Allegion

REVISED TEST REPORT TO 102031-39

90mm Smart, OEM200

Tested to The Following Standards:

FCC Part 15 Subpart C Section(s)

15.207 & 15.225
(13.110-14.010 MHz)

Report No.: 102031-39A

Date of issue: January 2, 2020

Test Certificate # 803.06

This test report bears the accreditation symbol indicating that the testing performed herein meets the test and reporting requirements of ISO/IEC 17025 under the applicable scope of testing for CKC Laboratories, Inc.

We strive to create long-term, trust based relationships by providing sound, adaptive, customer first testing services. We embrace each of our customers' unique EMC challenges, not as an interruption to set processes, but rather as the reason we are in business.

TABLE OF CONTENTS

ADMINISTRATIVE INFORMATION

Test Report Information

REPORT PREPARED FOR:

Allegion
500 Golden Ridge Road, Bldg 1, Suite 160
Golden, CO 80401

Representative: Michael Stock
Customer Reference Number: 4099813

REPORT PREPARED BY:

Darcy Thompson
CKC Laboratories, Inc.
5046 Sierra Pines Drive
Mariposa, CA 95338

Project Number: 102031

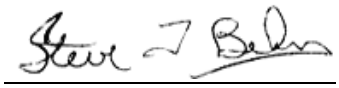
DATE OF EQUIPMENT RECEIPT: March 18, 2019
DATE(S) OF TESTING: March 18 – April 1, 2019

Revision History

Original: Testing of the 90mm Smart, OEM200 to FCC Part 15 Subpart C Section(s) 15.207 & 15.225 (13.110-14.010 MHz)
Revision A: The modulation reference has been revised on the General Product table and test sections. Since the time of testing, the manufacturer has revised the modulation from CW to ASK.

Report Authorization

The test data contained in this report documents the observed testing parameters pertaining to and are relevant for only the equipment provided by the client, tested in the agreed upon operational mode(s) and configuration(s) as identified herein. Compliance assessment remains the client's responsibility. This report may not be used to claim product endorsement by A2LA or any government agencies. This test report has been authorized for release under quality control from CKC Laboratories, Inc.



Steve Behm
Director of Quality Assurance & Engineering Services
CKC Laboratories, Inc.

Test Facility Information

Our laboratories are configured to effectively test a wide variety of product types. CKC utilizes first class test equipment, anechoic chambers, data acquisition and information services to create accurate, repeatable and affordable test results.

TEST LOCATION(S):
CKC Laboratories, Inc.
1120 Fulton Place
Fremont, CA 94539

Software Versions

CKC Laboratories Proprietary Software	Version
EMITest Emissions	5.03.12

Site Registration & Accreditation Information

Location	*NIST CB #	FCC	JAPAN
Fremont, CA	US0082	US1023	A-0149

*CKC's list of NIST designated countries can be found at: https://standards.gov/cabs/designations.html

SUMMARY OF RESULTS

Standard / Specification: FCC Part 15 Subpart C - 15.225

Test Procedure	Description	Modifications	Results
15.215(c)	Occupied Bandwidth	NA	Pass
15.225(a)-(c)	Field Strength of Fundamental	NA	Pass
15.225(e)	Frequency Stability	NA	Pass
15.225(d)	Field Strength of Spurious Emissions	NA	Pass
15.207	AC Conducted Emissions	NA	Pass

NA = Not Applicable

ISO/IEC 17025 Decision Rule
The declaration of pass or fail herein is based upon assessment to the specification(s) listed above, including where applicable, assessment of measurement uncertainties. For performance related tests, equipment was monitored for specified criteria identified in that section of testing.

Modifications During Testing

This list is a summary of the modifications made to the equipment during testing.

Summary of Conditions
No modifications were made during testing.

Modifications listed above must be incorporated into all production units.

Conditions During Testing

This list is a summary of the conditions noted to the equipment during testing.

Summary of Conditions
None

EQUIPMENT UNDER TEST (EUT)

During testing, numerous configurations may have been utilized. The configurations listed below support compliance to the standard(s) listed in the Summary of Results section.

Configuration 2

Equipment Tested:

Device	Manufacturer	Model #	S/N
90mm Smart	Allegion	OEM200	8A1815016

Support Equipment:

Device	Manufacturer	Model #	S/N
DC Power Supply	Allegion	PS-305D	020264904
Card	Allegion	None	None

General Product Information:

Product Information	Manufacturer-Provided Details
Equipment Type:	Radio Module
Modulation Type(s):	ASK
Maximum Duty Cycle:	100%
Antenna Type(s) and Gain:	Integral/1dbI
Antenna Connection Type:	Integral
Nominal Input Voltage:	12VDC
Firmware / Software used for Test:	M21_01_04

FCC Part 15 Subpart C

15.215(c) Occupied Bandwidth (20dB BW)

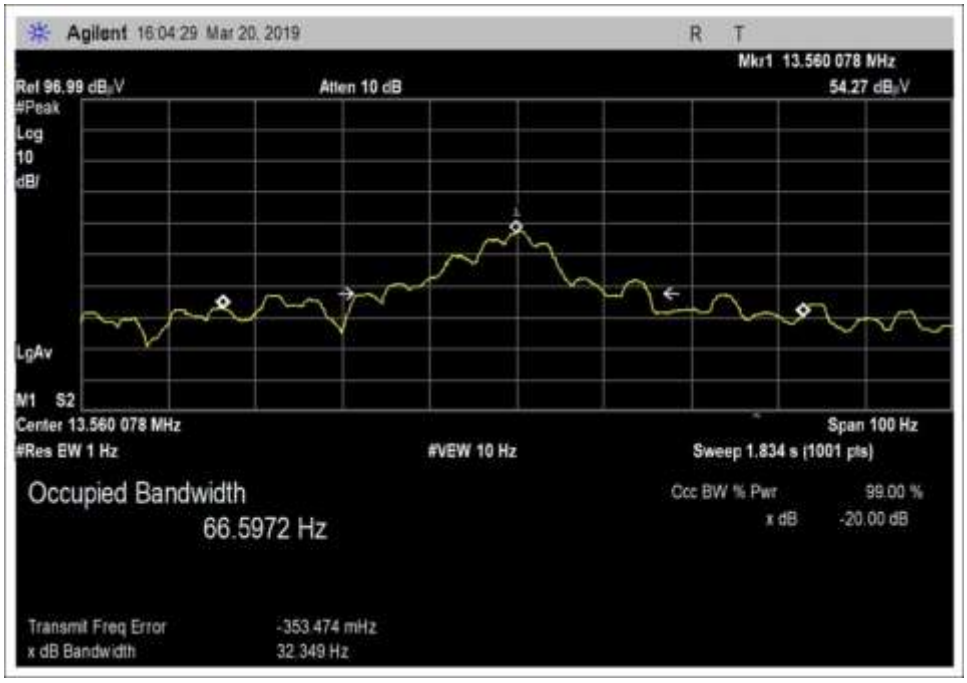
Test Setup/Conditions			
Test Location:	Fremont Lab C3	Test Engineer:	Hieu Song Nguyenpham
Test Method:	ANSI C63.10 (2013)	Test Date(s):	3/20/2019
Configuration:	2		
Test Setup:	The EUT is set up and operated as intended. It is powered at 12VDC from a DC Power supply which sits on the ground. The card is placed 2 inches away from the antenna to make the EUT transmit continuously. The measure antenna is 3m away for the EUT.		

Environmental Conditions			
Temperature (ºC)	23	Relative Humidity (%):	43

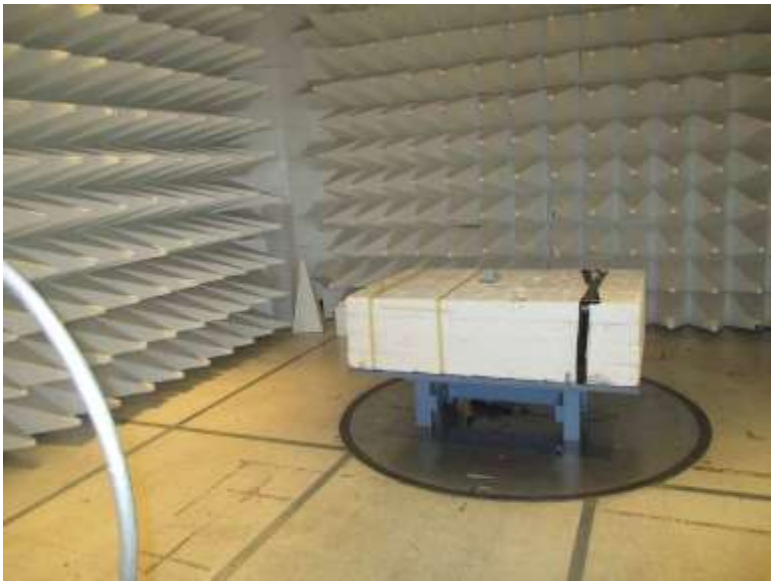
Test Equipment					
Asset#	**Description**	**Manufacturer**	**Model**	**Cal Date**	**Cal Due**
00432	Loop Antenna	EMCO	6502	2/19/2019	2/19/2021
P00880	Cable	Pasternack	RG214U	5/14/2018	5/14/2020
P06691	Cable	Pasternack	PE3062-180	5/14/2018	5/14/2020
02660	Spectrum Analyzer	Agilent	E4446A	10/19/2018	10/19/2020

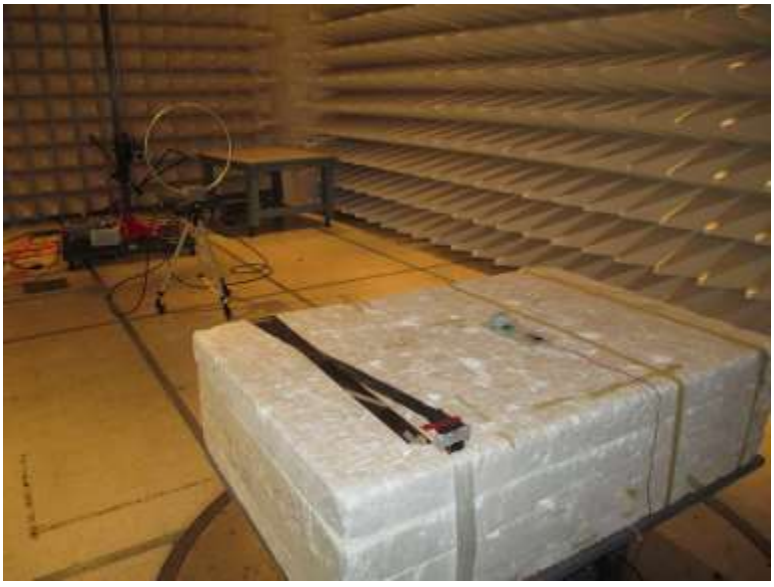
Test Data Summary					
Frequency (MHz)	**Antenna Port**	**Modulation**	**Measured (Hz)**	**Limit (kHz)**	**Results**
13.56	1	ASK	32.349	None	NA

Plot(s)


Agilent 16:04:29 Mar 20, 2019
R T
Mkr1 13.560 078 MHz
Ref 96.99 dBµV
Atten 10 dB
54.27 dBµV
#Peak
Log
10
dB/
LgAv
M1 S2
Center 13.560 078 MHz
Span 100 Hz
#Res BW 1 Hz
#VBW 10 Hz
Sweep 1.834 s (1001 pts)
Occupied Bandwidth
66.5972 Hz
Occ BW % Pwr 99.00 %
x dB -20.00 dB
Transmit Freq Error -353.474 mHz
x dB Bandwidth 32.349 Hz

Test Setup Photo(s)





15.225(a)-(c) Field Strength of Fundamental

Test Data Summary - Voltage Variations					
Frequency (MHz)	Modulation / Ant Port	$V_{Minimum}$ (dBuV/m@30m)	$V_{Nominal}$ (dBuV/m@30m)	$V_{Maximum}$ (dBuV/m@30m)	Max Deviation from $V_{Nominal}$ (dB)
13.56	ASK/Integral	34.3	34.3	34.3	0.0

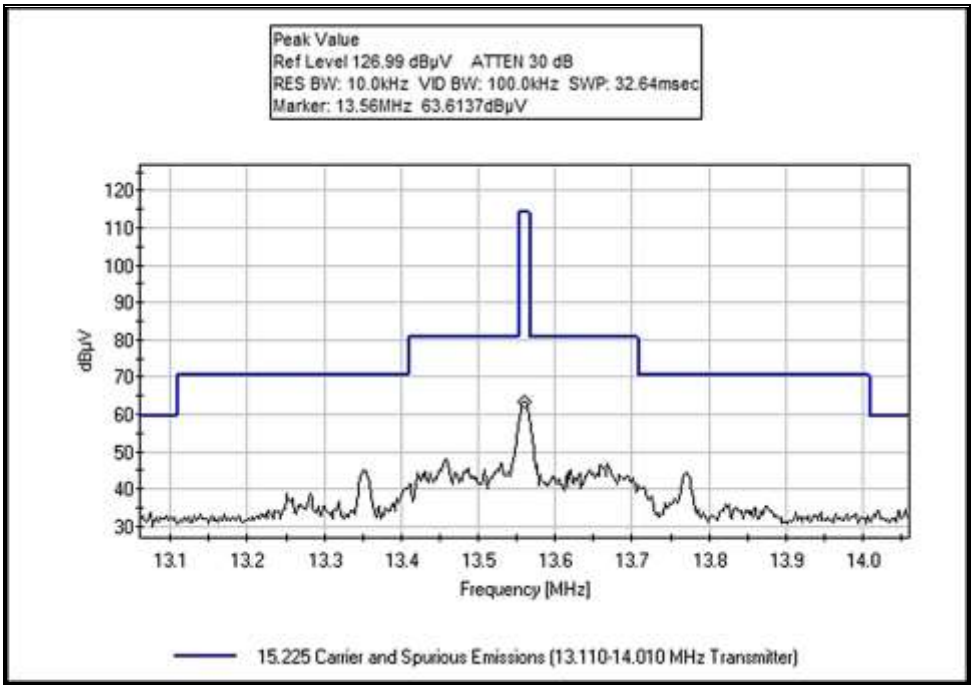
Test performed using operational mode with the highest output power, representing worst case.

Parameter Definitions:

Measurements performed at input voltage Vnominal ± 15%.

Parameter	Value
$V_{Nominal}$:	5-16VDC
$V_{Minimum}$:	4.25VDC
$V_{Maximum}$:	18.4VDC

Emissions Mask Data



Test Setup / Conditions / Data

Test Location:	CKC Laboratories Inc. • 1120 Fulton Place • Fremont, CA 94539 • 510 249-1170		
Customer:	**Allegion**		
Specification:	**15.225 Carrier and Spurious Emissions (13.110-14.010 MHz Transmitter)**		
Work Order #:	**102031**	Date:	3/21/2019
Test Type:	**Radiated Scan**	Time:	11:30:34
Tested By:	Hieu Song Nguyenpham	Sequence#:	142
Software:	EMITest 5.03.12		

Equipment Tested:

Device	Manufacturer	Model #	S/N
Configuration 2			

Support Equipment:

Device	Manufacturer	Model #	S/N
Configuration 2			

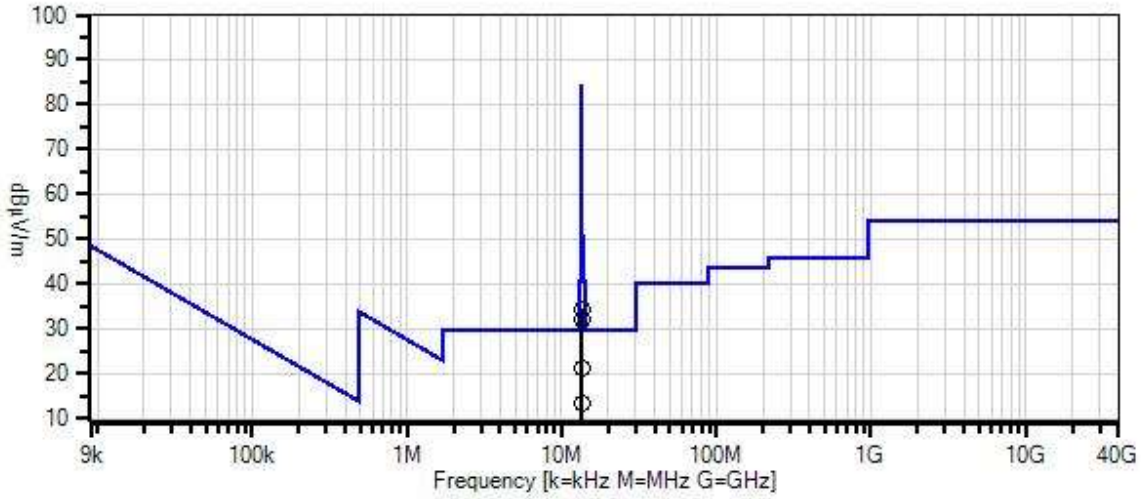
Test Conditions / Notes:

Fundamental

Temperature: 23.0°C
Relative Humidity: 43 %
Atmospheric Pressure: 101.4 kPa
High Clock: 27.12MHz
Transmitting operating frequency: 13.56MHz
Gain of the antenna: 1dBi
Firmware: M21_01_04
Method: ANSI C 63.10 2013

The EUT is set up and operated as intended. It is powered from a DC Power supply which sits on the ground. The card is placed 2 inches away from the antenna to make the EUT transmit continuously.

Allegion WO#: 102031 Sequence#: 142 Date: 3/21/2019
15.225 Carrier and Spurious Emissions (13.110-14.010 MHz Transmitter) Test Distance: 3 Meters



Readings
Peak Readings
QP Readings
Average Readings
Ambient
Software Version: 5.03.12
1 - 15.225 Carrier and Spurious Emissions (13.110-14.010 MHz Transmitter)

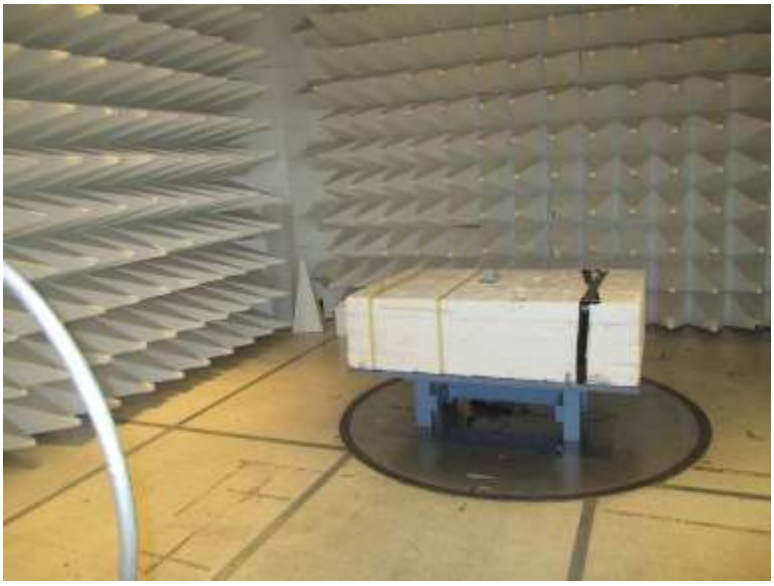
Test Equipment:

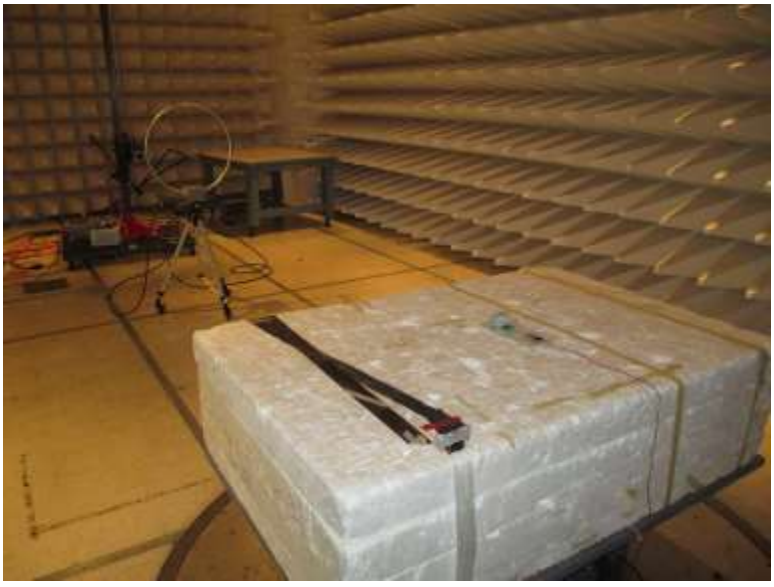
ID	Asset #	Description	Model	Calibration Date	Cal Due Date
T1	AN00432	Loop Antenna	6502	2/19/2019	2/19/2021
T2	ANP00880	Cable	RG214U	5/14/2018	5/14/2020
T3	ANP06691	Cable	PE3062-180	5/14/2018	5/14/2020
	AN02660	Spectrum Analyzer	E4446A	10/19/2018	10/19/2020

Measurement Data: Reading listed by margin. Test Distance: 3 Meters

#	Freq MHz	Rdng dBµV	T1 dB	T2 dB	T3 dB	dB	Dist Table	Corr dBµV/m	Spec dBµV/m	Margin dB	Polar Ant
1	13.560M	64.4	+9.5	+0.3	+0.1		-40.0	34.3	84.0 Y-axis-12V	-49.7	Paral
2	13.560M	64.3	+9.5	+0.3	+0.1		-40.0	34.2	84.0 Z-axis-12V	-49.8	Paral
3	13.560M	62.1	+9.5	+0.3	+0.1		-40.0	32.0	84.0 Y-axis-12V	-52.0	Perpe
4	13.560M	62.0	+9.5	+0.3	+0.1		-40.0	31.9	84.0 Z-axis-12V	-52.1	Perpe
5	13.560M	51.1	+9.5	+0.3	+0.1		-40.0	21.0	84.0 X-axis-12V	-63.0	Paral
6	13.560M	43.5	+9.5	+0.3	+0.1		-40.0	13.4	84.0 X-axis-12V	-70.6	Perpe

Test Setup Photo(s)





X-Axis

Y-Axis

Z-Axis

15.225(e) Frequency Stability

Test Setup/Conditions			
Test Location:	Fremont Lab Bench	Test Engineer:	Hieu Song Nguyenpham
Test Method:	ANSI C63.10 (2013)	Test Date(s):	4/1/2019
Configuration:	2		
Test Setup:	The EUT is operated as intended. It is placed inside of temperature chamber. The near field probe is placed next to the EUT.		

Environmental Conditions			
Temperature (ºC)	22.6	Relative Humidity (%):	46

Test Equipment					
Asset#	Description	Manufacturer	Model	Cal Date	Cal Due
02242	Thermometer	Omega	HH-26K	9/26/2018	9/26/2020
P06024	Near-Field Probe	CKC		6/4/2018	6/4/2020
P06692	Cable	Pasternack	PE3062-360	5/14/2018	5/14/2020
02721	Temperature Humidity Chamber/Oven	Thermotron	SM-8C	NCR	NCR

NCR = No Calibration Required

Test Data Summary					
Temperature (ºC)	Voltage	Frequency (MHz)	Deviation (%)	Limit (%)	Results
-20	$V_{Nominal}$	13.560230	0.0000013	±0.01	Pass
-10	$V_{Nominal}$	13.560230	0.0000013	±0.01	
0	$V_{Nominal}$	13.560200	0.0000010	±0.01	
10	$V_{Nominal}$	13.560170	0.0000007	±0.01	
20	$V_{Minimum}$	13.560100	0	±0.01	
20	$V_{Nominal}$	13.560100	0	±0.01	
20	$V_{Maximum}$	13.560100	0	±0.01	
30	$V_{Nominal}$	13.560070	0.0000003	±0.01	
40	$V_{Nominal}$	13.559970	0.0000013	±0.01	
50	$V_{Nominal}$	13.559970	0.0000013	±0.01	
Nominal Frequency:		13.560100			

Parameter Definitions:

Measurements performed at input voltage Vnominal ± 15%.

Parameter	Value
$V_{Nominal}$:	5-16VDC
$V_{Minimum}$:	4.25VDC
$V_{Maximum}$:	18.4VDC

Test Setup Photo

Temperature Testing

15.225(d) Radiated Emissions & Band Edge

Test Setup / Conditions/ Data

Test Location:	CKC Laboratories Inc. • 1120 Fulton Place • Fremont, CA 94539 • 510 249-1170		
Customer:	**Allegion**		
Specification:	**15.225 Carrier and Spurious Emissions (13.110-14.010 MHz Transmitter)**		
Work Order #:	**102031**	Date:	3/18/2019
Test Type:	**Radiated Scan**	Time:	15:12:25
Tested By:	Hieu Song Nguyenpham	Sequence#:	14
Software:	EMITest 5.03.12		

Equipment Tested:

Device	Manufacturer	Model #	S/N
Configuration 2			

Support Equipment:

Device	Manufacturer	Model #	S/N
Configuration 2			

Test Conditions / Notes:

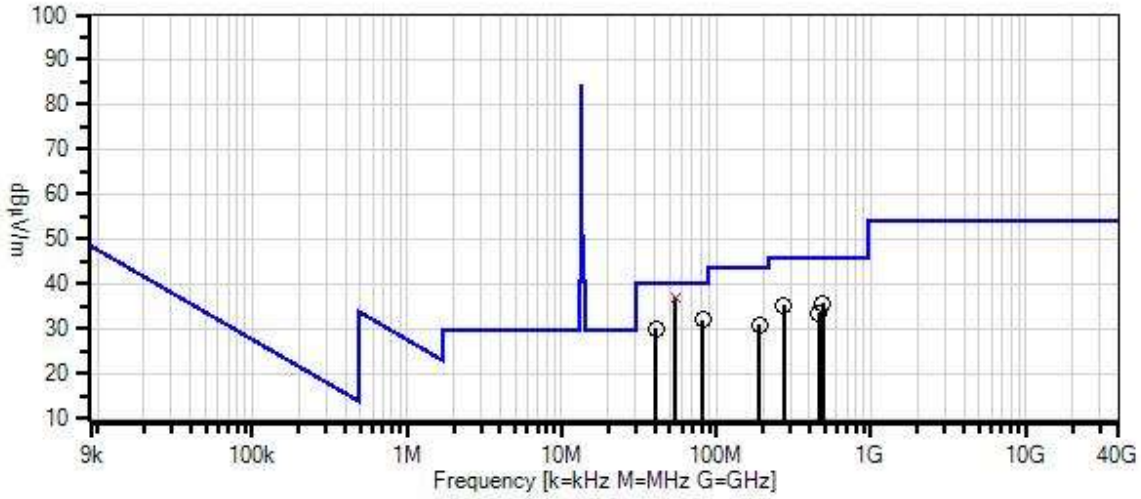
Radiated Emission
Frequency Range: 9kHz to 1000MHz

Temperature: 23.2°C
Relative Humidity: 38 %
Atmospheric Pressure: 101.15 kPa
High Clock: 27.12MHz
Transmitting operating frequency: 13.56MHz
Gain of the antenna: 1dBi
Firmware: M21_01_04
Test Method: ANSI C 63.10 2013

The EUT is set up and operated as intended. It is powered at 12VDC from a DC Power supply which sits on the ground. The card is placed 2 inches away from the antenna to make the EUT transmit continuously.

Transmit Mode
X-Axis

Allegion WO#: 102031 Sequence#: 14 Date: 3/18/2019
15.225 Carrier and Spurious Emissions (13.110-14.010 MHz Transmitter) Test Distance: 3 Meters



Readings
Peak Readings
QP Readings
Average Readings
Ambient
Software Version: 5.03.12
1 - 15.225 Carrier and Spurious Emissions (13.110-14.010 MHz Transmitter)

Test Equipment:

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
T1	AN00852	Biconilog Antenna	CBL 6111C	5/1/2018	5/1/2020
T2	ANP07508	Preamp	310N	10/15/2018	10/15/2020
T3	ANP06049	Attenuator	PE7002-6	5/14/2018	5/14/2020
T4	ANP00880	Cable	RG214U	5/14/2018	5/14/2020
T5	ANP01187	Cable	CNT-195	8/20/2018	8/20/2020
T6	ANP06691	Cable	PE3062-180	5/14/2018	5/14/2020
	AN02660	Spectrum Analyzer	E4446A	10/19/2018	10/19/2020
	AN00432	Loop Antenna	6502	2/19/2019	2/19/2021

Measurement Data: Reading listed by margin. Test Distance: 3 Meters

#	Freq	Rdng	T1 T5	T2 T6	T3	T4	Dist	Corr	Spec	Margin	Polar
	MHz	dBµV	dB	dB	dB	dB	Table	dBµV/m	dBµV/m	dB	Ant
1	54.243M QP	54.1	+7.9 +0.1	-32.1 +0.3	+6.0	+0.7	+0.0	37.0	40.0	-3.0	Vert
^	54.243M	55.0	+7.9 +0.1	-32.1 +0.3	+6.0	+0.7	+0.0	37.9	40.0	-2.1	Vert
3	81.376M	49.1	+7.9 +0.1	-32.1 +0.3	+5.9	+0.8	+0.0	32.0	40.0	-8.0	Vert
4	40.648M	41.0	+14.3 +0.1	-32.1 +0.2	+5.9	+0.5	+0.0	29.9	40.0	-10.1	Vert
5	488.140M	40.4	+17.7 +0.5	-32.0 +0.8	+6.0	+2.3	+0.0	35.7	46.0	-10.3	Horiz
6	271.203M	45.8	+12.9 +0.3	-32.0 +0.6	+6.0	+1.6	+0.0	35.2	46.0	-10.8	Horiz
7	460.993M	38.9	+17.1 +0.5	-32.0 +0.9	+5.9	+2.3	+0.0	33.6	46.0	-12.4	Horiz
8	189.882M	45.7	+9.1 +0.2	-32.0 +0.5	+6.0	+1.3	+0.0	30.8	43.5	-12.7	Horiz

Test Location:	CKC Laboratories Inc. • 1120 Fulton Place • Fremont, CA 94539 • 510 249-1170		
Customer:	**Allegion**		
Specification:	**15.225 Carrier and Spurious Emissions (13.110-14.010 MHz Transmitter)**		
Work Order #:	**102031**	Date:	3/18/2019
Test Type:	**Radiated Scan**	Time:	16:56:27
Tested By:	Hieu Song Nguyenpham	Sequence#:	29
Software:	EMITest 5.03.12		

Equipment Tested:

Device	Manufacturer	Model #	S/N
Configuration 2			

Support Equipment:

Device	Manufacturer	Model #	S/N
Configuration 2			

Test Conditions / Notes:

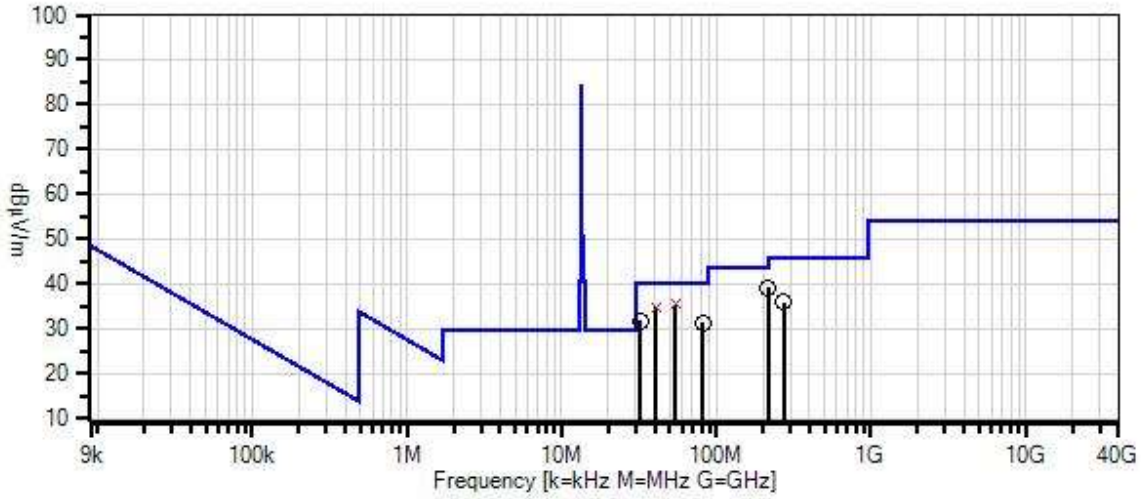
Radiated Emission
Frequency Range: 9kHz to 1000MHz

Temperature: 23.2°C
Relative Humidity: 38 %
Atmospheric Pressure: 101.15 kPa
High Clock: 27.12MHz
Transmitting operating frequency: 13.56MHz
Gain of the antenna: 1dBi
Firmware: M21_01_04
Test Method: ANSI C 63.10 2013

The EUT is set up and operated as intended. It is powered at 12VDC from a DC Power supply which sits on the ground. The card is placed 2 inches away from the antenna to make the EUT transmit continuously.

Transmit Mode
Y-axis

Allegion WO#: 102031 Sequence#: 29 Date: 3/18/2019
15.225 Carrier and Spurious Emissions (13.110-14.010 MHz Transmitter) Test Distance: 3 Meters



Readings
Peak Readings
QP Readings
Average Readings
Ambient
Software Version: 5.03.12
1 - 15.225 Carrier and Spurious Emissions (13.110-14.010 MHz Transmitter)

Test Equipment:

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
T1	AN00852	Biconilog Antenna	CBL 6111C	5/1/2018	5/1/2020
T2	ANP07508	Preamp	310N	10/15/2018	10/15/2020
T3	ANP06049	Attenuator	PE7002-6	5/14/2018	5/14/2020
T4	ANP00880	Cable	RG214U	5/14/2018	5/14/2020
T5	ANP01187	Cable	CNT-195	8/20/2018	8/20/2020
T6	ANP06691	Cable	PE3062-180	5/14/2018	5/14/2020
	AN02660	Spectrum Analyzer	E4446A	10/19/2018	10/19/2020
	AN00432	Loop Antenna	6502	2/19/2019	2/19/2021

Measurement Data: Reading listed by margin. Test Distance: 3 Meters

#	Freq	Rdng	T1 T5	T2 T6	T3	T4	Dist	Corr	Spec	Margin	Polar
	MHz	dBµV	dB	dB	dB	dB	Table	dBµV/m	dBµV/m	dB	Ant
1	54.240M	52.6	+7.9	-32.1	+6.0	+0.7	+0.0	35.5	40.0	-4.5	Vert
	QP		+0.1	+0.3							
^	54.240M	53.6	+7.9	-32.1	+6.0	+0.7	+0.0	36.5	40.0	-3.5	Vert
			+0.1	+0.3							
3	40.683M	46.0	+14.3	-32.1	+5.9	+0.5	+0.0	34.9	40.0	-5.1	Vert
	QP		+0.1	+0.2							
^	40.683M	48.1	+14.3	-32.1	+5.9	+0.5	+0.0	37.0	40.0	-3.0	Vert
			+0.1	+0.2							
5	216.940M	52.6	+10.3	-32.0	+6.0	+1.4	+0.0	39.2	46.0	-6.8	Horiz
			+0.3	+0.6							
6	32.020M	39.3	+17.9	-32.1	+5.9	+0.5	+0.0	31.8	40.0	-8.2	Vert
			+0.1	+0.2							
7	81.387M	48.5	+7.9	-32.1	+5.9	+0.8	+0.0	31.4	40.0	-8.6	Horiz
			+0.1	+0.3							
8	271.124M	46.5	+12.9	-32.0	+6.0	+1.6	+0.0	35.9	46.0	-10.1	Horiz
			+0.3	+0.6							

Test Location:	CKC Laboratories, Inc. • 1120 Fulton Place • Fremont, CA 94539 •		
Customer:	**Allegion**		
Specification:	**15.225 Carrier and Spurious Emissions (13.110-14.010 MHz Transmitter)**		
Work Order #:	**102031**	Date:	3/18/2019
Test Type:	**Radiated Scan**	Time:	16:34:58
Tested By:	Hieu Song Nguyenpham	Sequence#:	26
Software:	EMITest 5.03.12		

Equipment Tested:

Device	Manufacturer	Model #	S/N
Configuration 2			

Support Equipment:

Device	Manufacturer	Model #	S/N
Configuration 2			

Test Conditions / Notes:

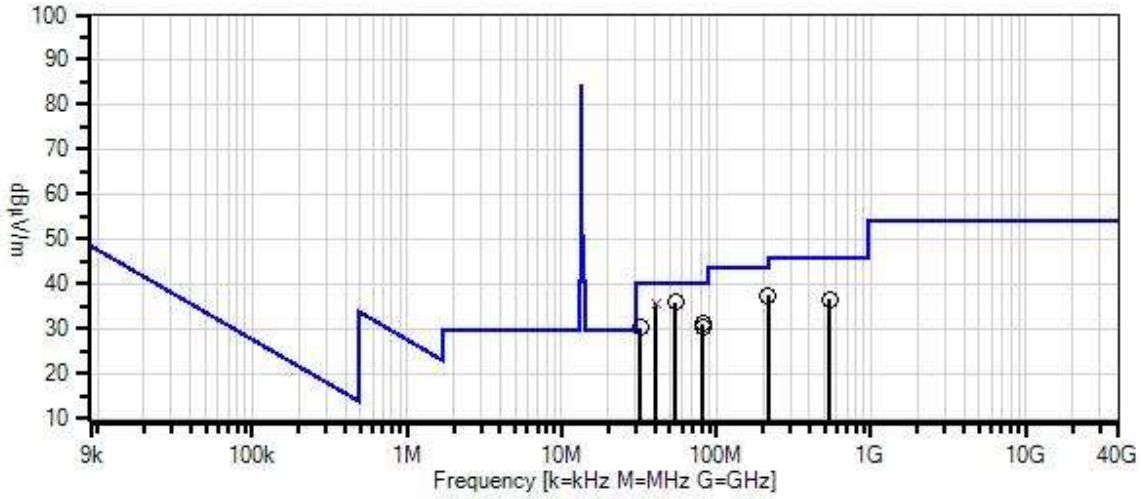
Radiated Emission
Frequency Range: 9kHz to 1000MHz

Temperature: 23.2°C
Relative Humidity: 38 %
Atmospheric Pressure: 101.15 kPa
High Clock: 27.12MHz
Transmitting operating frequency: 13.56MHz
Gain of the antenna: 1dBi
Firmware: M21_01_04
Test Method: ANSI C 63.10 2013

The EUT is set up and operated as intended. It is powered at 12VDC from a DC Power supply which sits on the ground. The card is placed 2 inches away from the antenna to make the EUT transmit continuously.

Transmit Mode
Z-axis

Allegion WO#: 102031 Sequence#: 26 Date: 3/18/2019
15.225 Carrier and Spurious Emissions (13.110-14.010 MHz Transmitter) Test Distance: 3 Meters



Readings
Peak Readings
QP Readings
Average Readings
Ambient
Software Version: 5.03.12
1 - 15.225 Carrier and Spurious Emissions (13.110-14.010 MHz Transmitter)

Test Equipment:

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
T1	AN00852	Biconilog Antenna	CBL 6111C	5/1/2018	5/1/2020
T2	ANP07508	Preamp	310N	10/15/2018	10/15/2020
T3	ANP06049	Attenuator	PE7002-6	5/14/2018	5/14/2020
T4	ANP00880	Cable	RG214U	5/14/2018	5/14/2020
T5	ANP01187	Cable	CNT-195	8/20/2018	8/20/2020
T6	ANP06691	Cable	PE3062-180	5/14/2018	5/14/2020
	AN02660	Spectrum Analyzer	E4446A	10/19/2018	10/19/2020
	AN00432	Loop Antenna	6502	2/19/2019	2/19/2021

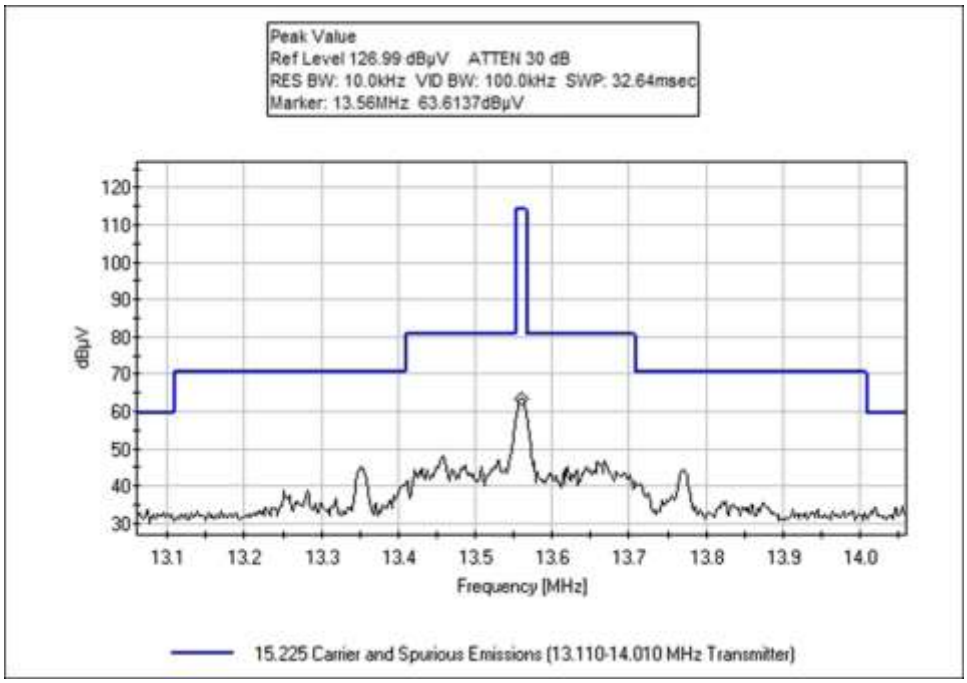
Measurement Data: Reading listed by margin. Test Distance: 3 Meters

#	Freq	Rdng	T1 T5	T2 T6	T3	T4	Dist	Corr	Spec	Margin	Polar
	MHz	dBµV	dB	dB	dB	dB	Table	dBµV/m	dBµV/m	dB	Ant
1	54.241M	52.9	+7.9 +0.1	-32.1 +0.3	+6.0	+0.7	+0.0	35.8	40.0	-4.2	Vert
2	40.682M QP	46.8	+14.3 +0.1	-32.1 +0.2	+5.9	+0.5	+0.0	35.7	40.0	-4.3	Vert
^	40.682M	48.7	+14.3 +0.1	-32.1 +0.2	+5.9	+0.5	+0.0	37.6	40.0	-2.4	Vert
4	216.940M	50.9	+10.3 +0.3	-32.0 +0.6	+6.0	+1.4	+0.0	37.5	46.0	-8.5	Horiz
5	81.387M	48.1	+7.9 +0.1	-32.1 +0.3	+5.9	+0.8	+0.0	31.0	40.0	-9.0	Vert
6	542.284M	39.8	+18.7 +0.6	-32.0 +1.0	+6.0	+2.5	+0.0	36.6	46.0	-9.4	Horiz
7	81.387M	47.5	+7.9 +0.1	-32.1 +0.3	+5.9	+0.8	+0.0	30.4	40.0	-9.6	Horiz
8	32.104M	37.7	+17.9 +0.1	-32.1 +0.2	+5.9	+0.5	+0.0	30.2	40.0	-9.8	Vert

Band Edge

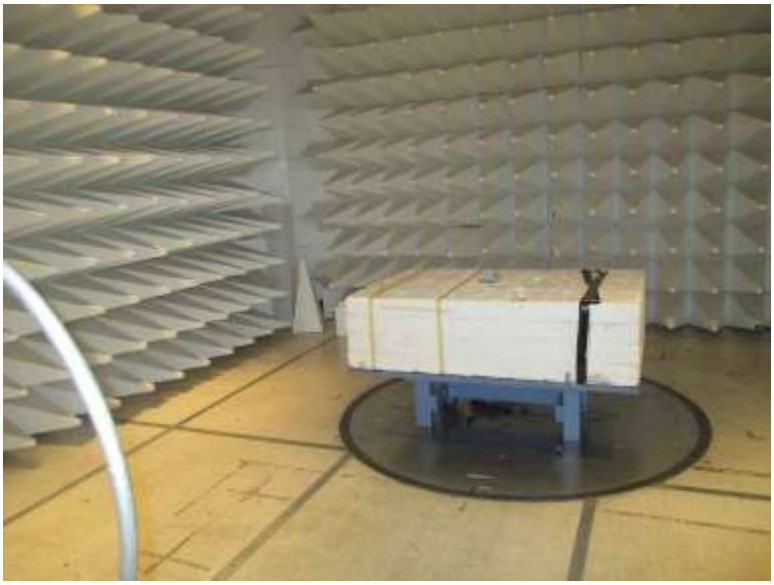
Band Edge Summary					
Frequency (MHz)	**Modulation**	**Ant. Type**	**Field Strength (dBuV/m @30m)**	**Limit (dBuV/m @30m)**	**Results**
13.110	ASK	Integral	1.6	≤29.5	Pass
14.010	ASK	Integral	0.8	≤29.5	Pass

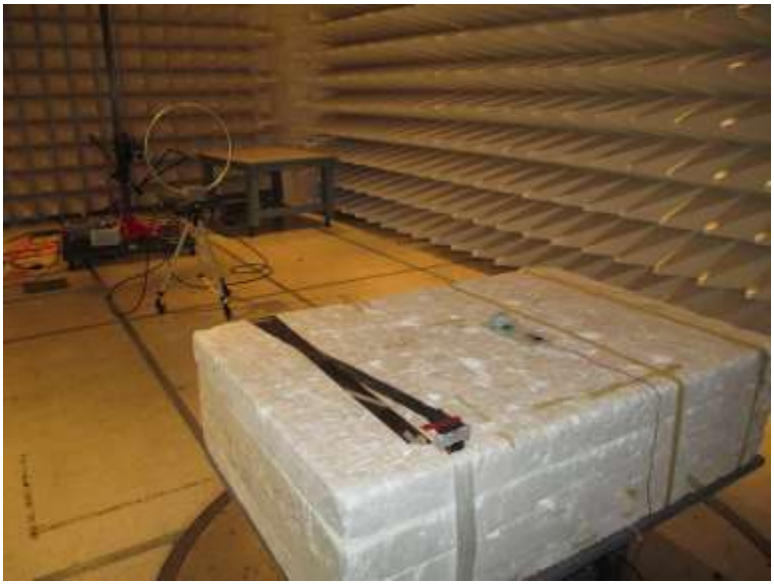
Band Edge Plots



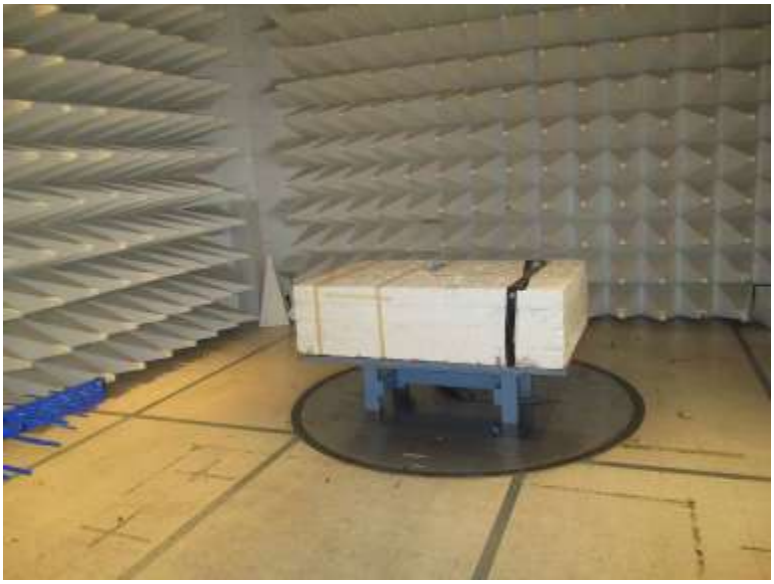
Test Setup Photo(s)

9kHz – 30MHz





30MHz – 1GHz



X-Axis

Y-Axis

Z-Axis

15.207 AC Conducted Emissions

Test Setup / Conditions / Data

Test Location:	CKC Laboratories Inc. • 1120 Fulton Place • Fremont, CA 94539 • 510 249-1170		
Customer:	**Allegion**		
Specification:	**15.207 AC Mains - Average**		
Work Order #:	**102031**	Date:	3/19/2019
Test Type:	**Conducted Emissions**	Time:	16:38:12
Tested By:	Hieu Song Nguyenpham	Sequence#:	101
Software:	EMITest 5.03.12		120V 60Hz

Equipment Tested:

Device	Manufacturer	Model #	S/N
Configuration 2			

Support Equipment:

Device	Manufacturer	Model #	S/N
Configuration 2			

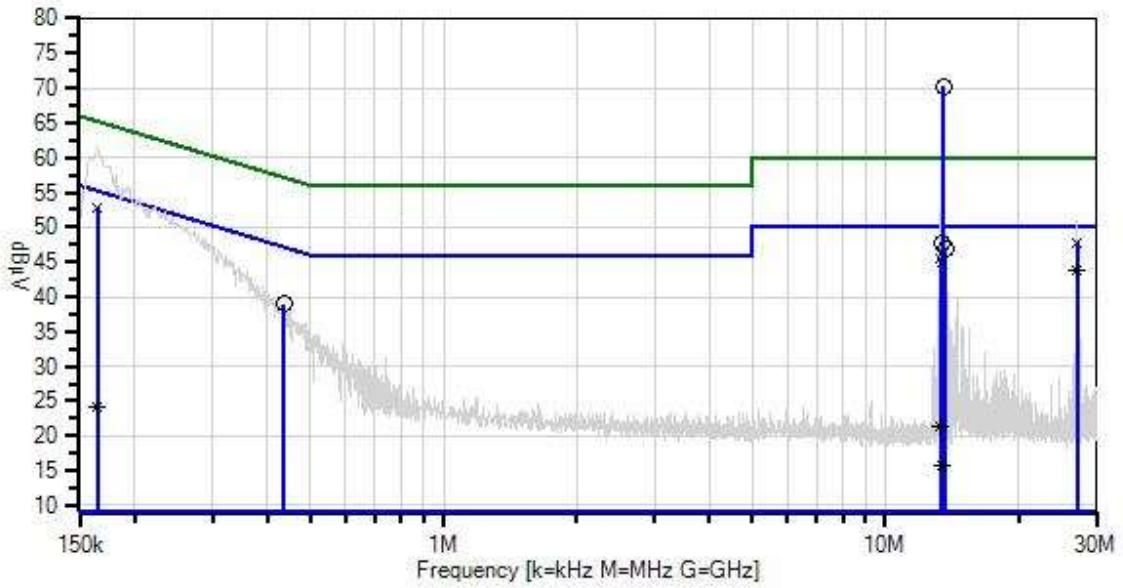
Test Conditions / Notes:

Conducted Emission
Frequency Range: 150kHz to 30MHz

Temperature: 23.2°C
Relative Humidity: 38 %
Atmospheric Pressure: 101.15 kPa
High Clock: 27.12MHz
Transmitting operating frequency: 13.56MHz
Gain of the antenna: 1dBi
Firmware: M21_01_04
Test Method: ANSI C63.10 (2013)

The EUT is set up and operated as intended. It is powered at 12VDC from a DC Power supply which sits next to the EUT. The card is placed 2 inches away from the antenna to make the EUT transmit continuously.

Allegion WO#: 102031 Sequence#: 101 Date: 3/19/2019
15.207 AC Mains - Average Test Lead: 120V 60Hz



Sweep Data
× QP Readings
Software Version: 5.03.12
Readings
Average Readings
1 - 15.207 AC Mains - Average
Peak Readings
Ambient
2 - 15.207 AC Mains - Quasi-peak

Test Equipment:

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
T1	ANP01211	Attenuator	23-10-34	2/22/2019	2/22/2021
T2	ANP00880	Cable	RG214U	5/14/2018	5/14/2020
T3	ANP06691	Cable	PE3062-180	5/14/2018	5/14/2020
	AN02660	Spectrum Analyzer	E4446A	10/19/2018	10/19/2020
T4	ANP05258	High Pass Filter	HE9615-150K-50-720B	9/19/2018	9/19/2020
T5	AN00494	50uH LISN-Line Loss (dB)	3816/NM	3/11/2019	3/11/2021
	AN00494	50uH LISN-Return Loss (dB)	3816/NM	3/11/2019	3/11/2021

Measurement Data: Reading listed by margin. Test Lead: Line

#	Freq	Rdng	T1 T5	T2	T3	T4	Dist	Corr	Spec	Margin	Polar
	MHz	dBµV	dB	dB	dB	dB	Table	dBµV	dBµV	dB	Ant
1	13.562M	59.6	+9.9 +0.3	+0.3	+0.1	+0.1	+0.0	70.3	50.0 Fundamental	+20.3	Line
2	13.436M	37.1	+9.9 +0.3	+0.3	+0.1	+0.1	+0.0	47.8	50.0	-2.2	Line
3	13.697M	36.1	+9.9 +0.3	+0.3	+0.1	+0.1	+0.0	46.8	50.0	-3.2	Line
4	27.120M Ave	33.1	+9.9 +0.1	+0.4	+0.2	+0.2	+0.0	43.9	50.0	-6.1	Line
5	435.790k	28.6	+9.9 +0.3	+0.0	+0.0	+0.1	+0.0	38.9	47.1	-8.2	Line
6	27.120M QP	37.0	+9.9 +0.1	+0.4	+0.2	+0.2	+0.0	47.8	60.0	-12.2	Line
^	27.120M	40.6	+9.9 +0.1	+0.4	+0.2	+0.2	+0.0	51.4	50.0	+1.4	Line
8	164.543k QP	42.3	+9.9 +0.3	+0.0	+0.0	+0.4	+0.0	52.9	65.2	-12.3	Line
9	13.348M QP	34.8	+9.9 +0.3	+0.3	+0.1	+0.1	+0.0	45.5	60.0	-14.5	Line
10	13.454M QP	34.1	+9.9 +0.3	+0.3	+0.1	+0.1	+0.0	44.8	60.0	-15.2	Line
11	13.348M Ave	10.7	+9.9 +0.3	+0.3	+0.1	+0.1	+0.0	21.4	50.0	-28.6	Line
^	13.348M	42.2	+9.9 +0.3	+0.3	+0.1	+0.1	+0.0	52.9	50.0	+2.9	Line
13	164.543k Ave	13.6	+9.9 +0.3	+0.0	+0.0	+0.4	+0.0	24.2	55.2	-31.0	Line
^	164.543k	49.5	+9.9 +0.3	+0.0	+0.0	+0.4	+0.0	60.1	55.2	+4.9	Line
15	13.454M Ave	5.1	+9.9 +0.3	+0.3	+0.1	+0.1	+0.0	15.8	50.0	-34.2	Line
^	13.454M	44.4	+9.9 +0.3	+0.3	+0.1	+0.1	+0.0	55.1	50.0	+5.1	Line

Test Location:	CKC Laboratories Inc. • 1120 Fulton Place • Fremont, CA 94539 • 510 249-1170		
Customer:	**Allegion**		
Specification:	**15.207 AC Mains - Average**		
Work Order #:	**102031**	Date:	3/19/2019
Test Type:	**Conducted Emissions**	Time:	16:49:50
Tested By:	Hieu Song Nguyenpham	Sequence#:	102
Software:	EMITest 5.03.12		120V 60Hz

Equipment Tested:

Device	Manufacturer	Model #	S/N
Configuration 2			

Support Equipment:

Device	Manufacturer	Model #	S/N
Configuration 2			

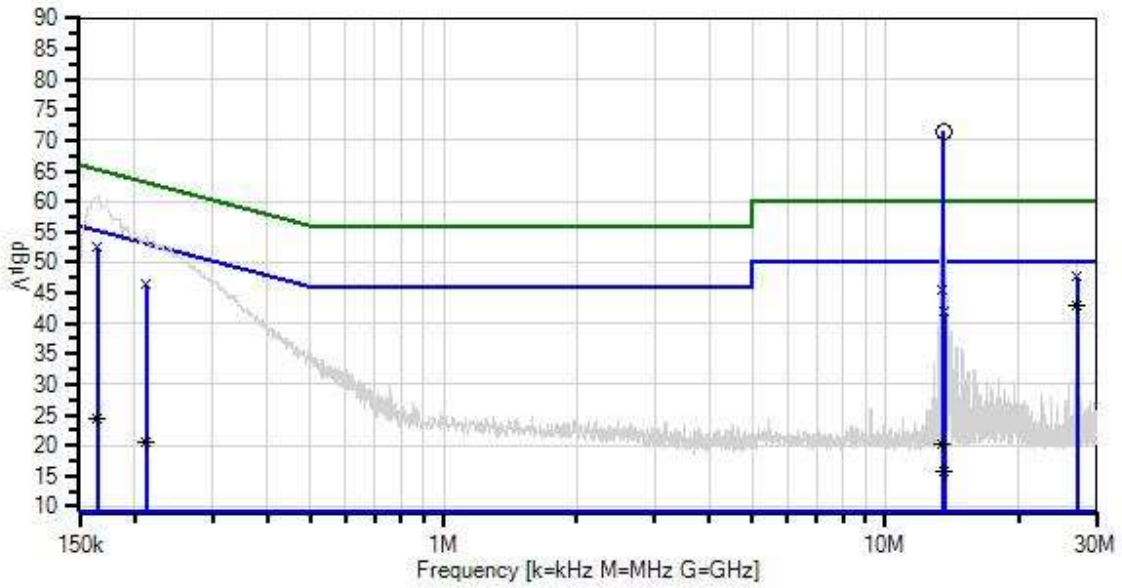
Test Conditions / Notes:

Conducted Emission
Frequency Range: 150kHz to 30MHz

Temperature: 23.2°C
Relative Humidity: 38 %
Atmospheric Pressure: 101.15 kPa
High Clock: 27.12MHz
Transmitting operating frequency: 13.56MHz
Gain of the antenna: 1dBi
Firmware: M21_01_04
Test Method: ANSI C63.10 (2013)

The EUT is set up and operated as intended. It is powered at 12VDC from a DC Power supply which sits next to the EUT. The card is placed 2 inches away from the antenna to make the EUT transmit continuously.

Allegion WO#: 102031 Sequence#: 102 Date: 3/19/2019
15.207 AC Mains - Average Test Lead: 120V 60Hz



Sweep Data
× QP Readings
Software Version: 5.03.12
Readings
Average Readings
1 - 15.207 AC Mains - Average
Peak Readings
Ambient
2 - 15.207 AC Mains - Quasi-peak

Test Equipment:

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
T1	ANP01211	Attenuator	23-10-34	2/22/2019	2/22/2021
T2	ANP00880	Cable	RG214U	5/14/2018	5/14/2020
T3	ANP06691	Cable	PE3062-180	5/14/2018	5/14/2020
	AN02660	Spectrum Analyzer	E4446A	10/19/2018	10/19/2020
T4	ANP05258	High Pass Filter	HE9615-150K-50-720B	9/19/2018	9/19/2020
	AN00494	50uH LISN-Line Loss (dB)	3816/NM	3/11/2019	3/11/2021
T5	AN00494	50uH LISN-Return Loss (dB)	3816/NM	3/11/2019	3/11/2021

Measurement Data: Reading listed by margin. Test Lead: Neutral

#	Freq	Rdng	T1 T5	T2	T3	T4	Dist	Corr	Spec	Margin	Polar
	MHz	dBµV	dB	dB	dB	dB	Table	dBµV	dBµV	dB	Ant
1	13.562M	60.9	+9.9 +0.2	+0.3	+0.1	+0.1	+0.0	71.5	50.0 Fundamental	+21.5	Neutr
2	27.120M Ave	32.2	+9.9 +0.0	+0.4	+0.2	+0.2	+0.0	42.9	50.0	-7.1	Neutr
3	27.120M QP	36.9	+9.9 +0.0	+0.4	+0.2	+0.2	+0.0	47.6	60.0	-12.4	Neutr
^	27.120M	39.3	+9.9 +0.0	+0.4	+0.2	+0.2	+0.0	50.0	50.0	+0.0	Neutr
5	164.543k QP	41.9	+9.9 +0.2	+0.0	+0.0	+0.4	+0.0	52.4	65.2	-12.8	Neutr
6	13.454M QP	35.0	+9.9 +0.2	+0.3	+0.1	+0.1	+0.0	45.6	60.0	-14.4	Neutr
7	212.539k QP	36.2	+9.9 +0.2	+0.0	+0.0	+0.1	+0.0	46.4	63.1	-16.7	Neutr
8	13.598M QP	31.3	+9.9 +0.2	+0.3	+0.1	+0.1	+0.0	41.9	60.0	-18.1	Neutr
9	13.454M Ave	9.6	+9.9 +0.2	+0.3	+0.1	+0.1	+0.0	20.2	50.0	-29.8	Neutr
^	13.454M	46.3	+9.9 +0.2	+0.3	+0.1	+0.1	+0.0	56.9	50.0	+6.9	Neutr
11	164.543k Ave	13.7	+9.9 +0.2	+0.0	+0.0	+0.4	+0.0	24.2	55.2	-31.0	Neutr
^	164.543k	49.4	+9.9 +0.2	+0.0	+0.0	+0.4	+0.0	59.9	55.2	+4.7	Neutr
13	212.539k Ave	10.5	+9.9 +0.2	+0.0	+0.0	+0.1	+0.0	20.7	53.1	-32.4	Neutr
^	212.539k	43.5	+9.9 +0.2	+0.0	+0.0	+0.1	+0.0	53.7	53.1	+0.6	Neutr
15	13.598M Ave	5.1	+9.9 +0.2	+0.3	+0.1	+0.1	+0.0	15.7	50.0	-34.3	Neutr
^	13.598M	41.2	+9.9 +0.2	+0.3	+0.1	+0.1	+0.0	51.8	50.0	+1.8	Neutr

Test Location:	CKC Laboratories Inc. • 1120 Fulton Place • Fremont, CA 94539 • 510 249-1170		
Customer:	**Allegion**		
Specification:	**15.207 AC Mains - Average**		
Work Order #:	**102031**	Date:	3/19/2019
Test Type:	**Conducted Emissions**	Time:	16:53:02
Tested By:	Hieu Song Nguyenpham	Sequence#:	103
Software:	EMITest 5.03.12		120V 60Hz

Equipment Tested:

Device	Manufacturer	Model #	S/N
Configuration 2			

Support Equipment:

Device	Manufacturer	Model #	S/N
Configuration 2			

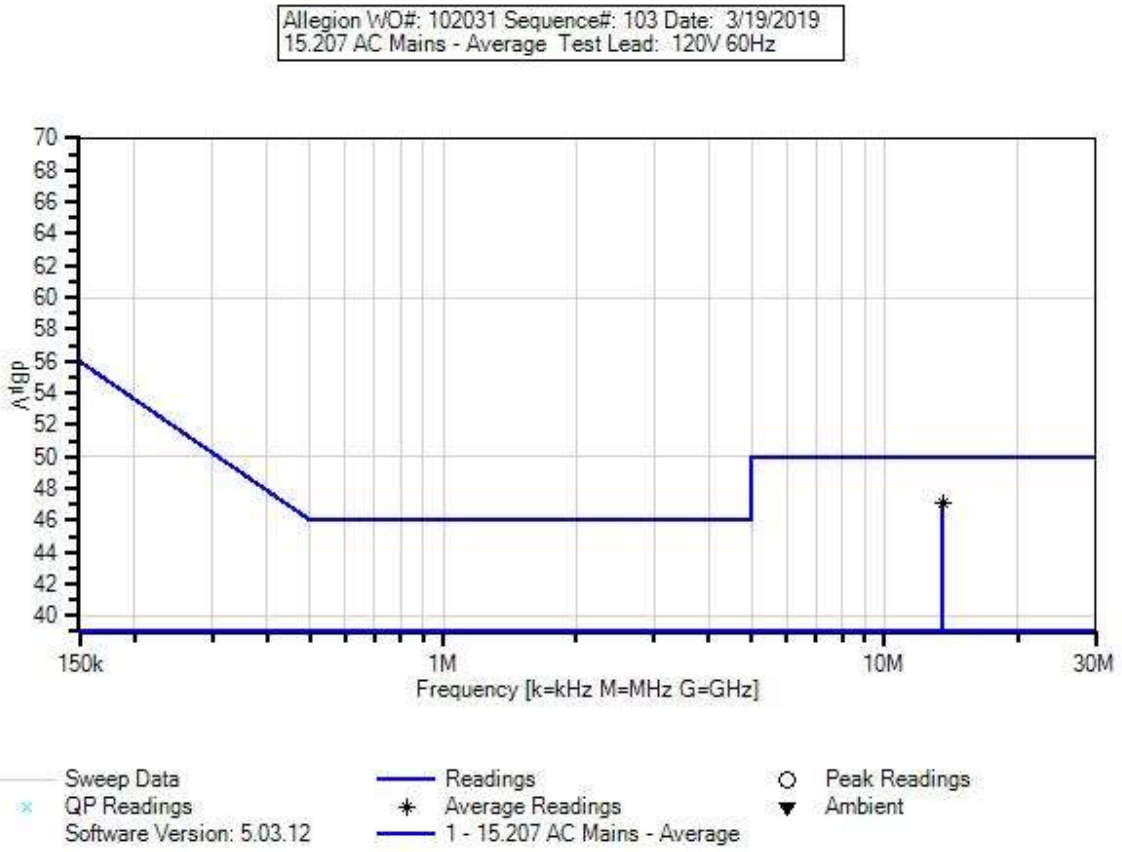
Test Conditions / Notes:

Conducted Emission
Frequency Range: 150kHz to 30MHz

Temperature: 23.2°C
Relative Humidity: 38 %
Atmospheric Pressure: 101.15 kPa
High Clock: 27.12MHz
Transmitting operating frequency: 13.56MHz
Gain of the antenna: 1dBi
Firmware: M21_01_04
Test Method: ANSI C63.10 (2013)

The EUT is set up and operated as intended. It is powered at 12VDC from a DC Power supply which sits next to the EUT. The 13.56MHz antenna is connected to 50Ohm Dummy Load.

Note: Fundamental



Test Equipment:

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
T1	ANP01211	Attenuator	23-10-34	2/22/2019	2/22/2021
T2	ANP00880	Cable	RG214U	5/14/2018	5/14/2020
T3	ANP06691	Cable	PE3062-180	5/14/2018	5/14/2020
	AN02660	Spectrum Analyzer	E4446A	10/19/2018	10/19/2020
T4	ANP05258	High Pass Filter	HE9615-150K-50-720B	9/19/2018	9/19/2020
T5	AN00494	50uH LISN-Line Loss (dB)	3816/NM	3/11/2019	3/11/2021
	AN00494	50uH LISN-Return Loss (dB)	3816/NM	3/11/2019	3/11/2021

Measurement Data: Reading listed by margin. Test Lead: Line

#	Freq	Rdng	T1 T5	T2	T3	T4	Dist	Corr	Spec	Margin	Polar
	MHz	dBµV	dB	dB	dB	dB	Table	dBµV	dBµV	dB	Ant
1	13.560M	36.4	+9.9	+0.3	+0.1	+0.1	+0.0	47.1	50.0	-2.9	Line
Ave			+0.3								
^	13.560M	46.4	+9.9	+0.3	+0.1	+0.1	+0.0	57.1	50.0	+7.1	Line
			+0.3								

Test Location:	CKC Laboratories Inc. • 1120 Fulton Place • Fremont, CA 94539 • 510 249-1170		
Customer:	**Allegion**		
Specification:	**15.207 AC Mains - Average**		
Work Order #:	**102031**	Date:	3/19/2019
Test Type:	**Conducted Emissions**	Time:	16:55:12
Tested By:	Hieu Song Nguyenpham	Sequence#:	104
Software:	EMITest 5.03.12		120V 60Hz

Equipment Tested:

Device	Manufacturer	Model #	S/N
Configuration 2			

Support Equipment:

Device	Manufacturer	Model #	S/N
Configuration 2			

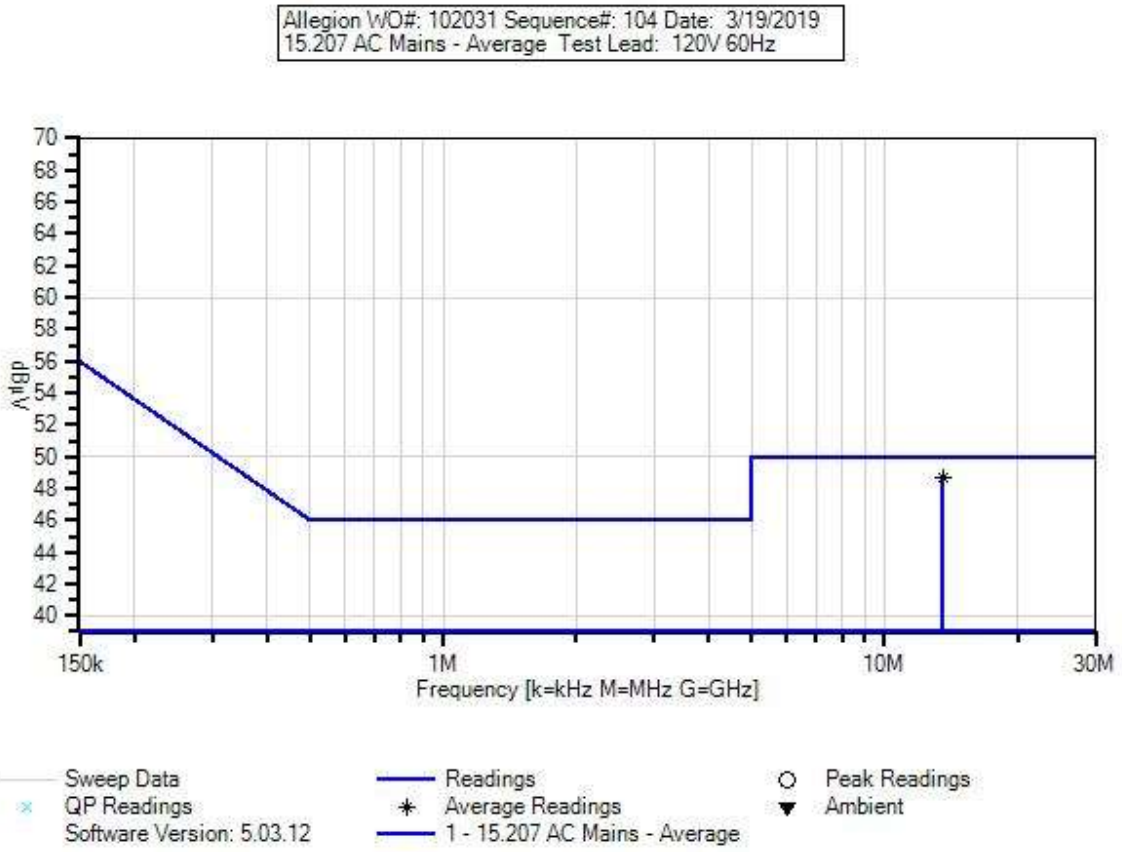
Test Conditions / Notes:

Conducted Emission
Frequency Range: 150kHz to 30MHz

Temperature: 23.2°C
Relative Humidity: 38 %
Atmospheric Pressure: 101.15 kPa
High Clock: 27.12MHz
Transmitting operating frequency: 13.56MHz
Gain of the antenna: 1dBi
Firmware: M21_01_04
Test Method: ANSI C63.10 (2013)

The EUT is set up and operated as intended. It is powered at 12VDC from a DC Power supply which sits next to the EUT. The 13.56MHz antenna is connected to 50Ohm Dummy Load.

Note: Fundamental



Test Equipment:

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
T1	ANP01211	Attenuator	23-10-34	2/22/2019	2/22/2021
T2	ANP00880	Cable	RG214U	5/14/2018	5/14/2020
T3	ANP06691	Cable	PE3062-180	5/14/2018	5/14/2020
	AN02660	Spectrum Analyzer	E4446A	10/19/2018	10/19/2020
T4	ANP05258	High Pass Filter	HE9615-150K-50-720B	9/19/2018	9/19/2020
	AN00494	50uH LISN-Line Loss (dB)	3816/NM	3/11/2019	3/11/2021
T5	AN00494	50uH LISN-Return Loss (dB)	3816/NM	3/11/2019	3/11/2021

Measurement Data: Reading listed by margin. Test Lead: Neutral

#	Freq	Rdng	T1 T5	T2	T3	T4	Dist	Corr	Spec	Margin	Polar
	MHz	dBµV	dB	dB	dB	dB	Table	dBµV	dBµV	dB	Ant
1	13.560M	38.1	+9.9	+0.3	+0.1	+0.1	+0.0	48.7	50.0	-1.3	Neutr
Ave			+0.2								
^	13.560M	47.8	+9.9	+0.3	+0.1	+0.1	+0.0	58.4	50.0	+8.4	Neutr
			+0.2								

Test Setup Photo(s)

SUPPLEMENTAL INFORMATION

Measurement Uncertainty

Uncertainty Value	Parameter
4.73 dB	Radiated Emissions
3.34 dB	Mains Conducted Emissions
3.30 dB	Disturbance Power

Uncertainties reported are worst case for all CKC Laboratories' sites and represent expanded uncertainties expressed at approximately the 95% confidence level using a coverage factor of k=2.
Compliance is deemed to occur provided measurements are below the specified limits.

Emissions Test Details

TESTING PARAMETERS

Unless otherwise indicated, the following configuration parameters are used for equipment setup: The cables were routed consistent with the typical application by varying the configuration of the test sample. Interface cables were connected to the available ports of the test unit. The effect of varying the position of the cables was investigated to find the configuration that produced maximum emissions. Cables were of the type and length specified in the individual requirements. The length of cable that produced maximum emissions was selected.

The equipment under test (EUT) was set up in a manner that represented its normal use, as shown in the setup photographs. Any special conditions required for the EUT to operate normally are identified in the comments that accompany the emissions tables.

The emissions data was taken with a spectrum analyzer or receiver. Incorporating the applicable correction factors for distance, antenna, cable loss and amplifier gain, the data was reduced as shown in the table below. The corrected data was then compared to the applicable emission limits. Preliminary and final measurements were taken in order to ensure that all emissions from the EUT were found and maximized.

CORRECTION FACTORS

The basic spectrum analyzer reading was converted using correction factors as shown in the highest emissions readings in the tables. For radiated emissions in dBµV/m, the spectrum analyzer reading in dBµV was corrected by using the following formula. This reading was then compared to the applicable specification limit. Individual measurements were compared with the displayed limit value in the margin column. The margin was calculated based on subtracting the limit value from the corrected measurement value; a positive margin represents a measurement exceeding the limit, while a negative margin represents a measurement less than the limit.

SAMPLE CALCULATIONS		
	Meter reading	(dBµV)
+	Antenna Factor	(dB/m)
+	Cable Loss	(dB)
-	Distance Correction	(dB)
-	Preamplifier Gain	(dB)
=	Corrected Reading	(dBµV/m)

TEST INSTRUMENTATION AND ANALYZER SETTINGS

The test instrumentation and equipment listed were used to collect the emissions data. A spectrum analyzer or receiver was used for all measurements. Unless otherwise specified, the following table shows the measuring equipment bandwidth settings that were used in designated frequency bands. For testing emissions, an appropriate reference level and a vertical scale size of 10 dB per division were used.

MEASURING EQUIPMENT BANDWIDTH SETTINGS PER FREQUENCY RANGE			
TEST	BEGINNING FREQUENCY	ENDING FREQUENCY	BANDWIDTH SETTING
CONDUCTED EMISSIONS	150 kHz	30 MHz	9 kHz
RADIATED EMISSIONS	9 kHz	150 kHz	200 Hz
RADIATED EMISSIONS	150 kHz	30 MHz	9 kHz
RADIATED EMISSIONS	30 MHz	1000 MHz	120 kHz
RADIATED EMISSIONS	1000 MHz	>1 GHz	1 MHz

SPECTRUM ANALYZER/RECEIVER DETECTOR FUNCTIONS

The notes that accompany the measurements contained in the emissions tables indicate the type of detector function used to obtain the given readings. Unless otherwise noted, all readings were made in the "positive peak" detector mode. Whenever a "quasi-peak" or "average" reading was recorded, the measurement was annotated with a "QP" or an "Ave" on the appropriate rows of the data sheets. In cases where quasi-peak or average limits were employed and data exists for multiple measurement types for the same frequency then the peak measurement was retained in the report for reference, however the numbering for the affected row was removed and an arrow or caret ("^") was placed in the far left-hand column indicating that the row above takes precedence for comparison to the limit. The following paragraphs describe in more detail the detector functions and when they were used to obtain the emissions data.

Peak

In this mode, the spectrum analyzer or receiver recorded all emissions at their peak value as the frequency band selected was scanned. By combining this function with another feature called "peak hold," the measurement device had the ability to measure intermittent or low duty cycle transient emission peak levels. In this mode the measuring device made a slow scan across the frequency band selected and measured the peak emission value found at each frequency across the band.

Quasi-Peak

Quasi-peak measurements were taken using the quasi-peak detector when the true peak values exceeded or were within 2 dB of a quasi-peak specification limit. Additional QP measurements may have been taken at the discretion of the operator.

Average

Average measurements were taken using the average detector when the true peak values exceeded or were within 2 dB of an average specification limit. Additional average measurements may have been taken at the discretion of the operator. If the specification or test procedure requires trace averaging, then the averaging was performed using 100 samples or as required by the specification. All other average measurements are performed using video bandwidth averaging. To make these measurements, the test engineer reduces the video bandwidth on the measuring device until the modulation of the signal is filtered out. At this point, the measuring device is set into the linear mode and the scan time is reduced.