August 28, 2017

BY ELECTRONIC FILING

Marlene H. Dortch, Secretary
Federal Communications Commission
445 12th Street, SW
Washington, DC 20554

Re: Written Ex Parte Presentation
Higher Ground LLC
IBFS File No. SES-LIC-20150616-00357

Dear Ms. Dortch:

In January 2017, the International Bureau, the Office of Engineering & Technology, and the Wireless Telecommunications Bureau authorized Higher Ground LLC (“Higher Ground”) to operate earth stations, known as “SatPaqs,” in the C-band subject to stringent conditions to ensure non-interference to other operations in the band.¹ SatPaqs are small satellite transceivers that attach to smartphones and enable real-time consumer messaging service across the United States, including in areas where no cell service exists. Since then, some point-to-point microwave interests filed applications for review raising error-laden claims that misunderstand or ignore Higher Ground’s interference protection regime and disregard the Higher Ground Order’s analysis and findings.² Higher Ground submitted a detailed opposition and made a subsequent filing in March 2017 that responded to all the technical claims.³ Higher Ground responds here to more recent – and equally misguided – filings.


³ Higher Ground Consolidated Opposition to Applications for Review (Mar. 6, 2017); Letter from Higher Ground to FCC (Mar. 13, 2017).
By way of background, the FCC granted the Higher Ground license after an 18-month review, concluding that Higher Ground’s interference protection regime provides sufficient safeguards to warrant waiver of the coordination rules designed to protect fixed service (“FS”) point-to-point microwave operations in the C-band (5925-6425 MHz). Higher Ground’s interference avoidance solution, known as Channel Master, provides a 360-degree assessment of all C-band point-to-point microwave receivers within at least 50 miles of a SatPaq’s location, incorporating all relevant data for each specific point-to-point receiver as recorded in the FCC’s Universal Licensing System (“ULS”). Channel Master then assigns a non-interfering channel for the SatPaq transmission. The Higher Ground Order concludes:

Higher Ground has incorporated interference avoidance techniques, including a detailed analysis of potential interference to FS stations, taking into account the characteristics of the SatPaq transmitting station, the FS receiving stations, and the propagation environment between the stations, frequency agility, and satellite diversity.\footnote{Higher Ground Order ¶ 19.}

The order went on to find “little risk of harmful interference,” based on both “the low power transmissions proposed and the comprehensive self-coordination safeguards developed by Higher Ground.”\footnote{See id. ¶ 35.} In fact, SatPaq transmit power levels are generally more than 100 times lower than microwave stations. To avoid harmful interference to any microwave stations, SatPaqs will only transmit if the interference level will be 6 dB or more below the thermal noise floor.\footnote{See id. ¶ 16.}

Microwave interests have put forward claims that are technically flawed and rely on assumptions that are incorrect, impractical or unreasonable. One commenter submitted a technical study and a subsequent addendum that are particularly misguided, as they do not account for the Channel Master interference protection regime or the conditions imposed in the Higher Ground Order.\footnote{Tri-State Response to Technical Appendix (filed Mar. 20, 2017); Tri-State Addendum at 1 (filed May 18, 2017).} The filer, Tri-State Generation and Transmission Association (“Tri-State”), characterizes its objections as “largely based on two areas of concern” – a technical appendix associated with Higher Ground’s initial application in June 2015 and Higher Ground’s use of ULS data to identify and protect all point-to-point receivers in the C-band.\footnote{Tri-State Addendum at 1.} Both
objections are wrong and, unfortunately, other filings parrot them.9 We address these and other flawed arguments below.

**Accounting for Channel Master.** Tri-State’s analysis focuses on a technical appendix associated with the initial application and ignores the Channel Master interference avoidance methodology that Higher Ground submitted during the proceeding to provide even more comprehensive protection. Channel Master replaces the protection zone approach (receiver acceptance cone and close proximity circle) with a 360-degree interference protection assessment of point-to-point microwave receivers. Higher Ground submitted multiple filings in the record describing Channel Master and demonstrated its capability to the FCC staff on several occasions.10 The *Higher Ground Order*, in turn, explicitly referenced and relied on the Channel Master multiple times.11 Yet Tri-State’s subsequent filings do not account for Channel Master, and this faulty premise undermines much of its analysis.

The Tri-State analysis is flawed in any case. As but one example, Tri-State calculates that a SatPaq must be at least 17,100 miles from a microwave point-to-point receiver to avoid interference and then argues that Higher Ground “cannot directly use distance at all as a factor” in interference mitigation.12 The filing does not acknowledge that standard C-band point-to-point microwave frequency coordination incorporates distance as a primary means of mitigating interference risk (and indeed, separation distance is used for interference mitigation across radio services). This is so because the Earth’s curvature necessarily impacts radio propagation between stations and thus is directly related to distance. Tri-State’s worst-case interference analysis argues without specificity that geography/terrain, atmospheric conditions, and man-made objects can extend radio signals beyond the earth’s curvature.13 Channel Master, however,

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11 See, e.g., *Higher Ground Order* ¶ 15 (“Specifically, Higher Ground will use its Channel Master software to identify non-interfering frequencies for SatPaq terminal operation, taking into account all relevant ULS-derived data for individual C-band point-to-point receivers as well as the SatPaq terminal’s location and orientation, and the use of frequency diversity and satellite choice.”). *See also id.* ¶¶ 5, 6.

12 Tri-State Addendum at 10 (emphasis in original).

13 *Id.*
incorporates an expansive margin of error to further reduce risk of interference. For example, in using a SatPaq’s geocoordinates to identify relevant point-to-point microwave receivers for protection, Channel Master assigns the SatPaq an elevation height level that is 10 meters above ground level (instead of the 1.5 meter above ground natural holding position of the SatPaq) to provide an exceedingly conservative assessment of potential interference risk.

Additionally, UTC, tracking Tri-State’s analysis, wrongly asserts that Higher Ground miscalculated SatPaq power by 6 dB. As an initial matter, any interference-to-noise (I/N) threshold analysis must account for the noise figure in the “victim” receiver so that protection is based on actual measurable levels in the receiver, just as Higher Ground did in its technical appendix. There was no miscalculation. But in any event, Higher Ground once again has committed to even further protection – as Tri-State acknowledges, Higher Ground only allows SatPaq transmissions if the signal level at any point-to-point receiver will be 6 dB below the thermal noise floor (which includes all noise terms associated with the receiver). At 6 dB below the thermal noise floor, a 1 dB (or less) degradation will occur to the overall receiver thermal noise level. Even Tri-State acknowledges, “a 1dB ‘hit’ to a microwave receive signal would likely be considered ‘reasonable’ in most circumstances.”

14 See UTC June 9 Letter at 2. See also Tri-State Addendum at 7.
15 See Tri-State Addendum at 7.
16 See UTC June 9 Letter at 2. See also Tri-State Addendum at 8-9.
18 See Tri-State Addendum.

Microwave interest are also incorrect in asserting that a 37.8 dB difference in antenna gain is unaccounted for in Higher Ground’s interference protection analysis. Yet again the analysis considers the initial protection zone approach of receiver acceptance cone and close proximity circle instead of the 360-degree Channel Master. Whereas the protection zone approach relied on certain assumptions regarding receiver antennas, Channel Master will use actual ULS data including antenna gain for each point-to-point microwave receiver. Antenna gains thus are determined based on real ULS data and the rolloff patterns required in Part 101 of the FCC rules for fixed service stations. And further, the analysis in the technical appendix was correct. Tri-State uses an incorrect assumption about the off-axis angle that Higher Ground was analyzing. There is no unaccounted for antenna gain.

**Incorporating Daily ULS Queries.** Tri-State does not account for Higher Ground’s use of ULS to update the Channel Master database on a daily basis with any new licenses, modifications, and pending applications in order to protect C-band microwave operations. Tri-State alleges that Higher Ground somehow miscalculated the number of microwave links it must
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protect for the hailing frequency at center frequency 5927.5 MHz (Higher Ground identified 18; Tri-State identified 10), and it asserts that the interference protection regime is thus suspect.\(^{19}\) To the contrary, the links that Higher Ground identified in its application were derived from a ULS query made on a single day (prior to the initial application). Tri-State’s query was conducted roughly two years after the application was filed.\(^{20}\) Invariably, the number of point-to-point operations that are to be protected will change. That is precisely why the Channel Master queries ULS and updates its database on a daily basis to incorporate any changes to the microwave operations in the C-band (an August 13, 2017 ULS data lookup shows 17 point-to-point microwave links licensed to operate in the 5925-5930 MHz band). Channel Master is built to address the very concern that Tri-State raises.

**Applying Microwave Licensees’ Own Data for Interference Protection.** UTC is misguided in asserting that Higher Ground relies on faulty assumptions about microwave systems in developing its interference protection regime. As noted, the Channel Master incorporates *actual antenna data* for each C-band microwave receiver in ULS – data that the microwave licensee itself is responsible for submitting into ULS. This data includes the coordinate locations and orientations of the receiving antennas, the frequencies of the stations, their antenna heights and heights above mean sea level, and receiving antenna polarizations.\(^{21}\) Combined with the location of the SatPaq, satellite diversity, and other factors, this antenna data enables the Channel Master to identify a non-interfering channel for a SatPaq transmission.

Further, contrary to UTC’s claim, Channel Master will account for multiple microwave antennas where a site has more than one (a common practice referred to as “spatial diversity”).\(^{22}\) Channel Master readily incorporates all data included in ULS microwave licenses, including receive and transmit antennas, diversity antennas, and reflectors.\(^{23}\)

On occasion microwave licensees input faulty data into ULS, and Commission precedent is clear that “the licensee, and not the Commission staff, bears responsibility for ensuring the

\(^{19}\) Tri-State Response to Technical Appendix at 12-13. For a discussion of temporary fixed stations, see *infra* at pp. 6-7.

\(^{20}\) See *id.* at 12-14.

\(^{21}\) Higher Ground Order ¶ 6 n.12.

\(^{22}\) UTC Application for Review at 13 n.28 (Feb. 17, 2017); UTC June 9 Letter at 2.

accuracy of [ULS licensing] information."24 Other parties reasonably may rely upon ULS licensing data, even if “attributable to an ‘error in the Commission’s data base.’”25 Nonetheless, where the flawed data is obvious (e.g., missing data), Higher Ground will protect the microwave operations by incorporating highly conservative assumptions into Channel Master. These data points are grounded in the most susceptible antenna standard in Section 101.115 of the Commission’s rules (the B1 antenna). While the Commission has found that microwave licensees should replace such low-performance antennas at their own expense,26 Higher Ground uses this lower performing antenna data so as to minimize the possibility of harmful interference into the microwave operations.

Appropriately Accounting for Reflectors. UTC is equally off-base in its claims about sources of reflection and Higher Ground’s interference avoidance solution.27 As an initial matter, microwave licensees are responsible for ensuring that reflectors used as part of the fixed service path are included in their licenses in the ULS database, and Channel Master thus accounts for such reflectors.28 UTC references unintentional reflectors, but Higher Ground is not aware of any Commission decision that incorporates unintentional sources of reflection into interference protection rules.

Properly Calculating Adjacent Channel Operations. Commenters are also wrong in their claim that Higher Ground underestimates the number of microwave licensees that could be impacted by SatPaq operations on a given channel.29 To be clear, Higher Ground correctly determines when any portion of a SatPaq channel would overlap any portion of a microwave operation’s channel, and not just the center frequency of operation. This is a fairly routine element of the Channel Master, and Higher Ground showed FCC staff this capability on multiple occasions. Some commenters raise concerns about channelization size,30 but there is no confusion: the Higher Ground Order permits SatPaq emissions using 8 MHz and 4 MHz

24 ACC Network Corp., 16 FCC Rcd 22446, 22448 ¶ 5 (WTB 2001); see also Comcast 38 GHz, Inc., 16 FCC Rcd 10862, ¶ 6 (WTB 2001) (“licensee, and not the Commission staff, is responsible for registering [license information] in the ULS”).

25 See Liberty Commc’ns., Inc. and Sprint Nextel Corp., 25 FCC Rcd 9197, 9203 ¶¶ 16-17 (PSHSB 2010).

26 See 47 C.F.R. § 101.115.

27 See, e.g., UTC June 9 Letter at 2.

28 See e.g., WTB Radio Station Authorization Call Sign KMZ81 (using a passive reflector).

29 See Tri-State Response to Technical Appendix at 15.

30 Id. at 8; UTC Application for Review at 12 n.27.
Applying Appropriate Design Techniques. Commenters also make assertions that Higher Ground’s use of “mobile design techniques” rather than “fixed point-to-point design techniques” undermines the interference avoidance scheme, but they do not offer detail in support. For each SatPaq, the Channel Master makes a determination whether it is permissible to transmit based on the SatPaq’s location and the surrounding microwave operations as described above, as well as other factors such as satellite diversity. Regardless of whether services are fixed or mobile, physical constraints such as propagation losses and antenna gains are applicable to both.

Protecting Temporary Microwave Operations. Finally, some microwave interests claim that temporary fixed stations will not be protected because they are authorized to operate in the C-band without including location data into their ULS licenses. Section 101.103(d)(1) requires prior coordination with “existing licensees, permittees and applicants in the area,” and the FCC typically issues temporary fixed licenses subject to a condition requiring prior coordination with existing users in accordance with Section 101.103(d). Higher Ground’s nationwide license authorizes it to serve the area, and temporary fixed licensees or their frequency coordinators should provide coordination notices of their station locations to Higher Ground (as well as other C-band licensees). Higher Ground does not assert that the notification requirement connotes any interference protection rights to Higher Ground; rather, it will enable Higher Ground to incorporate the temporary fixed location data into the Channel Master database, just like any license data from ULS. As a backstop, a frequency coordinator will provide Higher Ground with location data it receives from any temporary fixed coordination notices.

The Commission should dismiss these claims and deny the applications for review.

31 Higher Ground Order ¶ 39.
32 Tri-State Response to Technical Appendix at 20. See also UTC June 9 Letter at 2.
33 Tri-State Response to Technical Appendix at 12.
34 47 C.F.R. § 101.103(d)(1) (“Proposed frequency usage must be prior coordinated with existing licensees, permittees, and applicants in the area …. Coordination must be completed prior to filing an application for regular authorization ….”). According to the license classification framework used on ULS, “regular” authorizations include temporary fixed licenses.
35 See e.g., WTB Radio Station Authorization of ACS of the Northland License Sub, LLC, Call Sign WLK581 (granted Mar. 6, 2012); WTB Radio Station Authorization of Alascom Inc., Call Sign WSL69 (granted Mar. 6, 2012).
36 See 47 C.F.R. § 101.103(d)(1) (“In coordinating frequency usage with stations in the fixed satellite service, applicants must also comply with the requirements of § 101.21(f).”).
Please contact the undersigned should you have any questions.

Respectfully Submitted,

/s/ Adam D. Krinsky

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