Before the
FEDERAL COMMUNICATIONS COMMISSION
Washington, DC 20554

In the Matter of	)	
	)	
Globalstar, Inc. Petition for Rulemaking	)	RM-_____
to Reform the Commission's Regulatory	)	
Framework for Terrestrial Use of the	)	
Big LEO MSS Band	)	

PETITION FOR RULEMAKING OF GLOBALSTAR, INC.

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Executive Summary

In this Petition for Rulemaking, Globalstar, Inc. ("Globalstar") proposes pro-investment, pro-consumer reforms that will enable Globalstar to make the kind of innovative, efficient use of spectrum that the Commission seeks. By initiating a rulemaking proceeding, adopting the regulatory reforms proposed herein, and permitting flexible terrestrial use of Big LEO spectrum, the Federal Communications Commission ("Commission") will generate significant and immediate benefits for American consumers.

Globalstar's Commitment to MSS. Globalstar is licensed to provide mobile satellite service ("MSS") in the Big LEO band at 1610-1618.725 MHz (the "Lower Big LEO band" for uplink operations) and 2483.5-2500 MHz (the "Upper Big LEO band" for downlink operations). As a leading provider of MSS, Globalstar is deeply committed to the future of its satellite business. Since its inception, Globalstar has invested in excess of $5 billion in its global MSS network, including more than $1 billion in its second-generation MSS constellation, which Globalstar expects to be fully launched by early 2013. With over 550,000 subscribers worldwide, including approximately 100,000 duplex (voice) customers, Globalstar's MSS offerings have provided extraordinary public safety benefits to commercial and government customers and consumers around the world.

Globalstar has never wavered in meeting its core MSS commitments to public safety, even when faced with the deterioration of its first-generation constellation. Globalstar's family of SPOT products is now being used by subscribers to initiate on average more than one rescue per day, often life saving, with over 2,100 total rescues achieved since the SPOT's introduction in 2007. Now, with Globalstar's second-generation constellation nearing full deployment, first responders and other emergency personnel in the regions hardest hit by Hurricane Sandy are

turning to Globalstar's duplex services for critical communications when all existing terrestrial systems fail. Globalstar is working hard to develop an array of new and innovative MSS offerings for the public safety community and the rest of its growing customer base.

Yet, Globalstar wants to and should do more. In order to maximize public benefits, Globalstar must receive greater flexibility for terrestrial use of its Big LEO spectrum. With this Petition, Globalstar proposes both a long-term plan to utilize its full Big LEO spectrum allocation for a Frequency Division Duplex ("FDD") LTE-based mobile broadband network, as well as a completely separate near-term plan to utilize only the Upper Big LEO band at 2483.5-2495 MHz for an innovative terrestrial low-power service ("TLPS") offering. In the long run, by deploying an optimal mix of LTE and TLPS facilities in the Big LEO band, Globalstar will achieve a full and intensive terrestrial utilization of its spectrum.

FDD LTE and the Lower Big LEO Band. The highest and best terrestrial use of Big LEO spectrum in most locations will ultimately be for FDD LTE operations. With this planned FDD LTE build-out, Globalstar is not proposing any terrestrial use of its spectrum that would compromise the accuracy or dependability of Global Positioning System ("GPS") services. Globalstar's most successful products and services operate in the Lower Big LEO band and have built-in GPS chipsets for location awareness. As such, they depend entirely upon properly functioning GPS receivers and coexist in practice with GPS every day. Moreover, Globalstar's proposed FDD LTE terrestrial network architecture will require only low-power uplink transmissions from mobile handsets in its Lower Big LEO spectrum. Nevertheless, before FDD LTE can be deployed in the band, the Commission should address any concerns regarding the coexistence of GPS and commercial wireless operations within the Lower Big LEO band. With this Petition, Globalstar proposes an open and transparent rulemaking proceeding in which all

interested parties are invited to participate and resolve any issues that may be identified regarding Globalstar's terrestrial FDD LTE plans.

Terrestrial Low-Power Service. While the Commission and interested parties work through any technical issues described above, the Commission has an extraordinary opportunity to leverage Globalstar's spectrum location in the 2.4 GHz band, the public's prior investment in devices, and existing IEEE 802.11 technology to advance the rapid deployment of an innovative, pro-consumer TLPS. Applying a unique, hybrid spectrum approach, Globalstar will provide this low-power broadband service over 22 megahertz of spectrum that includes both Globalstar's exclusive terrestrial use spectrum at 2483.5-2495 MHz and adjacent unlicensed industrial, scientific and medical ("ISM") spectrum at 2473-2483.5 MHz. TLPS operations on this 2473-2495 MHz band segment are consistent with the 802.11 channelization scheme, which includes fourteen overlapping 22 megahertz channels between 2401 MHz and 2495 MHz.

If the Commission implements the necessary regulatory reforms to enable this hybrid approach, it will add 22 megahertz to the nation's wireless broadband spectrum inventory. In addition, this spectrum will be put quickly to use as American consumers utilize their current 802.11-enabled devices to receive Globalstar-managed TLPS, which will help alleviate the increasing congestion that is impeding use of existing 802.11 ISM channels in dense metropolitan areas. As Chairman Genachowski recently pointed out, Wi-Fi usage at high-traffic "hotspots" is proving to be an increasingly frustrating experience. With TLPS providing additional 802.11-based capacity, Globalstar will be able to provide consumers with improved wireless broadband service, including faster data speeds and better Voice over Internet Protocol ("VoIP") functionality. In addition, TLPS deployments will deliver meaningful public safety benefits. During disasters such as Hurricane Sandy, still-operating 802.11-based hotspots can

provide broadband and voice communications to citizens in affected areas who otherwise lack access to communications services. The addition of TLPS facilities will augment this important post-disaster resource. These TLPS-based public interest benefits will be long lasting, since TLPS deployments will likely remain the most efficient, economically viable terrestrial application over the long term in many geographic areas, including areas with lower population densities.

Commission Reform in the Upper Big LEO Band. For these near-term and long-term terrestrial services to become a reality, the Commission must reform its Big LEO rules by taking the following actions:

- Add co-primary Fixed and Mobile allocations to the 2483.5-2495 MHz band (or "AWS-5" band);
- Modify Globalstar's Big LEO license to include AWS-5 terrestrial authority, with common control of MSS and AWS-5 operations enabling intensive coordination to minimize interference to Globalstar's MSS offerings;
- Eliminate existing ancillary terrestrial component ("ATC") gating requirements, including the substantial satellite service requirement and the dual-mode equipment requirement;
- Adopt flexible technical and operational rules similar to those applied in other terrestrial wireless bands, thus allowing the use of various technologies in this band;
- Grant one national terrestrial authorization, rather than numerous geographic area licenses;
- Permit spectrum manager leases covering any volume of Big LEO spectrum and any geographic territory within the nationwide AWS-5 license area;
- Adopt performance requirements similar to those adopted in analogous commercial wireless bands that only become effective once the Commission has granted FDD LTE uplink authority in the Lower Big LEO band.

To accommodate the spectral mask of Globalstar's TLPS transmissions, the Commission should adopt an out-of-band emissions ("OOBE") limit similar to the one recently proposed for the adjacent 2.5 GHz band. To protect the integrity of the AWS-5 band, Globalstar will provide TLPS only to authenticated users and devices, and it will utilize available network management and security technologies to prevent unauthorized use of this spectrum.

If the Commission adopts the necessary reforms in the Upper Big LEO band, Globalstar commits to deploying thousands of free TLPS access points in the nation's public and non-profit schools, community colleges, and hospitals. These free deployments will bring all of the TLPS-related benefits to these critical environments. In addition, if the Commission takes these regulatory steps, Globalstar commits to provide its mobile satellite service ***free of charge*** to Globalstar subscribers within any federally declared "disaster area" following a natural or man-made disaster. With this offering, Globalstar customers will have the peace of mind of knowing that their satellite service is free during those times when they need the service the most.

Second Parallel Proceeding on Lower Big LEO band. When the Commission initiates a rulemaking proceeding on AWS-5 and TLPS, it should also begin a second, parallel proceeding on terrestrial operations in the Lower Big LEO band at 1610-1617.775 MHz. Once the Commission concludes this open, transparent process and resolves parties' concerns regarding the coexistence of Big LEO mobile handsets and GPS systems, the Commission should integrate the 1610-1617.775 MHz band into the AWS-5 block and extend its fundamental terrestrial-use reforms to this Lower Big LEO band spectrum. In conjunction with future terrestrial partners, Globalstar will then move forward expeditiously with the deployment of Big LEO FDD LTE systems. With the application of this globally emerging mobile technology, Globalstar's nearly 20 megahertz of terrestrial use spectrum will help meet the nation's exploding spectrum demand and improve the quality of wireless service for American consumers.

Thus, Globalstar urges the Commission to undertake the proposed Big LEO reforms expeditiously to generate the spectrum efficiency and other public interest benefits that it values so highly. By establishing a flexible AWS-5 regulatory framework and permitting the roll-out of TLPS, the Commission will add *22 megahertz* of additional spectrum for wireless broadband

operations to the nation's spectrum inventory. This additional use of Globalstar's spectrum will ensure the economic viability of its global Big LEO MSS system and all of the public interest benefits generated by that network. With reinvigorated MSS operations and a robust mobile broadband build-out in the MSS bands, Globalstar will be able to provide a full range of satellite and terrestrial services to consumers, public safety users, government and business customers, and rural and remote communities throughout the United States.

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PETITION FOR RULEMAKING OF GLOBALSTAR, INC.

Pursuant to Section 1.401 of the Commission's rules,[1] Globalstar, Inc. ("Globalstar") hereby petitions the Federal Communications Commission ("Commission") to initiate a rulemaking on terrestrial operations in the Big LEO mobile satellite service ("MSS") band, in order to encourage wireless investment and innovation, unleash a vital new supply of broadband spectrum, and deliver extraordinary benefits to American consumers. To realize these goals, Globalstar urges the Commission to undertake fundamental reform of its regulatory framework for terrestrial operations in the Big LEO band and make the necessary amendments to Parts 1, 2, 25, and 27 of its rules.

I. Introduction and Summary

The Commission should expeditiously initiate a rulemaking on terrestrial use of the Big LEO band in order to promote wireless broadband development, make more efficient use of available spectrum, and generate enormous benefits for consumers in the United States. In its March 2012 rulemaking proposal on terrestrial use of the 2 GHz MSS band ("*2 GHz NPRM*"), the Commission stated that it would subsequently hold a separate proceeding on terrestrial

[1] 47 C.F.R. § 1.401.

operations in the Big LEO band.[2] The Commission should move forward now with pro-investment, pro-consumer reforms in the Big LEO band, to replace its decade-old ancillary terrestrial component ("ATC") rules.[3]

Globalstar is licensed to provide mobile satellite service ("MSS") in the Big LEO band at 1610-1618.725 MHz (the "Lower Big LEO band" for uplink operations) and 2483.5-2500 MHz (the "Upper Big LEO band" for downlink operations). As a leading provider of MSS, Globalstar is deeply committed to the future of its satellite business. Since its inception, Globalstar has invested in excess of $5 billion in its global MSS network, including more than $1 billion in its second-generation MSS constellation, which Globalstar expects to be fully launched by early 2013. With over 550,000 subscribers worldwide, including approximately 100,000 duplex (voice) customers, Globalstar's MSS offerings have provided extraordinary public safety benefits to commercial and government customers and consumers around the world.

Globalstar has never wavered in meeting its core MSS commitments to public safety, even when faced with the deterioration of its first-generation constellation. Globalstar's family of SPOT products is now being used by subscribers to initiate on average more than one rescue per day, often life saving, with over 2,100 total rescues achieved since the SPOT's introduction in 2007. Now, with Globalstar's second-generation constellation nearing full deployment, first responders and other emergency personnel in the regions hardest hit by Hurricane Sandy are turning to Globalstar's duplex services for critical communications when all existing terrestrial

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[2] *Service Rules for Advanced Wireless Services in the 2000-2020 MHz and 2180-2200 MHz Bands*, Notice of Proposed Rulemaking and Notice of Inquiry, 27 FCC Rcd 3561 (2012) ("*2 GHz NPRM*").

[3] *See Flexibility for Delivery of Communications by Mobile Satellite Service Providers in the 2 GHz Band, the L-Band, and the 1.6/2.4 GHz Bands*, Report and Order and Notice of Proposed Rulemaking, 18 FCC Rcd 1962 (2003) ("*ATC Order*").

systems fail. Globalstar is working hard to develop an array of new and innovative MSS offerings for the public safety community and the rest of its growing customer base.

Yet, Globalstar wants to and should do more. In order to maximize public benefits, Globalstar must receive greater flexibility for terrestrial use of its Big LEO spectrum. With this Petition, Globalstar proposes both a long-term plan to utilize its full Big LEO spectrum allocation for a Frequency Division Duplex ("FDD") LTE-based mobile broadband network, as well as a completely separate near-term plan to utilize only the Upper Big LEO band at 2483.5-2495 MHz for an innovative terrestrial low-power service ("TLPS") offering. In the long run, by deploying an optimal mix of LTE and TLPS facilities in the Big LEO band, Globalstar will achieve a full and intensive terrestrial utilization of its spectrum.

Ultimately, the highest and best terrestrial use of Big LEO spectrum in most locations will involve the deployment of FDD LTE systems, with end user devices operating in the Lower Big LEO band and base stations in the Upper Big LEO band. With this planned FDD LTE build-out, Globalstar is not proposing any terrestrial use of its spectrum that would compromise the accuracy or dependability of Global Positioning System ("GPS") services. Globalstar's most successful products and services operate in the Lower Big LEO band and have built-in GPS chipsets for location awareness. As such, they depend entirely upon properly functioning GPS receivers and coexist in practice with GPS every day. Moreover, Globalstar's proposed FDD LTE terrestrial network architecture will require only low-power uplink transmissions from mobile handsets in its Lower Big LEO spectrum. Nevertheless, before FDD LTE can be deployed in the band, the Commission should address any concerns regarding the coexistence of GPS and commercial wireless operations within the Lower Big LEO band. With this Petition, Globalstar proposes an open and transparent rulemaking proceeding in which all interested

parties are invited to participate and resolve any issues that may be identified regarding Globalstar's terrestrial FDD LTE plans.

While the Commission and interested parties work through any technical issues described above, the Commission has an extraordinary opportunity to advance the rapid deployment of an innovative, pro-consumer terrestrial low-power service ("TLPS"). Acting now, the Commission can leverage Globalstar's spectrum location at 2.4 GHz, the public's prior investment in devices, and existing IEEE 802.11 technology to generate enormous benefits for American consumers. Applying a unique, hybrid spectrum approach, Globalstar will provide this low-power broadband service over 22 megahertz of spectrum that includes both Globalstar's exclusive terrestrial use spectrum at 2483.5-2495 MHz and adjacent unlicensed industrial, scientific and medical ("ISM") spectrum at 2473-2483.5 MHz. TLPS operations on this 2473-2495 MHz band segment are consistent with the 802.11 channelization scheme, which includes fourteen overlapping 22 megahertz channels between 2401 MHz and 2495 MHz.

If the Commission implements the necessary regulatory reforms to enable this hybrid approach, it will add 22 megahertz to the nation's wireless broadband spectrum inventory. In addition, this spectrum will be put quickly to use as American consumers utilize their existing 802.11-enabled devices to receive TLPS. This additional 802.11-based capacity will help alleviate the congestion – and frustration – currently experienced by many Wi-Fi users at high-traffic "hotspots" in dense metropolitan areas. TLPS will also deliver meaningful public safety benefits, since still-operating 802.11-based hotspots can provide much-needed broadband and voice communications to citizens in areas affected by hurricanes and other disasters. These TLPS-based public interest benefits will be long lasting, since TLPS deployments will likely

remain the most efficient, economically viable terrestrial application over the long term in many geographic areas, including areas with lower population densities.

To permit the eventual deployment of FDD LTE in the Big LEO band and enable the near-term roll-out of TLPS, the Commission should add co-primary Fixed and Mobile allocations to the 2483.5-2495 MHz band and make other necessary changes to Parts 1, 2, 25, and 27 of its rules. In addition to the new allocations, the Commission should adopt flexible terrestrial-use rules in the Upper Big LEO band that are similar to those proposed by the Commission in the *2 GHz NPRM*, albeit with certain distinctive elements. Given the similarity of Globalstar's proposed regulatory framework to the Commission's proposed AWS-4 approach at 2 GHz (as well as rules in other AWS bands), Globalstar believes that the Commission should refer to the terrestrial wireless spectrum at 2483.5-2495 MHz as the "AWS-5" band. As described *infra*, the Commission's pro-consumer, pro-investment AWS-5 framework should:

- Modify Globalstar's Big LEO license to include AWS-5 terrestrial authority, with common control of MSS and AWS-5 operations enabling intensive coordination to minimize interference to Globalstar's MSS offerings;
- Eliminate existing ATC gating requirements, including the substantial satellite service requirement and the dual-mode equipment requirement;
- Adopt flexible technical and operational rules similar to those applied in other terrestrial wireless bands, thus allowing the use of various technologies in this band
- Grant one national terrestrial authorization, rather than numerous geographic area licenses;
- Permit spectrum manager leases covering any volume of Big LEO spectrum and any geographic territory within the nationwide AWS-5 license area;
- Adopt performance requirements similar to those adopted in analogous commercial wireless bands that only become effective once the Commission has granted FDD LTE uplink authority in the Lower Big LEO band.

To accommodate the spectral mask of TLPS transmissions, the Commission should adopt an out-of-band emissions ("OOBE") limit for low-power operations in the AWS-5 band that is similar to what adjacent-band licensee Clearwire Corporation has proposed for terrestrial wireless operations in the 2.5 GHz Broadband Radio Service ("BRS")/Educational Broadband

Service ("EBS") band. To protect the integrity of the AWS-5 band, Globalstar will provide TLPS only to authenticated users and devices, and it will utilize available network management and security technologies to prevent unauthorized use of this spectrum.

If the Commission adopts the necessary reforms in the Big LEO band, Globalstar commits to deploying thousands of free TLPS access points in the nation's public and non-profit schools, community colleges, and hospitals. These free deployments will bring all of the TLPS-related benefits to these critical environments. In addition, if the Commission takes these regulatory steps, Globalstar commits to provide its mobile satellite service ***free of charge*** to Globalstar subscribers within any federally declared "disaster area" following natural and man-made disasters. With this offering, Globalstar customers will have the peace of mind of knowing that their satellite service is free during those times when they need the service the most.

At the same time that the Commission initiates a rulemaking proceeding on the AWS-5 band and the provision of TLPS, the Commission should begin a second, parallel proceeding on terrestrial operations in the Lower Big LEO band at 1610-1617.775 MHz. In that proceeding, the Commission should establish an open, transparent process for considering parties' remaining concerns regarding the coexistence of GPS systems and commercial mobile handsets in the Lower Big LEO band. Once the Commission resolves these technical issues, it should integrate the 1610-1617.775 MHz band into the AWS-5 block and extend its fundamental terrestrial-use reforms to this Lower Big LEO band spectrum. Globalstar will then move forward expeditiously with the deployment of Big LEO FDD LTE systems. Utilizing this globally emerging technology, Globalstar's nearly 20 megahertz of terrestrial use spectrum will help meet the nation's exploding spectrum demand and improve the quality of wireless service for American consumers.

By undertaking these Big LEO reforms and facilitating the delivery of these new services, the Commission will generate critical public interest benefits for American consumers and the U.S. economy. By establishing a flexible AWS-5 regulatory framework and allowing Globalstar to provide TLPS, the Commission will promote just the kind of innovative, efficient use of spectrum that the Chairman called for in his recent address on spectrum issues.[4] This roll-out of Globalstar-managed TLPS will add *22 megahertz* of additional spectrum to the nation's wireless broadband spectrum inventory, while ensuring the economic viability of its global Big LEO MSS system and all of the public interest benefits generated by that network. With reinvigorated MSS operations and a robust mobile broadband build-out in the MSS bands, Globalstar will be able to provide a full range of satellite and terrestrial services to consumers, public safety users, government and business customers, and rural and remote communities throughout the United States.

II. Globalstar's Commitment to Mobile Satellite Service

Existing MSS operations. Globalstar is a leading provider of mobile satellite voice and data services around the world. In 1995, the Commission authorized Globalstar to construct, launch, and operate a "Big LEO" MSS system.[5] Globalstar is licensed for uplink transmissions

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[4] *See Winning the Global Bandwidth Race: Opportunities and Challenges for Mobile Broadband*, Prepared Remarks of FCC Chairman Julius Genachowski, University of Pennsylvania – Wharton, Philadelphia, PA, at 3 (Oct. 4, 2012) ("*Genachowski Spectrum Speech*"), *available at*: <http://transition.fcc.gov/Daily_Releases/Daily_Business/2012/db1005/DOC-316661A1.pdf>.

[5] *Application of Loral/Qualcomm Partnership, L.P. For Authority to Construct, Launch, and Operate Globalstar, a Low Earth Orbit Satellite System to Provide Mobile Satellite Services in the 1610-1626.5 MHz/2483.5-2500 MHz Bands*, Order and Authorization, 10 FCC Rcd 2333 (IB 1995); *see also Spectrum and Service Rules for Ancillary Terrestrial Components in the 1.6/2.4 GHz Big LEO Bands; Review of the Spectrum Sharing Plan Among Non-Geostationary Satellite Orbit Mobile Satellite Service Systems in the 1.6/2.4 GHz Bands*, Second Order on Reconsideration, Second Report and Order, and Notice of Proposed Rulemaking, 22 FCC Rcd 19733, ¶¶ 8, 18-20 (2007).

(mobile earth stations to satellites) in the Lower Big LEO band at 1610-1618.725 MHz, and for downlink transmissions (satellites to mobile earth stations) in the Upper Big LEO band at 2483.5-2500 MHz.[6] Having invested over $5 billion to develop its global non-geostationary ("NGSO") MSS network, Globalstar today uses its global NGSO MSS constellation and 24 ground stations on six continents to provide cutting-edge MSS offerings to an expanding range of customers in the United States and around the world.

Globalstar initiated commercial service in 2000, and, based primarily on its duplex voice and data offerings, it enjoyed an approximately 30% annual growth in subscribership and revenues from 2003 to 2006. In early 2007, Globalstar's first-generation constellation suffered an unanticipated degradation of its S-band capability that temporarily precluded consistently reliable duplex voice and data services. In response, Globalstar refocused its energies on affordable consumer-based simplex products and services while simultaneously commencing the design, manufacture and launch of a second-generation constellation of satellites. As a result of this continuing growth, Globalstar currently provides affordable, high-quality MSS to more than 550,000 customers, including approximately 100,000 duplex (voice) customers, in over 120 countries around the world.[7] Globalstar became profitable on an Adjusted EBITDA basis during

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[6] Iridium is authorized to share spectrum with Globalstar at 1617.775-1618.725 MHz.

[7] In addition to individual consumers, Globalstar's customers include entities in government, the military, emergency preparedness, transportation, heavy construction, oil and gas, mining, forestry, and commercial fishing. For government and business customers, Globalstar's data solutions are ideal for asset and personal tracking, data monitoring, and supervisory control and data acquisition applications. Globalstar's services are available in all areas of the world, except in central and southern Africa, Southeast Asia, and the Indian subcontinent, areas in which Globalstar is working diligently to expand coverage.

the fourth quarter of 2011, and its financial results have improved during each subsequent quarter.[8]

Provision of mission-critical public safety services. Since initiating commercial MSS, Globalstar has been dedicated to providing mission-critical, emergency, and safety-of-life services to commercial, recreational, and government customers in remote, unserved, and underserved areas not reached by terrestrial deployments. In populated areas, Globalstar's MSS network provides critical back-up capabilities for public safety personnel during disasters when terrestrial facilities can be rendered unavailable. Public safety entities involved in relief efforts in the United States and around the world have relied on Globalstar's satellite services after earthquakes, hurricanes, and other disasters.

Globalstar's MSS network played a vital role during and after Hurricane Sandy's devastating effects in the Mid-Atlantic and Northeast regions of the United States, providing seamless communications in areas where terrestrial communications systems were damaged and rendered unavailable. For instance, New York Power Authority ("NYPA") employees at the Flynn Power Plant in Holtsville, New York relied exclusively on Globalstar MSS devices for their communications during the three-day period that terrestrial telephone and wireless systems were out of service. NYPA credited Globalstar as being "the only communications service functioning when all other wireless and landline systems went down." According to Frank Miller, the NYPA's Principal Communications Engineer, the Globalstar MSS equipment "performed as advertised. Once the plant made the initial call via Globalstar we all breathed a

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[8] Globalstar reported positive Adjusted EBITDA of $2.9 million for the three months ended June 30, 2012 compared to negative Adjusted EBITDA of $2.0 million for the three months ended June 30, 2011. This represented an increase of $4.9 million over the second quarter of 2011. *See* Globalstar Press Release, *Globalstar Announces Results for Second Quarter 2012 – Company Reports Continued Improvement in Adjusted EBITDA* (Aug. 9, 2012), *available at*: <http://www.globalstar.com/en/index.php?cid=7010&pressId=734>.

little easier. The whole purpose of our Globalstar implementation over the years was for events just like this one. We are quite satisfied with the service we received in the time of this emergency."

During post-Sandy recovery efforts, the New York Police Department requested an additional fifty MSS handsets in response to continued spottiness in traditional cellular service. Other agencies and organizations in the storm-affected area that have utilized Globalstar's MSS products and services include the Federal Emergency Management Agency, Metropolitan Transit Authority, the New York State Department of Environmental Protection, the Port Authority, Con Edison, and numerous hospitals. Overall, during and after the storm, Globalstar experienced a greater than 50% increase in duplex traffic throughout New York, New Jersey, and Connecticut, with the highest concentration of calls occurring in New York City. Existing customers increased their MSS usage, and significant numbers of Globalstar phones were activated by new users during this period.

In recent years, Globalstar has also focused on the development of affordable, consumer-oriented devices and services with significant public safety benefits. Most notably, Globalstar's innovative, consumer-oriented "SPOT" family of MSS devices has played a critical role in the provision of emergency and safety-of-life services to individual consumers beyond terrestrial wireless reach. From any location in Globalstar's global MSS footprint, SPOT devices can transmit a user's GPS coordinates and status updates to any e-mail, handheld device, or smartphone address in the world.[9] As of October 31, 2012, the family of SPOT devices has been used to achieve 2,113 emergency rescues, often life saving, in seventy-eight countries and at sea.

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[9] In June 2012, the United States Forest Service purchased 6,000 SPOT Satellite GPS Messenger devices in order to enhance employee safety. *See* Globalstar Press Release, *U.S. Forest Service Purchases 6,000 SPOT Devices* (June 27, 2012), *available at*: <http://www.globalstar.com/en/index.php?cid=7010&pressId=731>.

During 2012 alone, SPOT products have been used to achieve 595 rescues, more than two per day.[10]

Potentially bolstering the nation's public safety communications, Globalstar's MSS network can be used in conjunction with an "Emergency Response Interoperable Communications" ("ERIC") system to provide critical communications capabilities in affected areas in the first crucial hours after a catastrophic incident.[11] The ERIC system utilizes "drop-in" suitcases that can be deployed and utilized virtually immediately in areas where the existing terrestrial infrastructure has been damaged or disrupted and rendered temporarily unavailable. The ERIC system utilizes Globalstar's MSS network for seamless backhaul connectivity to public networks. While not yet authorized for operations in the United States, this system represents a highly cost-efficient means of providing flexible, robust, interoperable communications services to first responders and other public safety personnel.[12] Globalstar looks forward to demonstrating this technology to the Commission and other agencies in the near future.[13]

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[10] SPOT users receiving assistance have included hikers, boaters, pilots, and remote workers, among others. Specific examples include a Boy Scout troop leader who was seriously injured by a falling horse in Mount Hood National Forest and airlifted to safety by the National Guard, a backcountry skier in Norway who was located and rescued after being trapped at high elevation during a severe winter storm, and an Arkansas photographer who was rescued from a steep ravine after falling 30 feet in the Ozark National Forest.

[11] *See* Comments of Globalstar, Inc., PS Docket No. 11-15, at 6-8 (July 25, 2012) ("Globalstar ERIC Comments"); *see also* Comments of Globalstar Inc., NTIA, Docket No. 120928505-2505-01 (Nov. 1, 2012), *available at*: <http://www.ntia.doc.gov/files/ntia/globalstar_comments_-_firstnet_noi_11.01.12.pdf>.

[12] ERIC is capable of using spectrum that is licensed to existing commercial wireless, public safety, and private wireless operators, and the Commission is currently considering how and under what circumstances it might authorize the operation of ERIC and other similar aerial and ground-based emergency communications systems. *See Utilizing Rapidly Deployable Aerial Communications Architecture in Response to an Emergency,* Notice of Inquiry, 27 FCC Rcd 6402 (2012). Globalstar has made clear that these systems should operate only with the full approval and cooperation of the existing licensees whose bands will be utilized by these temporary operations. Globalstar ERIC Comments at 6-8. Globalstar looks forward to working

Second-generation MSS network. By mid-2013, Globalstar expects to become the first global LEO MSS voice and data company to complete the deployment of a state-of-the-art, second-generation MSS constellation that will enable *anyone* to stay connected beyond the reach of traditional terrestrial wireless networks. Pursuant to satellite construction and launch contracts with Thales Alenia Space and Arianespace, Globalstar has fully funded and almost entirely spent the more than $1 billion cost of designing, manufacturing, delivering, launching, and insuring the first 24 satellites of its second-generation MSS constellation.[14] Over the past two years, Globalstar has launched eighteen satellites of its second-generation MSS constellation, and all but one of these satellites had been placed into service as of the end of October 2012.[15] With the completion of these three launches, current subscribers and new users are experiencing substantially improved voice and duplex data performance on Globalstar's network.

The fourth and final launch necessary to return Globalstar to full duplex service is currently scheduled for February 2013 at the Baikonur Cosmodrome in Kazakhstan.[16] Once

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with commercial wireless carriers so that their customers can benefit from ERIC technology following disasters when existing terrestrial infrastructure is temporarily unavailable.

[13] Globalstar's commitment to provide satellite services free of charge in federally declared disaster areas, described *infra* at 44, includes free satellite services provided in conjunction with the ERIC system.

[14] Globalstar has also contracted with Thales AleniaSpace to upgrade its satellite operations and control center.

[15] Thales Alenia Space recently delivered to Globalstar the software patch needed to remedy a momentum wheel issue affecting one second-generation satellite currently in orbit. Globalstar has completed the upload of the software to this satellite and expects to place it back into commercial service in the very near future. This software solution could be utilized by Globalstar's other second-generation satellites should they experience any similar issues with their momentum wheels, which is not however anticipated.

[16] Globalstar has taken delivery of four of the final six satellites for the fourth launch, and these satellites are currently at the Cosmodrome being prepared for this launch. Globalstar expects to receive the final two satellites in December.

fully operational, Globalstar's second-generation MSS system will support highly reliable, crystal-clear CDMA-quality voice and data satellite services to the more than five billion consumers, public safety personnel, and other customers located within its global footprint. Globalstar's customers will enjoy the highest voice quality, fastest truly mobile data speeds, and the most affordable service in the MSS industry. Significant to the Commission's regulatory framework for MSS, Globalstar expects that by mid-2013, it will have the ability to meet the Commission's NGSO MSS coverage requirement (Section 25.143(b) of its rules) as applied to MSS voice and duplex data provided in both the Lower and Upper Big LEO bands.[17]

III. Globalstar's Business Plan for Terrestrial Operations in the Big LEO Band

A. Globalstar's Long-Term Terrestrial Goal: FDD LTE Operations in the Big LEO Band

In addition to the expansion of its consumer-based, safety-of-life MSS offerings, Globalstar's business plan includes the deployment of robust terrestrial wireless services throughout the Big LEO band. Certainly, Globalstar's licensed Big LEO MSS spectrum is uniquely positioned to support the simultaneous, robust build-out of mobile satellite and terrestrial mobile broadband services. Globalstar holds over 19 megahertz of terrestrial use spectrum in the Big LEO band, including almost eight megahertz of mobile uplink spectrum in the Lower Big LEO band at 1610-1617.775 MHz and 11.5 megahertz in the Upper Big LEO band at 2483.5-2495 MHz.[18] While Globalstar currently cannot operate terrestrial systems because it does not meet the Commission's ATC "gating" criteria, it is looking to the future as the Commission moves to allow more flexible and efficient terrestrial use of the MSS bands.

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[17] *See* 47 C.F.R. § 25.143(b).

[18] *Spectrum and Service Rules for Ancillary Terrestrial Components in the 1.6/2.4 GHz Big LEO Bands; Globalstar Licensee LLC, Authority to Implement an Ancillary Terrestrial Component*, Report and Order and Order Proposing Modification, 23 FCC Rcd 7210, ¶¶ 20-21, 30, 39 (2008).

Globalstar's Big LEO spectrum can support a variety of terrestrial mobile broadband applications and services. Globalstar's Upper Big LEO band spectrum at 2483.5-2495 MHz – which is already allocated internationally for Fixed and Mobile services – is a noise "refuge" in the 2.4 GHz band, with low-noise characteristics that significantly improve data capacity on a terrestrial wireless network. Meanwhile, Globalstar's Lower Big LEO band similarly enjoys unusually low interference and noise levels as well as highly favorable propagation characteristics, and, as a result, this band segment has among the highest data-carrying potential per hertz of any existing or anticipated commercial wireless band.[19] Globalstar notes that the terrestrial bandwidth requirements in its Lower Big LEO band uplink spectrum will be substantially less than in its downlink frequencies at 2483.5-2495 MHz, since most bandwidth consumption occurs on the downlink side. Thus, the quantitative asymmetry between Globalstar's Lower and Upper Big LEO band terrestrial-use spectrum will not limit the usefulness of this spectrum for terrestrial operations, as these band segments can still be paired for FDD operations.

Under its long-term plan for its licensed Big LEO spectrum, Globalstar in conjunction with future terrestrial wireless partners will deploy FDD LTE terrestrial wireless facilities in the paired Lower and Upper Big LEO bands on a widespread basis. Globalstar's Lower Big LEO band spectrum at 1610-1617.775 MHz will be used for terrestrial mobile device uplink operations, while its Upper Big LEO band spectrum at 2483.5-2495 MHz will be used for LTE base station downlink operations. Globalstar believes that such FDD LTE operations constitute the highest and

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[19] *See* Comments of Globalstar, Inc., ET Docket No. 10-142, at 7 (Sep. 15, 2010) ("Globalstar 2010 Comments").

best terrestrial use of the Big LEO band. Certainly, the development of LTE technology in the Big LEO band and elsewhere is a key component of America's broadband future.[20]

Globalstar recognizes, of course, that the Commission must address the coexistence of commercial mobile handsets and GPS systems before there can be a robust terrestrial use of the Lower Big LEO band. For this reason, the deployment of an FDD LTE network in the Big LEO band represents a long-term goal rather than a short-term operational plan, and Globalstar requests that the Commission initiate a separate and parallel rulemaking devoted to terrestrial operations in the Lower Big LEO band at 1610-1617.775 MHz.

B. The Commission Has a Unique Opportunity to Fashion a Rapidly Deployable, Pro-Consumer Terrestrial Low-Power Service in the Upper Big LEO Band

Even while any GPS-related concerns regarding use of the Lower Big LEO band are being resolved, the Commission has an extraordinary opportunity to realize the rapid deployment of an innovative, pro-consumer terrestrial low-power service in the Upper Big LEO band. By taking the regulatory actions described in Section V of this Petition, the Commission can leverage Globalstar's unique spectrum location, the public's prior investment in devices, and existing IEEE 802.11 technology to generate enormous benefits for American consumers. With Globalstar's diligent development and management of its licensed spectrum, the deployment of

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[20] *See*, *e.g.,* Qualcomm White Paper, *VoLTE with SRVCC: The Second Phase of Voice Evolution for Mobile LTE Devices*, at 1 (Oct. 31, 2012), *available at*: <http://www.qualcomm.com/media/documents/srvcc-white-paper> ("The 3GPP Long Term Evolution (LTE) high-speed, high-capacity data standard for mobile devices is well on its way to becoming a globally deployed standard. . . . It is clear that the majority of operators, both GSM and CDMA, will evolve their networks to LTE."); Interview of Kent German by Kara Tsuboi, CNET (Sept. 27, 2012), *available at*: <http://cnettv.cnet.com/lte-expanding-across-carriers-world/9742-1_53-50132071.html> (discussing how LTE is expanding to more cities, not only in the United States, but across the world, and is expected to become a global standard).

TLPS facilities should result in a highly productive and spectrally efficient use of the Upper Big LEO band during this interim period and beyond.

As described in the Technical Analysis in Appendix B to this Petition, the spectrum architecture for this Globalstar-controlled TLPS will be unique, made possible by the proximity of Globalstar's Upper Big LEO band to the ISM band below 2483.5 MHz.[21] Specifically, this innovative low-power service will be provided over 22 megahertz of spectrum at 2473-2495 MHz, encompassing both Globalstar's exclusive terrestrial use spectrum at 2483.5-2495 MHz and adjacent unlicensed ISM spectrum at 2473-2483.5 MHz.[22] This unique, hybrid spectrum approach will be consistent both with a new, more flexible regulatory framework for terrestrial operations in the Big LEO band,[23] and with existing Part 15 regulations for use of the ISM band.[24]

Globalstar-managed TLPS operations at 2473-2495 MHz will be based on IEEE 802.11 technology. As described in the Technical Analysis, the IEEE 802.11 standard specifies fourteen

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[21] Technical Analysis Regarding Globalstar's Proposed Terrestrial Low-Power Service, John Dooley (Appendix B) at 3-4 ("Technical Analysis").

[22] *Id*. at 3.

[23] As discussed in detail *infra* at 38-41 and in the Technical Analysis attached as Appendix B, Globalstar-managed TLPS will require not only a more flexible regulatory framework for MSS-terrestrial operations in the Upper Big LEO band, but also an out-of-band emissions limit that accommodates the emissions mask for TLPS transmissions.

[24] Any party can use the unlicensed ISM spectrum at 2473-2483.5 MHz as long as those operations do not cause interference to Globalstar's MSS operations above 2483.5 MHz. Globalstar-managed TLPS would co-exist with existing Bluetooth and other unlicensed uses of ISM spectrum without raising any harmful interference issues.

Globalstar's TLPS operations will not require a waiver or amendment of Section 15.249(d) of the Commission's rules, which states that "[e]missions radiated outside of the [2400-2483.5 MHz band], except for harmonics, shall be attenuated by at least 50 dB below the level of the fundamental or to the general radiated emission limits in §15.209, whichever is the lesser attenuation." 47 C.F.R. § 15.249(d). Globalstar's TLPS operations at 2483.5-2495 MHz will be functional, licensed, *in-band* transmissions in Globalstar's own Big LEO spectrum, not spurious or out-of-band emissions. The Commission's Section 15.249(d) out-of-band emissions limit will therefore be inapplicable to these TLPS operations above 2483.5 MHz.

overlapping 22 megahertz channels between 2401 MHz and 2495 MHz, and both the low-power TLPS base stations (or "access points") and consumer end-user devices will operate within the 22 megahertz band segment that the 802.11 standard designates as "Channel 14."[25] A key public interest benefit of TLPS will be consumers' ability to use *existing* handsets and other devices to receive this Globalstar-managed service. Most 802.11-enabled consumer devices have the hardware needed to operate at 2473-2495 MHz, but they lack the physical capability to operate above 2483.5 MHz in the United States because of restrictions in their radiofrequency ("RF") software.[26] If the Commission adopts the proposed AWS-5 rules, Globalstar and its future terrestrial partners will be able to transmit the necessary software update to authenticated customers' 802.11-enabled devices, and, virtually immediately, those devices will be able to operate above 2483.5 MHz and receive Globalstar's managed TLPS offering.[27] Thus, with the rollout of Globalstar-managed TLPS, consumers across the United States will be able to use their devices more efficiently and will rapidly gain access to terrestrial broadband spectrum that they would otherwise be unable to utilize.

Once a more flexible regulatory framework is in place for the Upper Big LEO band, Globalstar in conjunction with its terrestrial partners will likely deploy thousands of newly-

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[25] Technical Analysis at 1-3.

[26] *Facilitating Opportunities for Flexible, Efficient, and Reliable Spectrum Use Employing Cognitive Radio Technologies*, Report and Order, 20 FCC Rcd 5486, ¶ 73 n.112 (2005) ("*Cognitive Radio Order*"). As the Commission noted in the *Cognitive Radio Order* and as described in Globalstar's Appendix B Technical Analysis, unlicensed 802.11 transmissions at 2473-2495 MHz are effectively prohibited in the United States by Section 15.205(a) of the Commission's rules, which establishes Globalstar's licensed Big LEO spectrum at 2483.5-2500 MHz as a "restricted band" for unlicensed purposes. Technical Analysis at 2. Unlicensed operations on 802.11 Channels 12 and 13 are precluded in the United States by the Commission's Section 15.249(d) OOBE limit. *Id.* at 1-2.

[27] As discussed *infra* at note 105, before existing consumer devices can be modified to permit the reception of Globalstar-managed TLPS, the Commission will have to accept manufacturers' "permissive change" equipment certification filings for these devices.

manufactured TLPS access points across the United States.[28] While Globalstar's long-term vision for terrestrial use of the Big LEO band is focused on using FDD LTE technology, Globalstar-managed TLPS deployments will likely remain the most efficient, economically viable terrestrial application over the long term in some geographic areas, including areas with lower population densities. By deploying an optimal mix of LTE and TLPS facilities in the Big LEO band, Globalstar will achieve a full and intensive terrestrial utilization of its spectrum.

IV. By Adopting Fundamental Reform in the Big LEO Band, the Commission Will Advance Substantial and Critical Public Interest Benefits

If the Commission reforms its Big LEO rules to permit more flexible terrestrial use of Globalstar's spectrum, including the near-term deployment of TLPS, it will generate substantial public interest benefits. This new regulatory approach will encourage wireless broadband investment, help address the nation's need for additional broadband spectrum, and improve the quality of wireless service for American consumers. In addition, revenue from Globalstar's TLPS-related services and spectrum leases will help ensure the commercial viability of Globalstar's global MSS network, which provides significant public safety benefits.

A. Greater Terrestrial Flexibility in the Big LEO Band Will Help Address the Nation's Growing Spectrum Deficit

As the National Broadband Plan described, the convergence of Internet computing and mobile communications is fueling growth in consumer demand for mobile broadband services.[29] By 2015, it is expected that approximately 80 percent of total broadband subscriptions globally

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[28] As the Big LEO MSS licensee, Globalstar alone will be in a position to manage these TLPS operations, coordinate TLPS systems with its global NGSO MSS network, and minimize harmful interference to its MSS offerings. *See infra* at 29-30.

[29] *See* FCC, "Connecting America: The National Broadband Plan," at 76-77 (rel. March 16, 2010), *available at*: <http://download.broadband.gov/plan/national-broadband-plan.pdf> ("National Broadband Plan").

will be mobile subscriptions.[30] The use of broadband-capable smartphones continues to accelerate, with these devices now making up 41% of all wireless connections.[31] Smartphones currently generate 35-times more traffic than standard cellphones, and this data consumption will increase substantially as consumers more frequently use high-bandwidth applications on 4G networks.[32] Moreover, as Chairman Genachowski and Commissioner Pai have recently noted, tablet devices generate 121 times more traffic than traditional cellphones, and mobile-connected tablets are likely to produce as much traffic in 2016 as the entire global mobile network in 2012.[33] Overall, wireless data traffic more than doubled between July 2011 and June 2012,[34] and mobile traffic in the United States is projected to grow 16-fold by 2016.[35]

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[30] *See* Darrell M. West, Brookings Institution, *Ten Facts About Mobile Broadband*, at 2 (Dec. 8, 2011), *available at*: <http://www.brookings.edu/~/media/research/files/papers/2011/12/08%20mobile%20broadband%20west/1208_mobile_broadband_west.pdf> (citing Wireless Intelligence, July 2011; Informa Telecoms & Media (WBIS), July 2011). By 2015, it is expected that there will be 3.1 billion mobile broadband subscribers, compared to 848 million fixed broadband subscribers. *Id*.

[31] *See* Press Release, CTIA-The Wireless Association®, *Consumer Data Traffic Increased 104 Percent According to CTIA-The Wireless Association® Semi-Annual Survey* (Oct. 11, 2012) ("CTIA Study Press Release"), *available at*: <http://www.ctia.org/media/press/body.cfm/prid/2216>; *see also* CTIA Semi-Annual Mid-Year 2012 Top-Line Survey Results, *available at*: <http://files.ctia.org/pdf/CTIA_Survey_MY_2012_Graphics-_final.pdf>.

[32] *Genachowski Spectrum Speech* at 6 (stating that smartphones on a 4G network use 50% more data than the consumers using the same smartphone on a 3G network, because higher speeds and lower latency encourage the use of higher-bandwidth applications).

[33] *Genachowski Spectrum Speech* at 7; Remarks of Commissioner Ajit Pai at CTIA's MobileCon, San Diego, California, at 3 (Oct. 10, 2012), *available at*: <http://transition.fcc.gov/Daily_Releases/Daily_Business/2012/db1010/DOC-316746A1.pdf>. As Chairman Genachowski points out, in the future almost every imaginable device will have embedded Internet-connected sensors. Experts expect up to 50 billion Internet-connected devices by 2020.

[34] *See* CTIA Study Press Release.

[35] *Genachowski Spectrum Speech* at 3. *See also Cisco Visual Networking Index: Global Mobile Data Traffic Forecast Update, 2011-2016*, at 7 (Feb. 14, 2012), *available at*: <http://www.cisco.com/en/US/solutions/collateral/ns341/ns525/ns537/ns705/ns827/white_paper_c11-520862.pdf>. According to the Cisco study, global mobile data traffic overall will increase

This wireless broadband growth has created a pressing need for additional mobile broadband-capable spectrum in the United States. As Commissioner McDowell has observed, "[M]ore powerful 4G networks, sophisticated devices and complex mobile applications are taxing spectrum availability."[36] In a February 2012 study, the Council of Economic Advisors found that the current allocation of terrestrial wireless spectrum cannot accommodate the projected acceleration in mobile broadband demand, even with improvements in technology and substantial investment in new wireless facilities.[37] If this situation is insufficiently addressed and "wireless pathways are clogged, inefficiently used, or off-limits altogether,"[38] the "scarcity of

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18-fold between 2011 and 2016. Mobile data traffic will grow at a compound annual growth rate of 78 percent from 2011 to 2016, reaching 10.8 exabytes per month by 2016. *Id*. at 3.

[36] Remarks of the Honorable Robert M. McDowell Before *TIA 2012: Inside the Network*, Dallas, Texas, *A Spectrum Policy to Promote American Economic Growth*, at 5 (June 7, 2012), *available at*: <http://hraunfoss.fcc.gov/edocs_public/attachmatch/DOC-314505A1.pdf>. *See also* Prepared Remarks of Commissioner Mignon Clyburn, Second Annual Americas Spectrum Management Conference, Washington, DC, at 1 (Oct. 23, 2012), *available at*: <http://transition.fcc.gov/Daily_Releases/Daily_Business/2012/db1023/DOC-316948A1.pdf> ("The demand for mobile broadband is now growing at breathtaking speed. Today's smartphones generate 35 times more traffic than the standard cellphones, and last year alone in the U.S., mobile data traffic grew almost 300%."); Press Release, *FCC Commissioner Jessica Rosenworcel on Today's Report from the President's Council of Advisors on Science and Technology* (July 20, 2012), *available at*: <http://www.fcc.gov/document/commissioner-rosenworcel-todays-pcast-report> ("The demand for mobile broadband is growing at a breathtaking pace. So the pressure is on to find new and innovative ways to manage our spectrum resources.").

[37] *2 GHz NPRM* ¶ 10 (citing Council of Economic Advisors, *The Economic Benefits of New Spectrum for Wireless Broadband*, at 5 (Feb. 2012), *available at*: <http://www.whitehouse.gov/sites/default/files/cea_spectrum_report_2-21-2012.pdf>). In its own technical analysis in October 2010, the Commission estimated that the broadband spectrum deficit in the U.S. would likely approach 300 MHz by 2014. FCC Staff Technical Paper, *Mobile Broadband: The Benefits of Additional Spectrum*, at 2 (Oct. 2010), *available at*: <http://hraunfoss.fcc.gov/edocs_public/attachmatch/DOC-302324A1.pdf >.

[38] Remarks of FCC Commissioner Ajit Pai, *Unlocking Investment and Innovation in the Digital Age: The Path to a 21st-Century FCC*, Carnegie Mellon University, Pittsburgh, PA, at 7 (July 18, 2012) ("*Pai Spectrum Speech*"), *available at*: <http://hraunfoss.fcc.gov/edocs_public/attachmatch/DOC-315268A1.pdf>.

mobile broadband [spectrum] could mean higher prices, poor service quality, an inability for the U.S. to compete internationally, depressed demand and, ultimately, a drag on innovation."[39]

In response to this threatened spectrum gap, the Administration as well as the National Broadband Plan have called for an additional 500 MHz of spectrum to be made available for broadband use by 2020, including an additional 300 megahertz of spectrum suitable for flexible mobile use by 2015.[40] The Commission is utilizing a number of policy tools to reach these goals, and its hard work is yielding meaningful progress.[41] At the same time, the reallocation and auctioning of spectrum can be time-consuming processes,[42] and the television broadcast band, the federal government bands, and other targeted spectrum bands are unlikely to offer significant spectrum to the nation's broadband "spectrum inventory" for many years.[43]

In contrast to these bands, fundamental reform of the Big LEO band will *quickly* add more than twenty megahertz of broadband-capable spectrum to the U.S. spectrum inventory, and approximately eight megahertz more later, without the need for legislation or the relocation of incumbent licensees. Once the Commission adopts a flexible, Part 27 framework for terrestrial operations in the Upper Big LEO band, Globalstar will be able to implement TLPS almost

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39 National Broadband Plan at 77.

40 *Id.* at 84; *Genachowski Spectrum Speech* at 4.

41 *See Genachowski Spectrum Speech* at 9-10 (describing the Commission's multi-faceted effort to free up additional broadband spectrum, including the use of incentive auctions, the removal of regulatory barriers, dynamic spectrum sharing, the reallocation of government spectrum, and the use of white spaces). Chairman Genachowski in this speech noted that the Commission is "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." *Id*. at 5.

42 *Id.* at 3.

43 *See Pai Spectrum Speech* at 8 ("If we stay on our present course, we cannot meet the targets of the National Broadband Plan. In order to meet the first benchmark, we need to free up 300 MHz of spectrum for wireless broadband in the next 32 months. If we are to have any chance of meeting this goal, we will have to act quickly.").

immediately and make the 2473-2495 MHz band segment available for broadband use throughout the United States. Consumers around the country will be able to use their existing smartphones, tablets, and other wireless devices to receive this innovative service. Globalstar's TLPS deployments will benefit these consumers by helping to alleviate the increasing congestion that is impeding the use of existing 802.11 ISM channels in dense metropolitan areas.[44] As Chairman Genachowski has observed, accelerating Internet usage and resulting congestion have diminished the quality of Wi-Fi service at high-traffic 802.11 "hotspots."[45] With the deployment of additional 802.11-based capacity, Globalstar and its terrestrial partners will be able to provide consumers with improved wireless broadband service, including faster data speeds and better Voice over Internet Protocol ("VoIP") functionality.[46] In addition, Globalstar's TLPS deployments will deliver meaningful public safety benefits. During disasters such as Hurricane Sandy, still-operating 802.11-based hotspots can provide broadband and voice communications to citizens in affected areas who otherwise lack access to communications services.[47] The addition of TLPS facilities will augment this important post-disaster communications resource.

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[44] In the 2.4 GHz ISM band, the three primary unlicensed 802.11 Wi-Fi channels in the United States are Wi-Fi Channels 1, 6, and 11.

[45] *See Genachowski Spectrum Speech* at 11 ("Wi-Fi networks [are] get[ting] more and more congested – have you tried using Wi-Fi in a busy airport recently?").

[46] Terrestrial carriers could also "offload" their broadband services on to Globalstar's TLPS spectrum, much as they do with Wi-Fi offload today. This practice improves the quality of carriers' wireless voice and lower-speed data services for consumers.

[47] *See, e.g.*, Arik Hesseldahl, *After Sandy, Wi-Fi Becomes Precious Commodity*, ALL THINGS D, Oct. 31, 2012, *available at*: <http://allthingsd.com/20121031/after-sandy-wi-fi-becomes-precious-commodity/?reflink=ATD_yahoo_ticker>. *See also* Strixsystems Case Study, *WiFi Mesh for Public Safety*, *available at*: <http://www.strixsystems.com/cswifimeshforpublicsefety.aspx> (viewed Nov. 7, 2012) ("The public safety and emergency services communities require the use of broadband WiFi mesh networking for 'always available' high-speed connectivity to people, video surveillance cameras, strategic and tactical equipment, databases and much more.").

Accordingly, by granting Globalstar's Petition and implementing a new regulatory approach in the Big LEO band, the Commission can reduce the spectrum deficit, help make maximum, efficient use of all available spectrum, and promote wireless broadband investment throughout the country.

B. Greater Terrestrial Flexibility Will Enhance the Commercial Viability of Globalstar's Global MSS Network

By adopting fundamental reform in the Big LEO band, the Commission can also help ensure the commercial viability of Globalstar's MSS network. If the Commission establishes a flexible, Part 27 framework for the new terrestrial AWS-5 block, Globalstar will work to put this spectrum to use soon after the Commission's action. Globalstar may in many instances deploy TLPS systems on its own, providing customized services to its core public safety and industrial customer base, for example. Globalstar may also enter into joint ventures with terrestrial partners, leveraging the assets of existing wireless carriers and other technology companies. As indicated above, Globalstar has invested over $1 billion in the deployment of just its second-generation MSS constellation, and revenues from these future terrestrial services and spectrum leases will help cover these substantial capital costs as well as the ongoing operational costs of providing MSS. In addition, these revenues will enable Globalstar to invest in further MSS product development and roll out innovative MSS offerings like its family of SPOT devices. Thus, the requested Commission action will give Globalstar a stronger financial foundation on which to deliver its state-of-the-art satellite services and extraordinary public safety benefits to consumers, businesses, and governmental and public safety users in the United States and around the world.

V. The Commission Should Expeditiously Adopt Pro-Consumer, Pro-Investment Reform in the Upper Big LEO Band that Is Similar to the Proposed Reform in the 2 GHz MSS Band

In order to realize the full public interest potential of the Big LEO band, the Commission should expeditiously adopt pro-consumer, pro-investment reform that is similar to the Commission's proposed reform in the 2 GHz MSS band. Following up on the Commission's "AWS-4" proposal at 2 GHz, the Commission should add co-primary Fixed and Mobile allocations in the Upper Big LEO band at 2483.5-2495 MHz and establish a new terrestrial wireless band in that spectrum, identified as "AWS-5," that includes a flexible regulatory framework for terrestrial operations. The Commission should establish this new AWS-5 regulatory framework in Part 27 of its rules, with the amendments and additions to Parts 1, 2, 25, and 27 of the Commission's rules specified in Appendix A to this Petition. Once Globalstar gains greater terrestrial flexibility and is operating its completed second-generation MSS constellation and new ground segment infrastructure, Globalstar will deploy innovative new services and products in Big LEO spectrum – both satellite-based and terrestrial offerings – that will greatly benefit customers in the United States and elsewhere.

Globalstar expects that, in the future, the 1610-1617.775 MHz band will be incorporated into the AWS-5 framework and the Commission's terrestrial-use reforms will be extended to the Lower Big LEO band. Globalstar recognizes that near-term action in the 1.6 GHz band may not be possible, however, and, as addressed further below, it proposes a separate and parallel rulemaking track for that band. In the meantime, the Commission can and should undertake rapid reform in the Upper Big LEO band, where Globalstar will be able to deploy innovative, pro-consumer services with extraordinary public interest benefits almost overnight.

A. The Commission's Ongoing Shift to More Flexible Rules for MSS-Terrestrial Operations

In 2003, the Commission adopted rules for MSS ATC operations in the Big LEO band and other MSS bands.[48] Under the Commission's ATC framework, an MSS licensee must meet certain "gating" requirements in order to provide terrestrial service in its spectrum. These requirements include the provision of "substantial satellite service" and the deployment of dual-mode devices that have built-in MSS and terrestrial capability.[49] Globalstar obtained ATC authority in 2006 and is the only MSS operator to have had ATC deployments in its spectrum.[50] Globalstar has found, however, that the ATC framework is not conducive to the robust terrestrial use of MSS spectrum. As the National Broadband Plan pointed out in 2010, the restrictive nature of the MSS ATC rules has "made it difficult for MSS providers to deploy ancillary terrestrial networks, as well as to establish partnerships with wireless providers or other well-capitalized potential entrants."[51]

In response to the National Broadband Plan and recognizing the paucity of terrestrial operations in the MSS bands, the Commission in July 2010 issued a Notice of Inquiry as a first step toward eliminating regulatory barriers to terrestrial use of existing MSS spectrum.[52] The

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48 *ATC Order*, *supra* note 3.

49 47 C.F.R. § 25.149(b).

50 *Globalstar LLC; Request for Authority to Implement an Ancillary Terrestrial Component for the Globalstar Big LEO Mobile Satellite Service (MSS) System (Call Sign ES2115)*, Order and Authorization, 21 FCC Rcd 398 (IB 2006) ("*Globalstar ATC Authorization Order*").

51 National Broadband Plan at 88. Since the release of the National Broadband Plan, the Commission has made similar findings regarding the effects of its MSS ATC regulatory framework. In the *2 GHz NPRM*, the Commission stated that, given changing circumstances, "we believe that the ATC regulations would no longer be the best framework for development of terrestrial mobile broadband in this band." *2 GHz NPRM* ¶ 136.

52 *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-*

Commission specifically asked how it "can best increase the value, utilization, innovation and investment in the spectrum for terrestrial services throughout the 2 GHz, Big LEO and L-bands."[53] In its September 2010 comments, Globalstar proposed revisions to the Commission's ATC gating requirements, including elimination of the dual-mode equipment requirement. In addition, Globalstar proposed that MSS-terrestrial providers have operational flexibility similar to other terrestrial wireless operators.[54]

In March 2012, the Commission took another significant step toward reforming its MSS ATC framework with its Notice of Proposed Rulemaking on terrestrial use of the 2 GHz MSS band.[55] The Commission proposed a new terrestrial "AWS-4" band at 2 GHz and, to avoid interference problems in the band, it tentatively decided to modify DISH's MSS license to include the resulting AWS-4 terrestrial authorizations rather than assign "initial" AWS-4 licenses at auction.[56] The Commission also proposed to eliminate the ATC gating requirements in the 2 GHz band,[57] and to apply flexible Part 27-type rules to terrestrial operations at 2 GHz.[58] The

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2200 MHz, Notice of Proposed Rulemaking and Notice of Inquiry, 25 FCC Rcd 9481 (2010) ("*NPRM/NOI*").

[53] *NPRM/NOI* ¶ 26. The Commission in early 2011 granted a conditional waiver of its ATC rules to LightSquared. Had GPS interference concerns in the L band been resolved, this waiver would have permitted LightSquared to lease or sell wholesale MSS capacity to terrestrial wireless carriers who, in turn, could use that spectrum to provide terrestrial-only service to retail customers with single-mode terrestrial devices. *LightSquared LLC Request for Modification of its Authority for an Ancillary Terrestrial Component*, Order and Authorization, 26 FCC Rcd 566 (2011) ("*LightSquared Order*"). In February 2012, the Commission concluded that the GPS interference issues in the MSS L band would not be resolved within the foreseeable future, and proposed to rescind the ATC waivers granted to LightSquared. Public Notice, *International Bureau Invites Comment on NTIA Letter Regarding LightSquared Conditional Waiver*, 27 FCC Rcd 1596 (IB 2012).

[54] Globalstar 2010 Comments at ii-iv.

[55] *See 2 GHz NPRM*.

[56] *Id.* ¶¶ 69-71.

[57] *Id.* ¶ 136.

Commission's proposals in the *2 GHz NPRM* received widespread support from commenters, who recognized that this more flexible approach would promote the development of terrestrial mobile broadband in 2 GHz spectrum.

The Commission should build on the momentum toward greater terrestrial use of MSS spectrum by adopting pro-consumer, pro-investment reforms in the Big LEO band. The Commission should adopt the National Broadband Plan's recommendation to take "actions that will optimize license flexibility sufficient to increase terrestrial broadband use of MSS spectrum"[59] while also preserving the MSS industry's unique services. As described below, the Commission's rulemaking proposal on terrestrial use of Big LEO spectrum should incorporate a number of the basic reforms proposed by the Commission in the *2 GHz NPRM*.

B. The Commission Should Add Fixed and Mobile Allocations to the Upper Big LEO Band at 2483.5-2495 MHz

As the foundation for its pro-consumer, pro-investment reform in the Big LEO band, the Commission should modify the United States Table of Frequency Allocations in Section 2.106 of its rules by adding Fixed and Mobile allocations to the 2483.5-2495 MHz band. This change will harmonize the Commission's allocations at 2483.5-2495 MHz with the International Table of Allocations, which includes Fixed and Mobile allocations in this spectrum band in all regions, and will lay the groundwork for greater terrestrial flexibility in this Big LEO spectrum.[60] These new allocations will be co-primary with the existing MSS allocation in the band.

With the addition of co-primary Fixed and Mobile allocations to the 2483.5-2495 MHz band, the Commission should also modify footnote US380 to the Table of Frequency

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58 *Id.* ¶¶ 28-29.

59 National Broadband Plan at 87.

60 *See* 47 C.F.R. § 2.106.

Allocations, which states that ATC operations are permitted at 2483.5-2495 MHz. Along with adding terrestrial service allocations and eliminating the ATC framework in this spectrum (discussed below), the Commission should remove the references to the Upper Big LEO band from this footnote.[61]

C. The Commission Should Modify Globalstar's MSS License to Incorporate Terrestrial Authority in the New AWS-5 Band

With co-primary Fixed and Mobile allocations in place, the Commission should establish a new terrestrial "AWS-5" band at 2483.5-2495 MHz. As described below, the Commission should adopt a Part 27 regulatory framework for the AWS-5 band that permits flexible terrestrial use of the Upper Big LEO band spectrum. Similar to its 2 GHz proposal, the Commission should further promote investment, innovation, and greater spectrum efficiency by modifying Globalstar's MSS license under Section 316 of the Communications Act of 1934, as amended (the "Act") to include terrestrial authority in the AWS-5 band.[62]

Under Section 316 of the Act, the Commission has the authority to modify a station license if "in the judgment of the Commission such action will promote the public interest, convenience, and necessity."[63] Modification of Globalstar's MSS license to include AWS-5 authority will generate pro-consumer, pro-investment benefits and will meet this Section 316 standard. As explained *supra* in greater detail, this action will promote spectrum efficiency,

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[61] Globalstar notes that Footnote US380 references the entire Upper Big LEO band at 2483.5-2500 MHz, rather than just Globalstar's current ATC spectrum at 2483.5-2495 MHz. The Commission should delete this reference.

[62] 47 U.S.C. § 316.

[63] 47 U.S.C. § 316(a)(1). In *California Metro Mobile Communications v. FCC*, the D.C. Circuit stated that "Section 316 grants the Commission broad power to modify licenses; the Commission need only find that the proposed modification serves the public interest, convenience and necessity." *California Metro Mobile Communications v. FCC*, 365 F.3d 38, 45 (D.C. Cir. 2004).

make additional spectrum available for wireless broadband, enhance post-disaster public safety, help ensure the financial viability of Globalstar's global MSS network, and improve wireless services for U.S. consumers.

Significantly, this license modification will also prevent the harmful interference that would result from the assignment of AWS-5 authority to a licensee other than Globalstar. As the Commission found in its 2003 *ATC Order* and tentatively concluded in the *2 GHz NPRM*, spectrum sharing between separately licensed and controlled MSS and terrestrial wireless operators is not feasible.[64] Common control of the MSS and terrestrial operations in the AWS-5 band will be necessary to coordinate satellite and terrestrial operations and minimize interference to Globalstar's MSS offerings. In fact, given that NGSO satellites are constantly in motion, the need for common control is imperative in the Big LEO context. Tracking satellite beam patterns and dynamically allocating channels between the NGSO and terrestrial systems over time is extremely complex, and Globalstar itself must protect the integrity of its satellite services.[65]

In addition, there will likely be an evolving mix of terrestrial services in the AWS-5 band (including TLPS and FDD LTE), further complicating MSS-terrestrial coordination and heightening the need for Globalstar's control of this spectrum. With this control, Globalstar will be able to manage the size and location of any MSS exclusion zones that result from various

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[64] *ATC Order* ¶ 52; *2 GHz NPRM* ¶¶ 69-72.

[65] If the Commission were to assign the terrestrial authority in the AWS-5 band through competitive bidding, the new AWS-5 licensee would have to share its Upper Big LEO band spectrum not only with Globalstar's MSS network, but also with any ATC facilities that Globalstar deploys under its pre-existing ATC authority. (With the fourth and final launch in early 2013, Globalstar expects that its ATC authority would be fully restored by the Commission before the end of next year.) Such spectrum sharing between two separately controlled, competing terrestrial wireless systems would be technically infeasible. In proposing to modify DISH's license to include the new AWS-4 authority in the 2 GHz band, the Commission similarly pointed out the infeasibility of spectrum sharing between new, separately-licensed terrestrial facilities and any ATC systems that might be deployed by DISH. *2 GHz NPRM* ¶ 70.

terrestrial services in the band, with the goal of limiting such zones to core metropolitan areas where Globalstar's MSS network receives very little usage.[66]

D. For the Pro-Consumer, Pro-Investment AWS-5 Regulatory Framework, the Commission Should Eliminate Gating Requirements for Terrestrial Operations

To encourage investment and free additional broadband spectrum, the Commission should eliminate the gating requirements for terrestrial operations in the Upper Big LEO band, contained in Section 25.149 of the Commission's rules.[67] The relevant portions of Section 25.149 should be deleted, and no similar requirements should be incorporated into the new Part 27 AWS-5 rules. As the Commission found in the *2 GHz NPRM*, applying gating requirements no longer represents the best approach for developing terrestrial mobile broadband in MSS spectrum. Accordingly, for terrestrial operations in the AWS-5 band, the only "gating" factor should be that Globalstar holds its MSS license in good standing at the time the Commission assigns these new terrestrial rights.

First, the Commission should eliminate the existing "substantial satellite service" gating requirement for terrestrial operations in the Upper Big LEO band, including the requirements for 100% MSS coverage, the deployment of orbital spares, and nationwide commercial availability.[68] The removal of this gating requirement will increase terrestrial operators' interest in Big LEO spectrum and encourage investment in mobile broadband at AWS-5. With this step,

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[66] In the *2 GHz NPRM*, the Commission proposed a rule requiring that the terrestrial AWS-4 licensee protect the incumbent 2 GHz MSS licensee from harmful interference. *2 GHz NPRM* ¶ 68. An analogous rule is not necessary in the proposed regulatory framework for the Upper Big LEO band, since in this band the MSS licensee and the nationwide AWS-5 licensee should always be the same entity. As that licensee, Globalstar will manage its Upper Big LEO band spectrum in the manner necessary to minimize harmful interference.

[67] 47 C.F.R. § 25.149.

[68] These requirements are currently contained in Section 25.149(b)(1)-(3) of the Commission's rules. 47 C.F.R. § 25.149(b)(1)-(3).

Globalstar's prospective terrestrial partners will have greater confidence that terrestrial authority will remain in place and terrestrial services will not be disrupted in the event of satellite failures beyond those operators' control.[69] This approach will also protect consumers who rely on uninterrupted terrestrial service provided in the AWS-5 band.

Moreover, perpetuation of the substantial satellite service gating requirement is not necessary to ensure Globalstar's provision of robust MSS offerings. Globalstar is fully committed to the continued development and future success of its MSS business. As described above, Globalstar has invested over $5 billion in its global MSS network, and it is nearing full deployment of its second-generation MSS constellation. By mid-2013, Globalstar will have the ability to meet the Commission's Part 25 NGSO MSS coverage requirement.[70] Given the ongoing, vigorous competition among MSS providers, Globalstar and other MSS licensees have a strong incentive to maximize their signal coverage in order to attract and retain customers in the United States and worldwide.[71]

The Commission should also eliminate the integrated services ATC gating requirement, which effectively requires any terrestrial device to be dual-mode with built-in MSS capability.[72]

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[69] In recent years, Globalstar has held discussions with numerous potential terrestrial partners, and all of these parties have pointed to the substantial satellite service requirement as a strong deterrent against any terrestrial investment in MSS spectrum.

[70] 47 C.F.R. § 25.143(b)(2)(i)-(iii).

[71] Globalstar competes vigorously with the two other global MSS providers, Inmarsat and Iridium, and also competes with regional mobile satellite communications services that are available in several areas of the world. Globalstar competes as well with Fixed Satellite Service ("FSS") operators that offer communications services to business customers through private networks using very small aperture terminals ("VSATs"). *See* Comments of Globalstar Licensee, LLC, IB Docket No. 10-99, at 7-9 (Aug. 23, 2010).

[72] Under Section 25.149(b)(4) of the Commission's rules, an MSS licensee can satisfy the Commission's "integrated services" requirement by demonstrating that it will use a dual-mode handset that can communicate with both the MSS network and the MSS ATC component to provide the proposed ATC service. As an alternative to this dual-mode "safe harbor," an MSS

Dual-mode MSS-terrestrial devices have limited appeal to individual consumers and even to most government and business customers. Given consumers' preferences, the primary effect of the Commission's dual-mode requirement has been to discourage the development of terrestrial operations in the MSS bands. Permitting consumers to obtain terrestrial-only service via lightweight, single-mode devices will enable Globalstar to use AWS-5 spectrum efficiently and provide consumers with the innovative, market-ready services they want.[73]

E. The Commission Should Apply Technical Rules to AWS-5 Operations that Are Similar to the Rules Applied to Other Commercial Wireless Services

The existing technical requirements for terrestrial operations in the Big LEO band are contained in Section 25.254 of the Commission's rules. In adopting a Part 27 regulatory framework for the AWS-5 band, the Commission should incorporate appropriate components of Section 25.254 into new and modified provisions of Part 27, as delineated in Appendix A to this Petition. For instance, power limits for terrestrial operations in the Big LEO band should be incorporated into Section 27.50 of the Commission's rules (new Section 27.50(i)), while the OOBE limits for terrestrial systems should be integrated into Section 27.53 of its rules (Section 27.53(n)).[74] Rules requiring interference protection for GPS systems at 1.5/1.6 GHz and other

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licensee can provide "other evidence" establishing that it will provide an integrated service offering to the public. 47 C.F.R. § 25.149(b)(4)(i), (ii).

[73] The absence of a dual-mode requirement in the new MSS-terrestrial framework will not eliminate dual-mode capability from the MSS marketplace. Some MSS customers greatly value dual-mode functionality, and for competitive reasons most MSS operators will likely offer equipment that provides such capability. In conjunction with its technology partners, Globalstar continues to develop devices that provide dual-mode functionality, particularly for first responders and other public safety personnel.

[74] As described in Section V.H *infra*, Globalstar urges the Commission to adopt a specific OOBE limit for low-power services in the AWS-5 band, in order to permit the deployment of innovative TLPS operations.

systems in the 2450-2500 MHz band (*e.g.*, Broadcast Auxiliary Service facilities) should be incorporated into new Sections 27.1402 and 27.1403, respectively.[75]

In establishing its Part 27 AWS-5 regulatory framework for the 2483.5-2495 MHz band, the Commission should adopt flexible technical and operational rules, as it has for other commercial wireless services.[76] As in the case of other terrestrial wireless bands, Globalstar in the AWS-5 band should not be required to seek operational authority from the Commission on a technology-by-technology basis. Rather, Globalstar should have the freedom to utilize any technology or protocol (*e.g.*, LTE, 802.11) in the AWS-5 spectrum that will not cause harmful interference to other systems and services.[77] Among other things, the Commission should lift its prohibition on end-user device transmissions in the Upper Big LEO band (a rule the Commission waived in the Open Range proceeding).[78] This flexible technical approach will promote optimal use of the AWS-5 band and maximize benefits for consumers.

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[75] A number of Part 27 technical rules are applicable to all Part 27 services, including: Section 27.51 Equipment authorization; Section 27.52 RF safety; Section 27.54 Frequency stability; Section 27.56 Antenna structures; air navigation safety; and Section 27.63 Disturbance of AM broadcast station antenna patterns. 47 C.F.R. §§ 27.51, 27.52, 27.54, 27.56, 27.63. Globalstar proposes that all of these provisions apply to the AWS-5 licensee at 2483.5-2495 MHz.

[76] The Commission's AWS-5 framework should permit the AWS-5 licensee to employ this spectrum for any terrestrial use permitted by the U.S. Table of Frequency Allocations (*i.e.*, fixed or mobile services), as revised by the Commission in this proceeding.

[77] Globalstar acknowledges that the Commission's technical and operational rules for the AWS-5 band must account for the "spectrum neighborhood" surrounding this band.

[78] *See* 47 C.F.R. 25.149(a)(1); *Globalstar Licensee LLC; Application for Modification of License for Operation of Ancillary Terrestrial Component Facilities*, Order and Authorization, 23 FCC Rcd 15975, ¶ 31 (2008).

F. Other Service Rules, Including Spectrum Leasing and Nationwide Licensing in the AWS-5 Band

Consistent with its existing secondary market approach for MSS ATC spectrum,[79] the Commission should promote broadband investment and greater spectrum efficiency by permitting spectrum manager leasing in the AWS-5 band.[80] As in other terrestrial wireless services, Globalstar should be able to enter into spectrum manager leases that cover any amount of spectrum and any geographic territory within its license area. To maintain common control over all MSS and terrestrial operations in the band – critical for minimizing harmful interference to Globalstar's MSS offerings – the Commission should not permit either *de facto* transfer leasing[81] or the partition or disaggregation of the AWS-5 license to other entities.[82]

In addition, Globalstar urges the Commission to establish one unified, nationwide terrestrial authorization in the AWS-5 band that mirrors the geographic scope of Globalstar's MSS authorization.[83] A nationwide AWS-5 license will promote the flexible, efficient use of this broadband-capable spectrum. In contrast, establishing numerous geographic-area terrestrial licenses in the AWS-5 band would create needless administrative burdens for the Commission

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[79] 47 C.F.R. 25.149(g).

[80] *See, e.g., Promoting Efficient Use of Spectrum Through Elimination of Barriers to the Development of Secondary Markets*, Report and Order and Further Notice of Proposed Rulemaking, 18 FCC Rcd 20604 (2003).

[81] The Commission previously prohibited *de facto* transfer leasing in MSS ATC spectrum, and in the *2 GHz NPRM* the Commission proposed to permit *de facto* transfer leases only to the extent that it will allow the disaggregation and partitioning of AWS-4 spectrum and licenses. *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*, Report and Order, 26 FCC Rcd 5710, ¶¶ 14-19 (2011); *2 GHz NPRM* ¶ 117.

[82] For its spectrum manager leasing proposal, Globalstar requests amendment of the Commission's rules by the addition of Section 1.9046 (*see* Appendix A), while Globalstar's proposed prohibition on the partitioning and disaggregation of Big LEO spectrum is contained in proposed Section 27.15 in that Appendix.

[83] *See* proposed Section 27.6 in Appendix A.

and Globalstar without generating any public interest benefits.[84] In addition, the license term for the AWS-5 authorization should be fifteen years beginning on the effective date of the Commission's order on terrestrial reform in the Upper Big LEO band.[85] This period is equivalent to the license term for Globalstar's MSS space and earth station licenses.[86]

The license renewal provisions proposed for the AWS-4 licensee in the *2 GHz NPRM* should also be adopted by the Commission in the AWS-5 context.[87] Globalstar agrees that renewal of its AWS-5 license should be conditioned on its presentation of a detailed description of its provision of service during that license period. This renewal showing should include a description of the level and quality of the service provided (*e.g.*, number of subscribers and service offered), the date service began, information about any service interruptions, and details about any service to rural or tribal areas.[88] Finally, consistent with Section 27.10 of its rules, the Commission should require the AWS-5 licensee to indicate the regulatory status – common carrier, non-common carrier, or both – of the services that it chooses to provide.[89]

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[84] If a primary benefit of geographic area licensing is enabling multiple parties to hold authority in a particular spectrum band, that benefit should not be a consideration in the Big LEO band. As described above, Globalstar must control all MSS and terrestrial operations in Big LEO spectrum to minimize interference to its MSS offerings.

[85] *See* proposed Section 27.13 in Appendix A.

[86] *See* 47 C.F.R. § 25.121(a).

[87] *2 GHz NPRM* ¶¶ 121-124.

[88] *See* proposed Section 27.1401 in Appendix A.

[89] 47 C.F.R. § 27.10. While Globalstar as the AWS-5 licensee would be regulated primarily under Section 27 of the Commission's rules, it would also be required to comply with the requirements of other parts of the Commission's rules, including: application filing procedures for the Universal Licensing System, set forth in Part 1 of the Commission's rules (*see* 47 C.F.R. Part 1, Subpart F); practices and procedures listed in Part 1 of the Commission's rules for license applications and adjudicatory proceedings; the Commission's environmental provisions, including Section 1.1307 (47 C.F.R. § 1.1307); and the antenna structure provisions of Part 17 of the Commission's rules.

G. Performance Requirements for FDD LTE Operations in the Big LEO Band

Globalstar supports terrestrial wireless build-out obligations in the Big LEO band as a means of ensuring the full, efficient use of this spectrum. Globalstar also agrees with the Commission's finding in the *2 GHz NPRM* that the terrestrial performance requirements for a particular MSS band should be tailored to the unique circumstances of that band.[90] In addition, any performance requirements adopted by the Commission should be achievable and should reasonably accommodate a range of business plans, including both a new entrant's build-out of a competitive network and an MSS licensee's partnership or joint venture with existing terrestrial wireless operators.

As described *supra* at 13-15, Globalstar believes that, in most areas, the highest and best terrestrial use of the Big LEO band will be for FDD LTE operations. Given concerns regarding the coexistence of GPS systems and commercial wireless operations in the L band, however, Globalstar recognizes that it may require additional time for the Commission to authorize FDD LTE throughout the Big LEO band, including mobile uplink operations in the Lower Big LEO band.[91] Once the Commission permits FDD LTE operations throughout the Big LEO band, the Commission should adopt Big LEO terrestrial performance requirements that are similar to those that it has previously applied in other analogous commercial wireless bands.[92] In measuring signal coverage or other evidence of licensee activity, the Commission should account for Globalstar's build-out of both LTE and TLPS facilities, since the Big LEO band will ultimately

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[90] *2 GHz NPRM* ¶ 92.

[91] In Section VI *infra*, Globalstar requests that the Commission initiate a separate rulemaking process on terrestrial use of the Lower Big LEO band.

[92] Since geographic area licensing does not make sense in the Big LEO band and should not be adopted there, performance requirements in the Big LEO band should only be applicable to Globalstar's total, nationwide license area.

support an optimal mix of these terrestrial services. As described *infra* at 43-44, during the period prior to the Commission's grant of FDD LTE authority throughout the band, Globalstar commits to meeting a number of public interest obligations with respect to its planned TLPS deployment in the Upper Big LEO band as well as its provision of services after a disaster.[93]

In the event of non-compliance with these future Big LEO terrestrial performance requirements, the Commission should apply a case-by-case enforcement approach that accounts for the specific circumstances in this band and utilizes a variety of enforcement measures, including the reduction of Globalstar's license term, monetary penalties, and implementation of remediation plans. Any Commission sanctions should be tailored to the severity of the non-compliance at issue. The Commission's penalties should not be so severe that they would reduce potential consumer benefits by discouraging rather than promoting broadband investment and intensive use of the Big LEO spectrum.

In the *2 GHz NPRM*, the Commission proposed that DISH's nationwide MSS and terrestrial authority would automatically terminate if the licensee failed to comply with its interim three-year construction milestone.[94] This draconian approach would deter investment in Big LEO broadband facilities and potentially disenfranchise consumers. Certainly, it would be inappropriate for the Commission to impose a "death penalty" that nullifies Globalstar's

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[93] At the same time that the Commission permits FDD LTE (or other wireless broadband) operations throughout the entire Big LEO band and adopts terrestrial performance requirements for this spectrum, the Commission should adopt a provision regarding the permanent discontinuance of service, similar to what it proposed in the *2 GHz NPRM*. *2 GHz NPRM* ¶ 125. If after meeting its build-out requirements the AWS licensee's terrestrial wireless broadband service is discontinued throughout its nationwide license area for 180 consecutive days, the licensee's terrestrial authorization at 2483.5-2495 MHz and 1610-1617.775 MHz should automatically terminate.

[94] *2 GHz NPRM* ¶ 94. For non-compliance with the proposed seven-year requirement at 2 GHz, the Commission proposed the automatic termination of DISH's MSS and terrestrial authority within the relevant AWS-4 geographic area licenses. *Id*.

authority to provide MSS to consumers in the event it fails to meet its terrestrial performance requirement. As described above, Globalstar's growing MSS business provides satellite service to over 550,000 customers and provides enormous public safety benefits, and its customers should not be penalized because of issues relating to terrestrial build-out.

H. Issues Specific to Provision of TLPS

As indicated *supra* at 15-18, the Commission has an extraordinary opportunity to realize the deployment of an innovative terrestrial low-power wireless broadband service at 2473-2495 MHz, which includes the proposed AWS-5 band and utilizes a portion of the unlicensed ISM band below 2483.5 MHz. With the necessary regulatory action, Globalstar will be able to offer TLPS to consumers very quickly in numerous areas of the United States.[95]

To enable the roll-out of TLPS, the Commission should adopt an OOBE limit for low-power operations in the AWS-5 band that accommodates the spectral mask of Globalstar's TLPS transmissions. Meanwhile, Globalstar will protect the integrity of the AWS-5 band by providing TLPS only to authenticated users and devices and utilizing available technologies to prevent

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[95] Globalstar expects that TLPS will consist entirely of wireless broadband Internet access and interconnected VoIP service rather than interconnected mobile voice service, and, as such, will not be considered a Commercial Mobile Radio Service ("CMRS") or subject to Title II common carrier regulation. *See Appropriate Regulatory Treatment for Broadband Access to the Internet Over Wireless Networks*, Declaratory Ruling, 22 FCC Rcd 5901, ¶¶ 11, 13, 25-26 (2007); *Implementation of Section 6002(b) of the Omnibus Budget Reconciliation Act of 1993,* Fifteenth Report, 26 FCC Rcd 9664, ¶ 4 nn.26 & 27 (2011). TLPS will likely be subject to the Commission's mobile data roaming requirements, contained in Section 20.12 of the Commission's rules. 47 C.F.R. § 20.12(e); *See generally Reexamination of Roaming Obligations of Commercial Mobile Radio Service Providers and Other Providers of Mobile Data Services*, Second Report and Order, 26 FCC Rcd 5411 (2011) (*Data Roaming Order*), *appeals pending sub nom. Cellco P'ship v. FCC*, Nos. 11-1135 & 11-1136 (D.C. Cir. filed May 13, 2011). Given the unique, 802.11-base nature of TLPS technology and the absence of technological compatibility between TLPS and other mobile data services, however, Globalstar anticipates that, under Section 20.12(e) of the Commission's rules, it will be reasonable for TLPS providers not to offer data roaming arrangements. 47 C.F.R. § 20.12(e)(ii), (iii).

unauthorized use of this spectrum. If permitted to provide TLPS, Globalstar commits to using its Big LEO spectrum to meet specific, important public interest goals.

1. The Commission Should Adopt an Out-of-Band Emissions Limit Specifically Applicable to TLPS

To permit TLPS deployment at 2473-2495 MHz, the Commission should adopt an OOBE limit at the 2495 MHz band edge that is appropriate for such low-power operations. As described in the Technical Analysis in Appendix B to this Petition, the emissions mask for TLPS transmissions – both for consumer devices and low-power base stations – is different from the emissions mask for devices and base stations operating as part of higher-power commercial wireless services.[96] This low-power service is based on wide-band 802.11 technology, and TLPS end-user device and access point transmissions at 2473-2495 MHz will have more extensive sidebands than high-power commercial wireless devices and base stations.[97] To accommodate this technology and allow the roll-out of Globalstar-managed TLPS systems, the Commission should adopt the following OOBE standard for low-power operations in the AWS-5 band:

> For digital stations with EIRPs below 36 dBm, the attenuation factor shall be not less than 40 + 10 log (P) dB at the channel edge, 43 + 10 log(P) dB at 5 MHz from the channel edges, and 55 + 10 log (P) dB at X MHz from the channel edges where X is the greater of 6 MHz or the actual emission bandwidth.[98]

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[96] Technical Analysis at 4-5.

[97] As described in the Technical Analysis at 4, 802.11 TLPS emissions will occupy more than twice the channel bandwidth (approximately 22 MHz) than would have been utilized by other FDD or TDD technologies (likely 10 MHz channels).

[98] TLPS end-user devices cannot consistently meet the OOBE limit that is currently applicable to ATC mobile devices in the Lower Big LEO band: -57.1 dBW/30 kHz at the edge of the licensed MSS frequency assignment. 47 C.F.R. § 25.254(b). Nor can TLPS devices consistently comply with the OOBE limit currently applicable to end-user devices in adjacent Broadband Radio Service spectrum: 43 + 10 log (P) dB at the channel edge and 55 + 10 log (P) at 5.5 megahertz from the channel edge. 47 C.F.R. § 27.53(m)(4). In a pending rulemaking proceeding, the Commission is addressing the OOBE standard for BRS end-user devices. *See Amendment of Parts 1, 21, 73, 74 and 101 of the Commission's Rules to Facilitate the Provision of Fixed and Mobile Broadband Access, Educational and Other Advanced Services in the 2150-2162 and 2500-2690 MHz Bands*, Fourth Further Notice of Proposed Rulemaking, 26 FCC Rcd

Actual 802.11-based TLPS end-user devices operating at typical power levels should consistently comply with Globalstar's proposed OOBE limit. As described in the Technical Analysis, given the lack of passive filtration in existing 802.11-enabled consumer devices, 802.11 transceivers display virtually uniform emission masks, even across disparate chipset and device architectures.[99] Surveys of current-generation mobile devices in the Commission's equipment certification database indicate that the conducted power levels associated with these devices will enable compliance with the proposed OOBE limit without the need for additional hardware-based filtration.[100]

With respect to TLPS access points, Globalstar commits to incorporating the necessary filtering to ensure that these low-power base stations also comply with the proposed OOBE limit.[101] TLPS access points should *not* be required to meet the more stringent OOBE limit that is normally applicable to high-power commercial wireless base stations, which operate at up to four hundred times the effective radiated power level of these TLPS access points. TLPS access

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8133 (2011). In that proceeding, Clearwire has proposed OOBE limits for the BRS spectrum that are similar to the standard that Globalstar proposes here for the Upper Big LEO band. *See Ex Parte* Letter from Cathy Massey, Clearwire Corporation, to Marlene Dortch, Secretary, FCC, WT Docket No. 03-66, RM-11614, at 1 (Oct. 19, 2012). Globalstar has engaged in discussions with Clearwire regarding the OOBE limits for both the Big LEO and BRS/EBS bands, and Globalstar continues to work cooperatively with Clearwire on these issues. *See Ex Parte* Letter of L. Barbee Ponder IV, Globalstar, Inc., to Marlene Dortch, Secretary, FCC, WT Docket No. 03-66, RM-11614 (Nov. 5, 2012) ("Clearwire OOBE Letter").

[99] Technical Analysis at 6.

[100] *Id*. at 6-7.

[101] As described in the Technical Analysis at 7, 802.11 access point transceivers may generate spectral regrowth products that exceed the proposed OOBE limit. Remedial filtration in TLPS access points will consist of passive filtration devices applied to the RF path of the 802.11 transceiver in a band-pass configuration. The choice of filtration technology and method of design integration will be influenced by the form factor, economics, and power level associated with any given TLPS base station application. *Id*. at 8.

points will typically operate at a power level of 4 watts (36 dBm), making these transceivers more analogous to commercial wireless end-user devices than to CMRS base stations.[102]

As described in the Technical Analysis, TLPS end-user devices and access points that comply with Globalstar's proposed OOBE limit are unlikely to cause harmful interference to BRS systems operating on Channel BRS-1 at 2496-2502 MHz.[103] Given the low power levels of TLPS transmissions, TLPS operations will have much less impact on the RF environment than the higher-power systems operating in conventional commercial wireless networks. Moreover, BRS operators in the adjacent 2.5 GHz band have carefully studied and proposed virtually the same OOBE limit for wideband transmissions in their own band,[104] and application of a similar OOBE standard in adjacent Big LEO spectrum should provide adequate protection to BRS-1. Finally, the risk of harmful interference to BRS-1 will be further mitigated by Globalstar's incorporation of the passive filtering described above into its TLPS access points.

2. In Providing TLPS, Globalstar Will Protect the Integrity of the AWS-5 Band

In implementing and providing TLPS, Globalstar will protect the integrity of the AWS-5 band. Globalstar will provide TLPS only to approved customers and devices. Importantly, Globalstar will control the availability of the software update necessary for a 802.11 consumer device to operate throughout the 2473-2495 MHz band and receive TLPS. Globalstar will provide this software update only to device models that have been certified by the Commission

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[102] While commercial wireless mobile devices usually operate at a power level of approximately 1 watt, commercial wireless base stations typically operate at a power level up to 1585 watts (62 dBm).

[103] Technical Analysis at 9-10.

[104] *See* Clearwire OOBE Letter.

to operate in this expanded frequency range,[105] and only to customers who have been authenticated to receive service over its TLPS facilities.

Once TLPS becomes operational, Globalstar will utilize available network management and security technologies to prevent unauthorized use of the 2473-2495 MHz band. These measures will build upon already robust access control layers, which have evolved to support secure carrier and enterprise utilization of public 802.11 channels. Such control layers will permit Globalstar and its future terrestrial partners to secure TLPS access points and manage their operation through a network operating systems in a manner analogous to conventional femto or pico cellular infrastructure.

Globalstar will employ specific network security technologies such as Access Point Authentication Server ("APAS") in implementing provider-managed TLPS operations. APAS and similar approaches will require TLPS access points to authenticate end-user devices with a central management server over regular time intervals. A declined authentication will immediately terminate the access point's communications with a given device. Network security for TLPS is further supported by software and firmware barriers in base stations and end-user devices. These barriers are already highly effective today in limiting 802.11 use to ISM frequencies below 2473 MHz. TLPS implementation will trigger additional development of

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[105] Under the Commission's equipment certification rules, in order to expand the operating frequency range of existing 802.11-enabled consumer devices to include Globalstar's licensed spectrum at 2483.5-2495 MHz, the original grantees for those device models (or their authorized third-party agents) will have to submit "permissive change" filings describing the proposed modifications. 47 C.F.R. § 2.1043. Once the Commission formally "accepts" these permissive changes for the relevant devices, the remote software updates can proceed and these devices can be used to receive TLPS. Globalstar anticipates that, in contrast, most if not all TLPS access points will be newly manufactured equipment, and that these base stations along with next-generation TLPS-enabled consumer devices will receive new equipment certifications from the Commission.

integrated software and firmware security, permitting complete control of access point and device functionality and further reducing the likelihood of unauthorized TLPS operations.

In areas where Globalstar in conjunction with its terrestrial partners decides to transition from TLPS to an FDD LTE-based high-power deployment, authorized use of TLPS may be limited or terminated via the network operating system and APAS or equivalent access control layers. In the unlikely event that a small population of unauthorized TLPS devices remains operational in these areas, strong interference from a ubiquitous high-power LTE application will clear such residual usage. This omnipresent interference will be analogous to the impact that microwave oven operations at 2450 MHz have on 802.11-enabled devices on 802.11 Channels 7-8.

3. Globalstar Commits to Meeting Important Public Interest Goals

In addition to providing the public benefits inherent in its satellite and proposed terrestrial services, Globalstar hereby commits to meeting key public interest goals in conjunction with its proposed deployment of TLPS systems. If the Commission grants Globalstar the terrestrial flexibility needed to implement TLPS, Globalstar commits to deploying up to twenty thousand TLPS access points ***free of charge*** in the nation's public and non-profit schools, community colleges, and hospitals.[106] This action will further the statutory goal of improving broadband access in these critical environments.[107] Even at institutions that already have widely-deployed 802.11 facilities, Globalstar's TLPS deployments could significantly enhance the quality of

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[106] A "public" hospital is a hospital that is owned by a federal, state, or local government, receives government funding, and provides medical care free of charge. A "non-profit" hospital conducts business for the benefit of the general public without shareholders and without a profit motive.

[107] 47 U.S.C. § 254(h)(2). *See, e.g., Schools and Libraries Universal Service Support Mechanism*, Report and Order and Further Notice of Proposed Rulemaking, 25 FCC Rcd 6562, ¶ 33 (2009) ("Congress charged the Commission with establishing competitively neutral rules to enhance access to advanced telecommunications and information services for all public and nonprofit elementary and secondary school classrooms and libraries").

portable, wireless broadband for individuals at these locations. The Commission has previously found that such a commitment to privately-funded broadband deployments constitutes a significant public interest benefit.[108]

If the Commission takes the regulatory steps necessary for TLPS deployment, Globalstar further commits to provide its mobile satellite service ***free of charge*** to Globalstar subscribers within any federally declared "disaster area" following a natural or man-made disaster.[109] In the aftermath of Hurricane Sandy and other recent natural disasters in the United States, it is clear that this commitment could deliver substantial future benefits to the public safety community as well as the general public. At the very least, Globalstar customers will have the peace of mind of knowing that their satellite service is free during those times when they need the service the most.

VI. The Commission Should Conduct a Separate, Parallel Rulemaking on Terrestrial Operations in Lower Big LEO Band

Under its long-term plan for terrestrial operations, Globalstar, either on its own or in conjunction with one or more terrestrial partners, will deploy an FDD LTE terrestrial wireless network in the Big LEO band. As described *supra* at 13-15, Globalstar anticipates that, in the future, its Lower Big LEO band spectrum at 1610-1617.775 MHz will be used for terrestrial

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[108] *See, e.g., Applications filed by Qwest Communications International Inc. and CenturyTel, Inc. d/b/a CenturyLink for Consent to Transfer Control*, Memorandum Opinion and Order, 26 FCC Rcd 4194, ¶ 37 (2011) ("CenturyLink's broadband deployment and adoption commitments constitute public interest benefits. We emphasize that these voluntary commitments rely on private investment, and do not rely on public funding sources such as universal service support. This type of private-sector investment in broadband, and the competition it will promote among providers, is critical to ensuring a healthy and innovative broadband ecosystem and to encouraging new products and services that benefit American consumers and businesses of every size.").

[109] Under federal law, the President has authority to declare a state to be a disaster area in response to a gubernatorial request. *See* Robert T. Stafford Disaster Relief and Emergency Assistance Act, Pub. L. No. 100-707, signed into law November 23, 1988, amending the Disaster Relief Act of 1974, Pub. L. No. 93-288.

mobile device uplink operations, while its Upper Big LEO band spectrum at 2483.5-2495 MHz will be used for LTE base station downlink operations. Globalstar continues to believe that mobile device operations represent the highest and best terrestrial use of the Lower Big LEO band.

With the application of globally emerging FDD LTE technology, Globalstar's nearly 20 megahertz of terrestrial use spectrum will help meet the nation's exploding spectrum demand and improve the quality of wireless service for American consumers. To date, however, flexible terrestrial use of the L band has been prevented by concerns regarding the coexistence of commercial wireless systems with GPS equipment and devices. Based on its own analysis, Globalstar believes that LTE uplink operations in the Lower Big LEO band are unlikely to cause harmful interference to GPS receivers. These operations at 1610-1617.775 MHz would (i) be a considerable spectral distance away from the GPS center frequency at 1575.42 MHz, and (ii) consist only of low-power mobile uplink transmissions rather than high-power base station operations. Given these factors, Globalstar believes that the Commission could retain the existing OOBE limits that Globalstar and the National Telecommunications and Information Administration agreed to in the Lower Big LEO band in 2006, when the Commission first granted Globalstar MSS ATC authority while carefully considering the interests of government users of GPS technology in light of low-power uplink operations.[110]

Globalstar nonetheless recognizes that other parties may have different views on these GPS technical issues. Globalstar appreciates the enormous value of GPS and the importance of protecting GPS systems and devices around the world from interference. Indeed, GPS is a critical component of Globalstar's own family of SPOT devices.

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[110] *Globalstar ATC Authorization Order* ¶ 23.

Accordingly, to resolve any concerns about the coexistence of Big LEO terrestrial mobile devices with GPS systems, Globalstar requests that the Commission initiate a separate, parallel rulemaking on terrestrial operations at 1610-1617.775 MHz. Before integrating this spectrum into the AWS-5 block and extending terrestrial-use reforms to the Lower Big LEO band, the Commission should establish a process for further technical study of these GPS issues.[111] This process should be transparent and open to all interested parties, providing ample opportunity for presentation of parties' technical analysis. For its part, Globalstar is committed to working cooperatively with GPS industry members to resolve any technical issues presented by this Petition.

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[111] Once the Commission resolves the relevant technical issues and integrates the 1610-1617.775 MHz band into the Part 27 AWS-5 framework, the fundamental reforms adopted in the Upper Big LEO band should become effective in this Lower Big LEO band spectrum. Globalstar's Big LEO license should be modified to include AWS-5 terrestrial authority at 1610-1617.775 MHz, and the Commission should apply the terrestrial-use policies described in this Petition to the Lower Big LEO band, including the elimination of gating requirements, flexible technical and operational rules, a nationwide license area, flexible spectrum manager leasing, and appropriate performance requirements (*see* Section V, *supra*). The technical rules for terrestrial operations in the Lower Big LEO band should account for the spectral proximity of GPS and other systems, and Globalstar expects that the 1610-1617.775 MHz band will continue to be designated exclusively for mobile device uplink operations.

While there is no international allocation for terrestrial service in the Lower Big LEO band (*see* 47 C.F.R. § 2.106), this allocation issue should not prevent the Commission from applying its pro-consumer, pro-investment reforms to Globalstar's 1.6 GHz spectrum. The Commission can authorize a "non-conforming" use of a spectrum band as long as it adopts a regulatory framework that will prevent harmful interference to other licensed services, both within and outside the United States. *See*, *e.g.*, *PanAmSat Licensee Corp.; Application for Authority to Use Extended Ku-Band Frequencies for Domestic Service*, Order and Authorization, 20 FCC Rcd 14642, ¶¶ 6, 10-11 (IB 2005) ("In considering requests for non-conforming spectrum uses, the Commission has indicated that it would generally grant such waivers 'when there is little potential for interference into any service authorized under the Table of Frequency Allocations and when the non-conforming operator accepts any interference from authorized services'"). Globalstar believes that the Commission can establish a technical framework in the Lower Big LEO band that will avoid such harmful interference to GPS systems and any other licensed service in adjacent and nearby spectrum.

VII. Conclusion

For the reasons described in this Petition, Globalstar urges the Commission to issue a Notice of Proposed Rulemaking that undertakes pro-consumer, pro-investment reform of the regulatory framework for Big LEO terrestrial operations and proposes the necessary amendments to Parts 1, 2, 25, and 27 of the Commission's rules.

Respectfully submitted,

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APPENDIX A

Proposed Rules

Globalstar proposes to amend 47 CFR parts 1, 2, 25, 27 as follows:

PART 1 – PRACTICE AND PROCEDURE

1. The authority citation for Part 1 continues to read as follows:

AUTHORITY: 15 U.S.C. 79 *et seq.;* 47 U.S.C. 151, 154(i), 154(j), 155, 157, 225, 303(r), and 309.

2. Section 1.9046 is added to read as follows:

§ 1.9046 Special provisions relating to spectrum leasing arrangements involving the 2483.5-2495 MHz band.

The AWS licensee in the 2483.5-2495 MHz band may enter into a spectrum manager leasing arrangement with a spectrum lessee (*see* § 1.9020). Notwithstanding the provisions of §§ 1.9030 and 1.9035, a licensee at 2483.5-2495 MHz is not permitted to enter into a *de facto* transfer leasing arrangement with a spectrum lessee.

PART 2— FREQUENCY ALLOCATIONS AND RADIO TREATY MATTERS; GENERAL RULES AND REGULATIONS

3. The authority citation for part 2 continues to read as follows:

   Authority: 47 U.S.C. 154, 302a, 303, and 336, unless otherwise noted.

4. Section 2.106, the Table of Frequency Allocations, is amended as follows:

a. Page 38 is revised

b. In the list of United States (US) Footnotes, footnote US380 is revised.

§ 2.106 Table of Frequency Allocations.

The revision reads as follows:

5.150 5.282 5.395	5.150 5.282 5.393 5.394 5.396		2390-2395 MOBILE US276 2395-2400 G122 2400-2417 5.150 G122 2417-2450 Radiolocation G2 5.150	2390-2395 AMATEUR MOBILE US276 2395-2400 AMATEUR 2400-2417 AMATEUR 5.150 5.282 2417-2450 Amateur 5.150 5.282	Aviation (87) Amateur Radio (97) Amateur Radio (97) ISM Equipment (18) Amateur Radio (97)
2450-2483.5 FIXED MOBILE Radiolocation 5.150 5.397	2450-2483.5 FIXED MOBILE RADIOLOCATION 5.150		2450-2483.5 5.150 US41	2450-2483.5 FIXED MOBILE Radiolocation 5.150 US41	ISM Equipment (18) TV Auxiliary Broadcasting (74F) Private Land Mobile (90) Fixed Microwave (101)
2483.5-2500 FIXED MOBILE MOBILE-SATELLITE (space-to-Earth) 5.351A Radiolocation 5.150 5.371 5.397 5.398 5.399 5.400 5.402	2483.5-2500 FIXED MOBILE MOBILE-SATELLITE (space-to-Earth) 5.351A RADIODETERMINATION-SATELLITE (space-to-Earth) 5.398 RADIOLOCATION 5.150 5.402	2483.5-2500 FIXED MOBILE MOBILE-SATELLITE (space-to-Earth) 5.351A RADIOLOCATION Radiodetermination-satellite (space-to-Earth) 5.398 5.150 5.400 5.402	2483.5-2500 MOBILE-SATELLITE (space-to-Earth) US319 US380 US391 RADIODETERMINATION-SATELLITE (space-to-Earth) 5.398 5.150 5.402 US41	2483.5-2495 FIXED MOBILE MOBILE-SATELLITE (space-to-Earth) US380 RADIODETERMINATION-SATELLITE (space-to-Earth) 5.398 5.150 5.402 US41 US319 NG147 2495-2500 FIXED MOBILE except aeronautical mobile MOBILE-SATELLITE (space-to-Earth) US380 RADIODETERMINATION-SATELLITE (space-to-Earth) 5.398 5.150 5.402 US41 US319 US391 NG147	ISM Equipment (18) Satellite Communications (25) ISM Equipment (18) Satellite Communications (25) Wireless Communications (27)
2500-2520 FIXED 5.410 MOBILE except aeronautical mobile 5.384A 5.405 5.412	2500-2520 FIXED 5.410 FIXED-SATELLITE (space-to-Earth) 5.415 MOBILE except aeronautical mobile 5.384A 5.404	2500-2520 FIXED 5.410 FIXED-SATELLITE (space-to-Earth) 5.415 MOBILE except aeronautical mobile 5.384A MOBILE-SATELLITE (space-to-Earth) 5.351A 5.407 5.414 5.414A 5.404 5.415A	2500-2655	2500-2655 FIXED US205 MOBILE except aeronautical mobile	Wireless Communications (27)
2520-2655 FIXED 5.410 MOBILE except aeronautical mobile 5.384A BROADCASTING-SATELLITE 5.413 5.416 5.339 5.405 5.412 5.417C 5.417D 5.418B 5.418C	2520-2655 FIXED 5.410 FIXED-SATELLITE (space-to-Earth) 5.415 MOBILE except aeronautical mobile 5.384A BROADCASTING-SATELLITE 5.413 5.416 5.339 5.417C 5.417D 5.418B 5.418C	2520-2535 FIXED 5.410 FIXED-SATELLITE (space-to-Earth) 5.415 MOBILE except aeronautical mobile 5.384A BROADCASTING-SATELLITE 5.413 5.416 5.403 5.414A 5.415A 2535-2655 FIXED 5.410 MOBILE except aeronautical mobile 5.384A BROADCASTING-SATELLITE 5.413 5.416 5.339 5.417A 5.417B 5.417C 5.417D 5.418 5.418A 5.418B 5.418C	5.339 US205	5.339	

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UNITED STATES (US) FOOTNOTES

* * * * *

US380 In the bands 1525-1544 MHz, 1545-1559 MHz, 1610-1645.5 MHz, and 1646.5-1660.5 MHz, ~~and 2483.5-2500 MHz,~~ a non-Federal licensee in the mobile-satellite service (MSS) may also operate an ancillary terrestrial component in conjunction with its MSS network, subject to the Commission's rules for ancillary terrestrial component and subject to all applicable conditions and provisions of its MSS authorization.

* * * * *

PART 25— SATELLITE COMMUNICATIONS

5. The authority citation for part 25 continues to read as follows:

   Authority: 47 U.S.C. 701-744. Interprets or applies Sections 4, 301, 302, 303, 307, 309 and 332 of the Communications Act, as amended, 47 U.S.C. Sections 154, 301, 302, 303, 307, 309 and 332, unless otherwise noted.

6. Section 25.143 is amended by revising paragraphs (i) and (k) to read as follows:

§ 25.143 Licensing provisions for the 1.6/2.4 GHz mobile-satellite service and 2 GHz mobile-satellite service.

*****

(i) Incorporation of ancillary terrestrial component base stations into ~~a 1.6/2.4 GHz mobile-satellite service network or~~ a 2 GHz mobile-satellite service network. Any licensee authorized to construct and launch ~~a 1.6/2.4 GHz or~~ a 2 GHz mobile-satellite system may construct ancillary terrestrial component (ATC) base stations as defined in §25.201 at its own risk and subject to the

conditions specified in this subpart any time after commencing construction of the mobile-satellite service system.

*****

(k) Aircraft. ATC mobile terminals must be operated in accordance with 25.136(a). All portable or hand-held transceiver units (including transceiver units installed in other devices that are themselves portable or hand-held) having operating capabilities in the 2000-2020/2180-2200 MHz ~~or 1610-1626.5 MHz/2483.5-2500 MHz~~ bands shall bear the following statement in a conspicuous location on the device: "This device may not be operated while on board aircraft. It must be turned off at all times while on board aircraft."

7. Section 25.149 is amended by revising the section heading, revising paragraph (a)(1), removing and reserving paragraphs (a)(2)(iii), (b)(1)(iii), and (b)(5)(ii), and revising paragraphs (d) and (e), to read as follows:

§ 25.149 Application requirements for ancillary terrestrial components in the mobile-satellites service networks operating in the 1.5/1.6 GHz~~, 1.6/2.4 GHz,~~ and 2 GHz mobile-satellite service.

(a) ***

(1) ATC shall be deployed in the forward-band mode of operation whereby the ATC mobile terminals transmit in the MSS uplink bands and the ATC base stations transmit in the MSS downlink bands in portions of the 2000-2020 MHz/2180-2200 MHz bands (2 GHz band)~~,~~ and the 1626.5–1660.5 MHz/1525–1559 MHz bands (L-band)~~, and the 1610-1626.5 MHz/2483.5-2500 MHz bands~~.

*****

(d) Applicants for an ancillary terrestrial component authority shall demonstrate that the applicant does or will comply with the provisions of §1.924 of this chapter and 25.203(e) through 25.203(g) and with §25.252~~,~~ or §25.253, ~~or §25.254,~~ as appropriate, through certification or explanatory technical exhibit.

(e) Except as provided for in paragraph (f) of this section, no application for an ancillary terrestrial component shall be granted until the applicant has demonstrated actual compliance with the provisions of paragraph (b) of this section. Upon receipt of ATC authority, all ATC licensees must ensure continued compliance with this section and §25.252~~,~~ or §25.253, ~~or §25.254,~~ as appropriate.

*****

8. Section 25.254 is removed in its entirety and reserved.

§25.254 [Removed and Reserved].

9. Section 25.255 is amended by revising the section heading as follows:

§ 25.255 Procedures for resolving harmful interference related to operation of ancillary terrestrial components operating in the 1.5/1.6 GHz~~, 1.6/2.4 GHz,~~ and 2 GHz bands.

PART 27—MISCELLANEOUS WIRELESS COMMUNICATIONS SERVICES

10. The authority citation for part 27 continues to read as follows:

    Authority: 47 U.S.C. 154, 301, 302, 303, 307, 309, 332, 336, and 337 unless otherwise noted.

11. Section 27.1 is amended by adding paragraph (b)(10) to read as follows:

§ 27.1 Basis and purpose.

*****

(b) ***

(10) 2483.5-2495 MHz.

*****

12. Section 27.2 is amended by revising paragraph (a) and adding paragraph (d) to read as follows:

§ 27.2 Permissible uses.

(a) Miscellaneous wireless communications services. Except as provided in paragraphs (b) and (d) of this section and subject to technical and other rules contained in this part, a licensee in the frequency bands specified in §27.5 may provide any services for which its frequency bands are allocated, as set forth in the non-Federal Government column of the Table of Allocations in §2.106 of this chapter (column 5).

*****

(d) 2483.5-2495 MHz. Operators in the 2483.5-2495 MHz band may not provide mobile-satellite service under the provisions of this part; rather, mobile-satellite service shall be provided in a manner consistent with part 25 of this chapter.

13. Section 27.4 is amended by revising the paragraph titled Advanced wireless service (AWS) to read as follows:

§ 27.4 Terms and definitions.

*****

Advanced Wireless Service (AWS). A radiocommunication service licensed pursuant to this part for the frequency bands specified in § 27.5(h) or § 27.5(j).

*****

14. Section 27.5 is amended by adding paragraph (j) to read as follows:

§ 27.5 Frequencies.

*****

(j) 2483.5-2495 MHz band. The 2483.5-2495 MHz band is available for assignment on a nationwide basis.

15. Section 27.6 is amended by adding paragraph (i) to read as follows:

§ 27.6 Service areas.

*****

(i) 2483.5-2495 MHz band. The AWS service area for the 2483.5-2495 MHz band is available on a nationwide basis.

16. Section 27.13 is amended by adding paragraph (i) to read as follows:

§ 27.13 License period.

*****

(i) 2483.5-2495 MHz band. The authorization for the 2483.5-2495 MHz band will have a term not to exceed fifteen years from the date of issuance or renewal.

17. Section 27.14 is amended by revising the first sentence of paragraphs (a) and (f) to read as follows:

§ 27.14 Construction requirements; Criteria for renewal.

(a) AWS and WCS licensees, with the exception of WCS licensees holding authorizations for Block A in the 698–704 MHz and 728–734 MHz bands, Block B in the 704–710 MHz and 734–740 MHz bands, Block E in the 722–728 MHz band, Block C, C1, or C2 in the 746–757 MHz and 776–787 MHz bands, Block D in the 758–763 MHz and 788–793 MHz bands, Block A in the 2305–2310 MHz and 2350–2355 MHz bands, Block B in the 2310–2315 MHz and 2355–2360 MHz bands, Block C in the 2315–2320 MHz band, and Block D in the 2345–2350 MHz

band, and with the exception of the AWS licensee holding the authorization in the 2483.5-2495 MHz band, must, as a performance requirement, make a showing of "substantial service" in their license area within the prescribed license term set forth in §27.13. ***

*****

(f) Comparative renewal proceedings do not apply to WCS licensees holding authorizations for the 698–746 MHz, 747–762 MHz, and 777–792 MHz bands and the AWS licensee holding the authorization for the 2483.5-2495 MHz band. ***

* * * * *

18. Section 27.15 is amended by revising paragraph (a)(2), revising paragraph (d)(1)(i), and revising paragraph (d)(2)(i) to read as follows:

§ 27.15 Geographic partitioning and spectrum disaggregation.

(a) ***

(1) ***

(2) Except for the AWS licensee holding the authorization in the 2483.5-2495 MHz band, AWS and WCS licensees may apply to partition their licensed geographic service area or disaggregate their licensed spectrum at any time following the grant of their licenses.

(d) ***

(1) ***

(i) Except for WCS licensees holding authorizations for Block A in the 698–704 MHz and 728–734 MHz bands, Block B in the 704–710 MHz and 734–740 MHz bands, Block E in the 722–728 MHz band, Blocks C, C1, or C2 in the 746–757 MHz and 776–787 MHz bands, or Block D in the 758–763 MHz and 788–793 MHz bands; and for the AWS licensee holding the authorization in the 2483.5-2495 MHz band; the following rules apply to WCS and AWS

licensees holding authorizations for purposes of implementing the construction requirements set forth in §27.14. Parties to partitioning agreements have two options for satisfying the construction requirements set forth in §27.14. Under the first option, the partitioner and partitionee each certifies that it will independently satisfy the substantial service requirement for its respective partitioned area. If a licensee subsequently fails to meet its substantial service requirement, its license will be subject to automatic cancellation without further Commission action. Under the section option, the partitioner certifies that it has met or will meet the substantial service requirement for the entire, pre-partitioned geographic service area. If the partitioner subsequently fails to meet its substantial service requirement, only its license will be subject to automatic cancellation without further Commission action.

*****

(2) ***

(i) Except for WCS licensees holding authorizations for Block A in the 698–704 MHz and 728–734 MHz bands, Block B in the 704–710 MHz and 734–740 MHz bands, Block E in the 722–728 MHz band, Blocks C, C1, or C2 in the 746–757 MHz and 776–787 MHz bands, or Block D in the 758–763 MHz and 788–793 MHz bands; and for the AWS licensee holding the authorization in the 2483.5-2495 MHz band; the following rules apply to WCS and AWS licensees holding authorizations for purposes of implementing the construction requirements set forth in §27.14. Parties to disaggregation agreements have two options for satisfying the construction requirements set forth in §27.14. Under the first option, the disaggregator and disaggregatee each certifies that it will share responsibility for meeting the substantial service requirement for the geographic service area. If the parties choose this option and either party subsequently fails to satisfy its substantial service responsibility, both parties' licenses will be

subject to forfeiture without further Commission action. Under the second option, both parties certify either that the disaggregator or the disaggregatee will meet the substantial service requirement for the geographic service area. If the parties choose this option, and the party responsible subsequently fails to meet the substantial service requirement, only that party's license will be subject to forfeiture without further Commission action.

19. Section 27.50 is amended by adding paragraphs (i) to read as follows:

§ 27.50 Power Limits and Duty Cycle.

*****

(g) The following power limits apply to the 2483.5-2495 MHz band:

(1) Fixed and base stations are limited to 1640 watts EIRP.

(2) Mobile stations are limited to 2.0 watts EIRP.

*****.

20. Section 27.53 is amended by revising paragraph (n) and adding paragraph (o) to read as follows:

§ 27.53 Emission limits.

*****

(n) ~~When an emission outside of the authorized bandwidth causes harmful interference, the Commission may, at its discretion, require greater attenuation than specified in this section.~~ For stations in the 2483.5-2495 MHz band, the power of any station emissions above 2495 MHz shall be attenuated below the transmitter power (P) measured in watts in accordance with the standards below.

(1) For digital stations in the 2483.5-2495 MHz band with EIRPs below 36 dBm, the attenuation factor shall be not less than 40 + 10 log (P) dB at the channel edge, 43 + 10 log (P) dB at 5 MHz

from the channel edges, and 55 + 10 log (P) dB at X MHz from the channel edges where X is the greater of 6 MHz or the actual emission bandwidth.

(2) For other fixed and base stations in the 2483.5-2495 MHz band ("AWS-5 high-power base stations"), the attenuation shall be not less than 43 + 10 log (P) dB at the upper edge of the 2483.5-2495 MHz band ("AWS-5 band"), unless a documented interference complaint is received from an adjacent channel licensee in the BRS. Provided that a documented interference complaint cannot be mutually resolved between the parties, the following additional attenuation requirements set forth in subsections (2)-(5) shall apply:

(3) If a pre-existing BRS base station suffers harmful interference from emissions caused by a new or modified AWS-5 high-power base station located 1.5 km or more away, within 24 hours of the receipt of a documented interference complaint the AWS-5 licensee must attenuate its emissions by at least 67 + 10 log (P) dB measured at 3 megahertz above the edge of the AWS-5 band, and shall immediately notify the complaining licensee upon implementation of the additional attenuation.

(4) If a pre-existing BRS base station suffers harmful interference from emissions caused by a new or modified AWS-5 high-power base station located less than 1.5 km away, within 24 hours of the receipt of a documented interference complaint the AWS-5 licensee must attenuate its emissions by at least 67 + 10 log (P) −20 log(D_{km} /1.5) dB measured at 3 megahertz above the edge of the AWS-5 band, or if both base stations are co-located, limit its undesired signal level at the pre-existing BRS base station receiver(s) to no more than −107 dBm measured in a 5.5 megahertz bandwidth and shall immediately notify the complaining licensee upon such reduction in the undesired signal level.

(5) If a new or modified BRS base station suffers harmful interference from emissions caused by a pre-existing AWS-5 high-power base station located 1.5 km or more away, within 60 days of receipt of a documented interference complaint the licensee of the AWS-5 high-power base station must attenuate its base station emissions by at least 67 + 10 log (P) dB measured at 3 megahertz above the edge of the authorized ATC band.

(6) If a new or modified BRS base station suffers harmful interference from emissions caused by a pre-existing AWS-5 high-power base station located less than 1.5 km away, within 60 days of receipt of a documented interference complaint:

(i) the AWS-5 licensee must attenuate its base station emissions by at least 67 + 10 log (P) −20 log(D_{km} /1.5) dB measured 3 megahertz above the edge of the AWS-5 band, or

(ii) if both base stations are co-located, the AWS-5 licensee must limit its undesired signal level at the new or modified BRS base station receiver(s) to no more than −107 dBm measured in a 5.5 megahertz bandwidth.

(7) Compliance with these rules is based on the use of measurement instrumentation employing a resolution bandwidth of one megahertz or greater. However, in the one megahertz bands immediately above and adjacent to the 2495 MHz a resolution bandwidth of at least one percent of the emission bandwidth of the fundamental emission of the transmitter may be employed. A narrower resolution bandwidth is permitted in all cases to improve measurement accuracy, provided the measured power is integrated over the full required measurement bandwidth (i.e., one megahertz or one percent of emission bandwidth, as specified). The emission bandwidth is defined as the width of the signal between two points, one below the carrier center frequency and one above the carrier center frequency, outside of which all emissions are attenuated at least 26 dB below the transmitter power. When an emission outside of the authorized bandwidth causes

harmful interference, the Commission may, at its discretion, require greater attenuation than specified in this section.

(o) When an emission outside of the authorized bandwidth causes harmful interference, the Commission may, at its discretion, require greater attenuation than specified in this section.

*****

21. Section 27.57 is amended by revising paragraph (c) to read as follows:

§ 27.57 International Coordination.

*****

(c) Operation in the 1710-1755 MHz, ~~and~~ 2110-2155 MHz, and 2483.5-2495 MHz bands is subject to international agreements with Mexico and Canada.

******

22. Amend part 27 by adding heading of subpart to read as follows:

Subpart O—2483.5-2495 MHz band

*****

23. Section 27.1401 is added to read as follows:

§ 27.1401 Application for renewal of license.

Renewal Showing. The AWS licensee in the 2483.5-2495 MHz band ("AWS-5 band") must make a renewal showing, independent of its performance requirements, as a condition of renewal of its AWS-5 license. The showing must include a detailed description of the applicant's provision of service during the entire license period and address:

(1) The level and quality of service provided by the applicant (e.g., the population served, the area served, the number of subscribers, the services offered);

(2) The date service commenced, whether service was ever interrupted, and the duration of any interruption or outage;

(3) The extent to which service is provided to rural areas;

(4) The extent to which service is provided to qualifying tribal land as defined in § 1.2110(f)(3)(i); and

(5) Any other factors associated with the level of service to the public.

24. Section 27.1403 is added to read as follows:

§ 27.1402 Protection of 1559-1610 MHz band.

Base stations and mobile terminals operating in the 2483.5-2495 MHz shall not generate EIRP density, averaged over any two-millisecond active transmission interval, greater than −70 dBW/MHz in the 1559-1610 MHz band. The EIRP, averaged over any two-millisecond active transmission interval, of discrete out-of-band emissions of less than 700 Hz bandwidth from such base stations shall not exceed −80 dBW in the 1559-1610 MHz band. A root-mean-square detector function with a resolution bandwidth of one megahertz or equivalent and no less video bandwidth shall be used to measure wideband EIRP density for purposes of this rule, and narrowband EIRP shall be measured with a root-mean-square detector function with a resolution bandwidth of one kilohertz or equivalent.

25. Section 27.1402 is added to read as follows:

§ 27.1403 Protection of services sharing use of the 2450-2500 MHz band.

The AWS licensee in the 2483.5-2495 MHz band will take steps necessary to avoid causing interference to other services sharing the use of the 2450-2500 MHz band through frequency coordination.

APPENDIX B

Technical Analysis

TECHNICAL ANALYSIS OF TERRESTRIAL LOW POWER SERVICE (TLPS) FOR GLOBALSTAR PETITION FOR RULEMAKING

The Terrestrial Low Power Service (TLPS) described in Globalstar's Petition for Rulemaking represents an innovative terrestrial use of Big LEO spectrum. TLPS will utilize the existing IEEE 802.11 standard to rapidly deploy managed mobile broadband capabilities to consumers. This document summarizes key technical considerations associated with TLPS.

1. The Terrestrial Low Power Service (TLPS) is Based Upon the IEEE 802.11 Standard Specification.

The IEEE 802.11 standard specifies fourteen (14) 22 MHz channels in the 2.4 GHz band. These channels occupy spectrum in the range of approximately 2401-2495 MHz. Channels 1 through 13 have a 5 MHz center frequency of channel separation, with Channel 14 having a 12 MHz center frequency of channel separation. This channel configuration results in four (4) effectively non-overlapping 2.4 GHz 802.11 channels (*see* Figure 1).

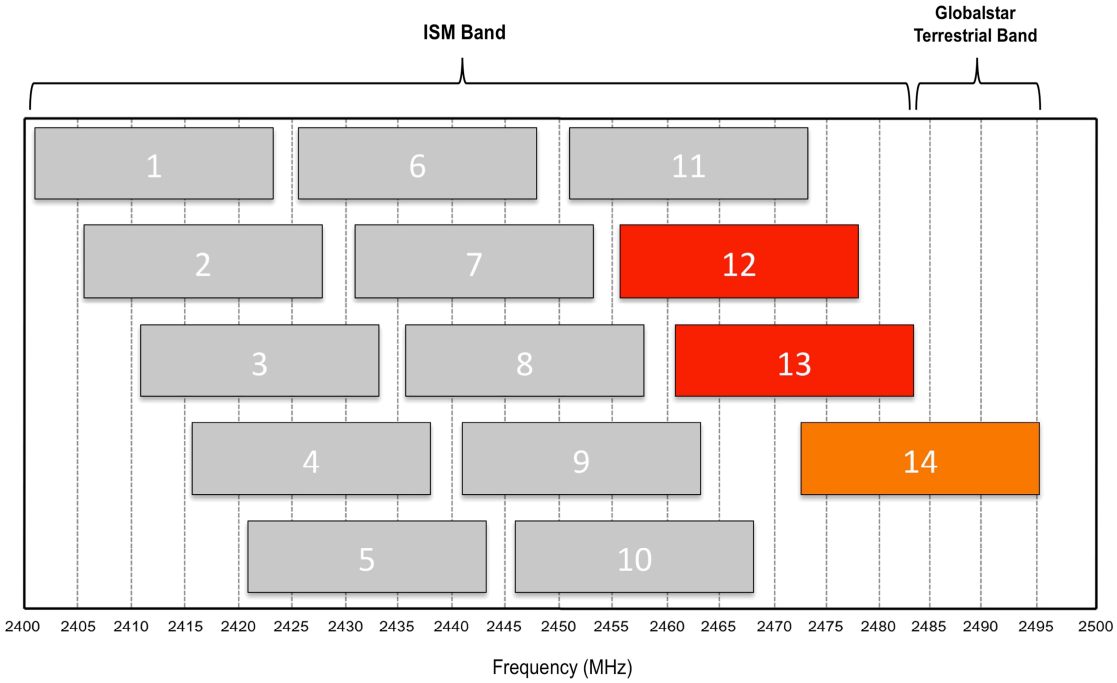

Figure 1: 802.11 Channelization – The IEEE 802.11 standard specifies 14 channels in the 2.4 GHz band. These channels have a 5 MHz center frequency of channel separation (except for Channel 14, which has a 12 MHz center frequency of channel separation). In the United States, only channels 1-11 can be utilized for unrestricted, unlicensed Part 15 operation. The spectral masks of Channels 12-14 extend outside the ISM band and into Mobile Satellite Service (MSS) spectrum above 2483.5 MHz.

While the 802.11 standard was developed by the IEEE to facilitate Part 15 unlicensed operations in the 2.4 GHz Industrial, Scientific, and Medical (ISM) Band, the ISM Band frequency range and the Out of Band Emissions (OOBE) limits imposed on the ISM Band preclude unlicensed operation on all 802.11 specified channels. The 2.4 GHz ISM allocation terminates at 2483.5 MHz, and the 2483.5-2500 MHz band is a "restricted band" in which unlicensed operations are prohibited (*see* Part 15.205 of the FCC's rules). This restriction prohibits any unlicensed use of 802.11 Channel 14 (2473-2495 MHz) in the United States. Emissions in the 2400 – 2483.5 MHz band are subject to attenuation equivalent to 50 + 10 log (P) dB of conducted output power at 2483.5 MHz (*see* Part 15.249(d)). This strict OOBE limit precludes full power (30 dBm conducted output power) use of 802.11 Channels 12 (2456 – 2478 MHz) and 13 (2461 – 2483 MHz). (*See* Part 15.247(b)(3))

Strict OOBE limits at the ISM band edge at 2483.5 MHz are critical to protecting the Mobile Satellite Service (MSS) at 2483.5-2500 MHz from interference from uncoordinated, unlicensed terrestrial operations. As a result of these attenuation limits, however, more than 10 MHz of the upper 2.4 GHz ISM Band (2473-2483.5 MHz) is currently unusable by unlicensed broadband applications. In extensive spectral studies conducted throughout selected Metropolitan Statistical Areas (MSAs), only extremely low-power and frequency-agile Bluetooth emissions are commonly observed above 2473 MHz (*see* Figure 2).

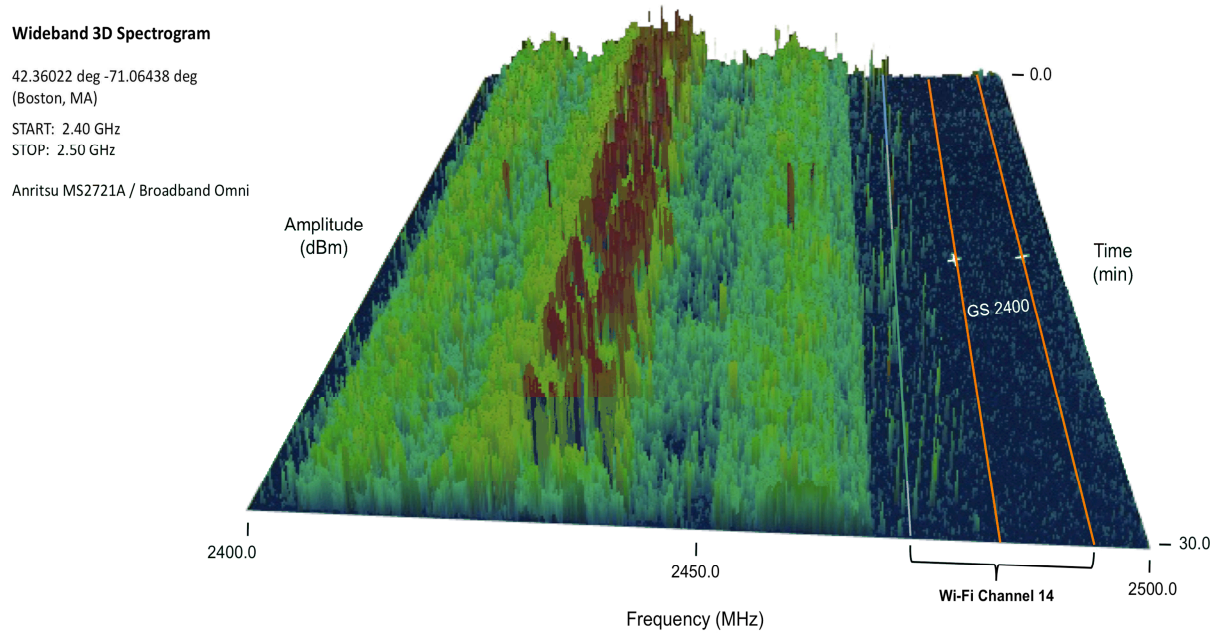

Figure 2: 3D Spectrographic View of 2.4 GHz Band – An 802.11 enabled TLPS will utilize both the Big LEO MSS terrestrial band (2483.5-2495 MHz) and a generally unused portion of the upper ISM band (2473-2483.5 MHz). In most environments, MSS terrestrial spectrum exhibits extremely low interference levels, while the upper ISM band contains only transient low power Bluetooth emissions.

Globalstar's proposed Terrestrial Low Power Service contemplates use of the 2473-2495 MHz band segment as a controlled broadband service that will operate at standard ISM power limits as defined in Part 15 (30 dBm maximum conducted output power / 36 dBm maximum Equivalent Isotropically Radiated Power (EIRP)). This service will occupy 11.5 MHz of terrestrially authorized MSS spectrum (2483.5-2495 MHz) and approximately 10.5 MHz of upper ISM spectrum (2473-2483.5 MHz).

Channel overlap in the IEEE 802.11 specification means that the overwhelming majority of 802.11 access points operate on Channels 1, 6, and 11. Due to the extreme prevalence of unlicensed 802.11 activity, these three channels are highly compromised by the effects of co-channel interference. TLPS implementation will make available a fourth non-overlapping 802.11 channel, which will maintain low-interference and high spectral efficiency characteristics as a managed service offering.

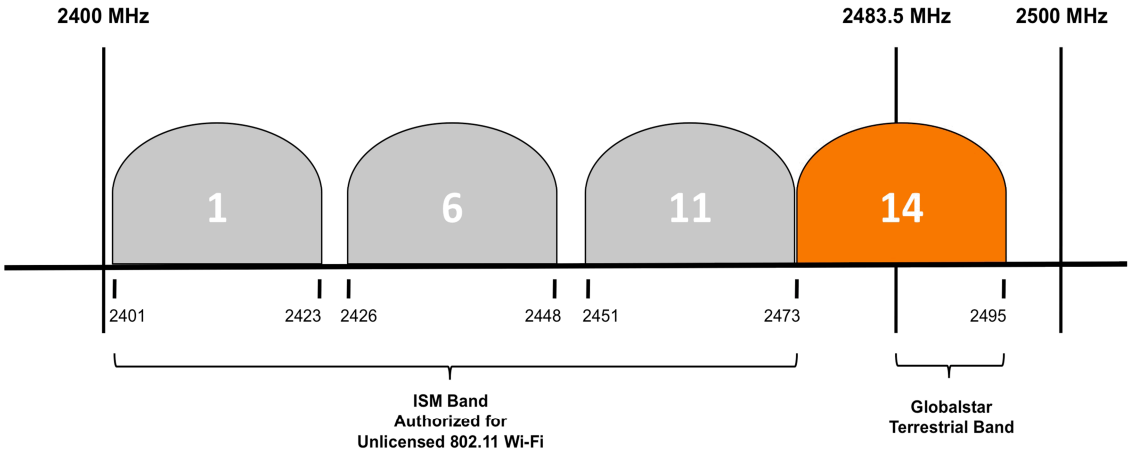

Figure 3: Channel 14 as Fourth Non-Overlapping Channel – Due to channel overlap in the IEEE 802.11 specification, almost all 802.11 access points operate on Channels 1, 6, and 11. These channels are highly compromised by the effects of co-channel interference.

In sum, implementing TLPS at 2473-2495 MHz generates a number of unique benefits. These include:

(a) Broad and Immediate Ecosystem – 802.11 compliant hardware is already capable of utilizing 802.11 Channel 14 with a device firmware modification. This means that TLPS will benefit from a substantial existing ecosystem, which can be utilized almost immediately.

(b) Use of Fallow Upper ISM Spectrum – TLPS permits a largely unused portion of the ISM spectrum to be rapidly utilized in a manner that will protect critical MSS functionality through management of terrestrial interference.

(c) High Broadband Capacity –In the unlicensed ISM band, most mobile device data connectivity currently occurs on the three interference-prone, non-overlapping public 802.11 channels (1, 6, and 11). A managed, fourth non-overlapping channel will expand upon the already high spectral efficiency of ISM based 802.11 connectivity, adding significant additional broadband capacity.

2. The Terrestrial Low Power Service (TLPS) Will Require a Special Out of Band Emissions (OOBE) Mask.

Previous terrestrial proposals for MSS spectrum in the 2483.5-2495 MHz band contemplated either a TDD or FDD (Downlink) application using conventional commercial protocols such as IEEE 802.16 (commonly WiMAX) or LTE, which were designed for licensed spectrum. In all cases, these services were to be high powered (62 dBm base station EIRP) and employ 10 MHz channels.

A TLPS utilization of the 2473-2495 MHz band will be fundamentally different. First, TLPS base stations and terminals will use the 802.11 standard, which has previously been exclusive to unlicensed spectrum. Second, TLPS base stations will be more than 400x lower in power (less than 36 dBm EIRP). Finally, TLPS emissions will occupy more than twice the channel bandwidth (approximately 22 MHz). Figure 4 illustrates the commonly described emissions profile of 802.11 in OFDM mode (802.11g/n).

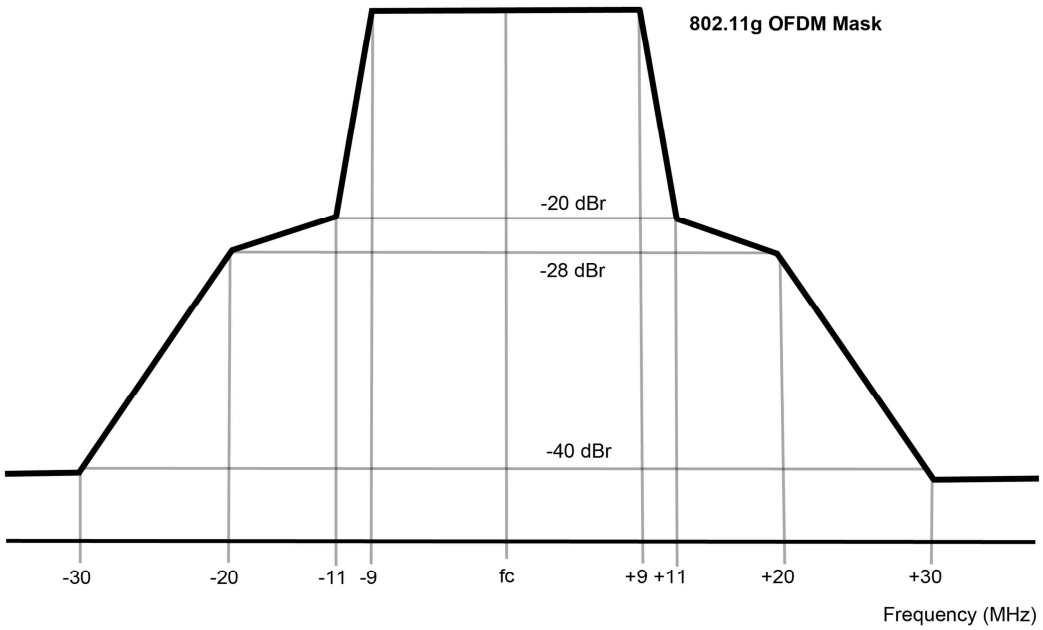

Figure 4: Textbook Emissions Profile of 802.11 – The emissions profiles referenced in the IEEE 802.11 specification demonstrate the power dependence of spectral regrowth

products outside the usable channel bandwidth. These theoretical profiles significantly exceed the emissions mask of practical 802.11 transceivers in DSSS (802.11b) or OFDM (802.11g/n) modes.

The limitations imposed by the 802.11 standard coupled with the standard's significantly larger channel bandwidth require an OOBE limit that is less stringent than that previously applied to more narrow-banded (<10 MHz channels) commercial wireless services in other parts of the spectrum. Extensive study of practical 802.11 terminal and base station transceiver emissions in OFDM modes (*see* Figure 5) indicates that OOBE limits highly analogous to those recently proposed for terminal utilization in nearby BRS/EBS spectrum (2502-2690 MHz) are appropriate to TLPS. While different in protocol and device transceiver architecture, the channel bandwidths and power levels associated with terminal operation in future TD-LTE services in the BRS/EBS bands are functionally similar to TLPS terminal and base station operation. Based on TLPS requirements and the recent BRS/EBS proposal, an appropriate OOBE limit is the following:

"For digital stations with EIRPs below 36 dBm, the attenuation factor shall be not less than 40 + 10 log (P) dB at the channel edge, 43 + 10 log (P) dB at 5 MHz from the channel edges, and 55 + 10 log (P) dB at X MHz from the channel edges where X is the greater of 6 MHz or the actual emission bandwidth."

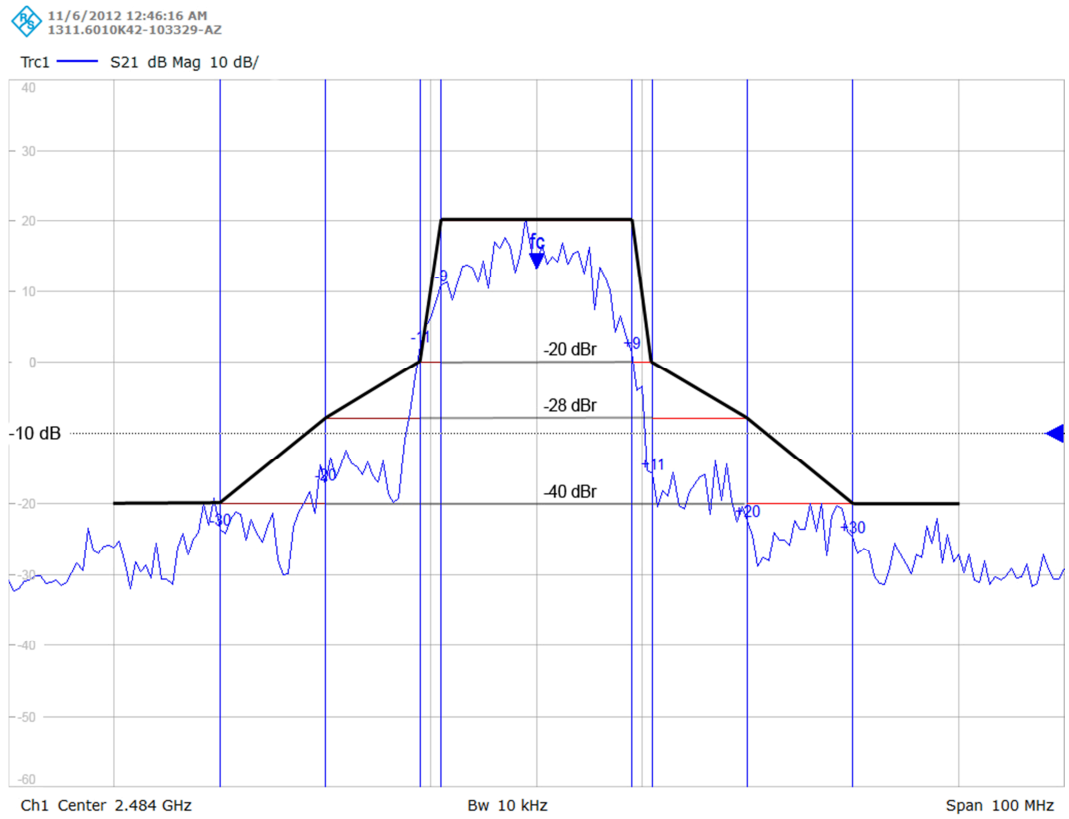

Figure 5: Laboratory Emissions Profile of 802.11 – The emissions profile of practical 802.11 devices studied in the laboratory is significantly more confined than commonly referenced theoretical profiles. This 802.11g (OFDM) example exhibits far greater sideband suppression than may be commonly inferred from generic mask diagrams of the standard.

3. Typical Terrestrial Low Power Service (TLPS) Mobile Terminals Will Comply with Proposed OOBE Limits Without Remedial Filtration.

A primary advantage of TLPS is the ability to rapidly enable service through the utilization of a substantial pre-existing ecosystem of 802.11 compliant transceiver chipsets. However, a disadvantage of utilizing this ecosystem is the difficulty in applying remedial filtration where it may be necessary to meet OOBE limits comparable to those currently proposed for BRS/EBS spectrum. Thus, the practical utility of current 802.11 device and chipset populations will be determined by their ability to meet the proposed emissions mask without hardware modification (e.g. the addition of passive filtration components).

Like all broadband signaling standards, 802.11 emissions generate significant spectral regrowth products that extend well beyond the usable signal bandwidth. However, unlike most broadband standards, 802.11 compliant transceivers display remarkable uniformity in their emissions mask across disparate chipset and overall device architectures. This is due to the general lack of passive filtration in the RF path of 802.11 devices. 802.11 transceivers achieve their spectral mask via software defined pulse shaping. While less efficient (i.e. selective) than comparatively high-performance passive-filtration-based control of the emissions mask, pulse shaping permits high predictability in spectral regrowth characteristics across disparate devices and a more linear relationship between conducted output power and OOBE characteristics.

Surveys of current-generation devices in the OET (FCC Office of Engineering and Technology) certification database indicate that typical 802.11 terminals in the 2.4 GHz band (e.g. smart phones, tablets, etc.) have a maximum conducted output power of less than 20 dBm (approximately 100 mW) and an average conducted output power of less than 17 dBm (approximately 50 mW). When applied to a practical 802.11 transceiver in OFDM mode (802.11 g/n), these conducted power levels produce Out of Band Emissions that are well within the limits proposed in Globalstar's Petition for Rulemaking. This allows for the conclusion that conducted power levels associated with typical mobile devices will permit compliance with the OOBE limits proposed for TLPS without the need for additional hardware based filtration.

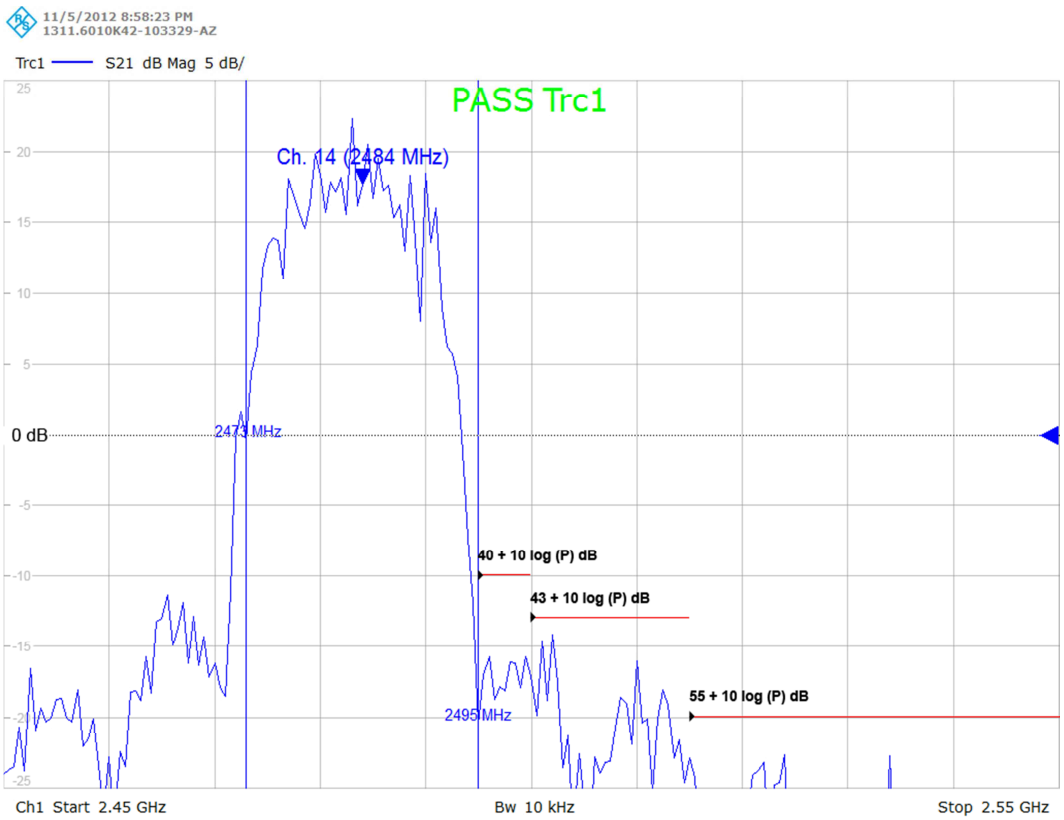

Figure 6: OOBE Analysis of TLPS Terminal – OFDM (802.11g) emissions from a TLPS terminal with a conducted output power below 20 dBm (100 mW) comply with the emissions mask proposed in Globalstar's Petition for Rulemaking without the need for hardware modification. Pulse shaping alone is sufficient to meet OOBE limits similar to those proposed for BRS/EBS terminals using broad (20 MHz) channels.

4. Terrestrial Low Power Service (TLPS) Base Stations Will Comply with Proposed OOBE Limits Through the Use of Remedial Filtration.

While TLPS mobile terminals will likely have technical requirements for maximum conducted powers less than 20 dBm (100 mW), TLPS base stations may be constructed that emit maximum conducted output powers approaching the Part 15 limit of 30 dBm (1 W). Laboratory analysis of representative 802.11 transceivers indicates that conducted output powers exceeding 23 dBm (200 mW) may generate spectral regrowth products that exceed the OOBE limits proposed in Globalstar's Petition for Rulemaking (*see* Figure 7). These regrowth products cannot be sufficiently suppressed through software defined pulse shaping alone.

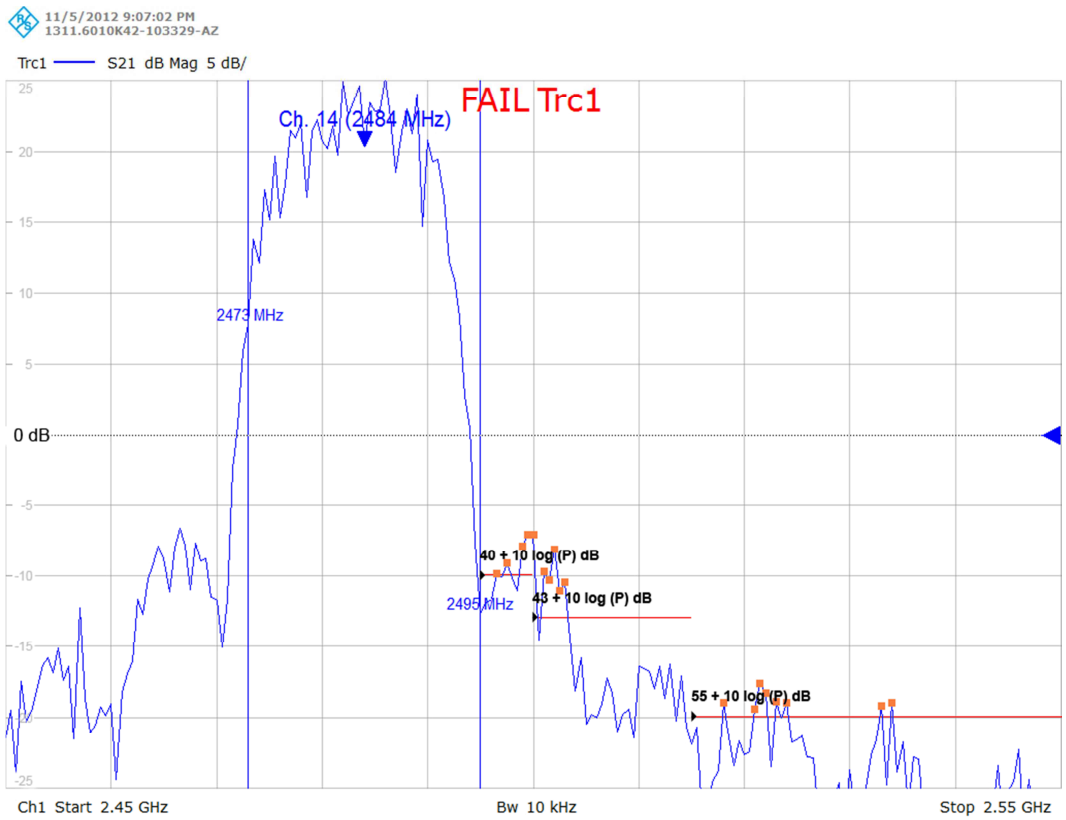

Figure 7: OOBE Analysis of TLPS Base Station – OFDM (802.11g) emissions from a TLPS base station with a conducted output power above 23 dBm (200 mW) do not comply with the emissions mask proposed in Globalstar's Petition for Rulemaking. For such applications, pulse shaping alone will not be sufficient to meet OOBE limits. Instead, TLPS base stations with conducted powers above 23 dBm will require the addition of remedial hardware filtration (e.g. a high selectivity passive filtration component).

TLPS base stations with conducted power outputs in excess of 23 dBm (200 mW) will require remedial filtration. This will take the form of passive filtration devices applied to the RF path of the 802.11 transceiver in a band-pass configuration. Such devices will exhibit high RF rejection above 2495 MHz and may be constructed from SAW (Surface Acoustic Wave), FBAR (thin Film Bulk Acoustic Resonator), or cavity resonator based technologies. The choice of filtration technology and method of design integration will be influenced by the form factor, economics, and power level (i.e. requirement for selectivity) associated with any given TLPS base station application. In all cases, current and anticipated filtration technologies may be readily adapted to TLPS base station utilization in ways that neither delay nor meaningfully impact the utility of the proposed service.

An inexpensive prototype filter for TLPS base stations (*see* Figure 8) is representative of technologies that will allow TLPS to readily meet OOBE restrictions at power levels where pulse shaping and other modulation derived methods are inadequate to suppress spectral regrowth products.

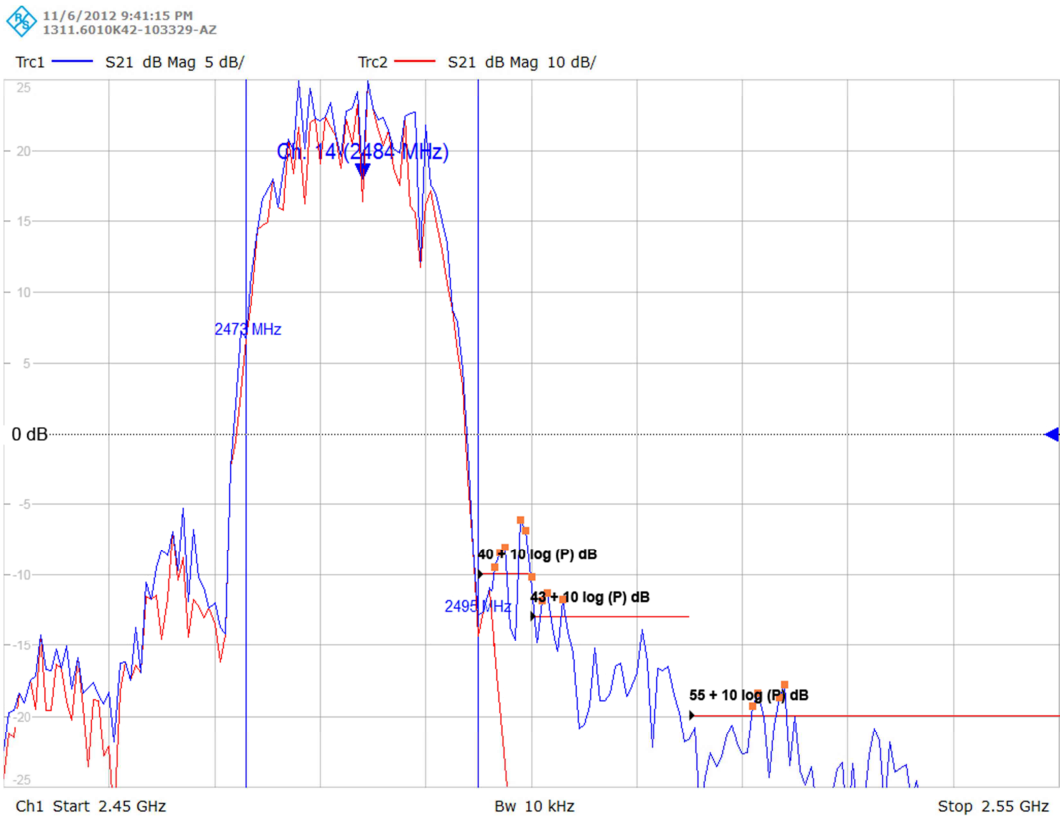

Figure 8: OOBE Analysis of TLPS Base Station with Remedial Filtration – As shown previously, OFDM (802.11g) emissions from a TLPS terminal with a conducted output power exceeding 23 dBm do not comply with the emissions mask proposed in Globalstar's Petition for Rulemaking (Trc1). The addition of high selectivity remedial hardware filtration suppresses regrowth products above 2495 MHz and permits a TLPS base station to readily meet the proposed OOBE limits.

5. Terrestrial Low Power Service (TLPS) Terminals and Base Stations That Comply with Proposed OOBE Limits are Unlikely to Cause Harmful Interference to BRS systems Operating on Channel BRS-1 at 2496-2502 MHz.

The proposed Terrestrial Low Power Service is unique in the extremely low power levels associated with both mobile terminal and fixed base station usage. TLPS fixed and mobile stations will comply with Part 15 maximum conducted power limits of 30 dBm (1 W) across the entire band (2473 – 2495 MHz). This is half the 33 dBm (2 W) maximum conducted power limit applied to mobile terminals in the EBS and BRS bands (*see* Part 27.50(h)(2)), and an extremely small fraction of the EIRP permitted for EBS and BRS fixed base stations. Because of the low power levels associated with fixed TLPS utilization, TLPS infrastructure elements will have significantly reduced impact on the RF environment relative to the exponentially higher

powered base stations that generally characterize more conventional commercial wireless services.

In addition to a uniquely low-power footprint, the Terrestrial Low Power Service described in Globalstar's Petition for Rulemaking will be limited by a proposed OOBE standard that is based upon that proposed for mobile terminal devices in BRS/EBS spectrum. This proposed BRS/EBS OOBE standard has been carefully studied by users of that spectrum and deemed appropriate for protection of adjacent wideband channels (exceeding 20 MHz) within the BRS/EBS services. Thus, a similar OOBE standard applied to an adjacent band operator should be adequate to protect Channel BRS-1.

Adding additional margin to the proposed OOBE standard is the practical reality that TLPS base stations with conducted output powers exceeding 23 dBm (200 mW) will utilize high selectivity passive filtration to achieve the required emissions mask. A consequence of passive filtration use will be the achievement of a considerably more confined spectral mask than that required in the proposed rulemaking, a technical reality that further mitigates risk of harmful impact (*see* Figure 8).

CERTIFICATION

I, John Dooley, am Managing Director of Jarvinian Ventures, a wireless investment fund. I am an Engineer with 17 years of experience in the development of advanced wireless technologies. I am qualified to provide the opinions and analyses presented in this Declaration.

Under penalty of perjury, I hereby declare that the preceding is true and correct to the best of my information, knowledge, and belief:

John Dooley

Dated: November 13, 2012