

# FCC TEST REPORT

## FCC ID:2AZ95-B101

Report Number..... : ZKT-210616L2662E

Date of Test..... Jun. 07, 2021 to Jun. 15, 2021

Date of issue ..... : Jun. 15, 2021

Total number of pages ..... 33

Test Result ..... : PASS

Testing Laboratory..... : Shenzhen ZKT Technology Co., Ltd.

Address ..... : 1/F, No. 101, Building B, No. 6, Tangwei Community Industrial Avenue, Fuhai Street, Bao'an District, Shenzhen, China

Applicant's name ..... : Shenzhen Anboli Electronic Co., Ltd.

Address ..... : 3/F, Building 1, First Tiegang Industrial Zone, Tiegang Village, Xixiang Street, Bao'an District, Shenzhen, China

Manufacturer's name ..... : Shenzhen Anboli Electronic Co., Ltd.

Address ..... : 3/F, Building 1, First Tiegang Industrial Zone, Tiegang Village, Xixiang Street, Bao'an District, Shenzhen, China

Test specification:

Standard ..... : FCC CFR Title 47 Part 15 Subpart C Section 15.249  
ANSI C63.10:2013

Test procedure..... : /

Non-standard test method ..... : N/A

Test Report Form No. .... : TRF-EL-111\_V0

Test Report Form(s) Originator .... : ZKT Testing

Master TRF ..... : Dated: 2020-01-06

This device described above has been tested by ZKT, and the test results show that the equipment under test (EUT) is in compliance with the FCC requirements. And it is applicable only to the tested sample identified in the report.

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Product name..... : Wireless mouse (Bluetooth BT 5.2+2.4G)

Trademark ..... : N/A

Model/Type reference ..... : A100  
A103, Q23, M3, Q8, V6, UO2, B101Ratings..... : DC 5V from adapter  
DC 3.7V from battery

Testing procedure and testing location:

Testing Laboratory.....: Shenzhen ZKT Technology Co., Ltd.

Address.....: 1/F, No. 101, Building B, No. 6, Tangwei Community  
Industrial Avenue, Fuhai Street, Bao'an District,  
Shenzhen, China

Tested by (name + signature).....: Alen He



Reviewer (name + signature).....: Joe Liu



Approved (name + signature).....: Lake Xie



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## 1.VERSION

Report No.	Version	Description	Approved
ZKT-210616L2662E	Rev.01	Initial issue of report	Jun. 15, 2021

## 2.1 SUMMARY OF TEST RESULTS

Test procedures according to the technical standards:

FCC Part15 (15.249) , Subpart C			
Standard Section	Test Item	Judgment	Remark
FCC part 15.203	Antenna requirement	PASS	
FCC part 15.207	AC Power Line Conducted Emission	PASS	
FCC part 15.249	Fundamental & Radiated Spurious Emission Measurement	PASS	
FCC part 15.249 (a)	Field strength of the fundamental signal	PASS	
FCC part 15.215	20dB Channel Bandwidth	PASS	
FCC part 15.205	Band Edge	PASS	

NOTE:

(1) "N/A" denotes test is not applicable in this Test Report

### 2.11.1 TEST FACILITY

Shenzhen ZKT Technology Co., Ltd.

Add. : 1/F, No. 101, Building B, No. 6, Tangwei Community Industrial Avenue, Fuhai Street, Bao'an District, Shenzhen, China

FCC Test Firm Registration Number: 692225

Designation Number: CN1299

IC Registered No.: 27033

### 2.11.2 MEASUREMENT UNCERTAINTY

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

No.	Item	Uncertainty
1	Conducted Emission Test	$\pm 1.38\text{dB}$
2	RF power conducted	$\pm 0.16\text{dB}$
3	Spurious emissions conducted	$\pm 0.21\text{dB}$
4	All emissions radiated(<1G)	$\pm 4.68\text{dB}$
5	All emissions radiated(>1G)	$\pm 4.89\text{dB}$
6	Temperature	$\pm 0.5^{\circ}\text{C}$
7	Humidity	$\pm 2\%$

### 3. GENERAL INFORMATION

#### 3.1 GENERAL DESCRIPTION OF EUT

Product Name:	Wireless mouse (Bluetooth BT 5.2+2.4G)
Trademark:	N/A
Model No.:	A100 A103, Q23, M3, Q8, V6, UO2, B101
Model Different.:	Only for different model name.
Serial No.:	N/A
Hardware Version:	H1.0
Software Version:	S1.0
Sample(s) Status:	Engineer sample
BT Version:	5.0
Operation Frequency:	2402MHz~2480MHz
Channel Numbers:	2.4G:40 BLE:40
Channel Separation:	2.4G:2MHz BLE:2MHz
Modulation Type:	2.4G: GFSK BLE: GFSK
Antenna Type:	PCB Antenna
Antenna gain:	-2.36dBi
Power supply:	DC 5V from adapter DC 3.7V from battery
Adapter(Provide by test lab):	Manufacturer: Shenzhen Sunshine Technological Co., Ltd. Model: BS-0500500HEN I/P: 100-240V~ 50/60Hz 0.8A Max O/P: 5V 0.5A



Operation Frequency each of channel (BLE&2.4G)							
Channel	Frequency	Channel	Frequency	Channel	Frequency	Channel	Frequency
1	2402 MHz	11	2422 MHz	21	2442 MHz	31	2462 MHz
2	2404 MHz	12	2424 MHz	22	2444 MHz	32	2464 MHz
3	2406 MHz	13	2426 MHz	23	2446 MHz	33	2466 MHz
4	2408 MHz	14	2428 MHz	24	2448 MHz	34	2468 MHz
5	2410 MHz	15	2430 MHz	25	2450 MHz	35	2470 MHz
6	2412 MHz	16	2432 MHz	26	2452 MHz	36	2472 MHz
7	2414 MHz	17	2434 MHz	27	2454 MHz	37	2474 MHz
8	2416 MHz	18	2436 MHz	28	2456 MHz	38	2476 MHz
9	2418 MHz	19	2438 MHz	29	2458 MHz	39	2478 MHz
10	2420 MHz	20	2440 MHz	30	2460 MHz	40	2480 MHz

Note:

In section 15.31(m), regards to the operating frequency range over 10 MHz, the Lowest frequency, the middle frequency, and the highest frequency of channel were selected to perform the test, and the selected channel see below:

Channel	Frequency(2.4G)	Frequency(BLE)
The lowest channel	2402MHz	2402MHz
The middle channel	2440MHz	2440MHz
The Highest channel	2480MHz	2480MHz

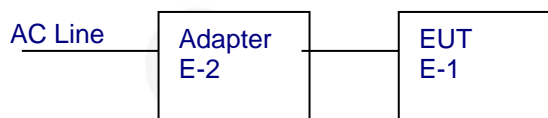
### 3.2 1.1 DESCRIPTION OF TEST MODES

Transmitting mode	Keep the EUT in continuously transmitting mode
Remark: During the test, the test voltage was tuned from 85% to 115% of the nominal rated supply voltage, and found that the worst case was under the nominal rated supply condition. So the report just shows that condition's data.	

Test Software	BT Test Tool
Power level setup	<0dBm

### 3.3 1.2 BLOCK DIGRAM SHOWING THE CONFIGURATION OF SYSTEM TESTED

All Emission



### 3.4 1.3 DESCRIPTION OF SUPPORT UNITS(CONDUCTED MODE)

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

Item	Equipment	Mfr/Brand	Model/Type No.	Series No.	Note
E-1	Wireless mouse (Bluetooth BT 5.2+2.4G)	N/A	A100	N/A	EUT
E-2	Adapter	N/A	BS-0500500HEN	N/A	N/A

Item	Shielded Type	Ferrite Core	Length	Note
USB Line	Unshielded	N/A	0.5m	N/A

Note:

- (1) The support equipment was authorized by Declaration of Confirmation.
- (2) For detachable type I/O cable should be specified the length in cm in 『Length』 column.

### 3.51.4 EQUIPMENTS LIST FOR ALL TEST ITEMS

#### Radiation Test equipment

Item	Equipment	Manufacturer	Type No.	Serial No.	Last calibration	Calibrated until
1	Spectrum Analyzer (9kHz-26.5GHz)	KEYSIGHT	9020A	MY45109572	Sep. 22, 2020	Sep. 21, 2021
2	Spectrum Analyzer (1GHz-40GHz)	Agilent	E4446A	100363	Sep. 22, 2020	Sep. 21, 2021
3	Test Receiver (9kHz-7GHz)	R&S	ESC17	101169	Sep. 22, 2020	Sep. 21, 2021
4	Bilog Antenna (30MHz-1400MHz)	Schwarzbeck	VULB9168	00877	Sep. 22, 2020	Sep. 21, 2021
5	Horn Antenna (1GHz-18GHz)	SCHWARZBEC K	BBHA9120D	1541	Sep. 22, 2020	Sep. 21, 2021
6	Horn Antenna (18GHz-40GHz)	A.H. System	SAS-574	588	Sep. 22, 2020	Sep. 21, 2021
7	Amplifier (30-1000MHz)	EM Electronics	EM330 Amplifier	N/A	Sep. 22, 2020	Sep. 21, 2021
8	Amplifier (1GHz-40GHz)	全聚达	DLE-161	097	Sep. 22, 2020	Sep. 21, 2021
9	Loop Antenna (9KHz-30MHz)	SCHWARZBEC K	FMZB1519B	014	Sep. 22, 2020	Sep. 21, 2021
10	RF cables1 (9kHz-30MHz)	N/A	9kHz-30MHz	N/A	Sep. 22, 2020	Sep. 21, 2021
11	RF cables2 (30MHz-1GHz)	N/A	30MHz-1GHz	N/A	Sep. 22, 2020	Sep. 21, 2021
12	RF cables3 (1GHz-40GHz)	N/A	1GHz-40GHz	N/A	Sep. 22, 2020	Sep. 21, 2021
13	CMW500 Test	R&S	CMW500	106504	Sep. 22, 2020	Sep. 21, 2021
14	ESG Signal Generator	Agilent	E4421B	GB40051203	Sep. 22, 2020	Sep. 21, 2021
15	Signal Generator	Agilent	N5182A	MY47420215	Sep. 22, 2020	Sep. 21, 2021
16	D.C. Power Supply	LongWei	TPR-6405D	\	\	\
17	Software	Frad	EZ-EMC	FA-03A2 RE	\	\

#### Conduction Test equipment

Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Last calibration	Calibrated until
1	LISN	R&S	ENV216	101471	Sep. 22, 2020	Sep. 21, 2021
2	LISN	CYBERTEK	EM5040A	E185040014 <sub>9</sub>	Sep. 22, 2020	Sep. 21, 2021
3	Test Cable	N/A	C01	N/A	Sep. 22, 2020	Sep. 21, 2021
4	Test Cable	N/A	C02	N/A	Sep. 22, 2020	Sep. 21, 2021
5	EMI Test Receiver	R&S	ESRP3	101946	Sep. 22, 2020	Sep. 21, 2021
6	Absorbing Clamp	DZ	ZN23201	N/A	Sep. 22, 2020	Sep. 21, 2021

#### 4. EMC EMISSION TEST

##### 4.1 1.5 CONDUCTED EMISSION MEASUREMENT

Test Requirement:	FCC Part15 C Section 15.207
Test Method:	ANSI C63.10:2013
Test Frequency Range:	150KHz to 30MHz
Receiver setup:	RBW=9KHz, VBW=30KHz, Sweep time=auto

##### 4.1.1 1.5.1 POWER LINE CONDUCTED EMISSION Limits

FREQUENCY (MHz)	Limit (dBuV)		Standard
	Quasi-peak	Average	
0.15 -0.5	66 - 56 *	56 - 46 *	FCC
0.50 -5.0	56.00	46.00	FCC
5.0 -30.0	60.00	50.00	FCC

Note:

(1) \*Decreases with the logarithm of the frequency.

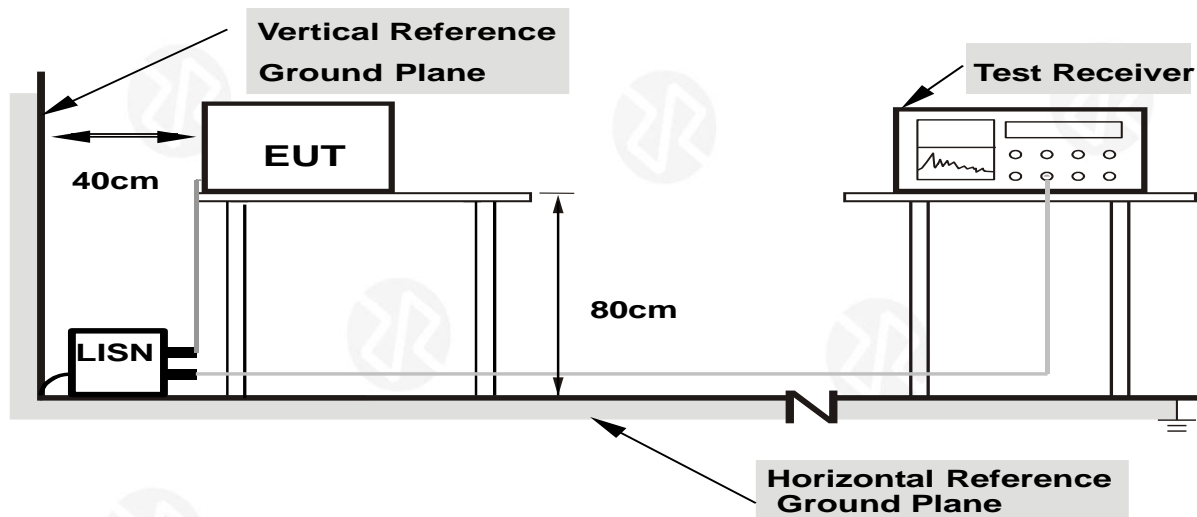
##### 4.1.2 1.5.2 TEST PROCEDURE

- The EUT was placed 0.8 meters from the horizontal ground plane with EUT being connected to the power mains through a line impedance stabilization network (LISN). All other support equipments powered from additional LISN(s). The LISN provide 50 Ohm/ 50uH of coupling impedance for the measuring instrument.
- Interconnecting cables that hang closer than 40 cm to the ground plane shall be folded back and forth in the center forming a bundle 30 to 40 cm long.
- I/O cables that are not connected to a peripheral shall be bundled in the center. The end of the cable may be terminated, if required, using the correct terminating impedance. The overall length shall not exceed 1 m.
- LISN at least 80 cm from nearest part of EUT chassis.
- For the actual test configuration, please refer to the related Item –EUT Test Photos.

##### 4.1.3 1.5.3 DEVIATION FROM TEST STANDARD

No deviation

#### 4.1.4 1.5.4 TEST SETUP



**Note: 1. Support units were connected to second LISN.**

**2. Both of LISNs (AMN) are 80 cm from EUT and at least 80 from other units and other metal planes**

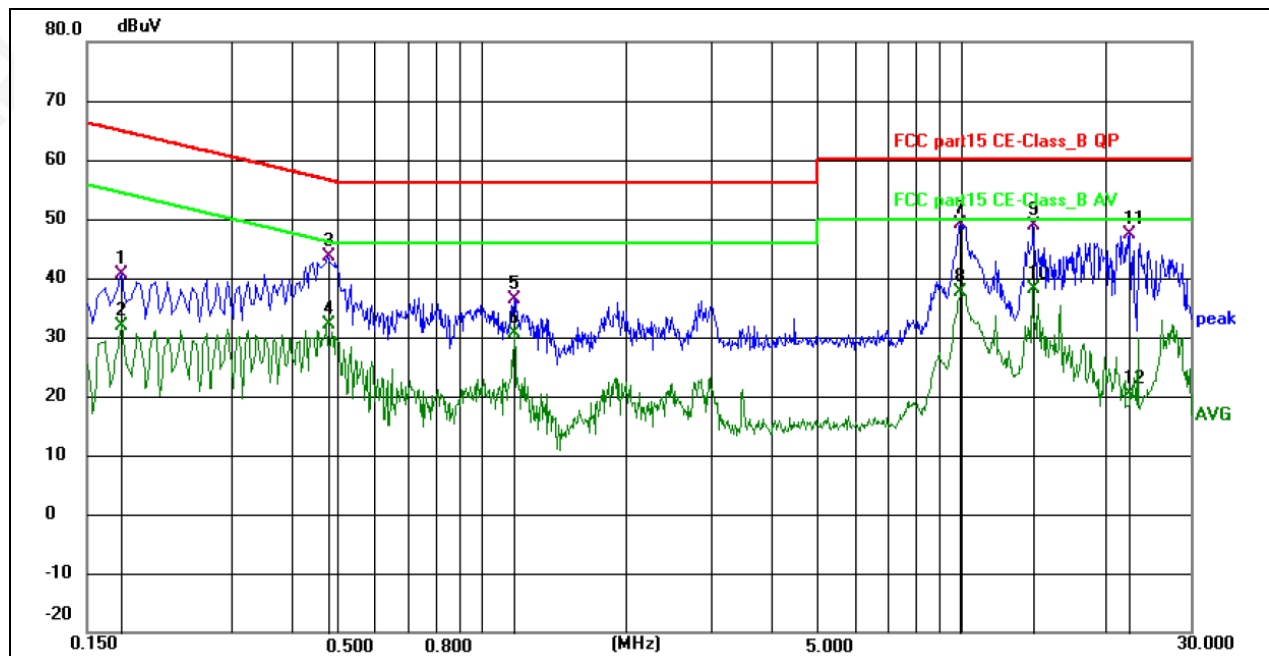
#### 4.1.5 1.5.5 EUT OPERATING CONDITIONS

The EUT was configured for testing in a typical fashion (as a customer would normally use it). The EUT has been programmed to continuously transmit during test. This operating condition was tested and used to collect the included data.

We pretest all voltage and all mode, the worst mode was AC 120V and GFSK low channel, and the data recording in the report.

#### 4.1.6 TEST RESULTS

Temperature :	26°C	Relative Humidity:	54%
Pressure :	101kPa	Phase :	L
Test Voltage :	AC 120V/60Hz		



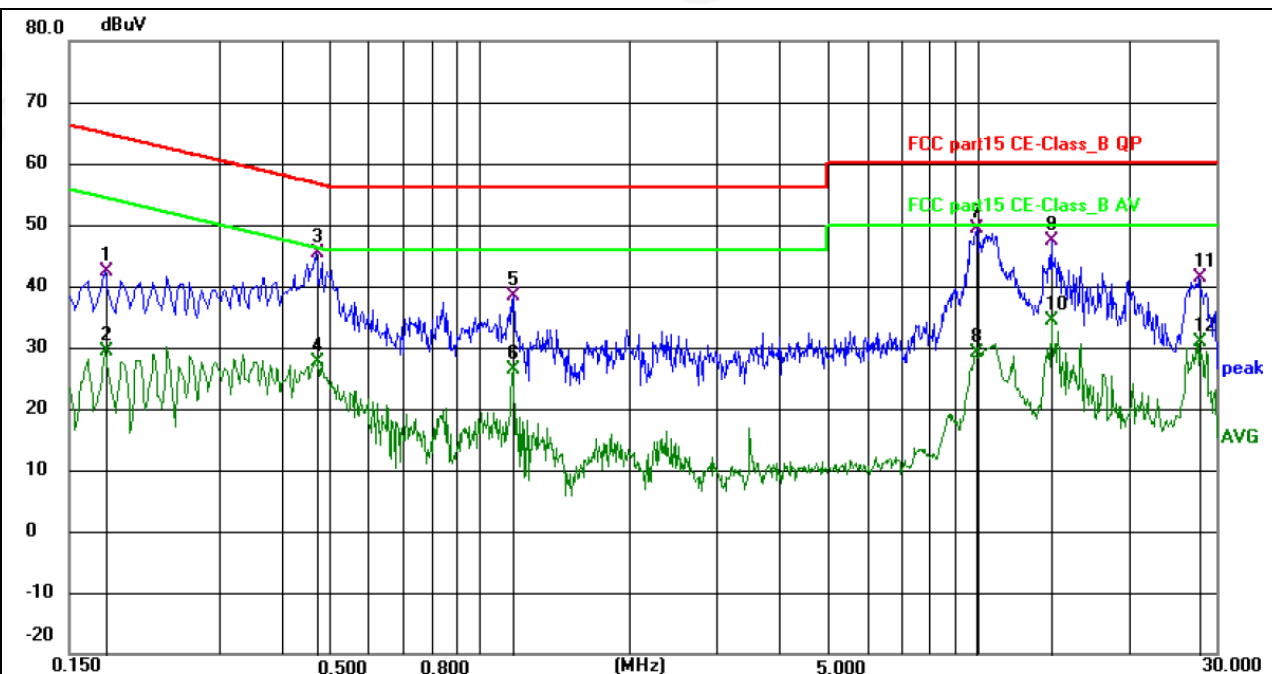
No.	Frequency (MHz)	Reading (dBuV)	Factor (dB)	Level (dBuV)	Limit (dBuV)	Margin (dB)	Detector	P/F	Remark
1	0.1768	30.57	10.13	40.70	64.63	23.93	QP	P	
2	0.1768	21.74	10.13	31.87	54.63	22.76	AVG	P	
3	0.4784	34.17	9.34	43.51	56.37	12.86	QP	P	
4	0.4784	22.77	9.34	32.11	46.37	14.26	AVG	P	
5	1.1669	26.74	9.54	36.28	56.00	19.72	QP	P	
6	1.1669	21.08	9.54	30.62	46.00	15.38	AVG	P	
7 *	9.9510	39.02	10.00	49.02	60.00	10.98	QP	P	
8	9.9510	27.64	10.00	37.64	50.00	12.36	AVG	P	
9	14.0864	38.63	10.17	48.80	60.00	11.20	QP	P	
10	14.0864	27.93	10.17	38.10	50.00	11.90	AVG	P	
11	22.4340	36.49	10.88	47.37	60.00	12.63	QP	P	
12	22.4340	9.45	10.88	20.33	50.00	29.67	AVG	P	

#### Notes:

1. An initial pre-scan was performed on the line and neutral lines with peak detector.
2. Quasi-Peak and Average measurement were performed at the frequencies with maximized peak emission.
3. Measurement Level = Reading level + Correct Factor



Temperature :	26°C	Relative Humidity:	54%
Pressure :	101kPa	Phase :	N
Test Voltage :	AC 120V/60Hz		



No.	Frequency (MHz)	Reading (dBuV)	Factor (dB)	Level (dBuV)	Limit (dBuV)	Margin (dB)	Detector	P/F	Remark
1	0.1770	32.26	10.12	42.38	64.63	22.25	QP	P	
2	0.1770	19.34	10.12	29.46	54.63	25.17	AVG	P	
3	0.4695	35.97	9.34	45.31	56.52	11.21	QP	P	
4	0.4695	18.34	9.34	27.68	46.52	18.84	AVG	P	
5	1.1669	28.81	9.54	38.35	56.00	17.65	QP	P	
6	1.1669	16.80	9.54	26.34	46.00	19.66	AVG	P	
7 *	9.9510	39.30	10.00	49.30	60.00	10.70	QP	P	
8	9.9510	19.12	10.00	29.12	50.00	20.88	AVG	P	
9	14.0415	37.10	10.17	47.27	60.00	12.73	QP	P	
10	14.0415	24.20	10.17	34.37	50.00	15.63	AVG	P	
11	27.7485	30.23	11.06	41.29	60.00	18.71	QP	P	
12	27.7485	19.92	11.06	30.98	50.00	19.02	AVG	P	

**Notes:**

1. An initial pre-scan was performed on the line and neutral lines with peak detector.
2. Quasi-Peak and Average measurement were performed at the frequencies with maximized peak emission.
3. Measurement Level = Reading level + Correct Factor

#### 4.2 1.6RADIATED EMISSION MEASUREMENT

Test Requirement:	FCC Part15 C Section 15.209				
Test Method:	ANSI C63.10:2013				
Test Frequency Range:	9kHz to 25GHz				
Test site:	Measurement Distance: 3m				
Receiver setup:	Frequency	Detector	RBW	VBW	Value
	9KHz-150KHz	Quasi-peak	200Hz	600Hz	Quasi-peak
	150KHz-30MHz	Quasi-peak	9KHz	30KHz	Quasi-peak
	30MHz-1GHz	Quasi-peak	100KHz	300KHz	Quasi-peak
	Above 1GHz	Peak	1MHz	3MHz	Peak
		Peak	1MHz	10Hz	Average

##### 4.2.1 1.6.1RADIATED EMISSION LIMITS

Frequencies (MHz)	Field Strength (micorvolts/meter)	Measurement Distance (meters)
0.009~0.490	2400/F(KHz)	300
0.490~1.705	24000/F(KHz)	30
1.705~30.0	30	30
30~88	100	3
88~216	150	3
216~960	200	3
Above 960	500	3

The field strength of emissions from intentional radiators operated within these frequency bands shall comply with the following:

Fundamental frequency	Field strength of fundamental (millivolts/meter)	Field strength of harmonics (microvolts/meter)
902-928 MHz	50	500
2400-2483.5 MHz	50	500
5725-5875 MHz	50	500
24.0-24.25 GHz	250	2500

##### LIMITS OF RADIATED EMISSION MEASUREMENT

FREQUENCY (MHz)	Limit (dBuV/m) (at 3M)	
	PEAK	AVERAGE
Above 1000	74	54

Notes:

- (1) The limit for radiated test was performed according to FCC PART 15C.
- (2) The tighter limit applies at the band edges.
- (3) Emission level (dBuV/m)=20log Emission level (uV/m).

##### 4.2.2 1.6.2TEST PROCEDURE

- The measuring distance of at 3 m shall be used for measurements at frequency up to 25GHz. For frequencies above 1GHz, any suitable measuring distance may be used.
- The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter semi-chamber test. The table was rotated 360 degrees to determine the position of the highest radiation.



- c. The height of the equipment or of the substitution antenna shall be 0.8m; above 1GHz, the height was 1.5m, the height of the test antenna shall vary between 1 m to 4 m. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
- d. The initial step in collecting conducted emission data is a spectrum analyzer peak detector mode pre-scanning the measurement frequency range. Significant peaks are then marked and then Quasi Peak detector mode re-measured.
- e. If the Peak Mode measured value compliance with and lower than Quasi Peak Mode Limit, the EUT shall be deemed to meet QP Limits and then no additional QP Mode measurement performed.
- f. For the actual test configuration, please refer to the related Item –EUT Test Photos.
- g. For the radiated emission test above 1GHz:

Place the measurement antenna away from each area of the EUT determined to be a source of emissions at the specified measurement distance, while keeping the measurement antenna aimed at the source of emissions at each frequency of significant emissions, with polarization oriented for maximum response.

The measurement antenna may have to be higher or lower than the EUT, depending on the radiation pattern of the emission and staying aimed at the emission source for receiving the maximum signal. The final measurement antenna elevation shall be that which maximizes the emissions. The measurement antenna elevation for maximum emissions shall be restricted to a range of heights of from 1 m to 4 m above the ground or reference ground plane.

Note:

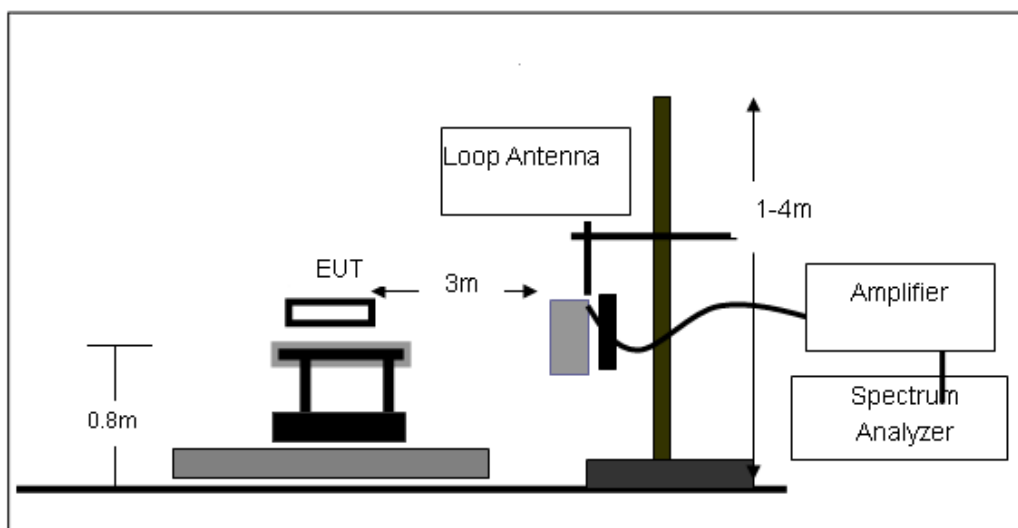
Both horizontal and vertical antenna polarities were tested and performed pretest to three orthogonal axis. The worst case emissions were reported

#### 4.2.3 1.6.3 DEVIATION FROM TEST STANDARD

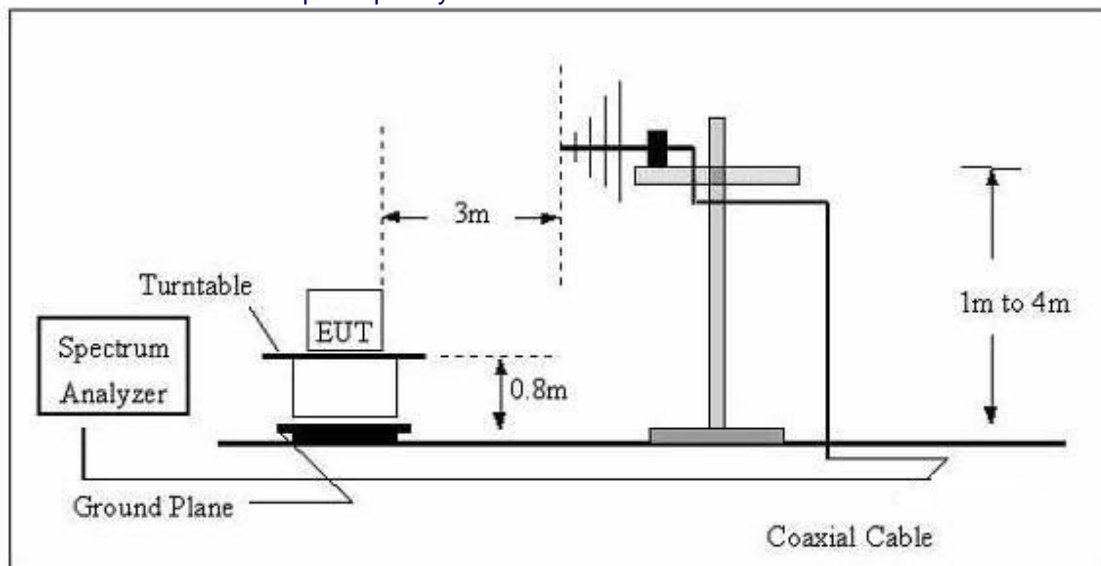
No deviation

#### 4.2.4 1.6.4 TEST SETUP

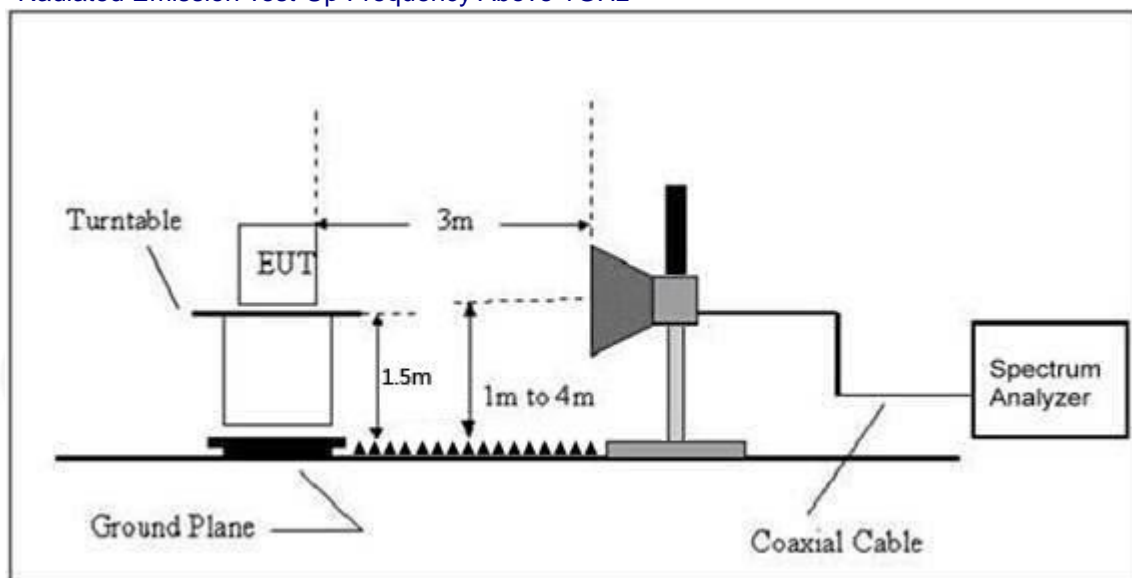
##### (A) Radiated Emission Test-Up Frequency Below 30MHz



(B) Radiated Emission Test-Up Frequency 30MHz~1GHz



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



4.2.5 1.6.5EUT OPERATING CONDITIONS

The EUT tested system was configured as the statements of 2.4 Unless otherwise a special operating condition is specified in the follows during the testing.

4.2.6 TEST RESULTS (Between 9KHz – 30 MHz)

The emission from 9 kHz to 30MHz was pre-tested and found the result was 20dB lower than the limit, and according to 15.31(o) & RSS-Gen 6.13, the test results no need to reported.

## Field Strength of The Fundamental Signal

### 2.4G GFSK

Peak value:

Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamplifier Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	polarization
2402	93.10	27.58	5.39	30.18	95.89	114	-18.11	Vertical
2402	91.88	27.58	5.39	30.18	94.67	114	-19.33	Horizontal
2440	90.69	27.55	5.43	30.06	93.61	114	-20.39	Vertical
2440	92.73	27.55	5.43	30.06	95.65	114	-18.35	Horizontal
2480	93.98	27.52	5.47	29.93	97.04	114	-16.96	Vertical
2480	91.86	27.52	5.47	29.93	94.92	114	-19.08	Horizontal

Average value:

Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamplifier Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	polarization
2402	79.79	27.58	5.39	30.18	82.58	94	-11.42	Vertical
2402	80.81	27.58	5.39	30.18	83.60	94	-10.40	Horizontal
2440	83.04	27.55	5.43	30.06	85.96	94	-8.04	Vertical
2440	79.80	27.55	5.43	30.06	82.72	94	-11.28	Horizontal
2480	81.92	27.52	5.47	29.93	84.98	94	-9.02	Vertical
2480	77.91	27.52	5.47	29.93	80.97	94	-13.03	Horizontal

### BLE GFSK

Peak value:

Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamplifier Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	polarization
2402	93.02	27.58	5.39	30.18	95.81	114	-18.19	Vertical
2402	92.44	27.58	5.39	30.18	95.23	114	-18.77	Horizontal
2440	91.23	27.55	5.43	30.06	94.15	114	-19.85	Vertical
2440	92.13	27.55	5.43	30.06	95.05	114	-18.95	Horizontal
2480	92.88	27.52	5.47	29.93	95.94	114	-18.06	Vertical
2480	92.03	27.52	5.47	29.93	95.09	114	-18.91	Horizontal

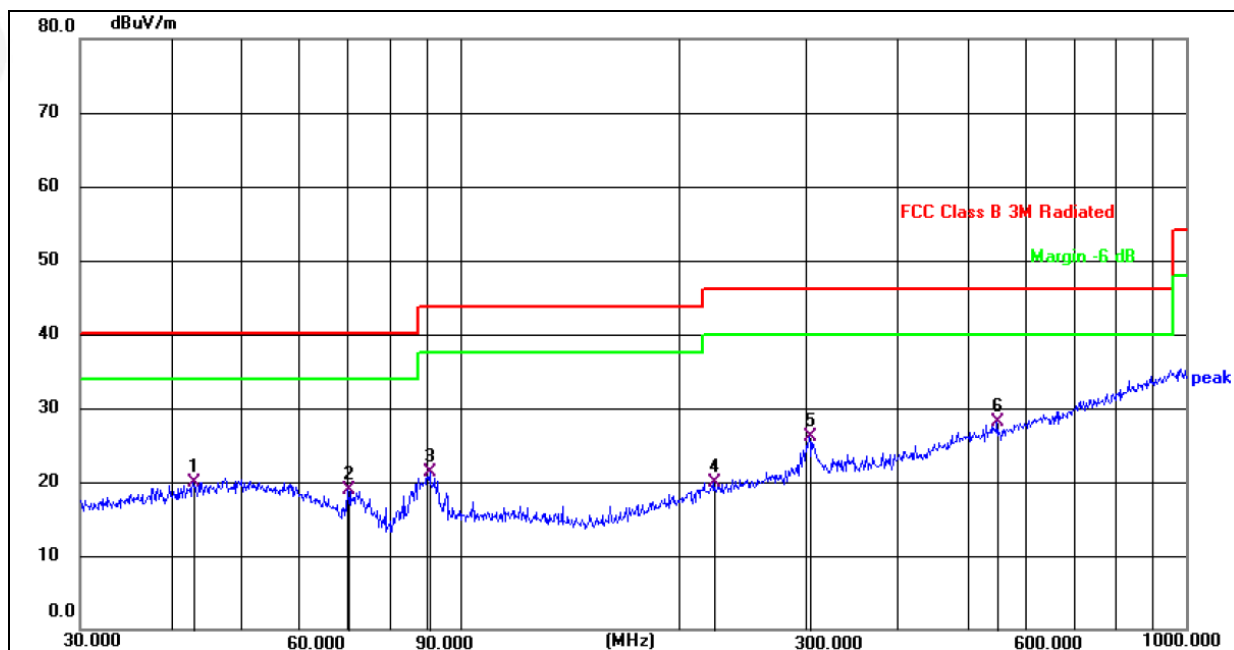
Average value:

Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamplifier Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	polarization
2402	81.18	27.58	5.39	30.18	83.97	94	-10.03	Vertical
2402	81.85	27.58	5.39	30.18	84.64	94	-9.36	Horizontal
2440	81.69	27.55	5.43	30.06	84.61	94	-9.39	Vertical
2440	81.05	27.55	5.43	30.06	83.97	94	-10.03	Horizontal
2480	81.34	27.52	5.47	29.93	84.40	94	-9.60	Vertical
2480	80.96	27.52	5.47	29.93	84.02	94	-9.98	Horizontal

2 Between 30MHz – 1GHz

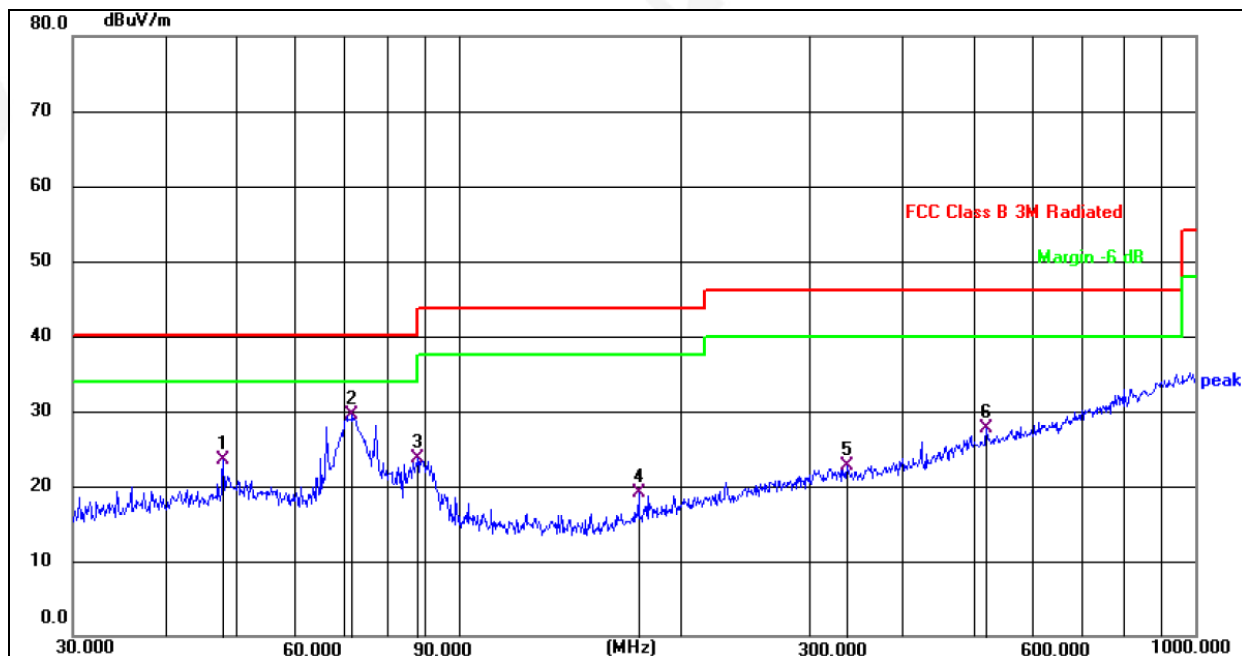
We pretest all voltage and all mode, the worst mode was AC 120V and 2.4G low channel, and the data recording in the report.

Temperature:	26°C	Relative Humidity:	54%
Pressure:	101 kPa	Polarization:	Horizontal
Test Voltage:	DC 5V(AC 120V/60Hz)		



No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV/m	Limit dB/m	Over dB	Detector
1		42.8998	33.86	-14.01	19.85	40.00	20.15	QP
2		70.0903	36.27	-17.28	18.99	40.00	21.01	QP
3		90.8554	38.47	-17.25	21.22	43.50	22.28	QP
4		223.7334	35.00	-15.00	20.00	46.00	26.00	QP
5		302.4812	38.58	-12.47	26.11	46.00	19.89	QP
6	*	549.0195	35.56	-7.41	28.15	46.00	17.85	QP

Temperature:	26°C	Relative Humidity:	54%
Pressure:	101kPa	Polarization:	Vertical
Test Voltage:	DC 5V(AC 120V/60Hz)		



No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV/m	Limit dB/m	Over dB	Detector
1		47.9940	36.92	-13.50	23.42	40.00	16.58	QP
2	*	71.8320	47.07	-17.65	29.42	40.00	10.58	QP
3		88.0329	41.35	-17.66	23.69	43.50	19.81	QP
4		175.6516	36.65	-17.58	19.07	43.50	24.43	QP
5		337.2155	34.61	-11.91	22.70	46.00	23.30	QP
6		520.8882	35.48	-7.78	27.70	46.00	18.30	QP

Remarks:

- 1.Final Level =Receiver Read level + Antenna Factor + Cable Loss – Preamplifier Factor
- 2.The emission levels of other frequencies are very lower than the limit and not show in test report.

1GHz~25GHz

Polar (H/V)	Frequency	Meter Reading	Pre- amplifier	Cable Loss	Antenna Factor	Emission Level	Limits	Margin	Detector Type
	(MHz)	(dBuV)	(dB)	(dB)	(dB)	(dBuV/m)	(dBuV/m)	(dB)	
2.4G Low Channel:2402MHz									
V	4804.00	53.43	30.55	5.77	24.66	53.31	74	-20.69	Pk
V	4804.00	43.04	30.55	5.77	24.66	42.92	54	-11.08	AV
V	7206.00	51.38	30.33	6.32	24.55	51.92	74	-22.08	Pk
V	7206.00	44.01	30.33	6.32	24.55	44.55	54	-9.45	AV
V	9608.00	52.51	30.85	7.45	24.69	53.80	74	-20.20	Pk
V	9608.00	42.93	30.85	7.45	24.69	44.22	54	-9.78	AV
V	12010.00	52.43	31.02	8.99	25.57	55.97	74	-18.03	Pk
V	12010.00	43.17	31.02	8.99	25.57	46.71	54	-7.29	AV
H	4804.00	53.55	30.55	5.77	24.66	53.43	74	-20.57	Pk
H	4804.00	43.01	30.55	5.77	24.66	42.89	54	-11.11	AV
H	7206.00	52.04	30.33	6.32	24.55	52.58	74	-21.42	Pk
H	7206.00	42.75	30.33	6.32	24.55	43.29	54	-10.71	AV
H	9608.00	51.70	30.85	7.45	24.69	52.99	74	-21.01	Pk
H	9608.00	42.77	30.85	7.45	24.69	44.06	54	-9.94	AV
H	12010.00	51.72	31.02	8.99	25.57	55.26	74	-18.74	Pk
H	12010.00	41.92	31.02	8.99	25.57	45.46	54	-8.54	AV

Polar (H/V)	Frequency	Meter Reading	Pre- amplifier	Cable Loss	Antenna Factor	Emission Level	Limits	Margin	Detector Type
	(MHz)	(dBuV)	(dB)	(dB)	(dB)	(dBuV/m)	(dBuV/m)	(dB)	
2.4G Middle Channel:2440MHz									
V	4880.00	52.32	30.55	5.77	24.66	52.20	74	-21.80	Pk
V	4880.00	43.55	30.55	5.77	24.66	43.43	54	-10.57	AV
V	7320.00	51.08	30.33	6.32	24.55	51.62	74	-22.38	Pk
V	7320.00	43.09	30.33	6.32	24.55	43.63	54	-10.37	AV
V	9760.00	51.38	30.85	7.45	24.69	52.67	74	-21.33	Pk
V	9760.00	43.03	30.85	7.45	24.69	44.32	54	-9.68	AV
V	12200.00	51.33	31.02	8.99	25.57	54.87	74	-19.13	Pk
V	12200.00	43.34	31.02	8.99	25.57	46.88	54	-7.12	AV
H	4880.00	53.75	30.55	5.77	24.66	53.63	74	-20.37	Pk
H	4880.00	42.94	30.55	5.77	24.66	42.82	54	-11.18	AV
H	7320.00	54.12	30.33	6.32	24.55	54.66	74	-19.34	Pk
H	7320.00	42.90	30.33	6.32	24.55	43.44	54	-10.56	AV
H	9760.00	53.95	30.85	7.45	24.69	55.24	74	-18.76	Pk
H	9760.00	42.75	30.85	7.45	24.69	44.04	54	-9.96	AV
H	12200.00	54.90	31.02	8.99	25.57	58.44	74	-15.56	Pk
H	12200.00	42.76	31.02	8.99	25.57	46.30	54	-7.70	AV

Remark:

1. Emission Level = Meter Reading + Antenna Factor + Cable Loss – Pre-amplifier,  
Margin= Emission Level - Limit
2. If peak below the average limit, the average emission was no test.
3. The amplitude of spurious emissions which are attenuated by more than 20dB below the permissible value has no need to be reported.



Polar (H/V)	Frequency	Meter Reading	Pre- amplifier	Cable Loss	Antenna Factor	Emission Level	Limits	Margin	Detector Type
	(MHz)	(dBuV)	(dB)	(dB)	(dB)	(dBuV/m)	(dBuV/m)	(dB)	
2.4G High Channel:2480MHz									
V	4960.00	52.16	30.55	5.77	24.66	52.04	74	-21.96	Pk
V	4960.00	43.45	30.55	5.77	24.66	43.33	54	-10.67	AV
V	7440.00	54.47	30.33	6.32	24.55	55.01	74	-18.99	Pk
V	7440.00	44.55	30.33	6.32	24.55	45.09	54	-8.91	AV
V	9920.00	54.25	30.85	7.45	24.69	55.54	74	-18.46	Pk
V	9920.00	44.31	30.85	7.45	24.69	45.60	54	-8.40	AV
V	12400.00	54.58	31.02	8.99	25.57	58.12	74	-15.88	Pk
V	12400.00	43.17	31.02	8.99	25.57	46.71	54	-7.29	AV
H	4960.00	52.16	30.55	5.77	24.66	52.04	74	-21.96	Pk
H	4960.00	42.92	30.55	5.77	24.66	42.80	54	-11.20	AV
H	7440.00	53.12	30.33	6.32	24.55	53.66	74	-20.34	Pk
H	7440.00	43.76	30.33	6.32	24.55	44.30	54	-9.70	AV
H	9920.00	53.94	30.85	7.45	24.69	55.23	74	-18.77	Pk
H	9920.00	43.63	30.85	7.45	24.69	44.92	54	-9.08	AV
H	12400.00	53.80	31.02	8.99	25.57	57.34	74	-16.66	Pk
H	12400.00	43.67	31.02	8.99	25.57	47.21	54	-6.79	AV

Polar (H/V)	Frequency	Meter Reading	Pre- amplifier	Cable Loss	Antenna Factor	Emission Level	Limits	Margin	Detector Type
	(MHz)	(dBuV)	(dB)	(dB)	(dB)	(dBuV/m)	(dBuV/m)	(dB)	
BLE Low Channel:2402MHz									
V	4804.00	53.28	30.55	5.77	24.66	53.16	74	-20.84	Pk
V	4804.00	42.92	30.55	5.77	24.66	42.80	54	-11.20	AV
V	7206.00	51.23	30.33	6.32	24.55	51.77	74	-22.23	Pk
V	7206.00	43.89	30.33	6.32	24.55	44.43	54	-9.57	AV
V	9608.00	52.36	30.85	7.45	24.69	53.65	74	-20.35	Pk
V	9608.00	42.81	30.85	7.45	24.69	44.10	54	-9.90	AV
V	12010.00	52.28	31.02	8.99	25.57	55.82	74	-18.18	Pk
V	12010.00	43.05	31.02	8.99	25.57	46.59	54	-7.41	AV
H	4804.00	53.40	30.55	5.77	24.66	53.28	74	-20.72	Pk
H	4804.00	42.89	30.55	5.77	24.66	42.77	54	-11.23	AV
H	7206.00	51.89	30.33	6.32	24.55	52.43	74	-21.57	Pk
H	7206.00	42.63	30.33	6.32	24.55	43.17	54	-10.83	AV
H	9608.00	51.55	30.85	7.45	24.69	52.84	74	-21.16	Pk
H	9608.00	42.65	30.85	7.45	24.69	43.94	54	-10.06	AV
H	12010.00	51.57	31.02	8.99	25.57	55.11	74	-18.89	Pk
H	12010.00	41.80	31.02	8.99	25.57	45.34	54	-8.66	AV

Remark:

1. Emission Level = Meter Reading + Antenna Factor + Cable Loss – Pre-amplifier,  
Margin= Emission Level - Limit
2. If peak below the average limit, the average emission was no test.
3. The amplitude of spurious emissions which are attenuated by more than 20dB below the permissible value has no need to be reported.

Polar (H/V)	Frequency	Meter Reading	Pre- amplifier	Cable Loss	Antenna Factor	Emission Level	Limits	Margin	Detector Type
	(MHz)	(dBuV)	(dB)	(dB)	(dB)	(dBuV/m)	(dBuV/m)	(dB)	
BLE Middle Channel:2440MHz									
V	4880.00	52.17	30.55	5.77	24.66	52.05	74	-21.95	Pk
V	4880.00	43.43	30.55	5.77	24.66	43.31	54	-10.69	AV
V	7320.00	50.94	30.33	6.32	24.55	51.48	74	-22.52	Pk
V	7320.00	42.97	30.33	6.32	24.55	43.51	54	-10.49	AV
V	9760.00	51.23	30.85	7.45	24.69	52.52	74	-21.48	Pk
V	9760.00	42.91	30.85	7.45	24.69	44.20	54	-9.80	AV
V	12200.00	51.18	31.02	8.99	25.57	54.72	74	-19.28	Pk
V	12200.00	43.22	31.02	8.99	25.57	46.76	54	-7.24	AV
H	4880.00	53.60	30.55	5.77	24.66	53.48	74	-20.52	Pk
H	4880.00	42.82	30.55	5.77	24.66	42.70	54	-11.30	AV
H	7320.00	53.97	30.33	6.32	24.55	54.51	74	-19.49	Pk
H	7320.00	42.79	30.33	6.32	24.55	43.33	54	-10.67	AV
H	9760.00	53.80	30.85	7.45	24.69	55.09	74	-18.91	Pk
H	9760.00	42.63	30.85	7.45	24.69	43.92	54	-10.08	AV
H	12200.00	54.75	31.02	8.99	25.57	58.29	74	-15.71	Pk
H	12200.00	42.64	31.02	8.99	25.57	46.18	54	-7.82	AV

Polar (H/V)	Frequency	Meter Reading	Pre- amplifier	Cable Loss	Antenna Factor	Emission Level	Limits	Margin	Detector Type
	(MHz)	(dBuV)	(dB)	(dB)	(dB)	(dBuV/m)	(dBuV/m)	(dB)	
BLE High Channel:2480MHz									
V	4960.00	52.01	30.55	5.77	24.66	51.89	74	-22.11	Pk
V	4960.00	43.33	30.55	5.77	24.66	43.21	54	-10.79	AV
V	7440.00	54.32	30.33	6.32	24.55	54.86	74	-19.14	Pk
V	7440.00	44.43	30.33	6.32	24.55	44.97	54	-9.03	AV
V	9920.00	54.10	30.85	7.45	24.69	55.39	74	-18.61	Pk
V	9920.00	44.19	30.85	7.45	24.69	45.48	54	-8.52	AV
V	12400.00	54.43	31.02	8.99	25.57	57.97	74	-16.03	Pk
V	12400.00	43.05	31.02	8.99	25.57	46.59	54	-7.41	AV
H	4960.00	52.01	30.55	5.77	24.66	51.89	74	-22.11	Pk
H	4960.00	42.80	30.55	5.77	24.66	42.68	54	-11.32	AV
H	7440.00	52.97	30.33	6.32	24.55	53.51	74	-20.49	Pk
H	7440.00	43.64	30.33	6.32	24.55	44.18	54	-9.82	AV
H	9920.00	53.79	30.85	7.45	24.69	55.08	74	-18.92	Pk
H	9920.00	43.51	30.85	7.45	24.69	44.80	54	-9.20	AV
H	12400.00	53.65	31.02	8.99	25.57	57.19	74	-16.81	Pk
H	12400.00	43.55	31.02	8.99	25.57	47.09	54	-6.91	AV

Remark:

1. Emission Level = Meter Reading + Antenna Factor + Cable Loss – Pre-amplifier,  
Margin= Emission Level - Limit
2. If peak below the average limit, the average emission was no test.
3. The amplitude of spurious emissions which are attenuated by more than 20dB below the permissible value has no need to be reported.



## 5. BANDWIDTH OF FREQUENCY BAND EDGE

### 5.1 TEST REQUIREMENT:

Test Requirement:	FCC Part15 C Section 15.209 and 15.205				
Test Method:	ANSI C63.10: 2013				
Test Frequency Range:	All of the restrict bands were tested, only the worst band's (2310MHz to 2500MHz) data was showed.				
Test site:	Measurement Distance: 3m				
Receiver setup:	Frequency	Detector	RBW	VBW	Value
	Above 1GHz	Peak	1MHz	3MHz	Peak
		Average	1MHz	3MHz	Average

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

### 5.2 TEST PROCEDURE

Above 1GHz test procedure as below:

- The EUT was placed on the top of a rotating table 1.5 meters above the ground at a 3 meter camber. The table was rotated 360 degrees to determine the position of the highest radiation.
- The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
- The antenna height is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
- For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters and the rota table was turned from 0 degrees to 360 degrees to find the maximum reading.
- The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.
- If the emission level of the EUT in peak mode was 10dB lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emissions that did not have 10dB margin would be re-tested one by one using peak, quasi-peak or average method as specified and then reported in a data sheet.
- Test the EUT in the lowest channel, the Highest channel

Note:

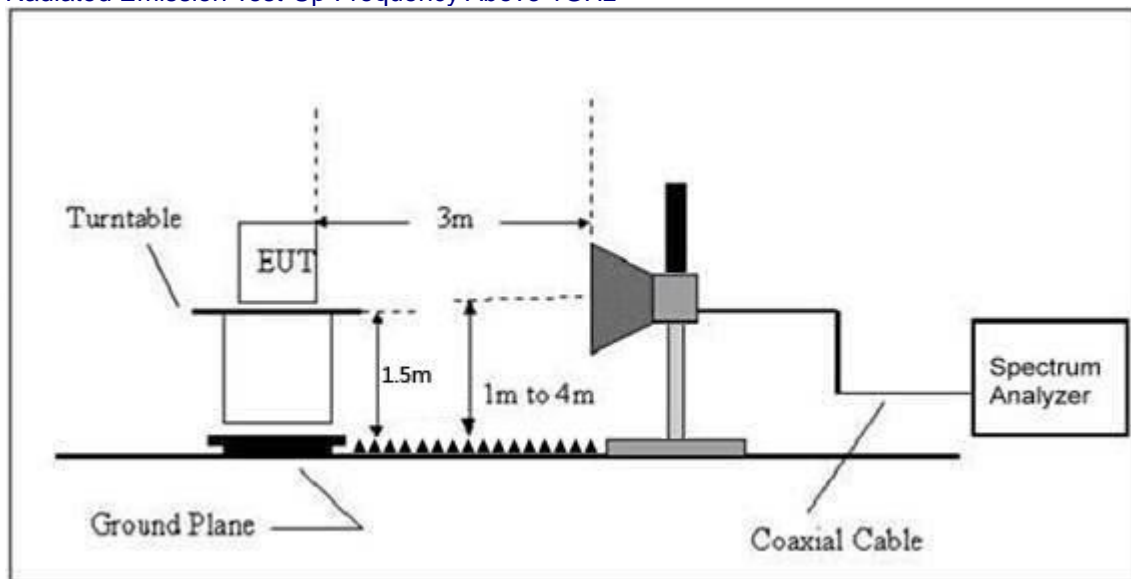
Both horizontal and vertical antenna polarities were tested and performed pretest to three orthogonal axis. The worst case emissions were reported

### 5.3 DEVIATION FROM TEST STANDARD

No deviation

### 5.4 TEST SETUP

## Radiated Emission Test-Up Frequency Above 1GHz



### 5.5 EUT OPERATING CONDITIONS

The EUT tested system was configured as the statements of 2.3 Unless otherwise a special operating condition is specified in the follows during the testing.

## 5.6 TEST RESULT

Test channel :	2.4G Lowest channel
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Peak value:

Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamplifier Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Polarization
2390.00	40.02	27.59	5.38	30.18	42.81	74	-31.19	Horizontal
2400.00	56.37	27.58	5.39	30.18	59.16	74	-14.84	Horizontal
2390.00	40.35	27.59	5.38	30.18	43.14	74	-30.86	Vertical
2400.00	55.31	27.58	5.39	30.18	58.10	74	-15.90	Vertical

Average value:

Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamplifier Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Polarization
2390.00	32.89	27.59	5.38	30.18	32.89	54	-18.32	Horizontal
2400.00	42.18	27.58	5.39	30.18	42.18	54	-9.03	Horizontal
2390.00	32.25	27.59	5.38	30.18	32.25	54	-18.96	Vertical
2400.00	44.30	27.58	5.39	30.18	44.30	54	-6.91	Vertical

Test channel :	2.4G Highest channel
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Peak value:

Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamplifier Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Polarization
2483.50	45.13	27.53	5.47	29.93	48.20	74	-25.80	Horizontal
2500.00	42.97	27.55	5.49	29.93	46.08	74	-27.92	Horizontal
2483.50	42.14	27.53	5.47	29.93	45.21	74	-28.79	Vertical
2500.00	41.45	27.55	5.49	29.93	44.56	74	-29.44	Vertical

Average value:

Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamplifier Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Polarization
2483.50	33.79	27.53	5.47	29.93	36.86	54	-17.14	Horizontal
2500.00	32.07	27.55	5.49	29.93	35.18	54	-18.82	Horizontal
2483.50	34.98	27.53	5.47	29.93	38.05	54	-15.95	Vertical
2500.00	31.00	27.55	5.49	29.93	34.11	54	-19.89	Vertical

Remark: Final Level = Receiver Read level + Antenna Factor + Cable Loss – Preamplifier Factor

Test channel :	BLE GFSK Lowest channel
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Peak value:

Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Polarization
2390.00	39.88	27.59	5.38	30.18	42.67	74	-31.33	Horizontal
2400.00	56.18	27.58	5.39	30.18	58.97	74	-15.03	Horizontal
2390.00	40.21	27.59	5.38	30.18	43.00	74	-31.00	Vertical
2400.00	55.12	27.58	5.39	30.18	57.91	74	-16.09	Vertical

Average value:

Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Polarization
2390.00	32.78	27.59	5.38	30.18	35.57	54	-18.43	Horizontal
2400.00	42.04	27.58	5.39	30.18	44.83	54	-9.17	Horizontal
2390.00	32.14	27.59	5.38	30.18	34.93	54	-19.07	Vertical
2400.00	44.15	27.58	5.39	30.18	46.94	54	-7.06	Vertical

Test channel :	BLE GFSK Highest channel
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Peak value:

Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Polarization
2483.50	44.98	27.53	5.47	29.93	48.05	74	-25.95	Horizontal
2500.00	42.83	27.55	5.49	29.93	45.94	74	-28.06	Horizontal
2483.50	42.00	27.53	5.47	29.93	45.07	74	-28.93	Vertical
2500.00	41.31	27.55	5.49	29.93	44.42	74	-29.58	Vertical

Average value:

Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Polarization
2483.50	33.67	27.53	5.47	29.93	36.74	54	-17.26	Horizontal
2500.00	31.96	27.55	5.49	29.93	35.07	54	-18.93	Horizontal
2483.50	34.87	27.53	5.47	29.93	37.94	54	-16.06	Vertical
2500.00	30.90	27.55	5.49	29.93	34.01	54	-19.99	Vertical

Remark: Final Level = Receiver Read level + Antenna Factor + Cable Loss – Preamplifier Factor

## 6. CHANNEL BANDWIDTH

Test Requirement:	FCC Part15 C Section 15.215
Test Method:	ANSI C63.10: 2013

### 7.1 APPLIED PROCEDURES / LIMIT

FCC Part15 (15.249) , Subpart C			
Section	Test Item	Frequency Range (MHz)	Result
15.215	Bandwidth	2400-2483.5	PASS

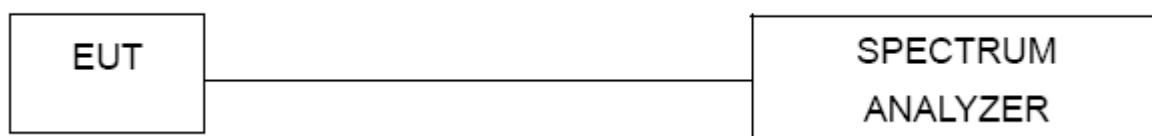
### 7.2 2.1 TEST PROCEDURE

1. Set resolution bandwidth (RBW) = 1-5% or DTS BW, not to exceed 100 kHz.
2. Set the video bandwidth (VBW)  $\geq 3 \times$  RBW.
3. Detector = Peak.
4. Trace mode = max hold.
5. Sweep = auto couple.
6. Allow the trace to stabilize.
7. Measure the maximum width of the emission that is constrained by the frequencies associated with the two outermost amplitude points (upper and lower) that are attenuated by 6 dB relative to the maximum level measured in the fundamental emission.

### 7.3 2.2 DEVIATION FROM STANDARD

No deviation.

### 7.4 2.3 TEST SETUP

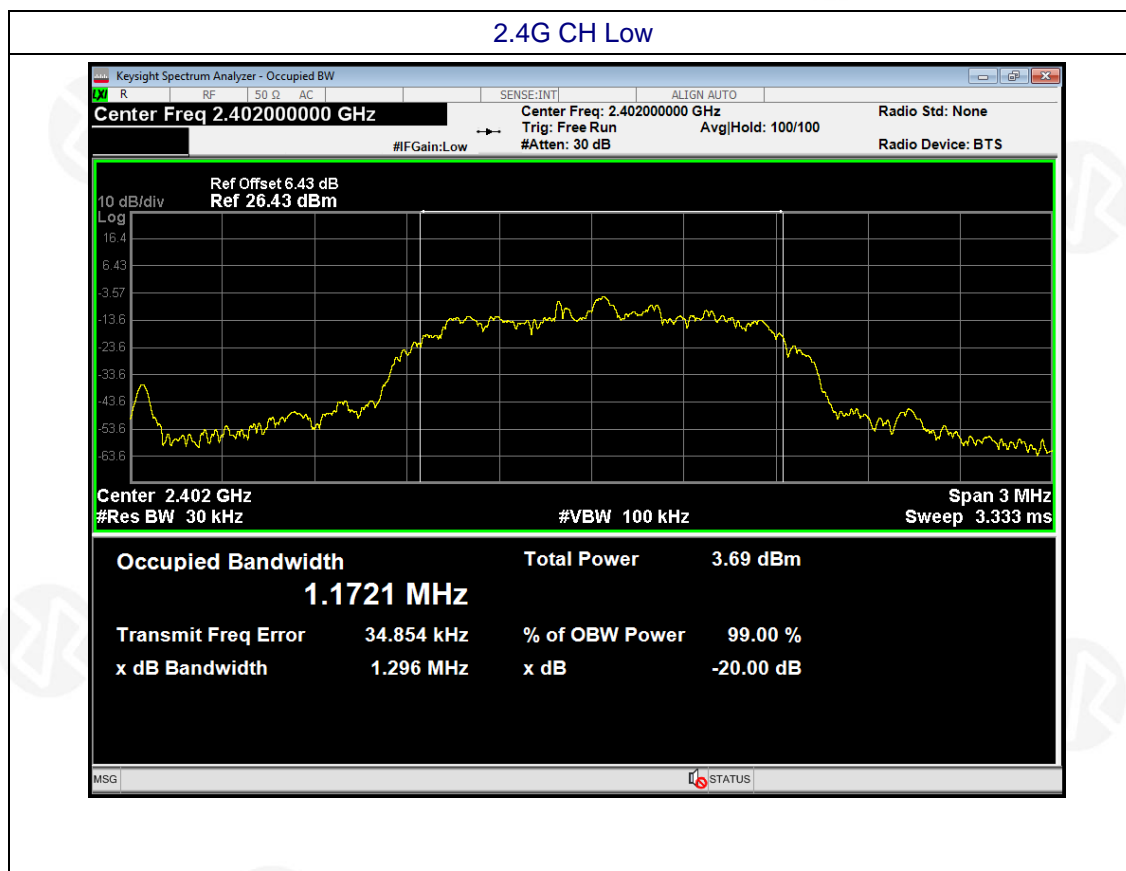


### 7.5 2.4 EUT OPERATION CONDITIONS

The EUT tested system was configured as the statements of 2.4 Unless otherwise a special operating condition is specified in the follows during the testing.

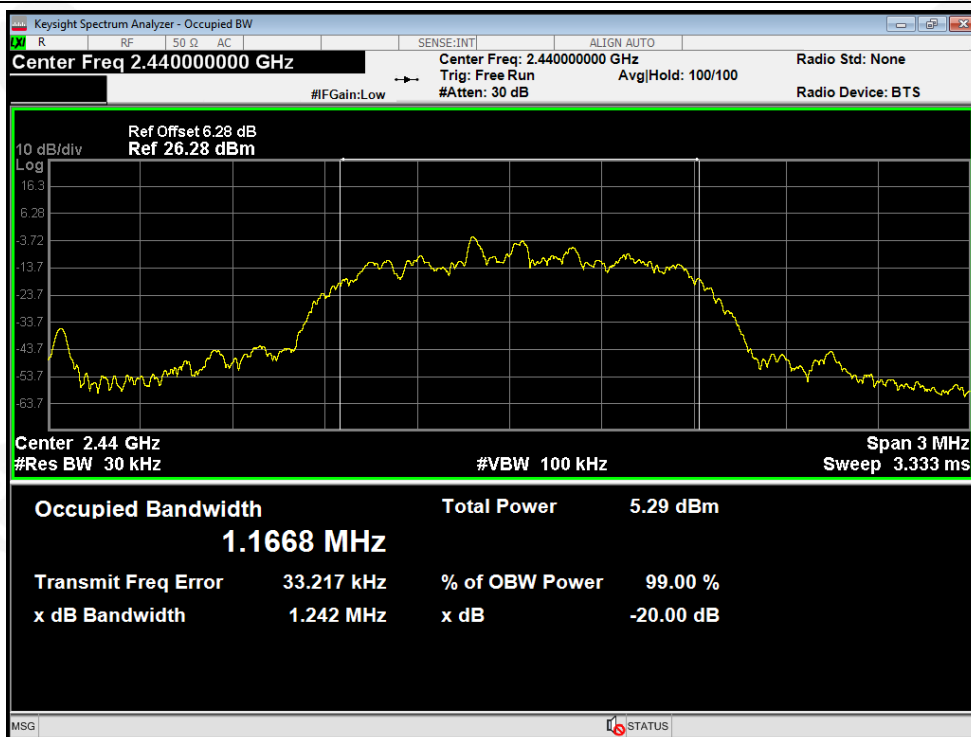
## 7.6 2.5TEST RESULTS

Mode	Test channel	Channel Bandwidth (MHz)	Result
2.4G	Lowest	1.296	Pass
	Middle	1.242	
	Highest	1.251	

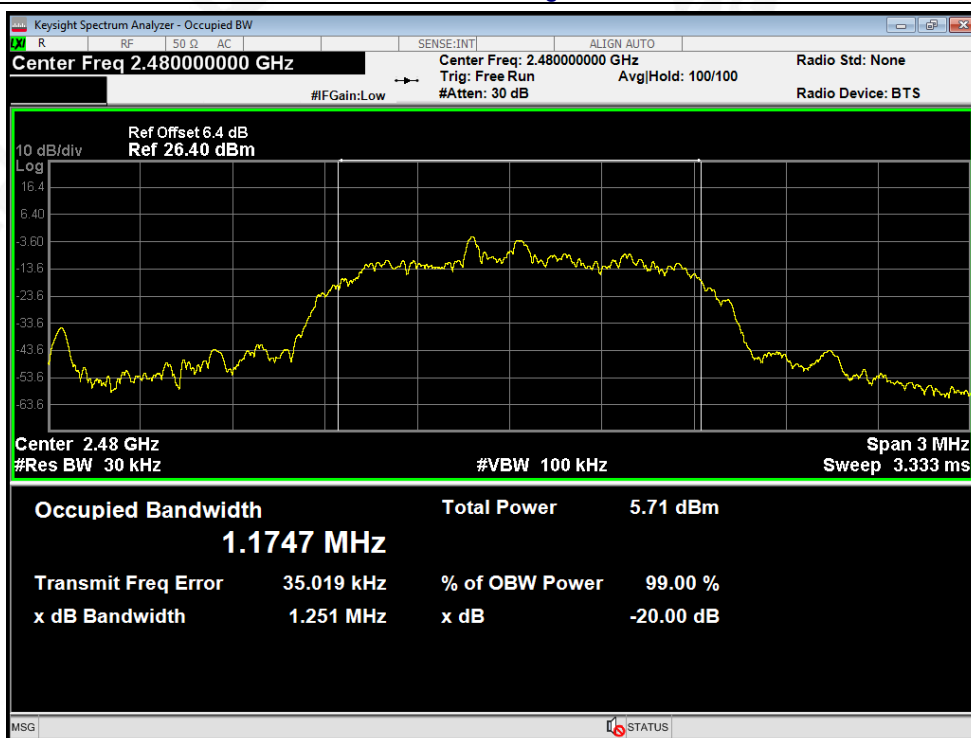




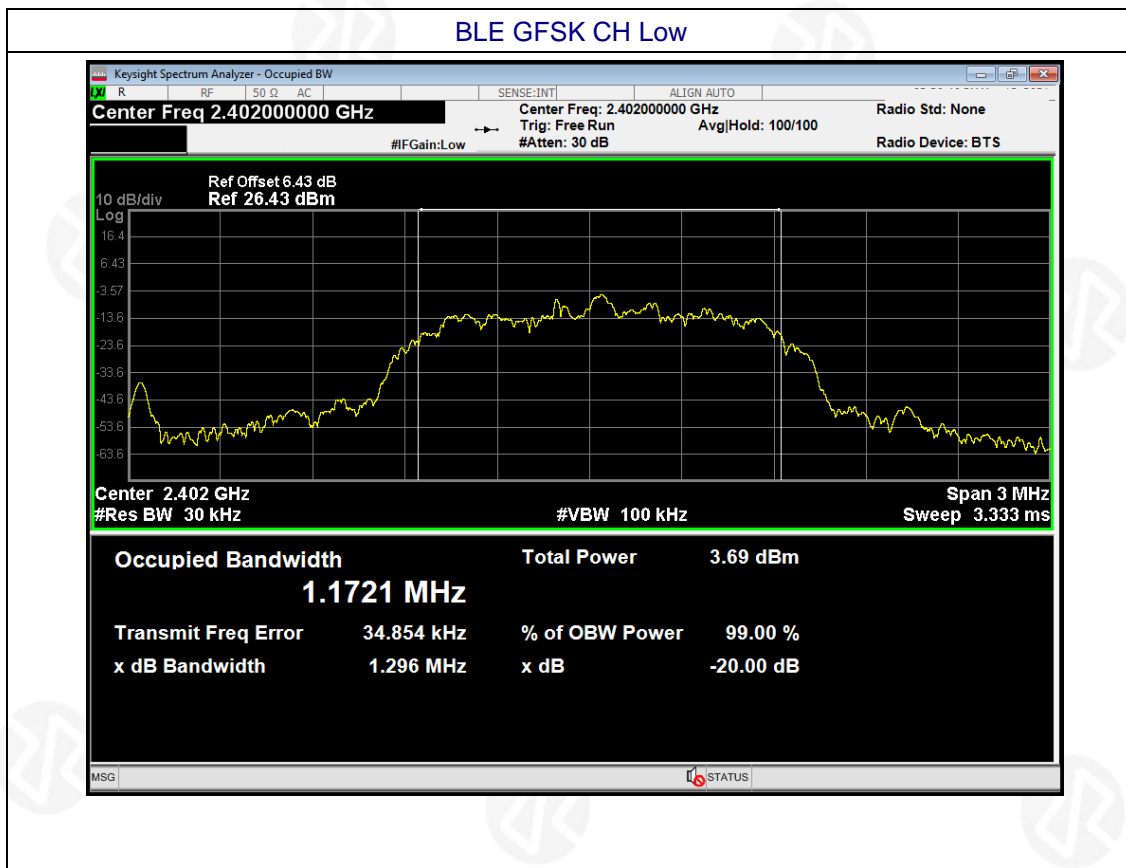
### 2.4G CH Mid



### 2.4G CH High

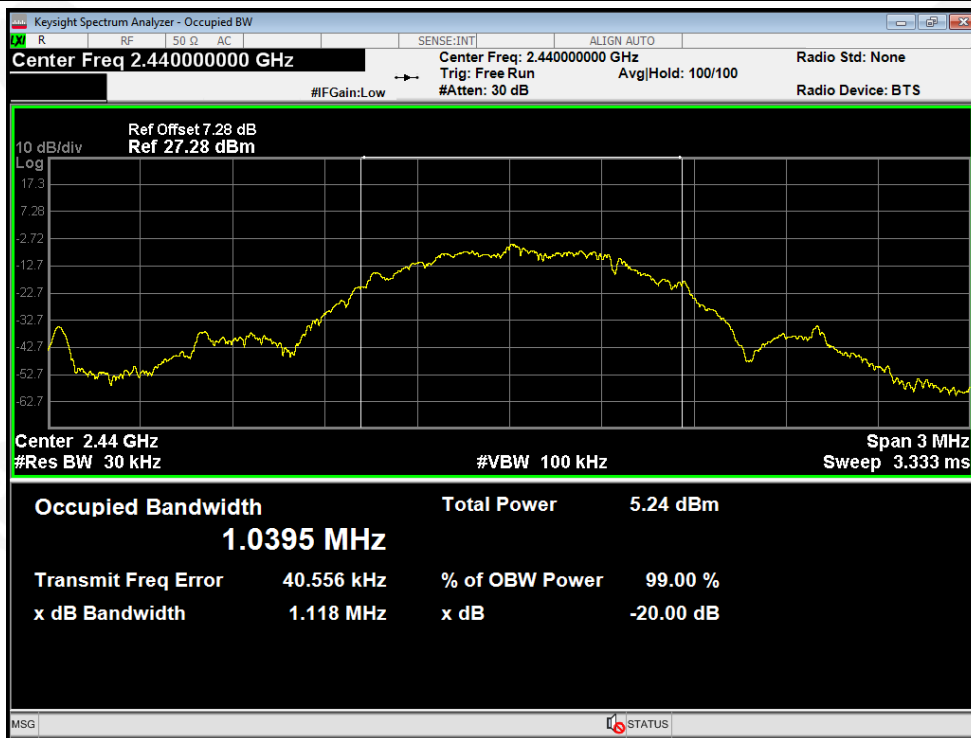


Mode	Test channel	Channel Bandwidth (MHz)	Result
BLE	Lowest	1.296	Pass
	Middle	1.118	
	Highest	1.116	

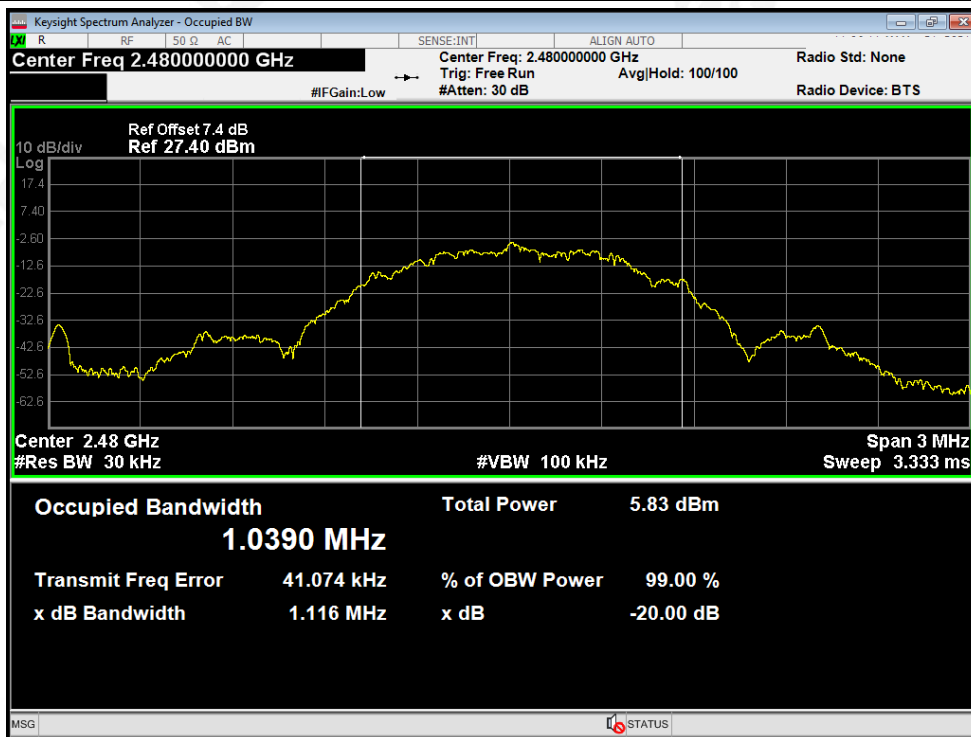




### BLE GFSK CH Mid



### BLE GFSK CH High



## 8. CONDUCTED SPURIOUS EMISSION

Test Requirement:	FCC Part15 C Section 15.249
Test Method:	ANSI C63.10: 2013

### 8.1 APPLICABLE STANDARD

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum 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.

### 8.2 TEST PROCEDURE

Using the following spectrum analyzer setting:

- A) Set the RBW = 100KHz.
- B) Set the VBW = 300KHz.
- C) Sweep time = auto couple.
- D) Detector function = peak.
- E) Trace mode = max hold.
- F) Allow trace to fully stabilize.

### 8.3 DEVIATION FROM STANDARD

No deviation.

### 8.4 TEST SETUP



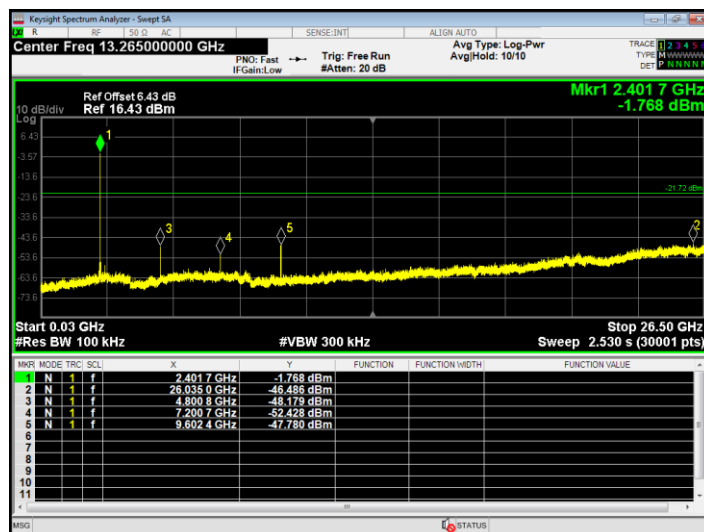
### 8.5 EUT OPERATION CONDITIONS

The EUT tested system was configured as the statements of 2.4 Unless otherwise a special operating condition is specified in the follows during the testing.

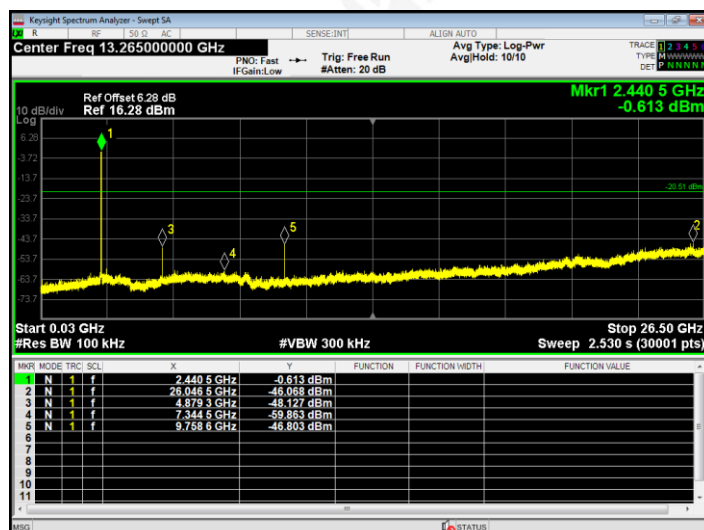
### 8.6 TEST RESULTS

We pretest all voltage and all mode, the worst mode was AC 120V and 2.4G low channel, and the data recording in the report.

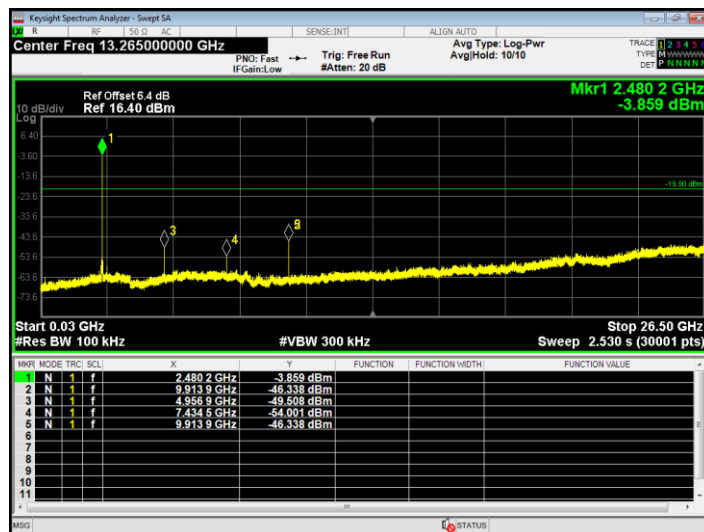
Lowest channel



Middle channel



Highest channel



## 9.ANTENNA REQUIREMENT

Standard requirement:	FCC Part15 C Section 15.203
15.203 requirement: 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.	
EUT Antenna:	
The antennas are PCB antenna, the best case gain of the antennas are -2.36dBi, reference to the internal for details	

## 10. TEST SETUP PHOTO

Reference to the appendix setup photo.

## 11. EUT CONSTRUCTIONAL DETAILS

Reference to the appendix external photo and internal photo.

\*\*\*\*\* END OF REPORT \*\*\*\*\*