Shenzhen CTA Testing Technology Co., Ltd.

Room 106, Building 1, Yibaolai Industrial Park, Qiaotou Community, Fuhai Street, Bao‘an District, Shenzhen, China

TEST REPORT
FCC Rules and Regulations Part PART 15.249

Report Reference No……..: **CTA25123101301**

FCC ID……..: **2BUI5-W68-V02-GREY**

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Date of issue.....	Jan. 20, 2026

Testing Laboratory Name	**Shenzhen CTA Testing Technology Co., Ltd.**
Address.....	Room 106, Building 1, Yibaolai Industrial Park, Qiaotou Community, Fuhai Street, Bao’an District, Shenzhen, China
Applicant’s name.....	**Shenzhen Huakai Weishi Technology Co., Ltd**
Address.....	1511, Chengtouxin Times Building, No. 2009 Pingshan Avenue, Liulian Community, Pingshan Street, Pingshan District, Shenzhen City, China
Standard	**FCC Rules and Regulations PART 15.249** **ANSI C63.10-2020+Cor. 1-2023+C63.10a-2024 + Errata to C63.10a-2024**

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Test item description	**Microphone**
Trade Mark	HUACAM
Manufacturer	Shenzhen Huakai Weishi Technology Co., Ltd
Model/Type reference.....	W68-V02-GREY
Listed Models	W68-V02-RED
Modulation	GFSK
Frequency.....	2402-2480MHz
Ratings.....	DC 3.7V From battery and DC 5.0V From external circuit
Result.....	**PASS**

TEST REPORT

Equipment under Test	:	Microphone
Model /Type	:	W68-V02-GREY
Listed Models	:	W68-V02-RED
Model difference	:	The PCB board, circuit, structure and internal of these models are the same, Only model number and colour is different for these model.
Applicant	:	**Shenzhen Huakai Weishi Technology Co., Ltd**
Address	:	1511, Chengtouxin Times Building, No. 2009 Pingshan Avenue, Liulian Community, Pingshan Street, Pingshan District, Shenzhen City, China
Manufacturer	:	**Shenzhen Huakai Weishi Technology Co., Ltd**
Address	:	1511, Chengtouxin Times Building, No. 2009 Pingshan Avenue, Liulian Community, Pingshan Street, Pingshan District, Shenzhen City, China

Test Result:	**PASS**

The test report merely corresponds to the test sample.
It is not permitted to copy extracts of these test result without the written permission of the test laboratory.

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1. TEST STANDARDS

The tests were performed according to following standards:

FCC Rules Part 15.249: Operation within the bands 902 - 928 MHz, 2400 - 2483.5 MHz, 5725 - 5875 MHz, and 24.0 - 24.25 GHz.

ANSI C63.10-2020+Cor. 1-2023+C63.10a-2024 + Errata to C63.10a-2024 : American National Standard for Testing Unlicensed Wireless Devices

2. SUMMARY

2.1. General Remarks

Date of receipt of test sample	:	Dec. 31, 2025
Testing commenced on	:	Dec. 31, 2025
Testing concluded on	:	Jan. 20, 2026

2.2. Product Description

Name of EUT	Microphone
Model Number	W68-V02-GREY
Power Rating	DC 3.7V From battery and DC 5.0V From external circuit
Hardware version:	V1.0
Software version:	V1.0
Sample ID:	CTA251231013-1# (Engineer sample) CTA251231013-2# (Normal sample)
Operation frequency	2402-2480MHz
Modulation	GFSK
Antenna Type	PCB antenna
Antenna Gain	0.69 dBi

2.3. Equipment Under Test

Power supply system utilised

Power supply voltage	:	○	230V / 50 Hz	○	120V / 60Hz
		○	12 V DC	○	24 V DC
		●	Other (specified in blank below)		

DC 3.7V From battery and DC 5.0V From external circuit

2.4. Short description of the Equipment under Test (EUT)

This is a Microphone.

For more details, refer to the user's manual of the EUT.

2.5. EUT configuration

The following peripheral devices and interface cables were connected during the measurement:

● - supplied by the manufacturer
○ - supplied by the lab

○	Adapter information (Auxiliary test supplied by test Lab)	Model: EP-TA20CBC Input: AC 100-240V 50/60Hz Output: DC 5V 2A

2.6. EUT operation mode

The Applicant use Key to control the EUT for staying in continuous transmitting and receiving mode for testing .There is 40 channels provided to the EUT. Channel Low,Mid and High was selected to test.

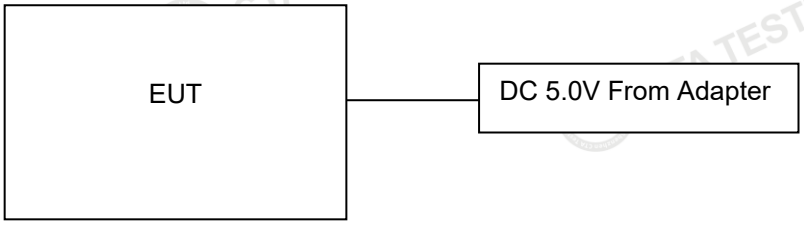
Operation Frequency：

Channel	Frequency (MHz)
00	**2402**
01	2404
02	2406
⋮	⋮
19	**2440**
⋮	⋮
37	2476
38	2478
39	**2480**

Test frequency:

Channel	Frequency (MHz)
Low	2402
Mid	2440
High	2480

2.7. Block Diagram of Test Setup



2.8. Modifications

No modifications were implemented to meet testing criteria.

3. TEST ENVIRONMENT

3.1. Address of the test laboratory

Shenzhen CTA Testing Technology Co., Ltd.
Room 106, Building 1, Yibaolai Industrial Park, Qiaotou Community, Fuhai Street, Bao'an District, Shenzhen, China

3.2. Test Facility

The test facility is recognized, certified, or accredited by the following organizations:
FCC-Registration No.: 517856 Designation Number: CN1318

Shenzhen CTA Testing Technology Co., Ltd. has been listed on the US Federal Communications Commission list of test facilities recognized to perform electromagnetic emissions measurements.

Industry Canada Registration Number. Is: 27890 CAB identifier: CN0127
The Laboratory has been registered by Certification and Engineering Bureau of Industry Canada for radio equipment testing.

A2LA-Lab Cert. No.: 6534.01

Shenzhen CTA Testing Technology Co., Ltd. has been listed by American Association for Laboratory Accreditation to perform electromagnetic emission measurement.

The 3m-Semi anechoic test site fulfils CISPR 16-1-4 according to ANSI C63.10 and CISPR 16-1-4:2010.

3.3. Environmental conditions

During the measurement the environmental conditions were within the listed ranges:

Radiated Emission:

Temperature:	23 ° C
Humidity:	48 %
Atmospheric pressure:	950-1050mbar

AC Main Conducted testing：

Temperature:	24 ° C
Humidity:	45 %
Atmospheric pressure:	950-1050mbar

Conducted testing：

Temperature:	24 ° C
Humidity:	45 %
Atmospheric pressure:	950-1050mbar

3.4. Summary of measurement results

FCC PART 15.249		
FCC Part 15.249(a)	Field Strength of Fundamental	PASS
FCC Part 15.209	Spurious Emission	PASS
FCC Part 15.209	Band edge	PASS
FCC Part 15.215(c)	20dB bandwidth	PASS
FCC Part 15.207	Conducted Emission	PASS
FCC Part 15.203	Antenna Requirement	PASS

3.5. Statement of the measurement uncertainty

The data and results referenced in this document are true and accurate. The reader is cautioned that there may be errors within the calibration limits of the equipment and facilities. The measurement uncertainty was calculated for all measurements listed in this test report acc. to TR-100028-01" Electromagnetic compatibility and Radio spectrum Matters (ERM);Uncertainties in the measurement of mobile radio equipment characteristics; Part 1" and TR-100028-02 "Electromagnetic compatibility and Radio spectrum Matters (ERM);Uncertainties in the measurement of mobile radio equipment characteristics; Part 2 " and is documented in the Shenzhen CTA Testing Technology Co., Ltd. quality system acc. to DIN EN ISO/IEC 17025. Furthermore, component and process variability of devices similar to that tested may result in additional deviation. The manufacturer has the sole responsibility of continued compliance of the device.
Hereafter the best measurement capability for Shenzhen CTA Testing Technology Co., Ltd. :

Test	Range	Measurement Uncertainty	Notes
Radiated Emission	9KHz~30MHz	3.02 dB	(1)
Radiated Emission	30~1000MHz	4.06 dB	(1)
Radiated Emission	1~18GHz	5.14 dB	(1)
Radiated Emission	18-40GHz	5.38 dB	(1)
Conducted Disturbance	0.15~30MHz	2.14 dB	(1)
Output Peak power	30MHz~18GHz	0.55 dB	(1)
Power spectral density	/	0.57 dB	(1)
Spectrum bandwidth	/	1.1%	(1)
Radiated spurious emission (30MHz-1GHz)	30~1000MHz	4.10 dB	(1)
Radiated spurious emission (1GHz-18GHz)	1~18GHz	4.32 dB	(1)
Radiated spurious emission (18GHz-40GHz)	18-40GHz	5.54 dB	(1)

(1)This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.

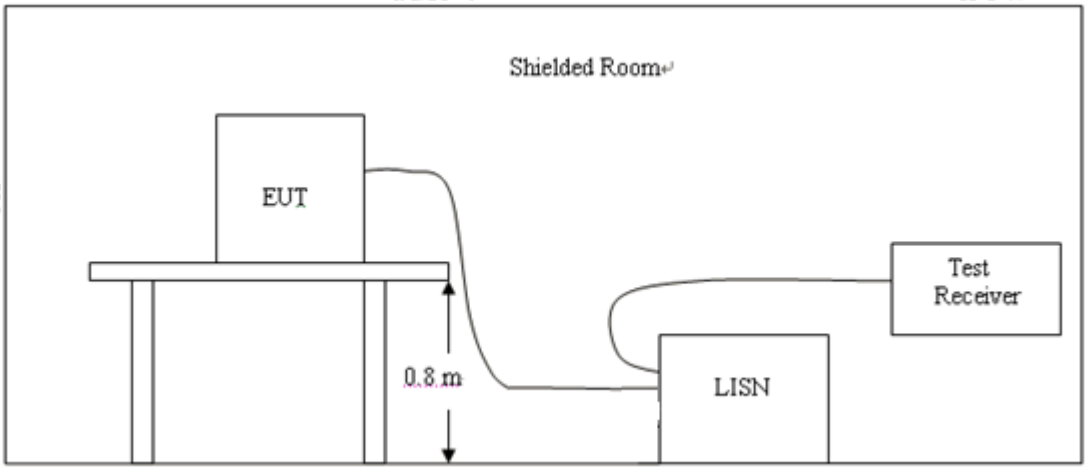
3.6. Equipments Used during the Test

Test Equipment	Manufacturer	Model No.	Equipment No.	Calibration Date	Calibration Due Date
LISN	R&S	ENV216	CTA-308	2025/08/04	2026/08/03
LISN	R&S	ENV216	CTA-314	2025/07/30	2026/07/29
EMI Test Receiver	R&S	ESPI	CTA-307	2025/07/30	2026/07/29
EMI Test Receiver	R&S	ESCI	CTA-306	2025/07/30	2026/07/29
Spectrum Analyzer	Agilent	N9020A	CTA-301	2025/05/17	2026/05/16
Spectrum Analyzer	Agilent	N9020A	CTA-301	2025/07/30	2026/07/29
Vector Signal generator	Agilent	N5182A	CTA-305	2025/07/30	2026/07/29
Analog Signal Generator	R&S	E4421B	CTA-304	2025/07/30	2026/07/29
WIDEBAND RADIO COMMUNICATION TESTER	R&S	CMW500	CTA-302	2025/07/30	2026/07/29
Temperature and humidity meter	Chigo	ZG-7020	CTA-326	2025/07/31	2026/07/30
Ultra-Broadband Antenna	Schwarzbeck	VULB9163	CTA-310	2023/10/17	2026/10/16
Horn Antenna	Schwarzbeck	BBHA 9120D	CTA-309	2023/10/13	2026/10/12
Loop Antenna	Zhinan	ZN30900C	CTA-311	2023/10/17	2026/10/16
Horn Antenna	Schwarzbeck	BBHA 9170	CTA-346	2025/05/18	2028/05/17
Amplifier	Schwarzbeck	BBV9745	CTA-312	2025/07/30	2026/07/29
Amplifier	Tonscend	TAP-011840	CTA-313	2025/07/30	2026/07/29
High-Pass Filter	XingBo	XBLBQ-GTA18	CTA-402	2025/07/30	2026/07/29
High-Pass Filter	XingBo	XBLBQ-GTA27	CTA-403	2025/07/30	2026/07/29
Automatic control unit	Tonscend	JS0806-2	CTA-351	2025/07/30	2026/07/29
Amplifier	SKET	LNPA 1840G-50	CTA-345	2025/05/17	2026/05/16
Spectrum analyzer	R&S	FSV40-N	CTA-344	2025/05/17	2026/05/16
Attenuator	XINQY	10dB	N/A	N/A	N/A
Programmable Constant Temperature And Humidity Test Chamber	DONGGUAN JINGYU	HT-H-408	CTA-053	2025/07/30	2026/07/29
EMI Test Software	Tonscend	TS®JS32-RE	5.0.0.2	N/A	N/A
EMI Test Software	Tonscend	TS®JS32-CE	5.0.0.1	N/A	N/A
RF Test Software	Tonscend	TS®JS1120-3	3.1.65	N/A	N/A
RF Test Software	Tonscend	TS®JS1120	3.1.46	N/A	N/A

4. TEST CONDITIONS AND RESULTS

4.1. AC Power Conducted Emission

TEST CONFIGURATION



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.
2, Support equipment, if needed, was placed as per ANSI C63.10.
3, All I/O cables were positioned to simulate typical actual usage as per ANSI C63.10.
4, If a EUT received DC power from the USB Port of Notebook PC, the PC's adapter received 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.

AC Power Conducted Emission Limit

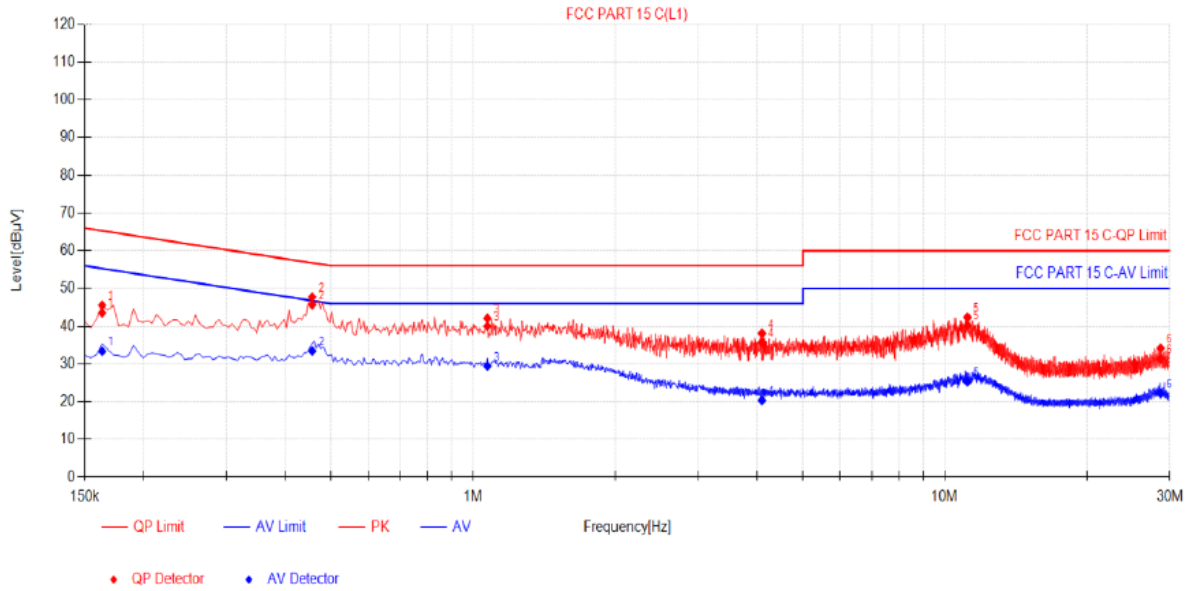
For intentional device, according to § 15.207(a) AC Power Conducted Emission Limits is as following：

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.		

TEST RESULTS

Remark:
1. Both 120 VAC, 50/60 Hz and 240 VAC, 50/60 Hz power supply have been tested, only the worst result of 120 VAC, 60 Hz was reported as below:

Polarization:	L

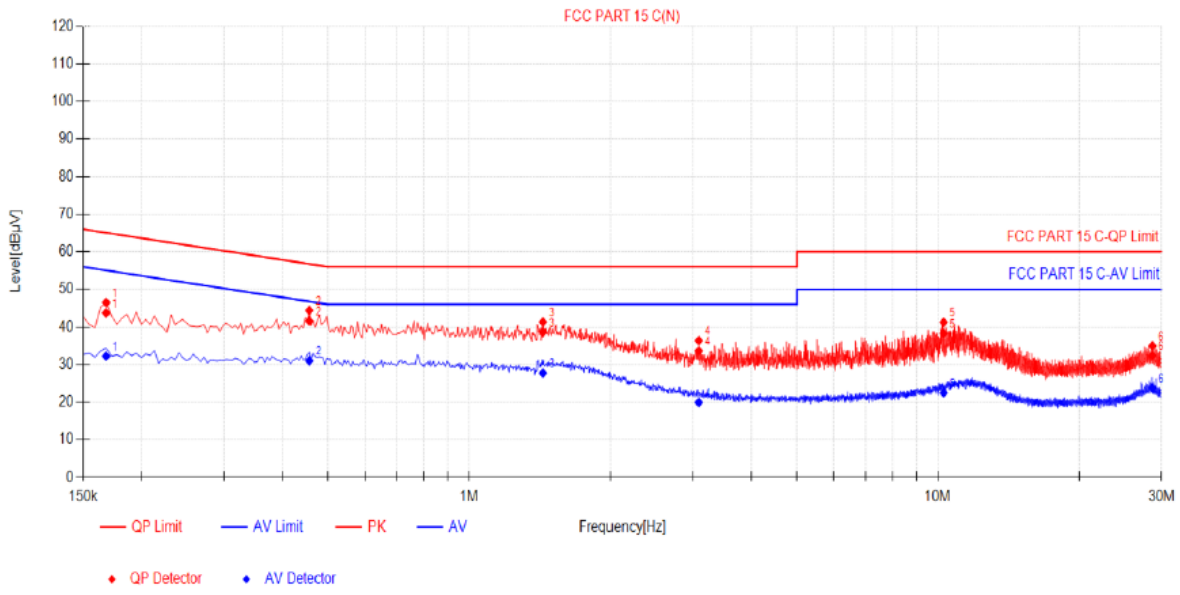


Final Data List

NO.	Freq. [MHz]	Factor [dB]	QP Reading[dBµV]	QP Value [dBµV]	QP Limit [dBµV]	QP Margin [dB]	AV Reading [dBµV]	AV Value [dBµV]	AV Limit [dBµV]	AV Margin [dB]	Verdict
1	0.1635	9.92	33.61	43.53	65.28	21.75	23.43	33.35	55.28	21.93	PASS
2	0.456	10.22	35.47	45.69	56.77	11.08	23.21	33.43	46.77	13.34	PASS
3	1.0725	10.43	29.61	40.04	56.00	15.96	18.98	29.41	46.00	16.59	PASS
4	4.0965	10.76	24.98	35.74	56.00	20.26	9.60	20.36	46.00	25.64	PASS
5	11.175	11.71	28.49	40.20	60.00	19.80	13.59	25.30	50.00	24.70	PASS
6	28.6845	13.48	17.92	31.40	60.00	28.60	8.65	22.13	50.00	27.87	PASS

Note:1).QP Value (dBµV)= QP Reading (dBµV)+ Factor (dB)
2). Factor (dB)=insertion loss of LISN (dB) + Cable loss (dB)
3). QPMargin(dB) = QP Limit (dBµV) - QP Value (dBµV)
4). AVMargin(dB) = AV Limit (dBµV) - AV Value (dBµV)

Polarization:	N



Final Data List

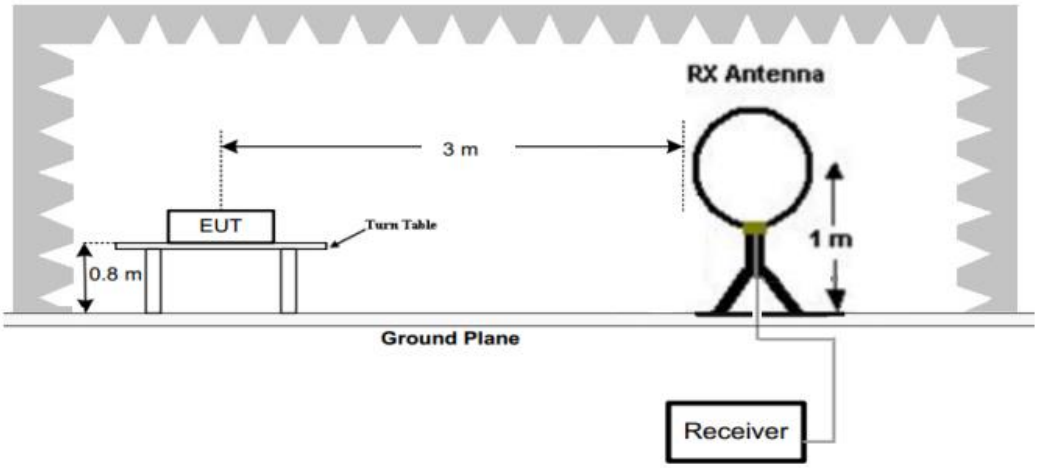
NO.	Freq. [MHz]	Factor [dB]	QP Reading[dBμV]	QP Value [dBμV]	QP Limit [dBμV]	QP Margin [dB]	AV Reading [dBμV]	AV Value [dBμV]	AV Limit [dBμV]	AV Margin [dB]	Verdict
1	0.168	9.89	33.83	43.72	65.06	21.34	22.32	32.21	55.06	22.85	PASS
2	0.456	10.22	31.38	41.60	56.77	15.17	20.78	31.00	46.77	15.77	PASS
3	1.437	10.41	28.16	38.57	56.00	17.43	17.29	27.70	46.00	18.30	PASS
4	3.0885	10.64	22.96	33.60	56.00	22.40	9.29	19.93	46.00	26.07	PASS
5	10.284	11.65	26.62	38.27	60.00	21.73	10.83	22.48	50.00	27.52	PASS
6	28.6845	13.71	18.64	32.35	60.00	27.65	10.05	23.76	50.00	26.24	PASS

Note:1).QP Value (dBμV)= QP Reading (dBμV)+ Factor (dB)
2). Factor (dB)=insertion loss of LISN (dB) + Cable loss (dB)
3). QPMargin(dB) = QP Limit (dBμV) - QP Value (dBμV)
4). AVMargin(dB) = AV Limit (dBμV) - AV Value (dBμV)

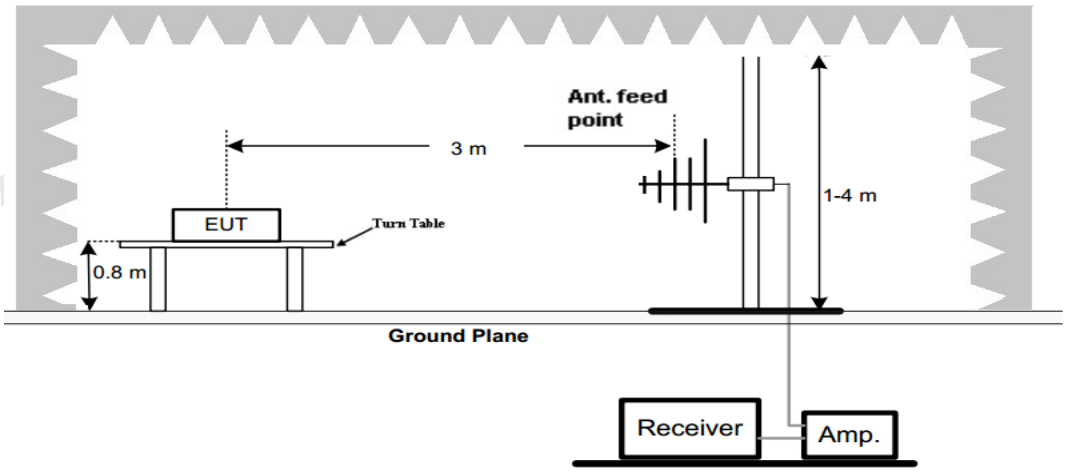
4.2. Radiated Emission and Band Edges

TEST CONFIGURATION

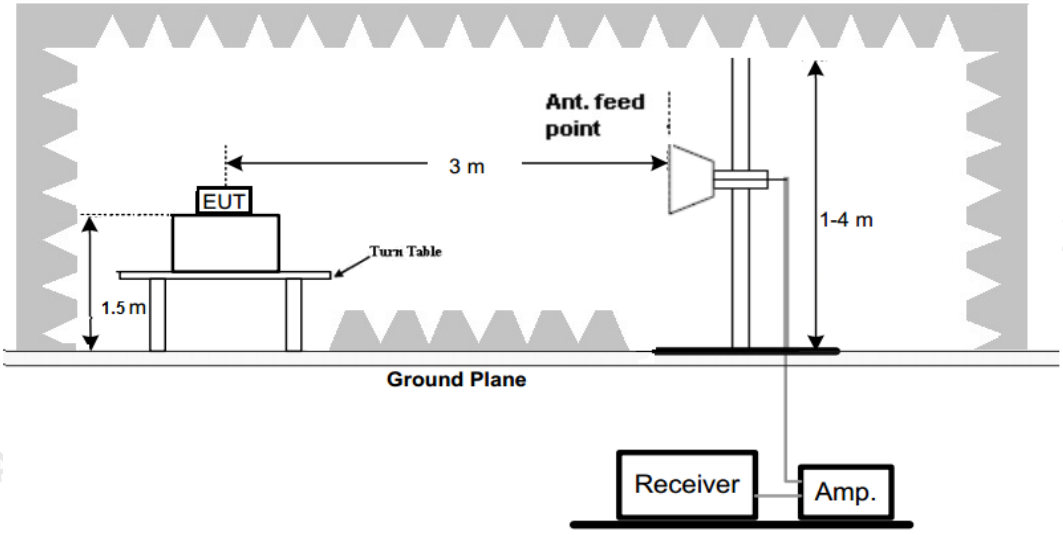
(A) Radiated Emission Test Set-Up, Frequency Below 30MHz

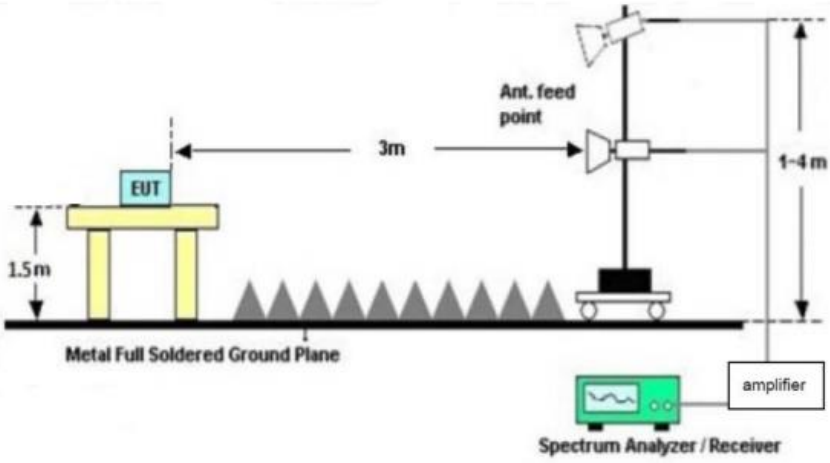


(B) Radiated Emission Test Set-Up, Frequency below 1000MHz



(C) Radiated Emission Test Set-Up, Frequency above 1000MHz





TEST PROCEDURE

1. The EUT was placed on a turn table which is 0.8m above ground plane when testing frequency range 9 KHz –25GHz.
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.
5. The EUT minimum operation frequency was 26MHz and maximum operation frequency was 1910MHz.so radiated emission test frequency band from 9KHz to 25GHz.
6. The distance between test antenna and EUT as following table states:

Test Frequency range	Test Antenna Type	Test Distance
9KHz-30MHz	Active Loop Antenna	3
30MHz-1GHz	Ultra-Broadband Antenna	3
1GHz-18GHz	Double Ridged Horn Antenna	3
18GHz-25GHz	Horn Anternna	1

7. Setting test receiver/spectrum as following table states:

Test Frequency range	Test Receiver/Spectrum Setting	Detector
9KHz-150KHz	RBW=200Hz/VBW=3KHz,Sweep time=Auto	QP
150KHz-30MHz	RBW=9KHz/VBW=100KHz,Sweep time=Auto	QP
30MHz-1GHz	RBW=120KHz/VBW=1000KHz,Sweep time=Auto	QP
1GHz-40GHz	Peak Value: RBW=1MHz/VBW=3MHz, Sweep time=Auto Average Value: RBW=1MHz/VBW=10Hz, Sweep time=Auto	Peak

Field Strength Calculation

The field strength is calculated by adding the Antenna Factor and Cable Factor and subtracting the Amplifier Gain and Duty Cycle Correction Factor(if any) from the measured reading. The basic equation with a sample calculation is as follows:

FS = RA + AF + CL - AG

Where FS = Field Strength	CL = Cable Attenuation Factor (Cable Loss)
RA = Reading Amplitude	AG = Amplifier Gain
AF = Antenna Factor	

Transd=AF +CL-AG

RADIATION LIMIT

According 15.249, the field strength of emissions from intentional radiators operated within 2400MHz-2483.5 MHz shall not exceed 94dBμV/m (50mV/m):

FCC PART 15.249(d) Emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50 dB below the level of the fundamental or to the general radiated emission limits in §15.209, whichever is the lesser attenuation.

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)

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

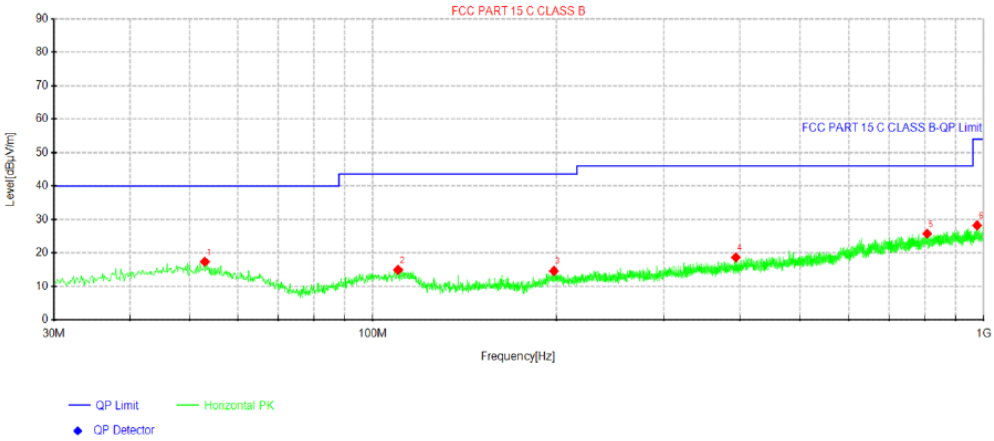
TEST RESULTS

Remark:

1. This test was performed with EUT in X, Y, Z position and the worse case was found when EUT in X position.
2. GFSK were tested at Low, Middle, and High channel and recorded worst mode at the High channel.
3. Radiated emission test from 9 KHz to 10th harmonic of fundamental was verified, and no emission found except system noise floor in 9 KHz to 30MHz and not recorded in this report.

For 30MHz-1GHz

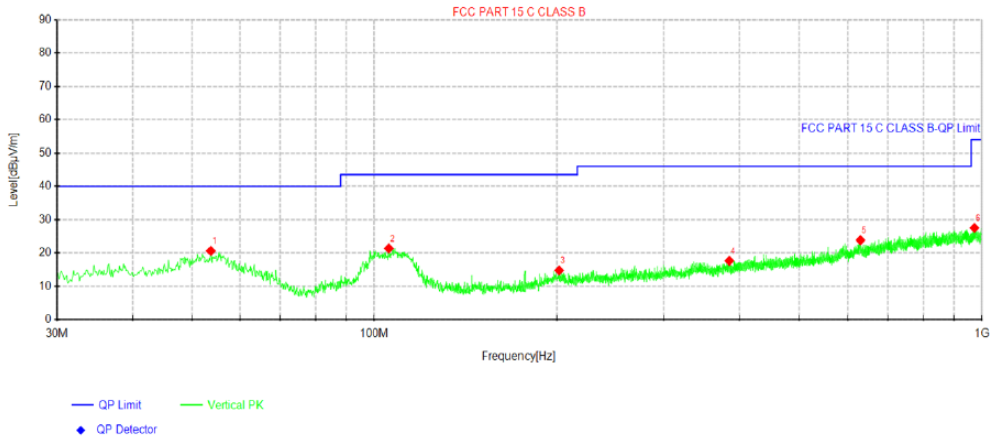
Horizontal



Suspected Data List									
NO.	Freq. [MHz]	Reading [dBμV]	Level [dBμV/m]	Factor [dB/m]	Limit [dBμV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	53.0375	28.07	17.35	-10.72	40.00	22.65	100	177	Horizontal
2	110.025	28.15	14.92	-13.23	43.50	28.58	100	360	Horizontal
3	198.052	27.92	14.61	-13.31	43.50	28.89	100	256	Horizontal
4	393.871	28.70	18.67	-10.03	46.00	27.33	100	359	Horizontal
5	807.455	28.80	25.75	-3.05	46.00	20.25	100	80	Horizontal
6	975.143	29.55	28.25	-1.30	54.00	25.75	100	360	Horizontal

Note:1).Level (dBμV/m)= Reading (dBμV)+ Factor (dB/m)
2). Factor(dB/m)=Antenna Factor (dB/m) + Cable loss (dB) - Pre Amplifier gain (dB)
3). Margin(dB) = Limit (dBμV/m) - Level (dBμV/m)

Vertical



Suspected Data List									
NO.	Freq. [MHz]	Reading [dBμV]	Level [dBμV/m]	Factor [dB/m]	Limit [dBμV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	53.765	31.42	20.63	-10.79	40.00	19.37	100	18	Vertical
2	105.66	33.96	21.39	-12.57	43.50	22.11	100	0	Vertical
3	201.69	28.02	14.80	-13.22	43.50	28.70	100	192	Vertical
4	384.777	28.12	17.64	-10.48	46.00	28.36	100	6	Vertical
5	630.672	28.82	23.85	-4.97	46.00	22.15	100	324	Vertical
6	971.627	28.81	27.53	-1.28	54.00	26.47	100	357	Vertical

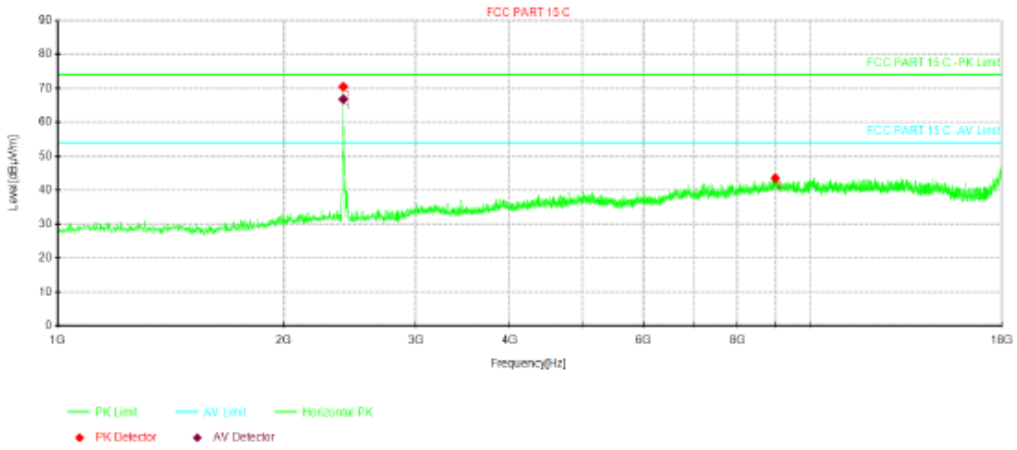
Note:1).Level (dBμV/m)= Reading (dBμV)+ Factor (dB/m)
2). Factor(dB/m)=Antenna Factor (dB/m) + Cable loss (dB) - Pre Amplifier gain (dB)
3). Margin(dB) = Limit (dBμV/m) - Level (dBμV/m)

For 1GHz to 18GHz

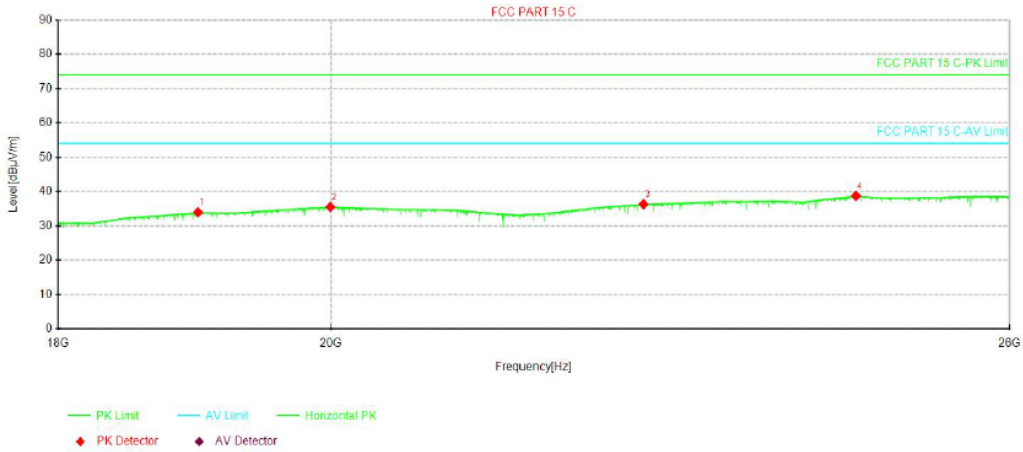
GFSK (above 1GHz)

2402MHz

Horizontal



Final Data List							
NO.	Freq. [MHz]	Factor [dB]	Reading [dBμV/m]	Value [dBμV/m]	Limit [dBμV/m]	Margin [dB]	Polarity
1	2402.6403	-21.50	91.97	70.47	114.00	43.53	Horizontal
	2402.6403	-21.50	88.23	66.73	94.00	27.27	Horizontal
2	8985.6986	-6.10	49.63	43.53	74.00	30.47	Horizontal



Suspected Data List							
NO.	Freq. [MHz]	Reading [dBμV]	Level [dBμV/m]	Factor [dB/m]	Limit [dBμV/m]	Margin [dB]	Polarity
1	18999.95	24.99	33.98	8.99	74.00	40.02	Horizontal
2	19997.1001	24.98	35.54	10.56	74.00	38.46	Horizontal
3	22569.3715	24.98	36.33	11.35	74.00	37.67	Horizontal
4	24500.475	24.97	38.76	13.79	74.00	35.24	Horizontal

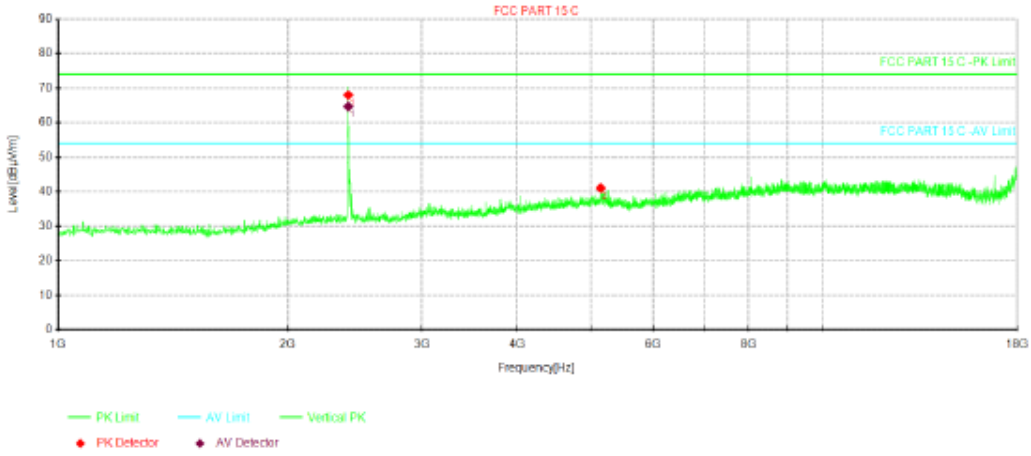
Note:1).Level (dBμV/m)= Reading (dBμV)+ Factor (dB/m)

2). Factor(dB/m)=Antenna Factor (dB/m) + Cable loss (dB) - Pre Amplifier gain (dB)

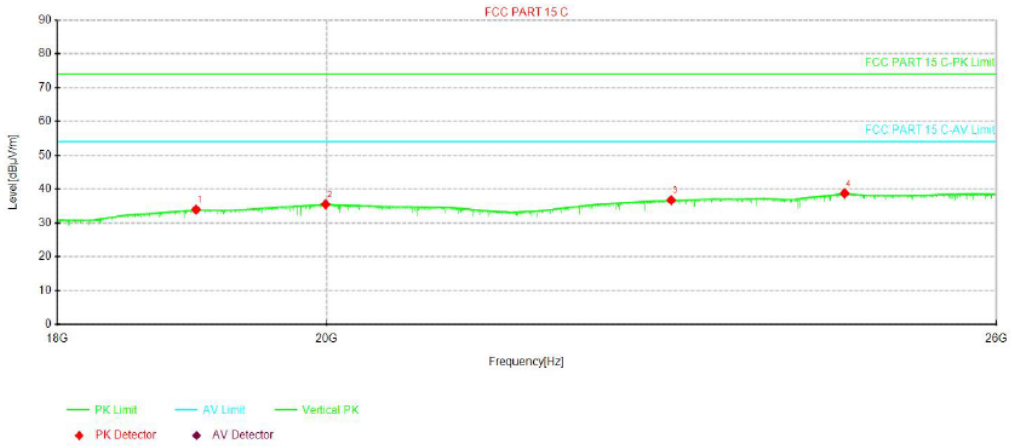
3). Margin(dB) = Limit (dBμV/m) - Level (dBμV/m)

2402MHz

Vertical



Final Data List							
NO.	Freq. [MHz]	Factor [dB]	Reading [dBμV/m]	Value [dBμV/m]	Limit [dBμV/m]	Margin [dB]	Polarity
1	2402.6403	-21.50	89.46	67.96	114.00	46.04	Vertical
	2402.6403	-21.50	86.15	64.65	94.00	29.35	Vertical
2	5146.7147	-14.16	55.23	41.07	74.00	32.93	Vertical



Suspected Data List							
NO.	Freq. [MHz]	Reading [dBμV]	Level [dBμV/m]	Factor [dB/m]	Limit [dBμV/m]	Margin [dB]	Polarity
1	19005.1497	24.98	33.97	8.99	74.00	40.03	Vertical
2	19993.9003	25.00	35.54	10.54	74.00	38.46	Vertical
3	22891.3554	24.99	36.76	11.77	74.00	37.24	Vertical
4	24498.8751	24.98	38.77	13.79	74.00	35.23	Vertical

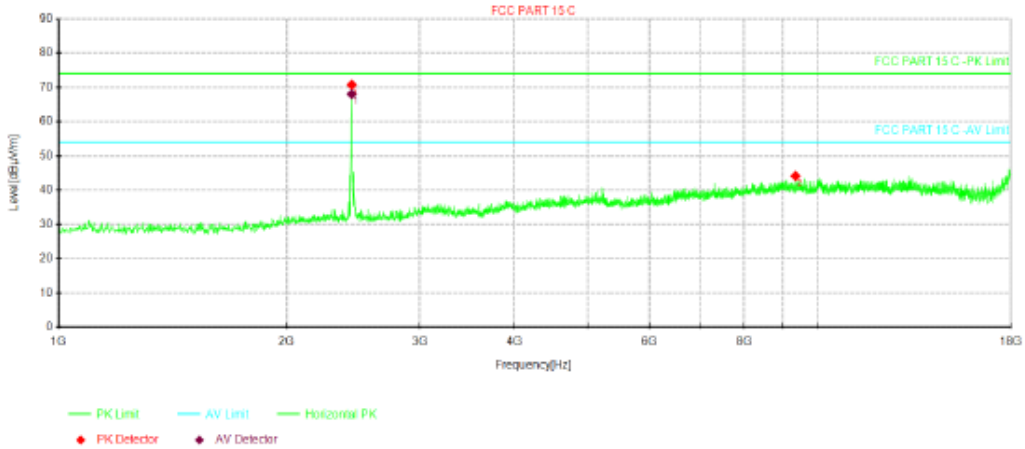
Note:1).Level (dBμV/m)= Reading (dBμV)+ Factor (dB/m)

2). Factor(dB/m)=Antenna Factor (dB/m) + Cable loss (dB) - Pre Amplifier gain (dB)

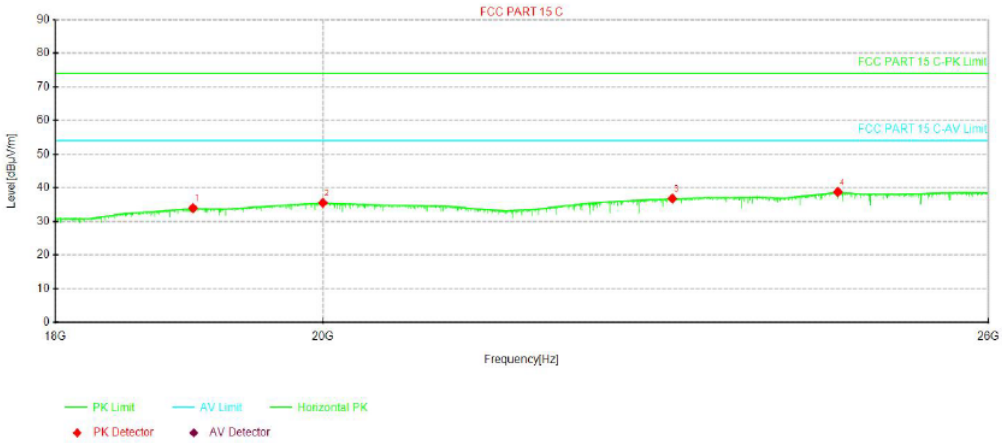
3). Margin(dB) = Limit (dBμV/m) - Level (dBμV/m)

2440MHz

Horizontal



Final Data List							
NO.	Freq. [MHz]	Factor [dB]	Reading [dBμV/m]	Value [dBμV/m]	Limit [dBμV/m]	Margin [dB]	Polarity
1	2440.044	-21.33	92.07	70.74	114.00	43.26	Horizontal
	2440.044	-21.33	89.33	68.00	94.00	26.00	Horizontal
2	9351.2351	-5.57	49.71	44.14	74.00	29.86	Horizontal



Suspected Data List							
NO.	Freq. [MHz]	Reading [dBμV]	Level [dBμV/m]	Factor [dB/m]	Limit [dBμV/m]	Margin [dB]	Polarity
1	19003.1498	24.98	33.97	8.99	74.00	40.03	Horizontal
2	20001.0999	24.99	35.55	10.56	74.00	38.45	Horizontal
3	22955.3522	25.00	36.83	11.83	74.00	37.17	Horizontal
4	24501.2749	24.99	38.78	13.79	74.00	35.22	Horizontal

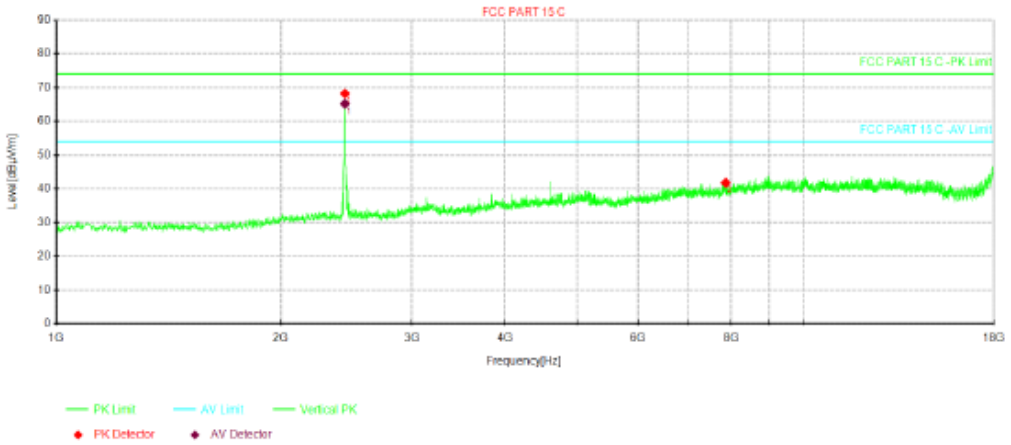
Note:1).Level (dBμV/m)= Reading (dBμV)+ Factor (dB/m)

2). Factor(dB/m)=Antenna Factor (dB/m) + Cable loss (dB) - Pre Amplifier gain (dB)

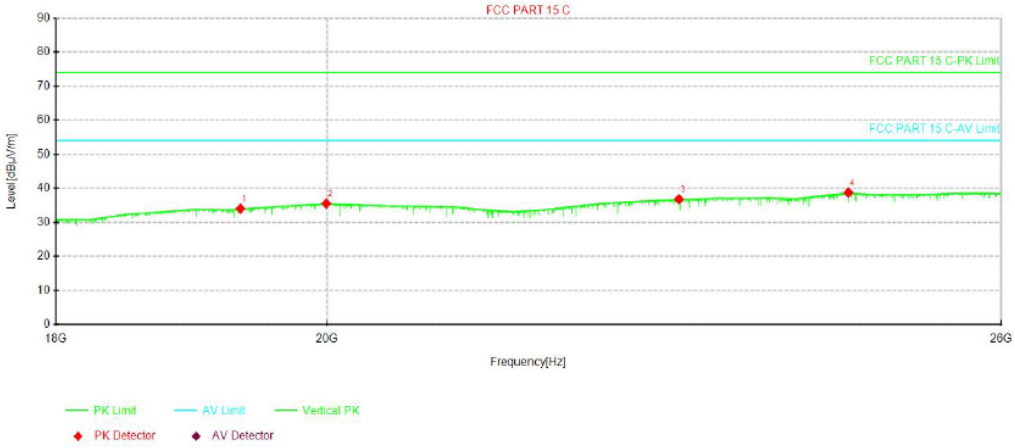
3). Margin(dB) = Limit (dBμV/m) - Level (dBμV/m)

2440MHz

Vertical



Final Data List							
NO.	Freq. [MHz]	Factor [dB]	Reading [dBµV/m]	Value [dBµV/m]	Limit [dBµV/m]	Margin [dB]	Polarity
1	2440.044	-21.33	89.52	68.19	114.00	45.81	Vertical
	2440.044	-21.33	86.48	65.15	94.00	28.85	Vertical
2	7865.2865	-8.65	50.45	41.80	74.00	32.20	Vertical



Suspected Data List							
NO.	Freq. [MHz]	Reading [dBµV]	Level [dBµV/m]	Factor [dB/m]	Limit [dBµV/m]	Margin [dB]	Polarity
1	19339.533	24.99	34.05	9.06	74.00	39.95	Vertical
2	19995.9002	25.00	35.54	10.54	74.00	38.46	Vertical
3	22936.5532	25.00	36.81	11.81	74.00	37.19	Vertical
4	24498.8751	24.99	38.78	13.79	74.00	35.22	Vertical

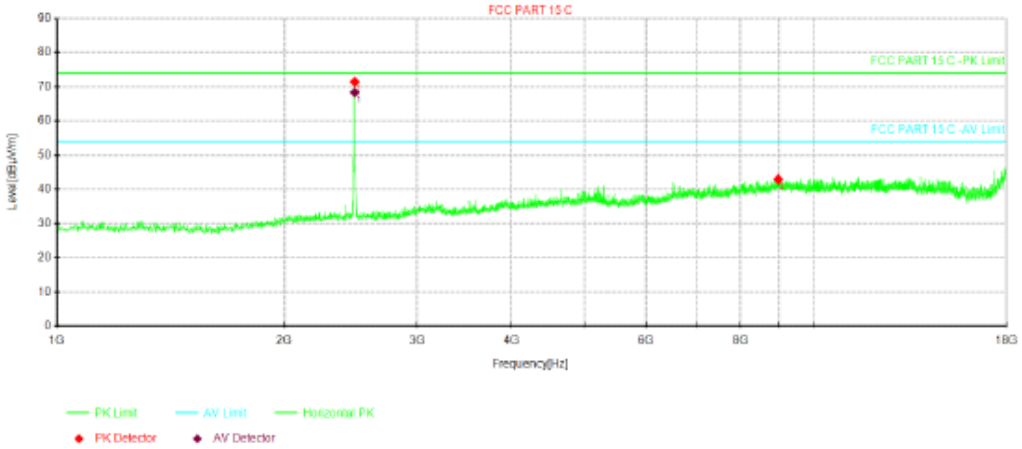
Note:1).Level (dBµV/m)= Reading (dBµV)+ Factor (dB/m)

2). Factor(dB/m)=Antenna Factor (dB/m) + Cable loss (dB) - Pre Amplifier gain (dB)

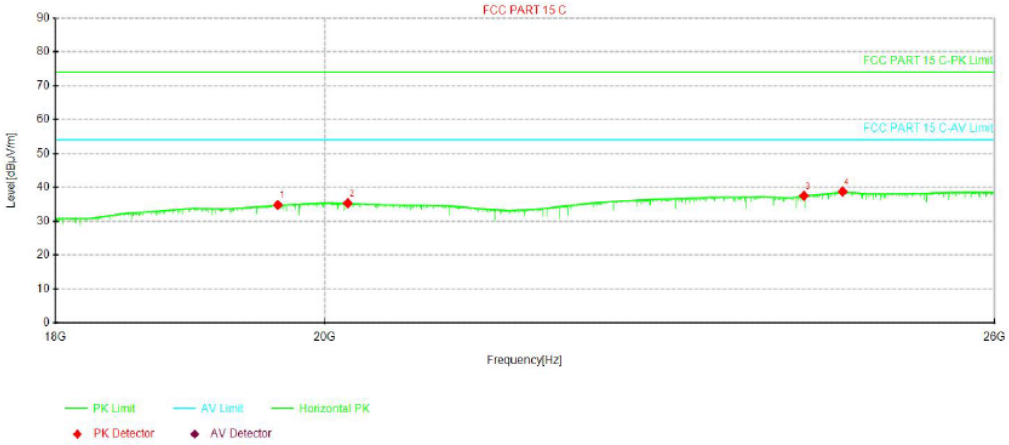
3). Margin(dB) = Limit (dBµV/m) - Level (dBµV/m)

2480MHz

Horizontal



Final Data List							
NO.	Freq. [MHz]	Factor [dB]	Reading [dBμV/m]	Value [dBμV/m]	Limit [dBμV/m]	Margin [dB]	Polarity
1	2480.8481	-21.16	92.58	71.42	114.00	42.58	Horizontal
	2480.8481	-21.16	89.47	68.31	94.00	25.69	Horizontal
2	8973.7974	-6.11	49.02	42.91	74.00	31.09	Horizontal



Suspected Data List							
NO.	Freq. [MHz]	Reading [dBμV]	Level [dBμV/m]	Factor [dB/m]	Limit [dBμV/m]	Margin [dB]	Polarity
1	19637.5181	24.99	34.82	9.83	74.00	39.18	Horizontal
2	20182.2909	24.99	35.35	10.36	74.00	38.65	Horizontal
3	24130.4935	24.99	37.54	12.55	74.00	36.46	Horizontal
4	24497.6751	24.99	38.78	13.79	74.00	35.22	Horizontal

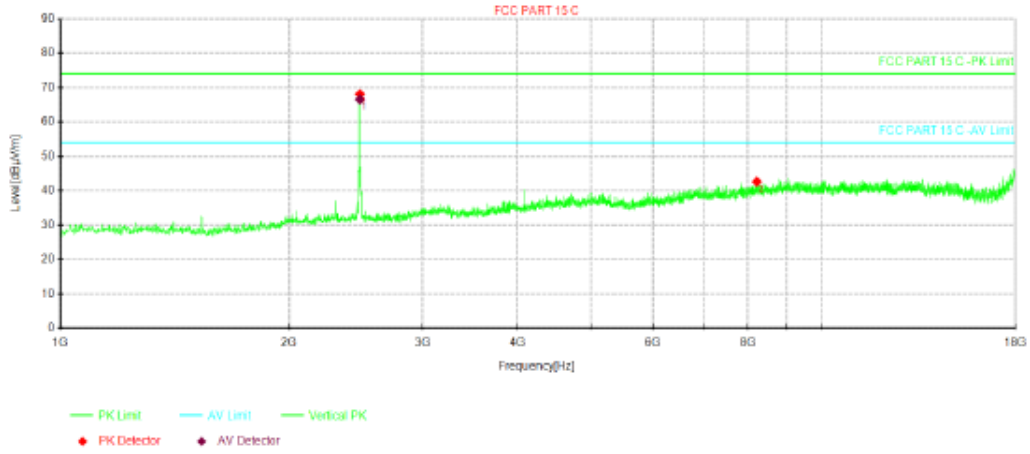
Note:1).Level (dBμV/m)= Reading (dBμV)+ Factor (dB/m)

2). Factor(dB/m)=Antenna Factor (dB/m) + Cable loss (dB) - Pre Amplifier gain (dB)

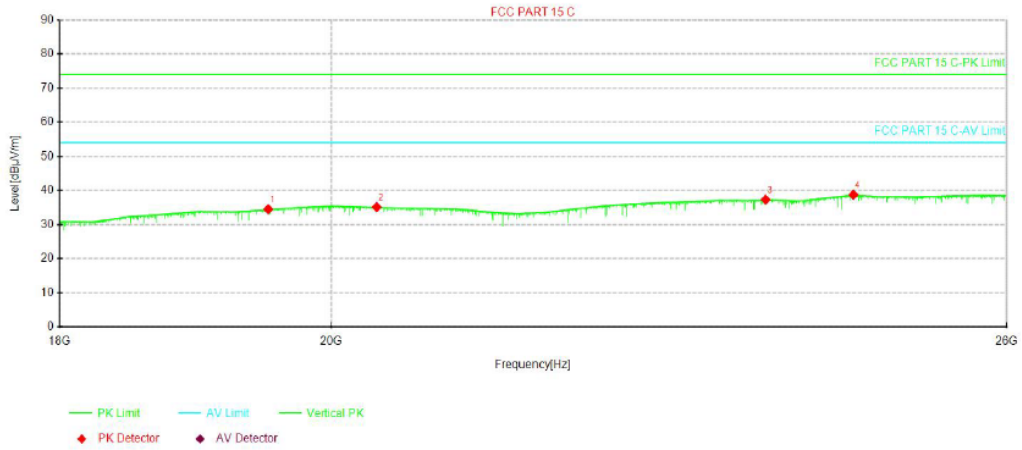
3). Margin(dB) = Limit (dBμV/m) - Level (dBμV/m)

2480MHz

Vertical



Final Data List							
NO.	Freq. [MHz]	Factor [dB]	Reading [dBμV/m]	Value [dBμV/m]	Limit [dBμV/m]	Margin [dB]	Polarity
1	2480.8481	-21.16	89.24	68.08	114.00	45.92	Vertical
	2480.8481	-21.16	87.65	66.49	94.00	27.51	Vertical
2	8217.2217	-7.92	50.57	42.65	74.00	31.35	Vertical



Suspected Data List							
NO.	Freq. [MHz]	Reading [dBμV]	Level [dBμV/m]	Factor [dB/m]	Limit [dBμV/m]	Margin [dB]	Polarity
1	19518.3241	24.99	34.51	9.52	74.00	39.49	Vertical
2	20357.4821	24.99	35.15	10.16	74.00	38.85	Vertical
3	23676.1162	24.99	37.34	12.35	74.00	36.66	Vertical
4	24496.8752	24.99	38.77	13.78	74.00	35.23	Vertical

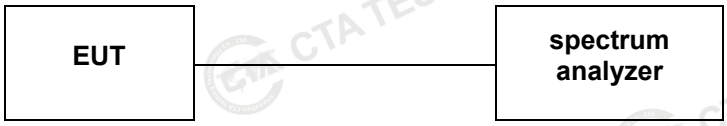
Note:1).Level (dBμV/m)= Reading (dBμV)+ Factor (dB/m)

2). Factor(dB/m)=Antenna Factor (dB/m) + Cable loss (dB) - Pre Amplifier gain (dB)

3). Margin(dB) = Limit (dBμV/m) - Level (dBμV/m)

4.3. 20dB Bandwidth Measurement

TEST CONFIGURATION



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 30KHz RBW and 300KHz VBW.

The 20dB bandwidth is defined as the total spectrum the power of which is higher than peak power minus 20dB.

LIMIT

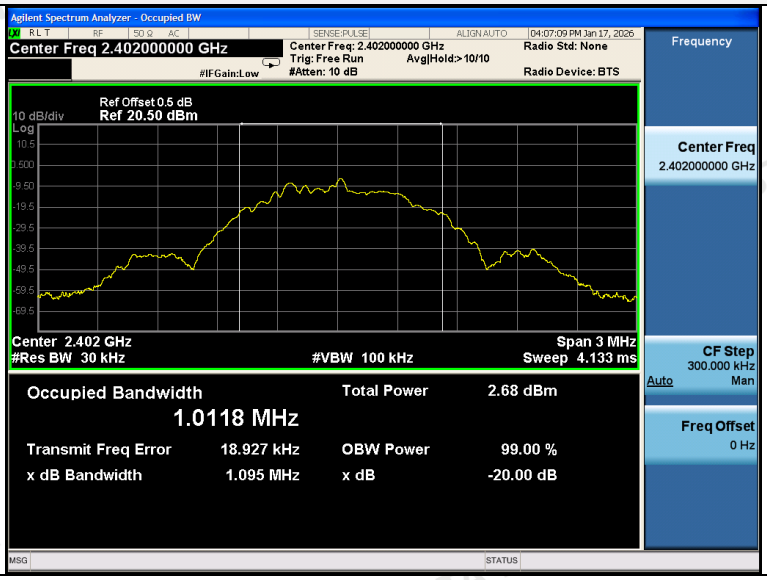
N/A

TEST RESULTS

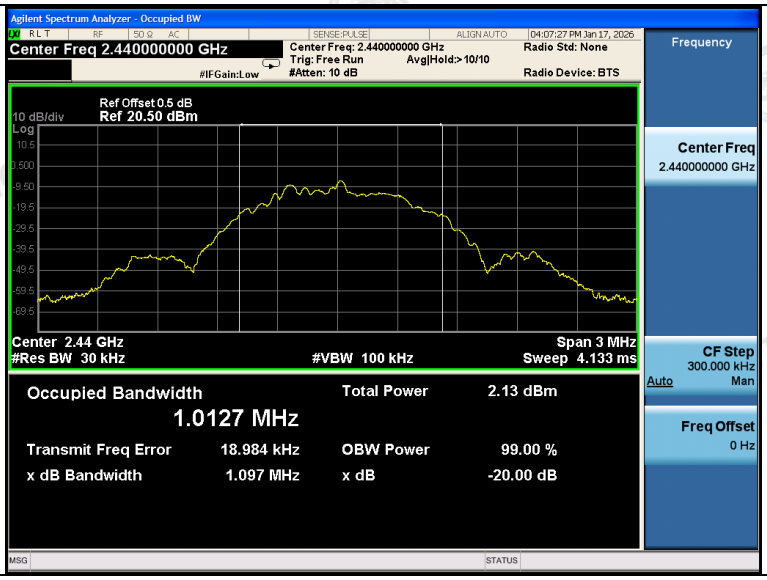
Modulation	Channel	20dB bandwidth (MHz)	Result
GFSK	Low	1.095	PASS
	Mid	1.097	
	High	1.098	

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

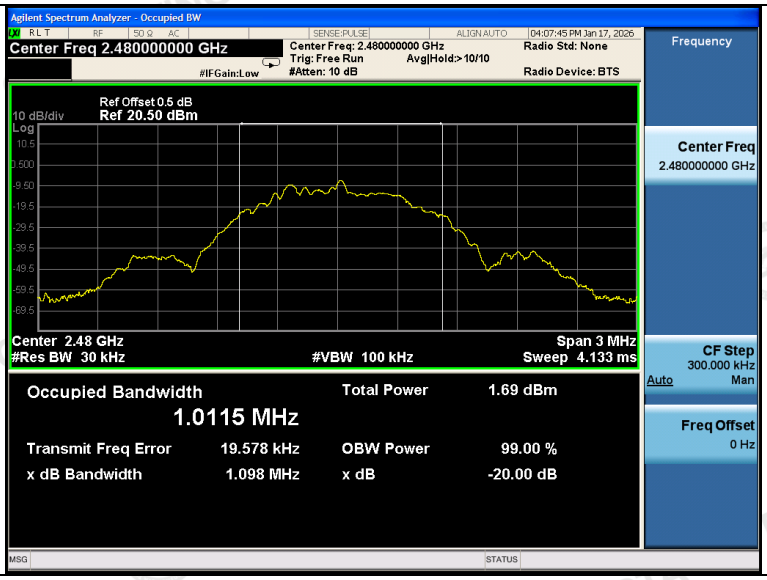
GFSK



Low



Mid



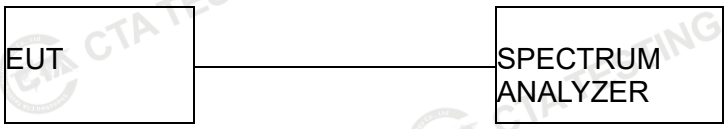
High

4.4. Emissions at Restricted Band

Standard Applicable

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)).

TEST CONFIGURATION



Test Procedures

According to ANSI C63.10 Field Strength Approach (linear terms):

$$E = EIRP - 20 \log d + 104.8$$

Where:
E is the electric field strength in dBuV/m
EIRP is the equivalent isotropically radiated power in dBm
d is the specified measurement distance in m
f) Compare the resultant electric field strength level with the applicable regulatory limit.
g) Perform the radiated spurious emission test.

Where all terms are as previously defined.

1). Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
2). Remove the antenna from the EUT and then connect to a low loss RF cable from the antenna port to an EMI test receiver, then turn on the EUT and make it operate in transmitting mode. Then set it to Low Channel and High Channel within its operating range, and make sure the instrument is operated in its linear range.
3). Set both RBW and VBW of spectrum analyzer to 100 kHz with a convenient frequency span including 100kHz bandwidth from band edge, for Radiated emissions restricted band RBW=1MHz, VBW=3MHz for peak detector and RBW=1MHz, VBW=3MHz for RMS detector, Max Hold=Average, Trace=100times for AV test.
4). Measure the highest amplitude appearing on spectral display and set it as a reference level. Plot the graph with marking the highest point and edge frequency.
5). Repeat above procedures until all measured frequencies were complete.
6). Measure the conducted output power (in dBm) using the detector specified by the appropriate regulatory agency for guidance regarding measurement procedures for determining quasi-peak, peak, and average conducted output power, respectively).
7). Add the maximum transmit antenna gain (in dBi) to the measured output power level to determine the EIRP level (see 12.2.5 for guidance on determining the applicable antenna gain)
8). Add the appropriate maximum ground reflection factor to the EIRP level (6 dB for frequencies ≤ 30 MHz, 4.7 dB for frequencies between 30 MHz and 1000 MHz, inclusive and 0 dB for frequencies > 1000 MHz).
9). For devices with multiple antenna-ports, measure the power of each individual chain and sum the EIRP of all chains in linear terms (e.g., Watts, mW).
10). Compare the resultant electric field strength level to the applicable regulatory limit.

11). Perform radiated spurious emission test duress until all measured frequencies were complete.

Test Results

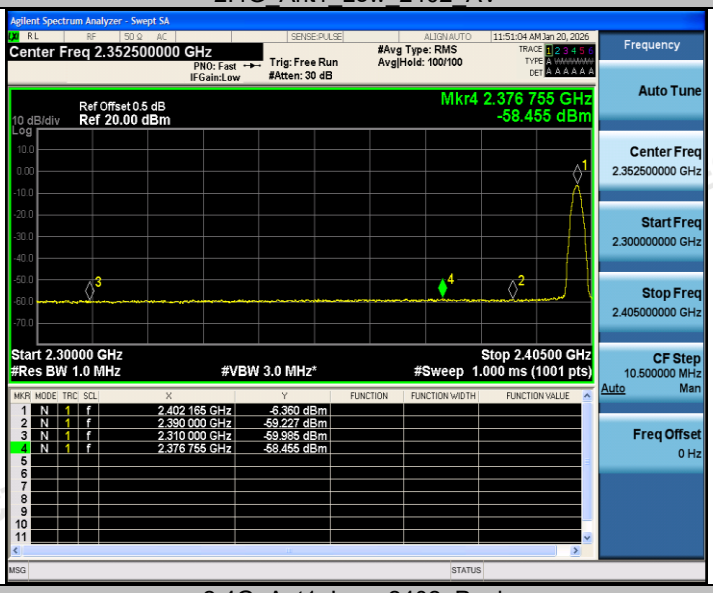
Remark:
1). Test results including cable loss;
2). Measured at difference Packet Type for each mode and recorded worst case for each mode.
3). "---"means that the fundamental frequency not for 15.209 limits requirement.
4). Measured at Hopping and Non-Hopping mode, recorded worst at Non-Hopping mode.
5). The other emission levels were very low against the limit.
6). The average measurement was not performed when the peak measured data under the limit of average detection.
7). Detector AV is setting spectrum/receiver. RBW=1MHz/VBW=3MHz/Sweep time=Auto/Detector=RMS, Max Hold=Average,Trace=100times.
8). Since the out-of-band characteristics of the EUT transmit antenna will often be unknown, the use of a conservative antenna gain value is necessary. Thus, when determining the EIRP based on the measured conducted power, the upper bound on antenna gain for a device with a single RF output shall be selected as the maximum in-band gain of the antenna across all operating bands, or 2 dBi, whichever is greater. However, for devices that operate in multiple frequency bands while using the same transmit antenna, the highest gain of the antenna within the operating band nearest in frequency to the restricted band emission being measured may be used in lieu of the overall highest gain when the emission is at a frequency that is within 20 percent of the nearest band edge frequency, but in no case shall a value less than 2 dBi be used.

TestMode	Antenna	ChName	Freq(MHz)	Detector	Freq [MHz]	Result [dBm]	Gain [dB]	DC Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Verdict
2.4G	Ant1	Low	2402	AV	2310.000	-59.99	2.00	1.80	39.01	≤54	PASS
				AV	2376.755	-58.46	2.00	1.80	40.54	≤54	PASS
				AV	2390.000	-59.23	2.00	1.80	39.77	≤54	PASS
				Peak	2310.000	-52.61	2.00	0.00	44.59	≤74	PASS
				Peak	2365.520	-47.97	2.00	0.00	49.23	≤74	PASS
				Peak	2390.000	-52.51	2.00	0.00	44.69	≤74	PASS
		High	2480	AV	2483.500	-57.89	2.00	1.80	41.11	≤54	PASS
				AV	2483.840	-57.88	2.00	1.80	41.12	≤54	PASS
				AV	2500.000	-59.08	2.00	1.80	39.92	≤54	PASS
				Peak	2483.500	-50.14	2.00	0.00	47.06	≤74	PASS
				Peak	2484.640	-46.83	2.00	0.00	50.37	≤74	PASS
				Peak	2500.000	-51.00	2.00	0.00	46.20	≤74	PASS

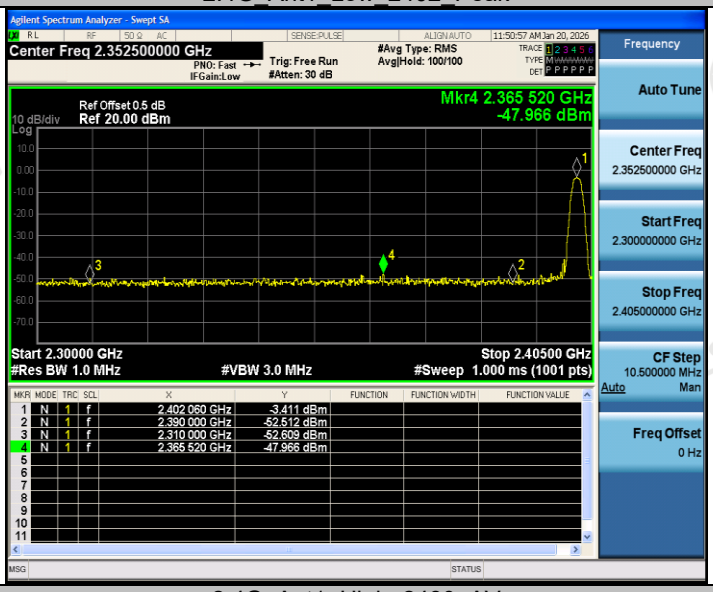
Note：
1. The limit in dBm for average detector is conversion from 54dBuV/m, according to 15.209(a). The limit in dBm for peak detector is 20dB above the limit of average detector in dBm.

Test Graphs

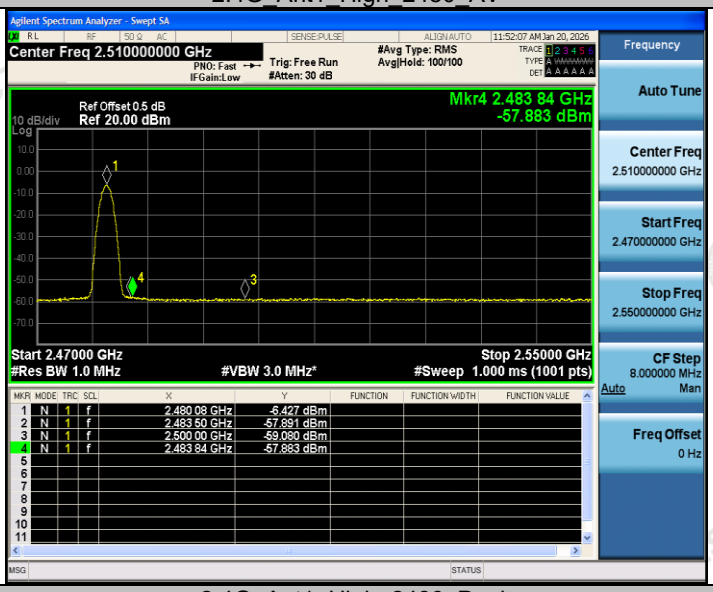
2.4G_Ant1_Low_2402_AV



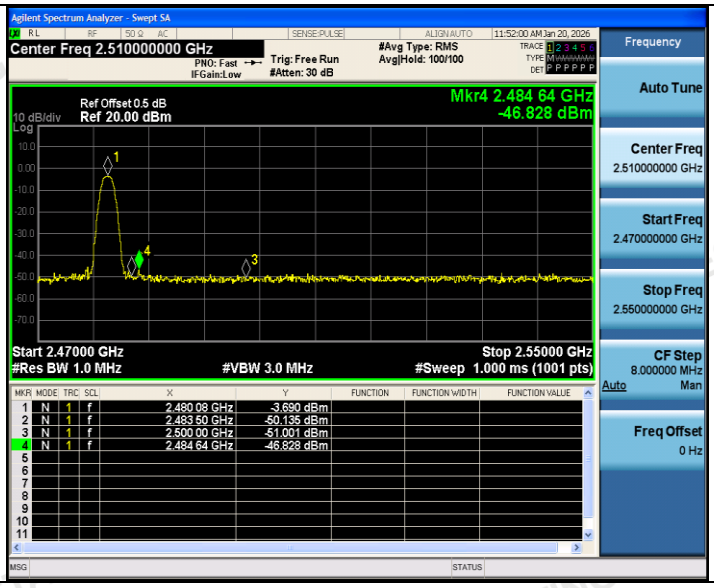
2.4G_Ant1_Low_2402_Peak



2.4G_Ant1_High_2480_AV



2.4G_Ant1_High_2480_Peak

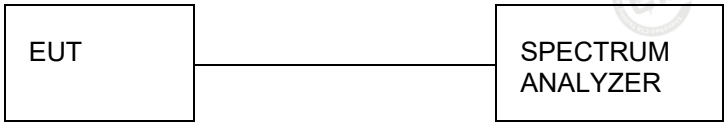

Agilent Spectrum Analyzer - Swept SA
Center Freq 2.510000000 GHz
PNO: Fast
IFGain:Low
Trig: Free Run
#Atten: 30 dB
#Avg Type: RMS
Avg|Hold: 100/100
11:52:00 AM Jan 20, 2026
Ref Offset 0.5 dB
10 dB/div Ref 20.00 dBm
Log
Mkr4 2.484 64 GHz
-46.828 dBm
Start 2.47000 GHz
#Res BW 1.0 MHz
#VBW 3.0 MHz
Stop 2.55000 GHz
#Sweep 1.000 ms (1001 pts)
1 N 1 f 2.480 08 GHz -3.690 dBm
2 N 1 f 2.483 50 GHz -50.135 dBm
3 N 1 f 2.500 00 GHz -51.001 dBm
4 N 1 f 2.484 64 GHz -46.828 dBm
Frequency
Auto Tune
Center Freq
2.510000000 GHz
Start Freq
2.470000000 GHz
Stop Freq
2.550000000 GHz
CF Step
8.000000 MHz
Auto Man
Freq Offset
0 Hz

4.5. On Time and Duty Cycle

Standard Applicable

None; for reporting purpose only.

TEST CONFIGURATION



Test Procedures

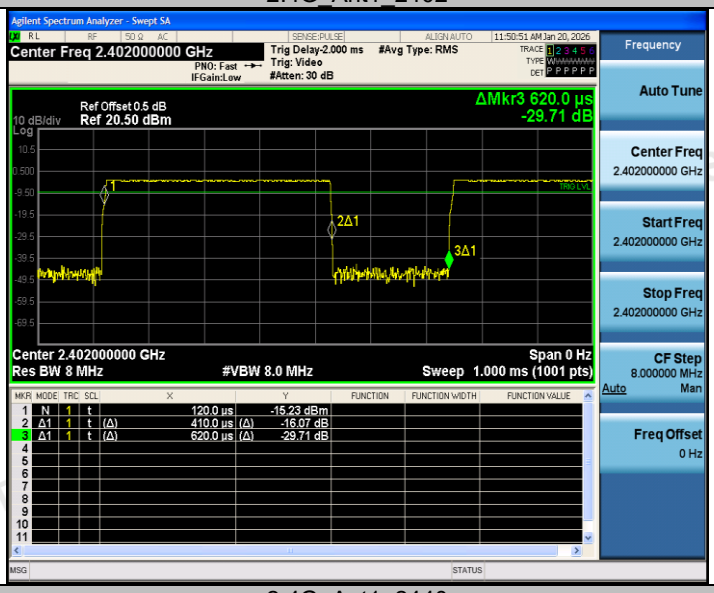
1). Set the Centre frequency of the spectrum analyzer to the transmitting frequency;
2). Set the span=0MHz, RBW=8MHz, VBW=8MHz, Sweep time=Auto;
3). Detector = peak;
4). Trace mode = Single hold.

TEST RESULTS

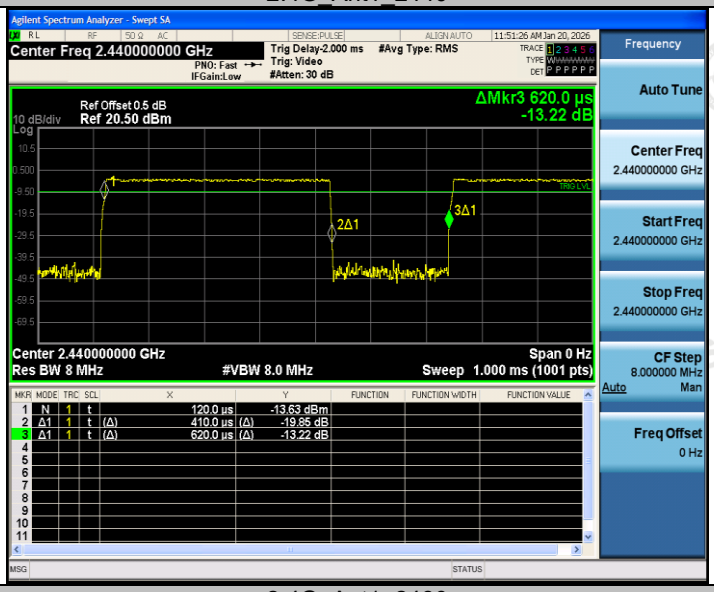
TestMode	Antenna	Freq(MHz)	ON Time [ms]	Period [ms]	X	DC [%]	xFactor	Limit	Verdict
2.4G	Ant1	2402	0.41	0.62	0.6613	66.13	1.80	---	---
		2440	0.41	0.62	0.6613	66.13	1.80	---	---
		2480	0.41	0.62	0.6613	66.13	1.80	---	---

Test Graphs

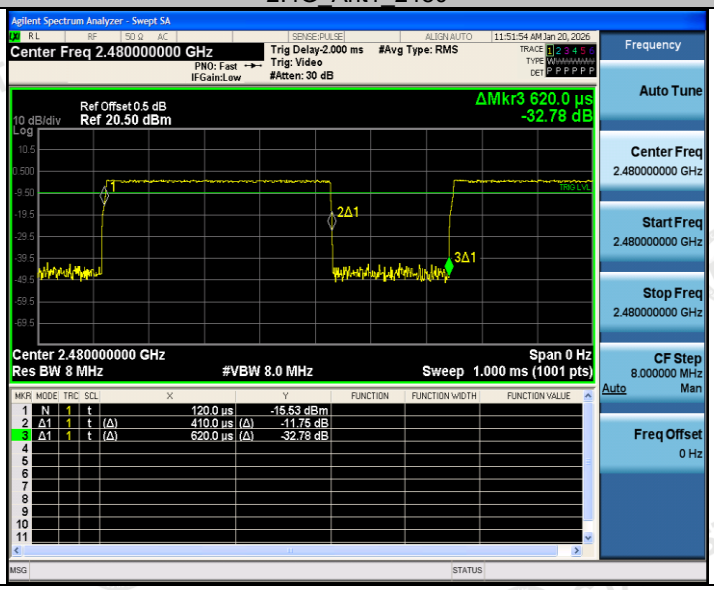
2.4G_Ant1_2402



2.4G_Ant1_2440



2.4G_Ant1_2480



4.6. Antenna 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 (c), 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.

Antenna Information

The maximum gain of antenna was 0.69 dBi.

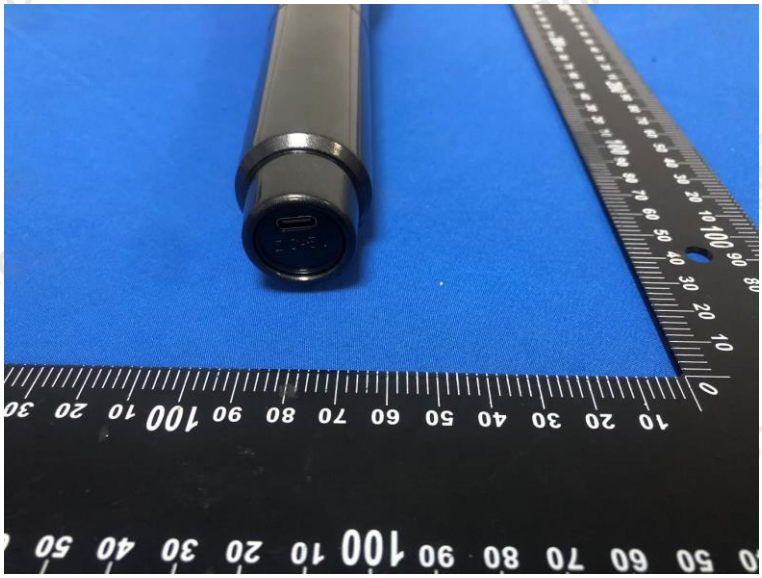
Remark:The antenna gain is provided by the customer , if the data provided by the customer is not accurate, Shenzhen CTA Testing Technology Co., Ltd. does not assume any responsibility.

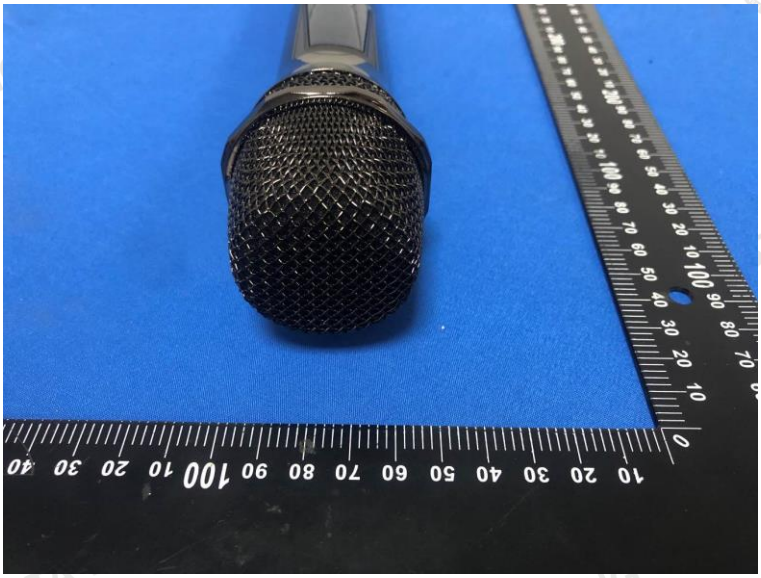
5. Test Setup Photos of the EUT

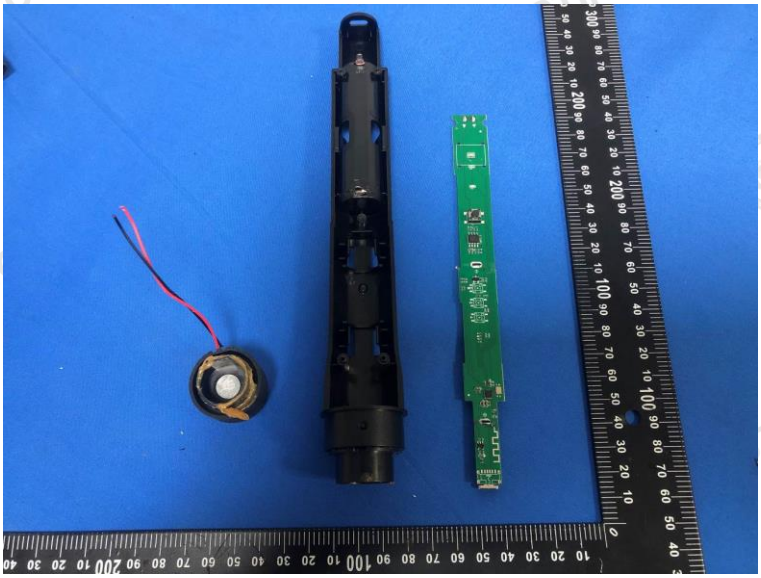
6. Test Photos of the EUT

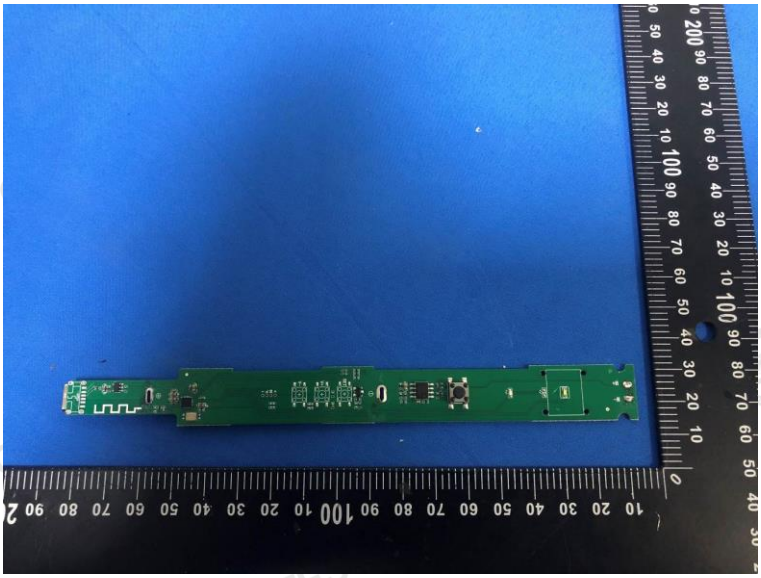
W68-V02-GREY

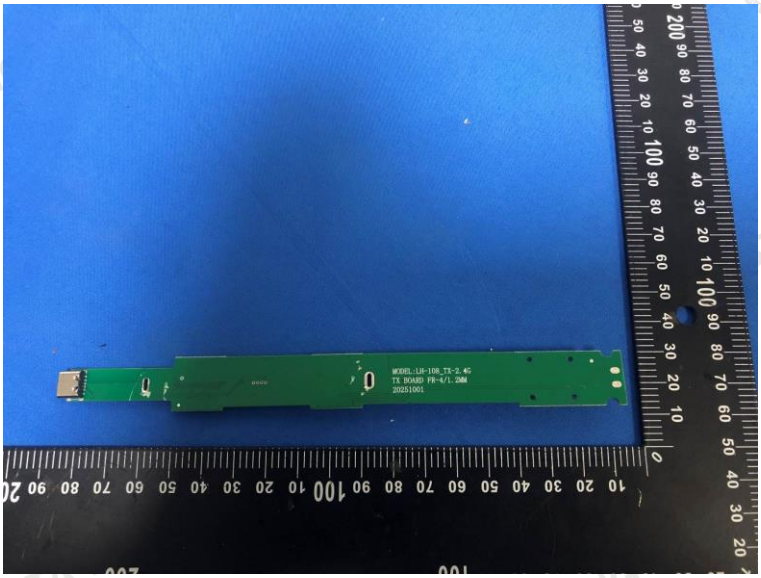
W68-V02-RED

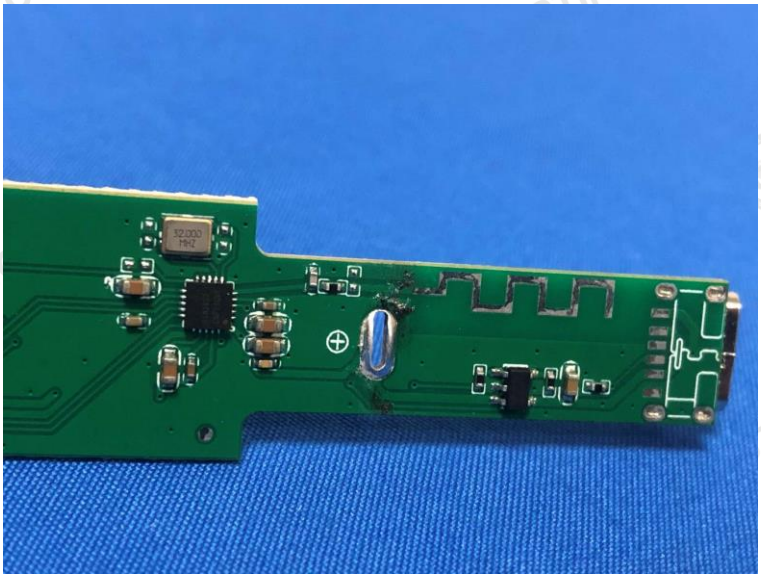












.....End of Report.....