FCC Test Report

Test report

On Behalf of

Huizhou Yinhua Technology Co, LTD.

For

D-ONE

Model No.: ONE

FCC ID: 2BKNM-ONE

Prepared For :	**Huizhou Yinhua Technology Co, LTD.** **Yuanhui Road No. 8-4, Mobile Smart Industry Base, Huicheng District, Huizhou City, Guangdong Province, China**
Prepared By :	**Shenzhen HUAK Testing Technology Co., Ltd.** **1-2/F., Building B2, Junfeng Zhongcheng Zhizao Innovation Park, Heping, Fuhai Street, Bao'an District, Shenzhen, Guangdong, China**
Date of Test:	**Jul. 09, 2024 ~ Aug. 13, 2024**
Date of Report:	**Aug. 13, 2024**
Report Number:	**HK2407093751-2E**

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Test Result Certification

Applicant's name ..... :	Huizhou Yinhua Technology Co, LTD.
Address ..... :	Yuanhui Road No. 8-4, Mobile Smart Industry Base, Huicheng District, Huizhou City, Guangdong Province, China
Manufacturer's Name ..... :	Huizhou Yinhua Technology Co, LTD.
Address ..... :	Yuanhui Road No. 8-4, Mobile Smart Industry Base, Huicheng District, Huizhou City, Guangdong Province, China

Product description

Trade Mark:	XPECE
Product name ..... :	D-ONE
Model and/or type reference .. :	ONE
Standards ..... :	**47 CFR FCC Part 15 Subpart C 15.247**

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Date of Test ..... :	
Date (s) of performance of tests ..... :	Jul. 09, 2024 ~ Aug. 13, 2024
Date of Issue ..... :	Aug. 13, 2024
Test Result ..... :	**Pass**

Testing Engineer : Len Liao

(Len Liao)

Technical Manager : Sliver Wan

(Sliver Wan)

Authorized Signatory : Jason Zhou

(Jason Zhou)

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** Modified History **

Revision	Description	Issued Data	Remark
Revision 1.0	Initial Test Report Release	Aug. 13, 2024	Jason Zhou

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Add: 1-2F., Building B2, Junfeng Zhongcheng Zhizao Innovation Park, Heping Community, Fuhai Street, Bao'an District, Shenzhen, Guangdong, China

1 Test Summary

1.1 Test Description

Test Item	Test Requirement	Result
Antenna Requirement	FCC Part 15.203 FCC Part 15.247(b)(4)	PASS
Conducted Emission	FCC Part 15.207	N/A
Radiated Emissions	FCC Part 15.205 FCC Part 15.209 FCC Part 15.247(d)	PASS
Maximum Peak Output Power	FCC Part 15.247(b)	PASS
Power Spectral Density	FCC Part 15.247(e)	PASS
6dB Bandwidth & 99% Bandwidth	FCC Part 15.247(a)(2)	PASS
Spurious RF Conducted Emission	FCC Part 15.247(d)	PASS
Band Edge	FCC Part 15.247(d) FCC Part 15.205(a)	PASS

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1.2 Measurement Uncertainty

The reported uncertainty of measurement y ± U, where expended uncertainty U is based on a standard uncertainty multiplied by a coverage factor of k=2, providing a level of confidence of approximately 95 %.

No.	Item	Uncertainty
1	Conducted Emission Test	±2.71dB
2	All emissions, radiated(<1G)	±3.90dB
3	All emissions, radiated(>1G)	±4.28dB

1.3 Information of the Test Laboratory

Shenzhen HUAK Testing Technology Co., Ltd.
Add.: 1-2/F., Building B2, Junfeng Zhongcheng Zhizao Innovation Park, Heping, Fuhai Street, Bao'an District, Shenzhen, Guangdong, China

Testing Laboratory Authorization：

A2LA Accreditation Code is 4781.01.
FCC Designation Number is CN1229.
Canada IC CAB identifier is CN0045.
CNAS Registration Number is L9589.

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2 General Information

2.1 General Description of EUT

EUT Name:	D-ONE
Model No:	ONE
Series Model:	N/A
Model Difference:	N/A
Trade Mark:	XPECE
Operation Frequency:	2402MHz - 2478MHz
Number of Channel:	77
Modulation Technology:	GFSK
Hardware Version:	V101
Software Version:	V101
Antenna Type:	ANT.1:Internal Antenna ANT.2:Internal Antenna
Antenna Gain:	ANT.1: 2.4dBi ANT.2: 2.66dBi
Power Supply:	DC 22.2V From Battery

Note:

1. For a more detailed features description, please refer to the manufacturer's specifications or the User's Manual.
2. Antenna gain Refer to the antenna specifications.
3. The cable loss data is obtained from the supplier.
4. The test results in the report only apply to the tested sample.

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2.2 Carrier Frequency of Channels

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

The EUT has been operated in modulations: GFSK independently.

NO.	Test Mode Description
1	Low channel TX
2	Middle channel TX
3	High channel TX

Note:
1. All the test modes can be supply by Built-in Li-ion battery, only the result of the worst case was recorded in the report if no any records.
2. For Radiated Emission, 3axis were chosen for testing for each applicable mode.

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2.3 Description of Test Conditions

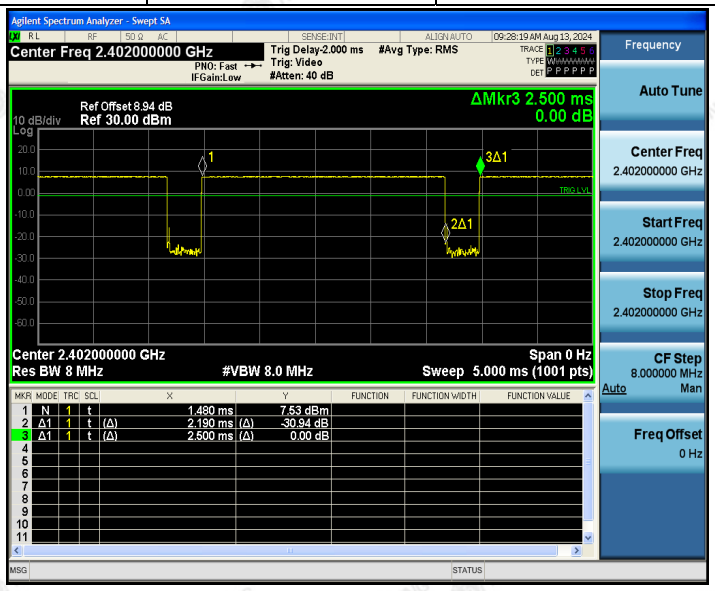
(1) E.U.T. test conditions:
For intentional radiators, measurements of the variation of the input power or the radiated signal level of the fundamental frequency component of the emission, as appropriate, shall be performed with the supply voltage varied between 85% and 115% of the nominal rated supply voltage. For battery operated equipment, the equipment tests shall be performed using a new battery.

(2) Frequency range of radiated measurements:
The test range will be up to the tenth harmonic of the highest fundamental frequency.

(3) Pre-test the EUT in all transmitting mode at the lowest (2402MHz), middle (2440 MHz) and highest (2478 MHz) channel with different data packet and conducted to determine the worst-case mode, only the worst-case results are recorded in this report.

(4) Mode Test Duty Cycle

Mode	Duty Cycle	Duty Cycle Factor (dB)
(1Mbps)	0.88	-0.56



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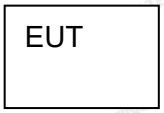
2.4 Description of Test Setup

Operation of EUT during testing:



The sample was placed (0.8m below 1GHz, 1.5m above 1GHz) above the ground plane of 3m chamber. Measurements in both horizontal and vertical polarities were performed. During the test, each emission was maximized by: having the EUT continuously working, investigated all operating modes, rotated about all 3 axis (X, Y & Z) and considered typical configuration to obtain worst position, manipulating interconnecting cables, rotating the turntable, varying antenna height from 1m to 4m in both horizontal and vertical polarizations. The emissions worst-case are shown in Test Results of the following pages. The worst case is X position.

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2.5 Description of Support Units

The EUT has been tested as an independent unit together with other necessary accessories or support units. The following support units or accessories were used to form a representative test configuration during the tests.

Item	Equipment	Trade Mark	Model/Type No.	Specification	Remark
1	D-ONE	XPECE	ONE	N/A	EUT

Note:

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.

3. For conducted measurements (Output Power, 6dB Emission Bandwidth, Power Spectral Density, Spurious Emissions), the antenna of EUT is connected to the test equipment via temporary antenna connector, the antenna connector is soldered on the antenna port of EUT, and the temporary antenna connector is listed in the Test Instruments.

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3 Equipments List for All Test Items

Item	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
1	L.I.S.N.	R&S	ENV216	HKE-002	2024/02/20	1 Year
2	L.I.S.N.	R&S	ENV216	HKE-059	2024/02/20	1 Year
3	EMI Test Receiver	R&S	ESR	HKE-005	2024/02/20	1 Year
4	Spectrum analyzer	Agilent	N9020A	HKE-025	2024/02/20	1 Year
5	Spectrum analyzer	R&S	FSV3044	HKE-126	2024/02/20	1 Year
6	Preamplifier	EMCI	EMC051845S	HKE-006	2024/02/20	1 Year
7	Preamplifier	Schwarzbeck	BBV 9743	HKE-016	2024/02/20	1 Year
8	Preamplifier	A.H. Systems	SAS-574	HKE-182	2024/02/20	1 Year
9	6d Attenuator	Pasternack	6db	HKE-184	2024/02/20	1 Year
10	EMI Test Receiver	Rohde & Schwarz	ESR-7	HKE-010	2024/02/20	1 Year
11	Broadband Antenna	Schwarzbeck	VULB9168	HKE-167	2024/02/21	2 Year
12	Loop Antenna	COM-POWER	AL-130R	HKE-014	2024/02/21	2 Year
13	Horn Antenna	Schwarzbeck	9120D	HKE-013	2024/02/21	2 Year
14	EMI Test Software	Tonscend	JS32-CE 2.5.0.6	HKE-081	/	/
15	EMI Test Software	Tonscend	JS32-RE 5.0.0	HKE-082	/	/
16	RF Automatic control unit	Tonscend	JS0806-2	HKE-060	2024/02/20	1 Year
17	High pass filter unit	Tonscend	JS0806-F	HKE-055	2024/02/20	1 Year
18	Wireless Communication Test Set	R&S	CMU200	HKE-026	2024/02/20	1 Year
19	Wireless Communication Test Set	R&S	CMW500	HKE-027	2024/02/20	1 Year
20	High-low temperature chamber	Guangke	HT-80L	HKE-118	2024/06/10	1 Year
21	Temperature and humidity meter	Boyang	HTC-1	HKE-075	2024/06/10	1 Year
22	RF Test Software	Tonscend	JS1120-3 Version 3.3.23	HKE-083	/	/
23	10dB Attenuator	Schwarzbeck	VTSD9561F	HKE-153	2024/02/20	1 Year
24	RSE Test Software	Tonscend	JS36-RSE 5.0.0	HKE-184	/	/

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4 Test Result

4.1 Antenna Requirement

4.1.1 Standard Requirement

Standard Applicable

For intentional device, according to FCC 47 CFR Section 15.203, an intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. And according to FCC 47 CFR Section 15.247, if transmitting antennas of directional gain greater than 6dBi are used, the power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6dBi.

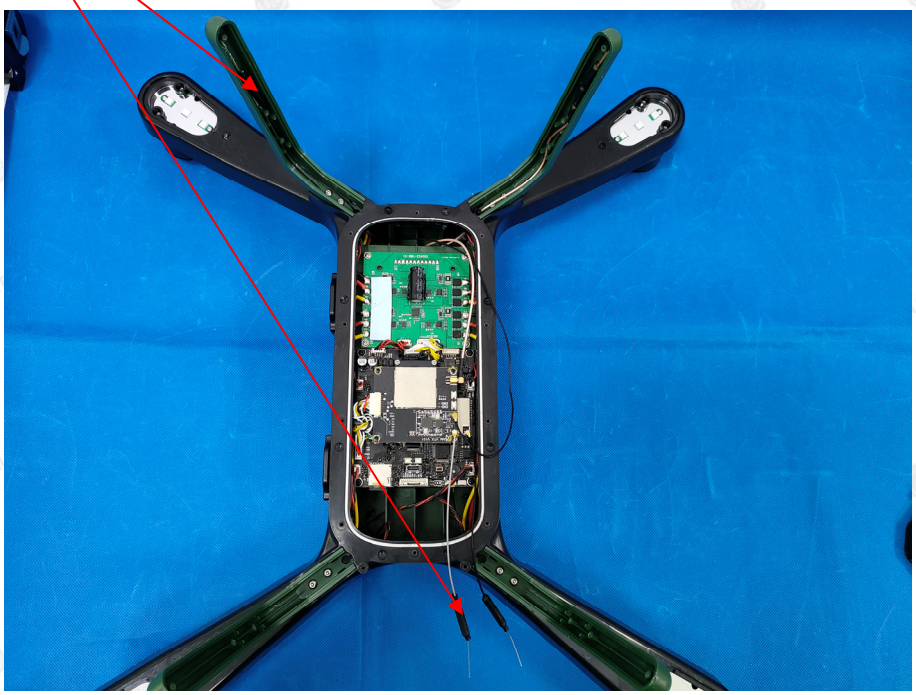
Refer to statement below for compliance.

The manufacturer may design the unit so that the user can replace a broken antenna, but the use of a standard antenna jack or electrical connector is prohibited. Further, this requirement does not apply to intentional radiators that must be professionally installed.

Antenna Connected Construction

The antenna used in this product is a Internal Antenna, need professional installation. It conforms to the standard requirements. and the best case gain of the antenna is Antenna port 1:2.4dBi and Antenna port 2:2.66dBi.

4.1.2 EUT Antenna



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4.2 Conduction Emissions Measurement

4.2.1 Applied Procedures / Limit

According to FCC CFR Title 47 Part 15 Subpart C Section 15.207, AC Power Line Conducted Emissions Limits for Licence-Exempt Radio Apparatus as below:

Frequency range (MHz)	Limit (dBuV)	
	Quasi-peak	Average
0.15-0.5	66 to 56*	56 to 46*
0.5-5	56	46
5-30	60	50

* Decreases with the logarithm of the frequency.

4.2.2 Test Procedure

1. The equipment was set up as per the test configuration to simulate typical actual usage per the user's manual. The EUT is a tabletop system; a wooden table with a height of 0.8 meters is used and is placed on the ground plane as per ANSI C63.10:2013.
2. Support equipment, if needed, was placed as per ANSI C63.10:2013.
3. All I/O cables were positioned to simulate typical actual usage as per ANSI C63.10:2013.
4. The adapter received AC120V/60Hz power through a Line Impedance Stabilization Network (LISN) which supplied power source and was grounded to the ground plane.
5. All support equipments received AC power from a second LISN, if any.
6. The EUT test program was started. Emissions were measured on each current carrying line of the EUT using a spectrum Analyzer / Receiver connected to the LISN powering the EUT. The LISN has two monitoring points: Line 1 (Hot Side) and Line 2 (Neutral Side). Two scans were taken: one with Line 1 connected to Analyzer / Receiver and Line 2 connected to a 50 ohm load; the second scan had Line 1 connected to a 50 ohm load and Line 2 connected to the Analyzer / Receiver.
7. Analyzer / Receiver scanned from 150 KHz to 30MHz for emissions in each of the test modes.
8. During the above scans, the emissions were maximized by cable manipulation.

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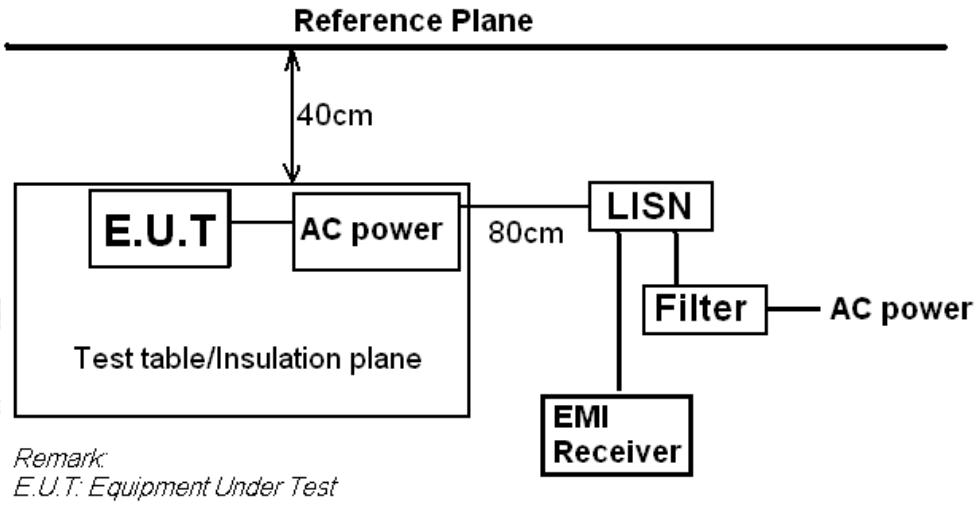
4.2.3 Test Setup



Remark:
E.U.T: Equipment Under Test
LISN: Line Impedence Stabilization Network
Test table height=0.8m

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4.2.4 Test Results

Not applicable.

Note: EUT power supply by DC Power, so this test item not applicable.

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4.3 Radiated Emissions Measurement

4.3.1 Applied Procedures / Limit

For intentional device, according to § 15.209(a), the general requirement of field strength of radiated emission out of authorized band shall not exceed the following table at a 3 meters measurement distance.

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).

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

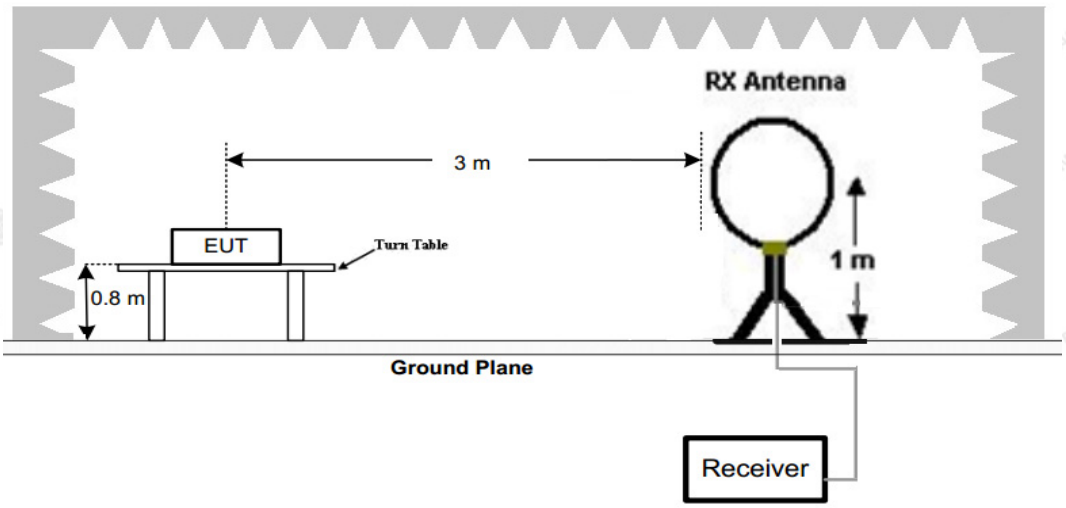
Radiated emission limits

Frequency (MHz)	Distance (Meters)	Radiated (dBμV/m)	Radiated (μV/m)
0.009-0.49	3	20log(2400/F(KHz))+40log(300/3)	2400/F(KHz)
0.49-1.705	3	20log(24000/F(KHz))+ 40log(30/3)	24000/F(KHz)
1.705-30	3	20log(30)+ 40log(30/3)	30
30-88	3	40.0	100
88-216	3	43.5	150
216-960	3	46.0	200
Above 960	3	54.0	500

4.3.2 Test Setup

Test Configuration:

1) 9 kHz to 30 MHz emissions:



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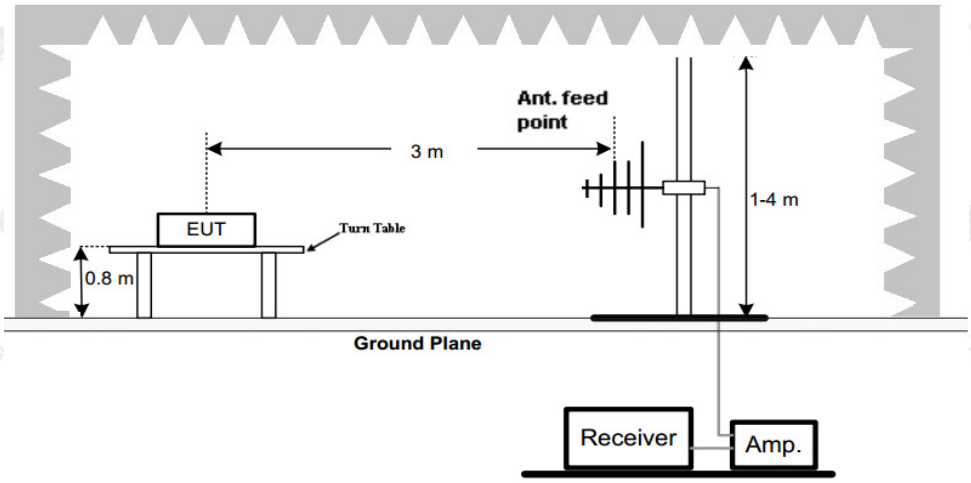
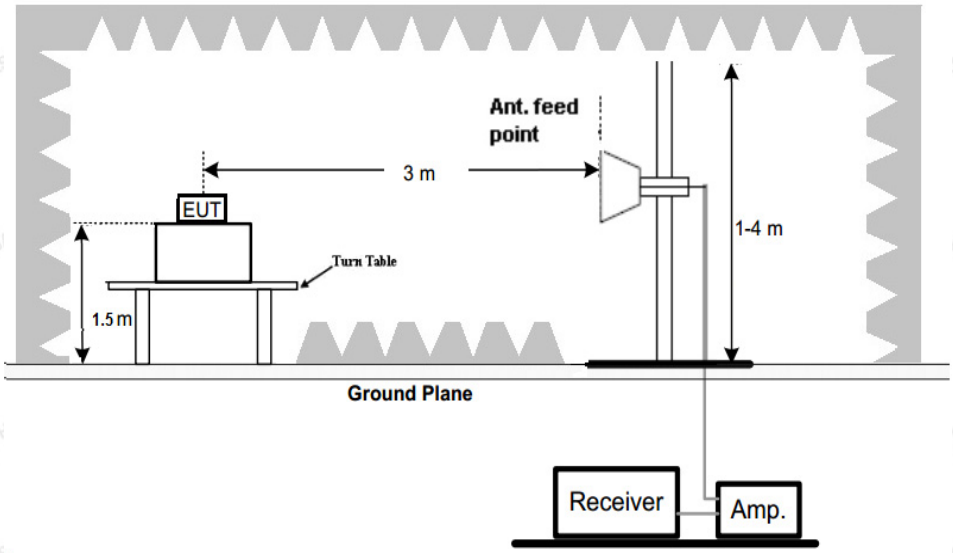
2) 30 MHz to 1 GHz emissions:



3) 1 GHz to 25 GHz emissions:



Test Procedure

1. The EUT was placed on turn table which is 0.8m above ground plane for below 1GHz test, and on a low permittivity and low loss tangent turn table which is 1.5m above ground plane for above 1GHz test.
2. Maximum procedure was performed by raising the receiving antenna from 1m to 4m and rotating the turn table from 0° to 360° to acquire the highest emissions from EUT.
3. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical.
4. Repeat above procedures until all frequency measurements have been completed.

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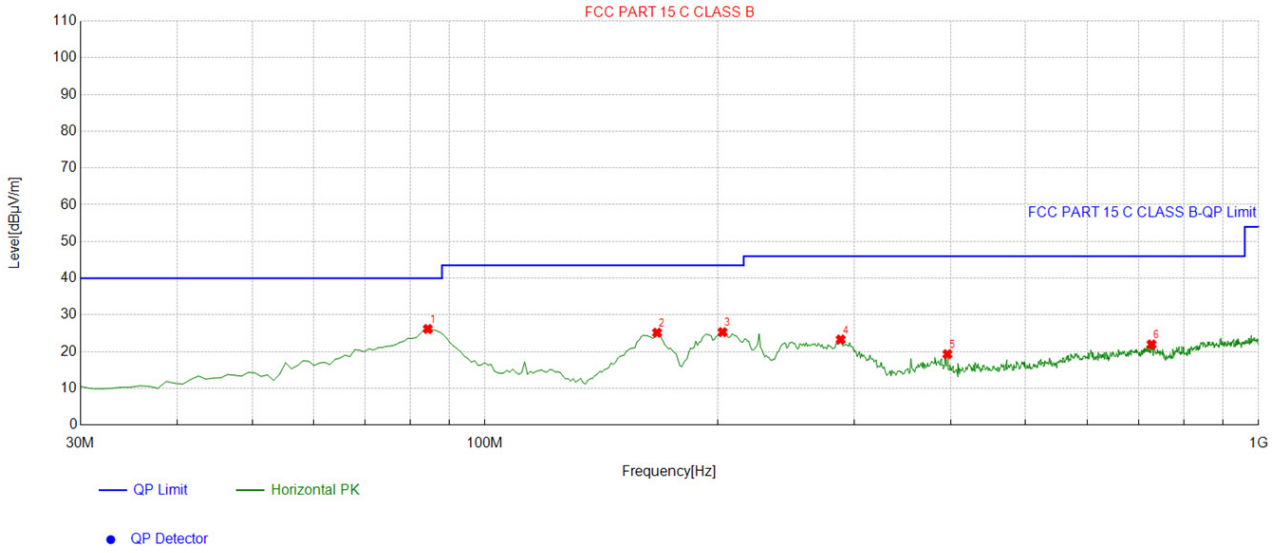
4.3.3 Test Result

Below 1GHz Test Results:

All modes have been tested, only the worst mode of Low channel TX is reflected.

ANT.1:

Antenna polarity: H



Suspected List									
NO.	Freq. [MHz]	Factor [dB]	Reading [dBµV/m]	Level [dBµV/m]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	84.374374	-17.88	44.04	26.16	40.00	13.84	100	1	Horizontal
2	166.90690	-17.40	42.56	25.16	43.50	18.34	100	288	Horizontal
3	202.83283	-15.23	40.54	25.31	43.50	18.19	100	142	Horizontal
4	288.27827	-12.19	35.49	23.30	46.00	22.70	100	142	Horizontal
5	396.05605	-9.26	28.58	19.32	46.00	26.68	100	124	Horizontal
6	727.15715	-3.80	25.76	21.96	46.00	24.04	100	41	Horizontal

Remark: Factor = Cable loss + Antenna factor + Attenuator – Preamplifier; Level = Reading + Factor; Margin = Limit – Level

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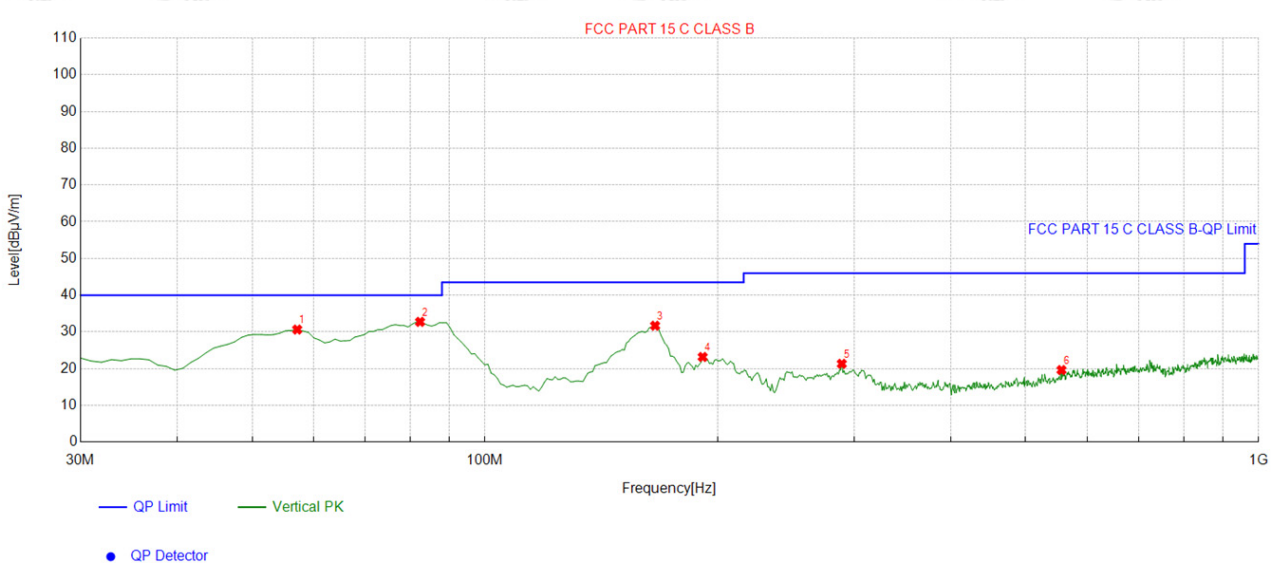
Antenna polarity: V



Suspected List									
NO.	Freq. [MHz]	Factor [dB]	Reading [dBµV/m]	Level [dBµV/m]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	57.187187	-13.76	44.40	30.64	40.00	9.36	100	21	Vertical
2	82.432432	-18.19	50.93	32.74	40.00	7.26	100	326	Vertical
3	165.93593	-17.41	49.10	31.69	43.50	11.81	100	52	Vertical
4	191.18118	-15.86	39.05	23.19	43.50	20.31	100	52	Vertical
5	289.24924	-12.10	33.42	21.32	46.00	24.68	100	28	Vertical
6	556.26626	-6.51	26.14	19.63	46.00	26.37	100	284	Vertical

Remark: Factor = Cable loss + Antenna factor + Attenuator – Preamplifier; Level = Reading + Factor; Margin = Limit – Level

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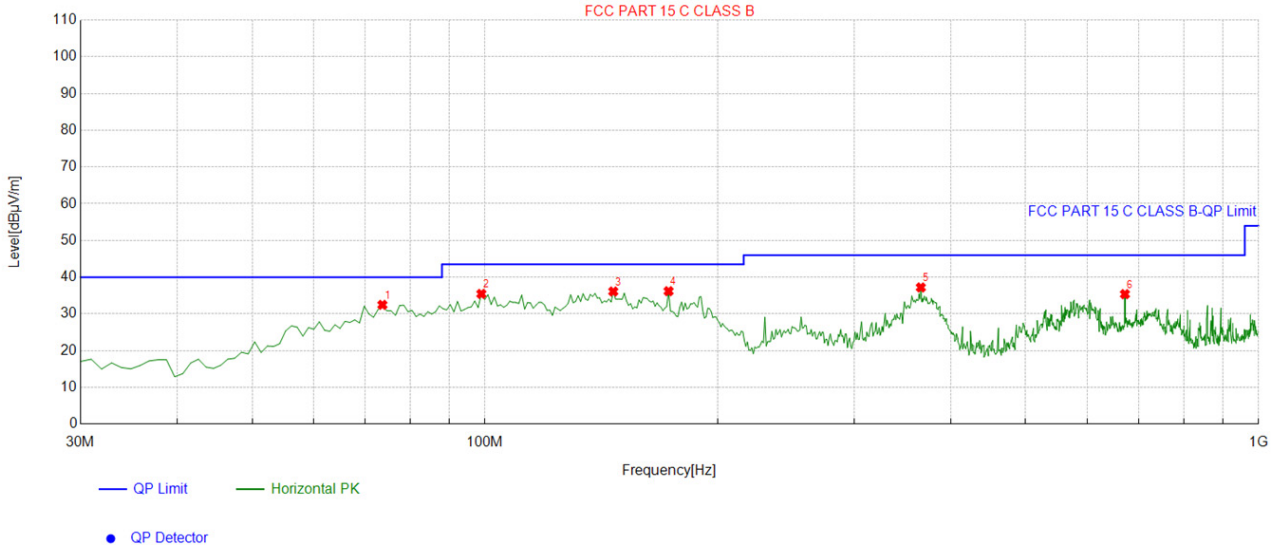
ANT.2:
Antenna polarity: H



Suspected List									
NO.	Freq. [MHz]	Factor [dB]	Reading [dBµV/m]	Level [dBµV/m]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	73.693694	-17.95	50.42	32.47	40.00	7.53	100	130	Horizontal
2	98.938939	-14.83	50.29	35.46	43.50	8.04	100	158	Horizontal
3	146.51651	-18.23	54.34	36.11	43.50	7.39	100	141	Horizontal
4	172.73273	-16.77	52.96	36.19	43.50	7.31	100	155	Horizontal
5	365.95595	-9.63	46.84	37.21	46.00	8.79	100	130	Horizontal
6	671.81181	-4.50	39.89	35.39	46.00	10.61	100	86	Horizontal

Remark: Factor = Cable loss + Antenna factor + Attenuator – Preamplifier; Level = Reading + Factor; Margin = Limit – Level

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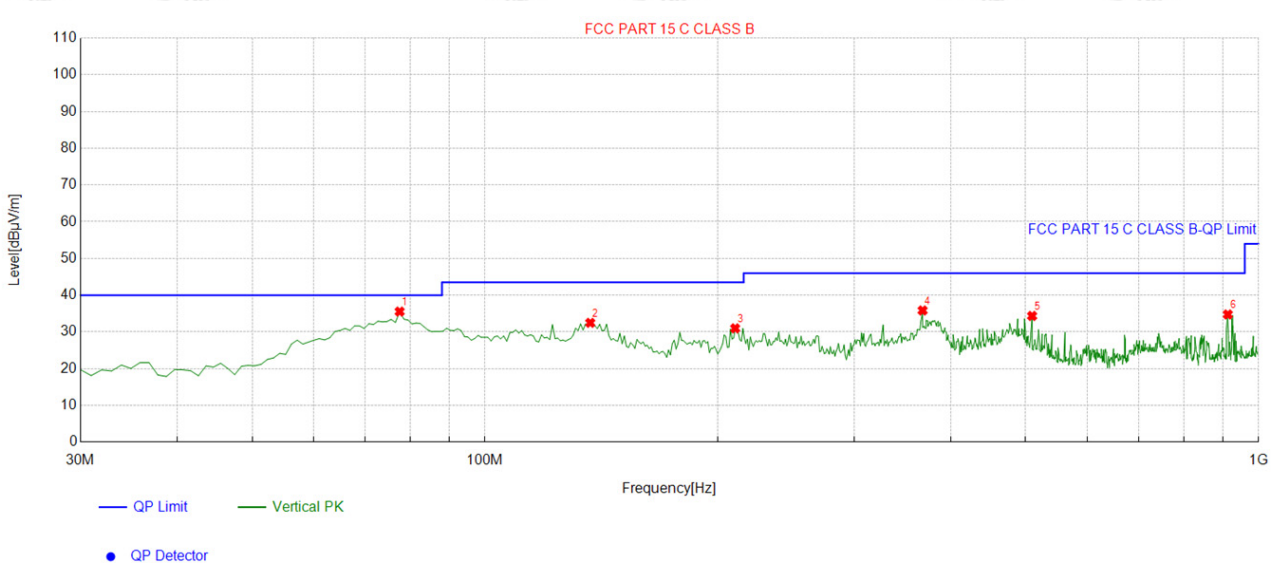
Antenna polarity: V



Suspected List									
NO.	Freq. [MHz]	Factor [dB]	Reading [dBµV/m]	Level [dBµV/m]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	77.577578	-18.02	53.56	35.54	40.00	4.46	100	266	Vertical
2	136.80680	-17.67	50.14	32.47	43.50	11.03	100	274	Vertical
3	210.60060	-14.88	45.85	30.97	43.50	12.53	100	125	Vertical
4	367.89789	-9.77	45.61	35.84	46.00	10.16	100	184	Vertical
5	509.65966	-8.34	42.69	34.35	46.00	11.65	100	118	Vertical
6	912.61261	-1.07	35.82	34.75	46.00	11.25	100	270	Vertical

Remark: Factor = Cable loss + Antenna factor + Attenuator – Preamplifier; Level = Reading + Factor; Margin = Limit – Level

Harmonics and Spurious Emissions

Frequency Range (9kHz-30MHz)

Frequency (MHz)	Level@3m (dBµV/m)	Limit@3m (dBµV/m)
--	--	--
--	--	--
--	--	--
--	--	--

Note:*1. Emission Level=Reading+ Cable loss+ Antenna factor-Amp factor.*

2. The emission levels are 20 dB below the limit value, which are not reported. It is deemed to comply with the requirement.

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For 1GHz to 25GHz

ANT.1:

CH Low (2402MHz)

Horizontal:

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dBμV)	(dB)	(dBμV/m)	(dBμV/m)	(dB)	
4804	53.83	-3.65	50.18	74.00	-23.82	peak
4804	45.22	-3.65	41.57	54.00	-12.43	AVG
7206	51.31	-0.95	50.36	74.00	-23.64	peak
7206	42.19	-0.95	41.24	54.00	-12.76	AVG
Remark: Factor = Cable loss + Antenna factor + Attenuator – Preamplifier; Level = Reading + Factor; Margin = Level – Limit						

Vertical:

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dBμV)	(dB)	(dBμV/m)	(dBμV/m)	(dB)	
4804	54.13	-3.65	50.48	74.00	-23.52	peak
4804	42.24	-3.65	38.59	54.00	-15.41	AVG
7206	51.13	-0.95	50.18	74.00	-23.82	peak
7206	41.67	-0.95	40.72	54.00	-13.28	AVG
Remark: Factor = Cable loss + Antenna factor + Attenuator – Preamplifier; Level = Reading + Factor; Margin = Level – Limit						

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CH Middle (2440MHz)

Horizontal:

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dBμV)	(dB)	(dBμV/m)	(dBμV/m)	(dB)	
4880	53.84	-3.54	50.30	74.00	-23.70	peak
4880	43.09	-3.54	39.55	54.00	-14.45	AVG
7320	51.46	-0.81	50.65	74.00	-23.35	peak
7320	41.07	-0.81	40.26	54.00	-13.74	AVG
Remark: Factor = Cable loss + Antenna factor + Attenuator – Preamplifier; Level = Reading + Factor; Margin = Level – Limit						

Vertical:

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dBμV)	(dB)	(dBμV/m)	(dBμV/m)	(dB)	
4880	52.44	-3.54	48.90	74.00	-25.10	peak
4880	46.12	-3.54	42.58	54.00	-11.42	AVG
7320	51.07	-0.81	50.26	74.00	-23.74	peak
7320	43.26	-0.81	42.45	54.00	-11.55	AVG
Remark: Factor = Cable loss + Antenna factor + Attenuator – Preamplifier; Level = Reading + Factor; Margin = Level – Limit						

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CH High (2478MHz)

Horizontal:

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dBμV)	(dB)	(dBμV/m)	(dBμV/m)	(dB)	
4956	52.47	-3.43	49.04	74.00	-24.96	peak
4956	45.17	-3.44	41.73	54.00	-12.27	AVG
7434	51.04	-0.77	50.27	74.00	-23.73	peak
7434	43.26	-0.77	42.49	54.00	-11.51	AVG
Remark: Factor = Cable loss + Antenna factor + Attenuator – Preamplifier; Level = Reading + Factor; Margin = Level – Limit						

Vertical:

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dBμV)	(dB)	(dBμV/m)	(dBμV/m)	(dB)	
4956	53.67	-3.43	50.24	74.00	-23.76	peak
4956	43.69	-3.44	40.25	54.00	-13.75	AVG
7434	51.03	-0.77	50.26	74.00	-23.74	peak
7434	42.11	-0.77	41.34	54.00	-12.66	AVG
Remark: Factor = Cable loss + Antenna factor + Attenuator – Preamplifier; Level = Reading + Factor; Margin = Level – Limit						

Remark：
(1) Measuring frequencies from 1 GHz to the 25 GHz.
(2) “F” denotes fundamental frequency; “H” denotes spurious frequency; “E” denotes band edge frequency.
(3) * denotes emission frequency which appearing within the Restricted Bands specified in provision of 15.205, then the general radiated emission limits in 15.209 apply.
(4) The emissions are attenuated more than 20dB below the permissible limits are not recorded in the report.
(5) The IF bandwidth of EMI Test Receiver between 30MHz to 1GHz was 120KHz, 1 MHz for measuring above 1 GHz, below 30MHz was 10KHz. The resolution bandwidth of test receiver/spectrum analyzer is 1MHz and video bandwidth is 3MHz for peak measurement with peak detector at frequency above 1GHz. The resolution bandwidth of test receiver/spectrum analyzer is 1MHz and video bandwidth is 10Hz for Average measurement with peak detection at frequency above 1GHz.
(6) When the test results of Peak Detected below the limits of Average Detected, the Average Detected is not need completed. For example: Top Channel at Fundamental 73.16dBuV/m(PK Value) <93.98(AV Limit), at harmonic 53.20 dBuV/m(PK Value) <54 dBuV/m(AV Limit), the Average Detected not need to completed.
(7) All modes of operation were investigated and the worst-case emissions are reported.

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ANT.2:

CH Low (2402MHz)

Horizontal:

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dBμV)	(dB)	(dBμV/m)	(dBμV/m)	(dB)	
4804	53.64	-3.65	49.99	74.00	-24.01	peak
4804	42.12	-3.65	38.47	54.00	-15.53	AVG
7206	52.32	-0.95	51.37	74.00	-22.63	peak
7206	40.16	-0.95	39.21	54.00	-14.79	AVG
Remark: Factor = Cable loss + Antenna factor + Attenuator – Preamplifier; Level = Reading + Factor; Margin = Level – Limit						

Vertical:

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dBμV)	(dB)	(dBμV/m)	(dBμV/m)	(dB)	
4804	55.09	-3.65	51.44	74.00	-22.56	peak
4804	44.62	-3.65	40.97	54.00	-13.03	AVG
7206	51.56	-0.95	50.61	74.00	-23.39	peak
7206	42.43	-0.95	41.48	54.00	-12.52	AVG
Remark: Factor = Cable loss + Antenna factor + Attenuator – Preamplifier; Level = Reading + Factor; Margin = Level – Limit						

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CH Middle (2440MHz)

Horizontal:

Frequency (MHz)	Meter Reading (dBμV)	Factor (dB)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector Type
4880	54.33	-3.54	50.79	74.00	-23.21	peak
4880	41.95	-3.54	38.41	54.00	-15.59	AVG
7320	52.14	-0.81	51.33	74.00	-22.67	peak
7320	40.46	-0.81	39.65	54.00	-14.35	AVG
Remark: Factor = Cable loss + Antenna factor + Attenuator – Preamplifier; Level = Reading + Factor; Margin = Level – Limit						

Vertical:

Frequency (MHz)	Meter Reading (dBμV)	Factor (dB)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector Type
4880	55.23	-3.54	51.69	74.00	-22.31	peak
4880	41.42	-3.54	37.88	54.00	-16.12	AVG
7320	51.09	-0.81	50.28	74.00	-23.72	peak
7320	40.12	-0.81	39.31	54.00	-14.69	AVG
Remark: Factor = Cable loss + Antenna factor + Attenuator – Preamplifier; Level = Reading + Factor; Margin = Level – Limit						

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CH High (2478MHz)

Horizontal:

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dBμV)	(dB)	(dBμV/m)	(dBμV/m)	(dB)	
4956	55.12	-3.43	51.69	74.00	-22.31	peak
4956	41.08	-3.44	37.64	54.00	-16.36	AVG
7434	51.82	-0.77	51.05	74.00	-22.95	peak
7434	40.73	-0.77	39.96	54.00	-14.04	AVG
Remark: Factor = Cable loss + Antenna factor + Attenuator – Preamplifier; Level = Reading + Factor; Margin = Level – Limit						

Vertical:

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dBμV)	(dB)	(dBμV/m)	(dBμV/m)	(dB)	
4956	54.06	-3.43	50.63	74.00	-23.37	peak
4956	43.23	-3.44	39.79	54.00	-14.21	AVG
7434	50.48	-0.77	49.71	74.00	-24.29	peak
7434	41.12	-0.77	40.35	54.00	-13.65	AVG
Remark: Factor = Cable loss + Antenna factor + Attenuator – Preamplifier; Level = Reading + Factor; Margin = Level – Limit						

Remark：
(1) Measuring frequencies from 1 GHz to the 25 GHz.
(2) “F” denotes fundamental frequency; “H” denotes spurious frequency; “E” denotes band edge frequency.
(3) * denotes emission frequency which appearing within the Restricted Bands specified in provision of 15.205, then the general radiated emission limits in 15.209 apply.
(4) The emissions are attenuated more than 20dB below the permissible limits are not recorded in the report.
(5) The IF bandwidth of EMI Test Receiver between 30MHz to 1GHz was 120KHz, 1 MHz for measuring above 1 GHz, below 30MHz was 10KHz. The resolution bandwidth of test receiver/spectrum analyzer is 1MHz and video bandwidth is 3MHz for peak measurement with peak detector at frequency above 1GHz. The resolution bandwidth of test receiver/spectrum analyzer is 1MHz and video bandwidth is 10Hz for Average measurement with peak detection at frequency above 1GHz.
(6) When the test results of Peak Detected below the limits of Average Detected, the Average Detected is not need completed. For example: Top Channel at Fundamental 73.16dBuV/m(PK Value) <93.98(AV Limit), at harmonic 53.20 dBuV/m(PK Value) <54 dBuV/m(AV Limit), the Average Detected not need to completed.
(7) All modes of operation were investigated and the worst-case emissions are reported.

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Radiated Band Edge Test:

ANT.1:
Operation Mode: TX CH Low (2402MHz)

Horizontal:

Frequency (MHz)	Reading Result (dBμV)	Factor (dB)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector Type
2310.00	54.32	-5.81	48.51	74	-25.49	peak
2310.00	/	-5.81	/	54	/	AVG
2390.00	53.18	-5.84	47.34	74	-26.66	peak
2390.00	/	-5.84	/	54	/	AVG
2400.00	51.77	-5.84	45.93	74	-28.07	peak
2400.00	/	-5.84	/	54	/	AVG
Remark: Factor = Cable loss + Antenna factor + Attenuator – Preamplifier; Level = Reading + Factor; Margin = Level – Limit						

Vertical:

Frequency (MHz)	Reading Result (dBμV)	Factor (dB)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector Type
2310.00	55.36	-5.81	49.55	74	-24.45	peak
2310.00	/	-5.81	/	54	/	AVG
2390.00	54.79	-5.84	48.95	74	-25.05	peak
2390.00	/	-5.84	/	54	/	AVG
2400.00	51.22	-5.84	45.38	74	-28.62	peak
2400.00	/	-5.84	/	54	/	AVG
Remark: Factor = Cable loss + Antenna factor + Attenuator – Preamplifier; Level = Reading + Factor; Margin = Level – Limit						

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Operation Mode: TX CH High (2478MHz)

Horizontal

Frequency (MHz)	Meter Reading (dBμV)	Factor (dB)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector Type
2483.50	53.79	-5.81	47.98	74	-26.02	peak
2483.50	/	-5.81	/	54	/	AVG
2500.00	52.06	-6.06	46	74	-28	peak
2500.00	/	-6.06	/	54	/	AVG
Remark: Factor = Cable loss + Antenna factor + Attenuator – Preamplifier; Level = Reading + Factor; Margin = Level – Limit						

Vertical:

Frequency (MHz)	Meter Reading (dBμV)	Factor (dB)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector Type
2483.50	52.64	-5.81	46.83	74	-27.17	peak
2483.50	/	-5.81	/	54	/	AVG
2500.00	51.89	-6.06	45.83	74	-28.17	peak
2500.00	/	-6.06	/	54	/	AVG
Remark: Factor = Cable loss + Antenna factor + Attenuator – Preamplifier; Level = Reading + Factor; Margin = Level – Limit						
Remark: All the other emissions not reported were too low to read and deemed to comply with FCC limit.						

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ANT.2:

Operation Mode: TX CH Low (2402MHz)

Horizontal:

Frequency (MHz)	Reading Result (dBμV)	Factor (dB)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector Type
2310.00	56.03	-5.81	50.22	74	-23.78	peak
2310.00	/	-5.81	/	54	/	AVG
2390.00	55.27	-5.84	49.43	74	-24.57	peak
2390.00	/	-5.84	/	54	/	AVG
2400.00	52.74	-5.84	46.9	74	-27.1	peak
2400.00	/	-5.84	/	54	/	AVG
Remark: Factor = Cable loss + Antenna factor + Attenuator – Preamplifier; Level = Reading + Factor; Margin = Level – Limit						

Vertical:

Frequency (MHz)	Reading Result (dBμV)	Factor (dB)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector Type
2310.00	55.49	-5.81	49.68	74	-24.32	peak
2310.00	/	-5.81	/	54	/	AVG
2390.00	54.12	-5.84	48.28	74	-25.72	peak
2390.00	/	-5.84	/	54	/	AVG
2400.00	51.66	-5.84	45.82	74	-28.18	peak
2400.00	/	-5.84	/	54	/	AVG
Remark: Factor = Cable loss + Antenna factor + Attenuator – Preamplifier; Level = Reading + Factor; Margin = Level – Limit						

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Operation Mode: TX CH High (2478MHz)

Horizontal

Frequency (MHz)	Meter Reading (dBμV)	Factor (dB)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector Type
2483.50	56.02	-5.81	50.21	74	-23.79	peak
2483.50	/	-5.81	/	54	/	AVG
2500.00	52.46	-6.06	46.4	74	-27.6	peak
2500.00	/	-6.06	/	54	/	AVG
Remark: Factor = Cable loss + Antenna factor + Attenuator – Preamplifier; Level = Reading + Factor; Margin = Level – Limit						

Vertical:

Frequency (MHz)	Meter Reading (dBμV)	Factor (dB)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector Type
2483.50	52.77	-5.81	46.96	74	-27.04	peak
2483.50	/	-5.81	/	54	/	AVG
2500.00	51.38	-6.06	45.32	74	-28.68	peak
2500.00	/	-6.06	/	54	/	AVG
Remark: Factor = Cable loss + Antenna factor + Attenuator – Preamplifier; Level = Reading + Factor; Margin = Level – Limit						
Remark: All the other emissions not reported were too low to read and deemed to comply with FCC limit.						

Remark:

1. If the PK measured levels comply with average limit, then the average level were deemed to comply with average limit.
2. In restricted bands of operation, the spurious emissions below the permissible value more than 20dB.
3. The amplitude of spurious emissions which are attenuated by more than 20dB below the permissible value has no need to be reported.

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4.4 Maximum Output Power Measurement

4.4.1 Limit

The Maximum Peak Output Power Measurement is 30dBm.

4.4.2 Test Procedure

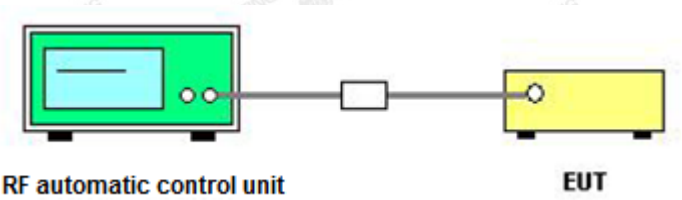
The maximum peak conducted output power may be measured using a broadband peak RF automatic control unit. The RF automatic control unit shall have a video bandwidth that is greater than or equal to the DTS bandwidth and shall utilize a fast-responding diode detector.

The maximum Average conducted output power may be measured using a wideband RF automatic control unit with a thermocouple detector or equivalent. The RF automatic control unit shall have a video bandwidth that is greater than or equal to the DTS bandwidth and shall utilize a fast-responding diode detector.

4.4.3 Deviation From Standard

No deviation.

4.4.4 Test Setup



4.4.5 Test Results

Channel	Channel Frequency (MHz)	Maximum Output Power (dBm)	Limit (dBm)	Result
Low	2402	-2.67	30.00	Pass
Middle	2440	-1.62		Pass
High	2478	-2.20		Pass

Note: 1.The test results including the cable lose.

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4.5 Power Spectral Density

4.5.1 Limit

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

4.5.2 Test Procedure

Use this procedure when the maximum peak conducted output power in the fundamental emission is used to demonstrate compliance.
Set the RBW =10 kHz.
Set the VBW =30 KHz.
Set the span to 1.5 times the DTS channel bandwidth.
Detector = peak.
Sweep time = auto couple.
Trace mode = max hold.
Allow trace to fully stabilize.
Use the peak marker function to determine the maximum power level.
If measured value exceeds limit, reduce RBW(no less than 3 kHz)and repeat.
The resulting peak PSD level must be 8 dBm.

4.5.3 Deviation From Standard

No deviation.

4.5.4 Test Setup

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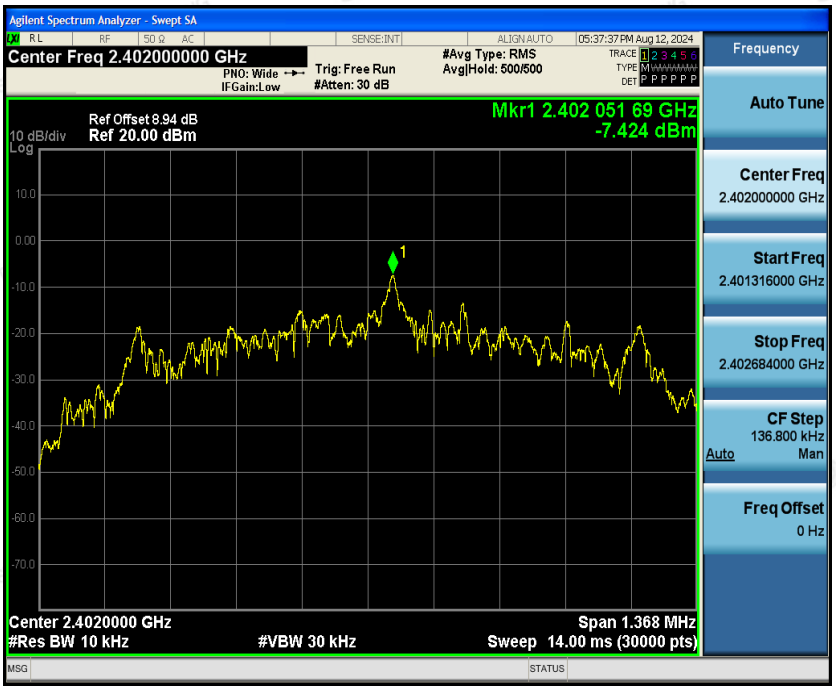
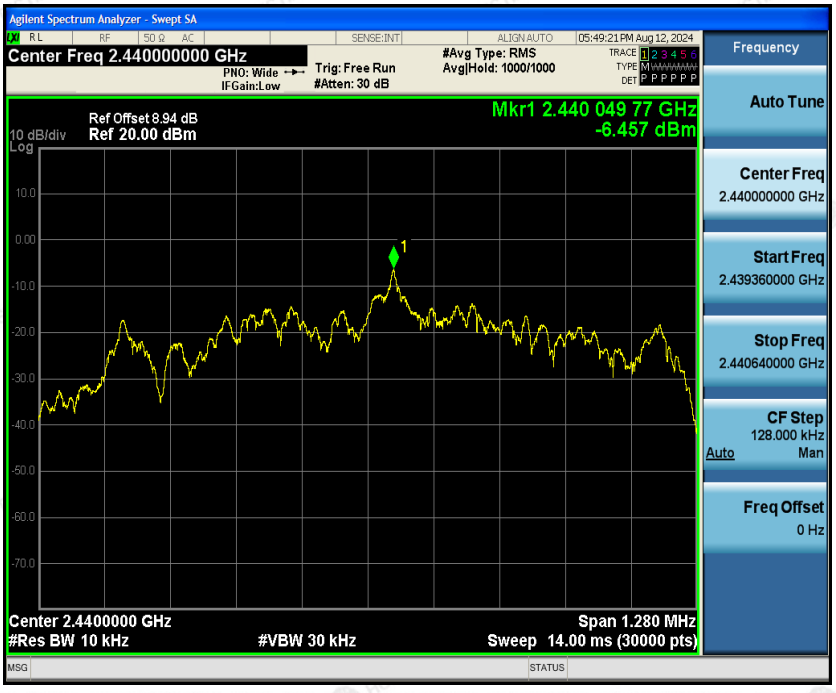
4.5.5 Test Results

Channel	Channel Frequency (MHz)	Test Result (dBm/ 10kHz)	10log (3/10)	Test Result (dBm/ 3kHz)	Limit (dBm/ 3KHz)	Result
Low	2402	-7.42	-5.23	-12.65	8.00	Pass
Middle	2440	-6.46	-5.23	-11.69		Pass
High	2478	-7.04	-5.23	-12.27		Pass
Note: PSD test result (dBm/3kHz)= PSD test result (dBm/10kHz)+10log(3/10)						

CH Low



CH Middle



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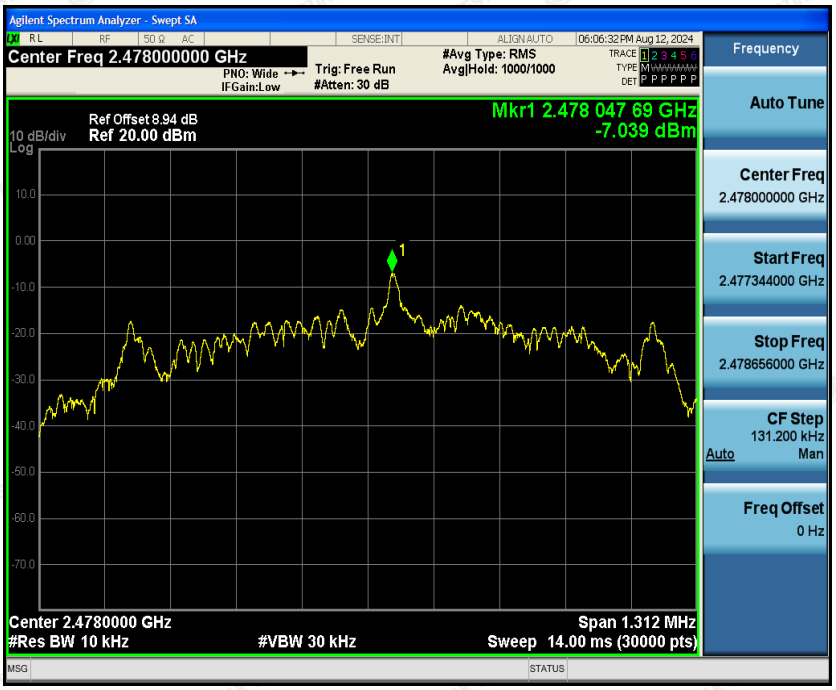
CH High



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4.6 6db Bandwidth

4.6.1 Limit

For digital modulation systems, the minimum 6 dB bandwidth shall be at least 500 kHz.

4.6.2 Test Procedure

The transmitter output was connected to the spectrum analyzer through an attenuator. The bandwidth of the fundamental frequency was measured by spectrum analyzer with RBW=100 KHz and VBW=300 KHz.
The 6dB bandwidth is defined as the total spectrum the power of which is higher than peak power minus 6dB.
1. Set RBW = 100 kHz.
2. Set the video bandwidth (VBW) ≥ 3 RBW.
3. Detector = Peak.
4. Trace mode = max hold.
5. Sweep = auto couple.
6. Allow the trace to stabilize.
7. Measure the maximum width of the emission that is constrained by the frequencies associated with the two outermost amplitude points (upper and lower frequencies) that are attenuated by 6 dB relative to the maximum level measured in the fundamental emission.

4.6.3 Deviation From Standard

No deviation.

4.6.4 Test Setup

4.6.5 Test Result

Channel	Channel Frequency (MHz)	6dB Bandwidth (MHz)	Limit (KHz)	Result
Low	2402	0.684	≥500	Pass
Middle	2440	0.640		Pass
High	2478	0.656		Pass

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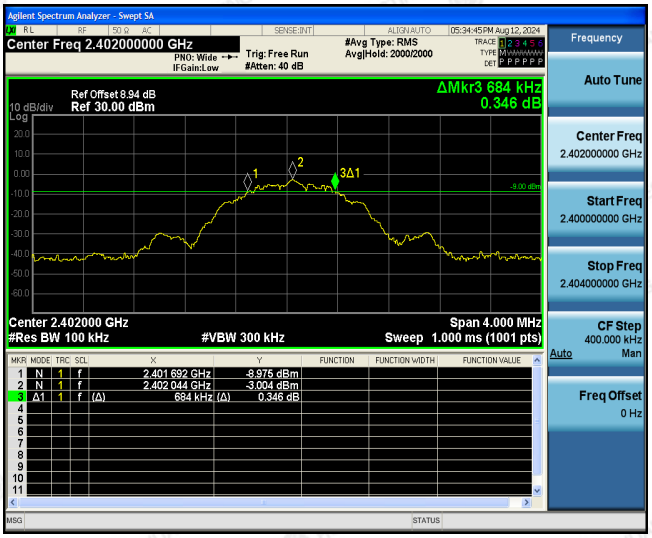
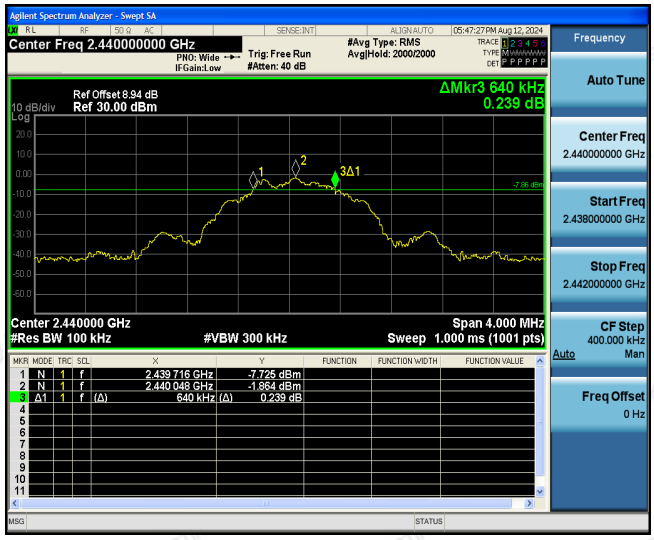
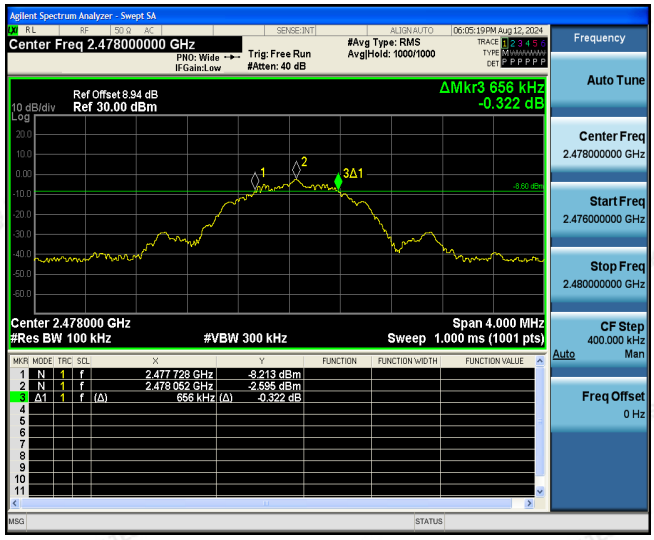
CH Low



CH Middle



CH High



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4.7 Occupied Bandwidth

4.7.1 Test Procedure

The occupied bandwidth is the frequency bandwidth such that, below its lower and above its upper frequency limits, the mean powers are each equal to 0.5% of the total mean power of the given emission. The following procedure shall be used for measuring 99% power bandwidth:
RBW=1% to 5% of the OBW
VBW=approximately 3 X RBW
Detector=Peak
Trace Mode: Max Hold
Use the 99% power bandwidth function of the instrument to measure the Occupied Bandwidth and recorded.

4.7.2 Deviation From Standard

No deviation.

4.7.3 Test Setup

4.7.4 Test Result

N/A

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4.8 Band Edge

4.8.1 Limit

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated device is operating, the RF power that is produced 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 that the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of root-mean-square averaging over a time interval, as permitted under FCC rules in section 5.8.1, the attenuation required shall be 30 dB instead of 20 dB.

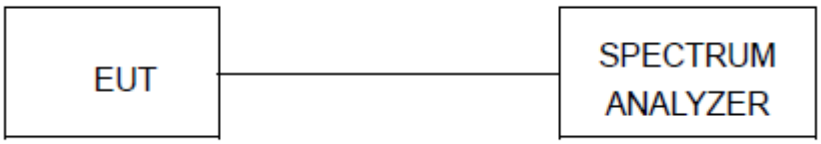
4.8.2 Test Procedure

a. The EUT was directly connected to the spectrum analyzer and antenna output port as show in the block diagram below.
b. Span = wide enough to capture the peak level of the emission operating on the channel closest to the band edge, as well as any modulation products which fall outside of the authorized band of operation, RBW ≥ 1% of the span, VBW ≥ RBW, Sweep = auto,
Detector function = peak, Trace = max hold.

4.8.3 Deviation From Standard

No deviation.

4.8.4 Test Setup



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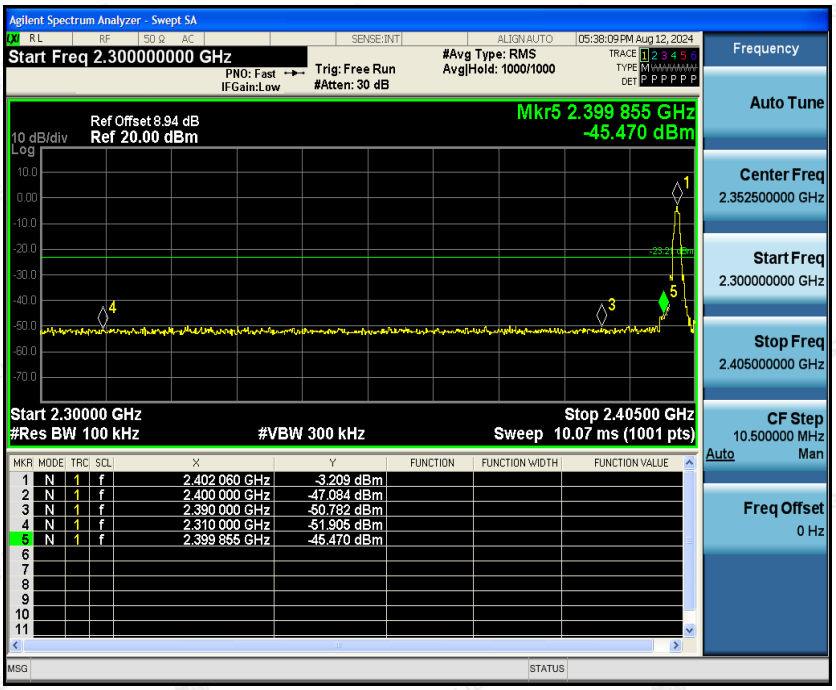
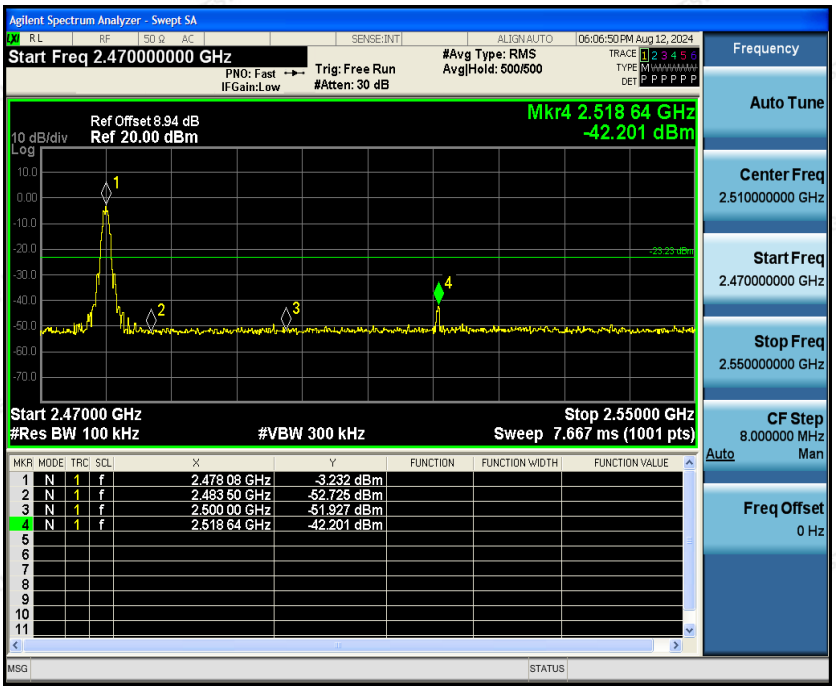
4.8.5 Test Results

PASS



CH Low



CH High

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4.9 Conducted Spurious Emissions

4.9.1 Applied Procedures / Limit

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated device is operating, the RF power that is produced 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 that the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of root-mean-square averaging over a time interval, as permitted under Section (b)(3) of RSS 5.4(4), the attenuation required shall be 30 dB instead of 20 dB.
For below 30MHz,For 9KHz-150kHz,150K-10MHz,We use the RBW 1KHz,10KHz, So the limit need to calculated by “10lg(BW1/BW2)“. for example For9KHz-150kHz,RBW 1KHz, The Limit= the highest emission level-20-10log(100/1)= the highest emission level-40.

4.9.2 Test Procedure

a.The EUT was directly connected to the spectrum analyzer and antenna output port as show in the block diagram below.
b.Span = wide enough to capture the peak level of the emission operating on the channel closest to the band edge, as well as any modulation products which fall outside of the authorized band of operation, RBW ≥ 1% of the span, VBW ≥ RBW, Sweep = auto,
Detector function = peak, Trace = max hold.

4.9.3 Deviation From Standard

No deviation.

4.9.4 Test Setup

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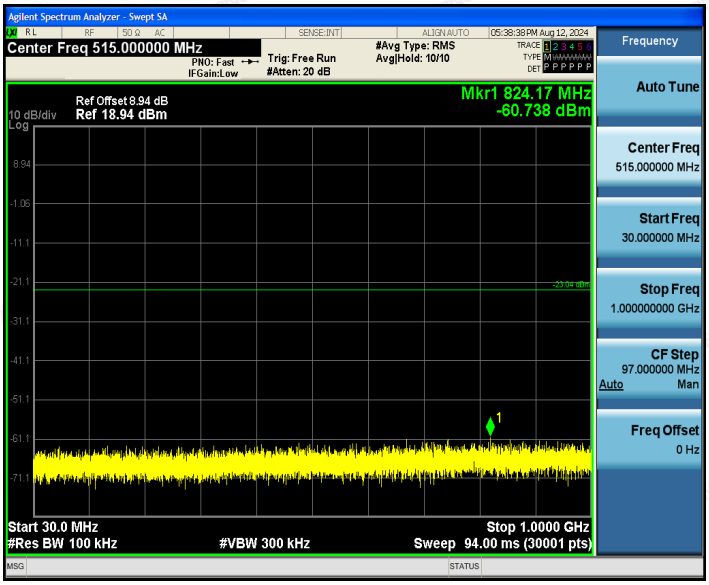
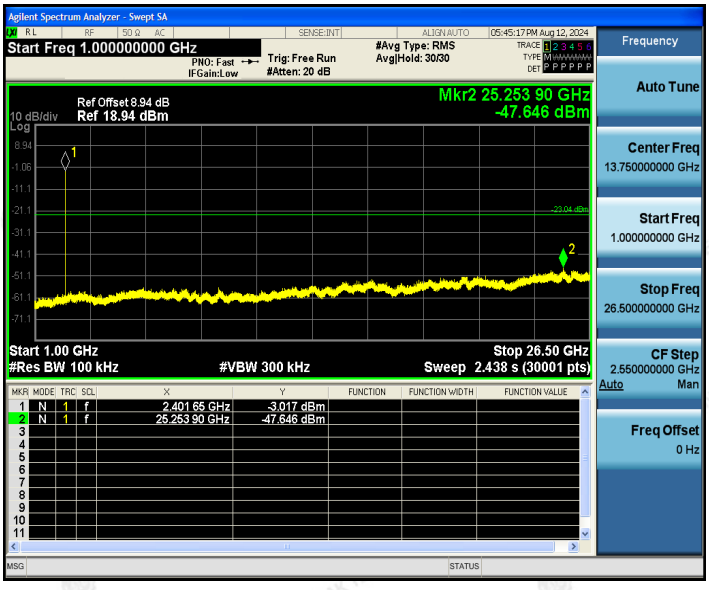
4.9.5 Test Results

CH Low





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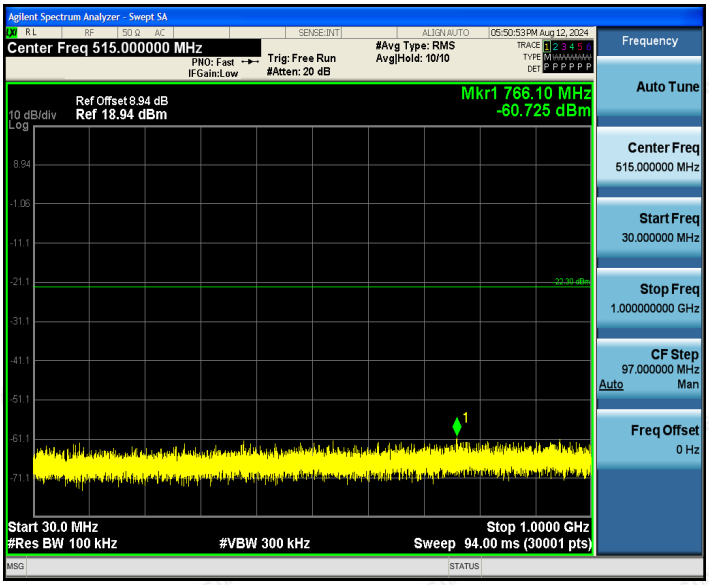
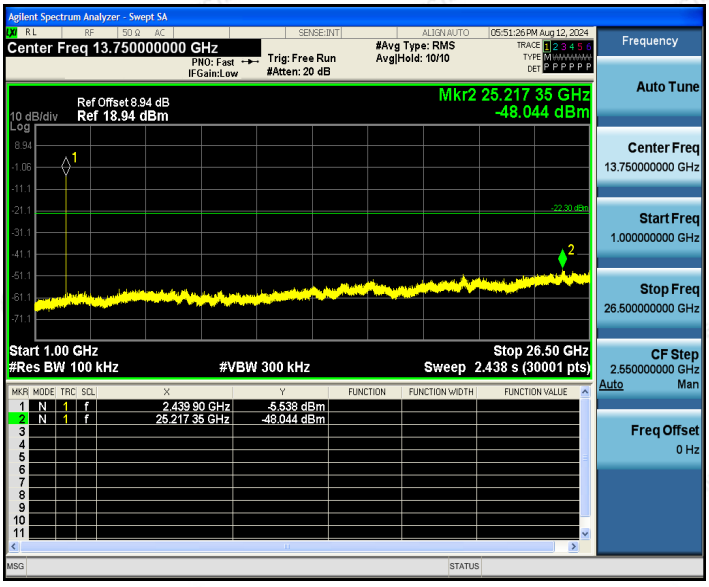
CH Middle





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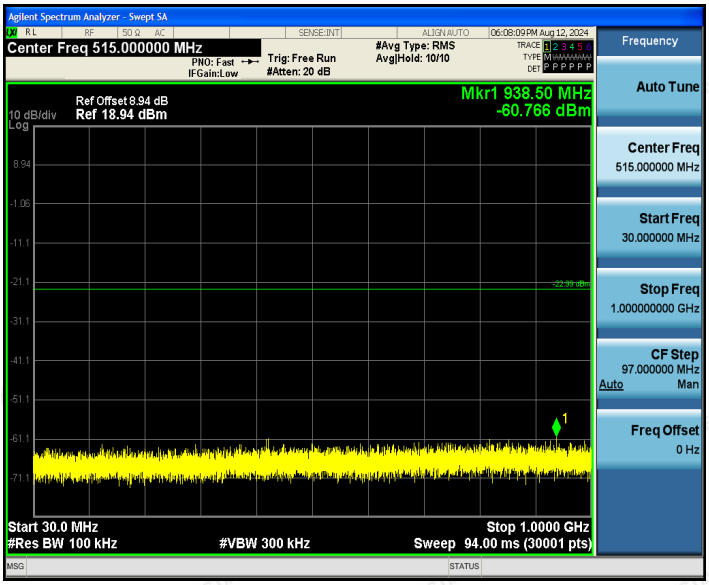
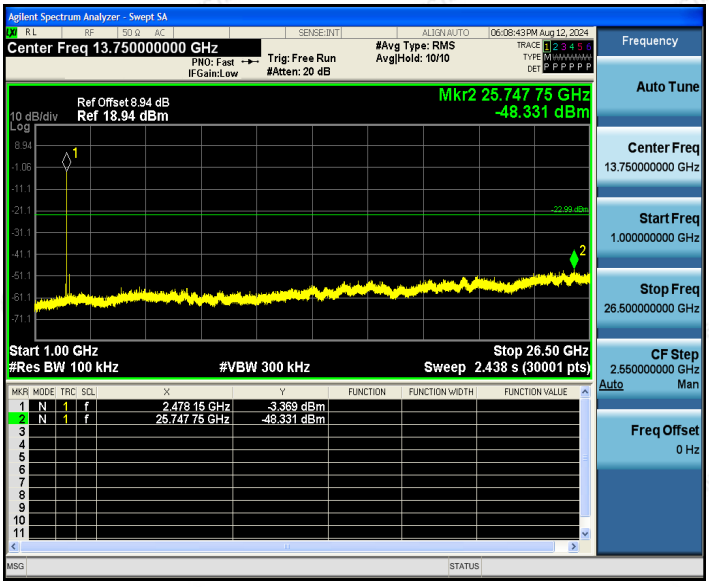
CH High





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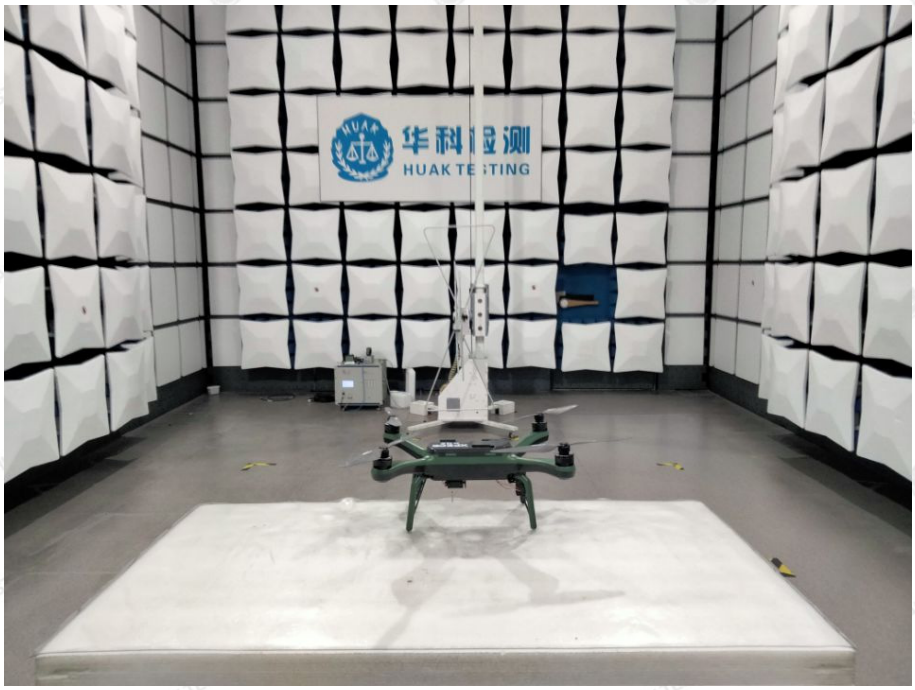
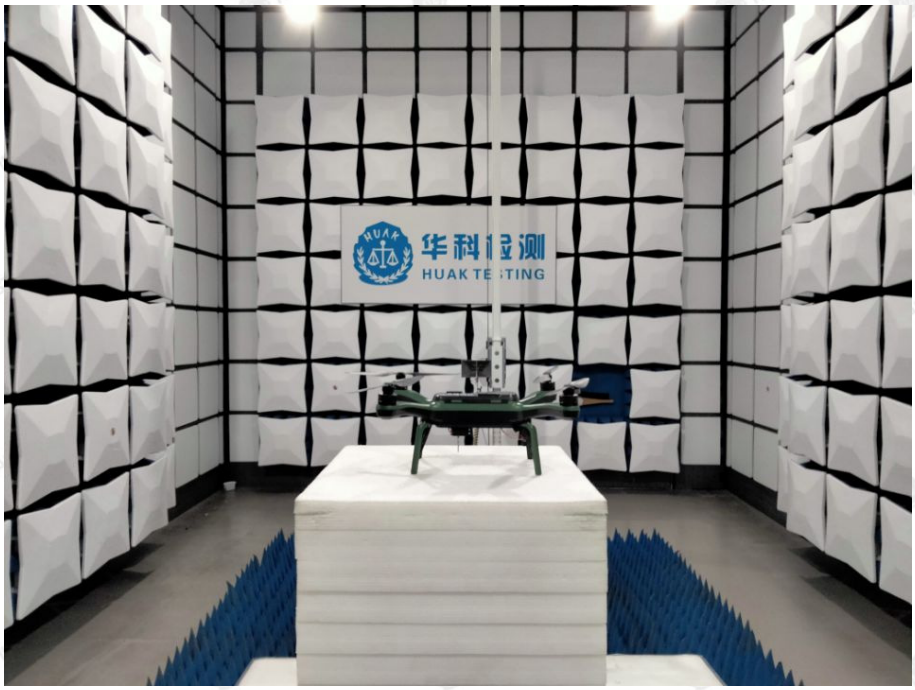
5 Test Setup Photo

Radiated Emissions





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Add: 1-2F., Building B2, Junfeng Zhongcheng Zhizao Innovation Park, Heping Community, Fuhai Street, Bao'an District, Shenzhen, Guangdong, China

6 Photos of the EUT

Reference to the report: ANNEX A of external photos and ANNEX B of internal photos.

---------End of test report---------

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