Before the
Federal Communications Commission
Washington DC 20554

In the Matter of	)	
	)	
Revision of Part 15 of the Commission's Rules	)	ET Docket 98-153
Regarding Ultra-Wideband Transmission	)	
Systems	)	

Opposition of XtremeSpectrum, Inc. To Petition for Reconsideration Of the Satellite Industry Association

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Pursuant to Section 1.249(f) of the Commission's Rules, XtremeSpectrum, Inc. hereby opposes the Petition for Reconsideration of the Commission's Memorandum Opinion and Order in this proceeding filed by the Satellite Industry Association (SIA).[1]

The attached Technical Statement is not an appendix, but an integral part of this Opposition.

A. Summary

SIA has filed a second reconsideration petition, following the Commission's denial of its first one. But the new petition offers no facts or law that were not available the first time -- nothing to say the first denial was wrong, except that SIA does not agree with it. But that will not support reconsideration. For that reason, both the Commission's Rules and its case law mandate summary dismissal of a repetitious petition, such as SIA's petition here.

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[1] Petition for Reconsideration of the Satellite Industry Association (filed May 22, 2003) (SIA Petition), seeking reconsideration of *Ultra-Wideband Transmission Systems*, 18 FCC Rcd 3857 (2003) (Memorandum Opinion and Order and Further Notice of Proposed Rule Making) (MO&O), *affirming with modifications Ultra-Wideband Transmission Systems*, 17 FCC Rcd 7435 (2002) (First R&O). Today XtremeSpectrum is also filing a separate Opposition to the Petitions for Reconsideration of Cingular Wireless LLC. XtremeSpectrum manufactures ultra-wideband communications systems as its sole business.

Moreover, the Commission has already dealt with all of the arguments that SIA raises, including interference-to-noise ratio, peak vs. average UWB emissions levels, and earth station geometries. Nothing in SIA's petition suffices to call the previous decisions into question.

Finally, XtremeSpectrum has re-run SIA's analyses with certain erroneous assumptions corrected. The result plainly shows that UWB communications devices will not cause harmful interference to a C-band earth station.

B. SIA's Petition must Be Dismissed as Repetitious.[2]

This is SIA's second Petition for Reconsideration. The Commission has already denied SIA's Petition for Reconsideration of the First R&O in an 89-page order that thoroughly addressed the issues raised by SIA and other petitioners. As we show below, SIA's present Petition now revisits the same issues.

Duplicative petitions for reconsideration are subject to dismissal. The Commission's Rules provide:

> Any order disposing of a petition for reconsideration which modifies rules adopted by the original order is, to the extent of such modification, subject to reconsideration in the same manner as the original order. *Except in such circumstance, a second petition for reconsideration may be dismissed by the staff as repetitious*.[3]

Because the MO&O did not modify the rules SIA objected to in its first Petition for Reconsideration, SIA's present petition should be dismissed pursuant to this rule.

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[2] XtremeSpectrum seeks dismissal of the Cingular Wireless LLC Petition on the same grounds.

[3] 47 C.F.R. Sec. 1.429(i) (emphasis added).

The bulk of the SIA Petition does nothing more than dispute the Commission's findings in the MO&O.[4] SIA adds no newly available facts or analysis. A mere rehash of arguments the Commission has already rejected cannot support reconsideration. Just a few weeks ago, the Commission held:

> Bare disagreement, absent new facts and arguments, is insufficient grounds for granting reconsideration. Furthermore, petitions for reconsideration are not granted for the purpose of altering our basic findings or debating matters that have been fully considered and substantively settled.[5]

A decision few weeks earlier explained:

> The Commission does not grant reconsideration for the purpose of allowing a petitioner to reiterate arguments already presented. *This is particularly true where a petitioner advances arguments that the Commission previously considered and rejected in a prior order on reconsideration.* If this were not the case, the Commission "would be involved in a never ending process of review that would frustrate the Commission's ability to conduct business in an orderly fashion."[6]

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[4] SIA Petition at 2-9.

[5] *Certification of Equipment in the 24.05-24.25 GHz Band*, ET Docket No. 98-156, Memorandum Opinion and Order, FCC 03-175 at para. 10 (released July 21, 2003) (citation footnoted omitted).

[6] *Competitive Bidding Procedures*, 18 FCC Rcd 10180 at para. 48 (2003) (emphasis added; citation footnotes omitted), *quoting Warren Price Communications, Inc.*, 7 FCC Rcd 6850 (1992). *See also Regulatory Flexibility in the 218-219 MHz Service*, 17 FCC Rcd 8520 at para. 15 (2002) (similar).

The rule on repetitious filings "brings finality to [the Commission's] decision making process and eliminates uncertainty."[7] It may be waived only when "the arguments that petitioners proffer in support of their requests [are] so compelling that they warrant departure from this policy."[8]

Nothing in the second SIA Petition is remotely "so compelling" as to justify departing from the policy against repetitious reconsiderations. The Commission has already rejected SIA's arguments. And SIA cannot support a second reconsideration merely by criticizing the Commission's denial of its first one. That leads to the infinite regress the Commission rejected in *Competitive Bidding Procedures*, above.

XtremeSpectrum therefore requests that the SIA Petition be dismissed without further consideration as repetitious pursuant to Section 1.429(i) of the Commission's Rules.

C. The Commission Has Considered and Rejected Each of SIA's Technical Arguments.

1. SIA declined to question the Commission's use of a 0 dB interference-to-noise ratio.

SIA objects to the Commission's use of a 0 dB interference-to-noise ratio, rather than -10 dB, in part by challenging the Commission's statement that SIA did not object to use of a 0 dB ratio.[9]

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[7] *37.0-38.6 GHz and 38.6-40.0 GHz Bands*, 14 FCC Rcd 12428 at para. 9 (1999), *citing MTS and WATS Market Structure*, 99 FCC 2d 708, 711, 712 (1984); *MTS and WATS Market Structure*, 97 FCC 2d 834, 879 (1984).

[8] *Id*.

[9] SIA Petition at 4.

The Commission explicitly adopted the 0 dB I/N ratio in the First Report and Order.[10] SIA petitioned for reconsideration of the First Report and Order, *but did not contest use of the 0 dB figure.*[11] SIA raises the issue now for the first time, yet does not explain why it waited a year to do so. SIA's challenge on this point more accurately seeks reconsideration of the First Report and Order, not the MO&O, and in that respect it is almost a year out of time.

SIA may not parcel out new issues over an endless number of reconsideration cycles. Having opted not to raise the matter in its first reconsideration petition, it must now live with that decision.

Even as a purely technical matter, however, we do not believe the -10 dB figure can be supported. Figure 1 in the attached Technical Statement shows that 0 dB is a reasonable ratio for interference analysis.

2. The Commission has fully considered SIA's technical assumptions.

SIA objects to the Commission's treatment of technical assumptions relating to elevation angle, natural and man-made obstructions, peak emissions levels, and antenna height (as well as I/N ratio, discussed above).[12] The Commission considered each of these issues in turn, explained its reasoning, and set out the basis for its decisions.[13] SIA offers no newly-available evidence or newly-decided legal precedent that might affect the outcome. Given the absence of any grounds

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[10] First R&O at para. 140.

[11] *See* Petition for Reconsideration of Satellite Industry Association (filed June 17, 2002).

[12] SIA Petition at 5-8.

[13] MO&O at paras. 128-131.

for change, the Commission's decision on each of these issues must stand. (We nonetheless revisit these issues in the attached Technical Statement.)

3. SIA misstates the effects of peak emissions.

SIA questions the Commission's finding that interference from outdoor UWB into FSS earth stations will be governed by average emissions, not peak emissions, and asks that the peak limits be reduced.[14]

But the Commission explained in detail why a UWB system with high pulse repetition frequency [PRF] is limited by average emissions.[15] Because handheld UWB devices are used for high-speed communications, they necessarily have high PRFs, and hence low peak-to-average ratios, and so the average limits govern.[16] XtremeSpectrum, for example, uses a PRF of 1.3 GHz, with a peak-to-average ratio of only about 8 dB.

Moreover, a victim receiver responds to average UWB emissions if its passband is less than the UWB PRF, and to peak emissions if its passband is higher than the PRF.[17] The bandwidth of any satellite transponder is far below XtremeSpectrum's PRF, and probably that of

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[14] SIA Petition at 8-9, *citing* MO&O at para. 130.

[15] The Commission said: "As the PRF decreases, the peak to average ratio increases, as described in Appendix E [of the First R&O]. As the PRF decreases below a certain level, depending on the RBW [resolution bandwidth] used to measure the peak emission, the peak limit becomes the defining standard and the average emission level generated in a 1 MHz RBW decreases below the limit specified in the regulations. Accordingly, UWB devices employing a low PRF are limited in their output levels by the standard on peak emission levels, not by the standard on average emission levels. MO&O at para. 154. A footnote adds: "Conversely, high PRF systems would be limited by the average limit established under the rules and not by the peak limit." MO&O at para. 154 n.347.

[16] MO&O at para. 130.

[17] First R&O at para. 214. *See also* the attached Technical Statement.

any practical handheld UWB device. For that reason also, an earth station will be sensitive to average, not peak, UWB emissions. (See the attached Technical Statement for more detail.)

SIA's request to reduce peak emissions thus would have no consequence for high-PRF devices such as handheld UWB. It would affect only low-PRF devices, such as ground-penetrating radar and other imaging equipment, which SIA does not claim to be a potential source of interference.

4. SIA's objections to XtremeSpectrum's claims about earth station geometry have been fully resolved.

SIA objects to what it calls the Commission's reliance on submissions by XtremeSpectrum regarding earth station geometries, specifically the effects of elevation angle and building blockage.[18] But these issues were not newly raised by XtremeSpectrum. To the contrary, they were thoroughly aired in the First Report and Order,[19] and yet again on reconsideration.[20] (We address them once more in the attached Technical Statement.) SIA has failed to offer new facts or law that would call the Commission's conclusions into question.

D. SIA Overestimates the Interference Potential of UWB.

The attached Technical Statement questions and corrects many of SIA's assumptions. It examines the appropriate interference-to-noise ratio for assessing UWB interference; the effects of peak vs. average emissions; geometries of UWB usage relative to earth stations; and required

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[18] SIA Petition at 9.

[19] First R&O at paras. 139-140.

[20] MO&O at paras. 126-127.

separation distances. For the reasons set out there in detail, we conclude that UWB communications devices will not cause harmful interference to a C-band earth station.

CONCLUSION

SIA's Petition does little more than rework its first reconsideration petition, which the Commission denied. The Commission has already addressed each of the specific arguments that SIA raises here. And our re-analysis again confirms a lack of interference potential from UWB.

Commission precedent and policy require dismissal of SIA's Petition as repetitious.

Respectfully submitted,

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September 4, 2003

Technical Statement of XtremeSpectrum, Inc.

Overview

This document explains the assumptions that XtremeSpectrum, Inc. (XSI) used in its calculations and why its results differ from those in SIA's Petition for Reconsideration, even allowing for most of the SIA assumptions. We find that high PRF UWB devices, such as XSI's, will not cause harmful interference to fixed satellite service (FSS) earth stations.

SIA asserts a –10 dB interference-to-noise is necessary for protection, but without specifying signal-to-noise or signal-to-interference ratios. Using SIA's stated operating levels, XSI demonstrates that an I/N of –6 dB assigned to a UWB device is an appropriate protection level.

SIA has inappropriately applied the peak limits shown in the Report and Order as the interfering levels affecting earth terminals. High PRF UWB devices, such as the XSI communications devices operating between 3.1–10.6 GHz, appear as Gaussian white noise to the 36 MHz bandwidth of the earth station receivers described by SIA, so that the measure of their interference potential is average (RMS) power. XSI plots the UWB signal level versus distance from the earth station and azimuth angle around the earth station using software developed by NTIA and PanAmSat to show that interference will not occur.

Link Margins and Required Interference-to-Noise Ratio

SIA asserts that a –10 dB Interference-to-Noise (I/N) ratio is necessary for protection of earth station receivers. XSI calculates an appropriate I/N ratio between UWB and FSS by examining the satellite link margin. We use the SIA Engineering Statement typical levels and develop the needed carrier, noise, and interference levels. Note that the situation calculated here is for the stated carrier-to-interference plus noise situation (C/(I+N)), rather than a simple carrier-to-noise problem. We recreate the plot of page 3 of the SIA Engineering Statement below, correcting for the included interference due to adjacent satellites and cross polarization terms. We maintain the 9.9 dB C/(I+N) used in the SIA analysis. Note that the receiver demodulator threshold is shown by the dashed line, and that the demodulator threshold is reached at an I/N = -0.5 dB (shown by the diamond). However, for an I/N = -6 dB (indicated by the triangle) there is less than a 0.5 dB drop in the C/(I+N). We can now use this plot in evaluating the statistical nature of the UWB interference in the earth station channel.

Peak Emissions and UWB Operations under the R&O

The band at issue is one in which the FCC has authorized the use of UWB communications devices[1]. The concern of the SIA Engineering Statement analysis appears to be focused on hand held and indoor UWB communications devices rather than any of the low-PRF safety-related imaging applications of UWB, which operate in limited numbers and with required coordination through FCC and NTIA channels. XtremeSpectrum's UWB devices are built to look like white noise in essentially all victim receivers. They guarantee this noise-appearance by using phase modulated UWB pulses with a PRF that is well above 1 GHz. Since the processed bandwidth of

[1] *Ultra-Wideband Transmission Systems*, 17 FCC Rcd 7435 (2002) (R&O).

all victim receivers (except other UWB receivers) is far less than 1 GHz, the modulated UWB pulses cannot be resolved and the resulting signal, as seen by the victim, looks like noise[2].

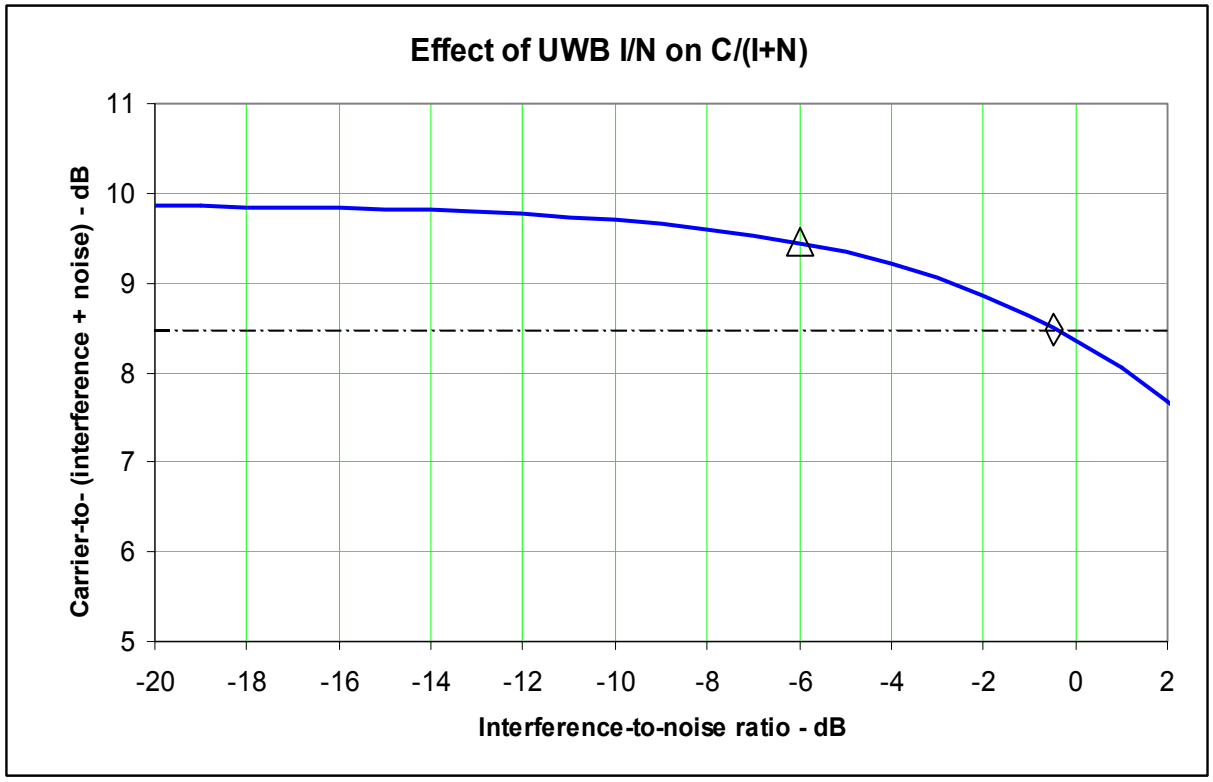

Figure 1. Effect of UWB I/N on FSS link margin

An example of this can be seen in figure 2, where the inset at (a) shows an expanded view of a simulated 500 MHz PRF UWB pulse stream and the main plot at (b) shows the resulting response of a simulated 50 MHz bandpass filter centered at the peak frequency of the UWB spectrum.

Required separation distance

The antenna response used by the SIA Engineering Statement seems to follow the old CCIR recommendation, which is not useful for interference analysis. An integration of the total power over the sphere exceeds unity, so this pattern overestimates the received signal level. Better choices include FCC 25.209 or ITU-R S.580-5[3] specifications that give an initial curve outside of the main lobe that follows the equation:

[2] Kissick, W. A., ed., NTIA Report 01-383, "The Temporal and Spectral Characteristics of Ultrawideband Signals", January 2001, Section 3.3 and Appendix B.
[3] See also Intelsat IESS-207 and IESS-601,

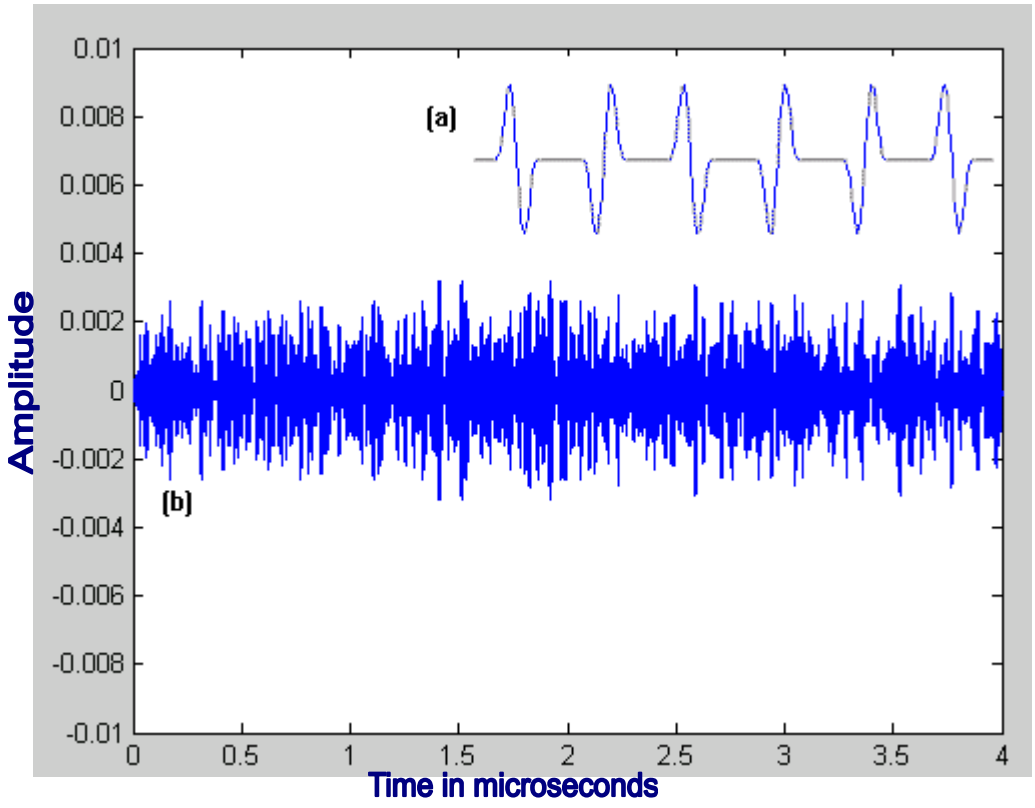

Figure 2. Response of bandpass filter to "dithered" UWB pulse stream

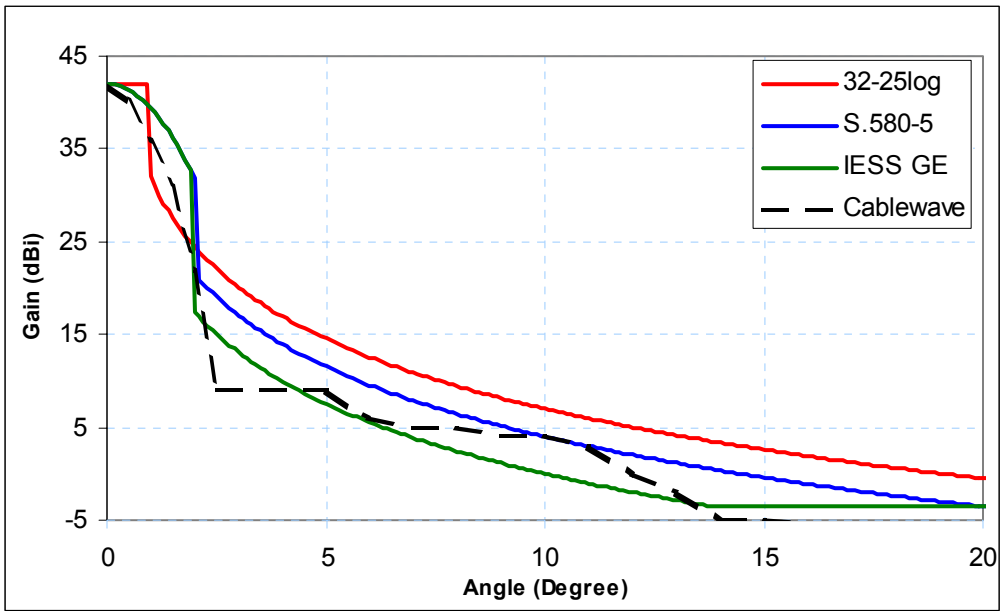

Figure 3. Antenna Elevation patterns

29 – 25 log(θ) dBi for angles up to 20°

and then transition to an intermediate –3.5 dBi until 26.5° followed by:

32 – 25Log(θ) dBi for angles up to 48° and –10 dBi for angles beyond that.

The 5° elevation case, although used for cross-country and transoceanic paths, requires careful attention to site selection with regard to clearance angle above populated areas. The increase in system noise due to man-made noise from ignition systems and other sources is only made worse if major portions of the near-in sidelobes illuminate large portions of city skylines. This becomes worse in the summer months when the black-body temperature of the city area rises. In some cases fencing or earth berms may be needed to block RFI from certain directions.[4] Low angle paths must pass through more atmosphere and are thus more susceptible to rain fading, atmospheric multipath, and beam deflection. This indicates an improved link margin is desirable and a more tightly controlled sidelobe pattern such as IESS-601 GE is a better choice to allow for increased uplink power and less co-channel interference pickup, as well as less RFI pick up from the surrounding area. Figure 3 compares the antenna response patterns, along with that of a high performance C-band antenna (dashed line) taken from the FCC repository of NSMA antenna patterns.

We use a modified version of the NTIA[5] spreadsheets from SP 01-43 with these antenna patterns. The NTIA spreadsheets use the Irregular Terrain Model[6] (ITM) to calculate propagation loss rather than the two-ray line-of-sight propagation model used in the SIA analysis[7]. We compared the two methods and found the difference was less than 0.5 dB out to 6 km, which should not be surprising as the model is virtually free-space until the breakpoint occurs. This breakpoint occurs at 1800 meters for a 1.5 m high UWB device, and approximately 1200 meters for a 1 m high UWB device. Although XSI expects the operational height of a handheld unit to be 1 meter, we use the 1.5 meter value in the calculations to be conservative. We set the spreadsheet to represent the aggregate level for a 9.9 dB C/(I+N) in a 36 MHz bandwidth channel and set the UWB I/N limit to – 6 dB to match the analysis of the first section. The following figures show the EIRP versus range for the outdoor 5° and 15° cases. The results are appropriate for dithered PRFs above 18 MHz since they will also look like noise in the 36 MHz bandwidth. The horizontal line represents the maximum allowed average EIRP for the outdoor case that occurs at the worst-case angle from the UWB. The intersection of the curve with the reference line indicates the required separation distance. The required separation distance for the indoor 1.5 m UWB occurs where the curve crosses –53.3 dBm (allowing for the 12 dB building loss).

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[4] *Earth Station Technology, Revision 5*, June 1999, INTELSAT, states "The primary objective should be to minimize potential RFI through the selection of natural geographical bowls or depressions within which the Earth station may be located to take advantage of site shielding. If the topography of the area precludes the existence of such natural shielding, it may be necessary to resort to artificial shielding through the installation of man-made barriers or application of automatic interference cancellation techniques."

[5] Ref: NTIA SP 01-43

[6] G. Hufford, et al, *A guide to the use of the ITS irregular terrain model in the area prediction mode*, Institute for Telecommunication Sciences, NTIA, April 1982

[7] SIA Technical Analysis, *ex parte* submission to 98-153, 10 JAN 2003

The geometry involved in the 15 m indoor case can be seen in figure 6. With the UWB device located at 15 meters, the roof will be approximately 3 meters higher. Calculations show that the near field limit is 245 meters and the transition region extends to 588 meters. The recommended approach to provide off-axis isolation in the transition region is to space the centerline of the antenna at least one antenna diameter away from any area occupied by man-made objects. This is the 25 meter height identified in figure 6. The distance, *R,* to clear this height is 200 meters for the 5° case, 100 meters in the 10° case, and 70 meters in the 15° case. However, we see that at these distances the building is in the near field of the antenna. Figures 7 and 8 show that there is no interference at these ranges when the beam is appropriately clear of the building.

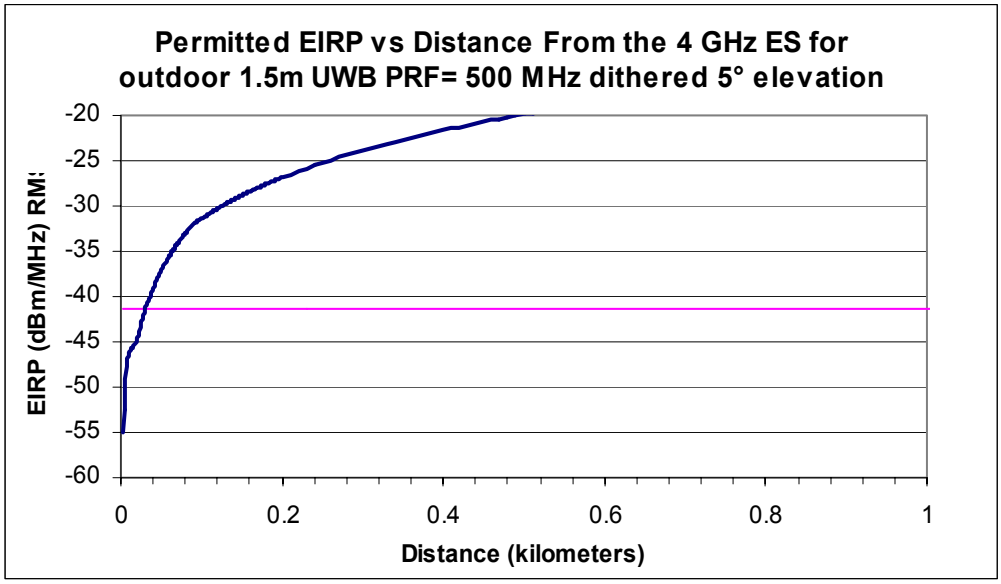

Figure 4. Allowed EIRP for 1.5 m handheld UWB at 5° elevation w/IESS-601 GE antenna

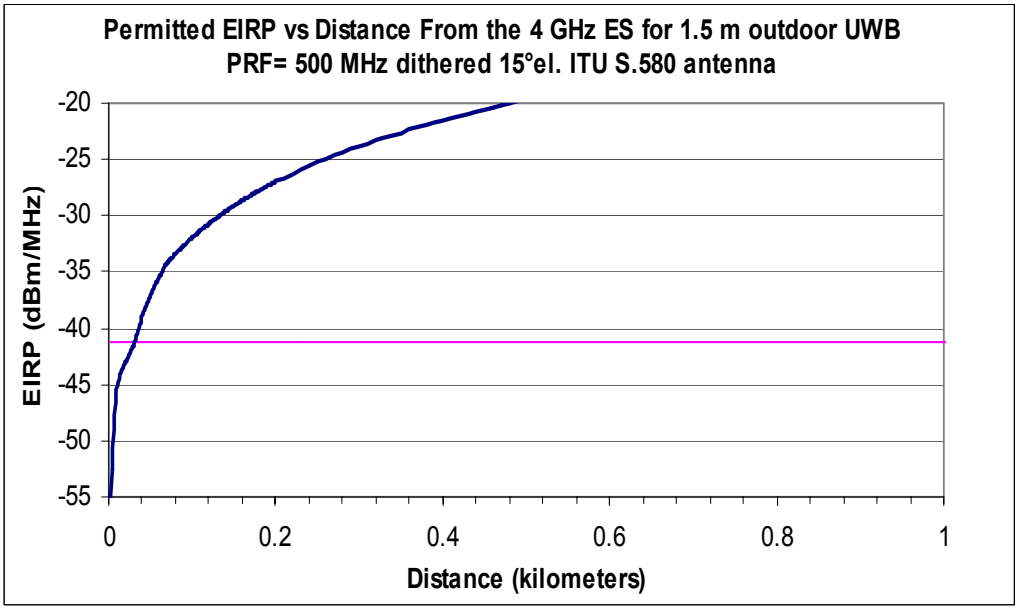

Figure 5. Allowed EIRP for 1.5 m handheld UWB at 15° elev. w/ITU S.580-5 antenna

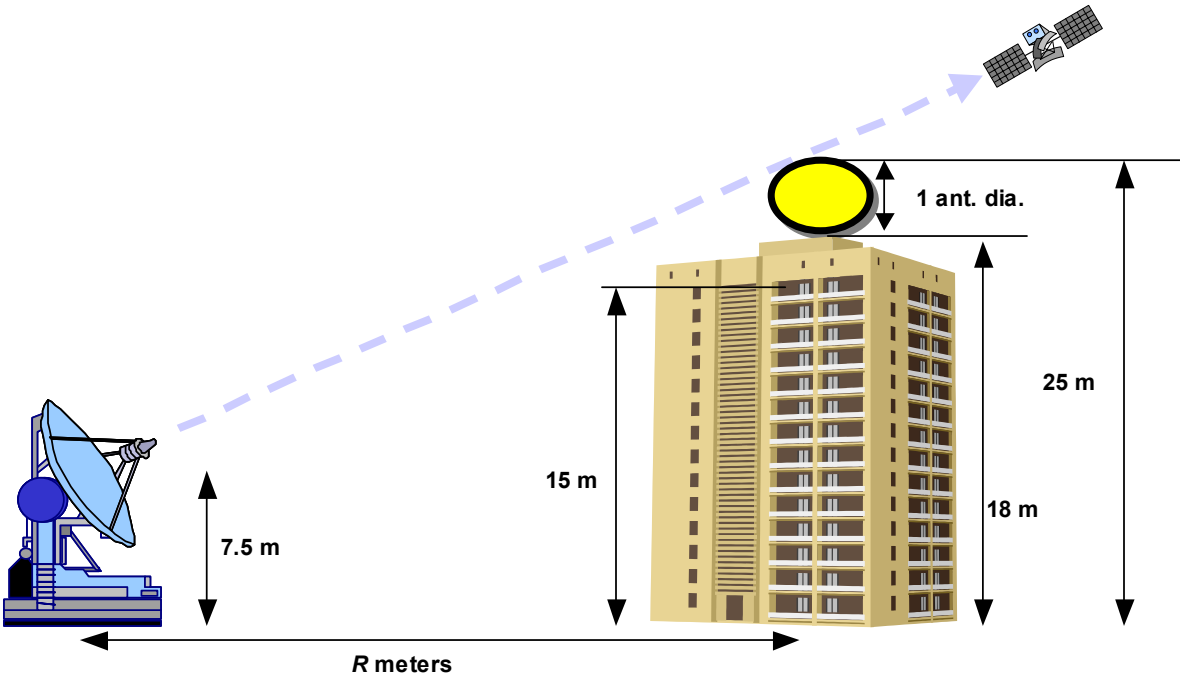

Figure 6. Earth Station geometry at low elevation angles

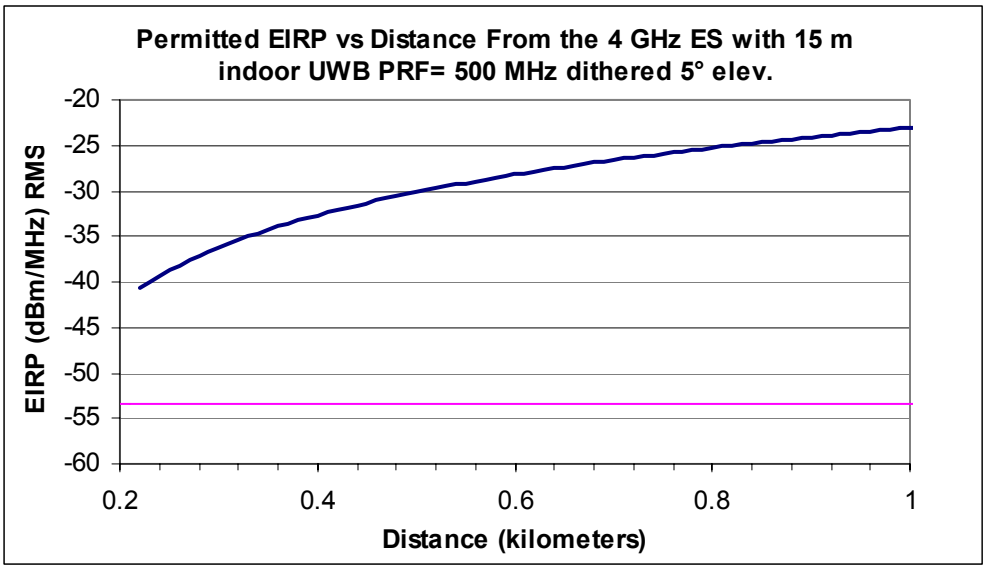

Figure 7. Allowed EIRP for 15 m indoor UWB at 5° elevation w/IESS-601 GE antenna

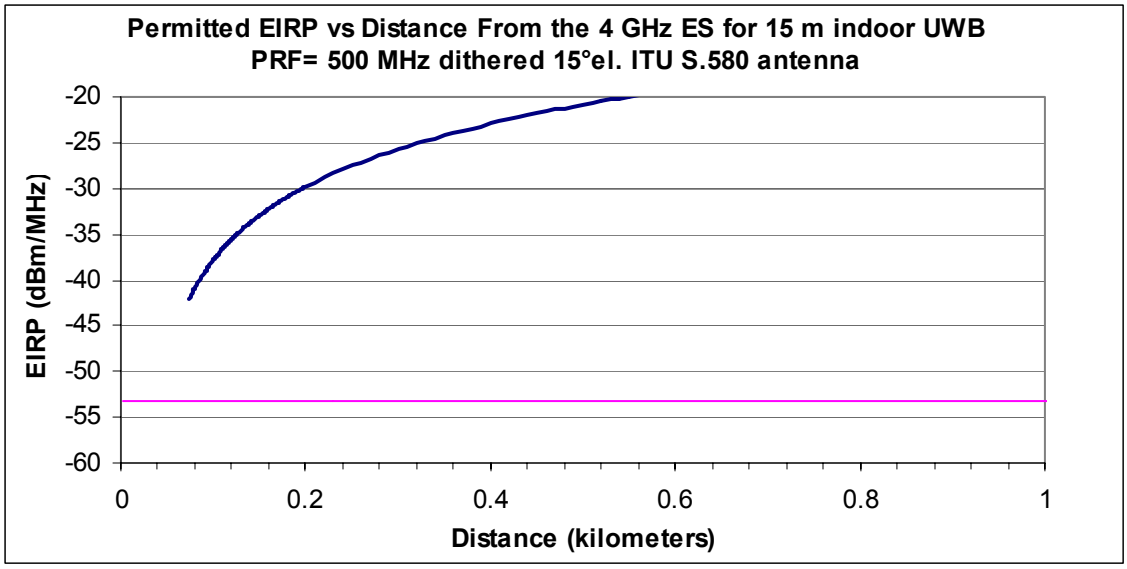

Figure 8 Allowed EIRP for 15 m indoor UWB at 15° elev. w/ITU S.580-5 antenna

Conclusion

The above calculations reflect a worst-case clear line of sight scenario along the main beam axis of the earth station. At the distances involved, the propagation losses are basically those expected for free-space propagation. The antenna of the UWB is aligned with the polarization of the earth station antenna, and oriented to exhibit maximum gain toward the earth station. For circularly polarized earth station antennas there will be an additional loss of 3 dB, and on average 3 dB less gain from the UWB device due to its antenna pattern effects. As shown, the clearance distance required to keep the antenna pattern from being destroyed by the building that contains the UWB device means that there can be no interference from UWB devices contained in buildings, or even on balconies or rooftops.

While we do not have access to the software used in the latest SIA filing, we have modified the Mathcad program provided by PanAmSat[8] to include the appropriate signal levels and antenna patterns. Figure 9 shows the response at 5° elevation with an IESS-GE standard antenna. As we see, the earth station is most susceptible to interference close to the azimuth boresite angle. Intervening foliage, berms, or fences will further reduce the signal level appearing at the earth station. Figure 9 shows the earth station is most susceptible for about 4% of its azimuth coverage.

Outdoor hand-held UWB transactions will typically last under a second and are not expected to occur frequently between random pedestrian traffic. Industry Canada has analyzed the impact of radio local area networks (RLAN) at 5 GHz[9] and has predicted, for various sized cities, a

[8] http://homepage.mac.com/montesquieu/FileSharing2.html
[9] Spectrum Engineering Branch, Industry Canada, "Simulation on Aggregate Interference from Wireless Access Systems including RLANs into Earth Exploration-Satellite Service in the 5250-5350 MHz Band", IEEE 802.11-RR-02/036, March 2002.

population density of 0.066 active units/km^2 for outdoor systems. This is for systems designed to support an outdoor infrastructure, something specifically prohibited for UWB by Sections 15.517(a)(1) and 15.519(a)(2). The vanishingly low probability of harmful interference depends on the joint probability that a handheld UWB device is actively transmitting, is close enough to a low-elevation earth station, is in the susceptible azimuth region, has its antenna oriented in the worst case direction, has the antenna aligned with a linearly polarized earth station antenna, lies along the boresite azimuth of the earth station antenna, has no other intervening people, fences, berms or foliage, and all at a moment when the earth station is suffering a fade deep enough to eat away its margin. The actual probability of all this occurring is essentially zero.

In summary, UWB systems will not cause harmful interference to an FSS Earth Station.

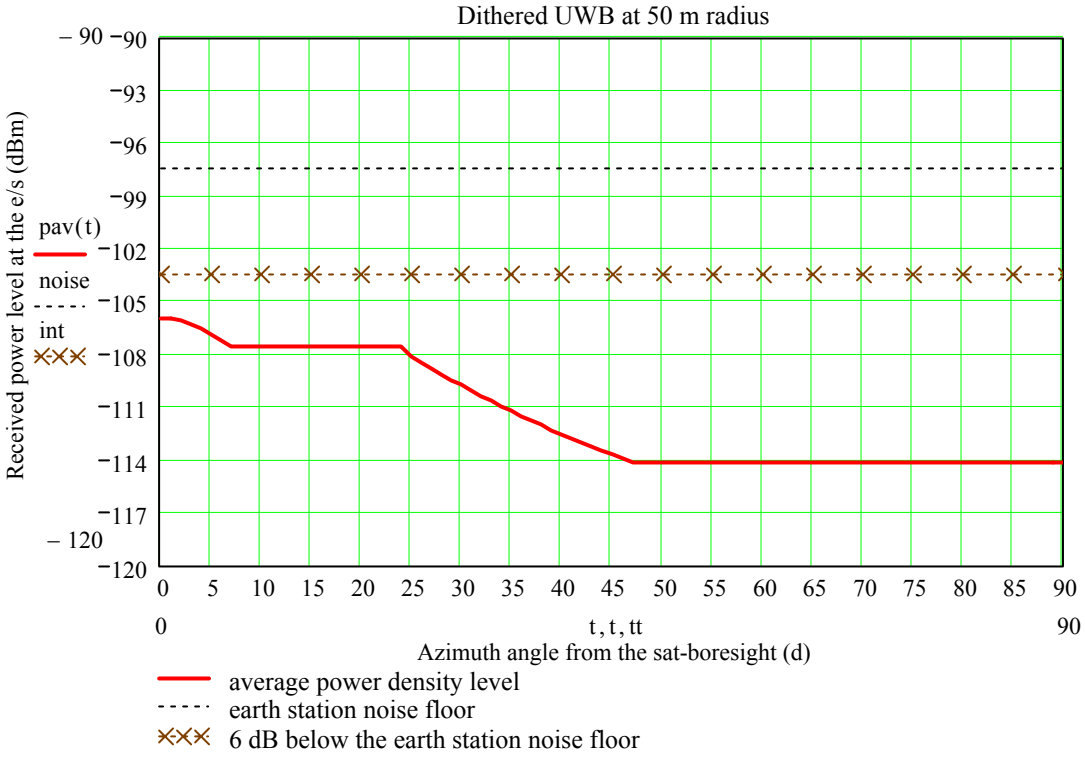

Figure 9 Expected signal level at GE standard 5° earth station from outdoor UWB at 50m radius

CERTIFICATE OF SERVICE

I, Deborah N. Lunt, a secretary for the law firm of Fletcher, Heald & Hildreth, P.L.C., hereby certify that a true copy of the foregoing "Opposition to Petition for Reconsideration of the Satellite Industry Association " was deposited this 4th day of September, 2003, for delivery via first class, United States mail, postage prepaid to the attached Service List, except by hand delivery and e-mail as indicated.

Deborah N. Lunt

***Denotes By Hand Delivery and E-mail**

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