



Radio Test Report

TTC7-25

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

5150-5250 MHz

Against the following Specifications:

LP0002:2016 Section 2.8



Cisco Systems
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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



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*%
- e) All AC testing was performed at one or more of the following supply voltages:

220V 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:

$$\text{Emission level [dBuV]} = \text{Indicated voltage level [dBuV]} + \text{Cable Loss [dB]} + \text{Other correction factors [dB]}$$

The combinations of correction factors are dependent upon the exact test configurations [see test equipment lists for further details] and may include:-

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

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

$$\text{Level in uV/m} = \text{Common Antilogarithm} [(X \text{ dBuV/m})/20] = Y \text{ uV/m}$$

Measurement Uncertainty Values

voltage and power measurements	± 2 dB
conducted EIRP measurements	± 1.4 dB
radiated measurements	± 3.2 dB
frequency measurements	$\pm 2.4 \cdot 10^{-7}$
temperature measurements	$\pm 0.54^\circ$.
humidity measurements	$\pm 2.3\%$
DC and low frequency measurements	$\pm 2.5\%$.

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

Radiated emissions (expanded uncertainty, confidence interval 95%)

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

Conducted emissions (expanded uncertainty, confidence interval 95%)

30 MHz – 40GHz	+/- 0.38 dB
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A product is considered to comply with a requirement if the nominal measured value is below the limit line. The product is considered to not be in compliance in case the nominal measured value is above the limit line.

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

25-SEP-2017 to 11-OCT-2017

2.4 Report Issue Date

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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.

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)
5150	Internal	4.26	4.24
5250	Internal	4.39	4.34



Section 3: Result Summary

3.1 Results Summary Table

Section	Test Item	Technical Regulation			Result
2	General Regulations				
2.3	RF voltage conducted back onto the AC power line	Freq. (MHz) 0.15-0.5 66-56 0.5-5 56 5-30 60	Quasi Peak (dBuV) 56-46 46 50	Average (dBuV)	Not tested*
2.8	Field Strength Limits (at 3 m) (at 3 m) (at 3 m) (at 3 m)	Frequency (MHz) 30(inc.) - 88 (inc.) 88(exc.) - 216 (inc.) 216(exc.) - 960 (inc.) above 960(exc.)	Field Strength (uV/m) 100 150 200 500		Pass
3.10	Operating band: 5725~5870 MHz 24.0-24.25 GHz	For frequency hopping or digitally modulated equipment			
3.10.1.2	Peak output power	≤ 1 W			Not tested*
3.10.1.5	Out of Band Radiated Emission Limits	> 20 dB below highest level in 100 kHz bandwidth or section 2.9 which has lesser attenuation			Not tested*
3.10.1.6(2)	Digital Modulation Techniques Systems Minimum 6 dB bandwidth Transmitter power spectral density (into the antenna) Processing Gain	≥ 500 kHz ≤ 8 dBm (in any 3 kHz band any time of continuous transmission) > 10 dB			Not tested*
4.7	UNII Equipment				
4.7.3.1	Peak Transmit Power for the band 5150-5250 MHz	≤1 W Max. Power Density ≤17 dBm in any 1 MHz band			Not tested*
4.7.3.2	Peak Transmit Power for the band 5250-5350 MHz, and 5470-5725 MHz	≤250 mW or 11 dBm+10 log B (whichever smaller) Max. Power Density ≤11 dBm in any 1 MHz band			Not tested*
4.7.3.3	Peak Transmit Power for the band 5725-5850MHz	Max. Power Density ≤30 dBm in any 500 kHz band			Not tested*
4.7.4	Out of Band Emissions				
4.7.4.1	5250-5350 MHz & 5470-5725 MHz	EIPR ≤ -27 dBm/MHz			Not tested*
4.7.4.2	5725-5850 MHz	EIPR ≤ 27~-15.6 dBm/MHz (within 5 MHz band edge) EIPR ≤ 15.6~10 dBm/MHz (within 5-25 MHz band edge) EIPR ≤ 10~-27 dBm/MHz (within 25-75 MHz band edge) EIPR ≤ -27 dBm/MHz (outside 75 MHz band edge)			Not tested*
4.7.6	Automatic Transmission Discontinue Limits	The device shall automatically discontinue transmission in case of either absence of information to transmit or operational failure.			Not tested*
4.7.7.1	Transmit Power Control (TPC)	Applicable in: 5250-5350 & 5470-5725 MHz 6 dB below the mean EIRP of 30dBm. EIRP < 500mW does not need to have TPC function			Not tested*
4.7.7.2	Dynamic Frequency Selection	Applicable in: 5250-5350 & 5470-5725 MHz			Not tested*



	(DFS)	Threshold Level: ≤ -62 dBm (<200 mW eirp & PSD<10 dBm/MHz) ≤ -64 dBm (<200 mW eirp & PSD $\geq$ 10 dBm/MHz) ≤ -64 dBm (200 mW – 1 W eirp)	
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*Radio module has previous approval. NCC ID: CCAJ15LP6160T6



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. Please also refer to the "Justification for worst Case test Configuration" section of this report for further details on the selection of EUT samples.

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	802.11a 6Mbps Tx	Continuous transmit mode. Single antenna. See Test Assessment Plan for full details.
2	802.11n HT20 MCS0 Tx	Continuous transmit mode. Dual antenna. See Test Assessment Plan for full details.
3	802.11n HT40 MCS0 Tx	Continuous transmit mode. Dual antenna. See Test Assessment Plan for full details.
4	802.11ac HT80 MCS0 Tx	Continuous transmit mode. Dual antenna. See Test Assessment Plan for full details.
5	802.11a 6Mbps Rx	Receive only mode. Dual antenna. See Test Assessment Plan for full details.

**Appendix A: Emission 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	✓	

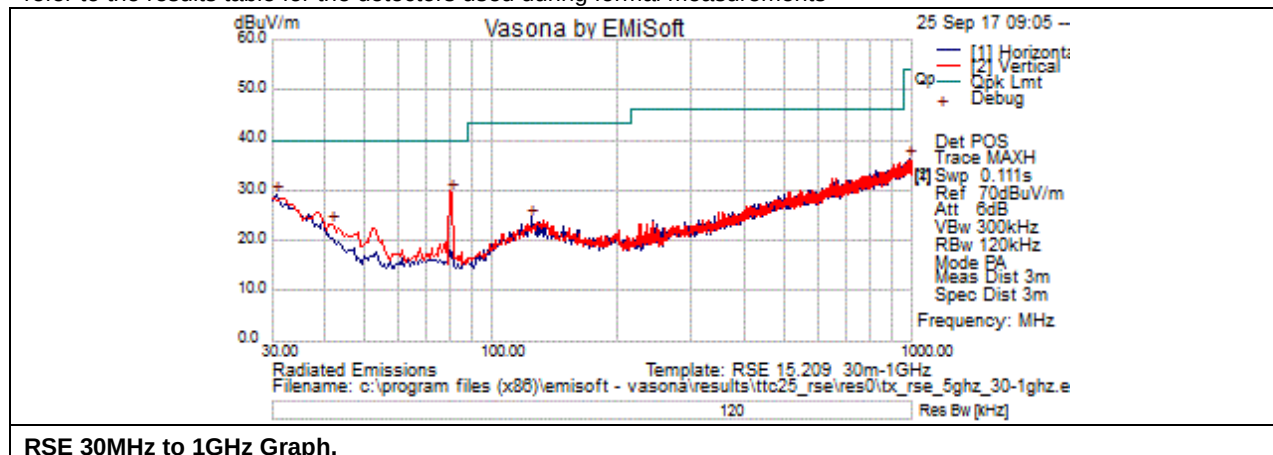
Tested By : Allan Beecroft	Date of testing: 25-SEP-2017
Test Result : PASS	

See Appendix B for list of test equipment



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



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	79.997	17.5	.8	7.7	26.1	Quasi Max	V	154	150	40.0	-13.9	Pass	
2	30.606	8.3	.5	20.8	29.6	Quasi Max	H	259	6	40.0	-10.4	Pass	
3	992.119	9.1	2.9	23.4	35.5	Quasi Max	H	224	66	54.0	-18.5	Pass	
4	124.575	6.6	1.0	13.9	21.5	Quasi Max	H	292	108	43.5	-22.0	Pass	
5	243.164	8.3	1.4	11.6	21.3	Quasi Max	V	138	280	46.0	-24.7	Pass	
6	224.063	8.6	1.4	10.8	20.7	Quasi Max	V	195	304	46.0	-25.3	Pass	
7	233.743	8.4	1.4	11.3	21.2	Quasi Max	V	193	46	46.0	-24.8	Pass	
8	227.174	8.6	1.4	10.9	20.9	Quasi Max	V	130	80	46.0	-25.1	Pass	

**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.

A notch filter at the fundamental frequency was used to prevent overloading the spectrum analyzer.
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

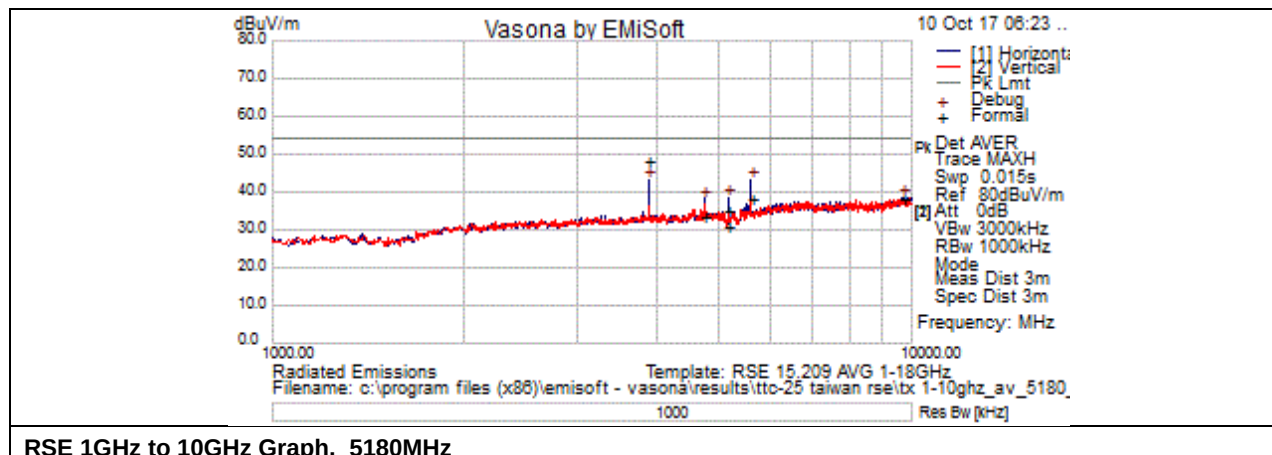
The results in this test report are representative for all supported operating modes and antennas.

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

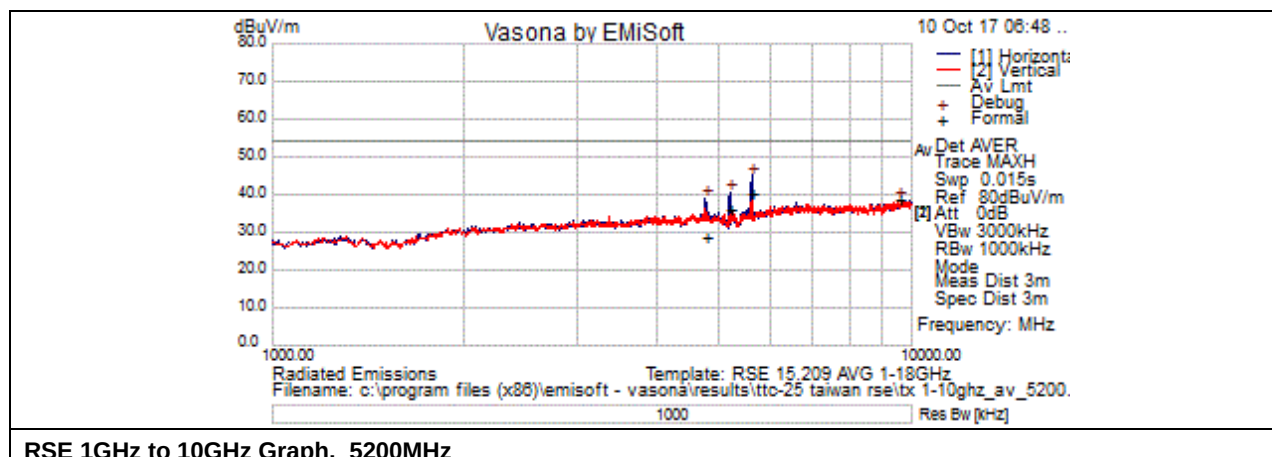
Tested By : Allan Beecroft	Date of testing: 10/11-OCT-2017
Test Result : PASS	

See Appendix B for list of test equipment

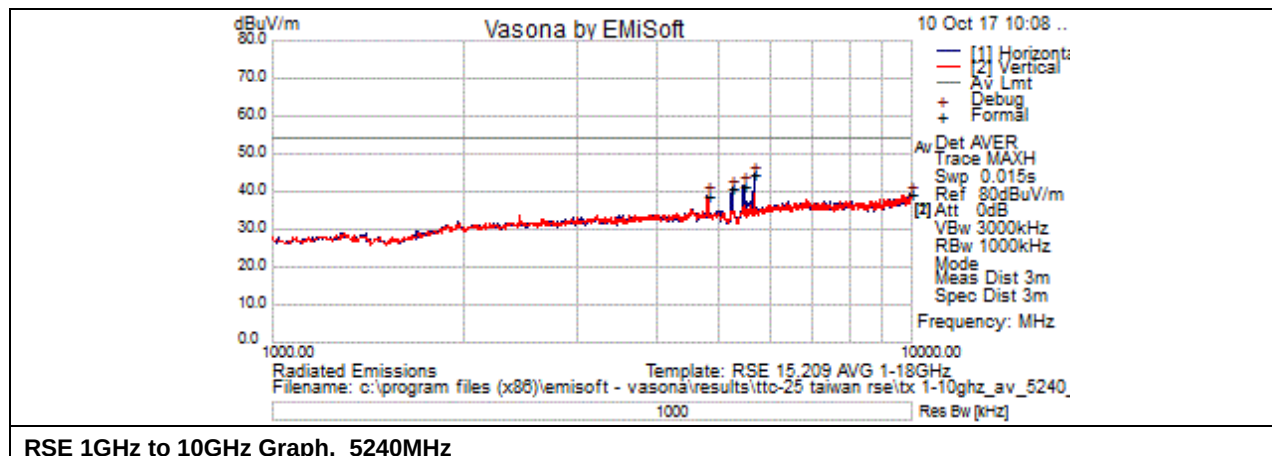
Graphs: Average Radiated Transmitter Spurious Emissions (1GHz to 10GHz)



RSE 1GHz to 10GHz Graph. 5180MHz



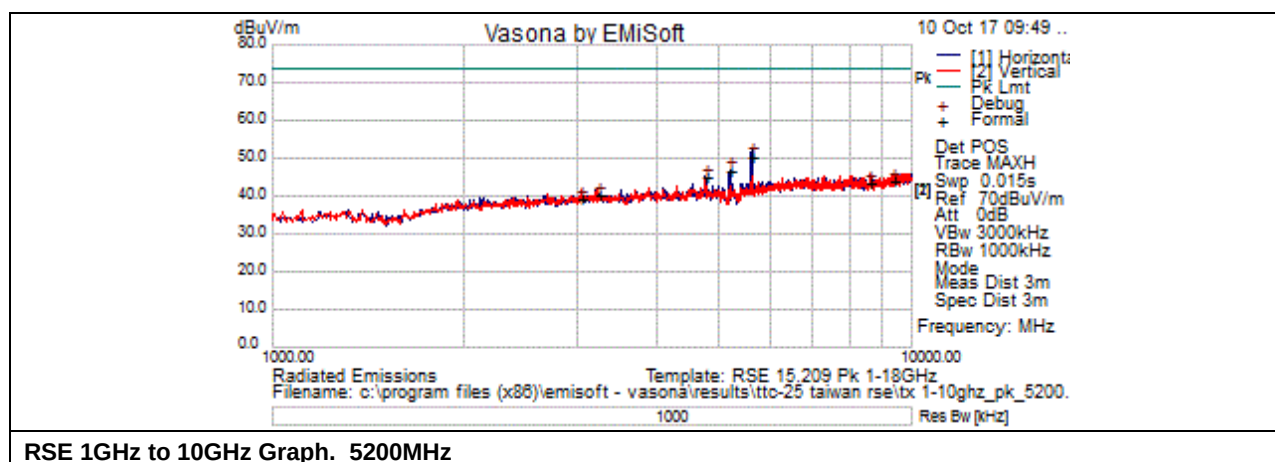
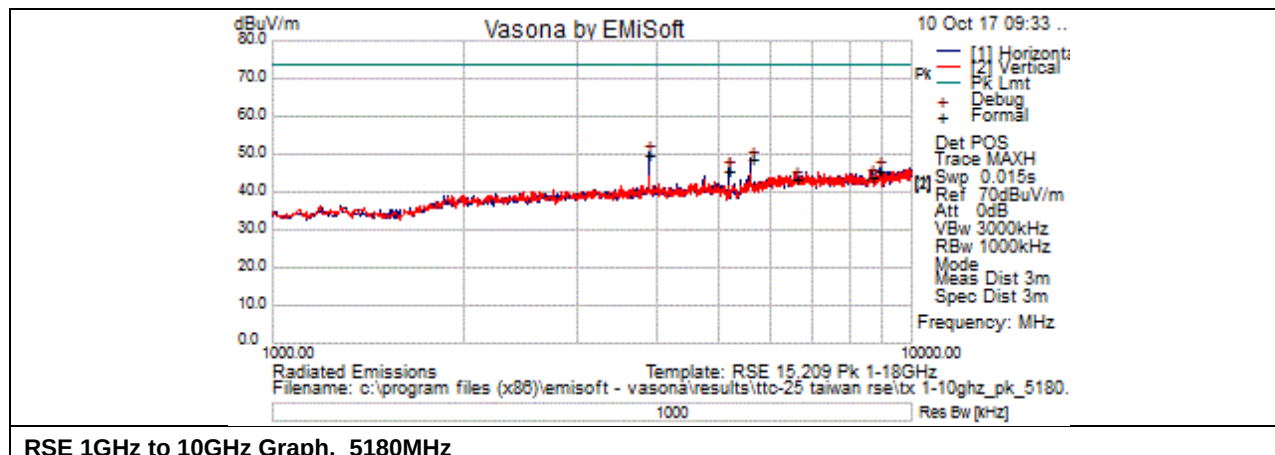
RSE 1GHz to 10GHz Graph. 5200MHz

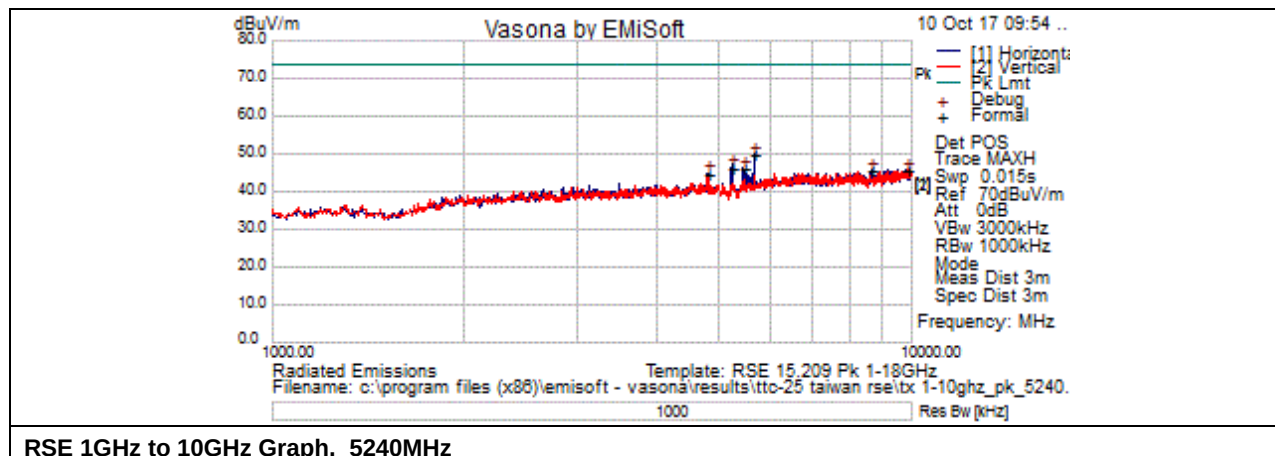


RSE 1GHz to 10GHz Graph. 5240MHz

**Worst Case 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	5612.500	39.2	7.3	-8.0	38.5	Average	H	102	5	54.0	-15.5	Pass	
2	3885.000	50.5	5.9	-8.3	48.1	Average	H	100	0	54.0	-5.9	Pass	narrow band
3	5179.938	32.7	6.9	-8.5	31.2	Average	H	120	360	54.0	-22.8	Pass	
4	5172.563	36.7	6.9	-8.5	35.1	Average	H	120	360	54.0	-18.9	Pass	
5	9690.625	32.2	10.1	-4.0	38.3	Average.	H	150	0	54.0	-15.7	Pass	
6	4748.844	35.4	6.6	-8.6	33.3	Average	H	100	0	54.0	-20.7	Pass	
7	5634.250	41.1	7.3	-7.8	40.6	Average	H	100	360	54.0	-13.4	Pass	
8	5205.188	37.6	6.9	-8.5	36.1	Average	H	118	0	54.0	-17.9	Pass	
9	4766.813	30.8	6.6	-8.5	28.9	Average	H	105	54	54.0	-25.1	Pass	
10	9555.625	33.5	10.1	-4.9	38.6	Average.	V	150	0	54.0	-15.4	Pass	
11	5676.523	45.1	7.3	-7.9	44.5	Average.	H	100	0	54.0	-9.5	Pass	
12	5465.276	42.6	7.2	-8.2	41.6	Average.	H	100	0	54.0	-12.4	Pass	
13	5238.851	42.4	7.0	-8.6	40.8	Average.	H	100	0	54.0	-13.2	Pass	
14	9955.000	32.5	10.3	-3.5	39.3	Average.	H	100	0	54.0	-14.7	Pass	
15	4803.022	41.0	6.6	-8.8	38.8	Average.	H	100	0	54.0	-15.2	Pass	

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

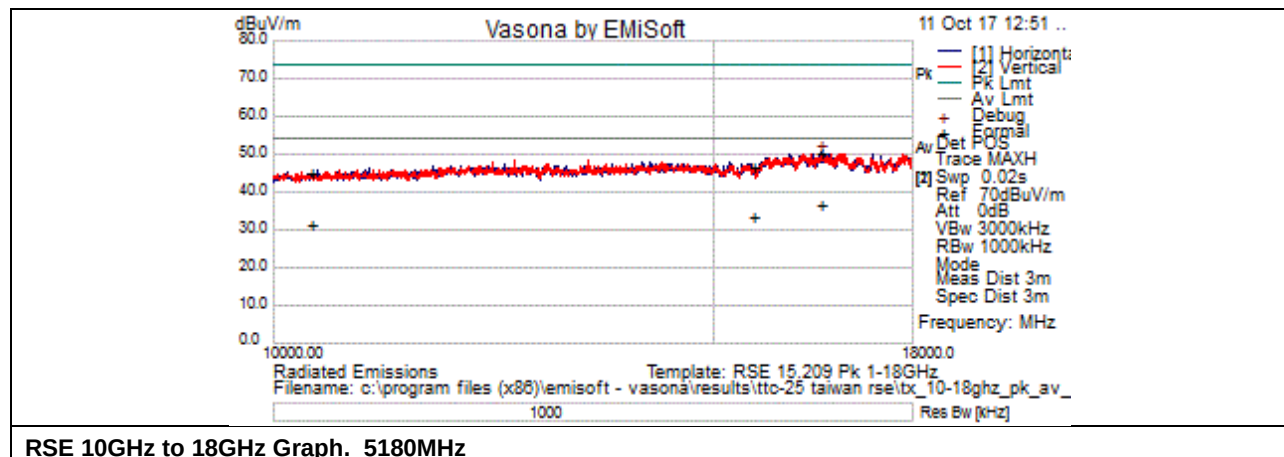


Worst Case Results Table Peak (1GHz to 10GHz):

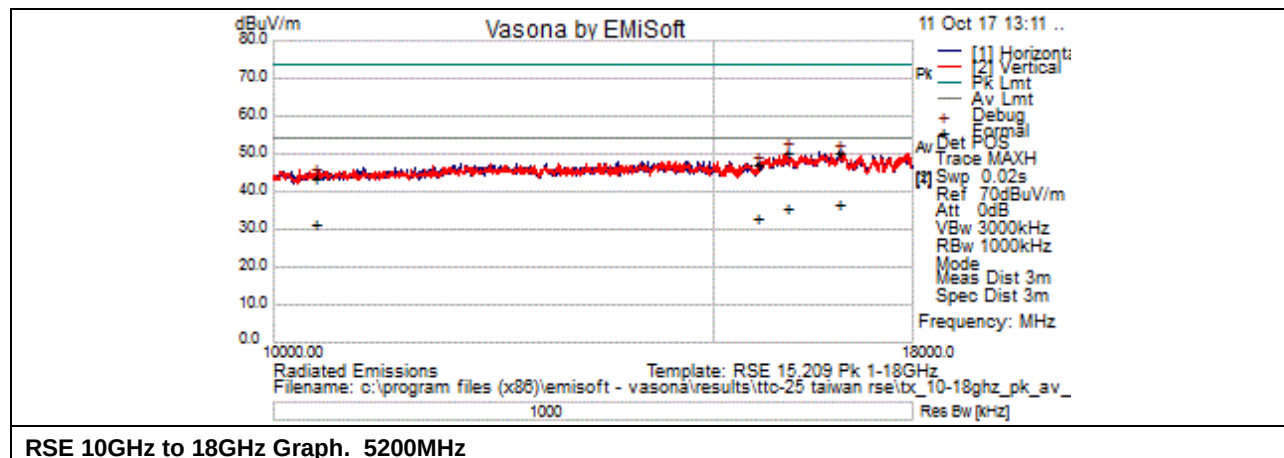
Formal Data													
No	Frequency MHz	Raw dBuV	Cable Loss	AF dB	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass / Fail	Comments
1	3885.000	52.6	5.9	-8.3	50.2	Peak.	H	120	0	74.0	-23.9	Pass	
2	5612.500	49.4	7.3	-8.0	48.7	Peak.	H	100	0	74.0	-25.3	Pass	
3	5179.938	47.5	6.9	-8.5	46.0	Peak.	H	100	0	74.0	-28.0	Pass	
4	5172.563	47.6	6.9	-8.5	46.0	Peak.	H	100	0	74.0	-28.0	Pass	
5	8915.268	42.1	9.6	-5.9	45.8	Peak.	H	100	0	74.0	-28.2	Pass	
6	6596.857	40.9	8.1	-5.4	43.6	Peak.	V	100	0	74.0	-30.4	Pass	
7	8633.571	40.3	9.6	-6.0	43.9	Peak.	V	100	0	74.0	-30.1	Pass	
8	8619.697	39.9	9.6	-6.0	43.5	Peak.	V	100	0	74.0	-30.6	Pass	
9	9360.084	39.3	9.9	-5.3	44.0	Peak.	V	100	0	74.0	-30.0	Pass	
10	3233.794	43.6	5.3	-8.7	40.3	Peak.	V	100	0	74.0	-33.7	Pass	
11	3036.697	42.9	5.1	-8.9	39.1	Peak.	V	100	0	74.0	-34.9	Pass	
12	5634.250	51.0	7.3	-7.8	50.5	Peak.	H	100	0	74.0	-23.5	Pass	
13	5205.188	48.4	6.9	-8.5	46.8	Peak.	H	118	0	74.0	-27.2	Pass	
14	4766.813	46.9	6.6	-8.5	45.0	Peak.	H	105	54	74.0	-29.0	Pass	
15	5676.523	50.3	7.4	-7.9	49.7	Peak.	H	101	0	74.0	-24.3	Pass	
16	5465.276	47.1	7.2	-8.2	46.0	Peak.	H	100	0	74.0	-28.0	Pass	
17	5238.851	48.1	7.0	-8.6	46.5	Peak.	H	100	0	74.0	-27.5	Pass	
18	4803.022	46.9	6.6	-8.9	44.7	Peak.	H	100	0	74.0	-29.3	Pass	
19	8678.770	42.2	9.6	-6.3	45.5	Peak.	H	100	0	74.0	-28.5	Pass	
20	9837.258	39.1	10.2	-3.8	45.5	Peak.	H	100	0	74.0	-28.5	Pass	



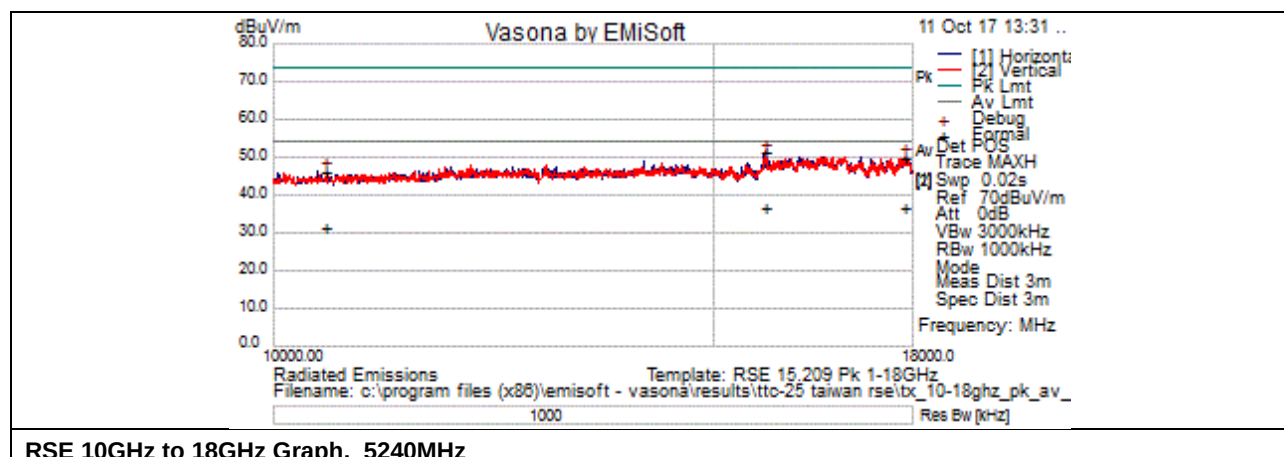
Graphs: Peak/Average Radiated Transmitter Spurious Emissions (10GHz to 18GHz)



RSE 10GHz to 18GHz Graph. 5180MHz



RSE 10GHz to 18GHz Graph. 5200MHz



RSE 10GHz to 18GHz Graph. 5240MHz

**Worst Case Results Table Peak/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	10360.000	50.2	10.5	-15.6	45.1	Peak.	H	150	360	74.0	-28.9	Pass	
2	10360.000	36.6	10.5	-15.6	31.5	Average	H	150	360	54.0	-22.5	Pass	
3	15540.000	46.4	13.2	-12.8	46.9	Peak.	H	150	360	74.0	-27.1	Pass	
4	15540.000	33.1	13.2	-12.8	33.5	Average	H	150	360	54.0	-20.5	Pass	
5	16545.000	47.3	13.8	-10.8	50.3	Peak.	H	150	94	74.0	-23.8	Pass	
6	16545.000	33.8	13.8	-10.8	36.7	Average	H	150	94	54.0	-17.3	Pass	
7	16045.000	48.6	13.5	-11.7	50.5	Peak.	V	150	198	74.0	-23.6	Pass	
8	16045.000	34.1	13.5	-11.7	35.9	Average	V	150	198	54.0	-18.1	Pass	
9	10400.000	48.8	10.5	-15.7	43.7	Peak.	H	150	68	74.0	-30.3	Pass	
10	10400.000	36.6	10.5	-15.7	31.5	Average	H	150	360	54.0	-22.5	Pass	
11	15600.000	46.5	13.3	-12.7	47.1	Peak.	V	150	198	74.0	-26.9	Pass	
12	15600.000	32.5	13.3	-12.7	33.1	Average	H	150	360	54.0	-20.9	Pass	
13	16825.348	47.0	14.0	-10.8	50.2	Peak.	H	150	360	74.0	-23.8	Pass	
14	16825.348	33.5	14.0	-10.8	36.7	Average	H	150	360	54.0	-17.3	Pass	
15	15720.000	50.7	13.4	-12.6	51.5	Peak.	V	150	215	74.0	-22.5	Pass	
16	15720.000	35.8	13.4	-12.6	36.6	Average	V	100	215	54.0	-17.4	Pass	
17	17870.000	44.9	14.5	-9.5	49.9	Peak.	V	150	4	74.0	-24.1	Pass	
18	17870.000	31.6	14.5	-9.5	36.6	Average	V	100	4	54.0	-17.4	Pass	
19	10480.000	51.3	10.6	-15.6	46.2	Peak.	H	150	360	74.0	-27.8	Pass	
20	10480.000	36.6	10.6	-15.6	31.6	Average	H	150	-1	54.0	-22.4	Pass	

**Transmitter Radiated Spurious Emissions 18GHz to 40GHz**

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 – 40 GHz	18GHz – 40 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.

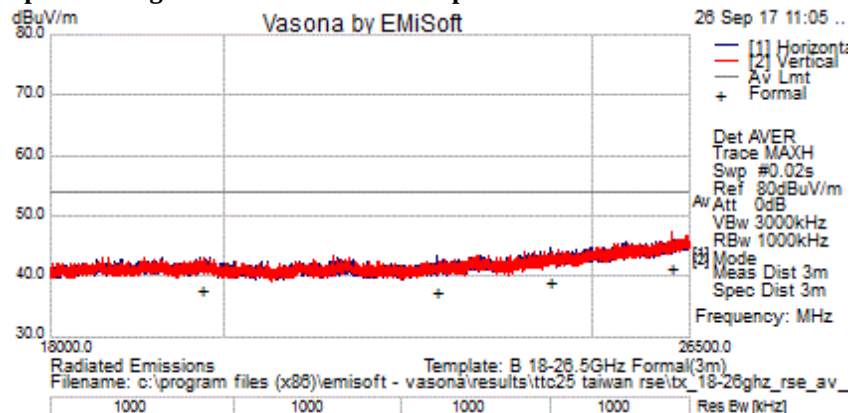
System Number	Description	Samples	System under test	Support equipment
1	EUT	S01, S02	✓	

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

See Appendix B for list of test equipment



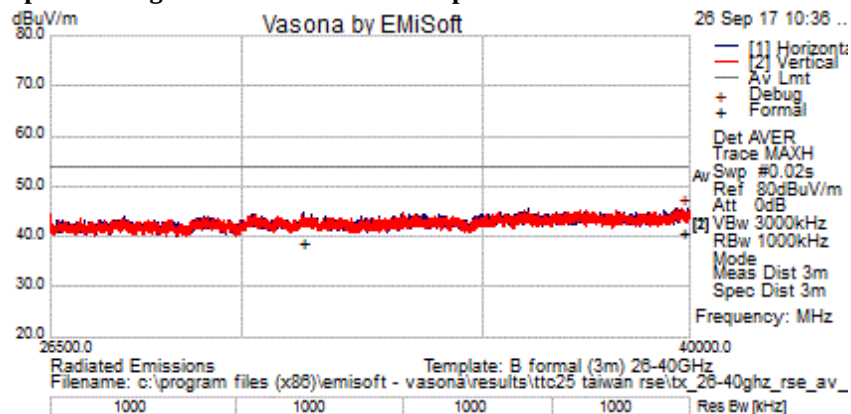
Graphs: Average Radiated Transmitter Spurious Emissions 18GHz – 26.5GHz



Worst Case Test Results Table Average (18GHz to 26.5GHz)

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	26215.249	23.1	.0	18.2	41.3	Average	V	150	0	54.0	-12.7	Pass	
2	24360.195	22.8	.0	16.4	39.2	Average	H	150	0	54.0	-14.8	Pass	
3	22749.340	21.7	.0	15.9	37.6	Average	H	150	0	54.0	-16.4	Pass	
4	19721.529	21.2	.0	16.4	37.6	Average	H	150	0	54.0	-16.4	Pass	

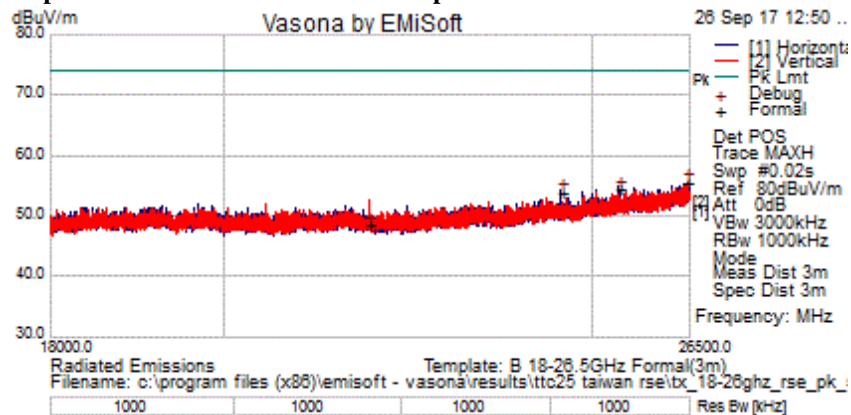
Graphs: Average Radiated Transmitter Spurious Emissions 26.5GHz – 40GHz



Worst Case Test Results Table Peak (26.5GHz to 40GHz)

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	39819.438	32.5	.0	8.2	40.7	Average	H	150	0	54.0	-13.3	Pass	
2	31191.247	35.0	.0	3.9	38.9	Average	H	150	0	54.0	-15.1	Pass	

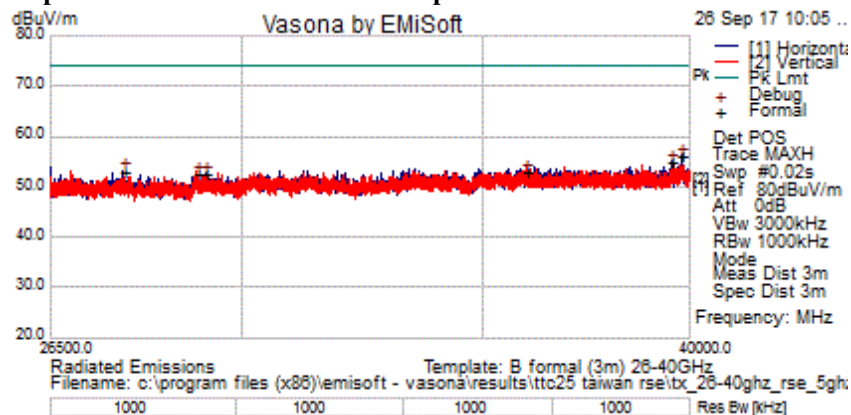
Graphs: Peak Radiated Transmitter Spurious Emissions 18GHz – 26.5GHz



Worst Case Test Results Table Peak (18GHz to 26.5GHz)

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	26464.937	36.8	.0	18.9	55.6	Peak [Scan]	V	150	0	74.0	-18.4	Pass	
2	25392.992	37.6	.0	16.9	54.5	Peak [Scan]	H	150	0	74.0	-19.5	Pass	
3	21828.196	32.2	.0	16.4	48.6	Peak [Scan]	V	150	0	74.0	-25.4	Pass	
4	24521.594	38.3	.0	15.8	54.1	Peak [Scan]	H	150	0	74.0	-19.9	Pass	

Graphs: Peak Radiated Transmitter Spurious Emissions 26.5GHz – 40GHz



**Worst Case Test Results Table Peak (26.5GHz to 40GHz)**

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	39797.462	47.7	.0	8.4	56.1	Peak [Scan]	V	150	0	74.0	-17.9	Pass	
2	39797.462	47.7	.0	8.4	56.1	Peak [Scan]	H	150	0	74.0	-17.9	Pass	
3	39529.266	47.4	.0	7.6	55.0	Peak [Scan]	H	150	0	74.0	-19.1	Pass	
4	36022.222	46.6	.0	6.4	53.0	Peak [Scan]	V	150	0	74.0	-21.0	Pass	
5	27768.999	58.8	.0	-5.6	53.2	Peak [Scan]	H	150	0	74.0	-20.8	Pass	
6	29117.368	56.7	.0	-4.1	52.6	Peak [Scan]	V	150	0	74.0	-21.4	Pass	
7	29291.519	56.7	.0	-4.1	52.6	Peak [Scan]	H	150	0	74.0	-21.4	Pass	

**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)

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, S02	✓	

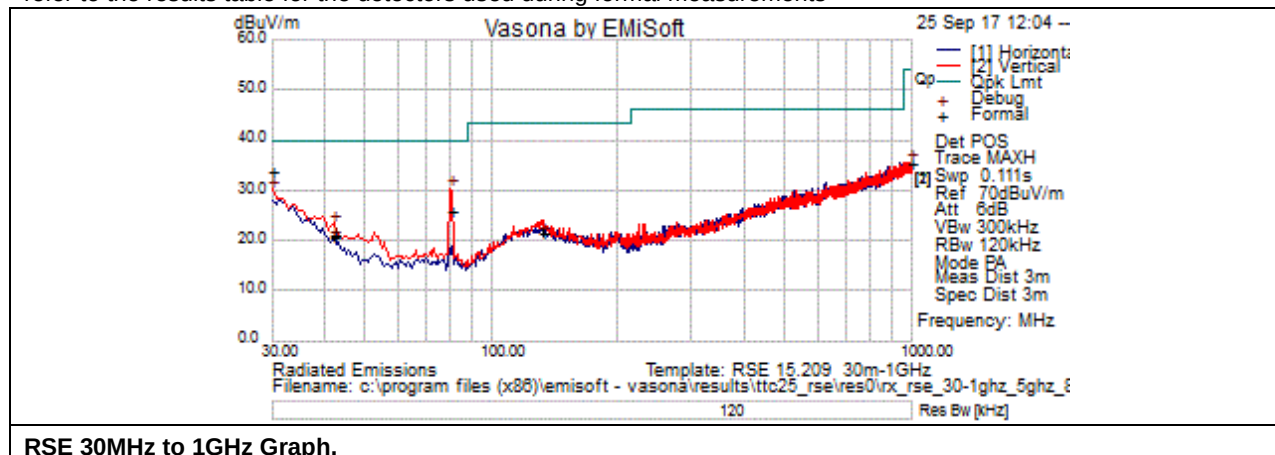
Tested By : Allan Beecroft	Date of testing: 25-SEP-2017
Test Result : PASS	

See Appendix B for list of test equipment



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.

Worst Case Test Results Table (30MHz to 1GHz)

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	

**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.

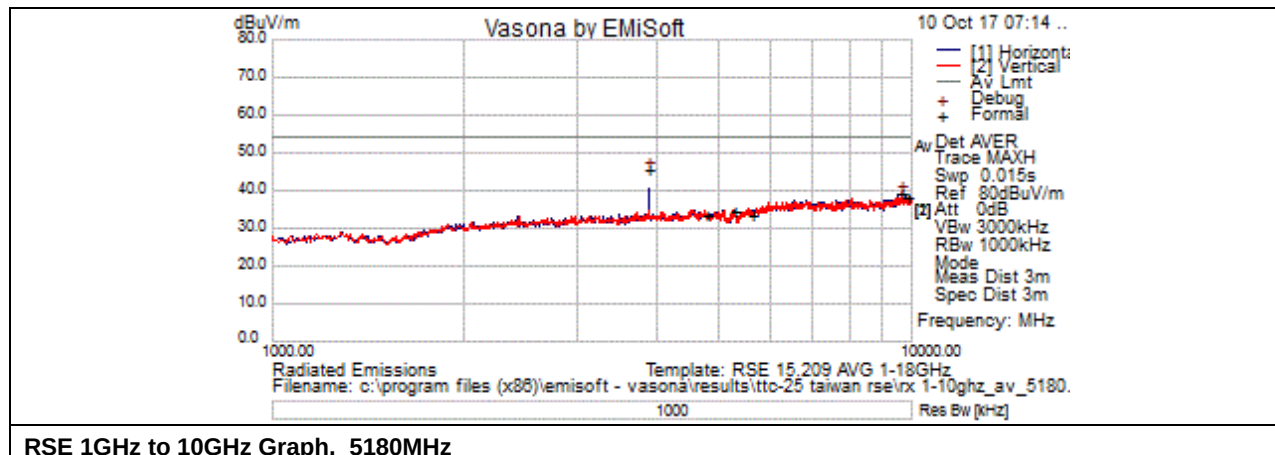
System Number	Description	Samples	System under test	Support equipment
1	EUT	S01, S02	✓	

Tested By : Allan Beecroft	Date of testing: 10/11-OCT-2017
Test Result : PASS	

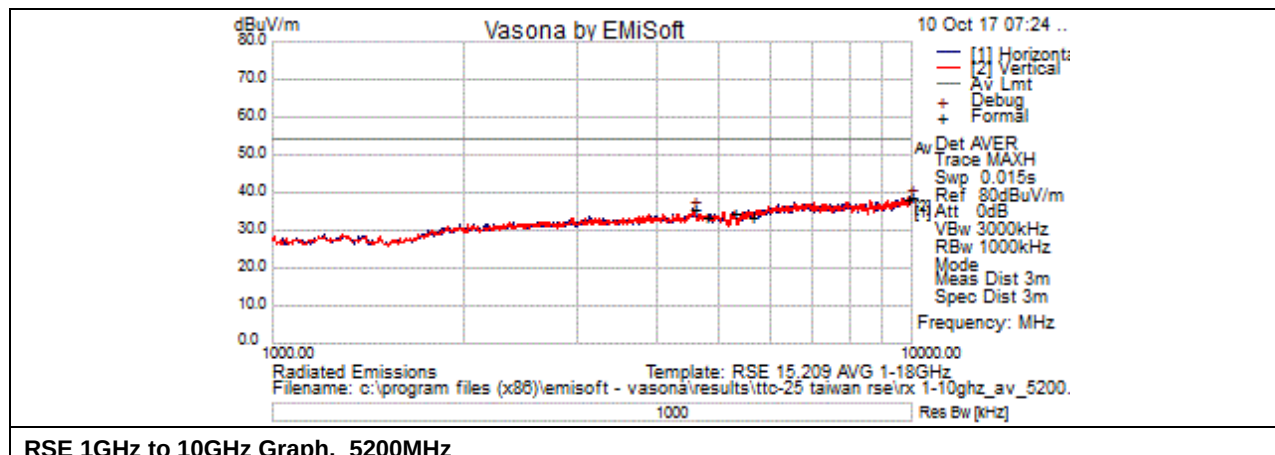
See Appendix B for list of test equipment



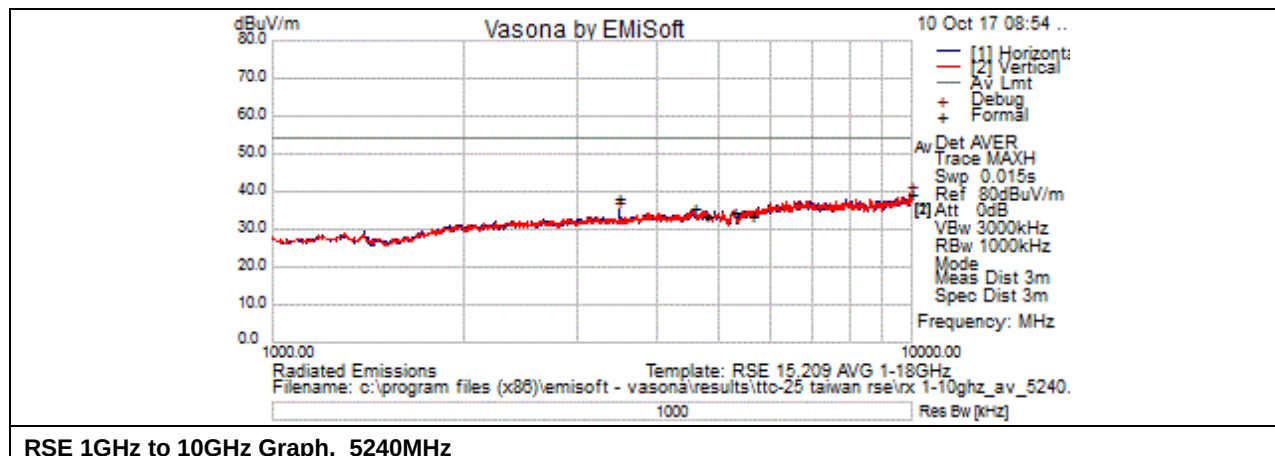
Graphs: Average Radiated Receiver Spurious Emissions (1GHz to 10GHz)



RSE 1GHz to 10GHz Graph. 5180MHz



RSE 1GHz to 10GHz Graph. 5200MHz



RSE 1GHz to 10GHz Graph. 5240MHz

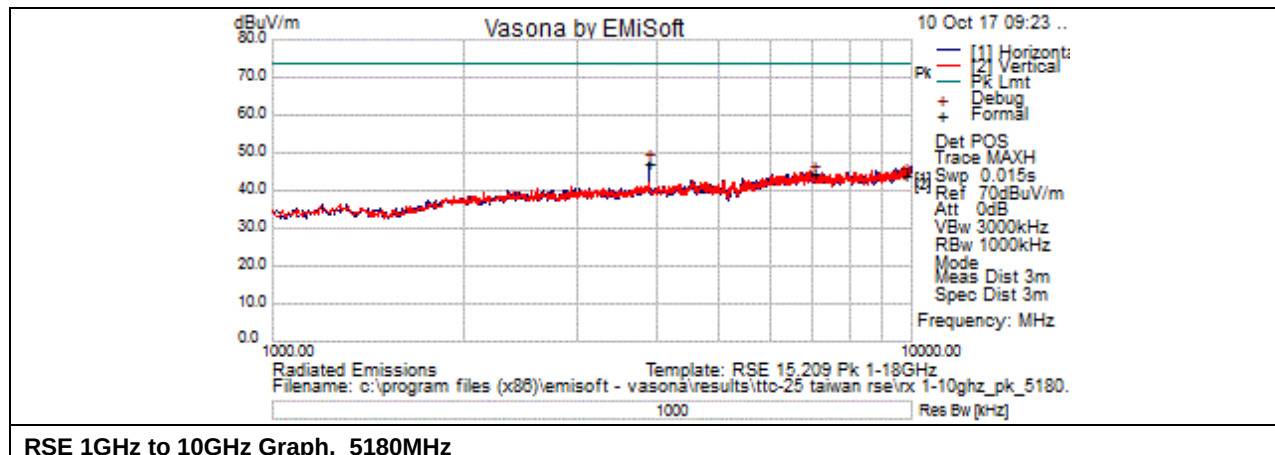


Worst Case Test Results Table Average (1GHz to 10GHz))

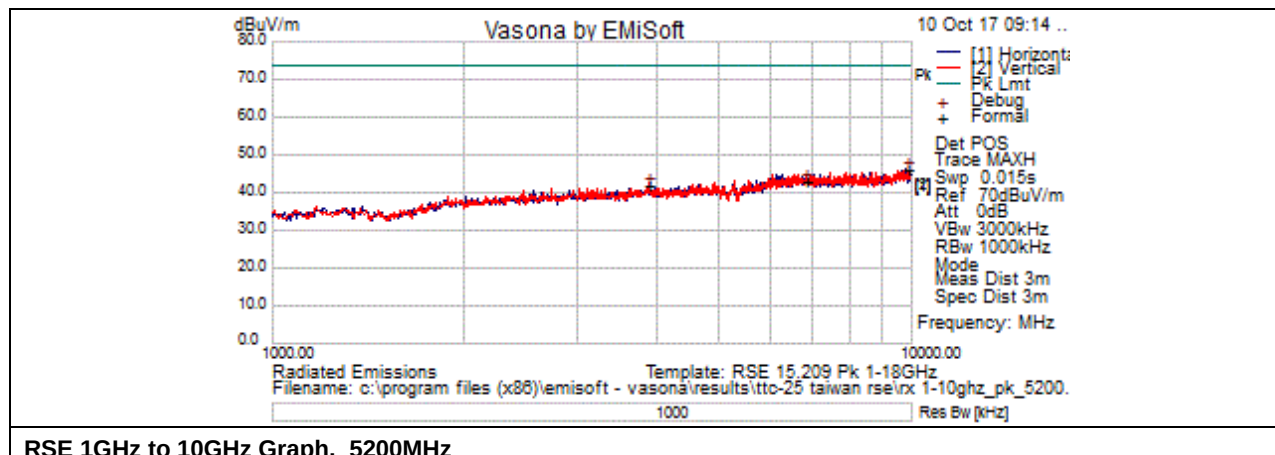
Formal Data													
No	Frequency MHz	Raw dBuV	Cable Loss	AF dB	Level dBuV / m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV / m	Margin dB	Pass /Fail	Comments
1	9814.375	32.0	10.2	-3.9	38.3	Average.	H	150	0	54.0	-15.7	Pass	
2	4766.027	35.5	6.6	-8.5	33.6	Average.	H	100	360	54.0	-20.4	Pass	
3	5277.939	36.2	7.0	-8.5	34.7	Average.	H	100	360	54.0	-19.3	Pass	
4	5639.621	34.3	7.3	-7.8	33.8	Average.	H	100	360	54.0	-20.2	Pass	
5	9662.500	33.3	10.1	-4.2	39.1	Average.	V	150	0	54.0	-14.9	Pass	
6	3884.969	48.0	5.9	-8.3	45.6	Average	H	100	0	54.0	-8.4	Pass	
7	9814.375	32.0	10.2	-3.9	38.3	Average.	H	150	0	54.0	-15.7	Pass	
8	4766.027	35.5	6.6	-8.5	33.6	Average.	H	100	360	54.0	-20.4	Pass	
9	5277.939	36.2	7.0	-8.5	34.7	Average.	H	100	360	54.0	-19.3	Pass	
10	5639.621	34.3	7.3	-7.8	33.8	Average.	H	100	360	54.0	-20.2	Pass	
11	9966.250	32.0	10.3	-3.5	38.7	Average.	H	150	0	54.0	-15.3	Pass	
12	4567.001	37.8	6.4	-8.7	35.5	Average.	H	100	0	54.0	-18.5	Pass	
13	4766.027	35.5	6.6	-8.5	33.6	Average.	H	100	360	54.0	-20.4	Pass	
14	5277.939	36.2	7.0	-8.5	34.7	Average.	H	100	360	54.0	-19.3	Pass	
15	5639.621	34.3	7.3	-7.8	33.8	Average.	H	100	360	54.0	-20.2	Pass	
16	4567.001	37.8	6.4	-8.7	35.5	Average.	H	100	0	54.0	-18.5	Pass	
17	9983.125	32.5	10.3	-3.5	39.3	Average.	V	150	0	54.0	-14.7	Pass	
18	3493.311	42.0	5.5	-9.1	38.5	Average	H	115	360	54.0	-15.5	Pass	narrow band



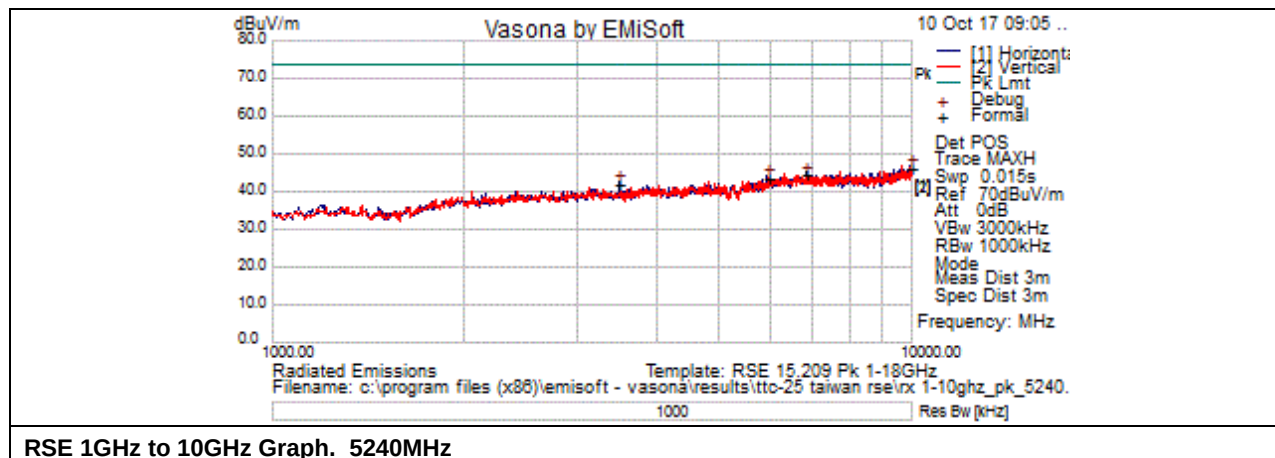
Graphs: Peak Radiated Receiver Spurious Emissions (1GHz to 10GHz)



RSE 1GHz to 10GHz Graph. 5180MHz



RSE 1GHz to 10GHz Graph. 5200MHz



RSE 1GHz to 10GHz Graph. 5240MHz

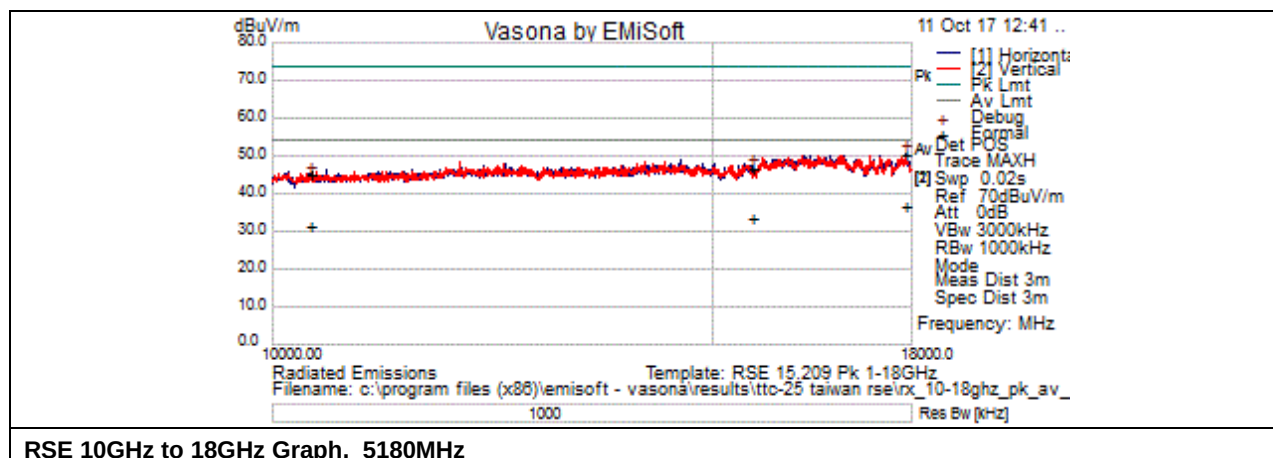


Worst Case Test Results Table Peak (1GHz to 10GHz)

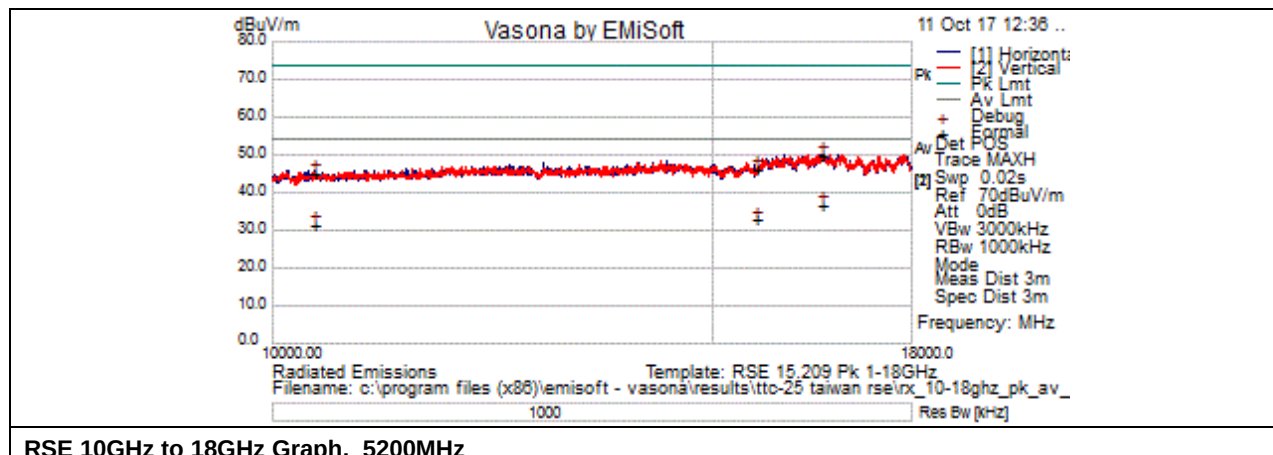
Formal Data													
No	Frequency MHz	Raw dBuV	Cable Loss	AF dB	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass /Fail	Comments
1	9758.067	37.5	10.2	-3.7	44.0	Peak.	V	100	0	74.0	-30.0	Pass	
2	3884.969	49.9	5.9	-8.3	47.4	Peak.	H	100	0	74.0	-26.6	Pass	narrow band
3	7025.087	42.1	8.4	-6.0	44.5	Peak.	H	100	0	74.0	-29.5	Pass	
4	9820.335	39.8	10.2	-3.9	46.1	Peak.	H	150	360	74.0	-27.9	Pass	
5	3880.149	44.2	5.9	-8.2	41.9	Peak.	V	150	360	74.0	-32.1	Pass	
6	6855.799	40.4	8.3	-5.7	42.9	Peak.	V	150	360	74.0	-31.1	Pass	
7	9820.335	39.8	10.2	-3.9	46.1	Peak.	H	150	360	74.0	-27.9	Pass	
8	3880.149	44.2	5.9	-8.2	41.9	Peak.	V	150	360	74.0	-32.1	Pass	
9	6855.799	40.4	8.3	-5.7	42.9	Peak.	V	150	360	74.0	-31.1	Pass	
10	3493.311	45.7	5.5	-9.1	42.2	Peak.	H	150	360	74.0	-31.8	Pass	
11	5945.509	42.9	7.6	-6.9	43.6	Peak.	H	150	360	74.0	-30.4	Pass	
12	6834.082	42.0	8.3	-5.6	44.6	Peak.	H	150	360	74.0	-29.4	Pass	
13	9967.996	39.5	10.3	-3.5	46.2	Peak.	H	150	360	74.0	-27.8	Pass	



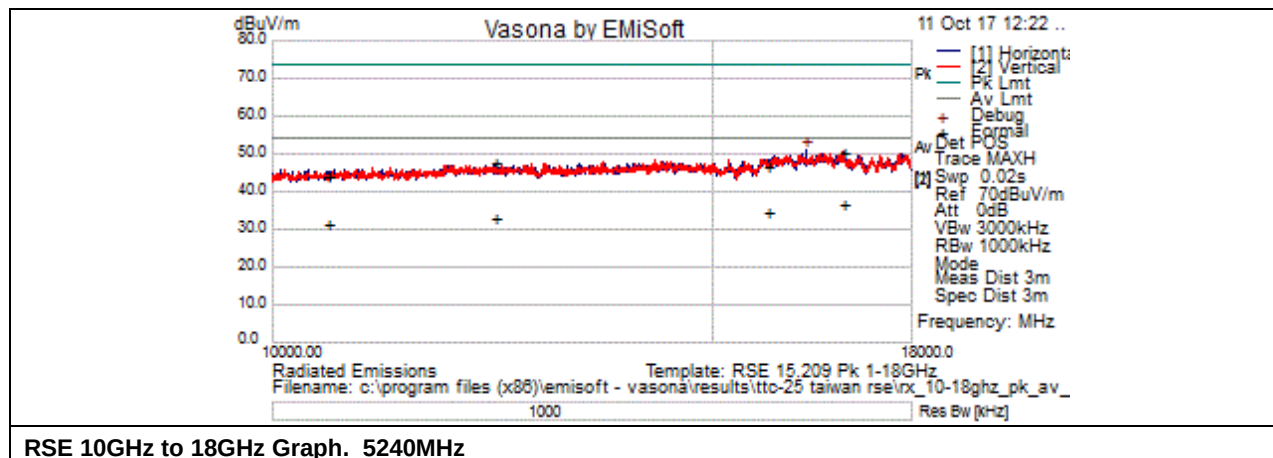
Graphs: Peak/Average Radiated Receiver Spurious Emissions (10GHz to 18GHz)



RSE 10GHz to 18GHz Graph. 5180MHz



RSE 10GHz to 18GHz Graph. 5200MHz



RSE 10GHz to 18GHz Graph. 5240MHz



Worst Case Test Results Table Peak/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	17910.000	45.4	14.5	-9.3	50.6	Peak.	H	150	349	74.0	-23.4	Pass	
2	17910.000	31.7	14.5	-9.3	36.9	Average	H	150	349	54.0	-17.1	Pass	
3	10360.000	50.2	10.5	-15.6	45.1	Peak.	H	150	360	74.0	-28.9	Pass	
4	10360.000	36.6	10.5	-15.6	31.5	Average	H	150	360	54.0	-22.5	Pass	
5	15540.000	46.4	13.2	-12.8	46.9	Peak.	H	150	360	74.0	-27.1	Pass	
6	15540.000	32.9	13.2	-12.8	33.3	Average	H	150	360	54.0	-20.7	Pass	
7	16580.000	47.0	14.0	-10.8	50.2	Peak.	H	150	134	74.0	-23.9	Pass	
8	16580.000	33.5	14.0	-10.8	36.7	Average	H	150	134	54.0	-17.3	Pass	
9	10400.000	50.4	10.5	-15.7	45.3	Peak.	H	150	0	74.0	-28.7	Pass	
10	10400.000	36.6	10.5	-15.7	31.5	Average	H	150	360	54.0	-22.5	Pass	
11	15600.000	45.8	13.3	-12.7	46.4	Peak.	H	150	0	74.0	-27.7	Pass	
12	15600.000	32.4	13.3	-12.7	33.0	Average	H	150	360	54.0	-21.0	Pass	
13	16915.000	47.3	14.0	-10.9	50.3	Peak.	V	150	24	74.0	-23.7	Pass	
14	16915.000	33.9	14.0	-10.9	36.9	Average	H	150	24	54.0	-17.1	Pass	
15	12285.172	50.6	11.6	-14.5	47.7	Peak.	H	150	0	74.0	-26.3	Pass	
16	12285.172	35.8	11.6	-14.5	32.9	Average	H	150	0	54.0	-21.1	Pass	
17	10520.000	49.4	10.6	-15.6	44.4	Peak.	H	150	0	74.0	-29.6	Pass	
18	10520.000	36.3	10.6	-15.6	31.3	Average	H	150	0	54.0	-22.7	Pass	
19	15780.000	46.0	13.3	-12.3	47.0	Peak.	H	150	0	74.0	-27.0	Pass	
20	15780.000	33.8	13.3	-12.3	34.8	Average	H	150	0	54.0	-19.2	Pass	

**Receiver Radiated Spurious Emissions 18GHz to 40GHz**

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 – 40 GHz	18GHz – 40 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.

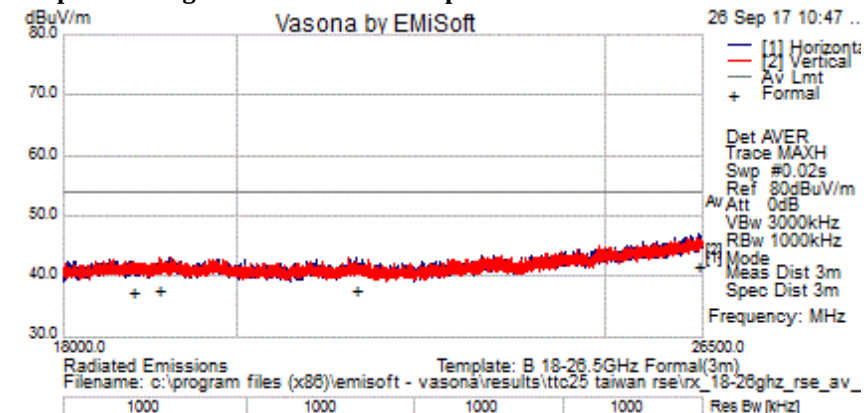
System Number	Description	Samples	System under test	Support equipment
1	EUT	S01, S02	✓	

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

See Appendix B for list of test equipment



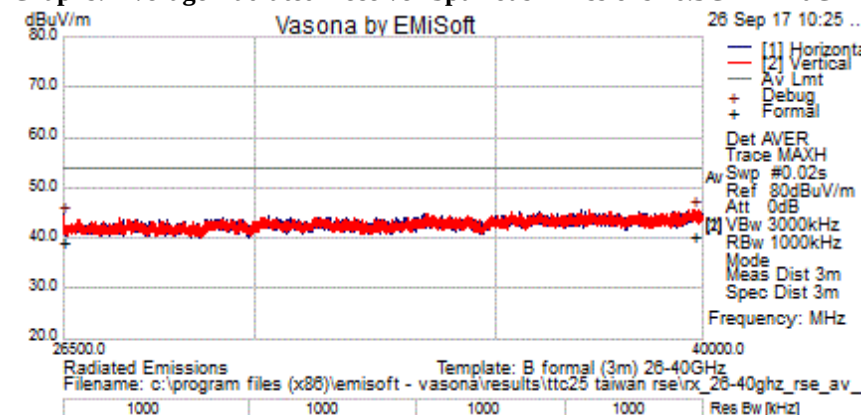
Graphs: Average Radiated Receiver Spurious Emissions 18GHz – 26.5GHz



Worst Case Test Results Table Average (18GHz to 26.5GHz)

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	26440.493	22.8	.0	18.8	41.6	Average	H	150	0	54.0	-12.4	Pass	
2	19078.532	21.6	.0	16.1	37.7	Average	H	150	0	54.0	-16.3	Pass	
3	21487.259	21.8	.0	16.1	37.9	Average	H	150	0	54.0	-16.1	Pass	
4	18782.980	21.4	.0	16.1	37.5	Average	V	150	0	54.0	-16.5	Pass	

Graphs: Average Radiated Receiver Spurious Emissions 26.5GHz – 40GHz

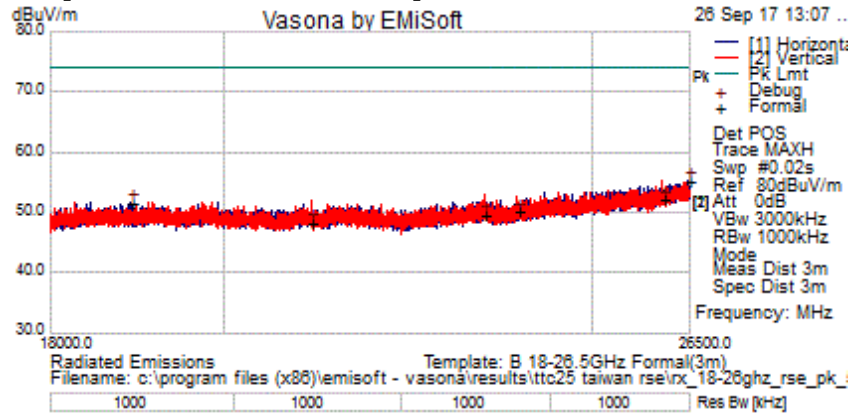


Worst Case Test Results Table Average (26.5GHz to 40GHz)

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	39778.938	32.3	.0	8.2	40.5	Average	H	150	0	54.0	-13.5	Pass	
2	26500.000	43.1	.0	-3.7	39.4	Average	V	150	0	54.0	-14.6	Pass	



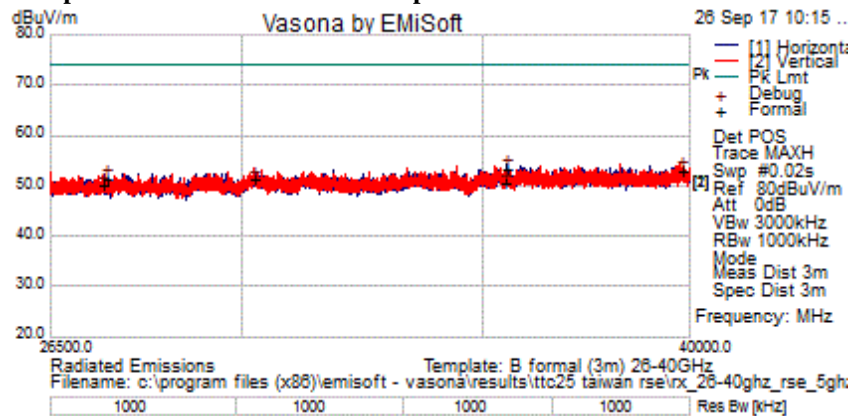
Graphs: Peak Radiated Receiver Spurious Emissions 18GHz – 26.5GHz



Worst Case Test Results Table Peak (18GHz to 26.5GHz)

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	26484.062	36.5	.0	18.9	55.4	Peak [Scan]	H	150	0	74.0	-18.6	Pass	
2	26076.183	34.1	.0	18.2	52.3	Peak [Scan]	V	150	0	74.0	-21.8	Pass	
3	21083.536	32.0	.0	16.3	48.3	Peak [Scan]	V	150	0	74.0	-25.7	Pass	
4	23875.000	34.4	.0	15.8	50.2	Peak [Scan]	V	150	0	74.0	-23.8	Pass	
5	18904.155	35.7	.0	16.0	51.7	Peak [Scan]	H	150	0	74.0	-22.3	Pass	
6	23410.356	33.8	.0	16.0	49.7	Peak [Scan]	V	150	0	74.0	-24.3	Pass	

Graphs: Peak Radiated Receiver Spurious Emissions 26.5GHz – 40GHz



**Worst Case Test Results Table Peak (26.5GHz to 40GHz)**

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	27462.178	57.5	.0	-5.8	51.7	Peak [Scan]	H	150	0	74.0	-22.3	Pass	
2	27399.454	55.9	.0	-5.7	50.2	Peak [Scan]	V	150	0	74.0	-23.8	Pass	
3	39763.760	45.1	.0	8.1	53.1	Peak [Scan]	V	150	0	74.0	-20.9	Pass	
4	30210.988	52.4	.0	-.9	51.5	Peak [Scan]	V	150	0	74.0	-22.6	Pass	
5	35538.791	47.1	.0	6.4	53.5	Peak [Scan]	H	150	0	74.0	-20.5	Pass	
6	35503.123	44.5	.0	6.1	50.6	Peak [Scan]	V	150	0	74.0	-23.4	Pass	

**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.

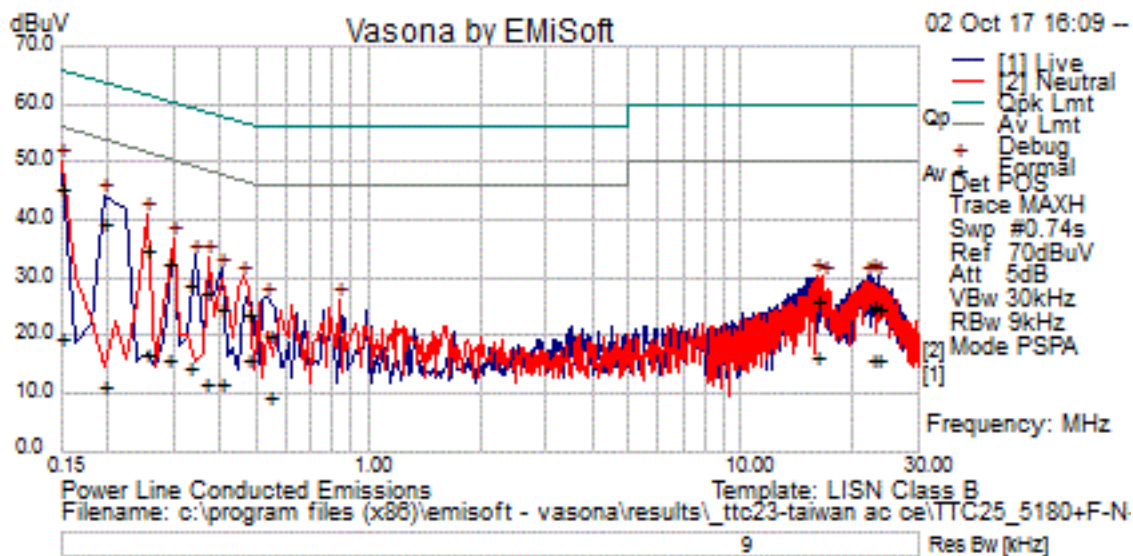
Using Vasona, configure the spectrum analyzer as shown below (be sure to enter all losses between the transmitter output and the spectrum analyzer). Place the radio in continuous transmit mode.

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



Formal Data

No	Frequency MHz	Raw dBuV	Cable Loss	Factors dB	Level dBuV	Measurement Type	Line	Limit dBuV	Margin dB	Pass /Fail	Comments
1	.195	-9.5	20.8	.2	11.5	Average	Live	53.8	-42.4	Pass	
2	.195	18.4	20.8	.2	39.4	Quasi Peak	Live	63.8	-24.5	Pass	fhss
3	.329	8.6	20.3	.1	28.9	Quasi Peak	Live	59.5	-30.5	Pass	fhss/hump
4	.402	4.7	20.1	.0	24.8	Quasi Peak	Live	57.8	-33.1	Pass	fhss/hump
5	.547	-0.0	19.9	.0	20.0	Quasi Peak	Live	56.0	-36.0	Pass	fhss/hump
6	22.512	4.4	20.4	.3	25.1	Quasi Peak	Live	60.0	-34.9	Pass	hand/series
7	23.551	3.8	20.4	.3	24.6	Quasi Peak	Live	60.0	-35.4	Pass	hand/series
8	.329	-5.9	20.3	.1	14.4	Average	Live	49.5	-35.1	Pass	
9	.402	-8.3	20.1	.0	11.8	Average	Live	47.8	-36.0	Pass	
10	.547	-10.6	19.9	.0	9.4	Average	Live	46.0	-36.6	Pass	
11	22.512	-4.5	20.4	.3	16.2	Average	Live	50.0	-33.8	Pass	
12	23.551	-4.7	20.4	.3	16.0	Average	Live	50.0	-34.0	Pass	
13	.150	24.1	21.1	.2	45.3	Quasi Peak	Neutral	66.0	-20.7	Pass	edge
14	.255	14.4	20.5	.1	35.0	Quasi Peak	Neutral	61.6	-26.6	Pass	fhss/hump
15	.292	12.2	20.4	.1	32.6	Quasi Peak	Neutral	60.5	-27.8	Pass	fhss/hump
16	.365	7.5	20.2	.0	27.7	Quasi Peak	Neutral	58.6	-30.9	Pass	fhss/hump
17	.475	3.7	19.9	.0	23.6	Quasi Peak	Neutral	56.4	-32.8	Pass	fhss/hump
18	16.026	5.7	20.3	.2	26.2	Quasi Peak	Neutral	60.0	-33.8	Pass	hand/series
19	.150	-1.6	21.1	.2	19.7	Average	Neutral	56.0	-36.3	Pass	
20	.255	-3.9	20.5	.1	16.8	Average	Neutral	51.6	-34.8	Pass	
21	.292	-4.3	20.4	.1	16.1	Average	Neutral	50.5	-34.3	Pass	
22	.365	-8.3	20.2	.0	11.9	Average	Neutral	48.6	-36.7	Pass	
23	.475	-4.1	19.9	.0	15.9	Average	Neutral	46.4	-30.5	Pass	
24	16.026	-4.2	20.3	.2	16.3	Average	Neutral	50.0	-33.7	Pass	



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	
47300	Keysight (Agilent/HP)/ N9038A	EMI Receiver	28-MAR-2017	28-MAR-2018	
40597	CISCO/Above 1GHz Site Cal	Above 1GHz Cspr Site Verification	25-SEP-2016	25-SEP-2017	
40597	CISCO/Above 1GHz Site Cal	Above 1GHz Cspr Site Verification	26-SEP-2017	26-SEP-2018	
43124	CISCO/Above 1GHz Site Cal	Above 1GHz Cspr 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	
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	

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

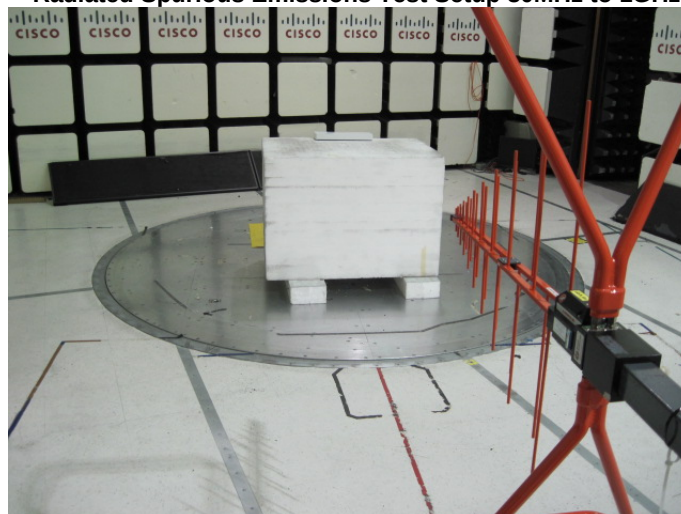


Appendix D: Photographs of EUT and Test Setups

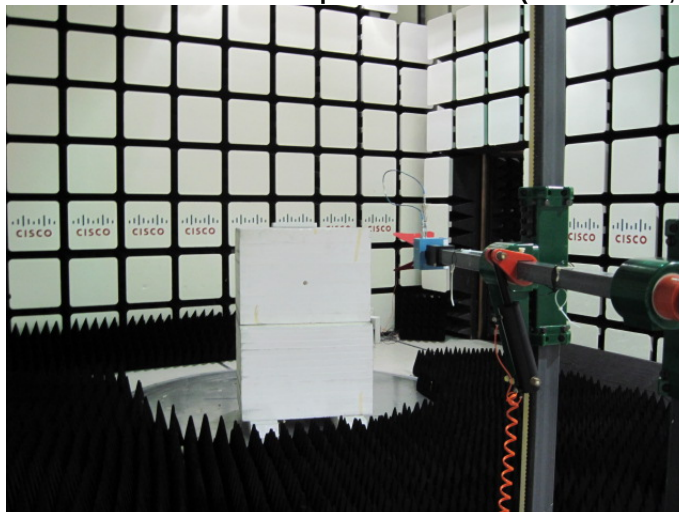




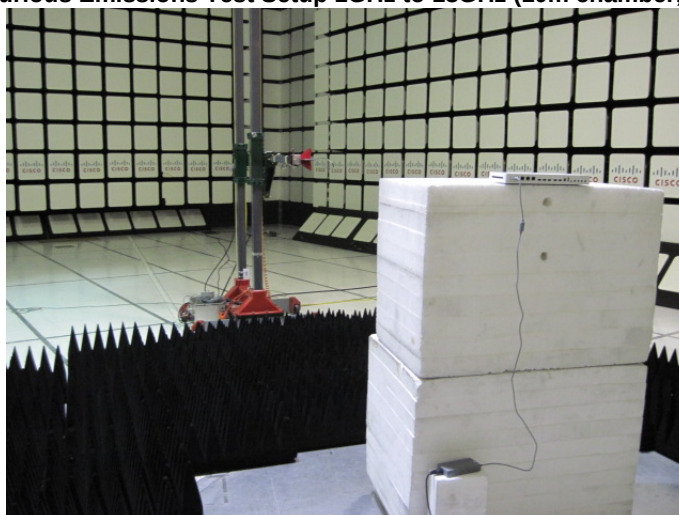
Radiated Spurious Emissions Test Setup 30MHz to 1GHz



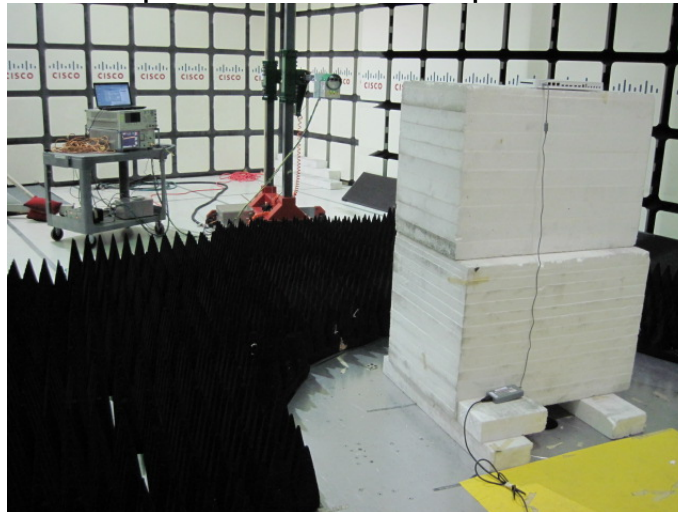
Radiated Spurious Emissions Test Setup 1GHz to 18GHz (5m chamber, 3m distance)



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



Radiated Spurious Emissions Test Setup 18GHz to 40GHz



AC Conducted Emissions





Appendix E: Software Used to Perform Testing

EMlsoft Vasona, version 6.024



Appendix F: Test Procedures

Measurements were made in accordance with

- KDB 789033 - D02 General UNII Test Procedures New Rules v01r02
- KDB 662911 - MIMO
- ANSI C63.10 2013 Intentional Radiators
- LP0002:2016

Test procedures are summarized below:

FCC 5GHz Test Procedures	EDCS # 1445048
FCC 5GHz RSE Test Procedures	EDCS # 1511600



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

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

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



Appendix I: Test Assessment Plan

Compliance Test Plan EDCS# 11633051.