Willow Run Test Labs, LLC
7117 Fieldcrest Dr.
Brighton, Michigan 48116 USA
Tel: (734) 252-9785
Fax: (734) 926-9785
e-mail: info@wrtest.com

Testing of

Electromagnetic Emissions

per

USA: CFR Title 47, Part 15.209 (Emissions)
Canada: ISED RSS-210/GENe (Emissions)

are herein reported for

Schlage Lock Company / Allegion
LE-ADD, LE-GRW

Test Report No.: 20161114-RPTALEG10009Ar2

Applicant/Provider:
Schlage Lock Company / Allegion
11819 North Pennsylvania Street, Carmel Indiana 46032 USA
Phone: +1 (317) 810-3700, Fax: +1 (317) 810-3051
Contact Person: Frank Nardelli; Frank.Nardelli@allegion.com

Data Recorded by: Dr. Joseph Brunett, EMC-002790-NE

Reviewed by: Dr. Joseph Brunett, EMC-002790-NE

Prepared by: Dr. Joseph Brunett, EMC-002790-NE

Date of Issue: November 18, 2016

Results of testing completed on (or before) November 18, 2016 are as follows.

Emissions: The transmitter intentional emissions **COMPLY** with the regulatory limit(s) by no less than 14.7 dB. Transmit chain spurious or harmonic emissions **COMPLY** by no less than 8.5 dB. Unintentional spurious emissions from digital circuitry **COMPLY** with radiated emission limit(s) by at least 11.8 dB.

Revision History

Rev. No.	Date	Details	Revised By
r0	November 18, 2016	Initial Release.	J. Brunett
r1	December 10, 2016	Corrections per Reviewer Comments	J. Brunett
r2	December 22, 2016	Corrections per Reviewer Comments	J. Brunett

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1 Test Report Scope and Limitations

1.1 Laboratory Authorization

Test Facility description and attenuation characteristics are on file with the FCC Laboratory, Columbia, Maryland (FCC Reg. No: 688478) and with ISED Canada, Ottawa, ON (File Ref. No: IC8719A-1 and IC22227-1).

1.2 Report Retention

For equipment verified to comply with the regulations herein, the manufacturer is obliged to retain this report with the product records for the life of the product, and no less than ten years. A copy of this Report will remain on file with this laboratory until November 2026.

1.3 Subcontracted Testing

This report does not contain data produced under subcontract.

1.4 Limitation of Results

The test results contained in this report relate only to the item(s) tested. Any electrical or mechanical modification made to the test item subsequent to the test date shall invalidate the data presented in this report. Any electrical or mechanical modification made to the test item subsequent to this test date shall require reevaluation.

1.5 Copyright

1.6 Endorsements

This report shall not be used to claim product endorsement by any accrediting, regulatory, or governmental agency.

1.7 Test Location

The EUT was fully tested by **Willow Run Test Labs, LLC**, 7117 Fieldcrest Dr., Brighton, Michigan 48116 USA. Table 1 lists all site(s) employed herein. Specific test sites utilized are also listed in the test results sections of this report.

Table 1: Test Site List.

Description	Location	Quality Num.
OATS (3 meter)	8501 Beck Rd. Bldg 2227, Belleville MI 48111	OATSA
OATS (3 meter)	7117 Fieldcrest Dr., Brighton, MI 48116	OATSB

1.8 Traceability and Equipment Used

Pertinent test equipment used for measurements at this facility is listed in Table 2. The quality system employed at Willow Run Test Labs, LLC has been established to ensure all equipment has a clearly identifiable classification, calibration expiry date, and that all calibrations are traceable to the SI through NIST, other recognized national laboratories, accepted fundamental or natural physical constants, ratio type of calibration, or by comparison to consensus standards.

Table 2: Equipment List.

Description	Manufacturer/Model	SN	Quality Num.	Last Cal By / Date Due
Spectrum Analyzer	Rhode-Schwarz / FSV30	101660	RSFSV30001	RS / May-2018
Biconical	EMCO / 93110B	9802-3039	BICEMCO01	Lib. Labs / Aug-2017
Log Periodic Antenna	EMCO / 3146	9305-3614	LOGEMCO01	Lib. Labs/ April-2017
Quad Ridge Horn	ETS Lind. / 3164-04	00066988	HRNQR316401	Lib. Labs / April-2017
Shielded Loop Antenna	EMCO / 6502	9502-2926	EMCOLOOP1	Lib. Labs. / Aug-2017

2 Test Specifications and Procedures

2.1 Test Specification and General Procedures

The ultimate goal of Schlage Lock Company / Allegion is to demonstrate that the Equipment Under Test (EUT) complies with the Rules and/or Directives below. Detailed in this report are the results of testing the Schlage Lock Company / Allegion LE-ADD, LE-GRW for compliance to:

Country/Region	**Rules or Directive**	**Referenced Section(s)**
United States	Code of Federal Regulations	CFR Title 47, Part 15.209
Canada	ISED Canada	ISED RSS-210/GENe

It has been determined that the equipment under test is subject to the rules and directives above at the date of this testing. In conjunction with these rules and directives, the following specifications and procedures are followed herein to demonstrate compliance (in whole or in part) with these regulations.

ANSI C63.4:2014	"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 (USA)	"American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices"
IEEE Trans. EMC, Vol. 47, No. 3 August 2005	"Extrapolating Near-Field Emissions of Low-Frequency Loop Transmitters," J.D.Brunett, V.V.Liepa, D.L.Sengupta
ISED Canada	"The Measurement of Occupied Bandwidth"
ICES-003; Issue 6 (2016)	"Information Technology Equipment (ITE) Limits and methods of measurement"

3 Configuration and Identification of the Equipment Under Test

3.1 Description and Declarations

The EUT is access card enabled electronic door lock. The EUT is approximately 25 x 10 x 12 cm (approx.) in dimension, and is depicted in Figure 1. It is powered by 6 VDC alkaline batteries. This device is used as an entry door lock that can be operated via LF key card. Table 3 outlines provider declared EUT specifications.

Figure 1: Photos of EUT.

Table 3: EUT Declarations.

General Declarations			
Equipment Type:	Electronic Door Lock	**Country of Origin:**	USA
Nominal Supply:	6 VDC	**Oper. Temp Range:**	-40^o to $+66^oC$
Frequency Range:	0.125, 13.56 MHz	**Antenna Dimension:**	Not Declared
Antenna Type:	Integral LF Coil	**Antenna Gain:**	Not Declared
Number of Channels:	1	**Channel Spacing:**	Not Applicable
Alignment Range:	Not Declared	**Type of Modulation:**	Not Applicable
United States			
FCC ID Number:	XPB-LE	**Classification:**	DXX
Canada			
IC Number:	8053B-LE	**Classification:**	RFID Device

3.1.1 EUT Configuration

The EUT is configured for testing as depicted in Figure 2.

3.1.2 Modes of Operation

The EUT is capable of operating as a LF access card reader to actuate a mechanical door lock feature, and as a BLE+WiLAN transceiver for access tracking. The BLE Bluetooth transceiver (FCC ID: QOQBGM111, IC: 5123A-BGM111) and WiLan transceiver (FCC ID: Z64-CC3100MODR1, IC: 451i-CC3100MODR1) employed in this product are both modularly approved. The LF card reader component and digital spurious emissions from this EUT (when fully operational) are evaluated in this report.

3.1.3 Variants

There is only a single electrical version of the EUT, but there are two variants of the external housing (escutcheon). Model LE-GRW employs the rounded escutcheon, model LE-ADD employs the square cornered escutcheon.

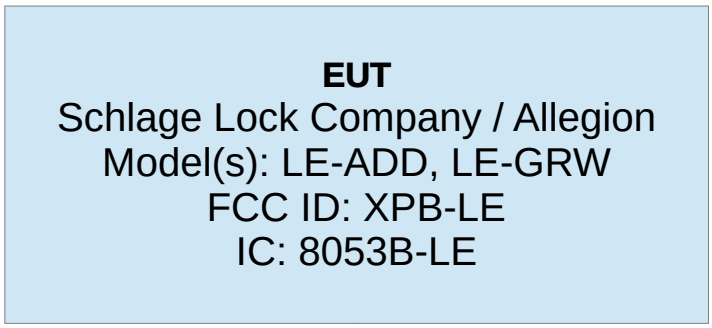


Figure 2: EUT Test Configuration Diagram.

3.1.4 Test Samples

Two samples of the EUT were provided for emissions testing. Both samples are electrically identical, but employ different escutcheon faceplates. Both samples were tested.

3.1.5 Functional Exerciser

Normal operating EUT functionality was verified by observation of transmitted signal.

3.1.6 Modifications Made

There were no modifications made to the EUT by this laboratory.

3.1.7 Production Intent

The EUT appears to be a production ready sample.

3.1.8 Declared Exemptions and Additional Product Notes

This EUT also employs a pre-approved Bluetooth (BLE) module and a pre-approved WiLAN module which can be used to monitor locking and unlocking of the mechanical door lock. The LF card reader component and digital spurious emissions from this EUT (when fully operational) are evaluated in this report.

4 Emissions

4.1 General Test Procedures

4.1.1 Radiated Test Setup and Procedures

Radiated electromagnetic emissions from the EUT are first pre-scanned in our shielded anechoic chamber or GTEM test cell. Spectrum and modulation characteristics of all emissions are recorded. Instrumentation, including spectrum analyzers and other test equipment as detailed in Section 1.7 are employed. After pre-scan, emission measurements are made on the test site of record. If the EUT connects to auxiliary equipment and is table or floor standing, the configurations prescribed in relevant test standards are followed. Alternatively, a layout closest to normal use (as declared by the provider) is employed if the resulting emissions appear to be worst-case in such a configuration. See Figure 3. All intentionally radiating elements that are not fixed-mounted in use are placed on the test table lying flat, on their side, and on their end (3-axes) and the resulting worst case emissions are recorded. If the EUT is fixed-mounted in use, measurements are made with the device oriented in the manner consistent with installation and then emissions are recorded.

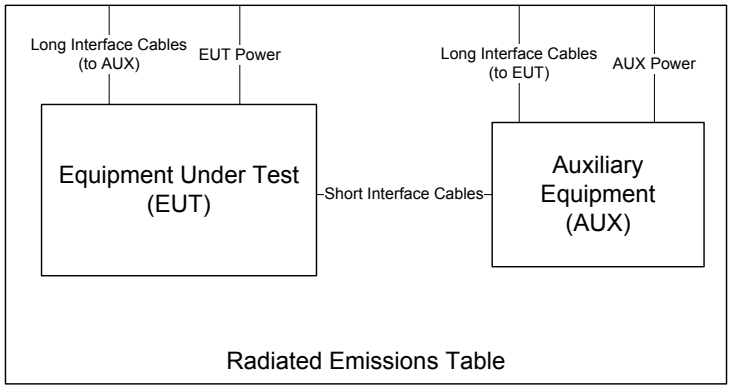


Figure 3: Radiated Emissions Diagram of the EUT.

If the EUT exhibits spurious emissions due to internal receiver circuitry, such emissions are measured with an appropriate carrier signal applied. For devices with intentional emissions below 30 MHz, a shielded loop antenna is used. It is placed at a 1 meter receive height. Emissions between 30 MHz and 1 GHz are measured using tuned dipoles and/or calibrated broadband antennas. For both horizontal and vertical polarizations, the test antenna is raised and lowered from 1 to 4 m in height until a maximum emission level is detected. The EUT is then rotated through 360^o in azimuth until the highest emission is detected. The test antenna is then raised and lowered one last time from 1 to 4 m and the worst case value is recorded. Emissions above 1 GHz are characterized using standard gain horn or broadband ridge-horn antennas on our OATS with a 4×5 m rectangle of H-4 absorber placed over the ground screen covering the OATS ground screen. Care is taken to ensure that test receiver resolution and video bandwidths meet the regulatory requirements, and that the emission bandwidth of the EUT is not reduced. Photographs of the test setup employed are depicted in Figure 4.

Where regulations allow for direct measurement of field strength, power values (dBm) measured on the test receiver / analyzer are converted to dBμV/m at the regulatory distance, using

$$E_{dist} = 107 + P_R + K_A - K_G + K_E - C_F$$

where P_R is the power recorded on spectrum analyzer, in dBm, K_A is the test antenna factor in dB/m, K_G is the combined pre-amplifier gain and cable loss in dB, K_E is duty correction factor (when applicable) in dB, and C_F is a distance conversion (employed only if limits are specified at alternate distance) in dB. This field strength value is then compared with the regulatory limit. If effective isotropic radiated power (EIRP) is computed, it is computed as

$$EIRP(dBm) = E_{3m}(dB\mu V/m) - 95.2.$$

When presenting data at each frequency, the highest measured emission under all possible EUT orientations (3-axes) is reported.

Figure 4: Radiated Emissions Test Setup Photograph(s).

4.1.2 Conducted Emissions Test Setup and Procedures

Battery Power Conducted Spurious The EUT is not subject to measurement of power line conducted emissions as it is powered solely by its internal battery.

4.1.3 Power Supply Variation

Tests at extreme supply voltages are made if required by the the procedures specified in the test standard, and results of this testing are detailed in this report.

In the case the EUT is designed for operation from a battery power source, the extreme test voltages are evaluated over the range specified in the test standard; no less than $\pm 10\%$ of the nominal battery voltage declared by the manufacturer. For all battery operated equipment, worst case intentional and spurious emissions are re-checked employing a new (fully charged) battery.

4.1.4 Thermal Variation

Tests at extreme temperatures are made if required by the procedures specified in the test standard, and results of this testing are detailed in this report. The provider has declared that the EUT is designed for operation over the temperature range -40^o to $+66^o$C. Before any temperature measurements are made, the equipment is allowed to reach a thermal balance in the test chamber, temperature and humidity are recorded, and thermal balance is verified via a thermocouple–based probe.

4.2 Intentional Emissions

4.2.1 Fundamental Emission Pulsed Operation

The details and results of testing the EUT for pulsed operation are summarized in Table 4. Plots showing the measurements made to obtain these values are provided in Figure 5.

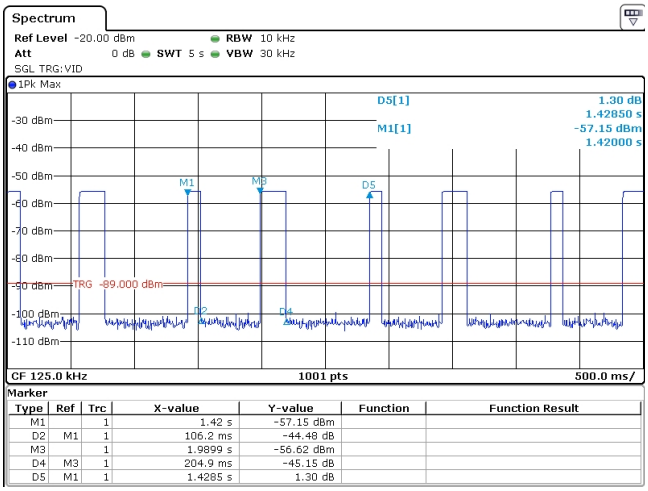
Table 4: Pulsed Emission Characteristics (Duty Cycle).

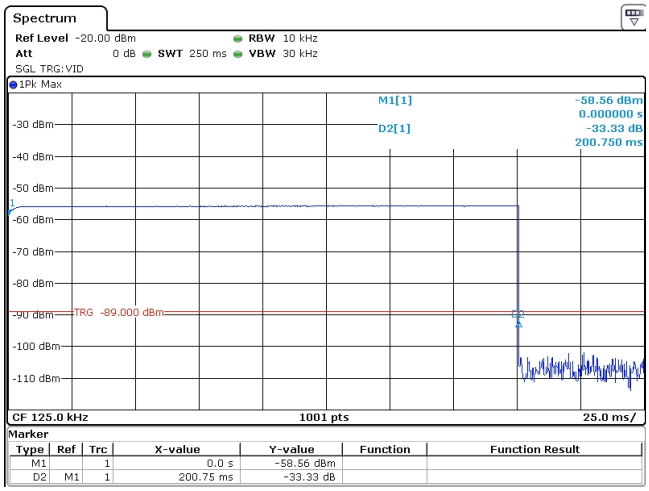
Frequency Range	Det	IF Bandwidth	Video Bandwidth
9 kHz ≤ f ≤ 150 kHz	Pk/QPk	200 Hz	300 Hz
150 kHz ≤ f ≤ 30 MHz	Pk/QPk	9 kHz/10 kHz	30 kHz
25 MHz ≤ f ≤ 1 000 MHz	Pk/QPk	120 kHz	300 kHz
f > 1 000 MHz	Pk	3 MHz	3MHz
f > 1 000 MHz	Avg	3 MHz	10kHz

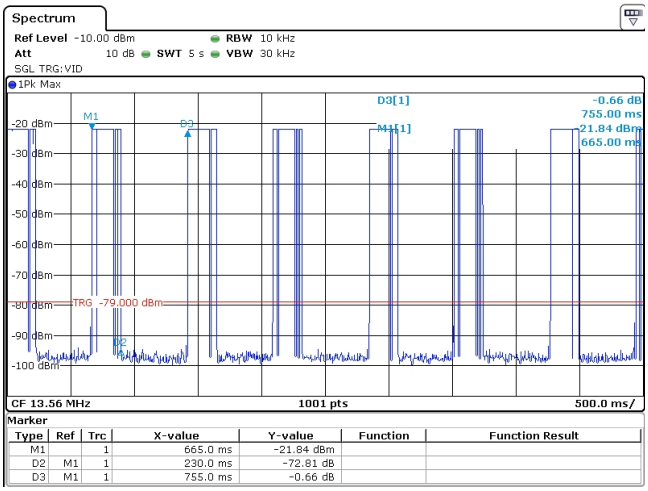
Test Date:	10-Nov-16
Test Engineer:	Joseph Brunett
EUT Mode:	Normal Operating
Meas. Distance:	3 meters
EUT Tested:	Allegion LE

		Overall Transmission			Internal Frame Characteristics			Computed Duty Cycle*	
#	EUT Mode	Min. Repetition Rate (sec)	Max. No. of Frames	Total Transmission Length (sec)	Max. Frame Length (ms)	Min. Frame Period (s)	Frame Encoding	(%)	Duty (dB)
1	Normal (125 kHz)	1.43	2	-	200.8	>100 ms	When a passive access key card is place over the access pad on the front of the EUT, the lock interrogates the passive card once every 1.43 seconds with a set of two CW pulses, the longest of which has on on time of 201ms. If the key card is removed, the interrogation ceases.	N/A	N/A
2	Normal (13.56 MHz)	0.76	4	0.2226	129.9	>100 ms	When a passive access key card is place over the access pad on the front of the EUT, the lock interrogates the passive card once every 0.76 seconds with a set of 4 CW pulses, the longest of which has an on time of 130ms. If the key card is removed, the interrogation ceases.	N/A	N/A

* No Duty Cycle is employed when demonstrating compliance.







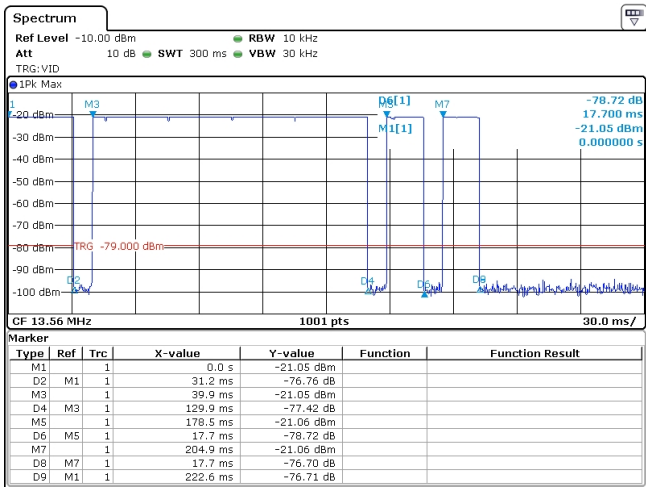


Figure 5: Pulsed Emission Characteristics (Duty Cycle).

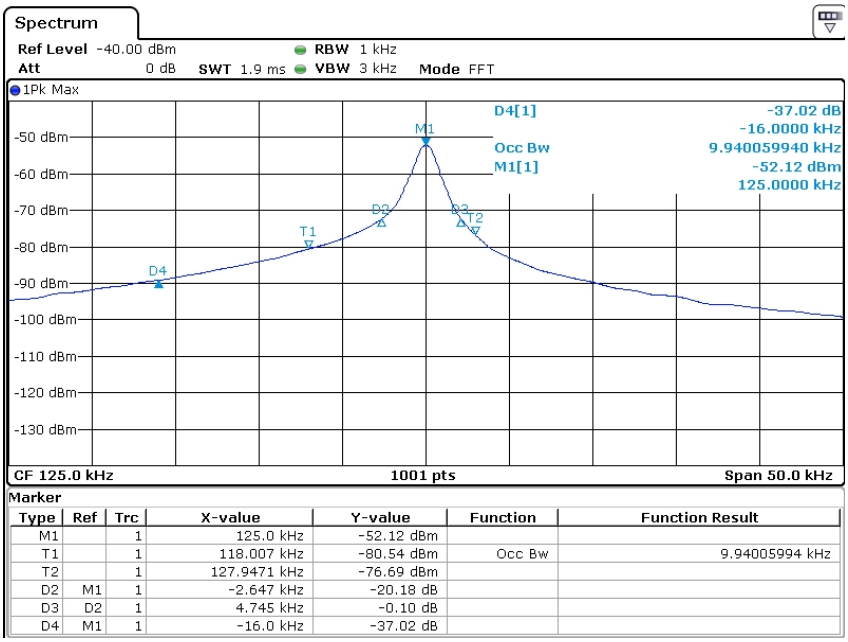
4.2.2 Fundamental Emission Bandwidth

Emission bandwidth (EBW) of the EUT is measured with the device placed in the test mode(s) with the shortest available frame length and minimum frame spacing. Radiated emissions are recorded following the test procedures listed in Section 2.1. The 20 dB EBW is measured as the max-held peak-detected signal when the IF bandwidth is greater than or equal to 1% of the receiver span. For complex modulations other than ASK and FSK, the 99% emission bandwidth per IC test procedures has a different result, and is also separately reported.The results of EBW testing are summarized in Table 5. Plots showing measurements employed to obtain the emission bandwidth reported are provided in Figure 6.

Table 5: Intentional Emission Bandwidth.

Frequency Range	Det	IF Bandwidth	Video Bandwidth		
9 kHz ≤ f ≤ 150 kHz	Pk	> 1% Span	>= 3 * IFBW	**Test Date:**	10-Nov-16
150 kHz ≤ f ≤ 30 MHz	Pk	> 1% Span	>= 3 * IFBW	**Test Engineer:**	Joseph Brunett
				EUT Mode:	Normal Operating
				Meas. Distance:	0.1 meters
				EUT Tested:	Allegion LE

#	Frequency Range (MHz)	Temp (C)	Supply (VDC)	99% PWR BW (kHz)	20 dB EBW (kHz)	110 kHz Restricted Band (dBc)			
1	0.125	21	6	9.94	4.75	37.0			
2	13.56	21	6	510.5	430.6	N/A			



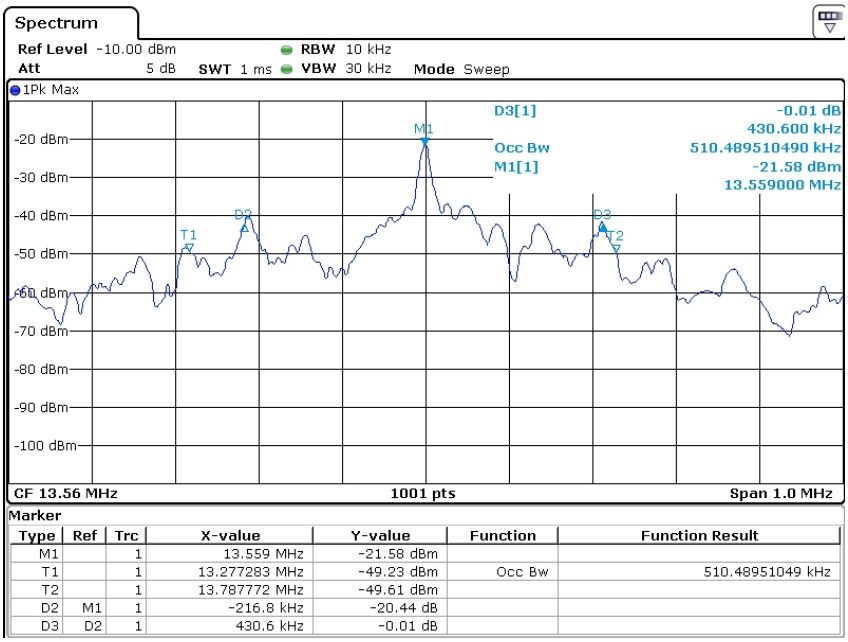


Figure 6: Intentional Emission Bandwidth.

4.2.3 Fundamental Emission

Following the test procedures listed in Section 2.1, field emissions measurements are made on the EUT for both Horizontal and Vertically polarized coupling fields. The EUT's loop antenna(s) are measured when the EUT loop axes are (1) aligned along the same axis as the test loop antenna and horizontal with respect to the test site ground plane, (2) aligned coplanar (in the same plane) with the test antenna and aligned horizontal with respect to the test site ground plane, and (3) aligned coplanar (in the same plane) with the test antenna and vertical with respect to the test site ground plane. Table 6 details the results of these measurements.

Table 6: Fundamental Radiated Emissions.

Frequency Range	Det	IF Bandwidth	Video Bandwidth
9 kHz ≤ f ≤ 150 kHz	Pk/QPk	200 Hz	300 Hz
150 kHz ≤ f ≤ 30 MHz	Pk/QPk	9 kHz	30 kHz
25 MHz ≤ f ≤ 1 000 MHz	Pk/QPk	120 kHz	300 kHz
f > 1 000 MHz	Pk	1 MHz	3MHz
f > 1 000 MHz	Avg	1 MHz	3MHz

Test Date:	25-Oct-16
Test Engineer:	Joseph Brunett
EUT Mode:	CW
Meas. Distance:	3 meters
EUT Tested:	Allegion LE

Fundamental Emissions Measurements

#	Mode	Test Antenna Polarization	Freq. MHz	Ant. Used	Pr (Pk) dBm	Pr (QPk/Avg)* dBm	Ka dB/m	Kg dB	Cf** 3m / 300m (dB)	E3m (Pk) dBuV/m	E300m (Pk) dBuV/m	E30m (QPk/Avg) dBuV/m	E300m Limit dBuV/m	Pass By***
1	**LE-GRW**													
2	CW	Coaxial - Horz	0.125	S. Loop	-60.2		10.1	0.0	80.0	56.9	-23.1		25.7	**48.8**
3		Coplanar - Vert	0.125	S. Loop	-67.1		10.1	0.0	80.0	50.0	-30.0		25.7	55.7
4		Coplanar - Horz	0.125	S. Loop	-68.7		10.1	0.0	80.0	48.4	-31.6		25.7	57.3
5	**LE-ADD**													
6	CW	Coaxial - Horz	0.125	S. Loop	-62.6		9.7	0.0	80.0	54.1	-25.9		25.7	51.6
7		Coplanar - Vert	0.125	S. Loop	-69.1		9.7	0.0	80.0	47.6	-32.4		25.7	58.1
8		Coplanar - Horz	0.125	S. Loop	-71.6		9.7	0.0	80.0	45.1	-34.9		25.7	60.6

#	Mode	Test Antenna Polarization	Freq. MHz	Ant. Used	Pr (Pk) dBm	Pr (QPk/Avg)* dBm	Ka dB/m	Kg dB	Cf** 3m / 30m (dB)	E30m (Pk) dBuV/m	E30m (Pk) dBuV/m	E30m (QPk/Avg) dBuV/m	E30m Limit dBuV/m	Pass By***
10	**LE-GRW**													
11	CW	Coaxial - Horz	13.56	S. Loop	-62.8		10.6	0.0	40.0	54.8	14.8		29.5	**14.7**
12		Coplanar - Vert	13.56	S. Loop	-70.1		10.6	0.0	40.0	47.5	7.5		29.5	22.0
13		Coplanar - Horz	13.56	S. Loop	-70.2		10.6	0.0	40.0	47.4	7.4		29.5	22.1
14	**LE-ADD**													
15	CW	Coaxial - Horz	13.56	S. Loop	-65.5		10.6	0.0	40.0	52.1	12.1		29.5	17.4
16		Coplanar - Vert	13.56	S. Loop	-71.6		10.6	0.0	40.0	46.0	6.0		29.5	23.5
17		Coplanar - Horz	13.56	S. Loop	-71.6		10.6	0.0	40.0	46.0	6.0		29.5	23.5
18														

#	Mode	Test Antenna Polarization	Freq. MHz	DC Supply Voltage	Pr (Pk) dBm
16	CW	Coaxial - Horz	.125	6.90	-60.1
17			.125	6.00	-60.2
18			.125	5.10	-60.1
19	CW	Coaxial - Horz	13.56	6.90	-62.4
20			13.56	6.00	-62.8
21			13.56	5.10	-62.6

* EUT was tested in CW mode. No averaging applies and Quasi-Peak data was not needed to demonstrate compliance.
** 40 dB/dec conversion factor employed

4.3 Unintentional Emissions

4.3.1 Transmit Chain Spurious Emissions

The results for the measurement of transmit chain spurious emissions at the nominal voltage and temperature are provided in Table 7. Following the test procedures listed in Section 2.1, field emissions measurements are made on the EUT for both Horizontal and Vertically polarized coupling fields. The EUT's loop antenna(s) are measured when the EUT loop axes are (1) aligned along the same axis as the test loop antenna and horizontal with respect to the test site ground plane, (2) aligned coplanar (in the same plane) with the test antenna and aligned horizontal with respect to the test site ground plane, and (3) aligned coplanar (in the same plane) with the test antenna and vertical with respect to the test site ground plane. The results for the measurement of transmit chain spurious emissions at the nominal voltage and temperature are provided in Table 7. Measurements are performed to 10 times the highest fundamental operating frequency.

Table 7(a): Transmit Chain Spurious Emissions.

Frequency Range	**Det**	**IF Bandwidth**	**Video Bandwidth**	**Test Date:**	24-Oct-16
9 kHz ≤ f ≤ 150 kHz	Pk/QPk	200 Hz	300 Hz	**Test Engineer:**	Joseph Brunett
150 kHz ≤ f ≤ 30 MHz	Pk/QPk	9 kHz	30 kHz	**EUT Mode:**	CW
25 MHz ≤ f ≤ 1 000 MHz	Pk/QPk	120 kHz	300 kHz	**Meas. Distance:**	3 meters
f > 1 000 MHz	Pk	3 MHz	3MHz	**EUT Tested:**	Allegion LE
f > 1 000 MHz	Avg	3 MHz	10kHz		

Transmit Chain Spurious Emissions

#	Mode	Test Antenna Polarization	Freq. kHz	Ant. Used	Pr (Pk) dBm	Pr (QPk/Avg)* dBm	Ka dB/m	Kg dB	Cf** (3 to 300m) dB	E-field (Pk) dBuV/m	E-field (Qpk/Avg) dBuV/m	E-field Limit (300m / 3m) dBuV/m	Pass By	Comments
1	**LE-GRW**													
2		Coaxial - Horz	250.0	SHLOOP01	-77.9		10.0	0.0	80.0	-40.9		19.6	60.5	
3		Coplanar - Vert	250.0	SHLOOP01	-85.2		10.0	0.0	80.0	-48.2		19.6	67.8	
4		Coplanar - Horz	250.0	SHLOOP01	-86.4		10.0	0.0	80.0	-49.4		19.6	69.0	
5		H/V (worst case)	375.0	SHLOOP01	-85.2		10.0	0.0	80.0	-48.2		16.1	64.3	background
6		H/V (worst case)	500.0	SHLOOP01	-88.0		10.2	0.0	80.0	-50.8		33.6	84.4	background
7	CW	H/V (worst case)	625.0	SHLOOP01	-89.9		10.2	0.0	80.0	-52.7		31.7	84.4	noise
8		H/V (worst case)	750.0	SHLOOP01	-84.8		10.1	0.0	80.0	-47.7		30.1	77.8	background
9		H/V (worst case)	875.0	SHLOOP01	-86.2		10.2	0.0	80.0	-49.0		28.8	77.8	background
10		H/V (worst case)	1000.0	SHLOOP01	-85.3		10.4	0.0	80.0	-47.9		27.6	75.5	background
11		H/V (worst case)	1125.0	SHLOOP01	-86.5		10.4	0.0	80.0	-49.1		26.6	75.7	background
12		H/V (worst case)	1250.0	SHLOOP01	-92.4		10.4	0.0	80.0	-55.0		25.7	80.7	noise
13	**LE-ADD**													
14		Coaxial - Horz	250.0	SHLOOP01	-77.3		10.0	0.0	80.0	-40.3		19.6	59.9	
15		Coplanar - Vert	250.0	SHLOOP01	-84.6		10.0	0.0	80.0	-47.6		19.6	67.2	
16		Coplanar - Horz	250.0	SHLOOP01	-87.6		10.0	0.0	80.0	-50.6		19.6	70.2	
17		H/V (worst case)	375.0	SHLOOP01	-86.0		10.0	0.0	80.0	-49.0		16.1	65.1	background
18		H/V (worst case)	500.0	SHLOOP01	-88.0		10.2	0.0	80.0	-50.8		33.6	84.4	background
19	CW	H/V (worst case)	625.0	SHLOOP01	-91.7		10.2	0.0	80.0	-54.5		31.7	86.2	noise
20		H/V (worst case)	750.0	SHLOOP01	-85.5		10.1	0.0	80.0	-48.4		30.1	78.5	background
21		H/V (worst case)	875.0	SHLOOP01	-89.1		10.2	0.0	80.0	-51.9		28.8	80.7	background
22		H/V (worst case)	1000.0	SHLOOP01	-84.9		10.4	0.0	80.0	-47.5		27.6	75.1	background
23		H/V (worst case)	1125.0	SHLOOP01	-86.7		10.4	0.0	80.0	-49.3		26.6	75.9	background
24		H/V (worst case)	1250.0	SHLOOP01	-92.4		10.4	0.0	80.0	-55.0		25.7	80.7	noise

* EUT was tested in CW mode. No averaging applies and Quasi-Peak data was not needed to demonstrate compliance.
** 40 dB/dec Far-field conversion factor employed.

Table 7(b): Transmit Chain Spurious Emissions.

Frequency Range	Det	IF Bandwidth	Video Bandwidth		
9 kHz ≤ f ≤ 150 kHz	Pk/QPk	200 Hz	300 Hz	**Test Date:**	24-Oct-16
150 kHz ≤ f ≤ 30 MHz	Pk/QPk	9 kHz	30 kHz	**Test Engineer:**	Joseph Brunett
25 MHz ≤ f ≤ 1 000 MHz	Pk/QPk	120 kHz	300 kHz	**EUT Mode:**	CW
f > 1 000 MHz	Pk	3 MHz	3MHz	**Meas. Distance:**	3 meters
f > 1 000 MHz	Avg	3 MHz	10kHz	**EUT Tested:**	Allegion LE

Transmit Chain Spurious Emissions

#	Mode	Test Antenna Polarization	Freq. MHz	Ant. Used	Pr (Pk) dBm	Pr (QPk/Avg)* dBm	Ka dB/m	Kg dB	Cf** (3 to 30m) dB	E-field*** (Pk) dBuV/m	E-field*** (Qpk/Avg) dBuV/m	E-field Limit (30m / 3m) dBuV/m	Pass By	Comments
1	**LE-GRW**													
2		Coaxial - Horz	27.1	SHLOOP01	-95.2		8.7	0.0	20.0	.5		29.5	29.0	max all, noise
3		Coplanar - Vert	27.1	SHLOOP01	-98.2		8.7	0.0	20.0	-2.5		29.5	32.0	max all, noise
4		Coplanar - Horz	27.1	SHLOOP01	-99.0		8.7	0.0	20.0	-3.3		29.5	32.8	max all, noise
5		H/V (worst case)	40.7	BICEMCO01			10.6	39.4	.0	13.7		40.0	26.3	noise
6		H/V (worst case)	54.2	BICEMCO01			8.6	39.1	.0	12.9		40.0	27.1	noise
7	CW	H/V (worst case)	67.8	BICEMCO01			7.7	38.8	.0	19.2		40.0	20.8	noise
8		H/V (worst case)	81.4	BICEMCO01			7.6	38.5	.0	24.1		40.0	15.9	noise
9		H/V (worst case)	94.9	BICEMCO01			8.1	38.2	.0	34.9		43.5	8.6	background
10		H/V (worst case)	108.5	BICEMCO01			9.0	37.9	.0	24.1		43.5	19.4	noise
11		H/V (worst case)	122.0	BICEMCO01			10.2	37.6	.0	23.5		43.5	20.0	noise
12		H/V (worst case)	135.6	BICEMCO01			11.3	37.4	.0	22.0		43.5	21.5	noise
13	**LE-ADD**													
14		Coaxial - Horz	27.1	SHLOOP01	-95.6		8.7	0.0	20.0	.1		29.5	29.4	background
15		Coplanar - Vert	27.1	SHLOOP01	-97.4		8.7	0.0	20.0	-1.7		29.5	31.2	background
16		Coplanar - Horz	27.1	SHLOOP01	-98.2		8.7	0.0	20.0	-2.5		29.5	32.0	background
17		H/V (worst case)	40.7	BICEMCO01			10.6	39.4	.0	14.8		40.0	25.2	noise
18		H/V (worst case)	54.2	BICEMCO01			8.6	39.1	.0	12.7		40.0	27.3	noise
19	CW	H/V (worst case)	67.8	BICEMCO01			7.7	38.8	.0	18.9		40.0	21.1	noise
20		H/V (worst case)	81.4	BICEMCO01			7.6	38.5	.0	23.2		40.0	16.8	noise
21		H/V (worst case)	94.9	BICEMCO01			8.1	38.2	.0	35.0		43.5	**8.5**	background
22		H/V (worst case)	108.5	BICEMCO01			9.0	37.9	.0	23.7		43.5	19.8	noise
23		H/V (worst case)	122.0	BICEMCO01			10.2	37.6	.0	23.4		43.5	20.1	noise
24		H/V (worst case)	135.6	BICEMCO01			11.3	37.4	.0	21.9		43.5	21.6	noise

* EUT was tested in CW mode. No averaging applies and Quasi-Peak data was not needed to demonstrate compliance.

** 20 dB/dec Far-field conversion factor employed, if 3 meters > lambda/(2*pi)

*** When E-field is reported directly from Spectrum Analyzer, Antenna Factors and Cable losses are included directly in SA settings.

4.3.2 Radiated Digital Spurious

The results for the measurement of digital spurious emissions (emissions arising from digital circuitry) at the nominal voltage and temperature are provided in Table 8. Radiation from digital components has been measured to 1000 MHz or to the highest frequency required by the applied standards, whichever is greater.

Table 8: Radiated Digital Spurious Emissions.

Frequency Range	Det	IF Bandwidth	Video Bandwidth		
25 MHz ≤ f ≤ 1 000 MHz	Pk/QPk	120 kHz	300 kHz	**Test Date:**	10-Nov-16
f > 1 000 MHz	Pk	1 MHz	3 MHz	**Test Engineer:**	Joseph Brunett
f > 1 000 MHz	Avg	1 MHz	10kHz	**EUT:**	Allegion LE
				EUT Mode:	LF+RF Active
				Meas. Distance:	3 meters

Digital Spurious Emissions FCC/IC + CE(CISPR)

	Test	Antenna		Pr (Pwr Rx.)*				E-Field @ 3m**		FCC/IC Class B		CE Class B		FCC/IC Class A		CE Class A		
	Freq.	QN	Test	Pk	QPk/Avg	Ka	Kg	Pk	QPk/Avg	E3lim	Pass	E3lim	Pass	E3lim	Pass	E3lim	Pass	
#	MHz	Used	Pol.	dBm	dBm	dB/m	dB	dBµV/m	dBµV/m	dBµV/m	dB	dBµV/m	dB	dBµV/m	dB	dBµV/m	dB	Comments
1	**Worst Case Emissions from both LE-ADD and LE-GRW variants.**																	
2	75.0	BICEMCO01	H			7.5	36.5		16.9	40.0	23.1	40.5	23.6	49.5	32.6	50.5	33.6	
3	75.0	BICEMCO01	V			7.5	36.5		25.4	40.0	14.6	40.5	15.1	49.5	24.1	50.5	25.1	background
4	132.5	BICEMCO01	H			11.1	35.3		25.3	43.5	18.2	40.5	15.2	54.0	28.7	50.5	25.2	
5	132.5	BICEMCO01	V			11.1	35.3		24.5	43.5	19.0	40.5	16.0	54.0	29.5	50.5	26.0	
6	156.0	BICEMCO01	V			12.9	34.9		25.3	43.5	18.2	40.5	15.2	54.0	28.7	50.5	25.2	
7	190.0	BICEMCO01	H			14.5	34.3		22.9	43.5	20.6	40.5	17.6	54.0	31.1	50.5	27.6	
8	190.0	BICEMCO01	V			14.5	34.3		22.2	43.5	21.3	40.5	18.3	54.0	31.8	50.5	28.3	
9	210.0	BICEMCO01	H			14.8	34.0		20.8	43.5	22.7	40.5	19.7	54.0	33.2	50.5	29.7	
10	210.0	BICEMCO01	V			14.8	34.0		23.8	43.5	19.7	40.5	16.7	54.0	30.2	50.5	26.7	
11	288.0	LOGEMCO01	H			13.5	32.9		27.1	46.0	18.9	47.5	20.4	56.9	29.8	57.5	30.4	
12	288.0	LOGEMCO01	V			13.5	32.9		18.5	46.0	27.5	47.5	29.0	56.9	38.4	57.5	39.0	
13	397.0	LOGEMCO01	H			15.7	31.5		18.0	46.0	28.0	47.5	29.5	56.9	38.9	57.5	39.5	
14	397.0	LOGEMCO01	V			15.7	31.5		19.3	46.0	26.7	47.5	28.2	56.9	37.6	57.5	38.2	
15	421.0	LOGEMCO01	H			16.1	31.3		15.7	46.0	30.3	47.5	31.8	56.9	41.2	57.5	41.8	
16	421.0	LOGEMCO01	V			16.1	31.3		24.8	46.0	21.2	47.5	22.7	56.9	32.1	57.5	32.7	
17	443.3	LOGEMCO01	H			16.5	31.0		26.6	46.0	19.4	47.5	20.9	56.9	30.3	57.5	30.9	
18	443.3	LOGEMCO01	V			16.5	31.0		23.1	46.0	22.9	47.5	24.4	56.9	33.8	57.5	34.4	
19	454.3	LOGEMCO01	H			16.7	30.9		17.0	46.0	29.0	47.5	30.5	56.9	39.9	57.5	40.5	
20	454.3	LOGEMCO01	V			16.7	30.9		18.4	46.0	27.6	47.5	29.1	56.9	38.5	57.5	39.1	
21	473.0	LOGEMCO01	H			17.0	30.7		20.2	46.0	25.8	47.5	27.3	56.9	36.7	57.5	37.3	
22	473.0	LOGEMCO01	V			17.0	30.7		23.5	46.0	22.5	47.5	24.0	56.9	33.4	57.5	34.0	
23	478.8	LOGEMCO01	H			17.1	30.6		25.2	46.0	20.8	47.5	22.3	56.9	31.7	57.5	32.3	
24	478.8	LOGEMCO01	V			17.1	30.6		32.1	46.0	13.9	47.5	15.4	56.9	24.8	57.5	25.4	background
25	485.6	LOGEMCO01	H			17.2	30.6		28.2	46.0	17.8	47.5	19.3	56.9	28.7	57.5	29.3	background
26	485.6	LOGEMCO01	V			17.2	30.6		16.9	46.0	29.1	47.5	30.6	56.9	40.0	57.5	40.6	
27	492.5	LOGEMCO01	H			17.3	30.5		17.0	46.0	29.0	47.5	30.5	56.9	39.9	57.5	40.5	
28	492.5	LOGEMCO01	V			17.3	30.5		20.5	46.0	25.5	47.5	27.0	56.9	36.4	57.5	37.0	
29	760.0	LOGEMCO01	H			21.1	27.9		29.5	46.0	16.5	47.5	18.0	56.9	27.4	57.5	28.0	background
30	760.0	LOGEMCO01	V			21.1	27.9		30.5	46.0	15.5	47.5	17.0	56.9	26.4	57.5	27.0	background
31	910.0	LOGEMCO01	H			22.7	26.5		24.4	46.0	21.6	47.5	23.1	56.9	32.5	57.5	33.1	
32	910.0	LOGEMCO01	V			22.7	26.5		19.2	46.0	26.8	47.5	28.3	56.9	37.7	57.5	38.3	
33	925.8	LOGEMCO01	H			22.9	26.4		32.8	46.0	13.2	47.5	14.7	56.9	24.1	57.5	24.7	background
34	925.8	LOGEMCO01	V			22.9	26.4		34.2	46.0	**11.8**	47.5	13.3	56.9	22.7	57.5	23.3	background
35	972.3	LOGEMCO01	H			23.6	25.9		39.7	54.0	14.3	47.5	7.8	60.0	20.3	57.5	17.8	background
36	972.3	LOGEMCO01	V			23.6	25.9		31.3	54.0	22.7	47.5	16.2	60.0	28.7	57.5	26.2	
37																		

*QPk detection below 1 GHz, Avg detection at or above 1 GHz with receiver bandwidth as specified at top of table.

** When E-field is reported directly from Spectrum Analyzer, Antenna Factors and Cable losses are included directly in SA settings.

5 Measurement Uncertainty

The maximum values of measurement uncertainty for the laboratory test equipment and facilities associated with each test are given in the table below. This uncertainty is computed for a 95.45% confidence level based on a coverage factor of $k = 2$.

Table 9: Measurement Uncertainty.

Measured Parameter	**Measurement Uncertainty**[†]
Radio Frequency	$\pm(f_{Mkr}/10^7 + RBW/10 + (SPN/(PTS-1))/2 + 1\,\text{Hz})$
Conducted Emm. Amplitude	$\pm 1.8\,\text{dB}$
Radiated Emm. Amplitude $(30 - 200\,\text{MHz})$	$\pm 2.7\,\text{dB}$
Radiated Emm. Amplitude $(200 - 1000\,\text{MHz})$	$\pm 2.5\,\text{dB}$
Radiated Emm. Amplitude $(f > 1000\,\text{MHz})$	$\pm 3.7\,\text{dB}$
DC and Low Frequency Voltages	$\pm 2\%$
Temperature	$\pm 0.5°\text{C}$
Humidity	$\pm 5\%$

[†]Ref: CISPR 16-4-2:2011+A1:2014