Test Report C9124AXD-B

Cisco Catalyst C9124AX Series 802.11ax Access Point 5GHz Auxiliary Radio

FCC ID: LDK-HTIAK2282

5250-5350 MHz

Against the following Specifications:

CFR47 Part 15.407



Cisco Systems 170 West Tasman Drive

San Jose, CA 95134

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	Revision: 1

This report replaces any previously entered test report under EDCS – **21574902**. 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 Engi	neering 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

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:

- 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*%

 All AC testing was performed at one or more of the following supply voltages: 110V 60 Hz (+/-20%)

Units of Measurement

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

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

Emission level [dBuV] = Indicated voltage level [dBuV] + Cable Loss [dB] + Other correction factors [dB] The combinations of correction factors are dependent upon the exact test configurations [see test equipment lists for further details] and may include:-

Antenna Factors, Pre Amplifier Gain, LISN Loss, Pulse Limiter Loss and Filter Insertion Loss Note: to convert the results from dBuV/m to uV/m use the following formula:-

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

Measurement Uncertainty Values

voltage and power measurements	± 2 dB
conducted EIRP measurements	± 1.4 dB
radiated measurements	± 3.2 dB
frequency measurements	± 2.4 10-7
temperature measurements	± 0.54°
humidity measurements	± 2.3%
DC and low frequency measurements	± 2.5%

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

Radiated emissions (expanded uncertainty, confidence interval 95%)

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

Conducted emissions (expanded uncertainty, confidence interval 95%)

30 MHz – 40GHz	+/- 0.38 dB

A product is considered to comply with a requirement if the nominal measured value is below the limit line. The product is considered to not be in compliance in case the nominal measured value is above the limit line.

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2.2 Date of testing

24-FEB-2021 through 10-MAR-2021

2.3 Report Issue Date

26-MAR-2021

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	Company #: 2461N-2
	San Jose, CA 95134	
Building P, 5m Chamber	125 West Tasman Dr	Company #: 2461N-1
	San Jose, CA 95134	
Building 7, 5m Chamber	425 E. Tasman Drive	Company #: 2461N-3
	San Jose, California 95134	
	United States	

Test Engineers

Said Abdelwafi, Julian Land

2.5 Equipment Assessed (EUT)

C9124AXI

2.6 EUT Description

The Cisco Catalyst 9124AX Series outdoor access points are next-generation Wi-Fi 6 access points encased in a rugged and robust design that service providers and enterprises can easily deploy.

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, One Antenna, 6 to 54 Mbps, 1ss

The following antennas are supported by this product series. Please note, the antenna information has been provided by the customer (the Cisco business unit). The data included in this report represent the worst-case data for all antennas.

Frequency	Antenna Name		Antenna Gain	
2.4GHz & 5GHz (Wi-Fi)	Antenna 1	TX/RX: internal	9dBi@2.4GHz 9dBi@5GHz	
2.4GHz & 5GHz (Wi-Fi)	Antenna 2	TX/RX: internal	9dBi@2.4GHz 9dBi@5GHz	
2.4GHz & 5GHz (Wi-Fi)	Antenna 3	TX/RX: internal	9dBi@2.4GHz 9dBi@5GHz	
2.4GHz & 5GHz (Wi-Fi)	Antenna 4	TX/RX: internal	9dBi@2.4GHz 9dBi@5GHz	
BLE	Antenna T	TX/RX: internal	4dBi	
2.4GHz & 5GHz (Aux)	Antenna A	TX/RX: internal	9dBi@2.4GHz 9dBi@5GHz	
2.4GHz & 5GHz (Aux)	Antenna B	RX: internal	9dBi@2.4GHz 9dBi@5GHz	

Ithaca (Internal Antenna) Model C9124AXD-x

Section 3: Result Summary

3.1 Results Summary Table

Conducted emissions

Basic Standard	Technical Requirements / Details	Result
		D
15.407	99% & 26 dB Bandwidth : The 99% occupied bandwidth is the frequency bandwidth such that, below its lower and above its upper frequency limits, the mean powers are each equal to 0.5% of the total mean power of the given emission. There is no limit for 99% OBW.	Pass
	The 26 dB emission is the width of the emission that is constrained by the frequencies associated with the two outermost amplitude points (upper and lower frequencies) that are attenuated by 26 dB relative to the maximum level measured in the fundamental emission.	
15.407	Output Power: 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	Pass
	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 powerspectral density shall be reduced by the amount in dB that the directionalgain of the antenna exceeds 6 dBi.	1 455
15.407	Power Spectral DensityThe maximum power spectral density shall not exceed 11 dBm in any 1megahertz band. If transmitting antennas of directional gain greater than 6dBi are used, both the maximum conducted output power and themaximum power spectral density shall be reduced by the amount in dBthat the directional gain of the antenna exceeds 6 dBi.	Pass
15.407	Conducted Spurious Emissions / Band-Edge: 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.	Pass
15.407 15.205 15.209	Restricted band: Unwanted emissions must comply with the general field strength limits set forth in §15.209.	Pass

Basic Standard	Technical Requirements / Details	Result
15.407 15.205 15.209	TX Spurious Emissions: Except as provided elsewhere in this subpart, the emissions from an intentional radiator shall not exceed the field strength levels specified in the field strength limits table in this section.	Not covered by the scope of this test report
15.207	AC conducted Emissions: U-NII devices using an AC power line are required to comply also with the conducted limits set forth in §15.207.	Not covered by the scope of this test report

Section 4: Sample Details

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

4.1 Sample Details

Sample No.	Equipment Details	Manufacturer	Hardware Rev.	Serial Number
S01	C9124AXI-B (used in Rack 9)	Foxconn (for Cisco)	074-125082-01	FOC243919ZU
S02	C9124AXI-B (used in Rack 4)	Foxconn (for Cisco)	074-125082-01	FOC243919PK

4.2 System Details

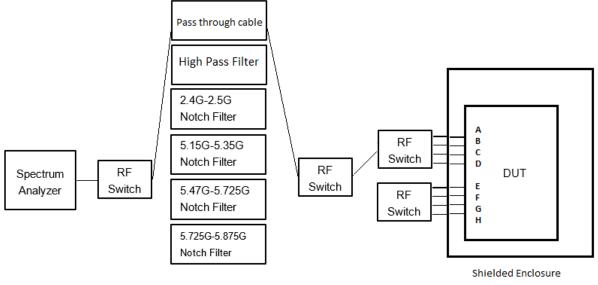
System #	Description	Samples
1	EUT (used in Rack 9)	S01
2	EUT (used in Rack 4)	S02

4.3 Mode of Operation Details

Mode#	Description	Comments
1	Continuous Transmit	AP Running Image: 8.8.1.10
	Testing using Rack 9	Cisco AP Software, (ap1g6a), [sjc-ads-
		9175:/nobackup/rahulsi6/ithaca/c175_throttle/router]
		Compiled Wed Feb 17 19:47:58 PST 2021
2	Continuous Transmit	AP Running Image: 8.8.1.10
	Testing using Rack 4	Cisco AP Software, (ap1g6a), [cheetah-
		build9:/san1/BUILD/workspace/c175_throttle_mfg/label/mfg-ap1g6a]
		Compiled Sun Mar 7 19:58:16 GMT 2021

Appendix A: Emission Test Results

Conducted Test Setup Diagram



8-port radio shown here Some radios will fewer transmit paths

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 \ge EBW if possible; otherwise, set RBW to the largest available value. Set VBW \ge 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 \le 16.7 microseconds.)

Duty Cycle Test Information

Tested By :	Date of testing:
Said Abdelwafi, Julian Land	24-FEB-2021 through 10-MAR-2021
Test Result : PASS	

Test Equipment

See Appendix C for list of test equipment

Duty Cycle Data Table

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

Frequency (MHz)	Mode	Data Rate (Mbps)	Duty Cycle Correction Factor (dB)
5260	Non HT20, 6 to 54 Mbps	6.0	0.13139
5280	Non HT20, 6 to 54 Mbps	6.0	0.11619
5300	Non HT20, 6 to 54 Mbps	6.0	0.11619
5320	Non HT20, 6 to 54 Mbps	6.0	0.11619

Data Screenshots

5260 MHz: Non HT20, 6 to 54 Mbps

Spec Swej	trum Ana ot SA	lyzer 1	•	Spectrum Analyzer 2 Occupied BW	+					\$	Frequency	· · · 深
KE' RL	/SIGH1 ·≁·	Couplir Align: (ng: DC	Input Ζ: 50 Ω Corrections: On Freq Ref: Int (S) NFE: Full	#Atten: 30 dB µW Path: Standa	PNO: Fast ard Gate: Off IF Gain: Lo Sig Track:	Avg Ho w Trig: F	vpe: Log-Powe old: 1/1 iree Run	Pr 123456 A WWWWW P N N N N N		Frequency 00000 GHz	Settings
1 Sp	ectrum		v					Mk	r4 116.0 μs		0000 Hz	
	e/Div 10	dB			Ref Level 15.00	dBm		-	19.208 dBm		ept Span	
Log 5.00		m pro	maged	Mana was a second and a second a	and have been been	man man	mmmy m	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	Mary and and and	Zer	o Span	
-5.00 -15.0		4			1 2					FI	ull Span	
-25.0										Start Fre		
-35.0 -45.0										L	00000 GHz	
-55.0		¥					<mark>P</mark>			Stop Fre		
-65.0										5.26000	00000 GHz	
-75.0										AU	TO TUNE	
	er 5.2600 BW 3.0 N		SHz		#Video BW 100) kHz		Sween 1 (Span 0 Hz 00 ms (1001 pts)	CF Step		
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	Mode	Trace	Scale		Y	Function	Function V	Nidth Fu	unction Value	Mar	ו	
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		1	t	107.0 µs						0 Hz		
		1	t	116.0 µs	-19.21 dBm					X Axis S	calo	
E E										Loc		
			_							📒 Lin		
	5	2		? Feb 25, 2021 5:20:47 AM	$\square $	9	7.02, 0.13			Signal Ti (Span Zo		

Antenna A

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). 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 ≥ 3 · 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

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%.

Tested By :	Date of testing:
Said Abdelwafi, Julian Land	24-FEB-2021 through 10-MAR-2021
Test Result : PASS	

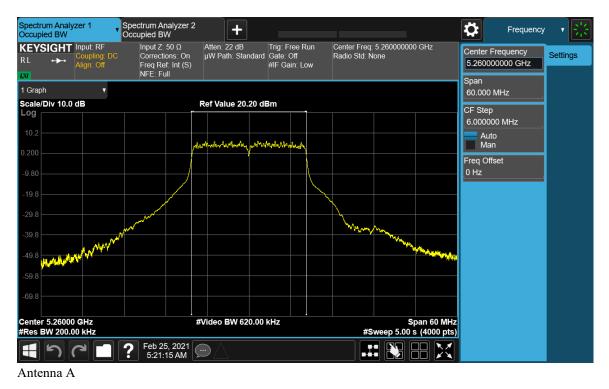
Test Equipment

See Appendix C for list of test equipment

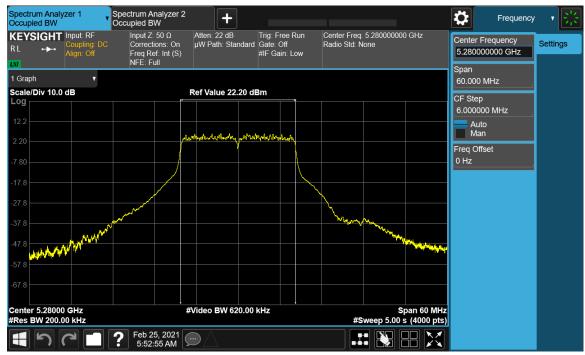
Frequency (MHz)	Mode	Data Rate (Mbps)	26dB BW (MHz)	99% BW (MHz)
52(0	Neg UT20 (to 54 Mbre		21.8	16 492
5260	Non HT20, 6 to 54 Mbps	6.0	21.8	16.483
5280	Non HT20, 6 to 54 Mbps	6.0	21.7	16.483
5300	Non HT20, 6 to 54 Mbps	6.0	21.8	16.487
5320	Non HT20, 6 to 54 Mbps	6.0	21.9	16.492

Data Screenshots

5260 MHz: Non HT20, 6 to 54 Mbps

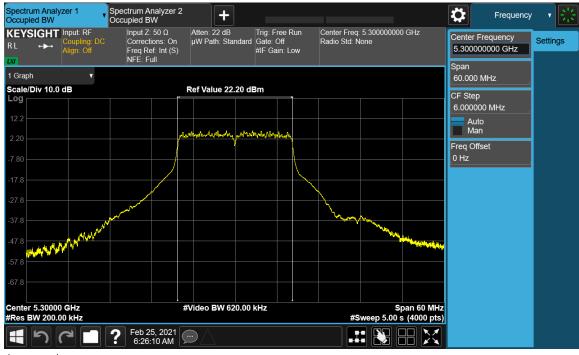


5280 MHz: Non HT20, 6 to 54 Mbps



Antenna A

5300 MHz: Non HT20, 6 to 54 Mbps



Antenna A

A.3 Maximum Conducted Output Power

Maximum Conducted Output Power Test Requirement

15.407 (2) 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. ... 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-andsum 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

Tested By :	Date of testing:
Said Abdelwafi, Julian Land	24-FEB-2021 through 10-MAR-2021
Test Result : PASS	

Test Equipment

See Appendix C for list of test equipment

Maximum Output Power

Frequency 5260 MHz

	Paths	related Antenna Gain ()	Max Power m)	y Cycle	Total Tx Channel Power (dBm)	it II)	gin
Mode	Tx Paths	Correlated (dBi)	Tx 1 Max (dBm)	Duty Cycl (dB)	Total Tx ((dBm)	Limit (dBm)	Margin (dB)
Non HT20, 6 to 54 Mbps	1	9	17.3	0.13	17.4	21	3.57

Frequency 5280 MHz

		ain			ver -		
Mode	Tx Paths	Correlated Antenna Gain (dBi)	Tx 1 Max Power (dBm)	Duty Cycle (dB)	Total Tx Channel Power (dBm)	Limit (dBm)	Margin (dB)
Non HT20, 6 to 54 Mbps	1	9	17.3	0.12	17.4	21	3.63

Frequency 5300 MHz

	Paths	Correlated Antenna Gain (dBi)	Tx 1 Max Power (dBm)	Duty Cycle (dB)	Total Tx Channel Power (dBm)	Limit (dBm)	Margin (dB)
Mode	<u>к</u>	<u>ਹੋਰ</u>	<u>유</u> 명	(gp)	<u> </u>	21	(qB)
Non HT20, 6 to 54 Mbps	1	9	17.1	0.12		21	3.74

Frequency 5320 MHz

Frequency 5320 MHz							
		Antenna Gain	Power		Total Tx Channel Power (dBm)		
Mode	Tx Paths	Correlated Antenna (dBi)	Tx 1 Max Power (dBm)	Duty Cycle (dB)	Total Tx Ch: (dBm)	Limit (dBm)	Margin (dB)
Non HT20, 6 to 54 Mbps	1	9	17.1	0.12	17.2	21	3.83

Data Screenshots

5260 MHz: Non HT20, 6 to 54 Mbps

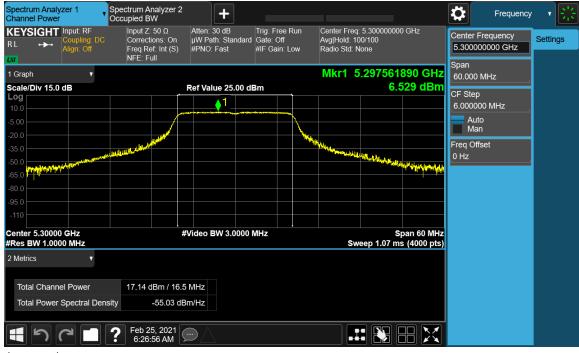
Spectrum Analyzer 1 Channel Power	Spectrum Analyzer 2 Occupied BW	+							Frequency	· · *
KEYSIGHT Input: RF R L ↔ Align: Off	Input Ζ: 50 Ω Corrections: On Freq Ref: Int (S) NFE: Full	Atten: 30 dB µW Path: Stand #PNO: Fast	Trig: Free lard Gate: Off #IF Gain:		Center Fred Avg Hold: 1 Radio Std: 1) GHz	Center Fr 5.260000 Span	requency 0000 GHz	Settings
1 Graph 🔹					Mkr1 (5.261882		60.000 N	ИHz	
Scale/Div 15.0 dB		Ref Value 23.0	0 dBm			6.8	309 dBm	CF Step		
Log 8.00			<u> </u>					6.00000	0 MHz	
-7.00				λ				Auto Man		
-22.0	. Louis and the second			NINTHA	Mara .			Freq Offs		
-37.0	La result and a state of the second state of t				and the second s	Minister of the State of the St		0 Hz	el .	
-52.0 -67.0							an a			
-82.0							'			
-97.0										
-112				+						
Center 5.26000 GHz #Res BW 1.0000 MHz	#	Video BW 3.00	00 MHz	•	Sw	S veep 1.07 m	pan 60 MHz s (4000 pts)			
2 Metrics v										
Total Channel Power	17.30 dBm / 16.5	MHz								
Total Power Spectral Den	-54.87 dB	m/Hz								
1 2 2 1	Feb 25, 2021 5:22:01 AM						HX			
Antenna A										

5280 MHz: Non HT20, 6 to 54 Mbps

Spectrum Analyzer 1 Channel Power	Spectrum Analyzer 2 Occupied BW	+				Frequency	- 湯
RL +++ Align: Off	Input Z: 50 Ω Corrections: On Freq Ref: Int (S) NFE: Full	µW Path: Standard	Trig: Free Run Gate: Off #IF Gain: Low	Center Freq: 5.28000 Avg Hold: 100/100 Radio Std: None	0000 GHz	Center Frequency 5.280000000 GHz	Settings
1 Graph ▼ Scale/Div 15.0 dB		Ref Value 25.00 dE	2m	Mkr1 5.2761	81545 GHz 6.751 dBm	Span 60.000 MHz	
Log	The second secon			high the same of the day to be for the day to be for the day to be for the same of the day to be for the day to be day to be day to be for the day to be for the d		CF Step 6.000000 MHz Auto Man Freq Offset 0 Hz	
-50.0 -65.0 -80.0 -95.0 -110					Maratenianen hydere		
Center 5.28000 GHz #Res BW 1.0000 MHz	#	Video BW 3.0000 M	MHz	Sweep 1.07	Span 60 MHz / ms (4000 pts)		
2 Metrics Total Channel Power Total Power Spectral De	17.25 dBm / 16.5 nsity -54.92 dB						
1 560	Feb 25, 2021 5:53:41 AM						

Antenna A

5300 MHz: Non HT20, 6 to 54 Mbps



Antenna A

A.4 Power Spectral Density

Power Spectral Density Test Requirement

15.407 (2) 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 requires "maximum power spectral density" measurements where the intent is to measure the maximum value of the time average of the power spectral density measured during a period of continuous transmission. 1. Create an average power spectrum for the EUT operating mode being tested by following the instructions in section II.E.2. for measuring maximum conducted output power using a spectrum analyzer or EMI receiver: select the appropriate test method (SA-1, SA-2, SA-3, or alternatives to each) and apply it up to, but not including, the step labeled, "Compute power...". (This procedure is required even if the maximum conducted output power measurement was performed using a power meter, method PM.)

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

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

b) If Method SA-3 Alternative was used and the linear mode was used in step II.E.2.g)(viii), add 1 dB to the final result to compensate for the difference between linear averaging and power averaging.

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

Ref. KDB 789033 D02 General UNII Test Procedures New Rules v02r01 2. Measurement using a Spectrum Analyzer or EMI Receiver (SA), (d) Method SA-2

Power Spectral Density

Test parameters

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

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

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

(iii) Set RBW = 1 MHz.

(iv) Set VBW \geq 3 MHz.

(v) Number of points in sweep ≥ 2 Span / RBW. (This ensures that bin-to-bin spacing is \le 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-andsum 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)

Tested By :	Date of testing:
Said Abdelwafi, Julian Land	24-FEB-2021 through 10-MAR-2021
Test Result · PASS	

Test Equipment

See Appendix C for list of test equipment

Power Spectral Density

Frequency 5260 MHz

Mode	Tx Paths	Correlated Antenna Gain (dBi)	Tx 1 PSD (dBm/MHz)	Duty Cycle (dB)	Total PSD (dBm/MHz)	Limit (dBm/MHz)	Margin (dB)
Non HT20, 6 to 54 Mbps	1	9	6.8	0.13	6.9	8	1.06

Frequency 5280 MHz

	st	Correlated Antenna Gain (dBi)	SD AHz)	ycle	SD AHz)	(HZ)	
Mode	Tx Paths	1	Tx 1 PSD (dBm/MHz)	Duty Cycle (dB)	Total PSD (dBm/MHz)	Limit (dBm/MHz)	Margin (dB)
Non HT20, 6 to 54 Mbps	1	9	6.8	0.12	6.9	8	1.13

Frequency 5300 MHz							
		lain					
		na G					
		Antenna Gain					
			(Z	e	(z)	(z)	
	Paths	late	DSD AHM	Cycle	DSD MHM	HM	.9
	x Pa	Correlated (dBi)	Tx 1 PSD (dBm/MHz)	Duty ((dB)	Total PSD (dBm/MHz)	Limit (dBm/MHz)	Margin (dB)
Mode	Tx						
Non HT20, 6 to 54 Mbps	1	9	6.5	0.12	6.6	8	1.35

Frequency 5320 MHz

ths lated Antenna Gain SSD MHz) Cycle Cycle BSD MHz) MHz) MHz) MHz)	Frequency 5520 MILL				1			
Mode Tx Pat Limit Limit Margi Margi	Mode	Tx Paths	Correlated Antenna Gain (dBi)	Tx 1 PSD (dBm/MHz)	Duty Cycle dB)	Total PSD (dBm/MHz)	Limit (dBm/MHz)	Margin (dB)
Non HT20, 6 to 54 Mbps 1 9 6.5 0.12 6.6 8 1.36								1 36

Data Screenshots

5260 MHz: Non HT20, 6 to 54 Mbps

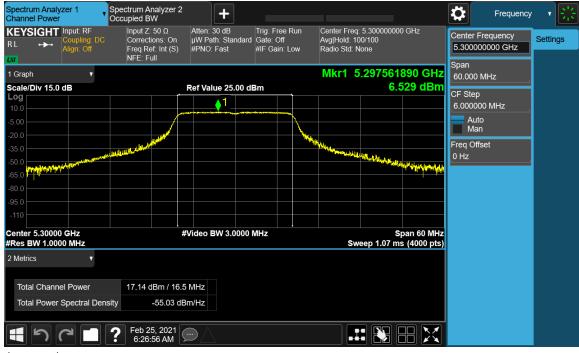
Spectrum Analyzer 1 Channel Power	Spectrum Analyzer 2 Occupied BW	+							Frequency	· · *
KEYSIGHT Input: RF R L ↔ Align: Off	Input Ζ: 50 Ω Corrections: On Freq Ref: Int (S) NFE: Full	Atten: 30 dB µW Path: Stand #PNO: Fast	Trig: Free lard Gate: Off #IF Gain:		Center Fred Avg Hold: 1 Radio Std: 1) GHz	Center Fr 5.260000 Span	requency 0000 GHz	Settings
1 Graph 🔹					Mkr1 (5.261882		60.000 N	ИHz	
Scale/Div 15.0 dB		Ref Value 23.0	0 dBm			6.8	309 dBm	CF Step		
Log 8.00			<u> </u>					6.00000	0 MHz	
-7.00				λ				Auto Man		
-22.0	. Louis and the second			NINTHA	Mara .			Freq Offs		
-37.0	La result and a state of the second state of t				and the second s	Minister of the State of the St		0 Hz	el .	
-52.0 -67.0							an a			
-82.0							'			
-97.0										
-112				+						
Center 5.26000 GHz #Res BW 1.0000 MHz	#	Video BW 3.00	00 MHz	•	Sw	S veep 1.07 m	pan 60 MHz s (4000 pts)			
2 Metrics v										
Total Channel Power	17.30 dBm / 16.5	MHz								
Total Power Spectral Den	-54.87 dB	m/Hz								
1 00	Feb 25, 2021 5:22:01 AM						HX			
Antenna A										

5280 MHz: Non HT20, 6 to 54 Mbps

Spectrum Analyzer 1 Channel Power	Spectrum Analyzer 2 Occupied BW	+				Frequency	- 湯
RL +++ Align: Off	Input Z: 50 Ω Corrections: On Freq Ref: Int (S) NFE: Full	µW Path: Standard	Trig: Free Run Gate: Off #IF Gain: Low	Center Freq: 5.28000 Avg Hold: 100/100 Radio Std: None	0000 GHz	Center Frequency 5.280000000 GHz	Settings
1 Graph ▼ Scale/Div 15.0 dB		Ref Value 25.00 dE	2m	Mkr1 5.2761	81545 GHz 6.751 dBm	Span 60.000 MHz	
Log	The second secon			high the same of the day to be for the day to be for the day to be for the same of the day to be for the day to be day to be day to be for the day to be for the d		CF Step 6.000000 MHz Auto Man Freq Offset 0 Hz	
-50.0 -65.0 -80.0 -95.0 -110					Maratenianen hydere		
Center 5.28000 GHz #Res BW 1.0000 MHz	#	Video BW 3.0000 M	MHz	Sweep 1.07	Span 60 MHz / ms (4000 pts)		
2 Metrics Total Channel Power Total Power Spectral De	17.25 dBm / 16.5 nsity -54.92 dB						
1 560	Feb 25, 2021 5:53:41 AM						

Antenna A

5300 MHz: Non HT20, 6 to 54 Mbps



Antenna A

A.5 Conducted Spurious Emissions

Conducted Spurious Emissions Test Requirement

15.407(b) Undesirable emission limits. Except as shown in paragraph (b)(7) of this section, the maximum emissions outside of the frequency bands of operation shall be attenuated in accordance with the following limits:

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

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

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	Average
RBW = 1 MHz	RBW = 1 MHz
$VBW \ge 3 MHz$	$VBW \ge 3 MHz$
Sweep = Auto	Sweep = Auto
Detector = Peak	Detector = RMS
Trace = Max Hold.	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).

Tested By :	Date of testing:
Said Abdelwafi, Julian Land	24-FEB-2021 through 10-MAR-2021
Test Result : PASS	

Test Equipment

See Appendix C for list of test equipment

Conducted Spurs Average Upper

Frequency 5260 MHz

	ths	lated Antenna Gain	Spur Power 1)	Cycle	Total Conducted Spur (dBm)		Ц
Mode	Tx Paths	Correlated Ar (dBi)	Tx 1 Spur Pov (dBm)	Duty Cycle (dB)	Total Conduc (dBm)	Limit (dB)	Margin (dB)
Non HT20, 6 to 54 Mbps	1	9	-71.5	0.13	-62.4	-41	21.12

Data Screenshots

5260 MHz: Non HT20, 6 to 54 Mbps

Spectr Swept	rum Ana SA	lyzer 1	v	Spectrum Analyzer 2 Occupied BW	+						*	Frequency	- * 🛞
KEY: RL	SIGH1	Input: I Couplii Align: (ng: DC	Input Ζ: 50 Ω Corrections: On Freq Ref: Int (S) NFE: Full	#Atten: 0 dB µW Path: Star	IF Gair	Dff	#Avg Type: P Avg Hold: 125 Trig: Free Ru	5/125	IS 1 2 3 4 5 6 A WW WW W A N N N N N	Center Fr 26.00000 Span	equency 00000 GHz	Settings
1 Spec	ctrum		v					Μ	kr4 3	9.020 GHz	28.0000	000 GHz	
Scale	/Div 10	dB			Ref Level -10.	.00 dBm			-71	1.454 dBm	Swe	ot Span Span	
-30.0 -40.0											Ful	l Span	
-50.0 -60.0										4-	Start Fred 12.00000	l 00000 GHz	
-70.0 -80.0 -90.0	2 ← ~~~~	James	۱	hand of the second subscription for	manderan	-	and and the state of the state		᠕ᠬᠬᠰ᠕ᢕ	manna	Stop Freq 40.00000) 00000 GHz	
-100	12.00 GI				#Video BW 3	.0 MHz*			s	top 40.00 GHz	AUT	O TUNE	
#Res	BW 1.0	MHz						Swee	p ~50.5	ms (1001 pts)			
5 Mark	ker Table		•								L	0000 GHz	
1	Mode N	Trace	Scale	e X 5.260 GHz	Y dB	Functi	on Fu	nction Width	Fun	ction Value	Auto Man		
2 3	Ν	1	f	10.520 GHz	dB	m					Freq Offs 0 Hz	et	
4 5 6	N			39.020 GHz	-71.45 dB	m					X Axis Sc Log Lin	ale	
	5	2		Peb 25, 2021 5:23:41 AM							Signal Tra (Span Zoo	ack m)	
Ante	enna /	4											

Conducted Spurs Peak Upper

Frequency	5260 I	MHz

		Paths	Correlated Antenna Gain (dBi)	l Spur Power m)	Total Conducted Spur (dBm)	lit)	rgin
Mode		Tx Paths	Correls (dBi)	Tx 1 Sp (dBm)	Total C (dBm)	Limit (dB)	Margin (dB)
Non HT	20, 6 to 54 Mbps	1	9	-49.2	-40.1	-21	18.82

Data Screenshots

-

5260 MHz: Non HT20, 6 to 54 Mbps

Spectr Swept	um Anal SA	yzer 1	•	Spectrum Analy Occupied BW	zer 2	+									Frequency	· •	尝
KEY: RL	SIGHT • • •	Input: F Couplir Align: C	ng: DC	Input Z: 50 Corrections Freq Ref: In NFE: Full	: On	#Atten: 0 dB µW Path: Star	IF Ga			#Avg Type: F Avg Hold: 12 Trig: Free Ru	25/125	M₩₩	456 \\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\		Frequency 000000 GHz	Setti	ngs
1 Spec	trum		•							N	lkr4 3	39.160	GHz	• •	0000 GHz		
Scale/	'Div 10 o	B			R	ef Level -10.	.00 dBm				-	49.17	dBm		ept Span o Span		
-30.0 -40.0													4	F	ull Span		
-50.0 -60.0	2			المالية المحاجز والمحاجز والم	Martin Strategy	Law Martin Martin	184 ⁴ -1-444/14-14 ¹⁴	Ward and	trutym	rither store of sold and the	ph.Manna	(Pad Maland	ute Wine	Start Fre	eq 000000 GHz		
-70.0 -80.0	Berry Western	***********	149.4.14a.											Stop Fre			
-90.0 -100														40.000	000000 GHz		
	2.00 GH	7			#	Video BW 3						Stop 40.0	0 GHz	AU	TO TUNE		
	3W 1.0 I									Swee		5 ms (10		CF Step)		
5 Mark	er Table		•											L	00000 GHz		
	Mode	Trace	Scale			Y	Func	tion	Fun	ction Width	Fun	nction Val	ue	Aut Ma			
1	N N	1	f	5.260 10.520) GHz	dB dB								Freq Of	fset		
3														0 Hz			
4 5 6	N	1	f	39.160) GHz	-49.17 dB	m							X Axis S Log Lin	g		
	5	2		? Feb 25, 2 5:25:32									X	Signal T (Span Zo	rack		
Ante	nna A	1															

Conducted Spurs Average

Frequency 5260 MHz

		=					
		Gain			-		
		la (nd		
		Antenna	er		s p		
		vnt	Spur Power)		cte		
		d A	r P	e	npu		
	hs	ate	nd	Cycle	O		e
	Pat	i)	m) C	м М	m) (I) iit	rgii
Mode	Tx Paths	Correlated (dBi)	Tx 1 S (dBm)	Duty (dB)	Total Conducted Spur (dBm)	Limit (dB)	Margin (dB)
Non HT20, 6 to 54 Mbps	1	9	-51.5	0.13	-42.4	-41	1.15

Frequency 5280 MHz

	tths	Correlated Antenna Gain (dBi)	Spur Power)	Cycle	Total Conducted Spur (dBm)		in
Mode	Tx Paths		Tx 1 (dBm	Duty Cycle (dB)		Limit (dB)	Margin (dB)
Non HT20, 6 to 54 Mbps	1	9	-50.9	0.12	-41.7	-41	0.49

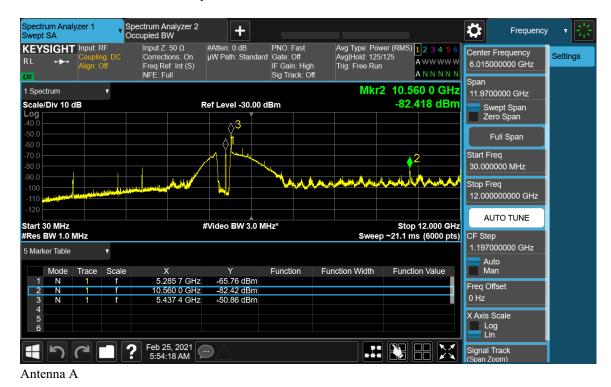
Frequency 5300 MHz	1						
		Gain					
		la G			pur		
		tenn	ver		ed S		
		An	Pov		luct		
	hs	Correlated Antenna (dBi)	Spur Power)	Cycle	Total Conducted Spur (dBm)		-
	Paths	rrel: 3i)		ty C	Total ((dBm)	s) mit	Margin (dB)
Mode	Tx	Corre (dBi)	Tx 1 (dBn	Duty (dB)	Toi (dE	Limit (dB)	Mar; (dB)
Non HT20, 6 to 54 Mbps	1	9	-53.0	0.12	-43.9	-41	2.65

Frequency 5320 MHz

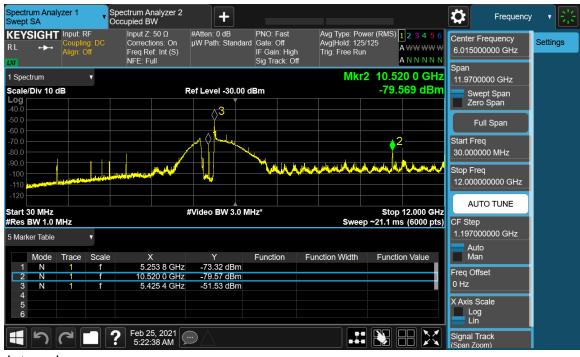
Frequency 5520 MILZ		1		1	T	r	
Mode	Tx Paths	Correlated Antenna Gain (dBi)	Tx 1 Spur Power (dBm)	Duty Cycle (dB)	Total Conducted Spur (dBm)	Limit (dB)	Margin (dB)
Non HT20, 6 to 54 Mbps	1	9	-53.0	0.12	-43.8	-41	2.59

Data Screenshots

5280 MHz: Non HT20, 6 to 54 Mbps



5260 MHz: Non HT20, 6 to 54 Mbps



Antenna A

5320 MHz: Non HT20, 6 to 54 Mbps



Antenna A

Conducted Spurs Peak

Frequency 5260 MHz

		Gain					
		Antenna G	wer		ted Spur		
	Tx Paths	elated	Spur Power m)	y Cycle	Total Conducted Spur (dBm)	it	.gin
Mode	Tx F	Corre (dBi)	Tx 1 S (dBm)	Duty (dB)	Total ((dBm)	Limit (dB)	Margin (dB)
Non HT20, 6 to 54 Mbps	1	9	-43.4	0.13	-34.3	-27	7.27

Frequency 5280 MHz

	ths	Correlated Antenna Gain (dBi)	Spur Power)	Cycle	Total Conducted Spur (dBm)		.5
Mode	Tx Paths	Correlated A (dBi)	Tx 1 (dBm	Duty Cycle (dB)		Limit (dB)	Margin (dB)
Non HT20, 6 to 54 Mbps	1	9	-42.6	0.12	-33.5	-27	6.48

Frequency 5300 MHz							
		Gain					
		la G			pur		
		Antenna	ver		ed S		
		An	Pov		luct		
	hs	Correlated (dBi)	Spur Power)	Cycle	Total Conducted Spur (dBm)		-
	Paths	rrel 3i)	-	3) (t)	Total ((dBm)	Limit (dB)	Margin (dB)
Mode	Tx	Corro (dBi)	Tx 1 (dBn	Duty (dB)	To ^r	Limi (dB)	Mar; (dB)
Non HT20, 6 to 54 Mbps	1	9	-44.7	0.12	-35.6	-27	8.58

Frequency 5320 MHz

Frequency 5520 MHZ	1						
		ıtenna Gain	wer		ted Spur		
	x Paths	Correlated Antenna Gain (dBi)	Tx 1 Spur Power (dBm)	Duty Cycle (dB)	Total Conducted Spur (dBm)	Limit (dB)	Margin (dB)
Mode	Tx						
Non HT20, 6 to 54 Mbps	1	9	-53.6	0.12	-44.5	-27	17.48

Data Screenshots

5280 MHz: Non HT20, 6 to 54 Mbps

Spectr Swept	um Anal SA	yzer 1		Spectrum Analyzer 2 Occupied BW	+							Frequency	▼ 2
KEY: RL	SIGH1	Input: I Couplii Align: 0	ng: DC	Input Ζ: 50 Ω Corrections: On Freq Ref: Int (S) NFE: Full	#Atten: 0 dB μW Path: Stand	PNO: Fas lard Gate: Off IF Gain: I Sig Track	Avg F High Trig:	Type: Po łold: 125/ Free Run	125	123456 MWWWW PNNNNN		r Frequency 5000000 GHz	Settings
1 Spec	trum		•					Μ	lkr4 5	.764 GHz		00000 GHz	
Log	/Div 10 (dB			Ref Level -7.00) dBm			-53	3.97 dBm		wept Span ero Span	
-17.0 - -27.0 -												Full Span	
-37.0 - -47.0 - -57.0 -					4					2	Start I 30.00	Freq 00000 MHz	
-67.0 -77.0 -87.0	1 Kershara Marka	Rand-point-site	ر مواري _{ا موس} ور	a deres de regel ange ar agt de plager	here a second	where and the states of the st	and the south of the	hamininana/~	ware with	physical	Stop I 12.00	Freq 00000000 GHz	
-97.0 Start 3	30 MHz				#Video BW 3.0) MHz			Stop	o 12.000 GHz	4		
	BW 1.0 I (er Table	MHz	•					Sweep	o ~21.2 m	ıs (1001 pts)	CF St 1,197	ep /000000 GHz	
5 Mark	Mode	Trace	Scale	e X	Y	Function	Function	Width	Funct	ion Value		uto 1an	
1 2	N N	1	f f	5.285 GHz 10.564 GHz	-69.00 dBm	1					Freq (0 Hz	Offset	
3 4 5	N N	1	f	5.428 GHz 5.764 GHz							X Axis	Scale	
6												.og .in	
	ょ	C		? Feb 25, 2021 5:55:04 AM								l Track Zoom)	
Ante	enna A	A											

5260 MHz: Non HT20, 6 to 54 Mbps



5300 MHz: Non HT20, 6 to 54 Mbps



A.6 Conducted Bandedge

Conducted Band Edge Test Requirement

15.407(b) Undesirable emission limits. Except as shown in paragraph (b)(7) of this section, the maximum emissions outside of the frequency bands of operation shall be attenuated in accordance with the following limits:

(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	Average
RBW = 1 MHz	RBW = 1 MHz

$VBW \ge 3 MHz$	$VBW \ge 3 MHz$
Sweep = Auto	Sweep = Auto
Detector = Peak	Detector = RMS
Trace = Max Hold.	Power Averaging

Tested By :	Date of testing:
Said Abdelwafi, Julian Land	24-FEB-2021 through 10-MAR-2021
Test Result : PASS	

Test Equipment

See Appendix C for list of test equipment

Conducted Bandedge Average

Frequency 5320 MHz

	x Paths	Correlated Antenna Gain (dBi)	Tx 1 Bandedge Level (dBm)	uty Cycle B)	Total Tx Bandedge Level (dBm)	imit B)	Margin (dB)
Mode	Tx P	Corre (dBi)	Tx 1 (dBn	Duty (dB)	Tota (dBn	Limit (dB)	Marg (dB)
Non HT20, 6 to 54 Mbps	1	9	-57.3	0.12	-48.2	-41	6.93

Data Screenshots

5320 MHz: Non HT20, 6 to 54 Mbps

Spec Swep	trum Ana ot SA	lyzer 1	•	Spectrum Analyzer 2 Occupied BW	+							Frequency	- • 影
KEY RL	′SIGH1 ·►· FAIL	Couplin Align: C	ig: DC	Input Ζ: 50 Ω Corrections: On Freq Ref: Int (S) NFE: Full	#Atten: 30 dB µW Path: Stand	PNO: Fa: lard Gate: Off IF Gain: I Sig Track	_ow	#Avg Type: Pe Avg Hold: 125 Trig: Free Ru	o/125 n A	23456 WWWWW NNNNN		requency 00000 GHz	Settings
1 Spe	ectrum		v					Mkr	2 5.353	37 GHz	• ·	0000 MHz	
Scale Log 13.0	e/Div 10	dB a 1 Fa			Ref Level 23.00	0 dBm			-57.3	09 dBm		ept Span o Span	
3.00 -7.00			11								FL	ull Span	
-17.0 -27.0	\	<u>ل</u>									Start Fre 5.32000	eq 00000 GHz	
-37.0 -47.0 -57.0		Burry C	Conversion of the second	12	หมูษาราชรถกฎษาชาวิห	արուսուտություններ	ทัมปา .คมใน	เฟลสมณหมีท	տողություն	14. A. Provenski stari	Stop Fre 5.46000	q 00000 GHz	
	5.32000				#Video BW 3.0		- u - yv - u		Stop 5	.46000 GHz		TO TUNE	
	BW 1.0	MHz	v					Sw	reep 1.00 m	ıs (601 pts)	CF Step 14.0000	000 MHz	
1	Mode N	Trace 1	Scal f	e X 5.350 00 GHz	Y -58.73 dBm	Function	Fur	nction Width	Functio	n Value	Auto Mar	ı	
2 3 4		1	f	5.353 37 GHz							Freq Off 0 Hz	set	
5											X Axis S Log Lin		
	5			Feb 25, 2021 7:08:40 AM							Signal Ti (Span Zo	rack om)	

Conducted Bandedge Peak

Frequency	5320	MHz

	•	Tx Paths	Correlated Antenna Gain (dBi)	1 Bandedge Level im)	Total Tx Bandedge Level (dBm)	nit ()	Margin (dB)
Mode Non HT	² 20, 6 to 54 Mbps		6 Corr (dBi)	H (map) -39.7	9.06- (dBm)	(dB)	(dB) 3.58

Data Screenshots

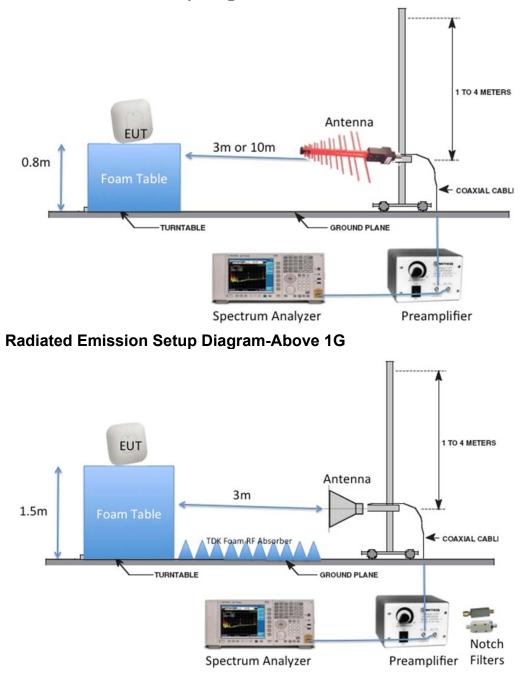
5320 MHz: Non HT20, 6 to 54 Mbps

Spectrum Swept SA		ter 1	v	Spectrum Ar Occupied BV	alyzer 2 V	+										Free	quency	۷	22
REYSIO	•••	Input: R Couplin Align: O	g: DC	Input Z: Correctio Freq Re NFE: Of	ons: On f: Int (S)	#Atten: 28 dE µW Path: Sta	ndard (F Gair		Avg	/g Type: L g Hold: 10 g: Free Ru		123 MWW PNN	₩₩₩		Frequenc		Settir	ngs
1 Spectrur	m		•								Mk	r2 5.3	51 03 (GHz		00000 MH	łz		
Scale/Div	v 10 dE		il			Ref Level 23	.00 dBr	n				-3	39.66 c	dBm		vept Spar ro Span	ו		
3.00																Full Span			
-17.0			<u></u> Թղու,	2										_	Start F 5.3200	req)00000 G	Hz		
-37.0 -47.0 -57.0			- 1 (") 	Male and	مەرىمىيەت مەرمىيەت مەرمەر م مەرمەر مەرمەر	เกษณะการสมประ	-incontra		alween/Role-ares	re the second	^{y Th} ord and and and and and and and and and an	اليحولين السيحان	ການເປັນເປັນແມ່ນແມ່ນ	┎╻╢╻╻╻╻┍	Stop Fi 5.4600	^r eq)00000 G	Hz		
-67.0 Start 5.32						#Video BW	3.0 MH:	z					p 5.46000			JTO TUN	E		
#Res BW 5 Marker 1		Hz	v								Sv	veep 1.0	0 ms (60	1 pts)	L	0000 MHz	<u>.</u>		
1	ode 1 N N	Ггасе 1 1	Scale f	5.350) 00 GHz 03 GHz	Y -45.36 dE -39.66 dE	3m	unctio	on F	Functio	n Width	Fund	ction Valu	Je	Freq O 0 Hz		_		
4 5 6															X Axis Lo	bg			
	า (? Feb 25 7:05:3	5, 2021 37 AM	\mathbb{D}								X	Signal (Span Z	Track oom)			

Appendix B: Emission Test Results

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

Radiated Emission Setup Diagram-Below 1G



B.1 Radiated Spurious Emissions

FCC 15.205 / 15.407 Radiated emissions which fall in the restricted bands, as defined in Section 15.205(a), must also comply with the radiated emission limits specified in Section 15.209(a) (see Section 15.205(c)).

Not covered by the scope of this test report.

B.2 Radiated Emissions 30MHz to 1GHz

FCC 15.209 / 15.205 / 15.407 Radiated emissions which fall in the restricted bands, as defined in Section 15.205(a), must also comply with the radiated emission limits specified in Section 15.209(a) (see Section 15.205(c)).

Ref. ANSI C63.10: 2013 section 6.5

Not covered by the scope of this test report.

B.3 AC Conducted Emissions

FCC 15.207 Except when the requirements applicable to a given device state otherwise, for any radio apparatus equipped to operate from the public utility AC power supply, either directly or indirectly (such as with a battery charger), the radio frequency voltage of emissions conducted back onto the AC power lines in the frequency range of 0.15 MHz to 30 MHz shall not exceed the limits shown in the table in these sections. The more stringent limit applies at the frequency range boundaries.

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

Not covered by the scope of this test report.

Equipment #	Manufacturer/ Model	acturer/ Model Description		Next Due	Test Item				
	Test Equipment used for conducted tests – Rack 9								
58719	Cisco/Automation Test Insertion Loss	Rack 9	Verify Before Use	Verify Before Use	A.1-A.6				
57562	Keysight (Agilent/HP)/ N9030B-550 OPT LNP EP0	PXA Signal Analyzer, 2Hz-50GHz with Options LNP and EP0	23-Jul-20	23-Jul-21	A.1-A.6				
58231	NATIONAL INSTRUMENTS / PXIe- 1062Q	CHASSIS	Cal Not Required	Cal Not Required	A.1-A.6				
58232	NATIONAL INSTRUMENTS / PXIe- 8840	Up to 2.6 GHz Quad-Core PXI Express Controller	Cal Not Required	Cal Not Required	A.1-A.6				
58234	NATIONAL INSTRUMENTS / PXI- 2796	40 GHz Dual 6x1 Multiplexer (SP6T)	Verify Before Use	Verify Before Use	A.1-A.6				
58236	NATIONAL INSTRUMENTS / PXI- 2796	40 GHz Dual 6x1 Multiplexer (SP6T)	Verify Before Use	Verify Before Use	A.1-A.6				
58237	NATIONAL INSTRUMENTS / PXI- 2799	Switch 1x1	Verify Before Use	Verify Before Use	A.1-A.6				
56327	PASTERNACK/ PE5019-1	Torque Wrench	14-May-20	14-May-21	A.1-A.6				
58256	COMET/ T7611-4	WEB SENSOR FOR REMOTE THERMOMETER HYGROMETER	3-Feb-21	3-Feb-22	A.1-A.6				

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

Equip#	Manufacturer/ Model	odel Description		Next Due	Test Item					
	Test Equipment used for conducted tests									
57478	Cisco/Automation Test Insertion Loss	Rack 4	Verify Before Use	Verify Before Use	A.1-A.6					
58702	Keysight (Agilent/HP)/ N9030B-550	PXA Signal Analyzer, 2Hz-50GHz	15-Oct-20	15-Oct-21	A.1-A.6					
55096	National Instruments/ PXI-1042	CHASSIS, PXI	Cal Not Required	Cal Not Required	A.1-A.6					

57239	National Instruments/ PXI-8115	Embedded Controller	Cal Not Required	Cal Not Required	A.1-A.6
57250	National Instruments/ PXI-2796	40 GHz Dual 6x1 Multiplexer (SP6T)	Verify Before Use	Verify Before Use	A.1-A.6
57251	National Instruments/ PXI-2799	Switch 1x1	Verify Before Use	Verify Before Use	A.1-A.6
56093	National Instruments/ PXI-2796	40 GHz Dual 6x1 Multiplexer (SP6T)	Verify Before Use	Verify Before Use	A.1-A.6
56327	PASTERNACK/ PE5019-1	Torque Wrench	14-May-20	14-May-21	A.1-A.6
58256	COMET/ T7611-4	WEB SENSOR FOR REMOTE THERMOMETER HYGROMETER	3-Feb-21	3-Feb-22	A.1-A.6

Appendix D: Abbreviation Key and Definitions

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	Н	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	А	Amp
L3	Line 3	μA	Micro Amp (1x10 ⁻⁶)
DC	Direct Current	mS	Milli Second (1x10 ⁻³)
RAW	Uncorrected measurement value, as indicated by the measuring device	μS	Micro Second (1x10 ⁻⁶)
RF	Radio Frequency	μS	Micro Second (1x10 ⁻⁶)
SLCE	Signal Line Conducted Emissions	m	Meter
Meas dist	Measurement distance	Spec dist	Specification distance
N/A or NA	Not Applicable	SL	Signal Line (or Telecom Line)
Р	Power Line	L	Live Line
Ν	Neutral Line	R	Return
S	Supply	AC	Alternating Current

The following table defines abbreviations used within this test report.

Appendix E: Photographs of Test Setups

EUT Photos have been omitted from this test report. Photos can be found in the supplementary exhibit included in the submission and EDCS# 21541319.

Appendix F: Software Used to Perform Testing

Cisco Internal LabView Radio Test Automation Software:

- RF Automation Main versions: 208, 218
- RF Domain Report Generation version 3

Appendix G:Test Procedures

Measurements were made in accordance with

- KDB Publication No. 789033 D02 General UNII Test Procedures New Rules v02r01
- KDB Publication No. 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# 21468206 Target Power Tables EDCS# 19774156

Appendix J: Worst Case Justification

N/A

End