

Test Report

FCC ID: LDKBRB4K1779

AIR-AP4800-B-K9, AIR-AP4800-T-K9

Cisco Aironet 802.11ac Dual Band Access Points

5725-5850 MHz

Against the following Specifications:

LP0002 (2018-01-10)

CFR47 Part 15.407

RSS-247



Cisco Systems

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This report replaces any previously entered test report under EDCS – **15874495**. This test report has been electronically authorized and archived using the CISCO Engineering Document Control system.

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Section 1: Overview

The samples were assessed against the tests detailed in section 3 under the requirements of the following specifications:

Specifications:
CFR47 Part 15.407
RSS-247
LP0002 (2018-01-10)

Measurements were made in accordance with

- ANSI C63.10:2013
- KDB 789033 D02 General UNII Test Procedures New Rules v01r03
- KDB 662911 D01 Multiple Transmitter Output v02r01

Section 2: Assessment Information

2.1 General

This report contains an assessment of an apparatus against Electromagnetic Compatibility Standards based upon tests carried out on the samples submitted. The testing was performed by and for the use of Cisco systems Inc:

With regard to this assessment, the following points should be noted:

- a) The results contained in this report relate only to the items tested and were obtained in the period between the date of the initial assessment and the date of issue of the report. Manufactured products will not necessarily give identical results due to production and measurement tolerances.
- b) The apparatus was set up and exercised using the configuration and modes of operation defined in this report only.
- c) Where relevant, the apparatus was only assessed using the susceptibility criteria defined in this report and the Test Assessment Plan (TAP).
- d) All testing was performed under the following environmental conditions:

Temperature	15°C to 35°C (54°F to 95°F)
Atmospheric Pressure	860mbar to 1060mbar (25.4" to 31.3")
Humidity	10% to 75*%
- e) All AC testing was performed at one or more of the following supply voltages:
110V 60 Hz (+/-20%)

Units of Measurement

The units of measurements defined in the appendices are reported in specific terms, which are test dependent. Where radiated measurements are concerned these are defined at a particular distance. Basic voltage measurements are defined in units of [dBuV]

As an example, the basic calculation for all measurements is as follows:

$$\text{Emission level [dBuV]} = \text{Indicated voltage level [dBuV]} + \text{Cable Loss [dB]} + \text{Other correction factors [dB]}$$

The combinations of correction factors are dependent upon the exact test configurations [see test equipment lists for further details] and may include:-

Antenna Factors, Pre Amplifier Gain, LISN Loss, Pulse Limiter Loss and Filter Insertion Loss

Note: to convert the results from dBuV/m to uV/m use the following formula:-

$$\text{Level in uV/m} = \text{Common Antilogarithm } [(X \text{ dBuV/m})/20] = Y \text{ uV/m}$$

Measurement Uncertainty Values

voltage and power measurements	± 2 dB
conducted EIRP measurements	± 1.4 dB
radiated measurements	± 3.2 dB
frequency measurements	$\pm 2.4 \cdot 10^{-7}$
temperature measurements	$\pm 0.54^\circ$
humidity measurements	$\pm 2.3\%$
DC and low frequency measurements	$\pm 2.5\%$

Where relevant measurement uncertainty levels have been estimated for tests performed on the apparatus. This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of $k=2$.

Radiated emissions (expanded uncertainty, confidence interval 95%)

30 MHz - 300 MHz	+/- 3.8 dB
300 MHz - 1000 MHz	+/- 4.3 dB
1 GHz - 10 GHz	+/- 4.0 dB
10 GHz - 18GHz	+/- 8.2 dB
18GHz - 26.5GHz	+/- 4.1 dB
26.5GHz - 40GHz	+/- 3.9 dB

Conducted emissions (expanded uncertainty, confidence interval 95%)

30 MHz – 40GHz	+/- 0.38 dB
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A product is considered to comply with a requirement if the nominal measured value is below the limit line.
The product is considered to not be in compliance in case the nominal measured value is above the limit line.

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2.2 Date of testing

1-Nov-17 – 16-Dec-18

2.3 Report Issue Date

18-Dec-18

Cisco uses an electronic system to issue, store and control the revision of test reports. This system is called the Engineering Document Control System (EDCS). The actual report issue date is embedded into the original file on EDCS. Any copies of this report, either electronic or paper, that are not on EDCS must be considered uncontrolled.

2.4 Testing facilities

This assessment was performed by:

Testing Laboratory

Cisco Systems, Inc.,
125 West Tasman Drive
San Jose, CA 95134, USA

Registration Numbers for Industry Canada

Cisco System Site	Address	Site Identifier
Building P, 10m Chamber	125 West Tasman Dr San Jose, CA 95134	Company #: 2461N-2
Building P, 5m Chamber	125 West Tasman Dr San Jose, CA 95134	Company #: 2461N-1
Building I, 5m Chamber	285 W. Tasman Drive San Jose, California 95134	Company #: 2461M-1

Test Engineers

Jose Aguirre

2.5 Equipment Assessed (EUT)

AIR-AP4800-B-K9

2.6 EUT Description

The Cisco Aironet 802.11ac Radio supports the following modes of operation. The modes are further defined in the radio Theory of Operation. The modes included in this report represent the worst case data for all modes.

802.11n/ac - Non HT20, One Antenna, 6 to 54 Mbps
802.11n/ac - Non HT20, Two Antennas, 6 to 54 Mbps
802.11n/ac - Non HT20, Three Antennas, 6 to 54 Mbps
802.11n/ac - Non HT20, Four Antennas, 6 to 54 Mbps

802.11n/ac - Non HT20 Beam Forming, Two Antennas, 6 to 54 Mbps
802.11n/ac - Non HT20 Beam Forming, Three Antennas, 6 to 54 Mbps
802.11n/ac - Non HT20 Beam Forming, Four Antennas, 6 to 54 Mbps

802.11n/ac - HT/VHT20, One Antenna, M0 to M7
802.11n/ac - HT/VHT20, Two Antennas, M0 to M7
802.11n/ac - HT/VHT20, Two Antennas, M8 to M15
802.11n/ac - HT/VHT20, Three Antennas, M0 to M7
802.11n/ac - HT/VHT20, Three Antennas, M8 to M15
802.11n/ac - HT/VHT20, Three Antennas, M16 to M23
802.11n/ac - HT/VHT20, Four Antennas, M0 to M7
802.11n/ac - HT/VHT20, Four Antennas, M8 to M15
802.11n/ac - HT/VHT20, Four Antennas, M16 to M23

802.11n/ac - HT/VHT20 Beam Forming, Two Antennas, M0 to M7
802.11n/ac - HT/VHT20 Beam Forming, Two Antennas, M8 to M15
802.11n/ac - HT/VHT20 Beam Forming, Three Antennas, M0 to M7
802.11n/ac - HT/VHT20 Beam Forming, Three Antennas, M8 to M15
802.11n/ac - HT/VHT20 Beam Forming, Three Antennas, M16 to M23
802.11n/ac - HT/VHT20 Beam Forming, Four Antennas, M0 to M7
802.11n/ac - HT/VHT20 Beam Forming, Four Antennas, M8 to M15
802.11n/ac - HT/VHT20 Beam Forming, Four Antennas, M16 to M23

802.11n/ac - HT/VHT20 STBC, Two Antennas, M0 to M7
802.11n/ac - HT/VHT20 STBC, Three Antennas, M0 to M7
802.11n/ac - HT/VHT20 STBC, Four Antennas, M0 to M7

802.11n/ac - Non HT40 Duplicate, One Antenna, 6 to 54 Mbps
802.11n/ac - Non HT40 Duplicate, Two Antennas, 6 to 54 Mbps
802.11n/ac - Non HT40 Duplicate, Three Antennas, 6 to 54 Mbps
802.11n/ac - Non HT40 Duplicate, Four Antennas, 6 to 54 Mbps

802.11n/ac - HT/VHT40, One Antenna, M0 to M7
802.11n/ac - HT/VHT40, Two Antennas, M0 to M7
802.11n/ac - HT/VHT40, Two Antennas, M8 to M15
802.11n/ac - HT/VHT40, Three Antennas, M0 to M7
802.11n/ac - HT/VHT40, Three Antennas, M8 to M15
802.11n/ac - HT/VHT40, Three Antennas, M16 to M23
802.11n/ac - HT/VHT40, Four Antennas, M0 to M7
802.11n/ac - HT/VHT40, Four Antennas, M8 to M15
802.11n/ac - HT/VHT40, Four Antennas, M16 to M23

802.11n/ac - HT/VHT40 Beam Forming, Two Antennas, M0 to M7
802.11n/ac - HT/VHT40 Beam Forming, Two Antennas, M8 to M15
802.11n/ac - HT/VHT40 Beam Forming, Three Antennas, M0 to M7
802.11n/ac - HT/VHT40 Beam Forming, Three Antennas, M8 to M15
802.11n/ac - HT/VHT40 Beam Forming, Three Antennas, M16 to M23
802.11n/ac - HT/VHT40 Beam Forming, Four Antennas, M0 to M7
802.11n/ac - HT/VHT40 Beam Forming, Four Antennas, M8 to M15
802.11n/ac - HT/VHT40 Beam Forming, Four Antennas, M16 to M23

802.11n/ac - HT/VHT40 STBC, Two Antennas, M0 to M7
802.11n/ac - HT/VHT40 STBC, Three Antennas, M0 to M7
802.11n/ac - HT/VHT40 STBC, Four Antennas, M0 to M7

802.11n/ac - Non HT80 Duplicate, One Antenna, 6 to 54 Mbps
802.11n/ac - Non HT80 Duplicate, Two Antennas, 6 to 54 Mbps
802.11n/ac - Non HT80 Duplicate, Three Antennas, 6 to 54 Mbps
802.11n/ac - Non HT80 Duplicate, Four Antennas, 6 to 54 Mbps

802.11ac - VHT80, One Antenna, M0.1 to M9.1
802.11ac - VHT80, Two Antennas, M0.1 to M9.1
802.11ac - VHT80, Two Antennas, M0.2 to M9.2
802.11ac - VHT80, Three Antennas, M0.1 to M9.1
802.11ac - VHT80, Three Antennas, M0.2 to M9.2
802.11ac - VHT80, Three Antennas, M0.3 to M9.3
802.11ac - VHT80, Four Antennas, M0.1 to M9.1
802.11ac - VHT80, Four Antennas, M0.2 to M9.2
802.11ac - VHT80, Four Antennas, M0.3 to M9.3

802.11ac - VHT80 Beam Forming, Two Antennas, M0.1 to M9.1
802.11ac - VHT80 Beam Forming, Two Antennas, M0.2 to M9.2
802.11ac - VHT80 Beam Forming, Three Antennas, M0.1 to M9.1
802.11ac - VHT80 Beam Forming, Three Antennas, M0.2 to M9.2
802.11ac - VHT80 Beam Forming, Three Antennas, M0.3 to M9.3
802.11ac - VHT80 Beam Forming, Four Antennas, M0.1 to M9.1
802.11ac - VHT80 Beam Forming, Four Antennas, M0.2 to M9.2
802.11ac - VHT80 Beam Forming, Four Antennas, M0.3 to M9.3

802.11ac - VHT80 STBC, Two Antennas, M0.1 to M9.1
802.11ac - VHT80 STBC, Three Antennas, M0.1 to M9.1
802.11ac - VHT80 STBC, Four Antennas, M0.1 to M9.1

The following antennas are supported by this product series.
The data included in this report represent the worst case data for all antennas.

Radio	Frequency	HOST PID Part Number - Please align Host(s) with antenna(s)	ANTENNA PID Part Number	Antenna Type	Antenna Gain (includes antenna cable loss)
2.4 GHz BLE	2.4 GHz	TX/RX: Internal	BLE	Single port, single band omni	2.5 dBi
WIFI: 5 GHz XOR	5 GHz	Micro-Cell: Internal	NA	Quad port, single band directional	5 dBi
WIFI: 2.4GHz XOR & 5 GHz Only	2.4 & 5 GHz	Macro-Cell: Internal	NA	Qual port, dual band Omni	2.5 dBi/3.5 dBi
WIFI: RX Only 2.4GHz XOR & 5 GHz XOR	2.4 & 5 GHz	Location Antenna Array	NA	Qual port Circular Array + Omni Elements	RX Only

Section 3: Result Summary

3.1 Results Summary Table

Conducted emissions

Basic Standard	Technical Requirements / Details	Result
FCC 15.407 RSS-GEN LP0002 (2018-01-10) 4.7.2.3	99% & 26 dB Bandwidth: The 99% occupied bandwidth is the frequency bandwidth such that, below its lower and above its upper frequency limits, the mean powers are each equal to 0.5% of the total mean power of the given emission. There is no limit for 99% OBW. The 26 dB emission is the width of the emission that is constrained by the frequencies associated with the two outermost amplitude points (upper and lower frequencies) that are attenuated by 26 dB relative to the maximum level measured in the fundamental emission.	Pass
FCC 15.407 RSS-247 LP0002 (2018-01-10) 4.7.3.3 (1)	Output Power: For the band 5.725-5.85 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W.	Pass
FCC 15.407 RSS-247 LP0002 (2018-01-10) 4.7.3.3 (2)	Power Spectral Density: 15.407 The maximum power spectral density shall not exceed 30 dBm in any 500-kHz band.	Pass
FCC 15.407 RSS-247	Conducted Spurious Emissions / Band-Edge: For transmitters operating in the 5.725-5.85 GHz band: All emissions within the frequency range from the band edge to 10 MHz above or below the band edge shall not exceed an e.i.r.p. of -17 dBm/MHz; for frequencies 10 MHz or greater above or below the band edge, emissions shall not exceed an e.i.r.p. of -27 dBm/MHz.	Pass
FCC 15.209 FCC 152.05 RSS-GEN LP0002 (2018-01-10) 4.8.1.4	Restricted band: Unwanted emissions falling within the restricted bands, as defined in FCC 15.205 (a) must also comply with the radiated emission limits specified in FCC 15.209 (a).	Pass

Radiated Emissions (General requirements)

Basic Standard	Technical Requirements / Details	Result
FCC 15.209 FCC 15.205 RSS-GEN LP0002 (2018-01-10) 2.8	TX Spurious Emissions: Except as provided elsewhere in this subpart, the emissions from an intentional radiator shall not exceed the field strength levels specified in the filed strength limits table in this section.	Pass
LP0002 (2018-01-10) 2.11	Receiver Radiated Emissions - The receiver radiated field strength must not exceed the emission specified in Section 2.8 and the receiver shall not receive, demodulate frequency listed in Section 2.7.	

FCC 15.207 RSS-GEN LP0002 (2018-01-10) 2.3	AC conducted Emissions: Except when the requirements applicable to a given device state otherwise, for any radio apparatus equipped to operate from the public utility AC power supply, either directly or indirectly (such as with a battery charger), the radio frequency voltage of emissions conducted back onto the AC power lines in the frequency range of 0.15 MHz to 30 MHz shall not exceed the limits shown in the table in these sections. The more stringent limit applies at the frequency range boundaries.	Pass
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* MPE calculation is recorded in a separate report

Section 4: Sample Details

Note: Each sample was evaluated to ensure that its condition was suitable to be used as a test sample prior to the commencement of testing.

4.1 Sample Details

Sample No.	Equipment Details	Manufacturer	Hardware Rev.	Firmware Rev.	Software Rev.	Serial Number
S01	AIR-AP4800-B-K9	Cisco Systems	P2	9.1.8.1	build-lnx-064	FOC21291N04
S02	AIR-PWR50 341-100460-001	Delta	A0	NA	NA	DAB2016S1GQ
S03	AIR-AP4800-B-K9	Cisco Systems	P2	9.1.8.1	build-lnx-064	FOC212601M3
S04	ADP-48DR BC 341-100460-01 A0	Delta	A0	NA	NA	DAB2016S1HK

4.2 System Details

System #	Description	Samples
1	AIR-AP4800-B-K9	S01
2	AIR-PWR50 341-100460-001	S02
3	EUT for Radiated Spurious Emissions	S03 & S04

4.3 Mode of Operation Details

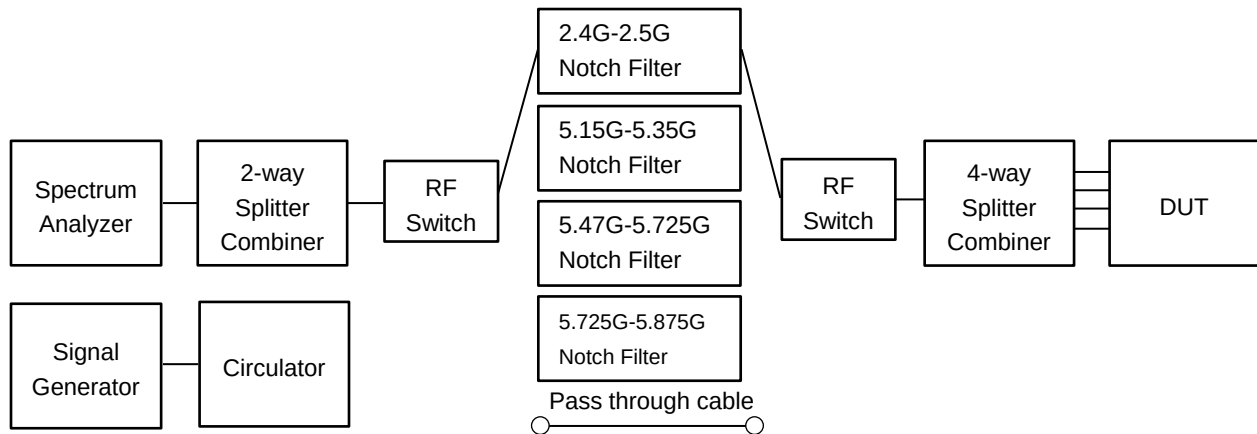
Mode#	Description	Comments
1	Continuous Transmitting	Continuous Transmitting ≥98% duty cycle

All measurements were made in accordance with

- ANSI C63.10:2013
- KDB 789033 D02 General UNII Test Procedures New Rules v01r03
- KDB 662911 D01 Multiple Transmitter Output v02r01

Appendix A: Emission Test Results

Conducted Test Setup Diagram



Target Maximum Channel Power

The following table details the maximum supported Total Channel Power for all operating modes.

Operating Mode	Maximum Channel Power (dBm)		
	Frequency (MHz)		
	5720		
Non HT20, 6 to 54 Mbps	18		
Non HT20 Beam Forming, 6 to 54 Mbps	18		
HT/VHT20, M0 to M23	21		
HT/VHT20 Beam Forming, M0 to M23	21		
HT/VHT20 STBC, M0 to M7	20		
	5710		
Non HT40, 6 to 54 Mbps	21		
HT/VHT40, M0 to M23	21		
HT/VHT40 Beam Forming, M0 to M23	21		
HT/VHT40 STBC, M0 to M7	21		
	5690		
Non HT80, 6 to 54 Mbps	21		
VHT80, M0 to M9, M0 to M9 1-2ss	21		
VHT80 Beam Forming, M0 to M9, M0 to M9 1-2ss	21		
VHT80 STBC, M0 to M9 1ss	21		

A.1 99% and 26dB Bandwidth

FCC 15.407 / RSS-GEN The 99% occupied bandwidth is the frequency bandwidth such that, below its lower and above its upper frequency limits, the mean powers are each equal to 0.5% of the total mean power of the given emission. There is no limit for 99% OBW.

LP0002 (2018-01-10) (4.7.2.3) The 26 dB emission is the width of the emission that is constrained by the frequencies associated with the two outermost amplitude points (upper and lower frequencies) that are attenuated by 26 dB relative to the maximum level measured in the fundamental emission.

Test Procedure

Ref. ANSI C63.10: 2013 Section 6.9.3

99% BW and EBW (-26dB)

Test Procedure

1. Set the radio in the continuous transmitting mode.
2. Allow the trace to stabilize.
3. Setting the x-dB bandwidth mode to -26dB and OBW power function to 99% within the measurement set up function.
4. Select the automatic OBW measurement function of an instrument to perform bandwidth measurement.
5. Capture graphs and record pertinent measurement data.

Ref. ANSI C63.10: 2013 Section 6.9.3

99% BW and EBW (-26dB)

Test parameters

Span = 1.5 x to 5.0 times OBW
 RBW = approx. 1% to 5% of the OBW
 VBW $\geq$ 3 x RBW
 Detector = Peak or where practical sample shall be used
 Trace = Max. Hold

System Number	Description	Samples	System under test	Support equipment
1	EUT	S01	☒	☐
	Support	S02	☐	☒

Tested By :

Jose Aguirre

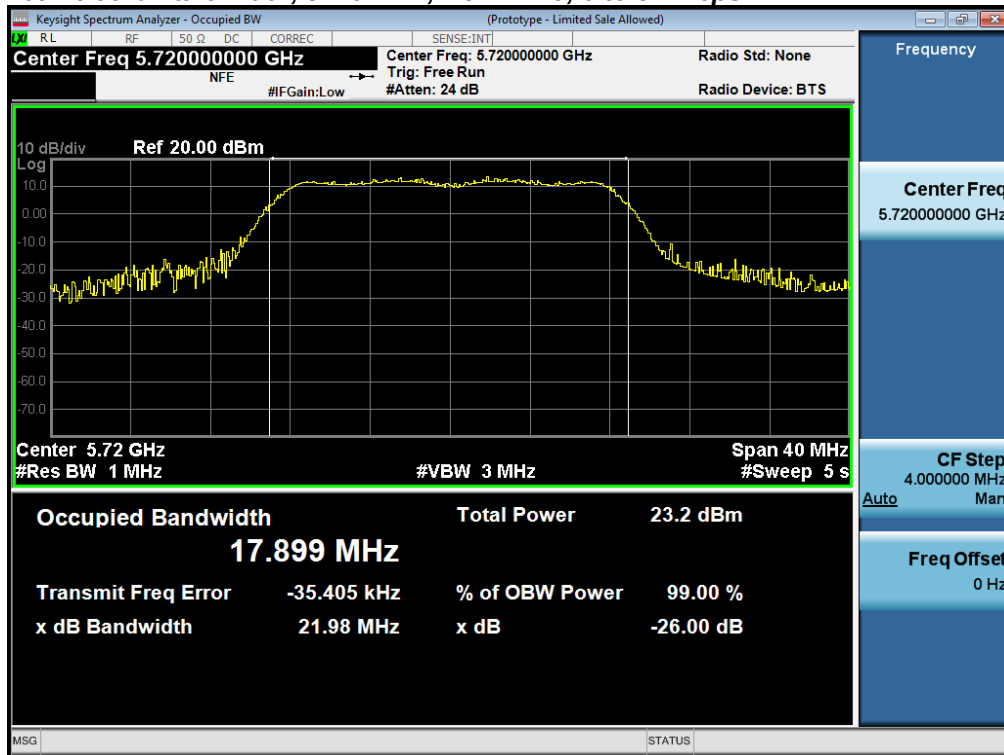
Date of testing:

1-Nov-17 - 20-Mar-18

Test Result : PASS

See Appendix C for list of test equipment

Frequency (MHz)	Mode	Data Rate (Mbps)	26dB BW (MHz)	99% BW (MHz)
5690	Non HT80, 6 to 54 Mbps	6	82.9	76.505
	VHT80, M0 to M9, M0 to M9 1-2ss	m0x1	83.5	76.493
5710	Non HT40, 6 to 54 Mbps	6	43.1	37.108
	HT/VHT40, M0 to M23	m0	42.9	36.764
5720	Non HT20, 6 to 54 Mbps	6	21.9	17.852
	HT/VHT20, M0 to M23	m0	22.7	18.473

26dB / 99% Bandwidth, 5720 MHz, Non HT20, 6 to 54 Mbps

A.2 Maximum Conducted Output Power

15.407 / RSS-247, LP0002 (2018-01-10) 4.7.3.3 (1) For the band 5.725-5.85 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi. However, fixed point-to-point U-NII devices operating in this band may employ transmitting antennas with directional gain greater than 6 dBi without any corresponding reduction in transmitter conducted power. Fixed, point-to-point operations exclude the use of point-to-multipoint systems, omnidirectional applications, and multiple collocated transmitters transmitting the same information. The operator of the U-NII device, or if the equipment is professionally installed, the installer, is responsible for ensuring that systems employing high gain directional antennas are used exclusively for fixed, point-to-point operations.

The peak correlated gain for each mode is listed in the table below. See the Theory of Operation for details on the correlated gain for each mode.

Test Procedure

Ref. KDB 789033 D02 General UNII Test Procedures New Rules v02r01
ANSI C63.10: 2013

Output Power Test Procedure
1. Set the radio in the continuous transmitting mode at full power 2. Compute power by integrating the spectrum across the EBW (or alternatively entire 99% OBW) of the signal using the instrument's band power measurement function. The integration shall be performed using the spectrum analyzer band-power measurement function with band limits set equal to the EBW or the OBW band edges. 3. Capture graphs and record pertinent measurement data.

Ref. KDB 789033 D02 General UNII Test Procedures New Rules v02r01
ANSI C63.10: 2013 section 12.3.2.2 Method SA-1

Output Power Test parameters
Span = >1.5 times the OBW RBW = 1MHz VBW ≥ 3 x RBW Sweep = Auto couple Detector = sample Trace = Trace Average 100

The "measure-and-sum technique" is used for measuring in-band transmit power of a device. In the measure-and-sum approach, the conducted emission level is measured at each antenna port. The measured results at the various antenna ports are then summed mathematically to determine the total emission level from the device. Summing is performed in linear power units. (See ANSI C63.10 section 14.3.2.2)

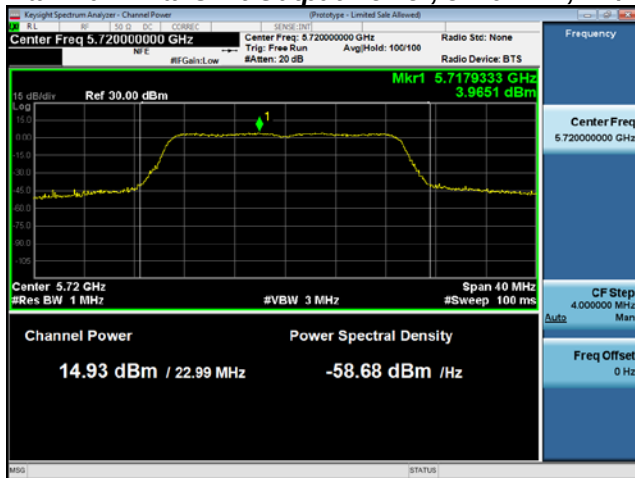
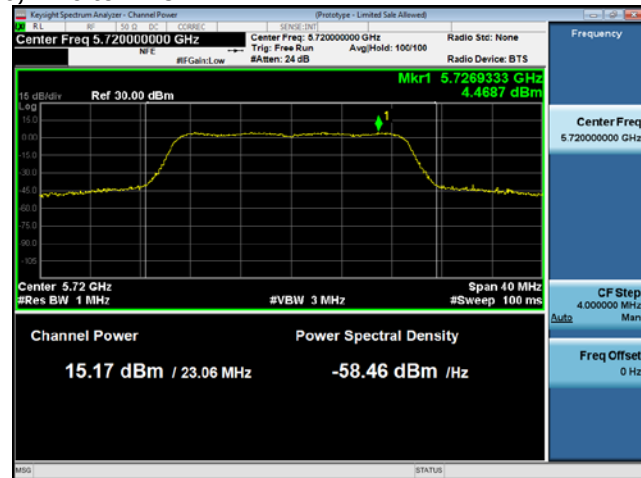
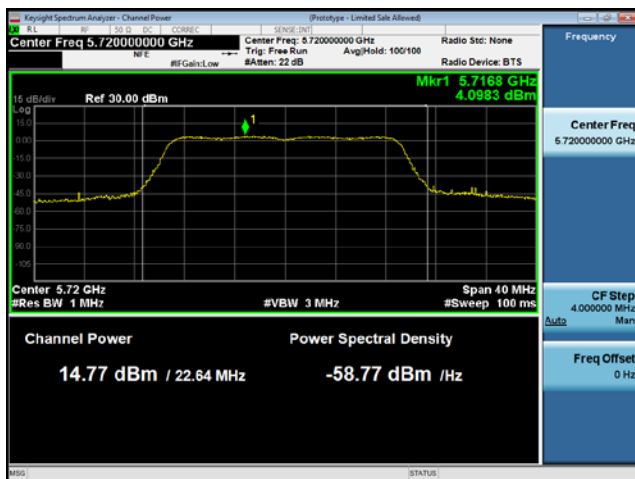
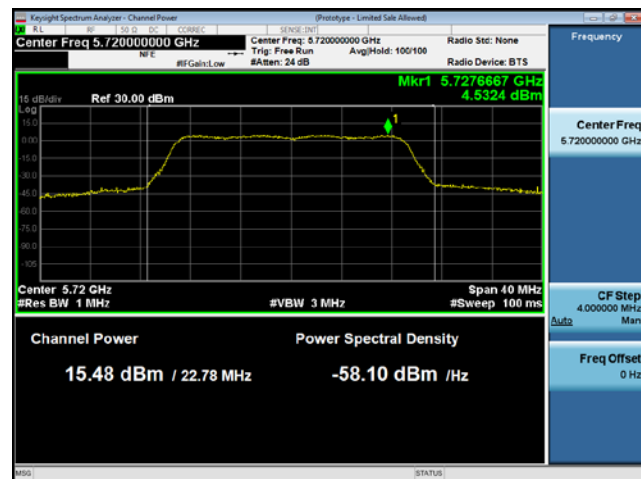
System Number	Description	Samples	System under test	Support equipment
1	EUT	S01	☒	☐
	Support	S02	☐	☒

Tested By : Jose Aguirre	Date of testing: 1-Nov-17 - 20-Mar-18
Test Result : PASS	

See Appendix C for list of test equipment

Frequency (MHz)	Mode	Tx Paths	Correlated Antenna Gain (dBi)	Tx 1 Max Power (dBm)	Tx 2 Max Power (dBm)	Tx 3 Max Power (dBm)	Tx 4 Max Power (dBm)	Total Tx Channel Power (dBm)	Limit (dBm)	Margin (dB)
5690	Non HT80, 6 to 54 Mbps	1	4	14.4				14.4	29.9	15.5
	Non HT80, 6 to 54 Mbps	2	4	14.4	14.1			17.3	29.9	12.6
	Non HT80, 6 to 54 Mbps	3	4	14.4	14.1	14.6		19.1	29.9	10.8
	Non HT80, 6 to 54 Mbps	4	4	14.4	14.1	14.6	14.9	20.5	29.9	9.4
	VHT80, M0 to M9 1ss	1	4	14.8				14.8	29.9	15.1
	VHT80, M0 to M9 1ss	2	4	14.8	14.5			17.7	29.9	12.2
	VHT80, M0 to M9 2ss	2	4	14.8	14.5			17.7	29.9	12.2
	VHT80, M0 to M9 1ss	3	4	14.8	14.5	14.9		19.5	29.9	10.4
	VHT80, M0 to M9 2ss	3	4	14.8	14.5	14.9		19.5	29.9	10.4
	VHT80, M0 to M9 3ss	3	4	14.8	14.5	14.9		19.5	29.9	10.4
	VHT80, M0 to M9 1ss	4	4	14.8	14.5	14.9	15.2	20.9	29.9	9.0
	VHT80, M0 to M9 2ss	4	4	14.8	14.5	14.9	15.2	20.9	29.9	9.0
	VHT80, M0 to M9 3ss	4	4	14.8	14.5	14.9	15.2	20.9	29.9	9.0
	VHT80 Beam Forming, M0 to M9 1ss	2	7	14.8	14.5			17.7	28.9	11.2
	VHT80 Beam Forming, M0 to M9 2ss	2	4	14.8	14.5			17.7	29.9	12.2
	VHT80 Beam Forming, M0 to M9 1ss	3	8	13.8	13.5	13.9		18.5	27.9	9.4
	VHT80 Beam Forming, M0 to M9 2ss	3	5	14.8	14.5	14.9		19.5	29.9	10.4
	VHT80 Beam Forming, M0 to M9 3ss	3	4	14.8	14.5	14.9		19.5	29.9	10.4
	VHT80 Beam Forming, M0 to M9 1ss	4	10	11.4	11.2	11.5	11.6	17.4	25.9	8.5
	VHT80 Beam Forming, M0 to M9 2ss	4	7	13.6	14.7	13.8	14.1	20.1	28.9	8.8
	VHT80 Beam Forming, M0 to M9 3ss	4	5	14.8	14.5	14.9	15.2	20.9	29.9	9.0
	VHT80 STBC, M0 to M9 1ss	2	4	14.8	14.5			17.7	29.9	12.2
	VHT80 STBC, M0 to M9 1ss	3	4	14.8	14.5	14.9		19.5	29.9	10.4
	VHT80 STBC, M0 to M9 1ss	4	4	14.8	14.5	14.9	15.2	20.9	29.9	9.0
5710	Non HT40, 6 to 54 Mbps	1	4	16.0				16.0	27.0	11.0
	Non HT40, 6 to 54 Mbps	2	4	16.0	16.2			19.1	27.0	7.9
	Non HT40, 6 to 54 Mbps	3	4	16.0	16.2	15.9		20.8	27.0	6.2
	Non HT40, 6 to 54 Mbps	4	4	13.6	13.9	13.7	14.1	19.8	27.0	7.2
	HT/VHT40, M0 to M7	1	4	14.8				14.8	27.0	12.2
	HT/VHT40, M0 to M7	2	4	14.8	15.0			17.9	27.0	9.1
	HT/VHT40, M8 to M15	2	4	14.8	15.0			17.9	27.0	9.1
	HT/VHT40, M0 to M7	3	4	14.8	15.0	14.7		19.6	27.0	7.4
	HT/VHT40, M8 to M15	3	4	14.8	15.0	14.7		19.6	27.0	7.4
	HT/VHT40, M16 to M23	3	4	14.8	15.0	14.7		19.6	27.0	7.4
	HT/VHT40, M0 to M7	4	4	13.6	13.8	13.5	14.0	19.7	27.0	7.3

	HT/VHT40, M8 to M15	4	4	14.8	15.0	14.7	15.1	20.9	27.0	6.1
	HT/VHT40, M16 to M23	4	4	14.8	15.0	14.7	15.1	20.9	27.0	6.1
	HT/VHT40 Beam Forming, M0 to M7	2	7	14.8	15.0			17.9	26.0	8.1
	HT/VHT40 Beam Forming, M8 to M15	2	4	14.8	15.0			17.9	27.0	9.1
	HT/VHT40 Beam Forming, M0 to M7	3	8	13.7	14.0	13.7		18.6	25.0	6.4
	HT/VHT40 Beam Forming, M8 to M15	3	5	14.8	15.0	14.7		19.6	27.0	7.4
	HT/VHT40 Beam Forming, M16 to M23	3	4	14.8	15.0	14.7		19.6	27.0	7.4
	HT/VHT40 Beam Forming, M0 to M7	4	10	11.4	11.6	11.3	11.7	17.5	23.0	5.5
	HT/VHT40 Beam Forming, M8 to M15	4	7	13.6	13.8	13.5	14.0	19.7	26.0	6.3
	HT/VHT40 Beam Forming, M16 to M23	4	5	14.8	15.0	14.7	15.1	20.9	27.0	6.1
	HT/VHT40 STBC, M0 to M7	2	4	14.8	15.0			17.9	27.0	9.1
	HT/VHT40 STBC, M0 to M7	3	4	14.8	15.0	14.7		19.6	27.0	7.4
	HT/VHT40 STBC, M0 to M7	4	4	14.8	15.0	14.7	15.1	20.9	27.0	6.1
5720	Non HT20, 6 to 54 Mbps	1	4	14.7				14.7	24.0	9.3
	Non HT20, 6 to 54 Mbps	2	4	14.7	14.8			17.8	24.0	6.2
	Non HT20, 6 to 54 Mbps	3	4	13.6	13.9	13.5		18.4	24.0	5.6
	Non HT20, 6 to 54 Mbps	4	4	10.5	10.6	10.4	10.9	16.6	24.0	7.4
	Non HT20 Beam Forming, 6 to 54 Mbps	2	7	14.7	14.8			17.8	23.0	5.2
	Non HT20 Beam Forming, 6 to 54 Mbps	3	8	12.6	12.8	12.4		17.4	22.0	4.6
	Non HT20 Beam Forming, 6 to 54 Mbps	4	10	10.5	10.6	10.4	10.9	16.6	20.0	3.4
	HT/VHT20, M0 to M7	1	4	14.9				14.9	24.0	9.1
	HT/VHT20, M0 to M7	2	4	14.9	15.2			18.1	24.0	5.9
	HT/VHT20, M8 to M15	2	4	14.9	15.2			18.1	24.0	5.9
	HT/VHT20, M0 to M7	3	4	13.9	14.1	13.7		18.7	24.0	5.3
	HT/VHT20, M8 to M15	3	4	14.9	15.2	14.8		19.7	24.0	4.3
	HT/VHT20, M16 to M23	3	4	14.9	15.2	14.8		19.7	24.0	4.3
	HT/VHT20, M0 to M7	4	4	10.6	10.7	10.5	10.9	16.7	24.0	7.3
	HT/VHT20, M8 to M15	4	4	13.9	14.1	13.7	14.2	20.0	24.0	4.0
	HT/VHT20, M16 to M23	4	4	14.9	15.2	14.8	15.5	21.1	24.0	2.9
	HT/VHT20 Beam Forming, M0 to M7	2	7	14.9	15.2			18.1	23.0	4.9
	HT/VHT20 Beam Forming, M8 to M15	2	4	14.9	15.2			18.1	24.0	5.9
	HT/VHT20 Beam Forming, M0 to M7	3	8	12.7	13.0	12.5		17.5	22.0	4.5
	HT/VHT20 Beam Forming, M8 to M15	3	5	14.9	15.2	14.8		19.7	24.0	4.3
	HT/VHT20 Beam Forming, M16 to M23	3	4	14.9	15.2	14.8		19.7	24.0	4.3
	HT/VHT20 Beam Forming, M0 to M7	4	10	10.6	10.7	10.5	10.9	16.7	20.0	3.3
	HT/VHT20 Beam Forming, M8 to M15	4	7	13.9	14.1	13.7	14.2	20.0	23.0	3.0
	HT/VHT20 Beam Forming, M16 to M23	4	5	14.9	15.2	14.8	15.5	21.1	24.0	2.9
	HT/VHT20 STBC, M0 to M7	2	4	14.9	15.2			18.1	24.0	5.9
	HT/VHT20 STBC, M0 to M7	3	4	14.9	15.2	14.8		19.7	24.0	4.3
	HT/VHT20 STBC, M0 to M7	4	4	13.9	14.1	13.7	14.2	20.0	24.0	4.0

Maximum Transmit Output Power, 5720 MHz, HT/VHT20, M16 to M23**Antenna A****Antenna B****Antenna C****Antenna D**

A.3 Power Spectral Density

15.407 / RSS-247, LP0002 (2018-01-10) 4.7.3.3 (2) The power spectral density shall not exceed 30 dBm in any 500 kHz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

Test Procedure

Ref. KDB 789033 D02 General UNII Test Procedures New Rules v01

Power Spectral Density
Test Procedure
1. Connect the antenna port(s) to the spectrum analyzer input. 2. Set the radio in the continuous transmitting mode at full power 3. Configure Spectrum analyzer as per test parameters below and Peak search marker 4. Capture graphs and record pertinent measurement data.

Ref. KDB 789033 D02 v01 section F.5

Power Spectral Density
Test parameters
Span = >1.5 times the OBW RBW = 500 kHz. VBW $\geq 3 \times$ RBW Sweep = 10s Detector = Peak Trace = Single Sweep Marker = Peak Search

The "Measure and add 10 log(N) dB technique", where N is the number of outputs, is used for measuring in-band Power Spectral Density. With this technique, spectrum measurements are performed at each output of the device, and the quantity 10 log(4) (or 6dB) is added to the worst case spectrum value before comparing to the emission limit. (ANSI C63.10 2013 section 14.3.2.3)

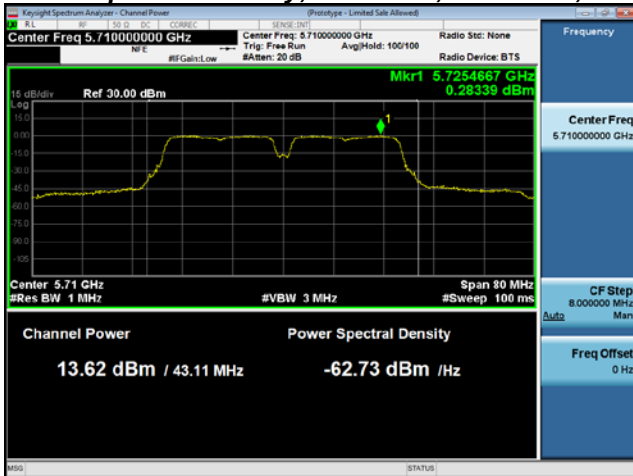
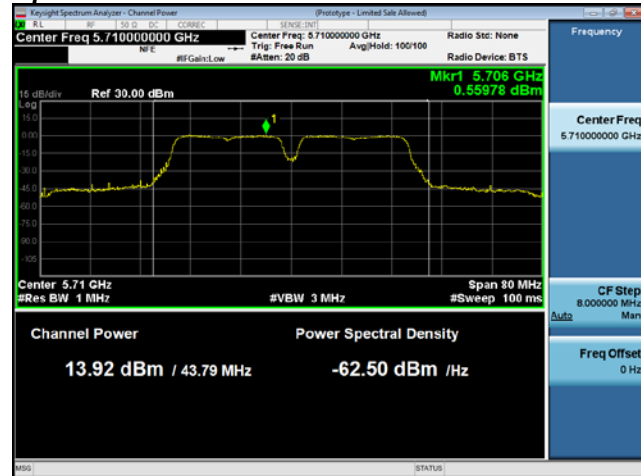
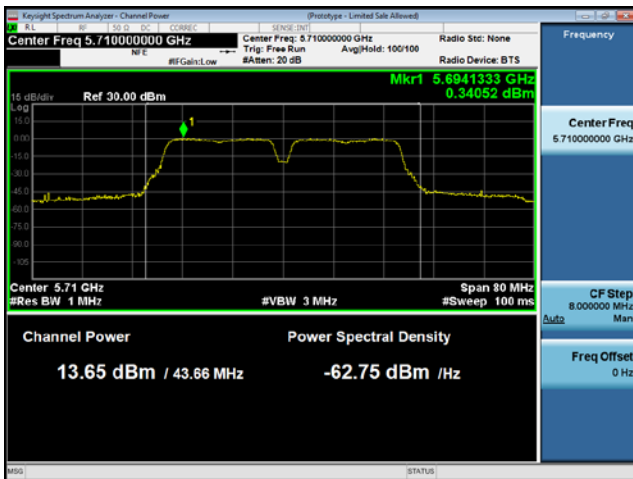
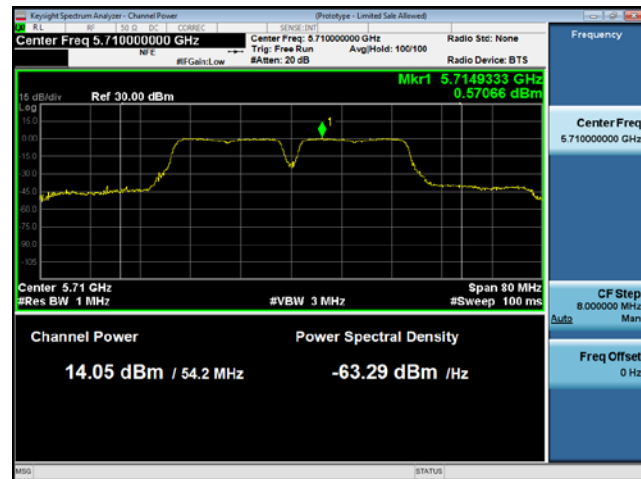
System Number	Description	Samples	System under test	Support equipment
1	EUT	S01	☒	☐
	Support	S02	☐	☒

Tested By : Jose Aguirre	Date of testing: 1-Nov-17 - 20-Mar-18
Test Result : PASS	

See Appendix C for list of test equipment

Frequency (MHz)	Mode	Tx Paths	Correlated Antenna Gain (dBi)	Tx 1 PSD (dBm/MHz)	Tx 2 PSD (dBm/MHz)	Tx 3 PSD (dBm/MHz)	Tx 4 PSD (dBm/MHz)	Total PSD (dBm/500MHz)	Limit (dBm/500MHz)	Margin (dB)
5690	Non HT80, 6 to 54 Mbps	1	4	-2.1				-2.1	29.9	32.0
	Non HT80, 6 to 54 Mbps	2	7	-2.1	-2.6			0.7	28.9	28.2
	Non HT80, 6 to 54 Mbps	3	8	-2.1	-2.6	-2.1		2.5	27.9	25.4
	Non HT80, 6 to 54 Mbps	4	10	-2.1	-2.6	-2.1	-1.8	3.9	25.9	22.0
	VHT80, M0 to M9 1ss	1	4	-2.3				-2.3	29.9	32.2
	VHT80, M0 to M9 1ss	2	7	-2.3	-2.8			0.5	28.9	28.4
	VHT80, M0 to M9 2ss	2	4	-2.3	-2.8			0.5	29.9	29.4
	VHT80, M0 to M9 1ss	3	8	-2.3	-2.8	-2.1		2.4	27.9	25.5
	VHT80, M0 to M9 2ss	3	5	-2.3	-2.8	-2.1		2.4	29.9	27.5
	VHT80, M0 to M9 3ss	3	4	-2.3	-2.8	-2.1		2.4	29.9	27.5
	VHT80, M0 to M9 1ss	4	10	-2.3	-2.8	-2.1	-2.1	3.7	25.9	22.2
	VHT80, M0 to M9 2ss	4	7	-2.3	-2.8	-2.1	-2.1	3.7	28.9	25.2
	VHT80, M0 to M9 3ss	4	5	-2.3	-2.8	-2.1	-2.1	3.7	29.9	26.2
	VHT80 Beam Forming, M0 to M9 1ss	2	7	-2.3	-2.8			0.5	28.9	28.4
	VHT80 Beam Forming, M0 to M9 2ss	2	4	-2.3	-2.8			0.5	29.9	29.4
	VHT80 Beam Forming, M0 to M9 1ss	3	8	-3.6	-3.8	-3.1		1.3	27.9	26.6
	VHT80 Beam Forming, M0 to M9 2ss	3	5	-2.3	-2.8	-2.1		2.4	29.9	27.5
	VHT80 Beam Forming, M0 to M9 3ss	3	4	-2.3	-2.8	-2.1		2.4	29.9	27.5
	VHT80 Beam Forming, M0 to M9 1ss	4	10	-6.0	-6.0	-5.6	-5.8	0.2	25.9	25.7
	VHT80 Beam Forming, M0 to M9 2ss	4	7	-3.6	-2.6	-3.4	-3.3	2.8	28.9	26.1
	VHT80 Beam Forming, M0 to M9 3ss	4	5	-2.3	-2.8	-2.1	-2.1	3.7	29.9	26.2
	VHT80 STBC, M0 to M9 1ss	2	4	-2.3	-2.8			0.5	29.9	29.4
	VHT80 STBC, M0 to M9 1ss	3	4	-2.3	-2.8	-2.1		2.4	29.9	27.5
	VHT80 STBC, M0 to M9 1ss	4	4	-2.3	-2.8	-2.1	-2.1	3.7	29.9	26.2
5710	Non HT40, 6 to 54 Mbps	1	4	2.8				2.8	30.0	27.2
	Non HT40, 6 to 54 Mbps	2	7	2.8	3.0			5.9	29.0	23.1
	Non HT40, 6 to 54 Mbps	3	8	2.8	3.0	2.8		7.6	28.0	20.4
	Non HT40, 6 to 54 Mbps	4	10	0.3	0.6	0.3	0.6	6.5	26.0	19.5
	HT/VHT40, M0 to M7	1	4	1.4				1.4	30.0	28.6
	HT/VHT40, M0 to M7	2	7	1.4	1.1			4.3	29.0	24.7
	HT/VHT40, M8 to M15	2	4	1.4	1.1			4.3	30.0	25.7
	HT/VHT40, M0 to M7	3	8	1.4	1.1	1.1		6.0	28.0	22.0
	HT/VHT40, M8 to M15	3	5	1.4	1.1	1.1		6.0	30.0	24.0
	HT/VHT40, M16 to M23	3	4	1.4	1.1	1.1		6.0	30.0	24.0

	HT/VHT40, M0 to M7	4	10	-0.3	0.1	-0.1	0.2	6.0	26.0	20.0
	HT/VHT40, M8 to M15	4	7	1.4	1.1	1.1	1.4	7.3	29.0	21.7
	HT/VHT40, M16 to M23	4	5	1.4	1.1	1.1	1.4	7.3	30.0	22.7
	HT/VHT40 Beam Forming, M0 to M7	2	7	1.4	1.1			4.3	29.0	24.7
	HT/VHT40 Beam Forming, M8 to M15	2	4	1.4	1.1			4.3	30.0	25.7
	HT/VHT40 Beam Forming, M0 to M7	3	8	0.1	0.6	0.1		5.0	28.0	23.0
	HT/VHT40 Beam Forming, M8 to M15	3	5	1.4	1.1	1.1		6.0	30.0	24.0
	HT/VHT40 Beam Forming, M16 to M23	3	4	1.4	1.1	1.1		6.0	30.0	24.0
	HT/VHT40 Beam Forming, M0 to M7	4	10	-2.5	-2.2	-2.2	-1.8	3.9	26.0	22.1
	HT/VHT40 Beam Forming, M8 to M15	4	7	-0.3	0.1	-0.1	0.2	6.0	29.0	23.0
	HT/VHT40 Beam Forming, M16 to M23	4	5	1.4	1.1	1.1	1.4	7.3	30.0	22.7
	HT/VHT40 STBC, M0 to M7	2	4	1.4	1.1			4.3	30.0	25.7
	HT/VHT40 STBC, M0 to M7	3	5	1.4	1.1	1.1		6.0	30.0	24.0
	HT/VHT40 STBC, M0 to M7	4	7	1.4	1.1	1.1	1.4	7.3	29.0	21.7
5720	Non HT20, 6 to 54 Mbps	1	4	4.2				4.2	30.0	25.8
	Non HT20, 6 to 54 Mbps	2	7	4.2	4.5			7.4	29.0	21.6
	Non HT20, 6 to 54 Mbps	3	8	3.3	3.4	2.9		8.0	28.0	20.0
	Non HT20, 6 to 54 Mbps	4	10	-0.2	0.2	-0.3	0.4	6.1	26.0	19.9
	Non HT20 Beam Forming, 6 to 54 Mbps	2	7	4.2	4.5			7.4	29.0	21.6
	Non HT20 Beam Forming, 6 to 54 Mbps	3	8	2.0	2.2	1.7		6.7	28.0	21.3
	Non HT20 Beam Forming, 6 to 54 Mbps	4	10	-0.2	0.2	-0.3	0.4	6.1	26.0	19.9
	HT/VHT20, M0 to M7	1	4	4.0				4.0	30.0	26.0
	HT/VHT20, M0 to M7	2	7	4.0	4.5			7.3	29.0	21.7
	HT/VHT20, M8 to M15	2	4	4.0	4.5			7.3	30.0	22.7
	HT/VHT20, M0 to M7	3	8	3.0	3.5	2.8		7.9	28.0	20.1
	HT/VHT20, M8 to M15	3	5	4.0	4.5	4.1		9.0	30.0	21.0
	HT/VHT20, M16 to M23	3	4	4.0	4.5	4.1		9.0	30.0	21.0
	HT/VHT20, M0 to M7	4	10	0.0	0.0	-0.3	0.1	6.0	26.0	20.0
	HT/VHT20, M8 to M15	4	7	3.0	3.5	2.8	3.4	9.2	29.0	19.8
	HT/VHT20, M16 to M23	4	5	4.0	4.5	4.1	4.5	10.3	30.0	19.7
	HT/VHT20 Beam Forming, M0 to M7	2	7	4.0	4.5			7.3	29.0	21.7
	HT/VHT20 Beam Forming, M8 to M15	2	4	4.0	4.5			7.3	30.0	22.7
	HT/VHT20 Beam Forming, M0 to M7	3	8	1.8	1.9	1.8		6.6	28.0	21.4
	HT/VHT20 Beam Forming, M8 to M15	3	5	4.0	4.5	4.1		9.0	30.0	21.0
	HT/VHT20 Beam Forming, M16 to M23	3	4	4.0	4.5	4.1		9.0	30.0	21.0
	HT/VHT20 Beam Forming, M0 to M7	4	10	0.0	0.0	-0.3	0.1	6.0	26.0	20.0
	HT/VHT20 Beam Forming, M8 to M15	4	7	3.0	3.5	2.8	3.4	9.2	29.0	19.8
	HT/VHT20 Beam Forming, M16 to M23	4	5	4.0	4.5	4.1	4.5	10.3	30.0	19.7
	HT/VHT20 STBC, M0 to M7	2	4	4.0	4.5			7.3	30.0	22.7
	HT/VHT20 STBC, M0 to M7	3	5	4.0	4.5	4.1		9.0	30.0	21.0
	HT/VHT20 STBC, M0 to M7	4	7	3.0	3.5	2.8	3.4	9.2	29.0	19.8

Power Spectral Density, 5710 MHz, Non HT40, 6 to 54 Mbps**Antenna A****Antenna B****Antenna C****Antenna D**

A.4 Conducted Spurious Emissions

15.205 / 15.209, LP0002 (2018-01-10) (4.8.1.4) - Radiated emissions which fall in the restricted bands, as defined in Section 15.205(a), must also comply with the radiated emission limits specified in Section 15.209(a) (see Section 15.205(c)).

RSS-Gen 8.9: Except when the requirements applicable to a given device state otherwise, emissions from licence-exempt transmitters shall comply with the field strength limits shown in Table 4 and Table 5 below. Additionally, the level of any transmitter emission shall not exceed the level of the transmitter's fundamental emission.

RSS-Gen 8.10 (b) Unwanted emissions that fall into restricted bands of Table 6 shall comply with the limits specified in RSS-Gen; and **(c)** Unwanted emissions that do not fall within the restricted frequency bands of Table 6 shall comply either with the limits specified in the applicable RSS or with those specified in this RSS-Gen.

Use formula below to substitute conducted measurements in place of radiated measurements

$$E[\text{dB}\mu\text{V/m}] = \text{EIRP}[\text{dBm}] - 20 \log(d[\text{meters}]) + 104.77, \text{ where } E = \text{field strength and } d = 3 \text{ meter}$$

- 1) Average Plot, Limit= -41.25 dBm eirp
- 2) Peak plot, Limit = -21.25 dBm eirp

Test Procedure

Ref. KDB 789033 D02 General UNII Test Procedures New Rules v02r01
ANSI C63.10: 2013

Conducted Spurious Emissions
Test Procedure
1. Connect the antenna port(s) to the spectrum analyzer input. 2. Place the radio in continuous transmit mode. Use the procedures in KDB 789033 D02 General UNII Test Procedures New Rules v02r01 to substitute conducted measurements in place of radiated measurements. 3. Configure Spectrum analyzer as per test parameters below (be sure to enter all losses between the transmitter output and the spectrum analyzer). 4. Record the marker waveform peak to spur difference. Also measure any emissions in the restricted bands. 5. The "measure-and-sum technique" is used for measuring in-band transmit power of a device. In the measure-and-sum approach, the conducted emission level is measured at each antenna port. The measured results at the various antenna ports are then summed mathematically to determine the total emission level from the device. Summing is performed in linear power units. The worst case output is recorded. 6. Capture graphs and record pertinent measurement data.

Ref. KDB 789033 D02 General UNII Test Procedures New Rules v02r01
ANSI C63.10: 2013 section 12.7.7.3 (average) & 12.7.6 (peak)

Conducted Spurious Emissions
Test parameters
Span = 30MHz to 18GHz / 18GHz to 40GHz RBW = 1 MHz VBW ≥ 3 x RBW Sweep = Auto couple Detector = Peak / Average Trace = Max Hold.

System Number	Description	Samples	System under test	Support equipment
1	EUT	S01	☒	☐
	Support	S02	☐	☒



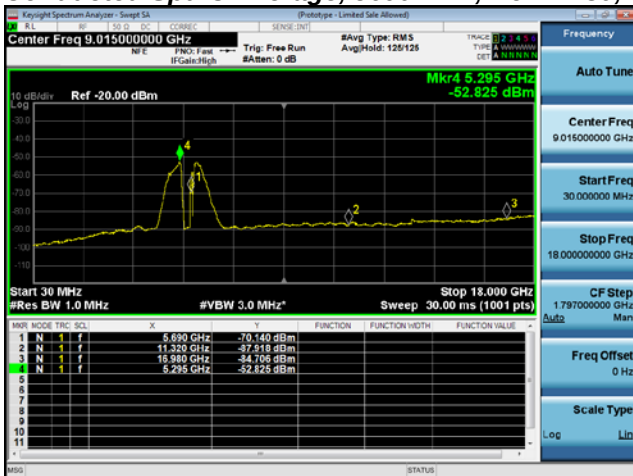
Tested By : Jose Aguirre	Date of testing: 1-Nov-17 - 20-Mar-18
Test Result : PASS	

See Appendix C for list of test equipment

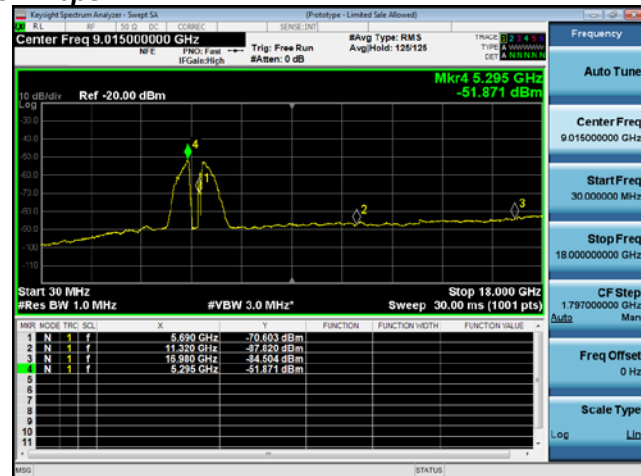
Frequency (MHz)	Mode	Tx Paths	Correlated Antenna Gain (dBi)	Tx 1 Spur Power (dBm)	Tx 2 Spur Power (dBm)	Tx 3 Spur Power (dBm)	Tx 4 Spur Power (dBm)	Total Conducted Spur (dBm)	Limit (dBm)	Margin (dB)
5690	Non HT80, 6 to 54 Mbps	1	4	-52.8				-48.8	-41.37	7.5
	Non HT80, 6 to 54 Mbps	2	4	-52.8	-51.9			-45.3	-41.37	4.0
	Non HT80, 6 to 54 Mbps	3	4	-52.8	-51.9	-53.1		-43.8	-41.37	2.4
	Non HT80, 6 to 54 Mbps	4	4	-52.8	-51.9	-53.1	-52.1	-42.4	-41.37	1.1
	VHT80, M0 to M9 1ss	1	4	-57.7				-53.7	-41.37	12.4
	VHT80, M0 to M9 1ss	2	4	-57.7	-56.2			-49.9	-41.37	8.5
	VHT80, M0 to M9 2ss	2	4	-57.7	-56.2			-49.9	-41.37	8.5
	VHT80, M0 to M9 1ss	3	4	-57.7	-56.2	-57.3		-48.2	-41.37	6.9
	VHT80, M0 to M9 2ss	3	4	-57.7	-56.2	-57.3		-48.2	-41.37	6.9
	VHT80, M0 to M9 3ss	3	4	-57.7	-56.2	-57.3		-48.2	-41.37	6.9
	VHT80, M0 to M9 1ss	4	4	-57.7	-56.2	-57.3	-57.3	-47.1	-41.37	5.7
	VHT80, M0 to M9 2ss	4	4	-57.7	-56.2	-57.3	-57.3	-47.1	-41.37	5.7
	VHT80, M0 to M9 3ss	4	4	-57.7	-56.2	-57.3	-57.3	-47.1	-41.37	5.7
	VHT80 Beam Forming, M0 to M9 1ss	2	7	-57.7	-56.2			-46.9	-41.37	5.5
	VHT80 Beam Forming, M0 to M9 2ss	2	4	-57.7	-56.2			-49.9	-41.37	8.5
	VHT80 Beam Forming, M0 to M9 1ss	3	8	-59.8	-58.5	-59.3		-46.4	-41.37	5.0
	VHT80 Beam Forming, M0 to M9 2ss	3	5	-57.7	-56.2	-57.3		-47.2	-41.37	5.9
	VHT80 Beam Forming, M0 to M9 3ss	3	4	-57.7	-56.2	-57.3		-48.2	-41.37	6.9
	VHT80 Beam Forming, M0 to M9 1ss	4	10	-61.1	-59.7	-60.9	-61.1	-44.6	-41.37	3.3
	VHT80 Beam Forming, M0 to M9 2ss	4	7	-58.1	-57.9	-57.6	-58.0	-44.9	-41.37	3.5
	VHT80 Beam Forming, M0 to M9 3ss	4	5	-57.7	-56.2	-57.3	-57.3	-46.1	-41.37	4.7
	VHT80 STBC, M0 to M9 1ss	2	4	-57.7	-56.2			-49.9	-41.37	8.5
	VHT80 STBC, M0 to M9 1ss	3	4	-57.7	-56.2	-57.3		-48.2	-41.37	6.9
	VHT80 STBC, M0 to M9 1ss	4	4	-57.7	-56.2	-57.3	-57.3	-47.1	-41.37	5.7
5710	Non HT40, 6 to 54 Mbps	1	4	-57.2				-53.2	-41.25	12.0
	Non HT40, 6 to 54 Mbps	2	4	-57.2	-55.4			-49.2	-41.25	7.9
	Non HT40, 6 to 54 Mbps	3	4	-57.2	-55.4	-56.7		-47.6	-41.25	6.3
	Non HT40, 6 to 54 Mbps	4	4	-58.2	-56.5	-57.6	-58.2	-47.5	-41.25	6.3
	HT/VHT40, M0 to M7	1	4	-57.9				-53.9	-41.25	12.7
	HT/VHT40, M0 to M7	2	4	-57.9	-56.0			-49.8	-41.25	8.6
	HT/VHT40, M8 to M15	2	4	-57.9	-56.0			-49.8	-41.25	8.6
	HT/VHT40, M0 to M7	3	4	-57.9	-56.0	-57.3		-48.2	-41.25	7.0
	HT/VHT40, M8 to M15	3	4	-57.9	-56.0	-57.3		-48.2	-41.25	7.0
	HT/VHT40, M16 to M23	3	4	-57.9	-56.0	-57.3		-48.2	-41.25	7.0
	HT/VHT40, M0 to M7	4	4	-58.3	-56.7	-57.7	-58.1	-47.6	-41.25	6.4

	HT/VHT40, M8 to M15	4	4	-57.9	-56.0	-57.3	-57.5	-47.1	-41.25	5.8
	HT/VHT40, M16 to M23	4	4	-57.9	-56.0	-57.3	-57.5	-47.1	-41.25	5.8
	HT/VHT40 Beam Forming, M0 to M7	2	7	-57.9	-56.0			-46.8	-41.25	5.6
	HT/VHT40 Beam Forming, M8 to M15	2	4	-57.9	-56.0			-49.8	-41.25	8.6
	HT/VHT40 Beam Forming, M0 to M7	3	8	-59.7	-58.0	-59.2		-46.1	-41.25	4.9
	HT/VHT40 Beam Forming, M8 to M15	3	5	-57.9	-56.0	-57.3		-47.2	-41.25	6.0
	HT/VHT40 Beam Forming, M16 to M23	3	4	-57.9	-56.0	-57.3		-48.2	-41.25	7.0
	HT/VHT40 Beam Forming, M0 to M7	4	10	-61.0	-59.3	-60.7	-60.8	-44.4	-41.25	3.1
	HT/VHT40 Beam Forming, M8 to M15	4	7	-58.3	-56.7	-57.7	-58.1	-44.6	-41.25	3.4
	HT/VHT40 Beam Forming, M16 to M23	4	5	-57.9	-56.0	-57.3	-57.5	-46.1	-41.25	4.8
	HT/VHT40 STBC, M0 to M7	2	4	-57.9	-56.0			-49.8	-41.25	8.6
	HT/VHT40 STBC, M0 to M7	3	4	-57.9	-56.0	-57.3		-48.2	-41.25	7.0
	HT/VHT40 STBC, M0 to M7	4	4	-57.9	-56.0	-57.3	-57.5	-47.1	-41.25	5.8
5720	Non HT20, 6 to 54 Mbps	1	4	-57.7				-53.7	-41.25	12.5
	Non HT20, 6 to 54 Mbps	2	4	-57.7	-56.3			-49.9	-41.25	8.7
	Non HT20, 6 to 54 Mbps	3	4	-59.8	-57.9	-59.3		-50.2	-41.25	8.9
	Non HT20, 6 to 54 Mbps	4	4	-61.4	-59.6	-61.2	-61.6	-50.9	-41.25	9.6
	Non HT20 Beam Forming, 6 to 54 Mbps	2	7	-57.7	-56.3			-46.9	-41.25	5.7
	Non HT20 Beam Forming, 6 to 54 Mbps	3	8	-60.4	-58.4	-60.0		-46.7	-41.25	5.5
	Non HT20 Beam Forming, 6 to 54 Mbps	4	10	-61.4	-59.6	-61.2	-61.6	-44.9	-41.25	3.6
	HT/VHT20, M0 to M7	1	4	-57.8				-53.8	-41.25	12.6
	HT/VHT20, M0 to M7	2	4	-57.8	-56.1			-49.9	-41.25	8.6
	HT/VHT20, M8 to M15	2	4	-57.8	-56.1			-49.9	-41.25	8.6
	HT/VHT20, M0 to M7	3	4	-59.5	-57.6	-59.1		-49.9	-41.25	8.6
	HT/VHT20, M8 to M15	3	4	-57.8	-56.1	-57.5		-48.3	-41.25	7.0
	HT/VHT20, M16 to M23	3	4	-57.8	-56.1	-57.5		-48.3	-41.25	7.0
	HT/VHT20, M0 to M7	4	4	-61.4	-59.8	-61.2	-61.8	-51.0	-41.25	9.7
	HT/VHT20, M8 to M15	4	4	-59.5	-57.6	-59.1	-59.3	-48.8	-41.25	7.5
	HT/VHT20, M16 to M23	4	4	-57.8	-56.1	-57.5	-57.6	-47.2	-41.25	5.9
	HT/VHT20 Beam Forming, M0 to M7	2	7	-57.8	-56.1			-46.9	-41.25	5.6
	HT/VHT20 Beam Forming, M8 to M15	2	4	-57.8	-56.1			-49.9	-41.25	8.6
	HT/VHT20 Beam Forming, M0 to M7	3	8	-60.3	-58.4	-60.0		-46.7	-41.25	5.5
	HT/VHT20 Beam Forming, M8 to M15	3	5	-57.8	-56.1	-57.5		-47.3	-41.25	6.0
	HT/VHT20 Beam Forming, M16 to M23	3	4	-57.8	-56.1	-57.5		-48.3	-41.25	7.0
	HT/VHT20 Beam Forming, M0 to M7	4	10	-61.4	-59.8	-61.2	-61.8	-45.0	-41.25	3.7
	HT/VHT20 Beam Forming, M8 to M15	4	7	-59.5	-57.6	-59.1	-59.3	-45.8	-41.25	4.5
	HT/VHT20 Beam Forming, M16 to M23	4	5	-57.8	-56.1	-57.5	-57.6	-46.2	-41.25	4.9
	HT/VHT20 STBC, M0 to M7	2	4	-57.8	-56.1			-49.9	-41.25	8.6
	HT/VHT20 STBC, M0 to M7	3	4	-57.8	-56.1	-57.5		-48.3	-41.25	7.0
	HT/VHT20 STBC, M0 to M7	4	4	-59.5	-57.6	-59.1	-59.3	-48.8	-41.25	7.5

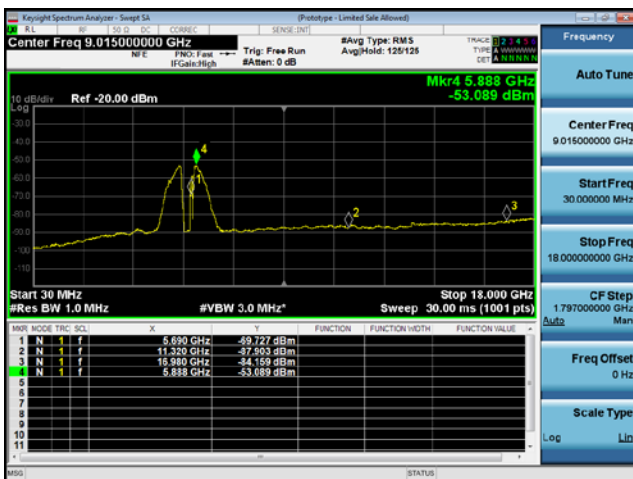
Conducted Spurs Average, 5690 MHz, Non HT80, 6 to 54 Mbps



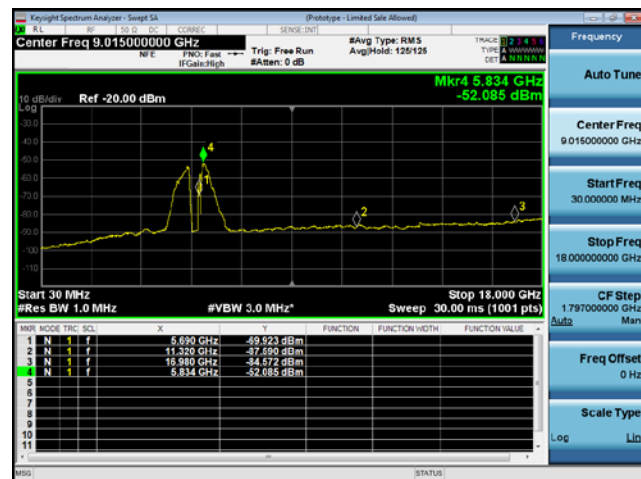
Antenna A



Antenna B



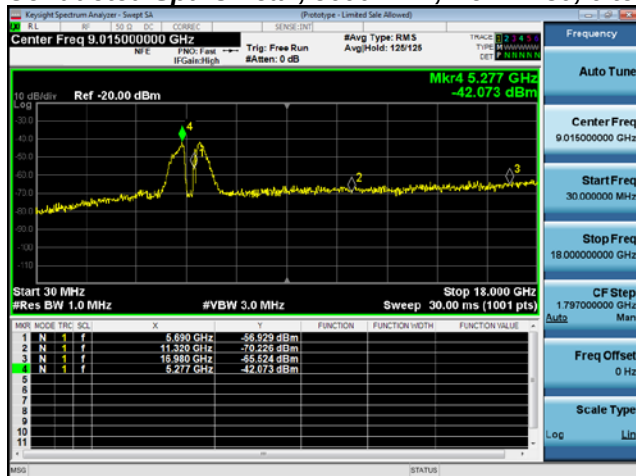
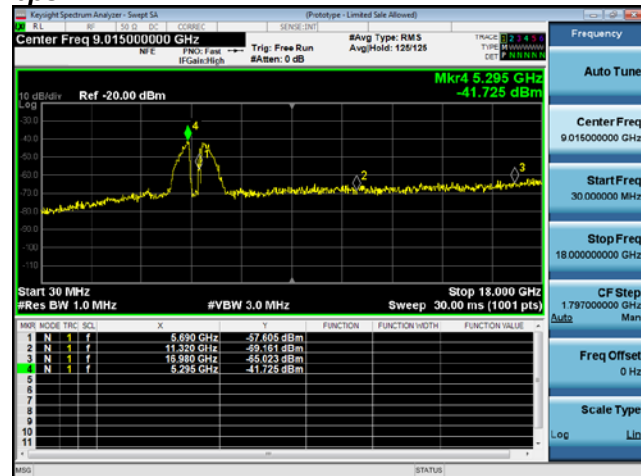
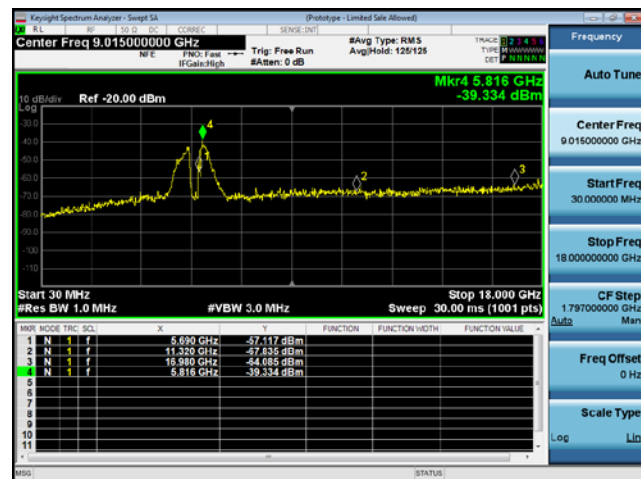
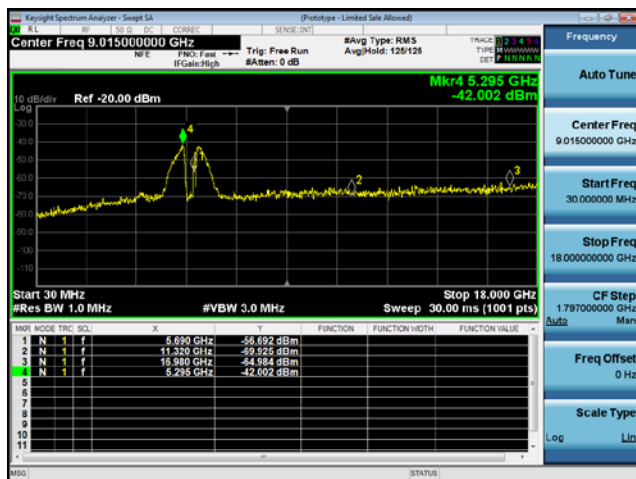
Antenna C



Antenna D

Frequency (MHz)	Mode	Tx Paths	Correlated Antenna Gain (dBi)	Tx 1 Spur Power (dBm)	Tx 2 Spur Power (dBm)	Tx 3 Spur Power (dBm)	Tx 4 Spur Power (dBm)	Total Conducted Spur (dBm)	Limit (dBm)	Margin (dB)
5690	Non HT80, 6 to 54 Mbps	1	4	-42.1				-38.1	-21.37	16.8
	Non HT80, 6 to 54 Mbps	2	4	-42.1	-41.7			-34.9	-21.37	13.5
	Non HT80, 6 to 54 Mbps	3	4	-42.1	-41.7	-42.0		-33.2	-21.37	11.8
	Non HT80, 6 to 54 Mbps	4	4	-42.1	-41.7	-42.0	-39.3	-31.1	-21.37	9.7
	VHT80, M0 to M9 1ss	1	4	-46.9				-42.9	-21.37	21.6
	VHT80, M0 to M9 1ss	2	4	-46.9	-44.8			-38.7	-21.37	17.4
	VHT80, M0 to M9 2ss	2	4	-46.9	-44.8			-38.7	-21.37	17.4
	VHT80, M0 to M9 1ss	3	4	-46.9	-44.8	-45.2		-36.8	-21.37	15.4
	VHT80, M0 to M9 2ss	3	4	-46.9	-44.8	-45.2		-36.8	-21.37	15.4
	VHT80, M0 to M9 3ss	3	4	-46.9	-44.8	-45.2		-36.8	-21.37	15.4
	VHT80, M0 to M9 1ss	4	4	-46.9	-44.8	-45.2	-41.8	-34.2	-21.37	12.9
	VHT80, M0 to M9 2ss	4	4	-46.9	-44.8	-45.2	-41.8	-34.2	-21.37	12.9
	VHT80, M0 to M9 3ss	4	4	-46.9	-44.8	-45.2	-41.8	-34.2	-21.37	12.9
	VHT80 Beam Forming, M0 to M9 1ss	2	7	-46.9	-44.8			-35.7	-21.37	14.4
	VHT80 Beam Forming, M0 to M9 2ss	2	4	-46.9	-44.8			-38.7	-21.37	17.4
	VHT80 Beam Forming, M0 to M9 1ss	3	8	-41.7	-46.3	-46.5		-31.5	-21.37	10.1
	VHT80 Beam Forming, M0 to M9 2ss	3	5	-46.9	-44.8	-45.2		-35.8	-21.37	14.4
	VHT80 Beam Forming, M0 to M9 3ss	3	4	-46.9	-44.8	-45.2		-36.8	-21.37	15.4
	VHT80 Beam Forming, M0 to M9 1ss	4	10	-49.6	-48.6	-48.3	-48.6	-32.7	-21.37	11.4
	VHT80 Beam Forming, M0 to M9 2ss	4	7	-47.4	-46.0	-47.1	-45.6	-33.4	-21.37	12.1
	VHT80 Beam Forming, M0 to M9 3ss	4	5	-46.9	-44.8	-45.2	-41.8	-33.2	-21.37	11.9
	VHT80 STBC, M0 to M9 1ss	2	4	-46.9	-44.8			-38.7	-21.37	17.4
	VHT80 STBC, M0 to M9 1ss	3	4	-46.9	-44.8	-45.2		-36.8	-21.37	15.4
	VHT80 STBC, M0 to M9 1ss	4	4	-46.9	-44.8	-45.2	-41.8	-34.2	-21.37	12.9
5710	Non HT40, 6 to 54 Mbps	1	4	-46.5				-42.5	-21.25	21.3
	Non HT40, 6 to 54 Mbps	2	4	-46.5	-45.5			-39.0	-21.25	17.7
	Non HT40, 6 to 54 Mbps	3	4	-46.5	-45.5	-46.2		-37.3	-21.25	16.0
	Non HT40, 6 to 54 Mbps	4	4	-48.0	-46.1	-47.0	-46.6	-36.8	-21.25	15.6
	HT/VHT40, M0 to M7	1	4	-46.7				-42.7	-21.25	21.5
	HT/VHT40, M0 to M7	2	4	-46.7	-45.2			-38.9	-21.25	17.6
	HT/VHT40, M8 to M15	2	4	-46.7	-45.2			-38.9	-21.25	17.6
	HT/VHT40, M0 to M7	3	4	-46.7	-45.2	-47.0		-37.5	-21.25	16.2
	HT/VHT40, M8 to M15	3	4	-46.7	-45.2	-47.0		-37.5	-21.25	16.2
	HT/VHT40, M16 to M23	3	4	-46.7	-45.2	-47.0		-37.5	-21.25	16.2
	HT/VHT40, M0 to M7	4	4	-48.0	-47.2	-47.6	-47.0	-37.4	-21.25	16.2

	HT/VHT40, M8 to M15	4	4	-46.7	-45.2	-47.0	-46.7	-36.3	-21.25	15.1
	HT/VHT40, M16 to M23	4	4	-46.7	-45.2	-47.0	-46.7	-36.3	-21.25	15.1
	HT/VHT40 Beam Forming, M0 to M7	2	7	-46.7	-45.2			-35.9	-21.25	14.6
	HT/VHT40 Beam Forming, M8 to M15	2	4	-46.7	-45.2			-38.9	-21.25	17.6
	HT/VHT40 Beam Forming, M0 to M7	3	8	-49.4	-47.7	-48.5		-35.7	-21.25	14.5
	HT/VHT40 Beam Forming, M8 to M15	3	5	-46.7	-45.2	-47.0		-36.5	-21.25	15.2
	HT/VHT40 Beam Forming, M16 to M23	3	4	-46.7	-45.2	-47.0		-37.5	-21.25	16.2
	HT/VHT40 Beam Forming, M0 to M7	4	10	-50.0	-48.5	-50.5	-50.5	-33.8	-21.25	12.5
	HT/VHT40 Beam Forming, M8 to M15	4	7	-48.0	-47.2	-47.6	-47.0	-34.4	-21.25	13.2
	HT/VHT40 Beam Forming, M16 to M23	4	5	-46.7	-45.2	-47.0	-46.7	-35.3	-21.25	14.1
	HT/VHT40 STBC, M0 to M7	2	4	-46.7	-45.2			-38.9	-21.25	17.6
	HT/VHT40 STBC, M0 to M7	3	4	-46.7	-45.2	-47.0		-37.5	-21.25	16.2
	HT/VHT40 STBC, M0 to M7	4	4	-46.7	-45.2	-47.0	-46.7	-36.3	-21.25	15.1
5720	Non HT20, 6 to 54 Mbps	1	4	-46.2				-42.2	-21.25	21.0
	Non HT20, 6 to 54 Mbps	2	4	-46.2	-45.1			-38.6	-21.25	17.4
	Non HT20, 6 to 54 Mbps	3	4	-47.7	-47.7	-47.1		-38.7	-21.25	17.5
	Non HT20, 6 to 54 Mbps	4	4	-50.3	-48.7	-48.9	-51.1	-39.6	-21.25	18.4
	Non HT20 Beam Forming, 6 to 54 Mbps	2	7	-46.2	-45.1			-35.6	-21.25	14.4
	Non HT20 Beam Forming, 6 to 54 Mbps	3	8	-49.3	-47.8	-48.9		-35.8	-21.25	14.6
	Non HT20 Beam Forming, 6 to 54 Mbps	4	10	-50.3	-48.7	-48.9	-51.1	-33.6	-21.25	12.4
	HT/VHT20, M0 to M7	1	4	-47.5				-43.5	-21.25	22.3
	HT/VHT20, M0 to M7	2	4	-47.5	-45.1			-39.1	-21.25	17.9
	HT/VHT20, M8 to M15	2	4	-47.5	-45.1			-39.1	-21.25	17.9
	HT/VHT20, M0 to M7	3	4	-48.3	-47.0	-47.1		-38.7	-21.25	17.4
	HT/VHT20, M8 to M15	3	4	-47.5	-45.1	-46.1		-37.4	-21.25	16.1
	HT/VHT20, M16 to M23	3	4	-47.5	-45.1	-46.1		-37.4	-21.25	16.1
	HT/VHT20, M0 to M7	4	4	-51.4	-49.8	-50.0	-48.5	-39.8	-21.25	18.5
	HT/VHT20, M8 to M15	4	4	-48.3	-47.0	-47.1	-46.1	-37.0	-21.25	15.8
	HT/VHT20, M16 to M23	4	4	-47.5	-45.1	-46.1	-45.8	-36.0	-21.25	14.8
	HT/VHT20 Beam Forming, M0 to M7	2	7	-47.5	-45.1			-36.1	-21.25	14.9
	HT/VHT20 Beam Forming, M8 to M15	2	4	-47.5	-45.1			-39.1	-21.25	17.9
	HT/VHT20 Beam Forming, M0 to M7	3	8	-48.0	-48.5	-48.8		-35.6	-21.25	14.4
	HT/VHT20 Beam Forming, M8 to M15	3	5	-47.5	-45.1	-46.1		-36.4	-21.25	15.1
	HT/VHT20 Beam Forming, M16 to M23	3	4	-47.5	-45.1	-46.1		-37.4	-21.25	16.1
	HT/VHT20 Beam Forming, M0 to M7	4	10	-51.4	-49.8	-50.0	-48.5	-33.8	-21.25	12.5
	HT/VHT20 Beam Forming, M8 to M15	4	7	-48.3	-47.0	-47.1	-46.1	-34.0	-21.25	12.8
	HT/VHT20 Beam Forming, M16 to M23	4	5	-47.5	-45.1	-46.1	-45.8	-35.0	-21.25	13.8
	HT/VHT20 STBC, M0 to M7	2	4	-47.5	-45.1			-39.1	-21.25	17.9
	HT/VHT20 STBC, M0 to M7	3	4	-47.5	-45.1	-46.1		-37.4	-21.25	16.1
	HT/VHT20 STBC, M0 to M7	4	4	-48.3	-47.0	-47.1	-46.1	-37.0	-21.25	15.8

Conducted Spurs Peak, 5690 MHz, Non HT80, 6 to 54 Mbps**Antenna A****Antenna B**

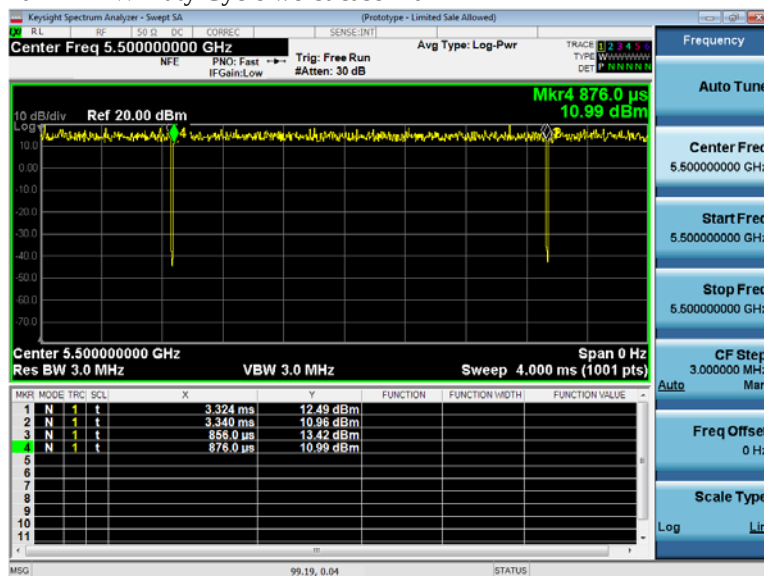
A.5 Duty Cycle

The zero-span mode on a spectrum analyzer or EMI receiver if the response time and spacing between bins on the sweep are sufficient to permit accurate measurements of the ON and OFF times of the transmitted signal:

- 1) Set the center frequency of the instrument to the center frequency of the transmission.
- 2) Set $RBW \geq OBW$ if possible; otherwise, set RBW to the largest available value.
- 3) Set $VBW \geq RBW$. Set detector = peak or average.

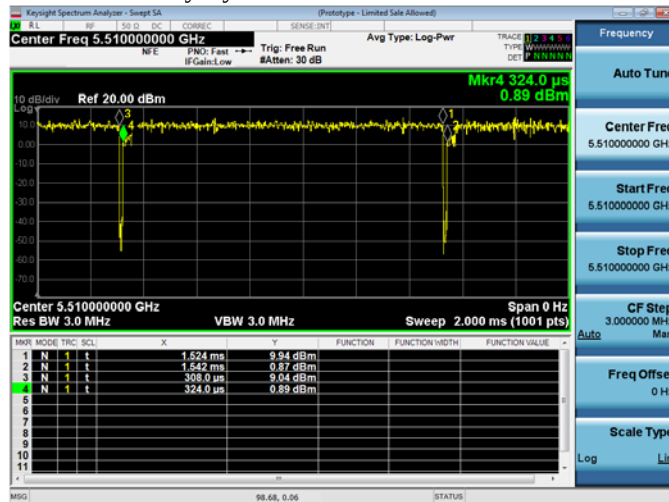
Add $[10 \log (1 / D)]$, where D is the duty cycle, to the measured value where it is needed
 For example, add $[10 \log (1/0.25)] = 6 \text{ dB}$ if the duty cycle is 25%

20MHz BW Duty Cycle worst case m0



The Duty cycle is 99.2%, no correction is needed for measurements of 20MHz BW.

40MHz BW Duty Cycle worst case m0



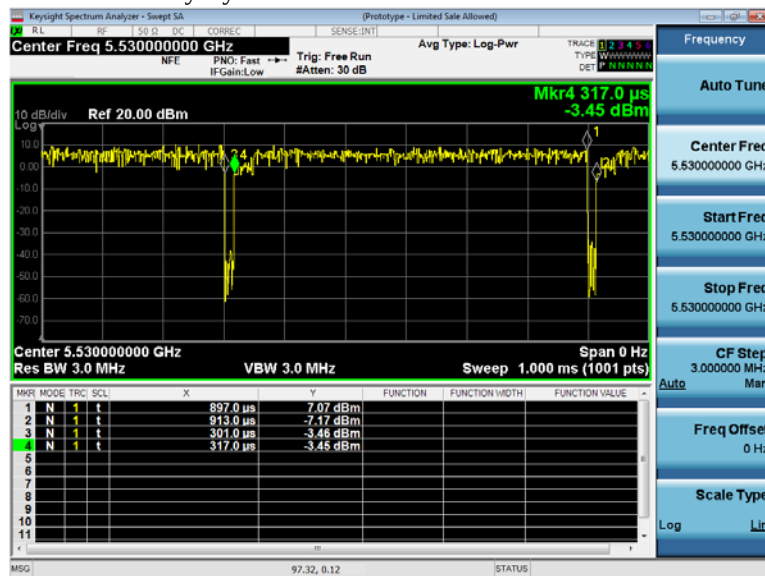
The Duty cycle of 40MHz BW is 98.7%, no correction is needed for measurements of 40MHz BW.

Time ON = 1.524ms – 0.324ms = 1.2 ms

Period = 1.524ms – 0.308ms = 1.216ms

Duty Cycle = Time ON / Period = 1.2/1.216ms = 0.9868

80MHz BW Duty Cycle worst case m0x1



The Duty cycle of 80MHz BW is 97.3%, a 0.2dB CF is added to measurements.

Time ON = 897us – 317us = 580us

Period = 897us – 301us = 596us

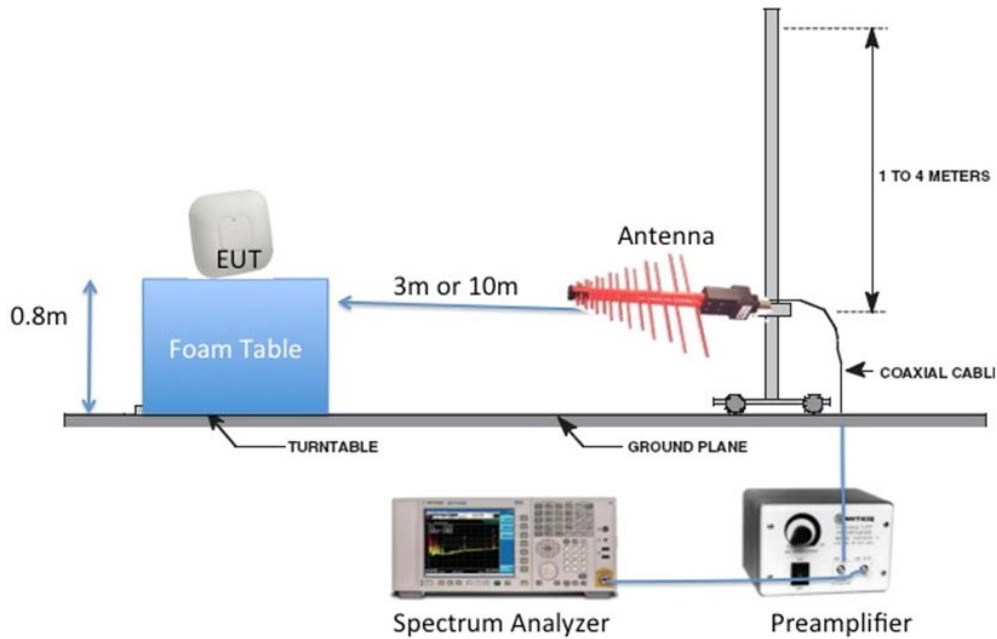
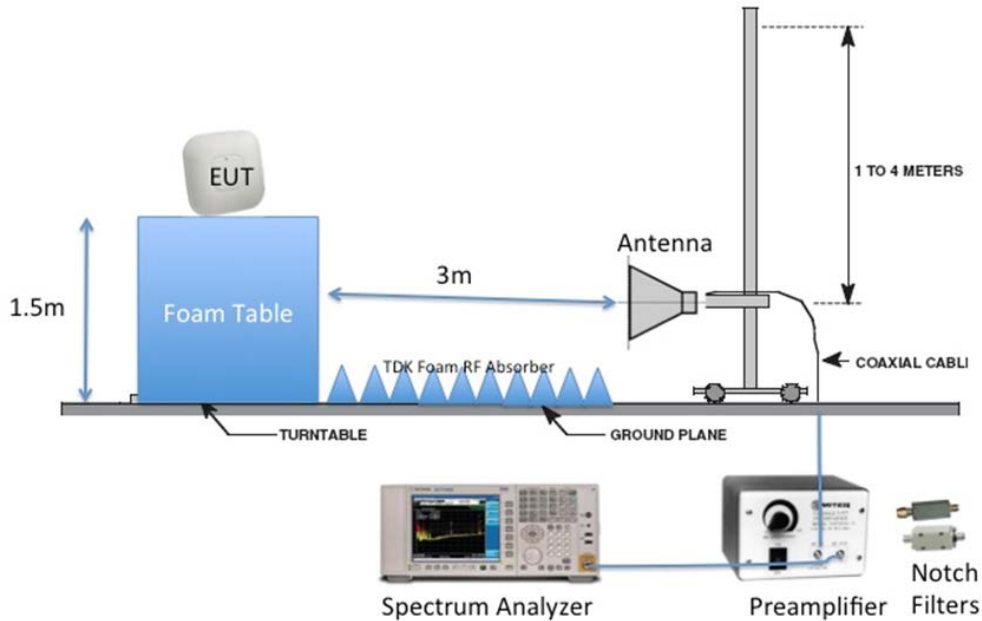
Duty Cycle = Time ON / Period = 580/596us = 0.9732

Duty Cycle Correction factor = 10 log (1/D) = 0.12dB



Title: Physical Test Arrangement Photograph

This is a dual band 2.4GHz / 5GHz device. All ports in this test set up photo are connected as all testing is automated. Section 2.6 of this test report given an overview of the different Tx antenna combinations used by this device.

Appendix B: Emission Test Results**Testing Laboratory:** Cisco Systems, Inc., 125 West Tasman Drive, San Jose, CA 95134, USA**Radiated Emission Setup Diagram-Below 1G****Radiated Emission Setup Diagram-Above 1G**

B.1 Radiated Spurious Emissions

15.407 / 15.209 / 15.205, LP0002 (2018-01-10) (2.8) For transmitters operating in the 5.725-5.85 GHz band: All emissions within the frequency range from the band edge to 10 MHz above or below the band edge shall not exceed an e.i.r.p. of -17 dBm/MHz; for frequencies 10 MHz or greater above or below the band edge, emissions shall not exceed an e.i.r.p. of -27 dBm/MHz. Unwanted emissions below 1 GHz must comply with the general field strength limits set forth in 15.209.

The provisions of §15.205 apply to intentional radiators operating under this section. When measuring the emission limits, the nominal carrier frequency shall be adjusted as close to the upper and lower frequency band edges as the design of the equipment permits

RSS-GEN Radiated emissions which fall in the restricted bands, as defined in RSS-GEN section 8.10. must also comply with the radiated limits specified in RSS-GEN section 8.9

Ref. ANSI C63.10: 2013 section 12.7.6 (peak) & 12.7.7.3 (average)

Using Vasona, configure the spectrum analyzer as shown below (be sure to enter all losses between the transmitter output and the spectrum analyzer). Place the radio in continuous transmit mode.

Span:	1GHz – 18 GHz
Reference Level:	80 dBuV
Attenuation:	10 dB
Sweep Time:	Coupled
Resolution Bandwidth:	1MHz
Video Bandwidth:	3 MHz
Detector:	Peak / Average

Terminate the access Point RF ports with 50 ohm loads.

Maximize Turntable (find worst case table angle), Maximize Antenna (find worst case height)

Save 2 plots: 1) Average plot (Vertical and Horizontal), Limit= 54dBuV/m @3m
2) Peak plot (Vertical and Horizontal), Limit = 74dBuV/m @3m

Place a marker at the end of the restricted band closest to the transmit frequency to show compliance. Also measure any emissions in the restricted bands.

This report represents the worst case data for all supported operating modes and antennas. There are no measurable emissions above 18 GHz.

System Number	Description	Samples	System under test	Support equipment
1	EUT	S01	☒	☐
	Support	S02	☐	☒

Tested By : Jose Aguirre	Date of testing: 10-Feb-18 - 16-Dec-18
Test Result : PASS	

See Appendix C for list of test equipment

B.1.A Transmitter Radiated Spurious Emissions-Average Worst Case

Frequency (MHz)	Mode	Data Rate (Mbps)	Spurious Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)
5690	Non HT20, 6 to 54 Mbps	6	51.5	54.0	2.5
5710	Non HT40, 6 to 54 Mbps	6	51.9	54.0	2.1
5720	Non HT80, 6 to 54 Mbps	6	50.8	54.0	3.2

Average Radiated Transmitter Spurs, 5690 MHz, 6 to 54 Mbps



Average Radiated Transmitter Spurs, 5710 MHz, 6 to 54 Mbps



Agilent Spectrum Analyzer - EMIsoft Vasona: EMI Emission Software

Marker 3 16.640000000000 GHz

PN0: Fast Trig: Free Run Avg Type: RMS
IFGain: High #Atten: 0 dB

02:46:20 PM Dec 16, 2018

TRACE 1 2 3 4 5
TYPE MinMaxAver
DET A A A A A A

10 dB/div Ref 80.00 dBμV

Log

70.0
60.0
50.0
40.0
30.0
20.0
10.0
0.00
-10.0

1

2

3

Mkr3 16.640 GHz
50.77 dBμV

Start 1.000 GHz Stop 18.000 GHz
#Res BW 1.0 MHz #VBW 3.0 MHz* Sweep 42.6 ms (1601 pts)

MARK	MODE	TRC	SCL	X	Y	FUNCTION	FUNCTION WIDTH	FUNCTION VALUE
1	N	1	f	5.718 GHz	70.30 dBμV			
2	N	1	f	1.191 GHz	30.04 dBμV			
3	N	1	f	16.640 GHz	50.77 dBμV			
4								
5								
6								
7								
8								
9								
10								
11								
12								

MSG

STATUS

Select Marker 3

Normal

Delta

Fixed

Properties

More 1 of

B.1.P Transmitter Radiated Spurious Emissions-Peak Worst Case

Frequency (MHz)	Mode	Data Rate (Mbps)	Spurious Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)
5690	Non HT20, 6 to 54 Mbps	6	67.1	74.0	6.9
5710	Non HT20, 6 to 54 Mbps	6	67.3	74.0	6.7
5720	Non HT20, 6 to 54 Mbps	6	67.2	74.0	6.8

Peak Radiated Transmitter Spurs, 5690 MHz, 6 to 54 Mbps



Peak Radiated Transmitter Spurs, 5710 MHz, 6 to 54 Mbps



Agilent Spectrum Analyzer - EFS Software: EMI Emission Software

Marker 3 16.661250000000 GHz #Avg Type: RMS

PNO: Fast Trig: Free Run
IFGain: Low #Atten: 10 dB

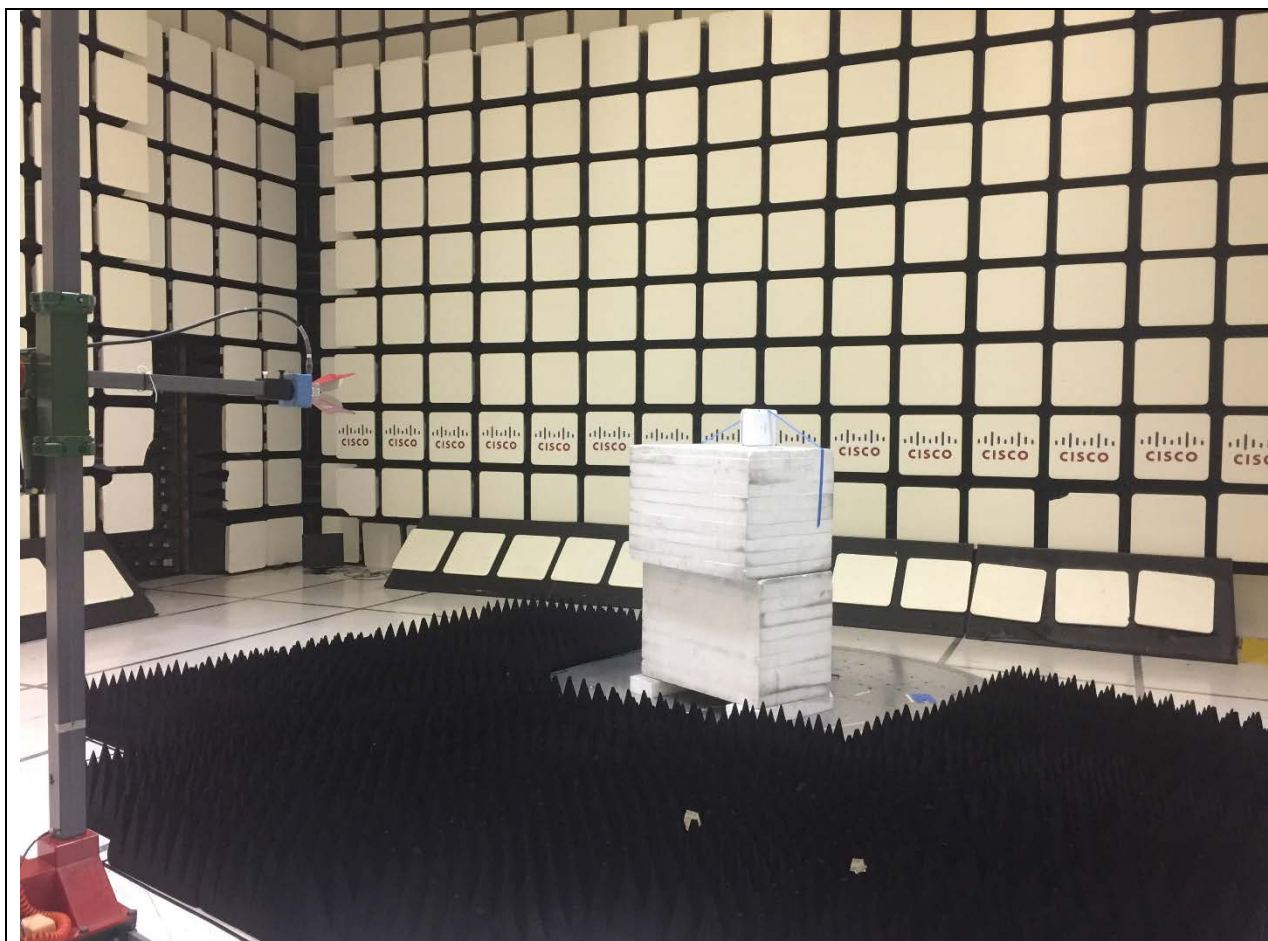
10 dB/div Ref 90.00 dBμV

Mkr3 16.661 GHz
67.21 dBμV

Start 1.000 GHz Stop 18.000 GHz
#Res BW 1.0 MHz #VBW 3.0 MHz Sweep 42.6 ms (1601 pts)

MKR	MODE	TRC	SCL	X	Y	FUNCTION	FUNCTION WIDTH	FUNCTION VALUE
1	N	1	f	5.718 GHz	77.38 dBμV			
2	N	1	f	1.191 GHz	42.38 dBμV			
3	N	1	f	16.661 GHz	67.21 dBμV			
4								
5								
6								
7								
8								
9								
10								
11								
12								

MSG STATUS



Title: Radiated Emissions Configuration Photograph

B.2 Receiver Spurious Emissions

LP0002 (2018-01-10) 2.11 - The receiver radiated field strength must not exceed the emission specified in Section 2.8 and the receiver shall not receive, demodulate frequency listed in Section 2.7.

RSS-Gen Receivers are required to comply with the limits of spurious emissions as set out in this section. Receiver emission measurements are to be performed as per the normative test method referenced in Section 3.

Radiated emissions which fall in the restricted bands, as defined in RSS-Gen section 8.10, must also comply with the radiated emission limits specified in RSS-Gen section 8.9.

For emissions at frequencies below 1 GHz, measurements shall be performed using a CISPR quasi-peak detector and the related measurement bandwidth. At frequencies above 1 GHz, measurements shall be performed using a linear average detector with a minimum resolution bandwidth of 1 MHz.

Ref. RSS-Gen section 8.9 & 8.10

ANSI C63.10: 2013 section 4.1.4.2.2, 4.1.4.2.3, 6.6.4 & 11.12.2

Using Vasona, configure the spectrum analyzer as shown below (be sure to enter all losses between the transmitter output and the spectrum analyzer). Place the radio in continuous transmit mode.

Span:	1GHz – 18 GHz
Reference Level:	80 dBuV
Attenuation:	10 dB
Sweep Time:	Coupled
Resolution Bandwidth:	1MHz
Video Bandwidth:	3MHz
Detector:	Peak / Average

Radiated emission measurements shall be performed with the receiver antenna connected to the receiver antenna terminals.

Maximize Turntable (find worst case table angle), Maximize Antenna (find worst case height)

Save plot: 1) Average Plot (Vertical and Horizontal), Limit= 54dBuV/m @3m
2) Peak Plot (Vertical and Horizontal), Limit= 74dBuV/m @3m

This report represents the worst case data for all supported operating modes and antennas. There are no measurable emissions above 18 GHz.

System Number	Description	Samples	System under test	Support equipment
1	EUT	S01	☒	☐
	Support	S02	☐	☒

Tested By : Jose Aguirre	Date of testing: 16-Dec-18
Test Result : PASS	

See Appendix C for list of test equipment

B.2.A Receiver Radiated Spurious Emissions (Average Measurements)

Frequency (MHz)	Mode	Data Rate (Mbps)	Spurious Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)
5690	Non HT20, 6 to 54 Mbps	6	50.3	54.0	3.7
5710	Non HT40, 6 to 54 Mbps	6	50.4	54.0	3.6
5720	Non HT80, 6 to 54 Mbps	6	50.5	54.0	3.5

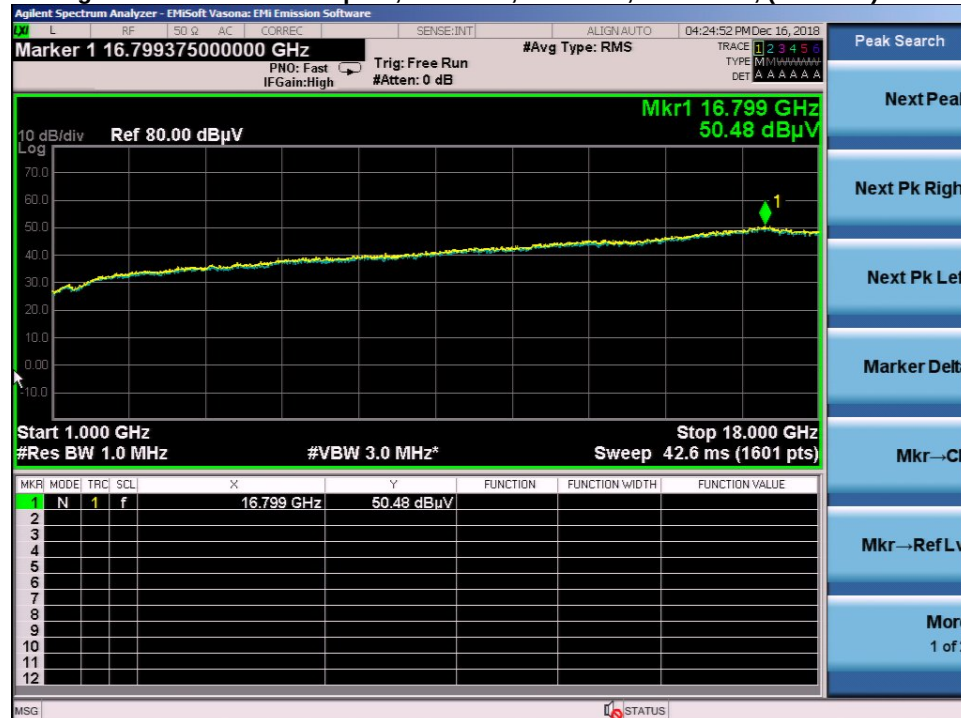
Average Radiated Receiver Spurs, 5690MHz, All Rates, All Modes, (1-18GHz) Horizontal



Average Radiated Receiver Spurs, 5710MHz, All Rates, All Modes, (1-18GHz) Horizontal



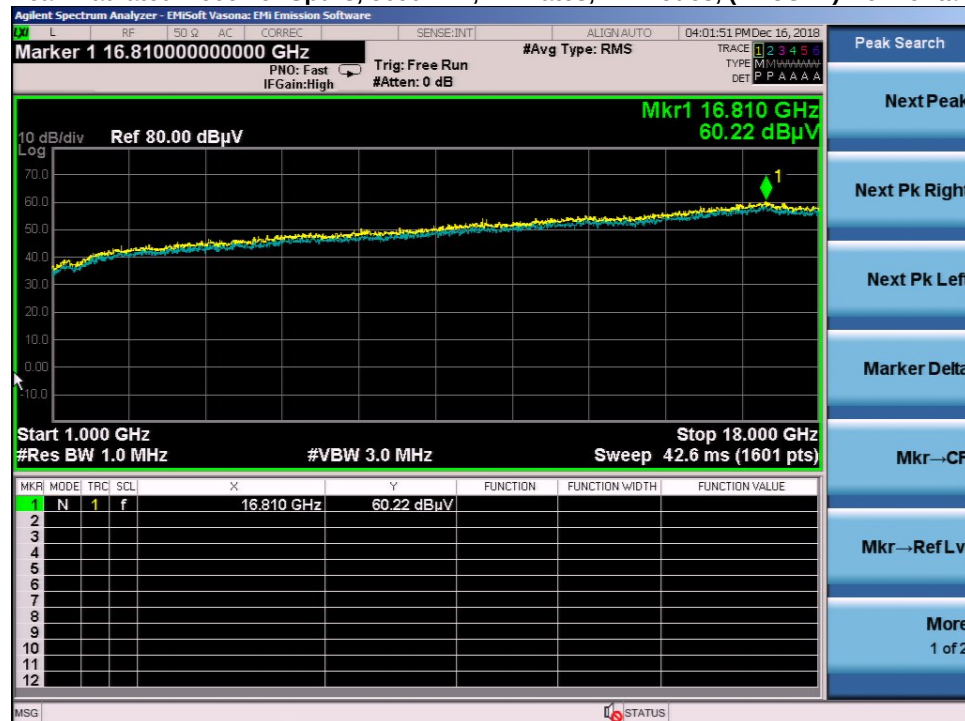
Average Radiated Receiver Spurs, 5720MHz, All Rates, All Modes, (1-18GHz) Horizontal



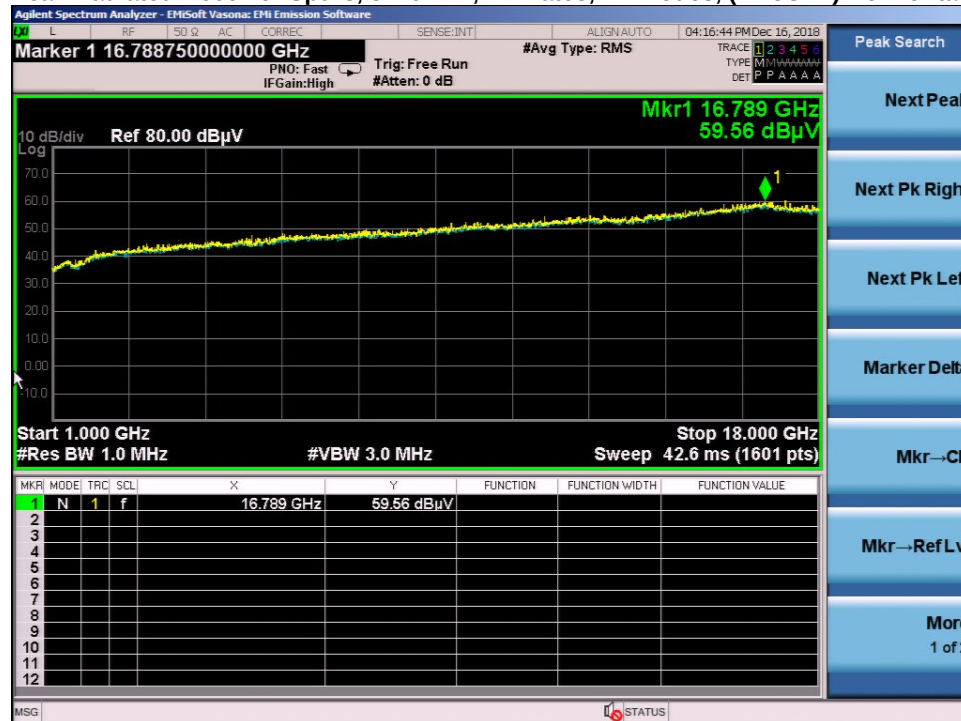
B.2.P Receiver Radiated Spurious Emissions (Peak Measurements)

Frequency (MHz)	Mode	Data Rate (Mbps)	Spurious Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)
5690	Non HT20, 6 to 54 Mbps	6	60.2	74.0	13.8
5710	Non HT20, 6 to 54 Mbps	6	59.6	74.0	14.4
5720	Non HT20, 6 to 54 Mbps	6	60.4	74.0	13.6

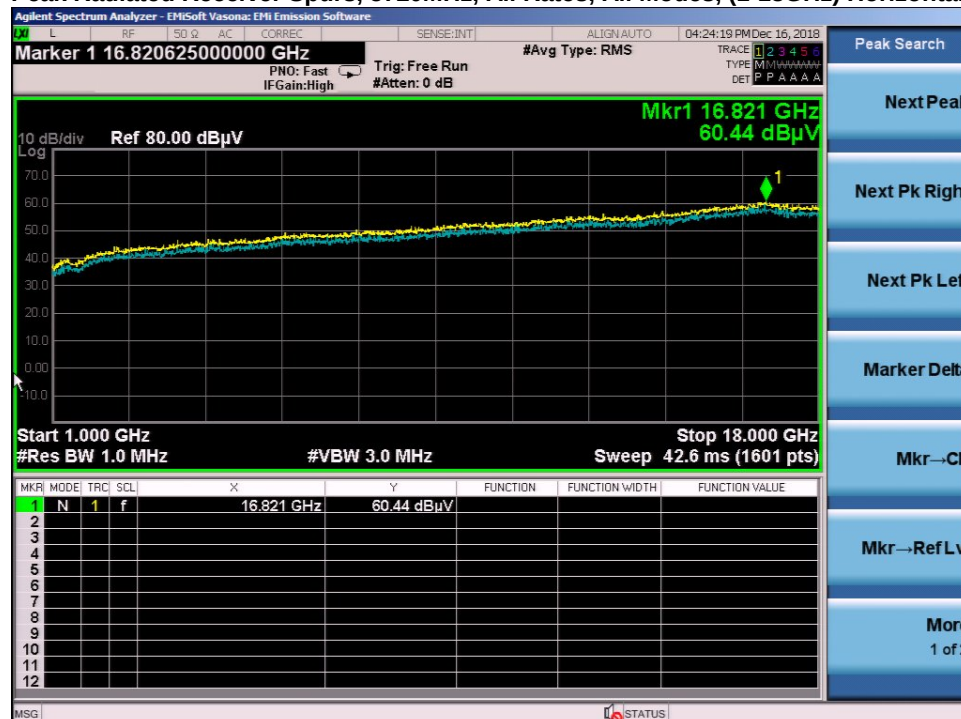
Peak Radiated Receiver Spurs, 5690MHz, All Rates, All Modes, (1-18GHz) Horizontal

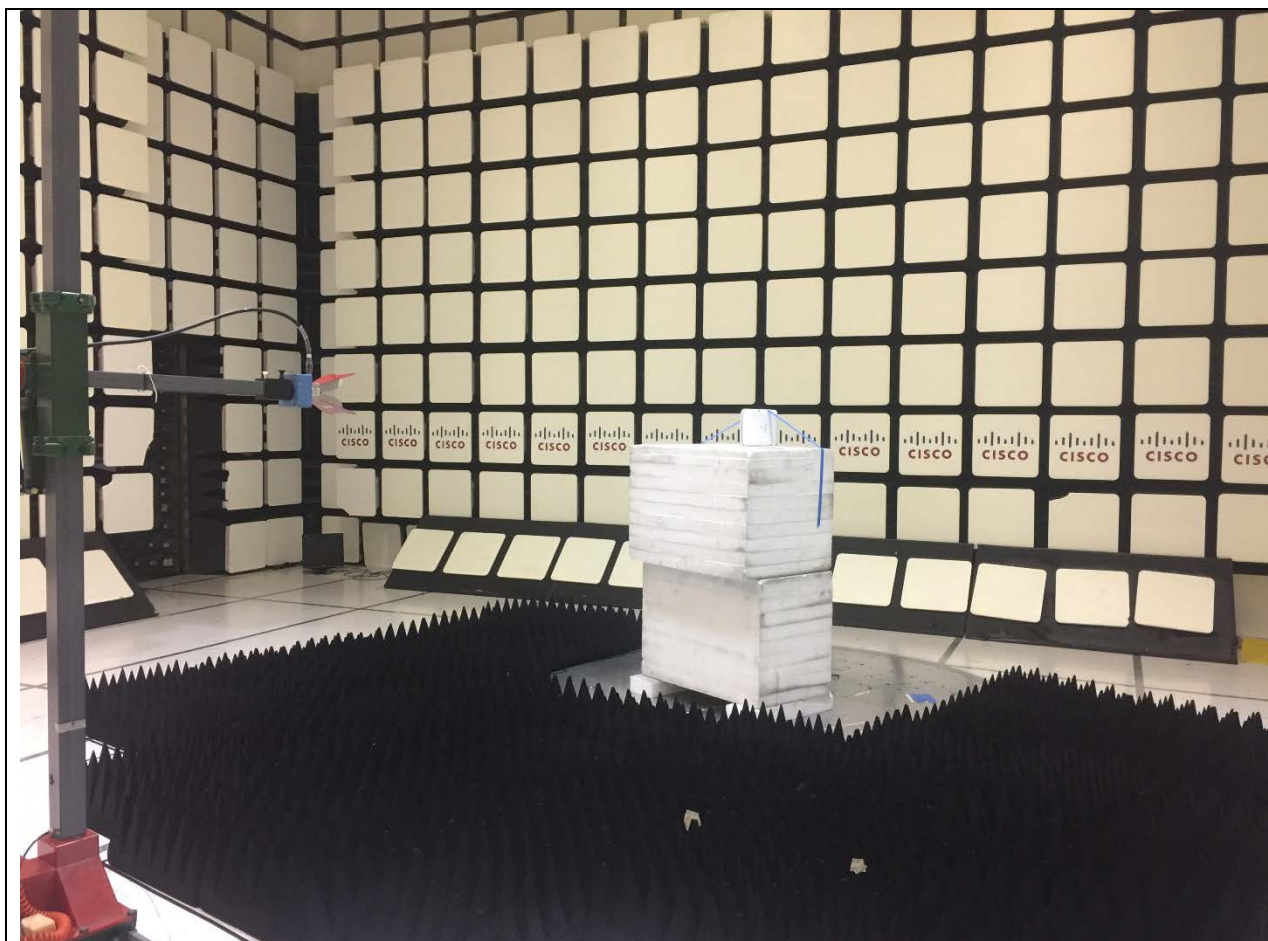


Peak Radiated Receiver Spurs, 5710MHz, All Rates, All Modes, (1-18GHz) Horizontal



Peak Radiated Receiver Spurs, 5720MHz, All Rates, All Modes, (1-18GHz) Horizontal





Title: Radiated Emissions Configuration Photograph

Appendix C: List of Test Equipment Used to perform the test

Test Equipment used for Radiated Emissions					
Equip No	Model Manufacturer	Description	Last Cal	Next Cal	Test Item
CIS008447	NSA 10m Chamber Cisco	NSA 10m Chamber	17-Oct-17	17-Oct-18	B.3
CIS021116	UFB311A-0-3540-520520 Micro-Coax	RF Coaxial Cable, to 18GHz, 354 in	19-Jan-18	19-Jan-19	B.3
CIS027233	CNE V York	Comparison Noise Emitter	Cal not required		B.3
CIS032806	JB1 Sunol Sciences	Combination Antenna	7-Jun-17	7-Jun-18	B.3
CIS037236	50CB-015 JFW	GPIB Control Box	Cal not required		B.3
CIS041979	1840 Cisco	18-40GHz EMI Test Head/Verification Fixture	30-Aug-17	30-Aug-18	B.3
CIS043124	Above 1GHz Site Cal Cisco	Above 1GHz Cspr Site Verification	15-Jan-18	15-Jan-19	B.3
CIS044940	ESU40 Rohde & Schwarz	EMI Test Receiver, 20Hz-40GHz	28-Nov-17	28-Nov-18	B.3
CIS047410	N9038A Agilent	MXE EMI Receiver 20Hz to 26.5 Ghz	31-Mar-17	31-Mar-18	B.3
CIS056154	Sucoflex 104PEA Huber + Suhner	RF N-Type cable 2 meter 18GHz	18-Jan-18	18-Jan-19	B.3
CIS001937	NSA 5m Chamber Cisco	NSA 5m Chamber	6-Feb-18	6-Feb-19	B.1
CIS007295	NSP1800-25-S1 Miteq	Broadband RF Preamplifier (1.0-18.0GHz,35-40dB)	13-Oct-17	13-Oct-18	B.1
CIS008024	SF106A Huber + Suhner	3 meter Sucoflex cable	10-Nov-17	10-Nov-18	B.1
CIS030443	UFB311A-0-1560-520520 Micro-Coax	RF Coaxial Cable, to 18GHz, 156 In.	10-Nov-17	10-Nov-18	B.1
CIS034075	RSG 2000 Schaffner	Reference Spectrum Generator, 1-18GHz	Cal not required		B.1
CIS037581	3117 ETS-Lindgren	Double Ridged Waveguide Horn Antenna	7-Dec-17	7-Dec-18	B.1
CIS041979	1840 Cisco	18-40GHz EMI Test Head/Verification Fixture	30-Aug-17	30-Aug-18	B.1
CIS042000	E4440A Agilent	Spectrum Analyzer	22-Aug-17	22-Aug-18	B.1
CIS044940	ESU40 Rohde & Schwarz	EMI Test Receiver, 20Hz-40GHz	28-Nov-17	28-Nov-18	B.1
CIS049413	iBTHP-5-DB9 Newport	5 inch Temp/RH/Press Sensor w/20ft cable	28-Dec-17	28-Dec-18	B.1
CIS049535	Above 1GHz Site Cal Cisco	Above 1GHz CISPR Site Validation	7-Feb-18	7-Feb-19	B.1
CIS055937	Sucoflex 106PA Huber + Suhner	N-Type 8m 18GHz Antenna Cable	10-Nov-17	10-Nov-18	B.1
CIS007295	NSP1800-25-S1 Miteq	Broadband RF Preamplifier (1.0-18.0GHz,35-40dB)	13-Oct-17	13-Oct-18	B.2
CIS021117	UFB311A-0-2484-520520 Micro-Coax	RF Coaxial Cable, to 18GHz, 248.4 in	16-Aug-17	16-Aug-18	B.2
CIS025716	11500E HP	Radio testing cable 3.5mm	27-Jun-17	27-Jun-18	B.2

CIS032544	3117 ETS-Lindgren	Double Ridged Waveguide Horn Antenna	12-Jul-17	12-Jul-18	B.2
CIS040597	Above 1GHz Site Cal Cisco	Above 1GHz Cspr Site Verification	26-Sep-17	26-Sep-18	B.2
CIS041979	1840 Cisco	18-40GHz EMI Test Head/Verification Fixture	30-Aug-17	30-Aug-18	B.2
CIS044940	ESU40 Rohde & Schwarz	EMI Test Receiver, 20Hz-40GHz	28-Nov-17	28-Nov-18	B.2
CIS047300	N9038A Agilent Technologies	MXE EMI Receiver 20Hz to 26.5 Ghz	28-Mar-17	28-Mar-18	B.2
CIS049553	5-T-MB Bird	5W 50 Ohm BNC Termination 4GHz	15-Nov-17	15-Nov-18	B.2
CIS054230	iBTHP-5-DB9 Newport	5 inch Temp/RH/Press Sensor w/20ft cable	9-Feb-18	9-Feb-19	B.2
CIS056158	Sucoflex104PEA Huber + Suhner	RF N Type Cable 18GHz 2m	18-Jan-18	18-Jan-19	B.2

Test Equipment used for AC Mains Conducted Emissions						
Equip No	Manufacturer	Model	Description	Last Cal	Next Cal	Test Item
45167	Stanley 33-428		8m Tape Measure	Cal not req	Cal not req	B.4
5687	Fluke 73 III		Digital Multimeter	11/1/2017	11/1/2018	B.4
45999	FCC F-090527-1009-2		Lisn Adapter	6/8/2017	6/8/2018	B.4
45050	Rohde & Schwarz ESCI		EMI Test Receiver	11/16/2017	11/16/2018	B.4
45998	FCC F-090527-1009-1		Line Impedance Stabilization Network	6/8/2017	6/8/2018	B.4
37229	Coleman RG-223		25ft BNC cable	4/12/2017	4/12/2018	B.4
49559	Bird 5-T-MB		5W 50 Ohm BNC Termination 4GHz	8/10/2017	8/10/2018	B.4
18963	York CNE V		Comparison Noise Emitter, 30 - 1000MHz	Cal not req	Cal not req	B.4
54228	Newport iBTHP-5-DB9		5 inch Temp/RH/Press Sensor w/20ft cable	2/10/2018	2/10/2019	B.4
46006	FCC F-090527-1009-1		Line Impedance Stabilization Network	6/8/2017	6/8/2018	B.4
8510	FCC FCC-450B-2.4-N		Instrumentation Limiter	5/16/2017	5/16/2018	B.4
46007	FCC F-090527-1009-2		Lisn Adapter	6/8/2017	6/8/2018	B.4
49531	TTE H785-150K-50-21378		High Pass Filter	5/3/2017	5/3/2018	B.4

Test Equipment used for RF Conducted Tests					
Equip No	Model Manufacturer	Description	Last Cal	Next Cal	Test Item
CIS053615	N9030A-550 Keysight	PXA Signal Analyzer 50 GHz	4-Apr-17	4-Apr-18	Appendix A
CIS055352	BRC50704-02 Micro-Tronics	Notch Filter 5.42 - 5.725GHz	5-Apr-17	5-Apr-18	Appendix A
CIS055579	BWS20-W2 Aeroflex	SMA 20dB Attenuator	20-Jul-17	20-Jul-18	Appendix A
CIS055577	BWS20-W2 Aeroflex	SMA 20dB Attenuator	20-Jul-17	20-Jul-18	Appendix A
CIS055353	BRC50703-02 Micro-Tronics	Notch Filter 5.15 - 5.35GHz	27-Jul-17	27-Jul-18	Appendix A
CIS055112	BRM50702-02 Micro-Tronics	Reject Band Filter	27-Jul-17	27-Jul-18	Appendix A
CIS054693	BRC50705-02 Micro-Tronics	Band Reject Filter	27-Jul-17	27-Jul-18	Appendix A
CIS054620	RA08-S1S1-12 Megaphase	SMA cable 12"	27-Jul-17	27-Jul-18	Appendix A
CIS054619	RA08-S1S1-12 Megaphase	SMA cable 12"	27-Jul-17	27-Jul-18	Appendix A
CIS054617	RA08-S1S1-12 Megaphase	SMA cable 12"	27-Jul-17	27-Jul-18	Appendix A
CIS054616	RA08-S1S1-12 Megaphase	SMA cable 12"	27-Jul-17	27-Jul-18	Appendix A
CIS054615	RA08-S1S1-12 Megaphase	SMA cable 12"	27-Jul-17	27-Jul-18	Appendix A
CIS054614	RA08-S1S1-12 Megaphase	SMA cable 12"	27-Jul-17	27-Jul-18	Appendix A
CIS054611	RA08-S1S1-12 Megaphase	SMA cable 12"	27-Jul-17	27-Jul-18	Appendix A
CIS054610	RA08-S1S1-12 MegaPhase	SMA cable 12"	27-Jul-17	27-Jul-18	Appendix A
CIS054633	F120-S1S1-48 Megaphase	SMA cable 48"	21-Sep-17	21-Sep-18	Appendix A
CIS054634	F120-S1S1-48 Megaphase	SMA cable 48"	29-Sep-17	29-Sep-18	Appendix A
CIS055929	SMSM-A2PH-012 Dynawave	12" SMA Cable	23-Oct-17	23-Oct-18	Appendix A
CIS055921	SMSM-A2PH-012 Dynawave	12" SMA Cable	23-Oct-17	23-Oct-18	Appendix A
CIS055868	SMSM-A2PH-024 Dynawave	24" SMA Cable	23-Oct-17	23-Oct-18	Appendix A
CIS055170	RFLT4WDC40GK RF Lambda	4 Way Power Divider 40GHz	22-Dec-17	22-Dec-18	Appendix A
CIS055872	SMSM-A2PH-024 Dynawave	24" SMA Cable	27-Jul-17	27-Jul-18	Appendix A
CIS055867	SMSM-A2PH-024 Dynawave	24" SMA Cable	27-Jul-17	27-Jul-18	Appendix A

Test Equipment used for Radiated Spurious Emissions 16-DEC-2018					
Equip No	Model Manufacturer	Description	Last Cal	Next Cal	Test Item
47410	Keysight (Agilent/HP)/ N9038A	EMI Receiver	19 Apr 2018	19 Apr 2019	Appendix B
56154	HUBER + SUHNER/ Sucoflex 104PEA	Sucoflex N Type blue 7ft cable	18 JAN 2018	18 JAN 2019	Appendix B
20975	MICRO-COAX/ UFB311A-0-1344-520520	Coaxial Cable-18Ghz	19 Feb 2018	19 Feb 2019	Appendix B
47246	CISCO /TH0118-PS	Power Supply for TH0118 1-18GHz Preamplifier	Cal Not Required	Cal Not Required	Appendix B
49549	JFW / 50CB-015	Control Box, GPIB	Cal Not Required	Cal Not Required	Appendix B
45167	STANLEY/ 33-428	26' TAPE MEASURE	Cal Not Required	Cal Not Required	Appendix B
45096	CISCO/ TH0118	Mast Mount Preamplifier Array, 1-18GHz	01-NOV- 2018	01-NOV- 2019	Appendix B
43124	CISCO/ Above 1GHz Site Cal	1GHz Cispr Site Verification	15 Jan 2018	15 Jan 2019	Appendix B
08137	HUBER + SUHNER/ Sucoflex 104	Coaxial Cable BMC-SMA, 610mm	10 May 2018	10 May 2019	Appendix B
7295	MITEQ/ NSP1800-25-S1	PREAMPLIFIER	16 Oct 2018	16 Oct 2019	Appendix B
41929	NEWPORT/ iBTHP-5-DB9	5 inch Temp/RH/Press Sensor w/20ft cable	28 Dec 2017	28 Dec 2018	Appendix B

Appendix D: Abbreviation Key and Definitions

The following table defines abbreviations used within this test report.

Abbreviation	Description	Abbreviation	Description
EMC	Electro Magnetic Compatibility	°F	Degrees Fahrenheit
EMI	Electro Magnetic Interference	°C	Degrees Celsius
EUT	Equipment Under Test	Temp	Temperature
ITE	Information Technology Equipment	S/N	Serial Number
TAP	Test Assessment Schedule	Qty	Quantity
ESD	Electro Static Discharge	emf	Electromotive force
EFT	Electric Fast Transient	RMS	Root mean square
EDCS	Engineering Document Control System	Qp	Quasi Peak
Config	Configuration	Av	Average
CIS#	Cisco Number (unique identification number for Cisco test equipment)	Pk	Peak
Cal	Calibration	kHz	Kilohertz (1x10 ³)
EN	European Norm	MHz	MegaHertz (1x10 ⁶)
IEC	International Electro technical Commission	GHz	Gigahertz (1x10 ⁹)
CISPR	International Special Committee on Radio Interference	H	Horizontal
CDN	Coupling/Decoupling Network	V	Vertical
LISN	Line Impedance Stabilization Network	dB	decibel
PE	Protective Earth	V	Volt
GND	Ground	kV	Kilovolt (1x10 ³)
L1	Line 1	μV	Microvolt (1x10 ⁻⁶)
L2	Line2	A	Amp
L3	Line 3	μA	Micro Amp (1x10 ⁻⁶)
DC	Direct Current	mS	Milli Second (1x10 ⁻³)
RAW	Uncorrected measurement value, as indicated by the measuring device	μS	Micro Second (1x10 ⁻⁶)
RF	Radio Frequency	μS	Micro Second (1x10 ⁻⁶)
SLCE	Signal Line Conducted Emissions	m	Meter
Meas dist	Measurement distance	Spec dist	Specification distance
N/A or NA	Not Applicable	SL	Signal Line (or Telecom Line)
P	Power Line	L	Live Line
N	Neutral Line	R	Return
S	Supply	AC	Alternating Current

Appendix E: Scope of Accreditation (A2LA certificate number 1178-01)

The scope of accreditation of Cisco Systems, Inc. can be found on the A2LA web page at:

<https://www.a2la.org/scopepdf/1178-01.pdf>

End Of Document