Test Report

AIR-AP1815I-B-K9

Cisco Aironet 802.11ac Dual Band Access Points

FCC ID: LDK102108

5150-5250 MHz

Against the following Specifications:

CFR47 Part 15.407

ACCREDITED

Cisco Systems
170 West Tasman Drive
San Jose, CA 95134

Author: Jose Aguirre **Tested By:**	**Approved By:** Jim Nicholson **Title:** Technical Leader, Engineering **Revision:** 1

This report replaces any previously entered test report under EDCS – **1570571**.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

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:

Emission level [dBuV] = Indicated voltage level [dBuV] + Cable Loss [dB] + 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:-

Level in uV/m = Common Antilogarithm [(X dBuV/m)/20] = Y uV/m

Measurement Uncertainty Values

voltage and power measurements	± 2 dB
conducted EIRP measurements	± 1.4 dB
radiated measurements	± 3.2 dB
frequency measurements	± 2.4 10-7
temperature measurements	± 0.54º
humidity measurements	± 2.3%
DC and low frequency measurements	± 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

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.

2.2 Date of testing

06-Jun-16 - 26-Jun-16

2.3 Report Issue Date

30-June-2016

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-AP1815I-A-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 - 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 Beam Forming, Two Antennas, M0 to M7
802.11n/ac - HT/VHT20 Beam Forming, Two Antennas, M8 to M15

802.11n/ac - HT/VHT20 STBC, Two 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 - 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 Beam Forming, Two Antennas, M0 to M7
802.11n/ac - HT/VHT40 Beam Forming, Two Antennas, M8 to M15

802.11n/ac - HT/VHT40 STBC, Two 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

802.11ac - VHT80, One Antenna, M0 to M9 1ss
802.11ac - VHT80, Two Antennas, M0 to M9 1ss
802.11ac - VHT80, Two Antennas, M0 to M9 2ss

802.11ac - VHT80 Beam Forming, Two Antennas, M0 to M9 1ss
802.11ac - VHT80 Beam Forming, Two Antennas, M0 to M9 2ss

802.11ac - VHT80 STBC, Two Antennas, M0 to M9 1ss

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

Frequency	Part Number	Antenna Type	Antenna Gain (dBi)
2.4 / 5 GHz	2x2 Internal	Omni	2 / 4

Section 3: Result Summary

3.1 Results Summary Table

Conducted emissions

Basic Standard	Technical Requirements / Details	Result
FCC 15.407	**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	**Output Power:** **15.407:** (i) For an outdoor access point operating in the band 5.15-5.25 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W provided the maximum antenna gain does not exceed 6 dBi. If transmitting antennas of directional gain greater than 6 dBi are used, the maximum conducted output power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi. The maximum e.i.r.p. at any elevation angle above 30 degrees as measured from the horizon must not exceed 125 mW (21 dBm). (ii) For an indoor access point operating in the band 5.15-5.25 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W provided the maximum antenna gain does not exceed 6 dBi. If transmitting antennas of directional gain greater than 6 dBi are used, the maximum conducted output power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.	Pass
FCC 15.407	**Power Spectral Density:** **15.407** The maximum power spectral density shall not exceed 17 dBm in any 1 megahertz band. 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.	Pass
FCC 15.407	**Conducted Spurious Emissions / Band-Edge:** For transmitters operating in the 5.15-5.25 GHz band: all emissions outside of the 5.15-5.25 GHz band shall not exceed an EIRP of -27dBm/MHz.	Pass
FCC 15.407 FCC 15.209 FCC 152.05	**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	**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
FCC 15.207	**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

***** 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-AP1815I-A-K9	Cisco Systems	P2	8.3.15.124	AP1G5	FOC20041PJB
S02*	Catalyst 3750E-24PD-E	Cisco Systems	A0	12.2(50)SE2	C3750E-UNIVERSALK9-M	FDO15422DE4

(*) is support equipment Power supply for EUT

4.2 System Details

System #	Description	Samples
1	AIR-AP1815I-A-K9	S01
2	POE	S02

4.3 Mode of Operation Details

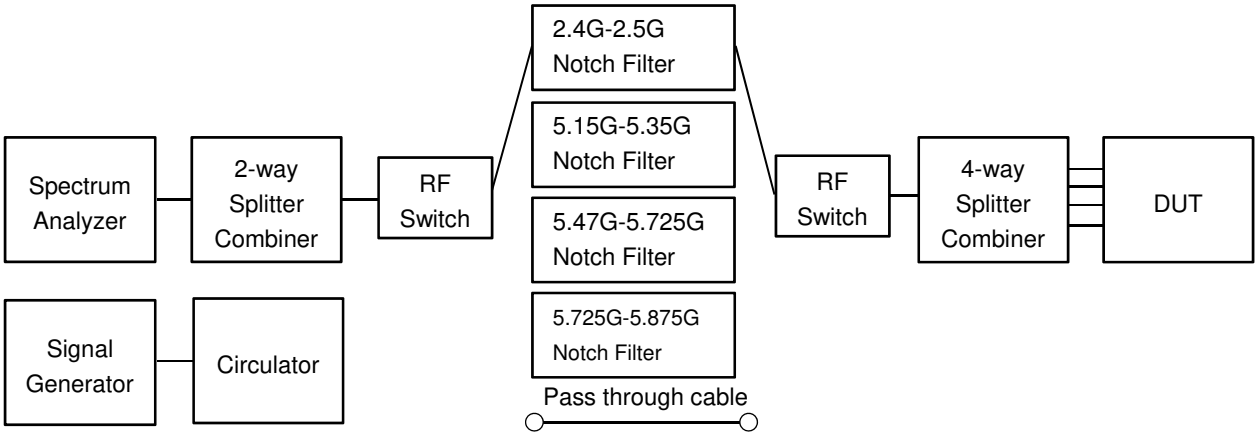
Mode#	Description	Comments
1	Continuous Transmitting	Continuous Transmitting ≥98% duty cycle

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.

	Maximum Channel Power (dBm)		
	Frequency (MHz)		
Operating Mode	5180	5220	5240
Non HT20, 6 to 54 Mbps	18	20	20
Non HT20 Beam Forming, 6 to 54 Mbps	18	20	20
HT/VHT20, M0 to M15	17	20	20
HT/VHT20 Beam Forming, M0 to M15	17	20	20
HT/VHT20 STBC, M0 to M7	17	20	20
	5190	5230	
Non HT40, 6 to 54 Mbps	17	20	
HT/VHT40, M0 to M15	17	20	
HT/VHT40 Beam Forming, M0 to M15	17	20	
HT/VHT40 STBC, M0 to M7	17	20	
	5210		
Non HT80, 6 to 54 Mbps	15		
VHT80, M0 to M9, M0 to M9 1-1ss	14		
VHT80 Beam Forming, M0 to M9, M0 to M9 1-1ss	14		
VHT80 STBC, M0 to M9 1ss	14		

A.1 99% and 26dB Bandwidth

FCC 15.407 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.

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 ≥ 3 x RBW Detector = Peak or where practical sample shall be used Trace = Max. Hold

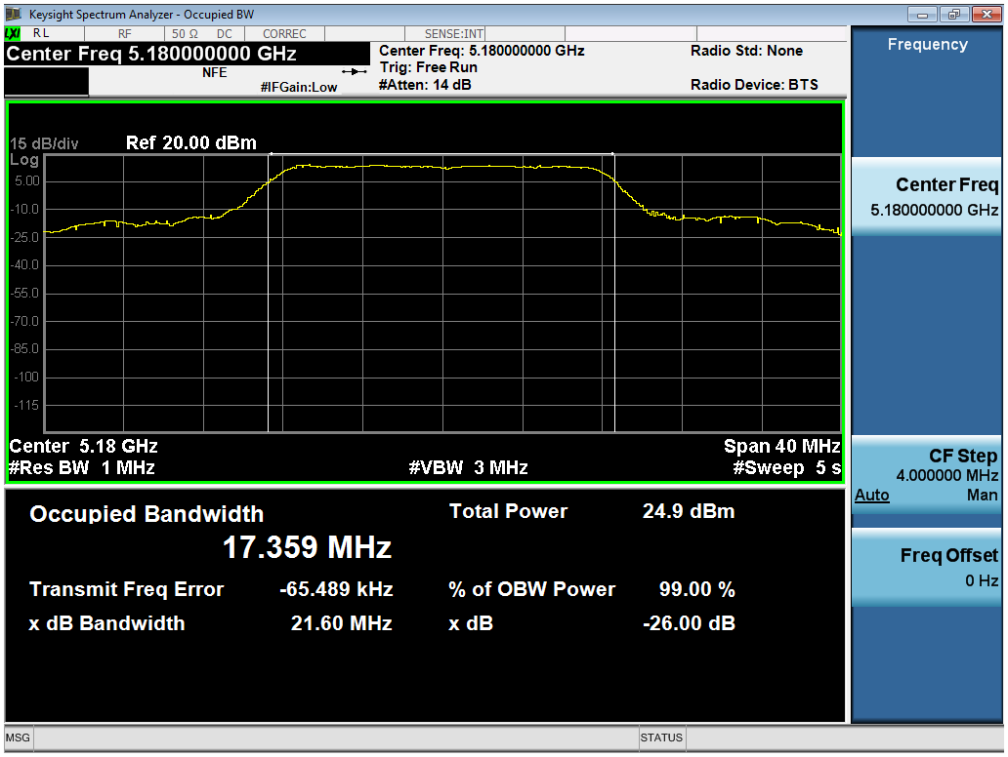
System Number	Description	Samples	System under test	Support equipment
1	EUT	S01	☑	☐
	Support	S02	☐	☑

Tested By :	**Date of testing:**
Jose Aguirre	06-Jun-16 - 26-Jun-16
Test Result : PASS	

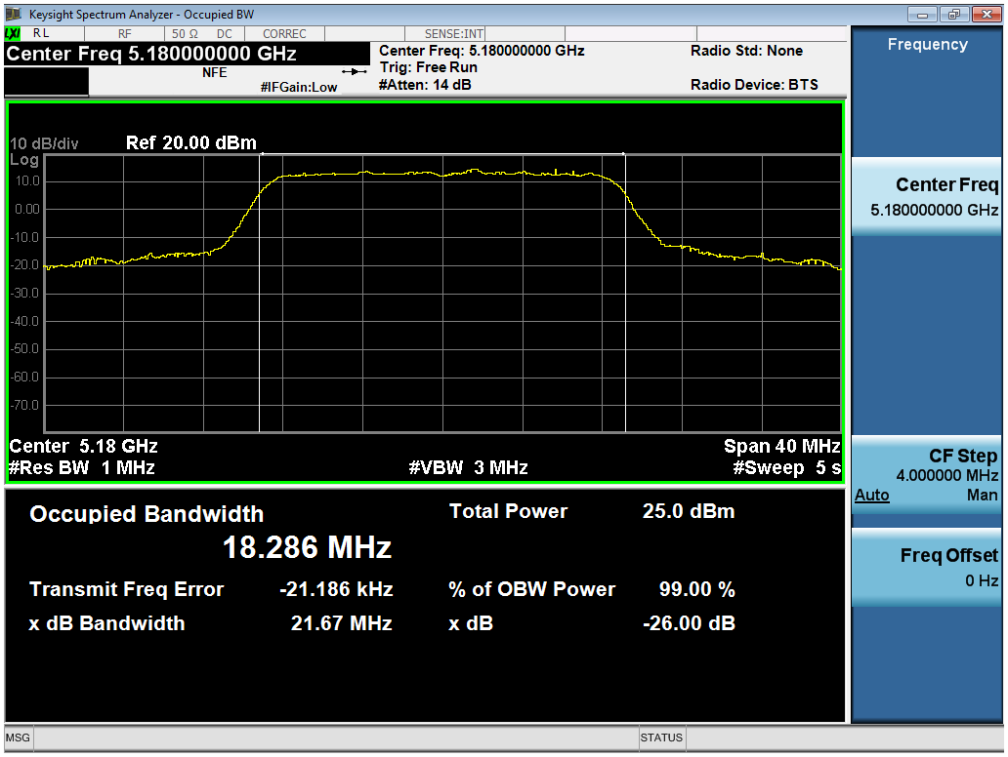
See Appendix C for list of test equipment

Frequency (MHz)	Mode	Data Rate (Mbps)	26dB BW (MHz)	99% BW (MHz)
5180	Non HT20, 6 to 54 Mbps	6	21.6	17.359
	HT/VHT20, M0 to M15	m0	21.7	18.300
5190	Non HT40, 6 to 54 Mbps	6	39.9	35.520
	HT/VHT40, M0 to M15	m0	40.8	36.341
5210	Non HT80, 6 to 54 Mbps	6	79.5	74.492
	VHT80, M0 to M9, M0 to M9 1-1ss	m0x1	80.5	75.861
5220	Non HT20, 6 to 54 Mbps	6	24.9	17.382
	HT/VHT20, M0 to M15	m0	23.1	18.323
5230	Non HT40, 6 to 54 Mbps	6	40.3	35.71
	HT/VHT40, M0 to M15	m0	43.3	36.529
5240	Non HT20, 6 to 54 Mbps	6	28.4	17.481
	HT/VHT20, M0 to M15	m0	23.7	18.401

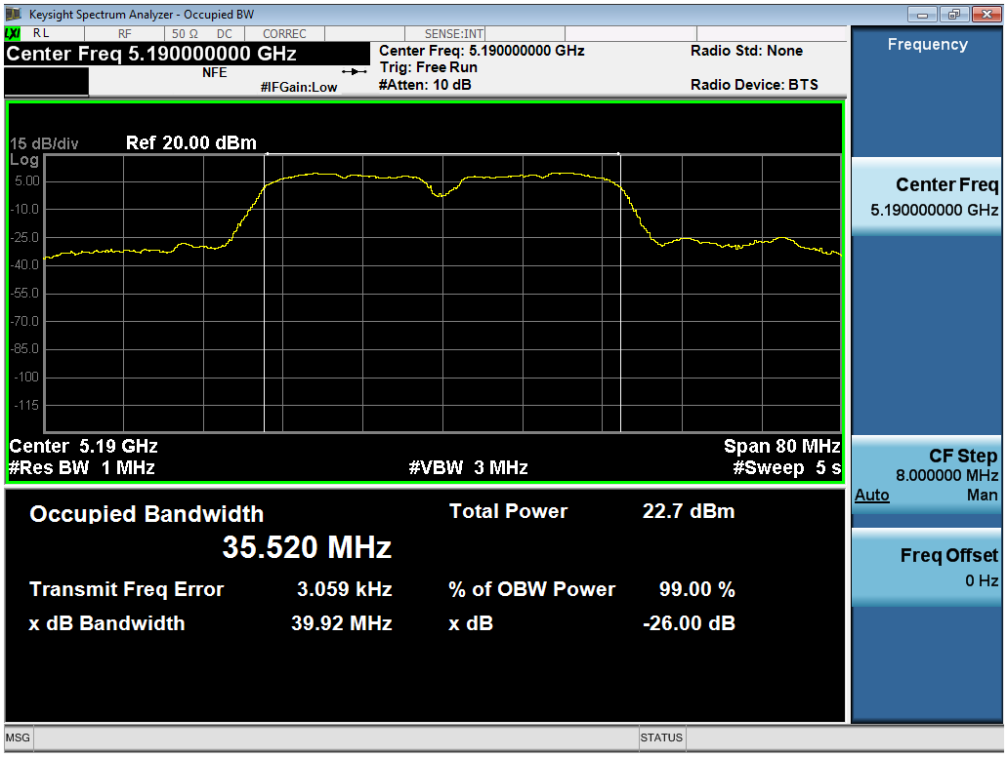
26dB / 99% Bandwidth, 5180 MHz, Non HT20, 6 to 54 Mbps



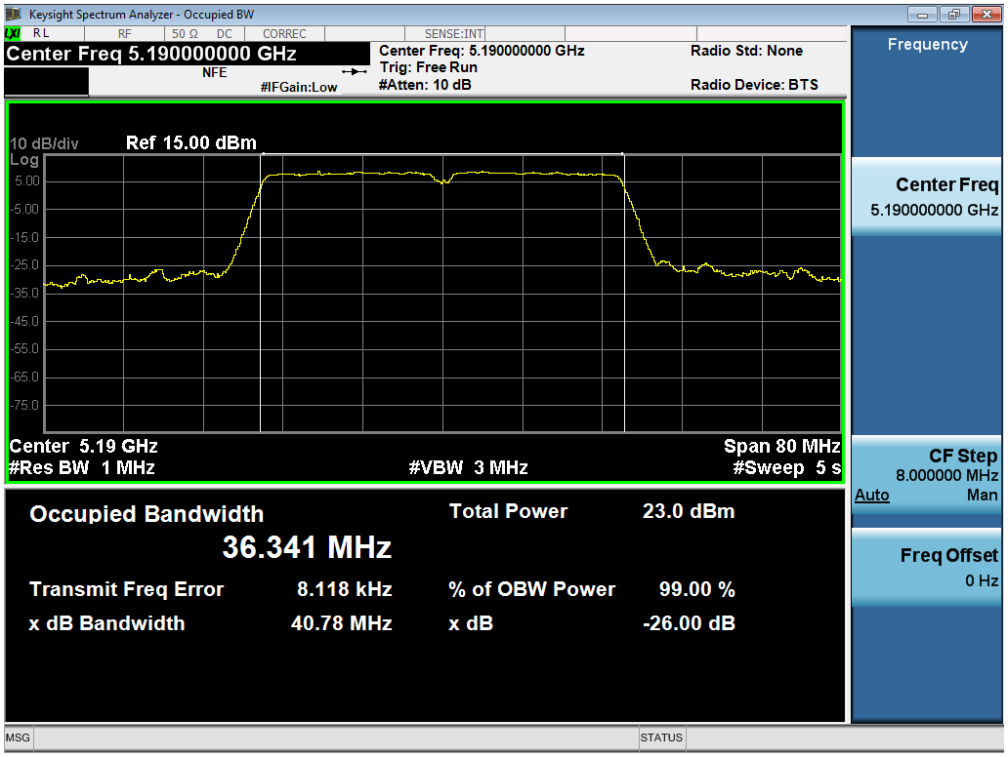
26dB / 99% Bandwidth, 5180 MHz, HT/VHT20, M0 to M15



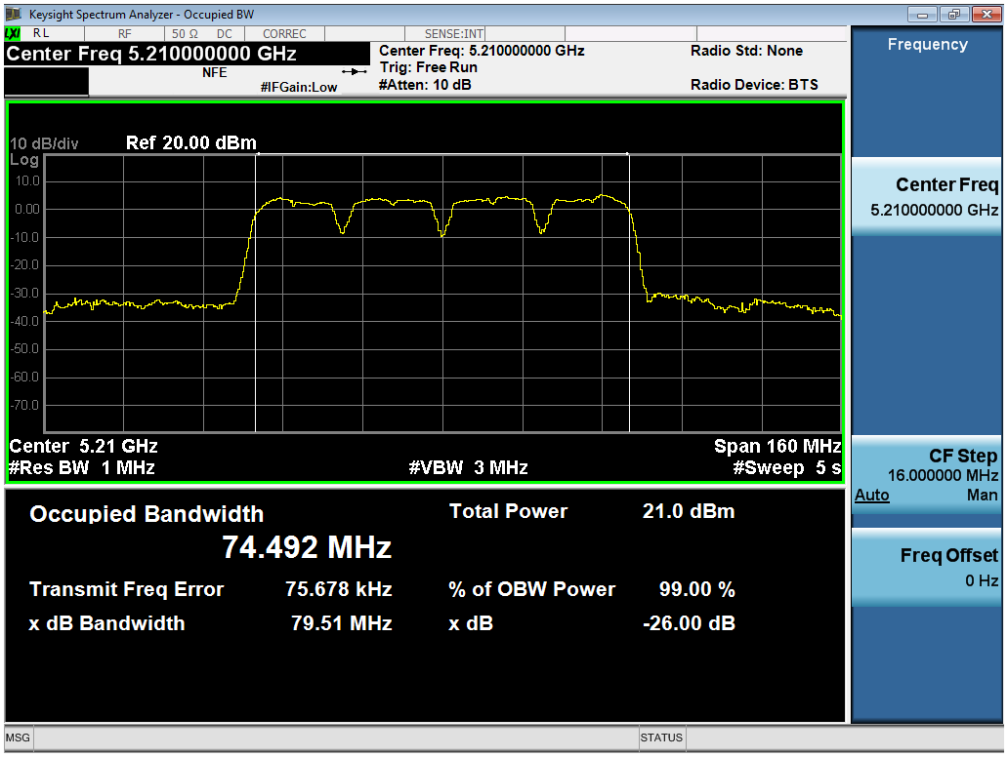
26dB / 99% Bandwidth, 5190 MHz, Non HT40, 6 to 54 Mbps



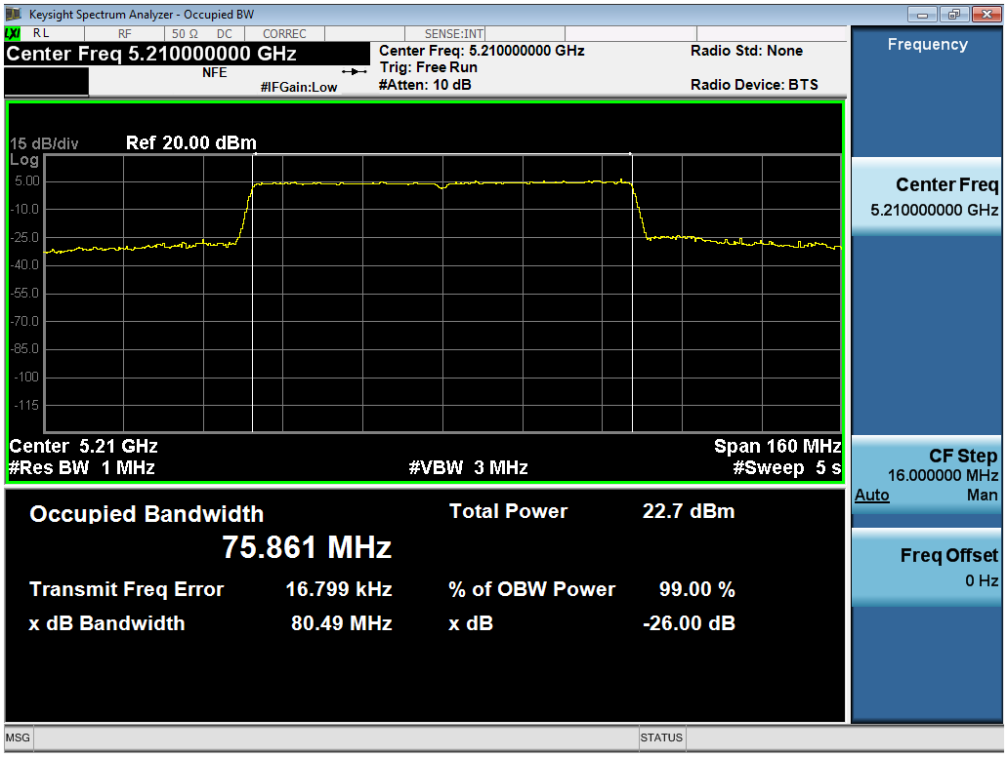
26dB / 99% Bandwidth, 5190 MHz, HT/VHT40, M0 to M15



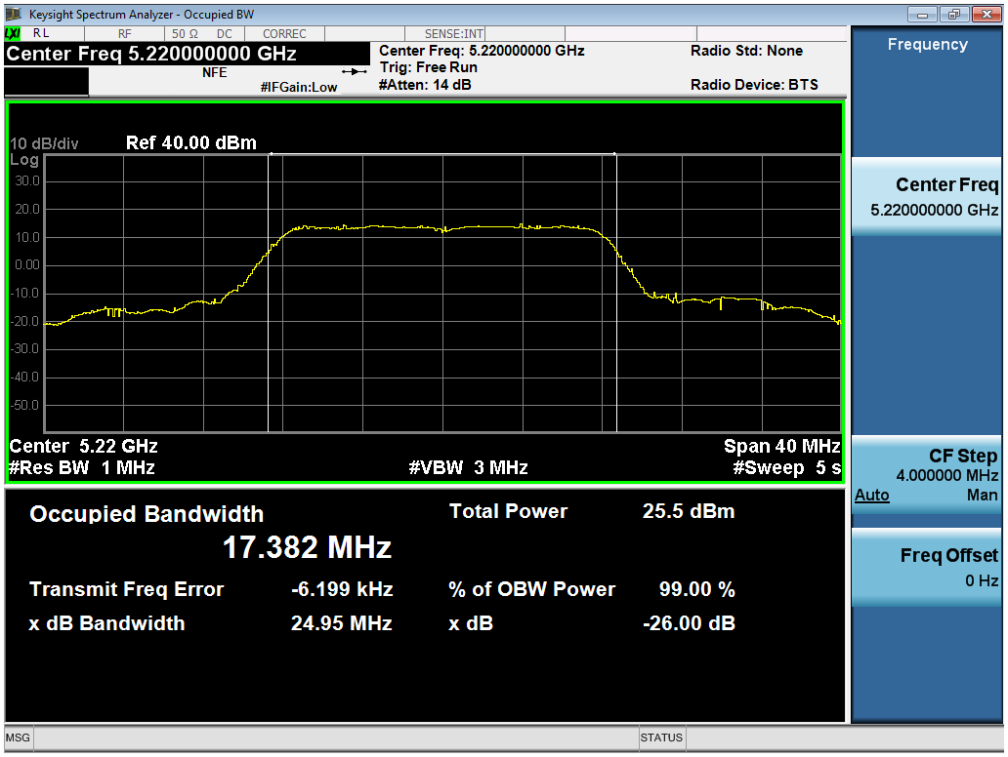
26dB / 99% Bandwidth, 5210 MHz, Non HT80, 6 to 54 Mbps



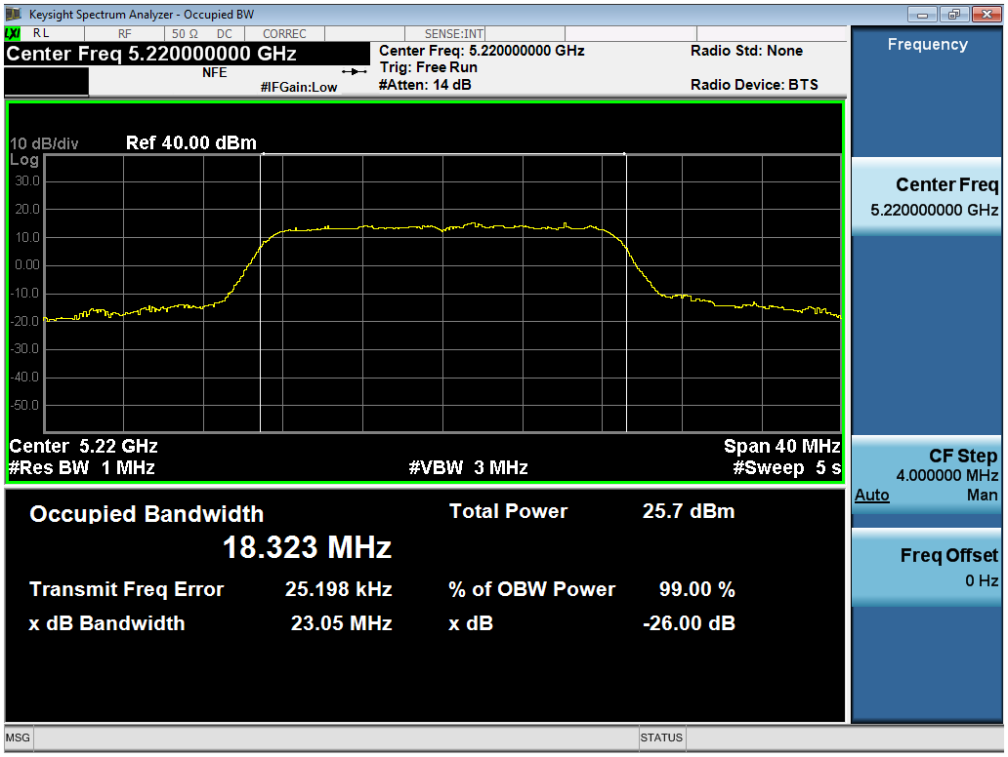
26dB / 99% Bandwidth, 5210 MHz, VHT80, M0 to M9, M0 to M9 1-1ss



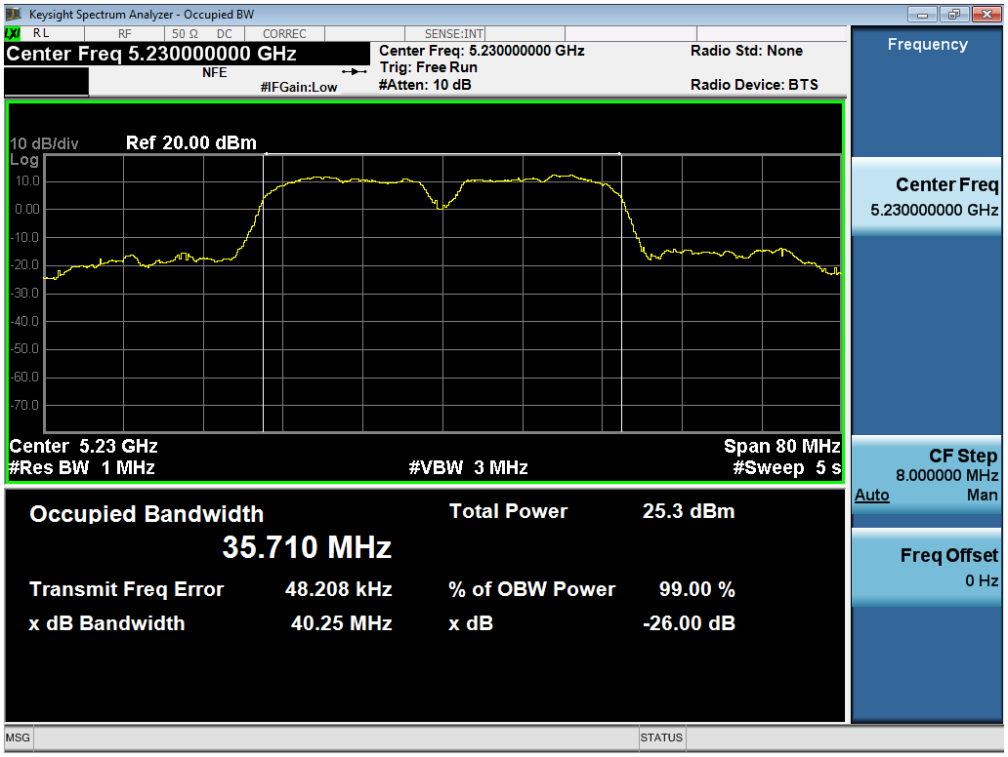
26dB / 99% Bandwidth, 5220 MHz, Non HT20, 6 to 54 Mbps



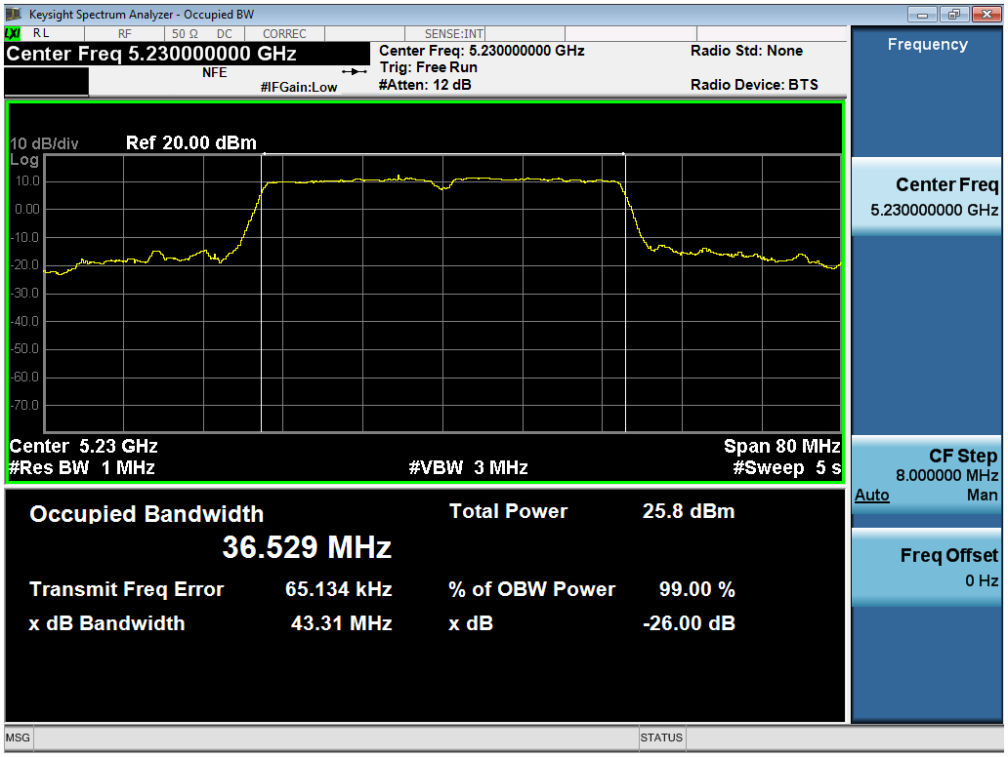
26dB / 99% Bandwidth, 5220 MHz, HT/VHT20, M0 to M15



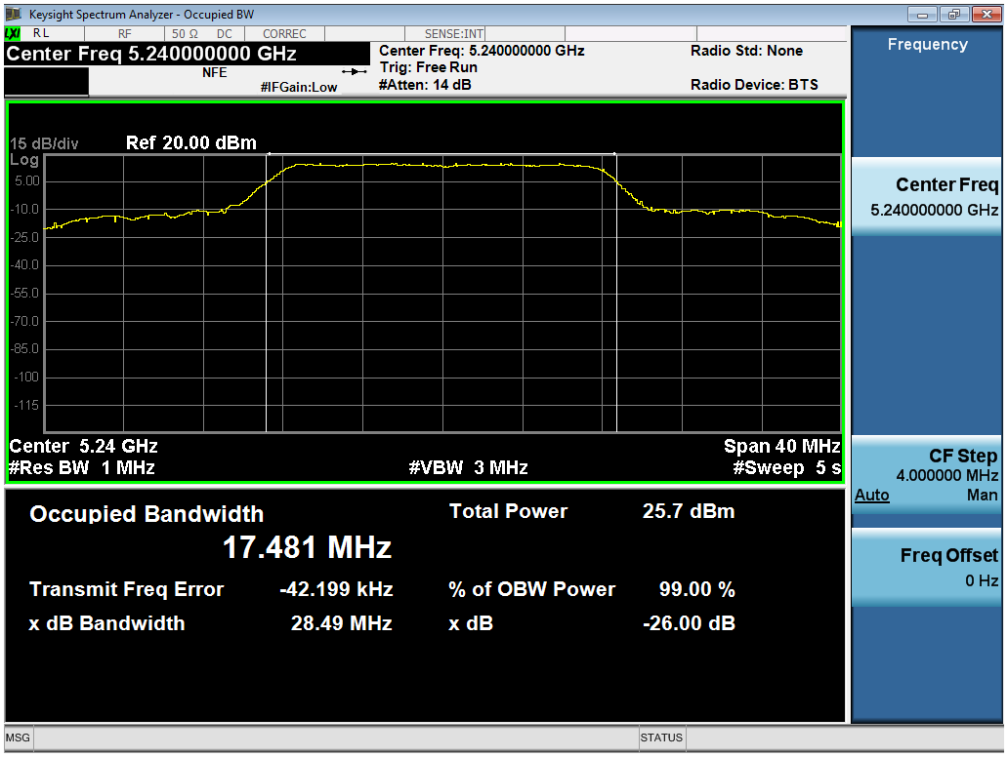
26dB / 99% Bandwidth, 5230 MHz, Non HT40, 6 to 54 Mbps



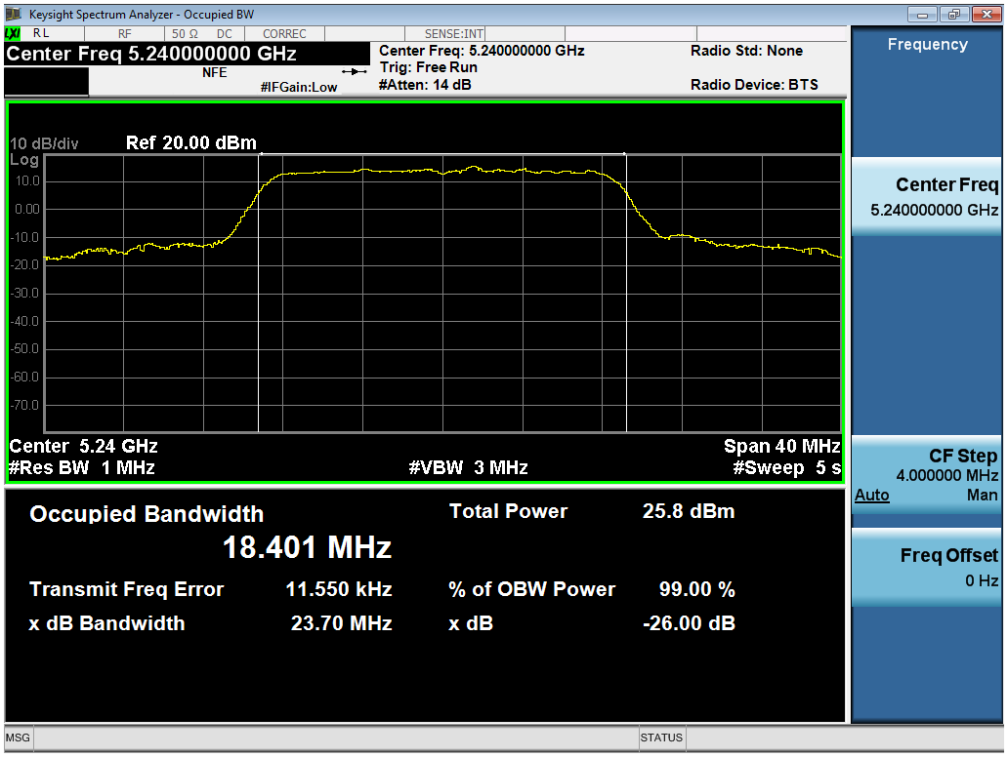
26dB / 99% Bandwidth, 5230 MHz, HT/VHT40, M0 to M15



26dB / 99% Bandwidth, 5240 MHz, Non HT20, 6 to 54 Mbps



26dB / 99% Bandwidth, 5240 MHz, HT/VHT20, M0 to M15



A.2 Maximum Conducted Output Power/ Power Spectral Density

15.407 (i) For an outdoor access point operating in the band 5.15-5.25 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W provided the maximum antenna gain does not exceed 6 dBi. In addition, the maximum power spectral density shall not exceed 17 dBm in any 1 megahertz band. 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. The maximum e.i.r.p. at any elevation angle above 30 degrees as measured from the horizon must not exceed 125 mW (21 dBm).

(ii) For an indoor access point operating in the band 5.15-5.25 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W provided the maximum antenna gain does not exceed 6 dBi. In addition, the maximum power spectral density shall not exceed 17 dBm in any 1 megahertz band. 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.

Test Procedure

Ref. KDB 789033 D02 General UNII Test Procedures New Rules v01r03
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 v01r03
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 :	**Date of testing:**
Jose Aguirre	06-Jun-16 - 26-Jun-16
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)	Total Tx Channel Power (dBm)	Limit (dBm)	Margin (dB)
5180	Non HT20, 6 to 54 Mbps	1	4	16.7		16.7	30.0	13.3
	Non HT20, 6 to 54 Mbps	2	4	13.8	15.2	17.6	30.0	12.4
	Non HT20 Beam Forming, 6 to 54 Mbps	2	7	13.8	15.2	17.6	29.0	11.4
	HT/VHT20, M0 to M7	1	4	16.5		16.5	30.0	13.5
	HT/VHT20, M0 to M7	2	4	13.7	15.1	17.5	30.0	12.5
	HT/VHT20, M8 to M15	2	4	13.7	15.1	17.5	30.0	12.5
	HT/VHT20 Beam Forming, M0 to M7	2	7	13.7	15.1	17.5	29.0	11.5
	HT/VHT20 Beam Forming, M8 to M15	2	4	13.7	15.1	17.5	30.0	12.5
	HT/VHT20 STBC, M0 to M7	2	4	13.7	15.1	17.5	30.0	12.5
5190	Non HT40, 6 to 54 Mbps	1	4	14.5		14.5	30.0	15.5
	Non HT40, 6 to 54 Mbps	2	4	13.5	14.6	17.1	30.0	12.9
	HT/VHT40, M0 to M7	1	4	14.7		14.7	30.0	15.3
	HT/VHT40, M0 to M7	2	4	13.7	14.8	17.3	30.0	12.7
	HT/VHT40, M8 to M15	2	4	13.7	14.8	17.3	30.0	12.7
	HT/VHT40 Beam Forming, M0 to M7	2	7	8.5	9.9	12.3	29.0	16.7
	HT/VHT40 Beam Forming, M8 to M15	2	4	13.7	14.8	17.3	30.0	12.7
	HT/VHT40 STBC, M0 to M7	2	4	13.7	14.8	17.3	30.0	12.7
5210	Non HT80, 6 to 54 Mbps	1	4	12.8		12.8	30.0	17.2
	Non HT80, 6 to 54 Mbps	2	4	11.7	12.1	14.9	30.0	15.1
	VHT80, M0 to M9 1ss	1	4	13.7		13.7	30.0	16.3
	VHT80, M0 to M9 1ss	2	4	10.8	11.1	14.0	30.0	16.0
	VHT80, M0 to M9 2ss	2	4	10.8	11.1	14.0	30.0	16.0
	VHT80 Beam Forming, M0 to M9 1ss	2	7	7.6	8.0	10.8	29.0	18.2
	VHT80 Beam Forming, M0 to M9 2ss	2	4	10.8	11.1	14.0	30.0	16.0
	VHT80 STBC, M0 to M9 1ss	2	4	10.8	11.1	14.0	30.0	16.0
5220	Non HT20, 6 to 54 Mbps	1	4	17.2		17.2	30.0	12.8
	Non HT20, 6 to 54 Mbps	2	4	17.2	17.0	20.1	30.0	9.9
	Non HT20 Beam Forming, 6 to 54 Mbps	**2**	**7**	**17.2**	**17.0**	**20.1**	**29.0**	**8.9**
	HT/VHT20, M0 to M7	1	4	17.1		17.1	30.0	12.9
	HT/VHT20, M0 to M7	2	4	17.1	16.9	20.0	30.0	10.0
	HT/VHT20, M8 to M15	2	4	17.1	16.9	20.0	30.0	10.0
	HT/VHT20 Beam Forming, M0 to M7	2	7	17.1	16.9	20.0	29.0	9.0
	HT/VHT20 Beam Forming, M8 to M15	2	4	17.1	16.9	20.0	30.0	10.0

	HT/VHT20 STBC, M0 to M7	2	4	17.1	16.9	20.0	30.0	10.0
5230	Non HT40, 6 to 54 Mbps	1	4	17.0		17.0	30.0	13.0
	Non HT40, 6 to 54 Mbps	2	4	17.0	16.4	19.7	30.0	10.3
	HT/VHT40, M0 to M7	1	4	17.3		17.3	30.0	12.7
	HT/VHT40, M0 to M7	2	4	17.3	16.7	20.0	30.0	10.0
	HT/VHT40, M8 to M15	2	4	17.3	16.7	20.0	30.0	10.0
	HT/VHT40 Beam Forming, M0 to M7	2	7	17.3	16.7	20.0	29.0	9.0
	HT/VHT40 Beam Forming, M8 to M15	2	4	17.3	16.7	20.0	30.0	10.0
	HT/VHT40 STBC, M0 to M7	2	4	17.3	16.7	20.0	30.0	10.0
5240	Non HT20, 6 to 54 Mbps	1	4	17.4		17.4	30.0	12.6
	Non HT20, 6 to 54 Mbps	2	4	17.4	16.5	20.0	30.0	10.0
	Non HT20 Beam Forming, 6 to 54 Mbps	2	7	17.4	16.5	20.0	29.0	9.0
	HT/VHT20, M0 to M7	1	4	17.3		17.3	30.0	12.7
	HT/VHT20, M0 to M7	2	4	17.3	16.4	19.9	30.0	10.1
	HT/VHT20, M8 to M15	2	4	17.3	16.4	19.9	30.0	10.1
	HT/VHT20 Beam Forming, M0 to M7	2	7	17.3	16.4	19.9	29.0	9.1
	HT/VHT20 Beam Forming, M8 to M15	2	4	17.3	16.4	19.9	30.0	10.1
	HT/VHT20 STBC, M0 to M7	2	4	17.3	16.4	19.9	30.0	10.1

Frequency (MHz)	Mode	Tx Paths	Correlated Antenna Gain (dBi)	Tx 1 PSD (dBm/MHz)	Tx 2 PSD (dBm/MHz)	Total PSD (dBm/MHz)	Limit (dBm/MHz)	Margin (dB)
5180	Non HT20, 6 to 54 Mbps	1	4	5.8		5.8	17.0	11.2
	Non HT20, 6 to 54 Mbps	2	7	2.9	4.5	6.8	16.0	9.2
	Non HT20 Beam Forming, 6 to 54 Mbps	2	7	2.9	4.5	6.8	16.0	9.2
	HT/VHT20, M0 to M7	1	4	5.6		5.6	17.0	11.4
	HT/VHT20, M0 to M7	2	7	2.7	4.0	6.4	16.0	9.6
	HT/VHT20, M8 to M15	2	4	2.7	4.0	6.4	17.0	10.6
	HT/VHT20 Beam Forming, M0 to M7	2	7	2.7	4.0	6.4	16.0	9.6
	HT/VHT20 Beam Forming, M8 to M15	2	4	2.7	4.0	6.4	17.0	10.6
	HT/VHT20 STBC, M0 to M7	2	4	2.7	4.0	6.4	17.0	10.6
5190	Non HT40, 6 to 54 Mbps	1	4	2.7		2.7	17.0	14.3
	Non HT40, 6 to 54 Mbps	2	7	0.9	2.1	4.6	16.0	11.4
	HT/VHT40, M0 to M7	1	4	0.4		0.4	17.0	16.6
	HT/VHT40, M0 to M7	2	7	-0.2	1.0	3.5	16.0	12.5
	HT/VHT40, M8 to M15	2	4	-0.2	1.0	3.5	17.0	13.5
	HT/VHT40 Beam Forming, M0 to M7	2	7	-5.6	-4.1	-1.8	16.0	17.8
	HT/VHT40 Beam Forming, M8 to M15	2	4	-0.2	1.0	3.5	17.0	13.5
	HT/VHT40 STBC, M0 to M7	2	4	-0.2	1.0	3.5	17.0	13.5
5210	Non HT80, 6 to 54 Mbps	1	4	-2.3		-2.3	17.0	19.3
	Non HT80, 6 to 54 Mbps	2	7	-4.0	-3.3	-0.6	16.0	16.6
	VHT80, M0 to M9 1ss	1	4	-3.4		-3.4	17.0	20.4
	VHT80, M0 to M9 1ss	2	7	-6.0	-5.7	-2.8	16.0	18.8
	VHT80, M0 to M9 2ss	2	4	-6.0	-5.7	-2.8	17.0	19.8
	VHT80 Beam Forming, M0 to M9 1ss	2	7	-9.1	-9.1	-6.1	16.0	22.1
	VHT80 Beam Forming, M0 to M9 2ss	2	4	-6.0	-5.7	-2.8	17.0	19.8
	VHT80 STBC, M0 to M9 1ss	2	4	-6.0	-5.7	-2.8	17.0	19.8
5220	Non HT20, 6 to 54 Mbps	1	4	6.3		6.3	17.0	10.7
	Non HT20, 6 to 54 Mbps	**2**	**7**	**6.3**	**6.5**	**9.4**	**16.0**	**6.6**
	Non HT20 Beam Forming, 6 to 54 Mbps	2	7	6.3	6.5	9.4	16.0	6.6
	HT/VHT20, M0 to M7	1	4	6.1		6.1	17.0	10.9
	HT/VHT20, M0 to M7	2	7	6.1	6.0	9.1	16.0	6.9
	HT/VHT20, M8 to M15	2	4	6.1	6.0	9.1	17.0	7.9
	HT/VHT20 Beam Forming, M0 to M7	2	7	6.1	6.0	9.1	16.0	6.9
	HT/VHT20 Beam Forming, M8 to M15	2	4	6.1	6.0	9.1	17.0	7.9

	HT/VHT20 STBC, M0 to M7	2	4	6.1	6.0	9.1	17.0	7.9
5230	Non HT40, 6 to 54 Mbps	1	4	5.0		5.0	17.0	12.0
	Non HT40, 6 to 54 Mbps	2	7	5.0	4.0	7.5	16.0	8.5
	HT/VHT40, M0 to M7	1	4	3.5		3.5	17.0	13.5
	HT/VHT40, M0 to M7	2	7	3.5	3.0	6.3	16.0	9.7
	HT/VHT40, M8 to M15	2	4	3.5	3.0	6.3	17.0	10.7
	HT/VHT40 Beam Forming, M0 to M7	2	7	3.5	3.0	6.3	16.0	9.7
	HT/VHT40 Beam Forming, M8 to M15	2	4	3.5	3.0	6.3	17.0	10.7
	HT/VHT40 STBC, M0 to M7	2	4	3.5	3.0	6.3	17.0	10.7
5240	Non HT20, 6 to 54 Mbps	1	4	6.6		6.6	17.0	10.4
	Non HT20, 6 to 54 Mbps	2	7	6.6	5.7	9.2	16.0	6.8
	Non HT20 Beam Forming, 6 to 54 Mbps	2	7	6.6	5.7	9.2	16.0	6.8
	HT/VHT20, M0 to M7	1	4	6.2		6.2	17.0	10.8
	HT/VHT20, M0 to M7	2	7	6.2	5.4	8.8	16.0	7.2
	HT/VHT20, M8 to M15	2	4	6.2	5.4	8.8	17.0	8.2
	HT/VHT20 Beam Forming, M0 to M7	2	7	6.2	5.4	8.8	16.0	7.2
	HT/VHT20 Beam Forming, M8 to M15	2	4	6.2	5.4	8.8	17.0	8.2
	HT/VHT20 STBC, M0 to M7	2	4	6.2	5.4	8.8	17.0	8.2

Peak Output Power, 5220 MHz, Non HT20 Beam Forming, 6 to 54 Mbps

Antenna A

Antenna B

Power Spectral Density, 5220 MHz, Non HT20, 6 to 54 Mbps

Antenna A

Antenna B

A.3 Conducted Spurious Emissions

15.407 (b) *Undesirable emission limits.* Except as shown in paragraph (b) (7) of this section, the maximum emissions outside of the frequency bands of operation shall be attenuated in accordance with the following limits:
(1) For transmitters operating in the 5.15-5.25 GHz band: All emissions outside of the 5.15-5.35 GHz band shall not exceed an e.i.r.p. of −27 dBm/MHz.

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)).

Test Procedure

Ref. KDB 789033 D02 General UNII Test Procedures New Rules v01r03
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 v01r03 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 v01r03
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 for Peak, 1kHz for Average Sweep = Auto couple Detector = Peak Trace = Max Hold.

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

Tested By :	**Date of testing:**
Jose Aguirre	06-Jun-16 - 26-Jun-16
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)	Total Conducted Spur (dBm)	Limit (dBm)	Margin (dB)
5180	Non HT20, 6 to 54 Mbps	1	4	-58.1		-54.1	-41.25	12.9
	Non HT20, 6 to 54 Mbps	2	4	-58.8	-73.7	-54.7	-41.25	13.4
	Non HT20 Beam Forming, 6 to 54 Mbps	2	7	-58.8	-73.7	-51.7	-41.25	10.4
	HT/VHT20, M0 to M7	1	4	-72.2		-68.2	-41.25	27.0
	HT/VHT20, M0 to M7	2	4	-58.8	-73.8	-54.7	-41.25	13.4
	HT/VHT20, M8 to M15	2	4	-58.8	-73.8	-54.7	-41.25	13.4
	HT/VHT20 Beam Forming, M0 to M7	2	7	-58.8	-73.8	-51.7	-41.25	10.4
	HT/VHT20 Beam Forming, M8 to M15	2	4	-58.8	-73.8	-54.7	-41.25	13.4
	HT/VHT20 STBC, M0 to M7	2	4	-58.8	-73.8	-54.7	-41.25	13.4
5190	Non HT40, 6 to 54 Mbps	1	4	-72.3		-68.3	-41.25	27.1
	Non HT40, 6 to 54 Mbps	2	4	-58.5	-73.8	-54.4	-41.25	13.1
	HT/VHT40, M0 to M7	1	4	-57.9		-53.9	-41.25	12.7
	HT/VHT40, M0 to M7	2	4	-58.7	-72.2	-54.5	-41.25	13.3
	HT/VHT40, M8 to M15	2	4	-58.7	-72.2	-54.5	-41.25	13.3
	HT/VHT40 Beam Forming, M0 to M7	2	7	-72.7	-73.8	-63.2	-41.25	22.0
	HT/VHT40 Beam Forming, M8 to M15	2	4	-58.7	-72.2	-54.5	-41.25	13.3
	HT/VHT40 STBC, M0 to M7	2	4	-58.7	-72.2	-54.5	-41.25	13.3
5210	Non HT80, 6 to 54 Mbps	1	4	-73.8		-69.8	-41.25	28.6
	Non HT80, 6 to 54 Mbps	2	4	-73.5	-73.2	-66.3	-41.25	25.1
	VHT80, M0 to M9 1ss	1	4	-58.3		-54.3	-41.25	13.1
	VHT80, M0 to M9 1ss	2	4	-73.5	-73.8	-66.6	-41.25	25.4
	VHT80, M0 to M9 2ss	2	4	-73.5	-73.8	-66.6	-41.25	25.4
	VHT80 Beam Forming, M0 to M9 1ss	2	7	-73.6	-74.0	-63.8	-41.25	22.5
	VHT80 Beam Forming, M0 to M9 2ss	2	4	-73.5	-73.8	-66.6	-41.25	25.4
	VHT80 STBC, M0 to M9 1ss	2	4	-73.5	-73.8	-66.6	-41.25	25.4
5220	Non HT20, 6 to 54 Mbps	1	4	-52.0		-48.0	-41.25	6.8
	Non HT20, 6 to 54 Mbps	2	4	-52.0	-51.5	-44.7	-41.25	3.5
	Non HT20 Beam Forming, 6 to 54 Mbps	2	7	-52.0	-51.5	-41.7	-41.25	0.5
	HT/VHT20, M0 to M7	1	4	-51.8		-47.8	-41.25	6.6
	HT/VHT20, M0 to M7	2	4	-51.8	-51.4	-44.6	-41.25	3.3
	HT/VHT20, M8 to M15	2	4	-51.8	-51.4	-44.6	-41.25	3.3
	HT/VHT20 Beam Forming, M0 to M7	**2**	**7**	**-51.8**	**-51.4**	**-41.6**	**-41.25**	**0.3**
	HT/VHT20 Beam Forming, M8 to M15	2	4	-51.8	-51.4	-44.6	-41.25	3.3

	HT/VHT20 STBC, M0 to M7	2	4	-51.8	-51.4	-44.6	-41.25	3.3
5230	Non HT40, 6 to 54 Mbps	1	4	-52.6		-48.6	-41.25	7.4
	Non HT40, 6 to 54 Mbps	2	4	-52.6	-51.5	-45.0	-41.25	3.8
	HT/VHT40, M0 to M7	1	4	-53.4		-49.4	-41.25	8.2
	HT/VHT40, M0 to M7	2	4	-53.4	-52.8	-46.1	-41.25	4.8
	HT/VHT40, M8 to M15	2	4	-53.4	-52.8	-46.1	-41.25	4.8
	HT/VHT40 Beam Forming, M0 to M7	2	7	-53.4	-52.8	-43.1	-41.25	1.8
	HT/VHT40 Beam Forming, M8 to M15	2	4	-53.4	-52.8	-46.1	-41.25	4.8
	HT/VHT40 STBC, M0 to M7	2	4	-53.4	-52.8	-46.1	-41.25	4.8
5240	Non HT20, 6 to 54 Mbps	1	4	-53.9		-49.9	-41.25	8.7
	Non HT20, 6 to 54 Mbps	2	4	-53.9	-52.9	-46.4	-41.25	5.1
	Non HT20 Beam Forming, 6 to 54 Mbps	2	7	-53.9	-52.9	-43.4	-41.25	2.1
	HT/VHT20, M0 to M7	1	4	-53.5		-49.5	-41.25	8.3
	HT/VHT20, M0 to M7	2	4	-53.5	-52.8	-46.1	-41.25	4.9
	HT/VHT20, M8 to M15	2	4	-53.5	-52.8	-46.1	-41.25	4.9
	HT/VHT20 Beam Forming, M0 to M7	2	7	-53.5	-52.8	-43.1	-41.25	1.9
	HT/VHT20 Beam Forming, M8 to M15	2	4	-53.5	-52.8	-46.1	-41.25	4.9
	HT/VHT20 STBC, M0 to M7	2	4	-53.5	-52.8	-46.1	-41.25	4.9

Frequency (MHz)	Mode	Tx Paths	Correlated Antenna Gain (dBi)	Tx 1 Spur Power (dBm)	Tx 2 Spur Power (dBm)	Total Conducted Spur (dBm)	Limit (dBm)	Margin (dB)
5180	Non HT20, 6 to 54 Mbps	1	4	-59.6		-55.6	-21.25	34.4
	Non HT20, 6 to 54 Mbps	2	4	-59.2	-57.2	-51.1	-21.25	29.8
	Non HT20 Beam Forming, 6 to 54 Mbps	2	7	-59.2	-57.2	-48.1	-21.25	26.8
	HT/VHT20, M0 to M7	1	4	-58.8		-54.8	-21.25	33.6
	HT/VHT20, M0 to M7	2	4	-58.4	-60.5	-52.3	-21.25	31.1
	HT/VHT20, M8 to M15	2	4	-58.4	-60.5	-52.3	-21.25	31.1
	HT/VHT20 Beam Forming, M0 to M7	2	7	-58.4	-60.5	-49.3	-21.25	28.1
	HT/VHT20 Beam Forming, M8 to M15	2	4	-58.4	-60.5	-52.3	-21.25	31.1
	HT/VHT20 STBC, M0 to M7	2	4	-58.4	-60.5	-52.3	-21.25	31.1
5190	Non HT40, 6 to 54 Mbps	1	4	-59.6		-55.6	-21.25	34.4
	Non HT40, 6 to 54 Mbps	2	4	-59.9	-59.2	-52.5	-21.25	31.3
	HT/VHT40, M0 to M7	1	4	-59.6		-55.6	-21.25	34.4
	HT/VHT40, M0 to M7	2	4	-58.4	-57.1	-50.7	-21.25	29.4
	HT/VHT40, M8 to M15	2	4	-58.4	-57.1	-50.7	-21.25	29.4
	HT/VHT40 Beam Forming, M0 to M7	2	7	-58.1	-59.9	-48.9	-21.25	27.6
	HT/VHT40 Beam Forming, M8 to M15	2	4	-58.4	-57.1	-50.7	-21.25	29.4
	HT/VHT40 STBC, M0 to M7	2	4	-58.4	-57.1	-50.7	-21.25	29.4
5210	Non HT80, 6 to 54 Mbps	1	4	-52.9		-48.9	-21.25	27.7
	Non HT80, 6 to 54 Mbps	2	4	-59.4	-58.9	-52.1	-21.25	30.9
	VHT80, M0 to M9 1ss	1	4	-58.5		-54.5	-21.25	33.3
	VHT80, M0 to M9 1ss	2	4	-57.4	-58.2	-50.8	-21.25	29.5
	VHT80, M0 to M9 2ss	2	4	-57.4	-58.2	-50.8	-21.25	29.5
	VHT80 Beam Forming, M0 to M9 1ss	2	7	-59.2	-60.8	-49.9	-21.25	28.7
	VHT80 Beam Forming, M0 to M9 2ss	2	4	-57.4	-58.2	-50.8	-21.25	29.5
	VHT80 STBC, M0 to M9 1ss	2	4	-57.4	-58.2	-50.8	-21.25	29.5
5220	Non HT20, 6 to 54 Mbps	1	4	-51.3		-47.3	-21.25	26.1
	Non HT20, 6 to 54 Mbps	2	4	-51.3	-57.6	-46.4	-21.25	25.1
	Non HT20 Beam Forming, 6 to 54 Mbps	**2**	**7**	**-51.3**	**-57.6**	**-43.4**	**-21.25**	**22.1**
	HT/VHT20, M0 to M7	1	4	-59.2		-55.2	-21.25	34.0
	HT/VHT20, M0 to M7	2	4	-59.2	-59.4	-52.3	-21.25	31.0
	HT/VHT20, M8 to M15	2	4	-59.2	-59.4	-52.3	-21.25	31.0
	HT/VHT20 Beam Forming, M0 to M7	2	7	-59.2	-59.4	-49.3	-21.25	28.0
	HT/VHT20 Beam Forming, M8 to M15	2	4	-59.2	-59.4	-52.3	-21.25	31.0

	HT/VHT20 STBC, M0 to M7	2	4	-59.2	-59.4	-52.3	-21.25	31.0
5230	Non HT40, 6 to 54 Mbps	1	4	-60.3		-56.3	-21.25	35.1
	Non HT40, 6 to 54 Mbps	2	4	-60.3	-60.4	-53.3	-21.25	32.1
	HT/VHT40, M0 to M7	1	4	-60.0		-56.0	-21.25	34.8
	HT/VHT40, M0 to M7	2	4	-60.0	-61.0	-53.5	-21.25	32.2
	HT/VHT40, M8 to M15	2	4	-60.0	-61.0	-53.5	-21.25	32.2
	HT/VHT40 Beam Forming, M0 to M7	2	7	-60.0	-61.0	-50.5	-21.25	29.2
	HT/VHT40 Beam Forming, M8 to M15	2	4	-60.0	-61.0	-53.5	-21.25	32.2
	HT/VHT40 STBC, M0 to M7	2	4	-60.0	-61.0	-53.5	-21.25	32.2
5240	Non HT20, 6 to 54 Mbps	1	4	-59.6		-55.6	-21.25	34.4
	Non HT20, 6 to 54 Mbps	2	4	-59.6	-58.7	-52.1	-21.25	30.9
	Non HT20 Beam Forming, 6 to 54 Mbps	2	7	-59.6	-58.7	-49.1	-21.25	27.9
	HT/VHT20, M0 to M7	1	4	-60.7		-56.7	-21.25	35.5
	HT/VHT20, M0 to M7	2	4	-60.7	-60.5	-53.6	-21.25	32.3
	HT/VHT20, M8 to M15	2	4	-60.7	-60.5	-53.6	-21.25	32.3
	HT/VHT20 Beam Forming, M0 to M7	2	7	-60.7	-60.5	-50.6	-21.25	29.3
	HT/VHT20 Beam Forming, M8 to M15	2	4	-60.7	-60.5	-53.6	-21.25	32.3
	HT/VHT20 STBC, M0 to M7	2	4	-60.7	-60.5	-53.6	-21.25	32.3

Conducted Spurs Average Upper, All Antennas

Conducted Spurs Peak Upper, All Antennas

Conducted Spurs Average, 5220 MHz, HT/VHT20 Beam Forming, M0 to M7

Antenna A

Antenna B

Conducted Spurs Peak, 5220 MHz, Non HT20 Beam Forming, 6 to 54 Mbps

Antenna A

Antenna B

A.4 Conducted Band Edge

15.205 / **15.209** - 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)).
Use formula below to substitute conducted measurements in place of radiated measurements

E[dBµV/m] = EIRP[dBm] - 20 log(d[meters]) + 104.77, where E = field strength and d = 3 meter

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

Test Procedure

Ref. ANSI C63.10: 2013

Conducted Bandedge 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 ANSI C63.10: 2013 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. 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. 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. 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 7. Capture graphs and record pertinent measurement data.

Ref. ANSI C63.10: 2013 section 12.7.6 (peak) & 12.7.7.3 (average, Method VB-A (Alternative))

Conducted Bandedge Test parameters restricted Band
RBW = 1 MHz VBW ≥ 3 x RBW for Peak, 100Hz for Average Sweep = Auto couple Detector = Peak Trace = Max Hold.

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

Tested By :	**Date of testing:**
Jose Aguirre	06-Jun-16 - 26-Jun-16
Test Result : PASS	

See Appendix C for list of test equipment

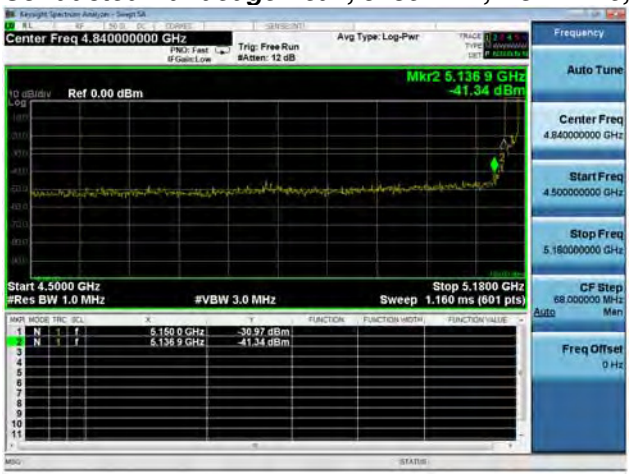
Frequency (MHz)	Mode	Tx Paths	Correlated Antenna Gain (dBi)	Tx 1 Bandedge Level (dBm)	Tx 2 Bandedge Level (dBm)	Total Tx Bandedge Level (dBm)	Limit (dBm)	Margin (dB)
5180	Non HT20, 6 to 54 Mbps	1	4	-47.5		-43.5	-41.25	2.3
	Non HT20, 6 to 54 Mbps	2	4	-54.9	-49.8	-44.6	-41.25	3.4
	Non HT20 Beam Forming, 6 to 54 Mbps	2	7	-54.9	-49.8	-41.6	-41.25	0.4
	HT/VHT20, M0 to M7	1	4	-46.3		-42.3	-41.25	1.1
	HT/VHT20, M0 to M7	2	4	-55.1	-49.8	-44.7	-41.25	3.4
	HT/VHT20, M8 to M15	2	4	-55.1	-49.8	-44.7	-41.25	3.4
	HT/VHT20 Beam Forming, M0 to M7	2	7	-55.1	-49.8	-41.7	-41.25	0.4
	HT/VHT20 Beam Forming, M8 to M15	2	4	-55.1	-49.8	-44.7	-41.25	3.4
	HT/VHT20 STBC, M0 to M7	2	4	-55.1	-49.8	-44.7	-41.25	3.4
5190	Non HT40, 6 to 54 Mbps	1	4	-45.7		-41.7	-41.25	0.5
	Non HT40, 6 to 54 Mbps	2	4	-48.8	-49.7	-42.2	-41.25	1.0
	HT/VHT40, M0 to M7	1	4	-46.2		-42.2	-41.25	1.0
	HT/VHT40, M0 to M7	2	4	-47.7	-49.7	-41.6	-41.25	0.3
	HT/VHT40, M8 to M15	2	4	-47.7	-49.7	-41.6	-41.25	0.3
	HT/VHT40 Beam Forming, M0 to M7	2	7	-54.6	-49.6	-41.4	-41.25	0.2
	HT/VHT40 Beam Forming, M8 to M15	2	4	-47.7	-49.7	-41.6	-41.25	0.3
	HT/VHT40 STBC, M0 to M7	2	4	-47.7	-49.7	-41.6	-41.25	0.3
5210	Non HT80, 6 to 54 Mbps	1	4	-45.4		-41.4	-41.25	0.1
	Non HT80, 6 to 54 Mbps	2	4	-47.1	-50.4	-41.4	-41.25	0.2
	VHT80, M0 to M9 1ss	**1**	**4**	**-45.3**		**-41.3**	**-41.25**	**0.0**
	VHT80, M0 to M9 1ss	2	4	-48.9	-50.5	-42.6	-41.25	1.4
	VHT80, M0 to M9 2ss	2	4	-48.9	-50.5	-42.6	-41.25	1.4
	VHT80 Beam Forming, M0 to M9 1ss	2	7	-53.3	-50.8	-41.9	-41.25	0.6
	VHT80 Beam Forming, M0 to M9 2ss	2	4	-48.9	-50.5	-42.6	-41.25	1.4
	VHT80 STBC, M0 to M9 1ss	2	4	-48.9	-50.5	-42.6	-41.25	1.4

Frequency (MHz)	Mode	Tx Paths	Correlated Antenna Gain (dBi)	Tx 1 Bandedge Level (dBm)	Tx 2 Bandedge Level (dBm)	Total Tx Bandedge Level (dBm)	Limit (dBm)	Margin (dB)
5180	**Non HT20, 6 to 54 Mbps**	**1**	**4**	**-31.0**		**-27.0**	**-21.25**	**5.8**
	Non HT20, 6 to 54 Mbps	2	4	-43.9	-39.8	-34.4	-21.25	13.1
	Non HT20 Beam Forming, 6 to 54 Mbps	2	7	-43.9	-39.8	-31.4	-21.25	10.1
	HT/VHT20, M0 to M7	1	4	-31.4		-27.4	-21.25	6.2
	HT/VHT20, M0 to M7	2	4	-42.6	-43.2	-35.9	-21.25	14.6
	HT/VHT20, M8 to M15	2	4	-42.6	-43.2	-35.9	-21.25	14.6
	HT/VHT20 Beam Forming, M0 to M7	2	7	-42.6	-43.2	-32.9	-21.25	11.6
	HT/VHT20 Beam Forming, M8 to M15	2	4	-42.6	-43.2	-35.9	-21.25	14.6
	HT/VHT20 STBC, M0 to M7	2	4	-42.6	-43.2	-35.9	-21.25	14.6
5190	Non HT40, 6 to 54 Mbps	1	4	-32.7		-28.7	-21.25	7.5
	Non HT40, 6 to 54 Mbps	2	4	-39.8	-40.6	-33.2	-21.25	11.9
	HT/VHT40, M0 to M7	1	4	-31.4		-27.4	-21.25	6.2
	HT/VHT40, M0 to M7	2	4	-36.0	-38.7	-30.1	-21.25	8.9
	HT/VHT40, M8 to M15	2	4	-36.0	-38.7	-30.1	-21.25	8.9
	HT/VHT40 Beam Forming, M0 to M7	2	7	-44.7	-46.4	-35.5	-21.25	14.2
	HT/VHT40 Beam Forming, M8 to M15	2	4	-36.0	-38.7	-30.1	-21.25	8.9
	HT/VHT40 STBC, M0 to M7	2	4	-36.0	-38.7	-30.1	-21.25	8.9
5210	Non HT80, 6 to 54 Mbps	1	4	-40.2		-36.2	-21.25	15.0
	Non HT80, 6 to 54 Mbps	2	4	-35.5	-41.5	-30.5	-21.25	9.3
	VHT80, M0 to M9 1ss	1	4	-35.4		-31.4	-21.25	10.2
	VHT80, M0 to M9 1ss	2	4	-40.7	-44.3	-35.1	-21.25	13.9
	VHT80, M0 to M9 2ss	2	4	-40.7	-44.3	-35.1	-21.25	13.9
	VHT80 Beam Forming, M0 to M9 1ss	2	7	-42.9	-46.4	-34.3	-21.25	13.0
	VHT80 Beam Forming, M0 to M9 2ss	2	4	-40.7	-44.3	-35.1	-21.25	13.9
	VHT80 STBC, M0 to M9 1ss	2	4	-40.7	-44.3	-35.1	-21.25	13.9

Conducted Bandedge Average, 5210 MHz, VHT80, M0 to M9 1ss

Antenna A

Conducted Bandedge Peak, 5180 MHz, Non HT20, 6 to 54 Mbps

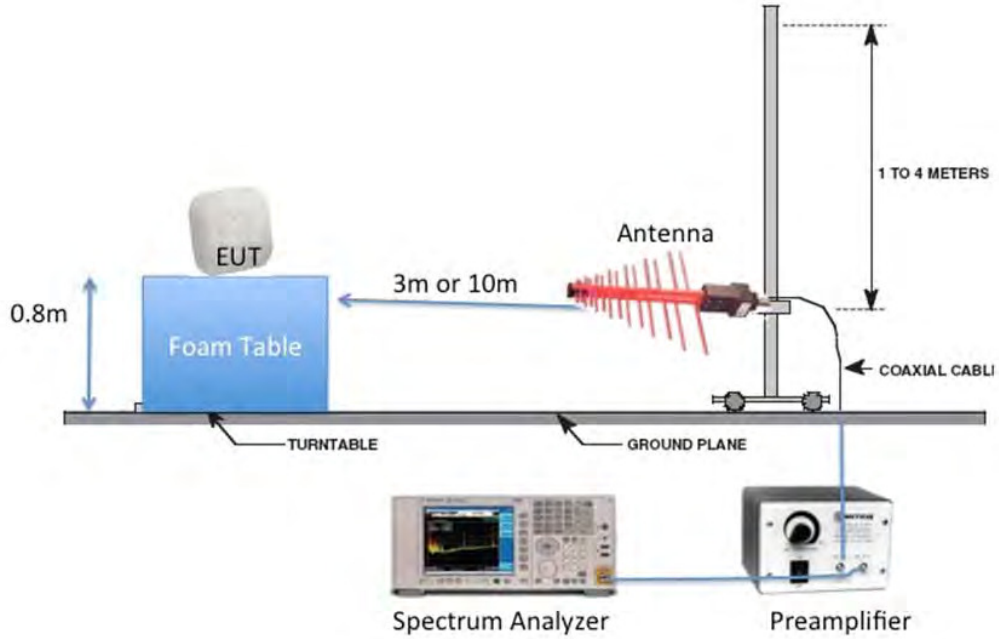


Antenna A

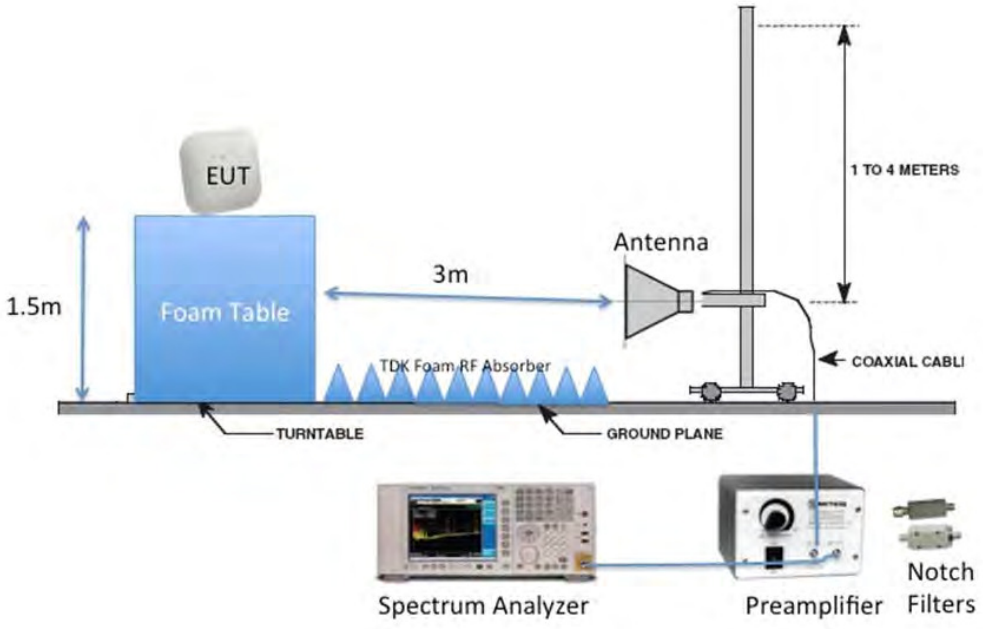
Appendix B: Emission Test Results

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

FCC 15.205 / **15.407** 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)).

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/18GHz-26G/26GHz-40GHz
Reference Level:	80 dBuV
Attenuation:	10 dB
Sweep Time:	Coupled
Resolution Bandwidth:	1MHz
Video Bandwidth:	3 MHz for peak, 1 KHz for average
Detector:	Peak

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
2	EUT	S03	☑	☐
	Support	S04	☐	☑

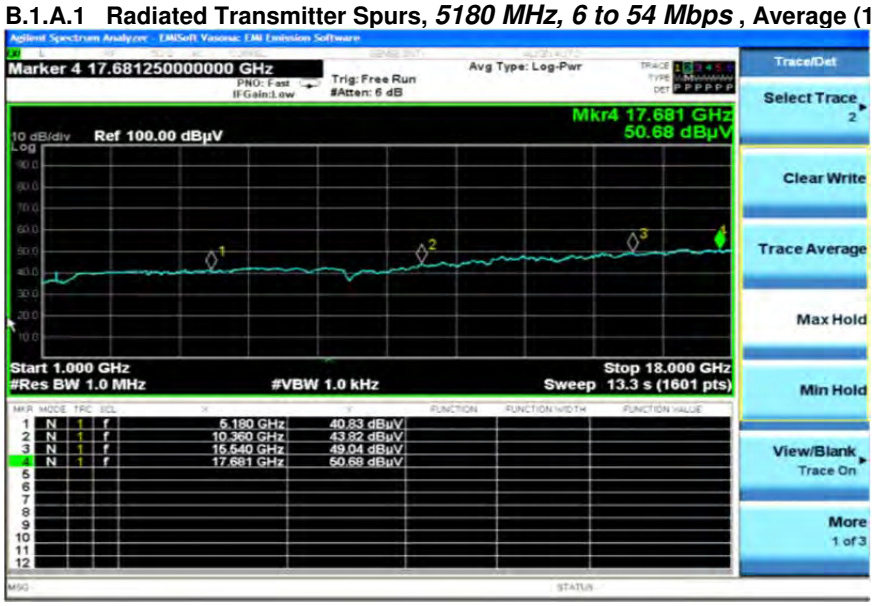
Tested By :	Date of testing:
Jose Aguirre	06-Jun-16 - 06-Jun-16
Test Result : PASS	

See Appendix C for list of test equipment

B.1.A Transmitter Radiated Spurious Emissions-Average

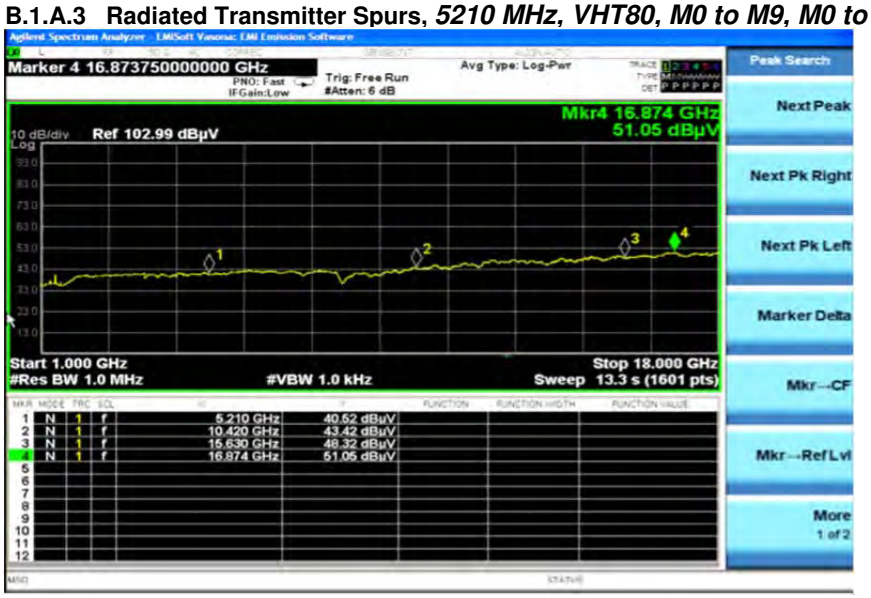
Frequency (MHz)	Mode	Data Rate (Mbps)	Spurious Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dBuV/m)
5180	6 to 54 Mbps	6	50.7	54	3.3
5190	HT/VHT40, M0 to M23, M0.0 to M9.4	m0	51.1	54	2.9
5210	VHT80, M0 to M9, M0 to M9 1-1ss	m0	51.1	54	2.9
5200	6 to 54 Mbps	6	50.9	54	3.1
5240	6 to 54 Mbps	6	50.5	54	3.5
5230	HT/VHT40, M0 to M23, M0.0 to M9.4	m0	50.9	54	3.1

B.1.A.1 Radiated Transmitter Spurs, *5180 MHz, 6 to 54 Mbps* , Average (1-18GHz)



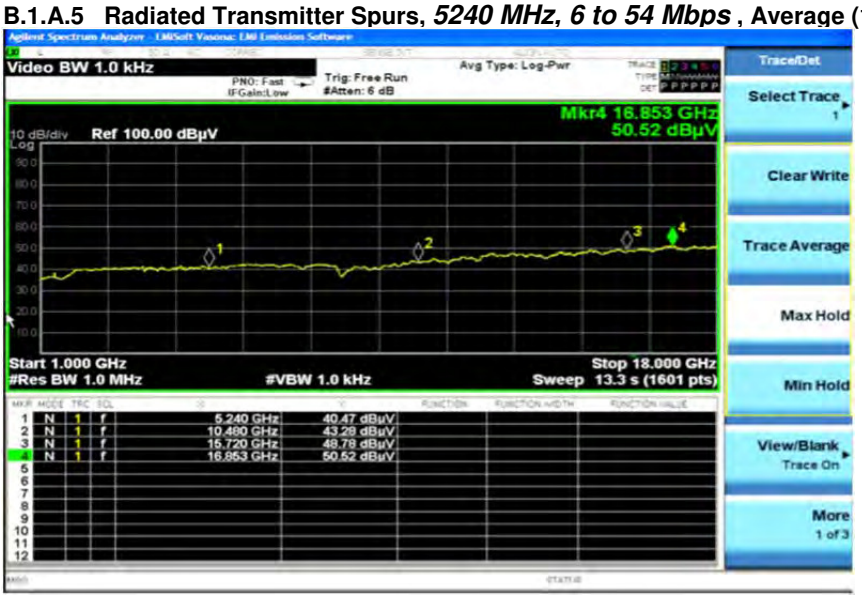
B.1.A.2 Radiated Transmitter Spurs, *5190 MHz, HT/VHT40, M0 to M23, M0.0 to M9.4*, Average (1-18GHz)

B.1.A.3 Radiated Transmitter Spurs, *5210 MHz, VHT80, M0 to M9, M0 to M9 1.1*, Average (1-18GHz)

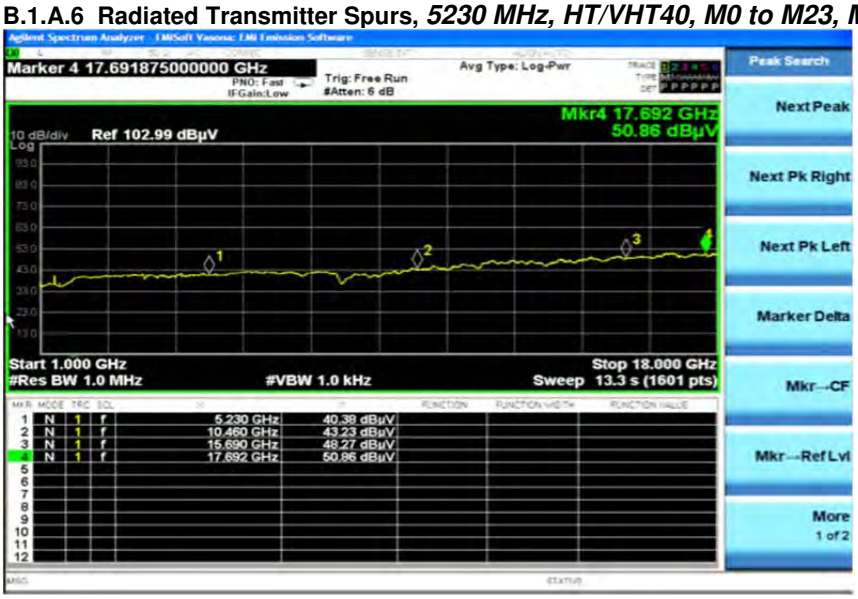


B.1.A.4 Radiated Transmitter Spurs, *5200 MHz, 6 to 54 Mbps* , Average (1-18GHz)

B.1.A.5 Radiated Transmitter Spurs, *5240 MHz, 6 to 54 Mbps* , Average (1-18GHz)



B.1.A.6 Radiated Transmitter Spurs, *5230 MHz, HT/VHT40, M0 to M23, M0.0 to M9.4*, Average (1-18GHz)



B.1.A.7 Radiated Transmitter Spurs, All rate, All modes, Average (18-26.5GHz) Vertical & Horiontal

B.1.A.9 Radiated Transmitter Spurs, All rate, All modes, Average (26.5- 40GHz) Vertical & Horizontal

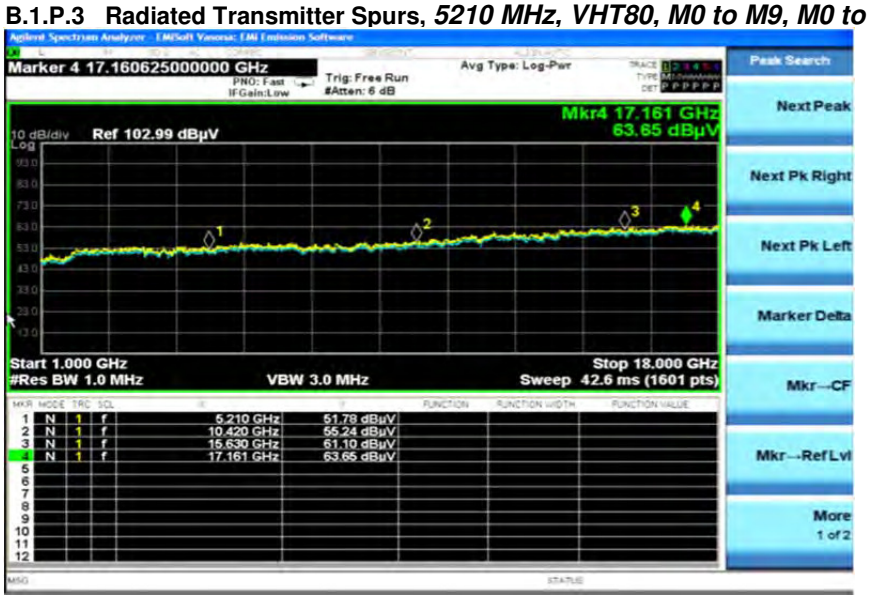
B.1.P Transmitter Radiated Spurious Emissions-Peak

Frequency (MHz)	Mode	Data Rate (Mbps)	Spurious Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dBuV/m)
5180	6 to 54 Mbps	6	63.8	74	10.2
5190	HT/VHT40, M0 to M23, M0.0 to M9.4	m0	63.2	74	10.8
5210	VHT80, M0 to M9, M0 to M9 1-1ss	m0	63.7	74	10.3
5200	6 to 54 Mbps	6	64.4	74	9.6
5240	6 to 54 Mbps	6	63.5	74	10.5
5230	HT/VHT40, M0 to M23, M0.0 to M9.4	m0	63.6	74	10.4

B.1.P.1 Radiated Transmitter Spurs, *5180 MHz, 6 to 54 Mbps* , (1-18GHz)

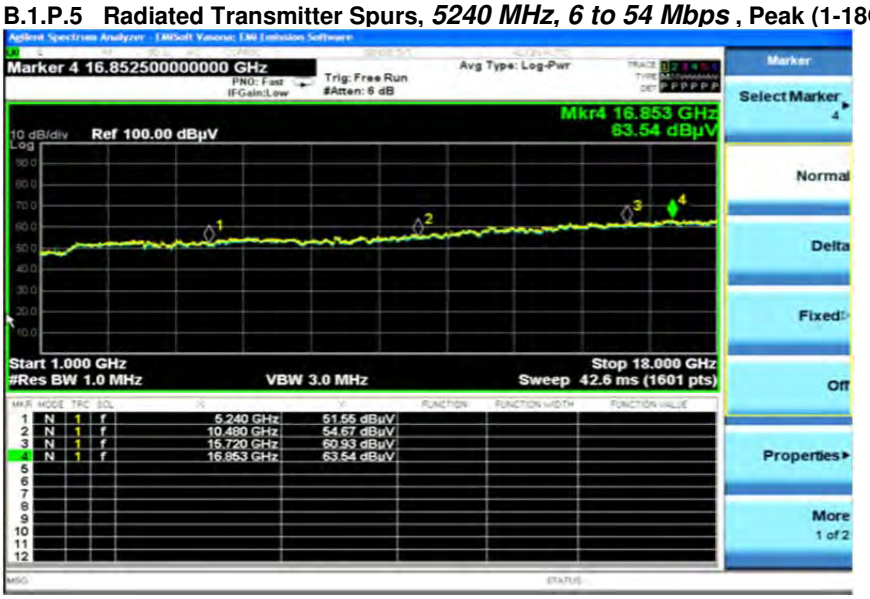
B.1.P.2 Radiated Transmitter Spurs, *5190 MHz, HT/VHT40, M0 to M23, M0.0 to M9.4*, Peak (1-18GHz)

B.1.P.3 Radiated Transmitter Spurs, *5210 MHz, VHT80, M0 to M9, M0 to M9 1.1*, Peak (1-18GHz)

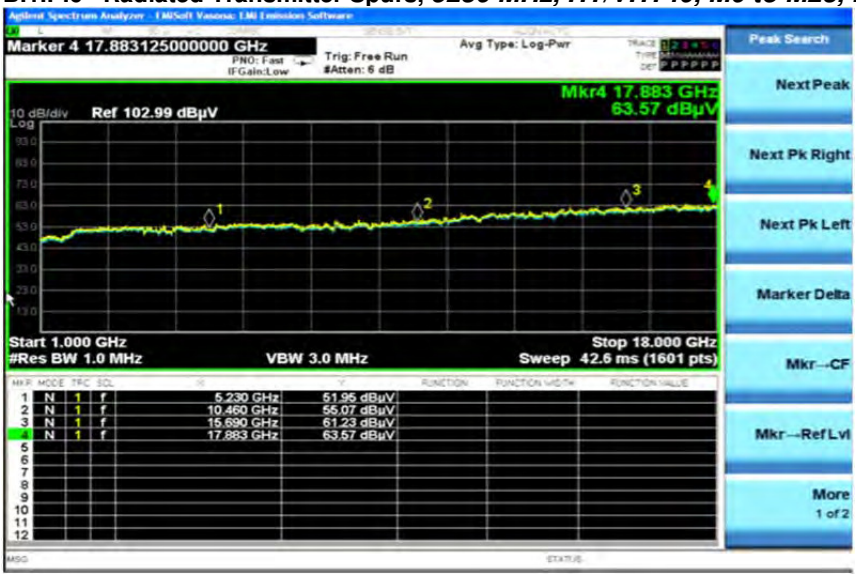


B.1.P.4 Radiated Transmitter Spurs, *5200 MHz, 6 to 54 Mbps* , Peak (1-18GHz)

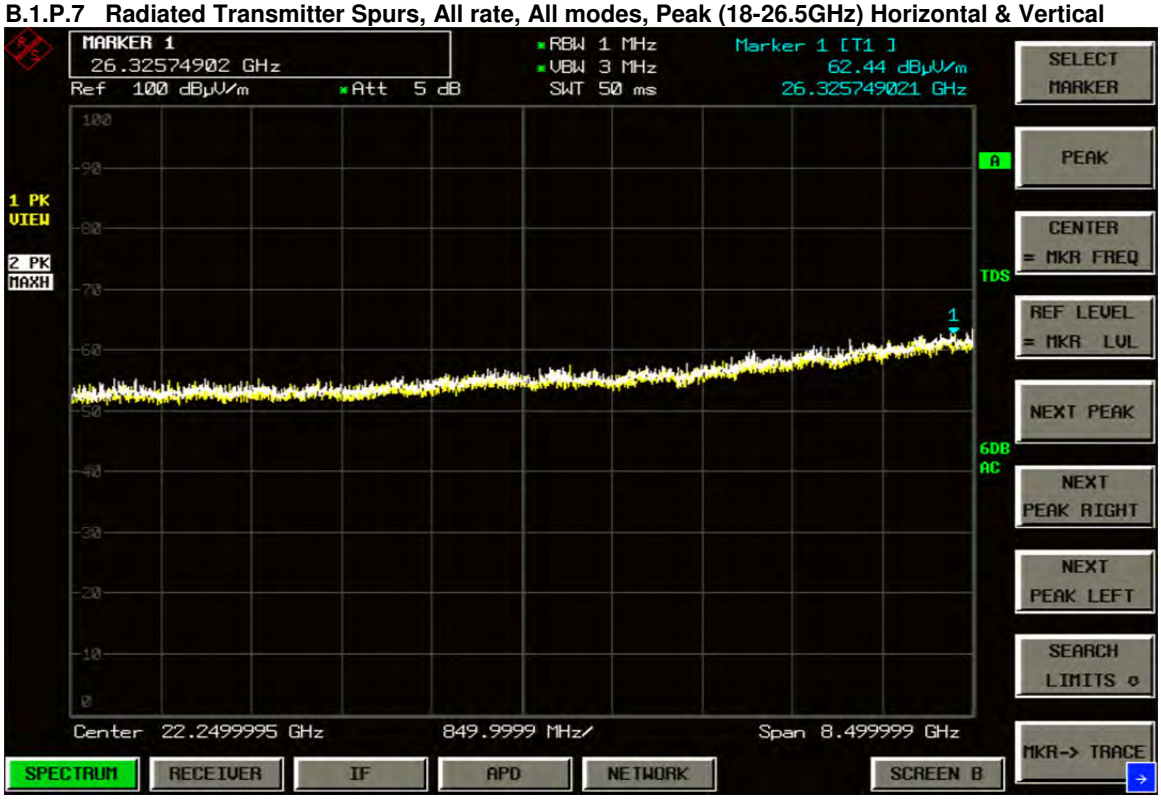
B.1.P.5 Radiated Transmitter Spurs, *5240 MHz, 6 to 54 Mbps* , Peak (1-18GHz)



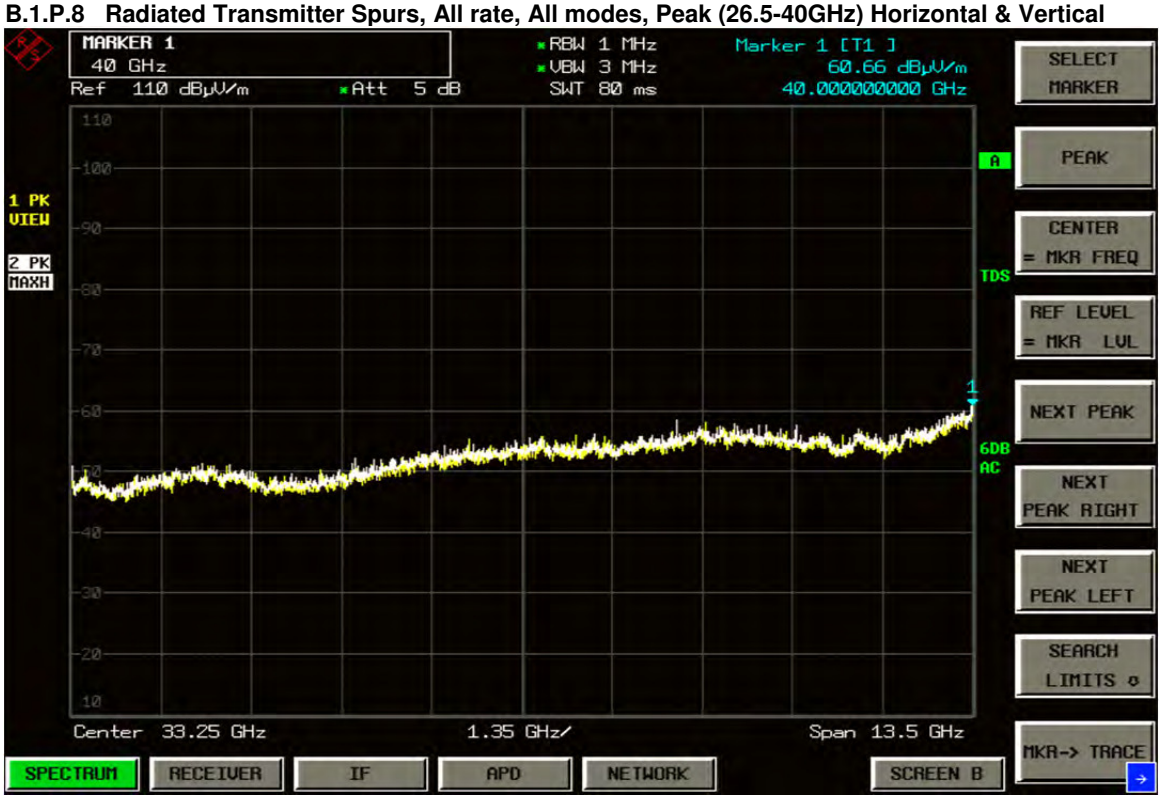
B.1.P.6 Radiated Transmitter Spurs, *5230 MHz, HT/VHT40, M0 to M23, M0.0 to M9.4*, Peak (1-18GHz)



B.1.P.7 Radiated Transmitter Spurs, All rate, All modes, Peak (18-26.5GHz) Horizontal & Vertical



B.1.P.8 Radiated Transmitter Spurs, All rate, All modes, Peak (26.5-40GHz) Horizontal & Vertical



B.2 Radiated Emissions 30MHz to 1GHz

FCC 15.209 / **15.205** / **15.407** 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)).

Ref. ANSI C63.10: 2013 section 6.5

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:	30MHz – 1GHz
Reference Level:	80 dBuV
Attenuation:	10 dB
Sweep Time:	Coupled
Resolution Bandwidth:	100kHz
Video Bandwidth:	300kHz
Detector:	Peak for Pre-scan, Quasi-Peak Compliance shall be determined using CISPR quasi-peak detection; however, peak detection is permitted as an alternative to quasi-peak detection.

Terminate the access Point RF ports with 50 ohm loads.

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

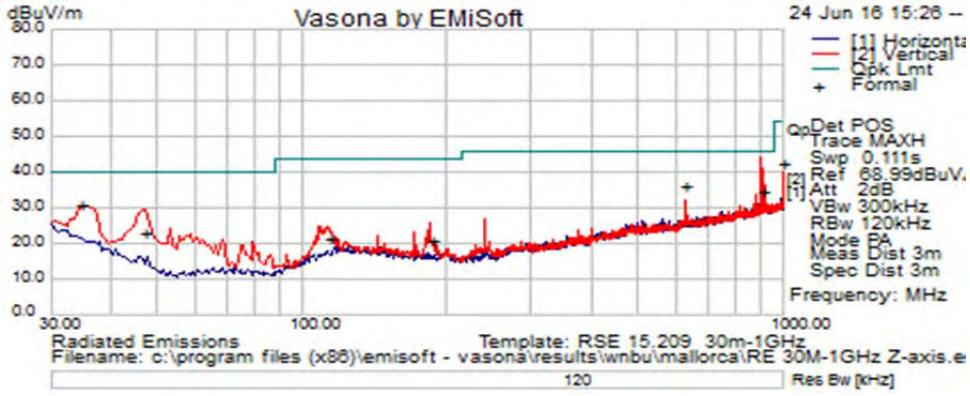
This report represents the worst case data for all supported operating modes and antennas.

System Number	Description	Samples	System under test	Support equipment
2	EUT	S03	☑	☐
	Support	S04	☐	☑

Tested By :	Date of testing:
Jose Aguirre	24-Jun-16
Test Result : PASS	

See Appendix C for list of test equipment

Test Results



Frequency MHz	Raw dBuV	Cable Loss	AF dB	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass /Fail
903.813	9.34	2.5	22.55	34.39	Quasi Max	V	183	210	46	-11.61	Pass
34.556	12.48	0.45	17.9	30.82	Quasi Max	V	103	114	40	-9.18	Pass
46.975	13.4	0.52	9.24	23.17	Quasi Max	V	123	266	40	-16.83	Pass
1000	16.48	2.63	23.4	42.51	Quasi Max	V	118	55	54	-11.49	Pass
625	14.71	2.06	19.5	36.27	Quasi Max	V	104	62	46	-9.73	Pass
184.766	8.66	1.12	11.2	20.98	Quasi Max	V	198	72	43.5	-22.52	Pass
113.056	7.25	0.87	13.09	21.21	Quasi Max	V	157	329	43.5	-22.29	Pass

B.3 AC Conducted Emissions

FCC 15.207 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.

Measurement Procedure
Accordance with ANSI C63.10:2013 section 6.2

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.

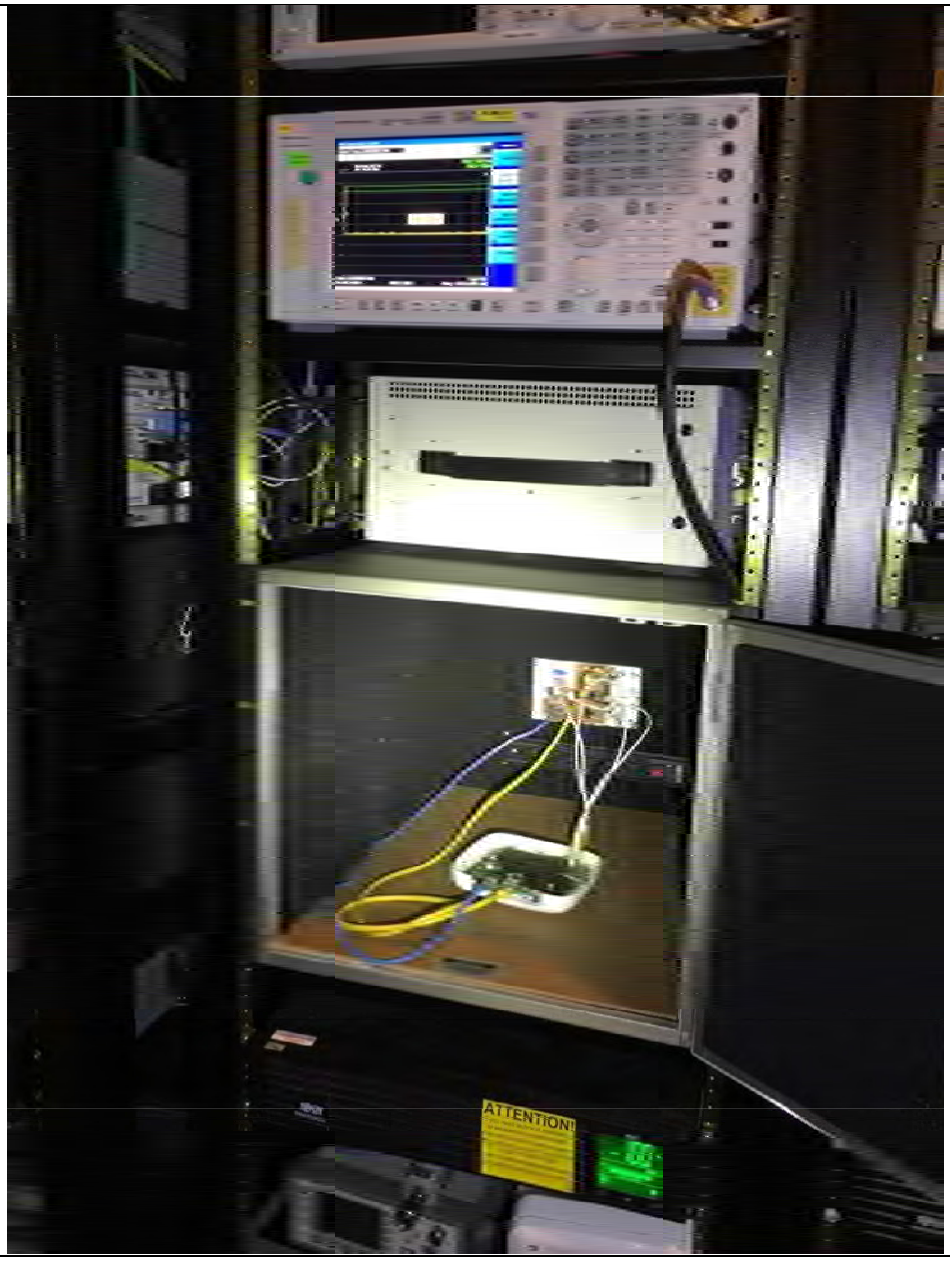
Span:	150 KHz – 30 MHz
Attenuation:	10 dB
Sweep Time:	Coupled
Resolution Bandwidth:	9 KHz
Video Bandwidth:	30 KHz
Detector:	Quasi-Peak / Average

System Number	Description	Samples	System under test	Support equipment
2	EUT	S03	☑	☐
	Support	S04	☐	☑

Tested By : Jose Aguirre	**Date of testing:**
Test Result : not tested , unit is POE powered	

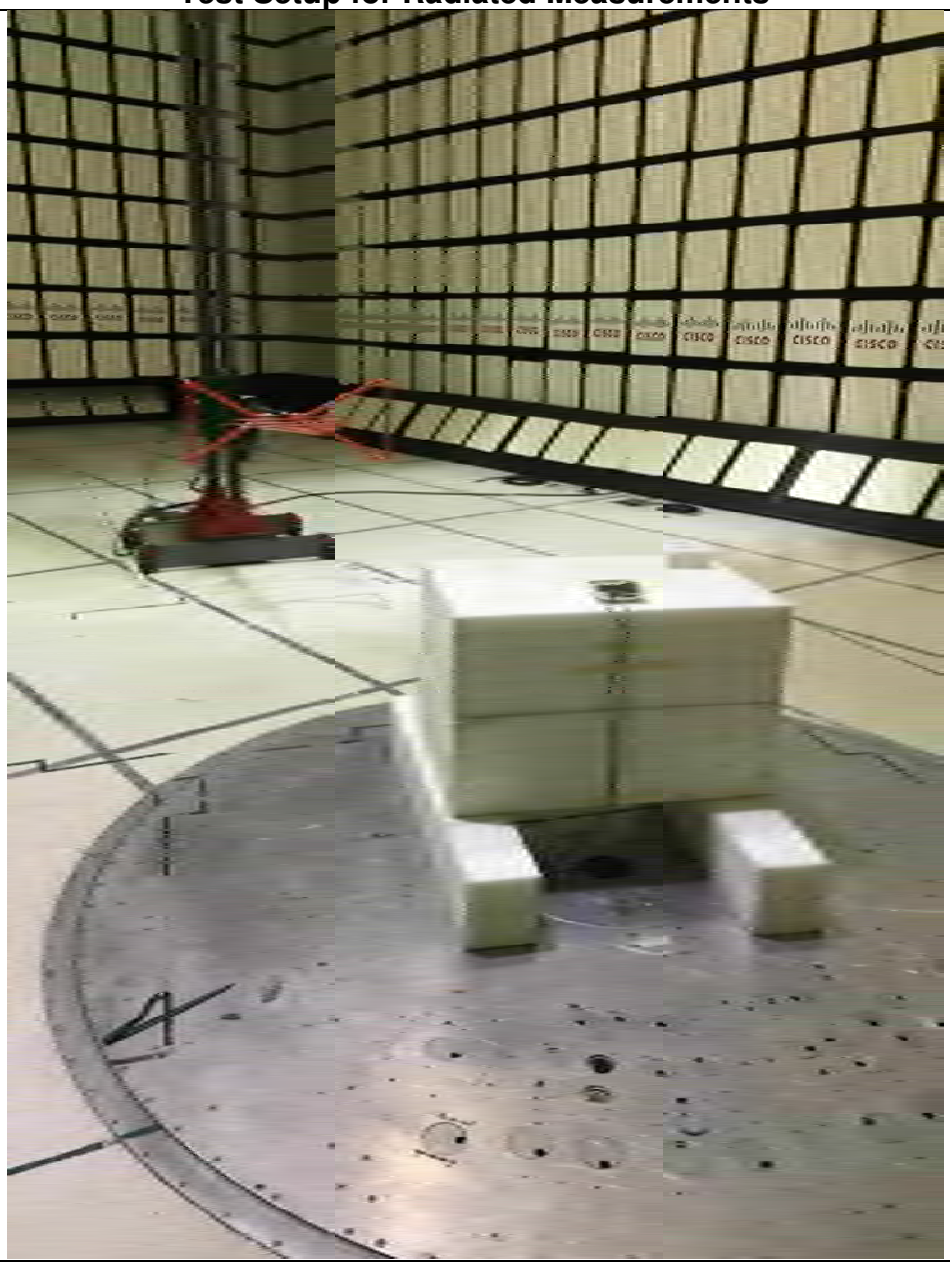
See Appendix C for list of test equipment

Test Setup Photo for Conducted Measurements

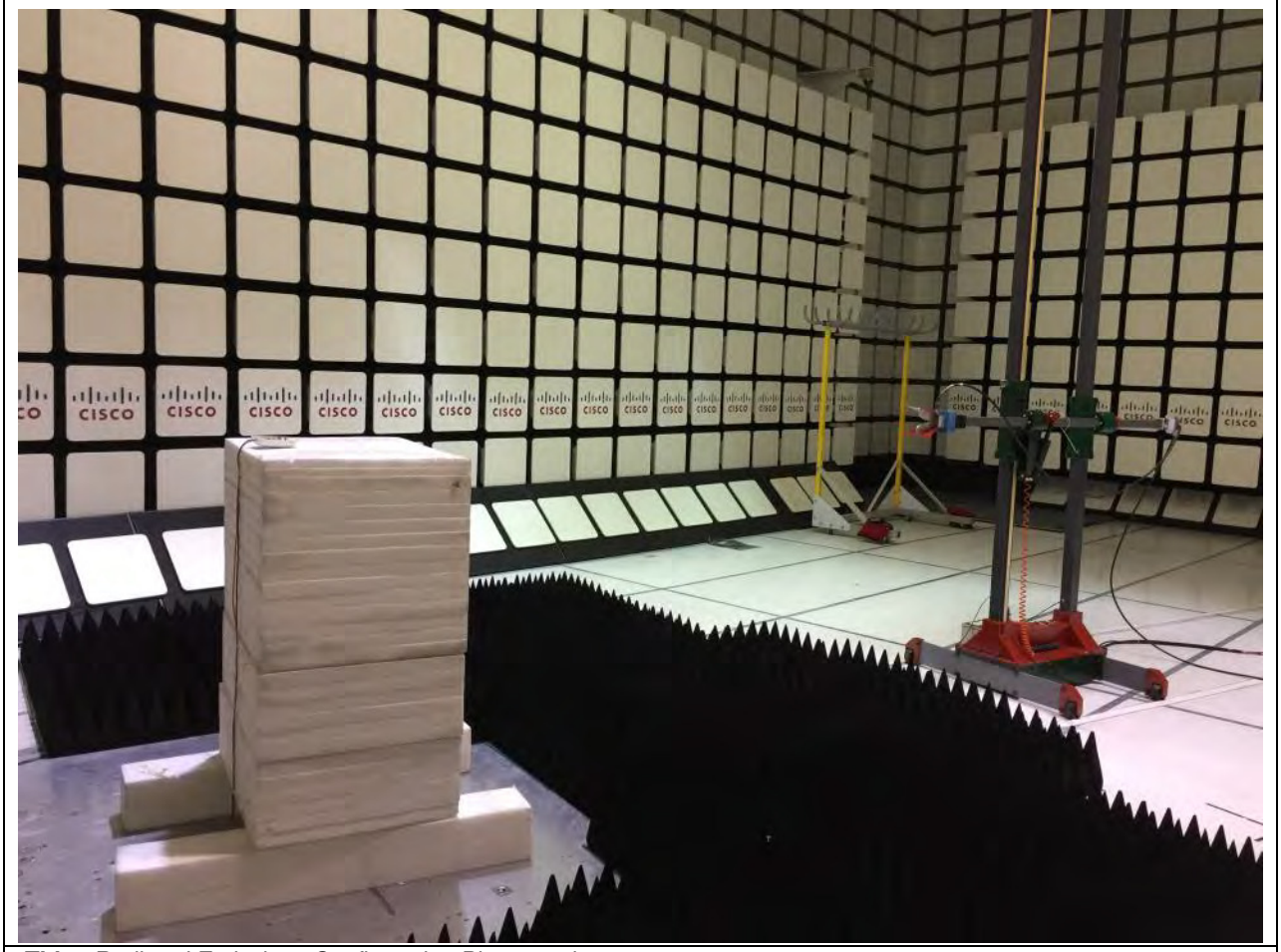


This is a dual band 2.4GHz / 5GHz device. All ports in this test set up photo are connected as all testing is automated. Section 2.6 of this test report given an overview of the different Tx antenna combinations used by this device.

Test Setup for Radiated Measurements



Title: Radiated Emissions Configuration Photograph



Title: Radiated Emissions Configuration Photograph

Test Setup for AC Conducted Emissions

Not tested, the Radio is power over Ethernet (POE) only .

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

Equip No	Model Manufacturer	Description	Last Cal	Next Cal	Tet Item
CIS051796	TTA1800-30-HG Miteq	SMA 18 GHz Pre-Amplifier	29-Sep-15	29-Sep-16	B.1, B.2
CIS035285	3117 ETS-Lindgren	Double Ridged Waveguide Horn Antenna	30-Sep-15	30-Sep-16	B.1, B.2
CIS008447	NSA 10m Chamber Cisco	NSA 10m Chamber	14-Oct-15	14-Oct-16	B.3
CIS045096	TH0118 Cisco	Mast Mount Preamplifier Array, 1-18GHz	4-Nov-15	4-Nov-16	B.1, B.2
CIS030652	JB1 Sunol Sciences	Combination Antenna, 30MHz-2GHz	4-Dec-15	4-Dec-16	B.3
CIS041929	iBTHP-5-DB9 Newport	5 inch Temp/RH/Press Sensor w/20ft cable	22-Dec-15	22-Dec-16	B.1, B.2, B.3
CIS043124	Above 1GHz Site Cal Cisco	Above 1GHz Cispr Site Verification	14-Jan-16	14-Jan-17	B.1, B.2
CIS047300	N9038A Agilent Technologies	MXE EMI Receiver 20Hz to 26.5 Ghz	28-Jan-16	28-Jan-17	B.1, B.2, B.3
CIS051642	Sucoflex 106PA Huber+Suhner	RF N Type Cable 8.5m	11-Feb-16	11-Feb-17	B.1, B.2, B.3
CIS030559	UFB311A-1-0950-504504 Micro-Coax	RF Coaxial Cable, to 18GHz, 95 in	15-Feb-16	15-Feb-17	B.1, B.2, B.3
CIS020975	UFB311A-0-1344-520520 Micro-Coax	RF Coaxial Cable, to 18GHz, 134.4 in	17-Feb-16	17-Feb-17	B.1, B.2, B.3
CIS051708	UFB293C-2-0840-300504 Micro-Coax	RF Coaxial SMA-N Type Cable	28-Jun-16	28-Jun-17	B.1, B.2, B.3
CIS044940	ESU40 Rohde & Schwarz	EMI Test Receiver, 20Hz-40GHz	2-Nov-15	2-Nov-16	B.1, B.2
CIS034075	RSG 2000 Schaffner	Reference Spectrum Generator, 1-18GHz	Cal Not Required	Cal Not Required	B.1, B.2
CIS041979	1840 Cisco	18-40GHz EMI Test Head/ Verification Fixture	13-Jul-15	13-Jul-16	B.1, B.2
CIS044940	ESU40 Rohde & Schwarz	EMI Test Receiver, 20Hz-40GHz	2-Nov-15	2-Nov-16	B.1, B.2,
CIS030652	JB1 Sunol Sciences	Combination Antenna, 30MHz-2GHz	4-Dec-15	4-Dec-16	B.3
CIS003003	83731B HP	Synthesized Signal Generator	29-Jan-16	29-Jan-17	B.1, B.2
CIS037236	50CB-015 JFW	GPIB Control Box			B.1, B.2

Test Equipment used for AC Mains Conducted Emissions					
Equip No	**Model Manufacturer**	**Description**	**Last Cal**	**Next Cal**	**Test Item**
					B.4

Test Equipment used for RF Conducted Tests					
Equip No	**Model Manufacturer**	**Description**	**Last Cal**	**Next Cal**	**Test Item**
CIS054666	RA08-S1S1-18 MegaPhase	SMA 18" Cable	25-Sep-15	25-Sep-16	A1 thru A7
CIS054667	RA08-S1S1-18 MegaPhase	SMA 18" Cable	25-Sep-15	25-Sep-16	A1 thru A7
CIS054668	RA08-S1S1-18 MegaPhase	SMA 18" Cable	25-Sep-15	25-Sep-16	A1 thru A7
CIS054669	RA08-S1S1-18 MegaPhase	SMA 18" Cable	25-Sep-15	25-Sep-16	A1 thru A7
CIS054686	NI PXI-2796 National Instruments	Plug-in switch module	6-Oct-15	6-Oct-16	A1 thru A7
CIS055166	RFLT4WDC40GK RF Lambda	4 Way Power Divider 40GHz	23-Nov-15	23-Nov-16	A1 thru A7
CIS054662	SF18-S1S1-36 MegaPhase	SMA 36" cable	24-Sep-15	24-Sep-16	A1 thru A7
CIS054656	BRC50705-02 Micro-Tronics	Band Reject Filter	24-Sep-15	24-Sep-16	A1 thru A7
CIS054655	BRC50704-02 Micro-Tronics	Notch Filter, SB:5.470-5.725GHz, to 12GHz	24-Sep-15	24-Sep-16	A1 thru A7
CIS054654	BRC50703-02 Micro-Tronics	Notch Filter, SB:5.150-5.350GHz, to 11GHz	24-Sep-15	24-Sep-16	A1 thru A7
CIS054653	BRM50702-02 Micro-Tronics	Notch Filter, SB:2.400-2.500GHz, to 18GHz	24-Sep-15	24-Sep-16	A1 thru A7
CIS054678	RA08-S1S1-12 MegaPhase	SMA 12" Cable	25-Sep-15	25-Sep-16	A1 thru A7
CIS054677	RA08-S1S1-12 MegaPhase	SMA 12" Cable	25-Sep-15	25-Sep-16	A1 thru A7
CIS054676	RA08-S1S1-12 MegaPhase	SMA 12" Cable	25-Sep-15	25-Sep-16	A1 thru A7
CIS054675	RA08-S1S1-12 MegaPhase	SMA 12" Cable	25-Sep-15	25-Sep-16	A1 thru A7
CIS054674	RA08-S1S1-12 MegaPhase	SMA 12" Cable	25-Sep-15	25-Sep-16	A1 thru A7
CIS054673	RA08-S1S1-12 MegaPhase	SMA 12" Cable	25-Sep-15	25-Sep-16	A1 thru A7
CIS054672	RA08-S1S1-12 MegaPhase	SMA 12" Cable	25-Sep-15	25-Sep-16	A1 thru A7
CIS054671	RA08-S1S1-12 MegaPhase	SMA 12" Cable	25-Sep-15	25-Sep-16	A1 thru A7
CIS054670	RA08-S1S1-12 MegaPhase	SMA 12" Cable	25-Sep-15	25-Sep-16	A1 thru A7
CIS054664	GC12-8181-16 MegaPhase	SMA 16" Cable	25-Sep-15	25-Sep-16	A1 thru A7
CIS054663	F120-S1S1-48 MegaPhase	SMA 48" Cable	25-Sep-15	25-Sep-16	A1 thru A7

CIS054686	NI PXI-2796 National Instruments	Plug-in switch module	6-Oct-15	6-Oct-16	A1 thru A7
CIS042005	BWS30W2+ Mini-Circuits	SMA 30dB Attenuator	16-Oct-15	16-Oct-16	A1 thru A7
CIS041995	BW-S6W2 Mini-Circuits	6dB Attenuator	16-Oct-15	16-Oct-16	A1 thru A7
CIS054695	D3C2060 Ditom	Circulator	20-Oct-15	20-Oct-16	A1 thru A7
CIS055146	RA08-S1S1-12 Megaphase	12" SMA Cable	17-Nov-15	17-Nov-16	A1 thru A7
CIS050721	N9030A Keysight	PXA Signal Analyzer	30-Mar-16	30-Mar-17	A1 thru A7
CIS054303	N5182B Keysight	MXG X-Series RF Vector Signal Generator	6-Apr-16	6-Apr-17	A1 thru A7
CIS055358	ZFSC-2-10G Mini-Circuits	Splitter	11-Apr-16	11-Apr-17	A1 thru A7
CIS055099	SMART2200RM2U Tripp-Lite	Power Supply	Cal Not Required		A1 thru A7
CIS055094	PXI-1042 National Instruments	Chassis	Cal Not Required		A1 thru A7

Appendix E: 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

End