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

In the Matter of	)	
	)	
Iridium Satellite LLC	)	File Nos. SES-MOD-20170413-00388 and
	)	SES-AMD-20170726-00812
	)	
Iridium Carrier Services LLC	)	File Nos. SES-MOD-20170413-00389 and
	)	SES-AMD-20170726-00813
	)	

CONSOLIDATED RESPONSE OF IRIDIUM

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September 18, 2017

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Iridium Satellite LLC and Iridium Carrier Services LLC (collectively, "Iridium") have filed applications (the "Applications") seeking blanket license modifications to add authority for a new terminal. The terminal will be used to provide Iridium Certus℠ - an enhanced service for land, air, and sea - via Iridium NEXT, Iridium's second-generation satellite system.

No one has opposed the Applications. Only comments were filed, by Inmarsat Inc. ("Inmarsat"), Globalstar, Inc. ("Globalstar"), the GPS Innovation Alliance ("GPSIA"), and Ligado Networks Subsidiary LLC ("Ligado"). Pursuant to Section 25.154 of the Commission's rules,[1] Iridium hereby responds to these comments.[2] As

[1] 47 C.F.R. § 25.154.
[2] When parties comment on applications filed under Part 25 of the Commission's rules, Section 25.154 provides for a two-step pleading cycle consisting of comments filed by a response.

shown below, the comments present no impediment to granting the Applications, and Iridium urges the Commission to do so promptly.

I. INTRODUCTION AND SUMMARY

Iridium's Network and Critical Services

Iridium provides global, reliable, and low-latency communications services using a large non-geostationary satellite orbit constellation operating in the mobile satellite service ("MSS"). Because of the unique capabilities of the Iridium network, commercial, military, and civilian government users depend on Iridium for mission-critical communications needs. In addition to supporting the missions of the Department of Defense, Iridium supports the core commercial operations of large and economically significant industrial sectors such as the aviation and energy industries, and a diverse set of civilian public safety functions, including the efforts of our first responders.

Iridium has a proven track record of being a good spectrum neighbor. Iridium's terminals have co-existed successfully with GPS devices for two decades, and already successfully operate on ships and airplanes with GPS devices installed as well. In fact, most of Iridium's commercial, military, and civilian government customers depend on properly functioning GPS devices in addition to the critical communications capability provided by Iridium's network.

Iridium is in the midst of launching its advanced, second-generation constellation, Iridium NEXT. Twenty Iridium NEXT satellites are already in orbit, and the next ten are scheduled to be launched on October 4, 2017. Backed by a $3 billion investment, Iridium NEXT will provide game changing – and potentially lifesaving - improvements in the delivery of mission-critical services. Iridium NEXT also supports services that depend on satellite connectivity, including real-time Automatic Dependent Surveillance – Broadcast (ADS-B) flight monitoring services. Iridium NEXT will enable new broadband multi-service capability while providing the technical flexibility to support innovative new services and technologies. As the Commission has stated, Iridium NEXT will "provide mobile voice and data services to end users on a network with improved voice quality and enhanced data transmission speeds."[3]

The Applications, Comments on the Applications, and Summary of Response

Iridium has filed the above-captioned modification Applications seeking blanket authority for the Iridium Certus terminal, which will be used to provide service on land, air, and sea, including Aeronautical Mobile-Satellite (Route) Service ("AMS(R)S"). The Iridium Certus terminal is designed to take advantage of the advanced operational

[3] *Application of Iridium Constellation LLC for Modification of License to Authorize a Second-Generation NGSO MSS Constellation,* Order and Authorization, 31 FCC Rcd 8675 (IB 2016) ("*Iridium NEXT Order*").

characteristics of the Iridium NEXT satellites; it supports higher order modulation schemes that will increase throughput for Iridium's customers.[4]

None of the four parties that filed comments — Inmarsat, Globalstar, Ligado, and GPSIA — objects to a grant of the Applications. Instead, they raise concerns relating to the potential for Iridium Certus terminals to cause interference and the capacity of Iridium Certus terminals to tolerate out-of-band emissions from adjacent bands. They also question various elements of Iridium's request to extend AMS(R)S authority to Iridium Certus and identify what they claim are gaps in Iridium's technical showing.

These concerns are misplaced. As explained in greater detail below:

- There are no in-band services for Iridium Certus terminals to protect, because Iridium is the exclusive U.S. licensee of the 1618.725-1626.5 MHz portion of the Big LEO band that is covered by the Applications.
- Iridium Certus terminals will protect non-GPS services in adjacent bands by complying with the applicable mean EIRP density limit set forth in footnote 5.364 of the Table of Allocations and the out-of-band emission ("OOBE") limits specified in Section 25.202(f) of the Commission's rules.
- Iridium Certus terminals will protect GPS
    - The Iridium Certus terminals will comply with the -70 dBW/MHz OOBE limit specified in Section 25.216 of the Commission's rules for protection of GPS by mobile earth stations.
    - GPSIA is "encouraged" with the OOBE shown in a test report for the Iridium Certus prototype and "expects that it will reach an understanding and agreement with Iridium on an appropriate OOBE limit for Certus terminals."

[4] On July 26, 2017, Iridium filed amendments to the Applications, providing additional information in response to questions from the International Bureau. On August 9, 2017, the Commission released a Public Notice accepting Iridium's Applications for filing.

- It would be inappropriate to apply to Iridium Certus terminals the more stringent -95 dBW/MHz OOBE limit GPSIA has negotiated with terrestrial services, because Iridium Certus is a conventional MSS service with different technical characteristics and a significantly different customer base than consumer terrestrial services.

- The interference environment in which earth station receivers need to operate is based on OOBE limits for adjacent bands; the Commission does not regulate receiver design. The technical specifications for Iridium Certus terminals ensure they can coexist with adjacent band services operating in accordance with the OOBE limits specified in Section 25.202(f) of the Commission's rules.

- Iridium's request for AMS(R)S authority for Iridium Certus terminals is consistent with Commission precedent, and none of the concerns raised by commenting parties presents any impediment to granting Iridium's request. Iridium has no objection to conditioning an AMS(R)S grant for Iridium Certus on: (1) compliance with the conditions that attach to Iridium's existing AMS(R)S authority, and (2) completing the FAA approval process.

- Ligado's claims concerning Iridium's technical showing are misplaced.

    - Ligado questions, based on the "EIRP for all carriers" value in the Applications, whether Iridium Certus will comply with the applicable EIRP limit. But the EIRP limit caps mean EIRP density, not EIRP for all carriers, and Iridium demonstrated in the Applications that the Iridium Certus terminals satisfy this limit.

    - Ligado questions Iridium's methodology for calculating EIRP and power at the antenna flange, but Ligado failed to consider the differences between passive antennas and active antenna arrays, which fully account for Iridium's methodology.

Moreover, the Comments must be viewed in the context in which they arise. Two of the filers, Inmarsat and Globalstar, are competitors of Iridium, and Iridium has objected to part of the terrestrial service proposals of a third filer, Ligado, on interference grounds. These three filers present no credible interference claims, but

nevertheless seek to delay action on Iridium's Certus application. One cannot help but get the impression, therefore, that these parties' filings are driven by private competitive concerns or a desire to gain leverage in unrelated proceedings.

There is, then, no technical, legal, or public policy reason to delay grant of the Applications – and there is every reason to grant them promptly.

II. IRIDIUM CERTUS WILL PROTECT OTHER SERVICES

A. Iridium Certus Terminals Will Protect Non-GPS Services

Inmarsat and Ligado suggest that non-GPS services might be interfered with by Iridium Certus operations. Inmarsat claims that compared with Iridium's existing terminals, Iridium Certus terminals "could cause more interference to operators using the same band and could impact users in adjacent bands."[5] Similarly, Ligado raises questions concerning Iridium Certus' interference potential since the EIRP per carrier specified in the Applications is "higher than its current authorization."[6]

It is important to put these claims into perspective. It is irrelevant whether Iridium Certus terminals will operate at higher power than the Iridium terminals the Commission already has licensed. If power were frozen based on initial authorizations, innovation would be stifled and spectrum efficiency would suffer.

[5] Inmarsat Comments at 3.
[6] Ligado Comments at 7.

Rather, what matters is whether Iridium satisfies the limits the Commission has established to protect in-band and adjacent band services. Iridium Certus complies with these limits in all respects.

The only potential interference that matters for this purpose is out-of-band interference. There are no in-band services to take into account, because Iridium is the exclusive U.S. licensee of the 1618.725-1626.5 MHz portion of the Big LEO band that is covered by the Applications.

To protect out-of-band services, Iridium Certus terminals are subject to a mean EIRP density limit and an OOBE limit. The mean EIRP density limit, which appears in international footnote 5.364 of the Table of Allocations, is -3dBW/4 kHz.[7] As demonstrated in Amendments to the Applications,[8] the Iridium Certus terminals satisfy this limit: the highest Iridium Certus mean EIRP density, which is produced by the Iridium Certus waveform associated with emission code 41K7Q7W, is only -3.9 dB(W/4 kHz), and therefore the mean EIRP density for each Iridium Certus waveform will be below the 5.364 limit by 0.9 dB or more.[9]

[7] *See* 47 C.F.R. § 2.106, footnote 5.364.
[8] Amendments filed on July 26, 2017, File Nos. SES-AMD-20170726-00812 and SES-AMD-20170726-00813 (the "Amendments").
[9] *See* Amendments, Answers to Questions from the International Bureau at 3.

The out-of-band emission limits for Iridium's Big LEO operations are specified in Section 25.202(f) of the Commission rules.[10] The Iridium Certus terminals satisfy these limits, too. As stated in the Amendments, Iridium Certus terminals will be the subject of equipment authorizations under Parts 2 and 25 of the FCC's rules. The applications for these equipment authorizations will include test reports that demonstrate compliance with Section 25.202(f). The Iridium Certus prototype already has been type certified under Parts 2 and 25.[11]

In sum, the Iridium Certus terminals fully satisfy applicable limits for protecting non-GPS services, and those services will be protected. The attempt by Iridium's competitors to impose obligations that are at odds with the Commission's rules should be swiftly rejected.

B. Iridium Certus Terminals Will Protect GPS

GPSIA has filed Comments addressing the need for GPS receivers operating in the 1559-1610 MHz band to be adequately protected from OOBE generated from Iridium Certus terminals."[12] GPSIA states in its Comments, and Iridium agrees, that it and Iridium "are actively engaged in constructive discussions."[13] Iridium is pleased that "GPSIA expects that it will reach an understanding and agreement with Iridium on

[10] 47 C.F.R. § 25.202(f).
[11] *See* Amendments, Answers to Questions from the International Bureau at 6.
[12] *See* GPSIA Comments at 1.
[13] *Id.* at 1.

an appropriate OOBE limit for Certus terminals,"[14] and Iridium is committed to providing information to GPSIA to facilitate an understanding.

Iridium's terminals have co-existed successfully with GPS devices for two decades, and already successfully operate on ships and airplanes that have GPS devices installed as well. In fact, most of Iridium's commercial, military, and civilian government customers depend on properly functioning GPS devices —in addition to the critical communications capability provided by Iridium's network — and as a result Iridium and its terminal manufacturers have every incentive to ensure that GPS is protected. Some of Iridium's manufacturer partners also manufacture equipment for aerospace, military, and general aviation customers that incorporates GPS receivers.

The Iridium Certus mobile earth stations will protect GPS operations in the 1559-1610 MHz band. As Iridium stated in the Applications, these terminals, like Iridium's currently licensed terminals, satisfy the -70 dBW/MHz OOBE limit specified in Section 25.216 of the Commission's rules for protection of GPS by mobile earth stations.[15] GPSIA itself is "encouraged" with the OOBE shown in a test report for the Iridium Certus prototype and states that "emissions from Certus terminals into the 1559-1610

[14] *Id.* at 2.
[15] *See* Amendments, Answers to Questions from the International Bureau at 4-5.

MHz RNSS band appear generally to be more than 20 dB below the OOBE limit of -70 dbW/MHz in Section 25.216(c) of the rules."[16]

Nevertheless, GPSIA suggests it might seek to apply to Iridium Certus terminals the more stringent -95 dBW/MHz OOBE limit it has negotiated with terrestrial services such as the ancillary terrestrial component of mobile satellite systems.[17] Application of a -95 dBW/MHz limit to Certus terminals would be inappropriate for several reasons.

Unlike ATC and other terrestrial services, Iridium Certus is a conventional MSS service that is subject to the mobile earth station limits of Section 25.216. Moreover, unlike what is contemplated for terrestrial ATC operations, Iridium Certus is not a ubiquitous consumer service. The principal markets for Iridium Certus terminals will be maritime and aeronautical, and typically only a single Iridium Certus terminal would be installed on a ship or airplane. In addition, ships and airplanes operate at a distance from one another because of safety requirements and physical constraints, among other reasons, making it extremely unlikely that Iridium Certus terminals will operate in close proximity to one another or in close proximity to another GPS user — unlike terrestrial mobile handsets used by consumers.

[16] GPSIA Comments at 4.
[17] *See* GPSIA Comments at 2, 5.

As GPSIA acknowledges, "there are differences between ATC terminals and MES terminals."[18] These differences make the application of a more stringent -95 dBW/MHz OOBE limit to Certus terminals inapposite and unnecessary. In any event, Iridium remains committed to providing the information needed to facilitate an understanding with GPSIA.

III. IRIDIUM CERTUS TERMINALS CAN CO-EXIST WITH ADJACENT BAND SERVICES

In ordinary circumstances, parties raise objections to radio station applications based on the potential for the applicant's proposed services to cause interference. Ligado turns this principle on its head by relying on the possibility that Iridium Certus terminals will receive interference. Ligado argues its operations in the MSS L Band and other adjacent-band MSS services could interfere with Iridium's Certus operations, and Ligado maintains it is incumbent on Iridium to prove its terminals can withstand this interference.[19] Ligado also contends Iridium should be required to provide extensive information about the Iridium Certus receivers to permit an evaluation of Iridium's

[18] GPSIA Comments at 4.

[19] In the case of its own adjacent-band operations, Ligado's argument appears to be limited to its MSS service. Ligado's Comments do not address the possibility that out-of-band emissions from Ligado's proposed ancillary terrestrial component ("ATC") service will interfere with Iridium Certus operations. This ATC service has a different regulatory status and substantially different operational characteristics than Ligado's MSS service, and Iridium has opposed part of Ligado's ATC proposal on interference grounds. See, e.g., Iridium Communications Inc., Technical Analysis of Ligado Interference Impact on Iridium User Links, IB Docket Nos. 11-109 and 12-340 (filed Sept. 1, 2016); Letter from Bryan N. Tramont and Patrick R. Halley, Counsel for Iridium, to Marlene H. Dortch, Secretary, FCC, IB Docket Nos. 11-109 and 12-340 (filed Aug. 3, 2017); Letter from Bryan N. Tramont and Patrick R. Halley, Counsel for Iridium, to Marlene H. Dortch, Secretary, FCC, IB Docket Nos. 11-109 and 12-340 (filed Mar. 27, 2017); Letter from Bryan N. Tramont and Patrick R. Halley, Counsel for Iridium, to Marlene H. Dortch, Secretary, FCC, IB Docket Nos. 11-109 and 12-340, at 10 (filed Dec. 14, 2016).

showing.[20] Ligado even goes so far as to suggest Iridium should have to coordinate its operations with adjacent-band MSS systems.[21]

Ligado's positions conflict with the rules the Commission has adopted for adjacent-band satellite operations. The Commission's Part 25 rules do not mandate particular receiver characteristics. And they do not require coordination between licensees in adjacent bands. Rather, as the Commission has stated: "[T]he technical and operating rules that the Commission adopts for a particular service are designed to prevent harmful interference … to other services that operate in adjacent bands and to establish the RF environment for adjacent band services to coexist." [22] In keeping with this policy, Section 25.202(f) of the rules specifies limits for out-of-band MSS emissions in the bands adjacent to Iridium's Big LEO frequencies, and these limits establish the co-existence environment in which receivers in adjacent bands must operate.

The receivers on Iridium's terminals have been operating successfully in this environment for 20 years. And that success will continue with Iridium Certus terminals, because when it comes to tolerating out-of-band emissions, the performance specifications Iridium and its manufacturing partners are required to meet for Iridium

[20] *See* Ligado Comments at 5-6.
[21] *See* Ligado Comments at 4, 14-15.
[22] *Amendment of Part 27 of the Commission's Rules to Govern the Operation of Wireless Communications Services in the 2.3 GHz Band/ Establishment of Rules and Policies for the Digital Audio Radio Satellite Service in the 2310-2360 MHz Frequency Band*, Order on Reconsideration, 27 FCC Rcd 13651 (2012) at ¶ 108.

Certus receivers are every bit as stringent as the performance specifications for the receivers on Iridium's already licensed products.

It makes no difference for this purpose whether Iridium Certus terminals are receiving satellite signals that are classified as primary or satellites signals that are classified as secondary. The out-of-band emissions produced by the MSS services of Ligado, Inmarsat, and Globalstar are subject to the same Section 25.202(f) limit without regard to whether services in adjacent bands are primary or secondary. What matters is the interference environment these out-of-band emissions present, and Iridium Certus receivers will be manufactured to operate in that environment.

IV. IRIDIUM's REQUEST FOR AMS(R)S AUTHORITY FOR IRIDIUM CERTUS IS CONSISTENT WITH COMMISSION PRECEDENT

In the Applications, Iridium requested AMS(R)S authority for Iridium Certus terminals. AMS(R)S is a radio communication service linking aircraft earth stations via satellite to ground stations or other aircraft stations; it is reserved for communications concerning safety and regularity of aircraft flight along national or international civil air routes.[23]

The Commission already has granted authority for Iridium's space stations and aeronautical terminals to be used for AMS(R)S.[24] Globalstar, Inmarsat, and Ligado

[23] *See* 47 C.F.R. § 2.1.
[24] *See Iridium Constellation LLC, Application For Authority to Modify License For A Low Earth Orbit Mobile Satellite System*, Call Sign S2110, File Nos. SES-AMD-20150923-00612, SES-AMD-20150923-00620, SES-

express various concerns with Iridium's request for AMS(R)S authority for Iridium Certus. These concerns present no impediment to granting Iridium's request.

A. Providing a Safety-of-Life Service is Consistent with the Table of Allocations

Globalstar questions whether it is appropriate to operate a safety-of-life service (*i.e.,* AMS(R)S) in the Iridium portion of the Big LEO band given that Iridium's MSS downlinks are secondary.[25] Globalstar seems not to know that "[t]he 1610-1626.5 MHz [Big LEO] band is also allocated for AMS(R)S on a primary basis regardless of the direction of transmission."[26] In light of this primary allocation for AMS(R)S in both directions, Globalstar's argument should be rejected.

B. Iridium Has No Objection to Continuation of Existing AMS(R)S Conditions

Globalstar requests that Commission extend to any grant of AMS(R)S authority for Iridium Certus a condition that applies to Iridium's existing AMS(R)S authority.[27] Under this condition, "any additional protection from interference from previously-authorized MSS operations in adjacent frequency bands, beyond that afforded by current arrangements, must be sought and obtained through inter-operator

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MOD-20130416-00322, and SES-MOD-20130416-00323, Memorandum Opinion and Order, 28 FCC Rcd 964 (IB 2013) ("*Iridium AMS(R)S Order*"); *Iridium NEXT Order*, 31 FCC Rcd 8675 at Appendix A.

[25] *See* Globalstar Comments at 2.

[26] *Iridium AMS(R)S Order* at ¶3.

[27] *See* Globalstar Comments at 3.

arrangements."[28] Ligado also makes note of this condition.[29] Iridium has no objection to a comparable condition for Iridium Certus or, as requested by Inmarsat, to an extension to Iridium Certus of the other conditions that attach to Iridium's AMS(R)S authority, including a condition for ITU coordination.[30]

C. Iridium's Network Can Implement Priority and Preemption for Iridium Certus

Ligado questions Iridium's ability to implement one of these other conditions, which requires that Iridium, like any AMS(R)S provider, give priority to safety messages and design and operate its systems with the capability for real-time pre-emption of non-safety-related traffic.[31] According to Ligado, Iridium's network might not be able to distinguish between AMS(R)S transmissions and non-AMS(R)S transmissions given that Iridium Certus terminals will be used for maritime, aeronautical, and terrestrial services.[32] What reason Ligado might have to comment on Iridium's AMS(R)S services, other than to seek leverage in unrelated proceedings, is unclear.

Regardless, Ligado's argument is based on a fiction. Each terminal on the Iridium network has a unique subscriber identification module ("SIM") that makes it possible to identify transmissions and service types from individual terminals,

[28] *Iridium AMS(R)S Order* at ¶3.
[29] *See* Ligado Comments at 9-10.
[30] *See* Inmarsat Comments at 1, 4.
[31] *Iridium AMS(R)S Order* at ¶13.
[32] *See* Ligado Comments at 13.

irrespective of the type of terminal that is used. Iridium, therefore, will have the capability to implement priority and preemption for AMS(R)S that is provided via AMS(R)S terminals.

D. The Request for AMS(R)S Authority for Iridium Certus is Ripe for Consideration

Inmarsat and Ligado propose that the Commission defer consideration of AMS(R)S authority for Iridium Certus until the FAA approval process has been completed.[33] It is truly important that the Commission reject this proposal.

Proceeding as suggested by Inmarsat and Ligado would be contrary to the public interest, because it would delay initiation of enhanced safety-of-life capabilities for no reason whatsoever. The Commission has all the information required to evaluate Iridium's Applications under its rules and policies. Civil aviation approvals can follow in due course, and Iridium has no objection to an AMS(R)S grant that is conditioned on completion of that process.

The FAA and the Radio Technical Commission for Aeronautics ("RTCA"), which serves as an advisory body to the FAA, have their own set of standards and procedures that are independent of the FCC. Any conditions they impose will be self-executing, just as in other circumstances there may be self-executing operating restrictions in coordination agreements that are more stringent than the terms of an FCC license.

[33] *See* Inmarsat Comments at 3-4; Ligado Comments at 12-13.

It may have made sense to await FAA action prior to granting Iridium's initial authority for AMS(R)S. When Iridium first sought that authority, there were no recommended practices in place for AMS(R)S operations in the Iridium band, and all attention had been focused on Inmarsat's AMS(R)S services.[34] Following a multi-year effort, however, the FAA issued a Technical Standard Order ("TSO") specifying performance requirements for approval of Iridium aircraft earth stations for AMS(R)S, following which it authorized use of Iridium's first generation equipment for AMS(R)S.[35] The Commission subsequently found that in light of the advancement of the TSO process, action on Iridium's request for AMS(R)S authority was timely.[36]

All that now remains is for the FAA to update its TSO and issue an additional authorization for Iridium Certus terminals, based on recommendations it will receive from RTCA. Inmarsat must follow this same procedure when it develops new AMS(R)S products. For the reasons stated, the Commission should act on Iridium's request without delay and can condition any Iridium Certus AMS(R)S grant on completion of the FAA approval process.

[34] *Iridium AMS(R)S Order* at ¶6.
[35] *Id.* ¶ 7.
[36] *Id.* 9.

V. LIGADO'S QUESTIONS CONCERNING IRIDIUM'S TECHNICAL SHOWING ARE MISPLACED

Ligado identifies what if claims are two technical gaps in Iridium's Applications. Ligado's claims have no merit.

Ligado states that Iridium should be required to explain how it can satisfy applicable EIRP limits given that Iridium Certus will "operate at an EIRP value of 27.7 dBW."[37] Ligado is comparing apples to oranges. The 27.7 dBW value shown in the applications is in response to Schedule B, item E40, which requests the total EIRP for all carriers. The applicable EIRP limits, however, are based on EIRP density, not EIRP for all carriers.

More specifically, international footnote 5.364 of the Table of Frequency Allocations establishes a mean EIRP density limit for Iridium Certus terminals of -3dBW/4 kHz.[38] As shown in the Iridium Certus Amendments,[39] and as stated in Section II.A above, the highest Iridium Certus mean EIRP density, which is produced by the Iridium Certus waveform associated with emission code 41K7Q7W, is only -3.9 dB(W/4 kHz). The mean EIRP density for each Iridium Certus waveform, therefore, will be below the 5.364 limit by 0.9 dB or more.[40]

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[37] Ligado Comments at 7.
[38] *See* 47 C.F.R. § 2.106, footnote 5.364.
[39] Amendments filed on July 26, 2017, File Nos. SES-AMD-20170726-00812 and SES-AMD-20170726-00813 (the "Amendments").
[40] *See* Amendments, Answers to Questions from the International Bureau at 3.

Ligado also questions Iridium's methodology for calculating EIRP and power at the antenna flange.[41] Ligado's assertions, however, fail to consider the significance of the active antenna used in Iridium Certus terminals.

Traditional satellite terminals utilize a single transmitter and passive antenna in their transmit path to send signals to satellites. With this configuration, the EIRP, in dBW, is calculated as the sum of the transmitter's power (in dBW) at the antenna flange and the isotropic gain (in dBi) of the antenna in the direction of the satellite.

But in an active antenna array, there is no physical antenna flange where the total transmit power can be measured. Rather, an equivalent power at the antenna flange must be determined by measuring EIRP and subtracting the gain of the antenna array. That is how the equivalent transmitter power at the theoretical antenna flange was calculated for Iridium's response to Schedule B, item E38 in the Applications. Iridium calculated the theoretically highest possible equivalent transmitter power by taking the maximum peak EIRP and subtracting the lowest passive antenna beam gain.[42]

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[41] *See* Ligado Comments at 7.

[42] In practice, the equivalent transmitter power always will be lower than this calculated value, because the elevation angle at which the maximum peak EIRP occurs is different from the elevation angle at which the lowest antenna gain occurs. In any event, interference potential is determined by the EIRP density of the Iridium Certus terminal, not the equivalent transmitter power at the theoretical antenna flange, and the EIRP and EIRP density values in the Applications are based on test lab measurements.

CONCLUSION

No one has opposed the authority requested by Iridium in the Applications. Although some parties have requested conditions on the grant of the Applications, each condition either is agreeable to Iridium or, for reasons explained above, is unwarranted. Accordingly, there should be no impediment to granting the Applications. Iridium urges the Commission to do so expeditiously, so that Iridium's military, public safety, and other customers may enjoy the enhanced capabilities afforded by Iridium's next-generation network.

Respectfully submitted,

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September 18, 2017

DECLARATION OF BRANDON HINTON

1. I am Engineering Manager, Advanced Wireless Solutions, Harris Corporation, Harris Corporation, and serve as a consultant to Iridium.

2. I hereby certify that I am the technically qualified person responsible for reviewing the engineering information contained in the foregoing Consolidated Response of Iridium, that I am familiar with Part 25 of the Commission's rules, that I have either prepared or reviewed the engineering information submitted in this pleading, and that it is complete and accurate to the best of my knowledge and belief.

I declare under penalty of perjury that the foregoing is true and correct.

By: /s/Brandon Hinton

Date: September 18, 2017

CERTIFICATE OF SERVICE

I hereby certify that a true and correct copy of the foregoing **CONSOLIDATED RESPONSE OF IRIDIUM** was sent by first class mail, postage prepaid, this 18th day of September, 2017, to:

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