United States GPS Industry Council

December 30, 2010

The Honorable Julius Genachowski
Chairman
Federal Communications Commission (FCC)
Office of the Commissioners
445 12th Street, S.W.
Room 8B201
Washington, D.C. 20554

Reference: LightSquared Application Request for Modification of its Authority for Ancillary Terrestrial Component (ATC) (FCC File No. SAT-MOD-20101118-00239)

Dear Mr. Chairman:

On behalf of the undersigned organizations and entities, including manufacturers and end-users of equipment that depends on the uninterrupted availability of GPS civilian signals, we bring to your attention the above referenced application recently filed at the FCC. This application, if granted as filed, poses a serious potential for harmful interference to the installed GPS user base. It would do so by adversely affecting reception of GPS signals in urban areas of the United States where the referenced FCC applicant proposes to operate a high-capacity terrestrial wireless service. GPS equipment is currently deployed across a broad range of diverse applications in the public (Federal, state, county, city) and private sectors, including in these affected urban areas and is all subject to harmful interference if this application is granted as filed.

We respectfully bring this matter to your attention in consideration of the FCC's responsibility – in cooperation with other Departments and Agencies – "to take appropriate and legally permissible actions required to mitigate interference to U.S. space-based positioning, navigation, and timing services within the United States."[1]

The referenced application filed by an FCC-licensed mobile-satellite service (MSS) operator seeks to modify and expand the operator's ATC operations in the radio frequency band allocated to MSS operations adjacent to the radio frequency band where the GPS L1 signal operates. The FCC applicant proposes to effectively operate a primary terrestrial service in a band allocated to mobile space-based services by deploying a high-capacity network of densely populated strong signal transmitters whose transmissions would blanket entire urban areas. Further, this applicant "estimates that the capacity of its fully deployed terrestrial network across all base stations will be tens of thousands of times the capacity of either of its Sky Terra satellites." Thus, the physics and dynamics

[1] National Space Policy of the United States of America at 5 (June 28, 2010), available at http://www.whitehouse.gov/sites/default/files/national_space_policy_6-28-10.pdf.

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of this newly proposed terrestrial service would radically change and degrade the environment in which the adjacent GPS L1 signal resides. The ultimate effect would be a loss of GPS service.

We are deeply concerned that the Commission may be on a fast track to authorize this referenced request. Specifically, the FCC placed the referenced application, dated November 18, 2010, on public notice on November 19, 2010, with an abbreviated period for public comment. This regulatory approach to a proposed modification of the L-band ATC license, one that effectively reallocates the MSS L-band to a primary terrestrial service, does not allow adequate consideration of the potentially harmful interference issues associated with this application. According to the Administrative Procedure Act and the FCC's own rules, a request for reallocation of spectrum use is normally considered under a rule-making proceeding.

Therefore, we respectfully request that the Commission consider the referenced application to modify the L-band ATC license under either 1) the current FCC Notice of Proposed Rule-Making/Notice of Inquiry (NPRM/NOI) on MSS broadband (ET Docket 10-142), or, 2) a separate, formally initiated rulemaking. Such a rulemaking and open process would enable all parties to understand the potential interference resulting from allowing greatly expanded use of L-band MSS spectrum for primary or co-primary terrestrial operations. Of equal importance, this regulatory approach would allow the co-regulator of the affected band, NTIA and potentially affected members of the Interdepartment Radio Advisory Committee (IRAC) to more effectively contribute their technical expertise to seemingly complementary objectives – protecting the availability of the GPS utility from interference while enabling innovation in adjacent spectrum bands.

To date the U.S. public sector investment in the dual-use GPS system is approximately $25 billion; in addition to an investment of several billion dollars in public sector augmentation systems. Since the first civilian GPS product introduction in 1981, there are approximately one billion users worldwide today with a significant percentage operating in the U.S., one of the largest world markets for GPS user equipment.[2] For three decades, the U.S. private sector has invested multi-billions of dollars in R&D in GPS products; systems; applications and commercial networks. U.S. economic productivity and the commercial operations of small, medium, and large companies providing several hundred thousand jobs in the United States depend on the ability to receive GPS signals. There is also a potential for a significant adverse economic impact on city, county, and state governments if the reception of GPS signals is significantly impaired in urban areas from a FCC authorization of this referenced application as filed.

Consequently, if the Commission proceeds to authorize this modification of the referenced applicant's ATC license without sufficient interference analysis and without ensuring necessary mitigation measures are taken to protect GPS, the resulting harm to GPS use could create a very serious setback for the Nation's broadband agenda, the utility of GPS and the economic recovery of the

[2] Colonel Dave Madden Looks Back, and Forward into GPS Future," article by Don Jewell, *GPS World*, July 27, 2010.

United States. This would be contrary to the intent of U.S. policy statements and legislation with respect to the promotion and protection of GPS for all users. We look forward to responding to any questions your office may have.

Respectfully submitted,

F. Michael Swiek, Executive Director
United States GPS Industry Council

/s/
Ken Mooyman, President
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/s/
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/s/
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Attachment

United States GPS Industry Council

December 13, 2010

Via U.S. Mail and Email
Mr. Karl Nebbia
Associate Administrator
Office of Spectrum Management
National Telecommunications and Information Administration ("NTIA")
U.S. Department of Commerce
1401 Constitution Avenue, NW
Washington, DC 20230

Re: LightSquared Application Request for Modification of its Authority for Ancillary Terrestrial Component
(FCC File No. SAT-MOD-20101118-00239)

Dear Mr. Nebbia:

I write to you on behalf of the United States Global Positioning System ("GPS") Industry Council ("Council"), whose members are manufacturers of Global Navigation Satellite System user equipment, to bring to your attention a recent development at the Federal Communications Commission ("FCC") with very serious potential interference ramifications for the GPS-installed user base. Specifically, I refer to an application by LightSquared, an FCC-licensed mobile-satellite service ("MSS") operator, which plans to modify and expand its Ancillary Terrestrial Component ("ATC") operations in the 1525 – 1559 MHz and 1626.5 – 1660 MHz frequency bands allocated to MSS operation on a primary basis and that brackets the radionavigation satellite service ("RNSS") frequency band (1559-1610 MHz) where the GPS L1 signal operates.

We respectfully bring this current matter to the attention of NTIA because of your role as co-regulator of the 1559 – 1610 MHz frequency band; as the entity that authorizes the radio transmitters of the GPS satellite system; and, as Chairman of the Interdepartment Radio Advisory Committee ("IRAC").

Proposed Modification of the MSS L-band ATC License

LightSquared filed an application with the FCC to update its MSS ATC implementation plans and to modify the original terms of its planned operations. Specifically, LightSquared's application seeks to reinterpret its rules for integrated MSS ATC operation to effectively convert its existing MSS ATC authorization into a license to provide a high-capacity terrestrial network for a primarily cellular voice and data mobile wireless service in urban areas while conducting its MSS operation during certain times of the day and outside of areas where its proposed terrestrial service would operate. Thus, LightSquared proposes to provide a primarily terrestrial wireless service with ancillary MSS, the opposite of the original premise of the service embodied in the current rules and its L-band ATC license.

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Proposed Modification Introduces a Different Interference Problem

Unlike the ancillary terrestrial operations originally proposed in 2002 by its predecessor, Mobile Satellite Ventures ("MSV"), LightSquared now proposes a co-primary/primary terrestrial voice and data broadband service provided by a high-capacity network of densely populated strong signal transmitters whose transmissions would effectively blanket entire urban areas. LightSquared "estimates that the capacity of its fully deployed terrestrial network across all base stations will be tens of thousands of times the capacity of either of the SkyTerra satellites." Thus, the physics and dynamics of the proposed terrestrial service will radically change the environment in which the adjacent satellite services operate. This proposed change in the L-band MSS use introduces a different interference problem at the GPS receiver that will require adjustments in these mobile terrestrial operations to mitigate the detrimental operational interference effect it will otherwise create in adjacent broadcast RNSS bands – adjustments that necessarily go beyond the established out-of-band emission ("OOBE") limits in the existing MSS ATC authorization and that are not mitigated by lowering these limits. (*See* Council discussion on "the interference impact on the GPS receiver," pages 11-14 in Council comments filed in FCC ET Docket 10-142, included in the attachment hereto). The Council believes this different interference problem also needs to be analyzed by the public sector to ensure appropriate mitigation is adopted to sustain the availability of GPS use in the adjacent L-band.[1]

Agreement on OOBE for GPS – Based on then-MSV's MSS ATC Operations

LightSquared's predecessor, MSV, initially was authorized by the FCC to provide MSS, with no terrestrial component in the L-band. In 2002, the FCC authorized the operation of ATC in three MSS band segments (L-band, Big Leo, and 2 GHz) on a secondary basis and proposed a single OOBE protection criterion for GPS operations of -70 dBW/MHz. Accordingly, when MSV sought to coordinate its license application to operate ATC with the IRAC members and NTIA, it initially proposed an OOBE protection criterion of -70 dBW/MHz for the adjacent GPS L1 band. During this process, MSV approached the Council, at the encouragement of the IRAC members in coordination with NTIA, to review the proposed protection criteria for GPS.

At the time, MSV was the single operator of both the proposed MSS and ATC operations in this L-band segment. The ATC operations were proposed as a gap-filler to augment and extend MSS coverage in areas such as urban canyons. In addition, MSV planned for the use of dual-mode handsets exclusively. Because MSV proposed to operate its integrated MSS/ATC service adjacent to the GPS L1 band, this would increase interference to GPS receivers. In considering the MSS ATC operations as proposed at this time, the Council negotiated an

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[1] The White House, "National Space Policy," Washington, DC, June 28, 2010; and The White House, "U.S. Space-based Positioning, Navigation, and Timing Policy," Washington, DC, December 15, 2004.

agreement with MSV to reduce OOBE in the GPS L1 band to protect GPS use, which the FCC included in its grant of an ATC license to MSV in 2004.[2]

Subsequently, MSV's corporate successor, SkyTerra, approached the Council concerning its proposal to introduce ATC femtocells for indoor operations and the original joint agreement was modified to provide for greater OOBE protection to indoor GPS use. In each case, the premise underlying these agreements is that MSV (now LightSquared) would not interfere with GPS transmissions in the adjacent L-band and that, accordingly, the FCC incorporated voluntary industry-negotiated protection limits into the authorizations.

Industry Comments on LightSquared's Application

Please find attached public comments filed with the FCC by the Council in response to the new LightSquared application. Many other parties filed comments raising similar concerns, including a Petition to Deny by the Wireless Communications Association. A brief review of the comments and the petition filed in the aforementioned FCC application proceeding reveals a consensus among a significant number of entities on four critical elements of the LightSquared application:

- What LightSquared proposes in essence would result in a reallocation of spectrum from a primary MSS to co-primary terrestrial and MSS;
- LightSquared is transforming itself into a wholesaler of terrestrial mobile services with an ancillary mobile satellite component, allowing the retail resellers and users to elect to use MSS spectrum to operate only as a terrestrial mobile service;
- The potential for interference to existing terrestrial and adjacent mobile space services from the introduction of a primary terrestrial voice and data broadband service based on densely populated strong signal adjacent-band transmitters is orders of magnitude more significant, than under the original MSS ATC mode of operation; and
- None of these changes can be fully and fairly vetted without an open rulemaking proceeding, as the current application process initiated by the FCC is insufficient for the proposed changes. Indeed, the FCC governing statute and its rules and regulations require an Administrative Procedure Act (APA)-sanctioned rulemaking in order to implement this transformation of use of spectrum and mode of operating a satellite service.

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[2] *See* Joint Letter from Bruce D. Jacobs, Counsel to MSV, and Raul R. Rodriguez, Counsel to the U.S. GPS Industry Council, to James Vorhies, Office of Spectrum Management, NTIA, dated July 25, 2002.

Potential Adverse Impact on the Public and Private Sector Users of GPS

A non-exclusive listing of potentially affected public sector (city, county, state, and Federal) and private sector GPS users operating in the affected urban areas:

- Public safety use: E911 ambulance, police, and fire; first responders; disaster response and mitigation; E911 cellphones and dispatch;
- Law Enforcement: vehicle tracking in urban areas; maintaining security of government officials and dignitaries;
- Transportation: most modes; intelligent vehicle-highway system operations; fleet management; public transportation;
- Scientific: monitoring earthquakes and tectonic plates measuring ground subsidence; measuring atmospheric humidity from the ground;
- Maritime and Waterways: vessel tracking services; search and rescue; harbor facility management;
- Railroad: railroad fleet monitoring; train control and collision avoidance;
- Geospatial information: surveying; geographic information systems; mapping; and
- Construction: road construction; road facility inventory and maintenance; building construction; monitoring status of road overpasses.

Precedent for NTIA Study of Potential Interference

Several years ago, the FCC initiated a rulemaking proceeding to authorize the unlicensed use of wide swaths of spectrum by ultra wideband devices ("UWB"). As in the case of the instant LightSquared application, that proposal presented very serious interference concerns for the entire GPS L1 installed user base as well as other licensed services. The various government agencies, through the IRAC, requested that NTIA undertake an analysis of the potential for UWB devices to interfere with GPS receivers, among other licensed uses of spectrum. NTIA proceeded to develop operational scenarios for a broad range of receivers, performed these analyses and issued a report and a special publication.[3] These documents were filed with the FCC and played a very important role in understanding the issues surrounding the introduction of UWB devices and their potential to interfere with many authorized services, including GPS. The

[3] NTIA Special Publication 01-45, *Assessment of Compatibility between Ultrawideband (UWB) Systems and Global Positioning System (GPS) Receivers,* February 2001, and NTIA Report 01-304, *Measurements to Determine Potential Interference to GPS Receivers from Ultrawideband Transmission Systems,* February 2001.

Council respectfully encourages NTIA to similarly undertake a study of the potential interference issues associated with LightSquared's newly proposed intended use of its MSS spectrum to provide a significant growth of terrestrial mobile wireless services.

We are concerned that the current referenced FCC proceeding on this modification of the L-band ATC license – placed on public notice on November 19, 2010, with an abbreviated period for public comment – will not allow adequate consideration of the interference issues associated with this application.

Therefore, I respectfully request that NTIA urge the FCC to consider this LightSquared application to modify their ATC license either under:

1) a separate, formally initiated rulemaking, especially to fully understand the potential interference effect resulting from allowing greatly expanded use of L-band MSS spectrum for primary or co-primary terrestrial operations; or,

2) the current FCC NPRM/NOI on MSS broadband (ET Docket 10-142).

Such a rulemaking and open process would allow NTIA and potentially affected members of the IRAC to more effectively contribute their technical expertise to seemingly complementary objectives – protecting the availability of the GPS utility from interference while enabling innovation in adjacent spectrum bands.

If the FCC proceeds to authorize this modification of LightSquared's ATC license without sufficient interference analysis and without ensuring the necessary additional mitigation to protect GPS, we believe that the resulting potential harm to GPS use could create a serious setback for both the Nation's broadband agenda and the utility of GPS. This result would be contrary to the intent of U.S. policy statements and legislation with respect to the promotion and protection of GPS. Nonetheless, the Council remains committed to seeking constructive technical solutions that support broadband innovation in the adjacent bands and that also protect the utility of GPS.

We look forward to responding to any questions.

Respectfully submitted,

Charles R. Trimble
Chairman

Attachment

cc (by U.S. Mail and Email): IRAC Representatives, Alternates, and Observers

BEFORE THE

Federal Communications Commission

WASHINGTON, DC 20554

In the Matter of	)	
	)	
LightSquared Subsidiary LLC	)	File No. SAT-MOD-20101118-00239
	)	
Request for Modification of its Authority for an Ancillary Terrestrial Component	)	

To: Chief, Satellite Division
International Bureau

COMMENTS OF THE U.S. GPS INDUSTRY COUNCIL

The U.S. GPS Industry Council (the "Council"), by its attorneys and pursuant to Section 25.154(a) of the Commission's Rules (47 C.F.R. § 25.154(a)), hereby comments on the proposal of LightSquared Subsidiary LLC ("LightSquared") to modify its authority to provide an Ancillary Terrestrial Component ("ATC") in connection with its licensed L-band mobile-satellite service ("MSS").[1] LightSquared's "application," which was filed on November 18, 2010, one day before the Public Notice was issued, was submitted as a letter purportedly providing the Commission with an update regarding its MSS ATC implementation plans.[2] The

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[1] The LightSquared proposal was quickly placed on Public Notice with Comments requested by November 29, 2010, and replies by December 6, 2010. *See* Public Notice, "Satellite Space Applications Accepted for Filing," Report No. SAT-00738 (released November 19, 2010). In response to a request for extension of time filed by CTIA – The Wireless Association, which was opposed by LightSquared, the Chief of the Satellite Division extended these deadlines to December 2, 2010 for Comments and December 9, 2010 for replies, partially granting CTIA's request. *See LightSquared Subsidiary LLC*, DA 10-2243, *slip op.* (Sat. Div., released Nov. 26, 2010). *See also* Section II, below.

[2] *See* Letter from Jeffrey J. Carlisle, Executive Vice President, Regulatory Affairs and Public Policy, LightSquared, to Marlene H. Dortch, Secretary, FCC, dated November 18, 2010 ("LightSquared November 18th Letter").

letter maintained that the information provided "demonstrates that LightSquared's revised business plan satisfies the Commission's integrated service requirements for L-band MSS systems." LightSquared November 18th Letter at 10.

As an initial matter, the Council notes for the record that in past situations and continuing to the present, it has proactively sought collaborative solutions to help ensure the smooth introduction of a communication service or new entrant technologies when there is the potential for adverse operational effects on Global Positioning System ("GPS") use. Indeed, the Council has already reached out to LightSquared in the context of the MSS Broadband proceeding discussed below to consider possible approaches for resolution of the potential for interference discussed in that proceeding.[3] The Council intends fully to continue its discussions with LightSquared notwithstanding its participation here, which is required in order to protect its interests in light of the significant interference considerations raised by the relief sought here.

I. LightSquared's Proposal Effectively Seeks a Reallocation of the L-Band MSS Spectrum to Provide a Co-Primary Allocation for Terrestrial Wireless Service.

Neither the applicant's characterization of its submission as an "update" nor the FCC's determination that the filing should be treated as an "application" to modify its existing MSS ATC authority survives scrutiny. The LightSquared November 18th Letter can be reasonably classified only as a Petition for Rule Making under Section 1.401 of the FCC's Rules. *See* 47 C.F.R. § 1.401. In the guise of a demonstration of compliance with Section 25.149(b) of the FCC's Rules, LightSquared is instead seeking to reinterpret radically the requirements contained therein with the result of converting its existing MSS ATC authorization into a license to provide a primarily terrestrial cellular voice and data mobile wireless service. This

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[3] *See*, *infra*, at pp. 4 -5.

implicit objective is in evidence throughout LightSquared's ten-page letter characterizing its new business plan as a compliant integrated service.

For example, LightSquared affirmatively states that "the capacity of its fully deployed terrestrial network across all base stations will be tens of thousands of times the capacity of either of the SkyTerra satellites." LightSquared November 18th Letter at 7 n.7. It also acknowledges that it intends to "operate its network on a wholesale basis" (*see* LightSquared November 18th Letter at 3), providing capacity to "retailers that purchase services from LightSquared" who can "choose to offer dual-mode *or terrestrial only* devices" to end users. LightSquared November 18th Letter at 2-3 (emphasis added). LightSquared further states that while it "has made no investment in a terrestrial-only chipset," "in theory [its] dual-mode chipset could be modified for terrestrial use only." LightSquared November 18th Letter at 2 n.5. The implication of these statements is that instead of a single MSS ATC operator being the primary service provider using dual-use handsets exclusively, a model wherein the service provider must be fully cognizant of the impact of the ATC operations on its satellite-delivered service, many terrestrial-only operators will be providing their own retail service that will be unconnected to provision of MSS, therefore removing the motivation of enlightened self-interest to ensure that the aggregate impact of terrestrial transmissions does not potentially harm the in-band and adjacent band satellite-delivered services, including GPS. Thus, the end result of LightSquared's updated business model for commercial operations in the L-band MSS is that it proposes to provide a primary terrestrial wireless service with ancillary MSS, the exact opposite of the original premise of the service embodied in the current rules and its L-band ATC license.

LightSquared itself illustrates this reversal of the original regulatory paradigm in its statement of intent to ensure that it can continue "to enable satellite communication during times and in places in which LightSquared's terrestrial network is not available." LightSquared November 18th Letter at 9. Although it does its best to promote the notion of continuing to offer a satellite-based service with an ATC aspect, the strong undercurrent of the facts evident in the filing suggests a partially-MSS service offering that has the real potential to disintegrate very rapidly into a mostly terrestrial wireless service offered in the MSS spectrum, as LightSquared states that "it is expected that *during the first year* of commercial operations at a minimum only dual-use devices will be available to users of the LightSquared network." LightSquared November 18th Letter at 2 n.5 (emphasis added).

The notion that the L-band MSS spectrum, as well as other frequency bands currently allocated primarily to MSS, might be reallocated in a manner that facilitates a co-primary terrestrial broadband component is neither surprising nor novel. Indeed, a Commission proceeding appropriate for consideration of the many technical and service-related issues that LightSquared's proposal raises has already been under way for several months.[4] To the extent that the evolution of LightSquared's business model that it describes in its November 18th Letter can be accommodated within this spectrum, the appropriate means of consideration is not a fabricated modification application proceeding, as it has been characterized here, but the broader MSS Broadband NPRM/NOI that has already been initiated with the specific objective

[4] *See, e.g., Fixed and Mobile Services in the Mobile Satellite Service Bands at 1525-1559 MHz and 1626.5-1660.5 MHz, 1610-1626.5 MHz and 2483.5-2500 MHz, and 2000-2020 MHz and 2180-2200 MHz*, 25 FCC Rcd 9481 (2010) ("MSS Broadband NPRM/NOI").

of allowing more flexible use of the L-band and S-band spectrum currently allocated to the MSS.[5]

Accordingly, the Commission should terminate the hastily initiated proceeding it launched on November 19th, and incorporate LightSquared's request to modify the interpretation of the existing MSS ATC rules with the already ongoing MSS Broadband proceeding. As the Council has already noted in that proceeding, the spectrum-use changes that are entailed in the MSS Broadband NPRM/NOI represent a paradigm shift in use that, unless implemented with appropriate care and due consideration, will impair the ability to make use of the distinctive properties of the MSS bands and also the adjacent spectrum that is allocated to space services – frequency bands that are uniquely suited to the critical, specialized functions those services offer, including E911 location services, personal emergency (medical) alert location devices, and other public safety applications.

Understanding the operational impact of enhanced terrestrial wireless use of the L-band is especially important due to the high probability that existing and planned mobile services (such as MSS, wireless broadband and Radionavigation-Satellite Service ("RNSS"), including GPS) are serving or will serve the same mobile customer base. These mobile service users have

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[5] The Council notes in this regard that the FCC's generally favorable discussion of LightSquared's terrestrial wireless ambitions in the context of approving its recent transfer of control is due no weight in this proceeding. *See SkyTerra Communications, Inc., et al.*, 25 FCC Rcd 3059, 3085-3089 (¶¶ 55-62 & 68-72) (IB/OET/WTB 2010). There, the Commission was neither asked to waive nor did it otherwise consider waiver of the MSS ATC integrated service requirements contained in Section 25.149(b)(4). Indeed, the Commission couched its discussion of LightSquared's plans as conjecture, noting only that "if realized" the plan "promises the possibility of providing several public interest benefits." *Id.* at 3087 (¶ 62). The benefits promised are not certainties, but must be realized, if at all, within the four corners of the rules, regulations and authorizations governing LightSquared's operations, as these requirements may be modified or amended. Because execution of LightSquared's evolved business plan cannot be implemented without changes to the applicable FCC rules, it now needs to go through that process in order to bring them to fruition.

well established operational dependencies on positioning, navigation and timing ("PNT") information that need to be taken into consideration to ensure the successful introduction of the proposed new services. Because the issues raised here are indeed inseparable from those being addressed in the MSS Broadband NPRM/NOI, the Council is attaching hereto, and incorporating herein by reference, a copy of its Comments in that docket, which discuss the spectrum-sharing, public safety and national security issues inherent in the spectrum evolution proposed there, and here. *See* Attachment, "Comments of the U.S. GPS Industry Council in Response to Notice of Proposed Rulemaking and Notice of Inquiry," ET Docket No. 10-142, filed September 15, 2010.

The Council notes that throughout the development of MSS ATC, it is been ready to devote the time and effort necessary to reach mutually agreeable solutions to allow both the development and evolution of this service. At its outset, MSS ATC was essentially a gap filler, designed simply to bring reliable coverage to dense urban communities and other areas that due to terrain or other features could not obtain adequate service via the primary satellite facilities. Subsequently, the Council worked with MSS licensees to facilitate the introduction of femtocells as an additional MSS ATC feature, allowing greater indoor use of the terrestrial portion of the service. Throughout these developments, the model of the service remained unchanged – a primarily satellite-delivered offering with single licensees both selling an integrated service to end-users and providing dual-use handsets. With the major evolution now proposed by LightSquared, this paradigm would be completely reworked, with potentially harmful consequences for the installed GPS user base, including public safety implementations, due to the dramatically increased number and broader distribution of terrestrial transmitting equipment. *See* Attachment at 9-12.

II. The Expedited Comment Approach Followed in this Proceeding Is Procedurally Deficient and Contrary to the Communications Act.

In addition to the foregoing issues involving established rules and long-term national policies, there is a fundamental procedural infirmity in the current proceeding. Although LightSquared initially submitted just a letter to update the FCC on its characterization of its service model under Section 25.149, the Satellite Division determined that the LightSquared November 18th Letter should be treated as a modification application.[6] The Division then quickly released a Public Notice soliciting public comment on the recharacterized application on an expedited schedule, with comments due within ten days (but since extended to thirteen days). *See LightSquared Subsidiary LLC*, DA 10-2243, *slip op.* (Sat. Div., released Nov. 26, 2010). Placement of the application on Public Notice necessarily suggests that the modification entailed is a major one – as minor modifications are not required to be placed on Public Notice. *See* 47 C.F.R. § 25.151(c)(1). As indicated in the attached Comments, any proposal to introduce co-primary terrestrial wireless service in MSS bands is inherently a major change due to the very significant interference issues raised. *See* 47 C.F.R. § 25.116(b)(1); Attachment at 8-12. For this reason, the Division's requirement that comments be filed earlier than 30 days after issuance of the Public Notice is improper.

The FCC's Rules make plain that any application for major modification must be placed on Public Notice (47 C.F.R. § 25.151(a)(3)), and further that "no application that has appeared

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[6] LightSquared stated no objection to this treatment when it opposed CTIA's request for extension of time, although it argued that the modification was nonetheless minor because "applications seeking [ATC] authority are classified as 'minor modifications,' and with the exception of applications for 'initial' ATC authority, which LightSquared's filing is not, ATC applications are therefore exempt from routine public notice." LightSquared Opposition at 1-2 (filed November 24, 2010). However, LightSquared leaves out the very important qualifier that he public notice exemption applies only to those ATC modification applications that "comply with the criteria specified in § 25.149." 47 C.F.R. § 25.117(f).

on public notice" pursuant to this rule "will be granted until the expiration of a period of thirty days following the issuance of the public notice listing the application," and that any comments or petitions regarding the application must be filed within that thirty day period "in accordance with §25.154." 47 C.F.R. § 25.151(d). Section 25.154, in turn, separately provides that "Petitions to deny, petitions for other forms of relief, and other objections must ... be filed within thirty (30) days after the date of public notice announcing the acceptance for filing of the application or major amendment thereto (unless the Commission otherwise extends the filing deadline)." 47 C.F.R. § 25.154(a)(2). Thus, the LightSquared application by rule cannot be subject to a comment period of less than thirty days, as the Commission, by virtue of its own rules, can only ***extend*** the deadline for filing comments on a modification application placed on public notice.

Finally, this provision of the rules cannot be waived by the Commission, let alone FCC staff acting on delegated authority, because the Commission's codification of these requirements in its rules is incorporated into Section 309(b) of the Communications Act of 1934, as amended (the "Act") by that section's express terms. In particular, Section 309(b) states that where the Commission has prescribed that the 30-day public notice established in Section 309(b) be extended to other classes of stations not named in the statute, "no such application ... shall be granted by the Commission earlier than thirty days following issuance of public notice by the Commission." 47 U.S.C. § 309(b). This language corresponds directly to Section 25.151(d) of the FCC's Rules quoted above. Section 309(d) of the Act makes all such applications subject to the statutory 30-day time period for submission of comments, which just like Section 25.154(a)(2) provides that the time specified for such public comment shall be "no

less than thirty days following the acceptance for filing of such application ..." 47 U.S.C. § 309(d).

For these reasons, the Satellite Division's establishment of an initial comment period of less than thirty days was improper, and the application, even if it were otherwise an appropriate vehicle for the requested relief, could not be processed until a full 30-day notice period had been provided. Indeed, in view of the confusion sowed by the unduly short comment timeline, it would be most appropriate for the FCC to start this proceeding anew, allowing all potentially interested parties a full 30-day response period within which to comment, commencing with the issuance of a new public notice that complies with the FCC's Rules and with the Act – i.e., soliciting additional rulemaking comments to supplement those already filed in the MSS Broadband NPRM/NOI.

III. Conclusion.

The introduction of new communication technologies and services offers potential benefits to MSS, GPS and wireless consumers alike. MSS operators already include GPS in their products and services. In the past, in situations where the introduction of new communication services has had the potential for adverse operational effects on GPS use, the Council has proactively sought collaborative solutions that help to ensure the smooth introduction of the new service while also protecting the continued availability of the GPS positioning, navigation, and timing information utility. Indeed it has already reached out to LightSquared in the context of the MSS Broadband NPRM/NOI to discuss approaches for resolution of that proceeding. Since the introduction of MSS ATC, the Council has worked collaboratively with LightSquared and its predecessors, as the MSS/ATC operator in the L-band, to reach mutual agreements. The Council believes that cooperative solutions continue to

be available to mitigate harmful impact to existing services, as outlined in its Comments regarding the MSS Broadband NPRM/NOI.

Respectfully submitted,

THE U.S. GPS INDUSTRY COUNCIL

By: */s/ Raul R. Rodriguez*
Raul R. Rodriguez
David S. Keir

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2000 K Street, NW, Suite 600
Washington, DC 20006
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December 2, 2010

Its Attorneys

CERTIFICATE OF SERVICE

I, Sharon Krantzman, do hereby certify that a true and correct copy of the foregoing "Comments of the U.S. GPS Industry Council" was sent by first-class, postage prepaid mail this 2nd day of December, 2010, to the following:

Mr. Jeffrey Carlisle
Executive Vice President
Regulatory Affairs & Public Policy
LightSquared
10802 Parkridge Boulevard
Reston, VA 20191

/s/ Sharon Krantzman
Sharon Krantzman

ATTACHMENT

"Comments of the U.S. GPS Industry Council in Response to Notice of Proposed Rulemaking and Notice of Inquiry," ET Docket No. 10-142, filed September 15, 2010.

BEFORE THE

Federal Communications Commission

WASHINGTON, DC 20554

In the Matter of	)	
	)	
Fixed and Mobile Services in the Mobile Satellite Service Bands at 1525-1559 MHz and 1626.5-1660.5 MHz, 1610-1626.5 MHz and 2483.5-2500 MHz, and 2000-2020 MHz and 2180-2200 MHz	)	ET Docket No. 10-142

To: The Commission

COMMENTS OF THE U.S. GPS INDUSTRY COUNCIL IN RESPONSE TO NOTICE OF PROPOSED RULEMAKING AND NOTICE OF INQUIRY

THE U.S. GPS INDUSTRY COUNCIL

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September 15, 2010

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SUMMARY

The Commission proposes to introduce new terrestrial mobile broadband services in radio frequency bands allocated to space-based communications services by way of the secondary marketing rules. This could result in new services that are very different in nature and scope from existing space-based and ancillary terrestrial services in these bands. This proposal represents a paradigm shift that, unless carefully implemented, will impair the ability to make use of the distinctive properties of both the Mobile-Satellite Service ("MSS") bands and the adjacent bands allocated to space services that are uniquely suited to those services. For these reasons, the U. S. GPS Industry Council (the "Council") urges the Commission to be mindful of the adverse effect that this alteration of spectrum use could have on adjacent space services, including the Radionavigation-Satellite Service ("RNSS") operating at 1559-1610 MHz

Understanding the operational impact of adopting this new proposal is especially important due to the high probability that existing and planned mobile services (MSS, terrestrial wireless and RNSS, including the Global Positioning Service ("GPS")) are serving or will serve the same mobile customer base, including mobile communications consumers. Critical infrastructure and key resource sectors depend on the positioning, navigation, and timing ("PNT") information broadcast by the GPS service. These dependencies need to be taken into consideration to ensure the successful introduction of the proposed new services without disruption to the GPS utility.

The Council therefore respectfully recommends that the Commission's efforts in this proceeding be implemented in a manner that: (1) preserves and codifies existing out-of-band emission ("OOBE") limits applicable to existing and planned MSS Ancillary Terrestrial Component ("ATC") services; (2) takes into account the fundamental change in the harmful

interference to the RNSS receiver (affecting the receiver's ability to function) arising from the dense deployment of newly proposed mobile terrestrial broadband services; and (3) ensures effective mitigation measures are in place that preserve the utility of existing bands for the installed base of global navigation satellite system ("GNSS") users.

In earlier Commission proceedings, the Council has worked collaboratively with MSS operators of ATC to seek mutual agreements that facilitate successful MSS ATC operations and avoid interference to the GPS installed base. The Council believes that solutions are available to mitigate the otherwise unavoidable harmful effects described in these comments and looks forward to working collaboratively with interested parties to explore these issues and potential solutions.

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To: The Commission

COMMENTS OF THE U.S. GPS INDUSTRY COUNCIL IN RESPONSE TO NOTICE OF PROPOSED RULEMAKING AND NOTICE OF INQUIRY

The U.S. GPS Industry Council (the "Council"), by its attorneys and pursuant to Sections 1.415 and 1.419 of the Commission's Rules (47 C.F.R. §§ 1.415 & 1.419), hereby comments on the proposals advanced in the above-captioned Notice of Proposed Rulemaking and Notice of Inquiry ("NPRM/NOI") released by the Commission on July 15, 2010.[1] In principle, the Council does not oppose the proposals contained in the NPRM/NOI to permit more flexible use of the L-band and S-band spectrum currently allocated to the Mobile-Satellite Service ("MSS"). The Commission proposes to allow the introduction of new terrestrial mobile wireless broadband services by way of the secondary marketing rules that are different in nature and scope from existing ancillary terrestrial services. These new terrestrial services would operate in radio

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[1] *See Fixed and Mobile Services in the Mobile Satellite Service Bands at 1525-1559 MHz and 1626.5-1660.5 MHz, 1610-1626.5 MHz and 2483.5-2500 MHz, and 2000-2020 MHz and 2180-2200 MHz*, FCC 10-126, *slip op.* (released July 15, 2010). A summary of the NPRM/NOI was published in the *Federal Register* on August 16, 2010, establishing September 15, 2010 as the Comment deadline. 75 Fed. Reg. 49,871 (Aug. 16, 2010).

frequency bands allocated to space-based communication services. This represents a paradigm shift in use that, unless carefully implemented, will impair the ability to make use of the distinctive properties of both these MSS bands and adjacent bands allocated to space services that are uniquely suited to the intended function of those services.

Understanding the operational impact of adopting this proposal is especially important due to the high probability that these existing and planned mobile services (MSS, terrestrial wireless broadband and Radionavigation-Satellite Service ("RNSS"), including the Global Positioning Service ("GPS")) are serving or will serve the same mobile customer base. These mobile service users have well established operational dependencies on positioning, navigation and timing ("PNT") information that need to be taken into consideration to ensure the successful introduction of the proposed new services. In reviewing the effects of this proposed shift in use of bands allocated to space-based services, the Council notes the National Space Policy goal that the "United States must maintain its leadership in the service, provision, and use of global navigation satellite systems ("GNSS"),"[2] and that the letter to the Commission in this proceeding from the National Telecommunications and Information Administration ("NTIA") expressly recognizes that "a key element of that policy is taking necessary measures to sustain the radiofrequency ("RF") environment in which critical U.S. space systems operate."[3] In that light, the Council respectfully recommends that the Commission's efforts in this proceeding be implemented in a manner that: (1) preserves and codifies existing out-of-band emission ("OOBE") limits

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[2] National Space Policy of the United States of America at 5 (June 28, 2010), available at http://www.whitehouse.gov/sites/default/files/national_space_policy_6-28-10.pdf.

[3] Letter from Karl B. Nebbia, Associate Administrator, Office of Spectrum Management, National Telecommunications and Information Administration, to Julius Knapp, Chief, Office of Engineering and Technology, FCC, ET Docket No. 10-142, at 1-2 (dated July 14, 2010).,

applicable to existing and planned services, including space-based and terrestrial augmentations (e.g., ATC); (2) takes into account the fundamental change in the harmful interference to the RNSS receiver (affecting the receiver's ability to function) arising from the dense deployment of newly proposed mobile terrestrial broadband services; and (3) ensures effective mitigation measures are in place that preserve the utility of existing bands for the installed base of GNSS users while enabling the successful introduction of new mobile terrestrial broadband services for adoption by those same users.

DISCUSSION

A. The FCC Should Be Mindful of the Importance of the GPS Utility.

The two central elements of the NPRM/NOI are: (1) to add co-primary Fixed and Mobile service allocations to the MSS allocations above and below 2 GHz, and (2) to apply the Commission's secondary market policies and rules permitting the leasing of spectrum for new terrestrial mobile wireless broadband services to all of the MSS bands. Should the Commission establish these general rule changes, the Council requests that the Commission be mindful of the adverse effect that this precedent setting alteration of spectrum use could have on the operating environment of adjacent space services, such as the RNSS at 1559-1610 MHz. The Council respectfully urges the Commission to take necessary steps to ensure that the more flexible frequency use anticipated will not harm the diverse installed user base of that adjacent band. Critical infrastructure and key resource sectors ("CIKR") depend on the positioning, navigation, and timing information broadcast by the GPS service.

A brief review of the evolution of GPS and its rapidly expanding ubiquity will be helpful to understanding the practical and effective technical solutions proposed to ensure the successful introduction of mobile terrestrial broadband services to customers, who in all likelihood already

depend on the availability of mobile GPS. The first GPS satellite was launched in 1978. In 1981, the first civilian GPS product was introduced for survey use for a Federal agency. In 1984, GPS products were introduced for timing infrastructure and commercial survey use. In 1989, the mobile GPS handheld was introduced for consumer use. In the early 1990's, dual-frequency GPS products were introduced for commercial and scientific use in dynamic high precision applications requiring a centimeter or better accuracy in real-time. The GPS system was declared to have Full Operational Capability in 1995. And in 1996, a Presidential Decision Directive announced, "GPS provides substantial military advantage and is now being integrated into virtually every facet of our military operations [and] GPS is also rapidly becoming an integral component of the emerging Global Information Infrastructure, with applications ranging from mapping and surveying to international air traffic management and global change research."[4] In the year 2000, the United States recognized the increasing importance of GPS to civil and commercial users by ending the deliberate degradation of accuracy for non-military signals, known as Selective Availability.[5] Since that time, commercial and civil GPS applications have continued to multiply and their importance has increased significantly. In 2004, the President's PNT Policy found that "Services dependent on Global Positioning System information are now an engine for economic growth enhancing economic development and improving safety-of-life, and the system is a key component of multiple sectors of U.S. critical infrastructure," and declared: "Over the past decade, the Global Positioning System has grown into a global utility whose multi-use services are integral to U.S. national security, economic growth, transportation safety, and

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[4] Fact Sheet, U.S. Global Positioning System Policy, Office of Science and Technology Policy, National Security Council (released March 29. 1996).

[5] *See* Statement by the President Regarding The United States' Decision To Stop Degrading Global Positioning System Accuracy, May 1, 2000.

homeland security and are an essential element of the worldwide economic infrastructure."[6] In 2006, GPS-enabled cellphones were introduced, including for E911 use. In 2008, several GPS-enabled mobile social networking applications were introduced. A 2009 report for a study chartered by the Office of the Secretary of Defense and the Department of Homeland Security, states:

> In today's digitally-intensive world, having access to extremely precise and stable time is a necessary component of making CIKRs function as an integrated collection of networks. Four CIKR sectors ... Energy, Transportation, Telecommunications, and Banking and Finance ... require highly reliable precise timing signals to keep their networks functioning correctly and efficiently. The transportation sector relies directly upon accurate positioning and navigation information from the civil GPS signal.[7]

This transportation sector includes GPS for public safety use (*e.g.*, emergency response). Today, GPS is an effective public utility with hundreds of millions of users across a broad range of applications worldwide, including consumer, infrastructure, and public safety, as recognized by the International Telecommunications Union ("ITU"). *See* Exhibit 2, attached hereto, ITU Information Paper on Uses of RNSS in Civil and Commercial Applications.

B. To Achieve Clarity and Certainty, Essential Interference Protections Adopted for Ancillary Terrestrial Component Operations Must Be Codified.

As the NPRM/NOI notes, most currently-licensed MSS systems have been authorized to operate ancillary terrestrial components ("ATC") associated with their authorized satellite operations, with the proviso in their FCC authorizations that emissions in the 1559-1610 MHz

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[6] NSPD-39: U.S. Space-Based Position, Navigation, and Timing Policy, released December 15, 2004.

[7] "Global Positioning System Impact to Critical Civil Infrastructure (GICCI)" at 1, Mission Assurance Division, Naval Surface Warfare Center, Dahlgren Division (November 30, 2009)..

band must not exceed specified limits on OOBE.[8] In the NPRM/NOI, the Commission specifically refers to these OOBE limits, and clearly states its intention to impose these limits on any new Fixed or Mobile service in the MSS bands, proposing to explicitly require these service providers to operate "according to the technical and operational conditions specified in the ATC authorizations." NPRM/NOI at 7 n.51; s*ee also* NPRM/NOI at 7 (¶ 13), 9 (¶ 18) & n.56. Nonetheless, the NPRM/NOI does not set forth anywhere the actual operating parameters that are currently specified in the various MSS ATC authorizations. With the number of individual entities operating terrestrial systems in these frequency bands likely to increase substantially in the event that the proposals set forth in the NPRM/NOI are adopted, the Council believes that the Commission needs to establish greater clarity with respect to the OOBE limits that apply in these bands, particularly because the actual conditions now imposed on all MSS licensees for ATC operation are different from the default provisions that are otherwise spelled out in the FCC's MSS Rules. *See* 47 C.F.R. §§ 25.252(a)(7), 25.253(d)(9) & 25.254(a)(4).

Moreover, the Commission makes plain its intention "that in the event that one or both of the 2 GHz MSS licenses were to be returned or cancelled for any reason, the returned spectrum could be used for terrestrial mobile broadband deployment" (NPRM/NOI at 8 (¶ 14)) and would not be "assigned to the remaining licensee, or made available for a new MSS licensee" (NPRM/NOI at 8 (¶ 15)). Instead, the Commission would turn the recovered spectrum over entirely to Fixed and Mobile service use. *See* NPRM/NOI at 8 (¶ 15). In such case, the existing conditions set forth in the current MSS licenses would cease to exist, and the Commission would not be able to rely on the applicability of technical operating requirements via its Rules and

[8] The lone MSS operator not authorized to provide an ATC service is Iridium, which operates bi-directionally in the L-band portion of the Big LEO MSS spectrum allocation.

policies governing secondary market spectrum leasing. It would thus be especially important in such a scenario for the Commission to have established as a regulatory baseline in its Rules the OOBE limits that would continue to apply to future terrestrial broadband services using these bands. To do otherwise would be to inadvertently create harmful interference to the installed base of existing and future RNSS users through a lapse in regulatory coverage of situations that are currently covered by requirements in the Commission's MSS ATC licenses.

Under the MSS ATC licenses that have been issued to current satellite service providers, mobile terrestrial stations must limit equivalent isotropically radiated power ("EIRP") density for wideband emissions to -95 dBW/MHz; while narrowband emissions are subject to a limit of -105 dBW/kHz.[9] In addition, fixed or mobile base stations must adhere to a wideband EIRP density emission limit of -100 dBW/MHz; and a narrowband emission limit of -110 dBW/kHz.[10] Finally, in the specific case of "femtocells" operating indoors, the EIRP density limit is -111.7 dBW/MHz when one femtocell is operating in a room and -114.7 dBW/MHz when two femtocells are operating in the same room.[11] These limits, however, appear only in the individual system authorizations, and therefore are not as readily accessible or identifiable as the codified provisions set forth in Part 25 of the FCC's Rules. In order to avoid the potential confusion that could arise from requiring many secondary market spectrum lessees to adhere to limits currently set forth only as conditions on licenses issued to individual MSS systems, the Commission should codify these limits in this proceeding as it makes the other service rule modifications governing

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[9] *See, e.g., Mobile Satellite Ventures Subsidiary LLC*, 19 FCC Rcd 22144, 22176-77 (¶ 95(c)) (IB 2004); *New ICO Satellite Services G.P.*, 24 FCC Rcd 172, 195 (¶ 65) & 197 (¶ 69(g)) (IB 2009).

[10] *Id.*

[11] *See SkyTerra Subsidiary LLC*, 25 FCC Rcd 3043,3057-58 (¶¶ 45 & 46(d)) (IB 2010).

MSS ATC operations that will be required to implement the changes proposed in the NPRM/NOI. *See* Exhibit 1, attached hereto, Proposed Rule Governing Out-of-Band Emissions Limitations in the Radionavigation-Satellite Service Band.

C. Additional Operational Limitations Are Required To Protect Existing RNSS From Harmful Interference Arising From Proposed New Terrestrial Operations.

In addition to codifying the existing OOBE limits, it is also critical for the Commission to take into consideration the fact that the OOBE limits set out in the individual MSS licenses were premised on ATC operation alone, *i.e.*, operation that is solely ancillary to primary MSS use. With the introduction of broader mobile terrestrial broadband use now being proposed in the NPRM/NOI, the physical characteristics of the necessary emissions from the dense deployment of this new terrestrial-only service will cause harmful interference to the RNSS receiver. Multiple strong terrestrial emitters will increase the probability of an RNSS receiver experiencing this harmful interference, thus undermining the fundamental utility of GPS and both the goal of U.S. Space-based PNT Policy to provide uninterrupted availability of PNT services and of the National Space Policy to ensure that the United States maintains its leadership in the service, provision and use of GNSS.

1. Essential Characteristics of Terrestrial and Space-Based Services Operating in Adjacent Bands.

MSS and RNSS now operate in adjacent or nearby allocations, where entire swaths of spectrum are allocated to satellite services, initially without any significant terrestrial transmissions. Space-based transmissions, particularly those that are mobile and omnidirectional in nature, use very low power, particularly in the space-to-Earth direction. As long as these space-based services remain truly satellite services, their spectrum and power levels could be moderated to avoid interference between satellite services, thereby establishing "harmony"

between two satellite services operating in adjacent bands. When MSS operators added ATC to complement their service offerings, this augmentation created the potential for significant new interference to space-based services operating in the L-band, and especially to broadcast RNSS operations in the L-band where MSS allocations "sandwich" the primary GPS L-1 frequencies.

Terrestrial and satellite operations have different physical and geometric characteristics that make it very difficult for the two to co-exist without the terrestrial transmissions interfering with the satellite transmissions. In recognition of this phenomenon, when ATC was introduced in the MSS bands, operators developed the OOBE limits cited above that are explicit conditions in FCC authorizations of MSS ATC operations. Even with the advent of ATC, RNSS operators could rely on the requirement that ATC operations remain truly "ancillary" to MSS and subject to intra-system monitoring and coordination. Furthermore, ATC was developed to complement and extend MSS beyond its physical limitations given the power levels and limitation of MSS operations. Nonetheless, the primary and principal purpose of MSS would remain precisely a space-based service function.

2. The Impact to RNSS Operations of Contemplated Changes in Spectrum Use.

When the changes in MSS operations contemplated in this NPRM/NOI are in place, MSS operators will be free – indeed, encouraged – to lease MSS spectrum to terrestrial mobile and fixed broadband operators. *See* NPRM/NOI at 11-12 (¶¶ 22-25). Thus, what was initially primary MSS with an ancillary terrestrial component, will become for all practical purposes multiple terrestrial services operating in a band with adjacent weak broadcast satellite transmissions. The physics and dynamics of terrestrial services will radically change the environment in which the adjacent satellite services operate. This change in the band use will require adjustments in these mobile terrestrial operations to mitigate the detrimental operational

interference effect it will otherwise create in adjacent broadcast RNSS bands – adjustments that necessarily go beyond the established OOBE limits in existing MSS ATC authorizations. In fact, without careful implementation of these new mobile terrestrial broadband services, legacy MSS receivers and services may also experience harmful interference.

Strong terrestrial emitters in nearby bands allocated to space-based services can cause problems for any space-to-Earth service, GPS included. The L-band radiofrequency spectrum has distinctive physical properties – a low loss characteristic through the atmosphere – that makes it uniquely suited for space/ground communication. This distinctive operating environment has been traditionally recognized by the Commission in its efforts to ensure that the L-band was prioritized and protected for satellite communication. Establishing a precedent of allowing a mobile terrestrial service in the midst of a space-based service operating in the L-band generates an unavoidable interference risk for any nearby satellite service that necessitates careful mitigation measures. In contrast, ATC does not represent such a precedent because it is defined to be ancillary to satellite operations. The rules for ATC require that it only be used by a full coverage space provider to augment the space-based service. *See* 47 C.F.R. § 25.149(b)(1). This "ancillary" requirement results in the MSS providers who would use ATC being good neighbors to other satellite operations due to the need to protect their own space-to-Earth communication operations. Also, as a practical matter, current ATC operators must provide dual-use (satellite as well as terrestrial) mobile terminals for their customers, and consequently have a particular interest not to overwhelm the satellite channels when close to an ATC base station. None of these considerations attend to the operation of a mobile terrestrial broadband communication service.

The consequences to GPS operations and use are significant. Broadcast satellite signals are very low power at the Earth's surface. In particular, GPS satellite signals are so low-power by

the time they reach the Earth that they operate below the noise floor, and are susceptible to interference from external sources. Depending on the interference source, the operational effect on GPS receivers' performance can result in desensitization, which prevents the receiver from functioning properly.

3. The Interference Impact on the GPS Receiver Due to the Proposed Changes in Spectrum Use.

From the point of view of a GPS receiver, the introduction of an adjacent-frequency broadband terrestrial service presents a threat of significant harmful interference. This can be illustrated through close examination of the GPS receiver. During three decades of evolving GPS receiver design, engineers have created layers of RF filtering in order to provide the selectivity needed by the GPS receiver to acquire and track GPS signals; to maintain positional accuracy; and to reacquire GPS signals following loss of lock. Selectivity is the ability to select only the positioning, navigation, and timing information transmitted by the GPS satellite signal and to reject all other signals. Filters are limited to how high a Q (the center frequency to bandwidth ratio) they are capable of achieving. At L-band frequencies, this means a significant amount of adjacent band energy makes it past the first RF filter. GPS engineers addressed this problem by downconverting the signal and improving the selectivity with filtering in each stage. This is because at lower frequencies it is feasible to construct a filter that eliminates most of the adjacent band energy. However, for a strong adjacent band emitter, the later filtering stages in a GPS receiver never get a chance to perform their function.

The RNSS L-band extends from 1559 MHz to 1610 MHz. For purposes of this discussion, suppose that a terrestrial transmitter is authorized to operate at 1555 MHz at 30 dBW of output power, which is within the current rules for ATC. The state-of-the art filtering for consumer-level GPS receivers is a Surface Acoustic Wave ("SAW") filter as the first element

after the antenna. At L-band, the narrowest bandwidth available in a SAW filter is about 20 MHz. Therefore, at 1555 MHz, the greatest attenuation you could expect from this filtering device would be about 5 dB. The next element after the SAW filter is a Low Noise Amplifier ("LNA"). The 1 dB compression point (above which the LNA produces no useful output) might be as good as -40 dBm referred to the input. So in the presence of our hypothetical 30 dBW (60 dBm) terrestrial broadband transmitter, the only thing allowing our GPS receiver to function is sufficient distance from the transmitter for path loss to add up to more than 95 dB (= 60 dBm - (-40 dBm) - 5 dBm). This amounts to a required separation distance from the transmitter of about 100 meters. For much of the mobile consumer GPS in use, including public safety (*e.g.*, E911 cellphones), the harmful interference effect would be somewhat worse than this case.

The situation is the same for precision commercial receivers. The state-of-the-art in filtering for these receivers is a dielectric resonator filter. While these filters have better selectivity and Q, the rolloff is not much different in the first ten to twenty megahertz outside the GPS band, so there would still be an overload radius on the order of 100 meters for these receivers as well. It is not hard to see how a mobile terrestrial broadband service made up of many such transmitters presents a concern for the GPS installed user base and potentially the users of other satellite services operating in the L-band.

The next step up in filtering from those currently used by GPS receivers would be resonant cavity filters. Unfortunately, the physics of these filters make them larger than an entire GPS handheld navigator and more expensive than an entire existing handheld as well. They are simply not practical for portable equipment.

4. Possible Techniques to Mitigate Harmful Interference to RNSS from the Introduction of Widely-Deployed Terrestrial Transmitters.

There are, nonetheless, a variety of ways the Commission could effectively mitigate these interference concerns, some of which are discussed below. It must first be emphasized that adjustment of the existing MSS ATC OOBE limits would not be one of them. As noted earlier in these Comments, it is important that the existing MSS ATC OOBE operating parameters specified in the various ATC licenses for mobile MSS handsets, ATC base stations, and indoor femtocells are formally recognized in the rules contemplated in this proceeding to protect the GPS installed user base from in-band interference. However, the introduction of densely populated strong signal adjacent-band terrestrial broadband transmitters is a different kind of problem that would not be mitigated from a further lowering of OOBE. The approaches suggested below are independent of the need to codify the current MSS ATC OOBE limits and of each other, although combinations of the techniques identified below could substantially mitigate the adjacent band interference concerns.

(1) *Introduce new terrestrial broadband transmitters as far from mobile satellite applications as possible, especially from the RNSS L-1 band at 1559 – 1610 MHz.* Placing terrestrial services in the midst of satellite services has the potential to harm any adjacent space-based service and is especially harmful to the well established installed user base of an adjacent broadcast RNSS service. To the extent the Commission authorizes the introduction of new terrestrial services in the MSS bands, the Council believes the proper approach is to migrate the satellite services closer together, and allocate terrestrial services at the edge of the satellite grouping as the band gets cleared. The objective of this approach is to keep the two types of distinctly different (space-based versus terrestrial) services separate, and have a modest amount of margin around the edge of all the satellite services to protect their fundamental operations and

utility to long-established installed user base of the adjacent L-band band RNSS services and devices.

(2) *Establish a power limit for the newly-proposed terrestrial transmitters based on their frequency proximity to the satellite bands (in particular the broadcast RNSS bands allocated to GPS/GNSS operations*). Those terrestrial transmitters close in frequency to the GPS band would have be limited to less than the current limit of 31.9 dBW,[12] in proportion to their proximity to the GPS band. This would alleviate the problem of strong terrestrial emitters overcoming the selectivity of GPS receivers. The actual limits to be used would have to be analyzed.

(3) *Establish a power limit for the introduction of new wireless broadband terrestrial transmitters in the MSS band based on the density of installations*. While this approach does not eliminate the potential effect of new terrestrial transmitters overcoming GPS receiver selectivity, it does reduce the probability of this occurring. It does this by limiting the scope of each potential interferer through a reduction of the harmful interference radius of each transmitter when there are many of them. In general, this approach is within the interest of a broadband provider to implement as well. Much like the co-location of multiple cellular services operating within their band allocation, the more base stations there are, the lower the power should be to enable the broadband service to reuse channels. Analysis would be required to establish the feasibility of this approach for both the new terrestrial service and for the neighboring satellite services.

CONCLUSION

A full range of available communication technologies and services are already deployed throughout the installed user base for existing and planned GPS products and services. The introduction of new communication technologies and services offers benefits to these GPS users

[12] *See* 47 C.F.R. § 25.253(d)(1).

and growth opportunities for everyone. MSS operators already include GPS in their products and services. In situations where the introduction of new communication services has the potential for adverse operational effects on GPS use, the Council has proactively sought collaborative solutions that help to ensure the smooth introduction of the new service while also protecting the continued availability of the GPS positioning, navigation, and timing information utility. In fact, since the introduction of ATC, working collaboratively with MSS operators of ATC in the L-band has resulted in several mutual agreements to facilitate successful operations free of harmful interference. The Council believes that collaborative solutions are available to mitigate the otherwise unavoidable harmful effects described in these Comments.

For the foregoing reasons, the Council respectfully urges the Commission, in connection with any order adopting the changes proposed in the NPRM/NOI to codify the existing OOBE limits that apply to MSS ATC licenses as set forth in the attached exhibit, and to adopt additional technical requirements for Fixed and Mobile stations using one or more of the methods proposed herein. The Council looks forward to continued constructive collaboration to achieve a mutually acceptable positive outcome.

Respectfully submitted,

THE U.S. GPS INDUSTRY COUNCIL

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Exhibit 1
Proposed Rules Governing Out-of-Band Emissions in the RNSS Band

§25.xxxx* **Out of Band Emission limitations in the Radionavigation-Satellite Service Band.**

(a) The requirements of this section govern the spectral characteristics of emissions for all users affecting the Radionavigation-Satellite Service. Users may use any type of emission or technology that complies with the technical rules in this subpart.

(b) The power of any out of band emission falling in the Radionavigation-Satellite Service ("RNSS") at the 1559-1610 MHz frequency range must be limited such that the EIRP density is controlled.

(1) Mobile transmitters having intermittent transmissions shall limit EIRP density for:
(i) Wideband emissions to no more than -95 dBW/MHz and ;
(ii) Narrowband emissions to no more than -105 dBW/kHz.

(2) Fixed or mobile base stations shall limit EIRP density for:
(i) Wideband emissions to no more than -100 dBW/MHz and;
(ii) Narrowband emissions to no more than -110 dBW/kHz.

(3) "Femtocells" operating indoors shall limit EIRP density for wideband emissions to no more than -111.7 dBW/MHz when one femtocell is operating in a room and to -114.7 dBW/MHz when two femtocells are operating in the same room.

* Could also be codified under Part 22 or Part 27 of the FCC's Rules.

Exhibit 2
Examples of Uses of RNSS

AGRICULTURE and FORESTRY
Forest area and timber estimates.
Identifying species habitats.
Fire perimeters.
Water resources.
Locating property boundaries.
Ploughing, planting and fertilizing without operators.

AVIATION
Oceanic and en route navigation.
Non-precision and precision all-weather approaches.
Direct routing of aircraft for fuel savings.
Improved aircraft separation standards for more efficient air traffic management.
Airport surface traffic management.
Monitor wing deflections in flight.
Wind shear detection.
Precise airfield and landing aid locations.
Seamless (global) air space management.
Less expensive avionics equipment.
Monitoring aircraft locations in flight.
Precision departures.
Missed approach applications
Enhanced ground proximity warning system.
Automatic dependent surveillance.

ELECTRIC POWER
Synchronization of power levels.
Event location.

EMERGENCY RESPONSE
Ambulance, police, and fire department dispatch.
Road service locating disabled vehicles.

ENVIRONMENTAL PROTECTION
Hazardous waste site investigation.
Ground mapping of ecosystems.
Oil spill tracking and cleanup.
Precise location of stored hazardous materials.

HIGHWAY and CONSTRUCTION
Intelligent vehicle-highway system operation.
Highway facility inventory and maintenance.
Accident location studies.
Highway construction.
Navigation for motor vehicle drivers.
Truck fleet on-the-road management.
Monitoring status of bridges.

LAW ENFORCEMENT and LEGAL SERVICES
Tracking and recovering stolen vehicles.
Tracking narcotics and contraband movements.
Maintaining security of high government officials and dignitaries while travelling.
Border surveillance.
Measuring and recording property boundaries.
Tort claim evidence in aviation and maritime accidents.

MARITIME and WATERWAYS
Navigation on the high seas.
Search and rescue.
All weather harbour approach navigation.
Vessel traffic services.
Dredging of harbours and waterways.
Positioning of buoys and marine navigation aids.
Navigation for recreational vessels.
Location of commercial fishing traps and gear.
Offshore drilling research.
Monitoring deflections in dams as a result of hydrostatic and thermal stress changes.
Ice breaking and monitoring icebergs and flows.
Observing tides and currents.
Harbour facility management.
Location of containers in marine terminals.

PUBLIC TRANSPORTATION
Bus fleet on-the-road management.
Passenger and operator security monitoring.

RAILROAD
Railroad fleet monitoring.
Train control and collision avoidance.
Facility inventory control and management.

RECREATION
Hiking and mountain climbing.
Measuring at sports events.
Setting lines on sports fields.

SURVEYING
Electronic bench marker providing absolute reference of latitude, longitude and altitude.
High precision surveys in minutes by anyone.
Real-time dam deformation monitoring.
Hydrographic surveying.
Efficient and accurate photo surveys.
Measuring areas without triangulation.
Oil and mineral prospecting.
National spatial data infrastructure.

TELECOMMUNICATIONS
Precise timing for interlacing messages/network synchronization.

WEATHER, SCIENTIFIC and SPACE
Use as weather balloon position radiosonde.
Measurement of sea level from satellites.
Navigating and controlling space shuttles.
Placing satellites into orbit.
Monitoring earthquakes and tectonic plates.
Measuring ground subsidence (sinking).
Measuring atmospheric humidity from ground.
Precise global mapping of ionosphere.