

**UNII-5 (5925 – 6425 MHz) Wi-Fi Radio Test Report  
(Radiated Spurious Emissions Only)**

For

**IW9165DH-B (5/6 GHz Radio)  
IW9165DH-A (5/6 GHz Radio)**

Supports

5/6 GHz 802.11 a/n/ac/ax Wi-Fi + Bluetooth LE v5.0 + GNSS radio

**FCC ID: LDKIW9165DH**

Equipment Class: 6SD

Against the following Specifications:

**47 CFR 15.205**


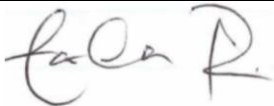

**47 CFR 15.209**

**CFR47 Part 15.407**



**CERTIFICATE #1178.01**

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

<b>Author:</b> Danh Le	
<b>Tested By:</b> Farida Rahmanzai <b>Title:</b> Test Engineer	
<b>Approved By:</b> Howard Ji <b>Title:</b> Compliance Manager	
<b>Revision</b>	1.0

This report replaces any previously entered test report under EDCS – #####. This test report has been electronically authorized and archived using the CISCO Engineering Document Control system. Test Report Template EDCS# 23517657

## Table of Contents

<b>SECTION 1: OVERVIEW .....</b>	<b>4</b>
1.1 TEST SUMMARY .....	4
<b>SECTION 2: ASSESSMENT INFORMATION .....</b>	<b>5</b>
2.1 GENERAL .....	5
2.2 UNITS OF MEASUREMENT .....	5
2.3 DATE OF TESTING (INITIAL SAMPLE RECEIPT DATE TO LAST DATE OF TESTING) .....	7
2.4 REPORT ISSUE DATE .....	7
2.5 TESTING FACILITIES .....	7
2.6 EQUIPMENT ASSESSED (EUT).....	8
2.7 EUT DESCRIPTION.....	8
<b>SECTION 3: RESULT SUMMARY.....</b>	<b>10</b>
<b>SECTION 4: SYSTEM DETAILS AND MODE OF OPERATION.....</b>	<b>11</b>
4.1 SAMPLE DETAILS .....	11
4.2 SYSTEM DETAILS .....	11
4.3 MODE OF OPERATION DETAILS.....	11
<b>APPENDIX A: EMISSION TEST RESULTS .....</b>	<b>12</b>
A.1 SETUP DIAGRAM .....	12
A.2 RADIATED SPURIOUS EMISSIONS TEST REQUIREMENTS & LIMITS .....	14
A.3 LIMIT CONVERSION (POWER TO FIELD STRENGTH) .....	17
A.4 TEST PROCEDURE.....	18
A.5 TX RADIATED SPURIOUS EMISSIONS GRAPHICAL DATA RESULTS.....	19
<b>APPENDIX B: LIST OF TEST EQUIPMENT USED TO PERFORM THE TEST .....</b>	<b>31</b>
<b>APPENDIX C: ABBREVIATION KEY AND DEFINITIONS.....</b>	<b>32</b>
<b>APPENDIX D: PHOTOGRAPHS OF TEST SETUPS.....</b>	<b>33</b>
<b>APPENDIX E: SOFTWARE USED TO PERFORM TESTING.....</b>	<b>34</b>
<b>APPENDIX F: TEST PROCEDURES .....</b>	<b>35</b>
<b>APPENDIX G: SCOPE OF ACCREDITATION (A2LA CERTIFICATE NUMBER 1178-01).....</b>	<b>36</b>
<b>APPENDIX H: TEST ASSESSMENT PLAN.....</b>	<b>37</b>
<b>APPENDIX I: WORST CASE JUSTIFICATION .....</b>	<b>38</b>

## **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:

<b>Specifications</b>
47 CFR 15.205
47 CFR 15.209
47 CFR 15.407

## 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:

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

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	$\pm 2$ dB
RF Output Power, conducted	$\pm 2$ dB
radiated measurements	$\pm 3.2$ dB
frequency measurements	$\pm 2.4 \cdot 10^{-7}$ MHz
temperature measurements	$\pm 0.54^{\circ}\text{C}$
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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Radio Test Report No: **EDCS - 24733400**

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

06-September-2023 to 11-September-2023

**2.4 Report Issue Date**

22-Januar-2024

**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**

Farida Rahmanzai

## 2.6 Equipment Assessed (EUT)

IW9165DH with embedded 5/6GHz radio module.

## 2.7 EUT Description

The Catalyst IW9165 Series addresses the growing need for reliable client wireless connectivity to mission-critical applications as organizations automate processes and operations. It comes with two 2x2 radios, features an industrial design, and is packed with advanced features.

The Cisco Catalyst IW9165D Heavy Duty Access Point is designed to make wireless backhaul deployment simple. It comes with a built-in directional antenna that enables long-range, high-throughput connectivity anywhere fiber is not an option. The external antenna ports let you quickly extend your network to new places when needed and choose the right antenna based on the use cases and deployment architectures. With heavy-duty IP67 design, the Catalyst IW9165D is certified to operate under wet, dusty, and extreme temperature conditions.

### IW9165DH Key Features:

- Dual radio – 5GHz, 5/6GHz
- Directional & External (2 x N Type) antennas
- 2x2 MIMO 2SS, Max data rate – 3.6 Gbps
- BTLE, GNSS radio
- CURWB mode provides reliable wireless connectivity
- RJ45, M12 – 1 x 2.5Gbps, 1x 1 Gbps
- Dual power input – PoE-in & 24-48VDC
- Dual mounting options – Pole & Wall mount
- IP67

### Wireless Protocols support

- Wi-Fi: IEEE 802.11a, 802.11n, 802.11ac, 802.11ax
- Bluetooth Low Energy v5.0: IEEE 802.15 (1Mbps & 2Mbps, single stream)
- GNSS (Global Navigation Satellite System) receiver

### 5/6 GHz radio specification:

- 802.11a (5 GHz band only): 6, 9, 12, 18, 24, 36, 48, 54 Mbps
- 802.11n (5 GHz band only): HT20 and HT40, MCS0 to 15
- 802.11ac (5 GHz band only):
  - VHT20 MCS0 to 8, 1 or 2 spatial streams
  - VHT80, VHT160 MCS0 to 9, 1 or 2 spatial streams
- 802.11ax: ◦ HE20, HT40, HE80, and HE160 MCS0 to 11, 1 or 2 spatial streams





Radio Test Report No: **EDCS - 24733400**

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The following antennas are supported by this product series.

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

Please note the following antenna gain information was provided by the customer (Cisco Business Unit):

Frequency	Part Number	Antenna Type	Peak Antenna Gain (dBi)
5/6 GHz	IW-ANT-OMH-2567-N	Tri-band 2.4Ghz 4dBi, 5/6GHz 7dBi Omnidirectional Collinear Array Antenna, Horizontally Polarized, N male connector	7.0

### Model/PID differences

All PIDs have identical components, PCB layout, electronics circuitries and enclosure. The only difference is domain code selected in the software.

The model differences are described below:

IW9165DH-B represents U.S PID with US domain code selected

IW9165DH-A represents Canada PID with Canada domain code selected.

IW9165DH-ROW represents Worldwide PID, except for US & CAN, with ROW domain code selected.





#### Section 4: System Details and Mode of Operation

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 Number	Equipment Details	Serial Number	CISCO Part Number	Radio FW Version
S01	IW9165DH with embedded 6GHz radio module.	FOC27095C9Z	68-103412-03	WLAN.HK.2.4.c2-00211-QCAHKSUPL_SILICO
S02	IW-PWRADPT-MFIT4PN Liteon AC Adaptor	LIN26292022	341-101392-01	----

##### 4.2 System Details

System #	Description	Samples
1	IW9165DH w/ embedded Wi-Fi Radio module + external power supply	S01, S02

##### 4.3 Mode of Operation Details

Mode #	Wi-Fi Mode	Modulation	Data Rate	BW
1. Transmit	MIMO 802.11ax/HE20	MIMO-OFDM	MCS0	20MHz

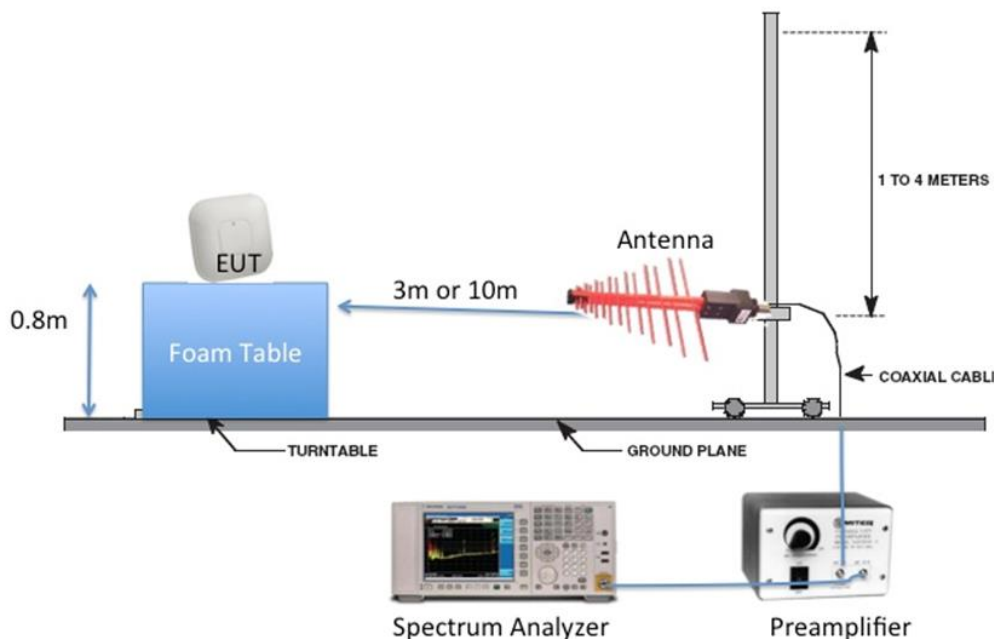
**Note:** Table above represents the worst-case scenarios for all modulations and data rate combination of each mode. The TX modes in the table above were determined to be the worst-case emissions of all TX modes and selected for RSE testing.

**Appendix A: Emission Test Results**

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

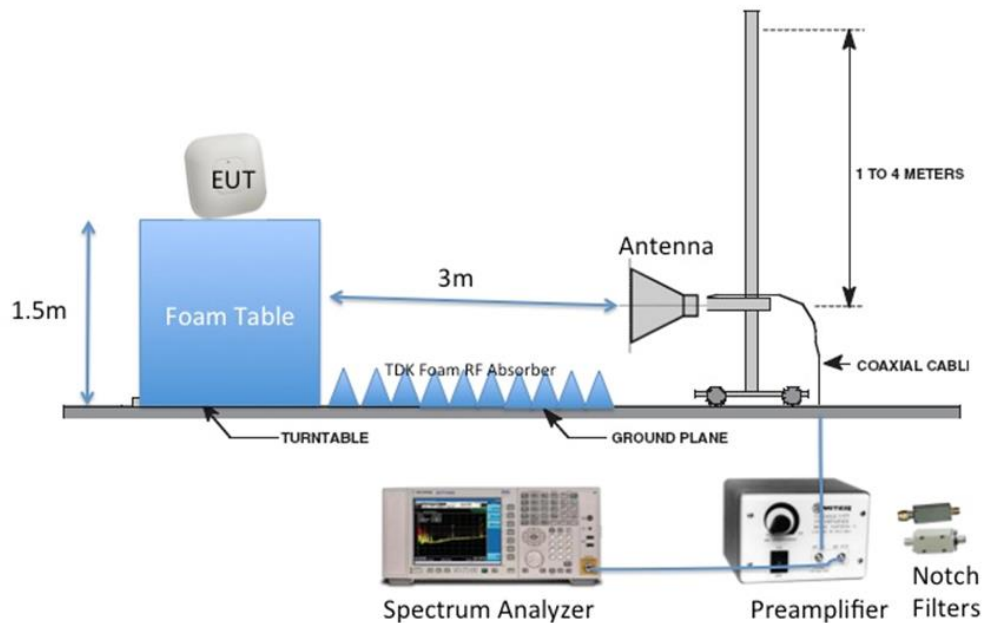
**A.1 Setup Diagram**

**Radiated Emission Setup Diagram-Below 1G  
(Preamp used is optional)**



**Note:** The radiated spurious emissions test setup referenced to KDB789033 D02, v02r01, Section II (G)(3)(b)(i)), the EUT antenna ports were terminated with 50Ω loads.

### Radiated Emission Setup Diagram-Above 1G



**Note:** The radiated spurious emissions test setup referenced to KDB789033 D02, v02r01, Section II (G)(3)(b)(i)), the EUT antenna ports were terminated with 50Ω loads.

## **A.2 Radiated Spurious Emissions Test Requirements & Limits**

Emissions on frequency or frequencies which are outside the necessary bandwidth and level of which may be reduced without effecting the corresponding transmission of information. Spurious emissions include harmonic emissions, parasitic emissions, intermodulation products and frequency conversion products, but exclude out-of-band emissions.

## Restricted bands Limits

### FCC 15.407 (b)

(10) The provisions of 15.205 apply to intentional radiators operating under this section.

### 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 below:

(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. At frequencies equal to or less than 1000 MHz, compliance with the limits in § 15.209 shall be demonstrated using measurement instrumentation employing a CISPR quasi-peak detector. Above 1000 MHz, compliance with the emission limits in § 15.209 shall be demonstrated based on the average value of the measured emissions. The provisions in § 15.35 apply to these measurements.

Restricted Bands for FCC			
MHz	MHz	MHz	GHz
0.090-0.110	16.42-16.423	399.9-410	4.5-5.15
10.495-0.505	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			

## Non-Restricted Bands Limits

### Below 1 GHz

#### FCC15.407 (b)

(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:

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

#### FCC 15.209

(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 specified in the table in FCC§15.209(a).

(C) The level of any unwanted emissions from an intentional radiator operating under these general provisions shall not exceed the level of the 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

#### FCC15.407

(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:

(6) For transmitters operating in the 5.925 – 7.125 GHz band(s): All emissions outside of the 5.925 – 7.125 GHz band shall not exceed an e.i.r.p. of -27 dBm/MHz



### A.3 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:

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

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

$$\text{dBm to Watts } W = 10^{((\text{dBm} - 30)/10)}$$

$$\begin{aligned} P(W) &= 10^{(-27 - 30) / 10} \\ &= 10^{-5.7} \\ &= 1.995 \times 10^{-6} \end{aligned}$$

#### (2) Convert from Watt to field strength

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

$$\begin{aligned} V/m &= \frac{\sqrt{30 \times Pt \times gt}}{3} \\ &= \frac{\sqrt{30 \times 0.000001995 \times 1}}{3} \\ &= 0.00257 \end{aligned}$$

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

$$\begin{aligned} \text{dB}\mu\text{V/m} &= 20 \log (V/m) + 120 \\ &= 68.2 \end{aligned}$$

#### A.4 Test Procedure

Ref. ANSI C63.10: 2013 section 5 / section 6.5, section 6.6

<b>Test Procedure</b>
<ol style="list-style-type: none"> <li>1. Place EUT on the tabletop 80cm above ground below 1GHz scan and 1.5m above 1GHz scan with @3m test distance from measuring antenna from 30MHz – 40GHz preferably. If necessary due to instrument setup capabilities in higher frequency range, 1m test distance can be used.</li> <li>2. Turn on the lowest radio operating frequency in continuous transmit mode.</li> <li>3. Use Vasona software to configure the Spectrum analyzer test parameters as shown below (be sure to enter all losses between the transmitter output and the spectrum analyzer).</li> <li>4. Allow Vasona software to initiate the pre-scan and identify all emissions close to the limits.</li> <li>5. Manually fine tune all identified emissions and use the marker function to determine the maximum spurs amplitude level.</li> <li>6. Record at least 6 highest identified emissions with amplitude relative to the limits. Emissions more than 20 dB below the peak limits do not need to be reported.</li> <li>7. For all emissions identified in the restricted bands, perform formal measurement.</li> <li>8. Capture graphs and record pertinent measurement data.</li> <li>9. Repeat step 2- 8 with middle and highest operating radio frequency.</li> </ol>
<p>Note: Vasona software shall automatically control the movement of the antenna height from 1m – 4m and rotation of the turntable from 0° - 360° and perform the measurement for all identified emissions.</p>

Ref. 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), Cisp16-1-1

<b>Test parameters</b>
<ol style="list-style-type: none"> <li>(i) Span = Entire frequency range or segment if necessary.</li> <li>(ii) Reference Level <math>\geq</math> 10dB headroom between Spectrum analyzer's ceiling and top carrier signal</li> <li>(iii) RBW = 100 kHz (less than or equal to 1 GHz); 1 MHz (above 1 GHz)</li> <li>(iv) VBW <math>\geq</math> 3 x RBW</li> <li>(v) Detector = Peak &amp; Quasi-Peak (frequency range 30 MHz to 1 GHz); Peak &amp; Average (frequency range above 1 GHz); Change VBW to 10 Hz for average measurement</li> <li>(vi) Sweep Time = Couple</li> </ol>

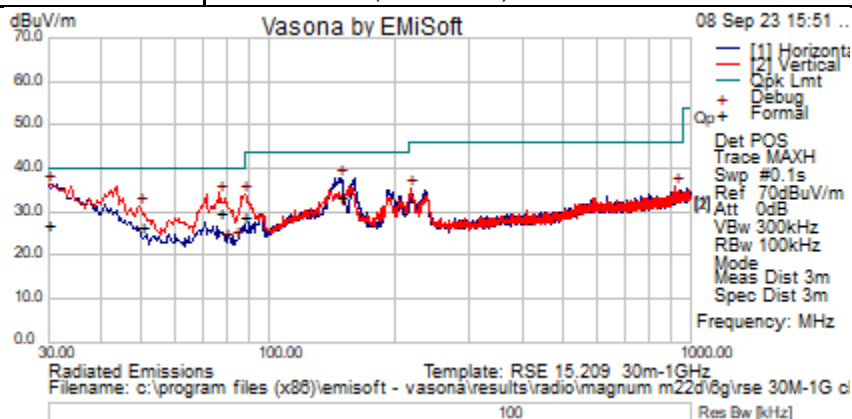
**Note:** The data displayed on the plots detailed in the graphical test results section were measured using a 'Peak Detector'. Please refer to the results table for the detectors used during formal measurements.



Radio Test Report No: **EDCS - 24733400**

**A.5 TX Radiated Spurious Emissions Graphical Data Results**

<b>Subtest Date</b>	08-Sept-2023
<b>Subtest Title</b>	Transmitter Spurious Emissions
<b>Frequency Range</b>	30MHz - 1GHz
<b>Mode</b>	2x2 MIMO 802.11ax/HE20 (Refer to section 4.3 for mode of operation details)
<b>Comments on the above Test Results</b>	Tx Channel 1 (5955 MHz)

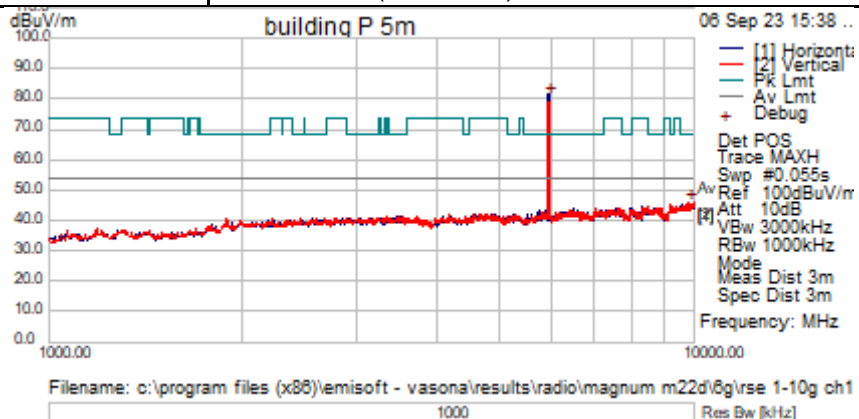


Frequency (MHz)	Raw (dBuV)	Cab Loss (dB)	AF (dB)	Level (dBuV)	Detector	Polarity	Height (cm)	Azt (Deg)	Limit (dBuV)	Margin (dB)	Results Pass / Fail	Comments
148.0608	19.94	0.92	12.63	33.49	Quasi-pk	H	230	280	43.5	-10.01	Pass	
76.685	20.93	0.65	8.07	29.65	Quasi-pk	V	156	322	40	-10.35	Pass	
87.54325	20.32	0.7	7.78	28.79	Quasi-pk	V	123	196	40	-11.21	Pass	
30.09475	5.37	0.46	21.35	27.18	Quasi-pk	V	107	76	40	-12.82	Pass	
49.836	17.56	0.58	8.49	26.63	Quasi-pk	V	140	38	40	-13.37	Pass	



Radio Test Report No: **EDCS - 24733400**

<b>Subtest Date</b>	06-Sept-2023
<b>Subtest Title</b>	Transmitter Spurious Emissions
<b>Frequency Range</b>	1GHz – 10GHz
<b>Mode</b>	2x2 MIMO 802.11ax/HE20 (Refer to section 4.3 for mode of operation details)
<b>Comments on the above Test Results</b>	Tx Channel 1 (5955 MHz)

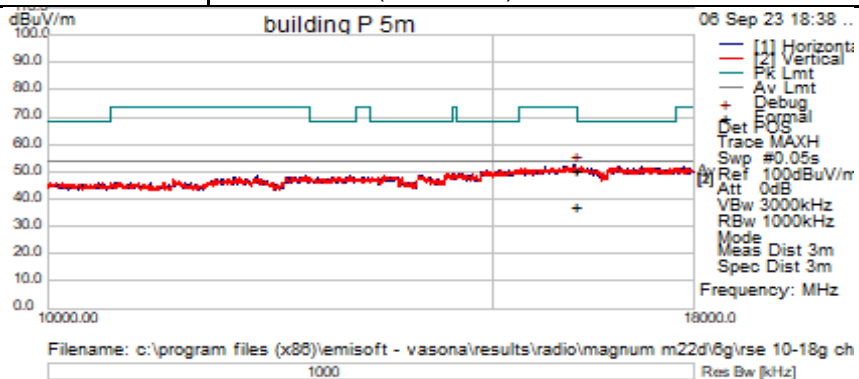


Frequency (MHz)	Raw (dBuV)	Cab Loss (dB)	AF (dB)	Level (dBuV)	Detector	Polarity	Height (cm)	Azt (Deg)	Limit (dBuV)	Margin (dB)	Results Pass / Fail	Comments
5959	89.91	6.61	-15.21	81.3	Peak	H	150	322	--	--	Ignored	fundamental
9820	50.25	8.7	-12.98	45.97	Peak	V	250	62	54	-8.03	Pass	Noise floor



Radio Test Report No: **EDCS - 24733400**

<b>Subtest Date</b>	06-Sept-2023
<b>Subtest Title</b>	Transmitter Spurious Emissions
<b>Frequency Range</b>	10GHz – 18GHz
<b>Mode</b>	2x2 MIMO 802.11ax/HE20 (Refer to section 4.3 for mode of operation details)
<b>Comments on the above Test Results</b>	Tx Channel 1 (5955 MHz)



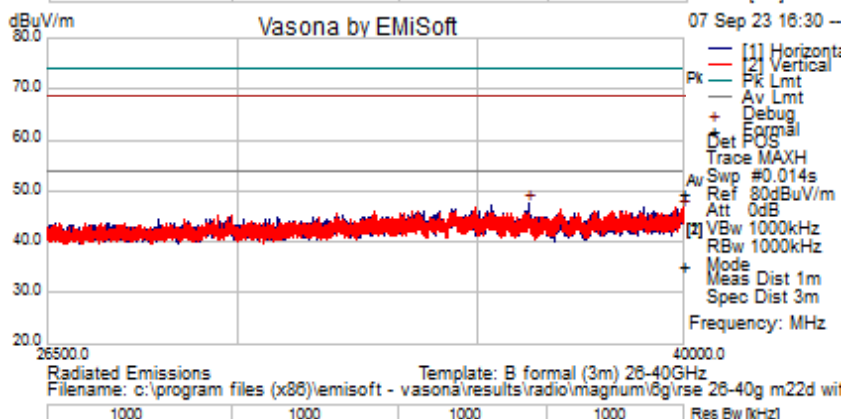
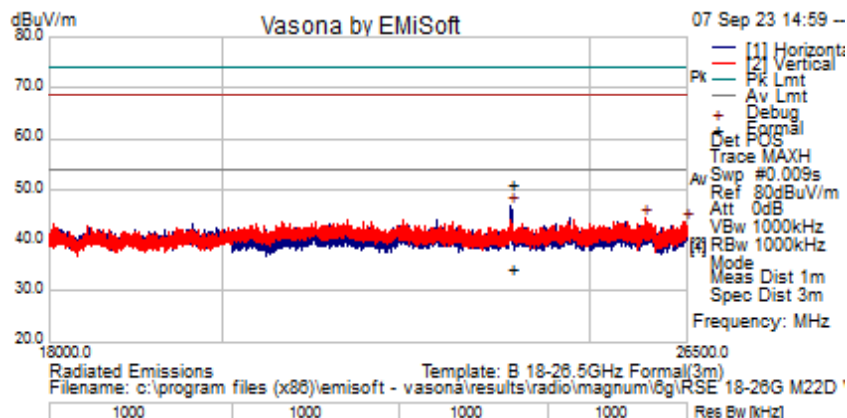
Frequency (MHz)	Raw (dBuV)	Cab Loss (dB)	AF (dB)	Level (dBuV)	Detector	Polarity	Height (cm)	Azt (Deg)	Limit (dBuV)	Margin (dB)	Results Pass / Fail	Comments
16156	47	12	-8.3	50.7	Peak	V	287	344	74	-23.3	Pass	RB
16156	33.41	11.97	-8.31	37.06	Average	H	260	280	54	-16.94	Pass	RB

Note: RB means restricted band



Radio Test Report No: **EDCS - 24733400**

<b>Subtest Date</b>	07-Sept-2023
<b>Subtest Title</b>	Transmitter Spurious Emissions
<b>Frequency Range</b>	18GHz - 40GHz
<b>Mode</b>	2x2 MIMO 802.11ax/HE20 (Refer to section 4.3 for mode of operation details)
<b>Comments on the above Test Results</b>	Tx Channel 1 (5955 MHz)



Legend: — 74dB $\mu$ V/m (Peak); — 54 dB $\mu$ V/m (Average); — 68dB $\mu$ V/m (Peak)(-27dbm)

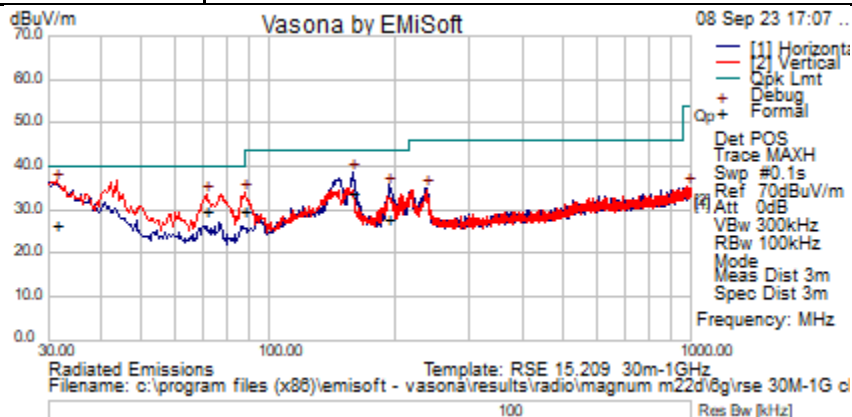
Frequency (MHz)	Raw (dBuV)	Cab Loss (dB)	AF (dB)	Level (dBuV)	Detector	Polarity	Height (cm)	Azt (Deg)	Limit (dBuV)	Margin (dB)	Results Pass / Fail	Comments
23826.49	61.84	0	-10.6	51.24	Peak	H	150	0	74	-22.76	Pass	RB
23826.49	45.15	0	-10.6	34.55	Average	H	150	0	54	-19.45	Pass	RB
39996.63	55.39	0	-5.92	49.47	Peak	V	150	0	74	-24.53	Pass	RB
39996.63	41.26	0	-5.92	35.34	Average	V	150	0	54	-18.66	Pass	RB

Note: RB means restricted band



Radio Test Report No: **EDCS - 24733400**

<b>Subtest Date</b>	08-Sept-2023
<b>Subtest Title</b>	Transmitter Spurious Emissions
<b>Frequency Range</b>	30MHz - 1GHz
<b>Mode</b>	<b>2x2 MIMO 802.11ax/HE20</b> (Refer to section 4.3 for mode of operation details)
<b>Comments on the above Test Results</b>	Tx Channel 45 (6175 MHz)

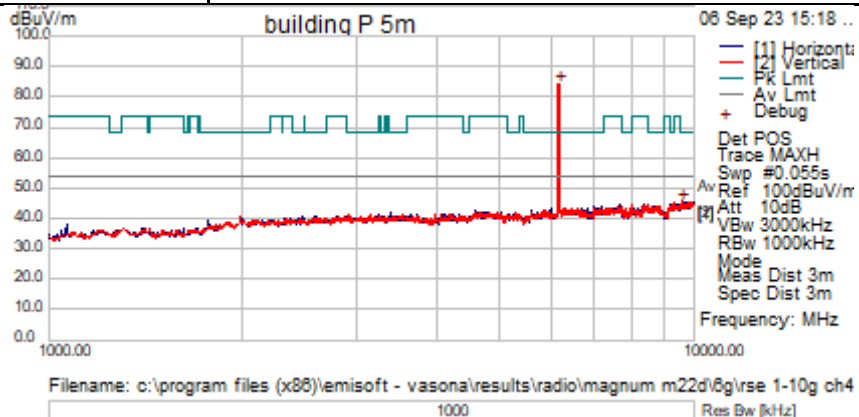


Frequency (MHz)	Raw (dBuV)	Cab Loss (dB)	AF (dB)	Level (dBuV)	Detector	Polarity	Height (cm)	Azt (Deg)	Limit (dBuV)	Margin (dB)	Results Pass / Fail	Comments
148.0608	19.94	0.92	12.63	33.49	Quasi-pk	H	230	280	43.5	-10.01	Pass	
76.685	20.93	0.65	8.07	29.65	Quasi-pk	V	156	322	40	-10.35	Pass	
87.54325	20.32	0.7	7.78	28.79	Quasi-pk	V	123	196	40	-11.21	Pass	
30.09475	5.37	0.46	21.35	27.18	Quasi-pk	V	107	76	40	-12.82	Pass	
49.836	17.56	0.58	8.49	26.63	Quasi-pk	V	140	38	40	-13.37	Pass	



Radio Test Report No: **EDCS - 24733400**

<b>Subtest Date</b>	06-Sept-2023
<b>Subtest Title</b>	Transmitter Spurious Emissions
<b>Frequency Range</b>	1GHz - 10GHz
<b>Mode</b>	2x2 MIMO 802.11ax/HE20 (Refer to section 4.3 for mode of operation details)
<b>Comments on the above Test Results</b>	Tx Channel 45 (6175 MHz)



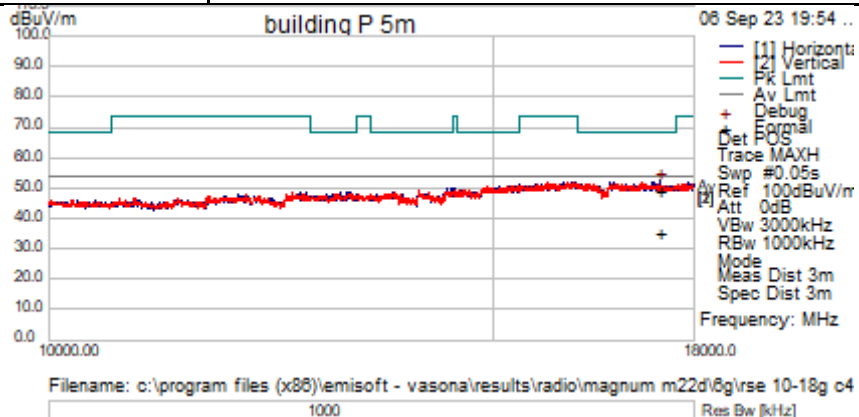
Frequency (MHz)	Raw (dBuV)	Cab Loss (dB)	AF (dB)	Level (dBuV)	Detector	Polarity	Height (cm)	Azt (Deg)	Limit (dBuV)	Margin (dB)	Results Pass / Fail	Comments
6179.5	92.67	6.74	-15	84.41	Peak	V	200	319	--	--	Ignored	fundamental
9577	50.38	8.57	-13.3	45.64	Peak	V	250	213	54	-8.36	Pass	Noise floor





Radio Test Report No: **EDCS - 24733400**

<b>Subtest Date</b>	06-Sept-2023
<b>Subtest Title</b>	Transmitter Spurious Emissions
<b>Frequency Range</b>	10GHz - 18GHz
<b>Mode</b>	2x2 MIMO 802.11ax/HE20 (Refer to section 4.3 for mode of operation details)
<b>Comments on the above Test Results</b>	Tx Channel 45 (6175 MHz)

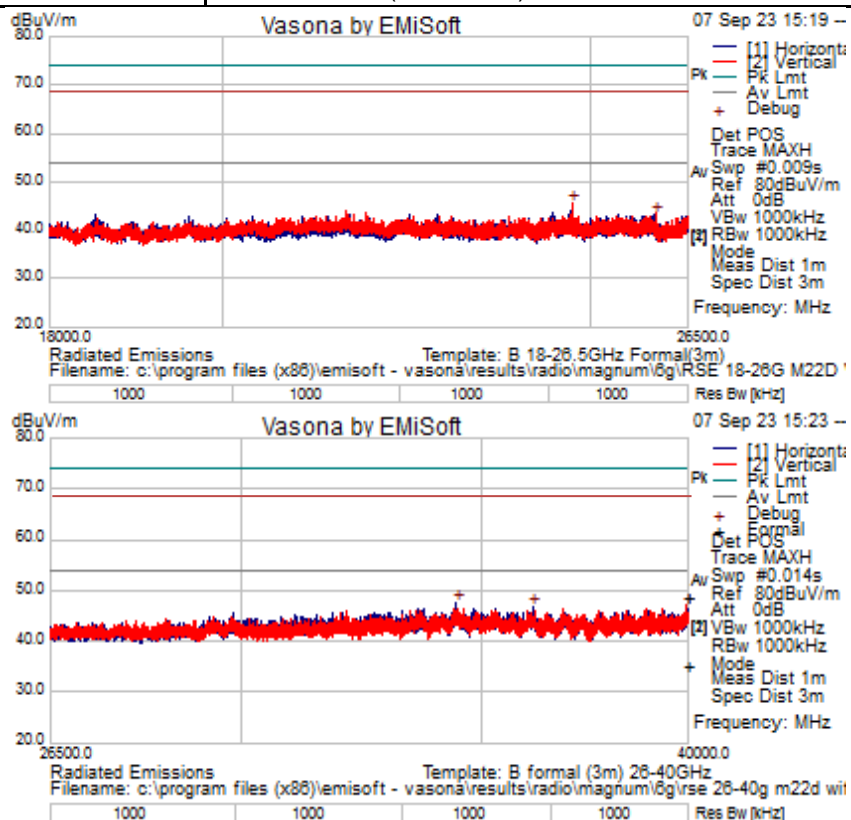


Frequency (MHz)	Raw (dBuV)	Cab Loss (dB)	AF (dB)	Level (dBuV)	Detector	Polarity	Height (cm)	Azt (Deg)	Limit (dBuV)	Margin (dB)	Results Pass / Fail	Comments
17448	43.59	12.57	-6.99	49.16	Peak	H	106	346	68.2	-19.04	Pass	
17448	30.01	12.57	-6.99	35.59	Average	H	106	346	54	-18.41	Pass	



Radio Test Report No: **EDCS - 24733400**

<b>Subtest Date</b>	07-Sept-2023
<b>Subtest Title</b>	Transmitter Spurious Emissions
<b>Frequency Range</b>	18GHz - 40GHz
<b>Mode</b>	2x2 MIMO 802.11ax/HE20 (Refer to section 4.3 for mode of operation details)
<b>Comments on the above Test Results</b>	Tx Channel 45 (6175 MHz)



Legend: — 74dB $\mu$ V/m (Peak); — 54 dB $\mu$ V/m (Average); — 68dB $\mu$ V/m (Peak)(-27dbm)

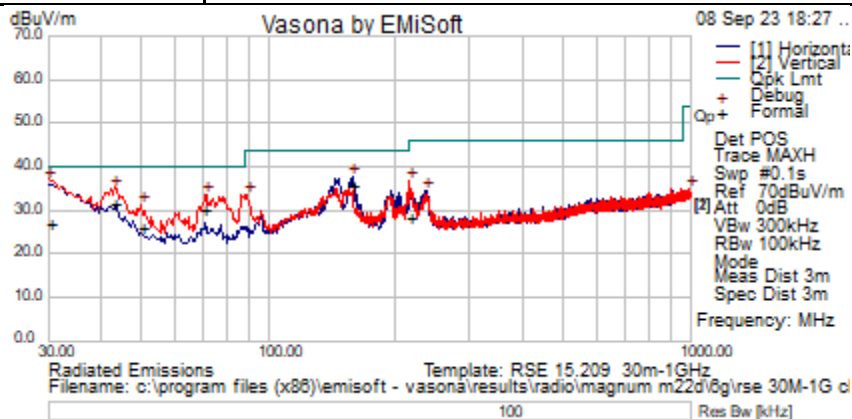
Frequency (MHz)	Raw (dBuV)	Cab Loss (dB)	AF (dB)	Level (dBuV)	Detector	Polarity	Height (cm)	Azt (Deg)	Limit (dBuV)	Margin (dB)	Results Pass / Fail	Comments
39984.81	54.69	0	-5.92	48.77	Peak	V	150	0	74	-25.23	Pass	RB
39984.81	41.28	0	-5.92	35.36	Average	V	150	0	54	-18.64	Pass	RB

Note: RB means restricted band



Radio Test Report No: **EDCS - 24733400**

<b>Subtest Date</b>	08-Sept-2023
<b>Subtest Title</b>	Transmitter Spurious Emissions
<b>Frequency Range</b>	30MHz - 1GHz
<b>Mode</b>	2x2 MIMO 802.11ax/HE20 (Refer to section 4.3 for mode of operation details)
<b>Comments on the above Test Results</b>	Tx Channel 93 (6415 MHz)

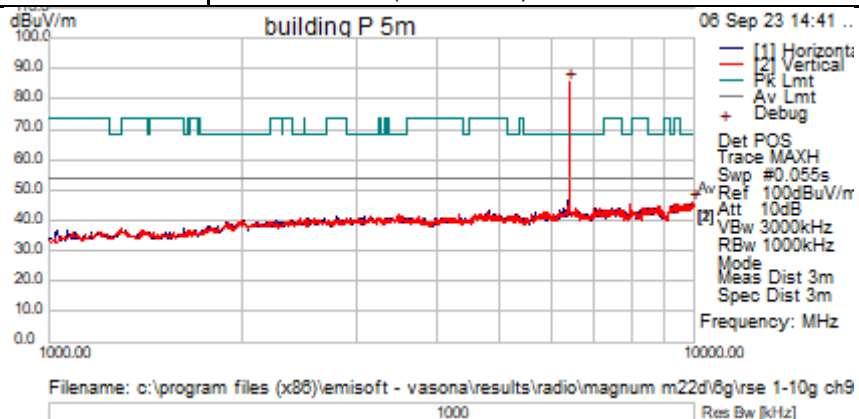


Frequency (MHz)	Raw (dBuV)	Cab Loss (dB)	AF (dB)	Level (dBuV)	Detector	Polarity	Height (cm)	Azt (Deg)	Limit (dBuV)	Margin (dB)	Results Pass / Fail	Comments
158.013	22.5	0.95	12.22	35.67	Quasi-pk	H	157	237	43.5	-7.83	Pass	
42.88275	18.93	0.54	12.07	31.54	Quasi-pk	V	117	142	40	-8.46	Pass	
70.6125	21.26	0.62	8.28	30.16	Quasi-pk	V	163	26	40	-9.84	Pass	
30.23225	5.35	0.46	21.27	27.08	Quasi-pk	H	158	149	40	-12.92	Pass	
49.831	17.17	0.58	8.49	26.24	Quasi-pk	V	142	322	40	-13.76	Pass	
215.752	15.42	1.13	11.72	28.26	Quasi-pk	H	155	64	43.5	-15.24	Pass	



Radio Test Report No: **EDCS - 24733400**

<b>Subtest Date</b>	06-Sept-2023
<b>Subtest Title</b>	Transmitter Spurious Emissions
<b>Frequency Range</b>	1GHz - 10GHz
<b>Mode</b>	2x2 MIMO 802.11ax/HE20 (Refer to section 4.3 for mode of operation details)
<b>Comments on the above Test Results</b>	Tx Channel 93 (6415 MHz)

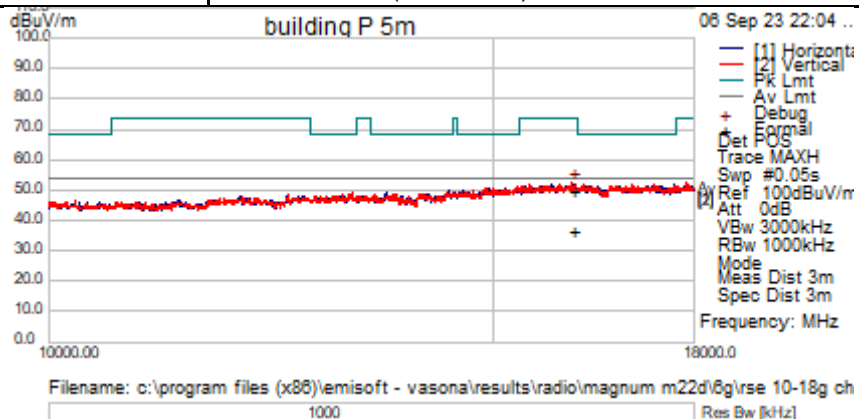


Frequency (MHz)	Raw (dBuV)	Cab Loss (dB)	AF (dB)	Level (dBuV)	Detector	Polarity	Height (cm)	Azt (Deg)	Limit (dBuV)	Margin (dB)	Results Pass / Fail	Comments
6422.5	93.42	6.88	-14.56	85.74	Peak [Scan]	V	150	20	--	--	Ignored	fundamental
9959.5	49.84	8.74	-12.62	45.96	Peak [Scan]	V	400	280	54	-8.04	Pass	Noise floor



Radio Test Report No: **EDCS - 24733400**

<b>Subtest Date</b>	06-Sept-2023
<b>Subtest Title</b>	Transmitter Spurious Emissions
<b>Frequency Range</b>	10GHz - 18GHz
<b>Mode</b>	2x2 MIMO 802.11ax/HE20 (Refer to section 4.3 for mode of operation details)
<b>Comments on the above Test Results</b>	Tx Channel 93 (6415 MHz)



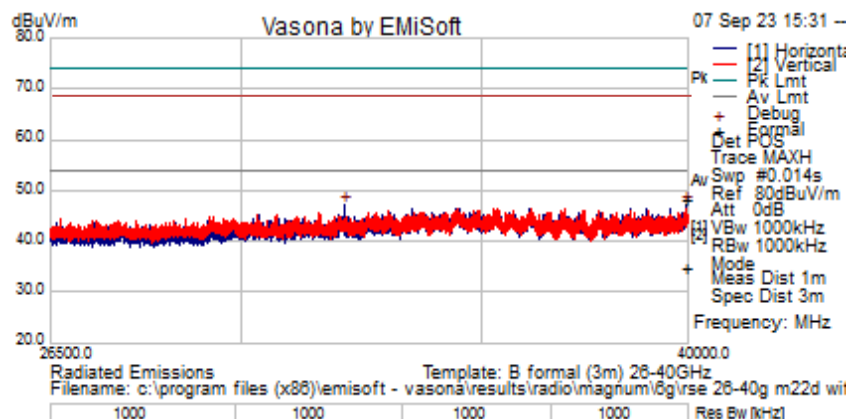
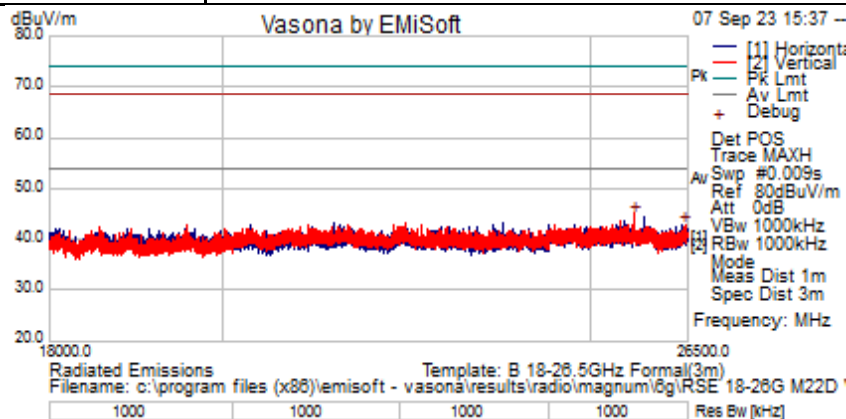
Frequency (MHz)	Raw (dBuV)	Cab Loss (dB)	AF (dB)	Level (dBuV)	Detector	Polarity	Height (cm)	Azt (Deg)	Limit (dBuV)	Margin (dB)	Results Pass / Fail	Comments
16120	46.45	11.95	-8.26	50.13	Peak	H	394	157	74	-23.87	Pass	RB
16120	32.92	11.95	-8.26	36.6	Average	H	394	157	54	-17.4	Pass	RB

Note: RB means restricted band



Radio Test Report No: **EDCS - 24733400**

<b>Subtest Date</b>	07-Sept-2023
<b>Subtest Title</b>	Transmitter Spurious Emissions
<b>Frequency Range</b>	18GHz - 40GHz
<b>Mode</b>	2x2 MIMO 802.11ax/HE20 (Refer to section 4.3 for mode of operation details)
<b>Comments on the above Test Results</b>	Tx Channel 93 (6415 MHz)



Legend: — 74dB $\mu$ V/m (Peak); — 54 dB $\mu$ V/m (Average); — 68dB $\mu$ V/m (Peak)(-27dbm)

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
39957.81	54.41	0	-6.04	48.37	Peak	H	150	0	74	-25.63	Pass	RB
39957.81	41.11	0	-6.04	35.06	Average	H	150	0	54	-18.94	Pass	RB

Note: RB means restricted band

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

Equip#	Manufacturer/ Model	Description	Last Cal	Next Due
<b>Radiated Emissions 30MHz – 1GHz</b>				
CIS008448	Cisco/NSA 5m Chamber	NSA 5m Chamber	29-Aug-2023	29-Aug-2024
CIS058263	ROHDE & SCHWARZ/ ESW44	EMI TEST RECEIVER, 44Ghz	22-Aug-2023	22-Aug-2024
CIS039114	Sunol Sciences / JB1	Combination Bi-Log Antenna, 30MHz-2GHz	14-Nov-2022	14-Nov-2023
CIS056158	Huber+Suhner Sucoflex 104PEA	Sucoflex N Type blue 7ft cable	01-Aug-2023	01-Aug-2024
CIS021117	Micro-Coax / UFB311A-0- 2484-520520	RF Coaxial Cable, 272.0 in. - 18GHz	12-Sep-2022	12-Sep-2023
CIS063527	Micro-Coax / UFB311A	RF Coaxial Cable	01-Jan-2023	01-Jan-2024
<b>Radiated Emissions 1GHz – 18GHz</b>				
CIS40597	Cisco/Above 1GHz Site Cal	1GHz Cispr Site Verification	23-Jun-2023	23-Jun-2024
CIS041202	ETS Lindgren / 3117	Double Ridged Horn Antenna	25-Apr-2023	25-Apr-2024
CIS063061	Cisco / TstHd1	External Preamp Array, 1-18GHz	06-Jul-2023	06-Jul-2024
CIS058263	ROHDE & SCHWARZ/ ESW44	EMI TEST RECEIVER, 44Ghz	22-Aug-2023	22-Aug-2024
CIS056158	Huber+Suhner Sucoflex 104PEA	Sucoflex N Type blue 7ft cable	01-Aug-2023	01-Aug-2024
CIS021117	Micro-Coax / UFB311A-0- 2484-520520	RF Coaxial Cable, 272.0 in. - 18GHz	12-Sep-2022	12-Sep-2023
CIS063527	Micro-Coax / UFB311A	RF Coaxial Cable	01-Jan-2023	01-Jan-2024
CIS064482	RF Lambda/ RHPF23G08G40	40GHz High Pass Filter	06-Sept-2023	06-Sep-2024
<b>Radiated Emissions 18GHz – 40GHz</b>				
CIS40597	Cisco/Above 1GHz Site Cal	1GHz Cispr Site Verification	23-Jun-2023	23-Jun-2024
CIS58778	ETS Lindgren/3116C	18-40 GHz, Horn Antenna	19-Sep-2022	19-Sep-2023
CIS59871	Cisco/Test Head 1840.2	18-40GHz test head, includes Pre-Amp, Ant Cable, 6inch formable cable to amp input, 15V pwr pack,+	23-Feb-2023	23-Feb-2024
CIS59832	ROHDE & SCHWARZ/ ESW44	EMI TEST RECEIVER, 44Ghz	31-Oct-2022	31-Nov-2023

## 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 <sup>3</sup> )
EN	European Norm	MHz	MegaHertz (1x10 <sup>6</sup> )
IEC	International Electro technical Commission	GHz	Gigahertz (1x10 <sup>9</sup> )
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 <sup>3</sup> )
L1	Line 1	μV	Microvolt (1x10 <sup>-6</sup> )
L2	Line2	A	Amp
L3	Line 3	μA	Micro Amp (1x10 <sup>-6</sup> )
DC	Direct Current	mS	Milli Second (1x10 <sup>-3</sup> )
RAW	Uncorrected measurement value, as indicated by the measuring device	μS	Micro Second (1x10 <sup>-6</sup> )
RF	Radio Frequency	μS	Micro Second (1x10 <sup>-6</sup> )
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 Test Setups**

EUT Photos have been omitted from this test report. Photos can be found in the supplementary exhibit included in the submission and EDCS#23771099



Radio Test Report No: **EDCS - 24733400**

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## **Appendix E: Software Used to Perform Testing**

EMlsoft Vasona, version 6.083  
RF Automation version ### NA

## Appendix F: Test Procedures

Measurements were made in accordance with:

- KDB 987694
  - 987594 D01 U-NII 6GHz General Requirements v02r02
  - 987594 D02 U-NII 6 GHz EMC Measurement v02r01
- KDB 789033
  - 789033 D02 General UNII Test Procedures New Rules v02r01
- KDB 662911 - MIMO
- ANSI C63.10 2013 Intentional Radiators

Test procedures are summarized below:

FCC 6GHz Test Procedures	EDCS # 23507622
FCC 5GHz RSE Test Procedures	EDCS # 1511600



Radio Test Report No: **EDCS - 24733400**

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

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

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



Radio Test Report No: **EDCS - 24733400**

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## **Appendix H: Test Assessment Plan**

Compliance Test Plan (Excel) EDCS# 24733406

Target Power Tables EDCS# 23409888

## **Appendix I: Worst Case Justification**

Worst case modes were selected to ANSI C63.10 2013 Section **5.6.2.2, 6.3.1**

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