Before the

FEDERAL COMMUNICATIONS COMMISSION

Washington, D.C. 20554

In the Matter of	)	
	)	
Service Rules for Advanced Wireless Services in the 2155-2175 MHz Band	)	WT Docket No. 07-195
	)	
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

COMMENTS OF TERRESTAR NETWORKS INC.

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COMMENTS OF TERRESTAR NETWORKS INC.

In a Further Notice of Proposed Rulemaking ("FNPRM") in the above-captioned proceeding,[1] the Commission seeks comment on proposed service rules for Advanced Wireless Service ("AWS") spectrum in the 1915-1920 MHz (H block), 1995-2000 MHz (H block), and 2155-2180 MHz (AWS-3) bands. Two of these bands – the 1995-2000 MHz band and the 2155-2180 MHz band – are adjacent to bands in which the 2 GHz mobile satellite service ("MSS") system of TerreStar Networks Inc. ("TerreStar") will operate. TerreStar hereby comments on the FNPRM.

I. SUMMARY

In these comments, TerreStar demonstrates that the power spectral density limits proposed in the FNPRM for H block and AWS-3 stations, because they are based on per MHz limits rather than per carrier limits, depart from PCS/AWS rules that TerreStar reasonably relied on when it designed its satellite and user handsets. TerreStar also shows that these proposed power spectral density limits, which do not

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[1] *In the Matter of Service Rules for Advanced Wireless Services in the 2155-2175 MHz Band; Services Rules for Advanced Wireless Services in the 1915-1920 MHz, 1995-2000 MHz, 2020-*

take into account the high degree of sensitivity that characterizes satellite and mobile earth station receivers, could expose TerreStar's satellite and its user handsets to harmful interference. Similarly, the attenuation rules proposed for AWS-3 stations do not take this high degree of sensitivity into account; require less attenuation than the rules that apply to TerreStar's network in comparable circumstances; and could expose TerreStar's user handsets to harmful interference. To redress these deficiencies, TerreStar proposes the following:

- To mitigate against the possibility of H block fixed and base station transmissions in the 1995-2000 MHz band overloading the receivers on 2 GHz MSS satellites, Terrestar proposes that H block fixed and base station transmit power spectral density be limited to 26 dBW/MHZ or less in the 1995-1999 MHz sub-band and 12 dBW/MHz or less in the 1999-2000 MHz sub-band.[2]

- To mitigate against the possibility of AWS-3 base and downlink fixed station transmissions in the 2155-2180 MHz band overloading the receivers on 2 GHz MSS METs, TerreStar proposes that the base and downlink fixed station power spectral density limit be no higher than 32 dBW/5 MHz.

- To mitigate against the possibility that out-of-band emissions from AWS-3 mobile, portable, and uplink fixed stations in the 2155-2180 MHz band could interfere with MET receivers tuned to the adjacent 2180-2200 MHz band, TerreStar proposes that the Commission

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2025 MHz, and 2175-2180 MHz Bands, Further Notice of Proposed Rulemaking, WT Docket Nos. 07-195 and 04-356 (rel. June 20, 2008).

[2] The power spectral density limits referred to in these comments are peak EIRP spectral density limits.

- exclude AWS-3 mobile, portable, and uplink fixed stations from the 2175-2180 MHz sub-band and pair the sub-band with the 2020-2025 MHz band.[3]

- require that mobile, portable and uplink fixed stations operating in the 2155-2175 MHz sub-band adhere to an OOBE attenuation requirement of 70 + 10 log (P) at 2180 MHz.

II. INTEREST OF TERRESTAR

TerreStar holds a letter of intent ("LOI") authorization, originally granted in 2001, to provide MSS in the United States using spectrum in the 2 GHz band via TerreStar-1, a geostationary orbit satellite.[4] TerreStar plans to build and operate a resilient, interoperable two-way broadband communications system that can be used to address homeland security, public safety, disaster preparedness, and rural and underserved community communications needs in North America. This will be achieved through a next-generation integrated mobile satellite and terrestrial communication network that will provide universal access and tailored applications throughout North America on a universal chipset that can be incorporated in a wide range of handsets, land mobile radios and other wireless devices.

TerreStar's network will be comprised of a satellite, mobile earth terminals ("METs"), ancillary terrestrial component ("ATC") base stations and mobile terminals, a satellite operations center, and gateway earth stations. MET-to-satellite

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[3] In an *ex parte* filing submitted on July 3, 2008, New ICO Satellite Services G.P. ("ICO"), provided a copy of an alternative band plan developed by Wireless Strategy that is intended to address many of the interference concerns expressed in this proceeding. Based on a preliminary review, it appears that the alternative plan would significantly mitigate the interference concerns raised in these comments.

[4] *See* Order, DA 07-2028 (Int'l Bur., May 10, 2007); *TMI Communications and Company, Limited Partnership*, Order, 16 FCC Rcd 13808 (Int'l Bur. 2001); *TMI Communications and Company, Limited Partnership, and TerreStar Networks, Inc. Application for Review and Request for Stay*, Memorandum Opinion and Order, 19 FCC Rcd 12603 (2004).

transmissions will be in the 2000-2020 MHz band, and satellite-to-MET transmissions will be in the 2180-2200 MHz band. ATC mobile terminals will transmit in the 2000-2020 MHz band, and ATC base stations will transmit in the 2180-2200 MHz band. Accordingly, TerreStar has an interest in ensuring that operations in the H block and in the AWS-3 band do not interfere with MSS/ATC operations.

III. THE POWER SPECTRAL DENSITY LIMITS PROPOSED IN THE FNPRM SHOULD BE REDUCED.

A. TerreStar Designed And Has Substantially Constructed Its System In Reliance On Per Carrier Power Spectral Density Limits That The FNPRM Is Proposing To Change.

Transmissions to and from geostationary satellite orbit ("GSO") satellites implicate unique considerations that are not present in the case of terrestrial communications. GSO satellites must be capable of receiving earth station signals that have travelled 22,300 miles from the ground to the satellite. Similarly, earth stations must be capable of receiving satellite signals that have travelled 22,300 miles from the satellite to the ground. This is in contrast to typical terrestrial systems in which base stations and handsets are rarely more than a few miles apart.

The need to communicate across such vast distances, particularly in the case of services such as TerreStar's employing handsets that must be small and portable in order to gain customer acceptance, has important consequences for GSO satellite networks. First, satellites and earth stations must employ highly sensitive receivers. Second, the sensitivity of the satellite and earth station receivers makes them vulnerable to overload from transmissions in adjacent bands. Finally, satellite networks operate with link budgets whose margin is minimal. For reasons that are discussed below, all of these factors are pertinent to the Commission's proposals in the FNPRM.

TerreStar's predecessor-in-interest, TMI Communications and Company Limited Partnership ("TMI"), completed the design of TerreStar-1 in November 2004, following which TMI certified to the Commission that the critical design review milestone had been satisfied.[5] TerreStar-1 is substantially constructed, and the designs of TerreStar's METs are at a late stage.

In designing its satellite and its user terminals (*i.e.*, METs), TerreStar/TMI needed to make assumptions about the technical characteristics of the terrestrial stations that would operate in adjacent bands. To develop these assumptions, TerreStar/TMI relied on the rules that were in effect, which established per carrier power limits for broadband PCS and AWS stations.[6]

In the FNPRM, however, the Commission proposes to adopt power spectral density ("PSD") limits on a per MHz basis rather than a per carrier basis.[7] This proposal would have a significant impact on the potential for causing harmful interference to TerreStar's satellite and METs. Changing the PSD limits for H block from a per 5 MHz carrier limit to a per MHz limit would increase the power to which the satellite receiver on TerreStar-1 would be exposed by 7 dB, which is five times the power. Similarly, changing the PSD limits for AWS-3 from a per 5 MHz carrier limit to a per MHz limit would increase the power to which the TerreStar's MET receivers

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[5] *See* letter from Gregory C. Staple, counsel for TMI, to Marlene H. Dortch, Secretary, FCC, File Nos. SAT-LOI-19970926-00161 *et al.* (Dec. 6, 2004).

[6] See Biennial Regulatory Review – Amendment of Parts 1, 22, 24, 27 and 90 to Streamline and Harmonize Various Rules Affecting Wireless Radio Services ("Biennial Review Proceeding"), Third Report and Order, ¶ 12 (March 21, 2008) ("The current radiated power rules for PCS and AWS measure EIRP per emission, and limit base station power -- regardless of bandwidth size -- to 1640 watts peak EIRP for antenna heights up to 300 meters height above average terrain (HAAT) (3280 watts peak EIRP for rural areas."). Four months ago, and years after TerreStar completed its satellite design, the Commission adopted per MHz PSD limits for certain PCS and AWS bands, not including H block and AWS-3. *See id.* ¶ 24.

[7] *See* FNPRM, Appendix A, proposed Sections 27.50(d)(1) and (d)(2).

would be exposed by 7 dB, which again is five times the power.[8] Implementing these changes inevitably would degrade the performance of TerreStar's system.

B. Absent A Reduction In Power, H Block Fixed And Base Station Transmissions In The 1995-2000 MHz Band Could Overload The Receivers On 2 GHz MSS Satellites.

Under the service rules the Commission adopted for 2 GHz MSS systems, licensees have to construct satellites that are capable of operating across the entire 2000-2020 MHz uplink band and the entire 2180-2200 MHz downlink band. The Commission "divide[d] the **...** uplink … and downlink … bands into distinct segments of equal bandwidth" based on the number of 2 GHz MSS applicants, and the segments consisted of "adjacent blocks ***stretching from one end of the band to the other***."[9] A licensee does not know which part of the uplink and downlink bands its satellite will operate in until the "satellite … reaches its intended orbit," at which time the licensee, based on the frequencies that remain available, "must notify the Commission in writing regarding [its] … Selected Assignment."[10]

TerreStar believes its METs will transmit to TerreStar-1 in the lower half of the 2000-2020 MHz band.[11] In the FNPRM, the Commission has proposed that H block fixed and base stations in the adjacent 1995-2000 MHz band be permitted to operate with power of up to "1640 watts peak EIRP in non-rural areas and 3280 watts peak

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[8] In comments filed in 2005 in the Biennial Review Proceeding, TerreStar expressed concern with increasing power in the H block and stated the need to analyze interference potential based on "the *total* amount of power radiated". Comments of TerreStar Networks Inc., WT Docket No. 03-264, n. 8 (Dec. 19, 2005).

[9] *Establishment of Policies and Service Rules for the Mobile Satellite Service in the 2 GHz Band*, Report and Order, 15 FCC Rcd 16127, ¶ 16 (2000) (emphasis added).

[10] *Id.*

[11] ICO, which is the other 2 GHz MSS licensee and which already has launched its satellite, has selected the upper half of the band for its system. *See* Public Notice, Report No. SAT-00526, DA 08-1265 (May 30, 2008).

EIRP in rural areas."[12] For carriers having an emission bandwidth greater than 1 MHz, these power limits would apply on a per MHz basis.[13]

The proposed power/PSD levels greatly exceed the levels TerreStar had reason to expect when TerreStar designed its network, and at the proposed levels H block fixed and base stations using the 1995-2000 MHz sub-band could overload TerreStar's satellite receiver and degrade the satellite's performance. H block fixed and base station EIRP density levels should be reduced to a level no higher than 32 dBW/5 MHz – the level on which TerreStar's system design is based - in order to mitigate against interference. In addition, in order to take account of the increased sensitivity of satellite receivers on the frequencies that are closest to an adjacent band,[14] the 32 dBW/5 MHz PSD should be distributed asymmetrically across the H block, such that the PSD is 26 dBW/MHz or less in the four MHz from 1995-1999 MHz and is 12 dBW/MHz or less in the one MHz from 1999-2000 MHz. Accordingly, TerreStar proposes that the Commission adopt EIRP density limits for H block fixed and base stations that are no higher than 26 dBW/MHz in the 1995-1999 MHz sub-band and 12 dBW/MHz in the 1999-2000 MHz sub-band. [15]

C. Absent A Reduction In Power, AWS-3 Base And Downlink Fixed Station Transmissions In The 2155-2180 MHz Band Could Overload MET Receivers.

In the FNPRM, the Commission has proposed that AWS-3 base and downlink fixed stations in the 2155-2180 MHz band be permitted to operate with power of up to "1640 watts peak EIRP in non-rural areas and 3280 watts peak EIRP in rural areas."[16]

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[12] FNPRM, ¶ 4.

[13] *See* FNPRM, Appendix A, proposed Sections 27.50(d)(1) and (d)(2).

[14] For several years, TerreStar has expressed the need for additional protection vis-à-vis the H block frequencies that are closest to TerreStar's frequencies. *See* Comments of TerreStar Networks Inc., WT Docket No. 03-264, n. 8 (Dec. 19, 2005).

[15] The analysis in this section assumes that there will be reasonable overhead gain suppression.

[16] FNPRM, ¶ 3.

For carriers having an emission bandwidth greater than 1 MHz, these power limits would apply on a per MHz basis.[17]

The proposed power/PSD levels greatly exceed the levels TerreStar had reason to expect when TerreStar designed its network, and at those levels AWS-3 base and downlink fixed stations could overload MET receivers in the adjacent 2180-2200 MHz band and degrade MET performance. The EIRP density levels for 2155-2180 MHz band base and downlink fixed stations should be reduced to 32 dBW/5 MHz or less to mitigate against interference. Accordingly, TerreStar proposes that the Commission adopt EIRP density limits for the 2155-2180 MHz block base and downlink fixed stations that are no higher than 32 dBW/5 MHz.

IV. AT THE PROPOSED ATTENUATION LEVELS, OUT-OF-BAND EMISSIONS FROM AWS-3 MOBILE, PORTABLE, AND UPLINK FIXED TERMINALS IN THE 2175-2180 MHZ SUB-BAND COULD INTERFERE WITH MET RECEIVERS.

Under the band plan that is envisioned in the FNPRM, AWS-3 mobile, portable, and uplink fixed stations would operate in the entire 2155-2180 MHz band. The 2155-2180 MHz band is immediately adjacent to the 2180-2200 MHz downlink band in which TerreStar's METs will receive transmissions from TerreStar-1.[18]

The same factors that make mobile earth station receivers unusually sensitive to overload also give them a high degree of sensitivity to out-of-band emissions from adjacent bands. It is essential, therefore, that out-of-band emissions be limited to protect against harmful interference. The need for protection against out-of-band emissions is particularly critical in the case of AWS-3 mobile, portable, and uplink fixed stations, because it is unpredictable where those stations will be located and

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17 *See* FNPRM, Appendix A, proposed Sections 27.50(d)(1) and (d)(2).

18 TerreStar believes its satellite will transmit to METs in the upper half of the 2180-2200 MHz band. ICO, which is the other 2 GHz MSS licensee and which already has launched its satellite, has selected the lower half of the band for its system. *See* Public Notice, Report No. SAT-00526, DA 08-1265 (May 30, 2008).

(unlike in the case of AWS-3 base stations) the stations are not typically located on towers that would ensure a degree of separation from MSS METs.

In the FNPRM, the Commission has proposed that AWS-3 mobile, portable, and uplink fixed stations attenuate below transmitter power by at least 60 + 10 log (P) dB outside their band.[19] That proposal, however, is inconsistent with the Commission's prior determination as to the level of attenuation required to guard against mobile-to-mobile interference. The Commission has adopted an out-of-band emissions rule that protects mobile stations operations in the band below 1995 MHz (*i.e.*, G block) by requiring mobile 2 GHz MSS ancillary terrestrial component ("ATC") stations to attenuate by at least 70 + 10 log (P) dB at the G block band edge.[20] Apart from the fact that earth station receivers are more sensitive than terrestrial station receivers, the same interference principles apply to ATC/G-block out-of-band emissions as apply to AWS-3/MET out-of-band emissions. So if 70 + 10 log (P) dB attenuation is required to protect G block mobile receivers against out-of-band emissions from ATC stations, then at least that much attenuation is required to protect MET receivers against out-of-band emissions from AWS-3 mobile, portable, and uplink fixed stations.

As a technical matter, however, broadband AWS-3 mobile, portable, and uplink fixed stations will not be capable of satisfying an attenuation requirement of 70 + 10 log (P) dB at the MSS band edge of 2180 MHz, making it necessary for there to be a 5 MHz guard band at 2175-2180 MHz. Accordingly, TerreStar proposes that AWS-3 operations in the 2175-2180 MHz be limited to base and downlink fixed stations and that the 2175-2180 MHz sub-band be paired with the 2020-2025 MHz band.

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[19] FNPRM, Appendix A, proposed Section 27.53(h)(2).
[20] *See* 47 C.F.R. § 25.252.

CONCLUSION

Accordingly, and for the reasons stated herein, the Commission should:

- Limit H block fixed and base station transmit PSD to 26 dBW/MHZ or less in the 1995-1999 MHz sub-band and 12 dBW/MHz or less in the 1999-2000 MHz sub-band.
- Adopt a PSD limit no higher than 32 dBW/5 MHz for AWS-3 base and downlink fixed station transmissions in the 2155-2180 MHz band.
- Exclude AWS-3 mobile, portable, and uplink fixed stations from the 2175-2180 MHz sub-band and pair the sub-band with the 2020-2025 MHz band.
- Require that mobile, portable and uplink fixed stations operating in the 2155-2175 MHz sub-band adhere to an OOBE attenuation requirement of 70 + 10 log (P) at 2180 MHz.

Respectfully submitted,

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