American Telecommunications Certification Body Inc.
6731 Whittier Ave, McLean, VA 22101

October 21, 2003

RE: FCC ID: RIM-IMON_ATCB000839

Attention: Rick McMurray / Kathy Grzovic

I have a few comments on this Application.

1. The 731 states the device operates under Part 15, 18 and 25. Please explain.

Response: The aspects of the device subject to certification fall under Part 15 only. Part 18 and 25 were incorrectly included on the 731 form. A revised 731 form is uploaded with this response.

2. Please note that in accordance with 2.1033, block diagrams must contain the frequencies of all clocks and their paths. Please note that the block diagram provided does not contain this information.

Response: Please refer to the revised block diagram uploaded with this response.

3. Please note that while part 18 and part 25 may have their own particular statements to be included in the manual, the 2-condition statement is a part 15 only statement. Reference to these two conditions therefore should only reflect part 15.

Response: Please refer to the manual uploaded with this response.

4. While you have provided a letter from the manufacturer that the device will be professionally installed, this information needs to be contained in the user manual and a sample of the installation instructions need to be provided. These installation instructions must also clearly indicate that when using a YAGI antenna the power must be appropriately reduced. Please provide the installation instructions for this device.

Response: Please refer to the installation manual uploaded with this response. The reference to the YAGI antenna power issue is on page 12 of the manual. The units will be installed by personnel trained by Luna iMonitoring. The professional installer will utilize the installation manual and the necessary PDA software to install and provision the units. The user does not have access to the installation software, and none of the actions described in the installation manual are available to the user.

5. Please note that in the photo "iTLM-1 RF SECTION BOTTOM" there appears to be another rf connector. This connector is not on the other models. Please explain this connector.

Response: The iTLM-1 contains an ultrasonic transducer that meets the definition of 18.107(f) and is subject to verification under Part 18 as a non-consumer ISM device. The connector in question connects to the ultrasonic transducer. A verification report exists for this aspect of the device.

6. The description of the hop sequencing for the device is unclear. It appears from the description that all transmitters may be hopping in step with each other. It appears that the device transmits the hop sequence after 53 hops, thus repeating the same pattern. Also, it appears that the modulation of the hop frequency is off most or at least a large part of the time, however, the device apparently continues hopping. This would seem to violate the condition whereby a FHSS device starts at the next hop channel in the table for the next transmission. It may even appear as if the device even continues transmitting the hop channels without modulation. Please note that the definition of a FHSS system is "A spread spectrum system in which the carrier is modulated with the coded information in a conventional manner causing a conventional spreading of the RF energy about the frequency carrier. " If the carrier is not modulated, it cannot spread the rf energy and thus is not a "spread Spectrum" device. Please clarify and explain the pseudorandom hopping of this system.

Response: Please refer to the explanation uploaded with this response.

7. Please note that a modification appears to have been made to the device to make it comply. Please provide a letter from the manufacturer that this modification will be installed in all devices. Also, please provide revised schematics showing the inclusion of the modifications performed on the device.

Response: Please refer to the cover letter exhibit and revised schematics, with notes, uploaded with this response.

8. Please note that the operational description says that The Microprocessor, radio, RF AMP, RF Switch, JTAG, RTC, LDO and Analog front end to the analog interfaces are all the same circuits and components. Please also note that the justification letter states the circuitry in the rf is 'identical'. However, because the digital circuitry is different in all three devices and because this additional circuitry may cause significant variations in at least the radiated emissions of each individual device, it is not possible to determine the worse case emissions by arbitrary selection as stated in the report. Please provide evidence that the device used in testing produced the worse case emissions.

Response: Based on an engineering investigation of the iEFM, iTLM-1, and iWPM-T schematics, PCB layout and mechanical assembly, we confirmed the manufacturer's attestation that the RF portions of each device were identical. As further justification, the conducted output power of each device was tested on three channels to see if any single device had a significantly higher output power. No device had a significant difference in output power. The motivation for this investigation was the theory that if one of the devices had a significant power difference, this difference would also appear in the harmonic and spurious radiation, therefore requiring further investigation of that device or devices. Since no significant variation was found, other characteristics were investigated to see if they would have an effect on emissions. We determined that the iTLM-1 would represent a worst case device because of the presence of the ultrasonic transducer, and the physical length of the transducer housing. Additionally, the emissions from the digital portions all three devices were tested and found to be compliant with significant margins. Individual verification reports are on file for all three devices.

9. Please note that for the dwell time you have only shown that in a 1 sec sweep the dwell is only 390ms. However, the limit is 400ms within a 20 second time frame. Please explain how this shows compliance. Please note that from the explanation of the FHSS hopping description you have a condition where the 333ms dwell rate may exceed the 400ms over 20 seconds. (53 channels each dwelling at 333ms = 17.69seconds. This means that in the next hop sequence it may be possible for the 333ms dwell to exceed channel occupancy limits. This would be an analyzer setting of 20 seconds showing the number of 333ms pulses occurring. This would mean that only one 333mx transmission would be allowed during that 20 seconds on any one channel). Please explain and show that under the long dwell condition the device is compliant during the full 20 seconds time limit.

Response: In discovery mode, a transmitting device alternates between hopping with 1ms dwell time and hopping with 15ms dwell time. Transmission occurs on all 53 channels with 1ms dwell time followed by a single 15ms dwell at the next frequency. The device then stops transmission to listen for a response for approximately 8ms on the same channel, and then restarts hopping with 1ms dwell time on all 53 channels followed by a 15ms dwell at the next frequency, etc. In this way, the channel with 15ms dwell time advances one position in the hop sequence for each 15ms dwell occurrence (which occurs every 76ms). Thus one 15ms dwell occurs for all 53 channels in the space of 4.028 seconds, and the whole sequence then repeats, typically until discovery of any potential target receiver(s) is complete. The net result is that each channel is occupied for 69 milliseconds in any 4.028 seconds interval, and in any case not more than 400ms in any 20 second period.

In normal transmission, a transmitting device channel hops in a pre-defined pseudo random sequence of 53 steps. Hopping is in synchronism with its target receiver with a hop rate of 3 hops per second. Any one channel is occupied for 333ms in this hop sequence which repeats after 53/3 seconds (17.667 seconds). In any case each channel in the hop sequence occupies no more than 400ms in any 20 second period.

10. FYI - Your documentation states that with the Yagi antenna a reduction in power is required. Please note that the Yagi antenna listed has a gain of 8.65dBi. The device has a conducted power output of 17.7dBm (59mW). The limit for a FHSS device in the 902 to 928MHz range using more than 50 hopping channels (your device is said to use 53) is 1 Watt (30dBm). This means with a 6dB gain antenna the device could output an EIRP of 36dBm. Reduction would then have to occur. With the conducted power listed this means that an antenna with a gain of almost 18dBi could be used before an equivalent reduction would have to occur. Unless the reason for reducing the power for the Yagi is for radiated emissions compliance, by not reducing the conducted power of this device, the range using the Yagi could be significantly increased.

Response: The power reduction was indeed necessary for radiated emissions compliance.

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The items indicated above must be submitted before processing can continue on the above referenced application. Failure to provide the requested information may result in application termination.
Correspondence should be considered part of the permanent submission and may be viewed from the Internet after a Grant of Equipment Authorization is issued.
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