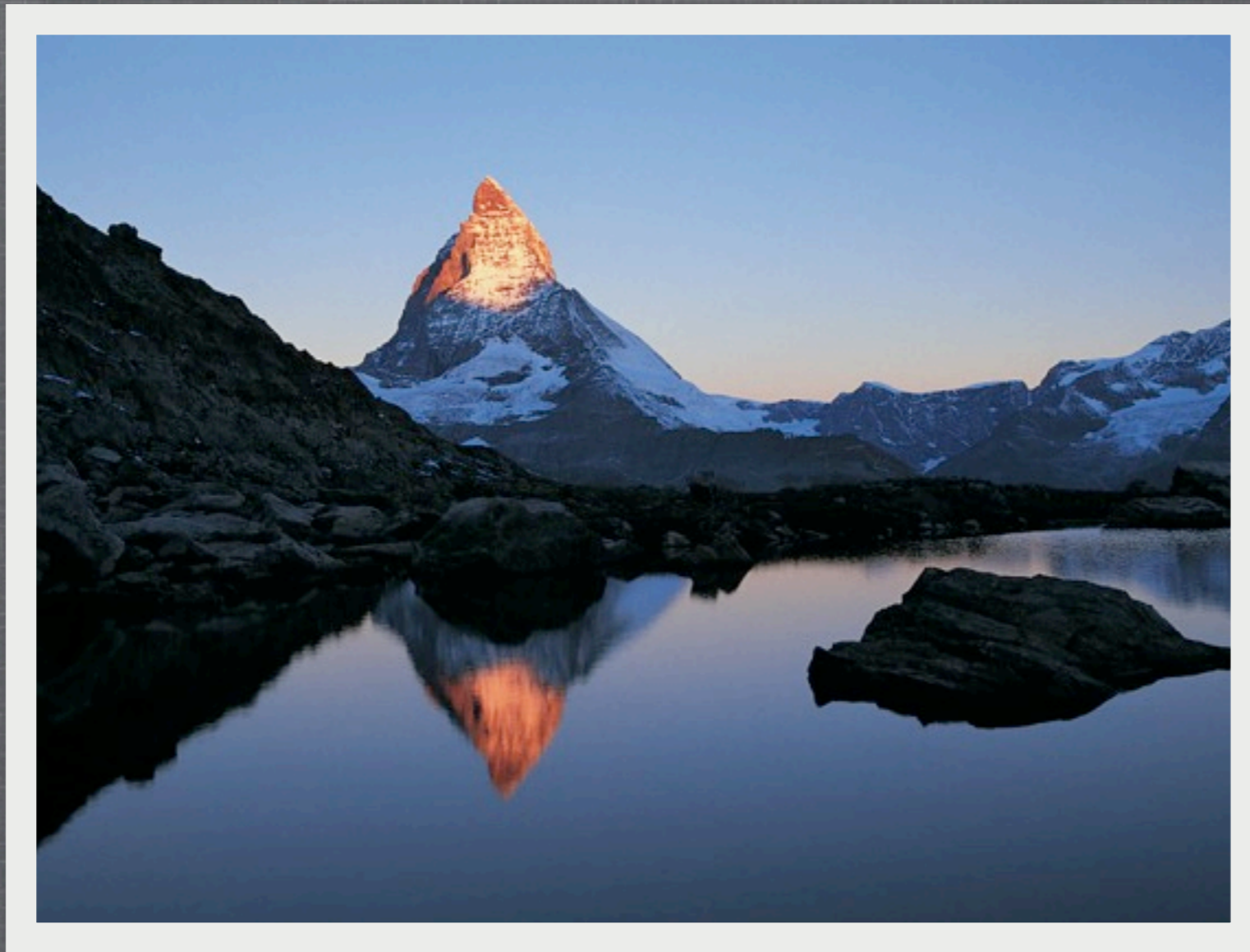


LIGHTSQUARED AND YOU

Sub title:RF allocation & Controversy
Richard Perry RVTEC 2011



About Lightsquared

- “**LightSquared** will deploy an open wireless broadband network using a technology called Long Term Evolution (LTE), the most widely adopted 4G standard in the world. Its LTE network will be combined with one of the largest commercial satellites ever launched, to provide coverage of the entire United States. This integrated LTE-satellite network is a world first.” - Lightsquared website
- “**LightSquared** will complement all existing and emerging players in the wireless market by operating on a wholesale basis exclusively, thereby avoiding any conflict of interest. This allows **LightSquared** to focus on developing individual, tailored, and cost-effective solutions for its business partners—**LightSquared** will be only as successful as they are.” - Lightsquared website
- **Spectrum Assets and Financing**

“**LightSquared** already owns valuable high quality spectrum assets, including 59 Mhz of nationwide ubiquitous spectrum in an advantageous frequency position.

In addition to the \$2.9 billion of assets already contributed by Harbinger Capital Partners and affiliates, **LightSquared** has more than \$2.3 billion in debt and equity financing.” - Lightsquared website

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L Sq Partners

- Partial List - -(Lightsquared website)
 - Best Buy
 - Sprint
 - Sharp
 - Cleartalk
 - VOX

The Problem

- LightSquared's original plan was to use broadcast frequencies in the 1545 to 1555 Mhz range, he said. That is close to the 1559-1610 Mhz frequencies used by GPS. The company is now proposing to use 1526 to 1536 Mhz., although critics say its eventual plans still call for using the higher range. - GPS World
- On January 26, 2011, The Federal Communications Commission granted LightSquared's Request for Modification of its Authority for an Ancillary Terrestrial Component. - TWG progress report #1
- Companies that provide global positioning systems, in addition to the United States Air Force, the operator of the GPS system, opposed the FCC waiver, saying that more time was needed to resolve concerns that LightSquared's service might interfere with their satellite-based offerings. - GPS World .
- Unfortunately, it's likely that LightSquared would affect high-precision GPS receivers *even more* than the consumer GPS receivers tested by Garmin. High-precision GPS receivers are those GPS L1 receivers that try to squeeze the most out of the GPS L1 signal to well under a meter. GPS World
- "Our RF (radio frequency) front-end is wide relative to some of the lower end (consumer) GPS receivers since a wide front-end gives better code tracking performance," said Michael Whitehead, vice president of technology at Hemisphere GPS. "But, it also opens you up more to interference susceptibility."

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The Investigation (part I) timeline

- January 26th LightSquared Order , - the FCC directs Lightsquared and USGIC to investigate GPS interference.
- In Feb 24th the GPS Technical Working Group (TWG) had a meeting to determine its structure.
- March 3 first TWG meeting.
- June 30th TWG “ final report”
- USGIC summary of report - **“1. The LightSquared Terrestrial Broadband Service Will Cause Harmful Interference to Nearly All GPS Receivers and GPS-Dependent Applications.”**
- The Witch is dead, or so we thought.

What was tested?

- The TWG has identified seven categories of receivers that are representative of the non-military use of GPS in the United States: aviation, cellular, general location/navigation, high precision, timing, space-based receivers and networks. Each category includes augmented and unaugmented devices.
- Testing at the upper portion of the Lightsquared controlled frequencies
- Testing was without any filtering devices due to the fact that none were available at the time of testing
- Some 130 individual devices were selected , but, not all were tested due to time constraints

Filtering?

Lightsquared's position

- “Many of the filtering proposals made by LightSquared only allow use of about 2 MHz of the GPS signal, which is the minimum bandwidth required to track the GPS signal. The GPS signal actually uses 32 MHz, so these proposed filters reject much of the GPS signal along with the LightSquared signal. Many GPS receivers incorporate sophisticated processing techniques that require the use of bandwidths larger than 2 MHz to improve measurement accuracy.” - USGIC Overview -June 30
- "Had the GPS industry complied with the 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," Carlisle (LS executive VP)wrote in the filing. Quoted in PC World August 11
- "GPS receivers incorporate filters that reject transmissions in adjacent bands that are hundreds of millions of times more powerful than those of GPS. What LightSquared is proposing, however, is to transmit signals that are at least one billion times more powerful," - Coalition to save our GPS quoted in PC world August 11
- In just a matter of weeks, Partron developed a \$6 component that would eliminate the problem for most high precision receivers. Javad came up with its own LightSquared-compliant receiver and PCTEL built a new antenna that is compatible with our network. - Lightsquared website Nov 4th
- So the question really has never been whether or not the interference issue could be solved. The GPS industry knew all along it could. They just didn't want to pay for their faulty design. LightSquared has already invested more than \$150 million in finding solutions to this issue. Now it's time for the GPS industry to do its part by funding their share of the solution for high precision devices through a standard product recall. Lightsquared Website NOV4th

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Political Issues

- **Senatoe Grassley to Block FCC Appointments over Agency's Approach to LightSquared/GPS Issue 3 November - Inside GNSS**
- **The Pentagon has worried for months that a project backed by a prominent Democratic donor might interfere with military GPS. Now Congress wants to know if the White House pressured a general to change his testimony. - The Daily Beast 15 Sept**

Now

- 2nd round of testing to begin Feb/ March 2012.
- Javad offers the GrAnt Gps antenna which claims to be interference free is available for \$ 1800.
 - I could not identify any test results for this antenna as of 11 nov.
- Javad offers to modify “ your” antenna for ~ \$ 800 - no specs offered
- PCTEL - antenna available - not sure at this time of actual availability
-

Outlook

- Points made by JavadAshjaee to Eric Gakstatter GPS World -
 - This is a spectrum issue that isn't going away even if LightSquared isn't allowed to proceed, so it's in the best interest of the GPS industry to work on a solution no matter what the FCC's decision is.
 - Secondly, Dr. Ashjaee opines that 4G LTE is something that the GPS industry needs. I don't disagree with that statement. More and more you see the latest high-precision GPS receivers designed with integrated communications, primarily GSM modems to enable internet connectivity in the field. Connectivity in the field has always been a weak point of GPS systems. If one wireless technology could replace UHF/VHF/Spread spectrum/GSM/MSS, that would be a good thing.
 - Lastly, Dr. Ashjaee states that with GPS modernization in full swing and with new GPS signals being deployed, GPS users are going to need to upgrade their equipment to keep up with the latest technology in order to stay productive.
- Recommendations. For RVTEC
 - Watch For test results of new equipment as well as workaround for old.
 - Try to assess what portion of our working field areas might be directly involved.
 - Be active in groups such as Save our GPS
 - Wait and see!

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Nov 9th 2011 Scott Burgess GARMIN

- At the end of the TWG testing process, LightSquared represented that over 99% of the installed GLN user base and cell phones were free from interference
- The math is specious. Only 29 of the many thousands of installed GLN devices were tested. Moreover, the 99% claim is based on:
 - A harmful interference definition of 6 dB degradation of receiver C/N0 instead of the commonly accepted 1 dB standard.
 - A propagation model that is unsuited for interference analysis.
- LightSquared's 99% figure presumes use of only the lower 10 MHz of frequencies.
- The vast majority of devices fail at the upper 10 MHz. The reality is that there is a major jamming issue with the installed base of GLN devices using the lower 10 MHz frequencies

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What Now?

- bobby mcfarren
- Be Happy ,~~Don't Worry~~
- WORRY!!

For More information

- <http://www.pnt.gov/interference/lightsquared/>
- pnt.gov is changing to gps.gov