TEST REPORT

Product Name:	FUSE VERT VINYL PLAYER WITH USB,BLUETOOTH,FM RADIO
FCC ID:	2A6OZ2FUSE
Trademark:	Fuse
Model Number:	Rad-Vert, Rad-Vert-X (X can be replaced by letter from "A" to "Z", number from "0" to "9" or blank)
Prepared For:	Master Tailgaters, LLC
Address:	13918 Valley Blvd, La Puente, CA 91746, United States
Manufacturer:	Timsen Development Limited
Address:	5F, 447 Tianhebei Road, Guangzhou, China
Prepared By:	Shenzhen CTB Testing Technology Co., Ltd.
Address:	Floor 1&2, Building A, No. 26 of Xinhe Road, Xinqiao Community, Xinqiao Street, Baoan District, Shenzhen, Guangdong China
Sample Received Date:	May.17, 2022
Sample tested Date:	May.17, 2022 to Jun.07, 2022
Issue Date:	Jun.07, 2022
Report No.:	CTB220607032RFX
Test Standards	FCC Part15.247 ANSI C63.10:2013
Test Results	PASS
Remark:	This is Bluetooth radio test report.

Compiled by:	Reviewed by:	Approved by:
Chen Zheng	Arron Liu	Bin Mei / Director

The test report is effective only with both signature and specialized stamp. This result(s) shown in this report refer only to the sample(s) tested. Without written approval of Shenzhen CTB Testing Technology Co., Ltd. this report can't be reproduced except in full. The tested sample(s) and the sample information are provided by the client.

TABLE OF CONTENT

(Note: N/A means not applicable)

1. VERSION

Report No.	Issue Date	Description	Approved
CTB220607032RFX	Jun.07, 2022	Original	Valid

2. TEST SUMMARY

The Product has been tested according to the following specifications:

Test Item	Test Requirement	Test method	Result
AC Power Line Conducted Emission	47 CFR Part 15 Subpart C Section 15.207	ANSI C63.10-2013	PASS
Radiated Spurious emissions	47 CFR Part 15 Subpart C Section 15.205/15.209	ANSI C63.10-2013	PASS
Band edge and RF Conducted Spurious Emissions	47 CFR Part 15 Subpart C Section 15.247(d)/15.205(a)	ANSI C63.10-2013	PASS
Conducted Peak Output Power	47 CFR Part 15 Subpart C Section 15.247 (b)(1)	ANSI C63.10-2013	PASS
20dB Occupied Bandwidth	47 CFR Part 15 Subpart C Section 15.247 (a)(1)	ANSI C63.10-2013	PASS
Carrier Frequencies Separation	47 CFR Part 15 Subpart C Section 15.247 (a)(1)	ANSI C63.10-2013	PASS
Hopping Channel Number	47 CFR Part 15 Subpart C Section 15.247 (a) (1)	ANSI C63.10-2013	PASS
Dwell Time	47 CFR Part 15 Subpart C Section 15.247 (a)(1)	ANSI C63.10-2013	PASS
Pseudorandom Frequency Hopping Sequence	47 CFR Part 15 Subpart C Section 15.247(b)(4)&TCB Exclusion List (7 July 2002)	ANSI C63.10-2013	PASS
Antenna Requirement	47 CFR Part 15 Subpart C Section 15.203/15.247 (b)	ANSI C63.10-2013	PASS
RF Exposure Evaluation	47 CFR Part 15 Subpart C Section 15.247 (i)/1.1310/2.1091	KDB447498D01v06	PASS

Remark:
Test according to ANSI C63.4-2014 & ANSI C63.10-2013.

3. MEASUREMENT UNCERTAINTY

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the Product as specified in CISPR 16-4-2. This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.

Item	Uncertainty
Occupancy bandwidth	54.3kHz
Conducted output power Above 1G	0.9dB
Conducted output power below 1G	0.9dB
Power Spectral Density , Conduction	0.9dB
Conduction spurious emissions	2.0dB
Out of band emission	2.0dB
3m camber Radiated spurious emission(9KHz-30MHz)	4.8dB
3m camber Radiated spurious emission(30MHz-1GHz)	4.6dB
3m chamber Radiated spurious emission(1GHz-18GHz)	5.1dB
3m chamber Radiated spurious emission(18GHz-40GHz)	3.4dB
humidity uncertainty	5.5%
Temperature uncertainty	0.63℃
frequency	1×10-7
Conducted Emission (150KHz-30MHz)	3.2 dB
Radiated Emission(30MHz ~ 1000MHz)	4.8 dB
Radiated Emission(1GHz ~6GHz)	4.9 dB

4. PRODUCT INFORMATION AND TEST SETUP

4.1 Product Information

Model(s):	Rad-Vert, Rad-Vert-X (X can be replaced by letter from“A”to“Z”, number from “0” to “9”or blank)
Model Description:	All the model are the same circuit and RF module, only for model nam e. Test sample model: Rad-Vert
Bluetooth Version:	Bluetooth 5.0
Hardware Version:	V1.0
Software Version:	V1.0

Operation Frequency:	Bluetooth: 2402-2480MHz
Max. RF output power:	Bluetooth: 2.987dBm
Type of Modulation:	Bluetooth: GFSK, π/4 DQPSK, 8DPSK
Antenna installation:	Bluetooth: PCB antenna
Antenna Gain:	Bluetooth: 1.0dBi
Ratings:	Adapter1:INPUT:100-240V~50/60Hz 0.5A OUTPUT:12.0V⎓1.0A 12.0W Adapter2:INPUT:100-240V~50/60Hz 0.3A OUTPUT:12.0V⎓1A Adapter3:INPUT:100-240V~50/60Hz 0.5A Max OUTPUT:12.0V⎓1A

4.2 Test Setup Configuration

See test photographs attached in EUT TEST SETUP PHOTOGRAPHS for the actual connections between Product and support equipment.

4.3 Support Equipment

Item	Equipment	Mfr/Brand	Model/Type No.	Series No.	Note
1	AC Adapter	Dongguan Xinchuang Technology Co.,Ltd	XC012WH-1201000UC	/	AE
2	AC Adapter	Shenzhen Guijin Technology Co.,Ltd	AK12WG-12001000UW	/	AE
3	AC/DC Adapter	SHENZHEN BOSHENGGAO TECHNOLOGY CO.,LTD	BX18W-1201000H	/	AE

1. All the equipment/cables were placed in the worst-case configuration to maximize the emission during the test.
2. Grounding was established in accordance with the manufacturer's requirements and conditions for the intended use.

4.4 Channel List

CH	Frequency (MHz)	CH	Frequency (MHz)	CH	Frequency (MHz)	CH	Frequency (MHz)
0	2402	1	2403	2	2404	3	2405
4	2406	5	2407	6	2408	7	2409
8	2410	9	2411	10	2412	11	2413
12	2414	13	2415	14	2416	15	2417
16	2418	17	2419	18	2420	19	2421
20	2422	21	2423	22	2424	23	2425
24	2426	25	2427	26	2428	27	2429
28	2430	29	2431	30	2432	31	2433
32	2434	33	2435	34	2436	35	2437
36	2438	37	2439	38	2440	39	2441
40	2442	41	2443	42	2444	43	2445
44	2446	45	2447	46	2448	47	2449
48	2450	49	2451	50	2452	51	2453
52	2454	53	2455	54	2456	55	2457
56	2458	57	2459	58	2460	59	2461
60	2462	61	2463	62	2464	63	2465
64	2466	65	2467	66	2468	67	2469
68	2470	69	2471	70	2472	71	2473
72	2474	73	2475	74	2476	75	2477
76	2478	77	2479	78	2480	79	/

4.5 Test Mode

All test mode(s) and condition(s) mentioned were considered and evaluated respectively by performing full tests, the worst data were recorded and reported.

Test mode	Low channel	Middle channel	High channel
Transmitting (GFSK, π/4 DQPSK, 8DPSK)	2402MHz	2441MHz	2480MHz
Receiving (GFSK, π/4 DQPSK, 8DPSK)	2402MHz	2441MHz	2480MHz

4.6 Test Environment

Humidity(%):	54
Atmospheric Pressure(kPa):	101
Normal Voltage(AC):	120V
Normal Temperature(℃)	23
Low Temperature(℃)	0
High Temperature(℃)	40

5. TEST FACILITY AND TEST INSTRUMENT USED

5.1 Test Facility

All measurement facilities used to collect the measurement data are located at Floor 1&2, Building A, No. 26 of Xinhe Road, Xinqiao Street, Baoan District, Shenzhen China. The site and apparatus are constructed in conformance with the requirements of ANSI C63.4 and CISPR 16-1-1 other equivalent standards.

5.2 Test Instrument Used

No.	Equipment	Manufacturer	Model No.	Serial No.	Calibrated date	Calibrated until
1	Spectrum Analyzer	Agilent	N9020A	MY52090073	2021.09.27	2022.08.05
2	Power Sensor	Agilent	U2021XA	MY56120032	2021.09.27	2022.08.05
3	Power Sensor	Agilent	U2021XA	MY56120034	2021.09.27	2022.08.05
4	Communication test set	R&S	CMW500	108058	2021.09.27	2022.08.05
5	Spectrum Analyzer	R&S	FSP40	100550	2021.09.27	2022.08.05
6	Signal Generator	Agilent	N5181A	MY49060920	2021.09.27	2022.08.16
7	Signal Generator	Agilent	N5182A	MY47420195	2021.09.27	2022.08.05
8	Communication test set	Agilent	E5515C	MY50102567	2021.09.27	2022.08.16
9	band rejection filter	Shenxiang	MSF2400-2483.5MS-1154	20181015001	2021.09.27	2022.08.05
10	band rejection filter	Shenxiang	MSF5150-5850MS-1155	20181015001	2021.09.27	2022.08.05
11	band rejection filter	Xingbo	XBLBQ-DZA120	190821-1-1	2021.09.27	2022.08.05
12	BT&WI-FI Automatic test software	Micowave	MTS8310	Ver. 2.0.0.0	2021.09.27	2022.08.05
13	Rohde & Schwarz SFU Broadcast Test System	R&S	SFU	101017	2021.09.27	2022.08.05
14	Temperature humidity chamber	Hongjing	TH-80CH	DG-15174	2021.09.27	2022.08.05
15	234G Automatic test software	Micowave	MTS8200	Ver. 2.0.0.0	2021.09.27	2022.08.05

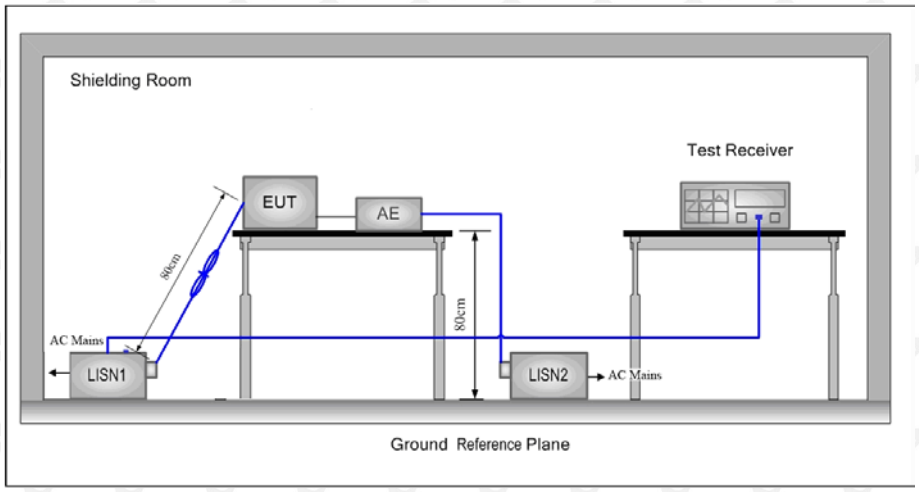
16	966 chamber	C.R.T.	966 Room	966	2021.09.27	2024.08.11
17	Receiver	R&S	ESPI	100362	2021.09.27	2022.08.05
18	Amplifier	HP	8447E	2945A02747	2021.09.27	2022.08.05
19	Amplifier	Agilent	8449B	3008A01838	2021.09.27	2022.08.05
20	TRILOG Broadband Antenna	Schwarzbeck	VULB 9163	869	2021.09.27	2022.08.07
21	Horn Antenna	Schwarzbeck	BBHA9120D	1911	2021.09.27	2022.08.08
22	Software	Fala	EZ-EMC	FA-03A2 RE	2021.09.27	2022.08.05
23	3-Loop Antenna	Daze	ZN30401	17014	2021.09.27	2022.08.05
24	loop antenna	ZHINAN	ZN30900A	/	2021.09.27	2022.08.05
25	Horn antenna	A/H/System	SAS-574	588	2021.09.27	2022.08.05
26	Amplifier	AEROFLEX	/	S/N/ 097	2021.09.27	2022.08.05

Continuous disturbance						
No.	Equipment	Manufacturer	Model No.	Serial No.	Calibrated date	Calibrated until
1	AMN	ROHDE&SCHWARZ	ESH3-Z5	831551852	2021.09.27	2022.08.05
2	Pulse limiter	ROHDE&SCHWARZ	ESH3Z2	357881052	2021.09.27	2022.08.05
3	EMI TEST RECEIVER	ROHDE&SCHWARZ	ESCS30	834115/006	2021.09.27	2022.08.05
4	Coaxial cable	ZDECL	Z302S	18091904	2021.09.27	2022.08.05
5	AAN	Schwarzbeck	NTFM8158	183	2021.09.27	2022.08.05
6	Communication test set	Agilent	E5515C	MY50102567	2021.09.27	2022.08.16
7	Communication test set	R&S	CMW500	108058	2021.09.27	2022.08.05
8	EZ-EMC	Frad	EMC-con3A1.1	/	/	/

Radiated emission						
No.	Equipment	Manufacturer	Model No.	Serial No.	Calibrated date	Calibrated until
1	Double Ridged Broadband Horn Antenna	Schwarzbeck	BBHA 9120D	1911	2021.09.27	2022.08.08
2	TRILOG Broadband Antenna	Schwarzbeck	VULB 9168	869	2021.09.27	2022.08.05
3	Amplifier	Agilent	8449B	3008A01838	2021.09.27	2022.08.05
4	Amplifier	HP	8447E	2945A02747	2021.09.27	2022.08.05
5	EMI TEST RECEIVER	ROHDE&SCHWARZ	ESPI7	100362	2021.09.27	2022.08.05
6	Coaxial cable	ETS	RFC-SNS-100-NMS-80 NI	/	2021.09.27	2022.08.05
7	Coaxial cable	ETS	RFC-SNS-100-NMS-20 NI	/	2021.09.27	2022.08.05
8	Coaxial cable	ETS	RFC-SNS-100-SMS-20 NI	/	2021.09.27	2022.08.05
9	Coaxial cable	ETS	RFC-NNS-100-NMS-300 NI	/	2021.09.27	2022.08.05
10	Communication test set	Agilent	E5515C	MY50102567	2021.09.27	2022.08.16
11	Communication test set	R&S	CMW500	108058	2021.09.27	2022.08.05
12	EZ-EMC	Frad	EMC-con3A1.1	/	/	/

6. AC POWER LINE CONDUCTED EMISSION

6.1 Block Diagram Of Test Setup



6.2 Limit

Table 4 – AC power-line conducted emissions limits

Frequency (MHz)	Conducted limit (dBµV)	
	Quasi-peak	Average
0.15 - 0.5	66 to 56[Note 1]	56 to 46[Note 1]
0.5 – 5	56	46
5 – 30	60	50

Note 1: The level decreases linearly with the logarithm of the frequency.

* Decreasing linearly with the logarithm of the frequency

6.3 Test procedure

1) The mains terminal disturbance voltage test was conducted in a shielded room.

2) The EUT was connected to AC power source through a LISN 1 (Line Impedance Stabilization Network) which provides a 50Ω/50µH + 5Ω linear impedance. The power cables of all other units of the EUT were connected to a second LISN 2, which was bonded to the ground reference plane in the same way as the LISN 1 for the unit being measured. A multiple socket outlet strip was used to connect multiple power cables to a single LISN provided the rating of the LISN was not exceeded.

3) The tabletop EUT was placed upon a non-metallic table 0.8m above the ground reference plane. And for floor-standing arrangement, the EUT was placed on the horizontal ground reference plane,

4) The test was performed with a vertical ground reference plane. The rear of the EUT shall be 0,4 m from the vertical ground reference plane. The vertical ground reference

plane was bonded to the horizontal ground reference plane. The LISN 1 was placed 0,8 m from the boundary of the unit under test and bonded to a ground reference plane for LISNs mounted on top of the ground reference plane. This distance was between the closest points of the LISN 1 and the EUT. All other units of the EUT and associated equipment was at least 0,8 m from the LISN 2.

5) In order to find the maximum emission, the relative positions of equipment and all of the interface cables must be changed according to ANSI C63.10 on conducted measurement**.**

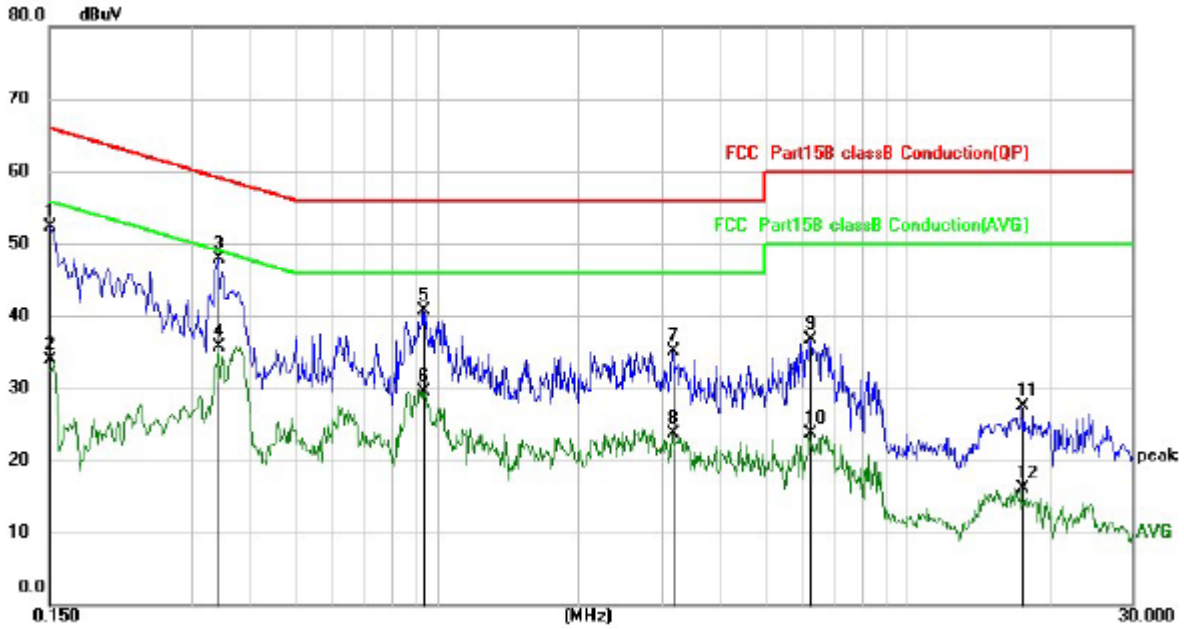
6) All modes were tested at AC 120V and 240V, only the worst result of AC 120V 60Hz was reported.

7) If a EUT received DC power from the USB Port of Notebook PC, the PC's adapter received AC120V/60Hz power through a Line Impedance Stabilization Network (LISN) which supplied power source and was grounded to the ground plane.

6.4 Test Result

Adapter 1#:

L:

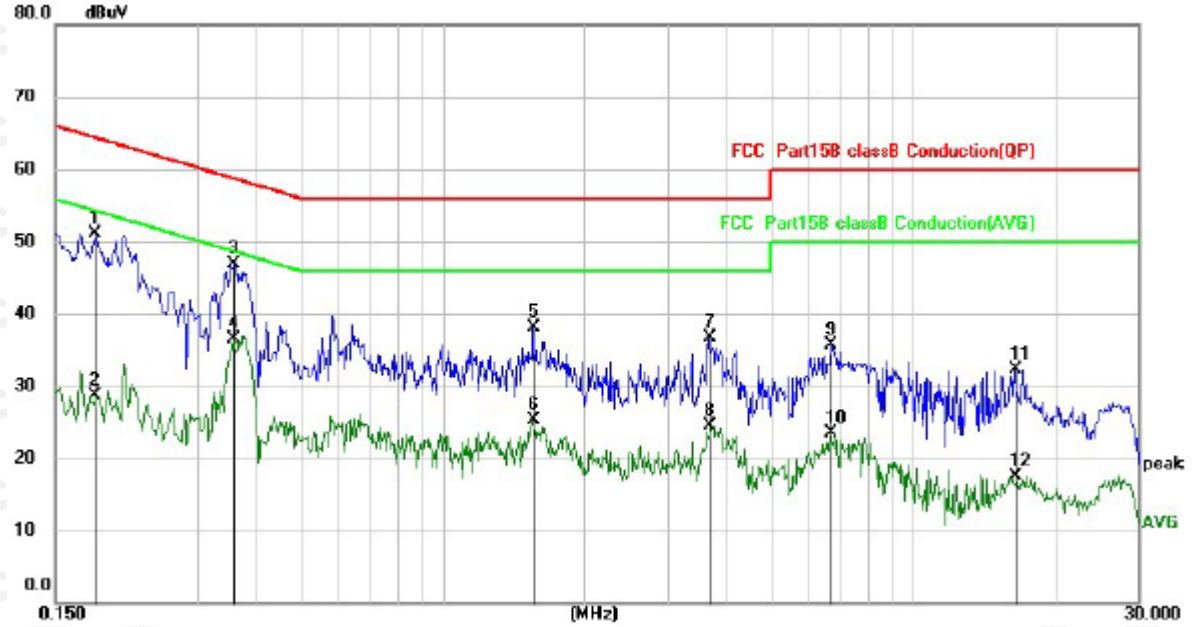


No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Margin	
		MHz	dBuV	dB	dBuV	dBuV	dB	Detector
1		0.1500	41.57	10.72	52.29	66.00	-13.71	QP
2		0.1500	23.22	10.72	33.94	56.00	-22.06	AVG
3	*	0.3427	37.24	10.61	47.85	59.14	-11.29	QP
4		0.3427	25.03	10.61	35.64	49.14	-13.50	AVG
5		0.9377	30.06	10.61	40.67	56.00	-15.33	QP
6		0.9377	18.90	10.61	29.51	46.00	-16.49	AVG
7		3.1700	24.52	10.64	35.16	56.00	-20.84	QP
8		3.1700	12.98	10.64	23.62	46.00	-22.38	AVG
9		6.2137	25.99	10.69	36.68	60.00	-23.32	QP
10		6.2137	12.96	10.69	23.65	50.00	-26.35	AVG
11		17.5059	16.64	10.95	27.59	60.00	-32.41	QP
12		17.5059	5.16	10.95	16.11	50.00	-33.89	AVG

Remark:

Factor = Cable loss + LISN factor, Margin = Measurement – Limit

N:



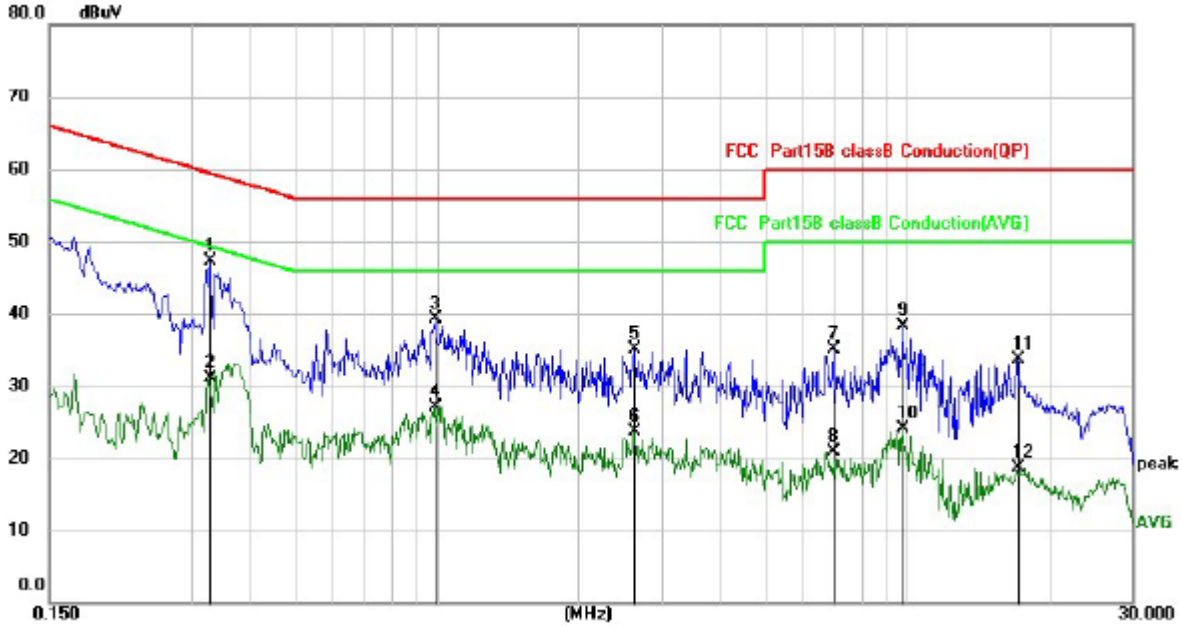
No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Margin	
		MHz	dBuV	dB	dBuV	dBuV	dB	Detector
1		0.1824	40.36	10.70	51.06	64.38	-13.32	QP
2		0.1824	17.92	10.70	28.62	54.38	-25.76	AVG
3	*	0.3593	36.38	10.60	46.98	58.74	-11.76	QP
4		0.3593	25.93	10.60	36.53	48.74	-12.21	AVG
5		1.5580	27.40	10.62	38.02	56.00	-17.98	QP
6		1.5580	14.59	10.62	25.21	46.00	-20.79	AVG
7		3.6779	25.99	10.64	36.63	56.00	-19.37	QP
8		3.6779	13.79	10.64	24.43	46.00	-21.57	AVG
9		6.6939	24.90	10.71	35.61	60.00	-24.39	QP
10		6.6939	12.74	10.71	23.45	50.00	-26.55	AVG
11		16.4779	21.46	10.93	32.39	60.00	-27.61	QP
12		16.4779	6.57	10.93	17.50	50.00	-32.50	AVG

Remark:

Factor = Cable loss + LISN factor, Margin = Measurement – Limit

Adapter 2#：

L:

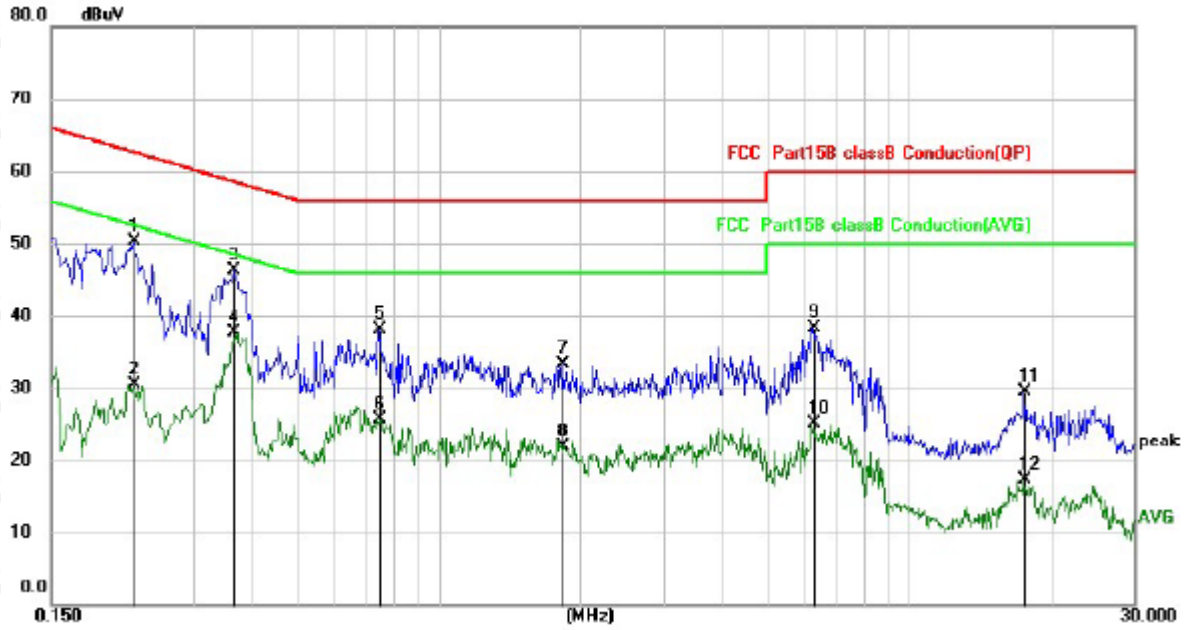


No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Margin	
		MHz	dBuV	dB	dBuV	dBuV	dB	Detector
1	*	0.3300	36.65	10.62	47.27	59.45	-12.18	QP
2		0.3300	20.46	10.62	31.08	49.45	-18.37	AVG
3		0.9900	28.60	10.62	39.22	56.00	-16.78	QP
4		0.9900	16.52	10.62	27.14	46.00	-18.86	AVG
5		2.6259	24.45	10.63	35.08	56.00	-20.92	QP
6		2.6259	13.09	10.63	23.72	46.00	-22.28	AVG
7		6.9538	24.44	10.72	35.16	60.00	-24.84	QP
8		6.9538	10.17	10.72	20.89	50.00	-29.11	AVG
9		9.7979	27.41	10.81	38.22	60.00	-21.78	QP
10		9.7979	13.28	10.81	24.09	50.00	-25.91	AVG
11		17.1259	22.79	10.94	33.73	60.00	-26.27	QP
12		17.1259	7.72	10.94	18.66	50.00	-31.34	AVG

Remark:

Factor = Cable loss + LISN factor, Margin = Measurement – Limit

N:



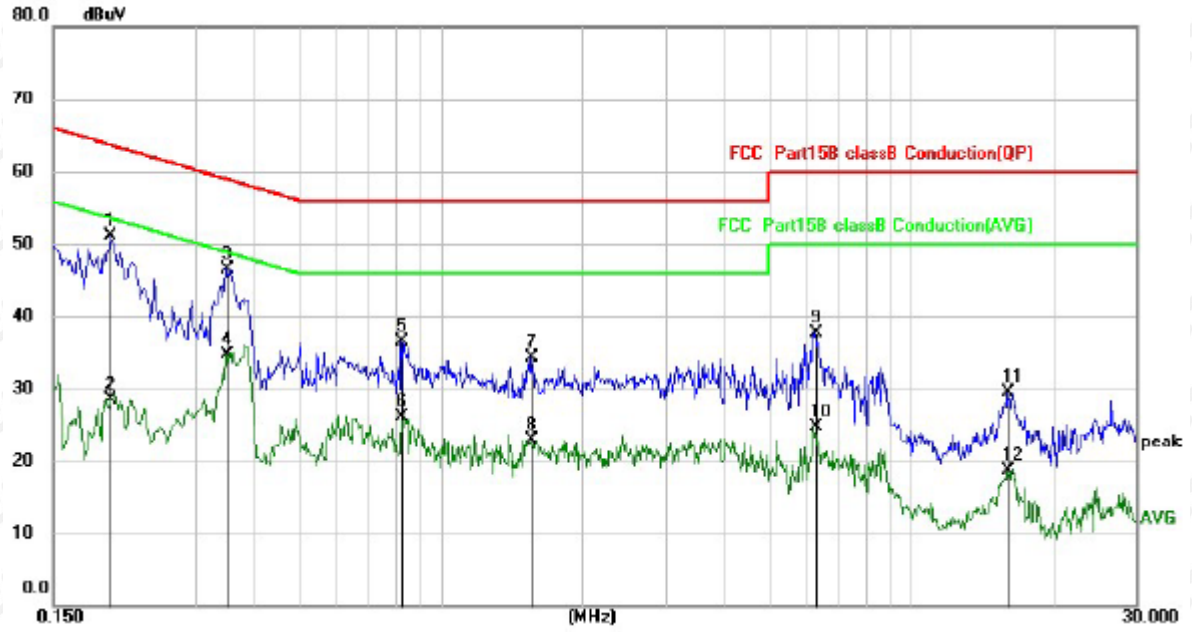
No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Margin	
		MHz	dBuV	dB	dBuV	dBuV	dB	Detector
1		0.2232	39.72	10.68	50.40	62.70	-12.30	QP
2		0.2232	19.86	10.68	30.54	52.70	-22.16	AVG
3		0.3659	35.74	10.60	46.34	58.59	-12.25	QP
4	*	0.3659	27.04	10.60	37.64	48.59	-10.95	AVG
5		0.7459	27.44	10.57	38.01	56.00	-17.99	QP
6		0.7459	15.04	10.57	25.61	46.00	-20.39	AVG
7		1.8300	22.75	10.63	33.38	56.00	-22.62	QP
8		1.8300	11.32	10.63	21.95	46.00	-24.05	AVG
9		6.2217	27.55	10.69	38.24	60.00	-21.76	QP
10		6.2217	14.46	10.69	25.15	50.00	-24.85	AVG
11		17.5059	18.64	10.95	29.59	60.00	-30.41	QP
12		17.5059	6.39	10.95	17.34	50.00	-32.66	AVG

Remark:

Factor = Cable loss + LISN factor, Margin = Measurement – Limit

Adapter 3#:

L:

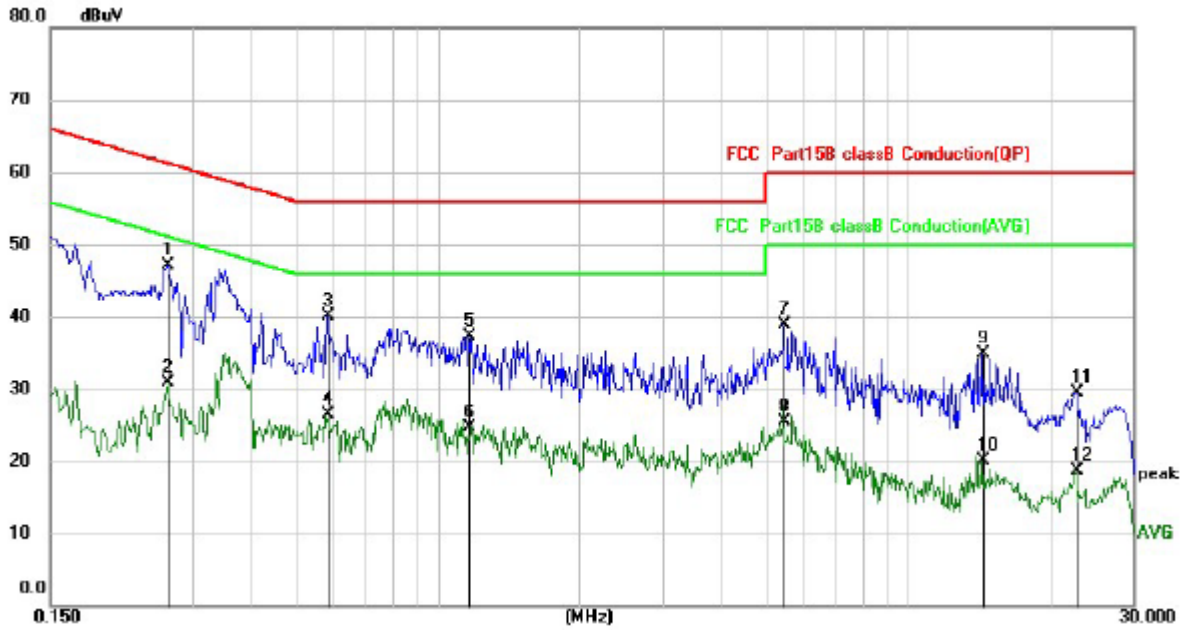


No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Margin	
		MHz	dBuV	dB	dBuV	dBuV	dB	Detector
1		0.1980	40.51	10.69	51.20	63.69	-12.49	QP
2		0.1980	17.73	10.69	28.42	53.69	-25.27	AVG
3	*	0.3500	35.99	10.61	46.60	58.96	-12.36	QP
4		0.3500	24.16	10.61	34.77	48.96	-14.19	AVG
5		0.8256	25.96	10.58	36.54	56.00	-19.46	QP
6		0.8256	15.44	10.58	26.02	46.00	-19.98	AVG
7		1.5580	23.71	10.62	34.33	56.00	-21.67	QP
8		1.5580	12.37	10.62	22.99	46.00	-23.01	AVG
9		6.2217	27.05	10.69	37.74	60.00	-22.26	QP
10		6.2217	13.96	10.69	24.65	50.00	-25.35	AVG
11		16.0015	18.59	10.92	29.51	60.00	-30.49	QP
12		16.0015	7.69	10.92	18.61	50.00	-31.39	AVG

Remark:

Factor = Cable loss + LISN factor, Margin = Measurement – Limit

N:



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Margin	
		MHz	dBuV	dB	dBuV	dBuV	dB	Detector
1	*	0.2660	36.54	10.65	47.19	61.24	-14.05	QP
2		0.2660	20.21	10.65	30.86	51.24	-20.38	AVG
3		0.5816	29.65	10.54	40.19	56.00	-15.81	QP
4		0.5816	15.88	10.54	26.42	46.00	-19.58	AVG
5		1.1616	26.63	10.62	37.25	56.00	-18.75	QP
6		1.1616	14.16	10.62	24.78	46.00	-21.22	AVG
7		5.4218	28.17	10.66	38.83	60.00	-21.17	QP
8		5.4218	14.93	10.66	25.59	50.00	-24.41	AVG
9		14.3700	24.06	10.89	34.95	60.00	-25.05	QP
10		14.3700	9.27	10.89	20.16	50.00	-29.84	AVG
11		22.7540	18.55	11.00	29.55	60.00	-30.45	QP
12		22.7540	7.71	11.00	18.71	50.00	-31.29	AVG

Remark:

Factor = Cable loss + LISN factor, Margin = Measurement – Limit

7. RADIATED SPURIOUS EMISSION

7.1 Block Diagram Of Test Setup

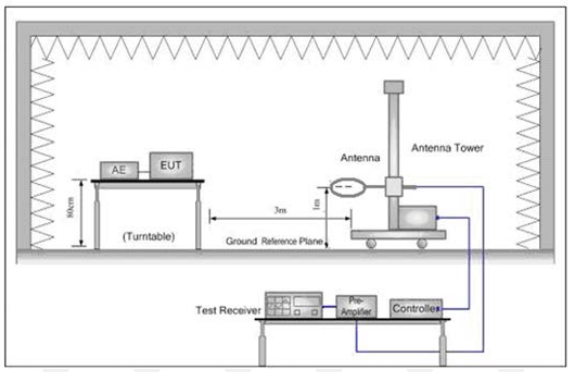


Figure 1. Below 30MHz

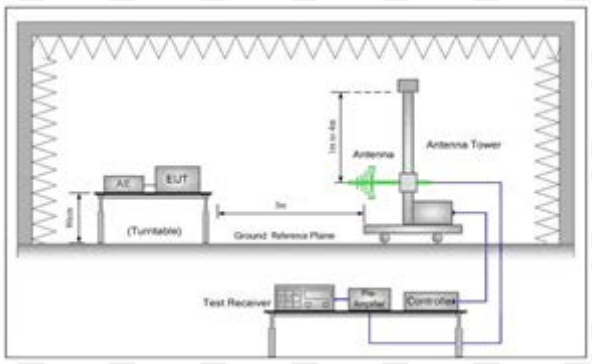


Figure 2. 30MHz to 1GHz

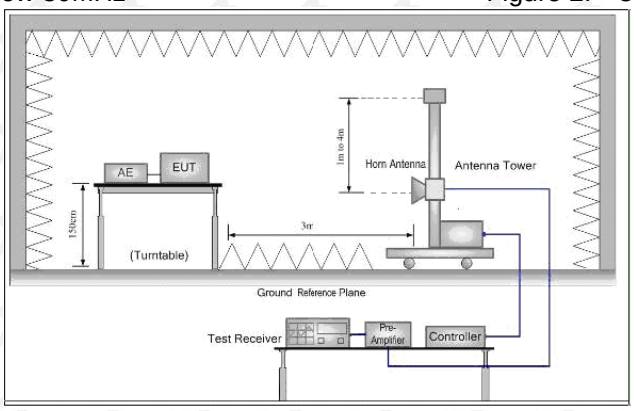


Figure 3. Above 1GHz

7.2 Limit

Spurious Emissions:

Frequency	Field strength (microvolt/meter)	Limit (dBμV/m)	Remark	Measurement distance (m)
0.009MHz-0.490MHz	2400/F(kHz)	-	-	300
0.490MHz-1.705MHz	24000/F(kHz)	-	-	30
1.705MHz-30MHz	30	-	-	30
30MHz-88MHz	100	40.0	Quasi-peak	3
88MHz-216MHz	150	43.5	Quasi-peak	3
216MHz-960MHz	200	46.0	Quasi-peak	3
960MHz-1GHz	500	54.0	Quasi-peak	3
Above 1GHz	500	54.0	Average	3

Note: 15.35(b), Unless otherwise specified, the limit on peak radio frequency emissions is 20dB above the maximum permitted average emission limit applicable to the equipment under test. This peak limit applies to the total peak emission level radiated by the device.

7.3 Test procedure

Below 1GHz test procedure as below:

a.The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter semi-anechoic camber. The table was rotated 360 degrees to determine the position of the highest radiation.

b.The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.

c.The antenna height is varied from one meter to four meters above the ground to determine the maximum value of the field strength. 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 from 1 meter to 4 meters (for the test frequency of below 30MHz, the antenna was tuned to heights 1 meter) and the rota table table was turned from 0 degrees to 360 degrees to find the maximum reading.

e.The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.

f.If the emission level of the EUT in peak mode was 10dB lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emissions that did not have 10dB margin would be re-tested one by one using peak, quasi-peak or average method as specified and then reported in a data sheet.

Above 1GHz test procedure as below:

g.Different between above is the test site, change from Semi- Anechoic Chamber to fully Anechoic Chamber and change form table 0.8 meter to 1.5 meter(Above 18GHz the distance is 1 meter and table is 1.5 meter).

h.Test the EUT in the lowest channel ,the middle channel ,the Highest channel

j.Repeat above procedures until all frequencies measured was complete.

j. Full battery is usedduring test

Receiver set:

Frequency	Detector	RBW	VBW	Remark
0.009MHz-0.090MHz	Peak	10kHz	30KHz	Peak
0.009MHz-0.090MHz	Average	10kHz	30KHz	Average
0.090MHz-0.110MHz	Quasi-peak	10kHz	30KHz	Quasi-peak
0.110MHz-0.490MHz	Peak	10kHz	30KHz	Peak
0.110MHz-0.490MHz	Average	10kHz	30KHz	Average
0.490MHz -30MHz	Quasi-peak	10kHz	30kHz	Quasi-peak
30MHz-1GHz	Quasi-peak	120 kHz	300KHz	Quasi-peak
Above 1GHz	Peak	1MHz	3MHz	Peak
	Peak	1MHz	10Hz	Average

7.4 Test Result

Below 1GHz Test Results:

Adapter 1#:

Antenna polarity: H

No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over	
		MHz	dBuV	dB	dBuV/m	dB/m	dB	Detector
1		37.3509	30.46	-5.91	24.55	40.00	-15.45	QP
2		78.0020	31.37	-9.39	21.98	40.00	-18.02	QP
3	!	138.6729	43.88	-5.53	38.35	43.50	-5.15	QP
4	*	227.2918	44.94	-6.11	38.83	43.50	-4.67	QP
5		273.2341	43.91	-5.48	38.43	46.00	-7.57	QP
6		405.3766	34.35	-1.55	32.80	46.00	-13.20	QP

Remark: Factor = Cable lose + Antenna factor - Pre-amplifier; Margin = Measurement– Limit

Antenna polarity: V

No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over	
		MHz	dBuV	dB	dBuV/m	dB/m	dB	Detector
1		36.3814	39.14	-6.15	32.99	40.00	-7.01	QP
2		52.5753	35.84	-5.78	30.06	40.00	-9.94	QP
3		93.7685	37.74	-9.33	28.41	43.50	-15.09	QP
4	*	138.1722	44.66	-5.57	39.09	43.50	-4.41	QP
5		213.7634	39.63	-7.18	32.45	43.50	-11.05	QP
6		565.6297	31.41	1.93	33.34	46.00	-12.66	QP

Remark: Factor = Cable lose + Antenna factor - Pre-amplifier; Margin = Measurement– Limit

Adapter 2#:

Antenna polarity: H

No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over	
		MHz	dBuV	dB	dBuV/m	dB/m	dB	Detector
1		37.3509	37.72	-5.91	31.81	40.00	-8.19	QP
2		64.8865	35.30	-7.03	28.27	40.00	-11.73	QP
3	*	138.9622	42.71	-5.51	37.20	43.50	-6.30	QP
4		221.3921	31.04	-6.58	24.46	43.50	-19.04	QP
5		565.6297	32.84	1.93	34.77	46.00	-11.23	QP
6		900.1474	27.76	6.21	33.97	46.00	-12.03	QP

Remark: Factor = Cable lose + Antenna factor - Pre-amplifier; Margin = Measurement– Limit

Antenna polarity: V

No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over	
		MHz	dBuV	dB	dBuV/m	dB/m	dB	Detector
1		36.7018	29.90	-6.07	23.83	40.00	-16.17	QP
2		78.0020	32.30	-9.39	22.91	40.00	-17.09	QP
3	!	139.1172	43.45	-5.50	37.95	43.50	-5.55	QP
4	*	229.2931	44.33	-5.95	38.38	43.50	-5.12	QP
5		405.3766	30.50	-1.55	28.95	46.00	-17.05	QP
6		565.6297	29.11	1.93	31.04	46.00	-14.96	QP

Remark: Factor = Cable lose + Antenna factor - Pre-amplifier; Margin = Measurement– Limit

Adapter 3#:

Antenna polarity: H

No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over	
		MHz	dBuV	dB	dBuV/m	dB/m	dB	Detector
1		37.0248	37.74	-5.99	31.75	40.00	-8.25	QP
2		50.7637	36.07	-5.68	30.39	40.00	-9.61	QP
3		94.5941	37.04	-9.23	27.81	43.50	-15.69	QP
4	*	144.0819	46.45	-5.46	40.99	43.50	-2.51	QP
5		394.8545	28.62	-1.86	26.76	46.00	-19.24	QP
6		565.6297	32.06	1.93	33.99	46.00	-12.01	QP

Remark: Factor = Cable lose + Antenna factor - Pre-amplifier; Margin = Measurement– Limit

Antenna polarity: V

No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over	
		MHz	dBuV	dB	dBuV/m	dB/m	dB	Detector
1		37.0248	29.79	-5.99	23.80	40.00	-16.20	QP
2		75.9773	35.69	-9.02	26.67	40.00	-13.33	QP
3	*	141.5777	45.57	-5.45	40.12	43.50	-3.38	QP
4	!	223.3415	44.82	-6.42	38.40	43.50	-5.10	QP
5		282.9852	42.25	-5.38	36.87	46.00	-9.13	QP
6		391.4082	33.79	-1.98	31.81	46.00	-14.19	QP

Remark: Factor = Cable lose + Antenna factor - Pre-amplifier; Margin = Measurement– Limit

Above 1 GHz Test Results:

CH Low (2402MHz)
Horizontal:

Frequency (MHz)	Reading Result (dBμV)	Factor (dB)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector Type
4804	56.42	-3.65	52.77	74.00	-21.23	peak
4804	50.47	-3.65	46.82	54.00	-7.18	AVG
7206	59.79	-0.95	58.84	74.00	-15.16	peak
7206	40.74	-0.95	39.79	54.00	-14.21	AVG
Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier. Emission level = Reading Result + Factor, Margin = Emission level - Limits						

Vertical:

Frequency (MHz)	Reading Result (dBμV)	Factor (dB)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector Type
4804	56.55	-3.65	52.90	74.00	-21.10	peak
4804	50.61	-3.65	46.96	54.00	-7.04	AVG
7206	59.71	-0.95	58.76	74.00	-15.24	peak
7206	41.01	-0.95	40.06	54.00	-13.94	AVG
Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier. Emission level = Reading Result + Factor, Margin = Emission level - Limits						

CH Middle (2441MHz)
Horizontal:

Frequency (MHz)	Reading Result (dBμV)	Factor (dB)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector Type
4882.00	59.14	-3.54	55.60	74.00	-18.40	peak
4882.00	48.38	-3.54	44.84	54.00	-9.16	AVG
7323.00	56.63	-0.81	55.82	74.00	-18.18	peak
7323.00	43.67	-0.81	42.86	54.00	-11.14	AVG
Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier. Emission level = Reading Result + Factor, Margin = Emission level - Limits						

Vertical:

Frequency (MHz)	Reading Result (dBμV)	Factor (dB)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector Type
4882.00	58.63	-3.54	55.09	74.00	-18.91	peak
4882.00	48.79	-3.54	45.25	54.00	-8.75	AVG
7323.00	57.60	-0.81	56.79	74.00	-17.21	peak
7323.00	42.77	-0.81	41.96	54.00	-12.04	AVG
Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier. Emission level = Reading Result + Factor, Margin = Emission level - Limits						

CH High (2480MHz)
Horizontal:

Frequency (MHz)	Reading Result (dBμV)	Factor (dB)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector Type
4960	56.88	-3.43	53.45	74.00	-20.55	peak
4960	47.34	-3.44	43.90	54.00	-10.10	AVG
7440	59.98	-0.77	59.21	74.00	-14.79	peak
7440	41.78	-0.77	41.01	54.00	-12.99	AVG
Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier. Emission level = Reading Result + Factor, Margin = Emission level - Limits						

Vertical:

Frequency (MHz)	Reading Result (dBμV)	Factor (dB)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector Type
4960	59.20	-3.43	55.77	74.00	-18.23	peak
4960	48.32	-3.44	44.88	54.00	-9.12	AVG
7440	60.15	-0.77	59.38	74.00	-14.62	peak
7440	40.70	-0.77	39.93	54.00	-14.07	AVG
Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier. Emission level = Reading Result + Factor, Margin = Emission level - Limits						

Remark:
(1) Measuring frequencies from 1 GHz to the 25 GHz。
(2). All modes of GFSK, π/4 DQPSK,8DPSK were test at Low, Middle, and High channel, only the worst result of GFSK DH5 Low Channel was reported for below 1GHz test.
(3). For BT above 1GHz test all modes of GFSK, π/4 DQPSK, 8DPSK were test at Low, Middle, and High channel, only the worst result of GFSK DH5 was reported.
(4). By preliminary testing and verifying three axis (X, Y and Z) position of EUT transmitted status, it was found that “Z axis” position was the worst, and test data recorded in this report.
(5). Radiated emission test from 9kHz to 10th harmonic of fundamental was verified, and no emission found except system noise floor in 9kHz to 30MHz and not recorded in this report.

Restricted bands around fundamental frequency (Radiated)

hopping
Operation Mode: TX CH Low (2402MHz)
Horizontal (Worst case)

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dBμV)	(dB)	(dBμV/m)	(dBμV/m)	(dB)	
2310.00	58.02	-5.81	52.21	74.00	-21.79	peak
2310.00	/	-5.81	/	54.00	/	AVG
2390.00	56.52	-5.84	50.68	74.00	-23.32	peak
2390.00	/	-5.84	/	54.00	/	AVG
Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier.						

Vertical:

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dBμV)	(dB)	(dBμV/m)	(dBμV/m)	(dB)	
2310.00	56.36	-5.81	50.55	74.00	-23.45	peak
2310.00	/	-5.81	/	54.00	/	AVG
2390.00	56.71	-5.84	50.87	74.00	-23.13	peak
2390.00	/	-5.84	/	54.00	/	AVG
Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier.						

Operation Mode: TX CH High (2480MHz)
Horizontal (Worst case)

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dBμV)	(dB)	(dBμV/m)	(dBμV/m)	(dB)	
2483.50	54.88	-5.81	49.07	74.00	-24.93	peak
2483.50	/	-5.81	/	54.00	/	AVG
2500.00	54.16	-6.06	48.10	74.00	-25.90	peak
2500.00	/	-6.06	/	54.00	/	AVG
Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier.						

Vertical:

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dBμV)	(dB)	(dBμV/m)	(dBμV/m)	(dB)	
2483.50	57.56	-5.81	51.75	74.00	-22.25	peak
2483.50	/	-5.81	/	54.00	/	AVG
2500.00	53.47	-6.06	47.41	74.00	-26.59	peak
2500.00	/	-6.06	/	54.00	/	AVG
Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier.						
Remark: All the other emissions not reported were too low to read and deemed to comply with FCC limit.						

NO hopping

Operation Mode: TX CH Low (2402MHz)
Horizontal (Worst case)

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dBμV)	(dB)	(dBμV/m)	(dBμV/m)	(dB)	
2310.00	55.41	-5.81	49.60	74.00	-24.40	peak
2310.00	/	-5.81	/	54.00	/	AVG
2390.00	55.54	-5.84	49.70	74.00	-24.30	peak
2390.00	/	-5.84	/	54.00	/	AVG
Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier.						

Vertical:

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dBμV)	(dB)	(dBμV/m)	(dBμV/m)	(dB)	
2310.00	54.67	-5.81	48.86	74.00	-25.14	peak
2310.00	/	-5.81	/	54.00	/	AVG
2390.00	54.97	-5.84	49.13	74.00	-24.87	peak
2390.00	/	-5.84	/	54.00	/	AVG
Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier.						

Operation Mode: TX CH High (2480MHz)
Horizontal (Worst case)

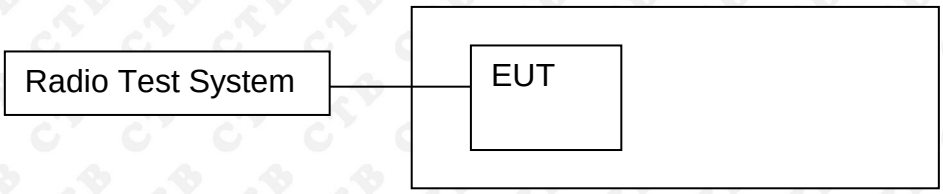
Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dBμV)	(dB)	(dBμV/m)	(dBμV/m)	(dB)	
2483.50	55.28	-5.81	49.47	74.00	-24.53	peak
2483.50	/	-5.81	/	54.00	/	AVG
2500.00	57.15	-6.06	51.09	74.00	-22.91	peak
2500.00	/	-6.06	/	54.00	/	AVG
Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier.						

Vertical:

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dBμV)	(dB)	(dBμV/m)	(dBμV/m)	(dB)	
2483.50	55.34	-5.81	49.53	74.00	-24.47	peak
2483.50	/	-5.81	/	54.00	/	AVG
2500.00	54.34	-6.06	48.28	74.00	-25.72	peak
2500.00	/	-6.06	/	54.00	/	AVG
Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier.						
Remark: All the other emissions not reported were too low to read and deemed to comply with FCC limit.						

8. BAND EDGE AND RF COUNDUCTED SPURIOUS EMISSIONS

8.1 Block Diagram Of Test Setup



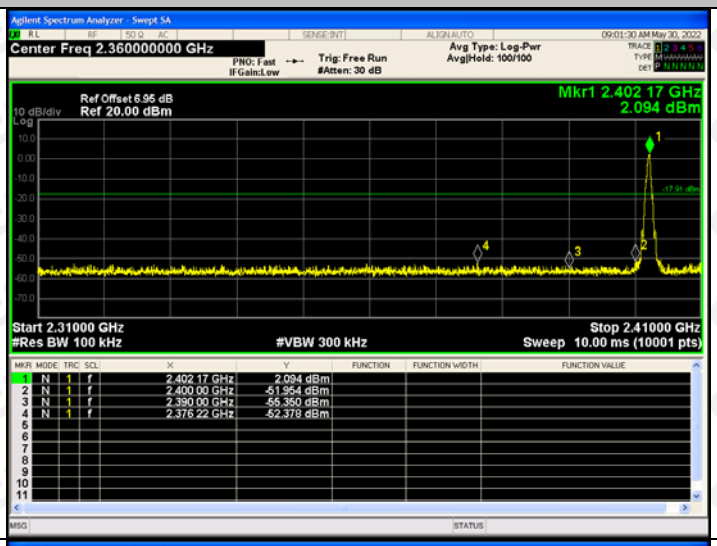
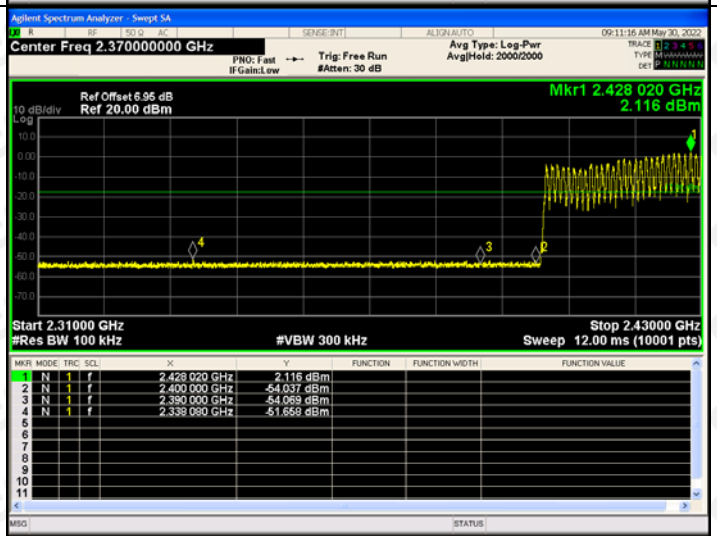
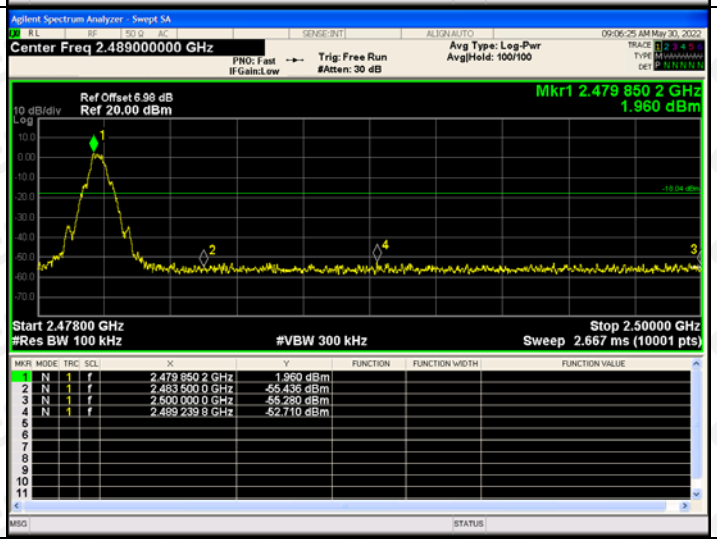
8.2 Limit

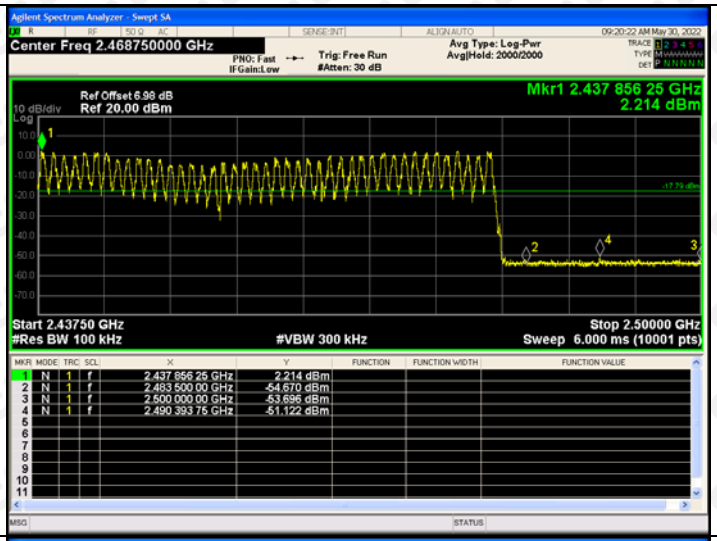
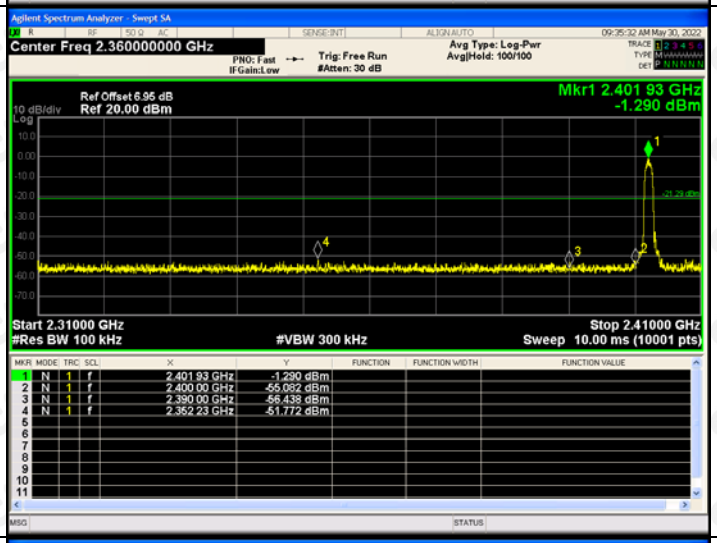
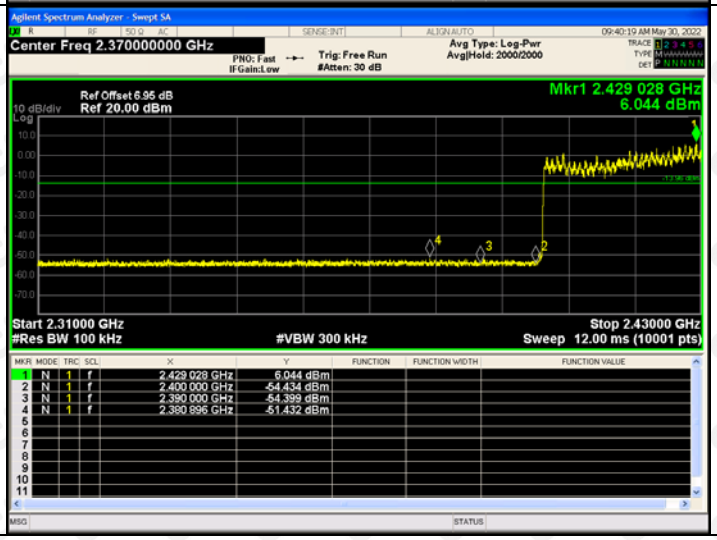
In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted 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 §15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a) (see §15.205(c)).

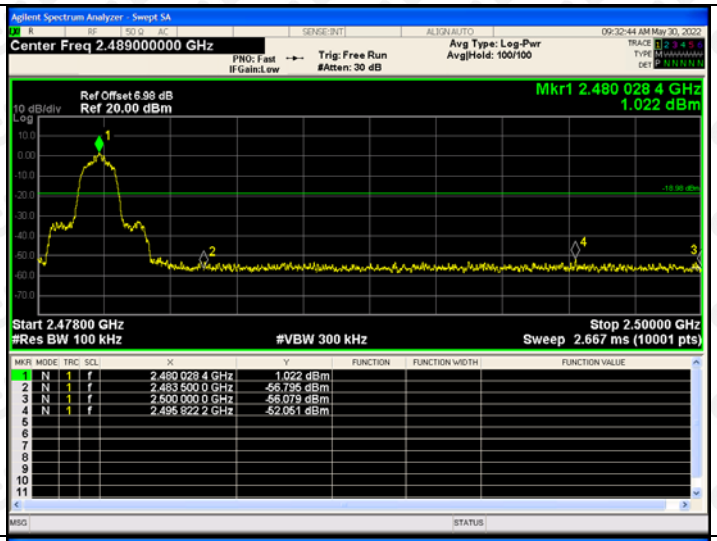
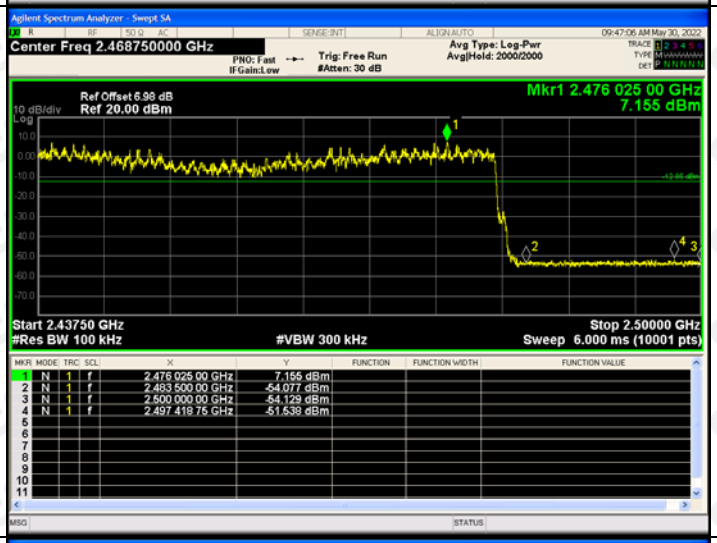
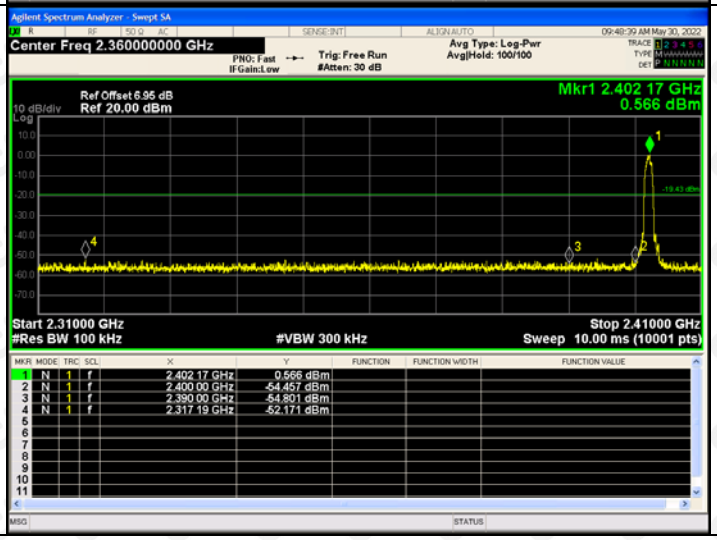
8.3 Test procedure

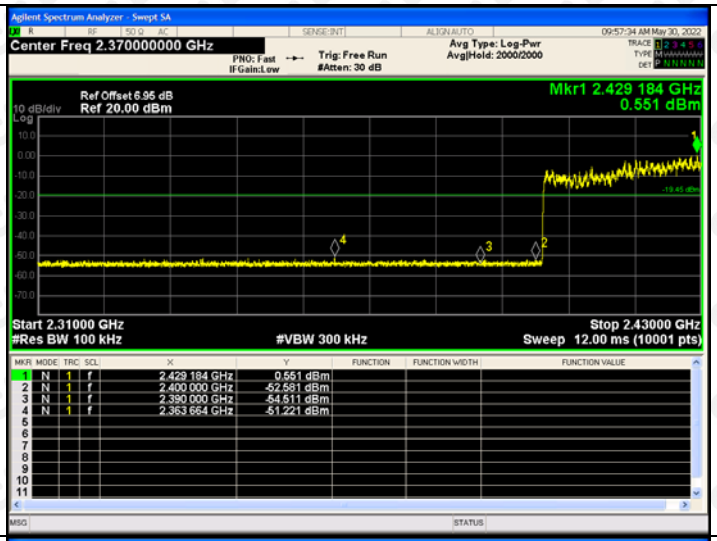
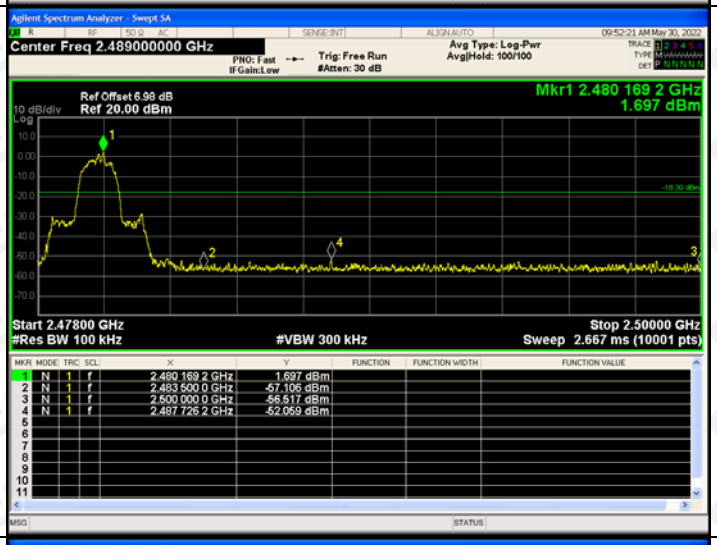
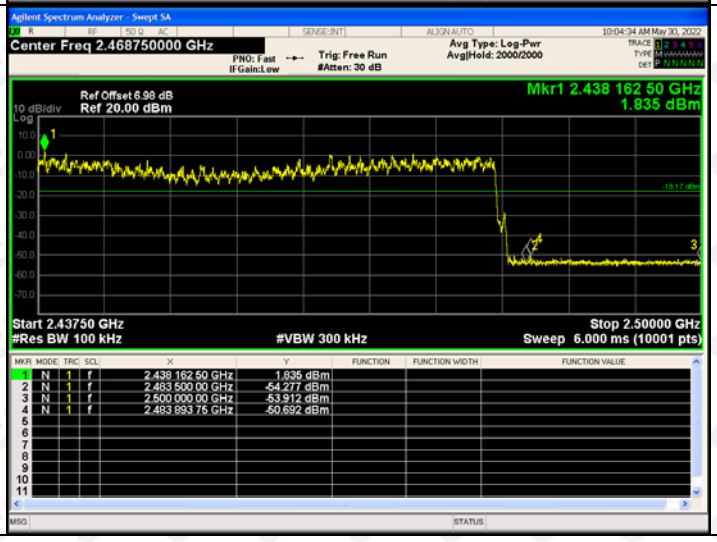
1. Remove the antenna from the EUT and then connect a low RF cable from the antenna port to the spectrum;
2. Set the spectrum analyzer:
Blow 30MHz:
RBW = 100kHz, VBW = 300kHz, Sweep = auto
Detector function = peak, Trace = max hold
Above 30MHz:
RBW = 100KHz, VBW = 300KHz, Sweep = auto
Detector function = peak, Trace = max hold

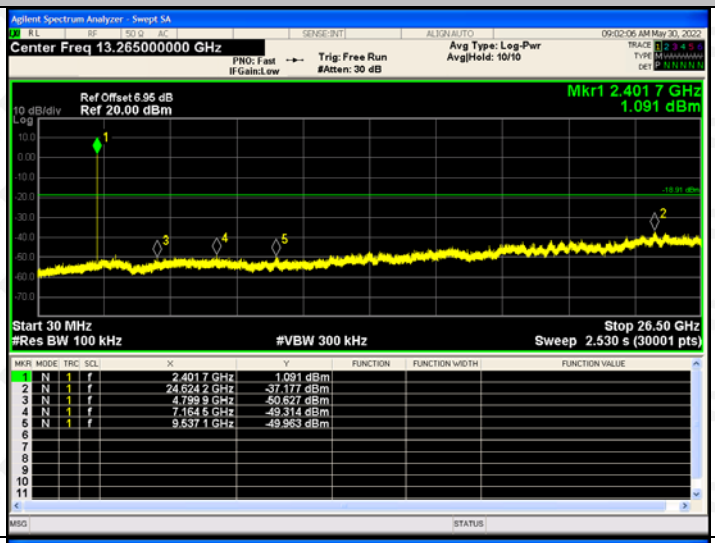
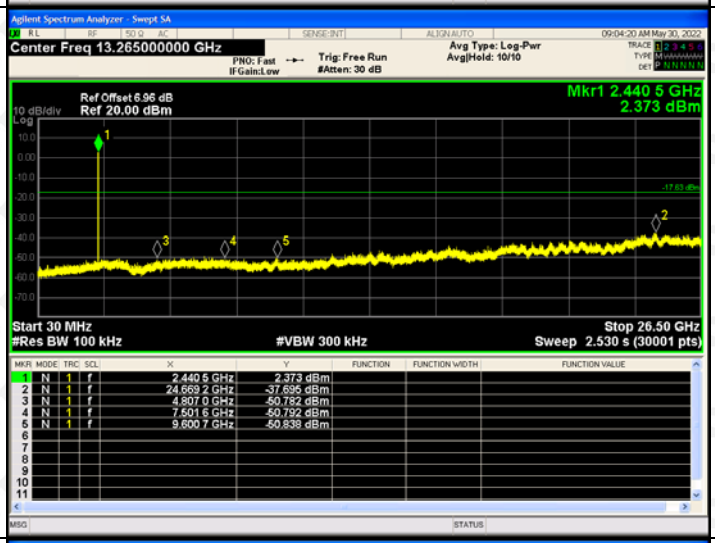
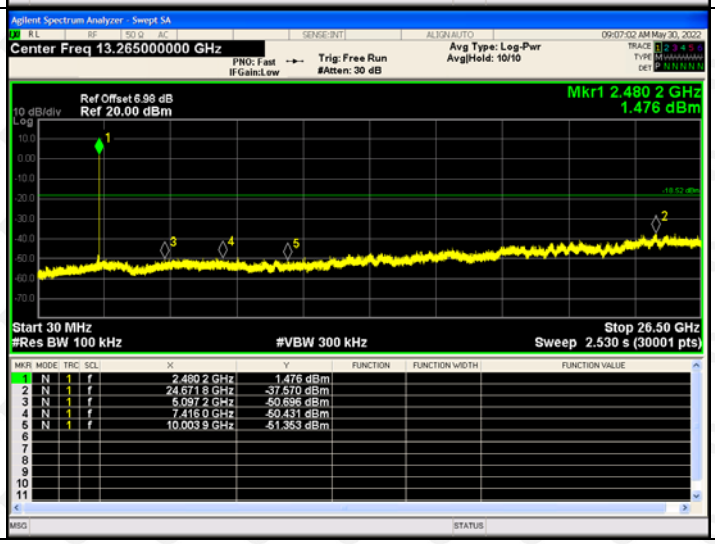
8.4 Test Result

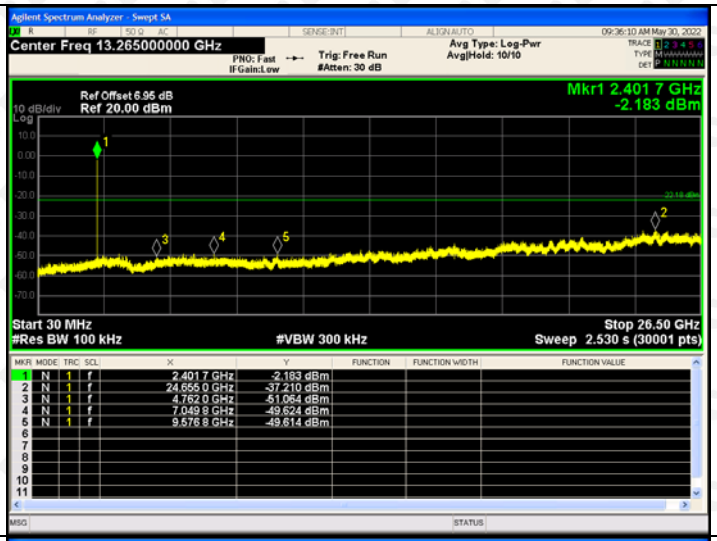
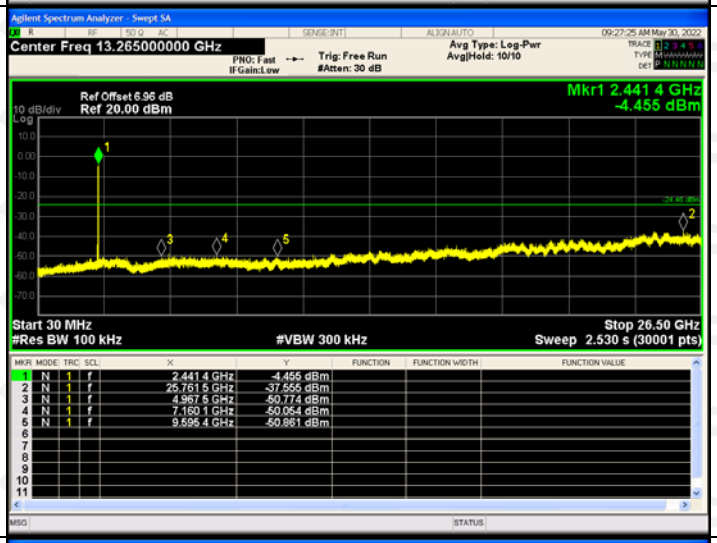
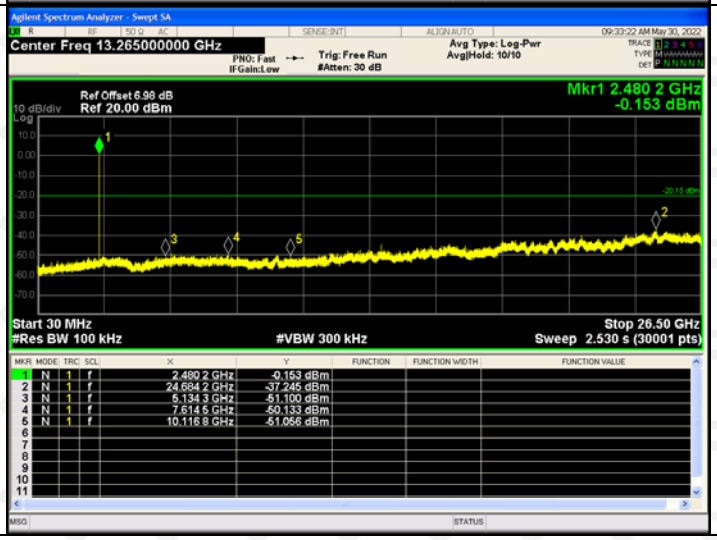
BAND EDGE Graphs			
GFSK/LCH/ No Hop			
GFSK/LCH/ Hop			
GFSK/HCH/ No Hop			

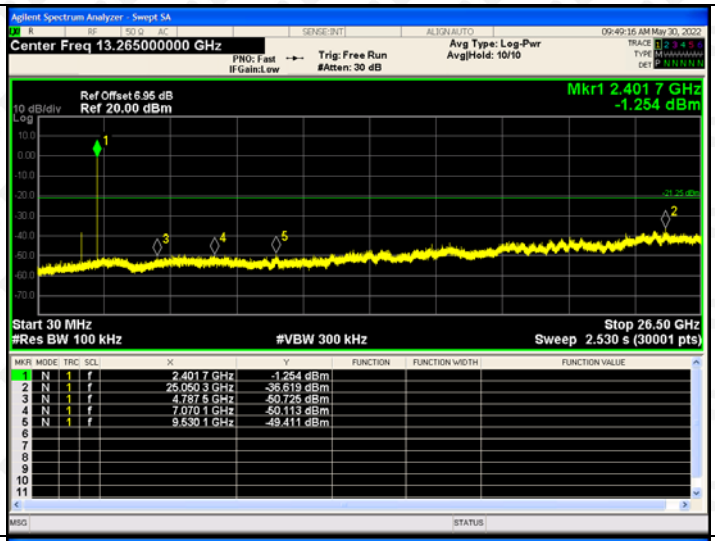
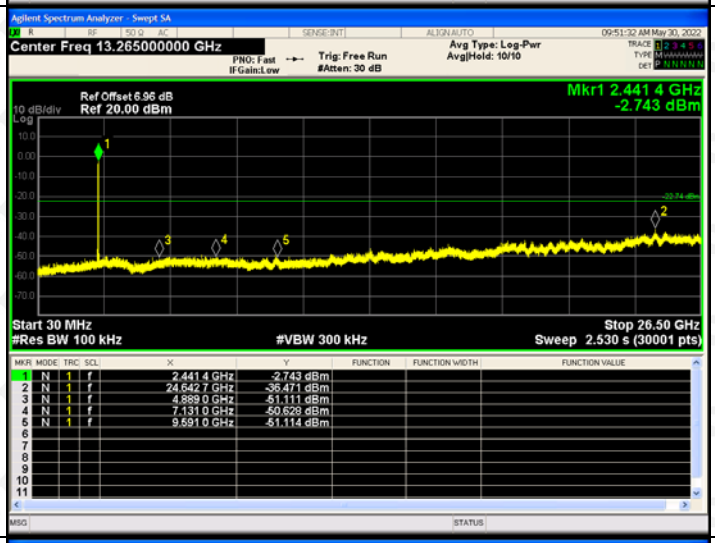
GFSK/HCH/ Hop			
π/4DQPSK/LCH/ No Hop			
π/4DQPSK/LCH/ Hop			

π/4DQPSK/HCH/ No Hop			
π/4DQPSK/HCH/ Hop			
8DPSK/LCH/No Hop			

8DPSK /LCH/Hop			
8DPSK /HCH/No Hop			
8DPSK /HCH/Hop			

RF Conducted Spurious Emissions Graphs			
GFSK/LCH			
GFSK/MCH			
GFSK/HCH			

π/4DQPSK /LCH			
π/4DQPSK/MCH			
π/4DQPSK/HCH			

8DPSK /LCH		
8DPSK /MCH		
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