Radio Test Report

TTC7-25

Audio/Video Codec (BTLE)

2400-2483.5 MHz

Against the following Specifications:

LP0002:2016 Section 2.8

ACCREDITED

Cisco Systems
170 West Tasman Drive
San Jose, CA 95134

Author: Allan Beecroft **Tested By:** Allan Beecroft / Chris Blair	**Approved By:** Gerard Thorpe **Title:** Manager. MGMT-Engineering **Revision:** 1.2

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

This document is uncontrolled. Please refer to the electronic copy within Doc Central for the most up to date version.
Cisco Systems, Inc. Company Confidential

This report replaces any previously entered test report under EDCS – 11879528. This test report has been electronically authorized and archived using the CISCO Engineering Document Control system 'Doc Central'.

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) 6
2.7 EUT DESCRIPTION 6

SECTION 3: RESULT SUMMARY **8**

3.1 RESULTS SUMMARY TABLE 8

SECTION 4: SAMPLE DETAILS **9**

4.1 SAMPLE DETAILS 9
4.2 SYSTEM DETAILS 9
4.3 MODE OF OPERATION DETAILS 9

APPENDIX A: TEST RESULTS **10**

TRANSMITTER RADIATED SPURIOUS EMISSIONS 10
RECEIVER RADIATED SPURIOUS EMISSIONS 23
AC CONDUCTED EMISSIONS 36

APPENDIX B: LIST OF TEST EQUIPMENT USED TO PERFORM THE TEST **38**

APPENDIX C: ABBREVIATION KEY AND DEFINITIONS **40**

APPENDIX D: PHOTOGRAPHS OF EUT AND TEST SETUPS **41**

APPENDIX E: SOFTWARE USED TO PERFORM TESTING **45**

APPENDIX F: TEST PROCEDURES **46**

APPENDIX G: SCOPE OF ACCREDITATION (A2LA CERTIFICATE NUMBER 1178-01) **47**

APPENDIX H: TEST ASSESSMENT PLAN **48**

This document is uncontrolled. Please refer to the electronic copy within Doc Central for the most up to date version.
Cisco Systems, Inc. Company Confidential

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
LP0002:2016 Section 2.8

This document is uncontrolled. Please refer to the electronic copy within Doc Central for the most up to date version.
Cisco Systems, Inc. Company Confidential

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) 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:

220V 60Hz (+/-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

This document is uncontrolled. Please refer to the electronic copy within Doc Central for the most up to date version.
Cisco Systems, Inc. Company Confidential

Measurement Uncertainty Values

voltage and power measurements	± 2 dB
conducted EIRP measurements	± 1.4 dB
radiated measurements	± 3.2 dB
frequency measurements	± 2.4^{x10-7}
temperature measurements	± 0.54ºC
humidity measurements	± 2.3%
DC and low frequency measurements	± 2.5%.

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

Radiated emissions (expanded uncertainty, confidence interval 95%)

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

Conducted emissions (expanded uncertainty, confidence interval 95%)

30 MHz – 40GHz	+/- 0.38 dB

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

This document is uncontrolled. Please refer to the electronic copy within Doc Central for the most up to date version.
Cisco Systems, Inc. Company Confidential

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

25-SEP-2017 to 03-NOV-2017

2.4 Report Issue Date

Cisco uses an electronic system to issue, store and control the revision of test reports. This system is called Doc Central. The actual report issue date is embedded into the original file in Doc Central. Any copies of this report, either electronic or paper, that are not in Doc Central must be considered uncontrolled

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

Test Engineers

Test Engineers: Allan Beecroft, Chris Blair

2.6 Equipment Assessed (EUT)

TTC7-25 Audio/Video Codec (802.11a/b/g/n/ac)

2.7 EUT Description

The TTC7-25 has an Audio/Video codec (encoder/decoder). The EUT is supplied with 12VDC power from an external AC/DC adapter. Operation of the EUT is via a Touch panel or cellphone. It supports Wifi (802.11a/b/g/n/ac 2.4GHz/5GHz, 2x2 MIMO) and Bluetooth 4.0.

This document is uncontrolled. Please refer to the electronic copy within Doc Central for the most up to date version.
Cisco Systems, Inc. Company Confidential

The following antennas are supported by this product series.

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

Frequency	Antenna Type	Antenna Gain 1 (dBi)	Antenna Gain 2 (dBi)
2400	Internal	2.54	2.12
2450	Internal	3.25	2.06
2500	Internal	3.28	2.18

This document is uncontrolled. Please refer to the electronic copy within Doc Central for the most up to date version.
Cisco Systems, Inc. Company Confidential

Section 3: Result Summary

3.1 Results Summary Table

<table>
<tr><th>Basic Standard</th><th>Technical Requirements</th><th>Result</th></tr>
<tr><td>LP0002:2016
Section 2.3</td><td>RF Voltage conducted back onto the AC power line:<table><tr><th>Freq. (MHz)</th><th>Quasi Peak (dBµV)</th><th>Average (dBµV)</th></tr><tr><td>0.15-0.5</td><td>66-56</td><td>56-46</td></tr><tr><td>0.5-5</td><td>56</td><td>46</td></tr><tr><td>5-30</td><td>60</td><td>50</td></tr></table></td><td>Not Tested*</td></tr>
<tr><td>LP0002:2016
Section 2.8</td><td>Field Strength Limits<table><tr><th></th><th>Frequency (MHz)</th><th>Field Strength (µV/m)</th></tr><tr><td>(at 3m)</td><td>30(inc.) - 88(inc.)</td><td>100</td></tr><tr><td>(at 3m)</td><td>88(exc.) – 216(inc.)</td><td>150</td></tr><tr><td>(at 3m)</td><td>216(exc.) – 960(inc.)</td><td>200</td></tr><tr><td>(at 3m)</td><td>Above 960(exc.)</td><td>500</td></tr></table></td><td>Pass</td></tr>
<tr><td>LP0002:2016
Section 3.10.1.2</td><td>Maximum Peak Output Power
≤ 1 W
Exception for antenna directional gain > 6 dBi</td><td>Not Tested*</td></tr>
<tr><td>LP0002:2016
Section 3.10.1.3</td><td>Antenna Gain Limits
For antenna directional gain > 6 dBi, reduced by 1 dB for every 3dB exceeds.</td><td>Not Tested*</td></tr>
<tr><td>LP0002:2016
Section 3.10.1.5</td><td>Out of Band Radiated Emission Limits
> 20 dB below highest level in 100 kHz bandwidth or section 2.9 which has lesser attenuation</td><td>Not Tested*</td></tr>
<tr><td>LP0002:2016
Section 3.10.1.6 (2)</td><td>Digital Modulation Techniques Systems
Minimum 6 dB bandwidth: ≥ 500 kHz
Transmitter power spectral density
(into the antenna): ≤ 8 dBm (in any 3 kHz band any time of continuous transmission)
Processing Gain: > 10 dB</td><td>Not Tested*</td></tr>
<tr><td colspan="3">*Radio module has previous approval. NCC ID: CCAJ15LP6160T6</td></tr>
</table>

This document is uncontrolled. Please refer to the electronic copy within Doc Central for the most up to date version.
Cisco Systems, Inc. Company Confidential

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	TTC7-25	CISCO	C	N/A	s01828-1.3.0 9bfa21a 2017-04-27 14:31:29 matchbox	FOC2048N4T2
S02	FSP070-AHAN2 AC/DC Adapter	FSP GROUP INC	A0	N/A	N/A	FST2102ICFM

4.2 System Details

System #	**Description**	**Samples**
1	EUT	S01, S02

4.3 Mode of Operation Details

Mode#	**Description**	**Comments**
1	TX BTLE	Continuous transmit mode. See Test Assessment Plan for full details.
2	Rx Mode	Receive only mode. See Test Assessment Plan for full details.

This document is uncontrolled. Please refer to the electronic copy within Doc Central for the most up to date version.
Cisco Systems, Inc. Company Confidential

Appendix A: Test Results

Transmitter Radiated Spurious Emissions

Radiated Emissions 30MHz to 1GHz

LP0002:2016 (2.8) Additional regulations shall apply except for this standard, the emissions from the low-power radio-frequency devices shall be less than or equal the field strength levels specified in the following table and the level of any unwanted emissions shall not exceed the level of the fundamental emission. The tighter limit applies at the band edges.

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:	70 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

Antenna ports terminated in 50 Ohms.
Maximize Turntable (find worst case table angle), Maximize Antenna (find worst case height)

The results in this test report are representative for all supported operating modes and antennas.

System Number	Description	Samples	System under test	Support equipment
1	EUT	S01, S02	✓	

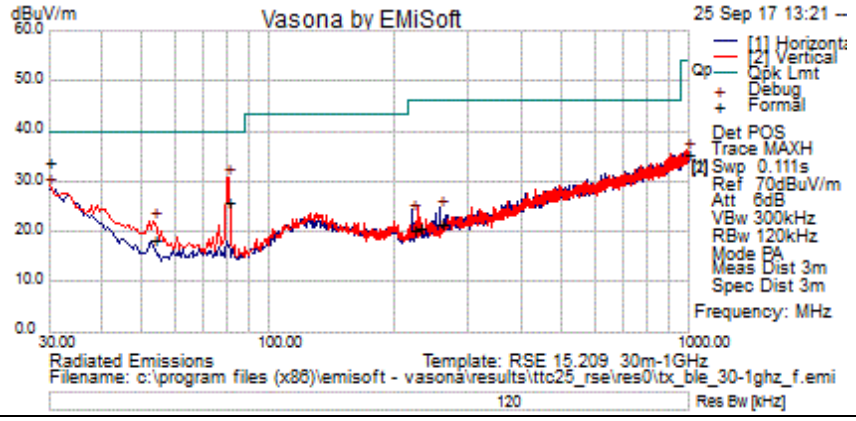
Tested By : Allan Beecroft	**Date of testing: 25-SEP-2017**
Test Result : PASS	

See Appendix B for list of test equipment

This document is uncontrolled. Please refer to the electronic copy within Doc Central for the most up to date version.
Cisco Systems, Inc. Company Confidential

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



RSE 30MHz to 1GHz Graph. BTLE

Worst Case Test Results Table

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	80.009	17.5	.8	7.7	26.0	Quasi Max	V	153	225	40.0	-14.0	Pass	
2	30.000	11.9	.5	21.3	33.7	Quasi Max	V	143	108	40.0	-6.3	Pass	
3	993.331	9.1	2.9	23.5	35.5	Quasi Max	V	213	212	54.0	-18.5	Pass	
4	53.400	10.5	.7	7.4	18.6	Quasi Max	V	103	203	40.0	-21.4	Pass	
5	256.398	8.2	1.5	11.8	21.5	Quasi Max	H	142	257	46.0	-24.5	Pass	
6	220.421	8.6	1.4	10.6	20.6	Quasi Max	H	113	181	46.0	-25.4	Pass	
7	228.341	8.5	1.4	11.0	20.9	Quasi Max	H	239	242	46.0	-25.1	Pass	

This document is uncontrolled. Please refer to the electronic copy within Doc Central for the most up to date version.
Cisco Systems, Inc. Company Confidential

Transmitter Radiated Spurious Emissions 1GHz to 18GHz

LP0002:2016 (2.8) Additional regulations shall apply except for this standard, the emissions from the low-power radio-frequency devices shall be less than or equal the field strength levels specified in the following table and the level of any unwanted emissions shall not exceed the level of the fundamental emission. The tighter limit applies at the band edges.

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.

	Peak	Average
Span:	1GHz – 18 GHz	1GHz – 18 GHz
Reference Level:	70 dBuV	70 dBuV
Attenuation:	0 dB	0 dB
Sweep Time:	Auto	Auto
Resolution Bandwidth:	1MHz	1MHz
Video Bandwidth:	3 MHz	3 MHz
Detector:	Peak	RMS (Average)

Antenna ports terminated in 50 Ohms.
Maximize Turntable (find worst case table angle), Maximize Antenna (find worst case height)

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

The results in this test report are representative for all supported operating modes and antennas.

System Number	Description	Samples	System under test	Support equipment
1	EUT	S01, S02	✓	

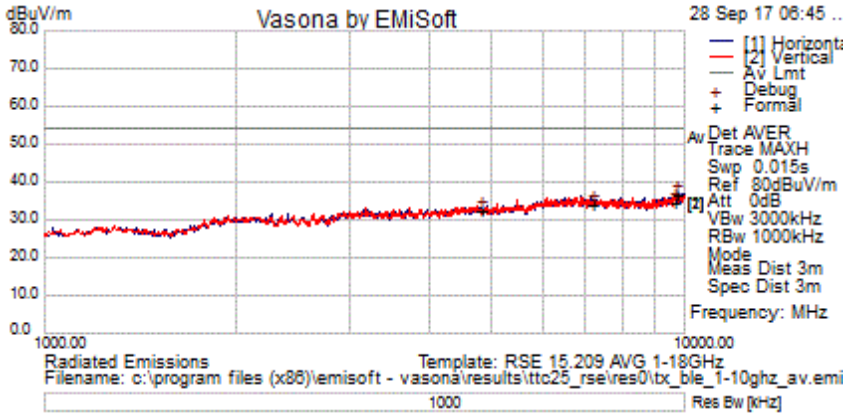
Tested By : Allan Beecroft	**Date of testing: 28/29-SEP-2017 / 09-OCT-2017**
Test Result : PASS	

See Appendix B for list of test equipment

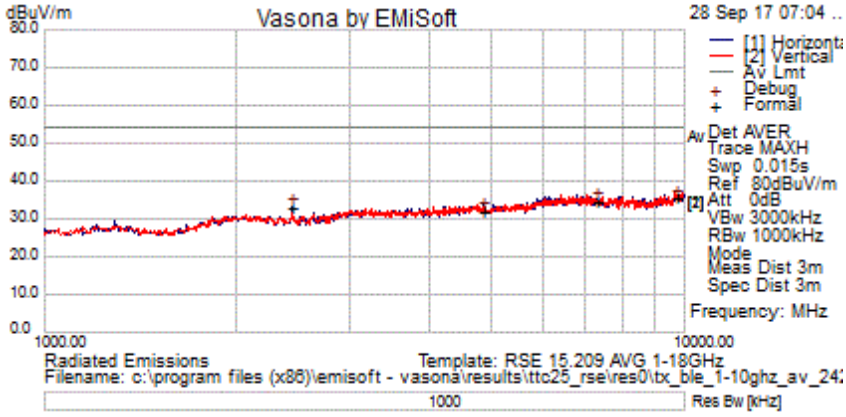
This document is uncontrolled. Please refer to the electronic copy within Doc Central for the most up to date version.
Cisco Systems, Inc. Company Confidential

Graphs: Average Radiated Transmitter Spurious Emissions

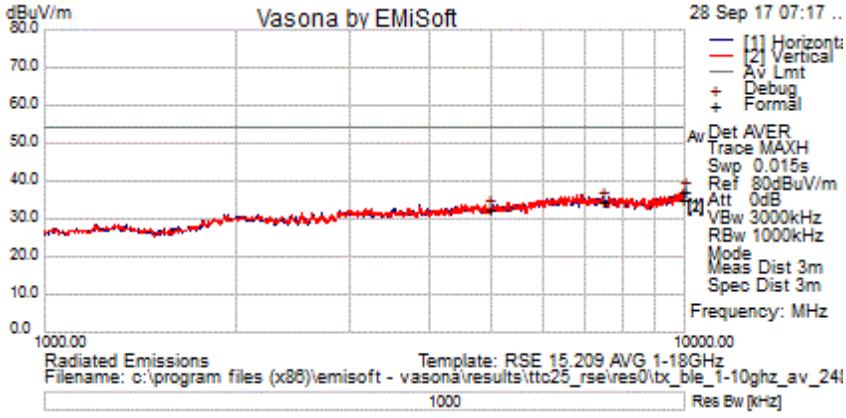
2402MHz BTLE, 1GHz to 10GHz



2426MHz BTLE, 1GHz to 10GHz



2480MHz BTLE, 1GHz to 10GHz



This document is uncontrolled. Please refer to the electronic copy within Doc Central for the most up to date version.
Cisco Systems, Inc. Company Confidential

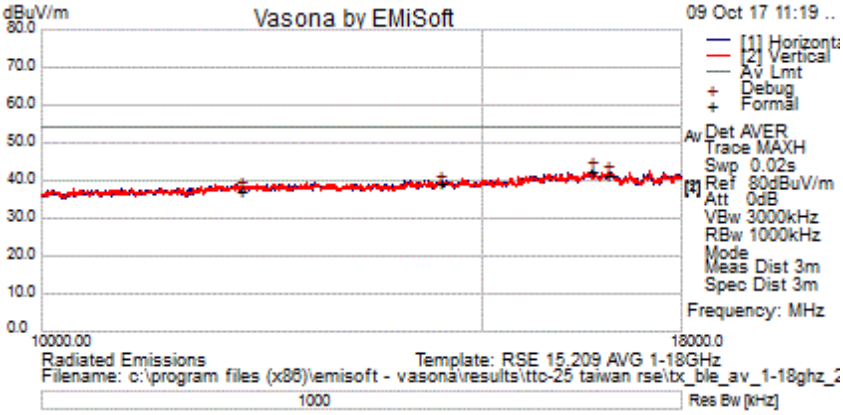
Worst Case Test Results Table Average (1GHz to 10GHz)

Formal Data

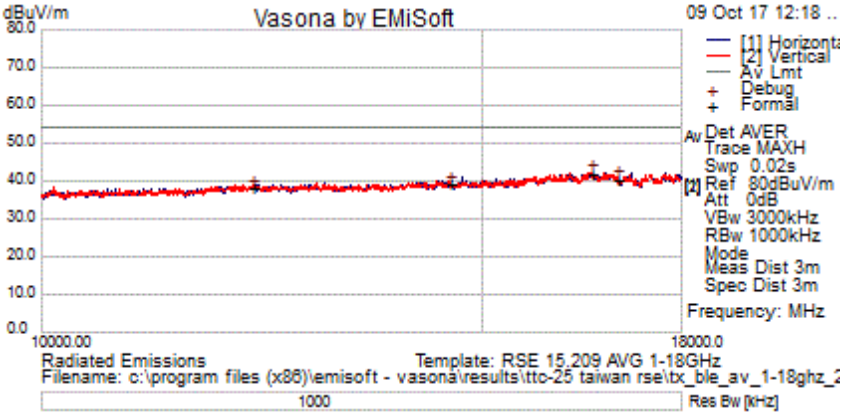
No	Frequency MHz	Raw dBuV	Cable Loss	AF dB	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass /Fail	Comments
1	9696.250	30.4	10.4	-3.9	36.9	Average.	V	150	0	54.0	-17.1	Pass	
2	4804.000	34.6	6.9	-8.8	32.7	Average.	H	150	360	54.0	-21.3	Pass	
3	7206.000	31.6	8.7	-6.1	34.3	Average.	H	150	360	54.0	-19.7	Pass	
4	9608.000	29.0	10.4	-4.8	34.6	Average.	H	150	360	54.0	-19.4	Pass	
5	10000.000	29.8	10.7	-3.5	37.0	Average.	H	150	0	54.0	-17.0	Pass	
6	4852.000	34.0	6.9	-8.8	32.1	Average.	V	150	360	54.0	-21.9	Pass	
7	7278.000	32.0	8.8	-6.1	34.7	Average.	V	150	360	54.0	-19.3	Pass	
8	9704.000	28.9	10.4	-3.9	35.4	Average.	V	150	360	54.0	-18.6	Pass	
9	2439.663	38.1	4.8	-9.8	33.1	Average.	H	150	360	54.0	-20.9	Pass	
10	9983.125	30.2	10.7	-3.5	37.4	Average.	V	150	0	54.0	-16.6	Pass	
11	4960.000	34.3	7.0	-8.8	32.5	Average.	H	150	360	54.0	-21.5	Pass	
12	7440.000	32.1	8.9	-6.2	34.9	Average.	V	150	360	54.0	-19.1	Pass	
13	9920.000	27.9	10.7	-3.5	35.0	Average.	V	150	360	54.0	-19.0	Pass	

This document is uncontrolled. Please refer to the electronic copy within Doc Central for the most up to date version.
Cisco Systems, Inc. Company Confidential

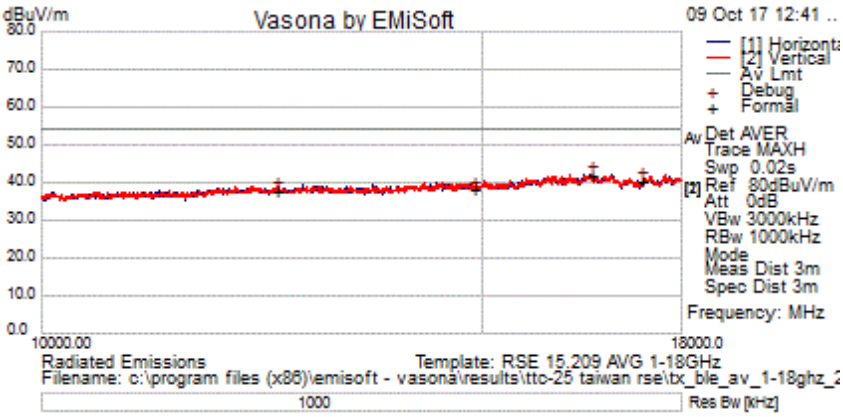
2402MHz BTLE, 10GHz to 18GHz



2426MHz BTLE, 10GHz to 18GHz



2480MHz BTLE, 10GHz to 18GHz



This document is uncontrolled. Please refer to the electronic copy within Doc Central for the most up to date version.
Cisco Systems, Inc. Company Confidential

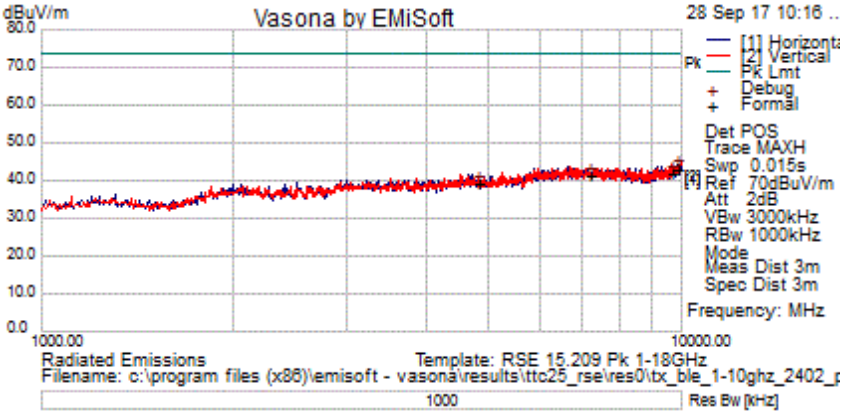
Worst Case Test Results Table Average (10GHz to 18GHz)

Formal Data

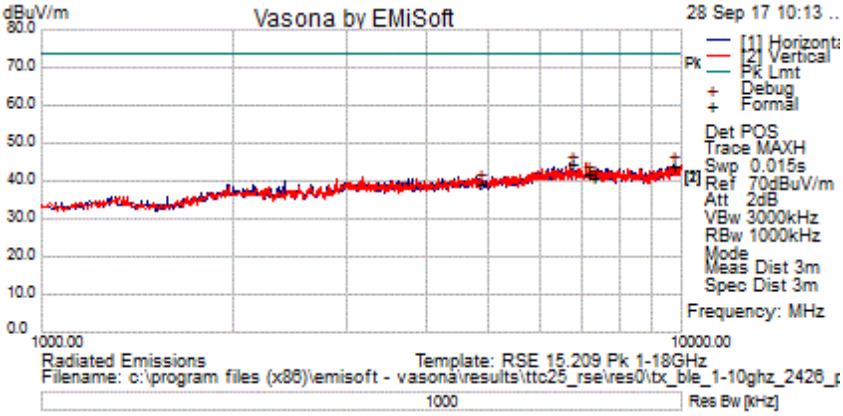
No	Frequency MHz	Raw dBuV	Cable Loss	AF dB	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass /Fail	Comments
1	16585.000	39.5	14.0	-10.8	42.7	Average.	H	150	0	54.0	-11.3	Pass	
2	12010.000	40.6	11.4	-14.5	37.5	Average.	V	150	0	54.0	-16.5	Pass	
3	14412.000	40.4	12.8	-14.0	39.3	Average.	V	150	0	54.0	-14.8	Pass	
4	16814.000	38.3	13.9	-10.7	41.5	Average.	H	150	0	54.0	-12.5	Pass	
5	16565.000	39.1	13.8	-10.7	42.2	Average.	H	150	0	54.0	-11.8	Pass	
6	12130.000	41.2	11.5	-14.5	38.2	Average.	V	150	0	54.0	-15.8	Pass	
7	14556.000	40.4	12.9	-14.2	39.1	Average.	H	150	0	54.0	-14.9	Pass	
8	16982.000	37.7	14.0	-11.4	40.4	Average.	H	150	0	54.0	-13.6	Pass	
9	16560.000	39.1	13.8	-10.7	42.2	Average.	H	150	0	54.0	-11.8	Pass	
10	12400.000	40.5	11.7	-14.4	37.8	Average.	V	150	0	54.0	-16.2	Pass	
11	14880.000	39.0	12.9	-13.7	38.2	Average.	V	150	0	54.0	-15.8	Pass	
12	17360.000	37.7	14.1	-11.1	40.6	Average.	H	150	0	54.0	-13.4	Pass	

This document is uncontrolled. Please refer to the electronic copy within Doc Central for the most up to date version.
Cisco Systems, Inc. Company Confidential

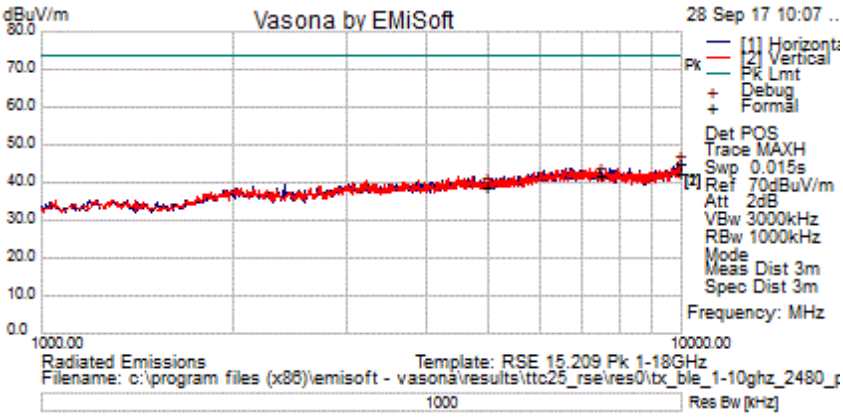
2402MHz BTLE, Peak 1GHz to 10GHz



2426MHz BTLE, Peak 1GHz to 10GHz



2480MHz BTLE, Peak 1GHz to 10GHz



This document is uncontrolled. Please refer to the electronic copy within Doc Central for the most up to date version.
Cisco Systems, Inc. Company Confidential

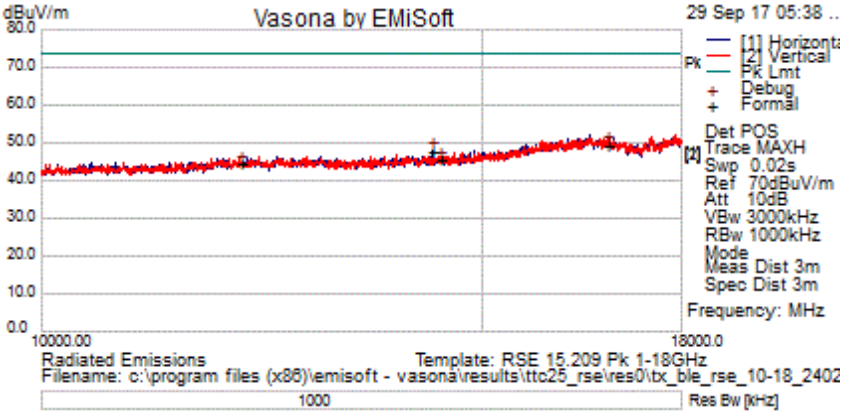
Worst Case Test Results Table Peak (1GHz to 10GHz)

Formal Data

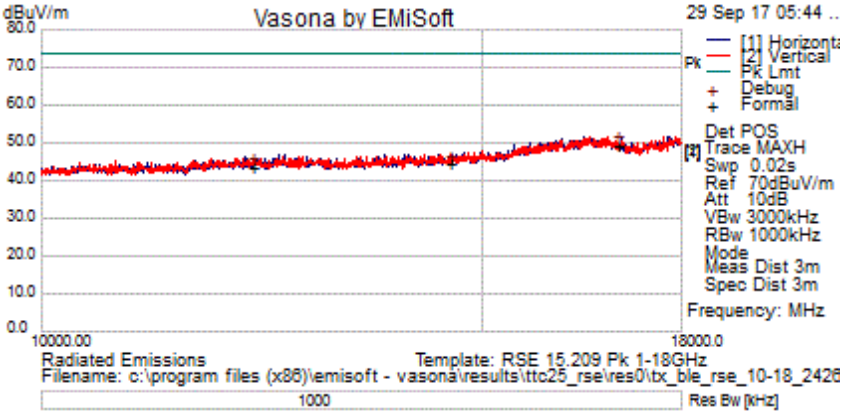
No	Frequency MHz	Raw dBuV	Cable Loss	AF dB	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass /Fail	Comments
1	9874.616	36.3	10.6	-3.8	43.1	Peak.	H	150	360	74.0	-30.9	Pass	
2	4804.000	41.2	6.9	-8.8	39.3	Peak.	V	150	360	74.0	-34.7	Pass	
3	7206.000	38.7	8.7	-6.1	41.3	Peak.	H	150	360	74.0	-32.7	Pass	
4	9608.000	36.2	10.4	-4.8	41.8	Peak.	H	150	360	74.0	-32.2	Pass	
5	4852.000	41.5	6.9	-8.8	39.6	Peak.	H	150	360	74.0	-34.4	Pass	
6	7278.000	38.2	8.8	-6.1	40.8	Peak.	V	150	360	74.0	-33.2	Pass	
7	9704.000	37.6	10.4	-3.9	44.2	Peak.	H	150	360	74.0	-29.8	Pass	
8	6725.625	41.8	8.4	-5.7	44.5	Peak.	H	150	360	74.0	-29.5	Pass	
9	7106.687	39.3	8.7	-6.0	42.0	Peak.	V	150	360	74.0	-32.0	Pass	
10	4960.000	40.7	7.0	-8.8	38.9	Peak.	V	150	0	74.0	-35.1	Pass	
11	7440.000	39.1	8.9	-6.2	41.8	Peak.	H	150	0	74.0	-32.2	Pass	
12	9920.000	35.5	10.7	-3.5	42.6	Peak.	H	150	0	74.0	-31.4	Pass	
13	9893.086	38.1	10.6	-3.7	45.0	Peak.	H	150	0	74.0	-29.0	Pass	

This document is uncontrolled. Please refer to the electronic copy within Doc Central for the most up to date version.
Cisco Systems, Inc. Company Confidential

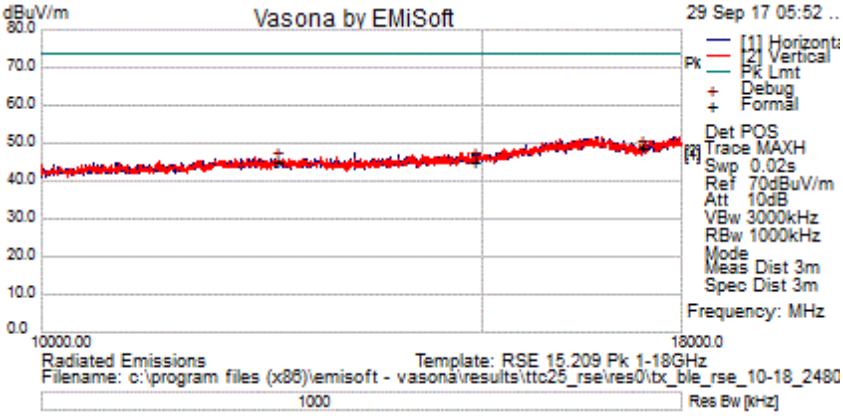
2402MHz BTLE, Peak 10GHz to 18GHz



2426MHz BTLE, Peak 10GHz to 18GHz



2480MHz BTLE, Peak 10GHz to 18GHz



This document is uncontrolled. Please refer to the electronic copy within Doc Central for the most up to date version.
Cisco Systems, Inc. Company Confidential

Worst Case Test Results Table Peak (10GHz to 18GHz)

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	12010.000	47.1	12.1	-14.5	44.6	Peak.	H	150	0	74.0	-29.4	Pass	
2	14412.000	45.6	14.0	-14.0	45.7	Peak.	H	150	0	74.0	-28.4	Pass	
3	16814.000	44.7	15.4	-10.7	49.4	Peak.	V	150	0	74.0	-24.6	Pass	
4	14324.878	48.4	13.7	-14.2	47.9	Peak.	H	150	0	74.0	-26.1	Pass	
5	12130.000	46.2	12.2	-14.5	43.8	Peak.	V	150	0	74.0	-30.2	Pass	
6	14556.000	44.7	14.0	-14.2	44.5	Peak.	V	150	0	74.0	-29.5	Pass	
7	16982.000	45.6	15.4	-11.4	49.6	Peak.	H	150	0	74.0	-24.4	Pass	
8	12400.000	47.3	12.4	-14.4	45.3	Peak.	H	150	0	74.0	-28.7	Pass	
9	14880.000	45.1	14.0	-13.7	45.4	Peak.	H	150	0	74.0	-28.6	Pass	
10	17360.000	44.4	15.5	-11.1	48.8	Peak.	H	150	0	74.0	-25.2	Pass	

This document is uncontrolled. Please refer to the electronic copy within Doc Central for the most up to date version.
Cisco Systems, Inc. Company Confidential

Transmitter Radiated Spurious Emissions 18GHz to 26.5GHz

LP0002:2016 (2.8) Additional regulations shall apply except for this standard, the emissions from the low-power radio-frequency devices shall be less than or equal the field strength levels specified in the following table and the level of any unwanted emissions shall not exceed the level of the fundamental emission. The tighter limit applies at the band edges.

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.

	Peak	Average
Span:	18GHz – 26.5 GHz	18GHz – 26.5 GHz
Reference Level:	80 dBuV	80 dBuV
Attenuation:	5 dB	0 dB
Sweep Time:	Auto	Auto
Resolution Bandwidth:	1MHz	1MHz
Video Bandwidth:	3 MHz	3 MHz
Detector:	Peak	RMS (Average)

Antenna ports terminated in 50 Ohms.
Maximize Turntable (find worst case table angle), Maximize Antenna (find worst case height)

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

The results in this test report are representative for all supported operating modes and antennas.

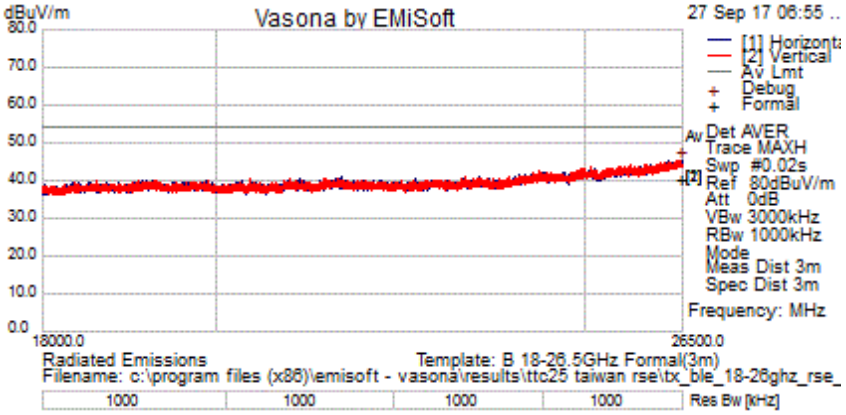
System Number	Description	Samples	System under test	Support equipment
1	EUT	S01, S02	✓	

Tested By : Allan Beecroft	**Date of testing: 26/27-SEP-2017**
Test Result : PASS	

See Appendix B for list of test equipment

This document is uncontrolled. Please refer to the electronic copy within Doc Central for the most up to date version.
Cisco Systems, Inc. Company Confidential

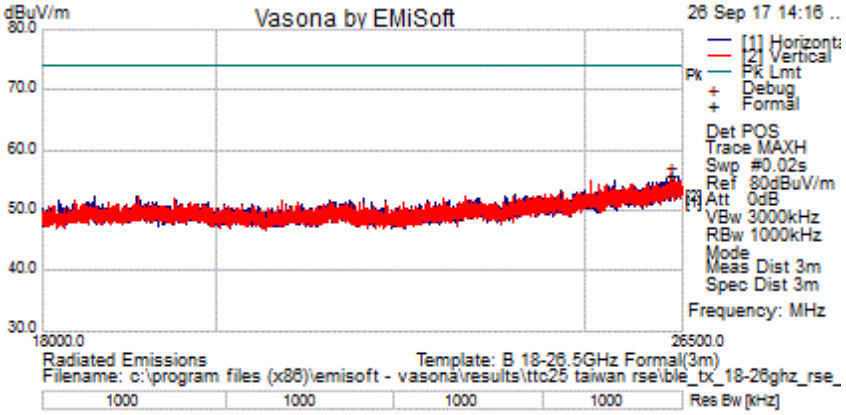
Graphs: Average Radiated Transmitter Spurious Emissions



Worst Case Test Results Table 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	26469.187	21.7	.0	18.9	40.6	Average	V	150	0	54.0	-13.4	Pass	

Graphs: Peak Radiated Transmitter Spurious Emissions



Worst Case Test Results Table 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	26319.374	37.6	.0	18.3	55.9	Peak [Scan]	V	150	0	74.0	-18.1	Pass	

This document is uncontrolled. Please refer to the electronic copy within Doc Central for the most up to date version.
Cisco Systems, Inc. Company Confidential

Receiver Radiated Spurious Emissions

Receiver Radiated Emissions 30MHz to 1GHz

LP0002:2016 (2.8) Additional regulations shall apply except for this standard, the emissions from the low-power radio-frequency devices shall be less than or equal the field strength levels specified in the following table and the level of any unwanted emissions shall not exceed the level of the fundamental emission. The tighter limit applies at the band edges.

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

Antenna ports terminated in 50 Ohms.
Maximize Turntable (find worst case table angle), Maximize Antenna (find worst case height)

The results in this test report are representative for all supported operating modes and antennas.

System Number	Description	Samples	System under test	Support equipment
1	EUT	S01, S02	✓	

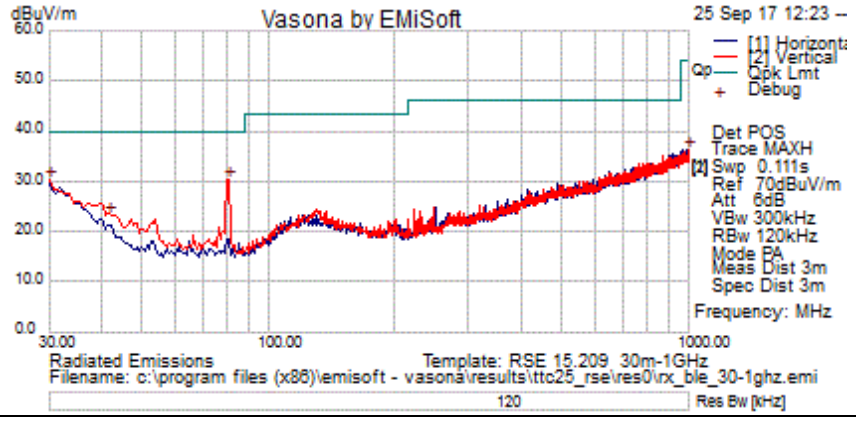
Tested By : Allan Beecroft	**Date of testing: 25-SEP-2017**
Test Result : PASS	

See Appendix B for list of test equipment

This document is uncontrolled. Please refer to the electronic copy within Doc Central for the most up to date version.
Cisco Systems, Inc. Company Confidential

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



RSE 30MHz to 1GHz Graph. BTLE

Worst Case Test Results Table

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	80.000	17.4	.8	7.7	25.9	Quasi Max	V	139	110	40.0	-14.1	Pass	
2	30.000	12.0	.5	21.3	33.8	Quasi Max	V	217	18	40.0	-6.2	Pass	
3	42.125	8.4	.6	12.3	21.3	Quasi Max	V	129	252	40.0	-18.7	Pass	
4	995.150	9.0	2.9	23.5	35.5	Quasi Max	V	215	174	54.0	-18.5	Pass	
5	42.087	8.1	.6	12.3	21.0	Quasi Max	V	179	346	40.0	-19.0	Pass	
6	133.107	6.7	1.0	13.6	21.4	Quasi Max	V	183	136	43.5	-22.1	Pass	

The emission at 80MHz was an ambient, and not emitting from the EUT.

This document is uncontrolled. Please refer to the electronic copy within Doc Central for the most up to date version.
Cisco Systems, Inc. Company Confidential

Receiver Radiated Spurious Emissions 1GHz to 18GHz

LP0002:2016 (2.8) Additional regulations shall apply except for this standard, the emissions from the low-power radio-frequency devices shall be less than or equal the field strength levels specified in the following table and the level of any unwanted emissions shall not exceed the level of the fundamental emission. The tighter limit applies at the band edges.

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.

	Peak	Average
Span:	1GHz – 18 GHz	1GHz – 18 GHz
Reference Level:	80 dBuV	80 dBuV
Attenuation:	10 dB	10 dB
Sweep Time:	Auto	Auto
Resolution Bandwidth:	1MHz	1MHz
Video Bandwidth:	3 MHz	3 MHz
Detector:	Peak	RMS (Average)

Antenna ports terminated in 50 Ohms.
Maximize Turntable (find worst case table angle), Maximize Antenna (find worst case height)

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

The results in this test report are representative for all supported operating modes and antennas.

System Number	Description	Samples	System under test	Support equipment
1	EUT	S01, S02	✓	

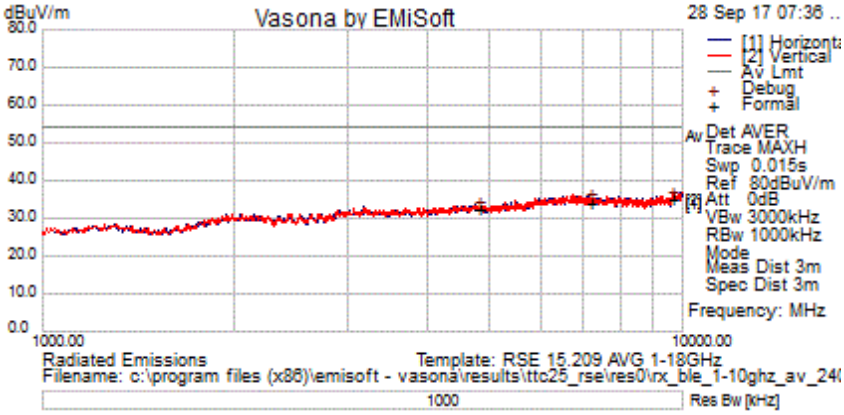
Tested By : Allan Beecroft	**Date of testing: 28/29-SEP-2017 / 09-OCT-2017**
Test Result : PASS	

See Appendix B for list of test equipment

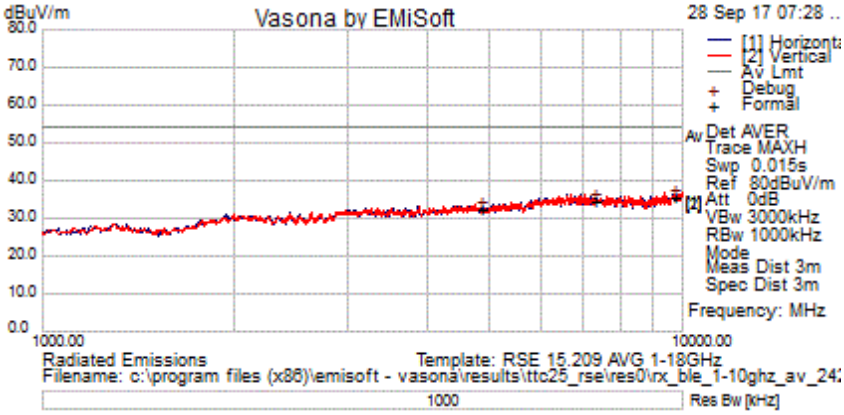
This document is uncontrolled. Please refer to the electronic copy within Doc Central for the most up to date version.
Cisco Systems, Inc. Company Confidential

Graphs: Average Radiated Receiver Spurious Emissions (1GHz to 10GHz)

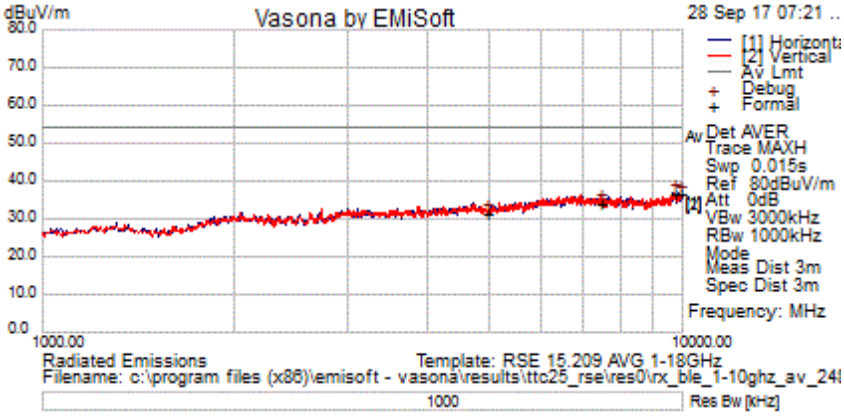
2402MHz Average Radiated Receiver Spurious Emissions



2426MHz Average Radiated Receiver Spurious Emissions



2480MHz Average Radiated Receiver Spurious Emissions



This document is uncontrolled. Please refer to the electronic copy within Doc Central for the most up to date version.
Cisco Systems, Inc. Company Confidential

Worst Case Test Results Table Average (1GHz to 10GHz)

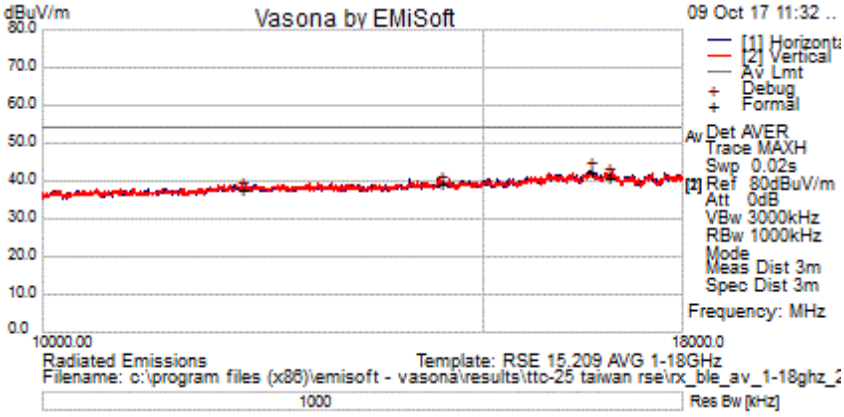
Formal Data

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	10000.000	29.9	10.7	-3.5	37.1	Average.	V	150	0	54.0	-16.9	Pass	
2	4804.000	34.2	6.9	-8.8	32.3	Average.	V	150	360	54.0	-21.8	Pass	
3	9608.000	29.4	10.4	-4.8	35.0	Average.	H	150	360	54.0	-19.0	Pass	
4	7206.000	31.6	8.7	-6.1	34.2	Average.	H	150	360	54.0	-19.8	Pass	
5	10000.000	29.8	10.7	-3.5	37.0	Average.	H	150	0	54.0	-17.0	Pass	
6	4852.000	34.4	6.9	-8.8	32.5	Average.	V	150	360	54.0	-21.5	Pass	
7	7278.051	31.8	8.8	-6.1	34.4	Average.	V	150	360	54.0	-19.6	Pass	
8	9704.000	28.9	10.4	-3.9	35.5	Average.	H	150	360	54.0	-18.5	Pass	
9	9741.250	30.2	10.5	-3.7	36.9	Average.	V	150	0	54.0	-17.1	Pass	
10	4960.000	33.3	7.0	-8.8	31.5	Average.	V	150	360	54.0	-22.5	Pass	
11	9920.000	29.4	10.7	-3.5	36.5	Average.	H	150	360	54.0	-17.5	Pass	
12	7440.000	31.5	8.9	-6.2	34.2	Average.	V	150	360	54.0	-19.8	Pass	

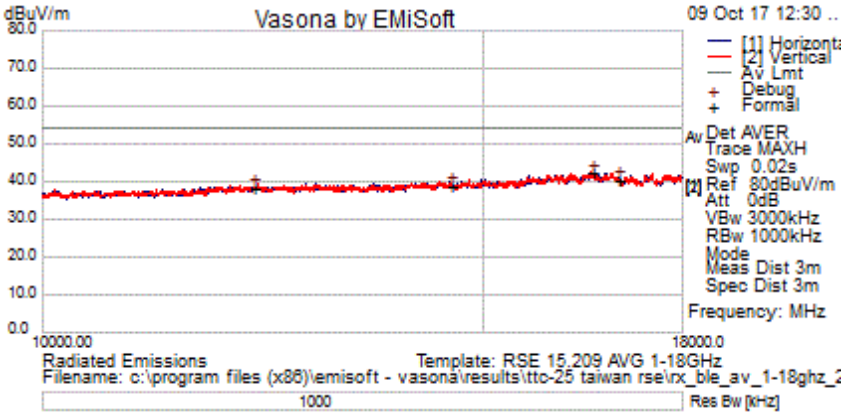
This document is uncontrolled. Please refer to the electronic copy within Doc Central for the most up to date version.
Cisco Systems, Inc. Company Confidential

Graphs: Average Radiated Receiver Spurious Emissions (10GHz to 18GHz)

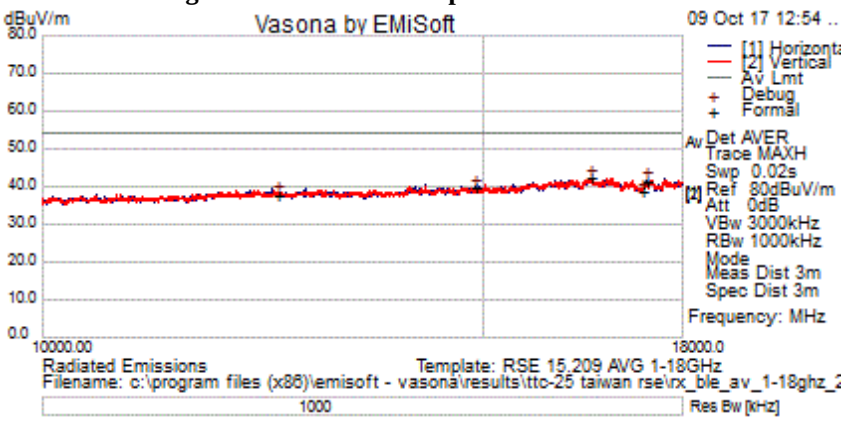
2402MHz Average Radiated Receiver Spurious Emissions



2426MHz Average Radiated Receiver Spurious Emissions



2480MHz Average Radiated Receiver Spurious Emissions



This document is uncontrolled. Please refer to the electronic copy within Doc Central for the most up to date version.
Cisco Systems, Inc. Company Confidential

Worst Case Test Results Table Average (10GHz to 18GHz)

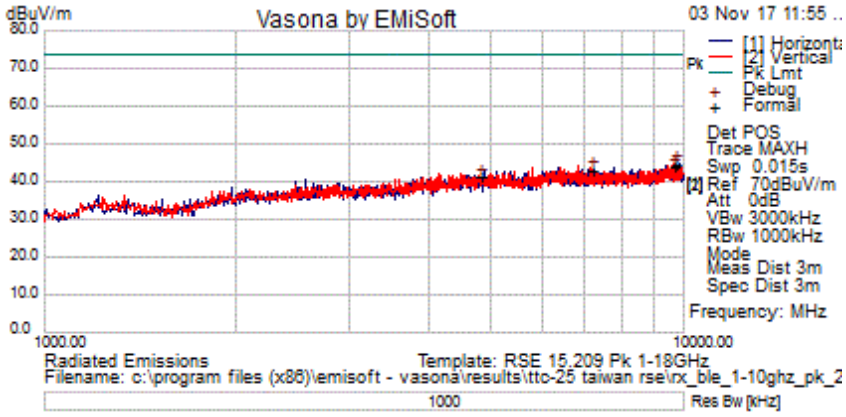
Formal Data

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	16545.000	39.6	13.8	-10.8	42.6	Average.	H	150	0	54.0	-11.4	Pass	
2	12010.000	40.8	11.4	-14.5	37.7	Average.	V	150	0	54.0	-16.3	Pass	
3	14412.000	40.4	12.8	-14.0	39.2	Average.	V	150	0	54.0	-14.8	Pass	
4	16814.000	37.9	13.9	-10.7	41.2	Average.	H	150	0	54.0	-12.8	Pass	
5	16560.000	39.4	13.8	-10.7	42.5	Average.	V	150	0	54.0	-11.5	Pass	
6	12130.000	41.4	11.5	-14.5	38.3	Average.	H	150	0	54.0	-15.7	Pass	
7	14556.000	40.3	12.9	-14.2	39.0	Average.	H	150	0	54.0	-15.0	Pass	
8	16982.000	38.0	14.0	-11.4	40.7	Average.	H	150	0	54.0	-13.3	Pass	
9	16530.000	39.3	13.8	-10.8	42.3	Average.	V	150	0	54.0	-11.7	Pass	
10	12400.000	40.6	11.7	-14.4	37.9	Average.	V	150	0	54.0	-16.1	Pass	
11	14880.000	40.4	12.9	-13.7	39.7	Average.	H	150	0	54.0	-14.4	Pass	
12	17360.000	35.8	14.1	-11.1	38.8	Average.	V	150	0	54.0	-15.2	Pass	
13	17415.094	37.8	14.3	-10.5	41.6	Average.	H	150	0	54.0	-12.4	Pass	

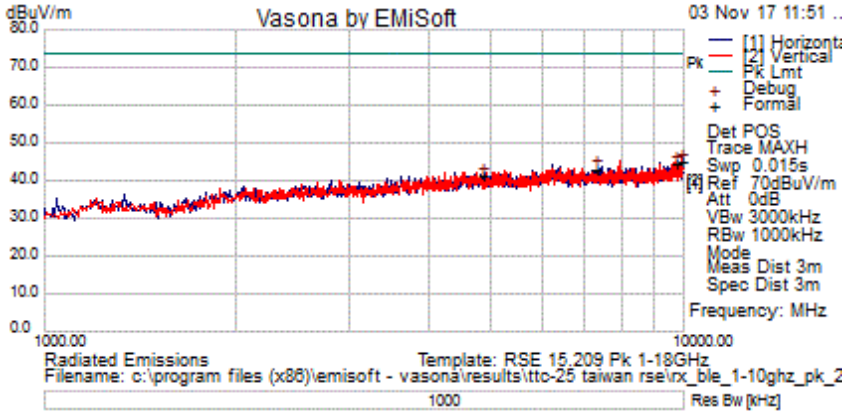
This document is uncontrolled. Please refer to the electronic copy within Doc Central for the most up to date version.
Cisco Systems, Inc. Company Confidential

Graphs: Peak Radiated Receiver Spurious Emissions (1GHz to 10GHz)

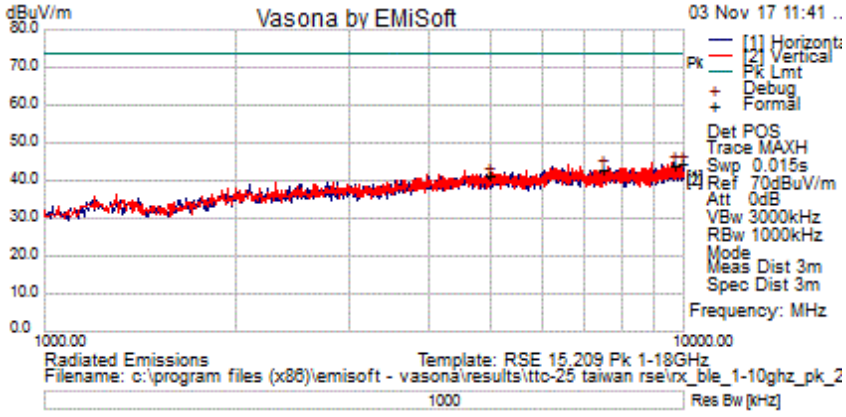
2402MHz Peak Radiated Receiver Spurious Emissions



2426MHz Peak Radiated Receiver Spurious Emissions



2480MHz Peak Radiated Receiver Spurious Emissions



This document is uncontrolled. Please refer to the electronic copy within Doc Central for the most up to date version.
Cisco Systems, Inc. Company Confidential

Worst Case Test Results Table Peak (1GHz to 10GHz)

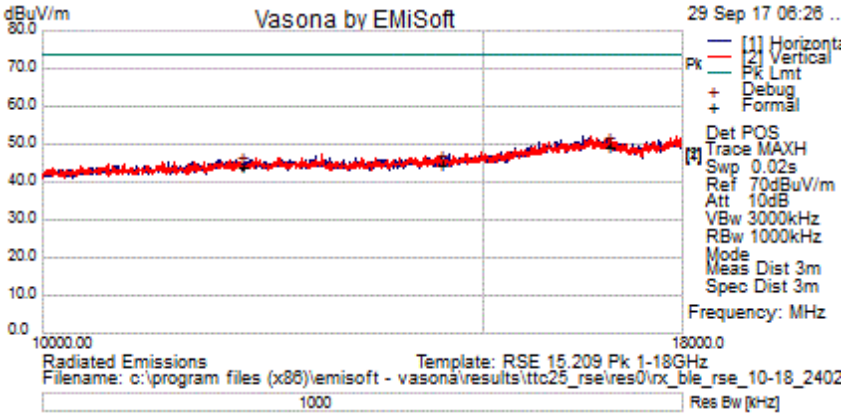
Formal Data

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	42.8	6.1	-7.5	41.4	Peak	V	150	0	74.0	-32.6	Pass	
2	7206.000	40.8	7.9	-5.5	43.3	Peak	V	150	0	74.0	-30.7	Pass	
3	9608.000	37.6	9.4	-3.1	44.0	Peak	V	150	0	74.0	-30.0	Pass	
4	9685.080	38.6	9.4	-3.3	44.7	Peak.	V	150	0	74.0	-29.4	Pass	
5	4852.000	42.5	6.2	-7.4	41.3	Peak	V	150	0	74.0	-32.7	Pass	
6	7278.000	40.5	8.0	-5.4	43.1	Peak	V	150	0	74.0	-30.9	Pass	
7	9704.000	38.4	9.4	-3.3	44.5	Peak	V	150	0	74.0	-29.5	Pass	
8	9921.650	38.2	9.6	-2.7	45.1	Peak	V	150	0	74.0	-28.9	Pass	
9	4960.000	42.4	6.3	-7.5	41.2	Peak	V	150	0	74.0	-32.8	Pass	
10	7440.000	40.5	8.1	-5.4	43.2	Peak	V	150	0	74.0	-30.8	Pass	
11	9920.000	37.6	9.6	-2.7	44.5	Peak	V	150	0	74.0	-29.5	Pass	
12	9634.421	37.9	9.4	-3.1	44.2	Peak	H	150	0	74.0	-29.8	Pass	

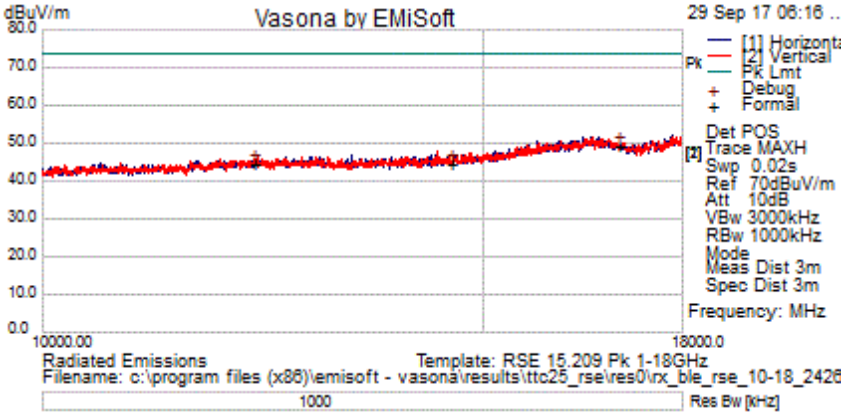
This document is uncontrolled. Please refer to the electronic copy within Doc Central for the most up to date version.
Cisco Systems, Inc. Company Confidential

Graphs: Peak Radiated Receiver Spurious Emissions (10GHz to 18GHz)

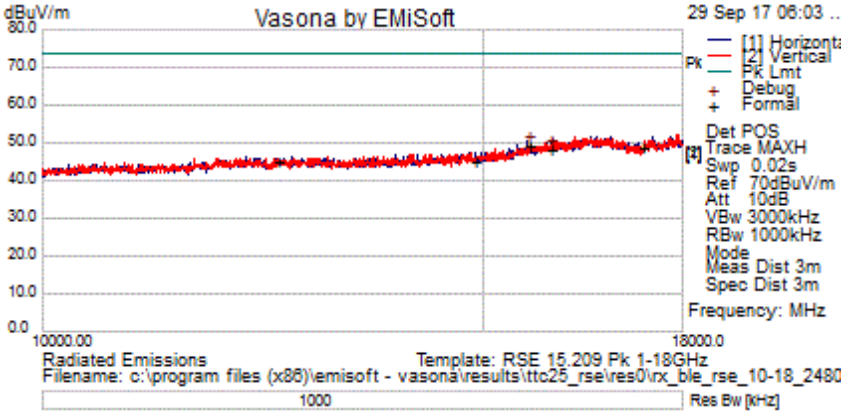
2402MHz Peak Radiated Receiver Spurious Emissions



2426MHz Peak Radiated Receiver Spurious Emissions



2480MHz Peak Radiated Receiver Spurious Emissions



This document is uncontrolled. Please refer to the electronic copy within Doc Central for the most up to date version.
Cisco Systems, Inc. Company Confidential

Worst Case Test Results Table Peak (10GHz to 18GHz)

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	12010.000	46.8	12.1	-14.5	44.4	Peak.	H	150	0	74.0	-29.6	Pass	
2	14412.000	44.7	14.0	-14.0	44.7	Peak.	V	150	0	74.0	-29.3	Pass	
3	16814.000	44.9	15.4	-10.7	49.6	Peak.	V	150	0	74.0	-24.4	Pass	
4	12130.000	47.0	12.2	-14.5	44.7	Peak.	H	150	0	74.0	-29.3	Pass	
5	14556.000	45.1	14.0	-14.2	44.9	Peak.	V	150	0	74.0	-29.1	Pass	
6	16982.000	45.4	15.4	-11.4	49.4	Peak.	H	150	0	74.0	-24.6	Pass	
7	15621.204	47.5	14.6	-12.5	49.6	Peak.	H	150	0	74.0	-24.4	Pass	
8	15960.594	45.7	14.9	-12.1	48.5	Peak.	H	150	0	74.0	-25.5	Pass	
9	12400.000	47.3	12.4	-14.4	45.3	Peak.	H	150	0	74.0	-28.7	Pass	
10	14880.000	45.1	14.0	-13.7	45.4	Peak.	H	150	0	74.0	-28.6	Pass	
11	17360.000	44.4	15.5	-11.1	48.8	Peak.	H	150	0	74.0	-25.2	Pass	

This document is uncontrolled. Please refer to the electronic copy within Doc Central for the most up to date version.
Cisco Systems, Inc. Company Confidential

Receiver Radiated Spurious Emissions 18GHz to 26.5GHz

LP0002:2016 (2.8) Additional regulations shall apply except for this standard, the emissions from the low-power radio-frequency devices shall be less than or equal the field strength levels specified in the following table and the level of any unwanted emissions shall not exceed the level of the fundamental emission. The tighter limit applies at the band edges.

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.

	Peak	Average
Span:	18GHz – 26.5 GHz	18GHz – 26.5 GHz
Reference Level:	80 dBuV	80 dBuV
Attenuation:	0 dB	0 dB
Sweep Time:	Auto	Auto
Resolution Bandwidth:	1MHz	1MHz
Video Bandwidth:	3 MHz	3 MHz
Detector:	Peak	RMS (Average)

Antenna ports terminated in 50 Ohms.
Maximize Turntable (find worst case table angle), Maximize Antenna (find worst case height)

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

The results in this test report are representative for all supported operating modes and antennas.

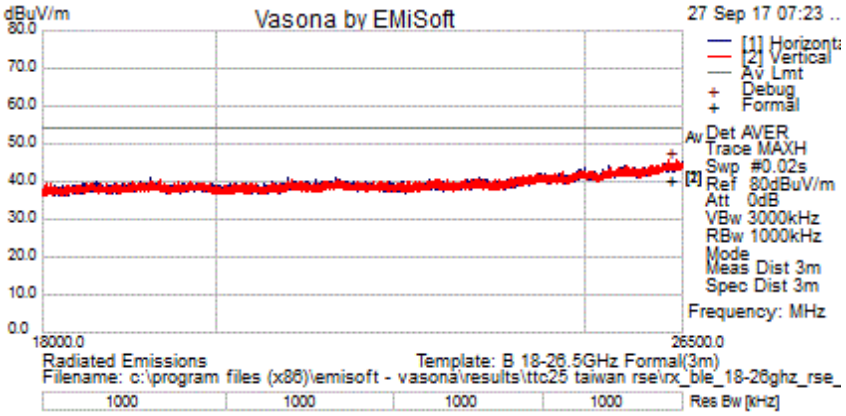
System Number	Description	Samples	System under test	Support equipment
1	EUT	S01, S02	✓	

Tested By : Allan Beecroft	**Date of testing: 26/27-SEP-2017**
Test Result : PASS	

See Appendix B for list of test equipment

This document is uncontrolled. Please refer to the electronic copy within Doc Central for the most up to date version.
Cisco Systems, Inc. Company Confidential

Graphs: Average Radiated Transmitter Spurious Emissions

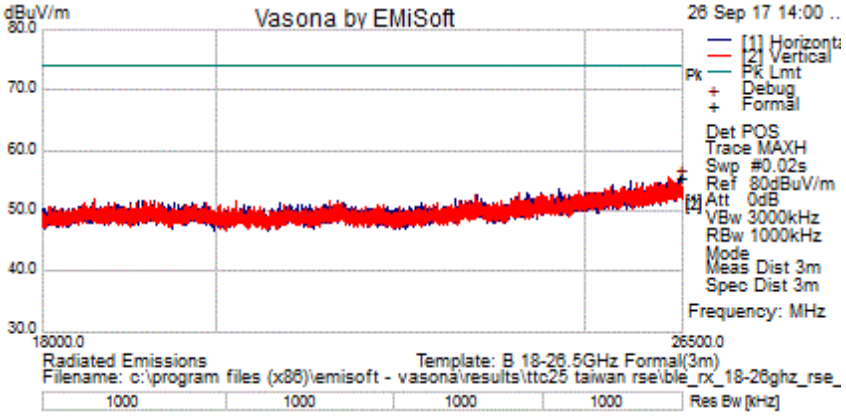


Worst Case Test Results Table Average

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	26295.999	21.9	.0	18.3	40.2	Average	V	150	0	54.0	-13.8	Pass	

Graphs: Peak Radiated Transmitter Spurious Emissions



Worst Case Test Results Table 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	26468.124	.0	.0	18.9	55.6	Peak [Scan]	H	150	0	74.0	-18.4	Pass	

This document is uncontrolled. Please refer to the electronic copy within Doc Central for the most up to date version.
Cisco Systems, Inc. Company Confidential

AC Conducted Emissions

LP0002
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.

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.

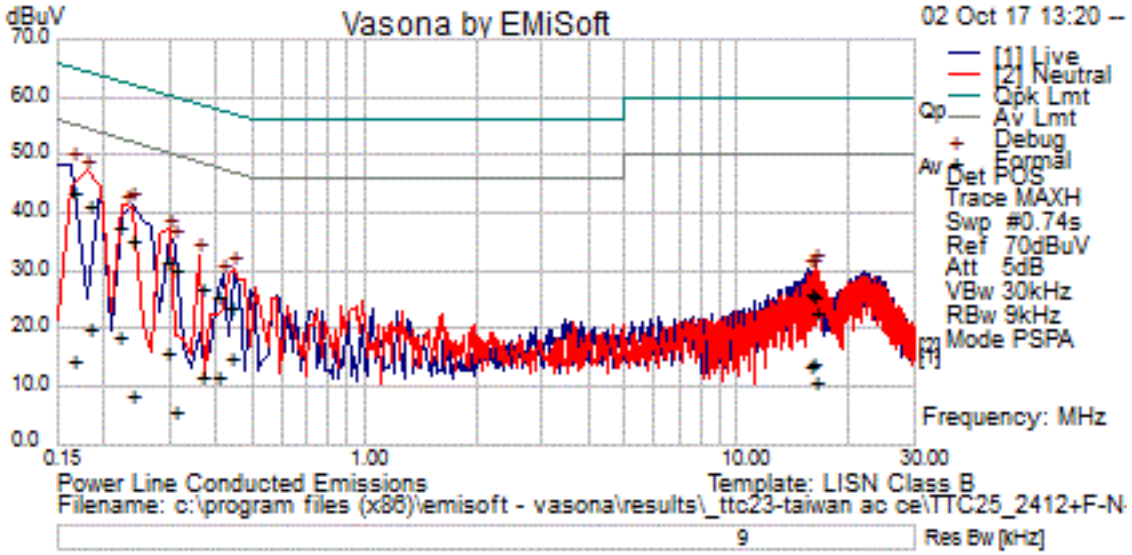
Span: 150 KHz – 30 MHz
Attenuation: 0 dB
Sweep Time: Coupled
Resolution Bandwidth: 9 KHz
Video Bandwidth: 30 KHz
Detector: Quasi-Peak / Average

System Number	Description	Samples	System under test	Support equipment
1	EUT	S01, S02	✓	

Tested By : Chris Blair	Date of testing: 2 October 2017
Test Result : PASS	

68-71F
1007-1011mbar
37-42%
210VAC,60Hz

This document is uncontrolled. Please refer to the electronic copy within Doc Central for the most up to date version.
Cisco Systems, Inc. Company Confidential



Formal Data

No	Frequency MHz	Raw dBuV	Cable Loss	Factors dB	Level dBuV	Measurement Type	Line	Limit dBuV	Margin dB	Pass /Fail	Comments
1	.183	20.6	20.9	.2	41.6	Quasi Peak	Neutral	64.4	-22.8	Pass	fhss/hump
2	.219	16.9	20.7	.1	37.7	Quasi Peak	Neutral	62.9	-25.1	Pass	fhss/hump
3	.293	11.4	20.4	.1	31.8	Quasi Peak	Neutral	60.4	-28.6	Pass	fhss/hump
4	.366	6.8	20.2	.0	27.0	Quasi Peak	Neutral	58.6	-31.6	Pass	fhss/hump
5	.439	4.0	20.0	.0	23.9	Quasi Peak	Neutral	57.1	-33.1	Pass	fhss/hump
6	16.303	2.6	20.3	.2	23.0	Quasi Peak	Neutral	60.0	-37.0	Pass	hand/series
7	.183	-.9	20.9	.2	20.1	Average	Neutral	54.4	-34.2	Pass	
8	.219	-2.3	20.7	.1	18.5	Average	Neutral	52.9	-34.3	Pass	
9	.293	-4.4	20.4	.1	16.0	Average	Neutral	50.4	-34.4	Pass	
10	.366	-8.5	20.2	.0	11.7	Average	Neutral	48.6	-36.9	Pass	
11	.439	-5.2	20.0	.0	14.8	Average	Neutral	47.1	-32.3	Pass	
12	16.303	-9.4	20.3	.2	11.1	Average	Neutral	50.0	-38.9	Pass	
13	.165	22.4	21.0	.2	43.6	Quasi Peak	Live	65.2	-21.6	Pass	fhss
14	.240	14.7	20.6	.1	35.4	Quasi Peak	Live	62.1	-26.7	Pass	fhss
15	.309	10.0	20.3	.1	30.4	Quasi Peak	Live	60.0	-29.6	Pass	fhss
16	.403	5.4	20.0	.0	25.5	Quasi Peak	Live	57.8	-32.3	Pass	fhss/hump
17	15.645	5.5	20.3	.2	26.0	Quasi Peak	Live	60.0	-34.0	Pass	hand/series
18	15.973	5.4	20.3	.2	25.9	Quasi Peak	Live	60.0	-34.1	Pass	hand/series
19	.165	-6.8	21.0	.2	14.4	Average	Live	55.2	-40.8	Pass	
20	.240	-12.1	20.6	.1	8.6	Average	Live	52.1	-43.5	Pass	
21	.309	-14.8	20.3	.1	5.6	Average	Live	50.0	-44.4	Pass	
22	.403	-8.4	20.0	.0	11.7	Average	Live	47.8	-36.1	Pass	
23	15.645	-6.7	20.3	.2	13.8	Average	Live	50.0	-36.2	Pass	
24	15.973	-6.6	20.3	.2	13.9	Average	Live	50.0	-36.1	Pass	

This document is uncontrolled. Please refer to the electronic copy within Doc Central for the most up to date version.
Cisco Systems, Inc. Company Confidential

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

Equip#	Manufacturer/ Model	Description	Last Cal	Next Due	
Test Equipment used for Radiated Emissions 30MHz to 1GHz					
30654	SUNOL SCIENCES/JB1	Combination Antenna, 30MHz-2GHz	19-JAN-2017	19-JAN-2018	
49563	HUBER + SUHNER/ Sucoflex 106A	Coaxial Cable, 8m	21-AUG-2017	21-AUG-2018	
21117	MICRO-COAX/ UFB311A-0-2484-520520	Coaxial Cable-18Ghz	16-AUG-2017	16-AUG-2018	
25662	MICRO-COAX/ UFB311A-1-0840-504504	Coaxial Cable, 84.0 in. to 18GHz	21-FEB-2017	21-FEB-2018	
47300	Keysight (Agilent/HP)/ N9038A	EMI Receiver	28-MAR-2017	28-MAR-2018	
54230	NEWPORT/ iBTHP-5-DB9	5 inch Temp/RH/Press Sensor w/20ft cable	11-FEB-2017	11-FEB-2018	
8448	CISCO/ NSA 5m Chamber	NSA 5m Chamber	10-JUN-2017	10-JUN-2018	
54647	STANLEY/ 33-605	Tape Measure, 10m	Cal Not Required	Cal Not Required	
27233	YORK/CNE V	COMPARISON NOISE EMITTER	Cal Not Required	Cal Not Required	
Test Equipment used for Radiated Emissions 1GHz to 18GHz					
32544	ETS Lindgren/3117	Double Ridged Horn Antenna	11-OCT-2016	11-OCT-2017	
45723	CISCO/TH0118	Mast mount preamplifier array, 1-18GHz	27-FEB-2017	27-FEB-2018	
42013	ETS Lindgren/3117	Double Ridged Horn Antenna	05/04/2017	05/04/2018	
45096	CISCO/TH0118	Mast mount preamplifier array, 1-18GHz	10/31/2017	10/31/2018	
47300	Keysight (Agilent/HP)/ N9038A	EMI Receiver	28-MAR-2017	28-MAR-2018	
47410	Keysight (Agilent/HP)/ N9038A	EMI Receiver	03/31/2017	03/31/2018	
25658	Micro-Coax/UFB311A-1-0840-504504	RF Coaxial Cable, to 18GHz, 84 in	02/16/2017	02/16/2018	
20975	Micro-Coax/UFB311A-0-1344-520520	RF Coaxial Cable, to 18GHz, 134.4 in	02/17/2017	02/17/2018	
55936	Huber + Suhner/Sucoflex 106PA	N-type 8m 18GHz Antenna cable	10/19/2017	10/19/2018	
49549	JFW/50CB-015	GPIB controller	Cal Not Required	Cal Not Required	
47246	CISCO/TH0118-PS	Power supply for TH0118 1-18GHz Preamplifier	Cal Not Required	Cal Not Required	
40597	CISCO/Above 1GHz Site Cal	Above 1GHz Cispr Site Verification	25-SEP-2016	25-SEP-2017	
40597	CISCO/Above 1GHz Site Cal	Above 1GHz Cispr Site Verification	26-SEP-2017	26-SEP-2018	
43124	CISCO/Above 1GHz Site Cal	Above 1GHz Cispr Site Verification	14-JAN-2017	14-JAN-2018	
34075	SCHAFFNER/ RSG 2000	Reference Spectrum Generator, 1-18GHz	Cal Not Required	Cal Not Required	
4883	EMCO/3115	HORN ANTENNA	Cal Not Required	Cal Not Required	
49563	HUBER + SUHNER/ Sucoflex 106A	Coaxial Cable, 8m	21-AUG-2017	21-AUG-2018	
21117	MICRO-COAX/ UFB311A-0-2484-520520	Coaxial Cable-18Ghz	16-AUG-2017	16-AUG-2018	
25662	MICRO-COAX/ UFB311A-1-0840-504504	Coaxial Cable, 84.0 in. to 18GHz	21-FEB-2017	21-FEB-2018	
54230	NEWPORT/ iBTHP-5-DB9	5 inch Temp/RH/Press Sensor w/20ft cable	11-FEB-2017	11-FEB-2018	

This document is uncontrolled. Please refer to the electronic copy within Doc Central for the most up to date version.
Cisco Systems, Inc. Company Confidential

54647	STANLEY/ 33-605	Tape Measure, 10m	Cal Not Required	Cal Not Required	
Test Equipment used for Radiated Emissions 18GHz to 26GHz					
41979	CISCO/1840	18-40GHz EMI Test Head/Verification Fixture	30-AUG-2017	30-AUG-2018	
44940	Rohde & Schwarz/ESU40	EMI Receiver, 40GHz	14-NOV-2016	14-NOV-2017	
37236	JFW/50CB-015	Control Box, GPIB	Cal Not Required	Cal Not Required	
54230	NEWPORT/ iBTHP-5-DB9	5 inch Temp/RH/Press Sensor w/20ft cable	11-FEB-2017	11-FEB-2018	
Test Equipment Used For AC Conducted Emissions					
5466	Keithley 580	MICRO OHMMETER	31 Oct 2016	31 Oct 2017	
33041	Fluke 175	True RMS Multimeter	01 Jun 2017	01 Jun 2018	
41933	Newport iBTHP-5-DB9	5 inch Temp/RH/Press Sensor w/20ft cable	22 Dec 2016	22 Dec 2017	
49531	TTE H785-150K-50-21378	HIGH PASS FILTER 150kHz	03 May 2017	03 May 2018	
8496	FCC-450B-2.4-N	Pulse Limiter	16 May 2017	16 May 2018	
49468	Coleman RG223	BNC cable	10 Mar 2017	10 Mar 2018	
45990	FCC F-090527-1009-1	LISN	15 Jun 2017	15 Jun 2018	
45991	FCC F-090527-1009-2	LISN adapter	15 Jun 2017	15 Jun 2018	
45050	R&S ESCI	EMI receiver	09 Nov 2016	09 Nov 2017	
46715	Bird 5-T-MB	Termination	16 Mar 2017	16 Mar 2018	
46714	Bird 5-T-MB	Termination	28 Nov 2016	28 Nov 2017	
18963	York CNE V	COMPARISON NOISE EMITTER	NA	NA	
04003	FCC FCC-801-M2-32A	DECOUPLING NETWORK	16 Mar 2017	16 Mar 2018	
8357	Coleman RG223	BNC cable	12 Apr 2017	12 Apr 2018	
54647	Stanley 33-605	10m tape measure	NA	NA	

This document is uncontrolled. Please refer to the electronic copy within Doc Central for the most up to date version.
Cisco Systems, Inc. Company Confidential

Appendix C: Abbreviation Key and Definitions

The following table defines abbreviations used within this test report.

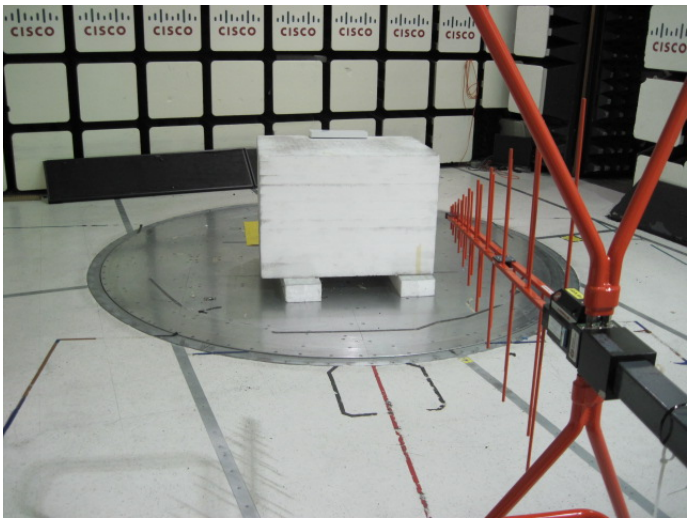
Abbreviation	Description	Abbreviation	Description
EMC	Electro Magnetic Compatibility	°F	Degrees Fahrenheit
EMI	Electro Magnetic Interference	°C	Degrees Celsius
EUT	Equipment Under Test	Temp	Temperature
ITE	Information Technology Equipment	S/N	Serial Number
TAP	Test Assessment Schedule	Qty	Quantity
ESD	Electro Static Discharge	emf	Electromotive force
EFT	Electric Fast Transient	RMS	Root mean square
EDCS	Engineering Document Control System	Qp	Quasi Peak
Config	Configuration	Av	Average
CIS#	Cisco Number (unique identification number for Cisco test equipment)	Pk	Peak
Cal	Calibration	kHz	Kilohertz ($1x10^3$)
EN	European Norm	MHz	MegaHertz ($1x10^6$)
IEC	International Electro technical Commission	GHz	Gigahertz ($1x10^9$)
CISPR	International Special Committee on Radio Interference	H	Horizontal
CDN	Coupling/Decoupling Network	V	Vertical
LISN	Line Impedance Stabilization Network	dB	decibel
PE	Protective Earth	V	Volt
GND	Ground	kV	Kilovolt ($1x10^3$)
L1	Line 1	µV	Microvolt ($1x10^{-6}$)
L2	Line2	A	Amp
L3	Line 3	µA	Micro Amp ($1x10^{-6}$)
DC	Direct Current	mS	Milli Second ($1x10^{-3}$)
RAW	Uncorrected measurement value, as indicated by the measuring device	µS	Micro Second ($1x10^{-6}$)
RF	Radio Frequency	µS	Micro Second ($1x10^{-6}$)
SLCE	Signal Line Conducted Emissions	m	Meter
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

This document is uncontrolled. Please refer to the electronic copy within Doc Central for the most up to date version.
Cisco Systems, Inc. Company Confidential

Appendix D: Photographs of EUT and Test Setups

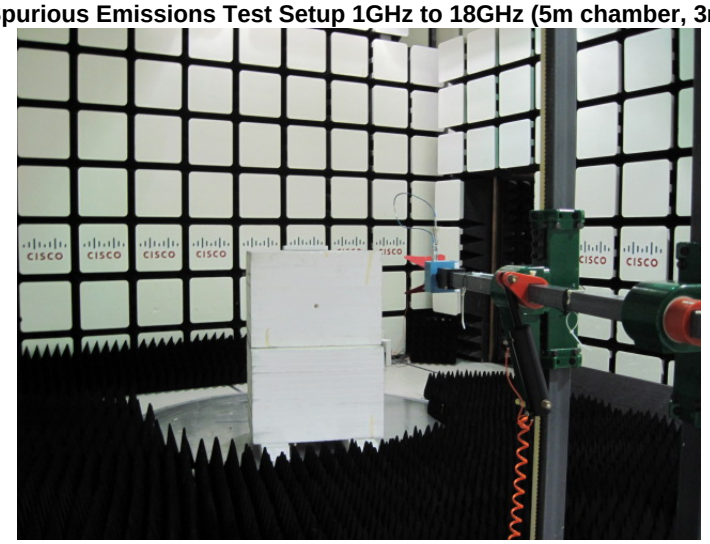
This document is uncontrolled. Please refer to the electronic copy within Doc Central for the most up to date version.
Cisco Systems, Inc. Company Confidential

Radiated Spurious Emissions Test Setup 30MHz to 1GHz

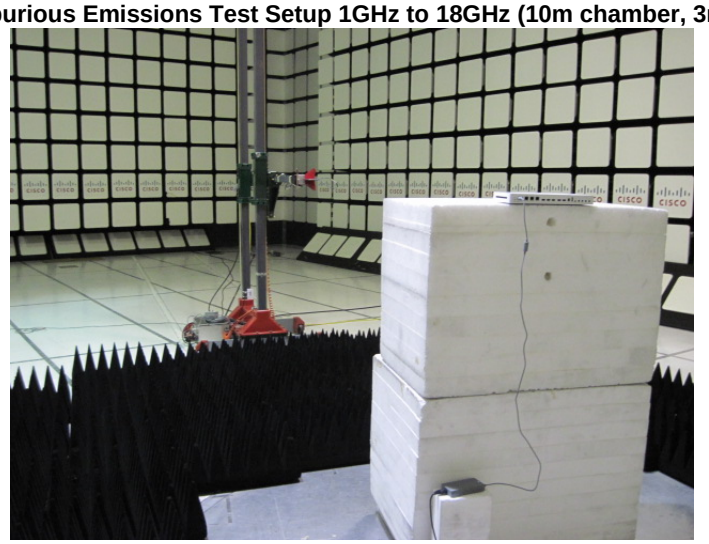


This document is uncontrolled. Please refer to the electronic copy within Doc Central for the most up to date version.
Cisco Systems, Inc. Company Confidential

Radiated Spurious Emissions Test Setup 1GHz to 18GHz (5m chamber, 3m distance)

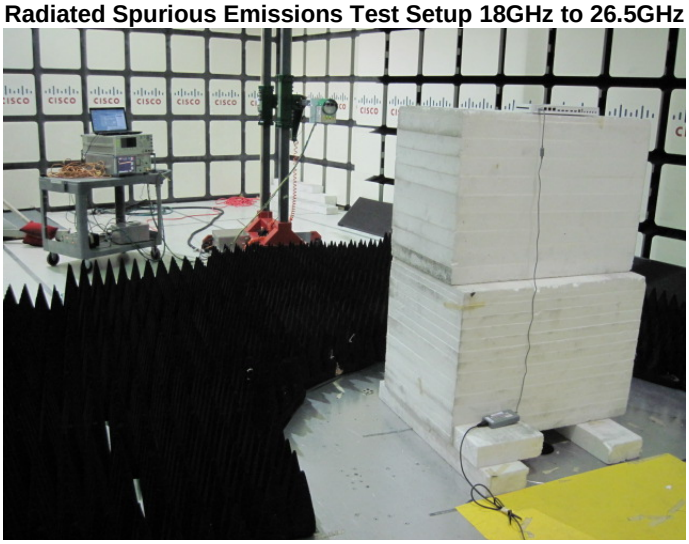


Radiated Spurious Emissions Test Setup 1GHz to 18GHz (10m chamber, 3m distance)

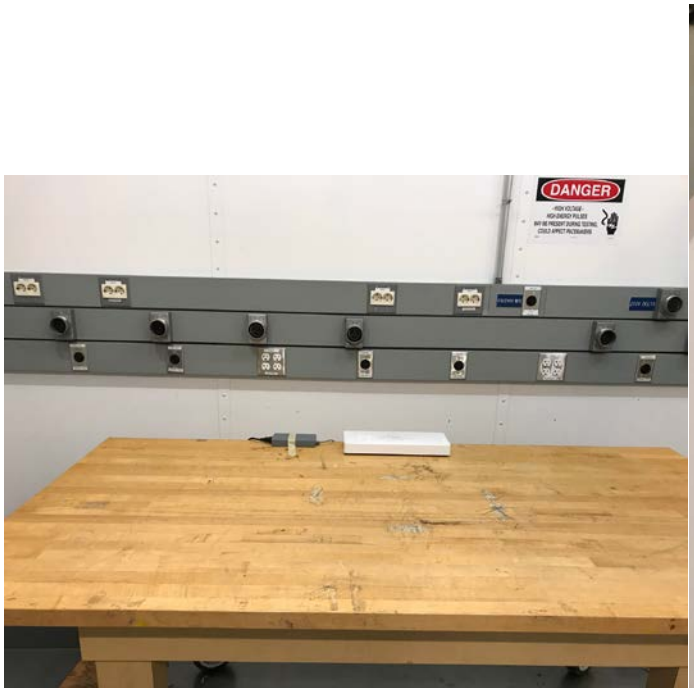


This document is uncontrolled. Please refer to the electronic copy within Doc Central for the most up to date version.
Cisco Systems, Inc. Company Confidential

Radiated Spurious Emissions Test Setup 18GHz to 26.5GHz



AC Conducted Emissions Test Setup



This document is uncontrolled. Please refer to the electronic copy within Doc Central for the most up to date version.
Cisco Systems, Inc. Company Confidential

Appendix E: Software Used to Perform Testing

EMIsoft Vasona, version 6.024

This document is uncontrolled. Please refer to the electronic copy within Doc Central for the most up to date version.
Cisco Systems, Inc. Company Confidential

Appendix F: Test Procedures

Measurements were made in accordance with

- KDB 558074 - D01 DTS Meas Guidance v03r05
- KDB 662911 - MIMO
- ANSI C63.10 2013 Intentional Radiators
- LP0002:2016

Test procedures are summarized below

FCC 2.4GHz Test Procedures	EDCS # 1445042
FCC 2.4GHz RSE Test Procedures	EDCS # 1480386

This document is uncontrolled. Please refer to the electronic copy within Doc Central for the most up to date version.
Cisco Systems, Inc. Company Confidential

Appendix G: Scope of Accreditation (A2LA certificate number 1178-01)

The scope of accreditation of Cisco Systems, Inc. can be found on the A2LA web page at:

https://www.a2la.org/scopepdf/1178-01.pdf

This document is uncontrolled. Please refer to the electronic copy within Doc Central for the most up to date version.
Cisco Systems, Inc. Company Confidential

Appendix H: Test Assessment Plan

Compliance Test Plan EDCS# 11633051.

This document is uncontrolled. Please refer to the electronic copy within Doc Central for the most up to date version.
Cisco Systems, Inc. Company Confidential