



August 11, 2011

FILED ELECTRONICALLY

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

**Re: Compliance with DoD's SPS Performance
Standard and ITU Recommendations
Call Sign S2358
LightSquared Application for Modification
FCC File No. SAT-MOD-20101118-00239
IB Docket No. 11-109**

Dear Ms. Dortch:

Following the August 3 filing of a letter from the National Space-based PNT Advisory Board (the "Board"), LightSquared filed a response to the points raised in that letter on August 8. Separately, however, the Board letter raises the more general issue of the extent to which the commercial GPS industry has heeded explicit warnings about interference from nearby bands, including the one used by LightSquared. GPS manufacturers participate actively in the federal government's development of GPS policies and standards and should be presumed to be well-familiar with them. For example, representatives of Trimble participate actively in the Board's work, as they do in the U.S. GPS Industry Council, which has been the principal spokesperson for the commercial GPS industry before the FCC.¹

The GPS manufacturers have claimed repeatedly that they had no warning of the technical characteristics of LightSquared terrestrial base stations, even though their participation in the Commission's many years of relevant proceedings show that to be false. But even that implausible assertion fails when one considers the Board's participation in the development of GPS performance recommendations published by the U.S. Department of Defense ("DoD").² For reasons that are explained

¹ Thus, Dr. Brad Parkinson, who co-authored the August 3 letter, is the Vice-Chairman of the PNT Board and a Trimble Board member; Charles Trimble, the founder and former CEO of Trimble, is on the PNT Board and is Chairman of the U.S. GPS Industry Council; and Ann Ciganer, Vice President for Strategic Planning for Trimble, is, according to her Trimble biography, a principal founder of the U.S. GPS Industry Council, and currently serves as the group's Executive Director for policy. A perusal of the attached excerpted Minutes of a March 2008 PNT Board meeting at which LightSquared's contemplated operations were a principal focus, shows Mr. Parkinson and Ms. Ciganer as the leading GPS industry participants in the discussion.

² U.S. Department of Defense, Global Positioning System Standard Positioning Service Performance Standard ("SPS Performance Standard") (4th edition, Sept. 2008), available at <http://www.pnt.gov/public/docs/2008/spsps2008.pdf> ("SPS").

below, had the GPS industry complied with DoD's recommended filtering standards for GPS receivers, there would be no issue with LightSquared's operations in the lower portion of its downlink band.

DoD's performance standards are "conditioned upon certain assumptions regarding use of the SPS SIS."³ The SPS is DoD's Standard Positioning Service Performance Standard for the Global Positioning System – in other words, the representation from the government as to the performance GPS manufacturers can expect to receive. As stated by DoD: "the SPS Performance Standard (SPS PS) defines the levels of Signal In Space (SIS) performance to be provided by the USG to the SPS user community. In addition to providing general information to the SPS user community, it is established to provide a basis for certification of SPS receivers for use in aviation Instrument Flight Rules (IFR) and to establish a minimum performance level which the GPS constellation must sustain."⁴

Those assumptions include the use of a GPS C/A code correlator receiver (and early-minus-late correlator with 1 chip spacing) that uses "an exact replica of the waveform within an ideal sharp-cutoff filter bandwidth at 24 MHz with linear phase centered at the L1 frequency."⁵ In other words, the specification is premised upon the use of a receiver with a 24 MHz (1563.42- 1587.42 MHz) pass band filter. To comply with these specifications to have a 24 MHz pass band filter,⁶ therefore, a GPS receiver would have to filter out transmissions from the adjacent band in which LightSquared operates.

The representative receiver characteristics set forth in SPS serve as "a framework for defining the SPS performance."⁷ While DoD, like the FCC, does not mandate receiver performance, DoD made clear that the receiver standards set forth in the SPS comprise "Minimum Usage Assumptions" that "are necessary attributes to achieve the SPS performance described" therein.⁸ Following those standards was made the responsibility of the GPS industry, the evident underlying presumption being that, having been advised what receiver criteria were necessary for them to achieve DoD's performance standards, responsible manufacturers would proceed accordingly. Unfortunately, this was not the case. GPS manufacturers did not design receivers capable of filtering out transmissions from the adjacent band, but are nevertheless trying to claim entitlement to DoD's full GPS functionality.

Under the SPS, GPS manufacturers were, in effect, granted a 4 MHz guard band of protection from the allocated band edge. Had the GPS manufacturers been responsible, they could have built to these standards, as other spectrum users have built to much tighter standards in heavily used frequency bands. But most of them avoided that responsibility. They are now also turning their back on LightSquared's offer to observe what basically amounts to a 23 MHz guard band, by shifting its terrestrial operations to the lower 10 MHz of its downlink band. The FCC and federal spectrum managers, who are faced with responding to the wireless industry's severe spectrum shortage, do not have the luxury of imposing such

³ *Id.* at 13.

⁴ *Id.* at 1.

⁵ *Id.*

⁶ We note that in a subsequent Interface Specification ("IS") the required bandwidths have been changed to 20.46 MHz and 30.69 MHz, depending upon the satellites from which signals are to be received. Global Positioning System Wing Systems Engineering & Integration, Interface Specification, IS-GPS-200 (June 8, 2010). The requirement of a sharp-cutoff filter remains unchanged. *Id.* Whether the bandwidth outside of which the filter should operate is 24 MHz, 20.46 MHz, or 30.69 MHz, the requirement of a filter, were it met, would protect against the receipt of signals in the lower 10 MHz of LightSquared's licensed L-band.

⁷ *Id.* at 7.

⁸ *Id.*

Ms. Marlene H. Dortch

August 11, 2011

Page 3

“guard bands,” yet the GPS industry has stated that the 23 MHz guard band is inadequate and are demanding that all of LightSquared’s downlink band lie fallow as a “guard band” of at least 34 MHz.

It should also be noted that when the GPS manufacturers chose to ignore DoD’s performance recommendations, they also turned a blind eye to ITU recommendations that are similar to DoD’s. Since 2000, the ITU has cautioned that “a more stringent pre-correlator filter may be needed to protect [GPS] receiver operations from adjacent band RF emissions.”⁹

The Commission does not have to search extensively to determine what type of adjacent band RF emissions that the GPS manufacturers should have taken into account in following DoD and ITU recommendations. As the US GPS Industry Council stated to the FCC in 2003, *in support of the more stringent technical standards it had negotiated with LightSquared*, the standards were necessary to address “[t]he increased user density from potentially millions of MSS mobile terminals operating in ATC mode . . . [and] **potentially tens of thousands of ATC wireless base stations.**”¹⁰

Underscoring the truth of that statement, at a meeting of the Board in 2008, with specific reference to the MSS/ATC service rules, it was emphasized that “MSS was no longer just a few handsets talking to satellites; rather, MSS was, potentially, a whole environment of cell phones connected into the system.”¹¹

It is apparent from the forgoing that the GPS industry turned a blind eye to the technical parameters that the Commission adopted for LightSquared, a blind eye to DoD’s recommendations regarding the immunity performance of commercial GPS receivers, and a blind eye to the ITU’s long-standing recommendations regarding GPS receiver performance.

In this regard, DoD, NASA, and the other federal agencies responsible for GPS were ill-used by the GPS manufacturers who participate in the Board’s work. An industry that benefits from an estimated \$18 billion subsidy in offering a commercial service using a government satellite system deliberately did not adhere to the GPS receiver filter performance criteria that DoD and ITU recommended to them for using that system – such an industry is not a reliable partner of the federal government.

Respectfully submitted,

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⁹ ITU Recommendation, ITU-R-M.1477 (May 2000), at 5, Table 2, n.1.

¹⁰ Reply Comments of USGIC, IB Docket No. 01-185, at 2 (Sep. 4, 2003) (emphasis added).

¹¹ PNT Advisory Board Minutes, Presentation of Mr. Karl Nebbia, Associate Administrator NTIA Office of Spectrum Management Board (March 2008), at 11. (For ease of reference, a copy of the Minutes of Mr. Nebbia’s Presentation is attached.)

**EXCERPT FROM PNT ADVISORY BOARD MEETING
MARCH 27-28, 2008**

Presentation: Protecting RNSS Spectrum

Mr. Karl Nebbia
Associate Administrator
NTIA Office of Spectrum Management

Mr. Nebbia said he would address Radio Navigation Satellite Services [RNSS] spectrum protection, domestically and internationally. NTIA, he stressed, took a different approach to the RNSS wavelength than to that used with any other radio activity. Historically, NTIA set emissions limits consisting of an on-channel power level, along with limits on out-of-band transmissions. Commonly, the latter had been set at 40 or 60 dB down from the main signal, and without reference to other radio signals. These standards, Mr. Nebbia added, were accepted domestically and internationally. However, as RNSS was subject to continuous technological change, provision for its protection was likely to conflict with existing generic standards. This, in turn, required other members of the radio community to adjust their practices. The Communications Act of 1934 established the Federal Communications Commission (FCC) and NTIA as co-equal regulators: the first for non-federal users; the second for federal users. He emphasized that this was *shared* management; consequently, NTIA lacked the authority to dictate processes and procedures favorable to GPS. Mr. Nebbia described NTIA's efforts in developing rules for new technologies and in responding to aspects of FCC rulemaking that might impact RNSS or the GPS system, e.g. when mobile satellite service first appeared, NTIA set limits for those services to protect GPS reception in the aviation environment.

Ms. Ciganer said the scenario Mr. Nebbia cited had been developed in 1994; GPS was then only an emerging application. The scenario, she added, was theoretical: it concerned landing an aircraft with an antenna on its top at an airport with 10 degrees of masking angle, and with a single unlicensed Mobile Satellite Service (MSS) emitter within a 100 meter radius. Prior to 2000, she said, the ITU had lacked necessary information on a civilian GPS receiver to do the needed interference analysis. When that interference analysis was done, the MSS community at the ITU had agreed that this particular scenario (-70 dBW per megahertz for out of bandwidth emissions) should be limited to the big LEO [Low-Earth Orbit]. Further, the ITU had concluded that any additional new service or new entrant technology would require additional study to determine appropriate standards. Yet, she added, despite this, the FCC for each new entrant technology continued to put forward the -70 dBW standard, e.g. this had been used when the FCC had a rulemaking introducing ATC [Ancillary Terrestrial Component] into the mobile satellite service bands. The ITU industry council negotiated with the sole U.S. MSS operator and reached an agreement to improve the -70 standard to -90 or -95 for handsets, while maintaining the -70 for satellite phones. She commented that when a negotiated agreement was reached with the sole member of an industry, the proposed rule based on that negotiation was adopted. However, in this instance, the NTIA and the FCC had continued use of the -70 standard. In consequence, the NTIA now had more work to do because rules must be individually negotiated with each individual proponent. This was done, he said, because such proponents had GPS in their products.

Dr. Parkinson said Ms. Ciganer had described a potentially severe problem: was there a lever for resolving it? Mr. Nebbia said the administration could apply pressure; he believed resolving the matter was in everyone's interests. He noted that every company doing Mobile Satellite Service/Ancillary Terrestrial Component [MSS/ATC] had come to NTIA, which had devised a pertinent answer. He said NTIA had two options for protecting RNSS: either it could take focused steps to manage the spectrum, or it could entirely recast the management of the spectrum. Ms. Ciganer said she was uncomfortable with the 'one size fits all' approach to out-of-band emission limits for RNSS to protect the noise floor; innovation in GPS continued to operate below the noise floor. She believed that having a 'rational case-by-case approach' promoted the introduction of the new technology without risking GPS innovation.

Mr. Nebbia described the development of ultra-wideband [UWB] rules; such devices, he said were difficult to develop without impinging on other bands. NTIA undertook to negotiate an agreement that set a number of limits: significantly, the previous standards for unwanted emission levels had been changed to create limits specifically designed to protect something specific, i.e. performance of RNSS. This, he said, constituted an exception level of protection, as NTIA had not acted to prevent other issues from interference from these devices. He noted that, as Ms. Ciganer had said, part of the issue was that the GPS requirements on the receiver side continued to change; for example, the discussion on protecting the aviation environment had occurred before GPS devices were common in automobiles, cell phones and elsewhere. One reality, he added, was that one 'simply could not change the rules for the radio community every year.'

Next, Mr. Nebbia commented on MSS/ATC service rules. He noted that MSS was no longer just a few handsets talking to satellites; rather, MSS was, potentially, a whole environment of cell phones connected into the system. He reported that the FCC had stalemated on the question of the value to be set for protection. NTIA and FCC, he said, had agreed that the -70 dB standard would remain for the present. All new systems needed to come to NTIA for approval; Mr. Nebbia said, 'We don't say "yes" until

they give us the number we are looking for.’ Dr. Parkinson asked why the FCC resisted creating a blanket policy. Mr. Nebbia responded that there had been considerable debate over what protection levels were required, particular in relation to UWB. In part, he said, this reflected hesitancy over addressing the matter in open discussion. Mr. Nebbia said ‘rational heads’ had opposed undertaking open rulemaking, believing that firming up the GNSS protection requirements needed to occur first. For the manufacturers, he adds, the issue was not one of the requirements themselves, which Mr. Nebbia said the manufacturers could meet, but with the consequences of ‘drawing a line in the sand.’

Ms. Ciganer commented that GPS was a global utility; at the recent World Radiocommunication Conference [WRC], a proposal that ATC be added to the MNSS band had been introduced rather late in the proceedings. At that time, rules for more than one MNSS providers carried the improved out of bandwidth emission limits [-90, -95], but that the FCC had removed them, saying it lacked technical information for any basis other than -70. She noted that adding ATC to the GPS II band affected GLONASS, COMPASS and Galileo raise the level of noise floor within that band. Ms. Ciganer said she regretted that the benefits of the U.S. rules could not be carried into the international arena. Mr. Nebbia said the commission did not wish to place into international rules something that was still unsettled domestically. Dr. Enge said he found the persistence of the -70 standard to be distressing. He noted that a 6-foot separation scenario produced a figure of -105. He urged Nebbia to work to rid U.S. regulations of the -70 standard.

Mr. Nebbia then addressed GPS Re-radiators: NTIA addressed this topic, he said, because these were being sold as unlicensed devices, which are not permitted to operate in restricted bands. GPS Re-Radiators had been removed from retail shelves and their manufacturers ‘clearly informed’ that they could be sold in the U.S. only to specifically authorized individuals. Mr. Nebbia noted that many requests for exceptions came in; no sufficient justifications had been presented. Ms. Neilan asked if such devices were still sold internationally. Mr. Nebbia said they were; in practice, a limited number were available from non-U.S. firms through the Internet.

Dr. Schlesinger observed that NTIA was supposed to be the guardian of the Federal spectrum; as was generally known, he said, budget authorities cast ‘a greedy eye’ on the spectrum, viewing it as something to be auctioned. He observed that it was NTIA’s responsibility to protect the necessary Federal uses of the spectrum; he added that that statement was not a question. Mr. Nebbia said it was indeed NTIA’s goal to do this.