FCC PART 15 SUBPART C TEST REPORT

FCC PART 15.247

Report Reference No.....:	**WTT150500201**	
FCC ID.....:	**2ADV6-L5**	
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.....:	May 25, 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.....:	**Ausentic technology co.,LTD**	
Address .....:	Floor 6th,Building 6th,TongFuYu Industrial Zone,Jiu Wei,XiXiang,Bao An District,ShenZhen City, 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 JIETONG INFORMATION TECHNOLOGY CO., LTD	

Test item description .....:	Bluetooth Headphone
Trade Mark .....:	N/A
Manufacturer.....:	**Ausentic technology co.,LTD**
Model/Type reference.....:	L5
Listed Models .....:	N/A
Modulation Type .....:	GFSK,8DPSK,π/4DQPSK
Operation Frequency.....:	From 2402MHz to 2480MHz
Rating .....:	DC 3.70V
Result.....:	**PASS**

T E S T R E P O R T

Test Report No. :	WTT150500201	May 25, 2015 Date of issue

Equipment under Test	:	Bluetooth Headphone
Model /Type	:	L5
Listed Models	:	N/A
Applicant	:	**Ausentic technology co.,LTD**
Address	:	Floor 6th,Building 6th,TongFuYu Industrial Zone,Jiu Wei,XiXiang,Bao An District,ShenZhen City, China
Manufacturer	:	**Ausentic technology co.,LTD**
Address	:	Floor 6th,Building 6th,TongFuYu Industrial Zone,Jiu Wei,XiXiang,Bao An District,ShenZhen City, 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 Testing Unlicensed Wireless Devices

DA 00-705-2000-03-20：Filing and Measurement Guidelines for Frequency Hopping Spread Spectrum Systems

2. SUMMARY

2.1. General Remarks

Date of receipt of test sample	:	May 14, 2015
Testing commenced on	:	May 14, 2015
Testing concluded on	:	May 25, 2015

2.2. Product Description

The **Ausentic technology co.,LTD**'s Model: L5 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	Bluetooth Headphone
Model Number	L5
Antenna Type	Internal
BT Modulation Type	GFSK,8DPSK,π/4DQPSK(BT 2.1+EDR)
Extreme temp. Tolerance	-30°C to +50°C
Extreme vol. Limits	3.40VDC to 4.20VDC (nominal: 3.70VDC)
Hardware Version	L5-BK-V1 2015-02-28
Software Version	L5-V1.0
Serial number	N/A
ANT Type	Integrated antenna
ANT Gain	0dBi

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 3.70V

2.4. EUT operation mode

The EUT has been tested under typical operating condition. There are EDR (Enhanced Data Rate) and BDR (Basic Data Rate) mode.The Applicant provides communication tools software to control the EUT for staying in continous transmitting and receiving mode for testing. There are 79 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**	40	2442
01	2403	41	2443
02	2404	42	2444
03	2405	43	2445
04	2406	44	2446
05	2407	45	2447
06	2408	46	2448
07	2409	47	2449
08	2410	48	2450
09	2411	49	2451
10	2412	50	2452
11	2413	51	2453
12	2414	52	2454
13	2415	53	2455
14	2416	54	2456
15	2417	55	2457
16	2418	56	2458
17	2419	57	2459
18	2420	58	2460
19	2421	59	2461
20	2422	60	2462
21	2423	61	2463
22	2424	62	2464
23	2425	63	2465
24	2426	64	2466
25	2427	65	2467
26	2428	66	2468
27	2429	67	2469
28	2430	68	2470
29	2431	69	2471
30	2432	70	2472
31	2433	71	2473
32	2434	72	2474
33	2435	73	2475
34	2436	74	2476
35	2437	75	2477
36	2438	76	2478
37	2439	77	2479
38	2440	**78**	**2480**
39	**2441**		

2.5. Internal Identification of AE used during the test

AE ID*	Description
AE1	Charger

AE1
Model: Ilium X200-C
INPUT: 100-240V 50/60Hz 0.15A
OUTPUT: DC 5.0V,500mAh

*AE ID: is used to identify the test sample in the lab internally.

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

This submittal(s) (test report) is intended for **FCC ID: 2ADV6-L5** filing to comply with Section 15.247 of the FCC Part 15, Subpart C Rules.

2.7. 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 information:

Shenzhen CTL Testing Technology Co., Ltd.
Floor 1-A, Baisha Technology Park, No. 3011, Shahexi Road, Nanshan,Shenzhen,China
Test Firm FCC Registration number: 970318

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. Test Conditions

Test Case	Test Conditions	
	Configuration	Description
20dB Emission Bandwidth (EBW)	Meas. Method	DA 00-705
	Test Environment	NTNV
	EUT Conf.	TM1_DH5_Ch00,TM1_DH5_Ch39,TM1_DH5_Ch78, TM3_3DH5_Ch00,TM3_3DH5_Ch39,TM3_3DH5_Ch78,
Carrier Frequency Separation	Meas. Method	DA 00-705
	Test Environment	NTNV
	EUT Conf.	TM1_DH5_Hop, TM3_3DH5_Hop,
Number of Hopping Channel	Meas. Method	DA 00-705
	Test Environment	NTNV
	EUT Conf.	TM1_DH5_Hop ,TM3_3DH5_Hop,
Time of Occupancy (Dwell Time)	Meas. Method	DA 00-705
	Test Environment	NTNV
	EUT Conf.	TM1_DH5_Ch39 ,TM3_3DH5_Ch39.
Maximum Peak Conducted Output Power	Meas. Method	DA 00-705
	Test Environment	NTNV
	EUT Conf.	TM1_DH3_Ch00,TM1_DH3_Ch39,TM1_DH3_Ch78,TM2_2DH3_Ch00,TM2_2DH3_Ch39,TM2_2DH3_Ch78,TM3_3DH3_Ch00,TM3_3DH3_Ch39,TM3_3DH3_Ch78,
Bandedge spurious emission (Conducted)	Meas. Method	DA 00-705
	Test Environment	NTNV
	EUT Conf.	TM1_DH3_Ch00,TM1_DH3_Ch78, TM3_3DH3_Ch00,TM3_3DH3_Ch78,
Conducted RF Spurious Emission	Meas. Method	DA 00-705
	Test Environment	NTNV
	EUT Conf.	TM1_DH5_Ch00, TM1_DH5_Ch39, TM1_DH5_Ch78, TM3_3DH5_Ch39, TM3_3DH5_Ch78.
Radiated Emissions in the Restricted Bands	Meas. Method	ANSI C63.4:2009 and DA 00-705 30 MHz to 1 GHz:

		Pre: RBW=100kHz; VBW=300kHz; Det. = Peak. Final: RBW=120kHz; Det. = CISPR Quasi-Peak. 1 GHz to 26.5GHz: Average: RBW=1 MHz; VBW= 10Hz; Det. = Peak; Sweep-time= Auto; Trace = Single. Peak: RBW=1 MHz; VBW= 3 MHz; Det. = Peak; Sweep-time= Auto; Trace≥ MaxHold * 100.
	Test Environment	NTNV
	EUT Conf.	30 MHz-1GHz TM1_DH5_Ch00 (Worst Conf.).
		1-18 GHz: TM1_DH5_Ch00, TM1_DH5_Ch39, TM1_DH5_Ch78, (Worst Conf.).

Test Case	Test Conditions	
	Configuration	Description
AC Power Line Conducted Emissions	Measurement Method	AC mains conducted.
	Test Environment	NTNV
	EUT Configuration	TM1_DH5_Ch39. (Worst Conf.).

Note:
1. 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.
2. For π/4 QPSK its same modulation type with 8-DPSK, and based exploratory test, there is no significant difference of that two types test result, so except output power, all other items final test were only performed with the worse case 8-DPSK and GFSK.

3.5. 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	-/-	-/-	-/-	-/-	☐	☐	☒	☐	Not applicable for FHSS!
§15.247(a)(1)	Carrier Frequency separation	GFSK 8DPSK	☒ Lowest ☒ Middle ☒ Highest	GFSK 8DPSK	☒ Middle	☒ ☒	☐	☐	☐	complies
§15.247(a)(1)	Number of Hopping channels	GFSK 8DPSK	☒ Full	GFSK 8DPSK	☒ Full	☒ ☒	☐	☐	☐	complies
§15.247(a)(1)	Time of Occupancy (dwell time)	GFSK 8DPSK	☒ Lowest ☒ Middle ☒ Highest	GFSK 8DPSK	☒ Middle	☒ ☒	☐	☐	☐	complies
§15.247(a)(1)	Spectrum bandwidth of a FHSS system 20dB bandwidth	GFSK 8DPSK	☒ Lowest ☒ Middle ☒ Highest	GFSK 8DPSK	☒ Lowest ☒ Middle ☒ Highest	☒ ☒	☐	☐	☐	complies
§15.247(b)(1)	Maximum output power	GFSK Π/4DQPSK 8DPSK	☒ Lowest ☒ Middle ☒ Highest	GFSK Π/4DQPSK 8DPSK	☒ Lowest ☒ Middle ☒ Highest	☒ ☒ ☒	☐	☐	☐	complies
§15.247(d)	Band edge compliance conducted	GFSK 8DPSK	☒ Lowest ☒ Highest	GFSK 8DPSK	☒ Lowest ☒ Highest	☒ ☒	☐	☐	☐	complies
§15.205	Band edge compliance radiated	GFSK 8DPSK	☒ Lowest ☒ Highest	GFSK	☒ Lowest ☒ Highest	☒	☐	☐	☐	complies
§15.247(d)	TX spurious emissions conducted	GFSK 8DPSK	☒ Lowest ☒ Middle ☒ Highest	GFSK 8DPSK	☒ Lowest ☒ Middle ☒ Highest	☒ ☒	☐	☐	☐	complies
§15.247(d)	TX spurious emissions radiated	GFSK 8DPSK	☒ Lowest ☒ Middle ☒ Highest	GFSK	☒ Lowest ☒ Middle ☒ Highest	☒	☐	☐	☐	complies
§15.109	RX spurious	-/-	-/-	-/-	-/-	☒	☐	☐	☐	complies

	emissions radiated									
§15.209(a)	TX spurious Emissions radiated < 30 MHz	GFSK	-/-	GFSK	-/-	☒	☐	☐	☐	complies
§15.107(a) §15.207	Conducted Emissions < 30 MHz	GFSK	-/-	GFSK	-/-	☒	☐	☐	☐	complies

Remark:
1. The measurement uncertainty is not included in the test result.
2. NA = Not Applicable; NP = Not Performed
3. We tested all test mode and recorded worst case in report

3.6. Equipments Used during the Test

AC Power Conducted Emission					
Item	Test Equipment	Manufacturer	Model No.	Serial No.	Last Cal.
1	Artificial Mains	Rohde&Schwarz	ENV216	101316	2014/07/02
2	EMI Test Receiver	Rohde&Schwarz	ESCI3	103710	2014/07/02
3	Pulse Limiter	Com-Power	LIT-153	53226	2014/07/01
4	EMI Test Software	Rohde&Schwarz	ES-K1 V1.71	N/A	N/A
5	Coaxial Cables	HUBER+SUHNER	SUCOFLEX 104PEA-3M	3m	2014/10/19

Radiated Emission					
Item	Test Equipment	Manufacturer	Model No.	Serial No.	Last Cal.
1	Bilog Antenna	Sunol Sciences Corp.	JB1	A061713	2014/07/12
2	EMI TEST Receivcer	Rohde&Schwarz	ESCI3	103710	2014/07/02
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	2014/07/12
6	Amplifer	HP	8447D	3113A07663	2014/10/22
7	Preamplifier	HP	8349B	3155A00882	2014/07/03
8	Amplifer	Compliance Direction systems	PAP1-4060	129	2014/07/03
9	Loop Antenna	Rohde&Schwarz	HFH2-Z2	100020	2014/06/29
10	TURNTABLE	MATURO	TT2.0	----	N/A
11	ANTENNA MAST	MATURO	TAM-4.0-P	----	N/A
12	Horn Antenna	SCHWARZBECK	BBHA9170	25849	2014/06/21
13	Spectrum Analyzer	Rohde&Schwarz	FSU26	201148	2014/07/02
14	Coaxial Cables	HUBER+SUHNER	SUCOFLEX 104PEA-10M	10m	2014/10/19
15	Coaxial Cables	HUBER+SUHNER	SUCOFLEX 104PEA-3M	3m	2014/10/19

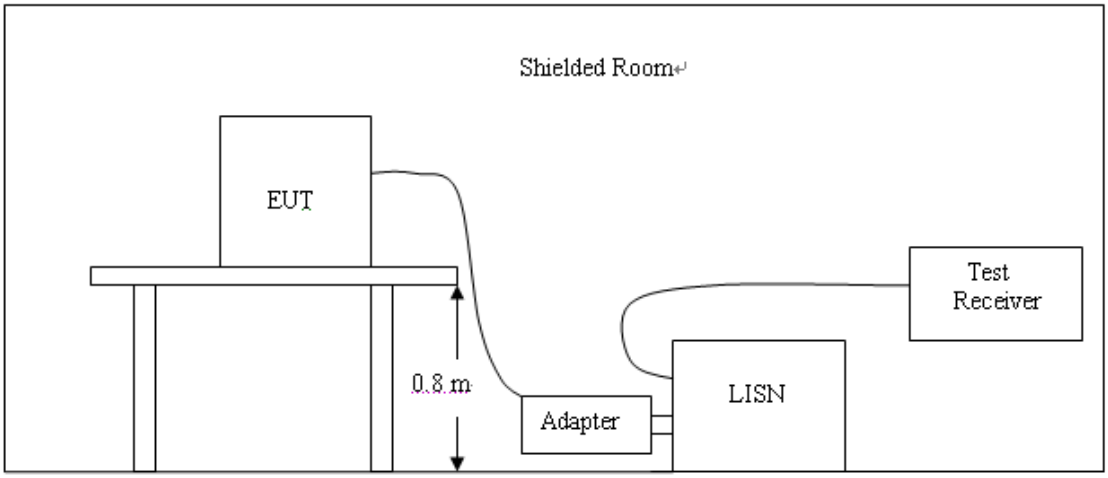
Maximum Peak Output Power / Power Spectral Density / 20dB Bandwidth / Band Edge Compliance of RF Emission / Spurious RF Conducted Emission					
Item	Test Equipment	Manufacturer	Model No.	Serial No.	Last Cal.
1	Spectrum Analyzer	Agilent	N9020A	5644123	2014/07/02
2	Spectrum Analyzer	Agilent	E4407B	MY45108355	2013/07/06
3	Power meter	Rohde & Schwarz	NRVD	260540	2014/07/02
4	Power Sensor	Rohde&Schwarz	NRR-Z81	256697	2014/07/02
5	MXA Signal Analyzer	Agilent	N9030A	MY53420615	2014/05/12
6	Coaxial Cables	WK CE Cable	N/A	N/A	2014/10/19
7	The temporary antenna connector	MMCX - SMA	1547	23657478	2014/10/19
8	Cable	MURATA	MM8430 - 2610	11548	2014/10/19

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：

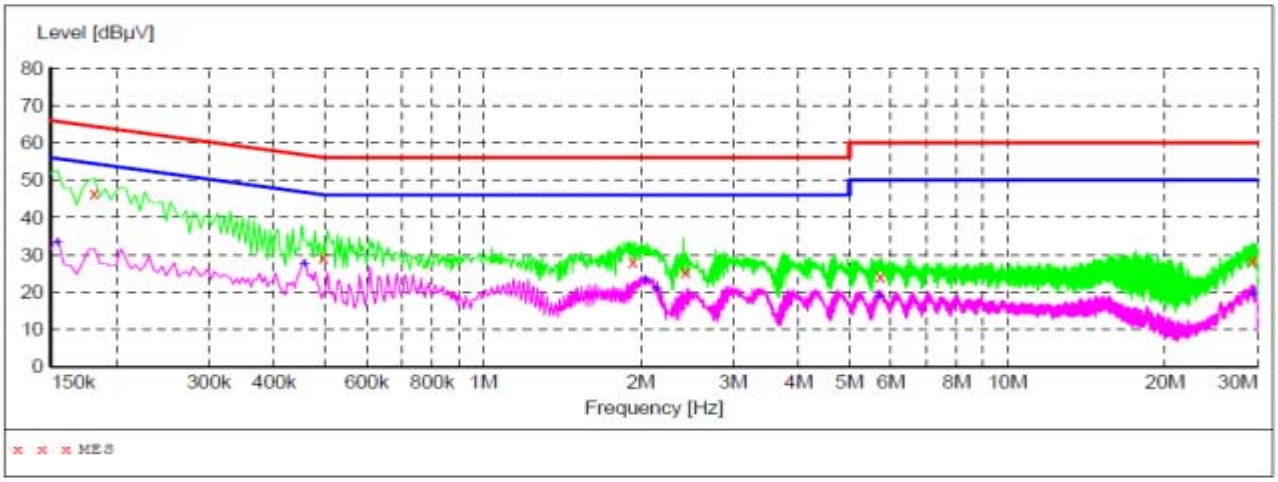
Frequency (MHz)	Maximum RF Line Voltage (dBμV)			
	CLASS A		CLASS B	
	Q.P.	Ave.	Q.P.	Ave.
0.15 - 0.50	79	66	66-56*	56-46*
0.50 - 5.00	73	60	56	46
5.00 - 30.0	73	60	60	50

* Decreasing linearly with the logarithm of the frequency

TEST RESULTS

Note: We tested Conducted Emission of GFSK, π/4 DQPSK and 8DPSK mode from 0.15 KHz to 30MHz (DH1, DH3 and DH5) and all channels (low, middle and high), recorded the worst case data at GFSK DH5 middle channel.

SCAN TABLE: "Voltage (9K-30M)FIN"
Short Description: 150K-30M Voltage



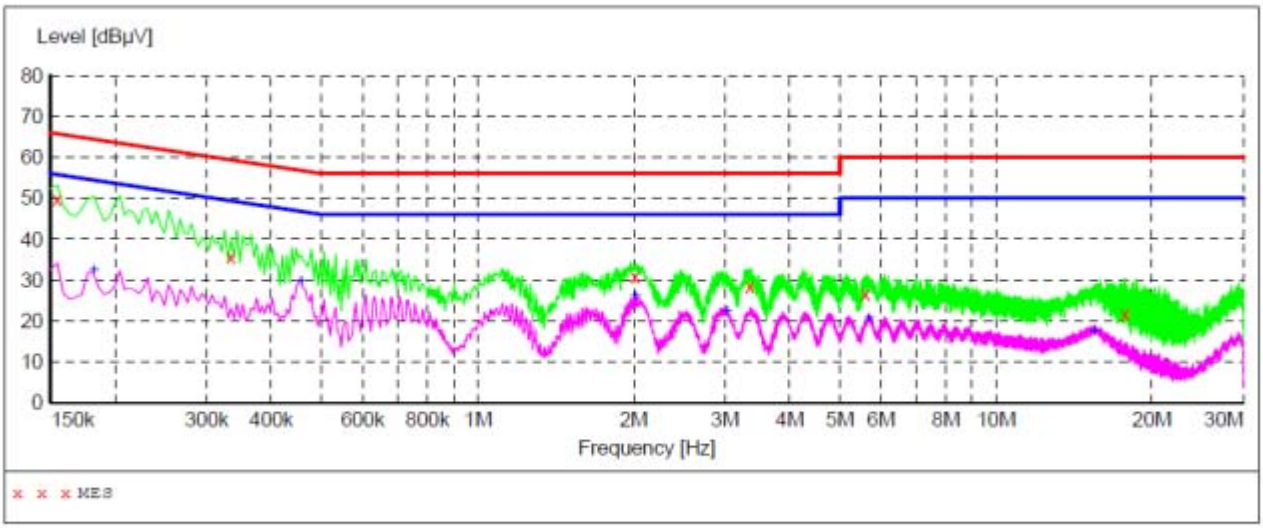
MEASUREMENT RESULT:

Frequency MHz	Level dBµV	Transd dB	Limit dBµV	Margin dB	Detector	Line	PE
0.181500	46.40	10.4	64	18.0	QP	L1	GND
0.496500	29.30	10.4	56	26.8	QP	L1	GND
1.932000	28.20	10.3	56	27.8	QP	L1	GND
2.436000	25.50	10.3	56	30.5	QP	L1	GND
5.725500	24.30	10.3	60	35.7	QP	L1	GND
29.355000	28.40	11.1	60	31.6	QP	L1	GND

MEASUREMENT RESULT:

Frequency MHz	Level dBµV	Transd dB	Limit dBµV	Margin dB	Detector	Line	PE
0.154500	33.20	10.3	56	22.6	AV	L1	GND
0.456000	27.60	10.4	47	19.2	AV	L1	GND
2.040000	23.30	10.3	46	22.7	AV	L1	GND
2.143500	20.80	10.3	46	25.2	AV	L1	GND
5.694000	18.80	10.3	50	31.2	AV	L1	GND
29.391000	19.50	11.1	50	30.5	AV	L1	GND

SCAN TABLE: "Voltage (9K-30M)FIN"
Short Description: 150K-30M Voltage



MEASUREMENT RESULT:

Frequency MHz	Level dBµV	Transd dB	Limit dBµV	Margin dB	Detector	Line	PE
0.154500	49.70	10.3	66	16.1	QP	N	GND
0.334500	35.60	10.6	59	23.7	QP	N	GND
2.008500	30.80	10.3	56	25.2	QP	N	GND
3.354000	28.50	10.3	56	27.5	QP	N	GND
5.604000	26.60	10.3	60	33.4	QP	N	GND
17.740500	21.90	10.7	60	38.1	QP	N	GND

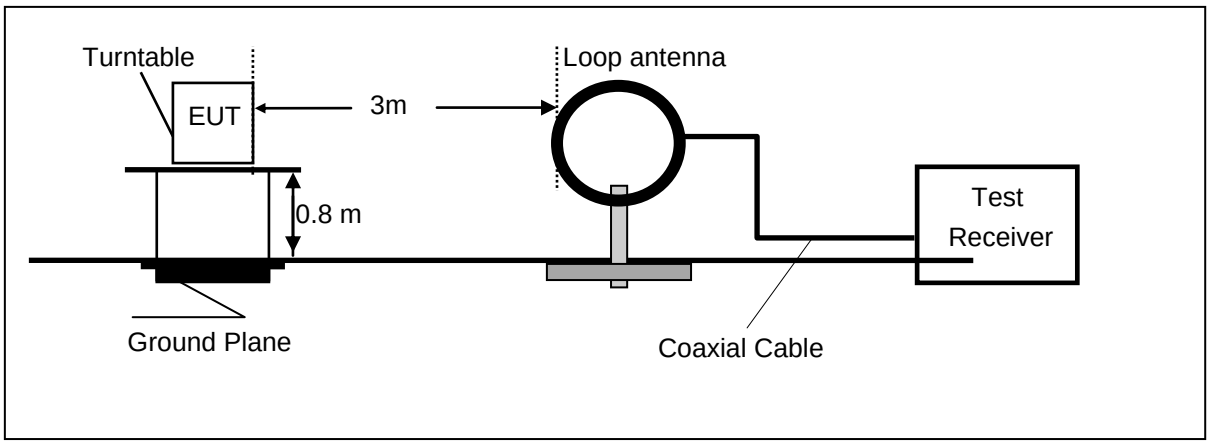
MEASUREMENT RESULT:

Frequency MHz	Level dBµV	Transd dB	Limit dBµV	Margin dB	Detector	Line	PE
0.181500	32.40	10.4	54	22.0	AV	N	GND
0.456000	29.50	10.4	47	17.3	AV	N	GND
2.013000	25.90	10.3	46	20.1	AV	N	GND
3.025500	22.40	10.3	46	23.6	AV	N	GND
5.685000	20.60	10.3	50	29.4	AV	N	GND
15.472500	17.40	10.7	50	32.6	AV	N	GND

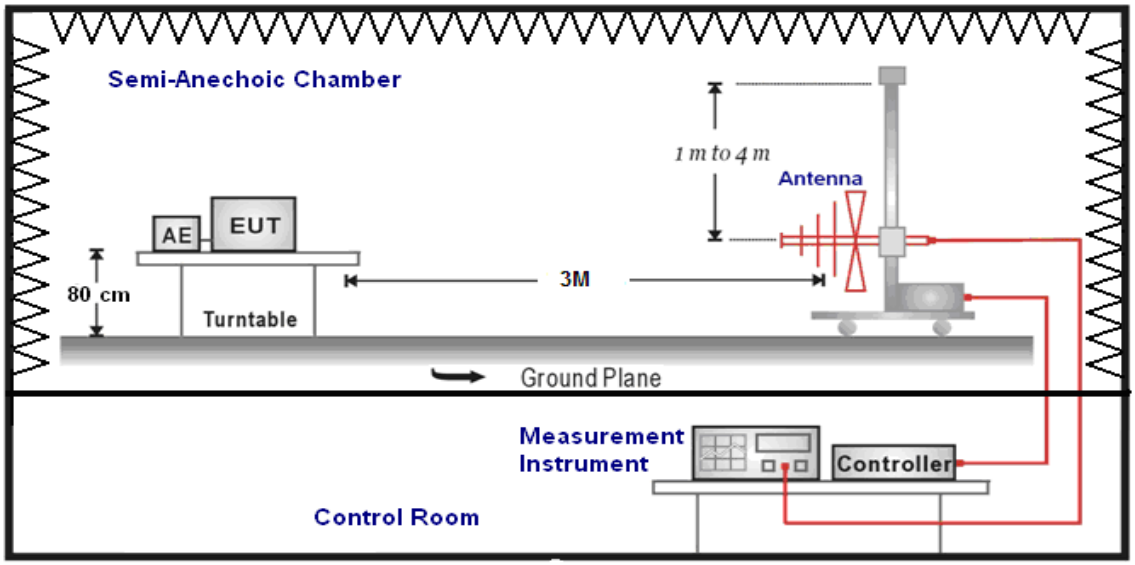
4.2. Radiated Emission

TEST CONFIGURATION

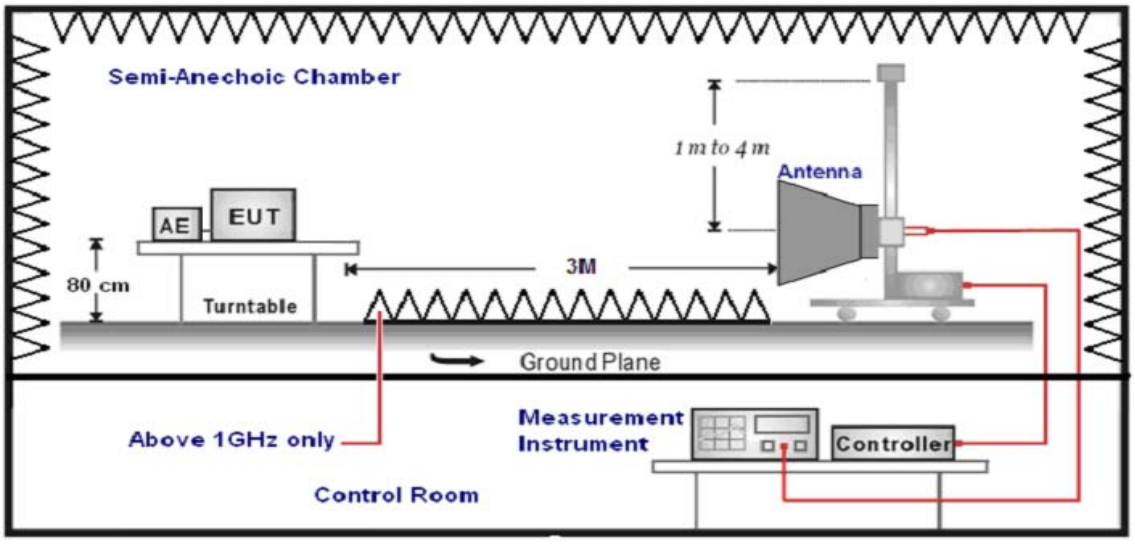
Frequency range 9 KHz – 30MHz



Frequency range 30MHz – 1000MHz



Frequency range above 1GHz-25GHz



TEST PROCEDURE

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 “oscillator’s frequency was 26MHz and maximum operation frequency was 2480MHz.so radiated emission test frequency band from 9KHz 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	1

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	

For example

Frequency (MHz)	FS (dBμV/m)	RA (dBμV/m)	AF (dB)	CL (dB)	AG (dB)	Transd (dB)
300.00	40	58.1	12.2	1.6	31.90	-18.1

Transd=AF +CL-AG

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.
The pre-test have done for the EUT in three axes and found the worst emission at position shown in test setup photos.

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) at all Packet type (DH1, DH3 and DH5) also for difference modulation type (GFSK, 8DPSK), recorded worst case at GFSK_DH5_Low channel (Channel 00) for below 1GHz and GFSK_DH5_Low channel (Channel 00), GFSK_DH5_Middle channel (Channel 39), GFSK_DH5_High channel (Channel 78) for above 1G.
2. ULTRA-BROADBAND ANTENNA for the radiation emission test below 1G.
3. HORN ANTENNA for the radiation emission test above 1G.
4. Test Mode: Continuously transmitting
5. "---" means not recorded as emission levels lower than limit.
6. Margin= Limit - Level

For 9KHz to 30MHz

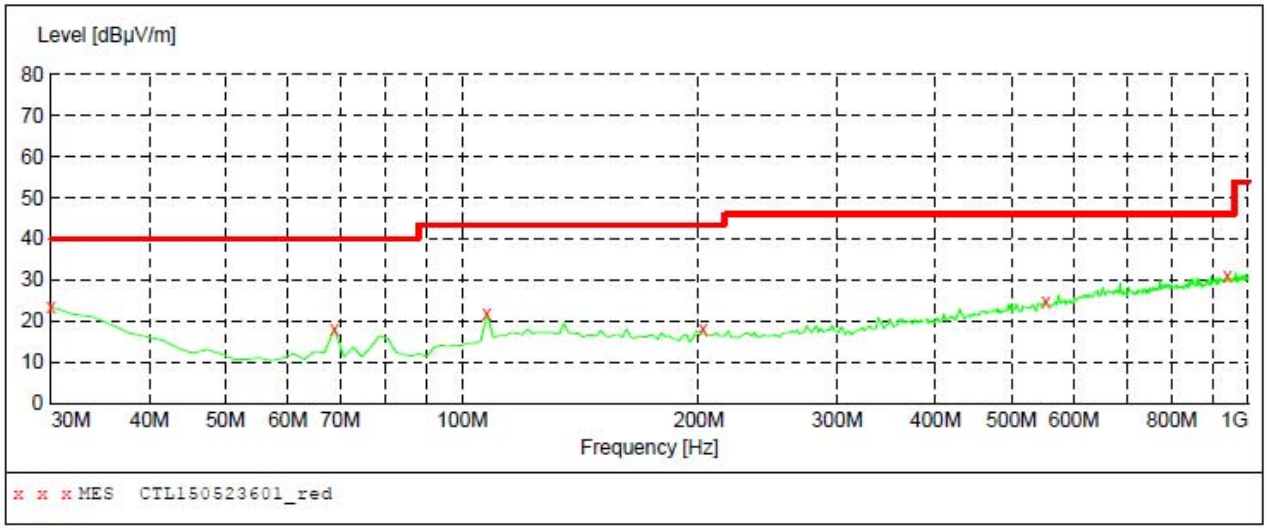
Frequency (MHz)	Corrected Reading (dBμV/m)@3m	FCC Limit (dBμV/m) @3m	Margin (dB)	Detector	Result
12.00	41.84	69.54	27.70	QP	PASS
24.00	39.65	69.54	29.89	QP	PASS

For 30MHz to 1000MHz

Polarization	*Vertical*

SWEEP TABLE: "test (30M-1G)"

Short Description:			Field Strength		
Start Frequency	Stop Frequency	Detector	Meas. Time	IF Bandw.	Transducer
30.0 MHz	1.0 GHz	MaxPeak	300.0 ms	120 kHz	JB1



MEASUREMENT RESULT: "CTL150523601_red"

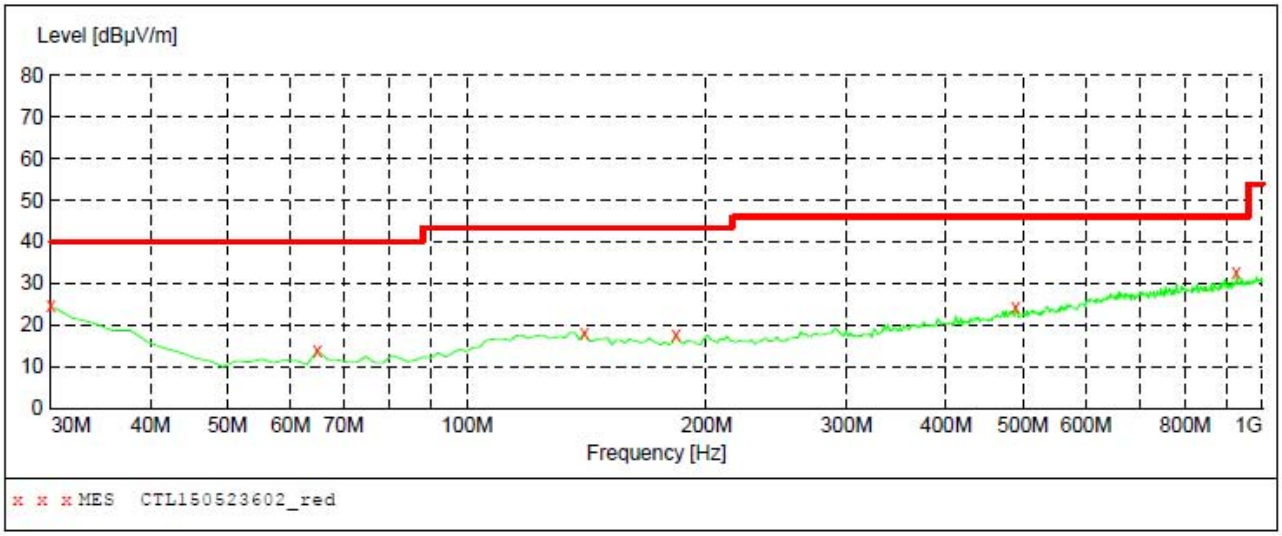
5/23/2015 1:39PM

Frequency MHz	Level dBµV/m	Transd dB	Limit dBµV/m	Margin dB	Det.	Height cm	Azimuth deg	Polarization
30.000000	23.40	21.1	40.0	16.6	Pk	0.0	0.00	VERTICAL
68.800000	18.00	8.4	40.0	22.0	Pk	0.0	0.00	VERTICAL
107.600000	21.70	13.3	43.5	21.8	Pk	0.0	0.00	VERTICAL
202.660000	18.00	14.4	43.5	25.5	Pk	0.0	0.00	VERTICAL
553.800000	24.90	21.1	46.0	21.1	Pk	0.0	0.00	VERTICAL
941.800000	31.10	26.5	46.0	14.9	Pk	0.0	0.00	VERTICAL

Polarization	Horizontal

SWEEP TABLE: "test (30M-1G)"

Short Description:			Field Strength		
Start Frequency	Stop Frequency	Detector	Meas. Time	IF Bandw.	Transducer
30.0 MHz	1.0 GHz	MaxPeak	300.0 ms	120 kHz	JB1



MEASUREMENT RESULT: "CTL150523602_red"

5/23/2015 1:40PM

Frequency MHz	Level dBµV/m	Transd dB	Limit dBµV/m	Margin dB	Det.	Height cm	Azimuth deg	Polarization
30.000000	24.60	21.1	40.0	15.4	PK	0.0	0.00	HORIZONTAL
64.920000	13.80	8.4	40.0	26.2	PK	0.0	0.00	HORIZONTAL
140.580000	18.20	14.6	43.5	25.3	PK	0.0	0.00	HORIZONTAL
183.260000	17.70	13.3	43.5	25.8	PK	0.0	0.00	HORIZONTAL
489.780000	24.50	20.3	46.0	21.5	PK	0.0	0.00	HORIZONTAL
928.220000	32.60	26.4	46.0	13.4	PK	0.0	0.00	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)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Antenna Factor (dB/m)	Cable Factor (dB)	Pre-amplifier	Correction Factor (dB/m)
1	4804.00	55.7	PK	74.00	18.3	1.00	63	53.62	31.58	7.00	36.5	2.08
2	4804.00	42.17	AV	54.00	11.83	1.00	63	40.09	31.58	7.00	36.5	2.08
3	7206.00	57.71	PK	74.00	16.29	1.00	271	47.05	37.06	8.90	35.3	10.66
4	7206.00	40.3	AV	54.00	13.7	1.00	271	29.64	37.06	8.90	35.3	10.66

ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M												
No.	Frequency (MHz)	Emssion Level (dBuV/m)		Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Antenna Factor (dB/m)	Cable Factor (dB)	Pre-amplifier	Correction Factor (dB/m)
1	4804.00	51.92	PK	74.00	22.08	1.00	216	49.84	31.58	7.00	36.5	2.08
2	4804.00	39.07	AV	54.00	14.93	1.00	216	36.99	31.58	7.00	36.5	2.08
3	7206.00	53.64	PK	74.00	20.36	1.00	191	42.98	37.06	8.90	35.3	10.66
4	7206.00	38.7	AV	54.00	15.3	1.00	191	28.04	37.06	8.90	35.3	10.66

Middle Channel @ Channel 40 @ 2442 MHz

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M												
No.	Frequency (MHz)	Emssion Level (dBuV/m)		Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Antenna Factor (dB/m)	Cable Factor (dB)	Pre-amplifier	Correction Factor (dB/m)
1	4884.00	56.93	PK	74.00	17.07	1.00	105	54.79	31.04	7.60	36.5	2.14
2	4884.00	42.49	AV	54.00	11.51	1.00	105	40.35	31.04	7.60	36.5	2.14
3	7326.00	58.71	PK	74.00	15.29	1.00	117	47.57	37.84	8.60	35.3	11.14
4	7326.00	40.55	AV	54.00	13.45	1.00	117	29.41	37.84	8.60	35.3	11.14

ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M												
No.	Frequency (MHz)	Emssion Level (dBuV/m)		Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Antenna Factor (dB/m)	Cable Factor (dB)	Pre-amplifier	Correction Factor (dB/m)
1	4884.00	52.39	PK	74.00	21.61	1.00	149	50.25	31.04	7.60	36.5	2.14
2	4884.00	39.25	AV	54.00	14.75	1.00	149	37.11	31.04	7.60	36.5	2.14
3	7326.00	53.71	PK	74.00	20.29	1.00	249	42.57	37.84	8.60	35.3	11.14
4	7326.00	38.78	AV	54.00	15.22	1.00	249	27.64	37.84	8.60	35.3	11.14

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)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Antenna Factor (dB/m)	Cable Factor (dB)	Pre-amplifier	Correction Factor (dB/m)
1	4960.00	57.35	PK	74.00	16.65	1.00	127	54.92	31.63	7.00	36.2	2.43
2	4960.00	42.72	AV	54.00	11.28	1.00	127	40.29	31.63	7.00	36.2	2.43
3	7340.00	58.81	PK	74.00	15.19	1.00	29	47.21	38.40	8.50	35.3	11.60
4	7340.00	40.6	AV	54.00	13.40	1.00	29	29.0	38.40	8.50	35.3	11.60

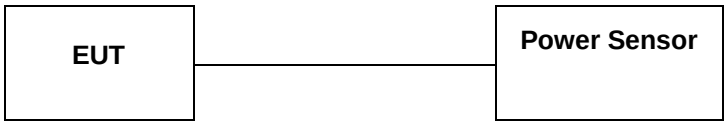
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M												
No.	Frequency (MHz)	Emssion Level (dBuV/m)		Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Antenna Factor (dB/m)	Cable Factor (dB)	Pre-amplifier	Correction Factor (dB/m)
1	4960.00	52.44	PK	74.00	21.56	1.00	319	50.01	31.63	7.00	-36.2	2.43
2	4960.00	39.27	AV	54.00	14.73	1.00	319	36.84	31.63	7.00	-36.2	2.43
3	7340.00	54.00	PK	74.00	20.00	1.00	295	42.40	38.40	8.50	-35.3	11.60
4	7340.00	38.84	AV	54.00	15.16	1.00	295	27.24	38.40	8.50	-35.3	11.60

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 ANSI C63.4:2009 Maximum peak conducted output power: Connent antenna port into power meter and reading Peak values.

LIMIT

For frequency hopping systems operating in the 2400–2483.5 MHz band employing at least 75 non-overlapping hopping channels, and all frequency hopping systems in the 5725–5850 MHz band: 1 watt. For all other frequency hopping systems in the 2400–2483.5 MHz band: 0.125 watts.

TEST RESULTS

Remark: We test maximum peak output power at difference Packet Type (DH1, DH3 and DH5), recorded worst case at DH5

4.3.1 GFSK Test Mode

A. Test Verdict

Channel	Frequency (MHz)	Measured Output Peak Power (dBm)	Limits (dBm)	Verdict
00	2402	1.530	30	PASS
39	2441	0.820	30	PASS
78	2480	0.790	30	PASS

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

4.3.2 π/4 DQPSK Test Mode

A. Test Verdict

Channel	Frequency (MHz)	Measured Output Peak Power (dBm)	Limits (dBm)	Verdict
00	2402	0.950	21	PASS
39	2441	0.350	21	PASS
78	2480	0.440	21	PASS

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

4.3.3 8DPSK Test Mode

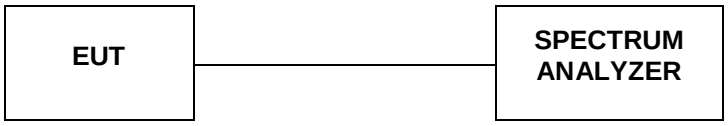
A. Test Verdict

Channel	Frequency (MHz)	Measured Output Peak Power (dBm)	Limits (dBm)	Verdict
00	2402	0.870	21	PASS
39	2441	0.260	21	PASS
78	2480	0.460	21	PASS

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

4.4. 20dB 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 with RBW=30 KHz and VBW=100KHz.
The 20dB bandwidth is defined as the total spectrum the power of which is higher than peak power minus 20dB.

LIMIT

For frequency hopping systems operating in the 2400MHz-2483.5MHz no limit for 20dB bandwith.

TEST RESULTS

GFSK Test Mode

Channel	Frequency (MHz)	20dB Bandwidth (MHz)	Limits (MHz)	Verdict
00	2402	0.821	/	PASS
39	2441	0.826	/	PASS
78	2480	0.822	/	PASS

8DPSKTest Mode

Channel	Frequency (MHz)	20dB Bandwidth (MHz)	Limits (MHz)	Verdict
00	2402	1.117	/	PASS
39	2441	1.110	/	PASS
78	2480	1.120	/	PASS

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

Test Plots

GFSK Modulation

CH00

CH39

CH78

8DSPSK Modulation

CH00

CH39

CH78

4.5. Band Edge

Applicable Standard

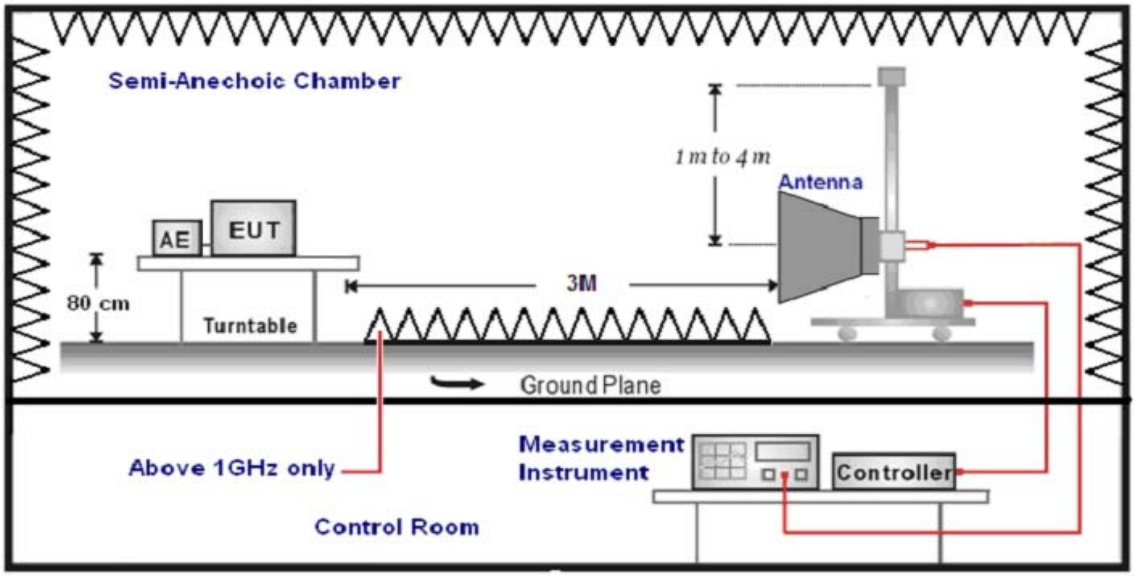
In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the 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

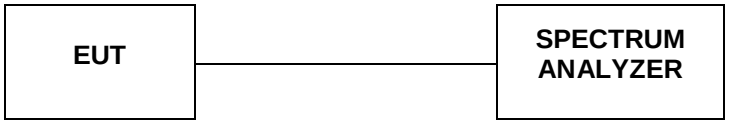
1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
2. Remove the antenna from the EUT and then connect to a low loss RF cable from the antenna port to a EMI test receiver, then turn on the EUT and make it operate in transmitting 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 both RBW and VBW of spectrum analyzer to 100 kHz with a convenient frequency span including 100kHz bandwidth from band edge, for Radiated emissions restricted band RBW=1MHz, VBW=3MHz.
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 CONFIGURATION

For Radiated



For Conducted



TEST PROCEDURE

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=3MHz, Sweep time=Auto	Average (Receiver)

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)

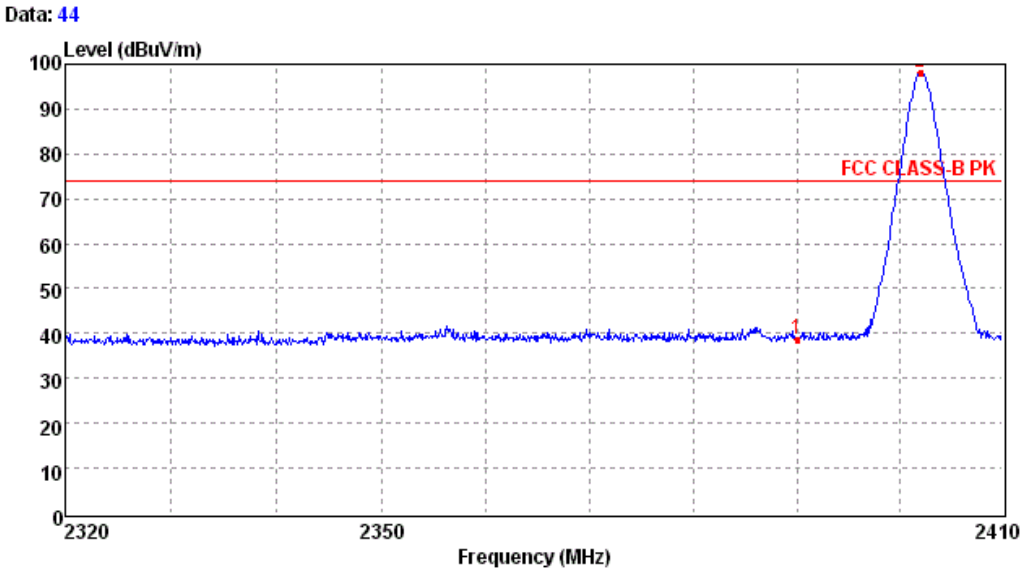
TEST RESULTS

Remark:
1. We test Band Edge at difference Packet Type (DH1, DH3 and DH5), recorded worst case at DH5.
2. "---" means not recorded as emission levels lower than limit.

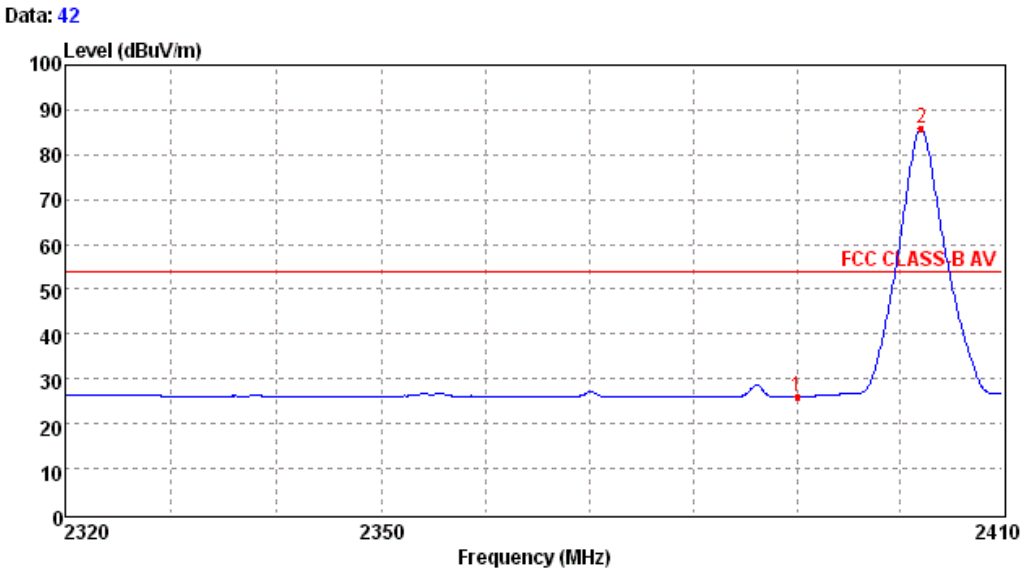
4.5.1 For Radiated Bandedge Measurement

Remark: we tested radiated bandedge at both hopping and no-hopping modes, recorded worst case at no-hopping mode of the GFSK(DH5).

Test Mode:	GFSK	Polarization:	Horizontal

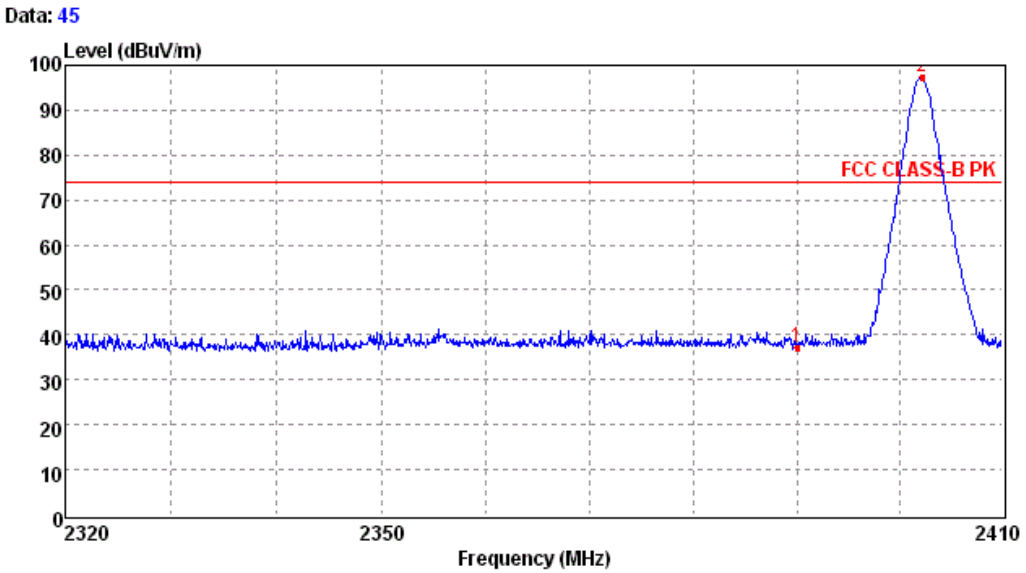


Mark	Frequency (MHz)	Level (dBuV/m)	Cable Loss (dB)	Antenna Factor (dB/m)	Preamp Factor (dB)	Reading Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
1	2390.00	38.48	3.32	27.49	36.12	43.76	74.00	35.52	Peak
2	**2402.03**	**98.14**	**3.32**	**27.49**	**36.12**	**103.45**	**74.00**	**-24.14**	**Peak**

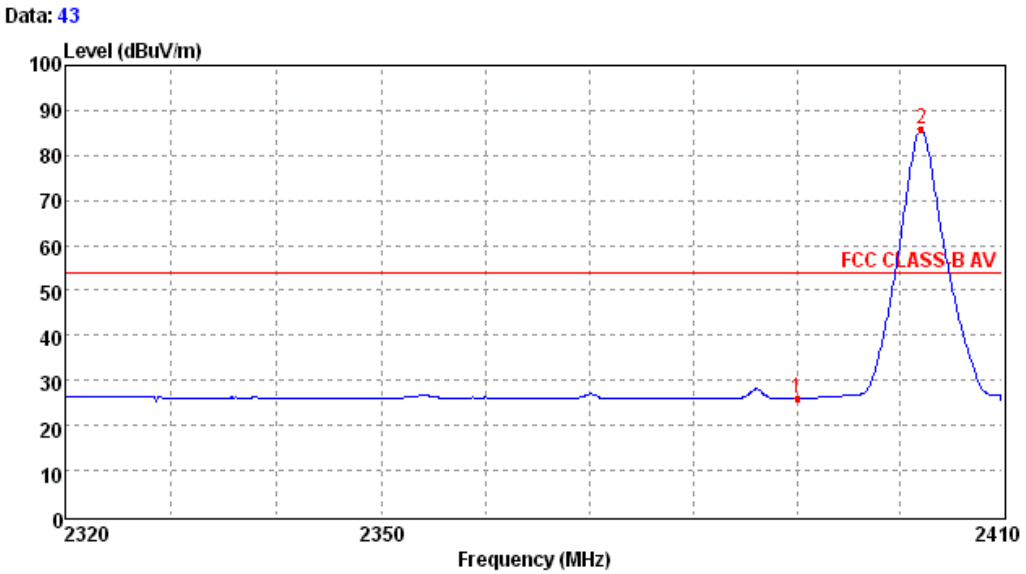


Mark	Frequency (MHz)	Level (dBuV/m)	Cable Loss (dB)	Antenna Factor (dB/m)	Preamp Factor (dB)	Reading Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
1	2390.00	26.02	3.32	27.49	36.12	31.30	54.00	27.98	Average
2	**2402.13**	**85.99**	**3.32**	**27.49**	**36.12**	**91.30**	**54.00**	**-31.99**	**Average**

Test Mode:	GFSK	Polarization:	Vertical

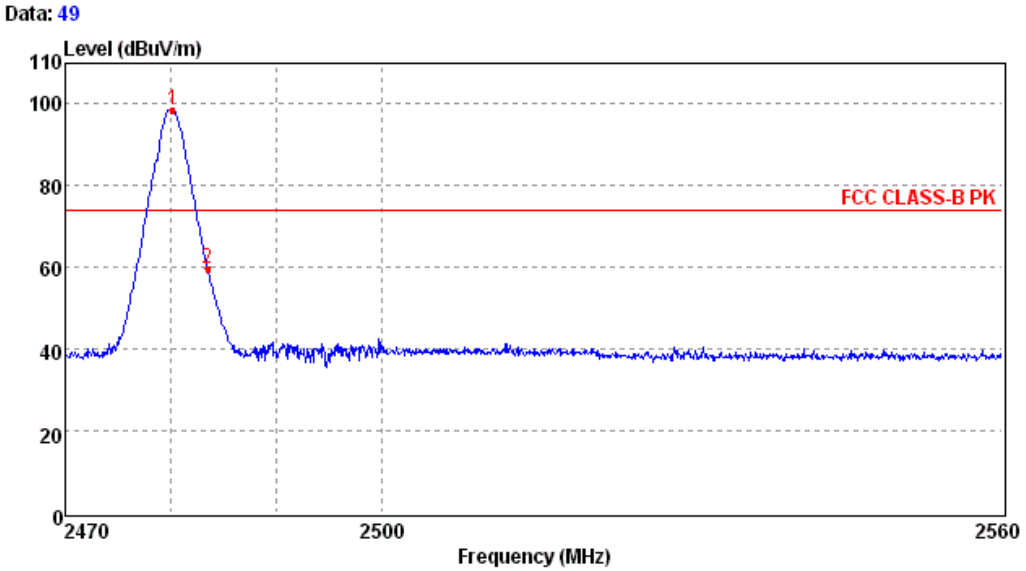


Mark	Frequency (MHz)	Level (dBuV/m)	Cable Loss (dB)	Antenna Factor (dB/m)	Preamp Factor (dB)	Reading Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
1	2390.00	37.16	3.32	27.49	36.12	42.44	74.00	36.84	Peak
2	**2402.22**	**97.35**	**3.32**	**27.49**	**36.12**	**102.66**	**74.00**	**-23.35**	**Peak**

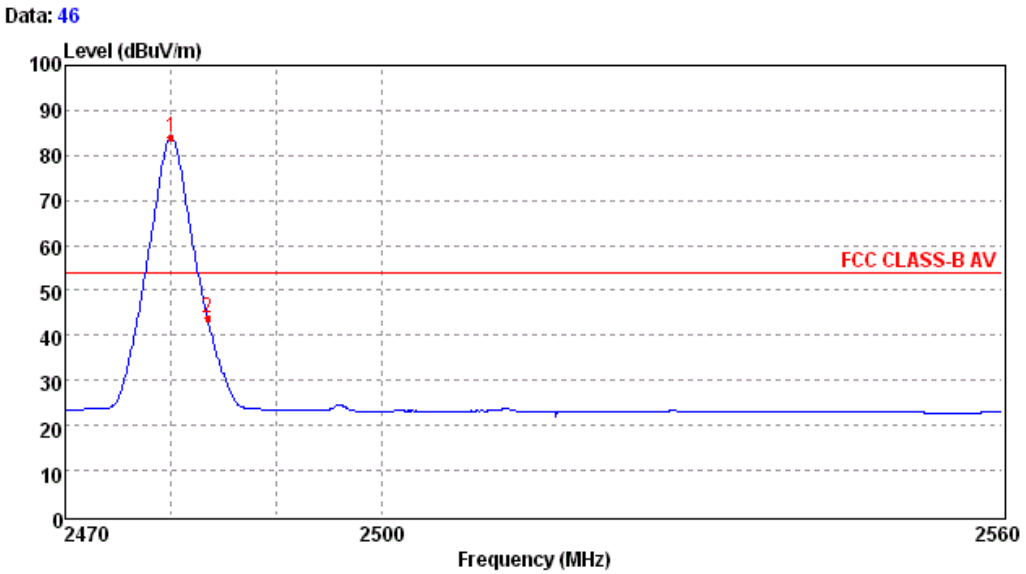


Mark	Frequency (MHz)	Level (dBuV/m)	Cable Loss (dB)	Antenna Factor (dB/m)	Preamp Factor (dB)	Reading Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
1	2390.00	26.00	3.32	27.49	36.12	31.28	54.00	28.00	Average
2	**2402.13**	**85.88**	**3.32**	**27.49**	**36.12**	**91.19**	**54.00**	**-31.88**	**Average**

Test Mode:	GFSK	Polarization:	Horizontal

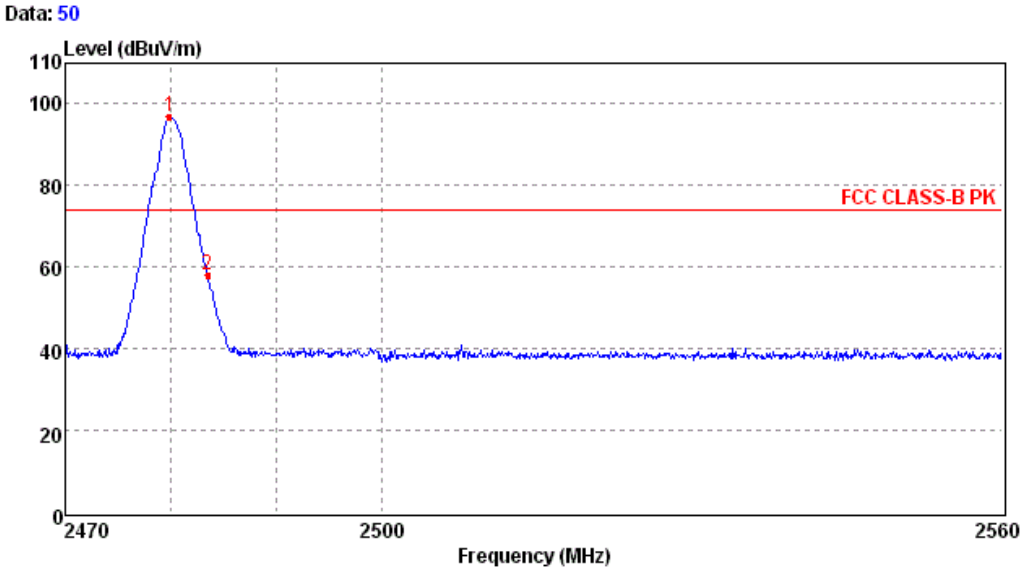


Mark	Frequency (MHz)	Level (dBuV/m)	Cable Loss (dB)	Antenna Factor (dB/m)	Preamp Factor (dB)	Reading Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
1	2480.19	95.68	3.88	27.45	36.55	103.90	74.00	-24.68	Peak
2	**2483.50**	**59.69**	**3.88**	**27.45**	**36.55**	**64.91**	**74.00**	**14.31**	**Peak**

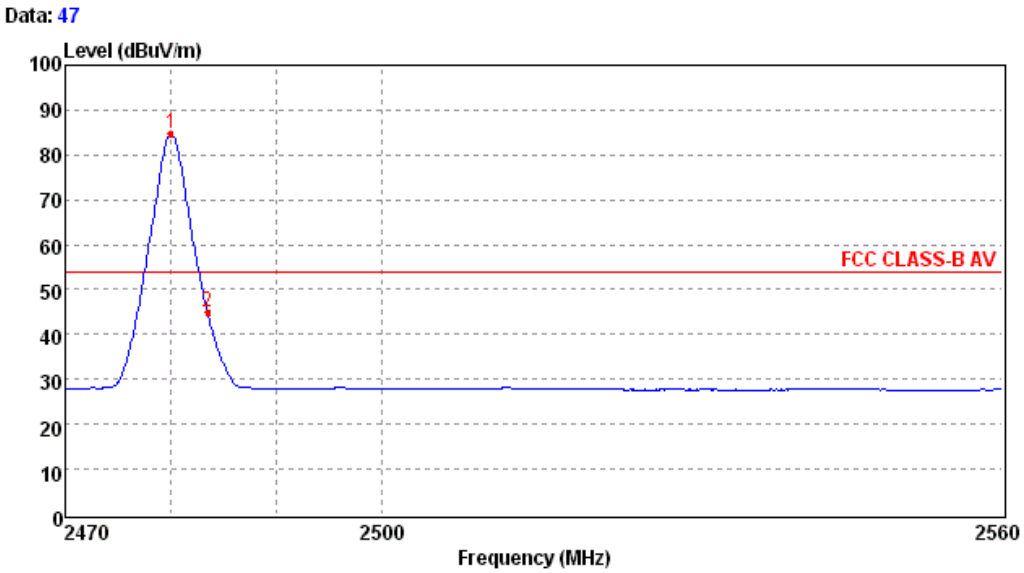


Mark	Frequency (MHz)	Level (dBuV/m)	Cable Loss (dB)	Antenna Factor (dB/m)	Preamp Factor (dB)	Reading Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
1	**2480.01**	**83.97**	**3.88**	**27.45**	**36.55**	**89.19**	**54.00**	**-29.97**	**Average**
2	2483.50	43.79	3.88	27.45	36.55	49.01	54.00	10.21	Average

Test Mode:	GFSK	Polarization:	Vertical



Mark	Frequency (MHz)	Level (dBuV/m)	Cable Loss (dB)	Antenna Factor (dB/m)	Preamp Factor (dB)	Reading Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
1	**2479.83**	**96.72**	**3.88**	**27.45**	**36.55**	**101.94**	**74.00**	**-22.72**	**Peak**
2	2483.50	57.91	3.88	27.45	36.55	63.13	74.00	16.09	Peak

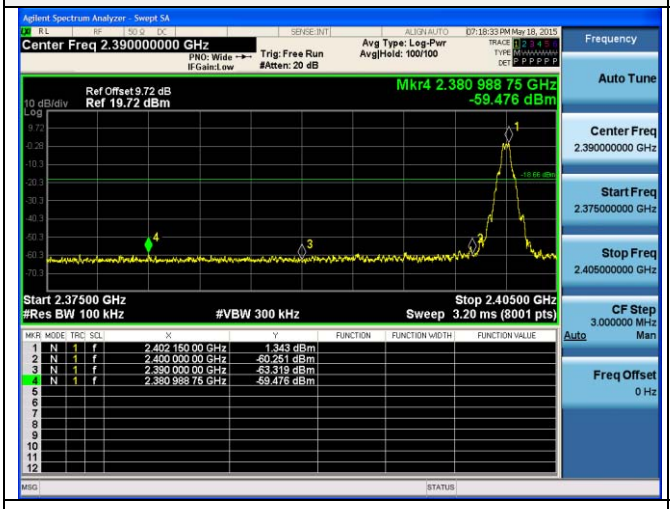
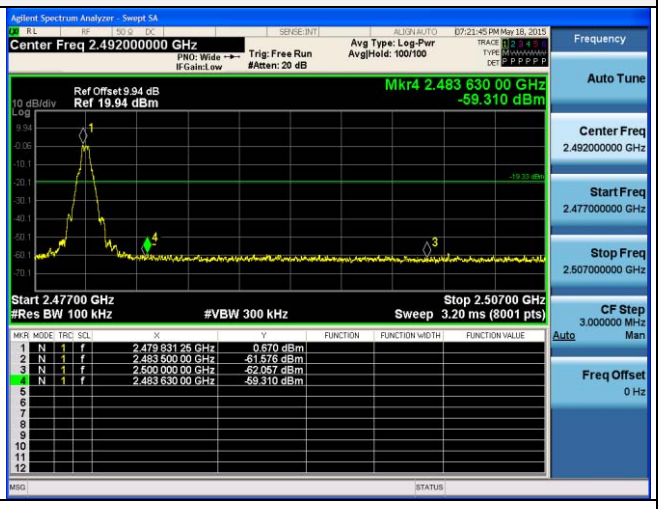
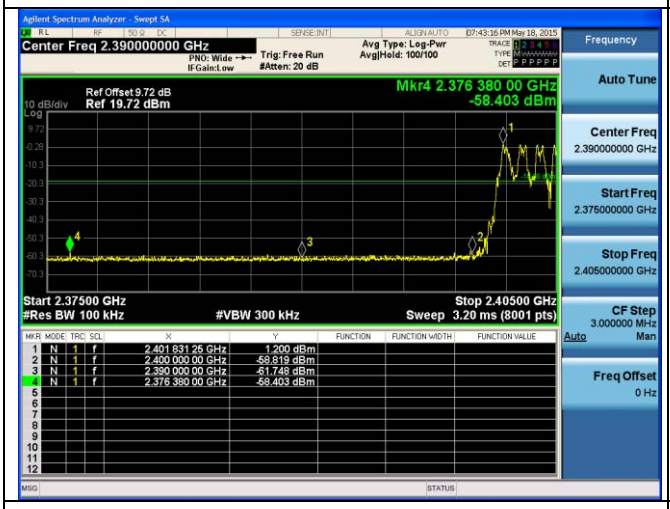
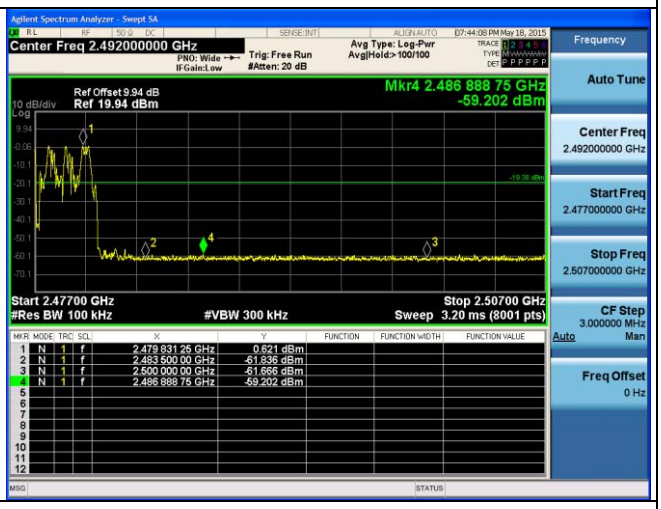


Mark	Frequency (MHz)	Level (dBuV/m)	Cable Loss (dB)	Antenna Factor (dB/m)	Preamp Factor (dB)	Reading Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
1	**2480.01**	**84.79**	**3.88**	**27.45**	**36.55**	**90.01**	**54.00**	**-30.79**	**Average**
2	2483.50	44.88	3.88	27.45	36.55	50.10	54.00	9.12	Average

4.5.2 For Conducted Bandedge Measurement

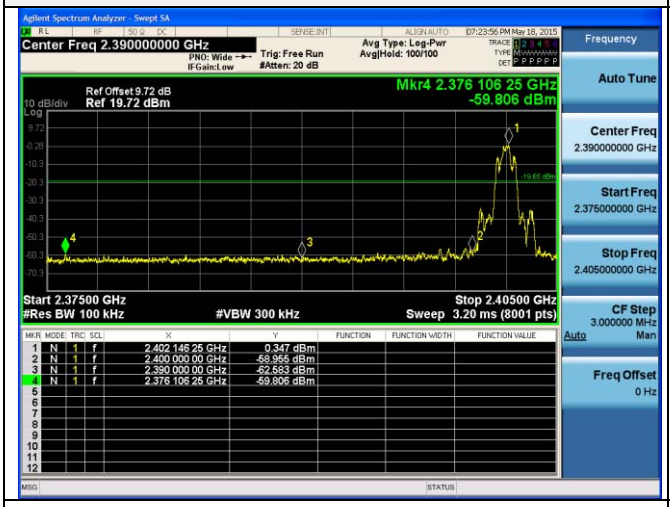
4.5.2.1 GFSK Test Mode

Frequency (MHz)	Delta Peak to Band emission (dBc)	Hoping Mode	Limit (dBc)	Verdict
2380.989	60.82	OFF	20	PASS
2376.380	59.60	ON	20	PASS
2483.630	59.98	OFF	20	PASS
2486.889	59.82	ON	20	PASS

2402	2480
	
Hoping Off	Hoping Off
	
Hoping On	Hoping On

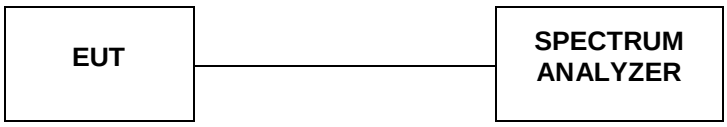
4.5.2.2 8DPSK Test Mode

Frequency (MHz)	Delta Peak to Band emission (dBc)	Hoping Mode	Limit (dBc)	Verdict
2376.106	60.16	OFF	20	PASS
2385.474	52.78	ON	20	PASS
2484.890	57.79	OFF	20	PASS
2483.611	57.78	ON	20	PASS

2402	2480
	
Hoping Off	Hoping Off
	
Hoping On	Hoping On

4.6. Frequency Separation

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 with RBW=30 KHz and VBW=100KHz.

LIMIT

According to 15.247(a)(1),frequency hopping systems shall have hopping channel carrier frequencies separated by minimum of 25KHz or the 2/3*20dB bandwidth of the hopping channel, whichever is greater.

TEST RESULTS

Remark: 1. We test Frequency Separation at difference Packet Type (DH1, DH3 and DH5) and all test channels, recorded worst case at DH5 and middle channel.

4.6.1 GFSK Test Mode

A. Test Verdict

Channel	Frequency (MHz)	Channel Separation (MHz)	Refer to Plot	Limits (MHz)	Verdict
38	2440	0.9998	Plot 4.6.1 A	0.8702	PASS
39	2441				

B. Test Plots

(Plot 4.6.1 A: Channel 39: 2441MHz @ GFSK)

4.6.2 8DPSK Test Mode

A. Test Verdict

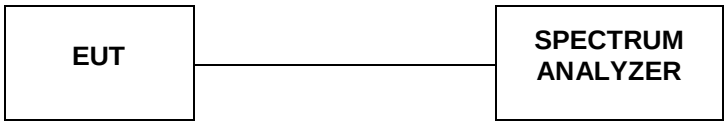
Channel	Frequency (MHz)	Channel Separation (MHz)	Refer to Plot	Limits (MHz)	Verdict
38	2440	0.9998	Plot 4.6.2 A	0.84936	PASS
39	2441				

B. Test Plots

(Plot 4.6.2 A: Channel 39: 2441MHz @ 8DPSK)

4.7. Number of hopping frequency

TEST CONFIGURATION



TEST PROCEDURE

The transmitter output was connected to the spectrum analyzer through an attenuator.Set spectrum analyzer start 2400MHz to 2483.5MHz with RBW=100 KHz and VBW=300 KHz.

LIMIT

Frequency hopping systems in the 2400–2483.5 MHz band shall use at least 15 channels.

TEST RESULTS

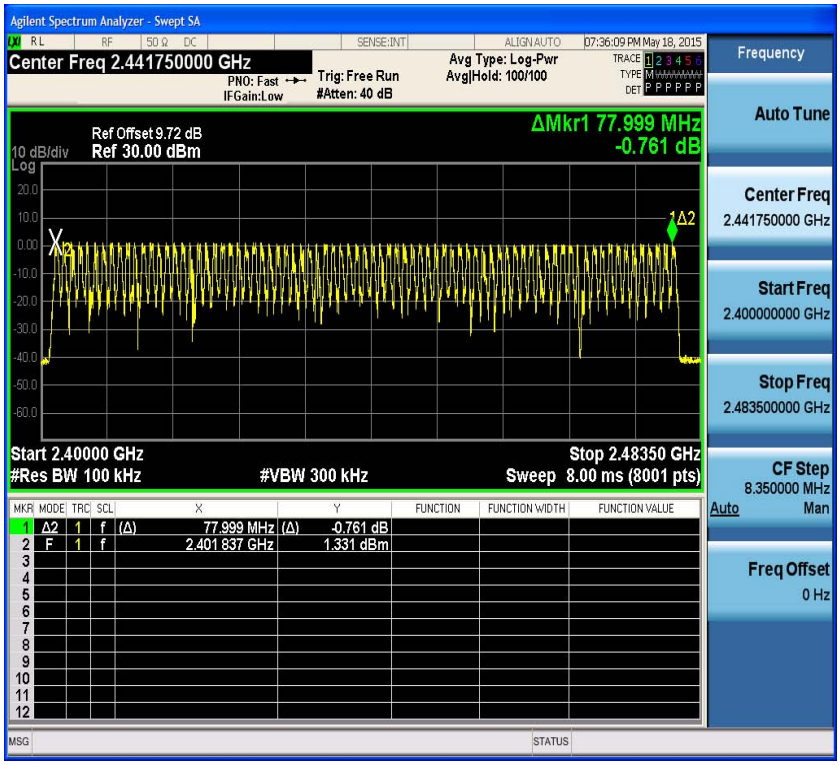
Remark: 1. We test Frequency Separation at difference Packet Type (DH1, DH3 and DH5), recorded worst case at DH5.

4.7.1 GFSK Test Mode

A. Test Verdict

Hopping Channel Frequency Range (MHz)	Number of Hopping Channel	Refer to Plot	Limit	Verdict
2400-2483.5	79	Plot 4.7.1 A1	≥15	PASS

B. Test Plots



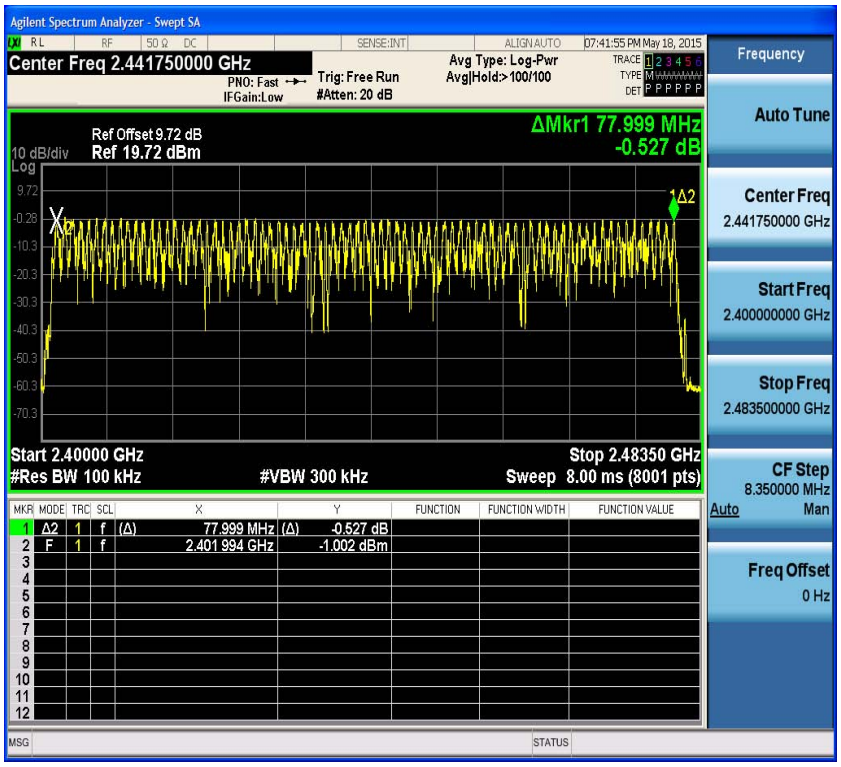
(Plot 4.7.1 A1: @ GFSK)

4.7.2 8DPSK Test Mode

A. Test Verdict

Hopping Channel Frequency Range (MHz)	Number of Hopping Channel	Refer to Plot	Limit	Verdict
2400-2483.5	79	Plot 4.7.2 A1	≥15	PASS

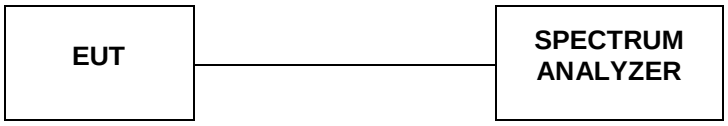
B. Test Plots



(Plot 4.7.2 A1: @ 8DPSK)

4.8. Time of Occupancy (Dwell Time)

TEST CONFIGURATION



TEST PROCEDURE

The transmitter output was connected to the spectrum analyzer through an attenuator. Set center frequency of spectrum analyzer=operating frequency with RBW=1MHz and VBW=1MHz, Span=0Hz.

LIMIT

The average time of occupancy on any channel shall not be greater than 0.4 seconds within a pe-riod of 0.4 seconds multiplied by the number of hopping channels employed.

TEST RESULTS

The Dwell Time=Burst Width*Total Hops. The detailed calculations are showed as follows:
The duration for dwell time calculation:0.4[s]*hopping number=0.4[s]*79[ch]=31.6[s*ch];
The burst width [ms/hop/ch], which is directly measured, refers to the duration on one channel hop.
The hops per second for all channels: The selected EUT Conf uses a slot type of 5-Tx&1-Rx and a hopping rate of 1600 [ch*hop/s] for all channels. So the final hopping rate for all channels is 1600/6=266.67 [ch*hop/s]
The hops per second on one channel: 266.67 [ch*hops/s]/79 [ch]=3.38 [hop/s];
The total hops for all channels within the dwell time calculation duration: 3.38 [hop/s]*31.6[s*ch]=106.67 [hop*ch];
The dwell time for all channels hopping: 106.67 [hop*ch]*Burst Width [ms/hop/ch].

Remark: 1. We test Frequency Separation at all test channels, recorded worst case at middle channel.

4.8.1 GFSK Test Mode

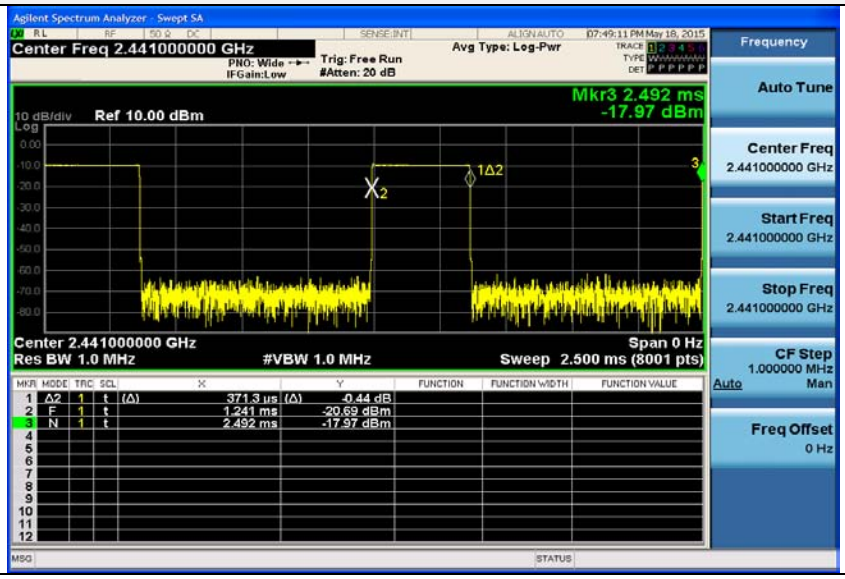
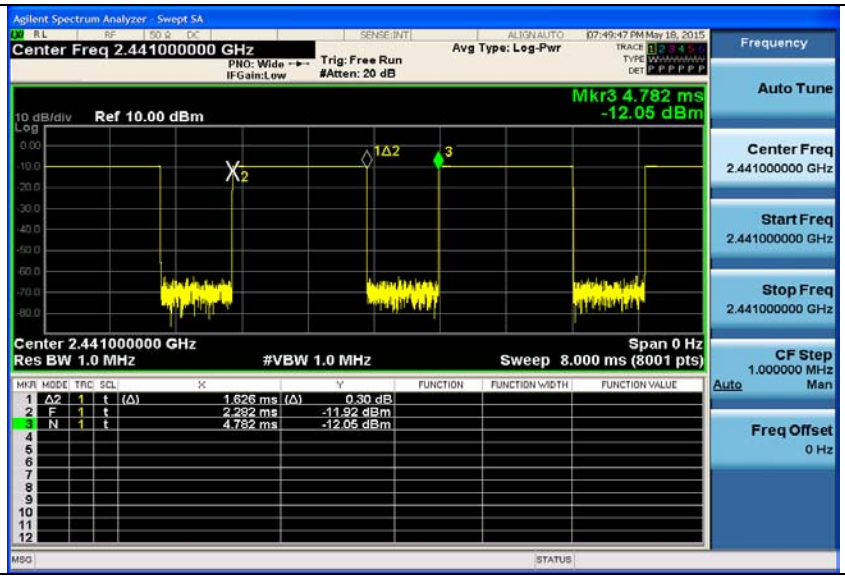
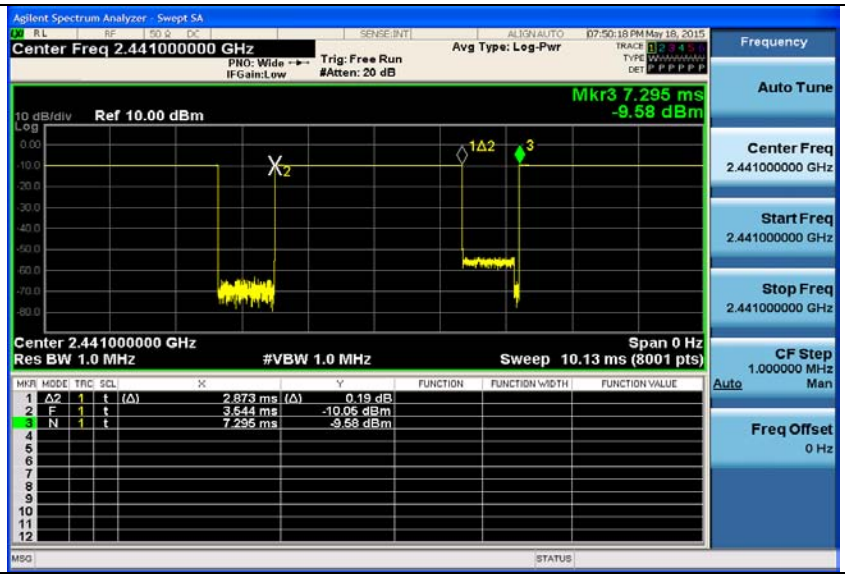
A. Test Verdict

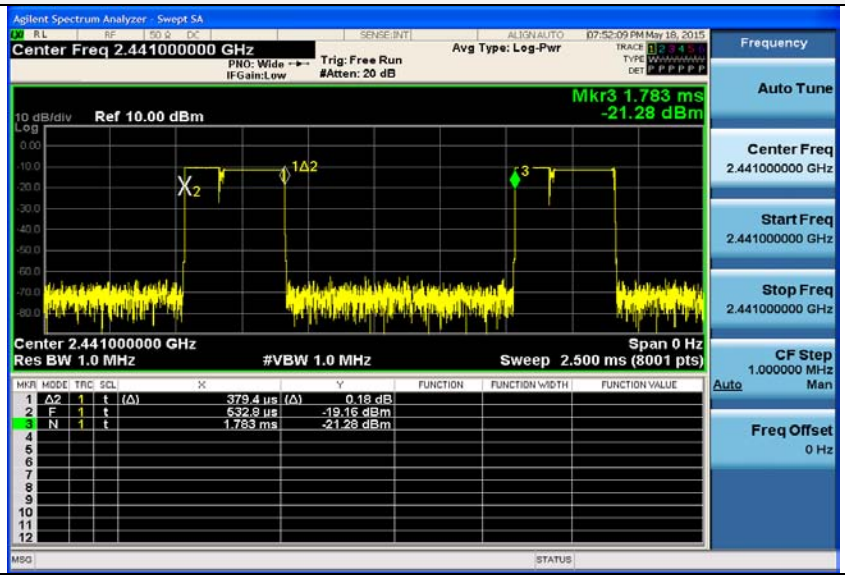
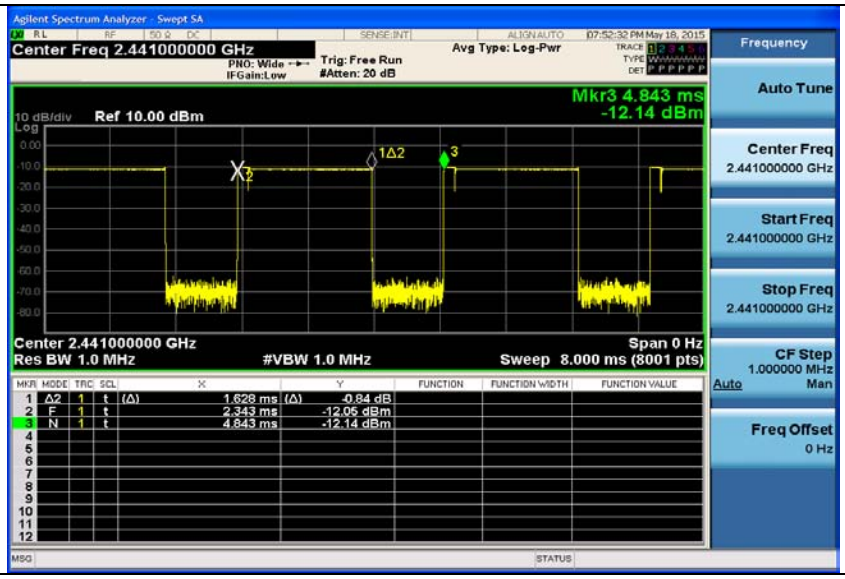
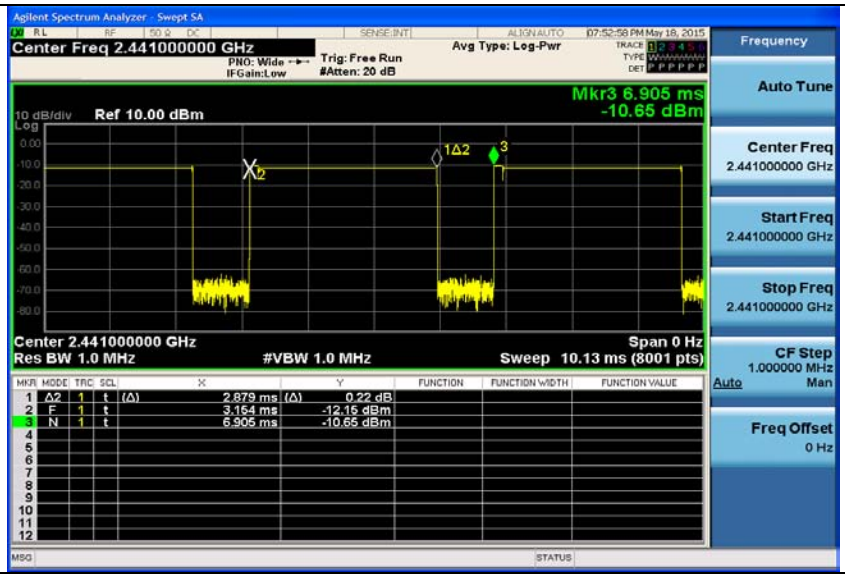
Modulation	Packet	Dwell time (second)	Limit (second)	Result
GFSK	DH1	118.720	0.40	Pass
	DH3	260.160		
	DH5	306.549		
8DSPSK	3-DH1	121.280	0.40	Pass
	3-DH3	260.480		
	3-DH5	307.189		

Note:

1. We have tested all mode at high,middle and low channel,and recoreded worst case at middle channel.
2. Dwell time=Pulse time (ms) × (1600 ÷ 2 ÷ 79) ×31.6 Second for DH1, 2-DH1, 3-DH1
   Dwell time=Pulse time (ms) × (1600 ÷ 4 ÷ 79) ×31.6 Second for DH3, 2-DH3, 3-DH3
   Dwell time=Pulse time (ms) × (1600 ÷ 6 ÷ 79) ×31.6 Second for DH5, 2-DH5, 3-DH5

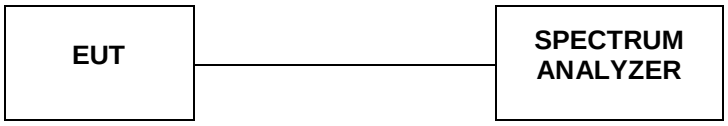
B. Test Plots

GFSK Modulation

DH1

DH3

DH5

8DSPSK Modulation

3DH1

3DH3

3DH5

4.9. 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=100kHz and VBM= 300KHz to measure the peak field strength , and measurement frequency range from 9KHz 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.

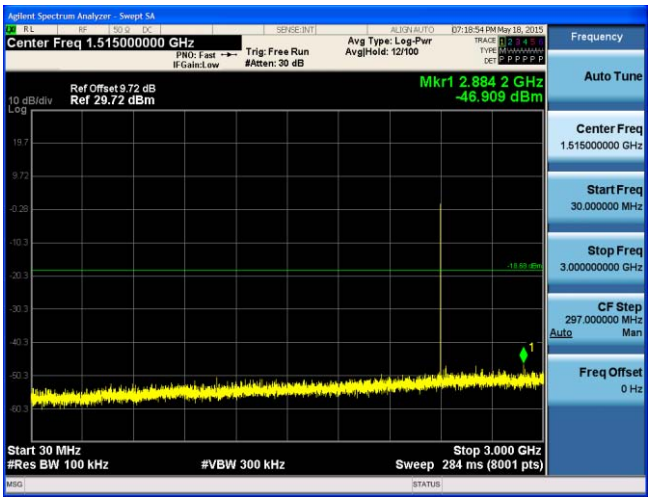
TEST RESULTS

Remark:
1. We test Frequency Separation at difference Packet Type (DH1, DH3 and DH5), recorded worst case at DH5.
2.For 9KHz -30MHz, the emission is more than 20dB below the Limit, So We did not recorded data.

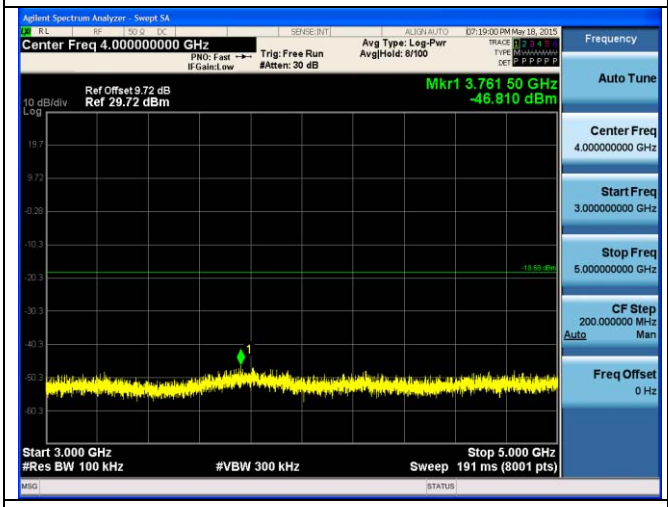
4.9.1 GFSK Test Mode

Test Mode:	GFSK	Test channel :	00

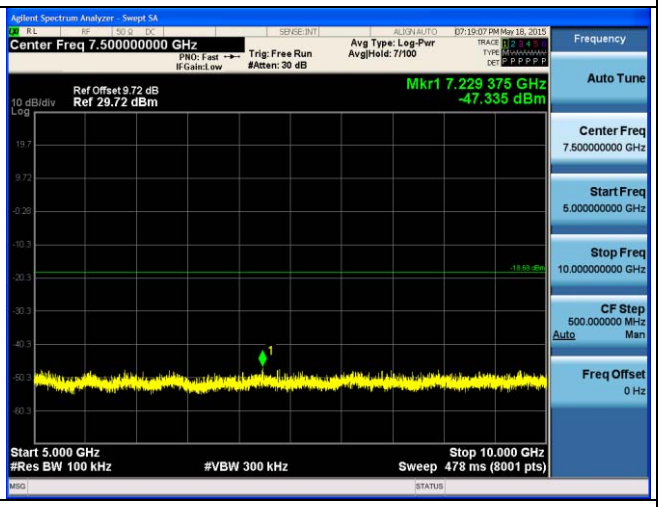
Reference level



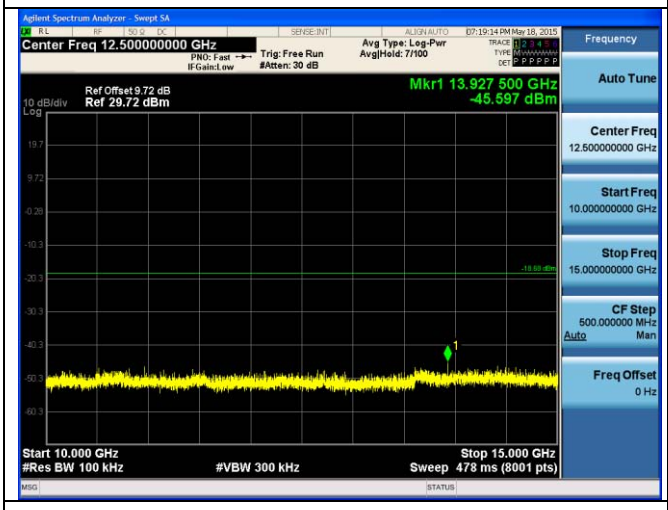
30MHz-1GHz



3GHz~5GHz



5GHz~10GHz

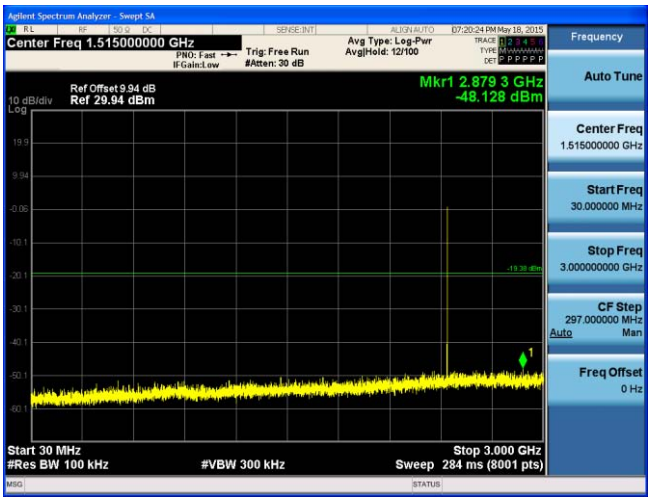


10GHz~15GHz

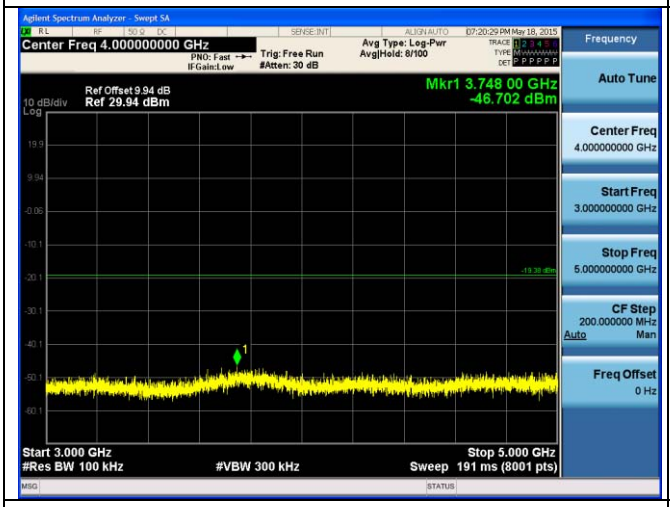
15GHz~25GHz

Test Mode:	GFSK	Test channel :	39

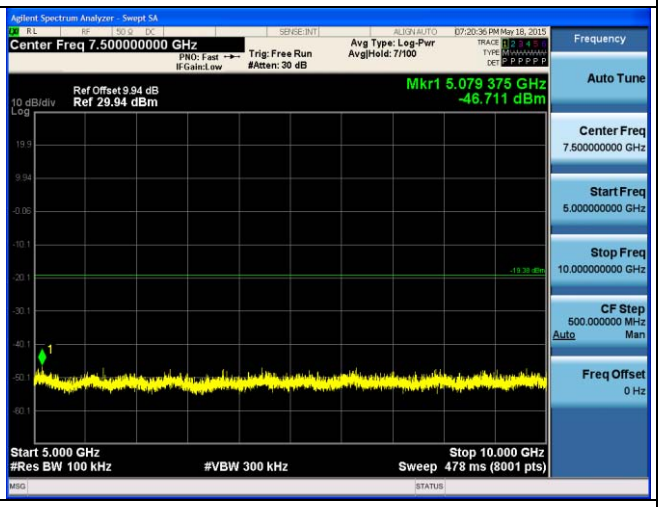
Reference level



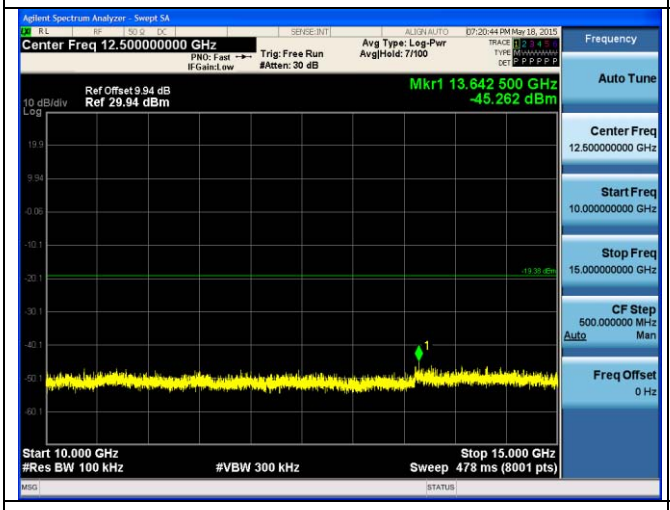
30MHz-1GHz



3GHz~5GHz



5GHz~10GHz

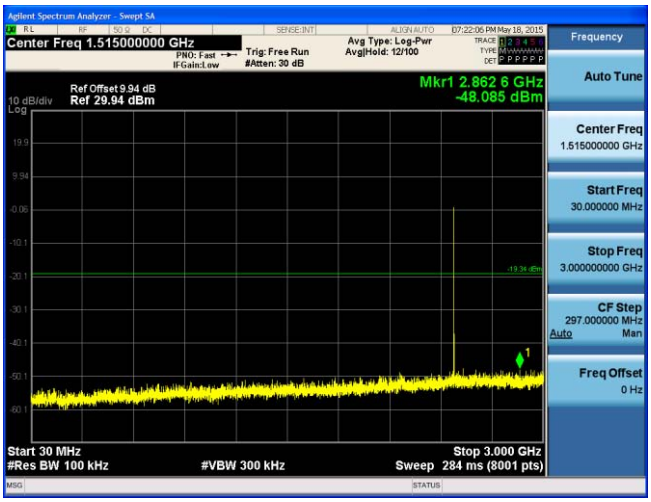


10GHz~15GHz

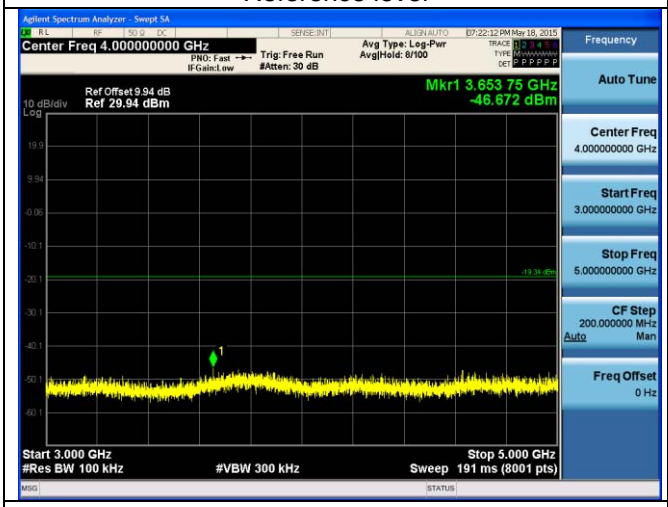
15GHz~25GHz

Test Mode:	GFSK	Test channel :	78

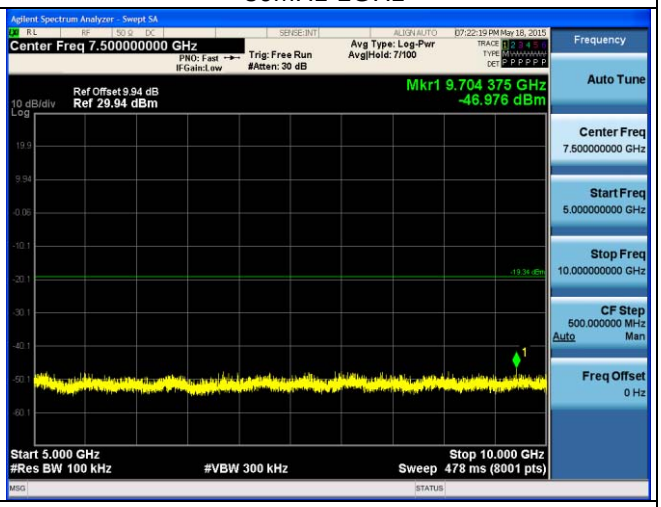
Reference level



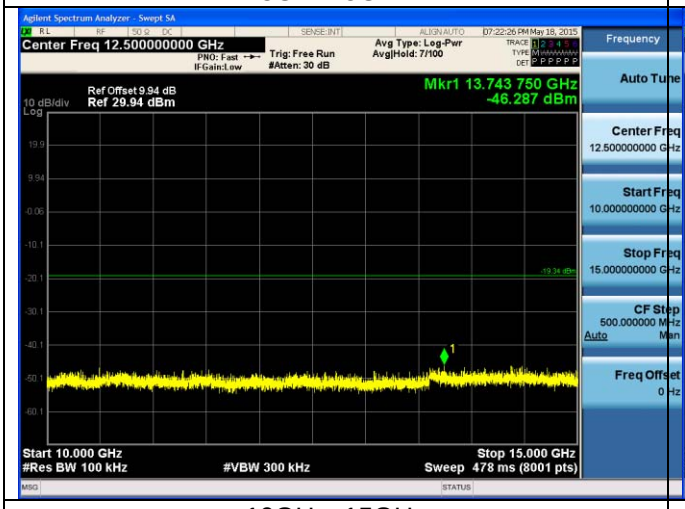
30MHz-1GHz



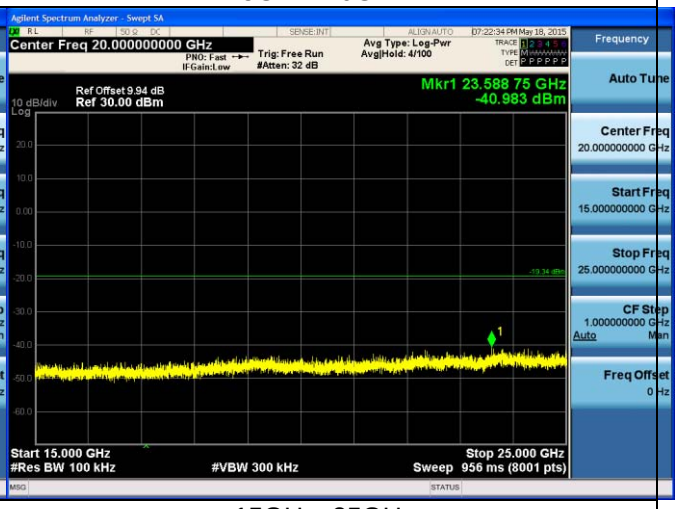
3GHz~5GHz



5GHz~10GHz



10GHz~15GHz

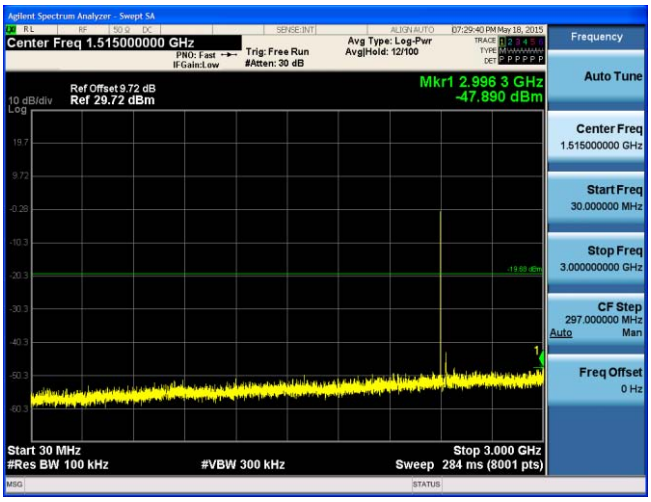


15GHz~25GHz

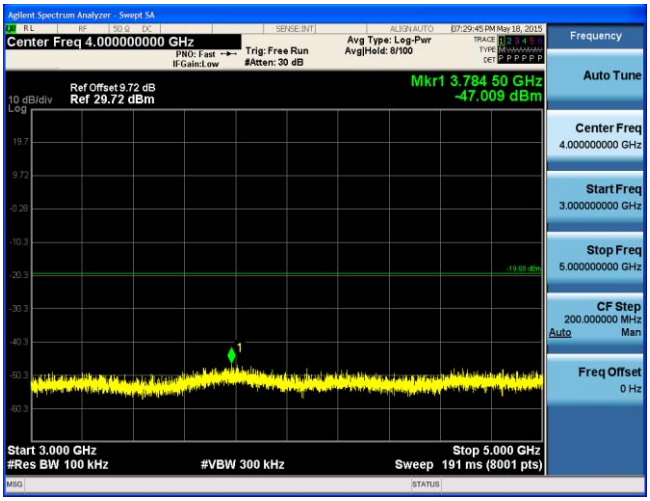
4.9.2 8DPSK Test Mode

Test Mode:	8DSPSK	Test channel :	00

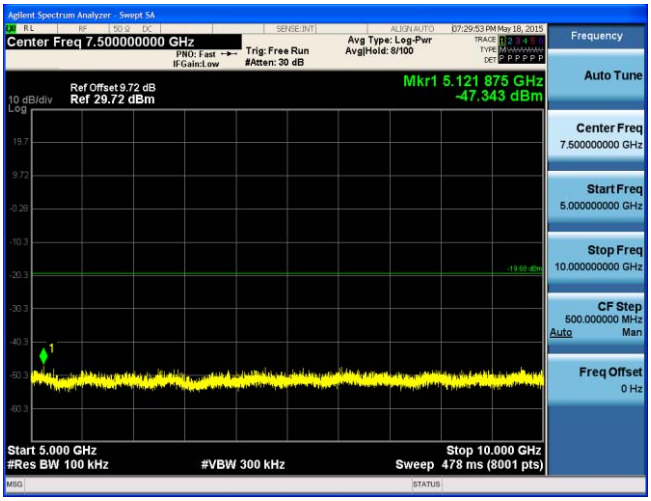
Reference level



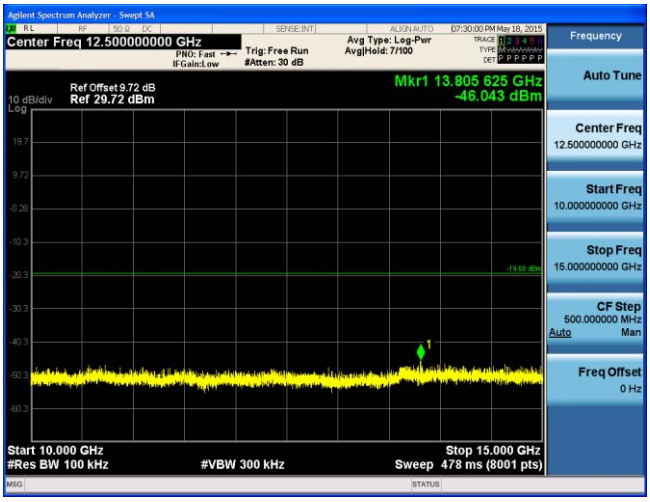
30MHz-1GHz



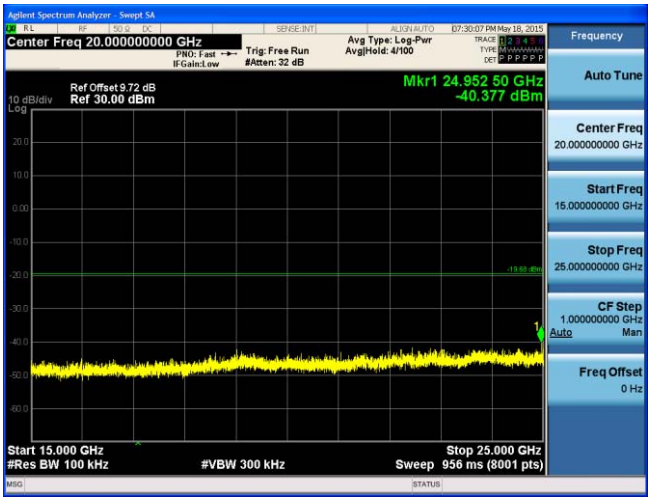
3GHz~5GHz



5GHz~10GHz



10GHz~15GHz

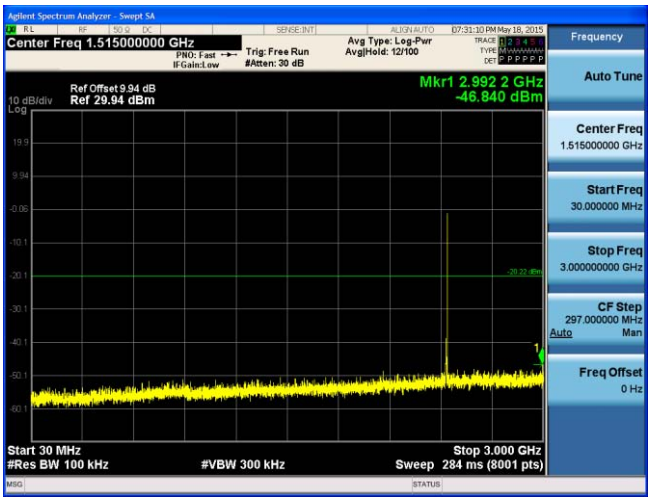


15GHz~25GHz

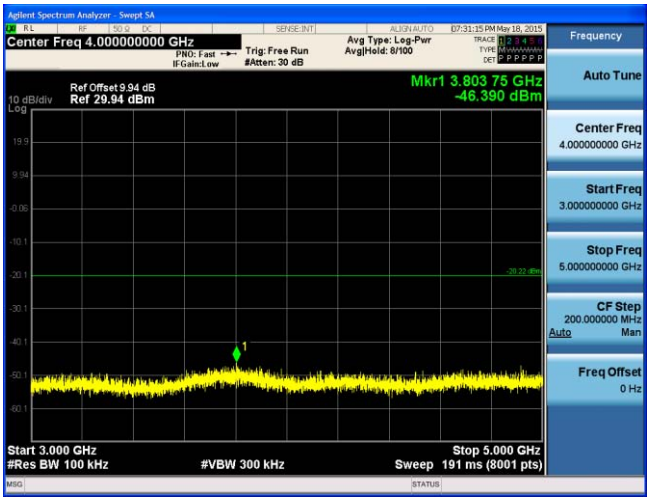
5.

Test Mode:	8DSPSK	Test channel :	39

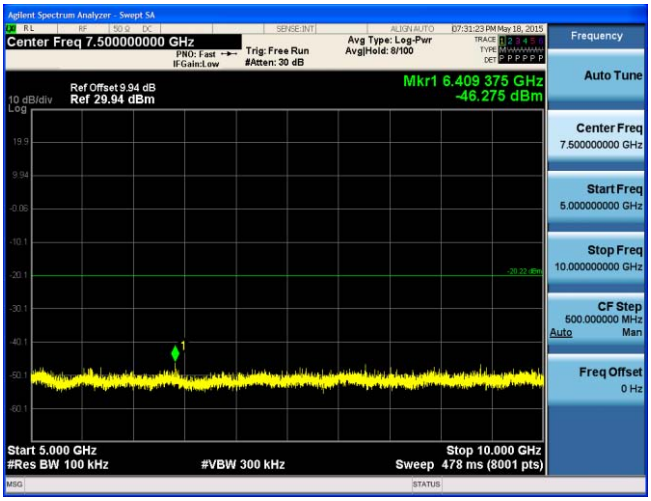
Reference level



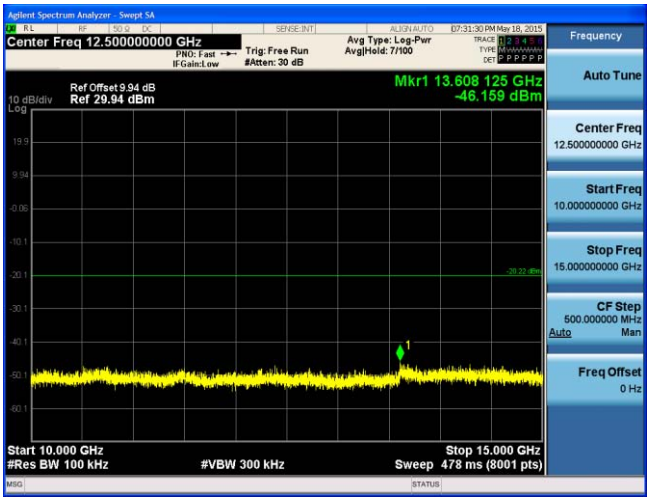
30MHz-1GHz



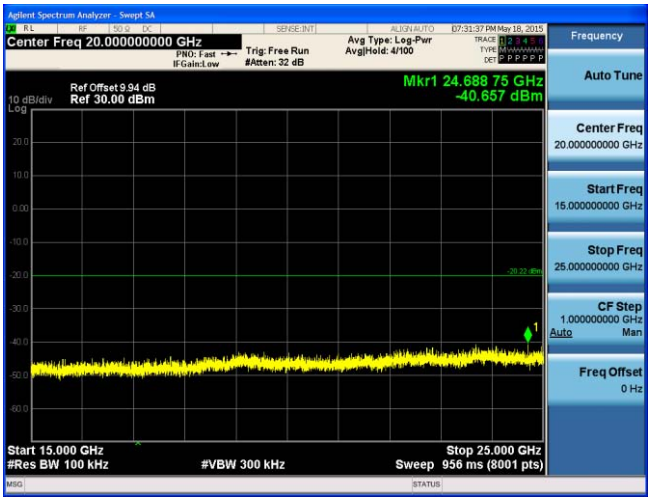
3GHz~5GHz



5GHz~10GHz



10GHz~15GHz

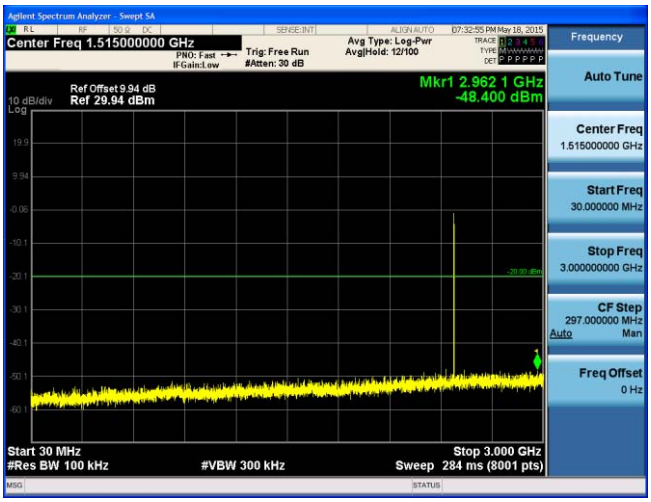


15GHz~25GHz

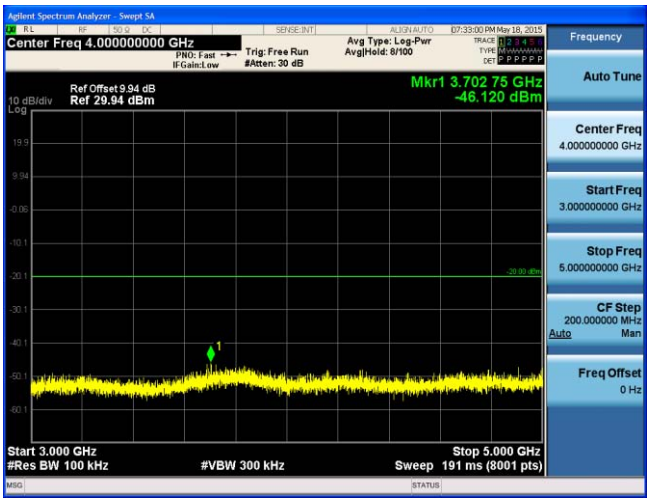
6.

Test Mode:	8DSPSK	Test channel :	78

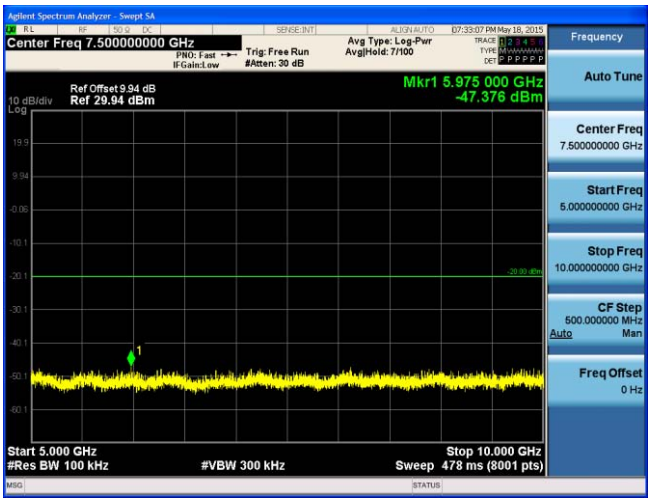
Reference level



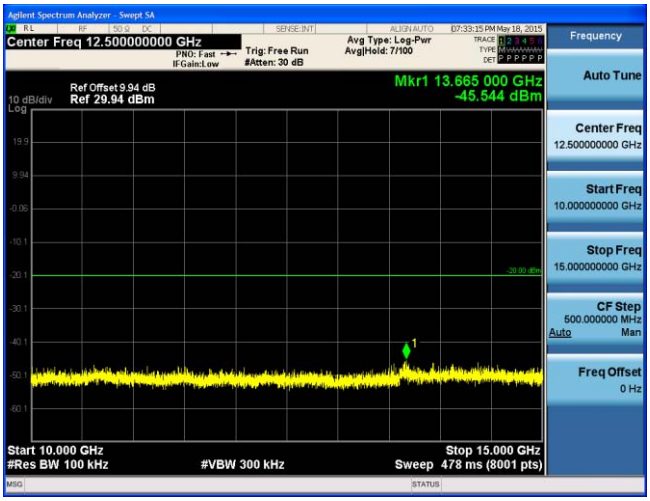
30MHz-1GHz



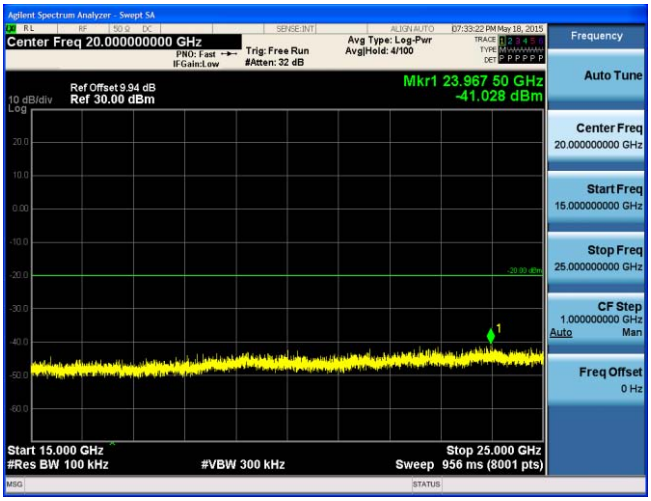
3GHz~5GHz



5GHz~10GHz



10GHz~15GHz



15GHz~25GHz

6.1. Pseudorandom Frequency Hopping Sequence

TEST APPLICABLE

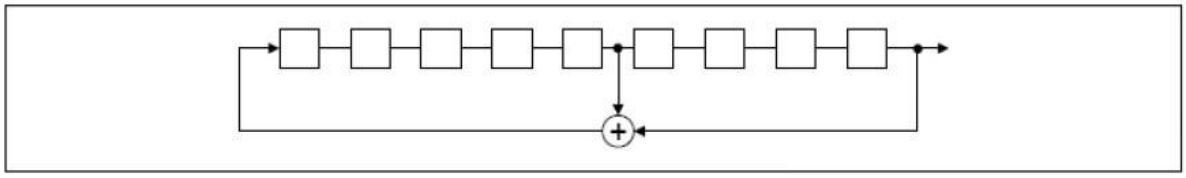
For 47 CFR Part 15C section 15.247 (a)(1) requirement:

Frequency hopping systems shall have hopping channel carrier fre-quencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hop-ping channel, whichever is greater. Al-ternatively, frequency hopping systems operating in the 2400–2483.5 MHz band may have hopping channel carrier fre-quencies that are separated by 25 kHz or two-thirds of the 20 dB bandwidth of the hopping channel, whichever is greater, provided the systems operate with an output power no greater than 125 mW. The system shall hop to chan-nel frequencies that are selected at the system hopping rate from a pseudo ran-domly ordered list of hopping fre-quencies. Each frequency must be used equally on the average by each trans-mitter. The system receivers shall have input bandwidths that match the hop-ping channel bandwidths of their cor-responding transmitters and shall shift frequencies in synchronization with the transmitted signals.

EUT Pseudorandom Frequency Hopping Sequence Requirement

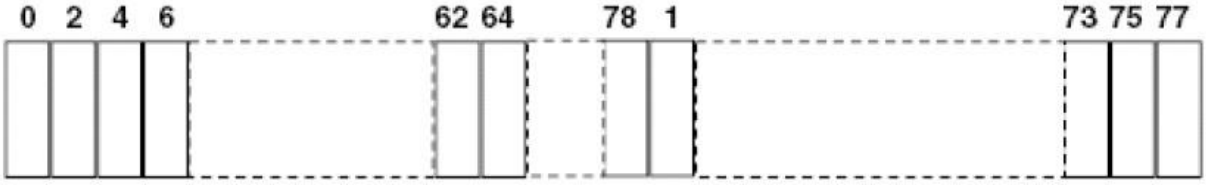
The pseudorandom frequency hopping sequence may be generated in a nice-stage shift register whose 5th and 9th stage outputs are added in a modulo-two addition stage.And the result is fed back to the input of the frist stage.The sequence begins with the frist one of 9 consecutive ones,for example:the shift register is initialized with nine ones.

- Number of shift register stages:9
- Length of pseudo-random sequence:29-1=511 bits
- Longest sequence of zeros:8(non-inverted signal)



Linear Feedback Shift Register for Generation of the PRBS sequence

An explame of pseudorandom frequency hopping sequence as follows:



Each frequency used equally one the average by each transmitter.
The system receiver have input bandwidths that match the hopping channel bandwidths of their corresponding transmitter and shift frequencies in synchronization with the transmitted signals.

6.2. 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.

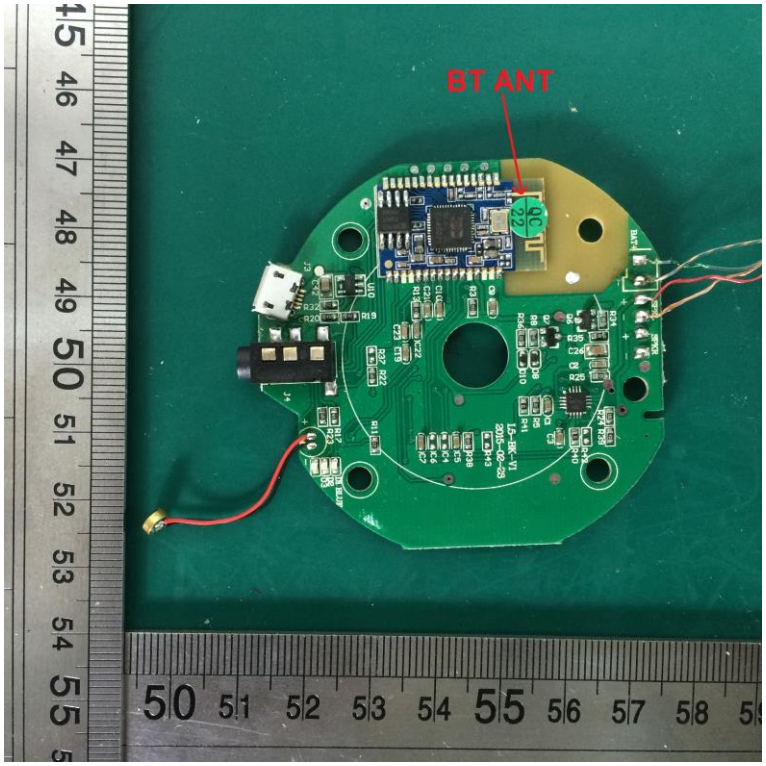
And according to FCC 47 CFR Section 15.247 (c), if transmitting antennas of directional gain greater than 6dBi are used, the power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6dBi.

Refer to statement below for compliance

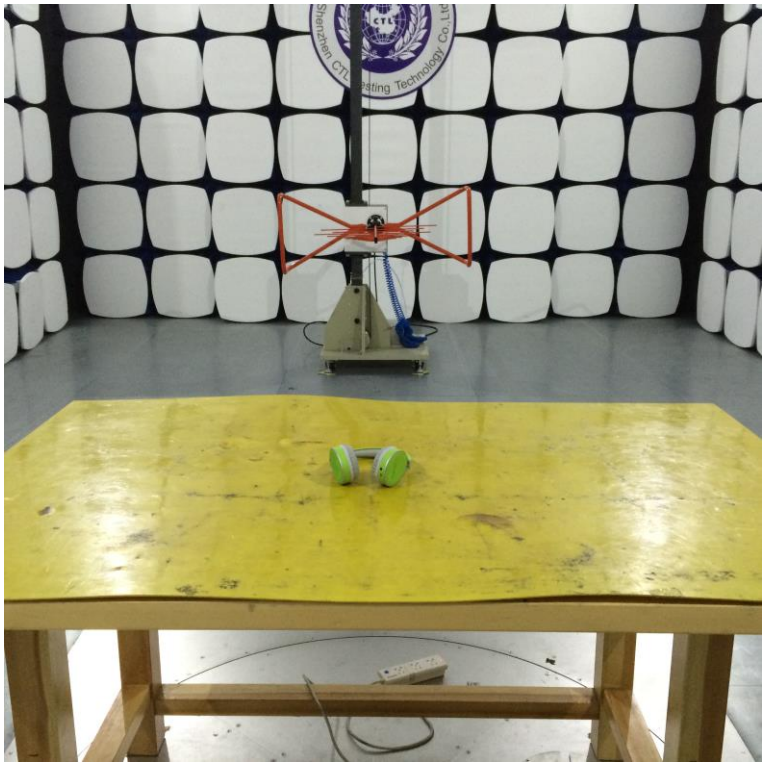
The manufacturer may design the unit so that the user can replace a broken antenna, but the use of a standard antenna jack or electrical connector is prohibited. Further, this requirement does not apply to intentional radiators that must be professionally installed.

Antenna Connected Construction

The maximum gain of Bluetooth antenna was 0.00dBi.



7. Test Setup Photos of the EUT



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