Before the
Federal Communications Commission
Washington, D.C. 20554

In the Matter of	}	
	}	
Revision of Part 15 of the Commission's	}	
Rules Regarding Ultra-Wideband	}	ET Docket No. 98-153
Transmission Systems	}	

Reply Comments of Multispectral Solutions, Inc.

Multispectral Solutions, Inc. (MSSI) is pleased to submit these further reply comments in response to the Notice of Proposed Rule Making (NPRM), FCC 00-163, in the above referenced proceeding. These comments specifically address the 25 July 2001 e*x parte* presentation made by XtremeSpectrum, Inc. (XSI).

In its viewgraph presentation to the Commission, XSI makes the following assertions:

1. *"Aggregation effects will not cause significant interference."*

2. *"Short range: Devices closer than about 10 meters share a common RF channel, and must reduce power, duty cycle, or both to function properly."*

3. *"Longer range: Indoor UWB signals propagate poorly, so signals from devices more than about 10 meters apart cannot add significantly."*

4. *"The specter of multiple, nearby UWB emitters all operating simultaneously at full power cannot come to pass."*

5. *"There is less interference from an office building with hundreds or thousands of UWB emitters than from 2.5 full-time UWB emitters at the same distance as the nearest emitter."*

Unfortunately, such claims are without basis in fact and are in conflict with the well documented results previously submitted under this proceeding by Government, university and commercial respondents.

XSI Claim 1: *"Aggregation effects will not cause significant interference."*

To date, the only documented results submitted in this proceeding relating to the aggregate effects of UWB emissions can be found in NTIA reports [1], [2]; a University of Texas – Austin (UT-Austin) report [3] and the companion Johns Hopkins University/Applied Physics Laboratory (JHU/APL) Final Report [4]; and technical Appendix C of the 27 October 2000 Reply Comments of Time Domain Corporation (TDC) [5].

The NTIA concluded in [1] from its measurement data [2] that "the well-accepted principle of linear addition of average (RMS) power from multiple sources holds equally well for average (RMS) power per unit bandwidth regardless of the nature of the UWB signal."

In the JHU/APL analysis [4] of the UT-Austin measurement data [3], the authors state that "the relationships [Normalized C/No vs. number of emitters] are nearly linear when plotted as function of 2N" and "[t]herefore, the theory that UWB signals add like Gaussian noise is demonstrated by the test result."

Figure 15, "Combined Radiated Emissions of Multiple UWB Transmitters", in TDC Appendix C [5] confirmed TDC's conclusion that "the power seems to add as white noise."

XSI Claim 2: ***"Short range: Devices closer than about 10 meters share a common RF channel, and must reduce power, duty cycle, or both to function properly."***

Not all UWB systems are constructed as envisioned by XSI. Several modern UWB systems, for example, utilize a combination of frequency division multiplex (FDM) and time division multiple access (TDMA) to accommodate multiple users as well as network configuration and management data for *ad hoc* wireless applications. One such system was recently fielded by MSSI and utilized wideband, orthogonal frequency channels in which multiple UWB emitters transmit simultaneously in close proximity. In three other developmental efforts, MSSI has incorporated FDM UWB for multi-user wireless intercom systems operating in severe multipath environments.

Thus, the assumption that all UWB manufacturers will produce cooperative, purely TDMA systems as implemented by XSI is false.

XSI Claim 3: ***"Longer range: Indoor UWB signals propagate poorly, so signals from devices more than about 10 meters apart cannot add significantly."***

That this claim is also without basis in fact is shown by way of the following examples.

In Figure 1 below, test results from an indoor UWB geolocation system are illustrated (Fontana [6]). UWB beacons were positioned within a commercial office suite; and the position of a UWB tag was measured through the use of time-of-flight measurement data obtained via the transponder system. The *peak* field strength intensity for each of the individual UWB transmitters was measured at 7.3 μV/m at 3 meters in a 1 MHz bandwidth. The maximum range achieved in these tests (not shown) was 340 feet, through multiple walls and other obstructions.

Figure 2 illustrates the results from using four UWB beacons, two located *inside* near windows and two located in an adjacent parking lot. Note that the signals from the two units inside were received more than 50 feet away in the parking lot. This latter example serves to debunk the claim made by XSI in its viewgraph entitled "Indoor UWB Operations in 'Glass' buildings" that "[e]ven buildings whose outer surface is mostly glass help to protect outdoor GPS from indoor UWB devices."

Figure 1. Measurement Results from Indoor UWB Geopositioning System.

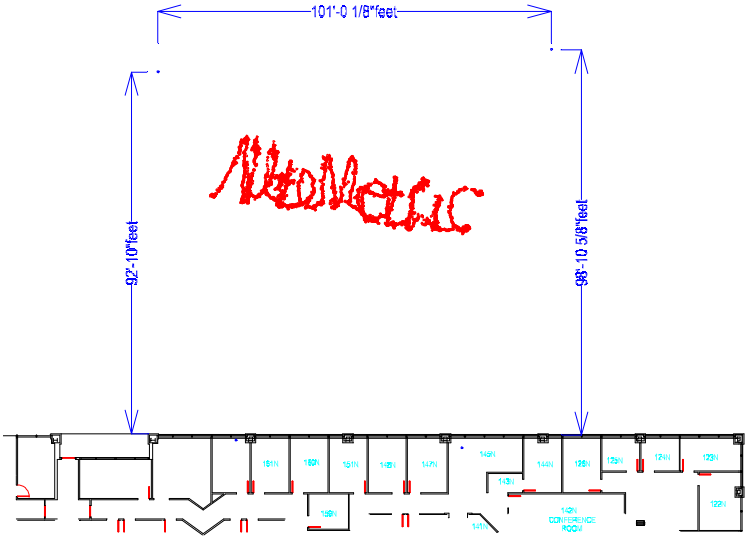

Figure 2. Indoor-to-outdoor Propagation of UWB Signals.

XSI Claim 4: ***"The specter of multiple, nearby UWB emitters all operating simultaneously at full power cannot come to pass."***

Part 15 devices cannot be controlled based upon user density, and the FCC must consider the widespread proliferation of UWB devices as projected by XSI and others. (See also remarks to XSI Claim 2 above.)

XSI Claim 5: ***"There is less interference from an office building with hundreds or thousands of UWB emitters than from 2.5 full-time UWB emitters at the same distance as the nearest emitter."***

This claim is completely unsubstantiated and is contrary to recent test data provided by the NTIA and other. (See also remarks to XSI Claim 1 above.)

In conclusion, the interference effects of UWB transmissions to existing spectrum users has been well documented. The introduction of UWB above 3.1 GHz (or 5.46 GHz as has also been proposed) is the obvious solution to a proceeding that continues to be mired in unnecessary controversy.

Respectfully submitted,

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[2] Kissick, W.A., editor, "The Temporal and Spectral Characteristics of Ultrawideband Signals," NTIA Report 01-383, U.S. Department of Commerce, January 2001, "Appendix E. Summary of Aggregate Measurements," pp. E-1 through E-9.

[3] Cardoza, M. et al., "Final Report Data Collection Campaign for Measuring UWB/GPS Compatibility Effects," TL-SG-01-01, 26 February 2001, sections 3.4.2, 4.3, 6.1.4 and 7.5.

[4] "Final Report Ultra WidebandGPS Compatibility Analysis Report," Strategic Systems Department, The Johns Hopkins University/Applied Physics Laboratory, 8 March 2001, "Appendix G Analysis of Aggregate Ranging Data", pp. G-1 through G-6.

[5] "Technical Appendix C to the October 27, 2000, Reply Comments of Time Domain Corporation, Revision A," 20 February 2001, Time Domain Corporation, pp. 48-50.

[6] Fontana, R.J., "Experimental Results from an Ultra Wideband Precision Geolocation System," EuroEM 2000, Edinburgh, Scotland, 30 May 2000, to be published in Ultra-Wideband, Short-Pulse Electromagnetics, Kluwer Academic/Plenum Publishers.