

FCC ID: M82-AIM37AC  
Report No.: T170919D06-A-RP1

Page: 1 / 65  
Rev.: 02

# RADIO TEST REPORT

## FCC 47 CFR PART 15 SUBPART C

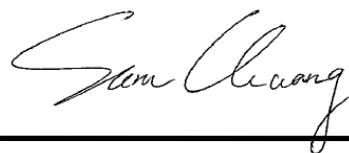
<b>Test Standard</b>	<b>FCC Part 15.247</b>
<b>Product name</b>	<b>Computer</b>
<b>Brand Name</b>	<b>ADVANTECH</b>
<b>Model Name</b>	<b>AIM-37ACxxxxxxxxxxxxxx; AIM37ACxxxxxxxxxxxxxx (where "x" may be any alphanumeric character, "-" or blank for marketing purpose and no impact safety related critical components and constructions)</b>
<b>Test Result</b>	<b>Pass</b>

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. (Wugu Laboratory)

Approved by:



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Sam Chuang  
Manager

Tested by:



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Jerry Chuang  
Engineer

Unless otherwise stated the results shown in this test report refer only to the sample(s) tested and such sample(s) are retained for 90 days only.  
除非另有說明，此報告結果僅對測試之樣品負責，同時此樣品僅保留90天。本報告未經本公司書面許可，不可部分複製。

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## Revision History

Rev.	Issue Date	Revisions	Revised By
00	January 24, 2018	Initial Issue	May Lin
01	May 14, 2018	1. Revised model discrepancy: P.4. 2. Revised radiation test photo: P.62	May Lin
02	July 31, 2018	1. Re-test AC Conducted Emissions and modify test setup photo: P.15-16, P.64	May Lin

## Table of contents

1. GENERAL INFORMATION .....	4
1.1 EUT INFORMATION .....	4
1.2 EUT CHANNEL INFORMATION .....	5
1.3 ANTENNA INFORMATION .....	5
1.4 MEASUREMENT UNCERTAINTY .....	6
1.5 FACILITIES AND TEST LOCATION .....	7
1.6 INSTRUMENT CALIBRATION .....	7
1.7 SUPPORT AND EUT ACCESSORIES EQUIPMENT .....	9
2. TEST SUMMERY .....	10
3. DESCRIPTION OF TEST MODES .....	11
3.1 THE WORST MODE OF OPERATING CONDITION .....	11
3.2 THE WORST MODE OF MEASUREMENT .....	12
3.3 EUT DUTY CYCLE .....	13
4. TEST RESULT .....	14
4.1 AC POWER LINE CONDUCTED EMISSION .....	14
4.2 20DB BANDWIDTH AND OCCUPIED BANDWIDTH(99%) .....	17
4.3 OUTPUT POWER MEASUREMENT .....	22
4.4 FREQUENCY SEPARATION .....	24
4.5 NUMBER OF HOPPING .....	28
4.6 CONDUCTED BANDEDGE AND SPURIOUS EMISSION .....	30
4.7 TIME OF OCCUPANCY (DWELL TIME) .....	35
4.8 RADIATION BANDEDGE AND SPURIOUS EMISSION .....	37
APPENDIX 1 - PHOTOGRAPHS OF EUT	

## 1. GENERAL INFORMATION

### 1.1 EUT INFORMATION

Applicant	Advantech Co.Ltd. No.1, Alley 20, Lane 26, Rueiguang Road, Neihu District, Taipei 114, Taiwan, R.O.C.																																		
Manufacturer	Advantech Co.Ltd. No.1, Alley 20, Lane 26, Rueiguang Road, Neihu District, Taipei 114, Taiwan, R.O.C.																																		
Equipment	Computer																																		
Model No.	AIM-37ACxxxxxxxxxxxxxx; AIM37ACxxxxxxxxxxxxxx (where "x" may be any alphanumeric character, "-" or blank for marketing purpose and no impact safety related critical components and constructions)																																		
Model Discrepancy	<table border="1"><thead><tr><th>Model Name</th><th colspan="5">Model Discrepancy</th></tr></thead><tbody><tr><td>-</td><td>-</td><td>Magnetic stripe reader</td><td>IC reader</td><td>Memory / Storage</td><td>Color</td></tr><tr><td rowspan="5">AIM-37AC</td><td>SKU1</td><td>V</td><td>V</td><td rowspan="2">4GB / 64GB</td><td rowspan="2">Orange</td></tr><tr><td>SKU2</td><td>V</td><td>V</td></tr><tr><td>SKU3</td><td rowspan="3">X</td><td rowspan="3">X</td><td>2GB / 32GB</td><td rowspan="3">Grey</td></tr><tr><td>SKU4</td><td></td></tr><tr><td>SKU5</td><td>4GB / 64GB</td></tr></tbody></table> AIM-37ACxxxxxxxxxxxxxx; AIM37ACxxxxxxxxxxxxxx (where "x" may be any alphanumeric character, "-" or blank for marketing purpose and no impact safety related critical components and constructions)					Model Name	Model Discrepancy					-	-	Magnetic stripe reader	IC reader	Memory / Storage	Color	AIM-37AC	SKU1	V	V	4GB / 64GB	Orange	SKU2	V	V	SKU3	X	X	2GB / 32GB	Grey	SKU4		SKU5	4GB / 64GB
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	SKU4																																		
	SKU5			4GB / 64GB																															
Received Date	September 19, 2017																																		
Date of Test	January 16 ~ July 27, 2018																																		
Output Power(W)	GFSK : 0.0055 8DPSK :0.0027																																		
Power Supply	VDC from Power Adapter Brand: Asian Power Devices Inc. Model name: WA-15I05R Input: 100-240Vac, 50-60Hz, 0.5A Max Output: 5Vdc, 3A																																		

## 1.2 EUT CHANNEL INFORMATION

Frequency Range	2402MHz-2480MHz
Modulation Type	1. GFSK for BR-1Mbps 2. 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
<input type="checkbox"/> 1 MHz or less	1	Middle
<input type="checkbox"/> 1 MHz to 10 MHz	2	1 near top and 1 near bottom
<input checked="" type="checkbox"/> More than 10 MHz	3	1 near top, 1 near middle, and 1 near bottom

## 1.3 ANTENNA INFORMATION

Antenna Type	<input checked="" type="checkbox"/> PIFA <input type="checkbox"/> PCB <input type="checkbox"/> Dipole <input type="checkbox"/> Coils
Antenna Gain	Gain: 1.13dBi

## 1.4 MEASUREMENT UNCERTAINTY

PARAMETER	UNCERTAINTY
AC Powerline Conducted Emission	+/- 2.96
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.11, Wugong 6th Rd., Wugu Dist., New Taipei City 24891, Taiwan. (R.O.C.)

Test site	Test Engineer	Remark
AC Conduction Room	Dally Hong	-
Radiation	Jerry Chuang	-
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
Power Meter	Anritsu	ML2495A	1033009	04/11/2017	04/10/2018
Power Sensor	Anritsu	MA2411B	917072	07/03/2017	07/02/2018
Spectrum Analyzer	R&S	FSV 40	101073	10/02/2017	10/01/2018
Directional Coupler	Agilent	87301D	MY44350252	07/25/2017	07/24/2018
SUCOFLEX Cable	HUBER SUHNER	SUCOFLEX 104PEA	25157	07/31/2017	07/30/2018
Divider	Solvang Technology	2-18GHz 4Way	STI08-0015	07/26/2017	07/25/2018

3M 966 Chamber Test Site					
Equipment	Manufacturer	Model	S/N	Cal Date	Cal Due
Bilog Antenna	Sunol Sciences	JB3	A030105	06/20/2017	06/19/2018
Horn Antenna	EMCO	3117	00055165	02/20/2017	02/19/2018
Pre-Amplifier	EMEC	EM330	060609	06/07/2017	06/06/2018
Spectrum Analyzer	Agilent	E4446A	US42510252	11/27/2017	11/26/2018
Loop Ant	COM-POWER	AL-130	121051	03/02/2017	03/01/2018
Antenna Tower	CCS	CC-A-1F	N/A	N.C.R	N.C.R
Controller	CCS	CC-C-1F	N/A	N.C.R	N.C.R
Turn Table	CCS	CC-T-1F	N/A	N.C.R	N.C.R
Pre-Amplifier	HP	8449B	3008A00965	06/27/2017	06/26/2018
Filter	N/A	2400-2500	N/A	N/A	N/A
Filter	N/A	0-6000	N/A	N/A	N/A
Cable	HUBER SUHNER	SUCOFLEX 104PEA	25157	07/31/2017	07/30/2018
Cable	HUBER SUHNER	SUCOFLEX 104PEA	20995	07/31/2017	07/30/2018

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

Report No.: T170919D06-A-RP1

Page: 8 / 65  
Rev.: 02

AC Conducted Emissions Test Site					
Equipment	Manufacturer	Model	S/N	Cal Date	Cal Due
LISN	R&S	ENV216	101054	02/06/2018	02/05/2019
LISN	SCHWARZBECK	NSLK 8127	8127-541	02/09/2018	02/08/2019
EMI Test Receiver	R&S	ESCI	101203	11/02/2017	11/01/2018

**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(K)	Toshiba	voyager	ZD 154034s	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, Part 15.205, Part 15.207, Part 15.209.

Report No.: T170919D06-A-RP1

Page: 10 / 65  
Rev.: 02

## 2. TEST SUMMARY

FCC Standard Section	Report Section	Test Item	Result
15.203	1.3	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) 8DPSK for EDR-3Mbps (DH5)
Test Channel Frequencies	<b>GFSK for BR-1Mbps:</b> 1.Lowest Channel : 2402MHz 2.Middle Channel : 2441MHz 3.Highest Channel : 2480MHz <b>8DPSK for EDR-3Mbps:</b> 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	
<b>Test Condition</b>	AC Power line conducted emission for line and neutral
<b>Voltage/Hz</b>	120V/60Hz
<b>Test Mode</b>	Mode 1: EUT power by AC adapter via power cable.
<b>Worst Mode</b>	<input checked="" type="checkbox"/> Mode 1 <input type="checkbox"/> Mode 2 <input type="checkbox"/> Mode 3 <input type="checkbox"/> Mode 4

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

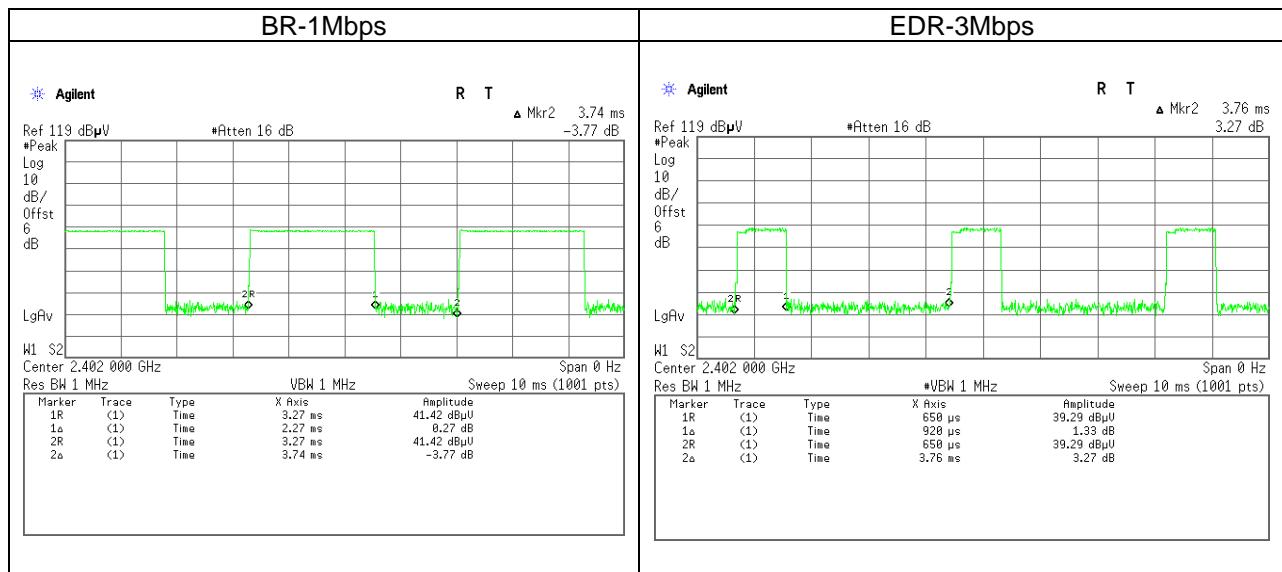
Radiated Emission Measurement Below 1G	
<b>Test Condition</b>	Radiated Emission Below 1G
<b>Voltage/Hz</b>	120V/60Hz
<b>Test Mode</b>	Mode 1: EUT power by AC adapter via power cable.
<b>Worst Mode</b>	<input checked="" type="checkbox"/> Mode 1 <input type="checkbox"/> Mode 2 <input type="checkbox"/> Mode 3 <input type="checkbox"/> 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 Horizontal) 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	2.2700	3.7400	60.70%	2.17
EDR-3Mbps	0.9200	3.7600	24.47%	6.11



## 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 $\mu$ 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

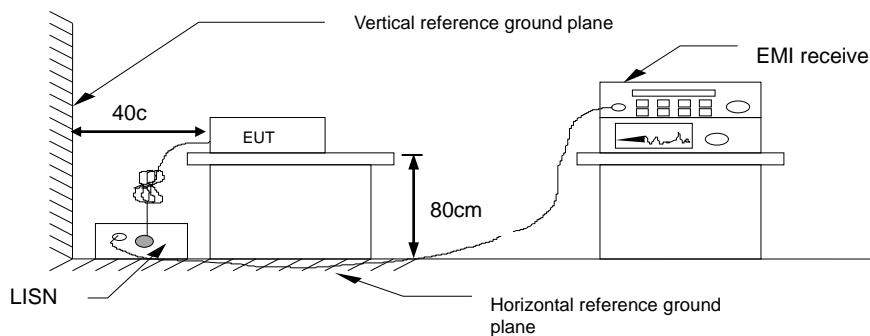
\* Decreases with the logarithm of the frequency.

#### 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

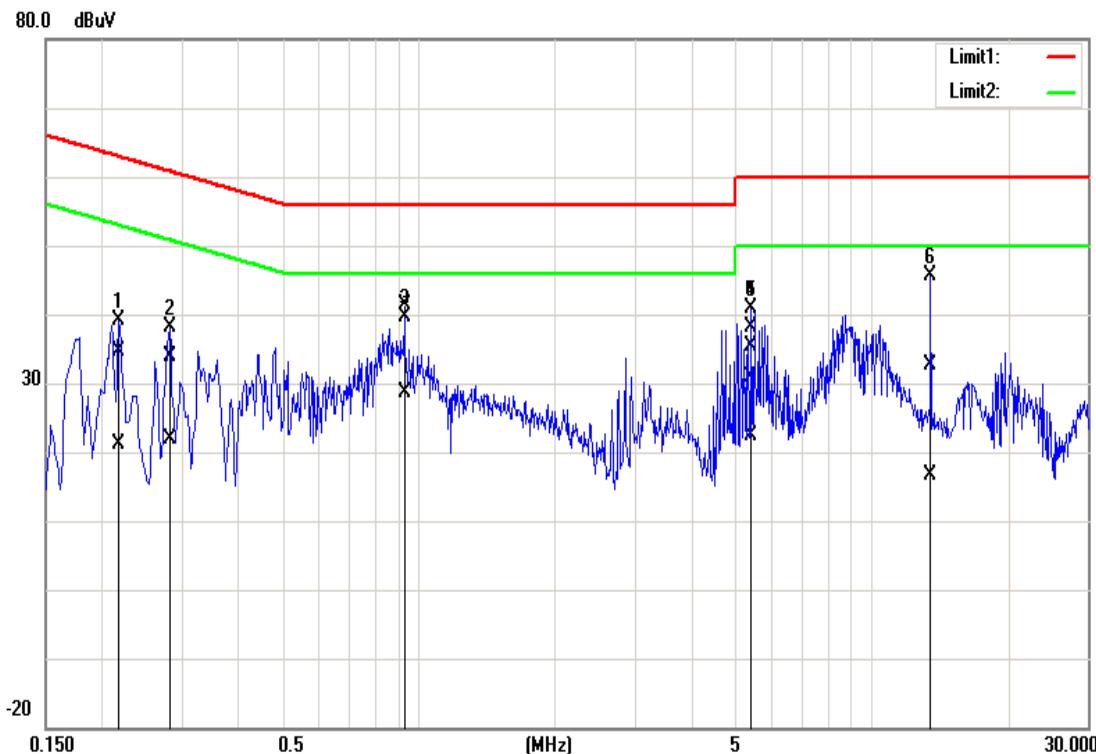


#### 4.1.4 Test Result

Pass.

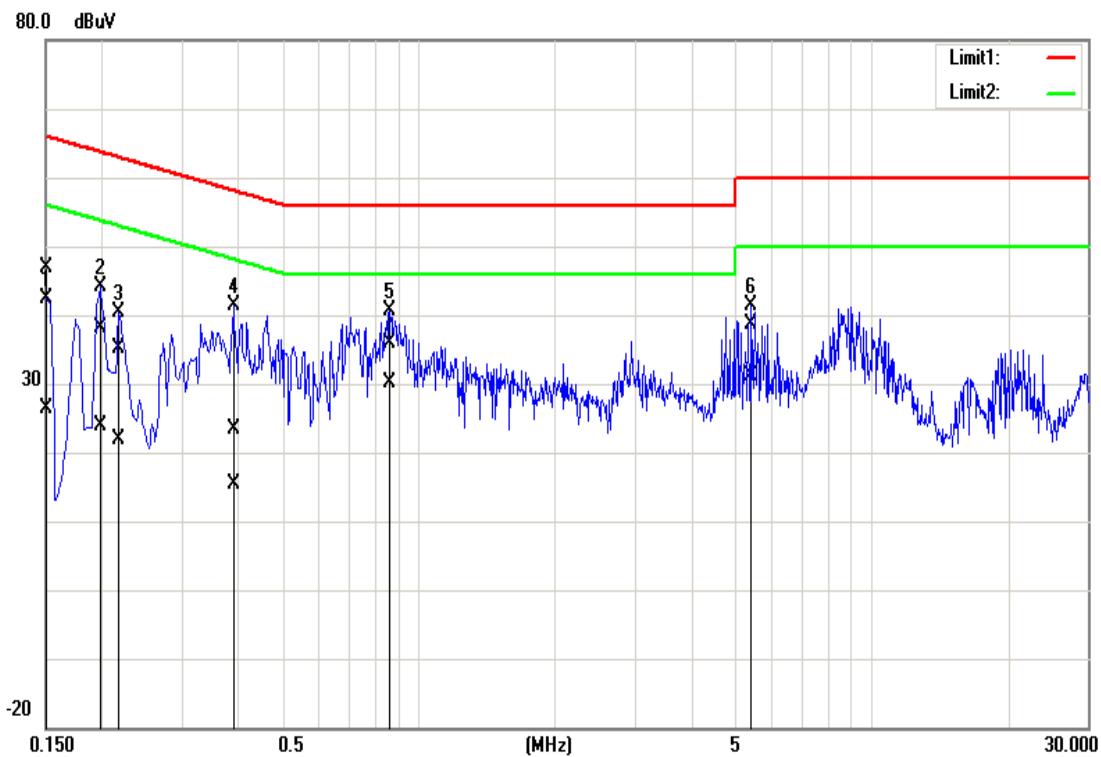
## Test Data

Test Mode:	Mode 1	Temp/Hum	24(°C)/ 50%RH
Test Voltage:	120Vac / 60Hz	Test Date	2018/07/27
Phase:	Line	Test Engineer	Dally Hong



No.	Frequency	QuasiPeak	Average	Correction	QuasiPeak	Average	QuasiPeak	Average	QuasiPeak	Average	Remark
		reading	reading	factor	result	result	limit	limit	margin	margin	
	(MHz)	(dBuV)	(dBuV)	(dB)	(dBuV)	(dBuV)	(dBuV)	(dBuV)	(dB)	(dB)	
1	0.2180	34.46	21.09	0.11	34.57	21.20	62.89	52.89	-28.32	-31.69	Pass
2	0.2820	33.70	21.81	0.11	33.81	21.92	60.76	50.76	-26.95	-28.84	Pass
3	0.9300	41.36	28.51	0.13	41.49	28.64	56.00	46.00	-14.51	-17.36	Pass
4	5.4420	37.99	30.72	0.22	38.21	30.94	60.00	50.00	-21.79	-19.06	Pass
5	5.4460	35.16	22.12	0.22	35.38	22.34	60.00	50.00	-24.62	-27.66	Pass
6	13.5340	32.27	16.31	0.36	32.63	16.67	60.00	50.00	-27.37	-33.33	Pass

Test Mode:	Mode 1	Temp/Hum	24(°C)/ 50%RH
Test Voltage:	120Vac / 60Hz	Test Date	2018/07/27
Phase:	Neutral	Test Engineer	Dally Hong



No.	Frequency	QuasiPeak reading	Average reading	Correction factor	QuasiPeak result	Average result	QuasiPeak limit	Average limit	QuasiPeak margin	Average margin	Remark
	(MHz)	(dBuV)	(dBuV)	(dB)	(dBuV)	(dBuV)	(dBuV)	(dBuV)	(dB)	(dB)	
1	0.1500	46.86	26.36	0.14	47.00	26.50	65.99	56.00	-18.99	-29.50	Pass
2	0.1980	38.05	23.67	0.13	38.18	23.80	63.69	53.69	-25.51	-29.89	Pass
3	0.2180	34.96	21.76	0.13	35.09	21.89	62.89	52.89	-27.80	-31.00	Pass
4	0.3899	23.13	15.22	0.13	23.26	15.35	58.06	48.07	-34.80	-32.72	Pass
5	0.8620	35.80	29.97	0.14	35.94	30.11	56.00	46.00	-20.06	-15.89	Pass
6	5.4420	38.29	30.87	0.22	38.51	31.09	60.00	50.00	-21.49	-18.91	Pass

## 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.

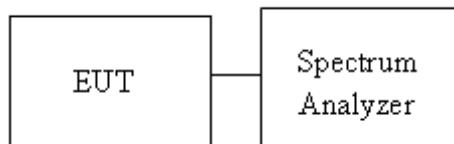
**Occupied Bandwidth(99%)** : For reporting purposes only.

### 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.
4. SA set RBW = 1% ~ 5% OBW, VBW = three times the RBW and Detector = Peak, to measurement 99% Bandwidth
5. Measure and record the result of 20 dB Bandwidth and 99% Bandwidth. in the test report.

### 4.2.3 Test Setup

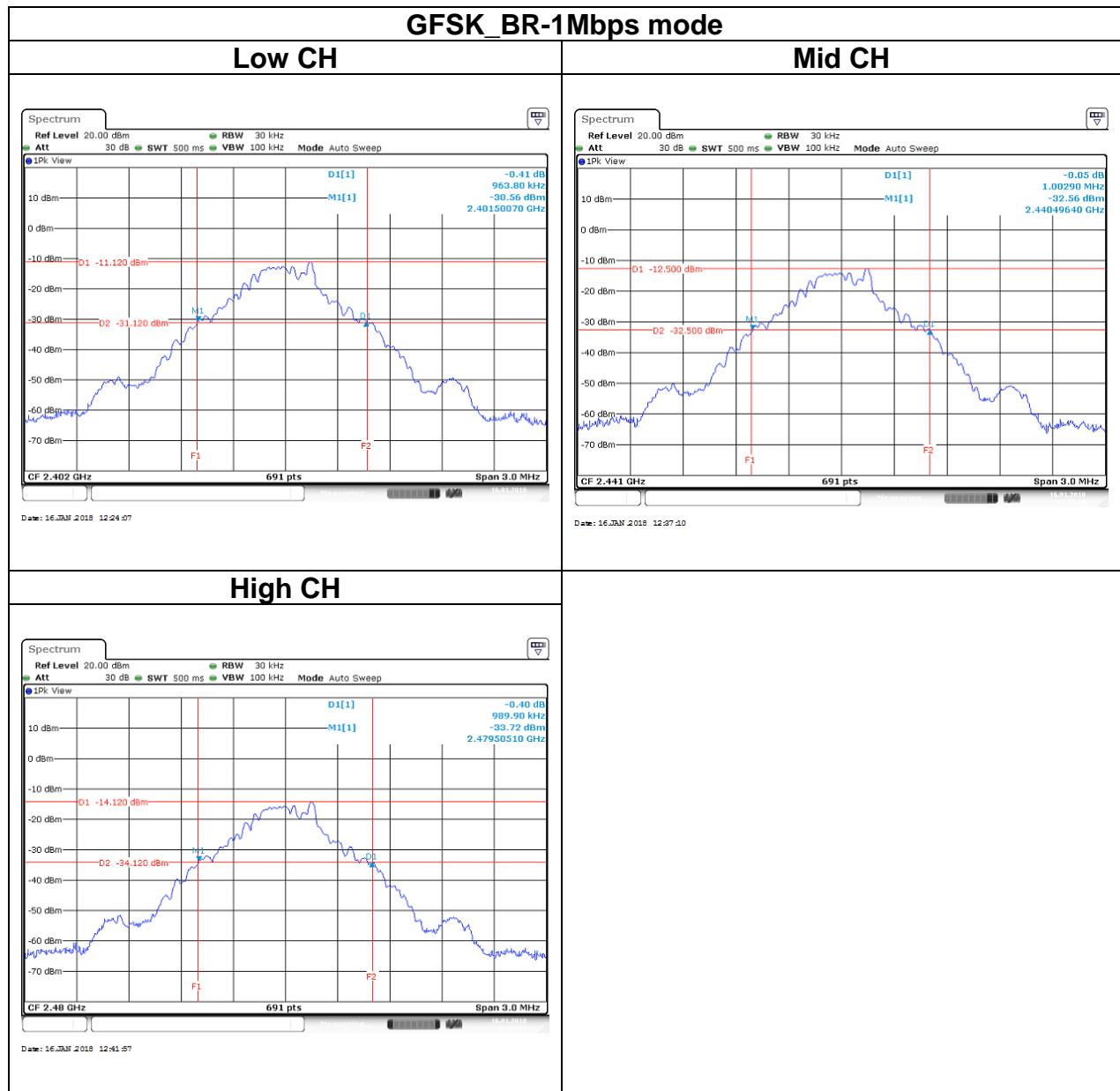


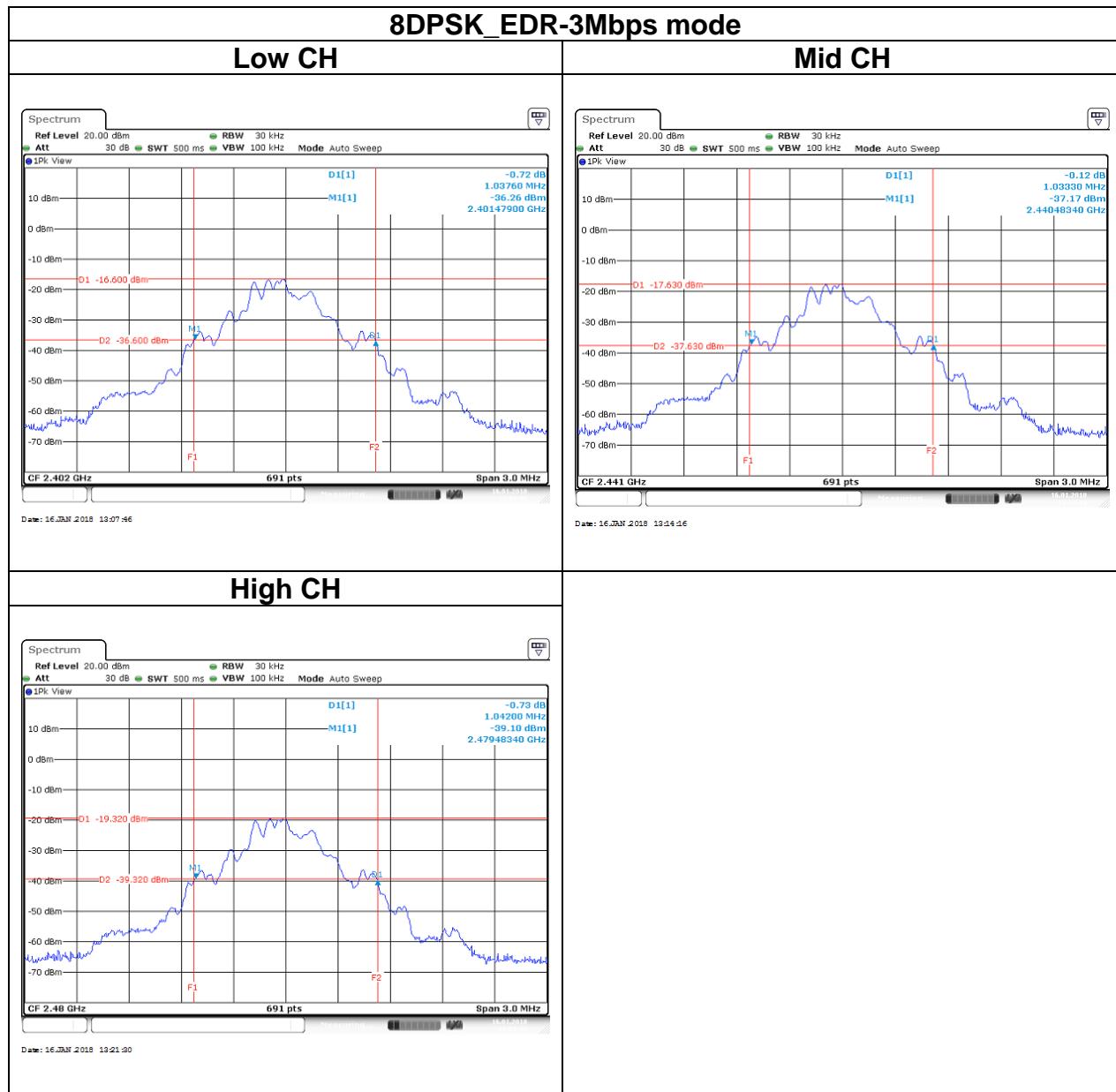
### 4.2.4 Test Result

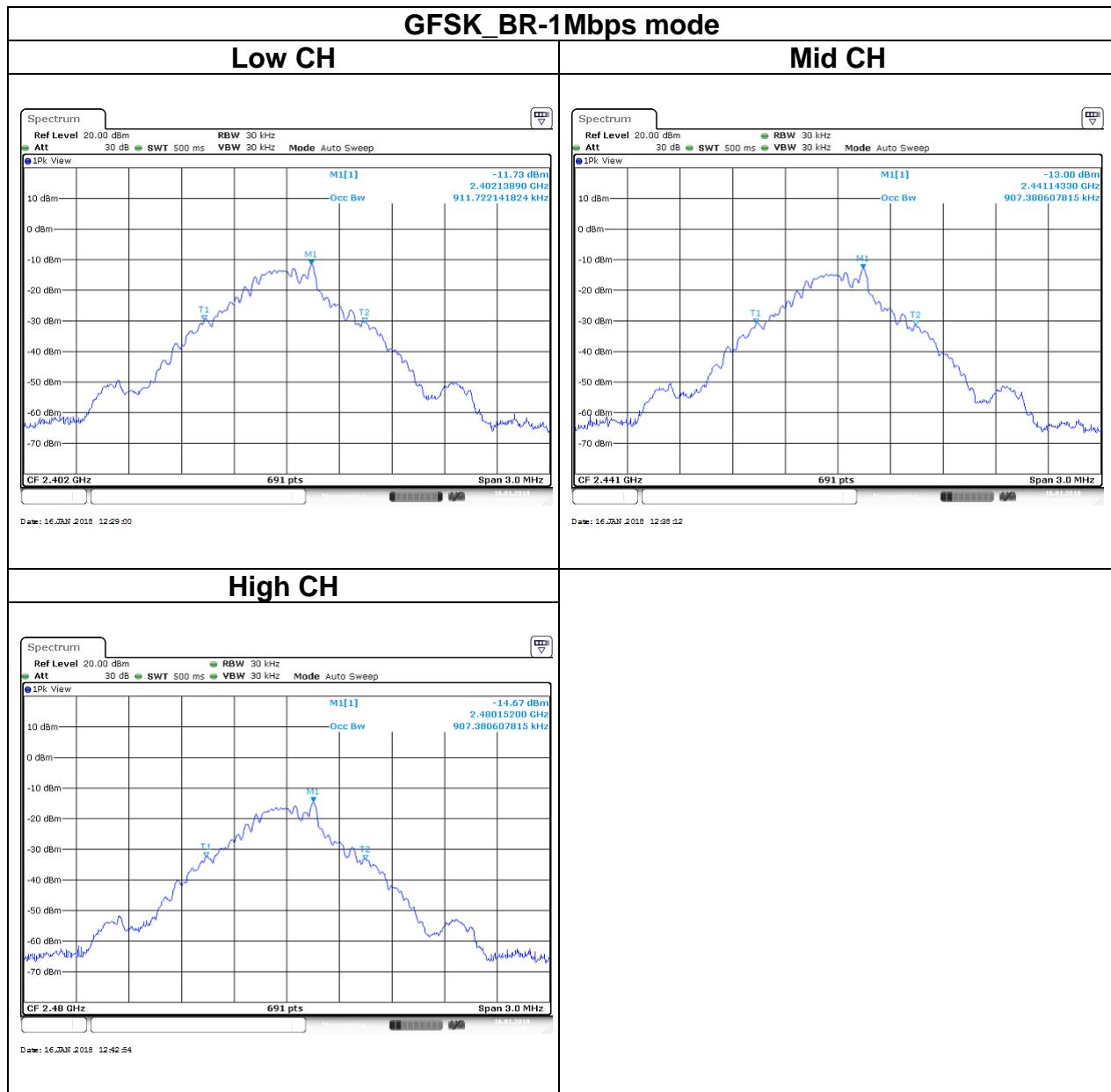
Test mode: GFSK_BR-1Mbps mode / 2402-2480 MHz			
Channel	Frequency (MHz)	OBW(99%) (MHz)	20dB BW (MHz)
Low	2402	0.9117	0.9638
Mid	2441	0.9073	1.0029
High	2480	0.9073	0.9899

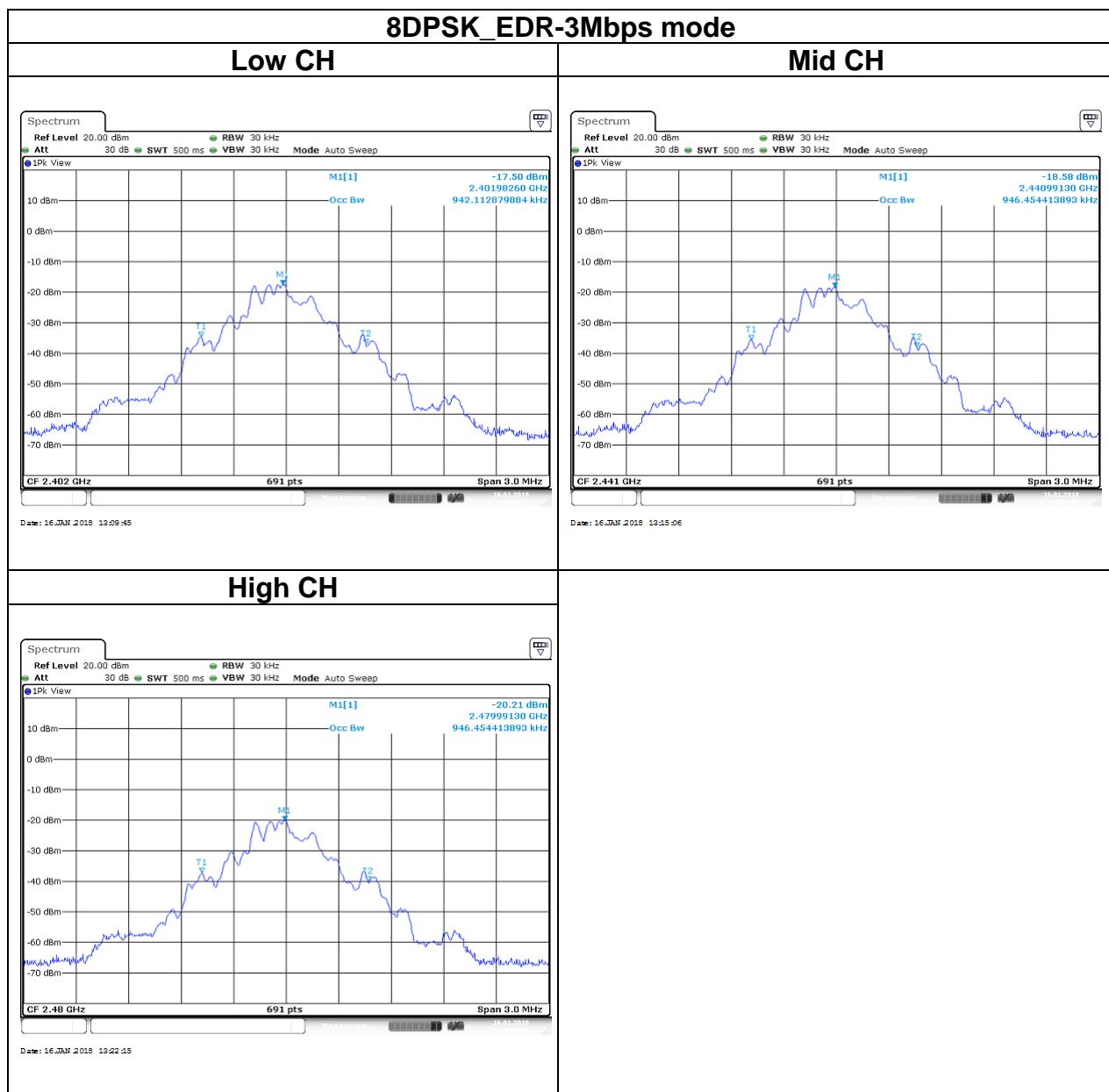
Test mode: 8DPSK_EDR-3Mbps mode / 2402-2480 MHz			
Channel	Frequency (MHz)	OBW(99%) (MHz)	20dB BW (MHz)
Low	2402	0.9421	1.0376
Mid	2441	0.9464	1.0333
High	2480	0.9464	1.0420

Report No.: T170919D06-A-RP1

**Test Data****20dB**



**99%OBW**



## 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.

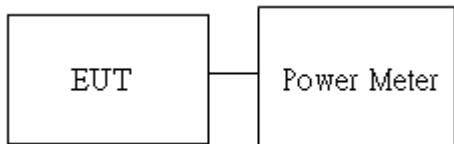
Limit	<input checked="" type="checkbox"/> Antenna not exceed 6 dBi : 21dBm <input type="checkbox"/> Antenna with DG greater than 6 dBi : 21dBm [ Limit = 30 – (DG – 6) ]
-------	--

**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)	PK Power (W)	Limit (dBm)
GFSK BR-1Mbps (DH5)	0	2402	7.38	0.0055	21
	39	2441	6.24	0.0042	
	78	2480	5.56	0.0036	
8DPSK EDR- 3Mbps (DH5)	0	2402	4.39	0.0027	21
	39	2441	3.78	0.0024	
	78	2480	4.38	0.0027	

##### Average output power :

BT			
Config.	CH	Freq. (MHz)	AV Power (dBm)
GFSK BR-1Mbps (DH5)	0	2402	2.38
	39	2441	1.34
	78	2480	0.62
8DPSK EDR- 3Mbps (DH5)	0	2402	6.09
	39	2441	5.57
	78	2480	5.59

## 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.

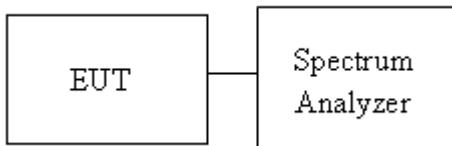
Alternatively, frequency hopping systems operating in the 2400-2483.5 MHz band may have hopping channel carrier frequencies that are separated by 25 kHz or two-thirds of the 20 dB bandwidth of the hopping channel, whichever is greater, provided the systems operate with an output power no greater than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

Limit	> two-thirds of the 20 dB bandwidth
-------	-------------------------------------

### 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

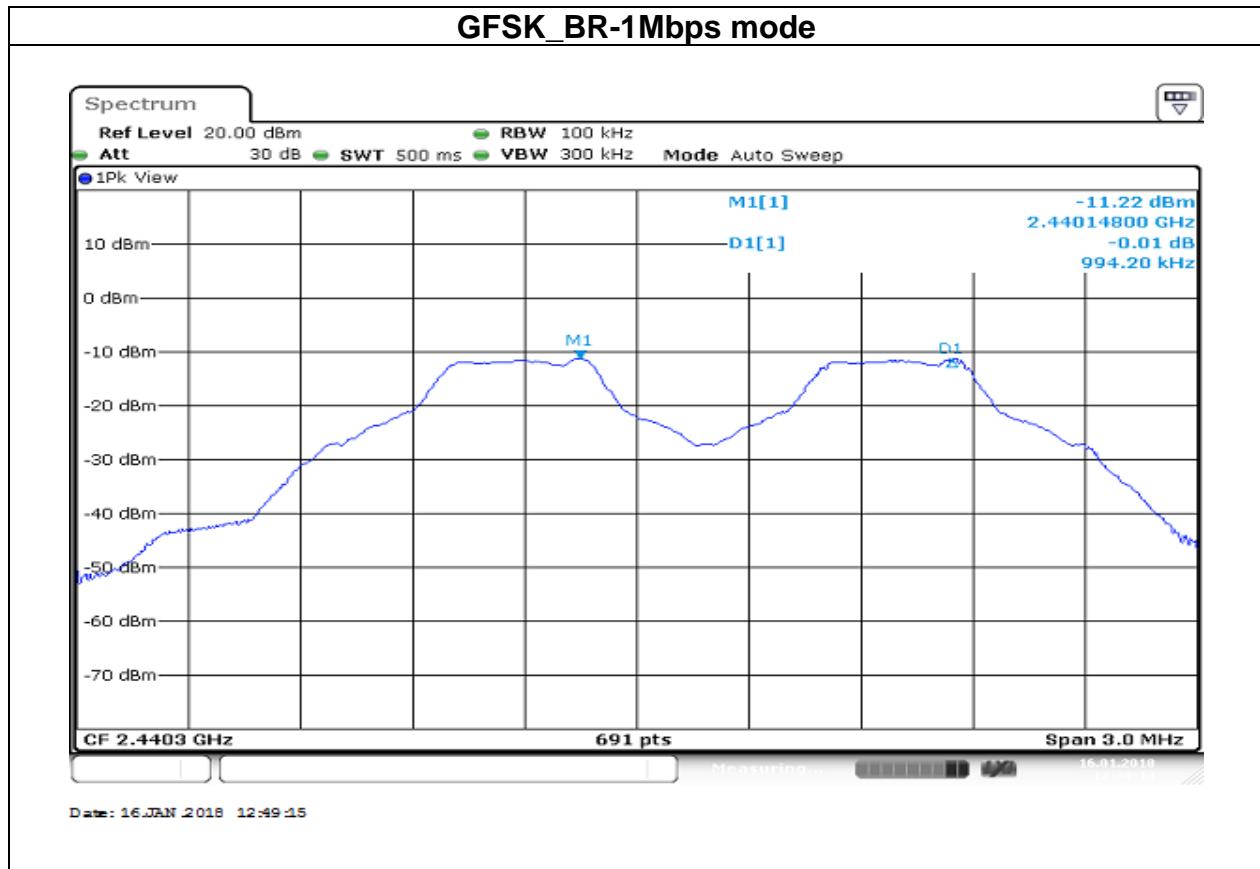


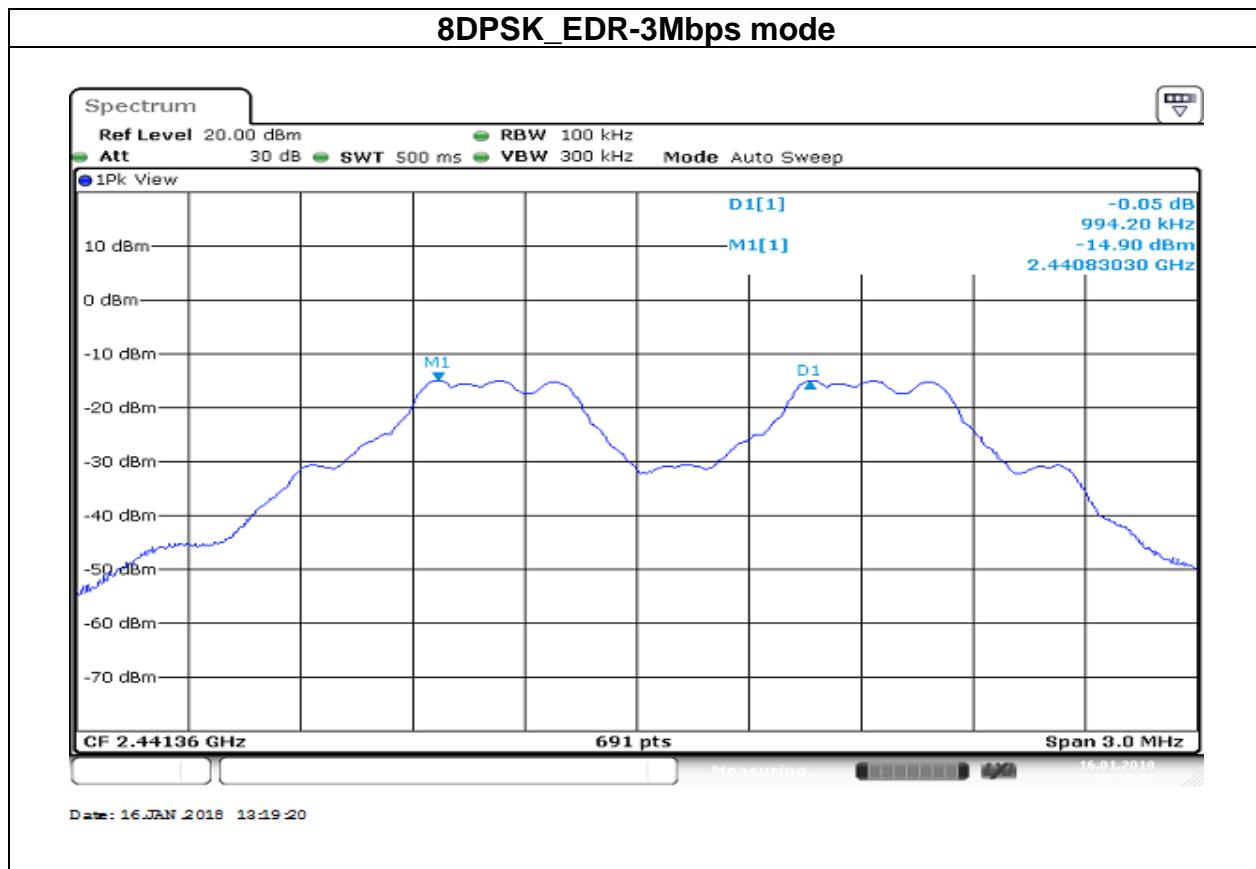
#### 4.4.4 Test Result

<b>Test mode: GFSK_BR-1Mbps mode / 2402-2480 MHz</b>				
<b>Channel</b>	<b>Frequency (MHz)</b>	<b>Channel Separation (MHz)</b>	<b>Channel Separation Limits (MHz)</b>	<b>Result</b>
Low	2402	0.9942	0.643	PASS
Mid	2441	0.9942	0.669	PASS
High	2480	0.9942	0.660	PASS

<b>Test mode: 8DPSK_EDR-3Mbps mode / 2402-2480 MHz</b>				
<b>Channel</b>	<b>Frequency (MHz)</b>	<b>Channel Separation (MHz)</b>	<b>Channel Separation Limits (MHz)</b>	<b>Result</b>
Low	2402	0.9942	0.692	PASS
Mid	2441	0.9942	0.689	PASS
High	2480	0.9942	0.695	PASS

## Test Data





## 4.5 NUMBER OF HOPPING

### 4.5.1 Test Limit

According to §15.247(a)(1)(iii),

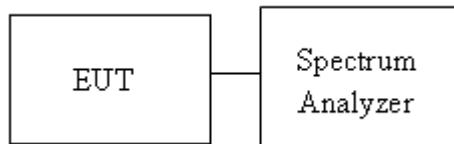
Frequency hopping system in the 2400-2483.5MHz band shall use at least 15 channels.

### 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



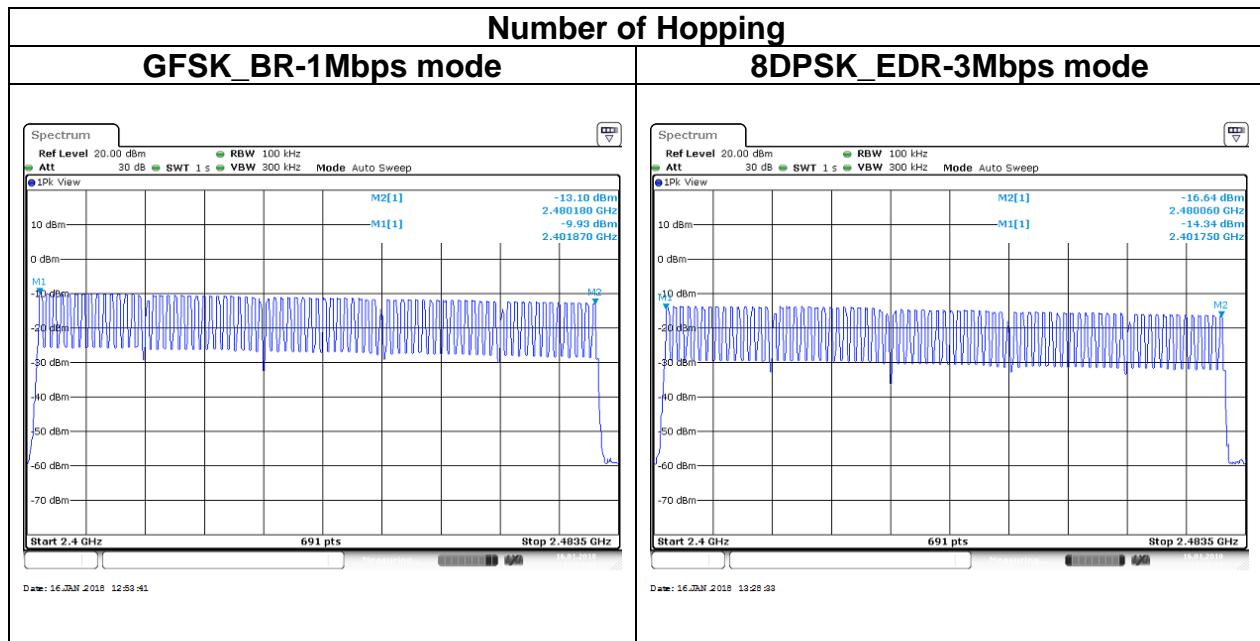
### 4.5.4 Test Result

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

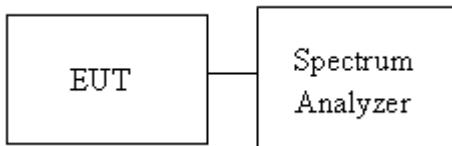
According to §15.247(d) and RSS-247 section 5.5

Limit	-20 dBc
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### 4.6.2 Test Procedure

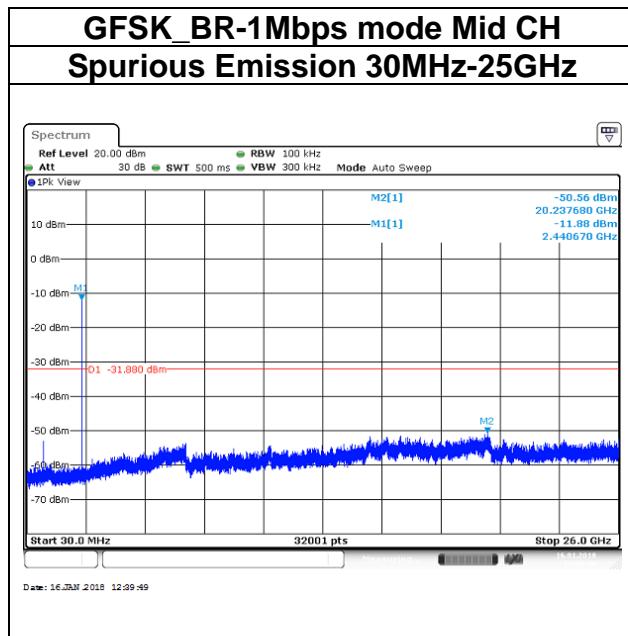
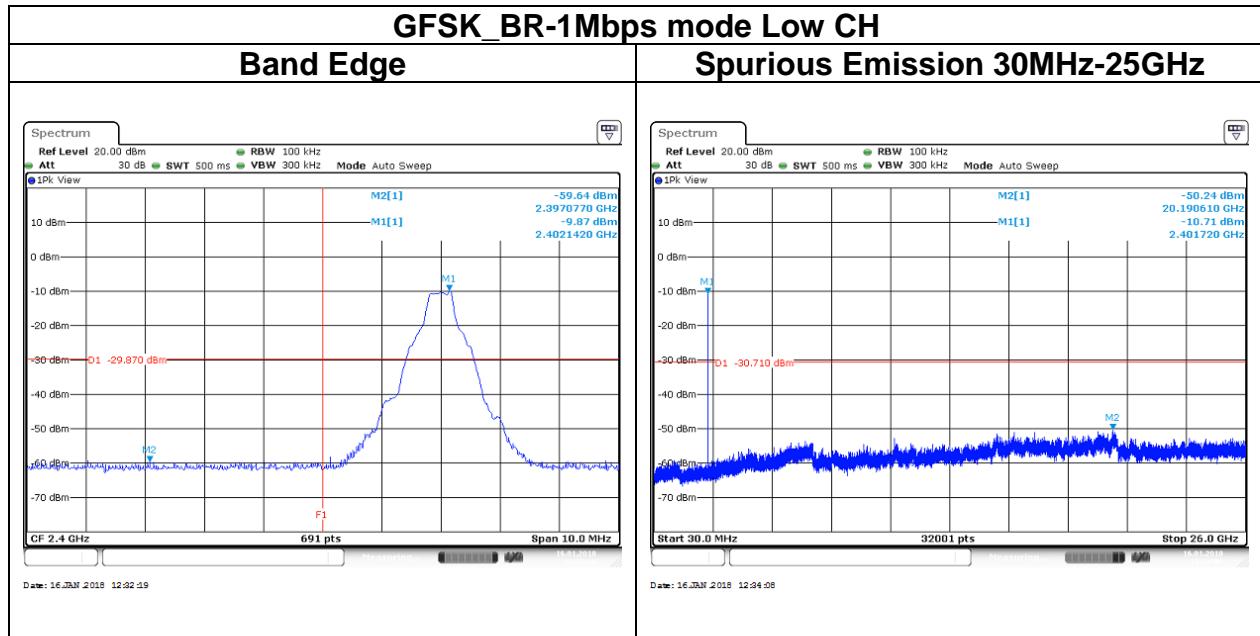
1. EUT RF output port connected to the SA by RF cable, and the path loss was compensated to result.
2. SA setting, RBW=100kHz, VBW=300kHz, Detector=Peak, Trace mode = max hold, SWT = Auto.
3. The Band Edge at 2.4GHz and 2.4835GHz are investigated with normal hopping mode.

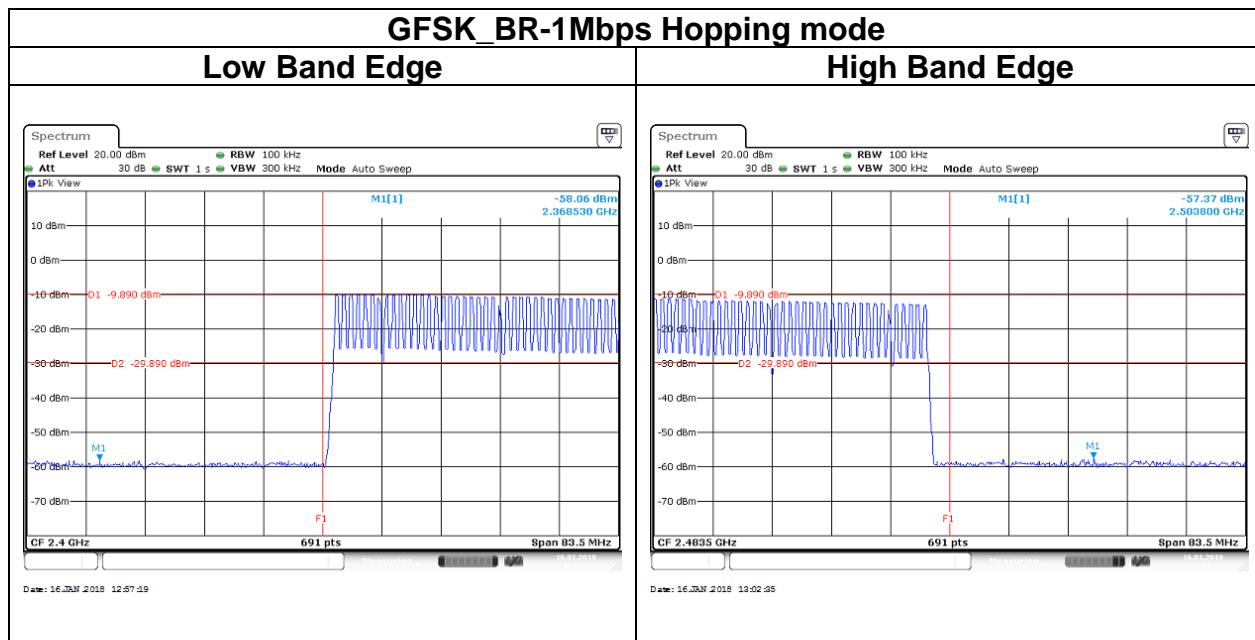
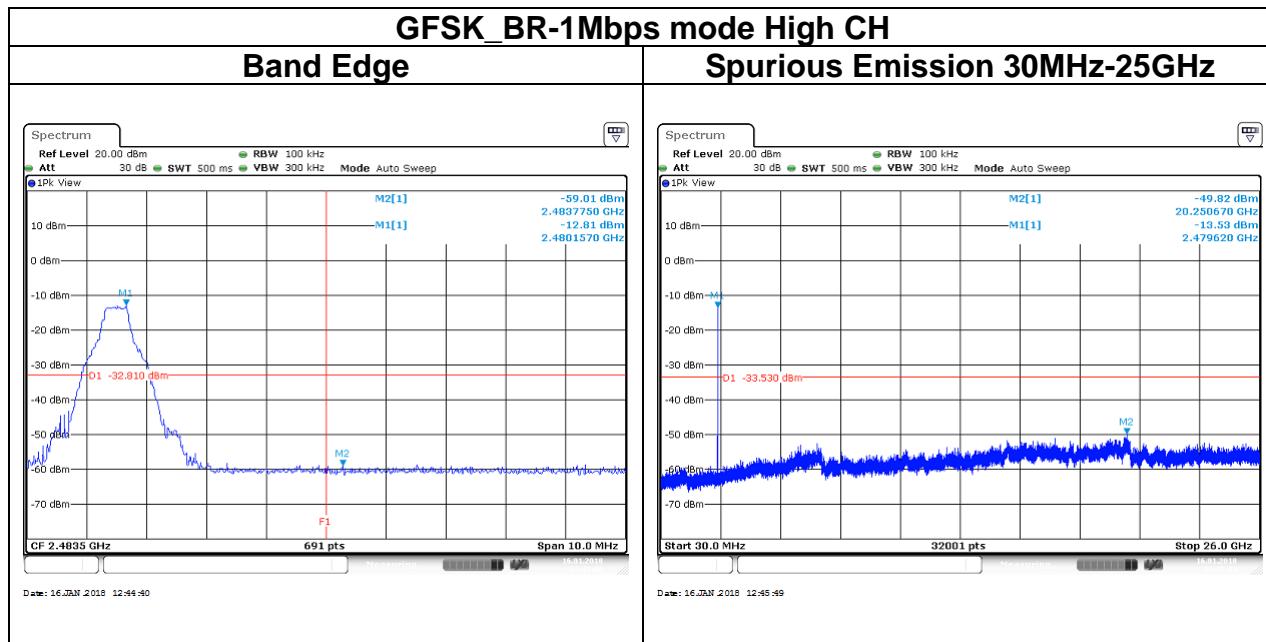
### 4.6.3 Test Setup

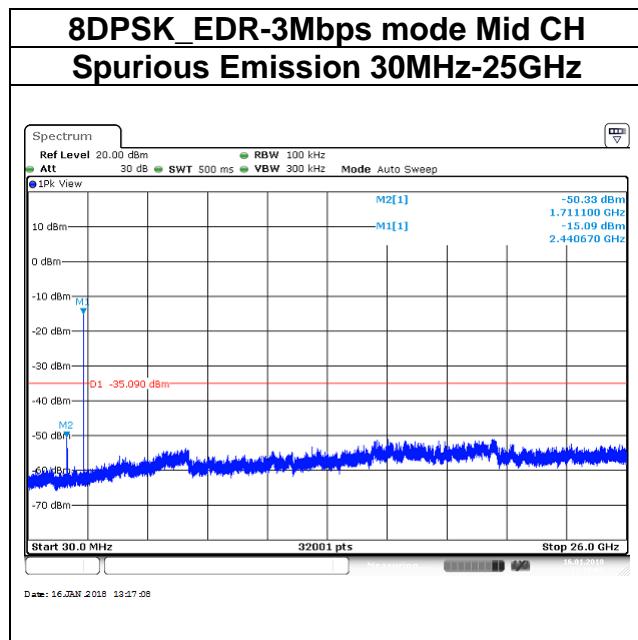
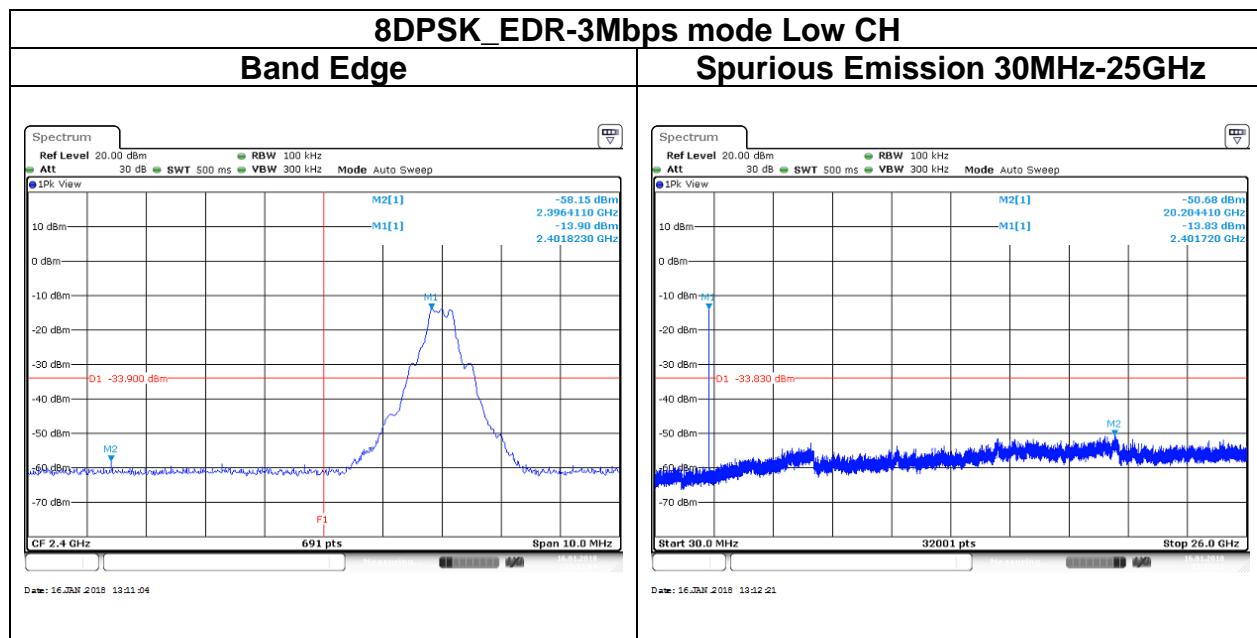


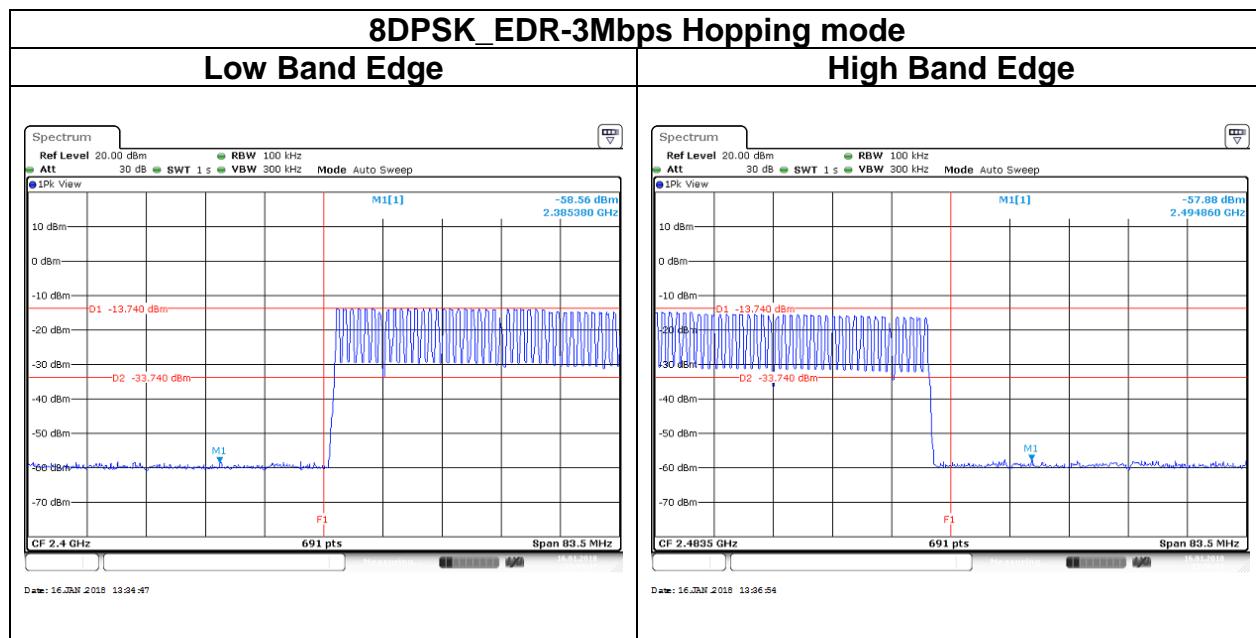
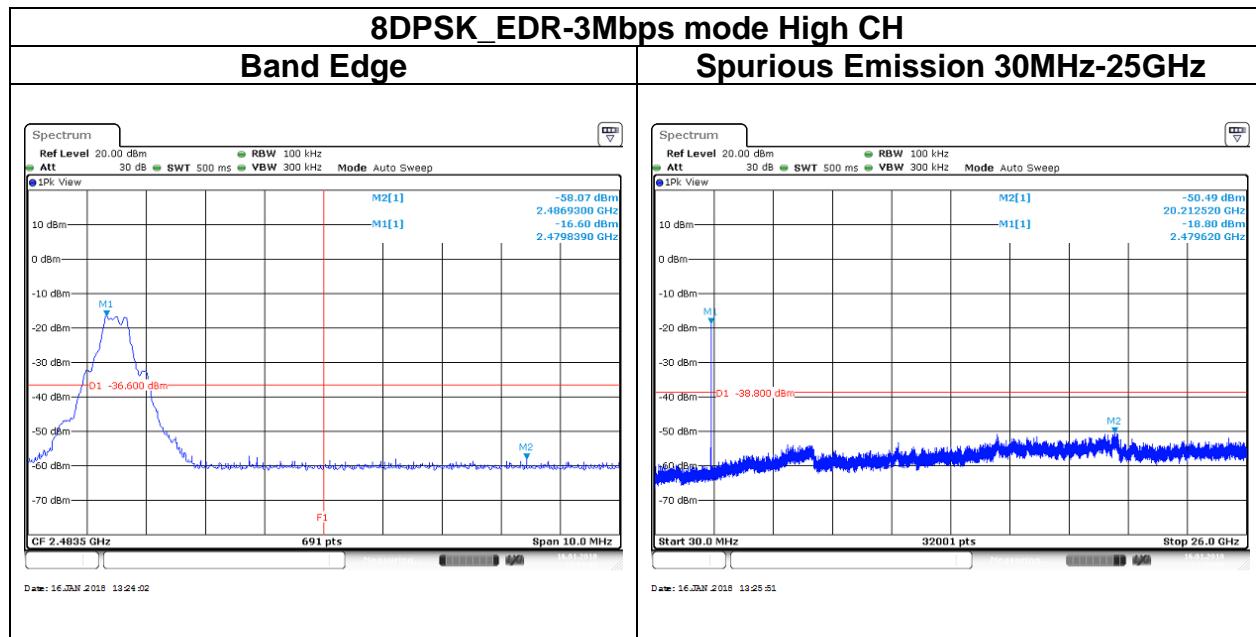
#### 4.6.4 Test Result

##### Test Data









## 4.7 TIME OF OCCUPANCY (DWELL TIME)

### 4.7.1 Test Limit

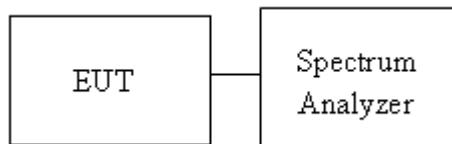
According to §15.247(a)(1)(iii).

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



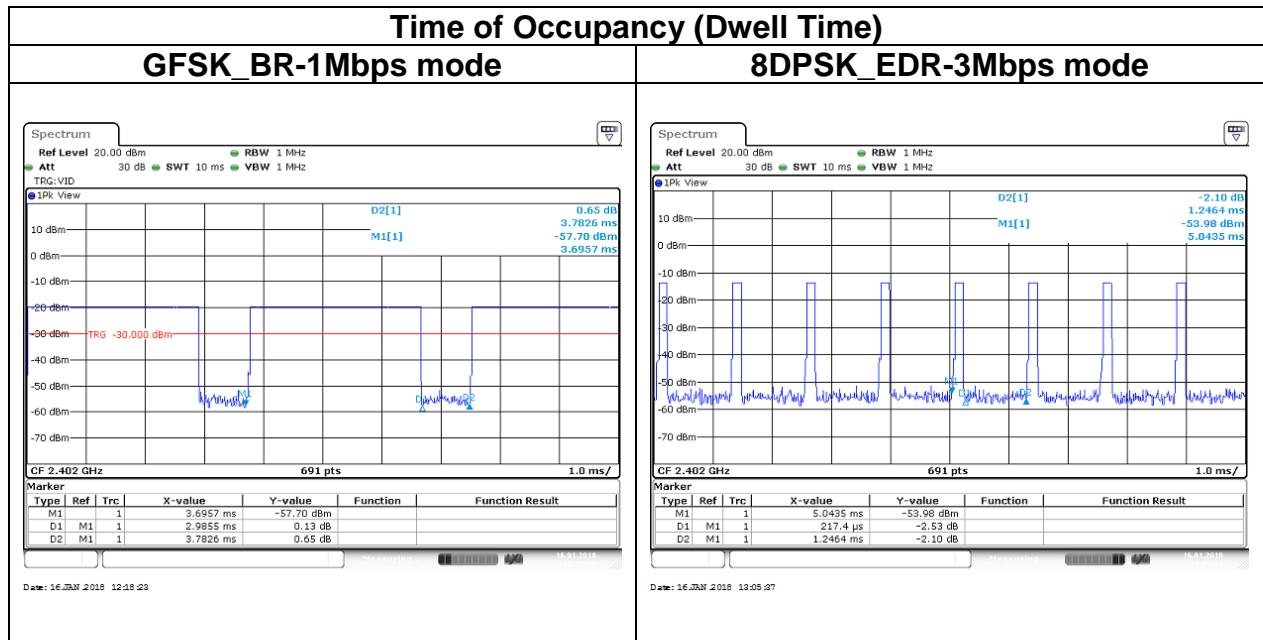
### 4.7.4 Test Result

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	2.9855	79	106.67	0.3185	0.4	Pass
EDR-3Mbps	2441	0.2174	79	106.67	0.0232	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  $6.666 * 0.4 * 20 = 53.33$

Report No.: T170919D06-A-RP1

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 are 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 9kHz to 26.5GHz set to the low, Mid and High channels with the EUT transmit.

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

Remark:

Although these tests were performed other than open area test site, adequate comparison measurements were confirmed against 30 m open are 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. 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

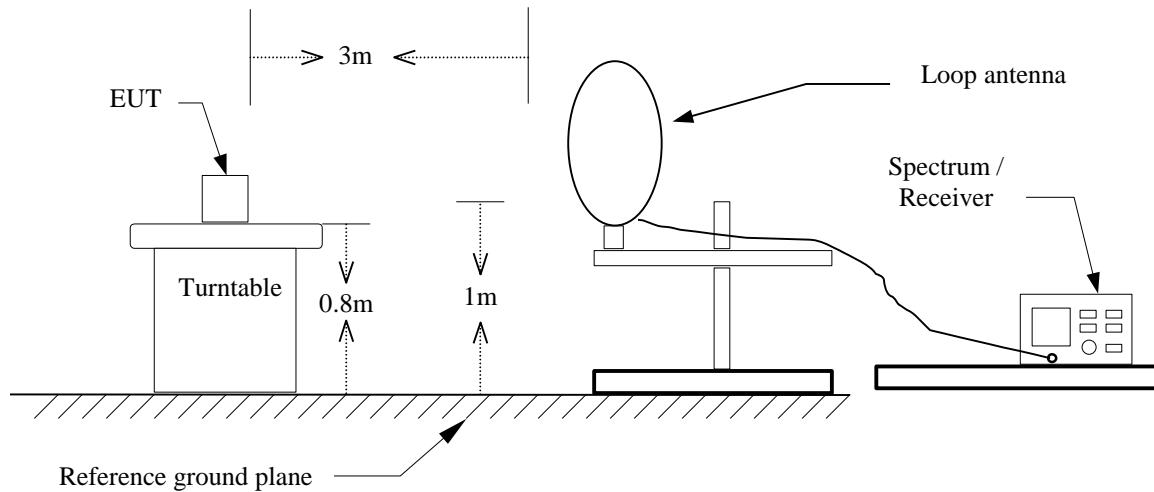
· If Duty Cycle  $\geq$  98%, VBW=10Hz.

· If Duty Cycle < 98%, VBW=1/T.

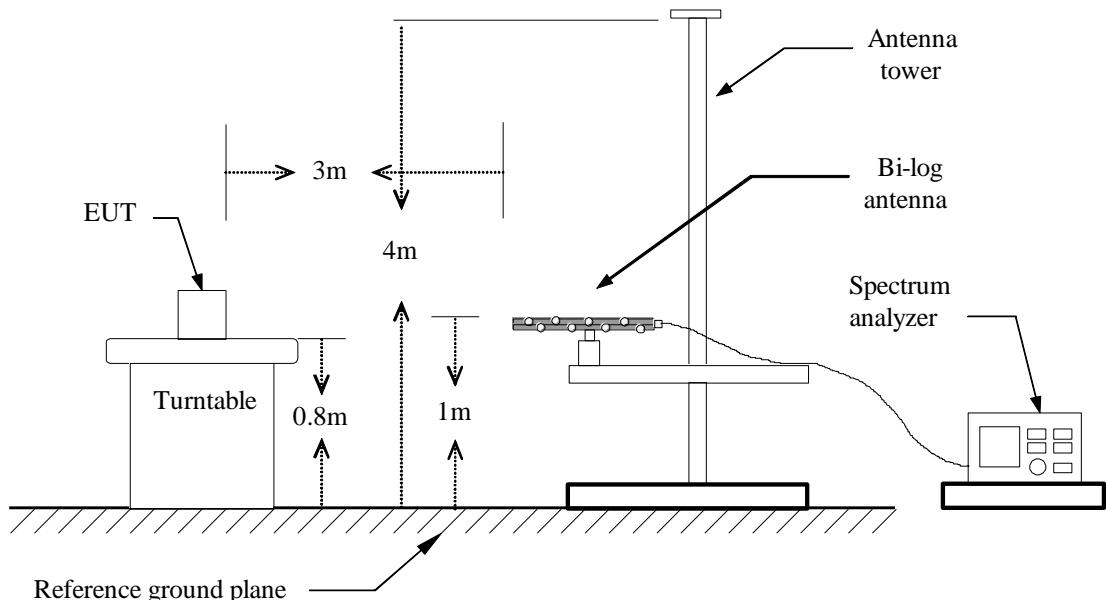
Configuration	Duty Cycle (%)	T(ms)	1/T (kHz)	VBW setting
GFSK_BR-1Mbps	61%	2.2700	0.441	430Hz
8DPSK_EDR-3Mbps	24%	0.9200	1.087	1.1KHz

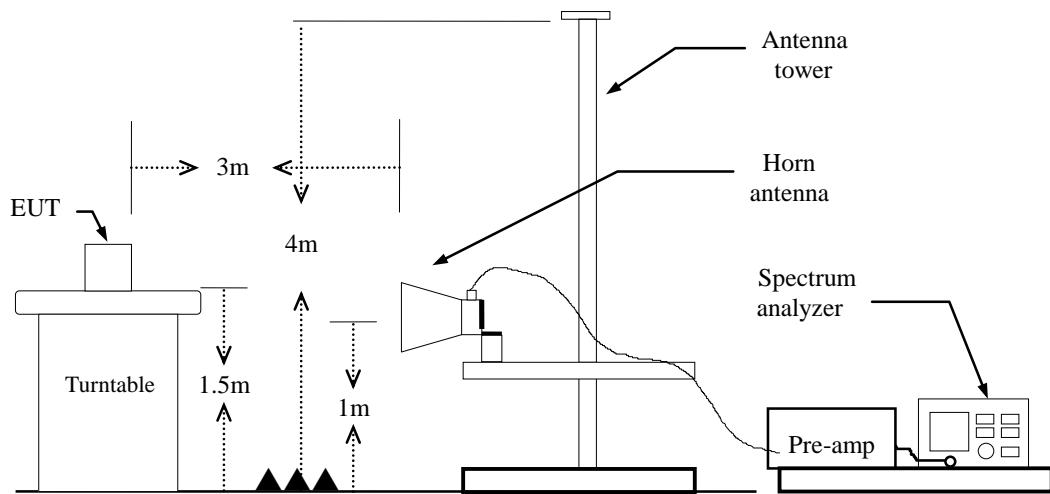
### 4.8.3 Test Setup

#### 9kHz ~ 30MHz



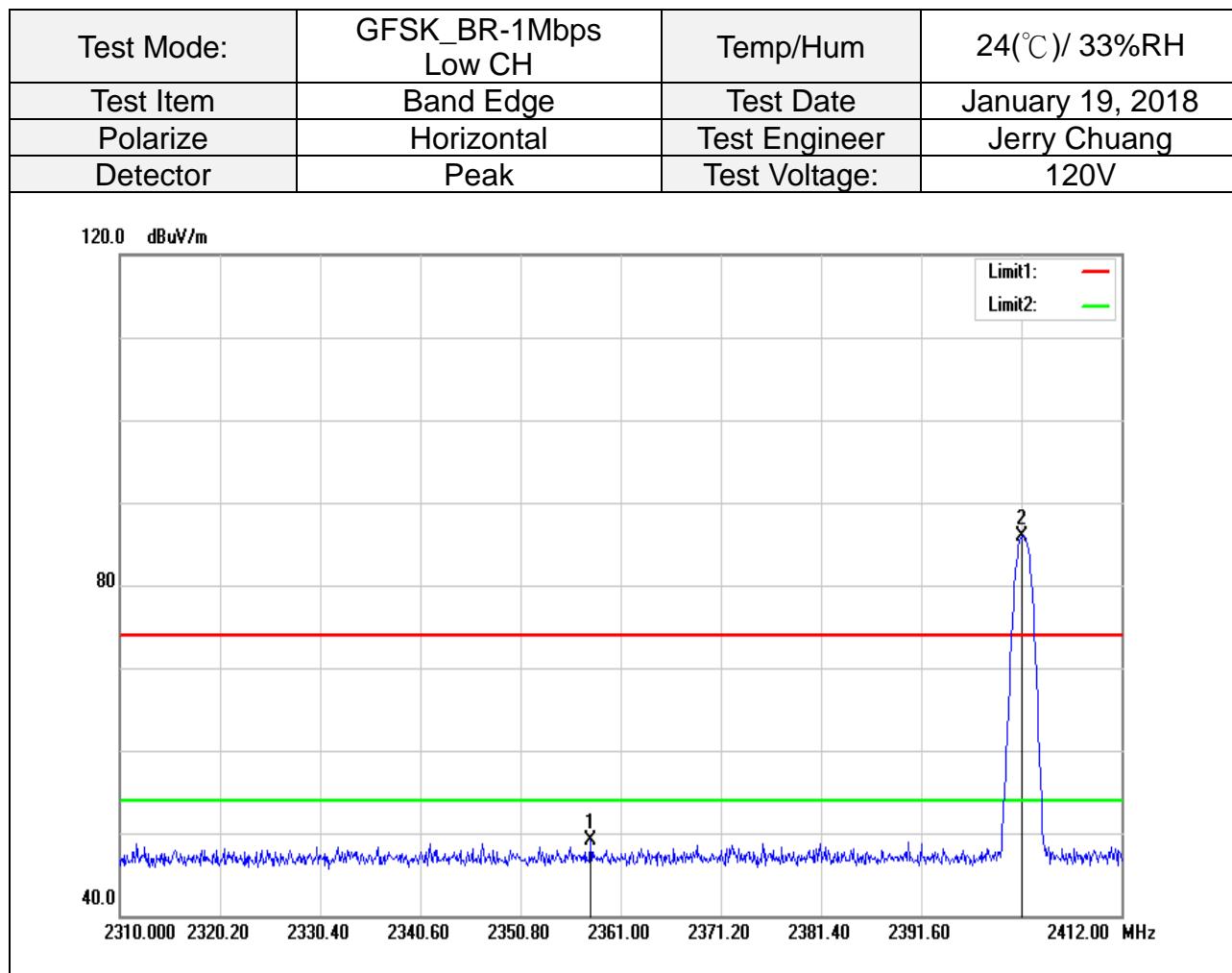
#### 30MHz ~ 1GHz



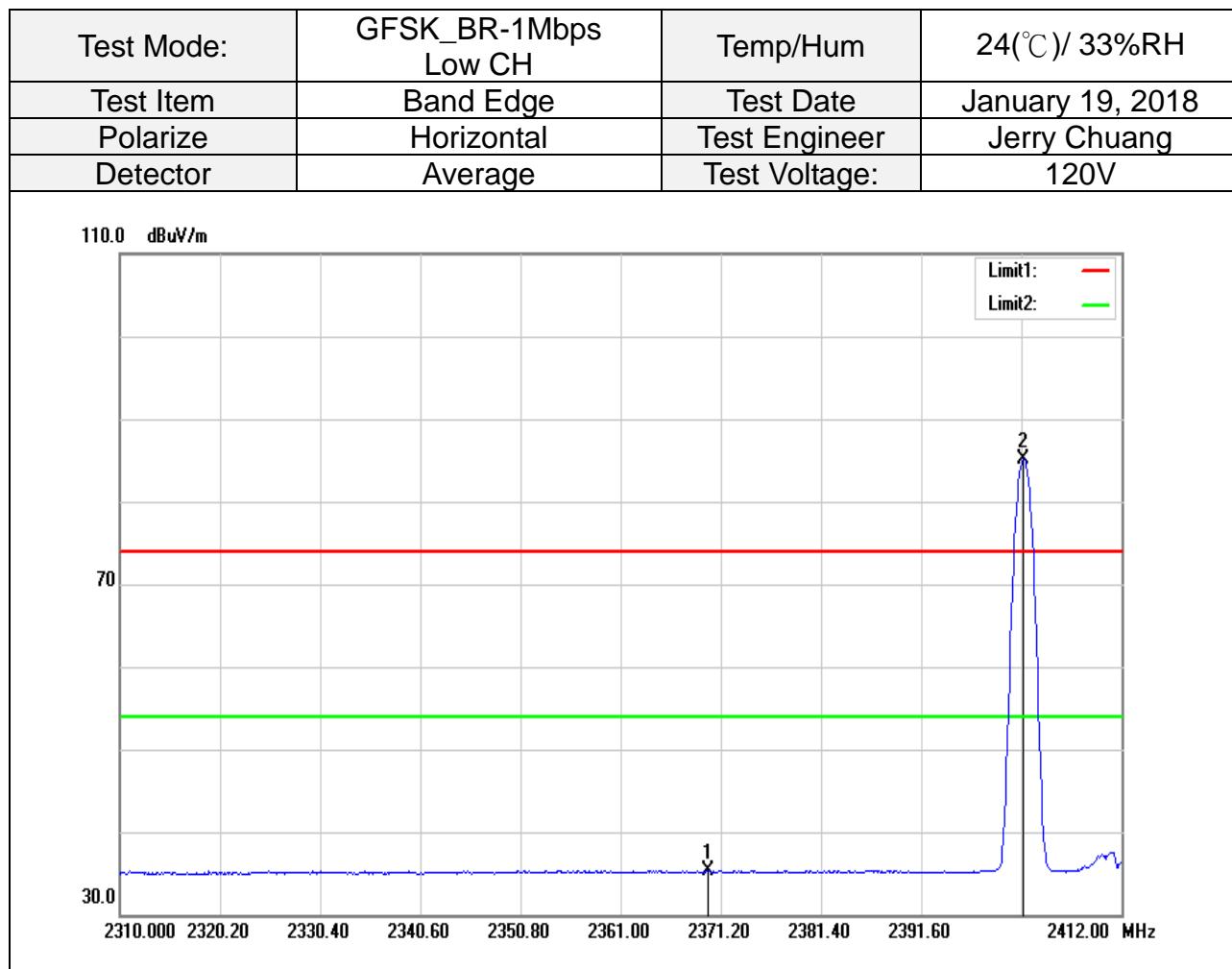
**Above 1 GHz**

#### 4.8.4 Test Result

##### Band Edge Test Data

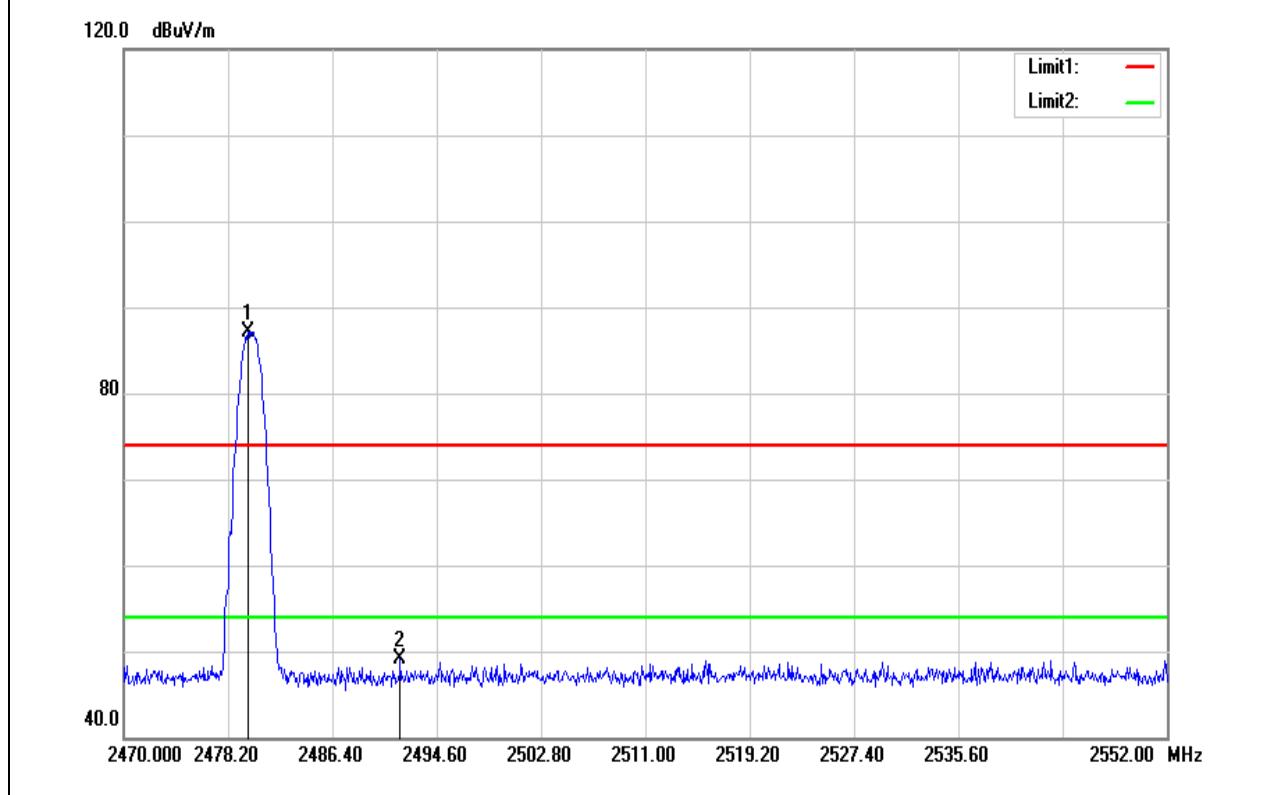


No.	Frequency (MHz)	Reading (dBuV)	Correct Factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	2357.940	52.17	-3.08	49.09	74.00	-24.91	peak
2	2401.902	88.80	-2.95	85.85	-	-	peak

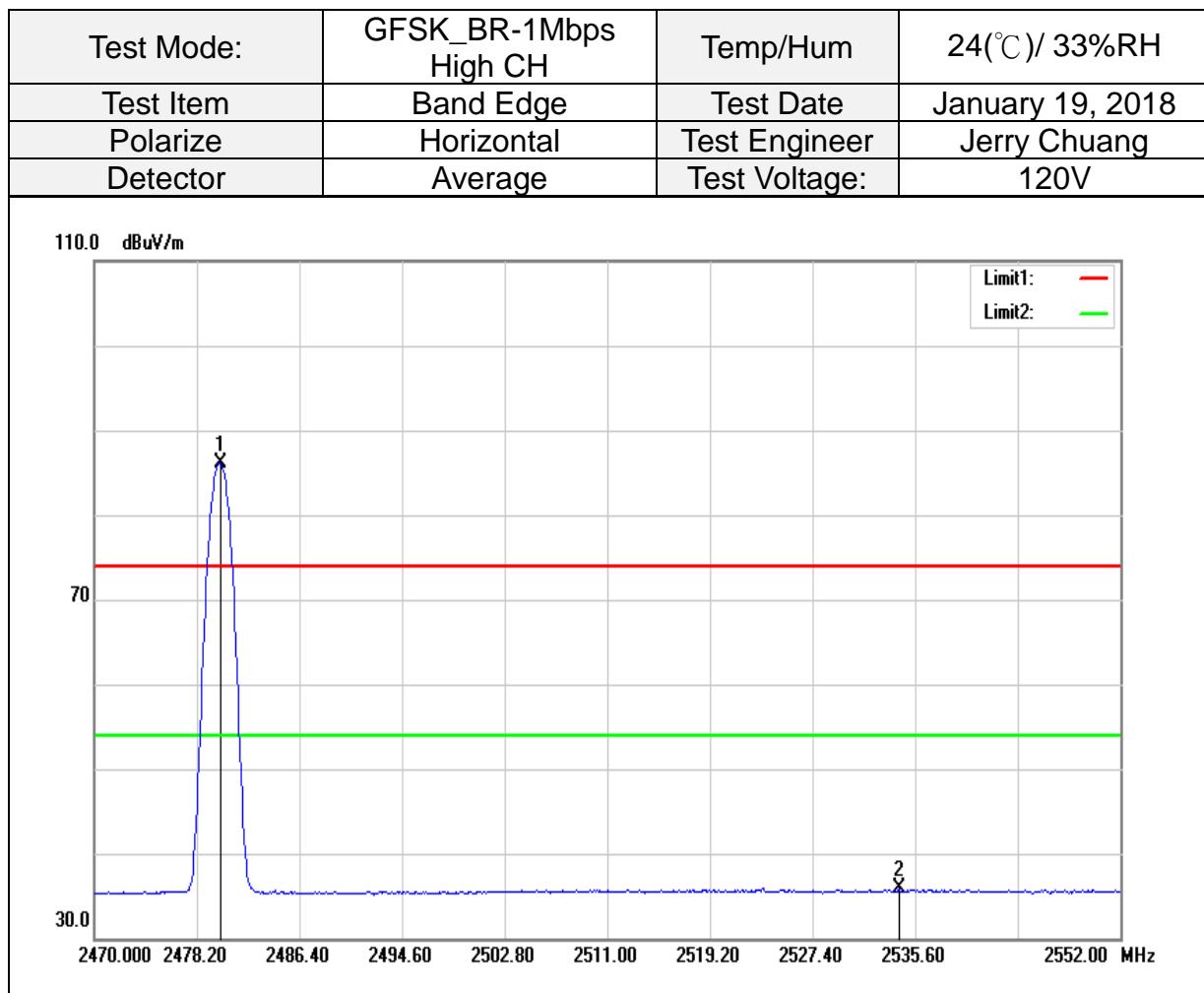


No.	Frequency (MHz)	Reading (dBuV)	Correct Factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	2369.874	38.42	-3.05	35.37	54.00	-18.63	AVG
2	2402.004	87.97	-2.95	85.02	-	-	AVG

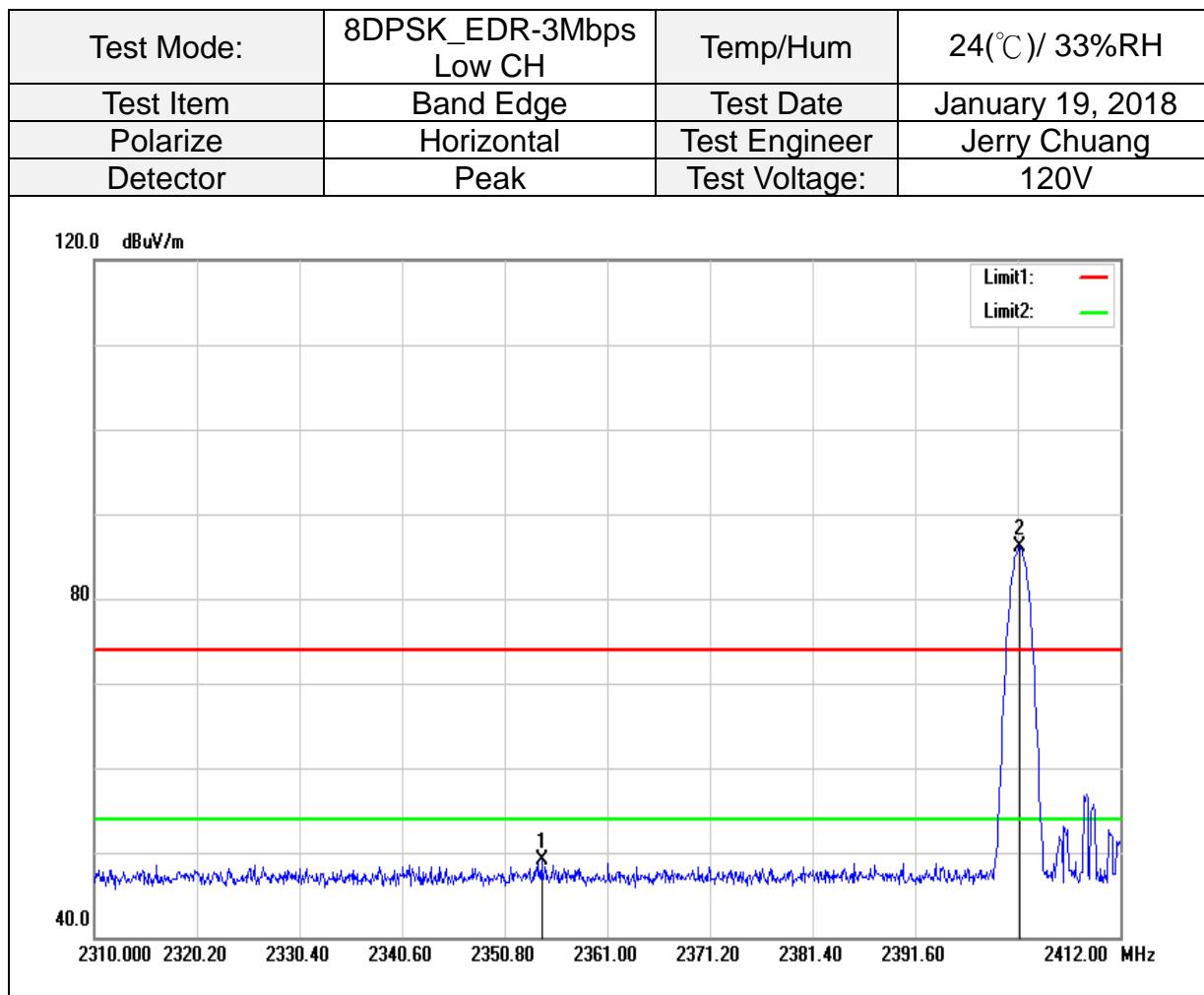
Test Mode:	GFSK_BR-1Mbps High CH	Temp/Hum	24(°C)/ 33%RH
Test Item	Band Edge	Test Date	January 19, 2018
Polarize	Horizontal	Test Engineer	Jerry Chuang
Detector	Peak	Test Voltage:	120V



No.	Frequency (MHz)	Reading (dBuV)	Correct Factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	2479.758	89.77	-2.70	87.07	-	-	peak
2	2491.730	51.80	-2.67	49.13	74.00	-24.87	peak

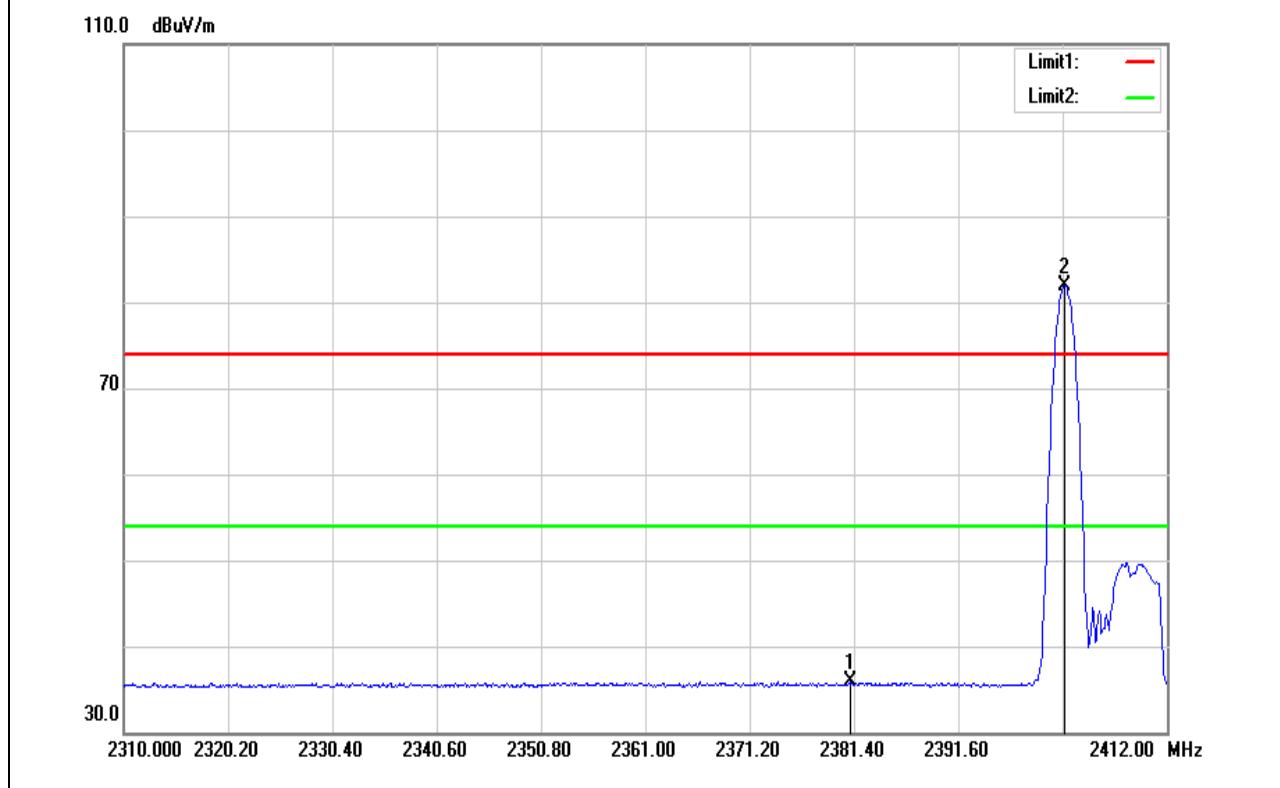


No.	Frequency (MHz)	Reading (dBuV)	Correct Factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	2480.086	88.80	-2.70	86.10	-	-	AVG
2	2534.288	38.37	-2.56	35.81	54.00	-18.19	AVG

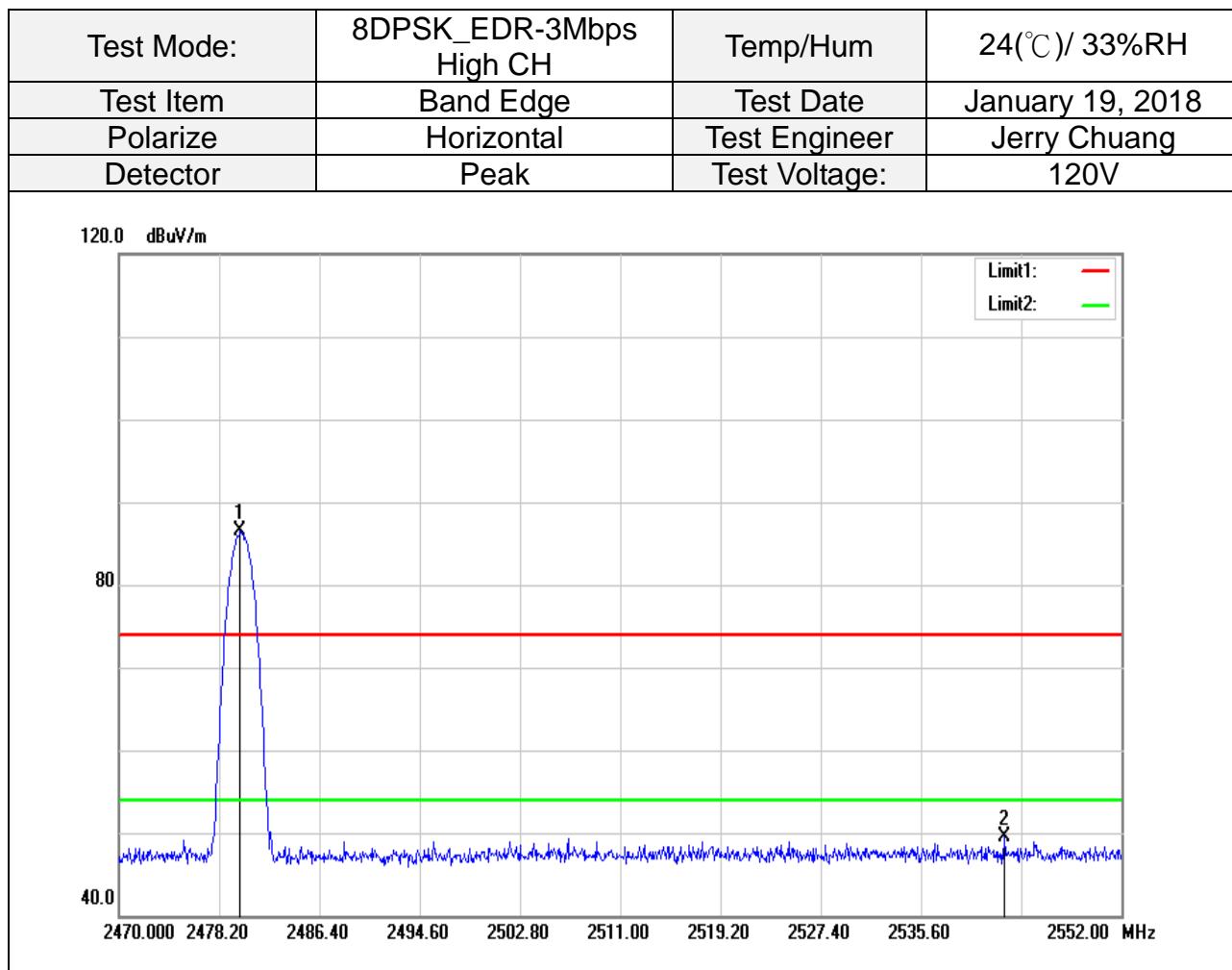


No.	Frequency (MHz)	Reading (dBuV)	Correct Factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	2354.472	52.17	-3.10	49.07	74.00	-24.93	peak
2	2402.004	89.01	-2.95	86.06	-	-	peak

Test Mode:	8DPSK_EDR-3Mbps Low CH	Temp/Hum	24(°C)/ 33%RH
Test Item	Band Edge	Test Date	January 19, 2018
Polarize	Horizontal	Test Engineer	Jerry Chuang
Detector	Average	Test Voltage:	120V

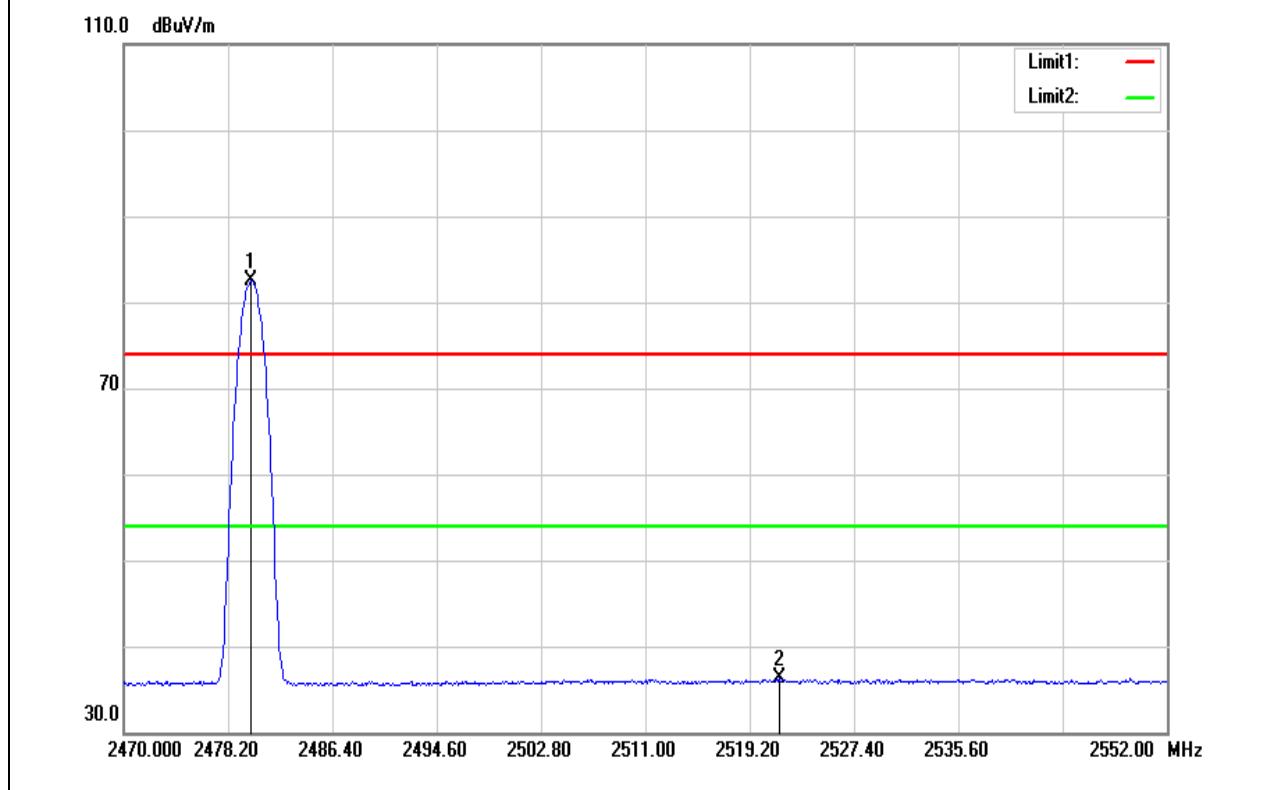


No.	Frequency (MHz)	Reading (dBuV)	Correct Factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	2380.992	38.85	-3.01	35.84	54.00	-18.16	AVG
2	2402.004	84.87	-2.95	81.92	-	-	AVG



No.	Frequency (MHz)	Reading (dBuV)	Correct Factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	2479.922	89.10	-2.70	86.40	-	-	peak
2	2542.406	52.11	-2.56	49.55	74.00	-24.45	peak

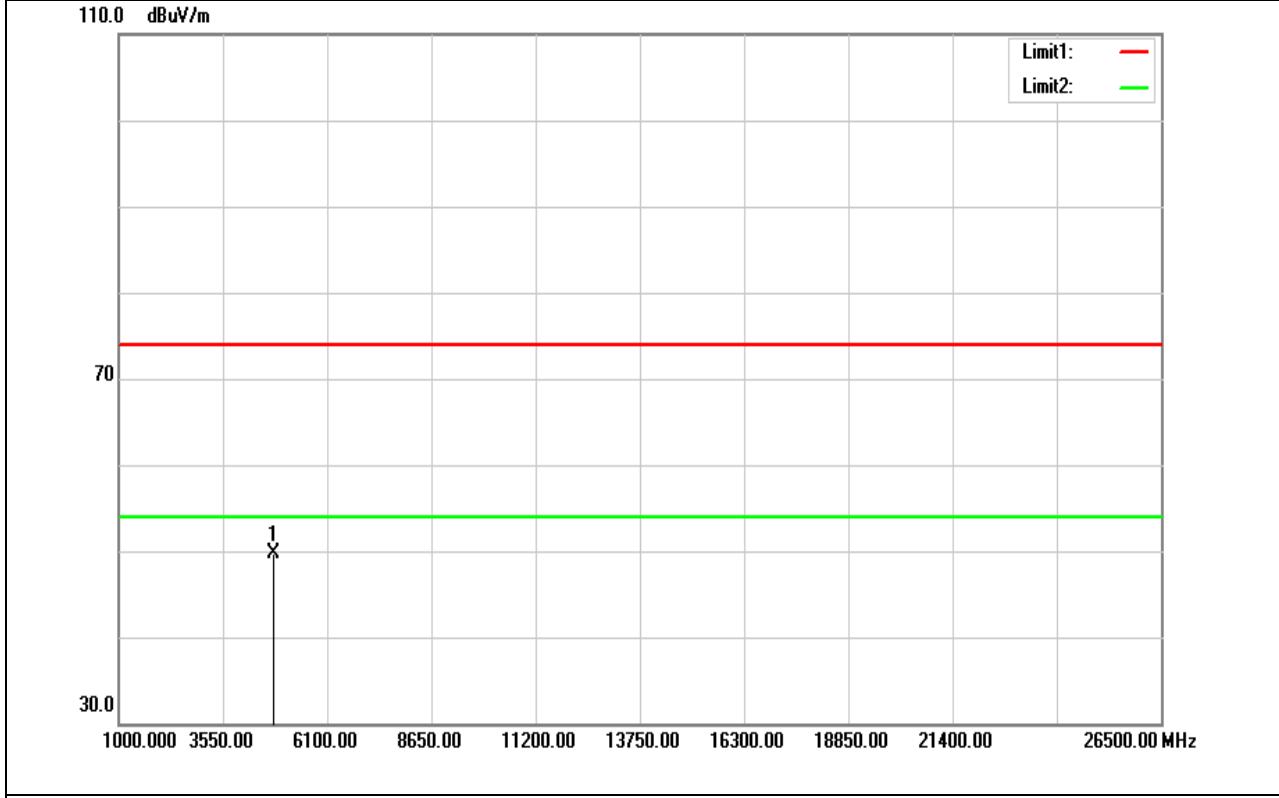
Test Mode:	8DPSK_EDR-3Mbps High CH	Temp/Hum	24(°C)/ 33%RH
Test Item	Band Edge	Test Date	January 19, 2018
Polarize	Horizontal	Test Engineer	Jerry Chuang
Detector	Average	Test Voltage:	120V



No.	Frequency (MHz)	Reading (dBuV)	Correct Factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	2480.004	85.14	-2.70	82.44	-	-	AVG
2	2521.496	38.85	-2.59	36.26	54.00	-17.74	AVG

Above 1G Test Data

Test Mode:	GFSK_BR-1Mbps Low CH	Temp/Hum	24(°C)/ 33%RH
Test Item	Harmonic	Test Date	January 22, 2018
Polarize	Vertical	Test Engineer	Jerry Chuang
Detector	Peak and Average	Test Voltage:	120V

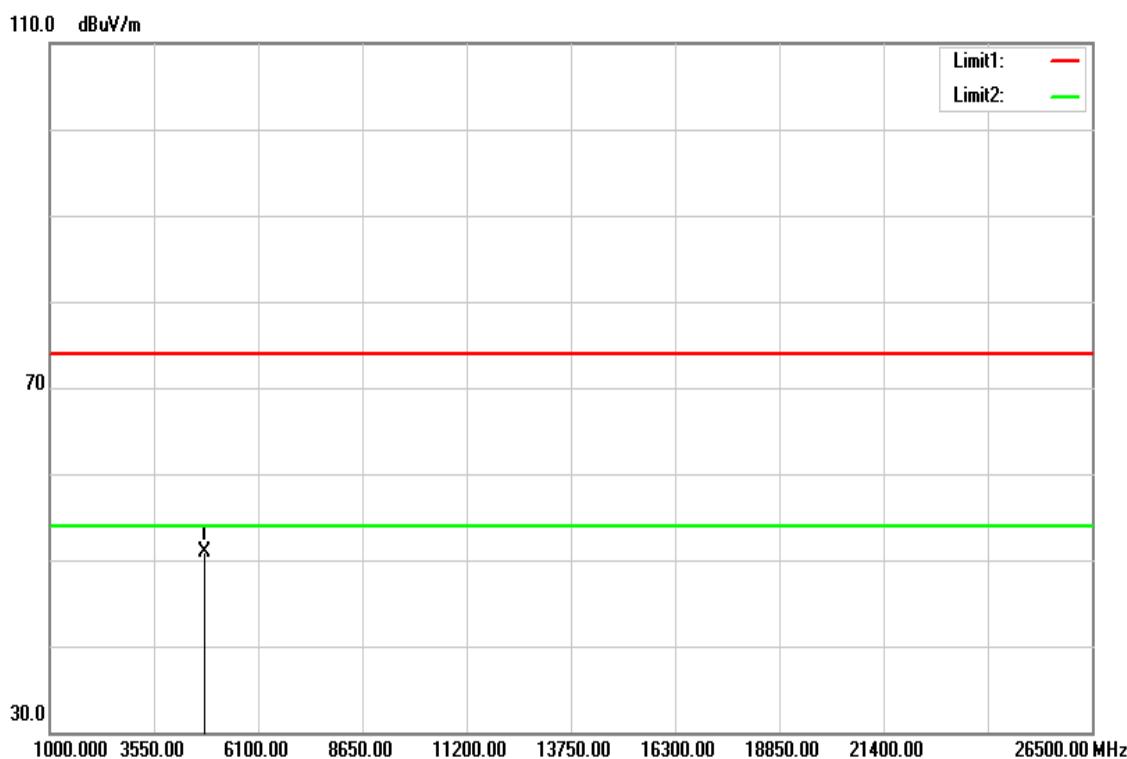


Frequency (MHz)	Reading (dBuV)	Correct Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
4804.000	45.41	4.34	49.75	74.00	-24.25	peak
N/A						

**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	January 22, 2018
Polarize	Horizontal	Test Engineer	Jerry Chuang
Detector	Peak and Average	Test Voltage:	120V



Frequency (MHz)	Reading (dBuV)	Correct Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
4804.000	46.61	4.34	50.95	74.00	-23.05	peak
N/A						

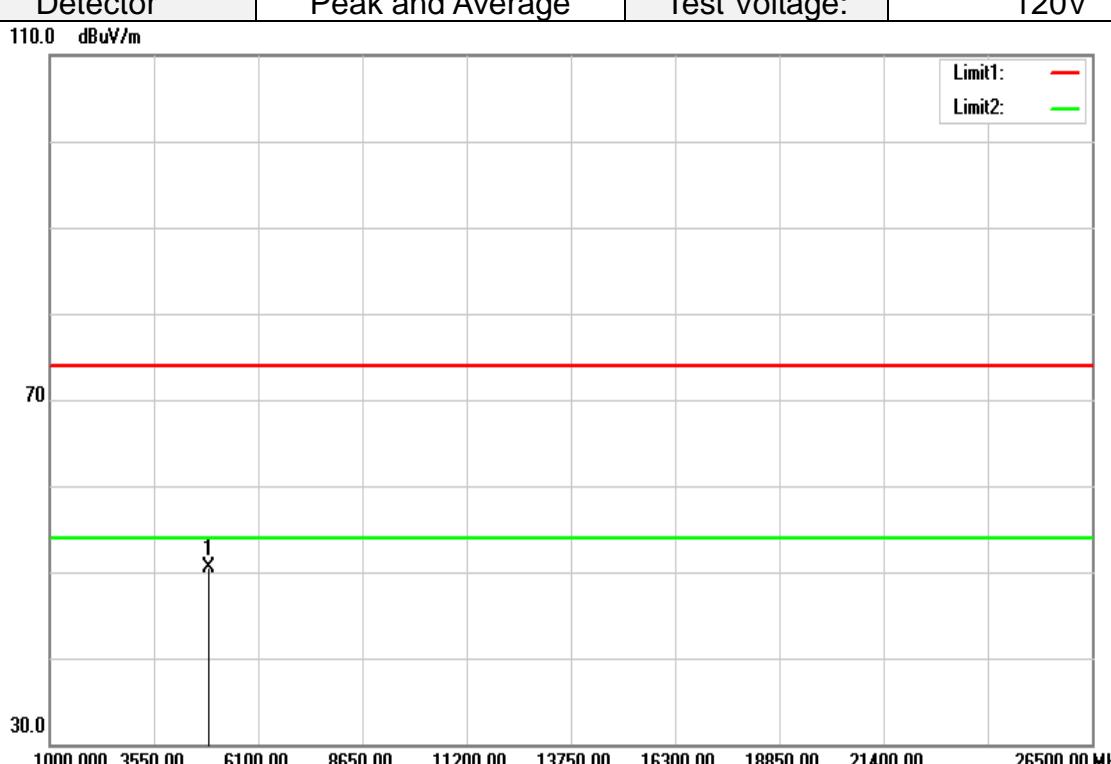
**Remark:**

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	January 22, 2018		
Polarize	Vertical		Test Engineer	Jerry Chuang		
Detector	Peak and Average		Test Voltage:	120V		
Frequency (MHz)	Reading (dBuV)	Correct Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
4882.000	46.14	4.49	50.63	74.00	-23.37	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	January 22, 2018		
Polarize	Horizontal		Test Engineer	Jerry Chuang		
Detector	Peak and Average		Test Voltage:	120V		
						
Frequency (MHz)	Reading (dBuV)	Correct Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
4882.000	45.92	4.49	50.41	74.00	-23.59	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

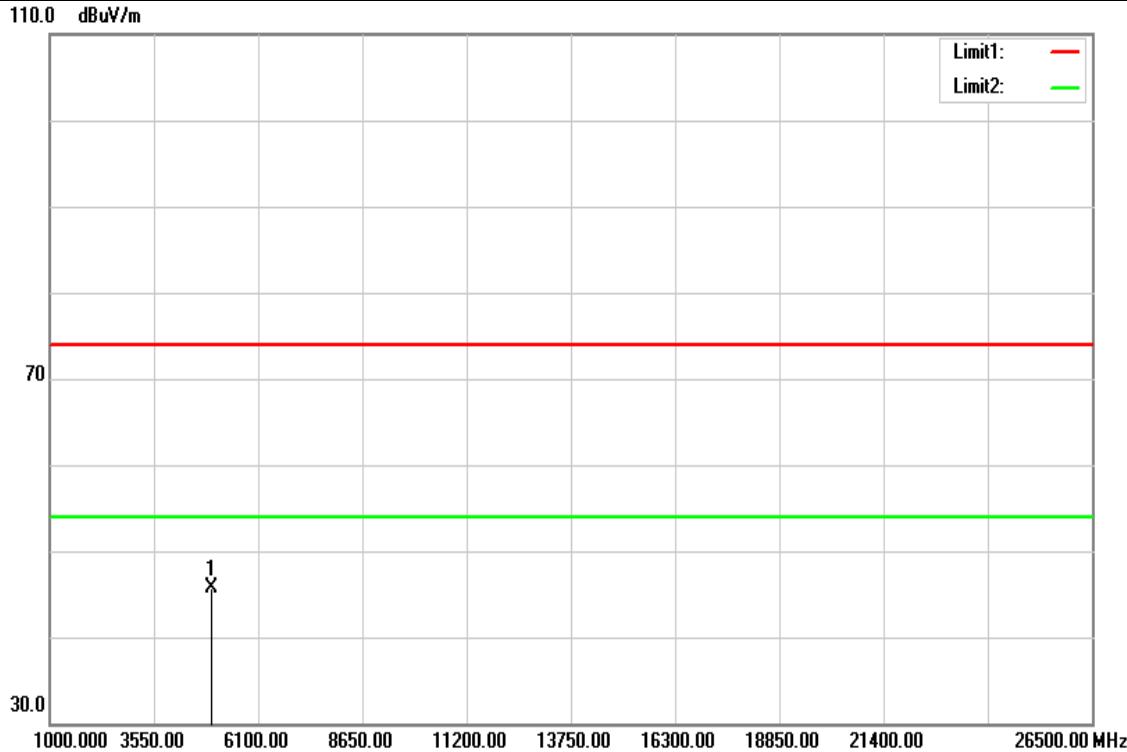
Test Mode:	GFSK_BR-1Mbps High CH		Temp/Hum	24(°C)/ 33%RH		
Test Item	Harmonic		Test Date	January 22, 2018		
Polarize	Vertical		Test Engineer	Jerry Chuang		
Detector	Peak and Average		Test Voltage:	120V		
Frequency (MHz)	Reading (dBuV)	Correct Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
4960.000	39.41	4.61	44.02	74.00	-29.98	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

Report No.: T170919D06-A-RP1

Test Mode:	GFSK_BR-1Mbps High CH	Temp/Hum	24(°C)/ 33%RH
Test Item	Harmonic	Test Date	January 22, 2018
Polarize	Horizontal	Test Engineer	Jerry Chuang
Detector	Peak and Average	Test Voltage:	120V



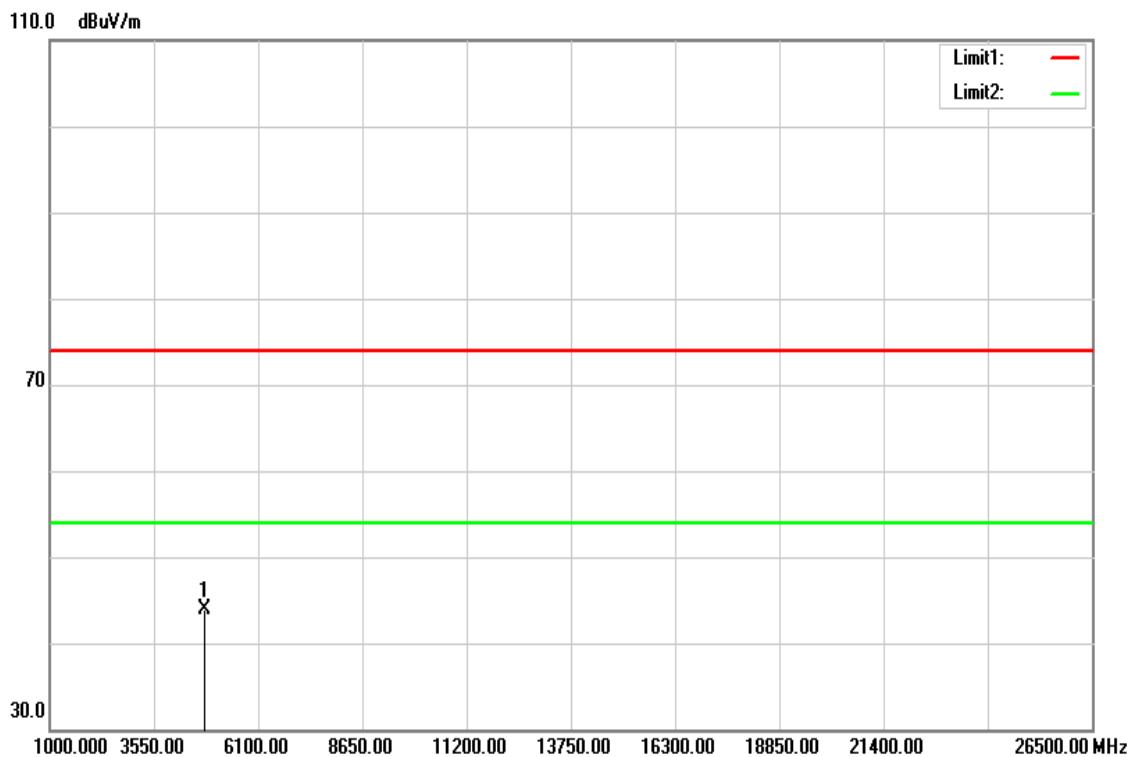
Frequency (MHz)	Reading (dBuV)	Correct Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
4960.000	41.16	4.61	45.77	74.00	-28.23	peak
N/A						

**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

Report No.: T170919D06-A-RP1

Test Mode	8DPSK_EDR-3Mbps Low CH	Temp/Hum	24(°C)/ 33%RH
Test Item	Harmonic	Test Date	January 22, 2018
Polarize	Vertical	Test Engineer	Jerry Chuang
Detector	Peak and Average	Test Voltage:	120V

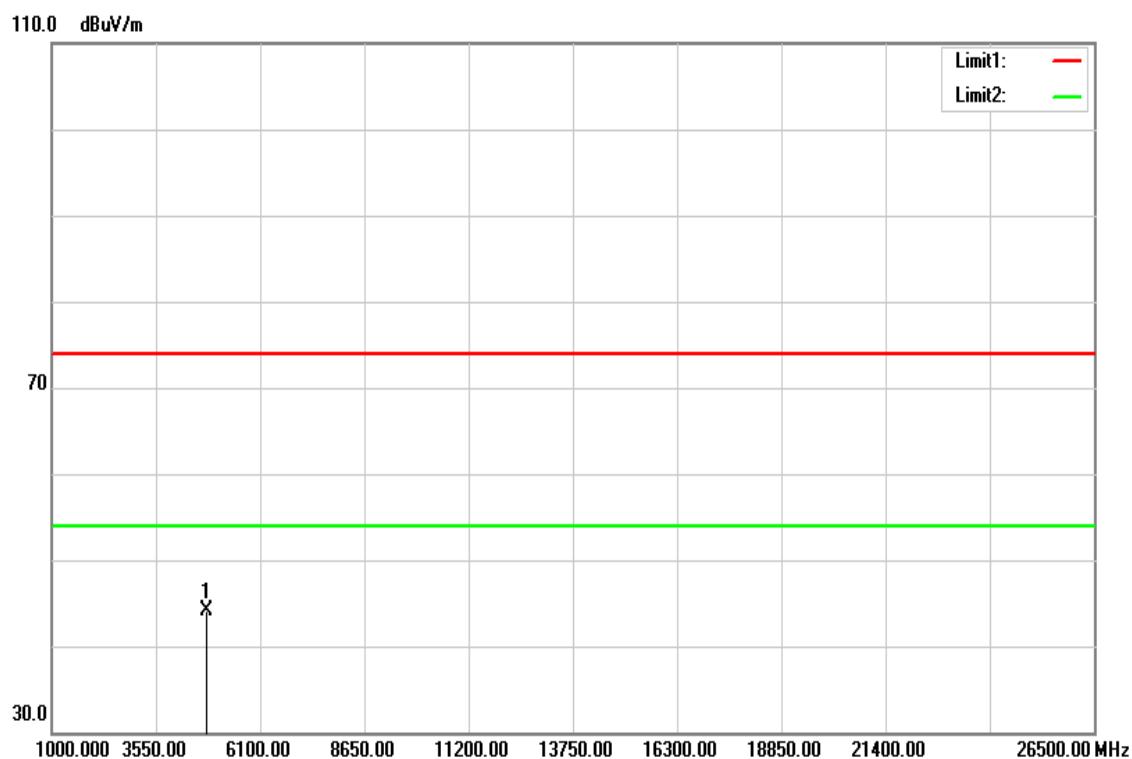


Frequency (MHz)	Reading (dBuV)	Correct Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
4804.000	39.56	4.34	43.90	74.00	-30.10	peak
N/A						

**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	January 22, 2018
Polarize	Horizontal	Test Engineer	Jerry Chuang
Detector	Peak and Average	Test Voltage:	120V

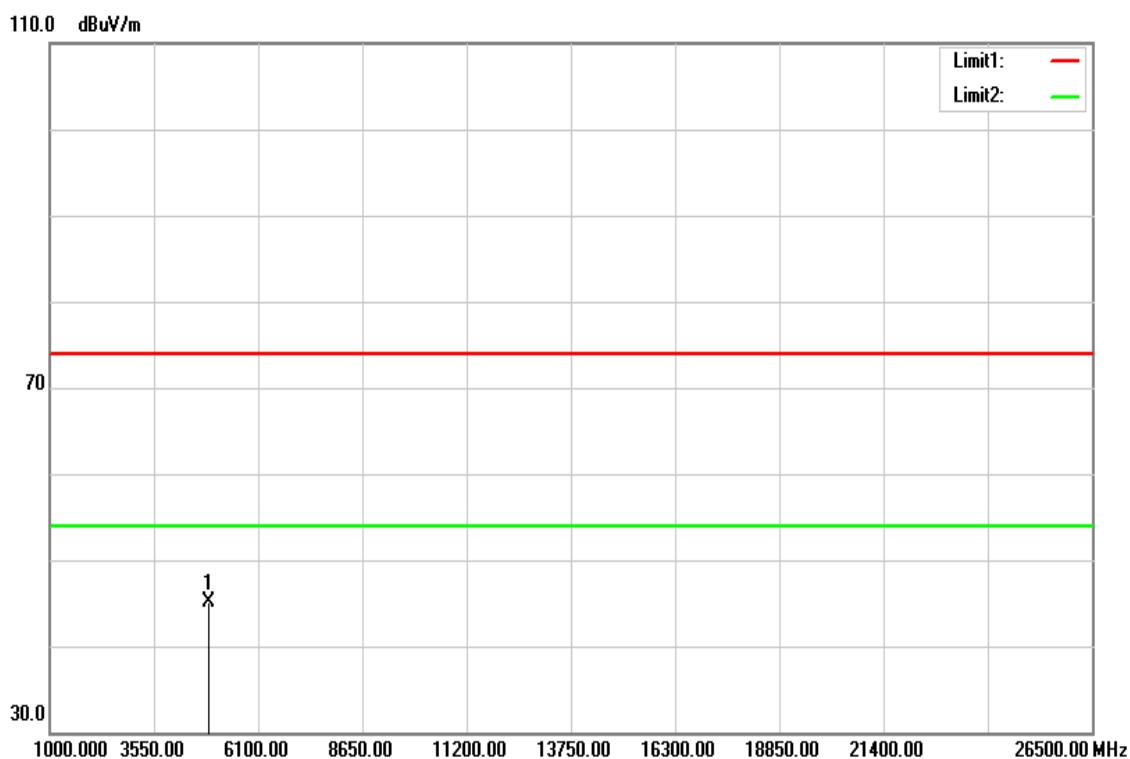


Frequency (MHz)	Reading (dBuV)	Correct Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
4804.000	39.81	4.34	44.15	74.00	-29.85	peak
N/A						

**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	January 22, 2018
Polarize	Vertical	Test Engineer	Jerry Chuang
Detector	Peak and Average	Test Voltage:	120V

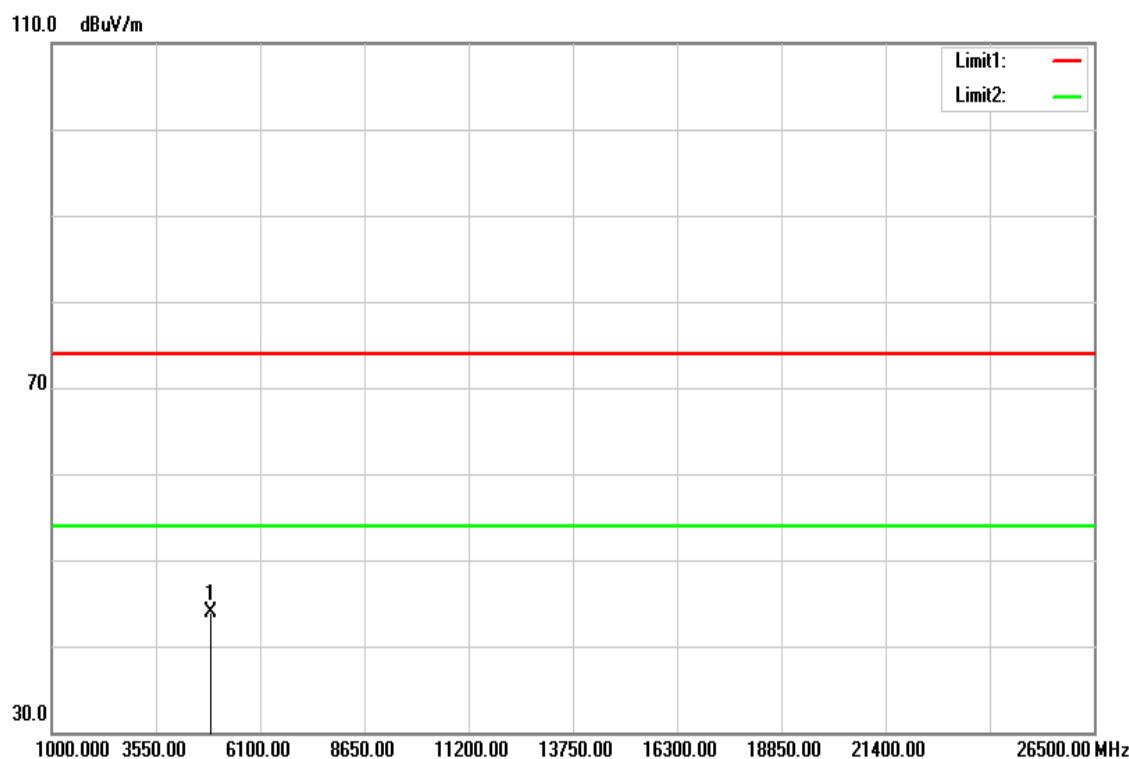


Frequency (MHz)	Reading (dBuV)	Correct Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
4882.000	40.55	4.49	45.04	74.00	-28.96	peak
N/A						

**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	January 22, 2018
Polarize	Horizontal	Test Engineer	Jerry Chuang
Detector	Peak and Average	Test Voltage:	120V

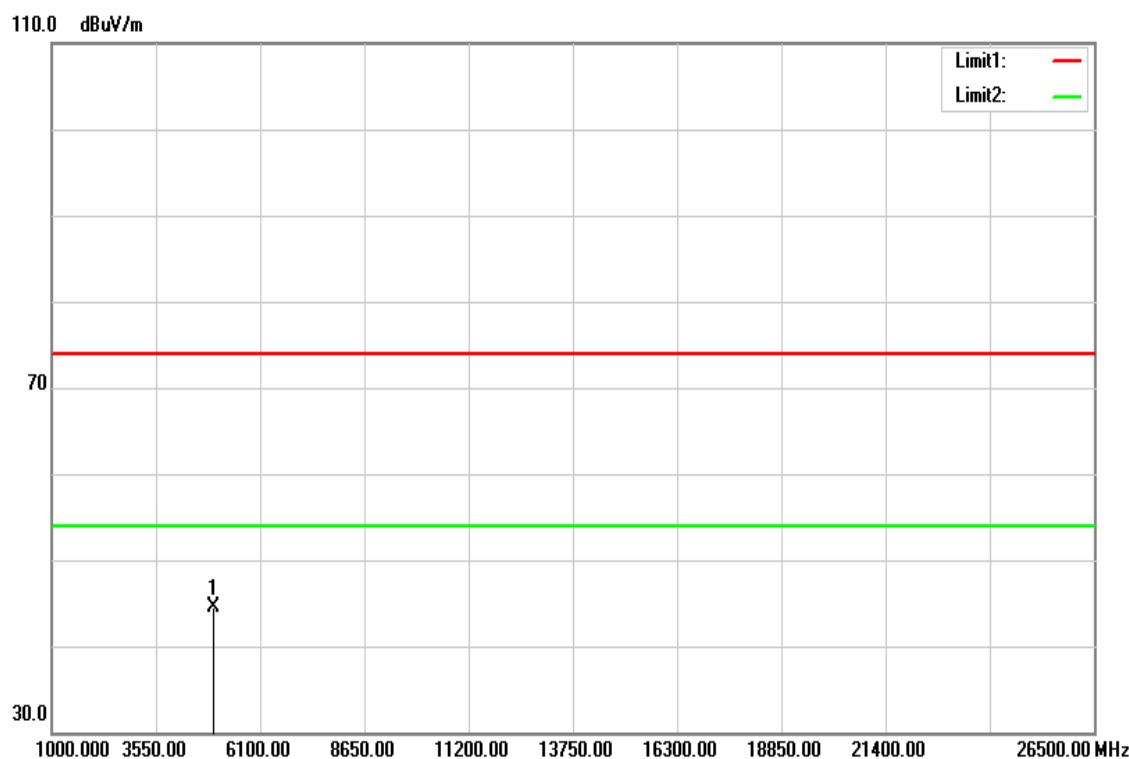


Frequency (MHz)	Reading (dBuV)	Correct Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
4882.000	39.49	4.49	43.98	74.00	-30.02	peak
N/A						

**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	January 22, 2018
Polarize	Vertical	Test Engineer	Jerry Chuang
Detector	Peak and Average	Test Voltage:	120V

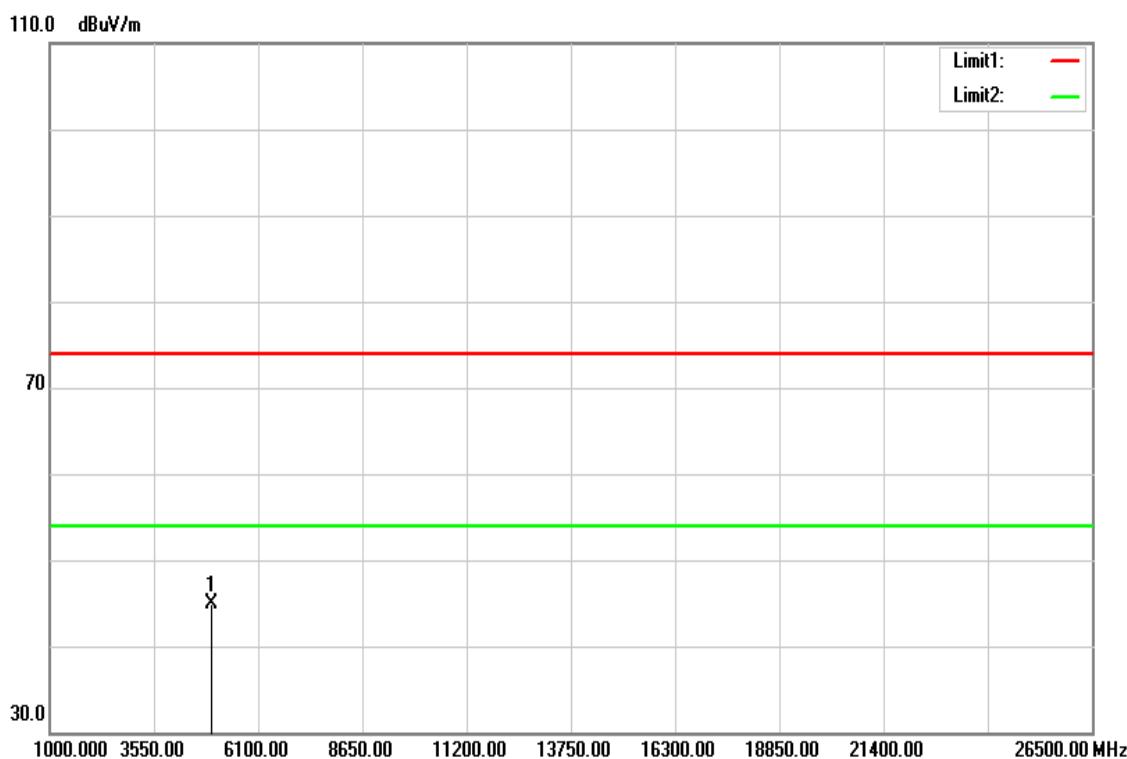


Frequency (MHz)	Reading (dBuV)	Correct Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
4960.000	39.90	4.61	44.51	74.00	-29.49	peak
N/A						

**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	8DPSK_EDR-3Mbps High CH	Temp/Hum	24(°C)/ 33%RH
Test Item	Harmonic	Test Date	January 22, 2018
Polarize	Horizontal	Test Engineer	Jerry Chuang
Detector	Peak and Average	Test Voltage:	120V



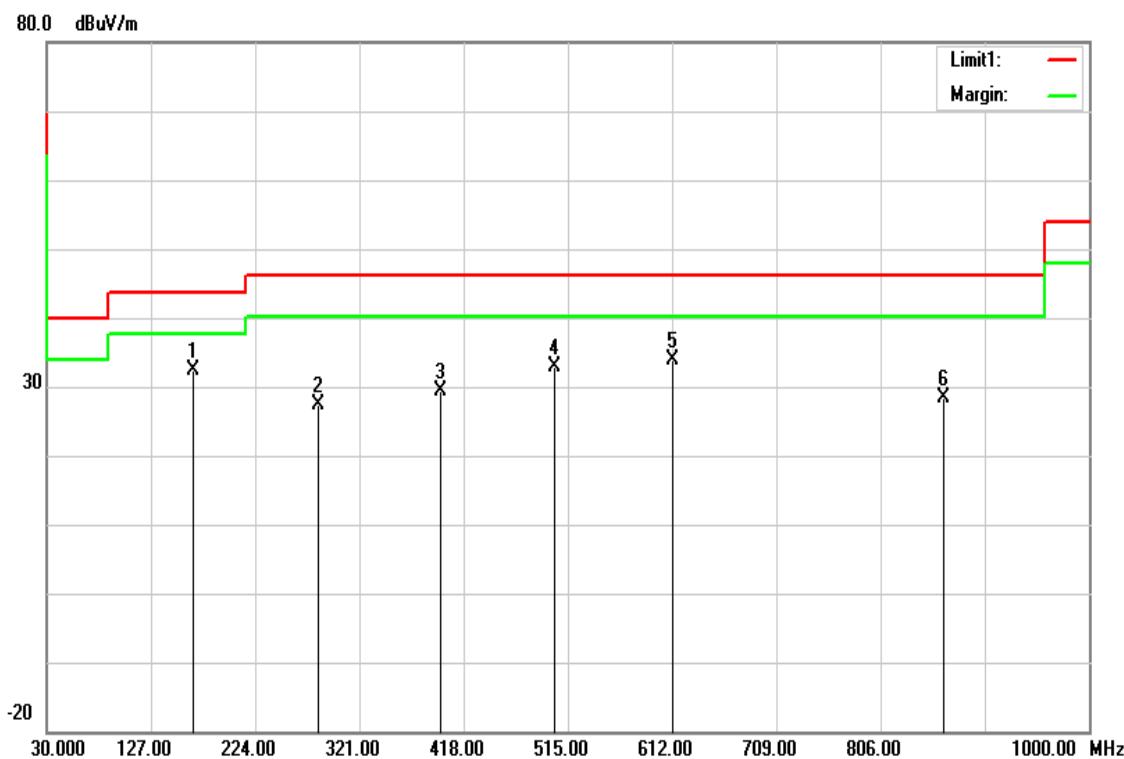
Frequency (MHz)	Reading (dBuV)	Correct Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
4960.000	40.31	4.61	44.92	74.00	-29.08	peak
N/A						

**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

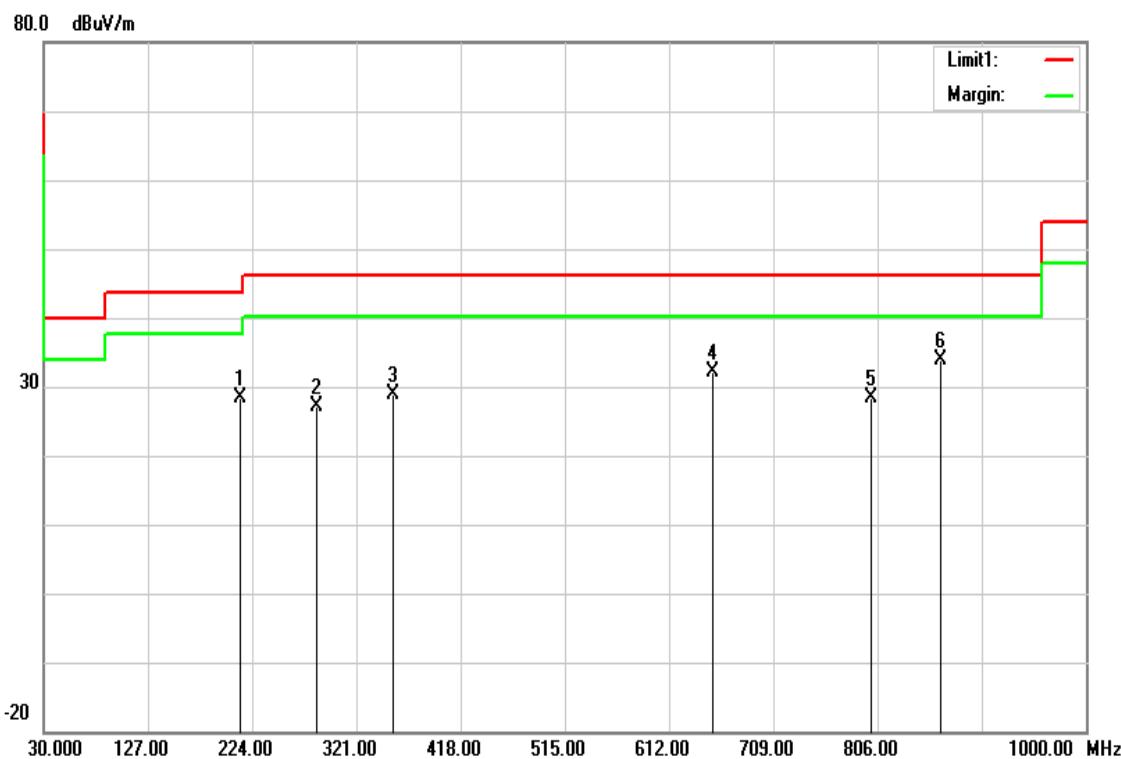
**Below 1G Test Data**

Test Mode:	Mode 1	Temp/Hum	24(°C)/ 33%RH
Test Item	30MHz-1GHz	Test Date	January 19, 2018
Polarize	Vertical	Test Engineer	Jerry Chuang
Detector	Peak and Quasi-peak	Test Voltage:	120V



Frequency (MHz)	Reading (dBuV)	Correct Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
167.2550	48.88	-16.39	32.49	43.52	-11.03	peak
283.1700	41.59	-14.24	27.35	46.02	-18.67	peak
396.6600	40.76	-11.50	29.26	46.02	-16.76	peak
502.3900	41.21	-8.45	32.76	46.02	-13.26	peak
613.4550	40.45	-6.55	33.90	46.02	-12.12	peak
864.2000	31.00	-2.62	28.38	46.02	-17.64	peak

Test Mode:	Mode 1	Temp/Hum	24(°C)/ 33%RH
Test Item	30MHz-1GHz	Test Date	January 19, 2018
Polarize	Horizontal	Test Engineer	Jerry Chuang
Detector	Peak and Quasi-peak	Test Voltage:	120V



Frequency (MHz)	Reading (dBuV)	Correct Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
213.3300	44.93	-16.66	28.27	43.52	-15.25	peak
284.6250	41.38	-14.23	27.15	46.02	-18.87	peak
355.4350	41.73	-12.81	28.92	46.02	-17.10	peak
653.2250	37.64	-5.50	32.14	46.02	-13.88	peak
800.1800	31.80	-3.38	28.42	46.02	-17.60	peak
864.2000	36.40	-2.62	33.78	46.02	-12.24	peak