

FCC TEST REPORT

FCC ID: 2A16IHV-FM25

Product : BLUETOOTH CAR MP3 MODULATOR

Model Name : HV-FM25,HV-FM201BT,HV-FM202BT,HV-FM203BT,HV-FM205BT,HV-FM206BT,HV-FM207BT,HV-FM208BT,HV-FM209BT,HV-FM210BT

Brand : HAVIT

Report No. : PTC801712160722E-FC02

Prepared for

Guangzhou Havit Technology Co.,LTD
ROOM 1307,13F,PHASE 2(B,C BUILDING) OF POLY WORLD TRADE CENTER,NO.1000,
XINGANG EAST ROAD,HAIZHU DISTRICT,GUANGZHOU,GUANGDONG,China

Prepared by

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TEST RESULT CERTIFICATION

Applicant's name : Guangzhou Havit Technology Co.,LTD

Address : ROOM 1307,13F,PHASE 2(B,C BUILDING) OF POLY WORLD TRADE CENTER,NO.1000, XINGANG EAST ROAD,HAIZHU DISTRICT,GUANGZHOU, GUANGDONG, China

Manufacture's name : Guangzhou Havit Technology Co.,LTD

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Product name : BLUETOOTH CAR MP3 MODULATOR

Model name : HV-FM25,HV-FM201BT,HV-FM202BT,HV-FM203BT,HV-FM205BT,HV-FM206BT,HV-FM207BT,HV-FM208BT,HV-FM209BT,HV-FM210BT

Standards : FCC CFR47 Part 15 Section 15.247

Test procedure : ANSI C63.10:2013,KDB 558074 D01 DTS MEAS GUIDANCE V03R05

Test Date : Jul. 29, 2016 ~Aug. 22, 2016

Date of Issue : Aug.24, 2016

Test Result : Pass

This device described above has been tested by PTC, 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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Testing Engineer

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Technical Manager

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Authorized Signatory

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Test Summary

Test Items	Test Requirement	Result
Conduct Emission	15.207	N/A
Radiated Spurious Emissions	15.205(a) 15.209 15.247(d)	PASS
Band edge	15.247(d) 15.205(a)	PASS
6dB Bandwidth	15.247(a)(2)	PASS
Maximum Peak Output Power	15.247(b)(1)	PASS
Power Spectral Density	15.247(e)	PASS
Antenna Requirement	15.203	PASS

Remark:

N/A: Not Applicable



2 General Information

2.1 General Description of E.U.T

Product Name	:	BLUETOOTH CAR MP3 MODULATOR
Model Name	:	HV-FM25,HV-FM201BT,HV-FM202BT,HV-FM203BT,HV-FM205BT,HV-FM206BT,HV-FM207BT,HV-FM208BT,HV-FM209BT,HV-FM210BT
Model Description	:	Just the model names and colors are different
Bluetooth Version	:	V4.0(With BLE)
Operating frequency	:	2402-2480MHz,40channels
Antenna installation:	:	PCB printed Antenna
Antenna Gain:	:	0dBi
The BT oscillator:	:	40MHz
Type of Modulation	:	GFSK
Power supply	:	DC 12V



2.2 Channel List

BLE							
Channel No.	Frequency (MHz)	Channel No.	Frequency (MHz)	Channel No.	Frequency (MHz)	Channel No.	Frequency (MHz)
0	2402	10	2422	20	2442	30	2462
1	2404	11	2424	21	2444	31	2464
2	2406	12	2426	22	2446	32	2466
3	2408	13	2428	23	2448	33	2468
4	2410	14	2430	24	2450	34	2470
5	2412	15	2432	25	2452	35	2472
6	2414	16	2434	26	2454	36	2474
7	2416	17	2436	27	2456	37	2476
8	2418	18	2438	28	2458	38	2478
9	2420	19	2440	29	2460	39	2480

2.3 Test Mode

All test mode(s) and condition(s) mentioned were considered and evaluated respectively by performing full tests, the worst data were recorded and reported.

Test mode	Low channel	Middle channel	High channel
Transmitting	2402MHz	2440MHz	2480MHz
Hopping	2402-2480MHz		
Tests Carried Out Under FCC part 15.207& 15.209			
Test Item	Test Mode		
Conduction Emission, 0.15MHz to 30MHz	BT Communication		
Radiated Emission, 30M-1GHz	BT Communication		



2.4 Test Voltage

Normal Test Voltage	Item
DC 12V	Conducted Emission N/A
DC 12V	Radiated Emission
Remark:N/A	



3 Equipment During Test

3.1 Equipments List

RF Conducted Test							
Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Last calibration	Calibrated until	Calibration period
1	EMC Analyzer (9k~26.5GHz)	Agilent	E4407B	MY45109572	July 15, 2016	July 14, 2017	1 year
2	EXA Signal Analyzer	Keysight	N9010A	MY50520207 526B25MPB W7X	July 15, 2016	July 14, 2017	1 year
3	EMI Test Receiver	R&S	ESCI	101155	July 15, 2016	July 14, 2017	1 year
Radiated Emissions							
Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Last calibration	Calibrated until	Calibration period
1	EMI Test Receiver	Rohde&Schwarz	ESCI	101417	July 15, 2016	July 14, 2017	1 year
2	Trilog Broadband Antenna	SCHWARZECK	VULB9160	9160-3355	July 15, 2016	July 14, 2017	1 year
3	Amplifier	EM	EM-30180	060538	July 15, 2016	July 14, 2017	1 year
4	Horn Antenna	SCHWARZECK	BBHA9120D	9120D-1246	July 15, 2016	July 14, 2017	1 year
5	Loop Antenna	SCHWARZECK	FMZB1516	9130D-1243	July 15, 2016	July 14, 2017	1 year
Conducted Emissions							
Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Last calibration	Calibrated until	Calibration period
1	EMI Test Receiver	R&S	ESCI	101155	July 15, 2016	July 14, 2017	1 year
2	LISN	SCHWARZECK	NSLK 8128	8128-289	July 15, 2016	July 14, 2017	1 year
3	Cable	LARGE	RF300	-	July 15, 2016	July 14, 2017	1 year



3.2 Measurement Uncertainty

Parameter	Uncertainty
RF output power, conducted	±1.0dB
Power Spectral Density, conducted	±2.2dB
Radio Frequency	± 1 x 10 ⁻⁶
Bandwidth	± 1.5 x 10 ⁻⁶
Time	±2%
Duty Cycle	±2%
Temperature	±1°C
Humidity	±5%
DC and low frequency voltages	±3%
Conducted Emissions(150kHz~30MHz)	±3.64dB
Radiated Emission(30MHz~1GHz)	±5.03dB
Radiated Emission(1GHz~25GHz)	±4.74dB



4 Radiated Spurious Emissions

Test Requirement: : FCC CFR47 Part 15 Section 15.209 & 15.247
 Test Method: : ANSI C63.10:2013,KDB 558074 D01 DTS MEAS GUIDANCE V03R05
 Test Result: : PASS
 Measurement Distance: : 3m
 Limit: : See the follow table

Frequency (MHz)	Field Strength		Field Strength Limit at 3m Measurement Dist	
	uV/m	Distance (m)	uV/m	dBuV/m
0.009 ~ 0.490	2400/F(kHz)	300	10000 * 2400/F(kHz)	20log ^{(2400/F(kHz))} + 80
0.490 ~ 1.705	24000/F(kHz)	30	100 * 24000/F(kHz)	20log ^{(24000/F(kHz))} + 40
1.705 ~ 30	30	30	100 * 30	20log ⁽³⁰⁾ + 40
30 ~ 88	100	3	100	20log ⁽¹⁰⁰⁾
88 ~ 216	150	3	150	20log ⁽¹⁵⁰⁾
216 ~ 960	200	3	200	20log ⁽²⁰⁰⁾
Above 960	500	3	500	20log ⁽⁵⁰⁰⁾

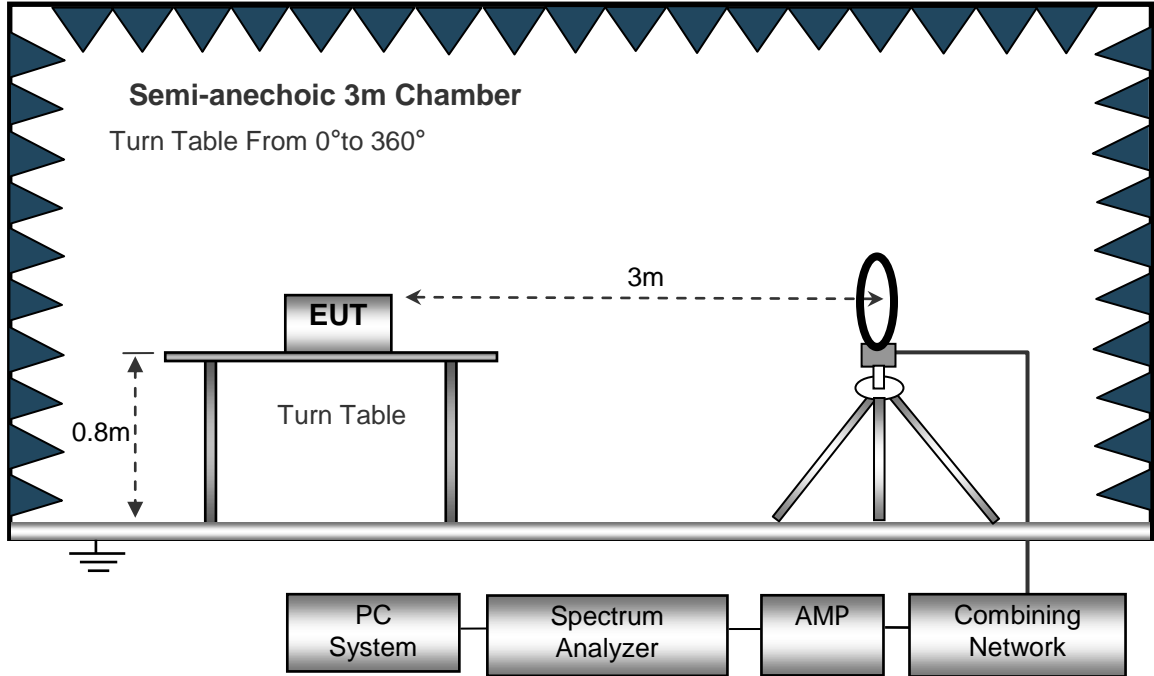
4.1 EUT Operation

Operating Environment :
 Temperature: : 23.5 °C
 Humidity: : 51.1 % RH
 Atmospheric Pressure: : 101.2kPa
 EUT Operation : : Refer to section 3.3

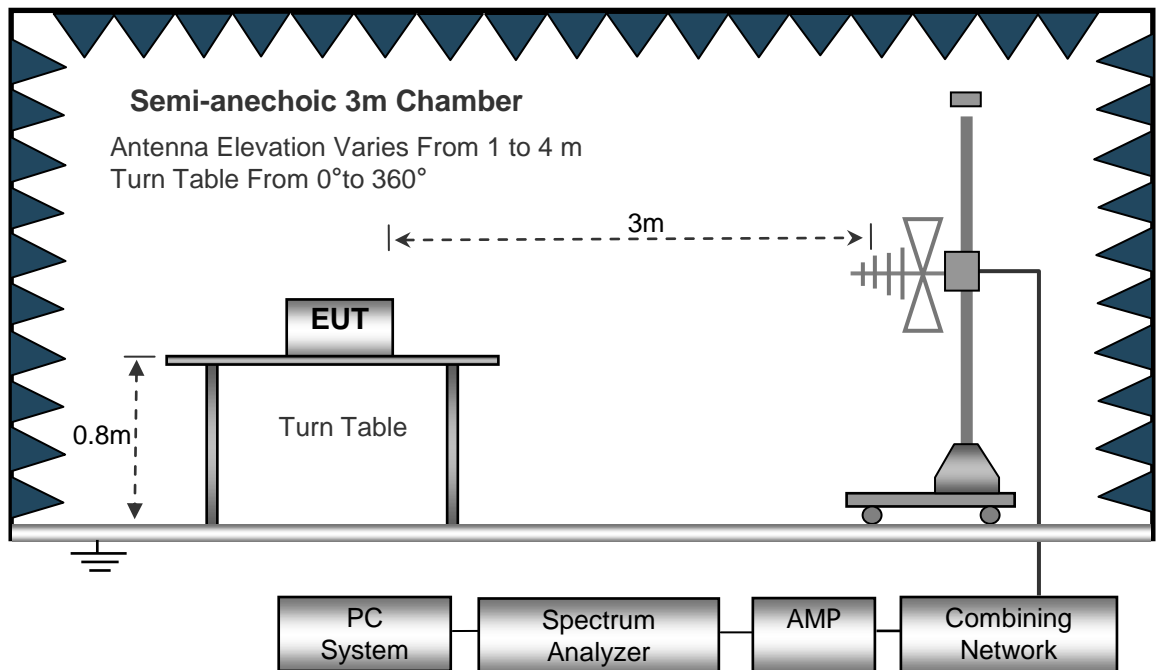
4.2 Test Setup

The radiated emission tests were performed in the 3m Semi- Anechoic Chamber testsite

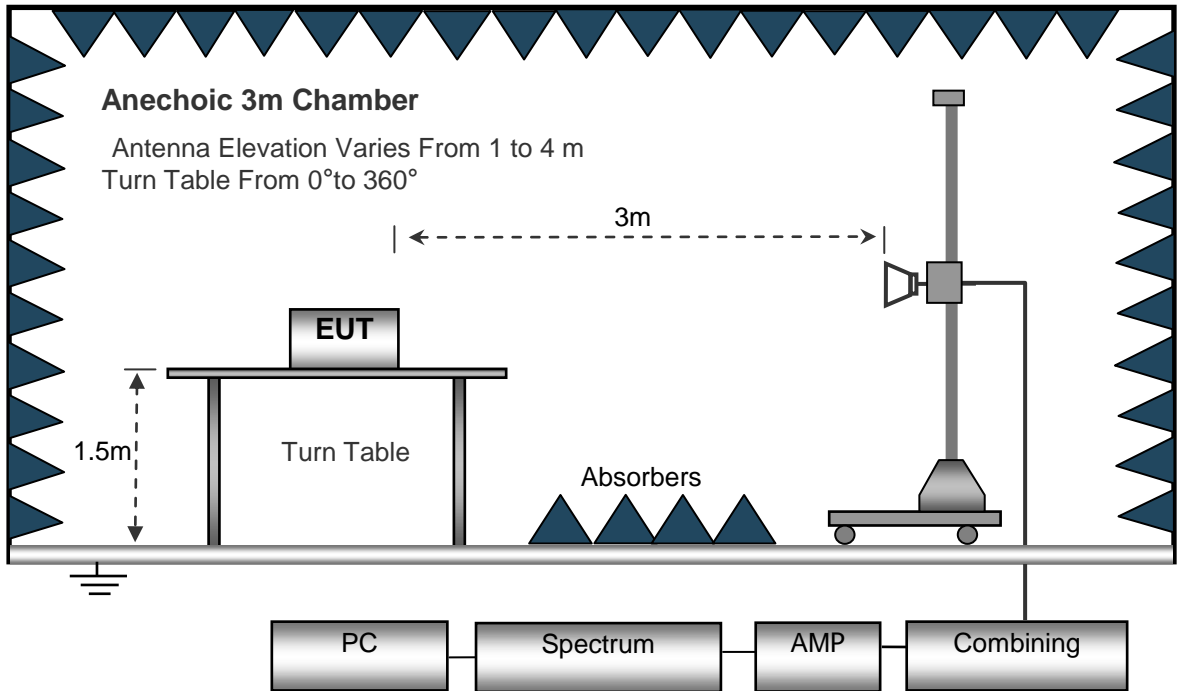
The test setup for emission measurement below 30MHz.



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



The test setup for emission measurement above 1 GHz.



4.3 Spectrum Analyzer Setup

Below 30MHz

Sweep Speed..... Auto
 IF Bandwidth.....10kHz
 Video Bandwidth10kHz
 Resolution Bandwidth10kHz

30MHz ~ 1GHz

Sweep Speed..... Auto
 Detector.....PK
 Resolution Bandwidth100kHz
 Video Bandwidth300kHz

Above 1GHz

Sweep Speed..... Auto
 Detector.....PK
 Resolution Bandwidth1MHz
 Video Bandwidth3MHz
 Detector.....Ave.
 Resolution Bandwidth1MHz
 Video Bandwidth10Hz



4.4 Test Procedure

1. The EUT is placed on a turntable, which is 0.8m above ground plane for below 1GHz and 1.5m for above 1GHz.
2. The turntable shall be rotated for 360 degrees to determine the position of maximum emission level.
3. EUT is set 3m away from the receiving antenna, which is moved from 1m to 4m to find out the maximum emissions. The spectrum was investigated from the lowest radio frequency signal generated in the device, without going below 9 kHz, up to the tenth harmonic of the highest fundamental frequency or to 40 GHz, whichever is lower.
4. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
5. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical.
6. Repeat above procedures until the measurements for all frequencies are complete.
7. The radiation measurements are tested under 3-axes(X,Y,Z) position(X denotes lying on the table, Y denotes side stand and Z denotes vertical stand), After pre-test, It was found that the worse radiation emission was get at the X position. So the data shown was the X position only.



4.5 Summary of Test Results

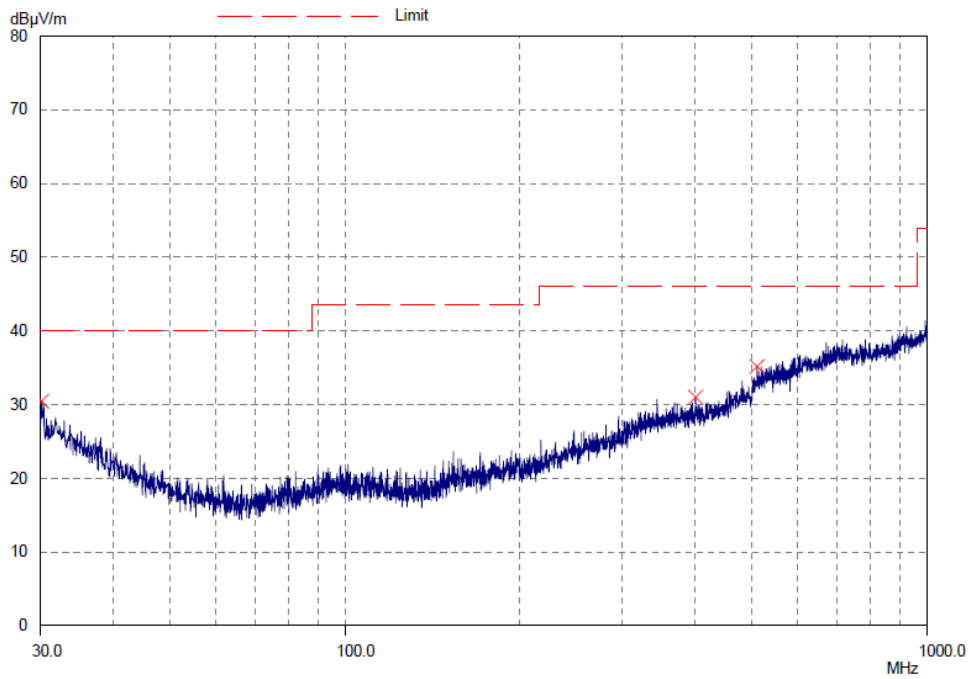
Test Frequency: Below 30MHz

The measurements were more than 30 dB below the limit and not reported.

Test Frequency: 30MHz ~ 1GHz

Note: the data display worst case mode with 2402MHz

Antenna Polarization: Horizontal



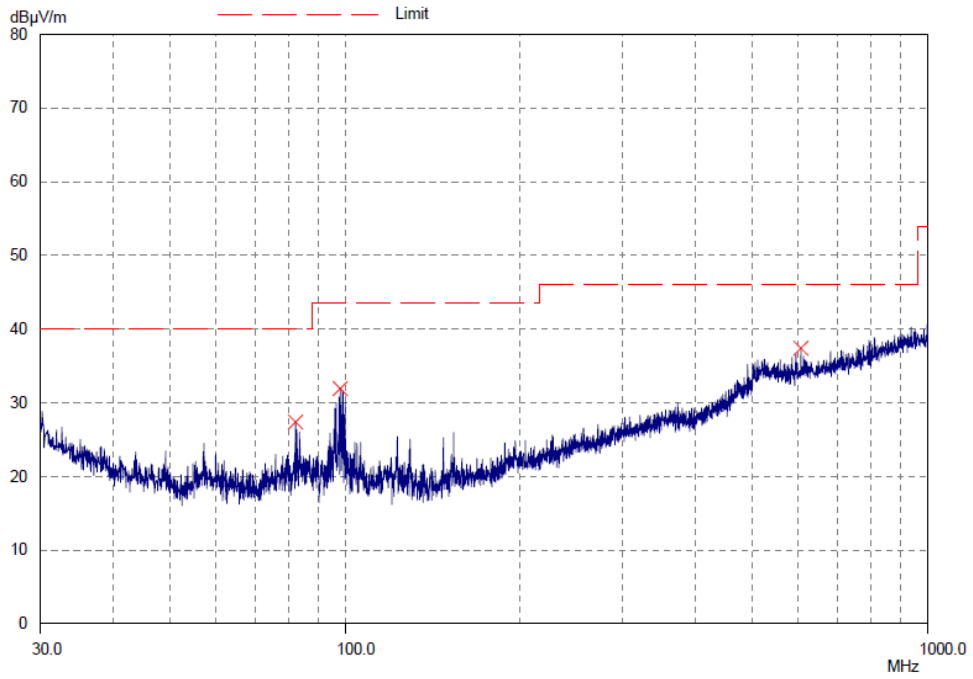
Peak Search Results

Frequency MHz	QP Level dBµV/m	QP Limit dBµV/m	QP Delta dB
30.125	30.40	40.00	9.60
400.4375	31.10	46.00	14.90
510.5625	35.10	46.00	10.90

Frequency MHz	Level dBµV/m	Limit dBµV/m	Delta dB
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Antenna Polarization: Vertical



Peak Search Results

Frequency MHz	QP Level dBµV/m	QP Limit dBµV/m	QP Delta dB
82.1875	27.30	40.00	12.70
98.125	31.90	43.50	11.60
605.875	37.40	46.00	8.60

Frequency MHz	Level dBµV/m	Limit dBµV/m	Delta dB
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Test Frequency: 1GHz ~ 18GHz

Frequency	Receiver Reading	Detector	Corrected Factor	Corrected Amplitude	Limit	Margin
(MHz)	(dBμV)	(PK/QP/Ave)	(dB)	(dBμV/m)	(dBμV/m)	(dB)
GFSK(BLE)Low Channel						
Harmonic& Spurious Emission						
1255.43	55.15	PK	-18.95	36.2	74	-37.8
1255.43	44.27	Ave	-18.95	25.32	54	-28.68
4804.00	56.2	PK	-1.06	55.14	74	-18.86
4804.00	42.34	Ave	-1.06	41.28	54	-12.72
7206.00	57.17	PK	1.33	58.5	74	-15.5
7206.00	43.24	Ave	1.33	44.57	54	-9.43
Restricted bands Emission						
2311.25	57.36	PK	-13.19	44.17	74	-29.83
2311.25	42.38	Ave	-13.19	29.19	54	-24.81
2345.63	55.51	PK	-13.14	42.37	74	-31.63
2345.63	44.92	Ave	-13.14	31.78	54	-22.22
2485.25	58.17	PK	-13.08	45.09	74	-28.91
2485.25	43.45	Ave	-13.08	30.37	54	-23.63
2390.00	56.11	PK	-13.14	42.97	74	-31.03
2390.00	43.56	Ave	-13.14	30.42	54	-23.58
Remark:						
1. Corrected Factor=ANT Factor + Cable Loss – Amp Gain						
2. The data display worst state in the horizontal direction						



Frequency	Receiver Reading	Detector	Corrected Factor	Corrected Amplitude	Limit	Margin
(MHz)	(dBμV)	(PK/QP/Ave)	(dB)	(dBμV/m)	(dBμV/m)	(dB)
GFSK(BLE)Middle Channel						
Harmonic& Spurious Emission						
1211.35	58.84	PK	-18.95	39.89	74	-34.11
1211.35	42.59	Ave	-18.95	23.64	54	-30.36
4880.00	57.09	PK	-0.93	56.16	74	-17.84
4880.00	43.28	Ave	-0.93	42.35	54	-11.65
7320.00	58.15	PK	1.67	59.82	74	-14.18
7320.00	44.62	Ave	1.67	46.29	54	-7.71
Restricted bands Emission						
2335.25	57.65	PK	-13.19	44.46	74	-29.54
2335.25	44.24	Ave	-13.19	31.05	54	-22.95
2357.68	59.65	PK	-13.14	46.51	74	-27.49
2357.68	43.21	Ave	-13.14	30.07	54	-23.93
2485.38	58.27	PK	-13.08	45.19	74	-28.81
2485.38	44.11	Ave	-13.08	31.03	54	-22.97
Remark:						
1. Corrected Factor=ANT Factor + Cable Loss – Amp Gain						
2. The data display worst state in the horizontal direction						



Frequency	Receiver Reading	Detector	Corrected Factor	Corrected Amplitude	Limit	Margin
(MHz)	(dBμV)	(PK/QP/Ave)	(dB)	(dBμV/m)	(dBμV/m)	(dB)
GFSK(BLE)High Channel						
Harmonic& Spurious Emission						
1219.58	57.69	PK	-18.95	38.74	74	-35.26
1219.58	45.29	Ave	-18.95	26.34	54	-27.66
4960.00	56.67	PK	-0.87	55.8	74	-18.2
4960.00	42.18	Ave	-0.87	41.31	54	-12.69
7440.00	56.45	PK	1.84	58.29	74	-15.71
7440.00	43.34	Ave	1.84	45.18	54	-8.82
Restricted bands Emission						
2319.67	57.19	PK	-13.19	44	74	-30.00
2319.67	43.27	Ave	-13.19	30.08	54	-23.92
2358.89	56.42	PK	-13.14	43.28	74	-30.72
2358.89	44.31	Ave	-13.14	31.17	54	-22.83
2485.47	57.12	PK	-13.08	44.04	74	-29.96
2485.47	43.58	Ave	-13.08	30.50	54	-23.50
2483.50	60.12	PK	-13.08	47.04	74	-26.96
2483.50	44.03	Ave	-13.08	30.95	54	-23.05
Remark:						
1. Corrected Factor=ANT Factor + Cable Loss – Amp Gain						
2. The data display worst state in the horizontal direction						

Test Frequency: 18-25GHz

The measurements were more than 30 dB below the limit and not reported

- Remark :
1. The testing has been conformed to 10*2480 =24800MHz.
 2. All other emissions more than 30dB below the limit



5 Conducted Spurious Emissions

- Test Requirement : FCC CFR47 Part 15 Section 15.247
- Test Method : ANSI C63.10 2013
- Test Limit : In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF 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 Section 15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in Section 15.205(a), must also comply with the radiated emission limits specified in Section 15.209(a) (see Section 15.205(c)).
- Test Result : PASS

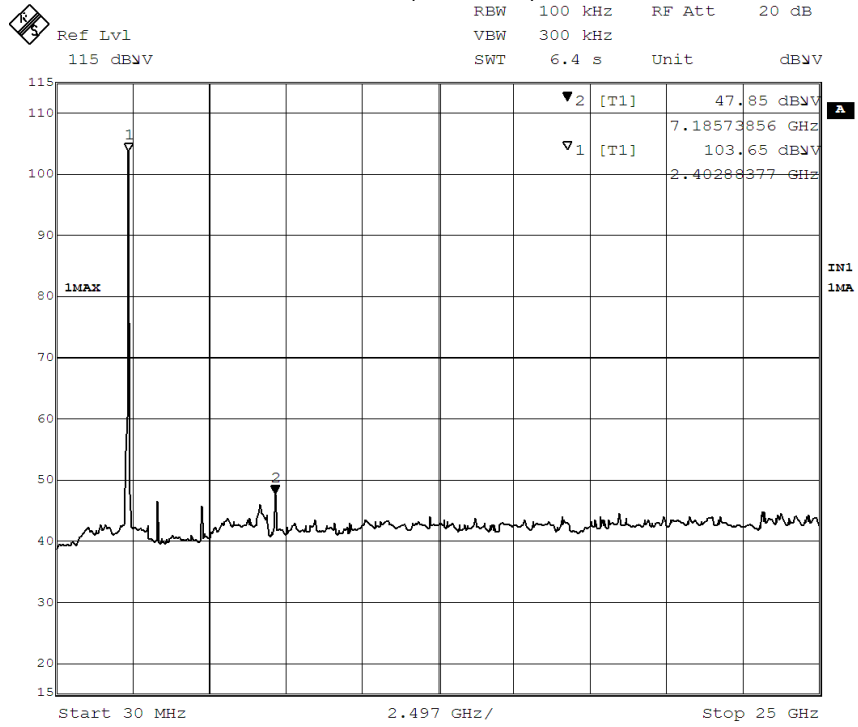
5.1 Test Procedure

1. Remove the antenna from the EUT and then connect a low RF cable from the antenna port to the spectrum;
2. Set the spectrum analyzer:
RBW = 100kHz, VBW = 300kHz, Sweep = auto
Detector function = peak, Trace = max hold

5.2 Test Result

Remark: only the worst data(2402MHz) were reported.

GFSK(2402MHz)





6 Band Edge Measurement

- TestRequirement : Section 15.247(d) In addition, radiated emissions which fall in the restricted bands. as defined in Section 15.205(a), must also comply with the radiated emission limits specified in Section 15.209(a) (see Section 15.205(c)).
- Test Method : ANSI C63.10:2013,KDB 558074 D01 DTS MEAS GUIDANCE V03R05
- Test Limit : Regulation 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) (see §15.205(c)).
- Test Mode : Transmitting & Hopping
- Remark : The worst case was recorded.

6.1 Test Procedure

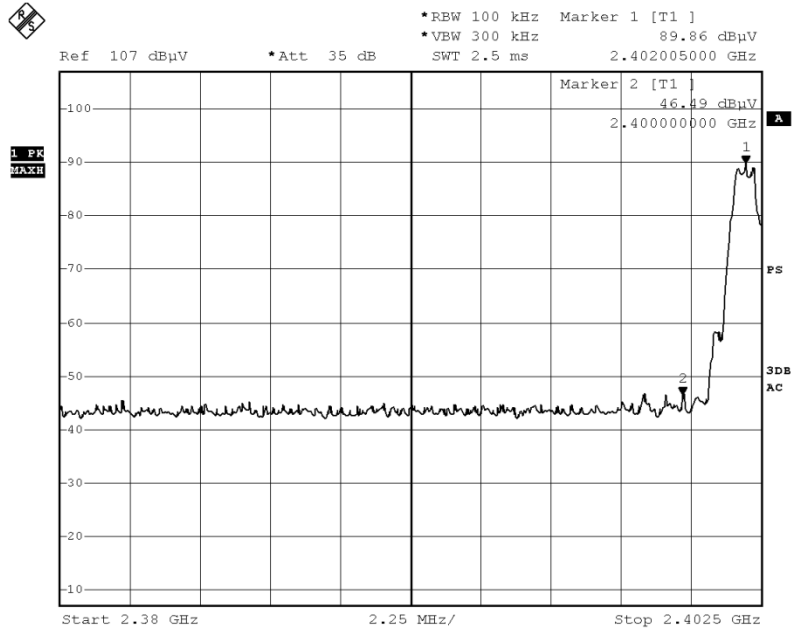
1. Remove the antenna from the EUT and then connect a low RF cable from the antenna port to the spectrum;
2. Set the spectrum analyzer: RBW = 100kHz, VBW = 300kHz, Sweep = auto

Detector function = peak, Trace = max hold

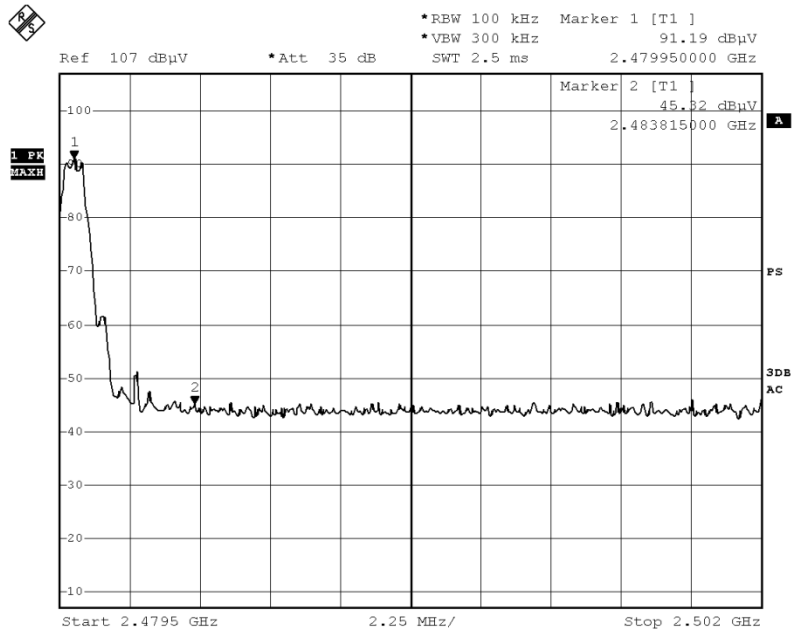
6.2 Test Result

Modulation	Mode	Band edge	Value (dBuV)	Limit (dBuV)	Result
GFSK(BLE)	Transmitting	Left	46.49	69.86	Pass
		Right	45.32	71.19	Pass
Remark:					
The limit is 20dB below the maximum peak level, please refer to the display line of the follow plot					

TX in GFSK Band edge-left side



TX in GFSK Band edge-right side





7 6dB Bandwidth Measurement

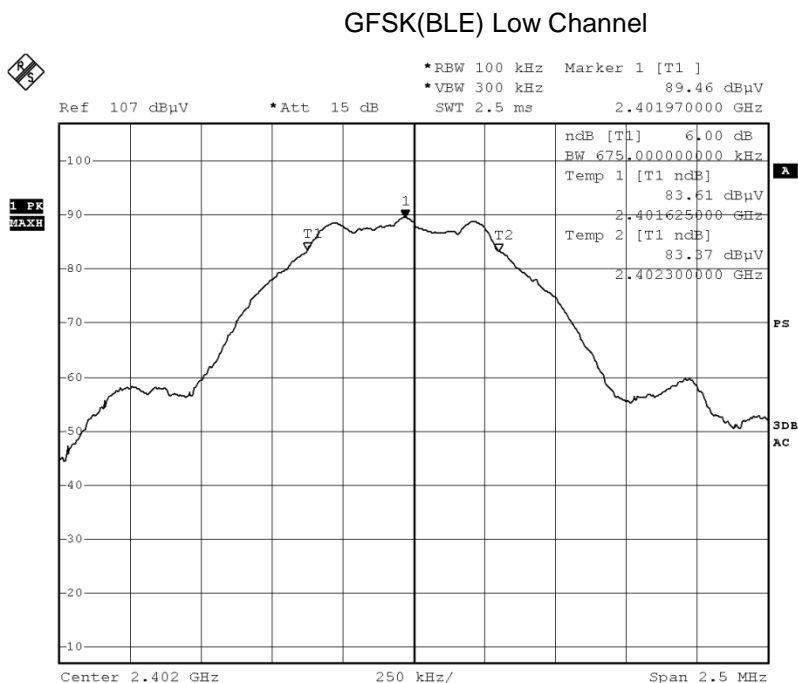
- Test Requirement : FCC CFR47 Part 15 Section 15.247
- Test Method : ANSI C63.10:2013, KDB 558074 D01 DTS MEAS GUIDANCE V03R03
- Test Limit : Systems using digital modulation techniques may operate in the 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz bands. The minimum 6 dB bandwidth shall be at least 500 kHz.
- Test Mode : Refer to section 3.3

7.1 Test Procedure

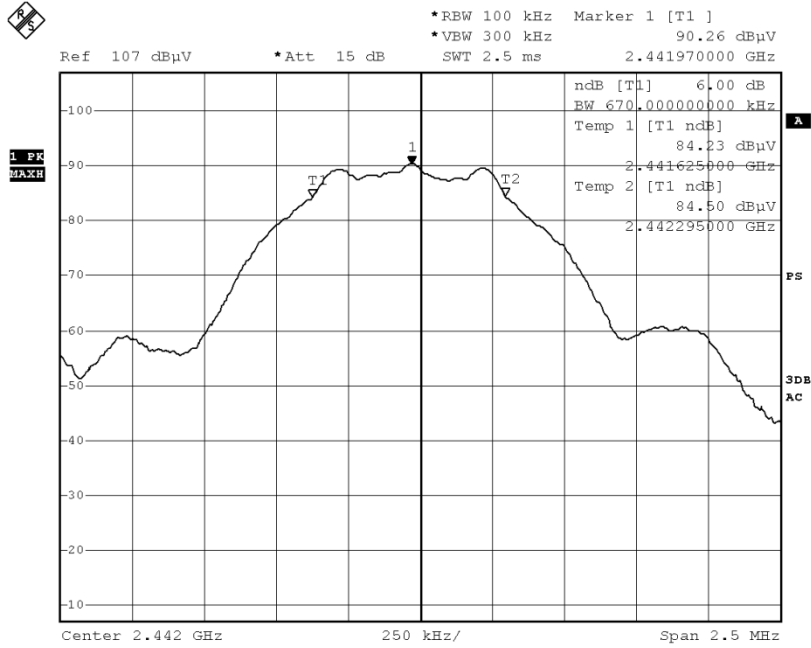
1. Remove the antenna from the EUT and then connect a low RF cable from the antenna port to the spectrum;
2. Set the spectrum analyzer: For BLE, RBW = 100 kHz, VBW = 300kHz, For WIFI, RBW = 100kHz, VBW = 300kHz,

7.2 Test Result

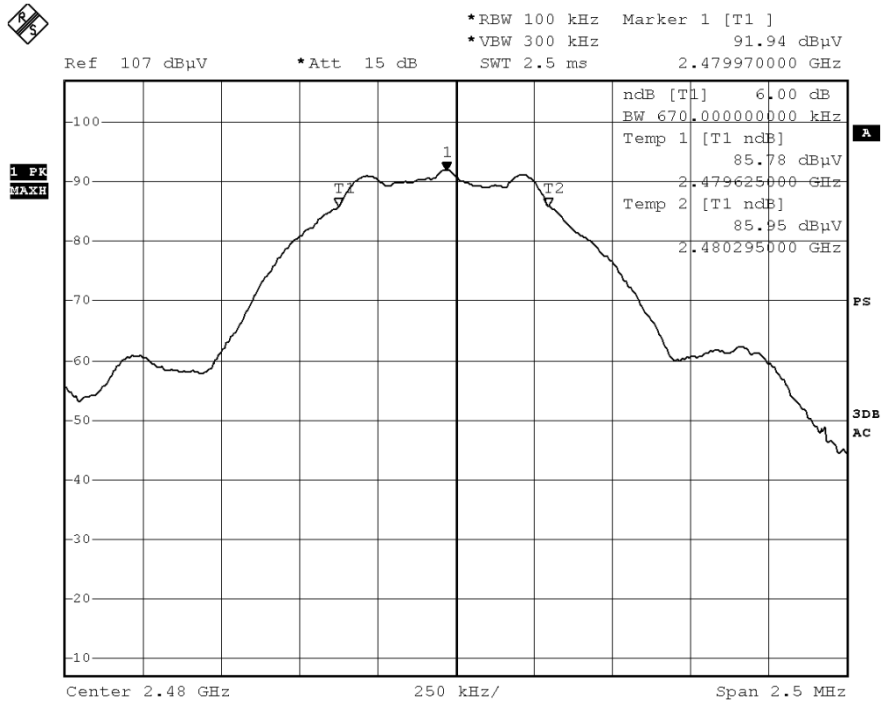
Modulation	Bandwidth(MHz)			Limit
	Low Channel	Middle Channel	High Channel	
GFSK(BLE)	0.675	0.670	0.670	≥500kHz



GFSK(BLE) Middle Channel



GFSK(BLE)High Channel





8 Maximum Peak Output Power

- Test Requirement : FCC CFR47 Part 15 Section 15.247
- Test Method : ANSI C63.10:2013,KDB 558074 D01 DTS MEAS GUIDANCE V03R03
- Test Limit : Regulation 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. As an alternative to a peak power measurement, compliance with the one Watt limit can be based on a measurement of the maximum conducted output power.
- Test Mode : Refer to section 3.3

8.1 Test Procedure

KDB 558074 D01 DTS Meas Guidance v03r03

section 9.1.1(For BLE)

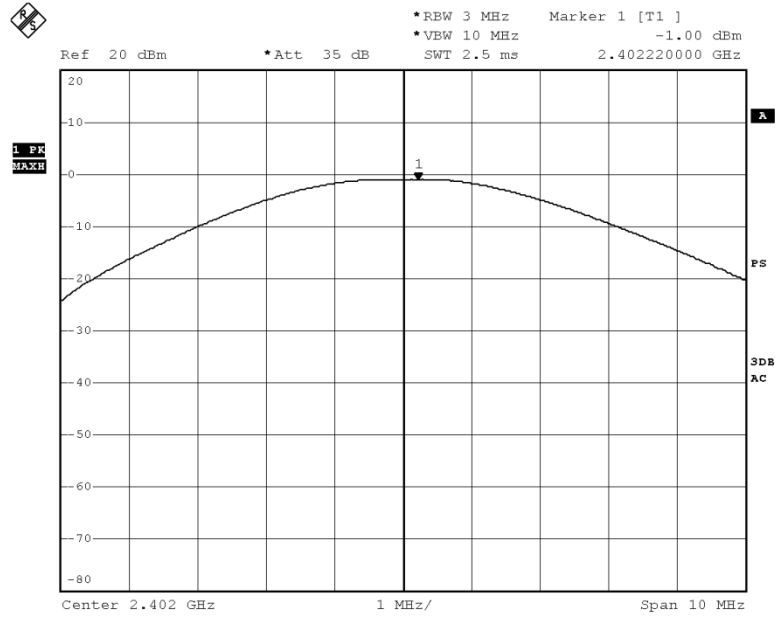
This procedure shall be used when the measurement instrument has available a resolution bandwidth that is greater than the DTS bandwidth.

- a)Set the RBW \geq DTS bandwidth.
- b)Set VBW \geq 3 RBW.
- c)Set span \geq 3 x 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.

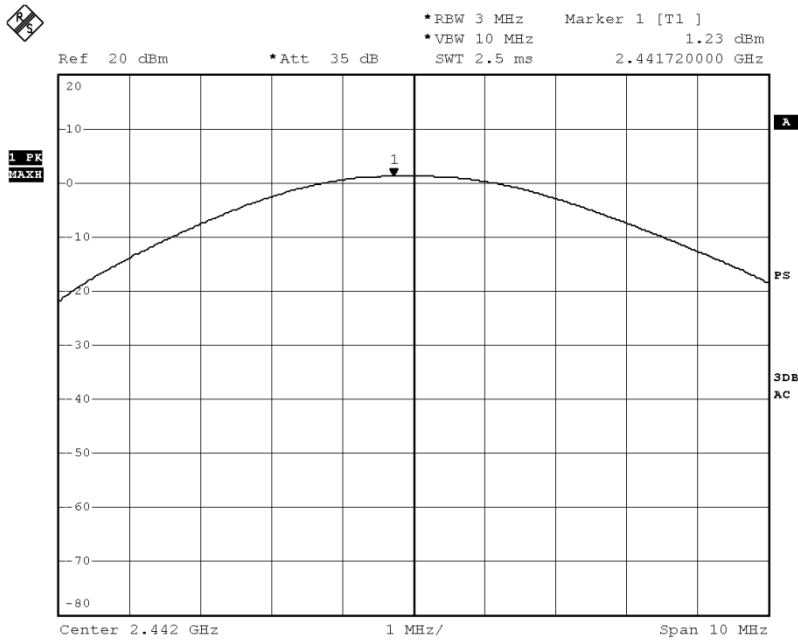
8.2 Test Result

Modulation	Maximum Peak Output Power (dBm)			Limit
	Low Channel	Middle Channel	High Channel	
GFSK(BLE)	-1.0	1.23	2.42	1W(30dBm)

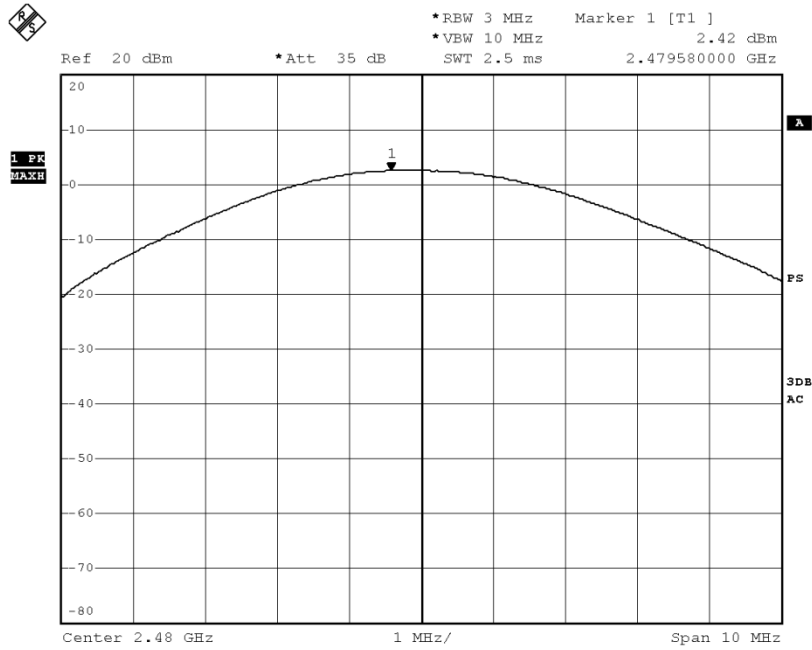
GFSK(BLE) Low Channel



GFSK(BLE) Middle Channel



GFSK(BLE)High Channel





9 Power Spectral density

- Test Requirement : FCC CFR47 Part 15 Section 15.247
- Test Method : ANSI C63.10:2013,KDB 558074 D01 DTS MEAS GUIDANCE V03R03
- Test Limit : Regulation 15.247(f)The power spectral density conducted from the intentional radiator to the antenna due to the digital modulation operation of the hybrid system, with the frequency hopping operation turned off, shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission.
- Test Mode : Refer to section 3.3

9.1 Test Procedure

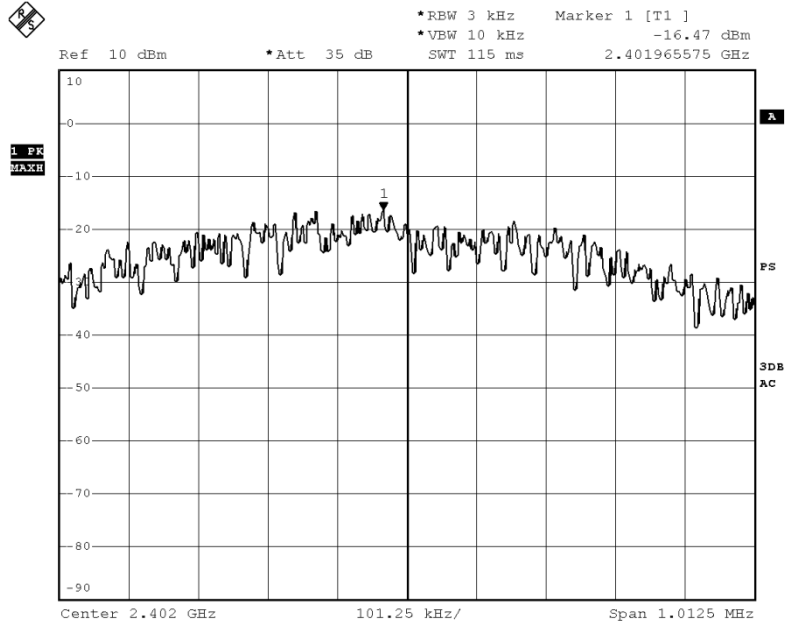
KDB 558074 D01 DTS Meas Guidance v03r03

1. Remove the antenna from the EUT and then connect a low RF cable from the antenna port to the spectrum.
2. Set the spectrum analyzer: RBW = 3kHz. VBW = 10kHz , Span = 1.5 times the DTS channel bandwidth(6 dB bandwidth). Sweep = auto; Detector Function = Peak. Trace = Max hold.
3. Allow the trace to stabilize. Use the marker-delta function to determine the separation between the peaks of the adjacent channels. The limit is specified in one of the subparagraphs of this Section Submit this plot.

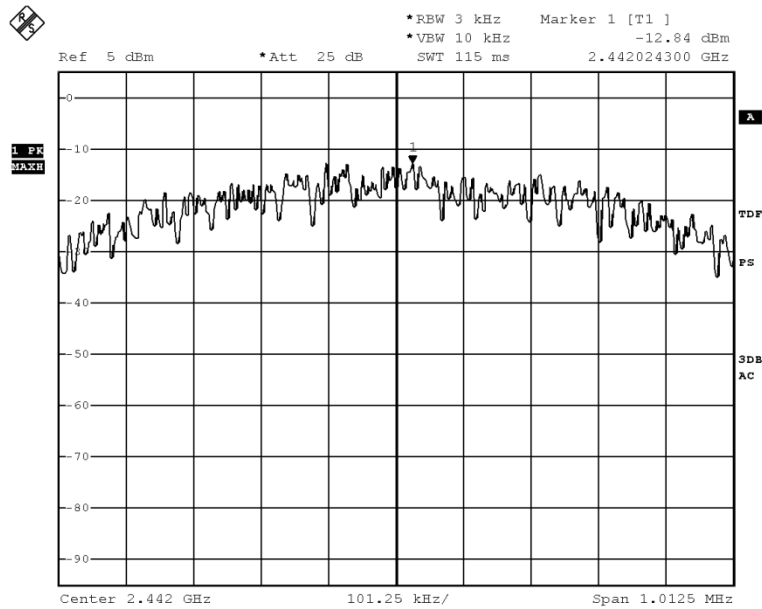
9.2 Test Result

Modulation	Power Spectral density (dBm/3kHz)			Limit
	Low Channel	Middle Channel	High Channel	
GFSK(BLE)	-16.47	-14.28	-13.28	8dBm/3kHz

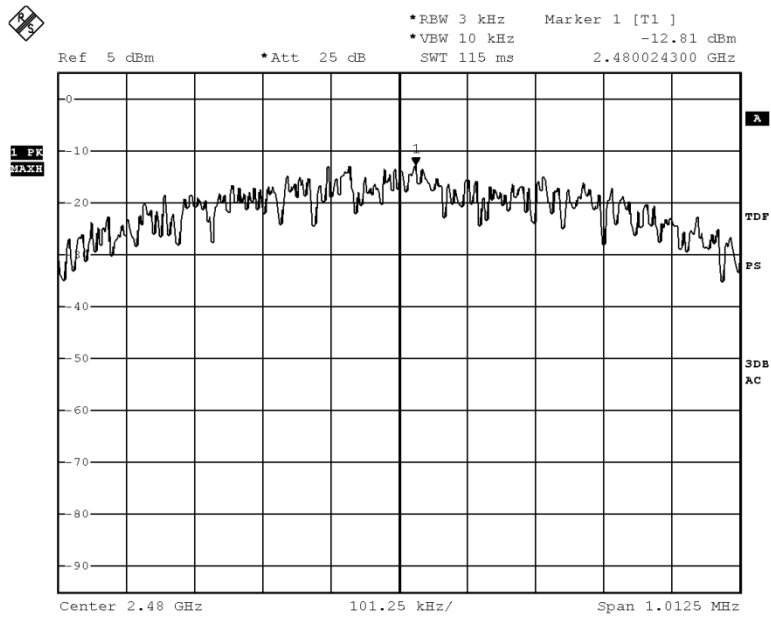
GFSK(BLE) Low Channel



GFSK(BLE) Middle Channel



GFSK(BLE)High Channel





10 Antenna Requirement

According to the FCC part15.203, a transmitter can only be sold or operated with antennas with which it was approved. This product has a PCB printed antenna, it meet the requirement of this section.

*******THE END REPORT*******