



June 14, 2011

By Electronic Filing

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

Re: *Ex Parte* Presentation
File No. SAT-MOD-20101118-00239; Call Sign S2358

Dear Ms. Dortch:

OnStar, LLC (“OnStar”) respectfully submits this letter to inform the Commission of (1) its ongoing participation in various tests conducted to evaluate the impact of the terrestrial operations of LightSquared Subsidiary, LLC (“LightSquared”) on Global Positioning System (“GPS”) receivers, and (2) the results of certain “live-sky” field tests conducted in April at Holloman Air Force Base, New Mexico (“Holloman AFB”) involving OnStar GPS receivers. Based upon the Holloman AFB test results, OnStar urges the Commission to require additional interference testing and demonstration of the effectiveness of interference mitigation strategies before reaching a final decision to allow LightSquared to commence terrestrial service. In view of the substantial benefits offered by OnStar and other GPS devices, and the risks if potential terrestrial service interference mitigation strategies are not effective, additional testing and analyses are required to protect the public interest.

I. Introduction

Since the International Bureau’s grant of a conditional waiver of the Ancillary Terrestrial Component (“ATC”) “integrated service” rule to LightSquared,¹ OnStar has been actively engaged in LightSquared-GPS interference issues. OnStar has worked closely with the Technical Working Group (“TWG”) as a member of the General Location and Navigation Sub-Group² and participated in live-sky testing at Holloman AFB³ and in Las Vegas, Nevada.⁴ In

¹ See *LightSquared Subsidiary LLC*, Order and Authorization, 26 FCC Rcd 566 (IB 2011).

² To its knowledge, OnStar is the only automotive industry member of the TWG.

³ The Holloman AFB test results involving OnStar devices are not expected to be included in the final report that LightSquared is required to file by June 15. Because of the significance of these results, OnStar is submitting them in this filing to ensure that they are included in the public record.

late May, OnStar also participated in the TWG-sponsored anechoic chamber testing in Naperville, Illinois.

The Holloman AFB test results demonstrate that if LightSquared deploys ATC as planned, its base station transmissions will cause harmful interference to OnStar GPS devices in or near the area of the base stations. This will severely impact a substantial percentage of OnStar subscribers nationwide and potentially the first responders that we rely upon. These harms are not hypothetical or speculative, but rather real and substantial.

Specifically, the Holloman AFB test results show that OnStar subscribers will experience significant degradation of GPS satellite signals within at least a quarter mile of any of the 38,000 LightSquared base stations to be deployed. A quarter mile represents the approximate distance observed between the test pad and the base station at Holloman AFB, where OnStar equipment was tested. Notably, the maximum distance from which harmful interference may be received was not tested. Therefore, a quarter mile represents a conservative measure of the distance—but not the maximum distance—at which harmful interference to GPS was observed.

In densely populated areas, the problem likely will be exacerbated due to the close proximity of multiple base stations. This interference could prevent OnStar from computing and relaying accurate location data to first responders. It also could prevent public safety service providers from utilizing their own GPS equipment to locate citizens in cases of emergency.

OnStar engineers have worked tirelessly to test and evaluate interference to OnStar GPS devices. To date, however, very little testing of any interference mitigation strategy has been conducted by the TWG or in any other formal setting. Accordingly, the Commission should require additional formal testing of potential real-world solutions before reaching any final decision on allowing LightSquared to commence ATC service. OnStar understands that the Commission views promoting widespread broadband deployment as a top priority and does not seek to impede LightSquared's business activities. Rather, OnStar has remained impartial and scientific in its approach to this critical issue. After extensive discussions with other affected parties and rigorous testing of its equipment, OnStar has concluded that there has not been sufficient time to evaluate GPS interference issues or to consider real-world solutions.

Many parties have suggested that interference mitigation strategies may be undertaken to minimize interference.⁵ These strategies must be considered for both existing and future GPS products and services. OnStar urges the Commission to continue the process of evaluating the impact of LightSquared's planned network deployment on GPS and to move forward with a more robust testing plan—one that specifically includes testing of possible mitigation strategies. Requiring additional testing and deliberations will foster increased cooperation from GPS end users, including first responders, and enable LightSquared to deliver the benefits of new mobile

⁴ Because the Las Vegas testing was conducted using a LightSquared base station operating at a significant power level reduction of 3 dB less than its planned deployment capabilities, OnStar believes those test results may not be accurate or predictive and thus is not including them in this filing.

⁵ For example, GPS interference to narrowband C/A-code receivers would likely be reduced if LightSquared base stations transmit at the lower end, rather than the upper end, of their assigned spectrum. This possible solution has yet to be fully tested.

broadband services to Americans across the country without sacrificing the critical role that GPS plays in all of our lives.

In support of its request, OnStar provides below a brief description of its products and services, a detailed summary of its Holloman AFB test results, and an explanation of the severe impact that LightSquared's planned ATC operations will have on OnStar subscribers and the first responder community.

II. OnStar Products and Services

OnStar, a wholly owned subsidiary of General Motors ("GM"), is the largest telematics service provider in the nation. OnStar provides safety, security and/or navigation services to approximately six million subscribers in the U.S. and Canada. The OnStar telematics system offers a wide range of services including automatic crash response ("ACR"), emergency roadside assistance, stolen vehicle recovery, and turn-by-turn navigation. All of these services rely on accurate and timely location information, which is transmitted from the subscriber's vehicle to an OnStar call center.⁶

For example, in the event that an OnStar subscriber is involved in a motor vehicle crash, ACR technology automatically would alert OnStar of the crash. OnStar then would relay the precise GPS-derived location of the subscriber's vehicle to the appropriate first responder, while remaining connected to the vehicle's occupant until help arrives. Any degradation of GPS satellite reception could impede OnStar's ability to acquire and provide accurate location information to first responders. This could significantly delay the arrival of emergency medical personnel and other first responders to the scene of the crash.

The ability of first responders to provide prompt assistance in an emergency will become even more important later this summer with the introduction of the "OnStar for My Vehicle" ("OnStar FMV") product since the number of subscribers relying upon GPS technology will be increasing significantly. Previously, OnStar's hardware has been embedded into the vehicle's chassis and was offered primarily on GM vehicles. However, OnStar recently announced the OnStar FMV, a new product offering that will enable millions of additional non-GM drivers to enjoy OnStar's core safety, security, and connectivity features, such as ACR, by replacing their vehicle's rearview mirror with an OnStar-equipped mirror.⁷ Both traditional OnStar and OnStar FMV services are dependent on GPS technology to provide the precise location of subscribers' vehicles. The delivery of accurate and timely vehicle coordinates is the cornerstone of OnStar's business, particularly in emergency situations and for turn-by-turn navigation.

⁶ OnStar also offers remote vehicle diagnostics, prepaid hands-free wireless calling, and many other valuable services that do not rely upon location information.

⁷ OnStar FMV will differ from the traditional OnStar product. *See FMV*, OnStar, <http://www.onstar.com/web/portal/test/onstarfmv> (last visited June 13, 2011).

III. Testing at Holloman AFB (April 2011)

A. Test Setup

OnStar engineers participated in live-sky tests at Holloman AFB in April to evaluate the effects of LightSquared base station transmissions on OnStar equipment. GPS industry participation at this event was widespread, including engineers from a number of GPS device manufacturers and component parts manufacturers, New Mexico public safety officials, U.S. military representatives, and LightSquared engineers.

OnStar utilized a 2011 Cadillac SRX, which was outfitted with several OnStar devices. Serial diagnostic connections were established with each device to allow the retrieval of binary logs to provide the following information:

- Satellite carrier-to-noise ratio (“C/N₀”)
- Satellite tracking status
- Raw measurements, including:
 - Pseudorange
 - Clock bias
 - Doppler
- Latitude, longitude, speed, and elevation

LightSquared engineers provided base station equipment, which was mounted to a steel tower approximately 400 meters from OnStar’s designated test location.

The tests were preceded by several minutes without LightSquared base station transmissions in order to establish receiver behavior in the absence of LightSquared interference. LightSquared transmission power was then switched on and gradually ramped up to full power in 1 dB increments.

Based upon LightSquared’s transmission plan, as communicated to OnStar engineers at Holloman AFB prior to testing, the LightSquared base station transmitted as follows:

Phase 0 = transmitting at a center frequency of 1552.7 MHz with 5 MHz downlink bandwidth

Phase 1 = transmitting at center frequencies of 1531 MHz and 1550.2 MHz with 5 MHz downlink bandwidth

Phase 2 = transmitting at center frequencies of 1531 MHz and 1550.2 MHz with 10 MHz downlink bandwidth⁸

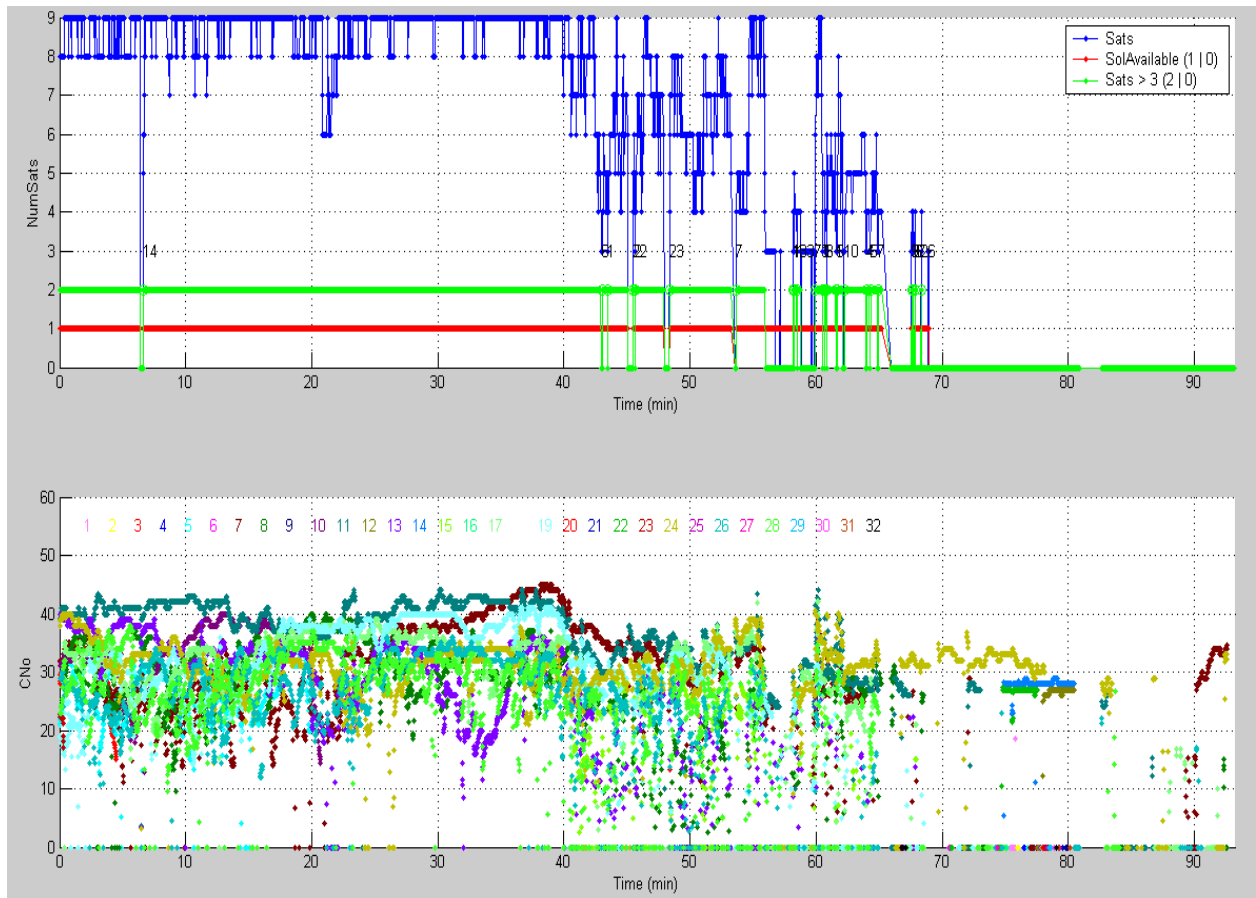
⁸ OnStar did not collect data during LightSquared’s Phase 2 transmissions, but believes that the test results would not have significantly varied from those obtained under the other phases.

B. Results

The test data shows considerable GPS interference and satellite reception degradation, at varying levels, for all tested OnStar devices. Specifically, all tested OnStar devices experienced harmful interference when the equipment was located within a quarter mile of the LightSquared transmitter under Phase 0 and 1 configurations. Specific effects include a reduced C/N_0 ratio, loss of satellites tracked, and significantly distorted or inaccurate location information.

1. Device #1 (static GPS tracking)

The test data below shows how Device #1, operating in a stationary vehicle, reacted to LightSquared base station transmissions. The top chart shows the number of satellites that the GPS device was able to track at a given point in time. The bottom chart shows the satellite C/N_0 ratios.



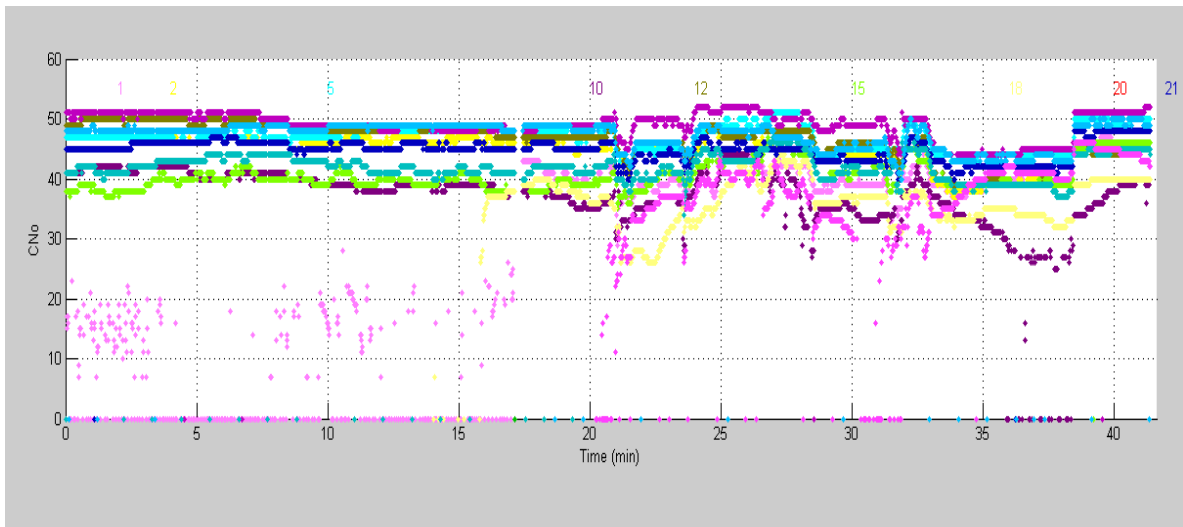
For the first 40 minutes, the LightSquared transmitter was turned off. During this time, OnStar's static GPS receiver was constantly tracking approximately nine satellites and never

dropped below six satellites.⁹ The satellite C/N_0 ratio almost always remained between 30 – 45 dB-Hz.

At the 40-minute point, the LightSquared transmitter was turned on. As the charts above show, as soon as the transmitter was turned on, an instant drop in the C/N_0 ratio occurred, resulting in a corresponding reduction in the number of satellites tracked. Notably, as the LightSquared power level was increased to the maximum value (as contemplated under LightSquared’s planned ATC deployment), the degradation effects became even more severe.

2. Device #2 (moving GPS tracking)

During the test period shown in the chart below, the LightSquared transmitter was continuously transmitting. When the vehicle began moving at the 21-minute point, the C/N_0 values degraded instantly because the GPS signal tracking loops within the OnStar device had trouble correlating with the satellites due to interference.¹⁰ A reduced C/N_0 ratio decreases the ability of the GPS receiver to compute an accurate location, thus impeding the reliability of turn-by-turn navigation and other GPS-based services.



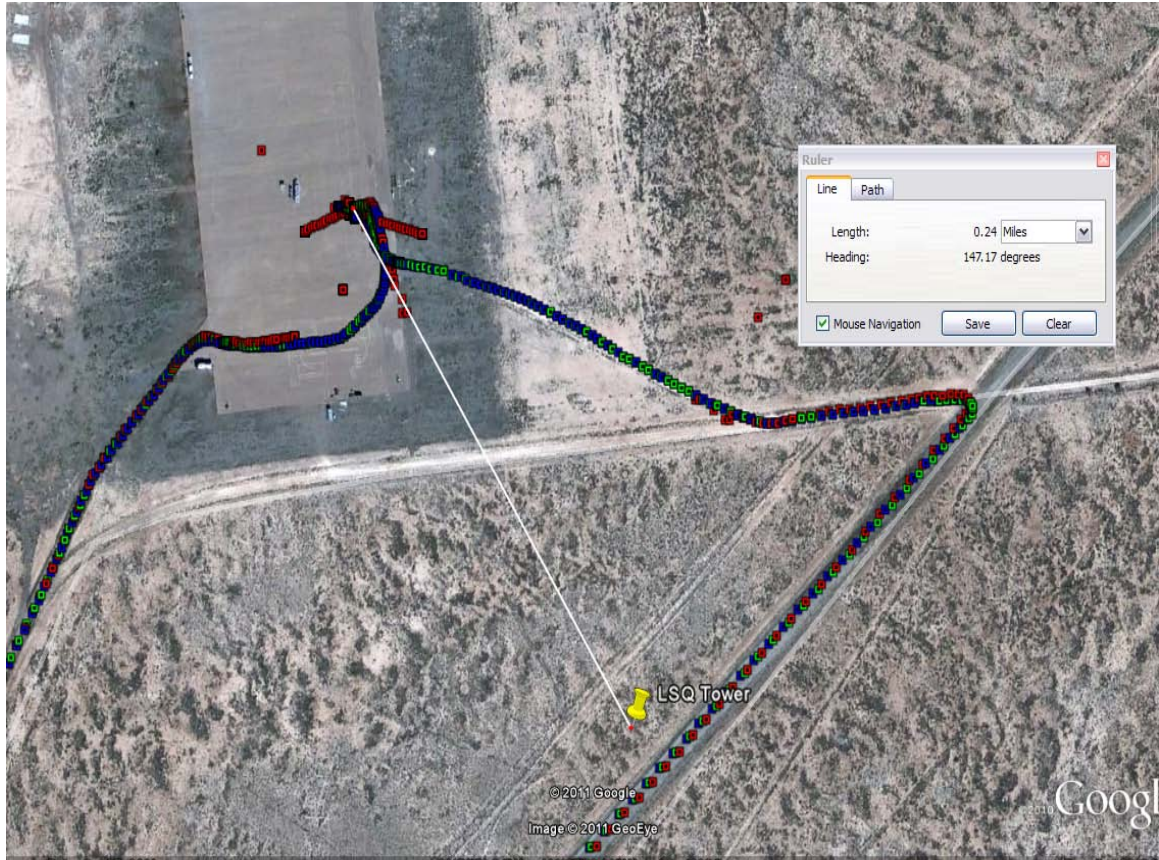
3. Vehicle Location Accuracy

The photo below illustrates the impact of the LightSquared base station transmissions on the accuracy of OnStar’s vehicle location data. The yellow thumb-tack in the photo represents the location of the LightSquared tower during testing. The white line emanating from the tower shows the orientation of the primary antenna lobe or, in other words, the direction of the transmission at a distance of a quarter mile. The white line ends at the test pad, which was the

⁹ A minimum of four GPS satellite signals are required to compute a three-dimensional fix (latitude, longitude, and elevation). However, in North America, 10 or more GPS satellite signals are often visible. In these conditions, the GPS receiver solution becomes “overdetermined,” and accuracy improves. Any reduction in the number of satellites tracked could result in degraded accuracy.

¹⁰ For the first 21 minutes, the vehicle was stationary, and no C/N_0 degradation was observed.

vehicle's start and end point. Each set of colored markers (*i.e.*, blue, green, and red) represents location data obtained using an OnStar device in the vehicle.



As the photo shows, interference occurred more drastically when the OnStar vehicle was in the direct path of the tower's transmission, resulting in a number of red markers that substantially deviated from the actual location of the vehicle.¹¹ In real-world conditions, similar location errors could occur in all directions within a quarter mile radius of any of the 38,000 towers that LightSquared plans to build nationwide.¹²

Under this scenario, if an OnStar subscriber were involved in an accident within at least a quarter mile of a LightSquared tower, OnStar would not receive accurate location information for the subscriber. This problem could be exacerbated in settings, such as dense urban areas,

¹¹ Some of these effects are lessened when GPS signals are augmented with vehicle sensor data. At times, this can be seen from the green and blue markers. Many OnStar devices receive supplemental inputs from other sensors within the vehicle such as a gyro, odometer data, or wheel speed information. These additional measurements can help the OnStar device sustain interference for brief periods of time. However, these signals augment GPS only for short periods of time, and they do not provide nearly the same accuracy as GPS signals.

¹² The received power level on the test pad was achieved by installing a directional antenna on the LightSquared tower. In normal operation, the same transmission power level would be achieved using an omnidirectional antenna. Therefore, the outliers observed northwest of the tower could occur anywhere within a quarter-mile radius of the tower during anticipated real-world transmissions.

where multiple LightSquared towers are constructed close to one another. If OnStar is unable to receive accurate location information, it cannot relay accurate location information to the appropriate first responder to enable a timely response in an emergency. Likewise, if a first responder is utilizing GPS technology to locate and provide assistance at the scene of an accident, GPS guidance may be unavailable as well.

IV. Conclusion

The Holloman AFB test data demonstrates that harmful interference from LightSquared ATC operations to GPS devices is no longer speculative, but rather is a serious issue that should be thoroughly investigated and resolved. Proper evaluation requires additional formal testing, including tests to determine (1) the impact of multiple LightSquared towers, transmitting at maximum signal strength in close proximity to one another, on GPS devices; (2) the effects on GPS receivers (both narrow C/A-code and semi-codeless) if LightSquared base stations, in urban and rural environments, transmit at the lower end of their assigned spectrum at maximum signal strength; and (3) the practicality and effectiveness of any proposed interference mitigation strategies with respect to existing legacy devices, as well as future contemplated devices.

Based upon the foregoing, OnStar respectfully requests that the Commission require additional testing before reaching a final decision to allow LightSquared to commence ATC service.

Sincerely,

/s/ Thomas Jeffers

Thomas Jeffers
Vice President for Public Policy
OnStar, LLC
400 GM Renaissance Center
P.O. Box 400
Detroit, MI 48265-4000
Telephone: (313) 665-2797
E-mail: thomas.jeffers@onstar.com

/s/ Nikola J Pudar

Nikola Pudar
Vice President for Business Development
OnStar, LLC
400 GM Renaissance Center
P.O. Box 400
Detroit, MI 48265-4000
Telephone: (313) 667-9148
E-mail: nick.pudar@onstar.com