BEFORE THE

Federal Communications Commission

WASHINGTON, DC 20554

In the Matter of	)	
	)	
Service Rules for Advanced Wireless Services in the 2000-2020 MHz and 2180-2200 MHz Bands	)	WT Docket No. 12-70
	)	
Fixed and Mobile Services in the Mobile Satellite Service Bands at 1525-1559 MHz and 1626.5-1660.5 MHz, 1610-1626.5 MHz and 2483.5-2500 MHz, and 2000-2020 MHz and 2180-2200 MHz	)	ET Docket No. 10-142
	)	
Service Rules for Advanced Wireless Services in the 1915-1920 MHz, 1995-2000 MHz, 2020-2025 MHz and 2175-2180 MHz Bands	)	WT Docket No. 04-356

To: The Commission

REPLY COMMENTS
OF THE U.S. GPS INDUSTRY COUNCIL

The U.S. GPS Industry Council (the "Council" or "USGIC"), by its attorneys and pursuant to Sections 1.415 and 1.419 of the Commission's Rules (47 C.F.R. §§ 1.415 & 1.419), hereby replies to initial comments filed concerning the above-captioned Notice of Proposed Rulemaking and Notice of Inquiry ("*AWS-4 NPRM/NOI*").[1] In their initial comments, the Council and others emphasized the need to codify in the Commission's new Part 27 Rules governing AWS-4 the current out-of-band emissions ("OOBE") limits that apply to previously authorized mobile-satellite service ("MSS") ancillary terrestrial component ("ATC") transmissions for the protection

[1] *See Service Rules for Advanced Wireless Services in the 2000-2020 MHz and 2180-2200 MHz Bands et al.*, FCC 12-32, *slip op.* (released March 21, 2012). A summary of the *AWS-4 NPRM/NOI* was published in the *Federal Register* on April 17, 2012, establishing May 17, 2012 as the Comment deadline and June 1, 2012 as the Reply Comment deadline. 77 Fed. Reg. 22720 (April 17, 2012). *See also* FCC Public Notice, "Wireless Telecommunications Bureau Announces Pleading Cycle for Comments and Reply Comments on Advanced Wireless Services in the 2 GHz Band," DA 12-603 (WTB, released April 17, 2012).

of radio-navigation-satellite services ("RNSS"), including the Global Positioning System ("GPS") operating at 1559-1610 MHz and below in the L-band. Some parties, however, made comments addressing OOBE limits generally that overlooked either the current limits applicable to MSS ATC at 2 GHz through Commission licensing decisions or the different level of protection from harmful OOBE interference required for navigation signals versus communications links. These Reply Comments address these points.

It is important to emphasize, as noted in the Council's Comments, that the -70 dBW/MHz OOBE wideband EIRP density limitation that applies generically under Part 25 of the Commission's Rules[2] does not apply to MSS ATC operations in any of the bands where such service is authorized, and therefore should not be imported into new rules covering the broader terrestrially-based mobile broadband service that is proposed in the *AWS-4 NPRM/NOI*.[3] As noted in the Council's initial Comments in this proceeding, MSS ATC operations, where permitted, have always been subject to the -95 dBW/MHz OOBE limit for wideband emissions in the RNSS band based on a condition contained in all of the extant MSS ATC authorizations, including the 2 GHz MSS licenses.[4] This limit was the result of joint discussions among the GPS

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[2] *See, e.g.*, 47 C.F.R. § 25.252(a)(7).

[3] *See* USGIC Comments at 6-9.

[4] *See, e.g.*, USGIC Comments at 7-8 & n. 18 (noting that the -70 dBW/MHz OOBE limit specified for Big LEO MSS user terminals was "not intended to be applied to any service other than MSS [mobile earth stations] operating in the 1-3 GHz range without further study" to determine the appropriate OOBE to protect RNSS) and *citing* International Telecommunication Union Recommendation ITU-R M.1903 at 2, Recommends 1-2 and Note 1 (2012). As noted there, terrestrial mobile broadband would be a "service other than MSS [mobile earth stations]." *See also New ICO Satellite Services G.P.*, 24 FCC Rcd 171,195 (¶ 65) & 197 (¶ 69(g)) (IB 2009); *TerreStar Networks, Inc*., 25 FCC Rcd 228, 237 (¶ 28) & 239 (¶ 34(g)) (Sat. Div. 2010) ("The limits in this table" – -95 dBW/MHz (mobile terminals) and -100 dBW/MHz (base stations) for wideband implementations, and -105 dBW (mobile terminals) and -110 dBW (base stations) for "discrete emissions of less than 700 Hz bandwidth" – "are material terms of the authorization").

community, MSS ATC licensees, and major equipment manufacturers, and it is specifically premised on handset manufacturing industry best practices. No commenting party submitted any information or showing that would warrant a reduction in agreed upon protection against OOBE into the RNSS band as such protection is reflected in the 2 GHz MSS/ATC authorizations.

There are sound and well-documented reasons that navigation applications like GPS reception require greater protection from OOBE than communications services do. At the simplest level, a more stringent OOBE limit is needed with respect to RNSS bands than for terrestrial wireless broadband communication bands because the RNSS received signal strength is substantially lower than for terrestrial mobile broadband services, including their long term evolution ("LTE") implementations. This difference in received signal strengths is vast, and the LTE signal can be in excess of a billion times greater than the GPS signal. Accordingly, OOBE values that are acceptable in frequencies used for terrestrial mobile broadband communications would simply overwhelm RNSS signals.

At a deeper level, RNSS differs from mobile broadband systems because it is a measurement system as well. In order for a GPS device to compute its position, for example, the distance to the satellites in view is computed using precise timing measurements. To make these accurate timing measurements, the GPS receiver determines the precise time of arrival of the received bit edges, rather than just detecting the value of a bit as is done when receiving a communications signal. These bit edge measurements take place by correlating signals between 1.023 and 10.23 MHz which is 20,000 to 200,000 times the communications rate. Accordingly, the required precision for detecting the edge measurement ranges from 300 picoseconds to 10 nanoseconds depending on the accuracy needed by the specific application. The more precise end of the range corresponds to public safety, scientific, mapping, construction and agricultural uses

of RNSS, which need to be accurate to within one to ten centimeters in real-time dynamic applications. In some applications, accuracy to within millimeters is required, such as monitoring critical infrastructure, including buildings, dams and bridges. Achieving these values depends on the level and uniformity of the noise in the RNSS band, and this is factored into the prior agreements with MSS licensees on OOBE limits, as well as the recommendations made in the initial Comments of the Council and others.[5]

Designers of RNSS equipment are always concerned about maintaining the quality of positioning results upon which the installed user base relies for accurate positioning, navigation, and timing. Unfortunately, many of the tools available to modern mobile broadband communications systems for improving transmission integrity and reducing bit-error rate in a noisy environment – error correction coding, channel equalization, spatial diversity – do not apply and have no counterparts in satellite-based position measurement and navigation systems, which are measuring bit edges.[6] Thus maintaining the low noise environment of the RNSS bands is absolutely critical to the continued functioning of the ubiquitous positioning capability that is currently available to aviation, public safety, military, government, business and individual users.

Finally, the Council notes that, unlike other bands allocated for MSS use, terrestrial operations in the 2 GHz band do not raise issues of "overload," or desensitization, interference affecting RNSS receivers, as there is no RNSS allocation in spectrum close to the 2000-2020

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[5] *See, e.g.*, USGIC Comments at 5-9; Deere & Company Comments at 3-5; Satellite Industry Association Comments at 2-3.

[6] The GPS industry has a long history of innovating to improve results required by the installed user base operating in challenging environments. For example, GPS performance in the presence of multi-path has improved dramatically due to improvements in signal processing, including narrow correlator spacing. The amount of time required to acquire and track GPS signals in challenging environments has also been improved due to large parallel search engines and advancements in predicting satellite ephemeris. There are, however, no available mitigations to maintain positional accuracy in the presence of broadband noise.

MHz or the 2180-2200 MHz frequency bands that are under consideration in this proceeding. This distinguishing factor, among others, is more than enough reason for the Commission to reject suggestions by a few commenters that it expand the scope of this proceeding to consider more intensive terrestrial use of the MSS L-band spectrum as well.[7] The unique characteristics of the different bands in which MSS and associated ATC operations are currently permitted necessitate separate consideration of expanded terrestrial operation within each band, as the Commission properly found in the *AWS-4 NPRM/NOI*.[8] Indeed, both Iridium Satellite LLC ("Iridium"), explicitly, and Globalstar, Inc. ("Globalstar"), implicitly, have endorsed this approach with respect to the MSS Big LEO band at 1610-1626.5 MHz/2483.5-2500 MHz.[9]

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For all of the foregoing reasons, in addition to those enumerated in its initial Comments, the Council urges the Commission to adopt as regulations the established OOBE limitations

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[7] *See* LightSquared Inc. Comments at 4; RCA – The Competitive Carriers Association Comments at 10.

[8] *See AWS-4 NPRM/NOI* at 3 (¶ 2) ("Due to the unique characteristics of each band, we intend to address the Commission's Ancillary Terrestrial Component (ATC) rules for Big LEO and L-band MSS separately").

[9] Iridium Comments at 1-2 ("Iridium supports the Commission's decision to exclude the Big LEO Mobile Satellite Service ("MSS") band (1610-1626.5 MHz/2483.5-2500 MHz) from the proposals in the 2 GHz MSS/AWS-4 NPRM …. Extending similar changes to other MSS bands would not be appropriate at this time, given the significant differences between the bands"); Globalstar Comments at 5 ("the FCC should issue an order in the 2 GHz proceeding promptly and launch expeditiously … [a separate] NPRM on terrestrial use of Big LEO spectrum").

embodied in the existing ATC authorizations issued to the 2 GHz MSS licensees. These limits should be codified as part of any new Part 27 Rules adopted in this docket.

Respectfully submitted,

THE U.S. GPS INDUSTRY COUNCIL

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