



**FCC Test Report for  
47CFR15, Subpart B for Unintentional Radiators, per Section 101  
Equipment authorization of unintentional radiators,  
and  
47CFR15, Subpart C per Section 209  
General Limits for Operation of Intentional Radiators**

on  
**5.8 GHz Short Distance Radar Sensor Alarm**  
[FCC ID: LQN2939]

Model:  
**902939**

Report No.  
**20050316-02-Fc15**

Judgement  
**Complies as Tested**

Provided for evaluation by  
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Lab Code: 200172-0

EN45001 Accredited Compliance Laboratory (RES-GmbH)  
Registration number: TTI-P-G 159/98-00 (RES-GmbH)

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**PART 1 General****Test Information**

<b>Product:</b>	5.8 GHz Short Distance Radar Sensor Alarm	
<b>Part Numbers:</b>	902939	
<b>Manufacturer's Name</b>	Connaught Electronics, LTD	
<b>Manufacturer's Address</b>	IDA Industrial Estate Dunmore Road, Tuam Co. Galway, Ireland	
<b>Contact</b>	Tel: + 353 (93) 23 161 Mr. Holger Grothe	Fax : +353 (93) 23 110 Email GrotheHolger@cel.ie
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<b>Test Number</b>	20050316-02	
<b>Report Number</b>	20050316-02-Fc15	
<b>Test Date(s) &amp; Issue Date</b>	March 24 - April 27, 2005	April 29, 2005
<b>Test Engineer</b>	Robert Kershaw	
<b>Documentation</b>	George W Brown II	
<b>Test Results</b>	<input checked="" type="checkbox"/> Complies as Tested	<input type="checkbox"/> Fail
<b>Total Number of Pages</b>	30	

The electromagnetic interference tests, which this report describes, were performed by an independent electromagnetic compatibility consultant, ITC Engineering Services, Inc. (ITC), in accordance with the emissions requirements specified in the FCC rules, 47CFR Part 15, Subparts B and C. It is the manufacturer's responsibility to assure that additional production units of this model are manufactured with identical electrical and mechanical characteristics. Any modifications specified in this report for compliance must be implemented in all production units for compliance to be maintained.

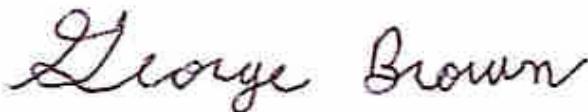
**Tests Performed:**

Emissions Requirements:

- OPEN FIELD RADIATED EMISSIONS in accordance with the FCC PART 15 Sub-Part B.

RF Requirements:

- FIELD STRENGTH OF FUNDAMENTAL in accordance with the FCC 47 CFR 15.209.
- HARMONIC EMISSIONS in accordance with the FCC 47 CFR 15.209.
- SPURIOUS EMISSIONS in accordance with the FCC 47 CFR 15.209.
- POWERLINE CONDUCTED EMISSIONS in accordance with FCC 47 CFR 15.207.

**PREPARED BY:****REVIEWED BY:**



George W Brown II  
Technical Writer

Michael Gbadebo, PE  
Project Manager

## PART 1 General (Cont)

### Declaration/Disclaimer

ITC Engineering Services, Inc. (ITC) reports apply only to the specific samples tested under stated test conditions. It is the manufacturer's responsibility to assure that additional production units of this model are manufactured with identical electrical and mechanical components. ITC Engineering Services, Inc. shall have no liability for any deductions, inferences or generalizations drawn by the client or others from ITC Engineering Services, Inc. issued reports.

This report is the confidential property of the client. As a mutual protection to our clients, the public and ourselves, extracts from the test report shall not be reproduced except in full with our written approval. The applicant/manufacturer shall not use this report to claim product endorsement by NIST, NVLAP or any US Government agency.

#### ITC Engineering Services, Inc. (ITC) is:

Accepted by the Federal Communications Commission (FCC) for FCC Methods, CISPR Methods and AUSTEL Technical Standards (Ref: NVLAP Lab Code 200172-0)

Approved by the Industry Canada for Telecom Testing

Certified by Rockford Engineering Services GmbH for EMC Testing according to the European EMC Directive 89/336/EEC per EN45001

Certified by Reg. TP for EMC Testing according to the European EMC Directive 89/336/EEC per EN45001 for RES GmbH (DAR-Registration number: TTI-P-G 159/98-00)

Certified by the Voluntary Control Council for Interference by Information Technology Equipment (VCCI) for EMC testing, in accordance with the Regulations for Voluntary Control Measures, Article 8, Registration Numbers - Site 1: C-1582 and R-1497.

## PART 1 General (Cont)

### Test Methodology

The electromagnetic interference tests, which this report describes, were performed by an independent electromagnetic compatibility consultant, ITC Engineering Services, Inc., in accordance with the FCC test procedure ANSI C63.4-1992.

### Test Facility

The open area test site, the conducted measurement facility, and the test equipment used to collect the emissions data is located in Sunol, California, and is fully described in site attenuation report. The approved site attenuation description is on file at the Federal Communications Commission.

**Table 1 Radio Device Measurement Information**

<b>Product Type Model</b>	5.8 GHz Short Distance Radar Sensor Alarm 902939	
<b>Applicant / Manufacturer Address</b>	Connaught Electronics, Ltd. IDA Industrial Estate, Dunmore Road, Tuam, Co. Galway, Ireland	
<b>Contact</b>	Mr. Joe Danaher Tel: +353 932-5128	Danaherjoe@cel.ie Fax: +353 932-5133
<b>Total Number of Pages including Appendices</b>	31 Pages	
<b>Test Report File No.</b>	20050316-02-FC15	

**Table 2 Measurement Uncertainty**

150kHz to 30MHz:		
Combined standard uncertainty $uc(y)$	$\pm 1.68$ dB	Normal
Expanded uncertainty $U$	$\pm 3.36$ dB	Normal ( $k = 2$ )
30MHz to 1GHz:		
Combined standard uncertainty $uc(y)$	$\pm 3.24$ dB	Normal
Expanded uncertainty $U$	$\pm 6.48$ dB	Normal ( $k = 2$ )
1GHz to 18GHz:		
Combined standard uncertainty $uc(y)$	$\pm 2.48$ dB	Normal
Expanded uncertainty $U$	$\pm 4.96$ dB	Normal ( $k = 2$ )
Above 18GHz:		
Radiated emission up to 26 GHz	$\pm 3$ dB	
Radiated emission up to 40 GHz	$\pm 3$ dB	
Radiated emission up to 75 GHz	$\pm 3$ dB	

## PART 2 RECEIVER MEASUREMENTS

### OPEN FIELD RADIATED EMISSIONS

#### Test Specification: 47 CFR PART 15, Sub-Part B

The EUT was set up at 1, 3 or 10 meters in accordance with the suggested configuration given in FCC Measurement Procedure ANSI C63.4-2001. The measurement instrumentation used was a receiver with bandwidth parameters as stipulated in ANSI C63.4-2001. The 5.8GHz Short Distance Radar Sensor was set up on a wooden non-conductive tabletop, 80 cm above the ground reference plane, in an open field. The transmit function was not activated for the tests.

**Table 3 Test Equipment – Radiated Emissions Tests**

Equipment Description	Manufacturer	Model Name	Serial Number	Calibration Due
Preamplifier	Hewlett-Packard	8449B	3008A00101	N/A
Preselector	Hewlett-Packard	85685A	2620A00265	12-11-2005
Biconical Antenna	EMCO	3104	9111-4463	01-16-2006
I.p. Ant (200 -1000MHz)	EMCO	3146	2261	01-22-2006
Quasi Peak Adapter	Hewlett-Packard	85650A	2521A00737	12-11-2005
Spectrum Analyzer	Hewlett-Packard	8568B	2841A04315	12-11-2005
Spectrum Analyzer Display	Hewlett-Packard			12-11-2005
Horn. Ant (Below 18GHz)	EMCO	3115	8812-3050	01-19-2006
Horn. Ant (Below 40GHz)	HP	3116	4663	02-18-2006
Spectrum Analyzer	Hewlett-Packard	8569A	2128A00270	04-23-2006

**Table 4 Support Equipment – Radiated Emissions Tests**

Description	Manufacturer	Model No.	Serial No.	Calibration Due
DC Power Supply	BK Precision	1688		n/a
Digital Multimeter	Fluke	16	79510141	December 14, 2005

#### Test Procedure – Radiated Emissions Tests

The measurement range investigated was from 30 MHz to 30 GHz. For measurements below 1GHz, the 5.8 GHz Short Distance Radar Sensor Alarm (the EUT) was set up at 10 meters from the receiving antenna, on an Open Area Test Site (OATS) with the EUT running in a continuous mode. The EUT was rotated 360 degrees azimuth and the search antenna height varied 1 to 4m in order to maximize the emissions. Significant peaks from the EUT were then recorded to determine margin to the limits. For measurements above 1GHz, the EUT was set up at 3 meters from the antenna, on the OATS, with the EUT running in a continuous mode. The EUT was rotated 360 degrees azimuth and the search antenna height varied 1 to 4m in order to maximize the emissions. Significant peaks from the EUT were then recorded to determine margin to the limits. For measurements above 18GHz, the EUT was set up at a 1 meter from the receiving in a semi-anechoic chamber with the EUT running in a continuous mode. The EUT was rotated 360 degrees azimuth and the search antenna height varied 1 to 4m in order to maximize the emissions. Significant peaks from the EUT were then recorded to determine margin to the limits.

## OPEN FIELD RADIATED EMISSIONS (cont)

### Spectrum Analyzer Configuration (during swept frequency scans) – Radiated Emissions

IF Bandwidth..... 120 kHz

Measurements below 1000 MHz (unless stated otherwise)

Analyzer Mode (for Peak Measurements) ..... Peak/Log

Resolution Bandwidth ..... 100 kHz

Video Bandwidth ..... 100 kHz

Analyzer Mode (for Quasi-Peak Measurements)

Quasi-Peak/Linear Resolution Bandwidth ..... 1000 kHz

Video Bandwidth ..... 1000 kHz

Measurements above 1000 MHz (unless stated otherwise)

Quasi-Peak Adapter Mode ..... Disabled

Analyzer Mode (for Peak Measurements) ..... Peak

Resolution Bandwidth ..... 1000 kHz

Video Bandwidth ..... 1000 kHz

Analyzer Mode (for Average Measurements) ..... Video Filter

Resolution Bandwidth ..... 1000 kHz

Video Bandwidth ..... 10 Hz

**Table 5 Data Table Legend and Field Strength Calculation – Radiated Emissions Tests**

Detector mode: Peak (P) or Quasi-Peak (QP) or Average (A)

	Polarization	Antenna	Freq Range (MHz)
VB	Vertical	EMCO 3104/sn 4463 Biconical	30 – 200
HB	Horizontal	EMCO 3104/sn 4463 Biconical	30 – 200
VL	Vertical	EMCO 3146/sn. 2261 Log Periodic	200 – 1000
HL	Horizontal	EMCO 3146/sn. 2261 Log Periodic	200 – 1000
VH1	Vertical	EMCO 3115/sn. 8812-3050 Horn	Below 18000
HH1	Horizontal	EMCO 3115/sn. 8812-3050 Horn	Below 18000
VH2	Vertical	HP 3116/sn. 4663 Horn	Below 26500
HH2	Horizontal	HP 3116/sn. 4663 Horn	Below 26500
VH4	Vertical	S&D DBD-520 Horn	Below 75000
HH4	Horizontal	S&D DBD-520 Horn	Below 75000

**The margin in the Table 6 is calculated as follows:**

Margin = Corrected Amplitude – Limit, where Corrected Amplitude = Spectrum Analyzer Amplitude + Cable Loss + Antenna Factor – Pre-Amp Gain.

## OPEN FIELD RADIATED EMISSIONS Results

### Site Used – Radiated Emissions Measurement

- Test Site 1 - Shielded Room: 16' x 12' x 9'
- Test Site 1 - 3m Open Field Radiated Site
- Test Site 1 - 10m Open Field Radiated Site
- Test Site 2 - Environmental Lab
- EMC Lab 1 - Test Laboratory
- Semi-Anechoic Absorber Lined Shielded Room
- Other: \_\_\_\_\_

### Administrative Details & Environmental Conditions – Radiated Emissions Measurement

Test Date:	March 24 <sup>th</sup> – 25 <sup>th</sup> 2005
Test Engineer:	Robert Kershaw
Temperature	75°F
Humidity	68%

**Table 6 Test Data for Radiated Emissions Measurement up to 1 GHz @ 10 meters**

The table below shows a summary of the highest amplitudes of the radiated emissions from the equipment under test at various antenna heights, antenna polarization, and EUT orientations.

INDICATED		CORRECTION		CORR		TURNTABLE ANT			CLASS A		CLASS B									
FREQ	AMPL	ANT	CAB	AMPL	ANG	HT	POL	AMPL	MARG	AMPL	MARG	DET	MHz	dBuV/m	dB	dBuV/m	dB	dBuV/m	dB	MODE
33.49	11.1	10.1	1.0	22.2	90	1.0	VB	-	-	30.0	-7.8	P								
50.12	10.5	10.9	1.1	22.5	0	3.0	HB	-	-	30.0	-7.5	P								
137.32	10.4	12.2	4.1	26.7	0	1.0	VB	-	-	33.0	-6.3	P								
210.18	4.1	11.3	3.7	19.1	0	1.0	VL	-	-	33.0	-13.9	P								
225.89	3.8	11.0	1.1	15.8	90	1.0	VL	-	-	36.0	-20.2	P								
243.76	10.2	11.8	3.9	25.9	90	1.0	VL	-	-	36.0	-10.1	P								
243.79	4.7	11.7	3.9	20.3	90	2.0	HL	-	-	36.0	-15.7	P								
489.99	5.5	17.7	5.0	28.3	0	1.0	VL	-	-	36.0	-7.7	P								
621.94	4.5	18.7	6.7	29.9	0	2.0	HL	-	-	36.0	-6.1	P								

No emission of significant level was observed above 30 MHz thru 1GHz.

### Test Data Legend

P = Peak

QP = Quasi Peak

The margin is calculated as follows:

Margin = Corrected Amplitude - Limit; where Corrected Amplitude = Amplitude + Cable Loss + Antenna Factor.

### Conclusion

The 5.8 GHz Short Distance Radar Sensor Alarm meets the requirements of FCC Part 15, Class B.

## OPEN FIELD RADIATED EMISSIONS Results (cont.)

### Spurious Emissions Test Setup Photographs



**Figure 1:** Maximized Radiated Emissions (below 1 GHz) – Front



**Figure 2:** Maximized Radiated Emissions (below 1 GHz) – Rear

## OPEN FIELD RADIATED EMISSIONS Results (cont.)

### Administrative Details and Environmental Conditions– Radiated Emissions Measurement

Test Date:	March 24 <sup>th</sup> – 25 <sup>th</sup> 2005
Test Engineer:	Robert Kershaw
Temperature	75°F
Humidity	69%

**Table 7 Test Data for Radiated Emissions Measurement above 1 GHz @ 3 meters**

The table below shows a summary of the highest amplitudes of the radiated emissions from the equipment under test at various antenna heights, antenna polarization, and EUT orientations.

INDICATED		CORRECTION		CORR	TURNTABLE ANT			CLASS A		CLASS B		
FREQ	AMPL	ANT	CAB	AMPL	ANG	HT	POL	AMPL	MARG	AMPL	MARG	DET
GHz	dBuV/m	dB	dB	dBuV/m	DEG	m	-	dBuV/m	dB	dBuV/m	dB	MODE
1025.0	46.5	25.0	-36.0	36.8	90	1.0	VH	-	-	54.0	-17.2	P
1133.0	45.0	25.4	-36.0	35.5	90	1.0	VH	-	-	54.0	-18.5	P
1133.0	44.2	25.4	-36.0	34.7	90	1.0	HH	-	-	54.0	-19.3	P
1165.0	47.0	25.7	-36.0	37.8	90	1.0	VH	-	-	54.0	-16.2	P
1220.0	46.2	25.8	-36.0	37.2	90	1.0	VH	-	-	54.0	-16.8	P
1221.0	45.8	25.5	-36.0	36.8	0	1.0	HH	-	-	54.0	-17.2	P
1317.0	45.7	26.0	-36.0	36.8	0	1.0	VH	-	-	54.0	-17.2	P
1389.0	45.3	26.2	-36.0	36.5	90	1.0	VH	-	-	54.0	-17.5	P
1452.0	45.8	26.2	-36.0	37.0	90	1.0	VH	-	-	54.0	-17.0	P
1455.0	44.6	26.8	-36.0	35.8	90	1.0	HH	-	-	54.0	-18.2	P
1500.0	45.9	27.0	-36.0	37.2	0	1.0	HH	-	-	54.0	-16.8	P
1588.0	44.8	27.7	-35.0	37.5	90	1.0	VH	-	-	54.0	-16.5	P
1589.0	45.0	27.7	-35.0	37.7	90	1.0	HH	-	-	54.0	-16.3	P
1796.0	46.2	28.0	-35.0	39.2	90	1.0	VH	-	-	54.0	-14.8	P
5802.0	12.0	36.0	-19.0	29.0*	0	1.0	VH	-	-	54.0	-25.0	P

No emission of significant level was observed in the range 5802.0MHz to 30GHz

### Test Data Legend

P = Peak

QP = Quasi Peak

The margin is calculated as follows:

Margin = Corrected Amplitude - Limit; where Corrected Amplitude = Amplitude + Cable Loss + Antenna Factor.

### Conclusion

The 5.8 GHz Short Distance Radar Sensor Alarm meets the requirements of FCC Part 15, Class B.

## OPEN FIELD RADIATED EMISSIONS Results (cont.)

### Spurious Emissions Test Setup Photographs



**Figure 3:** Maximized Radiated Emissions @ 3 meters (above 1 GHz)



**Figure 4:** Maximized Radiated Emissions @ 1meter (above 18 GHz)

## PART 3 RF MEASUREMENTS

### Test Specification: 47 CFR PART 15, Sub-Part C

#### EUT Description:

Connaught's 5.8 GHz Short Distance Radar Sensor Alarm, or the "EUT" as referred to in this report, is an intentional radiator. It comes with an antenna permanently attached. The EUT, was set up on a wooden table, 80cm above the ground reference plane in an anechoic chamber and or on an open field. It was powered and tested in normal continuous mode.

**Supply Voltage Tested: 13.5VDC**

**Table 8: Support Equipment – RF Measurements**

Description	Manufacturer	Model No.	Serial No.	Calibration Due
DC Power Supply	BK Precision	1688		n/a
Digital Multimeter	Fluke	16	79510141	December 14, 2005

**Table 9: Test Equipment – RF Measurements**

Equipment Description	Manufacturer	Model Name	Serial Number	Calibration Due
Preamplifier	Hewlett-Packard	8449B	3008A00101	N/A
Preselector	Hewlett-Packard	85685A	2620A00265	12-11-2005
Biconical Antenna	EMCO	3104	9111-4463	01-16-2006
I.p. Ant (200 -1000MHz)	EMCO	3146	2261	01-22-2006
Quasi Peak Adapter	Hewlett-Packard	85650A	2521A00737	12-11-2005
Spectrum Analyzer	Hewlett-Packard	8568B	2841A04315	12-11-2005
Spectrum Analyzer Display	Hewlett-Packard	-	-	12-11-2005
Horn. Ant (Below 18GHz)	EMCO	3115	8812-3050	01-19-2006
Horn. Ant (Below 40GHz)	HP	3116	4663	02-18-2006
Spectrum Analyzer	Hewlett-Packard	8569A	2128A00270	04-23-2006

**Table 10 Support Equipment – Radiated Emissions Tests**

Description	Manufacturer	Model No.	Serial No.	Calibration Due
DC Power Supply	BK Precision	1688		n/a
Digital Multimeter	Fluke	16	79510141	December 14, 2005

#### General Test Procedure – RF Tests

The measurement range investigated for radiated emissions was from 30 MHz to 60 GHz.

For the spurious and harmonics measurements, below 18GHz, the 5.8 GHz Short Distance Radar Sensor Alarm (the EUT) was set up at a 3 meter distance from the receiving antenna, on an Open Area Test Site (OATS), with the EUT running in a continuous mode. The EUT was rotated 360 degrees azimuth and the search antenna height varied 1 to 4m in order to maximize the emissions. Significant peaks from the EUT were then recorded to determine margin to the limits. For measurements above 18GHz, the EUT was set up at a 1 meter distance from the antenna, in a semi-anechoic chamber, with the EUT running in a continuous mode. The EUT was rotated 360 degrees azimuth and the search antenna height varied 1 to 4m in order to maximize the emissions. Significant peaks from the EUT were then recorded to determine margin to the limits.

For the field strength measurements of the fundamental frequency, the EUT was setup in an anechoic chamber at a 3 meter distance from the receiving antenna. The EUT was rotated 360 degrees azimuth and the search antenna height varied 1 to 4m in order to maximize the field strength emission of the fundamental. The maximum level of the fundamental emission from the EUT was measured and recorded at optimum antenna and table orientation to determine margin to the limits.

## PART 3 RF MEASUREMENTS (cont.)

### Spectrum Analyzer Configuration (during swept frequency scans) – Radiated Emissions

IF Bandwidth..... 120 kHz

Measurements below 1000 MHz (unless stated otherwise)

Analyzer Mode (for Peak Measurements) ..... Peak/Log

Resolution Bandwidth..... 100 kHz

Video Bandwidth..... 100 kHz

Analyzer Mode (for Quasi-Peak Measurements)

Quasi-Peak/Linear Resolution Bandwidth..... 1000 kHz

Video Bandwidth..... 1000 kHz

Measurements above 1000 MHz (unless stated otherwise)

Quasi-Peak Adapter Mode ..... Disabled (if available)

Analyzer Mode (for Peak Measurements) ..... Peak

Resolution Bandwidth..... 1000 kHz

Video Bandwidth..... 1000 kHz

Analyzer Mode (for Average Measurements) ..... Video Filter

Resolution Bandwidth..... 1000 kHz

Video Bandwidth..... 10 Hz

**Table 11 Data Table Legend and Field Strength Calculation – Radiated Emissions Tests**

Detector mode: Peak (P) or Quasi-Peak (QP) or Average (A)

	Polarization	Antenna	Freq Range (MHz)
VB	Vertical	EMCO 3104/sn 4463 Biconical	30 – 200
HB	Horizontal	EMCO 3104/sn 4463 Biconical	30 – 200
VL	Vertical	EMCO 3146/sn. 2261 Log Periodic	200 – 1000
HL	Horizontal	EMCO 3146/sn. 2261 Log Periodic	200 – 1000
VH1	Vertical	EMCO 3115/sn. 8812-3050 Horn	Below 18000
HH1	Horizontal	EMCO 3115/sn. 8812-3050 Horn	Below 18000
VH2	Vertical	HP 3116/sn. 4663 Horn	Below 26500
HH2	Horizontal	HP 3116/sn. 4663 Horn	Below 26500
VH4	Vertical	S&D DBD-520 Horn	Below 75000
HH4	Horizontal	S&D DBD-520 Horn	Below 75000

## FIELD STRENGTH OF FUNDAMENTAL

### FIELD STRENGTH Measurement

The EUT was set up as described above. The measurement instrumentation used was an Analyzer with bandwidth parameters as stipulated in ANSI C63.4-2001.

#### Site Used – Field Strength of Fundamental Measurements

- Test Site 1 - Shielded Room: 16' x 12' x 9'
- Test Site 1 - 3m Open Field Radiated Site
- Test Site 1 - 10m Open Field Radiated Site
- Test Site 2 - Environmental Lab
- EMC Lab 1 - Test Laboratory
- Semi-Anechoic Absorber Lined Shielded Room
- Other:

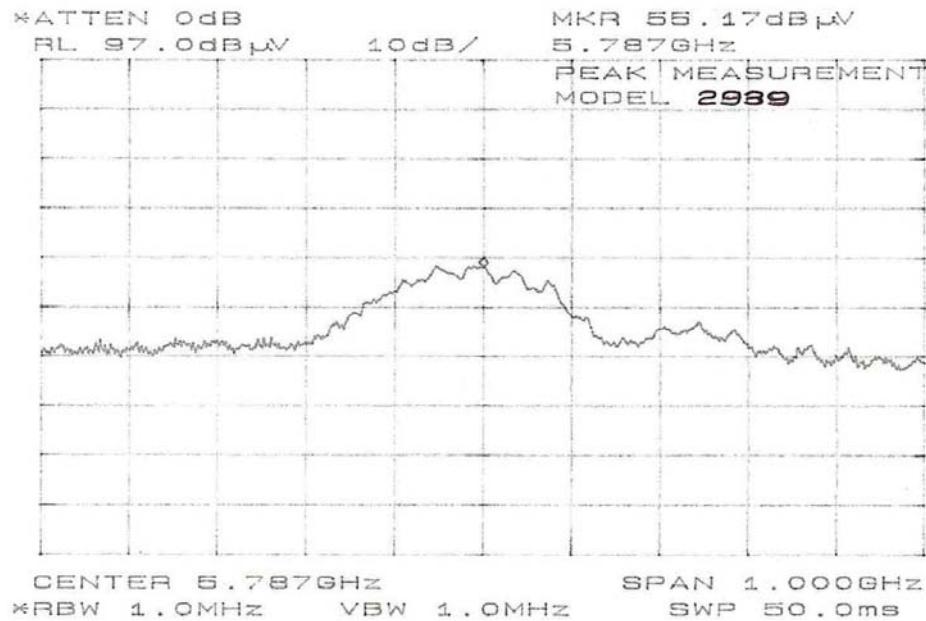
#### Administrative Details and Environmental Conditions – Field Strength of Fundamental Measurements

Test Date(s):	March 26 <sup>th</sup> – 27 <sup>th</sup> 2005
Test Engineer(s):	Robert Kershaw
Temperature	75°F
Humidity	65%

#### Test Data – Field Strength of Fundamental

The measurement plot below represents the maximum worst-case result from the measurement performed in accordance to the requirements of this section.

#### Field Strength of Fundamental Plot



**Figure 5:** Plot of Field Strength of Fundamental Average Measurement Performed at 3-Meter Distance

## FIELD STRENGTH OF FUNDAMENTAL (cont.)

INDICATED		CORRECTION		CORR	TURNTABLE ANT			CLASS A		CLASS B		
FREQ	AMPL	ANT	CAB / AMP	AMPL	ANG	HT	POL	AMPL	MARG	AMPL	MARG	DET
GHz	dBuV/m	dB	dB	dBuV/m	DEG	m	-	dBuV/m	dB	dBuV/m	dB	MODE
5.787	55.17	-19.2	34.4	70.30	90	1.2	VH	-	-	74	-3.7	p
5.787	52.98	-19.0	36.0	69.90	0	1.0	HH	-	-	74	-4.1	P

Table 12: Field Strength of Fundamental Test Data – Peak Measurement @ 1 meter

The margin in Table 12 is calculated as follows:

Margin = Corrected Amplitude – Limit, where Corrected Amplitude = Spectrum Analyzer Amplitude + Cable Loss + Antenna Factor – Pre-Amp Gain.

### Test-Data Summary – Peak Measurement:

Center Frequency = 5800 MHz  
 Peak Level: = 70.30dB $\mu$ V/m  
 Peak Limit (15.209) = 74.00dB $\mu$ V/m (54dB $\mu$ V/m + 20dB)

### Average Level Calculation

#### 47CFR 15.35c:

Unless otherwise specified, when the radiated emission limits are expressed in terms of the average value of the emission, and pulsed operation is employed, the measurement field strength shall be determined by averaging over one complete pulse train, including blanking intervals, as long as the pulse train does not exceed 0.1 seconds. As an alternative (provided the transmitter operates for longer than 0.1 seconds) or in cases where the pulse train exceeds 0.1 seconds, the measured field strength shall be determined from the average absolute voltage during a 0.1 second interval during which the field strength is at its maximum value.

### Average Level Calculation of Field Strength of Fundamental with Duty Cycle correction

The duty cycle rating as provided by the manufacturer is 0.83% (or 0.0083) over a 100mSec interval = 0.0083 seconds.

dB (in  $\mu$ V) Duty Cycle Correction = 0.0083 secs = 20log(0.0083) = -41.62dB $\mu$ V  
 Peak Level with Duty Cycle Correction = 70.30dB $\mu$ V/m - 20dB = 50.30dB $\mu$ V/m

### Test-Data Summary – Average Measurement:

Center Frequency = 5800 MHz  
 Average Level: = 50.30dB $\mu$ V/m (Calculated)  
 Average Limit (15.209) = 54.00dB $\mu$ V/m

### Conclusion

The 5.8 GHz Short Distance Radar Sensor Alarm meets the requirements of the test reference for Fundamental Frequency Field Strength.

## FIELD STRENGTH OF FUNDAMENTAL (cont.)

### OCCUPIED BANDWIDTH measurement

For the measurements, a spectrum analyzer was used. The EUT was measured according to the method specified in ANSI C63.4-2001.

#### Site Used – Occupied Bandwidth Measurements

- Test Site 1 - Shielded Room: 16' x 12' x 9'
- Test Site 1 - 3m Open Field Radiated Site
- Test Site 1 - 10m Open Field Radiated Site
- Test Site 2 - Environmental Lab
- EMC Lab 1 - Test Laboratory
- Semi-Anechoic Absorber Lined Shielded Room
- Other: \_\_\_\_\_

#### Administrative Details – Occupied Bandwidth Measurements

Test Date(s):	March 26 <sup>th</sup> – 27 <sup>th</sup> 2005
Test Engineer(s):	Robert Kershaw
Temperature	75°F
Humidity	65%

#### Test Measurement: Occupied Bandwidth Measurements (Performed in Anechoic Chamber)

The EUT was set up on a wooden non-conductive tabletop, 80 cm above the ground plane of the test location. Pre-scan measurements were first performed with a spectrum analyzer at 3 meter from a receiving antenna, in a Semi-Anechoic Chamber at the pre-determined worst-case height at 1 meter and in vertical polarity. The EUT running in continuous mode and was rotated 360 degrees azimuth in its x-y-z axis positions. It was also measured in the horizontal polarity. The analyzer was then placed in 'max-hold' mode to record signal level.

**Table 13: Spectrum Analyzer Configuration (during swept frequency scans) – Occupied Bandwidth**

Start Frequency .....	5.277 GHz
Stop Frequency .....	6.277 GHz
Sweep Speed .....	50 mSecs
RES Bandwidth.....	1000 kHz
Video Bandwidth.....	1000 kHz
Quasi Peak Adapter Mode .....	Bypass
Quasi peak Adapter Bandwidth.....	Disabled

## FIELD STRENGTH OF FUNDAMENTAL (cont.)

### Occupied Bandwidth Measurement Plot

The plot and test data below represents the maximum worst-case results from the measurements performed in accordance to the requirements of the standard and extreme test conditions specified at the beginning of this Part.

### Spectrum Mask Measurement

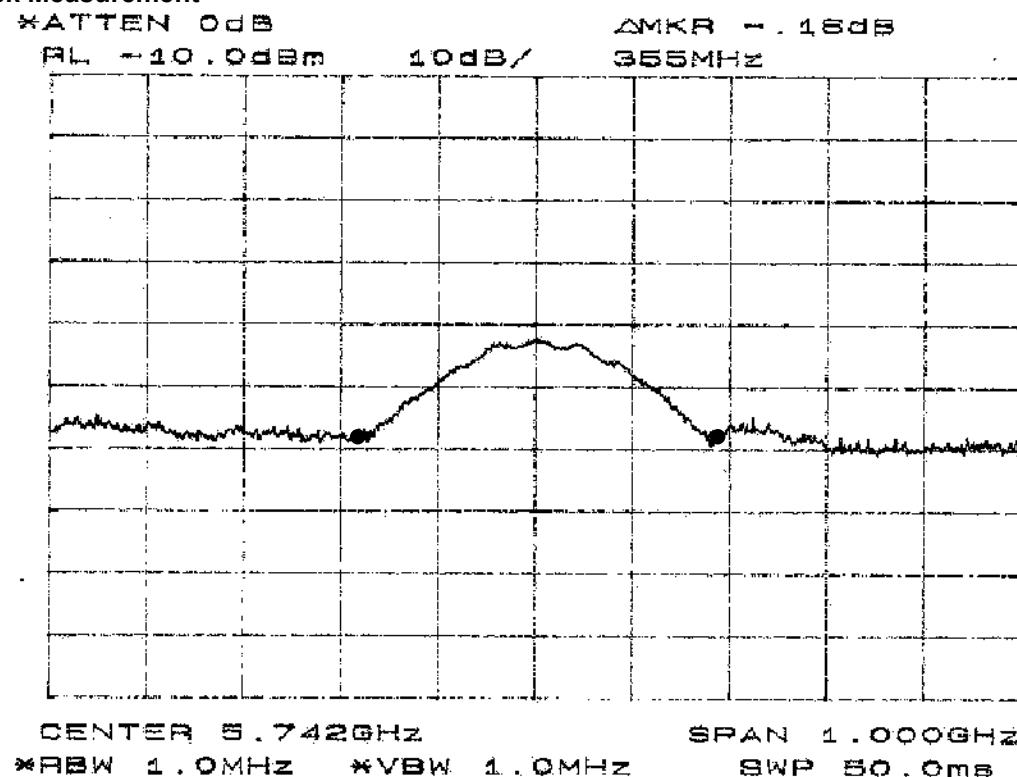


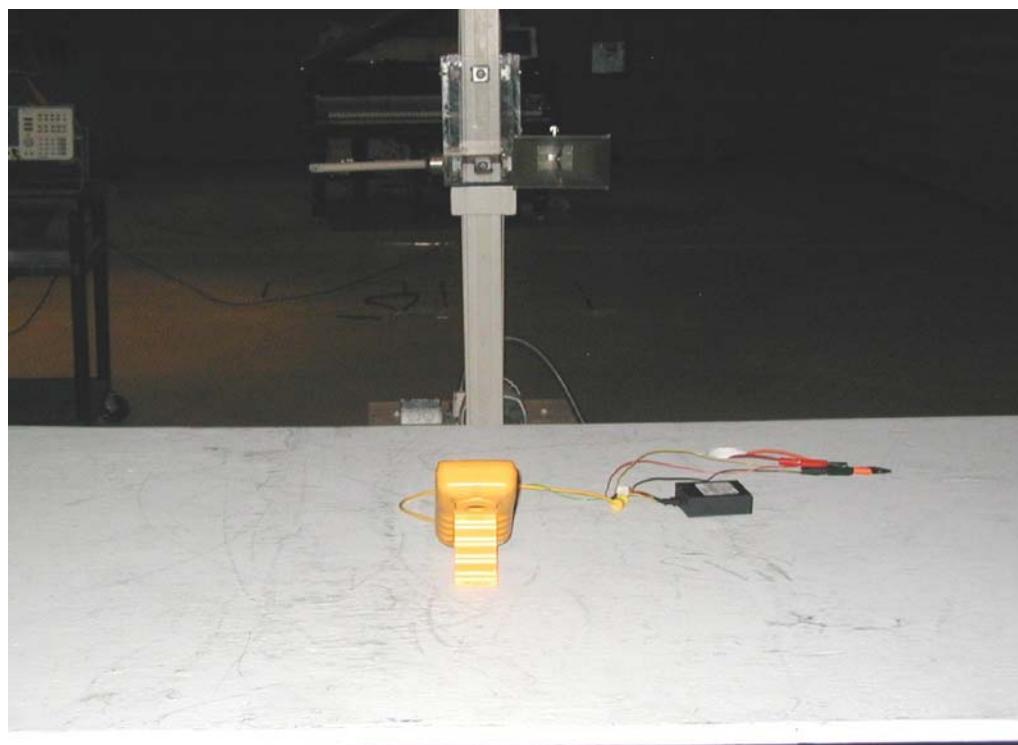
Figure 6: Occupied Bandwidth Plot

### Test-Data Summary – Occupied Bandwidth:

Center frequency: 5742 MHz  
Mask Bandwidth: 355 MHz

#### Occupied Bandwidth Data:

Upper Frequency ( $F_u$ )	$=f_0 + 355/2$	$=5742 \text{ MHz} + 177.5$	$=5564.5 \text{ MHz}$
Lower Frequency ( $f_L$ )	$=f_0 - 355/2$	$=5742 \text{ MHz} - 177.5$	$=5919.5 \text{ MHz}$

**FIELD STRENGTH OF FUNDAMENTAL (cont.)****Measurement Photographs for Field Strength of Fundamental and Occupied Bandwidth****Figure 7** Test Set Up Photos – Field Strength of Fundamental Measurement (Front)**Figure 8** Test Set Up Photos – Field Strength of Fundamental Measurement (Rear)

**SPURIOUS EMISSIONS, HARMONICS, and Emissions in the RESTRICTED BANDS**

**Test Specification:** FCC PART 15, SECTION 47 CFR 15.205  
FCC PART 15, SECTION 47 CFR 15.209

**Test Procedure – Spurious Emissions:**

The measurement range investigated was from 30 MHz to 18 GHz due to lack of emissions activity above 5.8GHz. The measurement instrumentation used was an Analyzer with bandwidth parameters as stipulated in ANSI C63.4-2001

**Site Used – Harmonics Emissions Measurements**

- Test Site 1 - Shielded Room: 16' x 12' x 9'
- Test Site 1 - 3m Open Field Radiated Site
- Test Site 1 - 10m Open Field Radiated Site
- Test Site 2 - Environmental Lab
- EMC Lab 1 - Test Laboratory
- Semi-Anechoic Absorber Lined Shielded Room
- Other:

**Administrative Details and Environmental Conditions– Spurious and Restricted Bands Emissions**

<b>Test Date:</b>	March 27 <sup>th</sup> 2005
<b>Test Engineer:</b>	Robert Kershaw
<b>Temperature:</b>	75°F
<b>Humidity:</b>	67%

**Spectrum Analyzer Configuration (during swept frequency scans) – Spurious and Restricted Emissions**

IF Bandwidth.....120 kHz

Measurements below 1000 MHz (unless stated otherwise)

- Analyzer Mode (for Peak Measurements) ..... Peak/Log
- Resolution Bandwidth ..... 100 kHz
- Video Bandwidth ..... 100 kHz
- Analyzer Mode (for Quasi-Peak Measurements)
- Quasi-Peak/Linear Resolution Bandwidth ..... 1000 kHz
- Video Bandwidth ..... 1000 kHz

Measurements above 1000 MHz (unless stated otherwise)

- Quasi-Peak Adapter Mode ..... Disabled (if available)
- Analyzer Mode (for Peak Measurements) ..... Peak
- Resolution Bandwidth ..... 1000 kHz
- Video Bandwidth ..... 1000 kHz
- Analyzer Mode (for Average Measurements) ..... Video Filter
- Resolution Bandwidth ..... 1000 kHz
- Video Bandwidth ..... 10 Hz

**SPURIOUS, HARMONICS, and RESTRICTED BANDS Emissions (cont.)****Test Details – Spurious and Restricted Bands Emissions**

Transmitter	Operating Mode
Limit	47CFR 15.209 (a)

The tables below shows the summary of the highest amplitudes of the spurious RF radiated emissions from the equipment under test.

**Table 14 Test Data – Spurious and Restricted Bands Emissions below 1GHz @ 3 meters**

INDICATED		CORRECTION		CORR	TURNTABLE ANT			CLASS A		CLASS B		
FREQ	AMPL	ANT	CAB	AMPL	ANG	HT	POL	AMPL	MARG	AMPL	MARG	DET
MHz	dBuV/m	dB	dB	dBuV/m	DEG	m	-	dBuV/m	dB	dBuV/m	dB	MODE
34.90	16.20	10.1	0.9	27.2	90	1.0	VB	-	-	40.0	-12.8	P
35.20	14.80	11.6	0.9	27.3	90	1.5	HB	-	-	40.0	-12.7	P
50.12	17.10	10.3	1.1	28.5	90	1.0	VB	-	-	40.0	-11.5	P
84.90	12.50	8.3	2.4	23.2	90	1.0	VB	-	-	40.0	-16.8	P
115.80	11.60	14.2	3.4	29.2	90	1.0	VB	-	-	40.0	-10.8	P
142.80	11.70	12.5	4.5	28.7	90	1.0	VB	-	-	43.0	-14.3	P
210.18	9.60	11.5	3.7	24.8	0	1.0	VL	-	-	43.0	-18.2	P
225.00	11.80	11.3	0.9	24.0	0	1.0	VL	-	-	46.0	-22.0	P
243.80	16.30	12.5	3.9	32.6	90	1.0	VL	-	-	46.0	-13.4	P
243.90	17.20	12.4	3.9	33.5	90	1.0	HL	-	-	46.0	-12.5	P
490.20	10.50	17.6	5.1	33.2	90	1.0	VL	-	-	46.0	-12.8	P
547.20	10.00	18.9	7.6	36.5	90	1.5	HL	-	-	46.0	-9.5	P
621.90	6.90	19.0	6.7	32.6	90	1.0	VL	-	-	46.0	-13.4	P

No emission of significant level was observed above 621.90MHz.

**Table 15 Test Data for Radiated Emissions Measurement above 1 GHz @ 3 meters (Measurements to 40 GHz)**

INDICATED		CORRECTION		CORR	TURNTABLE ANT			CLASS A		CLASS B		
FREQ	AMPL	ANT	CAB/ Pre-Amp	AMPL	ANG	HT	POL	AMPL	MARG	AMPL	MARG	DET
MHz	dBuV/m	dB	dB	dBuV/m	DEG	m	-	dBuV/m	dB	dBuV/m	dB	MODE
1165.00	47.00	25.0	-36.0	36.0	90	1.0	VH	-	-	54.0	-18.0	P
1188.00	42.00	25.4	-36.0	31.4	90	1.0	VH	-	-	54.0	-22.6	P
1189.00	40.00	25.4	-36.0	29.4	90	1.5	HH	-	-	54.0	-24.6	P
1209.00	44.00	25.7	-36.0	34.7	90	1.0	VH	-	-	54.0	-19.3	P
1235.00	48.00	25.8	-36.0	37.8	90	1.0	VH	-	-	54.0	-18.2	P
1235.00	47.00	25.5	-36.0	36.5	0	1.0	HH	-	-	54.0	-17.5	P
1295.00	47.00	26.0	-36.0	37.0	0	1.0	VH	-	-	54.0	-17.0	P
1315.00	51.00	26.2	-36.0	41.2	90	1.0	VH	-	-	54.0	-12.8	P
1315.00	49.00	26.2	-36.0	39.2	90	1.0	HH	-	-	54.0	-14.8	P
1350.00	51.00	26.8	-36.0	41.8	90	1.0	VH	-	-	54.0	-12.2	P
1386.00	46.00	27.0	-36.0	37.0	0	1.0	VH	-	-	54.0	-17.0	P
1624.00	47.00	27.7	-35.0	39.7	90	1.2	HH	-	-	54.0	-14.3	P
1625.00	44.00	27.7	-35.0	36.7	90	1.0	VH	-	-	54.0	-17.3	P
1662.00	47.00	28.0	-35.0	40.0	90	1.0	VH	-	-	54.0	-14.0	P
5787.00*	55.17	34.4	-19.2	70.3	90	1.2	VH	-	-	54.0	16.3	P
5787.00*	52.98	36.0	-19.0	69.9	0	1.0	HH	-	-	54.0	15.9	P
11574.00**	9.20	39.2	-18.0	30.4	90	1.2	VH	-	-	54.0	-23.6	P
11574.00**	9.10	39.3	-18.0	30.4	90	1.0	HH	-	-	54.0	-23.6	P
17361.00**	7.20	44.3	-8.0	43.5	90	1.0	VH	-	-	54.0	-10.5	P
17361.00**	7.00	43.6	-8.0	42.6	90	1.0	HH	-	-	54.0	-11.4	P

No emission of significant level was observed above 17361.00 MHz.

\* Fundamental Frequency

\*\* Noise Floor

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Tel: [925] 862-2944 Fax: [925] 862-9013  
Email: docs@itcemc.com Web: www.itcemc.com

Product: 5.8GHz Short Distance Radar Sensor Alarm  
P/N: 902939

FCC ID:LQN2939

## SPURIOUS, HARMONICS, and RESTRICTED BANDS Emissions (cont.)

### Test-Data Summary – Spurious, Harmonics, and Restricted Bands Measurements

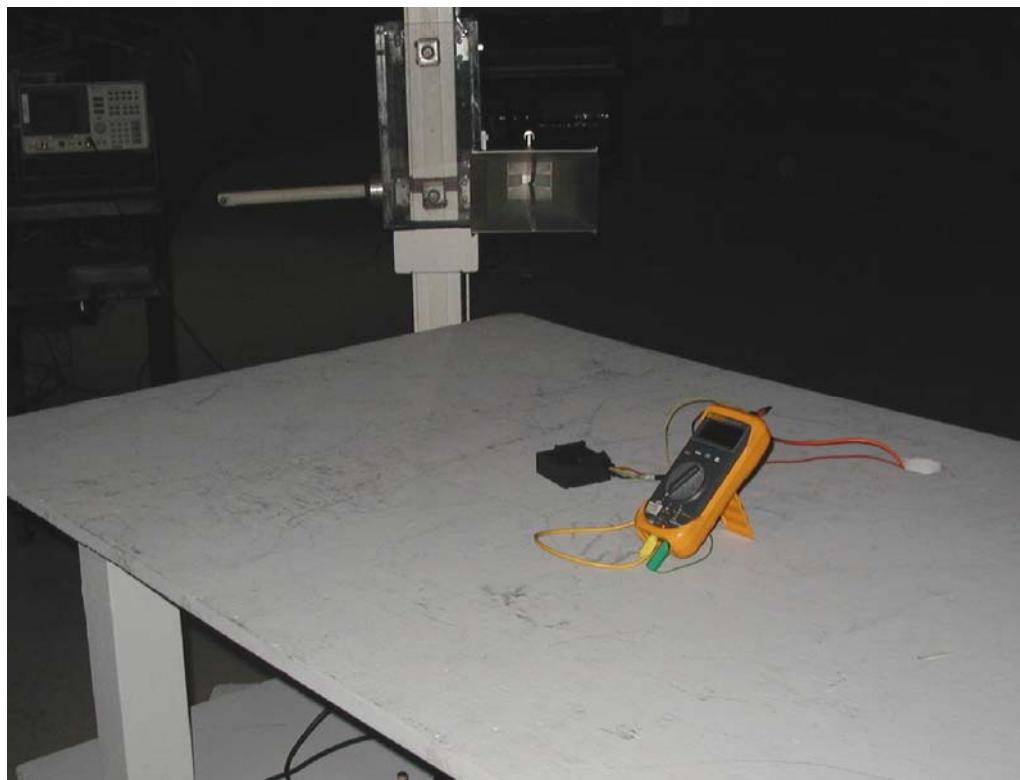
#### The margin in Table 6 is calculated as follows:

Margin = Corrected Amplitude – Limit, where Corrected Amplitude = Spectrum Analyzer Amplitude + Cable Loss + Antenna Factor – Pre-Amp Gain.

#### Conclusion

The 5.8 GHz Short Distance Radar Sensor Alarm meets the requirements of the test reference for Spurious and Restricted Bands emissions levels specified in the 47CFR15.209

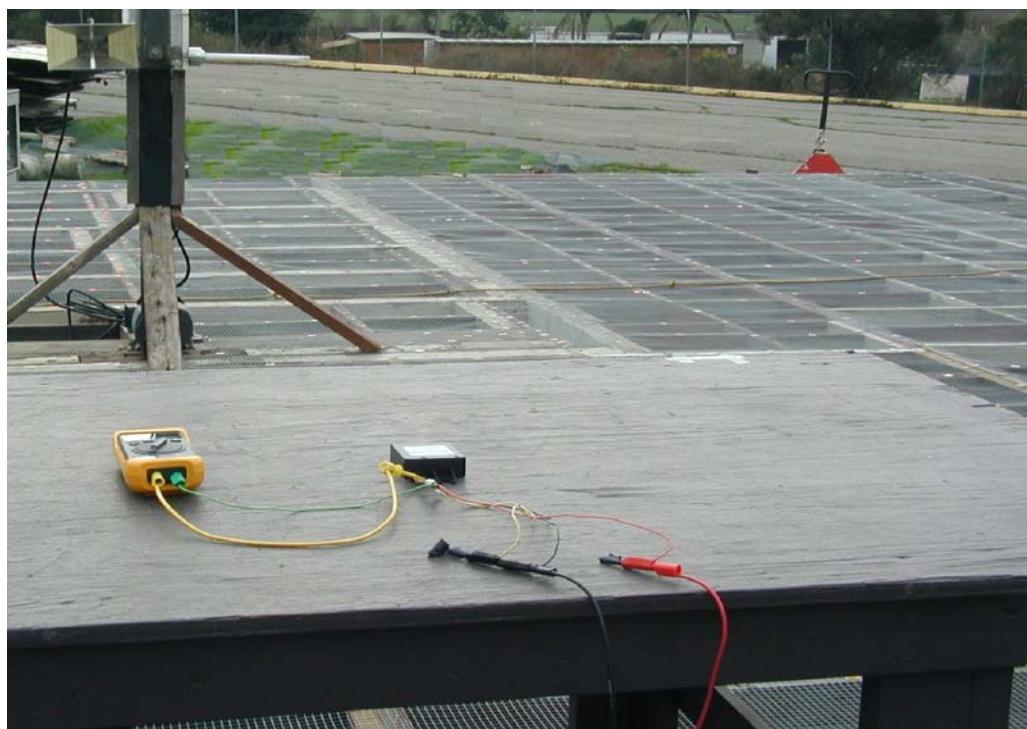
#### Measurement Photographs for Spurious, Harmonics, and Restricted Bands



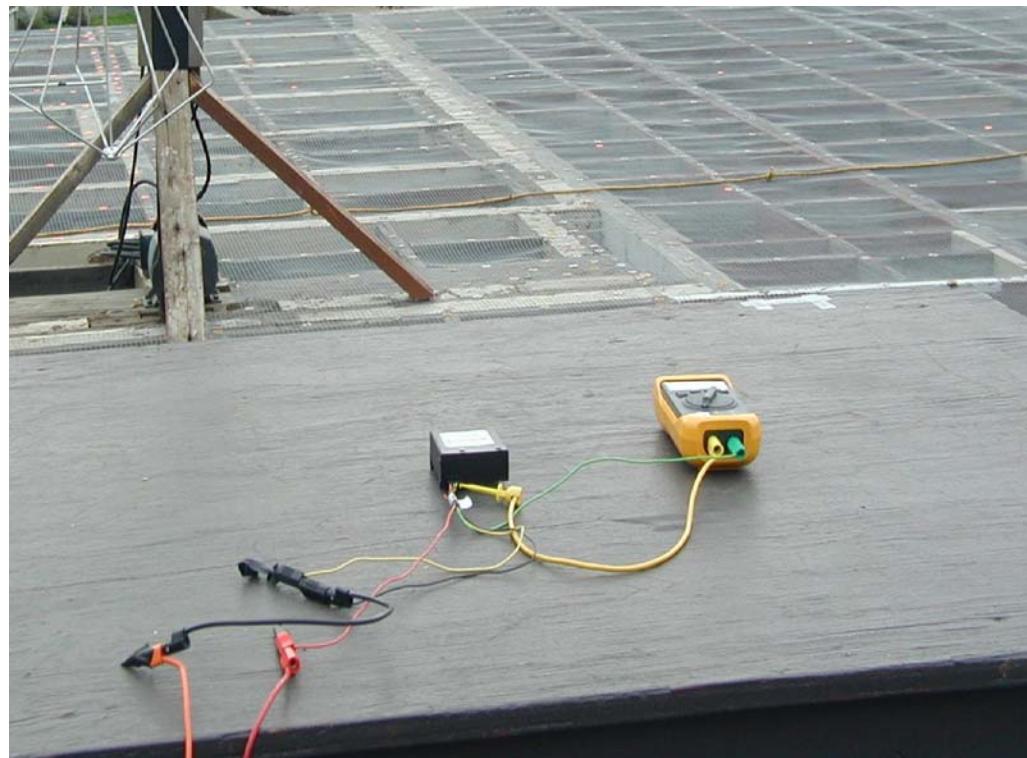
**Figure 9:** Test Set Up Photos – Spurious, Harmonics, and Restricted Bands Test Setup @ 1 meter

## SPURIOUS and RESTRICTED BANDS Emissions (cont)

### Measurement Photographs for Spurious, Harmonics, and Restricted Bands (cont)



**Figure 10:** Test Set Up Photos – Spurious, Harmonics, and Restricted Test Set up (above 1GHz)



**Figure 11:** Test Set Up Photos – Field Strength of Fundamental Measurement (below 1 GHz)

**PART 4 APPENDICES****A. EUT Technical Specification**

Applicant	Connaught Electronics, Ltd.	
Product Specifications		
Description	5.8GHz Short Distance Radar Sensor Alarm	
Frequency Range	5564.5 MHz to 5919.5 MHz	
Part Number(s)	CEL	902939
Serial Number(s)	0000000000000005A	
Central Processor	16LF876-041/SO	
Cable(s)	n/a	
Peak Output Power	-36dBm	
Mainboard	Manufacturer	CEL
	Model	CTX 0337
	Part Number	152887 Rev 002
	Dimension	Approx. 65mm x 60mm
	Connector(s)	One (1) 4-pin, p/n. 4-1393472-9
Antenna Board	Manufacturer	CEL
	Model	CTX/A 0406
	Part Number	500347
	Dimension	Approx. 23mm x 10mm
	Layers	2-sided
Ports	Antenna	
	Two (2) 10mm Dual loop, 1mm traces	
	One (1) 4-pin	
	Power Supply(s)	DC Cell
		Input
		13.5Vdc/50mA
	Output	n/a

## B. EUT Photographs



Figure 12: EUT Top View



Figure 13: EUT Front View

Prepared By: ITC Engineering Services, Inc.  
9959 Calaveras Road, PO Box 543  
Sunol, California 94586-0543  
Tel: [925] 862-2944 Fax: [925] 862-9013  
Email: [docs@itcemc.com](mailto:docs@itcemc.com) Web: [www.itcemc.com](http://www.itcemc.com)

Product: 5.8GHz Short Distance Radar Sensor Alarm  
P/N: 902939

FCC ID:LQN2939



Figure 14: EUT Board Mount View



Figure 15: EUT Rear View

## EUT Photographs (cont.)



Figure 16: EUT Internal View 1

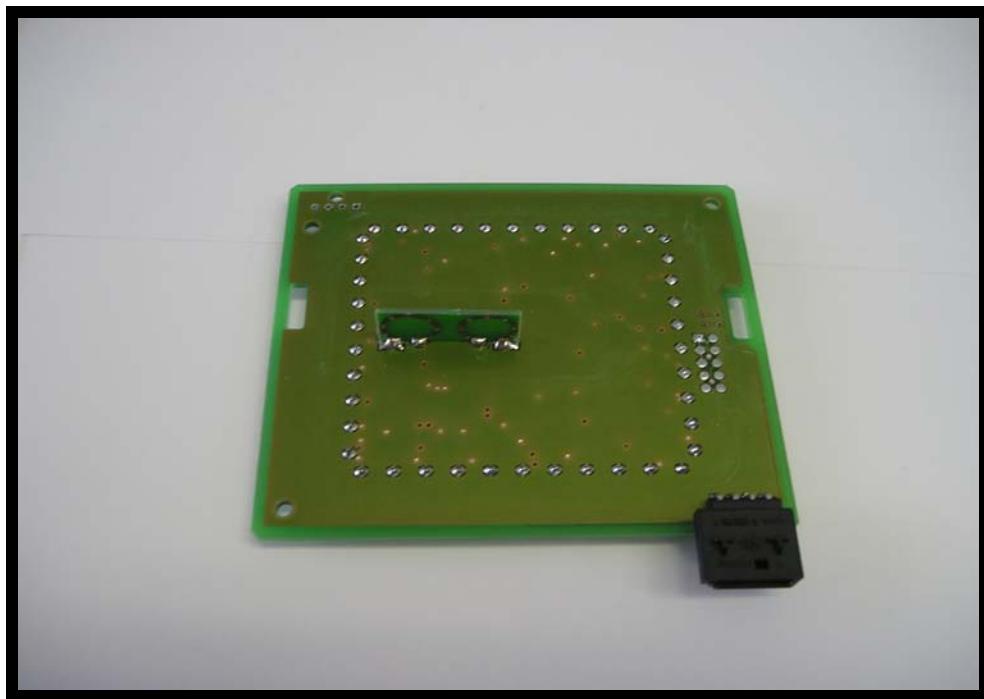


Figure 17: EUT Internal View 2

## C. Modification Letter

To Whom It May Concern:

This is to certify that no modifications were necessary for 5.8GHz Short Distance Radar Sensor Alarm, model 902939 to comply with the required Requirements of:

FCC Rules and Regulations per 47 CFR 15.209

It is the manufacturer's responsibility to ensure that additional production units of the 5.8GHz Short Distance Radar Sensor Alarm, model 902939 are manufactured with identical electrical and mechanical characteristics. For further information, please contact the manufacturer at:

Connaught Electronics, Ltd.  
IDA Industrial Estate, Dunmore Road,  
Tuam, Co. Galway, Ireland

Tel: +353 932-5128  
Attention: Mr. Joe Danaher