TESTIMONY

OF

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LIGHTSQUARED

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My testimony today will explain the network that LightSquared is building, extensive interference testing, and steps that LightSquared plans to take to mitigate interference. LightSquared is investing billions of dollars in American infrastructure, in order to bring competitive wireless broadband service across the country. We will do so in a way that protects the GPS-related work of the agencies under this Committee's jurisdiction. Indeed, LightSquared is in very much the same position as the agencies testifying before you today. We find long-planned and long-authorized operations threatened because the manufacturers of GPS devices have been building and selling receivers that ignored rules the FCC established in 2003 and 2005 with their knowledge, and without their opposition. Nevertheless, LightSquared is committed to working with the Committee and the agencies to do our part in addressing a problem we did not create, and we have already made substantial and real proposals. The interference issue is a question of technology choice, and can be addressed through proper design.

I. LIGHTSQUARED IS BUILDING CRITICAL INFRASTRUCTURE FOR THE 21ST CENTURY

LightSquared is investing $14 billion over the next eight years to build a nationwide wireless broadband network. This investment will support over 15,000 jobs a year for each of the five years that it will take to construct this network. When completed, our ground network will provide over 260 million people with wireless broadband service at expected speeds of 5 to 10 megabits per second. The ground network will provide the scale needed to make our new high-power satellite system viable over the long term, which will provide disaster-resistant service to a new generation of user devices that are the same size, weight, and cost as today's terrestrial mobile devices. LightSquared's network promises to increase competition in the marketplace, give consumers new choices, broaden access to broadband, increase public safety and emergency response, and, ultimately, lower prices.

This network is the culmination of years of hard work and billions of dollars of investment. LightSquared has been authorized to use spectrum for mobile satellite services (MSS) since 1989, and launch its first satellite in 1996. For the last 15 years, it has provided voice and data services over its satellites to federal, state and local governments, transportation and maritime industries, and others who need reliable communications when a ground network is unavailable.

In 2003, the FCC first issued rules authorizing the use of satellite spectrum for ground networks. The FCC issued an authorization to LightSquared's predecessor in 2004, and finalized the spectrum rules in 2005 on reconsideration. Since then LightSquared has worked hard to bring its network to market. It coordinated spectrum and developed technology to support an integrated satellite and ground network.

Now we are ready to move forward, and this investment is coming at a particularly crucial time. The U.S. ranks 15th in the world when it comes to broadband, according to a recent Cisco survey. Congestion in urban markets is leading to an unacceptable level of dropped calls and "no service'' displays. At the same time, many consumers in rural America don't even have a wireless broadband option: 28 percent of people who live in rural America still have no access to broadband. This puts rural communities at a disadvantage when it comes to attracting new businesses, creating jobs and gaining access to education.

Wireless infrastructure in the U.S. is manifestly unready to meet the challenges of the 21st century. The U.S. is seeing the beginning of almost vertical growth in data usage. Data usage in the will jump from under 2 million terabytes per year to almost 14 million terabytes in 2015. Spectrum is needed to carry that data, and spectrum is severely limited.

The FCC has already identified a need for at least 500 MHz of additional spectrum to be freed for broadband use over the next ten years. We are bringing 40 MHz of spectrum to be used for broadband services – a significant down payment on the FCC's ten year goal. No other company has such a significant slice of airwaves that is ready to deliver network capacity to our spectrum-starved nation, and no other company could conceivably offer this broad coverage in the same timeframe.

It is important to understand that LightSquared will do this in a way that is completely different from other wireless companies in two ways.

First, LightSquared will be the only wireless broadband network with an integrated satellite. Our first satellite was launched in November 2010, with the largest dish ever placed on a commercial spacecraft – seven stories tall. This represented a $1 billion investment in U.S. space technology. Our satellite allows a smartphone, tablet, data stick, or other device to link to the satellite when the ground network is not available, either because the device is out of range, or when ground networks have been destroyed by natural disasters. LightSquared already has a history of providing satellite communications in the places they are needed most: in Mississippi after Hurricane Katrina; in Kentucky after widespread and destructive ice storms; in Joplin, Missouri after its tornado; and in Maryland, Delaware and Virginia after Hurricane Irene. The size and cost of satellite-enabled devices, assuming we can take advantage of the scale offered by the ground network, will be the same as that of regular cellular devices. This is why the deployment of the ground network is so critical. A sustainable, reliable satellite function promises substantial long-term benefit to government, public safety, and individual consumers.

Second, LightSquared will be the first wholesale-only network. We will sell capacity to wireless companies, retailers and other companies that want to provide broadband services, and

they can then provide the integrated network to their consumers. Thus, when we build our network, we're not just enabling LightSquared as a competitor, we're enabling dozens of competitors in the marketplace.

In sum, then, what LightSquared is doing is making a massive private investment in critical U.S. infrastructure, making better and more efficient use of spectrum, and enabling wireless competition, all to the benefit of American consumers, public safety, and the nation as a whole.

II. GPS INTERFERENCE HAS BEEN STUDIED COMPREHENSIVELY

Part of LightSquared's spectrum is directly adjacent to the spectrum used by GPS. This is not a new development. When LightSquared's predecessor first proposed using satellite spectrum for a ground network over ten years ago, the GPS community, represented by the US GPS Industry Council (USGIC), asked us to voluntarily limit our energy that could bleed over into the GPS band. If we did nothing, comparatively powerful base stations used in cell sites would drown out faint GPS signals. We agreed to limits on emissions out of our band into GPS that were 1000 times stricter than what the FCC required, and designed our network around this agreement. Moreover, the power levels we are using today in our base stations are the same as what the FCC authorized in 2005, and we have committed to stay at those levels. I have attached a chronology, with citations to the public record, as Attachment 1 to my testimony.

The current concerns about interference do not stem from a concern about emissions into the GOPS band. Instead, in September 2010, the USGIC raised a new and different issue arising out of the fact that certain GPS receivers are designed to not only capture GPS signals, but also capture signals from our band and could be desensitized, or overloaded. Accordingly, no matter

how strictly we limited our out of band emissions, we could still cause overload of some GPS receivers. I have provided illustrations showing this effect as Attachment 2 to my testimony.

Much of the advocacy by the GPS manufacturers over the last 9 months has tried to portray this issue as having arisen only this year because LightSquared somehow changed the "nature" of its network. This narrative has been stated and restated with a purpose: to distract lawmakers from the fact that GPS manufacturers failed to raise this issue at the FCC when it was developing its rules and could have addressed this issue in the design of their receivers years ago. In 2005, they knew that the FCC rules allowed LightSquared to deploy tens of thousands of base stations in our band, all broadcasting at a power of 1.5 kw. Thus, if LightSquared's predecessor had had the resources to build its network at that time, it could have built exactly the same network as is planned today. Indeed, in 2003, the USGIC stated to the FCC that the effect of their rules was to allow us to use tens of thousands of base stations. (See Attachment 1 for citation.)

The GPS community's convenient story that we caused the problem because we asked for a modification to the types of end user devices that could be brought to our network is easily demonstrated to be false. End user devices have nothing to do with the overload effect the GPS community identified – it is entirely a function of the number and power of our base stations, which as I stated above was established in 2005. Moreover, as I stated above, the GPS community raised this issue in September, 2010, *two months* before we asked for any modification for end user devices. Finally, the USGIC did acknowledge, 8 years ago, that we would operate tens of thousands of base stations in our band. The possible scale and scope of our use of the network was well known by, or at least obvious to, any of the large companies that manufacture GPS receivers, all with presences in Washington, and yet they did nothing. This,

despite the fact that the Department of Defense's standards for use of the GPS constellation specify that manufacturers should use a receiver that filters out signals from adjacent bands if they expect to have full performance.

Notably, the original rules in 2003, our authorization in 2004, and the reconsideration of those rules in 2005 were all subject to full review by the NTIA's Interdepartment Radio Advisory Committee process, which includes input from all impacted federal agencies. Thus, when the FCC issued decisions allowing us to deploy tens of thousands of base stations, all transmitting at the powers we will use today, federal agencies had extensive and repeated opportunities for comment and input. Of course, as users of GPS devices, it is extremely difficult, if not impossible, for federal agencies to study this issue fully without the support and involvement of the GPS receiver manufacturers. The manufacturers' failure to identify the overload issue until a year ago may well explain why federal government users did not raise this issue earlier.

In the end, the GPS manufacturers either failed to understand the vulnerability of their own receivers or took the calculated risk that LightSquared would not be able to complete its network. Either way, they did nothing to prepare their receivers or their users for the changed spectrum environment.

Despite the history of this issue, the fact remains that many receivers were placed into the stream of commerce that were not going to be compatible with the uses established by the FCC in 2003 and 2005. If LightSquared was going to be able to move forward with its network within any reasonable period of time, the responsible thing to do would be to test to determine the scope of the issue and possible mitigation. This is exactly what the FCC did when, in

January of this year, it ordered us to work with the GPS community and federal agencies on joint testing.

What followed is perhaps the most extensive study of interference ever conducted. The Technical Working Group (TWG), co-chaired by LightSquared and the USGIC, comprised 37 individuals with strong technical expertise representing a full range of GPS receiver categories, installed user groups, and other interested parties. The TWG included representatives of all the major GPS manufacturers, the four major wireless companies, two public safety organizations, the Department of Defense, FAA, NASA, Boeing, Rockwell, and Lockheed Martin. The TWG also relied on advisors representing a full range of stakeholders including manufacturers, user groups and individual experts in the GPS field. Over a three-and-a-half month period, the TWG tested over 130 devices across seven GPS receiver categories — aviation, cellular, general location and navigation, high precision, networks, space-based receivers, and timing receivers. The Final TWG Report was filed June 30.

Separately, the Department of Defense, RTCA (the aviation safety standards organization) and the Jet Propulsion Laboratory conducted their own analysis and tests of dozens of GPS receivers. LightSquared provided equipment and engineering expertise for each of these tests. Several reports or summaries have already been made public including reports from RTCA and the NPEF Report of government receivers derived from the DoD tests. Accordingly, over the last 9 months, there has been more than adequate opportunity in numerous venues to fully test receiver vulnerability.

III. LIGHTSQUARED AND GPS CAN COEXIST

Key to understanding mitigation options is understanding that the vast majority of GPS receivers look only at LightSquared's spectrum that is immediately adjacent to GPS.

LightSquared's original plan, before USGIC advised of the overload issue in September 2010, was to use this spectrum first, and then bring additional spectrum online later, when it needed further spectrum to serve capacity needs. This additional spectrum is on the other end of LightSquared's band, as far away as possible from the border with GPS. Indeed, the frequencies LightSquared planned to use far away from GPS are a full 23 MHz removed from the bottom of the GPS frequency,

Unsurprisingly, then, testing shows that LightSquared's *planned* deployment would cause interference with a broad range of different types of GPS receivers, because the planned deployment would have started close to GPS. They also show, however, that use of the spectrum far away from GPS does not cause interference for the vast majority of GPS receivers. Among the recommendations of the NPEF report was a recommendation to conduct further testing of the 10 MHz furthest away from GPS, as the testing conducted by the federal government agencies on receivers so far has shown minimal or no interference. Similarly, the RTCA report stated that the 5 MHz furthest away from GPS does not cause a problem for aviation receivers under worst case analyses, and that further analysis is needed to confirm that the next 5 MHz is similarly clear. Notably, the RTCA also noted that aviation receivers tested performed significantly better than the minimum performance standards. LightSquared is optimistic that this further analysis will not change the report's conclusion.

LightSquared has developed its position in response to the actual testing data, and has made the following proposal to resolve GPS interference issues:

- First, LightSquared will operate at lower power than permitted by its existing FCC authorization, staying at the power level authorized in 2005.

- Second, LightSquared will agree to a standstill in the terrestrial use of its upper 10 MHz of its frequencies immediately adjacent to the GPS band.
- Third, LightSquared will commence terrestrial commercial operations only on those portions of its spectrum that pose no risk to the vast majority of GPS users and will coordinate and share the cost of underwriting a workable solution for the relatively small number of legacy precision measurement devices that may be at risk.
- Fourth, just this week, LightSquared has made a proposal to the FCC to limit the power reaching the ground to levels that would, based on actual testing data, definitely eliminate interference issues for the vast majority of receivers. More detail on this proposal was provided to the FCC earlier this week, and is attached as Attachment 3 hereto.

Initially, it should be noted that, though they are employed for a variety of important uses, legacy precision GPS receivers represent a small fraction of the overall installed base of GPS receivers. As compared to the 400 to 500 million cellular, personal navigation and aviation receivers that will be covered by our move to spectrum far away from GPS, precision receivers amount to approximately 500,000, used primarily in agriculture, surveying and construction. Precision receivers are also used in some of the scientific work undertaken by the agencies before the Committee. Some, but not all, precision receivers may still be impacted by operations on the other side of our band from GPS if they are specifically designed to look all the way across the band. These receivers use satellite signals from our band to augment the precision of their receivers. Notably, however, testing showed that not all precision receivers are so impacted. Ten out of 38 tested receivers were resilient to our operations in the spectrum farthest from GPS. The interference issue, then, is not a physics issue. It is a technology design issue and can be addressed through proper design.

Contrary to the claims of some of the GPS manufacturers, there are technical and operational solutions that will allow us to deploy our network while retaining the benefits provided by using these devices. LightSquared can coordinate its rollout so agricultural receivers and many other receivers in remote locations will not be near LightSquared base stations for several years. LightSquared will underwrite the development of filtering technology for new receivers that can then be used consistently with the placement of our network. LightSquared will also work with Inmarsat to find a place in our band where precision manufacturers can be placed over the long term, isolated from terrestrial operations and where they can have a much higher certainty for their ongoing operations than they do today.

IV. CONCLUSION

LightSquared has never dismissed or made light of the sincere concerns expressed by the GPS community over the interference issues raised by the design of GPS receivers. Nor has LightSquared ever said that, because it is a receiver issue, it is the job of the manufacturers to solve alone. LightSquared has an obligation to be a good neighbor, however or whenever this issue arose. By taking the steps I've outlined in my testimony, LightSquared will address this issue for over 99% of the receivers currently used. These steps are not inexpensive to us, and they are not easy, but they can and must be done. We are stepping up to this commitment so that Americans can get the benefit of our significant investment in critical infrastructure, and continue to have all the benefits of a robust GPS system.

Jeff Carlisle is Executive Vice President for Regulatory Affairs and Public Policy for LightSquared, where he is responsible for all domestic and international regulatory and policy matters including those at the FCC, Congress, the Executive Branch, the ITU, and in foreign markets.

Before joining LightSquared, Jeff served as Vice President of Regulatory Affairs for SkyTerra Communications. Before joining SkyTerra, he served as Vice President, International Public Policy and Government Relations of Lenovo, the global computer manufacturer. Jeff headed Lenovo's Washington office from 2005 until 2008.

From 2001 to 2005, Jeff served as Deputy Chief and then Chief of the FCC's Wireline Competition Bureau. At the FCC, he managed the development of the Commission's policies on broadband and competitive entry into the local exchange market, and he was the architect of the Commission's policies on Voice over Internet Protocol (VoIP) and bankruptcy of common carriers. From 1995 to 2001, he practiced law at O'Melveny & Myers and independently, starting as a transactional attorney and then specializing in broadcast and telecommunications law.

Jeff recently taught about regulation of the Internet at the Columbus School of Law at the Catholic University of America, and has spoken at numerous events on telecommunications, trade and security policy issues. He received a B.A. in History, magna cum laude and with honors, from UCLA; a J.D. from Boalt Hall at the University of California, Berkeley; and an M.A. in Law and Diplomacy from The Fletcher School.