



IW-6300H Series Access Point

2.4 GHz / 5 GHz 802.11 a/ac/b/g/n Wi-Fi radio

Cisco Industrial Wireless Hazardous Location Access Point

IW-6300H-AC-T-K9, IW-6300H-DC-T-K9, IW-6300H-DCW-T-K9, ESW-6300-CON-T-K9

FCC ID: LDKESW6300

IC ID: 2461D-ESW6300

5250-5350 MHz

Against the following Specifications:

47 CFR 15.407

47 CFR 15.209

47 CFR 15.205

RSS-247 issue 2

RSS-Gen issue 5

LP0002:2018



Cisco Systems

170 West Tasman Drive

San Jose, CA 95134

	
Author: Julian Land Tested By: Julian Land	Approved By: Adam Walb Title: MGR. IoT Compliance Revision: 1.0



This report replaces any previously entered test report under EDCS –**18731619**. This test report has been electronically authorized and archived using the CISCO Engineering Document Control system. Test Report Template EDCS# 11644123.



This test report has been electronically authorized and archived using the CISCO Engineering Document Control system.

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Section 1: Overview

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

Specifications:
CFR47 Part 15.407 RSS-247 LP0002:2018



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**

18-Nov-19 - 18-Nov-19

2.3 Report Issue Date

12/11/2019

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 (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

Julian Land



2.5 Equipment Assessed (EUT)

IW-6300H-DC-T-K9

2.6 EUT Description

The 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.

802.11a - Non HT20, Two Antennas, 6 to 54 Mbps, 1ss
802.11a - Non HT20 Beam Forming, Two Antennas, 6 to 54 Mbps, 1ss

802.11n/ac - HT/VHT20, One Antenna, M0 to M7, 1ss
802.11n/ac - HT/VHT20, Two Antennas, M0 to M7, 1ss
802.11n/ac - HT/VHT20, Two Antennas, M8 to M15, 2ss

802.11n/ac - HT/VHT20 Beam Forming, Two Antennas, M0 to M7, 1ss
802.11n/ac - HT/VHT20 Beam Forming, Two Antennas, M8 to M15, 2ss
802.11n/ac - HT/VHT20 STBC, Two Antennas, M0 to M7, 2ss

802.11a - Non HT40, One Antenna, 6 to 54 Mbps, 1ss
802.11a - Non HT40, Two Antennas, 6 to 54 Mbps, 1ss

802.11n/ac - HT/VHT40, One Antenna, M0 to M7, 1ss
802.11n/ac - HT/VHT40, Two Antennas, M0 to M7, 1ss
802.11n/ac - HT/VHT40, Two Antennas, M8 to M15, 2ss

802.11n/ac - HT/VHT40 Beam Forming, Two Antennas, M0 to M7, 1ss
802.11n/ac - HT/VHT40 Beam Forming, Two Antennas, M8 to M15, 2ss
802.11n/ac - HT/VHT40 STBC, Two Antennas, M0 to M7, 2ss

802.11a - Non HT80, One Antenna, 6 to 54 Mbps, 1ss
802.11a - Non HT80, Two Antennas, 6 to 54 Mbps, 1ss

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 2ss

802.11a - Non HT20, One Antenna, 6 to 54 Mbps, 1s



Model / PID Differences

IW-6300H-AC-x-K9, IW-6300H-DC-x-K9, IW-6300-DCW-x-K9 and ESW-6300-CON-x-K9, all have the same identical components, electronics circuitries, PCB layout and enclosure.

The only differences are listed as below:

IW-6300H-AC-x-K9
IW-6300H-DC-x-K9
IW-6300-DCW-x-K9
ESW-6300-CON-x-K9

Where “x” can be replaced with another letter to indicate country domain.

Domain letters: A, B, C, D, E, F, H, I, L, M, N, Q, R, S, T, Z

Where “AC” is Alternating Current (AC power supply)

Where “DC” is Direct Current (DC power supply), 54V native input

Where “DCW” is Direct Current; wide range 10-36VDC

Where “K9” is encryption software.

Note: Because the three models only differ in the way they are powered up, and the wireless features are exactly the same, only one set of data is collected and documented in this report. All the formal compliance testing was performed using IW6300H-DC-T-K9



The following antennas are tested by this product.

The data included in this report represent the worst case data for all antennas.

Frequency	Part Number	Antenna Type	Antenna Gain (dBi)	>30 degree 5 GHz Antenna Gain (dBi)
2.4/5 GHz	AIR-ANT2547V-N	Dual-band Omni	4 / 7	-6
	AIR-ANT2513P4M-N	Dual-band Polarization Diverse Patch Array	13 / 13	-5

**Section 3: Result Summary****3.1 Results Summary Table**

LP0002:2018			
Standard Section	Test Item	Judgment	Remark
4.7.3.4(2)	26 dB Emissions Bandwidth	PASS	None
4.7.3.1	Peak Transmit Power	PASS	None
4.7.3.1	Peak Power Spectral Density	PASS	None
4.7.4.5/2.3	AC Power Line Emissions	PASS	None
4.7.4/2.8	Radiated Emissions	PASS	None
4.7.4/2.8	Band Edge	PASS	None



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	IW-6300H-DC-T-K9	Cisco Systems, Inc.	11	9.1.8.1	9.0.5.5-W8964	FOC23241G16
S02	FSP150-AWAN3	FSP Group Inc.	-	-	-	H00000063

4.2 System Details

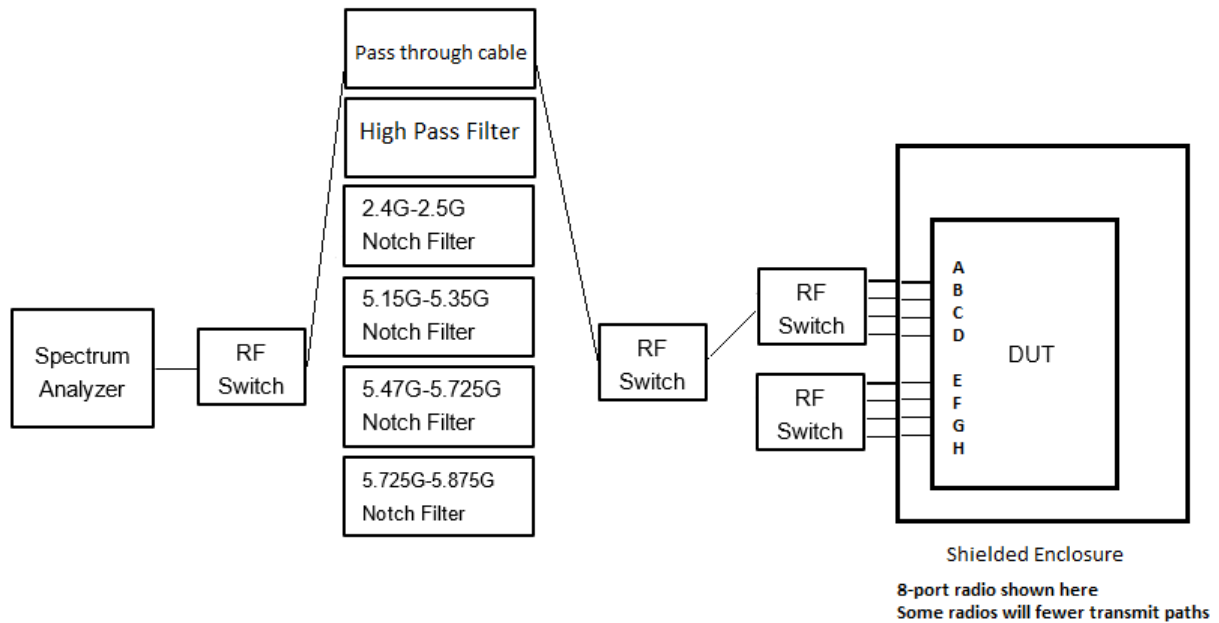
System #	Description	Samples
1	EUT and Power Supply	S01, S02

4.3 Mode of Operation Details

Mode#	Description	Comments
1	Continuous Transmitting	Continuous Transmitting $\geq 98\%$ 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.

Antenna Gain: 7dBi		Maximum Channel Power (dBm)			
Operating Mode		Frequency (MHz)			
		5260	5300	5320	
Non HT20, 6 to 54 Mbps		20	20	20	
Non HT20 Beam Forming, 6 to 54 Mbps		14	15	14	
HT/VHT20, M0 to M15		20	20	20	
HT/VHT20 Beam Forming, M0 to M15		19	19	18	
HT/VHT20 STBC, M0 to M7		19	19	18	
		5270	5310		
Non HT40, 6 to 54 Mbps		21	17		
HT/VHT40, M0 to M15		21	18		
HT/VHT40 Beam Forming, M0 to M15		19	18		
HT/VHT40 STBC, M0 to M7		19	18		
		5290			
Non HT80, 6 to 54 Mbps		14			
VHT80, M0 to M9, M0 to M9 1-2ss		17			
VHT80 Beam Forming, M0 to M9, M0 to M9 1-2ss		17			
VHT80 STBC, M0 to M9 1ss		17			
Antenna Gain: 13dBi		Maximum Channel Power (dBm)			
Operating Mode		Frequency (MHz)			
		5260	5300	5320	
Non HT20, 6 to 54 Mbps		13	13	12	
Non HT20 Beam Forming, 6 to 54 Mbps		13	12	12	
HT/VHT20, M0 to M15		13	13	12	
HT/VHT20 Beam Forming, M0 to M15		12	12	11	
HT/VHT20 STBC, M0 to M7		12	12	11	
		5270	5310		
Non HT40, 6 to 54 Mbps		12	10		
HT/VHT40, M0 to M15		13	12		
HT/VHT40 Beam Forming, M0 to M15		12	11		
HT/VHT40 STBC, M0 to M7		12	11		
		5290			
Non HT80, 6 to 54 Mbps		10			
VHT80, M0 to M9, M0 to M9 1-2ss		12			
VHT80 Beam Forming, M0 to M9, M0 to M9 1-2ss		12			
VHT80 STBC, M0 to M9 1ss		12			



A.1 Duty Cycle

Duty Cycle Test Requirement

From KDB 789033 D02 General UNII Test Procedures New Rules v02r01

B. Duty Cycle (x), Transmission Duration (T), and Maximum Power Control Level

1. All measurements are to be performed with the EUT transmitting at 100 percent duty cycle at its maximum power control level; however, if 100 percent duty cycle cannot be achieved, measurements of duty cycle, x, and maximum-power transmission duration, T, are required for each tested mode of operation.

Duty Cycle Test Method

From KDB 789033 D02 General UNII Test Procedures New Rules v02r01:

B. Duty Cycle (x), Transmission Duration (T), and Maximum Power Control Level

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. Set the center frequency of the instrument to the center frequency of the transmission. Set $RBW \geq EBW$ if possible; otherwise, set RBW to the largest available value. Set $VBW \geq RBW$. Set detector = peak or average. The zero-span measurement method shall not be used unless both RBW and VBW are $> 50/T$, where T is defined in section II.B.1.a), and the number of sweep points across duration T exceeds 100. (For example, if VBW and/or RBW are limited to 3 MHz, then the zero-span method of measuring duty cycle shall not be used if $T \leq 16.7$ microseconds.)

Duty Cycle Test Information

Tested By: Julian Land	Date of testing: 18-Nov-19 - 18-Nov-19
Test Result: PASS	

Test Equipment

See Appendix B for list of test equipment

Samples, Systems, and Modes

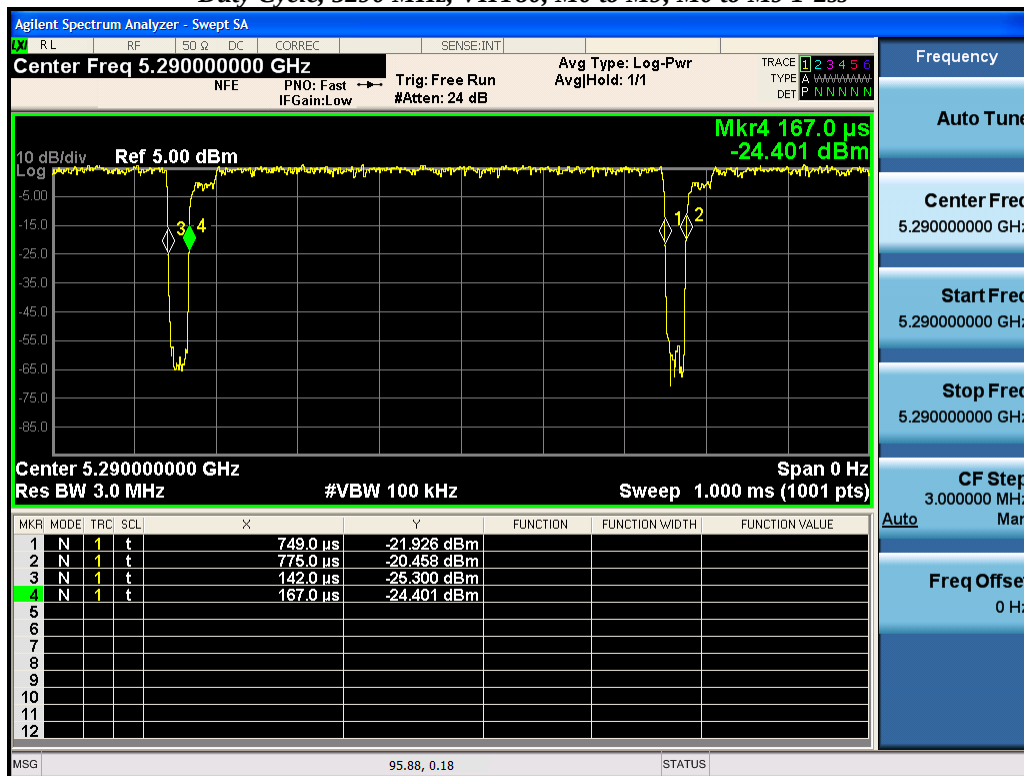
System Number	Description	Samples	System under test	Support equipment
1	EUT	S01	☒	☐
	Support	S02	☐	☒

Duty Cycle Data Table



Duty Cycle table and screen captures are shown below for power/psd modes.

Frequency	Mode	Data Rate	Duty Cycle correction (dB)
5260	Non HT20, 6 to 54 Mbps	6	0.0
	HT/VHT20, M0 to M15	m0	0.0
5270	Non HT40, 6 to 54 Mbps	6	0.0
	HT/VHT40, M0 to M15	m0	0.1
5290	Non HT80, 6 to 54 Mbps	6	0.0
	VHT80, M0 to M9, M0 to M9 1-2ss	m0x1	0.2
5300	Non HT20, 6 to 54 Mbps	6	0.0
	HT/VHT20, M0 to M15	m0	0.0
5310	Non HT40, 6 to 54 Mbps	6	0.0
	HT/VHT40, M0 to M15	m0	0.1
5320	Non HT20, 6 to 54 Mbps	6	0.0
	HT/VHT20, M0 to M15	m0	0.0

**Duty Cycle, 5290 MHz, VHT80, M0 to M9, M0 to M9 1-2ss**



A.2 99% and 26dB Bandwidth

99% and 26dB Bandwidth Test Requirement

There is no requirement for the value of bandwidth.

However, the 26dB BW (EBW) is used to calculate the power limits in 15.407 (a) (2), LP0002:4.7.2.3. 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).

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

Section D. 99 Percent Occupied Bandwidth

ANSI C63.10: 2013

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 D02 General UNII Test Procedures New Rules v02r01

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: Julian Land	Date of testing: 18-Nov-19 - 18-Nov-19
Test Result: PASS	

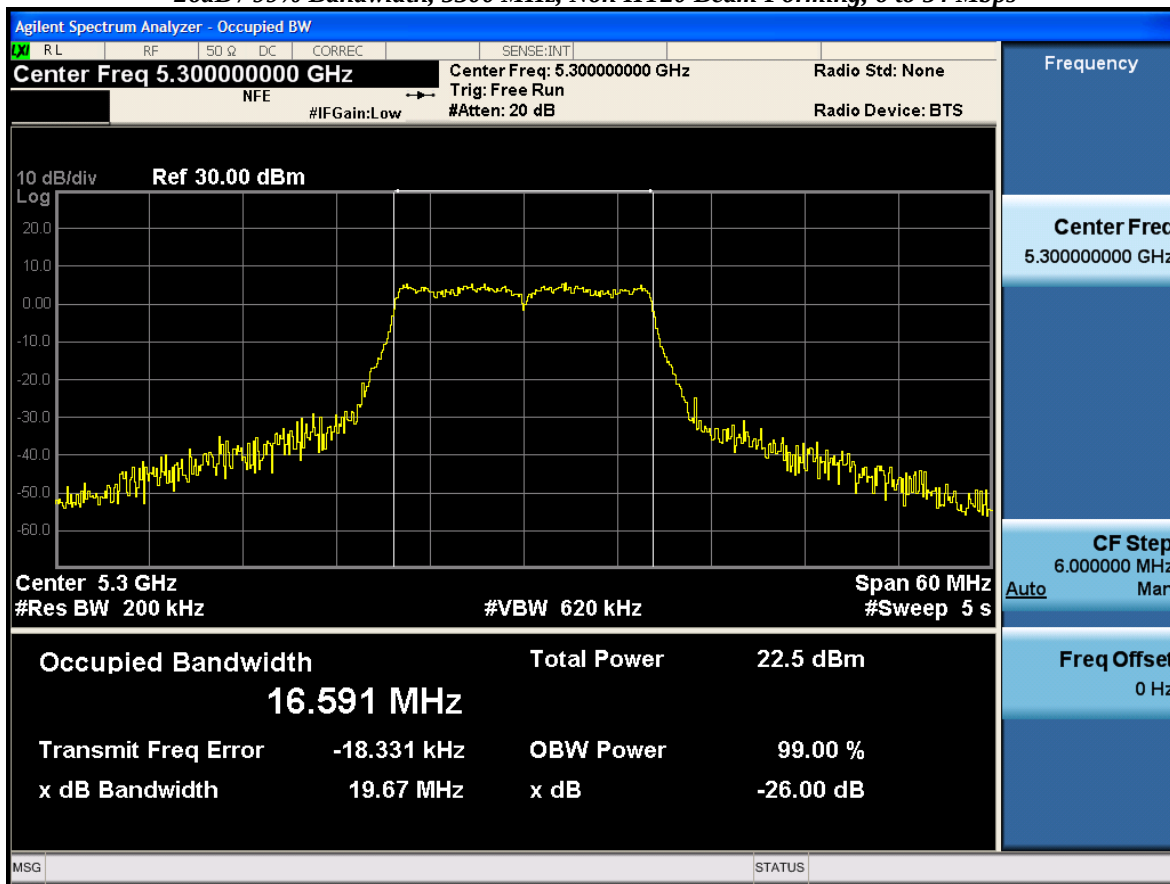
Test Equipment

See Appendix B for list of test equipment



99% and 26dB Bandwidth

Frequency (MHz)	Mode	Data Rate (Mbps)	26dB BW (MHz)	99% BW (MHz)
5260	Non HT20, 6 to 54 Mbps	6	19.7	16.599
	HT/VHT20, M0 to M15	m0	20.1	17.644
5270	Non HT40, 6 to 54 Mbps	6	42.2	36.403
	HT/VHT40, M0 to M15	m0	40.9	36.236
5290	Non HT80, 6 to 54 Mbps	6	83.6	76.383
	VHT80, M0 to M9, M0 to M9 1-2ss	m0x1	82.1	76.400
5300	Non HT20, 6 to 54 Mbps	6	19.7	16.591
	HT/VHT20, M0 to M15	m0	20.1	17.639
5310	Non HT40, 6 to 54 Mbps	6	41.0	36.401
	HT/VHT40, M0 to M15	m0	40.8	36.196
5320	Non HT20, 6 to 54 Mbps	6	19.7	16.591
	HT/VHT20, M0 to M15	m0	20.1	17.644

**26dB / 99% Bandwidth, 5300 MHz, Non HT20 Beam Forming, 6 to 54 Mbps**



A.3 Maximum Conducted Output Power

Maximum Conducted Output Power Test Requirement

15.407 (2), LP0002:4.7.3.2 (1)(3) For the 5.25-5.35 GHz and 5.47-5.725 GHz bands, the maximum conducted output power over the frequency bands of operation shall not exceed the lesser of 250 mW or $11 \text{ dBm} + 10 \log B$, where B is the 26 dB emission bandwidth in megahertz. ... 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.

15.407 (5) The maximum power spectral density is measured as a conducted emission by direct connection of a calibrated test instrument to the equipment under test. If the device cannot be connected directly, alternative techniques acceptable to the Commission may be used. Measurements in the 5.15-5.25 GHz, 5.25-5.35 GHz, and the 5.47-5.725 GHz bands are made over a bandwidth of 1 MHz or the 26-dB emission bandwidth of the device, whichever is less. A narrower resolution bandwidth can be used, provided that the measured power is integrated over the full reference bandwidth.

Referencing “644545 D03 Guidance for IEEE 802.11ac v01”, covering signals that cross the boundary between two adjacent UNII bands, the FCC describes a procedure to measure EBW, power, and PSD in each UNII band. For the case of a 160MHz signal equally distributed between UNII-1 and UNII-2a, we apply the following alternate procedure.

Rather than measure:

- The half of the signal in UNII-1, measured against the 30dBm power / 17dBm/MHz PSD limits
- The half of the signal in UNII-2a, measured against the 24dBm power / 11dBm/MHz PSD limits

If a 160MHz signal (equally distributed between the two bands) produces a total power of 27dBm across the entire 160 MHz EBW, the total power in each band would be half of the total, or 24dBm (which meets both the UNII-1 and UNII-2a limits), and would have a PSD no greater than 11dBm/MHz in either sub-band.

Given these facts, we have measured the complete 160 MHz EBW (across both sub-bands) against 27dBm power and 11dBm/MHz PSD limits, rather than individual sub band measurements against the individual sub band limits.”

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:

Julian Land

Date of testing:

18-Nov-19 - 18-Nov-19

Test Result: PASS**Test Equipment**

See Appendix B for list of test equipment



Maximum Output Power

Antenna Gain: 7dBi									
Frequency (MHz)	Mode	Tx Paths	Correlated Antenna Gain (dBi)	Tx 1 Max Power (dBm)	Tx 2 Max Power (dBm)	Duty Cycle Correction (dB)	Total Tx Channel Power (dBm)	Limit (dBm)	Margin (dB)
5260	Non HT20, 6 to 54 Mbps	1	7	20.1		0.0	20.1	22.94	2.81
	Non HT20, 6 to 54 Mbps	2	7	14.1	14.3	0.0	17.2	22.94	5.70
	Non HT20 Beam Forming, 6 to 54 Mbps	2	10	14.1	14.3	0.0	17.2	19.94	2.70
	HT/VHT20, M0 to M7	1	7	20.5		0.0	20.5	23.0	2.46
	HT/VHT20, M0 to M7	2	7	13.5	13.7	0.0	16.7	23.0	6.34
	HT/VHT20, M8 to M15	2	7	16.7	17.2	0.0	20.0	23.0	2.99
	HT/VHT20 Beam Forming, M0 to M7	2	10	13.5	13.7	0.0	16.7	20.0	3.34
	HT/VHT20 Beam Forming, M8 to M15	2	7	16.7	17.2	0.0	20.0	23.0	2.99
	HT/VHT20 STBC, M0 to M7	2	7	16.7	17.2	0.0	20.0	23.0	2.99
5270	Non HT40, 6 to 54 Mbps	1	7	21.6		0.0	21.6	23.0	1.37
	Non HT40, 6 to 54 Mbps	2	7	15.9	15.7	0.0	18.8	23.0	4.15
	HT/VHT40, M0 to M7	1	7	22.2		0.1	22.3	23.0	0.75
	HT/VHT40, M0 to M7	2	7	17.1	17.4	0.1	20.3	23.0	2.68
	HT/VHT40, M8 to M15	2	7	17.1	17.4	0.1	20.3	23.0	2.68
	HT/VHT40 Beam Forming, M0 to M7	2	10	14.0	13.9	0.1	17.0	20.0	2.99
	HT/VHT40 Beam Forming, M8 to M15	2	7	17.1	17.4	0.1	20.3	23.0	2.68
	HT/VHT40 STBC, M0 to M7	2	7	17.1	17.4	0.1	20.3	23.0	2.68
5290	Non HT80, 6 to 54 Mbps	1	7	14.1		0.0	14.1	23.0	8.86
	Non HT80, 6 to 54 Mbps	2	7	12.5	11.0	0.0	14.9	23.0	8.14
	VHT80, M0 to M9 1ss	1	7	13.9		0.2	14.1	23.0	8.92
	VHT80, M0 to M9 1ss	2	7	12.9	12.7	0.2	16.0	23.0	7.01
	VHT80, M0 to M9 2ss	2	7	12.9	12.7	0.2	16.0	23.0	7.01
	VHT80 Beam Forming, M0 to M9 1ss	2	10	10.8	10.5	0.2	13.8	20.0	6.15
	VHT80 Beam Forming, M0 to M9 2ss	2	7	12.9	12.7	0.2	16.0	23.0	7.01
	VHT80 STBC, M0 to M9 1ss	2	7	12.9	12.7	0.2	16.0	23.0	7.01
30	Non HT20, 6 to 54 Mbps	1	7	19.8		0.0	19.8	22.94	3.11



	Non HT20, 6 to 54 Mbps	2	7	14.2	13.4	0.0	16.9	22.94	6.08
	Non HT20 Beam Forming, 6 to 54 Mbps	2	10	14.2	13.4	0.0	16.9	19.94	3.08
	HT/VHT20, M0 to M7	1	7	20.0		0.0	20.0	23.0	2.96
	HT/VHT20, M0 to M7	2	7	14.4	13.6	0.0	17.1	23.0	5.93
	HT/VHT20, M8 to M15	2	7	17.5	17.0	0.0	20.3	23.0	2.69
	HT/VHT20 Beam Forming, M0 to M7	2	10	14.4	13.6	0.0	17.1	20.0	2.93
	HT/VHT20 Beam Forming, M8 to M15	2	7	17.5	17.0	0.0	20.3	23.0	2.69
	HT/VHT20 STBC, M0 to M7	2	7	17.5	17.0	0.0	20.3	23.0	2.69
5310	Non HT40, 6 to 54 Mbps	1	7	17.6		0.0	17.6	23.0	5.37
	Non HT40, 6 to 54 Mbps	2	7	15.7	15.0	0.0	18.4	23.0	4.59
	HT/VHT40, M0 to M7	1	7	15.5		0.1	15.6	23.0	7.45
	HT/VHT40, M0 to M7	2	7	15.5	14.8	0.1	18.2	23.0	4.77
	HT/VHT40, M8 to M15	2	7	15.5	14.8	0.1	18.2	23.0	4.77
	HT/VHT40 Beam Forming, M0 to M7	2	10	13.4	12.9	0.1	16.2	20.0	3.78
	HT/VHT40 Beam Forming, M8 to M15	2	7	15.5	14.8	0.1	18.2	23.0	4.77
	HT/VHT40 STBC, M0 to M7	2	7	15.5	14.8	0.1	18.2	23.0	4.77
5320	Non HT20, 6 to 54 Mbps	1	7	19.9		0.0	19.9	22.94	3.01
	Non HT20, 6 to 54 Mbps	2	7	14.5	13.4	0.0	17.0	22.94	5.91
	Non HT20 Beam Forming, 6 to 54 Mbps	2	10	13.4	12.6	0.0	16.1	19.94	3.88
	HT/VHT20, M0 to M7	1	7	20.0		0.0	20.0	23.0	2.96
	HT/VHT20, M0 to M7	2	7	14.7	13.7	0.0	17.3	23.0	5.72
	HT/VHT20, M8 to M15	2	7	17.6	17.0	0.0	20.4	23.0	2.64
	HT/VHT20 Beam Forming, M0 to M7	2	10	13.7	12.8	0.0	16.3	20.0	3.67
	HT/VHT20 Beam Forming, M8 to M15	2	7	17.6	17.0	0.0	20.4	23.0	2.64
	HT/VHT20 STBC, M0 to M7	2	7	17.6	17.0	0.0	20.4	23.0	2.64



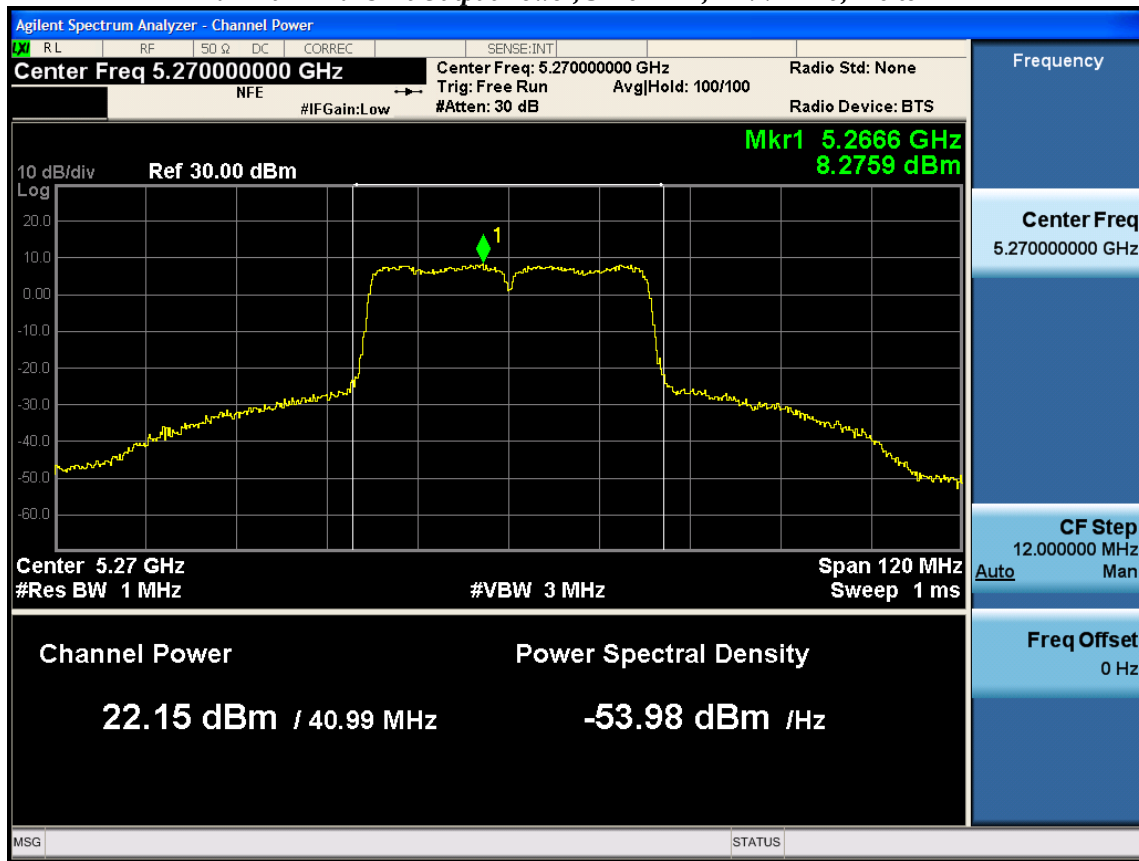
Antenna Gain: 13dBi									
Frequency (MHz)	Mode	Tx Paths	Correlated Antenna Gain (dBi)	Tx 1 Max Power (dBm)	Tx 2 Max Power (dBm)	Duty Cycle Correction (dB)	Total Tx Channel Power (dBm)	Limit (dBm)	Margin (dB)
5260	Non HT20, 6 to 54 Mbps	1	13	14.1		0.0	14.1	16.94	2.81
	Non HT20, 6 to 54 Mbps	2	13	8.1	8.3	0.0	11.2	16.94	5.70
	Non HT20 Beam Forming, 6 to 54 Mbps	2	16	8.1	8.3	0.0	11.2	13.94	2.70
	HT/VHT20, M0 to M7	1	13	14.6		0.0	14.6	17.0	2.36
	HT/VHT20, M0 to M7	2	13	8.5	8.6	0.0	11.6	17.0	5.40
	HT/VHT20, M8 to M15	2	13	11.6	11.7	0.0	14.7	17.0	2.30
	HT/VHT20 Beam Forming, M0 to M7	2	16	8.5	8.6	0.0	11.6	14.0	2.40
	HT/VHT20 Beam Forming, M8 to M15	2	13	11.6	11.7	0.0	14.7	17.0	2.30
	HT/VHT20 STBC, M0 to M7	2	13	11.6	11.7	0.0	14.7	17.0	2.30
5270	Non HT40, 6 to 54 Mbps	1	13	15.9		0.0	15.9	17.0	1.07
	Non HT40, 6 to 54 Mbps	2	13	10.1	9.8	0.0	13.0	17.0	4.00
	HT/VHT40, M0 to M7	1	13	16.1		0.1	16.2	17.0	0.85
	HT/VHT40, M0 to M7	2	13	11.0	10.7	0.1	13.9	17.0	3.08
	HT/VHT40, M8 to M15	2	13	12.2	11.9	0.1	15.1	17.0	1.88
	HT/VHT40 Beam Forming, M0 to M7	2	16	8.1	8.0	0.1	11.1	14.0	2.89
	HT/VHT40 Beam Forming, M8 to M15	2	13	12.2	11.9	0.1	15.1	17.0	1.88
	HT/VHT40 STBC, M0 to M7	2	13	12.2	11.9	0.1	15.1	17.0	1.88
5290	Non HT80, 6 to 54 Mbps	1	13	10.3		0.0	10.3	17.0	6.66
	Non HT80, 6 to 54 Mbps	2	13	6.1	5.9	0.0	9.1	17.0	7.95
	VHT80, M0 to M9 1ss	1	13	10.8		0.2	11.0	17.0	6.02
	VHT80, M0 to M9 1ss	2	13	8.9	8.6	0.2	11.9	17.0	5.05
	VHT80, M0 to M9 2ss	2	13	8.9	8.6	0.2	11.9	17.0	5.05
	VHT80 Beam Forming, M0 to M9 1ss	2	16	5.5	5.3	0.2	8.6	14.0	5.41
	VHT80 Beam Forming, M0 to M9 2ss	2	13	8.9	8.6	0.2	11.9	17.0	5.05
	VHT80 STBC, M0 to M9 1ss	2	13	8.9	8.6	0.2	11.9	17.0	5.05
30	Non HT20, 6 to 54 Mbps	1	13	14.2		0.0	14.2	16.94	2.71



	Non HT20, 6 to 54 Mbps	2	13	8.6	7.5	0.0	11.1	16.94	5.81
	Non HT20 Beam Forming, 6 to 54 Mbps	2	16	6.9	6.1	0.0	9.6	13.94	4.38
	HT/VHT20, M0 to M7	1	13	14.4		0.0	14.4	17.0	2.56
	HT/VHT20, M0 to M7	2	13	8.8	7.7	0.0	11.3	17.0	5.66
	HT/VHT20, M8 to M15	2	13	11.5	10.4	0.0	14.0	17.0	2.96
	HT/VHT20 Beam Forming, M0 to M7	2	16	7.0	6.2	0.0	9.7	14.0	4.33
	HT/VHT20 Beam Forming, M8 to M15	2	13	11.5	10.4	0.0	14.0	17.0	2.96
	HT/VHT20 STBC, M0 to M7	2	13	11.5	10.4	0.0	14.0	17.0	2.96
5310	Non HT40, 6 to 54 Mbps	1	13	13.9		0.0	13.9	17.0	3.07
	Non HT40, 6 to 54 Mbps	2	13	9.9	9.2	0.0	12.6	17.0	4.39
	HT/VHT40, M0 to M7	1	13	12.5		0.1	12.6	17.0	4.45
	HT/VHT40, M0 to M7	2	13	11.4	10.8	0.1	14.2	17.0	2.83
	HT/VHT40, M8 to M15	2	13	11.4	10.8	0.1	14.2	17.0	2.83
	HT/VHT40 Beam Forming, M0 to M7	2	16	7.1	6.7	0.1	10.0	14.0	4.03
	HT/VHT40 Beam Forming, M8 to M15	2	13	11.4	10.8	0.1	14.2	17.0	2.83
	HT/VHT40 STBC, M0 to M7	2	13	11.4	10.8	0.1	14.2	17.0	2.83
5320	Non HT20, 6 to 54 Mbps	1	13	14.5		0.0	14.5	16.94	2.41
	Non HT20, 6 to 54 Mbps	2	13	8.6	7.6	0.0	11.2	16.94	5.77
	Non HT20 Beam Forming, 6 to 54 Mbps	2	16	7.0	6.2	0.0	9.7	13.94	4.28
	HT/VHT20, M0 to M7	1	13	13.7		0.0	13.7	17.0	3.26
	HT/VHT20, M0 to M7	2	13	8.8	7.8	0.0	11.4	17.0	5.62
	HT/VHT20, M8 to M15	2	13	11.6	10.6	0.0	14.2	17.0	2.82
	HT/VHT20 Beam Forming, M0 to M7	2	16	7.2	6.4	0.0	9.9	14.0	4.13
	HT/VHT20 Beam Forming, M8 to M15	2	13	11.6	10.6	0.0	14.2	17.0	2.82
	HT/VHT20 STBC, M0 to M7	2	13	11.6	10.6	0.0	14.2	17.0	2.82



Antenna Gain: 7dBi
Maximum Transmit Output Power, 5270 MHz, HT/VHT40, M0 to M7



Antenna A

Maximum Transmit Output Power, 5270 MHz, HT/VHT40, M0 to M7





A.4 Power Spectral Density

Power Spectral Density Test Requirement

15.407 (2), LP0002:4.7.3.2 (2)(3) For the 5.25-5.35 GHz and 5.47-5.725 GHz bands, the maximum conducted output power over the frequency bands of operation shall not exceed the lesser of 250 mW or 11 dBm + 10 log B, where B is the 26-dB emission bandwidth in megahertz. 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.

15.407 (5) The maximum power spectral density is measured as a conducted emission by direct connection of a calibrated test instrument to the equipment under test. If the device cannot be connected directly, alternative techniques acceptable to the Commission may be used. Measurements in the 5.15-5.25 GHz, 5.25-5.35 GHz, and the 5.47-5.725 GHz bands are made over a bandwidth of 1 MHz or the 26-dB emission bandwidth of the device, whichever is less. A narrower resolution bandwidth can be used, provided that the measured power is integrated over the full reference bandwidth.

Referencing “644545 D03 Guidance for IEEE 802.11ac v01”, covering signals that cross the boundary between two adjacent UNII bands, the FCC describes a procedure to measure EBW, power, and PSD in each UNII band. For the case of a 160MHz signal equally distributed between UNII-1 and UNII-2a, we apply the following alternate procedure.

Rather than measure:

- The half of the signal in UNII-1, measured against the 30dBm power / 17dBm/MHz PSD limits
- The half of the signal in UNII-2a, measured against the 24dBm power / 11dBm/MHz PSD limits

If a 160MHz signal (equally distributed between the two bands) produces a total power of 27dBm across the entire 160 MHz EBW, the total power in each band would be half of the total, or 24dBm (which meets both the UNII-1 and UNII-2a limits), and would have a PSD no greater than 11dBm/MHz in either sub-band.

Given these facts, we have measured the complete 160 MHz EBW (across both sub-bands) against 27dBm power and 11dBm/MHz PSD limits, rather than individual sub band measurements against the individual sub band limits.”

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 require “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 logs(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 $\geq$ 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)

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. (See 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: Julian Land	Date of testing: 18-Nov-19 - 18-Nov-19
Test Result: PASS	

Test Equipment

See Appendix B for list of test equipment



Power Spectral Density

Antenna Gain: 7dBi									
Frequency (MHz)	Mode	Tx Paths	Correlated Antenna Gain (dBi)	Tx 1 PSD (dBm/MHz)	Tx 2 PSD (dBm/MHz)	Duty Cycle Correction (dB)	Total PSD (dBm/MHz)	Limit (dBm/MHz)	Margin (dB)
5260	Non HT20, 6 to 54 Mbps	1	7	9.7		0.0	9.7	10.0	0.27
	Non HT20, 6 to 54 Mbps	2	10	3.3	3.6	0.0	6.5	7.0	0.50
	Non HT20 Beam Forming, 6 to 54 Mbps	2	10	3.3	3.6	0.0	6.5	7.0	0.50
	HT/VHT20, M0 to M7	1	7	9.9		0.0	9.9	10.0	0.06
	HT/VHT20, M0 to M7	2	10	2.6	2.8	0.0	5.8	7.0	1.24
	HT/VHT20, M8 to M15	2	7	6.1	6.0	0.0	9.1	10.0	0.90
	HT/VHT20 Beam Forming, M0 to M7	2	10	2.6	2.8	0.0	5.8	7.0	1.24
	HT/VHT20 Beam Forming, M8 to M15	2	7	6.1	6.0	0.0	9.1	10.0	0.90
	HT/VHT20 STBC, M0 to M7	2	7	6.1	6.0	0.0	9.1	10.0	0.90
5270	Non HT40, 6 to 54 Mbps	1	7	8.2		0.0	8.2	10.0	1.77
	Non HT40, 6 to 54 Mbps	2	10	2.4	2.2	0.0	5.3	7.0	1.65
	HT/VHT40, M0 to M7	1	7	8.3		0.1	8.4	10.0	1.65
	HT/VHT40, M0 to M7	2	10	3.0	3.6	0.1	6.4	7.0	0.63
	HT/VHT40, M8 to M15	2	7	3.0	3.6	0.1	6.4	10.0	3.63
	HT/VHT40 Beam Forming, M0 to M7	2	10	0.4	0.0	0.1	3.3	7.0	3.73
	HT/VHT40 Beam Forming, M8 to M15	2	7	3.0	3.6	0.1	6.4	10.0	3.63
	HT/VHT40 STBC, M0 to M7	2	7	3.0	3.6	0.1	6.4	10.0	3.63
5290	Non HT80, 6 to 54 Mbps	1	7	-2.6		0.0	-2.6	10.0	12.56
	Non HT80, 6 to 54 Mbps	2	10	-4.1	-5.5	0.0	-1.7	7.0	8.69
	VHT80, M0 to M9 1ss	1	7	-3.2		0.2	-3.0	10.0	13.02
	VHT80, M0 to M9 1ss	2	10	-4.0	-4.2	0.2	-0.9	7.0	7.91
	VHT80, M0 to M9 2ss	2	7	-4.0	-4.2	0.2	-0.9	10.0	10.91
	VHT80 Beam Forming, M0 to M9 1ss	2	10	-6.5	-6.0	0.2	-3.0	7.0	10.05
	VHT80 Beam Forming, M0 to M9 2ss	2	7	-4.0	-4.2	0.2	-0.9	10.0	10.91
	VHT80 STBC, M0 to M9 1ss	2	7	-4.0	-4.2	0.2	-0.9	10.0	10.91



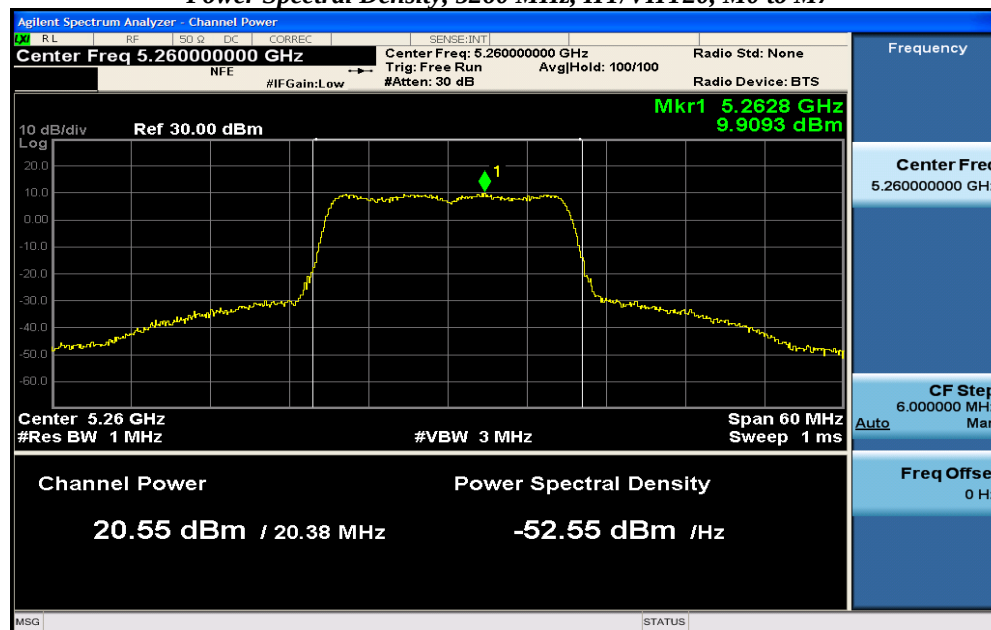
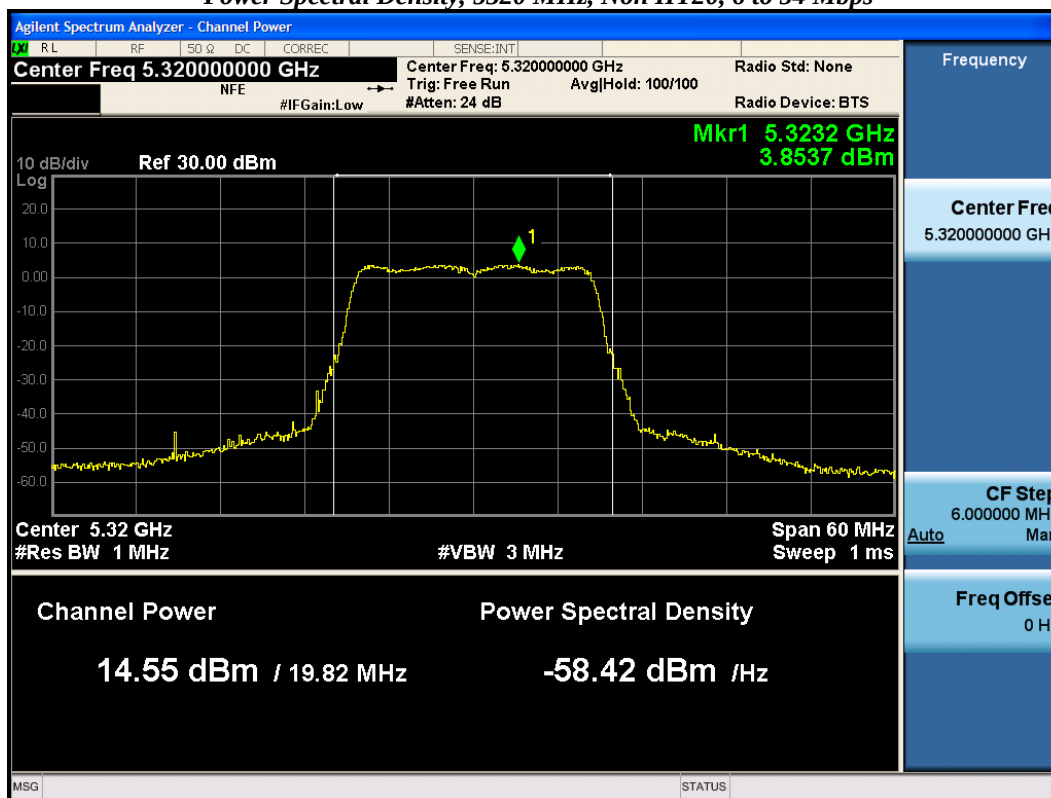
5300	Non HT20, 6 to 54 Mbps	1	7	9.5		0.0	9.5	10.0	0.47
	Non HT20, 6 to 54 Mbps	2	10	3.6	2.9	0.0	6.3	7.0	0.69
	Non HT20 Beam Forming, 6 to 54 Mbps	2	10	3.6	2.9	0.0	6.3	7.0	0.69
	HT/VHT20, M0 to M7	1	7	9.1		0.0	9.1	10.0	0.86
	HT/VHT20, M0 to M7	2	10	3.5	2.7	0.0	6.2	7.0	0.83
	HT/VHT20, M8 to M15	2	7	6.6	6.1	0.0	9.4	10.0	0.59
	HT/VHT20 Beam Forming, M0 to M7	2	10	3.5	2.7	0.0	6.2	7.0	0.83
	HT/VHT20 Beam Forming, M8 to M15	2	7	6.6	6.1	0.0	9.4	10.0	0.59
	HT/VHT20 STBC, M0 to M7	2	7	6.6	6.1	0.0	9.4	10.0	0.59
5310	Non HT40, 6 to 54 Mbps	1	7	4.3		0.0	4.3	10.0	5.67
	Non HT40, 6 to 54 Mbps	2	10	2.4	1.4	0.0	5.0	7.0	2.03
	HT/VHT40, M0 to M7	1	7	1.8		0.1	1.9	10.0	8.15
	HT/VHT40, M0 to M7	2	10	1.8	1.2	0.1	4.6	7.0	2.43
	HT/VHT40, M8 to M15	2	7	1.8	1.2	0.1	4.6	10.0	5.43
	HT/VHT40 Beam Forming, M0 to M7	2	10	-0.3	-1.0	0.1	2.4	7.0	4.57
	HT/VHT40 Beam Forming, M8 to M15	2	7	1.8	1.2	0.1	4.6	10.0	5.43
	HT/VHT40 STBC, M0 to M7	2	7	1.8	1.2	0.1	4.6	10.0	5.43
5320	Non HT20, 6 to 54 Mbps	1	7	9.2		0.0	9.2	10.0	0.77
	Non HT20, 6 to 54 Mbps	2	10	3.9	3.0	0.0	6.5	7.0	0.48
	Non HT20 Beam Forming, 6 to 54 Mbps	2	10	2.8	2.3	0.0	5.6	7.0	1.40
	HT/VHT20, M0 to M7	1	7	9.1		0.0	9.1	10.0	0.86
	HT/VHT20, M0 to M7	2	10	4.3	2.7	0.0	6.6	7.0	0.37
	HT/VHT20, M8 to M15	2	7	7.0	6.2	0.0	9.7	10.0	0.33
	HT/VHT20 Beam Forming, M0 to M7	2	10	2.8	2.0	0.0	5.5	7.0	1.53
	HT/VHT20 Beam Forming, M8 to M15	2	7	7.0	6.2	0.0	9.7	10.0	0.33
	HT/VHT20 STBC, M0 to M7	2	7	7.0	6.2	0.0	9.7	10.0	0.33



Antenna Gain: 13dbi									
Frequency (MHz)	Mode	Tx Paths	Correlated Antenna Gain (dBi)	Tx 1 PSD (dBm/MHz)	Tx 2 PSD (dBm/MHz)	Duty Cycle Correction (dB)	Total PSD (dBm/MHz)	Limit (dBm/MHz)	Margin (dB)
5260	Non HT20, 6 to 54 Mbps	1	13	3.3		0.0	3.3	4.0	0.67
	Non HT20, 6 to 54 Mbps	2	16	-2.5	-2.0	0.0	0.8	1.0	0.20
	Non HT20 Beam Forming, 6 to 54 Mbps	2	16	-2.5	-2.0	0.0	0.8	1.0	0.20
	HT/VHT20, M0 to M7	1	13	3.5		0.0	3.5	4.0	0.46
	HT/VHT20, M0 to M7	2	16	-2.6	-2.2	0.0	0.7	1.0	0.34
	HT/VHT20, M8 to M15	2	13	0.7	0.7	0.0	3.8	4.0	0.25
	HT/VHT20 Beam Forming, M0 to M7	2	16	-2.6	-2.2	0.0	0.7	1.0	0.34
	HT/VHT20 Beam Forming, M8 to M15	2	13	0.7	0.7	0.0	3.8	4.0	0.25
5270	Non HT40, 6 to 54 Mbps	1	13	2.4		0.0	2.4	4.0	1.57
	Non HT40, 6 to 54 Mbps	2	16	-3.4	-3.3	0.0	-0.3	1.0	1.30
	HT/VHT40, M0 to M7	1	13	2.5		0.1	2.6	4.0	1.45
	HT/VHT40, M0 to M7	2	16	-3.0	-3.1	0.1	0.0	1.0	0.99
	HT/VHT40, M8 to M15	2	13	-1.7	-1.8	0.1	1.3	4.0	2.69
	HT/VHT40 Beam Forming, M0 to M7	2	16	-5.8	-5.9	0.1	-2.8	1.0	3.79
	HT/VHT40 Beam Forming, M8 to M15	2	13	-1.7	-1.8	0.1	1.3	4.0	2.69
	HT/VHT40 STBC, M0 to M7	2	13	-1.7	-1.8	0.1	1.3	4.0	2.69
5290	Non HT80, 6 to 54 Mbps	1	13	-6.4		0.0	-6.4	4.0	10.36
	Non HT80, 6 to 54 Mbps	2	16	-10.5	-10.3	0.0	-7.3	1.0	8.35
	VHT80, M0 to M9 1ss	1	13	-6.5		0.2	-6.3	4.0	10.32
	VHT80, M0 to M9 1ss	2	16	-8.2	-8.3	0.2	-5.1	1.0	6.06
	VHT80, M0 to M9 2ss	2	13	-8.2	-8.3	0.2	-5.1	4.0	9.06
	VHT80 Beam Forming, M0 to M9 1ss	2	16	-11.9	-11.5	0.2	-8.5	1.0	9.50
	VHT80 Beam Forming, M0 to M9 2ss	2	13	-8.2	-8.3	0.2	-5.1	4.0	9.06
	VHT80 STBC, M0 to M9 1ss	2	13	-8.2	-8.3	0.2	-5.1	4.0	9.06



5300	Non HT20, 6 to 54 Mbps	1	13	3.6		0.0	3.6	4.0	0.37
	Non HT20, 6 to 54 Mbps	2	16	-2.0	-3.1	0.0	0.5	1.0	0.47
	Non HT20 Beam Forming, 6 to 54 Mbps	2	16	-3.7	-4.6	0.0	-1.1	1.0	2.08
	HT/VHT20, M0 to M7	1	13	3.5		0.0	3.5	4.0	0.46
	HT/VHT20, M0 to M7	2	16	-2.2	-3.2	0.0	0.4	1.0	0.62
	HT/VHT20, M8 to M15	2	13	0.7	-0.5	0.0	3.2	4.0	0.80
	HT/VHT20 Beam Forming, M0 to M7	2	16	-3.9	-4.5	0.0	-1.1	1.0	2.14
	HT/VHT20 Beam Forming, M8 to M15	2	13	0.7	-0.5	0.0	3.2	4.0	0.80
	HT/VHT20 STBC, M0 to M7	2	13	0.7	-0.5	0.0	3.2	4.0	0.80
5310	Non HT40, 6 to 54 Mbps	1	13	0.9		0.0	0.9	4.0	3.07
	Non HT40, 6 to 54 Mbps	2	16	-3.2	-4.1	0.0	-0.6	1.0	1.58
	HT/VHT40, M0 to M7	1	13	-1.3		0.1	-1.2	4.0	5.25
	HT/VHT40, M0 to M7	2	16	-2.1	-2.8	0.1	0.6	1.0	0.37
	HT/VHT40, M8 to M15	2	13	-2.1	-2.8	0.1	0.6	4.0	3.37
	HT/VHT40 Beam Forming, M0 to M7	2	16	-6.7	-7.1	0.1	-3.8	1.0	4.83
	HT/VHT40 Beam Forming, M8 to M15	2	13	-2.1	-2.8	0.1	0.6	4.0	3.37
	HT/VHT40 STBC, M0 to M7	2	13	-2.1	-2.8	0.1	0.6	4.0	3.37
5320	Non HT20, 6 to 54 Mbps	1	13	3.9		0.0	3.9	4.0	0.07
	Non HT20, 6 to 54 Mbps	2	16	-2.2	-3.1	0.0	0.4	1.0	0.58
	Non HT20 Beam Forming, 6 to 54 Mbps	2	16	-3.7	-4.3	0.0	-0.9	1.0	1.95
	HT/VHT20, M0 to M7	1	13	2.8		0.0	2.8	4.0	1.16
	HT/VHT20, M0 to M7	2	16	-1.9	-3.0	0.0	0.6	1.0	0.36
	HT/VHT20, M8 to M15	2	13	0.9	0.3	0.0	3.7	4.0	0.34
	HT/VHT20 Beam Forming, M0 to M7	2	16	-3.8	-4.4	0.0	-1.0	1.0	2.04
	HT/VHT20 Beam Forming, M8 to M15	2	13	0.9	0.3	0.0	3.7	4.0	0.34
	HT/VHT20 STBC, M0 to M7	2	13	0.9	0.3	0.0	3.7	4.0	0.34

**Antenna Gain: 7dBi****Power Spectral Density, 5260 MHz, HT/VHT20, M0 to M7****Antenna A****Antenna Gain: 13dBi****Power Spectral Density, 5320 MHz, Non HT20, 6 to 54 Mbps****Antenna A**



A.5 Conducted Spurious Emissions

Conducted Spurious Emissions Test Requirement

15.407(b), LP0002:4.7.4.1, LP0002:2.7, LP0002:2.8

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:

- (2) For transmitters operating in the 5.25-5.35 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
- (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.

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

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:

Julian Land

Date of testing:

18-Nov-19 - 18-Nov-19

Test Result: PASS**Test Equipment**

See Appendix B for list of test equipment

Note: Data with highest and lowest antenna gain were recorded as worst case



Conducted Spurious Emissions Average Table

Antenna Gain: 7dBi									
Frequency (MHz)	Mode	Tx Paths	Correlated Antenna Gain (dBi)	Tx 1 Spur Power (dBm)	Tx 2 Spur Power (dBm)	Duty Cycle Correction (dB)	Total Conducted Spur (dBm)	Limit (dBm)	Margin (dB)
5260	Non HT20, 6 to 54 Mbps	1	7	-53		0	-46.0	-41.25	4.75
	Non HT20, 6 to 54 Mbps	2	7	-57.5	-54.6	0	-45.8	-41.25	4.55
	Non HT20 Beam Forming, 6 to 54 Mbps	2	10	-57.5	-54.6	0	-42.8	-41.25	1.55
	HT/VHT20, M0 to M7	1	7	-52.6		0	-45.6	-41.25	4.35
	HT/VHT20, M0 to M7	2	7	-57	-54.1	0	-45.3	-41.25	4.05
	HT/VHT20, M8 to M15	2	7	-56.2	-50.6	0	-42.5	-41.25	1.29
	HT/VHT20 Beam Forming, M0 to M7	2	10	-57	-54.1	0	-42.3	-41.25	1.05
	HT/VHT20 Beam Forming, M8 to M15	2	7	-56.2	-50.6	0	-42.5	-41.25	1.29
	HT/VHT20 STBC, M0 to M7	2	7	-56.2	-50.6	0	-42.5	-41.25	1.29
5270	Non HT40, 6 to 54 Mbps	1	7	-52.7		0	-45.7	-41.25	4.45
	<u>Non HT40, 6 to 54 Mbps</u>	<u>2</u>	<u>7</u>	<u>-52.8</u>	-50.3	0	-41.4	-41.25	0.11
	HT/VHT40, M0 to M7	1	7	-52.4		0.1	-45.3	-41.25	4.05
	HT/VHT40, M0 to M7	2	7	-55.5	-50.2	0.1	-42.1	-41.25	0.83
	HT/VHT40, M8 to M15	2	7	-55.5	-50.2	0.1	-42.1	-41.25	0.83
	HT/VHT40 Beam Forming, M0 to M7	2	10	-56.6	-53.1	0.1	-41.5	-41.25	0.25
	HT/VHT40 Beam Forming, M8 to M15	2	7	-55.5	-50.2	0.1	-42.1	-41.25	0.83
	HT/VHT40 STBC, M0 to M7	2	7	-55.5	-50.2	0.1	-42.1	-41.25	0.83
5290	Non HT80, 6 to 54 Mbps	1	7	-53.8		0	-46.8	-41.25	5.55
	Non HT80, 6 to 54 Mbps	2	7	-53.4	-51.5	0	-42.3	-41.25	1.09
	VHT80, M0 to M9 1ss	1	7	-57.7		0.2	-50.5	-41.25	9.25
	VHT80, M0 to M9 1ss	2	7	-61	-55	0.2	-47.0	-41.25	5.78
	VHT80, M0 to M9 2ss	2	7	-61	-55	0.2	-47.0	-41.25	5.78
	VHT80 Beam Forming, M0 to M9 1ss	2	10	-62	-58.3	0.2	-46.8	-41.25	5.51
	VHT80 Beam Forming, M0 to M9 2ss	2	7	-61	-55	0.2	-47.0	-41.25	5.78
	VHT80 STBC, M0 to M9 1ss	2	7	-61	-55	0.2	-47.0	-41.25	5.78



5300	Non HT20, 6 to 54 Mbps	1	7	-53		0	-46.0	-41.25	4.75
	Non HT20, 6 to 54 Mbps	2	7	-57	-53.8	0	-45.1	-41.25	3.85
	Non HT20 Beam Forming, 6 to 54 Mbps	2	10	-57	-53.8	0	-42.1	-41.25	0.85
	HT/VHT20, M0 to M7	1	7	-52.9		0	-45.9	-41.25	4.65
	HT/VHT20, M0 to M7	2	7	-56.8	-53.8	0	-45.0	-41.25	3.79
	HT/VHT20, M8 to M15	2	7	-55.9	-50.6	0	-42.5	-41.25	1.23
	HT/VHT20 Beam Forming, M0 to M7	2	10	-56.8	-53.8	0	-42.0	-41.25	0.79
	HT/VHT20 Beam Forming, M8 to M15	2	7	-55.9	-50.6	0	-42.5	-41.25	1.23
	HT/VHT20 STBC, M0 to M7	2	7	-55.9	-50.6	0	-42.5	-41.25	1.23
5310	Non HT40, 6 to 54 Mbps	1	7	-53.6		0	-46.6	-41.25	5.35
	Non HT40, 6 to 54 Mbps	2	7	-56	-51.3	0	-43.0	-41.25	1.78
	HT/VHT40, M0 to M7	1	7	-57.3		0.1	-50.2	-41.25	8.95
	HT/VHT40, M0 to M7	2	7	-56.8	-53.4	0.1	-44.8	-41.25	3.52
	HT/VHT40, M8 to M15	2	7	-56.8	-53.4	0.1	-44.8	-41.25	3.52
	HT/VHT40 Beam Forming, M0 to M7	2	10	-57.4	-54.6	0.1	-42.8	-41.25	1.52
	HT/VHT40 Beam Forming, M8 to M15	2	7	-56.8	-53.4	0.1	-44.8	-41.25	3.52
	HT/VHT40 STBC, M0 to M7	2	7	-56.8	-53.4	0.1	-44.8	-41.25	3.52
5320	Non HT20, 6 to 54 Mbps	1	7	-52.8		0	-45.8	-41.25	4.55
	Non HT20, 6 to 54 Mbps	2	7	-56.7	-53.8	0	-45.0	-41.25	3.75
	Non HT20 Beam Forming, 6 to 54 Mbps	2	10	-56.7	-53.8	0	-42.0	-41.25	0.75
	HT/VHT20, M0 to M7	1	7	-52.7		0	-45.7	-41.25	4.45
	HT/VHT20, M0 to M7	2	7	-56.5	-53.5	0	-44.7	-41.25	3.49
	HT/VHT20, M8 to M15	2	7	-53.1	-50.5	0	-41.6	-41.25	0.35
	HT/VHT20 Beam Forming, M0 to M7	2	10	-56.5	-53.5	0	-41.7	-41.25	0.49
	HT/VHT20 Beam Forming, M8 to M15	2	7	-53.1	-50.5	0	-41.6	-41.25	0.35
	HT/VHT20 STBC, M0 to M7	2	7	-53.1	-50.5	0	-41.6	-41.25	0.35



Conducted Spurious Emissions Peak Table

Antenna Gain : 7dBi									
Frequency (MHz)	Mode	Tx Paths	Correlated Antenna Gain (dBi)	Tx 1 Spur Power (dBm)	Tx 2 Spur Power (dBm)	Tx 3 Spur Power (dBm)	Total Conducted Spur (dBm)	Limit (dBm)	Margin (dB)
5260	Non HT20, 6 to 54 Mbps	1	7	-42.6		0	-35.6	-21.25	14.35
	Non HT20, 6 to 54 Mbps	2	7	-46.6	-43.3	0	-34.6	-21.25	13.38
	Non HT20 Beam Forming, 6 to 54 Mbps	2	10	-46.6	-43.3	0	-31.6	-21.25	10.38
	HT/VHT20, M0 to M7	1	7	-41.8		0	-34.8	-21.25	13.55
	HT/VHT20, M0 to M7	2	7	-45.9	-44.3	0	-35.0	-21.25	13.77
	HT/VHT20, M8 to M15	2	7	-45.1	-38.3	0	-30.5	-21.25	9.23
	HT/VHT20 Beam Forming, M0 to M7	2	10	-45.9	-44.3	0	-32.0	-21.25	10.77
	HT/VHT20 Beam Forming, M8 to M15	2	7	-45.1	-38.3	0	-30.5	-21.25	9.23
	HT/VHT20 STBC, M0 to M7	2	7	-45.1	-38.3	0	-30.5	-21.25	9.23
5270	Non HT40, 6 to 54 Mbps	1	7	-41.1		0	-34.1	-21.25	12.85
	Non HT40, 6 to 54 Mbps	2	7	-41.9	-40.5	0	-31.1	-21.25	9.88
	HT/VHT40, M0 to M7	1	7	-41.8		0.1	-34.7	-21.25	13.45
	HT/VHT40, M0 to M7	2	7	-45.5	-40.2	0.1	-32.1	-21.25	10.83
	HT/VHT40, M8 to M15	2	7	-45.5	-40.2	0.1	-32.1	-21.25	10.83
	HT/VHT40 Beam Forming, M0 to M7	2	10	-46.4	-42.5	0.1	-31.0	-21.25	9.77
	HT/VHT40 Beam Forming, M8 to M15	2	7	-45.5	-40.2	0.1	-32.1	-21.25	10.83
	HT/VHT40 STBC, M0 to M7	2	7	-45.5	-40.2	0.1	-32.1	-21.25	10.83
5290	Non HT80, 6 to 54 Mbps	1	7	-43.5		0	-36.5	-21.25	15.25
	Non HT80, 6 to 54 Mbps	2	7	-42	-41.5	0	-31.7	-21.25	10.48
	VHT80, M0 to M9 1ss	1	7	-46.9		0.2	-39.7	-21.25	18.45
	VHT80, M0 to M9 1ss	2	7	-51.1	-45.2	0.2	-37.2	-21.25	15.96
	VHT80, M0 to M9 2ss	2	7	-51.1	-45.2	0.2	-37.2	-21.25	15.96
	VHT80 Beam Forming, M0 to M9 1ss	2	10	-50.9	-47.8	0.2	-36.1	-21.25	14.82
	VHT80 Beam Forming, M0 to M9 2ss	2	7	-51.1	-45.2	0.2	-37.2	-21.25	15.96
	VHT80 STBC, M0 to M9 1ss	2	7	-51.1	-45.2	0.2	-37.2	-21.25	15.96
30	Non HT20, 6 to 54 Mbps	1	7	-41.7		0	-34.7	-21.25	13.45



	Non HT20, 6 to 54 Mbps	2	7	-45.6	-42.7	0	-33.9	-21.25	12.65
	Non HT20 Beam Forming, 6 to 54 Mbps	2	10	-45.6	-42.7	0	-30.9	-21.25	9.65
	HT/VHT20, M0 to M7	1	7	-41.5		0	-34.5	-21.25	13.25
	HT/VHT20, M0 to M7	2	7	-45.3	-43.8	0	-34.5	-21.25	13.23
	HT/VHT20, M8 to M15	2	7	-45.2	-40.1	0	-31.9	-21.25	10.68
	HT/VHT20 Beam Forming, M0 to M7	2	10	-45.3	-43.8	0	-31.5	-21.25	10.23
	HT/VHT20 Beam Forming, M8 to M15	2	7	-45.2	-40.1	0	-31.9	-21.25	10.68
	HT/VHT20 STBC, M0 to M7	2	7	-45.2	-40.1	0	-31.9	-21.25	10.68
5310	Non HT40, 6 to 54 Mbps	1	7	-43.8		0	-36.8	-21.25	15.55
	Non HT40, 6 to 54 Mbps	2	7	-45.5	-41.4	0	-33.0	-21.25	11.72
	HT/VHT40, M0 to M7	1	7	-46.8		0.1	-39.7	-21.25	18.45
	HT/VHT40, M0 to M7	2	7	-46.3	-42	0.1	-33.6	-21.25	12.38
	HT/VHT40, M8 to M15	2	7	-46.3	-42	0.1	-33.6	-21.25	12.38
	HT/VHT40 Beam Forming, M0 to M7	2	10	-46.9	-43	0.1	-31.5	-21.25	10.27
	HT/VHT40 Beam Forming, M8 to M15	2	7	-46.3	-42	0.1	-33.6	-21.25	12.38
	HT/VHT40 STBC, M0 to M7	2	7	-46.3	-42	0.1	-33.6	-21.25	12.38
5320	Non HT20, 6 to 54 Mbps	1	7	-42.2		0	-35.2	-21.25	13.95
	Non HT20, 6 to 54 Mbps	2	7	-46.6	-43.4	0	-34.7	-21.25	13.45
	Non HT20 Beam Forming, 6 to 54 Mbps	2	10	-46.6	-43.4	0	-31.7	-21.25	10.45
	HT/VHT20, M0 to M7	1	7	-42.9		0	-35.9	-21.25	14.65
	HT/VHT20, M0 to M7	2	7	-46.7	-43.2	0	-34.6	-21.25	13.35
	HT/VHT20, M8 to M15	2	5	-40.4	-36.9	0.0	-28.3	-21.25	7.05
	HT/VHT20 Beam Forming, M0 to M7	2	10	-46.7	-43.2	0	-31.6	-21.25	10.35
	HT/VHT20 Beam Forming, M8 to M15	2	7	-42.4	-38.9	0	-30.3	-21.25	9.05
	HT/VHT20 STBC, M0 to M7	2	7	-42.4	-38.9	0	-30.3	-21.25	9.05



Conducted Spurious Emissions Average Table

Antenna Gain: 13dBi									
Frequency (MHz)	Mode	Tx Paths	Correlated Antenna Gain (dBi)	Tx 1 Spur Power (dBm)	Tx 2 Spur Power (dBm)	Duty Cycle Correction (dB)	Total Conducted Spur (dBm)	Limit (dBm)	Margin (dB)
5260	Non HT20, 6 to 54 Mbps	1	13	-59.5		0.0	-46.5	-41.25	5.22
	Non HT20, 6 to 54 Mbps	2	13	-65.1	-58.7	0.0	-44.8	-41.25	3.52
	Non HT20 Beam Forming, 6 to 54 Mbps	2	16	-65.1	-58.7	0.0	-41.8	-41.25	0.52
	HT/VHT20, M0 to M7	1	13	-58.9		0.0	-45.9	-41.25	4.61
	HT/VHT20, M0 to M7	2	13	-64.7	-58.3	0.0	-44.4	-41.25	3.11
	HT/VHT20, M8 to M15	2	13	-60.3	-56.8	0.0	-42.2	-41.25	0.90
	HT/VHT20 Beam Forming, M0 to M7	2	16	-64.7	-58.3	0.0	-41.4	-41.25	0.11
	HT/VHT20 Beam Forming, M8 to M15	2	13	-60.3	-56.8	0.0	-42.2	-41.25	0.90
	HT/VHT20 STBC, M0 to M7	2	13	-60.3	-56.8	0.0	-42.2	-41.25	0.90
5270	Non HT40, 6 to 54 Mbps	1	13	-54.9		0.0	-41.9	-41.25	0.62
	Non HT40, 6 to 54 Mbps	2	13	-60.6	-57.8	0.0	-42.9	-41.25	1.68
	HT/VHT40, M0 to M7	1	13	-54.7		0.1	-41.6	-41.25	0.40
	HT/VHT40, M0 to M7	2	13	-60.3	-56.9	0.1	-42.2	-41.25	0.96
	HT/VHT40, M8 to M15	2	13	-60.0	-56.3	0.1	-41.7	-41.25	0.45
	HT/VHT40 Beam Forming, M0 to M7	2	16	-64.8	-58.4	0.1	-41.5	-41.25	0.20
	HT/VHT40 Beam Forming, M8 to M15	2	13	-60.0	-56.3	0.1	-41.7	-41.25	0.45
	HT/VHT40 STBC, M0 to M7	2	13	-60.0	-56.3	0.1	-41.7	-41.25	0.45
5290	Non HT80, 6 to 54 Mbps	1	13	-56.1		0.0	-43.1	-41.25	1.81
	Non HT80, 6 to 54 Mbps	2	13	-62.2	-55.5	0.0	-41.6	-41.25	0.37
	VHT80, M0 to M9 1ss	1	13	-60.4		0.2	-47.2	-41.25	5.97
	VHT80, M0 to M9 1ss	2	13	-60.9	-58.1	0.2	-43.1	-41.25	1.84
	VHT80, M0 to M9 2ss	2	13	-60.9	-58.1	0.2	-43.1	-41.25	1.84
	VHT80 Beam Forming, M0 to M9 1ss	2	16	-66.2	-62.4	0.2	-44.7	-41.25	3.45
	VHT80 Beam Forming, M0 to M9 2ss	2	13	-60.9	-58.1	0.2	-43.1	-41.25	1.84
	VHT80 STBC, M0 to M9 1ss	2	13	-60.9	-58.1	0.2	-43.1	-41.25	1.84
30	Non HT20, 6 to 54 Mbps	1	13	-58.7		0.0	-45.7	-41.25	4.42



	Non HT20, 6 to 54 Mbps	2	13	-61.3	-58.6	0.0	-43.7	-41.25	2.45
	Non HT20 Beam Forming, 6 to 54 Mbps	2	16	-65.3	-59.4	0.0	-42.4	-41.25	1.12
	HT/VHT20, M0 to M7	1	13	-58.4		0.0	-45.4	-41.25	4.11
	HT/VHT20, M0 to M7	2	13	-61.2	-58.4	0.0	-43.5	-41.25	2.27
	HT/VHT20, M8 to M15	2	13	-60.2	-56.5	0.0	-41.9	-41.25	0.66
	HT/VHT20 Beam Forming, M0 to M7	2	16	-65.4	-59.3	0.0	-42.3	-41.25	1.05
	HT/VHT20 Beam Forming, M8 to M15	2	13	-60.2	-56.5	0.0	-41.9	-41.25	0.66
	HT/VHT20 STBC, M0 to M7	2	13	-60.2	-56.5	0.0	-41.9	-41.25	0.66
5310	Non HT40, 6 to 54 Mbps	1	13	-55.5		0.0	-42.5	-41.25	1.22
	Non HT40, 6 to 54 Mbps	2	13	-60.6	-57.3	0.0	-42.6	-41.25	1.35
	HT/VHT40, M0 to M7	1	13	-59.3		0.1	-46.2	-41.25	5.00
	HT/VHT40, M0 to M7	2	13	-60.0	-56.2	0.1	-41.6	-41.25	0.38
	HT/VHT40, M8 to M15	2	13	-60.0	-56.2	0.1	-41.6	-41.25	0.38
	HT/VHT40 Beam Forming, M0 to M7	2	16	-65.0	-58.9	0.1	-41.9	-41.25	0.64
	HT/VHT40 Beam Forming, M8 to M15	2	13	-60.0	-56.2	0.1	-41.6	-41.25	0.38
	HT/VHT40 STBC, M0 to M7	2	13	-60.0	-56.2	0.1	-41.6	-41.25	0.38
5320	Non HT20, 6 to 54 Mbps	1	13	-55.5		0.0	-42.5	-41.25	1.22
	Non HT20, 6 to 54 Mbps	2	13	-61.1	-58.2	0.0	-43.4	-41.25	2.12
	Non HT20 Beam Forming, 6 to 54 Mbps	2	16	-64.7	-59.3	0.0	-42.2	-41.25	0.92
	HT/VHT20, M0 to M7	1	13	-58.5		0.0	-45.5	-41.25	4.21
	HT/VHT20, M0 to M7	2	13	-60.9	-58.1	0.0	-43.2	-41.25	1.97
	HT/VHT20, M8 to M15	2	13	-59.6	-56.3	0.0	-41.6	-41.25	0.34
	HT/VHT20 Beam Forming, M0 to M7	2	16	-64.5	-59.1	0.0	-42.0	-41.25	0.71
	HT/VHT20 Beam Forming, M8 to M15	2	13	-59.6	-56.3	0.0	-41.6	-41.25	0.34
	HT/VHT20 STBC, M0 to M7	2	13	-59.6	-56.3	0.0	-41.6	-41.25	0.34



Conducted Spurious Emissions Peak Table

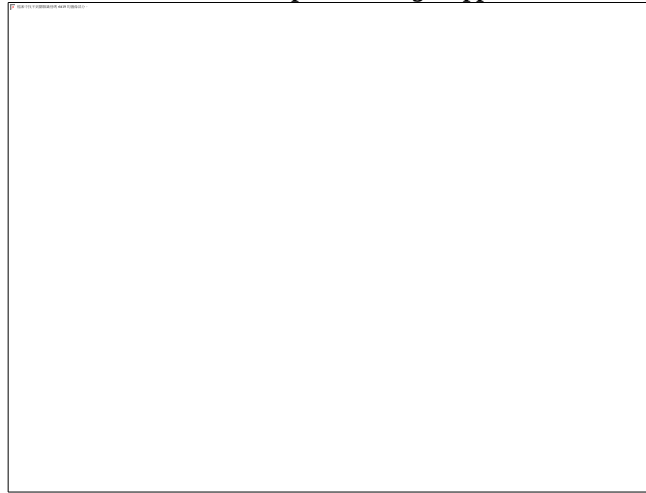
Antenna Gain: 13dBi									
Frequency (MHz)	Mode	Tx Paths	Correlated Antenna Gain (dBi)	Tx 1 Spur Power (dBm)	Tx 2 Spur Power (dBm)	Tx 3 Spur Power (dBm)	Total Conducted Spur (dBm)	Limit (dBm)	Margin (dB)
5260	Non HT20, 6 to 54 Mbps	1	13	-48.8		0.0	-35.8	-21.25	14.52
	Non HT20, 6 to 54 Mbps	2	13	-55.0	-47.9	0.0	-34.1	-21.25	12.84
	Non HT20 Beam Forming, 6 to 54 Mbps	2	16	-55.0	-47.9	0.0	-31.1	-21.25	9.84
	HT/VHT20, M0 to M7	1	13	-48.4		0.0	-35.4	-21.25	14.11
	HT/VHT20, M0 to M7	2	13	-53.9	-47.9	0.0	-33.9	-21.25	12.63
	HT/VHT20, M8 to M15	2	13	-50.1	-45.4	0.0	-31.1	-21.25	9.84
	HT/VHT20 Beam Forming, M0 to M7	2	16	-53.9	-47.9	0.0	-30.9	-21.25	9.63
	HT/VHT20 Beam Forming, M8 to M15	2	13	-50.1	-45.4	0.0	-31.1	-21.25	9.84
	HT/VHT20 STBC, M0 to M7	2	13	-50.1	-45.4	0.0	-31.1	-21.25	9.84
5270	Non HT40, 6 to 54 Mbps	1	13	-45.5		0.0	-32.5	-21.25	11.22
	Non HT40, 6 to 54 Mbps	2	13	-49.8	-46.9	0.0	-32.1	-21.25	10.82
	HT/VHT40, M0 to M7	1	13	-44.2		0.1	-31.1	-21.25	9.90
	HT/VHT40, M0 to M7	2	13	-50.8	-46.4	0.1	-32.0	-21.25	10.75
	HT/VHT40, M8 to M15	2	13	-50.7	-45.8	0.1	-31.5	-21.25	10.28
	HT/VHT40 Beam Forming, M0 to M7	2	16	-53.7	-46.0	0.1	-29.3	-21.25	8.02
	HT/VHT40 Beam Forming, M8 to M15	2	13	-50.7	-45.8	0.1	-31.5	-21.25	10.28
	HT/VHT40 STBC, M0 to M7	2	13	-50.7	-45.8	0.1	-31.5	-21.25	10.28
5290	Non HT80, 6 to 54 Mbps	1	13	-45.6		0.0	-32.6	-21.25	11.31
	Non HT80, 6 to 54 Mbps	2	13	-51.9	-44.2	0.0	-30.5	-21.25	9.23
	VHT80, M0 to M9 1ss	1	13	-50.1		0.2	-36.9	-21.25	15.67
	VHT80, M0 to M9 1ss	2	13	-49.7	-46.3	0.2	-31.5	-21.25	10.23
	VHT80, M0 to M9 2ss	2	13	-49.7	-46.3	0.2	-31.5	-21.25	10.23
	VHT80 Beam Forming, M0 to M9 1ss	2	16	-55.4	-52.1	0.2	-34.3	-21.25	13.00
	VHT80 Beam Forming, M0 to M9 2ss	2	13	-49.7	-46.3	0.2	-31.5	-21.25	10.23
	VHT80 STBC, M0 to M9 1ss	2	13	-49.7	-46.3	0.2	-31.5	-21.25	10.23
5300	Non HT20, 6 to 54 Mbps	1	13	-48.7		0.0	-35.7	-21.25	14.42
	Non HT20, 6 to 54 Mbps	2	13	-50.5	-46.8	0.0	-32.2	-21.25	10.97



	Non HT20 Beam Forming, 6 to 54 Mbps	2	16	-54.6	-48.5	0.0	-31.5	-21.25	10.26
	HT/VHT20, M0 to M7	1	13	-47.4		0.0	-34.4	-21.25	13.11
	HT/VHT20, M0 to M7	2	13	-49.9	-48.0	0.0	-32.8	-21.25	11.54
	HT/VHT20, M8 to M15	2	13	-49.7	-44.8	0.0	-30.5	-21.25	9.29
	HT/VHT20 Beam Forming, M0 to M7	2	16	-54.3	-48.3	0.0	-31.3	-21.25	10.03
	HT/VHT20 Beam Forming, M8 to M15	2	13	-49.7	-44.8	0.0	-30.5	-21.25	9.29
	HT/VHT20 STBC, M0 to M7	2	13	-49.7	-44.8	0.0	-30.5	-21.25	9.29
5310	Non HT40, 6 to 54 Mbps	1	13	-45.6		0.0	-32.6	-21.25	11.32
	Non HT40, 6 to 54 Mbps	2	13	-50.0	-46.5	0.0	-31.9	-21.25	10.61
	HT/VHT40, M0 to M7	1	13	-48.8		0.1	-35.7	-21.25	14.50
	HT/VHT40, M0 to M7	2	13	-49.2	-45.3	0.1	-30.8	-21.25	9.51
	HT/VHT40, M8 to M15	2	13	-49.2	-45.3	0.1	-30.8	-21.25	9.51
	HT/VHT40 Beam Forming, M0 to M7	2	16	-54.0	-48.4	0.1	-31.3	-21.25	10.04
	HT/VHT40 Beam Forming, M8 to M15	2	13	-49.2	-45.3	0.1	-30.8	-21.25	9.51
	HT/VHT40 STBC, M0 to M7	2	13	-49.2	-45.3	0.1	-30.8	-21.25	9.51
5320	Non HT20, 6 to 54 Mbps	1	13	-44.9		0.0	-31.9	-21.25	10.62
	Non HT20, 6 to 54 Mbps	2	13	-51.0	-47.6	0.0	-32.9	-21.25	11.68
	Non HT20 Beam Forming, 6 to 54 Mbps	2	16	-54.4	-49.0	0.0	-31.9	-21.25	10.62
	HT/VHT20, M0 to M7	1	13	-47.6		0.0	-34.6	-21.25	13.31
	HT/VHT20, M0 to M7	2	13	-50.1	-47.3	0.0	-32.4	-21.25	11.17
	HT/VHT20, M8 to M15	2	13	-49.6	-45.5	0.0	-31.0	-21.25	9.78
	HT/VHT20 Beam Forming, M0 to M7	2	16	-52.0	-48.3	0.0	-30.7	-21.25	9.46
	HT/VHT20 Beam Forming, M8 to M15	2	13	-49.6	-45.5	0.0	-31.0	-21.25	9.78
	HT/VHT20 STBC, M0 to M7	2	13	-49.6	-45.5	0.0	-31.0	-21.25	9.78

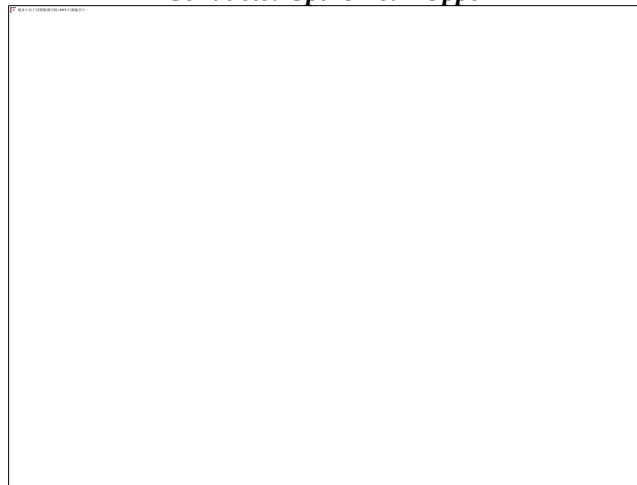


***Antenna Gain: 7dBi
Conducted Spurs Average Upper***



All Antennas

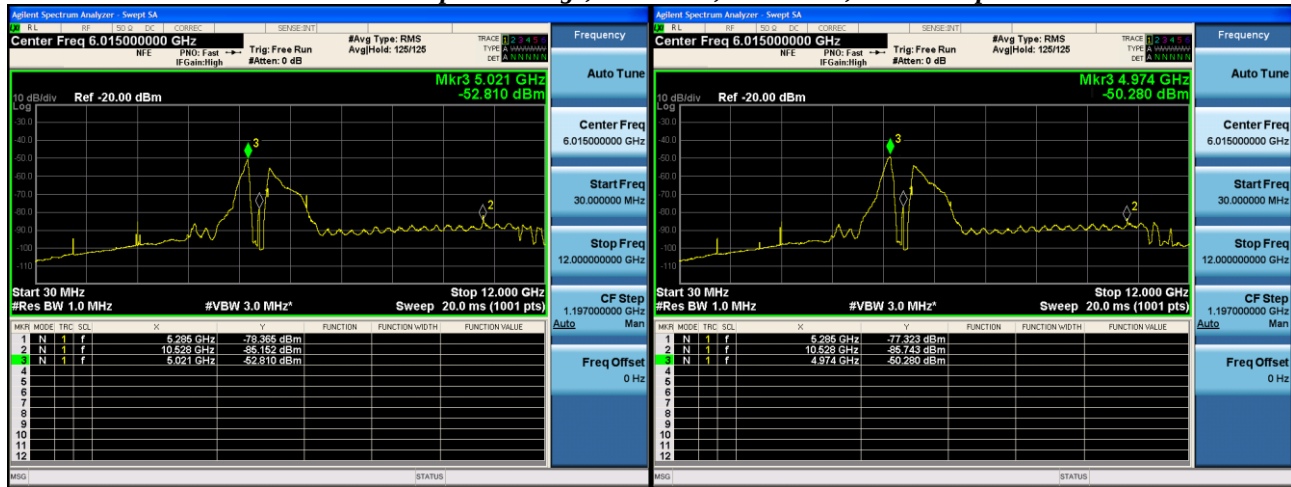
***Antenna Gain: 7dBi
Conducted Spurs Peak Upper***



All Antennas



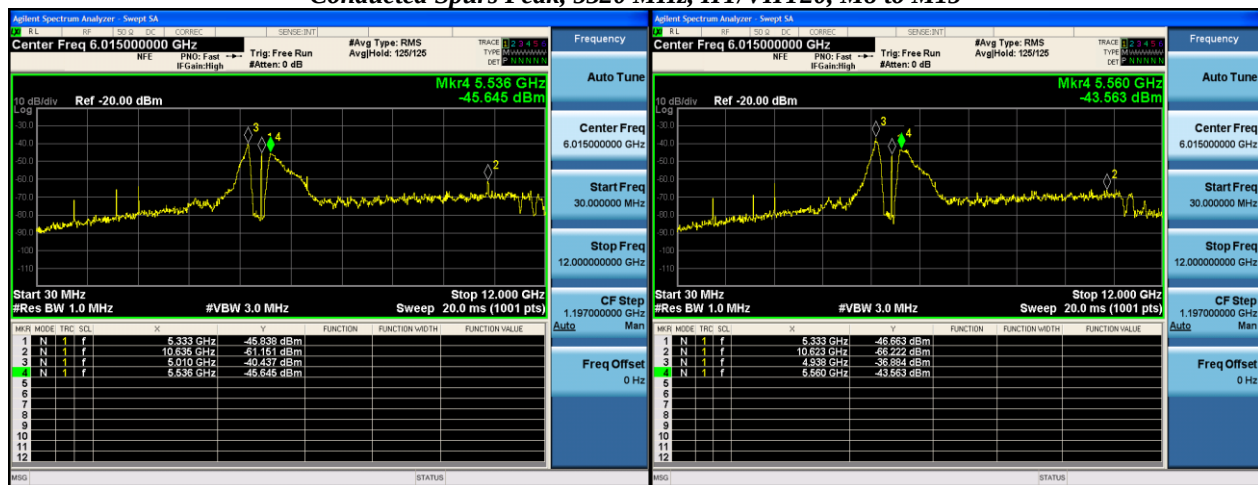
Antenna Gain: 7dBi
Conducted Spurs Average, 5270 MHz, Non HT40, 6 to 54 Mbps



Antenna A

Antenna B

Antenna Gain: 7dBi
Conducted Spurs Peak, 5320 MHz, HT/VHT20, M8 to M15



Antenna A

Antenna B

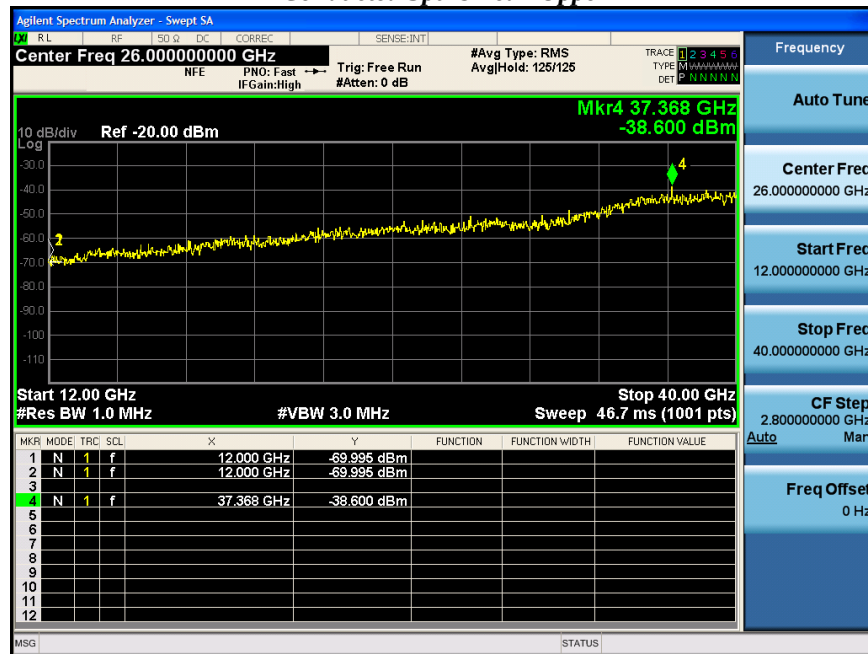


Antenna Gain: 13dBi
Conducted Spurs Average Upper



All Antennas

Antenna Gain: 13dBi
Conducted Spurs Peak Upper

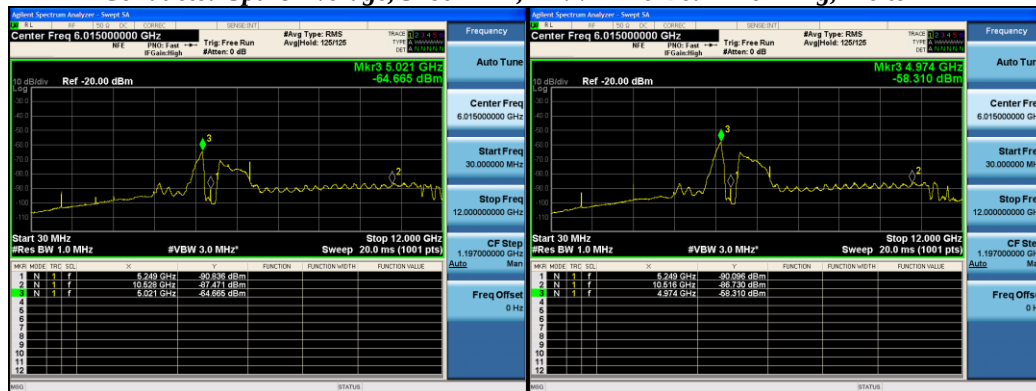


All Antennas



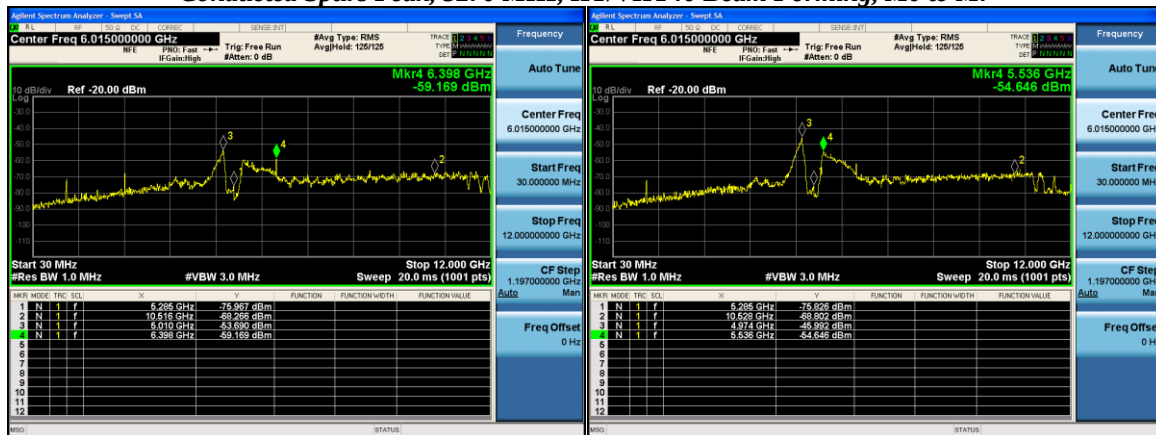
Antenna Gain: 13dbi

Conducted Spurs Average, 5260 MHz, HT/VHT20 Beam Forming, M0 to M7



Antenna Gain: 13dBi

Conducted Spurs Peak, 5270 MHz, HT/VHT40 Beam Forming, M0 to M7





A.6 Conducted Band edge

Conducted Band Edge Test Requirement

15.407(b), LP0002:4.7.4.1, LP0002:2.7, LP0002:2.8

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:

- (2) For transmitters operating in the 5.25-5.35 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.
- (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.

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:

Julian Land

Date of testing:

18-Nov-19 - 18-Nov-19

Test Result: PASS

Test Equipment

See Appendix B for list of test equipment

Conducted Band edge Average Table

Antenna Gain: 13dbi



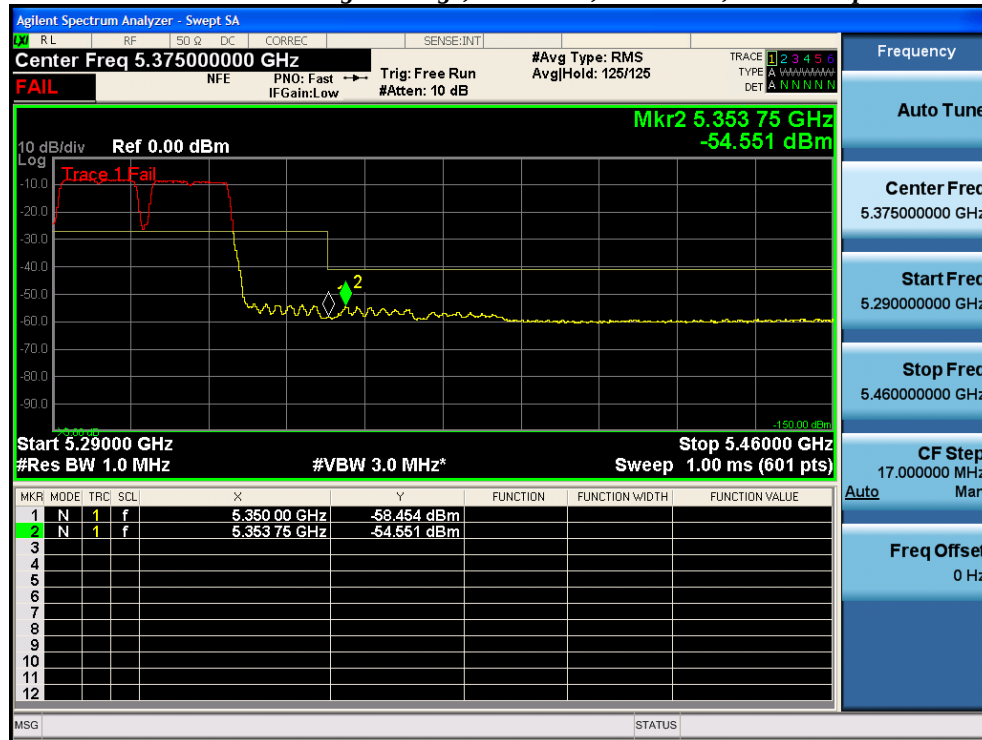
Frequency (MHz)	Mode	Tx Paths	Correlated Antenna Gain (dBi)	Tx 1 Band edge Level (dBm)	Tx 2 Band edge Level (dBm)	Duty Cycle Correction (dB)	Total Tx Band edge Level (dBm)	Limit (dBm)	Margin (dB)
5290	Non HT80, 6 to 54 Mbps	1	13	-54.6		0.0	-41.6	-41.25	0.31
	Non HT80, 6 to 54 Mbps	2	13	-62.8	-62.6	0.0	-46.6	-41.25	5.40
	VHT80, M0 to M9 1ss	1	13	-55.7		0.2	-42.5	-41.25	1.27
	VHT80, M0 to M9 1ss	2	13	-59.0	-58.0	0.2	-42.3	-41.25	1.03
	VHT80, M0 to M9 2ss	2	13	-59.0	-58.0	0.2	-42.3	-41.25	1.03
	VHT80 Beam Forming, M0 to M9 1ss	2	13	-59.0	-58.0	0.2	-42.3	-41.25	1.03
	VHT80 Beam Forming, M0 to M9 2ss	2	13	-59.0	-58.0	0.2	-42.3	-41.25	1.03
	VHT80 STBC, M0 to M9 1ss	2	13	-59.0	-58.0	0.2	-42.3	-41.25	1.03
5310	Non HT40, 6 to 54 Mbps	1	13	-60.2		0.0	-47.2	-41.25	5.91
	Non HT40, 6 to 54 Mbps	2	13	-63.2	-65.8	0.0	-48.3	-41.25	7.01
	HT/VHT40, M0 to M7	1	13	-59.8		0.1	-46.7	-41.25	5.50
	HT/VHT40, M0 to M7	2	13	-63.3	-63.7	0.1	-47.4	-41.25	6.18
	HT/VHT40, M8 to M15	2	13	-63.3	-63.7	0.1	-47.4	-41.25	6.18
	HT/VHT40 Beam Forming, M0 to M7	2	13	-63.3	-63.7	0.1	-47.4	-41.25	6.18
	HT/VHT40 Beam Forming, M8 to M15	2	13	-63.3	-63.7	0.1	-47.4	-41.25	6.18
	HT/VHT40 STBC, M0 to M7	2	13	-63.3	-63.7	0.1	-47.4	-41.25	6.18
5320	Non HT20, 6 to 54 Mbps	1	13	-61.7		0.0	-48.7	-41.25	7.42
	Non HT20, 6 to 54 Mbps	2	13	-63.6	-64.9	0.0	-48.2	-41.25	6.91
	Non HT20 Beam Forming, 6 to 54 Mbps	2	13	-63.6	-64.9	0.0	-48.2	-41.25	6.91
	HT/VHT20, M0 to M7	1	13	-61.2		0.0	-48.2	-41.25	6.91
	HT/VHT20, M0 to M7	2	13	-63.6	-65.3	0.0	-48.3	-41.25	7.06
	HT/VHT20, M8 to M15	2	13	-63.6	-65.3	0.0	-48.3	-41.25	7.06
	HT/VHT20 Beam Forming, M0 to M7	2	13	-63.6	-65.3	0.0	-48.3	-41.25	7.06
	HT/VHT20 Beam Forming, M8 to M15	2	13	-63.6	-65.3	0.0	-48.3	-41.25	7.06
	HT/VHT20 STBC, M0 to M7	2	13	-63.6	-65.3	0.0	-48.3	-41.25	7.06
Antenna Gain: 13dBi (Average)									



Frequency (MHz)	Mode	Tx Paths	Correlated Antenna Gain (dBi)	Tx 1 Band edge Level (dBm)	Tx 2 Band edge Level (dBm)	Total Tx Band edge Level (dBm)	Limit (dBm)	Margin (dB)
5290	Non HT80, 6 to 54 Mbps	1	13	-43.6		-30.6	-21.25	9.31
	Non HT80, 6 to 54 Mbps	2	13	-52.5	-52.9	-36.6	-21.25	15.40
	VHT80, M0 to M9 1ss	1	13	-43.6		-30.4	-21.25	9.17
	VHT80, M0 to M9 1ss	2	13	-45.8	-45.1	-29.2	-21.25	7.99
	VHT80, M0 to M9 2ss	2	13	-45.8	-45.1	-29.2	-21.25	7.99
	VHT80 Beam Forming, M0 to M9 1ss	2	13	-45.8	-45.1	-29.2	-21.25	7.99
	VHT80 Beam Forming, M0 to M9 2ss	2	13	-45.8	-45.1	-29.2	-21.25	7.99
	VHT80 STBC, M0 to M9 1ss	2	13	-45.8	-45.1	-29.2	-21.25	7.99
5310	Non HT40, 6 to 54 Mbps	1	13	-40.9		-27.9	-21.25	6.61
	Non HT40, 6 to 54 Mbps	2	13	-52.2	-51.6	-35.8	-21.25	14.59
	HT/VHT40, M0 to M7	1	13	-39.6		-26.5	-21.25	5.30
	HT/VHT40, M0 to M7	2	13	-45.0	-43.9	-28.4	-21.25	7.10
	HT/VHT40, M8 to M15	2	13	-45.0	-43.9	-28.4	-21.25	7.10
	HT/VHT40 Beam Forming, M0 to M7	2	13	-45.0	-43.9	-28.4	-21.25	7.10
	HT/VHT40 Beam Forming, M8 to M15	2	13	-45.0	-43.9	-28.4	-21.25	7.10
	HT/VHT40 STBC, M0 to M7	2	13	-45.0	-43.9	-28.4	-21.25	7.10
5320	Non HT20, 6 to 54 Mbps	1	13	-47.8		-34.8	-21.25	13.52
	Non HT20, 6 to 54 Mbps	2	13	-50.8	-47.0	-32.5	-21.25	11.20
	Non HT20 Beam Forming, 6 to 54 Mbps	2	13	-50.8	-47.0	-32.5	-21.25	11.20
	HT/VHT20, M0 to M7	1	13	-47.5		-34.5	-21.25	13.21
	HT/VHT20, M0 to M7	2	13	-49.0	-46.8	-31.7	-21.25	10.46
	HT/VHT20, M8 to M15	2	13	-49.0	-46.8	-31.7	-21.25	10.46
	HT/VHT20 Beam Forming, M0 to M7	2	13	-49.0	-46.8	-31.7	-21.25	10.46
	HT/VHT20 Beam Forming, M8 to M15	2	13	-49.0	-46.8	-31.7	-21.25	10.46
	HT/VHT20 STBC, M0 to M7	2	13	-49.0	-46.8	-31.7	-21.25	10.46



Antenna Gain: 13dBi
Conducted Band edge Average, 5290 MHz, Non HT80, 6 to 54 Mbps



Antenna A



Antenna Gain: 13dBi
Conducted Band edge Peak, 5310 MHz, HT/VHT40, M0 to M7



Antenna A

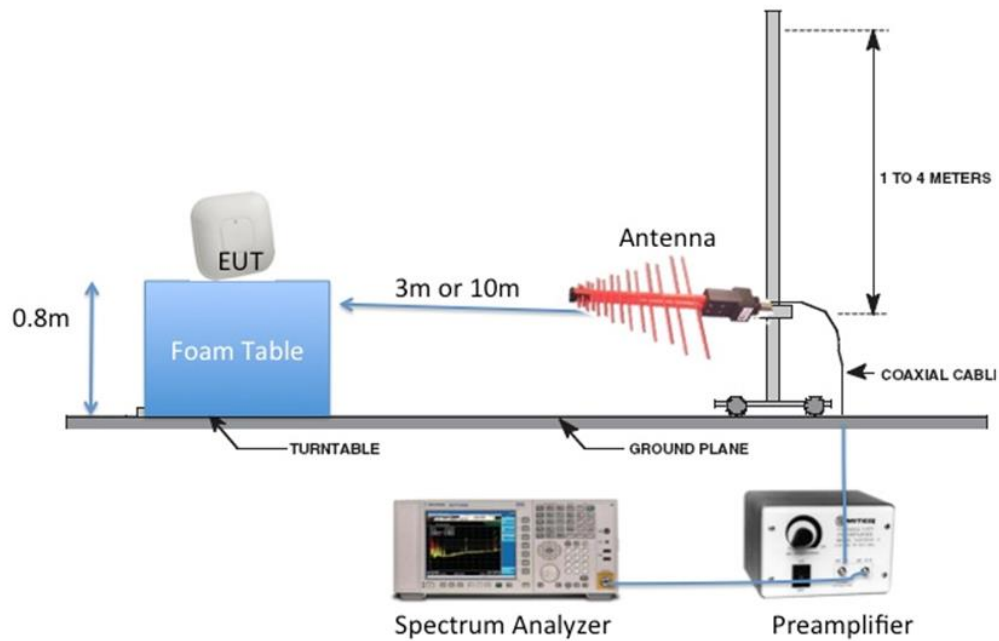
Appendix B: Radiated Spurious and AC Conducted Emissions

Testing Laboratory: Cisco Systems, Inc., 425 East Tasman Drive, San Jose, CA 95134, USA

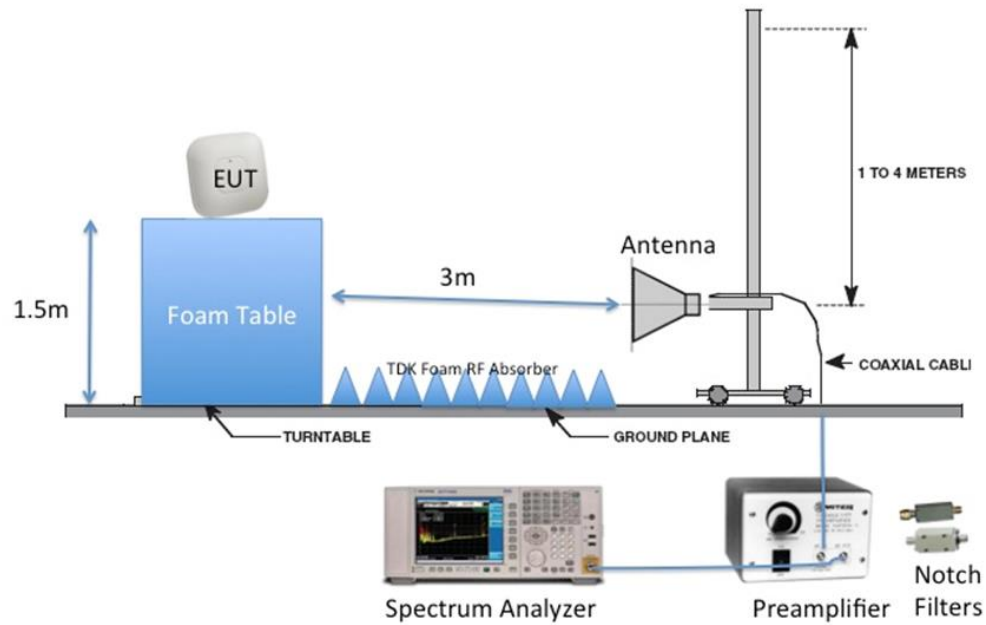
B.1 Radiated Spurious Emissions

B1.1 Setup Diagram

Below 1G (Preamp used is optional)



Above 1G



**B1.2 Restricted Bands****15.407 (b) (7), LP0002:4.7.4.1, LP0002:2.8**

The provisions of 15.205 apply to intentional radiators operating under this section

15.205 (b), LP0002:2.7

Except as provided in paragraphs (d) and (e) of this section, the field strength of emissions appearing within these frequency bands shall not exceed the limits shown in §15.209. Refer to limit section for detailed limits.

Restricted Bands for LP0002			
MHz	MHz	MHz	MHz
0.090~0.110	108.00~138.00	1660.0~1785.0	8025.0~8500.0
0.490~0.510	149.90~150.05	1805.0~1880.0	9000.0~9200.0
2.172~2.198	156.70~156.90	1885.0~1900.0	9300.0~9500.0
3.013~3.033	162.01~167.17	1905.0~1985.0	10600~12700
4.115~4.198	167.72~173.20	2010.0~2025.0	13250~13400
5.670~5.690	240.00~285.00	2110.0~2170.0	14470~14500
6.200~6.300	322.00~335.40	2200.0~2300.0	15350~16200
8.230~8.400	399.90~410.00	2310.0~2390.0	17700~21400
12.265~12.600	485.00~510.00	2483.5~2900.0	22010~23120
13.340~13.430	608.00~614.00	3260.0~3267.0	23600~24000
14.965~15.020	703.00~748.00	3332.0~3339.0	31200~31800
16.700~16.755	758.00~803.00	3345.8~3358.0	36430~36500
19.965~20.020	825.00~915.00	3500.0~4400.0	Above 38600
25.500~25.700	930.00~1240.0	4500.0~5250.0	
37.475~38.275	1300.0~1427.0	5350.0~5460.0	
73.500~75.400	1435.0~1626.5	7250.0~7750.0	

**RSS-Gen 8.10**

(b) Unwanted emissions that fall into restricted bands of [Table 6](#) shall comply with the limits specified in RSS-Gen.

(c) Unwanted emissions that do not fall within the restricted frequency bands of [Table 6](#) shall comply either with the limits specified in the applicable RSS or with those specified in this RSS-Gen.

Table 6 Restricted Bands

MHz	MHz	GHz
0.090-0.110	74.8-75.2	9.0-9.2
2.1735-2.1905	108-138	9.3-9.5
3.020-3.026	156.52475-156.52525	10.6-12.7
4.125-4.128	156.7-156.9	13.25-13.4
4.17725-4.17775	240-285	14.47-14.5
4.20725-4.20775	322-335.4	15.35-16.2
5.677-5.683	399.9-410	17.7-21.4
6.215-6.218	608-614	22.01-23.12
6.26775-6.26825	960-1427	23.6-24.0
6.31175-6.31225	1435-1626.5	31.2-31.8
8.291-8.294	1645.5-1646.5	36.43-36.5
8.362-8.366	1660-1710	Above 38.6
8.37625-8.38675	1718.8-1722.2	*
8.41425-8.41475	2200-2300	
12.29-12.293	2310-2390	
12.51975-12.52025	2655-2900	
12.57675-12.57725	3260-3267	
13.36-13.41	3332-3339	
16.42-16.423	3345.8-3358	
16.69475-16.69525	3500-4400	
16.80425-16.80475	4500-5150	
25.5-25.67	5350-5460	
37.5-38.25	7250-7750	
73-74.6	8025-8500	



B1.3 Limits

Below 1 GHz

FCC 15.209, LP0002:2.8

The level of any unwanted emissions from an intentional radiator operating under these general provisions shall not exceed the level of the fundamental emission. Except as provided elsewhere in this subpart, the emissions from an intentional radiator shall not exceed the field strength levels specified in the table specified in the table in FCC§15.209(a).

FCC15.407, LP0002:4.7.4.1

(b) (6) Unwanted emissions below 1GHz must comply with general field strength limits set forth in §15.209.

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

General Field Strength Limits Table			
Frequency (MHz)	Field strength (uV/meter)	Field strength (dBuV/meter)	Measurement distance (meters)
30-88	100**	40 Qp	3
88-216	150**	43.5 Qp	3
216-960	200**	46 Qp	3
Above 960	500	54 Av / 74 Pk	3

Above 1 GHz

15.407 (b) LP0002:4.7.4.1 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:

(2) For transmitters operating in the 5.25-5.35 GHz band: All emissions outside of the 5.47-5.725 GHz band shall not exceed an e.i.r.p. of -27 dBm/MHz

RSS-247 6.2.2.2

a) All emissions outside the band 5250-5350 MHz shall not exceed -27 dBm/MHz e.i.r.



Limit Conversion (power to field strength)

The field strength limit in dBμV can be converted from power (logarithmic) by using the field strength (linear) approach formula as follows:

$$V/m = \frac{\sqrt{30 \times P_t \times g_t}}{d}$$

where: **pt**= transmitter output power in watts,
gt= numeric gain of the transmitting antenna (unit less),
E = electric field strength in V/m,
d = measurement distance in meters (m).

From the equation above, unit conversion from log => linear with a known power limit of -27 dBm.

(1) Conversion from dBm to Watt

$$\text{dBm to Watts } W = 10^{((\text{dBm} - 30)/10)}$$

$$\begin{aligned} P(W) &= 10^{(-27 - 30) / 10} \\ &= 10^{-5.7} \\ &= 1.995 \times 10^{-6} \end{aligned}$$

(2) Convert from Watt to field strength

- a. Convert from Watt to V/m @ 3m distance

$$\begin{aligned} V/m &= \frac{\sqrt{30 \times P_t \times g_t}}{3} \\ &= \frac{\sqrt{30 \times 0.000001995 \times 1}}{3} \\ &= 0.00257 \end{aligned}$$

- b. Convert field strength to power density (V/m to dBμV/m)

$$\begin{aligned} \text{dB}\mu\text{V/m} &= 20 \log (V/m) + 120 \\ &= 68.2 \end{aligned}$$

**B1.4 Test Procedure****Ref.** ANSIC63.10-2013 section 6.5 & 6.6, Cisp16-1-1

ANSI C63.10: 2013 section 4.1.4 / section 12.7.5 (Quasi-Peak), section 12.7.6 (peak), section 12.7.7.3 (average)

Test parameters

- (i) Span = Entire frequency range or segment if necessary.
- (ii) Reference Level = 80 dBuV
- (iii) RBW = 100 kHz (less than or equal to 1 GHz); 1 MHz (above 1 GHz)
- (iv) VBW $\geq 3 \times$ RBW
- (v) Detector = Peak & Quasi-Peak (frequency range 30 MHz to 1 GHz);
Peak & Average (frequency range above 1 GHz); Change VBW to 10 Hz for average measurement
- (vi) Sweep Time = Couple

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.

Terminate the access Point RF ports with 50 ohm loads.

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

30MHz – 18GHz,

Save plots: Peak plot (Vertical and Horizontal) @3m

Above 18 GHz,

Save plots: Peak plot (Vertical and Horizontal) @1m

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.

Note: The data displayed on the plots detailed in the graphical test results section were measured using a 'Peak Detector'. Please refer to the results table for the detectors used during formal measurements.



This report represents the worst-case data for all supported operating modes with antenna which has maximum gain.

Samples, Systems, and Modes

System Number	Description	Samples	System under test	Support equipment
1	EUT	IW-6300H with Air-ANT2513P4M-N antenna	☒	☐
	Support	IW-6300H-AC-X-K9 power supply	☐	☒

Mode Setting#	Wi-Fi Mode	Modulation	Data Rate
1 (single antenna)	802.11a*	BPSK	6 Mbps
8 (dual antenna)	802.11n (HT40) *	BPSK	27.0 Mbps (MCS0)

Tested By: Test Engineer(s): Farida Rahmanzai, Jose Huamani	Date of testing: 23-Sep-2019 – 11-Oct-2019
Test Result: PASS	

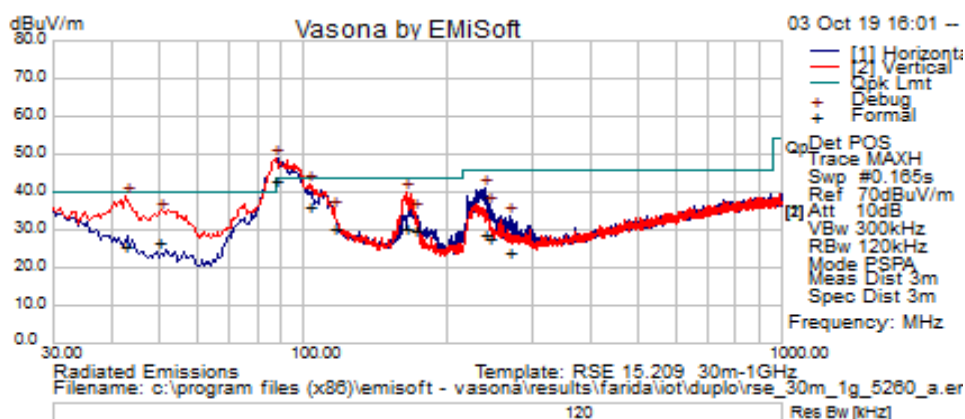
Test Equipment

See Appendix C for list of test equipment



B1.5 TX Radiated Spurious Emissions Graphical Data Results

Subtest Date:	03-Oct-2019
Engineer	Farida Rahmanzai Jose Huamani
Lab Information	Building 7, 5m Anechoic
Subtest Title	Transmitter Spurious Emissions
Frequency Range	30MHz - 1GHz
Comments on the above Test Results	802.11a, Tx Channel 52 (5260 MHz) (worst case)



Title: TX Spurious Emissions from 30MHz-1GHz – Ch52 (5260 MHz)

Frequency (MHz)	Raw (dBuV)	Cab Loss (dB)	AF (dB)	Level (dBuV)	Detector	Polarity	Height (cm)	Azt (Deg)	Limit (dBuV)	Margin (dB)	Results Pass / Fail	Comments
87.41375	34.74	0.98	7.5	43.22	Quasi Max	V	107	215	50*	-6.78	Pass	See notes
42.4665	12.86	0.67	12.12	25.66	Quasi Max	V	386	32	40	-14.34	Pass	
102.9353	24.52	1.06	10.69	36.26	Quasi Max	V	104	136	43.5	-7.24	Pass	
164.063	17.02	1.36	11.8	30.18	Quasi Max	V	105	137	43.5	-13.32	Pass	
239.624	15.69	1.62	11.7	29	Quasi Max	H	163	207	46	-17	Pass	
49.901	17.86	0.75	8.04	26.65	Quasi Max	V	162	207	40	-13.35	Pass	
115.6965	16.24	1.13	13.27	30.64	Quasi Max	H	254	235	43.5	-12.86	Pass	
170.9675	17.06	1.39	11.3	29.75	Quasi Max	H	145	199	43.5	-13.75	Pass	
243.9728	14.27	1.63	11.7	27.59	Quasi Max	H	149	217	46	-18.41	Pass	
269.7763	9.29	1.72	13.2	24.21	Quasi Max	H	121	187	46	-21.79	Pass	

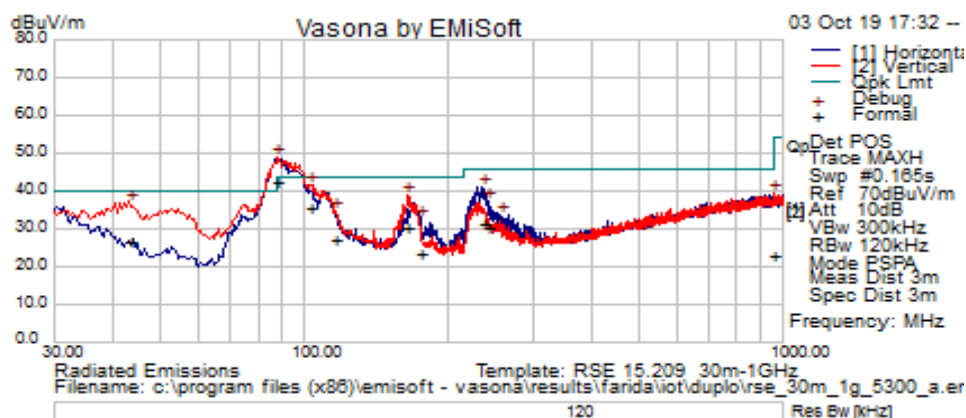
Note1: 87.41MHz is determined to be non-radio related signal. FCC part15.109 class A limit applied.
Also see FCC Part15.109 test report.

Note2: * means FCC part15.109 class A limit.

Subtest Date:	03-Oct-2019
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Engineer	Farida Rahmanzai Jose Huamani
Lab Information	Building 7, 5m Anechoic
Subtest Title	Transmitter Spurious Emissions
Frequency Range	30MHz - 1GHz
Comments on the above Test Results	802.11a, Tx Channel 60 (5300 MHz) (worst case)



Title: TX Spurious Emissions from 30MHz-1GHz – Ch60 (5300 MHz)

Frequency (MHz)	Raw (dBuV)	Cab Loss (dB)	AF (dB)	Level (dBuV)	Detector	Polarity	Height (cm)	Azt (Deg)	Limit (dBuV)	Margin (dB)	Results Pass / Fail	Comments
87.13	33.87	0.98	7.5	42.35	Quasi Max	H	252	269	50*	-7.65	Pass	See notes
102.553	24.26	1.05	10.61	35.92	Quasi Max	H	206	273	43.5	-7.58	Pass	
43.0555	14.35	0.68	11.67	26.7	Quasi Max	V	155	151	40	-13.3	Pass	
164.3655	16.98	1.36	11.8	30.14	Quasi Max	V	132	170	43.5	-13.36	Pass	
235.1478	18.45	1.6	11.5	31.55	Quasi Max	H	132	106	46	-14.45	Pass	
956.3023	-2.87	3.26	22.5	22.89	Quasi Max	V	329	187	46	-23.11	Pass	
242.1733	16.9	1.62	11.7	30.22	Quasi Max	H	140	221	46	-15.78	Pass	
116.0778	12.53	1.13	13.32	26.98	Quasi Max	H	274	80	43.5	-16.52	Pass	
174.3485	10.77	1.4	11.1	23.27	Quasi Max	V	166	315	43.5	-20.23	Pass	

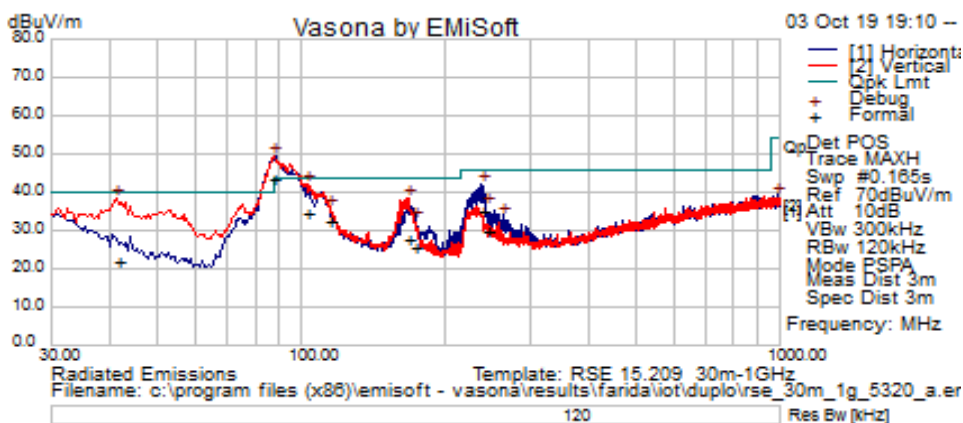
Note1: 87.13MHz is determined to be non-radio related signal. FCC part15.109 class A limit applied.

Also see FCC Part15.109 test report.

Note2: * means FCC part15.109 class A limit.



Subtest Date:	03-Oct-2019
Engineer	Farida Rahmanzai Jose Huamani
Lab Information	Building 7, 5m Anechoic
Subtest Title	Transmitter Spurious Emissions
Frequency Range	30MHz - 1GHz
Comments on the above Test Results	802.11a, Tx Channel 64 (5320 MHz) (worst case)



Title: TX Spurious Emissions from 30MHz-1GHz – Ch64 (5320 MHz)

Frequency (MHz)	Raw (dBuV)	Cab Loss (dB)	AF (dB)	Level (dBuV)	Detector	Polarity	Height (cm)	Azt (Deg)	Limit (dBuV)	Margin (dB)	Results Pass / Fail	Comments
87.59425	35.04	0.98	7.5	43.52	Quasi Max	H	179	259	50*	-6.48	Pass	See notes
102.778	23.11	1.05	10.66	34.82	Quasi Max	V	122	153	43.5	-8.68	Pass	
41.25975	8.48	0.67	13.02	22.16	Quasi Max	V	302	61	40	-17.84	Pass	
238.0203	21.69	1.61	11.6	34.9	Quasi Max	H	107	217	46	-11.1	Pass	
167.4485	14.69	1.37	11.56	27.62	Quasi Max	H	125	361	43.5	-15.88	Pass	
114.1328	18.44	1.12	13.03	32.59	Quasi Max	H	282	236	43.5	-10.91	Pass	
242.7903	16.32	1.62	11.7	29.65	Quasi Max	H	140	224	46	-16.35	Pass	
173.196	12.85	1.39	11.18	25.42	Quasi Max	V	107	139	43.5	-18.08	Pass	

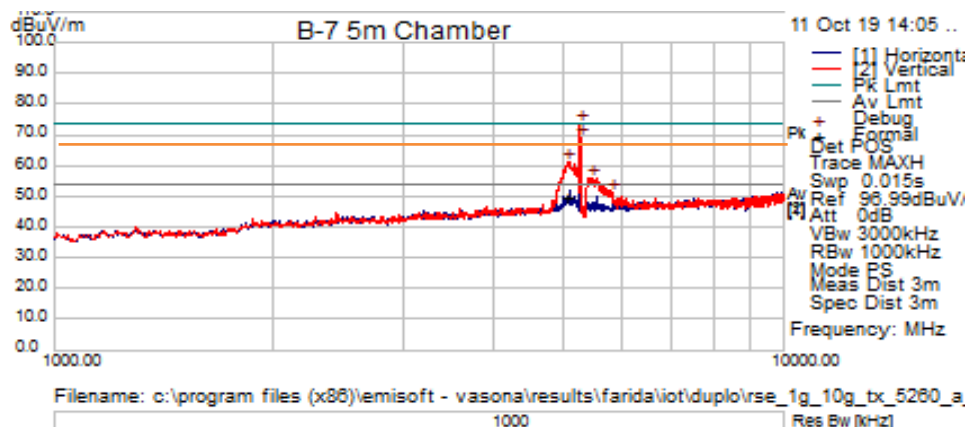
Note1: 87.59MHz is determined to be non-radio related signal. FCC part15.109 class A limit applied.

Also see FCC Part15.109 test report.

Note2: * means FCC part15.109 class A limit.



Subtest Date:	11-Oct-2019
Engineer	Farida Rahmanzai Jose Huamani
Lab Information	Building 7, 5m Anechoic
Subtest Title	Transmitter Spurious Emissions
Frequency Range	1GHz - 10GHz
Comments on the above Test Results	802.11a, Tx Channel 52 (5260 MHz)



Title: TX Spurious Emissions from 1GHz-10GHz – Ch 52 (5260 MHz)

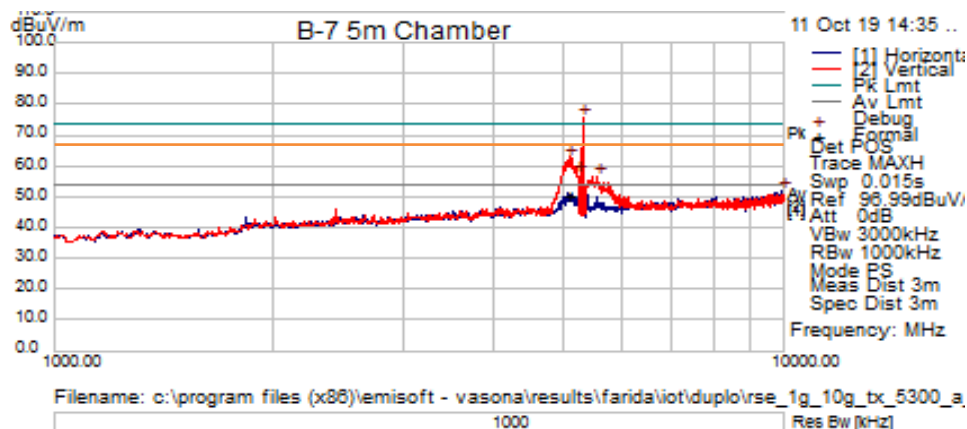
Frequency (MHz)	Raw (dBuV)	Cab Loss (dB)	AF (dB)	Level (dBuV)	Detector	Polarity	Height (cm)	Azt (Deg)	Limit (dBuV)	Margin (dB)	Results Pass / Fail	Comments
5252.5	69.84	9.44	-5.64	73.63	Peak	V	100	17	N/A	N/A	Ignored	Fundamental
5269.4	65.51	9.46	-5.62	69.35	Peak	V	150	336	N/A	N/A	Ignored	Fundamental
5055.625	57.8	9.24	-5.85	61.19	Peak	V	100	335	68.2	-7.01	Pass	RB
5054.12	46.41	9.24	-5.85	49.8	Average	V	100	334	54	-4.2	Pass	RB
5471.875	51.6	9.71	-5.22	56.1	Peak	V	100	330	68.2	-12.1	Pass	
5803.75	46.58	10.04	-5.03	51.59	Peak [Scan]	V	100	338	54	-16.61	Pass	

Note: RB means restricted band

Subtest Date:	11-Oct-2019
Engineer	Farida Rahmanzai Jose Huamani
Lab Information	Building 7, 5m Anechoic
Subtest Title	Transmitter Spurious Emissions
Frequency Range	1GHz - 10GHz
Comments on the above Test Results	802.11a, Tx Channel 60 (5300 MHz)



Subtest Date:	11-Oct-2019
Engineer	Farida Rahmanzai Jose Huamani
Lab Information	Building 7, 5m Anechoic
Subtest Title	Transmitter Spurious Emissions
Frequency Range	1GHz - 10GHz
Comments on the above Test Results	802.11a, Tx Channel 60 (5300 MHz)



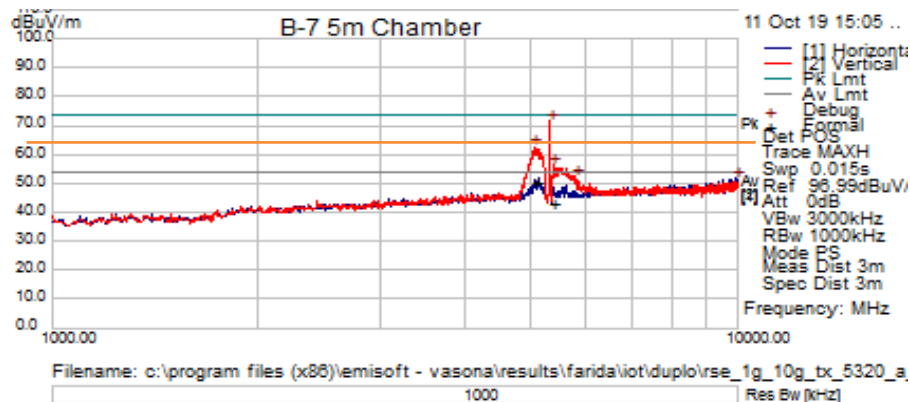
Title: TX Spurious Emissions from 1GHz-10GHz – Ch 60 (5300 MHz)

Frequency (MHz)	Raw (dBuV)	Cab Loss (dB)	AF (dB)	Level (dBuV)	Detector	Polarity	Height (cm)	Azt (Deg)	Limit (dBuV)	Margin (dB)	Results Pass / Fail	Comments
5308.75	71.92	9.52	-5.55	75.89	Peak	V	125	333	N/A	N/A	Ignored	Fundamental
5089.375	59.52	9.29	-5.86	62.95	Peak	V	125	344	68.2	-5.25	Pass	RB
5087.48	47.42	9.29	-5.87	50.83	Average	V	126	343	54	-3.17	Pass	RB
5218.75	54	9.41	-5.74	57.66	Peak	V	150	333	68.2	-10.54	Pass	
5556.25	52.17	9.73	-5.06	56.84	Peak	V	125	336	68.2	-11.36	Pass	

Note: RB means restricted band



Subtest Date:	11-Oct-2019
Engineer	Farida Rahmanzai Jose Huamani
Lab Information	Building 7, 5m Anechoic
Subtest Title	Transmitter Spurious Emissions
Frequency Range	1GHz - 10GHz
Comments on the above Test Results	802.11a, Tx Channel 64 (5320 MHz)



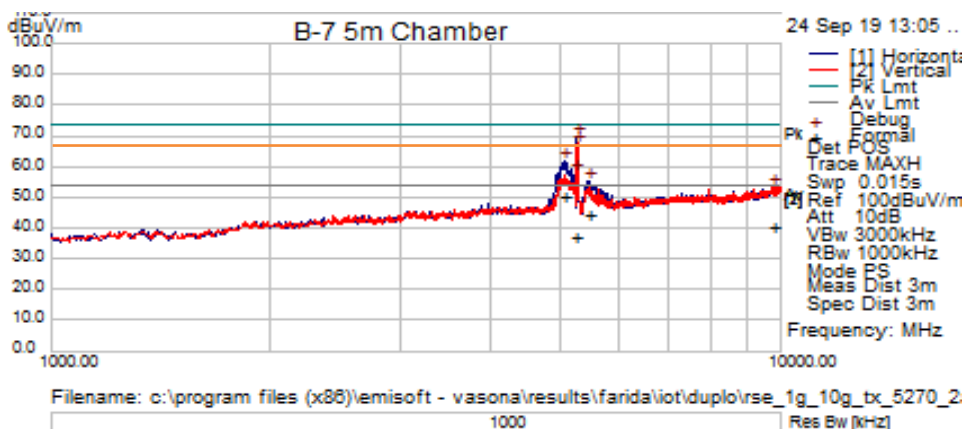
Title: TX Spurious Emissions from 1GHz-10GHz – Ch64 (5320 MHz)

Frequency (MHz)	Raw (dBuV)	Cab Loss (dB)	AF (dB)	Level (dBuV)	Detector	Polarity	Height (cm)	Azt (Deg)	Limit (dBuV)	Margin (dB)	Results Pass / Fail	Comments
5320	67.47	9.53	-5.51	71.49	Peak	V	125	338	N/A	N/A	Ignored	Fundamental
5055.625	59.35	9.24	-5.85	62.74	Peak	V	150	340	68.2	-5.46	Pass	RB
5076.14	47.4	9.28	-5.9	50.78	Average	V	151	337	54	-3.22	Pass	RB
5381.875	52.22	9.55	-5.56	56.21	Peak	V	125	338	68.2	-11.99	Pass	RB
5380.685	39.24	9.55	-5.56	43.23	Average	V	126	337	54	-10.77	Pass	RB
5798.125	47.39	10.02	-4.94	52.47	Peak	V	125	342	68.2	-15.73	Pass	

Note: RB means restricted band



Subtest Date:	24-Sep-2019
Engineer	Farida Rahmanzai Jose Huamani
Lab Information	Building 7, 5m Anechoic
Subtest Title	Transmitter Spurious Emissions
Frequency Range	1GHz - 10GHz
Comments on the above Test Results	802.11n40, Tx Channel 54 (5270 MHz)



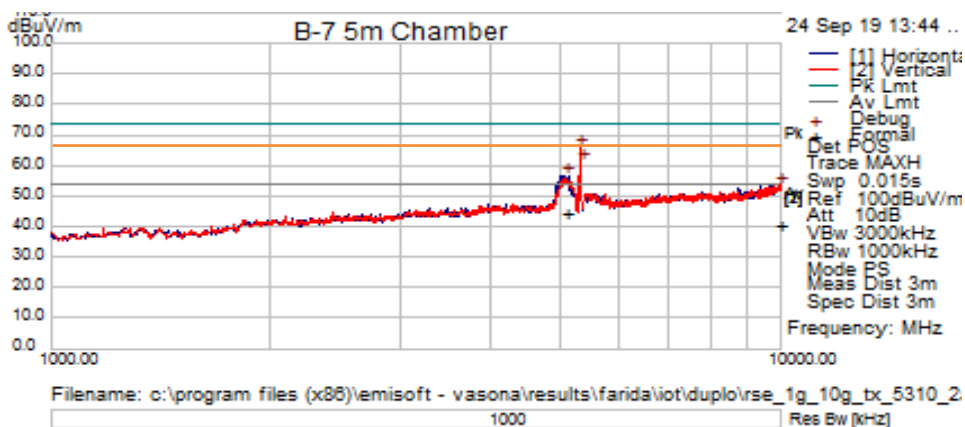
Title: TX Spurious Emissions from 1GHz-10GHz – Ch54 (5270 MHz)

Frequency (MHz)	Raw (dBuV)	Cab Loss (dB)	AF (dB)	Level (dBuV)	Detector	Polarity	Height (cm)	Azt (Deg)	Limit (dBuV)	Margin (dB)	Results Pass / Fail	Comments
5258.125	66.28	9.1	-5.64	69.75	Peak	H	100	320	N/A	N/A	Ignored	Fundamental
5269.375	64.11	9.13	-5.62	67.62	Peak	V	100	309	N/A	N/A	Ignored	Fundamental
5050	58.95	8.91	-5.87	62	Peak	H	100	308	68.2	-6.2	Pass	RB
5051.468	47.54	8.92	-5.86	50.6	Average	H	100	309	54	-3.4	Pass	RB
5235.625	54.81	9.08	-5.78	58.1	Peak	H	225	308	68.2	-10.1	Pass	
5449.375	51.56	9.24	-5.37	55.44	Peak	H	100	306	68.2	-12.76	Pass	RB
5449.965	40.52	9.24	-5.36	44.41	Average	H	101	309	54	-9.59	Pass	RB

Note: RB means restricted band



Subtest Date:	24-Sep-2019
Engineer	Farida Rahmanzai Jose Huamani
Lab Information	Building 7, 5m Anechoic
Subtest Title	Transmitter Spurious Emissions
Frequency Range	1GHz - 10GHz
Comments on the above Test Results	802.11n40, Tx Channel 62 (5310 MHz)



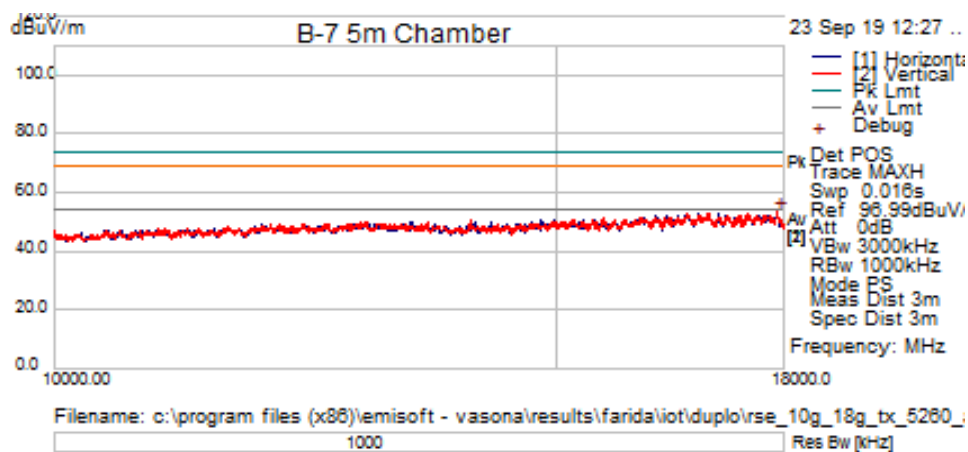
Title: TX Spurious Emissions from 1GHz-10GHz – Ch62 (5310 MHz)

Frequency (MHz)	Raw (dBuV)	Cab Loss (dB)	AF (dB)	Level (dBuV)	Detector	Polarity	Height (cm)	Azt (Deg)	Limit (dBuV)	Margin (dB)	Results Pass / Fail	Comments
5303.125	62.63	9.15	-5.56	66.22	Peak [Scan]	V	125	318	N/A	N/A	Ignored	Fundamental
5325.625	58.02	9.17	-5.53	61.65	Peak [Scan]	H	125	304	N/A	N/A	Ignored	Fundamental
5061.25	53.58	8.93	-5.83	56.68	Peak [Scan]	H	100	321	68.2	-11.52	Pass	RB
5062.27	41.78	8.93	-5.83	44.87	Average	H	99	322	54	-9.13	Pass	RB

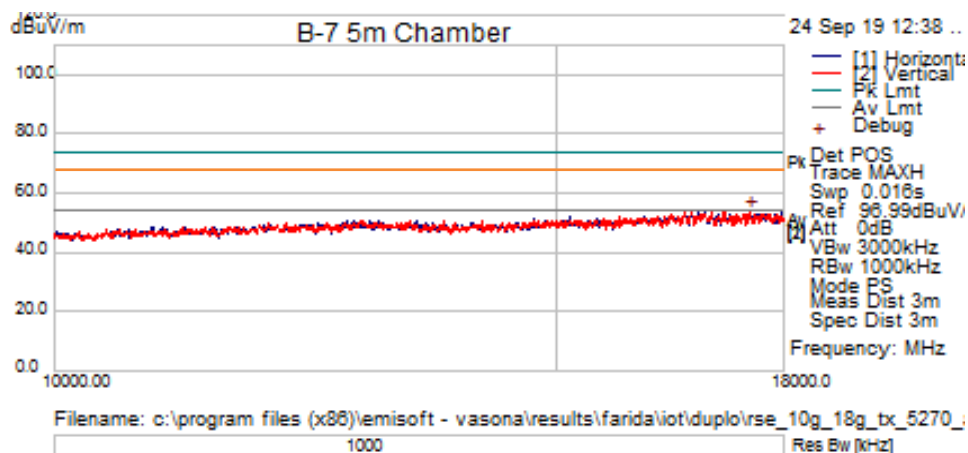
Note: RB means restricted band



Subtest Date:	23-Sep-2019 - 24-Sep-2019
Engineer	Farida Rahmanzai Jose Huamani
Lab Information	Building 7, 5m Anechoic
Subtest Title	Transmitter Spurious Emissions
Frequency Range	10GHz - 18GHz
Comments on the above Test Results	802.11a , Tx Channel 52 (5260 MHz) 802.11n40 , Tx Channel 54 (5270 MHz)



Title: TX Spurious Emissions from 10GHz-18GHz – Ch52 (5260 MHz)

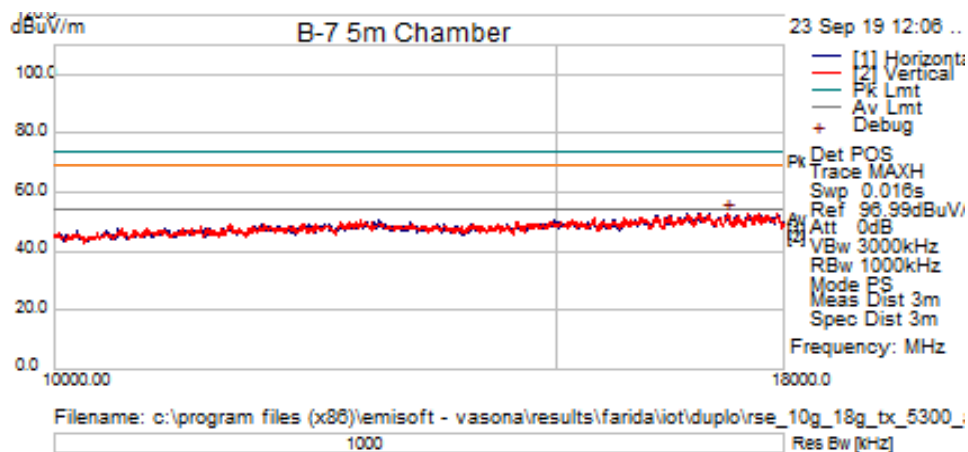


Title: TX Spurious Emissions from 10GHz-18GHz – Ch54 (5270 MHz)

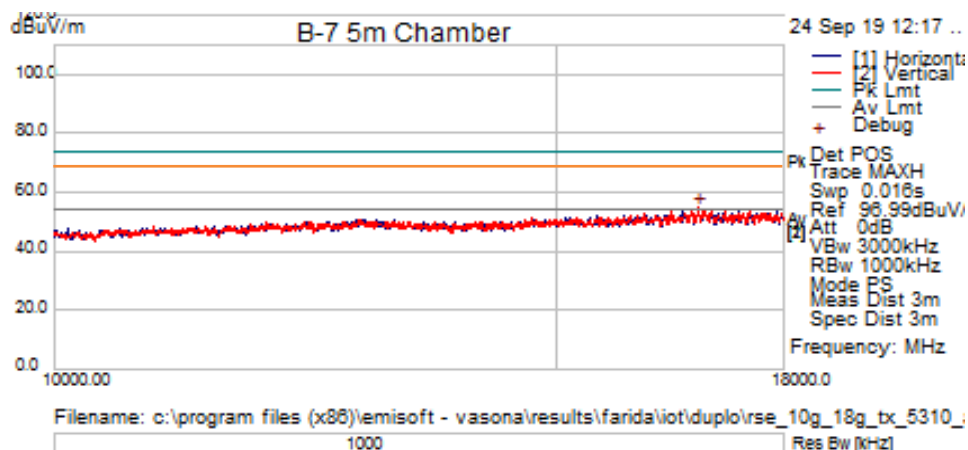
Subtest Date:	23-Sep-2019 - 24-Sep-2019
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Engineer	Farida Rahmanzai Jose Huamani
Lab Information	Building 7, 5m Anechoic
Subtest Title	Transmitter Spurious Emissions
Frequency Range	10GHz - 18GHz
Comments on the above Test Results	802.11a , Tx Channel 60 (5300 MHz) 802.11n40 , Tx Channel 62 (5310 MHz)



Title: TX Spurious Emissions from 10GHz-18GHz – Ch60 (5300 MHz)



Title: TX Spurious Emissions from 10GHz-18GHz – Ch62 (5310 MHz)

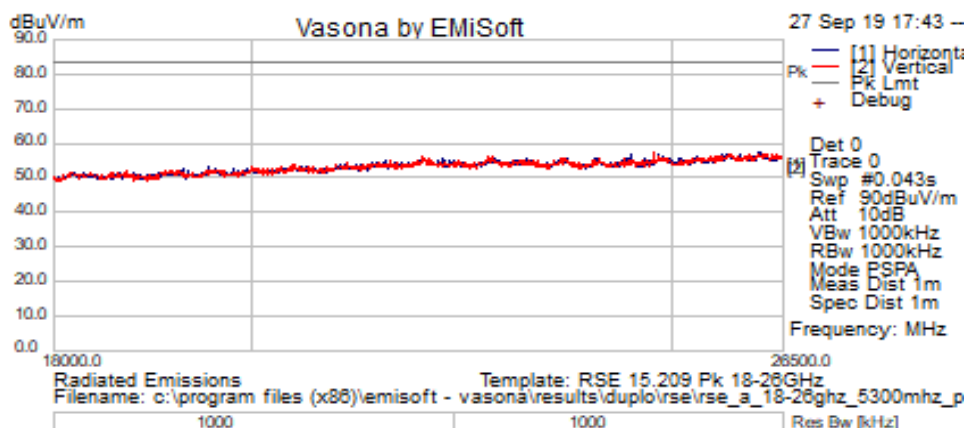
Subtest Date:	23-Sep-2019
Engineer	Farida Rahmanzai Jose Huamani



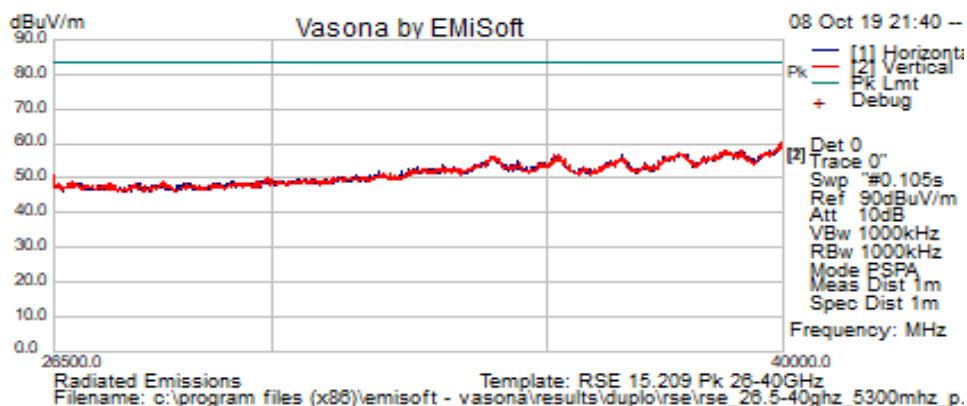
Lab Information	Building 7, 5m Anechoic
Subtest Title	Transmitter Spurious Emissions
Frequency Range	10GHz - 18GHz
Comments on the above Test Results	802.11a, Tx Channel 64 (5320 MHz)
dBuV/m B-7 5m Chamber 23 Sep 19 10:48 .. [1] Horizontal [2] Vertical Pk Lmt Av Lmt Debug Det POS Trace MAXH Swp 0.018s Ref 98.99dBuV Av Att 0dB VBw 3000kHz RBw 1000kHz Mode PS Meas Dist 3m Spec Dist 3m Frequency: MHz Filename: c:\program files (x86)\vmsisoft - vasona\results\farida\iot\duplo\rse_10g_18g_tx_5320_. 1000 Res Bw [kHz]	
Title: TX Spurious Emissions from 10GHz-18GHz – Ch64 (5320 MHz)	



Subtest Date:	27-Sep-2019
Engineer	Farida Rahmanzai Jose Huamani
Lab Information	Building 7, 5m Anechoic
Subtest Title	Transmitter Spurious Emissions
Frequency Range	18GHz - 40GHz
Comments on the above Test Results	802.11a, Tx Channel 60 (5300 MHz)



Title: TX Spurious Emissions from 18GHz-26.5GHz – Ch60 (5300 MHz)



Title: TX Spurious Emissions from 26.5GHz-40GHz – Ch60 (5300 MHz)

B.2 AC Conducted Emissions

B2.1 Limits

FCC 15.207: (a), LP0002:2.3

Except as shown in paragraphs (b) and (c) of this section, for an intentional radiator that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies, within the band 150 kHz to 30 MHz, shall not exceed the limits in the following table, as measured using a 50 μ H/50 ohms line impedance stabilization network (LISN).

Frequency of Emission (MHz)	Conducted Limits	
	Quasi-Peak	Average
0.15 – 0.5	66 to 56*	56 to 46*
0.5 – 5	56	46
5 – 30	60	50

RSS-Gen 8.8: Unless stated otherwise in the applicable RSS, for radio apparatus that are designed to be connected to the public utility AC power network, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies within the range 150 kHz to 30 MHz shall not exceed the limits in table 4 (AC power-line conducted emissions limit), as measured using a 50 μ H / 50 Ω line impedance stabilization network. This requirement applies for the radio frequency voltage measured between each power line and the ground terminal of each AC power-line mains cable of the EUT.

B2.2 Test Procedures

Ref: C63.10:2013, section 6.2.2

Section 6.2.2 Measurement requirements

Measured levels of ac power-line conducted emission shall be the emission voltages from the voltage probe or across the 50 Ω LISN port (to which the EUT is connected), where permitted, terminated into a 50 Ω measuring instrument, or where permitted or required, the emission currents on the power line sensed by a current probe. All emission voltage and current measurements shall be made on each current-carrying conductor at the plug end of the EUT power cord by the use of mating plugs and receptacles on the LISN, if used. Equipment shall be tested with power cords that are normally supplied or recommended by the manufacturer, and that have electrical and shielding characteristics that are the same as those cords normally supplied or recommended by the manufacturer. For those measurements, using a LISN, the 50 Ω measuring port is terminated by a measuring instrument having a 50 Ω input impedance. All other ports are terminated in 50 Ω loads. Figure 5, Figure 6, and Figure 7 show typical test setups for ac power-line conducted emissions testing (see 6.13). For information about the use of a RF-shielded (screen) room, vertical conducting plane and voltage probe, see ANSI C63.4.

Tabletop devices shall be placed on a platform of nominal size, 1 m by 1.5 m, raised 80 cm above the reference ground plane. The vertical conducting plane or wall of an RF-shielded (screen) room shall be located 40 cm to the rear of the EUT. Floor-standing devices shall be placed either directly on the reference ground-plane or on insulating material as described in ANSI C63.4. All other surfaces of tabletop or floor standing EUTs shall be at least 80 cm from any other grounded conducting surface, including the case or cases of one or more LISNs.

Section 6.2.5 Final ac power-line conducted emission measurements

Based on the exploratory tests of the EUT performed in 6.2.4, the one EUT cable configuration and arrangement and mode of operation that produced the emission with the highest amplitude relative to the limit is selected for the final measurement, while applying the appropriate modulating signal to the EUT. If the EUT is relocated from an exploratory test site to a final test site, the highest emissions shall be remaximized at the final test location before final ac power-line conducted emission measurements are performed. The final test on all current-carrying conductors of all of the power cords to the equipment that comprises the EUT (but not the cords associated with other non-EUT equipment in the system) is then performed for the full frequency range for which the EUT is being tested for compliance without further variation of the EUT arrangement, cable positions, or EUT mode of operation. If the EUT is comprised of equipment units that have their own separate ac power connections, e.g., floor-standing equipment with independent power cords for each shelf that are able to connect directly to the ac power network, each current-carrying conductor of one unit is measured while the other units are connected to a second (or more) LISN(s). All units shall be separately measured. If a power strip is provided by the manufacturer, to supply all of the units making up the EUT, only the conductors in the power cord of the power strip shall be measured.

Record the six highest EUT emissions relative to the limit of each of the current-carrying conductors of the power cords of the equipment that comprises the EUT over the frequency range specified by the procuring or regulatory agency.

Ref. C63.10-2013 section 6.2

Test Procedure
1. Using Vasona software, configure the spectrum analyzer as shown above (be sure to enter all losses



- between the transmitter output and the spectrum analyzer).
2. Set the radio in continuous transmit mode.
 3. Connect cable end to LISN Hot port and other cable end to the spectrum Analyzer/EMC receiver RF input port. Terminate the LISN neutral port with a 50 Ω impedance terminator.
 4. Sweep the frequency range from 150 kHz to 30 MHz (segment if necessary)
 5. Use the peak marker function to determine the maximum amplitude level.
 6. Center marker frequency and perform final measurement using applicable detector (Quasi-Pk/Average).
 7. Record at least 6 highest reading for the worst case operating modes in Quasi-peak/Average.
 8. Repeat the test on Neutral lead.
 9. Repeat step 3 – 7 with the radio sets in the Receiver mode.
 10. Record at least 6 highest reading in Quasi-peak/Average

Ref. C63.10-2013 section 4 / CISPR16-1-1**Test Parameters**

Span = Entire frequency range or segment if necessary.
Reference Level = 70 dBuV
RBW = 9 kHz
VBW $\geq 3 \times$ RBW
Sweep Time = Couple
Detector = Quasi-Peak & Average

**Samples, Systems, and Modes**

System Number	Description	Samples	System under test	Support equipment
2	EUT	IW-6300H with Air-ANT2513P4M-N antenna	☒	☐
	Support	IW-6300H-AC-X-K9 power supply	☐	☒

Mode Setting#	Wi-Fi Mode	Modulation	Data Rate
1 (single antenna)	802.11a*	BPSK	6 Mbps

Tested By: Test Engineer(s): Farida Rahmanzai, Jose Huamani	Date of testing: 13-Nov-2019
Test Result: PASS	

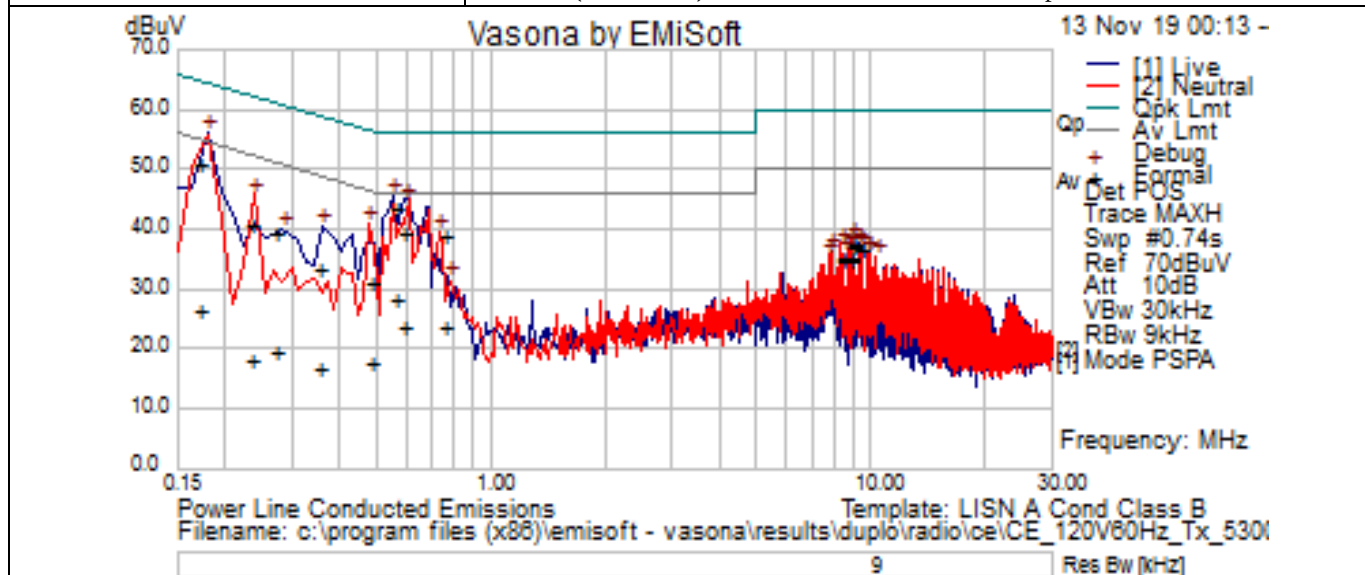
Test Equipment

See Appendix C for list of test equipment



B2.3 AC Conducted Emissions Test Data and Graphical Test Results

Subtest Date:	13-Nov-2019
Engineer	Farida Rahmanzai Jose Huamani
Lab Information	Building 7, formal immunity room
Subtest Title	Conducted Emissions
Frequency Range	150 kHz - 30 MHz
Comments on the above Test Results	TX Ch60 (5300 MHz) with BPSK modulation – 6 Mbps

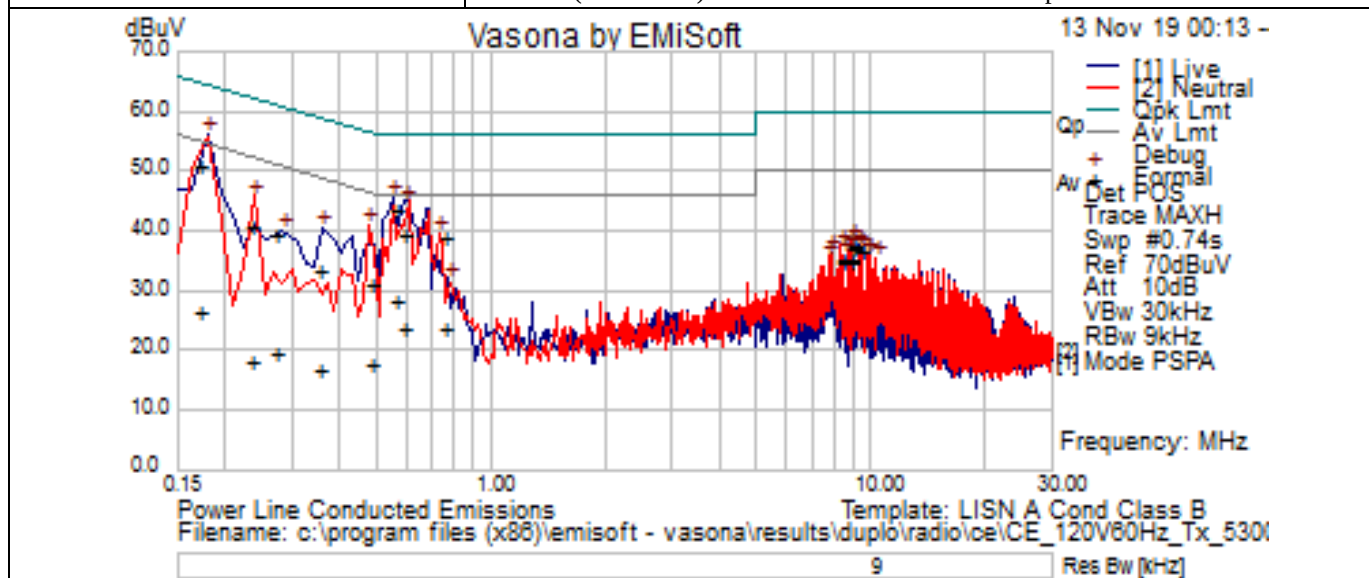


AC Conducted Emissions Test Result Tables for 802.11a / TX Ch60

Frequency (MHz)	Raw (dBuV)	Cab Loss (dB)	Factors (dB)	Level (dBuV)	Detector	Lines (Live/Neutral)	Limit (dBuV)	Margin (dB)	Results Pass / Fail	Comments
0.171138	29.93	21.06	0.1	51.1	Quasi Peak	Live	64.91	-13.81	Pass	TX / Ch 60
0.171138	5.21	21.06	0.1	26.38	Average	Live	54.91	-28.53	Pass	TX / Ch 60
0.270519	18.76	20.55	0.08	39.39	Quasi Peak	Live	61.1	-21.72	Pass	TX / Ch 60
0.270519	-0.8	20.55	0.08	19.82	Average	Live	51.1	-31.28	Pass	TX / Ch 60
0.355476	13.42	20.24	0.07	33.73	Quasi Peak	Live	58.83	-25.1	Pass	TX / Ch 60
0.355476	-3.24	20.24	0.07	17.08	Average	Live	48.83	-31.76	Pass	TX / Ch 60
0.560571	23.72	19.98	0.07	43.77	Quasi Peak	Live	56	-12.23	Pass	TX / Ch 60
0.560571	8.6	19.98	0.07	28.65	Average	Live	46	-17.35	Pass	TX / Ch 60
0.58767	19.67	19.98	0.06	39.7	Quasi Peak	Live	56	-16.3	Pass	TX / Ch 60
0.58767	3.78	19.98	0.06	23.81	Average	Live	46	-22.19	Pass	TX / Ch 60
9.352782	16.59	20.14	0.11	36.84	Quasi Peak	Live	60	-23.16	Pass	TX / Ch 60
9.352782	16.63	20.14	0.11	36.89	Average	Live	50	-13.11	Pass	TX / Ch 60
0.232638	20.23	20.72	0.08	41.03	Quasi Peak	Neutral	62.35	-21.33	Pass	TX / Ch 60
0.232638	-2.66	20.72	0.08	18.14	Average	Neutral	52.35	-34.21	Pass	TX / Ch 60
0.480582	11.39	19.98	0.07	31.44	Quasi Peak	Neutral	56.33	-24.89	Pass	TX / Ch 60



Subtest Date:	13-Nov-2019
Engineer	Farida Rahmanzai Jose Huamani
Lab Information	Building 7, formal immunity room
Subtest Title	Conducted Emissions
Frequency Range	150 kHz - 30 MHz
Comments on the above Test Results	TX Ch60 (5300 MHz) with BPSK modulation – 6 Mbps



AC Conducted Emissions Test Result Tables for 802.11a / TX Ch60

Frequency (MHz)	Raw (dBuV)	Cab Loss (dB)	Factors (dB)	Level (dBuV)	Detector	Lines (Live/Neutral)	Limit (dBuV)	Margin (dB)	Results Pass / Fail	Comments
0.480582	-2.1	19.98	0.07	17.95	Average	Neutral	46.33	-28.38	Pass	TX / Ch 60
0.749751	18.89	19.98	0.07	38.93	Quasi Peak	Neutral	56	-17.07	Pass	TX / Ch 60
0.749751	3.77	19.98	0.07	23.81	Average	Neutral	46	-22.19	Pass	TX / Ch 60
8.345967	15.14	20.13	0.08	35.35	Quasi Peak	Neutral	60	-24.65	Pass	TX / Ch 60
8.345967	14.66	20.13	0.08	34.87	Average	Neutral	50	-15.13	Pass	TX / Ch 60
8.775804	15.15	20.13	0.11	35.39	Quasi Peak	Neutral	60	-24.61	Pass	TX / Ch 60
8.775804	14.61	20.13	0.11	34.85	Average	Neutral	50	-15.15	Pass	TX / Ch 60
8.921454	17.25	20.14	0.1	37.48	Quasi Peak	Neutral	60	-22.52	Pass	TX / Ch 60
8.921454	17.1	20.14	0.1	37.33	Average	Neutral	50	-12.67	Pass	TX / Ch 60

**Appendix B: List of Test Equipment Used to perform the test**

Equip#	Manufacturer/ Model	Description	Last Cal	Next Due
RF Conducted at output antenna port				
7329	OMEGA/CT485B	Chart Recorder	18 Feb. 2019	18 Feb. 2020
49516	Keysight (Agilent/HP) / N9030A	PXA Signal Analyzer, 3Hz to 50GHz	29 Nov. 2019	29 Nov. 2019
55097	Nattional Instruments / PXI-1042	Chassis PXI	Cal Not Required	Cal Not Required
56089	National Instruments / PXI-2796	40GHz Dual 6x1 Multiplexer (SP6T)	Verify Before Use	Verify Before Use
56328	Pasternack / PE5019-1	Torque Wrench	13 Feb. 2019	13 Feb. 2020
57233	Nattional Instruments / PXI-8115	Embedded Controller	Cal Not Required	Cal Not Required
57253	National Instruments / PXI-2796	40GHz Dual 6x1 Multiplexer (SP6T)	Verify Before Use	Verify Before Use
57254	National Instruments / PXI-2799	Switch 1x1	Verify Before Use	Verify Before Use
57479	CISCO / ATIL	Automation Test Insertion Loss System	Verify Before Use	Verify Before Use



Equip#	Manufacturer/ Model	Description	Last Cal	Next Due	Test Item
Test Equipment used for Radiated Emissions					
CIS008113	Cisco/NSA 5m Chamber	NSA 5m Chamber	01-Oct-19	01-Oct-20	B1
CIS037581	ETS Lindgren / 3117	Double Ridged Guide Horn Antenna	25-Jan-19	25-Jan-20	B1
CIS039131	Cisco / TH0118	Mast Mount Preamplifier Array, 1-18GHz	25-Feb-19	25-Feb-20	B1
CIS038404	Sunol Sciences / JB1	Combination Bi-Log Antenna, 30MHz-2GHz	31-Jan-19	31-Jan-20	B1
CIS036710	Cisco/1840	18-40GHz EMI Test Head/Verification Fixture	12-Aug-19	12-Aug-20	B1
CIS018231	Rohde & Schwarz / ESI 40(ESIB 40)	EMI RECEIVER TEST 20Hz-40GHz	07-Mar-19	07-Mar-20	B1
CIS042012	Rohde & Schwarz / ESCI	EMI Test Receiver	12-Aug-19	12-Aug-20	B1
CIS040604	Agilent / E4440A	Precision Spectrum Analyzer	19-Oct-18	19-Oct-20	B1
CIS047311	Huber+ Suhner/Sucoflex 106PA	RF Coaxial Cable, to 18GHz, 8.5 m	30-Sep-19	30-Sep-20	B1
CIS055178	Huber+ Suhner/Sucoflex 106PA	RF Coaxial Cable, to 18GHz, 8.5 m	30-Sep-19	30-Sep-20	B1
CIS025660	Micro-Coax / UFB311A-1-0840-504504	RF Coaxial Cable, to 18GHz, 8.5 m	30-Sep-19	30-Sep-20	B1
CIS025640	Micro-Coax / UFB311A-0-2720-520520	Coaxial Cable, 272.0 in. to 18GHz	30-Sep-19	30-Sep-20	B1
CIS056059	Wainwright Instruments/ WRCJV8-5200-5250-5350-5400- 40SS	SMA Band Reject Filter 5.250GHz to 5.350GHz	10-Aprl-19	10-Apr-20	B1
Test Equipment used for AC Conducted Emissions					
CIS41955	Rohde & Schwarz / ESCI	EMI Test Receiver	25-Apr-19	25-Apr-20	B2
CIS08187	Fisher Custom Com / FCC-450B-2.4-N	Pulse Limiter	15-May-19	15-May-20	B2
CIS019210	TTE / H785-150K-50-21378	High Pass Filter 150KHz	25-Feb-19	25-Feb-20	B2
CIS05039	Fisher Custom Com / 50/250-50-2-02	LISN (9kHz-30MHz)	21-Feb-19	21-Feb-20	B2
CIS034158	Fisher Custom Com / 50-2-RA-NEMA-5-20R	LISN Receptacle Adaptor	21-Feb-19	21-Feb-20	B2
CIS040532	Coleman / RG-223	25 ft RG-223 Cable	04-Dec-18	04-Dec-19	B2
51663	Bird / 5-T-MB	50Ω termination	04-Dec-18	04-Dec-19	B2



Appendix C: 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
Measdist	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

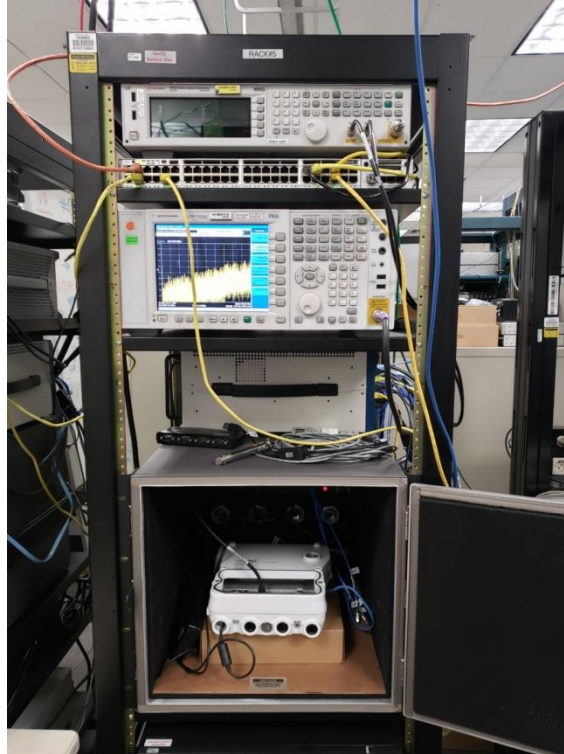
Appendix D: Photographs of EUT





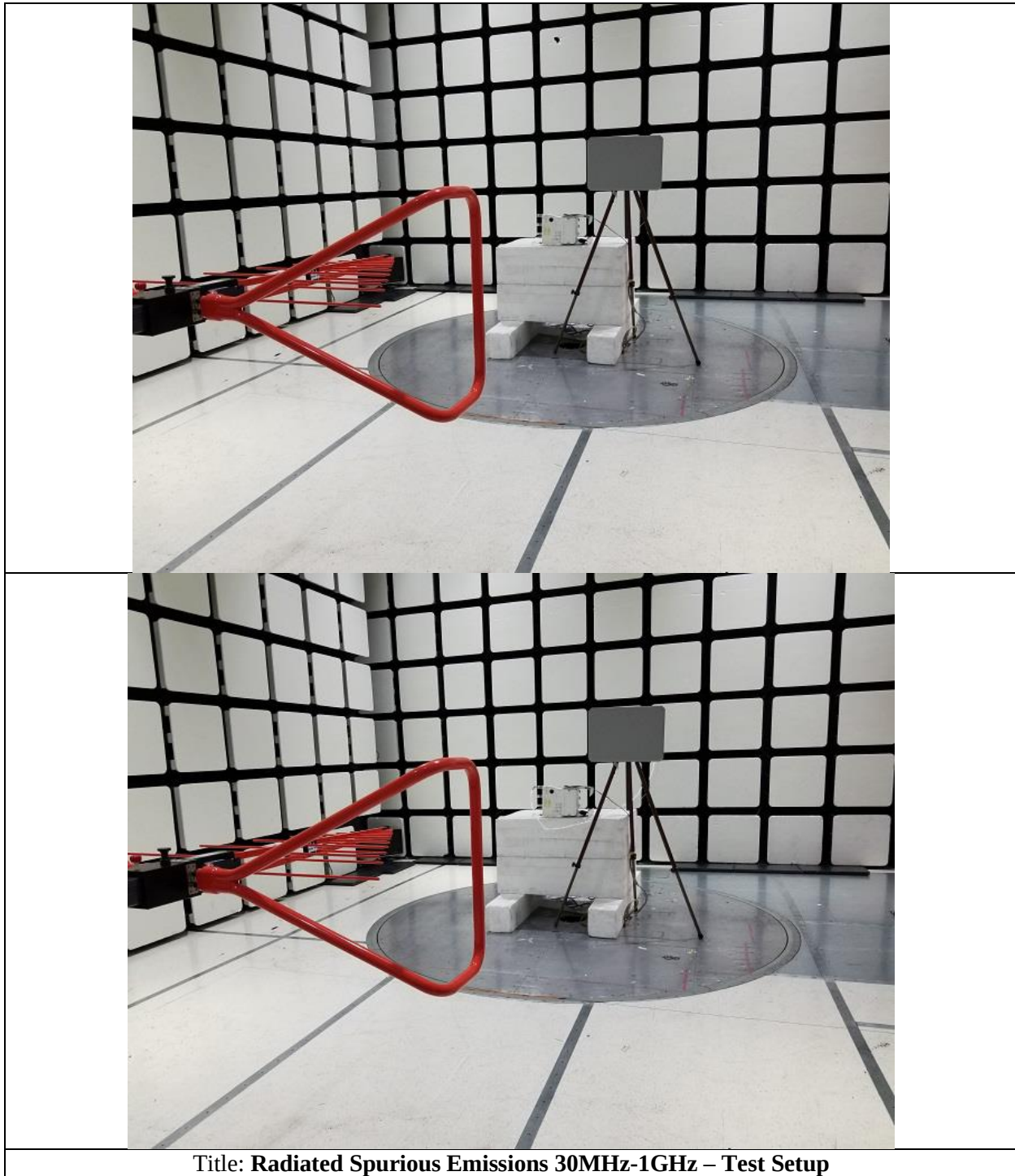
Appendix E: Photographs of Test Setups

Title: Radio Conducted Test Setup

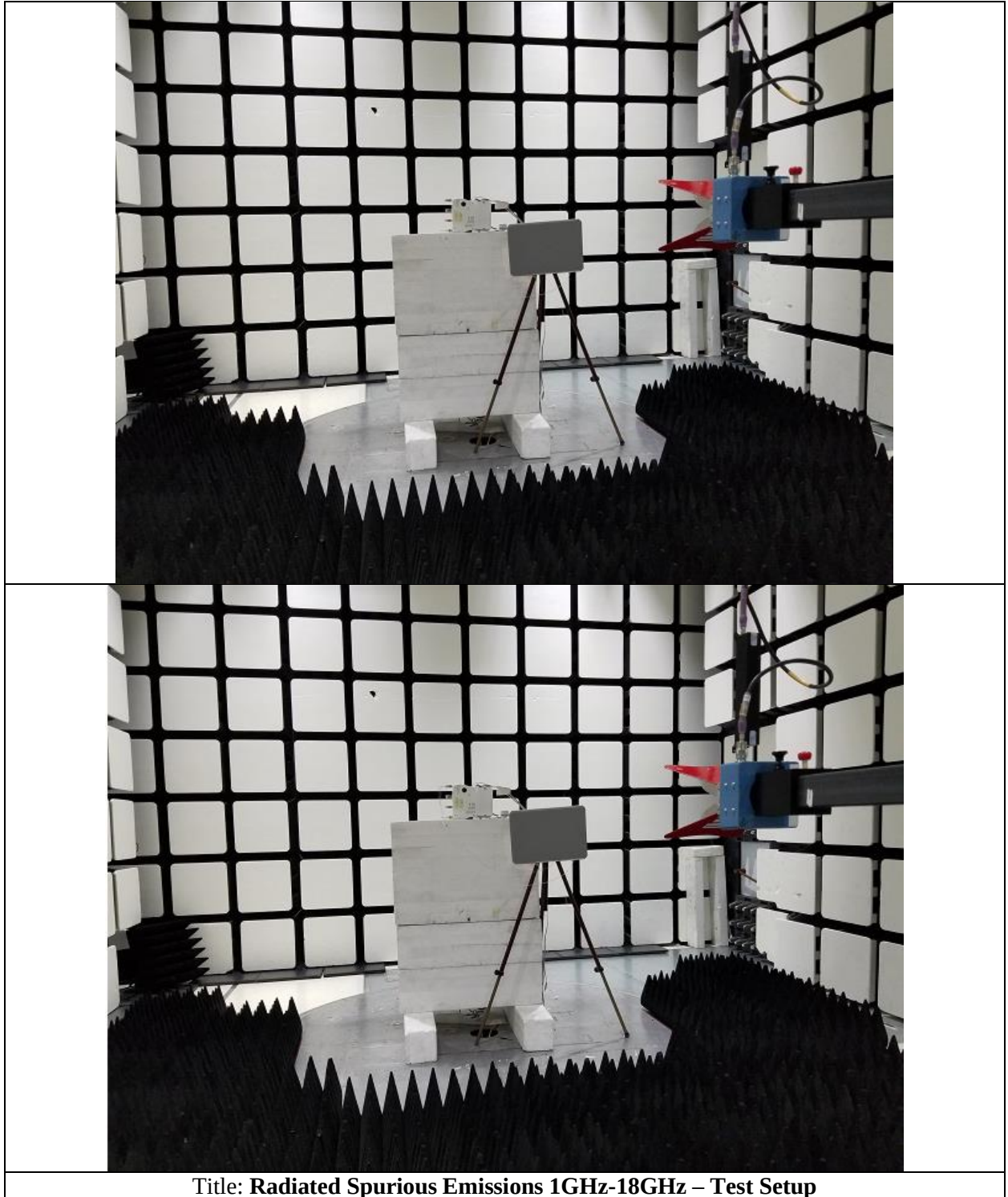




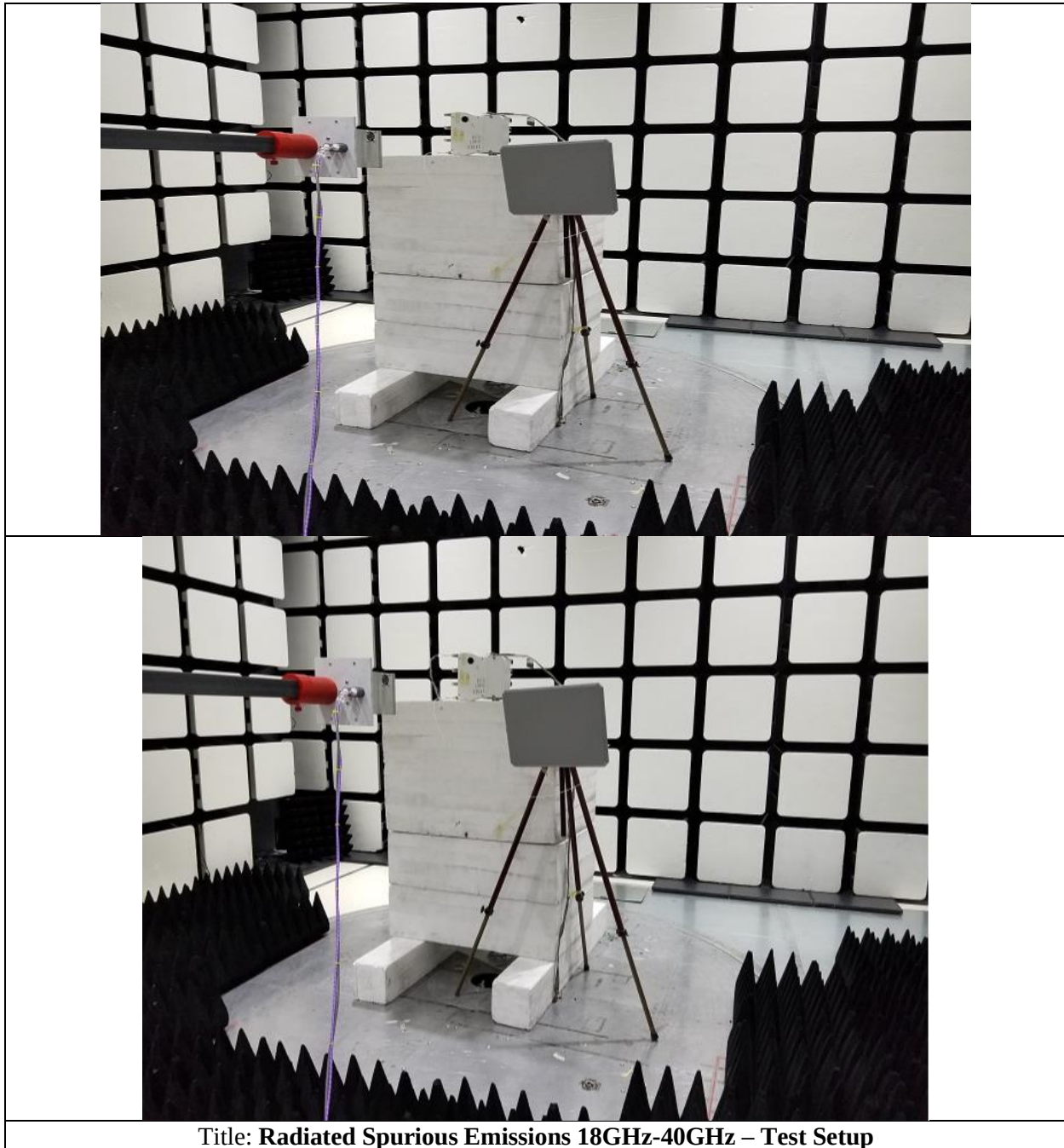
Title: Radiated Spurious Emissions Test Setup



Title: Radiated Spurious Emissions 30MHz-1GHz – Test Setup



Title: Radiated Spurious Emissions 1GHz-18GHz – Test Setup



Title: Radiated Spurious Emissions 18GHz-40GHz – Test Setup



Title: Conducted Emissions 150KHz-30MHz – Test Setup



Appendix F: Software Used to Perform Testing

EMIsoftVasona, version 6.024

Appendix G: 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 H: 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>



Appendix I: Test Assessment Plan

Compliance Test Plan (Excel) EDCS# 18357550
Target Power Tables EDCS# 18295686

Appendix J: Worst Case Justification

All 3 orientations (Z, Y, Z) of the EUT were assessed by performing pre-scan.
The Z orientation was determined to be the worst-case orientation.

Worst Case Mode: Worst case mode shall be the mode that produces the highest power level based on conducted power measurement.

Also see Appendix A the test report.



Appendix F: 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 G: 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>

End