

**Before the
FEDERAL COMMUNICATIONS COMMISSION
Washington, D.C. 20554**

In the Matter of)	
)	
Review of the Spectrum Sharing Plan Among)	
Non-Geostationary Satellite Orbit Mobile)	IB Docket No. 02-364
Satellite Service Systems in the 1.6/2.4 GHz)	
Bands)	
)	
Amendment of Part 2 of the Commission's)	
Rules to Allocate Spectrum Below 3 GHz for)	ET Docket No. 00-258
Mobile and Fixed Services to Support the)	
Introduction of New Advanced Wireless)	
Services, Including Third Generation Wireless)	
Systems)	
To: The Commission		

COMMENTS OF IRIDIUM SATELLITE, LLC

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EXECUTIVE SUMMARY

Throughout the record in this docket, Iridium has documented the urgent need for a more equitable allocation of spectrum in the Big LEO band in order to meet growing consumer demands, foster a competitive market for mobile satellite service, and more efficiently utilize 1.6 GHz spectrum. In order to remedy this spectral disparity, the Commission should grant Iridium additional access to spectrum in the 1616-1618.25 MHz band on a shared basis with Globalstar. Indeed, adoption of the sharing plan in the 1616-1618.25 MHz band is an essential step toward the goal of creating a thriving and competitive MSS marketplace that adequately serves the public interest.

While Iridium has fully documented its acute needs for spectrum to meet existing and future capacity needs, the *Big LEO Spectrum Sharing Order and FNPRM* stopped short of providing the required relief. Specifically, expanding shared access to an additional 2.25 MHz is warranted for the following reasons: (1) a spectrum-based communications company must have spectrum to meet existing and future customer peaks rather than be limited to non-peak requirements; (2) the Iridium network architecture has the strength of 24/7 global coverage, but this design carries the cost of regional peaks being tantamount to system peaks; (3) the Commission's decision does not fully address the fact that additional spectrum is needed to improve service quality, and that Iridium will use additional spectrum dynamically when peaks are not occurring; and (4) the Iridium system is designed to utilize immediately the additional spectrum.

There are considerable public interest benefits to providing Iridium with additional spectrum. Iridium has emerged as a leading provider of MSS in rural and underserved areas both domestically and globally. While Iridium has thus far managed to offer extensive services in these areas despite the strain imposed on its system due to

limited spectrum allocation, usage rates for Iridium service in rural communities has been growing at a rapid pace. In order to continue to serve these markets in the future, it is imperative that Iridium be granted additional access to spectrum on a shared basis. Access to additional spectrum also will allow Iridium to maintain reliability during extraordinary peak loads, such as those that occur during natural disasters, and to provide higher quality and expanded services. Moreover, permitting shared access to additional spectrum will promote the Commission's spectrum efficiency objectives.

It is also clear that sharing in 1616-1618.25 MHz band is technically feasible and will not cause harmful interference to Globalstar's operations. The success of the spectrum sharing plan implemented in the 1620.1-1621.35 MHz band pursuant to the Commission's grant of special temporary authority to Iridium beginning in April 2003 proves that both Big LEO MSS operators can coexist in the same band without creating harmful interference to either operator's system. Further, as Globalstar will retain access to all of its spectrum in the 1616-1618.25 MHz band, allowing Iridium access to that band will have no impact at all on Globalstar's ability to provide service globally.

In addition, sharing of an additional 2.25 MHz of spectrum would have no adverse effects on Globalstar's aviation or ancillary terrestrial component operations. Although Globalstar has suggested that such sharing would impede its ability to provide aviation services because it claims that it requires exclusive use of two channels in the 1616-1618.25 MHz band, Globalstar offers no evidence to support its contention. With respect to the effect of spectrum sharing on Globalstar's ATC service, Globalstar's claims of potential interference are again unsupported due to the fact that the Commission decided not to allocate the 1616-1618.25 MHz band for ATC use.

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To: The Commission

COMMENTS OF IRIDIUM SATELLITE, LLC

Iridium Satellite, LLC (“Iridium”), by its attorneys, hereby respectfully submits these comments in response to the *Big LEO Spectrum Sharing Order and FNPRM*, released July 16, 2004 in the proceeding referenced above.¹ As the Commission has recognized and as is demonstrated below, there is a compelling and pressing need for Iridium and Globalstar to share mobile satellite service (“MSS”) spectrum in the 1616-1618.25 MHz band. Providing Iridium access to this additional 2.25 MHz of spectrum

¹ Review of the Spectrum Sharing Plan Among Non-Geostationary Satellite Orbit Mobile Satellite Service Systems in the 1.6/2.4 GHz Bands; Amendment of Part 2 of the Commission's Rules to Allocate Spectrum Below 3 GHz for Mobile and Fixed Services to Support the Introduction of New Advanced Wireless Services, Including Third Generation Wireless Systems, IB Dkt. No. 02-364, ET Dkt. No. 00-258, *Report and Order, Fourth Report and Order and Further Notice of Proposed Rulemaking*, FCC 04-134 (Jul. 16, 2004) (“*Big LEO Spectrum Sharing Order and FNPRM*”).

will serve the public interest by making more efficient use of the limited available “Big LEO” spectrum and enabling Iridium to satisfy consumers’ growing demand for MSS service. Moreover, the proposed spectrum sharing will not introduce additional interference between the two operational Big LEO systems. In sum, adoption of the current spectrum sharing proposal, just like the Commission’s initial decision to permit sharing of 3.1 MHz of spectrum in the Big LEO band, will foster a more competitive marketplace for the delivery of MSS and deliver its attendant public interest benefits to consumers.

I. EXPANDED MSS SPECTRUM SHARING WILL MEET IRIDIUM’S DOCUMENTED EXISTING AND FUTURE CUSTOMER NEEDS

During the course of the Big LEO spectrum sharing plan rulemaking proceeding, Iridium presented the Commission with a substantial showing of its acute need for access to additional spectrum to meet existing and future capacity needs.² Beginning with its Petition for Rulemaking filed in July 2002, Iridium notified the Commission that it had a near-term need for additional spectrum.³ In January 2003, Iridium filed a technical spectrum report detailing spectrum requirements for the Iridium System and its current capacity constraints, including evidence of a 25 fold regional minute growth between 2001 and 2002 and a 380 percent minute growth in the Western United States during that

² Iridium has consistently demonstrated its pressing spectrum needs throughout this proceeding and its Special Temporary Authority proceedings. *See, e.g.*, Comments of Iridium Satellite, LLC, IB Dkt. No. 02-364 (July 11, 2003) (“Iridium Comments”); Reply Comments of Iridium Satellite, LLC, IB Dkt. No. 02-364 (July 25, 2003) (“Iridium Reply Comments”); Letter from Peter D. Shields, Counsel to Iridium Satellite, LLC, to James L. Ball, Chief of the Policy Division, FCC; (Dec. 18, 2003); Ex parte presentation of Iridium Satellite, LLC, IB Dkt. No. 02-364 (filed Mar. 17, 2004).

³ *See* Petition for Rulemaking of Iridium Satellite, LLC, IB Dkt. No. 02-364 (filed July 26, 2002).

same period.⁴ Additionally, Iridium has been documenting its spectrum constraints since April 2003 in STA requests and monthly spectrum use reports.

Significantly, Iridium also documented that additional spectrum is needed to improve the quality of service provided to its customers. Today, Iridium's services are limited to half-rate data rates and voice quality levels, an issue that is of great competitive importance when compared to the full data rate and voice quality levels typically provided by other wireless providers and its competitors. These lowered quality levels are dictated by Iridium not employing the full 10.5 MHz of spectrum that its satellite network was designed to use. This trade off results in less than optimum service quality – a point made by Iridium's competitors.⁵ While the shared 3.1 MHz authorized in the *Big LEO Spectrum Sharing Order and FNPRM* helps address capacity challenges for Iridium, the additional 2.25 MHz contemplated in the *FNPRM* will allow Iridium to use dynamically the additional spectrum to double the data rates for services to provide higher quality services when the spectrum capacity peaks are not present. This key point was not addressed in the *Big LEO Spectrum Sharing Order and FNPRM*, but it should be fully recognized in this further proceeding.

Although the 3.1 MHz of shared spectrum authorized in the *Big LEO Spectrum Sharing Order and FNPRM* provides a measure of relief for Iridium's customer needs, it stops short of the required mark. The expanded access to spectrum will help satisfy short term needs, but it is inadequate to address long term capacity needs as well as the need

⁴ See Letter from Richard E. Wiley, Counsel to Iridium Satellite, LLC, to the Honorable Michael K. Powell, Chairman, FCC, IB Dkt. No. 01-185 (Jan. 14, 2003).

⁵ See Frost & Sullivan, "Satellite Telephone Quality of Service Comparison: Iridium vs. Globalstar," July 25, 2002, at 6, available at <http://www.globalstarusa.com/quality/>.

for additional spectrum to improve service quality. Specifically, expanded spectrum sharing in another 2.25 MHz is warranted for the following reasons.

First, any spectrum-based communications company must have access to spectrum to meet both existing and future customer peaks, rather than be limited to non-peak requirements. A system that is constrained at the moment it experiences any increase in traffic levels will not be competitive in the MSS market, particularly when its only competitor does not have the same spectrum constraints. Furthermore, any such operator will be constrained in attempting to meet its customer's future needs or develop additional services.

Second, the Iridium network architecture has the strength to provide continuous coverage of the entire globe. In fact, Iridium is the only MSS operator that can provide complete global coverage 24 hours a day, 7 days a week. However, this design carries the cost of regional capacity peaks being tantamount to system capacity peaks. The Iridium system efficiently uses the same spectrum across all geographies; therefore, a geographically-focused spike in system usage, such as the increased demand present in the Middle East since April 2003, will not be met unless sufficient capacity is available in that region and therefore throughout the entire Iridium network. In addition, Iridium cannot readily predict where and when such capacity peaks may occur, due to the global nature of its communications network. This necessarily means that the full Iridium system must have access to sufficient spectrum throughout the system to meet such rolling peaks throughout the network. It is not rational for the Commission to characterize these capacity constraints as "sporadic and geographically-based need" when they affect the entire Iridium system.

Third, the *Big LEO Spectrum Sharing Order and FNPRM* ignores the documented fact that additional spectrum is needed to improve service quality. Even with shared access to an additional 3.1 MHz, Iridium will continue to experience spectrum-related performance degradation such as undue call drop rates and user acquisition failures. Access to an additional 2.25 MHz will allow Iridium to provide higher quality service when capacity peaks are not occurring, because Iridium will use the additional spectrum dynamically.

Finally, the Iridium system is designed to utilize immediately additional spectrum. The Iridium system was designed and constructed to operate over 10.5 MHz; however, the Commission licensed Iridium to operate with access to only 5.15 MHz of spectrum. Thus, Iridium will immediately be able to utilize any additional spectrum to which it is granted access. Moreover, it will be able to employ more of the spectrally efficient design features of the original Iridium system design.

II. ALLOWING THE BIG LEO OPERATORS TO SHARE AN ADDITIONAL 2.25 MHZ OF SPECTRUM WILL YIELD SUBSTANTIAL PUBLIC INTEREST BENEFITS

Increasing Iridium's access to Big LEO spectrum on a shared basis with Globalstar will yield numerous public interest benefits. To begin, the proposed spectrum sharing will promote the Commission's well-established spectrum efficiency objectives. In addition, allocating an additional 2.25 MHz for sharing by CDMA and TDMA MSS operators will allow Iridium to: (1) satisfy increased consumer demand; (2) improve service quality and provide more innovative and robust services to existing and future customers; and (3) expand service to domestic and international rural and underserved areas.

A. Additional Big LEO Spectrum Sharing Will Promote The Commission's Spectrum Efficiency Objectives

The proposed spectrum sharing will promote the Commission's spectrum efficiency objectives and thus serve the public interest. In June 2002, Chairman Powell established a Spectrum Policy Task Force to assist the Commission in identifying and evaluating changes in spectrum policy that will increase the public benefits derived from the use of the radio spectrum. The Spectrum Policy Task Force concluded in its final report that "there are certain common elements that the Commission should incorporate into its spectrum policy regardless of the regulatory model that is used . . . [including] [i]ncentives for efficient spectrum use."⁶ The Spectrum Policy Task Force defined spectrum efficiency as occurring "when the maximum amount of information is transmitted within the least amount of spectrum."⁷ In the *Big LEO Spectrum Sharing Order and FNPRM*, the Commission determined that sharing 3.1 MHz of spectrum in the Big LEO band would promote spectral efficiency consistent with the Commission's overall spectrum policies.⁸ Of even more import, the Commission compellingly argued that spectrum sharing as an approach should be implemented wherever possible.⁹ Clearly, adoption of the proposed spectrum sharing plan for an additional 2.25 MHz in the L-band will further promote the Commission's spectral efficiency objectives and, in turn, serve the public interest.

⁶ *FCC Spectrum Policy Task Force Report*, ET Dkt. No. 02-135, at 4 (rel. Nov. 2002); *id.* at 16.

⁷ *Id.* at 21.

⁸ *Big LEO Spectrum Sharing Order and FNPRM*, ¶¶ 45-47.

⁹ *Id.*

B. Iridium Needs Additional Spectrum to Meet Growing Customer Demand

In addition to promoting efficient spectrum use, adoption of the Commission's proposal to make an additional 2.25 MHz available to Iridium will also help meet growing demand and alleviate existing system congestion. For more than a year now, Iridium has been experiencing increased demand for its services.¹⁰ Moreover, Iridium has demonstrated that such demand is likely to continue to grow in the future on both global and regional levels.¹¹

The Iridium system must maintain reliability during anticipated peak traffic times and extraordinary peak loads. Iridium is relied upon by its customers as a communications link of last resort. During the current hurricane season, the Iridium System has experienced significant traffic increase in response to hurricanes Frances and Charley in Florida. Many companies and local governments turned to Iridium as their primary tool for emergency response. Iridium provided vital connectivity to emergency response teams, local businesses and essential public services such as power and light. Iridium users are incorporating Iridium service as part of established disaster relief plans and emergency preparedness. Granting Iridium's additional spectrum requirements serves the public interest in maintaining reliable, ubiquitous and immediately available mobile satellite communications when they are most needed.

¹⁰ See Iridium Satellite Spectrum Report, IB Dkt. No. 01-185 at 3-4 (filed Jan. 13, 2003) ("Iridium Spectrum Report"); Iridium Comments at 32-34; Iridium Reply Comments at 4-6.

¹¹ See Iridium Comments at 12-13; Iridium Reply Comments at 4-6; Iridium Spectrum Report at 3-4.

In response to increased customer demand, Iridium has made a concerted and sustained effort to exploit every technological advantage available to make the Iridium system as spectrally efficient as possible. These design features include on-board processing capability; on-board, real-time modulator/demodulator-to-beam switching capability; and intra- and inter-satellite frequency reuse capabilities. Iridium is working toward incorporating the additional 3.1 MHz of spectrum that the FCC reallocated on a shared basis now that the International Bureau has modified Iridium's license to permit the shared use of this spectrum.¹²

Despite these efforts, the Iridium system remains congested. The allocation of additional spectrum to Iridium, even on a shared basis, would relieve this congestion and better enable Iridium to satisfy growing demand. Indeed, Iridium's improved operations following the International Bureau's grant of additional spectrum to Iridium on a special temporary basis confirms that Iridium's principal system limitation can be remedied by access to additional spectrum. Thus, granting Iridium access to additional spectrum so that it can meet the needs of existing and future customers would plainly serve the public interest.

C. Additional Spectrum Will Enable Iridium to Provide its Customers With Higher Quality and Expanded Services

In addition to eliminating system congestion, additional spectrum would allow Iridium to improve existing services significantly and to expand its service offerings. As a result of the current insufficient spectral allocation, Iridium has limited its voice and

¹² Iridium Constellation LLC, Iridium Satellite LLC, Iridium Carrier Services Modification of Authority to Operate a Mobile Satellite System in the 1.6 GHz Frequency Band, File Nos. SAT-MOD-19990303-00021, SES-LIC-199960116-01966/01967, *Order*, DA 04-2869 (Int'l Bur. Sept. 3, 2004).

data services to half-rate vocoder mode since the system's original commercial activation in 1998. This reduction in voice and data rates has degraded the voice quality for subscribers and slowed the speeds at which a customer can send and access data. With increased spectrum, Iridium will be able to modify its operations to support full-rate voice channels thus resulting in improved voice quality for its customers. The additional spectrum will also permit Iridium to offer higher speed data transmissions.

Operation of the Iridium system at full-rate vocoder modes would also allow Iridium to expand its current data and handset-to-handset service offerings. By operating full-rate data services, Iridium could support a greater number of data users and provide efficient and fast packet-switched services. As a result, Iridium could better compete with other data-focused satellite services with more bandwidth and, thus, higher data speeds. This would provide a significant public interest benefit because demand for such data services outstrips even the demand for voice services. Similarly, additional spectrum would allow Iridium to provide additional handset-to-handset service, which typically requires twice the bandwidth of handset-to-network voice communication.

D. Additional Spectrum Will Allow Iridium to Continue Expanding Its Service to Remote and Underserved Areas

Additional spectrum will also allow Iridium to continue expanding its service to remote and underserved areas. Since 2000, Iridium has developed and successfully implemented a business strategy that targets customers in rural and remote areas in the United States and globally. These general public and government customers have significant needs that cannot be met by any other communications systems and require extremely high levels of service reliability. Iridium's commitment to servicing the growing demands of customers in remote and underserved areas is most evident in its

successful development of an expansive communications network in Alaska. Indeed, Iridium has emerged as a critical communications provider throughout Alaska, which has many remote areas and sparse terrestrial connectivity. In Alaska, private aircraft, remote industrial applications, fisherman, and the general rural populace are increasingly relying on Iridium for vital communications services. The service is also ideally suited for U.S. industrial applications such as heavy construction, defense/military, emergency services, maritime, mining, forestry, oil and gas and aviation.

Iridium is also emerging as a viable service to rural communities throughout the world. In nations such as Angola, Nigeria, Guinea, and Sierra Leone, Iridium is experiencing a substantial growth in demand. Additionally, Iridium has recently commenced service in remote areas of Senegal, Australia and Israel, with planned expansion into Malaysia, Papua New Guinea, and Equatorial Guinea. Critical rural services include health care, education, emergency communications from small villages, public safety, routine governmental and civic exchanges, industrial communications and monitoring, and manufacturing.

Providing service to these rural areas places significant demands on Iridium's system capacity. However, Iridium's current spectrum allocation is insufficient to allow Iridium to meet the growing needs of these communities. While providing quality service to underserved areas is, and will continue to be, a priority for Iridium, it is a priority that cannot be fully satisfied without increasing Iridium's current allocation of spectrum.

III. SHARING IN THE 1616-1618.25 MHZ BAND WILL NOT CAUSE HARMFUL MSS INTERFERENCE AND IS TECHNICALLY FEASIBLE

In the *Big LEO Spectrum Sharing Order and FNPRM*, the Commission sought comment on how to ensure that shared use of the 2.25 MHz of spectrum in question would not adversely impact the ability of both CDMA and TDMA MSS operators to provide a wide-range of services to the public.¹³ As shown below, Iridium's and Globalstar's prior spectrum sharing in the 1620.1-1621.35 MHz band proves that sharing an additional 2.25 MHz of spectrum in the L-band will not cause interference to either system. Moreover, spectrum sharing in the 1616-1618.25 MHz band will not adversely affect Globalstar's provision of global MSS, aviation services, or Ancillary Terrestrial Component ("ATC") operations. Finally, a technical review of the characteristics of the Iridium and Globalstar systems demonstrates that sharing is technically feasible.

A. Prior Spectrum Sharing in the 1620.1-1621.35 MHz Band Proves That Sharing An Additional 2.25 MHz Will Not Cause Harmful Interference To Either Big LEO MSS System

Since April 2003, Iridium successfully has been sharing spectrum in the 1620.1-1621.35 MHz band on a special temporary basis without causing harmful interference to the Globalstar system. In fact, in May 2003 Globalstar itself reported to the Commission that it "[had] not experienced harmful interference into our satellites" as a result of Iridium's STA operations.¹⁴ Similarly, as the Commission noted, the International Bureau's Satellite Division has found "no demonstrated interference" between the

¹³ *Big LEO Spectrum Sharing Order and FNPRM*, ¶ 99.

¹⁴ See Letter from William F. Adler, Counsel for Globalstar, to Thomas S. Tycz, Chief, Satellite Division, International Bureau, FCC, Attachment 2, at 1 (May 1, 2003) ("*Globalstar May 1, 2003 STA Opposition*").

Iridium and Globalstar systems.¹⁵ In reaching that conclusion, the International Bureau rejected Globalstar's attempt to attribute its increased Radio Link Failure ("RLF") rate in the 1620.1-1621.35 MHz band to Iridium's shared use of that spectrum pursuant to STA.¹⁶ This established track record of spectrum sharing supports the conclusion that sharing an additional 2.25 MHz in the L-band will not harm Globalstar's operations.

B. Shared Use of the 1616-1618.25 MHz Band Will Not Harm Globalstar's Provision of Global Service Because Globalstar Will Retain Access to All of Its Spectrum

The Commission seeks comment on "how any additional sharing requirements might impact the ability of Globalstar to provide global communications."¹⁷ The *Big LEO Spectrum Sharing Order and FNPRM* notes that Globalstar's French license starts at 1615 MHz, and Globalstar's Italian and Russian licenses are limited to frequencies above 1616 MHz.¹⁸ Additional sharing requirements will cause no adverse effect on Globalstar's provision of global services, because Globalstar will retain global access to all of its existing spectrum. For example, in the *Big LEO Spectrum Sharing Order and FNPRM*, where the Commission adopted a spectrum sharing plan for 3.1 MHz of

¹⁵ See *Big LEO Spectrum Sharing Order and FNPRM*, ¶ 29; *Modification of Licenses Held by Iridium Constellation, LLC and Iridium US LP*, Order, 18 FCC Rcd 20023 (Sat. Div., Int'l Bur. 2003).

¹⁶ Globalstar, L.P. and Globalstar USA, L.L.C. Petition to Deny Iridium June 9, 2003 Request for Extension of STA, STA-MS-20030515-0089, SES-MS-20030515-00666, at 1-2, Attachment at 1-2 (June 11, 2003) ("*Globalstar June 11, 2003 Petition to Deny*"); Iridium Request for Special Temporary Authority to Provide MSS in the 1616-1621.35 MHz frequency band, File No. SAT-STA-20030414-00066 (filed Apr. 11, 2003; grant dated April 11 2003 and April 14, 2003) ("*First STA Grant*").

¹⁷ See *Big LEO Spectrum Sharing Decision and FNPRM*, ¶ 99.

¹⁸ *Id.*

spectrum in the L-band previously available only to Globalstar, the Commission did not take away from Globalstar access to any spectrum or modify its license.

C. Additional Spectrum Sharing in the Big LEO Band Will Not Adversely Impact Aviation Services

The *Big LEO Spectrum Sharing Order and FNPRM* requests comment on the effect sharing an additional 2.25 MHz of spectrum would have on aviation services.¹⁹ Iridium currently provides significant services to aviation customers, spanning a wide range of applications, including air-to-air, air-to-ground and ground-to-air communications in a variety of public, private and government aircraft. Iridium currently offers ten different aviation products for the cockpit and cabin, which make use of Iridium's voice, data and Short Burst Data (SBD) offerings. The provision of additional spectrum, even under sharing conditions, would permit Iridium to offer more robust aviation services to its customers.

Globalstar has claimed during earlier stages of this proceeding that sharing spectrum with Iridium above 1616 MHz is impractical because inter-service protection requirements force Globalstar to assign particular services to particular frequency channels. Specifically, Globalstar has alleged that it must use spectrum above 1616 MHz for its aviation services, and that these aviation services require two *exclusive* channels (2.5 MHz) of L-Band spectrum.²⁰ However, Globalstar has not sufficiently demonstrated that its aviation services must operate above 1616 MHz. Iridium is confident that shared

¹⁹ *Id.*

²⁰ Ex parte presentation of Globalstar, L.P., IB Dkt. No. 02-364, at 10-11 (Sept. 15, 2003). Globalstar has also argued that it needed two aviation service channels due to system design limitations, rather than capacity limitations. *Id.* at 10 (“Speed of airplanes and movement through gateway service areas require assignment of two separate channels each for forward and return links”).

use of the proposed spectrum will not cause interference to either system, and the onus is on Globalstar to provide evidence that sharing the spectrum likely will cause interference to its aviation service.

Globalstar has relied on RTCA²¹ documents in an attempt to explain why it requires exclusive use of spectrum above 1616 MHz for aviation services.²² For example, RTCA/DO262 provides output power limits on Aircraft Earth Station (“AES”) terminals operating in the 1610–1626.5 MHz band, for protection of GNSS services below 1610 MHz. However, the proscribed limits do not describe any kind of emissions boundary at 1616 MHz. More importantly, DO262 proscribes limitations only on AES terminals used as part of the Aeronautical Mobile Satellite (Router) System (“AMS(R)S”) service. The new AES services being explored by Globalstar are for air-to-ground, cellular services, to be used by aviation passengers who wish to communicate to locations on the ground. Therefore, these services are not bound by DO262 because neither are they AMS(R)S services, nor is the Big LEO frequency band currently allocated for priority and preemptive services.²³

²¹ The RTCA, Inc (formerly known as Radio Technical Commission on Aeronautics)(“RTCA”) is an industry advisory group that acts as a Federal Advisory Group to develop consensus-based recommendations on aviation issues. The RTCA publishes documents that contain minimum operational standards for transmitters aboard aircraft. Document RTCA/DO262 entitled “Minimum Operational Performance Standards for Avionics Supporting Next Generation Satellite Systems (NGSS)” contains both in-band and out-of-band emission limitations for satellite transmitters operating in, among others, the Big LEO bands.

²² Ex parte presentation of Globalstar LLC and Thermo Capital Partners, L.L.C., IB Dkt. No. 02-364, at 1 (filed May 28, 2004) (“*Globalstar May 28, 2004 Ex Parte*”); Ex parte presentation of Globalstar LLC and Thermo Capital Partners, L.L.C., IB Dkt. No. 02-364, at 7 (filed May 27, 2004) (“*Globalstar May 27, 2004 Ex Parte*”).

²³ “The Aeronautical Mobile-Satellite (R) Service, abbreviated as AMS(R)S, is the designation by the ICAO and ITU for two-way communications via satellite(s) pertaining to the safety and regularity of flight along national or international civil air routes. The

The second RTCA document that Globalstar has used to support its claim that it cannot share spectrum currently used for aviation services, RTCA/DO228 (along with its corresponding Change 1), defines frequency selectivity requirements for active GNSS antenna and amplifier subsystems. These requirements place no restrictions on AES equipment and therefore provide no basis for Globalstar's exclusivity claims.

Furthermore, Globalstar has not demonstrated why it needs two channels partitioned exclusively for aviation services nor has it described why these two aviation channels could not be shared with other terminals on the earth's surface. The FCC is currently entertaining studies to determine if sharing of multiple air-to-ground services is feasible in only 4 MHz of spectrum rather than the 5 MHz of spectrum Globalstar claims is required for satellite-based aviation services.²⁴ More importantly, from a spectral efficiency standpoint, Iridium is currently providing extensive aviation services, along with all its other services, within only 5.35 MHz of spectrum. Certainly, if the Commission desires to continue to ensure efficient use of spectrum as it states in the *Big*

designator (R) is added to indicate that the international spectrum allocation is intended for aeronautical communications for aircraft flying civil aviation routes. Equipment and services operating in radio spectrum designated as (R) are historically accorded special measures of protection from interference and normally are used only for communications related to the safety and regularity of flight. In the case of AMS(R)S, non-safety communications are also permitted on a non-interference basis when priority and preemption can guarantee the precedence of safety communications. The term Aeronautical Mobile Satellite Service, AMSS, without the (R) is often used (e.g., in ICAO documentation) and is considered to comprise both AMS(R)S and non-safety aeronautical services, which can include specialized government and administrative communications as well as public correspondence." DO262, ¶ 1.3.

²⁴ See Amendment of Part 22 of the Commission's Rules To Benefit the Consumers of Air-Ground Telecommunications Services, *Notice of Proposed Rulemaking*, WT Dkt. No. 03-103, at 10 (April 29, 2003).

LEO Spectrum Sharing Order and FNPRM, it cannot consider the exclusive use of 5 MHz of spectrum for solely aviation services as in the public interest.²⁵

D. Spectrum Sharing Will Not Alter Globalstar’s Ability To Provide Viable ATC Services

The *Big LEO Spectrum Sharing Order and FNPRM* also seeks comment on whether and how sharing of the 1616-1618.25 MHz band would impact the ability of a CDMA MSS operator, currently only Globalstar, to provide viable ATC operations.²⁶ Iridium’s use of the 1616-1618.25 band will not affect Globalstar’s ability to provide ATC. First, in the spectrum proposed to be shared in this proceeding, the Commission has decided not to permit ATC use. In the *ATC Order*, the Commission promulgated rules allowing MSS operators to implement ATC in the 1610-1615.5 MHz band and the 2492.5-2498 MHz band.²⁷ Moreover, in the *Big LEO Spectrum Sharing Order and FNPRM*, the FCC determined that ATC service in the S-Band should be moved 5 MHz to 2487.5-2493 MHz.²⁸ As such, the Commission has not proposed any co-channel sharing between Globalstar ATC operations and Iridium satellite operations.

In addition, the existing out-of-band emission limits on Iridium already fully support directly adjacent channel operations between Iridium and Globalstar. Nothing in the Commission’s proposal gives rise to changes to these protections. Therefore, any

²⁵ *Globalstar May 28, 2004 ExParte* at 1 (“Globalstar needs a certain number of unshared channels above 1616 MHz for the deployment of [high data rate products for aviation] services.”).

²⁶ *Big LEO Spectrum Sharing Order and FNPRM*, ¶ 99.

²⁷ Flexibility for Delivery of Communications by Mobile Satellite Service Providers in the 2 GHz Band, the L-Band, and the 1.6/2.4 GHz Bands, *Report and Order and Notice of Proposed Rulemaking*, 18 FCC Rcd 1962 (2003) (“*ATC Order*”).

²⁸ *Big LEO Spectrum Sharing Order and FNPRM*, ¶ 75.

Globalstar ATC operations will continue to receive the same protection from Iridium’s operations in the 1616-1618.25 MHz band as currently exist.

E. Analysis of the Characteristics of the Globalstar and Iridium Systems Makes Clear that Spectrum Sharing Is Technically Feasible

Finally, the *Big LEO Spectrum Sharing Order and FNPRM* seeks comment on how additional sharing may be technically possible²⁹ and on any technical limitations that sharing may cause.³⁰ The following detailed analysis of the technical characteristics of the respective systems of Iridium and Globalstar conclusively demonstrates that spectrum sharing is feasible. The power budget for the Iridium terminal set forth below provides a telling example of how the two systems can continue to provide unimpeded service under the proposed sharing plan:

ISU Max. Tx Power EIRP	dBW	8.5
Time Average Over Frame Factor	dB	-10.4
Power Control Reduction	dB	-5
Average Tx EIRP	dBWi	-10.9

Propagation characteristics from the Iridium terminal to the Globalstar satellite receiver are described below:

Globalstar Satellite Altitude	km	1414
Typical Globalstar Satellite Slant Range	km	1740
Frequency	GHz	1.62
Path Loss	dB	161.4

The Globalstar satellite receiver characteristics are as follows:

Globalstar Sat. Antenna Gain	dBi	14.6
Cross-Polarization Isolation (RHCP vs. LHCP)	dB	-20
Globalstar Satellite Rx Bandwidth	MHz	1.23
Iridium Terminal Interference Power Density	dB(W/Hz)	-238.6

²⁹ *Id.*, ¶ 96.

³⁰ *Id.*, ¶ 98.

Thus, a single Iridium terminal will provide a power density level of -238.6 dB(W/Hz). This is a conservative power density level considering that other power reduction factors, such as voice activity factor and channel fading, have not been taken into account. In order to characterize the impact of multiple Iridium terminals on a Globalstar satellite receiver, the information provided in Globalstar's March 19, 2004, ex parte letter to the Commission containing an "Analysis of Iridium's December 18, 2003 Response" is useful.³¹ In this analysis, Globalstar notes that if Iridium were utilizing 100% of its channel resources, "one would expect 29 carriers in each 1.23 MHz [] or about six carriers per 1.23 MHz per Iridium beam Since, on average about three Iridium beams fall into one Globalstar beam, this means there should be 18 Iridium carriers per Globalstar beam on average."³² Therefore, the maximum number of Iridium carriers that could be seen in any channel in a Globalstar beam, would be 18; this is a factor of 12.6 dB. However, Globalstar goes on to say that, in its measurements of Iridium carriers in the continental United States: "At no time did Globalstar engineers see more than 5 Iridium carriers in any 1.23 MHz range on any Globalstar beam, and as stated above, on average only 0.75 carriers per Globalstar beam per 1.23 MHz channel were observed."³³ Another set of measurements "showed that Iridium had an average of 0.5 carriers per 1.23 MHz."³⁴ This minimum average number of 0.5 Iridium carriers is a factor of -3.0 dB.

³¹ Ex parte presentation of Globalstar, L.P., IB Dkt. No. 02-364 (Mar. 19, 2004) ("*Globalstar Mar. 19, 2004 Ex Parte*").

³² *Id.*, Attachment at 6.

³³ *Id.*

³⁴ *Id.*

This does not support Globalstar’s prior allegations of harmful interference into its satellite receiver. In their March 22, 2002 technical comments, Globalstar claimed that its “threshold of acceptable interference is assumed to be –213.8 dB(W/Hz) based upon a $\Delta T/T$ of 6%.”³⁵ This translates into the following:

		Minimum	Maximum	
Single Iridium Terminal Interference Power Density	dB(W/Hz)	-238.6	-238.6	
Number of Iridium Terminals in 1.23 MHz Channel, Within a Globalstar Spot Beam	dB	-3	12.6	
Aggregate Iridium Terminal Interference Power Density	dB(W/Hz)	-241.6	-226	
Globalstar Self-Claimed Interference Density Threshold	dB(W/Hz)	-213.8	-213.8	$\Delta T/T=6\%$
Margin	dB	27.8	12.2	

Therefore, using Globalstar’s own numbers, the *maximum* level of interference that Iridium could contribute would be at least 12 dB below Globalstar’s interference threshold and an average level nearly 28 dB below threshold.

The above analysis shows that there are a maximum of 18 possible Iridium terminals within a Globalstar spot beam per 1.23 MHz channel, which represents the extreme case of 100% spectrum utilization. It has also been shown that Iridium terminals have transmission EIRP levels very similar to those of Globalstar terminals; however, due to cross polarization isolation effects, the Iridium signals arrive at the Globalstar satellite receiver approximately 20 dB lower than a Globalstar signal would. Globalstar has frequently submitted to the FCC that it can support up to 60 users per spot beam, per channel. Therefore, one can assume that if the 1610.85-1620.1 MHz band (“Channel 8”) or the 1620.1-1621.35 MHz band (“Channel 9”) were being exclusively used by

³⁵ Comments of Globalstar L.P., IB Dkt. No. 01-185, Technical Appendix at 6 (Mar. 22, 2002).

Globalstar, each of these channels would be supporting 3 to 4 times the number of user terminals than Iridium terminals support, with each Globalstar terminal providing a received signal level 20 dB higher than an Iridium terminal. As such, Iridium treats with great skepticism Globalstar's claim that Iridium usage of Channel 8 or 9 causes the Globalstar satellite's C-band solid state power amplifier to go into overdrive, when even the maximum possible interference level allegedly caused by Iridium terminals would be much lower than the signal levels that Globalstar signals would normally be adding to the C-band amplifier.

IV. CONCLUSION

Allowing Iridium to access the 1616-1618.25 MHz band is a technically feasible plan that will vastly improve the quality of service in the mobile satellite industry and enable service providers to build upon essential public interest goals. The sharing plan provides for a fair allocation of spectrum that allows Iridium and Globalstar to have shared access to this band without creating any interference between either operator. For the foregoing reasons, the Commission should adopt the plan set forth in the *Big Leo Spectrum Sharing Order and FNPRM*.

Respectfully submitted,

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