



**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  
**Smart MDD 5.8GHz Sensor**  
[FCC ID: LQN2927]

Model and Part Number:  
**902927(Smart Part No: A4518200110/004)**

Report No.  
**20070122-01-FC15**

Judgement  
**Complies as Tested**

Provided for evaluation by  
**Connaught Electronics, LTD**  
IDA Industrial Estate  
Dunmore Road, Tuam  
Co. Galway, Ireland

Tests and Report by  
**ITC Engineering Services, Inc.**  
9959 Calaveras Road, Box 543  
Sunol, California 94586-0543  
Tel: (925) 862-2944  
Fax: (925) 862-9013  
Email: [itcemc@itcemc.com](mailto:itcemc@itcemc.com)  
Web Site: [www.itcemc.com](http://www.itcemc.com)



Lab Code: 200172-0

ISO 17025 Accredited Compliance Laboratory (RES-GmbH)

## Table of Contents

<b>PART 1 General.....</b>	<b>6</b>
Test Information.....	6
Tests Performed: .....	6
Declaration/Disclaimer .....	7
Test Methodology .....	8
Test Facility .....	8
<b>PART 2 RECEIVER MEASUREMENTS .....</b>	<b>9</b>
OPEN FIELD RADIATED EMISSIONS .....	9
Test Specification: 47 CFR PART 15, Sub-Part B .....	9
EUT Description. ....	9
Test Procedure – Radiated Emissions Tests .....	9
Spectrum Analyzer Configuration (during swept frequency scans) – Radiated Emissions .....	10
OPEN FIELD RADIATED EMISSIONS Results .....	11
Site Used – Radiated Emissions Measurement.....	11
Administrative and Environmental Conditions – Radiated Emissions Measurement.....	11
Remark.....	11
Open Field Radiated Emissions Test Setup Photographs.....	12
Administrative and Environmental Details– Radiated Emissions Measurement .....	13
Remark.....	13
Radiated Emissions Test Setup Photographs.....	14
<b>PART 3 RF MEASUREMENTS .....</b>	<b>15</b>
Test Specification: 47 CFR PART 15, Sub-Part C .....	15
General Test Procedure – RF Tests .....	15
Spectrum Analyzer Configuration (during swept frequency scans) – Radiated Emissions .....	16
FIELD STRENGTH OF FUNDAMENTAL.....	17
FIELD STRENGTH Measurement.....	17
Site Used – Field Strength of Fundamental Measurements .....	17
Administrative Details and Environmental Conditions – Field Strength of Fundamental Measurements .....	17
Test Data – Field Strength of Fundamental .....	17
Remark.....	18
OCCUPIED BANDWIDTH measurement.....	19
Site Used – Occupied Bandwidth Measurements .....	19
Administrative Details – Occupied Bandwidth Measurements .....	19
Test Measurement: Occupied Bandwidth Measurements (Performed in a Semi-Anechoic Chamber) .....	19
Occupied Bandwidth Measurement Plot .....	20
Spectrum Mask Measurement.....	20
Occupied Bandwidth Data: .....	20
Measurement Photographs for Field Strength of Fundamental and Occupied Bandwidth .....	21
SPURIOUS EMISSIONS, HARMONICS, and Emissions in the RESTRICTED BANDS .....	22
Test Procedure – Spurious Emissions:.....	22
Site Used – Harmonics Emissions Measurements.....	22
Administrative Details and Environmental Conditions– Spurious and Restricted Bands Emissions .....	22

**Applicant:** Connaught Electronics Ltd.

**Report No.:** 20070122-01-FC15

Spectrum Analyzer Configuration (during swept frequency scans) – Spurious and Restricted Emissions	22
Test Details – Spurious and Restricted Bands Emissions.....	23
Remark.....	24
Test Photographs .....	25
<b>PART 4 APPENDICES.....</b>	<b>27</b>
A. EUT Technical Specification.....	27
B. EUT Photographs.....	28
C. Modification Letter .....	31

## List of Tables

Table 1 Radio Device Measurement Information.....	8
Table 2 Measurement Uncertainty .....	8
Table 3 Test Equipment – Radiated Emissions Tests .....	9
Table 4 Support Equipment – Radiated Emissions Tests .....	9
Table 5 Data Table Legend and Field Strength Calculation – Radiated Emissions Tests.....	10
Table 6 Test Data for Radiated Emissions Measurement up to 1 GHz at 10 meters .....	11
Table 7 Test Data for Radiated Emissions Measurement above 1 GHz @ 3 meters.....	13
Table 8: Support Equipment – RF Measurements .....	15
Table 9: Test Equipment – RF Measurements.....	15
Table 10 Support Equipment – Radiated Emissions Tests .....	15
Table 11 Data Table Legend and Field Strength Calculation – Radiated Emissions Tests .....	16
Table 12: Field Strength of Fundamental Test Data – Peak Measurement .....	18
Table 13 Test Data – Spurious and Restricted Bands Emissions below 1GHz.....	23
Table 14 Test Data for Radiated Emissions Measurement above 1 GHz @ 3 meters .....	23

## List of Figures

Figure 1: Open Field Radiated Emissions below 1 GHz (View 1).....	12
Figure 2: Open Field Radiated Emissions below 1 GHz (View 2).....	12
Figure 3: Radiated Emissions above 1 GHz (View 1).....	14
Figure 4: Radiated Emissions above 1 GHz (View 2).....	14
Figure 5: Plot of Field Strength of Fundamental Peak Measurement. ....	17
Figure 6: Occupied Bandwidth Plot.....	20
Figure 7 Test Set Up Photos – Field Strength of Fundamental Measurement (Front).....	21
Figure 8: Spurious emissions below 1 GHz (View 1).....	25
Figure 9: Spurious emissions below 1GHz (View 2).....	25
Figure 10: Spurious emission above 1 GHz (View 1).....	26
Figure 11: Spurious emission above 1 GHz (View 2).....	26
Figure 12: EUT Top View.....	28
Figure 13: EUT Front View.....	28
Figure 14: EUT Rear View.....	29
Figure 15: EUT Internal View 1.....	29
Figure 16: EUT Internal View 2.....	30

## PART 1 General

### Test Information

<b>Product:</b>	Smart MDD 5.8GHz Sensor	
<b>Model Number:</b>	902927	
<b>Manufacturer's Name</b>	Connaught Electronics, LTD IDA Industrial Estate Dunmore Road, Tuam Co. Galway, Ireland Tel: + 011 353 (93) 25128 Mr. Patrick Denny	Fax : +011 353 (93) 25133 Email <a href="mailto:dennypatrick@cel.ie">dennypatrick@cel.ie</a>
<b>Manufacturer's Address</b>		
<b>Contact</b>		
<b>Test Laboratory</b>	ITC Engineering Services, Inc. 9959 Calaveras Road, PO Box 543 Sunol, CA 94586-0543 Email: <a href="mailto:itcemc@itcemc.com">itcemc@itcemc.com</a> Web Site: <a href="http://www.itcemc.com">http://www.itcemc.com</a>	Tel: +1(925) 862-2944 Fax: +1(925) 862-9013
<b>Test Number</b>	20050616-03	
<b>Report Number</b>	20070122-01-Fc15	
<b>Test Date(s) &amp; Issue Date</b>	Jan 8 – Jan 10, 2007	Jan 29, 2007
<b>Test Engineer(s)</b>	Femi Ojo	
<b>Documentation</b>	Femi Ojo	
<b>Test Results</b>	<input checked="" type="checkbox"/> Complies as Tested	<input type="checkbox"/> Fail
<b>Total Number of Pages</b>	31	

The electromagnetic interference and RF tests, which this report describes, were performed by an independent engineering consultancy firm, ITC Engineering Services, Inc. (ITC), in accordance with the 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:

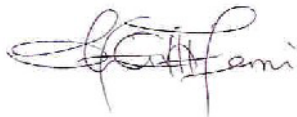
#### Emissions Requirements:

- 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.
- SPURIOUS and HARMONIC EMISSIONS in accordance with the FCC 47 CFR 15.209.

Report generated by



Femi Ojo,  
Compliance Engineer

Report reviewed by



Michael Gbadebo, P.E, Chief Engineer.  
(California License # 11303)

## 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 ISO 17025

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 and RF tests, which this report describes, were performed by an independent engineering consultancy firm, ITC Engineering Services, Inc. (ITC), in accordance with the FCC test procedure ANSI C63.4-2003

### Test Facility

The open area test site, the conducted measurement facility, the semi anechoic chamber and the test equipment used to collect the emissions and RF 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</b>	Smart MDD 5.8GHz Sensor	
<b>Model</b>	902927	
<b>Applicant / Manufacturer Address</b>	Connaught Electronics, Ltd. IDA Industrial Estate, Dunmore Road, Tuam, Co. Galway, Ireland	
<b>Contact</b>	Mr. Patrick Denny Tel: +011 353 93 25128	<a href="mailto:dennypatrick@cel.ie">dennypatrick@cel.ie</a> Fax: +011 353 93 25133
<b>Total Number of Pages including Appendices</b>	32 Pages	
<b>Test Report File No.</b>	20070122-01-Fc15	

**Table 2 Measurement Uncertainty**

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



## PART 2 RECEIVER MEASUREMENTS

### OPEN FIELD RADIATED EMISSIONS

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

#### EUT Description.

Connaught's product 5.8GHz microwave sensor, model; 902927 (or the EUT) as referred to in this report is an intentional radiator. The EUT was set up at 3 and 10 meters in accordance with the suggested configuration given in FCC Measurement Procedure ANSI C63.4-2003. The measurement instrumentation used was a receiver with bandwidth parameters as stipulated in ANSI C63.4-2003. The 5.8GHz Microwave 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	83051A	00000009025	1-31-2007
Preselector	Hewlett-Packard	85685A	2620A00265	1-31-2007
Biconical Antenna	EMCO	3104	9111-4463	02-16-2007
L.P Ant (200 -1000MHz)	EMCO	3146	2261	02-16-2007
Quasi Peak Adapter	Hewlett-Packard	85650A	2521A00737	1-31-2007
Spectrum Analyzer	Hewlett-Packard	8568B	2841A04315	1-31-2007
Spectrum Analyzer Display	Hewlett-Packard			1-31-2007
Horn. Ant (Below 18GHz)	EMCO	3115	8812-3050	02-16-2007
Spectrum Analyzer	Hewlett-Packard	8565E	3943A01328	08-16-2007

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

Description	Manufacturer	Model No.	Serial No.	Calibration Due
DC Power Supply	KEPCO	JQE 150-1.5M	H177085	n/a
Digital Multimeter	Fluke	16	79510141	December 08, 2007

#### Test Procedure – Radiated Emissions Tests

The measurement range investigated was from 30 MHz to 18 GHz due to lack of emissions activity above 5.8GHz. For measurements below 1GHz, 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 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)

#### 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 and Environmental Conditions – Radiated Emissions Measurement

Test Date:	Jan 8, 2007
Test Engineer:	Femi Ojo
Temperature	26.6°C
Humidity	30%

**Table 6 Test Data for Radiated Emissions Measurement up to 1 GHz at 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		NOTES
FREQ	AMPL	ANT	CAB	AMPL	ANG	HT	POL	AMPL	MARG	AMPL	MARG	
MHz	dBuV/m	dB	dB	dBuV/m	DEG	m	-	dBuV/m	dB	dBuV/m	db	
38.20	3.7	10.9	1.0	15.7	0	2.0	VB	-	-	30.0	-14.3	
45.40	4.9	12.0	1.2	18.1	0	2.0	HB	-	-	30.0	-11.9	
61.15	3.6	9.9	1.2	14.7	90	1.0	VB	-	-	30.0	-15.3	
70.43	7.7	7.6	1.3	16.6	90	4.0	HB	-	-	30.0	-13.4	
84.52	5.7	7.1	1.5	14.3	0	1.0	VB	-	-	30.0	-15.7	
121.76	9.4	11.9	1.7	23.0	180	3.0	VB	-	-	33.0	-10.0	
127.04	4.0	12.6	1.8	18.4	180	4.0	HB	-	-	33.0	-14.6	
150.04	7.1	12.3	1.9	21.3	180	4.0	HB	-	-	33.0	-11.7	
171.53	6.1	16.4	2.2	24.7	0	2.0	VB	-	-	33.0	-8.3	
186.26	7.8	17.8	2.2	27.8	0	3.0	VB	-	-	33.0	-5.2	
190.21	5.2	17.2	2.3	24.7	0	1.0	HB	-	-	33.0	-8.3	
224.95	7.9	11.0	2.5	21.4	180	3.0	VL	-	-	36.0	-14.6	
233.45	4.5	10.9	2.6	18.1	0	4.0	HL	-	-	36.0	-17.9	
281.38	6.4	13.6	3.2	23.2	90	1.0	VL	-	-	36.0	-12.8	
333.26	5.9	14.0	3.5	23.3	180	3.0	HL	-	-	36.0	-12.7	
337.16	4.0	14.7	3.5	22.2	0	1.0	VL	-	-	36.0	-13.8	
426.68	3.8	15.8	3.8	23.4	180	4.0	HL	-	-	36.0	-12.6	
464.53	4.4	16.5	3.6	24.4	0	4.0	HL	-	-	36.0	-11.6	
464.73	5.8	17.4	3.6	26.8	0	1.0	VL	-	-	36.0	-9.2	
537.95	8.4	18.4	3.8	30.6	0	3.0	VL	-	-	36.0	-5.4	
650.94	6.5	18.5	4.1	29.1	180	1.0	VL	-	-	36.0	-6.9	
663.30	8.3	19.7	4.2	32.2	0	4.0	HL	-	-	36.0	-3.8	
737.33	4.1	20.9	4.4	29.3	0	1.0	VL	-	-	36.0	-6.7	

No emission of significant level was observed from 737.33MHz – 1GHz.

**Remark:** The EUT meets the requirements of FCC class B for open field radiated emissions

## OPEN FIELD RADIATED EMISSIONS Results (cont.)

### Open Field Radiated Emissions Test Setup Photographs



**Figure 1: Open Field Radiated Emissions below 1 GHz (View 1)**



**Figure 2: Open Field Radiated Emissions below 1 GHz (View 2)**

## RADIATED EMISSIONS Results (cont.)

### Administrative and Environmental Details– Radiated Emissions Measurement

Test Date:	Jan 10, 2007
Test Engineer:	Femi Ojo
Temperature	27.3°C
Humidity	20%

**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		NOTES
FREQ	AMPL	ANT	CAB+ AMP	AMPL	ANG	HT	POL	AMPL	MARG	AMPL	MARG	
MHz	dBuV/ m	dB	dB	dBuV/ m	DEG	m	-	dBuV/m	dB	dBuV/m	db	
1064.20	35.0	24.8	-27.9	31.9	0	2.0	HH			54.0	-22.1	
1343.30	35.3	25.0	-27.8	32.5	0	1.0	VH			54.0	-21.5	
1390.80	35.0	25.5	-27.8	32.7	0	1.0	HH			54.0	-21.3	
1758.70	34.5	26.6	-27.6	33.5	0	1.0	VH			54.0	-20.5	
2093.30	34.7	28.3	-26.7	36.3	0	2.0	HH			54.0	-17.7	
2348.00	34.8	28.4	-27.2	36.0	0	1.0	VH			54.0	-18.0	
2763.00	34.8	29.5	-27.4	36.9	0	1.0	VH			54.0	-17.1	
2773.30	34.5	30.0	-27.4	37.1	180	1.0	HH			54.0	-16.9	
3167.50	36.0	31.0	-26.6	40.4	180	2.0	HH			54.0	-13.6	
3515.30	35.7	31.2	-27.1	39.8	0	1.0	VH			54.0	-14.2	
4277.00	36.0	32.2	-26.7	41.5	0	1.0	VH			54.0	-12.5	
5035.80	35.3	34.3	-25.5	44.1	0	1.0	HH			54.0	-9.9	
5385.00	35.7	34.4	-25.3	44.8	90	1.5	VH			54.0	-9.2	
5798.70	41.8	34.6	-25.4	51.0	0	1.0	VH			54.0	-3.0	Fund
5831.70	41.7	35.2	-25.5	51.4	0	1.0	HH			54.0	-2.6	Fund
6628.00	37.2	34.8	-23.8	48.2	0	1.0	VH			54.0	-5.8	
9613.30	31.2	38.7	-23.4	46.5	180	1.2	VH			54.0	-7.5	
9641.70	30.5	39.3	-24.0	45.8	0	1.0	HH			54.0	-8.2	
12430.00	31.7	38.8	-23.7	46.8	180	1.2	VH			54.0	-7.2	
13103.30	30.8	40.2	-24.7	46.3	180	2.0	HH			54.0	-7.7	
17808.70	30.8	41.2	-25.1	46.9	90	2.0	VH			54.0	-7.1	

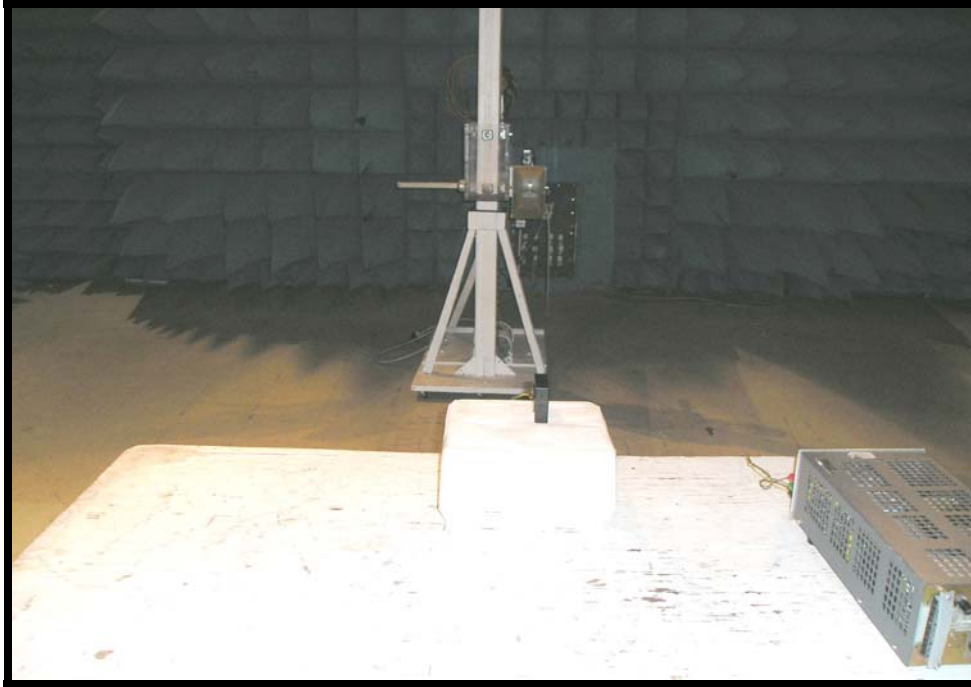
No emission of significant level was observed above 17.8GHz.

**Remark:** The EUT meets the requirements of FCC class B for radiated emissions



## **RADIATED EMISSIONS Results (cont.)**

### **Radiated Emissions Test Setup Photographs**



**Figure 3: Radiated Emissions above 1 GHz (View 1)**



**Figure 4: Radiated Emissions above 1 GHz (View 2)**

## PART 3 RF MEASUREMENTS

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

### EUT Description:

Connaught's product 5.8GHz microwave sensor, model; 902927 (or the EUT) as referred to in this report is an intentional radiator. The EUT was set up on a wooden table, 80cm above the ground reference plane in a semi anechoic chamber. 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	KEPCO	JQE 150-1.5M	H177085	n/a
Digital Multimeter	Fluke	16	79510141	December 08, 2007

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

Equipment Description	Manufacturer	Model Name	Serial Number	Calibration Due
Preamplifier	Hewlett-Packard	83051A	00000009025	1-31-2007
Preselector	Hewlett-Packard	85685A	2620A00265	1-31-2007
Biconical Antenna	EMCO	3104	9111-4463	02-16-2007
L.P Ant (200 -1000MHz)	EMCO	3146	2261	02-16-2007
Quasi Peak Adapter	Hewlett-Packard	85650A	2521A00737	1-31-2007
Spectrum Analyzer	Hewlett-Packard	8568B	2841A04315	1-31-2007
Spectrum Analyzer Display	Hewlett-Packard			1-31-2007
Horn. Ant (Below 18GHz)	EMCO	3115	8812-3050	02-16-2007
Spectrum Analyzer	Hewlett-Packard	8565E	3943A01328	08-16-2007

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

Description	Manufacturer	Model No.	Serial No.	Calibration Due
DC Power Supply	KEPCO	JQE 150-1.5M	H177085	n/a
Digital Multimeter	Fluke	16	79510141	December 08, 2007

### General Test Procedure – RF Tests

For the spurious and harmonics measurements, below 1GHz, the EUT was set up at a 10 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 1GHz, the EUT was set up at a 3 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

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 C63.4-2003.

#### 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):	Jan 10, 2006
Test Engineer(s):	Femi Ojo
Temperature	27.3°C
Humidity	20%

#### 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.

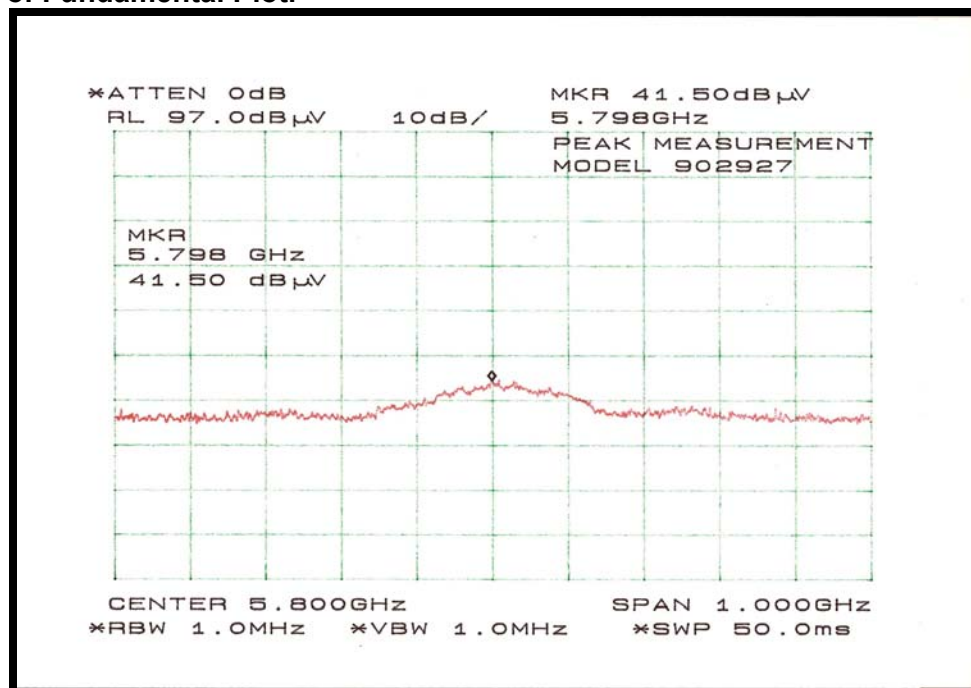


Figure 5: Plot of Field Strength of Fundamental Peak Measurement.

## 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
5.798	41.5	34.6	-25.4	51.0	90	1.0	VH	-	-	74	-23.0	p
5.831	41.0	35.2	-25.5	50.7	0	1.0	HH	-	-	74	-23.3	p

**Table 12: Field Strength of Fundamental Test Data – Peak Measurement**

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: = 51.0dBμV/m  
Peak Limit (15.209) = 74.00dBμV/m (54dBμV/m + 20dB)

### 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 μV) Duty Cycle Correction	=0.0083 secs	=20log(0.0083)	= -41. 62dBμV
Pulse Desensitization Factor (PDF)	= -40dB		
Peak Level with PDF	= 51.0 dBμV/m + 40dB		= 91.0dBμV/m
Peak Level with Duty Cycle Correction	=91.0dBμV/m – 41.62dB		= 49.38dBμV/m

### Test-Data Summary – Average Measurement:

Center Frequency = 5800 MHz  
Average Level: = 49.38dBμV/m (Calculated).  
Average Limit (15.209) = 54.00dBμV/m

### Remark

The EUT 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 C63.4-2003.

#### 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

<b>Test Date(s):</b>	Jan 10, 2006
<b>Test Engineer(s):</b>	Femi Ojo
<b>Temperature</b>	27.3°C
<b>Humidity</b>	20%

#### Test Measurement: Occupied Bandwidth Measurements (Performed in a Semi-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.

#### Spectrum Analyzer Configuration (during swept frequency scans) – Occupied Bandwidth

Start Frequency ..... 5.300 GHz  
 Stop Frequency ..... 6.300 GHz  
 Sweep Speed ..... 100 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

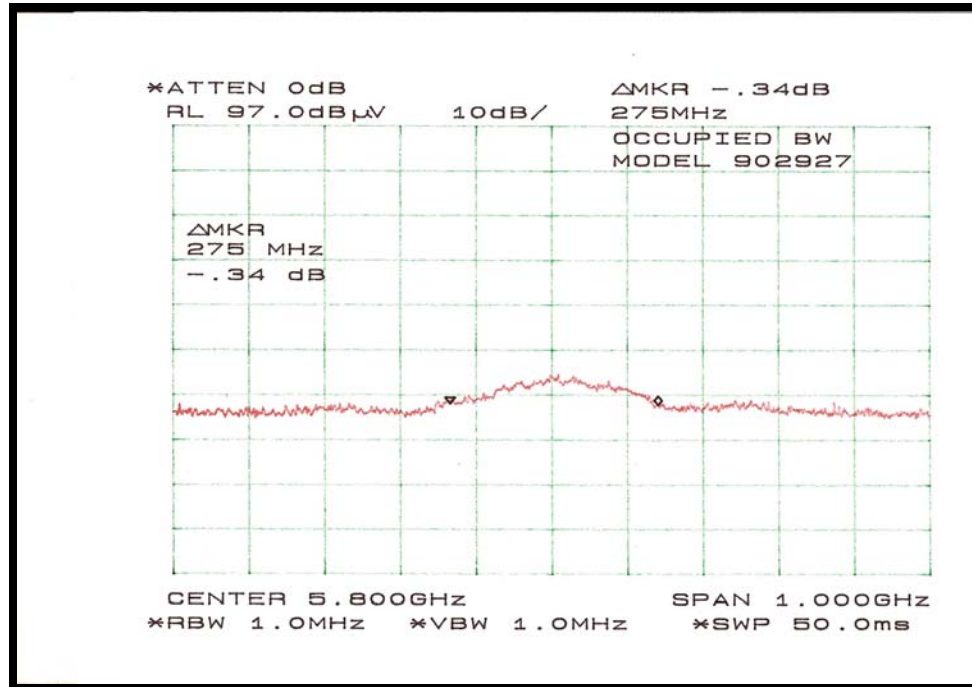


Figure 6: Occupied Bandwidth Plot

### Test-Data Summary – Occupied Bandwidth:

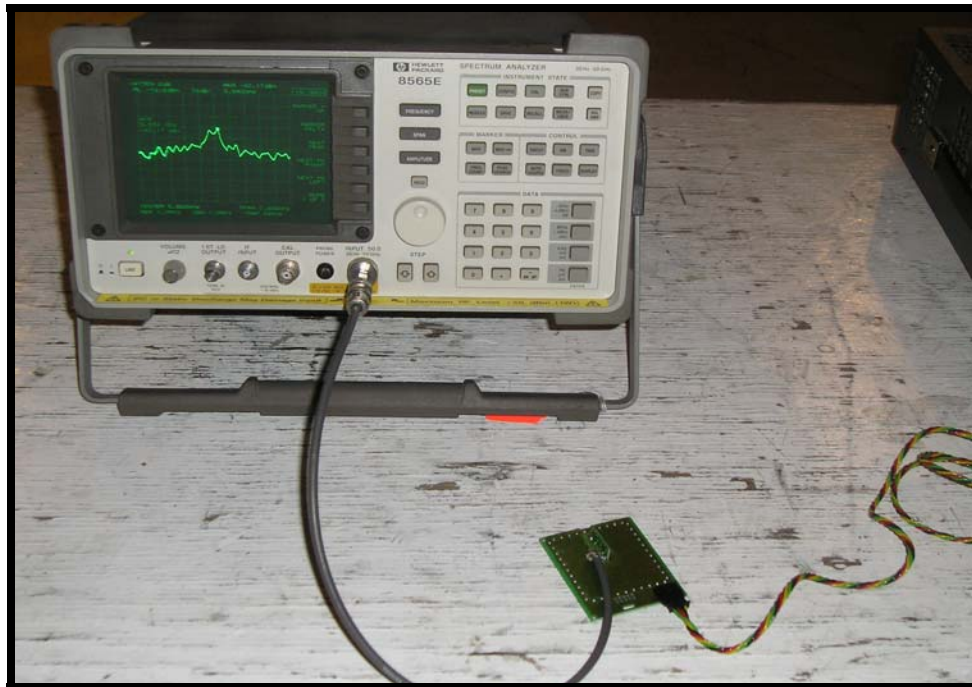
Center frequency: 5800 MHz  
Mask Bandwidth: 275 MHz

### Occupied Bandwidth Data:

Upper Frequency ( $F_u$ )	$=f_0 + 275/2$	$=5800 \text{ MHz} + 137.5$	$=5937.5 \text{ MHz}$
Lower Frequency ( $f_L$ )	$=f_0 - 275/2$	$=5800 \text{ MHz} - 137.5$	$=5662.5 \text{ MHz}$

## 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)**

## 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 C63.4-2003

### 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(s):</b>	Jan 8, 2007 & Jan 10, 2006
<b>Test Engineer:</b>	Femi Ojo
<b>Temperature(s)</b>	26.6°C & 27.3°C
<b>Humidity(s)</b>	30% & 20%

### 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 13 Test Data – Spurious and Restricted Bands Emissions below 1GHz**

INDICATED		CORRECTION		CORR	TURNTABLE ANT			CLASS A		CLASS B		NOTES
FREQ	AMPL	ANT	CAB	AMPL	ANG	HT	POL	AMPL	MARG	AMPL	MARG	
MHz	dBuV/m	dB	dB	dBuV/m	DEG	m	-	dBuV/m	dB	dBuV/m	db	
38.20	3.7	10.9	1.0	15.7	0	2.0	VB	-	-	30.0	-14.3	
45.40	4.9	12.0	1.2	18.1	0	2.0	HB	-	-	30.0	-11.9	
61.15	3.6	9.9	1.2	14.7	90	1.0	VB	-	-	30.0	-15.3	
70.43	7.7	7.6	1.3	16.6	90	4.0	HB	-	-	30.0	-13.4	
84.52	5.7	7.1	1.5	14.3	0	1.0	VB	-	-	30.0	-15.7	
121.76	9.4	11.9	1.7	23.0	180	3.0	VB	-	-	33.0	-10.0	
127.04	4.0	12.6	1.8	18.4	180	4.0	HB	-	-	33.0	-14.6	
150.04	7.1	12.3	1.9	21.3	180	4.0	HB	-	-	33.0	-11.7	
171.53	6.1	16.4	2.2	24.7	0	2.0	VB	-	-	33.0	-8.3	
186.26	7.8	17.8	2.2	27.8	0	3.0	VB	-	-	33.0	-5.2	
190.21	5.2	17.2	2.3	24.7	0	1.0	HB	-	-	33.0	-8.3	
224.95	7.9	11.0	2.5	21.4	180	3.0	VL	-	-	36.0	-14.6	
233.45	4.5	10.9	2.6	18.1	0	4.0	HL	-	-	36.0	-17.9	
281.38	6.4	13.6	3.2	23.2	90	1.0	VL	-	-	36.0	-12.8	
333.26	5.9	14.0	3.5	23.3	180	3.0	HL	-	-	36.0	-12.7	
337.16	4.0	14.7	3.5	22.2	0	1.0	VL	-	-	36.0	-13.8	
426.68	3.8	15.8	3.8	23.4	180	4.0	HL	-	-	36.0	-12.6	
464.53	4.4	16.5	3.6	24.4	0	4.0	HL	-	-	36.0	-11.6	
464.73	5.8	17.4	3.6	26.8	0	1.0	VL	-	-	36.0	-9.2	
537.95	8.4	18.4	3.8	30.6	0	3.0	VL	-	-	36.0	-5.4	
650.94	6.5	18.5	4.1	29.1	180	1.0	VL	-	-	36.0	-6.9	
663.30	8.3	19.7	4.2	32.2	0	4.0	HL	-	-	36.0	-3.8	
737.33	4.1	20.9	4.4	29.3	0	1.0	VL	-	-	36.0	-6.7	

No emission of significant level was observed from 737.33MHz – 1GHz.

**Table 14 Test Data for Radiated Emissions Measurement above 1 GHz @ 3 meters**

INDICATED		CORRECTION		CORR	TURNTABLE ANT			CLASS A		CLASS B		NOTES
FREQ	AMPL	ANT	CAB+ AMP	AMPL	ANG	HT	POL	AMPL	MARG	AMPL	MARG	
MHz	dBuV/m	dB	dB	dBuV/m	DEG	m	-	dBuV/m	dB	dBuV/m	db	
1064.20	35.0	24.8	-27.9	31.9	0	2.0	HH			54.0	-22.1	
1343.30	35.3	25.0	-27.8	32.5	0	1.0	VH			54.0	-21.5	
1390.80	35.0	25.5	-27.8	32.7	0	1.0	HH			54.0	-21.3	
1758.70	34.5	26.6	-27.6	33.5	0	1.0	VH			54.0	-20.5	
2093.30	34.7	28.3	-26.7	36.3	0	2.0	HH			54.0	-17.7	
2348.00	34.8	28.4	-27.2	36.0	0	1.0	VH			54.0	-18.0	
2763.00	34.8	29.5	-27.4	36.9	0	1.0	VH			54.0	-17.1	
2773.30	34.5	30.0	-27.4	37.1	180	1.0	HH			54.0	-16.9	
3167.50	36.0	31.0	-26.6	40.4	180	2.0	HH			54.0	-13.6	

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@itcenc.com Web: www.itcenc.com

Product: Smart MDD 5.8GHz Sensor  
Model Number:902927  
FCC ID:LQN2927



**Applicant:** Connaught Electronics Ltd.

**Report No.:** 20070122-01-FC15

3515.30	35.7	31.2	-27.1	39.8	0	1.0	VH			54.0	-14.2	
4277.00	36.0	32.2	-26.7	41.5	0	1.0	VH			54.0	-12.5	
5035.80	35.3	34.3	-25.5	44.1	0	1.0	HH			54.0	-9.9	
5385.00	35.7	34.4	-25.3	44.8	90	1.5	VH			54.0	-9.2	
5798.70	41.8	34.6	-25.4	51.0	0	1.0	VH			54.0	-3.0	Fund
5831.70	41.7	35.2	-25.5	51.4	0	1.0	HH			54.0	-2.6	Fund
6628.00	37.2	34.8	-23.8	48.2	0	1.0	VH			54.0	-5.8	
9613.30	31.2	38.7	-23.4	46.5	180	1.2	VH			54.0	-7.5	
9641.70	30.5	39.3	-24.0	45.8	0	1.0	HH			54.0	-8.2	
12430.00	31.7	38.8	-23.7	46.8	180	1.2	VH			54.0	-7.2	
13103.30	30.8	40.2	-24.7	46.3	180	2.0	HH			54.0	-7.7	
17808.70	30.8	41.2	-25.1	46.9	90	2.0	VH			54.0	-7.1	

No emission of significant level was observed above 17.8GHz.

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

**The margin in Table 14 is calculated as follows:**

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

### Remark

The EUT meets the requirements of the test reference for Spurious and Restricted Bands emissions levels specified in the 47CFR15.209



## SPURIOUS and RESTRICTED BANDS Emissions (cont)

### Test Photographs



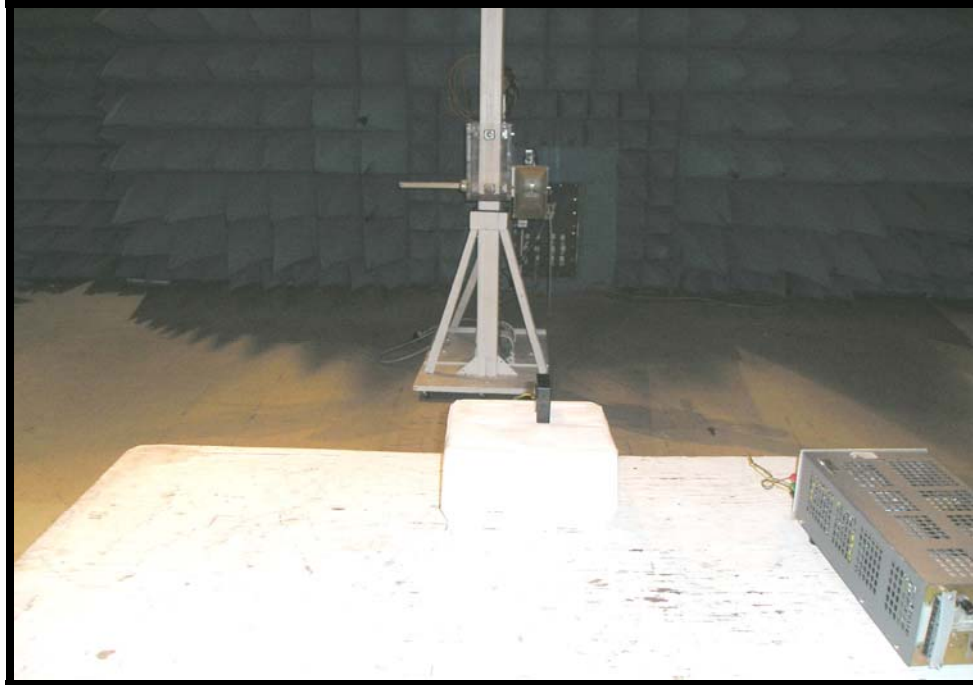
**Figure 8: Spurious emissions below 1 GHz (View 1)**



**Figure 9: Spurious emissions below 1GHz (View 2)**

**Spurious emissions (cont.)**

**Test Photographs (cont.)**



**Figure 10: Spurious emission above 1 GHz (View 1)**



**Figure 11: Spurious emission above 1 GHz (View 2)**

## PART 4 APPENDICES

### A. EUT Technical Specification

Applicant	Connaught Electronics, Ltd.		
Product Specifications			
Description	5.8GHz MDD Sensor		
	Frequency Range	5616.0 MHz to 5984.0 MHz	
	CEL Number(s)	CEL	902927
	Cable(s)	n/a	
	Peak Output Power	-40.0dBm	
	Main board	Manufacturer	CEL
		Part Number	171718 Rev 001.2
		Dimension	Approx. 65mm x 59mm
		Connector(s)	One (1) 4-pin
	Antenna Board	Manufacturer	CEL
		Dimension	Approx. 23mm x 10mm
		Layers	2-sided
		Antenna	Two (2) 10mm Dual loop, 1mm traces
	Ports	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





Figure 14: EUT Rear View



Figure 15: EUT Internal View 1

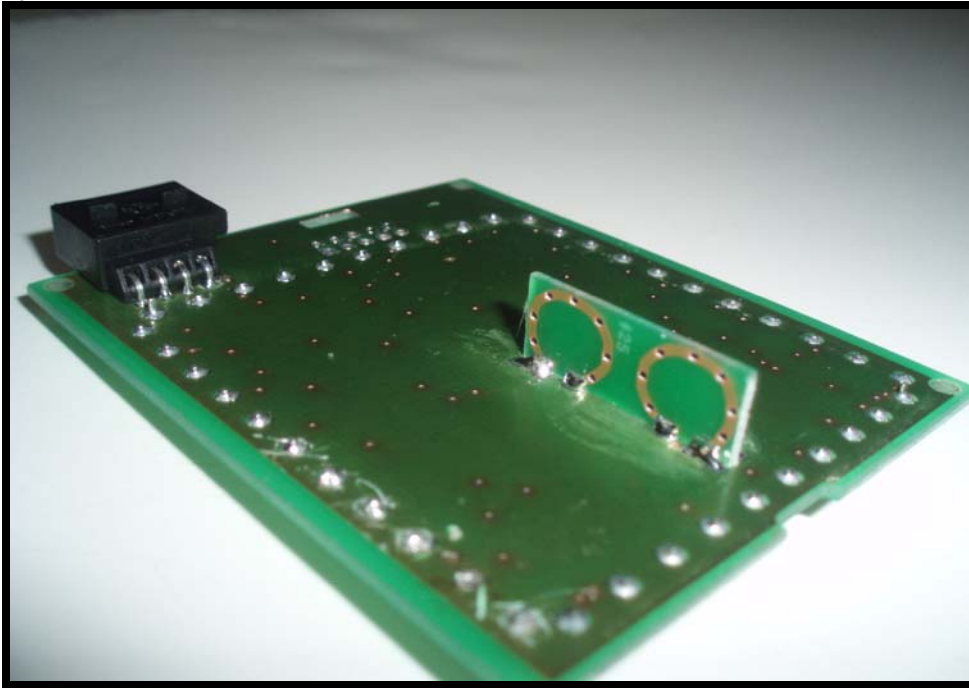


Figure 16: EUT Internal View 2

## **C. Modification Letter**

To Whom It May Concern:

This is to certify that no modifications were necessary for Smart MDD 5.8GHz Microwave Sensor, model 902927 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 Smart MDD 5.8GHz Microwave Sensor, model 902927 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. Patrick Denny