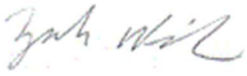
Test Report # 3514 A

Equipment Under Test:	Mobile Patient Monitor
Requirement(s):	FCC 15.407, FCC 15.247, FCC 15.209 RSS-GEN, FCC 15.247
Test Date(s):	September 20th to October 4th, 2021
Prepared for:	GE Healthcare Attn: Matthew Pekarske 8200 Tower Avenue Milwaukee, WI 53223

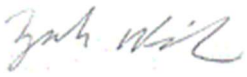
Report Issued by: Zach Wilson, EMC Engineer

Signature:  Date: 10/7/2021

Report Reviewed by: Adam Alger, Laboratory Manager

Signature:  Date: 10/07/2021

Report Constructed by: Zach Wilson, EMC Engineer

Signature:  Date: 9/29/2021

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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:

Certificate #1255.01

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

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Federal Communications Commission (FCC) – USA

Accredited Test Firm Registration Number: 953492

Recognition of two 3 meter Semi-Anechoic Chambers

Innovation, Science and Economic Development Canada

Accredited U.S. Identification Number: US0218

Recognition of two 3 meter Semi-Anechoic Chambers

1 TEST REPORT SUMMARY

During **September 20th to October 4th, 2021** the Equipment Under Test (EUT), **Mobile Patient Monitor**, as provided by **GE Healthcare** was tested to the following requirements of the **Federal Communications Commission** and **Innovation, Science and Economic Development Canada**:

Operation in the 5.15 – 5.25 GHz band

FCC	ISED Canada	Test Description	Limit	Compliant
15.407 (a)(1)(iv)	RSS-247 §6.2.1.1	Maximum Conducted Output Power	FCC: 24.0 dBm ISED: 23.0 dBm	Yes
15.407 (a)(1) (iv)	RSS-247 §6.2.1.1	Power Spectral Density	FCC: 11 dBm/MHz ISED: 10 dBm/MHz	Yes
15.1049	RSS-GEN §6.7	26dB / 99% Bandwidth	Reference Only	Yes
15.407 (b)(1) 15.407 (b)(10) 15.205 (a)	RSS-247 §6.2.1 RSS-GEN	Radiated Emissions: Restricted and Band Edges	Peak: 68.2 dBµV/m Avg: 54.0 dBµV/m (RB only)	Yes

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	GE Healthcare
Contact Person	Matt Pekarske
Address	8200 Tower Avenue Milwaukee, WI 53223

2.1 Equipment Under Test (EUT) Information

The following information has been supplied by the client

Product Name	Mobile Patient Monitor
Model Number	Portrait HUB01
Serial Number	SRW20440005SP
Module FCC ID	2AO8L-WL18DBMOD
Host FCC ID	2AO8L-HUB01
Module ISED ID	25821-WL18DBMOD
Host ISED ID	25821-HUB01

2.2 Product Description

GE WL18DBMOD WLAN 2.4/5 GHz Module. Battery powered. Dual antennas (top, bottom).

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 Radio Programming Information

TI calibrator SW with the shell scripts from GE GIT repository wearable-wireless-tools rev. 4c3f017. Customer put device into the proper test modes.

2.6 Antenna Information

- Integrated dual band monopole with parasitic element for 5GHz
- Top antenna (free space) max gain:
  - +6.0 dBi @ 2400-2483.5 MHz
  - +6.8 dBi @ 5170-5835 MHz
- Bottom antenna max gain:
  - +4.0 dBi @ 5170-5835 MHz

Tests using top antenna: Radiated Emissions, Power Spectral Density, Emission Bandwidth, Occupied Bandwidth, Output Power

Tests using bottom antenna: Power Spectral Density, Output Power

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 ±
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

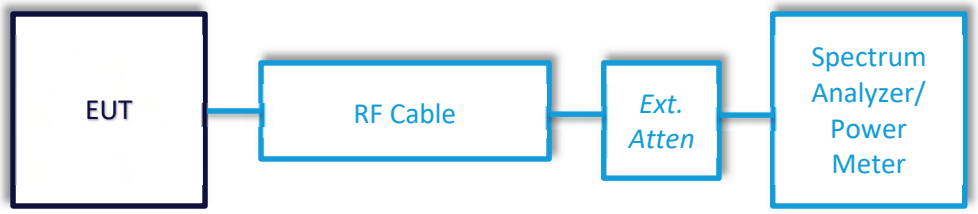
Parameter	ETSI U.C. ±	U.C. ±
Radio Frequency, from F0	$1x10^{-7}$	$0.55x10^{-7}$
Occupied Channel Bandwidth	5 %	2 %
RF conducted Power (Power Meter)	1.5 dB	1.2 dB
RF conducted emissions (Spectrum Analyzer)	3.0 dB	1.7 dB
All emissions, radiated	6.0 dB	5.3 dB
Temperature	1° C	0.65° C
Humidity	5 %	2.9 %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

5 TEST DATA

5.1 Antenna Port Conducted Emissions

Description of Measurement	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. The cable and attenuator factors are loaded into the analyzer or power meter allowing for direct measurement readings without the need for further corrections.
Example Calculations	Measurement (dBm) + Cable factor (dB) + External Attenuator (dB) = Corrected Reading (dBm) Margin (dB) = Limit (dBm) – Corrected Reading (dBm)

Block Diagram



5.1.1 Operation in the 5150-5250 Band (UNII 1) – 26 dB Emission Bandwidth

Operator	Anthony Smith	**QA**	Zach Wilson
Temperature	21.2°C, 20.1°C, 20.5°C	**R.H. %**	47.3%, 45.7%, 48.9%
Test Date	9/22/2021, 9/23/2021, 9/24/2021	**Location**	Conducted RF Bench
Requirement	FCC 15.407, RSS-247	**Method**	ANSI C63.10 §12.4.1

Limits

Reference Only

Test Parameters

Frequency	5180 MHz, 5200 MHz, 5220 MHz	**Setup**	Conducted
VBW	1 MHz	**RBW**	270 kHz
Span	40 MHz	**Detector**	Peak Max Hold

Instrumentation

Asset #	Description	Manufacturer	Model #	Serial #	Date	Due Date	Status
AA 960143	Cable	Gore	EKD01D01048.0	5546519	2/3/2021	2/3/2022	Active Verification
EE 960087	Analyzer - Spectrum	Agilent	N9010A	MY53400296	7/28/2021	7/28/2022	Active Calibration
EE 960090	Meter - RF Power	Anritsu	ML2495A	1335006	4/22/2021	4/22/2022	Active Calibration
EE 960091	Sensor - RF Power	Anritsu	MA2491A	1249277	4/22/2021	4/22/2022	Active Calibration

EUT Parameters

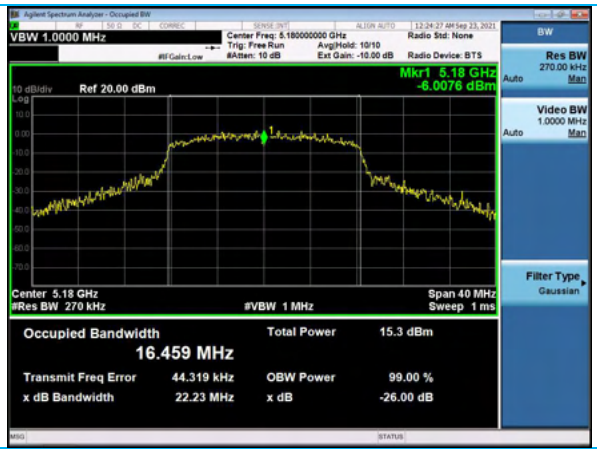
Input Power	5VDC via USB	**Mode**	WLAN 5GHz Transmit
Frequency	UNII 1 Band	**Channel**	36, 40, 48
Serial	SRW20440013SP	**Data Rates**	802.11a (6Mbps, 54Mbps) 802.11n (MCS0, MCS7)
Antenna Port	Top		

Data Table

Channel	Data Rate	26dB BW (MHz)
36	6 Mbps	26.6
36	54 Mbps	22.2
36	MCS0	24.1
36	MCS7	22.0
40	6 Mbps	26.8
40	54 Mbps	21.8
40	MCS0	27.4
40	MCS7	23.0
48	6 Mbps	25.6
48	54 Mbps	20.8
48	MCS0	29.0
48	MCS7	23.5

Plots

26 dB EBW, Channel 36, 6Mbps



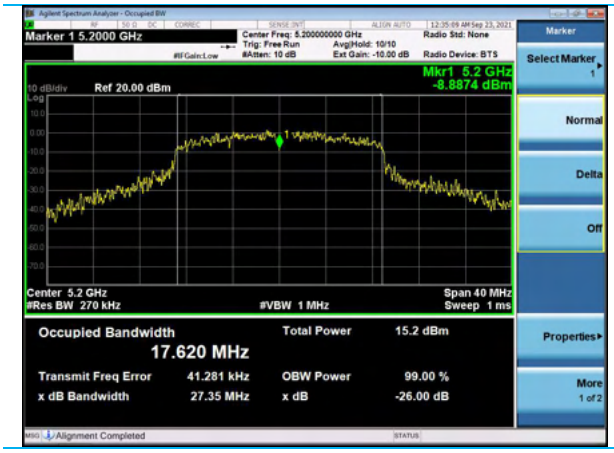
26 dB EBW, Channel 36, 54Mbps

26 dB EBW, Channel 36, MCS0

26 dB EBW, Channel 36, MCS7

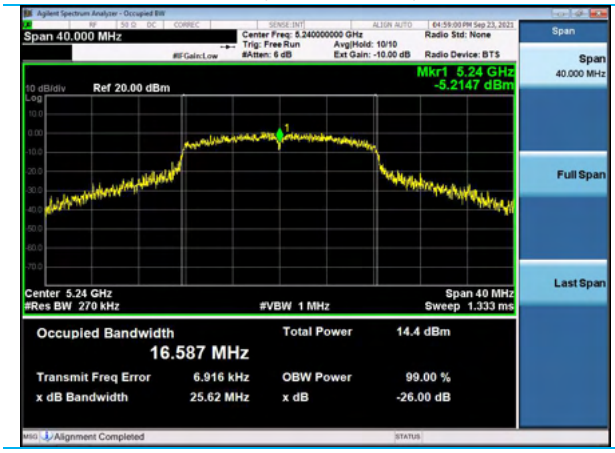
26 dB EBW, Channel 40, 6Mbps

26 dB EBW, Channel 40, 54Mbps

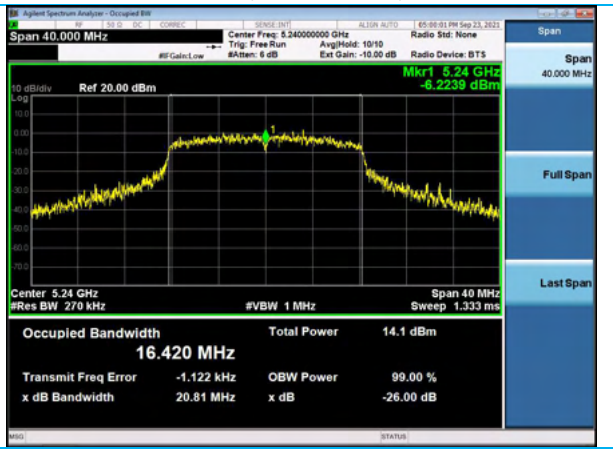


26 dB EBW, Channel 40, MCS0

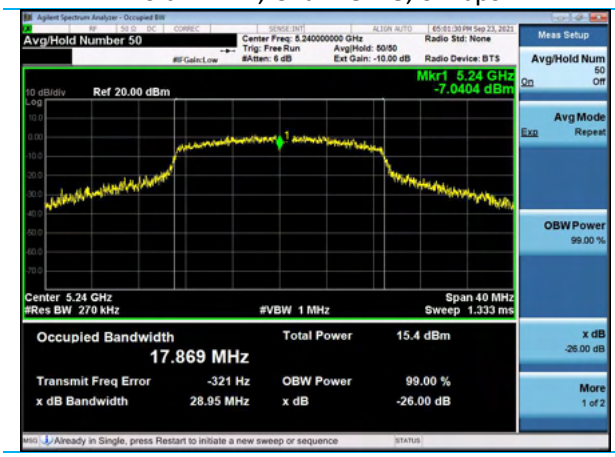
26 dB EBW, Channel 40, MCS7



26 dB EBW, Channel 48, 6Mbps



26 dB EBW, Channel 48, 54Mbps



26 dB EBW, Channel 48, MCS0

26 dB EBW, Channel 48, MCS7

5.1.2 Operation in the 5150-5250 Band (UNII 1) – 99% Occupied Bandwidth

Operator	Anthony Smith	**QA**	Zach Wilson
Temperature	21.2°C, 20.1°C, 20.5°C	**R.H. %**	47.3%, 45.7%, 48.9%
Test Date	9/22/2021, 9/23/2021, 9/24/2021	**Location**	Conducted RF Bench
Requirement	FCC 2.1049, RSS-GEN	**Method**	ANSI C63.10 §6.9.3

Limits

Reference Only

Test Parameters

Frequency	5180 MHz, 5200 MHz, 5220 MHz	**Setup**	Conducted
VBW	620 kHz	**RBW**	200 kHz
Span	30 MHz	**Detector**	Peak Max Hold

Instrumentation

Asset #	Description	Manufacturer	Model #	Serial #	Date	Due Date	Status
AA 960143	Cable	Gore	EKD01D01048.0	5546519	2/3/2021	2/3/2022	Active Verification
EE 960087	Analyzer - Spectrum	Agilent	N9010A	MY53400296	7/28/2021	7/28/2022	Active Calibration
EE 960090	Meter - RF Power	Anritsu	ML2495A	1335006	4/22/2021	4/22/2022	Active Calibration
EE 960091	Sensor - RF Power	Anritsu	MA2491A	1249277	4/22/2021	4/22/2022	Active Calibration

EUT Parameters

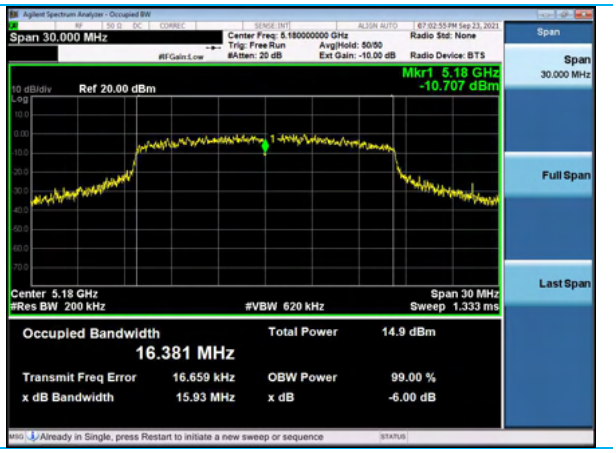
Input Power	5VDC via USB	**Mode**	WLAN 5GHz Transmit
Frequency	UNII 1 Band	**Channel**	36, 40, 48
Serial	SRW20440013SP	**Data Rates**	802.11a (6Mbps, 54Mbps) 802.11n (MCS0, MCS7)
Antenna Port	Top		

Data Table

Channel	Data Rate	99% Bandwidth (MHz)
36	6 Mbps	16.6
36	54 Mbps	16.4
36	MCS0	17.6
36	MCS7	17.5
40	6 Mbps	16.6
40	54 Mbps	16.4
40	MCS0	17.6
40	MCS7	17.5
48	6 Mbps	16.5
48	54 Mbps	16.4
48	MCS0	17.7
48	MCS7	17.5

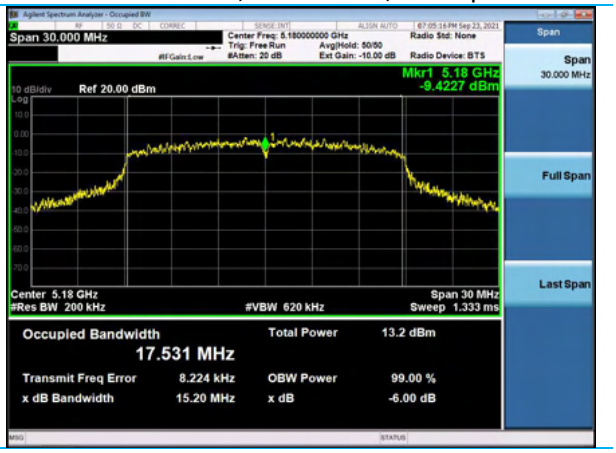
Plots

99% OCBW, Channel 36, 6Mbps



99% OCBW, Channel 36, 54Mbps

99% OCBW, Channel 36, MCS0



99% OCBW, Channel 36, MCS7

99% OCBW, Channel 40, 6Mbps

99% OCBW, Channel 40, 54Mbps

99% OCBW, Channel 40, MCS0

99% OCBW, Channel 40, MCS7

99% OCBW, Channel 48, 6Mbps

99% OCBW, Channel 48, 54Mbps

99% OCBW, Channel 48, MCS0

99% OCBW, Channel 48, MCS7

5.1.3 Operation in the 5150-5250 Band (UNII 1) – Maximum Conducted Output Power

Operator	Anthony Smith	**QA**	Zach Wilson
Temperature	21.2°C, 20.1°C, 20.5°C	**R.H. %**	47.3%, 45.7%, 48.9%
Test Date	9/22/2021, 9/23/2021, 9/24/2021, 10/4/2021	**Location**	Conducted RF Bench
Requirement	FCC 15.407, RSS-247	**Method**	ANSI C63.10 §12.3.3.2 PM-G

Limits

FCC: 24.0 dBm

ISED: 23.0 dBm

Test Parameters

Frequency	5180 MHz, 5200 MHz, 5220 MHz	**Setup**	Conducted
Detector(s)	Average (gated)		
Notes	No duty cycle correction as measurements made over “ON” time of transmitter.		

Instrumentation

Asset #	Description	Manufacturer	Model #	Serial #	Date	Due Date	Status
AA 960143	Cable	Gore	EKD01D01048.0	5546519	2/3/2021	2/3/2022	Active Verification
EE 960087	Analyzer - Spectrum	Agilent	N9010A	MY53400296	7/28/2021	7/28/2022	Active Calibration
EE 960090	Meter - RF Power	Anritsu	ML2495A	1335006	4/22/2021	4/22/2022	Active Calibration
EE 960091	Sensor - RF Power	Anritsu	MA2491A	1249277	4/22/2021	4/22/2022	Active Calibration

EUT Parameters

Input Power	5VDC via USB	**Mode**	WLAN 5GHz Transmit
Frequency	UNII 1 Band	**Channel**	36, 40, 48
Serial	SRW20440013SP	**Data Rates**	802.11a (6Mbps, 54Mbps) 802.11n (MCS0, MCS7)
Antenna Port	Top, Bottom		

Data Table – Top Antenna Port

Channel	Data Rate	Output Power (dBm)	FCC Limit (dBm)	FCC Margin (dB)	ISED Limit (dBm)	ISED Margin (dB)
36	6 Mbps	10.0	24.0	14.0	23.0	13.0
36	54 Mbps	9.2	24.0	14.8	23.0	13.8
36	MCS0	10.1	24.0	13.9	23.0	12.9
36	MCS7	7.4	24.0	16.6	23.0	15.6
40	6 Mbps	9.9	24.0	14.1	23.0	13.1
40	54 Mbps	9.5	24.0	14.6	23.0	13.6
40	MCS0	10.2	24.0	13.8	23.0	12.8
40	MCS7	7.7	24.0	16.3	23.0	15.3
48	6 Mbps	9.6	24.0	14.4	23.0	13.4
48	54 Mbps	9.0	24.0	15.1	23.0	14.1
48	MCS0	10.0	24.0	14.0	23.0	13.0
48	MCS7	7.2	24.0	16.8	23.0	15.8

Data Table – Bottom Antenna Port

Channel	Data Rate	Output Power (dBm)	FCC Limit (dBm)	FCC Margin (dB)	ISED Limit (dBm)	ISED Margin (dB)
36	6 Mbps	11.8	24.0	12.2	23.0	11.2
36	54 Mbps	11.1	24.0	12.9	23.0	11.9
36	MCS0	12.0	24.0	12.0	23.0	11.0
36	MCS7	9.3	24.0	14.7	23.0	13.7
40	6 Mbps	11.4	24.0	12.6	23.0	11.6
40	54 Mbps	10.9	24.0	13.2	23.0	12.2
40	MCS0	11.7	24.0	12.3	23.0	11.3
40	MCS7	9.1	24.0	14.9	23.0	13.9
48	6 Mbps	11.6	24.0	12.4	23.0	11.4
48	54 Mbps	11.0	24.0	13.0	23.0	12.0
48	MCS0	11.9	24.0	12.1	23.0	11.1
48	MCS7	9.2	24.0	14.8	23.0	13.8

5.1.4 Operation in the 5150-5250 Band (UNII 1) – Power Spectral Density

Operator	Anthony Smith	**QA**	Zach Wilson
Temperature	21.2°C, 20.1°C, 20.5°C	**R.H. %**	47.3%, 45.7%, 48.9%
Test Date	9/22/2021, 9/23/2021, 9/24/2021, 10/4/2021	**Location**	Conducted RF Bench
Requirement	FCC 15.407, RSS-247	**Method**	ANSI C63.10 §12.5 SA-2

Limits

FCC: 11.0 dBm/MHz

ISED: 10.0 dBm/MHz

Test Parameters

Frequency	5180 MHz, 5200 MHz, 5220 MHz	**Setup**	Conducted
VBW	3 MHz	**RBW**	1 MHz
Span	Encompass 26 dB EBW	**Detector**	RMS with Average Hold
Duty Cycle Correction	10LOG(1/D), where D is the duty cycle Ex: D= 0.6 or 60% duty cycle Ex: 10LOG(1/0.6) = 2.2 dB correction		

Instrumentation

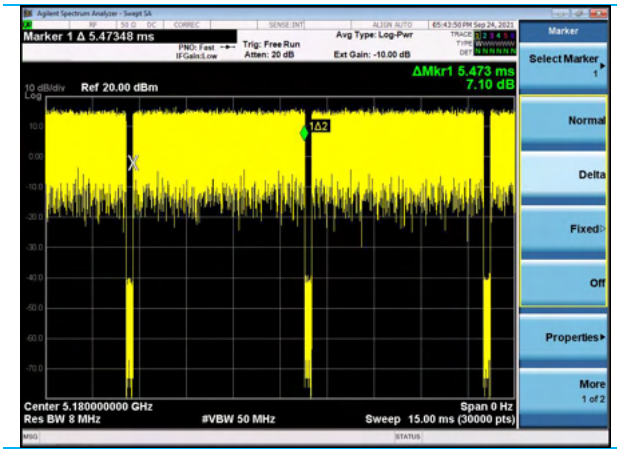
Asset #	Description	Manufacturer	Model #	Serial #	Date	Due Date	Status
AA 960143	Cable	Gore	EKD01D01048.0	5546519	2/3/2021	2/3/2022	Active Verification
EE 960087	Analyzer - Spectrum	Agilent	N9010A	MY53400296	7/28/2021	7/28/2022	Active Calibration
EE 960090	Meter - RF Power	Anritsu	ML2495A	1335006	4/22/2021	4/22/2022	Active Calibration
EE 960091	Sensor - RF Power	Anritsu	MA2491A	1249277	4/22/2021	4/22/2022	Active Calibration

EUT Parameters

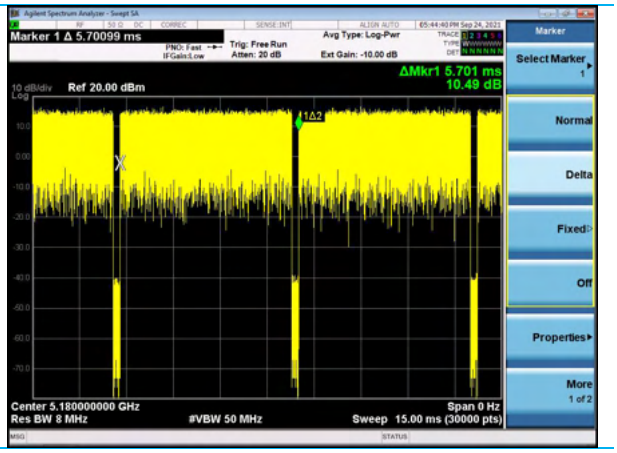
Input Power	5VDC via USB	**Mode**	WLAN 5GHz Transmit
Frequency	UNII 1 Band	**Channels**	36, 40, 48
Serial	SRW20440013SP	**Data Rates**	802.11a (6Mbps, 54Mbps) 802.11n (MCS0, MCS7)
Antenna Port	Top, Bottom		

Duty Cycle Information

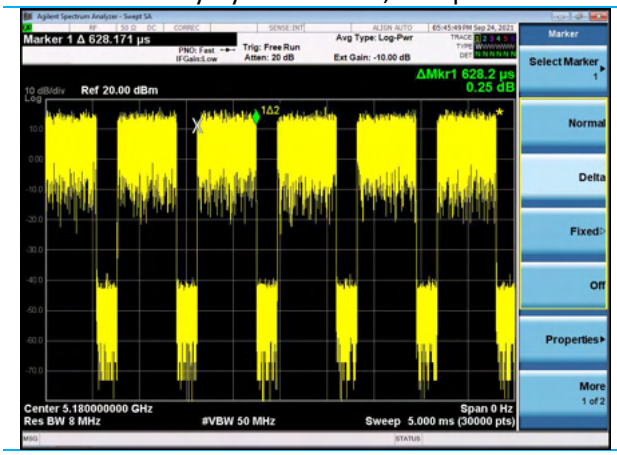
Data Rate	Duty Cycle	Correction (dB)
6Mbps	96.00%	0.177
54Mbps	73.80%	1.319
MCS0	95.68%	0.192
MCS7	68.36%	1.652



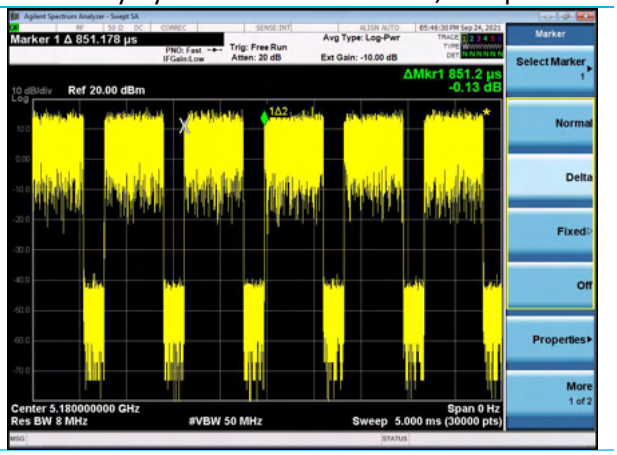
Duty Cycle On Time, 6Mbps



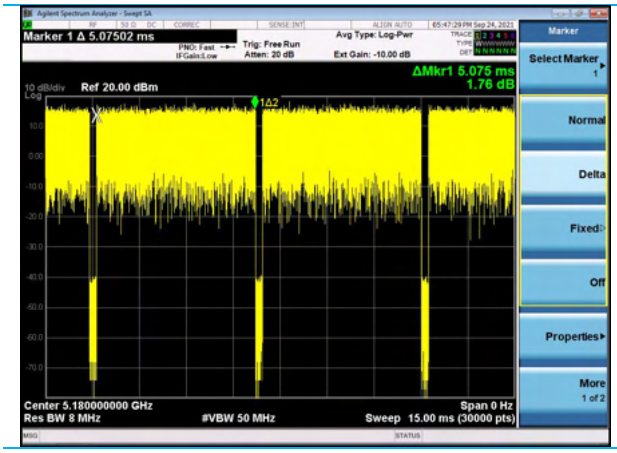
Duty Cycle Observation Period, 6Mbps



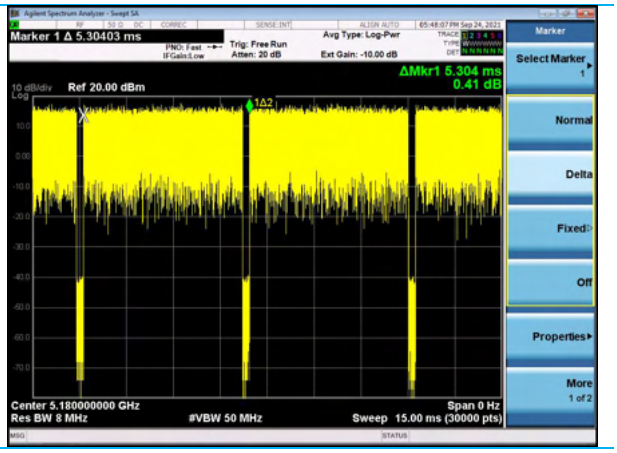
Duty Cycle On Time, 54Mbps



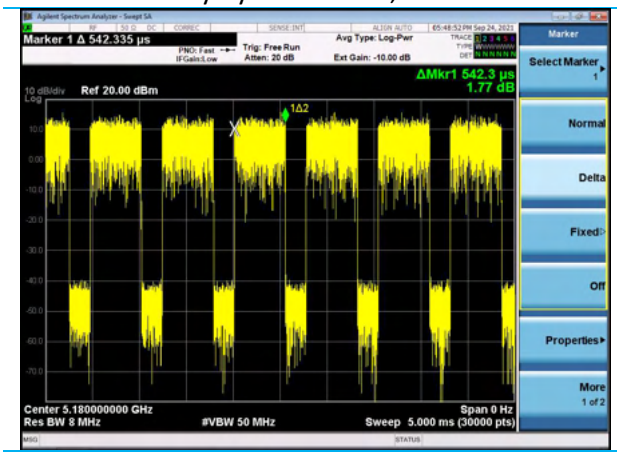
Duty Cycle Observation Period, 54Mbps



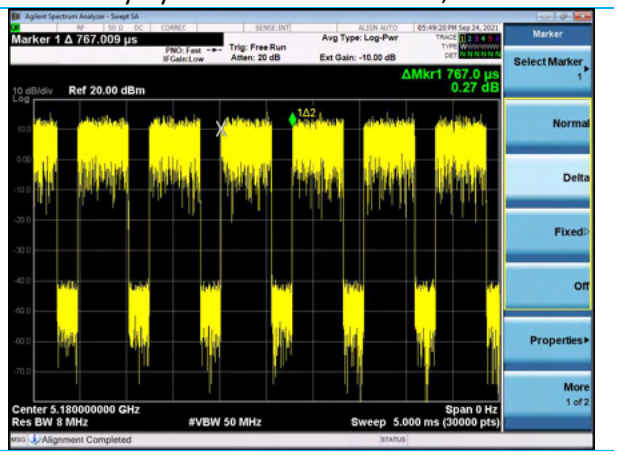
Duty Cycle On Time, MCS0



Duty Cycle Observation Period, MCS0



Duty Cycle On Time, MCS7



Duty Cycle Observation Period, MCS7

FCC Data Table – Top Antenna Port

Channel	Data Rate	Peak PSD (dBm/MHz)	Duty Cycle Correction Factor (dB)	Corrected Peak PSD (dBm/MHz)	FCC Limit (dBm/MHz)	Margin (dB)
36	6 Mbps	0.5	0.2	0.7	11.0	10.3
36	54 Mbps	-0.8	1.3	0.5	11.0	10.5
36	MCS0	1.2	0.2	1.4	11.0	9.6
36	MCS7	-2.5	1.7	-0.8	11.0	11.8
40	6 Mbps	0.6	0.2	0.8	11.0	10.2
40	54 Mbps	-0.9	1.3	0.4	11.0	10.6
40	MCS0	1.1	0.2	1.3	11.0	9.7
40	MCS7	-2.7	1.7	-1.0	11.0	12.0
48	6 Mbps	0.5	0.2	0.7	11.0	10.3
48	54 Mbps	-1.2	1.3	0.1	11.0	10.9
48	MCS0	0.2	0.2	0.4	11.0	10.6
48	MCS7	-3.3	1.7	-1.7	11.0	12.7

ISED Data Table – Top Antenna Port

Channel	Data Rate	Peak PSD (dBm/MHz)	Duty Cycle Correction Factor (dB)	Corrected Peak PSD (dBm/MHz)	ISED Limit (dBm/MHz)	Margin (dB)
36	6 Mbps	0.5	0.2	0.7	10.0	9.3
36	54 Mbps	-0.8	1.3	0.5	10.0	9.5
36	MCS0	1.2	0.2	1.4	10.0	8.6
36	MCS7	-2.5	1.7	-0.8	10.0	10.8
40	6 Mbps	0.6	0.2	0.8	10.0	9.2
40	54 Mbps	-0.9	1.3	0.4	10.0	9.6
40	MCS0	1.1	0.2	1.3	10.0	8.7
40	MCS7	-2.7	1.7	-1.0	10.0	11.0
48	6 Mbps	0.5	0.2	0.7	10.0	9.3
48	54 Mbps	-1.2	1.3	0.1	10.0	9.9
48	MCS0	0.2	0.2	0.4	10.0	9.6
48	MCS7	-3.3	1.7	-1.7	10.0	11.7

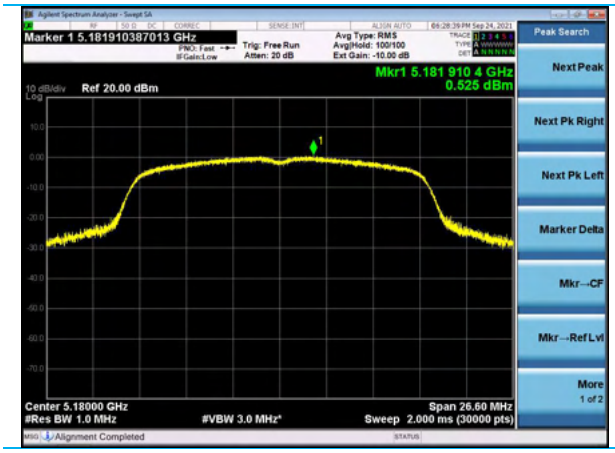
FCC Data Table – Bottom Antenna Port

Channel	Data Rate	Peak PSD (dBm/MHz)	Duty Cycle Correction Factor (dB)	Corrected Peak PSD (dBm/MHz)	FCC Limit (dBm/MHz)	Margin (dB)
36	6 Mbps	2.4	0.2	2.5	11.0	8.5
36	54 Mbps	0.8	1.3	2.1	11.0	8.9
36	MCS0	2.6	0.2	2.8	11.0	8.2
36	MCS7	-0.9	1.7	0.7	11.0	10.3
40	6 Mbps	1.8	0.2	2.0	11.0	9.0
40	54 Mbps	1.0	1.3	2.4	11.0	8.6
40	MCS0	2.4	0.2	2.6	11.0	8.4
40	MCS7	-1.3	1.7	0.4	11.0	10.6
48	6 Mbps	2.2	0.2	2.4	11.0	8.6
48	54 Mbps	0.6	1.3	1.9	11.0	9.1
48	MCS0	2.4	0.2	2.6	11.0	8.4
48	MCS7	-1.4	1.7	0.3	11.0	10.7

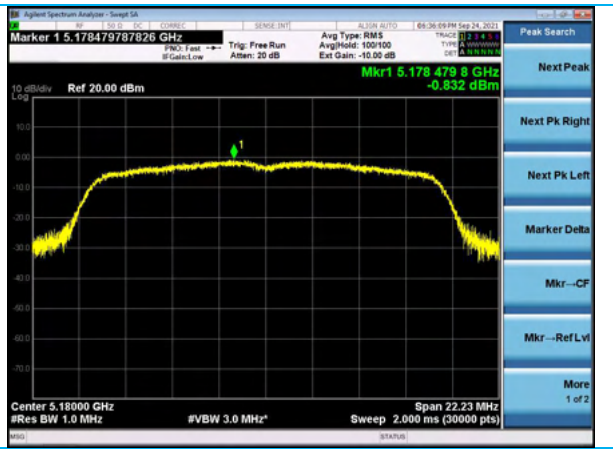
ISED Data Table – Bottom Antenna Port

Channel	Data Rate	Peak PSD (dBm/MHz)	Duty Cycle Correction Factor (dB)	Corrected Peak PSD (dBm/MHz)	ISED Limit (dBm/MHz)	Margin (dB)
36	6 Mbps	2.4	0.2	2.5	10.0	7.5
36	54 Mbps	0.8	1.3	2.1	10.0	7.9
36	MCS0	2.6	0.2	2.8	10.0	7.2
36	MCS7	-0.9	1.7	0.7	10.0	9.3
40	6 Mbps	1.8	0.2	2.0	10.0	8.0
40	54 Mbps	1.0	1.3	2.4	10.0	7.6
40	MCS0	2.4	0.2	2.6	10.0	7.4
40	MCS7	-1.3	1.7	0.4	10.0	9.6
48	6 Mbps	2.2	0.2	2.4	10.0	7.6
48	54 Mbps	0.6	1.3	1.9	10.0	8.1
48	MCS0	2.4	0.2	2.6	10.0	7.4
48	MCS7	-1.4	1.7	0.3	10.0	9.7

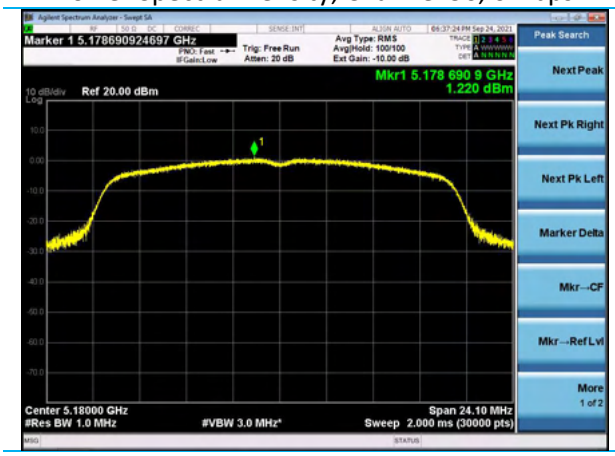
Plots – Top Antenna Port



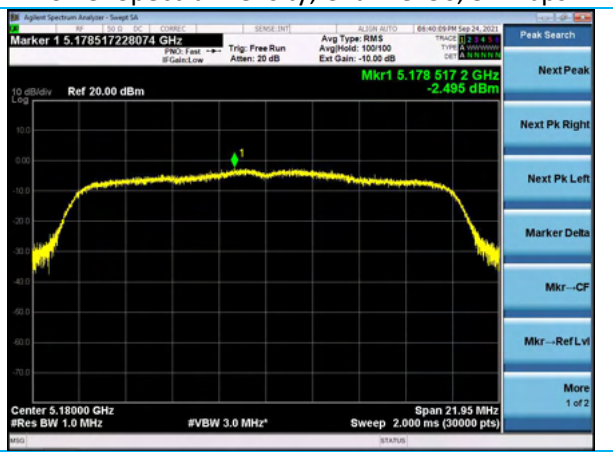
Power Spectral Density, Channel 36, 6Mbps



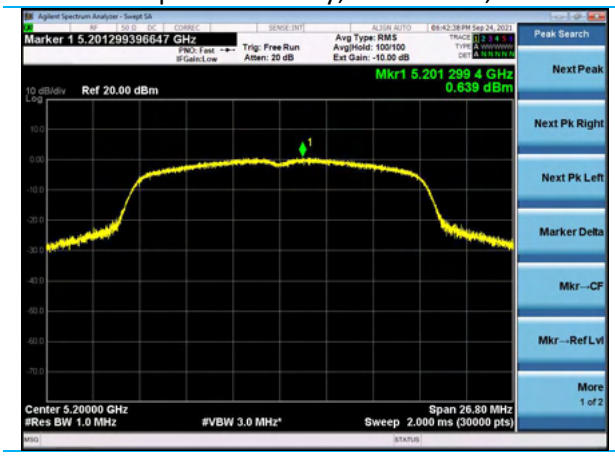
Power Spectral Density, Channel 36, 54Mbps



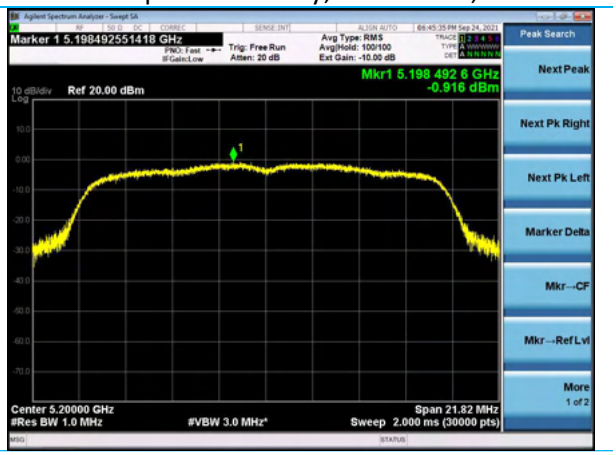
Power Spectral Density, Channel 36, MCS0



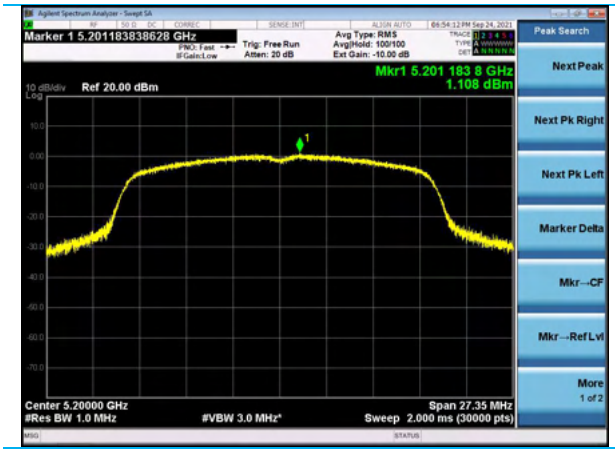
Power Spectral Density, Channel 36, MCS7



Power Spectral Density, Channel 40, 6Mbps

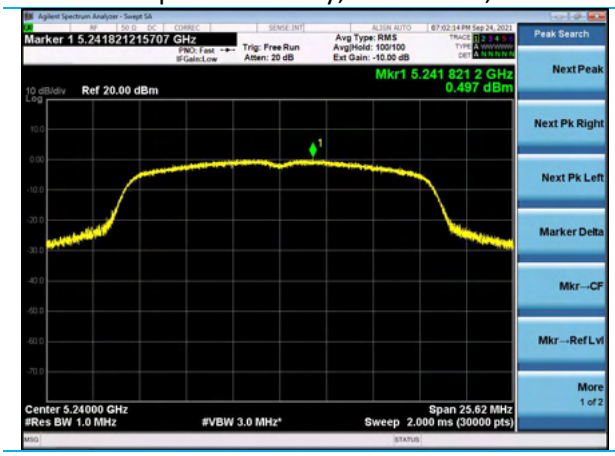


Power Spectral Density, Channel 40, 54Mbps

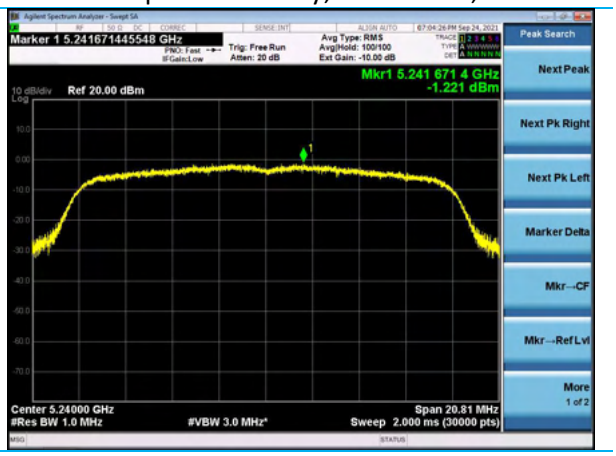


Power Spectral Density, Channel 40, MCS0

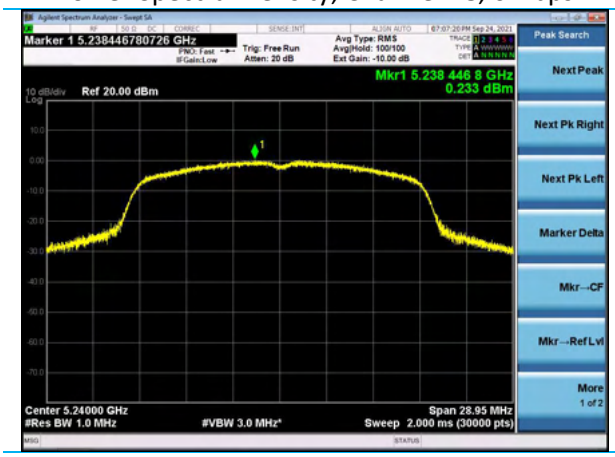
Power Spectral Density, Channel 40, MCS7



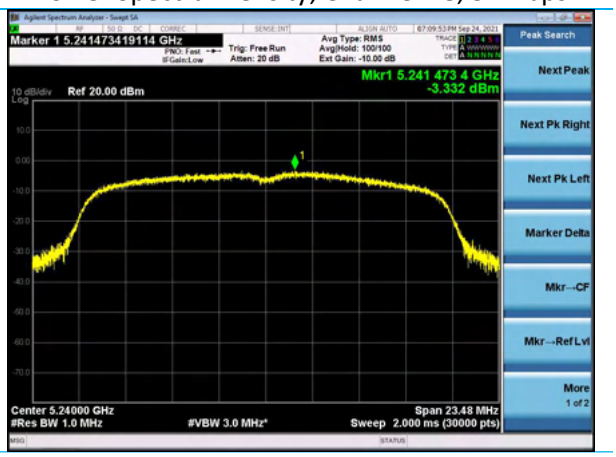
Power Spectral Density, Channel 48, 6Mbps



Power Spectral Density, Channel 48, 54Mbps

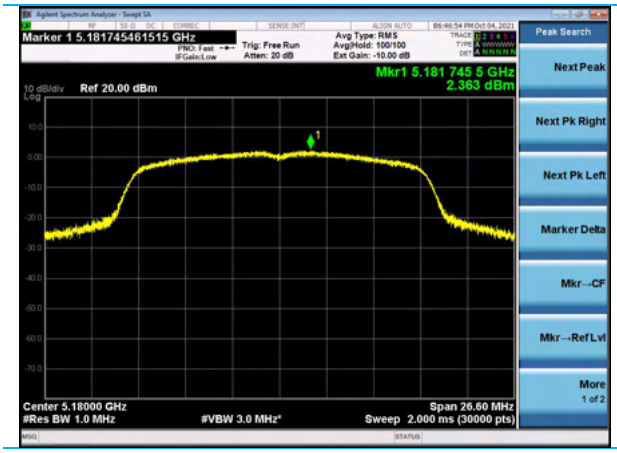


Power Spectral Density, Channel 48, MCS0

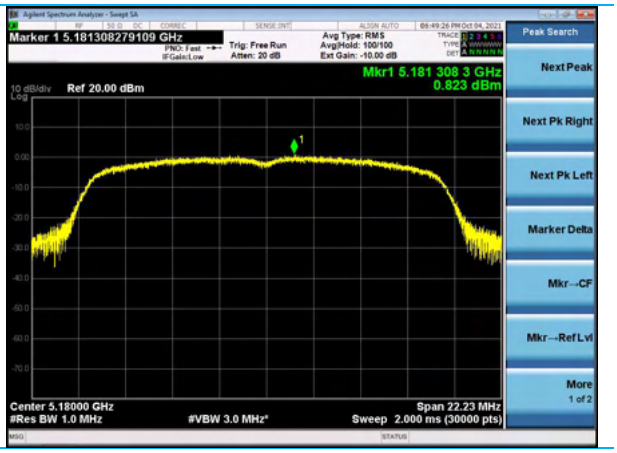


Power Spectral Density, Channel 48, MCS7

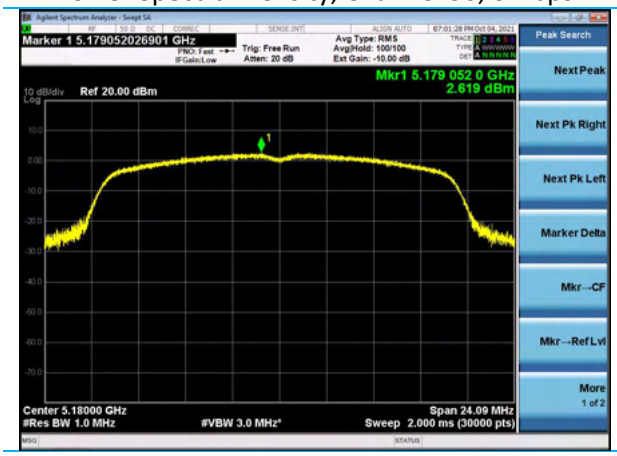
Plots – Bottom Antenna Port



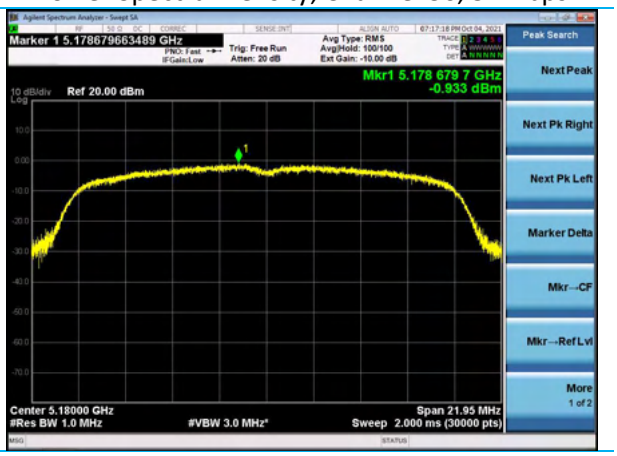
Power Spectral Density, Channel 36, 6Mbps



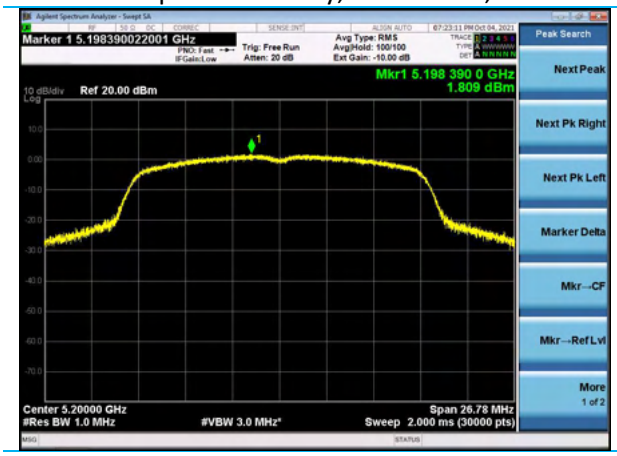
Power Spectral Density, Channel 36, 54Mbps



Power Spectral Density, Channel 36, MCS0

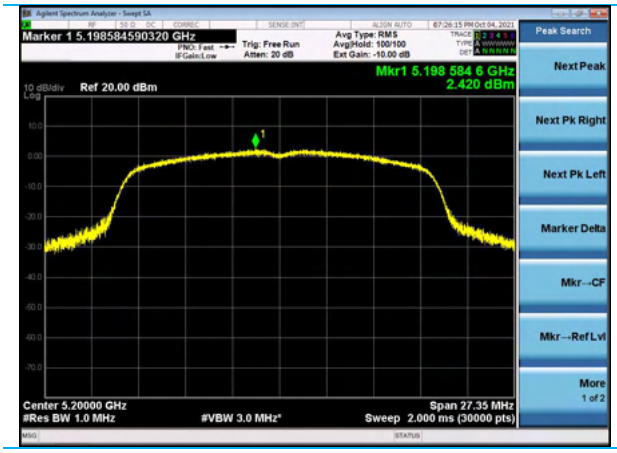


Power Spectral Density, Channel 36, MCS7



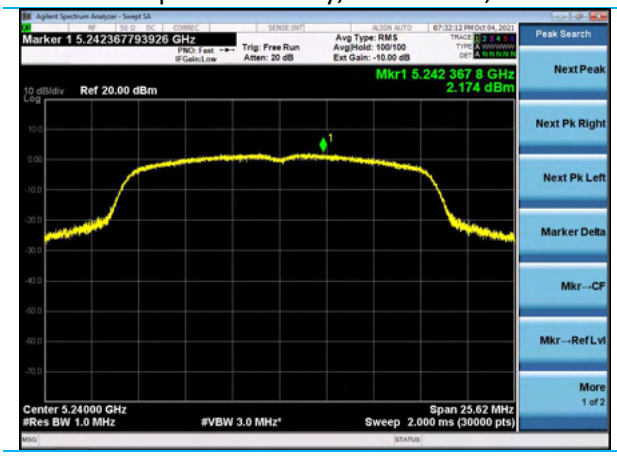
Power Spectral Density, Channel 40, 6Mbps

Power Spectral Density, Channel 40, 54Mbps

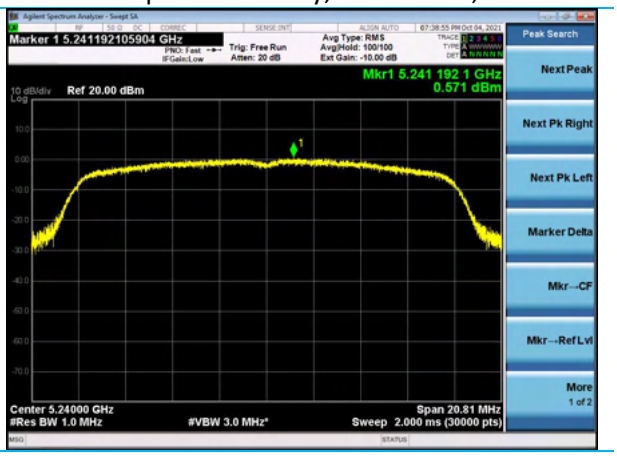


Power Spectral Density, Channel 40, MCS0

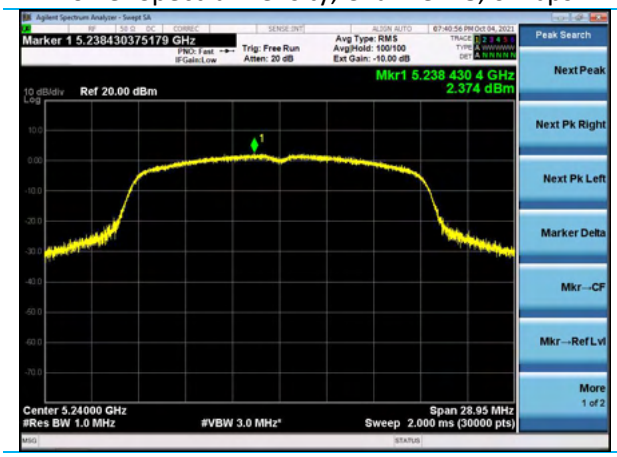
Power Spectral Density, Channel 40, MCS7



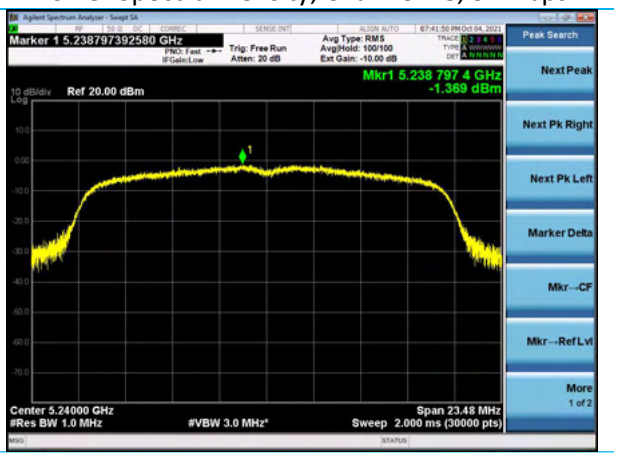
Power Spectral Density, Channel 48, 6Mbps



Power Spectral Density, Channel 48, 54Mbps



Power Spectral Density, Channel 48, MCS0

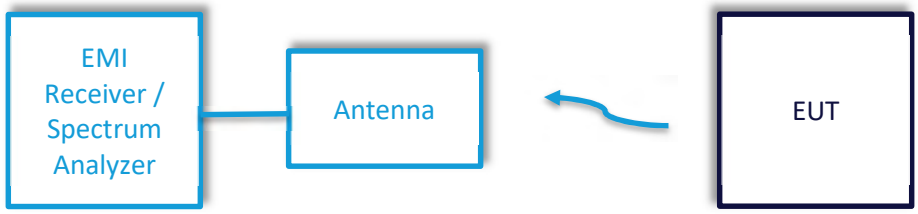


Power Spectral Density, Channel 48, MCS7

5.2 Radiated Emissions

Description of Measurement	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. 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. 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.
Example Calculations	Measurement (dBµV) + Cable factor (dB) + Other (dB) + Antenna Factor (dB/m) = Corrected Reading (dBµV/m) Margin (dB) = Limit (dBµV/m) - Corrected Reading (dBµV/m) 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

Block Diagram



5.2.1 Operation in the 5150-5250 MHz Band (UNII 1) - Radiated Emissions

Operator	Anthony Smith	**QA**	Zach Wilson
Temperature	20.7°C, 21.9°C	**R.H. %**	50.5%, 50%
Test Date	9/20/2021, 9/21/2021	**Location**	Chamber 5
Requirement	FCC 15.407, RSS-247, FCC 15.209	**Method**	ANSI C63.10

Limits

All emissions outside of the 5150-5350 MHz band shall not exceed an e.i.r.p of -27 dBm/MHz.

Restricted Bands: 68.2 dBµV/m Peak, 54.0 dBµV/m Average

Test Parameters

Frequency	4500-5150 MHz, 5350-5460 MHz 5460-5470 MHz, 8-40 GHz	**Distance**	3m
Detector(s)	Peak, Average for restricted bands	**Table height**	150cm
RBW	1 MHz	**VBW**	2 kHz for average 3 MHz for peak 30 kHz for emission identification
Notes	Top antenna declared worst case		
Example Calculations	-27.0 dBm/MHz + 95.2 (free space conversion) = 68.2 dBµV/m @ 3m		
Notes	No transmitter emissions found in the 8-40 GHz range. Low channel for each band shown.		

Instrumentation

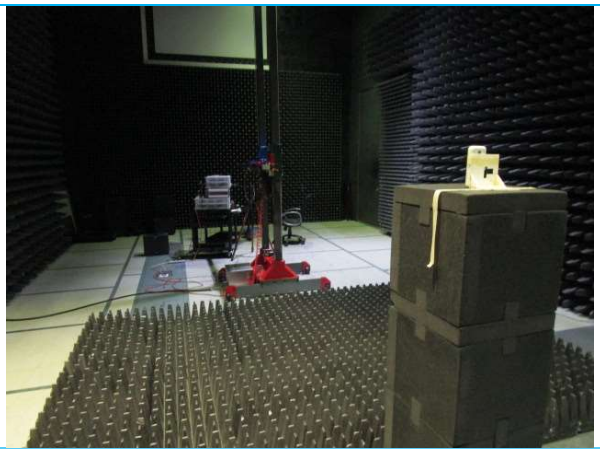
Asset #	Description	Manufacturer	Model #	Serial #	Date	Due Date	Status
AA 960007	Antenna - Double Ridge Horn	EMCO	3115	9311-4138	8/23/2021	8/23/2022	Active Calibration
AA 960161	Filter - Highpass 5 GHz	K&L Microwave	11SH10-8000	2	4/21/2021	4/21/2022	Active Calibration
AA 960162	Cable	MegaPhase	EM2-S1S1-120	51503501 001	2/3/2021	2/3/2022	Active Verification
AA 960171	Cable	A.H. Systems, Inc.	SAC-26G-6	386	2/3/2021	2/3/2022	Active Verification
AA 960174	Antenna - Small Horn	ETS Lindgren	3116C-PA	00206880	9/1/2021	9/1/2022	Active Calibration
AA 960209	Antenna - Low Noise Amplifier	Mini-Circuits	ZVA-213X-S+	037101808	8/23/2021	8/23/2022	Active Calibration
EE 960087	Analyzer - Spectrum	Agilent	N9010A	MY53400296	7/28/2021	7/28/2022	Active Calibration
EE 960198	Meter - Hygro-Thermometer	Control Company	90080-03	180045460	5/14/2021	5/14/2022	Active Calibration
EE 960203	Analyzer - EMI Receiver	Keysight	N9038A	MY56400072	4/20/2021	4/20/2022	Active Calibration

EUT Parameters

Input Power	Battery	**Mode**	WLAN Continuous TX
EUT	Module In Host	**EUT**	Top Antenna Only, EUT Vertical Orientation Only
Channels	36, 40, 48	**Data Rates**	802.11a 6Mbps for Band Edge 802.11n MCS0 for Harmonics
Antenna Port	Top		

Setup Photos

EUT Setup



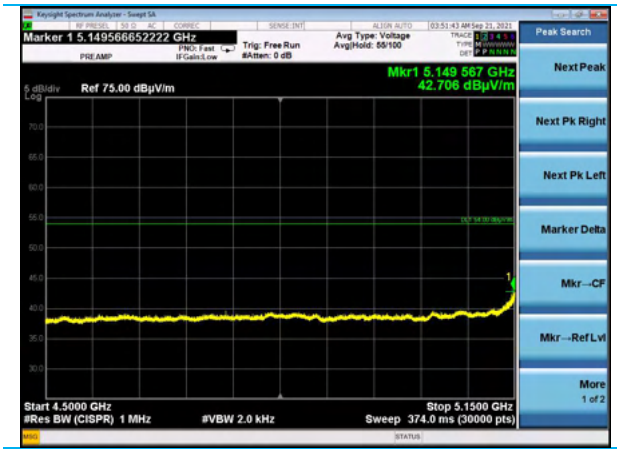
Chamber Setup

Data Tables

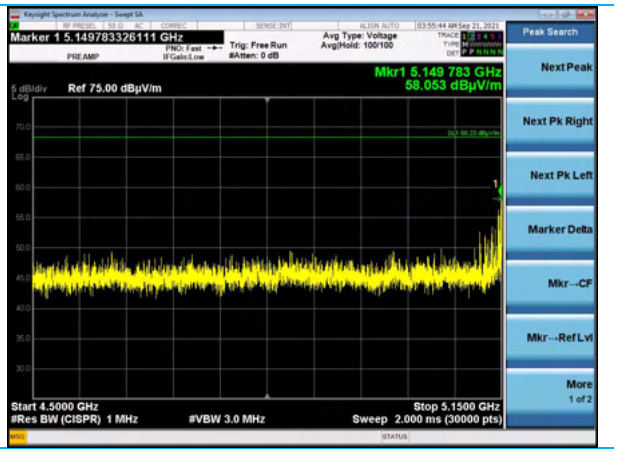
Frequency (MHz)	Antenna Polarity	Height (cm)	Azimuth (degree)	Average Reading (dBµV/m)	Average Limit (dBµV/m)	Average Margin (dB)	Channel	Data Rate (Mbps)
5149.6	Vertical	100	263	42.7	54.0	11.3	36	MCS0
5149.2	Vertical	100	263	41.4	54.0	12.6	40	MCS0
5459.9	Vertical	100	263	41.4	54.0	12.6	40	MCS0
5350.2	Vertical	100	263	40.9	54.0	13.1	48	MCS0

Frequency (MHz)	Antenna Polarity	Height (cm)	Azimuth (degree)	Peak Reading (dBµV/M)	Peak Limit (dBµV/m)	Peak Margin (dB)	Channel	Data Rate (Mbps)
5149.8	Vertical	100	263	58.1	68.2	10.2	36	MCS0
5462.0	Vertical	100	263	50.3	68.2	17.9	48	MCS0
5436.4	Vertical	100	263	51.0	68.2	17.2	48	MCS0
5456.5	Vertical	100	263	50.2	68.2	18.0	40	MCS0
5148.0	Vertical	100	263	56.3	68.2	11.9	40	MCS0

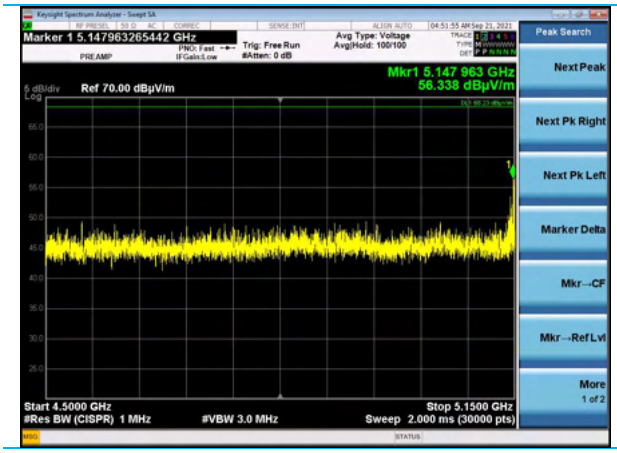
Plots



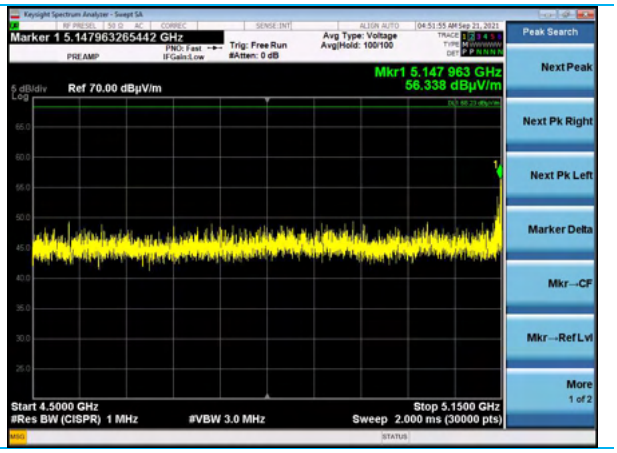
4500-5150 MHz, Channel 36, MCS0, Average Vertical Antenna



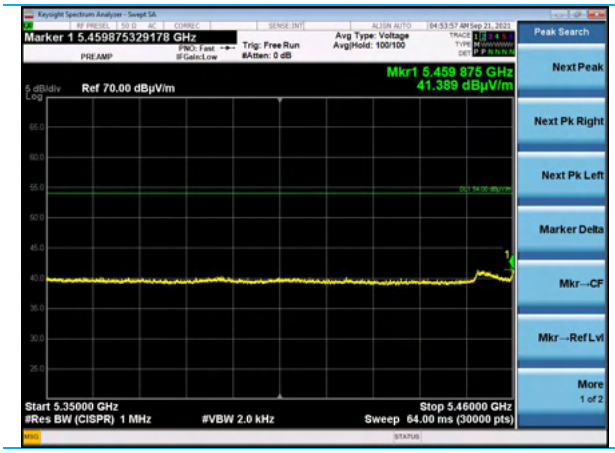
4500-5150 MHz, Channel 36, MCS0, Peak Vertical Antenna



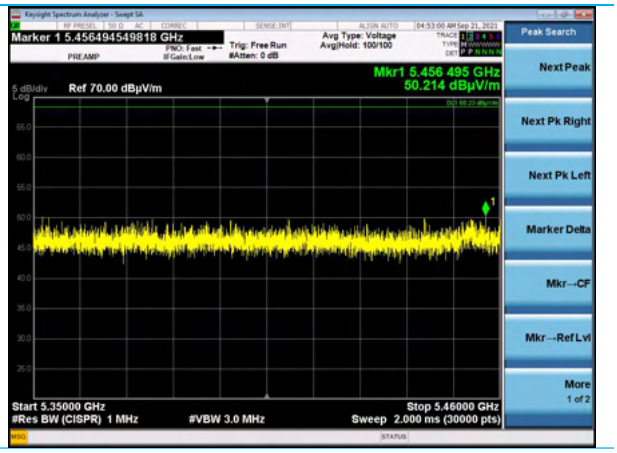
4500-5150 MHz, Channel 40, MCS0, Average Vertical Antenna



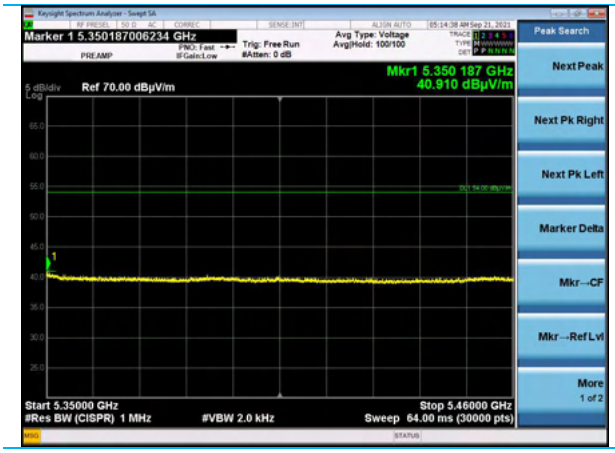
4500-5150 MHz, Channel 40, MCS0, Peak Vertical Antenna



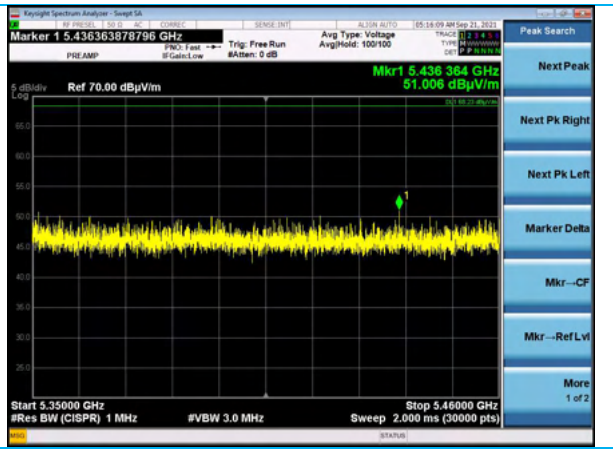
5350-5460 MHz, Channel 40, MCS0, Average Vertical Antenna



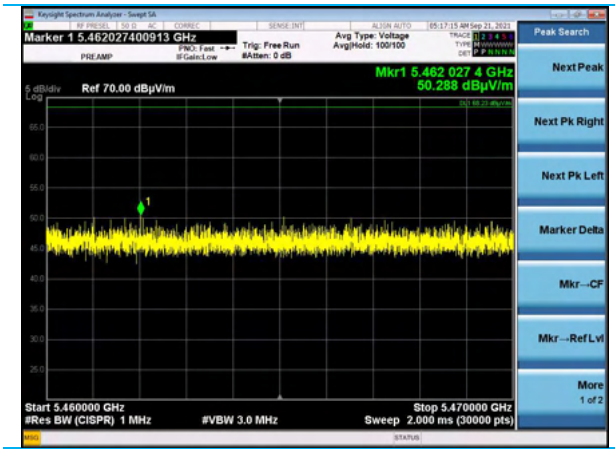
5350-5460 MHz, Channel 40, MCS0, Peak Vertical Antenna



5350-5460 MHz, Channel 48, MCS0, Average Vertical Antenna

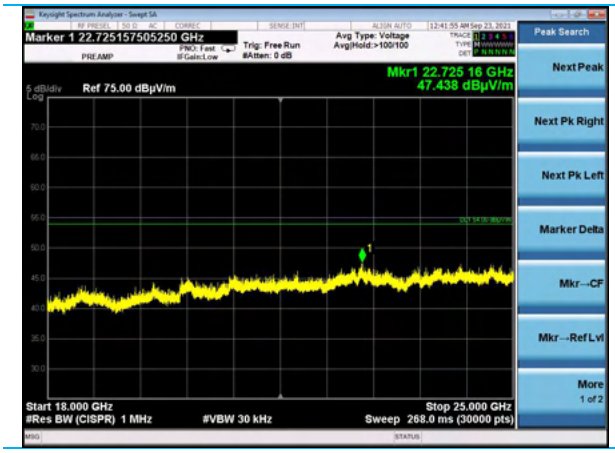


5350-5460 MHz, Channel 48, MCS0, Peak Vertical Antenna

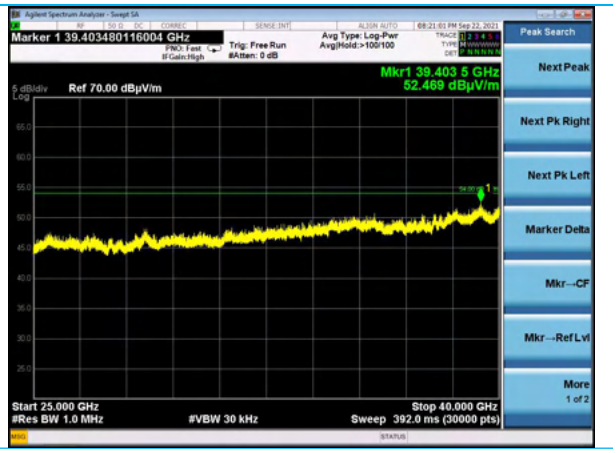


5460-5470 MHz, Channel 48, MCS0, Peak Vertical Antenna

8-18 GHz, Channel 36, 6Mbps, Reduced VBW Vertical Antenna



18-25 GHz, Channel 36, 6Mbps, Reduced VBW Vertical Antenna



25-40 GHz, Channel 36, 6Mbps, Reduced VBW Vertical Antenna

6 REVISION HISTORY

Version	Date	Notes	Person
0	10-4-2021	Initial Draft	Zach Wilson
1	10-7-2021	Full report split into three reports, one per UNII band for upload size reasons	Zach Wilson

END OF REPORT