XtremeSpectrum, Inc.
Form 442

EXHIBIT

XtremeSpectrum, Inc. requests a license in the Experimental Radio Service to refine an ultra-wideband modulation for communications purposes. No radar operations will be conducted.

All operations under this license will conform to the rules proposed for ultra-wideband communications devices in ET Docket No. 98-153.[1]

Technical Characteristics

Bandwidth:	2-10 GHz (at -12 dB points)
Field Strength (maximum):	500 uV/m at 3m into 1 MHz bandwidth[2]
Field Strength (average across 2-10 GHz):	approx. half the maximum
Power Spectral Density:	0.075uW/MHz (-71dBW/MHz)
Total Transmit Power:[3]	(0.075uW/MHz) * (approx. 5 GHz) = 375uW
Antenna Gain:	0 dBi
Radiated Emissions in GPS band:	less than 125 uV/m at 3m into a 1 MHz bandwidth at all frequencies below 2 GHz[4]

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[1] *See* Revision of Part 15 of the Commission's Rules Regarding Ultra-Wideband Transmission Systems , ET Docket No. 98-153, Notice of Proposed Rule Making, FCC 00-163 (released May 11, 2000) ("Notice").

[2] This field strength corresponds to Sections 15.209 (maximum emissions in bands not otherwise specified) and 15.109 (Class B digital devices). *See* Notice at para. 39. Maximum field strength occurs at about 4 GHz.

[3] This calculation sums across 5 GHz rather than 8 GHz to allow for the fact that 0.075uW/MHz represents the maximum, which is approximately twice the average power density.

[4] This level corresponds to the Commission's proposal of a 12 dB reduction below Section 15.209 levels at frequencies less than 2 GHz. *See* Notice at para. 39.

Modulation:	pseudo-noise-encoded bi-phase modulated wavelet
Peak/Average Ratio:	below 5 dB

A Note on Modulation

The Notice assumes that ultra-wideband systems necessarily transmit a train of very brief pulses. Accordingly, the Notice expects a "spiky" waveform with a high peak-to-average ratio. To accommodate such waveforms, the Notice proposes three distinct peak-to-average limits:[5]

(1) over a bandwidth of 50 MHz: 20 dB

(2) over the entire occupied bandwidth: [20 + 20log[10](-10 dB occupied bandwidth in Hertz/50 MHz)] dB.

(3) absolute maximum: 60 dB. This limit will control over (2) above for any occupied bandwidth over 5 GHz.

Most ultra-wideband systems other than XtremeSpectrum's produce pulse trains with a pulse repetition frequency (PRF) in the 0.1-100 MHz range. These waveforms have high peak-to-average ratios (>20 dB). Receivers with bandwidths higher than the PRF are sensitive to the relatively high peak energy in a single pulse, as opposed to the much lower average energy over the pulse train.[6] The proposed peak-to-average ratios anticipate this scenario.

XtremeSpectrum's modulation, however, differs from those anticipated by the Notice. XtremeSpectrum greatly reduces the threat of interference with a modulation having a very low peak-to-average ratio -- below 5 dB across any bandwidth -- and by operating with a PRF above 1 GHz, which is higher than all receiver bandwidths in the 2-10 GHz operating range.

Proposed Limitations

In addition to compliance with the technical specifications above, operation under this license will be subject to the following limitations:

1. Indoor operation only. The XtremeSpectrum system sees 10*F dB/m attenuation (F in GHz) through rebar concrete. For example, a rebar wall 50 cm thick will impose about 10-50 dB attenuation across the occupied bandwidth. Considering the minuscule power levels originating from the transmitter, this leaves very little energy to reach a potential interference victim.

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[5] Notice at para. 43.

[6] *See* Notice at para. 35.

2. No operation within 10 km of an airport handling commercial aviation. Although XtremeSpectrum is confident this condition is wholly redundant, we offer it in hopes of reassuring the aviation community that a grant of this license cannot cause it any conceivable harm. We also expect operation under the license to generate real-world data that helps to confirm this condition is unnecessary.

3. No operation of more than 10 transmitters simultaneously within a radius of 1km. This condition likewise is redundant, and offered in a spirit of reassurance as to the cumulative effects of multiple devices.[7]

4. Because transmitters operated under this license will not be certified, XtremeSpectrum will retain full control over every unit, and will be in a position to cease operation promptly on all transmitters if the Commission should require it.

Anticipated Experimental Performance

XtremeSpectrum expects to attain a data throughput of 100 Mbps at 10 meters range, with a bit error rate of 10^{-5} under a 10 dB link margin. The radio is fading immune, so all of the link margin is available for indoors materials penetration.

The system is software programmable as to data rate, scalable from 1-100Mbps, and is subject to classical trade-offs among output power, range, and data-rate.

Applications

In the long run, XtremeSpectrum's wireless technology will enable high data rate wireless connection of intelligent electronic devices -- Internet music (MP3 and other players), voice over IP cordless phones, digital still cameras, digital camcorders, digital projectors, web pads, and PDA & PDA-cellphone combinations, as well as more traditional LAN-type PC-PC, PC-printer, and PC-Internet connections. XtremeSpectrum will use its experimental license to test several of these applications.

Conclusion

A grant of the requested license will further the development of potentially valuable radio technologies with no prospect of significant interference, harmful or otherwise, to any other user of the spectrum.

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[7] *See* Notice at 34, 46-47.