

# FCC Part 15C Measurement and Test Report

For

Zhengzhou Bangmi Smart Technology CO.,LTD.

**FCC ID:2AQQO-WS-1060**

<b>FCC Rule(s):</b>	<u>FCC Part 15.247</u>	
<b>Product Description:</b>	<u>WINDOW CLEANING ROBOT</u>	
<b>Tested Model:</b>	<u>WS-1060</u>	
<b>Report No.:</b>	<u>BSL190812682301RF</u>	
<b>Tested Date:</b>	<u>Sept. 02-05, 2019</u>	
<b>Issued Date:</b>	<u>Sept. 05, 2019</u>	
<b>Tested By:</b>	<u>Cindy Zheng / Engineer</u>	<i>Cindy zheng</i>
<b>Reviewed By:</b>	<u>Haley Wen / EMC Manager</u>	<i>Haley wen</i>
<b>Approved &amp; Authorized By:</b>	<u>Mike Mo / PSQ Manager</u>	<i>Mike Mo</i>
<b>Prepared By:</b>		

**BSL Testing Co.,LTD.**  
No. 24, ZH Park, Nantou Nanshan District,  
Shenzhen, Guangdong, China  
Tel: 400-882-9628 Fax: 86- 755-26508703

**TABLE OF CONTENTS**

<b>1. GENERAL INFORMATION.....</b>	<b>3</b>
1.1 PRODUCT DESCRIPTION FOR EQUIPMENT UNDER TEST (EUT).....	3
1.2 TEST STANDARDS.....	4
1.3 TEST METHODOLOGY.....	4
1.4 TEST FACILITY.....	4
1.5 EUT SETUP AND TEST MODE.....	5
1.6 MEASUREMENT UNCERTAINTY.....	5
1.7 TEST EQUIPMENT LIST AND DETAILS.....	6
<b>2. SUMMARY OF TEST RESULTS.....</b>	<b>7</b>
<b>3. RF EXPOSURE.....</b>	<b>8</b>
3.1 STANDARD APPLICABLE.....	8
3.2 TEST RESULT.....	8
<b>4. ANTENNA REQUIREMENT.....</b>	<b>9</b>
4.1 STANDARD APPLICABLE.....	9
4.2 EVALUATION INFORMATION.....	9
<b>5. POWER SPECTRAL DENSITY.....</b>	<b>10</b>
5.1 STANDARD APPLICABLE.....	10
5.2 TEST PROCEDURE.....	10
5.3 ENVIRONMENTAL CONDITIONS.....	10
5.4 SUMMARY OF TEST RESULTS/PLOTS.....	10
<b>6. 6DB BANDWIDTH.....</b>	<b>13</b>
6.1 STANDARD APPLICABLE.....	13
6.2 TEST PROCEDURE.....	13
6.3 ENVIRONMENTAL CONDITIONS.....	13
6.4 SUMMARY OF TEST RESULTS/PLOTS.....	13
<b>7. RF OUTPUT POWER.....</b>	<b>16</b>
7.1 STANDARD APPLICABLE.....	16
7.2 TEST PROCEDURE.....	16
7.3 ENVIRONMENTAL CONDITIONS.....	16
7.4 SUMMARY OF TEST RESULTS/PLOTS.....	16
<b>8. FIELD STRENGTH OF SPURIOUS EMISSIONS.....</b>	<b>19</b>
8.1 STANDARD APPLICABLE.....	19
8.2 TEST PROCEDURE.....	19
8.3 CORRECTED AMPLITUDE & MARGIN CALCULATION.....	21
8.4 ENVIRONMENTAL CONDITIONS.....	21
8.5 SUMMARY OF TEST RESULTS/PLOTS.....	21
<b>9. OUT OF BAND EMISSIONS.....</b>	<b>27</b>
9.1 STANDARD APPLICABLE.....	27
9.2 TEST PROCEDURE.....	27
9.3 ENVIRONMENTAL CONDITIONS.....	28
9.4 SUMMARY OF TEST RESULTS/PLOTS.....	28
<b>10. CONDUCTED EMISSIONS.....</b>	<b>30</b>
10.1 TEST PROCEDURE.....	30
10.2 BASIC TEST SETUP BLOCK DIAGRAM.....	30
10.3 ENVIRONMENTAL CONDITIONS.....	30
10.4 TEST RECEIVER SETUP.....	31
10.5 SUMMARY OF TEST RESULTS/PLOTS.....	31
10.6 CONDUCTED EMISSIONS TEST DATA.....	31

## 1. GENERAL INFORMATION

---

### 1.1 Product Description for Equipment Under Test (EUT)

#### Client Information

Applicant: Zhengzhou Bangmi Smart Technology CO.,LTD.  
 Address of applicant: 96 Ruida Road, Zhengzhou City, Henan Province, China  
 Manufacturer: Zhengzhou Bangmi Smart Technology CO.,LTD.  
 Address of manufacturer: 96 Ruida Road, Zhengzhou City, Henan Province, China

General Description of EUT	
Product Name:	WINDOW CLEANING ROBOT
Brand Name:	N/A
Model No.:	WS-1060
Rated Voltage:	100-240V 50/60Hz
Adapter Information:	Output:24V 3.75A
<i>Note: The test data is gathered from a production sample provided by the manufacturer.</i>	

Technical Characteristics of EUT	
Bluetooth Version:	V4.0
Frequency Range:	2402-2480MHz
RF Output Power:	-7.84dBm (Conducted)
Modulation:	GFSK
Quantity of Channels:	40
Channel Separation:	2MHz
Type of Antenna:	PCB antenna
Antenna Gain:	0dBi

## 1.2 Test Standards

The following report is prepared on behalf of the Zhengzhou Bangmi Smart Technology CO.,LTD.in accordance with FCC Part 15,

Subpart C, and section 15.203, 15.205, 15.207, 15.209 and 15.247 of the Federal Communication Commissions rules.

The objective is to determine compliance with FCC Part 15, Subpart C, and section 15.203, 15.205, 15.207, 15.209 and 15.247 of the Federal Communication Commissions rules.

**Maintenance of compliance** is the responsibility of the manufacturer. Any modification of the product, which result in lowering the emission, should be checked to ensure compliance has been maintained.

## 1.3 Test Methodology

All measurements contained in this report were conducted with ANSI C63.10-2013, American National Standard for Testing Unlicensed Wireless Devices, and ANSI C63.4-2014, American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the range of 9 kHz to 40 GHz. The measurement guide KDB 558074 D01 15.247 Meas Guidance v05r02 for digital transmission systems shall be performed also.

## 1.4 Test Facility

BSL Testing Co.,LTD.

NO. 24, ZH Park, Nantou, Shenzhen, 518000 China

Designation Number : CN1217

Test Firm Registration Number: 866035

Tel: 86- 755-26508703

Fax: 86- 755-26508703

### 1.5 EUT Setup and Test Mode

The EUT was operated in the engineering mode to fix the Tx frequency that was for the purpose of the measurements. All testing shall be performed under maximum output power condition, and to measure its highest possible emissions level, more detailed description as follows:

Test Mode List		
Test Mode	Description	Remark
TM1	GFSK(BLE)	2402MHz, 2442MHz, 2480MHz

EUT Cable List and Details			
Cable Description	Length (m)	Shielded/Unshielded	With / Without Ferrite
/	/	/	/

Special Cable List and Details			
Cable Description	Length (m)	Shielded/Unshielded	With / Without Ferrite
/	/	/	/

Auxiliary Equipment List and Details			
Description	Manufacturer	Model	Serial Number
/	/	/	/
/	/	/	/

EUT Exercise Software

The test software: ‘Cube Station ’ was used in test. The worst condition (maximum power) was configured by default setting.

### 1.6 Measurement Uncertainty

Measurement uncertainty		
Parameter	Conditions	Uncertainty
RF Output Power	Conducted	$\pm 0.42\text{dB}$
Occupied Bandwidth	Conducted	$\pm 1.5\%$
Power Spectral Density	Conducted	$\pm 1.8\text{dB}$
Conducted Spurious Emission	Conducted	$\pm 2.17\text{dB}$
Conducted Emissions	Conducted	$\pm 2.88\text{dB}$
Transmitter Spurious Emissions	Radiated	$\pm 5.1\text{dB}$

**1.7 Test Equipment List and Details**

<b>Dscription</b>	<b>Manufacturer</b>	<b>Model</b>	<b>Serial No.</b>	<b>Cal Date</b>	<b>Due. Date</b>
Communication Tester	Rohde & Schwarz	CMW500	100358	2018-11-08	2019-11-07
Spectrum Analyzer	R&S	FSP40	100550	2018-10-08	2019-10-07
Test Receiver	R&S	ESCI7	US47140102	2018-10-08	2019-10-07
Signal Generator	HP	83630B	3844A01028	2018-10-08	2019-10-07
Test Receiver	R&S	ESPI-3	100180	2018-10-08	2019-10-07
Amplifier	Agilent	8449B	4035A00116	2018-10-08	2019-10-07
Amplifier	HP	8447E	2945A02770	2018-10-08	2019-10-07
Signal Generator	IFR	2023A	202307/242	2018-10-08	2019-10-07
Broadband Antenna	SCHAFFNER	2774	2774	2018-10-21	2019-10-20
Biconical and log periodic antennas	ELECTRO-METRICS	EM-6917B-1	171	2018-10-21	2019-10-20
Horn Antenna	R&S	HF906	100253	2018-10-21	2019-10-20
Horn Antenna	EM	EM-6961	6462	2018-10-21	2019-10-20
LISN	R&S	ESH3-Z5	100196	2018-10-08	2019-10-07
LISN	COM-POWER	LI-115	02027	2018-10-08	2019-10-07
3m Semi-Anechoic Chamber	Chengyu Electron	9 (L)*6 (W)* 6 (H)	BSL086	2018-10-08	2019-10-07
Horn Antenna	Schwarzbeck	BBHA9170	00814	2018-10-21	2019-10-20
power meter	DARE	RPR3006W	15I00041SNO03	2018-10-21	2019-10-20
EZ	EMC test software	/	/	/	/

**2. SUMMARY OF TEST RESULTS**

---

<b>FCC Rules</b>	<b>Description of Test Item</b>	<b>Result</b>
§ 2.1093	RF Exposure	PASS
§ 15.203; § 15.247(b)(4)(i)	Antenna Requirement	PASS
§15.205	Restricted Band of Operation	PASS
§ 15.207(a)	Conducted Emission	PASS
§ 15.247(e)	Power Spectral Density	PASS
§ 15.247(a)(2)	6 dB Bandwidth	PASS
§ 15.247(b)(3)	RF Output Power	PASS
§ 15.209(a)	Radiated Emission	PASS
§ 15.247(d)	Band Edge (Out of Band Emissions)	PASS

Note: PASS: applicable, N/A: not applicable.

### **3. RF Exposure**

---

#### **3.1 Standard Applicable**

According to § 1.1307(b)(1), system operating under the provisions of this section shall be operating in a manner that the public is not exposed to radio frequency energy level in excess limit for maximum permissible exposure.

#### **3.2 Test Result**

This product complied with the requirement of the RF exposure, please see the RF Exposure Report.



## **4. Antenna Requirement**

---

### **4.1 Standard Applicable**

According to FCC Part 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 shall be considered sufficient to comply with the provisions of this section.

### **4.2 Evaluation Information**

This product has a PCB antenna, fulfill the requirement of this section.

## 5. Power Spectral Density

---

### 5.1 Standard Applicable

According to 15.247(e) 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.

### 5.2 Test Procedure

According to the KDB 558074 D01 15.247 Meas Guidance v05r02, the test method of power spectral density as below:

- a) Set analyzer center frequency to DTS channel center frequency.
- b) Set the span to 1.5 times the DTS bandwidth.
- c) Set the RBW to:  $3 \text{ kHz} \leq \text{RBW} \leq 100 \text{ kHz}$ .
- d) Set the VBW  $\geq 3 \times \text{RBW}$ .
- e) Detector = peak.
- f) Sweep time = auto couple.
- g) Trace mode = max hold.
- h) Allow trace to fully stabilize.
- i) Use the peak marker function to determine the maximum amplitude level within the RBW.
- j) If measured value exceeds limit, reduce RBW (no less than 3 kHz) and repeat.

### 5.3 Environmental Conditions

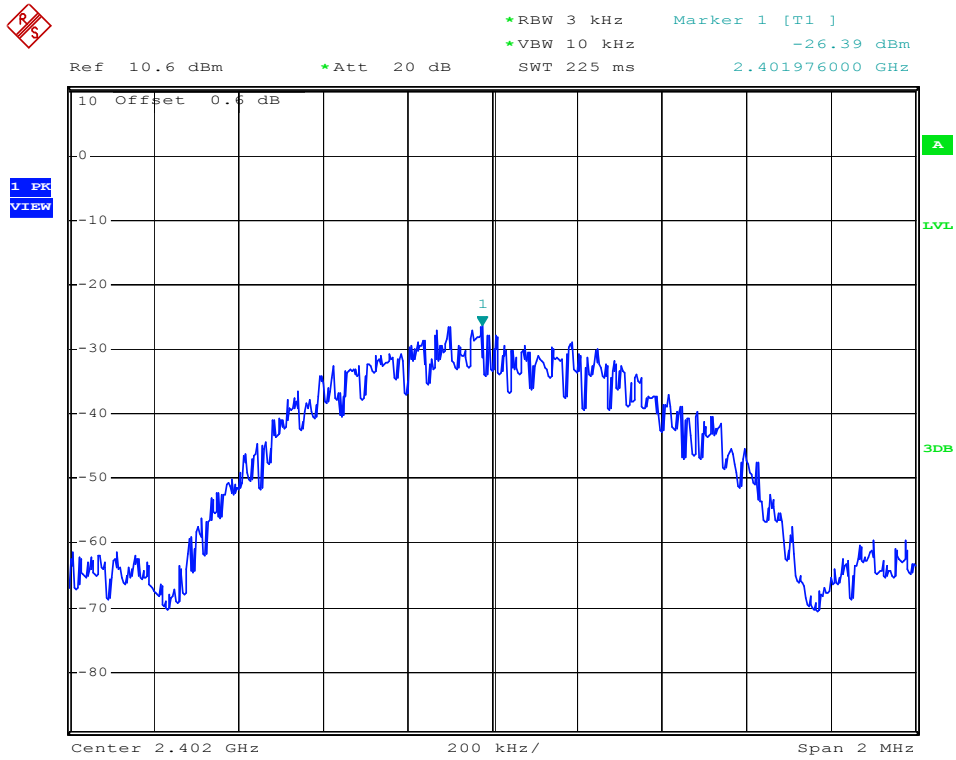
Temperature:	26° C
Relative Humidity:	54%
ATM Pressure:	1011 mbar

### 5.4 Summary of Test Results/Plots

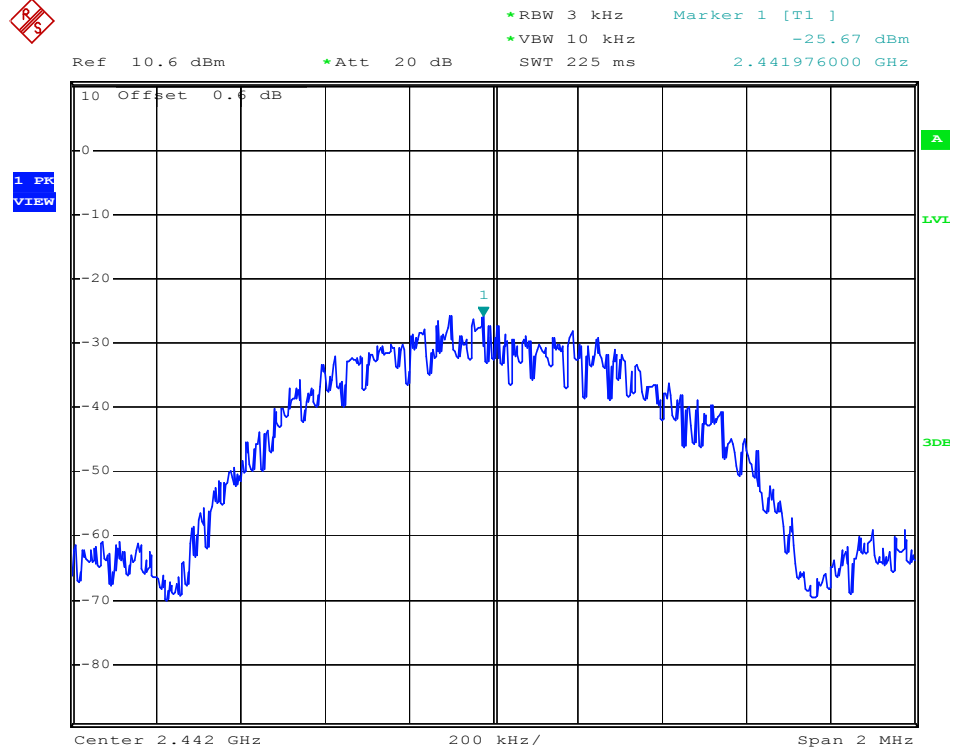
Test Mode	Test Channel MHz	Power Spectral Density dBm/3kHz	Limit dBm/3kHz
GFSK(BLE)	2402	-26.39	8
	2442	-25.67	8
	2480	-25.66	8

Please refer to the following test plots:

Low Channel



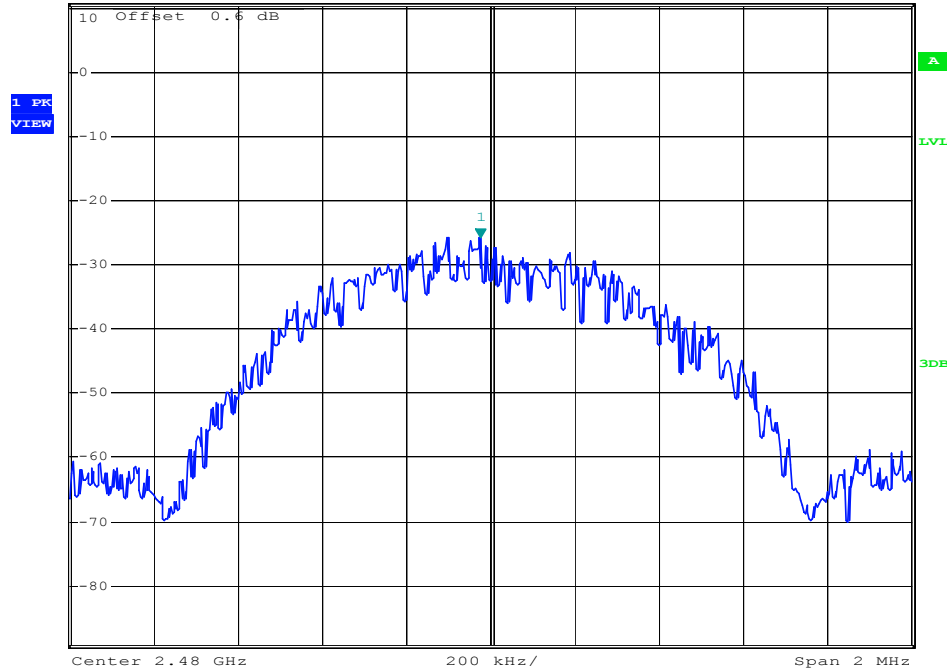
Middle Channel



High Channel



Ref 10.6 dBm      \*Att 20 dB      \*RBW 3 kHz      Marker 1 [T1 ]  
\*VBW 10 kHz      -25.66 dBm  
SWT 225 ms      2.479976000 GHz



## 6. 6dB Bandwidth

---

### 6.1 Standard Applicable

According to 15.247(a)(2). Systems using digital modulation techniques may operate in the 902–928 MHz, 2400–2483.5 MHz, and 5725–5850 MHz bands. The minimum 6 dB bandwidth shall be at least 500 kHz.

### 6.2 Test Procedure

- a) Set RBW = 100 kHz.
- b) Set the video bandwidth (VBW)  $\geq 3 \times$  RBW.
- c) Detector = Peak.
- d) Trace mode = max hold.
- e) Sweep = auto couple.
- f) Allow the trace to stabilize.
- g) Measure the maximum width of the emission that is constrained by the frequencies associated with the two outermost amplitude points (upper and lower frequencies) that are attenuated by 6 dB relative to the maximum level measured in the fundamental emission.

### 6.3 Environmental Conditions

Temperature:	25° C
Relative Humidity:	53%
ATM Pressure:	1018 mbar

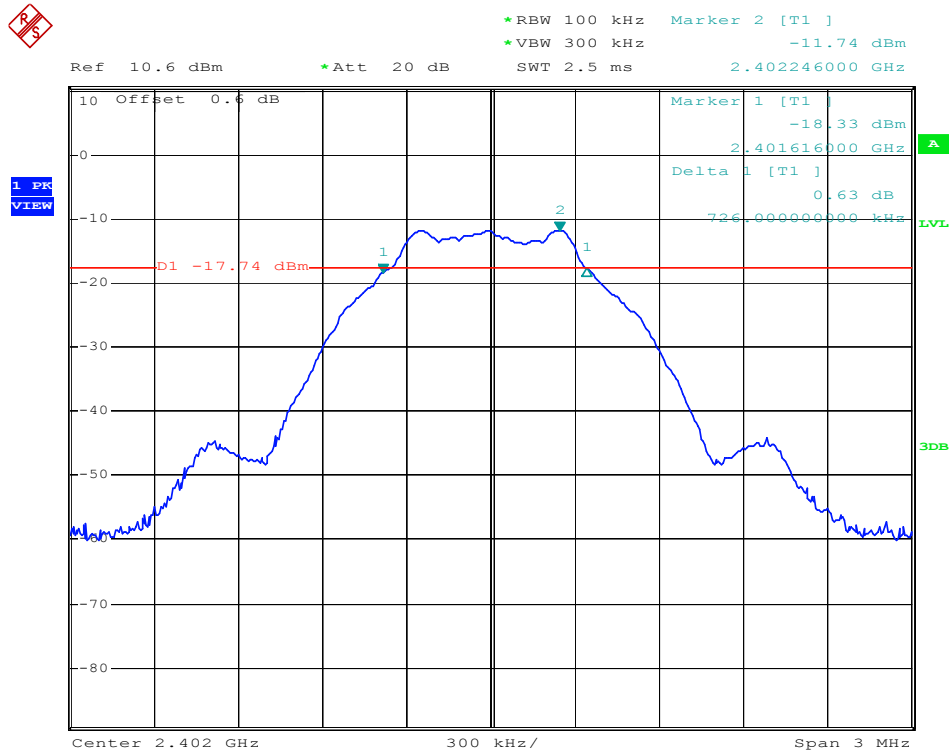
### 6.4 Summary of Test Results/Plots

Test Mode	Test Channel MHz	6 dB Bandwidth kHz	Limit kHz
GFSK(BLE)	2402	726	$\geq 500$
	2442	714	$\geq 500$
	2480	720	$\geq 500$

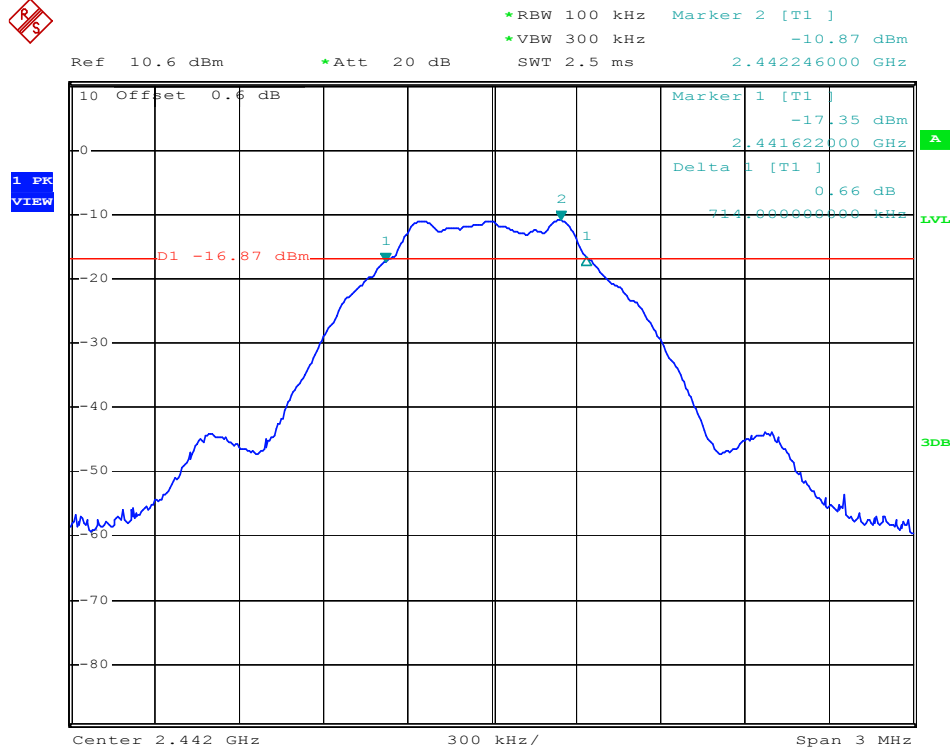
Please refer to the following test plots:

For BLE

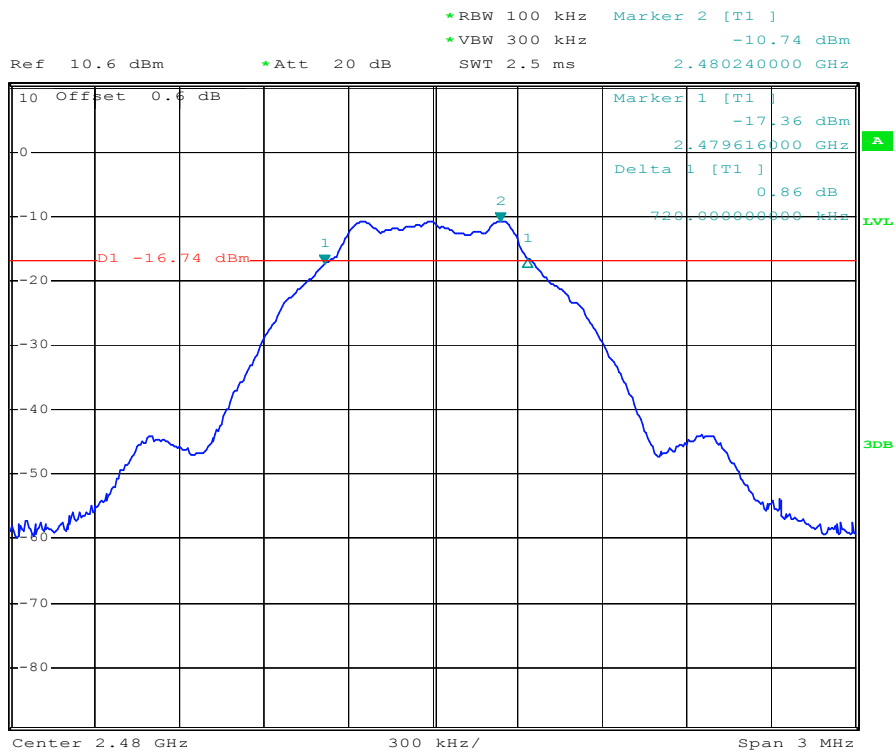
Low Channel:



Middle Channel:



High Channel:



## 7. RF Output Power

---

### 7.1 Standard Applicable

According to 15.247(b)(3). For systems using digital modulation in the 902–928 MHz, 2400–2483.5 MHz, and 5725–5850 MHz bands: 1 Watt.

### 7.2 Test Procedure

According to section KDB-558074 D01 v05 section 9.1.1, this procedure shall be used when the measurement instrument has available a resolution bandwidth that is greater than the DTS bandwidth.

- a) Set the RBW  $\geq$  DTS bandwidth.
- b) Set VBW  $\geq 3 \times$  RBW.
- c) Set span  $\geq 3 \times$  RBW
- d) Sweep time = auto couple.
- e) Detector = peak.
- f) Trace mode = max hold.
- g) Allow trace to fully stabilize.
- h) Use peak marker function to determine the peak amplitude level.

### 7.3 Environmental Conditions

Temperature:	26° C
Relative Humidity:	57%
ATM Pressure:	1011 mbar

### 7.4 Summary of Test Results/Plots

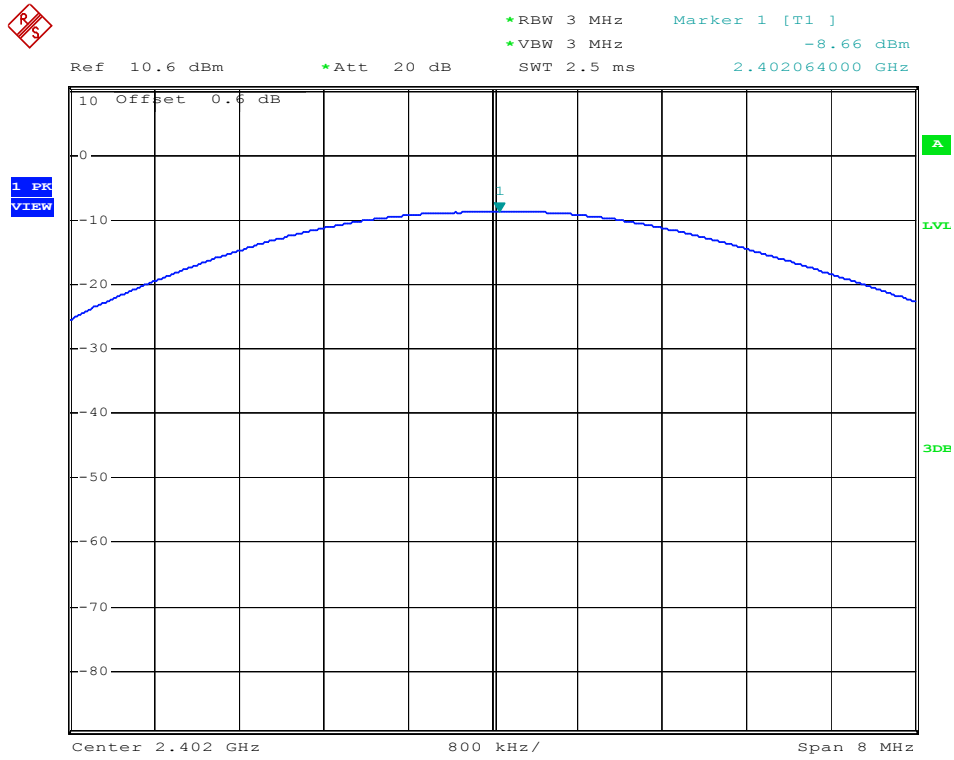
Test Mode	Frequency MHz	Reading dBm	Output Power mW	Limit mW
GFSK(BLE)	2402	-8.66	0.1361	1000
	2442	-7.84	0.1644	1000
	2480	-10.61	0.0869	1000

*Note: the antenna gain of 0dBi less than 6dBi maximum permission antenna gain value based on 1 watt peak output power limit.*

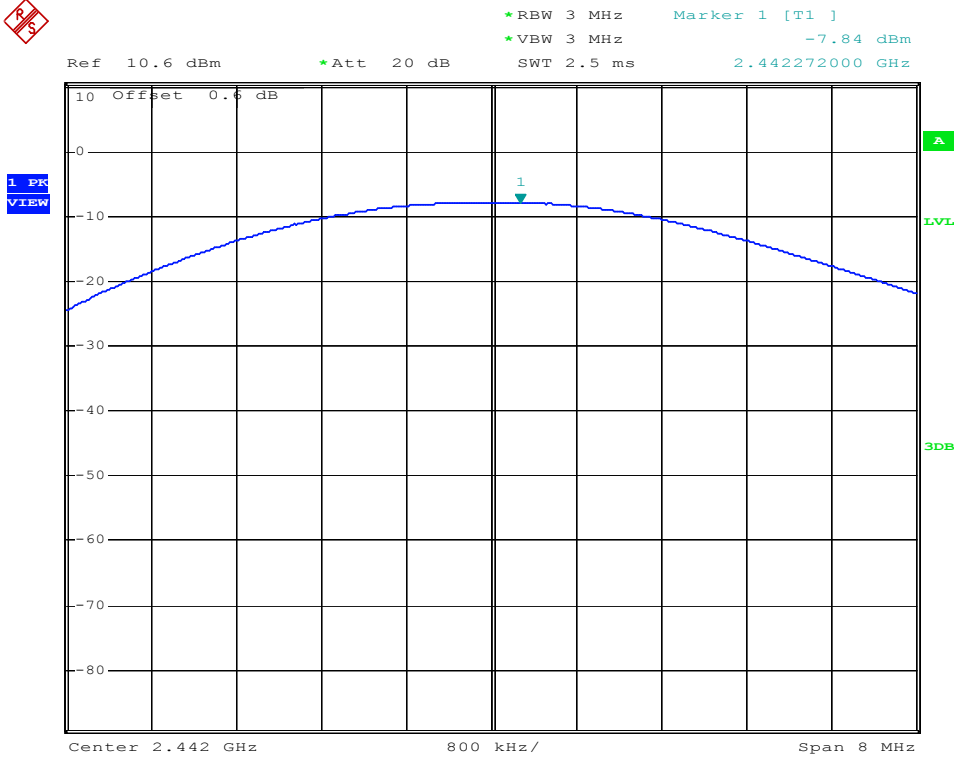


For BLE:

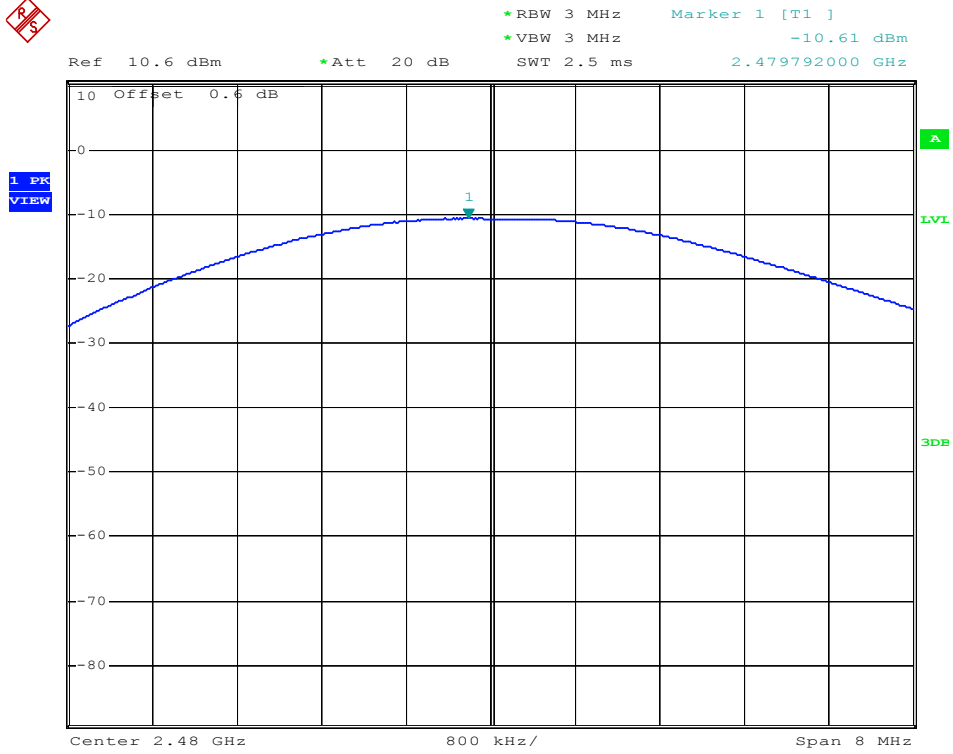
Low Channel:



Middle Channel:



High Channel:



## 8. Field Strength of Spurious Emissions

---

### 8.1 Standard Applicable

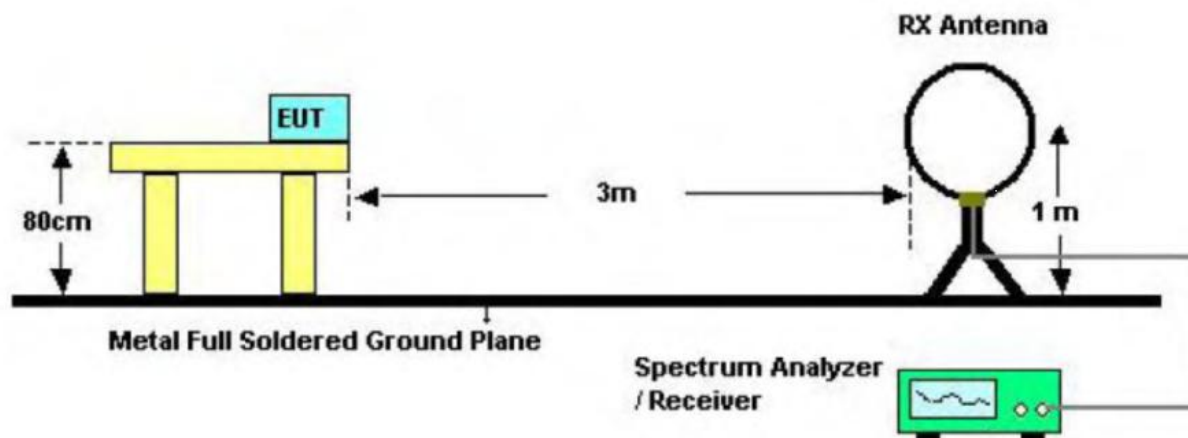
According to §15.247(d), in any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within 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).

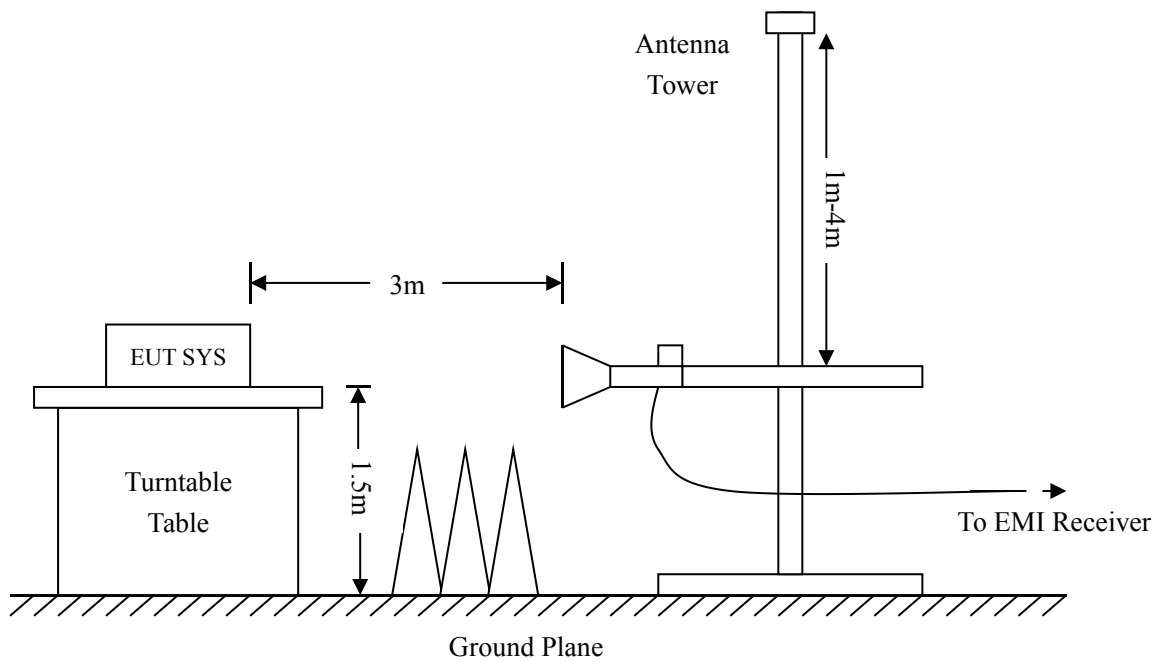
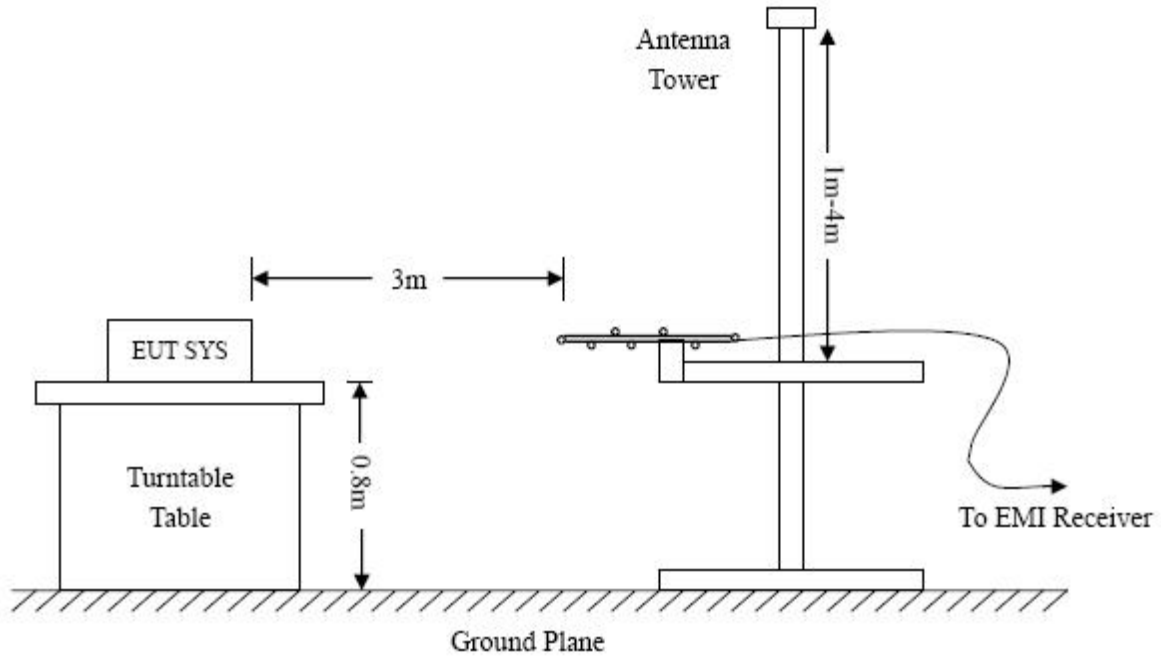
The emission limit in this paragraph is based on measurement instrumentation employing an average detector. The provisions in §15.35 for limiting peak emissions apply. Spurious Radiated Emissions measurements starting below or at the lowest crystal frequency.

### 8.2 Test Procedure

The setup of EUT is according with per ANSI C63.10-2013 measurement procedure. The specification used was with the FCC Part 15.205 15.247(a) and FCC Part 15.209 Limit.

The external I/O cables were draped along the test table and formed a bundle 30 to 40 cm long in the middle. The spacing between the peripherals was 10 cm.





Frequency :9kHz-30MHz  
 RBW=10KHz,  
 VBW =30KHz  
 Sweep time= Auto  
 Trace = max hold  
 Detector function = peak

Frequency :30MHz-1GHz  
 RBW=120KHz,  
 VBW=300KHz  
 Sweep time= Auto  
 Trace = max hold  
 Detector function = peak, QP

Frequency :Above 1GHz  
 RBW=1MHz,  
 VBW=3MHz(Peak), 10Hz(AV)  
 Sweep time= Auto  
 Trace = max hold  
 Detector function = peak, AV

### 8.3 Corrected Amplitude & Margin Calculation

The Corrected Amplitude is calculated by adding the Antenna Factor and the Cable Factor, and subtracting the Amplifier Gain from the Amplitude reading. The basic equation is as follows:

$$\text{Corr. Ampl.} = \text{Indicated Reading} + \text{Ant. Factor} + \text{Cable Loss} - \text{Ampl. Gain}$$

The “**Margin**” column of the following data tables indicates the degree of compliance with the applicable limit. For example, a margin of  $-6\text{dB}\mu\text{V}$  means the emission is  $6\text{dB}\mu\text{V}$  below the maximum limit. The equation for margin calculation is as follows:

$$\text{Margin} = \text{Corr. Ampl.} - \text{FCC Part 15 Limit}$$

### 8.4 Environmental Conditions

Temperature:	25 °C
Relative Humidity:	52%
ATM Pressure:	1012 mbar

### 8.5 Summary of Test Results/Plots

According to the data below, the FCC Part 15.205, 15.209 and 15.247 standards, and had the worst cases:

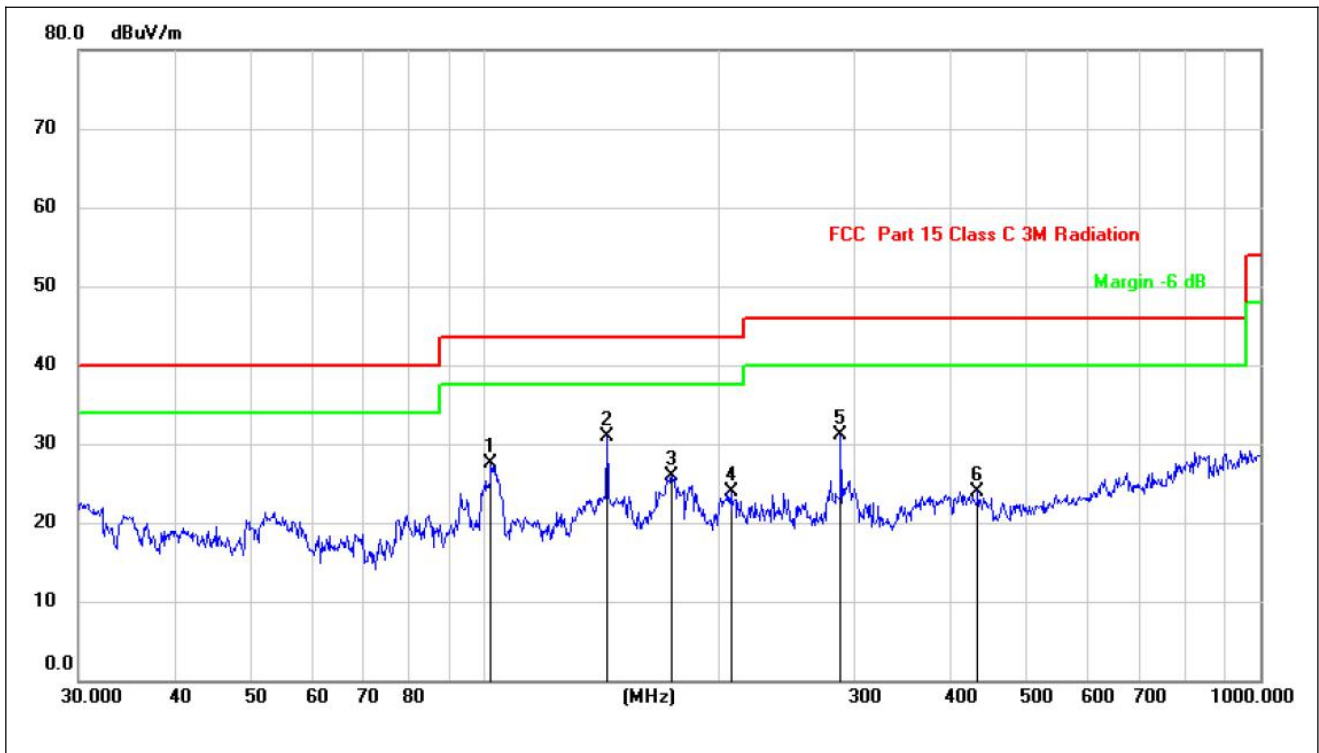
*Note:*

1. Worst-case radiated emission below 1GHz is GFSK (CH Middle ) mode.
2. Worst-case radiated emission above 1GHz is GFSK (CH Low, Middle, High) mode.

The Worst Test Data Below 1GHz GFSK (CH Middle ) mode:

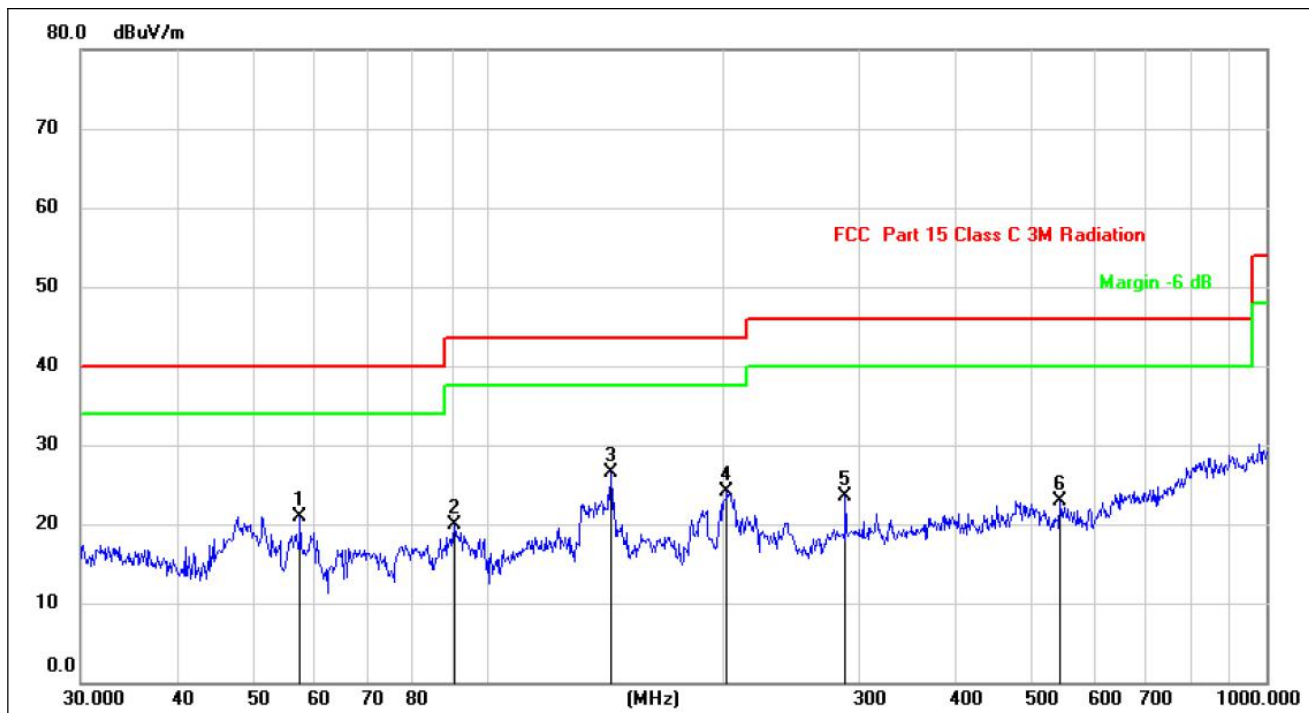
**Plot of Radiated Emissions**

Test Specification: Horizontal



No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dBuV/m	Measure- ment dBuV/m	Limit dBuV/m	Over dB	Detector	Comment
1		102.0014	26.95	0.52	27.47	43.50	-16.03	QP	
2	*	143.8294	29.45	1.45	30.90	43.50	-12.60	QP	
3		174.4241	25.16	0.69	25.85	43.50	-17.65	QP	
4		207.8500	22.32	1.50	23.82	43.50	-19.68	QP	
5		287.9904	27.21	3.82	31.03	46.00	-14.97	QP	
6		432.5457	17.33	6.67	24.00	46.00	-22.00	QP	

Test Specification: Vertical



No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dBuV/m	Measure- ment dBuV/m	Limit dBuV/m	Over dB	Detector	Comment
1		57.3922	20.21	0.71	20.92	40.00	-19.08	QP	
2		90.5374	20.40	-0.46	19.94	43.50	-23.56	QP	
3	*	143.8294	25.07	1.45	26.52	43.50	-16.98	QP	
4		202.8103	22.63	1.50	24.13	43.50	-19.37	QP	
5		287.9904	19.64	3.82	23.46	46.00	-22.54	QP	
6		543.2741	14.88	7.98	22.86	46.00	-23.14	QP	

Note:

1.Measurement = Reading Level+ Correct Factor.

2.Correct Factor =Ant. Factor + Cable Loss – Ampl. Gain.

*The Worst Spurious Emissions Above 1GHz*

Frequency	Rearding Level	Factor	Result	Limit	Margin	Polar	Detector
(MHz)	(dB $\mu$ V)	(dB/m)	(dB $\mu$ V/m)	(dB $\mu$ V/m)	(dB)	H/V	
Low Channel-2402MHz							
4804	51.33	4.62	55.95	74	-18.05	H	PK
4804	35.91	4.62	40.53	54	-13.47	H	AV
7206	49.88	3.51	53.39	74	-20.61	H	PK
7206	36.35	3.51	39.86	54	-14.14	H	AV
4804	52.48	4.62	57.10	74	-16.90	V	PK
4804	37.12	4.62	41.74	54	-12.26	V	AV
7206	50.49	3.51	54.00	74	-20.00	V	PK
7206	37.82	3.51	41.33	54	-12.67	V	AV
Middle Channel-2442MHz							
4884	50.28	3.65	53.93	74	-20.07	H	PK
4884	39.65	3.65	43.30	54	-10.70	H	AV
7326	51.37	3.48	54.85	74	-19.15	H	PK
7326	40.44	3.48	43.92	54	-10.08	H	AV
4884	51.25	3.65	54.90	74	-19.10	V	PK
4884	37.54	3.65	41.19	54	-12.81	V	AV
7326	50.41	3.48	53.89	74	-20.11	V	PK
7326	36.49	3.48	39.97	54	-14.03	V	AV
High Channel-2480MHz							
4960	52.01	2.51	54.52	74	-19.48	H	PK
4960	38.24	2.51	40.75	54	-13.25	H	AV
7440	51.14	3.10	54.24	74	-19.76	H	PK
7440	37.23	3.10	40.33	54	-13.67	H	AV
4960	51.52	2.51	54.03	74	-19.97	V	PK
4960	36.28	2.51	38.79	54	-15.21	V	AV
7440	51.54	3.10	54.64	74	-19.36	V	PK
7440	36.55	3.10	39.65	54	-14.35	V	AV

Note 1 :

1.Measurement = Reading Level + Correct Factor.

2.Correct Factor =Ant. Factor + Cable Loss – Ampl. Gain.

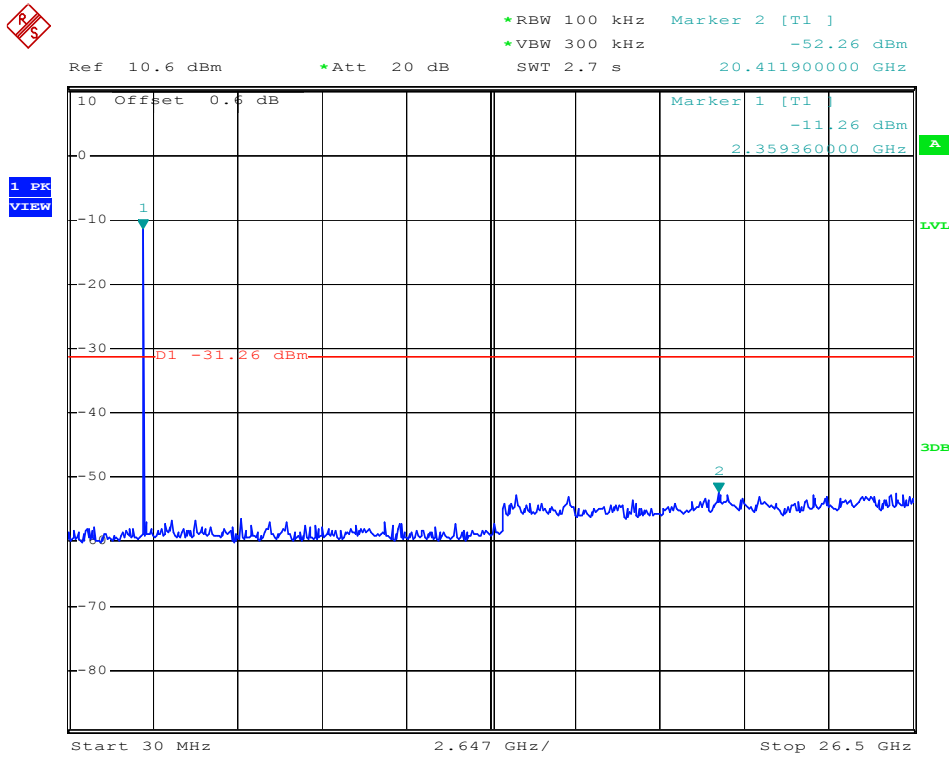
Note 2: Testing is carried out with frequency rang 9kHz to the tenth harmonics, other than listed in the table above are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.



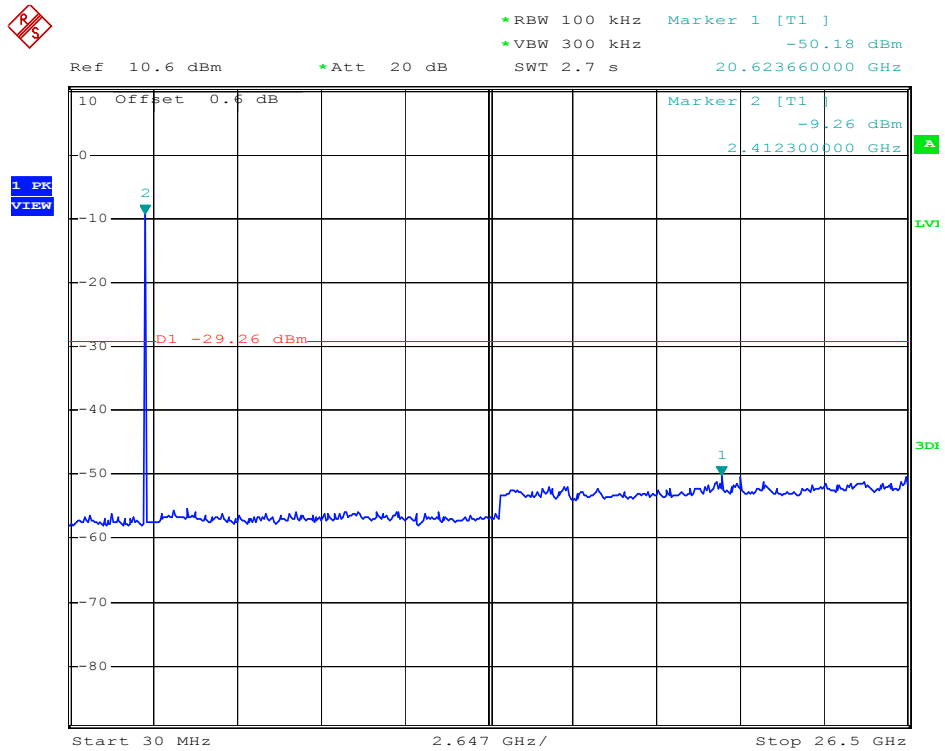
Spurious Emission(Conducted)

For BLE

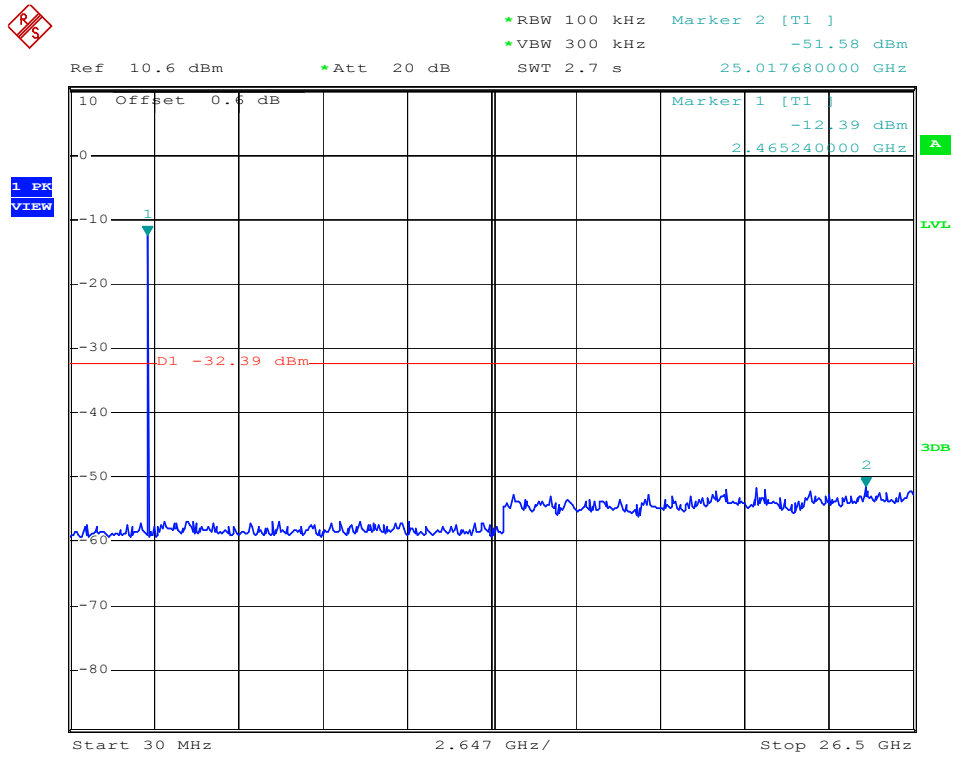
Low channel:



Middle channel:



High channel:



## 9. Out of Band Emissions

---

### 9.1 Standard Applicable

According to §15.247 (d) 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).

### 9.2 Test Procedure

According to the KDB 558074 D01 15.247 Meas Guidance v05r02, the band-edge radiated test method as follows:

Set span = wide enough to capture the peak level of the emission operating on the channel closest to the bandedge, as well as any modulation products which fall outside of the authorized band of operation (2310MHz to 2420MHz for low bandedge, 2460MHz to 2500MHz for the high bandedge)

RBW = 1MHz, VBW = 1MHz for peak value measured

RBW = 1MHz, VBW = 10Hz for average value measured

Sweep = auto; Detector function = peak/average; Trace = max hold

All the trace to stabilize, set the marker on the emission at the bandedge, or on the highest modulation product outside of the band, if this level is greater than that at the bandedge. Enable the marker-delta function, then use the marker-to-peak function to move the marker to the peak of the in-band emission. Those emission must comply with the 15.209 limit for fall in the restricted bands listed in section 15.205. Note that the method of measurement KDB publication number: 913591 may be used for the radiated bandedge measurements.

According to the KDB 558074 D01 15.247 Meas Guidance v05r02, the conducted spurious emissions test method as follows:

1. Set start frequency to DTS channel edge frequency.
2. Set stop frequency so as to encompass the spectrum to be examined.
3. Set RBW = 100 kHz.
4. Set VBW  $\geq$  300 kHz.
5. Detector = peak.
6. Trace Mode = max hold.
7. Sweep = auto couple.
8. Allow the trace to stabilize (this may take some time, depending on the extent of the span).
9. Use peak marker function to determine maximum amplitude of all unwanted emissions within any 100 kHz bandwidth.

Ensure that the amplitude of all unwanted emissions outside of the authorized frequency band (excluding

restricted frequency bands) are attenuated by at least the minimum requirements specified in section 8.1. Report the three highest emissions relative to the limit.

### 9.3 Environmental Conditions

Temperature:	23°C
Relative Humidity:	54%
ATM Pressure:	1011 mbar

### 9.4 Summary of Test Results/Plots

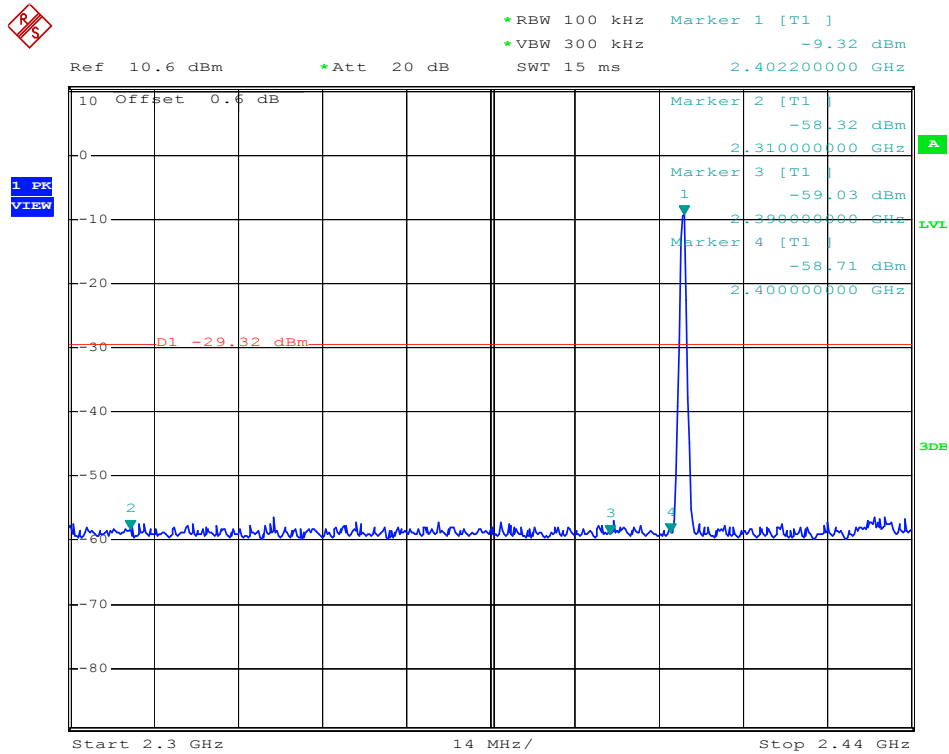
Bandedge (Radiated)

Lowest Bandedge-BLE

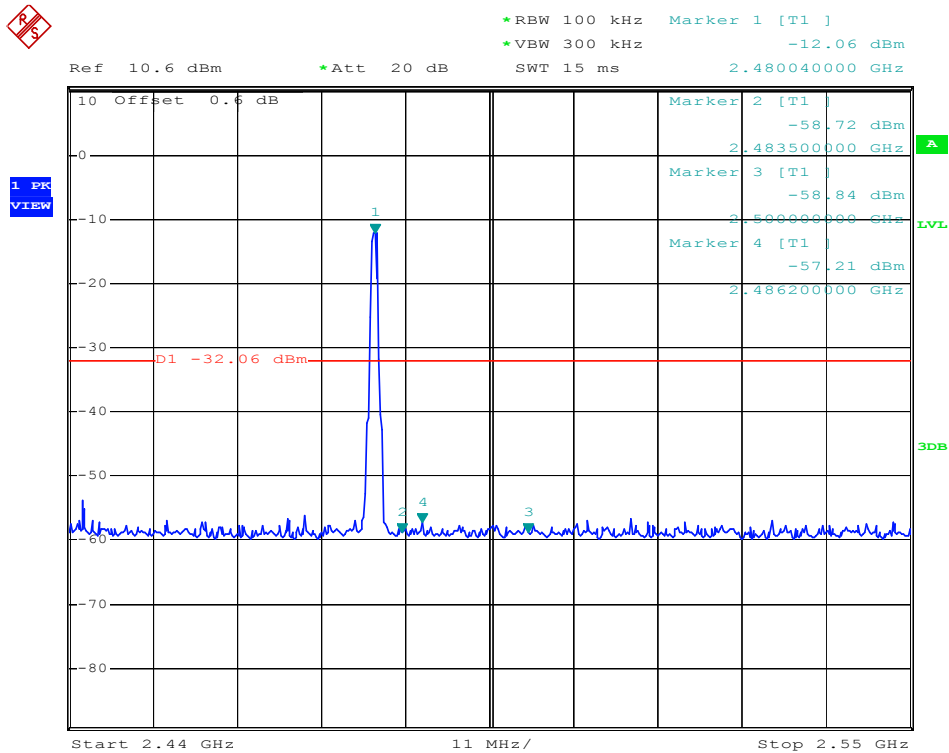
Channel	Freq.(MHz)	Reading(dBuV)	Factor (dB/m)	Level(dBuV/m)	Limit(dBuV/m)	Margin(dB)	Detector
LOW (2402MHz)	2390	51.99	2.36	54.35	74	-19.65	Peak
	2390	38.42	2.36	40.78	54	-13.22	Average
	2400	52.25	3.45	55.70	74	-18.30	Peak
	2400	38.74	3.45	42.19	54	-11.81	Average
HIGH (2480MHz)	2483.5	51.56	2.51	54.07	74	-19.93	Peak
	2483.5	37.22	2.51	39.73	54	-14.27	Average
	2500	48.18	3.01	51.19	74	-22.81	Peak
	2500	36.63	3.01	39.64	54	-14.36	Average

Bandedge (Conducted)

Lowest



High Channel:



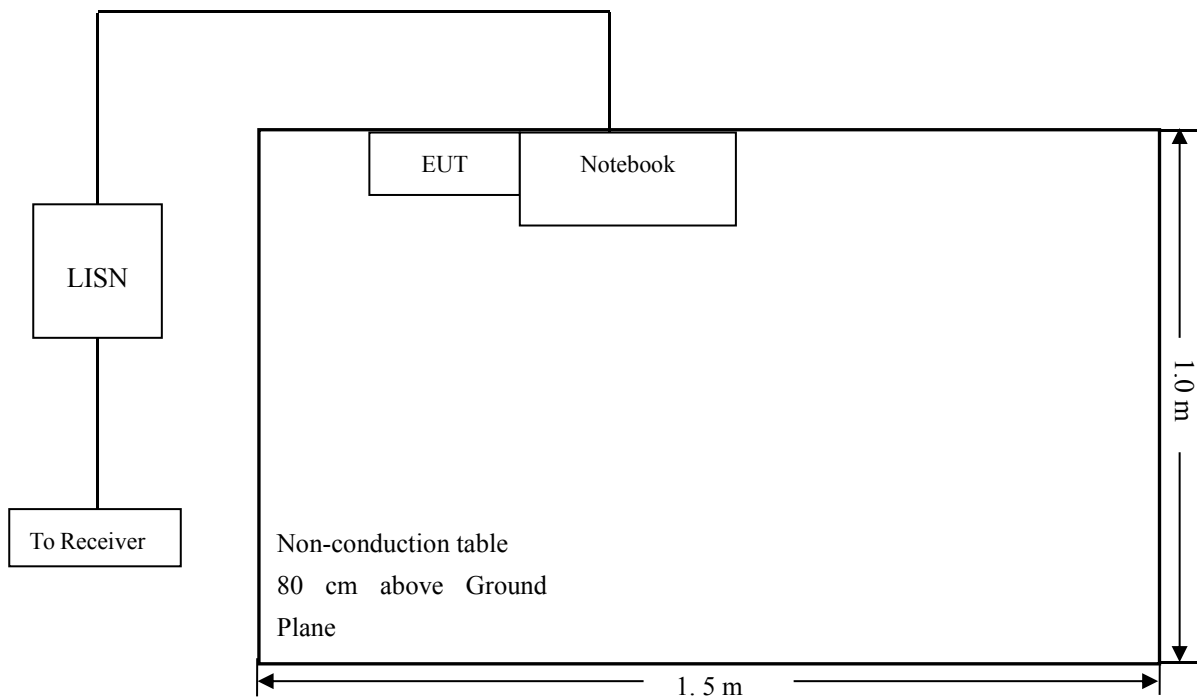
## 10. Conducted Emissions

### 10.1 Test Procedure

The setup of EUT is according with per ANSI C63.10:2013 measurement procedure. The specification used was with the FCC Part 15.207 Limit.

The external I/O cables were draped along the test table and formed a bundle 30 to 40 cm long in the middle. The spacing between the peripherals was 10 cm.

### 10.2 Basic Test Setup Block Diagram



### 10.3 Environmental Conditions

Temperature:	25 °C
Relative Humidity:	52%
ATM Pressure:	1012 mbar

### 10.4 Test Receiver Setup

During the conducted emission test, the test receiver was set with the following configurations:

Start Frequency..... 150 kHz  
Stop Frequency..... 30 MHz  
Sweep Speed..... Auto  
IF Bandwidth..... 10 kHz  
Quasi-Peak Adapter Bandwidth..... 9 kHz  
Quasi-Peak Adapter Mode..... Normal

### 10.5 Summary of Test Results/Plots

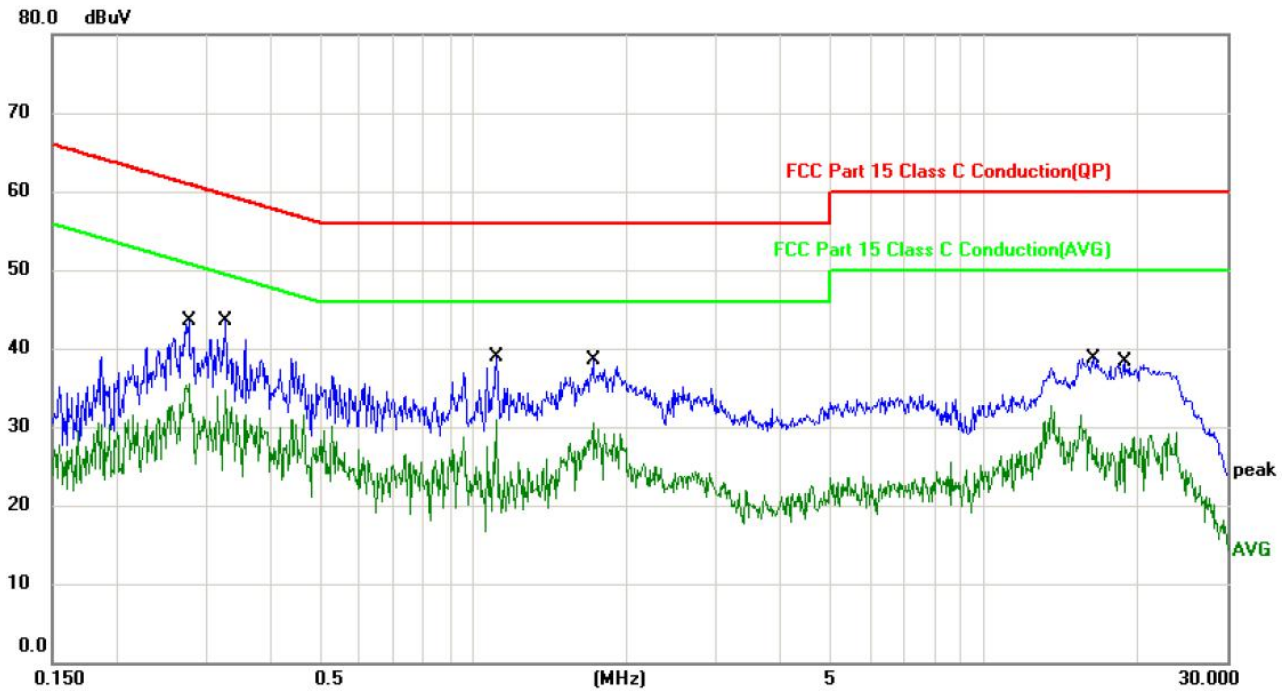
According to the data in section 10.6, the EUT complied with the FCC Part 15.207 Conducted margin for this device

### 10.6 Conducted Emissions Test Data

Note: We pre-scan all mode, the worst data is GFSK (Middle channel).

**Plot of Conducted Emissions The Worst Test Data GFSK (Middle channel):**

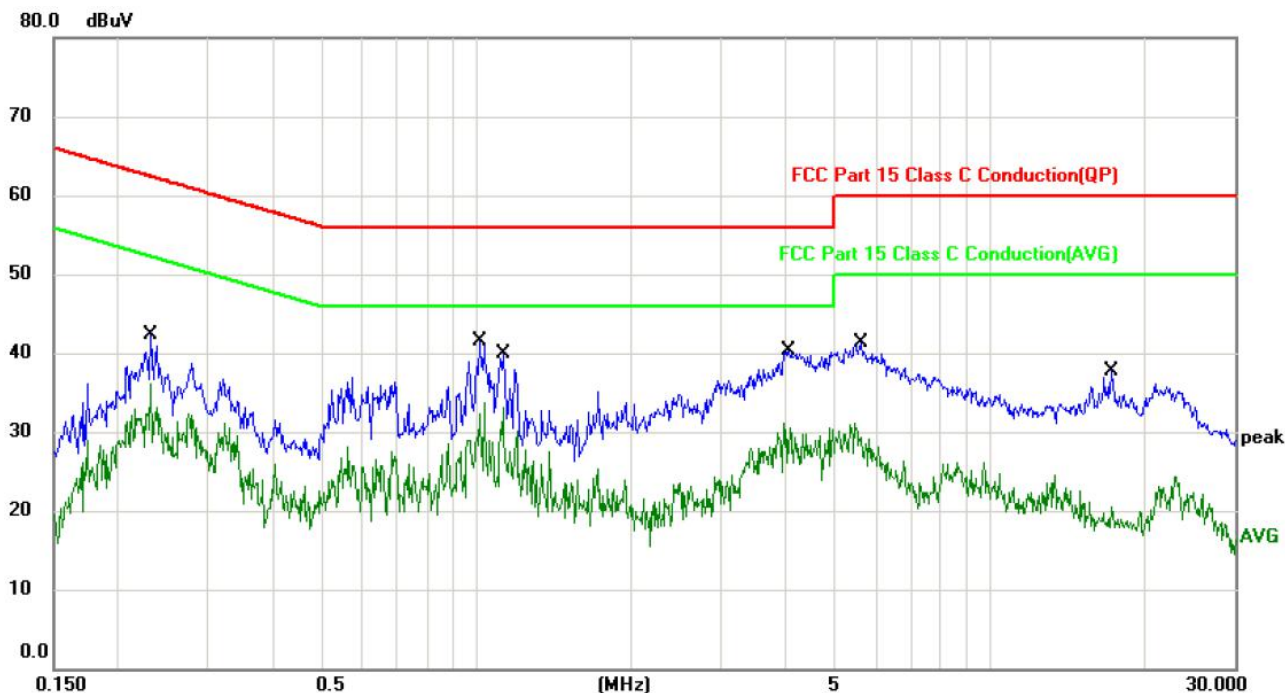
Test Specification: Neutral



No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV	Limit dBuV	Over dB	Detector	Comment
1		0.2772	43.14	0.33	43.47	60.90	-17.43	QP	
2		0.2772	35.93	0.33	36.26	50.90	-14.64	AVG	
3		0.3266	43.19	0.36	43.55	59.54	-15.99	QP	
4		0.3266	34.85	0.36	35.21	49.54	-14.33	AVG	
5		1.1111	38.24	0.69	38.93	56.00	-17.07	QP	
6	*	1.1111	31.49	0.69	32.18	46.00	-13.82	AVG	
7		1.7159	37.76	0.76	38.52	56.00	-17.48	QP	
8		1.7159	29.81	0.76	30.57	46.00	-15.43	AVG	
9		16.3982	36.77	1.95	38.72	60.00	-21.28	QP	
10		16.3982	31.52	1.95	33.47	50.00	-16.53	AVG	
11		18.8202	35.78	2.53	38.31	60.00	-21.69	QP	
12		18.8202	30.25	2.53	32.78	50.00	-17.22	AVG	



Test Specification: Line



No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV	Limit dBuV	Over dB	Detector	Comment
1		0.2316	41.97	0.30	42.27	62.39	-20.12	QP	
2		0.2316	35.86	0.30	36.16	52.39	-16.23	AVG	
3		1.0101	40.85	0.67	41.52	56.00	-14.48	QP	
4	*	1.0101	34.25	0.67	34.92	46.00	-11.08	AVG	
5		1.1231	39.15	0.69	39.84	56.00	-16.16	QP	
6		1.1231	33.00	0.69	33.69	46.00	-12.31	AVG	
7		4.0486	39.40	0.88	40.28	56.00	-15.72	QP	
8		4.0486	30.69	0.88	31.57	46.00	-14.43	AVG	
9		5.5936	40.39	0.93	41.32	60.00	-18.68	QP	
10		5.5936	29.29	0.93	30.22	50.00	-19.78	AVG	
11		17.1994	35.56	2.10	37.66	60.00	-22.34	QP	
12		17.1994	20.93	2.10	23.03	50.00	-26.97	AVG	

NOTE:

Corret Factor=LISN Factor+Cable loss.

Measurementt=Reading level+Corret Factor.

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