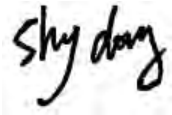
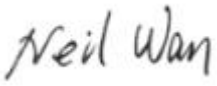
TEST REPORT

Report No. :	**KS2206S2549E01**
FCC ID :	2AHYV-EKEYB
Applicant :	**PEAG, LLC dba JLab Audio**
Address :	5972 LANDAU CT, Carlsbad, CA 92008
Manufacturer.....:	GuangDong Simpreal Intelligent Technology Co., Ltd
Address.....:	Room 2408, JiaHong ZhenXing DaSha, DongGuan Avenue #13, DongCheng District, DongGuan City, GuangDong Province, P.R. China
Product Name :	**Bluetooth Keyboard**
Trade Mark :	JLAB
Model/Type reference :	Epic Keyboard
Listed Model(s) :	N/A
Standard :	**FCC 15.247** **ANSI C63.10: 2013**
Date of Receipt :	June 17, 2022
Date of Test Date :	June 17, 2022 ~ July 04,2022
Date of issue :	July 04,2022
Test result :	**Pass**

Prepared by: (Printed Name + Signature)	Sky Dong	
Approved by: (Printed Name + Signature)	Neil Wan	

Testing Laboratory Name :	**KSIGN(Guangdong) Testing Co., Ltd.**
Address :	West Side of 1/F., Building C, Zone A, Fuyuan New Factory, Jiujiu Industrial Park, Minzhu, Shatou, Shajing, Bao'an District, Shenzhen, Guangdong, China

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1. TEST STANDARDS

The tests were performed according to following standards:

FCC Rules Part 15.247: Frequency Hopping, Direct Spread Spectrum and Hybrid Systems that are in operation within the bands of 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz.
ANSI C63.10-2013: American National Standard for Testing Unlicensed Wireless Devices
KDB558074 D01 V05r02: Guidance for Performing Compliance Measurements on Digital Transmission Systems (DTS) Operating Under §15.247

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2. SUMMARY

2.1.Product Description

Product Description:	Bluetooth Keyboard
Model/Type reference:	Epic Keyboard
Power supply(Battery):	DC 3.7V
Adapter information (Auxiliary test suppied by test Lab）	Model: EP-TA20CBC Input:AC 100-240V 50/60Hz Output:DC 5V
Testing sample ID：	KS2206S2549E01-1# (Engineer sample), KS2206S2549E01-2# (Normal sample)
Hardware version:	V2.1
Software version:	0x2931FC8B
Bluetooth BLE	
Supported type:	Bluetooth low Energy
Modulation:	GFSK
Operation frequency:	2402MHz to 2480MHz
Channel number:	40
Channel separation:	2 MHz
Antenna type:	PCB Antenna
Antenna gain:	0dBi

2.2.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 5V From external circuit

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

This is a Bluetooth Keyboard.
For more details, refer to the user's manual of the EUT.

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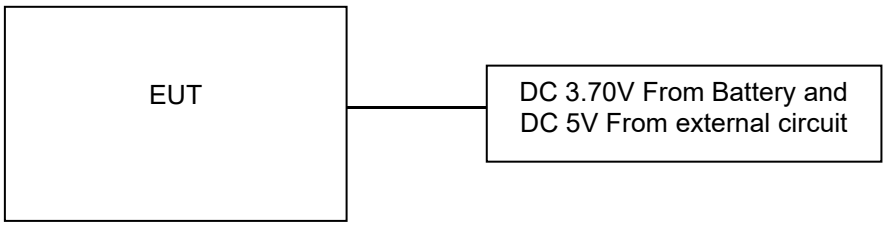
2.4.EUT operation mode

The Applicant provides communication tools software(Engineer mode) to control the EUT for staying in continuous transmitting (Duty Cycle more than 98%) and receiving mode for testing .There are 40 channels provided to the EUT and Channel 00/19/39 were selected to test.

Operation Frequency：

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

2.5.Block Diagram of Test Setup



2.6.Related Submittal(s) / Grant (s)

This submittal(s) (test report) is intended for the device filing to comply with Section 15.247 of the FCC Part 15, Subpart C Rules.

2.7.Modifications

No modifications were implemented to meet testing criteria.

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3. TEST ENVIRONMENT

3.1.Address of the test laboratory

KSIGN(Guangdong) Testing Co., Ltd.

West Side of 1/F., Building C, Zone A, Fuyuan New Factory, Jiujiu Industrial Park, Minzhu, Shatou, Shajing, Bao'an District, Shenzhen, Guangdong, China

3.2.Test Facility

The test facility is recognized, certified, or accredited by the following organizations:

Laboratory accreditation

The test facility is recognized, certified, or accredited by the following organizations:

CNAS-Lab Code: L13261
KSIGN(Guangdong) Testing Co., Ltd. has been assessed and proved to be in Compliance with CNAS-CL01 Accreditation Criteria for Testing and Calibration Laboratories (identical to ISO/IEC17025: 2017 General Requirements) for the Competence of Testing and Calibration Laboratories.

A2LA-Lab Cert. No.: 5457.01
KSIGN(Guangdong) Testing Co., Ltd. EMC Laboratory has been accredited by A2LA for technical Competence in the field of electrical testing, and proved to be in compliance with ISO/IEC 17025:2017 General Requirements for the Competence of Testing and Calibration Laboratories and any additional program requirements in the identified field of testing.

ISED#: 25693 CAB identifier.: CN0096
KSIGN(Guangdong) Testing Co., Ltd. has been listed by Innovation, Science and Economic Development Canada to perform electromagnetic emission measurement.

FCC-Registration No.: 294912 Designation Number: CN1328
KSIGN(Guangdong) Testing Co., Ltd. EMC Laboratory has been listed on the US Federal Communications Commission list of test facilities recognized to perform electromagnetic emissions measurements.

3.3.Environmental conditions

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

Temperature:	25 ° C
Humidity:	45 %
Atmospheric pressure:	950-1050mbar

AC Main Conducted testing：

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Temperature:	25 ° C
Humidity:	46 %
Atmospheric pressure:	950-1050mbar

Conducted testing：

Temperature:	25 ° C
Humidity:	44 %
Atmospheric pressure:	950-1050mbar

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3.4.Summary of measurement results

Test Specification clause	Test case	Test Mode	Test Channel	Recorded In Report		Test result
§15.247(e)	Power spectral density	BLE 1Mpbs 2 Mpbs	☒ Lowest ☒ Middle ☒ Highest	BLE 1Mpbs 2 Mpbs	☒ Lowest ☒ Middle ☒ Highest	complies
§15.247(a)(2)	Spectrum bandwidth – 6 dB bandwidth	BLE 1Mpbs 2 Mpbs	☒ Lowest ☒ Middle ☒ Highest	BLE 1Mpbs 2 Mpbs	☒ Lowest ☒ Middle ☒ Highest	complies
§15.247(b)(1)	Maximum output power	BLE 1Mpbs 2 Mpbs	☒ Lowest ☒ Middle ☒ Highest	BLE 1Mpbs 2 Mpbs	☒ Lowest ☒ Middle ☒ Highest	complies
§15.247(d)	Band edge compliance conducted	BLE 1Mpbs 2 Mpbs	☒ Lowest ☒ Highest	BLE 1Mpbs 2 Mpbs	☒ Lowest ☒ Highest	complies
§15.205	Band edge compliance radiated	BLE 1Mpbs 2 Mpbs	☒ Lowest ☒ Highest	BLE 1Mpbs 2 Mpbs	☒ Lowest ☒ Highest	complies
§15.247(d)	TX spurious emissions conducted	BLE 1Mpbs 2 Mpbs	☒ Lowest ☒ Middle ☒ Highest	BLE 1Mpbs 2 Mpbs	☒ Lowest ☒ Middle ☒ Highest	complies
§15.247(d)	TX spurious emissions radiated	BLE 1Mpbs 2 Mpbs	☒ Lowest ☒ Middle ☒ Highest	BLE 1Mpbs 2 Mpbs	☒ Lowest ☒ Middle ☒ Highest	complies
§15.209(a)	TX spurious Emissions radiated Below 1GHz	BLE 1Mpbs 2 Mpbs	-/-	BLE 1Mpbs	-/-	complies
§15.107(a) §15.207	Conducted Emissions < 30 MHz	BLE 1Mpbs 2 Mpbs	-/-	BLE 1Mpbs	-/-	complies

Remark:
1. The measurement uncertainty is not included in the test result.
2. We tested all test mode and recorded worst case in report

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 CISPR 16 - 4 „Specification for radio disturbance and immunity measuring apparatus and methods – Part 4: Uncertainty in EMC Measurements“ 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. is reported:

Test Items	Measurement Uncertainty	Notes
Maximum transmit power	±1.5dB	(1)
Power Spectral Density	±1.5dB	(1)
Duty Cycle, Tx-sequence, Tx-gap	±5%	(1)
Accumulated Transmit Time, Frequency Occupation and Hopping Sequence	±5%	(1)

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Hopping Frequency Separation	±5%	(1)
Medium Utilisation (MU) factor	±5%	(1)
Adaptively	±5%	(1)
Occupied Channel Bandwidth	±5%	(1)
Transmitter unwanted emissions in the out-of-band domain	±2.8dB	(1)
Transmitter unwanted emissions in the spurious domain	±2.8dB	(1)
Receiver spurious emissions	±2.8dB	(1)
Receiver Blocking	±2.8dB	(1)

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

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3.6.Equipments Used during the Test

Tonscend JS0806-2 Test system					
Item	Test Equipment	Manufacturer	Model No.	Serial No.	Cal. Until
1	Spectrum Analyzer	R&S	FSV40-N	101798	03/04/2023
2	Vector Signal Generator	Agilent	N5182A	MY50142520	03/04/2023
3	Analog Signal Generator	HP	83752A	3344A00337	03/04/2023
4	Power Sensor	Agilent	E9304A	MY50390009	03/04/2023
5	Power Sensor	Agilent	E9300A	MY41498315	03/04/2023
6	Wideband Radio Communication Tester	R&S	CMW500	157282	03/04/2023
7	Climate Chamber	Angul	AGNH80L	1903042120	03/04/2023
8	Dual Output DC Power Supply	Agilent	E3646A	MY40009992	03/04/2023
9	RF Control Unit	Tonscend	JS0806-2	/	03/04/2023

Transmitter spurious emissions & Receiver spurious emissions					
Item	Test Equipment	Manufacturer	Model No.	Serial No.	Cal. Until
1	EMI Test Receiver	R&S	ESR	102525	03/04/2023
2	High Pass Filter	Chengdu E-Microwave	OHF-3-18-S	0E01901038	03/04/2023
3	High Pass Filter	Chengdu E-Microwave	OHF-6.5-18-S	0E01901039	03/04/2023
4	Spectrum Analyzer	HP	8593E	3831U02087	03/04/2023
5	Ultra-Broadband logarithmic period Antenna	Schwarzbeck	VULB 9163	01230	12/04/2023
6	Loop Antenna	Beijin ZHINAN	ZN30900C	18050	03/04/2023
7	Spectrum Analyzer	R&S	FSV40-N	101798	03/04/2023
8	Horn Antenna	Schwarzbeck	BBHA 9120 D	2023	03/29/2023
9	Pre-Amplifier	Schwarzbeck	BBV 9745	9745#129	03/04/2023
10	Pre-Amplifier	EMCI	EMC051835SE	980662	03/04/2023

Note: The Cal.Interval was one year.

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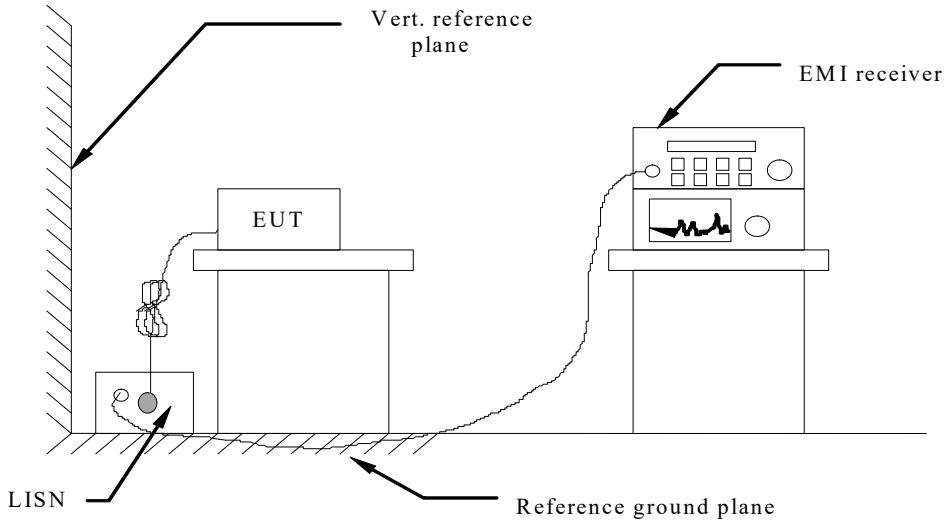
4. TEST CONDITIONS AND RESULTS

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 C63.10-2013.
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 EUT received DC 12V power from adapter, the adapter received AC120V/60Hz and AC 240V/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.

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.		

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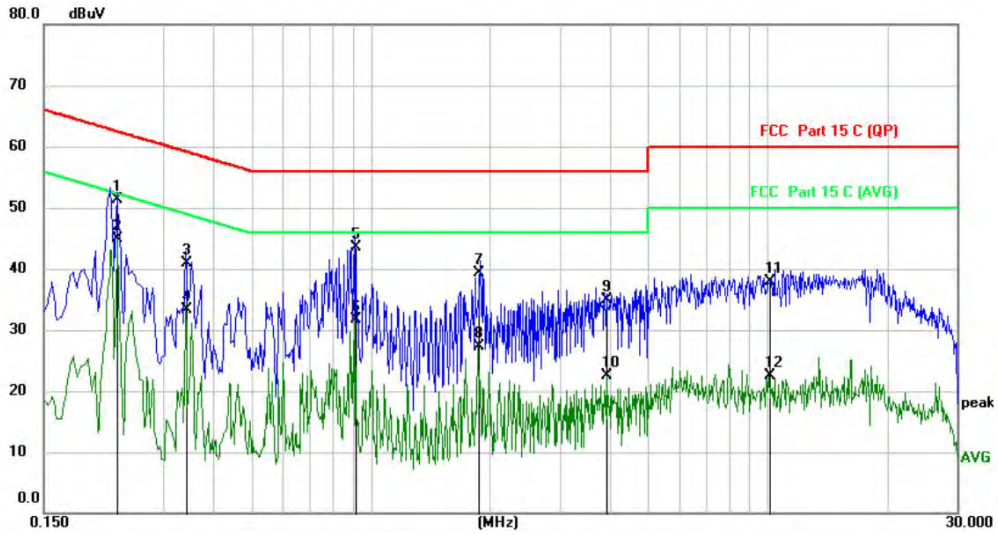
TEST RESULTS

Remark:

1. Both modes of BLE 1Mpbs and 2Mpbs were tested at Low, Middle, and High channel; only the worst result of BLE 1Mpbs was reported as below:

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:.

Power supply:	DC 5V From Adapter	Polarization	L



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over	
		MHz	dBuV	dB	dBuV	dBuV	dB	Detector
1		0.2300	40.64	10.74	51.38	62.45	-11.07	QP
2	*	0.2300	34.15	10.74	44.89	52.45	-7.56	AVG
3		0.3420	30.42	10.55	40.97	59.15	-18.18	QP
4		0.3420	22.66	10.55	33.21	49.15	-15.94	AVG
5		0.9140	33.08	10.48	43.56	56.00	-12.44	QP
6		0.9140	21.24	10.48	31.72	46.00	-14.28	AVG
7		1.8660	28.71	10.53	39.24	56.00	-16.76	QP
8		1.8660	16.76	10.53	27.29	46.00	-18.71	AVG
9		3.9300	24.39	10.60	34.99	56.00	-21.01	QP
10		3.9300	11.89	10.60	22.49	46.00	-23.51	AVG
11		10.1019	27.19	10.62	37.81	60.00	-22.19	QP
12		10.1019	11.85	10.62	22.47	50.00	-27.53	AVG

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)

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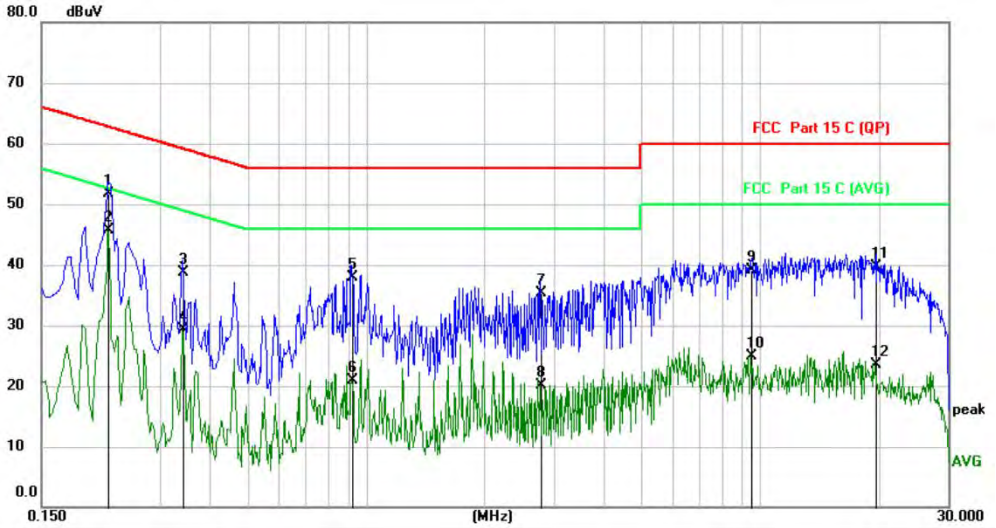
Power supply:	DC 5V From Adapter	Polarization	N



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over	
		MHz	dBuV	dB	dBuV	dBuV	dB	Detector
1		0.2220	41.05	10.73	51.78	62.74	-10.96	QP
2	*	0.2220	34.88	10.73	45.61	52.74	-7.13	AVG
3		0.3420	28.16	10.53	38.69	59.15	-20.46	QP
4		0.3420	18.77	10.53	29.30	49.15	-19.85	AVG
5		0.9220	27.45	10.47	37.92	56.00	-18.08	QP
6		0.9220	10.52	10.47	20.99	46.00	-25.01	AVG
7		2.7740	24.67	10.57	35.24	56.00	-20.76	QP
8		2.7740	9.56	10.57	20.13	46.00	-25.87	AVG
9		9.4938	28.45	10.58	39.03	60.00	-20.97	QP
10		9.4938	14.26	10.58	24.84	50.00	-25.16	AVG
11		19.5459	28.76	10.87	39.63	60.00	-20.37	QP
12		19.5459	12.56	10.87	23.43	50.00	-26.57	AVG

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)

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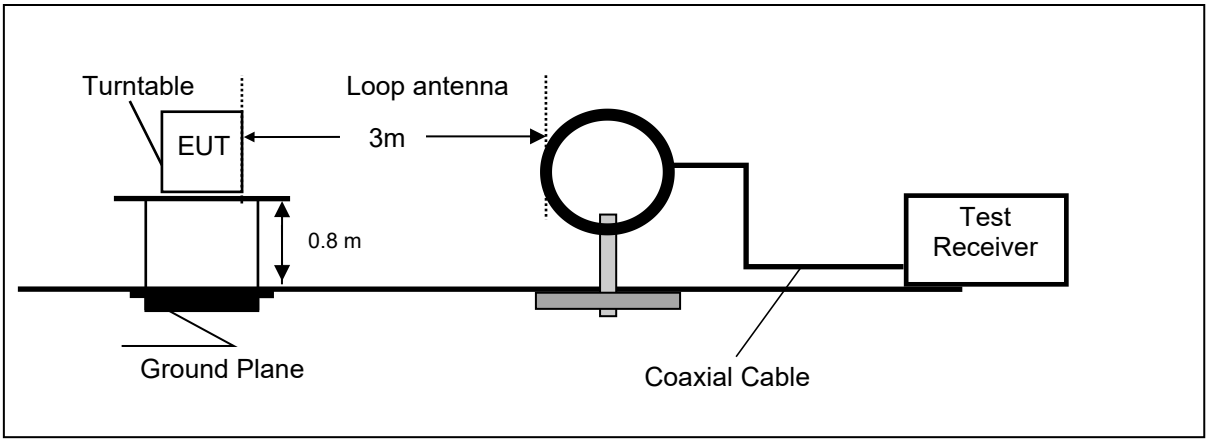
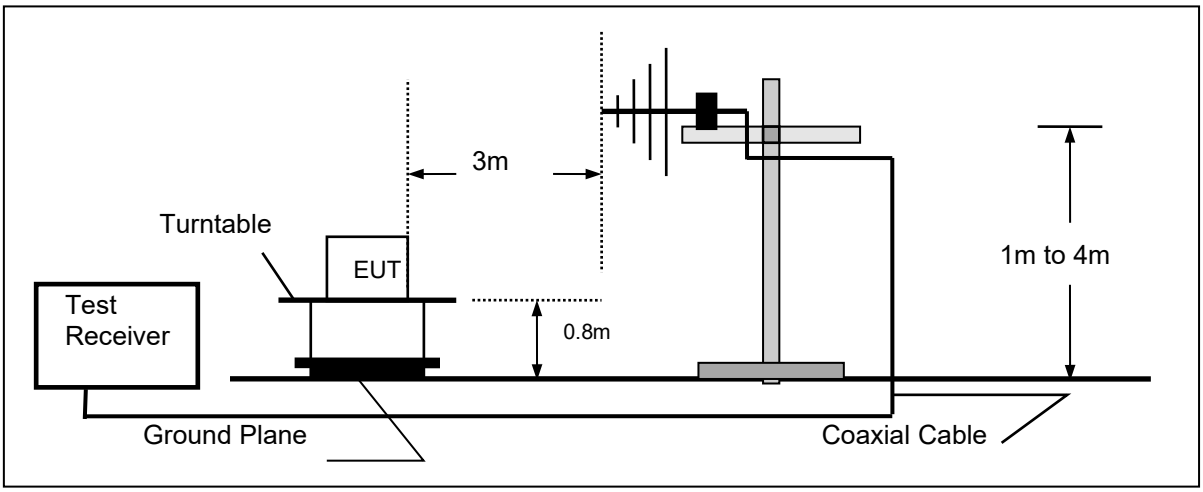
4.2.Radiated Emissions and Band Edge

TEST CONFIGURATION

Frequency range 9 KHz – 30MHz



Frequency range 30MHz – 1000MHz



Frequency range above 1GHz-25GHz

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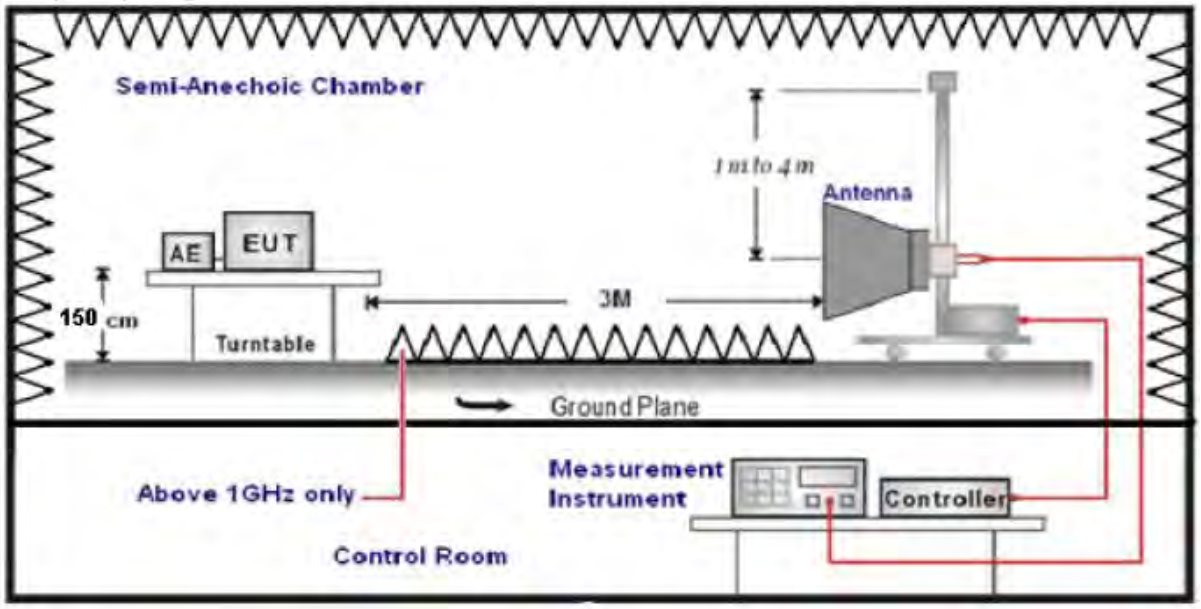

TEST PROCEDURE

1. The EUT was placed on a turn table which is 0.8m above ground plane when testing frequency range 9 KHz –1GHz;the EUT was placed on a turn table which is 1.5m above ground plane when testing frequency range 1GHz – 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 32.768KHz and maximum operation frequency was 2480MHz.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)

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RA = Reading Amplitude	AG = Amplifier Gain
AF = Antenna Factor	

Transd=AF +CL-AG

RADIATION LIMIT

For intentional device, according to § 15.209(a), the general requirement of field strength of radiated emission from intentional radiators at a distance of 3 meters shall not exceed the following table. According to § 15.247(d), in any 100kHz bandwidth outside the frequency band in which the EUT is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20dB below that in the100kHz bandwidth within the band that contains the highest level of desired power.

The pre-test have done for the EUT in three axes and found the worst emission at position shown in test setup photos.

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. Both modes of BLE 1Mpbs and 2Mpbs were tested at Low, Middle, and High channel and recorded worst mode at BLE 1Mpbs.
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.

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For 30MHz-1GHz

Horizontal

No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over	
		MHz	(dBuV)	(dB/m)	(dBuV/m)	(dBuV/m)	(dB)	Detector
1		140.1454	43.31	-21.27	22.04	43.50	-21.46	QP
2		192.7562	34.70	-18.31	16.39	43.50	-27.11	QP
3	*	280.5152	40.50	-15.13	25.37	46.00	-20.63	QP
4		399.8706	35.96	-10.91	25.05	46.00	-20.95	QP
5		433.3047	32.15	-10.51	21.64	46.00	-24.36	QP
6		458.6317	31.23	-10.25	20.98	46.00	-25.02	QP

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)

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Vertical

No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over	
		MHz	(dBuV)	(dB/m)	(dBuV/m)	(dBuV/m)	(dB)	Detector
1		140.4898	39.78	-21.28	18.50	43.50	-25.00	QP
2		203.0238	33.01	-17.88	15.13	43.50	-28.37	QP
3		300.0514	32.20	-14.66	17.54	46.00	-28.46	QP
4		333.3359	30.02	-13.24	16.78	46.00	-29.22	QP
5	*	400.0109	34.26	-10.91	23.35	46.00	-22.65	QP
6		667.4398	29.04	-7.29	21.75	46.00	-24.25	QP

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)

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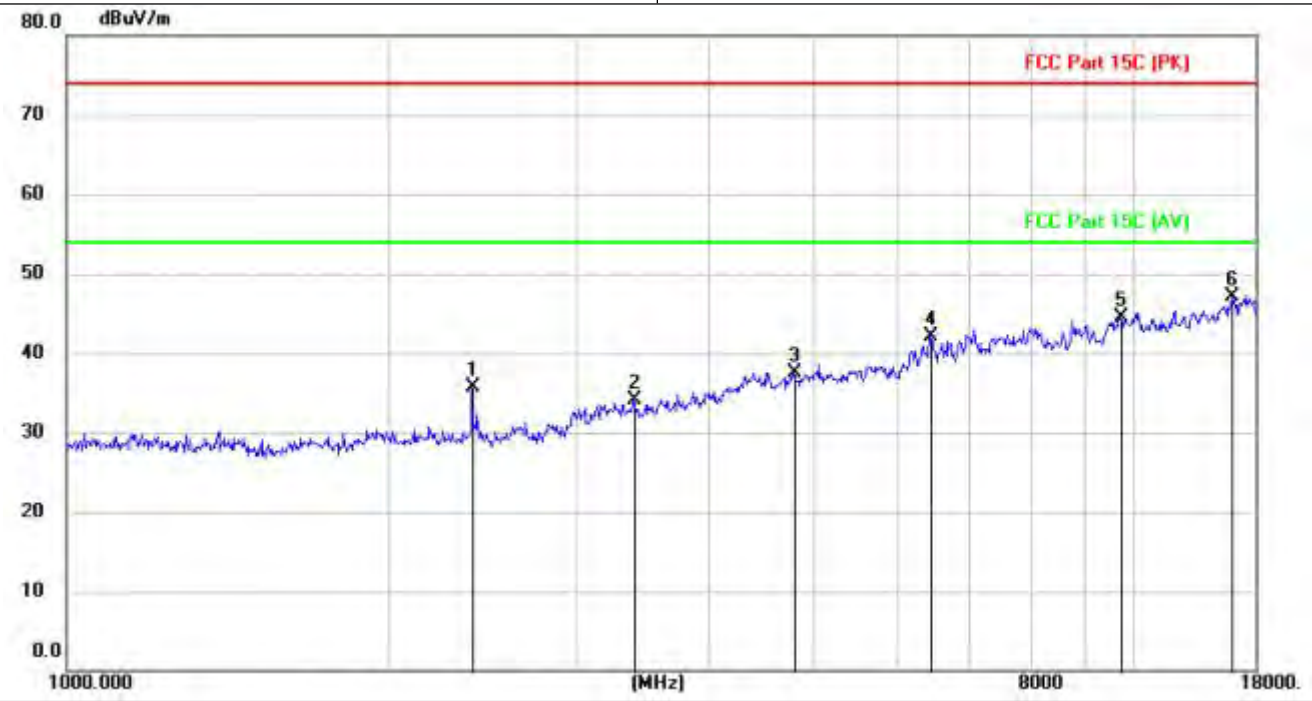
For 1GHz to 25GHz

GFSK (above 1GHz)

Test voltage:	DC 3.7V
Ant. Pol.:	Horizontal
Test Mode:	TX BLE Mode 2402MHz



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over	
		MHz	(dBuV)	(dB/m)	(dBuV/m)	(dBuV/m)	(dB)	Detector
1		2401.600	46.55	-10.91	35.64	74.00	-38.36	peak
2		3404.800	43.94	-9.86	34.08	74.00	-39.92	peak
3		4795.600	43.54	-5.95	37.59	74.00	-36.41	peak
4		6448.000	44.32	-2.28	42.04	74.00	-31.96	peak
5		9709.600	41.16	3.43	44.59	74.00	-29.41	peak
6	*	16668.800	38.39	8.69	47.08	74.00	-26.92	peak

Emission Level= Read Level+ Correct Factor

Add：West Side of 1/F., Building C, Zone A, Fuyuan New Factory, Jiujiu Industrial Park, Minzhu, Shatou, Shajing, Bao'an District, Shenzhen, Guangdong, China
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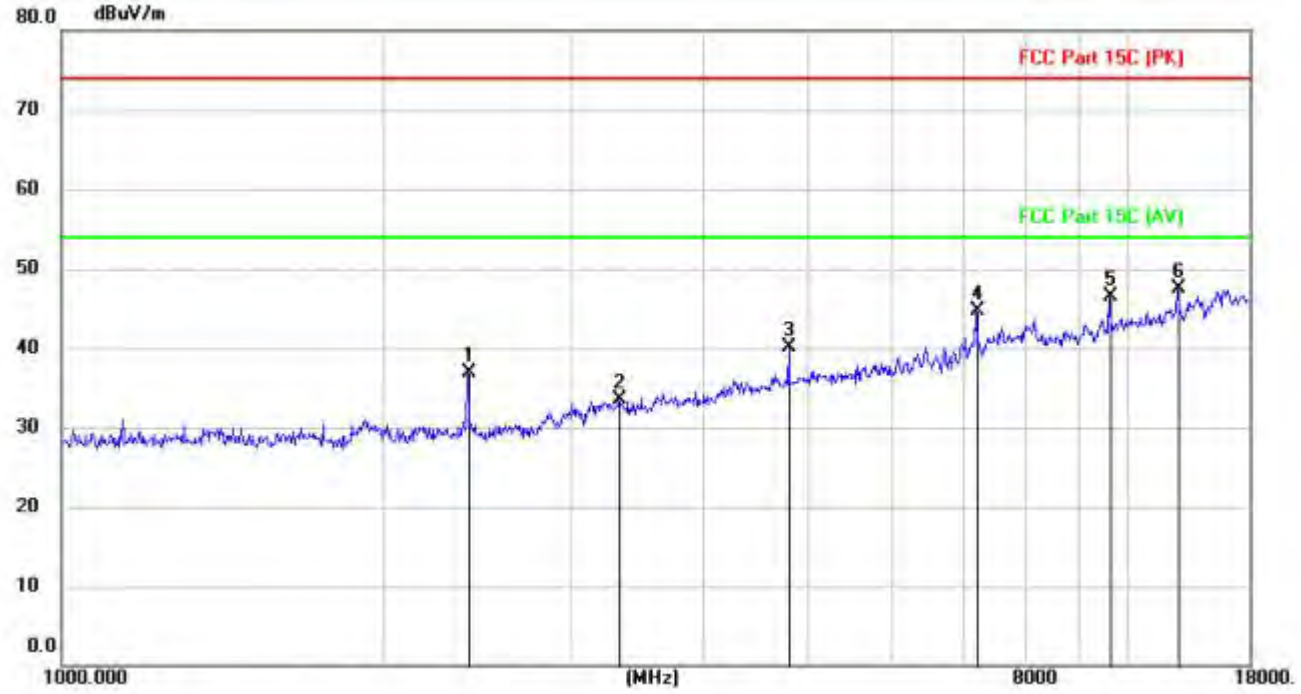
Test voltage:	DC 3.7V
Ant. Pol.:	Vertical
Test Mode:	TX BLE Mode 2402MHz



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over	
		MHz	(dBuV)	(dB/m)	(dBuV/m)	(dBuV/m)	(dB)	Detector
1		2406.400	47.75	-10.92	36.83	74.00	-37.17	peak
2		3330.400	43.55	-9.98	33.57	74.00	-40.43	peak
3		4812.400	45.99	-5.90	40.09	74.00	-33.91	peak
4		7218.400	44.84	-0.05	44.79	74.00	-29.21	peak
5		9623.200	43.22	3.23	46.45	74.00	-27.55	peak
6	*	13142.400	41.43	6.03	47.46	74.00	-26.54	peak

Emission Level= Read Level+ Correct Factor

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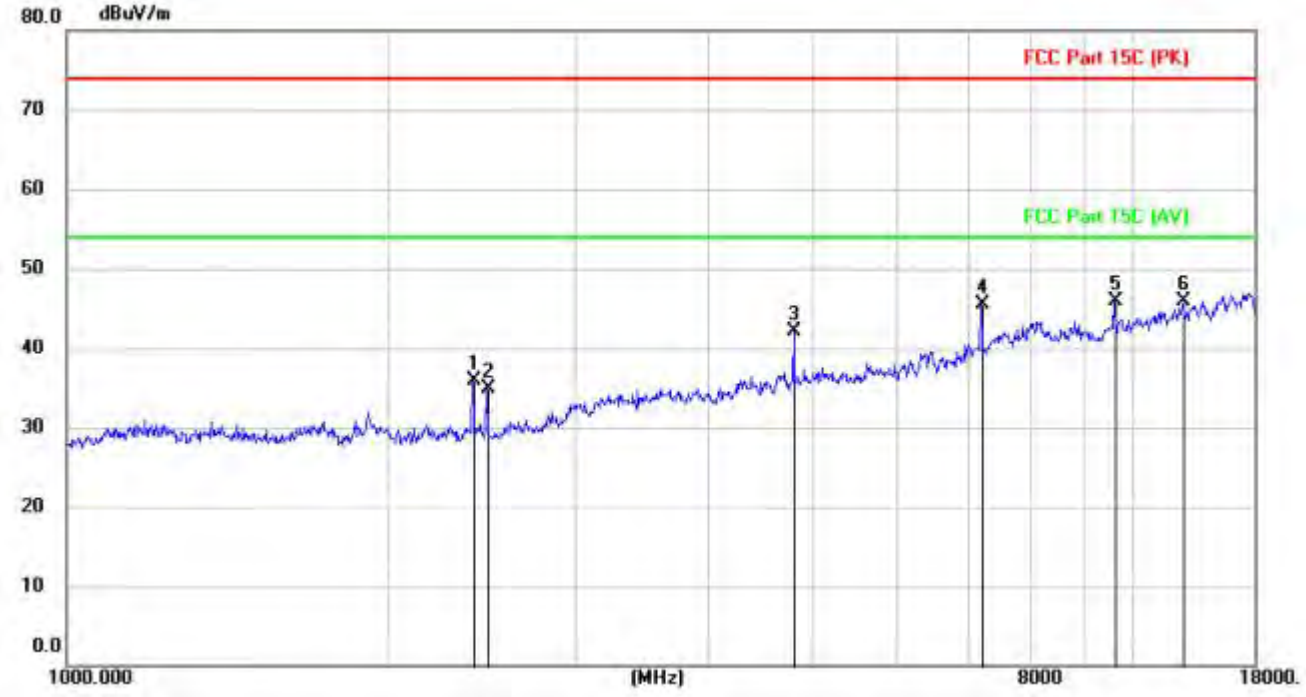
Test voltage:	DC 3.7V
Ant. Pol.:	Horizontal
Test Mode:	TX BLE Mode 2440MHz



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over	
		MHz	(dBuV)	(dB/m)	(dBuV/m)	(dBuV/m)	(dB)	Detector
1		2406.400	46.77	-10.92	35.85	74.00	-38.15	peak
2		2479.600	45.80	-10.89	34.91	74.00	-39.09	peak
3		4812.400	48.02	-5.90	42.12	74.00	-31.88	peak
4		7217.200	45.63	-0.05	45.58	74.00	-28.42	peak
5		9623.200	42.58	3.23	45.81	74.00	-28.19	peak
6	*	13156.800	39.78	6.07	45.85	74.00	-28.15	peak

Emission Level= Read Level+ Correct Factor

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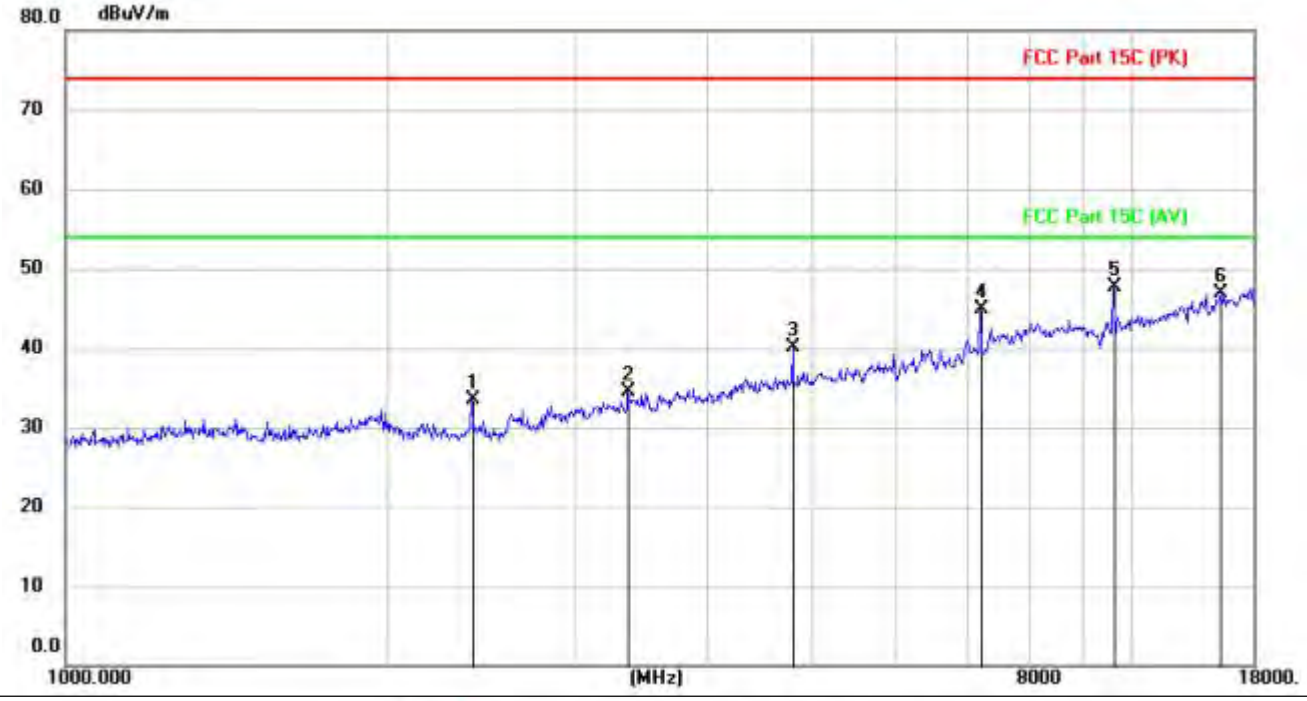
Test voltage:	DC 3.7V
Ant. Pol.:	Vertical
Test Mode:	TX BLE Mode 2440MHz



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over	
		MHz	(dBuV)	(dB/m)	(dBuV/m)	(dBuV/m)	(dB)	Detector
1		2406.400	44.46	-10.92	33.54	74.00	-40.46	peak
2		3367.600	44.47	-9.93	34.54	74.00	-39.46	peak
3		4812.400	45.99	-5.90	40.09	74.00	-33.91	peak
4		7217.200	44.90	-0.05	44.85	74.00	-29.15	peak
5	*	9623.200	44.57	3.23	47.80	74.00	-26.20	peak
6		15810.800	38.68	8.13	46.81	74.00	-27.19	peak

Emission Level= Read Level+ Correct Factor

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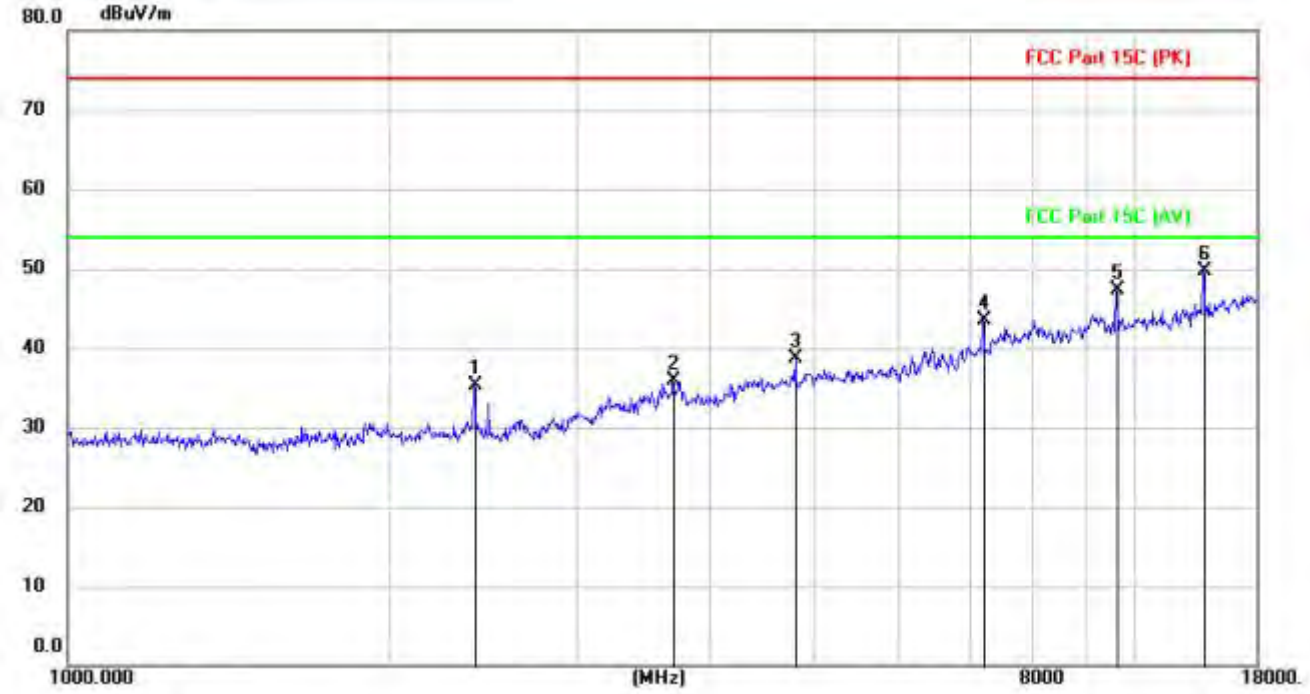
Test voltage:	DC 3.7V
Ant. Pol.:	Horizontal
Test Mode:	TX BLE Mode 2480MHz



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over	
		MHz	(dBuV)	(dB/m)	(dBuV/m)	(dBuV/m)	(dB)	Detector
1		2406.400	46.14	-10.92	35.22	74.00	-38.78	peak
2		3698.800	45.06	-9.18	35.88	74.00	-38.12	peak
3		4812.400	44.64	-5.90	38.74	74.00	-35.26	peak
4		7217.200	43.49	-0.05	43.44	74.00	-30.56	peak
5		9623.200	44.05	3.23	47.28	74.00	-26.72	peak
6	*	15105.600	42.55	7.07	49.62	74.00	-24.38	peak

Emission Level= Read Level+ Correct Factor

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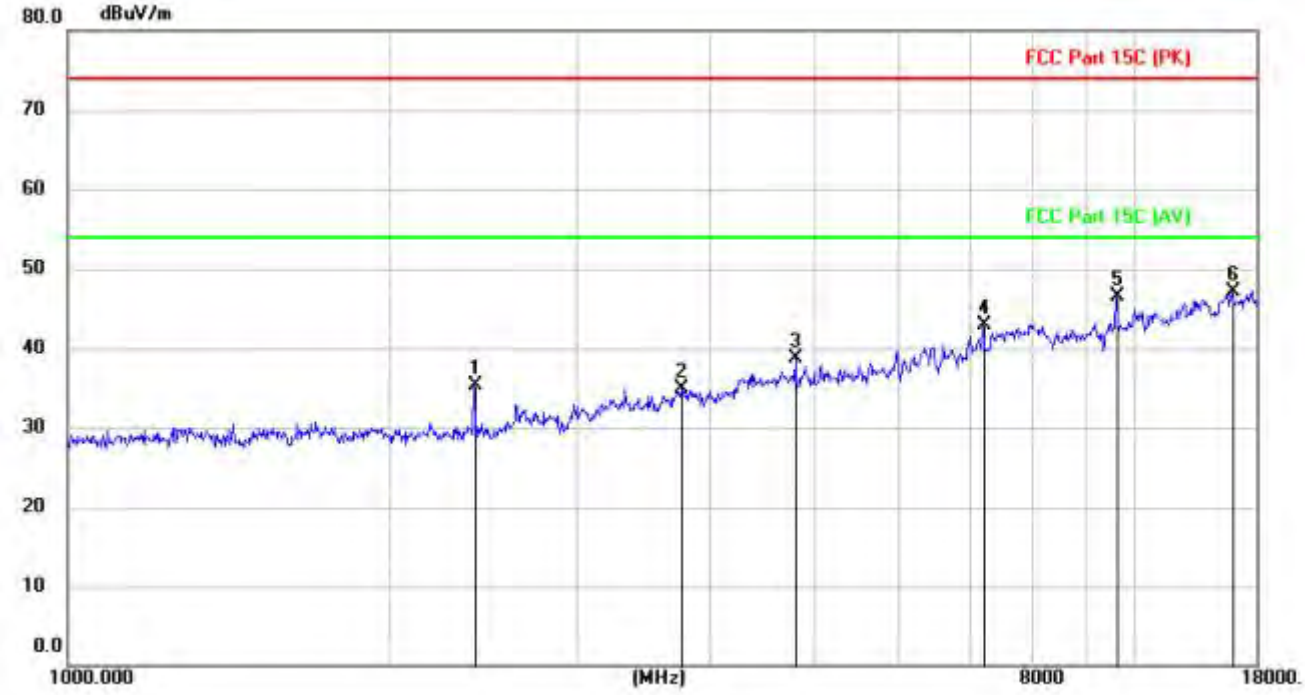
Test voltage:	DC 3.7V
Ant. Pol.:	Vertical
Test Mode:	TX BLE Mode 2480MHz



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over	
		MHz	(dBuV)	(dB/m)	(dBuV/m)	(dBuV/m)	(dB)	Detector
1		2405.200	46.19	-10.92	35.27	74.00	-38.73	peak
2		3764.800	43.89	-9.02	34.87	74.00	-39.13	peak
3		4812.400	44.63	-5.90	38.73	74.00	-35.27	peak
4		7218.400	42.87	-0.05	42.82	74.00	-31.18	peak
5		9625.600	43.33	3.25	46.58	74.00	-27.42	peak
6	*	16348.400	38.39	8.63	47.02	74.00	-26.98	peak

Emission Level= Read Level+ Correct Factor

REMARKS:

1. Emission level (dBuV/m) =Raw Value (dBuV)+Correction Factor (dB/m)
2. Correction Factor (dB/m) = Antenna Factor (dB/m)+Cable Factor (dB)- Pre-amplifier
3. Margin value = Limit value- Emission level.
4. -- Mean the PK detector measured value is below average limit.
5. The other emission levels were very low against the limit.

Note:

1.18GHz-26.5GHz is the background of the site, there is no radiated spurious.

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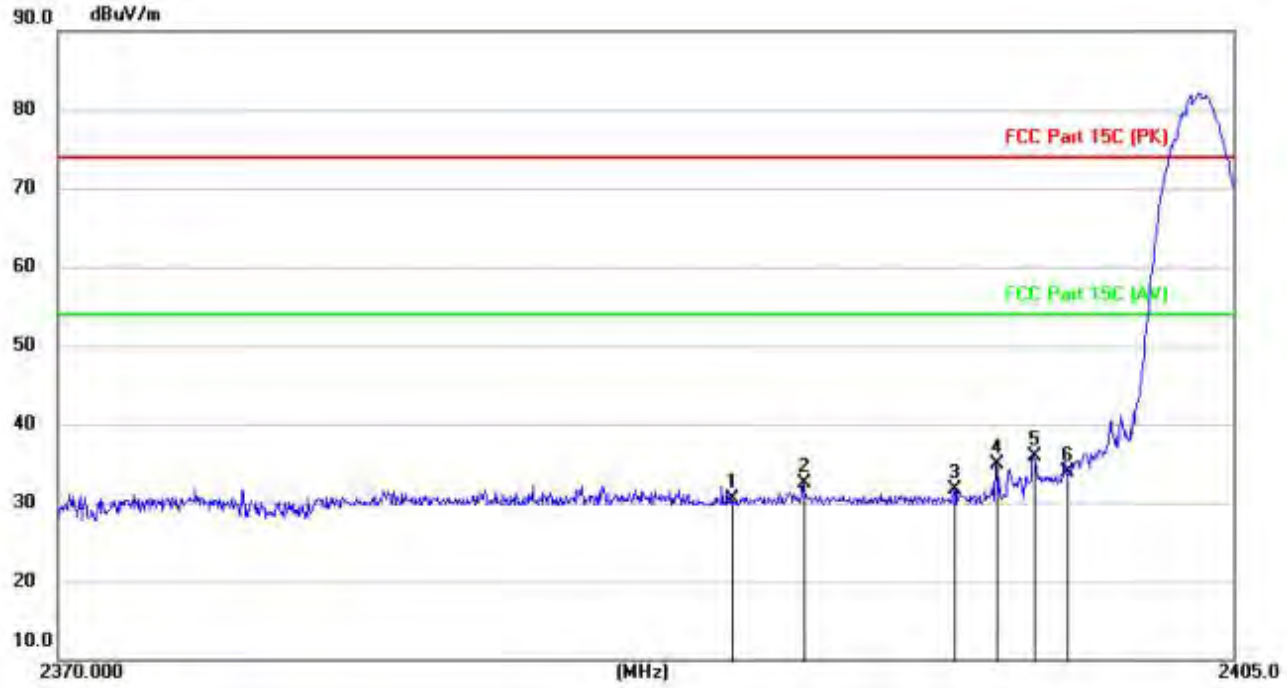
Results of Band Edges Test (Radiated)

GFSK

Test Voltage	DC 3.7V
Ant. Pol.:	Horizontal
Test Mode:	TX BLE Mode 2402MHz



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over	
		MHz	(dBuV)	(dB/m)	(dBuV/m)	(dBuV/m)	(dB)	Detector
1		2390.000	41.39	-10.92	30.47	74.00	-43.53	peak
2		2392.155	43.51	-10.92	32.59	74.00	-41.41	peak
3		2396.635	42.64	-10.92	31.72	74.00	-42.28	peak
4		2397.909	45.74	-10.92	34.82	74.00	-39.18	peak
5	*	2399.026	46.73	-10.92	35.81	74.00	-38.19	peak
6		2400.000	44.89	-10.92	33.97	74.00	-40.03	peak

Emission Level= Read Level+ Correct Factor

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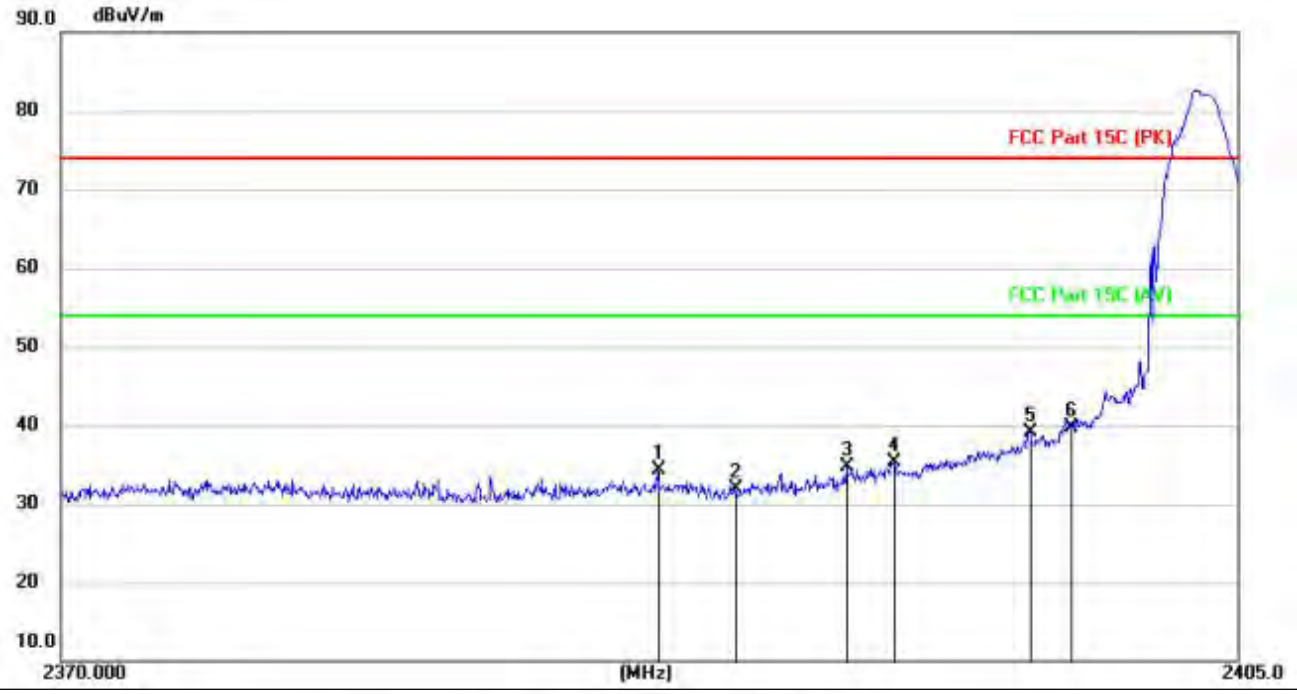
Test Voltage	DC 3.7V
Ant. Pol.	Vertical
Test Mode:	TX BLE Mode 2402MHz



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over	
		MHz	(dBuV)	(dB/m)	(dBuV/m)	(dBuV/m)	(dB)	Detector
1		2387.696	45.29	-10.92	34.37	74.00	-39.63	peak
2		2390.000	42.85	-10.92	31.93	74.00	-42.07	peak
3		2393.334	45.63	-10.92	34.71	74.00	-39.29	peak
4		2394.749	46.18	-10.91	35.27	74.00	-38.73	peak
5		2398.809	50.10	-10.92	39.18	74.00	-34.82	peak
6	*	2400.000	50.68	-10.92	39.76	74.00	-34.24	peak

Emission Level= Read Level+ Correct Factor

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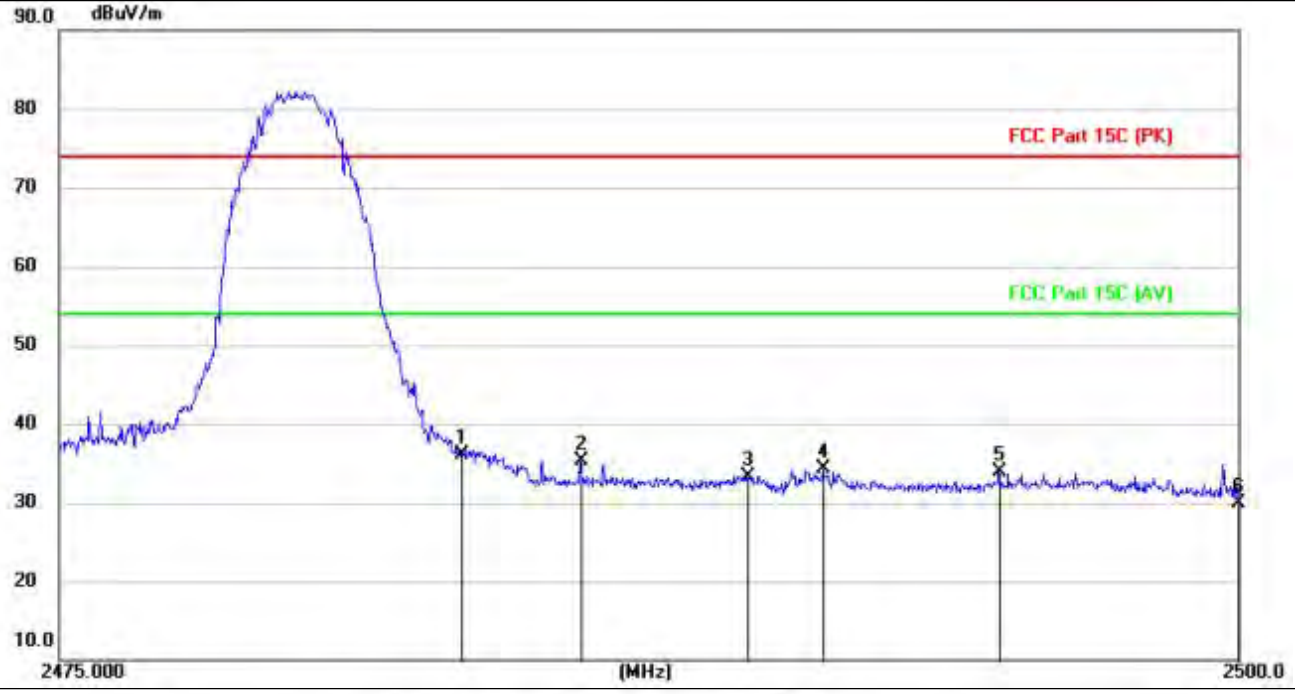
Test Voltage	DC 3.7V
Ant. Pol.	Horizontal
Test Mode:	TX BLE Mode 2480 MHz



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over	
		MHz	(dBuV)	(dB/m)	(dBuV/m)	(dBuV/m)	(dB)	Detector
1	*	2483.500	47.03	-10.88	36.15	74.00	-37.85	peak
2		2486.035	46.16	-10.88	35.28	74.00	-38.72	peak
3		2489.545	44.25	-10.89	33.36	74.00	-40.64	peak
4		2491.188	45.22	-10.89	34.33	74.00	-39.67	peak
5		2494.920	44.68	-10.87	33.81	74.00	-40.19	peak
6		2500.000	40.76	-10.88	29.88	74.00	-44.12	peak

Emission Level= Read Level+ Correct Factor

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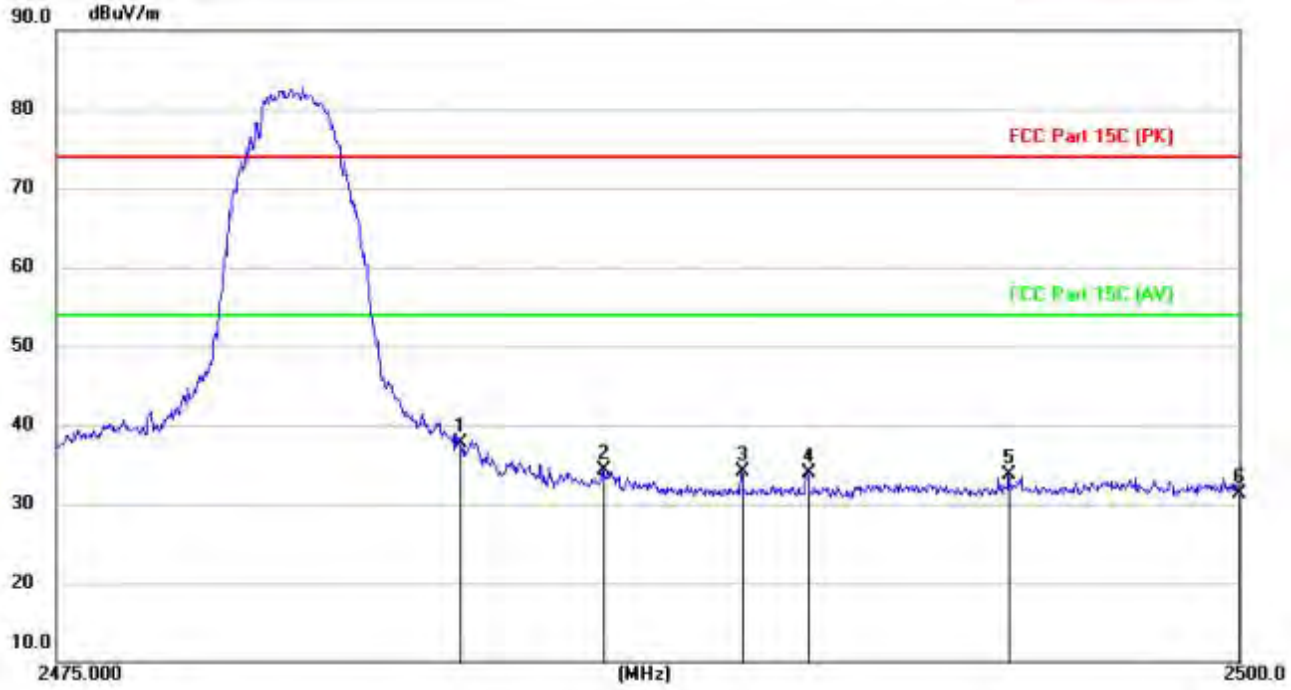
Test Voltage	DC 3.7V
Ant. Pol.	Vertical
Test Mode:	TX BLE Mode 2480 MHz



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over	
		MHz	(dBuV)	(dB/m)	(dBuV/m)	(dBuV/m)	(dB)	Detector
1	*	2483.500	48.53	-10.88	37.65	74.00	-36.35	peak
2		2486.525	45.22	-10.88	34.34	74.00	-39.66	peak
3		2489.450	45.03	-10.89	34.14	74.00	-39.86	peak
4		2490.865	44.77	-10.89	33.88	74.00	-40.12	peak
5		2495.122	44.59	-10.87	33.72	74.00	-40.28	peak
6		2500.000	42.26	-10.88	31.38	74.00	-42.62	peak

Emission Level= Read Level+ Correct Factor

REMARKS:

1. Emission level (dBuV/m) =Raw Value (dBuV)+Correction Factor (dB/m)
2. Correction Factor (dB/m) = Antenna Factor (dB/m)+Cable Factor (dB)- Pre-amplifier
3. Margin value = Limit value- Emission level.
4. -- Mean the PK detector measured value is below average limit.

Add：West Side of 1/F., Building C, Zone A, Fuyuan New Factory, Jiujiu Industrial Park, Minzhu, Shatou, Shajing, Bao'an District, Shenzhen, Guangdong, China
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4.3.Maximum Peak Output Power

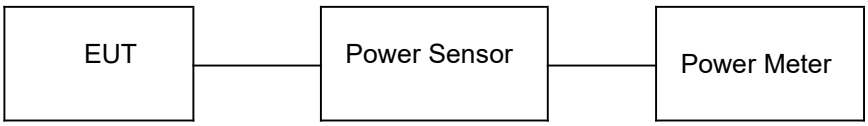
Limit

The Maximum Peak Output Power Measurement is 30dBm.

Test Procedure

Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the power sensor.

Test Configuration



Test Results

Type	Channel	Output power (dBm)	Limit (dBm)	Result
GFSK 1Mbps	00	-8.44	30.00	Pass
	19	-8.79		
	39	-9.46		
GFSK 2Mbps	00	-8.22	30.00	Pass
	19	-8.65		
	39	-9.23		

Test plot as follows:

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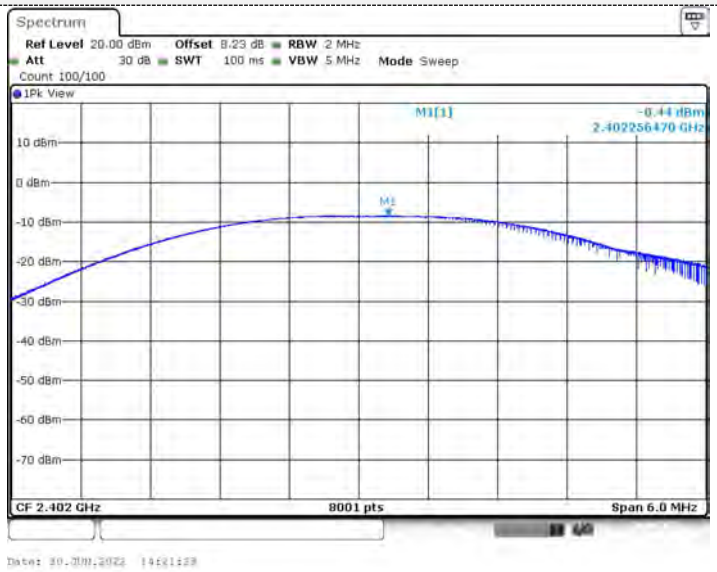
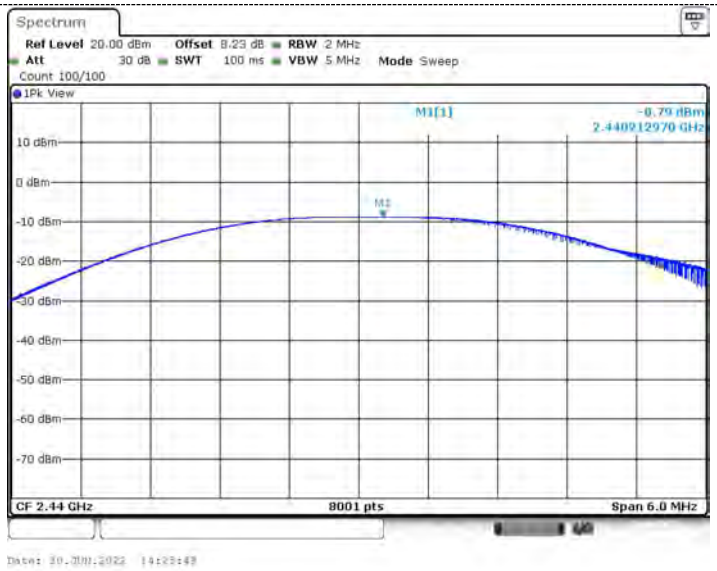
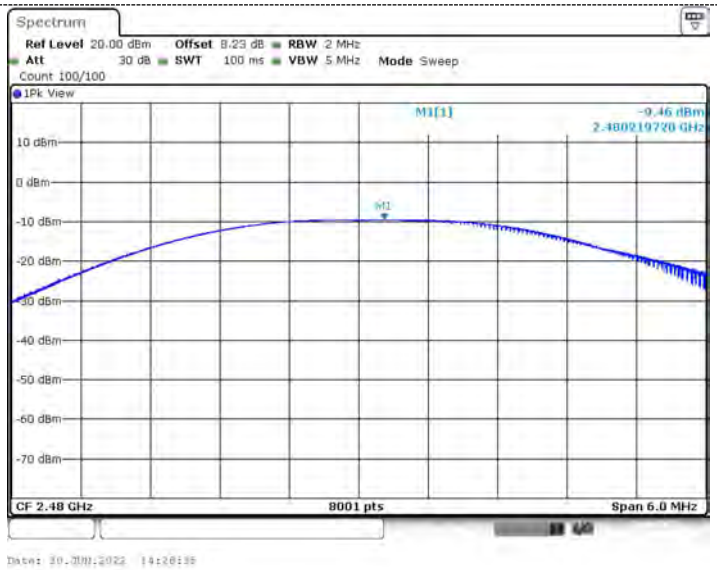
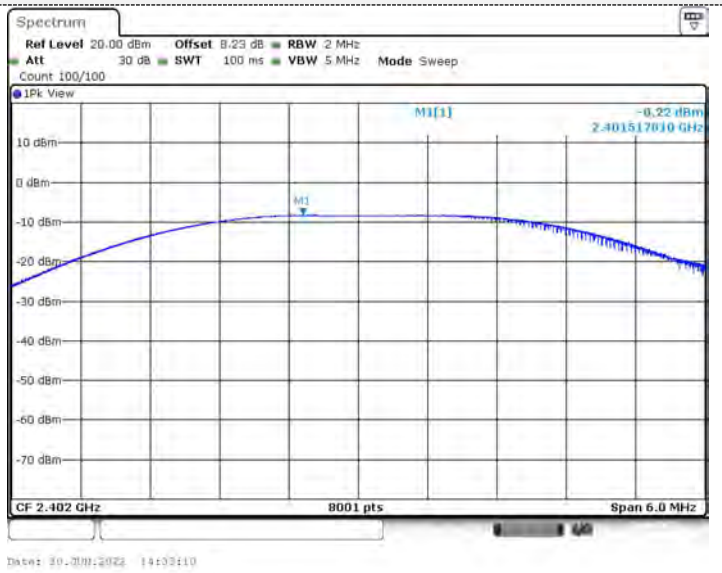
BLE GFSK 1Mpbs

CH00

CH19

Add：West Side of 1/F., Building C, Zone A, Fuyuan New Factory, Jiujiu Industrial Park, Minzhu, Shatou, Shajing, Bao'an District, Shenzhen, Guangdong, China
Tel：+(86) 0755-2985 2678 Fax: +(86) 0755-2985 2397 E-mail：info@gdksign.cn Web: www.gdksign.com



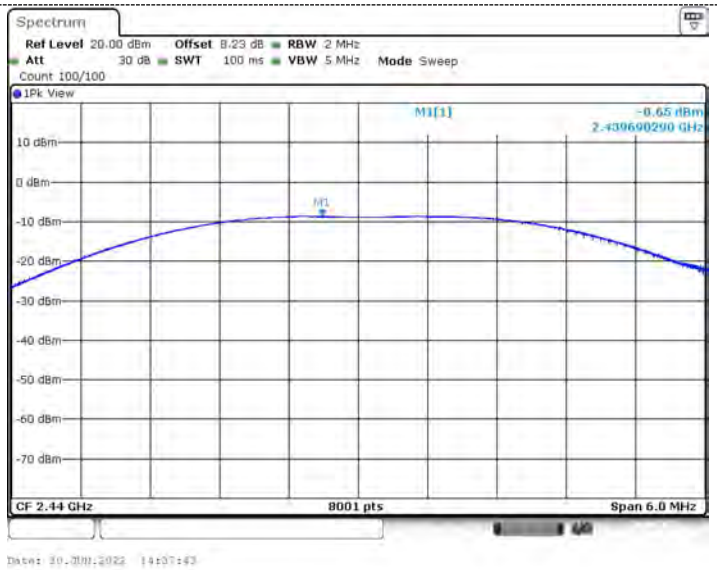
CH39

BLE GFSK 2Mpbs

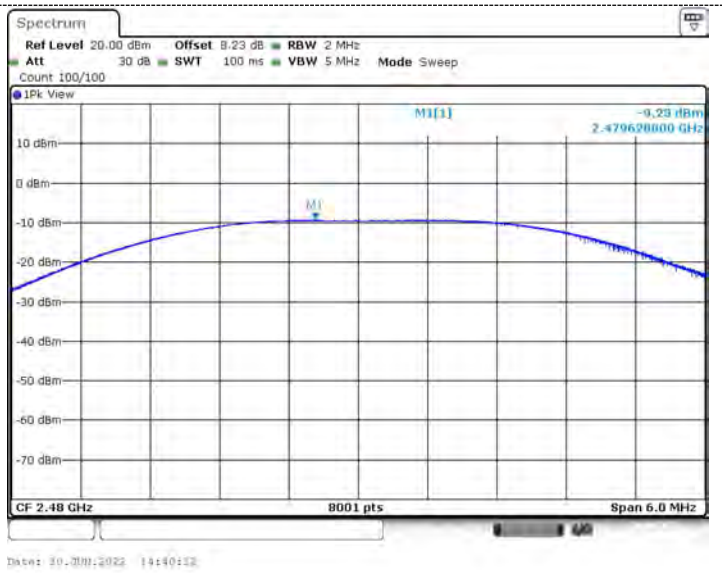


CH00

Add：West Side of 1/F., Building C, Zone A, Fuyuan New Factory, Jiujiu Industrial Park, Minzhu, Shatou, Shajing, Bao'an District, Shenzhen, Guangdong, China
Tel：+(86) 0755-2985 2678 Fax: +(86) 0755-2985 2397 E-mail：info@gdksign.cn Web: www.gdksign.com



CH19



CH39

Add：West Side of 1/F., Building C, Zone A, Fuyuan New Factory, Jiujiu Industrial Park, Minzhu, Shatou, Shajing, Bao'an District, Shenzhen, Guangdong, China
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4.4.Power Spectral Density

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.

Test Procedure

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

Test Configuration

Test Results

Type	Channel	Power Spectral Density (dBm/3KHz)	Limit (dBm/3KHz)	Result
GFSK 1Mbps	00	-24.18	8.00	Pass
	19	-24.38		
	39	-24.32		
GFSK 2Mbps	00	-28.43	8.00	Pass
	19	-29.05		
	39	-29.73		

Test plot as follows:

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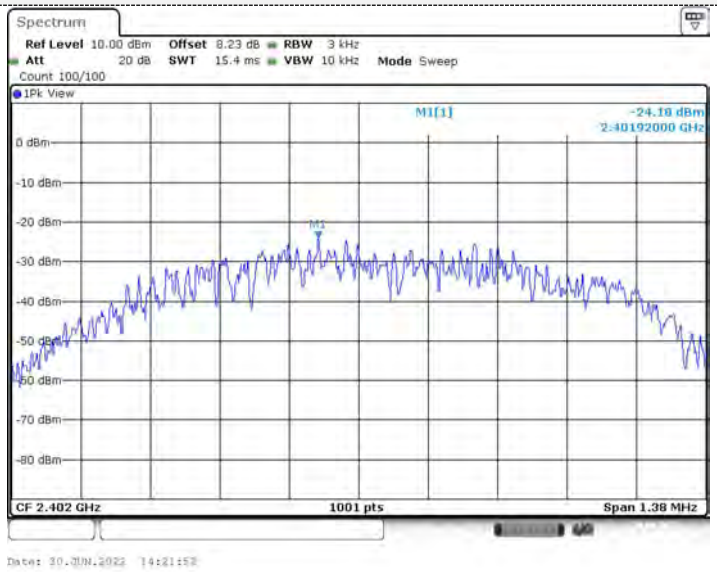
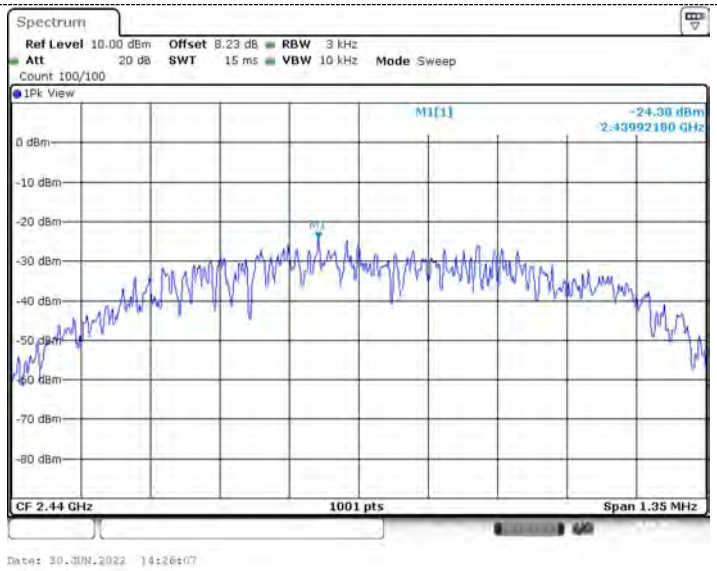
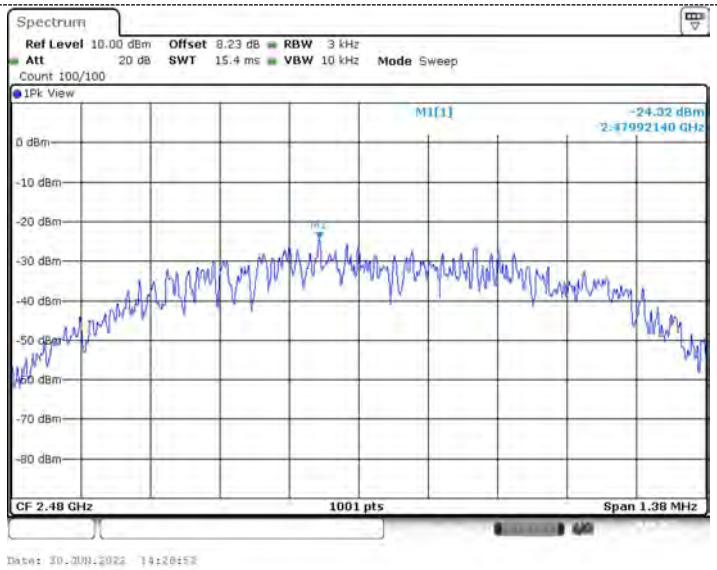
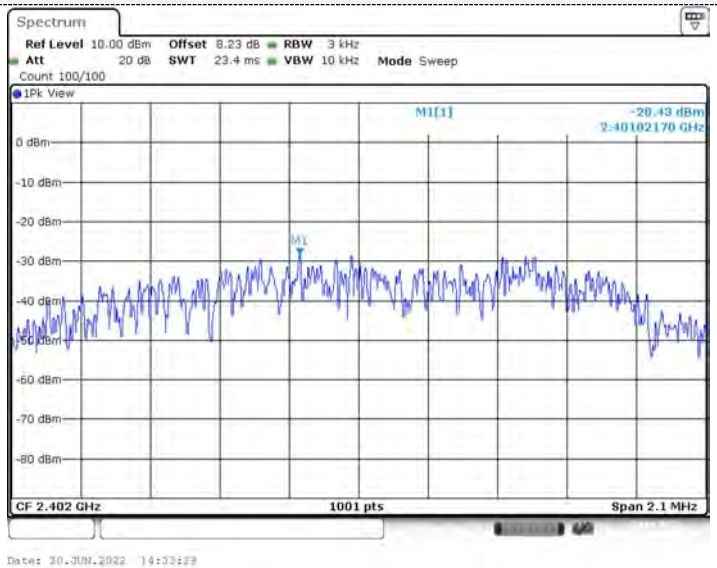
BLE GFSK 1Mpbs

CH00

CH19

Add：West Side of 1/F., Building C, Zone A, Fuyuan New Factory, Jiujiu Industrial Park, Minzhu, Shatou, Shajing, Bao'an District, Shenzhen, Guangdong, China
Tel：+(86) 0755-2985 2678 Fax: +(86) 0755-2985 2397 E-mail：info@gdksign.cn Web: www.gdksign.com



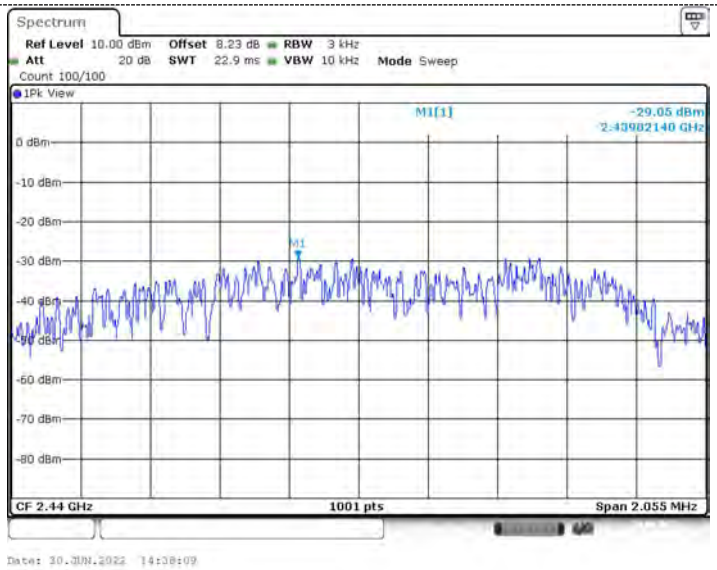
CH39

BLE GFSK 2Mpbs

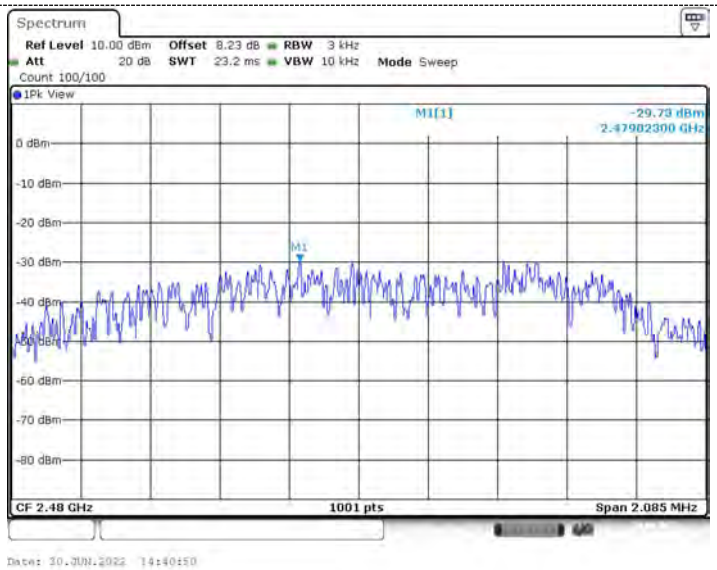


CH00

Add：West Side of 1/F., Building C, Zone A, Fuyuan New Factory, Jiujiu Industrial Park, Minzhu, Shatou, Shajing, Bao'an District, Shenzhen, Guangdong, China
Tel：+(86) 0755-2985 2678 Fax: +(86) 0755-2985 2397 E-mail：info@gdksign.cn Web: www.gdksign.com



CH19



CH39

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4.5.6dB Bandwidth

Limit

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

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 100 KHz RBW and 300 KHz VBW. The 6dB bandwidth is defined as the total spectrum the power of which is higher than peak power minus 6dB.

Test Configuration

Test Results

Type	Channel	6dB Bandwidth (MHz)	Limit (KHz)	Result
GFSK 1Mbps	00	0.92	≥500	Pass
	19	0.90		
	39	0.92		
GFSK 2Mbps	00	1.40	≥500	Pass
	19	1.37		
	39	1.39		

Test plot as follows:

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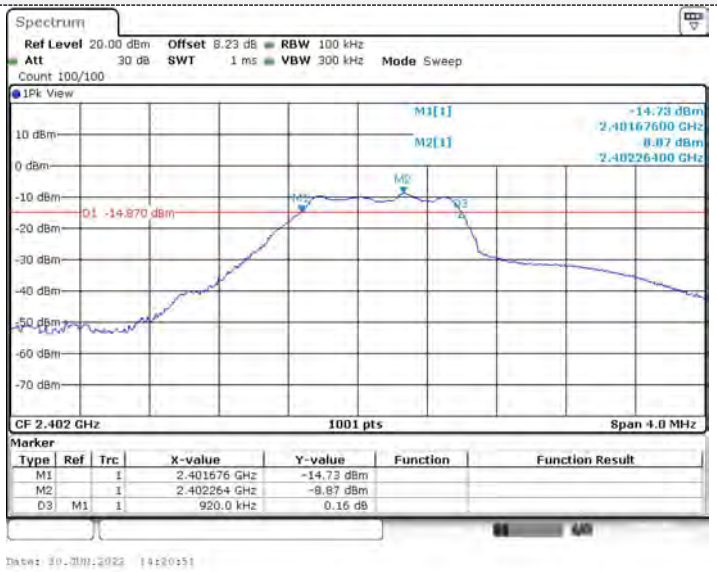
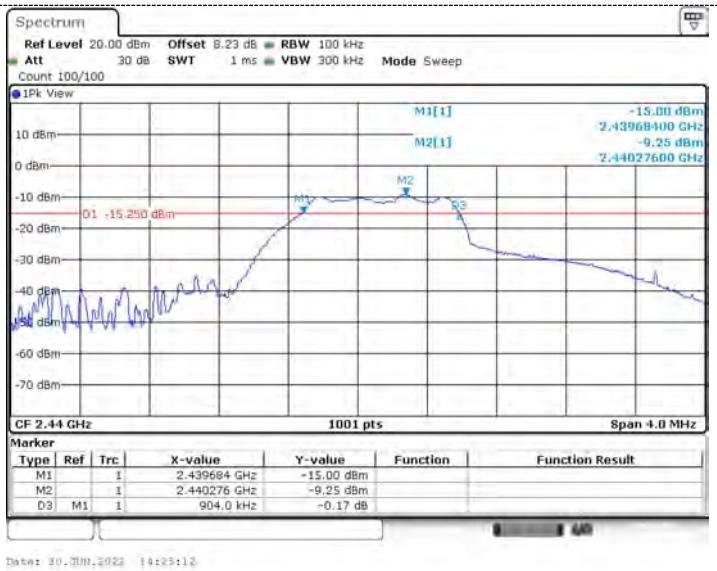
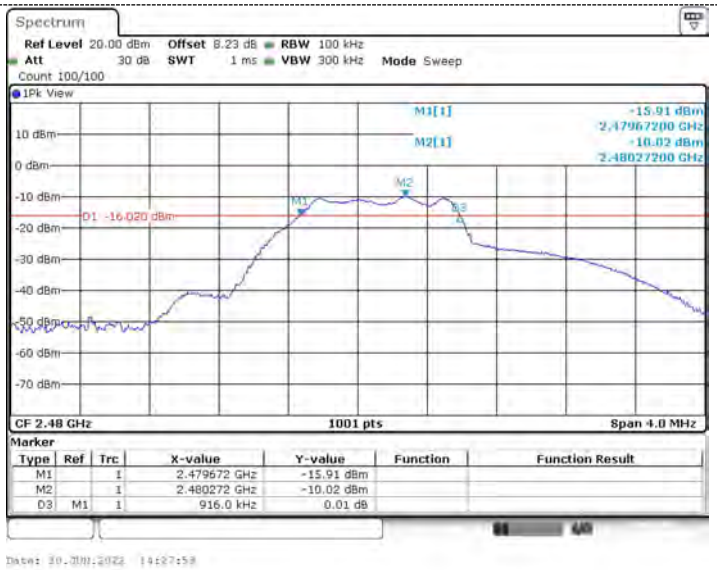
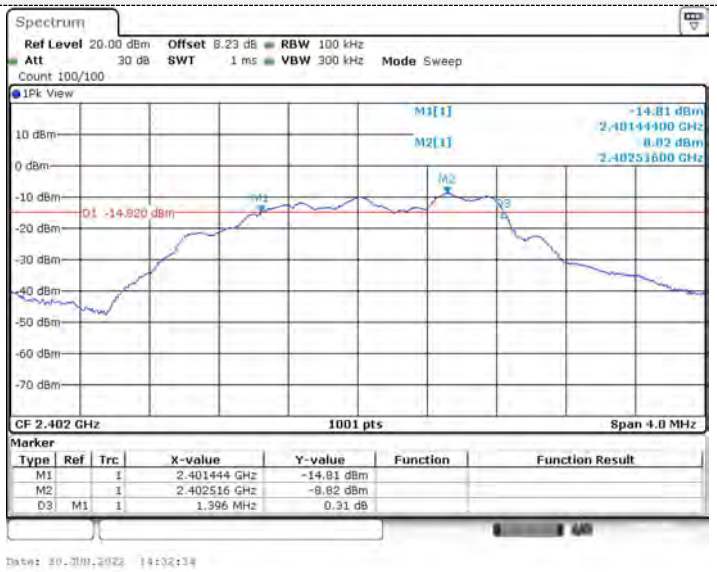
BLE GFSK 1Mpbs

CH00

CH19

Add：West Side of 1/F., Building C, Zone A, Fuyuan New Factory, Jiujiu Industrial Park, Minzhu, Shatou, Shajing, Bao'an District, Shenzhen, Guangdong, China
Tel：+(86) 0755-2985 2678 Fax: +(86) 0755-2985 2397 E-mail：info@gdksign.cn Web: www.gdksign.com



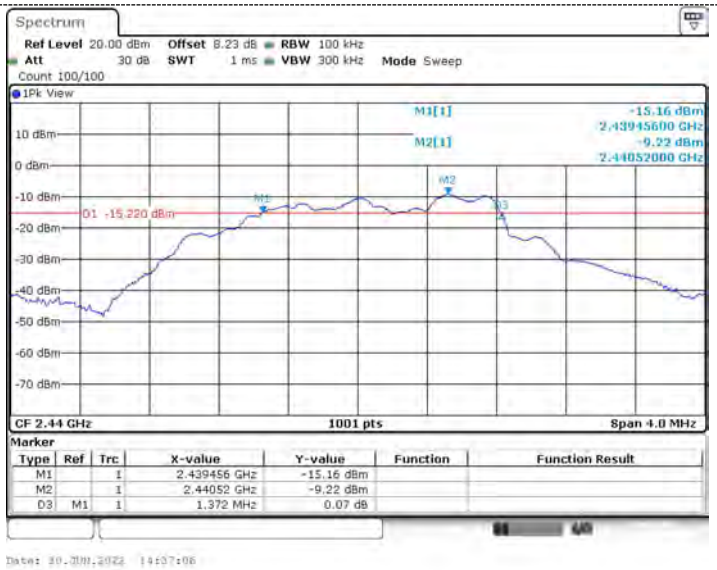
CH39

BLE GFSK 2Mpbs

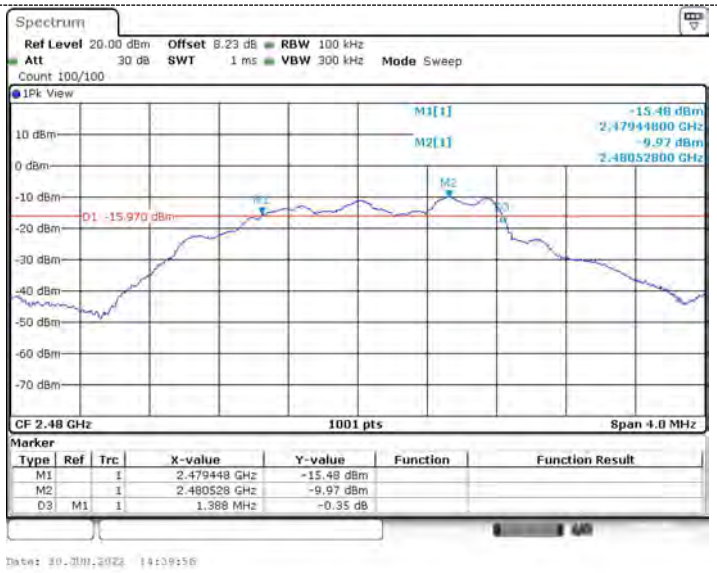


CH00

Add：West Side of 1/F., Building C, Zone A, Fuyuan New Factory, Jiujiu Industrial Park, Minzhu, Shatou, Shajing, Bao'an District, Shenzhen, Guangdong, China
Tel：+(86) 0755-2985 2678 Fax: +(86) 0755-2985 2397 E-mail：info@gdksign.cn Web: www.gdksign.com



CH19



CH39

Add：West Side of 1/F., Building C, Zone A, Fuyuan New Factory, Jiujiu Industrial Park, Minzhu, Shatou, Shajing, Bao'an District, Shenzhen, Guangdong, China
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4.6.Out-of-band Emissions

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 con-ducted or a radiated measurement, pro-vided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter com-plies 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.

Test Procedure

Connect the transmitter output to spectrum analyzer using a low loss RF cable, and set the spectrum analyzer to RBW=100 kHz, VBW= 300 kHz, peak detector , and max hold. Measurements utilizing these setting are made of the in-band reference level, bandedge and out-of-band emissions.

Test Configuration

Test Results

Remark: The measurement frequency range is from 30MHz to the 10th harmonic of the fundamental frequency. The lowest, middle and highest channels are tested to verify the spurious emissions and bandage measurement data.

Test plot as follows:

Add：West Side of 1/F., Building C, Zone A, Fuyuan New Factory, Jiujiu Industrial Park, Minzhu, Shatou, Shajing, Bao'an District, Shenzhen, Guangdong, China
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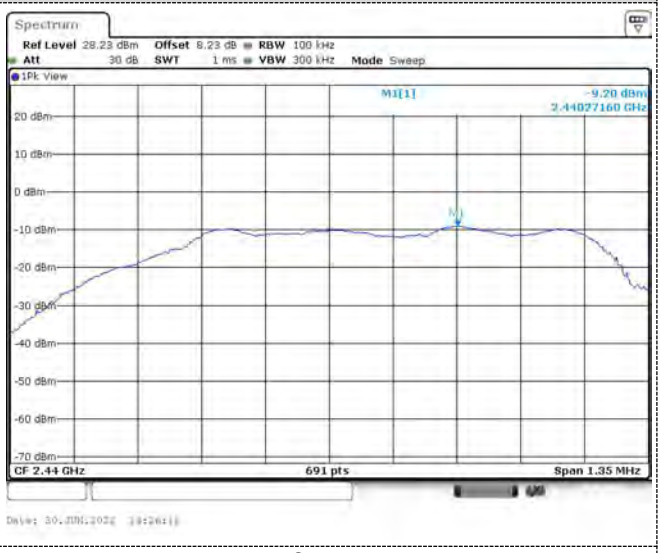
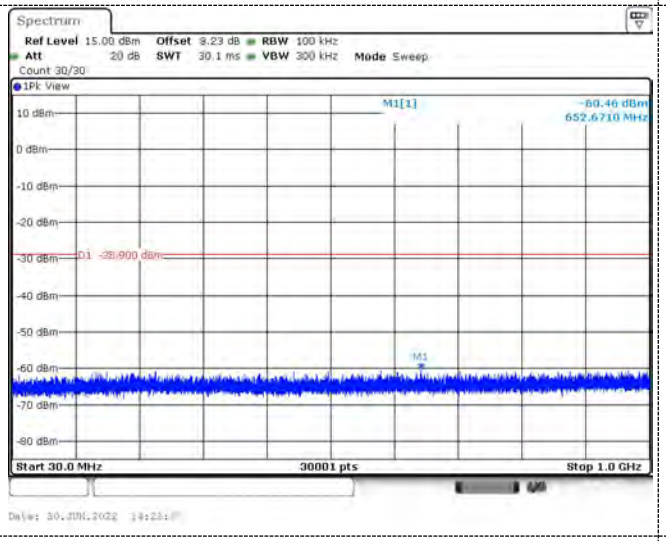
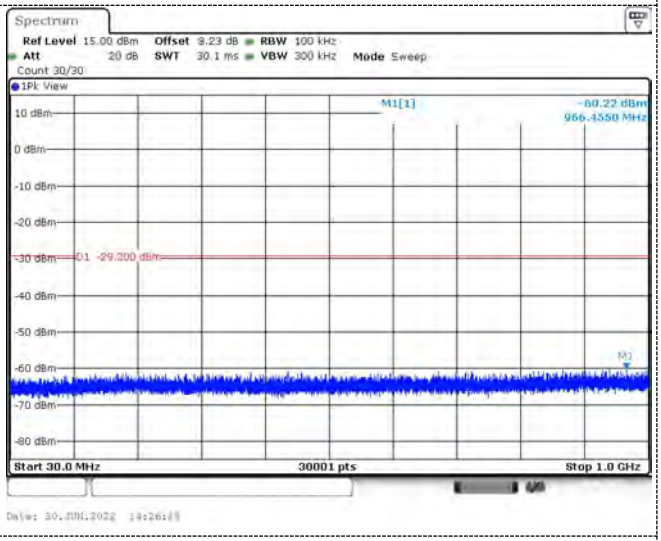
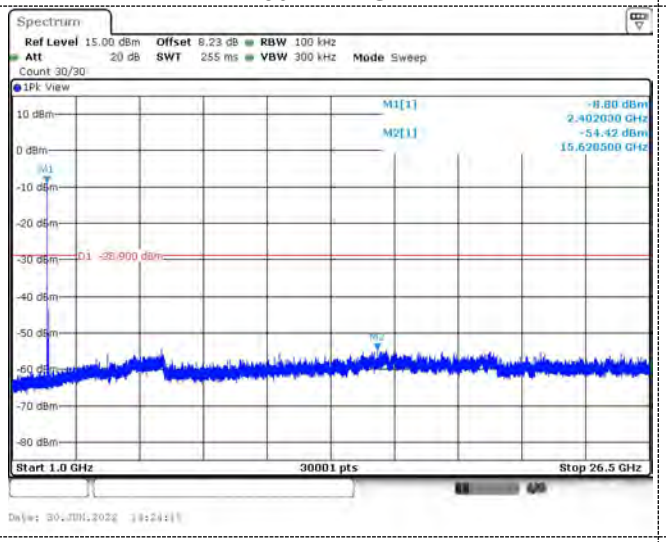
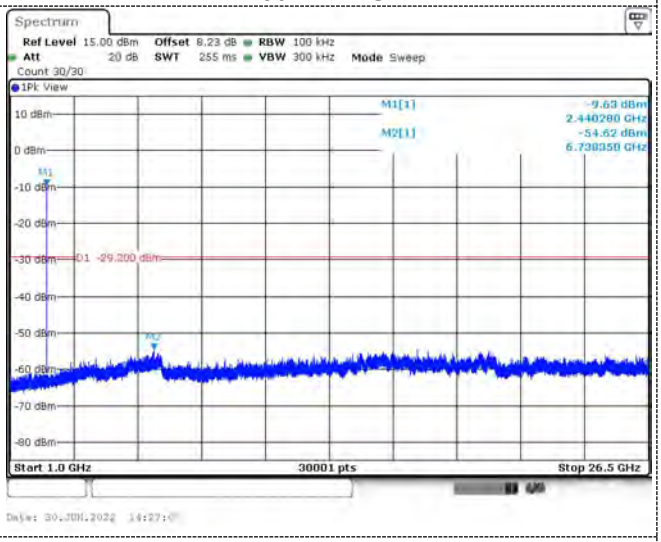
GFSK 1Mbps (CH00)	GFSK 1Mbps (CH39)
	
reference	reference
	
30MHz-1G	30MHz-1G
	
1G-26.5G	1G-26.5G

Add：West Side of 1/F., Building C, Zone A, Fuyuan New Factory, Jiujiu Industrial Park, Minzhu, Shatou, Shajing, Bao'an District, Shenzhen, Guangdong, China
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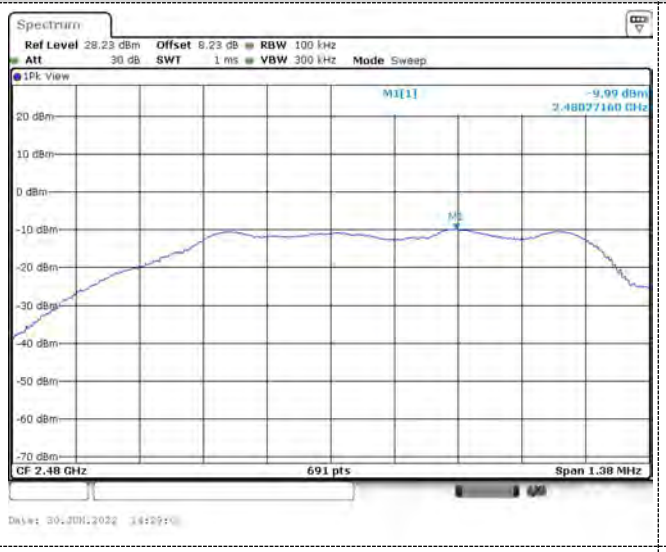
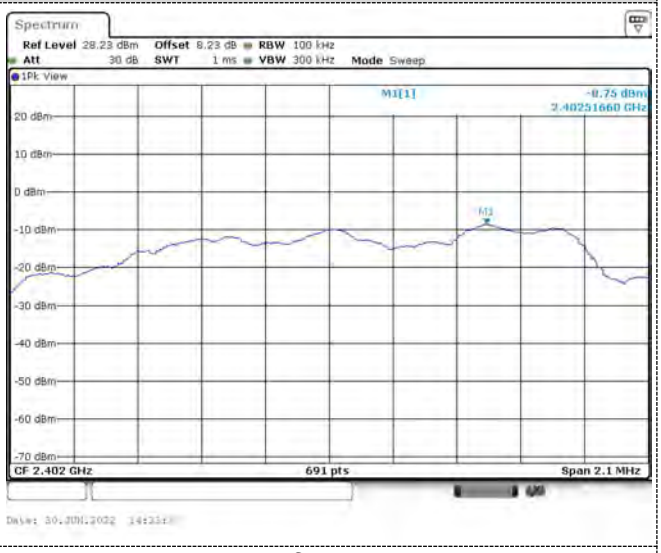
GFSK 1Mbps (CH78)	GFSK 2Mbps (CH00)
	
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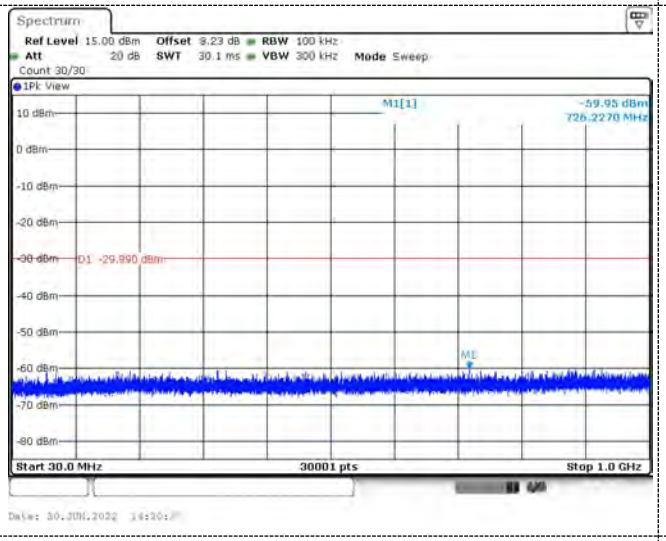
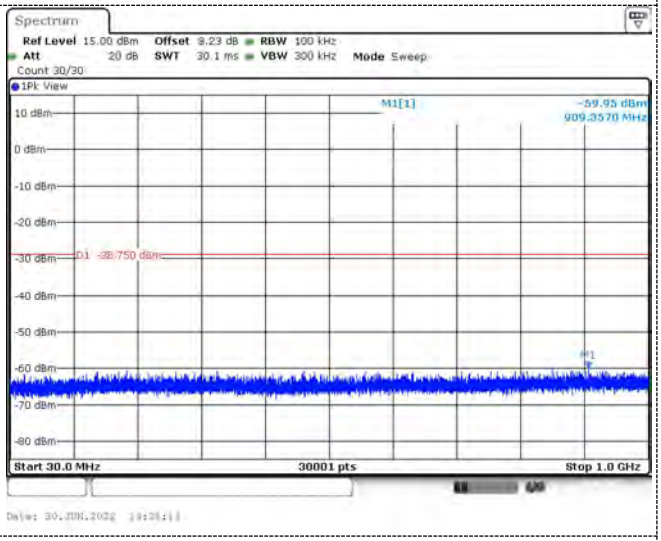
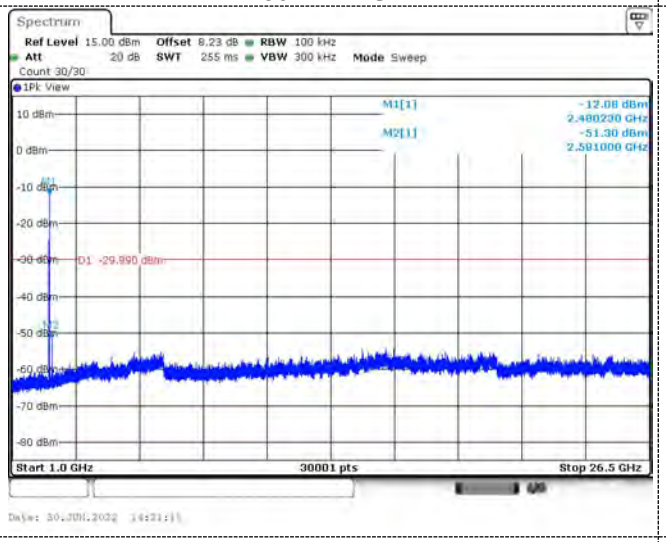
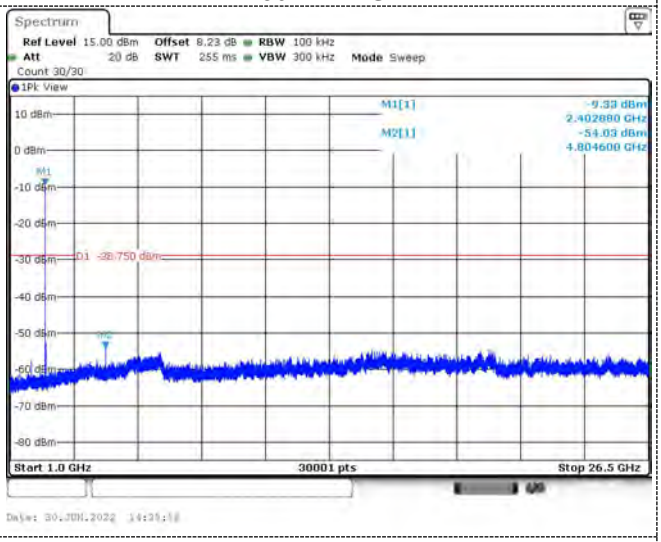
	
30MHz-1G	30MHz-1G
	
1G-26.5G	1G-26.5G

Add：West Side of 1/F., Building C, Zone A, Fuyuan New Factory, Jiujiu Industrial Park, Minzhu, Shatou, Shajing, Bao'an District, Shenzhen, Guangdong, China
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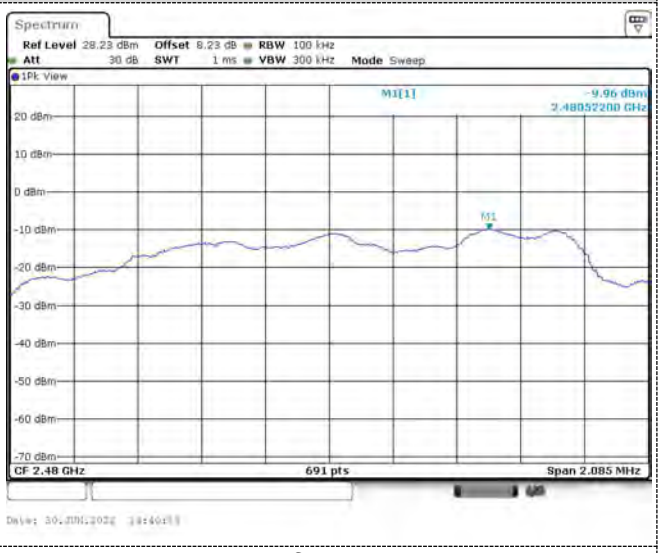
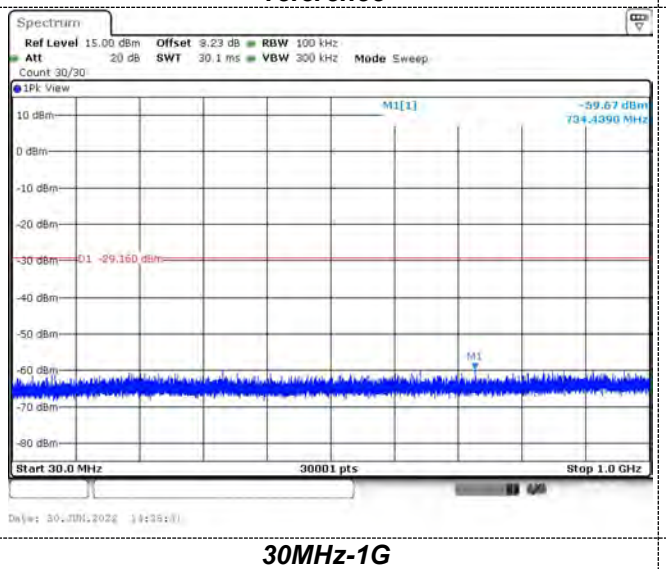
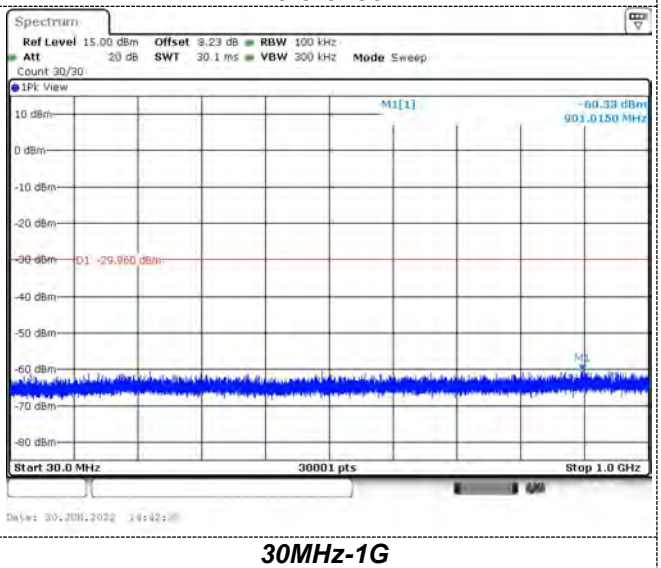
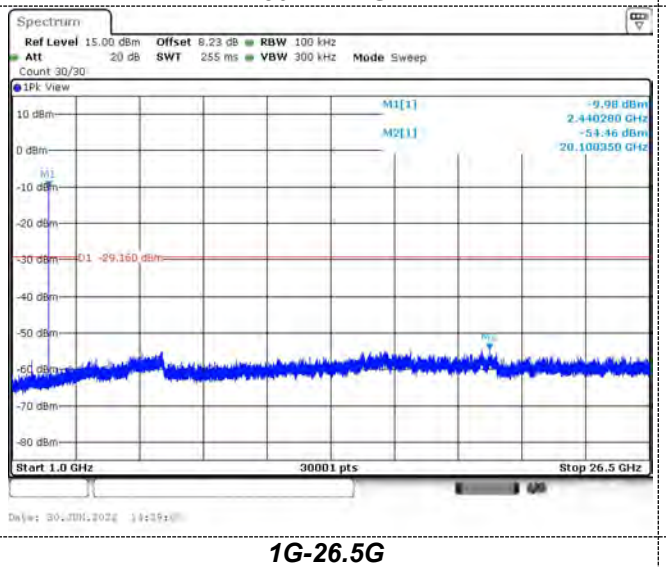
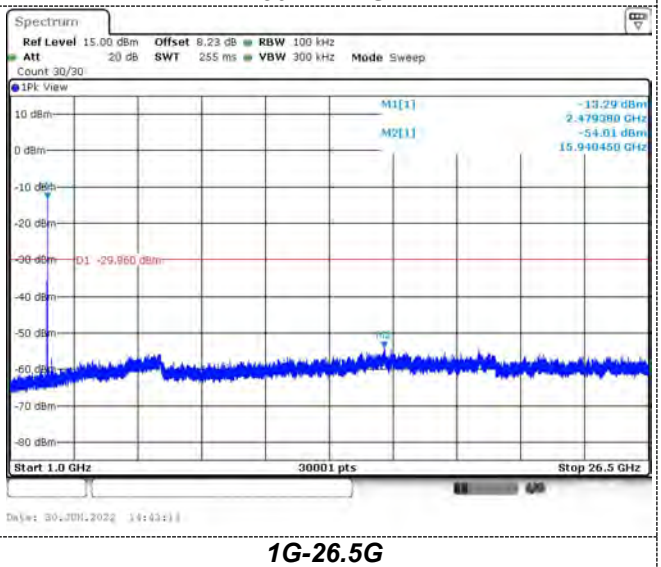
GFSK 2Mbps (CH39)	GFSK 2Mbps (CH78)
	
reference	reference
	
30MHz-1G	30MHz-1G
	
1G-26.5G	1G-26.5G

Add：West Side of 1/F., Building C, Zone A, Fuyuan New Factory, Jiujiu Industrial Park, Minzhu, Shatou, Shajing, Bao'an District, Shenzhen, Guangdong, China
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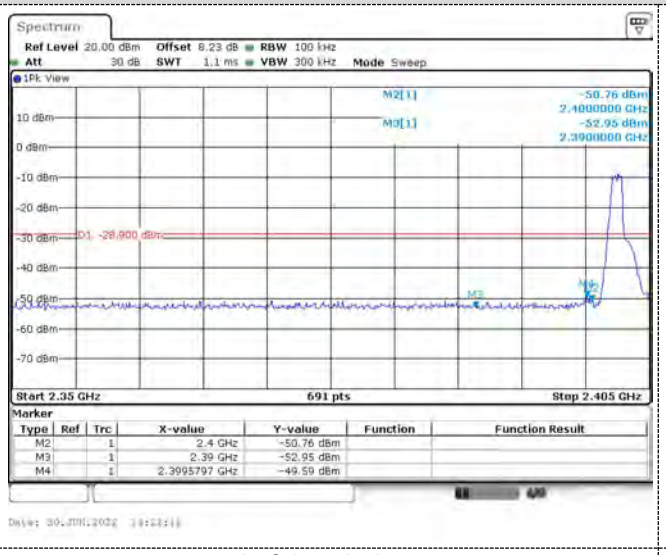
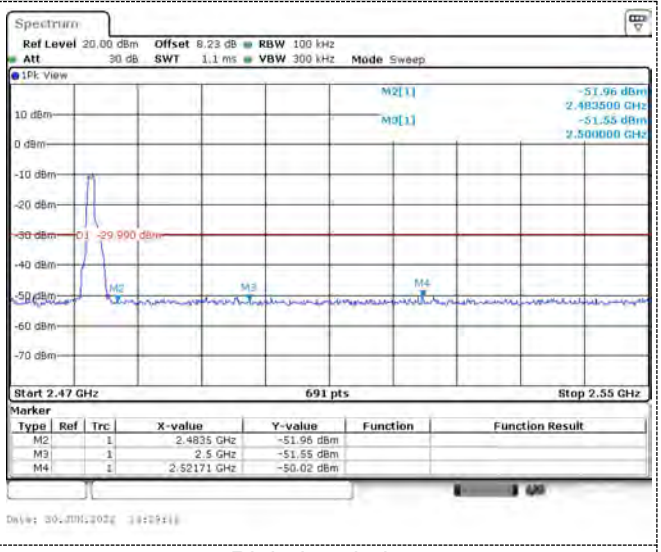
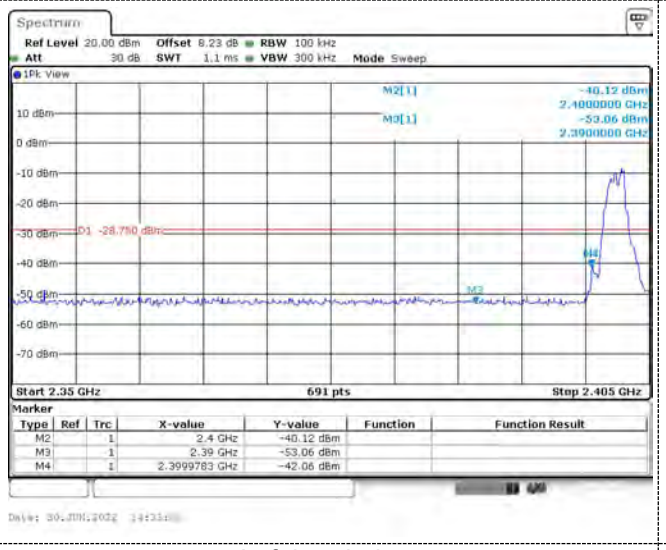
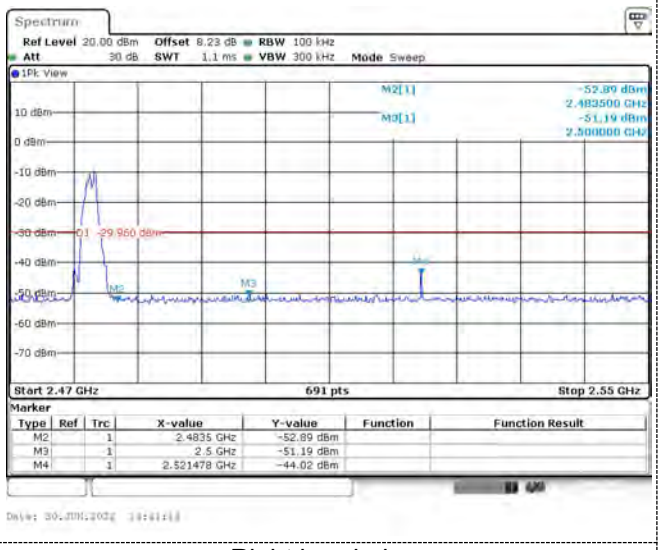
Band-edge Measurements for RF Conducted Emissions:

BLE GFSK 1Mpbs	
	
Left bandedge	Right bandedge

BLE GFSK 2Mpbs	
	
Left bandedge	Right bandedge

Add：West Side of 1/F., Building C, Zone A, Fuyuan New Factory, Jiujiu Industrial Park, Minzhu, Shatou, Shajing, Bao'an District, Shenzhen, Guangdong, China
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4.7.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. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator, the manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited

FCC CFR Title 47 Part 15 Subpart C Section 15.247(c) (1) (I):

(i) Systems operating in the 2400-2483.5 MHz band that is used exclusively for fixed. Point-to-point operations may employ transmitting antennas with directional gain greater than 6dBi provided the maximum conducted output power of the intentional radiator is reduced by 1 dB for every 3 dB that the directional gain of the antenna exceeds 6dBi.

Antenna Connected Construction

The maximum gain of antenna was 0 dBi.

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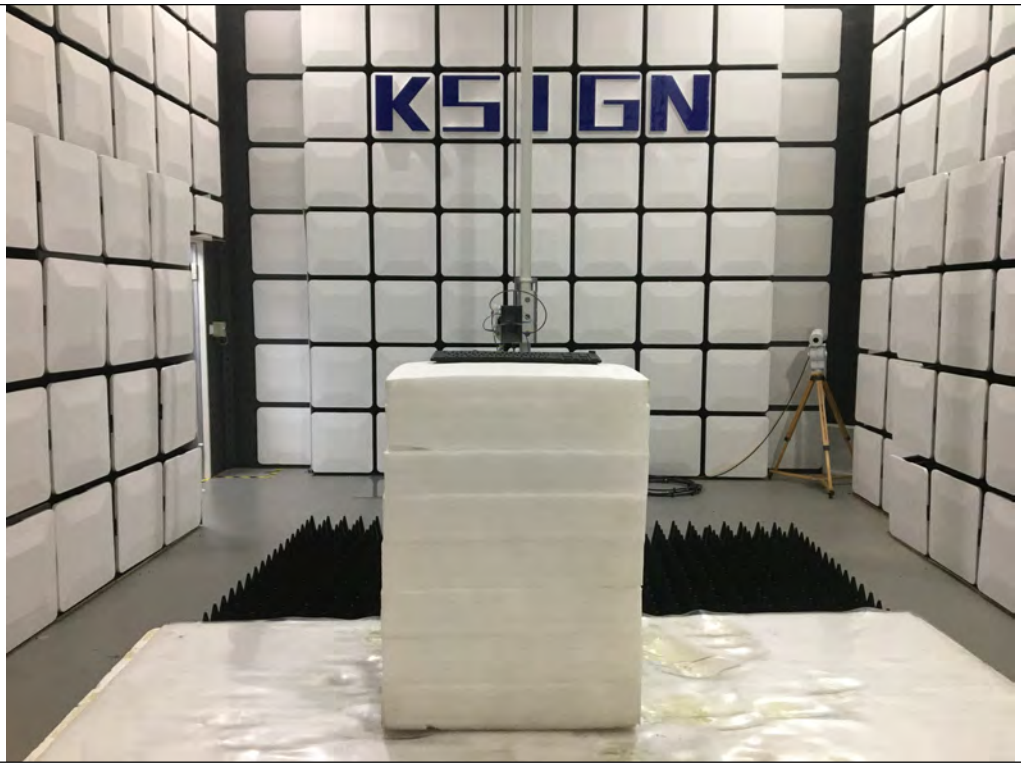
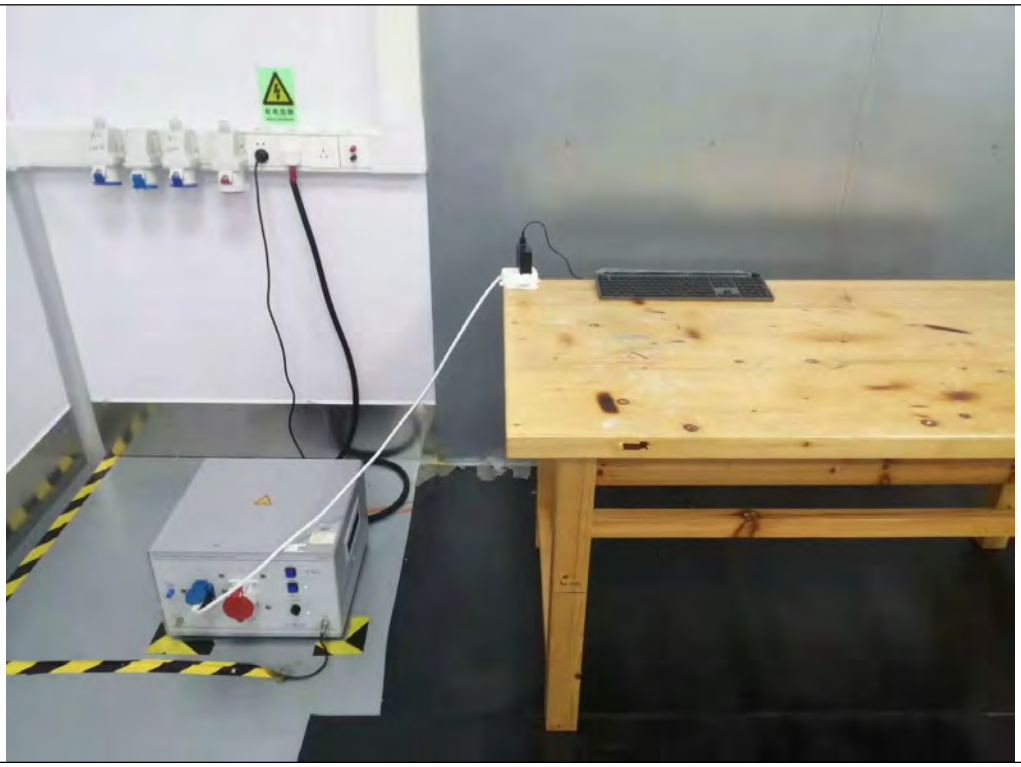
5. Test Setup Photos of the EUT

Radiated Measurement (Below 1GHz)

Radiated Measurement (Above 1GHz)



Add：West Side of 1/F., Building C, Zone A, Fuyuan New Factory, Jiujiu Industrial Park, Minzhu, Shatou, Shajing, Bao'an District, Shenzhen, Guangdong, China
Tel：+(86) 0755-2985 2678 Fax: +(86) 0755-2985 2397 E-mail：info@gdksign.cn Web: www.gdksign.com

Conducted Emission


Add：West Side of 1/F., Building C, Zone A, Fuyuan New Factory, Jiujiu Industrial Park, Minzhu, Shatou, Shajing, Bao'an District, Shenzhen, Guangdong, China
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6. Photos of the EUT

Reference to the test report No. KS2206S2549E02

********** End of Report **********

Add：West Side of 1/F., Building C, Zone A, Fuyuan New Factory, Jiujiu Industrial Park, Minzhu, Shatou, Shajing, Bao'an District, Shenzhen, Guangdong, China
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