

RADIO TEST REPORT

FCC 47 CFR PART 15 SUBPART C

Test Standard	FCC Part 15.247
FCC ID	2ANNL-SPK-080
Product name	XTREME OUTDOOR SOUNDBAR
Brand Name	peerless-AV
Model Name	SPK-080
Test Result	Pass

The test Result was tested by Compliance Certification Services Inc. The test data, data evaluation, test procedures, and equipment configurations shown in this report were given in ANSI C63.10: 2013 and compliance standards.

The test results of this report relate only to the tested sample (EUT) identified in this report.

The test Report of full or partial shall not copy. Without written approval of Compliance Certification Services Inc.(Tainan Laboratory)



Approved by:

A handwritten signature in black ink, appearing to read "Jeter Wu", is written over a light gray rectangular background.

Jeter Wu
Assistant Manager

Tested by:

A handwritten signature in black ink, appearing to read "Ed Chiang", is written in a cursive style.

Ed Chiang
Engineer

Revision History

Rev.	Issue Date	Revisions	Revised By
00	August 7, 2017	Initial Issue	Vicki Huang
01	October 16, 2017	1. Modify Section 1.8, Section 4.8.2 Test procedure, KDB558074 D01 version in P.8, 34 2. Added BR-2M peak and average output power in P.20 3. Delete model name SP-6801	Vicki Huang
02	November 22, 2017	1. Revised section 1.8 in page 9. 2. Added note in page 32.	Angel Cheng

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1. GENERAL INFORMATION

1.1 EUT INFORMATION

Applicant	Peerless Industries, Inc. 2300 White Oak Circle, Aurora, IL 60502 USA
Equipment	XTREME OUTDOOR SOUNDBAR
Model No.	SPK-080
Model Discrepancy	N/A
Received Date	June 29, 2017
Date of Test	July 27~ August 4, 2017
Output Power(W)	GFSK : 0.0044 (EIRP : 0.0054) 8DPSK :0.0044 (EIRP : 0.0054)
Power Supply	Power from AC power cable.

1.2 EUT CHANNEL INFORMATION

Frequency Range	2402MHz-2480MHz
Modulation Type	1. GFSK for BR-1Mbps 2. $\pi/4$ -DQPSK for EDR-2Mbps 3. 8DPSK for EDR-3Mbps
Number of channel	79 Channels

Remark:

Refer as ANSI 63.10:2013 clause 5.6.1 Table 4 for test channels

Number of frequencies to be tested		
Frequency range in which device operates	Number of frequencies	Location in frequency range of operation
☐ 1 MHz or less	1	Middle
☐ 1 MHz to 10 MHz	2	1 near top and 1 near bottom
☒ More than 10 MHz	3	1 near top, 1 near middle, and 1 near bottom

1.3 ANTENNA INFORMATION

Antenna Type	☐ PIFA ☐ PCB ☐ Dipole ☐ Coils ☒ omni-directional
Antenna Gain	Gain: -0.61dBi

1.4 MEASUREMENT UNCERTAINTY

PARAMETER	UNCERTAINTY
AC Powerline Conducted Emission	+/- 1.2575
Emission bandwidth, 20dB bandwidth	+/- 1.4003
RF output power, conducted	+/- 1.1372
Power density, conducted	+/- 1.4003
3M Semi Anechoic Chamber / 30M~200M	+/- 4.0138
3M Semi Anechoic Chamber / 200M~1000M	+/- 3.9483
3M Semi Anechoic Chamber / 1G~8G	+/- 2.5975
3M Semi Anechoic Chamber / 8G~18G	+/- 2.6112
3M Semi Anechoic Chamber / 18G~26G	+/- 2.7389
3M Semi Anechoic Chamber / 26G~40G	+/- 2.9683
3M Semi Anechoic Chamber / 40G~60G	+/- 1.8509
3M Semi Anechoic Chamber / 60G~75G	+/- 1.9869
3M Semi Anechoic Chamber / 75G~110G	+/- 2.9651
3M Semi Anechoic Chamber / 110G~170G	+/- 2.7807
3M Semi Anechoic Chamber / 170G~220G	+/- 3.6437
3M Semi Anechoic Chamber / 220G~325G	+/- 4.2982

Remark:

1. This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of $k=2$
2. ISO/IEC 17025 requires that an estimate of the measurement uncertainties associated with the emissions test results be included in the report.

1.5 FACILITIES AND TEST LOCATION

All measurement facilities used to collect the measurement data are located at
No.8, Jiucengling, Xinhua Dist., Tainan City 712, Taiwan (R.O.C.)

Test site	Test Engineer	Remark
AC Conduction Room	Eric Lee	
Radiation	Ed Chiang	
RF Conducted	Eric Lee	

Remark: The sites are constructed in conformance with the requirements of ANSI C63.7, ANSI C63.4 and CISPR Publication 22.

1.6 INSTRUMENT CALIBRATION

RF Conducted Test Site					
Equipment	Manufacturer	Model	S/N	Cal Date	Cal Due
BNC Coaxial Cable	CCS	BNC50	11	01/13/2017	01/12/2018
EMI Test Receiver	R&S	ESCS 30	100348	12/12/2016	12/11/2017
LISN	SCHWARZBECK	NNLK8130	8130124	11/08/2016	11/07/2017
LISN	FCC	FCC-LISN-50-32-2	08009	05/08/2017	05/07/2018
Pulse Limiter	R&S	ESH3-Z2	100116	01/13/2017	01/12/2018
BNC Coaxial Cable	CCS	BNC50	11	01/13/2017	01/12/2018

3M 966 Chamber Test Site					
Equipment	Manufacturer	Model	S/N	Cal Date	Cal Due
Active Loop Antenna	ETS-LINDREN	6502	8905-2356	07/20/2017	07/19/2019
Amplifier	HP	8447F	2443A01671	01/18/2017	01/17/2018
Bi-Log Antenna	Sunol	JB1	A070506-2	07/22/2017	07/21/2018
Cable	HUBER+SUHNER	SUCOFLEX 104PEA	SN25737 /4PEA	01/18/2017	01/17/2018
Double Ridged Guide Horn Antenna	ETS-LINDGREN	3116	00078900	03/20/2017	03/19/2019
EMI Test Receiver	R&S	ESCS 30	100294	12/02/2016	12/01/2017
EXA Spectrum Analyzer	KEYSIGHT	N9010A	MY54430216	05/09/2017	05/08/2018
Horn Antenna	Com-Power	AH-118	071032	02/09/2017	02/08/2018
Pre-Amplifier	EMCI	EMC012645	980098	01/17/2017	01/16/2018

AC Conducted Emissions Test Site					
Equipment	Manufacturer	Model	S/N	Cal Date	Cal Due
BNC Coaxial Cable	CCS	BNC50	11	01/13/2017	01/12/2018
EMI Test Receiver	R&S	ESCS 30	100348	12/12/2016	12/11/2017
Four BALACED PAIR ISN	FCC	F-071115-1057-1-09	111130	11/16/2016	11/15/2017
LISN	SCHWARZBECK	NNLK8130	8130124	11/08/2016	11/07/2017
LISN	FCC	FCC-LISN-50-32-2	08009	05/08/2017	05/07/2018
Pulse Limiter	R&S	ESH3-Z2	100116	01/13/2017	01/12/2018

Remark: Each piece of equipment is scheduled for calibration once a year.

1.7 SUPPORT AND EUT ACCESSORIES EQUIPMENT

EUT Accessories Equipment					
No.	Equipment	Brand	Model	Series No.	FCC ID
	N/A				

Support Equipment					
No.	Equipment	Brand	Model	Series No.	FCC ID
1	NB(D)	ASUS	A8J	N/A	N/A

1.8 Test methodology and applied standards

The test methodology, setups and results comply with all requirements in accordance with ANSI C63.10:2013, FCC Part 2, FCC Part 15.247.

2. TEST SUMMERY

FCC Standard Section	Report Section	Test Item	Result
15.203	1.2	Antenna Requirement	Pass
15.207(a)	4.1	AC Conducted Emission	Pass
15.247(a)(1)	4.2	20 dB Bandwidth	Pass
-	4.2	Occupied Bandwidth (99%)	Pass
15.247(b)(1)	4.3	Output Power Measurement	Pass
15.247(a)(1)	4.4	Frequency Separation	Pass
15.247(a)(1)(iii)	4.5	Number of Hopping	Pass
15.247(d)	4.6	Conducted Band Edge	Pass
15.247(d)	4.6	Conducted Emission	Pass
15.247(a)(1)(iii)	4.7	Time of Occupancy	Pass
15.247(d)	4.8	Radiation Band Edge	Pass
15.247(d)	4.8	Radiation Spurious Emission	Pass

3. DESCRIPTION OF TEST MODES

3.1 THE WORST MODE OF OPERATING CONDITION

Operation mode	GFSK for BR-1Mbps (DH5) $\pi/4$ -DQPSK for EDR-2Mbps (DH5) 8DPSK for EDR-3Mbps (DH5)
Test Channel Frequencies	GFSK for BR-1Mbps: 1.Lowest Channel : 2402MHz 2.Middle Channel : 2441MHz 3.Highest Channel : 2480MHz $\pi/4$-DQPSK for EDR-2Mbps: 1.Lowest Channel : 2402MHz 2.Middle Channel : 2441MHz 3.Highest Channel : 2480MHz 8DPSK for EDR-3Mbps: 1.Lowest Channel : 2402MHz 2.Middle Channel : 2441MHz 3.Highest Channel : 2480MHz

Remark:

1. EUT pre-scanned data rate of output power for each mode, the worst data rate were recorded in this report.

3.2 THE WORST MODE OF MEASUREMENT

AC Power Line Conducted Emission	
Test Condition	AC Power line conducted emission for line and neutral
Voltage/Hz	120V/60Hz
Test Mode	Mode 1:EUT power by AC power cable.
Worst Mode	☒ Mode 1 ☐ Mode 2 ☐ Mode 3 ☐ Mode 4

Radiated Emission Measurement Above 1G	
Test Condition	Band edge, Emission for Unwanted and Fundamental
Voltage/Hz	120V/60Hz
Test Mode	Mode 1:EUT power by AC power cable.
Worst Mode	☒ Mode 1 ☐ Mode 2 ☐ Mode 3 ☐ Mode 4
Worst Position	☐ Placed in fixed position. ☒ Placed in fixed position at X-Plane (E2-Plane) ☐ Placed in fixed position at Y-Plane (E1-Plane) ☐ Placed in fixed position at Z-Plane (H-Plane)
Worst Polarity	☐ Horizontal ☒ Vertical

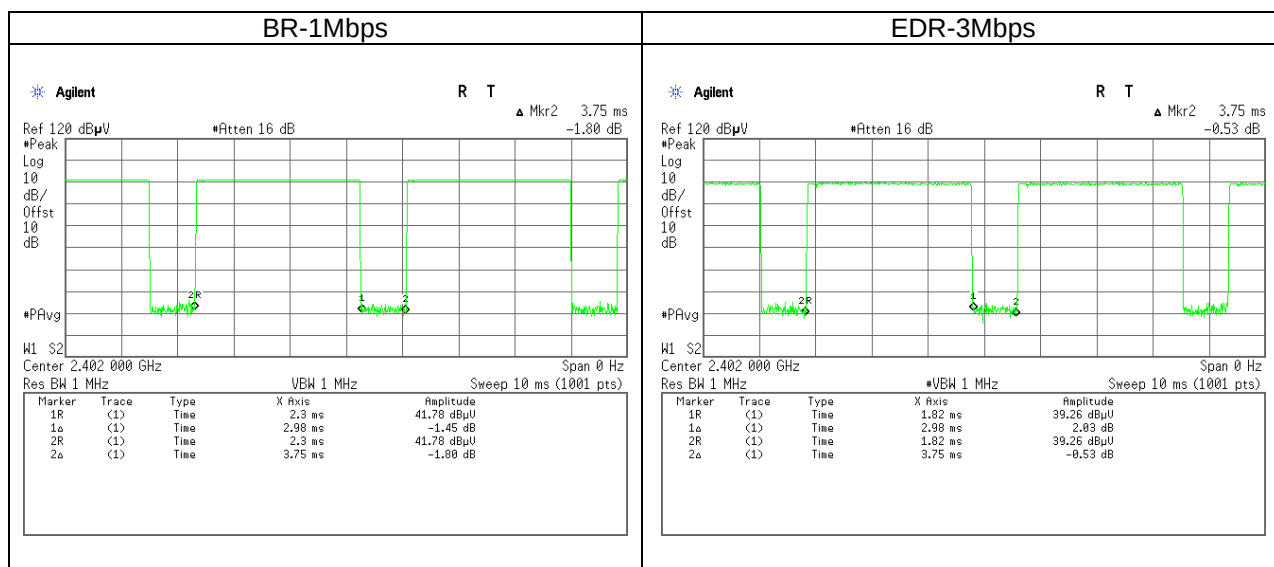
Radiated Emission Measurement Below 1G	
Test Condition	Radiated Emission Below 1G
Voltage/Hz	120V/60Hz
Test Mode	Mode 1:EUT power by AC power cable.
Worst Mode	☒ Mode 1 ☐ Mode 2 ☐ Mode 3 ☐ Mode 4

Remark:

1. The worst mode was record in this test report.
2. EUT pre-scanned in three axis ,X,Y, Z and two polarity, Horizontal and Vertical for radiated measurement. The worst case(X-Plane and Vertical) were recorded in this report
3. For below 1G, AC power line conducted emission and radiation emission were performed the EUT transmit at the highest output power channel as worse case.

3.3 EUT DUTY CYCLE

Duty Cycle				
Configuration	TX ON (ms)	TX ALL (ms)	Duty Cycle (%)	Duty Factor(dB)
BR-1Mbps	2.9800	3.7500	79.47%	1.00
EDR-3Mbps	2.9800	3.7500	79.47%	1.00



4. TEST RESULT

4.1 AC POWER LINE CONDUCTED EMISSION

4.1.1 Test Limit

According to §15.207(a),

Frequency Range (MHz)	Limits(dB μ V)	
	Quasi-peak	Average
0.15 to 0.50	66 to 56*	56 to 46*
0.50 to 5	56	46
5 to 30	60	50

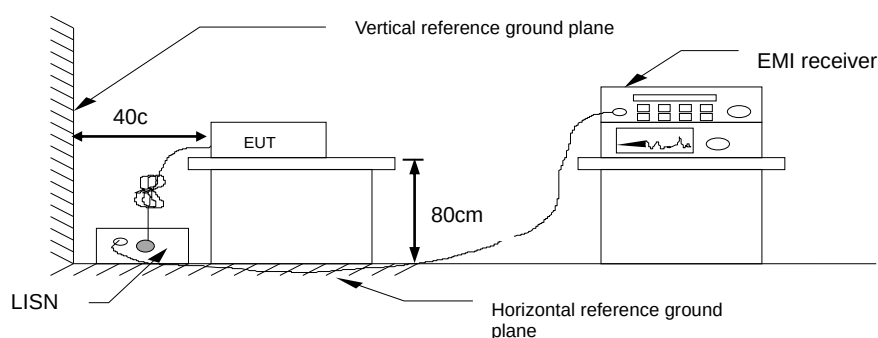
* Decreases with the logarithm of the frequency.

4.1.2 Test Procedure

Test method Refer as ANSI 63.10:2013 clause 6.2,

1. The EUT was placed on a non-conducted table, which is 0.8m above horizontal ground plane and 0.4m above vertical ground plane.
2. EUT connected to the line impedance stabilization network (LISN)
3. Receiver set RBW of 9kHz and Detector Peak, and note as quasi-peak and average.
4. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
5. Recorded Line for Neutral and Line.

4.1.3 Test Setup

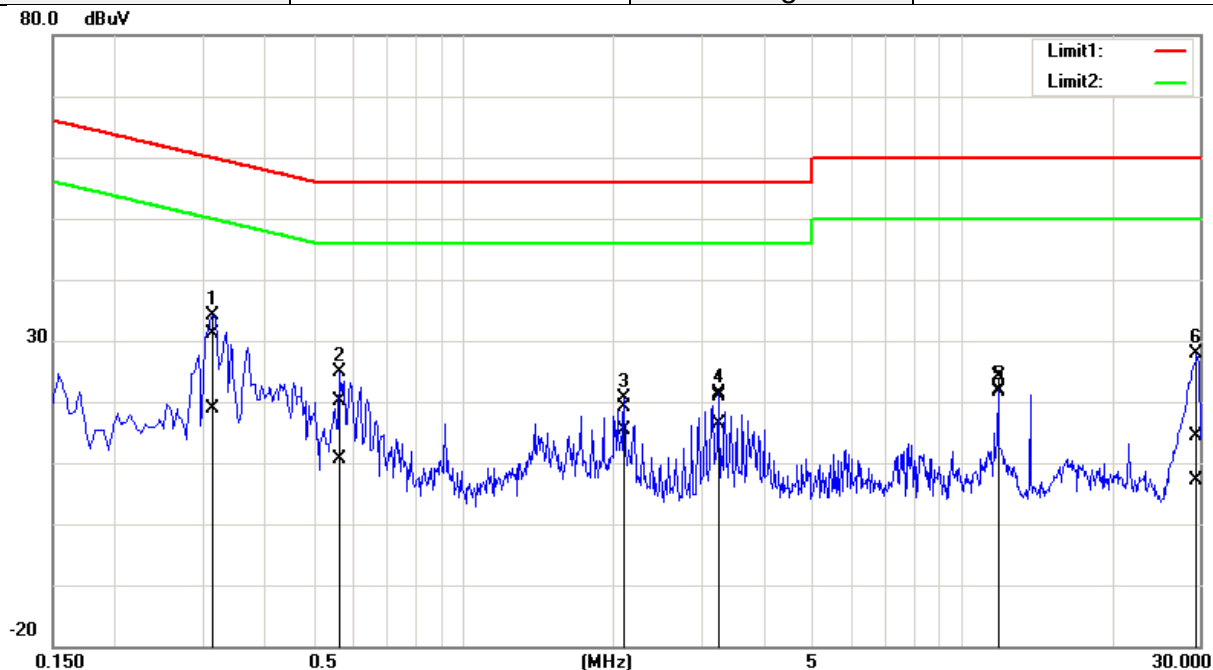


4.1.4 Test Result

PASS

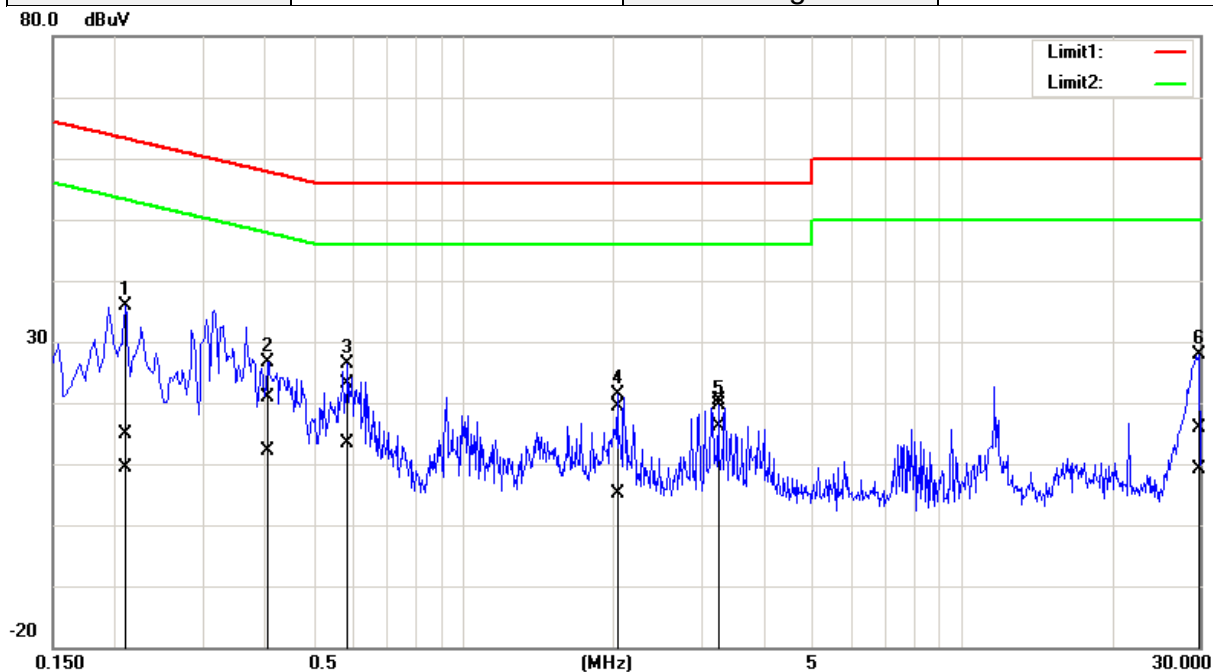
Test Data

Test Mode:	Mode 1	Temp/Hum	24(°C)/ 50%RH
Test Voltage:	120Vac / 60Hz	Test Date	2017/8/4
Phase:	Line	Test Engineer	Eric Lee



No.	Frequency (MHz)	QuasiPeak reading (dBuV)	Average reading (dBuV)	Correction factor (dB)	QuasiPeak result (dBuV)	Average result (dBuV)	QuasiPeak limit (dBuV)	Average limit (dBuV)	QuasiPeak margin (dB)	Average margin (dB)
1	0.3140	31.27	18.82	-0.04	31.23	18.78	59.86	49.86	-28.63	-31.08
2	0.5660	20.18	10.77	-0.05	20.13	10.72	56.00	46.00	-35.87	-35.28
3	2.1060	19.15	15.40	-0.06	19.09	15.34	56.00	46.00	-36.91	-30.66
4	3.2540	20.83	16.50	-0.05	20.78	16.45	56.00	46.00	-35.22	-29.55
5*	11.8140	24.05	21.55	0.10	24.15	21.65	60.00	50.00	-35.85	-28.35
6	29.6180	15.07	7.80	-0.58	14.49	7.22	60.00	50.00	-45.51	-42.78

Test Mode:	Mode 1	Temp/Hum	24(°C)/ 50%RH
Test Voltage:	120Vac / 60Hz	Test Date	2017/8/4
Phase:	Neutral	Test Engineer	Eric Lee



No.	Frequency (MHz)	QuasiPeak reading (dBuV)	Average reading (dBuV)	Correction factor (dB)	QuasiPeak result (dBuV)	Average result (dBuV)	QuasiPeak limit (dBuV)	Average limit (dBuV)	QuasiPeak margin (dB)	Average margin (dB)
1	0.2100	14.96	9.37	-0.10	14.86	9.27	63.21	53.21	-48.35	-43.94
2	0.4060	20.93	12.30	-0.13	20.80	12.17	57.73	47.73	-36.93	-35.56
3	0.5860	23.26	13.41	-0.13	23.13	13.28	56.00	46.00	-32.87	-32.72
4	2.0380	19.51	5.25	-0.14	19.37	5.11	56.00	46.00	-36.63	-40.89
5*	3.2540	20.55	16.18	-0.13	20.42	16.05	56.00	46.00	-35.58	-29.95
6	29.9660	16.43	9.63	-0.48	15.95	9.15	60.00	50.00	-44.05	-40.85

4.2 20DB BANDWIDTH AND OCCUPIED BANDWIDTH(99%)

4.2.1 Test Limit

According to §15.247(a) (1),

20 dB Bandwidth : For reporting purposes only.

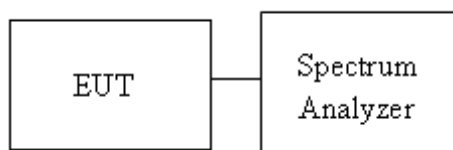
Occupied Bandwidth(99%) : For reporting purposes only.

4.2.2 Test Procedure

Test method Refer as ANSI 63.10:2013 clause 6.9.2 & 6.9.3.

1. The EUT RF output connected to the spectrum analyzer by RF cable.
2. Setting maximum power transmit of EUT
3. SA set RBW = 30kHz, VBW = 100kHz and Detector = Peak, to measurement 20 dB Bandwidth and 99% Bandwidth.
4. Measure and record the result of 20 dB Bandwidth and 99% Bandwidth. in the test report.

4.2.3 Test Setup

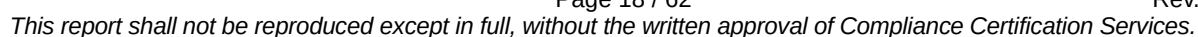


4.2.4 Test Result

Test mode: GFSK_BR-1Mbps mode / 2402-2480 MHz			
Channel	Frequency (MHz)	OBW(99%) (MHz)	20dB BW (MHz)
Low	2402	0.8683	0.9478
Mid	2441	0.8596	0.9434
High	2480	0.8596	0.9434

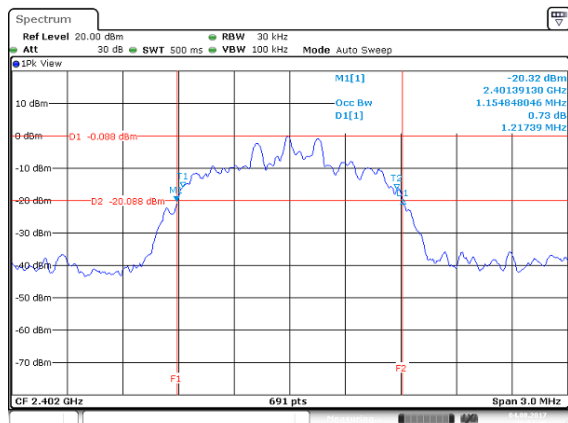
Test mode: 8DPSK_EDR-3Mbps mode / 2402-2480 MHz			
Channel	Frequency (MHz)	OBW(99%) (MHz)	20dB BW (MHz)
Low	2402	1.1548	1.2173
Mid	2441	1.2199	1.2652
High	2480	1.2373	1.2773

GFSK_BR-1Mbps mode



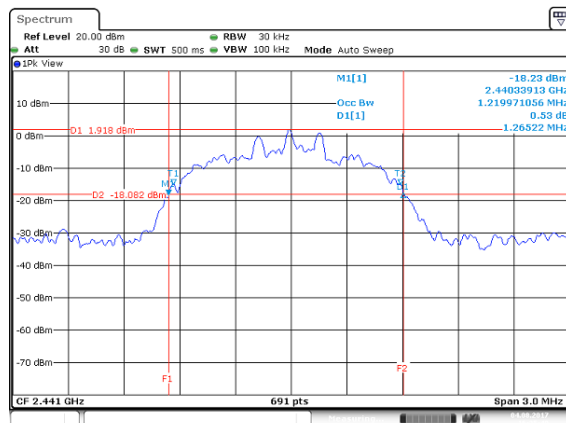
8DPSK_EDR-3Mbps mode

Low CH



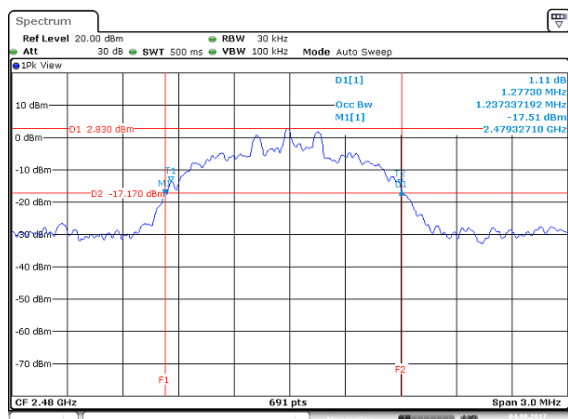
Date: 4.AUG.2017 16:51:19

Mid CH



Date: 4.AUG.2017 16:35:48

High CH



Date: 4.AUG.2017 16:58:42

4.3 OUTPUT POWER MEASUREMENT

4.3.1 Test Limit

According to §15.247(b)(1)

Peak output power :

FCC

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.

IC

For FHSs operating in the band 2400-2483.5 MHz, the maximum peak conducted output power shall not exceed 1.0 W and the e.i.r.p. shall not exceed 4 W if the hopset uses 75 or more hopping channels.

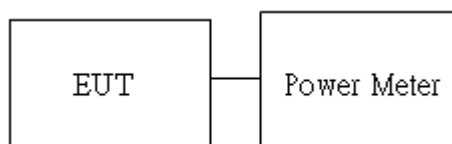
Limit	☒ Antenna not exceed 6 dBi : 21dBm ☐ Antenna with DG greater than 6 dBi : 21dBm [Limit = 30 – (DG – 6)]
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Average output power : For reporting purposes only.

4.3.2 Test Procedure

1. The EUT RF output connected to the power meter by RF cable.
2. Setting maximum power transmit of EUT.
3. The path loss was compensated to the results for each measurement.
4. Measure and record the result of Peak output power and Average output power. in the test report.

4.3.3 Test Setup



4.3.4 Test Result

Peak output power :

BT							
Config.	CH	Freq. (MHz)	PK Power (dBm)	EIRP PK Power (dBm)	PK Power (W)	EIRP PK Power (W)	FCC/IC Limit (dBm)
GFSK BR-1Mbps (DH5)	0	2402	4.34	5.23	0.0027	0.0033	21
	39	2441	4.72	5.61	0.0030	0.0036	
	78	2480	6.43	7.32	0.0044	0.0054	
$\pi/4$ -DQPSK EDR-2Mbps (DH5)	0	2402	3.12	4.01	0.0021	0.0025	
	39	2441	3.92	4.81	0.0025	0.0030	
	78	2480	6.19	7.08	0.0042	0.0051	
8DPSK EDR-3Mbps (DH5)	0	2402	3.65	4.54	0.0023	0.0028	
	39	2441	4.30	5.19	0.0027	0.0033	
	78	2480	6.45	7.34	0.0044	0.0054	

Average output power :

BT			
Config.	CH	Freq. (MHz)	AV Power (dBm)
GFSK BR-1Mbps (DH5)	0	2402	3.34
	39	2441	3.70
	78	2480	5.47
$\pi/4$ -DQPSK EDR-2Mbps (DH5)	0	2402	0.23
	39	2441	1.77
	78	2480	3.62
8DPSK EDR-3Mbps (DH5)	0	2402	0.53
	39	2441	2.06
	78	2480	3.98

Note:

We measure worst in EDR-3M, because the output powers less with EDR-2M.

4.4 FREQUENCY SEPARATION

4.4.1 Test Limit

According to §15.247(a)(1)

Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hopping channel, whichever is greater.

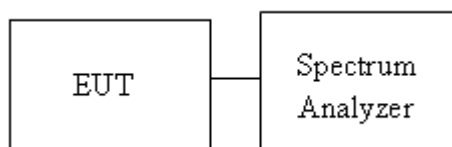
Alternatively, frequency hopping systems operating in the 2400-2483.5 MHz band may have hopping channel carrier frequencies that are separated by 25 kHz or two-thirds of the 20 dB bandwidth of the hopping channel, whichever is greater, provided the systems operate with an output power no greater than 125 mW.

Limit	> two-thirds of the 20 dB bandwidth
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4.4.2 Test Procedure

1. Place the EUT on the table and set it in transmitting mode.
2. EUT RF output port connected to the SA by RF cable.
3. Set the spectrum analyzer as RBW = 100kHz, VBW = 300kHz, Sweep = auto.
Max hold, mark 3 peaks of hopping channel and record the 3 peaks frequency

4.4.3 Test Setup



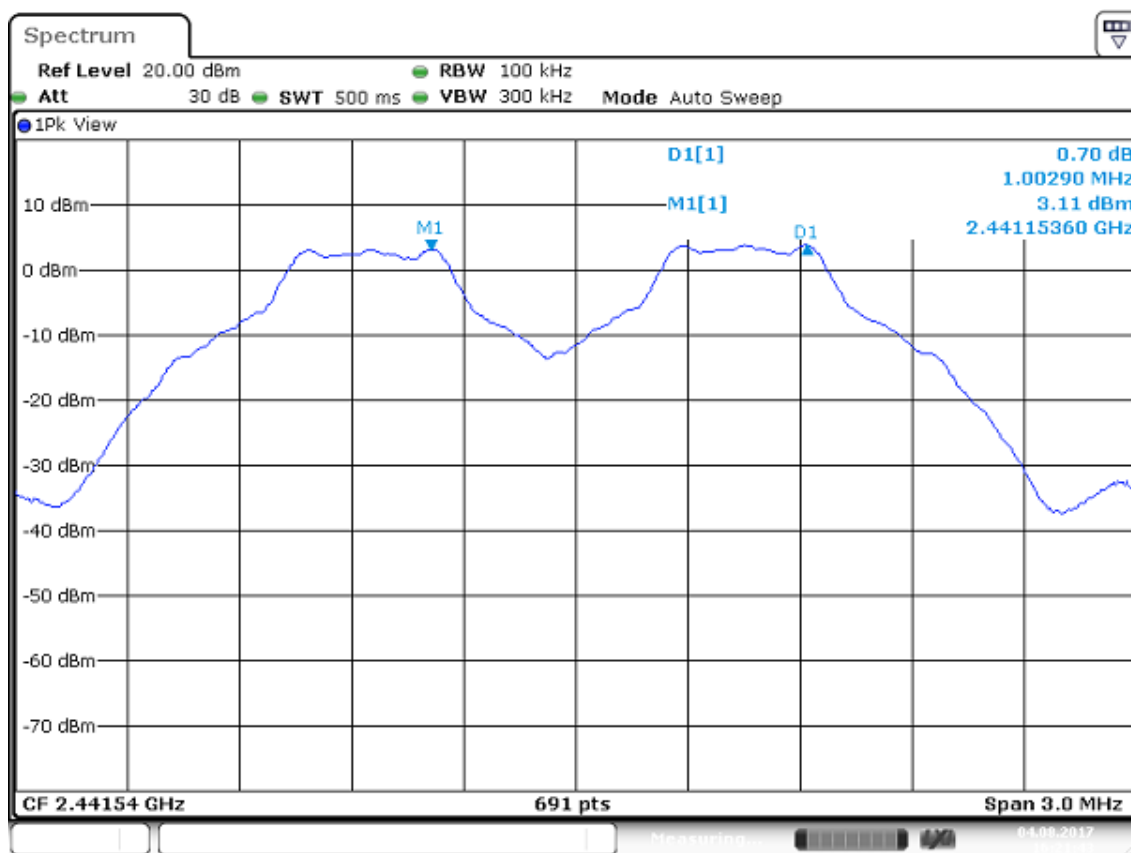
4.4.4 Test Result

Test mode: GFSK_BR-1Mbps mode / 2402-2480 MHz				
Channel	Frequency (MHz)	Channel Separation (MHz)	Channel Separation Limits (MHz)	Result
Low	2402	1.0029	0.6319	PASS
Mid	2441	1.0029	0.6289	PASS
High	2480	1.0029	0.6289	PASS

Test mode: 8DPSK_EDR-3Mbps mode / 2402-2480 MHz				
Channel	Frequency (MHz)	Channel Separation (MHz)	Channel Separation Limits (MHz)	Result
Low	2402	1.0029	0.8115	PASS
Mid	2441	1.0029	0.8435	PASS
High	2480	1.0029	0.8515	PASS

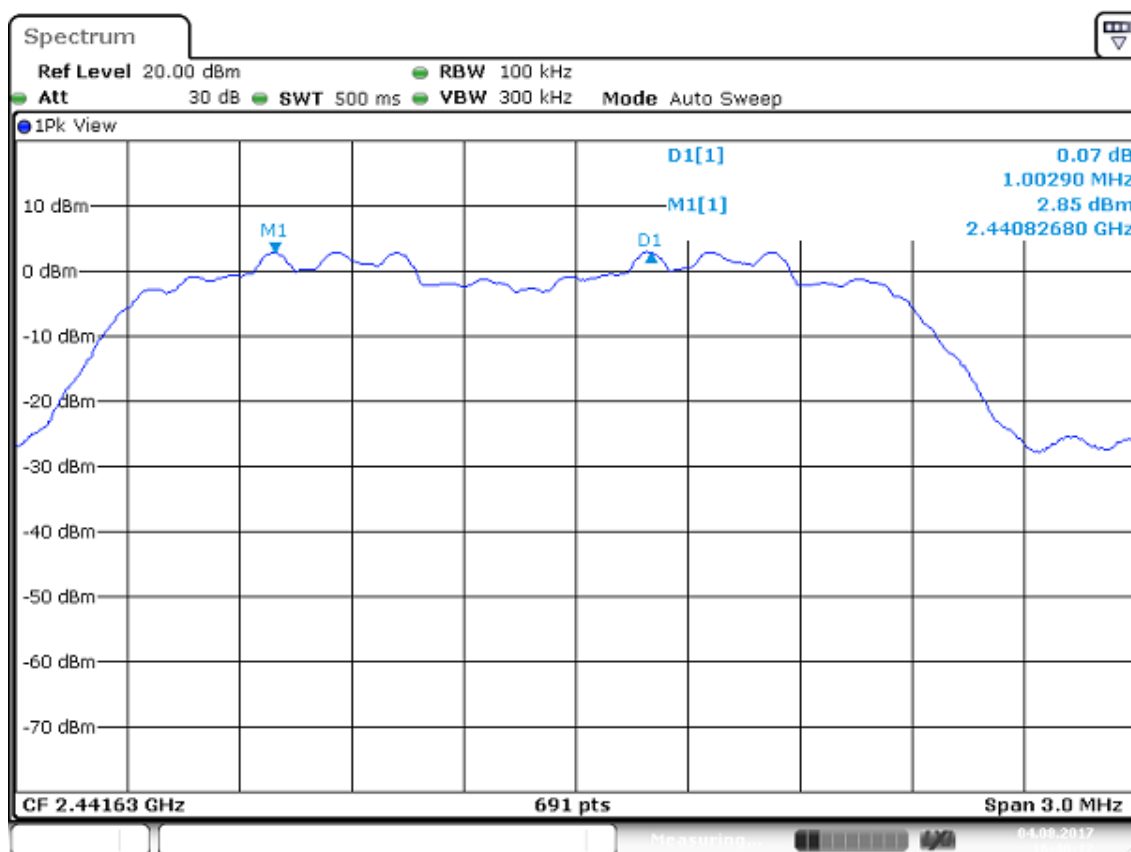
Test Data

GFSK BR-1Mbps mode



Date: 4.AUG.2017 16:21:42

8DPSK EDR-3Mbps mode



Date: 4.AUG.2017 16:40:11

4.5 NUMBER OF HOPPING

4.5.1 Test Limit

According to §15.247(a)(1)(iii)

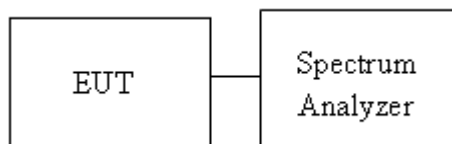
Frequency hopping system in the 2400-2483.5MHz band shall use at least 15 channels.

4.5.2 Test Procedure

Test method Refer as ANSI 63.10:2013 clause 7.8.3

1. Place the EUT on the table and set it in transmitting mode.
2. EUT RF output port connected to the SA by RF cable.
3. Set spectrum analyzer Start Freq. = 2400 MHz, Stop Freq. = 2483.5 MHz, RBW = 100KHz, VBW = 300KHz.
4. Max hold, view and count how many channel in the band.

4.5.3 Test Setup



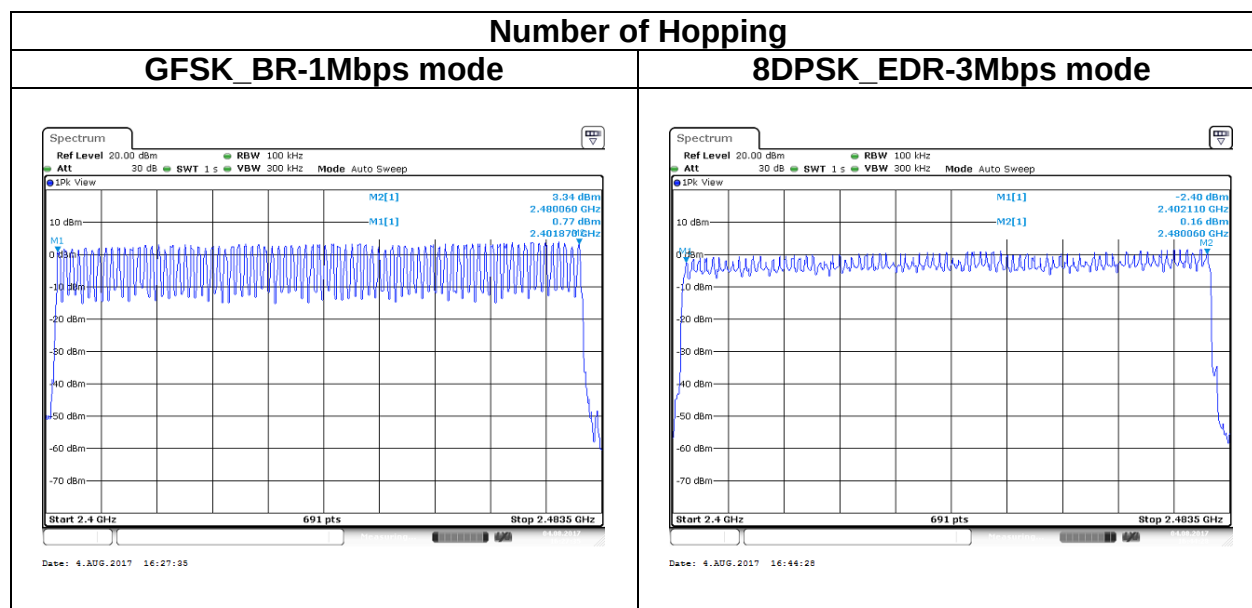
4.5.4 Test Result

Number of Hopping				
Mode	Frequency (MHz)	Hopping Channel Number	Hopping Channel Number Limits	Result
BR-1Mbps	2402-2480	79	15	Pass
EDR-3Mbps	2402-2480	79	15	

REMARK:

The frequency spectrum was broken up in to two sub-range to clearly show all of the hopping frequencies. In the AFH mode, this device operation was using 20 channels, so the requirement for minimum number of hopping channels is satisfied

Test Data



4.6 CONDUCTED BANDEDGE AND SPURIOUS EMISSION

4.6.1 Test Limit

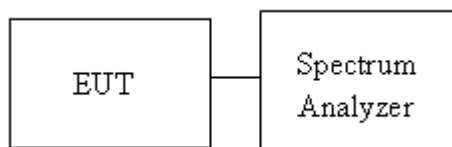
According to §15.247(d)

Limit	-20 dBc
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4.6.2 Test Procedure

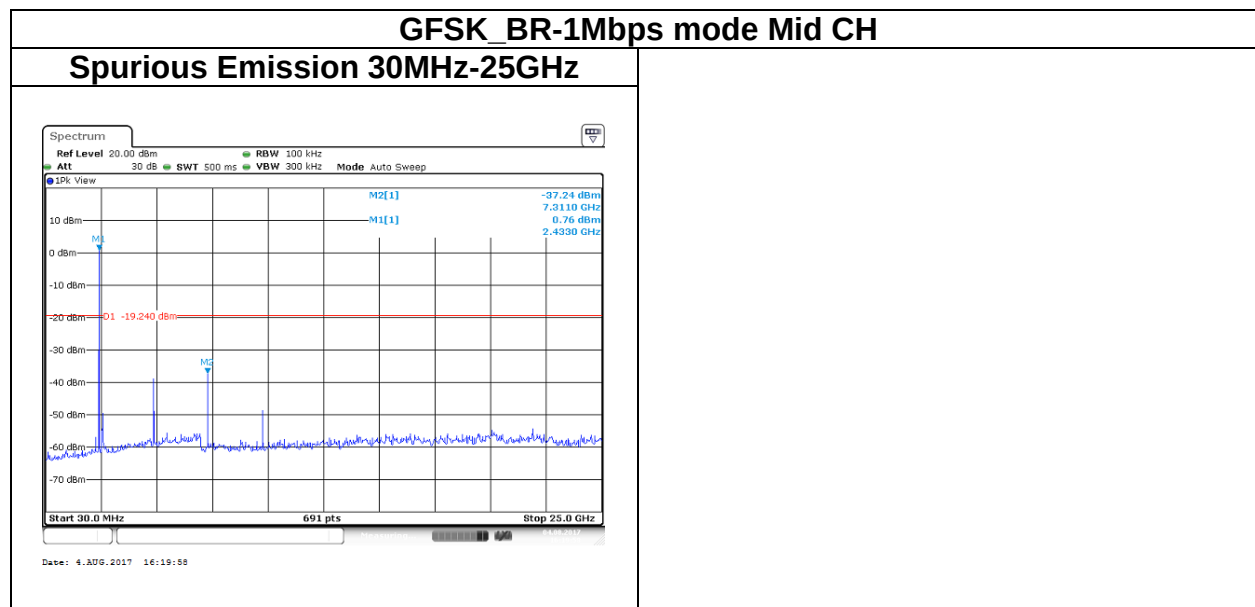
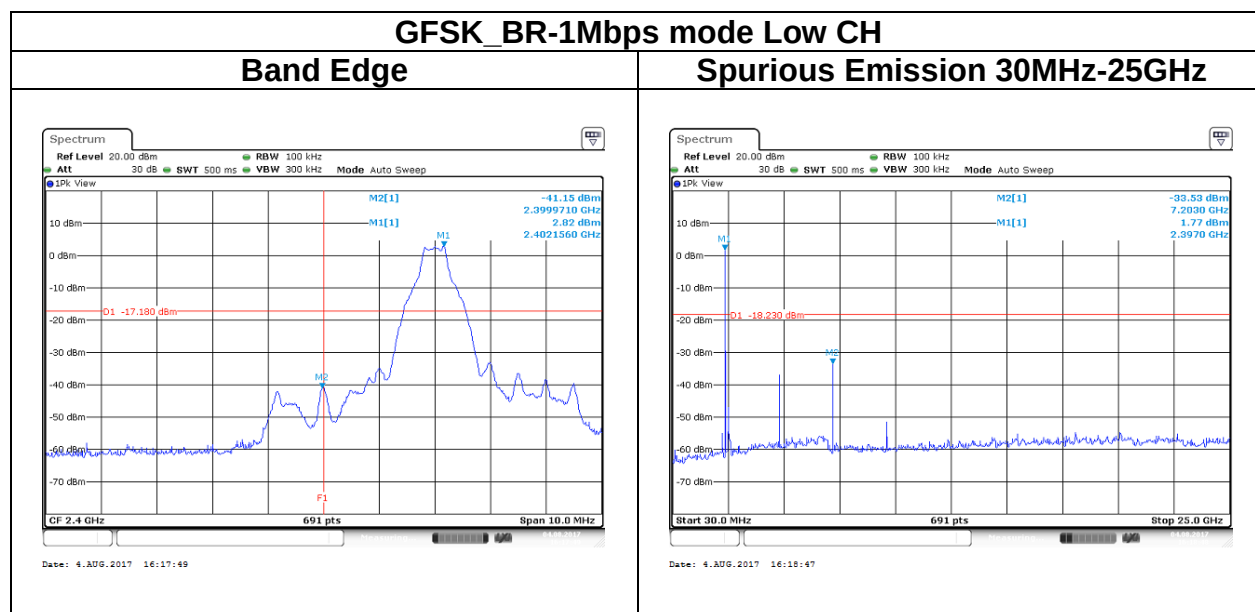
1. EUT RF output port connected to the SA by RF cable, and the path loss was compensated to result.
2. SA setting, RBW=100kHz, VBW=300kHz, Detector=Peak, Trace mode = max hold, SWT = Auto.
3. The Band Edge at 2.4GHz and 2.4835GHz are investigated with normal hopping mode.

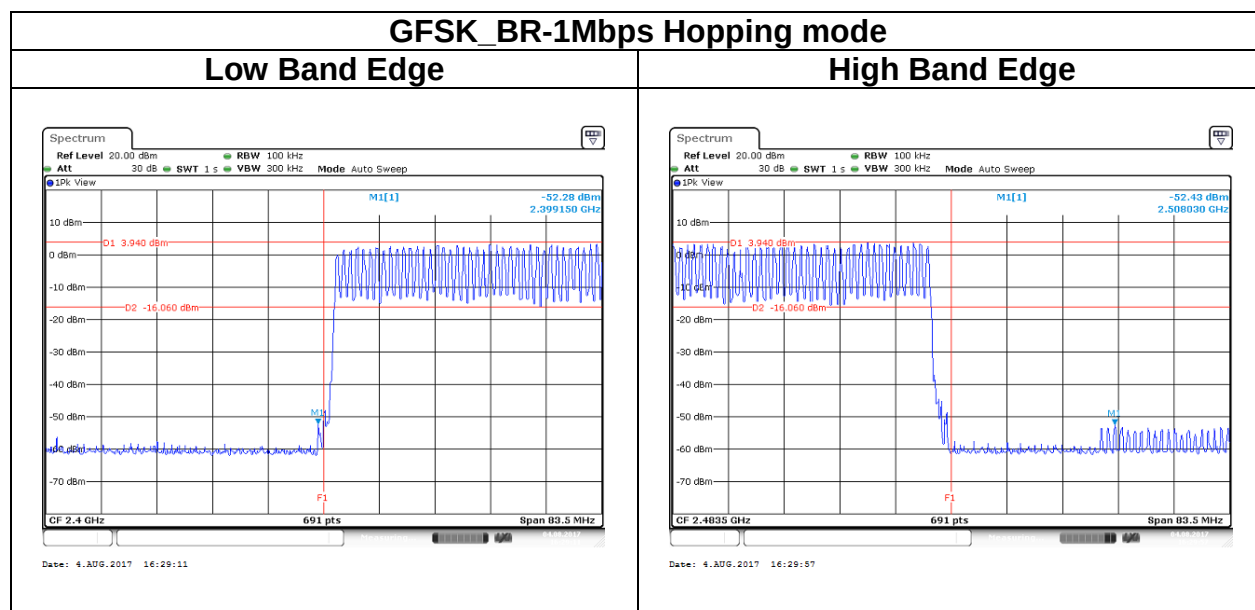
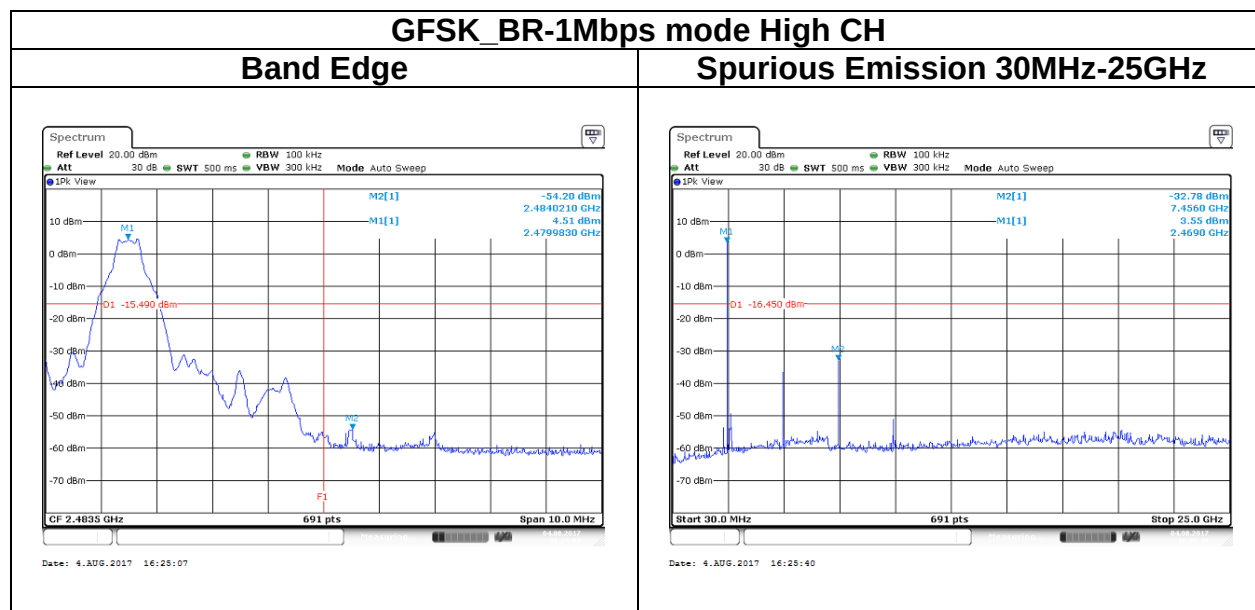
4.6.3 Test Setup

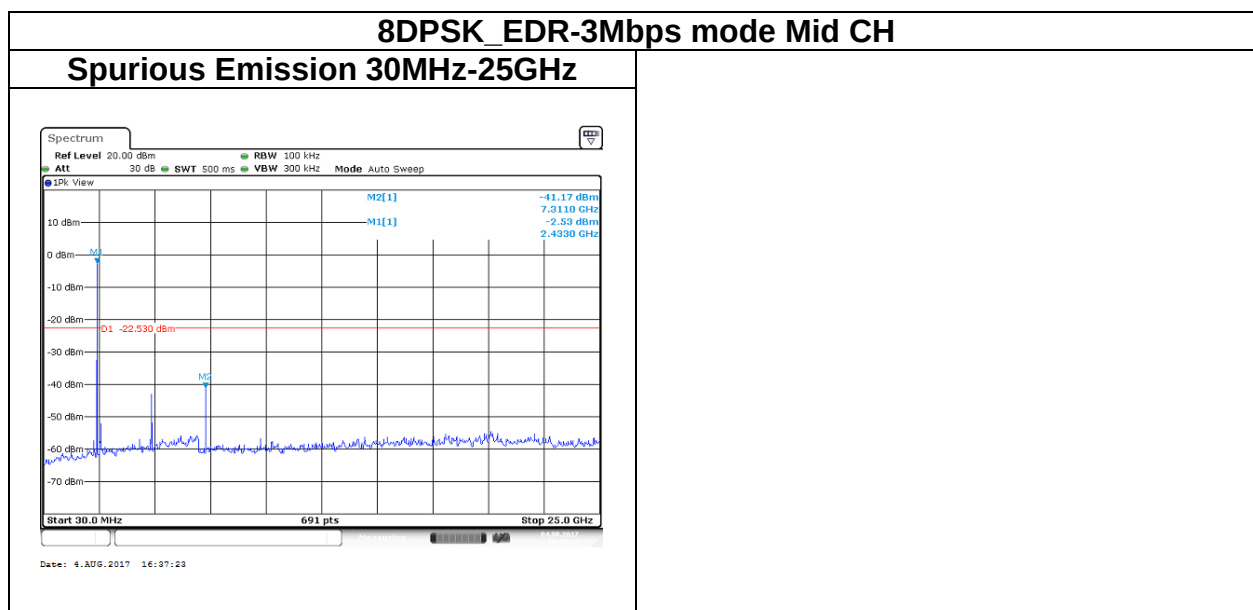
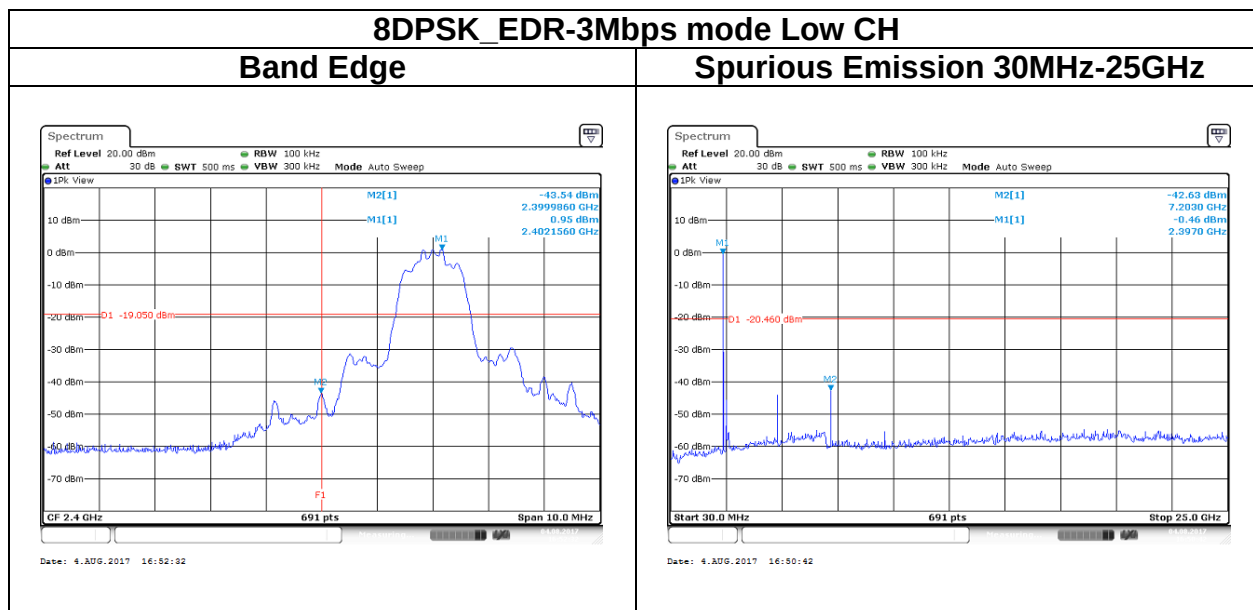


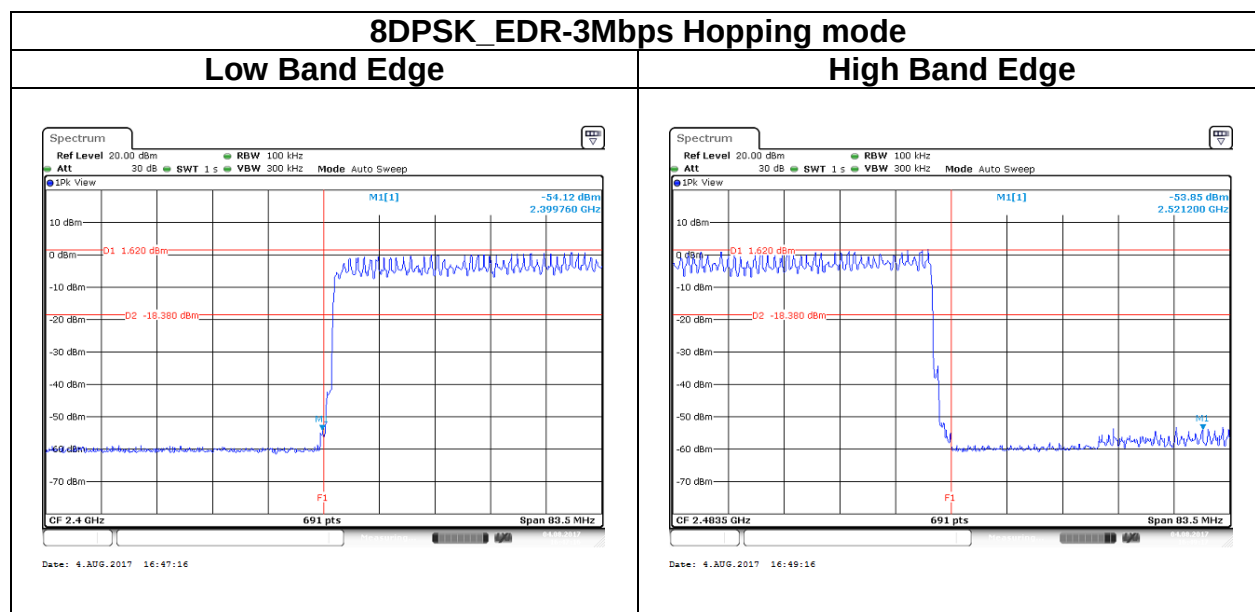
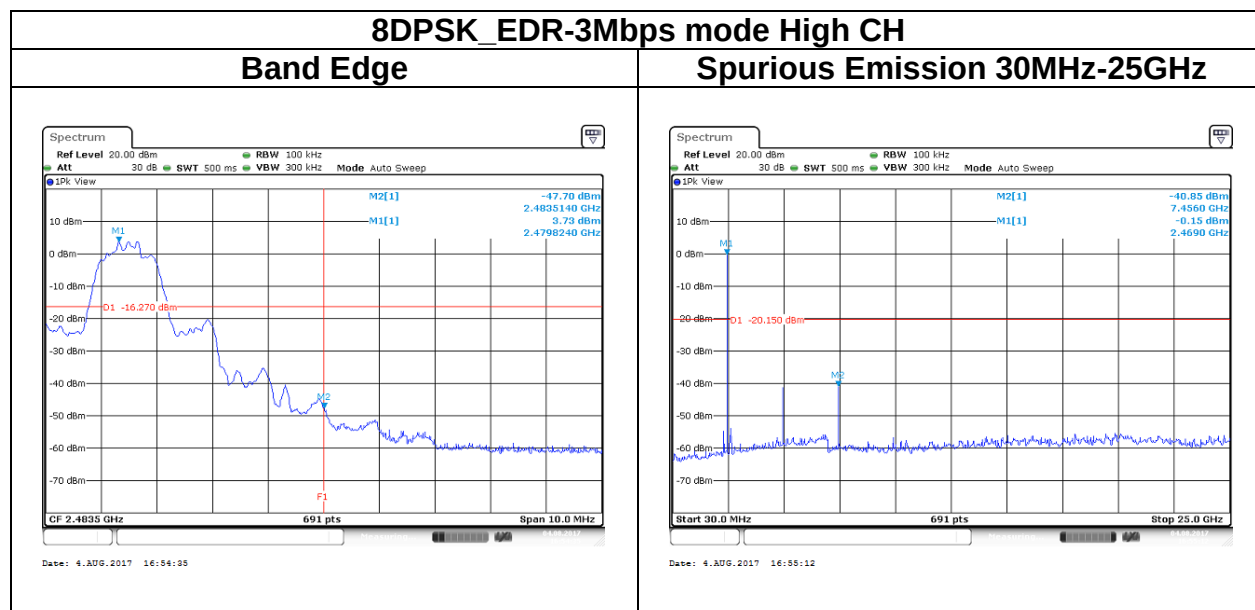
4.6.4 Test Result

Test Data









4.7 TIME OF OCCUPANCY (DWEELL TIME)

4.7.1 Test Limit

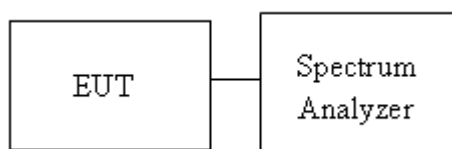
According to §15.247(a)(1)(iii)

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

4.7.2 Test Procedure

1. EUT RF output port connected to the SA by RF cable.
2. Set center frequency of spectrum analyzer = operating frequency.
3. Set the spectrum analyzer as RBW, VBW=1MHz, Sweep = 1 ms

4.7.3 Test Setup



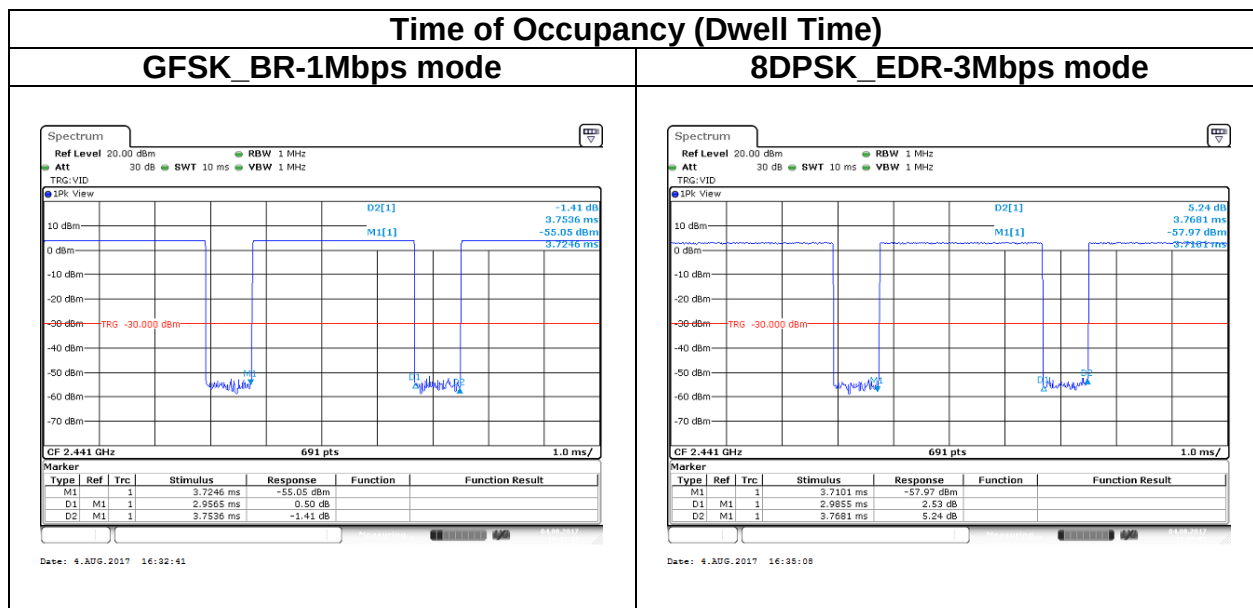
4.7.4 Test Result

Time of Occupancy (Dwell Time)							
Mode	Frequency (MHz)	Pulse Time Per Hopping (ms)	Minimum Number of Hopping Freq.	Number of pulse in	Dwell Time IN	Dwell Time Limits (s)	Result
				(0.4 * N sec)	(0.4 * N sec)		
BR-1Mbps	2441	2.9565	79	106.67	0.3154	0.4	Pass
EDR-3Mbps	2441	2.9855	79	106.67	0.3185	0.4	
Non-AFH: DH5 Packet permit maximum 1600/ 79 / 6 = 3.37 hops per second in each channel (5 time slots RX, 1 time slot TX). So, the dwell time is the time duration of the pulse times 3.37 * 0.4 *79 = 106.6							
AFH: DH5 Packet permit maximum 800/ 20 / 6 = 6.666 hops per second in each channel (5 time slots RX, 1 time slot TX). So, the dwell time is the time duration of the pulse times 6.666*0.4*20 = 53.33							

Note:

We selected worst case of Maximum Power and Maximum bandwidth to performed test.

Test Data



4.8 RADIATION BANDEDGE AND SPURIOUS EMISSION

4.8.1 Test Limit

FCC according to §15.247(d), §15.209 and §15.205,

In any 100 kHz bandwidth outside the authorized frequency band, all harmonic and spurious must be least 20 dB below the highest emission level with the authorized frequency band. Radiation emission which fall in the restricted bands must also follow the FCC section 15.209 as below limit in table.

Below 30 MHz

Frequency	Field Strength (microvolts/m)	Magnetic H-Field (microamperes/m)	Measurement Distance (metres)
9-490 kHz	2,400/F (F in kHz)	2,400/F (F in kHz)	300
490-1,705 kHz	24,000/F (F in kHz)	24,000/F (F in kHz)	30
1.705-30 MHz	30	N/A	30

Above 30 MHz

Frequency (MHz)	Field Strength microvolts/m at 3 metres (watts, e.i.r.p.)	
	Transmitters	Receivers
30-88	100 (3 nW)	100 (3 nW)
88-216	150 (6.8 nW)	150 (6.8 nW)
216-960	200 (12 nW)	200 (12 nW)
Above 960	500 (75 nW)	500 (75 nW)

Remark:

Although these tests were performed other than open area test site, adequate comparison measurements were confirmed against 30 m open area test site. Therefore sufficient tests were made to demonstrate that the alternative site produces results that correlate with the ones of tests made in an open field based on KDB 937606.

4.8.2 Test Procedure

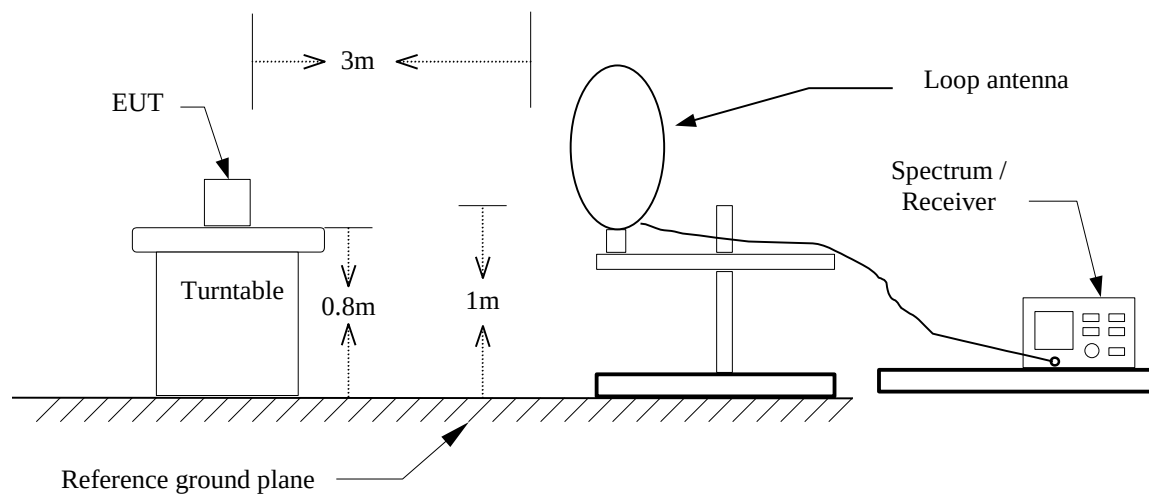
Test method Refer as KDB 558074 D01 V04, Section 12.1.

1. The EUT is placed on a turntable, Above 1 GHz is 1.5m and below 1 GHz is 0.8m above ground plane. The EUT Configured un accordance with ANSI C63.10, and the EUT set in a continuous mode.
2. The turntable shall be rotated for 360 degrees to determine the position of maximum emission level. And EUT is set 3m away from the receiving antenna, which is scanned from 1m to 4m above the ground plane to find out the highest emissions. Measurement are made polarized in both the vertical and the horizontal positions with antenna.
3. Span shall wide enough to full capture the emission measured. The SA from 30MHz to 26.5GHz set to the low, Mid and High channels with the EUT transmit.
4. For harmonic, the worst case of output power was BR-1Mbps. Therefore only BR-1Mbps record in the report.
5. The SA setting following :
 - (1) Below 1G : RBW = 100kHz, VBW $\geq$ 3 RBW, Sweep = Auto, Detector = Peak, Trace = Max hold.
 - (2) Above 1G :
 - (2.1) For Peak measurement : RBW = 1MHz, VBW $\geq$ 3 RBW, Sweep = Auto, Detector = Peak, Trace = Max hold.
 - (2.2) For Average measurement : RBW = 1MHz, VBW
If Duty Cycle $\geq$ 98%, VBW=10Hz.
If Duty Cycle < 98%, VBW=1/T.

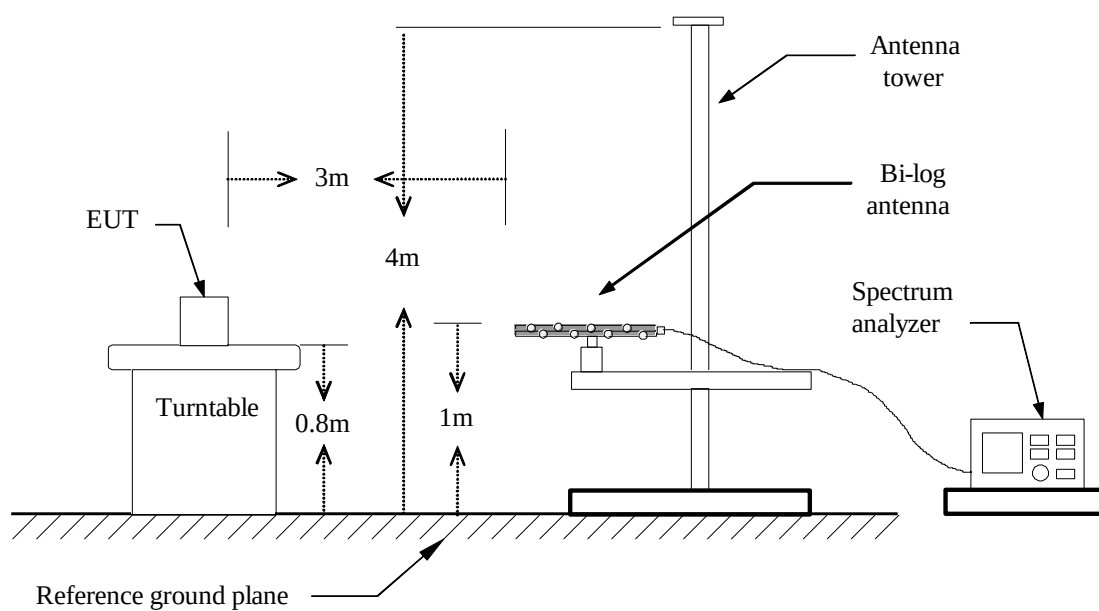
Configuration	Duty Cycle (%)	T(ms)	1/T (Hz)	VBW setting
GFSK_BR-1Mbps	79%	2.9800	0.336	360Hz
8DPSK_EDR-3Mbps	79%	2.9800	0.336	360Hz

4.8.3 Test Setup

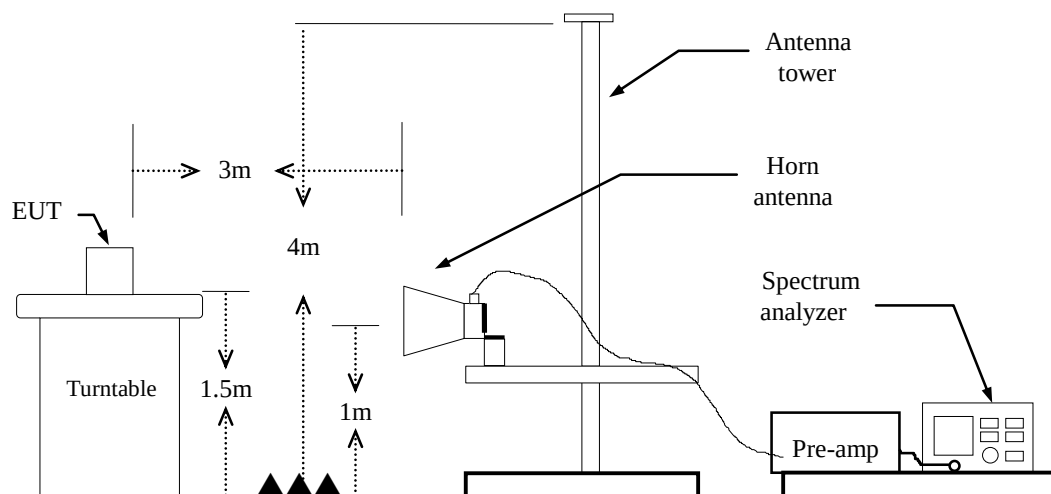
9kHz ~ 30MHz



30MHz ~ 1GHz



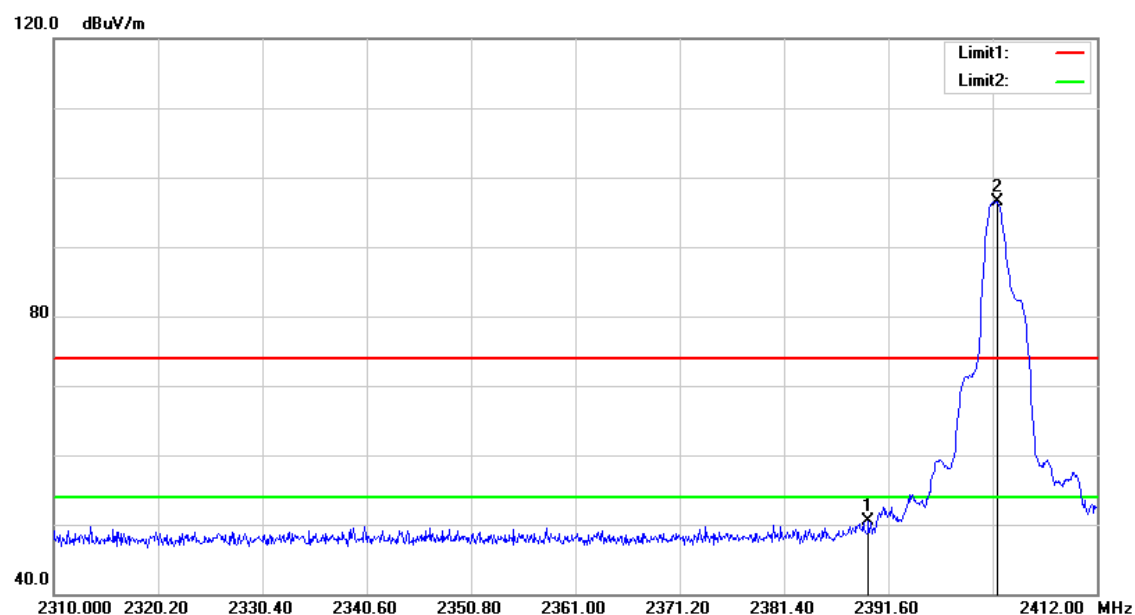
Above 1 GHz



4.8.4 Test Result

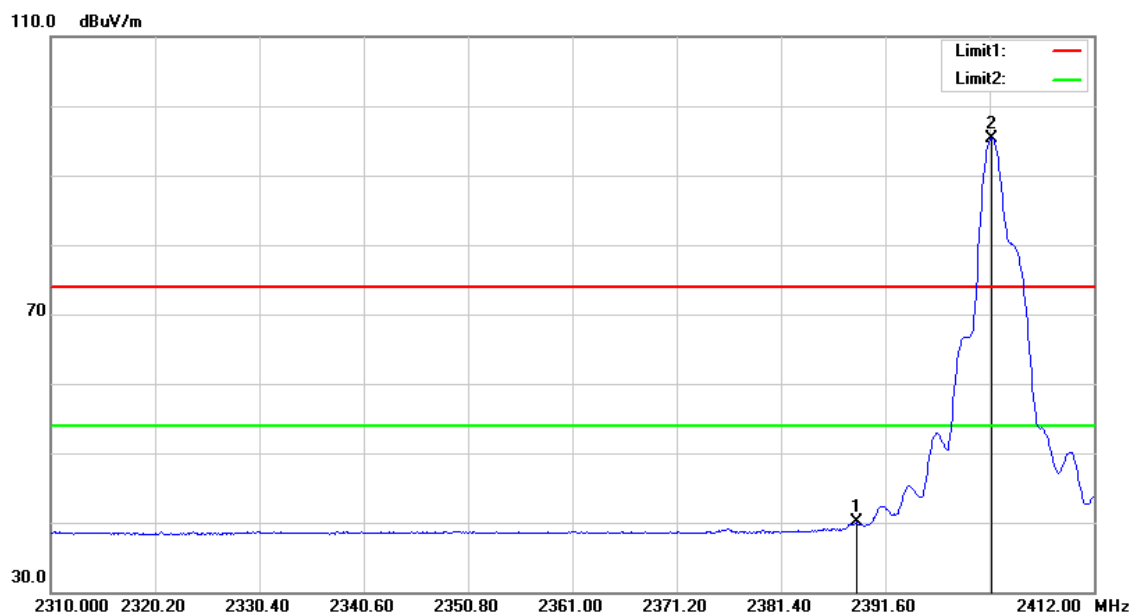
Band Edge Test Data

Test Mode:	GFSK_BR-1Mbps Low CH	Temp/Hum	24(°C)/ 33%RH
Test Item	Band Edge	Test Date	August 4, 2017
Polarize	Horizontal	Test Engineer	Ed Chiang
Detector	Peak	Test Voltage:	120Vac / 60Hz



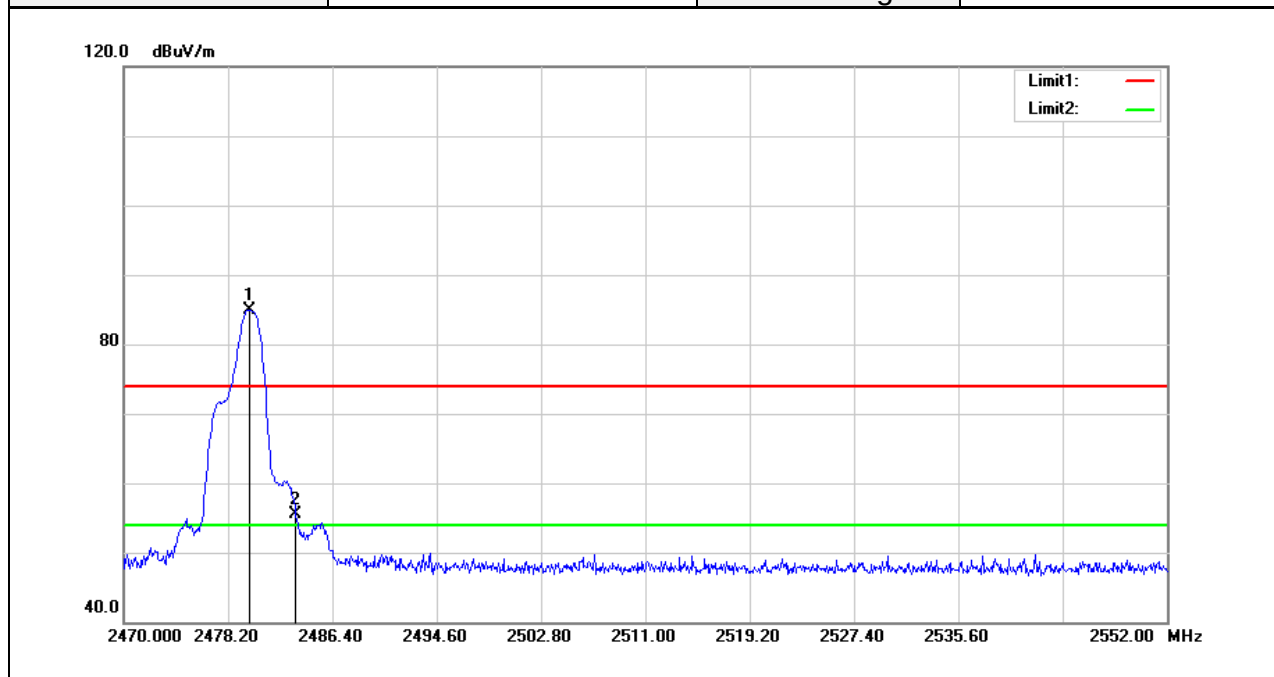
No.	Frequency (MHz)	Reading (dBuV)	Correct Factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	2389.662	67.77	-17.27	50.50	74.00	-23.50	peak
2	2402.208	113.82	-17.26	96.56	--	--	peak

Test Mode:	GFSK_BR-1Mbps Low CH	Temp/Hum	24(°C)/ 33%RH
Test Item	Band Edge	Test Date	August 4, 2017
Polarize	Horizontal	Test Engineer	Ed Chiang
Detector	Average	Test Voltage:	120Vac / 60Hz



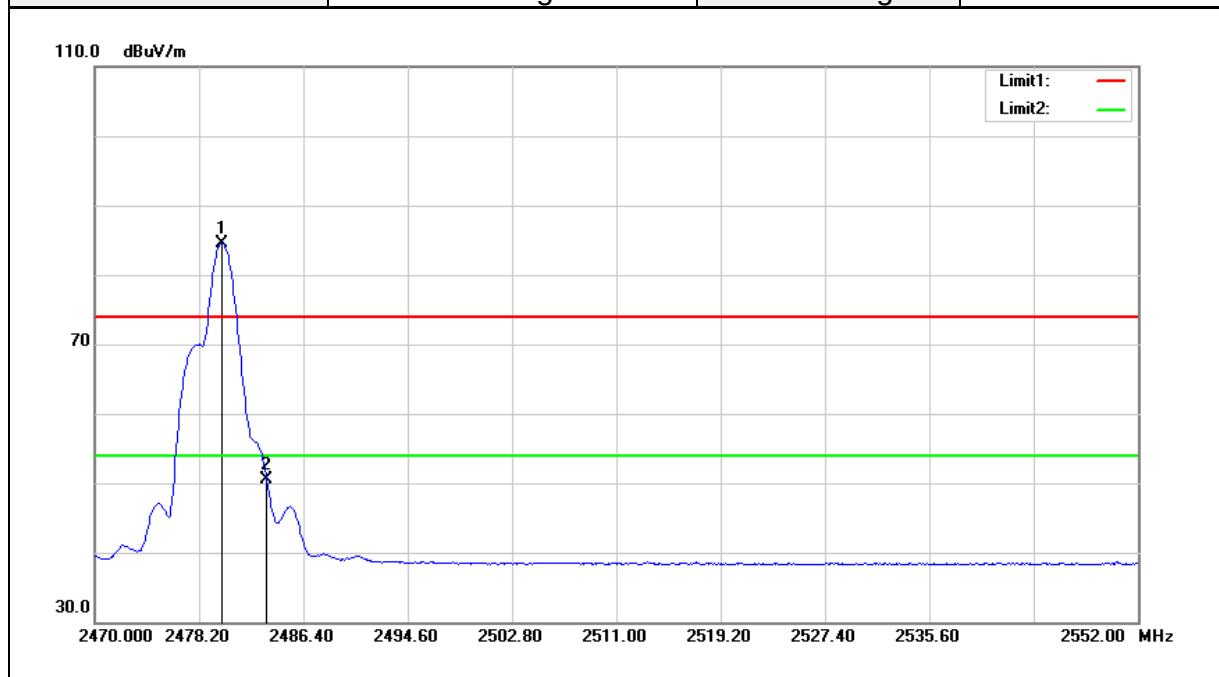
No.	Frequency (MHz)	Reading (dBuV)	Correct Factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	2388.744	57.29	-17.27	40.02	54.00	-13.98	AVG
2	2402.004	112.59	-17.26	95.33	--	--	AVG

Test Mode:	GFSK_BR-1Mbps High CH	Temp/Hum	24(°C)/ 33%RH
Test Item	Band Edge	Test Date	August 4, 2017
Polarize	Horizontal	Test Engineer	Ed Chiang
Detector	Peak	Test Voltage:	120Vac / 60Hz



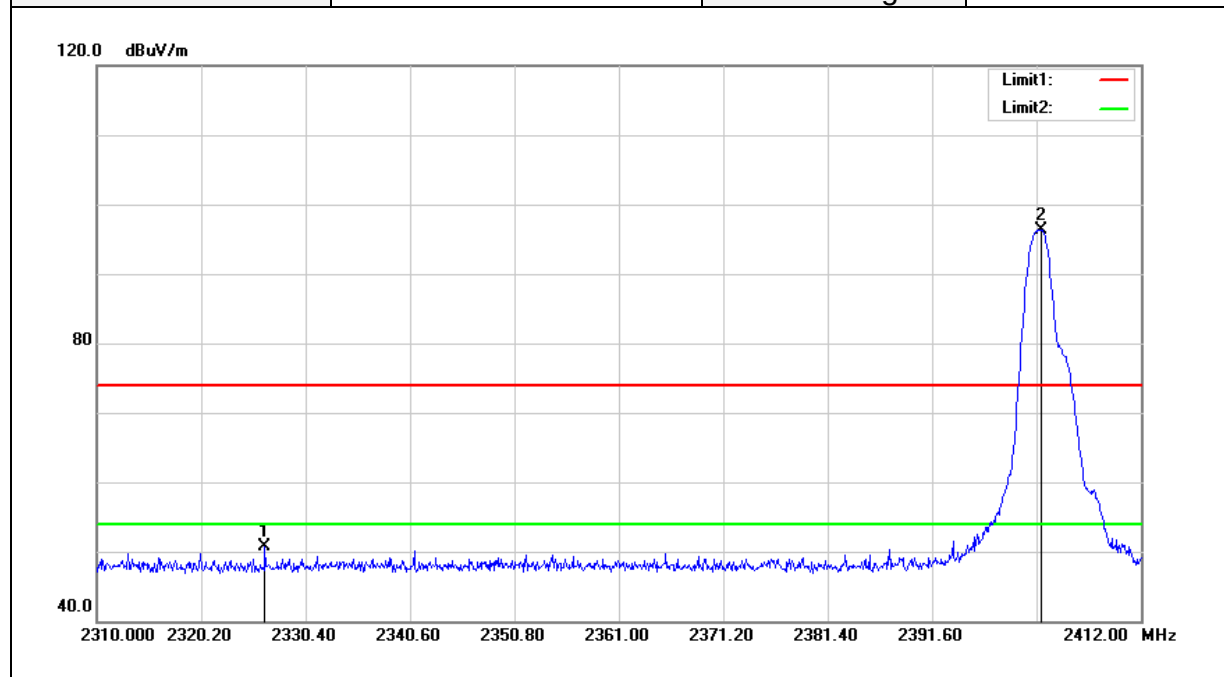
No.	Frequency (MHz)	Reading (dBuV)	Correct Factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	2479.840	102.06	-17.12	84.94	--	--	peak
2	2483.500	72.65	-17.12	55.53	74.00	-18.47	peak

Test Mode:	GFSK_BR-1Mbps High CH	Temp/Hum	24(°C)/ 33%RH
Test Item	Band Edge	Test Date	August 4, 2017
Polarize	Horizontal	Test Engineer	Ed Chiang
Detector	Average	Test Voltage:	120Vac / 60Hz



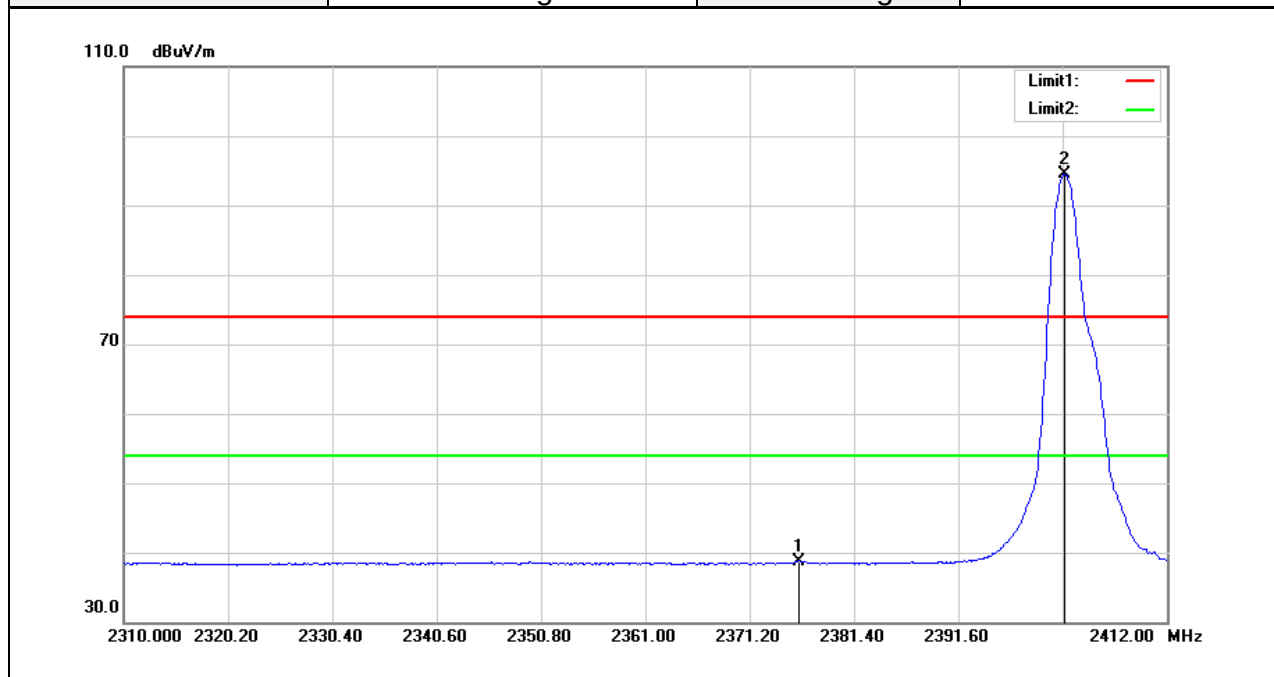
No.	Frequency (MHz)	Reading (dBuV)	Correct Factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	2480.004	101.68	-17.12	84.56	--	--	AVG
2	2483.500	67.53	-17.12	50.41	54.00	-3.59	AVG

Test Mode:	8DPSK_EDR-3Mbps Low CH	Temp/Hum	24(°C)/ 33%RH
Test Item	Band Edge	Test Date	August 4, 2017
Polarize	Horizontal	Test Engineer	Ed Chiang
Detector	Peak	Test Voltage:	120Vac / 60Hz



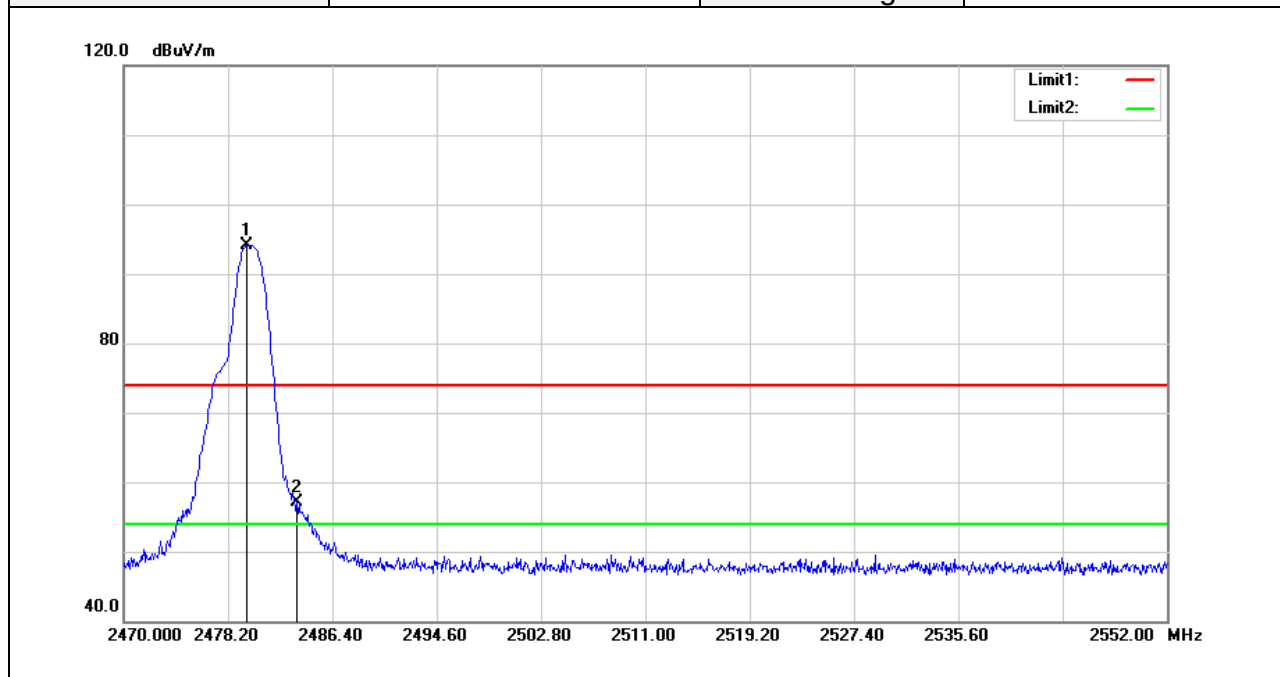
No.	Frequency (MHz)	Reading (dBuV)	Correct Factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	2326.422	68.01	-17.38	50.63	74.00	-23.37	peak
2	2402.310	113.65	-17.26	96.39	--	--	peak

Test Mode:	8DPSK_EDR-3Mbps Low CH	Temp/Hum	24(°C)/ 33%RH
Test Item	Band Edge	Test Date	August 4, 2017
Polarize	Horizontal	Test Engineer	Ed Chiang
Detector	Average	Test Voltage:	120Vac / 60Hz



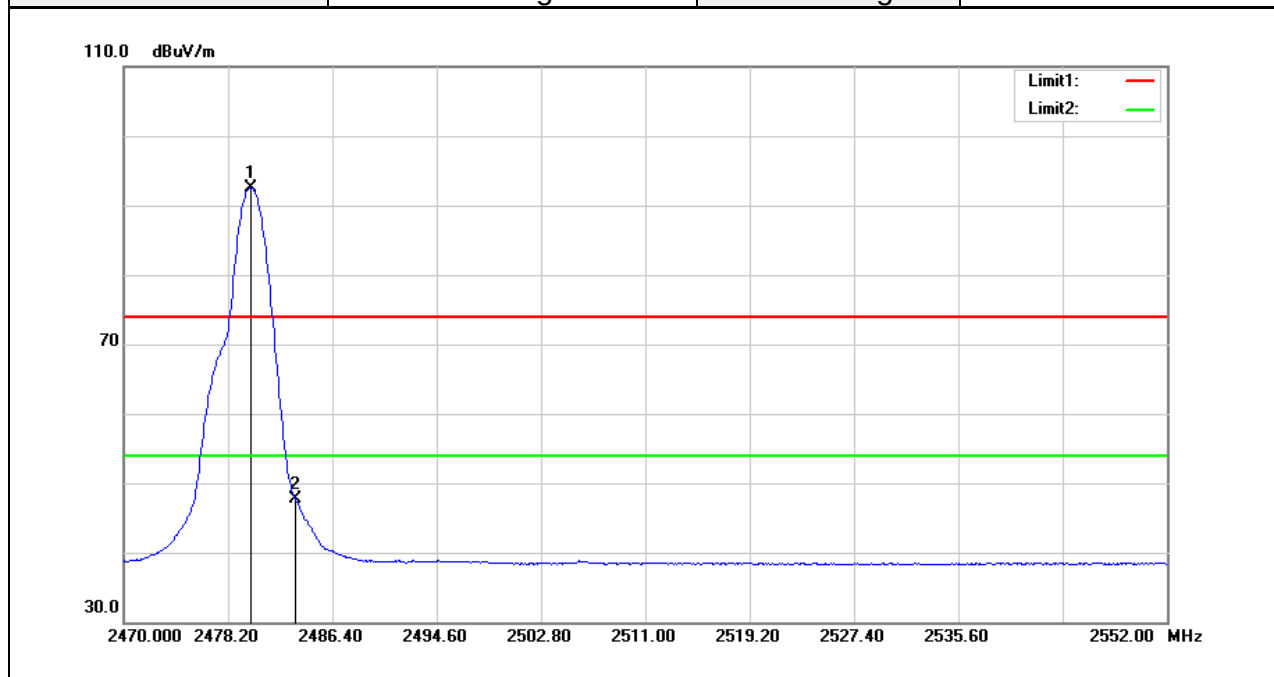
No.	Frequency (MHz)	Reading (dBuV)	Correct Factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	2375.994	56.09	-17.29	38.80	54.00	-15.20	AVG
2	2402.004	111.71	-17.26	94.45	--	--	AVG

Test Mode:	8DPSK_EDR-3Mbps High CH	Temp/Hum	24(°C)/ 33%RH
Test Item	Band Edge	Test Date	August 4, 2017
Polarize	Horizontal	Test Engineer	Ed Chiang
Detector	Peak	Test Voltage:	120Vac / 60Hz



No.	Frequency (MHz)	Reading (dBuV)	Correct Factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	2479.676	111.30	-17.12	94.18	--	--	peak
2	2483.612	74.25	-17.12	57.13	74.00	-16.87	peak

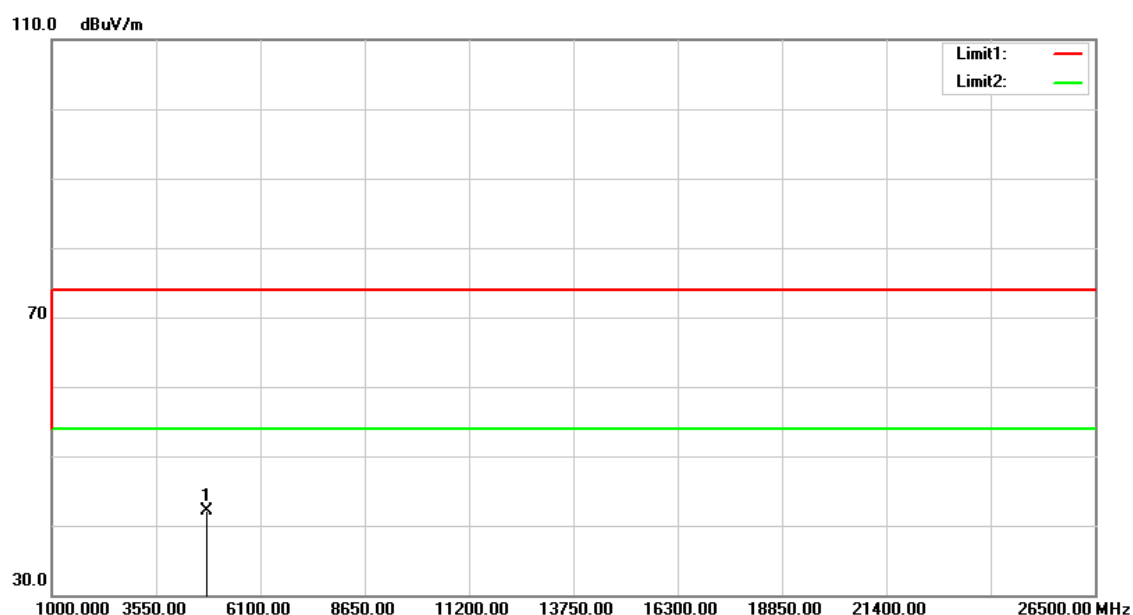
Test Mode:	8DPSK_EDR-3Mbps High CH	Temp/Hum	24(°C)/ 33%RH
Test Item	Band Edge	Test Date	August 4, 2017
Polarize	Horizontal	Test Engineer	Ed Chiang
Detector	Average	Test Voltage:	120Vac / 60Hz



No.	Frequency (MHz)	Reading (dBuV)	Correct Factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	2480.004	109.70	-17.12	92.58	--	--	AVG
2	2483.500	64.77	-17.12	47.65	54.00	-6.35	AVG

Above 1G Test Data

Test Mode:	GFSK_BR-1Mbps Low CH	Temp/Hum	24(°C)/ 33%RH
Test Item	Harmonic	Test Date	August 4, 2017
Polarize	Vertical	Test Engineer	Ed Chiang
Detector	Peak and Average	Test Voltage:	120Vac / 60Hz

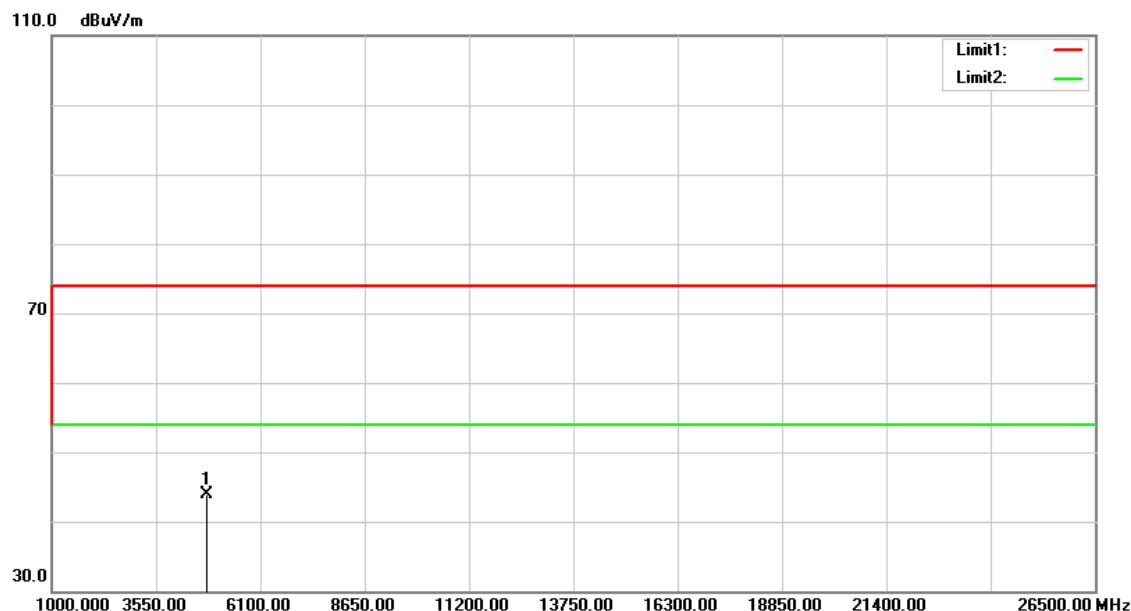


Frequency (MHz)	Reading (dBuV)	Correct Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
4804.000	52.84	-10.74	42.10	74.00	-31.90	peak
N/A						

Remark:

1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
2. For above 1GHz, the EUT peak value was under average limit, therefore the Average value compliance with the average limit

Test Mode:	GFSK_BR-1Mbps Low CH	Temp/Hum	24(°C)/ 33%RH
Test Item	Harmonic	Test Date	August 4, 2017
Polarize	Horizontal	Test Engineer	Ed Chiang
Detector	Peak and Average	Test Voltage:	120Vac / 60Hz

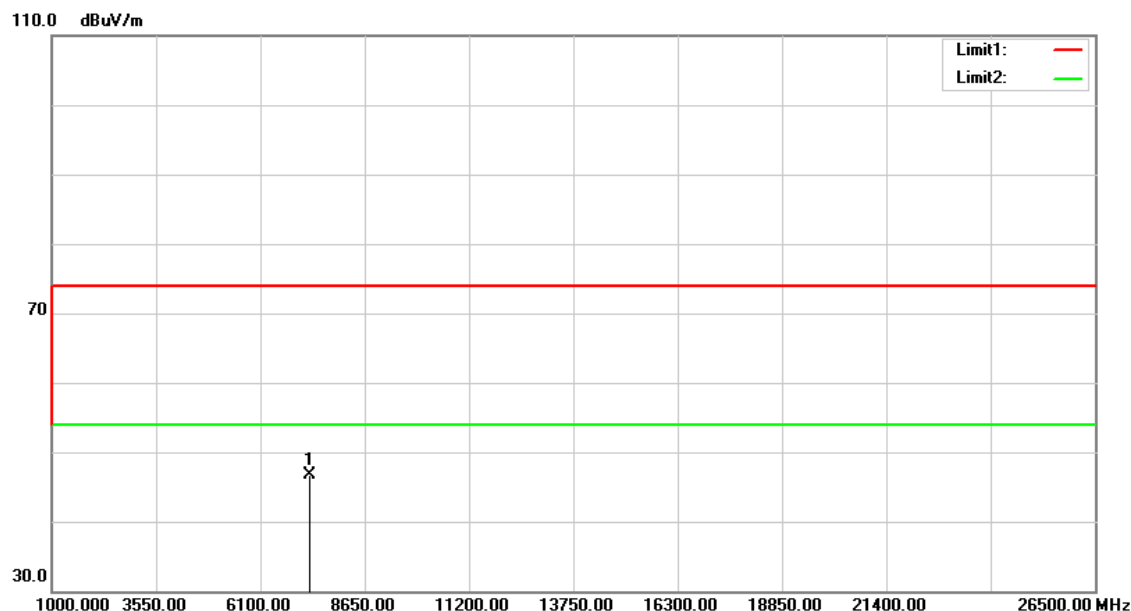


Frequency (MHz)	Reading (dBuV)	Correct Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
4804.000	54.56	-10.74	43.82	74.00	-30.18	peak
N/A						

Remark:

1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
2. For above 1GHz, the EUT peak value was under average limit, therefore the Average value compliance with the average limit

Test Mode:	GFSK_BR-1Mbps Mid CH	Temp/Hum	24(°C)/ 33%RH
Test Item	Harmonic	Test Date	August 4, 2017
Polarize	Vertical	Test Engineer	Ed Chiang
Detector	Peak and Average	Test Voltage:	120Vac / 60Hz

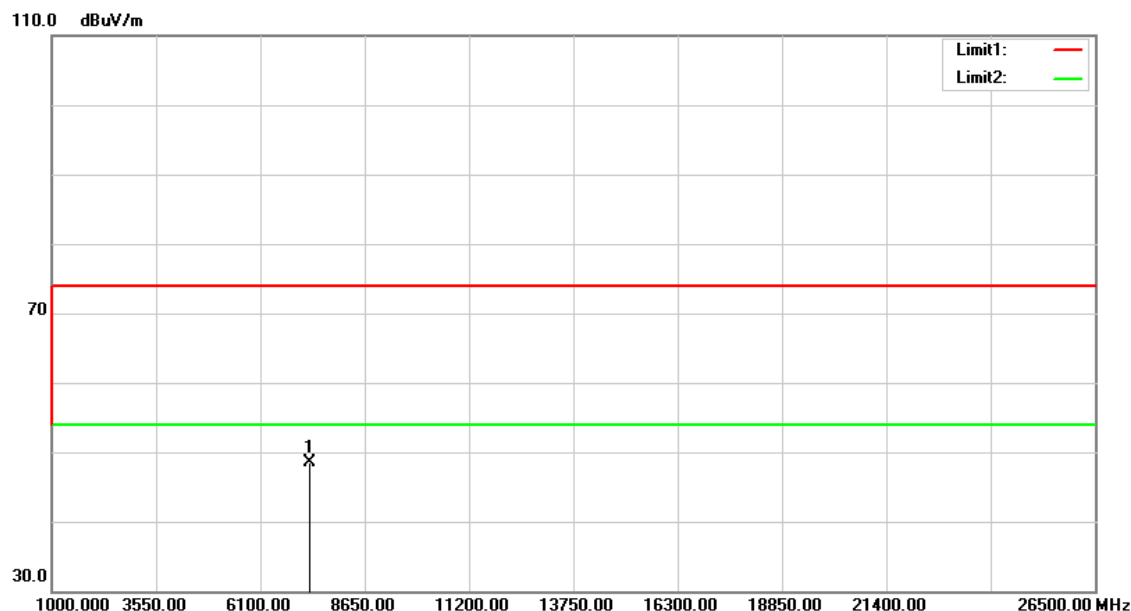


Frequency (MHz)	Reading (dBuV)	Correct Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
7320.000	51.45	-4.65	46.80	74.00	-27.20	peak
N/A						

Remark:

1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
2. For above 1GHz, the EUT peak value was under average limit, therefore the Average value compliance with the average limit

Test Mode:	GFSK_BR-1Mbps Mid CH	Temp/Hum	24(°C)/ 33%RH
Test Item	Harmonic	Test Date	August 4, 2017
Polarize	Horizontal	Test Engineer	Ed Chiang
Detector	Peak and Average	Test Voltage:	120Vac / 60Hz

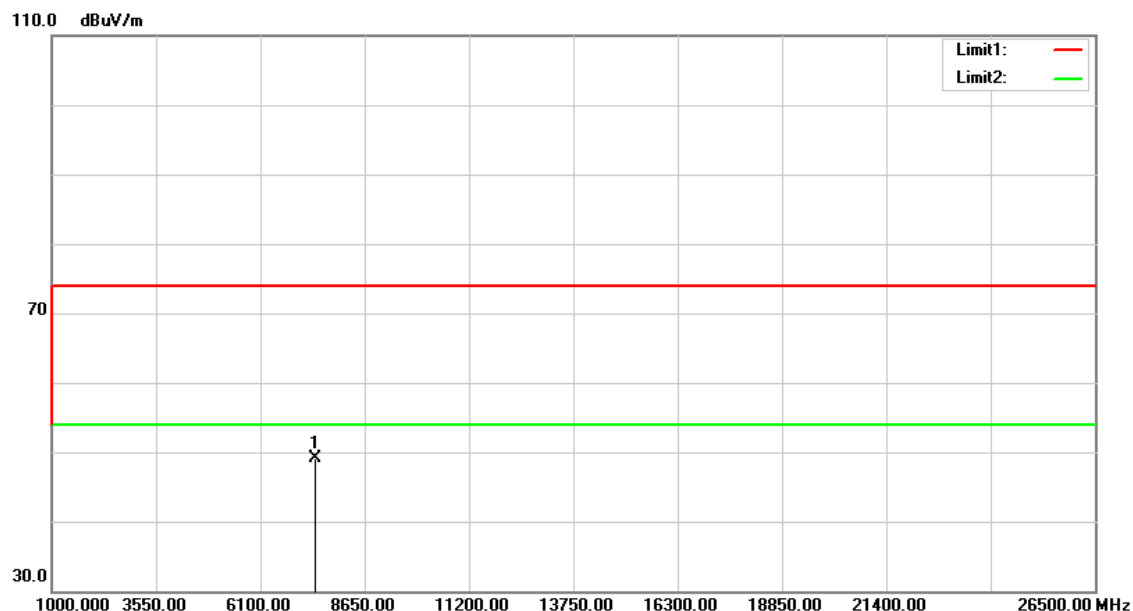


Frequency (MHz)	Reading (dBuV)	Correct Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
7320.000	53.16	-4.65	48.51	74.00	-25.49	peak
N/A						

Remark:

1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
2. For above 1GHz, the EUT peak value was under average limit, therefore the Average value compliance with the average limit

Test Mode:	GFSK_BR-1Mbps High CH	Temp/Hum	24(°C)/ 33%RH
Test Item	Harmonic	Test Date	August 4, 2017
Polarize	Vertical	Test Engineer	Ed Chiang
Detector	Peak and Average	Test Voltage:	120Vac / 60Hz

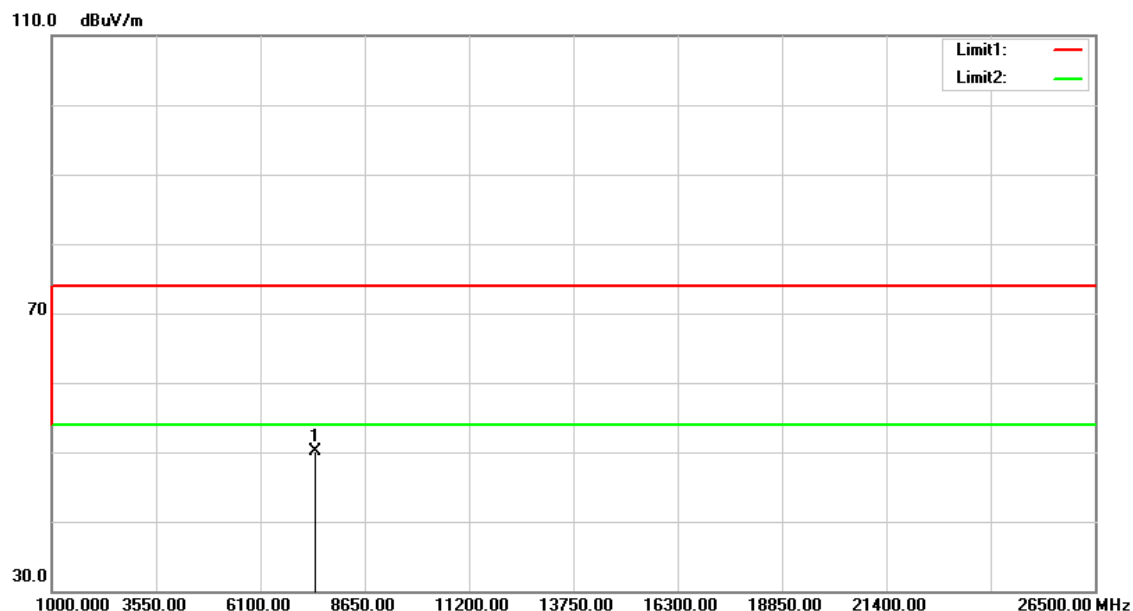


Frequency (MHz)	Reading (dBuV)	Correct Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
7438.000	53.53	-4.35	49.18	74.00	-24.82	peak
N/A						

Remark:

1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
2. For above 1GHz, the EUT peak value was under average limit, therefore the Average value compliance with the average limit

Test Mode:	GFSK_BR-1Mbps High CH	Temp/Hum	24(°C)/ 33%RH
Test Item	Harmonic	Test Date	August 4, 2017
Polarize	Horizontal	Test Engineer	Ed Chiang
Detector	Peak and Average	Test Voltage:	120Vac / 60Hz

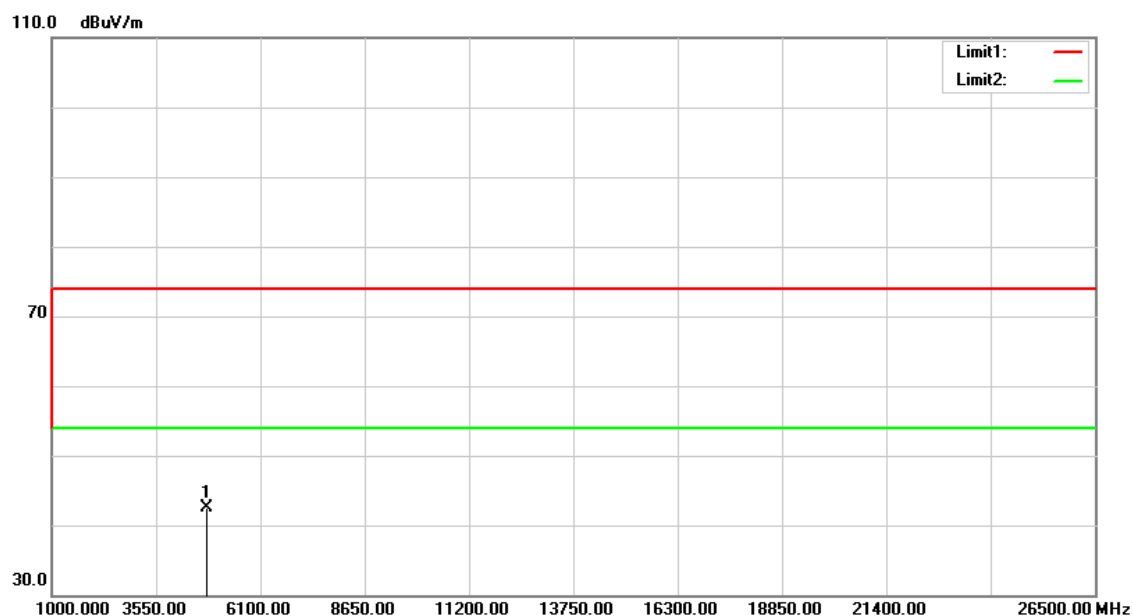


Frequency (MHz)	Reading (dBuV)	Correct Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
7438.000	54.48	-4.35	50.13	74.00	-23.87	peak
N/A						

Remark:

1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
2. For above 1GHz, the EUT peak value was under average limit, therefore the Average value compliance with the average limit

Test Mode	8DPSK_EDR-3Mbps Low CH	Temp/Hum	24(°C)/ 33%RH
Test Item	Harmonic	Test Date	August 4, 2017
Polarize	Vertical	Test Engineer	Ed Chiang
Detector	Peak and Average		

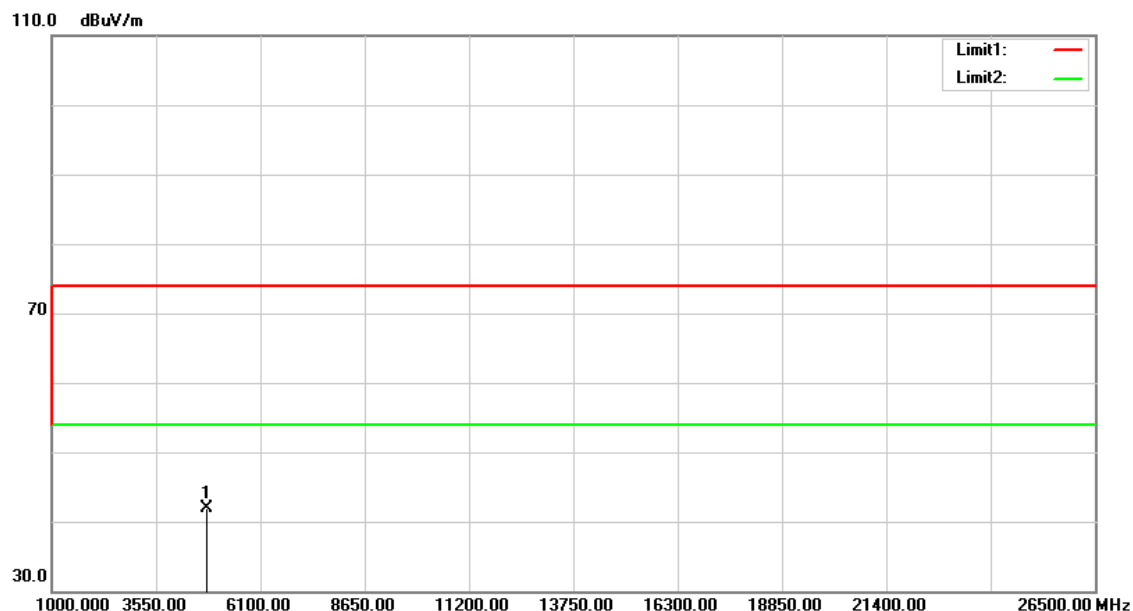


Frequency (MHz)	Reading (dBuV)	Correct Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
4804.000	53.20	-10.74	42.46	74.00	-31.54	peak
N/A						

Remark:

1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
2. For above 1GHz, the EUT peak value was under average limit, therefore the Average value compliance with the average limit

Test Mode	8DPSK_EDR-3Mbps Low CH	Temp/Hum	24(°C)/ 33%RH
Test Item	Harmonic	Test Date	August 4, 2017
Polarize	Horizontal	Test Engineer	Ed Chiang
Detector	Peak and Average		

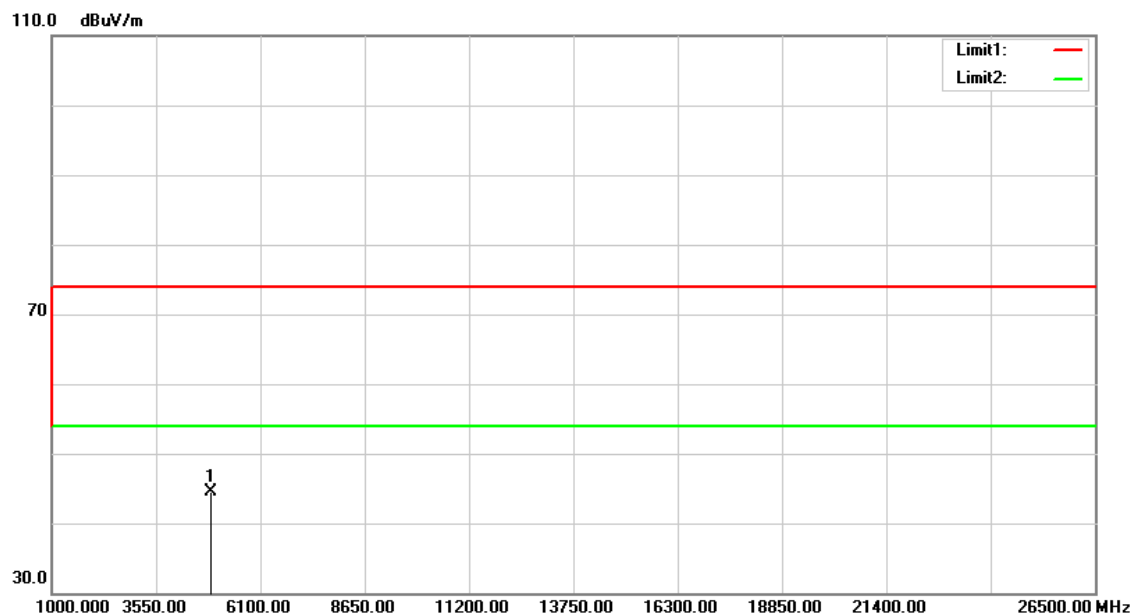


Frequency (MHz)	Reading (dBuV)	Correct Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
4804.000	52.67	-10.74	41.93	74.00	-32.07	peak
N/A						

Remark:

1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
2. For above 1GHz, the EUT peak value was under average limit, therefore the Average value compliance with the average limit

Test Mode	8DPSK_EDR-3Mbps Mid CH	Temp/Hum	24(°C)/ 33%RH
Test Item	Harmonic	Test Date	August 4, 2017
Polarize	Vertical	Test Engineer	Ed Chiang
Detector	Peak and Average		

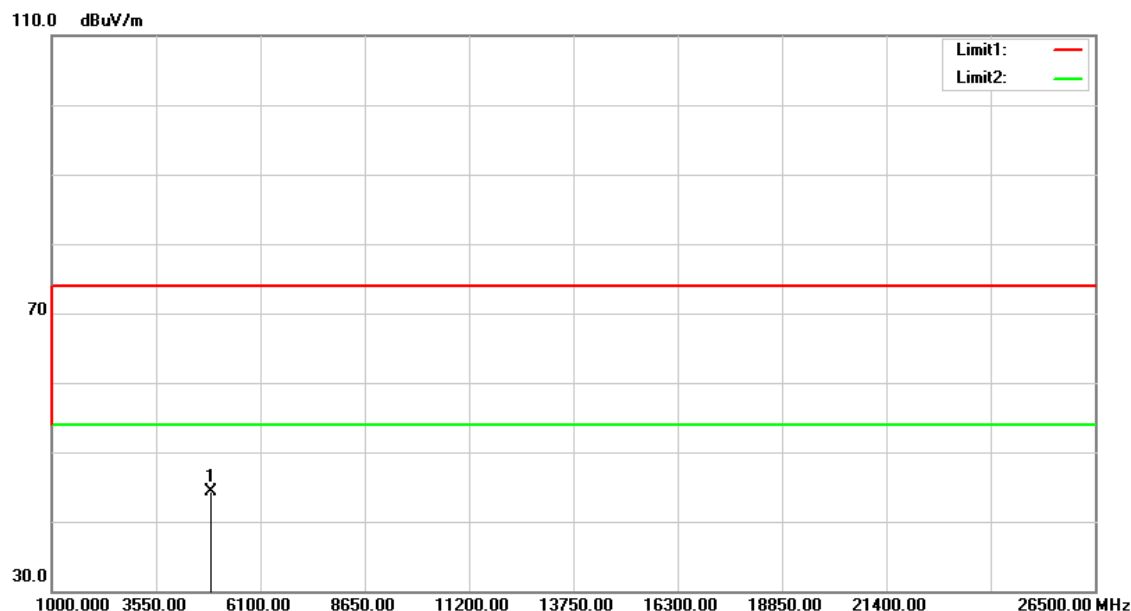


Frequency (MHz)	Reading (dBuV)	Correct Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
4880.000	55.04	-10.53	44.51	74.00	-29.49	peak
N/A						

Remark:

- Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
- For above 1GHz, the EUT peak value was under average limit, therefore the Average value compliance with the average limit

Test Mode	8DPSK_EDR-3Mbps Mid CH	Temp/Hum	24(°C)/ 33%RH
Test Item	Harmonic	Test Date	August 4, 2017
Polarize	Horizontal	Test Engineer	Ed Chiang
Detector	Peak and Average		

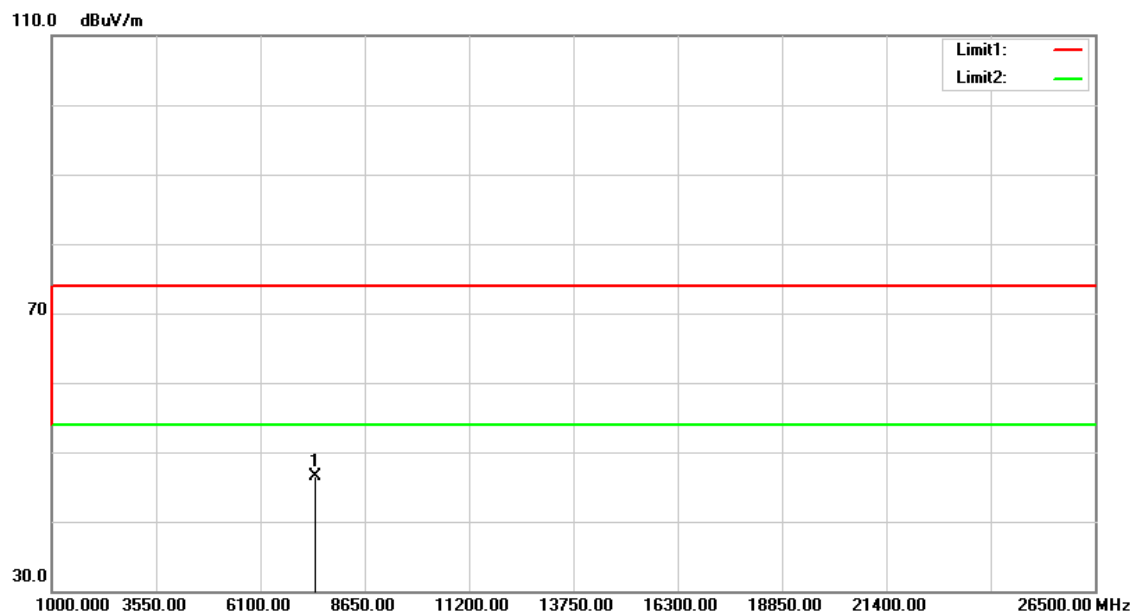


Frequency (MHz)	Reading (dBuV)	Correct Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
4880.000	54.73	-10.53	44.20	74.00	-29.80	peak
N/A						

Remark:

1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
2. For above 1GHz, the EUT peak value was under average limit, therefore the Average value compliance with the average limit

Test Mode	8DPSK_EDR-3Mbps High CH	Temp/Hum	24(°C)/ 33%RH
Test Item	Harmonic	Test Date	August 4, 2017
Polarize	Vertical	Test Engineer	Ed Chiang
Detector	Peak and Average		

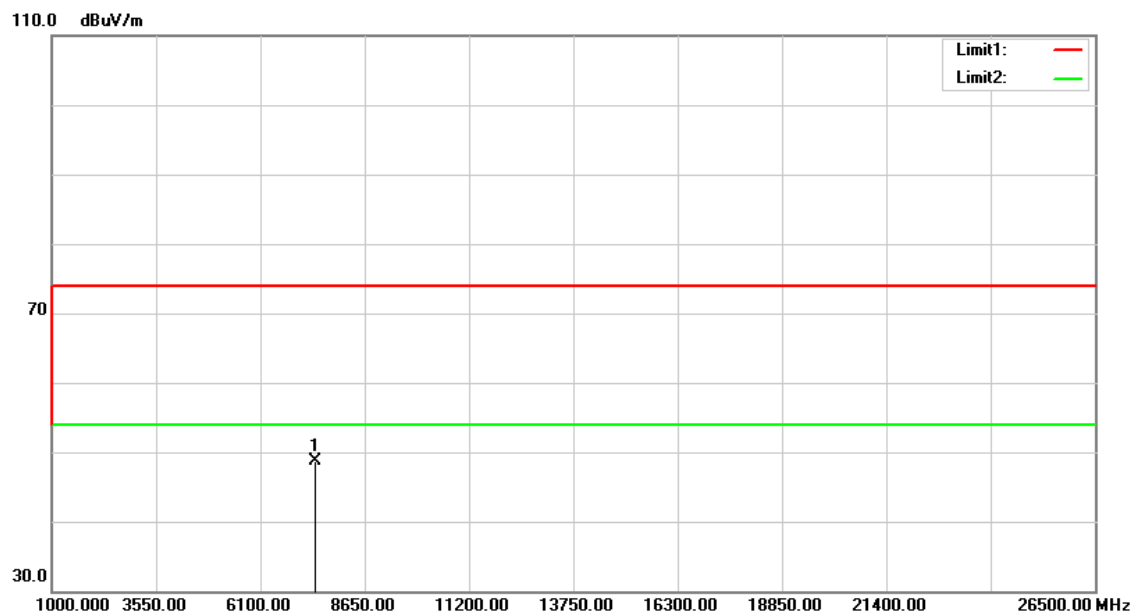


Frequency (MHz)	Reading (dBuV)	Correct Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
7440.000	50.93	-4.35	46.58	74.00	-27.42	peak
N/A						

Remark:

1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
2. For above 1GHz, the EUT peak value was under average limit, therefore the Average value compliance with the average limit

Test Mode	8DPSK_EDR-3Mbps High CH	Temp/Hum	24(°C)/ 33%RH
Test Item	Harmonic	Test Date	August 4, 2017
Polarize	Horizontal	Test Engineer	Ed Chiang
Detector	Peak and Average		



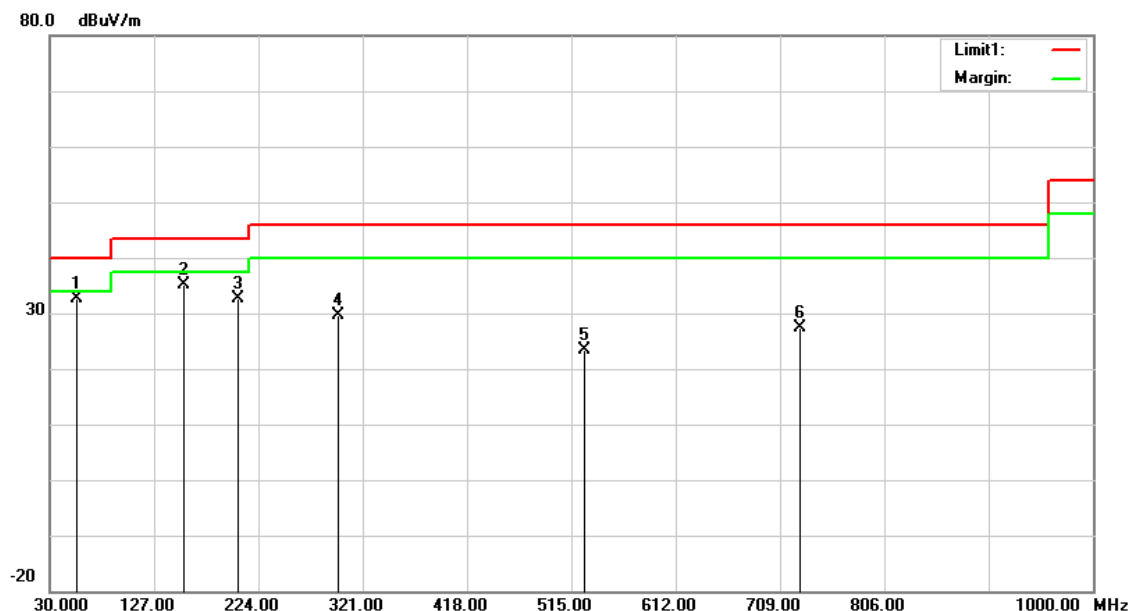
Frequency (MHz)	Reading (dBuV)	Correct Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
7438.000	53.05	-4.35	48.70	74.00	-25.30	peak
N/A						

Remark:

1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
2. For above 1GHz, the EUT peak value was under average limit, therefore the Average value compliance with the average limit

Below 1G Test Data

Test Mode:	Made 1	Temp/Hum	24(°C)/ 33%RH
Test Item	30MHz-1GHz	Test Date	August 4, 2017
Polarize	Vertical	Test Engineer	Ed Chiang
Detector	Peak and Qusi-peak	Test Voltage:	120Vac / 60Hz



Frequency (MHz)	Reading (dBuV)	Correct Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
55.2200	54.13	-21.61	32.52	40.00	-7.48	QP
154.1600	51.38	-16.19	35.19	43.50	-8.31	peak
205.5700	48.60	-15.94	32.66	43.50	-10.84	peak
298.6900	43.92	-14.26	29.66	46.00	-16.34	peak
526.6400	32.31	-8.84	23.47	46.00	-22.53	peak
727.4300	32.73	-5.44	27.29	46.00	-18.71	peak

Note: No emission found between lowest internal used/generated frequency to 30MHz(9KHz~30MHz)

Test Mode:	Made 1	Temp/Hum	24(°C)/ 33%RH
Test Item	30MHz-1GHz	Test Date	August 4, 2017
Polarize	Horizontal	Test Engineer	Ed Chiang
Detector	Peak and Qusi-peak	Test Voltage:	120Vac / 60Hz



Frequency (MHz)	Reading (dBuV)	Correct Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
69.7700	49.86	-20.75	29.11	40.00	-10.89	peak
144.4600	49.06	-15.91	33.15	43.50	-10.35	peak
204.6000	55.30	-15.87	39.43	43.50	-4.07	QP
321.9700	52.14	-13.65	38.49	46.00	-7.51	peak
349.1300	50.94	-12.91	38.03	46.00	-7.97	peak
657.5900	35.09	-6.49	28.60	46.00	-17.40	peak

Note: No emission found between lowest internal used/generated frequency to 30MHz(9KHz~30MHz)