Before the
FEDERAL COMMUNICATIONS Commission
Washington, DC 20554

In the Matter of	)	
	)	
Globalstar, Inc. Petition for Rulemaking to	)	RM No. 11685
Reform the Commission's Regulatory	)	
Framework for Terrestrial Use of the Big LEO	)	
MSS Band	)	

COMMENTS OF CLEARWIRE CORPORATION

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EXECUTIVE SUMMARY

Globalstar has not provided enough information regarding its proposals—a Terrestrial Low Power Service ("TLPS") and a Frequency Division Duplex ("FDD") LTE full power concept to allow for informed public comment. Clearwire and other affected parties need significantly more information before they can adequately evaluate the threat of harmful interference. Globalstar must provide information regarding the system architecture, base stations, user equipment, the scale of deployment, and interference-mitigation measures, among other things.

Although Globalstar does not provide adequate technical information, preliminary analysis suggests that the proposals will cause severe interference problems. For instance, Globalstar seeks authorization to provide service over a wide twenty-two megahertz channel, using, in part, unlicensed spectrum for the WiFi-like TLPS proposal. Although wider channels can carry broadband traffic more efficiently, they also emit wider bands of signals into adjacent channels. An initial analysis of Globalstar's TLPS proposal suggests that this wider channel would impair Clearwire's adjacent channel operations. Based on the limited information and specifications that Globalstar provides, TLPS would severely diminish the range, functionality, and throughput of Clearwire's system. Although Globalstar's full power FDD LTE concept poses equal, if not greater, interference concerns, insufficient information exists to construct an interference model with any predictive value.

Globalstar also asks for very relaxed out-of-band emissions limits to accommodate its proposed services. Globlastar's request follows negotiations where Clearwire agreed to adopt stringent emission limits to avoid similar emissions into Globalstar's spectrum. Indeed, when Globalstar received its authorization to provide an ancillary terrestrial service, the Commission prohibited Globalstar's terrestrial operations from causing any harmful interference to adjacent

services. The Commission explained that this bright-line rule was to prevent interference and create an environment promoting mutual cooperation. The same rule should apply here.

Globalstar, moreover, does not discuss whether harmful interference will occur to various adjacent and co-channel services, nor does Globalstar address how it might manage any interference that may occur. Globalstar, for example, does not mention adjacent and co-channel government operations, the Radionavigation Satellite Service, Radioastronomy operations, or even its own satellite offering. Until Globalstar provides more information, including more technical information and testing that would allow parties to fully analyze interference concerns, the record contains insufficient evidence to commence a rulemaking proceeding.

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COMMENTS OF CLEARWIRE CORPORATION

I. INTRODUCTION

Clearwire Corporation, pursuant to Section 1.405 of the Federal Communications Commission's rules,[1] submits these comments concerning the Petition for Rulemaking ("Petition") filed by Globalstar, Inc. ("Globalstar").[2] Globalstar is currently 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).[3]

In its petition, Globalstar proposes to operate two separate terrestrial broadband system architectures within its licensed MSS spectrum. In the near term, Globalstar would provide a WiFi-like wireline broadband supplement service that it calls Terrestrial Low Power Service ("TLPS") over twenty-two megahertz of spectrum in the 2473-2495 MHz band. At some unspecified point in the future, Globalstar would like to deploy a more traditional frequency-division duplex ("FDD") LTE wireless broadband operation across nineteen megahertz of its

[1] 47 C.F.R. § 1.405.
[2] *See* Globalstar, Inc. Petition for Rulemaking to Reform the Commission's Regulatory Framework for Terrestrial Use of the Big LEO MSS Band, RM No.11685, *Petition for Rulemaking* (Nov. 13, 2012) ("Petition").
[3] *Id.* at i, 2.

licensed MSS spectrum in the Big LEO band. The FDD LTE uplink would fall in the 1610-1617.775 MHz band, and the FDD LTE downlink would fall in the 2483.5-2495 MHz band. Although the petition remains ambiguous on this point, Globalstar appears to intend to operate both the TLPS and the FDD LTE systems concurrently, though it would attempt to avoid deploying both configurations simultaneously in the same geographic market.[4]

Whether Globalstar pursues the TLPS concept or the FDD LTE concept, or both, Clearwire supports Globalstar's ambition to offer additional terrestrial wireless broadband capacity for American consumers; however, Globalstar has not provided sufficient information about the architecture, base stations, user equipment, and interference-mitigation measures of either proposed system configuration to warrant commencement of a Commission rulemaking proceeding at this time.[5] In particular, initial analysis of Globalstar's TLPS proposal indicates that the TLPS base stations as proposed threaten to dramatically diminish the range, throughput and functionality of operational and planned wireless broadband systems in the adjacent 2.5 GHz band.

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[4] *See id.* at 43 (emphasis added) ("*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.).

[5] These comments principally address the interference concerns from potential TLPS services rather than the FDD-LTE proposal, which Globalstar itself recognizes is more of a "long-term goal." Petition at 15. If TLPS is short on details, the FDD-LTE concept is almost wholly unformed. For example, Globalstar provided an appendix including a technical analysis for its TLPS proposal; however, Globalstar provided no such analysis for the FDD-LTE concept. Indeed, about all that can be gleaned from the two pages Globalstar spends describing the proposal is that Globalstar seeks to deploy a frequency-division duplex service with a yet-to-be determined partner in its Upper and Lower Big LEO spectrum, and it would use its Lower Big LEO spectrum (1610 MHz -1617.775 MHz) for uplink and its Upper Big LEO spectrum (2483.5 MHz – 2495 MHz) for downlink. Although sparse on technical details, Globalstar nevertheless recognizes that the FDD-LTE concept creates significant "concerns regarding the coexistence of GPS and commercial wireless operations within the Lower Big LEO band," located just above spectrum allocated to GPS service. Petition at ii, 45. A full power commercial wireless service creates substantial interference risk for BRS-1, but parties to this proceeding are not required to speculate on how Globalstar will develop and deploy its system. Globalstar does not provide enough information for parties to meaningfully discuss the FDD-LTE concept, and the Commission should not squander resources pursuing one party's sparsely developed "long-term goal."

In continuing to develop any particular proposals and providing more information, Globalstar should work within the framework the Commission crafted to encourage cooperation between Globalstar and adjacent channel licensees. When the Commission first authorized Globalstar to provide an ancillary terrestrial component ("ATC") service, it gave Globalstar an absolute obligation to avoid interference to the operations of adjacent channel licensees. The Comission created this obligation in an attempt to foster cooperation between Globalstar and BRS-1 licensees to allow Globalstar to potentially use part of this spectrum immediately adjacent to BRS-1. Globalstar glosses over this important framework and obligation in its Petition.

To its credit, Globalstar invited Clearwire to share its initial concerns regarding its TLPS proposal in a number of conference calls among the companies' technical teams. Clearwire, therefore, remains hopeful that if the Globalstar proposal is significantly modified to be sufficiently protective of Clearwire's existing 4G 2.5 GHz network, Clearwire will be able to endorse the proposal. As it stands, however, Globalstar has provided too little information about its system concepts – and no laboratory or real-world testing – to allow Clearwire to accurately assess the likely interference environment Globalstar's TLPS proposal will create. The combination of Globalstar's proposed power levels, out-of-band emissions ("OOBE"), and potential outdoor installations creates a disconcertingly high probability for interference to Clearwire's operations and warrants far more in-depth technical analysis prior to proceeding any further with the concept. Globalstar should amend its petition to provide additional information about the system architecture, operational parameters, and interference-avoidance practices of both its TLPS and FDD LTE concepts. In addition, as was the case with Globalstar's initial ATC authorization, it should commit to fully protecting neighboring 2.5 GHz systems from

interference from both its TLPS and FDD LTE operations, a commitment that Globalstar has failed to make in its proposal.

II. DISCUSSION

Globalstar's primary proposal – and the fundamental interference challenges associated with it – rest on the concept of using of a much wider, twenty-two megahertz channel for broadband communications adjacent to the Broadband Radio Service ("BRS") and Educational Broadband Service ("EBS") spectrum in the 2495-2690 MHz band. Globalstar's desire for wider channelizations is understandable. With modern orthogonal frequency-division multiple access ("OFDM") technology, wider channel bandwidths prove substantially more efficient than narrower channel bandwidths. A twenty-megahertz channel, for example, can achieve a peak throughput double that of two, ten-megahertz channels. Because of this relative efficiency, manufacturers and service providers alike view wider broadband channels as an important and cost-effective tool in meeting growing consumer broadband demand.[6]

[6] Globalstar's TLPS concept joins a number of proposals to address localized WiFi capacity constraints. Chairman Genachowski, for example, recently announced that the Commission plans "to unleash up to 195 megahertz of spectrum in the 5 gigahertz band." Federal Communications Commission, *FCC Chairman Julius Genachowski Announces Major Effort to Increase Wi-Fi Speeds and Alleviate Wi-Fi Congestion At Airports, Convention Centers, and In Homes With Multiple Devices and Users* (Jan. 9, 2013), http://transition.fcc.gov/Daily_Releases/Daily_Business/2013/db0109/DOC-318326A1.pdf. This effort to increase "Gigabit WiFi Spectrum" promises to "relieve congested Wi-Fi networks at major hubs like convention centers and airports." *Id.* So too is the private sector working to increase capacity. Qualcomm, for instance, has developed software technology called StreamBoost that adds intelligence to WiFi routers and then uses a cloud-based service to allocate limited home bandwidth to the most data-intensive applications. Rather than have every open application competing for as much capacity as the connection can deliver, the router allocates only what the application actually needs to provide service to the end user. According to Qualcomm, "StreamBoost provides a superior connected experience to users of all devices on a home network by managing and shaping traffic, and giving each connected device and application the priority and bandwidth required for optimal performance." Qualcomm, *Qualcomm Introduces StreamBoost Technology to Optimize Performance and Capacity of Home* Networks, Press Release (Jan. 4, 2013), available at http://www.qualcomm.com/media/releases/2013/01/04/qualcomm-introduces-streamboost-technology-optimize-performance-and. Better management of existing bandwidth requirements, combined with the steady improvement of the WiFi interface itself, promise to allow existing WiFi resources to accommodate increased data traffic and may diminish the need for radically new approaches such as TLPS.

One of the fundamental challenges of actually deploying wider bandwidth channels, however, is that wider desired channels produce wider undesired OOBE.[7] As a rule, these OOBE products fall into descending "shelves" of higher power on either side of the desired signal. Unless controlled by rule or carefully coordinated by mutual agreement, OOBE can damage the ability of neighboring carriers to identify their desired point of communication and close the communications link with it.

Clearwire's comments in this proceeding focus on identifying the nature and extent of the wideband interference products that TLPS would create for BRS-EBS licensees. While multiple interference scenarios are possible, the two principal interference concerns for BRS-EBS licensees are: (1) OOBE interference, which can only be managed by the party producing the harmful signal or through the presence of additional "guard band" spectrum between the interferer and the victim; and (2) brute force overload ("BFO") interference, which the victim licensees can, at least theoretically, manage by installing additional filters on their receivers.

As described more fully below, the Globalstar TLPS proposal envisions the deployment of tens of thousands of base stations operating at up to four watts of power. Under the proposal, Globalstar could locate these base stations indoors or outdoors, at any height or elevation, with either a directional or omnidirectional antenna, and in any degree of density that Globalstar might deem warranted. The user equipment, meanwhile, would extend to any number of the hundreds of millions of consumer and commercial WiFi devices that Globalstar and its partners might choose to authorize to use in the 2473-2495 MHz band.

[7] The Commission's rules define OOBE as "[e]mission on a frequency or frequencies immediately outside the necessary bandwidth which results from the modulation process, but excluding spurious emissions." 47 C.F.R. § 2.1.

Detailed modeling of the interference products between the ambitious, loosely drawn system Globalstar proposes and the broadband and educational systems that currently operate in the 2.5 GHz band is challenging. In the absence of detailed information or baseline limits concerning the location, number, directionality, height, and density of TLPS base stations and user equipment, modeling can provide only limited insight into real-world conditions. In this case, however, assumptions based on the generous, open-ended parameters proposed by Globalstar indicate TLPS would generate levels of interference into operational BRS and EBS systems that would appear to prove difficult to overcome.

Of course, real-world conditions can be better – or worse – than theoretical interference models. Greater specificity about the proposed TLPS equipment design, system architecture, deployment model, air interface, and spatial configuration would greatly assist analysis. And additional testing – both in the field and in the lab – could conceivably demonstrate margins not identified in the current studies. At present, however, both Globalstar's TLPS and FDD LTE concepts for the Big LEO Band lack the critical system parameters and empirical data necessary to produce a notice of proposed rulemaking capable of generating informed commentary from the public.

A. Background

1. Clearwire

Clearwire is a leading provider of 4G wireless broadband services and offers 4G wireless broadband services in 80 markets covering more than 133 million Americans. Clearwire serves retail customers through its own CLEAR® brand as well as through wholesale relationships with some of the leading companies in the retail, technology and telecommunications industries, including Sprint and NetZero.

Since the Commission revised its 2.5 GHz regulations to promote a capacity-rich 4G mobile broadband network,[8] Clearwire has deployed its network at record-breaking speed.[9] As of September 30, 2012, Clearwire's network serves approximately 10.5 million total subscribers.[10] To support deployment, Clearwire relies upon BRS licenses and excess capacity leases from other BRS and EBS licensees.[11]

Clearwire offers a consumer-friendly "no contract" option and unlimited data plans under the brand name CLEAR®. It also offers its advanced wireless broadband service on a non-exclusive wholesale basis.[12] Clearwire continues to position itself as a capacity-rich "off ramp" for other carriers facing spectrum constraints. Beginning this year, Clearwire will start deploying TDD-LTE 4G services designed to provide wholesale capacity in dense urban markets

[8] *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, *Report and Order and Further Notice of Proposed Rulemaking*, WT Docket No. 03-66 (Jul. 29, 2004).

[9] Clearwire launched its first greenfield 4G network in Portland, Oregon in early 2009.

[10] The 10.5 million subscribers consist of 1.4 million retail subscribers and 9.1 million wholesale subscribers with high-speed residential and mobile Internet and interconnected voice over Internet protocol ("VoIP") services.

[11] As part of its relationship with its EBS lessors, Clearwire assists its EBS lessors in meeting their obligations under FCC rules to use their spectrum to provide essential educational services to schools and colleges across the country.

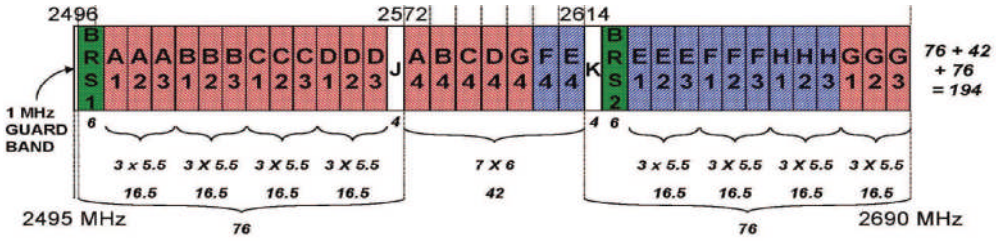
[12] Clearwire provides the broadband platform serving Sprint's 4G customers along with a group of disruptive upstarts including FreedomPop, NetZero, Karma, Mobile Beacon, Mobile Citizen, Leap Wireless, Cbeyond and Locus Telecommunications. These newcomers are using Clearwire's network to offer innovative pricing models, including free broadband to consumers. *See* Anton Troianovski, *Start-Up Skirts Cellphone Data Plans* (Oct. 1, 2012) , available at http://online.wsj.com/article/SB10000872396390443862604578028452045153628.html?mod=googlenews_wsj; *see also* Myriam Joire, *NetZero Launches '4G' Wireless Service, We Go Hands on* (Mar. 19, 2012), available at http://www.engadget.com/2012/03/19/netzero-launches-4g-wireless-service-we-go-hands-on/; Karl Bode, *Karma Offers Wireless at $14 a Gigabyte, Straight Latest MVNO Attempt to Disrupt Pricing*, available at http://www.dslreports.com/shownews/Karma-Offers-Wireless-at-14-a-Gigabyte-Straight-119948 (Jun. 15, 2012); Tammy Parker, *WiMAX Provider Mobile Beacon Offers Free Wi-Fi Service* (Sep. 23, 2012), available at http://www.fiercebroadbandwireless.com/story/wimax-provider-mobile-beacon-offers-free-wi-fi-service/2012-09-23.

where it is needed most.[13] On December 17, 2012, Sprint and Clearwire announced that they had entered into a definitive agreement by which Sprint will acquire the remaining stock of Clearwire that Sprint does not already own. The Sprint-Clearwire agreement is conditioned on the prior consummation of the previously announced SoftBank-Sprint transaction.[14]

2. BRS-EBS

Although Clearwire has deployed extensive broadband services, the BRS-EBS spectrum it controls through licenses and leases remains a disaggregated band with numerous, often dis-contiguous channels. The BRS-EBS band begins with a one megahertz guard band at 2495-2496 MHz. Above the guard band is BRS-1 at 2496-2502 MHz followed by twelve consecutive 5.5-megahertz EBS channels, which are often licensed in groups (as identified by letter classification), but sometimes licensed individually (as identified by letter and number classification). Additional BRS and EBS channels are available higher in the band according to the plan shown in Figure 1 below.[15]

Figure 1: BRS-EBS Band Plan



[13] *See* Kevin Fitchard, *Clearwire Breaking Ground on New LTE Network* (Sep. 20, 2012), available at http://gigaom.com/2012/09/20/clearwire-breaking-ground-on-new-lte-network/. Clearwire initially is targeting high demand "hot zones" in 31 major urban centers such as New York City, San Francisco, Los Angeles, Chicago, and Seattle where demand for 4G mobile broadband is high and the need for deep capacity resources is most acute.

[14] SoftBank has agreed to purchase 70% of Sprint. *See* Applications of Sprint Nextel Corporation, Transferor, and SoftBank Corp., and Starburst II, Inc., Transferees, for Consent to Transfer of Control of Licenses and Authorizations, Public Interest Statement, attached to ULS File No. 0005483246, IB Docket No. 12-343.

[15] Federal Communications Commission, *BRS-EBS Band Plans: Pre-Transition At 2500-2690 MHz & Post-Transition at 2495-2690 MHz* (Jan. 11, 2013, 2:00 P.M.), http://wireless.fcc.gov/services/brsebs/data/BRS-EBS-BandPlans.pdf.

Much of the 2.5 GHz band has been licensed using irregular geographic areas that can result in different geographic license areas on each channel in the band and do not correspond to customary patterns of commercial traffic and population density. Among the BRS channels, this licensing scheme is the result of an overlay of Basic Trading Area ("BTA") licenses over top of hundreds of incumbent site-specific licenses.[16] Further complicating matters, many of the legacy site-specific licenses in both the EBS and BRS bands overlap each other. While the Commission has adopted detailed rules to determine the geographic boundaries of the overlapping licenses, calculating the geographic license area can prove challenging, especially when multiple legacy, co-channel BRS or EBS stations overlap one another.[17]

3. BRS-1

The channel closest to Globalstar, BRS-1, is one of the BRS-EBS channels best able to support common national services. Most of the BRS-EBS band is comprised of small licenses in highly irregular geographic areas, often with substantial white space occurring among licenses in the band. BRS-EBS geographic license areas can and often do vary by channel. BRS-1 has a similarly diverse array of geographic-area license sizes, but is a channel where Clearwire has assembled a portfolio that is close to nationwide in scope. In a band otherwise characterized by a complex and diverse assignment of small geographic area licenses, the availability of geographically contiguous spectrum in the same frequency throughout most of the country allows for the development of network and device commonalities and scale as well as the

[16] 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, WT Docket No. 03-66, 23 FCC Rcd. 5992 ¶ 11 (Mar. 20, 2008) ("BRS/EBS 4th MO&O and 2d FNPRM").

[17] Applications of Sprint Nextel Corporation and Clearwire Corporation for Consent to Transfer Control of Licenses and Authorizations, File Nos. 0003463540, et al., WT Docket No. 08-94, Sprint Nextel Corp. & Clearwire Corp., Joint Opposition to Petitions to Deny and Reply to Comments, at 29-30 (Aug. 4, 2008).

deployment of systems and services that may not otherwise prove feasible. This ability of BRS-1 to accommodate common, near-nationwide operations on a single frequency represents an especially valuable asset.[18]

Before BRS-1 was located to the 2496-2502 MHz band, it was licensed in the 2150-2156 MHz band as part of the predecessor to BRS, the Multipoint Distribution Service ("MDS").[19] The Commission established MDS in 1974, anticipating it would be used for wireless cable service.[20] The plan for wireless cable service never came to fruition, however, and the Commission allowed licensees to provide additional services as technology developed.[21] In 2004, it renamed the multipoint distribution service the broadband radio service to better reflect the advanced broadband services expected to develop in the band, and further updated its rules to allow licensees to provide more advanced services.[22]

At the same time that it renamed the band, the Commission relocated BRS-1 from 2150 MHz to 2496-2502 MHz, clearing space for the advanced wireless services (AWS) band (2110-2155 MHz). The Commission required BRS-1 to share two-thirds of its new home, 2496 MHz through 2500 MHz, with Globalstar, in addition to approximately 100 "grandfathered" Broadcast Auxiliary Service ("BAS") licensees,[23] and industrial, scientific, and medical ("ISM")

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[18] *See, e.g.*, 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, WT Docket No. 03-66, Third Memorandum Opinion and Order and Second Report and Order, FCC 06-46 ¶¶ 28-29 (Apr. 27, 2006) ("BRS/EBS 3d MO&O and 2d R&O").

[19] 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, WT Docket No. 03-66, *Report and Order and Further Notice of Proposed Rulemaking*, 19 FCC Rcd. 14165 ¶ 11 (July 29, 2004) ("BRS/EBS R&O and FNPRM").

[20] *Id.*

[21] *See id.* ¶¶ 12-14.

[22] *Id.* ¶ 6.

[23] *Id.* ¶ 28 ("[T]here are 108 grandfathered terrestrial licenses for broadcast auxiliary service and private radio services that are protected by primary status."). The Society of Broadcast Engineers has petitioned to move

operations.[24] Several parties challenged the Commission decision through reconsideration and appeal.[25] Those challenges remain pending.

4. EBS

The Commission has granted more than 2,000 EBS licenses to approximately 1,300 educational entities throughout the United States, including: state government agencies; state universities and university systems; public community and technical colleges; private universities and colleges; public elementary and secondary school districts; private schools (including Catholic school systems); public television and radio stations; hospitals and hospital associations; and other non-profit educational entities. These entities use their licenses to provide educational and instructional television material to students,[26] such as providing students with high speed internet access.[27] In addition, EBS licensees lease excess capacity to commercial providers, which provides valuable financial support for the mission of educational and not-for-profit institutions.[28]

BAS from the band, but the Commission has not taken any action since it indicated in 2008 that it would "defer consideration . . . to a separate decision." BRS/EBS 4th MO&O and 2d FNPRM ¶ 88; Society of Broadcast Engineers, Inc., Petition for Reconsideration, IB Docket No. 02-364 (filed May 22, 2006). http://www.sbe.org/FCCLiaison/SBE_02-364_recon.pdf.

[24] "[T]he entire 2400-2500 MHz band is available for Industrial, Scientific, and Medical (ISM) operations which use electromagnetic energy to perform a function other than communications, such as heating substances in a microwave oven." BRS/EBS R&O & FNPRM ¶ 28 (citing 47 C.F.R. Part 18).

[25] Several parties, including Globalstar, petitioned for reconsideration of the Commission's decision to require co-primary sharing of this spectrum; however, the Commission affirmed this portion of its decision in April 2006. BRS/EBS 3d MO&O and 2d R&O ¶¶ 28-29 (Apr. 27, 2006). Sprint Nextel Corporation ("Sprint Nextel") appealed this decision to the D.C. Circuit, contending that sharing among these services in the 2496-2500 MHz band was not feasible. *Sprint Nextel Corp. v. FCC*, No. 06-1278 (D.C. Cir. filed July 21, 2006). Although Globalstar does not mention Sprint's appeal in its proposal, Globalstar has intervened in that case. Sprint has also further appealed the Commission's technical framework governing the sharing of 2496-2500 MHz, and Globalstar has intervened there as well. *Sprint Nextel Corp. v. FCC*, No. 08-1233 (D.C. Cir. filed Aug. 12, 2008). These cases have been consolidated and remain unresolved.

[26] BRS/EBS 4th MO&O and 2d FNPRM ¶ 146.

[27] *Id.* ¶ 147.

[28] BRS/EBS R&O and FNPRM ¶ 12.

B. Technical Analysis Indicates that Globalstar's TLPS Proposal Will Cause Harmful Interference to BRS-1.

Globalstar's initial TLPS deployment would consist of 20,000 base stations authorized to operate at up to four watts equivalent isotropically radiated power ("EIRP") and user equipment that would not exceed two watts EIRP. Both the base stations and the user equipment ("UE") would incorporate elements of "the 802.11 standard." According to the petition, Globalstar would use some version of the IEEE 802.11 standard to expand the pool of frequencies currently used by WiFi.[29] While identifying the IEEE 802.11 standard provides some information about channel bandwidth, duplexing and basic design, many of the system parameters critical to a detailed interference analysis remain unknown.

Globalstar, for example, does not provide information or baseline limits concerning the location, number, directionality, height, and density of TLPS base stations or user equipment. These omissions mean that modeling can provide only limited insight into real-world conditions. Assessing the cumulative effects of user equipment is especially challenging. Even limiting a TLPS model to smartphones in the United States (as opposed to all consumer and commercial hotspots) proves challenging because the embedded base of WiFi capable user equipment is so extensive. According to Informa, for example, WiFi accounted for more than two-thirds of all *smartphone-originated* data traffic within the sample base at the beginning of 2012.[30] And as more and more featurephones incorporate WiFi functionality, WiFi transmitters and traffic

[29] There is no single 802.11 standard. IEEE 802.11 is a "family of standards," including 802.11, 802.11b 802.11a, 802.11g, and 802.11n. These standards vary as to data throughput, modulation rate, maximum power, and other specifications. Interference considerations may vary accordingly, too. While not directly relevant to an analysis of the OOBE or BFO interference affecting BRS and EBS licensees, the air interface Globalstar chooses could affect other parties. Knowing the specific 802.11 standard upon which Globalstar intends to base its TLPS deployment is another data point where Globalstar's production of this information may provide information relevant to a holistic interference analysis.

[30] Informa Telecoms & Media, *Understanding Today's Smartphone User: Demystifying Data Usage Trends on Cellular & Wi-Fi Networks* (2012), http://www.informatandm.com/wp-content/uploads/2012/02/Mobidia_final.pdf.

volumes are only expected to increase. Further complicating matters are the uneven distribution of data traffic throughout the day and the pronounced variation in traffic distribution by location. These factors generate areas of peak-traffic and greater cumulative interference that a reasonable UE interference model should take into account.

Modeling the TLPS UE remains a critical prerequisite to a full understanding of Globalstar's proposal. In the absence of critical data about UE deployment and operations, however, modeling TLPS base station performance at least provides some baseline for interference study. As with the UE, Globalstar provides little to no information about the density or architecture of the TLPS base stations it intends to deploy. Based on reasonable assumptions about the nature of deployment, emissions from TLPS 4-watt base stations would generate levels of interference into operational BRS and EBS systems that would appear to prove difficult to overcome.

Globalstar never suggests that it is limited in deploying TLPS only at indoor locations and, indeed, indicates that it will deploy at least some meaningful percentage of its TLPS base stations in outdoor locations.[31] Presumably Globalstar wants the flexibility to establish outdoor TLPS base station architecture to satisfy the demands of end-user customers and potential business partners. Within the last two years, broadband providers have begun installing low-cost outdoor WiFi base stations in outdoor locations across the country. Large Internet service providers such as Comcast, Time Warner Cable, Bright House Networks, Cox Communications and Cablevision have already deployed dense networks of WiFi base stations in many areas,

[31] *See, e.g.*, Petition at 17-18 ("Globalstar in conjunction with its terrestrial partners will likely deploy thousands of newly-manufactured TLPS access points across the United States. . . . 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."). Presumably, for TLPS deployments to be an efficient option in rural areas, they will have to be deployed outdoors.

including New York, Philadelphia, and Los Angeles, to the point where today hundreds of thousands of WiFi base stations are in operation.[32] Driving the extensive and growing outdoor use of WiFi base stations is cost, simplicity and coverage. With outdoor hotspots proliferating rapidly to satisfy consumer demand, modeling the effects of an outdoor TLPS hot spot on BRS-EBS operations reflects a realistic and reasonable interference scenario. Using the limited information that has been provided, Clearwire has determined that a single outdoor Globalstar TLPS base station operating at maximum power in some proximity to a BRS-1 base station or BRS-1 UE potentially causes several types of interference, including OOBE and adjacent channel overload.[33] The study relies on the Walfisch-Ikegami Path Loss Model, which is an empirical path loss model that accounts for obstructions and clutter that can mitigate the predicted likelihood of Globalstar's TLPS concept to cause interference to adjacent-channel operators. A worst-case free space path loss might better represent actual conditions where a TLPS base station might operate in line-of-site of a BRS base station or UE. Yet, even this more forgiving path-loss model for a single four-watt outdoor TLPS base station yields disconcerting results.

Adopting reasonable assumptions about an outdoor TLPS 4-watt base station operating in an environment representative of the Walfisch-Ikegami Path Loss Model, Clearwire found that both the TLPS 4-watt base station and Clearwire's BRS-1 base station would require supplemental filtering to avoid system degradation. Specifically, based on the information Globalstar provided, Clearwire assumed that a TLPS 4-watt base station would employ a 30

[32] Chenda Ngak, *Time Warner, Comcast, Cablevision to Offer Free Wi-Fi hotpots*, CBS NEWS (May 22, 2012), http://www.cbsnews.com/8301-501465_162-57439268-501465/time-warner-comcast-cablevision-to-offer-free-wi-fi-hotspots/; Shalini Ramachandran, *Cable Firms Warm to Outdoor Wi-Fi*, WALL ST. J. (Feb. 29, 2012).

[33] While the model assumes the BRS-1 operator has deployed TDD-LTE air interface, no appreciable differences exist between TDD-LTE and WiMAX for purposes of this analysis.

dBm total power output into a omnidirectional antenna with 6 dBi antenna gain and would be mounted on the top of a building with a line of sight to one of Clearwire's BRS-1 base station antennas. Based on these assumptions, to avoid operational impairments, the Globalstar 4-watt base station would require a supplemental OOBE suppression filter, and the Clearwire BRS-1 base station would require a filter to suppress adjacent channel overload effects. Substituting a free space path loss model for the more-forgiving Walfisch-Ikegami Path Loss Model would make the situation worse.

Although supplemental filters can likely be used to mitigate the impacts to base station operations, Clearwire's models indicate that Clearwire's UE would be similarly impacted, and it is not possible to provision those devices with filters. This predicted interference to UE coupled with the inability to provide UE with filters suggests that TLPS operations would significantly impair Clearwire's BRS-1 system.

These results are not intended to be, and should not be considered, definitive. Too little information about Globalstar's TDD and FDD systems is available to perform a complete analysis. And the production of additional information from Globalstar about actual system operation and the development of a set of baseline limitations on deployment, such as an indoor-only use restriction, may render this initial formulaic analysis overly pessimistic.

As the petitioner, Globalstar bears the burden of offering enough detail for the Commission to develop a notice of proposed rulemaking that enables interested parties to reasonably participate in the rulemaking process.[34] Section 1.401(c) of the Commission's rules requires petitions for rulemaking to include "all facts, views, arguments and data deemed to

[34] *See MCI Telecom. Corp. v. FCC*, 57 F.3d 1136, 1141 (D.C. Cir. 1995) (noting that "[t]he APA requires the Commission to provide notice of a proposed rulemaking 'adequate to afford interested parties a reasonable opportunity to participate in the rulemaking process'" (quoting *Florida Power & Light Co. v. United States*, 846 F.2d 765, 771 (D.C. Cir. 1988))).

support the action requested."[35] In particular, petitioners are required to provide "sufficient technical" information when seeking relaxed emissions limits, including sufficient analysis regarding the risk of harmful interference to other services.[36] Globalstar has not met this burden—it must provide more information to allow for evaluation of the interference potential of its proposed terrestrial deployment models. Without considerable additional information, including test data, interested parties will prove unable to fully and effectively participate in any proceeding.

In response, Globalstar may note that, in lieu of detailed system configuration information, it has proposed to amend the Commission's rules by adding a Section 27.1403, which would, direct "[t]he AWS licensee in the 2483.5-2495 MHz band," to "take steps necessary to avoid causing interference to other services sharing the use of the 2450-2500 MHz band through frequency coordination."[37] While theoretically helpful, Globalstar presents no additional information regarding frequency coordination that allows interested parties to discern whether coordination would be technically feasible or practical or whether coordination would solve the potential interference challenges between Globalstar's operations and other services, such as BRS-1. Further, Globalstar omits any discussion of whether the new section 27.1403 would apply only to four-watt base stations or would extend to user equipment as well.

[35] 47 C.F.R. § 1.401(c).

[36] Petition for Rulemaking Filed by Checkpoint Systems, Inc. to Amend Part 15 of the Commission's Rules to Permit Increased Emissions for Electronic Article Surveillance Systems, RM-9092, *Order*, 13 FCC Rcd. 21600 ¶ 7 (Aug. 5, 1998); *see also* Amendment of the Commission's Rules to Provide Ancillary Services in the 849-851 and 894-896 MHz Bands, RM-7871, *Order*, 8 FCC Rcd. 3920 (June 4, 1993) (explaining Commission must have sufficient information to determine whether a service can effectively operate).

[37] Petition App'x A at 14.

Globalstar's desire to lump together customer devices and four-watt base stations in a single emissions category it calls a "digital station" further complicates matters.[38] Under Globalstar's proposal, TLPS base stations would be authorized to operate at up to four watts of power, which is four times the limit at which commercial mobile devices operate.[39] Despite the disparity, Globalstar asks for a single emissions limit for both user equipment and four-watt base stations.[40] Globalstar contends a single limit for base and mobile units is warranted because the proposed four-watt base stations operate at levels of power closer to one-watt user equipment than traditional base stations, which are authorized to use substantially more power.[41] That the four-watt base stations are less powerful than traditional commercial wireless base stations does not, by itself, justify adopting the same emissions limits for user equipment and base stations. Although Globalstar contends that TLPS emission limits should be similar to those in the BRS and EBS bands, separate and narrowly tailored emissions limits for user equipment and base stations stem from the common-sense recognition that these units not only emit at different levels, but also create different amounts of interference based on how they are used.[42] In this case, the location, power, antenna design and other factors would seem to support separate limits for base and end user equipment. At a minimum, Globalstar must provide further justification for grouping user equipment and base stations under a single, common emissions limit.

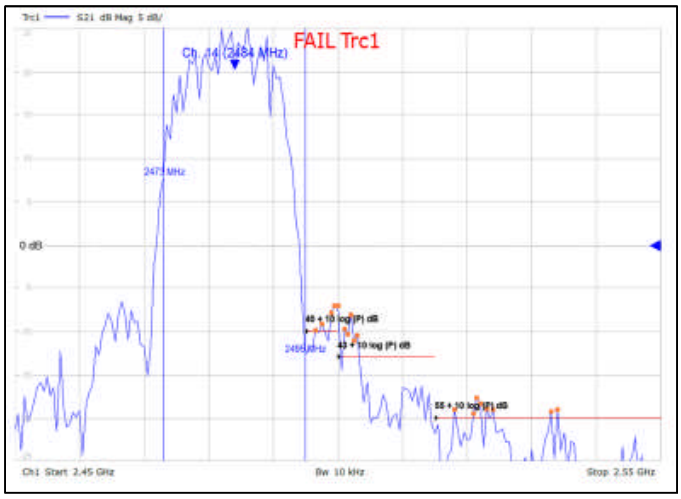
[38] *See* Petition at 39; Petition App'x A at 10-11
[39] Petition at 41 and n.102.
[40] *Id.* at 39.
[41] *Id.* at 40.
[42] The BRS and EBS bands have separate out of band emission limits for "digital base stations" and "mobile digital stations." 47 C.F.R. § 27.53(m)(2), (4).

C. Globalstar Has Provided Insufficient Information to Allow the Commission to Develop Informed Comments from the Public.

As indicated earlier, one of the fundamental challenges of actually deploying wider bandwidth channels is that wider bandwidths produce wider undesired shelves of undesired signals on either side of the desired channel. Whereas a five megahertz broadband channel produces five megahertz OOBE shelves on either side of the desired carrier signal, a twenty megahertz channel will produce twenty megahertz OOBE shelves on either side of the carrier signal. The larger the desired channel bandwidth, the larger the shelves of undesired OOBE.

Globalstar's TLPS concept is no exception. As shown in the graphic below, which is reproduced from the Globalstar's petition, deploying a twenty-two megahertz channel will produce two, twenty-two megahertz shelves of elevated OOBE that will affect BRS-EBS licensees in the 2.5 GHz band:[43]

Figure 2: A 22 MHz Channel Produces Two 22 MHz Shelves



The first (higher) shelf of elevated OOBE runs from roughly 2495 MHz to 2515 MHz (Globalstar's graphic breaks this shelf into two components), and the second (lower) shelf of

[43] Petition App'x B at 8.

elevated OOBE runs from roughly 2515-2545 MHz. BRS-EBS licensees affected by the higher shelf of OOBE include BRS-1, EBS-A1, EBS-A2, and a portion of EBS-A3. Licensees affected by the lower shelf of OOBE include EBS-B1, EBS-B2, and EBS-B3.

Both Globalstar's TLPS concept and the WiMAX air interface that BRS-EBS licensees have deployed in the 2.5 GHz band (as well as the TD-LTE air interface BRS-EBS licensees plan to deploy there) involve time-division duplex ("TDD") technologies that transmit and receive on the same frequency. The consequence of locating TDD systems on either side of the 2495 MHz band edge is that BRS-EBS licensees in the 2496-2550 MHz band could suffer from four separate potential interference scenarios as a result of Globalstar's TLPS concept: (1) TLPS base station transmissions into BRS-EBS base station receivers; (2) TLPS base station transmissions into BRS-EBS UE receivers; (3) TLPS UE transmissions into BRS-EBS base station receivers; and (4) TLPS UE transmissions into BRS-EBS UE receivers. Each scenario requires separate consideration and analysis. And notably, some of the scenarios, such as mobile–to-mobile interference, are more probabilistic or susceptible to mutual coordination than others, such as TLPS base station emissions into BRS-EBS mobile receivers.

Ordinarily, these same types of interference scenarios could emanate from BRS-EBS systems to potentially harm Globalstar's TLPS operations, and the prospect of mutually harmful interference could serve to encourage mutually beneficial coordination between the two otherwise incompatible systems. In this case, however, the incentive for mutual cooperation will be compromised because of the lack of reciprocity between the OOBE limits that Globalstar has proposed for its own TLPS service and what it is willing to accept in the neighboring 2.5 GHz band. Based on a petition for rulemaking filed by the Wireless Communications Association, International ("WCAI"), there is a pending rulemaking proposing changes to the OOBE

associated with mobile stations (a/k/a devices) to permit deployment of twenty-megahertz or greater channels in the 2.5 GHz band. Globalstar filed in opposition to the proposal citing interference concerns.[44] After cordial, but inconclusive negotiations with Globalstar over the issue, Clearwire supplemented the WCAI proposal to incorporate very sharp limits on OOBE from the BRS-EBS band into Globalstar's spectrum that preserve the exiting status quo at the 2496 GHz band edge.[45] The limits proposed for wide-channel BRS-EBS operations are so sharp, in fact, that they effectively *prohibit* BRS-EBS licensees from operating twenty-megahertz or greater channels near the 2496 MHz BRS-EBS band edge.[46] This hard stop at the 2496 MHz band edge was specifically incorporated into Clearwire's modified proposal to accommodate Globalstar.

Although Globalstar asserts in its petition that its proposed OOBE limits are "similar" to the OOBE limits for mobile stations that WCAI and Clearwire have sought in the 2.5 GHz band, there are important differences between the proposals that potentially create lopsided incentives for operations at the band edge. Whereas Clearwire's proposed broadband OOBE limits protect Globalstar by effectively prohibiting wider channel bandwidths near the 2496 MHz band edge, Globalstar's proposed TLPS operation would place its twenty-two megahertz TLPS broadband

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[44] Globalstar, Inc., Opposition to the Wireless Communications Association Int'l Petition to Amend Section 27.53(m) of the Commission's Rules, RM-11614 (Dec. 6, 2010).

[45] 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) ("Clearwire Ex Parte Letter").

[46] Specifically, Clearwire has proposed an OOBE mask where the current OOBE levels of 43 + 10 log (P) dB, 47 C.F.R. § 27.53(m), would remain in place at the 2496 MHz band edge. 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). Clearwire proposed this compromise to address concerns about OOBE that Globalstar had raised. *Id.* at 2. To be sure, Clearwire and other BRS-EBS licensees could still make use of the lower frequency 2.5 GHz spectrum by, for example, deploying narrower channel bandwidths of five or ten megahertz. Narrower channelizations will have lower throughput capability, but will produce smaller, less potentially harmful shelves of interference. The "dead stop" OOBE limits Clearwire has proposed for BRS-EBS at the 2496 MHz band edge, thus, comes at a material cost to BRS-EBS licensees and provide a meaningful benefit to Globalstar.

operations nearly adjacent to the BRS-EBS spectrum because it lacks a hard stop at the 2495 MHz band edge. This placement would extend the wide shelf of TLPS OOBE well into the BRS-EBS spectrum. In addition, the WCAI/Clearwire proposal is limited to a relaxed standard for devices. As discussed above, Globalstar is seeking a relaxed standard for both devices and base stations that potentially operate at four watts of power. And depending on the precise power, location, operation and design of the Globalstar TLPS system, the expansive OOBE profile could reduce BRS-EBS broadband coverage areas, diminish BRS-EBS broadband throughput speeds, and interrupt or even disable BRS-EBS broadband communications.

In short, the crux of the WCAI proposal, later modified by Clearwire, was to acknowledge the nature of OOBE emissions into Globalstar's spectrum and provide additional emissions protection for the benefit of Globalstar below the 2496 MHz band edge. The crux of the Globalstar proposal, by contrast, is to push unwanted emissions – as well as the concomitant costs of diminished, interrupted or infeasible broadband communications – onto the licensees of the BRS-EBS band. The Globalstar proposal thus lacks mutuality of obligation that fosters an environment of cooperation at the licensees' respective band edges.

D. Eliminating MSS ATC in Favor of an AWS-5 Band Threatens to Complicate Resolution of Interference Disputes.

Globalstar's proposal to eliminate MSS ATC in favor of a co-primary, terrestrial "AWS-5" assignment compounds the lack of mutuality found in Globalstar's proposed relaxation of the emissions mask and elimination of the absolute protection for BRS found in today's rules. In its MSS ATC Orders, the Commission imposed "gating criteria" on ATC to ensure that MSS operators would not deploy terrestrial infrastructure in their MSS spectrum at the expense of the satellite operations, which were to remain the preeminent service in the band. Among other things, the MSS ATC gating criteria require the MSS ATC licensees to maintain continuous,

nationwide satellite coverage. MSS licensees may not lawfully curtail satellite coverage to make room for their terrestrial infrastructure. Nor may the MSS ATC licensees deploy terrestrial infrastructure in ways that render infeasible satellite communications that might otherwise occur.

This nationwide satellite coverage requirement has worked better than expected in many ways. To protect the satellite operations in their spectrum, MSS ATC licensees have had to avoid design choices that create "exclusion zones" for satellite coverage. By extension, MSS ATC licensees have also had to avoid deploying terrestrial systems that might create additional harmful interference to co- and adjacent-channel licensees.[47]

The Commission should not consider adopting an AWS-5 allocation if it means eliminating the protections that the MSS ATC "gating criteria" and MSS ATC license conditions afford to co- and adjacent-channel operators. In this sense, the real issue is not whether to grant Globalstar some measure of flexibility to deploy services with fewer constraints on its business model; Globalstar would plainly benefit from such a decision. Rather the issue is whether the Commission can replace general and sometimes implicit interference protections that accompany MSS ATC with specific and explicit interference protections that not only protect co- and adjacent-channel licensees, but also are more transparent for Globalstar to identify and manage.

The MSS ATC "gating criteria" and associated license conditions applicable to Globalstar today provide important protection for co- and adjacent-channel licensees in the vicinity of Globalstar's spectrum. And whatever the status of same-band, separate-operator

[47] The Commission's original MSS ATC authorization for Globalstar memorialized this limitation by expressly directing Globalstar to "avoid causing harmful interference to other services." Spectrum and Service Rules for Ancillary Terrestrial Components in the 1.6/2.4 GHz Big LEO Bands, IB 07-253, *Report and Order and Order Proposing Modification*, 23 FCC Rcd. 7210 ¶ 36 (Apr. 10, 2008).

sharing may be in other MSS bands,[48] co-primary sharing between MSS and terrestrial broadband operators has been the reality in the 2496-2500 MHz band since 2008.[49] The Commission's *MSS-BRS Co-Primary Sharing Order* reasoned that power flux density ("PFD") levels applicable to the Big LEO satellite would work to prevent harmful interference into co-channel terrestrial infrastructure. While the PFD limits have no doubt helped, the principal mechanism through which the triple co-primary sharing arrangement the Commission required among MSS, BRS, and BAS licensees has worked is the Commission's decision to encourage cooperation through a *mutually shared* burden of coordination. The Commission should not consider removing the MSS ATC gating criteria and license conditions – and disrupting the careful balance of mutual incentives that accompany those protections – without first gaining access to the information necessary to adopt more explicit interference-protection measures. At present, Globalstar has presented insufficient information to accomplish this task.

[48] In the AWS-4 Report and Order, the Commission explained that "separately controlled MSS and terrestrial operations (*i.e.*, two ubiquitous mobile services) in the same band would be impractical because the parties would not be able to overcome the technical hurdles to reach a workable sharing arrangement." *See* Service Rules for Advanced Wireless Services in the 2000-2020 MHz and 2180-2200 MHz Bands, WT Docket No. 12-70, Fixed and Mobile Services in the Mobile Satellite Service Bands at 1525-1559 MHz and 1626.5-1660.5 MHz, 1610-1626.5 MHz and 2483.5-2500 MHz, and 2000-2020 MHz and 2180-2200 MHz, ET Docket No. 10-142, Service Rules for Advanced Wireless Services in the 1915-1920 MHz, 1995-2000 MHz, 2020-2025 MHz and 2175-2180 MHz Bands, WT Docket No. 04-356, *Report and Order and Proposed Modification*, FCC 12-151 ¶ 181 (Dec. 17, 2012) ("AWS-4 Report and Order").

[49] *See* BRS/EBS 4th MO&O and 2d FNPRM ¶ 94 ("We continue to believe that the currently codified PFD limits will permit a [same-band, separate-operator] shared solution [at 2496-2500 MHz] if proper engineering techniques are applied to the MSS and BRS systems."). The Commission's order for same-band, separate-operator sharing at 2496-2500 MHz is the subject of various appeals and petitions for reconsideration that remain pending. *See* BRS/EBS R&O & FNPRM; BRS/EBS 3d MO&O and 2d R&O; BRS/EBS 4th MO&O and 2d FNPRM; Sprint Nextel Corp. v. FCC, No. 06-1278 (D.C. Cir. filed July 21, 2006); Sprint Nextel Corp. v. FCC, No. 08-1233 (D.C. Cir. filed Aug. 12, 2008).

E. The Commission Conditioned Globalstar's Use of the 2493-2495 MHz Band on the "Absolute Obligation" to Eliminate Any Harmful Interference to Adjacent-Channel Services.

In recognition of the potential for interference from ATC into BRS, the Commission prohibited ATC from causing harmful interference into BRS. When the Commission moved BRS-1 to 2496 MHz in 2004, the Commission also shifted Globalstar's ATC spectrum "down from the 2492.5-2498 MHz band to the 2487.5-2493 MHz band."[50] The Commission relied on this three megahertz separation between ATC and BRS (2493 MHz – 2496 MHz) to protect against interference.[51] The Commission reasoned that it had previously determined that the ATC OOBE limits were sufficient to protect against ATC causing harmful interference at least 2 MHz away; the third megahertz was just added protection.[52]

In 2008, at Globalstar's request, the Commission extended Globalstar's ATC authorization from 2493 MHz to 2495 MHz.[53] The Commission found that "the 2493-2495 MHz segment can be used for ATC services, at least in some areas."[54] In doing so, the Commission decided to trade the three megahertz physical separation for a framework where Globalstar was prohibited from interfering with BRS-1 users. The Commission explained that Globalstar retained an "absolute obligation to eliminate any harmful interference to BRS that may nevertheless occur, including [an] obligation to reduce the power of operations in its upper channel or channels, or cease operations entirely in its upper channel or channels, to eliminate

[50] Review of the Spectrum Sharing Plan Among Non-Geostationary Satellite Orbit Mobile Satellite Service Systems in the 1.6/2.4 GHz Bands, IB Docket No. 02-364, *Report and Order*, 19 F.C.C.R. 13356 ¶ 27 (July 16, 2004) (Big LEO R&O).
[51] *Id.* ¶ 75.
[52] *Id.* ¶ 72, 75.
[53] Spectrum and Service Rules for Ancillary Terrestrial Components in the 1.6/2.4 GHz Big LEO Bands, IB 07-253, *Report and Order and Order Proposing Modification*, 23 FCC Rcd. 7210 (Apr. 10, 2008).
[54] *Id.* ¶ 30.

harmful interference to BRS Channel 1 operations."[55] The Commission recognized that this *absolute* obligation to avoid interference, together with future BRS deployments "will have the practical effect of rendering it infeasible for Globalstar to use the 2493-2495 MHz segment of the S-band for ATC in some geographical areas."[56] In addition to this obligation, the Commission also adopted stricter OOBE limits, but it explained that those limits would not offer sufficient protection for adjacent-channel licensees or create a safe harbor for ATC operations. According to the Commission, "ATC enjoys no rights vis-à-vis other primary services in the same or adjacent bands."[57]

Globalstar does not mention this history—that it only received the right to operate in the 2493-2495 MHz band in exchange for the guarantee that it would not cause interference. It does not discuss rule 47 C.F.R. § 25.255, which requires that "[i]f harmful interference is caused to other services by ancillary MSS ATC operations, . . . the MSS ATC operator must resolve any such interference." Globalstar's petition simply proposes to delete this critical measure of protection in its Appendix without further discussion. In place of the absolute prohibition on harmful interference, Globalstar seeks far more permissive emissions rules than exist today.

When it imposed a "cause-no-interference" obligation on Globalstar's terrestrial operations, the Commission sought to create a framework that would allow for cooperation. As the Commission explained, "[c]areful engineering, *cooperation between Globalstar and BRS Channel 1 licensees*, and improvements in technology . . . may allow Globalstar to operate ATC in the 2493-2495 MHz segment in all or some parts of the United States."[58] Globalstar's

[55] *Id.* ¶ 32.
[56] *Id.* ¶ 31.
[57] *Id.* ¶ 35.
[58] *Id.* ¶ 31

proposal would upend the concept of cooperation between Globalstar and BRS-1. In effect, Globalstar's proposal would impose an "accept any interference" mandate on BRS-EBS licensees and lessors, such as Clearwire.

For both Globalstar's TLPS concept and Globalstar's FDD LTE concept, Globalstar seeks to establish permissive power, operational and emissions limits that increase the potential for interference and, if adopted, all but eliminate any incentive for Globalstar to cooperate in the deployment of its TLPS concept with adjacent and near-adjacent channel licensees. Globalstar's TLPS proposal would operate four-watt TDD base stations and user equipment over twenty-two megahertz of spectrum using Globalstar's Upper Big LEO band spectrum from 2483.5-2495 MHz and adjacent unlicensed industrial, scientific, and medical ("ISM") spectrum at 2473-2483.5 MHz.[59] The operations would exceed existing emission limits.[60] Meanwhile, Globalstar's proposed FDD LTE concept appears to be a full-power next generation commercial wireless service, and would also require significant relaxation of emission limits.[61]

Developing a workable solution to interference that would be caused by Globalstar's proposal requires Globalstar not only to produce additional information but also to develop a set of specific proposals that, even if they fall short of the "cause-no-interference" regime applicable to BRS-1 today, imposes a burden mutually shared among adjacent channel licenses. If Globalstar is able to supplement the record with additional system parameters and testing evidence, the Commission may then have sufficient information to craft remedies for interference, including benchmarks for power reduction or service cessation should Globalstar's service interfere with BRS-EBS service even if Globalstar is operating within applicable OOBE

[59] Petition at iii, 4.
[60] Petition App'x B at 6-7.
[61] *See* Petition at 39.

limits. The Commission could also adopt other measures that preserve the level of protection that exist among services in this congested band segment. At present, however, insufficient information exists to establish rules to govern the service.

F. Globalstar Does Not Adequately Address the Risk of Harmful Interference into Numerous Other Co-Channel and Adjacent-Channel Services.

While the potential for harmful interference from Globalstar's FDD LTE or TLPS system into other services are not Clearwire's principal concern, the petition's failure to discuss the interference mechanisms at work with respect to each of these other services calls attention to the inadequacy of the present petition for rulemaking as a whole. Numerous other services – the Radionavigation service, the Radio Determination Satellite Service (RDSS), industrial, scientific and medical (ISM) uses, MSS, and EBS – operate in or near spectrum that is the subject of Globalstar's petition. Many of these potentially affected services go almost entirely or entirely unmentioned, however. And while Globalstar touches on the interference effects of TLPS (and to a much lesser degree, FDD LTE) into BRS-1, BAS and GPS, these showings provide insufficient guidance to perform an informed analysis of interference effects. Globalstar's technical analysis should, at a minimum, explain and demonstrate in some measure of detail whether and how emissions from their TLPS and FDD LTE proposals will affect all relevant co-channel or adjacent channel operators and services.

Globalstar never mentions certain other co- or adjacent channel services such as Radionavigation Satellite Service ("RNSS") or Radioastronomy operations. This silence stands in contrast to previous filings where Globalstar assured the Commission that there was no

interference with these services.[62] Nor does it discuss Radiodetermination Satellite Service ("RDSS"), a service allowing for space stations to take important measurements, with allocations at 1610-1626.5 MHz and 2483.5-2500 MHz, overlapping with both Globalstar's Upper and Lower Big LEO spectrum.

Similarly, Globalstar, does not discuss government uses at 2450-2483.5 MHz and 2483.5-2500 MHz. The National Aeronautics and Space Administration ("NASA") uses the 2450-2483.5 MHz band for tracking, telemetry, and command ("TT&C") with scientific balloon-borne payloads; video downlinks from unmanned aerial vehicles; and point-to-point microwave communication systems to its outlying sites in support of space programs.[63] The Coast Guard also uses the 2450-2483.5 MHz band for boat crew communications and radio frequency identification ("RFID") systems for container tracking and port security.[64] In the 2483.5-2495 MHz band, NASA operates point-to-point microwave communications systems to and from its outlying sites in support of space programs, and military agencies operate tactical communication systems used in training exercises at test ranges.[65] Globalstar's proposal may very well not affect these co- and adjacent channel government services, but the petition does not address them.

Furthermore, although Globalstar is itself a provider of satellite communications, it is silent as to interference issues of the TLPS and FDD LTE concepts to its own and other satellite providers' services. Beyond acknowledging in a footnote that Iridium, a competing satellite

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[62] *See* Globalstar Petition for Expedited Rulemaking for Authorization to Provide Ancillary Terrestrial Component Services in Its Entire Spectrum Allocation, IB Docket No. RM-11339 (June 20, 2006), available at http://apps.fcc.gov/ecfs/document/view?id=6518374706.

[63] NATIONAL TELECOMMUNICATIONS AND INFORMATION ADMINISTRATION, OFFICE OF SPECTRUM MANAGEMENT, FEDERAL SPECTRUM USE SUMMARY, 30 MHZ – 3000 GHZ 40 (2010), available at http://www.ntia.doc.gov/files/ntia/Spectrum_Use_Summary_Master-06212010.pdf.

[64] *Id*.

[65] *Id*.

service provider, is authorized to share spectrum with Globalstar at 1617.775-1618.725 MHz, Globalstar never mentions how FDD LTE service will affect Iridium's Big LEO satellite service. Globalstar's petition also provides little information concerning how a metro area with deployed TLPS operations could also support *Globalstar's* own MSS operations in the event of a disaster. For example, unless Globalstar has some mechanism through which to immediately terminate all TLPS use in a metro area in the event of a disaster, then Globalstar would seem challenged to claim that they can also provide MSS services in that metro area due to likely TLPS interference.

Globalstar contends that Section 15.249(d) of the Commission's rules, which set OOBE limits for operations in the 2400-2483.5 MHz band, will not apply to its TLPS use in the 2473-2483.5 MHz spectrum because the intent of the Commission's Part 15 rules is to protect Globalstar's MSS operations above 2483.5 MHz from interference.[66] But if WiFi devices cause harmful interference into Globalstar licensed TLPS service, must Globalstar accept it? Conversely, if other Globalstar TLPS operations on Channel 14 cause harmful interference into other WiFi channels, must those WiFi devices accept that interference? Similarly, since the devices will never have been reviewed by a telecommunications certification body ("TCB") for operations at frequencies above 2483.5 MHz, how will the type certification of equipment already in the field be effected to permit operations on Channel 14?[67]

[66] Petition at 16 n.24 (explaining that "[a]ny party can use the unlicensed ISM spectrum at 2473-2383.5 MHz as long as those operations do not cause interference to Globalstar's MSS operations above 2483.5 MHz").

[67] *See* 1998 Biennial Regulatory Review – Amendment of Parts 2, 25, and 68 of the Commission's Rules to Further Streamline the Equipment Authorization Process for Radio Frequency Equipment, Modify the Equipment Authorization Process for Telephone Terminal Equipment, Implement Mutual Recognition Agreements and Begin Implementation of the Global Mobile Personal Communications by Satellite (GMPCS) Arrangements, GEN Docket No. 98-68, *Report and Order*, FCC 98-338 ¶ 32 (rel. Dec. 23, 1998) (adopting the telecommunications certification body system and explaining that the Commission will use TCBs "to test and certify equipment as complying with our technical rules and requirements").

While not the focus of these comments, the potential for interference to the operations of other services and the effect Globalstar's licensed WiFi may have on unlicensed WiFi uses, warrants careful consideration and analysis before a petition for rulemaking is issued.

III. CONCLUSION

Globalstar's Petition lacks sufficient information to offer the public a meaningful opportunity to analyze the proposal and the potential for harmful interference. Initial analysis indicates that Globalstar's proposal poses a high risk of harmful interference. In addition, mutual cooperation is critical to efficient use of spectrum, and Globalstar's proposal would eliminate the framework that the Commission created to encourage cooperation between Globalstar and co- and adjacent channel licensees. Globalstar should supplement its filing with additional information about its technology, architecture, operations, and deployment. If Globalstar cannot provide additional information about its proposed terrestrial system, the potential for harmful interference, and the measures the Company plans to undertake to avoid harmful interference, the Commission should dismiss Globalstar's petition without prejudice.

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