Polarization: Right Hand Circular (or a vertically polarized antenna with appropriate adjustments made to recorded data)
- Pattern:
    - Azimuthal Gain: omnidirectional (approximate)
    - Elevational Gain: unspecified but calibrated (known gain versus elevation angle profile)

- The power shall be reported with respect to a 0 dBi antenna, corresponding to the elevation angle of the nearest base station antenna. The elevation angle will be determined from the recorded true position of the power measurement.