



DATE: 17 June 2014

I.T.L. (PRODUCT TESTING) LTD.

FCC Radio Test Report

for

Visonic Ltd.

Equipment under test:

Wireless Contact Sensor

MCT-340 SMA

Written by:

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Approved by:

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Approved by:

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This report relates only to items tested.



Measurement/Technical Report for Visonic Ltd.

Wireless Contact Sensor

MCT-340 SMA

FCC ID: WP3MCT340SMA

IC: 1467C-MCT340SMA

This report concerns: Original Grant: X
Class I Change:
Class II Change:

Equipment type: Digital Transmission System

Limits used: 47CFR15 Section 15.247

Measurement procedure used is KDB 558074 D01 9, April 2013 and ANSI C63.4-2003.

Application for Certification
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1. General Information

1.1 Administrative Information

Manufacturer:	Visonic Ltd.
Manufacturer's Address:	30 Habarzel St. Tel-Aviv 69710 Israel Tel: +972-3-768-1400 Fax: +972-3-768-1415
Manufacturer's Representative:	Arick Elshtein
Equipment Under Test (E.U.T):	Wireless Contact Sensor
Equipment Model No.:	MCT-340 SMA
Equipment Serial No.:	Not Designated
Date of Receipt of E.U.T:	11.05.14
Start of Test:	11.05.14
End of Test:	13.05.14
Test Laboratory Location:	I.T.L (Product Testing) Ltd. Kfar Bin Nun, ISRAEL 99780
Test Specifications:	FCC Part 15, Subpart C, Section 15.247



List of Accreditations

The EMC laboratory of I.T.L. is accredited by the following bodies:

1. The American Association for Laboratory Accreditation (A2LA) (U.S.A.), Certificate No. 1152.01.
2. The Federal Communications Commission (FCC) (U.S.A.), Registration No. 90715.
3. The Israel Ministry of the Environment (Israel), Registration No. 1104/01.
4. The Voluntary Control Council for Interference by Information Technology Equipment (VCCI) (Japan), Registration Numbers: C-1350, R-1285.
5. Industry Canada (Canada), IC File No.: 46405-4025; Site No. IC 4025B-1.

I.T.L. Product Testing Ltd. is accredited by the American Association for Laboratory Accreditation (A2LA) and the results shown in this test report have been determined in accordance with I.T.L.'s terms of accreditation unless stated otherwise in the report.



1.2 Product Description

The E.U.T. is a ZigBee protocol transceiver placed in a magnet detector manufactured by Visonic Ltd.

The MCT-340 is a fully supervised, wireless magnetic contact sensor, for the with iControl HZ 1.2 control panels. The sensor includes a built in reed switch (that opens upon removal of a magnet placed near it).

The MCT-340 tamper switch is activated when the cover is removed.

A periodic supervision message is transmitted automatically. The target receiver is thus informed at regular intervals, of the unit's active participation in the system.

Operating power is obtained from an on-board 3 F lithium battery. When the voltage is low, a "low battery" message will be sent to the receiver 30 days before expiration of battery life.

1.3 Test Methodology

Radiated testing was performed according to the procedures in KDB 558074 D01 9, April 2013 and ANSI C63.4: 2003. Radiated testing was performed at an antenna to EUT distance of 3 meters.

1.4 Test Facility

The radiated emissions tests were performed at I.T.L.'s testing facility at Kfar Bin-Nun, Israel. This site is a FCC listed test laboratory (FCC Registration No. 90715, date of listing November 21, 2012).

I.T.L.'s EMC Laboratory is also accredited by A2LA, certificate No. 1152.01.

1.5 Measurement Uncertainty

Radiated Emission (CISPR 11, EN 55011, CISPR 22, EN 55022, ANSI C63.4) for open site 30-1000 MHz:

Expanded Uncertainty (95% Confidence, K=2):

± 4.96 dB

2. System Test Configuration

2.1 *Justification*

Unit was test in 3 orthogonal orientations in order to determent the worst case radiation.

2.2 *EUT Exercise Software*

No EUT exercise software was used.

2.3 *Special Accessories*

No special accessories were needed in order to achieve compliance.

2.4 *Equipment Modifications*

No modifications were needed in order to achieve compliance

2.5 *Configuration of Tested System*

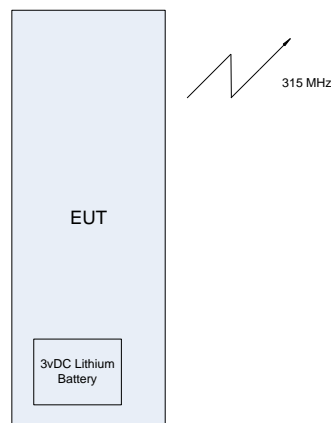


Figure 1. Configuration of Tested System

3. Radiated Measurement Test Set-up Photo



Figure 2. Radiated Emission Test



Figure 3. Radiated Emission Test

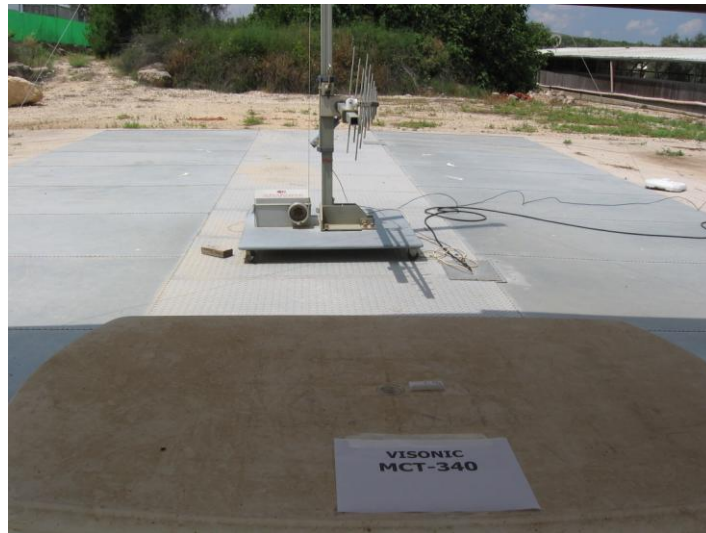


Figure 4. Radiated Emission Test



Figure 5. Radiated Emission Test

4. 6dB Minimum Bandwidth

4.1 Test Specification

F.C.C. Part 15, Subpart C: 15.247(a)(2)

4.2 Test procedure

The E.U.T was placed on a non-metallic table, 0.8 meters above the ground plane, on a remote-controlled turntable in the OATS. The test distance was 3 meters. The transmitter unit operated with normal modulation. The EMI receiver was set to 100 kHz resolution BW. The spectrum bandwidth of the transmitter unit was measured and recorded. The test was performed to measure the transmitter occupied bandwidth. The EUT was set up as shown in Figure 3, and its proper operation was checked. The transmitter occupied bandwidth was measured with the EMI receiver as frequency delta between reference points on modulation envelope. The E.U.T. was tested at 2405 MHz, 2445 MHz, and 2475MHz.

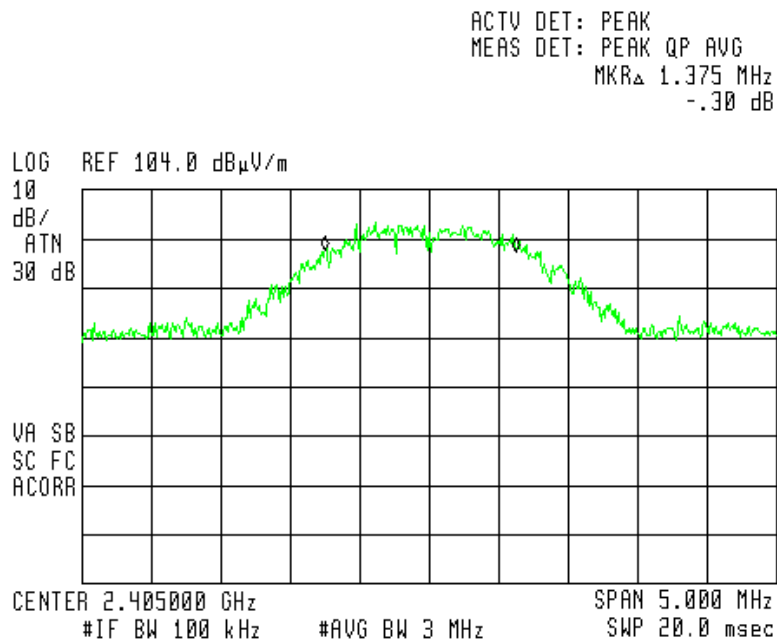


Figure 6. 2405MHz



ACTV DET: PEAK
MEAS DET: PEAK QP AVG
MKR Δ 1.500 MHz
-.00 dB

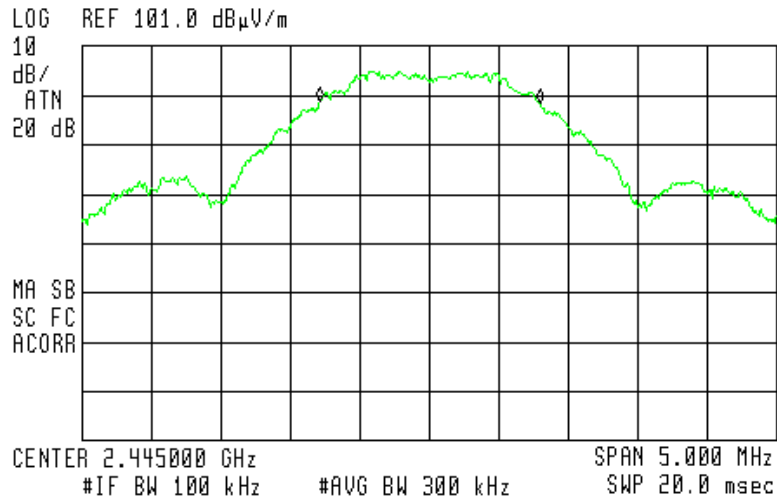


Figure 7. 2445MHz



ACTV DET: PEAK
MEAS DET: PEAK QP AVG
MKR Δ 1.600 MHz
-.15 dB

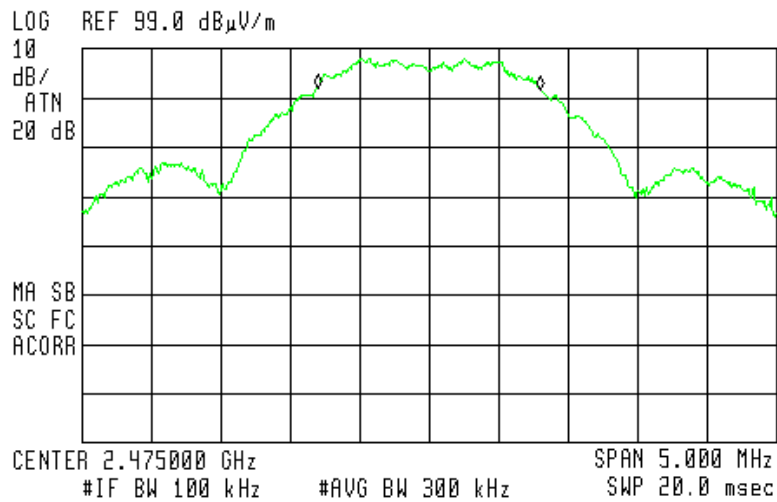


Figure 8. 2475MHz



4.3 Test Results

E.U.T Description: Wireless Contact Sensor

Model: MCT-340 SMA

Serial Number: Not Designated

Operation Frequency (MHz)	Bandwidth Reading (MHz)	Specification (MHz)
2405	1.375	>0.5
2445	1.588	>0.5
2475	1.600	>0.5

Figure 9 Test Results

JUDGEMENT: Passed

TEST PERSONNEL:

Tester Signature: 

Date: 23.06.14

Typed/Printed Name: A. Sharabi



4.4 Test Equipment Used; 6 dB Bandwidth

Instrument	Manufacturer	Model	Serial No.	Last Calibration Date	Period
EMI Receiver	HP	85422E	3906A00276	January 15, 2014	1 Year
RF Filter Section	HP	85420E	3705A00248	January 15, 2014	1 Year
Antenna Biconical	EMCO	3104	2606	August 30, 2012	2 Years
Antenna Log Periodic	ARA	LPD-2010/A	1038	April 2, 2013	2 Years
Double Ridged Waveguide Horn Antenna	ETS	3115	29845	March 14, 2012	3 Years
Horn Antenna	ARA	SWH-28	1007	March 30, 2014	3 Years
Low Noise Amplifier	DBS MICROWAVE	LNA-DBS-0411N313	013	August 21, 2013	1 Year
Low Noise Amplifier	Sophia Wireless	LNA 28-B	232	August 28, 2013	1 Year
Spectrum Analyzer	HP	8592L	3826A01204	February 28, 2014	1 Year
Spectrum Analyzer	HP	8564E	3442A00275	March 2, 2014	1 Year
Spectrum Analyzer	Rodhe & Schwarz	FSL6	100194	December 1, 2013	2 years
Antenna Mast	ARA	AAM-4A	1001	N/A	N/A
Turntable	ARA	ART-1001/4	1001	N/A	N/A
Mast & Table Controller	ARA	ACU-2/5	1001	N/A	N/A
Printer	HP	LaserJet 2200	JPKG19982	N/A	N/A

Figure 10 Test Equipment Used

5. 26dB Bandwidth

5.1 Test Specification

F.C.C. Part 15, Subpart C: 15.247(a)(2)

5.2 Test procedure

The E.U.T was placed on a non-metallic table, 0.8 meters above the ground plane, on a remote-controlled turntable in the OATS. The test distance was 3 meters. The transmitter unit operated with normal modulation. The EMI receiver was set to 100 kHz resolution BW. The spectrum bandwidth of the transmitter unit was measured and recorded. The test was performed to measure the transmitter occupied bandwidth. The EUT was set up as shown in Figure 3, and its proper operation was checked. The transmitter occupied bandwidth was measured with the EMI receiver as frequency delta between reference points on modulation envelope. The E.U.T. was tested at 2405 MHz, 2445 MHz, and 2475MHz.

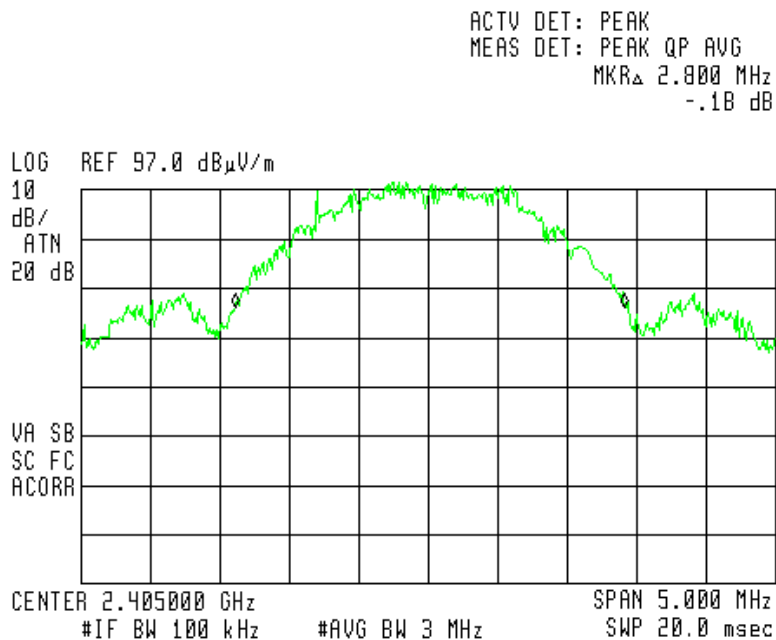


Figure 11. 2405MHz



ACTV DET: PEAK
MEAS DET: PEAK QP AVG
MKR Δ 2.988 MHz
-1.08 dB

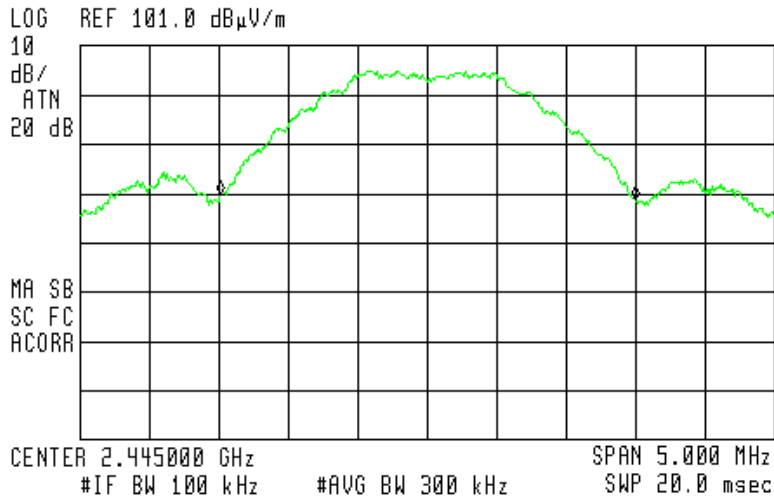


Figure 12. 2445MHz



ACTV DET: PEAK
MEAS DET: PEAK QP AVG
MKR Δ 3.050 MHz
.44 dB

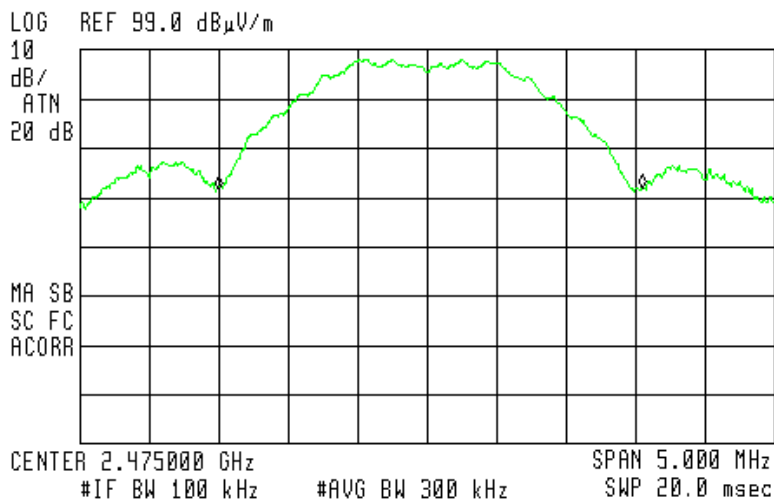


Figure 13. 2475MHz



5.3 Test Results

E.U.T Description: Wireless Contact Sensor

Model: MCT-340 SMA

Serial Number: Not Designated

Operation Frequency (MHz)	Bandwidth Reading (MHz)	Specification (MHz)
2405	2.800	>0.5
2445	2.988	>0.5
2475	3.050	>0.5

Figure 14 Test Results

JUDGEMENT: Passed

TEST PERSONNEL:

Tester Signature: 

Date: 23.06.14

Typed/Printed Name: A. Sharabi



5.4 Test Equipment Used; 26 dB Bandwidth

Instrument	Manufacturer	Model	Serial No.	Last Calibration Date	Period
EMI Receiver	HP	85422E	3906A00276	January 15, 2014	1 Year
RF Filter Section	HP	85420E	3705A00248	January 15, 2014	1 Year
Antenna Biconical	EMCO	3104	2606	August 30, 2012	2 Years
Antenna Log Periodic	ARA	LPD-2010/A	1038	April 2, 2013	2 Years
Double Ridged Waveguide Horn Antenna	ETS	3115	29845	March 14, 2012	3 Years
Horn Antenna	ARA	SWH-28	1007	March 30, 2014	3 Years
Low Noise Amplifier	DBS MICROWAVE	LNA-DBS-0411N313	013	August 21, 2013	1 Year
Low Noise Amplifier	Sophia Wireless	LNA 28-B	232	August 28, 2013	1 Year
Spectrum Analyzer	HP	8592L	3826A01204	February 28, 2014	1 Year
Spectrum Analyzer	HP	8564E	3442A00275	March 2, 2014	1 Year
Spectrum Analyzer	Rodhe & Schwarz	FSL6	100194	December 1, 2013	2 years
Antenna Mast	ARA	AAM-4A	1001	N/A	N/A
Turntable	ARA	ART-1001/4	1001	N/A	N/A
Mast & Table Controller	ARA	ACU-2/5	1001	N/A	N/A
Printer	HP	LaserJet 2200	JPKG19982	N/A	N/A

Figure 15 Test Equipment Used

6. Radiated Power Output

6.1 Test Specification

F.C.C. Part 15, Subpart C: 15.247(b)

6.2 Test procedure

The E.U.T was placed on a non-metallic table, 0.8 meters above the ground plane, on a remote-controlled turntable in the OATS. The test distance was 3 meters.

The transmitter unit operated with normal modulation. The EMI receiver was set to 1 MHz resolution BW. The EUT was set up as shown in Figure 3, and its proper operation was checked.

The readings were maximized by adjusting the antenna height between 1-4 meters, the turntable azimuth between 0-360°, and the antenna polarization.

The E.U.T. was tested in three operating channels and frequencies (1 (2.405 GHz); 8 (2.445 GHz); 14 (2.475 GHz)).

Radiated output power levels were measured at selected operation frequencies and the results were converted to power level

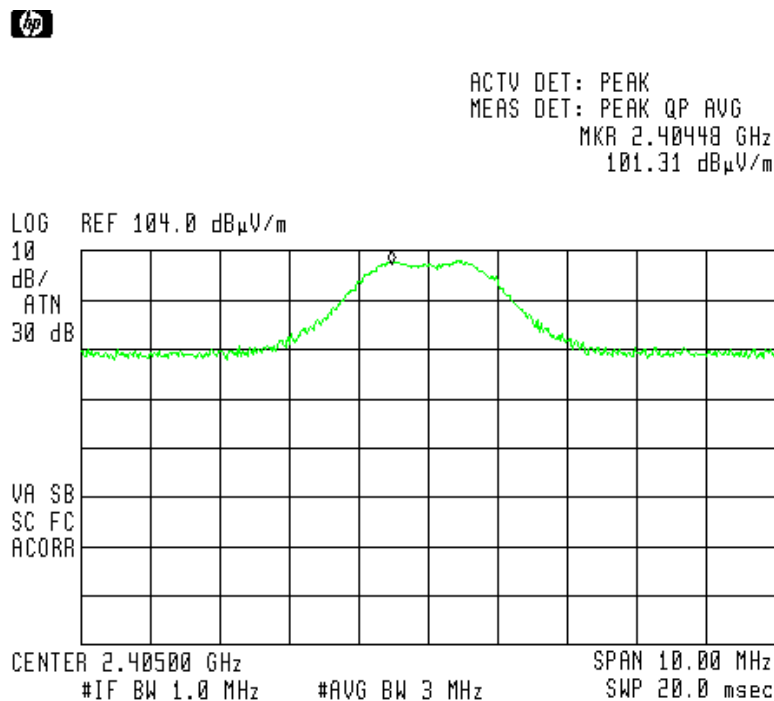


Figure 16 2405MHz - Horizontal



ACTV DET: PEAK
MEAS DET: PEAK QP AVG
MKR 2.44453 GHz
101.81 dB μ V/m

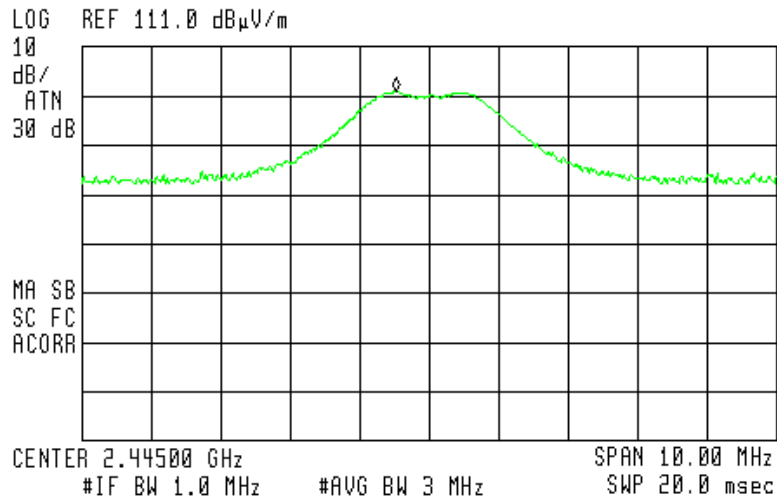


Figure 17 2445MHz - Horizontal



ACTV DET: PEAK
MEAS DET: PEAK QP AVG
MKR 2.47450 GHz
101.05 dB μ V/m

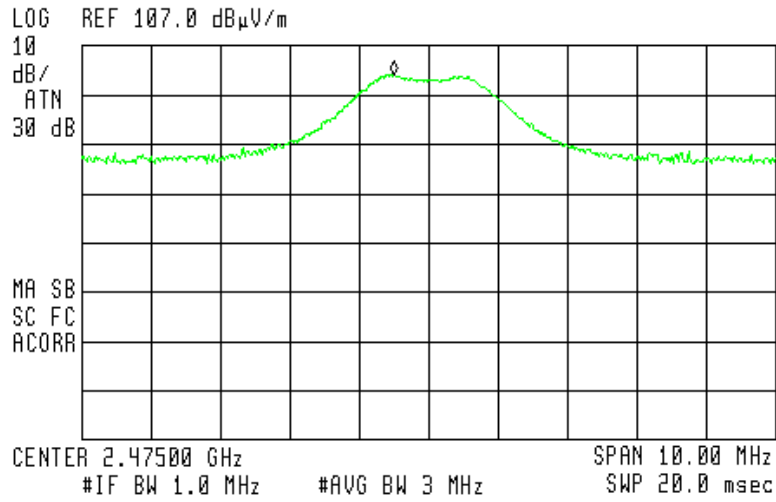


Figure 17 2475MHz- Horizontal



6.3 Results Calculation

E.U.T. Description: Wireless Contact Sensor

Model No.: MCT-340 SMA

Serial Number: Not Designated

Specification: F.C.C. Part 15, Subpart C

Operation Frequency (MHz)	Power (dBuV/m)	Power (dBm)	Specification (dBm)	Margin (dB)
2405	101.3	6.1	30.0	-23.9
2445	101.8	6.6	30.0	-23.4
2475	101.0	5.8	30.0	-24.2

JUDGEMENT: Passed

TEST PERSONNEL:

Tester Signature: 

Date: 23.06.14

Typed/Printed Name: A. Sharabi



6.4 Test Equipment Used; Radiated Maximum Power Output

Instrument	Manufacturer	Model	Serial No.	Last Calibration Date	Period
EMI Receiver	HP	85422E	3906A00276	January 15, 2014	1 Year
RF Filter Section	HP	85420E	3705A00248	January 15, 2014	1 Year
Antenna Biconical	EMCO	3104	2606	August 30, 2012	2 Years
Antenna Log Periodic	ARA	LPD-2010/A	1038	April 2, 2013	2 Years
Double Ridged Waveguide Horn Antenna	ETS	3115	29845	March 14, 2012	3 Years
Horn Antenna	ARA	SWH-28	1007	March 30, 2014	3 Years
Low Noise Amplifier	DBS MICROWAVE	LNA-DBS-0411N313	013	August 21, 2013	1 Year
Low Noise Amplifier	Sophia Wireless	LNA 28-B	232	August 28, 2013	1 Year
Spectrum Analyzer	HP	8592L	3826A01204	February 28, 2014	1 Year
Spectrum Analyzer	HP	8564E	3442A00275	March 2, 2014	1 Year
Spectrum Analyzer	Rodhe & Schwarz	FSL6	100194	December 1, 2013	2 years
Antenna Mast	ARA	AAM-4A	1001	N/A	N/A
Turntable	ARA	ART-1001/4	1001	N/A	N/A
Mast & Table Controller	ARA	ACU-2/5	1001	N/A	N/A
Printer	HP	LaserJet 2200	JPKG19982	N/A	N/A

Figure 18 Test Equipment Used

7. Band Edge

[In Accordance with section 15.247(d)]

7.1 Test procedure

The E.U.T was placed on a non-metallic table, 0.8 meters above the ground plane, on a remote-controlled turntable in the OATS. The test distance was 3 meters.

The transmitter unit operated with normal modulation. The EMI receiver was set to 1 MHz resolution BW. The EUT was set up as shown in Figure 3, and its proper operation was checked.

The EMI receiver was adjusted to the transmission channel at the maximum radiated level. The display line was set to 20 dBc and the EMI receiver was set to the band edge frequencies.

Maximum power level below 2400 MHz and above 2483.5 MHz was measured relative to power level at 2405MHz, and 2475 MHz correspondingly.

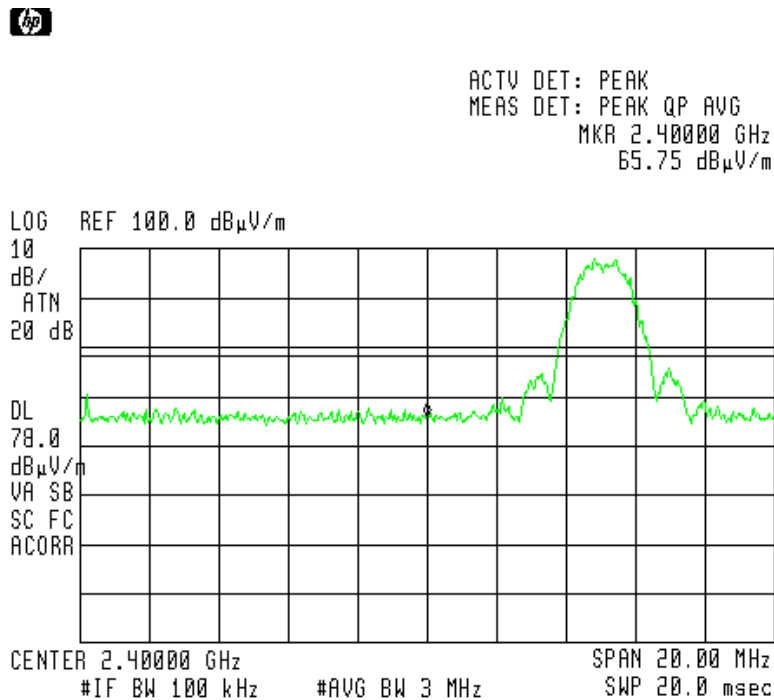


Figure 19 — 2405MHz (-20 dBc Limit)



ACTV DET: PEAK
MEAS DET: PEAK QP AVG
MKR 2.48350 GHz
67.23 dB μ V/m

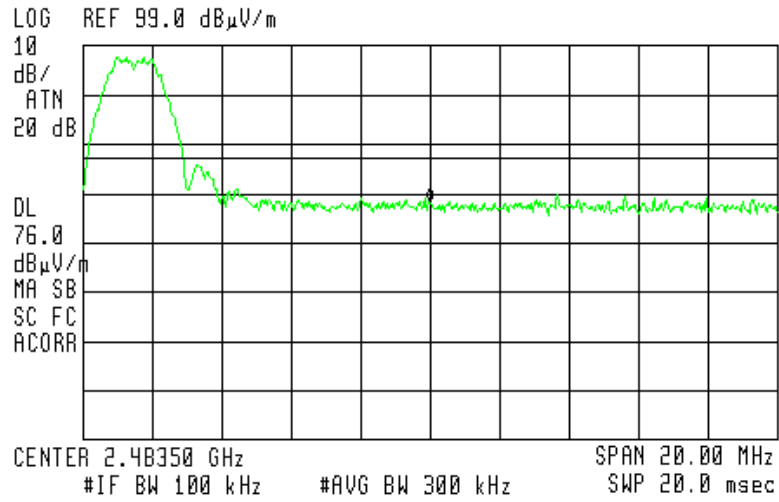


Figure 20 — 2475 MHz (-20 dBc Limit)



7.2 Results table


E.U.T. Description: Wireless Contact Sensor
Model No.: MCT-340 SMA
Serial Number: Not Designated
Specification: F.C.C. Part 15, Subpart C (15.247 (d))

Operation Frequency (MHz)	Band Edge Frequency (MHz)	Spectrum Level (dBuV/m)	Specification (dBuV/m)	Margin (dB)
2405	2400	65.75	78.0	-12.25
2475	2483.3	67.23	76.0	-8.77

Figure 21 Band Edge (- 20 dBc Limit)

JUDGEMENT: Passed by 8.77 dB

TEST PERSONNEL:

Tester Signature: 

Date: 23.06.14

Typed/Printed Name: A. Sharabi



7.3 Test Equipment Used; Band Edge Spectrum

Instrument	Manufacturer	Model	Serial No.	Last Calibration Date	Period
EMI Receiver	HP	85422E	3906A00276	January 15, 2014	1 Year
RF Filter Section	HP	85420E	3705A00248	January 15, 2014	1 Year
Antenna Biconical	EMCO	3104	2606	August 30, 2012	2 Years
Antenna Log Periodic	ARA	LPD-2010/A	1038	April 2, 2013	2 Years
Double Ridged Waveguide Horn Antenna	ETS	3115	29845	March 14, 2012	3 Years
Horn Antenna	ARA	SWH-28	1007	March 30, 2014	3 Years
Low Noise Amplifier	DBS MICROWAVE	LNA-DBS-0411N313	013	August 21, 2013	1 Year
Low Noise Amplifier	Sophia Wireless	LNA 28-B	232	August 28, 2013	1 Year
Spectrum Analyzer	HP	8592L	3826A01204	February 28, 2014	1 Year
Spectrum Analyzer	HP	8564E	3442A00275	March 2, 2014	1 Year
Spectrum Analyzer	Rodhe & Schwarz	FSL6	100194	December 1, 2013	2 years
Antenna Mast	ARA	AAM-4A	1001	N/A	N/A
Turntable	ARA	ART-1001/4	1001	N/A	N/A
Mast & Table Controller	ARA	ACU-2/5	1001	N/A	N/A
Printer	HP	LaserJet 2200	JPKG19982	N/A	N/A

Figure 22 Test Equipment Used



8. Radiated Emission, 9 kHz – 30 MHz

8.1 Test Specification

9 kHz-30 MHz, FCC, Part 15, Subpart C, Section 209

8.2 Test Procedure

The E.U.T. operation mode and test set-up are as described in Section 3.

A preliminary measurement to characterize the E.U.T was performed inside the shielded room at a distance of 3 meters, using peak detection mode and broadband antennas. The preliminary measurements produced a list of the highest emissions. The E.U.T was then transferred to the open site, and placed on a remote-controlled turntable. The E.U.T was placed on a non-metallic table, 0.8 meters above the ground. The configuration tested is shown in Figure 3.1.

The frequency range 9 kHz-30 MHz was scanned.

The emissions were measured using a computerized EMI receiver complying with CISPR 16 requirements. The specification limits and applicable correction factors are loaded to the receiver via a 3.5" floppy disk.

In the frequency range 9 kHz-30MHz, the loop antenna was rotated on its vertical axis. The antenna height (center of loop) was 1 meter at a distance of 3 meters.

The E.U.T. was tested in three operating frequencies
2.405 GHz, 2.445 GHz, and 2.475 GHz.

8.3 Measured Data

JUDGEMENT: Passed

The EUT met the requirements of the F.C.C. Part 15, Subpart C, Section 209 specification.

The results for all three channels were the same.

No signals were detected in the frequency range of 9 kHz – 30 MHz.

TEST PERSONNEL:

Tester Signature: 

Date: 23.06.14

Typed/Printed Name: A. Sharabi



8.4 Test Instrumentation Used, Radiated Measurements

Instrument	Manufacturer	Model	Serial Number	Calibration	Period
EMI Receiver	HP	85422E	3906A00276	January 15, 2014	1 year
RF Section	HP	85420E	3705A00248	January 15, 2014	1 year
Active Loop Antenna	EMCO	6502	9506-2950	November 4, 2013	1 year
Antenna Mast	ARA	AAM-4A	1001	N/A	N/A
Turntable	ARA	ART-1001/4	1001	N/A	N/A
Mast & Table Controller	ARA	ACU-2/5	1001	N/A	N/A
Printer	HP	LaserJet 2200	JPKGC19982	N/A	N/A

Figure 23 Test Equipment Used

8.5 Field Strength Calculation

The field strength is calculated directly by the EMI Receiver software, and a "Correction Factors" data disk, using the following equation:

$$FS = RA + AF + CF$$

FS: Field Strength [dB μ v/m]

RA: Receiver Amplitude [dB μ v]

AF: Receiving Antenna Correction Factor [dB/m]

CF: Cable Attenuation Factor [dB]

Example: FS = 30.7 dB μ V (RA) + 14.0 dB (AF) + 0.9 dB (CF) = 45.6 dB μ V

No external pre-amplifiers are used.

9. Spurious Radiated Emission 30 – 25000 MHz

9.1 Test Specification

30 MHz-25000 MHz, F.C.C., Part 15, Subpart C

9.2 Test Procedure

The E.U.T. operation mode and test set-up are as described in Section 3.

See Section 3.1 Justification of the System Test Configuration concerning the E.U.T. orientation for this test.

A preliminary measurement to characterize the E.U.T was performed inside the shielded room at a distance of 3 meters, using peak detection mode and broadband antennas. The preliminary measurements produced a list of the highest emissions. The E.U.T was then transferred to the open site, and placed on a remote-controlled turntable. The E.U.T was placed on a non-metallic table, 0.8 meters above the ground.

The frequency range 30 MHz-25000 MHz was scanned and the list of the highest emissions was verified and updated accordingly.

The levels of the emissions within the frequency ranges of the restricted bands (Section 15.205 of FCC Part 15) were compared to the limits of the table in Section 15.209 (a), General Requirements.

In the frequency range 30 MHz - 2.9 GHz, a computerized EMI receiver complying with CISPR 16 requirements was used. The specification limits and applicable correction factors are loaded to the receiver via a 3.5" floppy disk.

In the frequency range 2.9 - 25.0 GHz, a spectrum analyzer including a low noise amplifier was used. During average measurements, the IF bandwidth was 1 MHz and the video bandwidth was 100Hz. During peak measurements, the IF bandwidth was 1 MHz and the video bandwidth was 3 MHz.

The test distance was 3 meters.

The readings were maximized by adjusting the antenna height between 1-4 meters, the turntable azimuth between 0-360°, and the antenna polarization. Verification of the E.U.T emissions was based on the following methods: turning the E.U.T on and off; using a frequency span less than 10 MHz; observation of the signal level during turntable rotation. (Background noise is not affected by the rotation of the E.U.T.)

The E.U.T. was tested in three operating frequencies
2.405 GHz, 2.445 GHz, and 2.475 GHz.



9.3 Test Data

JUDGEMENT: Passed by 8.8 dB.

The EUT met the requirements of the F.C.C. Part 15, Subpart C specification.

In the frequency range of 30 – 1000 MHz no signals were detected.


For the operation channel 2.405 GHz, the margin between the emission level and the specification limit is 9.6 dB in the worst case at the frequency of 7215.00 MHz, vertical polarization.

For the operation channel 2.445 GHz, the margin between the emission level and the specification limit is 8.8 dB in the worst case at the frequency of 7335.00 MHz, vertical polarization.

For the operation channel 2.475GHz, the margin between the emission level and the specification limit is 9.6 dB in the worst case at the frequency of 7425.00MHz, vertical polarization.

The details of the highest emissions are given in *Figure 24* to *Figure 29*.

TEST PERSONNEL:

Tester Signature:  _____

Date: 23.06.14

Typed/Printed Name: A. Sharabi



Radiated Emission

E.U.T Description Wireless Contact Sensor
Type MCT-340 SMA
Serial Number: Not Designated

Specification: FCC, Part 15, Subpart C

Antenna Polarization: Horizontal/Vertical Frequency range: 1.0 GHz to 25.0 GHz
Test Distance: 3 meters Detector: Peak
Operation Frequency: 2405.00 MHz

Operation Frequency (MHz)	Freq. (MHz)	Polarity (H/V)	Peak Reading (dBμV/m)	Peak Specification (dB μV/m)	Margin (dB)
2405.00	2390.00	H	48.6	74.0	-25.4
2405.00	2390.00	V	49.7	74.0	-24.3
2405.00	4810.00	H	55.3	74.0	-18.7
2405.00	4810.00	V	54.7	74.0	-19.3
2405.00	7215.00	H	56.4	74.0	-17.6
2405.00	7215.00	V	55.9	74.0	-18.1

**Figure 24. Radiated Emission. Antenna Polarization: HORIZONTAL / VERTICAL.
Detector: Peak**

Margin refers to the test results obtained minus specified requirement; thus a positive number indicates failure, and a negative result indicates that the product passes the test.

“Peak Reading” includes correction factor.

* “Correction Factor” = Antenna Factor + Cable Loss- Low Noise Amplifier Gain



Radiated Emission

E.U.T Description Wireless Contact Sensor
Type MCT-340 SMA
Serial Number: Not Designated

Specification: FCC, Part 15, Subpart C

Antenna Polarization: Horizontal/Vertical Frequency range: 1.0 GHz to 25.0 GHz
Test Distance: 3 meters Detector: Peak
Operation Frequency: 2445.00 MHz

Operation Frequency (MHz)	Freq. (MHz)	Polarity (H/V)	Peak Reading (dBμV/m)	Peak Specification (dB μV/m)	Margin (dB)
2445.00	4890.00	H	54.6	74.0	-19.4
2445.00	4890.00	V	55.7	74.0	-18.3
2445.00	7335.00	H	56.4	74.0	-17.6
2445.00	7335.00	V	54.8	74.0	-19.2

**Figure 25. Radiated Emission. Antenna Polarization: HORIZONTAL / VERTICAL.
Detector: Peak**

Margin refers to the test results obtained minus specified requirement; thus a positive number indicates failure, and a negative result indicates that the product passes the test.

“Peak Reading” includes correction factor.

* “Correction Factor” = Antenna Factor + Cable Loss- Low Noise Amplifier Gain



Radiated Emission

E.U.T Description Wireless Contact Sensor
Type MCT-340 SMA
Serial Number: Not Designated

Specification: FCC, Part 15, Subpart C

Antenna Polarization: Horizontal/Vertical Frequency range: 1.0 GHz to 25.0 GHz
Test Distance: 3 meters Detector: Peak
Operation Frequency: 2475.00 MHz

Operation Frequency (MHz)	Freq. (MHz)	Polarity (H/V)	Peak Reading (dBμV/m)	Peak Specification (dB μV/m)	Margin (dB)
2475.00	2483.50	H	54.3	74.0	-19.7
2475.00	2483.50	V	50.4	74.0	-23.6
2475.00	4950.00	H	51.5	74.0	-22.5
2475.00	4950.00	V	52.3	74.0	-21.7
2475.00	7425.00	H	50.8	74.0	-23.2
2475.00	7425.00	V	51.4	74.0	-22.6

**Figure 26. Radiated Emission. Antenna Polarization: HORIZONTAL / VERTICAL.
Detector: Peak**

Margin refers to the test results obtained minus specified requirement; thus a positive number indicates failure, and a negative result indicates that the product passes the test.

“Peak Reading” includes correction factor.

* “Correction Factor” = Antenna Factor + Cable Loss- Low Noise Amplifier Gain



Radiated Emission

E.U.T Description Wireless Contact Sensor
Type MCT-340 SMA
Serial Number: Not Designated

Specification: FCC, Part 15, Subpart C

Antenna Polarization: Horizontal/Vertical Frequency range: 1.0 GHz to 25.0 GHz
Test Distance: 3 meters Detector: Average
Operation Frequency: 2405.00 MHz

Operation Frequency	Freq.	Polarity	Average Reading	Average Specification	Margin
(MHz)	(MHz)	(H/V)	(dBμV/m)	(dB μV/m)	(dB)
2405.00	2390.00	H	42.7	54.0	-11.3
2405.00	2390.00	V	40.6	54.0	-13.4
2405.00	4810.00	H	40.5	54.0	-13.5
2405.00	4810.00	V	42.2	54.0	-11.8
2405.00	7215.00	H	43.5	54.0	-10.5
2405.00	7215.00	V	44.4	54.0	-9.6

Figure 27. Radiated Emission. Antenna Polarization: HORIZONTAL / VERTICAL. Detector: Average

Notes:

Margin refers to the test results obtained minus specified requirement; thus a positive number indicates failure, and a negative result indicates that the product passes the test.

“Average Amp” includes correction factor.

* Correction Factor = Antenna Factor + Cable Loss- Low Noise Amplifier Gain



Radiated Emission

E.U.T Description Wireless Contact Sensor
Type MCT-340 SMA
Serial Number: Not Designated

Specification: FCC, Part 15, Subpart C

Antenna Polarization: Horizontal/Vertical Frequency range: 1.0 GHz to 25.0 GHz
Test Distance: 3 meters Detector: Average
Operation Frequency: 2445.00 MHz

Operation Frequency	Freq.	Polarity	Average Reading	Average Specification	Margin
(MHz)	(MHz)	(H/V)	(dBμV/m)	(dB μV/m)	(dB)
2445.00	4890.00	H	41.5	54.0	-12.5
2445.00	4890.00	V	42.7	54.0	-11.3
2445.00	7335.00	H	44.5	54.0	-9.5
2445.00	7335.00	V	45.2	54.0	-8.8

Figure 28. Radiated Emission. Antenna Polarization: HORIZONTAL / VERTICAL. Detector: Average

Notes:

Margin refers to the test results obtained minus specified requirement; thus a positive number indicates failure, and a negative result indicates that the product passes the test.

“Average Amp” includes correction factor.

* Correction Factor = Antenna Factor + Cable Loss- Low Noise Amplifier Gain



Radiated Emission

E.U.T Description Wireless Contact Sensor
Type MCT-340 SMA
Serial Number: Not Designated

Specification: FCC, Part 15, Subpart C

Antenna Polarization: Horizontal/Vertical Frequency range: 1.0 GHz to 25.0 GHz
Test Distance: 3 meters Detector: Average
Operation Frequency: 2475.00 MHz

Operation Frequency (MHz)	Freq. (MHz)	Polarity (H/V)	Average Reading (dBμV/m)	Average Specification (dB μV/m)	Margin (dB)
2475.00	2483.50	H	41.5	54.0	-12.5
2475.00	2483.50	V	42.1	54.0	-11.9
2475.00	4950.00	H	41.5	54.0	-12.5
2475.00	4950.00	V	40.8	54.0	-13.2
2475.00	7425.00	H	43.9	54.0	-10.1
2475.00	7425.00	V	44.4	54.0	-9.6

**Figure 29. Radiated Emission. Antenna Polarization: HORIZONTAL / VERTICAL.
Detector: Average**

Notes:

Margin refers to the test results obtained minus specified requirement; thus a positive number indicates failure, and a negative result indicates that the product passes the test.

“Average Amp” includes correction factor.

* Correction Factor = Antenna Factor + Cable Loss- Low Noise Amplifier Gain



9.4 Test Instrumentation Used, Radiated Measurements

Instrument	Manufacturer	Model	Serial No.	Last Calibration Date	Period
EMI Receiver	HP	85422E	3906A00276	January 15, 2014	1 Year
RF Filter Section	HP	85420E	3705A00248	January 15, 2014	1 Year
Antenna Biconical	EMCO	3104	2606	August 30, 2012	2 Years
Antenna Log Periodic	ARA	LPD-2010/A	1038	April 2, 2013	2 Years
Double Ridged Waveguide Horn Antenna	ETS	3115	29845	March 14, 2012	3 Years
Horn Antenna	ARA	SWH-28	1007	March 30, 2014	3 Years
Low Noise Amplifier	DBS MICROWAVE	LNA-DBS-0411N313	013	August 21, 2013	1 Year
Low Noise Amplifier	Sophia Wireless	LNA 28-B	232	August 28, 2013	1 Year
Spectrum Analyzer	HP	8592L	3826A01204	February 28, 2014	1 Year
Spectrum Analyzer	HP	8564E	3442A00275	March 2, 2014	1 Year
Spectrum Analyzer	Rodhe & Schwarz	FSL6	100194	December 1, 2013	2 years
Antenna Mast	ARA	AAM-4A	1001	N/A	N/A
Turntable	ARA	ART-1001/4	1001	N/A	N/A
Mast & Table Controller	ARA	ACU-2/5	1001	N/A	N/A
Printer	HP	LaserJet 2200	JPKG19982	N/A	N/A

Figure 30 Test Equipment Used



9.5 **Field Strength Calculation**

The field strength is calculated directly by the EMI Receiver software, and a "Correction Factors" data disk, using the following equation:

$$[\text{dB}\mu\text{v/m}] \text{ FS} = \text{RA} + \text{AF} + \text{CF}$$

- FS: Field Strength [dB μ v/m]
- RA: Receiver Amplitude [dB μ v]
- AF: Receiving Antenna Correction Factor [dB/m]
- CF: Cable Attenuation Factor [dB]

Example: FS = 30.7 dB μ V (RA) + 14.0 dB (AF) + 0.9 dB (CF) = 45.6 dB μ V

No external pre-amplifiers are used.

10. Radiated Power Spectral Density

[In accordance with section 15.247(d)]

10.1 Test procedure

The E.U.T was placed on a non-metallic table, 0.8 meters above the ground plane, on a remote-controlled turntable in the OATS. The test distance was 3 meters.

The transmitter unit operated with normal modulation. The EMI receiver was set to 1 MHz resolution BW. The EUT was set up as shown in Figure 3, and its proper operation was checked.

The readings were maximized by adjusting the antenna height between 1-4 meters, the turntable azimuth between 0-360°, and the antenna polarization.

The E.U.T. was tested in three operating frequencies (2.405 GHz, 2.445 GHz, and 2.475 GHz)).

Then the EMI receiver was set to 3 kHz resolution BW, span of 5MHz, and automatic sweep time. The spectrum peaks were located at each of the 3 operating frequencies.

Radiated peak output power levels were converted to power level

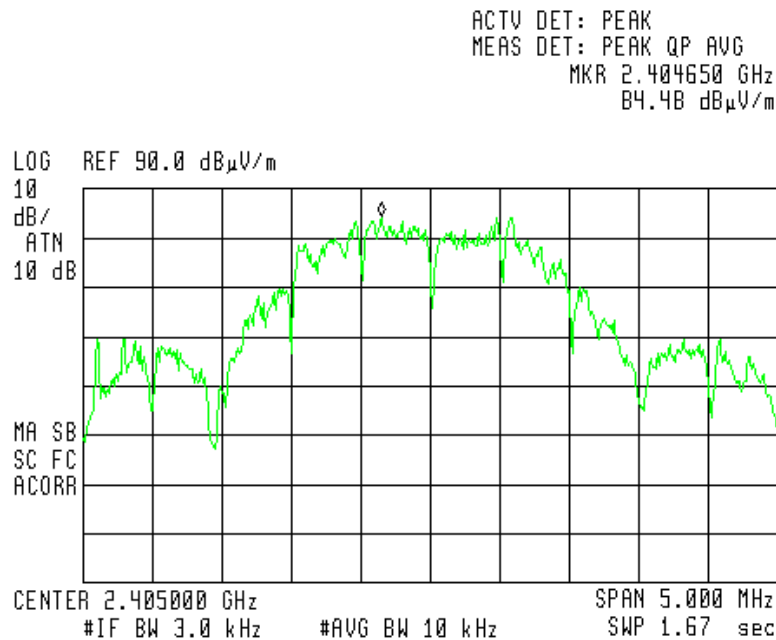


Figure 31 — 2405MHz



ACTV DET: PEAK
MEAS DET: PEAK QP AVG
MKR 2.444763 GHz
80.12 dB μ V/m

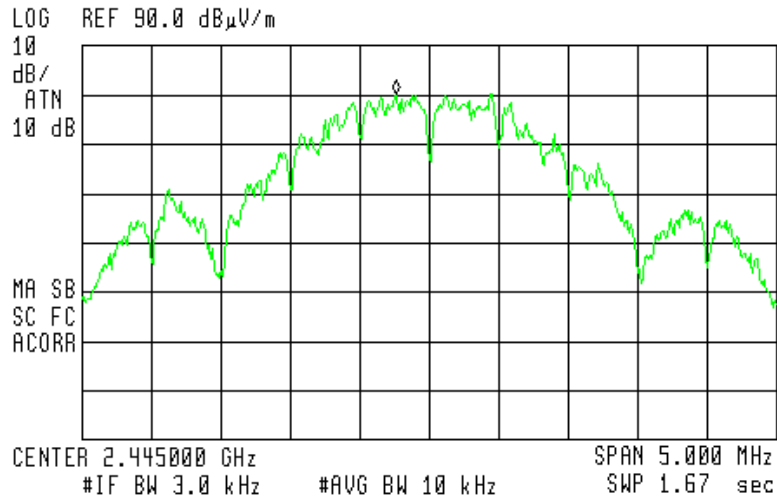


Figure 32 — 2445MHz



ACTV DET: PEAK
MEAS DET: PEAK QP AVG
MKR 2.474875 GHz
81.68 dB μ V/m

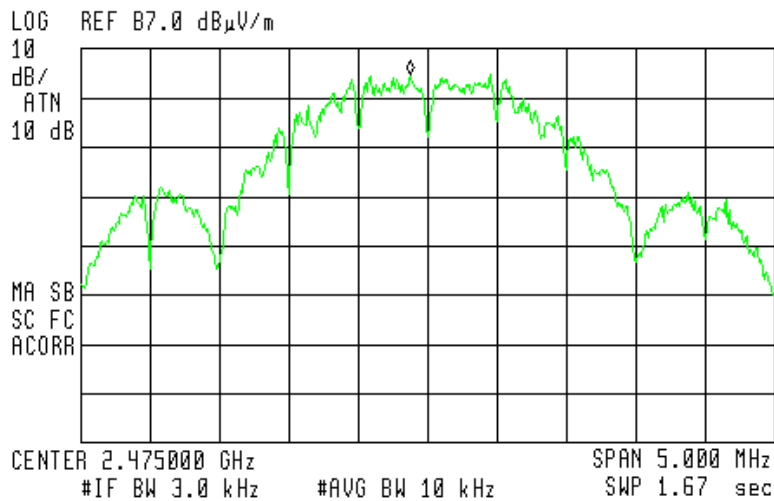


Figure 33 — 2475 MHz



10.2 Results table

E.U.T. Description: Wireless Contact Sensor

Model No.: MCT-340 SMA

Serial Number: Not Designated


Specification: F.C.C. Part 15, Subpart C (15.247(d))

Operation Frequency (MHz)	Spectral Density Result (dBuV/m)	Spectral Density Result (dBm)	Specification (dBm)	Margin (dB)
2405	84.48	-10.72	8.0	-18.72
2445	80.12	-15.08	8.0	-23.08
2475	81.68	-13.52	8.0	-21.52

Figure 34 Test Results

JUDGEMENT: Passed

TEST PERSONNEL:

Tester Signature: 

Date: 23.06.14

Typed/Printed Name: A. Sharabi

10.3 Test Equipment Used; Transmitted Power Density

Instrument	Manufacturer	Model	Serial No.	Last Calibration Date	Period
EMI Receiver	HP	85422E	3906A00276	January 15, 2014	1 Year
RF Filter Section	HP	85420E	3705A00248	January 15, 2014	1 Year
Antenna Biconical	EMCO	3104	2606	August 30, 2012	2 Years
Antenna Log Periodic	ARA	LPD-2010/A	1038	April 2, 2013	2 Years
Double Ridged Waveguide Horn Antenna	ETS	3115	29845	March 14, 2012	3 Years
Horn Antenna	ARA	SWH-28	1007	March 30, 2014	3 Years
Low Noise Amplifier	DBS MICROWAVE	LNA-DBS-0411N313	013	August 21, 2013	1 Year
Low Noise Amplifier	Sophia Wireless	LNA 28-B	232	August 28, 2013	1 Year
Spectrum Analyzer	HP	8592L	3826A01204	February 28, 2014	1 Year
Spectrum Analyzer	HP	8564E	3442A00275	March 2, 2014	1 Year
Spectrum Analyzer	Rodhe & Schwarz	FSL6	100194	December 1, 2013	2 years
Antenna Mast	ARA	AAM-4A	1001	N/A	N/A
Turntable	ARA	ART-1001/4	1001	N/A	N/A
Mast & Table Controller	ARA	ACU-2/5	1001	N/A	N/A
Printer	HP	LaserJet 2200	JPKG19982	N/A	N/A

Figure 35 Test Equipment Used



11. Antenna Gain/Information

The antenna gain is -1.0 dBi.



12. R.F Exposure/Safety

The typical placement of the E.U.T. is wall or ceiling mounted. The typical distance between the E.U.T. and the user is 25 cm.

Calculation of Maximum Permissible Exposure (MPE)

Based on Section 1.1310 Requirements

(a) FCC limits at 2445 MHz is: $1 \frac{mW}{cm^2}$

Using table 1 of Section 1.1310 limit for general population/uncontrolled exposures, the above level is an average over 30 minutes.

(b) The power density produced by the E.U.T. is

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

P_t - Transmitted Power 101.8 dBuV/m= 4.57 mw (Peak)

G_t - Antenna Gain, -1.0 dBi = 0.79 numeric

R - Distance from Transmitter using 25 cm worst case

(c) The peak power density is :

$$S_p = \frac{4.57 \times 0.79}{4\pi(25)^2} = 4.6 \times 10^{-4} \frac{mW}{cm^2}$$

(d) This is below the FCC limit.



13. APPENDIX B - CORRECTION FACTORS

13.1 Correction factors for CABLE

from EMI receiver
to test antenna
at 3 meter range.

FREQUENCY (MHz)	CORRECTION FACTOR (dB)	FREQUENCY (MHz)	CORRECTION FACTOR (dB)
10.0	0.3	1200.0	7.3
20.0	0.6	1400.0	7.8
30.0	0.8	1600.0	8.4
40.0	0.9	1800.0	9.1
50.0	1.1	2000.0	9.9
60.0	1.2	2300.0	11.2
70.0	1.3	2600.0	12.2
80.0	1.4	2900.0	13.0
90.0	1.6		
100.0	1.7		
150.0	2.0		
200.0	2.3		
250.0	2.7		
300.0	3.1		
350.0	3.4		
400.0	3.7		
450.0	4.0		
500.0	4.3		
600.0	4.7		
700.0	5.3		
800.0	5.9		
900.0	6.3		
1000.0	6.7		

NOTES:

1. The cable type is RG-214.
2. The overall length of the cable is 27 meters.
3. The above data is located in file 27MO3MO.CBL on the disk marked "Radiated Emission Tests EMI Receiver".



13.2 Correction factors for CABLE

from EMI receiver
to test antenna
at 3 meter range.

FREQUENCY (GHz)	CORRECTION FACTOR (dB)
1.0	1.2
2.0	1.6
3.0	2.0
4.0	2.4
5.0	3.0
6.0	3.4
7.0	3.8
8.0	4.2
9.0	4.6
10.0	5.0
12.0	5.8

NOTES:

- 1. The cable type is RG-8.*
- 2. The overall length of the cable is 10 meters.*



13.3 Correction factors for LOG PERIODIC ANTENNA

Type LPD 2010/A at 3 and 10 meter ranges.

Distance of 3 meters

FREQUENCY (MHz)	AFE (dB/m)
200.0	9.1
250.0	10.2
300.0	12.5
400.0	15.4
500.0	16.1
600.0	19.2
700.0	19.4
800.0	19.9
900.0	21.2
1000.0	23.5

Distance of 10 meters

FREQUENCY (MHz)	AFE (dB/m)
200.0	9.0
250.0	10.1
300.0	11.8
400.0	15.3
500.0	15.6
600.0	18.7
700.0	19.1
800.0	20.2
900.0	21.1
1000.0	23.2

NOTES:

1. Antenna serial number is 1038.
2. The above lists are located in file number 38M30.ANT for a 3 meter range,
and file number 38M100.ANT for a 10 meter range.
3. The files mentioned above are located on the disk marked "Radiated Emission
Test EMI Receiver".



13.4 Correction factors for BICONICAL ANTENNA

**Type 3109,
at 3 meter range**

FREQUENCY (MHz)	AFE (dB/m)
30.0	13.3
40.0	12.7
50.0	11.0
60.0	9.2
70.0	10.0
80.0	7.2
90.0	7.9
100.0	9.4
120.0	11.9
140.0	13.1
160.0	12.3
180.0	12.4
200.0	14.8
250.0	15.3
300.0	17.9

NOTE:

1. Antenna serial number is 002-3244.



13.5 Correction factors for Double-Ridged Waveguide Horn

**Model: 3115, S/N 29845
at 3 meter range.**

FREQUENCY (GHz)	ANTENNA FACTOR (dB 1/m)	ANTENN A Gain (dBi)	FREQUENCY (GHz)	ANTENNA FACTOR (dB 1/m)	ANTENNA Gain (dBi)
1.0	24.8	5.4	10.0	38.8	11.4
1.5	26.1	7.6	10.5	38.9	11.8
2.0	28.6	7.7	11.0	39.0	12.1
2.5	29.8	8.4	11.5	39.6	11.8
3.0	31.4	8.4	12.0	39.8	12.0
3.5	32.4	8.7	12.5	39.6	12.5
4.0	33.7	8.6	13.0	40.0	12.5
4.5	33.4	9.9	13.5	39.8	13.0
5.0	34.5	9.7	14.0	40.2	13.0
5.5	35.1	9.9	14.5	40.6	12.9
6.0	35.4	10.4	15.0	41.3	12.4
6.5	35.6	10.8	15.5	39.5	14.6
7.0	36.2	10.9	16.0	38.8	15.5
7.5	37.3	10.4	16.5	40.0	14.6
8.0	37.7	10.6	17.0	41.4	13.4
8.5	38.3	10.5	17.5	44.8	10.3
9.0	38.5	10.8	18.0	47.2	8.1
9.5	38.7	11.1			



13.6 Correction factors for

**Horn Antenna
Model: SWH-28
at 1 meter range.**

FREQUENCY (GHz)	AFF (dB /m)	Gain (dB1)
18.0	40.3	16.1
19.0	40.3	16.3
20.0	40.3	16.1
21.0	40.3	16.3
22.0	40.4	16.8
23.0	40.5	16.4
24.0	40.5	16.6
25.0	40.5	16.7
26.0	40.6	16.4



13.7 Correction factors for ACTIVE LOOP ANTENNA

Model 6502

S/N 9506-2950

FREQUENCY (MHz)	Magnetic Antenna Factor (dB)	Electric Antenna Factor (dB)
.009	-35.1	16.4
.010	-35.7	15.8
.020	-38.5	13.0
.050	-39.6	11.9
.075	-39.8	11.8
.100	-40.0	11.6
.150	-40.0	11.5
.250	-40.0	11.6
.500	-40.0	11.5
.750	-40.1	11.5
1.000	-39.9	11.7
2.000	-39.5	12.0
3.000	-39.4	12.1
4.000	-39.7	11.9
5.000	-39.7	11.8
10.000	40.2	11.3
15.000	-40.7	10.8
20.000	-40.5	11.0
25.000	-41.3	10.2
30.000	42.3	9.2



14. Comparison Industry Canada Requirements With FCC

IC: 1467C-MCT340SMA

FCC ID: WP3MCT340SMA

Test	FCC	IC
<input type="checkbox"/> Max power / Peak power	15.247(b)(3)	RSS 210 Issue 8 A8.4(4)
<input type="checkbox"/> 6dB BW	15.247(a)2	RSS 210 Issue 8 A8.2(a)
<input type="checkbox"/> Power density	15.247(e)	RSS 210 Issue 8 A8.2(b)
<input type="checkbox"/> Spurious radiated emission in the restricted band	15.205(c)	RSS GEN Issue 3, 7.2.5 (Table 5)
<input type="checkbox"/> Band edge spectrum	15.247(d)	RSS 210 Issue 8 A8.5
<input type="checkbox"/> RF Exposure Limits	1.1310	RSS 102 4.4