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TEST REPORT #: 314274 A
LSR Job #: C-2308

Compliance Testing of:

AD Multi-tech 2

Test Date(s):

10/6/15 10/8/15
10/7/15 10/20/15

Prepared For:

Allegion
Attn: Ryan Kincaid
11819 N. Pennsylvania St.
Carmel, IN 46074

This Test Report is issued under the Authority of:
Michael Hintzke, EMC Engineer

Signature: Date: 12/2/15

Test Report Reviewed by:	Tested by:
Adam Alger, Quality Manager –Test Services	Michael Hintzke, EMC Engineer
Signature: Date: 11/24/15	Signature: Date: 12/2/15

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EXHIBIT 1: INTRODUCTION

1.1 Scope

References:	FCC Part 15, Subpart C, Section 15.225
Title:	Telecommunication – Code of Federal Regulations, CFR 47, Part 15

References:	FCC Part 15, Subpart C, Section 15.209
Title:	Telecommunication – Code of Federal Regulations, CFR 47, Part 15

References:	FCC Part 15, Subpart C, Section 15.109
Title:	Telecommunication – Code of Federal Regulations, CFR 47, Part 15

References:	RSS 210 Annex 2
Title:	Low-power License-exempt Radio communication Devices (All Frequency Bands): Category I equipment.

References:	RSS GEN
Title:	General requirements and Information for the Certification of Radio communication Equipment.

Test Procedures:	Radiated emissions measurements were conducted in accordance with American National Standards Institute ANSI C63.4 – American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz.

1.2 Normative References

Publication	Year	Title
47 CFR, Parts 0-15 (FCC)	2015	Code of Federal Regulations - Telecommunications
RSS 210 Annex 2	2010	Low-power License-exempt Radio communication Devices (All Frequency Bands): Category I equipment.
RSS GEN	2014	General requirements and information for the certification of Radio communication Equipment.
ANSI C63.4	2014	American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz.
ANSI C63.10	2013	Specification for radio disturbance and immunity measuring apparatus and methods. Part 1-1: Measuring Apparatus.

1.3 LS Research, LLC Test Facility

As an EMC Testing Laboratory, our Accreditation and Assessments are recognized through the following:

TESTING CERT #1255.01

A2LA – American Association for Laboratory Accreditation

Accreditation based on ISO/IEC 17025: 2005 with Electrical (EMC) Scope of Accreditation
A2LA Certificate Number: 1255.01

Federal Communications Commission (FCC) – USA

Listing of 3 Meter Semi-Anechoic Chamber based on Title 47 CFR – Part 2.948
FCC Registration Number: 90756

Industrie Canada Industry Canada

Canada

Industry Canada

On file, 3 Meter Semi-Anechoic Chamber based on RSS-212 – Issue 1
File Number: IC 3088-A
On file, 3 and 10 Meter OATS based on RSS-212 – Issue 1
File Number: IC 3088

U. S. Conformity Assessment Body (CAB) Validation

Validated by the European Commission as a U. S. Competent Body operating under the U. S./EU, Mutual Recognition Agreement (MRA) operating under the European Union Electromagnetic Compatibility –Council Directive 2004/108/EC (formerly 89/336/EEC, Article 10.2).
Date of Validation: January 16, 2001

Validated by the European Commission as a U.S. Notified Body operating under the U.S. /EU, Mutual Recognition Agreement (MRA) operating under the European Union Telecommunication Equipment – Council Directive 99/5/EC, Annex V.
Date of Validation: November 20, 2002
Notified Body Identification Number: 1243

1.4 Test Equipment Utilized

A list of the test equipment and antennas utilized for the Radiated Emissions test can be found in Appendix A. This list includes calibration information and equipment descriptions. All equipment is calibrated and used according to the operation manuals supplied by the manufacturers. All calibrations of the antennas used were performed at a calibration laboratory accredited to the requirements of ISO 17025, and are traceable to the SI Standard. In addition, the Connecting Cables were measured for losses using a calibrated Signal Generator and EMI Receiver. The resulting correction factors and the cable loss factors from these calibrations were entered into the EMI Receiver database. As a result, the data taken from the EMI Receiver accounts for the antenna correction factor as well as cable loss or other corrections, and can therefore be entered into the database as a corrected meter reading. The EMI Receiver was operated with a resolution bandwidth of 120 kHz for measurements below 1 GHz (video bandwidth of 300 kHz), and a bandwidth of 1 MHz for measurements above 1 GHz (video bandwidth of 1 MHz).

EXHIBIT 2: PERFORMANCE ASSESSMENT

2.1 Client Information

Manufacturer Name:	Allegion
Address:	11819 North Pennsylvania Street Carmel, IN 46032
Contact Person:	Ryan Kincaid
Contact Phone:	(317) 810-3362
Contact Email:	ryan.kincaid@allegion.com

2.2 Equipment Under Test (EUT) Information

The following information has been supplied by the applicant.

Product Name:	AD Multi-tech 2
Model Number:	24670119
Serial Number:	Engineering Sample

2.3 Associated Antenna Description

PCB Loop Trace (3.4 x 2.2 inch)

2.4 EUT'S Technical Specifications

Frequency Range (in MHz)	13.56 MHz
RF Power in Watts (Near-field measurement at 3 meters)	0.0414 Watts
Conducted Output Power (in dBm)	N/A
EIRP (in mW)	N/A
Field Strength at 3 meters	81.4 dBµV/m
Occupied Bandwidth (99% BW)	314.83 kHz
Type of Modulation	Un-modulated when scanning. AM when reading
Emission Designator	315KA1D
Transmitter Spurious (worst case) at 3 meters	37.24 dBµV/m at 224.1 MHz
Receiver Spurious (worst case) at 3 meters	Refer to transmitter since EUT transmit and receives at the same time.
Frequency Tolerance %, Hz, ppm	Better than 100 ppm
Microprocessor Model # (if applicable)	NXP RC663
EUT will be operated under FCC/IC Rule	CFR 47 part 15.225 RSS 210
Antenna Information:	
a) Antenna Type	trace/loop
b) Detachable/Non-Detachable	Non-detachable
c) Antenna Gain (in dBi)	Not available
Modular Filing	☐ Yes ☒ No
Portable or Mobile?	Portable

2.5 Product Description

The Multitech reader is one of Allegion's ACP (Access Control Point) that can be paired with any of Allegion's accces point modules. The Multitech ACP in this case is paired with a WPR which provides a wireless link with access point modules. The WPR implements a modular RF transceiver operating in the 902 to 928 MHz ISM band. Information contained in the user credential is read by the Multitech reader via either 125 kHz (PROX) or 13.56 MHz (SmartCard) signal and relayed by the WPR to access point modules which control lock functions and maintains audit trails of the credential used. The Multitech gets its power from the WPR which runs on a rechargeable battery. The WPR can only supply power to the Multitech reader when it is switched to the battery operated mode and not while it is in the charging mode.

EXHIBIT 3: EUT OPERATING CONDITIONS & CONFIGURATIONS

3.1 Climate Test Conditions

Temperature:	71° Fahrenheit
Humidity:	30%
Pressure:	741 mmHg

3.2 Applicability & Summary Of EMC Emission Test Results

FCC/IC Paragraph	Test Requirements	Compliance (yes/no)
FCC: 15.225(a) IC : RSS 210 A2.6(a)	Maximum RF Output Power	Yes
FCC: 15.225(b)(c)(d) FCC: 15.209(c) IC : RSS 210 A2.6(b)(c)(d)	Maximum RF Spurious Emissions	Yes
FCC: 15.109 FCC: 15.205 IC : RSS 210 2.5	Transmitter General Radiated Emissions	Yes
FCC: 2.1049 IC: RSS GEN 4.6	Occupied Bandwidth	Yes
FCC: 15.109(a) IC : RSS 210 2.5	Un-Intentional Radiated Emissions	Yes
FCC 15.225(e)	Frequency Tolerance	Yes

3.3 Modifications Incorporated In The EUT For Compliance Purposes

☒ None ☐ Yes (explain below)

3.4 Deviations & Exclusions From Test Specifications

☒ None ☐ Yes (explain below)

EXHIBIT 4: DECLARATION OF CONFORMITY

The EUT was found to MEET the requirements as described within the specification of FCC Title 47, CFR Part 15.225 and Industry Canada RSS-210 for a Low-Power License-Exempt Transmitter, as well as the specification of FCC Title 47, CFR Part 15.209, Part 15.107 and Industry Canada RSS-GEN for non-intentional radiators.

If some emissions are seen to be within 3 dB of their respective limits:
As these levels are within the tolerances of the test equipment and site employed, there is a possibility that this unit, or a similar unit selected out of production may not meet the required limit specification if tested by another agency.

LS Research, LLC certifies that the data contained herein was taken under conditions that meet or exceed the requirements of the test specifications. The results in this Test Report apply only to the item(s) tested on the above-specified dates. Any modifications made to the EUT subsequent to the indicated test date(s) will invalidate the data herein, and void this certification.

EXHIBIT 5: RADIATED EMISSIONS TEST

5.1 Test Setup

The test setup was assembled in accordance with Title 47, CFR FCC Part 15, RSS GEN, and ANSI C63.4. The AD Multi-tech 2 device, henceforth referred to as the EUT, was placed on an 80cm high non-conductive pedestal, centered on a flush mounted 2-meter diameter turntable inside a 3 meter Semi-Anechoic, FCC listed Chamber.

The EUT operates on a single channel at 13.56 MHz.

For the test, the EUT was in normal configuration where it continuously looks for a badge. Measurements were performed at a 3m separation to identify the emissions below 30MHz.

5.2 Test Procedure

Radiated RF measurements were performed at a separation distance of 3 meters on the EUT in a Semi-Anechoic, FCC listed Chamber. The frequency range from 10 kHz to 1000 MHz was scanned and investigated. The radiated RF emission levels were manually noted at the various fixed degree settings of azimuth on the turntable and antenna height. A Biconical Antenna was used to measure emissions from 30 MHz to 200 MHz and a Log Periodic Dipole Array Antenna was used to measure emissions from 200 MHz to 1000 MHz. For emissions below 30 MHz, an active loop antenna was used. The loop antenna was set at a height of 1m above the conducting ground plane and it was rotated about its vertical and horizontal axes (while utilizing the turntable to rotate the EUT) in order to measure the maximum radiated RF emissions. The maximum radiated RF emissions above 30MHz were found by raising and lowering the antenna between 1 and 4 meters in height, using both horizontal and vertical antenna polarities and rotating the EUT using the turntable.

The receiver was operated with the resolution bandwidth set at 200 Hz for measurements between 9 kHz and 150 kHz, 9 kHz for measurements between 150 kHz and 30 MHz and 120 kHz for measurements between 30 MHz and 1000 MHz.

Due to the nature of the device, while in normal operation, the emissions of the transmitter and receiver can be measured simultaneously. The graphs and data represented in this report are that of both TRANSMIT and RECEIVE modes.

5.3 Test Equipment Utilized

A list of the test equipment and antennas utilized for the Radiated Emissions test can be found in Appendix A. This list includes calibration information and equipment descriptions. All equipment is calibrated and used according to the operation manuals supplied by the manufacturers. All calibrations of the antennas used were performed at an IEC/ISO 17025 accredited calibration laboratory, traceable to the SI standard. In addition, the Connecting Cables were measured for losses using a calibrated EMI Receiver. The resulting correction factors and the cable loss factors from these calibrations were entered into the EMI Receiver database. As a result, the data taken from the EMI Receiver accounts for the antenna correction factor as well as cable loss or other corrections, and can therefore be entered into the database as a corrected meter reading. The EMI Receiver was operated with resolution bandwidths as prescribed in ANSI C63.4.

5.4 Test Results

The EUT was found to **MEET** the Radiated Emissions requirements of FCC Part 15.225 and RSS 210 for a Low-Power License-Exempt transmitter.

The EUT was found to **MEET** the Radiated Emissions requirements of FCC Part 15.109 and RSS Gen for Unintentional Radiators.

5.5 Calculation of Radiated Emissions Limits

Transmitter Limits

The field strength of an intentional radiator within the band 13.553-13-567 MHz, as specified in FCC Part 15.225, shall not exceed 15,848 microvolts/meter at 30 meters. This limit is calculated the in formula below.

$$20\log(15{,}848) = 84\ dB\mu V/m$$

The field strength within the bands 13.410-13.553 MHz and 13.567-13.710 MHz shall not exceed 334 microvolts/meter at 30 meters. The limit is calculated in the formula below.

$$20\log(334) = 50.5\ dB\mu V/m$$

The field strength within the bands 13.110-13.410 MHz and 13.710-14.010 MHz shall not exceed 106 microvolts/meter at 30 meters. The limit is calculated in the formula below.

$$20\log(106) = 40.5\ dB\mu V/m$$

The above limits for emissions measured at a 3 meter separation were extrapolated to the limit distance per ANSI C63.10-2013 using the following equations:

$$FS_{limit} = FS_{max} - 40\log\frac{d_{near\ field}}{d_{measure}} - 20\log\frac{d_{limit}}{d_{near\ field}}$$

Where,

$$d_{near\ field} = \frac{47.77}{f_{MHz}}$$

Any emissions outside of the 13.110-14.010 MHz band shall not exceed the limits as specified in FCC Part 15.209. The following table depicts these limits.

Frequency (MHz)	Limit (μV/m)	Measurement Distance (m)
0.009-0.490	2400/F (kHz)	300
0.490-1.705	24000/F (kHz)	30
1.705-30.0	30	30
30-88	100	3
88-216	150	3
216-960	200	3
Above 960	500	3

5.6 Radiated Emissions Test Data Chart

3 Meter Measurements of Electromagnetic Radiated Emissions
Frequency Range Inspected: 9 kHz to 1000 MHz

Manufacturer:	Allegion						
Date(s) of Test:	10/6/15						
Project Engineer:	Michael Hintzke						
Test Engineer(s):	Michael Hintzke						
Voltage:	6VDC (4-AA batteries)						
Operation Mode:	Simultaneous transmit and receive						
Environmental Conditions in the Lab:	Temperature: 20 – 25˚C Relative Humidity: 30 – 60 %						
EUT Power:		Single Phase 120VAC		3 Phase ___VAC			
	√	Battery		Other:			
EUT Placement:	√	80cm non-conductive table		10cm Spacers			
EUT Test Location:		5 Meter Semi-Anechoic FCC Listed Chamber	√	3 Meter Semi-Anechoic FCC Listed Chamber			
Measurements:		Pre-Compliance		Preliminary	√	Final	
Detectors Used:	√	Peak	√	Quasi-Peak	√	Average	

13.553-13.567 MHz Data

Frequency (MHz)	Antenna Polarity	EUT	EUT Orientation	Height (m)	Azimuth (degrees)	QP @ 3 m (dBµV/m)	QP @ 30 m (dBµV/m)	QP limit @ 30 m (dBµV/m)	Margin (dB)
13.56	H	WPR	V	1.00	0	80.5	59.1	84.0	24.9
13.56	H	WPR	S	1.00	0	81.4	60.0	84.0	24.0
13.56	H	WPR	F	1.00	0	70.0	48.6	84.0	35.4
13.56	V	WPR	F	1.00	0	69.9	48.5	84.0	35.4
13.56	V	WPR	S	1.00	0	70.9	49.5	84.0	34.5
13.56	V	WPR	V	1.00	0	68.8	47.4	84.0	36.6

Frequency MHz	Antenna Polarity	EUT	EUT Orientation	Height (m)	Azimuth (0° - 360°)	QP @ 3m (dBuV/m)	QP @ 30m (dBuV/m)	QP limit @ 30 m (dBuV/m)	Margin (dB)
13.56	H	AD200	V	1.00	0	75.2	53.8	84.0	30.2
13.56	V	AD200	V	1.00	0	64.0	42.6	84.0	41.4
13.56	H	AD 300	V	1.00	0	74.8	53.4	84.0	30.6
13.56	V	AD 300	V	1.00	0	62.9	41.5	84.0	42.5
13.56	H	AD 400	V	1.00	0	75.3	53.9	84.0	30.1
13.56	V	AD 400	V	1.00	0	62.0	40.6	84.0	43.5

Note: The emissions in the tables above were measured at 3 meters, but were extrapolated to 30 meters as specified in C63.10-2013.

Note: The emissions were performed with the EUT installed in the WPR, AD 200, AD 300 and AD 400. The emissions mwasured with the WPR were found to be the worst case.

13.410-13.553 MHz & 13.567-13.710 MHz Data

Frequency (MHz)	Antenna Polarity	EUT	EUT Orientation	Height (m)	Azimuth (degrees)	QP @ 3 m (dBµV/m)	QP @ 30 m (dBµV/m)	QP limit @ 30 m (dBµV/m)	Margin (dB)
13.55	H	WPR	V	1.00	0	56.3	34.8	50.5	15.6
13.57	H	WPR	V	1.00	0	60.9	39.5	50.5	11.0

Note: The emission in the tables above were measured at 3 meters, but were extrapolated to 30 meters as specified in C63.10-2013.

13.110-13.410 MHz & 13.710-14.010 MHz Data

Frequency (MHz)	Antenna Polarity	EUT	EUT Orientation	Height (m)	Azimuth (degrees)	QP @ 3 m (dBµV/m)	QP @ 30 m (dBµV/m)	QP limit @ 30 m (dBµV/m)	Margin (dB)
13.35	H	WPR	V	1.00	0	31.6	10.0	40.5	30.5
13.77	H	WPR	V	1.00	0	35.0	13.7	40.5	26.8

Note: The emissions above were measured at 3 meters, but were extrapolated to 30 meters as specified in C63.10-2013.

Outside the 13.110-14.010 MHz Band Data

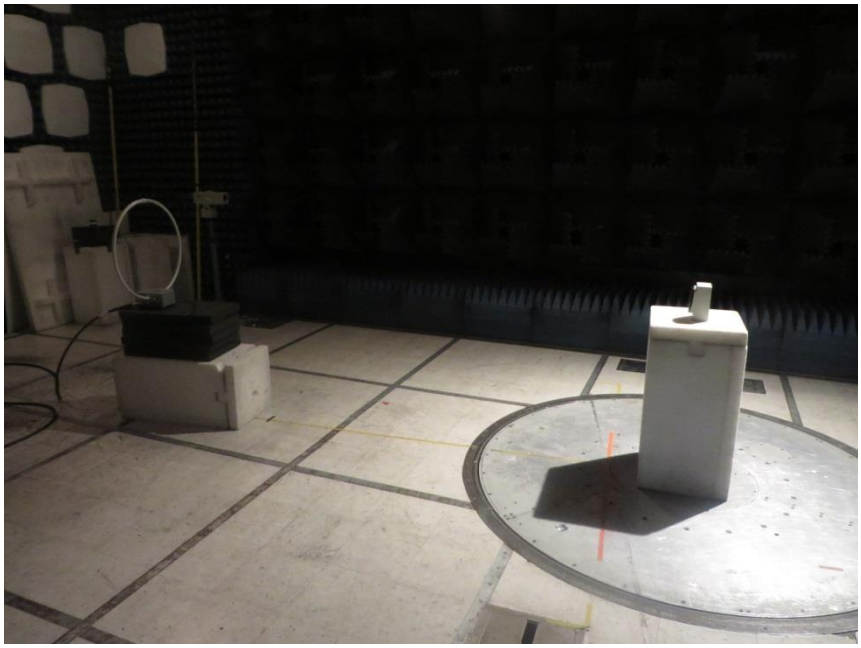
Frequency (MHz)	Antenna Polarity	EUT	EUT Orientation	Height (m)	Azimuth (degrees)	QP @ 3 m (dBµV/m)	QP @ 300 m (dBµV/m)	QP limit @ 300 m (dBµV/m)	Margin (dB)
0.155	H	WPR	V	1.00	0	54.7	-25.6	23.8	49.4
0.125	H	WPR	V	1.00	0	60.6	-21.5	23.8	45.3

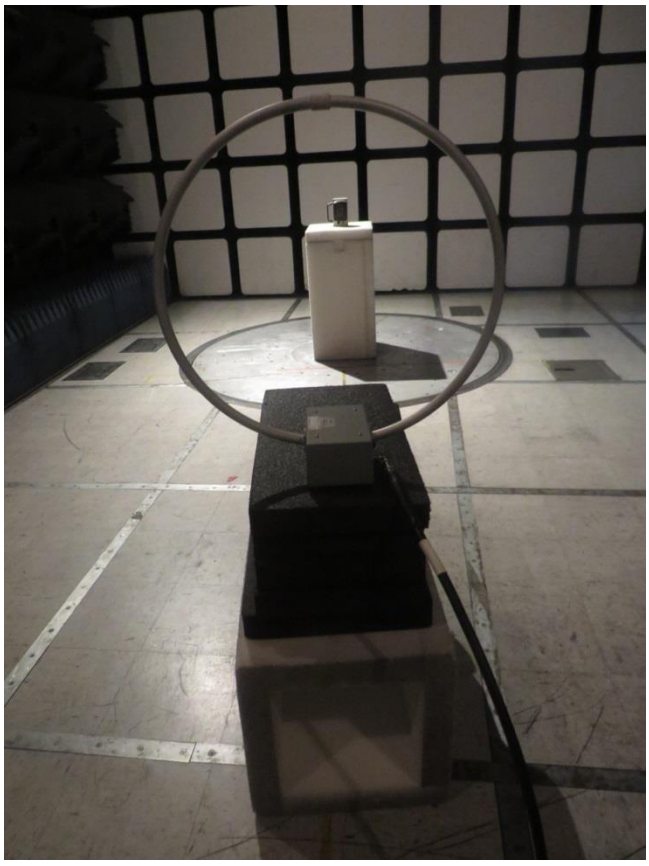
Note: The emissions above were measured at 3 meters, but were extrapolated to 300 meters as specified in C63.10-2013.

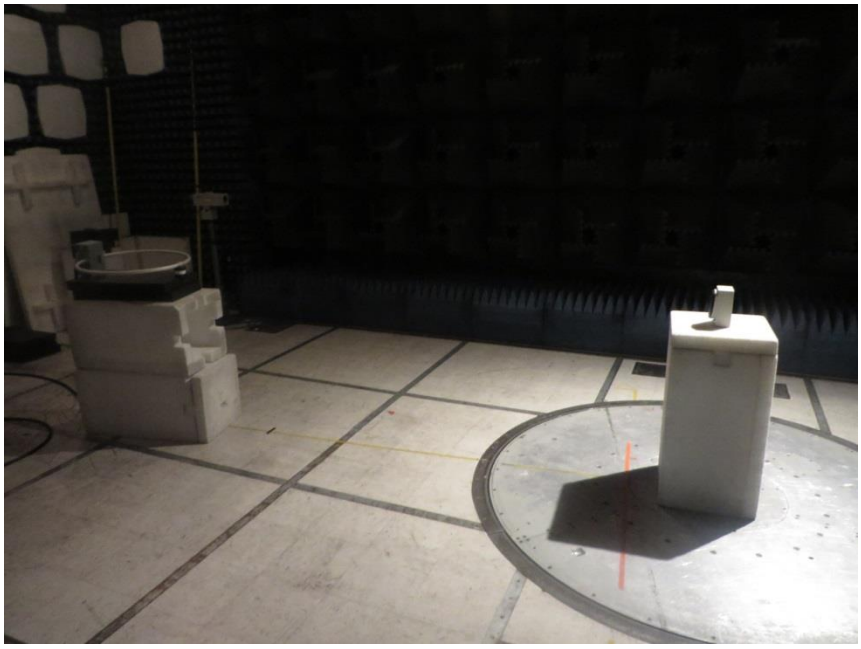
30-1000 MHz Data

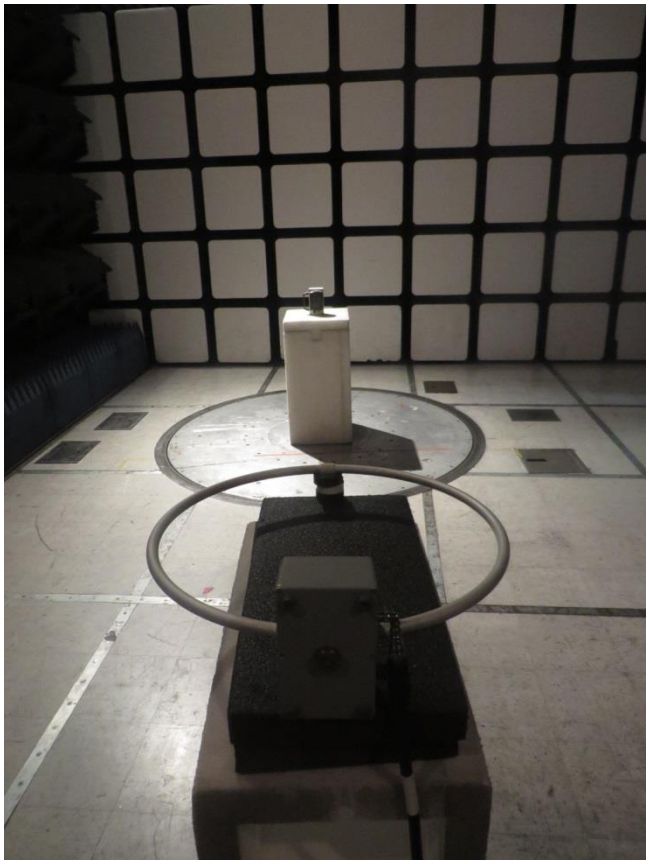
Frequency (MHz)	Height (m)	Azimuth (degree)	Quasi Peak Reading (dBµV/m)	Quasi Peak Limit (dBµV/m)	Margin (dB)	Antenna Polarity	EUT orientation
135.7	1.59	0	21.97	43.5	21.5	H	V
122.0	1.49	0	18.23	43.5	25.3	H	V
40.7	1.00	109	25.83	40.0	14.2	V	V
135.6	1.00	348	23.14	43.5	20.4	V	V
275.8	1.83	242	23	46.0	23.0	V	V
315.4	1.69	218	23.62	46.0	22.4	V	V
224.1	1.51	271	37.24	46.0	8.8	H	V
223.1	1.55	169	28.75	46.0	17.3	V	V
224.1	1.59	180	28.2	46.0	17.8	V	S
224.1	1.38	290	37.13	46.0	8.9	H	S
225.0	1.00	289	24.26	46.0	21.7	H	F
224.1	1.00	284	33.71	46.0	12.3	V	F

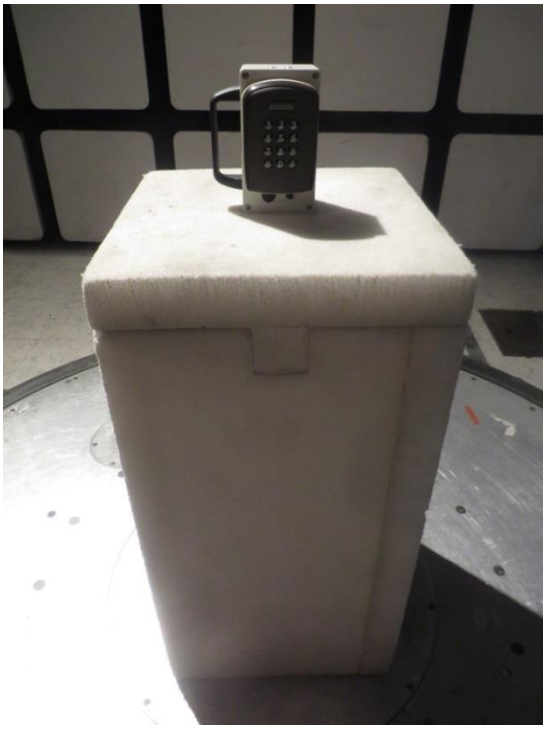
5.7 Test Setup Photo(s) – Radiated Emissions Test





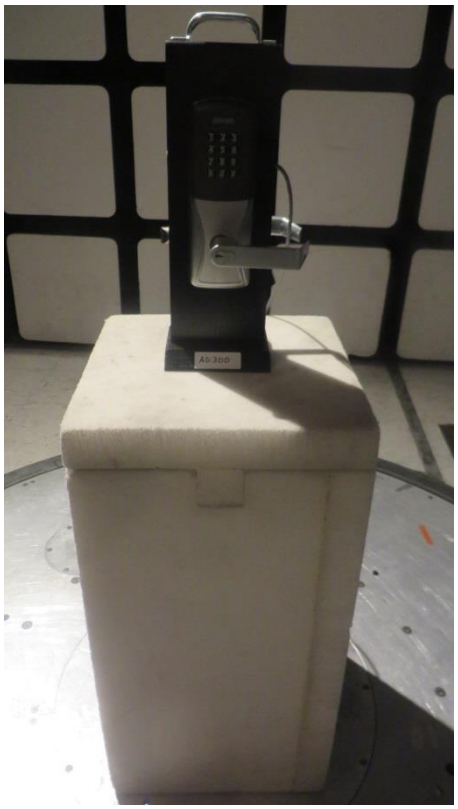




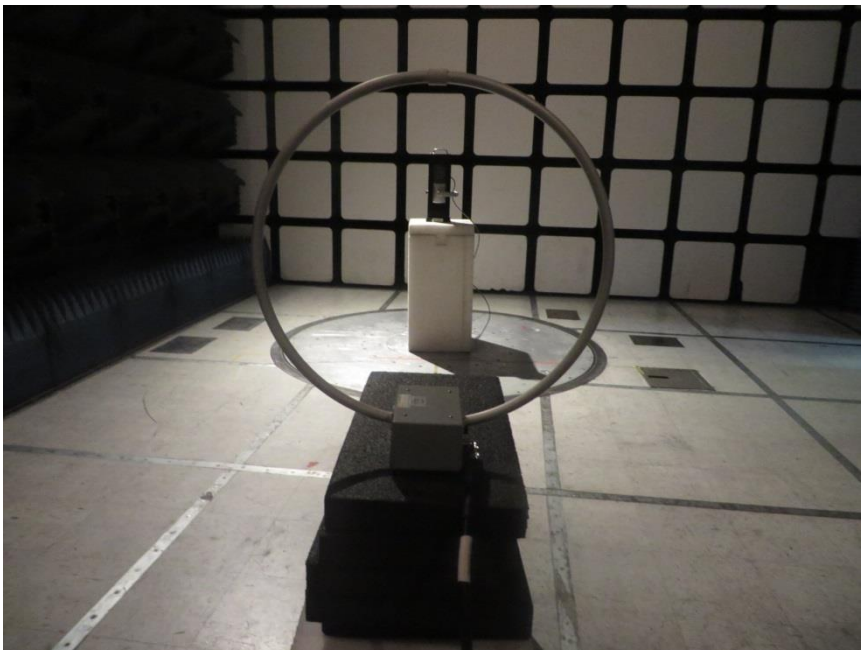


The photos above show the EUT attached to the WPR

EUT attached to AD 400



EUT attached to AD 300



EUT attached to AD 200

5.8 Screen Captures - Radiated Emissions Test

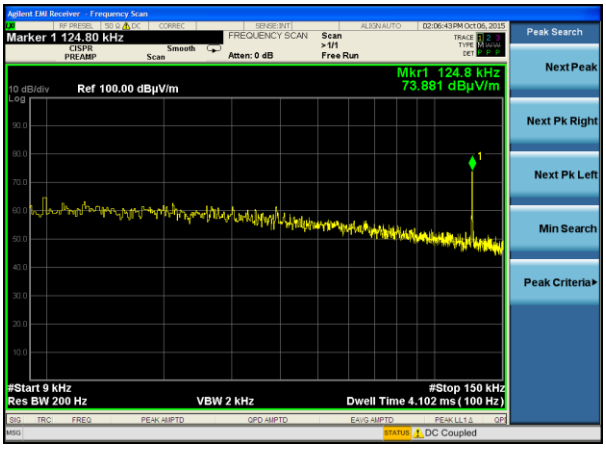
These screen captures represent Peak Emissions. For radiated emission measurements, a Quasi-Peak or Average detector function is utilized when measuring frequencies below 1 GHz.

The signature scans shown here are from worst-case emissions with the sense antenna in either vertical or horizontal polarity for worst case presentations.

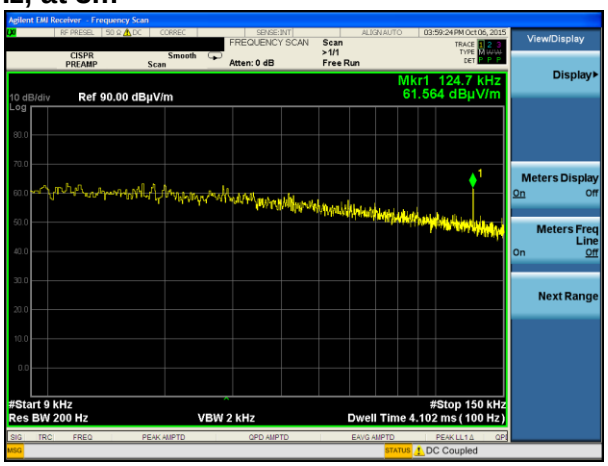
The scans shown below represent the EUT operating simultaneously in both transmit and receive modes.

EUT with WPR

9 kHz to 150 kHz, at 3m

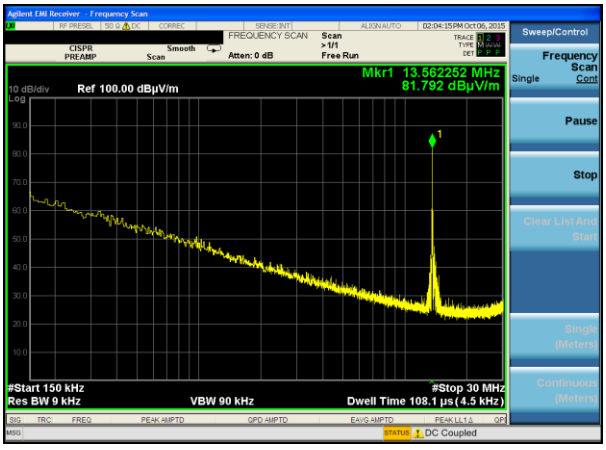


Horizontal Polarity



Vertical Polarity

150 kHz to 30 MHz, at 3m



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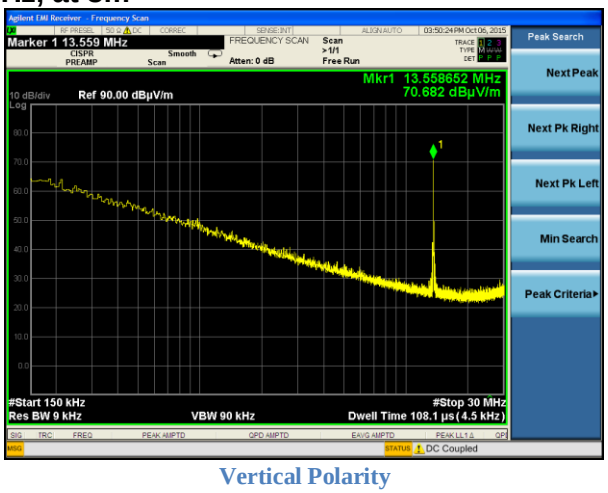
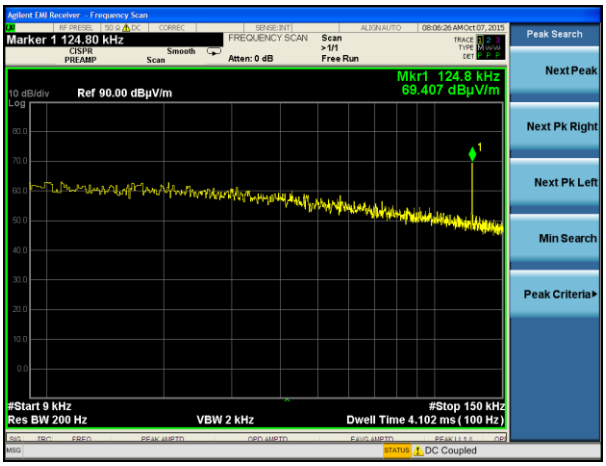


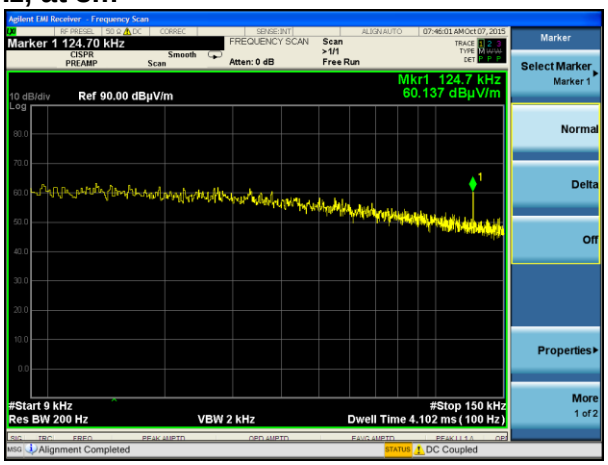
Vertical Polarity

EUT with AD 400

9 kHz to 150 kHz, at 3m

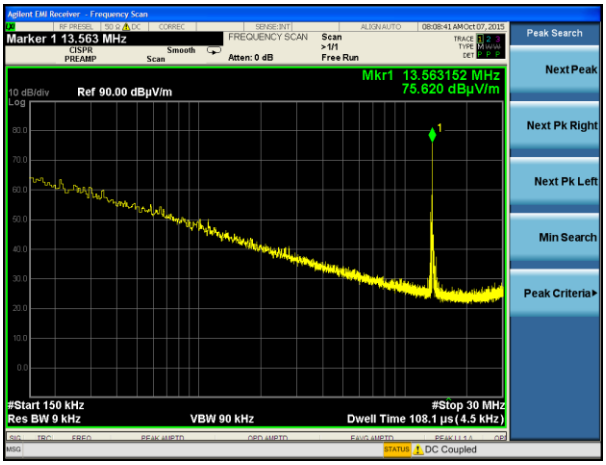


Horizontal Polarity

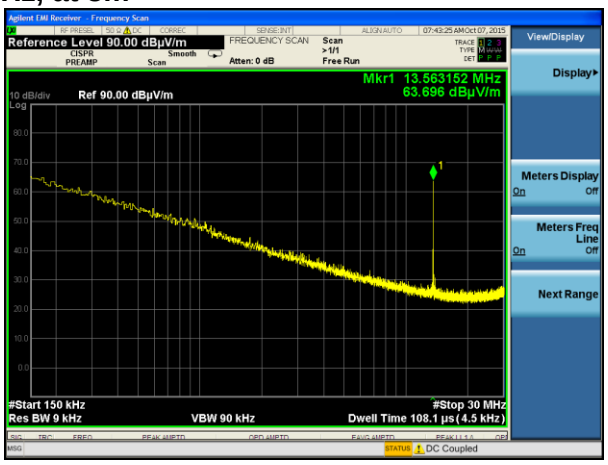


Vertical Polarity

150 kHz to 30 MHz, at 3m



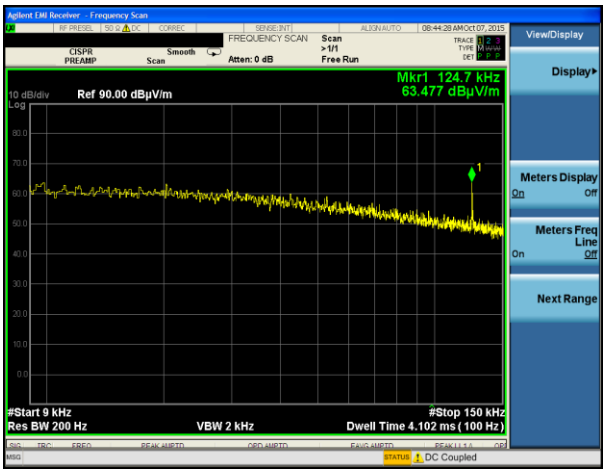
Horizontal Polarity



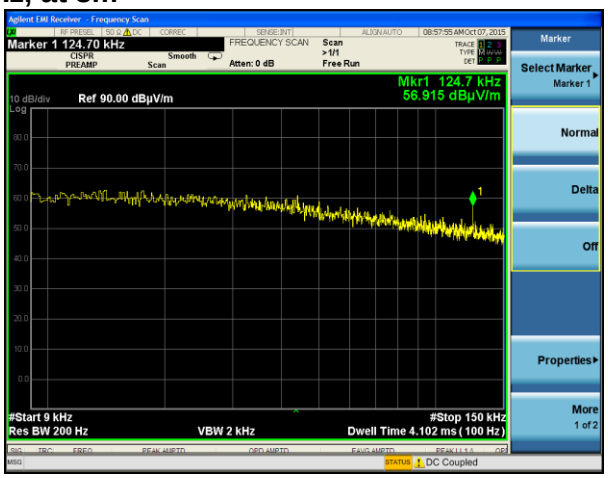
Vertical Polarity

EUT w/AD 300

9 kHz to 150 kHz, at 3m

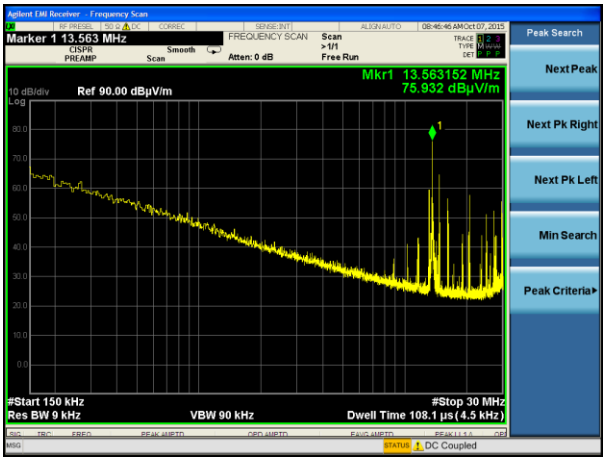


Horizontal Polarity

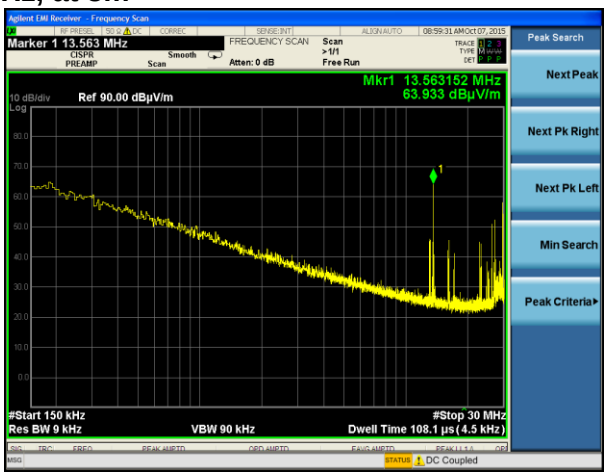


Vertical Polarity

150 kHz to 30 MHz, at 3m



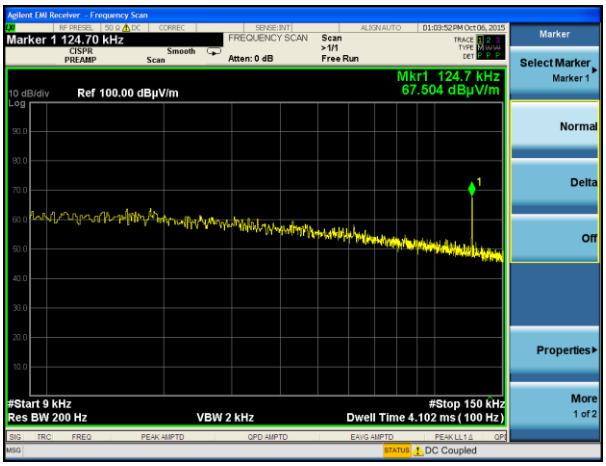
Horizontal Polarity



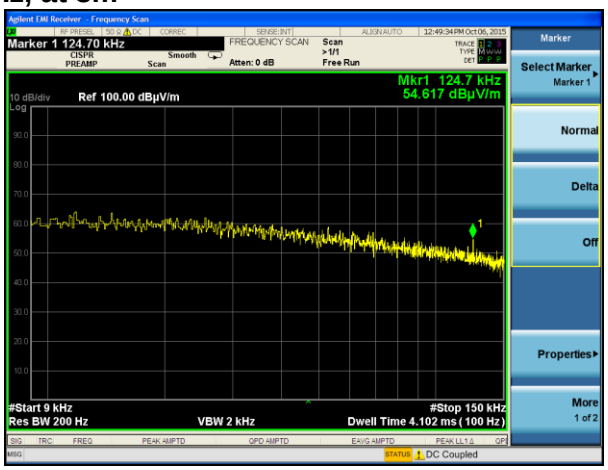
Vertical Polarity

EUT w/AD 200

9 kHz to 150 kHz, at 3m

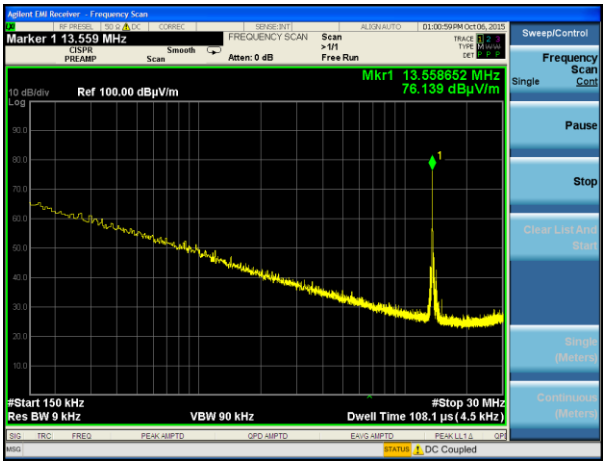


Horizontal Polarity

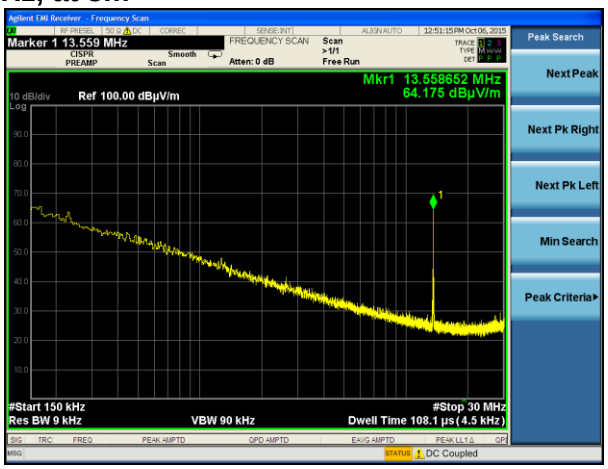


Vertical Polarity

150 kHz to 30 MHz, at 3m



Horizontal Polarity



Vertical Polarity

EUT w/WPR

13.110 MHz to 14.010 MHz, at 3m

Horizontal Polarity

13.110 MHz to 13.410 MHz & 13.710 MHz to 14.010 MHz, at 3m

Horizontal Polarity

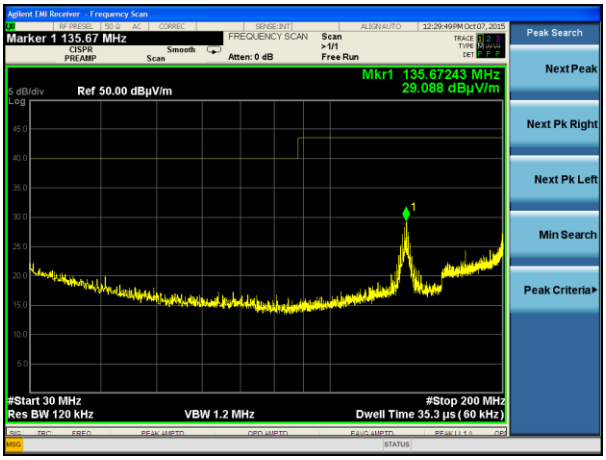
Horizontal Polarity

13.410 MHz to 13.553 MHz & 13.567 MHz to 13.710 MHz, at 3m

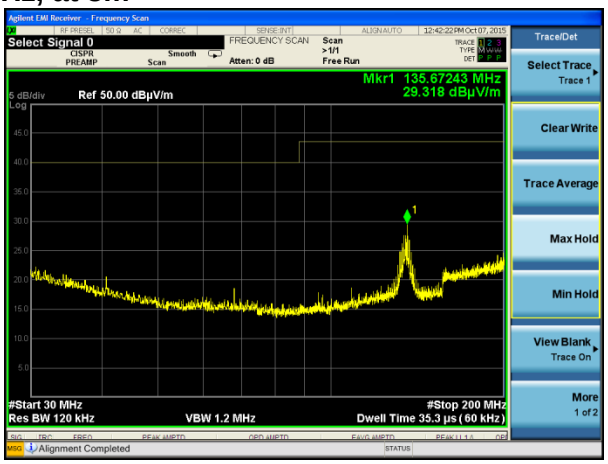
Horizontal Polarity

Horizontal Polarity

30MHz to 200 MHz, at 3m

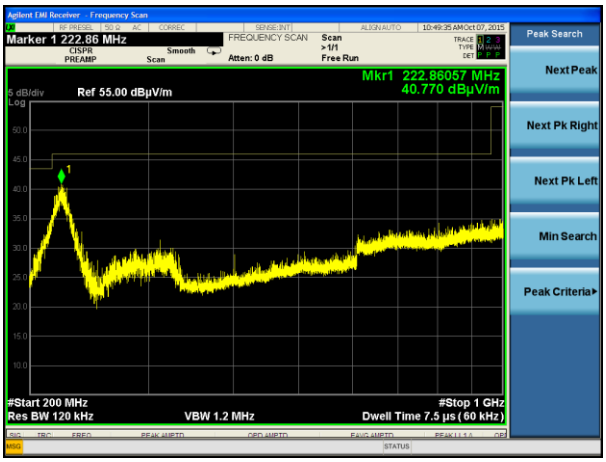


Horizontal Polarity

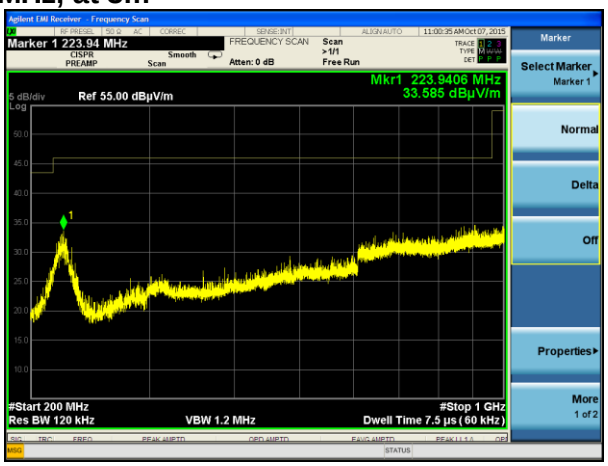


Vertical Polarity

200 MHz to 1000 MHz, at 3m



Horizontal Polarity



Vertical Polarity

EXHIBIT 6: Frequency Tolerance

6.1 Limits

The frequency tolerance of the carrier signal shall be maintained within ±0.01% of the operating frequency over a temperature variation of -20 degrees to +50 degrees C at normal supply voltage and for a variation in normal supply voltage from 85% to 115%.

6.2 Method of Measurements

The EUT was placed in a portable temperature chamber. The carrier emission was measured at normal supply voltage with new batteries over a temperature variation of -20 degrees to +50 degrees C with a spectrum analyzer with resolution bandwidth = video bandwidth = 1 kHz using the peak search function.

The EUT was placed in a portable temperature chamber. The carrier emission was measured at ±15% of the primary supply voltage. This measurement was performed at both room temperature and over a temperature variation of -20 degrees to +50 degrees C.

6.3 Test Data

Carrier Frequency = 13.56 MHz

Supply Voltage (VDC)	Frequency (MHz)			Deviation (%)		
	-20°C	+20°C	+50°C	-20°C	+20°C	+50°C
20.4	-	13.560778500	-	-	-0.000004	-
24.0	13.560792500	13.560778000	13.560792000	-0.000107	-	-0.000103
27.6	-	13.560777000	-	-	0.000007	-

EXHIBIT 7: Occupied Bandwidth

7.1 Limits

There is no limit. Measurement of the 99% bandwidth is required by Industry Canada per RSS GEN.

7.2 Method of Measurements

The transmitter output was placed in normal operation mode. The bandwidth of the fundamental frequency was measured via radiated measurement using the Spectrum Analyzer bandwidth measurement function.

7.3 Test Data

Center Frequency (MHz)	Measured 99%. BW (kHz)
13.56	314.83

7.4 Screen Capture - 99% BANDWIDTH

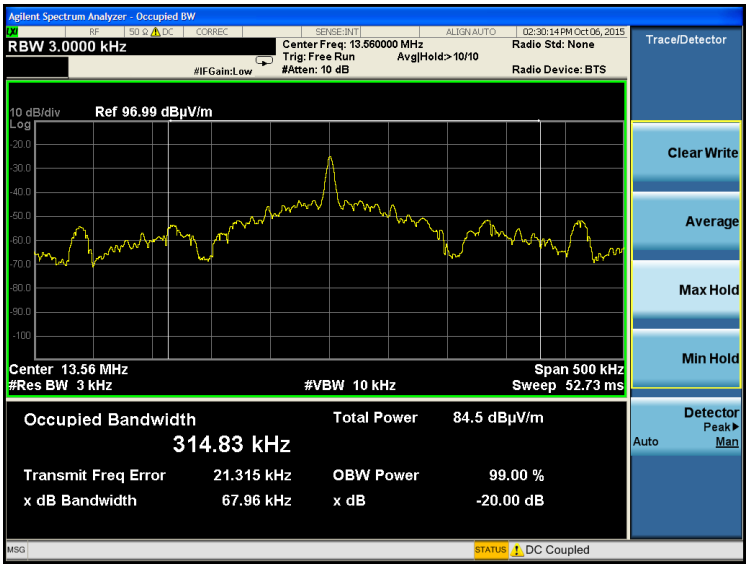


EXHIBIT 8: Conducted AC Emissions

8.1 Test Setup

The EUT was placed on a non-conductive table, with a height of 80 cm above the reference ground plane. The EUT was plugged into a Line Impedance Stabilization Network (LISN). The AC power source to the LISN was connected through an appropriate broadband EMI Filter. The test area and setup are in accordance with ANSI C63.4 per the requirements of CFR Part 15.207.

The EUT was installed in the AD 200 for the conducted AC emissions test. The AD 200 is hard-wired for DC power input. The AD 200 was powered with a generic power supply.

Note: Test was performed with the following AC/DC power supply:

Manufacturer	Cobra
Model Number	CA 45C
Input	120VAC 60Hz
Output	16 VDC

Note: The WPR, AD 300 and AD 400 are strictly battery powered, therefore, are this test is not applicable on those configurations

8.2 Test Procedure

After the EUT was setup and connected to the LISN, the RF Sampling Port of the LISN was connected the EMI Receiver with an internal 10 dB limiter enabled at the measurement port. The LISN used has the ability to terminate the unused port with a 50Ω load when switched to either L1 (line) or L2 (neutral). The bandwidth used for these measurements is 9 kHz for Quasi-Peak and Average Detectors in the frequency range of 150 kHz to 30 MHz. Final readings were then measured and recorded.

8.3 Test Equipment Utilized

A complete list of test equipment can be found in Appendix A. Correction factors and cable loss factors were entered into the EMI Receiver database. As a result, the data taken from the EMI Receiver accounts for the antenna correction factor as well as cable loss or other corrections, and can therefore be entered into the database as a corrected meter reading.

8.4 Test Results

The EUT was found to MEET the Conducted Emissions requirements of CFR Part 15.207. The frequencies with significant signals were recorded and plotted as shown in the Data Charts and Graphs.

8.5 Calculation of Conducted Emissions Limits

The following table indicates the conducted emission limits for tests performed on the low voltage AC mains port.

Frequency range MHz	Limits dB(μV)	
	Quasi-peak	Average
0,15 to 0,50	66 to 56	56 to 46
0,50 to 5	56	46
5 to 30	60	50
NOTE 1 The lower limit shall apply at the transition frequencies. NOTE 2 The limit decreases linearly with the logarithm of the frequency in the range 0,15 MHz to 0,50 MHz.		

8.6 Conducted Emissions Data Chart

Frequency Range Inspected: 150 kHz to 30 MHz

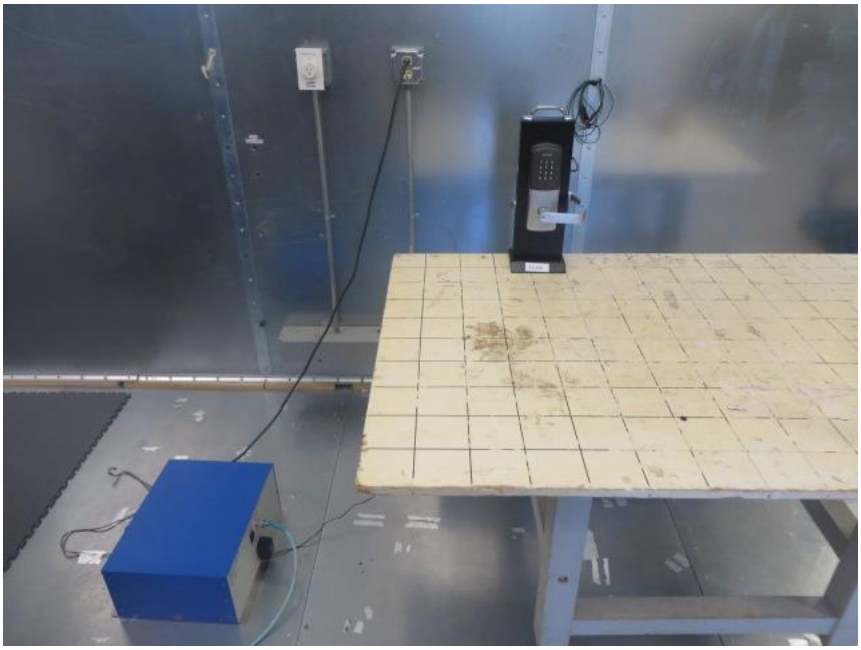
Manufacturer:	Allegion						
Date(s) of Test:	10/20/15						
Project Engineer:	Michael Hintzke						
Test Engineer(s):	Michael Hintzke						
Voltage:	16VDC						
Operation Mode:	Simultaneous transmit and receive						
Environmental Conditions in the Lab:	Temperature: 20 – 25˚C Relative Humidity: 30 – 60 %						
EUT Power:		Single Phase 120VAC		3 Phase ___VAC			
		Battery	√	Other: AC/DC supply			
EUT Placement:	√	80cm non-conductive table		10cm Spacers			
EUT Test Location:	√	Conducted Test Area					
Measurements:		Pre-Compliance		Preliminary	√	Final	
Detectors Used:		Peak	√	Quasi-Peak	√	Average	

Line	Frequency (MHz)	Q-Peak Reading (dBµV)	Q-Peak Limit (dBµV)	Quasi-Peak Margin (dB)	Average Reading (dBµV)	Average Limit (dBµV)	Average Margin (dB)
1	0.155	42.8	65.7	22.9	32.3	55.7	23.4
1	0.164	41.8	65.3	23.5	32.0	55.3	23.3
1	0.209	40.5	63.2	22.7	30.0	53.2	23.2
1	13.561	44.8	60.0	15.2	39.3	50.0	10.7
2	0.173	38.9	64.8	25.9	21.3	54.8	33.5
2	0.218	40.0	62.9	22.9	20.2	52.9	32.7
2	0.273	36.7	61.0	24.3	22.7	51.0	28.3
2	13.561	44.6	60.0	15.4	39.0	50.0	11.0

EUT with AD 200

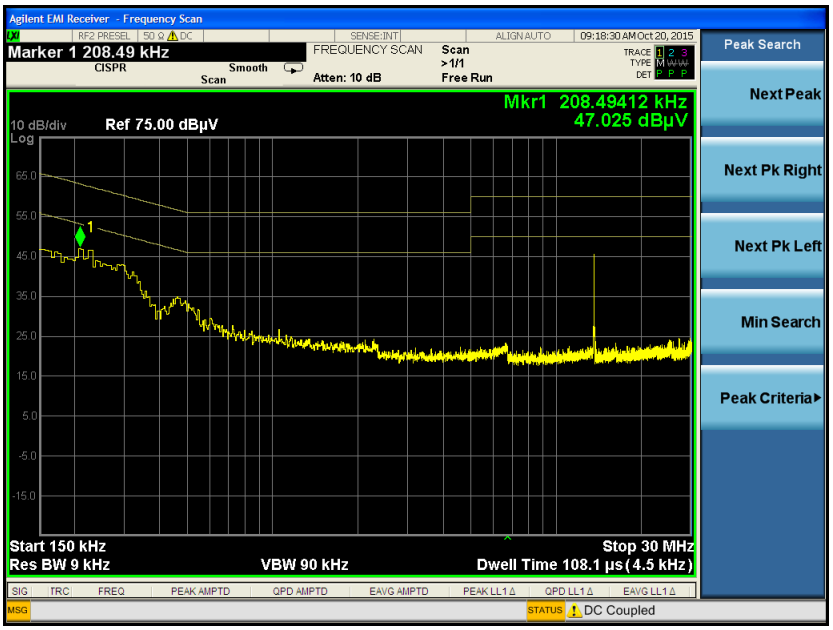
8.7 Test Setup Photo(s) – Conducted Emissions Test

EUT with AD 200



8.8 Screen Captures - Conducted Emissions Test

150 kHz to 30 MHz



Line 1

Line 2

Appendix A: Instrument List

LS RESEARCH LLC
Wireless Product Development
Equipment Calibration

Date : 7-Oct-2015 Type Test : Radiated Emissions Job # : C-2308

Prepared By: Mike Hintzke Customer : Allegion Quote #: 314274

No.	Asset #	Description	Manufacturer	Model #	Serial #	Cal Date	Cal Due Date	Equipment Status
1	EE 960085	N9038A MXE 26.5GHz Receiver	Agilent	N9038A	MY51210148	5/6/2015	5/6/2016	Active Calibration
2	AA 960006	Active Loop Antenna	EMCO	6502	9205-2753	8/14/2015	8/14/2017	Active Calibration
3	AA 960005	Biconical Antenna	EMCO	93110B	9601-2280	8/6/2015	8/6/2016	Active Calibration
4	AA 960004	Log Periodic Antenna	EMCO	93146	9512-4276	8/18/2015	8/18/2016	Active Calibration

LS RESEARCH LLC
Wireless Product Development
Equipment Calibration

Date : 7-Oct-2015 Type Test : Conducted Emissions (207) Job # : C-2308

Prepared By: Mike Hintzke Customer : Allegion Quote #: 314274

lo.	Asset #	Description	Manufacturer	Model #	Serial #	Cal Date	Cal Due Date	Equipment Status
	EE 960088	8GHz MXE Spectrum Analyzer	Agilent	N9038A	MY51210138	1/9/2015	1/9/2016	Active Calibration
	EE 960089	LISN - 15A	COM-POWER	LI-215A	191943	3/2/2015	3/2/2016	Active Calibration

Appendix B: Test Standards - Current Publication Dates

STANDARD #	DATE	Am. 1	Am. 2
ANSI C63.4	2014		
ANSI C63.10	2013		
FCC 47 CFR, Parts 0-15, 18, 90, 95	2015		
RSS GEN	2014		
RSS 210	2010		

Appendix C: Uncertainty Statements

Table of Expanded Uncertainty Values, (K=2) for Specified Measurements

Measurement Type	*Particular Configuration*	*Uncertainty Values*
Radiated Emissions	*3 – Meter chamber, Biconical Antenna*	*4.82 dB*
Radiated Emissions	*3-Meter Chamber, Log Periodic Antenna*	*4.88 dB*
Radiated Emissions	*3-Meter Chamber, Horn Antenna*	*4.85 dB*
Radiated Emissions	*10-Meter OATS, Biconical Antenna*	*4.32 dB*
Radiated Emissions	*10-Meter OATS, Log Periodic Antenna*	*3.63 dB*
Absolute Conducted Emissions	*Agilent PSA/ESA Series*	*1.38 dB*
AC Line Conducted Emissions	*Shielded Room/EMCO LISN*	*3.20 dB*
Radiated Immunity	*3 Volts/Meter in 3-Meter Chamber*	*2.05 Volts/Meter*
Conducted Immunity	*3 Volts level*	*2.33 V*
EFT Burst, Surge, VDI	*230 VAC*	*54.4 V*
ESD Immunity	*Discharge at 15kV*	*3200 V*
Temperature/Humidity	*Thermo-hygrometer*	*0.64° / 2.88 %RH*