FCC PART 15 SUBPART C TEST REPORT

FCC PART 15.247

Report Reference No.....:	**WTT150700101**	
FCC ID.....:	**2AFETHY-NP-01**	
Compiled by (position+printed name+signature)..:	File administrators Kelly Wu	Kelly Wu
Supervised by (position+printed name+signature)..:	Project Engineer Kelly Wu	Kelly Wu
Approved by (position+printed name+signature)..:	RF Manager Eric Wang	Eric Wang
Date of issue.....:	Jul 18, 2015	
Representative Laboratory Name.:	**SHENZHEN WTT TESTING TECHNOLOGY CO.,LTD.**	
Address .....:	602,Fuhua building,Xiaweiyuan New Village , Gushu,Xixiang, Bao'an District,Shenzhen,China	
Testing Laboratory Name.....:	**Shenzhen CTL Testing Technology Co., Ltd.**	
Address .....:	Floor 1-A, Baisha Technology Park, No. 3011, Shahexi Road, Nanshan,Shenzhen,China	
Applicant's name.....:	**Shenzhen Hyan Microelectronics Co.,Ltd**	
Address .....:	Building1-2#,Tongfuyu Industrial Park,Aiqun Road,Shiyan Town,Baoan district,Shenzhen,China	
Test specification .....:		
Standard .....:	**FCC Part 15.247: Operation within the bands 902-928 MHz, 2400-2483.5 MHz and 5725-5850 MHz**	
TRF Originator.....:	SHENZHEN WTT TESTING TECHNOLOGY CO.,LTD.	

Test item description .....:	*Ddiaper*
Trade Mark .....:	H
Manufacturer.....:	**Shenzhen Hyan Microelectronics Co.,Ltd**
Model/Type reference.....:	HY-NP-01
Listed Models .....:	N/A
Modulation Type .....:	GFSK
Operation Frequency.....:	From 2402MHz to 2480MHz
Rating .....:	DC 3.00V
Hardware version .....:	SBM-BB01_V03A
Software version .....:	SBM-BB01_V03A_V1.0
Result.....:	**PASS**

TEST REPORT

Test Report No. :	WTT150700101	Jul 18, 2015 Date of issue

Equipment under Test	:	Ddiaper
Model /Type	:	HY-NP-01
Listed Models	:	N/A
Applicant	:	**Shenzhen Hyan Microelectronics Co.,Ltd**
Address	:	Building1-2#,Tongfuyu Industrial Park,Aiqun Road,Shiyan Town,Baoan district,Shenzhen,China
Manufacturer		**Shenzhen Hyan Microelectronics Co.,Ltd**
Address	:	Building1-2#,Tongfuyu Industrial Park,Aiqun Road,Shiyan Town,Baoan district,Shenzhen,China

Test Result	PASS

The test report merely corresponds to the test sample.
It is not permitted to copy extracts of these test result without the written permission of the test laboratory.

Contents

1. TEST STANDARDS

The tests were performed according to following standards:

FCC Rules Part 15.247: Frequency Hopping, Direct Spread Spectrum and Hybrid Systems that are in operation within the bands of 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz

ANSI C63.4-2009: 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

558074 D01 DTS Meas Guidance v03r03: GUIDANCE FOR PERFORMING COMPLIANCE MEASUREMENTS ON DIGITAL TRANSMISSION SYSTEMS (DTS) OPERATING UNDER §15.247

2. SUMMARY

2.1. General Remarks

Date of receipt of test sample	:	Jul 01,2015
Testing commenced on	:	Jul 02,2015
Testing concluded on	:	Jul 18, 2015

2.2. Product Description

The **Shenzhen Hyan Microelectronics Co.,Ltd** 's Model: HY-NP-01 or the "EUT" as referred to in this report; more general information as follows, for more details, refer to the user's manual of the EUT.

Name of EUT	Ddiaper
Model Number	HY-NP-01
BT Modulation Type	GFSK (BT4.0 BLE)
Hardware version	SBM-BB01_V03A
Software version	SBM-BB01_V03A_V1.0
Extreme temp. Tolerance	-30°C to +50°C
Extreme vol. Limits	2.80VDC to 3.20VDC (nominal: 3.00VDC)

2.3. Equipment Under Test

Power supply system utilised

Power supply voltage	:	○	120V / 60 Hz	○	115V / 60Hz
		○	12 V DC	○	24 V DC
		●	Other (specified in blank below)		

DC 3.00V

2.4. Description of the test mode

The application provider specific test software to control sample in continuous TX and RX (Duty Cycle >98%)

For testing meet KDB558074 test requirement.

The EUT has been tested under typical operating condition. The Applicant provides communication tools software to control the EUT for staying in continuous transmitting and receiving mode for testing. There are 40 channels of EUT, and the test carried out at the lowest channel, middle channel and highest channel

Channel	Frequency(MHz)	Channel	Frequency(MHz)
00	**2402**	20	2442
01	2404	21	2444
02	2406	22	2446
03	2408	23	2448
04	2410	24	2450
05	2412	25	2452
06	2414	26	2454
07	2416	27	2456
08	2418	28	2458
09	2420	29	2460
10	2422	30	2462

11	2424	31	2464
12	2426	32	2466
13	2428	33	2468
14	2430	34	2470
15	2432	35	2472
16	2434	36	2474
17	2436	37	2476
18	2438	38	2478
19	**2440**	**39**	**2480**

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

2.5.1 General Description

The EUT was programmed to be in continuously transmitting mode and the transmit duty cycle is not less than 98%.

2.5.2 Customized Configurations

#EUT Conf.	Signal Description	Operating Frequency
TM1_ Ch00	GFSK modulation	Ch No. 00/2402MHz
TM1_ Ch19	GFSK modulation	Ch No. 19/ 2440MHz
TM1_ Ch39	GFSK modulation	Ch No. 39/ 2480MHz

2.5.3 Test Environments

NOTE: The values used in the test report maybe stringent than the declared.

Environment Parameter	Selected Values During Tests		
NTNV	Temperature	Voltage	Relative Humidity
	Ambient	3.0VDC	Ambient

2.6. EUT operation mode

The EUT has been tested under typical operating condition. The Applicant provides command

to control the EUT for staying in continuous transmitting (Duty Cycle >98%) and receiving mode for testing.

2.7. EUT configuration

The following peripheral devices and interface cables were connected during the measurement:

● - supplied by the manufacturer

○ - supplied by the lab

○	Power Cable	Length (m) :	/
		Shield :	/
		Detachable :	/
○	Multimeter	Manufacturer :	/
		Model No. :	/

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

This submittal(s) (test report) is intended for **FCC ID: 2AFETHY-NP-01** filing to comply with Section 15.247 of the FCC Part 15, Subpart C Rules.

2.9. Modifications

No modifications were implemented to meet testing criteria.

3. TEST ENVIRONMENT

3.1. Address of the test laboratory

Shenzhen CTL Testing Technology Co., Ltd.

Floor 1-A, Baisha Technology Park, No. 3011, Shahexi Road, Nanshan,Shenzhen,China
The sites are constructed in conformance with the requirements of ANSI C63.7, ANSI C63.4 (2009) and CISPR Publication 22.

3.2. Test Facility

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

FCC-Registration No.: 970318

Shenzhen CTL Testing Technology Co., Ltd. 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. Registration 970318, Dec 19, 2013

3.3. Environmental conditions

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

Temperature:	15-35 ° C
Humidity:	30-60 %
Atmospheric pressure:	950-1050mbar

3.4. Statement of the measurement uncertainty

The data and results referenced in this document are true and accurate. The reader is cautioned that there may be errors within the calibration limits of the equipment and facilities. The measurement uncertainty was calculated for all measurements listed in this test report acc. to CISPR 16 - 4 „Specification for radio disturbance and immunity measuring apparatus and methods – Part 4: Uncertainty in EMC Measurements“ and is documented in the Shenzhen CTL Testing Technology Co., Ltd. National Digital Electronic Product Testing Center quality system acc. to DIN EN ISO/IEC 17025. Furthermore, component and process variability of devices similar to that tested may result in additional deviation. The manufacturer has the sole responsibility of continued compliance of the device.

Hereafter the best measurement capability for Shenzhen CTL Testing Technology Co., Ltd. National Digital Electronic Product Testing Center
is reported:

Test	Range	Measurement Uncertainty	Notes
Radiated Emission	9KHz~30MHz	4.56 dB	(1)
Radiated Emission	30~1000MHz	4.24 dB	(1)
Radiated Emission	1~18GHz	5.16 dB	(1)
Radiated Emission	18-40GHz	5.54 dB	(1)
Conducted spurious emission	9KHz-12.75 GHz	1.60 dB	(1)
Transmitter power conducted	---------	0.57 dB	(1)
6dB Bandwidth	---------	0.42 dB	(1)
Power Spectral Density	---------	0.78 dB	(1)

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

3.5. Test Description

Test Item	FCC Part No.	Requirements	Verdict
DTS (6 dB) Bandwidth	15.247(a)(2)	≥ 500 kHz.	PASS
Maximum Peak Conducted Output Power	15.247(b)(3)	For directional gain:< 30dBm – (G[dBi] –6 [dB]),peak; Otherwise :< 30dBm, peak.	PASS
Maximum Power Spectral Density Level	15.247(e)	For directional gain :< 8dBm/3 kHz – (G[dBi] –6[dB]), peak. Otherwise :< 8dBm/3 kHz, peak.	PASS
Band Edges Compliance	15.247(d)	< -20dBr/100 kHz if total peak power ≤power limit.	PASS
Unwanted Emissions into Non-Restricted Frequency Bands	15.247(d)	< -20dBr/100 kHz if total peak power ≤power limit.	PASS
Unwanted Emissions into Restricted Frequency Bands (Conducted)	15.247(d) 15.209	< -20dBr/100 kHz if total peak power ≤power limit.	PASS
Unwanted Emissions into Restricted Frequency Bands (Radiated)	15.247(d) 15.209	FCC Part 15.209 field strength limit;	PASS
AC Power Line Conducted Emissions	15.207	FCC Part 15.207 conducted limit;	N/A

Remark: 1:The measurement uncertainty is not included in the test result.
2:N/A stand for “Not applicable”

3.6. Summary of measurement results

Test Specification clause	Test case	Test Mode	Test Channel	Recorded In Report		Pass	Fail	NA	NP	Remark
§15.247(b)(4)	Antenna gain	GFSK	☒ Lowest ☒ Middle ☒ Highest	GFSK	☒ Lowest ☒ Middle ☒ Highest	☒	☐	☐	☐	complies
§15.247(e)	Power spectral density	GFSK	☒ Lowest ☒ Middle ☒ Highest	GFSK	☒ Lowest ☒ Middle ☒ Highest	☒	☐	☐	☐	complies
§15.247(a)(1)	Spectrum bandwidth – 6 dB bandwidth	GFSK	☒ Lowest ☒ Middle ☒ Highest	GFSK	☒ Lowest ☒ Middle ☒ Highest	☒ ☒	☐	☐	☐	complies
§15.247(b)(1)	Maximum output power	GFSK	☒ Lowest ☒ Middle ☒ Highest	GFSK	☒ Lowest ☒ Middle ☒ Highest	☒ ☒ ☒	☐	☐	☐	complies
§15.247(d)	Band edge compliance conducted	GFSK	☒ Lowest ☒ Highest	GFSK	☒ Lowest ☒ Highest	☒ ☒	☐	☐	☐	complies
§15.205	Band edge compliance radiated	GFSK	☒ Lowest ☒ Highest	GFSK	☒ Lowest ☒ Highest	☒	☐	☐	☐	complies
§15.247(d)	TX spurious emissions conducted	GFSK	☒ Lowest ☒ Middle ☒ Highest	GFSK	☒ Lowest ☒ Middle ☒ Highest	☒ ☒	☐	☐	☐	complies
§15.247(d)	TX spurious emissions radiated	GFSK	☒ Lowest ☒ Middle ☒ Highest	GFSK	☒ Lowest ☒ Middle ☒ Highest	☒	☐	☐	☐	complies
§15.109	RX spurious emissions radiated	-/-	-/-	-/-	-/-	☒	☐	☐	☐	complies
§15.209(a)	TX spurious Emissions radiated < 30 MHz	GFSK	-/-	GFSK	-/-	☒	☐	☐	☐	complies
§15.107(a) §15.207	Conducted Emissions < 30 MHz	GFSK	-/-	GFSK	-/-	☐	☐	☒	☐	

Remark:
1. The measurement uncertainty is not included in the test result.
2. NA = Not Applicable; NP = Not Performed

3.7. Test Conditions

Test Case	Test Conditions	
	Configuration	Description
DTS (6 dB) Bandwidth	Measurement Method	FCC KDB 558074 §8.2 Option 2
	Test Environment	NTNV
	EUT Configuration	TM1_ Ch00 TM1_ Ch19 TM1_ Ch39
Maximum Peak Conducted Output Power	Measurement Method	FCC KDB 558074§9.1.2
	Test Environment	NTNV
	EUT Configuration	TM1_ Ch00 TM1_ Ch19 TM1_ Ch39
Maximum Power Spectral Density Level	Measurement Method	FCC KDB 558074 §10.2 (peak PSD).
	Test Environment	NTNV
	EUT Configuration	TM1_ Ch00 TM1_ Ch19 TM1_ Ch39
Unwanted Emissions into Non-Restricted Frequency Bands	Measurement Method	FCC KDB 558074§11.0
	Test Environment	NTNV
	EUT Configuration	TM1_ Ch00 TM1_ Ch19 TM1_ Ch39
Unwanted Emissions into Restricted Frequency Bands (Conducted)	Measurement Method	FCC KDB 558074§12.2, Conducted (antenna-port).
	Test Environment	NTNV
	EUT Configuration	TM1_ Ch00 TM1_ Ch19 TM1_ Ch39
Unwanted Emissions into Restricted	Measurement Method	FCC KDB 558074§12.1,Radiated(cabinet/case emissions with Impedance matching for antenna-port).
	EUT Configuration	TM1_ Ch00 TM1_ Ch19 TM1_ Ch39

Note: For Radiated Emissions, By preliminary testing and verifying three axis (X, Y and Z) position of EUT transmitted status, it was found that “Z axis” position was the worst, then the final test was executed the worst condition and test data were recorded in this report.

3.8. Equipments Used during the Test

Radiated Emission					
Item	Test Equipment	Manufacturer	Model No.	Serial No.	Last Cal.
1	Bilog Antenna	Sunol Sciences Corp.	JB1	A061713	2015/06/02
2	EMI TEST Receivcer	Rohde&Schwarz	ESCI3	103710	2015/06/02
3	EMI TEST Software	Audix	E3	N/A	N/A
4	EMI TEST Software	Rohde&Schwarz	ESK1	N/A	N/A
5	HORN ANTENNA	Sunol Sciences Corp.	DRH-118	A062013	2015/05/19
6	Amplifer	HP	8447D	3113A07663	2015/06/02
7	Preamplifier	HP	8349B	3155A00882	2015/06/02
8	Amplifer	Compliance Direction systems	PAP1-4060	129	2015/06/02
9	Active Loop Antenna	Daze	ZN30900A	N/A	2015/05/19
10	TURNTABLE	MATURO	TT2.0	----	N/A
11	ANTENNA MAST	MATURO	TAM-4.0-P	----	N/A
12	Horn Antenna	SCHWARZBECK	BBHA9170	25849	2015/05/19
13	Spectrum Analyzer	Rohde&Schwarz	FSU26	201148	2015/05/20
14	Coaxial Cables	HUBER+SUHNER	SUCOFLEX 104PEA-10M (9kHz-26.5G)	10m	2015/05/20
15	Coaxial Cables	HUBER+SUHNER	SUCOFLEX 104PEA-3M (9kHz-26.5G)	3m	2015/05/20

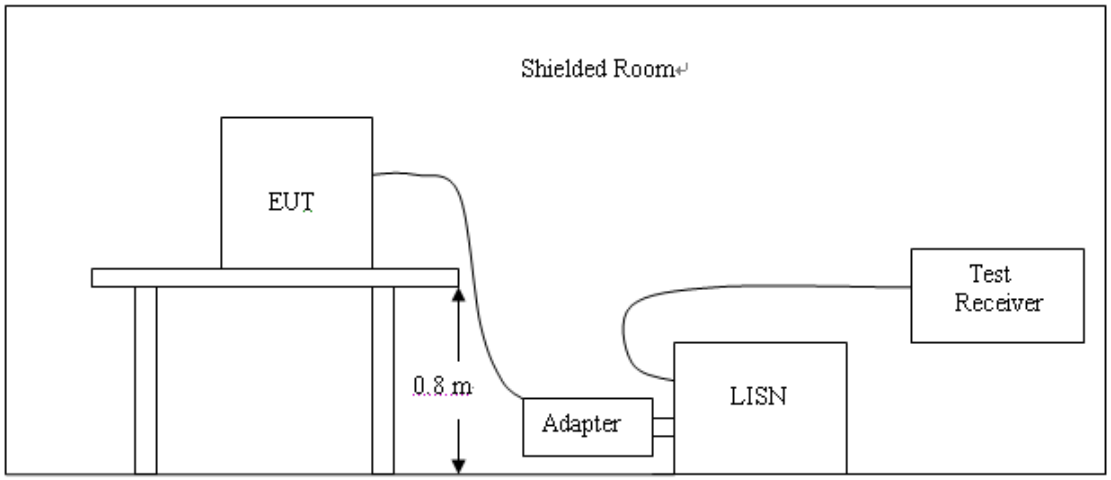
Maximum Peak Output Power / Power Spectral Density / 20dB Bandwidth / Band Edge Compliance of RF Emission / Spurious RF Conducted Emission					
Item	Test Equipment	Manufacturer	Model No.	Serial No.	Last Cal.
1	Spectrum Analyzer	Rohde&Schwarz	FSU26	201148	2015/05/20
2	Spectrum Analyzer	Agilent	E4407B	MY45108355	2015/05/21
3	Power meter	Rohde & Schwarz	NRVD	260540	2015/05/19
4	Power Sensor	Rohde&Schwarz	NRR-Z81	256697	2015/05/19
6	Coaxial Cables	WK CE Cable	N/A(9kHz-26.5G)	N/A	2015/05/20
7	The temporary antenna connector	MMCX - SMA	1547	23657478	2015/05/20
8	Cable	MURATA	MM8430 - 2610 (9kHz-26.5G)	11548	2015/05/20

Note: The temporary antenna connector is soldered on the PCB board in order to perform conducted tests and this temporary antenna connector is listed in the equipment list
The Cal.Interval was one year

4. TEST CONDITIONS AND RESULTS

4.1. AC Power Conducted Emission

TEST CONFIGURATION



TEST PROCEDURE

1. The equipment was set up as per the test configuration to simulate typical actual usage per the user's manual. The EUT is a tabletop system; a wooden table with a height of 0.8 meters is used and is placed on the ground plane as per ANSI C63.4-2009.
2. Support equipment, if needed, was placed as per ANSI C63.4-2009
3. All I/O cables were positioned to simulate typical actual usage as per ANSI C63.4-2009
4. The EUT received DC5V power from the adapter, the adapter received AC120V/60Hz power through a Line Impedance Stabilization Network (LISN) which supplied power source and was grounded to the ground plane.
5. All support equipments received AC power from a second LISN, if any.
6. The EUT test program was started. Emissions were measured on each current carrying line of the EUT using a spectrum Analyzer / Receiver connected to the LISN powering the EUT. The LISN has two monitoring points: Line 1 (Hot Side) and Line 2 (Neutral Side). Two scans were taken: one with Line 1 connected to Analyzer / Receiver and Line 2 connected to a 50 ohm load; the second scan had Line 1 connected to a 50 ohm load and Line 2 connected to the Analyzer / Receiver.
7. Analyzer / Receiver scanned from 150 KHz to 30MHz for emissions in each of the test modes.
8. During the above scans, the emissions were maximized by cable manipulation.

AC Power Conducted Emission Limit

For intentional device, according to § 15.207(a) AC Power Conducted Emission Limits is as following:

Frequency (MHz)	Maximum RF Line Voltage (dBμV)			
	CLASS A		CLASS B	
	Q.P.	Ave.	Q.P.	Ave.
0.15 - 0.50	79	66	66-56*	56-46*
0.50 - 5.00	73	60	56	46
5.00 - 30.0	73	60	60	50

* Decreasing linearly with the logarithm of the frequency

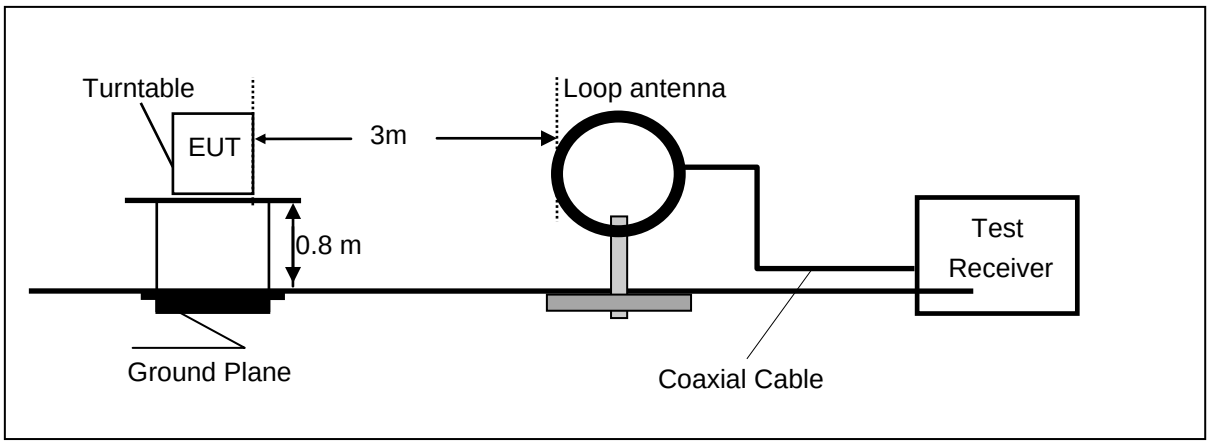
TEST RESULTS

The EUT is powered by a battery, So this test item is not applicable for the EUT.

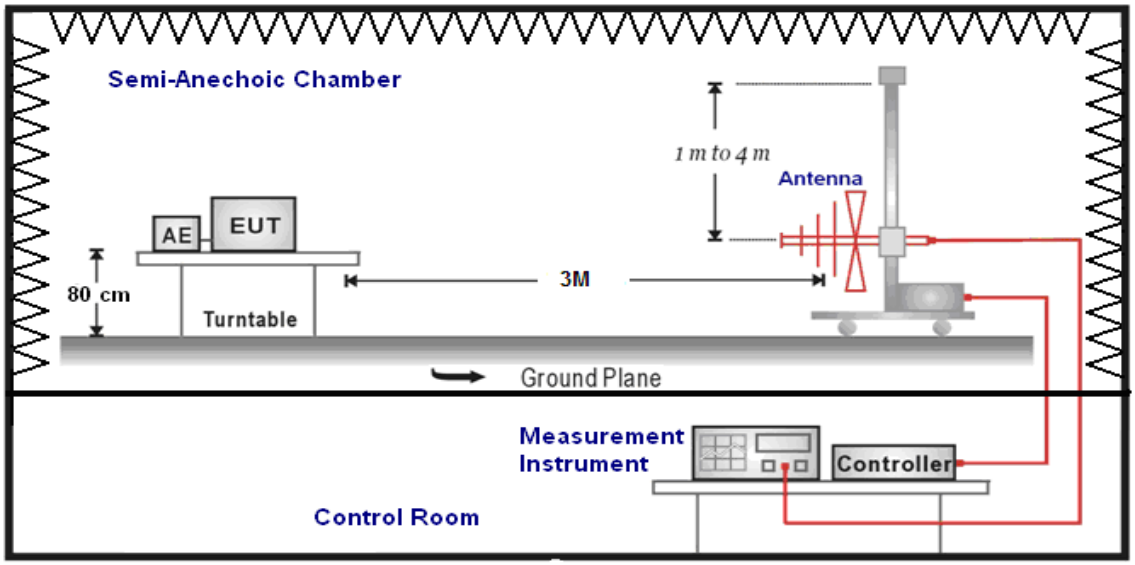
4.2. Radiated Emission

TEST CONFIGURATION

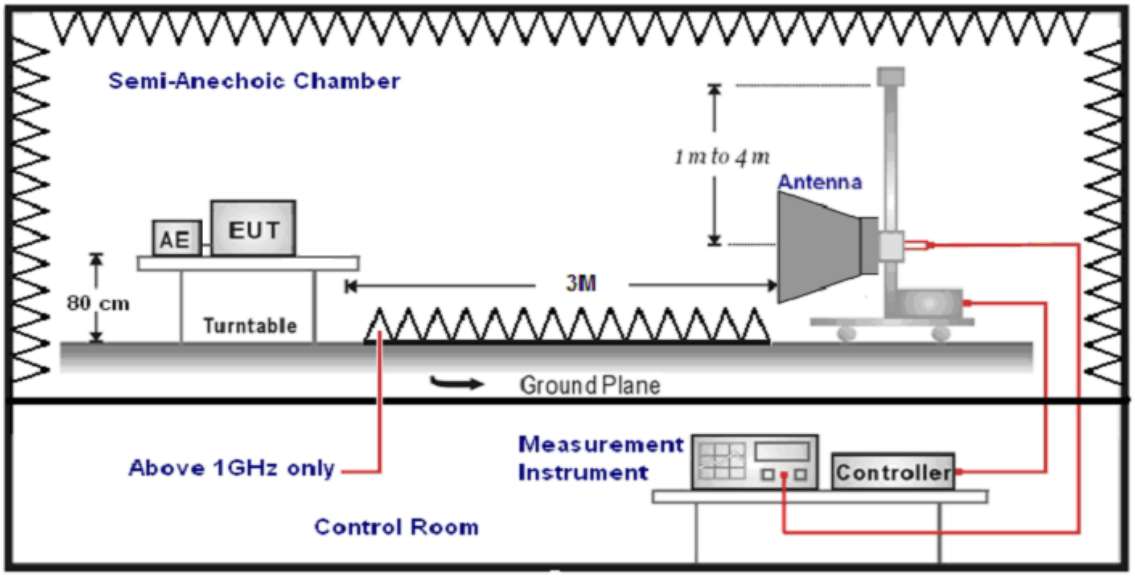
Frequency range 9 KHz – 30MHz



Frequency range 30MHz – 1000MHz



Frequency range above 1GHz-25GHz



TEST PROCEDURE

1. 1. The EUT was placed on a turn table which is 0.8m above ground plane.
2. Maximum procedure was performed by raising the receiving antenna from 1m to 4m and rotating the turn table from 0℃ to 360℃ to acquire the highest emissions from EUT.
3. 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.
4. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical.
5. Repeat above procedures until all frequency measurements have been completed.
6. The EUT minimum operation frequency was 12MHz and maximum operation frequency was 2480MHz.so radiated emission test frequency band from 9 KHz to 25GHz..
7. The distance between test antenna and EUT as following table states:

Test Frequency range	Test Antenna Type	Test Distance
9KHz-30MHz	Active Loop Antenna	3
30MHz-1GHz	Ultra-Broadband Antenna	3
1GHz-18GHz	Double Ridged Horn Antenna	3
18GHz-25GHz	Horn Anternna	3

8. Setting test receiver/spectrum as following table states:

Test Frequency range	Test Receiver/Spectrum Setting	Detector
9KHz-150KHz	RBW=200Hz/VBW=3KHz,Sweep time=Auto	QP
150KHz-30MHz	RBW=9KHz/VBW=100KHz,Sweep time=Auto	QP
30MHz-1GHz	RBW=120KHz/VBW=1000KHz,Sweep time=Auto	QP
1GHz-40GHz	Peak Value: RBW=1MHz/VBW=3MHz, Sweep time=Auto	Peak (Receiver)
	Average Value: RBW=1MHz/VBW=3MHz, Sweep time=Auto	Average (Receiver)

Field Strength Calculation

The field strength is calculated by adding the Antenna Factor and Cable Factor and subtracting the Amplifier Gain and Duty Cycle Correction Factor (if any) from the measured reading. The basic equation with a sample calculation is as follows:

FS = RA + AF + CL - AG

Where FS = Field Strength	CL = Cable Attenuation Factor (Cable Loss)
RA = Reading Amplitude	AG = Amplifier Gain
AF = Antenna Factor	

RADIATION LIMIT

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

Frequency (MHz)	Distance (Meters)	Radiated (dBμV/m)	Radiated (μV/m)
0.009-0.49	300	20log(2400/F(KHz))+80	2400/F(KHz)
0.49-1.705	30	20log(24000/F(KHz))+40	24000/F(KHz)
1.705-30	30	20log(30)+40	30
30-88	3	40.0	100
88-216	3	43.5	150
216-960	3	46.0	200
Above 960	3	54.0	500

TEST RESULTS

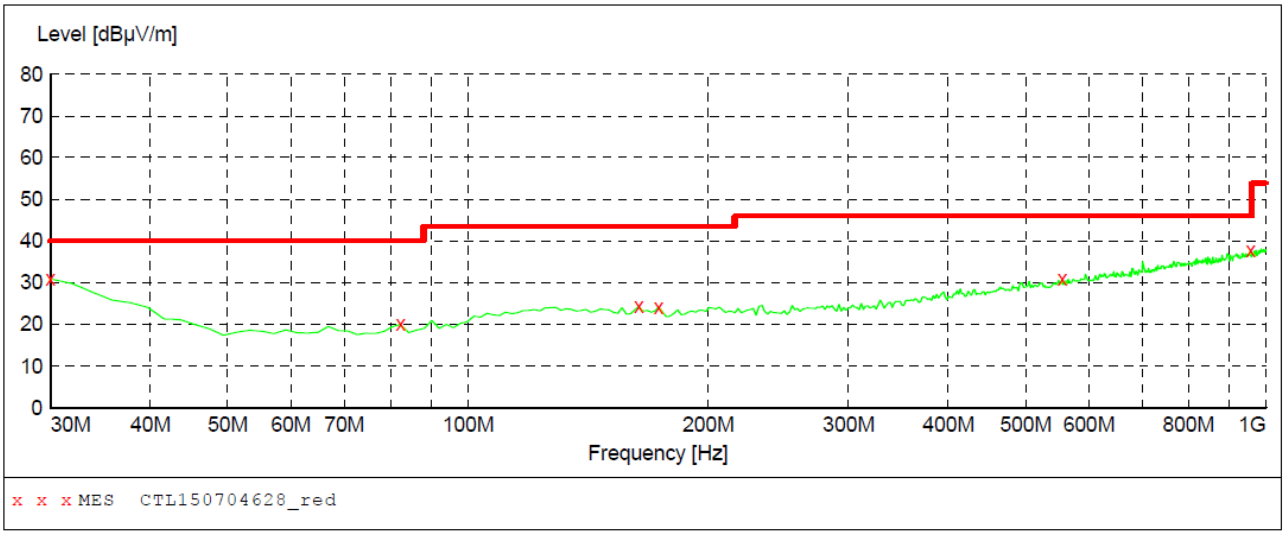
Remark:
1. The radiated measurement are performed the each channel (low/mid/high), the datum recorded below (the middle channel) is the worst case for all test channels.
2. ULTRA-BROADBAND ANTENNA for the radiation emission test below 1G.
3. HORN ANTENNA for the radiation emission test above 1G.
4. We tested both battery powered and powered by adapter charging mode at three orientations, recorded worst case at powered by adapter charging mode.
5. "---" means not recorded as emission levels lower than limit.
6. Margin= Limit - Level

For 9KHz to 30MHz

Frequency (MHz)	Corrected Reading (dBμV/m)@3m	FCC Limit (dBμV/m) @3m	Margin (dB)	Detector	Result
12.00	43.28	69.54	26.26	QP	PASS
24.00	41.12	69.54	28.42	QP	PASS

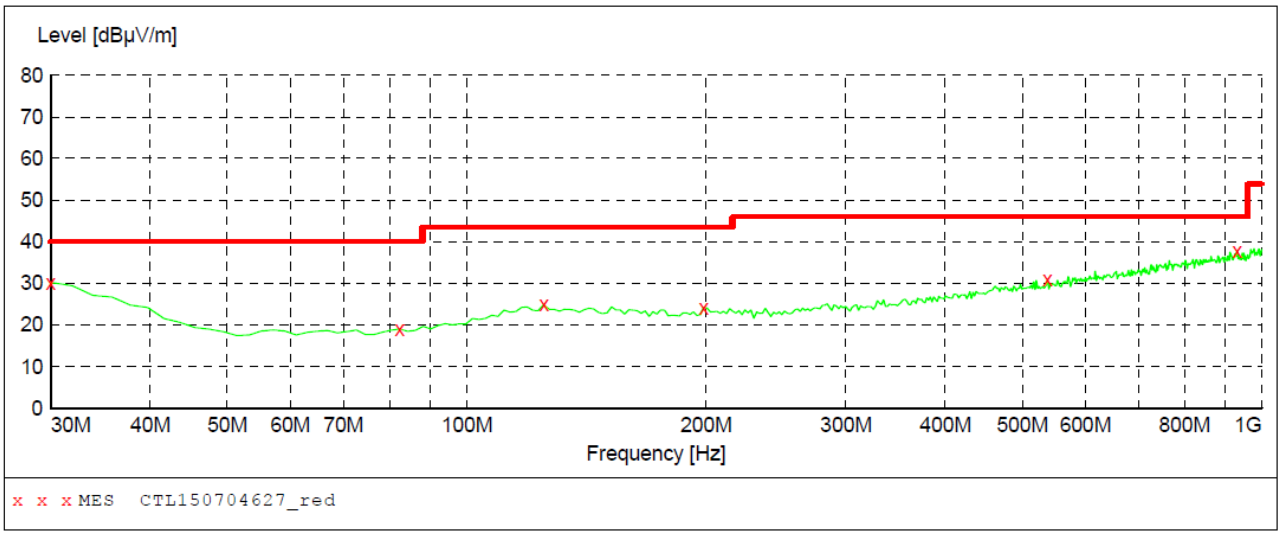
For 30MHz to 1000MHz

Polarization	*Vertical*



Frequency MHz	Level dBμV/m	Transd dB	Limit dBμV/m	Margin dB	Polarization
30.000000	30.90	21.1	40.0	9.1	VERTICAL
82.380000	20.00	9.0	40.0	20.0	VERTICAL
163.860000	24.30	13.9	43.5	19.2	VERTICAL
173.560000	24.20	13.3	43.5	19.3	VERTICAL
555.740000	30.80	21.1	46.0	15.2	VERTICAL
957.320000	37.70	26.7	46.0	8.3	VERTICAL

Polarization	Horizontal



Frequency MHz	Level dBµV/m	Transd dB	Limit dBµV/m	Margin dB	Polarization
30.000000	30.20	21.1	40.0	9.8	HORIZONTAL
82.380000	19.00	9.0	40.0	21.0	HORIZONTAL
125.060000	24.90	15.0	43.5	18.6	HORIZONTAL
198.780000	24.20	14.2	43.5	19.3	HORIZONTAL
538.280000	30.80	20.7	46.0	15.2	HORIZONTAL
932.100000	37.80	26.4	46.0	8.2	HORIZONTAL

For 1GHz to 25GHz

Low Channel @ Channel 00 @ 2402 MHz

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M										
No.	Frequency (MHz)	Emssion Level (dBuV/m)		Limit (dBuV/m)	Margin (dB)	Raw Value (dBuV)	Antenna Factor (dB/m)	Cable Factor (dB)	Pre-amplifier (dB)	Correction Factor (dB/m)
1	4804.00	53.02	PK	74.00	20.98	48.51	33.49	6.91	35.89	4.51
2	4804.00	39.55	AV	54.00	14.45	35.04	33.49	6.91	35.89	4.51
3	7206.00	55.10	PK	74.00	18.90	43.99	36.95	9.18	35.03	11.11
4	7206.00	37.72	AV	54.00	16.28	26.61	36.95	9.18	35.03	11.11

ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M										
No.	Frequency (MHz)	Emssion Level (dBuV/m)		Limit (dBuV/m)	Margin (dB)	Raw Value (dBuV)	Antenna Factor (dB/m)	Cable Factor (dB)	Pre-amplifier (dB)	Correction Factor (dB/m)
1	4804.00	49.27	PK	74.00	24.73	44.76	33.49	6.91	35.89	4.51
2	4804.00	36.40	AV	54.00	17.60	31.89	33.49	6.91	35.89	4.51
3	7206.00	50.99	PK	74.00	23.01	39.88	36.95	9.18	35.03	11.11
4	7206.00	36.08	AV	54.00	17.92	24.97	36.95	9.18	35.03	11.11

Middle Channel @ Channel 40 @ 2440 MHz

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M										
No.	Frequency (MHz)	Emssion Level (dBuV/m)		Limit (dBuV/m)	Margin (dB)	Raw Value (dBuV)	Antenna Factor (dB/m)	Cable Factor (dB)	Pre-amplifier (dB)	Correction Factor (dB/m)
1	4880.00	54.30	PK	74.00	19.70	48.05	33.60	6.95	34.30	6.25
2	4880.00	39.86	AV	54.00	14.14	33.61	33.60	6.95	34.30	6.25
3	7320.00	56.09	PK	74.00	17.91	42.31	37.46	9.23	32.91	13.78
4	7320.00	37.87	AV	54.00	16.13	24.09	37.46	9.23	32.91	13.78

ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M										
No.	Frequency (MHz)	Emssion Level (dBuV/m)		Limit (dBuV/m)	Margin (dB)	Raw Value (dBuV)	Antenna Factor (dB/m)	Cable Factor (dB)	Pre-amplifier (dB)	Correction Factor (dB/m)
1	4880.00	49.77	PK	74.00	24.23	43.52	33.60	6.95	34.30	6.25
2	4880.00	36.58	AV	54.00	17.42	30.33	33.60	6.95	34.30	6.25
3	7320.00	51.09	PK	74.00	22.91	37.31	37.46	9.23	32.91	13.78
4	7320.00	36.25	AV	54.00	17.75	22.47	37.46	9.23	32.91	13.78

High Channel @ Channel 78 @ 2480 MHz

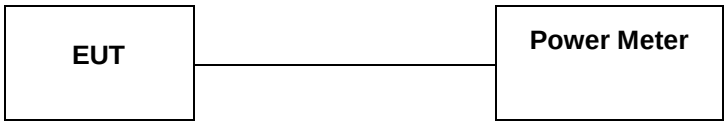
ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M										
No.	Frequency (MHz)	Emssion Level (dBuV/m)		Limit (dBuV/m)	Margin (dB)	Raw Value (dBuV)	Antenna Factor (dB/m)	Cable Factor (dB)	Pre-amplifier (dB)	Correction Factor (dB/m)
1	4960.00	54.54	PK	74.00	19.46	49.62	33.84	7.00	35.92	4.92
2	4960.00	39.90	AV	54.00	14.10	34.98	33.84	7.00	35.92	4.92
3	7340.00	56.05	PK	74.00	17.95	44.10	37.64	9.28	34.97	11.95
4	7340.00	37.81	AV	54.00	16.19	25.86	37.64	9.28	34.97	11.95

ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M										
No.	Frequency (MHz)	Emssion Level (dBuV/m)		Limit (dBuV/m)	Margin (dB)	Raw Value (dBuV)	Antenna Factor (dB/m)	Cable Factor (dB)	Pre-amplifier (dB)	Correction Factor (dB/m)
1	4960.00	49.65	PK	74.00	24.35	44.73	33.84	7.00	35.92	4.92
2	4960.00	36.48	AV	54.00	17.52	31.56	33.84	7.00	35.92	4.92
3	7340.00	51.21	PK	74.00	22.79	39.26	37.64	9.28	34.97	11.95
4	7340.00	36.05	AV	54.00	17.95	24.10	37.64	9.28	34.97	11.95

REMARKS:
1. Emission level (dBuV/m) =Raw Value (dBuV) + Correction Factor (dB/m)
2. Correction Factor (dB/m) = Antenna Factor (dB/m)+Cable Factor (dB)-Pre-amplifier Factor
3. The other emission levels were very low against the limit.
4. Margin value = Limit value- Emission level.
5. The average measurement was not performed when the peak measured data under the limit of average detection.

4.3. Maximum Peak Output Power

TEST CONFIGURATION



TEST PROCEDURE

According to 558074 D01 DTS Meas Guidance v03r03 9.1.2 PKPM1 Peak power meter method "The maximum peak conducted output power may be measured using a broadband peak RF power meter. The power meter shall have a video bandwidth that is greater than or equal to the DTS bandwidth and shall utilize a fast-responding diode detector."Connect antenna port into power meter and reading Peak values

Maximum conducted (Peak) output power: As an alternative to spectrum analyzer or EMI receiver measurements, measurements may be performed using a wideband RF power meter with a thermocouple detector or equivalent if all of the conditions listed below are satisfied.
1. The EUT is configured to transmit continuously,
2. At all times when the EUT is transmitting, it shall be transmitting at its maximum power control level.
3. The integration period of the power meter exceeds the repetition period of the transmitted signal by at least a factor of five.

LIMIT

The Maximum Peak Output Power Measurement is 30dBm.

TEST RESULTS

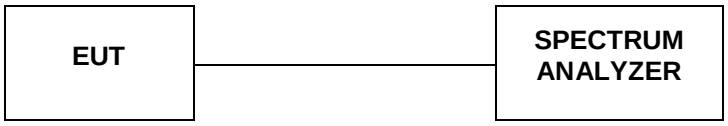
A. Test Verdict

Channel	Frequency (MHz)	Measured Output Peak Power (dBm)	Limits (dBm)	Verdict
00	2402	-2.49	30	PASS
19	2440	-2.11	30	PASS
39	2480	-2.24	30	PASS

Note:
1. The test results including the cable lose.

4.4. Power Spectral Density

TEST CONFIGURATION



TEST PROCEDURE

According to KDB 558074 D01 V03 Method PKPSD (peak PSD) this procedure shall be used if maximum peak conducted output power was used to demonstrate compliance, and is optional if the maximum conducted (average) output power was used to demonstrate compliance.
1. Set analyzer center frequency to DTS channel center frequency.
2. Set the span to 1.5 times the DTS bandwidth.
3. Set the RBW to: 3 kHz ≤ RBW ≤ 100 kHz.
4. Set the VBW ≥ 3 RBW.
5. Detector = peak.
6. Sweep time = auto couple.
7. Trace mode = max hold.
8. Allow trace to fully stabilize.
9. Use the peak marker function to determine the maximum amplitude level within the RBW.
10. If measured value exceeds limit, reduce RBW (no less than 3 kHz) and repeat.

LIMIT

For digitally modulated systems, the power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission.

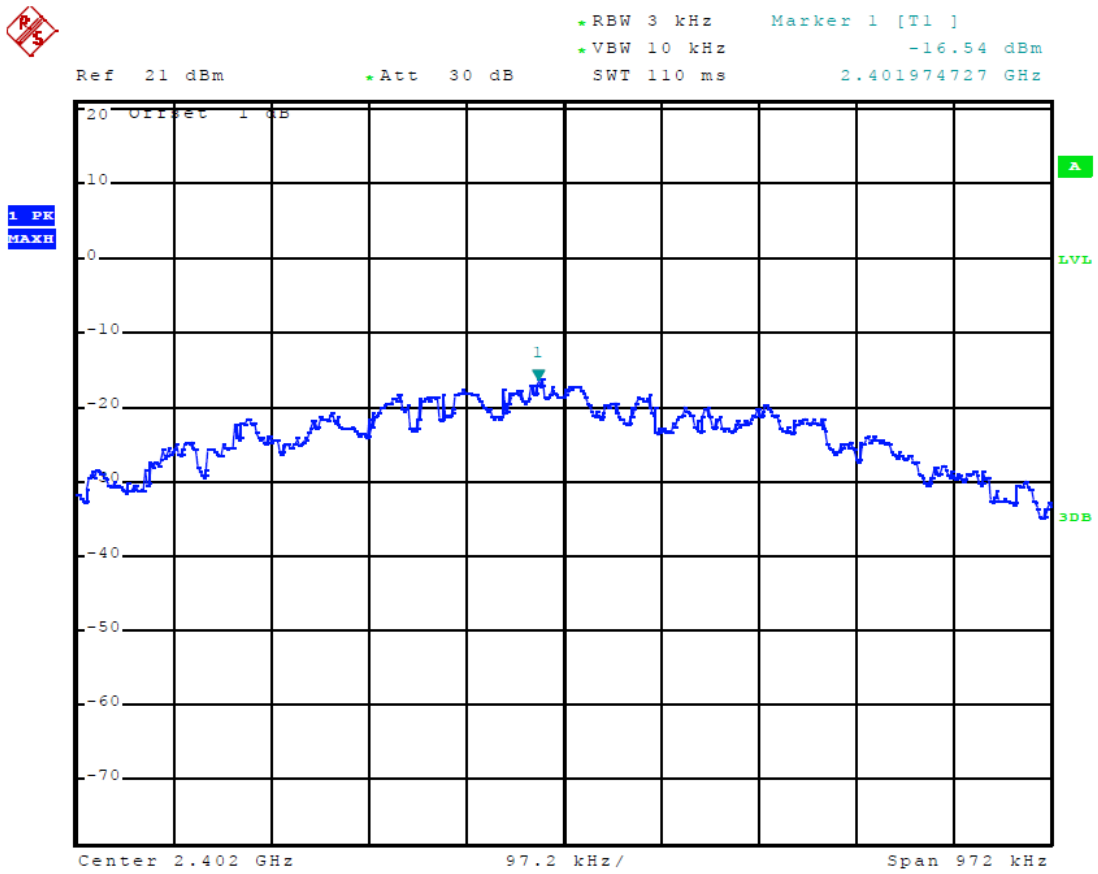
TEST RESULTS

A. Test Verdict

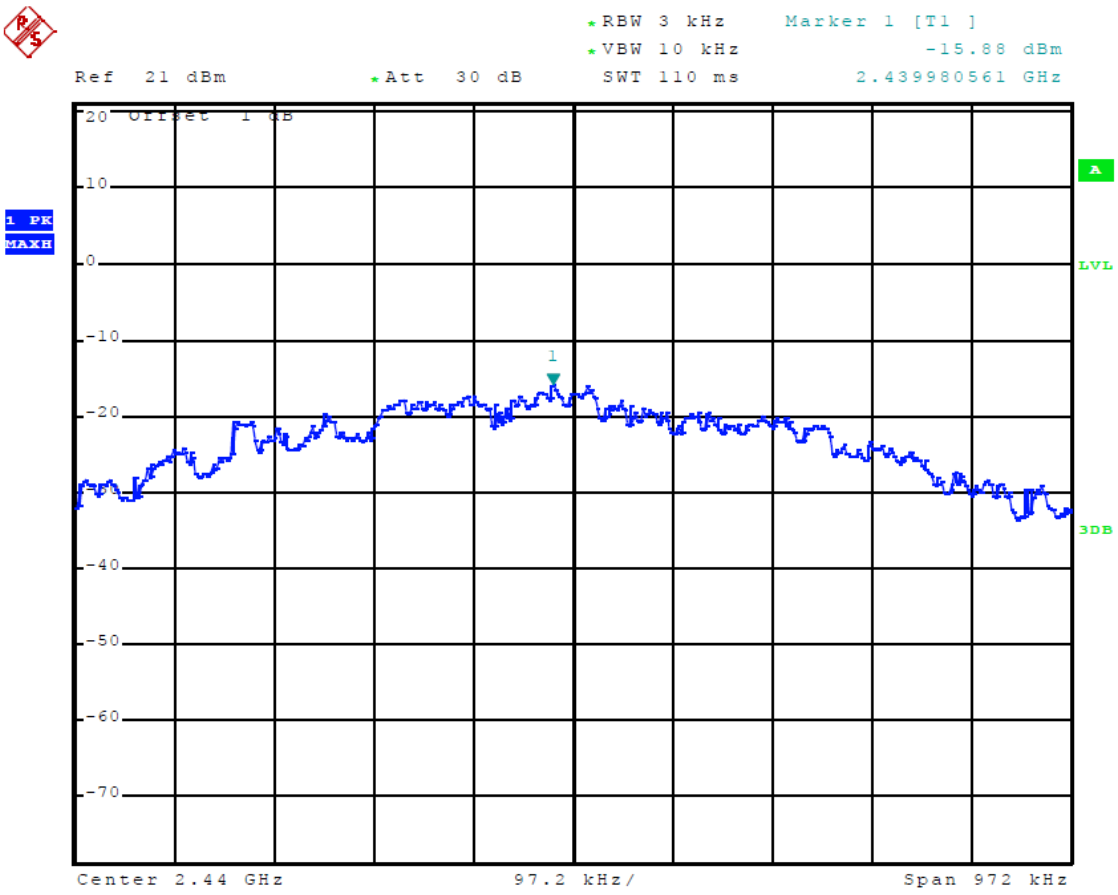
Channel	Frequency (MHz)	Report PSD (dBm/3kHz)	Refer to Plot	Limits (dBm/3KHz)	Verdict
00	2402	-16.54	Plot 4.4.1 A	8	PASS
19	2440	-15.88	Plot 4.4.1 B	8	PASS
39	2480	-16.34	Plot 4.4.1 C	8	PASS

Note
1.The test results including the cable lose.

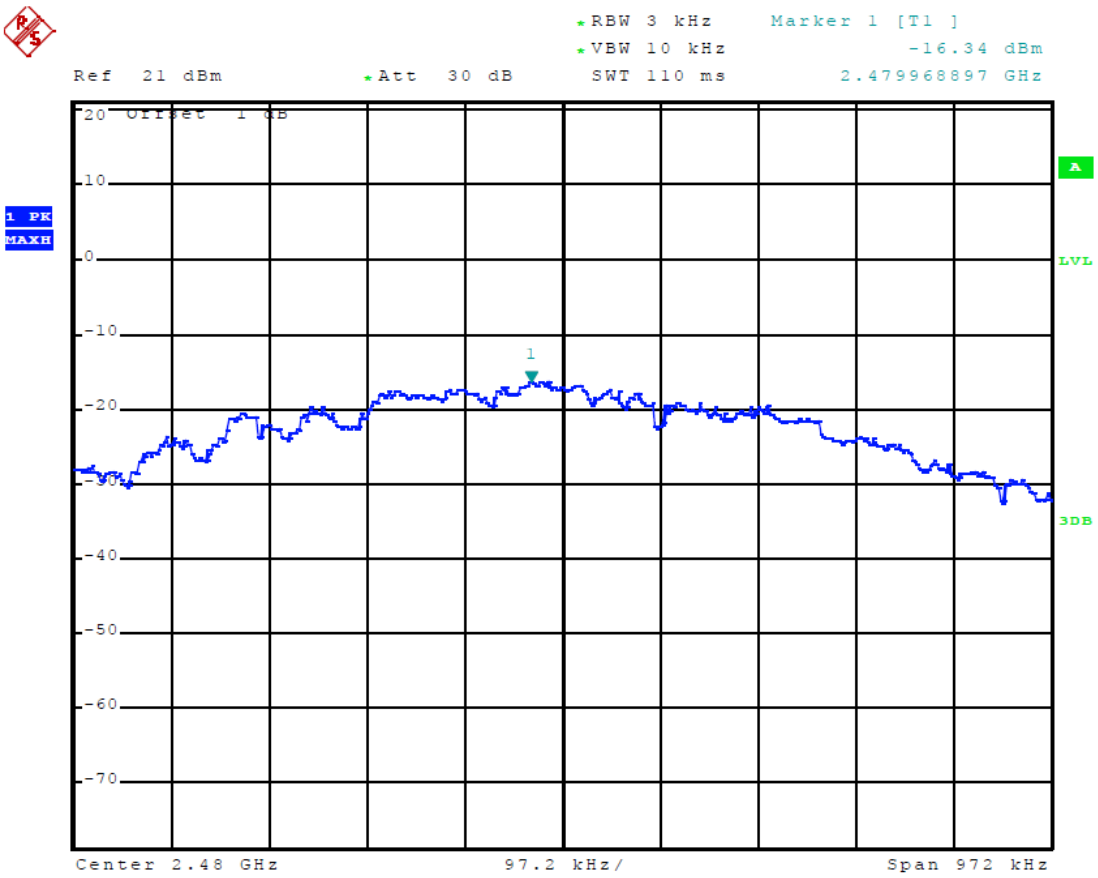
B. Test Plots



(Plot 4.4.1 A: Channel 00: 2402 MHz @ GFSK)



(Plot 4.4.1 B: Channel 19: 2440 MHz @ GFSK)



(Plot 4.4.1 C: Channel 39: 2480 MHz @ GFSK

4.5. Band Edge Compliance of RF Emission

TEST REQUIREMENT

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 PROCEDURE

For Conducted

1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
2. Remove the antenna from the EUT and then connect to a low loss RF cable from the antenna port to a EMI test receiver, then turn on the EUT and make it operate in transmitting mode. Then set it to Low Channel and High Channel within its operating range, and make sure the instrument is operated in its linear range.
3. Set the RBW of spectrum analyzer to 100 kHz and the VBW of spectrum analyzer to 300 kHz with a convenient frequency span including 100kHz bandwidth from band edge..
4. Measure the highest amplitude appearing on spectral display and set it as a reference level. Plot the graph with marking the highest point and edge frequency.
5. Repeat above procedures until all measured frequencies were complete.

TEST PROCEDURE

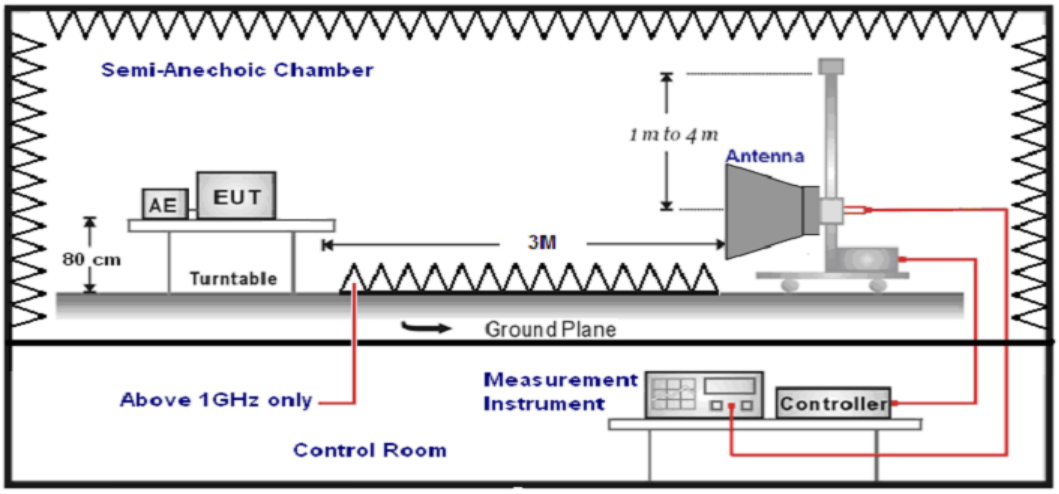
For Radiated

1. The EUT was placed on a turn table which is 0.8m above ground plane.
2. Maximum procedure was performed by raising the receiving antenna from 1m to 4m and rotating the turn table from 0℃ to 360℃ to acquire the highest emissions from EUT.
3. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical.
4. Repeat above procedures until all frequency measurements have been completed..
5. The distance between test antenna and EUT was 3 meter:
6. Setting test receiver/spectrum as following table states:

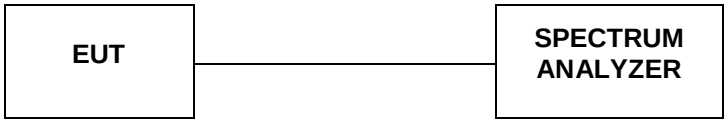
Test Frequency range	Test Receiver/Spectrum Setting	Detector
1GHz-40GHz	Peak Value: RBW=1MHz/VBW=3MHz, Sweep time=Auto	Peak (Receiver)
1GHz-40GHz	Average Value: RBW=1MHz/VBW=10Hz, Sweep time=Auto	Average (Receiver)

TEST CONFIGURATION

For Radiated



For Conducted



LIMIT

Below -20dB of the highest emission level in operating band.
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)

TEST RESULTS

4.5.1 For Radiated Bandedge Measurement

Test Mode:		GFSK(2402MHz)			Polarization:		Horizontal		
Mark	Frequency (MHz)	Reading Level (dBuV/m)	Cable Loss (dB)	Antenna Factor (dB/m)	Preamp Factor (dB)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
1	2390.00	16.97	4.60	28.72	0.00	50.29	74.00	23.71	Peak
2	2390.00	6.59	4.60	28.72	0.00	39.91	54.00	14.09	Average
3	2401.74	61.08	4.61	28.78	0.00	94.47	74.00	-20.47	Peak
4	2401.98	59.79	4.61	28.78	0.00	93.18	54.00	-39.18	Average

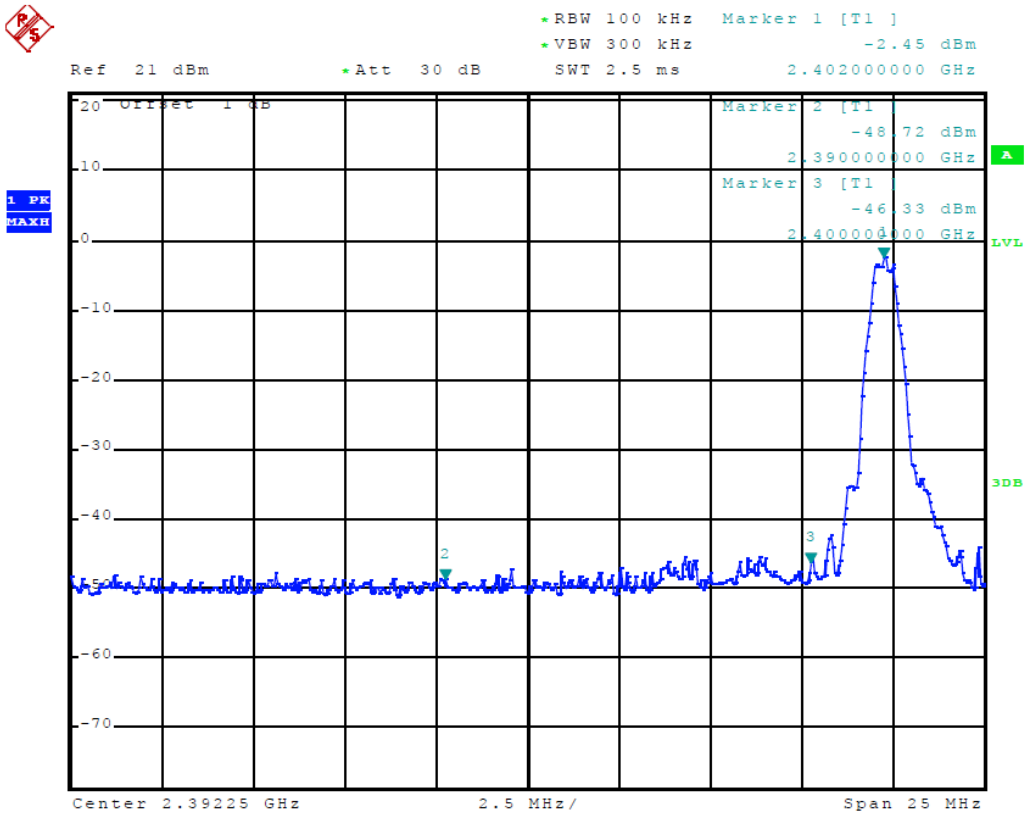
Test Mode:		GFSK(2402MHz)			Polarization:		Vertical		
Mark	Frequency (MHz)	Reading Level (dBuV/m)	Cable Loss (dB)	Antenna Factor (dB/m)	Preamp Factor (dB)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
1	2390.00	18.08	4.60	28.72	0.00	51.40	74.00	22.60	Peak
2	2390.00	8.28	4.60	28.72	0.00	41.60	54.00	12.40	Average
3	2401.72	60.83	4.61	28.78	0.00	94.22	74.00	-20.22	Peak
4	2402.01	59.48	4.61	28.78	0.00	92.87	54.00	-38.87	Average

Test Mode:		GFSK(2480MHz)			Polarization:		Horizontal		
Mark	Frequency (MHz)	Reading Level (dBuV/m)	Cable Loss (dB)	Antenna Factor (dB/m)	Preamp Factor (dB)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
1	2480.20	62.08	4.70	28.92	0.00	95.70	74.00	-21.70	Peak
2	2479.99	60.88	4.70	28.92	0.00	94.50	54.00	-40.50	Average
3	2483.50	18.24	4.70	28.93	0.00	51.87	74.00	22.13	Peak
4	2483.50	8.02	4.70	28.93	0.00	41.65	54.00	12.35	Average

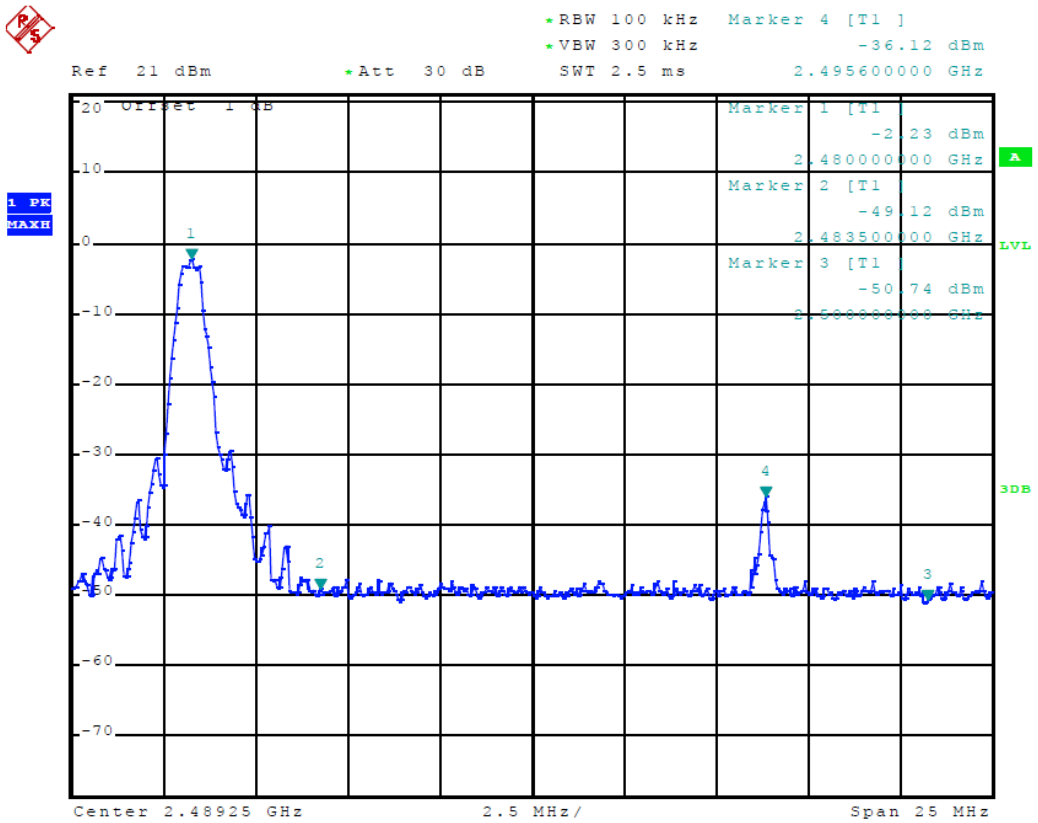
Test Mode:		GFSK(2480MHz)			Polarization:		Vertical		
Mark	Frequency (MHz)	Reading Level (dBuV/m)	Cable Loss (dB)	Antenna Factor (dB/m)	Preamp Factor (dB)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
1	2480.21	61.09	4.70	28.92	0.00	94.71	74.00	-20.71	Peak
2	2480.05	59.76	4.70	28.92	0.00	93.38	54.00	-39.38	Average
3	2483.50	18.89	4.70	28.93	0.00	52.52	74.00	21.48	Peak
4	2483.50	7.47	4.70	28.93	0.00	41.10	54.00	12.90	Average

4.5.2 For Conducted Bandedge Measurement

A. Test Plots



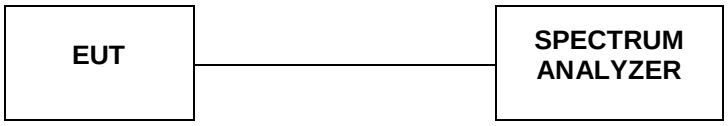
(Plot 4.5.2.1 A: Channel 00: 2402MHz @ GFSK)



(Plot 4.5.2.1 B: Channel 39: 2402MHz @ GFSK)

4.6. Spurious RF Conducted Emission

TEST CONFIGURATION



TEST PROCEDURE

The Spurious RF conducted emissions compliance of RF radiated emission should be measured by following the guidance in ANSI C63.4-2009 with respect to maximizing the emission by rotating the EUT, measuring the emission while the EUT is situated in three orthogonal planes (if appropriate), adjusting the measurement antenna height and polarization etc. Set RBW=100 kHz and VBW= 300 KHz to measure the peak field strength, and measure frequency range from 9 KHz to 26.5GHz.

LIMIT

1. Below -20dB of the highest emission level in operating band.
2. Fall in the restricted bands listed in section 15.205. The maximum permitted average field strength is listed in section 15.209.

TEST RESULTS

Remark: The measurement frequency range is from 9KHz to the 10^{th} harmonic of the fundamental frequency. The lowest, middle and highest channels are tested to verify the spurious emissions and bandege measurement data.

TEST RESULTS

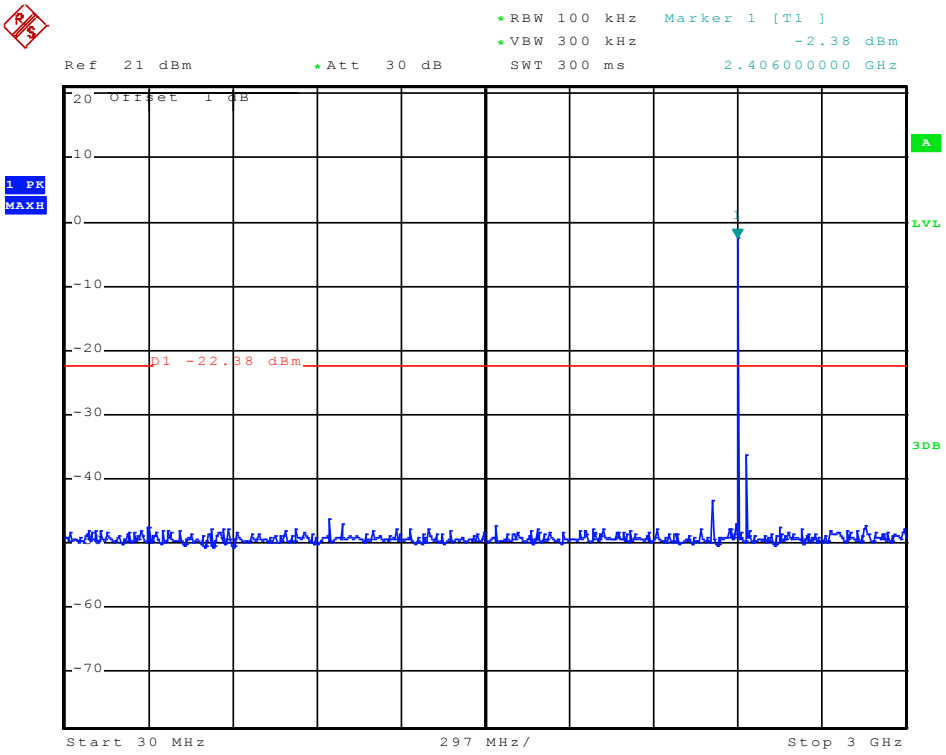
Remark: The measurement frequency range is from 9 KHz to the 10^{th} harmonic of the fundamental frequency. The lowest, middle and highest channels are tested to verify the spurious emissions and bandege measurement data.

A. Test Verdict

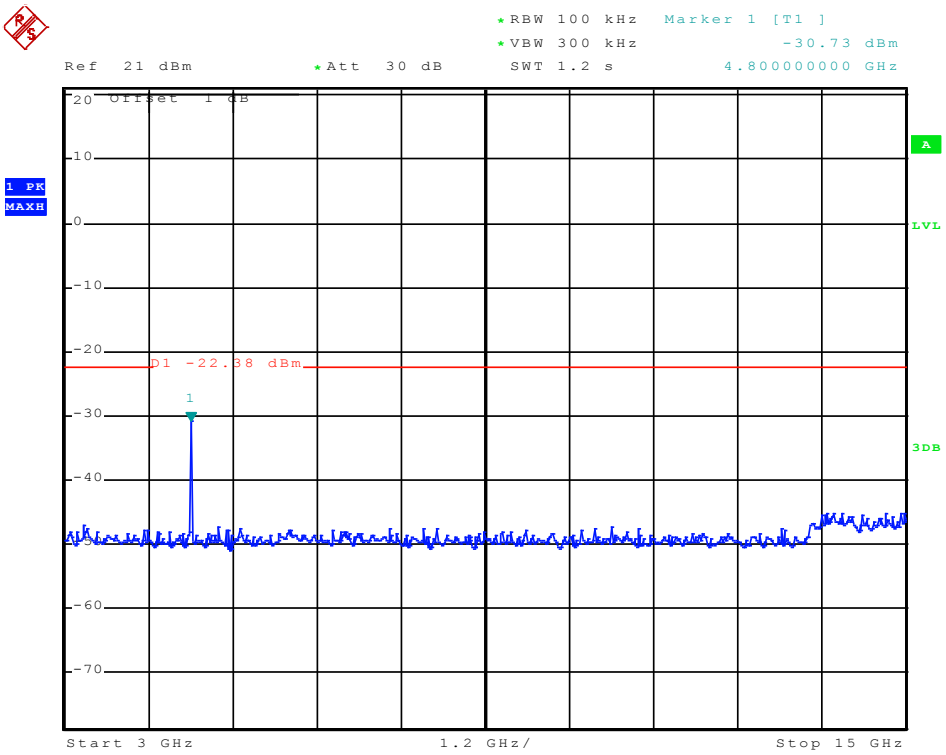
Channel	Frequency (MHz)	Frequency Range	Refer to Plot	Limit (dBc)	Verdict
00	2402	30MHz-3 GHz	Plot 4.6.1 A1	-20	PASS
		3 GHz-15GHz	Plot 4.6.1 A2	-20	PASS
		15GHz-25GHz	Plot 4.6.1 A3	-20	PASS
19	2440	30MHz-3 GHz	Plot 4.6.1 B1	-20	PASS
		3 GHz-15GHz	Plot 4.6.1 B2	-20	PASS
		15GHz-25GHz	Plot 4.6.1 B3	-20	PASS
39	2480	30MHz-3 GHz	Plot 4.6.1 C1	-20	PASS
		3 GHz-15GHz	Plot 4.6.1 C2	-20	PASS
		15GHz-25GHz	Plot 4.6.1 C3	-20	PASS

Note:
1. The test results including the cable lose.
2. For 9KHz -30MHz,Because there was more 20dB less than limt So We did not recorded data.

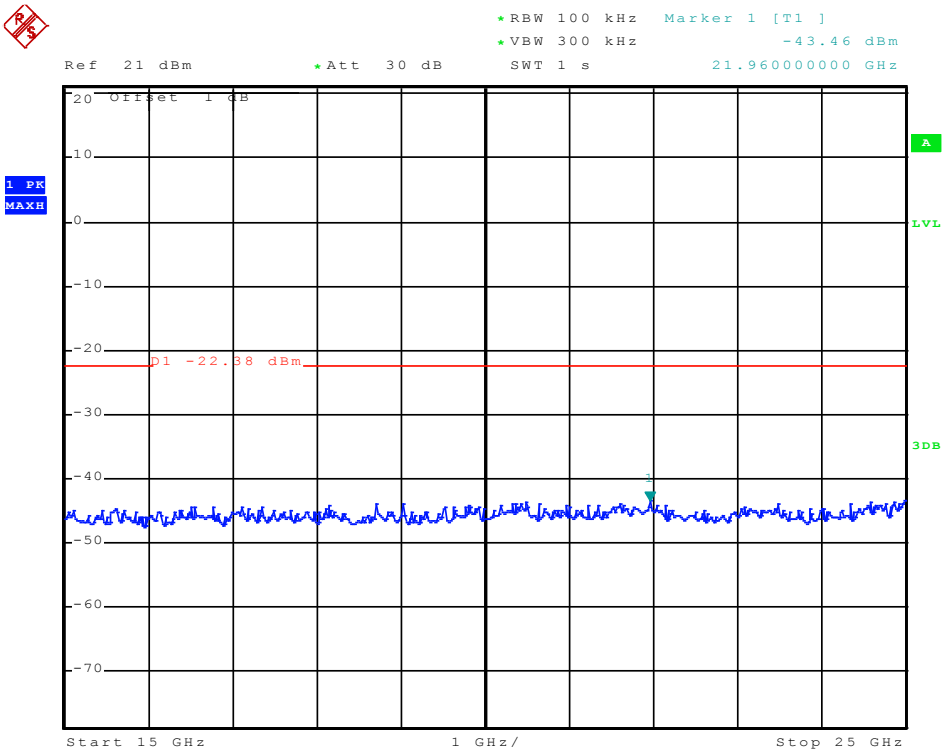
B. Test Plots



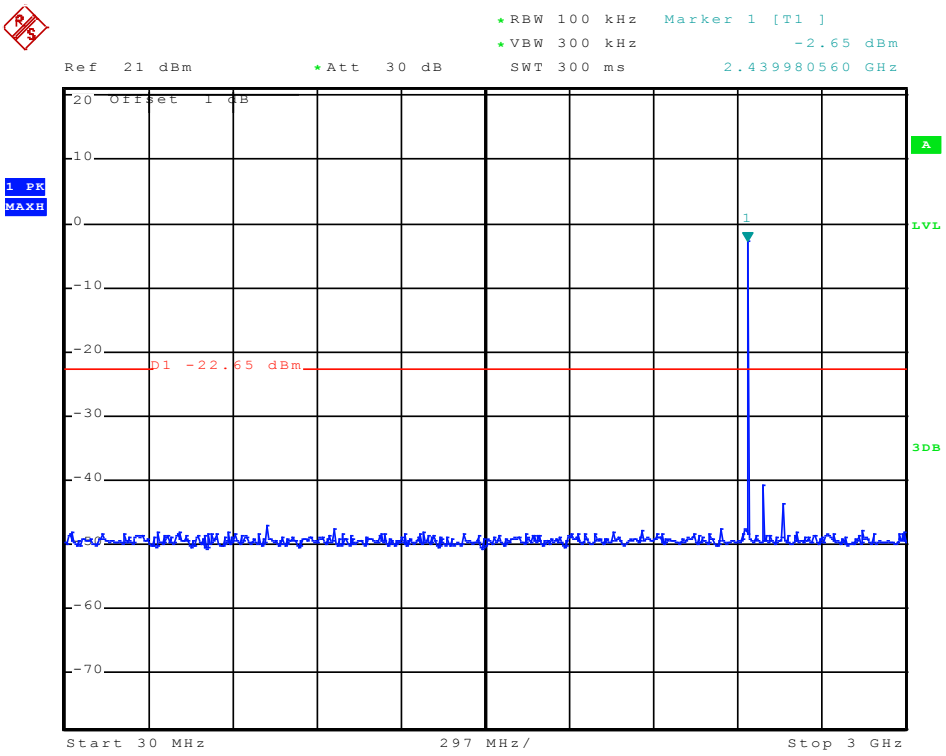
(Plot 4.6.1 A1: Channel 00: 2402MHz @ GFSK)



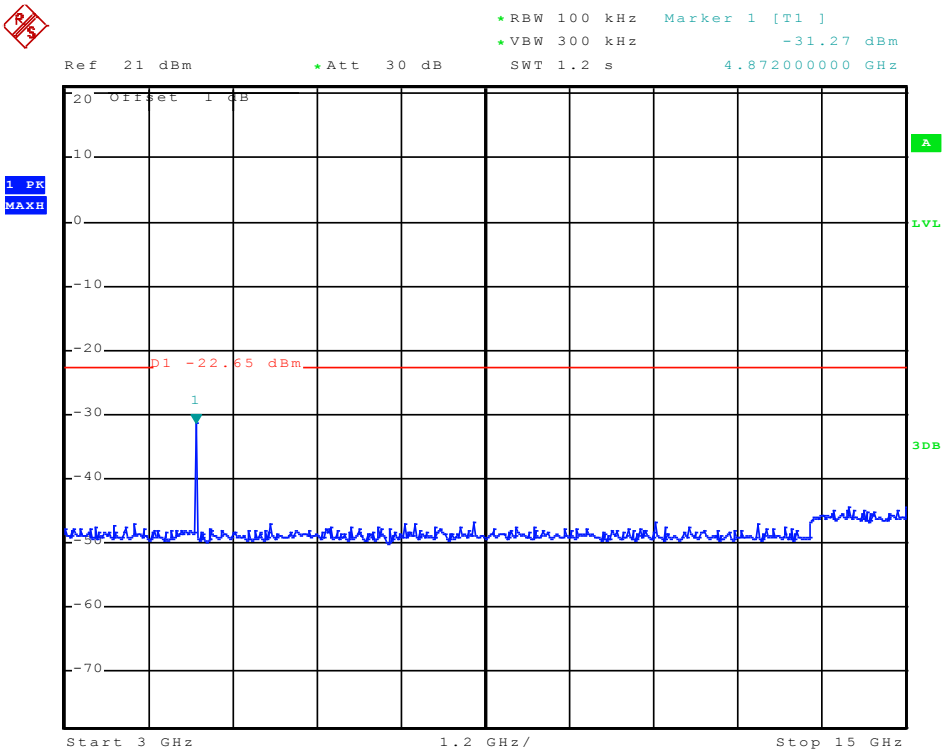
(Plot 4.6.1 A2: Channel 00: 2402MHz @ GFSK)



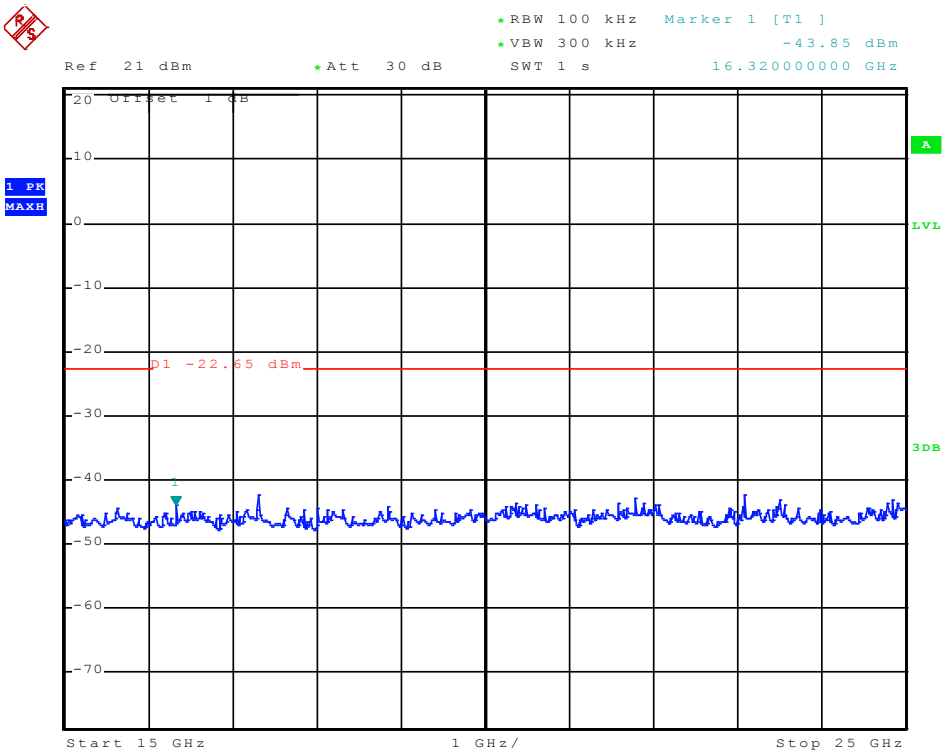
(Plot 4.6.1 A3: Channel 00: 2402MHz @ GFSK)



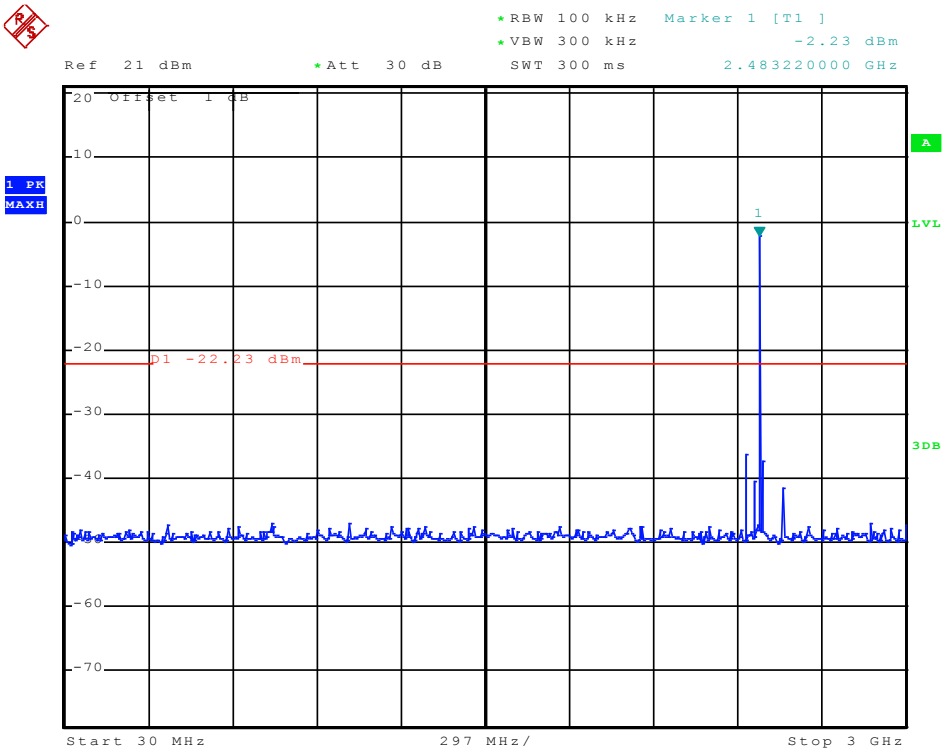
(Plot 4.6.1 B1: Channel 19: 2440MHz @ GFSK)



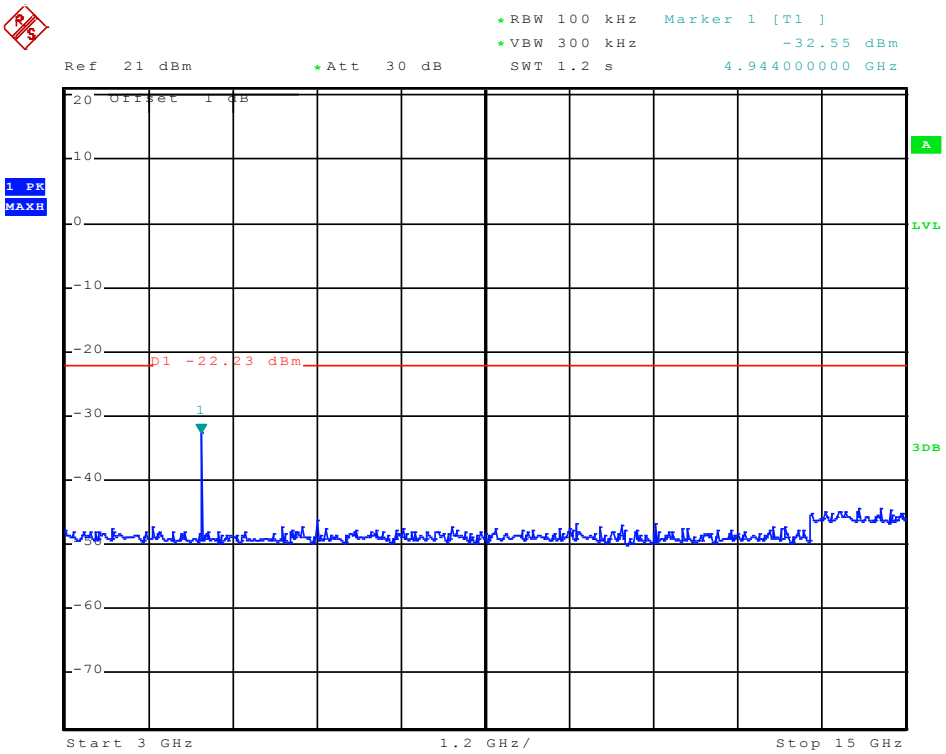
(Plot 4.6.1 B2: Channel 19: 2440MHz @ GFSK)



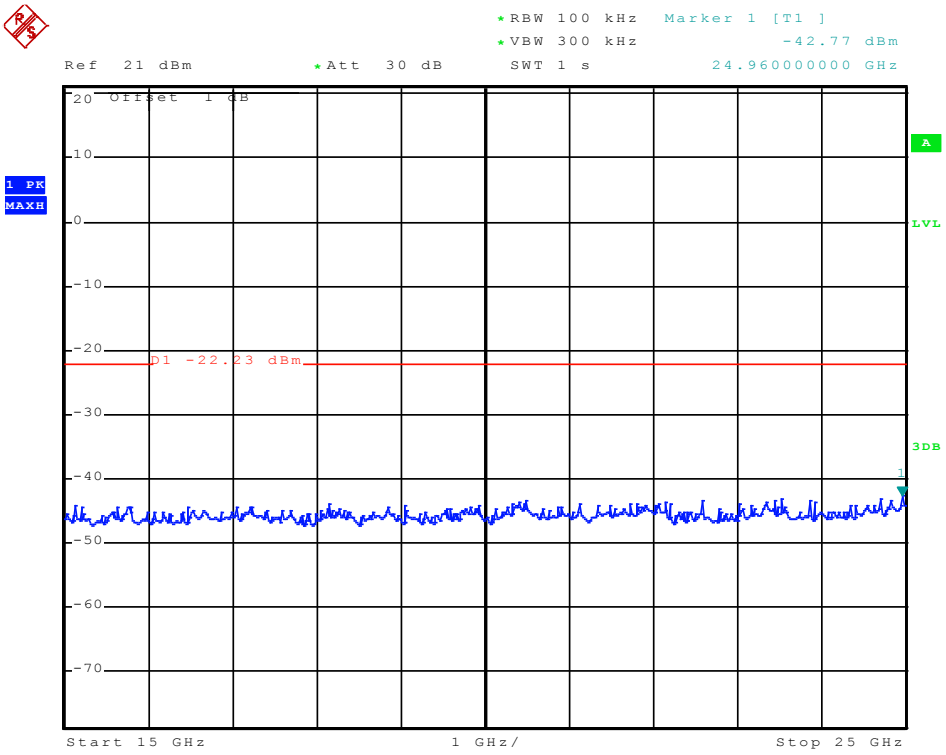
(Plot 4.6.1 B3: Channel 19: 2440MHz @ GFSK)



(Plot 4.6.1 C1: Channel 39: 2480MHz @ GFSK)



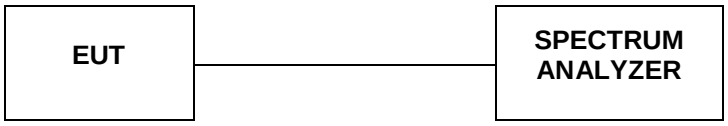
(Plot 4.6.1 C2: Channel 39: 2480MHz @ GFSK)



(Plot 4.6.1 C3: Channel 39: 2480MHz @ GFSK)

4.7. 6dB Bandwidth

TEST CONFIGURATION



TEST PROCEDURE

The transmitter output was connected to the spectrum analyzer through an attenuator. The bandwidth of the fundamental frequency was measured by spectrum analyzer with100 KHz RBW and 300KHz VBW.
The 6dB bandwidth is defined as the total spectrum the power of which is higher than peak power minus 6dB.
According to KDB558074 D01 V03 for one of the following procedures may be used to determine the modulated DTS device signal bandwidth.
1. Set RBW = 100 kHz.
2. Set the video bandwidth (VBW) ≥ 3 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 frequencies) that are attenuated by 6 dB relative to the maximum level measured in the fundamental emission.

LIMIT

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

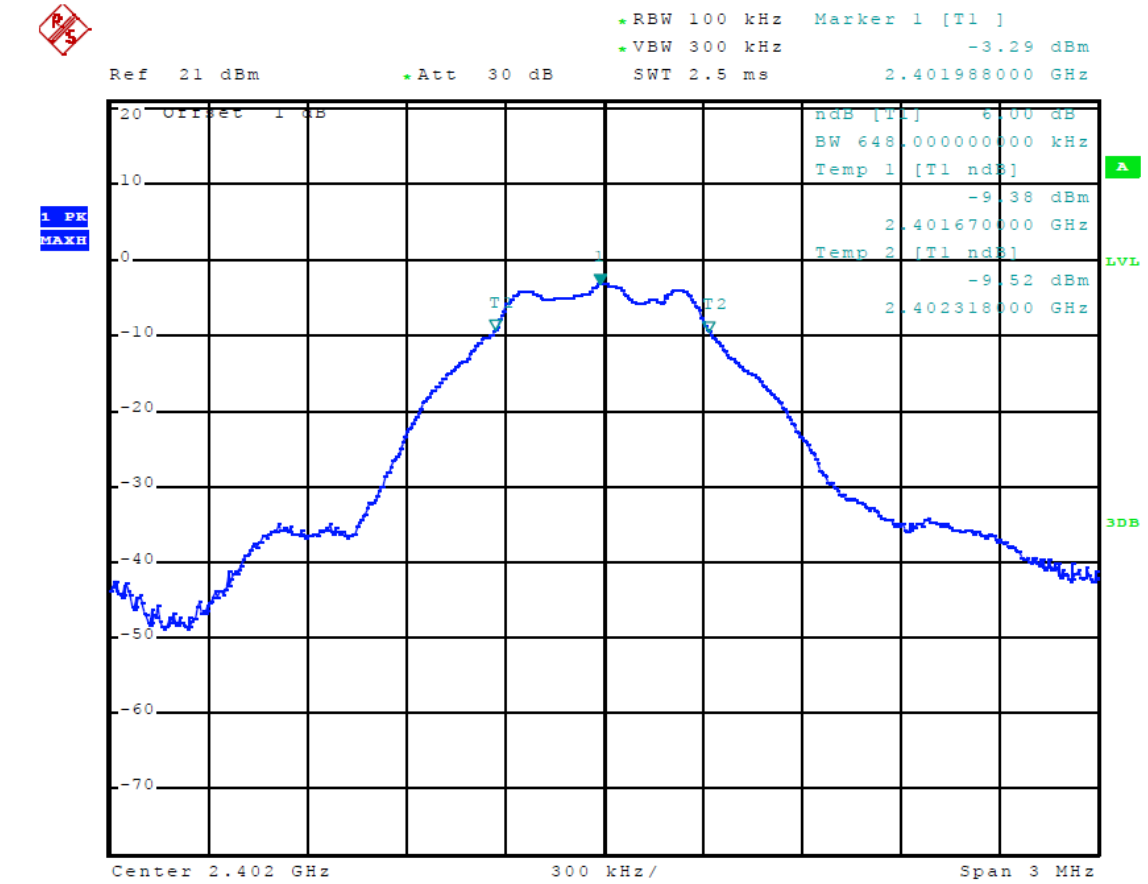
TEST RESULTS

A. Test Verdict

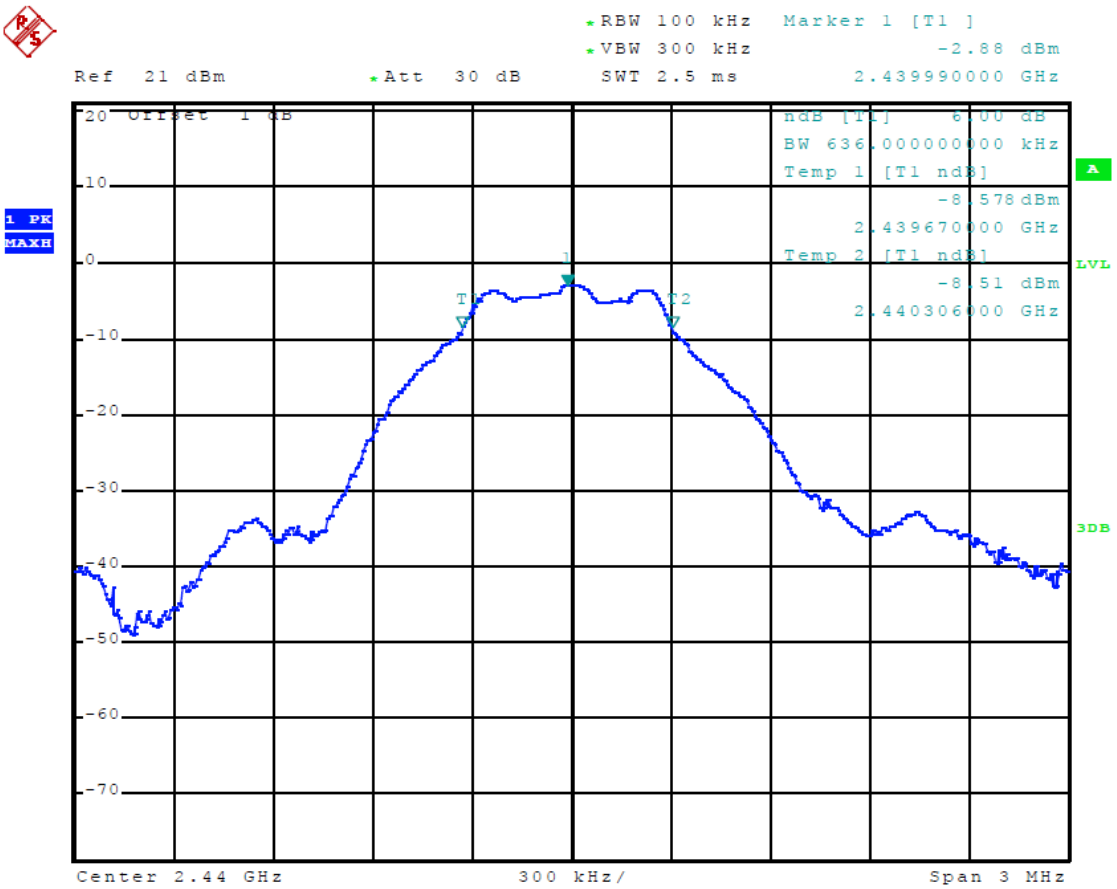
Channel	Frequency (MHz)	6 dB Bandwidth (MHz)	Refer to Plot	Limits (kHz)	Verdict
00	2402	0.648	Plot 4.7.1 A	≥500	PASS
19	2440	0.636	Plot 4.7.1 B	≥500	PASS
39	2480	0.642	Plot 4.7.1 C	≥500	PASS

Note:
1.The test results including the cable lose.

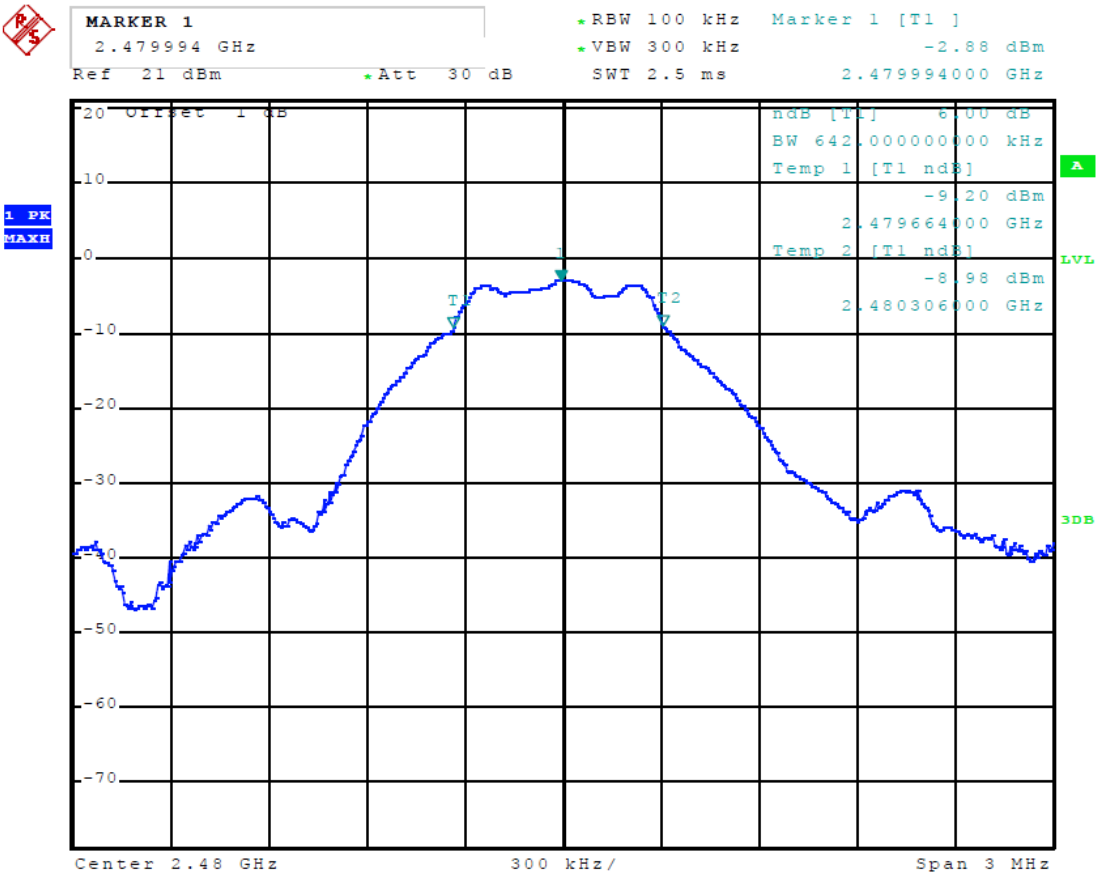
B. Test Plots



(Plot 4.7.1 A: Channel 00: 2402MHz @ GFSK)



(Plot 4.7.1 B: Channel 19: 2440MHz @ GFSK)



(Plot 4.7.1 C: Channel 39: 2480MHz @ GFSK)

4.8. Antenna Requirement

Standard Applicable

For intentional device, according to FCC 47 CFR Section 15.203, an intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device.

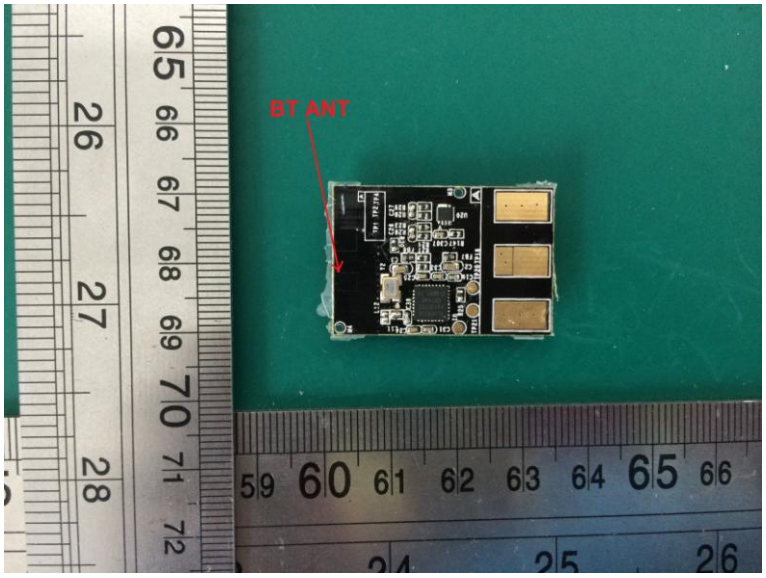
And according to FCC 47 CFR Section 15.247 (c), if transmitting antennas of directional gain greater than 6dBi are used, the power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6dBi.

Refer to statement below for compliance

The manufacturer may design the unit so that the user can replace a broken antenna, but the use of a standard antenna jack or electrical connector is prohibited. Further, this requirement does not apply to intentional radiators that must be professionally installed.

Antenna Connected Construction

The maximum gain of Bluetooth antenna was -0.5dBi and it is a Integrated antenna.



5. Test Setup Photos of the EUT

.....End of Report.....