LS Research, LLC

W66 N220 Commerce Court ● Cedarburg, WI 53012 ● USA
Phone: 262.375.4400 ● Fax: 262.375.4248
www.lsr.com

ENGINEERING TEST REPORT # 308118- TX
LSR Job # R448

Compliance Testing of:
Passive Entry FOB
Model # 5908935

Test Date(s):
January 23, 28, 2008

Prepared For:
Strattec Security Corporation
Attn.: Mr. George Barker
3333 West Good Hope Road
Milwaukee, WI 53209

In accordance with:
Federal Communications Commission (FCC)
Part 15, Subpart C, Section 15.231(b)
Operating in the
Frequency Band 260 MHz - 470 MHz

This Test Report is issued under the Authority of:
Brian E. Petted, VP of Engineering

Signature: Date: April 14, 2008

Test Report Reviewed by:	**Tested by:**
Teresa A. White, Quality Manager	Kenneth L. Boston, Sr. EMC Engineer
Signature: Teresa A. White	Signature: Kenneth L Boston
Date: April 14 2008	Date: April 14, 2008

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EXHIBIT 1. INTRODUCTION

1.1 SCOPE

References:	FCC Part 15, Subpart C, Section 15.231(b)
Title:	Telecommunication – Code of Federal Regulations, CFR 47, Part 15
Purpose of Test:	To gain FCC Certification Authorization for Transmitters operating in the Frequency Band of 260 MHz – 470 MHz
Test Procedures:	Both conducted and radiated emissions measurements were conducted in accordance with American National Standards Institute ANSI C63.4 – American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz.
Environmental Classification:	• Commercial, Industrial or Business • Residential

1.2 NORMATIVE REFERENCES

Publication	Year	Title
47 CFR, Parts 0-15 (FCC)	2005	Code of Federal Regulations - Telecommunications
RSS-GEN and RSS-210, Issue 7	2007 2007	Requirements for License-exempt Radio Communication Devices
ANSI C63.4	2003	American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz.
CISPR 22 CISPR 22 +A1 EN 55022	2003, 04-10 2004, 10-14 2003	Information Technology Equipment – Radio Disturbance Characteristics – Limits and Methods of Measurement
CISPR 16-1-1	2003	Specification for radio disturbance and immunity measuring apparatus and methods. Part 1-1: Measuring Apparatus.
CISPR 16-2-1	2003	Specification for radio disturbance and immunity measuring apparatus and methods. Part 201: Conducted disturbance measurement.
FCC Public Notice DA 00-1407	2000	Part 15 Unlicensed Modular Transmitter Approval

1.3 LS Research, LLC TEST FACILITY

LS Research, LLC is accredited by A2LA (American Association for Laboratory Accreditation) to conform to ISO/IEC 17025, 2005 "General Requirements for the Competence of Calibration and Testing Laboratories".

LS Research, LLC's scope of accreditation includes all test methods listed herein, unless otherwise noted. A copy of the accreditation may be accessed on our web site: www.lsr.com. Accreditation status can be verified at A2LA's web site: www.a2la2.net.

1.4 LOCATION OF TESTING

All testing was performed at LS Research, LLC, W66 N220 Commerce Court, Cedarburg, Wisconsin, 53012 USA, utilizing the facilities listed below, unless otherwise noted.

List of Facilities Located at LS Research, LLC:

- Compact Chamber
- Semi-Anechoic Chamber
- Open Area Test Site (OATS)

1.5 TEST EQUIPMENT UTILIZED

A complete list of equipment utilized in testing is provided in Appendix A of this test report. Calibration dates are indicated in Appendix A. All test equipment is calibrated in accordance with A2LA standards.

EXHIBIT 2. PERFORMANCE ASSESSMENT

2.1 CLIENT INFORMATION

Manufacturer Name:	**Strattec Security Corporation**
Address:	**3333 West Good Hope Road** **Milwaukee, WI 53209**
Contact Person:	**George Barker 414.247.3343 gbarker@strattec.com**

2.2 EQUIPMENT UNDER TEST (EUT) INFORMATION

The following information has been supplied by the applicant.

Product Name:	Passive Entry FOB
Model Number:	5908935
Serial Number:	08010079 (cw); 08010089 (modulated)

2.3 ASSOCIATED ANTENNA DESCRIPTION

There are two antennas located on the Wireless Ignition System Fob.

The receive antenna is a three axis surface mounted coil. This antenna is constructed on a small non conducting frame allowing multiple layer solenoid wound ferrite loaded coils to be placed such that the major line of magnetic flux from each coil is orientated along three orthogonal axes. The "Z" axis is normal to the printed circuit board and the other two axes, "X" and "Y" are parallel to the printed circuit board's surface. Each axis corresponds to an axis in a 3 dimensional Cartesian reference system. The coils are individually resonated to 125 KHz by means of capacitors forming a parallel tank circuit for each axis. The high impedance side of the resulting tank is fed to a three channel single chip 125 KHz receiver.

The transmit antenna is a small (circumscribed length much less than one wavelength) loop and is printed on the printed circuit board. The loop is matched to the single chip 433.92 MHz transmitter with passive inductors and capacitors which allow a peak transmitted response at 433.92 MHz.

For either antenna, there is no user adjustment possible.

2.4 EUT'S TECHNICAL SPECIFICATIONS

Additional Information:

Frequency Range (in MHz)	433.92 MHz
RF Power in Watts	.0031 Watts
Field Strength (and at what distance)	78.6 dBuV/m @ 3 m
Occupied Bandwidth (99% BW) in kHz	348.0 kHz
Type of Modulation	FM
Emission Designator	125KF1D
Transmitter Spurious (worst case)	57.5 dBuV/m @ 3m; 2604 MHz
Frequency Tolerance %, Hz, ppm	n/a
Microprocessor Model # (if applicable)	n/a
EUT will be operated under FCC Rule Part(s)	15.231(b)
Antenna Information	
Detachable/non-detachable	Non-detachable
Type	PCB Loop
Gain (in dBi)	-21.6 dBi
Portable/Mobile	☒ Portable ☐ Mobile
Modular Filing	☐ Yes ☒ No

RF Technical Information:

Type of Evaluation (check one)		SAR Evaluation: Device Used in the Vicinity of the Human Head
		SAR Evaluation: Body-worn Device
	X	RF Evaluation

If RF Evaluation checked above, test engineer to complete the following:

- Evaluated against exposure limits: ☒ General Public Use ☐ Controlled Use
- Duty Cycle used in evaluation: 100 %
- Standard used for evaluation: RSS-GEN (2007); RSS-210 (2007)
- Measurement Distance: 0.000028 m
- RF Value: 0.028 ☐ V/m ☐ A/m ☒ W/m^2
  ☐ Measured ☐ Computed ☒ Calculated

2.5 PRODUCT DESCRIPTION

A) The FOB is a part of a larger system which is used to functionally replace the key ignition system of an automobile. In function, the user presses a start button on the car dash board. This causes a 125 KHz data transmitter to transmit a burst, coded signal which the FOB is tuned to receive. If the FOB is within the limited range of the 125 KHz signal, then it will respond with a data burst transmission at a nominal 433.92 MHz.

B) The FOB transmitter frequency is 433.92 MHz. The FOB transmitter operating frequency is controlled by a reference crystal at 13.56 MHz. This reference crystal controls an embedded PLL based transmitter. The transmitter deviation is set by design to a nominal 36 KHz. Data for the FOB transmitter is supplied by the on board CPU. The FOB transmitter is set to one frequency only. The nominal data rate is 1000 bits per second, NRZ encoded.

The FOB also has a 125 KHz receiver. This receiver is fixed tuned by virtue of an on-board LC tuned circuit. The receive antenna's self inductance is resonated with on board capacitors to set the peak response at 125 KHz. The circuit is fixed tuned and not adjustable.

C) The FOB is battery operated using a single Lithium CR-2032 3.0 V coin cell. The battery holder for the FOB is soldered to the board.

D) There are data connections at the board edge which are used to program the CPU during manufacture. When installed in the plastic enclosure, these pads are inaccessible to the user. When in use, no varying signals are available on these pads.

There are also touch switch pads on the reverse side of the printed circuit board. These are not used in the current product release and are intended for a future revision in which the product will also serve as a remote keyless entry transmitter.

E) The FOB transmitter antenna is a printed element on the PCB. The receive antenna is a soldered on three axis inductor.

The power source is a single CR2032 Lithium cell. There is no provision to externally excite the transmitter. Data for transmission is generated by the on-board CPU.

EXHIBIT 3. EUT OPERATING CONDITIONS & CONFIGURATIONS DURING TESTS

3.1 CLIMATE TEST CONDITIONS

Condition	Normal Conditions
Temperature:	24 °C
Relative Humidity:	30 %
Atmospheric Pressure:	86 kPa – 106 kPa

3.2 APPLICABILITY & SUMMARY OF EMC EMISSION TEST RESULTS

FCC Paragraph	Test Requirements	Compliance (yes/no)
15.207	Power Line Conducted Emissions Measurements	n/a
15.231(a)	Periodic operation of low-power transmitters	yes
15.231(b), 15.209 & 15.205	Transmitter Radiated Emissions	yes
15.231(c)	Occupied Operational Bandwidth	yes
15.231(d)	Stability with temperature and voltage variations	n/a
1.1307, 1.1310, 2.1091 & 2.1093	RF Exposure Limit	yes
The digital circuit portion of the EUT has been tested and verified to comply with FCC Part 15, Subpart B, Class B Digital Devices and the associated Radio Receiver has also been tested and found to comply with Part 15, Subpart B – Radio Receivers. The Receiver Test Report is available upon request.		

3.3 MODIFICATIONS INCORPORATED IN THE EUT FOR COMPLIANCE PURPOSES

☒ None ☐ Yes (explain below)

3.4 DEVIATIONS & EXCLUSIONS FROM TEST SPECIFICATIONS

☒ None ☐ Yes (explain below)

EXHIBIT 4. DECLARATION OF CONFORMITY

The EUT was found to MEET the requirements as described within the specification of FCC Title 47, CFR Part 15.231, and Industry Canada RSS-210 (Annex 1.1), Issue 7, 2007.

If some emissions are seen to be within 3 dB of their respective limits:
As these levels are within the tolerances of the test equipment and site employed, there is a possibility that this unit, or a similar unit selected out of production may not meet the required limit specification if tested by another agency.

LS Research, LLC certifies that the data contained herein was taken under conditions that meet or exceed the requirements of the test specifications. The results in this Test Report apply only to the item(s) tested on the above-specified dates. Any modifications made to the EUT subsequent to the indicated test date(s) will invalidate the data herein, and void this certification.

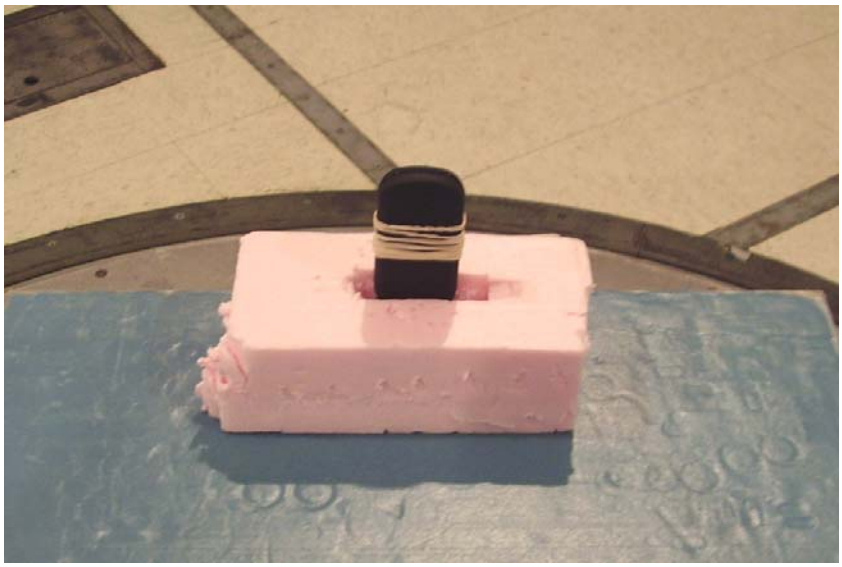
EXHIBIT 5. RADIATED EMISSIONS TEST

5.1 Test Setup

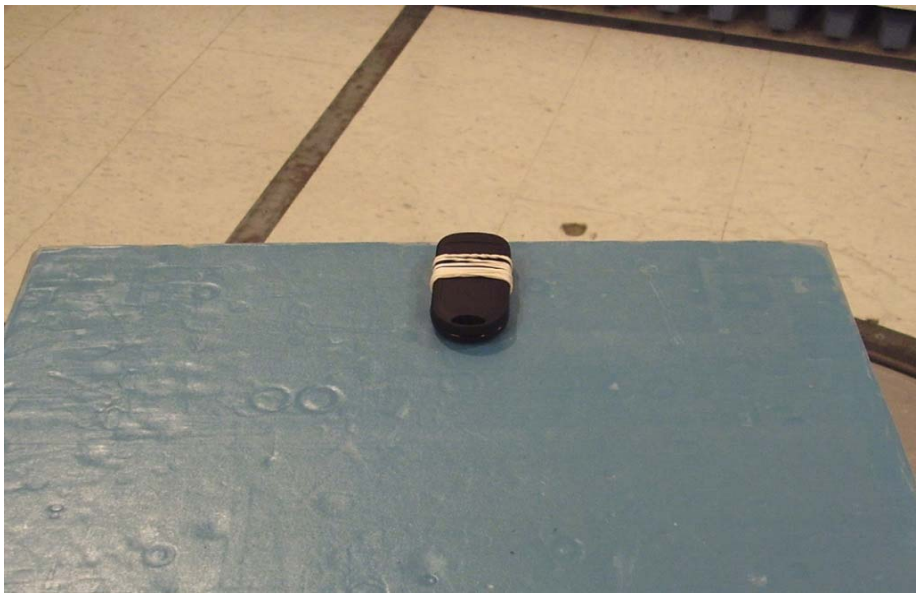
The EUT was placed on an 80cm high, non-conductive pedestal, which was centered on a 2m diameter metal turntable which is flush-mounted in the metal floor (GP) of the chamber. The EUT was configured to run in a continuous CW transmit mode during the 15.231(a) and 15.231(b) measurements. A Peak Detector was used on the receiver for the reported measurements. The EUT was then returned to normal operation for measurements of the data packet length and occupied bandwidth.

5.2 Test Setup Photo(s)

Vertical Orientation



Horizontal Orientation



Side Orientation

5.3 Test Procedure

The fundamental and spurious (harmonic) emissions of the transmitter were tested for compliance to FCC Title 47 CFR Part 15.231(b) limits for manually operated periodic devices.

The EUT was tested from the lowest frequency generated by the transmitter (without going below 9 kHz) to the 10th harmonic of the fundamental frequency generated by the device. The appropriate limits were also observed when the fundamental or spurious signals were located within any of the restricted bands as described in FCC Part 15.205(a).

When a reading is taken using the Peak Detector, a duty cycle correction factor can be applied for conversion to an average reading. This operation can be used when measuring short-duration bursts of data transmission, under FCC Part 15.231. Please refer to later sections in this report for a formal justification of the requested relaxation factor.

The resultant average reading can then be compared to the appropriate limit in order to determine compliance with the limits. The HP 8546A EMI Receiver was operated with a resolution bandwidth of 120 kHz for measurements below 1 GHz (video bandwidth of 300 kHz), and a bandwidth of 1 MHz for measurements above 1 GHz (video bandwidth of 1 MHz).

The device was investigated in three orthogonal orientations for maximum emissions.
The battery was checked and replaced as necessary during the course of the investigations.
Battery voltage remained within the range of 3.15 to 3.0 VDC during the emissions tests.

5.4 Test Equipment Utilized

A list of the test equipment and antennas utilized for the Radiated Emissions test can be found in Appendix A. This list includes calibration information and equipment descriptions. All equipment is calibrated and used according to the operation manuals supplied by the manufacturers. All calibrations of the antennas used were performed at an N.I.S.T. traceable site. In addition, the Connecting Cables were measured for losses using a calibrated Signal Generator and a HP 8546A EMI Receiver. The resulting correction factors and the cable loss factors from these calibrations were entered into the HP 8546A EMI Receiver database. As a result, the data taken from the HP 8546A EMI Receiver accounts for the antenna correction factor as well as cable loss or other corrections, and can therefore be entered into the database as a corrected meter reading. The HP 8546A EMI Receiver was operated with a resolution bandwidth of 120 kHz for measurements below 1 GHz (video bandwidth of 300 kHz), and a bandwidth of 1 MHz for measurements above 1 GHz (video bandwidth of 1 MHz). From 5 GHz to 18 GHz, an HP E4407B Spectrum Analyzer and an EMCO Horn Antenna were used. From 18 GHz to 25 GHz, the HP E4407B Spectrum Analyzer with a standard gain horn, and preamp were used.

Test Equipment	Manufacturer	Model No.	Serial No.
EMI Receiver	HP	8546A	3617A00320
EMI Receiver Pre-Select.	HP	85460A	3448A00296
Spectrum Analyzer	Agilent	E4446A	US45300564
Log Periodic Antenna	EMCO	93146	9701-4855
Horn Antenna	EMCO	3115	6907
Bicon Antenna	EMCO	93110B	9702-2918
Pre-Amp	Adv. Microwave	WLA612	1145A04094
Horn Antenna – Std. Gain	EMCO	3160-09	9809-1120

5.5 Test Results

The EUT was found to **MEET** the Radiated Emissions requirements of Title 47 CFR, FCC Part 15.231(b) for a momentary low power transmitter [Canada RSS-210, (Issue 7, 2007), Annex 1]. The frequencies with significant RF signal strength were recorded and plotted as shown in the Data Charts and Graphs.

5.6 CALCULATION OF RADIATED EMISSIONS LIMITS

FIELD STRENGTH OF FUNDAMENTAL FREQUENCIES:
The calculation involves a linear interpolation of 3750 to 12500 µV/m over 260-470 MHz, where field strength of the fundamental frequency (f_0) when 260 ≤ f_0 ≤ 470 MHz, can be found by: 41.6667*(f_0)-7083.3333, where f_0 is in MHz.

FIELD STRENGTH OF SPURIOUS/HARMONIC FREQUENCIES:
The spurious and harmonic emissions are subject to the limits expressed in FCC Parts 15.205 and 15.209, if within the restricted bands and dictated by the following calculation elsewhere.

The calculation involves a linear interpolation of 375 to 1250 µV/m over 260 to 470 MHz, where field strength of the harmonic frequencies (2 f_0, 3 f_0…) when 260 ≤ f_0 ≤ 470 MHz, can be found by: 4.1667*(f_0)-708.3333, where f_0 is in MHz.

At fundamental frequency f_0 = 433.92 MHz
Fundamental Limit: 41.6667*(f_0)-7083.3333 = µV/m @ 3m
Harmonic Limit: 4.1667*(f_0)-708.3333 = µV/m @ 3m
Above 470 MHz, the limit on the spurious and harmonic emissions is 1,250 µV/m @ 3m.

Frequency (MHz)	*Fundamental Limit (µV/m @ 3m)*	*Fundamental Limit (dBµV/m @ 3m)*	*Harmonic Limit (µV/m @3m)*	*Harmonic Limit (dBµV/m @ 3m)*
433.92	***10,996.7***	***80.8***	***1099.7***	***60.8***

Spurious RF emissions limits as described in 47CFR 15.209 and 15.205

Frequency (MHz)	3 m Limit µV/m	3 m Limit (dBµV/m)	1 m Limit (dBµV/m)
30-88	100	40.0	-
88-216	150	43.5	-
216-960	200	46.0	-
960-24,000	500	54.0	63.5

Sample conversion from field strength µV/m to dBµV/m:
dBµV/m = 20 $\log_{10}$ (100)
= 40 dBµV/m (from 30-88 MHz)

For measurements made at 1.0 meter, a 9.5 dB correction has been invoked.

960 MHz to 10,000 MHz
500µV/m or 54.0 dB/µV/m at 3 meters
54.0 + 9.5 = 63.5 dB/µV/m at 1 meter

5.7 RADIATED EMISSIONS DATA CHART

3 Meter Measurements of Electromagnetic Radiated Emissions
Test Standard: 47CFR, Part 15.231(b)
Frequency Range Inspected: 30 MHz to 4500 MHz

Manufacturer:	Strattec Security Corporation						
Date(s) of Test:	January 23 and 28, 2008						
Test Engineer(s):	Ken Boston						
Voltage:	3.1 VDC						
Operation Mode:	Continuous transmit or C.W. mode; s/n 08010079						
Environmental Conditions in the Lab:	Temperature: 20 – 25° C Relative Humidity: 30 – 60 %						
EUT Power:		Single Phase ___VAC		3 Phase ___VAC			
	X	Battery: 3.1 VDC		Other:			
EUT Placement:	X	80cm non-conductive pedestal		10cm Spacers			
EUT Test Location:	X	3 Meter Semi-Anechoic FCC Listed Chamber		3/10m OATS			
Measurements:		Pre-Compliance		Preliminary	X	Final	
Detectors Used:		Peak	X	Quasi-Peak	X	Average	

The table depicts the level of significant radiated emissions found:

Frequency (MHz)	Ant./EUT Polarity	Height (meters)	Azimuth (0° - 360°)	Measured EFI (dBμV/m)	EFI Corrected For Averaging (dBμV/m)	15.231(b) Limit (dBμV/m)	Margin (dB)
433.92	V/V	1.3	260	78.6	72.6	80.8	8.2
867.8	H/H	1.0	320	53.8	47.8	60.8	13.0
1301.8	H/H	1.2	330	57.2	51.2	54.0	2.8
1735.7	H/H	1.3	335	57.0	51.0	60.8	9.8
2169.7	H/H	1.0	185	62.4	56.4	60.8	4.4
2603.7	H/V	1.0	175	64.4	58.4	60.8	2.4
3037.7	H/H	1.15	145	54.7	48.7	60.8	12.1
3471.7	H/H	1.0	255	53.6	47.6	60.8	13.2
3905.6	H/H	1.03	250	55.7	49.7	54.0	4.3
4339.5	H/H	1.08	245	54.0	48.0	54.0	6.0

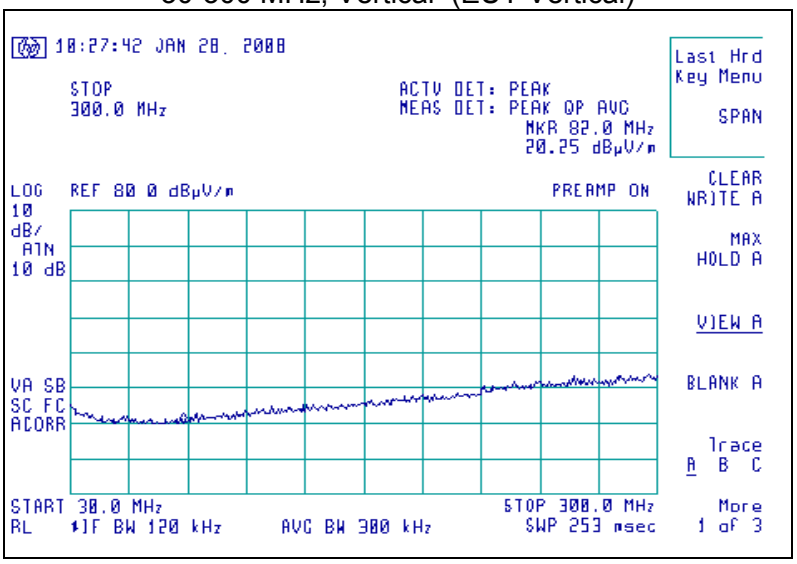
Notes:

1) A Peak Detector was used in measurements of the fundamental and harmonics below 1 GHz, and a Peak Detector was used in measurements above 1 GHz.
2) Measurement at receiver system noise floor.
3) A relaxation of the Peak EFI measurements by 6.0 dB is applied based on the average duty factor of the transmitter on-air-time. Justification for this request appears in the appendix section of this report, and is supported by measurements as documented in the body of this report.
4) Measurement of the fundamental and all harmonics were made with the EUT in CW mode.

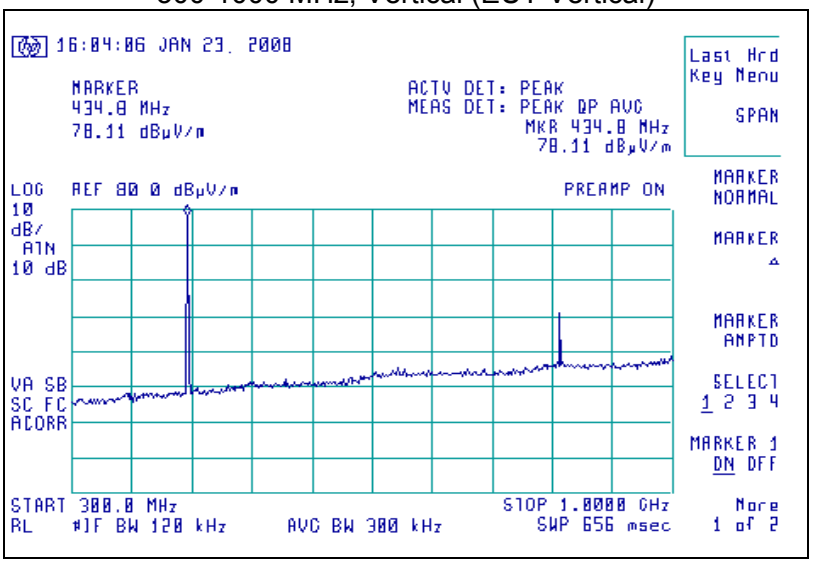
5.8 Screen Captures - Radiated Emissions Testing

The signature scans shown here are from worst-case emissions, as measured with the sense antennas both in vertical and horizontal polarity for worst case presentations.

30-300 MHz, Vertical (EUT Vertical)

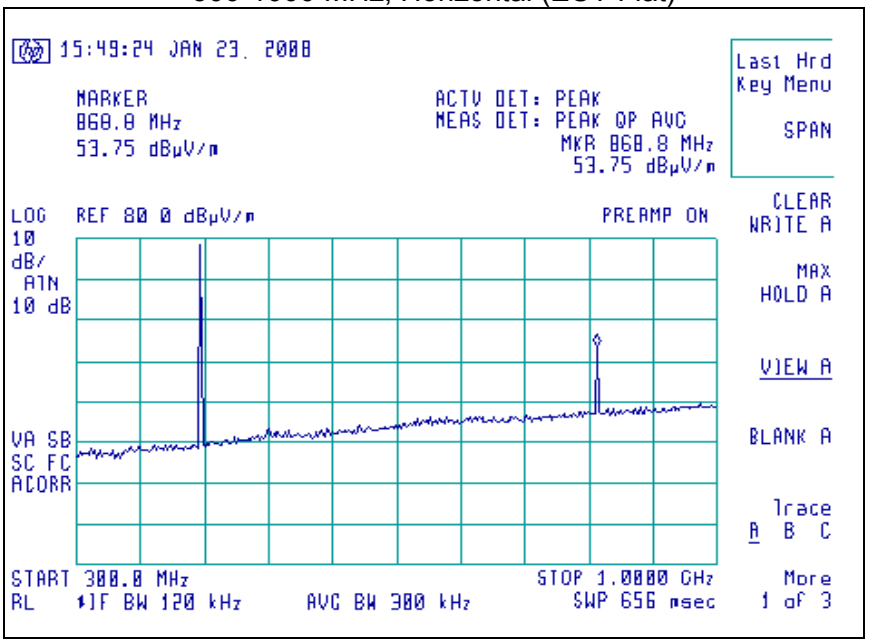


300-1000 MHz, Vertical (EUT Vertical)

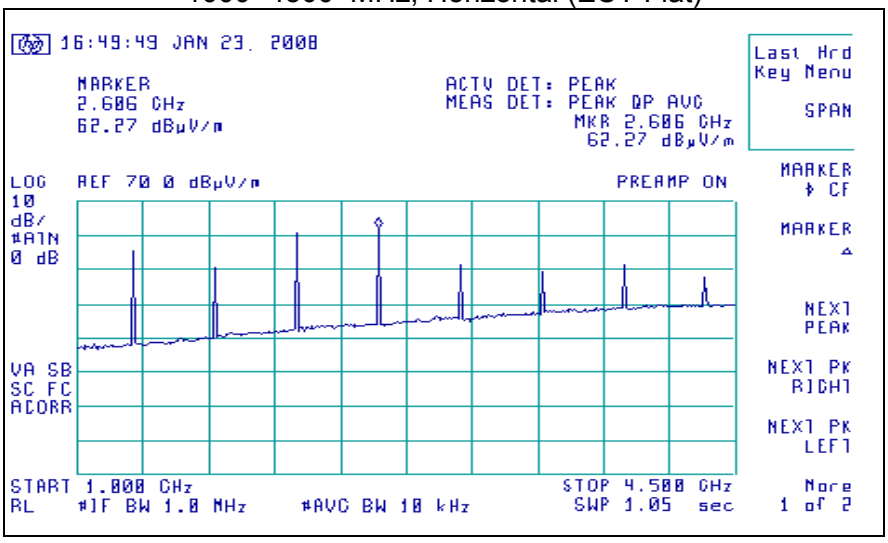


Screen Captures - Radiated Emissions Testing **(continued)**

300-1000 MHz, Horizontal (EUT Flat)

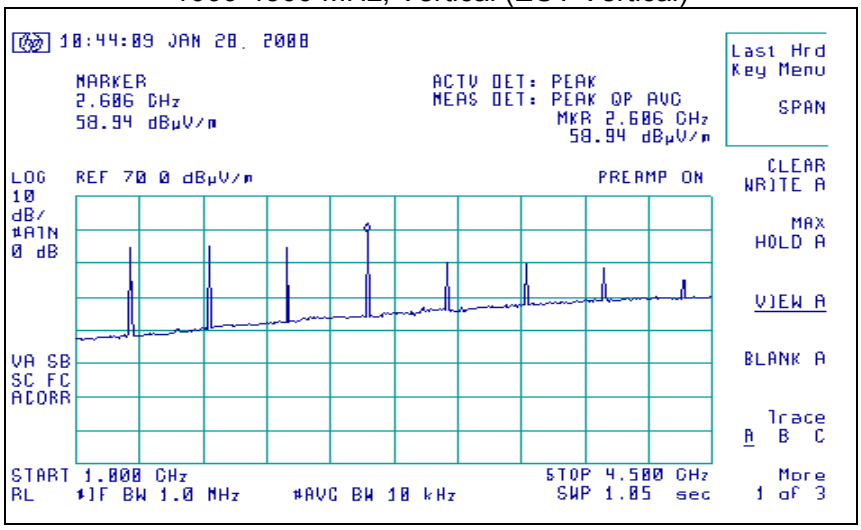


1000- 4500 MHz, Horizontal (EUT Flat)

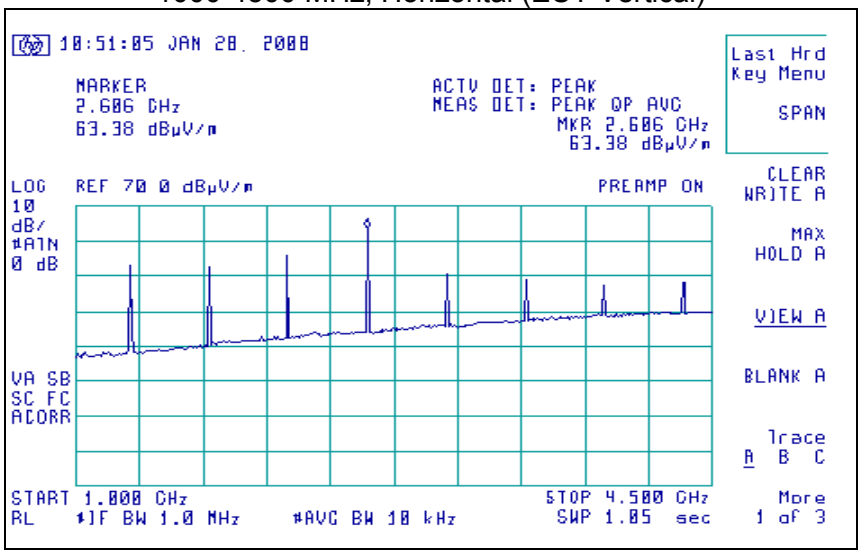


Screen Captures - Radiated Emissions Testing **(continued)**

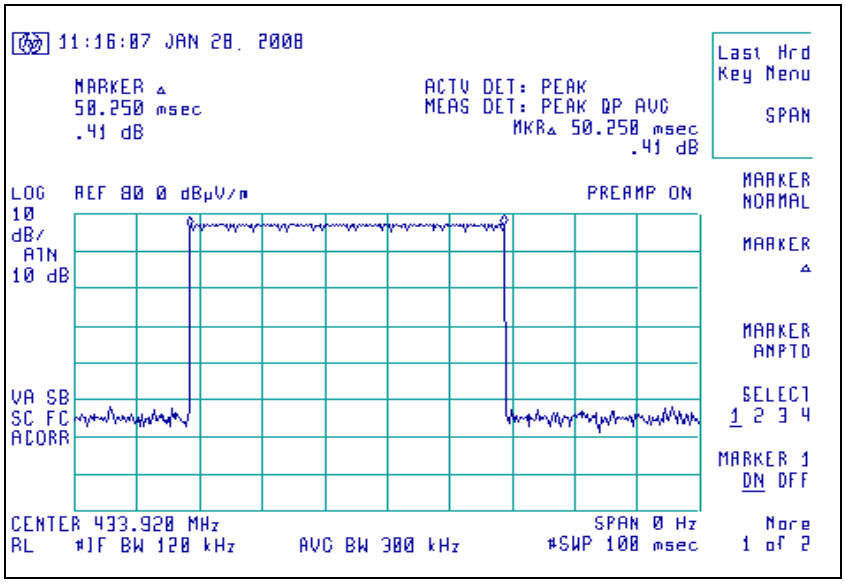
1000-4500 MHz, Vertical (EUT Vertical)



1000-4500 MHz, Horizontal (EUT Vertical)



5.9 Data Packet Detail – Radiated Emissions, 100ms Window



5.10 Data Packet Detail, 1 second Window

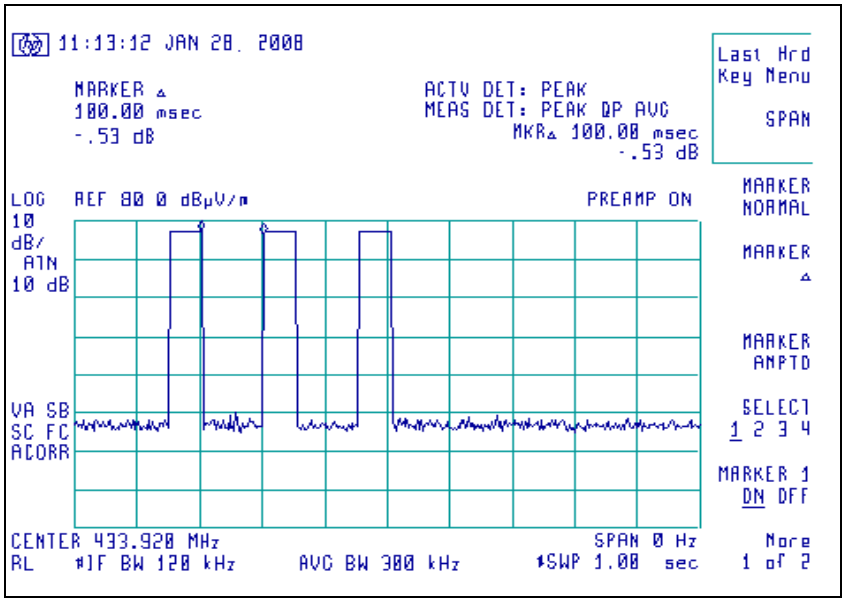


EXHIBIT 6. CONDUCTED EMISSIONS TEST, AC POWER LINE: 15.207

Note: The EUT is a battery operated product, and does not require conducted emission testing.

EXHIBIT 7. OCCUPIED BANDWIDTH: 15.231(c)

7.1 Test Procedure

In addition to measuring the levels of Radiated Emissions, the Occupied Bandwidth of the transmitter was measured. In accordance with FCC Part 15.231(c), the -20 dB_C bandwidth of the transmitted signal should be within a window of 0.25% of the center carrier frequency. The resolution bandwidth was set to the closest available filter setting on the HP 8546A EMI Receiver, then corresponded to 5% of the allowable bandwidth determined in the calculation mentioned above, without going below the resolution bandwidth of 10 kHz, as dictated in ANSI C63.4.

7.2 Test Equipment Utilized

The connecting cables used were also measured for loss using a calibrated Signal Generator and the HP 8546A EMI Receiver. The resulting loss factors were entered into the HP 8546A EMI Receiver database. This allowed for automatic change in the antenna correction factor. The resulting data taken from the HP 8546A EMI Receiver is an actual measurement and can be entered into the database as a corrected measurement.

Test Equipment	Manufacturer	Model No.	Serial No.
Spectrum Analyzer	Agilent	E4407B	US39160256
Spectrum Analyzer	Agilent	E4446A	US45300564

7.3 Occupied Bandwidth Calculations

FCC Part 15.231(c) states that the bandwidth of a manually operated device shall be no wider than 0.25% of the center frequency for devices operating between 70 MHz and 900 MHz.

Said bandwidth is determined at the -20 dB reference to peak carrier points.

Refer to the set of screen captures in this report, which show the actual Occupied Bandwidth of the transmitter as measured.

For this device, operating at a center frequency of 433.92 MHz, the allowed Occupied Bandwidth is calculated to be:

433.92 MHz x 0.0025 = 1.0848 MHz

7.4 Test Data

Frequency (MHz)	-20 dB_C Occupied Bandwidth (MHz)	Occupied Bandwidth Limit (MHz)	Pass/Fail
433.9	0.348	1.085	Pass

7.5 Screen Captures – OCCUPIED BANDWIDTH

Occupied Bandwidth

Measurement of the Occupied Bandwidth was made with the EUT in continuous transmit mode, with typical modulation as applied by the EUT circuitry.

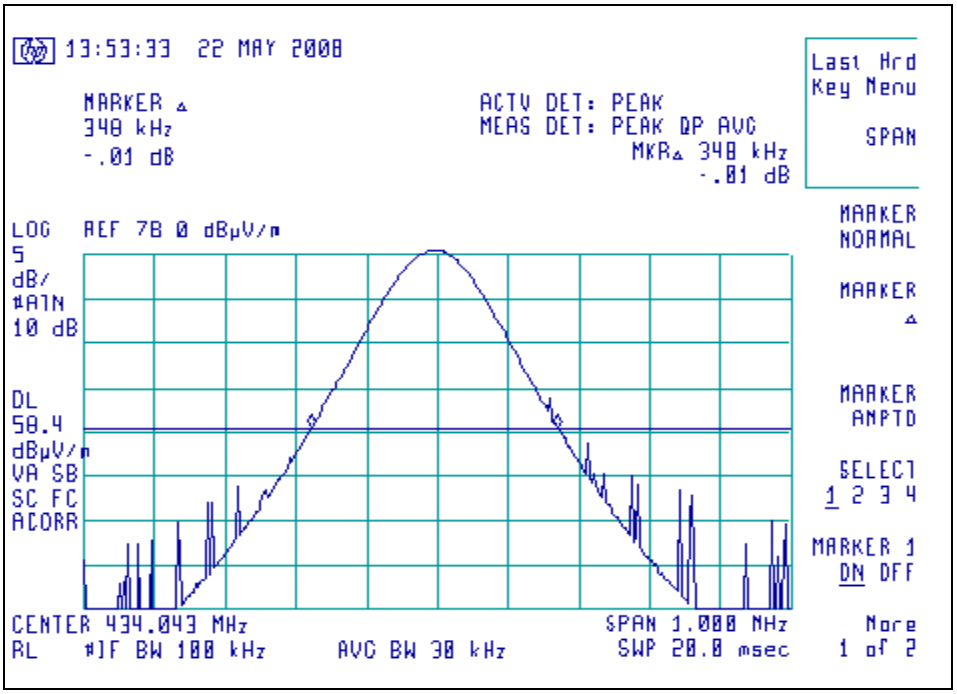


EXHIBIT 8. POWER STABILITY OVER VOLTAGE & TEMPERATURE VARIATIONS

Note: The EUT does not require a test of frequency stability or tolerance as specified in 15.231(d), as it does not operate within the frequency band 40.60 to 40.70 MHz. A new CR2031 battery was used for each test performed.

EXHIBIT 9 . MPE CALCULATIONS

The following MPE calculations are based on a centimeter printed circuit board trace antenna, with a measured ERP of 78.6 dBµV/m, at 3 meters, and a calculated RF power of +5.0 dBm as presented to the antenna. The calculated gain of this antenna, based on the ERP measurements is -21.6 dBi.

Prediction of MPE limit at a given distance

Equation from page 18 of OET Bulletin 65, Edition 97-01

$$S = \frac{PG}{4\pi R^2}$$

where: S = power density
P = power input to the antenna
G = power gain of the antenna in the direction of interest relative to an isotropic radiator
R = distance to the center of radiation of the antenna

Maximum peak output power at antenna input terminal:	5.00	(dBm)
Maximum peak output power at antenna input terminal:	3.162	(mW)
Antenna gain(typical):	-21.6	(dBi)
Maximum antenna gain:	0.007	(numeric)
Prediction distance:	2.5	(cm)
Prediction frequency:	433.9	(MHz)
MPE limit for uncontrolled exposure at prediction frequency:	0.28	(mW/cm^2)
Power density at prediction frequency:	0.000279	(mW/cm^2)
Maximum allowable antenna gain:	8.4	(dBi)
Margin of Compliance at 2.5 cm =	30.0	dB

EXHIBIT 10. TRANSMITTER DUTY CYCLE AND RELAXATION FACTOR CALCULATIONS

The following calculations support the request for relaxation factor as applied to the radiated EFI measurements, based on the duty factor of the transmitter.

For a graphical presentation of the data packets from the transmitter, refer to the Data Packet Detail in previous sections of this report. These images were captured on a spectrum analyzer in zero span. The transmitter was functioning in normal operating mode, and activated by pressing the transmit buttons.

Average (Relaxation) Factor

Average Factor = 20 * Log_{10} (Worst Case EUT On-time over 100 ms time window)

Transmit packet on-time is 50 milliseconds, FM modulation.

Average Factor = 20 * Log_{10} (50.0 / 100.0 ms) = -6.0 dB

A relaxation factor of 6.0 dB would be allowable for this product.

APPENDIX A

Test Equipment List

Asset #	Manufacturer	Model #	Serial #	Description	Date	Due
AA960008	EMCO	3816/2NM	9701-1057	Line Impedance Stabilization Network	12/6/07	12/6/08
AA960031	HP	119474A	3107A01708	Transient Limiter	Note 1	Note 1
AA960077	EMCO	93110B	9702-2918	Biconical Antenna	9/19/07	9/19/08
AA960078	EMCO	93146	9701-4855	Log-Periodic Antenna	9/19/07	9/19/08
AA960081	EMCO	3115	6907	Double Ridge Horn Antenna	12/04/07	12/04/08
CC00221C	Agilent	E4407B	US39160256	Spectrum Analyzer	1/11/07	1/11/08
EE960004	EMCO	2090	9607-1164	Device Controller	N/A	N/A
EE960013	HP	8546A	3617A00320	Receiver RF Section	9/20/07	9/20/08
EE960014	HP	85460A	3448A00296	Receiver Pre-Selector	9/20/07	9/20/08
EE960073	Agilent	E4446A	US45300564	Spectrum Analyzer	8/17/07	8/17/08
N/A	LSC	Cable	0011	3 Meter ½" Armored Cable	Note 1	Note 1
N/A	LSC	Cable	0050	10 Meter RG 214 Cable	Note 1	Note 1
N/A	Pasternack	Attenuator	N/A	10 dB Attenuator	Note 1	Note 1

Note 1 - Equipment calibrated within a traceable system.

Uncertainty Statement

This uncertainty represents an expanded uncertainty expressed at approximately the 95 % confidence level, using a coverage factor of k=2.

Table of Expanded Uncertainty Values, (K=2) for Specified Measurements

Measurement Type	Particular Configuration	Uncertainty Values
Radiated Emissions	3 – Meter chamber, Biconical Antenna	4.24 dB
Radiated Emissions	3-Meter Chamber, Log Periodic Antenna	4.8 dB
Radiated Emissions	10-Meter OATS, Biconical Antenna	4.18 dB
Radiated Emissions	10-Meter OATS, Log Periodic Antenna	3.92 dB
Conducted Emissions	Shielded Room/EMCO LISN	1.60 dB
Radiated Immunity	3 Volts/Meter in 3-Meter Chamber	1.128 Volts/Meter
Conducted Immunity	3 Volts level	1.0 V