

CISCO Test Report

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

Cisco Aironet 802.11ac Dual Band Access Points

FCC ID: LDKBRB4K1779

5150-5250 MHz

Against the following Specifications:

LP0002 (2018-01-10)

CFR47 Part 15.407



Cisco Systems

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San Jose, CA 95134

	
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This report replaces any previously entered test report under EDCS – [15874494](#). This test report has been electronically authorized and archived using the CISCO Engineering Document Control system. Test Report Template EDCS# 11644122.

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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 LP0002 (2018-01-10)

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-2017 – 16-DEC-2018

2.3 Report Issue Date

17-Dec-2018

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2.4 Testing facilities

This assessment was performed by:

Testing Laboratory

Cisco Systems, Inc.
125 West Tasman Drive (Building P)
San Jose, CA 95134
USA

Headquarters

Cisco Systems, Inc.,
170 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
Building 7, 5m Chamber	425 E. Tasman Drive San Jose, California 95134	Company #: 2461N-3

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

802.11n/ac - Non HT160, One Antenna, 6 to 54 Mbps
802.11n/ac - Non HT160, Two Antennas, 6 to 54 Mbps
802.11n/ac - Non HT160, Three Antennas, 6 to 54 Mbps
802.11n/ac - Non HT160, Four Antennas, 6 to 54 Mbps

802.11ac - VHT160, One Antenna, M0.1 to M9.1
802.11ac - VHT160, Two Antennas, M0.1 to M9.1
802.11ac - VHT160, Two Antennas, M0.2 to M9.2
802.11ac - VHT160, Three Antennas, M0.1 to M9.1
802.11ac - VHT160, Three Antennas, M0.2 to M9.2
802.11ac - VHT160, Three Antennas, M0.3 to M9.3
802.11ac - VHT160, Four Antennas, M0.1 to M9.1
802.11ac - VHT160, Four Antennas, M0.2 to M9.2
802.11ac - VHT160, Four Antennas, M0.3 to M9.3

802.11ac - VHT160 Beam Forming, Two Antennas, M0.1 to M9.1
802.11ac - VHT160 Beam Forming, Two Antennas, M0.2 to M9.2
802.11ac - VHT160 Beam Forming, Three Antennas, M0.1 to M9.1
802.11ac - VHT160 Beam Forming, Three Antennas, M0.2 to M9.2
802.11ac - VHT160 Beam Forming, Three Antennas, M0.3 to M9.3
802.11ac - VHT160 Beam Forming, Four Antennas, M0.1 to M9.1
802.11ac - VHT160 Beam Forming, Four Antennas, M0.2 to M9.2
802.11ac - VHT160 Beam Forming, Four Antennas, M0.3 to M9.3

802.11ac - VHT160 STBC, Two Antennas, M0.1 to M9.1
802.11ac - VHT160 STBC, Three Antennas, M0.1 to M9.1
802.11ac - VHT160 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 LP0002 (2018-01-10) (4.7.2.3)	<p>99% & 26 dB Bandwidth:</p> <p>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.</p> <p>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.</p>	Pass

<p>FCC 15.407 LP0002 (2018-01-10) (4.7.3.1) (1) (A)</p> <p>LP0002 (2018-01-10) (4.7.3.1) (2) (A)</p>	<p>Output Power: (1) For the band 5.15-5.25 GHz.</p> <p>(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, both 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).</p> <p>(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, 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.</p> <p>(iii) For fixed point-to-point access points 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. ...Fixed point-to-point U-NII devices may employ antennas with directional gain up to 23 dBi without any corresponding reduction in the maximum conducted output power or maximum power spectral density. For fixed point-to-point transmitters that employ a directional antenna gain greater than 23 dBi, a 1 dB reduction in maximum conducted output power and maximum power spectral density is required for each 1 dB of antenna gain in excess of 23 dBi. Fixed, point-to-point operations exclude the use of point-to-multipoint systems, omnidirectional applications, and multiple colocated 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.</p> <p>(iv) For mobile and portable client devices in the 5.15-5.25 GHz band, the maximum conducted output power over the frequency band of operation shall not exceed 250 mW provided the maximum antenna gain does not exceed 6 dBi. In addition, the maximum power spectral density shall not exceed 11 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.</p>	<p>Pass</p>
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FCC 15.407 LP0002 (2018-01-10) (4.7.3.1) (1) (B) & (2) (B)	Power Spectral Density (i) For an outdoor access point operating in the band 5.15-5.25 GHz...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 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. (iii) For fixed point-to-point access points operating in the band 5.15-5.25 GHz ...the maximum power spectral density shall not exceed 17 dBm in any 1 megahertz band. Fixed point-to-point U-NII devices may employ antennas with directional gain up to 23 dBi without any corresponding reduction in the ... maximum power spectral density. For fixed point-to-point transmitters that employ a directional antenna gain greater than 23 dBi, a 1 dB reduction in maximum conducted output power and maximum power spectral density is required for each 1 dB of antenna gain in excess of 23 dBi. 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. (iv) For mobile and portable client devices in the 5.15-5.25 GHz band...the maximum power spectral density shall not exceed 11 dBm in any 1 megahertz band. If transmitting antennas of directional gain greater than 6 dBi are used... 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 LP0002 (2018-01-10) (4.7.4.1)	Conducted Spurious Emissions / Band-Edge: 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 EIRP of -27dBm/MHz.	Pass
FCC 15.407 FCC 15.209 FCC 15.205 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 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 field strength limits table in this section.	Pass
FCC 15.207 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

* 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-Inx-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-Inx-064	FOC212601M3
S04	ADP-48DR BC 341-100460-01 A0	Delta	A0	NA	NA	DAB2016S1HK

4.2 System Details

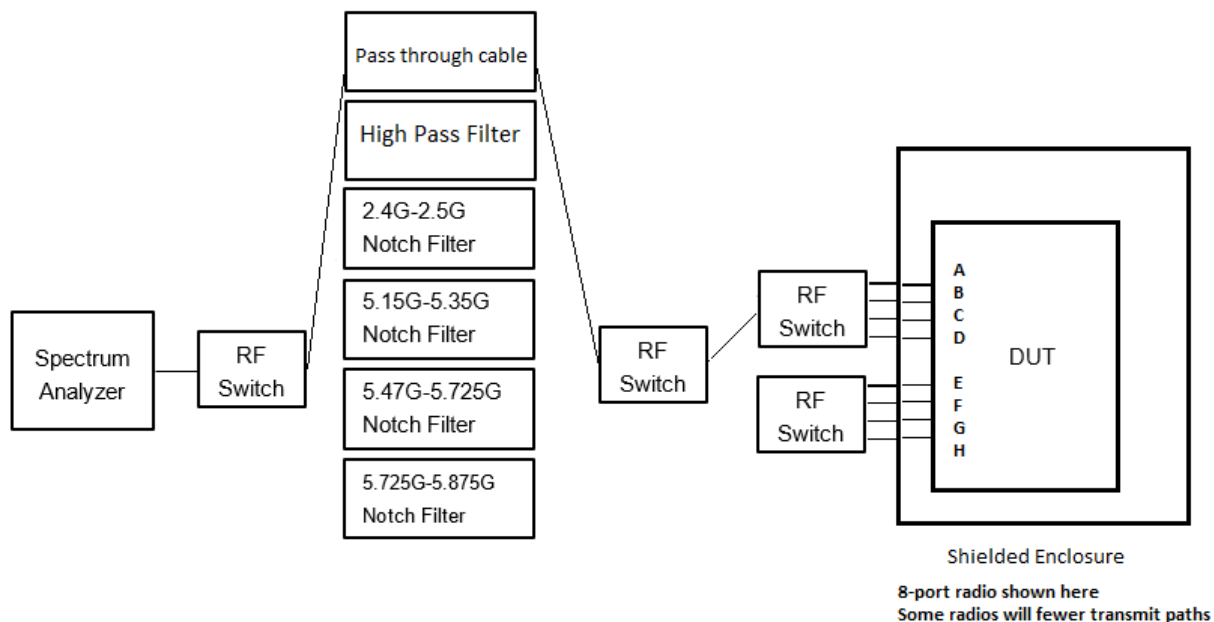
System #	Description	Samples
1	AIR-AP4800-B-K9	S01
2	ADP-48DR BC 341-100460-01 A0	S02
3	EUT for 5250 MHz Radiated Spurious Emissions	S03 & S04

4.3 Mode of Operation Details

Mode#	Description	Comments
1	Continuous Transmitting	Continuous Transmitting ≥98% duty cycle (or compensated)

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)		
	5250		
Non HT160, 6 to 54 Mbps	15		
VHT160, M0 to M9, M0 to M9 1-2ss	19		
VHT160 Beam Forming, M0 to M9, M0 to M9 1-2ss	19		
VHT160 STBC, M0 to M9 1ss	19		

A.1 99% and 26dB Bandwidth

99% and 26dB Bandwidth Test Requirement

For the FCC:

There is no requirement for the value of bandwidth.

Power measurements are made using the 99% Bandwidth as the integration bandwidth.

99% and 26dB Bandwidth Test Procedure

The 99-percent 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. Measurement of the 99-percent occupied bandwidth is required only as a condition for using the optional band-edge measurement techniques described in section II.G.3.d). Measurements of 99-percent occupied bandwidth may also optionally be used in lieu of the EBW to define the minimum frequency range over which the spectrum is integrated when measuring maximum conducted output power as described in section II.E. However, the EBW must be measured to determine bandwidth dependent limits on maximum conducted output power in accordance with 15.407(a).

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.

Ref. KDB 789033 Section D. 99 Percent Occupied Bandwidth

99% BW

Test Parameters

1. Set center frequency to the nominal EUT channel center frequency.
2. Set span = 1.5 times to 5.0 times the OBW.
3. Set RBW = 1 % to 5 % of the OBW
4. Set VBW $\geq 3 \cdot$ RBW
5. Video averaging is not permitted. Where practical, a sample detection and single sweep mode shall be used. Otherwise, peak detection and max hold mode (until the trace stabilizes) shall be used.
6. Use the 99 % power bandwidth function of the instrument (if available).

Ref KDB 789033 in Section C. Measurement Bandwidth, Section 1

26 BW

Test parameters

X dB BW = -26dB (using the OBW function of the spectrum analyzer)

Emission Bandwidth (EBW)

- a) Set RBW = approximately 1% of the emission bandwidth.
- b) Set the VBW > RBW.
- c) Detector = Peak.
- d) Trace mode = max hold.
- e) Measure the maximum width of the emission that is 26 dB down from the maximum of the emission. Compare this with the RBW setting of the analyzer. Readjust RBW and repeat measurement as needed until the RBW/EBW ratio is approximately 1%.

Samples, Systems, and Modes

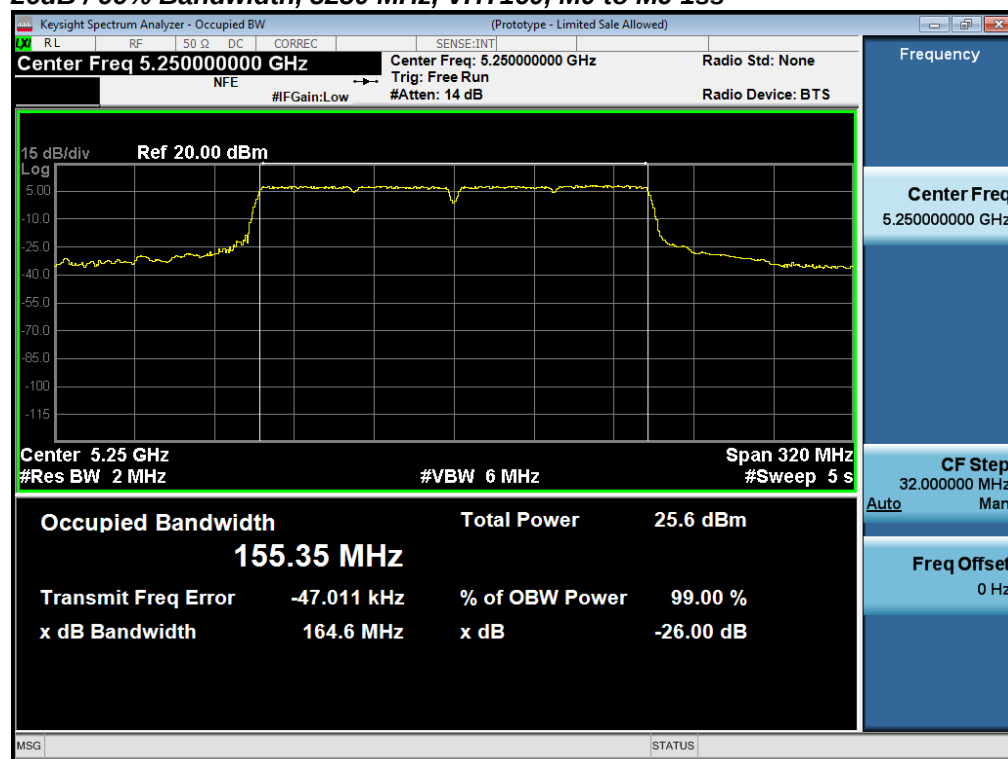
System Number	Description	Samples	System under test	Support equipment
1	EUT	S01	☒	☐
	Support	S02	☐	☒

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

Test Equipment

See Appendix C for list of test equipment

Frequency (MHz)	Mode	Data Rate (Mbps)	26dB BW (MHz)	99% BW (MHz)
5250	Non HT160, 6 to 54 Mbps	6	163.8	155.375
	VHT160, M0 to M9, M0 to M9 1-2ss	m0x1	164.8	155.295

26dB / 99% Bandwidth, 5250 MHz, VHT160, M0 to M9 1ss

A.2 Maximum Conducted Output Power

Maximum Conducted Output Power Test Requirement

15.407 (i), LP0002 (2018-01-10) (4.7.3.1) (1) (A) & (4.7.3.1) (1) (B) General technical requirements, (a) Power limits: (1) For the band 5.15-5.25 GHz.

(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, 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).

5.407 (ii), LP0002 (2018-01-10) (4.7.3.1) (2) (A) & (4.7.3.1) (2) (B) (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, 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.

(iii) For fixed point-to-point access points 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. ...Fixed point-to-point U-NII devices may employ antennas with directional gain up to 23 dBi without any corresponding reduction in the maximum conducted output power or maximum power spectral density. For fixed point-to-point transmitters that employ a directional antenna gain greater than 23 dBi, a 1 dB reduction in maximum conducted output power and maximum power spectral density is required for each 1 dB of antenna gain in excess of 23 dBi. 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.

(iv) For client devices in the 5.15-5.25 GHz band, the maximum conducted output power over the frequency band of operation shall not exceed 250 mW provided the maximum antenna gain does not exceed 6 dBi. In addition, the maximum power spectral density shall not exceed 11 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.

Maximum Conducted Output Power Test Procedure

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

Maximum Conducted 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**2. Measurement using a Spectrum Analyzer or EMI Receiver (SA), (d) Method SA-2****Maximum Conducted Output Power**

Test parameters

Method SA-2 (trace averaging across on and off times of the EUT transmissions, followed by duty cycle correction).

(i) Measure the duty cycle, x , of the transmitter output signal as described in section II.B.

(ii) Set span to encompass the EBW (or, alternatively, the entire 99% occupied bandwidth) of the signal.

(iii) Set RBW = 1 MHz.

(iv) Set VBW $\geq$ 3 MHz.

(v) Number of points in sweep $\geq$ 2 Span / RBW. (This ensures that bin-to-bin spacing is $\leq$ RBW/2, so that narrowband signals are not lost between frequency bins.)

(vi) Sweep time = auto.

(vii) Detector = RMS (i.e., power averaging), if available. Otherwise, use sample detector mode.

(viii) Do not use sweep triggering. Allow the sweep to “free run”.

(ix) Trace average at least 100 traces in power averaging (i.e., RMS) mode; however, the number of traces to be averaged shall be increased above 100 as needed to ensure that the average accurately represents the true average over the on and off periods of the transmitter.

(x) Compute power by integrating the spectrum across the EBW (or, alternatively, the entire 99% occupied bandwidth) of the signal using the instrument’s band power measurement function with band limits set equal to the EBW (or occupied bandwidth)

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. ANSI C63.10 section 14.3.2.2

Samples, Systems, and Modes

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

Tested By :

Jose Aguirre

Date of testing:

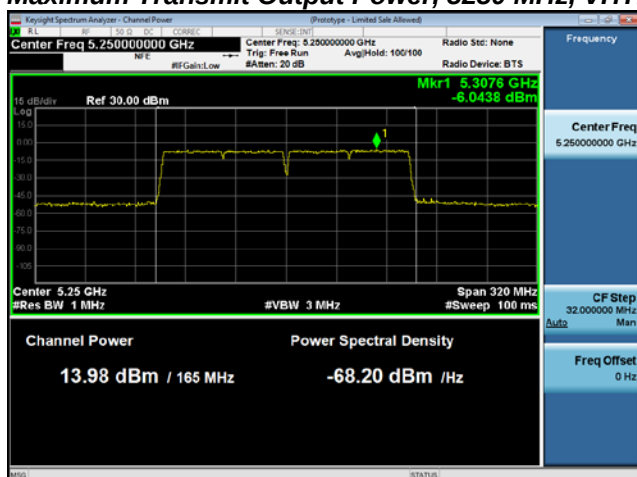
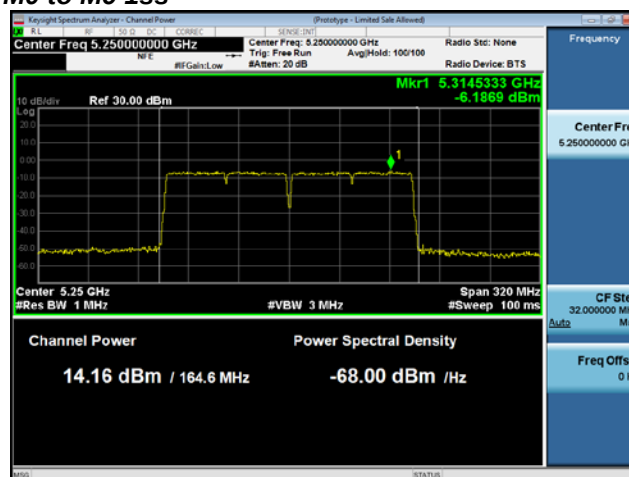
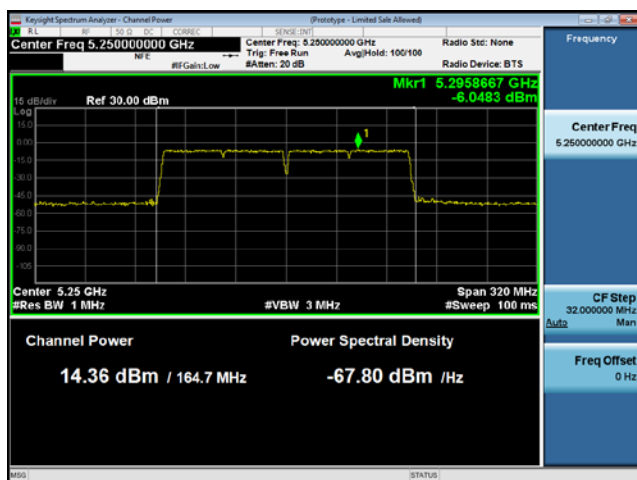
1-Nov-17 - 20-Mar-18

Test Result : PASS**Test Equipment**

See Appendix C for list of test equipment

Maximum Output Power

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)
5250	Non HT160, 6 to 54 Mbps	1	4	12.3				12.3	29.8	17.5
	Non HT160, 6 to 54 Mbps	2	4	10.0	10.2			13.1	29.8	16.7
	Non HT160, 6 to 54 Mbps	3	4	10.0	10.2	10.3		14.9	29.8	14.9
	Non HT160, 6 to 54 Mbps	4	4	9.0	9.2	9.4	9.0	15.2	29.8	14.6
	VHT160, M0 to M9 1ss	1	4	15.1				15.1	29.8	14.7
	VHT160, M0 to M9 1ss	2	4	15.1	15.3			18.2	29.8	11.6
	VHT160, M0 to M9 2ss	2	4	15.1	15.3			18.2	29.8	11.6
	VHT160, M0 to M9 1ss	3	4	14.0	14.2	14.4		19.0	29.8	10.8
	VHT160, M0 to M9 2ss	3	4	14.0	14.2	14.4		19.0	29.8	10.8
	VHT160, M0 to M9 3ss	3	4	14.0	14.2	14.4		19.0	29.8	10.8
	VHT160, M0 to M9 1ss	4	4	12.9	13.0	13.2	12.8	19.0	29.8	10.8
	VHT160, M0 to M9 2ss	4	4	12.9	13.0	13.2	12.8	19.0	29.8	10.8
	VHT160, M0 to M9 3ss	4	4	12.9	13.0	13.2	12.8	19.0	29.8	10.8
	VHT160 Beam Forming, M0 to M9 1ss	2	7	12.9	13.0			16.0	28.8	12.8
	VHT160 Beam Forming, M0 to M9 2ss	2	4	15.1	15.3			18.2	29.8	11.6
	VHT160 Beam Forming, M0 to M9 1ss	3	8	10.7	10.9	10.9		15.6	27.8	12.2
	VHT160 Beam Forming, M0 to M9 2ss	3	5	12.9	13.0	13.2		17.8	29.8	12
	VHT160 Beam Forming, M0 to M9 3ss	3	4	14.0	14.2	14.4		19.0	29.8	10.8
	VHT160 Beam Forming, M0 to M9 1ss	4	10	7.8	8.0	8.1	7.7	13.9	25.8	11.9
	VHT160 Beam Forming, M0 to M9 2ss	4	7	10.7	10.9	10.9	10.6	16.8	28.8	12
	VHT160 Beam Forming, M0 to M9 3ss	4	5	12.9	13.0	13.2	12.8	19.0	29.8	10.8
	VHT160 STBC, M0 to M9 1ss	2	4	15.1	15.3			18.2	29.8	11.6
	VHT160 STBC, M0 to M9 1ss	3	4	14.0	14.2	14.4		19.0	29.8	10.8
	VHT160 STBC, M0 to M9 1ss	4	4	12.9	13.0	13.2	12.8	19.0	29.8	10.8

Maximum Transmit Output Power, 5250 MHz, VHT160, M0 to M9 1ss**Antenna A****Antenna B****Antenna C**

A.3 Power Spectral Density

Power Spectral Density Test Requirement

15.407, LP0002 (2018-01-10) (4.7.3.1) (1) (B) & (2) (B) General technical requirements, (a) Power limits: (1) For the band 5.15-5.25 GHz.

(i) For an outdoor access point operating in the band 5.15-5.25 GHz ... 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.

(ii) For an indoor access point operating in the band 5.15-5.25 GHz... 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.

(iii) For fixed point-to-point access points operating in the band 5.15-5.25 GHz...the maximum power spectral density shall not exceed 17 dBm in any 1 megahertz band. Fixed point-to-point U-NII devices may employ antennas with directional gain up to 23 dBi without any corresponding reduction in the maximum conducted output power or maximum power spectral density. For fixed point-to-point transmitters that employ a directional antenna gain greater than 23 dBi, a 1 dB reduction in maximum conducted output power and maximum power spectral density is required for each 1 dB of antenna gain in excess of 23 dBi. 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.

(iv) For client devices in the 5.15-5.25 GHz band, the maximum power spectral density shall not exceed 11 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.

Power Spectral Density Test Procedure

Ref. KDB 789033 D02 General UNII Test Procedures New Rules v02r01

F. Maximum Power Spectral Density (PSD)

Power Spectral Density

Test Procedure

The rules requires “maximum power spectral density” measurements where the intent is to measure the maximum value of the time average of the power spectral density measured during a period of continuous transmission.

1. Create an average power spectrum for the EUT operating mode being tested by following the instructions in section II.E.2. for measuring maximum conducted output power using a spectrum analyzer or EMI receiver: select the appropriate test method (SA-1, SA-2, SA-3, or alternatives to each) and apply it up to, but not including, the step labeled, “Compute power...”. (This procedure is required even if the maximum conducted output power measurement was performed using a power meter, method PM.)
2. Use the peak search function on the instrument to find the peak of the spectrum and record its value.
3. Make the following adjustments to the peak value of the spectrum, if applicable: a) If Method SA-2 or SA-2 Alternative was used, add $10 \log(1/x)$, where x is the duty cycle, to the peak of the spectrum.
b) If Method SA-3 Alternative was used and the linear mode was used in step II.E.2.g)(viii), add 1 dB to the final result to compensate for the difference between linear averaging and power averaging.

4. The result is the Maximum PSD over 1 MHz reference bandwidth.

Ref. KDB 789033 D02 General UNII Test Procedures New Rules v02r01

2. Measurement using a Spectrum Analyzer or EMI Receiver (SA), (d) Method SA-2

Power Spectral Density

Test parameters

Method SA-2 (trace averaging across on and off times of the EUT transmissions, followed by duty cycle correction).

(i) Measure the duty cycle, x , of the transmitter output signal as described in section II.B.

(ii) Set span to encompass the EBW (or, alternatively, the entire 99% occupied bandwidth) of the signal.

(iii) Set RBW = 1 MHz.

(iv) Set VBW ≥ 3 MHz.

(v) Number of points in sweep ≥ 2 Span / RBW. (This ensures that bin-to-bin spacing is $\leq$ RBW/2, so that narrowband signals are not lost between frequency bins.)

(vi) Sweep time = auto.

(vii) Detector = RMS (i.e., power averaging), if available. Otherwise, use sample detector mode.

(viii) Do not use sweep triggering. Allow the sweep to “free run”.

(ix) Trace average at least 100 traces in power averaging (i.e., RMS) mode; however, the number of traces to be averaged shall be increased above 100 as needed to ensure that the average accurately represents the true average over the on and off periods of the transmitter.

(x) Compute power by integrating the spectrum across the EBW (or, alternatively, the entire 99% occupied bandwidth) of the signal using the instrument’s band power measurement function with band limits set equal to the EBW (or occupied bandwidth)

F. Maximum Power Spectral Density (PSD)

2. Use the peak search function on the instrument to find the peak of the spectrum and record its value.

3. Make the following adjustments to the peak value of the spectrum, if applicable: a) If Method SA-2 or SA-2 Alternative was used, add $10 \log(1/x)$, where x is the duty cycle, to the peak of the spectrum.

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. ANSI C63.10 section 14.3.2.2

Samples, Systems, and Modes

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

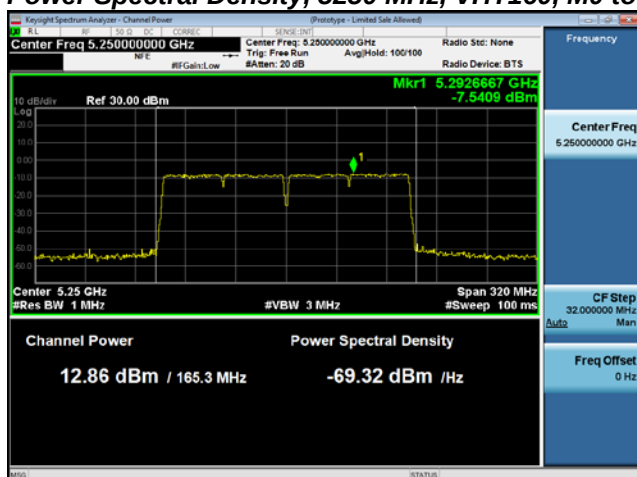
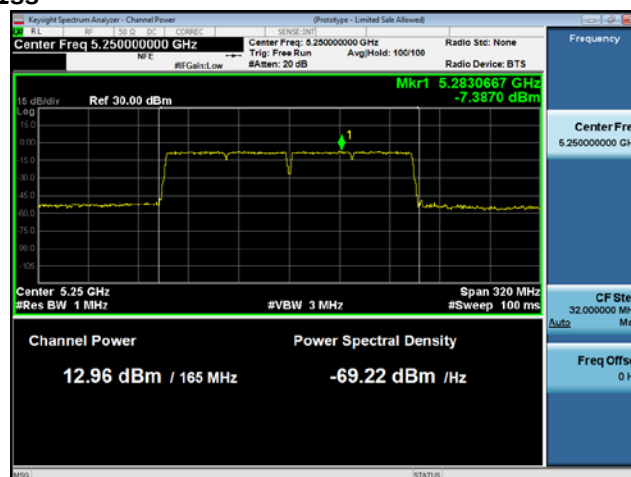
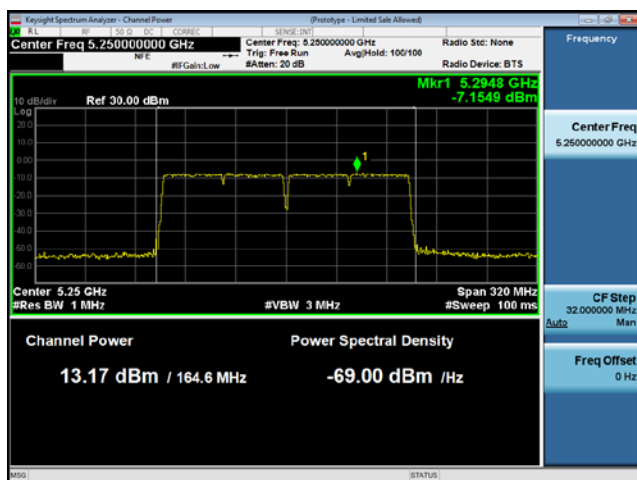
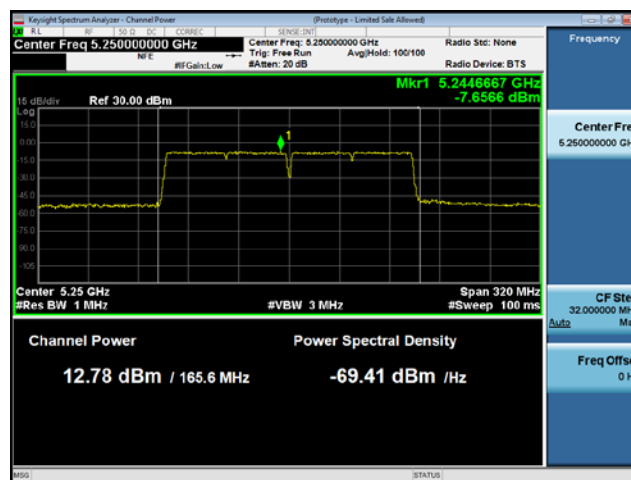
Test Result : PASS

Test Equipment

See Appendix C for list of test equipment

Power Spectral Density

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/MHz)	Limit (dBm/MHz)	Margin (dB)
5250	Non HT160, 6 to 54 Mbps	1	4	-7.3				-7.3	16.8	24.1
	Non HT160, 6 to 54 Mbps	2	7	-9.7	-9.6			-6.6	15.8	22.4
	Non HT160, 6 to 54 Mbps	3	8	-9.7	-9.6	-9.7		-4.9	14.8	19.7
	Non HT160, 6 to 54 Mbps	4	10	-10.4	-10.7	-10.4	-11.0	-4.6	12.8	17.4
	VHT160, M0 to M9 1ss	1	4	-5.2				-5.2	16.8	22
	VHT160, M0 to M9 1ss	2	7	-5.2	-5.0			-2.1	15.8	17.9
	VHT160, M0 to M9 2ss	2	4	-5.2	-5.0			-2.1	16.8	18.9
	VHT160, M0 to M9 1ss	3	8	-6.0	-6.2	-6.0		-1.3	14.8	16.1
	VHT160, M0 to M9 2ss	3	5	-6.0	-6.2	-6.0		-1.3	16.8	18.1
	VHT160, M0 to M9 3ss	3	4	-6.0	-6.2	-6.0		-1.3	16.8	18.1
	VHT160, M0 to M9 1ss	4	10	-7.5	-7.4	-7.2	-7.7	-1.4	12.8	14.2
	VHT160, M0 to M9 2ss	4	7	-7.5	-7.4	-7.2	-7.7	-1.4	15.8	17.2
	VHT160, M0 to M9 3ss	4	5	-7.5	-7.4	-7.2	-7.7	-1.4	16.8	18.2
	VHT160 Beam Forming, M0 to M9 1ss	2	7	-7.5	-7.4			-4.4	15.8	20.2
	VHT160 Beam Forming, M0 to M9 2ss	2	4	-5.2	-5.0			-2.1	16.8	18.9
	VHT160 Beam Forming, M0 to M9 1ss	3	8	-9.5	-9.6	-9.7		-4.8	14.8	19.6
	VHT160 Beam Forming, M0 to M9 2ss	3	5	-7.5	-7.4	-7.2		-2.6	16.8	19.4
	VHT160 Beam Forming, M0 to M9 3ss	3	4	-6.0	-6.2	-6.0		-1.3	16.8	18.1
	VHT160 Beam Forming, M0 to M9 1ss	4	10	-12.4	-12.4	-12.2	-12.8	-6.4	12.8	19.2
	VHT160 Beam Forming, M0 to M9 2ss	4	7	-9.5	-9.6	-9.7	-9.9	-3.7	15.8	19.5
	VHT160 Beam Forming, M0 to M9 3ss	4	5	-7.5	-7.4	-7.2	-7.7	-1.4	16.8	18.2
	VHT160 STBC, M0 to M9 1ss	2	4	-5.2	-5.0			-2.1	16.8	18.9
	VHT160 STBC, M0 to M9 1ss	3	4	-6.0	-6.2	-6.0		-1.3	16.8	18.1
	VHT160 STBC, M0 to M9 1ss	4	4	-7.5	-7.4	-7.2	-7.7	-1.4	16.8	18.2

Power Spectral Density, 5250 MHz, VHT160, M0 to M9 1ss**Antenna A****Antenna B****Antenna C****Antenna D**

A.4 Conducted Spurious Emissions

Conducted Spurious Emissions Test Requirement

15.407(b), LP0002 (2018-01-10) (4.8.1.4) (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.
- (5) The emission measurements shall be performed using a minimum resolution bandwidth of 1 MHz. A lower resolution bandwidth may be employed near the band edge, when necessary, provided the measured energy is integrated to show the total power over 1 MHz.
- (6) Unwanted emissions below 1 GHz must comply with the general field strength limits set forth in §15.209.
- (7) The provisions of §15.205 apply to intentional radiators operating under this section.
- (8) 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.

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

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

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

KDB 789033 D02 General UNII Test Procedures New Rules v02r01

2. Unwanted Emissions that fall Outside of the Restricted Bands

- a) For all measurements, follow the requirements in II.G.3. “General Requirements for Unwanted Emissions Measurements.”
- b) At frequencies below 1000 MHz, use the procedure described in II.G.4. “Procedure for Unwanted Emissions Measurements Below 1000 MHz.”
- c) At frequencies above 1000 MHz, use the procedure for maximum emissions described in II.G.5., “Procedure for Unwanted Emissions Measurements Above 1000 MHz.”
- (i) Sections 15.407(b)(1-3) specifies the unwanted emissions limit for the U-NII-1 and U-NII-2 bands. As specified, emissions above 1000 MHz that are outside of the restricted bands are subject to a peak emission limit of -27 dBm/MHz.³

Conducted Spurious Emissions Test Procedure

KDB 789033 D02 General UNII Test Procedures New Rules v02r01

Ref. 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
3. Configure Spectrum analyzer as per test parameters below (be sure to enter all losses between the transmitter output and the spectrum analyzer).
4. Use the peak marker function to determine the maximum spurs amplitude level.
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. (see ANSI C63.10:2013 section 14.3.2.2)

6. Capture graphs and record pertinent measurement data.

Ref. ANSI C63.10: 2013 section 12.7.6 (Peak) and 12.7.7.2 (Average)

KDB 789033 D02 General UNII Test Procedures New Rules v02r01, Sec. 5 (Peak), Sec. 6 (Average Method AD)

Conducted Spurious Emissions

Test parameters

Peak

RBW = 1 MHz

VBW $\geq$ 3 MHz

Sweep = Auto

Detector = Peak

Trace = Max Hold.

Average

RBW = 1 MHz

VBW $\geq$ 3 MHz

Sweep = Auto

Detector = RMS

Power Averaging

Add the max antenna gain + ground reflection factor (4.7 dB for frequencies between 30 MHz and 1000 MHz, and 0 dB for frequencies > 1000 MHz).

Samples, Systems, and Modes

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

Tested By :

Jose Aguirre

Date of testing:

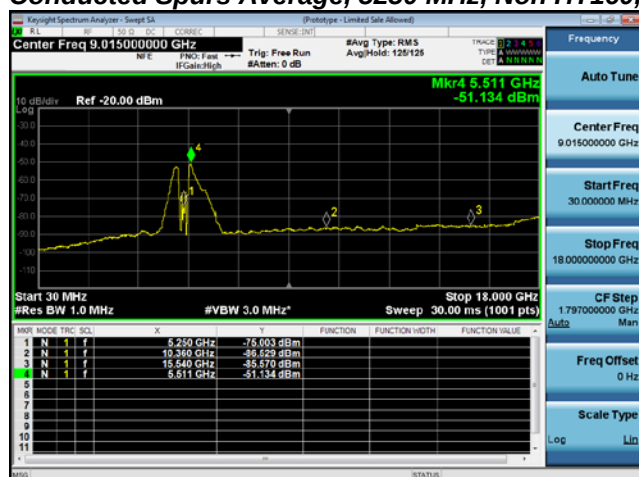
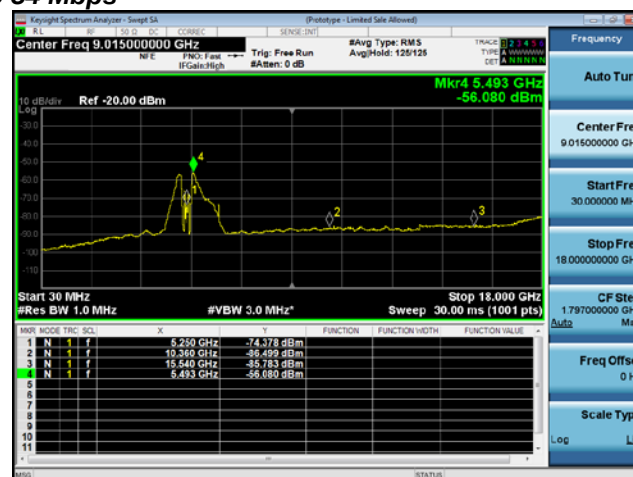
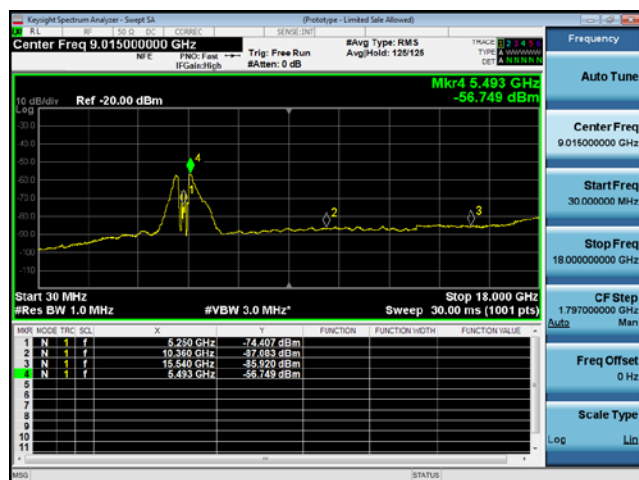
1-Nov-17 - 20-Mar-18

Test Result : PASS

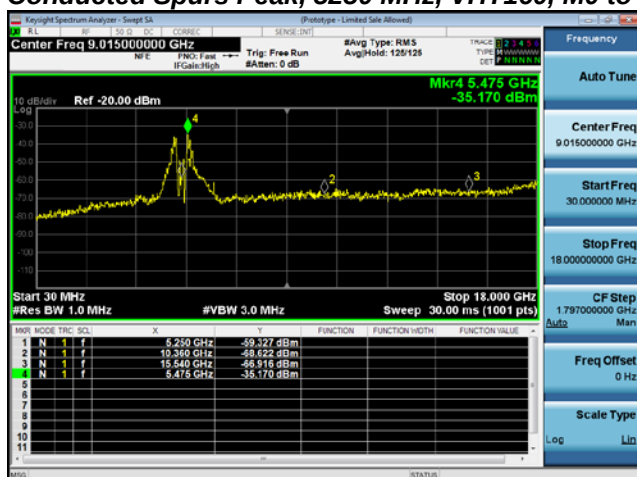
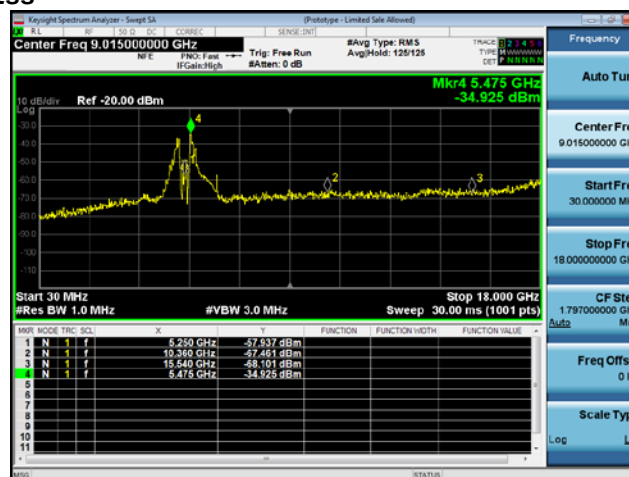
Test Equipment

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)
5250	Non HT160, 6 to 54 Mbps	1	4	-50.8				-46.8	-41.45	5.4
	Non HT160, 6 to 54 Mbps	2	4	-51.1	-56.1			-45.9	-41.45	4.5
	Non HT160, 6 to 54 Mbps	3	4	-51.1	-56.1	-56.7		-45.1	-41.45	3.6
	Non HT160, 6 to 54 Mbps	4	4	-57.3	-56.3	-57.0	-57.6	-47.0	-41.45	5.6
	VHT160, M0 to M9 1ss	1	4	-53.8				-49.8	-41.45	8.4
	VHT160, M0 to M9 1ss	2	4	-53.8	-53.6			-46.7	-41.45	5.2
	VHT160, M0 to M9 2ss	2	4	-53.8	-53.6			-46.7	-41.45	5.2
	VHT160, M0 to M9 1ss	3	4	-56.2	-56.2	-55.7		-47.3	-41.45	5.8
	VHT160, M0 to M9 2ss	3	4	-56.2	-56.2	-55.7		-47.3	-41.45	5.8
	VHT160, M0 to M9 3ss	3	4	-56.2	-56.2	-55.7		-47.3	-41.45	5.8
	VHT160, M0 to M9 1ss	4	4	-58.3	-58.0	-57.8	-57.0	-47.7	-41.45	6.3
	VHT160, M0 to M9 2ss	4	4	-58.3	-58.0	-57.8	-57.0	-47.7	-41.45	6.3
	VHT160, M0 to M9 3ss	4	4	-58.3	-58.0	-57.8	-57.0	-47.7	-41.45	6.3
	VHT160 Beam Forming, M0 to M9 1ss	2	7	-58.3	-58.0			-48.1	-41.45	6.7
	VHT160 Beam Forming, M0 to M9 2ss	2	4	-53.8	-53.6			-46.7	-41.45	5.2
	VHT160 Beam Forming, M0 to M9 1ss	3	8	-60.7	-60.3	-60.8		-47.8	-41.45	6.4
	VHT160 Beam Forming, M0 to M9 2ss	3	5	-58.3	-58.0	-57.8		-48.3	-41.45	6.8
	VHT160 Beam Forming, M0 to M9 3ss	3	4	-56.2	-56.2	-55.7		-47.3	-41.45	5.8
	VHT160 Beam Forming, M0 to M9 1ss	4	10	-65.7	-65.8	-66.0	-62.0	-48.5	-41.45	7
	VHT160 Beam Forming, M0 to M9 2ss	4	7	-60.7	-60.3	-60.8	-60.7	-47.6	-41.45	6.2
	VHT160 Beam Forming, M0 to M9 3ss	4	5	-58.3	-58.0	-57.8	-57.0	-46.7	-41.45	5.3
	VHT160 STBC, M0 to M9 1ss	2	4	-53.8	-53.6			-46.7	-41.45	5.2
	VHT160 STBC, M0 to M9 1ss	3	4	-56.2	-56.2	-55.7		-47.3	-41.45	5.8
	VHT160 STBC, M0 to M9 1ss	4	4	-58.3	-58.0	-57.8	-57.0	-47.7	-41.45	6.3

Conducted Spurs Average, 5250 MHz, Non HT160, 6 to 54 Mbps**Antenna A****Antenna B****Antenna C**

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)
5250	Non HT160, 6 to 54 Mbps	1	4	-36.2				-32.2	-21.45	10.8
	Non HT160, 6 to 54 Mbps	2	4	-40.9	-44.5			-35.3	-21.45	13.9
	Non HT160, 6 to 54 Mbps	3	4	-40.9	-44.5	-44.9		-34.3	-21.45	12.8
	Non HT160, 6 to 54 Mbps	4	4	-46.9	-46.3	-46.2	-45.7	-36.2	-21.45	14.8
	VHT160, M0 to M9 1ss	1	4	-35.2				-31.2	-21.45	9.8
	VHT160, M0 to M9 1ss	2	4	-35.2	-34.9			-28.0	-21.45	6.6
	VHT160, M0 to M9 2ss	2	4	-35.2	-34.9			-28.0	-21.45	6.6
	VHT160, M0 to M9 1ss	3	4	-38.4	-37.6	-38.9		-29.5	-21.45	8
	VHT160, M0 to M9 2ss	3	4	-38.4	-37.6	-38.9		-29.5	-21.45	8
	VHT160, M0 to M9 3ss	3	4	-38.4	-37.6	-38.9		-29.5	-21.45	8
	VHT160, M0 to M9 1ss	4	4	-42.6	-41.5	-41.4	-40.2	-31.3	-21.45	9.9
	VHT160, M0 to M9 2ss	4	4	-42.6	-41.5	-41.4	-40.2	-31.3	-21.45	9.9
	VHT160, M0 to M9 3ss	4	4	-42.6	-41.5	-41.4	-40.2	-31.3	-21.45	9.9
	VHT160 Beam Forming, M0 to M9 1ss	2	7	-42.6	-41.5			-32.0	-21.45	10.6
	VHT160 Beam Forming, M0 to M9 2ss	2	4	-35.2	-34.9			-28.0	-21.45	6.6
	VHT160 Beam Forming, M0 to M9 1ss	3	8	-47.2	-46.3	-45.7		-33.6	-21.45	12.1
	VHT160 Beam Forming, M0 to M9 2ss	3	5	-42.6	-41.5	-41.4		-32.0	-21.45	10.6
	VHT160 Beam Forming, M0 to M9 3ss	3	4	-38.4	-37.6	-38.9		-29.5	-21.45	8
	VHT160 Beam Forming, M0 to M9 1ss	4	10	-52.4	-52.9	-53.0	-51.0	-36.2	-21.45	14.8
	VHT160 Beam Forming, M0 to M9 2ss	4	7	-47.2	-46.3	-45.7	-47.0	-33.5	-21.45	12
	VHT160 Beam Forming, M0 to M9 3ss	4	5	-42.6	-41.5	-41.4	-40.2	-30.3	-21.45	8.9
	VHT160 STBC, M0 to M9 1ss	2	4	-35.2	-34.9			-28.0	-21.45	6.6
	VHT160 STBC, M0 to M9 1ss	3	4	-38.4	-37.6	-38.9		-29.5	-21.45	8
	VHT160 STBC, M0 to M9 1ss	4	4	-42.6	-41.5	-41.4	-40.2	-31.3	-21.45	9.9

Conducted Spurs Peak, 5250 MHz, VHT160, M0 to M9 1ss**Antenna A****Antenna B**

A.5 Conducted Band Edge

Conducted Band Edge Test Requirement

15.407(b), 15.209, LP0002 (2018-01-10) (4.7.4.1) 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.
- (5) The emission measurements shall be performed using a minimum resolution bandwidth of 1 MHz. A lower resolution bandwidth may be employed near the band edge, when necessary, provided the measured energy is integrated to show the total power over 1 MHz.
- (6) Unwanted emissions below 1 GHz must comply with the general field strength limits set forth in §15.209.
- (7) The provisions of §15.205 apply to intentional radiators operating under this section.
- (8) 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.

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

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

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

KDB 789033 D02 General UNII Test Procedures New Rules v02r01

2. Unwanted Emissions that fall Outside of the Restricted Bands

- a) For all measurements, follow the requirements in II.G.3. “General Requirements for Unwanted Emissions Measurements.”
- b) At frequencies below 1000 MHz, use the procedure described in II.G.4. “Procedure for Unwanted Emissions Measurements Below 1000 MHz.”
- c) At frequencies above 1000 MHz, use the procedure for maximum emissions described in II.G.5., “Procedure for Unwanted Emissions Measurements Above 1000 MHz.”
- (i) Sections 15.407(b)(1-3) specifies the unwanted emissions limit for the U-NII-1 and U-NII-2 bands. As specified, emissions above 1000 MHz that are outside of the restricted bands are subject to a peak emission limit of -27 dBm/MHz.³

Conducted Band Edge Test Procedure

KDB 789033 D02 General UNII Test Procedures New Rules v02r01

Ref. 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
3. Configure Spectrum analyzer as per test parameters below (be sure to enter all losses between the transmitter output and the spectrum analyzer).
4. Use the peak marker function to determine the maximum spurs amplitude level.
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. (see ANSI C63.10:2013 section 14.3.2.2)

6. Capture graphs and record pertinent measurement data.

Ref. ANSI C63.10: 2013 section 12.7.6 (Peak) and 12.7.7.2 (Average)

KDB 789033 D02 General UNII Test Procedures New Rules v02r01, Sec. 5 (Peak), Sec. 6 (Average Method AD)

Conducted Spurious Emissions

Test parameters

Peak

RBW = 1 MHz

VBW $\geq$ 3 MHz

Sweep = Auto

Detector = Peak

Trace = Max Hold.

Average

RBW = 1 MHz

VBW $\geq$ 3 MHz

Sweep = Auto

Detector = RMS

Power Averaging

Samples, Systems, and Modes

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

Tested By :

Jose Aguirre

Date of testing:

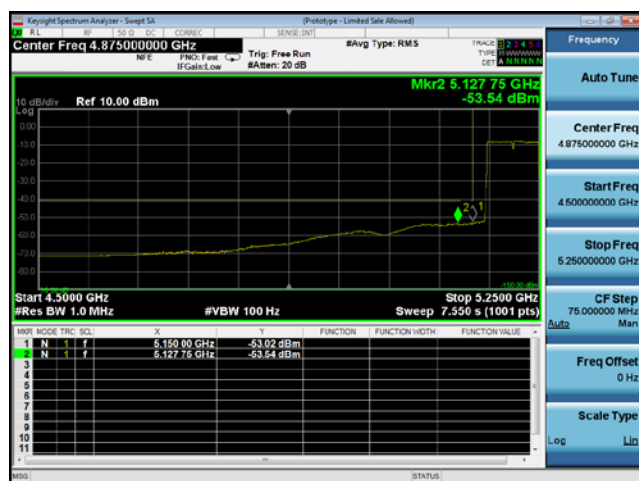
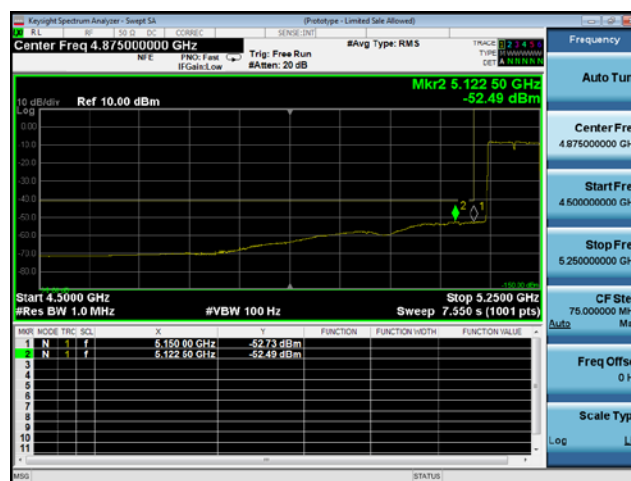
1-Nov-17 - 20-Mar-18

Test Result : PASS

Test Equipment

See Appendix C for list of test equipment

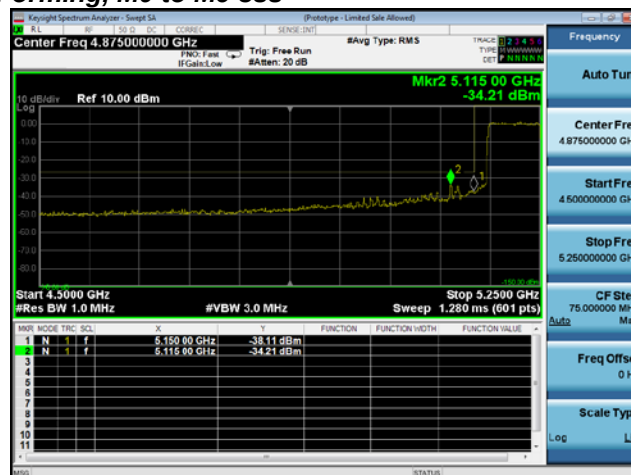
Frequency (MHz)	Mode	Tx Paths	Correlated Antenna Gain (dBi)	Tx 1 Bandedge Level (dBm)	Tx 2 Bandedge Level (dBm)	Tx 3 Bandedge Level (dBm)	Tx 4 Bandedge Level (dBm)	Total Tx Bandedge Level (dBm)	Limit (dBm)	Margin (dB)
5250	Non HT160, 6 to 54 Mbps	1	4	-46.7				-42.7	-41.45	1.3
	Non HT160, 6 to 54 Mbps	2	4	-49.4	-51.3			-43.2	-41.45	1.8
	Non HT160, 6 to 54 Mbps	3	4	-49.4	-51.3	-53.4		-42.3	-41.45	0.8
	Non HT160, 6 to 54 Mbps	4	4	-54.8	-52.0	-53.9	-54.3	-43.6	-41.45	2.1
	VHT160, M0 to M9 1ss	1	4	-49.7				-45.7	-41.45	4.3
	VHT160, M0 to M9 1ss	2	4	-49.7	-48.2			-41.9	-41.45	0.4
	VHT160, M0 to M9 2ss	2	4	-49.7	-48.2			-41.9	-41.45	0.4
	VHT160, M0 to M9 1ss	3	4	-51.4	-50.4	-51.0		-42.1	-41.45	0.7
	VHT160, M0 to M9 2ss	3	4	-51.4	-50.4	-51.0		-42.1	-41.45	0.7
	VHT160, M0 to M9 3ss	3	4	-51.4	-50.4	-51.0		-42.1	-41.45	0.7
	VHT160, M0 to M9 1ss	4	4	-53.5	-51.8	-53.0	-52.5	-42.6	-41.45	1.2
	VHT160, M0 to M9 2ss	4	4	-53.5	-51.8	-53.0	-52.5	-42.6	-41.45	1.2
	VHT160, M0 to M9 3ss	4	4	-53.5	-51.8	-53.0	-52.5	-42.6	-41.45	1.2
	VHT160 Beam Forming, M0 to M9 1ss	2	7	-53.5	-51.8			-42.6	-41.45	1.1
	VHT160 Beam Forming, M0 to M9 2ss	2	4	-49.7	-48.2			-41.9	-41.45	0.4
	VHT160 Beam Forming, M0 to M9 1ss	3	8	-56.2	-54.1	-55.5		-42.4	-41.45	1
	VHT160 Beam Forming, M0 to M9 2ss	3	5	-53.5	-51.8	-53.0		-42.9	-41.45	1.5
	VHT160 Beam Forming, M0 to M9 3ss	3	4	-51.4	-50.4	-51.0		-42.1	-41.45	0.7
	VHT160 Beam Forming, M0 to M9 1ss	4	10	-59.3	-57.7	-58.7	-58.5	-42.5	-41.45	1
	VHT160 Beam Forming, M0 to M9 2ss	4	7	-56.2	-54.1	-55.5	-55.7	-42.3	-41.45	0.8
	VHT160 Beam Forming, M0 to M9 3ss	4	5	-53.5	-51.8	-53.0	-52.5	-41.6	-41.45	0.2
	VHT160 STBC, M0 to M9 1ss	2	4	-49.7	-48.2			-41.9	-41.45	0.4
	VHT160 STBC, M0 to M9 1ss	3	4	-51.4	-50.4	-51.0		-42.1	-41.45	0.7
	VHT160 STBC, M0 to M9 1ss	4	4	-53.5	-51.8	-53.0	-52.5	-42.6	-41.45	1.2

Conducted Bandedge Average, 5250 MHz, VHT160 Beam Forming, M0 to M9 3ss**Antenna A****Antenna B****Antenna C****Antenna D**

Frequency (MHz)	Mode	Tx Paths	Correlated Antenna Gain (dBi)	Tx 1 Bandedge Level (dBm)	Tx 2 Bandedge Level (dBm)	Tx 3 Bandedge Level (dBm)	Tx 4 Bandedge Level (dBm)	Total Tx Bandedge Level (dBm)	Limit (dBm)	Margin (dB)
5250	Non HT160, 6 to 54 Mbps	1	4	-33.6				-29.6	-21.45	8.2
	Non HT160, 6 to 54 Mbps	2	4	-41.3	-38.2			-32.5	-21.45	11
	Non HT160, 6 to 54 Mbps	3	4	-41.3	-38.2	-38.1		-30.2	-21.45	8.7
	Non HT160, 6 to 54 Mbps	4	4	-40.6	-42.3	-43.7	-40.0	-31.4	-21.45	9.9
	VHT160, M0 to M9 1ss	1	4	-33.5				-29.5	-21.45	8.1
	VHT160, M0 to M9 1ss	2	4	-33.5	-34.9			-27.1	-21.45	5.7
	VHT160, M0 to M9 2ss	2	4	-33.5	-34.9			-27.1	-21.45	5.7
	VHT160, M0 to M9 1ss	3	4	-33.7	-33.2	-34.9		-25.1	-21.45	3.7
	VHT160, M0 to M9 2ss	3	4	-33.7	-33.2	-34.9		-25.1	-21.45	3.7
	VHT160, M0 to M9 3ss	3	4	-33.7	-33.2	-34.9		-25.1	-21.45	3.7
	VHT160, M0 to M9 1ss	4	4	-35.0	-34.2	-34.7	-34.2	-24.5	-21.45	3
	VHT160, M0 to M9 2ss	4	4	-35.0	-34.2	-34.7	-34.2	-24.5	-21.45	3
	VHT160, M0 to M9 3ss	4	4	-35.0	-34.2	-34.7	-34.2	-24.5	-21.45	3
	VHT160 Beam Forming, M0 to M9 1ss	2	7	-35.0	-34.2			-24.6	-21.45	3.1
	VHT160 Beam Forming, M0 to M9 2ss	2	4	-33.5	-34.9			-27.1	-21.45	5.7
	VHT160 Beam Forming, M0 to M9 1ss	3	8	-39.9	-38.9	-39.2		-26.5	-21.45	5.1
	VHT160 Beam Forming, M0 to M9 2ss	3	5	-35.0	-34.2	-34.7		-24.8	-21.45	3.4
	VHT160 Beam Forming, M0 to M9 3ss	3	4	-33.7	-33.2	-34.9		-25.1	-21.45	3.7
	VHT160 Beam Forming, M0 to M9 1ss	4	10	-43.8	-40.9	-40.8	-40.9	-25.4	-21.45	4
	VHT160 Beam Forming, M0 to M9 2ss	4	7	-39.9	-38.9	-39.2	-39.1	-26.2	-21.45	4.8
	VHT160 Beam Forming, M0 to M9 3ss	4	5	-35.0	-34.2	-34.7	-34.2	-23.5	-21.45	2
	VHT160 STBC, M0 to M9 1ss	2	4	-33.5	-34.9			-27.1	-21.45	5.7
	VHT160 STBC, M0 to M9 1ss	3	4	-33.7	-33.2	-34.9		-25.1	-21.45	3.7
	VHT160 STBC, M0 to M9 1ss	4	4	-35.0	-34.2	-34.7	-34.2	-24.5	-21.45	3

Conducted Bandedge Peak, 5250 MHz, VHT160 Beam Forming, M0 to M9 3ss

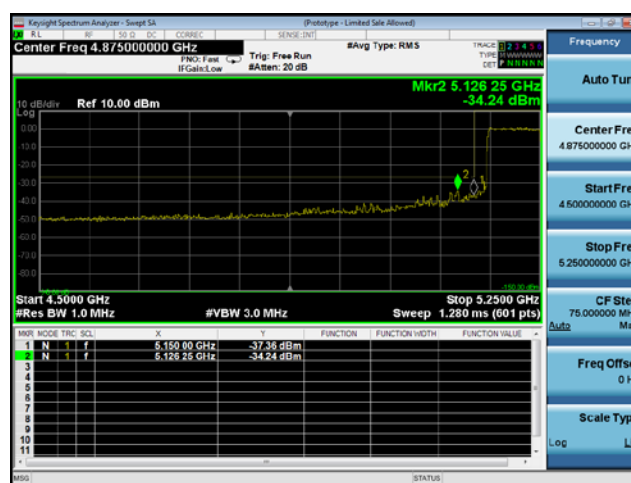
Antenna A



Antenna B



Antenna C



Antenna D

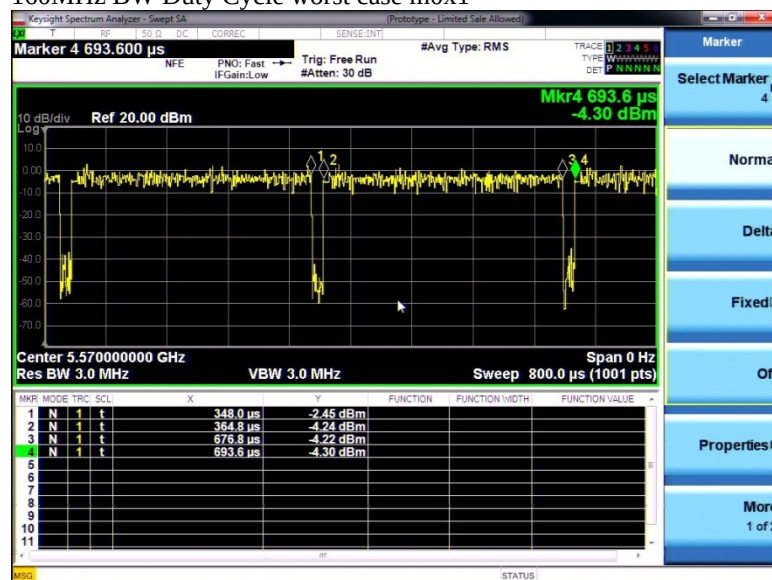
A.6 Duty Cycle

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%

160MHz BW Duty Cycle worst case m0x1



The Duty cycle of 160MHz BW is 95%, a 0.2dB CF is added to measurements.

Time ON = 676.8us – 364.8us = 311.8us

Period = 676.8us – 348us = 328.8us

Duty Cycle = Time ON / Period = 311.8/328.8us = 0.9482

Duty Cycle Correction factor = $10 \log (1/D) = 0.2\text{dB}$

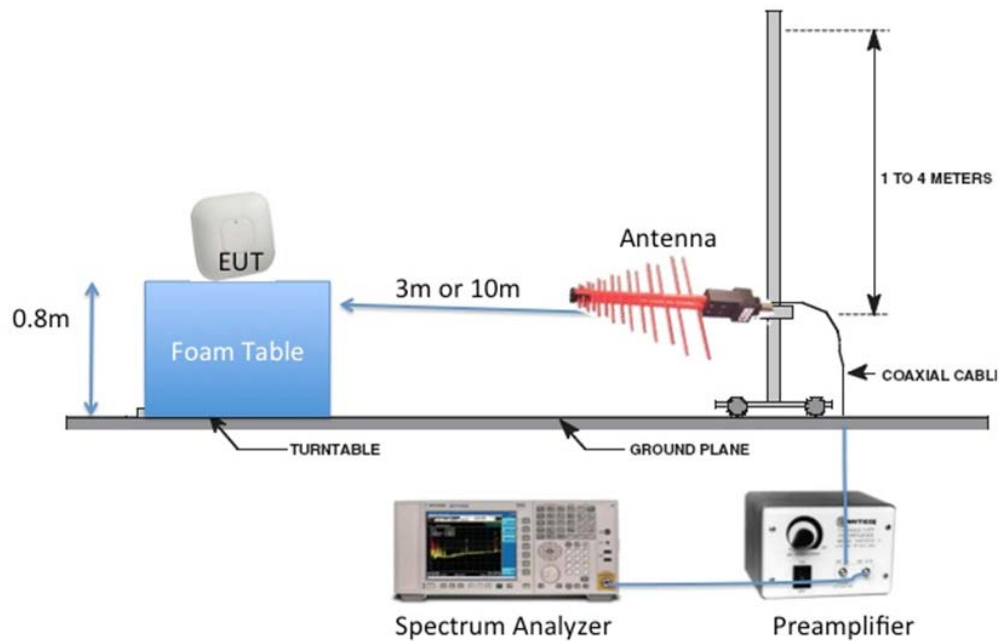
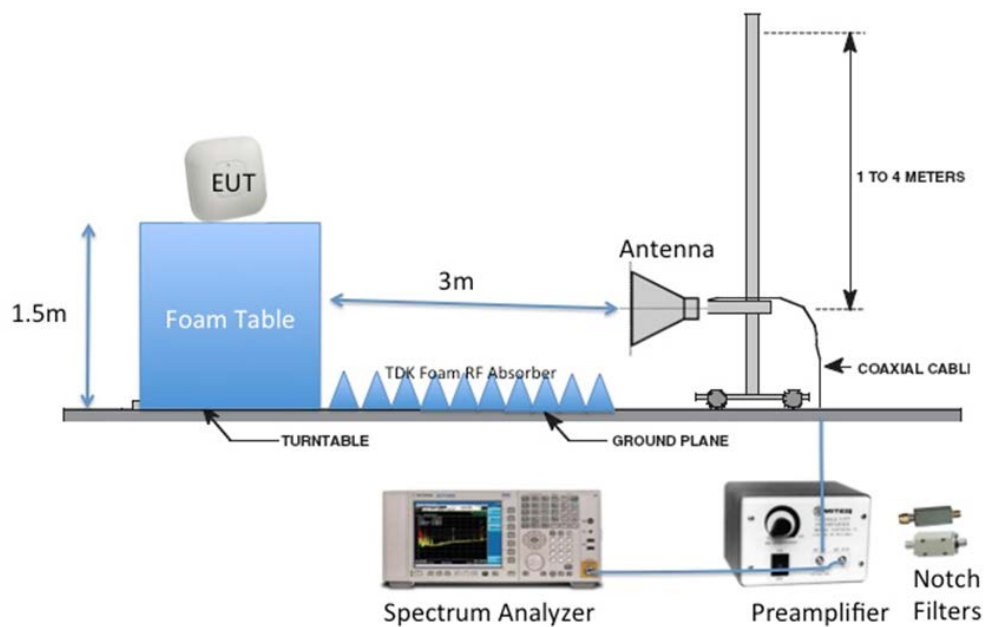


Title: Physical Test Arrangement Photograph

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

FCC 15.205 / 15.407, LP0002 (2018-01-10) (2.8) 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
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. The 20MHz Channel plan is worst case. There are no measurable emissions above 18 GHz.

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

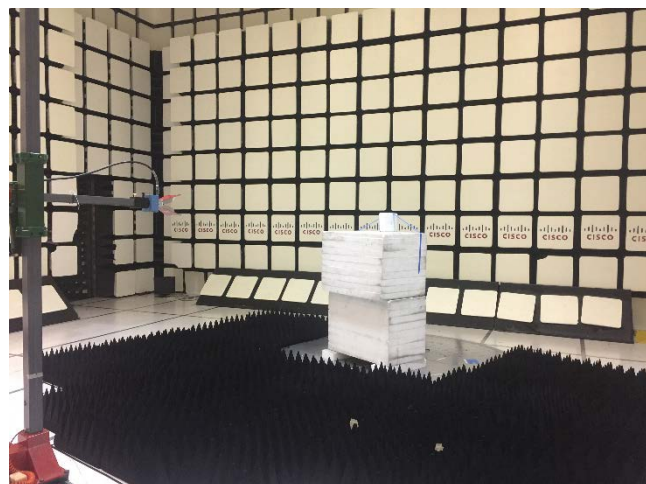
Tested By : Jose Aguirre	Date of testing: 10-Feb-18 - 16-Feb-18
Test Result : PASS	

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 (MHz)
5250	Non HT20, 6 to 54 Mbps	6	51.2	54.0	-2.8

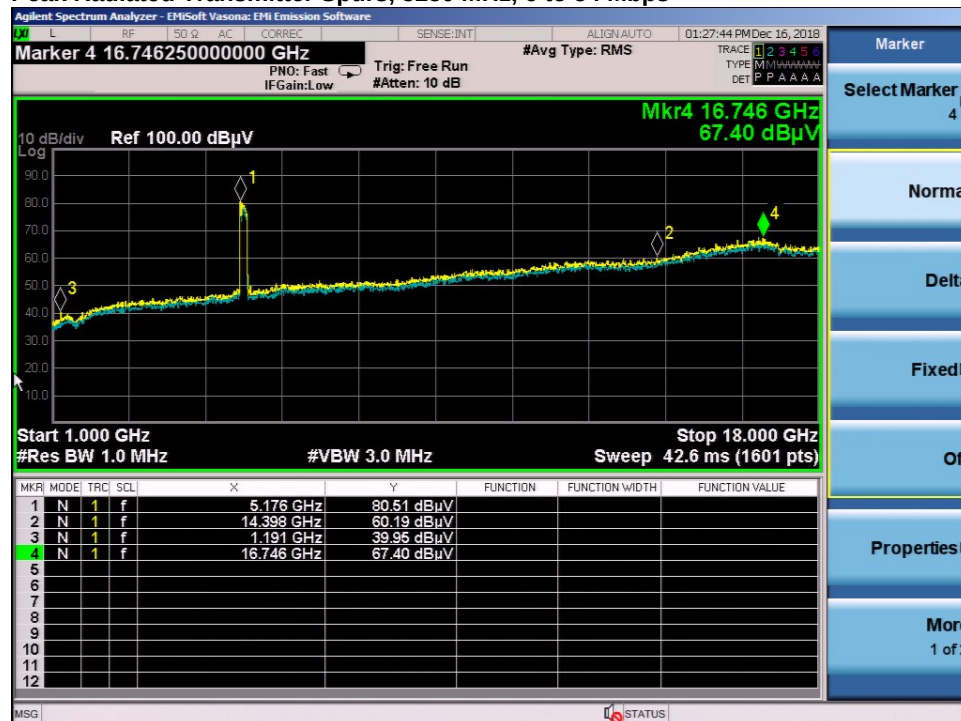
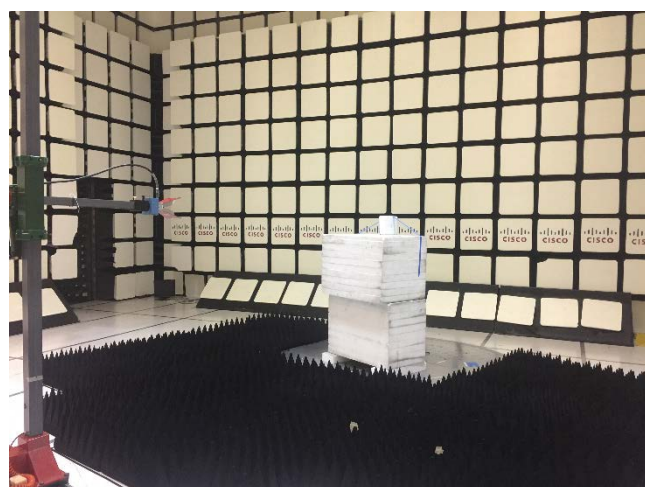
Average Radiated Transmitter Spurs, 5250 MHz, 6 to 54 Mbps



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 (MHz)
5250	Non HT20, 6 to 54 Mbps	6	67.4	74	-6.6

Peak Radiated Transmitter Spurs, 5250 MHz, 6 to 54 Mbps



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

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 17-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: Test Procedures

Measurements were made in accordance with

- KDB 789033 - D02 General UNII Test Procedures New Rules v02r01
- KDB 662911 - MIMO
- ANSI C63.4 2014 Unintentional Radiators
- ANSI C63.10 2013 Intentional Radiators

Test procedures are summarized below:

FCC 5GHz Test Procedures	EDCS # 1445048
FCC 5GHz RSE Test Procedures	EDCS # 1511600

Appendix F: 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:

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

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