

# Test Report # 319351 A

**Equipment Under Test:** Allegion AD 900 MHz Module v3

**Requirement(s):** FCC 15.247, RSS-247 (LMA)

**Test Date(s):** October 13<sup>th</sup> – 27<sup>th</sup>, 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: 1/13/2022

**Report Reviewed by:** Adam Alger, Laboratory Manager

Signature: *Adam Alger*

Date: 11/1/2021

**Report Constructed by:** Zach Wilson, EMC Engineer

Signature: *Zach Wilson*

Date: 10/27/2021

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Company: Allegion	Page 1 of 33	Name: Allegion AD 900 MHz Module v3
Report: TR319351 A		Model: COMAD400V3
Job: C-3419		Serial: Engineering Sample

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**Laird Connectivity Test Services in Review**

The Laird Connectivity, Inc. 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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Report: TR319354 A		Model: COMAD400V3
Job: C-3419		Serial: Engineering Sample

## 1 TEST REPORT SUMMARY

During **October 13<sup>th</sup>-27<sup>th</sup>, 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: 15.247 (a)(2) IC: RSS-247 5.2 (a)	Digital Modulation System 6 dB bandwidth	500 kHz	ANSI C63.10	Compliant
FCC: 2.1049 IC: RSS-GEN 6.7	Occupied Bandwidth	Reported	ANSI C63.10	Compliant
FCC: 15.247 (b)(3) IC: RSS-247 5.4 (d)	Maximum Conducted Output Power	30 dBm	ANSI C63.10	Compliant
FCC: 15.247 (e) IC: RSS-247 5.2 (b)	Digital Modulation System Power Spectral Density	8 dBm / 3 kHz	ANSI C63.10	Compliant
FCC: 15.247 (d) IC: RSS-247 5.5	RF Spurious Emissions at the Transmitter Antenna Terminal	30 dBc	ANSI C63.10	Compliant
FCC: 15.247 (d) IC: RSS-GEN 8.10	Spurious Radiated Emissions in Restricted Bands	FCC 15.209 RSS-GEN 8.9	ANSI C63.10	Compliant
FCC: 2.1055 (d) IC: RSS-GEN 6.11	Frequency Stability	Reported	ANSI C63.10	Compliant

### 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

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

### 2.1 Equipment Under Test (EUT) Information

*The following information has been supplied by the client*

<b>Product Name</b>	Allegion AD 900 MHz Module v3
<b>Model Number</b>	COMAD400V3
<b>Serial Number</b>	Engineering Sample
<b>FCC ID</b>	XPB-COMAD400V3
<b>IC ID</b>	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
    - 6.5 dBi maximum gain @ 2200-2700 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

Two models tested for radiated emissions. One model contained the trace antenna. The other model had an SMA connector with a 50-ohm termination for cabinet radiated measurements.

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### 3 REFERENCES

Publication	Edition	Date	AMD 1	AMD 2
eCFR	-	2021	-	-
ANSI C63.10	-	2013	-	-
RSS-247	2	2017	-	-
RSS-GEN	5	2018	2019	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 $\pm$
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. $\pm$	U.C. $\pm$
Radio Frequency, from F0	$1 \times 10^{-7}$	$0.55 \times 10^{-7}$
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 %

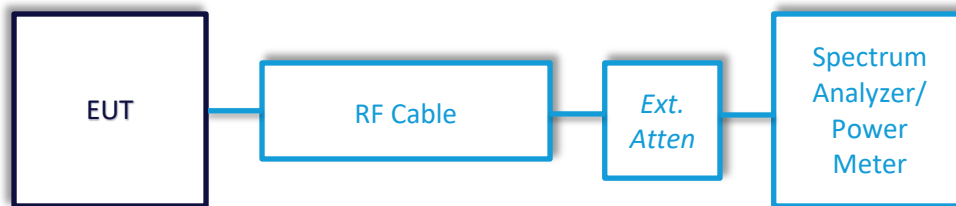


## 5 TEST DATA

### 5.1 Antenna Port Conducted Emissions

<b>Description of Measurement</b>	<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>
<b>Example Calculations</b>	<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 DTS Bandwidth

<b>Operator</b>	Anthony Smith	<b>QA</b>	Zach Wilson
<b>Temperature</b>	23.8°C, 24.0°C	<b>R.H. %</b>	56.8%, 50.1%
<b>Test Date</b>	10/13/2021, 10/14/2021	<b>Location</b>	Conducted RF Bench
<b>Requirement</b>	FCC 15.247, RSS-247	<b>Method</b>	ANSI C63.10 §10.8.2

Limits: DTS Bandwidth greater than 500 kHz

#### Test Parameters

<b>Frequency</b>	906 MHz, 914 MHz, 924 MHz	<b>Setup</b>	Conducted
<b>RBW</b>	100 kHz	<b>VBW</b>	300 kHz
<b>Detector(s)</b>	Peak max hold	<b>Sweep</b>	Auto

#### 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

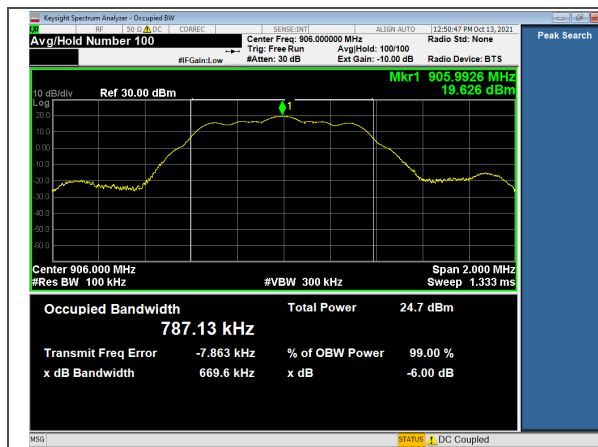
#### EUT Parameters

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

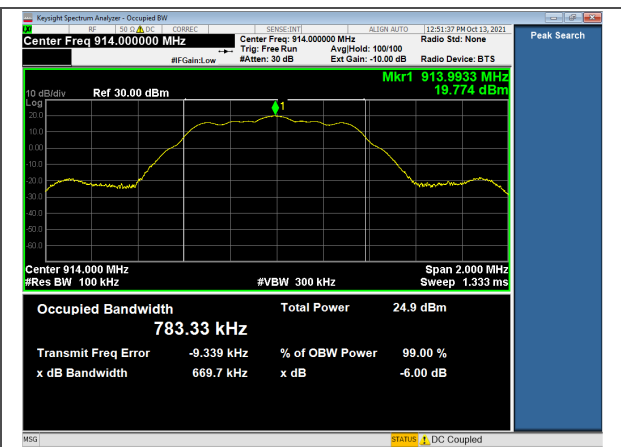
### Data Table

Channel	DTS BW 6dB (kHz)	Limit (kHz)	Margin (kHz)
1	669.6	500.0	169.6
5	669.7	500.0	169.7
10	668.9	500.0	168.9

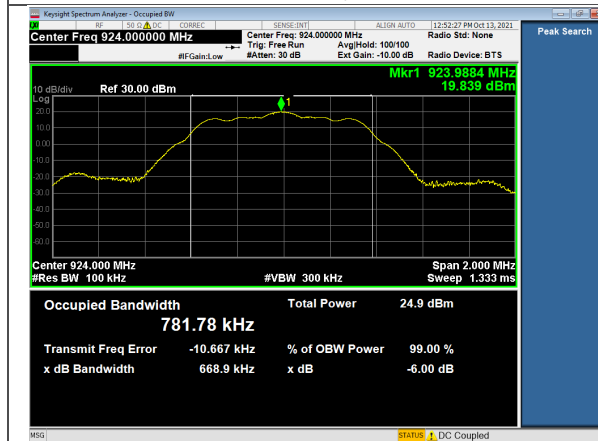
### Plots



DTS Bandwidth, Channel 1



DTS Bandwidth, Channel 5



DTS Bandwidth, Channel 10

### 5.1.2 99% Bandwidth

<b>Operator</b>	Anthony Smith	<b>QA</b>	Zach Wilson
<b>Temperature</b>	23.8°C, 24.0°C	<b>R.H. %</b>	56.8%, 50.1%
<b>Test Date</b>	10/13/2021, 10/14/2021	<b>Location</b>	Conducted RF Bench
<b>Requirement</b>	FCC 2.1049, RSS-GEN	<b>Method</b>	ANSI C63.10 §6.9.3

#### Limits: Reported

#### Test Parameters

<b>Frequency</b>	906 MHz, 914 MHz, 924 MHz	<b>Setup</b>	Conducted
<b>RBW</b>	8.2 kHz	<b>VBW</b>	30 kHz
<b>Detector(s)</b>	Peak max hold	<b>Sweep</b>	Auto

#### 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

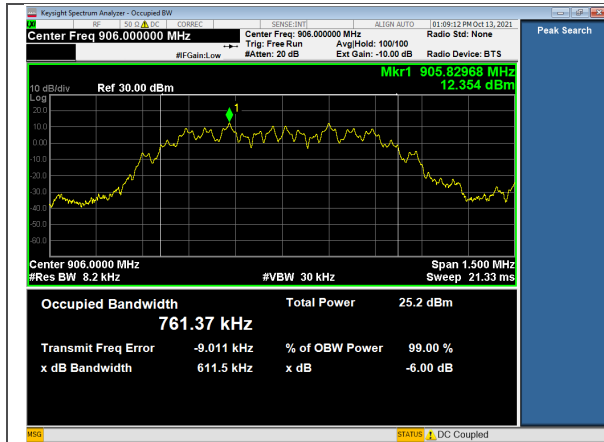
#### EUT Parameters

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

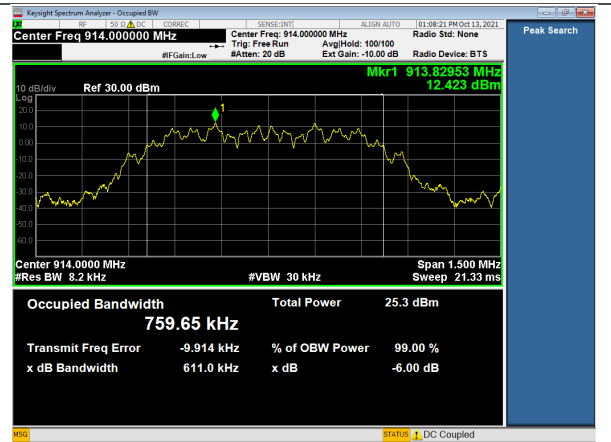
Data Table

Channel	99% OBW (kHz)
1	761.4
5	759.7
10	757.9

Plots



99% OBW, Channel 1



99% OBW, Channel 5



99% OBW, Channel 10

### 5.1.3 Average Output Power

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

Limits: 1W or 30dBm

#### Test Parameters

<b>Frequency</b>	906 MHz, 914 MHz, 924 MHz	<b>Setup</b>	Conducted
<b>RBW</b>	9 kHz	<b>VBW</b>	30 kHz
<b>Detector(s)</b>	RMS	<b>Mode</b>	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

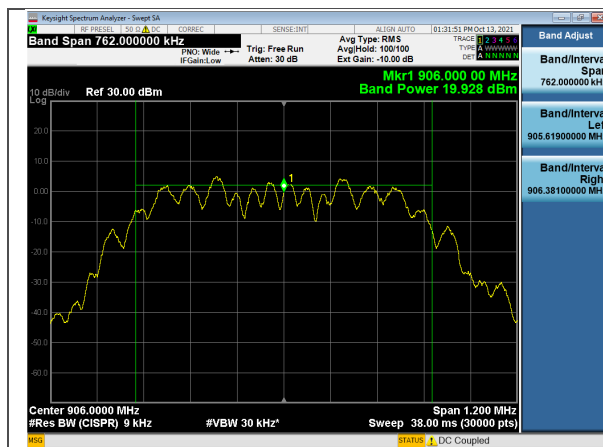
#### EUT Parameters

<b>Input Power</b>	5VDC	<b>Mode</b>	Modulated Transmit
<b>Frequency</b>	906-924 MHz	<b>Channel</b>	1, 5, 10
<b>Duty Cycle</b>	100%		

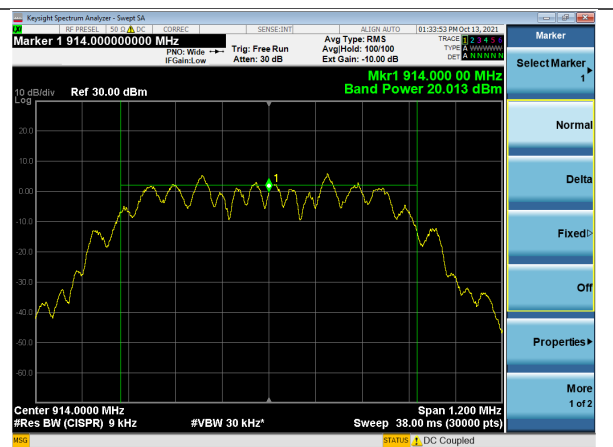
Data Table

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

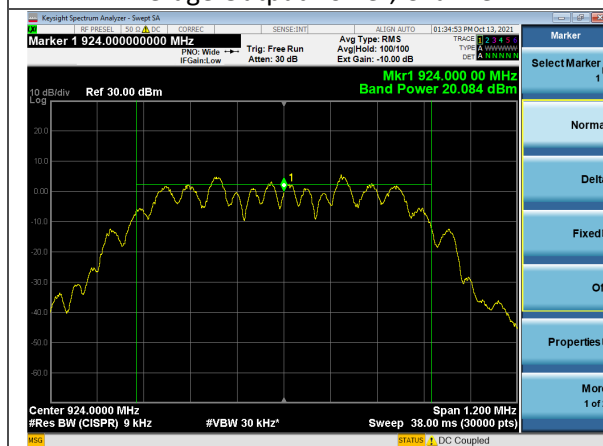
Plots



Average Output Power, Channel 1



Average Output Power, Channel 5



Average Output Power, Channel 10

### 5.1.4 Average Power Spectral Density

<b>Operator</b>	Anthony Smith	<b>QA</b>	Zach Wilson
<b>Temperature</b>	23.8°C, 24.0°C	<b>R.H. %</b>	56.8%, 50.1%
<b>Test Date</b>	10/13/2021, 10/14/2021	<b>Location</b>	Conducted RF Bench
<b>Requirement</b>	FCC 15.247, RSS-247	<b>Method</b>	ANSI C63.10 §11.10.3 AVGPDS-1

Limits: 8dBm/3kHz

#### Test Parameters

<b>Frequency</b>	906 MHz, 914 MHz, 924 MHz	<b>Setup</b>	Conducted
<b>RBW</b>	3 kHz	<b>VBW</b>	10 kHz
<b>Detector(s)</b>	RMS	<b>Mode</b>	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

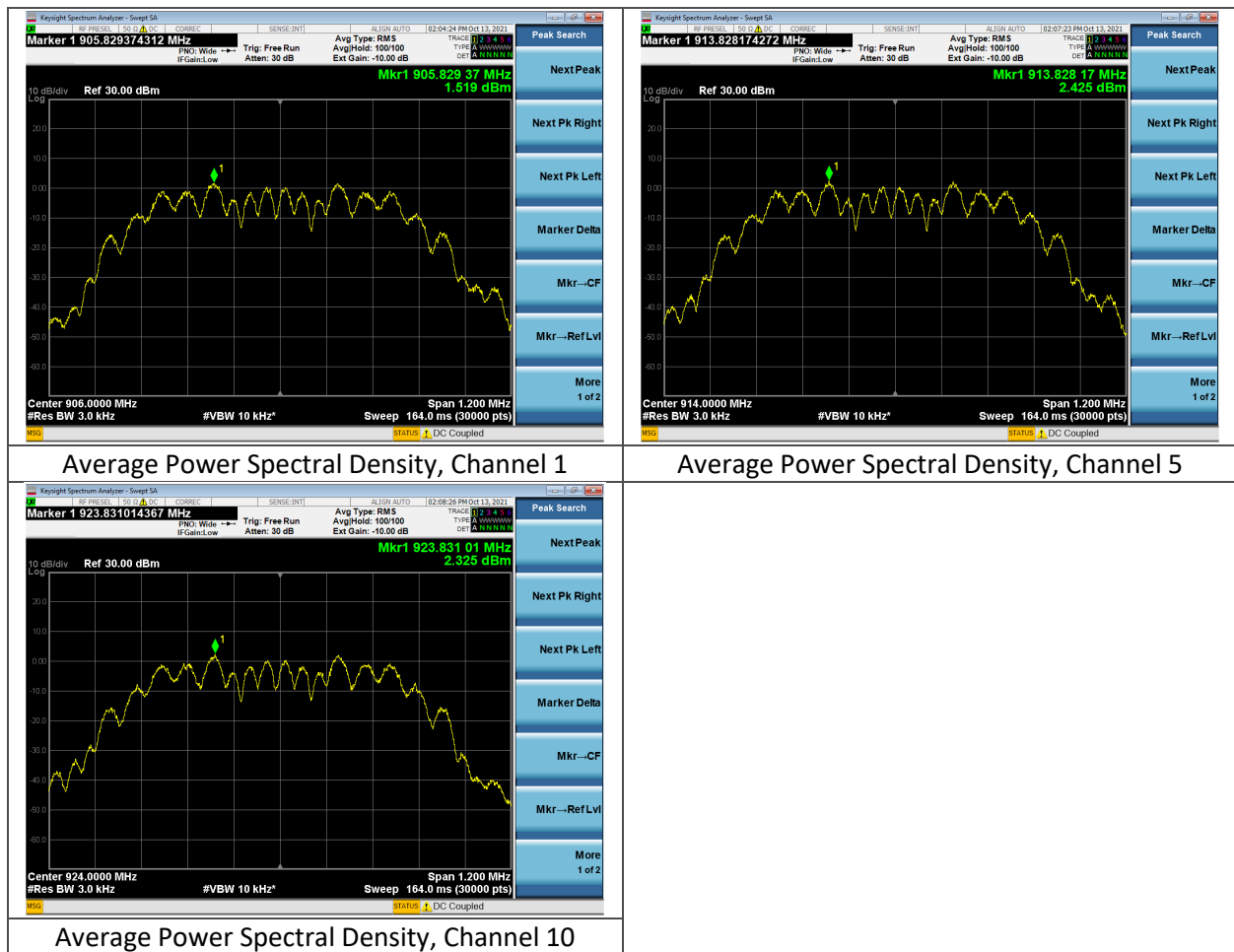
<b>Input Power</b>	5VDC	<b>Mode</b>	Modulated Transmit
<b>Frequency</b>	906-924 MHz	<b>Channel</b>	1, 5, 10



Data Table

Channel	Frequency (MHz)	Average PSD (dBm/3kHz)	Limit (dBm/3kHz)	Margin (dB)
1	905.8	1.5	8.0	6.5
5	913.8	2.4	8.0	5.6
10	923.8	2.3	8.0	5.7

Plots



### 5.1.5 Conducted Spurious Emissions

<b>Operator</b>	Anthony Smith	<b>QA</b>	Zach Wilson
<b>Temperature</b>	23.8°C, 24.0°C	<b>R.H. %</b>	56.8%, 50.1%
<b>Test Date</b>	10/13/2021, 10/14/2021	<b>Location</b>	Conducted RF Bench
<b>Requirement</b>	FCC 15.247, RSS-247	<b>Method</b>	ANSI C63.10 §11.11 and §11.12

Limits: 30dBc

#### Test Parameters

<b>Frequency</b>	30 MHz to 10 GHz	<b>Setup</b>	Conducted
<b>RBW</b>	100 kHz	<b>VBW</b>	300 kHz
<b>Detector(s)</b>	Peak max hold.	<b>Sweep</b>	Auto

#### 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

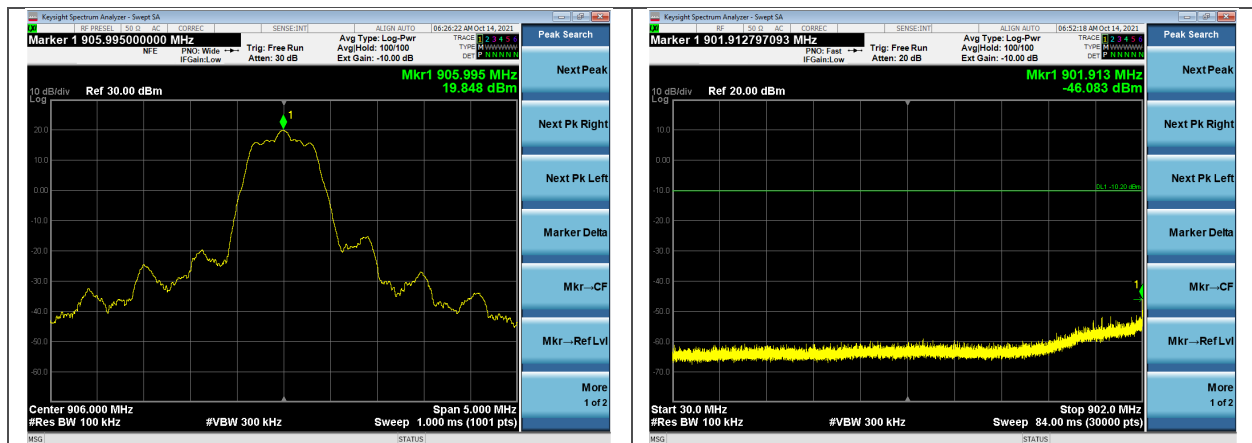
#### EUT Parameters

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

### Data Table

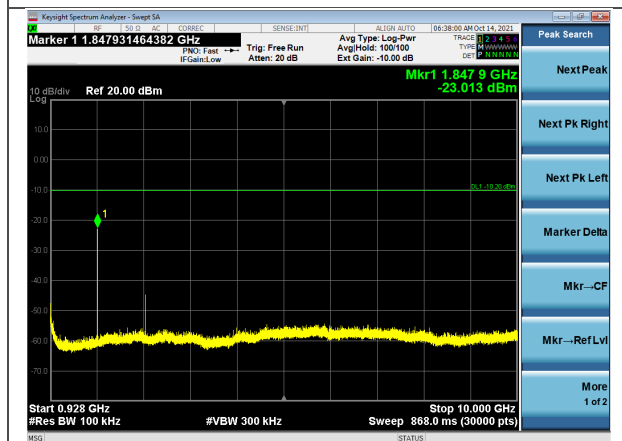
Channel	Frequency (MHz)	Spurious Emission Level (dBm)	Limit (dBm)	Margin (dB)
10	1847.9	-23.0	-10.2	12.9
10	2772.1	-44.8	-10.2	34.6
5	1828.0	-22.88	-10.2	12.7
5	2741.9	-43.95	-10.2	33.7
1	1811.9	-22.77	-10.2	12.6
1	2718.0	-43.50	-10.2	33.3
1	901.9	-46.08	-10.2	35.9

### Plots



Lowest power reference level emission  
19.8 dBm

30-902 MHz, Channel 1



928-10000 MHz, Channel 10

### 5.1.6 Conducted Spurious Emissions (terminated antenna method)

<b>Operator</b>	Anthony Smith	<b>QA</b>	Zach Wilson
<b>Temperature</b>	23.8°C, 24.0°C	<b>R.H. %</b>	56.8%, 50.1%
<b>Test Date</b>	10/13/2021, 10/14/2021	<b>Location</b>	Conducted RF Bench
<b>Requirement</b>	FCC 15.247, RSS-247	<b>Method</b>	ANSI C63.10 §11.11 and §11.12

#### Limits:

**Below 1 GHz: 15.209 Limits using Quasi Peak**

**Above 1 GHz: 54 dBµV/m average, 74 dBµV/m peak**

#### Test Parameters

<b>Frequency</b>	30 MHz to 10 GHz	<b>Setup</b>	Conducted
<b>RBW</b>	Below 1 GHz: 120 kHz Above 1 GHz: 1 MHz	<b>VBW</b>	Below 1 GHz: 1.2 MHz Above 1 GHz: 3 MHz
<b>Detector(s)</b>	Peak max hold. Reduced VBW of 10 Hz for average.	<b>Sweep</b>	Auto
<b>Example Calculations</b>	Electric Field Strength in dBµV/m = EIRP – 20LOG(d) + 104.8 Where d = measurement distance		
<b>Antenna Gain Note</b>	Per 11.12.2.6 of ANSI C63.10, antenna gain of 6.5 used for emissions in the 2700-2800 MHz range. The highest gain antenna lists this frequency of operation in its data sheet.		

#### 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

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

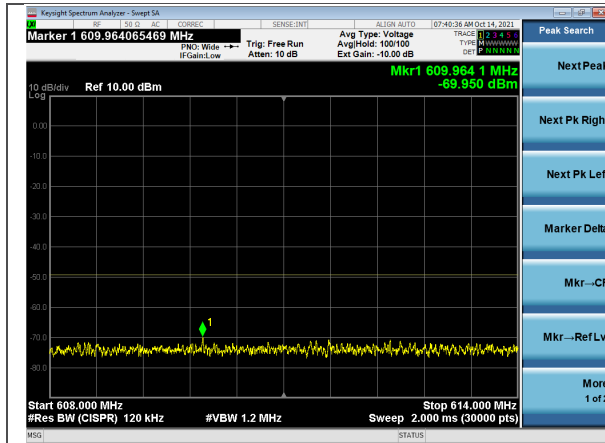
## Data Table

Channel	Frequency (MHz)	Average Reading (dBm)	Antenna Gain (dBi)	EIRP Conducted Average Reading (dBm)	Conducted Average Converted to Radiated (dBμV/m)	Average Limit (dBμV/m)	Average Margin (dB)
10	2772.0	-49.5	6.5	-43.0	52.3	54.0	1.7
5	2742.0	-48.9	6.5	-42.4	52.9	54.0	1.1
1	2718.0	-48.5	6.5	-42.0	53.3	54.0	0.7

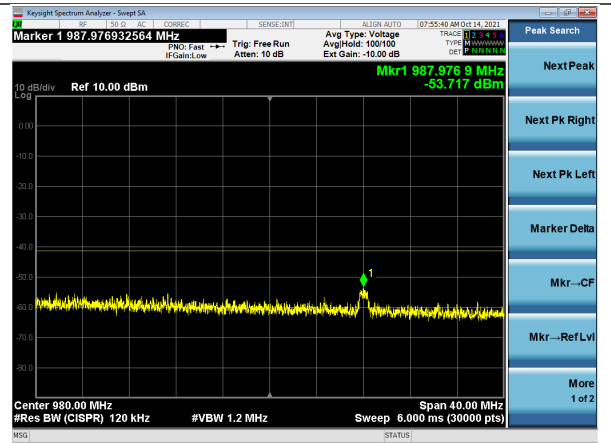
Channel	Frequency (MHz)	Peak Reading (dBm)	Antenna Gain (dBi)	EIRP Conducted Peak Reading (dBm)	Conducted Peak Converted to Radiated (dBμV/m)	Peak Limit (dBμV/m)	Peak Margin (dB)
10	2772	-44.8	6.5	-38.3	57.0	74.0	17.0
5	2742	-44.2	6.5	-37.7	57.6	74.0	16.4
1	2718	-43.9	6.5	-37.4	57.9	74.0	16.1

Channel	Frequency (MHz)	Quasi-Peak Reading (dBm)	Ground Plane Reflection Factor (dB)	Maximum Antenna Gain (dBi)	EIRP Conducted Quasi Peak Reading (dBm)	Radiated Quasi Peak Conversion (dBμV/m)	Quasi Peak Limit (dBμV/m)	Quasi Peak Margin (dB)
10	988.0	-56.3	4.7	8.5	-43.1	52.2	54.0	1.8
5	977.7	-56.6	4.7	8.5	-43.4	51.9	54.0	2.1
1	970.1	-58.2	4.7	8.5	-45.0	50.3	54.0	3.7

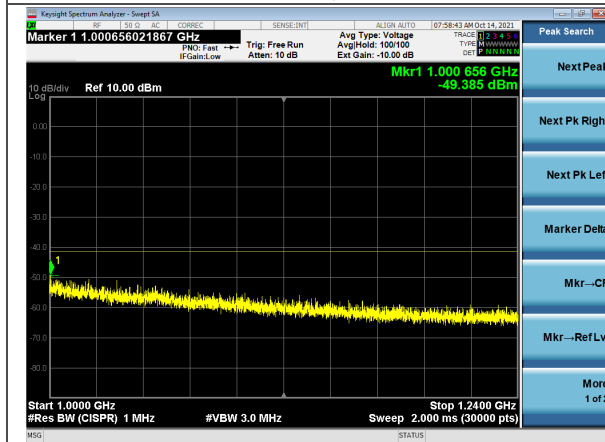
Plots



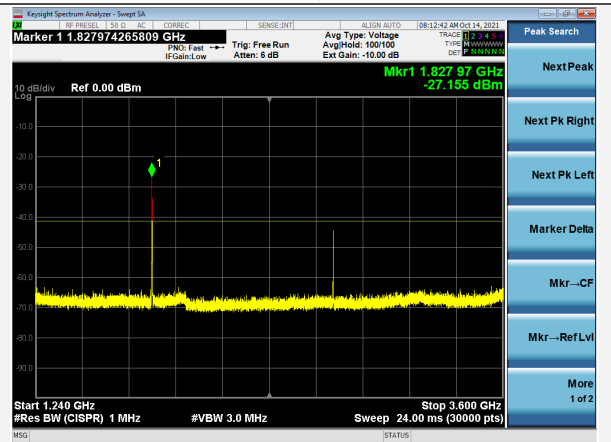
608-614 MHz, Channel 1



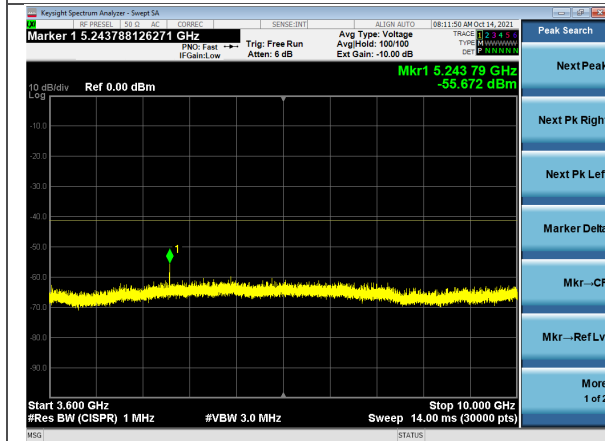
960-1000 MHz, Channel 10



1000-1240 MHz, Channel 10



1240-3600 MHz, Channel 10  
Emission not in restricted band at 1828 MHz



3600-10000 MHz, Channel 1

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Report: TR319354 A		Model: COMAD400V3
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### 5.1.7 Frequency Stability

<b>Operator</b>	Anthony Smith	<b>QA</b>	Zach Wilson
<b>Temperature</b>	23.8°C, 24.0°C	<b>R.H. %</b>	56.8%, 50.1%
<b>Test Date</b>	10/13/2021, 10/14/2021	<b>Location</b>	Conducted RF Bench
<b>Requirement</b>	FCC 2.1055, RSS-GEN	<b>Method</b>	ANSI C63.10 §6.8.2

#### Limits: Reported

#### Test Parameters

<b>Frequency</b>	906 MHz, 914 MHz, 924 MHz	<b>Setup</b>	Conducted
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#### 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

<b>Input Power</b>	4.3 VDC, 5.0 VDC, 5.8 VDC	<b>Mode</b>	CW Transmit
<b>Frequency</b>	906-924 MHz	<b>Channel</b>	1, 5, 10

#### Data Table

Channel	Frequency (Hz)	Power Input (VDC)	Deviation (Hz)
1	905979838.0	4.3	20162.0
1	905978802.0	5.0	21198.0
1	905993510.0	5.8	6490.0
5	913975334.0	4.3	24666.0
5	913991782.0	5.0	8218.0
5	914003325.0	5.8	3325.0
10	923998393.0	4.3	1607.0
10	923987918.0	5.0	12082.0
10	923967608.0	5.8	32392.0

## 5.2 Radiated Emissions

<p><b>Description of Measurement</b></p>	<p>The frequency spectrum is investigated for intentional and / or unintentional signals emanating from the EUT by use of a standardized test site and measurement antenna.</p> <p>The antenna, cable, pre-amp, and other necessary measurement system correction factors are loaded onto the EMI receiver / spectrum analyzer when the measurements are performed allowing the data to be gathered and reported as corrected values.</p> <p>The maximum emissions from the EUT are determined by turn-table azimuth rotation (360°) and scanning of the measurement antenna. Maximized levels are noted at degree values of azimuth, measurement antenna height, and measurement antenna polarity.</p>
<p><b>Example Calculations</b></p>	<p>Measurement (dBμV) + Cable factor (dB) + Other (dB) + Antenna Factor (dB/m) = Corrected Reading (dBμV/m)</p> <p>Margin (dB) = Limit (dBμV/m) - Corrected Reading (dBμV/m)</p> <p>Example at 4000 MHz:            Reading = 40 dBμV + 3.4 dB + 0.9 dB + 6.5 dB/m = 50.8 dBμV/m            Average Limit = 20 log (500) = 54 dBμV/m            Margin = 54 dBμV/m - 50.8 dBμV/m = 3.2 dB</p>

### Block Diagram





### 5.2.1 Radiated Emissions – Trace Antenna

<b>Operator</b>	Ivan Alvarez, Anthony Smith	<b>QA</b>	Braden Smith
<b>Temperature</b>	24.4°C, 21.6°C	<b>R.H. %</b>	45.0%, 42.7%
<b>Test Date</b>	10/15/2021 – 10/27/2021	<b>Location</b>	Chamber 3
<b>Requirement</b>	FCC 15.209, RSS-GEN	<b>Method</b>	ANSI C63.10

#### Limits:

Frequency (MHz)	Quasi Peak Limit (dBµV/m @ 3m)	Average Limit (dBµV/m @ 3m)	Peak Limit (dBµV/m @ 3m)
30-88	40.0	-	-
88-216	43.5	-	-
216-960	46.0	-	-
960-1000	54.0	-	-
1000-10000	-	54	74

#### Test Parameters

<b>Frequency</b>	30 MHz to 10 GHz	<b>Distance</b>	3m
<b>Detector(s)</b>	Quasi peak detector for measurements under 1 GHz. Average measurements taken at 10Hz reduced VBW. Peak max hold for plots.	<b>Table height</b>	80cm under 1 GHz 150cm above 1GHz
<b>RBW</b>	120 kHz, 1 MHz	<b>VBW</b>	1.2 MHz, 3 MHz, 10 Hz

#### Instrumentation

Asset #	Description	Manufacturer	Model #	Serial #	Date	Due Date	Status
AA 960005	Antenna - Biconical	EMCO	93110B	9601-2280	8/19/2021	8/19/2022	Active Calibration
AA 960143	Cable	Gore	EKD01D01048.0	5546519	2/3/2021	2/3/2022	Active Verification
AA 960153	Filter - High Pass 2.4 GHz	KWM	HPF-L-14186	7272-04	4/21/2021	4/21/2022	Active Calibration
AA 960158	Antenna - Double Ridge Horn	ETS Lindgren	3117	109300	9/27/2021	9/27/2022	Active Calibration
AA 960163	Antenna - Log Periodic	A.H. Systems, Inc.	SAS-512-2	500	7/29/2021	7/29/2022	Active Calibration
EE 960085	Analyzer - EMI Receiver	Agilent	N9038A	MY51210148	4/20/2021	4/20/2022	Active Calibration

### EUT Parameters

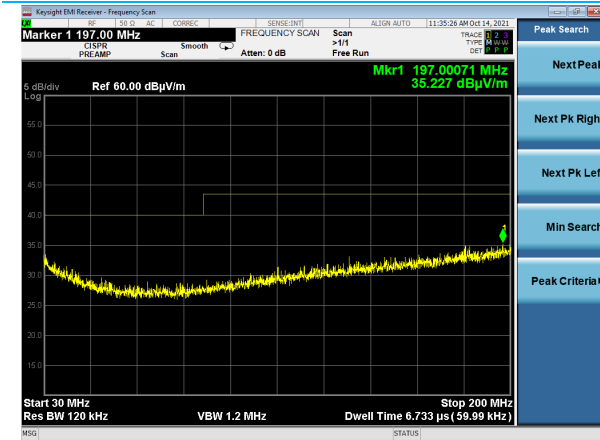
<b>Input Power</b>	5VDC	<b>Mode</b>	Modulation Transmit
<b>Channels</b>	1, 6, 10	<b>Antenna</b>	Trace
<b>Orientations</b>	Flat, Vertical, Horizontal (only worst case shown)		

### Data Tables

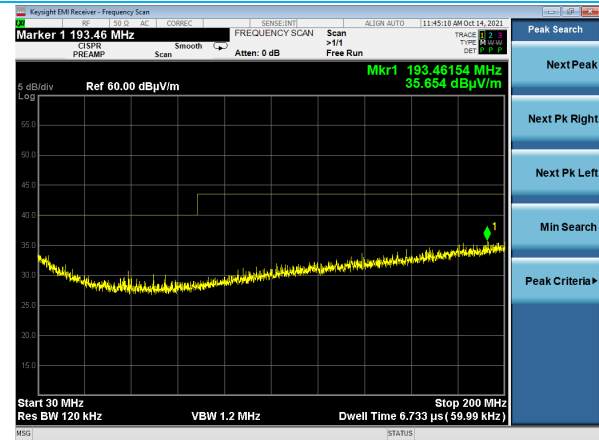
Frequency (MHz)	Antenna Polarity	EUT Orientation	Height (cm)	Azimuth (degree)	Quasi Peak Reading (dB $\mu$ V/m)	Quasi Peak Limit (dB $\mu$ V/m)	Quasi Peak Margin (dB)	Channel
892.5	H	V	100	0	33.7	46.0	12.3	10
900.5	V	V	100	0	33.8	46.0	12.2	1
934.8	H	V	100	0	33.8	46.0	12.2	10
995.3	V	V	100	0	34.5	46.0	11.5	10

Frequency (MHz)	Antenna Polarity	EUT Orientation	Height (cm)	Azimuth (degree)	Average Reading (dB $\mu$ V/m)	Average Limit (dB $\mu$ V/m)	Average Margin (dB)	Peak Reading (dB $\mu$ V/m)	Peak Limit (dB $\mu$ V/m)	Peak Margin (dB)	Channel
1828.0	H	V	150	15	35.7	54.0	18.3	40.4	74.0	33.6	6
9873.9	V	V	150	15	34.8	54.0	19.2	39.3	74.0	34.7	6
1828.0	H	V	150	10	34.9	54.0	19.1	37.8	74.0	36.2	10
1826.7	H	V	150	15	31.9	54.0	22.1	37.0	74.0	37.0	1
9707.6	H	F	150	10	31.7	54.0	22.3	39.6	74.0	34.4	6
9715.2	V	F	150	8	31.0	54.0	23.0	40.5	74.0	33.5	6

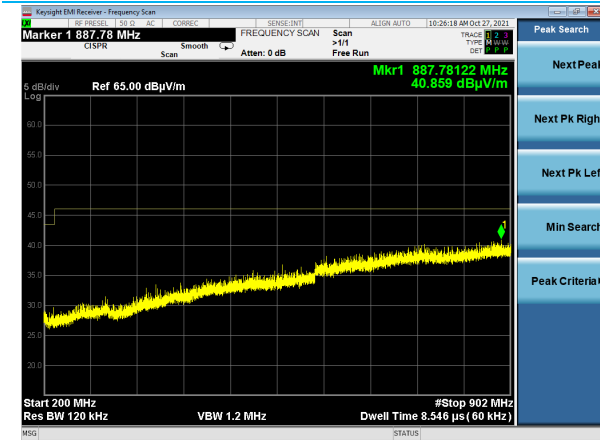
Plots



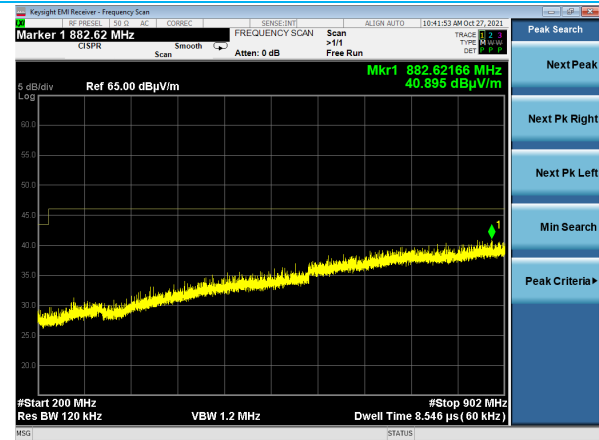
30-200 MHz, Horizontal Antenna



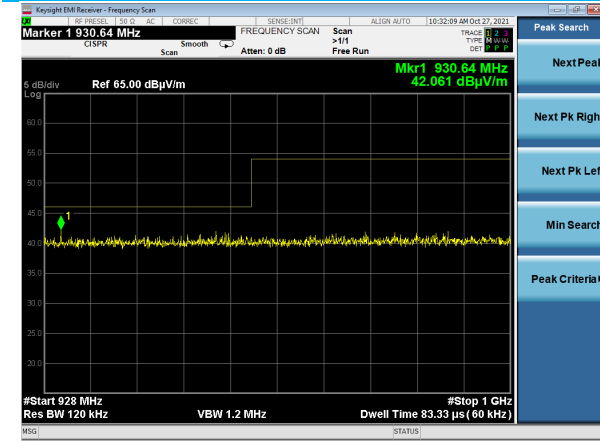
30-200 MHz, Vertical Antenna



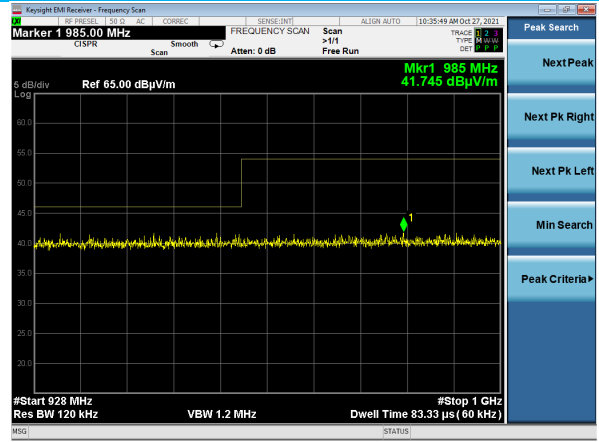
200-902 MHz, Horizontal Antenna  
Channel 1



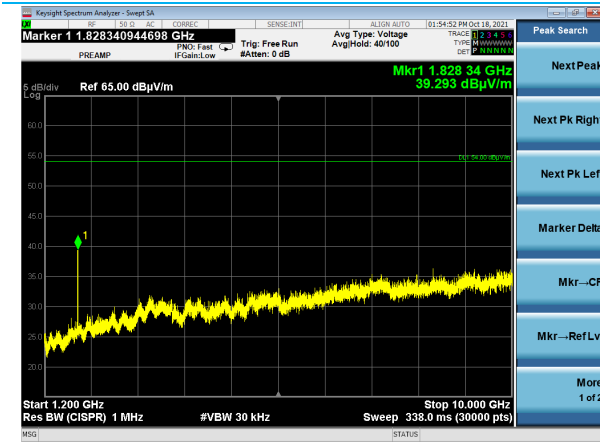
200-902 MHz, Vertical Antenna  
Channel 1



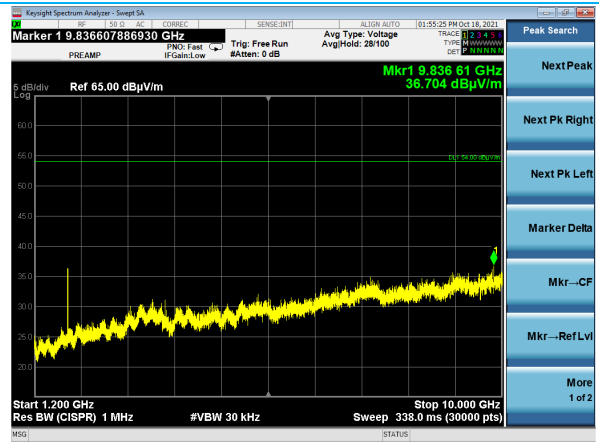
928-1000 MHz, Horizontal Antenna  
Channel 10



928-1000 MHz, Vertical Antenna  
Channel 10



1-10 GHz, Horizontal Antenna  
Channel 6



1-10 GHz, Vertical Antenna  
Channel 6

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### 5.2.2 Radiated Emissions – Terminated Antenna

<b>Operator</b>	Ivan Alvarez	<b>QA</b>	Braden Smith
<b>Temperature</b>	24.4°C	<b>R.H. %</b>	45.0%
<b>Test Date</b>	10/15/2021 – 10/18/2021	<b>Location</b>	Chamber 3
<b>Requirement</b>	FCC 15.209, RSS-GEN	<b>Method</b>	ANSI C63.10

#### Limits:

Frequency (MHz)	Quasi Peak Limit (dBµV/m @ 3m)	Average Limit (dBµV/m @ 3m)	Peak Limit (dBµV/m @ 3m)
30-88	40.0	-	-
88-216	43.5	-	-
216-960	46.0	-	-
960-1000	54.0	-	-
1000-10000	-	54	74

#### Test Parameters

<b>Frequency</b>	30 MHz to 10 GHz	<b>Distance</b>	3m
<b>Detector(s)</b>	Quasi peak detector for measurements under 1 GHz. Average measurements taken at 10Hz reduced VBW. Peak max hold for plots.	<b>Table height</b>	80cm under 1 GHz 150cm above 1GHz
<b>RBW</b>	120 kHz, 1 MHz	<b>VBW</b>	1.2 MHz, 3 MHz, 10 Hz

#### Instrumentation

Asset #	Description	Manufacturer	Model #	Serial #	Date	Due Date	Status
AA 960005	Antenna - Biconical	EMCO	93110B	9601-2280	8/19/2021	8/19/2022	Active Calibration
AA 960143	Cable	Gore	EKD01D01048.0	5546519	2/3/2021	2/3/2022	Active Verification
AA 960153	Filter - High Pass 2.4 GHz	KWM	HPF-L-14186	7272-04	4/21/2021	4/21/2022	Active Calibration
AA 960158	Antenna - Double Ridge Horn	ETS Lindgren	3117	109300	9/27/2021	9/27/2022	Active Calibration
AA 960163	Antenna - Log Periodic	A.H. Systems, Inc.	SAS-512-2	500	7/29/2021	7/29/2022	Active Calibration
EE 960085	Analyzer - EMI Receiver	Agilent	N9038A	MY51210148	4/20/2021	4/20/2022	Active Calibration

### EUT Parameters

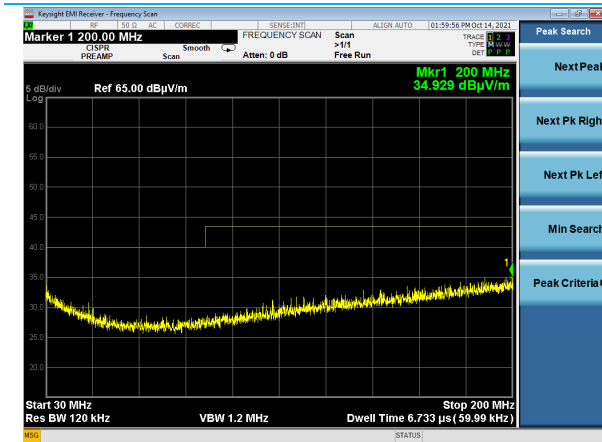
<b>Input Power</b>	5VDC	<b>Mode</b>	Modulation Transmit
<b>Channels</b>	1, 6, 10	<b>Antenna</b>	Terminated at output port
<b>Orientations</b>	Flat, Vertical, Horizontal (only worst case shown)		

### Data Tables

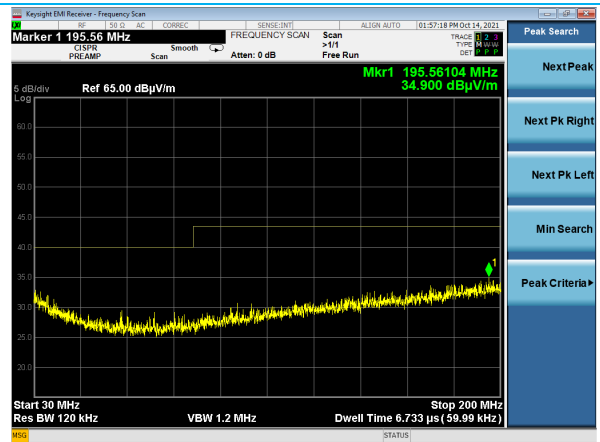
Frequency (MHz)	Antenna Polarity	EUT Orientation	Height (cm)	Azimuth (degree)	Quasi Peak Reading (dB $\mu$ V/m)	Quasi Peak Limit (dB $\mu$ V/m)	Quasi Peak Margin (dB)	Channel
195.5	V	V	100	0	29.1	43.5	14.4	6
199.9	H	V	100	0	28.5	43.5	15.0	6
890.5	V	V	100	0	32.5	46.0	13.5	6
894.3	H	V	100	0	32.6	46.0	13.5	6
964.7	H	V	100	0	33.8	54.0	20.2	6
993.9	V	V	100	0	33.8	54.0	20.2	6

Frequency (MHz)	Antenna Polarity	EUT Orientation	Height (cm)	Azimuth (degree)	Average Reading (dB $\mu$ V/m)	Average Limit (dB $\mu$ V/m)	Average Margin (dB)	Peak Reading (dB $\mu$ V/m)	Peak Limit (dB $\mu$ V/m)	Peak Margin (dB)	Channel
9577.6	H	V	100	0	27.0	54.0	27.0	34.2	74.0	39.8	6
9589.3	H	V	100	0	29.1	54.0	24.9	32.1	74.0	41.9	6
9639.8	V	F	100	0	28.8	54.0	25.2	29.6	74.0	44.4	1
9733.9	V	F	100	0	29.8	54.0	24.2	30.1	74.0	43.9	6
9794.8	V	F	100	0	27.0	54.0	27.0	29.8	74.0	44.2	10
9823.1	H	F	100	0	30.6	54.0	23.4	33.5	74.0	40.5	6

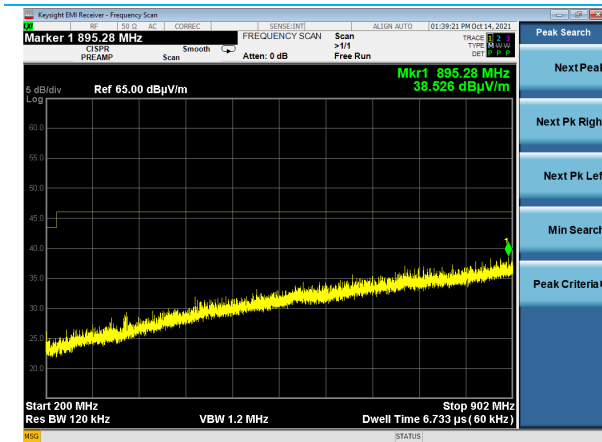
Plots



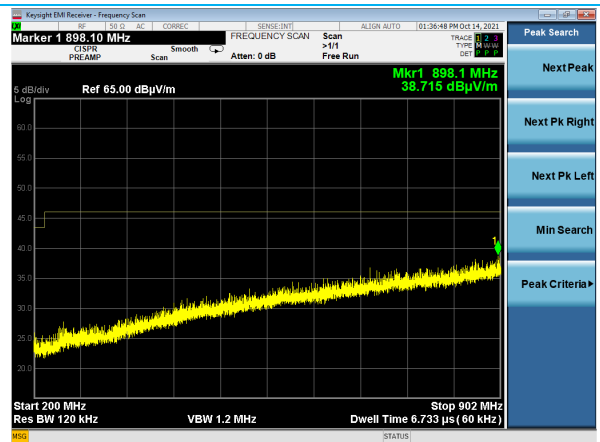
30-200 MHz, Horizontal Antenna Channel 6



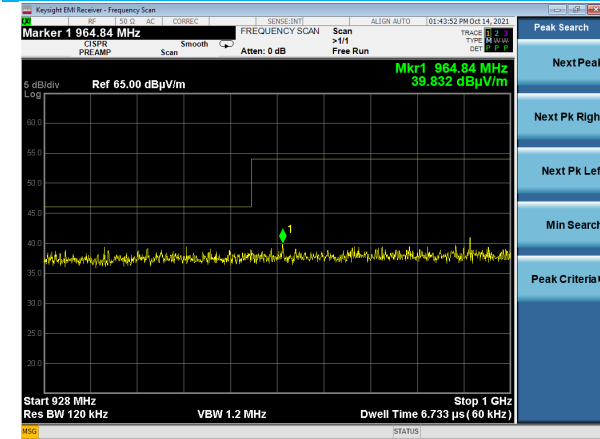
30-200 MHz, Vertical Antenna Channel 6



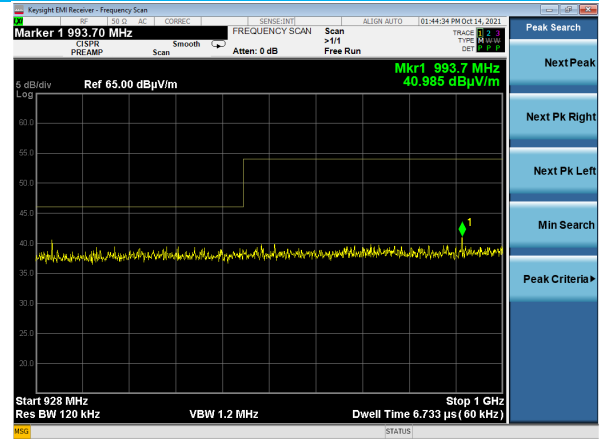
200-902 MHz, Horizontal Antenna Channel 1



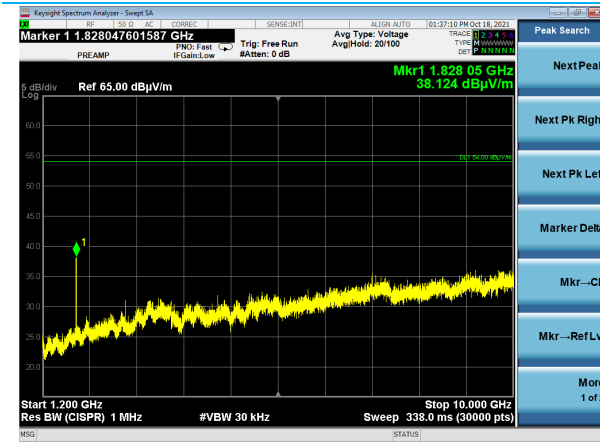
200-902 MHz, Vertical Antenna Channel 1



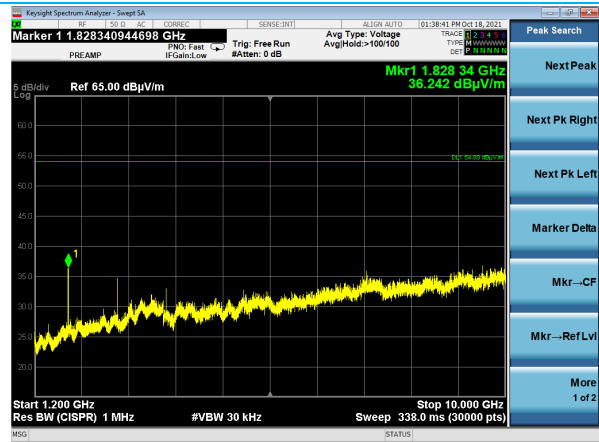
928-1000 MHz, Horizontal Antenna  
Channel 10



928-1000 MHz, Vertical Antenna  
Channel 10



1-10 GHz, Horizontal Antenna  
Channel 6



1-10 GHz, Vertical Antenna  
Channel 6

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## 6 REVISION HISTORY

Version	Date	Notes	Person
0	10/27/2021	Initial Draft	Zach Wilson
1	1/13/2022	Revised HVIN/PMN	Zahc Wilson

**END OF REPORT**