Selective Comments:

I appreciate having the opportunity to submit comments on the recently completed Technical Working Group Report by LightSquared and the GPS Industry Council regarding the interference of LightSquared’s proposed Ancillary Terrestrial Component with GPS.

My experience with GPS dates back to 1982 when I tested a prototype GPS receiver at M.I.T. and determined baselines with centimeter accuracy. Around 1984 I was a GPS consultant to the millimeter-accurate Stanford Linear Accelerator alignment survey. In 1996 I developed techniques for combining GPS and GLONASS observations for accurate baseline determination. The latter activities demonstrated the advantages of combining observations from multiple satellite systems. Since 1980 I have been teaching undergraduate and graduate courses on GPS and geodesy. I am the author of the book GPS Satellite Surveying (J. Wiley) and the Editor-In-Chief of the peer-reviewed journal GPS Solutions (Springer Verlag).

It is my professional opinion that the Report correctly points out the significant and detrimental interference that the planned LightSquared transmissions would have on GPS observations. I further agree that transmitting only at the 10 MHz band at the bottom of the LightSquared band would still cause disruptive interference, in particular for high precision receivers used in government and commercial applications which LightSquared appears to consider collateral damage of its plan. These types of receivers deliver accurate real-time centimeter positions which make GPS such a truly unique national asset by any standard of measurement. I also further agree that there are no known filtering techniques, let alone proven ones, that could filter out a billion times stronger LightSquared signal, and still render an “observable” that is geometrically useful for high-accuracy real-time applications. More testing is required to understand the impact of transmitting at the lower 10 MHz band on high precision receivers. Moreover, additional time is necessary to develop solutions and to verify to what level interference can be mitigated.

The outcome of this study, including assertions and counter assertions, is no surprise and could have easily been predicted by any expert on GPS. It would be highly desirable to give guidance to future companies, who do not have a deep understanding of the complexities of satellite positioning, in particular real-time high accuracy positioning, to avoid proposing systems that cannot be realized because of interference with existing GPS/GNSS satellite systems. Given the 30+ year history of GPS, its entrenchment with the daily lives of citizens, and its indispensible role as a national utility, one cannot tolerate a disruptive or diminishing effectiveness of GPS utilization.
Many of LightSquared rebuttals in the report demonstrate that the company has little understanding of the manner in which high-accuracy GPS positioning is used in competitive markets in transportation, engineering, surveying, geographic information systems, and others. In an effort to minimize the interference area, LightSquared seems to suggest that morphological data must be considered when evaluating propagation models. The actual implication of such explicit dependency is that the boundary around a LightSquared tower, within which high precision receivers would not perform adequately, would be a complicated function of the distance to the tower. Moreover, the shape of such a demarcation line would probably be temporal in nature as it certainly would likely change with seasons. Such high uncertainty of GPS availability is not acceptable for commercial application in a competitive market. It would also create competitive distortions, as one company could fully explore the economics of positioning with GPS, while the competitor who is closer to the LightSquared transmission tower could not.

GPS positioning, in particular real-time accurate positioning, is unique to GPS and it therefore represents a unique nation-wide capability and asset that needs to be preserved for the benefit of the nation and not treated as collateral damage.

Fortunately it is possible to solve the problem for the benefit of all participants and also to best serve the needs of the nation. I suggest that LightSquared transmissions be moved to the S-band, as other broadband carriers have done.

Creating an electronic barrier in the L band which will interfere with GPS signals has yet another major disadvantage. The Russian GLONASS system, the forthcoming European Galileo system, and possibly the Chinese COMPASS system, all make use of the L-band. Major efforts have been made at the international level to achieve interoperability of these systems. Setting up LightSquared’s proposed electronic barrier would also interfere with these other systems. Considering the fact that using more satellites provides more robust and more rapid positioning, the opportunity costs of the inability to fully utilize these signals would be long lasting and substantial to the US economy.

Alfred Leick, PhD
Professor
University of Maine
Dept. of Spatial Information Science and Engineering
Orono, ME