

# TEST REPORT

Reference No. .... : WTX22X02110201W-1  
FCC ID..... : 2A4VA7023B  
Applicant ..... : Shenzhen Qiluoxiang Technology Co., Ltd.  
Address ..... : Room 1811, Block A, Xintianxia Bairuida Building, Vanke City Community,  
Bantian Street, Longgang District, Shenzhen  
Product Name ..... : Upgraded 7 inch Standard Car Stereo  
Test Model..... : 7023B  
Standards ..... : FCC Part 15.247  
Date of Receipt sample .... : February 11, 2022  
Date of Test..... : February 11, 2022 to February 25, 2022  
Date of Issue..... : February 25, 2022  
Test Result..... : **Pass**

Remarks:

The results shown in this test report refer only to the sample(s) tested, this test report cannot be reproduced, except in full, without prior written permission of the company. The report would be invalid without specific stamp of test institute and the signatures of compiler and approver.

**Prepared By:**

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**Report version**

Version No.	Date of issue	Description
Rev.00	February 25, 2022	Original
/	/	/

## 1. GENERAL INFORMATION

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

#### Client Information

Applicant: Shenzhen Qiluoxiang Technology Co., Ltd.  
 Address of applicant: Block A, Xintianxia Bairuida Building, Vanke City  
 Community, Bantian Street, Longgang District, Shenzhen

Manufacturer: Shenzhen Qiluoxiang Technology Co., Ltd.  
 Address of manufacturer: Block A, Xintianxia Bairuida Building, Vanke City  
 Community, Bantian Street, Longgang District, Shenzhen

General Description of EUT	
Product Name:	Upgraded 7 inch Standard Car Stereo
Brand Name:	Hieha
Model No.:	7023B
Adding Model(s):	CP01,CP07,CP08,CP09,CP11,CP12,CP13,CP17, CP21,CP28,CP30,CP50,CP68,SWM-N8, H901,FC009,CZ01, CZ02, CZ05,CZ07,CZ08,CZ09
Rated Voltage:	DC 12V
Power Adapter:	/
Software Version:	/
Hardware Version:	/
Serial Number:	975612354A115
<i>Note: The test data is gathered from a production sample provided by the manufacturer. provided by the manufacturer. The appearance of others models listed in the report is different from main-test model 7023B, but the circuit and the electronic construction do not change, declared by the manufacturer.</i>	

Technical Characteristics of EUT	
Bluetooth Version:	V5.0 BLE
Frequency Range:	2402-2480MHz
RF Output Power:	4.367dBm (Conducted)
Data Rate:	1Mbps
Modulation:	GFSK
Quantity of Channels:	40
Channel Separation:	2MHz
Type of Antenna:	PCB
Antenna Gain:	0.68dBi

## 1.2 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.

**558074 D01 15.247 Meas Guidance v05r02**: Guidance For Compliance Measurements On Digital Transmission System, Frequency Hopping Spread Spectrum System, And Hybrid System Devices Operating Under Section 15.247 Of The Fcc Rules

**ANSI C63.10-2013**: American National Standard for Testing Unlicensed Wireless Devices.

**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, KDB 558074 D01 15.247 Meas Guidance v05r02.

The equipment under test (EUT) was configured to measure its highest possible emission level. The test modes were adapted accordingly in reference to the Operating Instructions.

## 1.4 Test Facility

### Address of the test laboratory

Laboratory: Waltek Testing Group (Shenzhen) Co., Ltd.

Address: 1/F., Room 101, Building 1, Hongwei Industrial Park, Liuxian 2nd Road, Block 70 Bao'an District, Shenzhen, Guangdong, China

### FCC – Registration No.: 125990

Waltek Testing Group (Shenzhen) Co., Ltd. EMC Laboratory has been registered and fully described in a report filed with the FCC (Federal Communications Commission). The acceptance letter from the FCC is maintained in our files. The Designation Number is CN5010, and Test Firm Registration Number is 125990.

## 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, with a duty cycle equal to 100%, and to measure its highest possible emissions level, more detailed description as follows:

Test Mode List		
Test Mode	Description	Remark
TM1	Low	2402MHz
TM2	Middle	2440MHz
TM3	High	2480MHz

Test Conditions	
Temperature:	22~25 °C
Relative Humidity:	50~55 %.
ATM Pressure:	1019 mbar

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

## 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	9-150kHz $\pm 3.74\text{dB}$
		0.15-30MHz $\pm 3.34\text{dB}$
Transmitter Spurious Emissions	Radiated	30-200MHz $\pm 4.52\text{dB}$
		0.2-1GHz $\pm 5.56\text{dB}$
		1-6GHz $\pm 3.84\text{dB}$
		6-18GHz $\pm 3.92\text{dB}$

**1.7 Test Equipment List and Details**

No.	Description	Manufacturer	Model	Serial No.	Cal Date	Due. Date
SEMT-1075	Communication Tester	Rohde & Schwarz	CMW500	148650	2021-03-27	2022-03-26
SEMT-1063	GSM Tester	Rohde & Schwarz	CMU200	114403	2021-03-27	2022-03-26
SEMT-1072	Spectrum Analyzer	Agilent	E4407B	MY41440400	2021-03-27	2022-03-26
SEMT-1079	Spectrum Analyzer	Agilent	N9020A	US47140102	2021-03-27	2022-03-26
SEMT-1080	Signal Generator	Agilent	83752A	3610A01453	2021-03-27	2022-03-26
SEMT-1081	Vector Signal Generator	Agilent	N5182A	MY47070202	2021-03-27	2022-03-26
SEMT-1028	Power Divider	Weinschel	1506A	PM204	2021-03-27	2022-03-26
SEMT-1082	Power Divider	RF-Lambda	RFLT4W5M18G	14110400027	2021-03-27	2022-03-26
SEMT-1031	Spectrum Analyzer	Rohde & Schwarz	FSP30	836079/035	2021-03-27	2022-03-26
SEMT-1007	EMI Test Receiver	Rohde & Schwarz	ESVB	825471/005	2021-03-27	2022-03-26
SEMT-1008	Amplifier	Agilent	8447F	3113A06717	2021-04-12	2022-04-11
SEMT-1043	Amplifier	C&D	PAP-1G18	2002	2021-04-12	2022-04-11
SEMT-1069	Loop Antenna	Schwarz beck	FMZB 1516	9773	2021-03-19	2023-03-18
SEMT-1068	Broadband Antenna	Schwarz beck	VULB9163	9163-333	2021-03-19	2023-03-18
SEMT-1042	Horn Antenna	ETS	3117	00086197	2021-03-19	2023-03-18
SEMT-1121	Horn Antenna	Schwarzbeck	BBHA 9170	BBHA 9170582	2021-04-27	2023-04-26
SEMT-1169	Pre-amplifier	Direction Systems Inc.	PAP-2640	14145-14153	2021-04-27	2022-04-26
SEMT-1163	Spectrum Analyzer	Rohde & Schwarz	FSP40	100612	2021-03-27	2022-03-26
SEMT-1166	Power Limiter	Agilent	N9356B	MY45450376	2021-03-27	2022-03-26
SEMT-1076	RF Switcher	Top Precision	RCS03-A2	/	2021-03-19	2023-03-18
SEMT-C001	Cable	Zheng DI	LL142-07-07-10M(A)	/	/	/
SEMT-C002	Cable	Zheng DI	ZT40-2.92J-2.92J-6M	/	/	/
SEMT-C003	Cable	Zheng DI	ZT40-2.92J-2.92J-2.5M	/	/	/
SEMT-C004	Cable	Zheng DI	2M0RFC	/	/	/
SEMT-C005	Cable	Zheng DI	1M0RFC	/	/	/
SEMT-C006	Cable	Zheng DI	1M0RFC	/	/	/

<b>Software List</b>			
<b>Description</b>	<b>Manufacturer</b>	<b>Model</b>	<b>Version</b>
EMI Test Software (Radiated Emission)*	Farad	EZ-EMC	RA-03A 1
EMI Test Software (Conducted Emission)*	Farad	EZ-EMC	RA-03A 1

\*Remark: indicates software version used in the compliance certification testing



## 2. SUMMARY OF TEST RESULTS

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

N/A: not applicable

### **3. Antenna Requirement**

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#### **3.1 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.

#### **3.2 Evaluation Information**

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

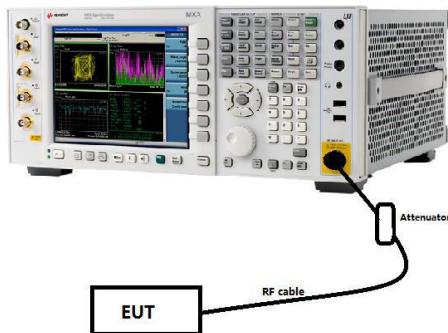
## 4. Power Spectral Density

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### 4.1 Standard Applicable

According to 15.247(a)(1)(iii), for digitally modulated systems, the power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission.

### 4.2 Test Setup Block Diagram



### 4.3 Test Procedure

According to the KDB 558074 D01 v05r02 Subclause 8.4 and ANSI C63.10-2013 Subclause 11.10.2, 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.

### 4.4 Summary of Test Results/Plots

Please refer to Appendix A

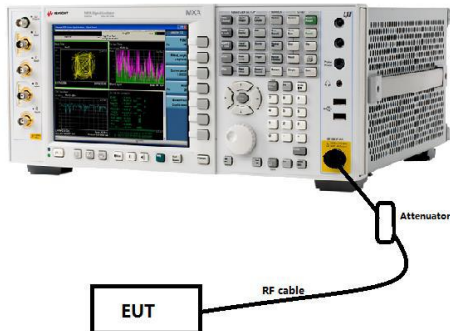
## 5. DTS Bandwidth

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### 5.1 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.

### 5.2 Test Setup Block Diagram



### 5.3 Test Procedure

According to the KDB 558074 D01 v05r02 Subclause 8.2 and ANSI C63.10-2013 Subclause 11.8.1, the test method of DTS Bandwidth as below:

- 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.

### 5.3 Summary of Test Results/Plots

Please refer to Appendix B

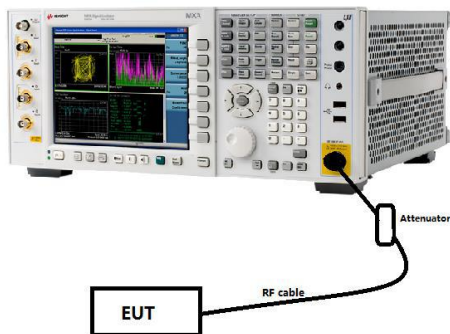
## 6. RF Output Power

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### 6.1 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.

### 6.2 Test Setup Block Diagram



### 6.3 Test Procedure

According to the KDB-558074 D01 v05r02 Subclause 8.3.1.1 and ANSI C63.10-2013 Subclause 11.9.1.1, 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.

### 6.4 Summary of Test Results/Plots

Please refer to Appendix C

## 7. Field Strength of Spurious Emissions

### 7.1 Standard Applicable

According to §15.247(d), in any 100kHz 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 20dB below that in the 100kHz 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 30dB instead of 20dB. 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).

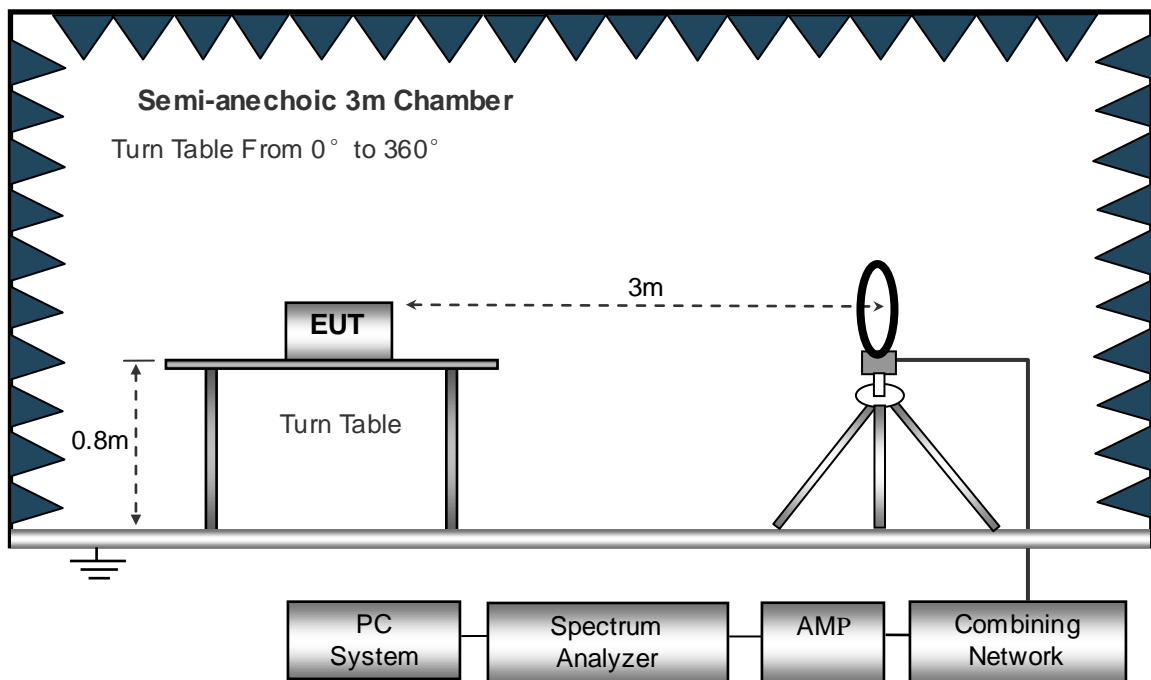
The emission limit in this paragraph is based on measurement instrumentation employing an average detector. The provisions in §15.35 for limiting peak emissions apply. Spurious Radiated Emissions measurements starting below or at the lowest crystal frequency.

### 7.2 Test Procedure

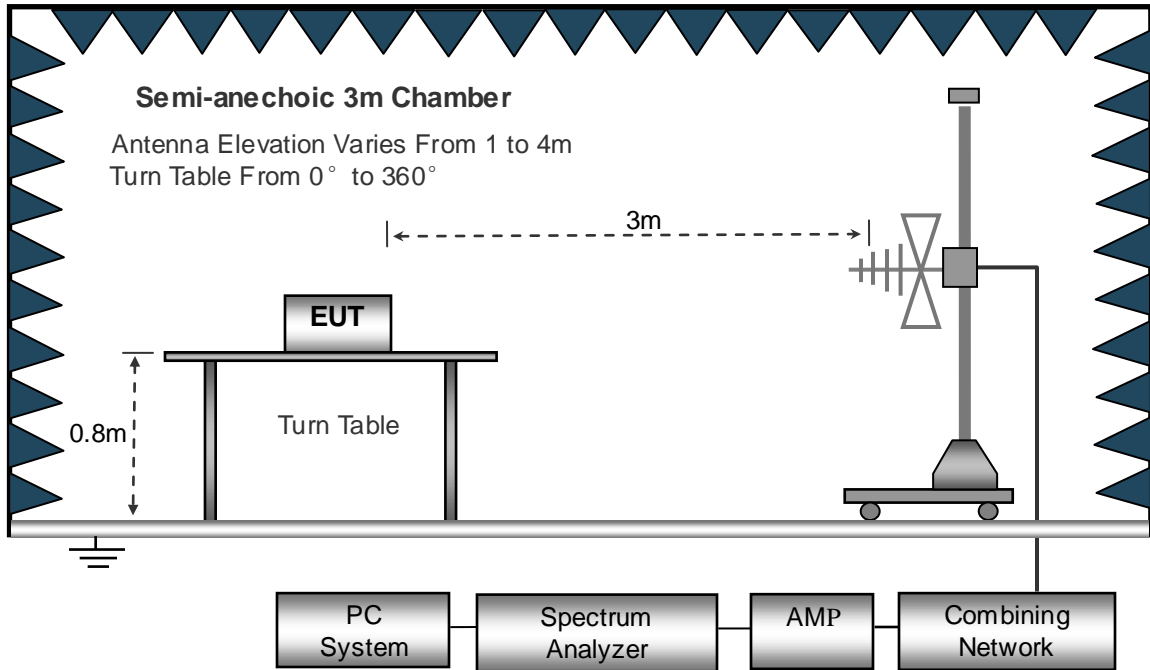
The setup of EUT is according with per ANSI C63.10-2013 measurement procedure. The specification used was with the FCC Part 15.205 15.247(a) and FCC Part 15.209 Limit.

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

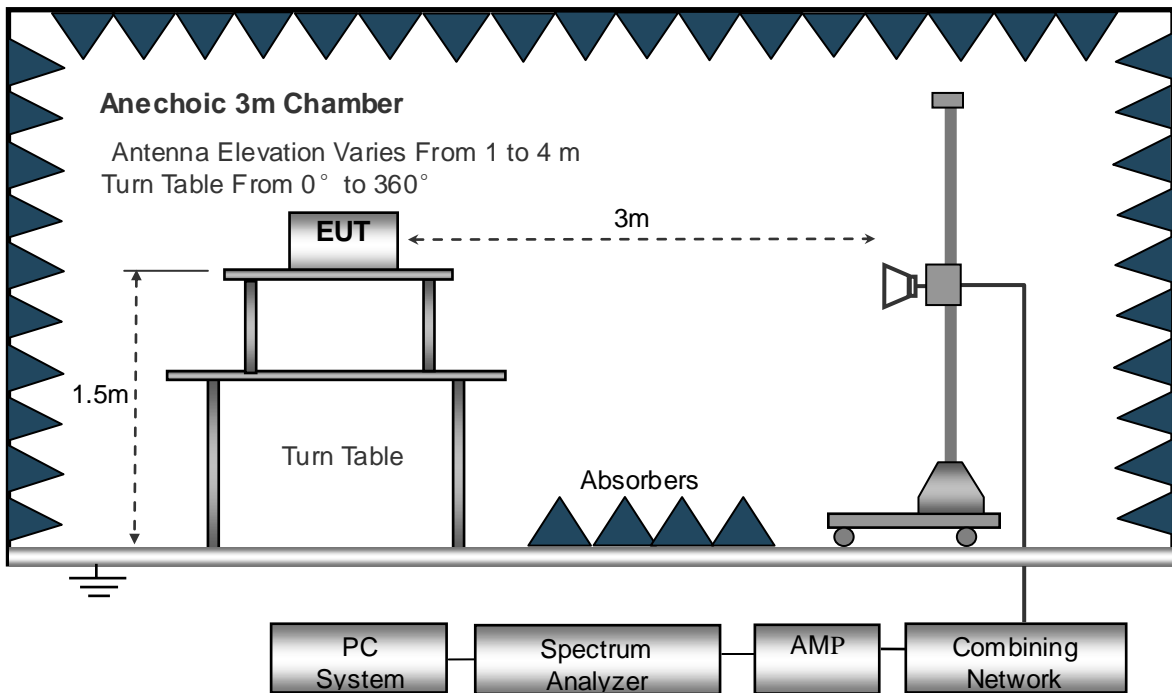
The test setup for emission measurement below 30MHz.



The test setup for emission measurement from 30MHz to 1GHz.



The test setup for emission measurement above 1GHz.



Frequency :9kHz-30MHz	Frequency :30MHz-1GHz	Frequency :Above 1GHz
RBW=10KHz,	RBW=120KHz,	RBW=1MHz,
VBW =30KHz	VBW=300KHz	VBW=3MHz(Peak), 10Hz(AV)
Sweep time= Auto	Sweep time= Auto	Sweep time= Auto
Trace = max hold	Trace = max hold	Trace = max hold
Detector function = peak	Detector function = peak, QP	Detector function = peak, AV

### 7.3 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:

$$\begin{aligned} \text{Result} &= \text{Indicated Reading} + \text{Correct} \\ \text{Correct} &= \text{Ant. Factor} + \text{Cable Loss} - \text{Ampl. Gain} \end{aligned}$$

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

$$\text{Margin} = \text{Result} - \text{FCC Part 15 Limit}$$

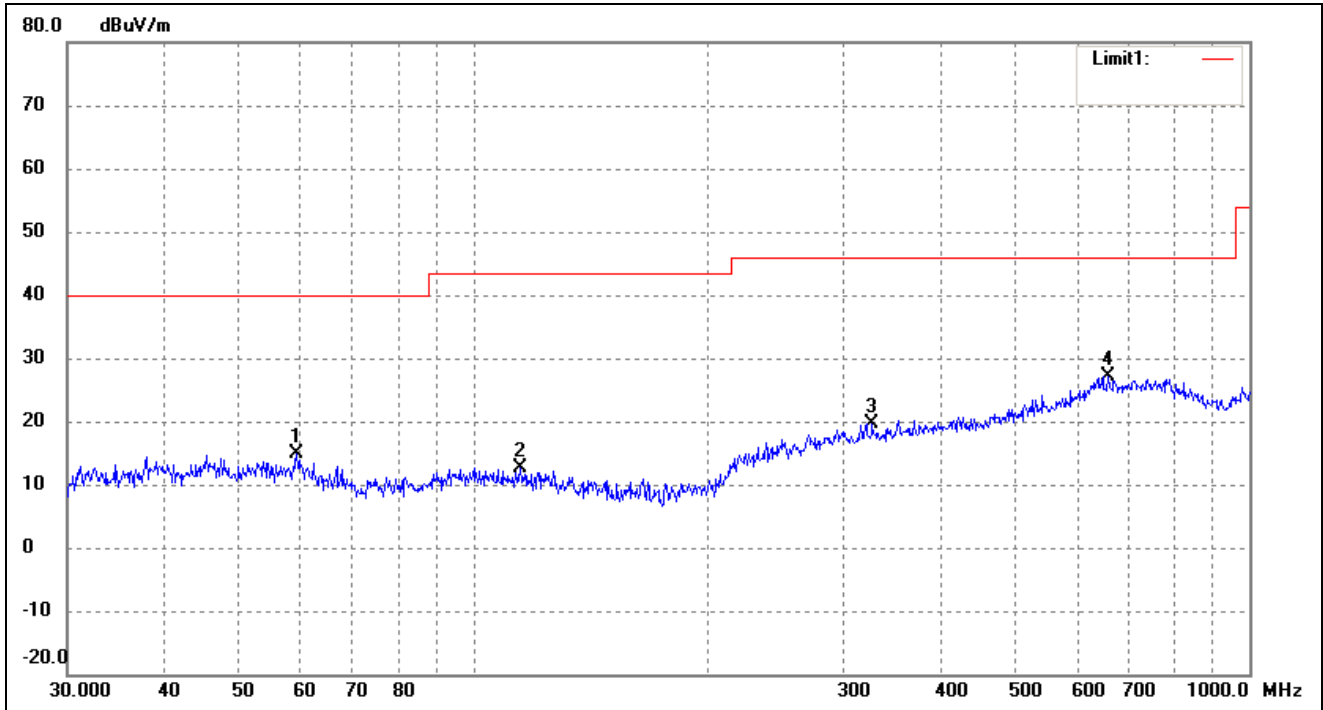
### 7.4 Summary of Test Results/Plots

*Note: this EUT was tested in 3 orthogonal positions and the worst case position data was reported.*



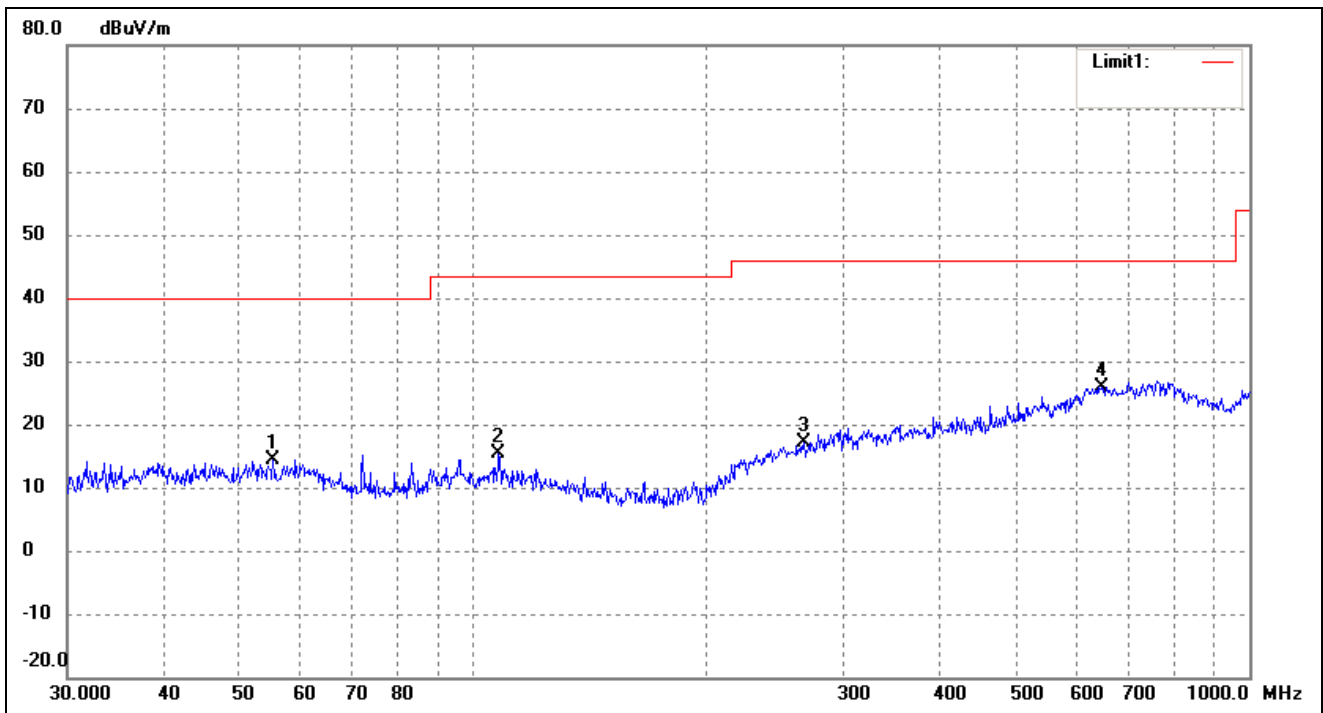
➤ Spurious Emissions Below 1GHz

Test Channel	Low	Polarity:	Horizontal
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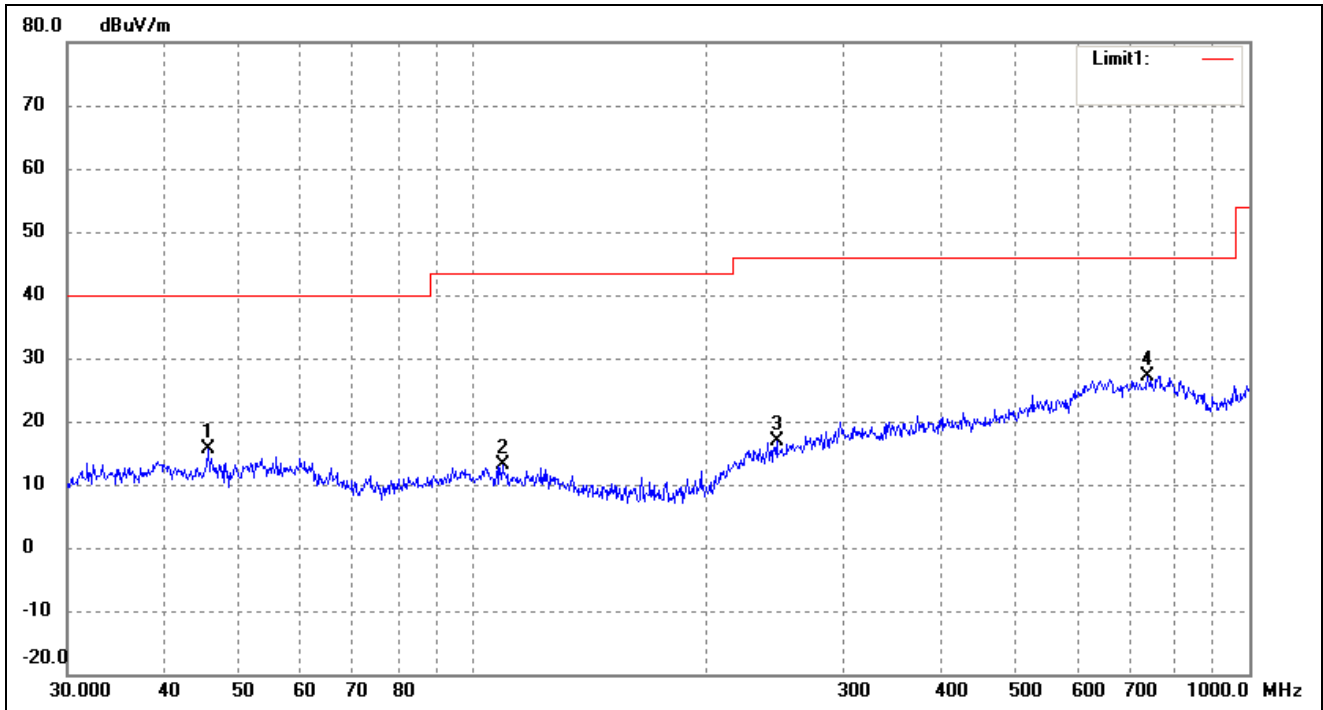
No.	Frequency (MHz)	Reading (dBu V/m)	Correct dB/m	Result (dBu V/m)	Limit (dBu V/m)	Margin (dB)	Degree ( )	Height (cm)	Remark
1	59.2325	31.46	-16.52	14.94	40.00	-25.06	343	100	peak
2	114.9169	29.27	-16.64	12.63	43.50	-30.87	93	100	peak
3	326.7395	29.16	-9.47	19.69	46.00	-26.31	91	100	peak
4	658.8362	28.65	-1.47	27.18	46.00	-18.82	91	100	peak

Test Channel	Low	Polarity:	Vertical
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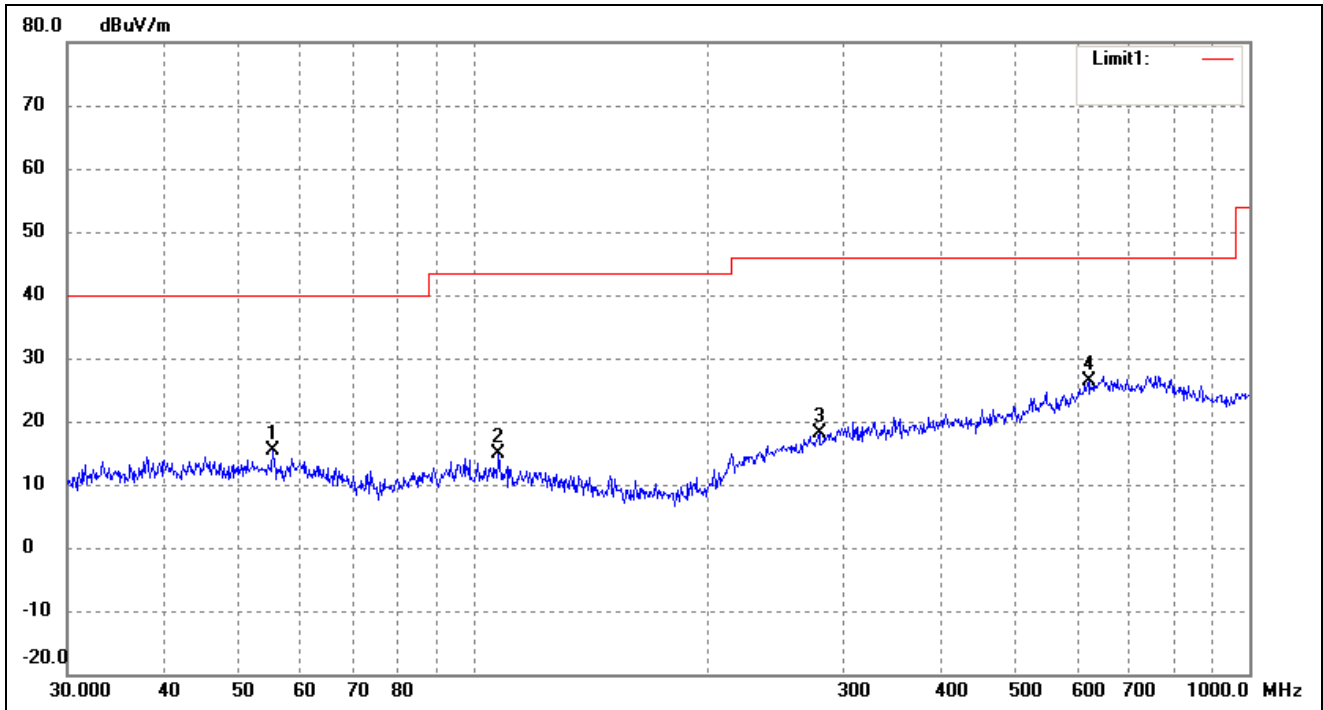
No.	Frequency (MHz)	Reading (dBu V/m)	Correct (dB/m)	Result (dBu V/m)	Limit (dBu V/m)	Margin (dB)	Degree ( )	Height (cm)	Remark
1	55.2207	30.81	-16.51	14.30	40.00	-25.70	232	100	peak
2	107.8877	31.88	-16.61	15.27	43.50	-28.23	92	100	peak
3	266.6089	28.34	-11.31	17.03	46.00	-28.97	223	100	peak
4	645.1195	27.14	-1.15	25.99	46.00	-20.01	232	100	peak

Test Channel	Middle	Polarity:	Horizontal
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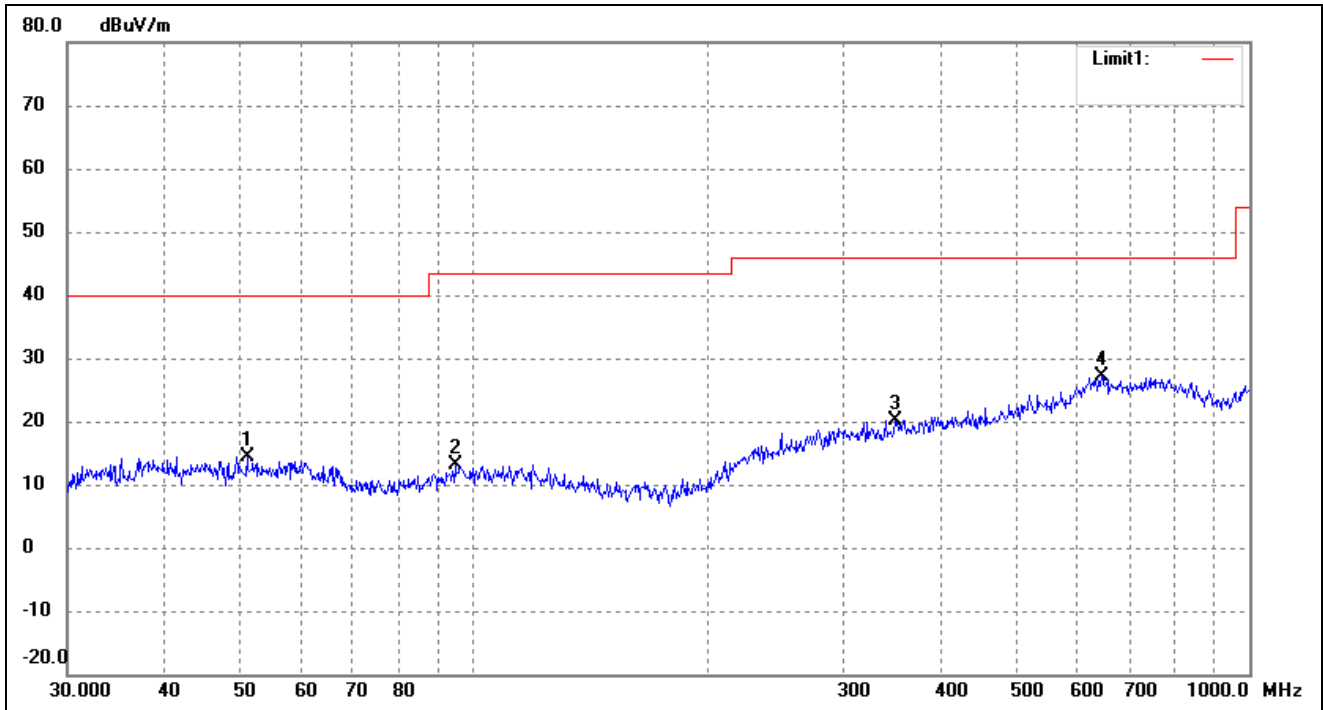
No.	Frequency (MHz)	Reading (dBu V/m)	Correct (dB/m)	Result (dBu V/m)	Limit (dBu V/m)	Margin (dB)	Degree ( )	Height (cm)	Remark
1	45.5348	32.24	-16.49	15.75	40.00	-24.25	58	100	peak
2	109.0286	29.76	-16.62	13.14	43.50	-30.36	164	100	peak
3	245.9509	29.20	-12.30	16.90	46.00	-29.10	284	100	peak
4	739.6605	27.01	0.15	27.16	46.00	-18.84	58	100	peak

Test Channel	Middle	Polarity:	Vertical
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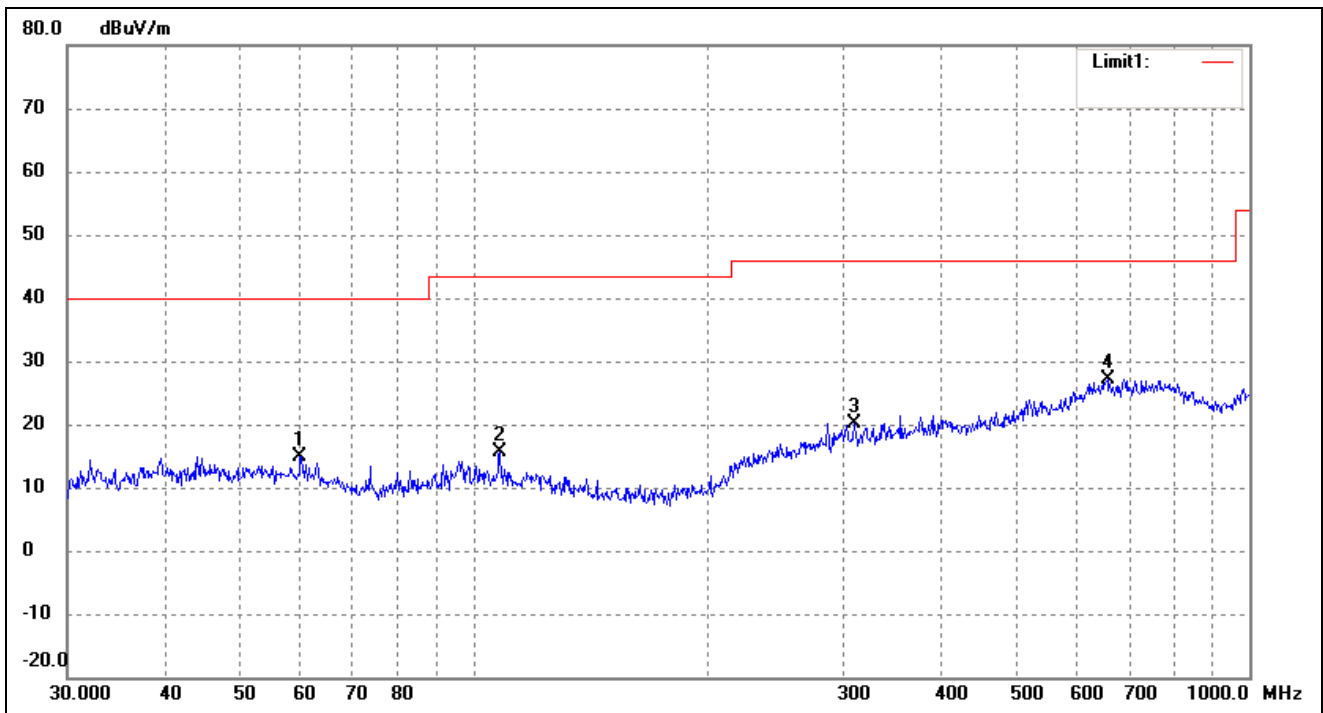
No.	Frequency (MHz)	Reading (dBu V/m)	Correct (dB/m)	Result (dBu V/m)	Limit (dBu V/m)	Margin (dB)	Degree ( )	Height (cm)	Remark
1	55.2207	31.91	-16.51	15.40	40.00	-24.60	315	100	peak
2	107.8877	31.60	-16.61	14.99	43.50	-28.51	90	100	peak
3	279.0436	28.49	-10.43	18.06	46.00	-27.94	51	100	peak
4	620.7096	28.05	-1.67	26.38	46.00	-19.62	227	100	peak

Test Channel	High	Polarity:	Horizontal
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No.	Frequency (MHz)	Reading (dBu V/m)	Correct (dB/m)	Result (dBu V/m)	Limit (dBu V/m)	Margin (dB)	Degree ( )	Height (cm)	Remark
1	51.1209	30.96	-16.52	14.44	40.00	-25.56	80	100	peak
2	94.7601	30.38	-17.34	13.04	43.50	-30.46	124	100	peak
3	350.4768	29.51	-9.26	20.25	46.00	-25.75	139	100	peak
4	645.1195	28.26	-1.15	27.11	46.00	-18.89	142	100	peak

Test Channel	High	Polarity:	Vertical
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No.	Frequency (MHz)	Reading (dBu V/m)	Correct (dB/m)	Result (dBu V/m)	Limit (dBu V/m)	Margin (dB)	Degree ( )	Height (cm)	Remark
1	59.8588	31.43	-16.51	14.92	40.00	-25.08	100	100	peak
2	108.2667	32.24	-16.61	15.63	43.50	-27.87	86	100	peak
3	309.9977	29.51	-9.46	20.05	46.00	-25.95	113	100	peak
4	656.5300	28.50	-1.41	27.09	46.00	-18.91	100	100	peak

## ➤ Spurious Emissions Above 1GHz

Frequency (MHz)	Reading (dBuV/m)	Correct dB	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Polar H/V	Detector
Low Channel-2402MHz							
4804	60.23	-3.59	56.64	74	-17.36	H	PK
4804	40.73	-3.59	37.14	54	-16.86	H	AV
7206	61.39	-0.52	60.87	74	-13.13	H	PK
7206	38.79	-0.52	38.27	54	-15.73	H	AV
4804	60.95	-3.59	57.36	74	-16.64	V	PK
4804	38.95	-3.59	35.36	54	-18.64	V	AV
7206	59.1	-0.52	58.58	74	-15.42	V	PK
7206	41.06	-0.52	40.54	54	-13.46	V	AV
Middle Channel-2440MHz							
4880	60.69	-3.49	57.2	74	-16.8	H	PK
4880	40.37	-3.49	36.88	54	-17.12	H	AV
7320	60.5	-0.47	60.03	74	-13.97	H	PK
7320	39.78	-0.47	39.31	54	-14.69	H	AV
4880	61.24	-3.49	57.75	74	-16.25	V	PK
4880	39.69	-3.49	36.2	54	-17.8	V	AV
7320	61.68	-0.47	61.21	74	-12.79	V	PK
7320	41.84	-0.47	41.37	54	-12.63	V	AV
High Channel-2480MHz							
4960	60.91	-3.41	57.5	74	-16.5	H	PK
4960	39.98	-3.41	36.57	54	-17.43	H	AV
7440	58.49	-0.42	58.07	74	-15.93	H	PK
7440	38.76	-0.42	38.34	54	-15.66	H	AV
4960	61.65	-3.41	58.24	74	-15.76	V	PK
4960	40.32	-3.41	36.91	54	-17.09	V	AV
7440	60.47	-0.42	60.05	74	-13.95	V	PK
7440	38.4	-0.42	37.98	54	-16.02	V	AV

*Note: 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.*

## 8. Out of Band Emissions

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### 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).

### 8.2 Test Procedure

According to the KDB 558074 D01 v05r02 Subclause 8.4 and ANSI C63.10-2013 Subclause 11.11, the Emissions in nonrestricted frequency bands test method as follows:

- a) Set the center frequency and span to encompass frequency range to be measured.
- b) Set the RBW = 100 kHz.
- c) Set the VBW  $\geq [3 \times \text{RBW}]$ .
- d) Detector = peak.
- e) Sweep time = auto couple.
- f) Trace mode = max hold.
- g) Allow trace to fully stabilize.
- h) Use the peak marker function to determine the maximum amplitude level.

According to the KDB 558074 D01 v05r02 Subclause 8.5 and ANSI C63.10-2013 Subclause 11.12, the Emissions in restricted frequency bands test method as follows:

#### A. Radiated emission measurements:

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.



**B. Antenna-port conducted measurements**

Peak emission levels are measured by setting the instrument as follows:

- a) RBW = as specified in Table 9/
- b) VBW  $\geq$  [3  $\times$  RBW].
- c) Detector = peak.
- d) Sweep time = auto.
- e) Trace mode = max hold.
- f) Allow sweeps to continue until the trace stabilizes. (Note that the required measurement time may be lengthened for low-duty-cycle applications.)

**Table 9—RBW as a function of frequency**

Frequency	RBW
9 kHz to 150 kHz	200 Hz to 300 Hz
0.15 MHz to 30 MHz	9 kHz to 10 kHz
30 MHz to 1000 MHz	100 kHz to 120 kHz
>1000 MHz	1 MHz

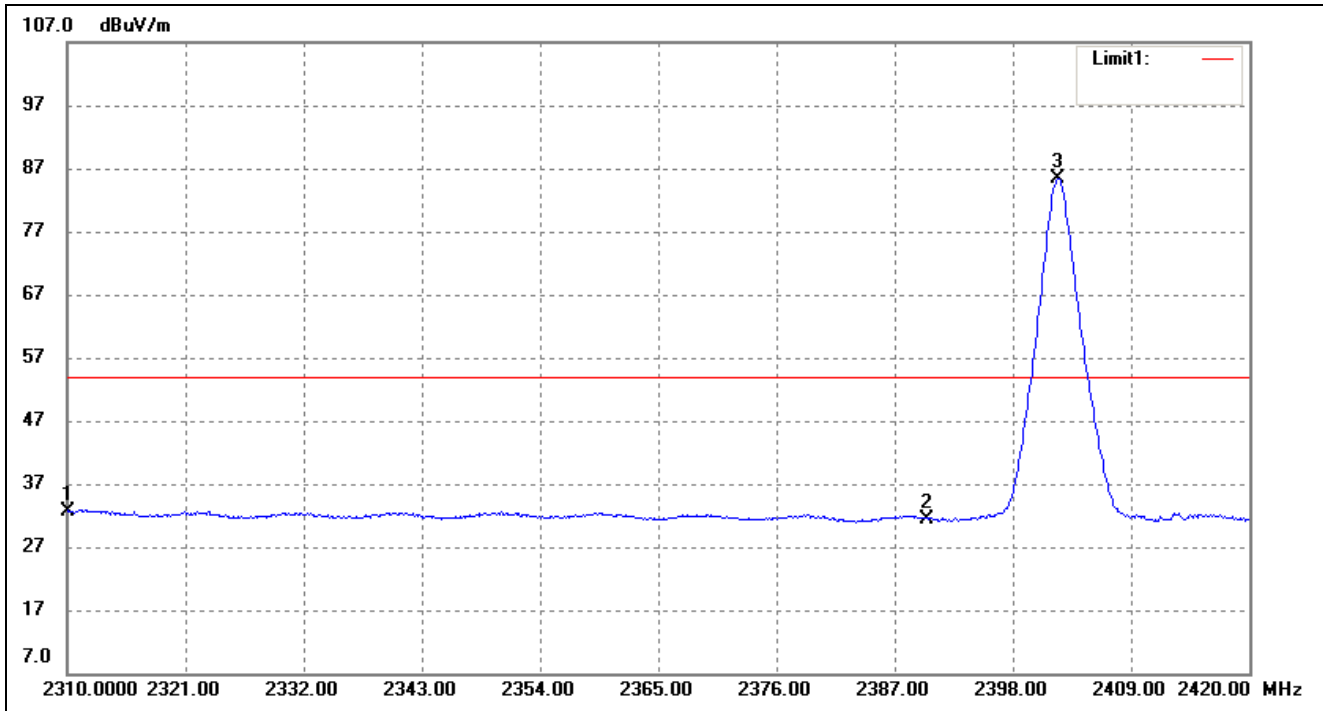
If the peak-detected amplitude can be shown to comply with the average limit, then it is not necessary to perform a separate average measurement.

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.

### 8.3 Summary of Test Results/Plots

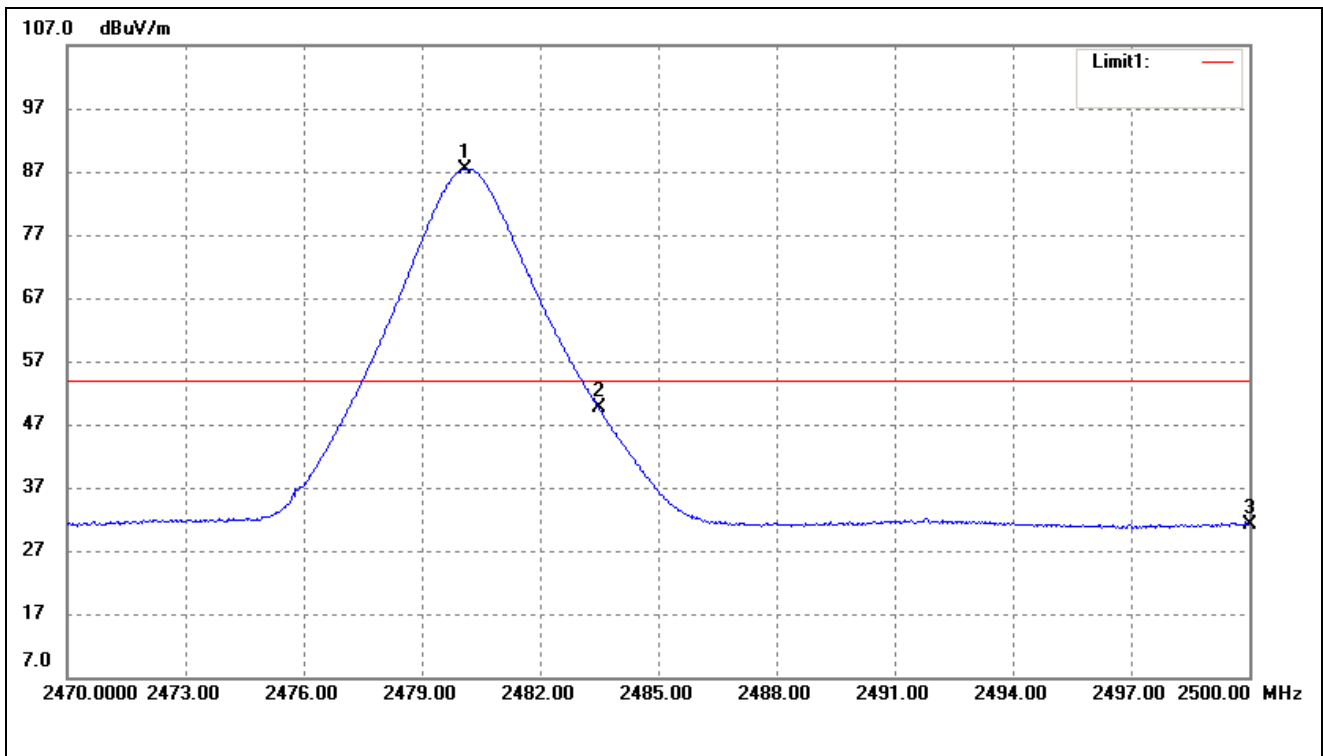
➤ Radiated test

Test Channel	Low	Polarity:	Vertical(worst case)
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No.	Frequency (MHz)	Reading (dBuV/m)	Correct Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	2310.000	38.89	-6.38	32.51	54.00	-21.49	Average Detector
	2310.000	52.38	-6.38	46.00	74.00	-28.00	Peak Detector
2	2390.000	38.73	-7.26	31.47	54.00	-22.53	Average Detector
	2390.000	54.44	-7.26	47.18	74.00	-26.82	Peak Detector
3	2402.180	92.77	-7.39	85.38	/	/	Average Detector
	2402.400	97.69	-7.40	90.29	/	/	Peak Detector

Test Channel	High	Polarity:	Vertical(worst case)
--------------	------	-----------	----------------------



No.	Frequency (MHz)	Reading (dBuV/m)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	2480.110	94.77	-7.28	87.49	/	/	Average Detector
	2480.410	99.95	-7.28	92.67	/	/	Peak Detector
2	2483.500	56.80	-7.28	49.52	54.00	-4.48	Average Detector
	2483.500	66.31	-7.28	59.03	74.00	-14.97	Peak Detector
3	2500.000	38.39	-7.25	31.14	54.00	-22.86	Average Detector
	2500.000	51.92	-7.25	44.67	74.00	-29.33	Peak Detector

➤ Conducted test

**Please refer to Appendix D**

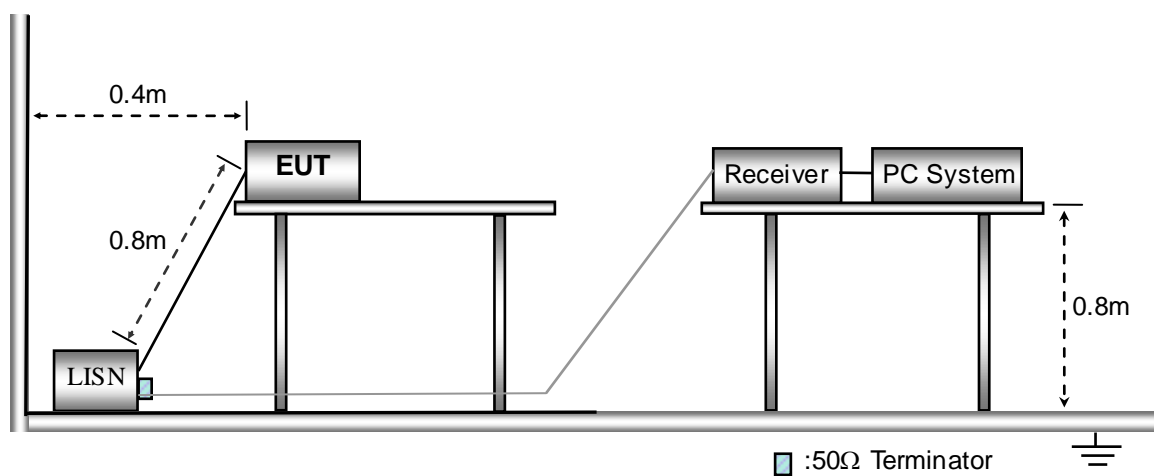
## 9. Conducted Emissions

### 9.1 Test Procedure

The setup of EUT is according with per ANSI C63.4-2014 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.

### 9.2 Basic Test Setup Block Diagram



### 9.3 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

### 9.4 Summary of Test Results/Plots

N/A, The EUT is DC supply, so this item is not applicable.

**APPENDIX SUMMARY**

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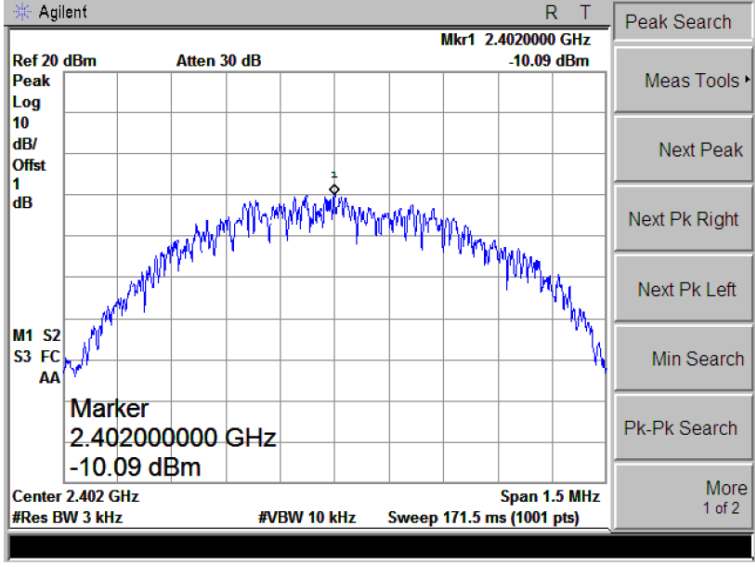
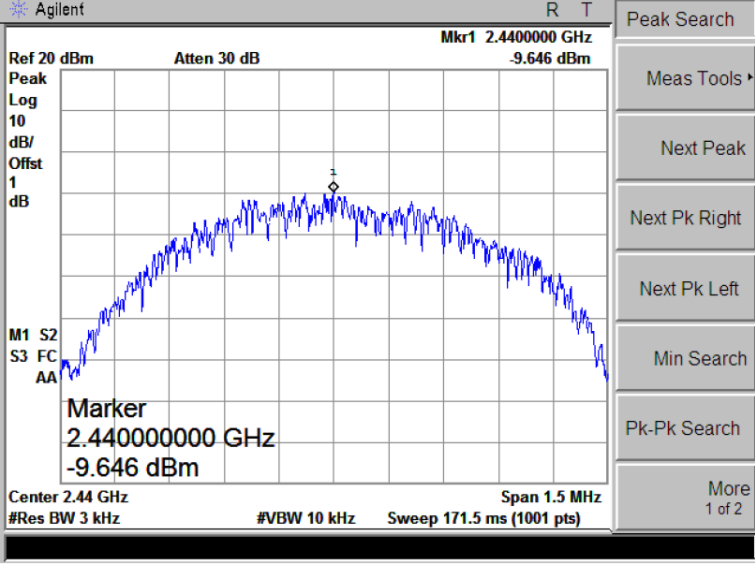
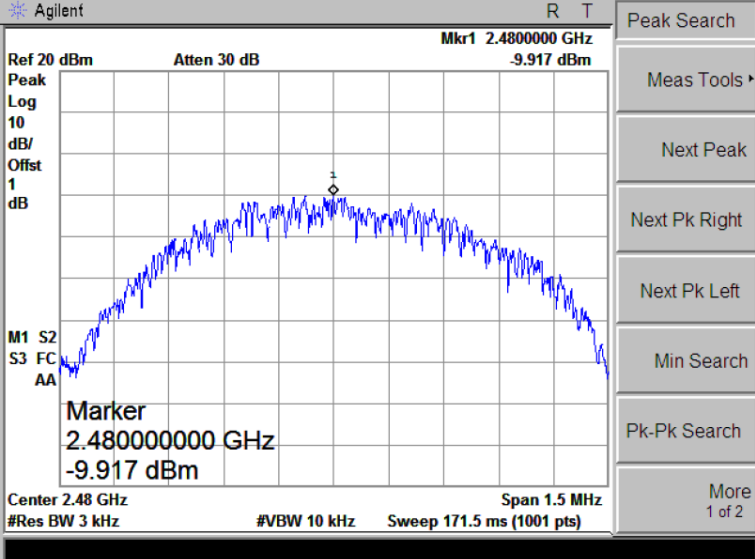
Project No.	WTX22X02110201W-1	Test Engineer	Tom Wang
Start date	2022/02/11	Finish date	2022/02/25
Temperature	24.7°C	Humidity	47%
RF specifications	BT-BLE		

<b>APPENDIX</b>	<b>Description of Test Item</b>	<b>Result</b>
A	Power Spectral Density	Compliant
B	DTS Bandwidth	Compliant
C	RF Output Power	Compliant
D	Conducted Out of Band Emissions	Compliant

**APPENDIX A**

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Power Spectral Density			
Test Mode	Test Channel	Power Spectral Density dBm/3kHz	Limit dBm/3kHz
GFSK(BLE)	Low	-10.09	8
	Middle	-9.646	8
	High	-9.917	8

<p>Low</p>	 <p>Agilent R T          Ref 20 dBm Atten 30 dB Mkr1 2.4020000 GHz          Peak Log 10 dB/Offst 1 dB          M1 S2 S3 FC AA          Marker          2.40200000 GHz          -10.09 dBm          Center 2.402 GHz Span 1.5 MHz          #Res BW 3 kHz #VBW 10 kHz Sweep 171.5 ms (1001 pts)</p>
<p>Middle</p>	 <p>Agilent R T          Ref 20 dBm Atten 30 dB Mkr1 2.4400000 GHz          Peak Log 10 dB/Offst 1 dB          M1 S2 S3 FC AA          Marker          2.44000000 GHz          -9.646 dBm          Center 2.44 GHz Span 1.5 MHz          #Res BW 3 kHz #VBW 10 kHz Sweep 171.5 ms (1001 pts)</p>
<p>High</p>	 <p>Agilent R T          Ref 20 dBm Atten 30 dB Mkr1 2.4800000 GHz          Peak Log 10 dB/Offst 1 dB          M1 S2 S3 FC AA          Marker          2.48000000 GHz          -9.917 dBm          Center 2.48 GHz Span 1.5 MHz          #Res BW 3 kHz #VBW 10 kHz Sweep 171.5 ms (1001 pts)</p>



**APPENDIX B**

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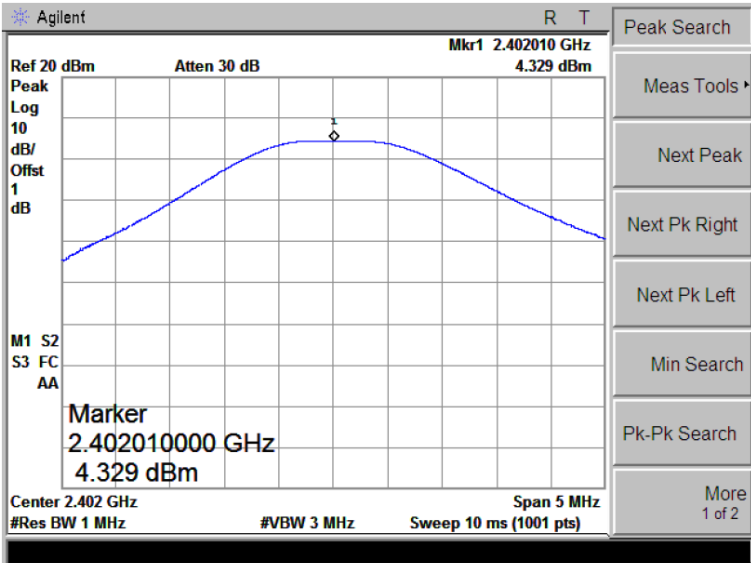
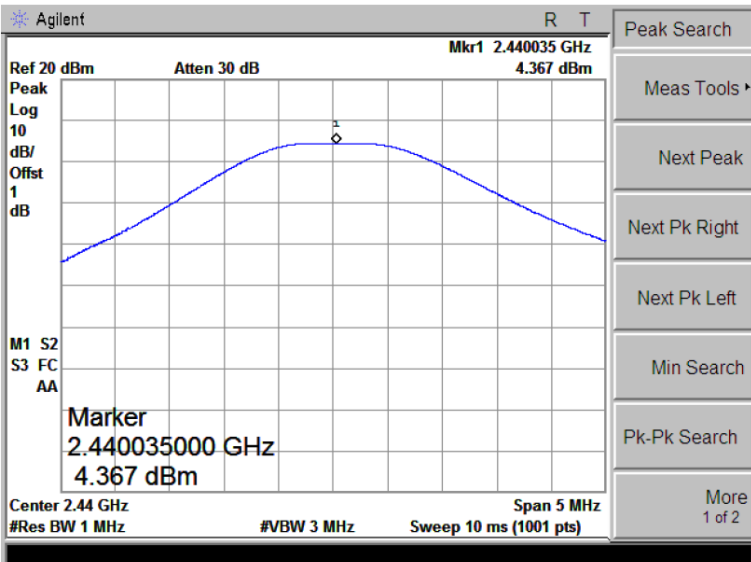
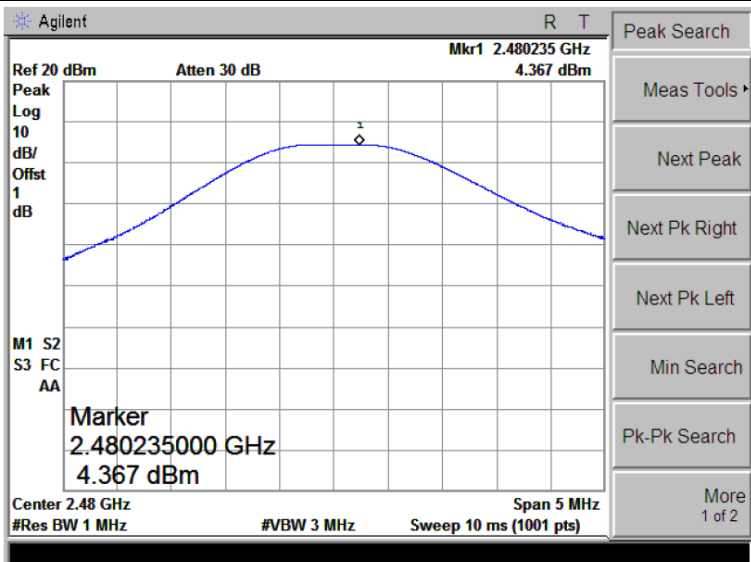
DTS Bandwidth			
Test Mode	Test Channel	6 dB Bandwidth kHz	Limit kHz
GFSK(BLE)	Low	709.2	$\geq 500$
	Middle	699.8	$\geq 500$
	High	719.8	$\geq 500$

<p>Low</p>	<p>Agilent R T Trace/View</p> <p>Ch Freq 2.402 GHz Trig Free</p> <p>Occupied Bandwidth</p> <p>Center 2.40200000 GHz</p> <p>Ref 20 dBm Atten 30 dB</p> <p>#Peak Log 10 dB/Offset 1 dB</p> <p>Center 2.402 GHz Span 3 MHz #Res BW 100 kHz #VBW 300 kHz Sweep 10 ms (1001 pts)</p> <p><b>Occupied Bandwidth</b> Occ BW % Pwr 99.00 % <b>1.0422 MHz</b> x dB -6.00 dB</p> <p>Transmit Freq Error 20.087 kHz x dB Bandwidth 709.246 kHz</p> <p>Trace 1 2 3 Clear Write Max Hold Min Hold View Blank More 1 of 2</p>
<p>Middle</p>	<p>Agilent R T Trace/View</p> <p>Ch Freq 2.44 GHz Trig Free</p> <p>Occupied Bandwidth</p> <p>Center 2.44000000 GHz</p> <p>Ref 20 dBm Atten 30 dB</p> <p>#Peak Log 10 dB/Offset 1 dB</p> <p>Center 2.44 GHz Span 3 MHz #Res BW 100 kHz #VBW 300 kHz Sweep 10 ms (1001 pts)</p> <p><b>Occupied Bandwidth</b> Occ BW % Pwr 99.00 % <b>1.0449 MHz</b> x dB -6.00 dB</p> <p>Transmit Freq Error 18.776 kHz x dB Bandwidth 699.830 kHz</p> <p>Trace 1 2 3 Clear Write Max Hold Min Hold View Blank More 1 of 2</p>
<p>High</p>	<p>Agilent R T Trace/View</p> <p>Ch Freq 2.48 GHz Trig Free</p> <p>Occupied Bandwidth</p> <p>Center 2.48000000 GHz</p> <p>Ref 20 dBm Atten 30 dB</p> <p>#Peak Log 10 dB/Offset 1 dB</p> <p>Center 2.48 GHz Span 3 MHz #Res BW 100 kHz #VBW 300 kHz Sweep 10 ms (1001 pts)</p> <p><b>Occupied Bandwidth</b> Occ BW % Pwr 99.00 % <b>1.0527 MHz</b> x dB -6.00 dB</p> <p>Transmit Freq Error 19.178 kHz x dB Bandwidth 719.807 kHz</p> <p>Trace 1 2 3 Clear Write Max Hold Min Hold View Blank More 1 of 2</p>

**APPENDIX C**

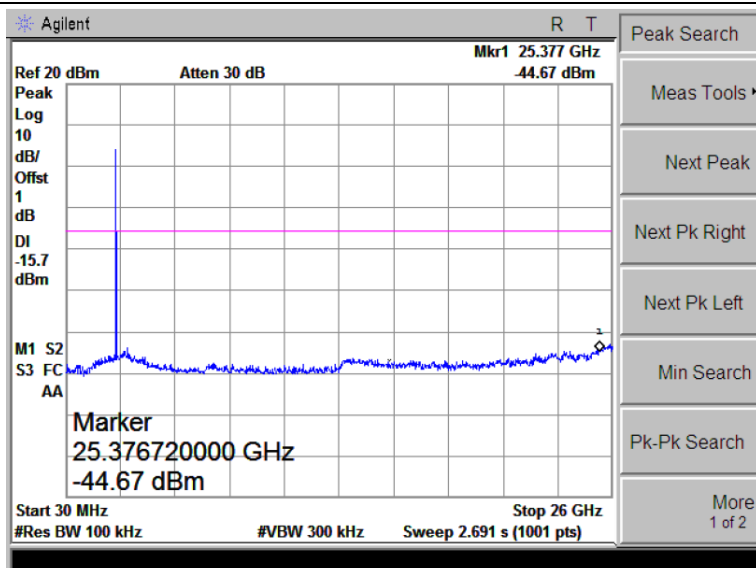
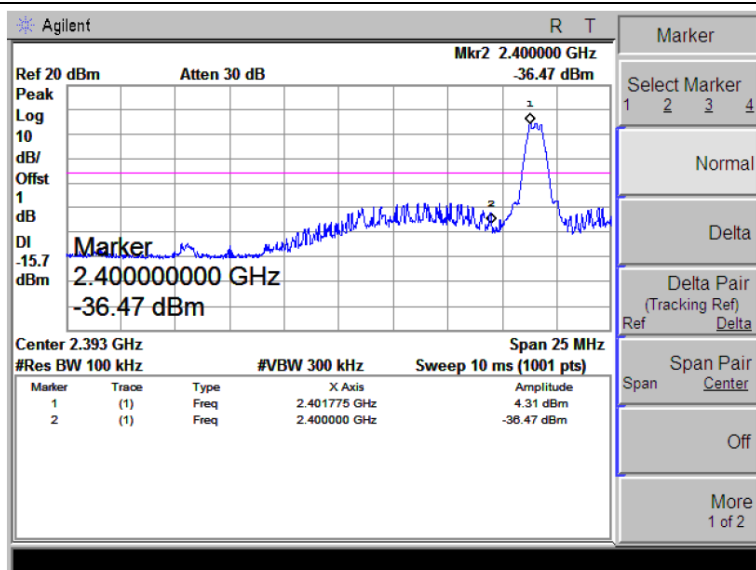
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RF Output Power			
Test Mode	Test Channel	Reading dBm	Limit dBm
GFSK(BLE)	Low	4.329	30
	Middle	4.367	30
	High	4.367	30

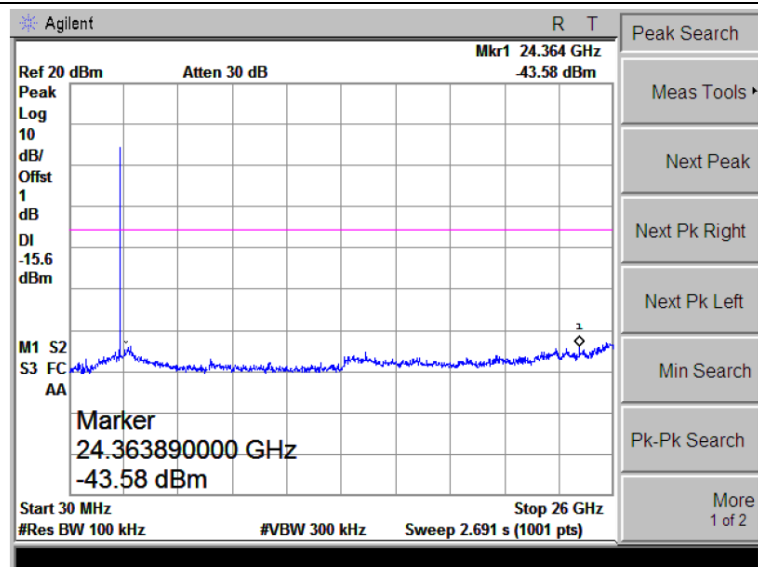
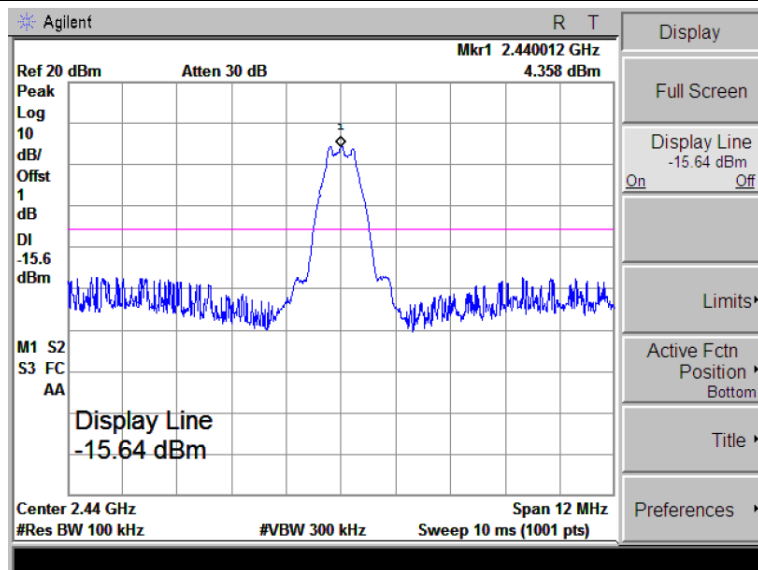
<p>Low</p>	 <p>Agilent R T          Ref 20 dBm Atten 30 dB Mkr1 2.402010 GHz          4.329 dBm          Peak Search          Meas Tools          Next Peak          Next Pk Right          Next Pk Left          Min Search          Pk-Pk Search          More 1 of 2</p> <p>Marker          2.402010000 GHz          4.329 dBm</p> <p>Center 2.402 GHz Span 5 MHz          #Res BW 1 MHz #VBW 3 MHz Sweep 10 ms (1001 pts)</p>
<p>Middle</p>	 <p>Agilent R T          Ref 20 dBm Atten 30 dB Mkr1 2.440035 GHz          4.367 dBm          Peak Search          Meas Tools          Next Peak          Next Pk Right          Next Pk Left          Min Search          Pk-Pk Search          More 1 of 2</p> <p>Marker          2.440035000 GHz          4.367 dBm</p> <p>Center 2.44 GHz Span 5 MHz          #Res BW 1 MHz #VBW 3 MHz Sweep 10 ms (1001 pts)</p>
<p>High</p>	 <p>Agilent R T          Ref 20 dBm Atten 30 dB Mkr1 2.480235 GHz          4.367 dBm          Peak Search          Meas Tools          Next Peak          Next Pk Right          Next Pk Left          Min Search          Pk-Pk Search          More 1 of 2</p> <p>Marker          2.480235000 GHz          4.367 dBm</p> <p>Center 2.48 GHz Span 5 MHz          #Res BW 1 MHz #VBW 3 MHz Sweep 10 ms (1001 pts)</p>

# APPENDIX D

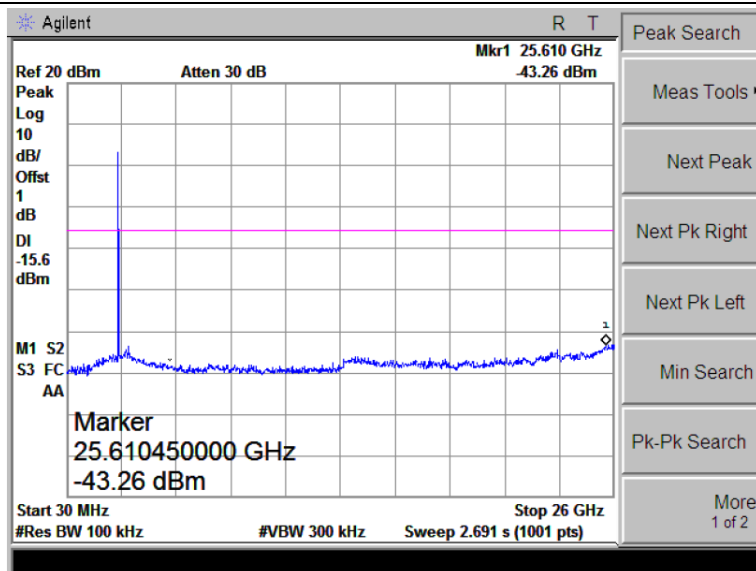
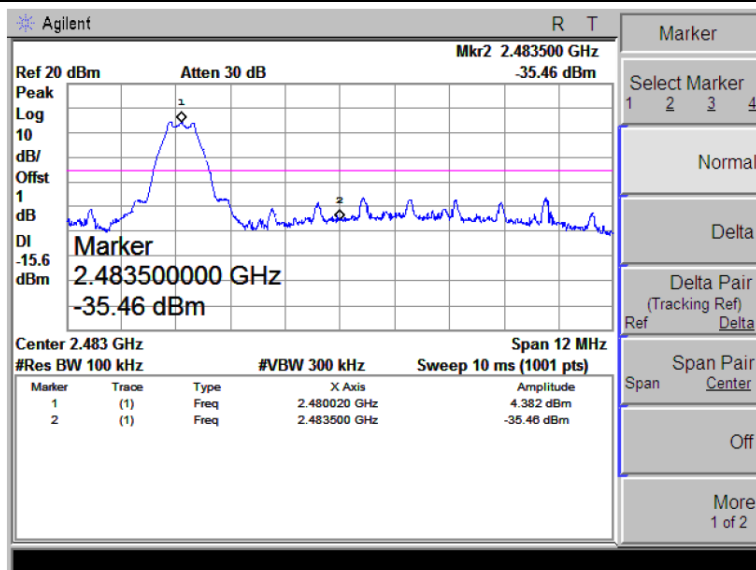
Low



Middle



High



## **APPENDIX PHOTOGRAPHS**

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Please refer to “ANNEX”

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