Indian Hill
Hardware Compliance Test Laboratory
Electromagnetic Compatibility Test Report

Tested Product:
TrailScout sensor system

Type of Test:
FCC Part 15, Subpart C, INTENTIONAL RADIATORS

CERTIFICATION OF REPORT

This report has been prepared by the Indian Hill Global Hardware Compliance and Engineering Analysis Group to document compliance of the device described below to FCC Part 15, Subpart C, INTENTIONAL RADIATORS. This report may be reproduced in full, partial reproduction may only be made with written consent of the laboratory. The results in this report apply only to the sample tested.

Applicant: Ultrec Engineered Products

Manufacturer: Ultrec Engineered Products

Model Name: TrailScout sensor system

Model Numbers: TSS1 & TSR1

Test Engineer:

Nilesh Patel

Approving Manager:

Phil Fair

Test Start Date:
March 06, 2006

Test End Date:
March 14, 2006

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1 CLIENT INFORMATION

1.1 Applicant:

Company Name: Ultrec Engineered Products
860 Maple Ridge Lane
Brookfield, WI 53045

Contact Name: John Kitscha
Title: Engineering Manager

1.2 Manufacturer:

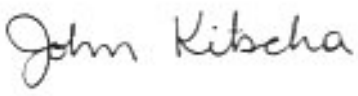
Company Name: Ultrec Engineered Products
860 Maple Ridge Lane
Brookfield, WI 53045

Contact Name: John Kitscha
Title: Engineering Manager

1.3 Party Responsible for Declaration of Conformity:

Company Name: Ultrec Engineered Products
860 Maple Ridge Lane
Brookfield, WI 53045

Contact Name: John Kitscha
Title: Engineering Manager

Signature: 

2 EQUIPMENT UNDER TEST (EUT)

2.1 Identification of EUT:

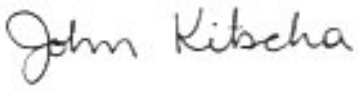
Brand Name:	Ultrec
Model Name/Number:	TSS1 & TSR1
Options Fitted:	ANT-418-CW-QW & ANT-418-CW-QH

2.2 Description of EUT:

The Trail-Scout sensor system allows you to detect motion in any area around you. Both the Sensor and Receiver are battery-operated systems. The TrailScout sensor system is designed to work with up to 4 sensors and 1 receiver. Each sensor can be set at a different channel, therefore providing sensing coverage of 4 different areas. Each sensor contains a PIR (pyroelectric infrared sensor). Infrared radiation exists in the electromagnetic spectrum at a wavelength that is longer than visible light. It cannot be seen but it can be detected. Objects that generate heat also generate infrared radiation and those objects include animals and the human body.

2.3 Modifications on EUT:

There were no modifications or special accessories required to comply with the specification.

Signature: 

Typed Name: John Kitscha

Title: Engineering Manager

3 TEST SPECIFICATION, METHODS AND PROCEDURES

3.1 Test Specification:

Title: FCC Part 15, Subpart C, INTENTIONAL RADIATORS

Purpose of Test: The test was performed to qualify the EUT to FCC Part 15, Subpart C, INTENTIONAL RADIATORS, Section 15.209, Radiated Emission Limits, General Requirements and Section 15.231, Additional Provisions - Periodic operation in the band 40.66 - 40.70 MHz and above 70 MHz.

3.2 Methods & Procedures:

3.2.1 Radiated emission limits, general requirements - Section 15.209.

(a) Except as provided elsewhere in this Subpart, the emissions from an intentional radiator shall not exceed the field strength levels specified in the following table:

Frequency (MHz)	Field Strength (microvolts/meter)	Measurement Distance (meters)
0.009 - 0.490	2400/F(kHz)	300
0.490 - 1.705	24000/F(kHz)	30
1.705 - 30.0	30	30
30 - 88	100 **	3
88 - 216	150 **	3
216 - 960	200 **	3
Above 960	500	3

** Except as provided in paragraph (g), fundamental emissions from intentional radiators operating under this Section shall not be located in the frequency bands 54-72 MHz, 76-88 MHz, 174-216 MHz or 470-806 MHz. However, operation within these frequency bands is permitted under other sections of this Part, e.g., Sections 15.231 and 15.241.

(b) In the emission table above, the tighter limit applies at the band edges.

(c) The level of any unwanted emissions from an intentional radiator operating under these general provisions shall not exceed the level of the fundamental emission. For intentional radiators which operate under the provisions of other Sections within this Part and which are required to reduce their unwanted emissions to the limits specified in this table, the limits in this table are based on the frequency of the

unwanted emission and not the fundamental frequency. However, the level of any unwanted emissions shall not exceed the level of the fundamental frequency.

(d) The emission limits shown in the above table are based on measurements employing a CISPR quasi-peak detector except for the frequency bands 9-90 kHz, 110-490 kHz and above 1000 MHz. Radiated emission limits in these three bands are based on measurements employing an average detector.

(e) The provisions in Sections 15.31, 15.33, and 15.35 for measuring emissions at distances other than the distances specified in the above table, determining the frequency range over which radiated emissions are to be measured, and limiting peak emissions apply to all devices operated under this Part.

(f) In accordance with Section 15.33(a), in some cases the emissions from an intentional radiator must be measured to beyond the tenth harmonic of the highest fundamental frequency designed to be emitted by the intentional radiator because of the incorporation of a digital device. If measurements above the tenth harmonic are so required, the radiated emissions above the tenth harmonic shall comply with the general radiated emission limits applicable to the incorporated digital device, as shown in Section 15.109 and as based on the frequency of the emission being measured, or, except for emissions contained in the restricted frequency bands shown in Section 15.205, the limit on spurious emissions specified for the intentional radiator, whichever is the higher limit. Emissions which must be measured above the tenth harmonic of the highest fundamental frequency designed to be emitted by the intentional radiator and which fall within the restricted bands shall comply with the general radiated emission limits in Section 15.109 that are applicable to the incorporated digital device.

(g) Perimeter protection systems may operate in the 54-72 MHz and 76-88 MHz bands under the provisions of this section. The use of such perimeter protection systems is limited to industrial, business and commercial applications.

3.2.2 Periodic operation in the band, 40.66 - 40.70 MHz and above 70 MHz - Section 15.231.

(a) The provisions of this Section are restricted to periodic operation within the band 40.66 - 40.70 MHz and above 70 MHz. Except as shown in paragraph (e) of this Section, the intentional radiator is restricted to the transmission of a control signal such as those used with alarm systems, door openers, remote switches, etc. Continuous transmissions, voice, video and the radio control of toys are not permitted. Data is permitted to be sent with a control signal. The following conditions shall be met to comply with the provisions for this periodic operation:

(1) A manually operated transmitter shall employ a switch that will automatically deactivate the transmitter within not more than 5 seconds of being released.
(2) A transmitter activated automatically shall cease transmission within 5 seconds after activation.
(3) Periodic transmissions at regular predetermined intervals are not permitted. However, polling or supervision transmissions, including data, to determine system integrity of transmitters used in security or safety applications are allowed if the total duration of transmissions does not exceed more than two seconds per hour for each transmitter. There is no limit on the number of individual transmissions, provided the total transmission time does not exceed two seconds per hour.

(4) Intentional radiators, which are employed for radio control purposes during emergencies involving fire, security, and safety of life, when activated to signal an alarm, may operate during the pendency of the alarm condition.
(5) Transmission of set-up information for security systems may exceed the transmission duration limits in paragraphs (a)(1) and (a)(2) of this section, provided such transmission are under the control of a professional installer and do not exceed ten seconds after a manually operated switch is released or a transmitter is activated automatically. Such set-up information may include data.

(b) In addition to the provisions of Section 15.205, the field strength of emissions from intentional radiators operated under this Section shall not exceed the following:

Fundamental Frequency (MHz)	Field Strength of Fundamental (microvolts/meter)	Field Strength of Spurious Emissions (microvolts/meter)
40.66 - 40.70	2,250	225
70 - 130	1,250	125
130 - 174	1,250 to 3,750 **	125 to 375 **
174 - 260	3,750	375
260 - 470	3,750 to 12,500 **	375 to 1,250 **
Above 470	12,500	1,250

** linear interpolations

[Where F is the frequency in MHz, the formulas for calculating the maximum permitted fundamental field strengths are as follows: for the band 130-174 MHz, uV/m at 3 meters = 56.81818(F) - 6136.3636; for the band 260-470 MHz, uV/m at 3 meters = 41.6667(F) - 7083.3333. The maximum permitted unwanted emission level is 20 dB below the maximum permitted fundamental level.]

(1) The above field strength limits are specified at a distance of 3 meters. The tighter limits apply at the band edges.
(2) Intentional radiators operating under the provisions of this Section shall demonstrate compliance with the limits on the field strength of emissions, as shown in the above table, based on the average value of the measured emissions. As an alternative, compliance with the limits in the above table may be based on the use of measurement instrumentation with a CISPR quasi-peak detector. The specific method of measurement employed shall be specified in the application for equipment authorization. If average emission measurements are employed, the provisions in Section 15.35 for averaging pulsed emissions and for limiting peak emissions apply. Further, compliance with the provisions of Section 15.205 shall be demonstrated using the measurement instrumentation specified in that section.
(3) The limits on the field strength of the spurious emissions in the above table are based on the fundamental frequency of the intentional radiator. Spurious emissions shall be attenuated to the

average (or, alternatively, CISPR quasi-peak) limits shown in this table or to the general limits shown in Section 15.209, whichever limit permits higher field strength.

3.2.3 Test Procedure

Testing for radiated emissions was done in two steps. First the testing was done in a semi anechoic chamber to determine the peak frequencies radiated by the EUT. This testing was done by placing the EUT on a non-conductive surface located 3-meters from the measurement antenna. The EUT was placed on a turntable and rotated 360 degrees while the measurement antenna was scanned in height from 1-2 meters.

Emissions were compared to Section 15.209, Radiated Emission Limits for General Requirements and Section 15.231, Spurious Emissions Limits for Periodic operation in the band 40.66 - 40.70 MHz and above 70 MHz.

The fundamental transmit frequency of the sensor unit was compared to the Section 15.231, Fundamental Emissions Limits for Periodic operation in the band 40.66 - 40.70 MHz and above 70 MHz.

The second step involved testing the EUT at the Open Area Test Site (OATS). The fundamental frequency of the sensor unit at 418MHz was re-measured at 3-meter distance but now with a 4-meter antenna height scan. Measurements were made, both for horizontal and vertical polarity.

4 OPERATION OF EUT DURING TESTING

4.1 Operating Environment:

Power Supply: Both, Sensor and Receiver units operate on 9V DC Batteries

4.2 Operating Modes:

The sensor unit was programmed to transmit continuously in order to activate the receiver unit and to make it possible to take emissions measurement in the full frequency range. The receiver's vibration mode was turned on during the test.

4.3 Test Configuration:

Figure 4.3a: Setup of sensor and receiver at 3-meters from antenna

4.4 Test Results

4.4.1 Radiated emissions:

4.4.1.1 Sensor with Receiver (Short Antenna), General Requirement Limits

Frequency (MHz)	Polarity	Receiver Reading (dBµV)	Gain/Loss Factor (dB)	Correction Factor (dB)	Field Strength (dBµV/m)	Limit (dBµV/m)	Margin (dB)
75.1403	Horz	11.45 pk	0.7	9.1	21.25	40	-18.75
80.1933	Vert	19.69 pk	0.6	7.7	27.99	40	-12.01
117.5857	Vert	11.89 pk	0.8	6.7	19.48	43.5	-24.02
386.4628	Vert	11.18 pk	1.8	15	27.98	46	-18.02

4.4.1.2 Sensor with Receiver (Long Antenna), General Requirement Limits

Frequency (MHz)	Polarity	Receiver Reading (dBµV)	Gain/Loss Factor (dB)	Correction Factor (dB)	Field Strength (dBµV/m)	Limit (dBµV/m)	Margin (dB)
80.0249	Vert	19.44 pk	0.7	7.8	27.94	40	-12.06
88.1097	Vert	12.21 pk	0.9	6.6	19.71	43.5	-23.79
117.2488	Vert	11.33 pk	0.8	6.7	18.83	43.5	-24.67
237.5107	Vert	12.81 pk	1.3	10.3	24.41	46	-21.59
376.4192	Vert	8.31 pk	1.8	14.5	24.61	46	-21.39
994.7595	Vert	10.48 pk	3.0	23.3	36.78	54	-17.22

4.4.1.3 Sensor (Transmitter), Additional Provisions Limits

Frequency (MHz)	Polarity	Receiver Reading (dBµV)	Gain/Loss Factor (dB)	Correction Factor (dB)	Field Strength (dBµV/m)	Limit (dBµV/m)	Margin (dB)
418.11	Vert	59.47 qp	1.9	15.4	76.77	79.9	-3.13
418.11	Horz	50.49 qp	1.9	15.4	67.79	79.9	-12.11

Measurement Uncertainty

The measurement uncertainty (with 95% confidence level) for this test at 418 MHz was 2.96dB@ 3 meters.

RESULT

The EUT complied with the specification limit by a margin of -3.13 dB.

4.4.2 Sample of Conversion of Receiver reading to dBuV/m

Signal level in dBμV/m = 107 + Cable loss (dB) + Antenna factors (dB) + Signal level (dBm)

Frequency:	81.9 MHz
Resolution BW:	30 KHz
Peak meas.:	-81.29 dBm
QP meas.:	-85.0 dBm
QP Limit (10m):	39.1 dBμV/m
Cable loss:	2.51 dB
Ant. Factor:	7.09 dB
Meas. distance:	10m

Measurements in dBμV/m = 107 + Cable loss (dB) + Antenna factor (dB) + Measurement in dBm
= 107 + 2.51 + 7.09 – 85 (QP)
= 31.6 dBμV/m
Therefore the margin is = -7.5 dBμV/m (QP)

APPENDIX 1: TEST SITE AND TEST EQUIPMENT

EMC Laboratory 1 is a 31' x 18' x 8.5' semi-anechoic chamber. It is built as a six-sided screen room with pyramidal absorber material on five sides. The floor subsurface is a bronze screen that bonds intimately with the room's metal skin, forming a ground plane. The subsurface is covered with a layer of 1/4" Masonite to provide a smooth working surface. A 10' remote-controlled flush-mounted turntable provides 360 degree rotation of the (EUT) for radiated emission testing. The receiving antenna is set 3 meters from the EUT, and a remote-controlled antenna mast can change polarities and perform height scans from 1 to 2 meters. Lab 1 is used for pre-scanning measurements of larger EUTs.

The Open Area Test Site (OATS) is a 3 m and 10 m all-weather measurement facility. A 69' x 33' fiberglass building is the EUT shelter, and a freestanding control room houses the test equipment. The site is equipped with a 20 foot diameter remotely controlled turntable integrated into the site ground plane. A remotely controlled fiberglass antenna mast allows the antenna to be moved through the required 1 to 4 meter height range and for control of the antenna polarization.

The OATS is recognized by the Federal Communications Commission (FCC) as a listed electromagnetic test site (FCC #31040/SIT).

EQUIPMENT USED FOR RADIATED EMISSIONS					
Description	**Manufacturer**	**Model #**	**Serial #**	**Last Cal**	**Cal Due**
EMI Receiver	HP	8546A	3330A00181	10/26/05	10/26/06
Antenna, BiLog	Chase	CBL6140	1026	03/22/05	03/22/06

APPENDIX 2: PHOTOGRAPHS

Photograph 1: Setup of Sensor and Receiver Unit (Short Antenna)

Photograph 2: Setup of Sensor and Receiver Unit (Long Antenna)

Photograph 3: Receiver Unit – Assembled

Photograph 4: Receiver Unit – Disassembled, Component Side

Photograph 5: Sensor Unit – Assembled

Photograph 6: Sensor Unit – Disassembled, Component Side

APPENDIX 3: FCC PART 15 COMPLIANCE INFORMATION

Labeling falls under §15.19(a)(5), due to the size of the product. Only the FCC identifier, product trade name and model number as shown in §15.19(b)(1)(i) will be placed on the product label. The text shown below would be included in the instruction manual as stated in §15.19(a)(5).

"This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation."