Before the
Federal Communications Commission
Washington, DC

In the Matter of:

Terrestrial Use of the 2473-2495 MHz Band for Low-Power Mobile Broadband Networks	)	IB Docket No. 13-213
Amendment to Rules for the Ancillary Terrestrial Component of Mobile Satellite Service Systems	)	RM-11685

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Summary

Globalstar, a Mobile Satellite Service ("MSS") provider, has petitioned the Commission for permission to create a Terrestrial Low Power Service ("TLPS") in the terrestrial portion of the MSS-designated S band at 2483.5-2495 MHz. Globalstar wants to use the upper portion of the adjacent unlicensed 2.4 GHz band at 2473-2483.5 MHz in conjunction with the S band to provide TLPS; consumers would use this managed, hybrid licensed/unlicensed network to access the Internet. Globalstar would be the only unlicensed user of the upper unlicensed band not subject to the out of band emission ("OOBE") limit that restricts unlicensed emissions into the S band—a limit that currently prevents higher-power unlicensed users from using the upper unlicensed band.

Globalstar's proposed TLPS would increase the dynamic and spectral efficiency of both the S band and the upper unlicensed band and the Commission should allow it. However, the Commission should reduce the OOBE limit on all unlicensed users to mitigate the impact Globalstar's use of the upper unlicensed band and create a level playing field. This would permit all unlicensed users, including Globalstar, to transmit on competitive terms, thereby serving the goals of the unlicensed band

Reducing the OOBE would also address existing unlicensed users' interference concerns by spurring innovation in unlicensed technology, which would evolve to account for TLPS's use of the unlicensed band. Unlicensed users, adept at avoiding the interference they are required to accept from other unlicensed users, are well equipped to deal with the potential interference TLPS's introduction would cause.

Licensed providers, unlike unlicensed providers, have interference protection rights that the Commission must consider before approving Globalstar's TLPS. However, of the licensed users in the S band, only Broadcast Auxiliary Service ("BAS") providers have expressed concern about potential interference from TLPS. Moreover, BAS operates primarily below 2483.5 MHz and already successfully coexists with Wi-Fi throughout its

allocation in 2450-2495 MHz. As TLPS will be using the same IEEE 802.11 technology that Wi-Fi uses, successful coexistence with Wi-Fi indicates that BAS would also be able to successfully coexist with Globalstar's TLPS.

The Commission might consider other options: not approving TLPS for fear of Globalstar gaining a windfall from approval, waiting to auction or license the S band to another user, protecting unlicensed users from TLPS's potential interference on their services. These options are not as attractive as approving TLPS contingent on a reduced OOBE, which would most benefit consumers by both adding spectrum to the congested mobile broadband market and opening up additional spectrum for unlicensed use.

Discussion

The Samuelson-Glushko Technology Law and Policy Clinic ("TLPC") at Colorado Law allows student attorneys to participate in regulatory matters at the intersection of technology, law, and policy. Student attorneys examine the diverse perspectives, public interest values, and costs and tradeoffs involved in their chosen topic. After thorough analysis, student-attorneys take action in the name of TLPC; in this proceeding, the TLPC is not representing any organizations or individuals.

Globalstar has petitioned the Commission for permission to create a low-power ancillary terrestrial component ("ATC") at 2.4 GHz.[1] This terrestrial low power service ("TLPS") would use both the terrestrial portion of Globalstar's licensed spectrum and the adjacent unlicensed spectrum.[2]

We believe this proceeding provides the Commission the opportunity to affirm the open nature of the unlicensed band, further encourage spectrum sharing, and continue to move spectrum to the mobile broadband market. We urge the Commission to allow

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[1] *Terrestrial Use of the 2473-2495 MHz Band for Low-Power Mobile Broadband Networks; Amendments to the Rules for the Ancillary Terrestrial Component of Mobile Satellite Service Systems*, Notice of Proposed Rulemaking, IB Docket No. 13-213, 28 FCC Rcd. 15,351, 15,352-53, ¶¶ 1-3 (Nov. 1, 2013) ("*TLPS NPRM*").

[2] In 2003, the Commission allowed mobile satellite licensees to develop the terrestrial portions of their bands by creating ATCs. *Flexibility for Delivery of Communications by Mobile Satellite Service Providers*, Report and Order and Notice of Proposed Rulemaking, IB Docket Nos. 01-185, 02-364, 18 F.C.C.R. 1962, 1965-66, ¶ 1 (2003) ("*ATC Report and Order*"). Although MSS licensees' plans for these ATCs usually involve creating a high power terrestrial system through cell towers, Globalstar has proposed creating a low-powered version. *TLPS NPRM*, 28 FCC Rcd. at 15,363, ¶ 31.Globalstar's terrestrial low power service uses existing IEEE 802.11 technology—the same technology that Wi-Fi uses. *TLPS NPRM*, 28 FCC Rcd. at 15,353, ¶ 3.

Globalstar's TLPS, but only contingent on a reduced OOBE limit for unlicensed users in the 2.4 GHz band.[3]

I. Background

A. Globalstar's TLPS Proposal

Globalstar's TLPS would use two portions of underused spectrum: the terrestrial component of its MSS-designated S band at 2483.5-2495 MHz and the adjacent, lightly used upper unlicensed band at 2473-2483.5 MHz.[4] The TLPS would use existing IEEE 802.11 technology to build a managed network to provide mobile broadband services to consumers.[5]

Globalstar contends that it would act as an unlicensed user in the upper unlicensed band and comply with existing Part 15 rules like any other any unlicensed user.[6] However, because the upper unlicensed band is adjacent to the S band, Globalstar would not be subject to the OOBE limit by which other unlicensed users must abide.[7] While Globalstar's unlicensed portion of its TLPS would emit into the S band, Globalstar allegedly would be able to coordinate its TLPS emissions to prevent interference to its MSS system.[8]

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[3] The Commission sought comment on relaxing the OOBE limit to allow unlicensed use of Wi-Fi Channel 12 and 13 and specifically asked whether relaxing the limits would degrade MSS capabilities. *TLPS NPRM*, 28 FCC Rcd. at 15,367-68, ¶ 41.

[4] *TLPS NPRM*, 28 FCC Rcd. at 15,352-53, ¶ 3.

[5] *See Petition for Rulemaking of Globalstar, Inc.*, RM-11685, 15-17 (Nov. 13, 2012) ("*Globalstar Petition*"), *available at* http://apps.fcc.gov/ecfs/document/view?id=7022079787.

[6] Globalstar would not be subject to the same OOBE limit, but would comply with power limits, accept interference from other unlicensed users, and not have the expectation to continue operating on that frequency. *TLPS NPRM*, 28 FCC Rcd. at 15,368, ¶ 40 & nn.107-08.

[7] *See TLPS NPRM*, 28 FCC Rcd at 15,367-68, ¶¶ 39-40 & nn.107-08.

[8] *Id.* at 15,368, ¶ 40 & n.108.

B. TLPS would affect existing users in the upper 2.4 GHz band.

Globalstar's TLPS would increase the likelihood of interference to both licensed and unlicensed users in the 2.4 GHz band; however, it is unlikely that this interference would preclude licensed operations. Other S band licensees include Broadcast Auxiliary Service ("BAS") and the federal government on a limited basis.[9] Wi-Fi and Bluetooth enabled devices both use the unlicensed spectrum at 2.4 GHz.[10]

Of the S band licensees, only BAS providers appear to have expressed concern that TLPS would harm their services.[11] BAS providers are authorized to operate in the 2450-2500 MHz to extend the reach of television program transmissions.[12] BAS contends that the TLPS would "invariably result in interference" to BAS channels.[13] Commission rules currently require ATC operations not to cause harmful interference to BAS.[14]

Billions of devices enabled with Wi-Fi and Bluetooth technologies rely on the unlicensed band to transmit radio signals.[15] These unlicensed technologies produce extraordinary value to consumers and to the economy—by one recent estimate, $222 billion in 2013, with $6.7 billion contributing to the U.S. gross domestic product.[16]

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[9] *TLPS NPRM*, 28 FCC Rcd. at 15,355-56, ¶¶ 7-11.
[10] *Id.* at 15,359-61, ¶¶ 21-23.
[11] *TLPS NPRM*, 28 FCC Rcd at 15,365-66, ¶¶ 35-38.
[12] *Id.* at 15,365, ¶ 35.
[13] *Comments of the Society of Broadcast Engineers, Inc.*, IB Docket No. 13-213, 2 (May 5, 2014) ("*SBE Comments*").
[14] *See* 47 CFR § 25.254(a)(3).
[15] *Comments of the Bluetooth Special Interest Group*, IB Docket No. 13-213, 2-4 (Jan. 14, 2013) ("*Bluetooth SIG Petition Comments*") (estimating more than two billion Bluetooth devices shipped in 2011); *Reply Comments of the Consumer Electronics Association*, RM-11685, 3 (Jan. 29, 2013) (estimating over 165 million Wi-Fi enabled devices sold in 2012); *Comments of the Wi-Fi Alliance*, RM-11685, 2 (Jan. 11 2013) ("*Wi-Fi Alliance Petition Comments*") (citing "many millions" of Wi-Fi devices operating in the market today).
[16] This estimate takes into account the marginal benefits created by Wi-Fi connections. Raul Katz, *Assessment of the Economic Value of Unlicensed Spectrum in the United States*, 8 (Feb. 2014), *available at* http://www.wififorward.org/wp-content/uploads/2014/01/Value-of-

Wi-Fi providers are concerned about Globalstar's proposal. Wi-Fi is widely deployed and heavily depended upon by consumers.[17] Wi-Fi does much more than just provide wireless broadband services at home and in public spaces; it also has an enormous role in transmitting data offloaded from cell phones.[18] Global analysts estimate that 40% of cellular traffic is offloaded onto public and private Wi-Fi facilities.[19] Wi-Fi's efficient use of the spectrum resource helps meet the ever-increasing demand from consumers for wireless services over their phones, tablets, and laptops.[20]

Wi-Fi, which uses IEEE 802.11 technology similar to the proposed TLPS, separates its channels with 3 MHz guard bands to reduce the likelihood of interference between channels.[21] But Globalstar's proposed TLPS would directly abut one of Wi-Fi's channels in the upper unlicensed band; interference to this abutted channel could affect millions of deployed Wi-Fi-enabled devices.[22] The lack of a guard band would increase the likelihood of interference to the adjacent Wi-Fi channel—and the loss of one channel would increase use of the other, already congested, channels.[23]

Providers of Bluetooth technology, which uses the unlicensed band at 2.4 GHz to transmit data using very low power transmissions, are also concerned.[24] Bluetooth has

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Unlicensed-Spectrum-to-the-US-Economy-Full-Report.pdf; *see also* Richard Thanki, *The Economic Significance of License-Exempt Spectrum to the Future of the Internet*, 8 (2012), *available at* http://www.wirelessinnovationalliance.org/index.cfm?objectid=DC8708C0-D1D2-11E1-96E9000C296BA163 (placing the total economic gain of Wi-Fi using households alone at $52 to $99 billion annually).

[17] Thanki, *supra*, at 32-33.

[18] Thanki, *supra.* at 33.

[19] Katz, *supra*, at 29.

[20] *See TLPS NPRM*, 28 FCC Rcd. at 15,356-57, ¶¶ 13-15.

[21] *Id.* at 15,359-60, ¶ 21 (showing Bluetooth and Wi-Fi channels).

[22] *See id.* at 15,360, 15,362-63, ¶¶ 22, 29-30.

[23] *Id.* at 15,362-63, ¶¶ 29-30.

[24] *Id.* at 15,360, ¶ 22.

relied upon the quiet nature of 2473-2483.5 MHz to provide a "safe haven" for transmissions.[25] Bluetooth enables various services such as health monitoring systems and hands-free communication; it is also predicted to be instrumental in development of the "Internet of Things," the collection of sensors embedded in physical objects and connected to the Internet.[26] Between the more than two billion Bluetooth devices shipped in 2011 and the potential future uses of Bluetooth Low Energy technology, Bluetooth devices provide numerous current consumer benefits likely to increase in the future.[27]

Introducing TLPS likely would interfere with safe haven operations.[28] TLPS, just like Wi-Fi, would be a low power, but intensely used, system.[29] According to the Bluetooth Special Interest Group ("Bluetooth SIG"), Bluetooth needs a safe haven because of potential interference from and the pervasiveness of Wi-Fi in the 2.4 GHz band.[30] Bluetooth's advertising bands avoid the most intensely-used frequencies of Wi-Fi's three channels, which occupy much of the unlicensed spectrum below 2473 MHz.[31] Bluetooth

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[25] *Id.* at 15,360-61, ¶¶ 21-22.

[26] *Id.* at 15,359, ¶ 21. This technology could provide huge advancements in medical devices, health care, safety, agriculture, education, and manufacturing. Plans have even been made regarding the planning of "smart cities," which use this technology to reduce waste and increase efficiency and safety. Michael Chui, Markus Löffler, & Roger Roberts, *The Internet of Things*, McKinsey Quarterly (March 2010), *available at* http://www.mckinsey.com/insights/high_tech_telecoms_internet/the_internet_of_things; Ruthbea Yesner Clark, *Smart Cities and the Internet of Everything* (Oct. 2013) *available at* http://www.cisco.com/web/strategy/docs/scc/ioe_citizen_svcs_white_paper_idc_2013.pdf.

[27] *Bluetooth SIG Petition Comments* at 2.

[28] *Id.* at 2-4.

[29] *See TLPS NPRM*, 28 FCC Rcd. at 15,352-53, ¶¶ 3-4.

[30] *Id.* at 15,359-60, ¶ 21.

[31] Bluetooth's advertising bands are located at 2402 MHz, 2426 MHz, and 2480 MHz; Wi-Fi Channels 1, 6, and 11 are located at 2401-2423 MHz, 2426-2448 MHz, and 2452-2473 MHz. Joe Decuir, *Bluetooth 4.0: Low Energy*, CSR, Inc., slide 14 (2010) *available at* http://chapters.comsoc.org/vancouver/BTLER3.pdf.

SIG contends that loss of the safe haven might affect the intended expansion of Bluetooth into emerging medical, safety, military, home security, industrial, and machine-to-machine communication markets.[32]

C. Introducing TLPS would alter the nature of the unlicensed 2.4 GHz band.

The Commission allows wireless devices to transmit radio frequencies in certain bands without a license under Part 15 rules.[33] This allowance is subject to the unlicensed band's rules, which include equipment certification, transmission and emission limits, and not interfering with licensed users.[34]

However, within the unlicensed band, barriers for competitive entry are low because access to spectrum is free after equipment has been certified.[35] This low cost allows innovators to quickly and inexpensively test and deploy new products.[36] Moreover, regulatory oversight of this band is minimal after equipment certification, allowing new technologies to rapidly develop and change without the need for Commission approval.[37] These dynamics benefit consumers because unlicensed technology providers can avoid barriers to entry and regulatory costs, enabling them to provide cheaper devices.[38]

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[32] *Bluetooth SIG Petition Comments* at 2.
[33] 47 C.F.R. pt. 15.
[34] *See generally* J.H. Snider, *Spectrum Policy Wonderland: A Critique of Conventional Property Rights and Commons Theory in a World of Low Power Wireless Devices*, 8-12 (Sept. 2006), *available at* http://papers.ssrn.com/sol3/papers.cfm?abstract_id=2106858.
[35] *Id.* at 21-27.
[36] *Id.* at 25-26.
[37] *Id.*
[38] Kenneth R. Carter, Ahmed Lahjouji & Neal McNeil, *Unlicensed and Unshackled: A Joint OSP-OET White Paper on Unlicensed Devices and Their Regulatory Issues*, 5 (2003), *available* https://apps.fcc.gov/edocs_public/attachmatch/DOC-234741A1.pdf.

To maintain these dynamics, the Commission does not apply specific rules to specific unlicensed users—every user abides by the same emission limits.[39] Allowing a particular unlicensed user to disregard the emission limits in a specific portion of the unlicensed band might change the nature of the unlicensed market if other users attempted similar actions.[40]

Globalstar, acting as an unlicensed user with the same power limits as other unlicensed users, would be able to use the upper 2.4 GHz in a way that no other unlicensed user could: it could ignore the OOBE limit and emit into the adjacent S band.[41] Because Globalstar would be emitting into its own band, it would not need to taper its emissions as it approaches the 2483.5 MHz barrier as other unlicensed users

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[39] *See generally* Mike Marcus, Wi-Fi and Bluetooth - The Path from Carter and Reagan-era Faith in Deregulation to Widespread Products Impacting Our World, The Genesis of the Unlicensed Wireless Policy: An Information Economy Project Conference, George Mason University, 25 (Mar. 8, 2008) *available at* http://www.marcus-spectrum.com/resources/WiFi-rev.pdf (citing a lack of preference for big players as the reason for the success of the unlicensed band); Durga P. Satapathy & Jon Peha, *Spectrum Sharing Without Licenses: Opportunities and Dangers*, Telecommunications Policy Research Conference, 4 (Oct. 1996) *available at* http://users.ece.cmu.edu/~peha/TPRC96.pdf (the Commission's etiquette in unlicensed bands was designed to inhibit excessive spectrum use, reducing potential tragedy of the commons); *see also* Jonathan E. Nuechterlein & Philip J. Weiser, *Digital Crossroads: American Telecommunications Policy in the Internet Age*, 256 (1st ed. 2007) (commons users are incentivized to try to out-power one another absent clear regulation of how the commons can be used).

[40] *See* Paul R. Milgrom, Jonathan Levin & Assaf Eilat, *The Case for Unlicensed Spectrum*, 6 (Oct. 23, 2011), http://papers.ssrn.com/sol3/papers.cfm?abstract_id=1948257 (users of unlicensed bands do not enjoy exclusivity); Mark M. Bykowsky, Mark A. Olson & William W. Sharkey, *A Market-based Approach to Establishing Licensing Rules: Licensed Versus Unlicensed Use of Spectrum*, Office of Strategic Planning and Policy Analysis Working Paper No. 43, 3 (2008) (unlicensed spectrum treated as an open access resource available to all without charge).

[41] *TLPS NPRM*, 28 FCC Rcd. at 15,366-67, .¶¶ 39-40 & nn. 107-108

do.[42] This would afford Globalstar a competitive advantage it might use to out-power other unlicensed users in the upper unlicensed band.

II. The Commission should allow the TLPS contingent on reducing the OOBE limit for unlicensed users.

TLPS is a creative proposal that uses underused spectrum in a more spectrally and dynamically efficient way. The Commission should support creative and efficient proposals to encourage similar proposals from other licensees, and therefore should adjust Part 25 rules to enable Globalstar's use of the S band for its proposed TLPS.

However, Globalstar's proposal alters the terms of use of the unlicensed band for one specific user. To remedy this inequity and preserve the dynamic that makes unlicensed spectrum so successful, the Commission should reduce the OOBE limit for other unlicensed users in the 2.4 GHz band in conjunction with permitting Globalstar's TLPS.

A. The Commission should allow TLPS.

The Commission has the authority to authorize Globalstar's flexible use of the terrestrial portion of the S band. TLPS and existing users would be able to coexist both in the S band and in the unlicensed band. The transaction costs of sharing would prohibit another operator from successfully using the S band. Finally, allowing TLPS increases the dynamic and spectral efficiency in the S band and the unlicensed band.

1. Commission precedent authorizes flexible use of MSS licenses.

A decade ago, the Commission enabled MSS licensees to build out ancillary terrestrial components of their satellite-designated bands.[43] The Commission values mobile satellite services because they provide an important service to consumers in remote rural areas and in emergency situations. Accordingly, the Commission saw ATC

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[42] *Id.* at 15,364, 15,367, ¶¶ 32, 40, nn.87, 108-09.
[43] *ATC Report and Order*, 18 F.C.C.R. at 1965-66, ¶ 1.

services as a means to improve this service in urban areas where satellite signals have difficulty reaching handsets.[44]

When promulgating the ATC rules, the Commission wanted to ensure that no MSS licensee could "game" the rules by building an ATC cellular network and then discontinuing its satellite services.[45] Thus, the Commission's rules only allowed the creation of ATCs contingent on gating criteria.[46] The gating criteria require MSS licensees to provide and maintain a substantial satellite service with a spare satellite, integrate ATC operations with the underlying satellite service, and comply with other operational and build-out requirements.[47] Several MSS licensees attempted to create ATCs, but none succeeded because the gating requirements imposed prohibitive costs.[48]

To enable the use of MSS spectrum for mobile broadband services, the Commission removed regulatory barriers and adopted service, technical, and licensing rules that would encourage innovation and investment in mobile broadband for the AWS-4 bands, located at 2000-2020 MHz and 2180-2200 MHz.[49] The Commission not only allowed the incumbent MSS provider to use the AWS-4 terrestrial spectrum in a non-ancillary capacity, but also eliminated the gating criteria for the 2 MHz MSS band.[50]

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[44] *TLPS NPRM*, 28 FCC Rcd. at 15,356, ¶ 12; *ATC Report and Order*, 18 F.C.C.R. at 1966, 1974-1989, 2064-2065, ¶¶ 2, 20-45, 210-11.
[45] *ATC Report and Order*, 18 F.C.C.R. at 1965, ¶ 3, n.5.
[46] *Id.* at 1999-2009, ¶¶ 66-88.
[47] 47 C.F.R. § 25.149(b).
[48] *See Service Rules for Advanced Wireless Services in the 2000-2020 MHz and 2180-2200 MHz Bands*, Notice of Proposed Rulemaking and Notice of Inquiry, WT Docket Nos. 12-70, 04-356, ET Docket Nos. 10-142, 27 FCC Rcd. 3561, 3565-66, ¶¶ 7-9 (Mar. 21, 2012) .
[49] *See Service Rules for Advanced Wireless Services in the 2000-2020 MHz and 2180-2200 MHz Bands*, Report and Order and Order of Proposed Modification, WT Docket Nos. 12-70, 04-356, ET Docket Nos. 10-142, 27 FCC Rcd. 16,102, 16,103, ¶ 1 (Dec. 17, 2012) ("*AWS-4 Report and Order*").
[50] *Id.* at 16,199-200, ¶ 259.

The Commission encouraged flexible use of MSS spectrum to ensure that mobile broadband spectrum was brought to market; it has the authority to do so in the 2.4 GHz band as well. The Commission's proposal to modify Part 25 rules to permit low power broadband in MSS spectrum, in part to relieve Globalstar of certain ATC gating criteria such as build out requirements, would encourage flexible use of MSS spectrum.[51] Thus, the Commission has the authority to allow Globalstar's TLPS.

Allowing mobile broadband services in the terrestrial portion of MSS bands would also be consistent with the National Broadband Plan. The Plan recommended that the Commission "accelerate terrestrial deployment in 90 megahertz of MSS spectrum."[52] The Plan also urged immediate Commission action to "optimize license flexibility sufficient to increase terrestrial use of MSS spectrum."[53]

2. Existing users and TLPS likely can coexist in the upper 2.4 GHz and S bands.

The Commission has asked for technical analysis of the impact of TLPS on existing licensed and unlicensed users.[54] Although it is necessary to examine technical matters before altering the terms of a spectrum license, rigorous technical analysis by the Commission may not eradicate all potential interference given the complexity of Globalstar's proposal.[55] Thus, the lack of concrete technical analysis in this proceeding should not concern the Commission; in today's increasingly complex spectral

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[51] *See TLPS NPRM*, 28 FCC Rcd. at 15,358-59, ¶¶ 16-18.
[52] Federal Communications Commission, *National Broadband Plan*, Ch. 5: Spectrum, 87-88 (2010) *available at* http://download.broadband.gov/plan/national-broadband-plan-chapter-5-spectrum.pdf (Recommendation 5.8.4).
[53] *Id.* at 87-88.
[54] *TLPS NPRM*, 28 FCC Rcd. at 15,362, ¶ 23.
[55] Ellen P. Goodman, *Spectrum Rights in the Telecosm to Come*, 41 San Diego L. Rev. 269, 299-300 (2004) (discussing the Commission's declaration that it is not always possible to guarantee well-defined interference protection rights based on comprehensive predictive analysis).

environment, there is no way to ensure, even with comprehensive technical information, that systems will be able to successfully coexist.

Here, the record demonstrates that:

(1) BAS providers operate primarily outside the S band and do so while coexisting with Wi-Fi, a system similar to TLPS;[56]

(2) Wi-Fi and Bluetooth technologies expect interference and retransmit messages to improve the likelihood of successful reception;[57] and

(3) Specific concerns regarding TLPS's abutting a Wi-Fi channel likely will be resolved by the market.

Accordingly, it is likely that licensed and unlicensed users can coexist in 2.4 GHz.

Existing S band licensees sparingly use the band, already coexist with similar services, and would be better able to coexist with TLPS because it is a managed network. The Commission's rules currently state that any ATC in the S band must not cause harmful interference to existing licensees.[58] However, it is unlikely that the low power service that Globalstar intends to provide will interfere with BAS, the only other concerned S band licensee.

In the S band, there are 186 grandfathered BAS licensees actively operating.[59] But for the most part, BAS licensees seem relatively uninterested in providing services in the S

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[56] *See TLPS NPRM*, 28 FCC Rcd. at 15,366, ¶ 35.

[57] *See* Rob Alderfer, Dirk Grunwald & Kenneth Baker, *Toward Expanded Wi-Fi Access in the 5 GHz Band*, CableLabs, 47 (2013), *available at http://apps.fcc.gov/ecfs/document/view?id=7520933307*; *see also* Erik Vlugt, *Bluetooth Low Energy, Beacons and Retail*, 9 (Oct. 23, 2013), *available at* http://www.verifone.com/media/3603729/bluetooth-low-energy-beacons-retail-wp.pdf (citing the robust nature of Bluetooth LE, but noting that careless installation next to a Wi-Fi router would cause problems.).

[58] 47 C.F.R. § 90.317(a)(1).

[59] *TLPS NPRM*, 28 FCC Rcd. at 15,366, ¶ 35.

band and have sought instead to migrate their services below 2483.5 MHz.[60] Below 2483.5 MHz, BAS licensees already coexist successfully with Wi-Fi, a similar service, in the unlicensed 2.4 GHz band. Moreover, cognitive radios used by IEEE 802.11 systems likely would prevent Globalstar's TLPS from transmitting on any frequency in use by an existing licensee.[61]

Unlicensed users' technology and rapid development cycles allow them to adapt quickly to new interference. Unlicensed technology designers have good reason to tout the robust nature of their technology: it developed in an environment without interference protection.[62] The success of unlicensed technologies such as Wi-Fi and Bluetooth has depended on the ability to develop innovative technology to avoid interference. Efforts to avoid interference have led to the development of technologies such as cognitive radios, automatic frequency hopping, and beaconing devices, which allow unlicensed devices to opportunistically use unlicensed spectrum.[63] These technologies would continue to mitigate interference if the TLPS was introduced into the unlicensed band.

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[60] The Society of Broadcast Engineers ("SBE") and, more recently, the Engineers for the Integrity of Broadcast Auxiliary Services Spectrum ("EIBASS") have advocated for re-farming of their designated spectrum in the 2.4 GHz band. *See Ex Parte of Sprint Nextel and SBE*, IB Docket No. 02-364, ET Docket No. 00-258, SBE Filing at 1-2 (June 4, 2007); Engineers for the Integrity of Broadcast Auxiliary Services Spectrum, Comments, WC Docket No. 11-183, 4-6, ¶¶ 11-15 (Nov. 17, 2011).

[61] *See* Nuechterlein & Weiser, *supra*, at 253.

[62] *See* Yochai Benkler, *Open Wireless vs, Licensed Spectrum: Evidence from Market Adoption*, 26 Harv J. L. & Tech. 69, 89 (2012); Jon M. Peha, *Sharing Spectrum through Spectrum Policy Reform and Cognitive Radio*, Proceedings of the IEEE, Vol. 97, No. 4, 2-3 (2008), *available at* . http://users.ece.cmu.edu/~peha/ spectrum_sharing_through_policy_reform_and_cognitive_radio.pdf

[63] Michael Calabrese, *Use it or Share it: Unlocking the Vast Wasteland of Fallow Spectrum*, New American Foundation, 15-22 (Sept. 2011), *available at* http://papers.ssrn.com/sol3/ papers.cfm?abstract_id=1992421.

Further, the lack of regulatory interference allows unlicensed technology designers to rapidly change their technology. Though Globalstar may plan to rapidly deploy its TLPS, the rapid pace of wireless technology—new technologies are deployed, on average, every eighteen months—would allow quick mitigation of potential problems.[64]

Although the Bluetooth SIG claims that Globalstar's TLPS could substantially degrade the quality of service of its existing life-saving health and wellness products, wireless technology for those products is not confined to the unlicensed band.[65] The Commission has allocated multiple frequencies for such medical devices.[66] Under Part 95 MedRadio service rules, both implanted and body-worn wireless medical devices may transmit in designated bands without a license.[67] MedRadio rules were recently expanded to allow Medical Body Area Network (MBAN) devices in the 2360-2400 MHz band; analysis of Bluetooth technology concluded that existing low power 2.4 GHz band transceiver chips could be easily modified to operate in the 2360-2400 MHz band.[68]

Finally, Bluetooth designers' decision to provide critical services in an unlicensed band is taken at their own risk; the Commission's rules clearly state that unlicensed spectrum use is not guaranteed continued operation or interference protection.[69] Altering the rules to protect certain unlicensed users would give them rights in a band that thrives *because* users do not have rights superior to other users.

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[64] *See* Benkler, *supra*, at 94 & n.122; *see also* Gordon E. Moore, *Progress in Digital Integrated Electronics*, *in Technical Digest of the Int'l Electron Devices Meeting*, IEEE Press, 13 (1975), *available at* http://www.eng.auburn.edu/~agrawvd/COURSE/E7770_Spr07/READ/Gordon_Moore_1975_Speech.pdf.
[65] *Comments of Bluetooth SIG*, IB Docket No. 13-213, 3 (May 5, 2014).
[66] 47 CFR §§ 95.627-95.630, 95.1101-95.1129, 95.1201-95.1225.
[67] 47 CFR § 95.1201.
[68] *Amendment of the Commission's Rules to Provide Spectrum for the Operation of Medical Body Area Networks*, First Report and Order and Further Notice of Proposed Rulemaking, ET Docket No. 08-59, 27 FCC Rcd. 6422, 6430-31 ¶ 15 (May 24, 2012).
[69] 47 C.F.R. § 15.5(a)-(b).

The mobile broadband market will further promote coexistence between TLPS and Wi-Fi users. Mobile broadband providers need more spectrum to meet consumer demand for wireless data services.[70] Wi-Fi has greatly contributed to alleviating mobile broadband congestion, but consumer demand for wireless broadband service still outweighs the supply of available spectrum. Allowing Globalstar to create a TLPS would help reduce congestion by introducing an additional 22 MHz channel to the mobile broadband market.

Although the Wi-Fi Alliance asserts that allowing TLPS will harm users, the Commission can rely on market forces to mitigate potential interference between Wi-Fi and TLPS.[71] It is unlikely that TLPS will disrupt Wi-Fi unless its service is better than the existing service—if that is the case, then consumers will benefit from the shift in technology and interference to existing Wi-Fi networks will not harm consumers.

3. The transaction costs of sharing the S band with Globalstar would prevent another user from using it as efficiently.

The Commission seeks comment on whether the technical, policy, and legal bases adopted in the *ATC Report and Order* for restricting ATC licensing to incumbent MSS licensees should apply to Globalstar's proposed operations.[72] The core policy basis for restricting ATC licensing to incumbents still holds true: non-incumbent operators, facing prohibitive transaction costs, will not be able to efficiently use the terrestrial component of an MSS band. If transaction costs exceed the potential benefit gained, the transaction will not occur.[73]

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[70] *E.g.*, *TLPS NPRM*, 28 FCC Rcd. at 15,356-57, ¶¶13-15.
[71] *Comments of the Wi-Fi Alliance*, IB Docket No. 13-213, 1 (May 5, 2014) ("*Wi-Fi Alliance Comments*").
[72] *TLPS NPRM*, 28 FCC Rcd. at 15,359, ¶ 18.
[73] *See generally* R.H. Coase, *The Nature of the Firm*, 4 Economica 16, 386-405 (1937).

In 2003, the Commission was faced with the same hard decision it faces here: would consumer benefits outweigh the potential inequity of a MSS licensee's windfall? The Commission decided the benefits outweighed the potential inequity and chose to grant, rather than withhold, access to spectrum resources.[74]

The rationale employed in 2003 holds true today: granting access to spectrum resources would be better for consumers than withholding them. Globalstar is offering consumers a proven spectrally efficient service that can be rapidly deployed; given the transaction costs, there is no alternative as spectrally efficient.

In spectrum markets, transaction costs can be particularly prohibitive because spectrum use requires negotiation of the spectrum allocation on a dynamic basis.[75] Negotiation of spectrum use even on a static basis is difficult. Matheson's electrospace model for defining property rights in wireless communications outlines a seven-dimensional definition of a spectrum right.[76] The cost incurred through examining all seven dimensions nationwide, on a continuous basis, likely would be prohibitive.[77]

Globalstar's MSS license would allow it to avoid coordination costs and more efficiently use the terrestrial portion of the S band, while other operators would be subject to the cost of coordinating band use with Globalstar. A separate operator in the terrestrial S band would need to negotiate in such a manner or have a static allocation that is unnecessarily conservative.

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[74] *ATC Report and Order*, 18 F.C.C.R. at 1965, ¶ 2.
[75] Benkler, *supra*, at 89.
[76] Robert J. Matheson, *Principles of Flexible-Use Spectrum Rights*, 8 J. Comm. & Networks 144, 144 (2006); *see also* Benkler, *supra*, at 88 & nn.96-97 (citing Matheson, *supra*).
[77] The complexity and transaction costs would increase with multiple licensees because adjacent licensees would have to not only negotiate with Globalstar, but also with each other.

As wireless transmissions do not predictably propagate, nationwide static allocations are more conservative than dynamic allocations; such static allocations apply emission standards needed to prevent interference in the worst-case scenario. Conservative terms of use do not allow users to maximize spectral efficiency.[78]

Negotiating static terms of use in the S band, especially if the Commission denied Globalstar's request to use the terrestrial portion of the spectrum, would likely result in even more conservative terms of use.[79] Any incumbent would be resistant to sharing, but a sharing scenario would likely make Globalstar less willing to compromise by changing its technology or coordinating use.

4. Allowing Globalstar's TLPS would increase dynamic and spectral efficiency in the S band.

The Commission is bound to serve the public interest by promoting "efficient" spectrum use.[80] But there are multiple facets to efficiency: static (consisting of technical and allocative), dynamic, and spectral.[81]

Dynamic efficiency trumps static efficiency in providing consumer benefit. Static efficiency measures a provider's ability to use a resource given the current technology.[82]

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[78] Arthur S. de Vany, et al., *A Property System for Market Allocation of the Electromagnetic Spectrum: A Legal-Economic-Engineering Study*, 21 Stan. L. Rev. 1499, 1512-17 (1969).
[79] *See* Goodman, *supra*, at 301 (incumbents have incentives to maintain or introduce hypersensitive services to claim harmful interference to bar new entrants in their or the adjacent band).
[80] Federal Communications Commission Spectrum Policy Task Force, *Report of the Spectrum Efficiency Working Group*, 4 (Nov. 15, 2002), *available at* http://transition.fcc.gov/sptf/files/SEWGFinalReport_1.pdf. *See generally* Goodman, *supra*, at 305-311 (as early as 1980, the Commission interpreted the public interest requirement to mean encouraging the economic efficiency in the use of spectrum).
[81] *See* Commerce Spectrum Management Advisory Committee (CSMAC), *Definitions of Efficiency in Spectrum Use*, 2-3 (Oct. 1, 2008), *available at* http://www.ntia.doc.gov/legacy/advisory/spectrum/meeting_files/Spectral_Efficiency_Final.pdf

Dynamic efficiency, which measures the efficiency of resource use over time, takes into account the effects of introducing innovative new services and production methods.[83]

With the rapid pace of wireless technological development and the regulatory delay inherent in allowing new spectrum license use, dynamic efficiency is preferable to static efficiency.[84] Commission rules that encourage dynamic efficiency thus encourage innovation and investment in new technologies. Because of this, rules encouraging dynamic efficiency trump rules encouraging static efficiency in terms of improving consumer welfare.[85] Thus, regulation that focuses on protecting the competitive process driving investment and innovation is therefore more desirable than regulation that ensures the success of individual competitors.[86] Accordingly, the Commission should enact rules that encourage dynamic efficiency, enabling competition rather than controlling market outcomes.

Commission approval of TLPS would encourage dynamic efficiency as TLPS would both increase competition and offer an innovative use of the spectral resource. TLPS would increase competition as it would be a new entrant in the wireless broadband market; it would innovate by providing a hybrid managed service, while using typically

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[82] *See* Christopher S. Yoo, *Beyond Net Neutrality*, 19 Harv. J. L. & Tech 1, 19 (2005) (static efficiency holds the quantity of inputs and technology constant and asks whether goods or services are being produced using the fewest resources and are being allocated to the consumers that place the highest value on them).

[83] Dennis L. Weisman, *On Market Power and the Power of Markets: A Schumpeterian View of Dynamic Industries,* The Free State Foundation, 2 (2008), *available at* http://www.freestatefoundation.org/images/Power_of_Markets.pdf.

[84] Dennis L. Weisman, *A "Principled" Approach to the Design of Telecommunications Policy*, 6 J. Comp. L. & Econ. 927, 934-937 (2010).

[85] Encouragement of dynamic efficiency is particularly critical in industries that serve as key drivers of innovation, such as wireless industries. Weisman, *supra*. at 935-36.

[86] Weisman, *supra*, at 935-36.

unmanaged technology, that straddles the barrier between licensed and unlicensed spectrum.

Globalstar's proposed TLPS would improve spectral efficiency. Another key facet of efficiency is spectral efficiency. Spectral efficiency can only be determined on a system-by-system basis because it measures how well the wireless technology does what it is intended to do.[87] Spectral efficiency analysis must not only take into account the amount of spectrum used, the area covered, the time the spectrum is in use, and the data transmitted, but also the purpose of the wireless service.[88]

Current terrestrial S band and upper unlicensed band use is spectrally inefficient: few licensees are using the terrestrial portion of the S band spectrum and only very low power users are in the upper unlicensed band.[89] Allowing Globalstar's TLPS would increase the spectral efficiency of the S band and the upper unlicensed band.

Moreover, Globalstar's proposed TLPS would be more spectrally efficient than the Commission's initial vision for ATCs because it would (1) use existing IEEE 802.11 technology and (2) be a managed network.[90] Spectral efficiency in mobile broadband services can be defined in the measurement of bits per second per Hertz per sector.[91] Measured in these terms, the aggregate spectral efficiency of Wi-Fi using IEEE 802.11 technology at 2.4 GHz is 30 times greater than the overall efficiency of any cellular

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[87] CSMAC, *supra*, at 5.

[88] *Id.* For example, radars seem spectrally inefficient as compared to commercial communication services, but may be considered spectrally efficient in light of their intended purpose of sensing. Likewise, military communication systems are inefficient as compared to commercial communication systems due to security requirements, but would not be as secure without the additional operational requirements that cause the inefficiency.

[89] *TLPS NPRM*, 28 FCC Rcd. at 15,359-60, 15,366-67, ¶¶ 21-22, 35-38.

[90] *See id.* at 15,352-53, ¶ 3.

[91] CSMAC, *supra*, at 9-10. Bits per second per Hertz per sector is the appropriate unit of measure here because of Globalstar's intent to provide mobile broadband services.

band.[92] Managed networks are also definitionally more spectrally efficient than unmanaged ones. Thus, the TLPS would significantly increase the spectral efficiency of the terrestrial portion of the S band and upper unlicensed band—even more so than an unlicensed Wi-Fi network would be able to.

Of course, the Commission should consider not only whether Globalstar's TLPS will use the S band in a spectrally efficient way, but also the effect on existing users' spectral efficiency. If the loss in efficiency to other services outweighs the spectral efficiency derived from TLPS, overall spectral efficiency would not be increased by TLPS's introduction.

However, BAS and unlicensed users have expressed only speculative concerns about the effect of TLPS on their systems.[93] Absent a showing that sharing will significantly degrade the licensed or unlicensed services offered in 2.4 GHz, the Commission should conclude that spectral efficiency will be increased by allowing the TLPS.

B. The Commission should not allow TLPS without reducing the OOBE in the upper unlicensed band.

While TLPS will likely benefit consumers without negatively impacting existing users, allowing Globalstar to operate in a different way than other unlicensed users might open the door to other disparities in unlicensed use. This is troubling because the dynamic environment that developed in unlicensed bands was fostered by the inherently equitable rules in the unlicensed band. Thus, the Commission should reduce the OOBE limit to

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[92] Thanki, *supra*, 91.

[93] No commenter other than Globalstar appears to have performed any testing or proven any demonstrable harm. *See TLPS NPRM*, 28 FCC Rcd. at 15,354, ¶ 6; *see also* SBE Comments at 2 & n.2; *Wi-Fi Alliance Comments* at 6-10; *Comments of Bluetooth SIG*, IB Docket No. 13-213, RM-11685, 5 (May 2, 2014).

level the playing field for all users of the upper unlicensed band, including Globalstar.[94] Reducing the OOBE limit would also increase unlicensed users' access to the upper unlicensed spectrum without harming S band licensees.

1. Reducing the OOBE limit would maintain the upper unlicensed band's benefits.

Unlicensed spectrum provides a forum for innovation, competition, and rapid technological development.[95] The Commission's unlicensed rules were designed to allow the "forces of the marketplace to drive the implementation of [spread spectrum devices], unhampered by regulations other than those needed to prevent harmful interference to licensed systems."[96] The sparse regulation of this band has kept initial and transitional regulatory transaction costs low, allowing Coasian efficiency to thrive.[97]

Giving particular users rights over others would change this dynamic. Here, leaving the OOBE limit in place would give Globalstar's TLPS the ability to transmit at levels that would, if intensely used, prohibit other users from competing because the TLPS would uniquely be able to transmit at a higher power, drowning out other users' transmissions in the upper unlicensed band.

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[94] This limit should be analogous to those in Europe and Japan, which allow use of Wi-Fi Channels 12 and 13. *See* Ian Poole, *Wi-Fi / WLAN Channels, Frequencies, Bands & Bandwidths*, Radio-Electronics.com (last visited Jun 4, 2014), *available at* http://www.radio-electronics.com/info/wireless/wi-fi/80211-channels-number-frequencies-bandwidth.php.

[95] *See, e.g.*, Benkler. *supra*, at 160-61.

[96] *See generally Authorization of Spread Spectrum and other Wideband Emissions not Presently Provided for in FCC Rules and Regulations*, Docket 81-413, Further Notice of Inquiry and Notice of Proposed Rulemaking, 98 F.C.C.2d 380, 386-87, ¶ 18 (May 21, 1984).

[97] *See* Yochai Benkler, *The Wealth of Networks*, 87-89 (2006) *available at* http://www.benkler.org/Benkler_Wealth_Of_Networks_Chapter_3.pdf.

On the other hand, reducing the OOBE limit would help level the playing field for all unlicensed users. Moreover, the doing so would spur innovation that would in turn mitigate potential interference.

Further, the Commission should take pains not to afford unlicensed users any semblance of rights in light of the uncertainty created by the recent *Progeny* proceeding.[98] Allowing TLPS without harmonizing the OOBE limit for other unlicensed users might open the door for arguments that the Commission is doing so by allowing licensees on the edge of unlicensed bands encroach into the unlicensed space on unequal terms to other unlicensed users.[99]

2. Increased access to unlicensed spectrum would benefit consumers.

Reducing the OOBE limit would not only protect the nature of unlicensed spectrum, but encourage adaptation and innovation by existing and other new unlicensed users. In particular, lowering the OOBE limit would effectively open up an additional 10 MHz of spectrum for unlicensed use in 2.4 GHz. This increased access would, for example, allow Wi-Fi providers to add a fourth channel to their access point systems.

Increased access to unlicensed spectrum would spur technological development; competition and low barriers to entry in the unlicensed market encourage unlicensed users to use all available spectrum.[100] As Wi-Fi's channels are unmanaged and especially

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[98] *See* discussion *infra* Part III(C).
[99] *See, e.g.*, Comments of the Wi-Fi Alliance, IB Docket No. 13-213, RM-11685, at 8 (May 5, 2014) (attempting to apply *Progeny* to this proceeding).
[100] *See* Benkler, *Open Wireless vs. Licensed Spectrum*, *supra*, at 158.

congested in urban areas, its designers have an incentive to take advantage of additional spectrum.[101]

Economies of scale would further encourage Wi-Fi's use of the upper unlicensed band if the Commission reduces the OOBE limit.[102] For example, Europe and Japan allow unlicensed devices to access Wi-Fi channels 12 and 13, which unlicensed devices cannot access in the U.S.[103] Harmonizing these rules would allow interested companies to develop new products; the economies of scale facilitated by international harmony will further encourage investment in technologies usable worldwide using the "new" spectrum.[104]

3. The OOBE limit can be lifted without harming S band users.

Globalstar did not object to the Commission seeking comments on lifting the OOBE limit at the time of the NPRM.[105] However, Globalstar and the Commission are concerned that unlicensed use may interfere with MSS.[106]

These concerns are likely unwarranted; so long as intentional emissions are kept at or below the existing limit for spurious emissions, there likely would not be additional interference added into the S band. Moreover, if needed, the OOBE limit could be geographically limited to prevent harmful interference to Globalstar's four U.S.-based

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[101] Bluetooth designers, who have historically taken into account Wi-Fi's channel distribution, likely would adjust their equipment accordingly. *See* DeCuir, *supra*, at slide 14.
[102] *See* Benkler, *Open Wireless vs. Licensed Spectrum*, *supra*, at 148-49.
[103] *See Poole*, *supra*.
[104] *See* Benkler, *Open Wireless vs. Licensed Spectrum*, *supra*, at 148-49.
[105] *TLPS NPRM*, 28 FCC Rcd. at 15,367, ¶ 41).
[106] *See id.*

downlink stations.[107] However, this geographical limit should only be enacted if Globalstar can demonstrate that OOBE would harmfully interfere with the stations.

Globalstar might also be concerned that increased unlicensed use in the upper 2.4 GHz might interfere with its TLPS in the S band. Yet this concern would be mitigated, at least for IEEE-based technologies, because the IEEE Standards body provides a forum for industry experts to resolve interference issues.[108]

TLPS would use IEEE 802.11 technology, the same technology used by Wi-Fi; the IEEE also originally developed Bluetooth's technology.[109] This commonality would ease coordination between the services. The Commission should encourage unlicensed and licensed user coordination in this proceeding, as it has been in other proceedings, to maximize available unlicensed spectrum. Reducing the OOBE limit would encourage such coordination.

4. The Commission need not delay this proceeding to address interference concerns if TLPS is hinged on a reduced OOBE limit.

The Wi-Fi Alliance, Bluetooth SIG, and BAS are concerned that approving TLPS without more information on its potential effect on the spectral environment will harm existing users.[110] Wi-Fi Alliance and Bluetooth SIG have asked the Commission not to act without more information; Globalstar has asked the Commission not to reduce the OOBE for fear that it will interfere with its MSS.[111]

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[107] Alderfer, Grunwald & Baker, *supra*, at 18 (Globalstar has only four U.S.-based gateway ground stations).
[108] Alderfer, Grunwald & Baker, *supra*, at 68 (advocating the IEEE standards body as a potential forum for ITS/DSRC and Wi-Fi to coexist in 5.9 GHz).
[109] *Globalstar Petition* at iii, 4.
[110] *TLPS NPRM*, 28 FCC Rcd. at 15354, ¶ 5, n.17 (citations omitted).
[111] *Bluetooth SIG Comments* at 5; *Wi-Fi Alliance Comments* at 8-9; *Comments of Globalstar*, IB Docket No. 13-213, 32-33 (May 5, 2014).

In addressing these requests, the Commission should consider the precedent it is setting for future similar proceedings.[112] Attempts to mitigate potential interference through complex technical rules incur significant costs.[113] And the Commission has long recognized that comprehensive predictive analysis does not always lead to well-defined interference protection.[114]

Thus, the consumer benefit gained from Commission efforts to prevent potential interference would not outweigh the cost of regulatory delay. Rather than creating technical rules, the Commission should set transmission limits and encourage industry participants to collaborate and share the spectrum.

Further, interference should not be viewed as an impenetrable barrier, but rather a flexible hurdle that technology and service provider collaboration is gradually conquering.[115] Consequently, the Commission can examine the technical implications of introducing the TLPS and reducing the OOBE limit with less concern for getting it "right" and rely more on market forces to solve potential interference problems.[116] The Commission's rules for navigating the barrier between the upper unlicensed band and the

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[112] Sherille Ismail, *Parity Rules: Mapping Regulatory Treatment of Similar Services*, 56 Fed. Comm. L.J. 447, 448-50 (2004) (Absent different treatment required by statute, a lack of jurisdiction, or Congressional mandate the Commission is likely to treat similar providers the same in similar proceedings. However, it is rarely the case that two services are so similar that they must be treated in exactly the same manner).

[113] *See* de Vany *supra*, at 1517.

[114] *See* Federal Communications Commission Spectrum Policy Task Force, *Report of the Interference Protection Working Group*, 5 n. 23 (2002), *available at* http://transition.fcc.gov/sptf/files/IPWGFinalReport.pdf; *see also Interference Immunity Performance Specifications for Radio Receivers*, Notice of Inquiry, 18 F.C.C.R. 6039, 6041, ¶ 8 (Mar. 13, 2003).

[115] *See* Kevin Werbach, *Supercommons: Toward a Unified Theory of Wireless Communications*, 82 Tex. L. Rev. 863, 964 (2004).

[116] *See* Thomas W. Hazlett & Sarah Oh, *Exactitude in Defining Rights: Radio Spectrum and the "Harmful Interference" Conundrum*, 28 Berkeley Tech. L.J. 227, 227 (2013); Goodman, *supra*, at 299 (according to the Commission, it is not always possible to guarantee well-defined interference protection rights based on comprehensive predictive analysis).

terrestrial portion of the S band should mimic the rules that have made the unlicensed band so successful—setting clear transmission power limits and allowing market participants to determine the best way to coexist.

III. The Commission's other options are not as beneficial to consumers.

Instead of allowing Globalstar's TLPS contingent on reducing the OOBE limit, the Commission could deny Globalstar's proposal, delay terrestrial use of S band until it can be auctioned, or create rules that limit Globalstar's use of the unlicensed band to protect existing unlicensed users. Because these options have unattractive consequences, we urge the Commission to adopt our proposal instead.

A. Denying TLPS would not benefit consumers.

There is some fear that granting MSS licensees terrestrial rights may result in a windfall.[117] However, a potential windfall is not a concern if consumers are not harmed. The appropriate question is whether consumers are better off waiting another decade or longer before the terrestrial portion of the S band is brought to market to prevent such a windfall.

As Jon Nuechterlein and Phil Weiser note, "[f]rom a consumer welfare perspective, granting incumbents this 'windfall' [by allowing them to use rather than auctioning off their spectrum]—if that is the only quick way to free up the spectrum at issue for more efficient uses—is usually superior to letting the incumbents tie up that spectrum in perpetuity with the less efficient uses specified in their licenses."[118] The Commission estimates that it takes six years to re-allocate spectrum.[119] One estimate places the cost of

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[117] *See, e.g.*, *ATC Report & Order*, 18 F.C.C.R. at 2075 & n.592.
[118] Nuechterlein & Weiser, *supra*, at 246.
[119] Hazlett & Oh, *supra*, at 233.

regulatory delay at 25.4% of the total social value of a project.[120] Unless and until the record reflects otherwise, action now should outweigh action later.

The Commission should also be wary of unintended consequences from denying Globalstar's proposal. Globalstar has invested time, energy, and resources developing this novel proposal, initiating the rulemaking process, and conducting tests to determine the potential impact of its proposed service on existing licensed and unlicensed users.[121] The Commission should encourage proposals that would put underused spectrum to use, whether they come from existing licensees or from individuals through the finder's preference program.[122]

B. Auctioning the S band would take significant effort and result in a less spectrally efficient use.

The Commission has expressed interest in auctioning off the terrestrial portion of satellite bands.[123] So has the Obama Administration—its proposed American Jobs Act of 2011 would require the Commission to recover "a significant portion of the value of such right" either though spectrum auctions or spectrum license user fees. [124] Auctions ensure that a license goes to the person that values it the most because the initial financial investment incentivizes spectrum use to recoup that cost.[125]

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[120] *Id.* at 233.
[121] *TLPS NPRM*, 28 FCC Rcd. at 15,352-55, ¶¶ 3-6.
[122] *See Amendment of Parts 1 and 90 of the Commission's Rules Concerning the Construction, Licensing, and Operation of Private Land Mobile Radio Stations*, Report and Order, PR Docket No. 90-481, 6 FCC Rcd. 7297, 7309, ¶ 77 (1991).
[123] *See* FCC, Fiscal Year 2015 Budget in Brief, 5 (March 2014) *available at* http://transition.fcc.gov/Daily_Releases/Daily_Business/2014/db0304/DOC-325872A1.pdf.
[124] The American Jobs Act of 2011, S. 1549, 112th Cong., §§ 274, 278 (2011) *available at* http://www.whitehouse.gov/sites/default/files/omb/legislative/reports/american-jobs-act.pdf.
[125] Gregory L. Rosston & Jeffrey S. Steinberg, *Using Market-Based Spectrum Policy to Promote the Public Interest*, 50 Fed. Communications L.J. 87, 108 & n.70 (Dec. 1, 1997).

However, auctioning the S band would require regulatory action to:

(1) Resolve the unanswered questions raised by the 2005 *Northpoint* case, such as whether the Commission needs to distinguish between domestic and international satellite bands to auction the terrestrial portion a satellite a band;[126]

(2) Clear or negotiate terms of use with the band's existing licensees and with the Canadian and Mexican governments for use at these countries' borders;

(3) Set technical rules to mitigate potential interference between an unwilling incumbent MSS licensee and the separate terrestrial component operator; and

(4) Design, develop, and enact auction rules.

Although reaping financial gain from the terrestrial portion of this band is an attractive option, the delay involved would outweigh the benefits of an auction. Delay is costly.[127] Moreover, another user, bogged down by transaction costs and conservative rules to prevent interference with Globalstar's MSS, would provide a less spectrally efficient service than Globalstar would. Offering a less spectrally efficient service reduces long-term consumer benefit.

C. Restricting or denying Globalstar's use of the unlicensed band to protect existing unlicensed users would skew the dynamic of unlicensed spectrum.

The Wi-Fi Alliance and Bluetooth SIG urged the Commission to consider TLPS's effect on unlicensed technologies. This consideration should not include Commission action to protect unlicensed users, such as restricting Globalstar's use of the unlicensed

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[126] *See Northpoint Tech., Ltd. v. Commission*, 412 F.3d 145, 155-56 (D.C. Cir. 2005) (holding that the Commission must distinguish between international and domestic satellite services before auctioning Direct Broadcast Satellite (DBS) spectrum).

[127] One estimate places the cost of waiting six years at 25.4% of the total social value of a project. *Hazlett & Oh*, *supra*, at 233.

band on different terms than other unlicensed users, providing safe harbors for unlicensed users, or otherwise enshrining the rights of unlicensed users.

Commission action that would protect existing unlicensed users from interference from a new unlicensed user would drastically change the nature of the unlicensed band. Commission action allowing TLPS contingent on a reduced OOBE would not drastically change the nature of the unlicensed band—unlicensed users would operate throughout the upper unlicensed band equally except for the few MHz at the band edge where TLPS would not need to taper its emissions. Weighing the potential consequences leaves the Commission with a choice between (1) giving band-edge licensees an inconsequential advantage at the barrier of the unlicensed band; or (2) destroying the dynamic of the unlicensed band.[128]

Unlicensed spectrum, like a commons, is available for anyone to use as long as they do not violate the rules of the band.[129] Changing Part 15 rules to allow Globalstar to emit at the edge of the unlicensed band into its adjacent licensed band, while modifying the OOBE limit to allow other unlicensed users to do the same, would not affect the unlicensed band as much as giving Globalstar or other unlicensed users rights in the unlicensed band.[130]

The Wi-Fi Alliance has urged the Commission to protect unlicensed users, relying on the Commission action in June 2013's *Progeny* proceeding.[131] In that proceeding, Progeny,

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[128] *See* Satapathy and Peha, *supra*, at 5-9 (describing the difficulty of setting limits within unlicensed spectrum, preventing "greedy" design approaches, and encouraging efficient use of the spectrum).
[129] *E.g.*, 47 CFR §§ 15.5, 15.245, 15.247, 15.249, 15.35; *see also* Satapathy and Peha, *supra*, at 2.
[130] Modifying licenses to increase interference protection could constitute a regulatory taking in violation of Section 316 of the Communications Act. Goodman, *supra* at 310 n.122 (citing *Comments of Sprint Corporation*, ET Docket No. 02-135, at 10-11 (July 8, 2002)).
[131] *Wi-Fi Alliance Comments* at 7-8.

a narrowband licensee in the typically wideband designated 902-928 MHz band, requested a waiver to begin commercial operations of its multilateration location and monitoring service ("M-LMS").[132] The Commission seemingly affirmed the value of unlicensed devices by ruling that Progeny could not provide a new service in its licensed band if it caused "unacceptable levels of interference" to unlicensed devices operating in the adjacent band.[133] The Commission required Progeny to conduct tests to show that its new system did not produce an unacceptable level of interference to a representative sample of existing Part 15 users.[134]

Although the Commission refused to elevate Part 15 users to a co-equal status with licensed M-LMS providers, it adopted a "safe harbor" rule that afforded unlicensed users a measure of protection.[135] This rule shielded existing unlicensed users that conformed to certain technical standards from any future harmful interference claims by Progeny.[136] The Commission emphasized that its rules sought to "minimize" rather than "eliminate" interference to unlicensed users.[137]

If the Commission builds upon the Progeny proceeding by providing a safe harbor or "unacceptable interference" standard in this proceeding, it would create an expectation among unlicensed spectrum users that the Commission would require new services not to interfere with their services.[138] While Wi-Fi and Bluetooth services are valuable and

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[132] *Request by Progeny LMS, LLC for Waiver of Certain Multilateration Location and Monitoring Service Rules*, Order, WT Docket No. 11-49, 28 FCC Rcd. 8555, 8555 ¶ 1 (June 6, 2013) ("*Progeny Order*").
[133] *See id*.
[134] *See id.*
[135] *Id.* at 8560, ¶¶ 9-10.
[136] *Id.* at 8560, ¶ 10.
[137] *Id.* at 8567-68, ¶ 28.
[138] *See Wi-Fi Alliance Comments* at 5, 7-8.

ubiquitously deployed, affording them quasi-licenses would undermine the value of unlicensed spectrum, causing greater harm than benefit.

Moreover, as thousands of different unlicensed devices are authorized to operate within the 2.4 GHz band, it would be difficult to enforce any quasi-property rights—it would be hard to tell which user caused the interference. Even locating, let alone negotiating with, these numerous users would be costly.[139] Finally, determining which unlicensed users have what rights would require a significant investment of time and resources.

The unlicensed commons should remain open. No one doubts the benefits that specific unlicensed services, such as Wi-Fi and Bluetooth, provide. But instead of trying to protect unlicensed users through enshrining rights, perhaps the Commission should look to creating a market for low power licenses. This would allow successfully developed services to obtain interference protection for valuable services. The market for spectrum licenses through auctions or through secondary licensing consists of only high power licenses. These are not attractive to low power users.

IV. Conclusion

The Commission should support proposals increasing efficient use of spectrum absent demonstrable harm. Granting, rather than withholding, the spectrum resource benefits consumers. Here, concerns of potential interference to licensed users are minimal— the Commission's record shows that majority of the opposition to TLPS comes from unlicensed users who have no right to expect to continue to operate on their frequencies, much less receive protection from interference. And even these unlicensed

[139] *See Wi-Fi Alliance Petition Comments* (the WiFi Alliance alone has completed more than 15,000 product certifications).

users merely raise questions regarding TLPS's potential impact on their services; they never explicitly state that their services will be irreparably harmed by it.

Globalstar has creatively devised a way to make the historically difficult to navigate ATC rules more manageable. Further, Globalstar has found a spectrally and dynamically efficient use of both the unused terrestrial portion of its MSS-licensed band and the underused adjacent unlicensed band. However, its proposed use of the upper unlicensed band is unfair to other unlicensed users given the unnecessarily stringent OOBE limit. To remedy this inequity, the Commission should hinge approval of TLPS of a reduction of that limit. Reducing the OOBE will encourage innovation and investment. Such action will also indirectly mitigate potential interference to unlicensed users, which is more than unlicensed users should expect from the Commission.

The unlicensed band, open for use by any certified equipment, is a competitive environment. Affording one user in the band protection from another user would alter this competitive environment—it would give incumbents preferences similar to the rights afforded incumbents in licensed bands. To protect consumers, who benefit from the rapid innovation and low costs that result from the open nature of unlicensed spectrum, the Commission should make certain that they do not mistakenly apply Progeny's principles here.

Respectfully submitted,

/s/

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