UNITED STATES DEPARTMENT OF COMMERCE
National Telecommunications and Information Administration
Washington, D.C. 20230

MAY 25 2005

Mr. Donald Abelson
Chief, International Bureau
Federal Communications Commission
445 12th Street, SW
Washington, DC 20554

Dear Mr. Abelson:

On April 15, 2005, the Federal Communications Commission (Commission) released two Public Notices listing applications for Globalstar LLC (GLLC) requesting the authority to implement an Ancillary Terrestrial Component (ATC) for the Globalstar above 1 GHz mobile satellite service (MSS) system.[1] In the applications GLLC seeks to modify its: 1) space station license for blanket authority to construct and operate an unlimited number of ATC base stations (BSs); and 2) earth station license to offer dual-mode MSS ATC mobile earth terminals (METs).[2] The proposed GLLC ATC BS will transmit in the 2487.5-2493 MHz band and the proposed METs will transmit in the 1610-1615.5 MHz band. The National Telecommunications and Information Administration (NTIA) has reviewed the GLLC applications and would like to provide comments on the proposed emission limits of GLLC ATC BSs and METs in the radionavigation satellite service (RNSS) bands used by the Global Positioning System (GPS), the protection of radio astronomy service (RAS) operations, and the use of transportable ATC BSs.[3]

The GLLC applications describe the protection requirements of RNSS receivers from the emissions of their ATC BSs and METs.[4] Specifically, under 47 C.F.R. Section 25.254(a)(4), GLLC is required to demonstrate that its ATC BSs operating in the 2487.5-2493 MHz band shall not generate an equivalent isotropically radiated power (EIRP) density of greater than -70 dBW/MHz in the 1559-1610 MHz band. The level of discrete emissions (less than 700 Hz) shall not exceed an EIRP of -80 dBW in the 1559-1610 MHz band. Similarly, under 47 C.F.R.

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1. Federal Communications Commission, Public Notice, Report No. SAT-00284 (April 15, 2005); Federal Communications Commission, Public Notice, Report No. SES-00704 (April 15, 2005).

2. Globalstar LLC Applications for Modification to Add Authority to Operate an ATC, SAT-MOD-20050301-00054 (filed March 1, 2005) (GLLC ATC BS Application); Globalstar USA, LLC Application for Modification to Add Authority to Operate an ATC, SES-MOD-20050301-00261 (filed March 1, 2005) (GUSA ATC MET Application).

3. The bands 1164-1215 MHz, 1215-1300 MHz, and 1559-1610 MHz are allocated to RNSS. GPS operates in the 1574.397-1576.433 MHz, 1164-1188 MHz, and 1215-1240 MHz portions of the RNSS bands.

4. GLLC ATC BS Application, at Exhibit B-6; GUSA ATC MET Applications, at Exhibit B-6.

Section 25.254(b)(4), GLLC is required to demonstrate that its ATC METs (in addition to its MSS METs) operating in the 1610-1615.5 MHz band shall not generate an EIRP density greater than -70 dBW/MHz in the 1559-1605 MHz band or greater than a level determined by linear interpolation in the 1605-1610 MHz band from -70 dBW/MHz at 1605 MHz to -10 dBW/MHz at 1610 MHz. The level of discrete emissions (less than 700 Hz) shall not exceed an EIRP of -80 dBW in the 1559-1605 MHz band or exceed a level determined by linear interpolation from -80 dBW at 1605 MHz to -20 dBW at 1610 MHz.

In the MSS ATC proceeding, the Commission decided that ATC BSs and METs will operate in compliance with the same limits on emissions in the 1559-1610 MHz band that were adopted for MSS METs in the Global Mobile Personal Communications by Satellite (GMPCS) proceeding.[5] The NTIA comments in the MSS ATC rulemaking proceeding identified several problems associated with using the GMPCS emission limits for ATC BSs and METs. First, the EIRP limit of -70 dBW/MHz for GMPCS terminals was based on the protection of aviation GPS receivers used for precision approaches. Many of the factors considered in the analysis of aviation receivers do not apply to GPS receivers used in terrestrial applications.[6] Second, the type of GPS receiver used in the development of the GMPCS emission limits was based on a conventional coarse/acquisition (C/A) code architecture. However, the use of assisted-GPS receiver technology has emerged as a critical terrestrial application that can be more sensitive to interference compared to a C/A code receiver, particularly in urban areas where the GPS received signals could be degraded and ATC use is likely to be higher.[7] Finally, the -70 dBW/MHz was a compromise reached between the aviation and MSS communities, driven by the limitations on the filters that could be practically implemented in GMPCS METs to reduce the levels of emissions in the 1559-1610 MHz band. Since the ATC METs will operate at lower power levels than MSS or GMPCS METs, it should be possible to reduce the emissions in the RNSS frequency bands without significantly impacting ATC operations.

In the MSS ATC Report and Order (R&O), Mobile Satellite Ventures (MSV), an L-Band MSS ATC provider, and the GPS Industry Council (IC) reached an agreement in which MSV

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5. *See 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; Review of the Spectrum Sharing Plan Among Non-Geostationary Satellite Orbit Mobile Satellite Service Systems in the 1.6/2.4 GHz Bands*, IB Docket No. 01-185 and 02-364, Report and Order and Notice of Proposed Rulemaking, FCC 03-15, 18 FCC Rcd 1962, at 2028-29, ¶¶ 124-126; 2051-53,¶¶ 180-184 (2003), (MSS Flexibility R&O).

6. For example, GPS terrestrial receivers do not have the protection provided to the GPS aviation receive antenna that is mounted on top of the aircraft, and thus is shielded to some extent from the mobile METs below the aircraft. Terrestrial GPS receivers operate under handicaps such as signal attenuation due to destructive multipath, foliage, or building shadowing. It is also possible that the separation distance between a MET and a GPS terrestrial receiver can be much less than the 100 feet used in the aviation receiver analysis.

7. Assisted-GPS describes a system where outside sources, such as an assistance server and reference network, help a GPS receiver perform tasks required to make range measurements and position solutions. Assisted-GPS modules for applications in cell phones can detect signals at -182 dBW, which is 22 dB below the GPS minimum guaranteed signal level of -160 dBW.

committed to ensure that the EIRP density of emissions from its ATC BSs do not exceed -100 dBW/MHz in the 1559-1610 MHz band and the EIRP of discrete ATC BS emissions do not exceed -110 dBW in that band. MSV also agreed that all METs accessing its ATC network would restrict the EIRP density of emissions in the 1559-1605 MHz band to -90 dBW/MHz, restrict the EIRP of discrete emissions to -100 dBW in that band, restrict the EIRP density of emissions in the 1605-1610 MHz band to a level determined by linear interpolation from -90 dBW/MHz at 1605 MHz to -66 dBW/MHz at 1610 MHz, and restrict the EIRP of discrete emissions in the 1605-1610 MHz band to a level determined by linear interpolation, from -100 dBW at 1605 MHz to -76 dBW at 1610 MHz. Further, MSV agreed that all new METs placed in service more than five years after it commences ATC operation would restrict the EIRP density of emissions to -95 dBW/MHz in the 1559-1605 MHz band, restrict the EIRP of discrete emissions to -105 dBW in that band, restrict in the 1605-1610 MHz band to a level determined by linear interpolation from -95 dBW/MHz at 1605 MHz to -71 dBW/MHz at 1610 MHz, and restrict the EIRP of discrete emissions to a level determined by linear interpolation from -105 dBW at 1605 MHz to -81 dBW at 1610 MHz.[8] These EIRP limits apply to ATC BSs and METs that employ either Time Division Multiple Access (TDMA) or Code Division Multiple Access (CDMA).

NTIA performed an analysis proposing out-of-band emission levels that were consistent with those agreed to by MSV and the GPS IC.[9] NTIA also performed an analysis to determine the effect that various EIRP limits would have on the ability of a GPS receiver to meet the Commission's Enhanced 911 performance accuracy requirement of 150 meters with 95 percent availability. The analysis showed that at an EIRP of -70 dBW/MHz there would be a significant degradation in performance availability. However, at the EIRP levels agreed by MSV and the GPS IC, the performance availability would be high.[10] The Commission declined to adopt the more stringent emission limits endorsed by NTIA, GPS IC, and MSV because they believed that there was not a sufficient basis in the public record to support adoption of the stricter emission limits.[11] The GPS IC has also filed a petition for reconsideration requesting that the more

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8. *See Mobile Satellite Ventures Subsidiary LLC Application for Minor Modifications of Space Station License for AMSC-1; Minor Amendment to Application for Authority to Launch and Operate a Next-Generation Replacement MSS Satellite, Application for Minor Modification of Blanket License for Authority to Operate Mobile Earth Terminals with MSAT-1*, Files Nos. SAT-MOD-20031118-00333, SAT-AMD-2003-1118-00332, SES-MOD-20031118-01879, Order and Authorization, DA 04-3553 (released November 8, 2004).

9. Letter from Fredrick R. Wentland, Acting Associate Administrator, Office of Spectrum Management, National Telecommunications and Information Administration to Donald Abelson, Chief, International Bureau, Federal Communications Commission (November 12, 2002).

10. Letter from Fredrick R. Wentland, Acting Associate Administrator, Office of Spectrum Management, National Telecommunications and Information Administration to Edmond Thomas, Chief, Office of Engineering and Technology, Federal Communications Commission (January 24, 2003).

11. *See 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*, IB Docket No. 01-185, Memorandum Opinion and Order and Second Order on Reconsideration, FCC 05-30, at ¶ 69 (April 13, 2005), (MSS Flexibility MO&O).

stringent emission limits be adopted for MSS ATC BSs and METs, but the Commission has not acted on it at this time.[12]

On December 8, 2004, President Bush authorized a new national policy that establishes guidance and implementation actions for space-based positioning, navigation, and timing (PNT) programs, augmentations, and activities for U.S. national and homeland security, civil, scientific, and commercial purposes.[13] The PNT policy directs the Secretary of Commerce to protect the radio frequency spectrum used by GPS and its augmentations through appropriate domestic and international spectrum management regulatory practices.[14] The PNT policy further directs the Secretary of Commerce, in cooperation with the Chairman of the Commission to take the appropriate and legally permissible actions required to mitigate interference to GPS.[15] The President's PNT policy also calls for the establishment of an inter-agency Executive Committee, on which the Chairman of the Commission is invited to participate as a liaison, and a National Space-Based PNT Coordination Office.[16] The MSS ATC Memorandum Opinion and Order (MO&O) states that the Commission intends to establish discussions with other agencies, through the PNT Executive Committee and Coordination Office, to better understand what levels are necessary to protect GPS operations.[17]

Since there are inherent differences between GMPCS equipment and ATC equipment such as power (higher power for MSS METs and lower power for ATC METs) and deployment (low density for MSS MET versus high density for ATC METs), NTIA believes that it is appropriate to establish different emission limits for ATC METs in the 1559-1610 MHz RNSS frequency band. Moreover, the applications of GPS and the technologies used to process lower received signal levels have evolved and must be taken into consideration when establishing emission limits to protect GPS operations. The analysis performed by NTIA was based in part on proposals made by MSV for its ATC implementation. However, the NTIA analysis is general in nature and can be applied to ATC METs operating in the 1610-1615.5 MHz band. There has been no information provided in the public record of the MSS ATC rulemaking proceeding that would indicate the levels proposed by NTIA and the GPS IC are not achievable using existing technology. The only MSS ATC licensee, MSV, has agreed to comply with the emission limits recommended by NTIA and supported by the GPS IC, and the Commission has made compliance with those limits a condition of their license, thereby establishing current best practices for the industry. The lower emission limits are necessary to protect existing and future GPS operations

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12. U.S. GPS Industry Council, Petition for Reconsideration, IB Docket No. 01-185 (June 11, 2003).

13. *See* U.S. Space-Based Positioning, Navigation, and Timing Policy, December 15, 2004, Fact Sheet, available at www.ostp.gov/html/FactSheetSPACE-BASEDPOSITIONINGNAVIGATIONTIMING.pdf.

14. *Id.* at 9.

15. *Id.* at 11.

16. *Id.* at 4.

17. MSS Flexibility MO&O, at ¶ 70.

and will not restrict the deployment of GLLC's ATC services. Also, establishing these emission limits in the RNSS frequency band is consistent with the PNT policy established by the President.

Unlike MSV's ATC BSs that operate in the 1525-1559 MHz band, the GLLC ATC BSs operating in the 2487.5-2493 MHz band are separated in frequency by over 800 MHz from the RNSS frequency band used by GPS. Given this amount of frequency separation, the frequency response of typical filters, and the low radiating efficiency of the ATC BS antennas for signals in the 1559-1610 MHz range, the attenuation of the GLLC BS signals should be at a level consistent with that agreed to by MSV. Furthermore, since the ATC BSs are at fixed known locations (e.g., not unlicensed with unknown device densities and locations), the risk of potential interference is limited. Therefore, NTIA fully expects that GLLC ATC BSs will meet the -100 dBW/MHz in the 1559-1610 MHz band; NTIA is not recommending that the Commission require measurements to confirm compliance with this emission limit. However, the issue of emission limits for potential interference sources considering the difference between the operating frequency of the source and the GPS frequency bands will be addressed as part of a more detailed study to be performed under the President's PNT policy.

In Exhibit B-6 of the GLLC applications, it is stated that ATC METs must comply with International Telecommunication Union Radio Regulation S5.372 and 47 C.F.R. Sections 25.203(e), 25.203(f), 25.213, and 25.254(b)(1) which are intended to protect RAS observations in the 1610.6-1613.8 MHz band. GLLC ATC BSs must comply with the Commission's radio quiet zone requirements in 47 C.F.R. Section 1.924 and Section 25.203 (e) and (f). Finally ATC METs used on aircraft must adhere to the existing National Science Foundation and Globalstar coordination agreement for the 1610.6-1613.8 MHz band.[18] In the GLLC applications, it is also stated that their future ATC system will have the capability to avoid assigning frequencies to METs in the 1610.6-1613.8 MHz band when they are located within certain distances of RAS sites listed in 47 C.F.R. Section 25.213(a)(1)(i) and (ii). NTIA recommends that the requirements to protect RAS operations should be included in the authorization for GLLC to implement ATC service.

The GLLC ATC BS application describes a transportable ATC BS that can be used to provide communication services to customers in areas that are currently unserved or underserved by existing wireline and wireless service providers.[19] In the MSS ATC R&O, the Commission explained that the purpose of ATC is to extend the communications services of the MSS systems to urban areas and in buildings where the satellite signals are attenuated.[20] Outside of the urban areas the satellite component of the MSS ATC system is to be used. Globalstar's proposal for a

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18. *Technical Operational Coordination Agreement for the Joint Usage of the Band 1610.6-1613.8 MHz Between the National Science Foundation and Globalstar for Airborne Mobile Earth Stations Operating in its MSS Network* (November 29, 2001).

19. GLLC ATC BS Application, Exhibit A at 4.

20. MSS Flexibility R&O, at ¶ 14.

transportable ATC BS seems to be in conflict with the Commission's intention for the MSS ATC. However, NTIA believes that the transportable ATC BSs could provide an important communications capability during emergency situations. Therefore, NTIA recommends that the Commission limit the use of transportable ATC BSs to federal and non-federal public safety entities.

The MSS ATC MO&O states that if additional ATC applications are filed, the Commission will coordinate any ATC authority grant with NTIA, pursuant to the general notification process to assure that GPS operations are adequately protected.[21] We therefore strongly recommend that the Commission limit the EIRP density, in the 1559-1605 MHz band, from the GLLC MSS ATC METs to -90 dBW/MHz (and eventually -95 dBW/MHz) and limit the EIRP density in the 1605-1610 MHz band to a level determined by linear interpolation from -90 dBW/MHz (-95 dBW/MHz) at 1605 MHz to -42 dBW/MHz (-47 dBW/MHz) at 1610 MHz.[22] Unless these emission levels are met, the Commission should delay acting on the GLLC MSS ATC MET application until the issue concerning protection of GPS is resolved via follow-up work to the President's directive to protect GPS. We also recommend that the requirements to protect RAS operations should be included in the authorization for GLLC to implement ATC service and that the use of transportable ATC BSs be limited to federal and non-federal public safety entities. If you have any questions about our recommendations, please feel free to contact me at 202-482-1850.

Sincerely,

Fredrick R. Wentland
Associate Administrator
Office of Spectrum Management

21. *Id.* at ¶ 71.

22. 47 C.F.R. Section 25.254(b)(3) specifies that the ATC METs must meet an out-of-channel EIRP limit of -57.1 dBW/30 kHz (-41.87 dBW/MHz) at the edge of the licensed MSS frequency assignment.