

# Global EMC Inc. Labs EMC & RF Test Report

As per

**RSS 210 Issue 7:2007**

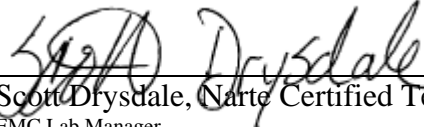
**&**

**FCC Part 15 Subpart C:2008**

**Unlicensed Intentional Radiators**

on the

**ECS-WOL Wireless Occupancy Sensor**


  
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Testing produced for




See Appendix A for full customer & EUT details.



Client	<b>Intuitious Energy Conservation</b>	
Product	ECS-WOL Wireless Occupancy Sensor	
Standard(s)	RSS 210 Issue 7:2007 / FCC Part 15 Subpart C 15:2008	

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Client	<b>Intuitious Energy Conservation</b>	
Product	ECS-WOL Wireless Occupancy Sensor	
Standard(s)	RSS 210 Issue 7:2007 / FCC Part 15 Subpart C 15:2008	

## Report Scope

This report addresses the EMC verification testing and test results of the ECS-WOL Wireless Occupancy Sensor, herein referred to as EUT (Equipment Under Test) performed at Global EMC Labs.

The EUT was tested for compliance against the following standards:


RSS 210 Issue 7:2007 / FCC Part 15 Subpart C 15:2008

Test procedures, results, justifications, and engineering considerations, if any, follow later in this report.

The results contained in this report relate only to the item(s) tested.

This report does not imply product endorsement by A2LA or any other accreditation agency, any government, or Global EMC Inc.


Opinions/interpretations expressed in this report, if any, are outside the scope of Global EMC Inc accreditation. Any opinions expressed do not necessarily reflect the opinions of Global EMC Inc, unless otherwise stated.

Client	<b>Intuitous Energy Conservation</b>	
Product	ECS-WOL Wireless Occupancy Sensor	
Standard(s)	RSS 210 Issue 7:2007 / FCC Part 15 Subpart C 15:2008	

## Summary


The results contained in this report relate only to the item(s) tested.

EUT FCC Certification #, FCC ID:	XDF43870194
EUT Industry Canada Certification #, IC:	8354A-43870194
Frequency of operation	418 MHz
EUT Passed all tests performed.	Yes (see test results summary)
Tests conducted by	Scott Drysdale

Client	<b>Intuitious Energy Conservation</b>	
Product	ECS-WOL Wireless Occupancy Sensor	
Standard(s)	RSS 210 Issue 7:2007 / FCC Part 15 Subpart C 15:2008	

## Test Results Summary

Standard/Method	Description	Class/Limit	Result
FCC 15.203	Antenna Requirement	Unique	Pass See Justification
FCC 15.205 RSS 210 (Table 1)	Restricted Bands for intentional operation	QuasiPeak Average	Pass
FCC 15.207	Power line conducted emissions	QuasiPeak Average	See Justification
FCC 15.209 RSS-210 (Table 2)  FCC 15.231(b) RSS-210 (Table 4)  FCC 15.231(e) RSS-210 (Table 5)	Spurious Radiated emissions	QuasiPeak Average	Pass
FCC 15.231(a) RSS-210 A1.1	Type of transmission	Not a continuous transmissions, voice, video or radio control of toys.	Pass See Justification
FCC 15.231 (a)(1) RSS-210 A1.1.1(a)	Manual transmission Release holdover	< 5 seconds	Pass See Justification
FCC 15.231 (a)(2) RSS-210 A1.1.1(b)	Automatic transmission Transmission time	< 5 seconds	Pass See Justification
FCC 15.231 (a)(3) RSS-210 A1.1.1(c)	Predetermined intervals Transmission Non Security/Safety	None	Pass See Justification
FCC 15.231 (a)(3) RSS-210 A1.1.1(c)	Predetermined intervals Transmission Security/Safety	< 2 seconds per hour	Pass See Justification
FCC 15.231 (c) RSS-210 A1.1.3	20 dB Bandwidth	< 0.25% of carrier	Pass
<b>Overall Result</b>			<b>PASS</b>

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All tests were performed by Scott Drysdale.

If the product as tested or otherwise complies with the specification, the EUT is deemed to comply with the requirement and is deemed a 'PASS' grade. If not 'FAIL' grade will be issued. Note that 'PASS' / 'FAIL' grade is independent of any measurement uncertainties. A 'PASS' / 'FAIL' grade within measurement uncertainty is marked with a '\*'.

### ***Justifications, Descriptions, or Deviations***

The following justifications for tests not performed or deviations from the above listed specifications apply:

For the Antenna requirement specified in FCC 15.203 (RSS 210 section 5.5), this has a built in soldered antenna and has no provision for connection or replacement of the antenna.

For the Restricted Bands of operation as specified in FCC 15.205, the EUT is designed to only operate between 418 MHz.


For the power line conducted emissions requirements, the EUT is DC powered, and this test does not apply.

The type of transmission is a data signal in the form of a digital pulse train sent with a control signal, which complies with the requirements of 15.231(a).

The manual transmission (achieved by pressing the learn button), release holdover time was verified to be for all practical circumstances, instantaneous. This is significantly less than the 5 second requirement.


The transmission achieved by detecting the presence of motion, which could be argued to be a manual transmission. For the purpose of determining compliance with FCC 15.231(a)(1) or FCC 15.231(a)(2), this transmission is 0.5 seconds, which is a pass in either manual or automatic category. This transmission, even in the case of continuous motion being applied, which is functionally equivalent to a transmit button being continuously depressed, will not re-transmit for approximately 5 minutes.

For 15.231(a)(3) compliance, this device does not transmit at pre-determined intervals. This device requires end-user motion to manually trigger the transmit function. For the purposes of saving battery life, the next following transmission cannot re-occur within 5 minutes of the last transmission. The next transmission would only occur after the next following manual motion activated trigger that occurs after the 5 minute interval.

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## ***Applicable Standards, Specifications and Methods***

ANSI C63.4:2003	- Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz
CFR 47 FCC 15	- Code of Federal Regulations – Radio Frequency Devices
CISPR 22:1997	- Information technology equipment – Radio disturbance characteristics – Limits and methods of measurement
ICES-003:2004	- Digital Apparatus - Spectrum Management and Telecommunications Policy Interference-Causing Equipment Standard
ISO 17025:2005	- General Requirements for the competence of testing and calibration laboratories
RSS 210:2007	- Issue 7: Spectrum Management and Telecommunications Policy. Radio Standards Specification Low Power Licence-Exempt Radiocommunication Devices

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### ***Sample calculation(s)***

Margin = limit – (received signal + antenna factor + cable loss – pre-amp gain)


Margin = 50.5dBuV/m – (50dBuV + 10dB + 2.5dB – 20dB)

Margin = 8.5 dB

### ***Document Revision Status***

Revision 1 - June 15, 2009



Client	<b>Intuitous Energy Conservation</b>	
Product	ECS-WOL Wireless Occupancy Sensor	
Standard(s)	RSS 210 Issue 7:2007 / FCC Part 15 Subpart C 15:2008	

## Definitions and Acronyms

The following definitions and acronyms are applicable in this report.  
See also ANSI C63.14.

**AE** – Auxillary Equipment.

**BW** – Bandwidth. Unless otherwise stated, this refers to the 6 dB bandwidth.

**EMC** – Electro-Magnetic Compatibility

**EMI** – Electro-Magnetic Immunity


**EUT** – Equipment Under Test

**ITE** – Information Technology Equipment with a primary function(s) of entry, storage, display, retrieval, transmission, processing, switching, or control, of data.

**LISN** – Line impedance stabilization network

**NCR** – No Calibration Required

**RF** – Radio Frequency


Client	<b>Intuitious Energy Conservation</b>	
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## Testing Facility

Testing for EMC on the EUT was carried out at Global EMC labs in Toronto, Ontario, Canada. The testing lab consists of a 3m semi-anechoic chamber calibrated to be able to allow measurements on an EUT with a maximum width or length of up to 2m and height up to 3m. The chamber is equipped with a turn table that is capable of testing devices up to 3300lb in weight. This facility is capable of testing products that are rated for 120 Vac and 240Vac single phase, or 208 Vac 3 phase input. DC capability is also available. The chamber is equipped with an antenna mast that controls polarization and height from the control room adjoining the shielded chamber. Radiated emissions measurements are performed using a Bilog, and Horn antenna where applicable. Conducted emissions, unless otherwise stated, are performed using a LISN.

## Calibrations and Accreditations


The measurement site used is registered with Federal Communications Commission (FCC) and Industry Canada (IC). This site is calibrated for Normalized Site Attenuation (NSA) using test procedures outlined in ANSI C63.4 “Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz”. The semi-anechoic chamber is lined with ferrite tiles and absorption cones to minimize any undesired reflections. All measuring equipment is calibrated on an annual or bi-annual basis as listed for each respective test.

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## ***Testing Environmental Conditions and Dates***

Following were the environmental conditions in the facility during time of testing –

<b>Date</b>	<b>Test</b>	<b>Init.</b>	<b>Temperature (°C)</b>	<b>Humidity (%)</b>	<b>Pressure (kPa)</b>
June 5, 2009	All	SD	20-25°C	30-45%	100 -103kPa

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## Detailed Test Results Section

Client	Intuitious Energy Conservation	
Product	ECS-WOL Wireless Occupancy Sensor	
Standard(s)	RSS 210 Issue 7:2007 / FCC Part 15 Subpart C 15:2008	

## ***Radiated Emissions of Spurious Emissions***

### **Purpose**

The purpose of this test is to ensure that the RF energy unintentionally emitted from the EUT does not exceed the limits listed below as defined in the applicable test standard, as measured from a receiving antenna. This helps protect broadcast radio services such as television, FM radio, pagers, cellular telephones, emergency services, and so on, from unwanted interference.

### **Limit(s) and Method**

The method is as defined in ANSI C63.4:2003.


The limits are as defined in FCC Part 15, Section 15.209 and 15.231 (b), whichever limit permits the higher field strength. The below table represents the combined limits. This table presents whichever limit permits the higher field strength.

30 MHz to 40.66 MHz - 100 uV/m (40.0 dBuV/m<sup>1</sup>) at 3 m  
 40.66 MHz to 40.77 MHz – 200 uV/m (47.0 dBuV/m<sup>1</sup>) at 3 m  
 40.77 MHz to 70 MHz – (40.0 dBuV/m<sup>1</sup>) at 3 m  
 70 MHz to 88 MHz - 125 uV/m (41.9 dBuV/m<sup>1</sup>) at 3 m  
 88 MHz to 134.5 MHz - 150 uV/m (43.5 dBuV/m<sup>1</sup>) at 3 m  
 134.5 MHz to 174 MHz – 5.681818\*(freq in MHz) – 613.3636, expressed in uV/m  
 134.5 MHz to 174 MHz – 43.5 dBuV/m to 51.5 dBuV/m<sup>1</sup>  
 174 to 260 MHz – 375 dBuV/m (51.5 dBuV/m<sup>1</sup>)  
 260 to 470 MHz – 4.16667\*(freq in MHz) – 708.33333, expressed in uV/m  
 260 to 470 MHz – 51.5 dBuV/m to 62 dBuV/m<sup>1</sup>  
 Above 470 MHz, 1250 uV/m (62.0 dBuV/m<sup>1,2</sup>) at 3 m

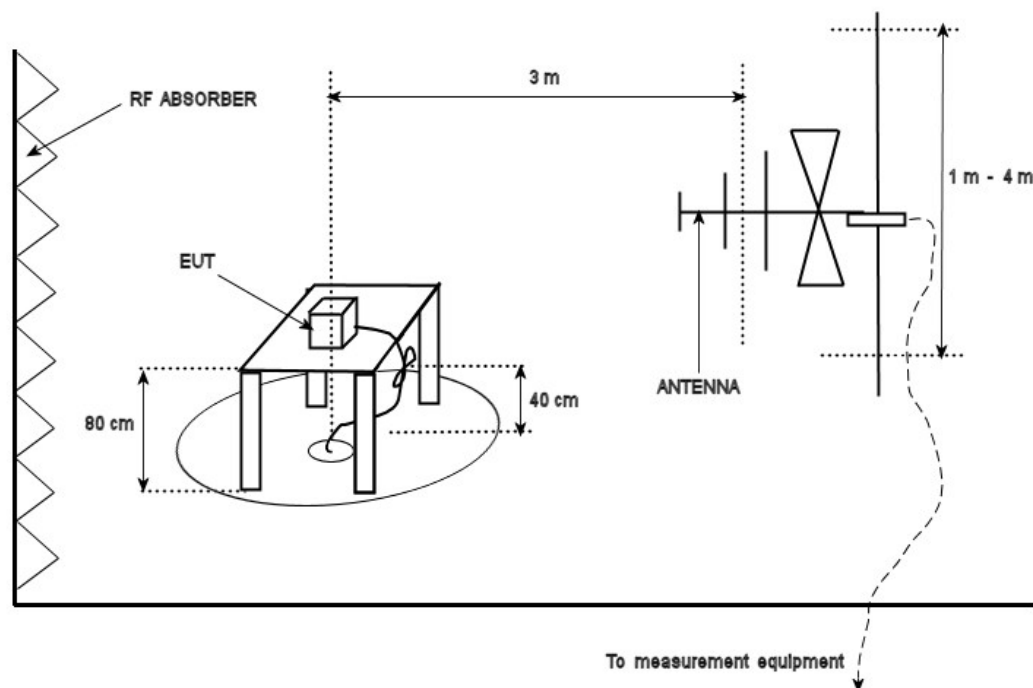
Note: A peak limit that is 20 dB higher than the limits specified above applies.

<sup>1</sup>Limit below 1 GHz is measured with 120 kHz measurement bandwidth and a using a Quasi Peak detector. If the limit is exceeded with the Quasi-Peak detector, it will be re-measured with an Average detector and compared against the limits specified in 15.231(b) if so applicable. The detector (and method) used shall be noted in the final measurement table in this report.

<sup>2</sup>Limit above 1 GHz is is with 1 MHz measurement bandwidth and using an Average detector, and scanned in accordance with 15.33 to 2 GHz for devices operating under 500 MHz.

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### Typical Radiated Emissions Setup




### Measurement Uncertainty

The expanded measurement uncertainty is calculated in accordance with CISPR 16-4-2 and is  $\pm 4.4$  dB with a 'k=2' coverage factor and a 95% confidence level.

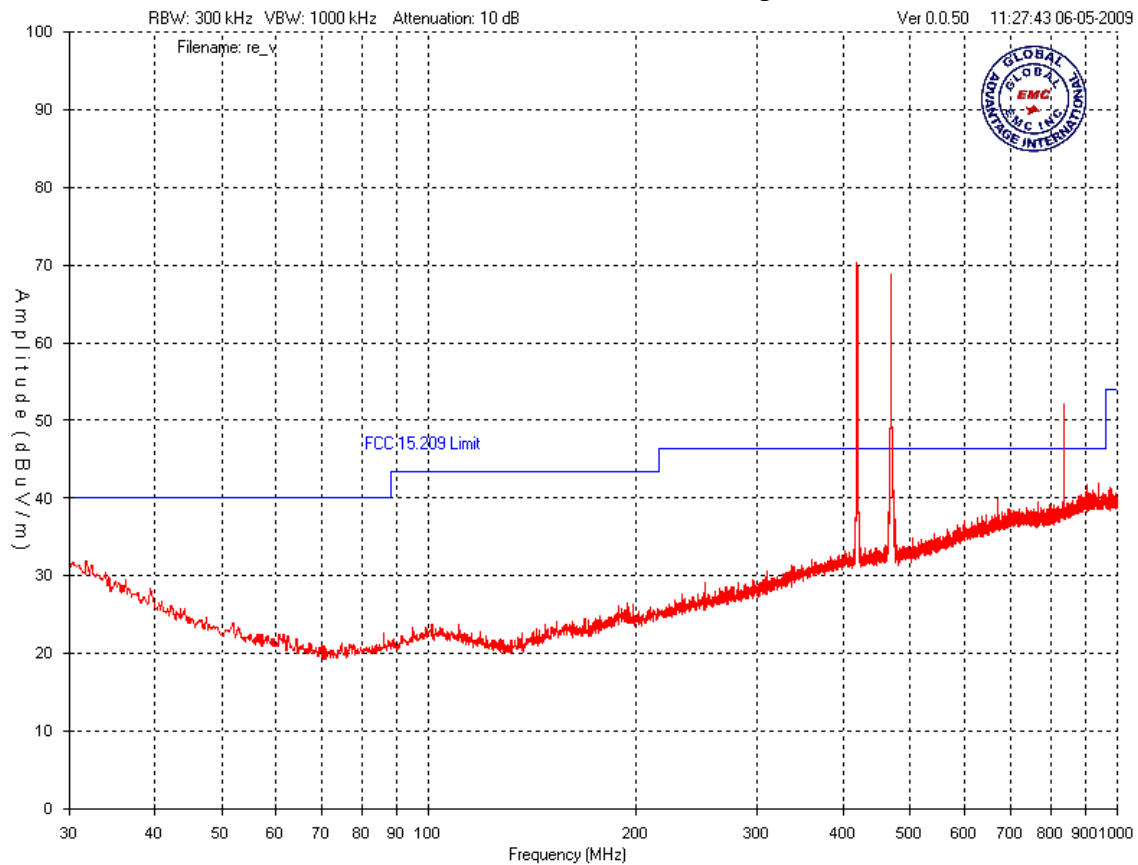
### Preliminary Graphs


Note the graphs shown below are for graphical illustration only. For final measurements with the appropriate detector, please refer to the final measurement table where applicable. The graph shown below is a maximized peak measurement graph, measured with a resolution bandwidth greater than the final required detector and over a full 0-360 rotation. This peaking process is done as a worst case measurement. This process enables the detection of frequencies of concern for final measurement, and provides considerable time savings.

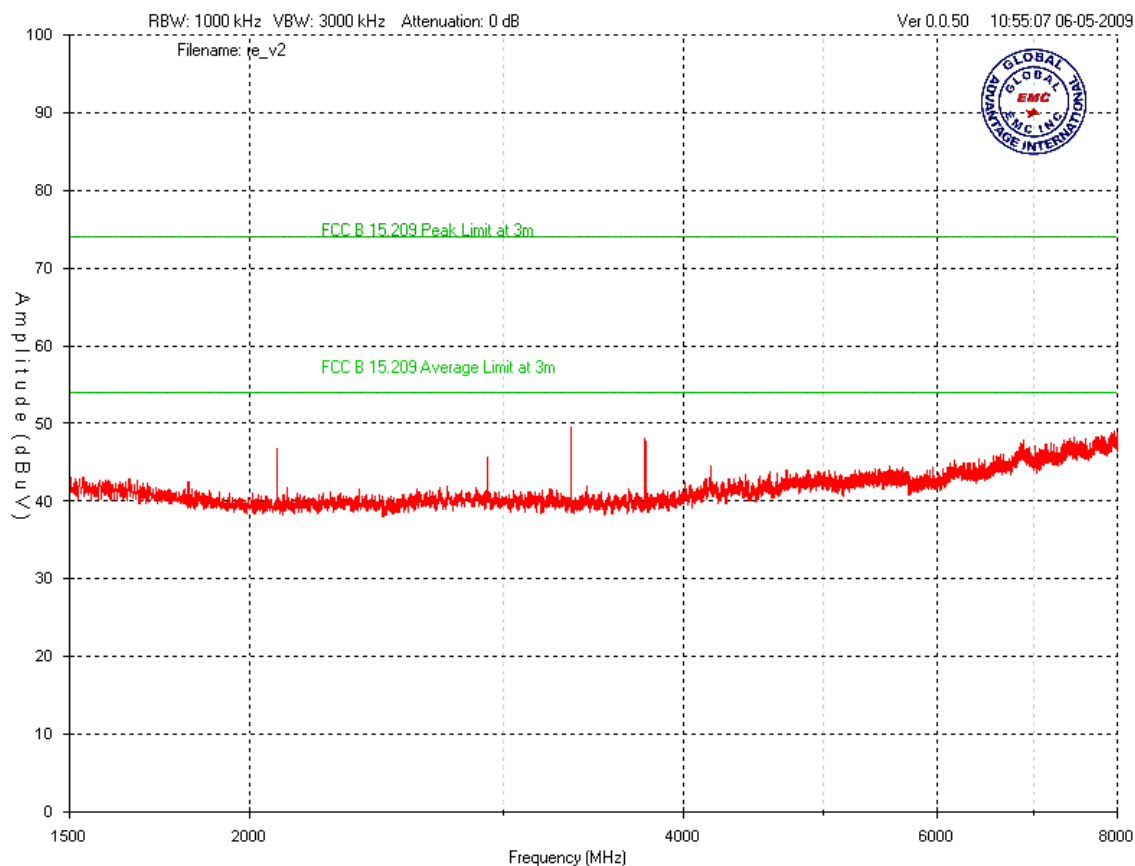
In accordance with FCC Part 15, Subpart A, Section 15.33, the device was scanned to a minimum of a 2 GHz.

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### Vertical – Peak Emissions Graph



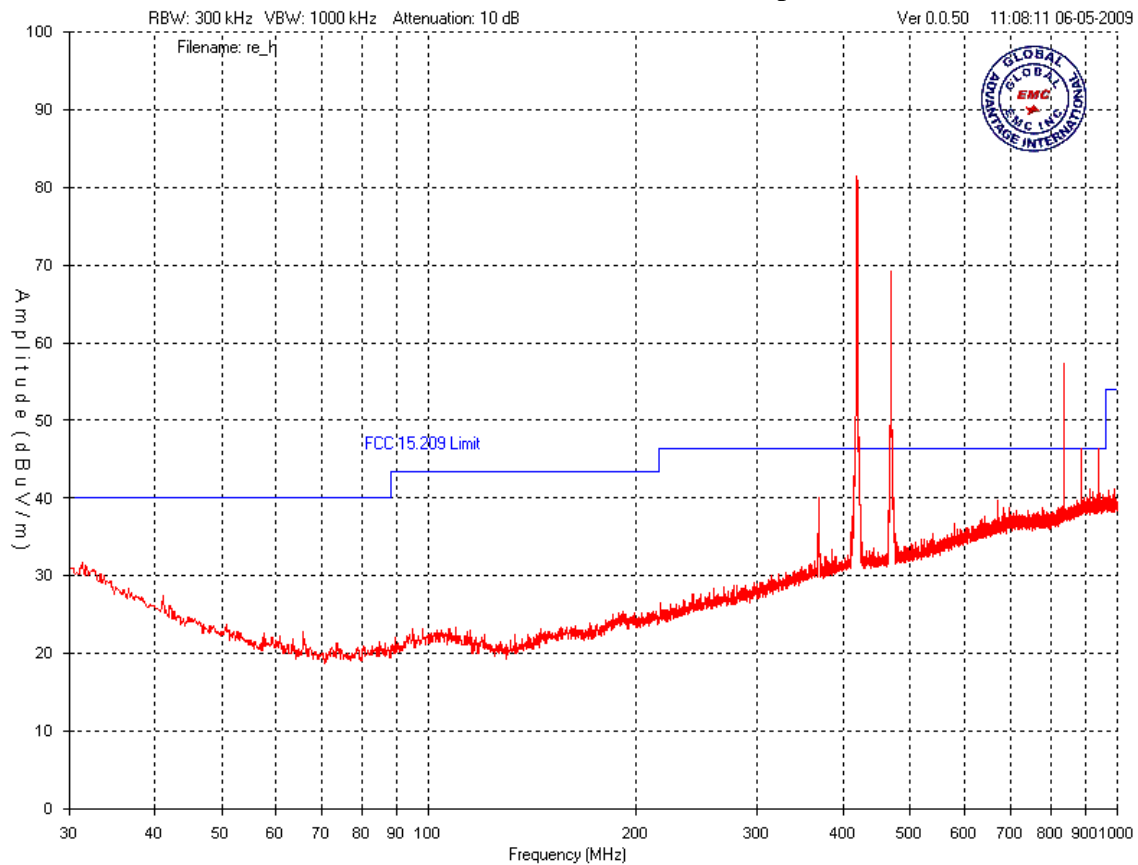
Client	Intuitous Energy Conservation	
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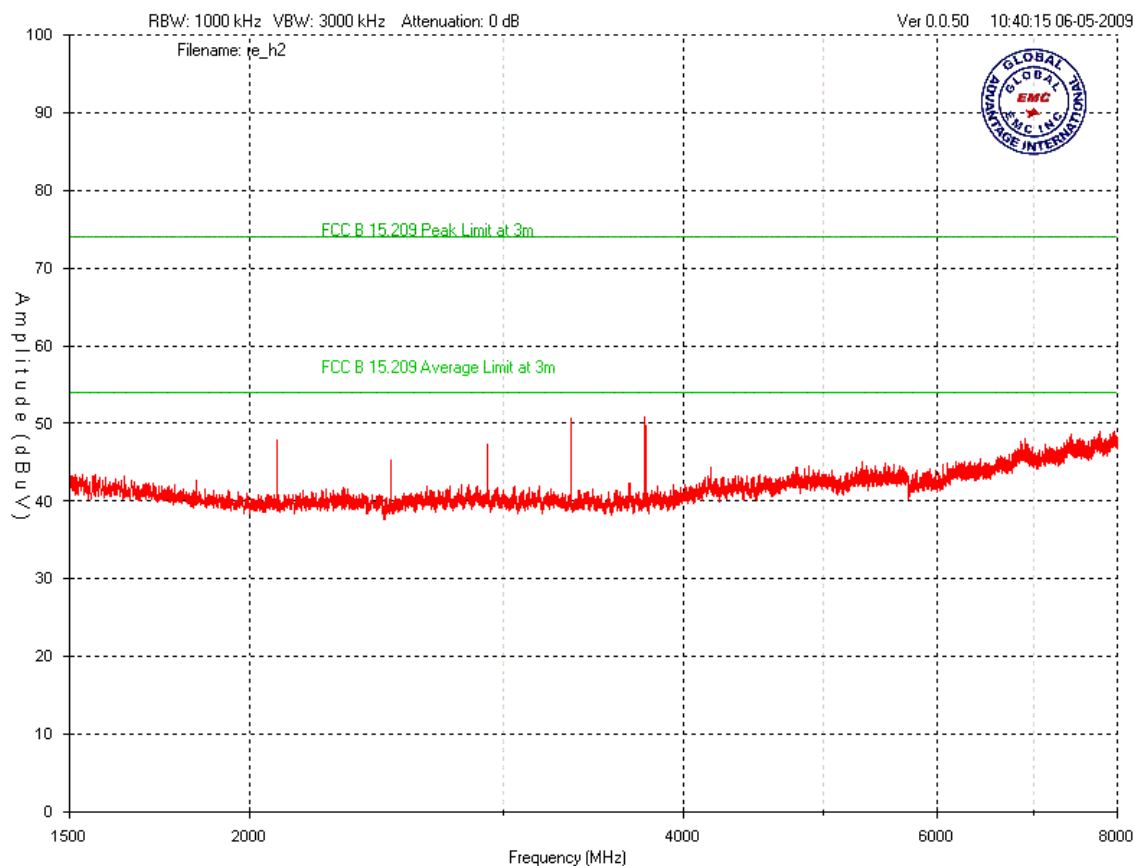



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### Horizontal – Peak Emissions Graph



Client	Intuitous Energy Conservation	
Product	ECS-WOL Wireless Occupancy Sensor	
Standard(s)	RSS 210 Issue 7:2007 / FCC Part 15 Subpart C 15:2008	



Client	<b>Intuitious Energy Conservation</b>	
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Standard(s)	RSS 210 Issue 7:2007 / FCC Part 15 Subpart C 15:2008	

## Final Measurements


### Vertical

Frequency (MHz)	Reading (dBuV)	QP AV PK.	Ant – Factor (dB/m)	Atten Factor (dB)	Preamp – Factor (dB)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Pass / Fail
31.746	36.7	QP	17.3	10	-32	32	40	8	Pass
469.119	62.2	QP	17.7	10	-31.1	58.8	60.3	1.5	Pass
836.07	49.9	QP	22.6	10	-30.3	52.2	61.9	9.7	Pass
1254.09	35.3	AV	26.1	10	-29.5	41.9	61.9	20.0	Pass

### Horizontal

Frequency (MHz)	Reading (dBuV)	QP AV PK.	Ant – Factor (dB/m)	Atten Factor (dB)	Preamp – Factor (dB)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Pass / Fail
31.358	36.2	QP	17.5	10	-32	31.7	40.0	8.3	Pass
368.239	45.2	QP	16.2	10	-31.3	40.1	58.3	18.2	Pass
469.022	62.6	QP	17.7	10	-31.1	59.2	60.3	1.1	Pass
836.07	55	QP	22.6	10	-30.3	57.3	61.9	4.6	Pass
886.995	43.1	QP	23.5	10	-30.2	46.4	61.9	15.5	Pass
937.629	42.7	QP	23.8	10	-30.1	46.4	61.9	15.5	Pass
1254.09	35.3	AV	26.1	10	-29.5	41.9	61.9	20.0	Pass


Note: Average measurements applied above were made with an average detector with the device continuously transmitting data. These measurements do not apply a duty cycle correction factor to the peak data to correct for the average measurement.

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## Test Equipment List

Equipment	Model No.	Manufacturer	Last calibration date	Next calibration due date	Asset #
Spectrum Analyzer	8566B	HP	2008-02-28	2010-02-28	GEMC 6
Quasi Peak Adapter	85650A	HP	2008-02-28	2010-02-28	GEMC 7
BiLog Antenna	3142-C	ETS	2009-02-12	2011-02-12	GEMC 8
Attenuator 3 dB	FP-50-3	Trilithic	NCR	NCR	GEMC 40
Schaffner Preamplifier 9kHz - 2 GHz	CPA9231A	Schaffner	8/26/2008	8/26/2010	GEMC 116
RF Cable 7m	LMR-400-7M-50OHM-MN-MN	LexTec	NCR	NCR	GEMC 28
RF Cable 1m	LMR-400-1M-50OHM-MN-MN	LexTec	NCR	NCR	GEMC 29
RF Cable 0.5M	LMR-400-0.5M-50OHM-MN-MN	LexTec	NCR	NCR	GEMC 31

This report module is based on GEMC template "FCC - 15.209 - Radiated Emissions\_Rev1.doc"

Client	Intuitous Energy Conservation	
Product	ECS-WOL Wireless Occupancy Sensor	
Standard(s)	RSS 210 Issue 7:2007 / FCC Part 15 Subpart C 15:2008	

## ***Radiated Emissions of Fundamental***

### **Purpose**

The purpose of this test is to ensure that the RF energy intentionally emitted from the EUT does not exceed the limit listed below as defined in the applicable test standard, as measured from a receiving antenna. This helps protect other periodic operating devices, and licensed broadcasting devices, and so on, from unwanted interference.


### **Limit(s) and Method**

The method is as defined in ANSI C63.4:2003.

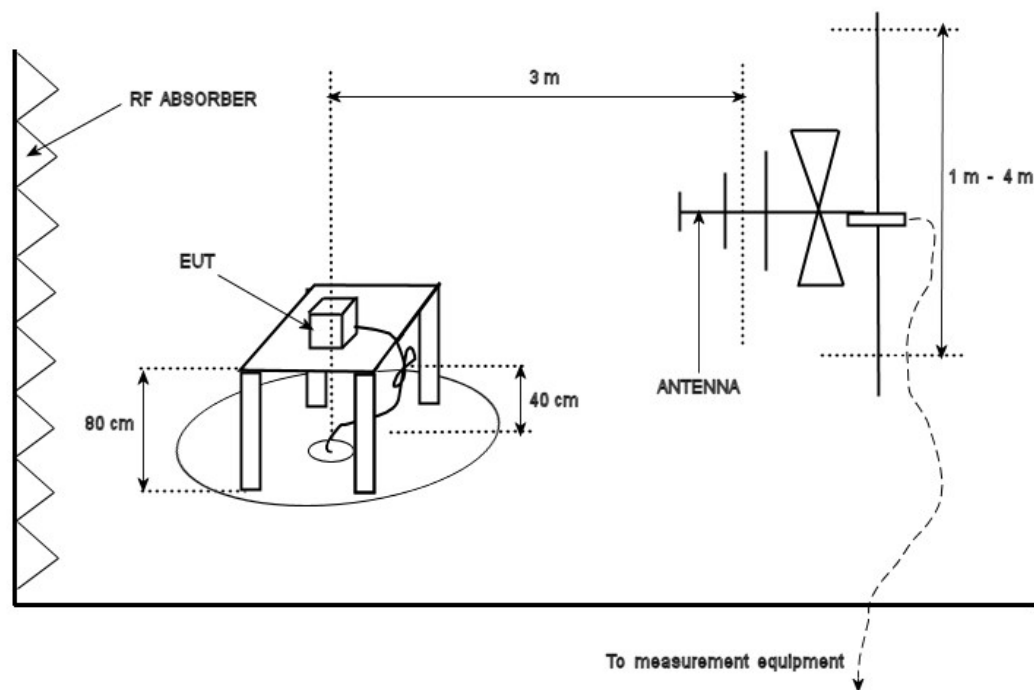
The limits are as defined in FCC Part 15, Section 15.231 (b), and is specific for the one frequency for the fundamental transmit frequency.


418 MHz – 80.3 dBuV/m<sup>1</sup>.

<sup>1</sup>Based on the average value of the measured emissions. As an alternative, compliance with the limits in the above table may be based on the use of measurement instrumentation with a CISPR quasi-peak detector.

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Standard(s)	RSS 210 Issue 7:2007 / FCC Part 15 Subpart C 15:2008	

### Typical Radiated Emissions Setup



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## Measurement Uncertainty

The expanded measurement uncertainty is calculated in accordance with CISPR 16-4-2 and is +/-4.4 dB with a 'k=2' coverage factor and a 95% confidence level.

## Final Measurements


The device complies with the requirement. A worst case measurement of 78.3 dBuV/m at 3 meters was obtained using a quasi-peak detector at a center frequency of 418.05 MHz in the horizontal polarity. See spurious emissions section for related graphs. For information purposes, this corresponds to an effective isotropic radiated power level

This is passing with 1.9 dB of margin to the requirement.

## Test Equipment List

Equipment	Model No.	Manufacturer	Last calibration date	Next calibration due date	Asset #
Spectrum Analyzer	8566B	HP	2008-02-28	2010-02-28	GEMC 6
Quasi Peak Adapter	85650A	HP	2008-02-28	2010-02-28	GEMC 7
BiLog Antenna	3142-C	ETS	2009-02-12	2011-02-12	GEMC 8
Attenuator 3 dB	FP-50-3	Trilithic	NCR	NCR	GEMC 40
Schaffner Preamp 9kHz - 2 GHz	CPA9231A	Schaffner	8/26/2008	8/26/2010	GEMC 116
RF Cable 7m	LMR-400-7M-50OHM-MN-MN	LexTec	NCR	NCR	GEMC 28
RF Cable 1m	LMR-400-1M-50OHM-MN-MN	LexTec	NCR	NCR	GEMC 29
RF Cable 0.5M	LMR-400-0.5M-50OHM-MN-MN	LexTec	NCR	NCR	GEMC 31

This report module is based on GEMC template "FCC - 15.209 - Radiated Emissions\_Rev1.doc"

Client	Intuitious Energy Conservation	
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Standard(s)	RSS 210 Issue 7:2007 / FCC Part 15 Subpart C 15:2008	

## ***20 dB Bandwidth of Periodically Operated Transmitters***

### **Purpose**

The purpose of this test is to ensure that the bandwidth occupied does not exceed a stated minimum. This helps ensure the utilization of the frequency allocation is sufficiently narrow, and not occupying excessive spectrum. This also helps prevent accidentally interference of data by ensuring adequate data separation to distinguish the reception of the intended information by enabling the receiver to have a relatively narrow band response tuned to the transmitters frequency.

### **Limits**


The Limit is as specified in FCC Part 15 and RSS 210.

For periodic transmitters below 900 MHz, this should not exceed 0.25 % of the fundamental frequency. For periodic transmitters above 900 MHz, this should not exceed 0.5 % of the fundamental frequency. This should be measured with a RBW equal to approximately %1 of the 20 dB BW of the signal and a VBW > then the RBW.

### **Results**

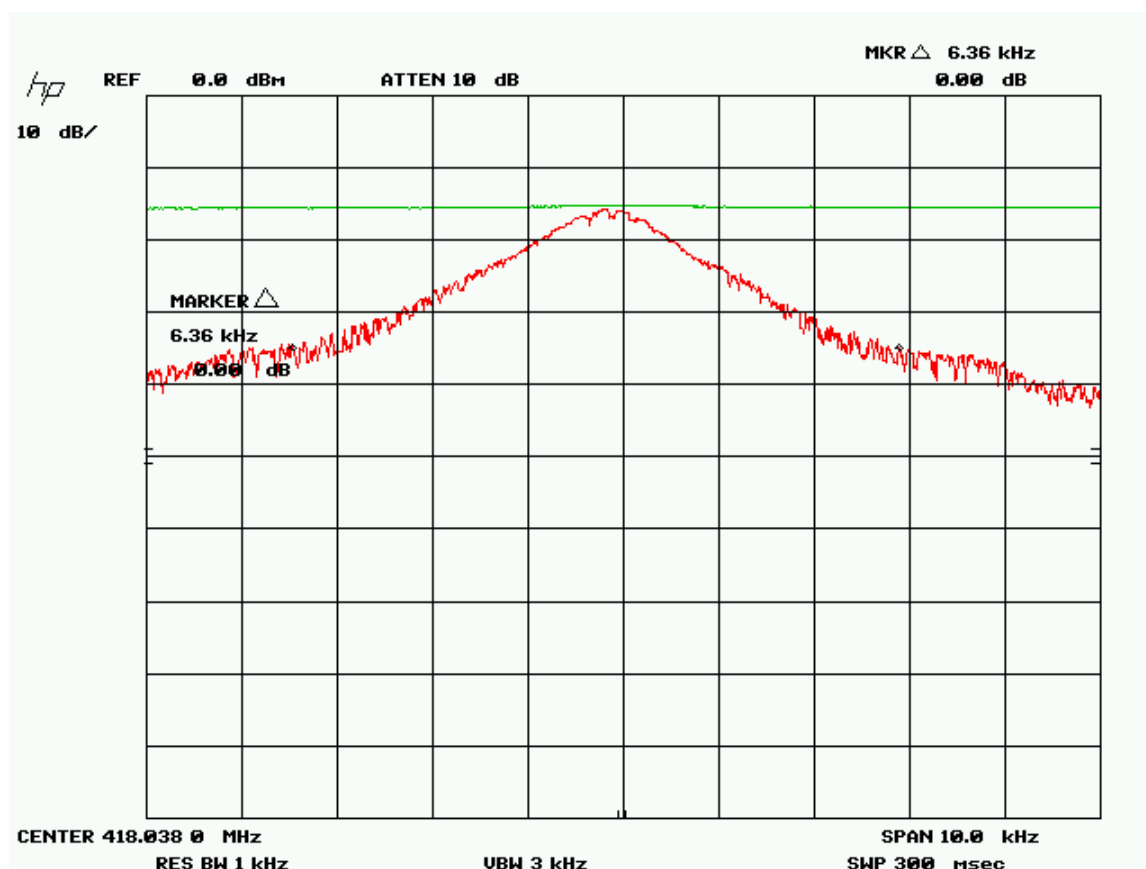
The EUT passed. The 20 dB BW measured was 6.5 kHz and the requirement was that this be less than 1 MHz. This represents a pass with significant margin.




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## Graph(s)

The graphs shown below shows the channel spacing during the operation of the device. This is measured by a max hold on the spectrum analyzer and the highest resolution bandwidth that is approximately 1 % of the 20 dB BW during operation of the EUT. This measurement is a peak measurement. Max hold is performed for a duration of not less then 1 minute.




Note: See 'Appendix B – EUT & Test Setup Photographs' for photos showing the test set-up.

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Standard(s)	RSS 210 Issue 7:2007 / FCC Part 15 Subpart C 15:2008	

## Test Equipment List

Equipment	Model No.	Manufacturer	Last calibration date	Next calibration due date	Asset #
Attenuator 20 dB	FP-50-20	Trilithic	NCR	NCR	GEMC 43
Spectrum Analyzer	8566B	HP	2008-02-28	2010-02-28	GEMC 6
Quasi Peak Adapter	85650A	HP	2008-02-28	2010-02-28	GEMC 7
RF Cable 1m	LMR-400-1M-50OHM-MN-MN	LexTec	NCR	NCR	GEMC 29
Power Attenuator 20 dB	25-A-FFN-20	Bird / Hutton	NCR	NCR	GEMC 49

This report module is based on GEMC template "FCC – Power Line Conducted Emissions Class B\_Rev1"

Client	Intuitious Energy Conservation	
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Standard(s)	RSS 210 Issue 7:2007 / FCC Part 15 Subpart C 15:2008	


## Appendix A – EUT Summary

For further details for filing purposes, refer to filing package.


### General EUT Description

<b>Manufacturer</b>	Intuitious Inc. 223 Hidden Lake Road Collingwood, ON L9Y 3Z2 Canada
<b>EUT Name</b>	ECS-WOL Wireless Occupancy Sensor
<b>FCCID</b>	XDF43870194
<b>IC #</b>	8354A-43870194
<b>Approximate Size (LxWxH)</b>	9cm x 9cm x 6cm Or 9cm diameter, 6cm depth.
<b>Equipment Category (Commercial / Residential / Medical)</b>	Residential
<b>Input Voltage and Frequency</b>	4 x AA batteries only.
<b>Rated Input Current</b>	N/A
<b>Table Top / Wall mount / Floor standing (choose table top if unsure)</b>	Ceiling mount, tested as table top.
<b>I/O Connectors available on EUT</b>	None.
<b>Peripherals required for test</b>	None, receiver not part of transmitter tests
<b>Minimum Separation distance from operator</b>	> 20 cm.
<b>Types and lengths of all I/O cables</b>	None.
<b>Test mode</b>	The device is set by special hardware configuration to continuously transmit the modulated signal. This mode of operation is not available to end-users.

Note the EUT is considered to have been received the date of the commencement of the first test, unless otherwise stated. For a close-up picture of the EUT, see ‘Appendix B – EUT & Test Setup Photographs’.

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## Appendix B – EUT and Test Setup Photographs

Client	<b>Intuitous Energy Conservation</b>	
Product	ECS-WOL Wireless Occupancy Sensor	
Standard(s)	RSS 210 Issue 7:2007 / FCC Part 15 Subpart C 15:2008	

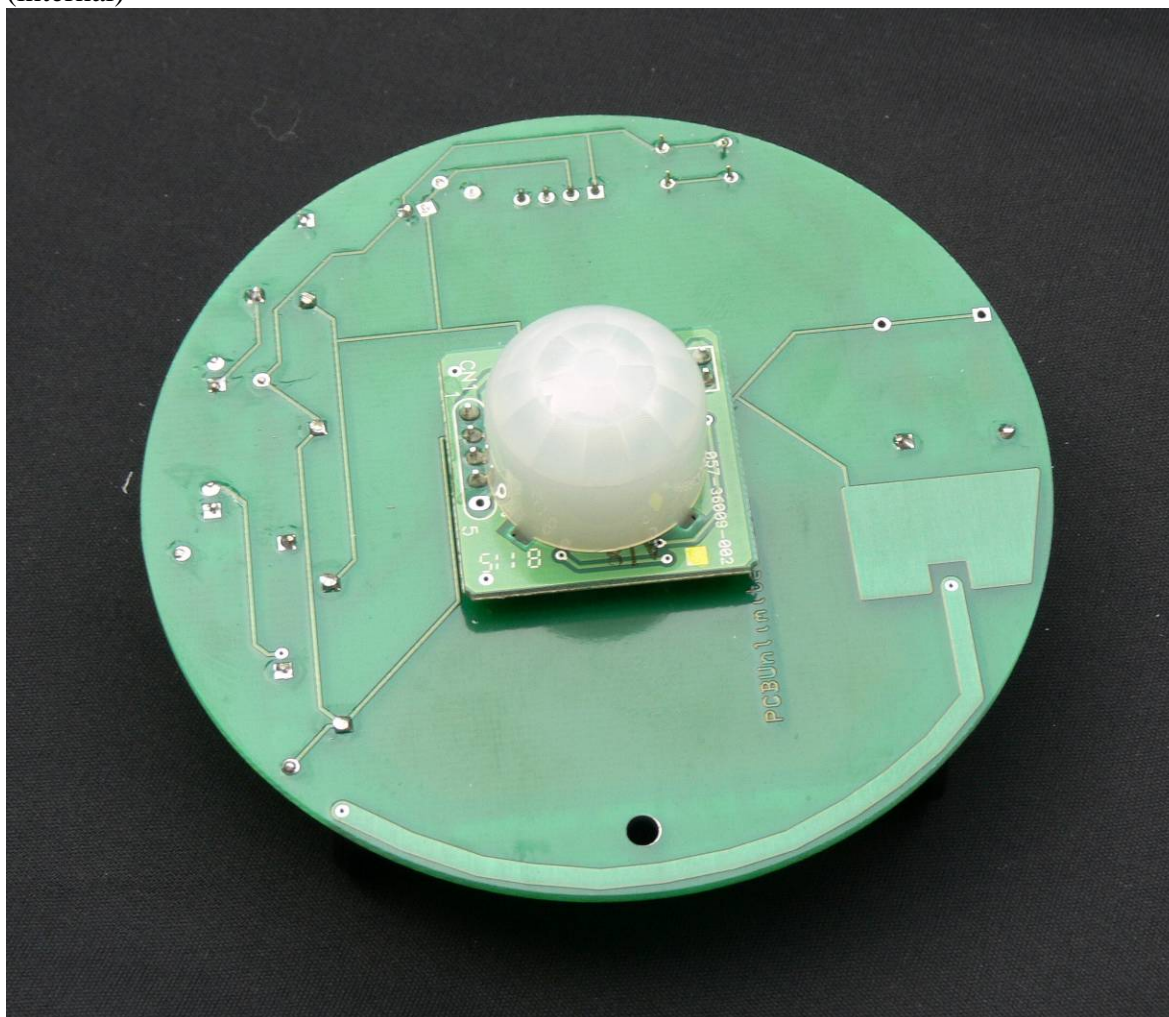
Note: These photos are for information purposes only. Also refer to PDF files that are separate from this test report.

EUT Front (assembled)




Client	<b>Intuitous Energy Conservation</b>	
Product	ECS-WOL Wireless Occupancy Sensor	
Standard(s)	RSS 210 Issue 7:2007 / FCC Part 15 Subpart C 15:2008	

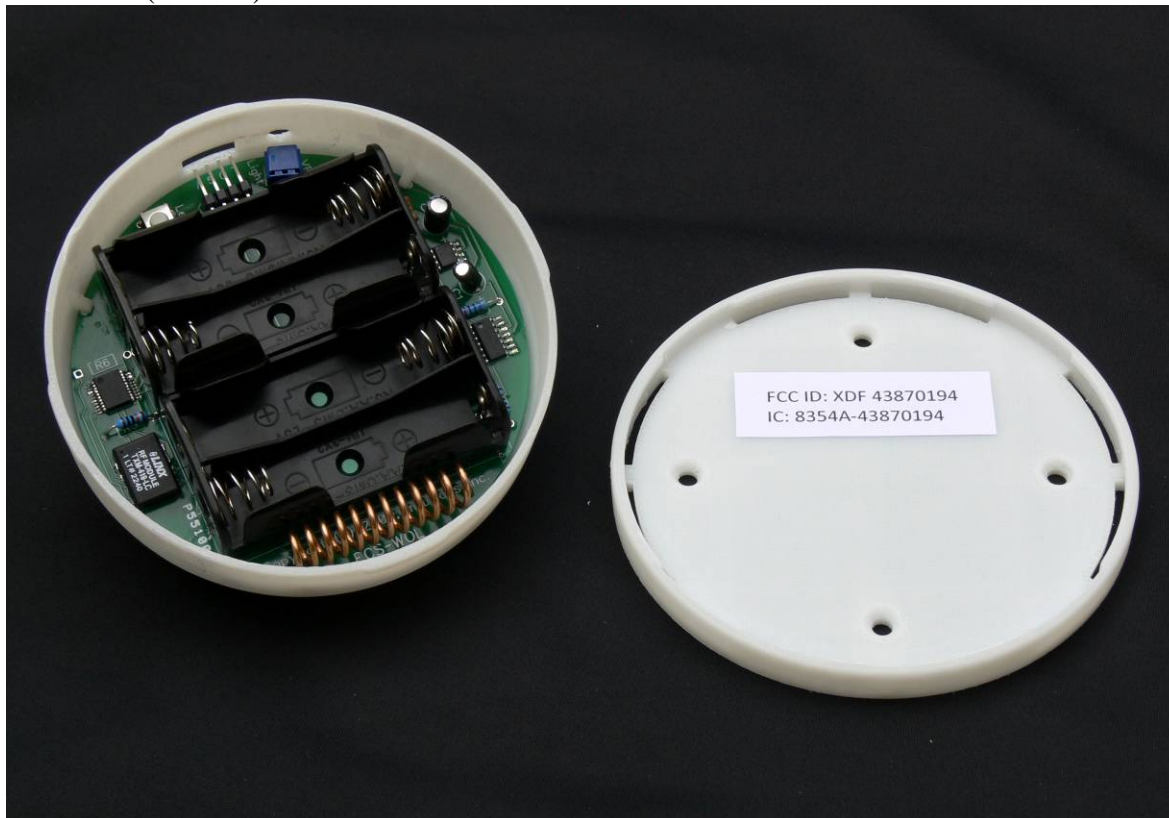
EUT Front  
(internal)






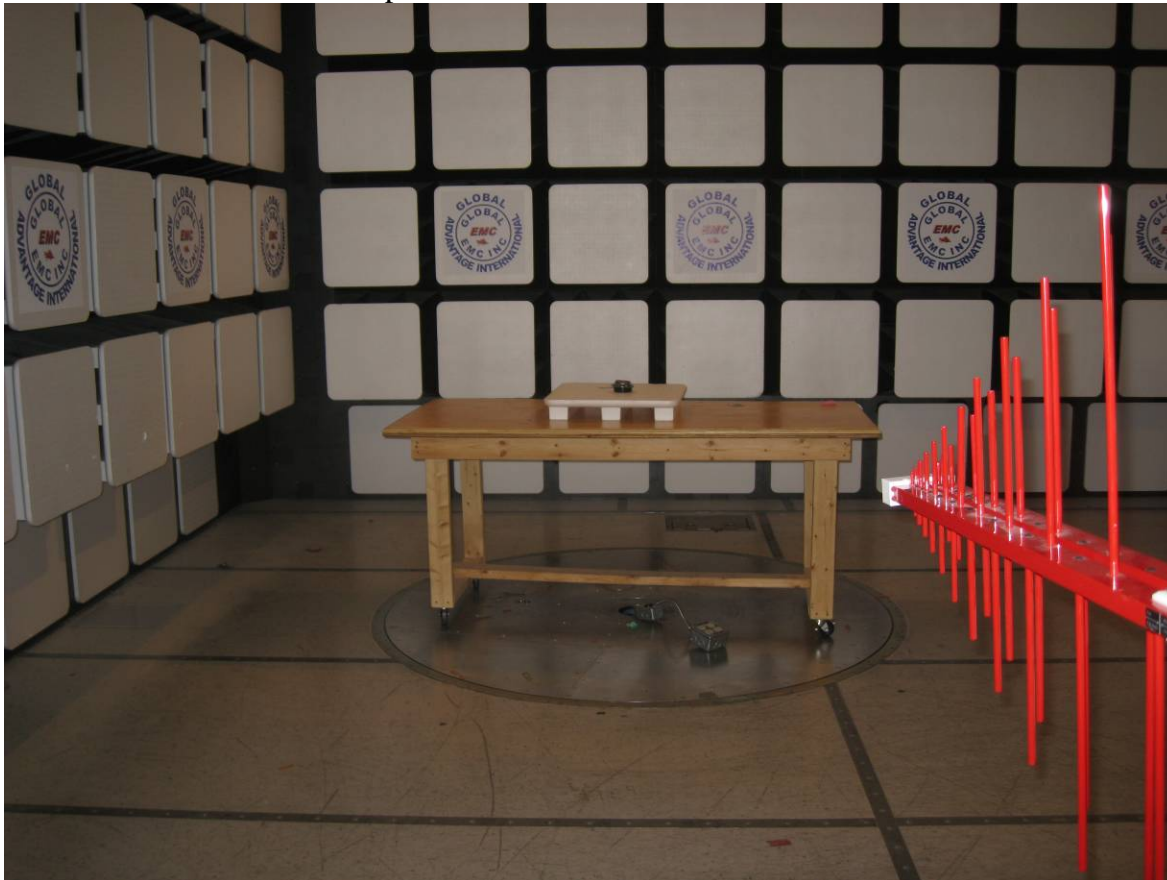
Client	Intuitious Energy Conservation	
Product	ECS-WOL Wireless Occupancy Sensor	
Standard(s)	RSS 210 Issue 7:2007 / FCC Part 15 Subpart C 15:2008	

#### EUT Rear (internal)




Client	<b>Intuitious Energy Conservation</b>	
Product	ECS-WOL Wireless Occupancy Sensor	
Standard(s)	RSS 210 Issue 7:2007 / FCC Part 15 Subpart C 15:2008	

### Radiated Emissions Test Setup





Client	<b>Intuitous Energy Conservation</b>	
Product	ECS-WOL Wireless Occupancy Sensor	
Standard(s)	RSS 210 Issue 7:2007 / FCC Part 15 Subpart C 15:2008	

Radiated Emissions Test Setup (close up)

