



Radio Test Report

C9130AXE-A; C9130AXE-B; C9130AXE-T;

C9130AXE-S; C9130AXE-K; C9130AXE-D; C9130AXE-Z;

Wi-Fi 6 Access Point

FCC ID: LDK948342197

IC ID: 2461N-948342197

Wi-Fi/Chillwave 2412-2462 MHz

BLE 2402MHz – 2480MHz

Against the following Specifications:

FCC Part 15.247; LP0002 (2018);

RSS-247 Issue 2, Feb 2017;

RSS-Gen Issue 5, Feb 2019



Cisco Systems

170 West Tasman Drive

San Jose, CA 95134

Author: Allan Beecroft Tested By: Allan Beecroft	Approved By: Gerard Thorpe Title: Manager. MGMT-Engineering
Revision: 3.0	Issue Date: 29-JAN-2020

This report replaces any previously entered test report under EDCS – 18500314. This test report has been electronically authorized and archived using the CISCO Engineering Document Control system. Test Report Template EDCS# 703456.



SECTION 1: OVERVIEW	3
1.1 TEST SUMMARY	3
SECTION 2: ASSESSMENT INFORMATION	4
2.1 GENERAL	4
2.2 UNITS OF MEASUREMENT	4
2.3 DATE OF TESTING (INITIAL SAMPLE RECEIPT DATE TO LAST DATE OF TESTING)	6
2.4 REPORT ISSUE DATE	6
2.5 TESTING FACILITIES	6
2.6 EQUIPMENT ASSESSED (EUT)	7
2.7 EUT DESCRIPTION	7
SECTION 3: RESULT SUMMARY	9
3.1 RESULTS SUMMARY TABLE	9
SECTION 4: SAMPLE DETAILS	10
4.1 SAMPLE DETAILS	10
4.2 SYSTEM DETAILS	10
4.3 MODE OF OPERATION DETAILS	10
APPENDIX A: EMISSION TEST RESULTS (2.4GHZ WI-FI & CHILLWAVE)	11
RADIATED EMISSION SETUP DIAGRAM-BELOW 1G	11
A.1 RADIATED SPURIOUS EMISSIONS 1GHZ – 26.5GHZ	12
A.2 RADIATED EMISSIONS 30MHZ TO 1GHZ	23
APPENDIX B: EMISSION TEST RESULTS (BLE)	25
RADIATED EMISSION SETUP DIAGRAM-BELOW 1G	25
B.1 RADIATED SPURIOUS EMISSIONS 1GHZ – 26.5GHZ	26
B.3 RADIATED EMISSIONS 30MHZ TO 1GHZ	37
APPENDIX C: LIST OF TEST EQUIPMENT USED TO PERFORM THE TEST	39
APPENDIX D: ABBREVIATION KEY AND DEFINITIONS	42
APPENDIX E: PHOTOGRAPHS OF TEST SETUPS	43
APPENDIX F: PHOTOGRAPHS OF EUT	45
APPENDIX G: SOFTWARE USED TO PERFORM TESTING	45
APPENDIX H: TEST PROCEDURES	45
APPENDIX I: SCOPE OF ACCREDITATION (A2LA CERTIFICATE NUMBER 1178-01)	46
APPENDIX J: TEST ASSESSMENT PLAN	46



Section 1: Overview

1.1 Test Summary

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

Specifications
FCC Part 15.247; LP0002 (2018); RSS-247 Issue 2, Feb 2017; RSS-Gen Issue 5, Feb 2019



Section 2: Assessment Information

2.1 General

This report contains an assessment of an apparatus against Radio 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*%
- 1.All AC testing was performed at one or more of the following supply voltages:
110V 60 Hz (+/-20%)

2.2 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	$\pm 2.4 \cdot 10^{-7}$
temperature measurements	$\pm 0.54^\circ$
humidity measurements	$\pm 2.3\%$
DC and low frequency measurements	$\pm 2.5\%$

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

Radiated emissions (expanded uncertainty, confidence interval 95%)

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

Conducted emissions (expanded uncertainty, confidence interval 95%)

30 MHz – 40GHz	+/- 0.38 dB
----------------	-------------

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.

This report must not be reproduced except in full, without written approval of Cisco Systems.

**2.3 Date of testing (initial sample receipt date to last date of testing)**

28-OCT-2019 to 07-NOV-2019

2.4 Report Issue Date

See cover page.

2.5 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 ISED (Innovation, Science and Economic Development Canada)

Cisco System Site	Address	Site Identifier
Building P, 10m Chamber	125 West Tasman Dr San Jose, CA 95134 United States	Company #: 2461N-2
Building P, 5m Chamber	125 West Tasman Dr San Jose, CA 95134 United States	Company #: 2461N-1
Building I, 5m Chamber	285 W. Tasman Drive San Jose, California 95134 United States	Company #: 2461M-1
Building 7, 5m Chamber	425 E. Tasman Drive San Jose, California 95134 United States	Company #: 2461N-3

Test Engineers

Allan Beecroft



2.6 Equipment Assessed (EUT)

C9130AXE

2.7 EUT Description

Product Name - Catalyst 9130AX 802.11ax Access Point









Program Summary – Mid-tier 8x8 802.11ax Access Point with Dual Band (2.4Ghz - 4x4 MIMO with 4 SS/ 5Ghz - 8X8 with 8 Spatial Streams) supports max 8 SS

The modes included in this report represent data for all modes.



The following antennas are supported by this product series.
The data included in this report represents data for all antennas.

List of External Antennas Supported on C9130AXE

Part Number	Description	Gain
C-ANT9101=	Ceiling Mount Omni Self-Identifying Antenna with Bluetooth, 8-port, with DART connectors.	2 dBi (2.4 GHz) 6 dBi (5 GHz) 3 dBi (BLE)
C-ANT9102=	Pole or Wall Mount Omni Self-Identifying Antenna with Bluetooth, 8-port, with DART connectors.	4 dBi (2.4 GHz) 4 dBi (5 GHz) 4 dBi (BLE)
C-ANT9103=	Pole or Wall mount 75° Directional Self-Identifying Antenna with Bluetooth, 8-port, with DART connectors.	6 dBi (2.4 GHz) 6 dBi (5 GHz) 6 dBi (BLE)
AIR-ANT2524V4C-R=	Ceiling Mount Omni Antenna, 4-port, with RP-TNC connectors.	2 dBi (2.4 GHz) 4 dBi (5 GHz)
	 Note <u>Connect to AP using AIR-CAB002-D8-R=.</u>	
AIR-ANT2524V4C-RS=	Ceiling Mount Omni Self-Identifying Antenna, 4-port, with RP-TNC connectors.	2 dBi (2.4 GHz) 4 dBi (5 GHz)
	 Note <u>Connect to AP using AIR-CAB002-D8-R=.</u>	
AIR-ANT2544V4M-R=	Wall Mount Omni Antenna, 4-port, with RP-TNC connectors.	4 dBi (2.4 GHz) 4 dBi (5 GHz)
	 Note <u>Connect to AP using AIR-CAB002-D8-R=.</u>	
AIR-ANT2544V4M-RS=	Wall Mount Omni Self-Identifying Antenna, 4-port, with RP-TNC connectors.	4 dBi (2.4 GHz) 4 dBi (5 GHz)
	 Note <u>Connect to AP using AIR-CAB002-D8-R=.</u>	
AIR-ANT2566D4M-R=	60° Patch Antenna, 4-port, with RP-TNC connectors. ¹	6 dBi (2.4 GHz) 6 dBi (5 GHz)
	 Note <u>Connect to AP using AIR-CAB002-D8-R=.</u>	
AIR-ANT2566D4M-RS=	60° Patch Self-Identifying Antenna, 4-port, with RP-TNC connectors.	6 dBi (2.4 GHz) 6 dBi (5 GHz)
	 Note <u>Connect to AP using AIR-CAB002-D8-R=.</u>	
AIR-ANT2566P4W-R=	Directional Antenna, 4-port, with RP-TNC connectors.	6 dBi (2.4 GHz) 6 dBi (5 GHz)
	 Note <u>Connect to AP using AIR-CAB002-D8-R=.</u>	
AIR-ANT2566P4W-RS=	Directional Self-Identifying Antenna, 4-port, with RP-TNC connectors.	6 dBi (2.4 GHz) 6 dBi (5 GHz)
	 Note <u>Connect to AP using AIR-CAB002-D8-R=.</u>	



Section 3: Result Summary

3.1 Results Summary Table

Radiated Emissions (General requirements)

Basic Standard	Technical Requirements / Details	Result
FCC 15.209 FCC 15.205 FCC 15.247 RSS-Gen Sec 8.9 & 8.10 RSS-247 Sec 5.5 LP0002 (2018) Sec 3.10, 2.7 & 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



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	Axel-E	KWC233200VP	800-106171-01	S01	Axel-E	KWC233200VP
S02	CISCO POE16U-1AF Power Injector	PHI 95204Y5	341-0556-01 REV A0	S02	CISCO POE16U-1AF Power Injector	PHI 95204Y5

4.2 System Details

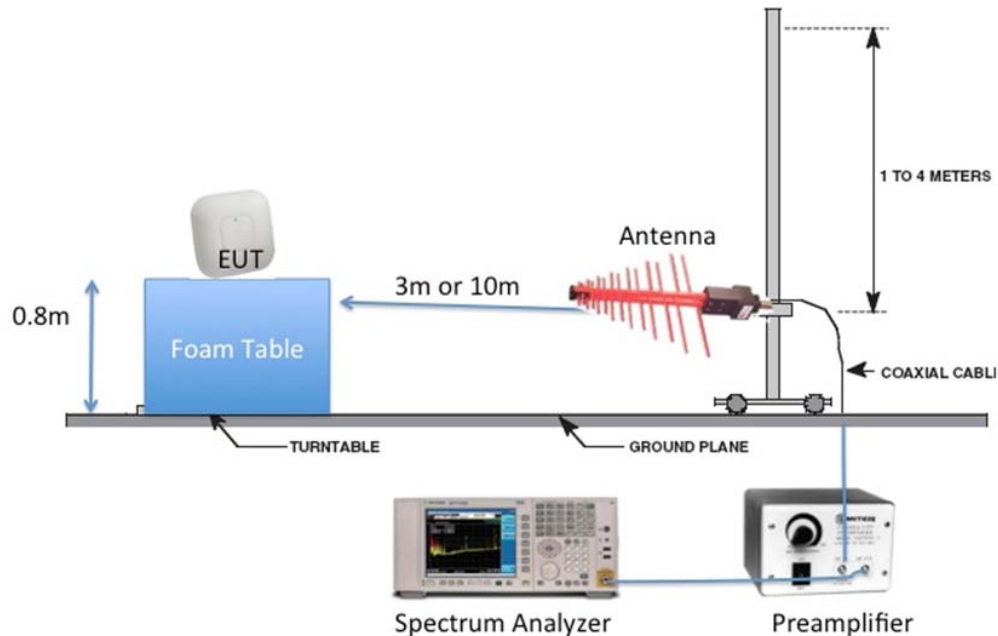
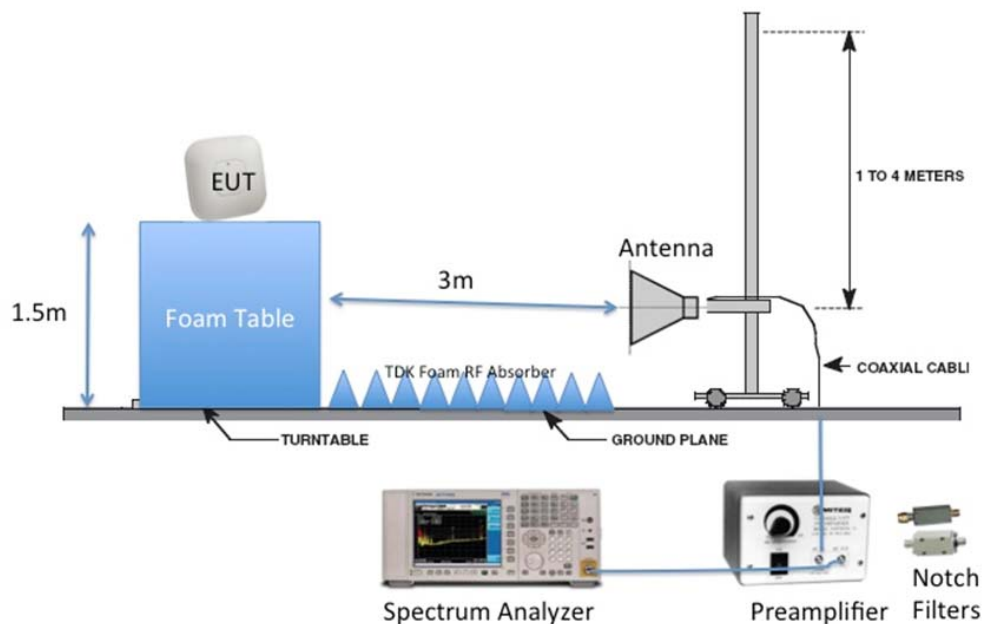
System #	Description	Samples
1	Equipment Under Test	S01
2	POE Power Injector (support equipment)	S02

4.3 Mode of Operation Details

Mode#	Description	Comments
1	Multiple Radio Mode	Both 2.4GHz and Chillwave radios were operating simultaneously.
2	BLE	BLE radio only

Appendix A: Emission Test Results (2.4GHz Wi-Fi & Chillwave)

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

Radiated Emission Setup Diagram-Below 1G**Radiated Emission Setup Diagram-Above 1G**



A.1 Radiated Spurious Emissions 1GHz – 26.5GHz

15.205 / RSS-Gen: 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

Radiated Spurious Emissions	
Test parameters	
Peak Span = 1-18GHz /18GHz-26.5GHz RBW = 1 MHz VBW \geq 3 MHz Sweep = Auto couple Detector = Peak Trace = Max Hold.	Average Span = 1-18GHz /18GHz-26.5GHz RBW = 1 MHz VBW \geq 3 MHz Sweep = Auto couple Detector = Average

Using Vasona, configure the spectrum analyzer as shown above (be sure to enter all losses between the transmitter output and the spectrum analyzer). Place the radio in continuous transmit mode. Terminate the access Point RF ports with 50 ohm loads.

Define worst case orientation x, y, z
 Maximize Turntable (find worst case table angle), Maximize Antenna (find worst case height)

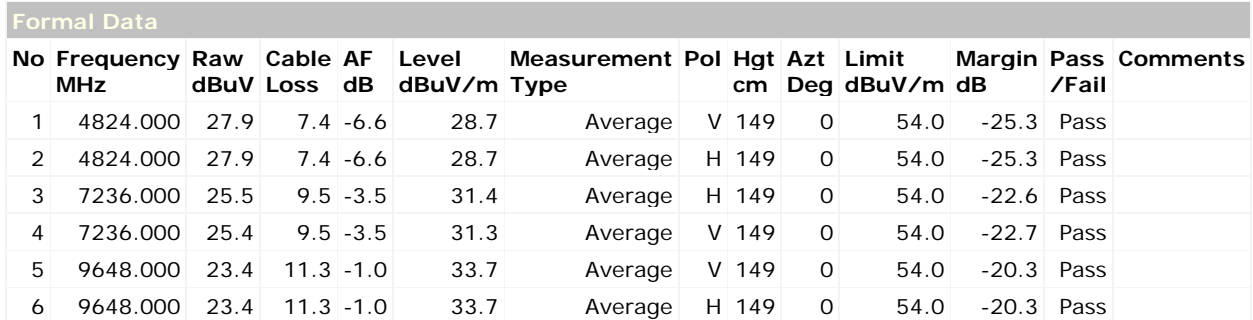
This report represents data for all supported operating modes and antennas.

System Number	Description	Samples	System under test	Support equipment
1	EUT	S01	<input checked="" type="checkbox"/>	<input type="checkbox"/>
	Support	S02	<input type="checkbox"/>	<input checked="" type="checkbox"/>

Tested By : Allan Beecroft	Date of testing: 31-OCT-2019 to 06-NOV-2019
Test Result : PASS	

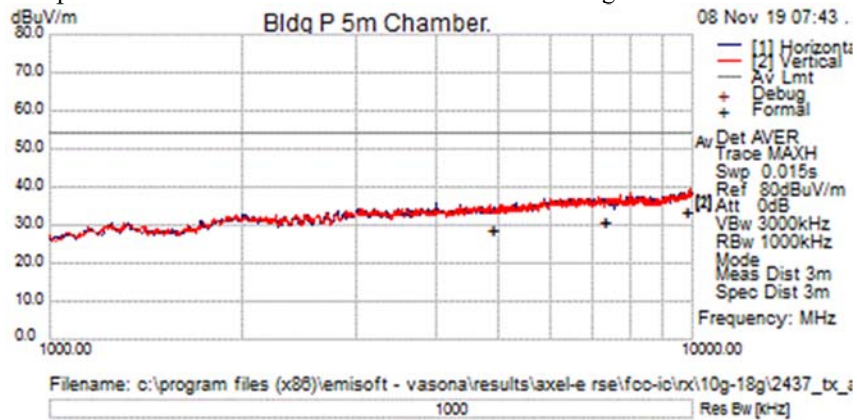
See Appendix C for list of test equipment

Tx Spurious Emissions 1GHz-10GHz. 2412MHz average





Tx Spurious Emissions 1GHz-10GHz. 2437MHz average

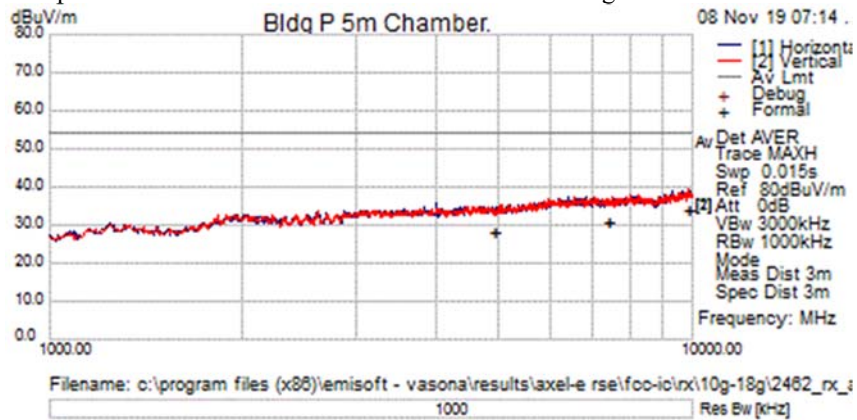


Formal Data

No	Frequency MHz	Raw dBuV	Cable Loss	AF dB	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass /Fail	Comments
1	4874.000	27.8	7.5	-6.7	28.6	Average	V	149	0	54.0	-25.4	Pass	
2	4874.000	27.8	7.5	-6.7	28.6	Average	H	149	0	54.0	-25.4	Pass	
3	7311.000	25.1	9.5	-3.5	31.2	Average	H	149	0	54.0	-22.8	Pass	
4	7311.000	25.1	9.5	-3.5	31.1	Average	V	149	0	54.0	-22.9	Pass	
5	9748.000	23.4	11.4	-1.2	33.7	Average	V	149	0	54.0	-20.3	Pass	
6	9748.000	23.5	11.4	-1.2	33.7	Average	H	149	0	54.0	-20.3	Pass	



Tx Spurious Emissions 1GHz-10GHz. 2462MHz average

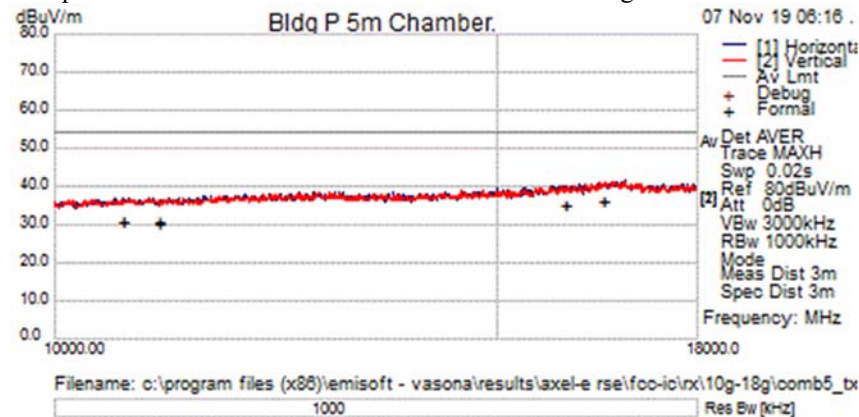


Formal Data

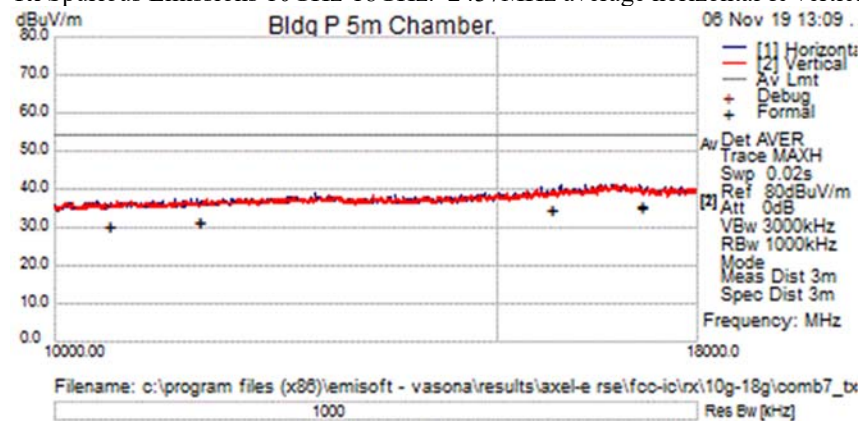
No	Frequency MHz	Raw dBuV	Cable Loss	AF dB	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass /Fail	Comments
1	4924.000	27.5	7.5	-6.6	28.3	Average	V	149	0	54.0	-25.7	Pass	
2	4924.000	27.5	7.5	-6.6	28.4	Average	H	149	0	54.0	-25.6	Pass	
3	7386.000	25.0	9.6	-3.6	31.0	Average	H	149	0	54.0	-23.0	Pass	
4	7386.000	25.0	9.6	-3.6	31.0	Average	V	149	0	54.0	-23.0	Pass	
5	9848.000	23.1	11.5	-.7	33.9	Average	V	149	0	54.0	-20.1	Pass	
6	9848.000	23.2	11.5	-.7	33.9	Average	H	149	0	54.0	-20.1	Pass	



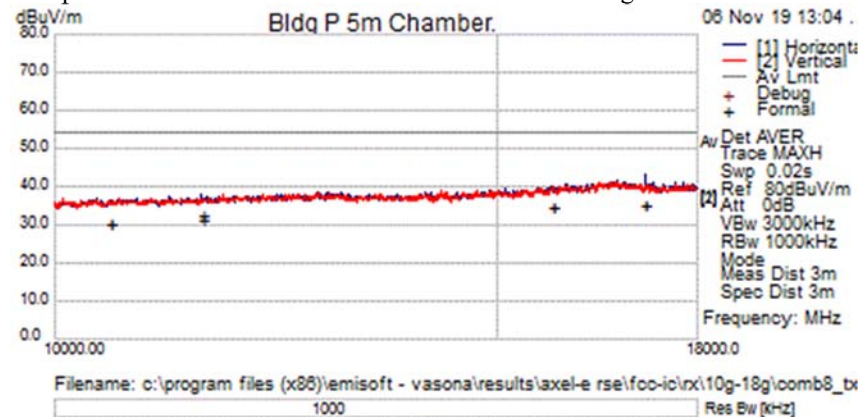
Tx Spurious Emissions 10GHz-18GHz. 2412MHz average horizontal & vertical



Tx Spurious Emissions 10GHz-18GHz. 2437MHz average horizontal & vertical

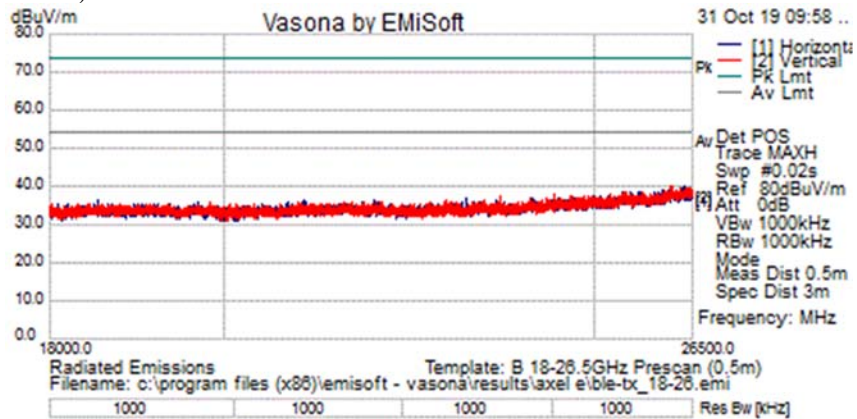


Tx Spurious Emissions 10GHz-18GHz. 2462MHz average horizontal & vertical





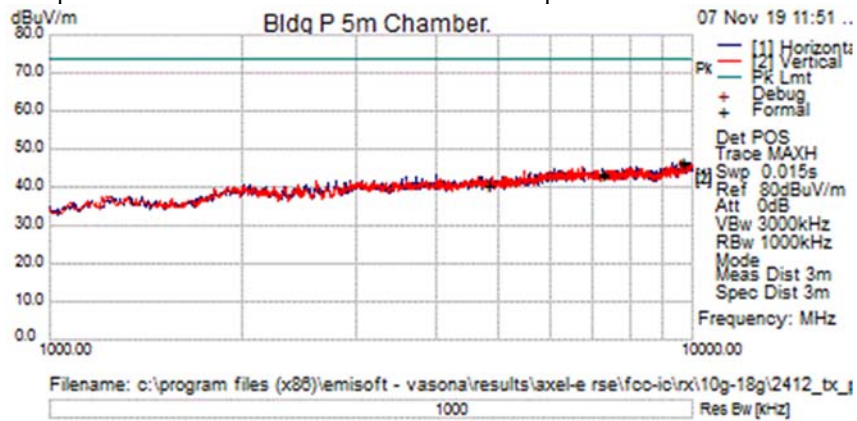
Transmitter Radiated Spurious Emissions peak/average horizontal & vertical 18GHz – 26.5GHz (2.4GHz Wi-Fi All Modes)





A.1.P Transmitter Radiated Spurious Emissions-Peak

Tx Spurious Emissions 1GHz-10GHz. 2412MHz peak

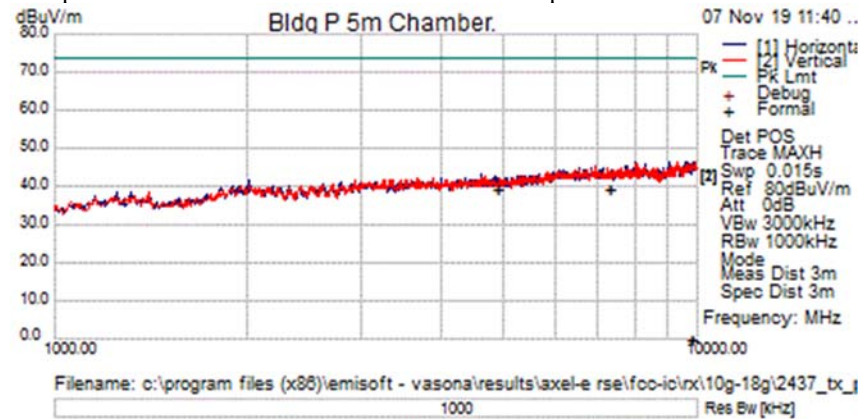


Formal Data

No	Frequency MHz	Raw dBuV	Cable Loss	AF dB	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass /Fail	Comments
1	4824.000	39.4	7.4	-6.6	40.2	Peak	V	148	360	74.0	-33.8	Pass	
2	4824.000	39.8	7.4	-6.6	40.7	Peak	H	148	360	74.0	-33.3	Pass	
3	7236.000	37.5	9.5	-3.5	43.5	Peak	H	148	360	74.0	-30.5	Pass	
4	7236.000	37.1	9.5	-3.5	43.0	Peak	V	148	360	74.0	-31.0	Pass	
5	9648.000	35.9	11.3	-1.0	46.2	Peak	V	148	360	74.0	-27.8	Pass	
6	9648.000	36.3	11.3	-1.0	46.7	Peak	H	148	360	74.0	-27.3	Pass	



Tx Spurious Emissions 1GHz-10GHz. 2437MHz peak

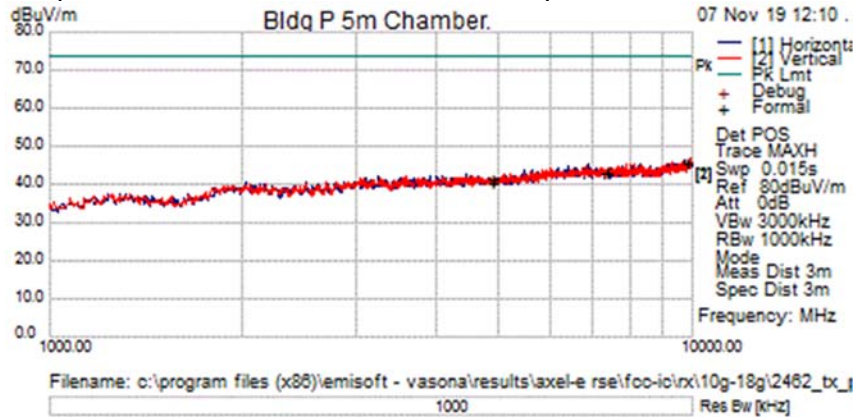


Formal Data

No	Frequency MHz	Raw dBuV	Cable Loss	AF dB	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass /Fail	Comments
1	4874.000	40.1	7.5	-6.7	40.9	Peak	V	148	360	74.0	-33.1	Pass	
2	4874.000	40.7	7.5	-6.7	41.6	Peak	H	148	360	74.0	-32.4	Pass	
3	7311.000	37.6	9.5	-3.5	43.6	Peak	H	148	360	74.0	-30.4	Pass	
4	7311.000	37.8	9.5	-3.5	43.8	Peak	V	148	360	74.0	-30.2	Pass	
5	9748.000	36.1	11.4	-1.2	46.3	Peak	V	148	360	74.0	-27.7	Pass	
6	9748.000	35.7	11.4	-1.2	45.9	Peak	H	148	360	74.0	-28.1	Pass	



Tx Spurious Emissions 1GHz-10GHz. 2462MHz peak

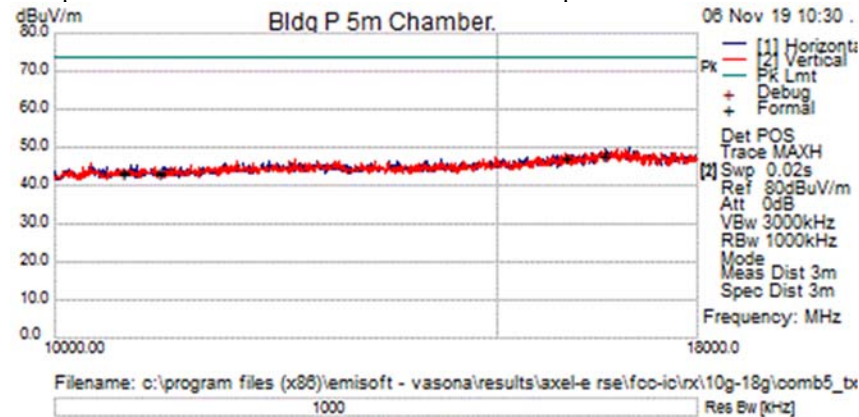


Formal Data

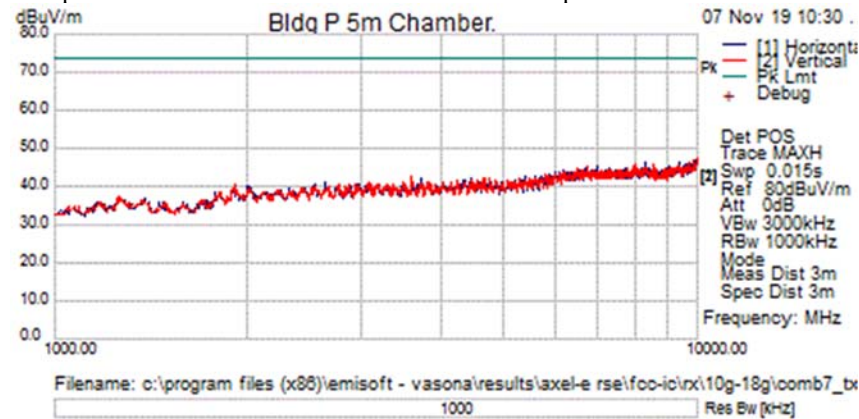
No	Frequency MHz	Raw dBuV	Cable Loss	AF dB	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass /Fail	Comments
1	4924.000	39.5	7.5	-6.6	40.3	Peak	V	148	360	74.0	-33.7	Pass	
2	4924.000	40.0	7.5	-6.6	40.9	Peak	H	148	360	74.0	-33.1	Pass	
3	7386.000	37.4	9.6	-3.6	43.4	Peak	V	148	360	74.0	-30.6	Pass	
4	7386.000	37.4	9.6	-3.6	43.4	Peak	H	148	360	74.0	-30.6	Pass	
5	9848.000	35.3	11.5	-.7	46.1	Peak	H	148	360	74.0	-27.9	Pass	
6	9848.000	35.0	11.5	-.7	45.8	Peak	V	148	360	74.0	-28.2	Pass	



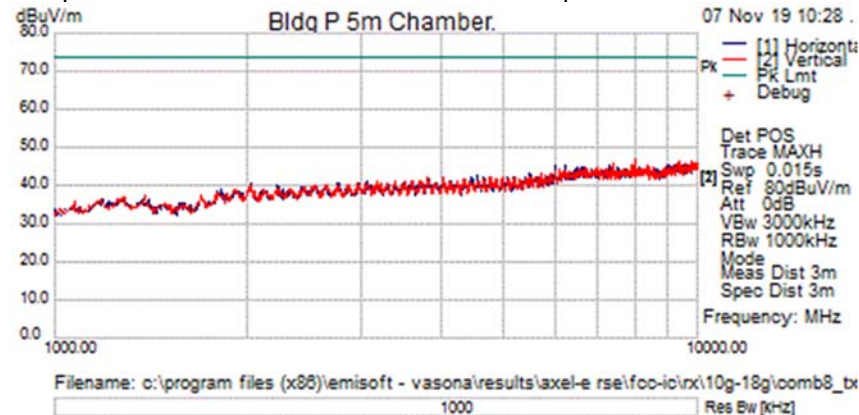
Tx Spurious Emissions 10GHz-18GHz. 2412MHz peak



Tx Spurious Emissions 10GHz-18GHz. 2437MHz peak

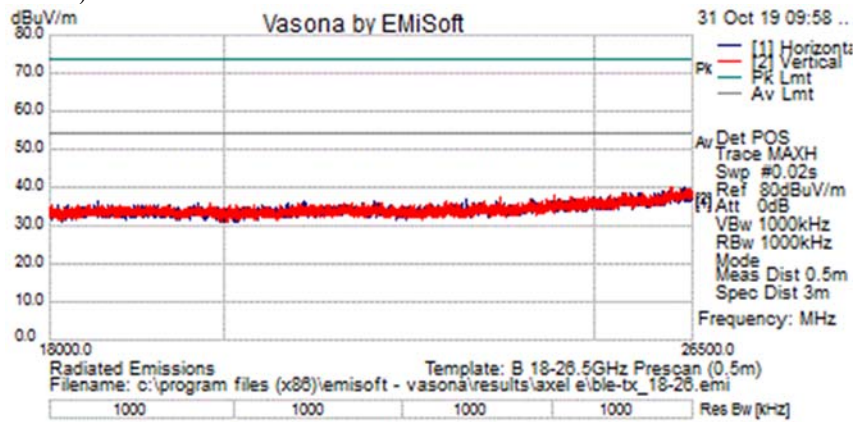


Tx Spurious Emissions 10GHz-18GHz. 2462MHz peak





Transmitter Radiated Spurious Emissions peak/average horizontal & vertical 18GHz – 26.5GHz (2.4GHz Wi-Fi All Modes)





A.2 Radiated Emissions 30MHz to 1GHz

15.205 / 15.209 / RSS-Gen:

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.

Test Procedure

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.

Define worst case orientation x, y, z.

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.

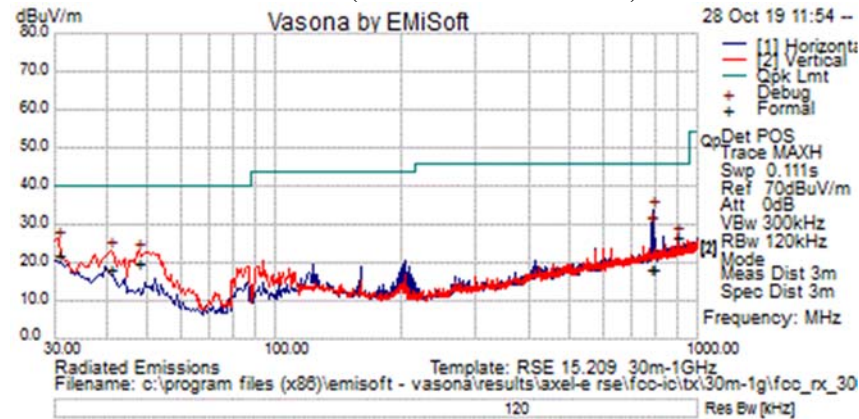
System Number	Description	Samples	System under test	Support equipment
1	EUT	S01	<input checked="" type="checkbox"/>	<input type="checkbox"/>
	Support	S02	<input type="checkbox"/>	<input checked="" type="checkbox"/>

Tested By : Allan Beecroft	Date of testing: 28-OCT-2019
Test Result : PASS	

See Appendix C for list of test equipment



Transmitter Radiated Emission (2.4GHz Wi-Fi All modes)



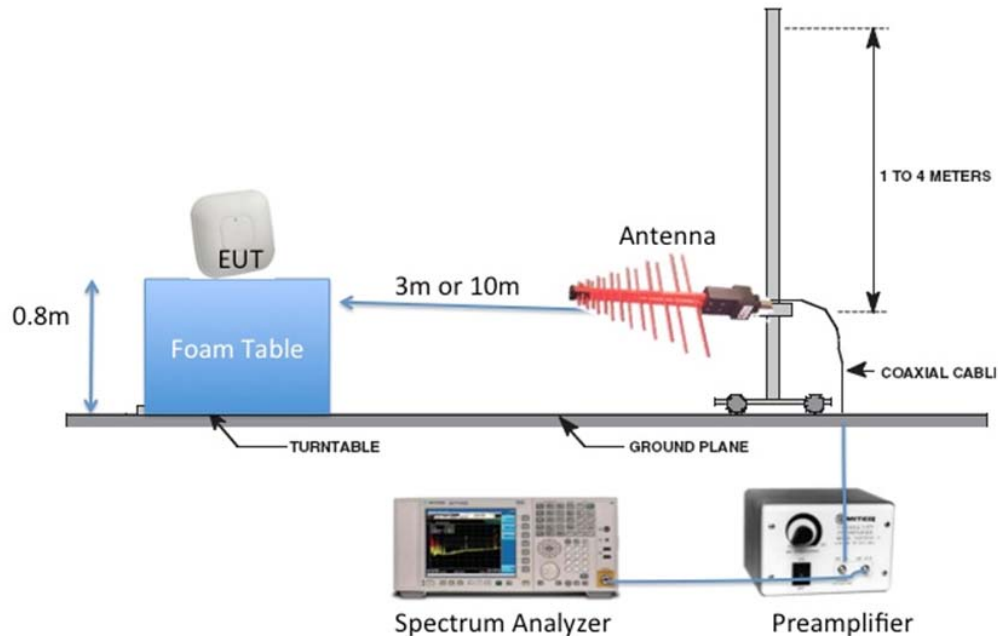
Formal Data

No	Frequency MHz	Raw dBuV	Cable Loss	AF dB	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass /Fail	Comments
1	785.388	22.3	2.7	-6.9	18.1	Quasi Max	H	198	192	46.0	-27.9	Pass	amb
2	30.606	28.3	.6	-6.8	22.1	Quasi Max	V	100	4	40.0	-17.9	Pass	
3	779.931	22.3	2.7	-6.9	18.1	Quasi Max	H	399	52	46.0	-27.9	Pass	amb
4	40.913	32.0	.7	-14.6	18.0	Quasi Max	V	100	90	40.0	-22.0	Pass	
5	47.581	37.8	.7	-18.9	19.6	Quasi Max	V	100	132	40.0	-20.4	Pass	
6	899.969	29.4	2.9	-5.6	26.7	Quasi Max	V	100	161	46.0	-19.3	Pass	

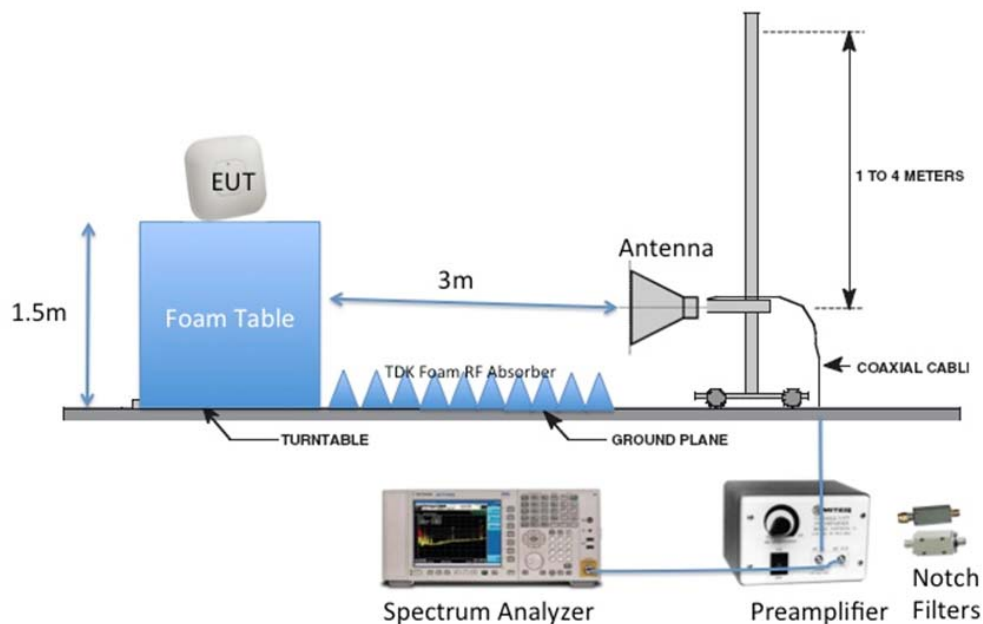
Appendix B: Emission Test Results (BLE)

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

Radiated Emission Setup Diagram-Below 1G



Radiated Emission Setup Diagram-Above 1G





B.1 Radiated Spurious Emissions 1GHz – 26.5GHz

15.205 / RSS-Gen: 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

Radiated Spurious Emissions	
Test parameters	
Peak Span = 1-18GHz /18GHz-26.5GHz RBW = 1 MHz VBW \geq 3 MHz Sweep = Auto couple Detector = Peak Trace = Max Hold.	Average Span = 1-18GHz /18GHz-26.5GHz RBW = 1 MHz VBW \geq 3 MHz Sweep = Auto couple Detector = Average

Using Vasona, configure the spectrum analyzer as shown above (be sure to enter all losses between the transmitter output and the spectrum analyzer). Place the radio in continuous transmit mode. Terminate the access Point RF ports with 50 ohm loads.

Define worst case orientation x, y, z
 Maximize Turntable (find worst case table angle), Maximize Antenna (find worst case height)

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

System Number	Description	Samples	System under test	Support equipment
1	EUT	S01	<input checked="" type="checkbox"/>	<input type="checkbox"/>
	Support	S02	<input type="checkbox"/>	<input checked="" type="checkbox"/>

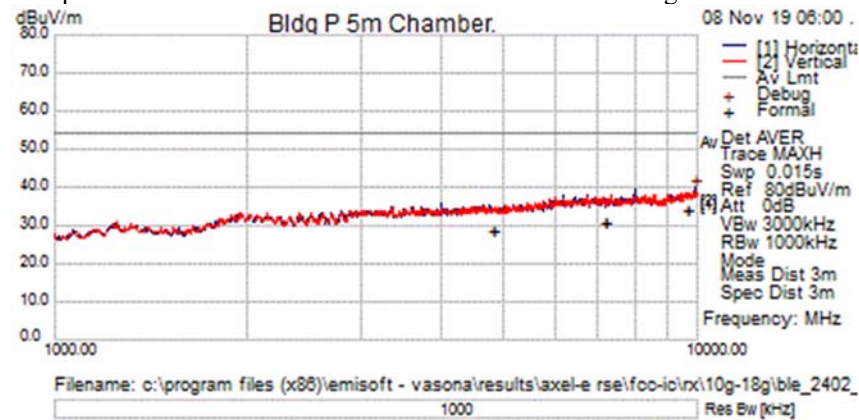
Tested By : Allan Beecroft	Date of testing: 30-OCT-2019 to 06-NOV-2019
Test Result : PASS	

See Appendix B for list of test equipment



B.1.A Transmitter Radiated Spurious Emissions-Average

Tx Spurious Emissions 1GHz-10GHz. BLE 2402MHz average

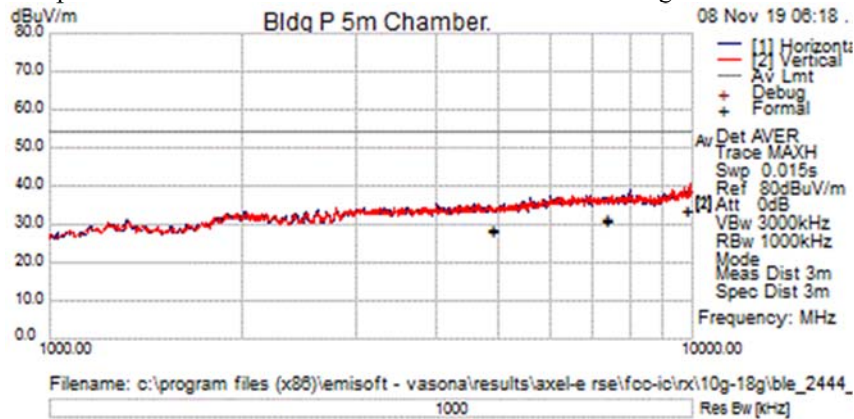


Formal Data

No	Frequency MHz	Raw dBuV	Cable Loss	AF dB	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass /Fail	Comments
1	4804.000	27.8	7.4	-6.6	28.7	Average	V	151	0	54.0	-25.3	Pass	
2	4804.000	27.9	7.4	-6.6	28.7	Average	H	151	0	54.0	-25.3	Pass	
3	7206.000	25.3	9.4	-3.7	31.0	Average	H	151	0	54.0	-23.0	Pass	
4	7206.000	25.3	9.4	-3.7	31.0	Average	V	151	0	54.0	-23.0	Pass	
5	9608.000	23.5	11.3	-.8	34.0	Average	V	99	217	54.0	-20.0	Pass	
6	9608.000	23.5	11.3	-.8	34.0	Average	H	99	217	54.0	-20.0	Pass	



Tx Spurious Emissions 1GHz-10GHz. BLE 2444MHz average

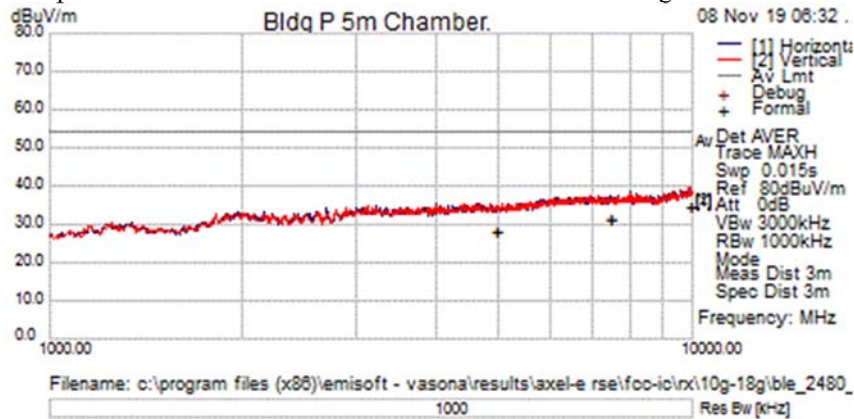


Formal Data

No	Frequency MHz	Raw dBuV	Cable Loss	AF dB	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass /Fail	Comments
1	4888.000	27.8	7.5	-6.7	28.6	Average	V	99	360	54.0	-25.4	Pass	
2	4888.000	27.7	7.5	-6.7	28.5	Average	H	157	360	54.0	-25.5	Pass	
3	7326.000	25.3	9.5	-3.5	31.3	Average	H	157	360	54.0	-22.7	Pass	
4	7326.000	25.0	9.5	-3.5	31.0	Average	V	151	0	54.0	-23.0	Pass	
5	9776.000	23.2	11.4	-1.1	33.5	Average	H	157	360	54.0	-20.5	Pass	
6	9776.000	23.2	11.4	-1.1	33.5	Average	V	157	360	54.0	-20.5	Pass	



Tx Spurious Emissions 1GHz-10GHz. BLE 2480MHz average

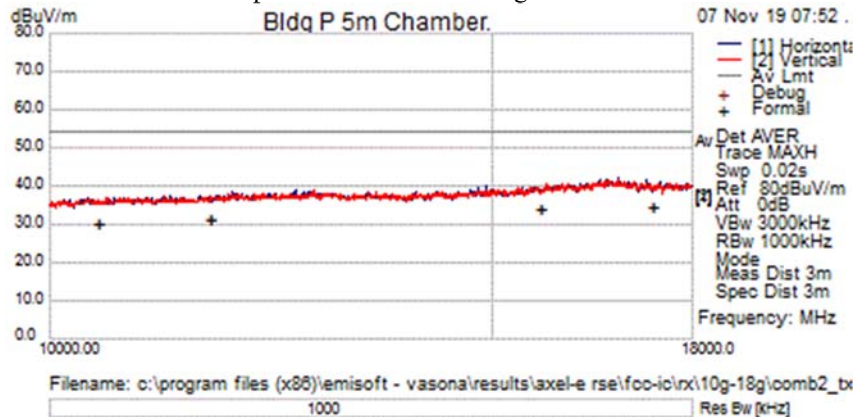


Formal Data

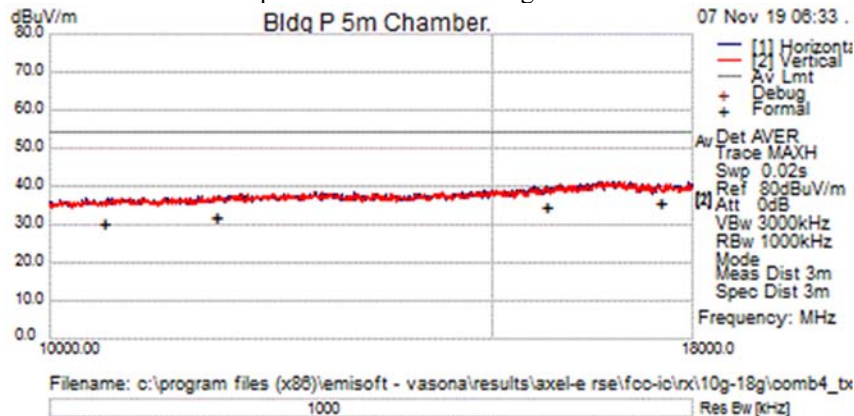
No	Frequency MHz	Raw dBuV	Cable Loss	AF dB	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass /Fail	Comments
1	4960.000	27.6	7.5	-6.7	28.5	Average	V	150	360	54.0	-25.5	Pass	
2	4960.000	27.6	7.5	-6.7	28.5	Average	H	150	360	54.0	-25.5	Pass	
3	7440.000	25.3	9.6	-3.5	31.4	Average	H	150	360	54.0	-22.6	Pass	
4	7440.000	25.2	9.6	-3.5	31.4	Average	V	150	360	54.0	-22.6	Pass	
5	9920.000	23.3	11.5	-.4	34.4	Average	V	150	360	54.0	-19.6	Pass	
6	9920.000	23.2	11.5	-.4	34.4	Average	H	150	360	54.0	-19.6	Pass	



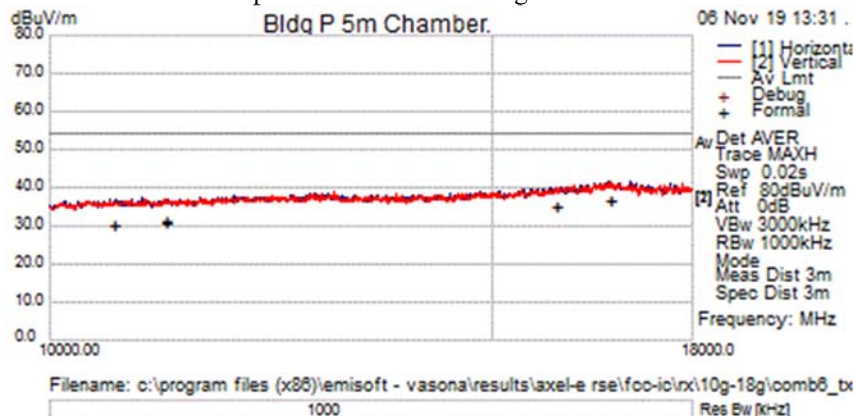
Transmitter Radiated Spurious Emissions average horizontal & vertical 10GHz – 18GHz (BLE 2402MHz)



Transmitter Radiated Spurious Emissions average horizontal & vertical 10GHz – 18GHz (BLE 2444MHz)

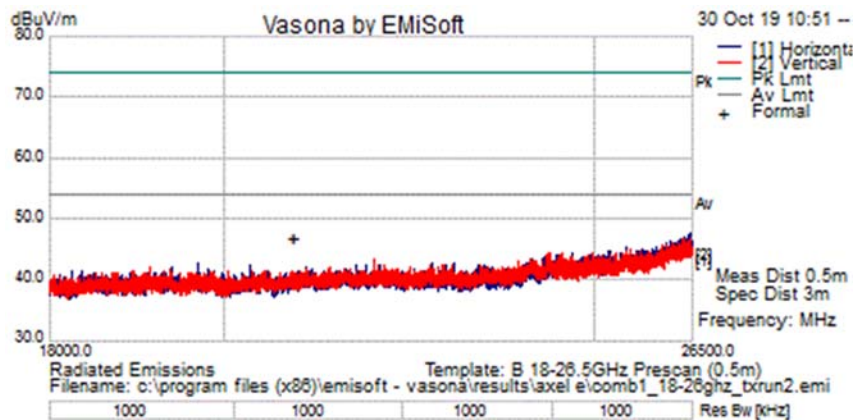


Transmitter Radiated Spurious Emissions average horizontal & vertical 10GHz – 18GHz (BLE 2480MHz)





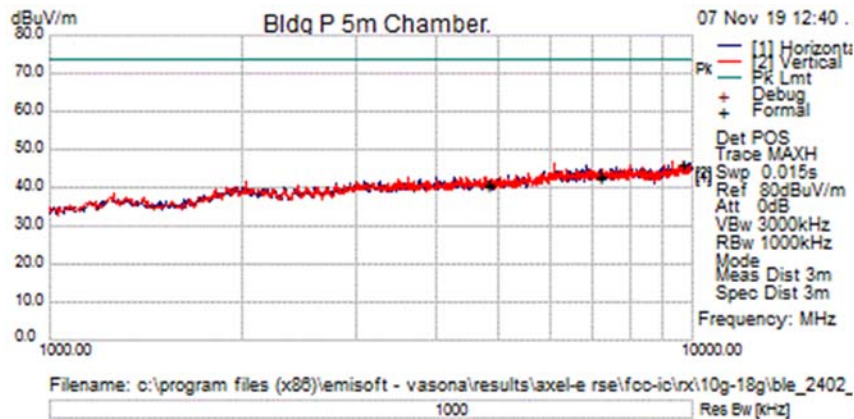
Transmitter Radiated Spurious Emissions average horizontal & vertical 18GHz – 26.5GHz (BLE All Modes)





B.1.P Transmitter Radiated Spurious Emissions-Peak

Tx Spurious Emissions 1GHz-10GHz. BLE 2402MHz peak

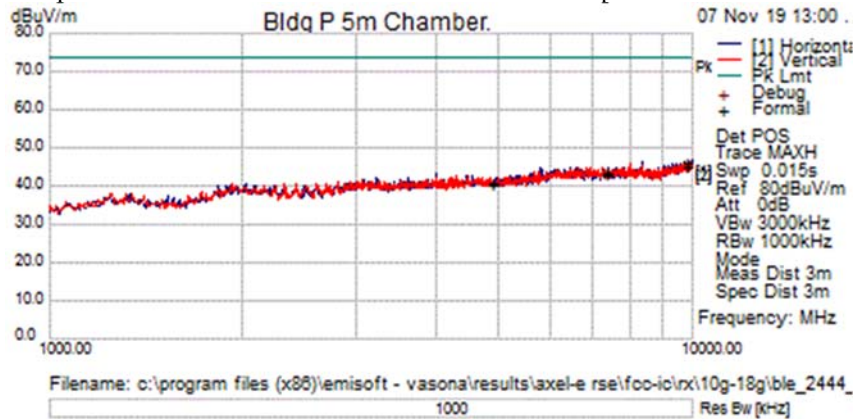


Formal Data

No	Frequency MHz	Raw dBuV	Cable Loss	AF dB	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass /Fail	Comments
1	4804.000	39.9	7.4	-6.6	40.7	Peak	V	148	360	74.0	-33.3	Pass	
2	4804.000	39.8	7.4	-6.6	40.7	Peak	H	148	360	74.0	-33.3	Pass	
3	7206.000	37.2	9.4	-3.7	42.9	Peak	H	148	360	74.0	-31.1	Pass	
4	7206.000	37.1	9.4	-3.7	42.8	Peak	V	148	360	74.0	-31.2	Pass	
5	9608.000	35.8	11.3	-.8	46.2	Peak	V	148	360	74.0	-27.8	Pass	
6	9608.000	35.8	11.3	-.8	46.2	Peak	H	148	360	74.0	-27.8	Pass	



Tx Spurious Emissions 1GHz-10GHz. BLE 2444MHz peak

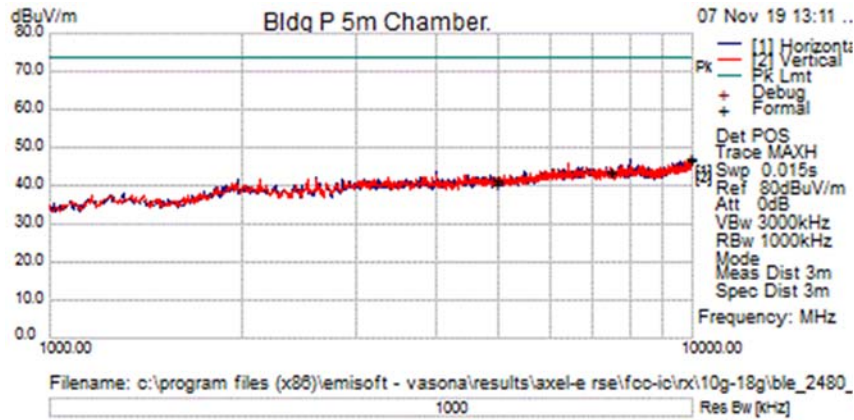


Formal Data

No	Frequency MHz	Raw dBuV	Cable Loss	AF dB	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass /Fail	Comments
1	4888.000	39.7	7.5	-6.7	40.5	Peak	V	148	360	74.0	-33.5	Pass	
2	4888.000	39.9	7.5	-6.7	40.7	Peak	H	148	360	74.0	-33.3	Pass	
3	7326.000	37.4	9.5	-3.5	43.4	Peak	H	148	360	74.0	-30.6	Pass	
4	7326.000	37.2	9.5	-3.5	43.2	Peak	V	148	360	74.0	-30.8	Pass	
5	9776.000	34.6	11.4	-1.1	45.0	Peak	V	148	360	74.0	-29.0	Pass	
6	9776.000	35.7	11.4	-1.1	46.1	Peak	H	148	360	74.0	-27.9	Pass	



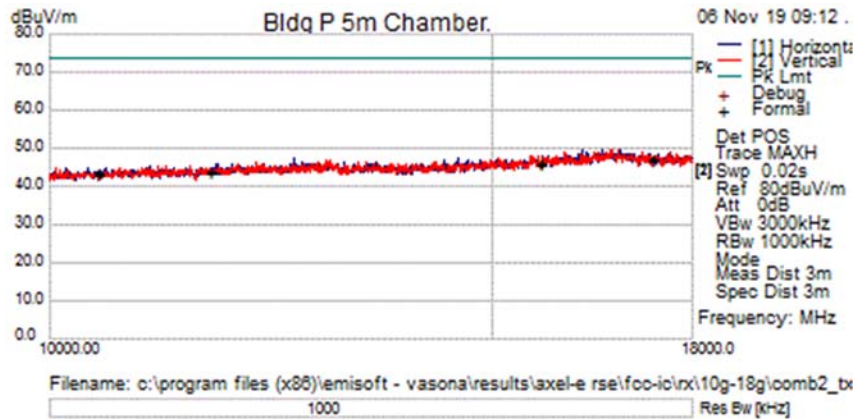
Tx Spurious Emissions 1GHz-10GHz. BLE 2480MHz peak



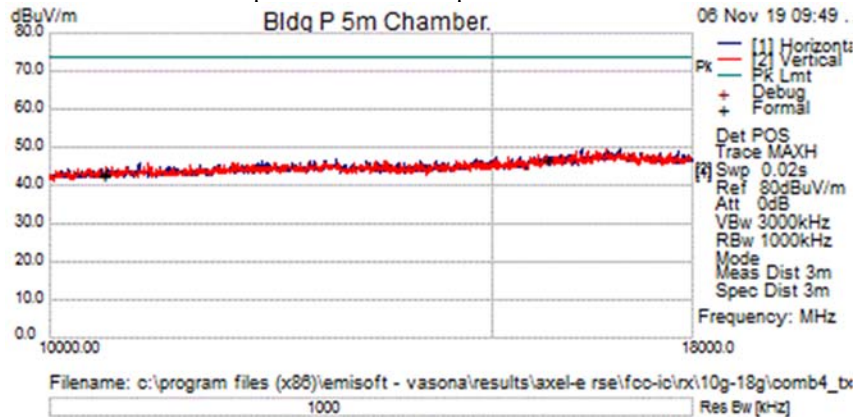
Formal Data													
No	Frequency MHz	Raw dBuV	Cable Loss	AF dB	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass /Fail	Comments
1	4960.000	40.4	7.5	-6.7	41.3	Peak	V	148	360	74.0	-32.7	Pass	
2	4960.000	39.4	7.5	-6.7	40.3	Peak	H	148	360	74.0	-33.7	Pass	
3	9920.000	36.1	11.5	-.4	47.3	Peak	H	148	360	74.0	-26.7	Pass	
4	9920.000	35.3	11.5	-.4	46.5	Peak	V	148	360	74.0	-27.5	Pass	
5	7440.000	37.5	9.6	-3.5	43.7	Peak	V	148	360	74.0	-30.3	Pass	
6	7440.000	37.3	9.6	-3.5	43.4	Peak	H	148	360	74.0	-30.6	Pass	



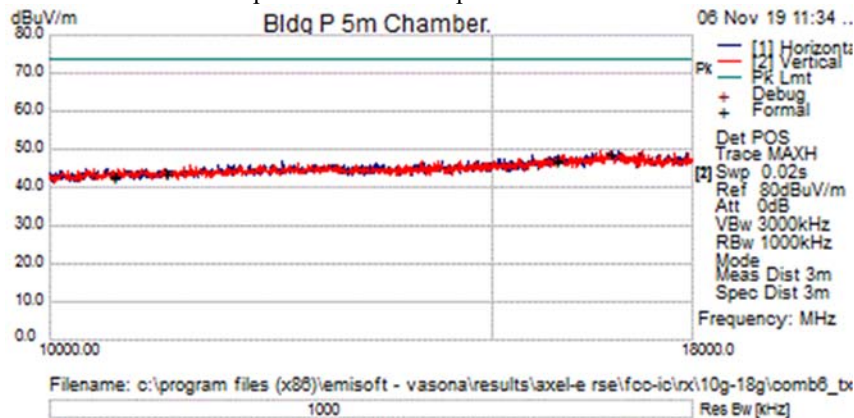
Transmitter Radiated Spurious Emissions peak horizontal & vertical 10GHz – 18GHz (BLE 2402MHz)



Transmitter Radiated Spurious Emissions peak horizontal & vertical 10GHz – 18GHz (BLE 2444MHz)

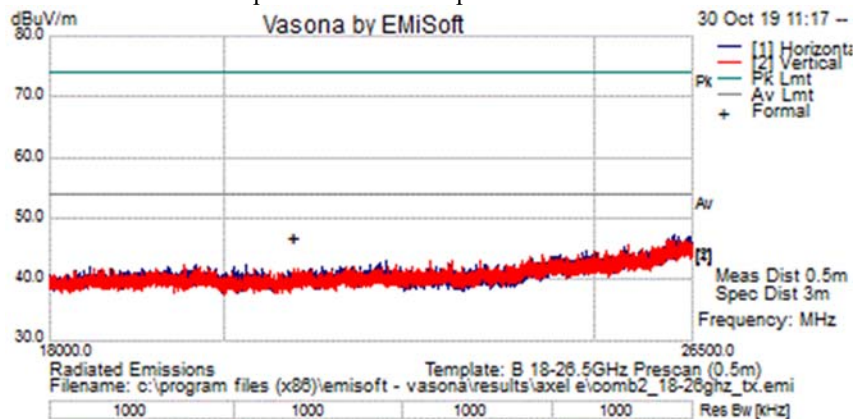


Transmitter Radiated Spurious Emissions peak horizontal & vertical 10GHz – 18GHz (BLE 2480MHz)





Transmitter Radiated Spurious Emissions peak horizontal & vertical 18GHz – 26.5GHz (BLE All Modes)





B.3 Radiated Emissions 30MHz to 1GHz

15.205 / 15.209 / RSS-Gen:

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.

Test Procedure

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.

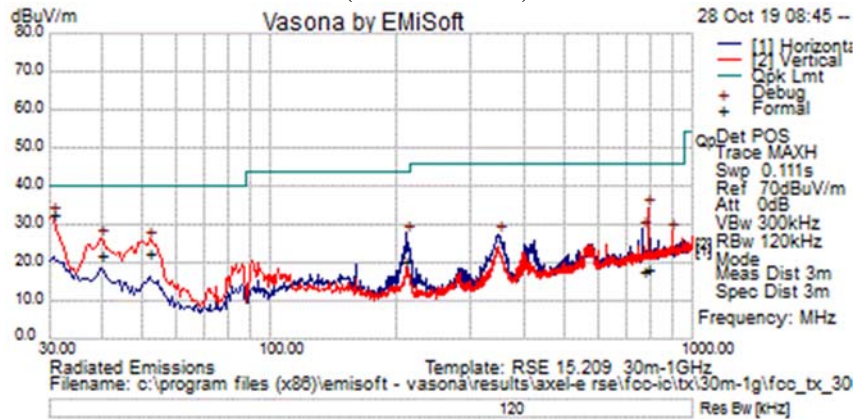
System Number	Description	Samples	System under test	Support equipment
1	EUT	S01	<input checked="" type="checkbox"/>	<input type="checkbox"/>
	Support	S02	<input type="checkbox"/>	<input checked="" type="checkbox"/>

Tested By : Allan Beecroft	Date of testing: 28-OCT-2019
Test Result : PASS	

See Appendix C for list of test equipment



Transmitter Radiated Emission (BLE All modes)



Formal Data

No	Frequency MHz	Raw dBuV	Cable Loss	AF dB	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass /Fail	Comments
1	30.584	38.9	.6	-6.7	32.7	Quasi Max	V	122	11	40.0	-7.3	Pass	
2	51.884	41.8	.7	-20.1	22.4	Quasi Max	V	117	12	40.0	-17.6	Pass	
3	39.622	34.8	.6	-13.7	21.8	Quasi Max	V	124	88	40.0	-18.2	Pass	
4	210.606	35.9	1.4	-16.7	20.6	Quasi Max	H	322	85	43.5	-22.9	Pass	
5	786.051	22.2	2.7	-6.9	18.0	Quasi Max	V	219	50	46.0	-28.0	Pass	
6	766.956	22.3	2.7	-7.4	17.6	Quasi Max	H	164	200	46.0	-28.4	Pass	



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

Equip#	Manufacturer/ Model	Description	Last Cal	Next Cal
30MHz to 1GHz				
CIS008448	NSA 5m Chamber Cisco	NSA 5m Chamber	26-SEP-19	26-SEP-20
CIS047300	Keysight N9038A	MXE EMI Receiver	29-MAY-2019	29-MAY-2020
CIS030654	JB1 Sunol Sciences	Combination Antenna, 30MHz-2GHz	05 Jun 2019	05 Jun 2020
CIS021117	MICRO-COAX UFB311A-0-2484-520520	Coaxial Cable-18Ghz	12 Aug 2019	12 Aug 2020
CIS 56157	HUBER + SUHNER Sucoflex 104PEA	Sucoflex N Type blue 7ft cable	15 Jan 2019	15 Jan 2020
CIS49563	HUBER + SUHNER Sucoflex 106A	Coaxial Cable, 8m	12 Aug 2019	12 Aug 2020
CIS45166	STANLEY 33-428	26' Tape Measure	Cal Not Required	Cal Not Required
CIS54230	NEWPORT iBTHP-5-DB9	5 inch Temp/RH/Press Sensor w/20ft cable	06 Feb 2019	06 Feb 2020
CIS27233	YORK VNE V	Comparison Noise Emitter	Cal Not Required	Cal Not Required
CIS54235	PASTERNAK PE5011-1	PRESET TORQUE WRENCH, 8 IN/LBS	28 Feb 2019	28 Feb 2020



1GHz to 18GHz				
CIS040597	CISCO Above 1GHz Site Cal	1GHz Cispr Site Verification	27 Sep 2019	27 Sep 2020
CIS047300	Keysight N9038A	MXE EMI Receiver	29-MAY-2019	29-MAY-2020
CIS035285	ETS Lindgren 3117	Double Ridged Horn Antenna	25 Jan 2019	25 Jan 2020
CIS45096	CISCO TH0118	Mast Mount Preamplifier Array, 1-18GHz	01 Nov 2018	01 Nov 2019
CIS49563	HUBER + SUHNER Sucoflex 106A	Coaxial Cable, 8m	12 Aug 2019	12 Aug 2020
CIS35040	Micro-Tronics HPM50112-02	Notch Filter	27 Jun 2019	27 Jun 2020
CIS34304	Micro-Tronics BRM50702-02	Band Reject Filter	27 Jun 2019	27 Jun 2020
CIS021117	MICRO-COAX UFB311A-0-2484-520520	Coaxial Cable-18Ghz	12 Aug 2019	12 Aug 2020
CIS 56157	HUBER + SUHNER Sucoflex 104PEA	Sucoflex N Type blue 7ft cable	15 Jan 2019	15 Jan 2020
CIS45166	STANLEY 33-428	26' Tape Measure	Cal Not Required	Cal Not Required
CIS54230	NEWPORT iBTHP-5-DB9	5 inch Temp/RH/Press Sensor w/20ft cable	06 Feb 2019	06 Feb 2020
CIS54235	PASTERNAK PE5011-1	PRESET TORQUE WRENCH, 8 IN/LBS	28 Feb 2019	28 Feb 2020
CIS4883	EMCO 3115	Horn Antenna	Cal Not Required	Cal Not Required
CIS8171	Keysight (Agilent/HP) 8491B Opt 010	ATTENUATOR	23 Apr 2019	23 Apr 2020
CIS34075	SCHAFFNER RSG 2000	Reference Spectrum Generator, 1-18GHz	Cal Not Required	Cal Not Required



18GHz to 26.5GHz				
CIS040597	CISCO Above 1GHz Site Cal	1GHz Cisp Site Verification	27 Sep 2019	27 Sep 2020
CIS45166	STANLEY 33-428	26' Tape Measure	Cal Not Required	Cal Not Required
CIS54230	NEWPORT iBTHP-5-DB9	5 inch Temp/RH/Press Sensor w/20ft cable	06 Feb 2019	06 Feb 2020
CIS54235	PASTERNAK PE5011-1	PRESET TORQUE WRENCH, 8 IN/LBS	28 Feb 2019	28 Feb 2020
CIS41979	CISCO 1840	18-40GHz EMI Test Head/Verification Fixture	09 Apr 2019	09 Apr 2020
CIS5972	Keysight (Agilent/HP) 83712B	SYNTHESIZED CW GENERATOR	Cal Not Required	Cal Not Required
CIS44940	ROHDE & SCHWARZ ESU40	EMI RECEIVER, 40GHZ	13 Dec 2018	13 Dec 2019
CIS37236	JFW 50CB-015	Control Box, GPIB	Cal Not Required	Cal Not Required



Appendix D: Abbreviation Key and Definitions

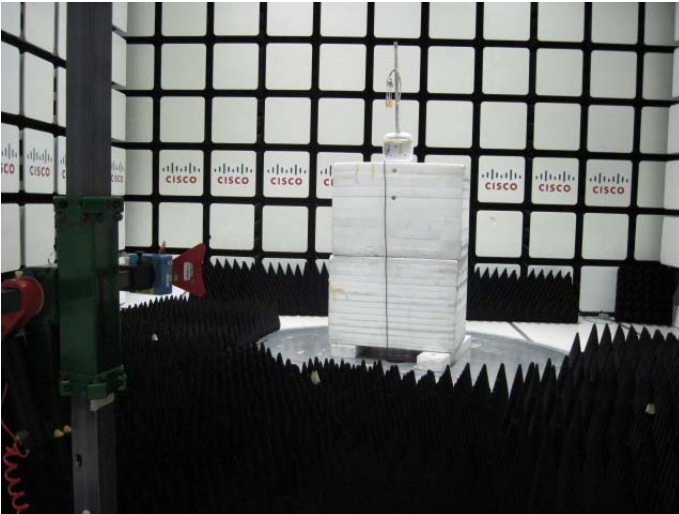
The following table defines abbreviations used within this test report.

Abbreviation	Description	Abbreviation	Description
EMC	Electro Magnetic Compatibility	°F	Degrees Fahrenheit
EMI	Electro Magnetic Interference	°C	Degrees Celsius
EUT	Equipment Under Test	Temp	Temperature
ITE	Information Technology Equipment	S/N	Serial Number
TAP	Test Assessment Schedule	Qty	Quantity
ESD	Electro Static Discharge	emf	Electromotive force
EFT	Electric Fast Transient	RMS	Root mean square
EDCS	Engineering Document Control System	Qp	Quasi Peak
Config	Configuration	Av	Average
CIS#	Cisco Number (unique identification number for Cisco test equipment)	Pk	Peak
Cal	Calibration	kHz	Kilohertz (1×10^3)
EN	European Norm	MHz	MegaHertz (1×10^6)
IEC	International Electro technical Commission	GHz	Gigahertz (1×10^9)
CISPR	International Special Committee on Radio Interference	H	Horizontal
CDN	Coupling/Decoupling Network	V	Vertical
LISN	Line Impedance Stabilization Network	dB	decibel
PE	Protective Earth	V	Volt
GND	Ground	kV	Kilovolt (1×10^3)
L1	Line 1	μ V	Microvolt (1×10^{-6})
L2	Line2	A	Amp
L3	Line 3	μ A	Micro Amp (1×10^{-6})
DC	Direct Current	mS	Milli Second (1×10^{-3})
RAW	Uncorrected measurement value, as indicated by the measuring device	μ S	Micro Second (1×10^{-6})
RF	Radio Frequency	μ S	Micro Second (1×10^{-6})
SLCE	Signal Line Conducted Emissions	m	Meter
Meas dist	Measurement distance	Spec dist	Specification distance
N/A or NA	Not Applicable	SL	Signal Line (or Telecom Line)
P	Power Line	L	Live Line
N	Neutral Line	R	Return
S	Supply	AC	Alternating Current

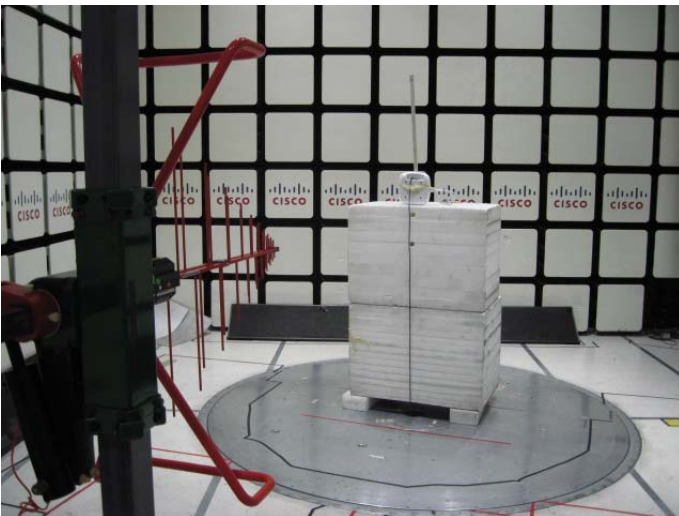
Appendix E: Photographs of Test Setups

Test Setup for Radiated Measurements

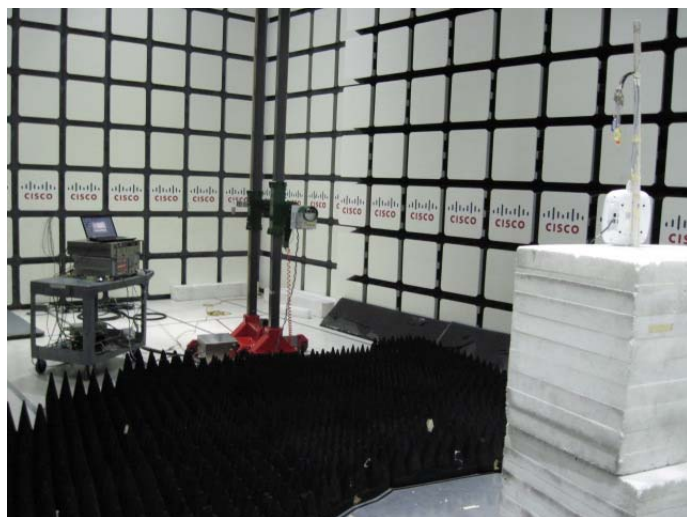
Title: Radiated Emissions Configuration Photograph 1-18GHz



Title: Radiated Emissions Configuration Photograph 30MHz-1GHz



Title: Radiated Emissions Configuration Photograph 18GHz to 40GHz



Appendix F: Photographs of EUT



Appendix G: Software Used to Perform Testing

EMIsoft Vasona, version 6.047

Appendix H: Test Procedures

Measurements were made in accordance with

- KDB 558074 - D01 DTS Meas Guidance v05
- KDB 662911 - MIMO
- ANSI C63.10 2013 Intentional Radiators

Test procedures are summarized below

FCC 2.4GHz RSE Test Procedures	EDCS # 1480386
--------------------------------	----------------



Appendix I: 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 J: Test Assessment Plan

Compliance Test Plan EDCS# 18486508