Radio Test Report

(Radiated Spurious Emissions and Conducted Emissions Only)

For

IW-6300H

Supports

2.4 GHz / 5 GHz 802.11 a/ac/b/g/n Wi-Fi radio

FCC ID: LDKESW6300

ISED ID: 2461B-ESW6300

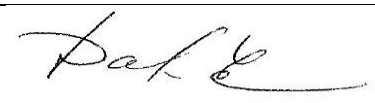
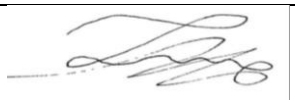
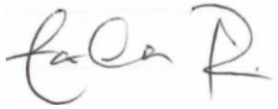
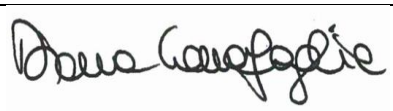
Operating Frequency Band: UNII-3 (5725-5850 MHz)

Against the following Specifications:

47 CFR 15.407
47 CFR 15.209
47 CFR 15.205
RSS-247 issue 2
RSS-Gen issue 5

ACCREDITED

Cisco Systems
170 West Tasman Drive
San Jose, CA 95134

Author:	
Tested By: **Title**: Test Engineers	 Jose Huamani  Farida Rahmanzai
Approved By: **Title**: Compliance Manager	
Version:	1.0

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This test report has been electronically authorized and archived using the CISCO Engineering Document Control system.

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
CFR47 Part 15.247 CFR47 Part 15.205 CFR47 Part 15.209 RSS-247 Issue 2: Feb 2017 RSS-Gen Issue 5: Nov 2018

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:
110V 60 Hz (+/-20%)

2.2 Units of Measurement

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

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

Emission level [dBuV] = Indicated voltage level [dBuV] + Cable Loss [dB] + Other correction factors [dB]

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

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

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

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

Measurement Uncertainty Values

voltage and power measurements	± 2 dB
conducted EIRP measurements	± 1.4 dB
radiated measurements	± 3.2 dB
frequency measurements	± 2.4 10-7
temperature measurements	± 0.54º.
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.

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

20-Sep-2019 to 13-Nov-2019

2.4 Report Issue Date

Cisco uses an electronic system to issue, store and control the revision of test reports. This system is called the Engineering Document Control System (EDCS). The actual report issue date is embedded into the original file on EDCS. Any copies of this report, either electronic or paper, that are not on EDCS must be considered uncontrolled

2.5 Testing facilities

This assessment was performed by:

Testing Laboratory

Cisco Systems, Inc.
425 West Tasman Drive (Building 7)
San Jose, CA 95134
USA

Headquarters

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

Registration Numbers for Industry Canada

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

Test Engineers

Farida Rahmanzai

Jose Huamani

2.6 Equipment Assessed (EUT)

IW-6300H

2.7 EUT Description

IW-6300H is the next generation Industrial Wireless Access Point designed for hazardous location environments known on a go-forward basis as the “IW-6300-Hazloc” or “IW-6300H” model. The IW-6300 supports one 5GHz radio capable of 2x2:2SS and one 2.4 Ghz radio 2x2:2SS with the capability of accommodate 5GHz Mesh and 2.4GHz access simultaneously.

Features Supported:

802.11 AC Wave 2, IP67 rated, and HazLoc Class 1 Division 2 certified Aironet Access Point supporting advanced features.
--> Light weight and compact size
--> Improved temperature range: -50C to 75C
--> Powering Options: AC, DC, and POE In Power
--> Redundant Power via AC & POE-In
--> Dual POE Out provides industry leading versatility
--> IoT Module: Supports a bolt-on module with USB and POE connectivity to enable Wireless HART, ISA 100.11a, and other types of functionality.

IW-6300H has 3 versions,

IW-6300H-AC-X-K9 with ESW-6300-CON-X-K9 is DUPLO with AC Power(100-240V, 50/60Hz)
IW-6300H-DC-X-K9 with ESW-6300-CON-X-K9 is DUPLO with DC Power (44-57VDC)
IW-6300H-DCW-X-K9 with ESW-6300-CON-X-K9 is DUPLO with DC Power (10.8-36VDC)

Wireless Protocols support

● Wi-Fi: IEEE 802.11a, 802.11b, 802.11g, 802.11n, 802.11ac

- **2.4GHz WLAN Radio Supported Modes:**
- 802.11b (1Mbps – 11Mbps)
- 802.11g (6Mbps - 54Mbps)

MIMO single antenna
- 802.11n (HT20, M0 – M7)
- 802.11n (HT40, M0 – M7)

MIMO dual antenna
- 802.11n (HT20, M0 – M15)
- 802.11n (HT40, M0 – M15)

5GHz WLAN Radio Supported Modes:
- 802.11a (6Mbps – 54Mbps)

MIMO Single antenna
- 802.11n (HT20, M0 – M7)
- 802.11n (VHT20, M0 – M7)
- 802.11n (HT40, M0 – M7)
- 802.11n (VHT40, M0 – M7)

MIMO dual antenna
- 802.11n (HT20, M0 – M15)
- 802.11n(VHT20, M0 – M15)
- 802.11n (HT40, M0 – M15)
- 802.11n (VHT40, M0 – M15)

MIMO Single/Dual antenna
- 802.11ac (VHT20, M0 – M9)
- 802.11ac (VHT40, M0 – M9)
- 802.11ac (VHT80, M0 – M9)

Model Differences

IW-6300H-AC-x-K9, IW-6300H-DC-x-K9, IW-6300-DCW-x-K9 and ESW-6300-CON-x-K9, all have the same identical components, electronics circuitries, PCB layout and enclosure.

The only differences are listed as below:

IW-6300H-AC-x-K9
IW-6300H-DC-x-K9
IW-6300-DCW-x-K9
ESW-6300-CON-x-K9

Where “x” can be replaced with another letter to indicate country domain.
Domain letters: A, B, C, D, E, F, H, I, L, M, N, Q, R, S, T, Z

Where “AC” is Alternating Current (AC power supply)
Where “DC” is Direct Current (DC power supply), 54V native input
Where “DCW” is Direct Current; wide range 10-36VDC
Where “K9” is encryption software.

Antenna Specification

The following antennas are supported by this product series.

Frequency	Part Number	Antenna Type	Antenna Gain (dBi)
2.4 GHz	AIR-ANT2450V-N	Single Band Omni	**5**
	AIR-ANT2450V-N-HZ	Single Band Omni, Hazloc	**5**
	AIR-ANT2480V-N	Single Band Omni	**8**
	AIR-ANT2450HG-N	Horizontal Polarized Omni	**5**
	AIR-ANT2450VG-N	Vertical Polarized Omni	**5**
	AIR-ANT2413P2M-N	Single Band, Dual Polarized Directional Patch	**13**
5 GHz	AIR-ANT5180V-N	Single Band Omni	**4**
	AIR-ANT5150HG-N	Horizontal Polarized Omni	**4**
	AIR-ANT5150VG-N	Vertical Polarized Omni	**6**
	AIR-ANT5114P2M-N	Single Band, Dual Polarized Directional Patch	**8**
2.4 GHz/5GHz	AIR-ANT2547V-N=	Dual-band Omni	**4 / 7**
	AIR-ANT2547VG-N=	Dual-band Omni, Gray	**4 / 7**
	AIR-ANT2547V-N-HZ=	Dual-band Omni, Hazloc	**4 / 7**
	AIR-ANT2568VG-N	Dual-band Omni	**6 / 8**
	AIR-ANT2588P3M-N=	Dual-band/Dual Polarized Directional, Patch	**8 / 8**
	AIR-ANT2513P4M-N	Dual-band Polarization Diverse Patch Array	**13 / 13**

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

Section 3: Result Summary

3.1 Results Summary Table

RF Conducted Emissions		
Basic Standard	**Technical Requirements / Details**	**Result**
FCC 15.407	**99%& 26dB Bandwidth:** (e) The 99% occupied bandwidth is the frequency bandwidth such that, below its lower and above its upper frequency limits, the mean powers are each equal to 0.5% of the total mean power of the given emission. The 6 dB emission is the width of the emission that is constrained by the frequencies associated with the two outermost amplitude points (upper and lower frequencies) that are attenuated by 6 dB relative to the maximum level measured in the fundamental emission. Within the 5.725-5.850 GHz band, the minimum 6 dB bandwidth of UNII devices shall be at least 500kHz.	Pass See Note1
FCC 15.407	**Output Power**: (a) (3) For the band 5.725-5.85 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W (30dBm). If the transmitting antennas of directional gain greater than 6dBi are used, The maximum conducted output power shall be reduced by amount in dB that the directional gain of the antenna exceeds 6 dBi.	Pass See Note1
FCC 15.407	**Power Spectral Density**: (a) (2) The maximum power spectral density shall not exceed 30 dBm in any 500-kHz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.	Pass See Note1
FCC 15.407	**Conducted Spurious Emissions / Band-Edge:** (b) (4) (i) For transmitters operating in the 5.725-5.85 GHz band, all emissions shall be limited to a level (e.i.r.p) of: a) -27 dBm/MHz at 75 MHz or more above or below the band edge; b) increasing linearly to 10 dBm/MHz at 25 MHz above or below the band edge, and from 25 MHz above or below the band edge; c) increasing linearly to a level of 15.6 dBm/MHz at 5 MHz above or below the band edge, and from 5 MHz above or below the band edge increasing linearly to a level of 27 dBm/MHz at the band edge.	Pass See Note1

Note1: See FCC Radio test report EDCS#xxxxxxxx

AC Conducted Emissions		
Basic Standard	**Technical Requirements / Details**	**Result**
FCC 15.207	**AC conducted Emissions:** (a) Except as shown in paragraphs (b) and (c) of this section, for an intentional radiator that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies, within the band 150 kHz to 30 MHz, shall not exceed the limits in the section, as measured using a 50 μH/50 ohms line impedance stabilization network (LISN).	Pass

Radiated Spurious Emissions		
FCC 15.407	**Undesirable emission limits**: (b) (4) (i) For transmitters operating in the 5.725-5.850 GHz band: (i) All emissions shall be limited to a level of −27 dBm/MHz at 75 MHz or more above or below the band edge. (6) Unwanted emissions below 1 GHz must comply with the general field strength limits set forth in §15.209. Further, any U-NII devices using an AC power line are required to comply also with the conducted limits set forth in §15.207.	Pass
FCC 15.209	**TX Radiated emissions limits:** (a) Except as provided elsewhere in this subpart, the emissions from an intentional radiator shall not exceed the field strength levels specified in the table of this subpart.	
FCC 15.407	**Restricted band:** (b) (7) The provisions of §15.205 apply to intentional radiators operating under this section.	Pass
FCC 15.205	(a) Except as shown in paragraph (d) of this section, only spurious emissions are permitted in any of the frequency bands listed in the table of this subpart. (b) Except as provided in paragraphs (d) and (e) of this section, the field strength of emissions appearing within these frequency bands shall not exceed the limits shown in §15.209.	

Note1: See FCC Radio test report EDCS#xxxxxxxx
Note2: MPE calculation to be reported in separate report

RF Conducted Emissions		
Basic Standard	**Technical Requirements / Details**	**Result**
RSS-247	**99% & 26 dB Bandwidth**: (6.4.2.1) The 99% occupied bandwidth is the frequency bandwidth such that, below its lower and above its upper frequency limits, the mean powers are each equal to 0.5% of the total mean power of the given emission. The 6 dB emission is the width of the emission that is constrained by the frequencies associated with the two outermost amplitude points (upper and lower frequencies) that are attenuated by 6 dB relative to the maximum level measured in the fundamental emission. Within the 5.725-5.850 GHz band, the minimum 6 dB bandwidth of UNII devices shall be at least 500kHz.	Pass See Note3
RSS-247	**Power Limits**: 6.2.4.1 For equipment operating in the band 5725-5850 MHz, the minimum 6 dB bandwidth shall be at least 500 kHz.The maximum conducted output power shall not exceed 1 W. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.	Pass See Note3
RSS-247	**Power Spectral Density:** 6.2.4.1 The maximum power spectral density shall not exceed 30 dBm in any 500-kHz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.	Pass See Note3
RSS-247	**Conducted Spurious Emissions / Band-Edge**: 6.2.4.2 Devices operating in the band 5725-5850 MHz shall have e.i.r.p. of unwanted emissions comply with the following: a) 27 dBm/MHz at frequencies from the band edges decreasing linearly to 15.6 dBm/MHz at 5 MHz above or below the band edges; b) 15.6 dBm/MHz at 5 MHz above or below the band edges decreasing linearly to 10 dBm/MHz at 25 MHz above or below the band edges; c) 10 dBm/MHz at 25 MHz above or below the band edges decreasing linearly to -27 dBm/MHz at 75 MHz above or below the band edges; and d) -27 dBm/MHz at frequencies more than 75 MHz above or below the band edges.	Pass See Note3

Note3: See RSS Radio test report EDCS#xxxxxxxx

AC Conducted Emissions		
Basic Standard	**Technical Requirements / Details**	**Result**
RSS-Gen	**AC Conducted Emissions:** 8.8 Unless stated otherwise in the applicable RSS, for radio apparatus that are designed to be connected to the public utility AC power network, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies within the range 150 kHz to 30 MHz shall not exceed the limits in table 4, as measured using a 50 µH / 50 Ω line impedance stabilization network.	Pass

Radiated Spurious Emission		
RSS-247	**Unwanted Emissions:** 6.2.4.2 (a) Devices operating in the band 5725-5850 MHz shall have e.i.r.p. of unwanted emissions comply with the following: d) -27 dBm/MHz at frequencies more than 75 MHz above or below the band edges.	Pass
RSS-Gen	**TX Spurious Emissions:** 8.9 Except when the requirements applicable to a given device state otherwise, emissions from licence-exempt transmitters shall comply with the field strength limits shown in Table 4 and Table 5 below. Additionally, the level of any transmitter emission shall not exceed the level of the transmitter's fundamental emission.	
RSS-Gen	**Restricted band:** 8.10 (b) Unwanted emissions that fall into restricted bands of Table 6 shall comply with the limits specified in RSS-Gen.	Pass

Note3: See RSS Radio test report EDCS#xxxxxxxx
Note2: MPE calculation to be reported in separate report

Section 4: Sample Details

Note: Each sample was evaluated to ensure that its condition was suitable to be used as a test sample prior to the commencement of testing. 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	IW-6300H (radiated sample)	Cisco	12	9.1.8.1	2.4.26	FOC23241G3L
S02	IW-6300H (AC conducted sample)	Cisco	12	9.1.8.1	2.4.26	FOC23241G3Q
S03	Air-ANT2513P4M-N Antenna	Cisco	Production	--------	--------	MAS19440415
S04	IW-6300H-AC-X-K9 Power Supply	Delta	Production	--------	--------	DTH2329000P

4.2 System Details

System #	Description	Samples
1	IW-6000H	S01, S03, S04
2	IW-6000H	S02, S03, S04

4.3 Mode of Operation Details

Mode (# of Antenna) Setting#	Wi-Fi Mode	Modulation	Data Rate
Single Mode Antenna			
1 (single antenna)	802.11a*	BPSK	6 Mbps
2 (single antenna)	802.11an (HT20)	BPSK	6.5 Mbps (MCS0)
3 (single antenna)	802.11an (HT40)	BPSK	13.5 Mbps (MCS0)
4 (single antenna)	802.11ac (VHT20)	BPSK	6.5 Mbps (MCS0)
5 (single antenna)	802.11ac (VHT40)	BPSK	13.5 Mbps (MCS0)
6 (single antenna)	802.11ac (VHT80)	BPSK	29.3 Mbps (MCS0)
Dual Mode Antenna			
7 (dual antenna)	802.11an (HT20)	BPSK	13.0 Mbps (MCS0)
8 (dual antenna)	802.11an (HT40)*	BPSK	27.0 Mbps (MCS0)
9 (dual antenna)	802.11ac (VHT20)	BPSK	13.0 Mbps (MCS0)
10 (dual antenna)	802.11ac (VHT40)	BPSK	27.0 Mbps (MCS0)
11 (dual antenna)	802.11ac (VHT80)	BPSK	58.5 Mbps (MCS0)

Note: Table above represents the worst case scenarios for all modulations and data rate combination of each mode.

***: Setting**# was determined to be the worst case emissions of all modes and selected for RSE testing.

Appendix A: RF Conducted Emissions

Target Maximum Channel Power

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

Operating Mode	Maximum Channel Power (dBm) Frequency (MHz)	

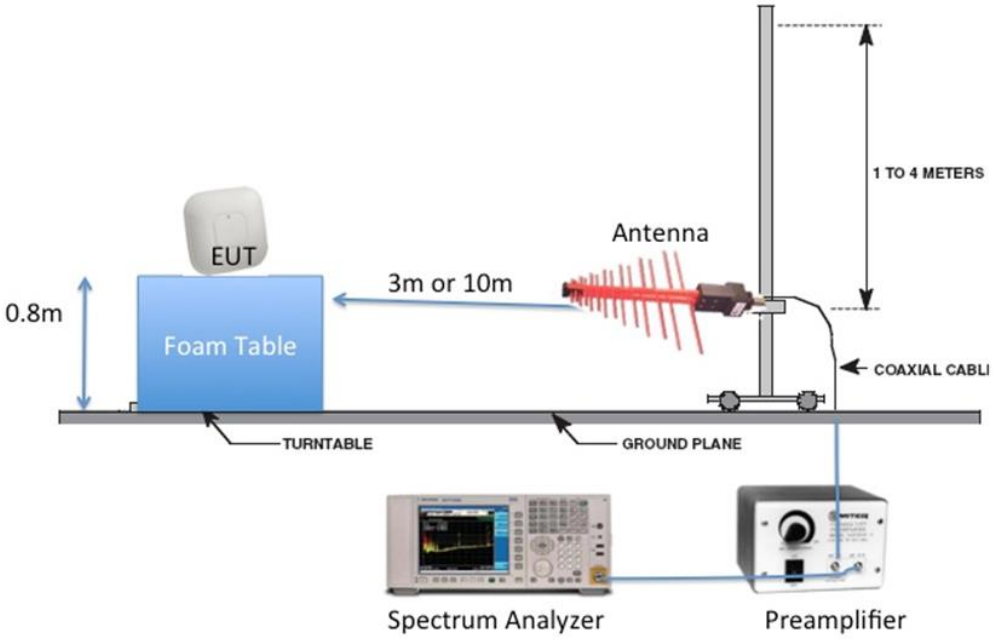
Appendix B: Radiated Spurious and AC Conducted Emissions

Testing Laboratory: Cisco Systems, Inc., 425 East Tasman Drive, San Jose, CA 95134, USA

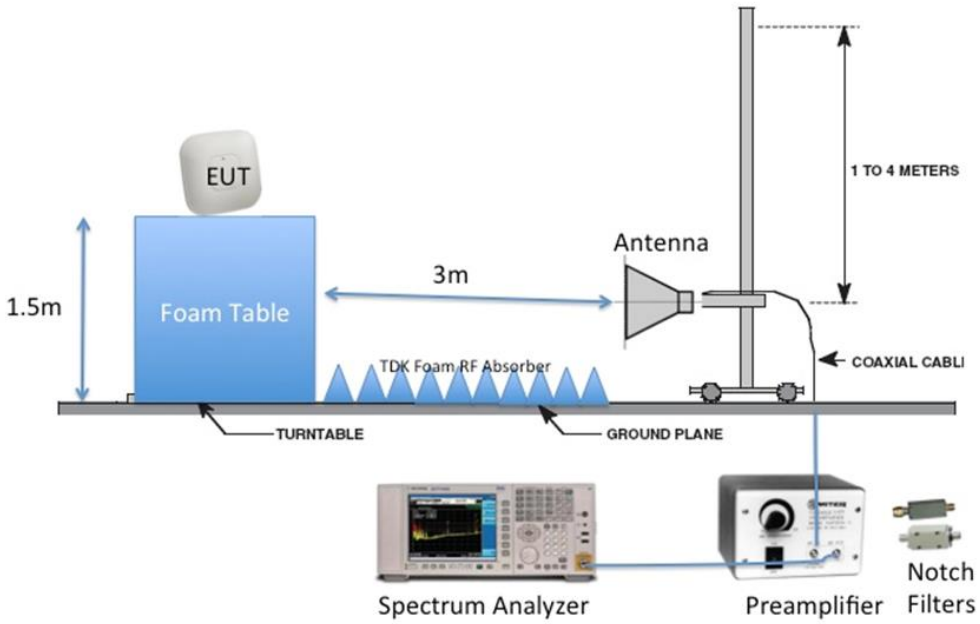
B.1 Radiated Spurious Emissions

B1.1 Setup Diagram

Below 1G (Preamp used is optional)



Above 1G



B1.2 Restricted Bands

15.407 (b) (7) The provisions of 15.205 apply to intentional radiators operating under this section

15.205 (b) Except as provided in paragraphs (d) and (e) of this section, the field strength of emissions appearing within these frequency bands shall not exceed the limits shown in §15.209. Refer to limit section for detailed limits.

Restricted Bands for FCC			
MHz	**MHz**	**MHz**	**GHz**
0.090-0.110	16.42-16.423	399.9-410	4.5-5.15
[1]0.495-0.505	16.69475-16.69525	608-614	5.35-5.46
2.1735-2.1905	16.80425-16.80475	960-1240	7.25-7.75
4.125-4.128	25.5-25.67	1300-1427	8.025-8.5
4.17725-4.17775	37.5-38.25	1435-1626.5	9.0-9.2
4.20725-4.20775	73-74.6	1645.5-1646.5	9.3-9.5
6.215-6.218	74.8-75.2	1660-1710	10.6-12.7
6.26775-6.26825	108-121.94	1718.8-1722.2	13.25-13.4
6.31175-6.31225	123-138	2200-2300	14.47-14.5
8.291-8.294	149.9-150.05	2310-2390	15.35-16.2
8.362-8.366	156.52475-156.52525	2483.5-2500	17.7-21.4
8.37625-8.38675	156.7-156.9	2690-2900	22.01-23.12
8.41425-8.41475	162.0125-167.17	3260-3267	23.6-24.0
12.29-12.293	167.72-173.2	3332-3339	31.2-31.8
12.51975-12.52025	240-285	3345.8-3358	36.43-36.5
12.57675-12.57725	322-335.4	3600-4400	Above 38.6
13.36-13.41			

RSS-Gen 8.10

(**b**) Unwanted emissions that fall into restricted bands of Table 6 shall comply with the limits specified in RSS-Gen.

(**c**) Unwanted emissions that do not fall within the restricted frequency bands of Table 6 shall comply either with the limits specified in the applicable RSS or with those specified in this RSS-Gen.

Table 6 Restricted Bands

MHz	MHz	GHz
0.090-0.110	74.8-75.2	9.0-9.2
2.1735-2.1905	108-138	9.3-9.5
3.020-3.026	156.52475-156.52525	10.6-12.7
4.125-4.128	156.7-156.9	13.25-13.4
4.17725-4.17775	240-285	14.47-14.5
4.20725-4.20775	322-335.4	15.35-16.2
5.677-5.683	399.9-410	17.7-21.4
6.215-6.218	608-614	22.01-23.12
6.26775-6.26825	960-1427	23.6-24.0
6.31175-6.31225	1435-1626.5	31.2-31.8
8.291-8.294	1645.5-1646.5	36.43-36.5
8.362-8.366	1660-1710	Above 38.6
8.37625-8.38675	1718.8-1722.2	*
8.41425-8.41475	2200-2300	
12.29-12.293	2310-2390	
12.51975-12.52025	2655-2900	
12.57675-12.57725	3260-3267	
13.36-13.41	3332-3339	
16.42-16.423	3345.8-3358	
16.69475-16.69525	3500-4400	
16.80425-16.80475	4500-5150	
25.5-25.67	5350-5460	
37.5-38.25	7250-7750	
73-74.6	8025-8500	

B1.3 Limits

Below 1 GHz

FCC 15.209
The level of any unwanted emissions from an intentional radiator operating under these general provisions shall not exceed the level of the fundamental emission. Except as provided elsewhere in this subpart, the emissions from an intentional radiator shall not exceed the field strength levels specified in the table specified in the table in FCC§15.209(a).

FCC15.407

(b) (6) Unwanted emissions below 1GHz must comply with general field strength limits set forth in §15.209.

RSS-Gen 8.9: Except when the requirements applicable to a given device state otherwise, emissions from licence-exempt transmitters shall comply with the field strength limits shown in Table below. Additionally, the level of any transmitter emission shall not exceed the level of the transmitter's fundamental emission.

General Field Strength Limits Table			
Frequency (MHz)	**Field strength (uV/meter)**	**Field strength (dBuV/meter)**	**Measurement distance (meters)**
30-88	100**	40 Qp	3
88-216	150**	43.5 Qp	3
216-960	200**	46 Qp	3
Above 960	500	54 Av / 74 Pk	3

Above 1 GHz

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

(4) For transmitters operating in the 5.725-5.850 GHz band:

(i) All emissions shall be limited to a level of −27 dBm/MHz at 75 MHz or more above or below the band edge increasing linearly to 10 dBm/MHz at 25 MHz above or below the band edge, and from 25 MHz above or below the band edge increasing linearly to a level of 15.6 dBm/MHz at 5 MHz above or below the band edge, and from 5 MHz above or below the band edge increasing linearly to a level of 27 dBm/MHz at the band edge.

RSS-247 6.2.4.2

Devices operating in the band 5725-5850 MHz shall have e.i.r.p. of unwanted emissions comply with the following:

a) 27 dBm/MHz at frequencies from the band edges decreasing linearly to 15.6 dBm/MHz at 5 MHz above or below the band edges;

b) 15.6 dBm/MHz at 5 MHz above or below the band edges decreasing linearly to 10 dBm/MHz at 25 MHz above or below the band edges;

c) 10 dBm/MHz at 25 MHz above or below the band edges decreasing linearly to -27 dBm/MHz at 75 MHz above or below the band edges; and

d) -27 dBm/MHz at frequencies more than 75 MHz above or below the band edges.

Limit Conversion (power to field strength)

The field strength limit in dBµV can be converted from power (logarithmic) by using the field strength (linear) approach formula as follows:

$$\mathbf{V/m} = \frac{\sqrt{30 \times Pt \times gt}}{d}$$

where: **pt** = transmitter output power in watts,
gt = numeric gain of the transmitting antenna (unit less),
E = electric field strength in V/m,
d = measurement distance in meters (m).

From the equation above, unit conversion from log => linear with a known power limit of -27 dBm.

(1) Conversion from dBm to Watt

dBm to Watts W = 10((dBm – 30)/10)

$P(W) = 10^{(-27 -120) / 20}$
$= 10^{-5.7}$
$= 1.995 \times 10^{-6}$

(2) Convert from Watt to field strength

a. Convert from Watt to V/m @ 3m distance

$$\mathbf{V/m} = \frac{\sqrt{30 \times Pt \times gt}}{3}$$

$$= \frac{\sqrt{30 \times 0.000001995 \times 1}}{3}$$

= **0.00257**

b. Convert field strength to power density (**V/m to dBµV/m)**

dBµV/m = 20 log (V/m) + 120

= **68.2**

B1.4 Test Procedure

Ref. ANSI C63.10-2013 section 6.5 & 6.6, Cispr16-1-1

ANSI C63.10: 2013 section 4.1.4 / section 12.7.5 (Quasi-Peak), section 12.7.6 (peak), section 12.7.7.3 (average)

Test parameters
(i) Span = Entire frequency range or segment if necessary. (ii) Reference Level = 80 dBuV (iii) RBW = 100 kHz (less than or equal to 1 GHz); 1 MHz (above 1 GHz) (iv) VBW ≥ 3 x RBW (v) Detector = Peak & Quasi-Peak (frequency range 30 MHz to 1 GHz); Peak & Average (frequency range above 1 GHz); Change VBW to 10 Hz for average measurement (vi) Sweep Time = Couple

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.

Terminate the access Point RF ports with 50 ohm loads.
Maximize Turntable (find worst case table angle), Maximize Antenna (find worst case height)

30MHz – 18GHz,
Save plots: Peak plot (Vertical and Horizontal) @3m

Above 18 GHz,
Save plots: Peak plot (Vertical and Horizontal) @1m

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

Note: The data displayed on the plots detailed in the graphical test results section were measured using a 'Peak Detector'. Please refer to the results table for the detectors used during formal measurements.

This report represents the worst case data for all supported operating modes with antenna which has maximum gain.

Samples, Systems, and Modes

System Number	Description	Samples	System under test	Support equipment
1	EUT	IW-6300H with Air-ANT2513P4M-N antenna	☑	☐
	Support	IW-6300H-AC-X-K9 power supply	☐	☑

Mode Setting#	Wi-Fi Mode	Modulation	Data Rate
1 (single antenna)	802.11a*	BPSK	6 Mbps
8 (dual antenna)	802.11an (HT40)*	BPSK	27.0 Mbps (MCS0)

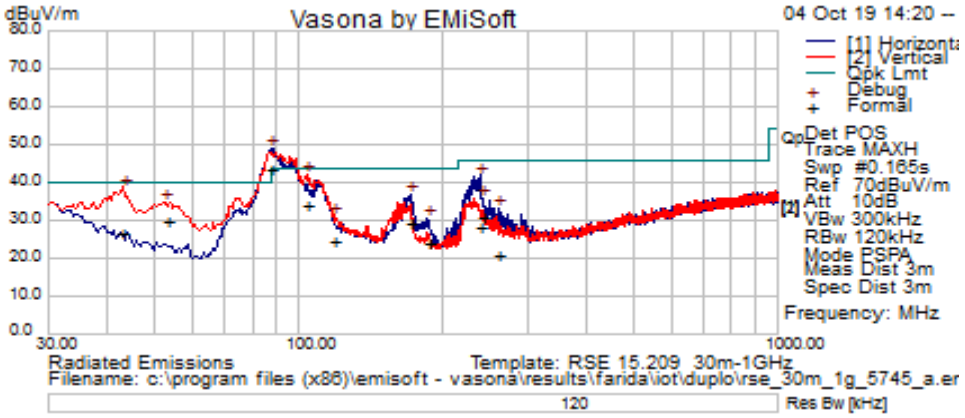
Tested By:	**Date of testing:**
Test Engineer(s): Farida Rahmanzai, Jose Huamani	20-Sep-2019 – 11-Oct-2019
Test Result: PASS	

Test Equipment

See Appendix C for list of test equipment

B1.5 TX Radiated Spurious Emissions Graphical Data Results

Subtest Date:	04-Oct-2019
Engineer	Farida Rahmanzai Jose Huamani
Lab Information	Building 7, 5m Anechoic
Subtest Title	Transmitter Spurious Emissions
Frequency Range	30MHz - 1GHz
Comments on the above Test Results	**802.11a**, Tx Channel 149 (5745 MHz)



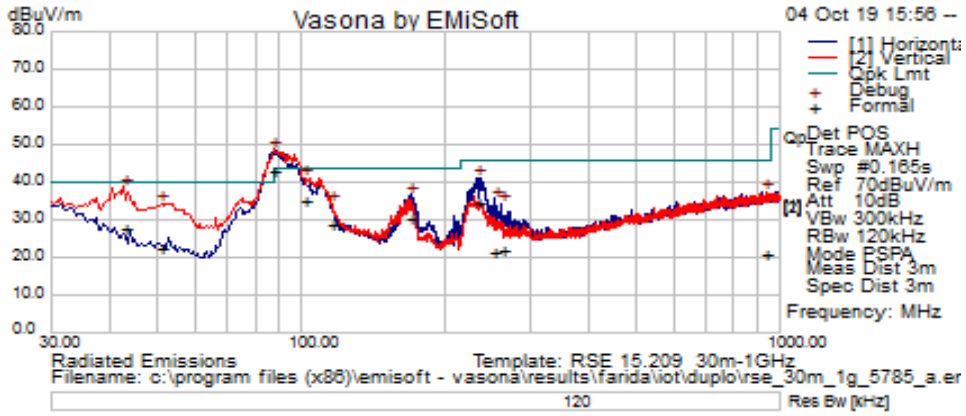
Title: **TX Spurious Emissions from 30MHz-1GHz – Ch149 (5745 MHz)**

Frequency (MHz)	Raw (dBuV)	Cab Loss (dB)	AF (dB)	Level (dBuV)	Detector	Polarity	Height (cm)	Azt (Deg)	Limit (dBuV)	Margin (dB)	Results Pass / Fail	Comments
87.2345	35.53	0.49	7.5	43.53	Quasi Max	H	365	96	50*	-6.47	Pass	See notes
104.2968	22.48	0.54	11.06	34.07	Quasi Max	H	210	222	43.5	-9.43	Pass	
42.786	14.32	0.35	11.87	26.54	Quasi Max	V	213	221	40	-13.46	Pass	
238.3423	15.73	0.83	11.63	28.19	Quasi Max	H	358	235	46	-17.81	Pass	
53.0545	22.05	0.4	7.29	29.75	Quasi Max	V	102	187	40	-10.25	Pass	
171.4943	17.4	0.71	11.3	29.41	Quasi Max	H	208	218	43.5	-14.09	Pass	
242.2598	18.2	0.83	11.7	30.74	Quasi Max	H	104	207	46	-15.26	Pass	
118.015	10.59	0.57	13.6	24.76	Quasi Max	V	198	74	43.5	-18.74	Pass	
261.2858	8	0.86	12.26	21.12	Quasi Max	H	226	124	46	-24.88	Pass	
185.9803	12.39	0.74	10.8	23.92	Quasi Max	H	153	238	43.5	-19.58	Pass	

Note1: 87.23MHz is detemined to be non-radio related signal. FCC part15.109 class A limit applied.
Also see FCC Part15.109 test report.

Note2: * means FCC part15.109 class A limit.

Subtest Date:	04-Oct-2019
Engineer	Farida Rahmanzai Jose Huamani
Lab Information	Building 7, 5m Anechoic
Subtest Title	Transmitter Spurious Emissions
Frequency Range	30MHz - 1GHz
Comments on the above Test Results	**802.11a**, Tx Channel 157 (5785 MHz)



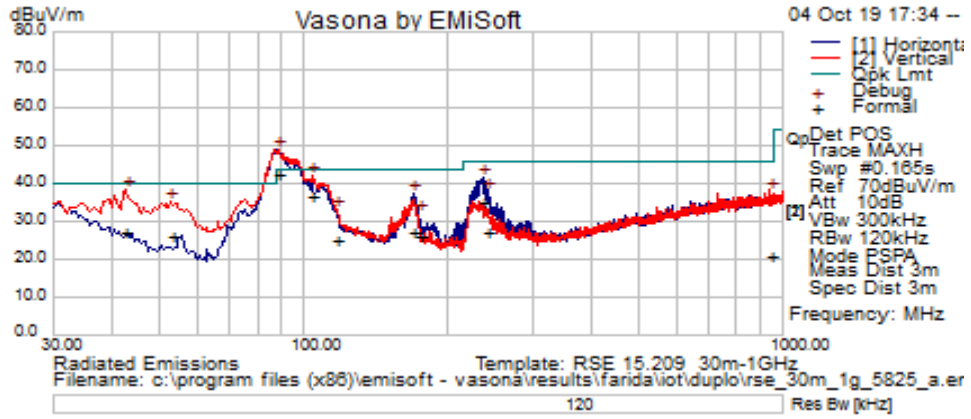
Title: **TX Spurious Emissions from 30MHz-1GHz – Ch157 (5785 MHz)**

Frequency (MHz)	Raw (dBuV)	Cab Loss (dB)	AF (dB)	Level (dBuV)	Detector	Polarity	Height (cm)	Azt (Deg)	Limit (dBuV)	Margin (dB)	Results Pass / Fail	Comments
87.74475	35.04	0.5	7.5	43.03	Quasi Max	H	199	261	50*	-6.97	Pass	See notes
42.5945	15.28	0.35	12.02	27.65	Quasi Max	V	118	36	40	-12.35	Pass	
101.5068	24.41	0.53	10.35	35.29	Quasi Max	V	153	263	43.5	-8.21	Pass	
232.7433	22.52	0.82	11.37	34.71	Quasi Max	H	107	215	46	-11.29	Pass	
50.70275	14.32	0.39	7.79	22.5	Quasi Max	V	296	359	40	-17.5	Pass	
169.796	18.43	0.7	11.42	30.55	Quasi Max	H	161	229	43.5	-12.95	Pass	
935.6403	-2.9	1.66	22.34	21.1	Quasi Max	V	321	158	46	-24.9	Pass	
115.2458	15	0.56	13.22	28.79	Quasi Max	V	184	118	43.5	-14.71	Pass	
253.3625	8.94	0.85	11.5	21.29	Quasi Max	V	177	0	46	-24.71	Pass	
262.6198	8.73	0.87	12.52	22.12	Quasi Max	V	117	143	46	-23.88	Pass	

Note1: 87.74MHz is detemined to be non-radio related signal. FCC part15.109 class A limit applied.
Also see FCC Part15.109 test report.

Note2: * means FCC part15.109 class A limit.

Subtest Date:	04-Oct-2019
Engineer	Farida Rahmanzai Jose Huamani
Lab Information	Building 7, 5m Anechoic
Subtest Title	Transmitter Spurious Emissions
Frequency Range	30MHz - 1GHz
Comments on the above Test Results	**802.11a**, Tx Channel 165 (5825 MHz)



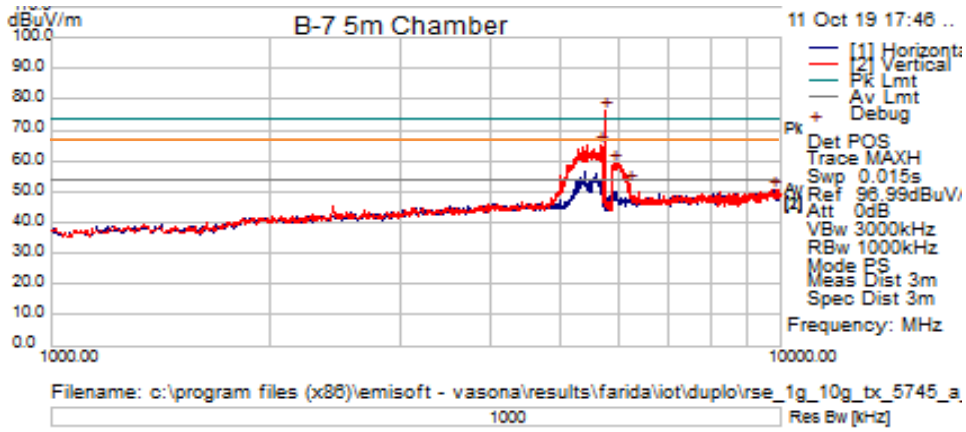
Title: **TX Spurious Emissions from 30MHz-1GHz – Ch165 (5825 MHz)**

Frequency (MHz)	Raw (dBuV)	Cab Loss (dB)	AF (dB)	Level (dBuV)	Detector	Polarity	Height (cm)	Azt (Deg)	Limit (dBuV)	Margin (dB)	Results Pass / Fail	Comments
88.179	34.64	0.5	7.52	42.65	Quasi Max	H	214	251	53.5*	-10.85	Pass	See notes
103.9708	25.22	0.53	10.99	36.74	Quasi Max	V	133	140	43.5	-6.76	Pass	
42.17225	14.47	0.35	12.36	27.18	Quasi Max	V	142	129	40	-12.82	Pass	
236.1693	22.95	0.82	11.52	35.29	Quasi Max	H	103	227	46	-10.71	Pass	
53.03025	18.31	0.4	7.3	26.02	Quasi Max	V	251	335	40	-13.98	Pass	
169.8175	15.03	0.7	11.42	27.15	Quasi Max	V	198	166	43.5	-16.35	Pass	
241.9645	14.5	0.83	11.7	27.03	Quasi Max	H	164	231	46	-18.97	Pass	
938.7485	-2.91	1.67	22.37	21.14	Quasi Max	H	325	348	46	-24.86	Pass	
117.2658	11.15	0.57	13.53	25.25	Quasi Max	H	150	220	43.5	-18.25	Pass	
174.499	14.35	0.71	11.1	26.16	Quasi Max	H	139	199	43.5	-17.34	Pass	

Note1: 88.18MHz is detemined to be non-radio related signal. FCC part15.109 class A limit applied.
Also see FCC Part15.109 test report.

Note2: * means FCC part15.109 class A limit.

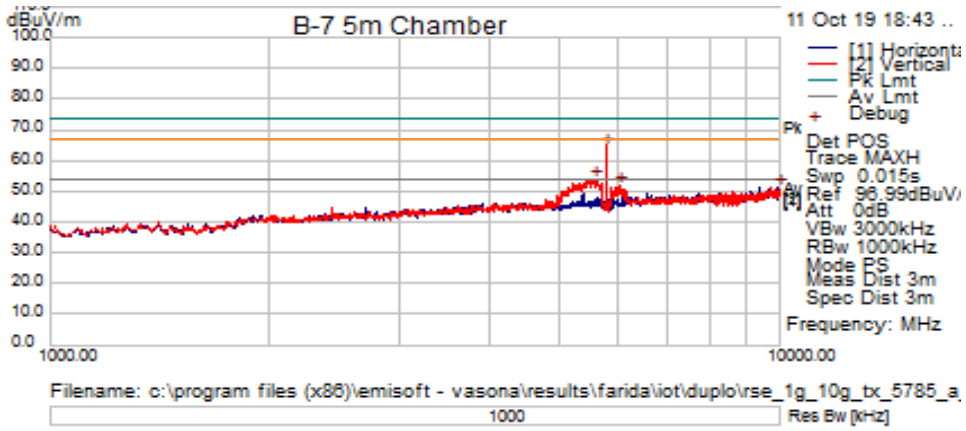
Subtest Date:	11-Oct-2019
Engineer	Farida Rahmanzai Jose Huamani
Lab Information	Building 7, 5m Anechoic
Subtest Title	Transmitter Spurious Emissions
Frequency Range	1GHz - 10GHz
Comments on the above Test Results	**802.11a**, Tx Channel 149 (5745 MHz)



Title: **TX Spurious Emissions from 1GHz-10GHz – Ch149 (5745 MHz)**

Frequency (MHz)	Raw (dBuV)	Cab Loss (dB)	AF (dB)	Level (dBuV)	Detector	Polarity	Height (cm)	Azt (Deg)	Limit (dBuV)	Margin (dB)	Results Pass / Fail	Comments
5741.875	71.45	9.97	-5.05	76.36	Peak	V	125	340	N/A	N/A	Ignored	Fundamental
5668.75	60.55	9.9	-5.34	65.1	Peak	V	125	332	72.2	-7.1	Pass	-23dBm/MHz
5910.625	54.07	10.18	-4.98	59.27	Peak	V	100	336	73.2	-13.9	Pass	-22dBm/MHz
6203.125	46.53	10.53	-4.27	52.8	Peak	V	100	342	68.2	-15.4	Pass	-27dBm/MHz

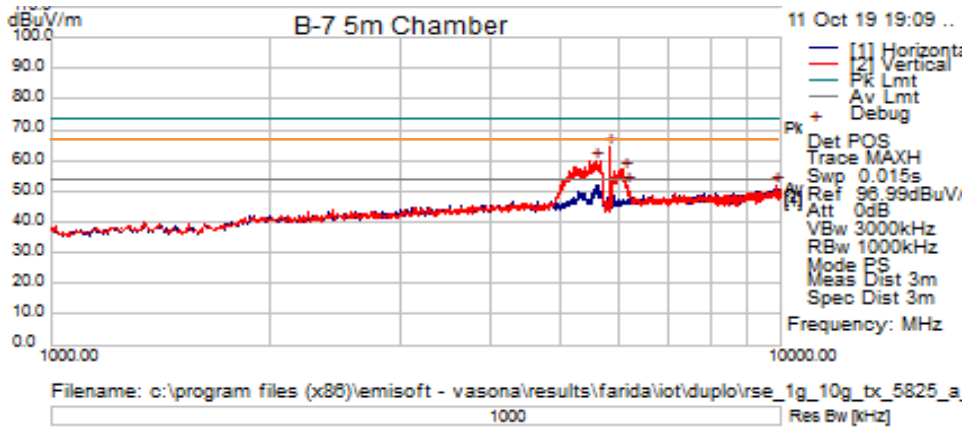
Subtest Date:	11-Oct-2019
Engineer	Farida Rahmanzai Jose Huamani
Lab Information	Building 7, 5m Anechoic
Subtest Title	Transmitter Spurious Emissions
Frequency Range	1GHz - 10GHz
Comments on the above Test Results	**802.11a**, Tx Channel 157 (5785 MHz)



Title: **TX Spurious Emissions from 1GHz-10GHz – Ch157 (5785 MHz)**

Frequency (MHz)	Raw (dBuV)	Cab Loss (dB)	AF (dB)	Level (dBuV)	Detector	Polarity	Height (cm)	Azt (Deg)	Limit (dBuV)	Margin (dB)	Results Pass / Fail	Comments
5781.25	59.69	9.97	-4.83	64.84	Peak	V	150	342	N/A	N/A	Ignored	Fundamental
5573.125	49.56	9.75	-5.26	54.04	Peak	V	100	332	68.2	-14.16	Pass	-27dBm/MHz
6034.375	46.39	10.39	-4.56	52.22	Peak	V	125	334	68.2	-15.98	Pass	-27dBm/MHz

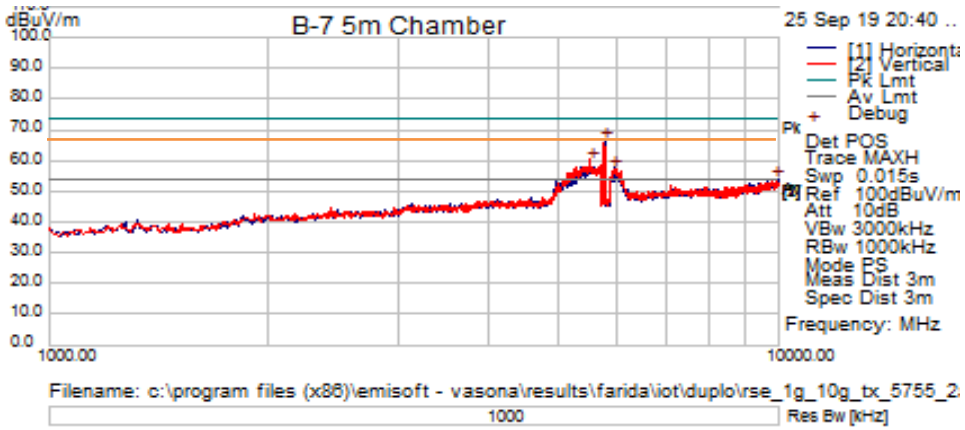
Subtest Date:	11-Oct-2019
Engineer	Farida Rahmanzai Jose Huamani
Lab Information	Building 7, 5m Anechoic
Subtest Title	Transmitter Spurious Emissions
Frequency Range	1GHz - 10GHz
Comments on the above Test Results	**802.11a**, Tx Channel 165 (5825 MHz)



Title: **TX Spurious Emissions from 1GHz-10GHz – Ch165 (5825 MHz)**

Frequency (MHz)	Raw (dBuV)	Cab Loss (dB)	AF (dB)	Level (dBuV)	Detector	Polarity	Height (cm)	Azt (Deg)	Limit (dBuV)	Margin (dB)	Results Pass / Fail	Comments
5820.625	59.78	10.09	-5.2	64.67	Peak [Scan]	V	150	338	N/A	N/A	Ignored	Fundamental
6090.625	51.05	10.4	-4.39	57.06	Peak [Scan]	V	150	333	68.2	-11.14	Pass	-27dBm/MHz
6169.375	45.65	10.49	-4.22	51.92	Peak [Scan]	V	100	334	68.2	-16.28	Pass	-27dBm/MHz

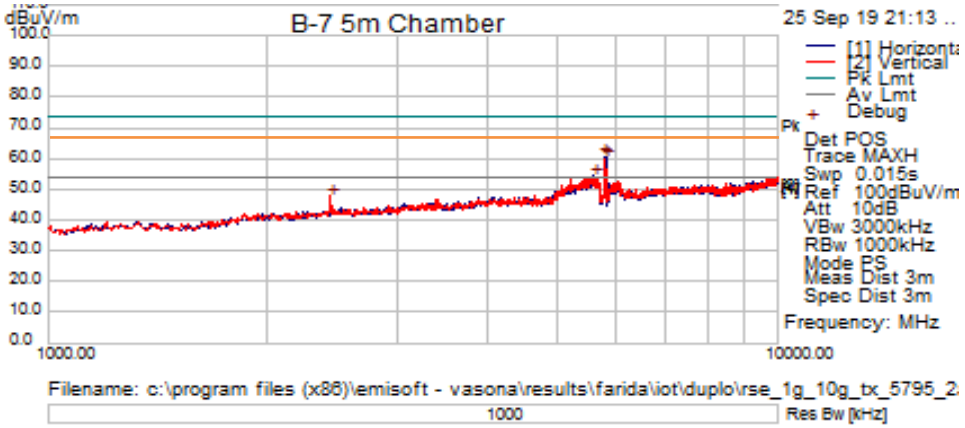
Subtest Date:	25-Sep-2019
Engineer	Farida Rahmanzai Jose Huamani
Lab Information	Building 7, 5m Anechoic
Subtest Title	Transmitter Spurious Emissions
Frequency Range	1GHz - 10GHz
Comments on the above Test Results	**802.11n40**, Tx Channel 151 (5755 MHz)



Title: **TX Spurious Emissions from 1GHz-10GHz – Ch151 (5755 MHz)**

Frequency (MHz)	Raw (dBuV)	Cab Loss (dB)	AF (dB)	Level (dBuV)	Detector	Polarity	Height (cm)	Azt (Deg)	Limit (dBuV)	Margin (dB)	Results Pass / Fail	Comments
5770	61.63	9.53	-4.78	66.38	Peak	H	150	20	N/A	N/A	Ignored	Fundamental
5500.745	55.54	9.31	-5.37	59.49	Peak	V	101	16	68.2	-8.71	Pass	
5946.583	50.74	9.76	-4.61	55.88	Peak	H	101	28	68.2	-12.32	Pass	

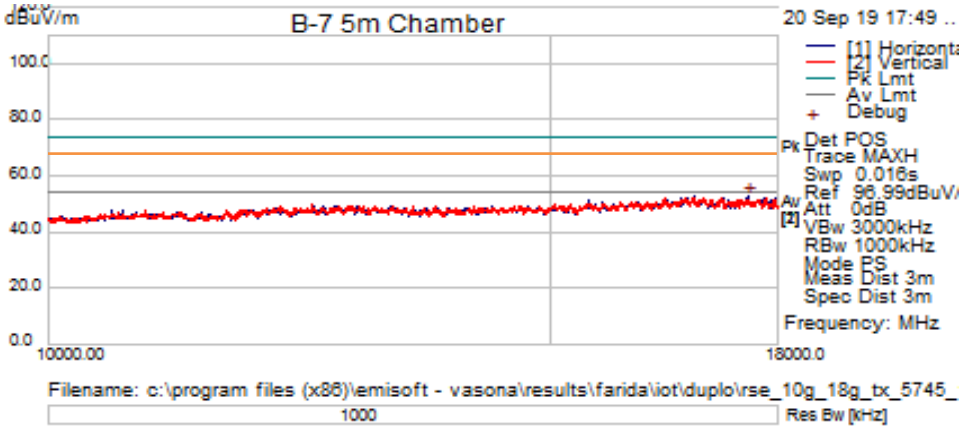
Subtest Date:	25-Sep-2019
Engineer	Farida Rahmanzai Jose Huamani
Lab Information	Building 7, 5m Anechoic
Subtest Title	Transmitter Spurious Emissions
Frequency Range	1GHz - 10GHz
Comments on the above Test Results	**802.11n40**, Tx Channel 159 (5795 MHz)



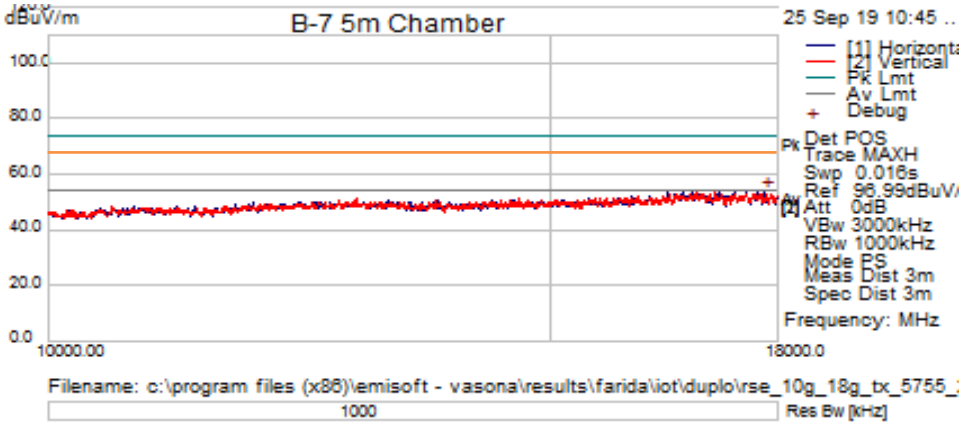
Title: **TX Spurious Emissions from 1GHz-10GHz – Ch159 (5795 MHz)**

Frequency (MHz)	Raw (dBuV)	Cab Loss (dB)	AF (dB)	Level (dBuV)	Detector	Polarity	Height (cm)	Azt (Deg)	Limit (dBuV)	Margin (dB)	Results Pass / Fail	Comments
5781.25	55.72	9.56	-4.83	60.45	Peak [Scan]	H	125	15	N/A	N/A	Ignored	Fundamental
5595.625	50.26	9.37	-5.39	54.24	Peak [Scan]	H	125	15	68.2	-13.96	Pass	
2440	48.97	5.89	-7.09	47.77	Peak [Scan]	V	125	148	68.2	-20.43	Pass	

Subtest Date:	20-Sep-2019 - 25-Sep-2019
Engineer	Farida Rahmanzai Jose Huamani
Lab Information	Building 7, 5m Anechoic
Subtest Title	Transmitter Spurious Emissions
Frequency Range	10GHz - 18GHz
Comments on the above Test Results	**802.11a**, Tx Channel 149 (5745 MHz) **802.11n40**, Tx Channel 151 (5755 MHz)

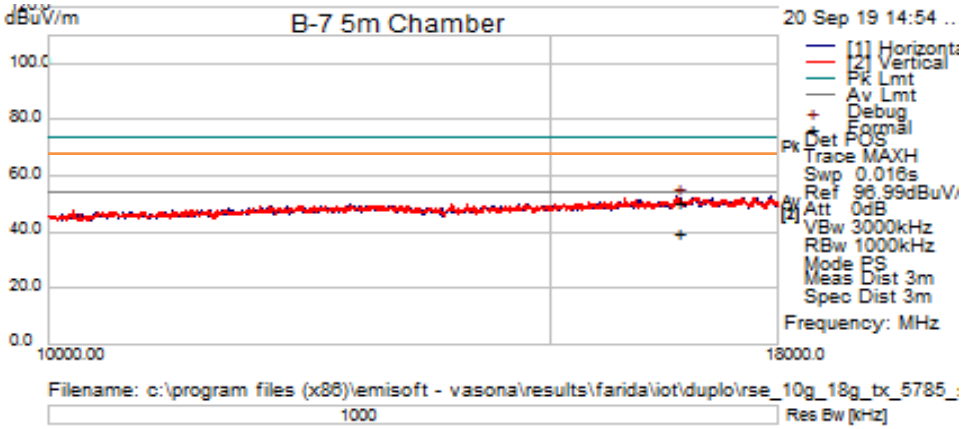


Title: **TX Spurious Emissions from 10GHz-18GHz – Ch149 (5745 MHz)**

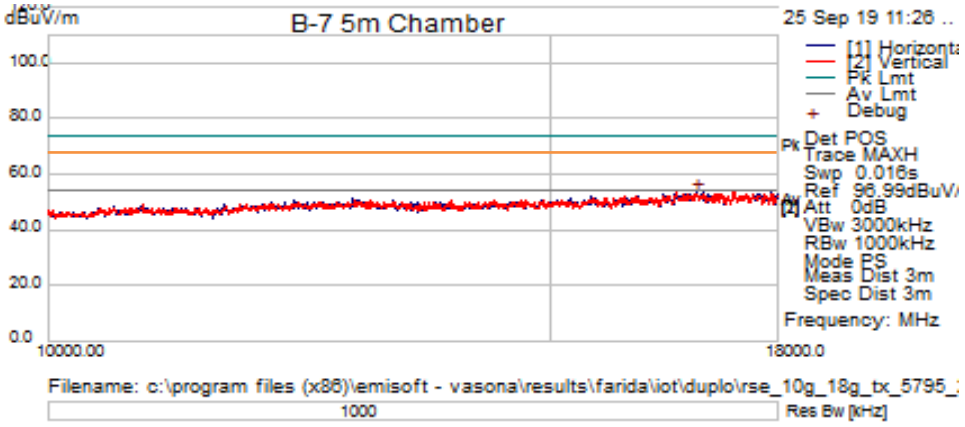


Title: **TX Spurious Emissions from 10GHz-18GHz – Ch151 (5755 MHz)**

Subtest Date:	20-Sep-2019 - 25-Sep-2019
Engineer	Farida Rahmanzai Jose Huamani
Lab Information	Building 7, 5m Anechoic
Subtest Title	Transmitter Spurious Emissions
Frequency Range	10GHz - 18GHz
Comments on the above Test Results	**802.11a**, Tx Channel 157 (5785 MHz) **802.11n40**, Tx Channel 159 (5795 MHz)

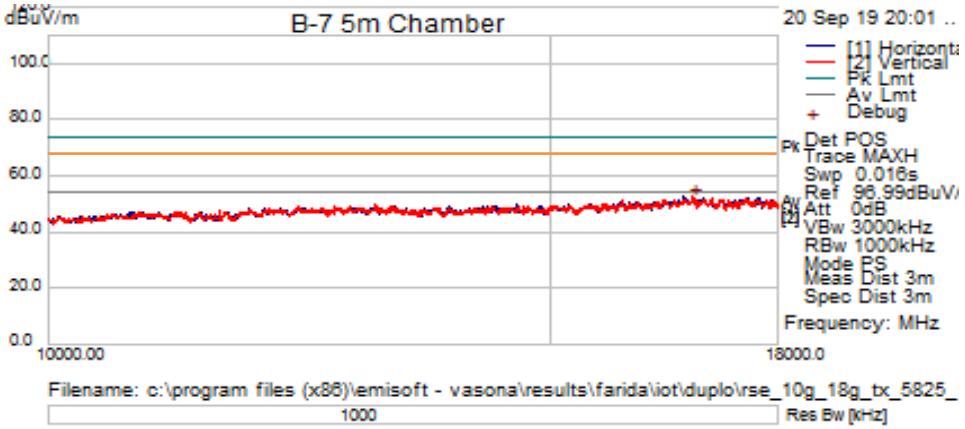


Title: **TX Spurious Emissions from 10GHz-18GHz – Ch157 (5785 MHz)**



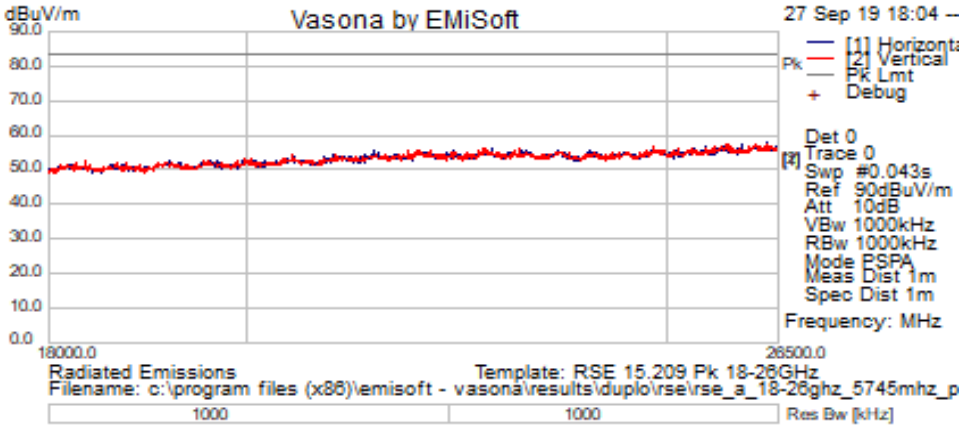
Title: **TX Spurious Emissions from 10GHz-18GHz – Ch159 (5795 MHz)**

Subtest Date:	20-Sep-2019
Engineer	Farida Rahmanzai Jose Huamani
Lab Information	Building 7, 5m Anechoic
Subtest Title	Transmitter Spurious Emissions
Frequency Range	10GHz - 18GHz
Comments on the above Test Results	**802.11a**, Tx Channel 165 (5825 MHz)

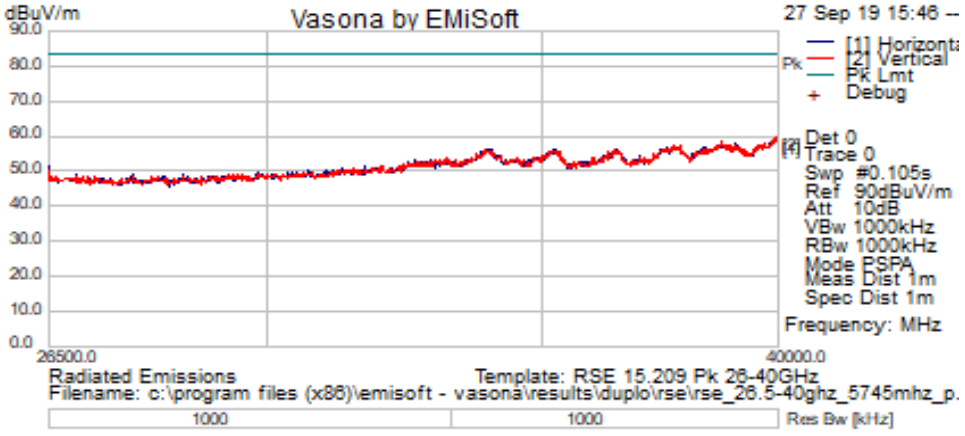


Title: **TX Spurious Emissions from 10GHz-18GHz – Ch165 (5825 MHz)**

Subtest Date:	27-Sep-2019
Engineer	Farida Rahmanzai Jose Huamani
Lab Information	Building 7, 5m Anechoic
Subtest Title	Transmitter Spurious Emissions
Frequency Range	18GHz - 40GHz
Comments on the above Test Results	**802.11a**, Tx Channel 149 (5745 MHz)



Title: **TX Spurious Emissions from 18GHz-26.5GHz – Ch149 (5745 MHz)**



Title: **TX Spurious Emissions from 26.5GHz-40GHz – Ch149 (5745 MHz)**

B.2 AC Conducted Emissions

B2.1 Limits

FCC 15.207: (a) Except as shown in paragraphs (b) and (c) of this section, for an intentional radiator that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies, within the band 150 kHz to 30 MHz, shall not exceed the limits in the following table, as measured using a 50 μH/50 ohms line impedance stabilization network (LISN).

	Conducted Limits	
Frequency of Emission (MHz)	Quasi-Peak	Average
0.15 – 0.5	66 to 56*	56 to 46*
0.5 – 5	56	46
5 – 30	60	50

RSS-Gen 8.8: Unless stated otherwise in the applicable RSS, for radio apparatus that are designed to be connected to the public utility AC power network, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies within the range 150 kHz to 30 MHz shall not exceed the limits in table 4 (AC power-line conducted emissions limit), as measured using a 50 μH / 50 Ω line impedance stabilization network. This requirement applies for the radio frequency voltage measured between each power line and the ground terminal of each AC power-line mains cable of the EUT.

B2.2 Test Procedures

Ref: C63.10:2013, section 6.2.2

Section 6.2.2 Measurement requirements

Measured levels of ac power-line conducted emission shall be the emission voltages from the voltage probe or across the 50 Ω LISN port (to which the EUT is connected), where permitted, terminated into a 50 Ω measuring instrument, or where permitted or required, the emission currents on the power line sensed by a current probe. All emission voltage and current measurements shall be made on each current-carrying conductor at the plug end of the EUT power cord by the use of mating plugs and receptacles on the LISN, if used. Equipment shall be tested with power cords that are normally supplied or recommended by the manufacturer, and that have electrical and shielding characteristics that are the same as those cords normally supplied or recommended by the manufacturer. For those measurements, using a LISN, the 50 Ω measuring port is terminated by a measuring instrument having a 50 Ω input impedance. All other ports are terminated in 50 Ω loads. Figure 5, Figure 6, and Figure 7 show typical test setups for ac power-line conducted emissions testing (see 6.13). For information about the use of a RF-shielded (screen) room, vertical conducting plane and voltage probe, see ANSI C63.4.

Tabletop devices shall be placed on a platform of nominal size, 1 m by 1.5 m, raised 80 cm above the reference ground plane. The vertical conducting plane or wall of an RF-shielded (screen) room shall be located 40 cm to the rear of the EUT. Floor-standing devices shall be placed either directly on the reference ground-plane or on insulating material as described in ANSI C63.4. All other surfaces of tabletop or floor standing EUTs shall be at least 80 cm from any other grounded conducting surface, including the case or cases of one or more LISNs.

Section 6.2.5 Final ac power-line conducted emission measurements

Based on the exploratory tests of the EUT performed in 6.2.4, the one EUT cable configuration and arrangement and mode of operation that produced the emission with the highest amplitude relative to the limit is selected for the final measurement, while applying the appropriate modulating signal to the EUT. If the EUT is relocated from an exploratory test site to a final test site, the highest emissions shall be remaximized at the final test location before final ac power-line conducted emission measurements are performed. The final test on all current-carrying conductors of all of the power cords to the equipment that comprises the EUT (but not the cords associated with other non-EUT equipment in the system) is then performed for the full frequency range for which the EUT is being tested for compliance without further variation of the EUT arrangement, cable positions, or EUT mode of operation. If the EUT is comprised of equipment units that have their own separate ac power connections, e.g., floor-standing equipment with independent power cords for each shelf that are able to connect directly to the ac power network, each current-carrying conductor of one unit is measured while the other units are connected to a second (or more) LISN(s). All units shall be separately measured. If a power strip is provided by the manufacturer, to supply all of the units making up the EUT, only the conductors in the power cord of the power strip shall be measured.

Record the six highest EUT emissions relative to the limit of each of the current-carrying conductors of the power cords of the equipment that comprises the EUT over the frequency range specified by the procuring or regulatory agency.

Ref. C63.10-2013 section 6.2

Test Procedure
1. Using Vasona software, configure the spectrum analyzer as shown above (be sure to enter all losses between the transmitter output and the spectrum analyzer). 2. Set the radio in continuous transmit mode. 3. Connect cable end to LISN Hot port and other cable end to the spectrum Analyzer/EMC receiver RF input port. Terminate the LISN neutral port with a 50 Ω impedance terminator. 4. Sweep the frequency range from 150 kHz to 30 MHz (segment if necessary) 5. Use the peak marker function to determine the maximum amplitude level. 6. Center marker frequency and perform final measurement using applicable detector (Quasi-Pk/Average). 7. Record at least 6 highest reading for the worst case operating modes in Quasi-peak/Average. 8. Repeat the test on Neutral lead. 9. Repeat step 3 – 7 with the radio sets in the Receiver mode. 10. Record at least 6 highest reading in Quasi-peak/Average

Ref. C63.10-2013 section 4 / CISPR16-1-1

Test Parameters
Span = Entire frequency range or segment if necessary. Reference Level = 70 dBuV RBW = 9 kHz VBW ≥ 3 x RBW Sweep Time = Couple Detector = Quasi-Peak & Average

Samples, Systems, and Modes

System Number	Description	Samples	System under test	Support equipment
2	EUT	IW-6300H with Air-ANT2513P4M-N antenna	☑	☐
	Support	IW-6300H-AC-X-K9 power supply	☐	☑

Mode Setting#	Wi-Fi Mode	Modulation	Data Rate
1 (single antenna)	802.11a*	BPSK	6 Mbps

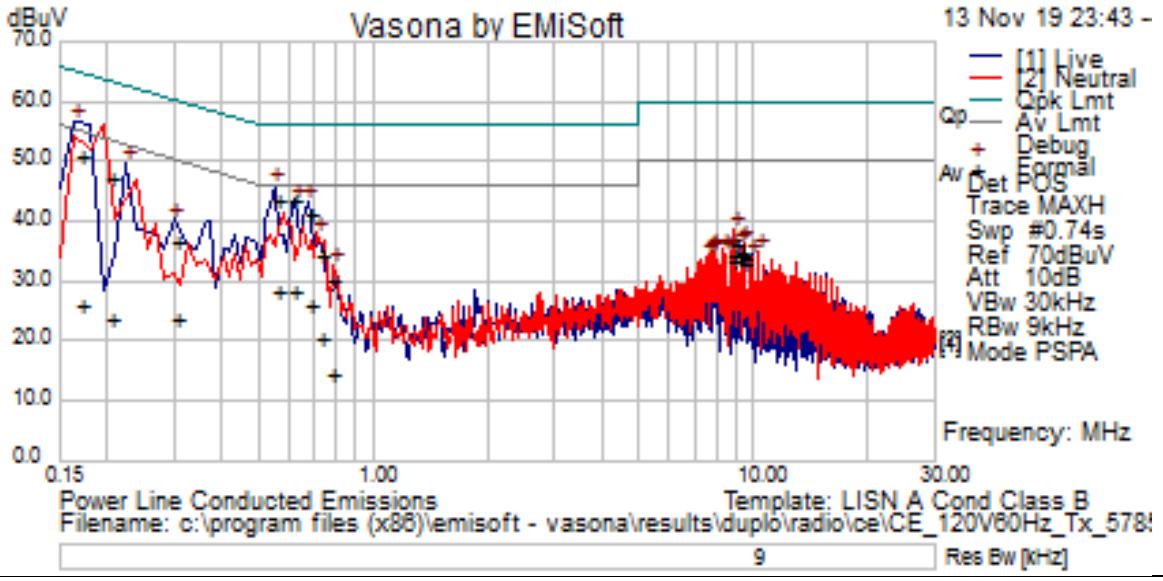
Tested By:	**Date of testing:**
Test Engineer(s): Farida Rahmanzai, Jose Huamani	13-Nov-2019
Test Result: PASS	

Test Equipment

See Appendix C for list of test equipment

B2.3 AC Conducted Emissions Test Data and Graphical Test Results

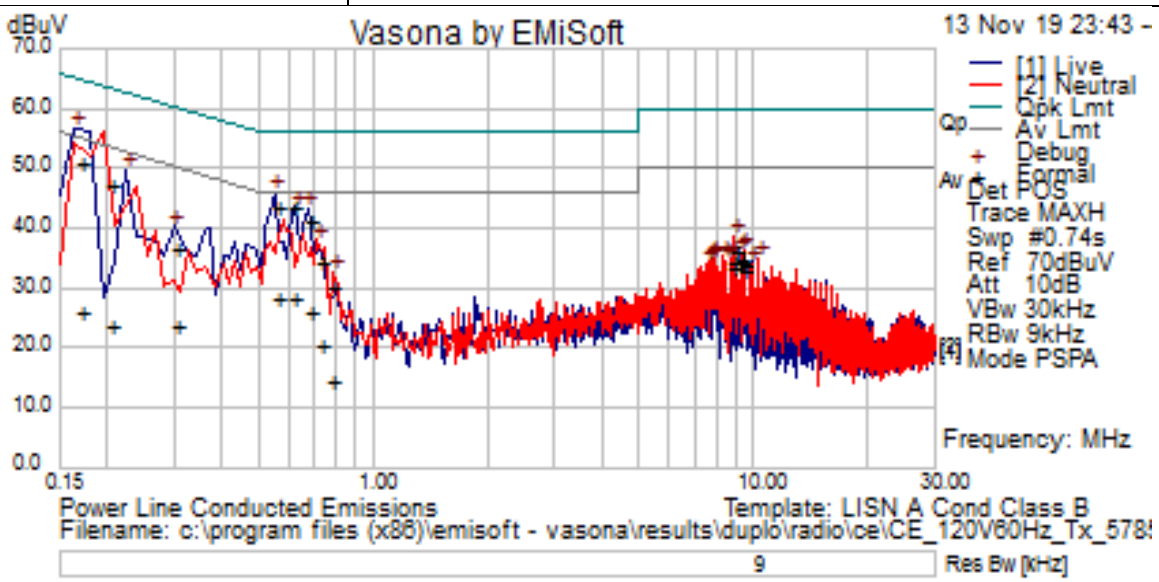
Subtest Date:	13-Nov-2019
Engineer	Farida Rahmanzai Jose Huamani
Lab Information	Building 7, formal immunity room
Subtest Title	Conducted Emissions
Frequency Range	150 kHz - 30 MHz
Comments on the above Test Results	TX Ch157 (5785 MHz) with BPSK modulation – 6 Mbps



AC Conducted Emissions Test Result Tables for 802.11a / TX Ch157

Frequency (MHz)	Raw (dBuV)	Cab Loss (dB)	Factors (dB)	Level (dBuV)	Detector	Lines (Live/Neutral)	Limit (dBuV)	Margin (dB)	Results Pass / Fail	Comments
0.170091	30.08	21.07	0.11	51.26	Quasi Peak	Live	64.96	-13.7	Pass	TX / Ch157
0.170091	5.02	21.07	0.11	26.2	Average	Live	54.96	-28.75	Pass	TX / Ch157
0.206625	26.25	20.85	0.1	47.2	Quasi Peak	Live	63.34	-16.14	Pass	TX / Ch157
0.206625	2.78	20.85	0.1	23.73	Average	Live	53.34	-29.61	Pass	TX / Ch157
0.304884	16.22	20.41	0.08	36.71	Quasi Peak	Live	60.11	-23.4	Pass	TX / Ch157
0.304884	3.27	20.41	0.08	23.76	Average	Live	50.11	-26.34	Pass	TX / Ch157
0.561183	23.66	19.98	0.07	43.7	Quasi Peak	Live	56	-12.3	Pass	TX / Ch157
0.561183	8.52	19.98	0.07	28.57	Average	Live	46	-17.43	Pass	TX / Ch157
0.623712	23.58	19.98	0.06	43.61	Quasi Peak	Live	56	-12.39	Pass	TX / Ch157
0.623712	8.35	19.98	0.06	28.38	Average	Live	46	-17.62	Pass	TX / Ch157
0.686883	21.2	19.98	0.06	41.24	Quasi Peak	Live	56	-14.76	Pass	TX / Ch157
0.686883	5.91	19.98	0.06	25.95	Average	Live	46	-20.05	Pass	TX / Ch157

Subtest Date:	13-Nov-2019
Engineer	Farida Rahmanzai Jose Huamani
Lab Information	Building 7, formal immunity room
Subtest Title	Conducted Emissions
Frequency Range	150 kHz - 30 MHz
Comments on the above Test Results	TX Ch157 (5785 MHz) with BPSK modulation – 6 Mbps



AC Conducted Emissions Test Result Tables for 802.11a / TX Ch157

Frequency (MHz)	Raw (dBuV)	Cab Loss (dB)	Factors (dB)	Level (dBuV)	Detector	Lines (Live/Neutral)	Limit (dBuV)	Margin (dB)	Results Pass / Fail	Comments
0.72642	14.58	19.98	0.06	34.62	Quasi Peak	Neutral	56	-21.38	Pass	TX / Ch157
0.72642	0.63	19.98	0.06	20.67	Average	Neutral	46	-25.33	Pass	TX / Ch157
0.777771	10.29	19.97	0.07	30.34	Quasi Peak	Neutral	56	-25.66	Pass	TX / Ch157
0.777771	-5.31	19.97	0.07	14.74	Average	Neutral	46	-31.26	Pass	TX / Ch157
8.775516	14.01	20.13	0.11	34.25	Quasi Peak	Neutral	60	-25.75	Pass	TX / Ch157
8.775516	13.27	20.13	0.11	33.51	Average	Neutral	50	-16.49	Pass	TX / Ch157
8.919039	16.11	20.14	0.1	36.35	Quasi Peak	Neutral	60	-23.65	Pass	TX / Ch157
8.919039	16.02	20.14	0.1	36.26	Average	Neutral	50	-13.74	Pass	TX / Ch157
9.348696	14.83	20.14	0.11	35.08	Quasi Peak	Neutral	60	-24.92	Pass	TX / Ch157
9.348696	14.34	20.14	0.11	34.59	Average	Neutral	50	-15.41	Pass	TX / Ch157
9.493626	13.59	20.15	0.1	33.84	Quasi Peak	Neutral	60	-26.16	Pass	TX / Ch157
9.493626	12.99	20.15	0.1	33.23	Average	Neutral	50	-16.77	Pass	TX / Ch157

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

Equip#	Manufacturer/ Model	Description	Last Cal	Next Due	Test Item
Test Equipment used for Radiated Emissions					
CIS008113	Cisco/NSA 5m Chamber	NSA 5m Chamber	01-Oct-19	01-Oct-20	B1
CIS037581	ETS Lindgren / 3117	Double Ridged Guide Horn Antenna	25-Jan-19	25-Jan-20	B1
CIS039131	Cisco / TH0118	Mast Mount Preamplifier Array, 1-18GHz	25-Feb-19	25-Feb-20	B1
CIS038404	Sunol Sciences / JB1	Combination Bi-Log Antenna, 30MHz-2GHz	31-Jan-19	31-Jan-20	B1
CIS036710	Cisco/1840	18-40GHz EMI Test Head/Verification Fixture	12-Aug-19	12-Aug-20	B1
CIS018231	Rohde & Schwarz /ESI 40(ESIB 40)	EMI RECEIVER TEST 20Hz-40GHz	07-Mar-19	07-Mar-20	B1
CIS042012	Rohde & Schwarz / ESCI	EMI Test Receiver	12-Aug-19	12-Aug-20	B1
CIS040604	Agilent / E4440A	Precision Spectrum Analyzer	19-Oct-18	19-Oct-20	B1
CIS047311	Huber+ Suhner/Sucoflex 106PA	RF Coaxial Cable, to 18GHz, 8.5 m	30-Sep-19	30-Sep-20	B1
CIS055178	Huber+ Suhner/Sucoflex 106PA	RF Coaxial Cable, to 18GHz, 8.5 m	30-Sep-19	30-Sep-20	B1
CIS025660	Micro-Coax / UFB311A-1-0840-504504	RF Coaxial Cable, to 18GHz, 8.5 m	30-Sep-19	30-Sep-20	B1
CIS025640	Micro-Coax / UFB311A-0-2720-520520	Coaxial Cable, 272.0 in. to 18GHz	30-Sep-19	30-Sep-20	B1
CIS056058	Wainwright Instruments/ WRCJV12-5695-5725-5850-5880-40SS	SMA Band Reject Filter 5.725GHz to 5.850GHz	10-Aprl-19	10-Apr-20	B1
Test Equipment used for AC Conducted Emissions					
CIS41955	Rohde & Schwarz / ESCI	EMI Test Receiver	25-Apr-19	25-Apr-20	B2
CIS08187	Fisher Custom Com / FCC-450B-2.4-N	Pulse Limiter	15-May-19	15-May-20	B2
CIS019210	TTE / H785-150K-50-21378	High Pass Filter 150KHz	25-Feb-19	25-Feb-20	B2
CIS05039	Fisher Custom Com / 50/250-50-2-02	LISN (9kHz-30MHz)	21-Feb-19	21-Feb-20	B2
CIS034158	Fisher Custom Com / 50-2-RA-NEMA-5-20R	LISN Receptacle Adaptor	21-Feb-19	21-Feb-20	B2
CIS040532	Coleman / RG-223	25 ft RG-223 Cable	04-Dec-18	04-Dec-19	B2
51663	Bird / 5-T-MB	50Ω termination	04-Dec-18	04-Dec-19	B2

Appendix D: Abbreviation Key and Definitions

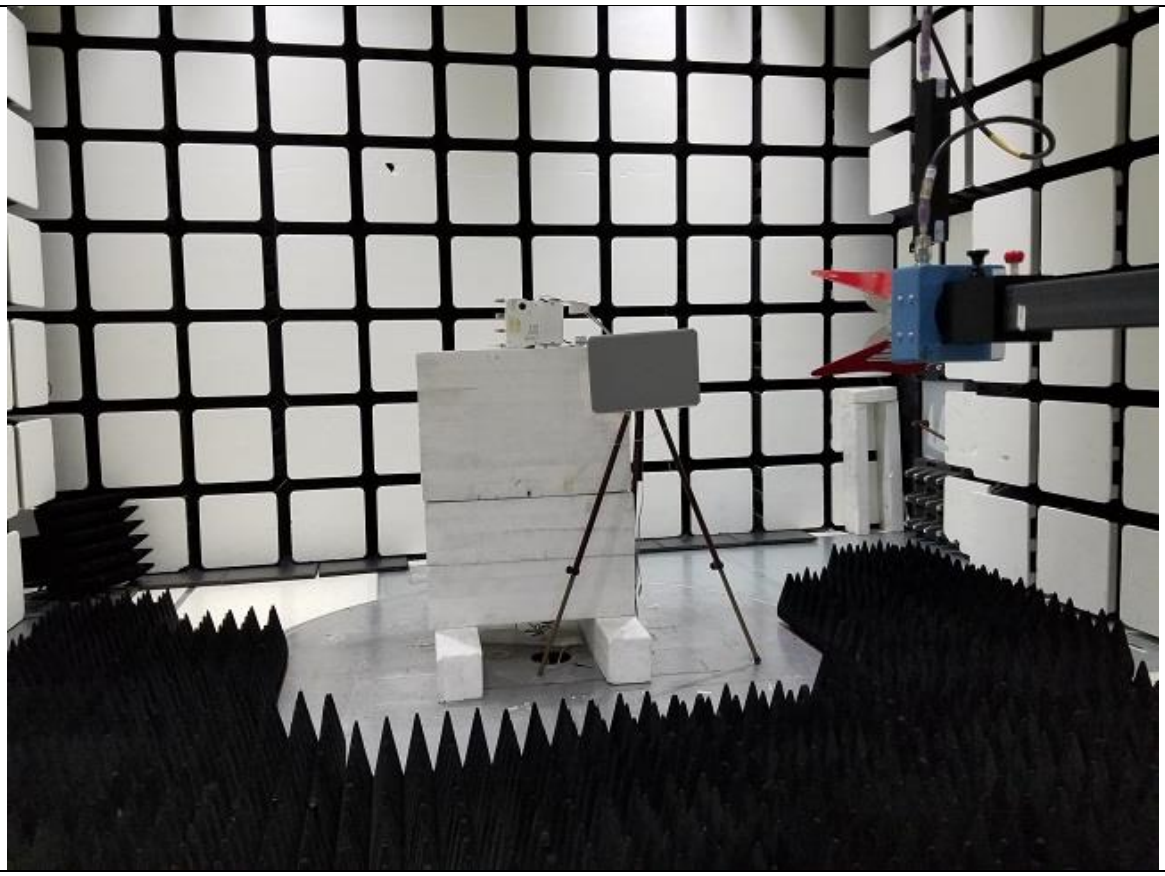
The following table defines abbreviations used within this test report.

Abbreviation	Description	Abbreviation	Description
EMC	Electro Magnetic Compatibility	°F	Degrees Fahrenheit
EMI	Electro Magnetic Interference	°C	Degrees Celsius
EUT	Equipment Under Test	Temp	Temperature
ITE	Information Technology Equipment	S/N	Serial Number
TAP	Test Assessment Schedule	Qty	Quantity
ESD	Electro Static Discharge	emf	Electromotive force
EFT	Electric Fast Transient	RMS	Root mean square
EDCS	Engineering Document Control System	Qp	Quasi Peak
Config	Configuration	Av	Average
CIS#	Cisco Number (unique identification number for Cisco test equipment)	Pk	Peak
Cal	Calibration	kHz	Kilohertz ($1x10^3$)
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

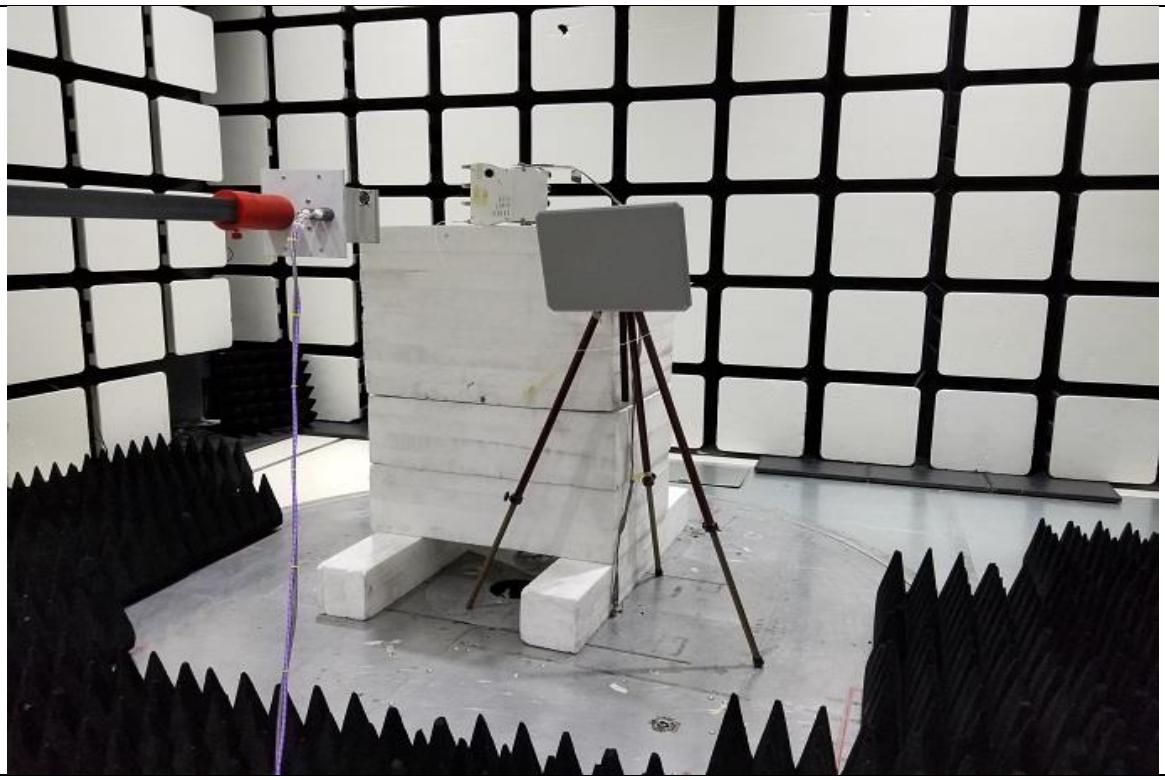
Appendix E: Photographs of Test Setups

Title: Radiated Spurious Emissions Test Setup

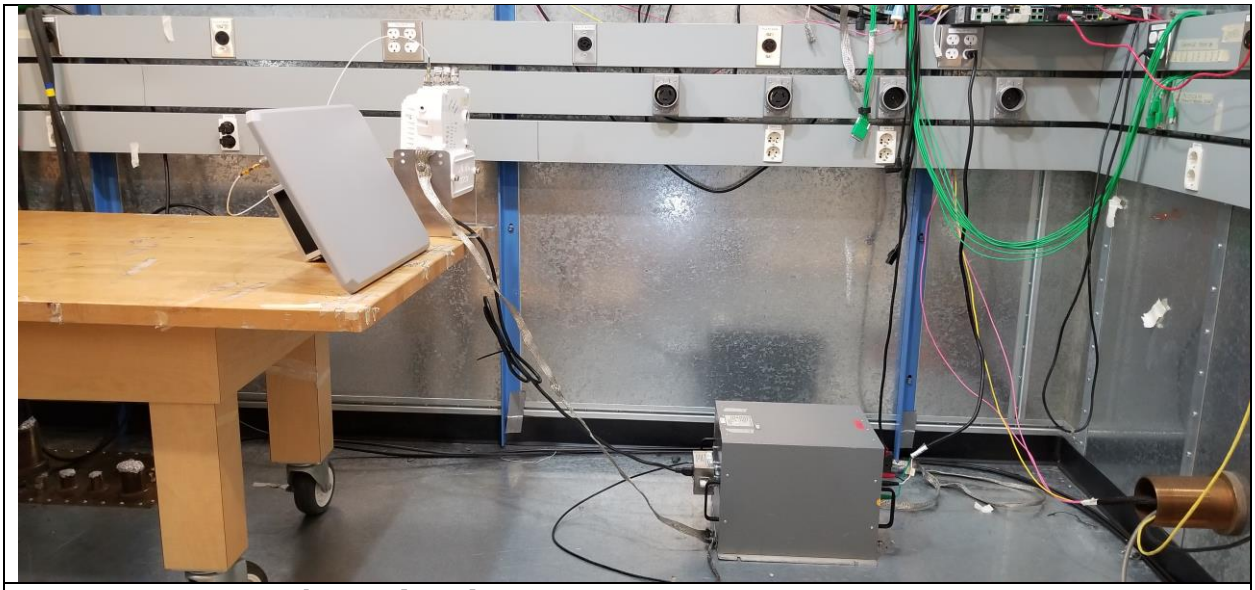
Title: **Radiated Spurious Emissions 30MHz-1GHz – Test Setup**



Title: **Radiated Spurious Emissions 1GHz-18GHz – Test Setup**



Title: **Radiated Spurious Emissions 18GHz-40GHz – Test Setup**



Title: **Conducted Emissions 150KHz-30MHz – Test Setup**

Appendix F: Software Used to Perform Testing

EMIsoft Vasona, version 6.024

Appendix G:Test Procedures

Measurements were made in accordance with

- KDB 789033 - D02 General UNII Test Procedures New Rules v02r01
- KDB 662911 - MIMO
- ANSI C63.4 2014 Unintentional Radiators
- ANSI C63.10 2013 Intentional Radiators

Test procedures are summarized below:

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

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

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

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

Appendix I: Test Assessment Plan

Compliance Test Plan (Excel) EDCS# 18357550
Target Power Tables EDCS# 18295686

Appendix J: Worst Case Justification

All 3 orientations (Z, Y, Z) of the EUT were assessed by performing pre-scan.
The Z orientation was determined to be the worst case orientation.

Worst Case Mode: Worst case mode shall be the mode that produces the highest power level based on conducted power measurement.

Also see Appendix A the test report.

Compliance testing for Radiated Spurious and AC Conducted Emissions shall be performed with the highest gain antenna installed.

All formal data can be found in EDCS# 18295686