

Test Report # 319351 B

Equipment Under Test: Allegion AD 900 MHz Module v3

Requirement(s): FCC 2.1091, FCC 1.1307, RSS-102

Test Date(s): October 13th – 27th, 2021

Prepared for:
 Allegion
 Attn: Brian Telljohann
 11819 North Pennsylvania Street
 Carmel, Indiana 40632

Report Issued by: Zach Wilson, EMC Engineer

Signature: *Zach Wilson*

Date: 2/14/2022

Report Reviewed by: Adam Alger, Laboratory Manager

Signature: *Adam Alger*

Date: 2/14/2022

Report Constructed by: Zach Wilson, EMC Engineer

Signature: *Zach Wilson*

Date: 2/14/2022

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Report: TR319351 B		Model: COMAD400V3
Job: C-3419		Serial: Engineering Sample

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Laird Connectivity Test Services in Review

The Laird Connectivity LLC laboratory located at W66 N220 Commerce Court Cedarburg, Wisconsin, 53012 USA is recognized through the following organizations:



A2LA – American Association for Laboratory Accreditation

Accreditation based on ISO/IEC 17025:2017 with Electrical (EMC) Scope

A2LA Certificate Number: 1255.01

Scope of accreditation includes all test methods listed herein unless otherwise noted



Federal Communications Commission (FCC) – USA

Accredited Test Firm Registration Number: 953492

Recognition of two 3 meter Semi-Anechoic Chambers



**Government
of Canada**

Innovation, Science and Economic Development Canada

Accredited U.S. Identification Number: US0218

Recognition of two 3 meter Semi-Anechoic Chambers

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1 TEST REPORT SUMMARY

During **October 13th-27th, 2021** the Equipment Under Test (EUT), **Allegion AD 900 MHz Module v3**, as provided by **Allegion** was tested to the following requirements of the **Federal Communications Commission** and **Innovation, Science and Economic Development Canada**:

Requirement	Description	Specification	Method	Result
FCC Part 1.1307, 2.1091	RF Exposure and equipment authorization requirements	Reported	FCC KDB 447498	Reported
ISED Canada RSS-102	Radio Frequency Radiation Exposure Evaluation	Reported	RSS-102 Section 2.5.2	Reported

Notice:

The results relate only to the item tested as configured and described in this report. Any additional configurations, modes of operation, or modifications made to the equipment under test after the specified test date(s) are at the decision of the client and may not apply to the data seen in this test report.

The decision rule for Pass / Fail assessment to the specification or standard listed in this test report has been agreed upon by the client and laboratory to be as follows:

Measurement Type	Rule
Emissions – Amplitude	1 dB below specified limit
Emissions – Frequency	1% less than the specification
Immunity	Tested at specified level

2 CLIENT INFORMATION

Company Name	Allegion
Contact Person	Brian Telljohann
Address	11819 North Pennsylvania Street Carmel, Indiana 46032

2.1 Equipment Under Test (EUT) Information

The following information has been supplied by the client

Product Name	Allegion AD 900 MHz Module v3
Model Number	COMAD400V3
Serial Number	Engineering Sample
FCC ID	XPB-COMAD400V3
IC ID	8053B-COMAD400V3

2.2 Product Description

The EUT is a 900 MHz radio module used in door locks. The EUT is powered at 5VDC.

2.3 Modifications Incorporated for Compliance

None noted at time of test

2.4 Deviations and Exclusions from Test Specifications

None noted at time of test

2.5 Programming Information

The radio was programmed using Ingersoll Rand Test Tool, version 1.4d.

- Channels 1-10 (906 MHz, Low), (914 MHz, Mid), (924 MHz, High)
- Power Setting: 11
- Data Rate: BPSK-40
- Data Pattern: Pseudo Random

2.6 Antennas

- PCB Trace Antenna
 - 5.7 dBi maximum gain @ 870-960 MHz
- MA-CC60-60
 - Dual beam antenna, 3.5 dBi maximum gain @ 870-960 MHz
- MA-CL677-15
 - Multi band directional panel antenna, 8.5 dBi maximum gain @ 870-960 MHz
- MA-CL92-5
 - Quasi-Omni panel antenna, 4.5 dBi maximum gain @ 870-960 MHz
- MA-CM36-15
 - Multi-band omni directional antenna, 2.0 dBi maximum gain @ 870-960 MHz

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3 REFERENCES

Publication	Edition	Date	AMD 1
eCFR	-	2021	-
RSS-102	5	2015	2021
KDB 447498 D04	01	2021	-

4 UNCERTAINTY SUMMARY

Using the guidance of the following publications the calculated measurement uncertainty represents an expanded uncertainty expressed at approximately the 95 % confidence level, using a coverage factor of k = 2.

References	Version / Date
CISPR 16-4-1	Ed. 2 (2009-02)
CISPR 16-4-2	Ed. 2 (2011-06)
CISPR 32	Ed. 1 (2012-01)
ANSI C63.23	2012
A2LA P103	February 4, 2016
A2LA P103c	August 10, 2015
ETSI TR 100-028	V1.3.1 (2001-03)

Measurement Type	Configuration	Uncertainty ±
Radiated Emissions	Biconical Antenna	5.0 dB
Radiated Emissions	Log Periodic Antenna	5.3 dB
Radiated Emissions	Horn Antenna	4.7 dB
AC Line Conducted Emissions	Artificial Mains Network	3.4 dB
Telecom Conducted Emissions	Asymmetric Artificial Network	4.9 dB
Disturbance Power Emissions	Absorbing Clamp	4.1 dB
Radiated Immunity	3 Volts/meter	2.2 dB
Conducted Immunity	CDN/EM/BCI	2.4/3.5/3.4 dB
EFT Burst/Surge	Peak pulse voltage	164 volts
ESD Immunity	15 kV level	1377 Volts

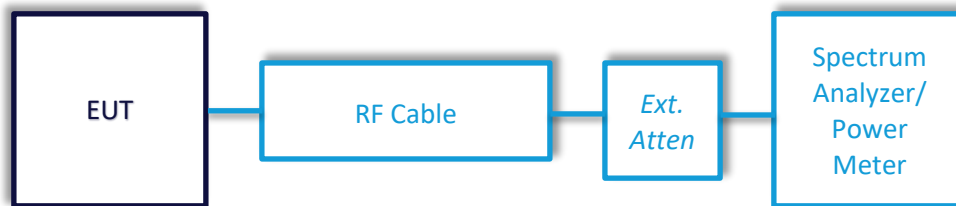
Parameter	ETSI U.C. ±	U.C. ±
Radio Frequency, from F0	1x10 ⁻⁷	0.55x10 ⁻⁷
Occupied Channel Bandwidth	5 %	2 %
RF conducted Power (Power Meter)	1.5 dB	1.2 dB
RF conducted emissions (Spectrum Analyzer)	3.0 dB	1.7 dB
All emissions, radiated	6.0 dB	5.3 dB
Temperature	1° C	0.65° C
Humidity	5 %	2.9 %
Supply voltages	3 %	1 %

5 TEST DATA

5.1 Antenna Port Conducted Emissions

Description of Measurement	<p>The direct measurement of emissions at the antenna port of the EUT is achieved by use of a RF connection to a spectrum analyzer or power meter.</p> <p>The cable and attenuator factors are loaded into the analyzer or power meter allowing for direct measurement readings without the need for further corrections.</p>
Example Calculations	<p>Measurement (dBm) + Cable factor (dB) + External Attenuator (dB) = Corrected Reading (dBm)</p> <p>Margin (dB) = Limit (dBm) – Corrected Reading (dBm)</p>

Block Diagram



5.1.1 Average Output Power

Operator	Anthony Smith	QA	Zach Wilson
Temperature	23.8°C, 24.0°C	R.H. %	56.8%, 50.1%
Test Date	10/13/2021, 10/14/2021	Location	Conducted RF Bench
Requirement	FCC 15.247, RSS-247	Method	ANSI C63.10 §11.9.2.2.2 AVGSA-1

Limits: 1W or 30dBm

Test Parameters

Frequency	906 MHz, 914 MHz, 924 MHz	Setup	Conducted
RBW	9 kHz	VBW	30 kHz
Detector(s)	RMS	Mode	Trace averaging over 100 traces

Instrumentation

Asset #	Description	Manufacturer	Model #	Serial #	Date	Due Date	Status
AA 960144	Cable	Gore	EKD01D010720	5800373	2/3/2021	2/3/2022	Active Verification
EE 960085	Analyzer - EMI Receiver	Agilent	N9038A	MY51210148	4/20/2021	4/20/2022	Active Calibration

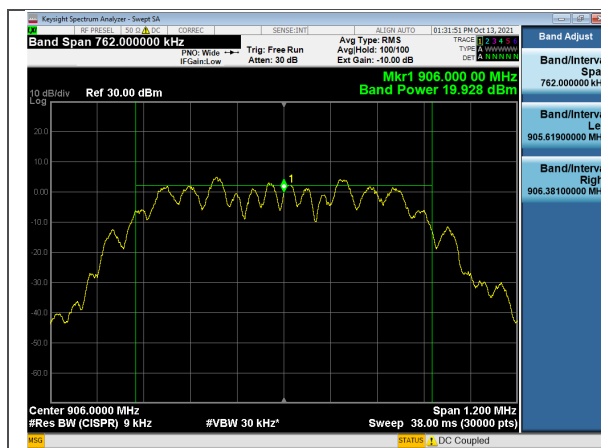
EUT Parameters

Input Power	5VDC	Mode	Modulated Transmit
Frequency	906-924 MHz	Channel	1, 5, 10

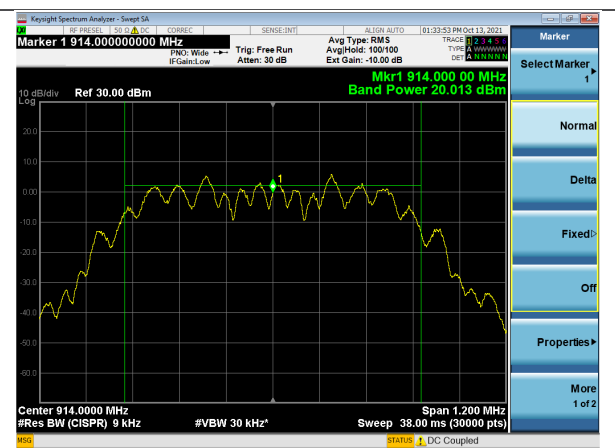
Data Table

Channel	Frequency (MHz)	Average Output Power (dBm)	Limit (dBm)	Margin (dB)
1	906.0	19.9	30.0	10.1
5	914.0	20.0	30.0	10.0
10	924.0	20.1	30.0	9.9

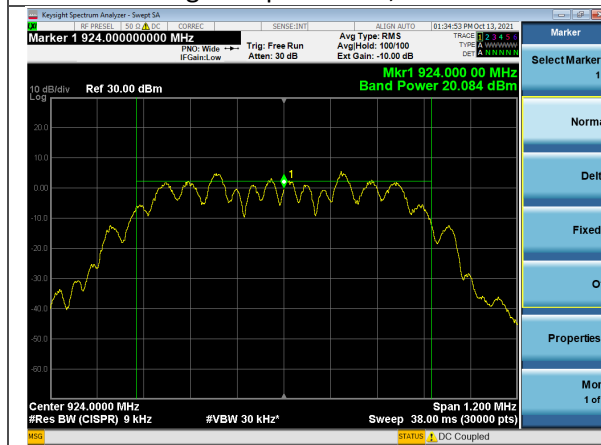
Plots



Average Output Power, Channel 1



Average Output Power, Channel 5



Average Output Power, Channel 10

6 EXCLUSION CALCULATION

6.1 FCC

Worst Case Output Power (conducted) = 20.1 dBm at 924 MHz

Tune-Up Tolerance = 2.0 dB

Peak Antenna Gain = 8.5 dBi

EUT ERP = 22.1 dBm + 8.5 dBi = 30.6 dBm = 1149 mW

Distance to User = $d = 20$ cm

Formulas per KDB 447498 D04 v01:

$$P_{th} \text{ (mW)} = ERP_{20 \text{ cm}} \text{ (mW)} = \begin{cases} 2040f & 0.3 \text{ GHz} \leq f < 1.5 \text{ GHz} \\ 3060 & 1.5 \text{ GHz} \leq f \leq 6 \text{ GHz} \end{cases} \quad (\text{B. 1})$$

$$ERP_{20\text{cm}} \text{ (mW)} = 2040 * 0.924 = 1885\text{mW}$$

$$x = -\log_{10} \left(\frac{60}{ERP_{20 \text{ cm}} \sqrt{f}} \right)$$

$$x = -\log_{10}(60/1885 * \sqrt{0.924}) = \mathbf{1.48}$$

$$P_{th} \text{ (mW)} = \begin{cases} ERP_{20 \text{ cm}} (d/20 \text{ cm})^x & d \leq 20 \text{ cm} \\ ERP_{20 \text{ cm}} & 20 \text{ cm} < d \leq 40 \text{ cm} \end{cases} \quad (\text{B. 2})$$

$$P_{th} \text{ (mW)} = 1885(20/20)^x = \mathbf{1885 \text{ mW}}$$

Result

The EUT's 900 MHz radio complies with the FCC SAR-based Exemption power thresholds at a 20cm separation distance as the EUT ERP of **1149 mW** is lower than the Power Threshold of **1885 mW**.

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6.2 ISED Canada

Per Section 2.5.2:

Maximum EIRP Limit =

$$1.31 \times 10^{-2} (924^{0.6834}) W = 1.393 W$$

Result

The EUT's 900 MHz radio meets ISED's MPE Exemption limit at 20 cm as the maximum **1.149 W EIRP** is less than **1.393 W**.

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7 REVISION HISTORY

Version	Date	Notes	Person
0	2/14/2022	Initial Draft	Zach Wilson

END OF REPORT