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The Spectrum Crunch, MSS Spectrum and LightSquared

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THE SPECTRUM CRUNCH, MSS SPECTRUM AND LIGHTSQUARED

Thomas M. Lenard and Lawrence J. White*

I. Introduction

The growth of wireless broadband has been a bright spot in the U.S. economy. U.S. users employ more than 320 million devices for everything from watching movies to playing games to sending email to catching up on the news.[1] Innovators are rapidly adding new uses. A recent Deloitte report identified as areas of particular promise applications such as mobile health care diagnosis and treatment (mHealth) and automotive telematics—by 2020, an estimated 90 percent of new cars sold will be "connected".[2] But the same report indicated that continued U.S. leadership in this area is not assured.

Maintaining U.S. leadership in wireless innovation depends on having sufficient spectrum and using that spectrum efficiently. Economists are virtually unanimous in believing that a market system is the only way to assure that resources are allocated to their highest-valued uses, and spectrum is no exception. As a group of distinguished experts concluded: "Although one can identify a number of reasons why a market-based system will not function

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[1] See CTIA. "Wireless Quick Facts" at http://www.ctia.org/advocacy/research/index.cfm/AID/10323, last accessed April 11, 2013.

[2] Deloitte. 2012. "Airwave overload? Addressing spectrum strategy issues that jeopardize U.S. mobile broadband leadership", September; http://www.deloitte.com/assets/Dcom-UnitedStates/Local%20Assets/Documents/TMT_us_tmt/us_tmt_Spectrum_Thought_Leadership_September_092512.PDF.

perfectly…there is no serious contender for a system that can be expected to perform as well or better."[3]

Despite progress toward a more market-based approach to spectrum allocation over the last 20 years, much of the most valuable spectrum is either unavailable to the private sector or is locked into inefficient uses under FCC license terms. This is reflected in the results of a recent paper by Wallsten, which constructs a spectrum price index.[4] The results show that spectrum license prices have increased steadily over the past five years, indicating that the demand for wireless services has grown more rapidly than the increases in the efficiency with which spectrum is used. Wallsten's results also show that license flexibility increases spectrum value.

The FCC's 2010 National Broadband Plan established a goal of making 500 MHz of spectrum available for mobile broadband by 2020, of which 300 MHz were to be made available by 2015.[5] In the short run, the most available spectrum—indeed, the only significant block of spectrum that is already licensed but not deployed—is the Mobile Satellite Service (MSS) spectrum, most of which is licensed to Dish and LightSquared. Both LightSquared and Dish have spectrum that is similar in magnitude to that of T-Mobile and Sprint, as illustrated in Figure 1.

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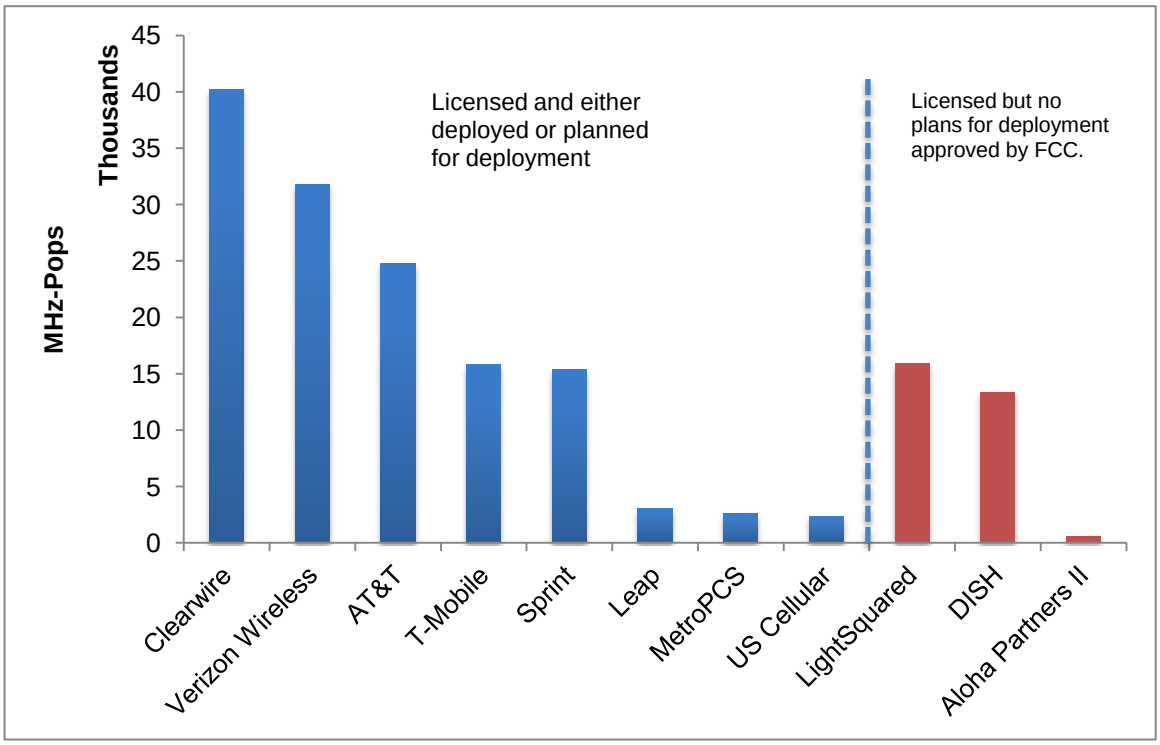
[3] Lenard, Thomas M., White, Lawrence J., et al. 2006. "DACA Report from the Working Group on New Spectrum Policy, Release 1.0," *The Progress & Freedom Foundation*, March; http://www.techpolicyinstitute.org/files/9.pdf.
[4] Wallsten, Scott. 2013. "Is There Really a Spectrum Crisis?" *Technology Policy Institute*, January; http://www.techpolicyinstitute.org/files/wallsten_is_there_really_a_spectrum_crisis2.0.pdf.
[5] Federal Communications Commission (FCC). 2010. "Connecting America: The National Broadband Plan"; http://download.broadband.gov/plan/national-broadband-plan.pdf, (National Broadband Plan).

Figure 1: Licensed Spectrum Available for Broadband[6]



There do not appear to be significant regulatory or legal impediments to the deployment of the Dish spectrum.[7] LightSquared, on the other hand, has been embroiled in a dispute with the Global Positioning System (GPS) industry (users of the adjacent spectrum), which threatens to make the LightSquared spectrum unusable. By resolving this issue in a manner that allows LightSquared to use its spectrum, the FCC can produce significant benefits for millions of users of mobile broadband services and for the U.S. economy more generally.

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[6] Feldman, Brett. 2012. "Key Updates on Major Spectrum Deals. Industry Update*". Deutsche Bank, Markets Research*.

[7] See *Service Rules for Advanced Wireless Services in the 2000-2020 MHz and 2180-2200 MHz Bands*, Report and Order and Order of Proposed Modification, WT Docket No. 12-70 (released December 17, 2012).

II. The FCC's National Broadband Plan

The FCC's National Broadband Plan highlights the importance of freeing up more spectrum for wireless broadband. In principle, additional spectrum for flexibly licensed uses can come from the following sources: excess capacity from the more than 1500 MHz that have been reserved by the federal government for its own use; spectrum that is controlled by TV broadcasters; spectrum that is in the pipeline slated to be auctioned; and spectrum that has already been licensed but not yet deployed for broadband use.[8] U.S. experience indicates that large-scale reallocations of spectrum have taken 6-13 years to complete.[9]

The challenges that are involved in freeing up government spectrum are well known.[10] A recent report from the President's Council of Advisors on Science and Technology reflected the difficulties in overcoming these challenges by largely abandoning the goal of clearing government spectrum to make it available for licensed use in favor of spectrum sharing between government and private-sector users.[11]

The FCC projects that 120 MHz of the 300 MHz targeted by the National Broadband Plan for 2015 will come from the two-sided auctions that the agency is planning to free up some broadcast spectrum. These auctions are currently being designed and will not take place until 2014 at the earliest. How much spectrum will actually become available—and when—is uncertain. What is relatively certain is that the process will be long and arduous.

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[8] Lenard, Thomas M., White, Lawrence J., Riso, James L., 2010. "Increasing Spectrum for Broadband: What are the Options?" *Technology Policy Institute*, February; http://www.techpolicyinstitute.org/files/increasing_spectrum_for_broadband1.pdf.

[9] See National Broadband Plan, chapter 5, p. 4.

[10] See Lenard, White, and Riso.

[11] President's Council of Advisors on Science and Technology (PCAST), 2012. "Realizing the Full Potential of Government-Held Spectrum to Spur Economic Growth," July; http://www.whitehouse.gov/sites/default/files/microsites/ostp/pcast_spectrum_report_final_july_20_2012.pdf.

A much smaller amount of spectrum—the advanced wireless services (AWS) spectrum—is in the pipeline waiting to be auctioned. Since those auctions have yet to be scheduled, when and how much of that spectrum will become available is also uncertain.

Finally, the National Broadband Plan counted a significant block of MSS spectrum—90 MHz—but this estimate has been more than cut in half since then.

The most recent tally is contained in an October 2012 speech by FCC Chairman Genachowski, in which he outlined the progress that had been made toward achieving the 300 MHz 2015 goal.[12] Table 1 compares the status in 2012 with the 2010 plan:

- The initial 300 MHz plan consisted of 290 MHz of exclusively licensed spectrum combined with 10 MHz of spectrum shared with government users. By 2012, only 215 MHz were in the exclusively licensed category, due to a decline of 50 MHz of MSS spectrum and 25 MHz of AWS spectrum.
- The FCC has made up the difference by including 0-100 MHz of TV white spaces that have been allocated as unlicensed spectrum.[13] The order that permits unlicensed devices to operate in the white spaces was adopted in 2010, but the proceeding had been underway since 2002.[14]

[12] Genachowski, Julius. 2012. "Speech: Winning the Global Bandwidth Race: Opportunities and Challenges for Mobile Broadband," University of Pennsylvania – Wharton; http://www.fcc.gov/document/chairman-genachowski-winning-global-bandwidth-race (Genachowski Speech).
[13] The variation in spectrum that is available from unlicensed TV white spaces depends on location. Some areas have large amounts of unused broadcast spectrum; others, such as New York City, have none.
[14] See *Unlicensed Operation in the TV Broadcast Bands*, Second Memorandum Opinion and Order, ET Docket No. 04-186 (released September 25, 2010).

- The spectrum that is closest to deployment is the 20 MHz of wireless communications services (WCS) spectrum that have recently been purchased by AT&T, which is expected to be available for use by 2016.
- With the exception of the MSS spectrum, the remaining licensed spectrum still needs to be auctioned. None of the auctions has been scheduled to date.

Table 1: Status of FCC's Goal of 300 MHz by 2015

	2010 National Broadband Plan[15]	Oct 2012, "On track" Genachowski Speech[16]	Milestones	Notes
Exclusively Licensed	**290 MHz**	**215 MHz**		
WCS Spectrum	20	20 MHz *(2305-2315 & 2350-2360)*	FCC Approval – Dec 2012	Expected deployment 2016[17]
AWS Spectrum	60	35 MHz *(1915-1920 & 1995-2000) (2155-2180)*	H-Block auction – Expected 2013 AWS-3 Auction by 2015	Includes the AWS-2 H Block and AWS-3 bands; buildout requirement – 70% of population by 2023[18]
MSS Spectrum	90	40 MHz *(2000-2020 & 2180-2200)*	Approved – Dec 2012	Decrease from 40 MHz L-Band and 10 MHz Big LEO Spectrum with continuing interference issues; buildout requirement - 70% of population by 2019[19]
Broadcast Television Incentive Auction	120	120 MHz *(various frequencies)*	Expected auction by 2014; subsequent band transition/clearing	120 MHz is a "best case" scenario of the TV incentive auctions
Shared with Gov't Users	**10 MHz**	**25 MHz**		
700 MHz D-Block	10	0 MHz		Dedicated exclusively to public safety by the 2012 Middle Class Tax Relief Bill[20]
AWS Spectrum	0	25 MHz *(1755 – 1780)*	Possible auction by Sept 2014	T-Mobile is currently testing proposed sharing with Gov't users[21]
Unlicensed	**0**	**0 – 100 MHz**		
TV Whitespaces		0 – 100 MHz *(various frequencies)*	Database of whitespaces approved	Amount varies on location and current broadcast TV deployments[22]
Other	**0**	**15 MHz**		
Other AWS Spectrum		15 MHz *(potentially 1695-1710)*	Possible auction by Sept 2014	15 MHz of AWS is not quoted, however 1695-1710 is a likely candidate[23]
Total	**300 MHz**	**255 – 355 MHz**		Depends on location

[15] See *National Broadband Plan*.
[16] See Genachowski Speech.
[17] AT&T Press Release, December 2012, http://www.att.com/gen/press-room?pid=23645&cdvn=news&newsarticleid=35870.
[18] See *Service Rules for Advanced Wireless Services H Block—Implementing Section 6401 of the Middle Class Tax Relief and Job Creation Act of 2012 Related to the 1915-1920 MHz and 1995-2000 MHz Banes*, Notice of Proposed Rulemaking, WT Docket No. 12-357 (released December 17, 2012).
[19] See *Service Rules for Advanced Wireless Services in the 2000-2020 MHz and 2180-2200 MHz Bands*, Report and Order and Order of Proposed Modification, WT Docket No. 12-70 (released December 17, 2012).
[20] See *Middle Class Tax Relief and Job Creation Act of 2012*, Pub. L. No. 112-96, § 3106, 126 Stat. 156 (2012)
[21] Genachowski, Julius. 2013. *Letter to Secretary Strickling.* March 20, 2013 accessed at: http://transition.fcc.gov/Daily_Releases/Daily_Business/2013/db0321/DOC-319708A1.pdf
[22] Spectrum Bridge, *United States TV White Spaces: Usage & Availability Analysis White Paper* (2010), at http://spectrumbridge.com/Libraries/White_Papers/TV_WhiteSpaces_Usage_Availability_Analysis.sflb.ashx
[23] See Genachowski, Julius. *Letter to Secretary Strickling*.

III. Mobile Satellite Service

Beginning in 1986, the FCC allocated over 150 MHz of prime spectrum to MSS. Three licensees hold this spectrum, as indicated in Table 2.

Table 2[24]
Mobile Satellite Services (MSS) Spectrum [a]

Band	Bandwidth (MHz)	Relevant Frequencies	Licensee
L-Band	68	1525 - 1559 MHz 1626.5 - 1660.5 MHz	LightSquared
Big LEO	45.7	1610 - 1626.5 MHz 2483.5 - 2496 MHz	Globalstar
2 GHz (S-Band) (now AWS-4)	40	2000 - 2020 MHz 2180 – 2200 MHz	Dish
Total	153.7	per FCC [b]	

[a] Does not include "Little LEO," a 4 MHz MSS allocation for narrowband services.
[b] FCC (2009) also counts a Big LEO downlink at 1613.8-1626.5, which falls entirely within the range tabled above. FCC.gov (http://fcc.gov/ib/sd/ssr/atc.html) lists frequencies that would attribute 33 MHz to Big LEO (which rectifies the above), but differs regarding L-Band (here 66 MHz), and 2 GHz (here 70 MHz: 1990-2025 and 2165-2200). The alternate total is thus 169 MHz.

The MSS spectrum was initially allocated for "satellite phone" service: communication among mobile devices that use orbiting satellites as the communication links. Satellite phones

[24] Federal Communications Commission (FCC). 2009. In the Matter of "'Implementation of Section 6002(b) of the Omnibus Reconciliation Act of 1993' and 'Annual Report and Analysis of Competitive Market Conditions with Respect to Commercial Mobile Services,' *Thirteenth Report*. WT Docket No. 08-27, January; http://hraunfoss.fcc.gov/edocs_public/attachmatch/DA-09-54A1.pdf.

are more expensive and more complicated to use than are standard mobile phones, and the extra expense is greater than the extra benefits for most users. Although there is demand for satellite phones for use in isolated areas where standard cellular service is unavailable, the devices have been adopted by a very small subscriber base—just over one million worldwide at year-end 2012.[25]

Reflecting the low demand for satellite phone service, MSS licensees have had high rates of bankruptcy and have sought modifications to their licenses that would allow greater flexibility. The FCC has granted some of these requests. First, in 2003 MSS license holders received permission to integrate ancillary terrestrial components (ATC) into their networks, with the restriction that the terrestrial component remained ancillary to the principal MSS offering.[26] This additional flexibility was not, however, sufficient to produce viable business models. Ultimately, in order to use the spectrum efficiently, license holders asked the FCC for permission to offer stand-alone terrestrial service. The FCC ruled favorably on the petitions of LightSquared and Dish.[27] Globalstar's petition is pending.[28]

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[25] Satellite Markets & Research "Vital Statistics" at http://www.satellitemarkets.com/vital_statistic, last accessed April 11, 2013.

[26] See *In the Matter of Flexibility for Delivery of Communications by Mobile Satellite Providers in the 2 GHz Band, the L-band, and the 1.6/2.4 GHz Bands and Review of the Spectrum Sharing Plan Among Non-Geostationary Satellite Orbit Mobile Satellite Service Systems in the 1.6/2.4 GHz Bands,* Report and Order and Notice of Proposed Rulemaking, IB Docket No.01-185, IB Docket No. 02-364, (released February 10, 2003).

[27] See *LightSquared Subsidiary LLC, Request for Modification of its Authority for an Ancillary Terrestrial Component*, SAT-MOD-20101118-00239 (filed Nov. 18, 2010) and *Service Rules for Advanced Wireless Services in the 2000-2020 MHz and 2180-2200 MHz Bands,* Report and Order and Order of Proposed Modification, WT Docket No. 12-70 (released December 17, 2012).

[28] See *Globalstar, Inc. Petition for Rulemaking to Reform the Commission's Regulatory Framework for Terrestrial Use of the Big LEO MSS Band,* Petition for Rulemaking of Globalstar, Inc., RM-11685 (November 13, 2012).

This process of moving from a license that is restricted to MSS to a license that permits the offering of advanced mobile broadband services has taken over 25 years, during which time this valuable spectrum resource was, for all practical purposes, unused.

The FCC's National Broadband Plan indicated that 90 MHz of MSS spectrum were usable for terrestrial broadband and included those 90 MHz in its 300 MHz 2015 goal.[29] Chairman Genachowski's 2012 speech dropped the LightSquared spectrum and Globalstar spectrum from the tally, in part due to events (discussed below) that raised questions about whether this spectrum would in the near-term be productively used. Only the Dish spectrum is retained for broadband deployment.[30]

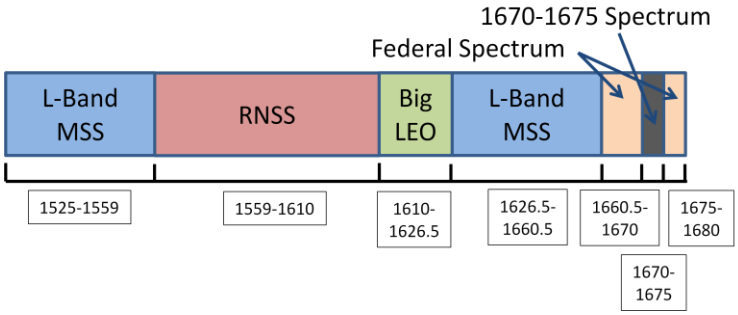
LightSquared and the L-Band

The L-band consists of two 34 MHz blocks at 1525-1559 MHz and 1626.5-1660.5 MHz. In 2010, Harbinger Capital Partners consolidated control over the L-band spectrum by acquiring a controlling interest in Skyterra—renamed LightSquared—and leasing spectrum from Inmarsat. In between the two blocks of L-band spectrum are the Radio Navigation Satellite Services band (1559-1610 MHz) that is utilized mostly by Global Position System (GPS) devices, and a portion of the Big LEO MSS band (1610-1626.5 MHz).

[29] Coordinating with legacy MSS users in these bands, particularly international users, prevents the entire 153.7 MHz of spectrum from being deployed for terrestrial mobile broadband services.

[30] See Genachowski speech: "We're also working with stakeholders to enable use of the portions of the mobile satellite spectrum in the L- and BIG LEO bands for terrestrial service, and this would add to our megahertz total."

Figure 2: L-Band Spectrum[31]



Shortly after consolidating the L-band spectrum, LightSquared announced plans for a nationwide 4G-LTE wholesale network that would use 40 MHz of its spectrum. One study estimated that if used for wireless broadband, the LightSquared spectrum is worth $12 billion and could yield $120 billion in benefits to consumers.[32]

At the time the plan was announced, LightSquared applied for a waiver of the "integrated service" rule, in order to be able to offer stand-alone terrestrial service. The GPS industry then raised concerns with the FCC about potential overload interference in the L-band. As FCC officials noted in congressional testimony, "to be clear, the GPS industry was not complaining about out of band emissions or interference caused by handsets, or the power levels authorized for the L-band—they were instead notifying us of their own receivers potentially picking up signals from the neighboring band."[33] In 2011, the FCC granted LightSquared's waiver request, conditional on resolution of the interference problem with the GPS receivers.[34]

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[31] See FCC Spectrum Dashboard, accessed at http://reboot.fcc.gov/spectrumdashboard/searchSpectrum.seam.
[32] Bazelon, Coleman. 2011. "GPS Interference: Implicit Subsidy to the GPS Industry and Cost to LightSquared of Accommodation", *The Brattle Group Inc.* June; http://www.brattle.com/_documents/UploadLibrary/Upload957.pdf. (GPS Interference).
[33] Knapp-DeLa Torre testimony before the House Oversight and Investigations Committee. September 21, 2012. The testimony also noted "In this instance—unlike any other I can recall in my decades at the FCC—the GPS

GPS receivers were designed and implemented at a time when the adjacent L-band spectrum was used sparingly and at low power. Hence, many receivers were not designed to filter out signals from the adjacent spectrum. In effect, according the FCC testimony, "some GPS legacy equipment effectively treats the GPS spectrum and the L-band spectrum as one band."[35] These overload interference problems proved difficult to resolve. The Commission revoked the conditional approval for LightSquared's stand-alone terrestrial network after the NTIA informed the FCC that "LightSquared's proposed mobile broadband network will impact GPS services and that there is no practical way to mitigate the potential interference at this time."[36]

In March 2012, LightSquared filed for bankruptcy and is in the process of restructuring. In September 2012, LightSquared petitioned the FCC to modify its spectrum license to address the concerns that were raised by the GPS industry. LightSquared's petition proposed to vacate permanently the 10 MHz that is closest to GPS receivers (1545-1555 MHz) and delay deployment on another nearby band (1526-1536 MHz). LightSquared proposed starting its nationwide wireless broadband network with 25 MHz of currently licensed spectrum that is further away from the GPS band (1627.5-1637.5 MHz, 1646.7-1656.7 MHz, and 1670-1675

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industry did not do so [i.e., notify the Commission of the potential for receiver overload] until very late in the proceeding."

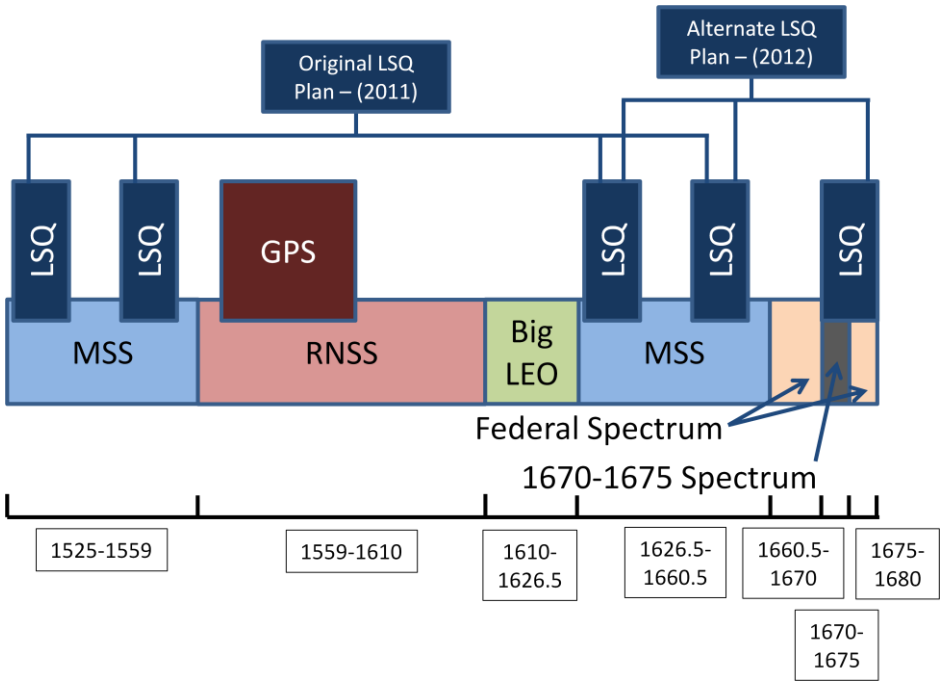
[34] See *LightSquared Subsidiary LLC, Request for Modification of its Authority for an Ancillary Terrestrial Component*, Order and Authorization, SAT-MOD-20101118-00239, (released January 26, 2011).

[35] *Id.*

[36] Strickling, Lawrence E. *Letter to Chairman Genachowski*. February 14, 2012, accessed at http://www.ntia.doc.gov/files/ntia/publications/lightsquared_letter_to_chairman_genachowski_-_feb_14_2012.pdf.

MHz), combined with 5 MHz (1675-1680 MHz) that it is requesting to share with government users.[37] LightSquared's petition is now pending.

Figure 3: LightSquared's Proposed License Modification[38]



What Went Wrong?

The inefficiencies that were associated with the MSS spectrum and the failure to resolve the LightSquared-GPS interference problem are ultimately due to the absence of a flexibly licensed regime for both MSS and GPS spectrum—in essence, the lack of clearly defined priority rights and the absence of a market mechanism for buying and selling those rights. Neither the L-band nor the GPS band had market mechanisms that allowed spectrum to move to higher-valued uses. Moreover, the absence of well-defined rights has made it difficult for the occupants of the

[37] See *Modification Application of LightSquared Subsidiary LLC*, IBFS File Nos. SAT-MOD-20120928-00160, -00161, SES-MOD-20121001-00872 (filed Sept. 28, 2012 and Oct. 1, 2012 with identical narrative text).
[38] See *Id.*

adjacent bands to strike a mutually beneficially deal that would also have enhanced the value of the spectrum and benefited consumers.

The MSS bands have operated under the FCC's traditional "command-and-control" regime whereby the FCC allocates blocks of spectrum for specific uses, such as MSS or broadcasting. Licenses can be modified only with the permission of the FCC. In the case of MSS, the FCC allocated a large amount of spectrum to a use for which the operational costs turned out to be high and for which the demand turned out to be very limited. At the time that the licenses were initially granted the opportunity cost may not have been high. However, with the explosion of demand for mobile telephony and broadband, the opportunity cost of these large blocks of underutilized spectrum became very large.

The operation of the GPS band combines the inefficiencies of government-occupied spectrum with the inefficiencies of unlicensed spectrum. GPS technology, originally developed by the government, is currently used for important government purposes involving national security and public safety such as aviation, scientific, and military uses.

As is well known, government users do not face the appropriate incentives to use spectrum efficiently.[39] Unlike most inputs that are used by government agencies, which are subject to annual budgetary appropriations, the spectrum that is occupied by a government agency was originally received as an allocation from the Department of Commerce and now is effectively "owned" by that agency. From the agency's perspective, the spectrum is a free resource. The agency does not face the opportunity cost of the spectrum it occupies, which,

[39] See Lenard, White and Riso.

given the current scarcity of spectrum, is often very large. Thus, government agencies have little if any incentive to economize on their use of spectrum.

Private GPS systems, which are now ubiquitous, also have access to the government satellites and the associated GPS-band spectrum. The implicit subsidy to the U.S. commercial GPS industry is estimated to be $18 billion in present value.[40]

Typically, the FCC addresses the interference problem on unlicensed spectrum—which shares many characteristics with the GPS band—by setting technical standards (e.g., power limits) for the devices that are permitted to operate in those bands. This is what happened, for example, with garage door openers and wi-fi routers. However, because the GPS-band is not a typical unlicensed band, the FCC has not promulgated standards for GPS devices. Thus, many GPS devices have been designed without appropriate filters, so that they perceive as "interference" some transmissions that are within the spectrum that has been licensed by LightSquared.

Interference disputes between adjacent license holders are not uncommon, and solutions are routinely negotiated.[41] However, with unlicensed spectrum occupied by large numbers of devices, the transactions costs of negotiating any change in the status quo are prohibitive. Once a particular use or type of equipment becomes established, it is very difficult to change. (Think about the cost of negotiating with millions of garage door opener owners). This problem is more severe with the GPS band, again, because of the absence of technical standards.

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[40] See Bazelon.

[41] Rath, Charla M. 2010. "Defining Property Rights – Theory and Practice", Position paper for the conference on *The Unfinished Radio Revolution: New Approaches to Handling Wireless Interference*, November; http://jthtl.org/content/articles/V9I2/JTHTLv9i2_DeVries.PDF.

Nevertheless, since the value of the LightSquared spectrum for mobile broadband is almost certainly larger than the cost of retrofitting or replacing the GPS devices that are affected by interference,[42] a solution that would permit the LightSquared buildout to go forward should have been (and should still be) possible. The least-cost solution would likely have been for the FCC to not have rescinded LightSquared's waiver, and to have permitted the company to move forward with its network. Individual GPS owners would then have been responsible for retrofitting or replacing their GPS devices so that they would work properly. Many would not have had to do anything.[43]

Other solutions were also possible. Product recalls involving millions of products—for example, those related to product safety—while expensive, are now fairly routine. Even though the interference problem is not LightSquared's fault, it would have been in the company's interest to spend a reasonable amount of money to resolve the problem in order to be able to move on with building out its network.

The GPS industry, however, had little incentive to make a deal. The costs of delay have primarily been borne by LightSquared (and the potential users of the network). Moreover, the industry was able, at a relatively low cost, to use the regulatory process to prevent LightSquared from moving ahead. (The industry reported lobbying expenses of $1.8 million during the first three quarters of 2011.)[44] The industry argued that existing GPS receivers should be protected,

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[42] See Bazelon.
[43] GPS.gov. 2011. *Statement by National Executive Committee for Space-Based Positioning, Navigation, and Timing.* December; http://www.gps.gov/news/2011/12/lightsquared/.
[44] Ho, Catherine. 2011. "LightSquared's foes assemble lobbying force over GPS issue". *Washington Post* online. October; http://articles.washingtonpost.com/2011-10-30/business/35278199_1_gps-signals-gps-industry-garmin.

notwithstanding their design defects: "if there is no way to prevent interference, it [LightSquared's Network] should not be permitted to operate. GPS users or providers should not have to bear any of the consequences of LightSquared's actions."[45] Thirty three Senators and 66 Representatives sent letters to FCC Chairman Genachowski supporting the GPS industry position.[46,47] Less than a year later, the conditional waiver on Lightsquared's network was revoked.

IV. Conclusion

The MSS spectrum is a valuable resource that is currently being wasted. Moreover, because it is already licensed and doesn't need to be auctioned, it can be deployed for mobile broadband more rapidly than can other spectrum blocks in the FCC's inventory. In the case of LightSquared, a business plan was relatively advanced before it was derailed by the GPS dispute.

At this stage, the FCC has the following options:

- Go ahead with the original waiver, letting the GPS industry take care of itself. Though, as explained above, this is likely the most efficient solution, it does not appear to be politically feasible.
- Deny LightSquared's request to modify its spectrum license, thereby making it impossible for LightSquared (or presumably anyone else) to proceed and leaving a large block of valuable spectrum unusable for the foreseeable future.

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[45] Kirkland, Jim. 2011. Testimony before the House Appropriations Committee. *Coalition to Save our GPS*. March; http://www.saveourgps.org/pdf/Testimony_of_Jim_Kirkland.pdf

[46] Roberts, Pat, Nelson, Benjamin, et al. 2011. *Letter to Chairman Genachowski*. May; http://www.saveourgps.org/pdf/Letter_Signed-5-19-11.pdf

[47] Neugebauer, Randy, Austria, Steve, et al. 2011. Letter to Chairman Genachowski, June; http://www.saveourgps.org/pdf/Final_House_Letter_to_FCC.pdf

- Grant LightSquared's license modification request and allow the company to move forward and use at least some of its spectrum.

It seems clear that the third option, even if second-best, is the only reasonable one at this stage.

More generally, the FCC should learn from this experience the critical importance of clearly defined rights. The absence of such rights, and therefore a market mechanism for moving spectrum to higher-valued uses, is the cause of the failure to resolve the LightSquared-GPS dispute in an economically efficient manner. In order to minimize the likelihood of similar failures in the future, the FCC should convert all of the MSS licenses to flexible-use licenses.