


# RF TEST REPORT

**FCC ID: PJZ2428GN**

Test Report No.....: RF240730013-01-001

Product(s) Name.....: GPON ONT

Model(s).....: 2428GN, 2428TE

Trade Mark.....: 

Applicant.....: DZS Inc.

Address.....: 5700 Tennyson Parkway, Plano, TX 75024 USA


Receipt Date.....: 2024.07.31

Test Date.....: 2024.08.01~2024.08.06

Issued Date.....: 2024.08.07

Standards.....: 47 CFR FCC Part 15, Subpart C(Section 15.247);  
ANSI C63.10:2013

Testing Laboratory.....: Shenzhen Haiyun Standard Technical Co., Ltd.

Prepared By:	Checked By:	Approved By:	
Black Ding	Tim Zhang	Misue Su	
<i>Black Ding</i>	<i>Tim.zhang</i>	<i>Misue Su</i>	

# Table of Contents

<b>History of this test report.....</b>	<b>4</b>
<b>1. General Information .....</b>	<b>5</b>
1.1 Applicant.....	5
1.2 Manufacturer .....	5
1.3 Basic Description of Equipment Under Test.....	5
1.4 Transmit Operating Mode.....	6
<b>2. Summary of Test Results .....</b>	<b>7</b>
2.1 Summary of Test Items .....	7
2.2 Application of Standard .....	7
2.3 Test Instruments.....	8
2.4 Test Mode.....	8
2.5 Test Condition .....	8
2.6 Duty Cycle of Test Signal .....	9
2.7 Measurement Uncertainty .....	9
2.8 Description of Support Units.....	9
2.9 Test Location .....	9
<b>3. Test Procedure And Results .....</b>	<b>10</b>
3.1 AC Power Line Conducted Emission.....	10
3.1.1 Limit .....	10
3.1.2 Test Procedure .....	10
3.1.3 Test Setup .....	10
3.1.4 Test Result .....	11
3.2 Radiated Emission and Band Edge.....	19
3.2.1 Limit .....	19
3.2.2 Test Procedure .....	19
3.2.3 Test Setup .....	20
3.2.4 Test Result .....	22
3.3 Spurious Emission at Antenna Port.....	29

3.3.1	Limit .....	29
3.3.2	Test Procedure .....	29
3.3.3	Test Setup .....	30
3.3.4	The Result .....	30
3.4	6dB Bandwidth .....	31
3.4.1	Limit .....	31
3.4.2	Test Procedure .....	31
3.4.3	Test Setup .....	31
3.4.4	Test Result .....	32
3.5	Maximum conducted output power.....	33
3.5.1	Limit .....	33
3.5.2	Test Procedure .....	33
3.5.3	Test Setup .....	33
3.5.4	The Result .....	33
3.6	Power Spectral Density .....	34
3.6.1	Limit .....	34
3.6.2	Test Procedure .....	34
3.6.3	Test Setup .....	34
3.6.4	The Result .....	35

## History of this test report

Amendment Report Issue Date: 2024.08.07

☐ No additional attachment

☒ Additional attachments were issued following record

Attachment No.	Issue Date	Description
FR332121A	2023.05.17	Original report
RF240730013-01-001	2024.08.07	Compared with original report (FR332121A), reduce one heat sink, change size of remaining two heat sinks and appearance of product. Please see the following table for details. The radiated emissions the worst case have been re-evaluated. In this report only updated the test results for radiated emissions and ac power conducted emissions, other are kept the same

# 1. General Information

## 1.1 Applicant

**DZS Inc.**


5700 Tennyson Parkway, Plano, TX 75024 USA

## 1.2 Manufacturer

**DZS Inc.**

5700 Tennyson Parkway, Plano, TX 75024 USA

## 1.3 Basic Description of Equipment Under Test

Product No.	POC240730013-S001, POC240730013-S002																			
Equipment Name	GPON ONT																			
Model Name	2428GN, 2428TE																			
Model difference	Only 2.5G WAN port and optical fiber port part of the circuit are different 2428GN: with optical fiber port, without 2.5G WAN port 2428TE: without optical fiber port, with 2.5G WAN port																			
Trade Mark																				
Power Supply	DC 12V from adapter or DC 12V from 8 pin PSU																			
Adapter Information	Model: SOY-1200250US-459 Input: 100-240V~ 50/60Hz 0.9A Max Output: 12V== 2.5A 30.0W																			
Operate temperature	0℃-45℃																			
EUT Stage	○ Product Unit		● Final-Sample																	
Operating Band and Conducted Output Power (Max power)	2400MHz ~ 2483.5MHz		●IEEE 802.11g:29.73Bm(0.9397W)																	
Antenna Function Description	<table><tr><td></td><td>Ant. 0</td><td>Ant. 1</td><td>Ant. 2</td></tr><tr><td>802.11 b/g/n/ax SISO</td><td>V</td><td>V</td><td>V</td></tr><tr><td>802.11 b/g/n/ax CDD 1S3T</td><td>V</td><td>V</td><td>V</td></tr><tr><td>802.11 ax Tx Beamforming 1S3T</td><td>V</td><td>V</td><td>V</td></tr></table>					Ant. 0	Ant. 1	Ant. 2	802.11 b/g/n/ax SISO	V	V	V	802.11 b/g/n/ax CDD 1S3T	V	V	V	802.11 ax Tx Beamforming 1S3T	V	V	V
	Ant. 0	Ant. 1	Ant. 2																	
802.11 b/g/n/ax SISO	V	V	V																	
802.11 b/g/n/ax CDD 1S3T	V	V	V																	
802.11 ax Tx Beamforming 1S3T	V	V	V																	
Nominal Bandwidth	20MHz / 40MHz																			
Modulation	IEEE 802.11b: DSSS IEEE 802.11g/n: OFDM IEEE 802.11ax: OFDMA																			
Antenna gain	Ant0: 3.52dBi, Ant1: 3.60dBi, Ant2: 3.61dBi																			
Antenna type	PCB antenna																			

Eleven channels are provided for 802.11b, 802.11g, 802.11n20, 802.11ax20:

Frequency Band	Channel No.	Frequency	Channel No.	Frequency
2400MHz ~ 2483.5 MHz	01	2412MHz	07	2442MHz
	02	2417MHz	08	2447MHz
	03	2422MHz	09	2452MHz
	04	2427MHz	10	2457MHz
	05	2432MHz	11	2462MHz
	06	2437MHz	/	/

Seven channels are provided for 802.11n40, 802.11ax40:

Frequency Band	Channel No.	Frequency	Channel No.	Frequency
2400MHz ~ 2483.5 MHz	03	2422 MHz	07	2442MHz
	04	2427MHz	08	2447MHz
	05	2432MHz	09	2452MHz
	06	2437MHz	/	/

Note:

1. For SISO&MIMO mode, the whole testing has assessed only MIMO mode by referring to their higher conducted power.
2. For 802.11n/ax 20/40MHz mode, the power setting of 802.11n 20/40MHz mode is the same or lower than 802.11ax 20/40MHz mode. Therefore, the whole testing has assessed only 802.11ax HE20/HE40 mode.
3. The device supports 1S3T for MIMO(CDD&TXBF) mode. 1S3T means NSS=1, MIMO 3Tx.
4. 802.11ax support Tx Beamforming mode, and the Tx Beamforming power/EIRP is not greater than CDD mode, so we only evaluate CDD mode by referring to their maximum conducted power.
5. The device does not support partial RU tone for 802.11ax mode

## 1.4 Transmit Operating Mode

Please refer to original report(FR332121A)

## 2. Summary of Test Results

### 2.1 Summary of Test Items

47 CFR FCC Part 15, Subpart C (Section 15.247)			
Test item	FCC Clause	Results	Remarks
AC Power Conducted Emission	15.207	Pass	/
Radiated Emission and Band Edge Measurement	15.205/15.209 /15.247(d)	Pass	Note3
Spurious Emission at Antenna Port	15.247(d)	Pass	Note2
6dB Bandwidth	15.247(a)(2)	Pass	Note2
Maximum Conducted Power	15.247(b)	Pass	Note2
Power Spectral Density	15.247(e)	Pass	Note2
Antenna Requirements	15.203	Compliance	Note1
<p>Note:</p> <ol style="list-style-type: none"> <li>1. The EUT has 3 PCB Antennas arrangement which was permanently attached.</li> <li>2. For test item: 6dB Bandwidth, Spurious Emission at Antenna Port, Maximum Conducted Power and Power Spectral Density, Please refer to original report(FR332121A)</li> <li>3. Worst case for Radiated Emission and Band Edge were recorded.</li> </ol>			

### 2.2 Application of Standard

47 CFR FCC Part 15, Subpart C (Section 15.247)

KDB 558074 D01 15.247 Meas Guidance v05r02

KDB 662911 D01 Multiple Transmitter Output v02r01

ANSI C63.10:2013

## 2.3 Test Instruments

Radiated Emissions							
No.	Equipment	Manufacturer	Type No.	Serial No.	Inventory No.	Cal. date (yyyy/mm/dd)	Cal. Due date (yyyy/mm/dd)
1	Test receiver	Rohde&Schwarz	ESU	100184	JLE011	2024/4/24	2025/4/23
2	Log periodic antenna	Schwarzbeck	VULB 9168	1151	JLE012	2024/4/20	2025/4/19
3	Low frequency amplifier	/	LNA 0920N	2014	JLE023	2024/4/24	2025/4/23
4	High frequency amplifier	Schwarzbeck	BBV 9718	284	JLE024	2024/4/24	2025/4/23
5	Horn Antenna	SCHWARZBEC K	BBHA 9120 D	9120D-1273	JLE028	2024/4/20	2025/4/19
6	Temp&Humid ity Recorder	Meideshi	JR900	/	JLE021	2024/4/24	2025/4/23
7	Horn Antenna	SCHWARZBEC K	BBHA 9170	9170#685	JLE029	2024/7/15	2025/7/14
8	Loop Antenna	SCHWARZBEC K	FMZB15 19B	00029	JLE030	2024/7/15	2025/7/14
9	Broadband preamplifier	Schwarzbeck	BBV9721	9721-019	JLE025	2024/4/24	2025/4/23
10	MXA Signal Analyzer	Keysight	N9010A	MY51440 158	JLE076	2024/4/20	2025/4/19
11	Test software	Farad Technology Co., Ltd	EZ-EMC Ver.TW-03A2				
Conducted Emission							
1	LISN	Rohde&Schwarz	ENV216	100075	JLE002	2024/4/24	2025/4/23
2	ISN	Schwarzbeck	CATE 5 8158	#171	JLE003	2024/4/24	2025/4/23
3	Test receiver	Rohde&Schwarz	ESCI	100718	JLE010	2024/4/24	2025/4/23
4	Pulse limiter	Rohde&Schwarz	ESH3-Z2	102299	JLE047	2024/4/24	2025/4/23
5	Temp&Humid ity Recorder	Meideshi	JR900	/	JLE020	2024/4/24	2025/4/23
6	Test software	Farad Technology Co., Ltd	EZ-EMC Ver.TW-03A2				

## 2.4 Test Mode

Please refer to original report(FR332121A)

## 2.5 Test Condition

Applicable to	Environmental conditions	Input Power	Tested by
AC Power Conducted Emission	23.3°C, 51% RH	AC 120V/60Hz	Albert Fan
Radiated Emission and Band Edge Measurement	23.4°C, 55% RH	AC 120V/60Hz	Albert Fan

Note: Adapter supply voltage AC 120V/60Hz.



## 2.6 Duty Cycle of Test Signal

Please refer to original report(FR332121A)

## 2.7 Measurement Uncertainty

ISO/IEC 17025 requires that an estimate of the measurement uncertainties associated with the emissions test results be included in the report. The measurement uncertainties given below are based on a 95% confidence level (based on a coverage factor (k=2))

Uncertainty	
Parameter	Uncertainty
Occupied Channel Bandwidth	±102kHz
Power Spectral Density	±0.377dB
Conducted Spurious Emission	±0.743dB
RF power conducted	±1.328dB
Conducted emission(9kHz~30MHz) AC main	±2.68dB
Radiated emission(9kHz~30MHz)	±2.74dB
Radiated emission (30MHz~1GHz)	±4.22dB
Radiated emission (1GHz~18GHz)	±5.06dB
Radiated emission (18GHz~40GHz)	±4.98dB

## 2.8 Description of Support Units

No.	Equipment	Model Name	Manufacturer	Remarks
1	Telephone 1	/	/	/
2	Telephone 2	/	/	/
3	Microcomputer	TY510S-07IAB	LENOVO	YLX2QPQJ
4	Microcomputer	TY510S-07IAB	LENOVO	YLX2QPM7
5	Microcomputer	M4600t-N000	LENOVO	M703V3VF
6	Notebook	L450	Think	/
7	Notebook	L450	Think	/
8	USB Disk	/	Kingston	/
9	Optical local terminal	C300	/	/
10	8 pin PSU	/	/	/

## 2.9 Test Location

Company:	Shenzhen Haiyun Standard Technical CO., Ltd.
Address:	No. 110-113, 115, 116, Block B, Jinyuan Business Building, Bao'an District, Shenzhen, China
CNAS Registration Number:	CNAS L18252
CAB identifier	CN0145
A2LA Certificate Number	6823.01
Telephone:	0755-26024411

### 3. Test Procedure And Results

#### 3.1 AC Power Line Conducted Emission

##### 3.1.1 Limit

Frequency	Maximum RF Line Voltage	
	Quasi-Peak Level dB( $\mu$ V)	Average Level dB( $\mu$ V)
150kHz ~ 500kHz	66 ~ 56*	56 ~ 46*
500kHz ~ 5MHz	56	46
5MHz ~ 30MHz	60	50

Notes: 1. \* Decreasing linearly with logarithm of frequency.

2. The lower limit shall apply at the transition frequencies.

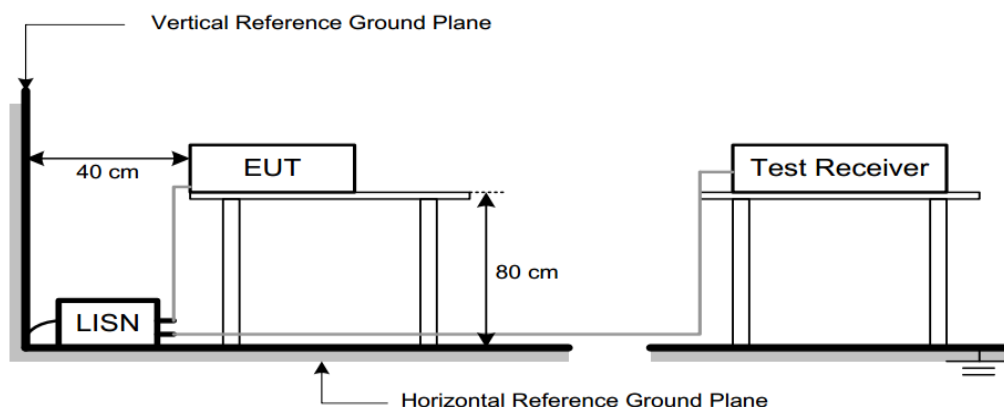
##### 3.1.2 Test Procedure

Test Method	
<input checked="" type="radio"/> Conducted Measurement	<input type="radio"/> Radiated Measurement
Test Channels	
<input type="radio"/> Lowest, Middle and Highest Channel	<input type="radio"/> Lowest and Highest Channel
Environmental conditions	
<input checked="" type="radio"/> Normal	<input type="radio"/> Normal and Extreme

Note: ● : Test    ○ : No Test

- The EUT was placed 0.4 meters from the conducting wall of the shielded room with EUT being connected to the power mains through a line impedance stabilization network (LISN). Other support units were connected to the power mains through another LISN. The two LISNs provide 50 ohm/ 50uH of coupling impedance for the measuring instrument.
- Both lines of the power mains connected to the EUT were checked for maximum conducted interference.
- The frequency range from 150kHz to 30MHz was searched. Emission levels under (Limit - 20dB) was not recorded.

##### 3.1.3 Test Setup



### 3.1.4 Test Result

#### Note:

1. Correct Factor = LISN Factor + Cable Loss + Pulse Limiter Factor, the value was added to Original Receiver Reading by the software automatically.
2. Measurement = Reading + Correct Factor.
3. Over = Measurement – Limit

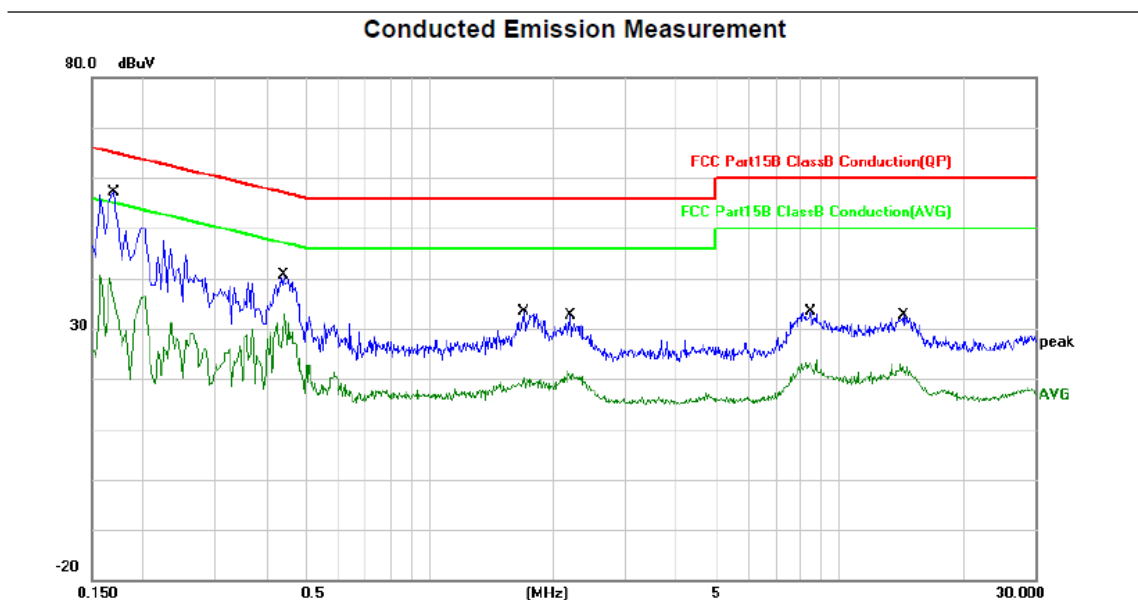
We only recorded the data of the worst mode. Please see the following:

2428GN:

For adapter

150kHz~30MHz	Worst Case Operating Mode: AX20MIMO Channel 2
--------------	---

Line



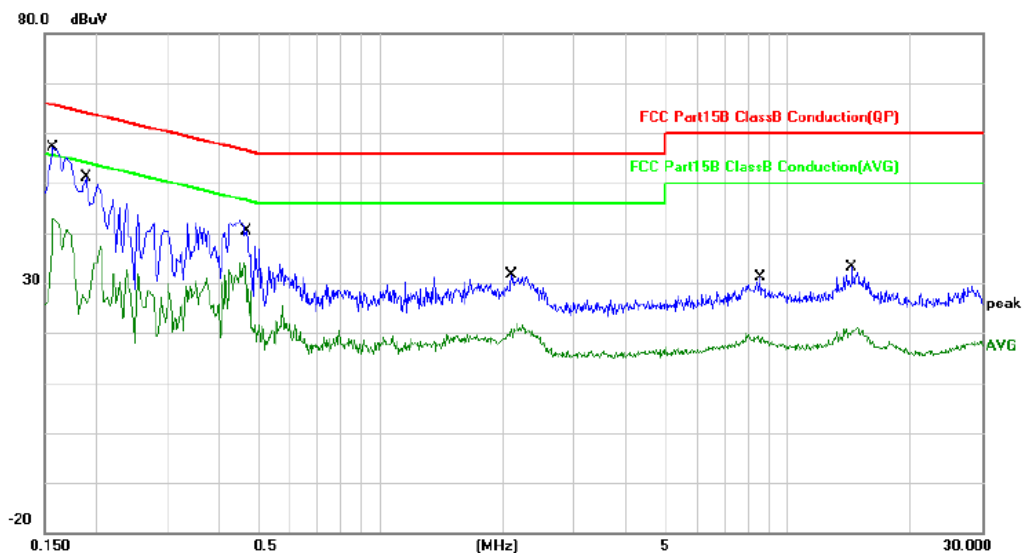
No.	Mk.	Freq.	Reading Level	Correct Factor	Measurement	Limit	Over		
		MHz	dBuV	dB	dBuV	dBuV	dB	Detector	Comment
1	*	0.1700	33.03	20.16	53.19	64.96	-11.77	QP	
2		0.1700	15.68	20.16	35.84	54.96	-19.12	AVG	
3		0.4420	16.94	20.30	37.24	57.02	-19.78	QP	
4		0.4420	8.78	20.30	29.08	47.02	-17.94	AVG	
5		1.7020	3.97	20.10	24.07	56.00	-31.93	QP	
6		1.7020	-1.51	20.10	18.59	46.00	-27.41	AVG	
7		2.2020	6.16	20.16	26.32	56.00	-29.68	QP	
8		2.2020	0.21	20.16	20.37	46.00	-25.63	AVG	
9		8.5020	7.05	20.12	27.17	60.00	-32.83	QP	
10		8.5020	1.19	20.12	21.31	50.00	-28.69	AVG	
11		14.4380	6.15	20.19	26.34	60.00	-33.66	QP	
12		14.4380	0.45	20.19	20.64	50.00	-29.36	AVG	

150kHz~30MHz

Worst Case Operating Mode: AX20MIMO Channel 2

Neutral

### Conducted Emission Measurement



No.	Mk.	Freq.	Reading Level	Correct Factor	Measurement	Limit	Over		
		MHz	dBuV	dB	dBuV	dBuV	dB	Detector	Comment
1		0.1580	26.25	20.32	46.57	65.57	-19.00	QP	
2		0.1580	3.32	20.32	23.64	55.57	-31.93	AVG	
3	*	0.1900	26.21	20.34	46.55	64.04	-17.49	QP	
4		0.1900	5.43	20.34	25.77	54.04	-28.27	AVG	
5		0.4700	16.79	20.08	36.87	56.51	-19.64	QP	
6		0.4700	6.68	20.08	26.76	46.51	-19.75	AVG	
7		2.1060	5.50	20.34	25.84	56.00	-30.16	QP	
8		2.1060	-0.45	20.34	19.89	46.00	-26.11	AVG	
9		8.5540	2.99	20.21	23.20	60.00	-36.80	QP	
10		8.5540	-2.27	20.21	17.94	50.00	-32.06	AVG	
11		14.4380	5.31	20.32	25.63	60.00	-34.37	QP	
12		14.4380	-0.25	20.32	20.07	50.00	-29.93	AVG	

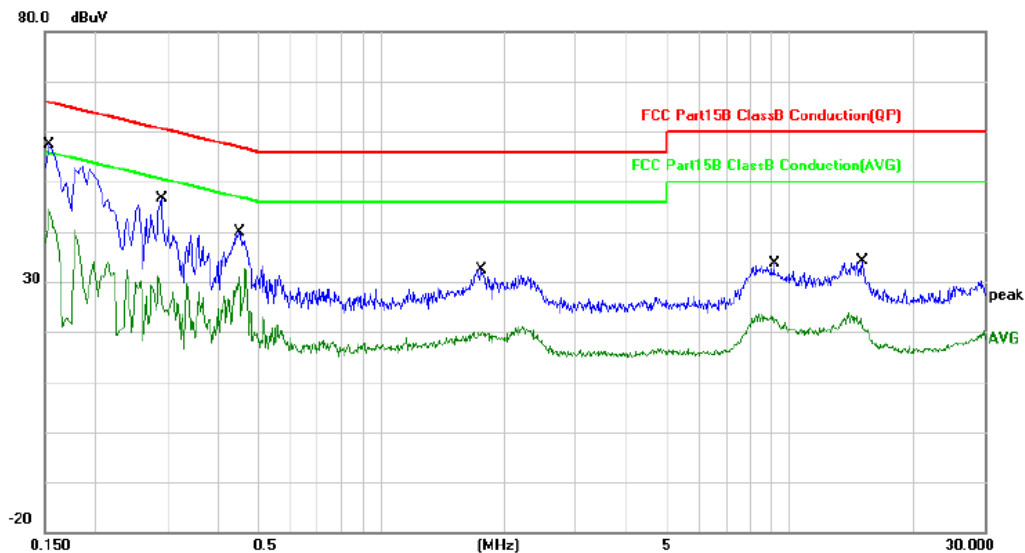
For 8 pin PSU

150kHz~30MHz

Worst Case Operating Mode: AX20MIMO Channel 2

Line

### Conducted Emission Measurement



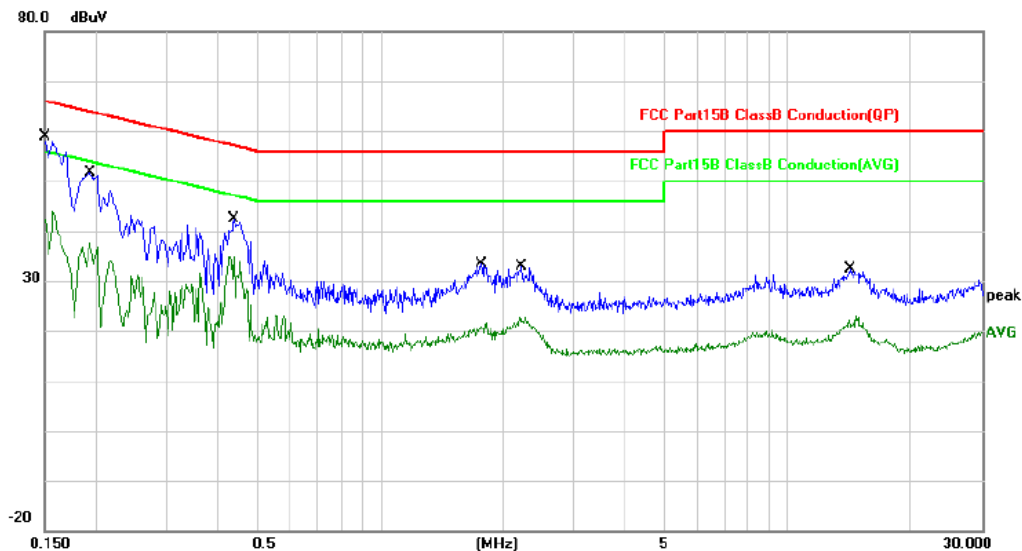
No.	Mk.	Freq.	Reading Level	Correct Factor	Measurement	Limit	Over		
		MHz	dBuV	dB	dBuV	dBuV	dB	Detector	Comment
1	*	0.1540	36.08	20.10	56.18	65.78	-9.60	QP	
2		0.1540	20.52	20.10	40.62	55.78	-15.16	AVG	
3		0.2900	15.56	20.09	35.65	60.52	-24.87	QP	
4		0.2900	1.35	20.09	21.44	50.52	-29.08	AVG	
5		0.4500	16.72	20.29	37.01	56.88	-19.87	QP	
6		0.4500	8.90	20.29	29.19	46.88	-17.69	AVG	
7		1.7700	6.39	20.13	26.52	56.00	-29.48	QP	
8		1.7700	-0.96	20.13	19.17	46.00	-26.83	AVG	
9		9.1700	6.69	20.19	26.88	60.00	-33.12	QP	
10		9.1700	0.59	20.19	20.78	50.00	-29.22	AVG	
11		15.0860	5.67	20.18	25.85	60.00	-34.15	QP	
12		15.0860	0.00	20.18	20.18	50.00	-29.82	AVG	

150kHz~30MHz

Worst Case Operating Mode: AX20MIMO Channel 2

Neutral

### Conducted Emission Measurement



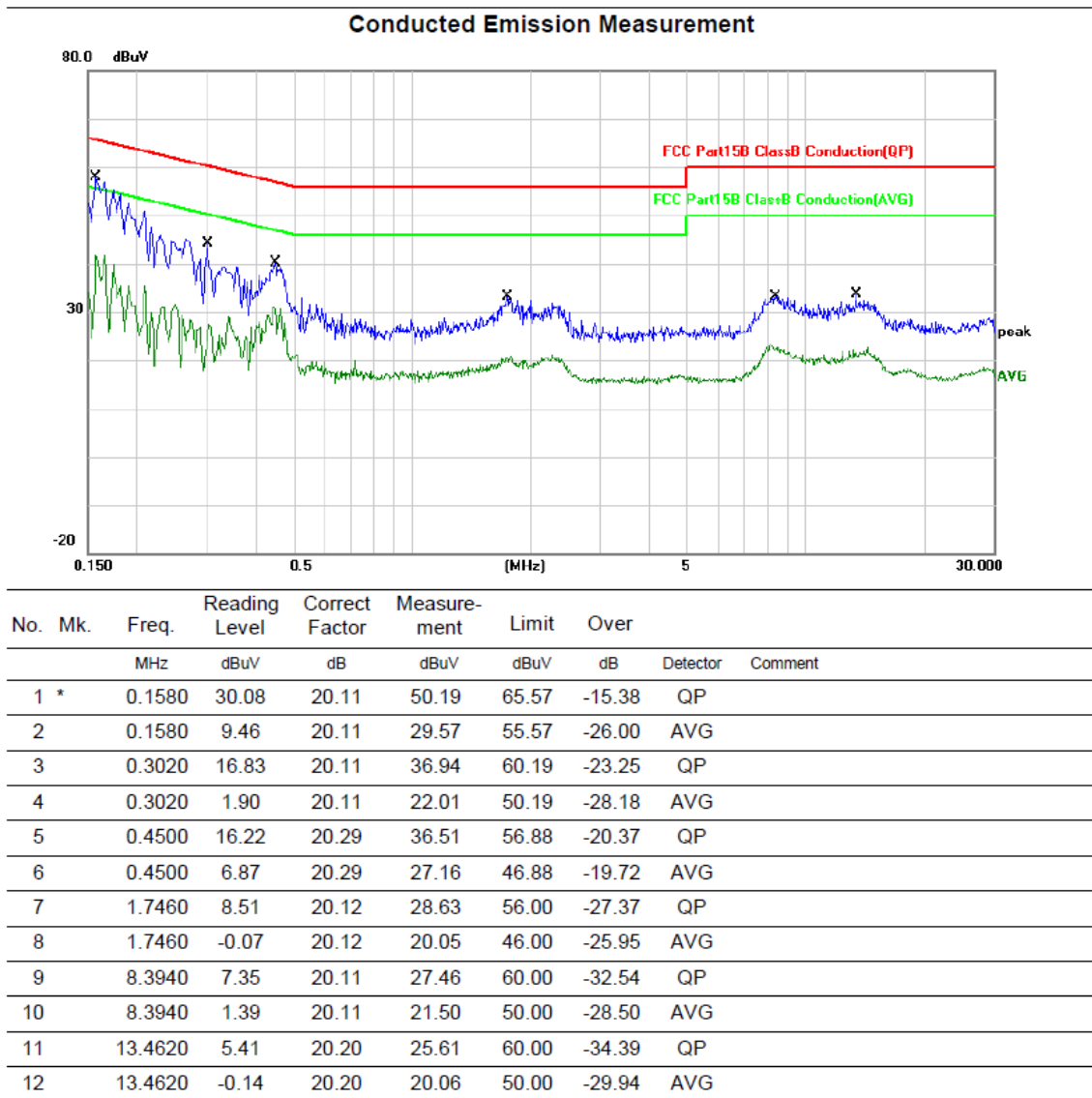
No.	Mk.	Freq.	Reading Level	Correct Factor	Measurement	Limit	Over	Detector	Comment
		MHz	dBuV	dB	dBuV	dBuV	dB		
1	*	0.1500	36.21	20.35	56.56	66.00	-9.44	QP	
2		0.1500	18.27	20.35	38.62	56.00	-17.38	AVG	
3		0.1955	27.97	20.35	48.32	63.80	-15.48	QP	
4		0.1955	9.29	20.35	29.64	53.80	-24.16	AVG	
5		0.4380	18.88	20.15	39.03	57.10	-18.07	QP	
6		0.4380	9.59	20.15	29.74	47.10	-17.36	AVG	
7		1.7780	2.39	20.36	22.75	56.00	-33.25	QP	
8		1.7780	-2.29	20.36	18.07	46.00	-27.93	AVG	
9		2.2300	6.80	20.31	27.11	56.00	-28.89	QP	
10		2.2300	0.46	20.31	20.77	46.00	-25.23	AVG	
11		14.2500	5.93	20.31	26.24	60.00	-33.76	QP	
12		14.2500	0.25	20.31	20.56	50.00	-29.44	AVG	

2428TE:

150kHz~30MHz

Worst Case Operating Mode: AX20MIMO Channel 2

Line

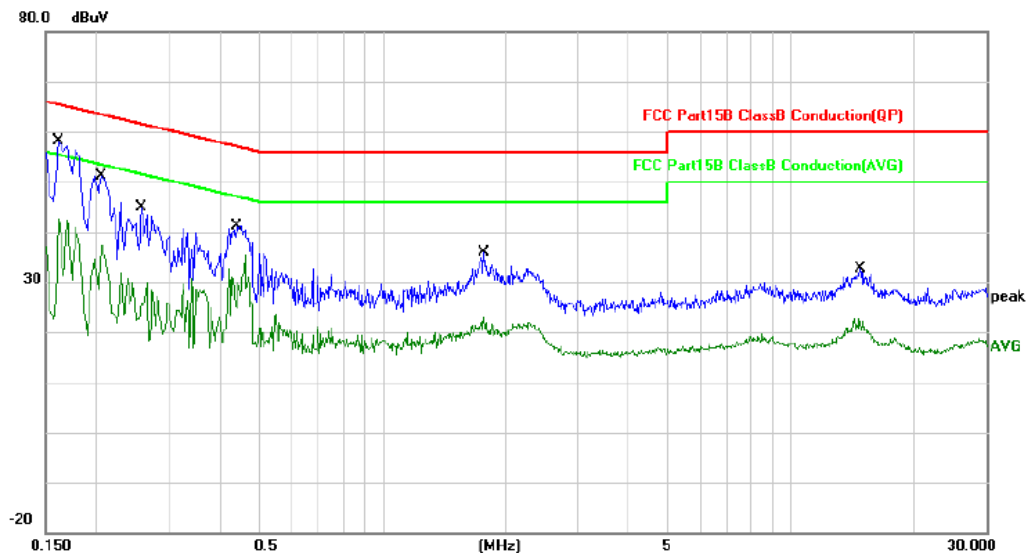


150kHz~30MHz

Worst Case Operating Mode: AX20MIMO Channel 2

Neutral

### Conducted Emission Measurement



No.	Mk.	Freq.	Reading Level	Correct Factor	Measurement	Limit	Over		
		MHz	dBuV	dB	dBuV	dBuV	dB	Detector	Comment
1	*	0.1620	35.35	20.30	55.65	65.36	-9.71	QP	
2		0.1620	18.16	20.30	38.46	55.36	-16.90	AVG	
3		0.2060	27.40	20.34	47.74	63.37	-15.63	QP	
4		0.2060	10.10	20.34	30.44	53.37	-22.93	AVG	
5		0.2580	20.94	20.10	41.04	61.50	-20.46	QP	
6		0.2580	4.77	20.10	24.87	51.50	-26.63	AVG	
7		0.4420	19.46	20.14	39.60	57.02	-17.42	QP	
8		0.4420	9.19	20.14	29.33	47.02	-17.69	AVG	
9		1.7780	9.75	20.36	30.11	56.00	-25.89	QP	
10		1.7780	0.48	20.36	20.84	46.00	-25.16	AVG	
11		14.7820	5.15	20.34	25.49	60.00	-34.51	QP	
12		14.7820	-0.39	20.34	19.95	50.00	-30.05	AVG	

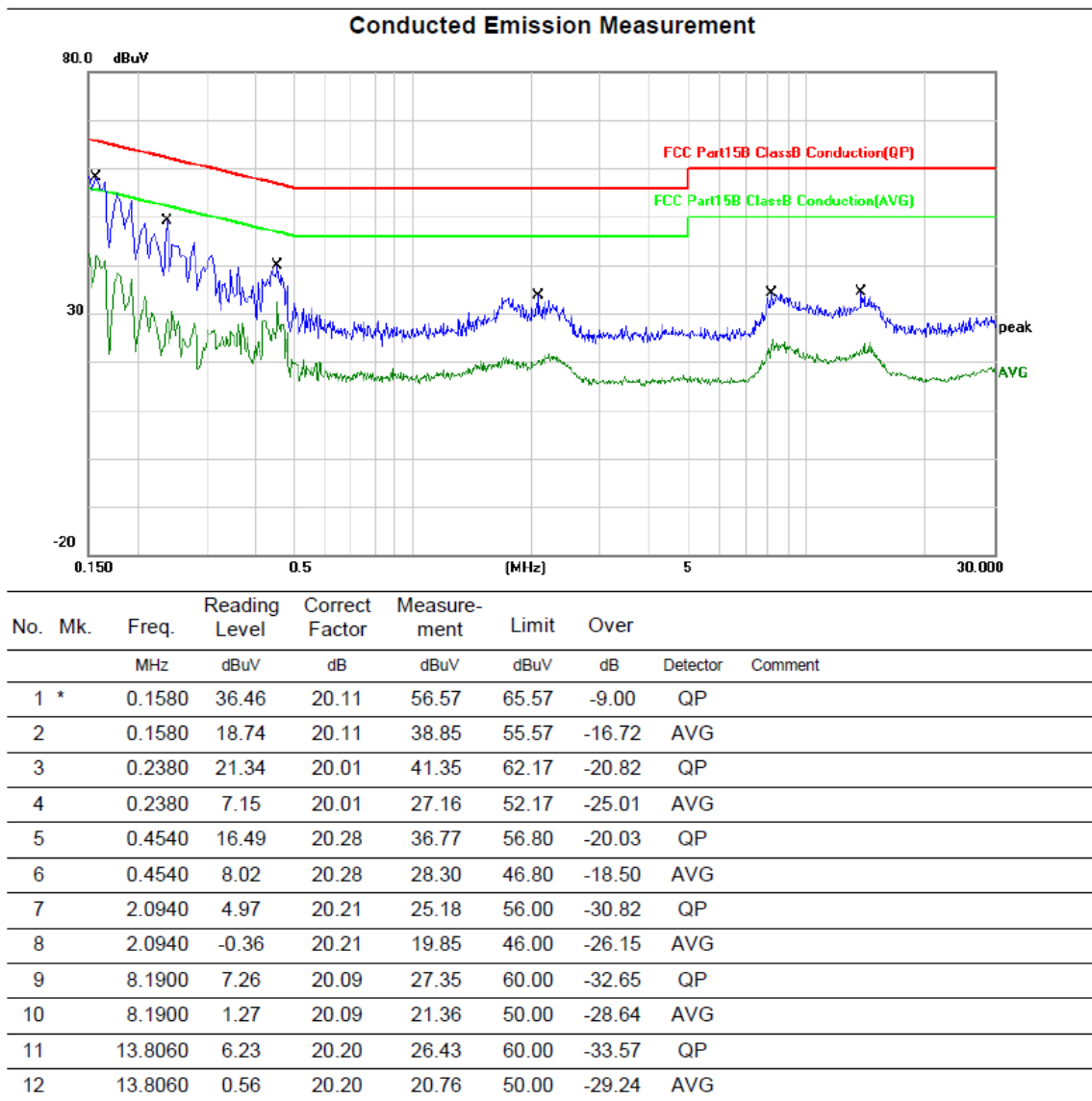


For 8 pin PSU

150kHz~30MHz

Worst Case Operating Mode: AX20MIMO Channel 2

Line

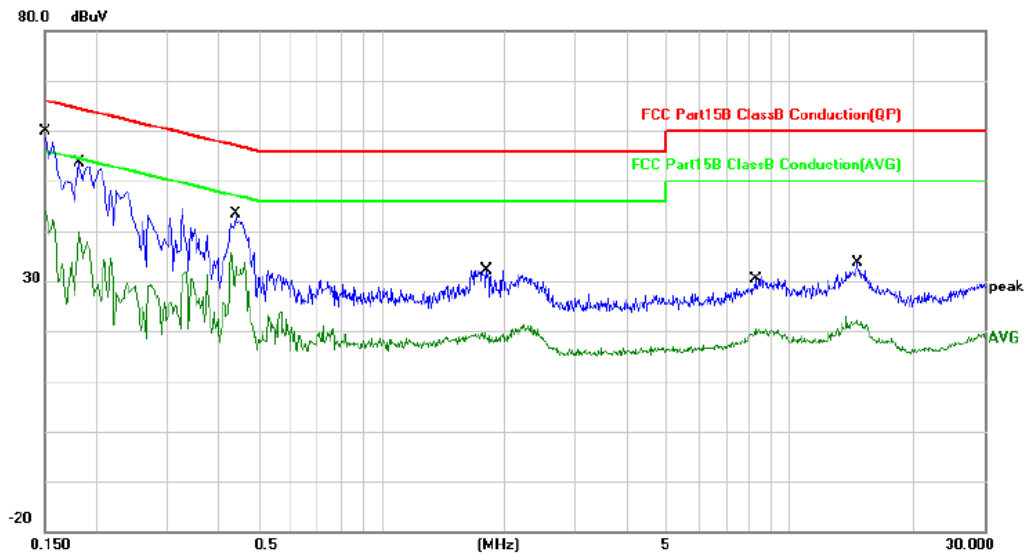


150kHz~30MHz

Worst Case Operating Mode: AX20MIMO Channel 2

Neutral

### Conducted Emission Measurement



No.	Mk.	Freq.	Reading Level	Correct Factor	Measurement	Limit	Over		
		MHz	dBuV	dB	dBuV	dBuV	dB	Detector	Comment
1	*	0.1500	36.85	20.35	57.20	66.00	-8.80	QP	
2		0.1500	18.93	20.35	39.28	56.00	-16.72	AVG	
3		0.1820	30.90	20.31	51.21	64.39	-13.18	QP	
4		0.1820	14.88	20.31	35.19	54.39	-19.20	AVG	
5		0.4420	19.86	20.14	40.00	57.02	-17.02	QP	
6		0.4420	11.06	20.14	31.20	47.02	-15.82	AVG	
7		1.8140	3.39	20.36	23.75	56.00	-32.25	QP	
8		1.8140	-1.78	20.36	18.58	46.00	-27.42	AVG	
9		8.2780	4.19	20.23	24.42	60.00	-35.58	QP	
10		8.2780	-1.38	20.23	18.85	50.00	-31.15	AVG	
11		14.6020	6.35	20.33	26.68	60.00	-33.32	QP	
12		14.6020	0.85	20.33	21.18	50.00	-28.82	AVG	

## 3.2 Radiated Emission and Band Edge

### 3.2.1 Limit

Radiated emissions which fall in the restricted bands must comply with the radiated emission limits specified as below table. Other emissions shall be at least 20dB below the highest level of the desired power:

Frequency (MHz)	Distance Meters(m)	Field Strength Limit	
		$\mu\text{V/m}$	$\text{dB}(\mu\text{V})/\text{m}$
0.009 – 0.49	300	2400/F(kHz)	-
0.490 – 1.705	30	24000/F(kHz)	-
1.705 – 30	30	30	-
30~88	3	100	40.0
88~216	3	150	43.5
216~960	3	200	46.0
960~1000	3	500	54.0
Above 1000	3	74.0 $\text{dB}(\mu\text{V})/\text{m}$ (Peak) 54.0 $\text{dB}(\mu\text{V})/\text{m}$ (Average)	

Note: (1) Emission level  $\text{dB}\mu\text{V} = 20 \log \text{Emission level } \mu\text{V/m}$

(2) The smaller limit shall apply at the cross point between two frequency bands.

(3) Distance is the distance in meters between the measuring instrument, antenna and the closest point of any part of the device or system.

### 3.2.2 Test Procedure

Test Method	
<input type="radio"/> Conducted Measurement	<input checked="" type="radio"/> Radiated Measurement
Test Channels	
<input checked="" type="radio"/> Lowest, Middle and Highest Channel	<input type="radio"/> Lowest and Highest Channel
Environmental conditions	
<input checked="" type="radio"/> Normal	<input type="radio"/> Normal and Extreme
Note: <input checked="" type="radio"/> : Test <input type="radio"/> : No Test	

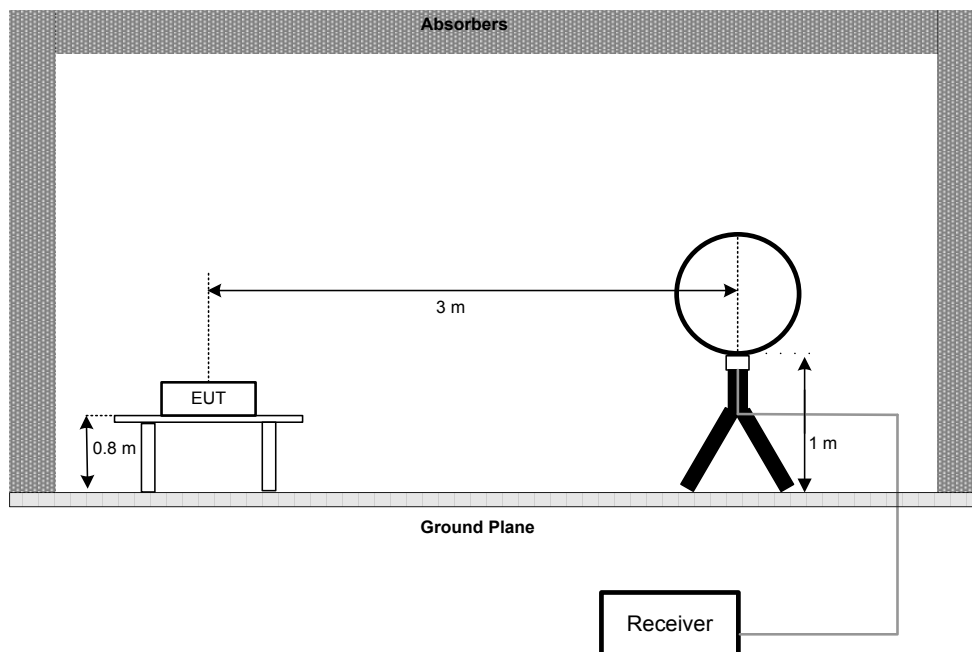
- The measuring distance of 3 m shall be used for measurements. The EUT was placed on the top of a rotating table 0.8 meter above the ground at a 3 meter semi-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.(below 1 GHz)
- The measuring distance of 3 m or 1.5m shall be used for measurements. The EUT was placed on the top of a rotating table 1.5 meter above the ground at a 3 meter semi-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.(above 1GHz)
- The height of the equipment or of the substitution antenna shall be 0.8m or 1.5m; the height of the test antenna shall vary between 1 m to 4 m. Both horizontal and vertical polarizations of

the antenna are set to make the measurement.

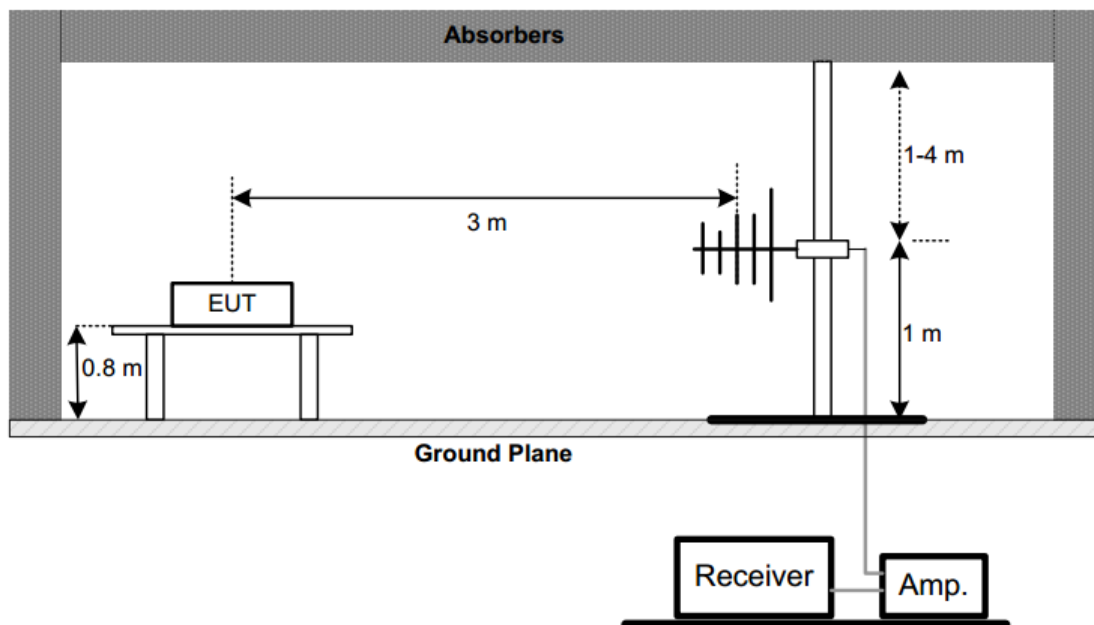
- d) For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights find the maximum reading (used Bore sight function).
- e) The receiver system was set to peak and average detect function and specified bandwidth with maximum hold mode when the test frequency is above 1 GHz.
- f) The initial step in collecting radiated emission data is a receiver peak detector mode pre-scanning the measurement frequency range. Significant peaks are then marked and then Quasi Peak detector mode re-measured.
- g) All readings are Peak unless otherwise stated QP in column of Note. Peak denotes that the Peak reading compliance with the QP Limits and then QP Mode measurement didn't perform. (below 1 GHz)
- h) All readings are Peak Mode value unless otherwise stated AVG in column of Note. If the Peak Mode Measured value compliance with the Peak Limits and lower than AVG Limits, the EUT shall be deemed to meet both Peak & AVG Limits and then only Peak Mode was measured, but AVG Mode didn't perform. (above 1 GHz)
- i) For the actual test configuration, please refer to the related Item -EUT Test Photos.

### 3.2.3 Test Setup

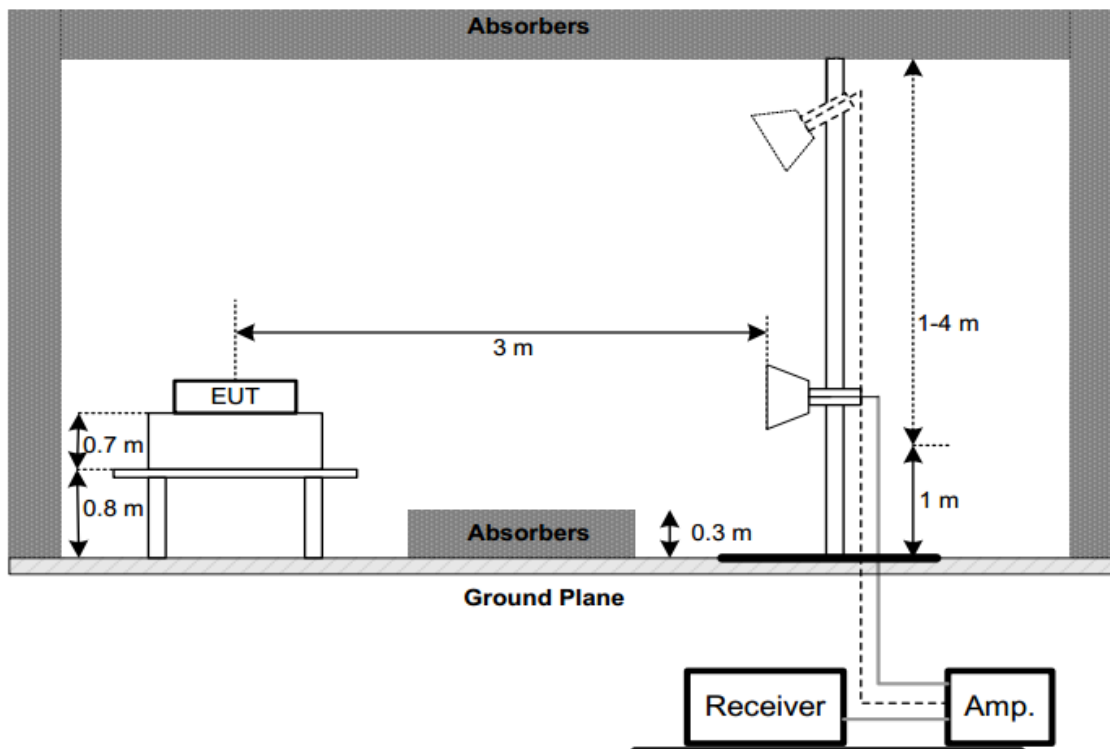
#### (A) Radiated Emission Test Set-Up Frequency Below 30 MHz



(B) Radiated Emission Test Set-Up Frequency 30 MHz-1000 MHz



(C) Radiated Emission Test Set-Up Frequency Above 1 GHz



### 3.2.4 Test Result

#### 1) Radiated emission: 9kHz-30MHz

The low frequency, which started from 9 kHz to 30MHz, was pre-scanned and the result which was 20dB lower than the limit line was not recorded in this report.

#### 2) Radiated emission: 30MHz-1G

**Note:**

1. Measurement = Reading + Correct Factor.
2. Over = Measurement – Limit

We only recorded the data of the worst mode. Please see the following:

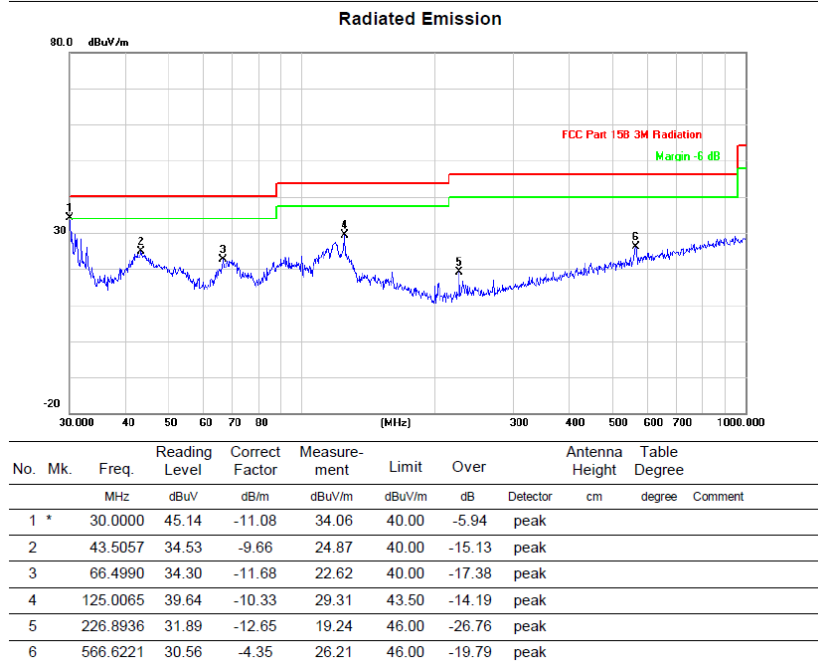
2428GN:

For adapter

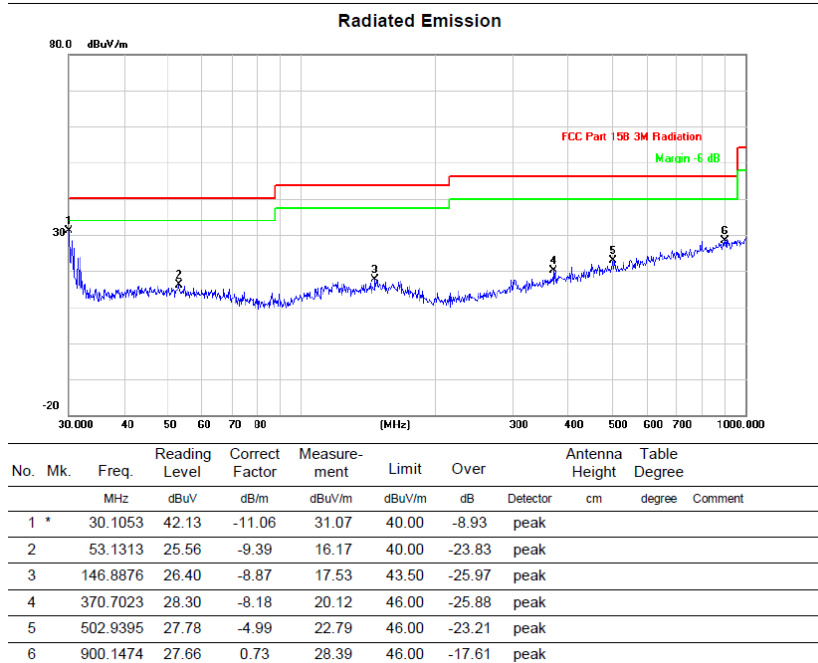
Below 1G (30MHz~1GHz)

Worst Case Operating Mode: AX20MIMO Channel 2

### VERTICAL



### HORIZONTAL

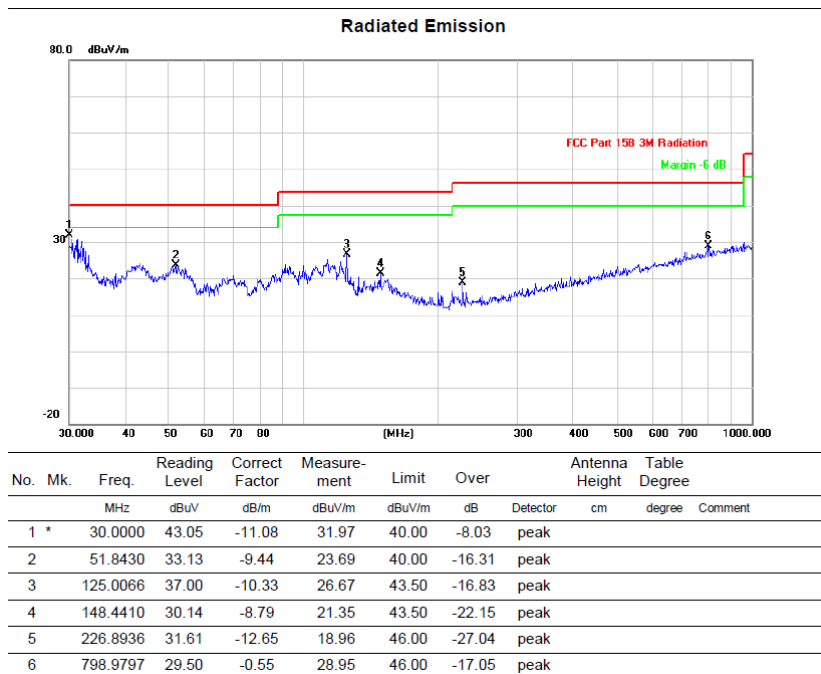


For 8 pin PSU

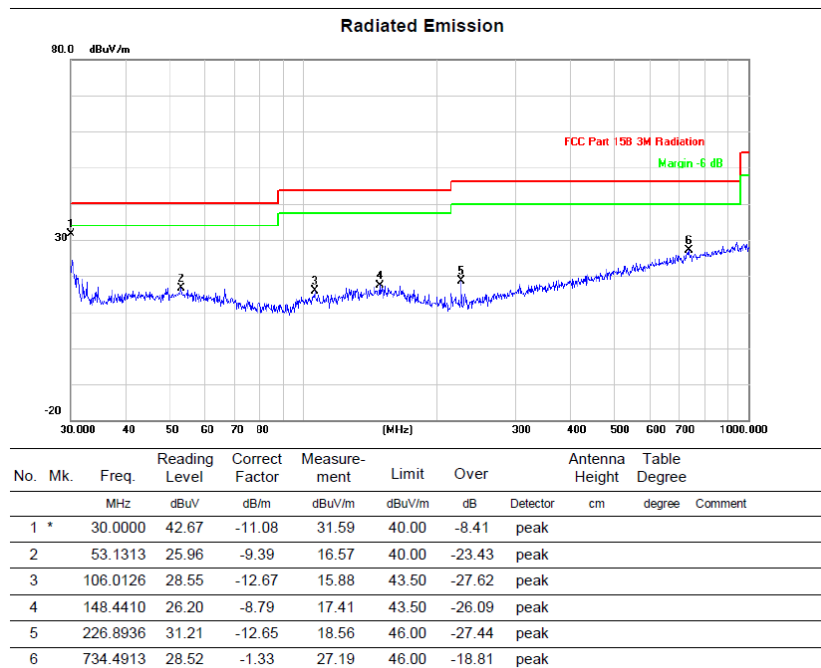
Below 1G (30MHz~1GHz)

Worst Case Operating Mode: AX20MIMO Channel 2

### VERTICAL



### HORIZONTAL





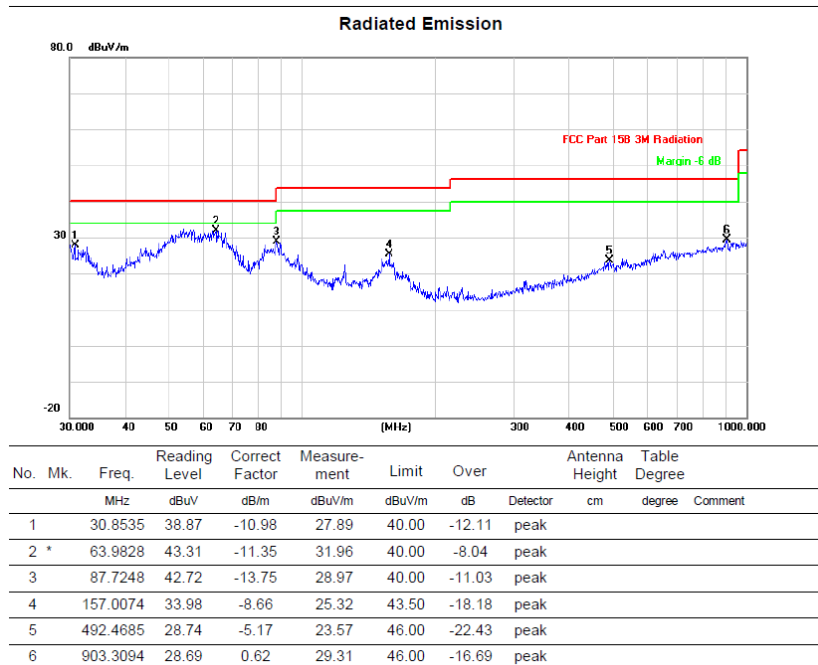
2428TE:

For adapter

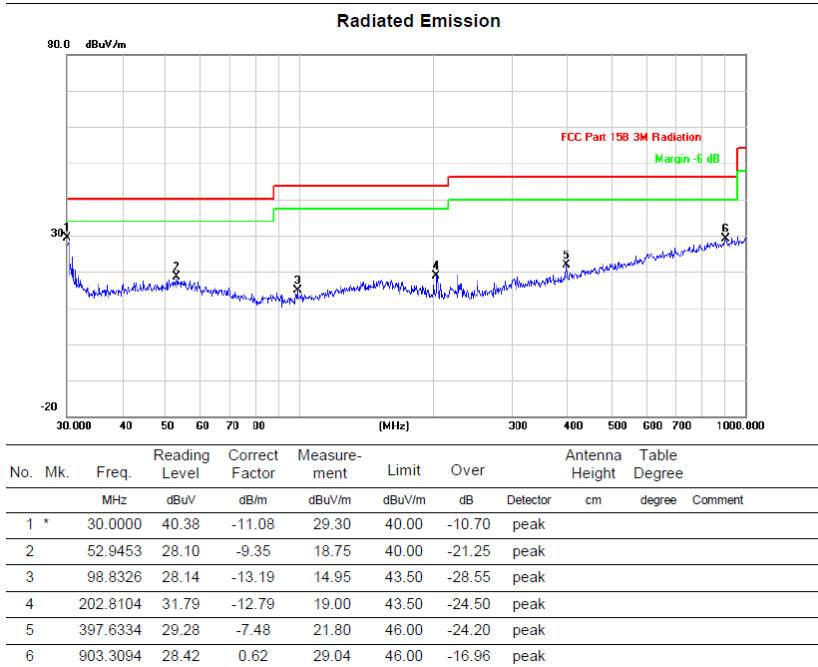
Below 1G (30MHz~1GHz)

Worst Case Operating Mode: AX20MIMO Channel 2

### VERTICAL



### HORIZONTAL

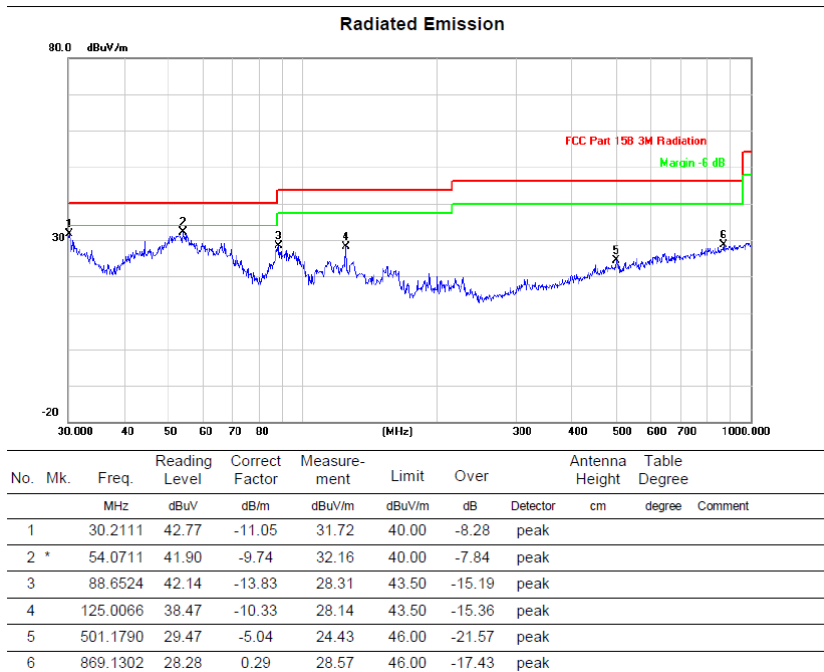


For 8 pin PSU

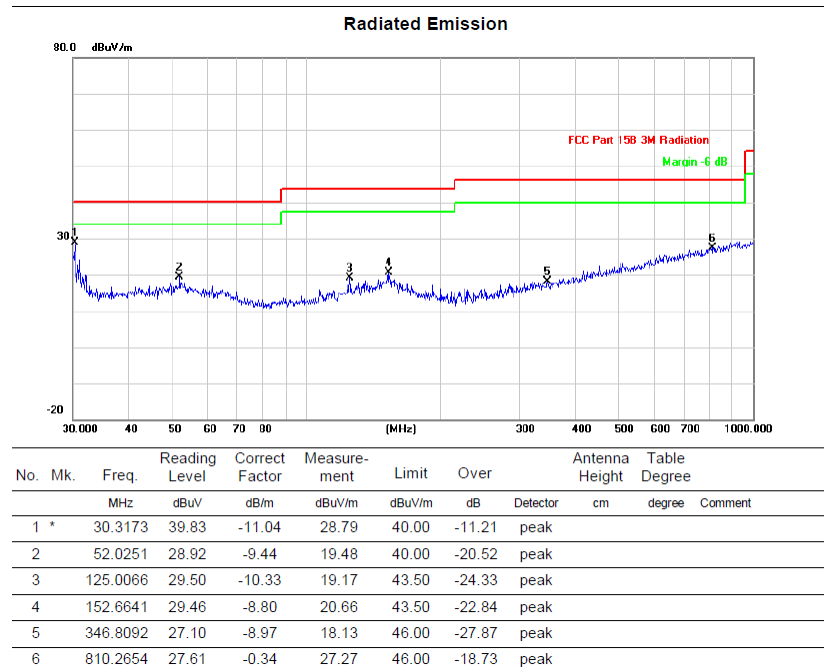
Below 1G (30MHz~1GHz)

Worst Case Operating Mode: AX20MIMO Channel 2

### VERTICAL



### HORIZONTAL



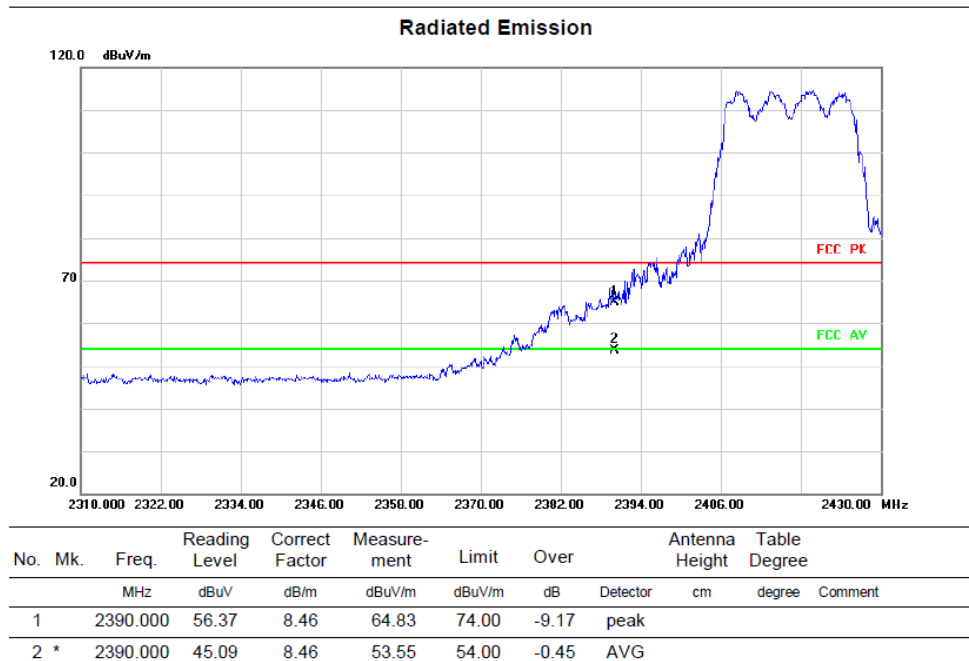
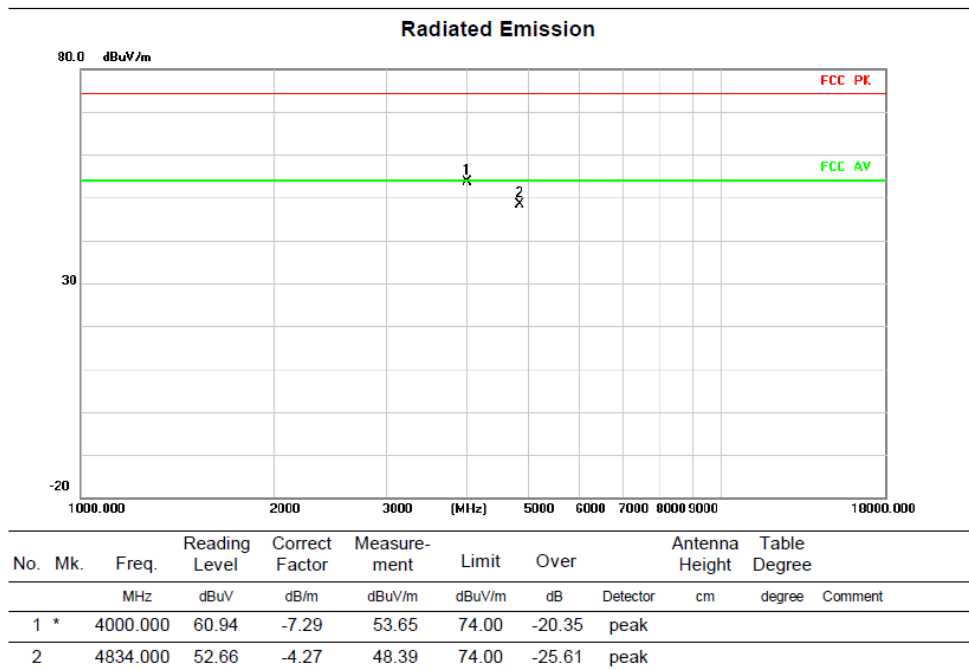
### 3) Radiated emission: Above 1G

#### Note:

1. Measurement = Reading + Correct Factor.
2. Over = Measurement – Limit
3. We only recorded the data of the worst mode. Please see the following:

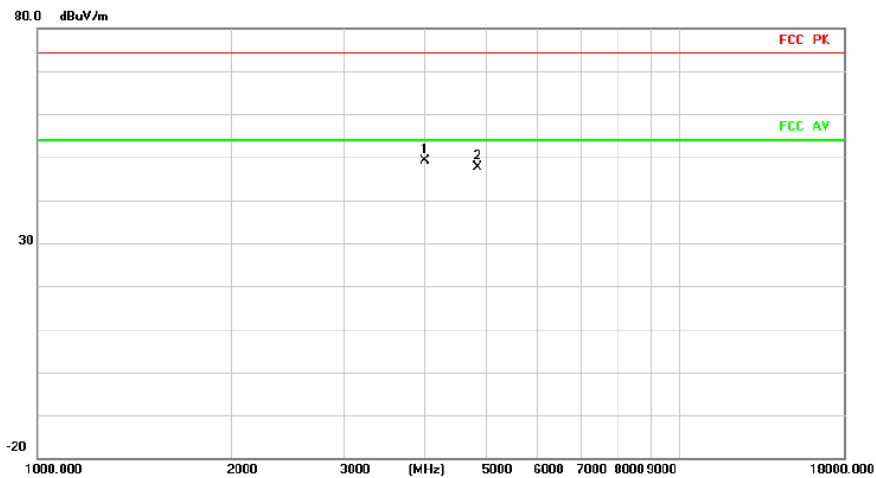
Above 1G (1GHz~18GHz)	Test mode: AX20MIMO	Test Channel:2
-----------------------	---------------------	----------------

#### VERTICAL



## HORIZONTAL

### Radiated Emission



No.	Mk.	Freq.	Reading Level	Correct Factor	Measurement	Limit	Over	Antenna Height	Table Degree	
		MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	cm	degree	Comment
1	*	4000.000	56.40	-7.29	49.11	74.00	-24.89	peak		
2		4834.000	51.83	-4.27	47.56	74.00	-26.44	peak		

### Radiated Emission



No.	Mk.	Freq.	Reading Level	Correct Factor	Measurement	Limit	Over	Antenna Height	Table Degree	
		MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	cm	degree	Comment
1		2390.000	53.93	8.46	62.39	74.00	-11.61	peak		
2	*	2390.000	44.82	8.46	53.28	54.00	-0.72	AVG		

The high frequency, which started from 18GHz to 26.5GHz, was pre-scanned and the result which was 20dB lower than the limit line was not recorded in this report.

### 3.3 Spurious Emission at Antenna Port

#### 3.3.1 Limit

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak Output Power limits. If the transmitter complies with the Output Power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in Section 15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in Section 15.205(a), must also comply with the radiated emission limits specified in Section 15.209(a) (see Section 15.205(c)).

#### 3.3.2 Test Procedure

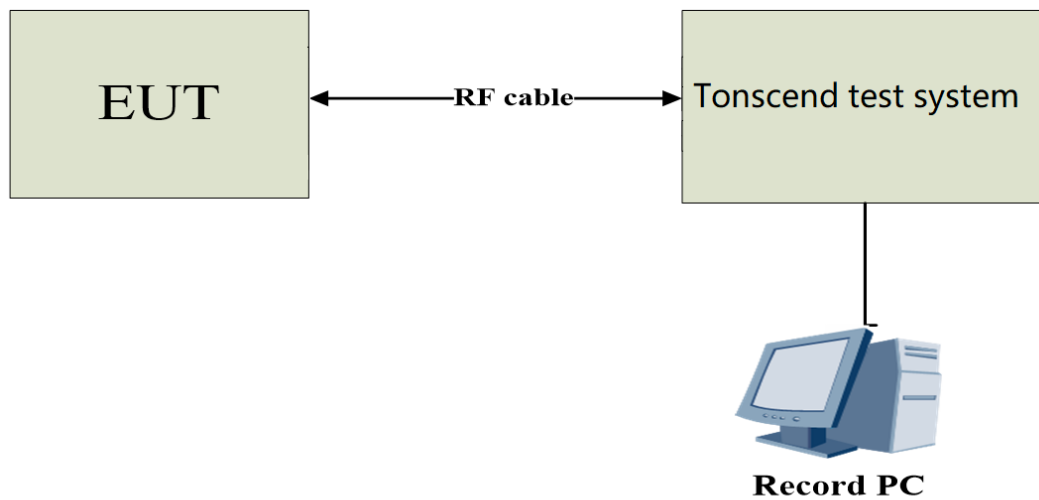
Test Method	
<input checked="" type="radio"/> Conducted Measurement	<input type="radio"/> Radiated Measurement
Test Channels	
<input checked="" type="radio"/> Lowest, Middle and Highest Channel	<input type="radio"/> Lowest and Highest Channel
Environmental conditions	
<input checked="" type="radio"/> Normal	<input type="radio"/> Normal and Extreme
Note: <input checked="" type="radio"/> : Test <input type="radio"/> : No Test	

a) The EUT was directly connected to the tonscond test system and antenna output port as show in the block diagram below.

b) Spectrum Setting as below:

Centre Frequency	The centre frequency of the channel under test
Spectrum Parameters	Setting
Start Frequency	30 MHz
Stop Frequency	26.5 GHz
RBW	100 kHz
VBW	300 kHz
Detector	Peak
Trace	Max Hold
Sweep Time	Auto

### 3.3.3 Test Setup



### 3.3.4 The Result

Test result: PASS

Note: For test data, please refer to original report(FR332121A).

### 3.4 6dB Bandwidth

#### 3.4.1 Limit

For direct sequence systems, the minimum 6dB bandwidth shall be at least 500kHz

#### 3.4.2 Test Procedure

Test Method	
<input checked="" type="radio"/> Conducted Measurement	<input type="radio"/> Radiated Measurement
Test Channels	
<input checked="" type="radio"/> Lowest, Middle and Highest Channel	<input type="radio"/> Lowest and Highest Channel
Environmental conditions	
<input checked="" type="radio"/> Normal	<input type="radio"/> Normal and Extreme
Note: <input checked="" type="radio"/> : Test <input type="radio"/> : No Test	

a) The EUT was connected to the tonscend test system, and the spectrum analyser is set as follow:

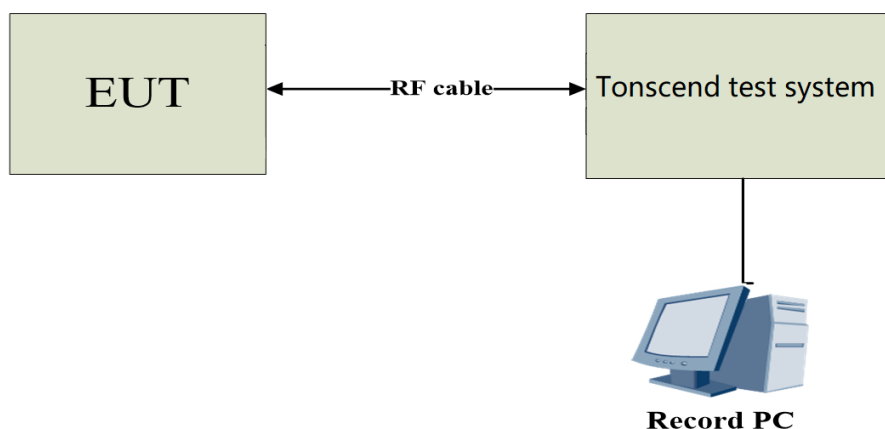
Centre Frequency	The centre frequency of the channel under test
RBW	100kHz
VBW	300kHz
Frequency span	2x Nominal Channel Bandwidth
Detector Mode	Peak
Trace Mode	Max Hold
Sweep Time	Auto Couple

b) Wait for the trace to stabilize then find the peak value of the trace and place the analyser marker on this peak.

c) Use the -6dB bandwidth function of the spectrum analyser to measure the 6dB Bandwidth of the EUT. This value shall be recorded.

d) Make sure that the power envelope is sufficiently above the noise floor of the analyser to avoid the noise signals left and right from the power envelope being taken into account by this measurement.

#### 3.4.3 Test Setup





#### 3.4.4 Test Result

Test result: PASS

Note: For test data, please refer to original report(FR332121A).



### 3.5 Maximum conducted output power

#### 3.5.1 Limit

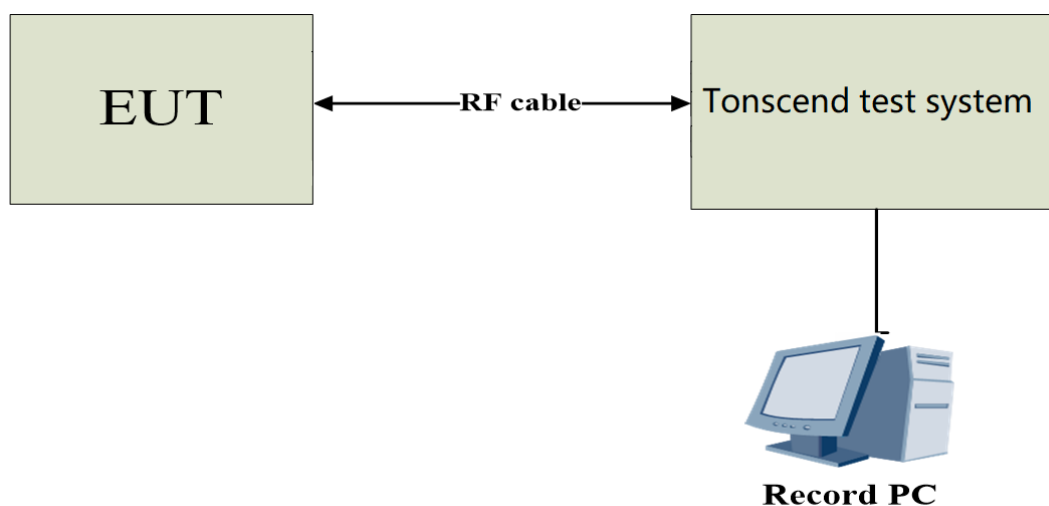
For systems using digital modulation in the 2400~2483.5MHz, The Maximum output Power shall not exceed 1W(30dBm)

#### 3.5.2 Test Procedure

Test Method	
<input checked="" type="radio"/> Conducted Measurement	<input type="radio"/> Radiated Measurement
Test Channels	
<input checked="" type="radio"/> Lowest, Middle and Highest Channel	<input type="radio"/> Lowest and Highest Channel
Environmental conditions	
<input checked="" type="radio"/> Normal	<input type="radio"/> Normal and Extreme
Note: ● : Test    ○ : No Test	

- The EUT was directly connected to the tonscend test system and antenna output port as show in the block diagram below.
- The maximum conducted output power was performed in accordance with method 11.9.2.3 (for average power) of ANSI C63.10-2013 and FCC KDB 662911 D01 v02r01 Multiple Transmitter Output.

#### 3.5.3 Test Setup



#### 3.5.4 The Result

Test result: PASS

Note: For test data, please refer to original report(FR332121A).

### 3.6 Power Spectral Density

#### 3.6.1 Limit

For digitally modulated systems, the power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8dBm in any 3kHz band during any time interval of continuous transmitting.

#### 3.6.2 Test Procedure

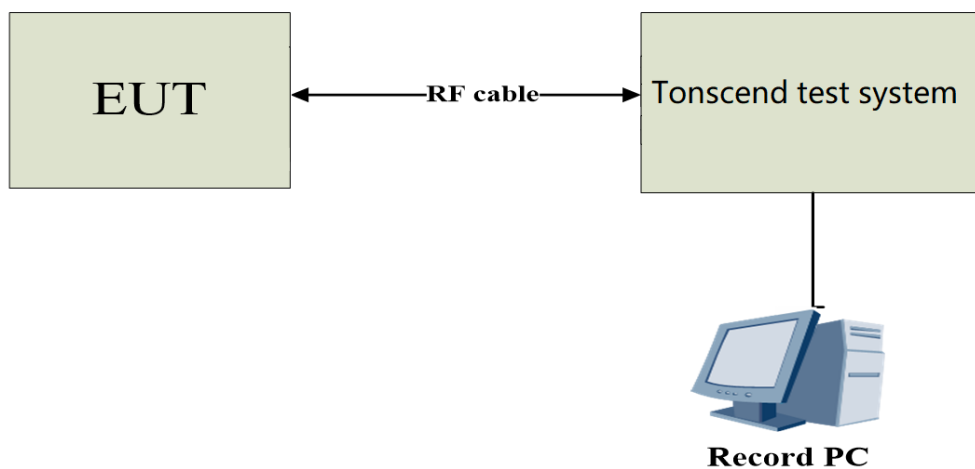
Test Method	
<input checked="" type="radio"/> Conducted Measurement	<input type="radio"/> Radiated Measurement
Test Channels	
<input checked="" type="radio"/> Lowest, Middle and Highest Channel	<input type="radio"/> Lowest and Highest Channel
Environmental conditions	
<input checked="" type="radio"/> Normal	<input type="radio"/> Normal and Extreme
Note: <input checked="" type="radio"/> : Test <input type="radio"/> : No Test	

a) The EUT was directly connected to the tonscond test system and antenna output port as show in the block diagram below.

b) Spectrum analyser settings as following:

Spectrum Parameters	Setting
Span Frequency	1.5 times the DTS bandwidth
RBW	3 kHz
VBW	10 kHz
Detector	Average
Trace	Max Hold
Sweep Time	Auto

#### 3.6.3 Test Setup





#### 3.6.4 The Result

Test result: PASS

Note: For test data, please refer to original report(FR332121A).

## Statement

1. The report is invalid without the official seal or special seal of Shenzhen Haiyun Standard Technology Co., Ltd. (hereinafter referred to as the unit).
2. The report is invalid without the signature of the approver.
3. The report is invalid if altered arbitrarily.
4. The report shall not be partially copied without the written approval of the unit.
5. The reported test results are only valid for the tested samples.
6. If there is any objection to the test report, it shall be submitted to the test unit within 15 days from the date of receiving the report, and the overdue shall not be accepted.

## Shenzhen Haiyun Standard Technology Co., Ltd.

Address: Room 110, 111, 112, 113, 115, 116, Block B, Jinyuan Business Building, No. 302, Xixiang Avenue, Labor Community, Xixiang Street, Baoan District, Shenzhen, China

Tel: 0755-26024411

Email: [service@hy-lab.cn](mailto:service@hy-lab.cn)

**End of Test Report**