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Test Report

AIR-AP1815W-x-K9 (x=A,B,D,N,T,Z)

Cisco Aironet 802.11ac Dual Band Access Points

FCC ID: LDK102106 IC: 2461B-102106

Bluetooth Low Engergy (BLE)

2400-2483.5 MHz

Antenna Gain = 2dBi Against the following Specifications:

> CFR47 Part 15.247 RSS-247 RSS-Gen AS/NZS 4268 LP0002 G.S.R 45 (E)

Cisco Systems

170 West Tasman Drive San Jose, CA 95134

ster Aguine nuhlan Author: Jose Aguirre Approved By: Jim Nicholson Title: Technical Leader, Engineering Tested By: Jose Aguirre Revision: 2

This report replaces any previously entered test report under EDCS – **11549012**. This test report has been electronically authorized and archived using the CISCO Engineering Document Control system.

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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 under the requirements of the following specifications:

Emission

CFR47 Part 15.247 RSS247 Issue 1: May 2015

RSS-Gen Issue 4: Nov 2014

Measurements were made in accordance with

- ANSI C63.10:2013
- FCC KDB 662911 D01
- KDB 558074 D01 Meas Guidance v03r03

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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*%

*[Where applicable] For ESD testing the humidity limits used were 30% to 60% and for EFT/B tests the humidity limits used were 25% to 75%.

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

Units of Measurement

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

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

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

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

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

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

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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
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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

12-Dec-16 - 04-Jan-17

2.3 Report Issue Date

04-Jan-2017

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2.4 Testing facilities

This assessment was performed by:

Testing Laboratory

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

Registration Numbers for Industry Canada

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

Test Engineers

Jose Aguirre

2.5 Equipment Assessed (EUT)

AIR-AP1815W-A-K9

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2.6 EUT Description

The Cisco Aironet 802.11n Dual Band Access Points support 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. Data is recorded at the lowest supported data rate for each mode. This report covers operation on channel 1-11.

BlueTooth LE v4.0: GFSK(1Mbps)

WLAN

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

802.11n/ac - HT/VHT80, One Antenna, M0 to M7, 1ss 802.11n/ac - HT/VHT80, Two Antennas, M0 to M7, 1ss 802.11n/ac - HT/VHT80, Two Antennas, M8 to M15, 2ss

802.11n/ac - HT/VHT80 Beam Forming, Two Antennas, M0 to M7, 1ss 802.11n/ac - HT/VHT80 Beam Forming, Two Antennas, M8 to M15, 2ss

802.11n/ac - HT/VHT80 STBC, Two Antennas, M8 to M15, 2ss

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

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Frequency	Part Number	Antenna Type	Antenna Gain (dBi)
24/5 CH-	BLE	Omni	2
2.4 / 5 GHz	2x2 Internal	TW / WP Omni	2/3

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Section 3: Result Summary

3.1 Results Summary Table

Conducted emissions			
Basic Standard	Technical Requirements / Details	Result	
FCC 15.247 RSS-247 LP0002:3.10.1(6.2.1)	6dB Bandwidth: Systems using digital modulation techniques may operate in the 2400-2483.5MHz band. The minimum 6dB bandwidth shall be at least 500 kHz.	Pass	
FCC 15.247 RSS-247	99% & 26 dB Bandwidth: The 99% occupied bandwidth is the frequency bandwidth such that, below its lower and above its upper frequency limits, the mean powers are each equal to 0.5% of the total mean power of the given emission. There is no limit for 99% OBW. The 26 dB emission is the width of the emission that is constrained by the frequencies associated with the two outermost amplitude points (upper and lower frequencies) that are attenuated by 26 dB relative to the maximum level measured in the fundamental emission.	Pass	
FCC 15.247 RSS-247 LP0002:3.10.1(2.3)	Output Power: 15.247 The maximum conducted output power of the intentional radiator for systems using digital modulation in the 2400-2483.5 MHz band shall not exceed 1 Watt (30dBm). If transmitting antennas of directional gain greater than 6 dBi are used, the maximum conducted output power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi. RSS-247 For DTSs employing digital modulation techniques operating in the band 2400-2483.5 MHz, the maximum peak conducted output power shall not exceed 1W. Except as provided in Section 5.4(5), the e.i.r.p. shall not exceed 4 W.		
FCC 15.247 RSS-247 LP0002:3.10.1(6.2.2)	Power Spectral Density: For digitally modulated systems, the power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission.	Pass	
FCC 15.247 RSS-247 LP0002:3.10.1(5)/2.8	Conducted Spurious Emissions / Band-Edge: In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in §15.209(a) is not required	Pass	
FCC 15.247 RSS-247 FCC 15.205 RSS-Gen	Restricted band: Unwanted emissions falling within the restricted bands, as defined in FCC 15.205 (a) and RSS-Gen 8.10 must also comply with the radiated emission limits specified in FCC 15.209 (a) and RSS-Gen 8.9.	Pass	

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Radiated Emissions (General requirements)				
Basic Standard	Technical Requirements / Details	Result		
FCC 15.209 RSS-Gen LP0002:3.10.1(5)/2.8	TX Spurious Emissions: Except as provided elsewhere in this subpart, the emissions from an intentional radiator shall not exceed the field strength levels specified in the filed strength limits table in this section. Unwanted emissions falling within the restricted bands, as defined in FCC 15.205 (a) and RSS-Gen 8.10 must also comply with the radiated emission limits specified in FCC 15.209 (a) and RSS-Gen 8.9.	Pass		
RSS-Gen LP0002:3.10.1(5)2.8	 RX Spurious Emissions: RSS-Gen 8.9 Except when the requirements applicable to a given device state otherwise, emissions from licence-exempt transmitters shall comply with the field strength limits shown in Table 4 and Table 5 below. Additionally, the level of any transmitter emission shall not exceed the level of the transmitter's fundamental emission. RSS-Gen 8.10 Unwanted emissions that fall into restricted bands of Table 6 shall comply with the limits specified in RSS-Gen; and (c) Unwanted emissions that do not fall within the restricted frequency bands of Table 6 shall comply either with the limits specified in the applicable RSS or with those specified in this RSS-Gen. 	Pass		
FCC 15.207 RSS-Gen LP0002:2.3	AC conducted Emissions: Except when the requirements applicable to a given device state otherwise, for any radio apparatus equipped to operate from the public utility AC power supply, either directly or indirectly (such as with a battery charger), the radio frequency voltage of emissions conducted back onto the AC power lines in the frequency range of 0.15 MHz to 30 MHz shall not exceed the limits shown in the table in these sections. The more stringent limit applies at the frequency range boundaries.	Pass		

Radiated Emissions (General requirements)

* MPE calculation is recorded in a separate report

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Section 4: Sample Details

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

4.1 Sample Details

Sample No.	Equipment Details	Manufacturer	Hardware Rev.	Firmware Rev.	Software Rev.	Serial Number
S01	AIR-AP1815W-A-K9	Cisco Systems	P2	8.3.15.124	AP1G5	FOC20390WV4
S02*	AIR-PWRINJ6	Cisco Systems	V01	NA	NA	C15456663000 3247

(*) S02 is support equipment Power supply for EUT S01

4.2 System Details

System #	Description	Samples
1	AIR-AP1815W-A-K9	S01
2	AIR-PWRINJ6	S02

4.3 Mode of Operation Details

ľ	Mode#	Description	Comments	
	1	Continuous Transmitting	Transmit - BLE (GFSK), 1Mbps	

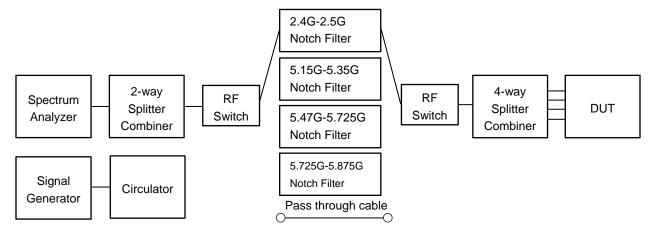
Measurements were made in accordance with

- ANSI C63.10:2013
- KDB 558074 D01 Meas Guidance v03r03

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Appendix A: Emission Test Results

Conducted Test Setup Diagram



Target Maximum Channel Power

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

	Maximum Channel Power (dBm EIRP)		
	Frequency (MHz)		
Operating Mode	2412 2426 2480		2480
BLE (GFSK)	5.4	5.6	4.4

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A.1 6dB Bandwidth

15.247 / RSS-247 / LP0002:3.10.1(6.2.1) Systems using digital modulation techniques may operate in the 2400-2483.5MHz band. The minimum 6dB bandwidth shall be at least 500 kHz.

Test Procedure

Ref. KDB 558074 D01 DTS Meas Guidance v03r03 ANSI C63.10: 2013

6 BW

Test Procedure

1. Set the radio in the continuous transmitting mode.

2. Allow the trace to stabilize.

3. Setting the x-dB bandwidth mode to -6dB within the measurement set up function.

4. Select the automatic OBW measurement function of an instrument to perform bandwidth measurement.

5. Capture graphs and record pertinent measurement data.

Ref. KDB 558074 D01 DTS Meas Guidance v03r03

ANSI C63.10: 2013 section 11.8.2 Option 2

6 BW

Test parametersX dB BW = 6dB (using the OBW function of the spectrum analyzer)Span = Large enough to capture the entire EBWRBW = 100 KHzVBW \geq 3 x RBWSweep = Auto coupleDetector = Peak or where practical sample shall be usedTrace = Max. Hold

System Number	Description	Samples	System under test	Support equipment	
	EUT	S01	N		
1	Support	S02		\checkmark	

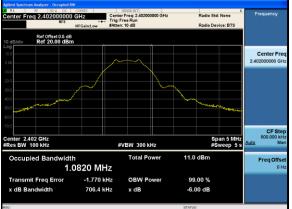
Tested By :	Date of testing:
Jose Aguirre	12-Dec-16 - 04-Jan-17
Test Result : PASS	

See Appendix C for list of test equipment

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Frequency (MHz)	Mode	Data Rate (Mbps)	6dB BW (kHz)	Limit (kHz)	Margin (kHz)
2402	GFSK, 1Mbps	1	706	>500	206
2426	GFSK, 1Mbps	1	715	>500	215
2480	GFSK, 1Mbps	1	728	>500	228

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6dB Bandwidth, 2402 MHz, GFSK, 1Mbps

6dB Bandwidth, 2426 MHz, GFSK, 1Mbps



6dB Bandwidth, 2480 MHz, GFSK, 1Mbps



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A.2 99% and 26dB Bandwidth

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

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

Test Procedure Ref. ANSI C63.10: 2013

26 BW & 99% BW

Test Procedure

1. Set the radio in the continuous transmitting mode.

2. Allow the trace to stabilize.

3. Setting the x-dB bandwidth mode to -26dB & OBW to 99% within the measurement set up function.

4. Select the automatic OBW measurement function of an instrument to perform bandwidth measurement.

5. Capture graphs and record pertinent measurement data.

Ref. ANSI C63.10: 2013 section 6.9.3

26 BW & 99% BW
Test parameters
X dB BW = -26dB (using the OBW function of the spectrum analyzer)
OBW = 99%
Span = 1.5 to 5 times the OBW
RBW = 1% to 5% of the OBW
VBW ≥ 3 x RBW
Sweep = Auto couple
Detector = Peak or where practical sample shall be used
Trace = Max. Hold

System Number	Description	Samples	System under test	Support equipment	
	EUT	S01	V		
1	Support	S02		\checkmark	

Tested By :	Date of testing:
Jose Aguirre	12-Dec-16 - 04-Jan-17
Tot Doo K DAGO	

Test Result : PASS

See Appendix C for list of test equipment

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Frequency (MHz)	Mode	Data Rate (Mbps)	26dB BW (MHz)	99% BW (MHz)
2402	GFSK, 1Mbps	1	1.35	1.06
2426	GFSK, 1Mbps	1	1.34	1.06
2480	GFSK, 1Mbps	1	1.34	1.06

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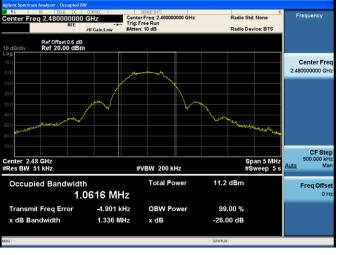


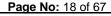
26dB / 99% Bandwidth, 2402 MHz, GFSK, 1Mbps





26dB / 99% Bandwidth, 2480 MHz, GFSK, 1Mbps





A.3 Maximum Conducted Output Power

15.247 / RSS-247 section 5.4 / LP0002:3.10.1(2.3) The maximum conducted output power of the intentional radiator for systems using digital modulation in the 2400-2483.5 MHz band shall not exceed 1 Watt (30dBm). If transmitting antennas of directional gain greater than 6 dBi are used, the maximum conducted output power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

As an alternative to a peak power measurement, compliance can be based on a measurement of the maximum conducted output power. The maximum conducted output power is the total transmit power delivered to all antennas and antenna elements, averaged across all symbols in the signaling alphabet when the transmitter is operating at its maximum power control level. Power must be summed across all antennas and antenna elements. The average must not include any time intervals during which the transmitter is off or transmitting at a reduced power level. If multiple modes of operation are implemented, the maximum conducted output power is the highest total transmit power occurring in any mode.

The maximum supported antenna gain is 2dBi. The peak correlated gain for each mode is listed in the table below.

Test Procedure

Ref. KDB 558074 D01 DTS Meas Guidance v03r05 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 usin
the instrument's band power measurement function. The integration shall be performed using the spectrum analyze 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. 558074 D01 DTS Meas Guidance v03r05 section 9.2 Method AVGSA-1 ANSI C63.10: 2013 section 11.9.2 Method AVGSA-1

System Number	Description	Samples	System under test	Support equipment
	EUT	S01	\checkmark	
1	Support	S02		\checkmark

Tested By :	Date of testing:
Jose Aguirre	12-Dec-16 - 04-Jan-17
Test Des He DA00	

Test Result : PASS See Appendix C for list of test equipment

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Frequency (MHz)	Mode	Tx Paths	Correlated Antenna Gain (dBi)	Tx 1 Max Power (dBm)	Total Tx Channel Power (dBm)	Limit (dBm) EIRP	Margin (dB)
2402	GFSK, 1Mbps	1	2	3.4	5.4	36	30.6
2426	GFSK, 1Mbps	1	2	3.6	5.6	36	30.4
2480	GFSK, 1Mbps	1	2	2.4	4.4	36	31.6

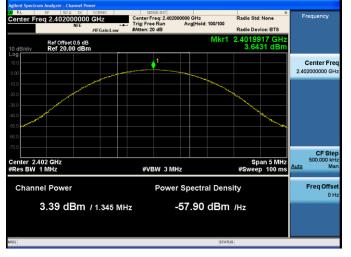
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Peak Output Power, 2402 MHz, GFSK, 1Mbps



Peak Output Power, 2426 MHz, GFSK, 1Mbps



Peak Output Power, 2480 MHz, GFSK, 1Mbps



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A.4 Power Spectral Density

15.247 / RSS-247 / LP0002:3.10.1(6.2.2) For digitally modulated systems, the peak power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission.

Test Procedure

Ref. KDB 558074 D01 DTS Meas Guidance v03r03 ANSI C63.10: 2013

Power Spectral Density

Test Procedure

1. Set the radio in the continuous transmitting mode at full power

2.Configure Spectrum analyzer as per test parameters below and Peak search marker

3. Capture graphs and record pertinent measurement data.

Ref. 558074 D01 DTS Meas Guidance v03r03 section 10.2 Peak PSD

Power Spectral Density	
Test parameters	
Span = >1.5 times the OBW	
$RBW = 3 kHz \le RBW \le 100 kHz.$	
VBW ≥ 3 x RBW	
Sweep = Auto couple	
Detector = Peak	
Trace = Max Hold	
Allow trace to fully stabilize	
Use Peak Marker function to determin max amplitude level	

System Number	Description	Samples	System under test	Support equipment
	EUT	S01	$\mathbf{\nabla}$	
1	Support	S02		\checkmark

Tested By :	Date of testing:
Jose Aguirre	12-Dec-16 - 04-Jan-17

Test Result : PASS

See Appendix C for list of test equipment

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Frequency (MHz)	Mode	Data Rate (Mbps)	PSD / Antenna (dBm/3kHz)	Total PSD (dBm/3kHz)	Limit (dBm/3kHz)	Margin (dB)
2402	GFSK, 1Mbps	1	-7.5	-7.5	8	15.5
2426	GFSK, 1Mbps	1	-7.0	-7	8	15
2480	GFSK, 1Mbps	1	-7.7	-7.7	8	15.7

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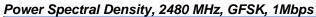
cisca



Power Spectral Density, 2402 MHz, GFSK, 1Mbps









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A.5 Conducted Spurious Emissions

15.205 / RSS-Gen / LP0002:3.10.1(5) & 2.8 Radiated emissions which fall in the restricted bands, as defined in Section 15.205(a) and RSS-Gen section 8.10, must also comply with the radiated emission limits specified in Section 15.209(a) (see Section 15.205(c)) and RSS-Gen section 8.9.

RSS-Gen 8.9 Except when the requirements applicable to a given device state otherwise, emissions from licence-exempt transmitters shall comply with the field strength limits shown in Table 4 and Table 5 below. Additionally, the level of the transmitter emission of the level of the transmitter emission.

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

Test Procedure

Ref. KDB 558074 D01 DTS Meas Guidance v03r03

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. 558074 D01 DTS Meas Guidance v03r03 section 11.1b, 11.2-3, 12.2.4 & 12.2.5.3 ANSI C63.10: 2013 section 11.10.3 & 11.12.2.4 & 11.12.2.5.3

Conduct Conducted Spurious Emissions Test parameters restricted Band KDB 558074 D01 v03r03 section 12.2.4 & 12.2.5.3 also see ANSI C63.10: 2013 section 11.12.4 & 11.12.5.3 RBW = 1 MHz VBW ≥ 3 x RBW for Peak, 1kHz for Average Sweep = Auto couple Detector = Peak Trace = Max Hold.

KDB: 558074 D01 DTS Meas Guidance v03r03 section 12.2.2 © 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).

System Number	Description	Samples	System under test	Support equipment
4	EUT	S01	S	
1	Support	S02		K

Tested By :	Date of testing:
Jose Aguirre	12-Dec-16 - 04-Jan-17
Tot Doo K. DAGO	

Test Result : PASS

See Appendix C for list of test equipment

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Average Measurements

Frequency (MHz)	Mode	Tx Paths	Correlated Antenna Gain (dBi)	Tx 1 Emission Level (dBm)	Total Emission Level (dBm)	Limit (dBm)	Margin (dB)
2402	GFSK, 1Mbps	1	2	-58.4	-56.4	-41.25	15.2
2426	GFSK, 1Mbps	1	2	-55.2	-53.2	-41.25	12.0
2480	GFSK, 1Mbps	1	2	-57.3	-55.3	-41.25	14.1

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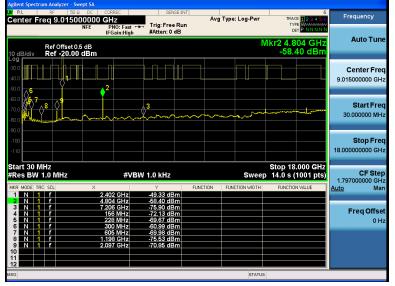
Conducted Spurs Average Upper, All Antennas



Conducted Spurs Peak Upper, All Antennas



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Conducted Spurs, 2402 MHz, GFSK 1Mbps, Average Plot

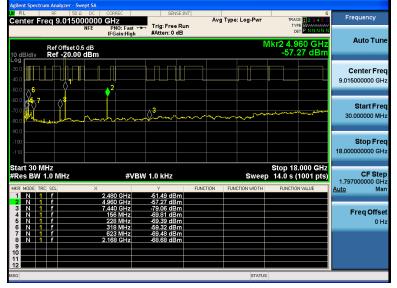
Conducted Spurs, 2426 MHz, GFSK 1Mbps, Average Plot

gilent Spectrum Analyzer - Swept SA						
C RL RF 50 Ω DC Center Freq 9.015000000 NFF	CORREC GHZ PNO: Fast +	SENSE:INT		Type: Log-Pwr	6 TRACE 123456 TYPE WWWWWWW	Frequency
Ref Offset 0.5 dB 10 dB/div Ref -20.00 dBm	IFGain:High	#Atten: 0 dB		ľ	lkr2 4.852 GHz -55.15 dBm	Auto Tune
						Center Free 9.015000000 GH
		2 ³	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~		L	Start Fre 30.000000 MH
-100						Stop Fre 18.000000000 GH
ttart 30 MHz Res BW 1.0 MHz	#VB	W 1.0 kHz		Sweep	Stop 18.000 GHz 14.0 s (1001 pts)	CF Ste 1.797000000 GH
2 N 1 f	2.426 GHz 4.852 GHz	Y -46.84 dBm -55.15 dBm	FUNCTION	FUNCTION WIDTH	FUNCTION VALUE	<u>Auto</u> Ma
4 N 1 F 5 N 1 F 6 N 1 F 7 N 1 F 8 N 1 F 9	7.278 GHz 156 MHz 228 MHz 300 MHz 605 MHz 2.115 GHz	-76.62 dBm -71.42 dBm -71.21 dBm -60.63 dBm -69.45 dBm -69.55 dBm				Freq Offse 0 H
10 11 12 56				STATUS		

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Conducted Spurs, 2480 MHz, GFSK 1Mbps, Average Plot



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Peak Measurements

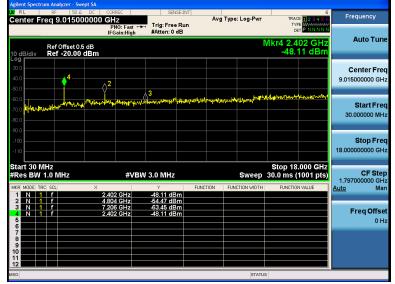
Frequency (MHz)	Mode	Tx Paths	Correlated Antenna Gain (dBi)	Tx 1 Emission Level (dBm)	Total Emission Level (dBm)	Limit (dBm)	Margin (dB)
2402	GFSK, 1Mbps	1	2	-54.5	-52.5	-21.25	31.3
2426	GFSK, 1Mbps	1	2	-52.7	-50.7	-21.25	29.5
2480	GFSK, 1Mbps	1	2	-54.8	-52.8	-21.25	31.6

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Conducted Spurs, 2426 MHz, GFSK 1Mbps, Peak Plot

Agilent Spectr	rum Analyzer - Sv									
	req 9.0150		2		SE:INT	Avg Typ	e: Log-Pwr	TRA	6 CE 123456 PE WAAAAAAA	Frequency
10 dB/div	Ref Offset 0 Ref -20.00	IFGa .5 dB	0: Fast ↔ in:High	. Trig: Free #Atten: 0 c				₀ Mkr4 2.4	20 GHz 07 dBm	Auto Tune
-30.0 -40.0 -50.0	¢4			A3						Center Fred 9.015000000 GH:
-60.0 -70.0	petter a series and a series of the	and the second second	hapad ^{an a} n maraka	apa ana ana ana ana ana ana ana ana ana	relikostostosreta	Marydoll-fictor	through the direct of	\$10+83+83+{{L}2++		Start Free 30.000000 MH;
-100										Stop Free 18.000000000 GH
Start 30 N #Res BW MKR MODE TR 1 N 4	1.0 MHz	× 2.426	GHz	4 3.0 MHz		TION FU	Sweep	30.0 ms (.000 GHz 1001 pts) NVALUE	CF Ste 1.797000000 GH <u>Auto</u> Ma
2 N 1 3 N 1 4 N 1 5 6 7 8 9		4.852 7.278 2.420	GHz	-52.68 dB -60.56 dB -46.07 dB	m					Freq Offse 0 H
10 11 12 4SG							STATU	s		

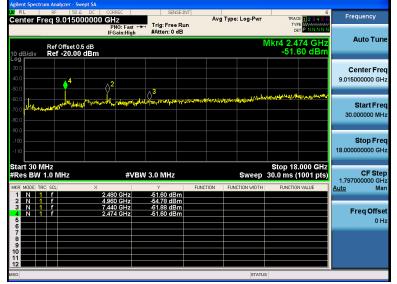
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A.6 Conducted Bandedge

15.205 / 15.247 / RSS-Gen / RSS-247 / LP0002:3.10.1(5) & 2.8 In any 100 kHz bandwidth outside the frequency band in which the digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 30 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power.

Radiated emissions which fall in the restricted bands, as defined in Section 15.205(a), and RSS-Gen 8.10 must also comply with the radiated emission limits specified in Section 15.209(a) (see Section 15.205(c)) and RSS-Gen 8.9...

Test Procedure

Ref. KDB 558074 D01 DTS Meas Guidance v03r05

ANSI (C63.10:	2013
--------	---------	------

Conducted Band edge

Conducted Dand Edge						
Test Procedure						
1. Connect the antenna port(s) to the spectrum analyzer in						
2. Place the radio in continuous transmit mode. Use the pro-	cedures in KDB 558074 D01 DTS Meas Guidance v03r05 to					
substitute conducted measurements in place of radiated m	easurements.					
3. Configure Spectrum analyzer as per test parameters belo	by below (be sure to enter all losses between the transmitter					
output and the spectrum analyzer).						
4. Place a marker at the end of the restricted band closest	to the transmit frequency to show compliance.					
Also measure any emissions in the restricted bands						
5. The "measure-and-sum technique" is used for measuring	g in-band transmit power of a device. In the					
	is measured at each antenna port. The measured results at					
the various antenna ports are then summed mathematical						
Summing is performed in linear power units. The worst ca						
6. Place a marker at the end of the restricted band closest	to the transmit frequency to show compliance.					
Also measure any emissions in the restricted bands						
7. Capture graphs and record pertinent measurement data						
Conducted Bandedge	Conducted Bandedge					
Test parameters non-restricted Band	Test parameters restricted Band					
KDB 558074 D01 v03r05 section 11.1b, 11.2-3, also see	KDB 558074 D01 v03r05 section 12.2.4 & 12.2.5.3 also					
ANSI C63.10: 2013 section 11.10.3 see ANSI C63.10: 2013 section 11.12.4 & 11.12.5.3						

ANSI C63.10: 2013 section 11.10.3	see ANSI C63.10: 2013 section 11.12.4 & 11.12.5.3
RBW = 100 kHz	RBW = 1 MHz
VBW ≥ 3 x RBW	VBW ≥ 3 x RBW for Peak, 100Hz for Average
Sweep = Auto couple	Sweep = Auto couple
Detector = Peak	Detector = Peak
Trace = Max Hold.	Trace = Max Hold.

System Number	Description	Samples	System under test	Support equipment	
	EUT	S01	$\mathbf{\nabla}$		
1	Support	S02		\checkmark	

Tested By :	Date of testing:
Jose Aguirre	12-Dec-16 - 04-Jan-17

Test Result : PASS

See Appendix C for list of test equipment

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Restricted Band

Frequency (MHz)	Mode	Tx Paths	Correlated Antenna Gain (dBi)	Tx 1 Bandedge Level (dBm)	Total Tx Bandedge Level (dBm)	Limit (dBm)	Margin (dB)
2412	CCK, 1 to 11 Mbps	1	2	-66.6	-64.6	-41.25	23.4
2462	CCK, 1 to 11 Mbps	1	2	-57.1	-55.1	-41.25	13.9

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	um Analyzer - S										
Center Fr	req 2.061	900000 G			E:INT	Avg Type	: Log-Pwr	TRAC	6 E <mark>1 2 3 4 5 6</mark> E M WWWW	Frequency	
10 dB/div	Ref Offset	0.5 dB	PNO: Fast G FGain:Low	#Atten: 10			Mk	r2 2.38	B 5 GHz 61 dBm	Auto Tu	une
-10.0 -20.0 -30.0										Center F 2.061900000 (
-40.0 -50.0 -60.0 -70.0									<u> </u>	Start F 1.718800000 (
-80.0					I				-150.00 dBm	Stop F 2.405000000 (
Start 1.71 #Res BW	1.0 MHz		#VB۱	N 100 Hz				5.35 s (1050 GHz 1001 pts)	CF S 68.620000 M	MHz
MKR MODE TR	f f		0 0 GHz 3 5 GHz	-68.31 dBr -66.61 dBr		TION FUN	CTION WIDTH	FUNCTIO	N VALUE	Auto I	Man
3 4 5 6										Freq Off ر	f set 0 Hz
7 8 9 10 11 12											
MSG							STATUS				

Conducted Bandedge Average, 2402 MHz, GFSK, 1 Mbps

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	um Analyzer -									
Center Fi	req 2.872	500000 0		SENS		Avg Type	: Log-Pwr	TRAC	6 E <mark>1 2 3 4 5 6</mark>	Frequency
10 dB/div	Ref Offset Ref 0.00	NFE 0.5 dB dBm	PNO: Fast	Trig: Free #Atten: 10			Mkr2	DE 2.493 7	80 GHz 34 dBm	Auto Tune
-10.0 -20.0 -30.0										Center Freq 2.872500000 GHz
-40.0 -50.0 -60.0 -70.0										Start Freq 2.478000000 GHz
-80.0		·····		,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,		· · · · · · · · · · · · · · · · · · ·			-150.00 dBm	Stop Freq 3.267000000 GHz
Start 2.47 #Res BW	1.0 MHz		#VB	W 100 Hz	E ING			6.15 s (2670 GHz 1001 pts)	CF Step 78.900000 MHz
1 N 1 2 N 1	f f		500 GHz 780 GHz	Y -57.04 dBr -67.34 dBr		HUN FUN	CTION WIDTH	FUNCTIO	N VALUE	<u>Auto</u> Man
3 4 5 6										Freq Offset 0 Hz
7 8 9 10 11 12										
MSG							STATUS			

Conducted Bandedge Average, 2480 MHz, GFSK, 1 Mbps

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Frequency (MHz)	Mode	Tx Paths	Correlated Antenna Gain (dBi)	Tx 1 Bandedge Level (dBm)	Total Tx Bandedge Level (dBm)	Limit (dBm)	Margin (dB)
2402	GFSK, 1 Mbps	1	2.0	-53.7	-51.7	-21.3	30.5
2480	GFSK, 1 Mbps	1	2.0	-47.9	-45.9	-21.3	24.7

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XI RL	req 2.3575	2 DC CC 00000 GI	RREC	SENSE	Avg	j Type: Log-Pwr	6 TRACE 123456	Frequency
10 dB/div	Ref Offset 0	IF .5 dB	PNO: Fast ⊂ Gain:Low	Trig: Free R #Atten: 10 d		Mkr	1 2.390 00 GHz -53.66 dBm	Auto Tune
-10.0								Center Free 2.357500000 GH
40.0	า/กรูกคุาสามาณาสา	in Nothernautorise (74	mmun	and the second sec	here and the second	-set Caller of flere	1	Start Fre 2.310000000 GH
70.0							-150.00 dBm	Stop Fre 2.405000000 GH
itart 2.31 Res BW		×	#VB	W 3.0 MHz	FUNCTION		Stop 2.40500 GHz 1.00 ms (601 pts)	
1 N 1 2 3 3 3 4 5 5 5 5 6 6 6 7 8 8	f	2.390 (0 GHz	-53.66 dBm				Freq Offso 0 ⊢
9 10 11 12 SG						STATUS		

Conducted Bandedge Peak, 2402 MHz, GFSK, 1 Mbps

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X/RL	rum Analyzer - Swept SA RF 50 Ω DC req 2.489000000		SENSE:IN	Avg	Type: Log-Pwr	6 TRACE 123456 TYPE MWWWWW DET P. N.N.N.N	Frequency
10 dB/div	Ref Offset 0.5 dB Ref 0.00 dBm	IFGain:Low	#Atten: 10 dB		Mkr	1 2.483 50 GHz -47.87 dBm	Auto Tune
-10.0 -20.0 -30.0							Center Fred 2.489000000 GHz
40.0 50.0 60.0		1	~ myyervell-unorgonorouth	herman water of	Hurler monorthan	herren lavor la villanda itthere	Start Free 2.478000000 GH:
-70.0 -80.0 -90.0						-150.00 dBm	Stop Fre 2.500000000 GH
Start 2.47 Res BW	RC SOL X	#VBV	V 3.0 MHz -47.87 dBm	FUNCTION	Sweep	Stop 2.50000 GHz 1.00 ms (601 pts) FUNCTION VALUE	CF Stej 2.200000 MH <u>Auto</u> Ma
2 3 4 5 6							Freq Offse 0 H
7 8 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9							
12 5 6					STATUS	3	

Conducted Bandedge Peak, 2480 MHz, GFSK, 1 Mbps

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Non-Restristred Band

Frequency (MHz)	Mode	Data Rate (Mbps)	Conducted Bandedge Delta (dB)	Limit (dBc)	Margin (dB)
2402	GFSK, 1 Mbps	1	51.3	>30	21.3

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Conducted Bandedge Delta, 2402 MHz, GFSK, 1 Mbps

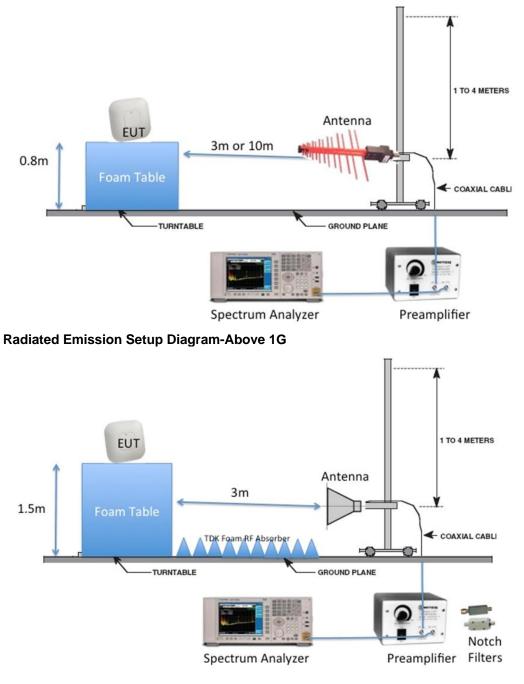


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Appendix B: Emission Test Results

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

Radiated Emission Setup Diagram-Below 1G



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B.1 Radiated Spurious Emissions

15.205 / RSS-Gen / LP0002:3.10.1(5)/2.8 Radiated emissions which fall in the restricted bands, as defined in Section 15.205(a) and RSS-Gen 8.10, must also comply with the radiated emission limits specified in Section 15.209(a) (see Section 15.205(c)) and RSS-Gen 8.9.

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

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

Span:	1GHz – 18 GHz
Reference Level:	80 dBuV
Attenuation:	10 dB
Sweep Time:	Coupled
Resolution Bandwidth:	1MHz
Video Bandwidth:	3 MHz for peak, 1 KHz for average
Detector:	Peak

Terminate the access Point RF ports with 50 ohm loads.

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

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

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

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

System Number	Description	Samples	System under test	Support equipment
	EUT	S01	\checkmark	
1	Support	S02		\checkmark

Tested By :	Date of testing:
Jose Aguirre	12-Dec-16 - 04-Jan-17
Test Result : PASS	

See Appendix C for list of test equipment

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B.1.A Transmitter Radiated Spurious Emissions-Average

Frequency (MHz)	Mode	Data Rate (Mbps)	Spurious Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dBuV/m)
2402	GFSK 1Mbps	1	53.3	54.0	0.7
2426	GFSK 1Mbps	1	53.9	54.0	0.1
2480	GFSK 1Mbps	1	50.1	54.0	3.9

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Radiated Spurs, 2402 MHz, GFSK 1Mbps, Average

Radiated Spurs, 2426 MHz, GFSK 1Mbps, Average



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Radiated Spurs, 2480 MHz, GFSK 1Mbps, Average



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Ref Lul		37.76 dBµU/m		1 M 1 k	Hz	RF Att	Ø dB
90 dB+	22.0	8817587 GHz	SWT	21.5	5	Unit	dBµU∕m
80							+
70							
60						88	1
1VIEN 2NAX							1
50							
10							
mm	-	m					
30							ļ
20							
10							
0							
		Vasona Emissi	Saftur	e : EMis	oft		
Start 18 GH:			999 MHz/	C. CITA		top 26.49	0000 CU-

Radiated Spurs, All Rates, All Modes, Average

no emissions seen above 18GHz. The plot above is representative of all modes tested

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Frequency (MHz)	Mode	Data Rate (Mbps)	Spurious Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dBuV/m)
2402	GFSK 1Mbps	1	64.1	74.0	9.9
2426	GFSK 1Mbps	1	60.3	74.0	13.7
2480	GFSK 1Mbps	1	60.7	74.0	13.3

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Marker 3 16.555000000000 GHz PNO: Fast IFGain:Low #Atten: 10 dB Marker Avg Type: Log-Pwr TYPE MMWWWWW Select Marker Mkr3 16.555 GH: 64.04 dBµ\ Ref 100.00 dBµV Normal ♦3 **∂**² Delta **Fixed** Stop 18.000 GHz Sweep 42.6 ms (1601 pts) Start 1.000 GHz #Res BW 1.0 MHz #VBW 3.0 MHz Off 70.29 dBµV 54.63 dBµV 64.04 dBµV 4.804 GHz 16.555 GHz N 1 f N 1 f **Properties** More 1 of 2 10

Radiated Spurs, 2402 MHz, GFSK 1Mbps, Peak

Radiated Spurs, 2426 MHz, GFSK 1Mbps, Peak



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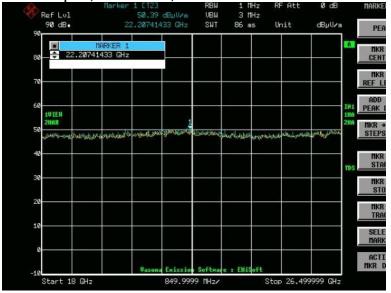
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Radiated Spurs, 2480 MHz, GFSK 1Mbps , Peak



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Radiated Spurs, All channels, Peak



no emissions seen above 18GHz. The above plot is representative of all channels tested

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B.2 Receiver Spurious Emissions

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

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

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

Ref. RSS-Gen section 8.9 & 8.10 ANSI C63.10: 2013 section 4.1.4.2.2, 4.1.4.2.3, 6.6.4 & 11.12.2

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

1GHz – 18 GHz
80 dBuV
10 dB
Coupled
1MHz
3MHz for Peak, 1 kHz for average
Peak

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

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

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

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

System Number	Description	Samples	System under test	Support equipment	
	EUT	S01	V		
1	Support	S02		\checkmark	

Tested By :	Date of testing:
Jose Aguirre	12-Dec-16 - 04-Jan-17

Test Result : PASS

See Appendix C for list of test equipment

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

RL RF 50.0	AC CORREC PNO: Fast C IFGain:Low	Trig: Free Run #Atten: 6 dB	ALIGN AUTO Avg Type: Log-Pwr	04:03:34 PMDec 09, 2016 TRACE 12:3456 TYPE MM	Peak Search
0 dB/div Ref 100.00			M	kr1 16.470 GHz 48.96 dBµV	Next Peak
0.0 0.0 0.0					Next Pk Right
0.0 0.0 0.0				1	Next Pk Left
					Marker Delta
tart 1.000 GHz Res BW 1.0 MHz	#VB\	N 1.0 kHz	Sweep	Stop 18.000 GHz 13.3 s (1601 pts)	Mkr→CF
1 N 1 f 2 33 4 5 5	16.470 GHz	48.96 dBµV			Mkr→RefLvi
7 8 9 0 1					More 1 of 2
12			STATUS		

B.2.A.1 Radiated Receiver Spurs, All rates, All Mode, Average (1-18GHz)

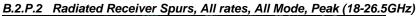


1916-1919 - 1 1 - 58 - 1	18 dt	RF Att	Hz	11	VBM VBM		38.01	Narker		Ref Lu	
ՑաՍ∕տ	dBµV∕	Unit	5	21.5	SWT	28 GHz	679358	21	*	90 dB	90
8								MARKER 1			
	<u>.</u>							5828 GHz		÷	80
_	-										70
INI		- 22							_		60
111A 211A	-									1NAX 2VIEN	
~~~		and and			~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	the					40
TDS _											30
											20
											10
											0
			oft	e : ENis	Softman	Emissio	Vasona				-10

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	DOOOOO GHz PNO: Fast C IFGain:Low	Trig: Free Run #Atten: 6 dB	Avg Type: Log-Pwr	TRACE 123456 TYPE MMMMMM DET PPPPP	
dB/div Ref 100.00	dBμV		M	kr1 16.470 GHz 61.05 dBµV	Next Pea
9 0 0					Next Pk Righ
	and the second		Martine States and a state of the states of		Next Pk Le
0 0 0					Marker Del
art 1.000 GHz es BW 1.0 MHz		W 3.0 MHz		Stop 18.000 GHz 42.6 ms (1601 pts)	Mkr→C
N MODE TRC SCL	× 16.470 GHz	Υ FUN 61.05 dBμV	CTION FUNCTION WIDTH	FUNCTION VALUE	Mkr→RefL

B.2.P.1 Radiated Receiver Spurs, All rates, All Mode, Peak (1-18GHz)



	ØdB	F Att	Hz F Hz	1 M 3 M	RBW	BµU≠m		Marker		Ref Lul
	dBµV∕m	nit	5 l	86 m	SWT	31 GHz	.973947	22		90 dB+
A								RKER 1	MA	
								31 GHz	2.973947	÷ 22
INI				_						
188 288					1					1VIEH 2MAX
	Mary Kin	unculor.	-	Amaria	time	and and a state	1. Southers of the st	attend the	elata joba	Munthala
TDS										
				-						
				_						
			oft	- FHIS	oftwar	Emission	Vasona			

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# B.3 Radiated Emissions 30MHz to 1GHz

**15.205 / 15.209 / RSS-Gen / LP0002:3.10.1(5)/2.8** Radiated emissions which fall in the restricted bands, as defined in Section 15.205(a), must also comply with the radiated emission limits specified in Section 15.209(a) (see Section 15.205(c)) and RSS-Gen section 8.9.

Ref. ANSI C63.10: 2013 section 6.5

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

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

Terminate the access Point RF ports with 50 ohm loads.

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

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

System Number	Description	Samples	System under test	Support equipment	
	EUT	S01	$\checkmark$		
1	Support	S02		$\mathbf{\nabla}$	

Tested By :	Date of testing:
Jose Aguirre	12-Dec-16 - 04-Jan-17
Test Result : PASS	

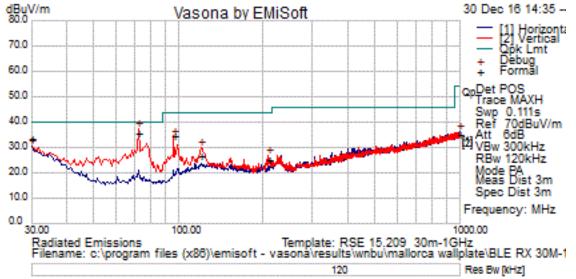
See Appendix C for list of test equipment

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#### **Graphical Test Results**

Note that the data displayed on the plots detailed in this appendix were measured using a 'Peak Detector'. Please refer to the results table for the detectors used during formal measurements



#### **Test Results Table**

Frequency	Raw	Cable	AF	Level	Measurement	Р	Hgt	Azt	Limit	Margin	Pass
MHz	dBuV	Loss	dB	dBuV/m	Туре	ol	cm	Deg	dBuV/m	dB	/Fail
72.109	26.7	0.8	8.2	35.7	Quasi Max	V	124	22	40	-4.3	Pass
96.175	24.8	0.9	9.1	34.8	Quasi Max	V	103	360	43.5	-8.7	Pass
30	11.8	0.4	21.6	33.8	Quasi Max	Н	241	320	40	-6.2	Pass
120.331	11.7	1	13.8	26.5	Quasi Max	V	104	55	43.5	-17	Pass
208.575	13.1	1.3	10.5	25	Quasi Max	V	101	338	43.5	-18.5	Pass
998.788	9.1	2.7	23.3	35.1	Quasi Max	Н	280	134	54	-18.9	Pass

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# B.4 AC Conducted Emissions

FCC 15.207 (a) & RSS-Gen 8.8 / LP0002:2.3 Except when the requirements applicable to a given device state otherwise, for any radio apparatus equipped to operate from the public utility AC power supply, either directly or indirectly (such as with a battery charger), the radio frequency voltage of emissions conducted back onto the AC power lines in the frequency range of 0.15 MHz to 30 MHz shall not exceed the limits shown in the table in these sections. The more stringent limit applies at the frequency range boundaries.

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

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

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

System Number	Description	Samples	System under test	Support equipment
	EUT	S01	$\checkmark$	
1	Support	S02		$\checkmark$

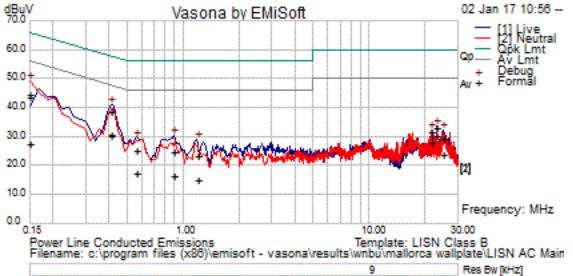
Tested By :	Date of testing:
Jose Aguirre	12-Dec-16 - 04-Jan-17
Test Result : PASS	

See separate EMC test report for test data.

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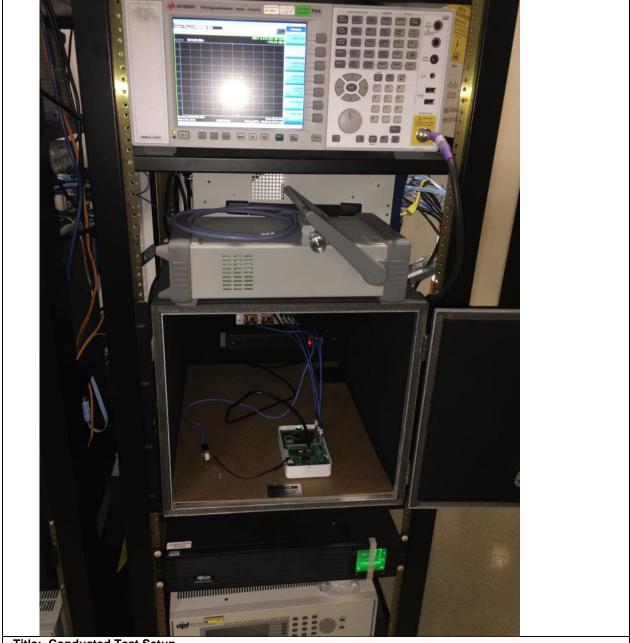
#### **Graphical Test Results**

Note that the data displayed on the plots detailed in this appendix were measured using a 'Peak Detector'. Please refer to the results table for the detectors used during formal measurements



Test Results									
Frequency MHz	Raw dBuV	Cable Loss	Factors dB	Level dBuV	Measurement Type	Line	Limit dBuV	Margin dB	Pass /Fail
0.56	5	20.1	0	25.1	Quasi Peak	Live	56	-30.9	Pass
0.411	18.3	20.2	0	38.5	Quasi Peak	Live	57.6	-19.1	Pass
0.15	23	21.4	0.1	44.5	Quasi Peak	Live	66	-21.5	Pass
21.662	10.8	20.6	0.3	31.6	Quasi Peak	Live	60	-28.4	Pass
23.129	12.4	20.6	0.3	33.2	Quasi Peak	Live	60	-26.8	Pass
24.959	8.6	20.6	0.3	29.5	Quasi Peak	Live	60	-30.5	Pass
0.896	4.7	20.1	0	24.8	Quasi Peak	Live	56	-31.2	Pass
1.195	3.2	20.1	0	23.3	Quasi Peak	Live	56	-32.7	Pass
0.411	18.4	20.2	0	38.7	Quasi Peak	Neutral	57.6	-19	Pass
0.896	4.7	20.1	0	24.9	Quasi Peak	Neutral	56	-31.1	Pass
0.15	22.2	21.4	0.1	43.7	Quasi Peak	Neutral	66	-22.3	Pass
1.195	3.2	20.1	0	23.3	Quasi Peak	Neutral	56	-32.7	Pass
24.959	8.6	20.6	0.3	29.5	Quasi Peak	Neutral	60	-30.5	Pass
0.56	5.1	20.1	0	25.2	Quasi Peak	Neutral	56	-30.8	Pass
23.129	12.4	20.6	0.3	33.3	Quasi Peak	Neutral	60	-26.7	Pass
21.662	10.8	20.6	0.3	31.6	Quasi Peak	Neutral	60	-28.4	Pass
0.56	-2.9	20.1	0	17.2	Average	Live	46	-28.8	Pass
0.411	10.1	20.2	0	30.4	Average	Live	47.6	-17.3	Pass
0.15	6.2	21.4	0.1	27.7	Average	Live	56	-28.3	Pass
21.662	7	20.6	0.3	27.8	Average	Live	50	-22.2	Pass
23.129	9.2	20.6	0.3	30.1	Average	Live	50	-19.9	Pass
24.959	2.9	20.6	0.3	23.8	Average	Live	50	-26.2	Pass
0.896	-3.8	20.1	0	16.3	Average	Live	46	-29.7	Pass
1.195	-5	20.1	0	15.1	Average	Live	46	-30.9	Pass
0.411	10.3	20.2	0	30.5	Average	Neutral	47.6	-17.1	Pass
0.896	-3.8	20.1	0	16.3	Average	Neutral	46	-29.7	Pass
0.15	5.9	21.4	0.1	27.4	Average	Neutral	56	-28.6	Pass
1.195	-4.9	20.1	0	15.2	Average	Neutral	46	-30.8	Pass
24.959	2.8	20.6	0.3	23.8	Average	Neutral	50	-26.2	Pass
0.56	-2.7	20.1	0	17.4	Average	Neutral	46	-28.6	Pass
23.129	9.2	20.6	0.3	30.1	Average	Neutral	50	-19.9	Pass
21.662	7	20.6	0.3	27.8	Average	Neutral	50	-22.2	Pass

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## Photographs of setup

Title: Conducted Test Setup

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

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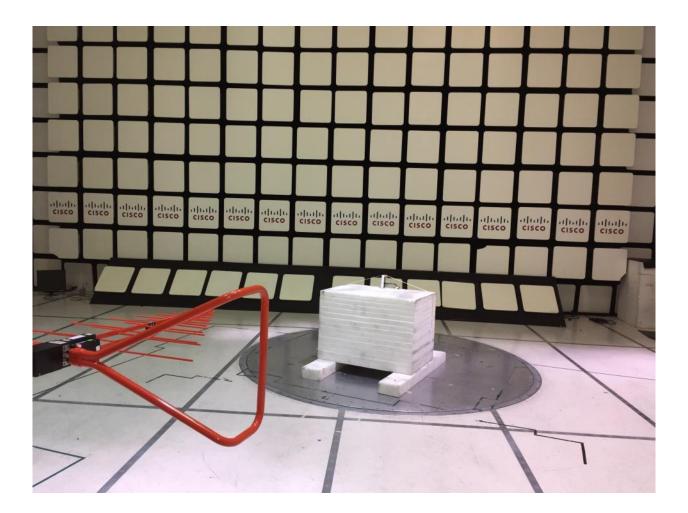
## AIR-AP1815W-x-K9 AC Mains Conducted Emissions setup



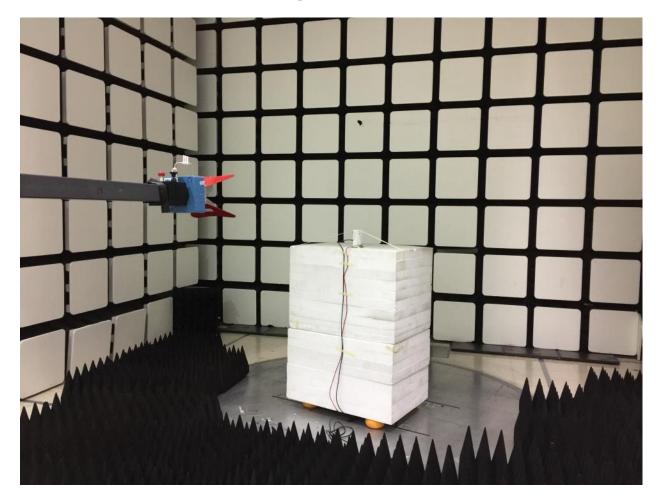
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AIR-AP1815W-x-K9 Radiated Emissions setup 30MHz – 1GHz



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AIR-AP1815W-x-K9 Radiated Emissions setup above 1GHz

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

Test Equipment used for Radiated Emissions							
Equip No	Manufacturer	Description	Luot Our	Next Cal	rest tion		
CIS041929	iBTHP-5-DB9 Newport	5 inch Temp/RH/Press Sensor w/20ft cable	22-Dec-16	22-Dec-17	B.1, B.2, B.3		
CIS001937	NSA 5m Chamber Cisco	NSA 5m Chamber	12-Feb-16	12-Feb-17	B.3		
CIS049535	Above 1GHz Site Cal Cisco	Above 1GHz CISPR Site Validation	13-Feb-16	13-Feb-17	B.1, B.2		
CIS028072	1840 Cisco	18-40GHz EMI Test Head	22-Feb-16	22-Feb-17	B.1, B.2		
CIS045588	JB1 Sunol Sciences	Combination Antenna, 30MHz-2GHz	9-Mar-16	9-Mar-17	B.3		
CIS042000	E4440A Agilent	Spectrum Analyzer	6-Jul-16	6-Jul-17	B.1, B.2		
CIS037581	3117 ETS-Lindgren	Horn Antenna	7-Oct-16	7-Oct-17	B.1, B.2		
CIS045098	TH0118 Cisco	Mast Mount Preamplifier Array, 1-18GHz	31-Oct-16	31-Oct-17	B.1, B.2		
CIS033602	CSY-NMNM-80-273001 Midwest Microwave	RF Coaxial Cable, to 18GHz	8-Nov-16	8-Nov-17	B.1, B.2, B.3		
CIS030443	UFB311A-0-1560-520520 Micro-Coax	RF Coaxial Cable, to 18GHz	8-Nov-16	8-Nov-17	B.1, B.2, B.3		
CIS008024	SF106A Huber + Suhner	3 meter Sucoflex cable	8-Nov-16	8-Nov-17	B.1, B.2, B.3		
CIS024201	FSEK30 Rohde & Schwarz	Spectrum Analyzer 20Hz - 40GHz	23-Nov-16	23-Nov-17	B.1, B.2		
CIS037235	50CB-015 JFW	GPIB Control Box	Cal not Required	Cal not Required	B.1, B.2		
CIS035244	926-8ME Klein Tools	8 Meter Tape Measure	Cal not Required	Cal not Required	B.1, B.2, B.3		
CIS043124	Above 1GHz Site Cal Cisco	Above 1GHz Cispr Site Verification	14-Jan-16	14-Jan-17	B.1, B.2		
CIS047300	N9038A Agilent Technologies	MXE EMI Receiver 20Hz to 26.5 Ghz	28-Jan-16	28-Jan-17	B.1, B.2, B.3		
CIS030559	UFB311A-1-0950-504504 Micro-Coax	RF Coaxial Cable, to 18GHz, 95 in	15-Feb-16	15-Feb-17	B.1, B.2, B.3		
CIS020975	UFB311A-0-1344-520520 Micro-Coax	RF Coaxial Cable, to 18GHz, 134.4 in	17-Feb-16	17-Feb-17	B.1, B.2, B.3		
CIS019630	ESI 40(ESIB 40) Rohde & Schwarz	EMI Test Receiver, 20Hz - 40GHz	22-Feb-16	22-Feb-17	B.1, B.2		
CIS008447	NSA 10m Chamber Cisco	NSA 10m Chamber	14-Oct-16	14-Oct-17	B.3		
CIS036710	1840 Cisco	18-40GHz EMI Test Head/Verification Fixture	17-Nov-16	17-Nov-17	B.1, B.2		
CIS030652	JB1 Sunol Sciences	Combination Antenna, 30MHz-2GHz	16-Dec-16	16-Dec-17	B.3		

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	Test Equipmer	nt used for AC Mains Conducted Er	nissions		
Equip No	Model Manufacturer	Description	Last Cal	Next Cal	Test Item
CIS051642	Sucoflex 106PA Huber+Suhner	RF N Type Cable 8.5m	11-Feb-16	11-Feb-17	B.4
CIS030559	UFB311A-1-0950-504504 Micro-Coax	RF Coaxial Cable, to 18GHz, 95 in	15-Feb-16	15-Feb-17	B.4
CIS020975	UFB311A-0-1344-520520 Micro-Coax	RF Coaxial Cable, to 18GHz, 134.4 in	17-Feb-16	17-Feb-17	B.4
CIS046717	5-T-MB Bird	5W 50 Ohm BNC Termination 4GHz	9-Mar-16	9-Mar-17	B.4
CIS008510	FCC-450B-2.4-N Fischer Custom Communications	Instrumentation Limiter	16-May-16	16-May-17	B.4
CIS023796	FCC-LISN-PA-520R Fischer Custom Communications	POWER ADAPTOR, POLARIZED 120VAC	27-Jul-16	27-Jul-17	B.4
CIS023794	FCC-LISN-50/250-50-2-02 Fischer Custom Communications	LISN	27-Jul-16	27-Jul-17	B.4
CIS019206	H785-150K-50-21378 TTE	High Pas Filter,Fo=150kHz	13-Sep-16	13-Sep-17	B.4
CIS005687	73 III Fluke	Digital Multimeter	3-Nov-16	3-Nov-17	B.4
CIS041929	iBTHP-5-DB9 Newport	5 inch Temp/RH/Press Sensor w/20ft cable	22-Dec-16	22-Dec-17	B.4
CIS054645	33-428 Stanley	Tape measure 8 meter	Cal Not Required	Cal Not Required	B.4

Equip No	Model	Description	Last Cal	Next Cal	Test Item
	Manufacturer	Description	Last Car	Next car	rest item
CIS049445	BRC50704-02	Notch Filter, SB:5.470-5.725GHz, to 12GHz	12-Apr-16	12-Apr-17	Section A
	Micro-Tronics			•	
CIS035038	BRC50703-02	Notch Filter, SB:5.150-5.350GHz, to 11GHz	6-Jul-16	6-Jul-17	Section A
	Micro-Tronics				
CIS055561	F120-S1S1-48	SMA Cable 48"	15-Jul-16	15-Jul-17	Section A
	MegaPhase				
CIS054635	F120-S1S1-48	SMA cable 48"	15-Jul-16	15-Jul-17	Section A
	Megaphase				
CIS055588	BWS30-W2	SMA 30dB Attenuator	21-Jul-16	21-Jul-17	Section A
	Aeroflex				
CIS055578	BWS20-W2	SMA 20dB Attenuator	21-Jul-16	21-Jul-17	Section A
	Aeroflex				
CIS054656	BRC50705-02	Band Reject Filter	19-Sep-16	19-Sep-17	Section A
	Micro-Tronics				
CIS054653	BRM50702-02	Notch Filter, SB:2.400-2.500GHz, to 18GHz	19-Sep-16	19-Sep-17	Section A
	Micro-Tronics				
CIS055858	SMSM-A2PH-012	12" SMA Cable	29-Sep-16	29-Sep-17	Section A
	Dynawave				
CIS055856	SMSM-A2PH-012	12" SMA Cable	29-Sep-16	29-Sep-17	Section A
	Dynawave				
CIS055849	SMSM-A2PH-012	12" SMA Cable	29-Sep-16	29-Sep-17	Section A
	Dynawave				
CIS055848	SMSM-A2PH-012	12" SMA Cable	29-Sep-16	29-Sep-17	Section A
	Dynawave				
CIS055847	SMSM-A2PH-012	12" SMA Cable	29-Sep-16	29-Sep-17	Section A
	Dynawave				
CIS055846	SMSM-A2PH-012	12" SMA Cable	29-Sep-16	29-Sep-17	Section A
	Dynawave				

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CIS055845	SMSM-A2PH-012	12" SMA Cable	29-Sep-16	29-Sep-17	Section A
	Dynawave				
CIS055844	SMSM-A2PH-012	12" SMA Cable	29-Sep-16	29-Sep-17	Section A
	Dynawave				
CIS055843	SMSM-A2PH-012	12" SMA Cable	29-Sep-16	29-Sep-17	Section A
	Dynawave				
CIS055842	SMSM-A2PH-012	12" SMA cable	29-Sep-16	29-Sep-17	Section A
	Dynawave				
CIS055874	SMSM-A2PH-024	24" SMA Cable	7-Oct-16	7-Oct-17	Section A
	Dynawave				
CIS055872	SMSM-A2PH-024	24" SMA Cable	7-Oct-16	7-Oct-17	Section A
	Dynawave				
CIS055868	SMSM-A2PH-024	24" SMA Cable	7-Oct-16	7-Oct-17	Section A
	Dynawave				
CIS055867	SMSM-A2PH-024	24" SMA Cable	7-Oct-16	7-Oct-17	Section A
	Dynawave				
CIS055885	SMSM-A2PH-018	18" SMA Cable	10-Oct-16	10-Oct-17	Section A
	Dynawave				
CIS055170	RFLT4WDC40GK	4 Way Power Divider 40GHz	29-Nov-16	29-Nov-17	Section A
	RF Lambda				
CIS050721	N9030A	PXA Signal Analyzer	30-Mar-16	30-Mar-17	Section A
	Keysight				
CIS054303	N5182B	MXG X-Series RF Vector Signal Generator	6-Apr-16	6-Apr-17	Section A
	Keysight				
CIS055099	SMART2200RM2U	Power Supply	Cal Not	Cal Not	Section A
	Tripp-Lite		Required	Required	
CIS055094	PXI-1042	Chassis	Cal Not	Cal Not	Section A
	National Instruments		Required	Required	

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## Appendix E: Abbreviation Key and Definitions

Abbreviation	Description	Abbreviation	Description
EMC	Electro Magnetic Compatibility	°F	Degrees Fahrenheit
EMI	Electro Magnetic Interference	°C	Degrees Celsius
EUT	EUT Equipment Under Test		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.

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# End

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