



**FCC CFR47 PART 15.245 SUBPART C
INDUSTRY CANADA RSS-210 ISSUE 7, ANNEX 7**

CERTIFICATION TEST REPORT

FOR

WIRELESS MICROWAVE/ PIR MOTION SENSOR

MODEL NUMBER: 5898

FCC ID: CFS8DL5898

IC: 573F-5898

REPORT NUMBER: 09U12555-1A

ISSUE DATE: JUNE 03, 2009

Prepared for
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FOLSOM, CA 95630, U.S.A.**

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NVLAP LAB CODE 200065-0

Revision History

Rev.	Issue Date	Revisions	Revised By
--	05/07/09	Initial Issue	F. Ibrahim
A	06/03/09	Revised Applicable standard and deleted pages 17-19	A. Zaffar

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1. ATTESTATION OF TEST RESULTS

COMPANY NAME: HONEYWELL INTERNATIONAL
625 COOLIDGE DRIVE, SUITE 150
FOLSOM, CA 95630, U.S.A.

EUT DESCRIPTION: Wireless Microwave/ PIR Motion Sensor

MODEL: 5898

SERIAL NUMBER: 02304

DATE TESTED: May 05-06, 2009

APPLICABLE STANDARDS	
STANDARD	TEST RESULTS
FCC PART 15.245 SUBPART C	Pass
INDUSTRY CANADA RSS-210 Issue 7, Annex 7	Pass
INDUSTRY CANADA RSS-GEN Issue 2	Pass

Compliance Certification Services, Inc. (CCS) tested the above equipment in accordance with the requirements set forth in the above standards. All indications of Pass/Fail in this report are opinions expressed by CCS based on interpretations and/or observations of test results. The test results show that the equipment tested is capable of demonstrating compliance with the requirements as documented in this report.

Note: The results documented in this report apply only to the tested sample, under the conditions and modes of operation as described herein. This document may not be altered or revised in any way unless done so by CCS and all revisions are duly noted in the revisions section. Any alteration of this document not carried out by CCS will constitute fraud and shall nullify the document. No part of this report may be used to claim product certification, approval, or endorsement by NVLAP, NIST, or any government agency.

Approved & Released For CCS By:

Tested By:



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EMC SUPERVISOR
COMPLIANCE CERTIFICATION SERVICES

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2. TEST METHODOLOGY

The tests documented in this report were performed in accordance with ANSI C63.4-2003, FCC CFR 47 Part 2, FCC CFR 47 Part 15.245, RSS-GEN Issue 2, and RSS-210 Issue 7, Annex 7.

3. FACILITIES AND ACCREDITATION

The test sites and measurement facilities used to collect data are located at 47173 Benicia Street, Fremont, California, USA.

CCS is accredited by NVLAP, Laboratory Code 200065-0. The full scope of accreditation can be viewed at <http://www.ccsemc.com>.

4. CALIBRATION AND UNCERTAINTY

4.1. MEASURING INSTRUMENT CALIBRATION

The measuring equipment utilized to perform the tests documented in this report has been calibrated in accordance with the manufacturer's recommendations, and is traceable to recognized national standards.

4.2. MEASUREMENT UNCERTAINTY

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the apparatus:

PARAMETER	UNCERTAINTY
Power Line Conducted Emission	+/- 2.3 dB
Radiated Emission	+/- 3.4 dB

Uncertainty figures are valid to a confidence level of 95%.

5. EQUIPMENT UNDER TEST

5.1. DESCRIPTION OF EUT

The EUT is a Microwave / PIR Motion Sensor that operates at 24.125 GHz. The EUT is manufactured by Honeywell International.

5.2. DESCRIPTION OF AVAILABLE ANTENNAS

The antenna is a Patch Array, permanently integrated into the EUT.

5.3. MAXIMUM OUTPUT POWER

The transmitter has maximum peak E-field strength @ 3m distance as follows:

Frequency (GHz)	Mode	Output Power (dBuV/m)
24.125	Normal Mode	117.50

5.4. WORST-CASE CONFIGURATION

The worst-case position of the EUT was determined as that which produced the highest output power. After investigation of the three orthogonal positions, the Y Position was found to be the worst-case, so all emissions tests were done with the EUT in the Y orientation.

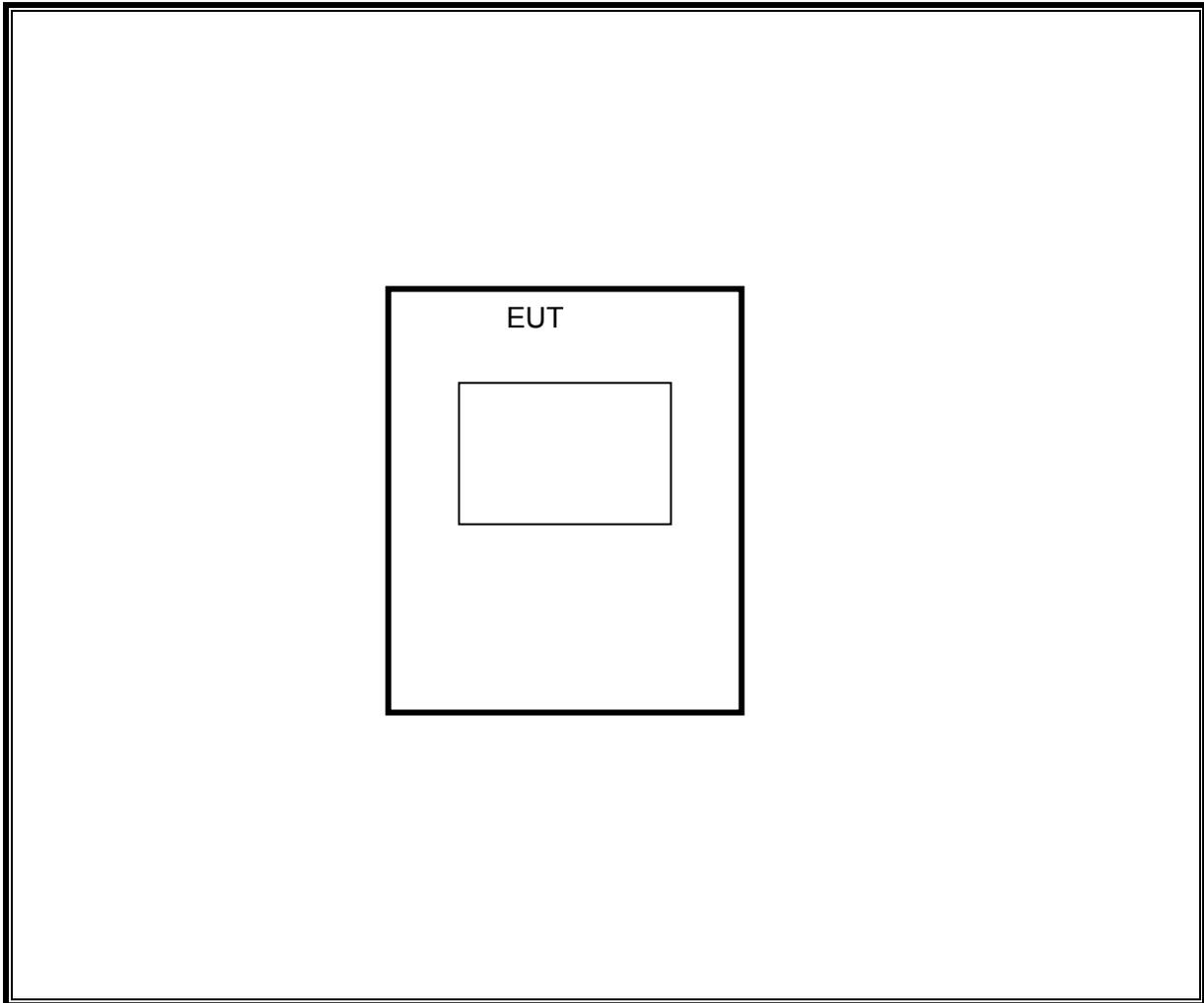
5.5. DESCRIPTION OF TEST SETUP

TEST SETUP

The EUT was operated by 4 batteries 1.5V each, it was running in both TX/RX modes simultaneously.

SETUP DIAGRAM FOR TESTS

SETUP



6. TEST AND MEASUREMENT EQUIPMENT

The following test and measurement equipment was utilized for the tests documented in this report:

TEST EQUIPMENT LIST					
Description	Manufacturer	Model	Asset	Cal Date	Cal Due
Preamplifier, 1300 MHz	Agilent / HP	8447D	C00580	12/01/08	12/01/09
Spectrum Analyzer, 26.5 GHz	Agilent / HP	E4407B	C01098	11/07/08	02/07/10
30-2400MHz Bilog antenna	Sunol Sciences	JB1	C01011	01/14/09	01/14/10
Antenna, Horn, 18-26 GHz	EMCO	MWH-1826/B	C00589	04/22/08	11/28/09
Antenna, Horn, 18 GHz	EMCO	3115	C00945	04/22/08	05/22/09
Preamplifier, 26.5 GHz	Agilent / HP	8449B	C01052	08/05/08	08/05/09
Spectrum Analyzer, 44 GHz	Agilent / HP	E4446A	C01159	11/07/08	02/07/10
Antenna, Horn, 26.5 GHz	ARA	MWH-1826/B	1013	09/29/08	09/29/09
Antenna, Horn 33 ~ 50 GHz	ATM	(0R8N4) 22-442-6	Lot#7046005	CNR	CNR
Antenna, Horn 50 ~ 75 GHz	ATM	15-442-6	Lot#7046105	CNR	CNR
Antenna, Horn 75 ~ 100 GHz	ATM	10-442-6	Lot#7046205	CNR	CNR
Antenna, Horn 75 ~ 110 GHz	ATM	10-442-6	Lot#7046205	CNR	CNR

7. TEST RESULTS

7.1. DUTY CYCLE

LIMITS

None; for reporting purposes only.

RESULTS

Tx on (usec)	Tx on + Tx off (usec)	Duty Cycle (%)	Correction Factor (dB)
25.5	337.5	7.56	11.22

7.2. 99% BANDWIDTH

LIMITS

None; for reporting purposes only.

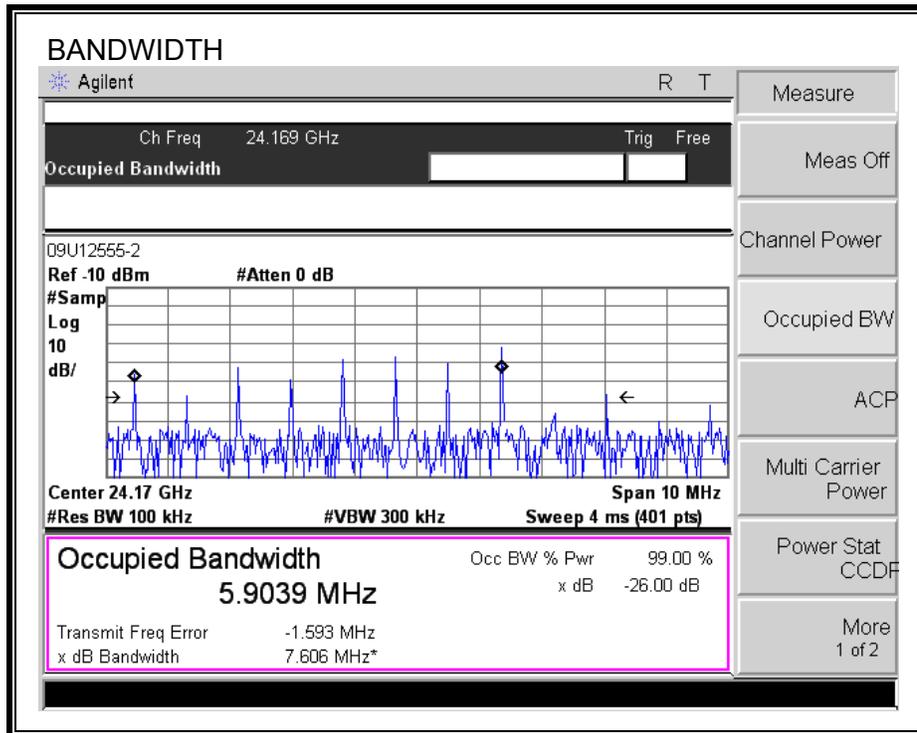
TEST PROCEDURE

The transmitter outputs are connected to the spectrum analyzer via a combiner. The RBW is set to 1% to 3% of the measured bandwidth. The VBW is set to 3 times the RBW. The sweep time is coupled. The spectrum analyzer internal bandwidth function is utilized.

RESULTS

Frequency (GHz)	99% Bandwidth (MHz)
24.125	5.9039

99% BANDWIDTH



7.3. RADIATED EMISSION

LIMIT

§15.245

IC RSS-210, Section 2.6 (Transmitter), Annex 7

IC RSS-GEN, Section 6 (Receiver)

The field strength of emissions from intentional radiators operated within these frequency bands shall comply with the following:

Limits for radiated disturbance of an intentional radiator		
Fundamental Frequency (MHz)	Field Strength of fundamental (millivolts / meter)	Field Strength of harmonic (millivolts / meter)
902-928	500	1.6
2435-2465	500	1.6
5785-5815	500	1.6
10500-10550	2500	25
24075-24175	2500	25

TEST PROCEDURE

ANSI C63.4

The EUT is an intentional radiator that does not incorporate a digital device, the highest fundamental frequency generated or used in the device is 24.125 GHz; therefore, the frequency range was investigated from 30 MHz to the 5th harmonic of the highest fundamental frequency (120.625 GHz).

RESULTS

7.3.1. FUNDAMENTAL RADIATED EMISSION

High Frequency Measurement																
Compliance Certification Services, Fremont 5m Chamber																
Company:		Honeywell														
Project #:		09U12555														
Date:		05/05/09														
Test Engineer:		Thanh Nguyen														
Configuration:		EUT only														
Mode:		Normal														
Test Equipment:																
Horn 1-18GHz			Pre-amplifier 1-26GHz			Pre-amplifier 26-40GHz			Horn > 18GHz			Limit				
T34 HP 8449B			T39; ARA 18-26GHz; S/N:1013													
Hi Frequency Cables																
3' cable 22807700			12' cable 22807600			20' cable 22807500			HPF		Reject Filter		Peak Measurements RBW=VBW=1MHz			
40G_2195			40G_2210							Average Measurements RBW=1MHz ; VBW=10Hz						
f GHz	Dist (m)	Read Pk dBuV	Read Avg dBuV	AF dB/m	CL dB	Amp dB	D Corr dB	Filtr dB	Peak dBuV/m	Avg dBuV/m	Pk Lim dBuV/m	Avg Lim dBuV/m	Pk Mar dBm	Avg Mar dB	Notes (V/H)	
Y position																
24.150	3.0	103.7	47.2	33.6	13.0	-32.8	0.0	0.0	117.5	61.0	148.0	128.0	-30.5	-67.0	H	
24.150	3.0	94.2	46.5	33.6	13.0	-32.8	0.0	0.0	108.0	60.3	148.0	128.0	-40.0	-67.7	V	
X position																
24.150	3.0	95.0	46.3	33.6	13.0	-32.8	0.0	0.0	108.8	60.1	148.0	128.0	-39.2	-67.9	H	
24.150	3.0	94.0	46.2	33.6	13.0	-32.8	0.0	0.0	107.8	60.0	148.0	128.0	-40.2	-68.0	V	
Z position																
24.150	3.0	90.8	46.0	33.6	13.0	-32.8	0.0	0.0	104.6	59.8	148.0	128.0	-43.4	-68.2	H	
24.150	3.0	102.8	46.7	33.6	13.0	-32.8	0.0	0.0	116.6	60.5	148.0	128.0	-31.4	-67.5	V	
Rev. 11.10.08																
f	Measurement Frequency			Amp	Preamp Gain			Avg Lim	Average Field Strength Limit							
Dist	Distance to Antenna			D Corr	Distance Correct to 3 meters			Pk Lim	Peak Field Strength Limit							
Read	Analyzer Reading			Avg	Average Field Strength @ 3 m			Avg Mar	Margin vs. Average Limit							
AF	Antenna Factor			Peak	Calculated Peak Field Strength			Pk Mar	Margin vs. Peak Limit							
CL	Cable Loss			HPF	High Pass Filter											

The AV should be the PK + duty cycle correction factor

7.3.2. TX SPURIOUS RADIATED EMISSIONS ABOVE 1 GHz

High Frequency Measurement
 Compliance Certification Services, Fremont 5m Chamber

Company: Honeywell International
Project #: 09U12555
Date: 05/06/09
Test Engineer: Thanh Nguyen
Configuration: Stand Alone EUT at worst position.
Mode: Normal Operation

Test Equipment:

Horn 1-18GHz	Pre-amplifier 1-26GHz	Pre-amplifier 26-40GHz	Horn > 18GHz	Limit
T60; S/N: 2238 @3m	T145 Agilent 3008A0056			FCC 15.209

Hi Frequency Cables

3' cable 22807700	12' cable 22807600	20' cable 22807500	HPF	Reject Filter	Peak Measurements RBW=VBW=1MHz
3' cable 22807700	12' cable 22807600	20' cable 22807500			Average Measurements RBW=1MHz ; VBW=10Hz

f GHz	Dist (m)	Read Pk dBuV	Read Avg dBuV	AF dB/m	CL dB	Amp dB	D Corr dB	Filtr dB	Peak dBuV/m	Avg dBuV/m	Pk Lim dBuV/m	Avg Lim dBuV/m	Pk Mar dB	Avg Mar dB	Notes (V/H)
1.24	3.0	47.7	40.5	25.3	2.6	-36.0	0.0	0.0	39.6	32.4	74	54	-34.4	-21.6	Y
1.74	3.0	44.6	38.8	26.9	3.2	-35.6	0.0	0.0	39.1	33.3	74	54	-34.9	-20.7	Y
1.39	3.0	44.4	36.7	25.8	2.8	-35.9	0.0	0.0	37.1	29.4	74	54	-36.9	-24.6	H
2.08	3.0	42.3	35.4	27.9	3.5	-35.3	0.0	0.0	38.3	31.4	74	54	-35.7	-22.6	H
No other emissions above noise floor.															

Rev. 11.10.08

f	Measurement Frequency	Amp	Preamp Gain	Avg Lim	Average Field Strength Limit
Dist	Distance to Antenna	D Corr	Distance Correct to 3 meters	Pk Lim	Peak Field Strength Limit
Read	Analyzer Reading	Avg	Average Field Strength @ 3 m	Avg Mar	Margin vs. Average Limit
AF	Antenna Factor	Peak	Calculated Peak Field Strength	Pk Mar	Margin vs. Peak Limit
CL	Cable Loss	HPF	High Pass Filter		

Noise Floor Levels:

Specification Distance: 3 meters							
Freq GHz	SA dBuV	AF dB/m	Distance m	Distance dB	Field dBuV/m	Limit dBuV/m	Margin dB
33 to 50 GHz							
RBW = 1 MHz, peak detection							
50	39.2	44.2	0.1	-29.5	53.86	74	-20.14
RBW = 1 MHz, average detection							
50	27.2	44.2	0.1	-29.5	41.86	54	-12.14
50 to 75 GHz							
RBW = 1 MHz, peak detection							
75	39.2	47.7	0.1	-29.5	57.36	74	-16.64
RBW = 1 MHz, average detection							
75	27.2	47.7	0.1	-29.5	45.36	54	-8.64
75 to 110 GHz							
RBW = 1 MHz, peak detection							
110	39.2	51.0	0.1	-29.5	60.66	74	-13.34
RBW = 1 MHz, average detection							
110	27.2	51.0	0.1	-29.5	48.66	54	-5.34

Note: there are no emissions found from EUT above the system noise floor level from 2 GHz to 120.635 GHz.

MAXIMUM PERMISSIBLE EXPOSURE

FCC RULES

§1.1310 The criteria listed in Table 1 shall be used to evaluate the environmental impact of human exposure to radio-frequency (RF) radiation as specified in §1.1307(b), except in the case of portable devices which shall be evaluated according to the provisions of §2.1093 of this chapter.

TABLE 1—LIMITS FOR MAXIMUM PERMISSIBLE EXPOSURE (MPE)

Frequency range (MHz)	Electric field strength (V/m)	Magnetic field strength (A/m)	Power density (mW/cm ²)	Averaging time (minutes)
(A) Limits for Occupational/Controlled Exposures				
0.3–3.0	614	1.63	*(100)	6
3.0–30	1842/f	4.89/f	*(900/f ²)	6
30–300	61.4	0.163	1.0	6
300–1500 .....	.....	.....	f/300	6
1500–100,000 .....	.....	.....	5	6
(B) Limits for General Population/Uncontrolled Exposure				
0.3–1.34	614	1.63	*(100)	30
1.34–30	824/f	2.19/f	*(180/f ²)	30

TABLE 1—LIMITS FOR MAXIMUM PERMISSIBLE EXPOSURE (MPE)—Continued

Frequency range (MHz)	Electric field strength (V/m)	Magnetic field strength (A/m)	Power density (mW/cm ²)	Averaging time (minutes)
30–300	27.5	0.073	0.2	30
300–1500 .....	.....	.....	f/1500	30
1500–100,000 .....	.....	.....	1.0	30

f = frequency in MHz

* = Plane-wave equivalent power density

NOTE 1 TO TABLE 1: Occupational/controlled limits apply in situations in which persons are exposed as a consequence of their employment provided those persons are fully aware of the potential for exposure and can exercise control over their exposure. Limits for occupational/controlled exposure also apply in situations when an individual is transient through a location where occupational/controlled limits apply provided he or she is made aware of the potential for exposure.

NOTE 2 TO TABLE 1: General population/uncontrolled exposures apply in situations in which the general public may be exposed, or in which persons that are exposed as a consequence of their employment may not be fully aware of the potential for exposure or can not exercise control over their exposure.

IC RULES

IC Safety Code 6, Section 2.2.1 (a) A person other than an RF and microwave exposed worker shall not be exposed to electromagnetic radiation in a frequency band listed in Column 1 of Table 5, if the field strength exceeds the value given in Column 2 or 3 of Table 5, when averaged spatially and over time, or if the power density exceeds the value given in Column 4 of Table 5, when averaged spatially and over time.

**Table 5
 Exposure Limits for Persons Not Classed As RF and Microwave Exposed Workers (Including the General Public)**

1 Frequency (MHz)	2 Electric Field Strength; rms (V/m)	3 Magnetic Field Strength; rms (A/m)	4 Power Density (W/m ²)	5 Averaging Time (min)
0.003–1	280	2.19		6
1–10	280/ <i>f</i>	2.19/ <i>f</i>		6
10–30	28	2.19/ <i>f</i>		6
30–300	28	0.073	2*	6
300–1 500	1.585 <i>f</i> ^{0.5}	0.0042 <i>f</i> ^{0.5}	<i>f</i> /150	6
1 500–15 000	61.4	0.163	10	6
15 000–150 000	61.4	0.163	10	616 000 / <i>f</i> ^{1.2}
150 000–300 000	0.158 <i>f</i> ^{0.5}	4.21 x 10 ⁻⁴ <i>f</i> ^{0.5}	6.67 x 10 ⁻⁵ <i>f</i>	616 000 / <i>f</i> ^{1.2}

* Power density limit is applicable at frequencies greater than 100 MHz.

- Notes:**
1. Frequency, *f*, is in MHz.
 2. A power density of 10 W/m² is equivalent to 1 mW/cm².
 3. A magnetic field strength of 1 A/m corresponds to 1.257 microtesla (μT) or 12.57 milligauss (mG).

CALCULATIONS

Given

$$E = \sqrt{(30 * P * G) / d}$$

and

$$S = E^2 / 3770$$

where

E = Field Strength in Volts/meter

P = Power in Watts

G = Numeric antenna gain

d = Distance in meters

S = Power Density in milliwatts/square centimeter

Combining equations, rearranging the terms to express the distance as a function of the remaining variables, changing to units of Power to mW and Distance to cm, and substituting the logarithmic form of power and gain yields:

$$d = 0.282 * 10^{((P + G) / 20)} / \sqrt{S}$$

where

d = MPE distance in cm

P = Power in dBm

G = Antenna Gain in dBi

S = Power Density Limit in mW/cm²

Rearranging terms to calculate the power density at a specific distance yields

$$S = 0.0795 * 10^{((P + G) / 10)} / (d^2)$$

The power density in units of mW/cm² is converted to units of W/m² by multiplying by a factor of 10.

LIMITS

From FCC §1.1310 Table 1 (B), the maximum value of S = 1.0 mW/cm²

From IC Safety Code 6, Section 2.2 Table 5 Column 4, S = 10 W/m²

RESULTS

Band	MPE Distance (cm)	Output Power (dBm)	FCC Power Density (mW/cm ²)	IC Power Density (W/m ²)
24075-24175 MHz	20.0	22.30	0.03	0.34

CONVERSION OF FIELD STRENGTH TO EIRP:

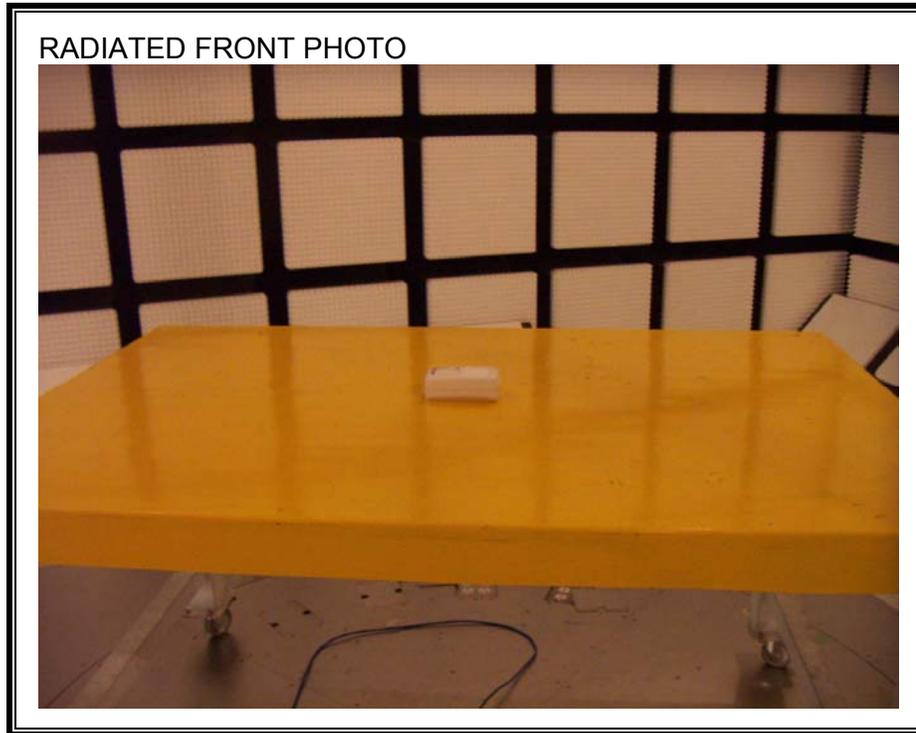
For frequencies where measurement equipment limitations preclude substitution measurements, the measured field strength at a 3 meter test distance is converted to EIRP using:

$$\text{EIRP (dBm)} = \text{Field Strength at 3 meters (dBuV/m)} - 95.2$$

8. SETUP PHOTOS

RADIATED RF MEASUREMENT SETUP

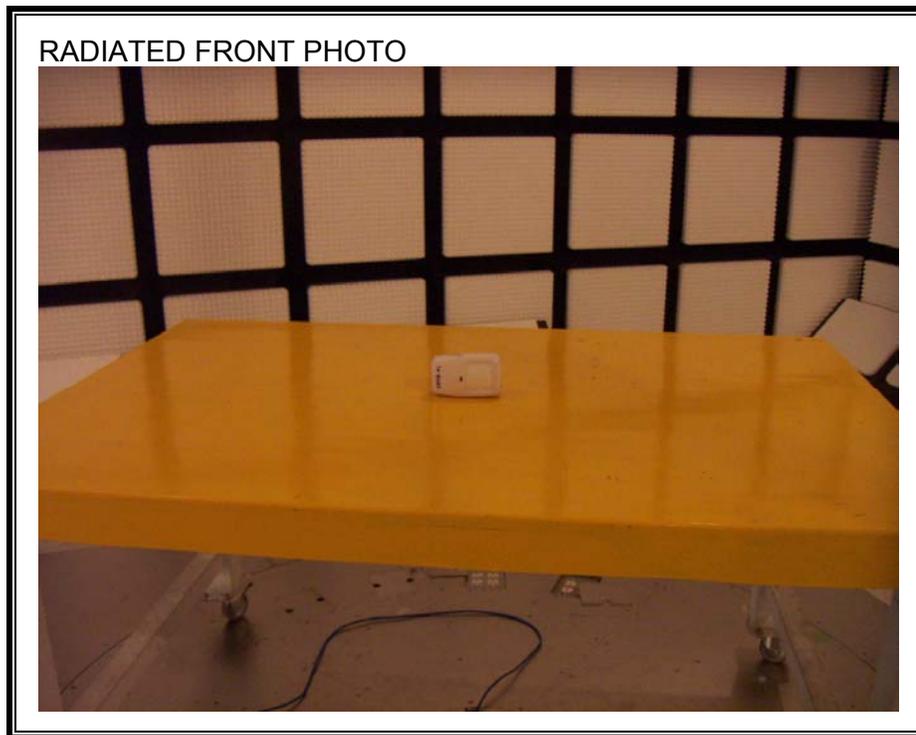
X - POSITION



Y - POSITION



Z - POSITION



END OF REPORT