

**Before the
FEDERAL COMMUNICATIONS COMMISSION
Washington, DC 20554**

In the Matter of)	
)	
Revision of Part 15 of the Commission’s Rules)	ET Docket No. 13-49
To Permit Unlicensed National Information)	
Infrastructure (U-NII) Devices in the)	
5 GHz Band)	

COMMENTS OF GLOBALSTAR, INC.

Globalstar, Inc. (“Globalstar”) hereby comments on the Federal Communications Commission’s (“Commission’s”) Notice of Proposed Rulemaking (“*NPRM*”) in the above-captioned proceeding.¹ Globalstar appreciates and supports the Commission’s ongoing effort to free up additional spectrum for wireless and mobile broadband applications in order to meet the enormous consumer demand for these services, as provided in the National Broadband Plan (“*NBP*”).² While Globalstar favors most of the *NPRM*’s recommendations, permitting the outdoor operation of unlicensed devices in the U-NII-1 band would threaten substantial harmful interference to Globalstar’s mobile satellite service (“*MSS*”) feeder link operations at 5096-5250 MHz. Accordingly, the Commission should maintain its existing prohibition on outdoor operations in the U-NII-1 band and ensure that Globalstar’s *MSS* offerings are protected from harmful interference.

¹ *Revision of Part 15 of the Commission’s Rules to Permit Unlicensed National Information Infrastructure (U-NII) Devices in the 5 GHz Band*, Notice of Proposed Rulemaking, 28 FCC Rcd 1769 (2013).

² See FCC, “Connecting America: The National Broadband Plan,” at 76-77 (rel. March 16, 2010), *available at*: <<http://download.broadband.gov/plan/national-broadband-plan.pdf>> (“National Broadband Plan”).

I. GLOBALSTAR'S GLOBAL MSS NETWORK

Licensed in 1995 to operate in the Big LEO band, Globalstar is a leading provider of global mobile satellite voice and data services. With over \$5 billion invested in its global non-geostationary (“NGSO”) MSS network, Globalstar today uses its constellation of satellites and ground stations on six continents to provide affordable, high-quality MSS to more than 550,000 customers in over 120 countries around the world. Globalstar is licensed for uplink transmissions (mobile earth stations to satellites) in the Lower Big LEO band at 1610-1618.725 MHz, and for downlink transmissions (satellites to mobile earth stations) in the Upper Big LEO band at 2483.5-2500 MHz.³ For its feeder links, Globalstar is authorized for uplink transmissions between its gateway earth stations and space stations in the 5096-5250 MHz band, and for downlink transmission from its satellites to its gateway facilities at 6875-7055 MHz.⁴

In February 2013, Globalstar successfully completed the launch campaign for twenty-four second-generation satellites with a design life of fifteen years. Once fully operational later this year, Globalstar’s second-generation MSS system will support highly reliable, crystal-clear CDMA-quality voice and data satellite services to the more than five billion consumers, public safety users, and other potential customers located within its global footprint.⁵ In offering an

³ Iridium is authorized to share spectrum with Globalstar at 1617.775-1618.725 MHz.

⁴ See *Globalstar Licensee LLC, Application for Modification of Non-geostationary Mobile Satellite Service Space Station License*; *GUSA Licensee LLC, Applications for Modification of Mobile Satellite Service Earth Station Licenses*; *GCL Licensee LLC, Applications for Modification of Mobile Satellite Service Earth Station Licenses*, Order, 26 FCC Rcd 3948, ¶¶ 2 n.1, 3 (2011) (DA 11-520) (“*Globalstar 2011 Modification Order*”). Globalstar’s earth station in Clifton, Texas also utilizes the 5091-5092 MHz band for uplink transmissions to its space stations.

⁵ Globalstar’s second generation satellites are licensed for operation and registered with the United Nations by the Republic of France. In March 2011, the Commission modified fixed and mobile earth station licenses held by GUSA Licensee LLC to permit those earth station facilities

array of services to customers throughout the world, Globalstar's satellite network will provide the highest voice quality, fastest truly mobile data speeds, and most affordable service in the MSS industry.⁶

II. GLOBALSTAR SUPPORTS MOST OF THE *NPRM* PROPOSALS

Globalstar has been very supportive of the Commission's efforts to free up additional spectrum for mobile broadband applications in order to address consumers' ever-increasing desire for more data-intensive applications.⁷ In November 2012, Globalstar filed its own petition for rulemaking for authority to use its MSS spectrum for a variety of different and innovative mobile broadband applications that could quickly and efficiently add over twenty megahertz of prime spectrum to the nation's broadband inventory.⁸ These potential applications include the innovative Terrestrial Low Power Service ("TLPS") that could rapidly and dramatically relieve existing congestion on public Wi-Fi channels, the "Wi-Fi Traffic Jam," through a carrier-grade, carrier-managed service. The Commission should commence a formal rulemaking process in the near future to make these opportunities a reality. Unlike other spectrum proposals promising consumer benefits that are in fact years away, Globalstar's TLPS plans can be implemented almost immediately by leveraging existing investments in facilities and hardware.

Regarding the proposals outlined in the *NPRM*, Globalstar supports the Commission's proposed revisions to the operating rules for U-NII-2A and U-NII-3 devices, as well as the

to communicate with Globalstar's French-licensed second-generation Big LEO satellite system. *See Globalstar 2011 Modification Order* ¶ 1.

⁶ In populated areas, Globalstar's MSS network provides critical back-up capabilities for public safety personnel during disasters when terrestrial facilities can be rendered unavailable. Public safety entities involved in relief efforts in the United States and around the world have relied on Globalstar's satellite services after earthquakes, hurricanes, and other disasters.

⁷ *See, e.g.*, Comments of Globalstar, Inc., WT Docket No. 12-70 (May 17, 2012).

⁸ Petition for Rulemaking of Globalstar, Inc., RM-11685 (Nov. 13, 2012).

Commission's proposal to make available an additional 195 MHz of spectrum for use by U-NII devices. Once implemented by the marketplace over a multi-year process, these regulatory steps should yield additional broadband capacity and generate consumer benefits.

III. THE COMMISSION SHOULD MAINTAIN ITS PROHIBITION ON OUTDOOR OPERATIONS IN THE U-NII-1 BAND

In the *NPRM*, the Commission requests comment on whether it should harmonize the technical rules for the U-NII-1 band at 5150-5250 MHz with technical rules that currently apply to the U-NII-2A and U-NII-3 bands.⁹ Specifically, the Commission asks whether it should:

- Increase the power limits in the U-NII-1 band to those applicable in the U-NII-2A band, *i.e.*, from 50 mW to 250 mW with a maximum EIRP of 30 dBm with 6 dBi antenna gain, and increase the permitted peak power spectral density ("PSD") in the U-NII-1 band to the level allowed in the U-NII-2A band, *i.e.*, from 4 dBm/MHz to 11 dBm/MHz;
- Increase the power limits in the U-NII-1 band to those applicable in the U-NII-3 band, *i.e.*, from 50 mW to 1 W with a maximum EIRP of 36 dBm with 6 dBi antenna gain, and increase the permitted peak PSD to the level allowed in the U-NII-2A band, *i.e.*, from 4 dBm/MHz to 17 dBm/MHz;
- Eliminate the existing prohibition on outdoor operation of unlicensed devices in the U-NII-1 band, and, if so, whether it should permit such outdoor operations under the current technical rules in the U-NII-1 band or the technical rules for the U-NII-2A and U-NII-3 bands.

In response to these proposals, Globalstar urges the Commission to maintain its existing prohibition on the outdoor operation of unlicensed devices in the U-NII-1 band. Such outdoor transmissions would threaten substantial harmful interference to Globalstar's NGSO MSS feeder uplink operations at 5096-5250 MHz.¹⁰ The attached Technical Appendix demonstrates the

⁹ *NPRM* ¶¶ 36-41.

¹⁰ In its 2002 order establishing technical rules for the U-NII bands, the Commission limited the U-NII-1 band to indoor operations in order to provide interference protection to co-channel NGSO MSS operations. See *NPRM* ¶ 36; *Amendment of Parts 2, 25, 97 of the Commission's Rules with Regard to the Mobile-Satellite Service Above 1 GHz*, Report and Order, 17 FCC Rcd 2658 (2002).

likelihood of such harmful interference.¹¹ Under the Commission’s existing U-NII-1 rules, including the existing indoor operational requirement, over 200,000 U-NII devices can operate simultaneously in the United States at 5150-5250 MHz without causing harmful interference to Globalstar’s feeder uplink facilities.¹² In contrast, if outdoor transmissions were permitted, only 4,000 unlicensed devices could operate simultaneously in the U-NII-1 band without causing harmful interference to Globalstar’s feeder uplinks.¹³ If the Commission combined outdoor operations with increased U-NII-1 power limits, the number of devices that could simultaneously operate at 5150-5250 MHz without causing harmful interference to Globalstar would decrease to either 798 or 201 (depending on whether the power limits were raised to U-NII-2A or U-NII-3 levels).¹⁴

In a second examination of this interference threat, the Technical Appendix assumes the operation of approximately 70,000 Wi-Fi “hotspots” in the U-NII-1 band at 5150-5250 MHz.¹⁵ If U-NII-1 access points were permitted to operate in outdoor environments, those operations would raise the noise level for Globalstar’s feeder uplink by as much as 26%.¹⁶ If the Commission also increased the U-NII-1 power limits to U-NII-2A or U-NII-3 levels, those

¹¹ Two international norms, Recommendations ITU-R S.1426 and S.1432, have established levels of acceptable interference that can be tolerated by FSS feeder uplinks for NGSO MSS systems. Interference exceeding these levels can impair the operation of these feeder links. *See* Technical Appendix at 1.

¹² Technical Appendix at 2.

¹³ *Id.*

¹⁴ *Id.*

¹⁵ *Id.* at 4. Globalstar’s research indicated that there are an estimated 140,000 Wi-Fi “hotspots” currently in the United States. *See* JiWire, *WiFi Finder*, <http://v4.jiwire.com/search-hotspots-locations.htm>. To assess the potential interference, it was assumed that half of these “hotspots” would be equipped with one access point operating in the 5150-5250 MHz band.

¹⁶ Technical Appendix at 3-4.

operations would raise this noise level by 131% or 522%, respectively.¹⁷ Such noise levels would result in chronic, harmful interference to the link between Globalstar's gateways and its satellites.¹⁸ Given the coverage of Globalstar's satellites and the location of its gateways, this interference would reduce the quality of Globalstar's two-way services not only in the United States, but also in Canada, Mexico, the Caribbean, Central America, and even parts of Russia and Japan (if the interference is from unlicensed devices in Alaska).

The Commission must take the steps necessary to avoid this harm to Globalstar's MSS operations. Globalstar has spent more than \$1 billion to deploy its second-generation MSS constellation and restore its duplex capabilities. To use this second-generation network to provide innovative two-way satellite services to its growing and diverse customer base, Globalstar must continue to have access to spectrum that is free from harmful interference. Clearly, impaired communications between Globalstar's gateway facilities and its satellites will jeopardize the development of these two-way services. Thus, in revising its rules for the U-NII-1 band at 5150-5250 MHz, the Commission should preserve its existing restriction on outdoor operations in the U-NII-1 band and protect the integrity and reliability of Globalstar's industry-leading MSS offerings.

¹⁷ *Id.*

¹⁸ *Id.* Globalstar's technical analysis indicates that if the Commission maintains its existing prohibition on outdoor operations, an increase in the U-NII-1 power limit to the level permitted in the U-NII-2A band would raise the noise level for Globalstar's feeder link operations by only 2.6%. Technical Appendix at 3-4. Globalstar believes that any resulting interference to its MSS operations in this scenario would be manageable, and Globalstar therefore does not oppose this proposed higher power limit in the U-NII-1 band. If the Commission takes this action, however, the FCC will have to account for the increased noise level in Globalstar's feeder uplink spectrum if in the future a co-primary aeronautical radionavigation operator seeks authority to provide service in the United States. *See* Recommendation ITU-R S.1432-1, "Apportionment of allowable error performance degradations to fixed-satellite service (FSS) hypothetical reference digital paths arising from time invariant interference for systems operating below 30 GHz," Geneva, 2006.

IV. CONCLUSION

For the aforementioned reasons, the Commission should maintain its prohibition on outdoor operations in the U-NII-1 band at 5150-5250 MHz and ensure that Globalstar's feeder link operations at 5096-5250 MHz are protected from harmful interference.

Respectfully submitted,

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Attachment

**Technical Appendix to
Comments of Globalstar, Inc.
In the Matter of
Revision of Part 15 of the Commission's Rules to Permit
Unlicensed National Information Infrastructure (U-NII) Devices
in the 5 GHz Band**

The Federal Communications Commission ("Commission" or "FCC") is seeking comment on potential changes to its Part 15 Rules to allow greater unlicensed access to spectrum in the 5.150 - 5.925 GHz range. Specifically, with the instant Notice of Proposed Rulemaking ("NPRM"), the FCC is seeking comment on the elimination of the prohibition on outdoor operation of unlicensed devices in the U-NII-1 band at 5150-5250 MHz, and increasing the power limits for the U-NII-1 band to levels authorized for the U-NII-2A band, 30 dBm or 0 dBW, or those authorized for the U-NII-3 band, 36 dBm or 6 dBW.

The 5091-5250 MHz band is also allocated to the Fixed Satellite Service ("FSS") to support feeder links for non-geostationary orbit ("NGSO") satellite systems in the Mobile-Satellite Service ("MSS"). Globalstar's space stations are authorized to receive feeder uplink transmissions from its ground stations in the 5096-5250 MHz band. This Technical Appendix addresses the likely effects of the FCC's contemplated rule changes in the U-NII-1 band on the feeder uplinks of the Globalstar system.

Two international norms, Recommendations ITU-R S.1426 and S.1432, have established levels of acceptable interference that can be tolerated by feeder uplinks for NGSO MSS systems in the FSS. Exceeding these levels can lead to impaired operation of these FSS links. Notably, the power flux density (PFD) level given in Recommendation ITU-R S.1426 results in a $\Delta T/T$ of 1.5%, approximately equal to the objective given for interference from Services barred from causing interference to other Services allocated to the 5150-5250 MHz band.

Table 1 below provides calculations of the levels of interference that could be caused to the feeder uplinks of the Globalstar system as a result of allowing outdoor deployment and increased power levels of U-NII devices operating in the 5150-5250 MHz band.

In this analysis, it was assumed that all "802.11" Wi-Fi access points operating at 5150-5250 MHz are currently deployed indoors and are operating at the maximum authorized power level

of 23 dBm or -7 dBW. In addition, it was assumed that only 802.11 access points would contribute to any interference, since tablets and smart phones with Wi-Fi capability at 5150-5250 MHz typically operate at power levels that are 5 to 8 dB lower than the +23 dBm limit currently provided in the Part 15 rules.

The upper portion of Table 1 below shows the number of U-NII devices that could be activated in the 5150-5250 MHz band under the deployment restrictions given and the power levels allowed in the three U-NII bands. In the case of indoor deployment, an attenuation of 17 dB is assumed to result from the passage of the U-NII signal from indoors to outdoors and thus to the Globalstar spacecraft (S/C). It is further assumed that there is no attenuation beyond free-space path loss when a U-NII device is deployed outdoors.

As shown in the first column in Table 1, under current power level and deployment restrictions, over 200,000 simultaneously operating U-NII devices can be compatibly accommodated in the four U-NII channels across the 5150-5250 MHz band. Allowing outdoor deployment using the same power level decreases this number markedly, to just over 4000 devices across the same four channels that can operate without causing unacceptable interference to Globalstar's feeder uplink operations. If the FCC were to allow outdoor deployment and also increase the permitted power levels, consistent with power levels in the U-NII-2A and U-NII-3 bands, the number of simultaneously operating devices would fall to 798 and 201, respectively throughout the United States. Note that allowing a power level increase to U-NII-2A levels but still retaining the indoor deployment restriction would permit more than 40,000 U-NII devices to be used simultaneously across the 5150-5250 MHz band.

Table 1

	Current	U-NII-1 Levels with Outdoor Operation	Power Increase to U-NII-2 Levels Indoors	Power Increase to U-NII-2 Levels Outdoors	Power Increase to U-NII-3 Levels Outdoors
	5150-5250 MHz	515-5250 MHz	5150-5250 MHz	5150-5250 MHz	5150-5250 MHz
Globalstar System Characteristics					
Satellite Altitude (km)	1414	1414	1414	1414	1414
Spreading Loss (dB)	134.0	134.0	134.0	134.0	134.0
Comparison of PFD with $\Delta T/T$					
T of Globalstar (K)	509.3	509.3	509.3	509.3	509.3
Log (K)	27.1	27.1	27.1	27.1	27.1
Boltzmann's Const.(dBW/K/Hz)	-228.6	-228.6	-228.6	-228.6	-228.6
No of Globalstar Spacecraft (S/C) (dBW/Hz)	-201.5	-201.5	-201.5	-201.5	-201.5
Frequency (MHz)	5200.0	5200.0	5200.0	5200.0	5200.0
Area of 0dB Gain Ant. (m ²)	-35.8	-35.8	-35.8	-35.8	-35.8
Rx Lvl for 1% Delta T/T (dBW/MHz)	-161.5	-161.5	-161.5	-161.5	-161.5
Rx Lvl for -124 dBW/MHz/m ² PFD	-159.8	-159.8	-159.8	-159.8	-159.8
Rec. ITU-R S.1426 PFD => $\Delta T/T$	1.50	1.50	1.50	1.50	1.50
# of Compatible U-NII Users					
U-NII EIRP Density 802.11a (dBW/MHz)	-20.0	-20.0	-13.0	-13.0	-7.0
Indoor/Outdoor Attenuation (dB)	17.0	0.0	17.0	0.0	0.0
U-NII PFD 802.11a (dBW/MHz/m ²)	-171.0	-154.0	-164.0	-147.0	-141.0
Rec. ITU-R S.1426 PFD (dBW/MHz/m ²)	-124.0	-124.0	-124.0	-124.0	-124.0
Allowable number 802.11a U-NII Users per Chan in Sat Receive Beam	50131	1000	10003	200	50
Number of U-NII Chans	4	4	4	4	4
Total U-NII Users	200525	4001	40010	798	201
Access Points					
# of Access Points in USA	140000				
# 802.11a Equipped	70000	70000	70000	70000	70000
Access Point per Chan EIRP (dBW)	-7	-7	0	0	6
802.11 Chans Avail	4	4	4	4	4
# of Access Points per Chan	17500	17500	17500	17500	17500
Bandwidth of U-NII Chan (MHz)	20	20	20	20	20
Indoor/Outdoor Attenuation (dB)	17	0	17	0	0
Access Pt EIRP/Chan Indoor (dBW)	18.4	35.4	25.4	42.4	48.4
PFD @ S/C (dBW/MHz/m ²)	-128.6	-111.6	-121.6	-104.6	-98.6
Path Loss @ 1414km (dB)	-169.8	-169.8	-169.8	-169.8	-169.8
Pwr @ S/C/20MHz Chan (dBW)	-151.3	-134.3	-144.3	-127.3	-121.3
Pwr @ S/C/1.23 MHz Chan (dBW)	-163.5	-146.5	-156.5	-139.5	-133.5
Delta T/T	0.5	26.2	2.6	131.2	522.2

The lower portion of Table 1 shows the increase in Globalstar system noise ($\Delta T/T$) that would be attributable to changes in the FCC Part 15 Rules for access points operating in the 5150-5250 MHz band. Research indicated that there are approximately 140,000 Wi-Fi “hotspots” currently in the United States in all 802.11 bands.¹ To assess the potential

¹ <http://v4.jiwire.com/search-hotspots-locations.htm>.

interference, it was assumed that half of these "hotspots" would be equipped with one access point operating in the 5150-5250 MHz band.

The left-hand column of Table 1 indicates that 70,000 "802.11" access points operating simultaneously across four channels in the 5150-5250 MHz band would result in a $\Delta T/T$ of 0.5%. Allowing outdoor operation of these same access points would result in a $\Delta T/T$ of 26%, an amount equivalent to a 1 dB degradation in feeder uplink carrier-to-noise ratio. Given the coverage of Globalstar's satellites and the location of its gateways, these increased noise levels would reduce the quality of Globalstar's two-way services not only in the United States, but also in Canada, Mexico, the Caribbean, Central America, and even parts of Russia and Japan (if the interference is from unlicensed devices in Alaska).

The third column indicates the increase in Globalstar system noise for 70,000 access points if the FCC increased the U-NII-1 power limit to the level applicable to U-NII-2A, while maintaining its prohibition on outdoor operations at 5150-5250 MHz. Specifically, Globalstar's technical analysis indicates that, in this scenario, the noise level for Globalstar's feeder link operations would increase by only 2.6%. Although greater than the objective contained in Recommendation ITU-R S.1432, Globalstar believes that this noise increase represents an amount of interference that can be managed within the Globalstar MSS system. If the Commission takes this action, however, the FCC will have to account for the increased noise level in Globalstar's feeder uplink spectrum if in the future a co-primary aeronautical radionavigation operator seeks authority to provide service in the United States. See Recommendation ITU-R S.1432-1, "Apportionment of allowable error performance degradations to fixed-satellite service (FSS) hypothetical reference digital paths arising from time invariant interference for systems operating below 30 GHz," Geneva, 2006.

The fourth and fifth columns in Table 1 show the increases in Globalstar system noise that would result if the FCC allowed outdoor operation of access points at the power levels currently permitted in the U-NII-2A and U-NII-3 bands, respectively. It is apparent that this type of operation would result in increases in Globalstar system noise that are well in excess of any norms associated with satellite system operation and are equivalent to degradations of 3.6 dB and 7.9 dB in feeder uplink carrier-to-noise, respectively.

Summary

Revision of the current FCC Part 15 Rules to allow outdoor deployment and raise the permitted power levels would increase the interference received by the feeder uplinks of the Globalstar system. Globalstar's analysis in this Technical Appendix indicates that the outdoor deployment of "802.11" access points would cause unacceptable interference to Globalstar's feeder link operations at 5150-5250 MHz. Were the FCC to increase access point power levels in the U-NII-1 band to the current U-NII-2A levels while maintaining the indoor deployment restriction, Globalstar believes that the additional interference to Globalstar's MSS network would be manageable.

Declaration

I hereby certify under penalty of perjury that the engineering statements made in the foregoing Comments of Globalstar, Inc., and attached Technical Appendix, are true and correct to the best of my knowledge.

Dated: May 28, 2013

/s/ Paul A. Monte

Paul A. Monte

Vice President, Engineering and Product Development
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