

ORIGINAL

BEFORE THE
Federal Communications Commission
WASHINGTON, DC 20554

In the Matter of)
)
LightSquared Subsidiary LLC)
)
Request for Modification of its Authority for)
an Ancillary Terrestrial Component)

File No. SAT-MOD-20101118-00239

FILED/ACCEPTED

To: The Commission

FEB 25 2011

Federal Communications Commission
Office of the Secretary

Application for Review

I, Tom Stansell, am an actively practicing consultant in the field of Navigation by Satellite, with over 40 years of experience with particular emphasis on GPS but also involving other Global Navigation Satellite Systems (GNSS); I am well known within the field, as attested by winning the prestigious Kepler Award from the Satellite Navigation Division of the Institute of Navigation (www.ion.org/awards/kepler2003.cfm). This background enables me to speak with professional certainty about the effects of the radio interference environment upon the functioning of GPS and other GNSS systems. I respectfully submit this Application for Review, pursuant to Section 1.115 of the Commission’s Rules (47CFR1.115) concerning the Order and Authorization adopted by the International Bureau (the “Bureau”) in the above-captioned proceeding (the “Waiver Order”).¹ For the reasons indicated below, I believe that the Bureau erred in its decision and exceeded its authority thereby setting the stage for future scenarios of interference to GPS that will potentially cause significant harm to a broad community of radionavigation users – government, consumers, commerce, and industry practitioners, including myself.

¹ *LightSquared Subsidiary LLC*, DA 11-133. (IB, released January 26, 2011).

I. Statement of Interest and Qualifications

First I will focus on the potential harm, not only to me but also to GPS in general, which could occur if LightSquared prematurely deployed their system based on the Bureau's Waiver Order. Such premature deployment would cause a significant diversion of resources from the normal business of developing, manufacturing, marketing, and distributing GPS products, systems, and services to an immediate focus on how to protect millions of GPS receivers from desensitization and how to handle the flood of angry responses from millions of customers. This would have a wide variety of severe impacts. (In addition to the potential loss of GPS functionality and availability, other impacts would include loss of domestic and international trust in the U.S. intent and ability to maintain its commitments and to protect this vital infrastructure. No doubt there would be a flood of complaints to Congress and the Executive branch, but innumerable lawsuits would be filed from many affected companies and organizations.)

I have become aware of the brief comment period that preceded the Waiver Order. I did not have the opportunity to provide an input during that period. Because the comment period began immediately after Thanksgiving and lasted an extremely brief period of two weeks, which I understand is exceptionally short for FCC practice (given the extreme significance of this matter), I was not made aware of the issue until after the comment period had closed. The timing and duration of the comment period was totally inadequate for hundreds of companies and thousands of GPS experts to receive notification and to respond appropriately. There were some responses, but not as many as this issue deserves.

I believe the Waiver Order is flawed from the outset as it seeks to waive a Commission rule, (i.e., an important, specific element of the MSS ATC gating requirement). The Waiver Order is flawed in a number of ways, e.g., it conflicts with the Communications Act, the APA, FCC procedures, and the Commission's orders establishing MSS ATC; involves a waiver of FCC rules that has never before been addressed by the Commission; it therefore is inappropriate for resolution on delegated authority; and it is the product of a prejudicial procedural error (failure to initiate a rulemaking, improper handling as a modification application), etc. The unreasonably expedited process, the letters of support which poured in from unqualified observers associated with a public relations firm, and the concerns raised by the February 2, 2011 letter from the National Legal and Policy Center to Congressmen Darrell Issa and Edolphus Towns cause me to believe the process was defective.

The LightSquared Initiative

I am not inherently opposed to the LightSquared concept. If LightSquared and GPS and other services can live in harmony, side by side, it would be ideal. This should be encouraged and promoted if the technical issues can be resolved.

Therefore, my concern is with the rush to authorization and the rush to implementation. As a GPS consultant, I am greatly concerned about the potential interference the LightSquared signals might have on GPS services across the nation. Many other GPS constituents have raised these concerns as well.

Request and Petition

My request is that the process of authorizing the LightSquared service slow down and take the time needed to properly evaluate the potential impact to the critical national infrastructure GPS has become as well the impact to other services adjacent to or within the 1535-1559 MHz MSS band, which is just below the 1559-1610 MHz GPS spectrum. LightSquared deployment plans must be delayed until a full understanding of potential harmful effects can be established and effective regulations put into effect to prevent harmful effects.

It is worth noting that this request to follow a measured and deliberate path to understanding and preventing harmful interference likely is in the best interests of LightSquared and its investors. Deploying the LightSquared system is extremely costly. Because it is unlikely that the US public or its representatives in Congress or the Administration would allow severe degradation of GPS, which has become vital to US business, commerce, and defense, a premature deployment of LightSquared would be devastating to its investors if the system were shut down entirely or were severely delayed while modifications were made to eliminate the interference. It is best for all concerned to do the proper job of understanding the potential for problems, to test the mitigations, and to proceed with caution.

I note that the Waiver Order requires LightSquared to:

“commence offering commercial service on its MSS L-band frequencies under the authority granted herein only upon the completion of the process for addressing interference concerns relating to GPS, as set forth in paragraphs 41-43 of this Order. As further detailed in paragraphs 41-43 of this Order, LightSquared shall help organize and fully participate in a GPS interference technical working group, and shall submit working group reports to the Commission and to NTIA. An

initial report shall be submitted on February 25, 2011. Progress reports be submitted on a monthly basis thereafter, due on the 15th day of each month (or, if that day is a holiday, as defined in 47 C.F.R. § 1.4(e)(1), on the first business day thereafter), and the final report shall be submitted no later than June 15, 2011. The process will be complete once the Commission, after consultation with NTIA, sends a letter to LightSquared stating that the process is complete.”²

The wording of this paragraph highlights that the Bureau visualizes only an outcome whereby LightSquared deploys the proposed service. Moreover, there is no clarity of what criteria would be used to determine what constitutes interference that needs to be mitigated, or who would be responsible for taking the mitigating actions. There is no mention of what to do if the Technical Working Group shows that LightSquared signals would cause harmful interference to vital GPS services. The last sentence states that the study process will be complete when the Commission decides it is complete? What process would there be for further public review/comment of the report? Clearly the Commission should contemplate what to do in case an unacceptable interference problem is found. Also, it is my understanding that LightSquared will, at the least, co-chair the working group. Without proper oversight, there is likely to be the appearance of a conflict of interest.

GPS Technical Discussion

First, it should be understood that there are a myriad of GPS technologies and applications. No one company and no one organization, including the US GPS Industry Council, adequately represents or speaks for the entire GPS community. To properly evaluate the impact on all these aspects of GPS, it is necessary to involve experts from each sector. Classification of GPS sectors is very difficult. For example, the US Military purchases a wide variety of special-built receivers for many different military applications, but commercial and consumer grade GPS receivers also are used extensively by our military. Civilian applications include time transfer, E911

² *Waiver Order* at ¶48.

positioning, location based services, personal and car navigation, agriculture, survey, engineering, exploration, child and pet tracking, law enforcement, border patrol, earthquake monitoring, weather forecasting, and many other services.

Second, it is vital to understand that GPS signals are very weak and therefore very susceptible to interference. GPS satellites orbit about 11,000 miles above the earth, and the transmitted power of each L1 signal (in the 1559-1610 MHz band) is about 50 watts. Therefore, the signal energy on the earth is similar to the amount of light from a 500 watt incandescent bulb, backed by a reflector spreading the light uniformly over the visible earth's surface, from a distance of 11,000 miles. (Assumes typical 10% light efficiency of the incandescent bulb.) Clearly GPS signals are very weak and must be protected to prevent interference.

Third, it is important to realize that communication engineers think of signals differently than GPS navigation engineers. Communication is intended to move information from one point to another, and doing so with the minimum power while using as little spectrum as possible is important. Many techniques have been developed to optimize these characteristics. On the other hand, the most important aspect of GPS navigation is to measure the location of signal transitions, i.e., the location of the edges of the spreading code transitions. Barriers include multipath signals, the low GPS signal power, and the "sharpness" of the code transition edges. Sharper edges, i.e., faster transitions, provide more precise measurements and aid in rejection of multipath signals. One example is the use being made of GPS for precise agriculture in which tractors are guided with 10 cm (4 inch) accuracy. This would not be possible at all without very wide bandwidth GPS receivers. This also is true for many other engineering and scientific

applications. A communications engineer might ask: “why do you need such a wide bandwidth when the C/A code switches at a rate of only about 1 MHz and most of the signal energy is within ± 1 MHz of the center frequency?” The answer is that the wide bandwidth is necessary to receive and measure very fast signal transitions.

A reasonable question, therefore, might be why GPS receivers were designed without assuming there would be strong signals in adjacent spectrum. The simple answer is that (a) effectively there are no such signals, (b) the adjacent bands were protected against use by terrestrial transmitters (such as the LightSquared proposal) because they were quite clearly set aside for space to earth signals from satellites, and (c) wide bandwidth receivers were needed for a huge variety of reasons and applications.

Another important consideration relates to the very weak GPS signals. For decades the Commission has specified that unintentional emissions from all sorts of devices, from radios to electric drills to fluorescent lamps, must be weaker than -41.3 dBm/MHz in bands above 960 MHz. Unfortunately, a signal of that magnitude would prevent GPS use within blocks of the emitter. Fortunately, careful studies have shown that, with extremely rare exceptions, the real world environment is free of such interfering signals in the GPS band. As a result, GPS has been successful at transforming and improving many aspects of modern life. GPS is recognized as critical US infrastructure, and the Department of Homeland Security (DHS) has been tasked specifically to protect GPS for that very reason. It is vital that LightSquared as well as other terrestrial transmitters be limited to out of band emissions within GPS bands many tens of dB below the unintentional emissions limit. Work must be done to evaluate the appropriate limit

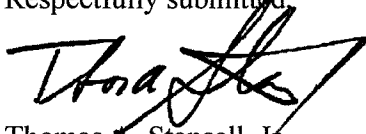
based on transmitter power, separation distance to the nearest GPS receivers, and density of transmitter deployments. In addition, interference effects such as third order intermodulation products, which can place spurious signals directly on top of GPS signals, must be evaluated and restricted.

The LightSquared proposal, so rapidly approved by the Bureau, turns the status quo upside down. Literally millions of GPS users are threatened. Safety of life transportation applications are threatened. The cost to recover from this threat would be billions of dollars over tens of years, and the result would be uncertain.

Summary and Conclusion

The purpose of this request is not to torpedo the LightSquared concept. LightSquared could provide a much needed and extremely valuable increase in spectrum for wideband wireless communications. However, the headlong rush to approve and deploy this capability is not justified. The risk to critical US infrastructure and the potential negative impact on millions of users and thousands of applications demand a very thorough and methodical process. It will take more time, but the risks are too high to rush forward without adequate evaluation and testing. I urge the Commission not to bend the rules but to follow them carefully. This should include adequate time for the entire GPS community to understand and evaluate the risks. This also will protect LightSquared investors from large expenditures which might never generate an adequate return. Personally I hope a way forward can be found which does not harm GPS and the expansion of wireless wideband services will be successful. I would be happy to help this process if at all possible.

Respectfully submitted,



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CERTIFICATE OF SERVICE

I, Thomas A. Stansell, Jr., do hereby certify that a true and correct copy of the foregoing "Application for Review" was served by U.S. mail, first class, postage-prepaid on the 25th day of February, 2011, on the following:

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