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October 26, 2015

Ms. Marlene H. Dortch
Secretary
Federal Communications Commission
445 12th Street, SW
Washington, DC 20554

Re: *Ex parte* presentation in IB Docket No. 12-340; IB Docket No. 11-109; IBFS File Nos. SAT-MOD-20101118-00239; SAT-MOD-20120928-00160; SAT-MOD-20120928-00161; SES-MOD-20121001-00872

Dear Ms. Dortch:

Attached are comments that LightSquared submitted to the Department of Transportation addressing the Department's draft test plan for the Adjacent Band Compatibility Study. In the comments, LightSquared stated that the test plan is fundamentally flawed and, for reasons we have made clear previously, should be conducted by the FCC and the Department of Commerce. The comments stressed that not only does the test plan contain significant omissions that leave the scope and schedule of the proposed testing uncertain, it also fails to respond to or even consider concerns raised repeatedly by LightSquared and other stakeholders on critical issues such as device selection, transparency, independence of the testing process, testing procedures, the repeatability and verifiability of the testing regime, and the evaluation of test results. Most significantly, the proposed test plan establishes that DOT refuses to measure what counts: the impact of any interference on performance of the device. The comments explained that is what the FCC defines as "harmful interference." Given this failure to use the expert agency's metric, the test will not actually add to the dialog that is needed to ensure that this vital spectrum can be used by both GPS and next-generation broadband services, and the long delay caused by the DOT testing will be for naught.

We also want to use this opportunity to make three points in response to a recent *ex parte* letter from ATIS about the issue of GPS timing devices, their importance to wireless and wireline networks, and possible impact from LTE use in adjacent bands.[1] *First*, we agree completely with ATIS that the effect of LTE in adjacent bands on network timing devices is an important one that the industry and the company should address. *Second*, the company and the industry have already spent considerable time not only studying the issue but developing

[1] Letter from Thomas Goode, General Counsel, ATIS, to Marlene H. Dortch (Oct. 13, 2015).

solutions that in fact resolve any concerns. Specifically, as far back as 2010, one of ATIS's members, Alcatel-Lucent, issued an advisory notice (hereinafter, "2010 Alcatel-Lucent Notice") to its customers making them aware of a new antenna the customers could install that would resolve any issues with adjacent band interference and protect the network receivers.[2] The 2010 Alcatel-Lucent Notice came out of the dialogue that LightSquared was having at that time with the carriers on a coordination process. Thus, not only does the 2010 Alcatel-Lucent Notice show that carriers and manufacturers have known about the timing issue for years, it also shows that Alcatel-Lucent itself since 2010 has had compatible receivers. *Third*, we look forward to further dialogue with ATIS on this matter, and we will undertake additional testing if that is necessary, including as part of the Roberson and Associates testing. That discussion of course will take place against the backdrop that (a) there are current coordination requirements that have been in place since 2003, and (b) one of ATIS's leading members, Alcatel-Lucent, has been well aware of the issue and has offered customers a solution for over five years.

Please direct any questions to the undersigned.

Respectfully submitted,

/s/Gerard J. Waldron
Gerard J. Waldron
Paul Swain

Counsel to LightSquared

Attachments

[2] *See* Attachment 2. (The company received this document from Alcatel-Lucent in 2010 in connection with discussions about resolving any interference issues, and the company's nondisclosure agreements with Alcatel-Lucent have long since expired.)

Before the
DEPARTMENT OF TRANSPORTATION
Washington, DC 20590

In the Matter of	)	
Draft Test Plan To Obtain Interference Tolerance Masks for GNSS Receivers in the L1 Radiofrequency Band (1559-1610 MHz)	)	Docket No. DOT-OST-2015-0099

COMMENTS OF LIGHTSQUARED

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October 16, 2015

Executive Summary

The Department of Transportation's draft test plan is fundamentally flawed and, for reasons we have made clear previously, should be conducted by the FCC and the Department of Commerce. Not only does the test plan contain significant omissions that leave the scope and schedule of the proposed testing uncertain, it also fails to respond to or even consider concerns raised repeatedly by LightSquared and other stakeholders on critical issues such as device selection, transparency, independence of the testing process, testing procedures, the repeatability and verifiability of the testing regime, and the evaluation of test results. Most significantly, the proposed test plan establishes that DOT refuses to measure what counts: the impact of any interference on performance of the device. That is what the FCC defines as "harmful interference." Given this failure to use the expert agency's metric, the test will not actually add to the dialog that is needed to ensure that this vital spectrum can be used by both GPS and next-generation broadband services, and the long delay caused by the DOT testing will be for naught.

The DOT study intends to measure a change in the noise floor, specifically a 1 dB change in C/N_0, and to report on any such change caused by LTE use. Choosing to measure a 1 dB change may have been justified in the last century, when testing equipment was not as advanced as it is today and so interference analysis was based on changes in the noise floor—not because it was necessarily a useful metric but because that was all that could be measured. But to rely on this old, and flawed, metric, which has no correlation with actual performance of the GPS device, is misguided when modern tools are available to measure what consumers care about: whether interference causes the GPS device to give an end user faulty position or timing information.

For this reason, we advocate that any testing should focus on position and timing error. This proposal is supported by the FCC's rules, principles of sound engineering, and with the GPS device manufacturers' own promises to their customers regarding device performance. Indeed, these customer commitments provide powerful evidence as to what is useful as a gauge of consumer expectations with respect to the accuracy of GPS devices—and it is not changes in the noise floor.

These and other significant problems with the draft test plan serve as further evidence that DOT is not the right agency to evaluate compatible uses of spectrum, particularly when there are expert agencies—the FCC and NTIA—who grapple with these issues regularly, and who are statutorily charged with the responsibility of regulating spectrum usage.

LightSquared's Comments on the draft test plan are an attempt to ensure that if DOT proceeds with its testing, the results will be useful to the FCC and NTIA as the ultimate decision-makers on compatibility issues. Importantly, LightSquared urges DOT to ensure that its testing bears the hallmarks of high-quality scientific experimentation—*i.e.*, that the tests themselves and the results obtained are repeatable, verifiable, and can be proven as false or true. The test plan that Roberson and Associates presented at the recent DOT workshop (attached herein) meets those criteria and is designed to contribute to the vital debate on this important mid-band spectrum.

Table of Contents

I. Significant Omissions in the Draft Test Plan Are Likely To Cause Further Unnecessary Delay 2

II. Using Position Error, Instead of 1 dB Change in C/N_0, As the Key Study Metric Is Consistent with FCC Rules, Sound Engineering, and GPS Manufacturers' Own Promises to Their Customers 4

A. Device Position Error Is Consistent with FCC Rules 5

B. Device Position Error Reflects Sound Engineering Principles 5

C. Device Position Error Is Based on the GPS Manufacturers' Own Statements to Their Customers 7

III. The Draft Test Plan Leaves Many Important Questions Regarding the Scope of the Project Unresolved 8

A. Projection of Power 8

B. Multi-GNSS Receivers 9

C. MSS-Augmented Receivers 9

D. Spectrum Bands 10

E. Receiver Study 11

IV. The Test Plan Should Provide Detailed Information Regarding Device Selection and Procurement 13

V. The Draft Test Plan Omits Important Information Regarding the Testing Process 14

A. Test Procedures and Outputs 14

B. Test Process and Timeline 15

C. Test Facility and Personnel 15

D. Review and Audit of Test Results 16

VI. Information Submitted by GPS Manufacturers Should Be Made Available to Stakeholders Subject to Appropriate Confidentiality Protections 17

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DEPARTMENT OF TRANSPORTATION
Washington, DC 20590

In the Matter of	)	
Draft Test Plan To Obtain Interference Tolerance Masks for GNSS Receivers in the L1 Radiofrequency Band (1559-1610 MHz)	)	Docket No. DOT-OST-2015-0099

COMMENTS OF LIGHTSQUARED

LightSquared Subsidiary LLC ("LightSquared") respectfully submits these Comments in response to the draft test plan released by the Department of Transportation ("DOT") in the above-captioned proceeding. The draft test plan reveals that there is still significant uncertainty regarding key aspects of DOT's proposed testing, including: the scope of the project, testing schedule, device selection and procurement, testing procedures, and transparency regarding device selection and test results. Moreover, the information that has been provided demonstrates that the test plan in its current form is substantially flawed and is unlikely to provide useful or actionable information to the Federal Communications Commission ("FCC") or National Telecommunications and Information Administration ("NTIA"), the agencies ultimately responsible for regulating spectrum. The significant problems with the test plan further highlight the fact that DOT is not the appropriate agency to oversee the proposed testing and that the underlying issues are best left to FCC and NTIA, which are more experienced in this area and better equipped to study spectrum use compatibility.

I. Significant Omissions in the Draft Test Plan Are Likely To Cause Further Unnecessary Delay.

In January 2012, the National Space-Based Position, Navigation and Timing Executive Committee ("EXCOM") proposed to draft new spectrum interference standards to inform future proposals for spectrum uses in bands adjacent to GPS. Some eleven months later, DOT completed the thirteen-page GPS Adjacent-Band Compatibility Assessment Plan (the "Assessment Plan"); however, this document was not publicly released until August 2014—approximately 20 months after the document's creation and 31 months after the EXCOM proposal.

Despite the significant time period that elapsed between its initiation and release, the Assessment Plan was missing critical details about how such an assessment would be undertaken. Among the key missing pieces were an end-to-end project plan describing the different steps and phases in the assessment process, a schedule as to when testing would be initiated and completed, a defined process for the selection of devices to be tested, and a definition of roles and responsibilities among DOT, the Volpe Center ("Volpe"), other federal agencies, and private interests.

DOT and Volpe scheduled four public workshops between September 2014 and June 2015 (the June 2015 workshop was subsequently canceled) in order to solicit public input into its Adjacent Band Compatibility Study (the "ABC Study"). DOT and Volpe had committed to release a test plan by early May 2015.[1] However, a draft test plan was not released until late September 2015.

[1] *See Stephen Mackey*, Recap and Program Plan Update, Slide 6 (Mar. 12, 2015), *available at* http://www.rita.dot.gov/pnt/recap/slide6.

Not only was the test plan delayed, it is incomplete. It is not the comprehensive, actionable document that was expected. Indeed, it discloses up front that key information and elements are missing and are being relegated to a "Test Procedure" document for which no specific information or delivery date is provided.[2] This is the first mention of any bifurcation of the test plan document and represents yet another delay in the assessment process. By identifying, but not describing, the Test Procedure document, DOT has created an enormous hole and introduced further uncertainty into the process. The reader of the test plan document is left to wonder whether items missing from that document will be addressed by the Test Procedure document, or are left out of the process entirely. Because of this, it is impossible to provide complete, effective input into the testing process without the ability to review both documents simultaneously. Unfortunately, DOT has provided no information about what will be included in the Test Procedure document, when it will be released, and whether it will also be put out for public comment as was pledged at the March 2015 workshop for the overall test plan (which both documents would seem to encompass).

Given the delay in the release of just the first part of the test plan to the public and the further delay necessitated by DOT bifurcating the draft test plan from the Test Procedure document, DOT has stated that testing will not begin this year.[3] As a result, the ABC Study will reach its four-year anniversary in January 2016 without having produced *any* actionable data. Moreover, it is not possible to determine exactly how far off course the ABC Study is at this

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[2] There are some plan elements where the technical feasibility is still under assessment, as disclosed in the last workshop, and where the outcome could affect the test plan. One example is the feasibility of filtering OOBE from the test signals to licensed limits established by the FCC, especially for frequencies close the GNSS band.

[3] *See Stephen Mackey*, Recap and Program Plan Update, Slide 10 (Oct. 2, 2015), *available at* http://ntl.bts.gov/lib/55000/55700/55703/01_Mackey_Workshop_IV_Recap_Program_Plan_Update.pdf.

point, since DOT has yet to produce a detailed, comprehensive project plan. Such a plan should be standard practice for an undertaking as large and time-consuming as the ABC Study.

In addition to the unexplained delays, the overall scope of the phases of the ABC Study continues to change as well. The test plan document has mysteriously moved the testing of multi-GNSS receivers from Phase 2 of the ABC Study into Phase 1 without an explanation. Such an important change in the scope of Phase 1 should be more fully explained. It is unclear what circumstances have changed to make this re-categorization necessary and what effect this will have on the expected completion of Phase 1, which already is seriously delayed.[4]

II. Using Position Error, Instead of 1 dB Change in C/N_0, As the Key Study Metric Is Consistent with FCC Rules, Sound Engineering, and GPS Manufacturers' Own Promises to Their Customers.

The DOT study intends to measure a change in the noise floor, specifically a 1 dB change in the Carrier to Noise Density Ratio ("C/N_0"), and to report on any such change caused by LTE use. Choosing to measure a 1 dB change may have been justified in the last century, when testing equipment was not as advanced as it is today and so analysis was based on changes in the noise floor—not because it was necessarily a useful metric but because that was all that could be measured. But to rely on this old, and flawed, metric, which has no correlation with actual performance of the GPS device, is misguided when modern tools are available to measure what counts: whether interference causes the GPS device to give an end user faulty position or timing information.[5] For this reason, we advocate that any testing should focus on position and timing error. Three reasons support that conclusion.

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[4] This is even more puzzling when one considers that the DOT test plan includes the QZSS L-1 signal, which will be received only within Japan and not the United States.

[5] At the DOT Workshop held October 2, Roberson and Associates presented an approach based on measuring actual position/timing error. That presentation is attached.

A. Device Position Error Is Consistent with FCC Rules.

The FCC has adopted a definition of "harmful interference," and the Department should use the standard set by the expert agency or else justify its departure from this long-time standard. DOT has done neither.

The FCC defines "harmful interference" as follows: "Interference which endangers the functioning of a radionavigation service or of other safety services or seriously degrades, obstructs, or repeatedly interrupts a radiocommunication service operating in accordance with [the International Telecommunication Union] Radio Regulations."[6] This definition of harmful interference, which comes from the constitution of the International Telecommunication Union's Radio Regulations, has been used by the FCC for decades.[7]

It is axiomatic that for evidence to be given due weight by an expert agency it needs to be consistent with that agency's rules. Thus, for a test of GPS devices to be given full consideration by the Commission as to whether it accurately measures harm to a GPS device, it should measure what the Commission has defined as harmful interference. There is no need for DOT to create a new metric when the expert agency already has supplied one. DOT has failed to address or justify its departure from this standard.

B. Device Position Error Reflects Sound Engineering Principles.

The draft test plan states that its Interference Tolerance Mask ("ITM"), which is the test plan's analog for "profile of harmful interference thresholds," will be derived by measuring a 1 dB change in C/N_0 when in the presence of an adjacent-band LTE signal. DOT has provided

[6] 47 C.F.R. § 2.1(c).

[7] *See* ITU Radio Regulations § 1.169; FED. COMMC'NS COMM'N, REPORT OF THE INTERFERENCE PROTECTION WORKING GROUP SPECTRUM POLICY TASK FORCE 8 (2002), *available at* http://transition.fcc.gov/sptf/files/IPWGFinalReport.pdf.

no basis for the use of this measure, which does not reflect any user-observable change or degradation in device operation.[8] By using an incorrect and unjustifiable measure of harmful interference and by refusing to identify and endorse best practices for receiver design, the ITM will essentially establish transmit power limits based on the worst-performing GPS receivers, while doing nothing to encourage improved receiver design practices.

DOT has expressed a willingness to collect additional data about receiver performance, including location accuracy, and that change to DOT's plan from what was presented at the March 2015 workshop is welcome. However, the test plan does not state whether this will be collected for all devices or how this information is to be used. More troublingly, the plan already has deemed C/N_0 to be the only measure to be considered in establishing the ITM for each receiver class. The failure to specify how this data will be used either exposes another missing element in the test plan or, worse, indicates that the data will be collected but not utilized in DOT's assessment.

The sound engineering approach would be for DOT to gather a complete dataset for each device, including position/timing error, satellites in view, and change in C/N_0 at multiple levels beyond 1 dB, with the impact to end users measured primarily by noticeable decreases in position/timing accuracy.[9] In order to fully understand the range of performance among tested

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[8] Some Workshop participants at various times have cited ITU Recommendation ITU-R M-1903 as a basis for such a choice. But that recommendation cannot be a basis for DOT's decision for the following reasons. For one, the ITU Recommendation is not a *standard* by itself and has not been incorporated into any public standard. It was suggested for adoption as a standard for assisted GPS, which is used in cellular technology. But critically, it has not been adopted by either of the principal cellular standards bodies—3GPP (3rd Generation Partnership Project) or 3GPP2 (3rd Generation Partnership Project 2)—nor by the FCC. In addition, it applies to co-channel (out of channel emissions and out of band emission) interference, *not* to overload interference.

[9] Roberson and Associates ("Roberson") is a technology and management consulting company currently testing the compatibility of GPS devices and terrestrial LTE operations. Unlike DOT's (continued…)

devices, four ITMs should be established for each device category based on change in position/timing accuracy. These would show the LTE power tolerance levels (based on position/timing accuracy) for the 90th, 50th, 15th and zero percentile devices based on the test criteria. This approach will give the FCC the data necessary to make the ultimate determination regarding the power levels that result in harmful interference. The data produced will also be useful to determine what correlation, if any, exists between changes in C/N_0 (of 1 dB and greater) and position/timing accuracy.

C. Device Position Error Is Based on the GPS Manufacturers' Own Statements to Their Customers.

Perhaps the best evidence to support the assertion that device position error is the key metric comes from the GPS companies themselves. In considering what should be tested, we urge the Department to weigh heavily the *GPS manufacturers' own commitments* to their customers. That is powerful evidence as to what is useful as a gauge of consumer expectations with respect to the accuracy of GPS devices. Importantly, GPS companies do *not* warrant to their customers they will not experience a 1 dB change in C/N_0. That is not surprising. What is perhaps surprising is that the GPS companies, while talking about 1 dB change in C/N_0 with the Department, discuss the issue very differently with their customers. With their customers, the

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draft test plan, the Roberson testing, which is currently underway, evaluates potential effects on GPS device function from the end-user perspective by analyzing changes in position/timing accuracy, along with other key performance metrics. For example, the Roberson testing measures Time to First Fix ("TTFF") with respect to public safety devices. Based on feedback from the National Public Safety Telecommunications Council ("NPSTC"), Roberson understands that this data is particularly important to the public safety user group. Roberson will not collect TTFF data for all categories of devices, as this would significantly increase the amount of time necessary to complete testing. DOT's testing apparently will not measure TTFF. Roberson's presentation on these topics at the October 2015 workshop is attached hereto as Exhibit 5.

GPS manufacturers focus on the same exact metric of harm that LightSquared is advocating the Department use: positional accuracy of their devices. For example:

- Garmin's GPSMAP 76 CSx owner's manual represents that the device is accurate within 10 meters 95 percent of the time.[10]

- Trimble, in its product brochure for the Lassen IQ GPS Module, represents that the horizontal position displayed by the device will be accurate within 5 meters 50 percent of the time and accurate within 8 meters 90 percent of the time.[11]

- Deere, in its owner's manual for the high-precision Deere RTK Radio 450, represents that the device "delivers 1 in. repeatable accuracy."[12]

Determining the effect of LTE operations in adjacent bands on the accuracy warranted by GPS manufacturers in representations such as those cited above is therefore the appropriate analytical tool in assessing the ultimate impact, if any, to end users of the manufacturers' devices.

III. The Draft Test Plan Leaves Many Important Questions Regarding the Scope of the Project Unresolved.

A. Projection of Power

In the March 2015 workshop, there was considerable discussion about whether power is appropriately measured at the LTE transmit antenna, or at the antenna of the GNSS receiver—the latter obviating the need for the ABC Study to decide upon an appropriate propagation model. Since there is no mention of propagation models in the test plan document, LightSquared assumes that the power will be measured at the GNSS antenna. If this is not the case, then the

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[10] *See* Garmin GPSMAP 76 CSx Owner's Manual, *available at* http://static.garmincdn.com/pumac/GPSMAP76CSx_OwnersManual.pdf (last visited Oct. 13, 2015).

[11] *See* Lassen IQ GPS Module Product Brochure, *available at* ftp://ftp.trimble.com/pub/sct/misc/bin/Exact%20Imaging%20Folder%2010_07/LasseniQ/022542-006A_LasseniQ_DS_0907%20US_hr.pdf (last visited Oct. 13, 2015).

[12] *See* Deere RTK Radio 450 Manual, *available at* http://www.deere.com/en_US/services_and_support/technology-solutions/stellarsupport/stellarsupport_home.page (last visited Oct. 13, 2015).

choice and justification of propagation model(s) is a critical missing element from the test plan document.

B. Multi-GNSS Receivers

The unexplained movement of multi-GNSS receivers into Phase 1 of the ABC Program creates a slew of questions which are not addressed in the draft test plan. Principal among these is whether DOT intends to test receivers capable of receiving foreign GNSS signals even though such receivers have not been approved by the FCC for use in the United States.[13] It is at best odd for a government agency to test devices that another government agency has not authorized, yet DOT has not addressed this critically important point.

In addition, DOT simply ignores that the FCC already has made important policy statements concerning multi-GNSS receivers. Specifically, the Commission stated that E911 related devices that rely on multi-GNSS are "expected to certify that the devices have been tested to determine their ability to detect and mitigate the effects of harmful interference."[14] Any testing by DOT of multi-GNSS devices would need to take into account that the FCC already has made clear that it expects certain GPS devices to detect and mitigate the very interference that DOT is seeking to test.

C. MSS-Augmented Receivers

A further change in the scope relates to how DOT is positioning receivers that utilize MSS spectrum for augmentation. It would seem that DOT is no longer categorizing these as GPS or GNSS receivers, but has identified—yet failed to explain—a need to isolate these from

[13] *See* 47 C.F.R. §§ 25.131(j)(1), 25.137.

[14] *Wireless E911 Location Accuracy Requirements*, Fourth Report and Order, 30 FCC Rcd 1259, 1273 (2015).

all other GNSS receivers (presumably including high precision receivers that receive augmentation information from other spectrum bands):

> The objective of this test is to collect data to determine Interference Tolerance Masks (ITM) for categories of GPS and GNSS receivers processing signals in the 1559-1610 MHz Radionavigation Satellite Service (RNSS) frequency band, *as well as receivers that process Mobile Satellite Service (MSS) signals to receive differential corrections.*[15]

It is unclear whether DOT is implying that a data stream that is generated by private companies, and delivered by private satellites, should somehow receive special protection by the United States government as a result of the ABC Study. If so, this assertion needs to be explained—and justified—in much greater detail so that interested parties may weigh in on such a substantial change in policy. For example, is it being asserted that the protection due to the RNSS band is applicable to any band that might be used by an augmentation signal, noting that such signals exist in bands other than the MSS L-band?

D. Spectrum Bands

DOT continues to shift the spectrum bands to be considered as part of the ABC Study and is now proposing to evaluate spectrum that is 100 MHz higher and lower than the GPS center frequency of 1575.42 MHz. Yet DOT has provided no justification for this arbitrary figure. That raises the following questions:

- What is the significance of the 100 MHz figure? Why not 50 MHz or 200 MHz?
- Why did DOT choose the center frequency of the GPS band and not the GNSS band (1584.5 MHz)?
- EXCOM directed that DOT address non-space uses of the bands adjacent to GPS, yet spectrum below 1525 MHz and above 1670 MHz is already allocated for non-space use. What is the justification for studying such bands?

[15] Test Plan to Develop Interference Tolerance Masks for GNSS Receivers in the L1 Radiofrequency Band (1559-1610 MHz), § 2 (emphasis added).

- What is the justification for studying LightSquared's uplink bands? It has been conclusively demonstrated that terrestrial operations in uplink spectrum, which occur at much lower power and with much weaker emissions into the GNSS band than satellite operations, will pose no harm to GNSS services.[16]

It is also important to note that disruption of device performance due to receiver overload is a function of both power levels and the spectral proximity of other transmitters to the GNSS band. Interference caused by out of band emissions ("OOBE") and intermodulation products can result from transmissions in bands up to hundreds of megahertz away from the GNSS spectrum. Therefore, it is appropriate that DOT's ABC Study focus only on the adjacent-band issue of receiver overload, not OOBE.

LightSquared's OOBE specifications were set according to agreements with the GPS industry and are consistent with those more recently agreed to between the GPS industry and the AWS-4 licensee at 2110-2130 MHz for emissions into the GNSS band. These limits are *much stricter* than those that are applied to other terrestrial spectrum bands (with respect to GNSS), including the PCS, AWS-1, and AWS-3 spectrum bands. As such, it would not produce any useful data to show the effects of OOBE from LightSquared's very low limits, unless this were part of a comprehensive study to examine the effects of OOBE emanating from multiple spectrum bands—which is clearly beyond the scope of the ABC Study. In any case, an OOBE study would comprise an *emitter characterization* activity, not a *receiver characterization* activity, which is the mandated scope of the present work.

E. Receiver Study

The draft test plan reveals a one-sided view of the issue which looks only at transmissions in the "adjacent bands" and does not lay out a plan to identify and promote the

[16] *See* Letter from John P. Janka to Marlene H. Dortch, Secretary, FCC (July 15, 2013), *available at* http://apps.fcc.gov/ecfs/document/view?id=7520930804.

relatively simple ways that GNSS devices can be made more resilient to operations outside of the GNSS band. An approach that would promote receivers to become more resilient is not only beneficial in terms of furthering the President's goal of making more spectrum available for wireless services,[17] it also will make GNSS receivers better able to protect themselves from both intentional and unintentional jamming. This approach has been embraced by the FCC[18] and also endorsed in a key finding and recommendation of the report of the President's Council of Advisors on Science and Technology in their report to the President in July 2012 ("PCAST Report").[19] The PCAST Report found that "receiver characteristics increasingly constrain effective and flexible spectrum usage" and recommended that the FCC and NTIA "establish methodologies for spectrum management that consider both transmitter and receiver characteristics."[20] The wider the pass-band that exists for GNSS devices, the more susceptible they are to interference from a variety of sources. The radiofrequency front-end design is completely under the control of GPS manufacturers and should be a primary element of DOT's focus.

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[17] *See* Memorandum on Unleashing the Wireless Broadband Revolution, 2010 DAILY COMP. PRES. DOC. 556 (June 28, 2010).

[18] *Wireless E911 Location Accuracy Requirements*, Fourth Report and Order, 30 FCC Rcd 1259, 1273 (2015) ("We believe that CMRS providers seeking to use non-U.S. satellites should also conduct testing to ensure that operation with these signals does not inadvertently introduce vulnerabilities to the devices that could impair E911 performance or compromise data integrity. For example, devices that are augmented to receive signals from multiple satellite constellations may be more susceptible to radio frequency interference than devices that receive signals from GPS alone. Devices should also be evaluated to determine their capabilities to detect and mitigate the effects of inaccurate or corrupted data from any RNSS system that could result in incorrect location information, or no information at all, being relayed to a PSAP.").

[19] *See* Report to the President, Realizing the Full Potential of Government-Held Spectrum to Spur Economic Growth, Executive Office of the President, President's Council of Advisors on Science and Technology (July 2012).

[20] *Id.* at xii.

LightSquared notes that DOT has adopted its suggestion that manufacturers provide detailed RF front-end information on the devices selected for testing; however, without utilizing this data for the identification of best practices or some type of receiver standards, this information will be of little value.

IV. The Test Plan Should Provide Detailed Information Regarding Device Selection and Procurement.

While it is encouraging that DOT has requested detailed front-end information from manufacturers, it has not explained how it will utilize such information. Nor has it stated whether it will test devices even if a manufacturer does not provide the requested information. These are critical issues and are representative of the many holes that still exist in the ABC Study process that have yet to be addressed in the many years since it was first conceived.

Perhaps more importantly, DOT still has not stated how it will determine the lineup of devices to be tested. It has asked for device sales information from manufacturers, but has not stated how DOT will use that information to select actual devices for testing. Will DOT actually specify in advance the devices to be tested, as they had previously committed to do by May of this year?[21] Will manufacturers be allowed to bring additional devices to be tested and considered beyond those specified by DOT?

Furthermore, DOT has not explained the important process of how it will acquire the devices for testing: will they be provided by the manufacturers themselves, or will they be procured by DOT without any manufacturer involvement, or both? These are not trivial issues, as device procurement can be a complex and time-consuming process and the necessity of

[21] *See Stephen Mackey*, Recap and Program Plan Update, Slides 5-7 (Mar. 12, 2015), *available at* http://www.rita.dot.gov/pnt/recap/slide5.

ensuring that the devices tested are actual production models that have not been modified in any way is absolutely crucial.

V. The Draft Test Plan Omits Important Information Regarding the Testing Process.

A. Test Procedures and Outputs

Section VI of the test plan document states: "A bandpass white noise signal that matches the bandwidth and roll-off characteristics of the LTE signal is expected to produce similar masks as exemplified by previous testing (at least for the downlink or base-station transmitted signal)." This is incorrect, as band-limited white noise will have greater Peak-to-Average-Power Ratio than an LTE signal. This fact is important since the result would bias the results towards lower overload thresholds.

Figure 1 of the test plan document is labeled as a "Notional illustration of an interference tolerance mask surface." However, this figure is confusing. It is unclear why the B=1 MHz mask is wider than the B=10 MHz mask—one would expect the opposite. It is also unclear what the dotted lines mean, or why the 10 MHz mask is raised above the 1 MHz mask. If this is to be the basis of the ITM, it must be explained more clearly.

In addition, several issues are raised by Section VIII-iii of the test plan document:

- Detail of the proposed test environment provided at the October 2015 workshop indicated that 100 devices are planned to be tested simultaneously in the chamber. The density of devices and their associated cabling to external measurement logging devices (presumably a computer of some type) presents not only mutual electromagnetic interference issues but also severe physical and logistical issues for cabling, placement of the recording computers, and synchronizing the recording measurements to the test conditions. How these issues will be addressed is not stated.

- There is no description of the distance with which GNSS receivers will be separated from each other in order to avoid mutual spurious signal interference. Depending on the setup geometry, a single calibration at the center of the test table, as is being suggested, may not be adequate. In the previous testing conducted by the National PNT Engineering Forum in 2011, the calibration was performed at several points.

- It is stated that "[l]inear polarization (perpendicular to line-of-sight to receivers under test)" will be utilized. However, it is not stated whether this linear polarization will be vertical or horizontal.

- The mounting of the GNSS transmit antenna is not described in this section. It could be assumed that the GNSS signals will be generated by a simulator and fed to the GNSS transmit antenna, but this is not certain and should be definitively stated.

- The document states that the test configuration "is designed to have both the linearly polarized interference and the GNSS RHCP electromagnetic waves impinge on the bore sight of the receiver antenna." However, the document does not explain how this will be achieved while minimizing coupling between the Interference and GNSS antennas.

- If position reports are going to be captured, the UERE errors (satellite clock, ephemeris, ionospheric and tropospheric delay) should also be simulated. Without these typical impairments, receivers that do not have to the ability to correct these errors by using augmentation signals will show inaccurate levels of sensitivity to adjacent-band overload.

B. Test Process and Timeline

In addition to lacking an end-to-end process plan, the test plan does not present any timelines specific to the testing process itself. Therefore the public has no way to estimate the start, duration, or end date of the testing program. At a minimum, DOT should provide firm dates for the following milestones in the testing process:

- Device acquisition initiation and completion;
- Lab setup initiation and finalization;
- Initiation and conclusion of production testing;
- Conclusion of data compilation; and
- Initiation and conclusion of analytical phase.

C. Test Facility and Personnel

The test plan does not state what facility or facilities will be used to conduct the testing, nor does it lay out how facilities will be selected. This is important, as facility limitations or scheduling conflicts could have a significant impact on DOT's ability to conduct this testing in a complete manner within a reasonable time period.

Additionally, the test plan does not state whether testing will be done by DOT/Volpe employees or third parties. To the extent that third parties will be used, what criteria will be used to ensure that the actual test personnel are qualified to do such work? The test plan itself does not state whether or not equipment manufacturers will participate in the testing process, or to what extent. This is a critically important factor, as any such involvement would necessary require safeguards to ensure the integrity of the test results.

Additional information regarding manufacturer participation in the test process was provided by Volpe at the October 2015 Workshop. However, it is not clear whether this information is actually part of the test plan, because it was not included in the document that was published in the *Federal Register*. The presentation by Volpe personnel at the Workshop indicated that device manufacturers would provide their devices to DOT fully equipped with the required physical interfaces, device software, and measurement recording software necessary for the tests. The presentation also indicated that the manufacturers would place their devices into the test chamber, configure them for testing, and process the raw measurements from their devices *a posteriori*, providing the results to DOT possibly at a later time. This expected process is not transparent and does not adequately ensure the security of the measurement data from tampering. It is recommended that measurement all data be recorded, secured, and processed by an independent third party.

D. Review and Audit of Test Results

The test plan does not discuss how interested parties will be afforded a view of the testing process and whether they will have any ability to review the test setup or audit the test results. It is also not stated whether third parties would be given access to manufacturer cables, test mounts/interfaces, and software codes necessary to perform validation testing.

More fundamentally, given the uncertainty around the devices selected and the lack of transparency of the test information (discussed below), it is clear that the testing will not be (a) repeatable, (b) verifiable, or (c) able to be proven as false or true. If the identities of the devices tested are not disclosed, proprietary methods of data collection and analysis are utilized by device manufacturers, and no safeguards are in place to ensure that all test results are fully and properly documented, it will be impossible for the testing to be repeatable, verifiable, and able to be proven as false or true. Yet those are the acid tests of high-quality analytical tests that the FCC and NTIA, as well as private stakeholders, can rely on.

VI. Information Submitted by GPS Manufacturers Should Be Made Available to Stakeholders Subject to Appropriate Confidentiality Protections.

DOT has stated that GPS manufacturers may submit certain information to the agency subject to a Non-Disclosure Agreement ("NDA"), but has not provided a form of the NDA, described what elements would be covered by the NDA, or explained whether and under what conditions interested third-parties will be able to view confidential information submitted subject to the NDA. These important issues must be resolved, because an overly broad confidentiality policy could reduce substantially the utility of the data collected—as was evidenced by the GPS Technical Working Group and National PNT Engineering Forum test results that were issued in 2011. LightSquared has already submitted a proposed Confidentiality and Non-Disclosure Agreement, which was distributed to all attendees prior to the March 2015 workshop.[22] DOT could use this document, or similar documents routinely used by the FCC for many years,[23] as a

[22] LightSquared's proposed Confidentiality and Non-Disclosure Agreement is attached hereto as Exhibit 3. LightSquared's presentation at the March 2015 Workshop and model Statement of Work and Timeline for the ABC Study are attached hereto as Exhibits 1 and 2, respectively.

[23] *See, e.g.*, *Applications of Cricket License Company, LLC, et al., Leap Wireless International, Inc., and AT&T Inc. for Consent to Transfer Control of Authorizations*, Second Protective Order, 28 FCC Rcd 11803 (2013); *Applications of AT&T Inc. and Deutsche Telekom AG for Consent to* (continued…)

model to protect confidential information submitted in connection with the ABC Study while enabling relevant information to be both accessed and protected by interested parties.

One specific item that has been discussed since the first Workshop in September 2014 is whether it is appropriate to "de-correlate" device test results from device identities. If there is no such correlation, it will not be possible to fully assess the test results and determine the ultimate impact, if any, on the end-user community, and the test results will be of no value to the FCC in making decisions regarding harmful interference. In fact, "de-correlation" all but ensures that the test is not repeatable, is not verifiable, and is not able to be proven true or false, and thus substantially reduces its value to any decision-maker.

At the October 2 Workshop, one GPS manufacturer objected to the submission of device information to DOT (even with confidential treatment), arguing that such information would somehow become subject to release under the Freedom of Information Act ("FOIA"). This assertion has no basis in the law. *First*, FOIA contains an exemption for "trade secrets and commercial or financial information obtained from a person [that is] privileged or confidential."[24] *Second*, DOT rules provide for the designation of confidential commercial information as confidential and set forth a procedure by which DOT must alert and consult with

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Assign or Transfer Control of Licenses and Authorizations, Second Protective Order (Revised), 26 FCC Rcd 8801 (2011); *Applications for Consent to the Assignment and/or Transfer of Control of Licenses Adelphia Communications Corporation (and Subsidiaries, Debtors-In-Possession), Assignors, to Time Warner Cable Inc. (Subsidiaries), Assignees, Adelphia Communications Corporation, (and Subsidiaries, Debtors-In-Possession), Assignors and Transferors, to Comcast Corporation (Subsidiaries), Assignees and Transferees*, Second Protective Order, 20 FCC Rcd 20073 (2005); *Applications of WorldCom, Inc. and MCI Communications Corporation for Transfer of Control of MCI Communications Corporation to WorldCom, Inc.*, Order Adopting Protective Order, 13 FCC Rcd 11166 (1998).

[24] 5 U.S.C. § 552(b)(4).

the submitting party in the event that the agency receives a request for such information.[25] DOT frequently solicits and receives confidential commercial information from major manufacturers, service providers, and other parties with strong interests in the confidentiality of their information.[26] DOT's procedures are similar to those of the FCC and other agencies that frequently solicit and receive confidential commercial information, including information regarding radio frequency device schematics.[27] The assertion that information submitted by GPS manufacturers would be subject to FOIA ignores the existence of these procedures, as well as other measures (such as the NDA described above) that will be adopted by DOT in connection with the ABC Study. Thus, GPS manufacturers and others have no legitimate basis to assert that they cannot submit confidential information to the Department.

* * *

LightSquared respectfully requests that the DOT reconsider and revise its draft test plan in light of the information provided herein.

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[25] *See* 49 C.F.R. §§ 7.2, 7.29.

[26] *See, e.g.*, *Confidential Business Information Reporting Requirements*, Request for Public Comments, 80 Fed. Reg. 7525 (Feb. 10, 2015) (discussing confidentiality protections for sensitive airframe and aircraft engine cost data submitted to the Bureau of Transportation Statistics); *Rulemaking Procedures—Federal Motor Carrier Safety Regulations; Treatment of Confidential Business Information*, 80 Fed. Reg. 32861 (June 10, 2015) (establishing procedures for the Federal Motor Carrier Safety Administration to collect confidential business information in connection with notice-and-comment rulemaking).

[27] *See, e.g.*, *Equipment Authorization Confidentiality Request Procedures*, FCC Office of Engineering and Technology, Laboratory Division (Mar. 5, 2015), *available at* http://apps.fcc.gov/kdb/GetAttachment.html?id=futAcYAsDlC9Ltc6aDmn6A%3D%3D&desc=726920%20D01%20Confidentiality%20Request%20Procedures%20v01r01&tracking_number=41731 (describing procedures for protection of confidential information submitted by device manufacturers as part of FCC's equipment authorization process).

Respectfully submitted,

/s/Gerard J. Waldron

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Counsel for LightSquared

October 16, 2015

Exhibits

1. LightSquared Presentation to DOT Workshop (Mar. 12, 2015)
2. LightSquared Model Statement of Work and Timeline for ABC Study (Mar. 12, 2015)
3. LightSquared Proposed Confidentiality and Non-Disclosure Agreement (Mar. 12, 2015)
4. Letter from Gerard J. Waldron to Marlene H. Dortch, Secretary, FCC (Aug. 18, 2015)
5. Roberson and Associates Presentation to DOT Workshop (Oct. 2, 2015)
6. Letter from Gerard J. Waldron to Marlene H. Dortch, Secretary, FCC (Oct. 13, 2015)

Presentation to DOT Workshop

March 12, 2015

LightSquared

LightSquared Comments on Testing Program

- The FCC has Exclusive Jurisdiction to Regulate Spectrum Emissions
- The Established Process is for Agencies to Ask the FCC to Conduct Such Studies
- The Only Purpose of Any Such Study is to Inform FCC Regulatory Action
  - If DOT does enter into an agreement with Volpe to perform a study, it should make sure the work is useful to the FCC
- In Order for a Study to be Useful
  - It must be based on a published, detailed test plan
  - Testing should inform the FCC's consideration of economic and social issues
  - The study's conclusions must be capable of being proved true or false by a competing study
  - The evidence used must be available for LightSquared or others to study
  - The study must begin and end in 2015
  - The study should adduce evidence relevant to "actual harm"
  - The study should identify the gold standard of GPS resiliency

Appropriate Elements of Study

- Overall Roles and Responsibilities
  - DOT to gather all relevant datasets, position and timing error for widely used GPS devices
  - Full dataset, along with DOT perspective, shall be submitted to NTIA and FCC for review, public comment and action
  - Subject to confidentiality protection for proprietary elements, dataset should be capable of testing by LightSquared
- Scope
  - Downlink spectrum band only
- Focus of Assessment
  - Position / timing error
  - Change in C/N_0
  - Providing detailed test results for both elements is essential
    - Positional and timing variance is what matters to determine “actual harm”
    - Signal/noise is a very poor proxy.
- All Testing to be Performed by Volpe or Qualified Independent Laboratories

Devices for Testing

- The Devices Tested Should Cover:
  - Top selling devices for 2014 by SKU and seller
  - Top selling devices 2004-2013 that manufacturers believe are still in widespread use
    - Supporting information to DOT
    - Ability to provide test samples to DOT
  - Devices that are newly released in 2015 or ready for release with test devices available
- For Each Model Provided To DOT for Testing; Volpe Will Test two Identical Units
  - If units fail to achieve consistent results in confirmational testing; an additional two units will be provided
- Manufacturers to Make Identical Devices, “Test Mode” Software Codes, and Any Necessary Data Collection Cables Available to 3rd Parties For Parallel Testing
  - DOT can use confidentiality agreements to protect proprietary elements
- GPS Receive Antenna Patterns to be Made Available in Order to Perform Subsequent Use-Case Analyses
- The Frequency Selectivity Curve and Linearity of the Receiver Front-End for all Devices to be Provided to DOT (and FCC)
- Manufacturers to Provide Description of Typical Use Cases for Devices Submitted
- LightSquared to Have Same Information and Access in Order to Perform its Own Tests

Testing Process and Output

- Conducted Testing Will be Performed When Feasible; Otherwise Over-the-Air Testing Will be Performed
- Adjacent Band Power Will be Measured at the GPS Antenna Connector (or Immediately Adjacent to the Antenna for Over-the-Air Testing)
  - Eliminates need for propagation model assumptions in the analysis process
- All Test Results, Including Full Device Identities, to be Publicly Released on a Rolling Basis as Testing is Completed
- In Order to Provide a Complete Data Set to NTIA and the FCC, DOT to Create a Series of Receiver Masks to Illustrate the Impact of the Adjacent Band on Different Classes of Devices
  - Mask representing all devices within a category
  - Mask which eliminates the 15% of devices with the poorest rejection of adjacent band signals
  - Mask which shows the top 50% of devices with respect to rejection of adjacent band signals
- Multi-GNSS Receivers Will not be Tested Since There is Currently no Authorization for Non-GPS Satellite Receivers to Be Used in the United States
- “Gold Standard” to be Assessed

Openness and Transparency

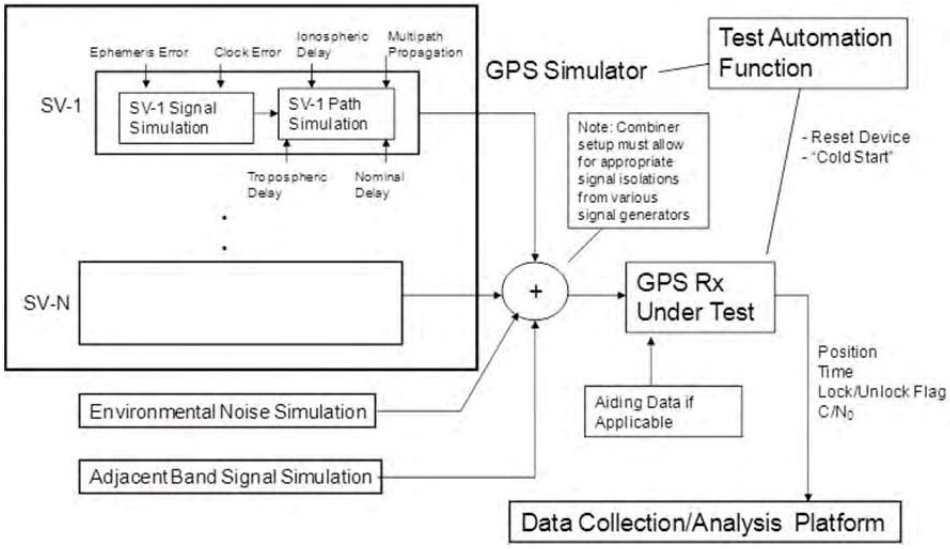
- Creation of an “Issues Log” to Track All Items Raised at Workshops and Private Meetings; Updated and Released Weekly
  - Date
  - Description
  - Status
  - Resolution
  - Responsible Party
- Public Availability of Information
- Confidentiality Would be Afforded to Proprietary Information Only
  - Specific sales volumes for devices
  - Device front-end information (such as frequency selectivity and linearity of devices submitted for testing)
- All Communications and Materials Presented at Meetings Between DOT and Study Participants Outside of Workshops to be Posted to the DOT ABC Website
- Audio Recording of Future Workshops to be Available at the DOT ABC Website in Addition to the Meeting Materials

Key Milestones

Redraft of Current Test Plan, Public Comment and Final Draft Released	5/4/2015
Devices to be Tested Provided to Volpe by Manufacturers	5/18/2015
Lab Setup Complete / Final Test Plan Issued	5/25/2015
Device Testing Begins	5/25/2015
Test Results Released	Rolling
Device Testing Complete	8/26/15
Final Results Submitted to NTIA/FCC (No Interference Standards to be Recommended)	9/30/2015

Statement of Work

for Volpe Center Execution of DOT GPS Adjacent Band Compatibility Testing Program

Development of Test Plan	Volpe to produce a finalized test plan document by April 15, 2015, which will contain the following:
	
	• Detailed process for conducted testing or (less preferred) radiated testing of GPS devices within an anechoic chamber, including:
	  o A defined number of satellite vehicles (SVs) presented per test procedure
	  o A single 10 MHz LTE channel from 1526-1536 MHz will be simulated operating at a range of power, measured at the GPS receiver[1], that is sufficient to either cause the device to exceed the highest established threshold of position/timing error and change in C/N_0 as discussed below, or sufficiently large to represent 32 dBW of peak transmit EIRP from a macro-cellular base station antenna, whichever is less.
	  o Use of a large number of position measurements and statistical processing thereof
	  o Definition of accuracy metric: 2D position error
	  o SV signal errors (clock, ephemeris)
	  o Ionospheric/troposhperic delay error models
	  o Multipath profiles
	  o Representative environmental noise
	  o Different distributions of SV signal levels corresponding to different operating scenarios
	  o HDOP (dilution of precision) range: as per defined scenarios
	  o Consideration of time to provide position fix
	• Schematics for the RF-setup and transmit components to emulate GPS signals and LightSquared transmissions concurrently as depicted in the image below:
	 

[1] For conducted testing, this would occur at the device antenna connector; for radiated testing, this point would be at the point closest to the GPS antenna that is most practical to measure.

	• All testing will be performed in the manner prescribed above and will be accomplished either by qualified engineers on staff at Volpe or by a suitably qualified third-party laboratory that has been deemed by Volpe to have no conflicts-of-interest in undertaking all of the assigned tasks. • This test plan should address spectrum in the licensed blocks up to 50 MHz below the GPS L1 center frequency of 1575.42 MHz.

Issues Record	Volpe to create an "Issues Document" that memorializes all questions and issues, in the manner detailed below, that are raised during the course of the public workshops, or otherwise communicated to Volpe and OST-R.
	
	• Description of issue
	• Identity of organization raising issue
	• Submission date
	• Initial qualification of issue by submitter (question, objection, correction, etc.)
	• Expected resolution date
	• Assigned DOT decision-maker
	• Information re: resolution process
	  o Detail any additional information requested by Volpe or DOT to any party
	  o Detail any non-public discussions with external stakeholders by DOT or Volpe
	• Actual resolution, explanation and date entered
	
	The Issues Document will be updated and released by Volpe on a weekly basis.

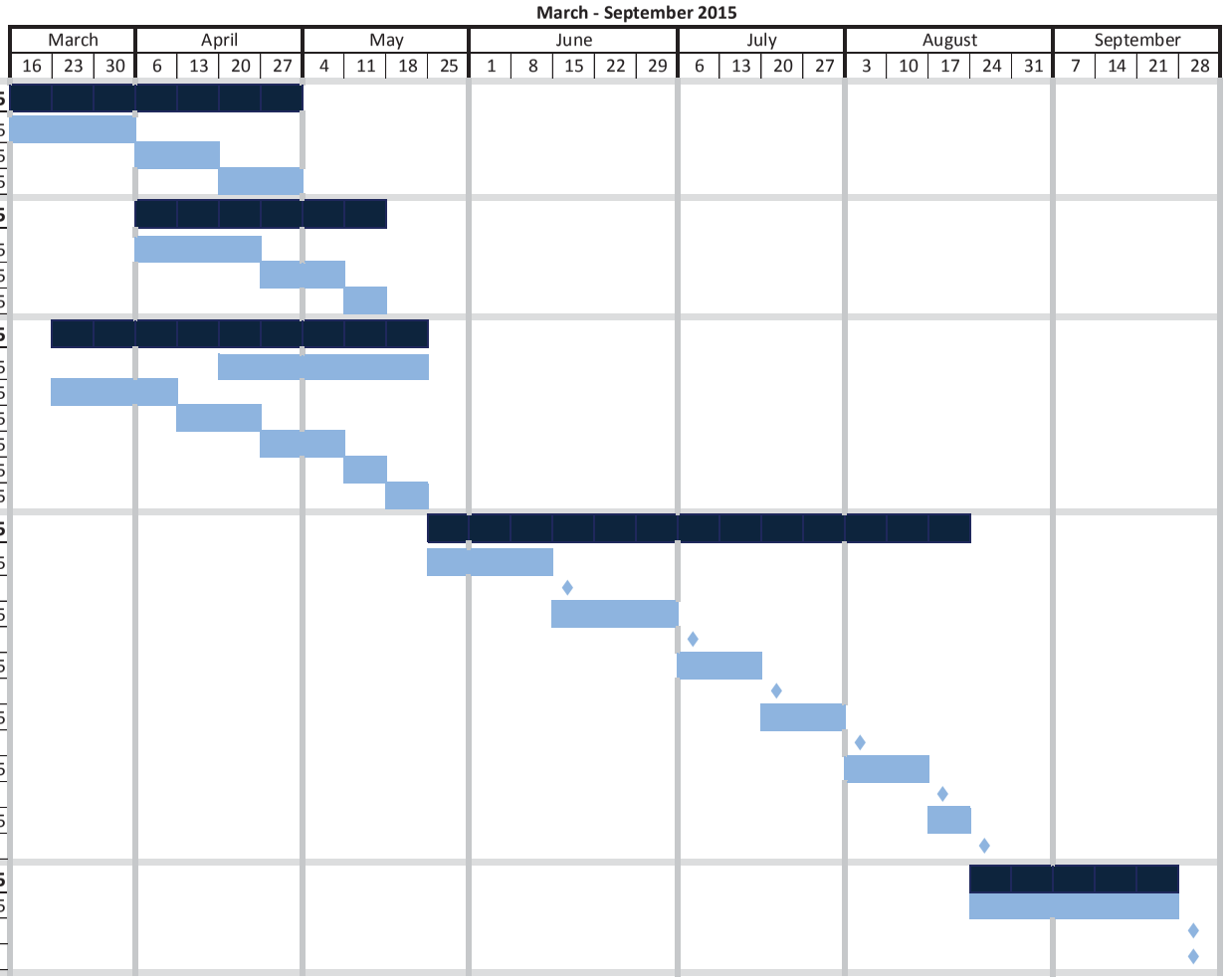
Conduct of Testing Program	Based on experience in commissioning testing, the following statement of work should lead to the collection of a complete data set and possible recommendations that can be of some use in any appropriate regulatory proceeding at the Federal Communications Commission. Although typically testing of the sort proposed by the Department of Transportation is done under the auspices of the FCC, in the event that the DOT wishes to commission Volpe Center to examine the impact of licensed uses of certain spectrum on GPS devices, the work ought to be done according to the practices described in this document.
Devices to be Tested	DOT should cause GPS firms to produce to Volpe for testing the following devices: • The ten (10) top selling device models in the United States for the calendar year 2014. In addition GPS manufacturers will provide Volpe with the identities of their top selling models for each of the years 2004-14, along with the percentage of these devices that the manufacturer believes are still in operation. To the extent that Volpe determines that a particular receiver still has a significant current user base, Volpe may elect to require the GPS manufacturer to provide such units for testing. Finally, GPS manufacturers shall provide Volpe with test samples for newly released and soon-to-be released devices which the manufacturer reasonably expects to be a top seller within the 2015 calendar year. Estimates, if available, of the number of such devices currently in use. • A statement regarding the intended use of the device and a description of the nominal usage mode (*e.g.*, hand held, mounted on dashboard inside a car, mounted on a farm tractor cab, etc.) • For each device, the band-pass filter will be described in detail.

	• The azimuth and elevation antenna pattern for each model that is submitted for testing. • Sales figures for the above models, attested to by an officer of the manufacturer, which validate the models' position within the top-ten ranking; such information will be treated consistent with the confidentiality policy described further in this document. • Two (2) test-ready devices for each model with a description of how the devices were obtained and a certification stating that the devices are actual production models that have not been damaged or altered in any way. • Additional test devices for the same model may be required to be submitted should the original two devices not produce test results that are consistent among the two devices according to Volpe's tolerance standards which will be detailed in the test plan. • Two (2) test-ready devices for each model that can be tested by LightSquared or any other firm interested in comparing its results with Volpe's.
Device Validation	Confirmation testing will be conducted to ensure that the pair of GPS devices presented for testing deliver similar results within tolerances defined by Volpe in its test plan. If the difference in results exceeds the established tolerances, then the the manufacturer will provide two additional devices for conformational testing with final testing occurring between two devices that produce results within the tolerance difference prescribed by Volpe in its test plan.
Test Measurements	The testing facility will obtain baseline measurements of device position or timing (as appropriate) as well as the device-reported level of C/N_0 in the defined environment absent of LightSquared's LTE signal. For each change in the LightSquared transmit power level, the testing facility will record the LightSquared power level *at the GPS device receive antenna* and the change (if any) in a device's mean position accuracy. The device testing should include sufficient samples of position/time estimates that both the mean value of the 2D position error and its centralized standard deviation have converged. Testing should continue until the mean error, in the presence of the adjacent band signal, has increased by either 25% or 2-sigma, whichever is greater, where the increase is relative to a baseline established in the absence the adjacent band signal. The testing facility will examine the use case for each device and report on whether under test conditions the predicted use for commercial purposes was materially affected by use of adjacent spectrum blocks. Material will mean inaccuracies in positioning or timing that might cause a consumer or user to be unable to use the device for its purpose for reasonably long period of time and while at a reasonable distance from a base station. If the testing facility also will record the LightSquared power level necessary, *at the GPS device antenna*, to cause changes in the signal to noise ratio, then it should measure the device under test to register changes of 1, 3, 6, 10 and 20 dB C/N_0 compared to the baseline measurement. Volpe's test plan will provide additional detail regarding test procedures such as power increments, necessary dwell time, etc.
Confidential Materials	The attached Confidentiality and Non-Disclosure Agreement will be used so all interested parties can protect and access confidential information.

Evaluation of Test Results	• Test results for individual devices will be publicly released on a rolling basis as testing for each device is completed. • Adjacent band power "masks" will be created by Volpe that account for different selections of devices as described below: 1) Results from all devices tested 2) Results from devices that exclude the least-resilient 15% of GPS devices 3) Results from devices that represent the top 50% of devices tested in terms of resiliency to adjacent band power
Timeline	See the attached Gantt Chart for schedule of work.

Project Timeline

	Begin Date	End By
Test Plan Finalization	**3/16/2015**	**5/4/2015**
Redraft of Test Plan	3/16/2015	4/6/2015
Circulation and Comment	4/6/2015	4/20/2015
Interim Test Plan Preparation and Release	4/20/2015	5/4/2015
Device Selection	**4/6/2015**	**5/18/2015**
Selection Criteria Finalized	4/6/2015	4/27/2015
Manufacturer Device Collection	4/27/2015	5/11/2015
Volpe Device Intake	5/11/2015	5/18/2015
Lab Setup	**3/23/2015**	**5/25/2015**
Software Development for Data Collection	4/20/2015	5/25/2015
Rerserve Lab Facilities	3/23/2015	4/13/2015
Rent Lab Equipment (if Necessary)	4/13/2015	4/27/2015
Lab Setup	4/27/2015	5/11/2015
Test / Fine Tune Lab Setup	5/11/2015	5/18/2015
Issue Final Test Plan	5/18/2015	5/25/2015
Device Testing	**5/25/2015**	**8/24/2015**
Test Group 1	5/25/2015	6/15/2015
Group 1 Results Released	6/17/2015	
Test Group 2	6/15/2015	7/6/2015
Group 2 Results Released	7/8/2015	
Test Group 3	7/6/2015	7/20/2015
Group 3 Results Released	7/22/2015	
Test Group 4	7/20/2015	8/3/2015
Group 4 Results Released	8/5/2015	
Test Group 5	8/3/2015	8/17/2015
Group 5 Results Released	8/19/2015	
Overflow/Retest	8/17/2015	8/24/2015
Overflow/Retest Results Released	8/26/2015	
Analysis of Results	**8/24/2015**	**9/28/2015**
Volpe Analysis of Test Results	8/24/2015	9/28/2015
Volpe Release of Mask Data	9/30/2015	
Transmit to NTIA for Filing with FCC	9/30/2015	



LIGHTSQUARED PROPOSED CONFIDENTIALITY AND NON-DISCLOSURE AGREEMENT

This Confidentiality and Non-Disclosure Agreement ("Agreement") is entered into and made effective as of [DATE] (the "Effective Date") between [NAME OF COMPANY] ("Company"), having its principal place of business at [ADDRESS]; the John A. Volpe National Transportation Systems Center ("Volpe"), having its principal place of business at [ADDRESS]; and any company or interested third party that executes this Agreement ("Recipient").

WHEREAS, Company has developed one or more GPS devices (the "Devices");

WHEREAS, the Department of Transportation ("DOT") has engaged Volpe to assist it in conducting a GPS Adjacent Band Compatibility Assessment involving the testing and evaluation of GPS devices in order to derive power limit criteria for compatible operation between GPS receivers and wireless applications (the "Study");

WHEREAS, Company is participating in the Study and is interested in having its Devices so tested;

WHEREAS, Recipient is participating in the Study and will be provided with or otherwise have access to Confidential Information as defined hereunder;

NOW THEREFORE, in consideration of the promises and mutual covenants contained herein and for other good and valuable consideration, the receipt and sufficiency of which are hereby mutually acknowledged, the parties now hereby agree as follows:

I. Purpose

The "Purpose" of this Agreement shall be for Company to provide Recipient with information concerning the Company's Devices in connection with the Study. Confidential Information provided to Recipient in connection with the Study shall include Device schematics and component parts, detailed U.S. sales figures for each Device, and software test codes. Non-confidential information provided to Recipient in connection with the Study shall include the identity of the Devices (including the marketing name and model number of each Device when it was first available for consumer purchase), the corresponding test results obtained through Company's participation in the Study, the antenna pattern of each Device, the date each Device was manufactured.

Recipient shall use this information solely to (a) evaluate the performance of the Devices and (b) produce reports or analyses of the performance of the Devices in conjunction with similar products in connection with the Study. The Purpose shall be limited in time to the term of this Agreement and shall not continue thereafter.

II. Confidential Information

As used in this Agreement, "Confidential Information" shall include, but is not limited to, all trade secrets, non-public information, data, interfaces and specifications relating to Company, its

business, or its Devices. Confidential Information consists of any information that the Company identifies as proprietary or confidential at the time of disclosure, and derivatives thereof to the extent that the derivative discloses the underlying Confidential Information. This Section will apply to Confidential Information (a) disclosed on paper or in electronic form only if the writing is marked "Confidential" or "Proprietary," or (b) if not marked, which would be reasonably construed to be confidential in the context disclosed. Notwithstanding the foregoing, Confidential Information shall not include a Device's identity (including the marketing name and model number of the Device when it was first available for consumer purchase), the corresponding test results obtained through Company's participation in the Study, the antenna pattern of a Device, or the date a Device was manufactured.

Confidential Information shall not include any information that is:

(a) already lawfully in the possession of or known to Recipient as of the Effective Date without any obligation of confidentiality;

(b) already in the public domain at the time of disclosure to Recipient or which, after such disclosure, enters into the public domain through no fault of Recipient;

(c) lawfully furnished or disclosed to Recipient by a non-party to this Agreement without any obligation of confidentiality and through no wrongful act of Recipient;

(d) independently developed by Recipient; or

(e) explicitly approved for public release by Company.

III. Non-Disclosure of Confidential Information

Recipient shall not disclose Confidential Information to any third party (other than to employees and outside counsel as set forth below). Recipient shall hold Confidential Information in strict confidence and shall take reasonable measures to protect Confidential Information from misuse and unauthorized disclosure, but in no event less than the measures it takes to protect its own confidential information. Any employee or outside counsel given access to any Confidential Information must agree not to use or disclose such Confidential Information except as permitted herein.

A disclosure of Confidential Information required under legal process shall not be considered to be a breach of confidentiality by Recipient or a waiver of such obligation by Company. Before any such disclosure, however, Recipient shall provide prompt written notice to Company to enable Company to seek a protective order or prevent disclosure.

IV. Non-Use of Confidential Information

Recipient shall not use Confidential Information except as required to carry out the Purpose of this Agreement. Recipient shall not make copies of Confidential Information in any manner that obstructs or obscures the confidentiality marking of Company. This Agreement does not grant Recipient a license or any other rights of any type under any patents, know-how, copyrights, trade secrets, trademarks, or other intellectual property owned or controlled by Company or its

Affiliates, including but not limited to, any name, trademark, trade dress, logo, or equivalents. "Affiliates" shall mean any entity that controls, is controlled by, or under common control with a party to this Agreement, where control is established by ownership of a majority of the voting equity securities of the controlled entity or by the ability to direct the general affairs of the controlled entity.

V. Return of Materials

All documents and other tangible forms of Confidential information, and all copies thereof, shall be and remain the sole and exclusive property of Company, and shall be promptly returned or destroyed by Recipient upon termination of this agreement. Recipient shall promptly certify that it has returned or destroyed all Confidential Information to the satisfaction of Company.

VI. Term and Termination

This Agreement shall terminate upon the earlier of [TIME PERIOD] after the Effective Date or upon receipt of written notice of termination from a party. The obligations of Recipient under this Agreement shall survive termination and shall not expire.

VII. Warranties and Representations

Company warrants that it has the right to disclose information disclosed hereunder. Company represents that Company's information is accurate to the best of its knowledge and belief at the time the information is disclosed. Otherwise, all information disclosed hereunder is provided AS IS and without any warranty, express or implied, as to its accuracy or completeness, fitness for a particular purpose, merchantability and all warranties to such information are hereby disclaimed, whether express or implied.

The parties represent and warrant they will comply with all applicable federal, state and local laws, rules, regulations, statutes, ordinances, codes, orders, and/or programs, whether in effect as of the Effective Date of this Agreement or enacted during the term of this Agreement.

VIII. No Additional Obligations

This Agreement shall not be interpreted to obligate Company to provide any Confidential Information to Recipient, or to enter into any further contract or arrangement with Recipient, or to purchase or sell any products or services from or to Recipient, or to create any joint-venture or partnership.

IX. General Provisions

A. Prohibition on Assignment

Recipient agrees not to assign any rights or delegate any duties under this Agreement without Company's prior written consent, and any attempt to do so is void and has no effect.

B. Binding Effect

This Agreement will be binding upon and inure to the benefit of the parties hereto and their respective successors and permitted assigns.

C. Governing Law

The laws of [STATE/COMMONWEALTH], without giving effect to its conflicts of law principles, govern all matters arising out of or relating to this Agreement, including, without limitation, its validity, interpretation, construction, performance, and enforcement. Litigation or legal proceedings which arise out of or relate to this Agreement are to be conducted before a judge and not a jury.

D. Venue

The parties consent to the exclusive jurisdiction of, and venue in, any federal or state court of competent jurisdiction located in [STATE/COMMONWEALTH] for the purposes of adjudicating any matter arising out of or relating to this Agreement.

E. No Waiver

The failure of Company to enforce a provision, exercise a right or pursue a default of this Agreement shall not be considered a waiver. The express waiver of a provision is to be effective only in the specific instance, and as to the specific purpose, for which it was given.

F. Severability

If any provision of this Agreement is determined to be invalid, illegal, or unenforceable, the remaining provisions of this Agreement remain in full force and effect so long as the essential terms and conditions of this Agreement reflect the original intent of the parties and remain valid, legal, and enforceable.

G. Section Headings and Captions

The section headings and captions contained in this Agreement are for convenience only and do not affect the construction or interpretation of any provision of this Agreement.

H. Construction

This Agreement is to be construed without regard to the party or parties responsible for its drafting or preparation.

I. Counterparts

This Agreement may be executed in counterparts and delivered to each of the parties by facsimile. Facsimile or photocopy signatures are deemed as legally enforceable as the original. Each such counterpart is deemed an original instrument, but all such counterparts taken together constitute one and the same agreement.

J. Remedies

It is agreed that monetary damages may not be a sufficient remedy for breach of this Agreement. Company is entitled to seek injunctive relief without proof of actual damages. In addition, Company may seek other appropriate relief, including monetary damages.

Unless stated otherwise, all remedies provided for in this Agreement are to be cumulative and in addition to, and not in lieu of, any other remedies available to either party at law, in equity or otherwise.

K. Entire Agreement

This Agreement embodies the entire agreement and understanding of the parties and supersedes any and all prior oral agreements, arrangements, and understandings relating to the Purpose provided for herein.

L. Modification

No amendment, waiver or modification of this Agreement is binding unless it is in a writing that explicitly references this Agreement and is signed by authorized representatives of both parties.

* * *

The duly authorized representatives of the parties agree to the above provisions by signing below as of the Effective Date.

[NAME OF COMPANY]	[NAME OF RECIPIENT]
By:_____	By:_____
Name: _____	Name: _____
Title: _____	Title: _____
Date: _____	Date: _____

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Via Electronic Filing

August 18, 2015

Marlene H. Dortch
Secretary
Federal Communications Commission
445 12th Street, SW
Washington, DC 20554

Re: IB Docket No. 12-340; IBFS File Nos. SAT-MOD-20101118-00239; SAT-MOD-20120928-00160; SAT-MOD-20120928-00161; SES-MOD-20121001-00872

Dear Ms. Dortch:

LightSquared is filing this letter in response to an August 14, 2015, letter from the GPS Innovation Alliance (GPSIA) regarding testing of GPS devices being conducted by Roberson & Associates (Roberson). GPSIA has now made clear that despite ample opportunity to do so, it does not wish to provide useful input or help to the Roberson testing. While input from GPSIA and its members was solicited in the spirit of openness and transparency, Roberson is proceeding with testing devices that are most representative of each category of GPS devices, and thus the most significant portions of the market for such devices, as planned.

LightSquared hopes that the Department of Transportation's testing if done right can contribute to the understanding that will be promoted by the Roberson study. We would note, however, as GPSIA does, that the initial DOT testing plan was released in December 2012, and so far not a single device has yet been tested, nor has any end date of testing been identified. The Roberson testing needs to proceed in a timely way in order to provide relevant input into the Commission's process, and will do so notwithstanding GPSIA's failure to contribute.

LightSquared would note that GPSIA's characterization of the Roberson testing as using standards "of questionable relevance" is wholly incorrect. GPSIA provides no specific criticisms of any of the standards proposed by Roberson that would allow substantiation of such a claim. For example, GPSIA does not explain how anyone would consider a measure such as position error to be of "questionable relevance" to the performance of a GPS device, the primary purpose of which is to report position to a user. GPSIA apparently prefers "internationally agreed" standards, but provides no detail at all as to what standards it means. Assuming GPSIA is again referring to a standard based on an increase in the noise floor, GPSIA fails to address the detailed explanation already provided by the undersigned that this measurement is wholly

inappropriate as a measure of harmful interference and is not, in fact, used by any standards body as a measure of harmful interference for bands adjacent to GPS.[1]

LightSquared looks forward to the completion of the Roberson testing and the provision of useful information to the Commission that shows how GPS and terrestrial broadband can coexist.

Respectfully submitted,

Gerard J. Waldron

Gerard J. Waldron
Counsel to LightSquared

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[1] *See* Letter from Gerard J. Waldron to Marlene H. Dortch, Secretary, FCC, IB Docket No. 12-340; IBFS File Nos. SAT-MOD-20101118-00239; SAT-MOD-20120928· 00160; SAT-MOD-20120928-00161; SES-MOD-20121001- 00872 (filed July 2, 2015) at 5-6.

GPS Device Testing Based on User Performance Metrics

Department of Transportation
Adjacent Band Compatibility Workshop
October 2, 2015
Washington, DC

Ken Zdunek, Ph.D.
Chief Technology Officer
Roberson and Associates, LLC

Rev 1.1

About Roberson and Associates

- Technology and Management Consulting Company Founded in 2008
- Services Include
  - RF Spectrum Management
  - RF Measurements and Analysis
  - Technology Strategy
  - Technology Development
- Combined 400 Years of High Technology Management and Technical Leadership Experience with Strong Wireless Communications Focus with Firms Including:
  - Motorola
  - ARRIS
  - Bell Labs/Alcatel-Lucent
  - Cisco
  - Google
  - IBM
  - Nokia
  - Illinois Institute of Technology

Topics

- Rationale for a Test Program Based on User Performance Metrics
- Roberson and Associates Test Program
- Status of, and Revisions to, the Roberson and Associates Test Program
- Comparison of Roberson and DoT/Volpe Programs

Rationale for Testing Based on User Performance Metrics

- Focus on Identifying and Resolving Compatibility Issues, if any, Between Terrestrial LTE Operations Proposed by LightSquared and Reliable GPS Operation
- FCC Definition of *Harmful Interference (47 CFR 2.1)*
  - Interference which endangers the functioning of a radionavigation service or of other safety services or seriously degrades, obstructs, or repeatedly interrupts a radiocommunication service operating in accordance with [the ITU] Radio Regulations. (CS)
- Evaluate Change or Meaningful Degradation of GPS Device Function From the End-User Perspective
- Focus on Key Performance Indicators (KPI), for Example:
  - Position Accuracy
  - Timing Accuracy
- Understand the Interaction of these KPIs with Respect to Other System Data
  - Change in C/N_0
  - Satellites in View
  - Dilution of Precision
- Measure Devices That are Representative in the Marketplace
- Analyze Collected Data in Use Cases That Replicate Typical Operating Conditions
- Identify Specific Types of GPS Device Compatibility Issues and Compare with Best-in-Class, Achievable Device Performance to Understand Options to Achieve Improved Device Resiliency

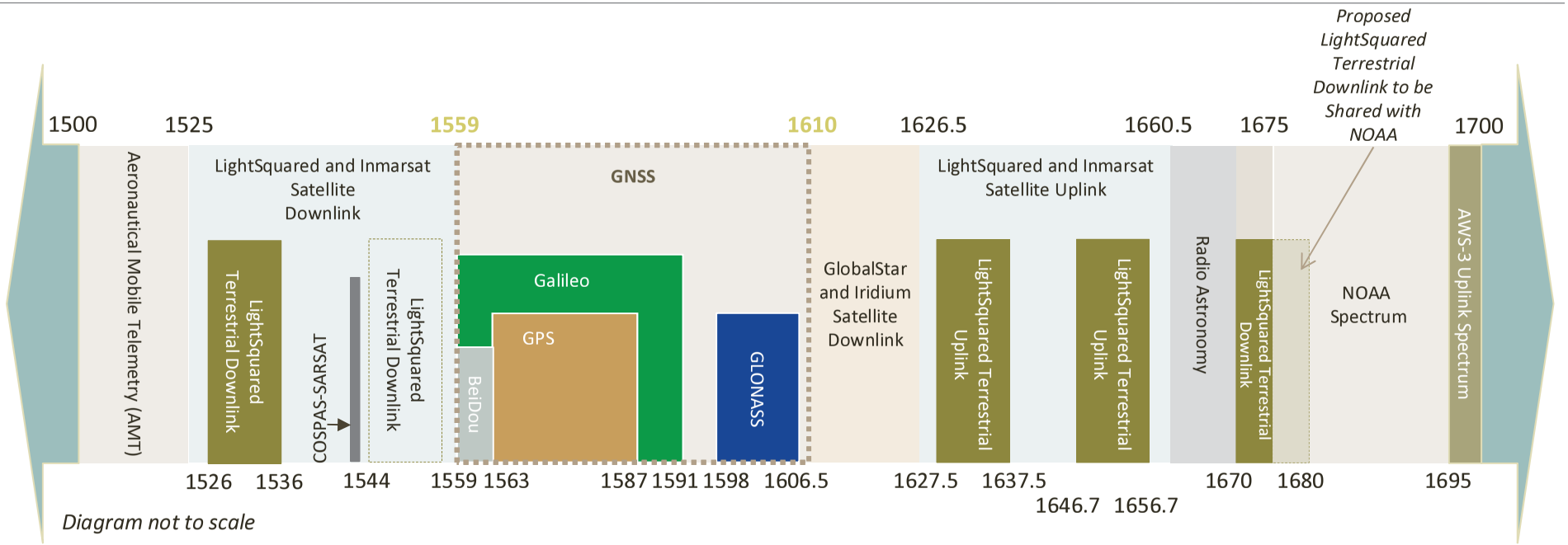
Overview of Roberson and Associates Test and Analysis Plan

Key Elements of Roberson Measurement and Analysis Approach

- Incorporate Knowledge Gained in 2011 TWG
  - Understanding of GPS Device Susceptibility to LTE Emissions
- Incorporate Revised LightSquared LTE Deployment Plan: Frequencies and Power
- GPS Device Measurements:
  - Radiated RF Measurements of GPS Devices' Susceptibility to LTE Emissions
  - Identification of LTE "Threshold of Harm" Level Based on GPS Service (User) KPI Impact
- Statistical Analysis of Geographic and Temporal Impact to GPS Device in LTE Environment
- Identification of Characteristics of GPS Devices Compatible with LightSquared Terrestrial LTE operations
- Identification of Compatibility Solutions for GPS Devices Not Currently Compatible

GNSS Spectrum Neighborhood and LightSquared Spectrum

Roberson and Associates, LLC
Technology and Management Consultants



1526-1536
Downlink

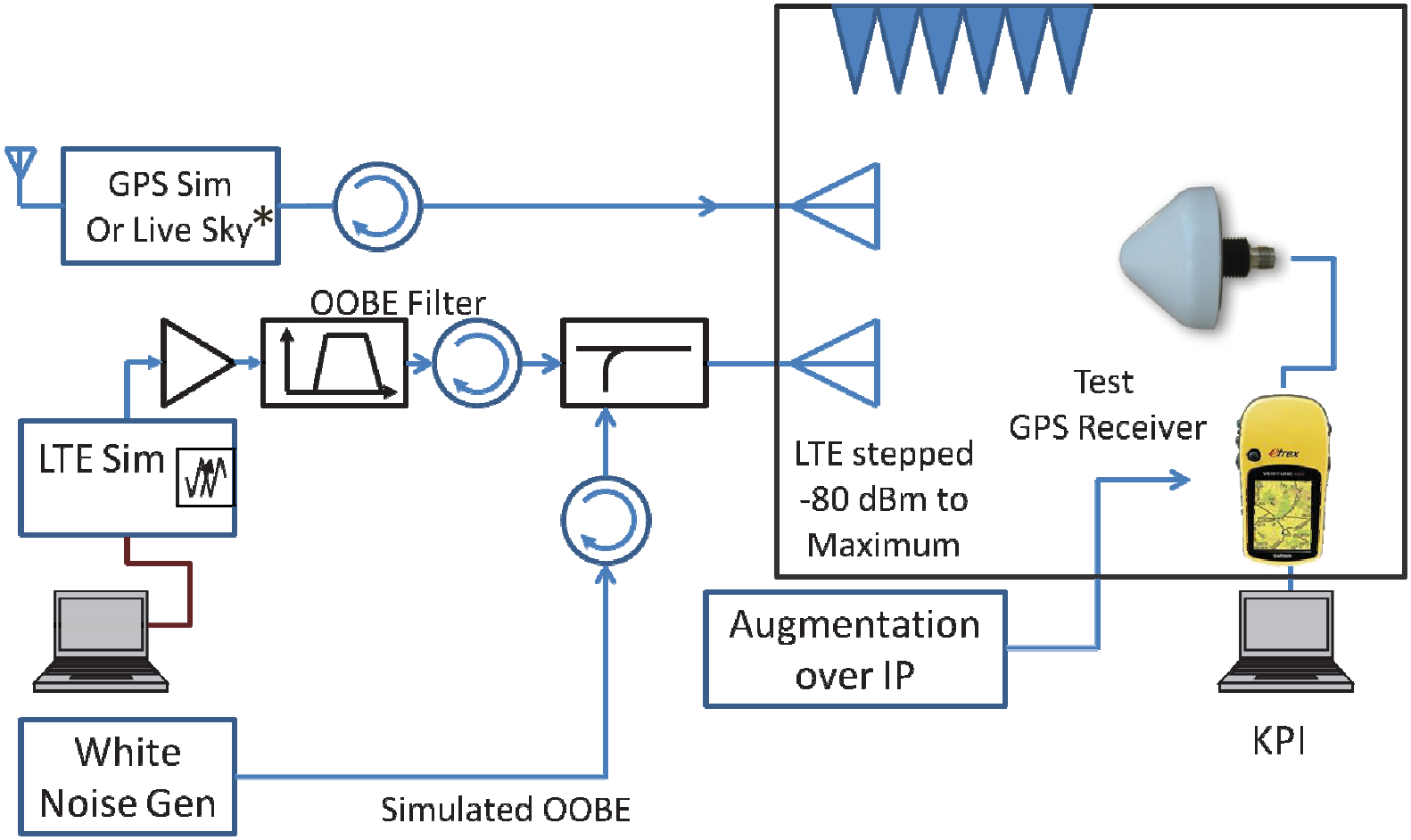
1627.5-1637.5
Uplink

1646.7-1656.7
Uplink

1670-1680
Downlink

LTE Signals in the Frequencies Shown Utilized for Radiated Tests

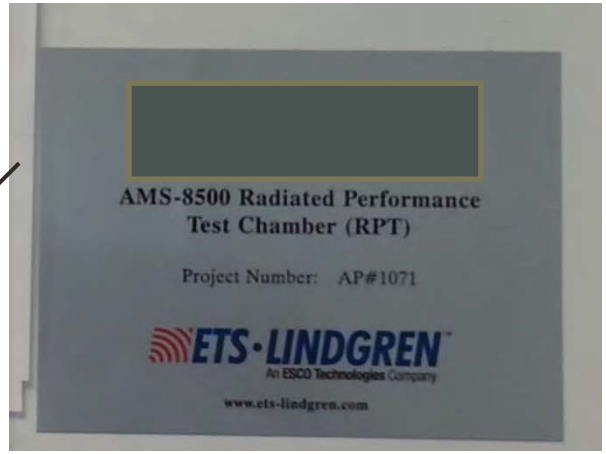
Test Schematic Example



* Live Sky for MSS-Augmented GPS

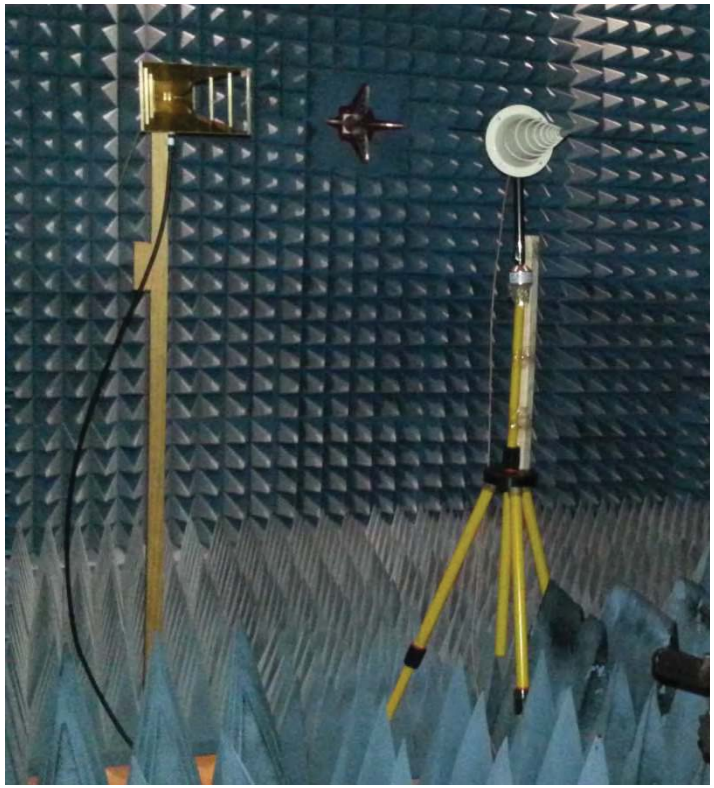
KPI Test Bed: Anechoic Chamber

Roberson and Associates, LLC
Technology and Management Consultants



KPI Testbed

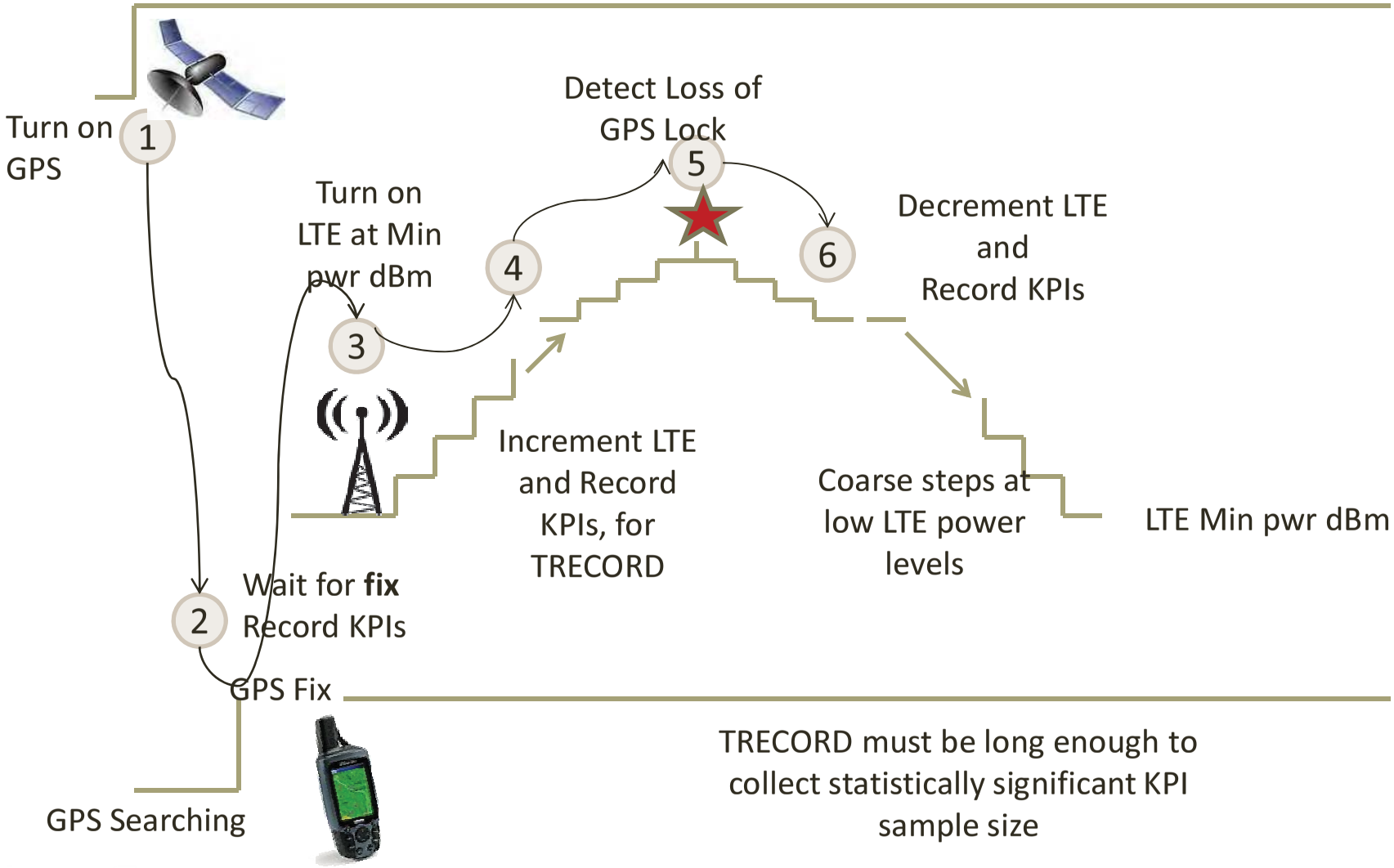
LTE and GPS Antennas



Devices Under Test

Basic KPI Measurement Sequence

Roberson and Associates, LLC
Technology and Management Consultants



KPIs and System Data Recorded, and Device Categories

Roberson and Associates, LLC
Technology and Management Consultants

	Aviation (Cert)	Aviation (Uncert.)	HP (High Precision)	Timing	Cellular	General Nav
KPI	1) 3D Position Error	1) 3D Position Error	1) 3D Position Error 2) Loss of RTK	1) Timing Error	1) 3GPP KPIs 2) 2D Position Error	1) 2D Position Error
System Data	1) C/N_0 2) WAAS message error rate 3) DOP	1) Satellites in view 2) C/N_0 3) DOP 4) WAAS message error rate	1) Augmentation Signal Quality 2) Satellites in View 3) C/N_0 4) DOP	1) Frequency Error 2) Satellites in view 3) C/N_0 4) DOP	1) Satellites in View 2) C/N_0 3) DOP	1) Satellites in View 2) C/N_0 3) DOP

Status of Roberson and Associates Testing

- Initial Measurements on 30+ GPS Devices
  - GPS Baseline- No LTE
  - LTE Applied for 4 Frequencies
- Remaining Measurements Ongoing
- Validation of Procedure and Results: in Process
- GPS User Performance Metrics Process Learning
  - Most GPS Devices Have NMEA or Proprietary Outputs (e.g. GPX) from which LTE Impact on KPIs can be Derived (e.g. Position Error)

GPS Device Testing Based on User Performance Metrics (KPIs) is Feasible With Appropriate Test Process

Key Updates to Roberson and Associates Test Plan Based on Stakeholder Feedback

Accepted feedback and modified Test Plan, including:

- Added WAAS (Wide Area Augmentation Signal) to the GPS signals.
  - Permits WAAS enabled receivers to function at improved baseline position accuracy.
- WAAS message loss rate will be characterized for Aviation devices.
- Additional testing will be performed on select devices, such devices used by Public Safety, up to -10 dBm LTE Power.
- Devices used by Public Safety devices will be tested for re-acquisition with LTE signals present as requested by NPSTC.

Comparison of R&A and Proposed DoT/Volpe Process

Category	DOT Volpe Test Plan	Roberson and Associates Test Plan
Overall Goal	Identify tolerance profile for existing GPS receivers	Identify joint GPS receiver design, and LTE deployment , compatibility solutions
Compatibility Metric	C/N_0, an RF metric	Position Error /User KPI, a functional metric
Test Frequencies	1475MHz to 1675MHz	Focused on LightSquared LTE deployment 1526 - 1536MHz; 1670 - 1680MHz 1627 - 1637MHz; 1647 - 1657MHz
GNSS Test Signals	Generate all GNSS signal as practical (GPS SBAS, GLONASS, Galileo, QZSS, BeiDou)	Generate GPS sgnals and augmentation only (Include devices with other GNSS capability)
Stressed GPS Condition	No plans to test	Real-World, stressed GPS simulated (reduced SVs and Power)
Adjacent Band Signal	Bandlimited 10MHz and 1MHz narrowband noise signals.	Testing with typical commercial 10MHz LTE signal
Time to First Fix	No plans to test	Testing Time to First Fix for public safety units Per NPSTC request
3rd Order Intermodulation	Injecting two signals (such as 1530 and 1550MHz) to measure the 3rd order IM	No plans to test 3rd order IM, since planned deployments do not have this problem

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October 13, 2015

Ms. Marlene H. Dortch
Secretary
Federal Communications Commission
445 12th Street, SW
Washington, DC 20554

Re: *Ex parte* filing in IB Docket Nos. 11-109, 12-340; IBFS File Nos. SAT-MOD-20101118-00239; SAT-MOD-20120928-00160; SAT-MOD-20120928-00161; SES-MOD-20121001-00872

Dear Ms. Dortch:

This *ex parte* letter responds to *ex parte* meetings Garmin International, Inc. ("Garmin") held with Julius Knapp and Philip Verveer on September 22, 2015. In those meetings, Garmin representatives discussed GPS performance criteria and presented a hand-out stating that there are "four aspects to GPS performance that are critical in many existing and emerging applications." These aspects, also referred to in the hand-out as "parameters," are "Accuracy, Integrity, Availability and Continuity."

LightSquared has stated many times in this proceeding that the Commission must evaluate harmful interference according to whether the functioning of a GPS device is actually endangered, meaning that there would be a user-perceptible impact on the position reported by the device. The testing being conducted by Roberson and Associates seeks to show whether operation of wireless broadband near GPS causes any such impact. Garmin now appears to agree that understanding real world impact on GPS is, ultimately, the appropriate way of understanding harmful interference and determining whether it exists.

But rather than actually measure that impact, Garmin still wants to determine harmful interference by using a 1 dB rise in the carrier to noise ratio (the "1dB proposal"). Garmin states that to use any other measure "would require analyzing many complicated use cases for interference impact." This quite plainly shows that not even Garmin believes the 1 dB proposal shows actual harmful interference. Rather, the 1 dB proposal is a proxy Garmin wants to use for no other reason than Garmin's belief that it is just too hard to show harmful interference any other way.

Perhaps this sort of argument would make sense if an increase in the noise floor was the most significant variable in assessing interference for GPS devices and was the only variable that was measurable in a testing lab. Neither proposition is true. All of the other routine variables such as satellite position and atmospheric conditions contribute far more to the range of error

for a GPS device's reported location than background radio noise. GPS receivers are designed to operate in hostile environmental and spectral environments, correct for the errors introduced by those environments, and continue functioning accurately. Furthermore, it is possible to measure key performance indicators that relate directly to the user experience, such as position error. Roberson and Associates is testing such indicators, and is doing so without help from the GPS community despite repeated requests.

Quite aside from insisting that the 1 dB proposal is the only way to determine harmful interference, Garmin asserts that a "small increase in the noise floor may impact any one of these parameters in unexpected or dramatic ways." This statement shows even more clearly why the 1 dB proposal is wrong. Garmin provides no evidence whatsoever to substantiate that an increase in the noise floor of as small as 1dB *would actually* impact any actual performance of the device—nor has the GPS Innovation Alliance or any other party in this or related proceedings. It is merely asserted, and almost five years into this process these assertions increasingly appear to be little more than articles of faith.

Even Garmin's own reference to the ICAO International GNSS Standards and Recommended Practices (SARPS) fails to support its position. The ICAO SARPS include definitions and requirements for accuracy, integrity, availability and continuity, as Garmin states. Nowhere, however, do the ICAO SARPS use an increase of as small as 1 dB in the carrier to noise ratio as the threshold for showing that the parameter is not met.

Remarkably, Garmin and others continue to make these kinds of arguments, even though only last year the Commission flatly rejected GPS Innovation Alliance arguments for applying stricter out-of-band emission limits to AWS-3 spectrum because of general, but unsubstantiated, concerns about interference. The Commission did so stating that "GPSIA's arguments that the proposed OOBE limit *may* present some risk of interference do not warrant deferring action on the proposed OOBE limit."[1]

Aside from its assertion that an increase may impact performance parameters, Garmin states that its 1 dB proposal has been "internationally recognized." While this is slightly more accurate than a previous GPS Innovation Alliance assertion that the 1 dB proposal is the accepted interference standard, this statement is still misleading. As LightSquared has explained,[2] and will explain again here, the 1 dB proposal was *recommended* by the International Telecommunication Union for a very limited purpose—for *co-channel* interference as applied only to GPS devices using assisted GPS (*i.e.*, cellular), which were the only devices addressed by the recommendation. And Garmin fails to note—as GPS parties have repeatedly

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[1] *Amendment of the Commission's Rules with Regard to Commercial Operations in the 1695-1710 MHz, 1755-1780 MHz, and 2155-2180 MHz Bands*, Report and Order, GN Docket No. 13-185, ¶ 62 (Mar. 31, 2014) (emphasis in original).

[2] Letter from Gerard J. Waldron to Marlene H. Dortch, IB Docket No. 12-340, at 5–6 (filed July 2, 2015).

failed to note—that this recommendation, as narrow as it is, has never been adopted by any relevant equipment standards body (such as 3GPP).

Thus, while the Garmin hand-out does helpfully discuss performance parameters that actually relate to the use of GPS devices, it raises more questions about the 1 dB proposal than it answers. Moreover, the hand-out fails to show what steps, if any, Garmin is taking to make its devices more resilient to licensed operations in adjacent bands, so that these functions are not negatively impacted by poor receiver design choices.

Please direct any questions to the undersigned.

Respectfully submitted,

/s/ Gerard J. Waldron

Gerard J. Waldron
Counsel to LightSquared

CC: Julius Knapp
Philip Verveer

10−1151a GPS Interference when colocated with LightSquared transmitters

Type: Maintenance
Urgency: Urgent
Publish Date: 23 Nov 2010
Country: USA
Expiration: none
Product Category: Mobile

Reason for Reissue:
A solution has been tested and approved.

Overview:
LightSquared has recently issued a coordination notice advising that their L−Band base station transmissions may cause near−band interference with colocated GPS receivers. A GPS antenna with enhanced filtering is required to attenuate the strong near−band transmission to prevent the GPS receiver from being over driven. ALU has tested and approved a new GPS antenna for this application.

Impact:
Sites colocating with or within 1000 feet light−of−sight of LightSquared transmission antennas require a GPS antenna upgrade to avoid GPS signal degradation or loss. Las Vegas, Phoenix, Denver, Baltimore and Washington DC have been identified as the initial markets where this needs to be addressed before March 2011.

Context:
LightSquared equipment transmits in a near−band to the GPS spectrum. The filter in the standard ALU offered GPS antenna is insufficient to colocate with this equipment. Sites colocated with this antenna are expected to report frequent or CRITICAL flywheeling alarms caused by severe GPS signal degradation or a complete loss of signal reception. A new version GPS antenna having enhanced filtering has been tested and approved by ALU.

Cause:
The attached website link contains some information about the recent spectrum change (FCC allowing satellite spectrum for terrestrial use). This allows LightSquared to transmit (downlink) in spectrum adjacent to the GPS receive spectrum. Colocation presents a strong near−field, near−frequency signal to the GPS antenna which must be attenuated to avoid an overdrive situation.
http://connectedplanetonline.com/3g4g/news/lightsquared−inmarsat−spectrum−081810/

Action To Be Taken:
If notified that LightSquared equipment will be colocated or nearby, replace the GPS antenna with the new enhanced filter version antenna. ALU recommends that LightSquared be consulted to understand the specific location and number of sites in the area.

Solution Availability:
New enhanced filter GPS antenna orderable item codes (orderable Jan 1, 2011):
L112D − 26dB antenna − 849143987
L116C − 40dB antenna − 849143001
L126 − 26dB antenna w/mount kit − 849143995
L127 − 40dB antenna w/mount kit − 849143019
The new antennas will be visually identifyable by a colored band at the base of the radome.

Contact:
Alcatel−Lucent Technical Support
Please contact the technical support team for your country. If you are unsure of who that is, you can locate the correct number by using our Technical Support phone numbers look−up tool, at
https://support.alcatel−lucent.com/