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# RADIO TEST REPORT

## FCC 47 CFR PART 15 SUBPART C

### INDUSTRY CANADA RSS-247

<b>Test Standard</b>	<b>FCC Part 15.247 and RSS-247 Issue 2</b>
<b>FCC ID</b>	<b>A4C-1000DA</b>
<b>ISED No.</b>	<b>10199A-1000DA</b>
<b>Trade name</b>	<b>Rand McNally</b>
<b>Product name</b>	<b>OverDryve™ 8Pro</b>
<b>Model No.</b>	<b>OD8</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. (Hsinchu Lab)

The sample selected for test was production product and was provided by manufacturer.



Approved by:

Reviewed by:

Handwritten signature of Davis Tseng in blue ink.

Handwritten signature of Zeus Chen in black ink.

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Davis Tseng  
Sr. Engineer

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Zeus Chen  
Supervisor

## Revision History

Rev.	Issue Date	Revisions	Revised By
00	January 25, 2017	Initial Issue	Angel Cheng
01	March 27, 2017	1. Add Test Setup Photos in page 54, 55. 2. Revise 4.8.2 Duty Cycle in page 34.	Doris Chu
02	March 28, 2017	1. Modify Antenna Category & Antenna Type in page 5.	Angel Cheng
03	March 30, 2017	1. Remove remark in page 4. 2. Revise section 4.2.2 in page 16. 3. Revise Section 4.8.4 in Pages 49-52.	Angel Cheng
04	April 13, 2017	1. Update the test result sections in page 16, 19, 21, 24, 31.	Angel Cheng

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# 1. GENERAL INFORMATION

## 1.1 EUT INFORMATION

Applicant	RM Acquisition, LLC 9855 Woods Drive Skokie, IL 60077 USA.
Equipment	OverDryve™ 8Pro
Model Name	OD8
Model Discrepancy	N/A
EUT Functions	IEEE 802.11 abgn+BT+GPS+FM
Received Date	Dec 22, 2016
Date of Test	Jan 03, 2017 ~ Jan 18, 2017
Output Power(W)	GFSK : 0.0005 (EIRP : 0.0006) $\pi/4$ -DQPSK :0.0004 (EIRP : 0.0005) 8DPSK : 0.0005 (EIRP : 0.0005)
Power Operation	<input checked="" type="checkbox"/> Adapter Model: W12-010N3A I/P: 100-240V, 50/60Hz, 0.3A O/P: 5V, 2A <input checked="" type="checkbox"/> Host system <input checked="" type="checkbox"/> DC Type : <input checked="" type="checkbox"/> Battery <input checked="" type="checkbox"/> Car Charger <input type="checkbox"/> DC Power Supply

## 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 and RSS-GEN Table A1 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

<b>Antenna Category</b>	<input type="checkbox"/> Integral: antenna permanently attached <input type="checkbox"/> External dedicated antennas <input checked="" type="checkbox"/> External Unique antenna connector
<b>Antenna Type</b>	<input type="checkbox"/> PIFA <input checked="" type="checkbox"/> PCB <input type="checkbox"/> Dipole <input type="checkbox"/> Coils
<b>Antenna Gain</b>	0.63 dBi

## 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.11, Wugong 6th Rd., Wugu Dist., New Taipei City 24891, Taiwan. (R.O.C.)

Test site	Test Engineer	Remark
AC Conduction Room	Jim Lian	
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
Spectrum Analyzer	R&S	FSV 40	101073	08/01/2017	07/31/2017

3M 966 Chamber Test Site					
Equipment	Manufacturer	Model	S/N	Cal Due	Cal Due
Bi-log Antenna	TESEQ	CBL 6112D	35403	07/03/2016	07/02/2017
Double Ridged BroadBand Horn Antenna	SCHWARZBECK	BBHA 9120 D	9120D-778	07/15/2016	07/14/2017
Double Ridged Guide Horn Antenna	ETS · LINDGREN	3117	00078733	11/17/2016	11/16/2017
EMI Test Receiver	ROHDE & SCHWARZ	ESCI	100221	04/27/2016	04/26/2017
Horn Antenna	COM-POWER	AH-840	03077	12/02/2016	12/01/2017
Loop Antenna	COM-POWER	AL-130	121060	05/24/2016	05/23/2017
Preamplifier	Agilent	8447D	2944A10052	07/13/2016	07/12/2017
Preamplifier	Agilent	8449B	3008A01916	07/13/2016	07/12/2017
PSA Series Spectrum Analyzer	Agilent	E4446A	MY46180323	04/13/2016	04/12/2017
Software	E3.815206a				

AC Conducted Emissions Test Site					
Equipment	Manufacturer	Model	S/N	Cal Date	Cal Due
EMI Test Receiver	R&S	ESCI	101201	08/20/2016	08/19/2017
LISN	Schwarzbeck	NNLK 8129	8129-286	08/19/2016	08/18/2017
LISN(EUT)	Schwarzbeck	NSLK 8127	8127-527	08/19/2016	08/18/2017
Pulse Limiter	R&S	ESH3Z2	C3010026-2	08/21/2016	08/22/2017
Software	EZ-EMC				

**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	Earphone	INTOPIC	JASS-288	N/A	N/A
2	Monitor	ASUS	PA248Q	G5LMQS071275	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, KDB 558074 D01 v03r05, RSS-247 Issue 2 and RSS-GEN Issue 4.

## 1.9 Table of accreditations and listings

Country	Agency	Scope of Accreditation	Logo
USA	FCC	3M Semi Anechoic Chamber (FCC MRA: TW1027) to perform FCC Part 15 measurements	
Canada	Industry Canada	3M Semi Anechoic Chamber (IC 2324G-1 / IC 2324G-2) to perform	



## 2. TEST SUMMERY

FCC Standard Section	IC Standard Section	Report Section	Test Item	Result
15.203	-	1.2	Antenna Requirement	Pass
15.207(a)	RSS-GEN 8.8	4.1	AC Conducted Emission	Pass
15.247(a)(1)	RSS-247(5.2)(a)	4.2	20 dB Bandwidth	Pass
-	RSS-GEN 6.6	4.2	Occupied Bandwidth (99%)	Pass
15.247(b)(1)	RSS-247(5.4)(b)	4.3	Output Power Measurement	Pass
15.247(a)(1)	RSS-247(5.1)(b)	4.4	Frequency Separation	Pass
15.247(a)(1)(iii)	RSS-247(5.1)(d)	4.5	Number of Hopping	Pass
15.247(d)	RSS-247(5.5)	4.6	Conducted Band Edge	Pass
15.247(d)	RSS-247(5.5)	4.6	Conducted Emission	Pass
15.247(a)(1)(iii)	RSS-247(5.1)(d)	4.7	Time of Occupancy	Pass
15.247(d)	RSS-GEN 8.9, 8.10	4.8	Radiation Band Edge	Pass
15.247(d)	RSS-GEN 8.9, 8.10	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	<p><b>GFSK for BR-1Mbps:</b>                      1.Lowest Channel : 2402MHz                      2.Middle Channel : 2441MHz                      3.Highest Channel : 2480MHz</p> <p><b><math>\pi/4</math>-DQPSK for EDR-2Mbps:</b>                      1.Lowest Channel : 2402MHz                      2.Middle Channel : 2441MHz                      3.Highest Channel : 2480MHz</p> <p><b>8DPSK for EDR-3Mbps:</b>                      1.Lowest Channel : 2402MHz                      2.Middle Channel : 2441MHz                      3.Highest Channel : 2480MHz</p>

*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

Worst Mode of Power			
Bluetooth Mode	Data Rate	Maximum Peak Conducted Output Power (dBm)	Worst Mode
BR(GFSK)	1 Mbps	-3.21	V
EDR( $\pi/4$ -DQPSK)	2 Mbps	-3.56	
EDR(8DPSK)	3 Mbps	-3.44	V

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 host system via USB Cable
Worst Mode	<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	
Test Condition	Band edge, Emission for Unwanted and Fundamental
Voltage/Hz	120V/60Hz
Test Mode	Mode 1:EUT power by Battery
Worst Mode	<input checked="" type="checkbox"/> Mode 1 <input type="checkbox"/> Mode 2 <input type="checkbox"/> Mode 3 <input type="checkbox"/> Mode 4
Worst Position	<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)
Worst Polarity	<input checked="" type="checkbox"/> Horizontal <input type="checkbox"/> Vertical

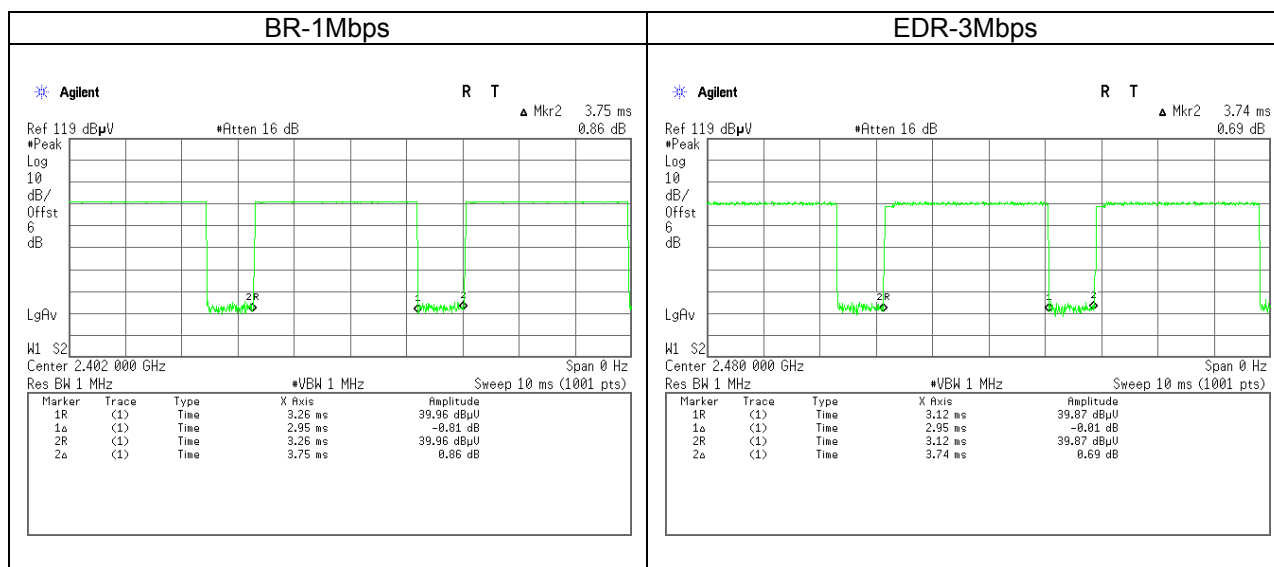
Radiated Emission Measurement Below 1G	
Test Condition	Radiated Emission Below 1G
Voltage/Hz	120V/60Hz
Test Mode	Mode 1:EUT power by Battery
Worst Mode	<input checked="" type="checkbox"/> Mode 1 <input type="checkbox"/> Mode 2 <input type="checkbox"/> Mode 3 <input type="checkbox"/> Mode 4

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 Maximum bandwidth and Middle channel as worse case.
4. EUT Transmit only can by Battery to set. Therefore EUT used Battery mode for Radiated measurement above 1G and Conduction below 1G in test report.

### 3.3 EUT DUTY CYCLE

Duty Cycle				
Configuration	TX ON (ms)	TX ALL (ms)	Duty Cycle (%)	Duty Factor(dB)
BR-1Mbps	2.95	3.75	78.67	1.04
EDR-3Mbps	2.95	3.74	78.88	1.03



## 4. TEST RESULT

### 4.1 AC POWER LINE CONDUCTED EMISSION

#### 4.1.1 Test Limit

According to §15.207(a) and RSS-GEN section 8.8,

Frequency Range (MHz)	Limits(dBµV)	
	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

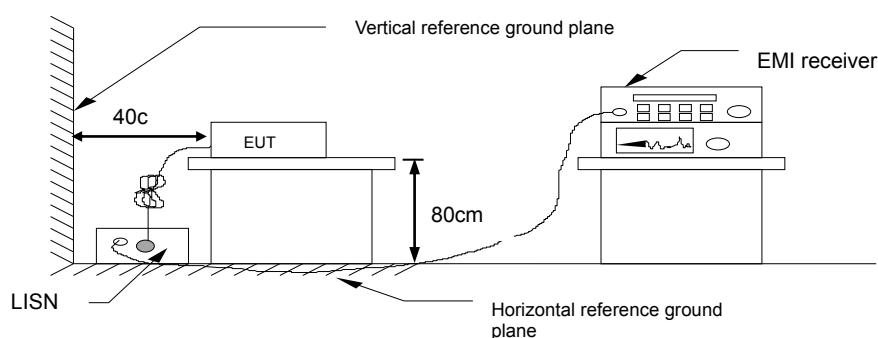
\* Decreases with the logarithm of the frequency.

#### 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

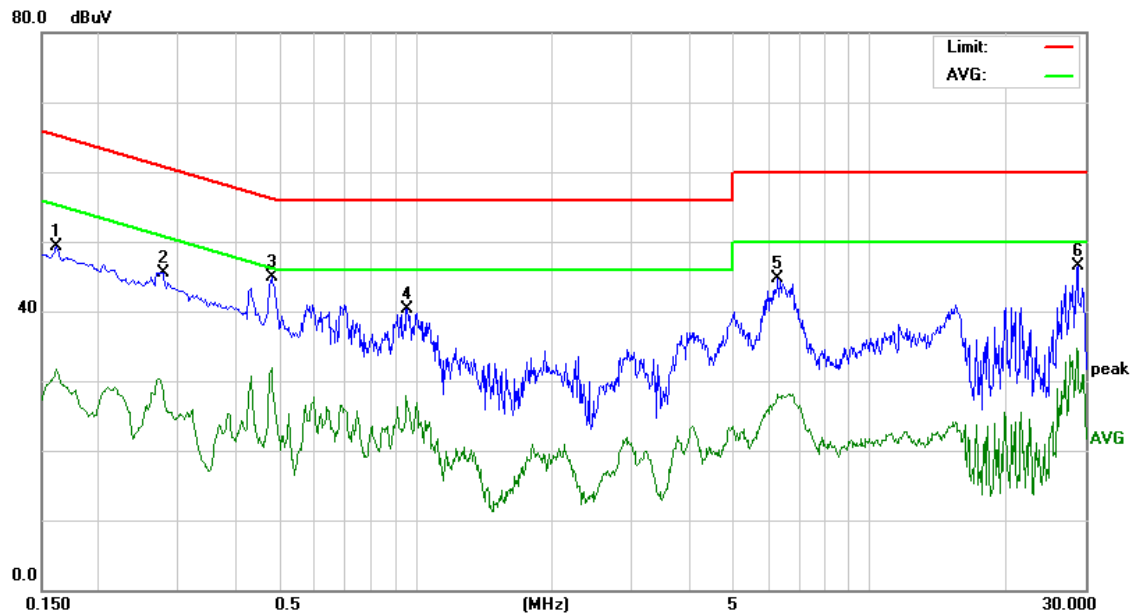


#### 4.1.4 Test Result

**PASS**

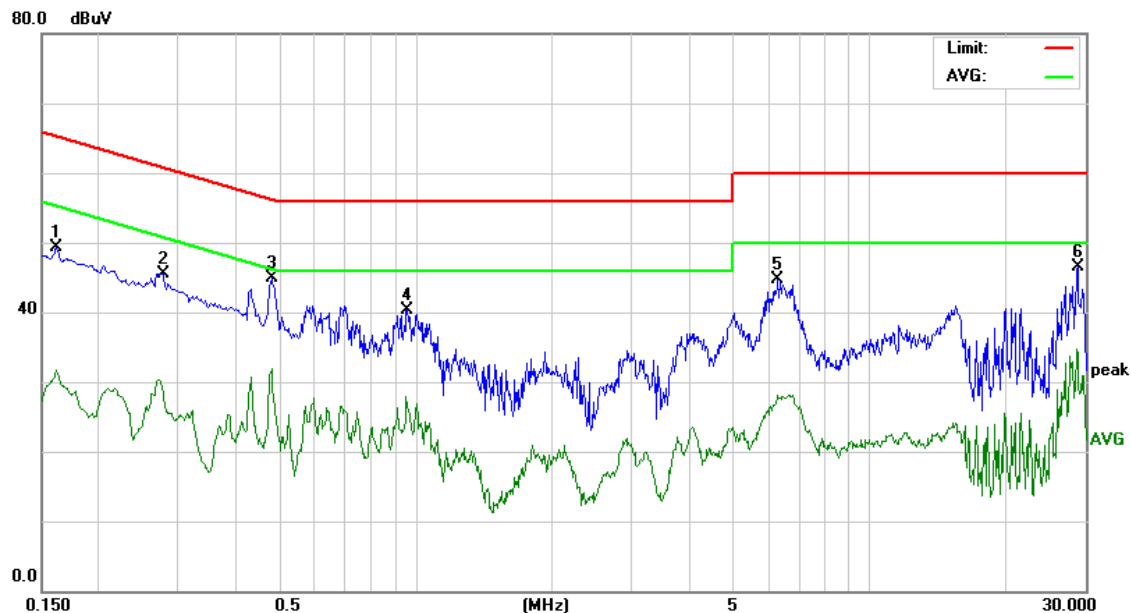
**Test Data**

Test Mode:	Mode 1	Temp/Hum	27(°C)/ 53%RH
Test Voltage:	120Vac / 60Hz	Test Date	Jan 03, 2017
Phase:	Line	Test Engineer	Jim Lian



Frequency (MHz)	Reading (dBuV)	Factor (dB)	Result (dB)	Limit (dBuV)	Margin (dBuV)	Detector (dBuV)
0.16	39.26	9.97	49.23	65.36	-16.13	Peak
0.28	35.49	10.02	45.51	60.88	-15.37	Peak
0.48	34.90	10.03	44.93	56.30	-11.37	Peak
0.96	30.20	10.06	40.26	56.00	-15.74	Peak
6.29	34.40	10.32	44.72	60.00	-15.28	Peak
28.76	35.67	10.87	46.54	60.00	-13.46	Peak

Test Mode:	Mode 1	Temp/Hum	27(°C)/ 53%RH
Test Voltage:	120Vac / 60Hz	Test Date	Jan 03, 2017
Phase:	Neutral	Test Engineer	Jim Lian



Frequency (MHz)	Reading (dBuV)	Factor (dB)	Result (dB)	Limit (dBuV)	Margin (dBuV)	Detector (dBuV)
0.16	44.85	9.92	54.77	65.36	-10.59	Peak
0.21	41.87	9.99	51.86	63.04	-11.18	Peak
0.27	40.76	9.99	50.75	61.24	-10.49	Peak
0.43	37.89	9.98	47.87	57.18	-9.31	Peak
0.43	30.18	9.98	40.16	47.18	-7.02	AVG
0.48	41.20	10.00	51.20	56.30	-5.10	Peak
0.48	33.00	10.00	43.00	46.30	-3.30	AVG
0.59	37.56	10.01	47.57	56.00	-8.43	Peak
0.60	26.96	10.01	36.97	46.00	-9.03	AVG

## 4.2 20DB BANDWIDTH AND OCCUPIED BANDWIDTH(99%)

### 4.2.1 Test Limit

According to §15.247(a) (1), RSS-247 section 5.2(a) and RSS-GEN 6.6,

**20 dB Bandwidth** : For reporting purposes only.

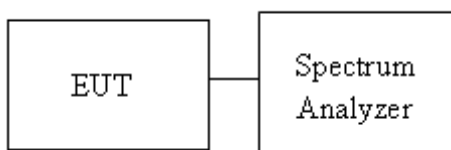
**Occupied Bandwidth(99%)** : For reporting purposes only.

### 4.2.2 Test Procedure

Test method Refer as ANSI 63.10:2013 clause 11.8.1.

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

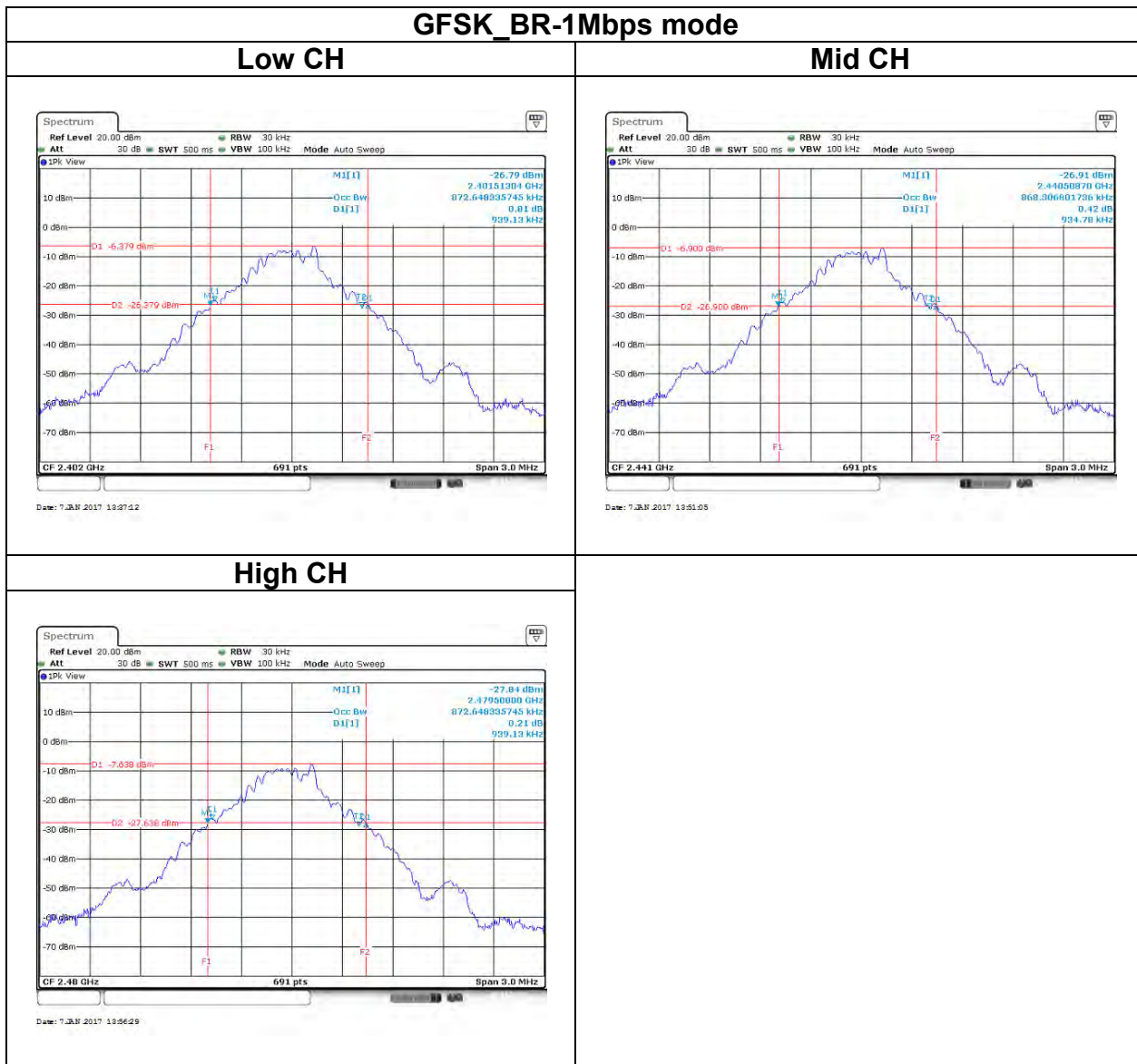
Test mode: GFSK_BR-1Mbps mode / 2402-2480 MHz			
Channel	Frequency (MHz)	OBW(99%) (MHz)	20dB BW (MHz)
Low	2402	0.8726	0.9391
Mid	2441	0.8683	0.9347
High	2480	0.8726	0.9391

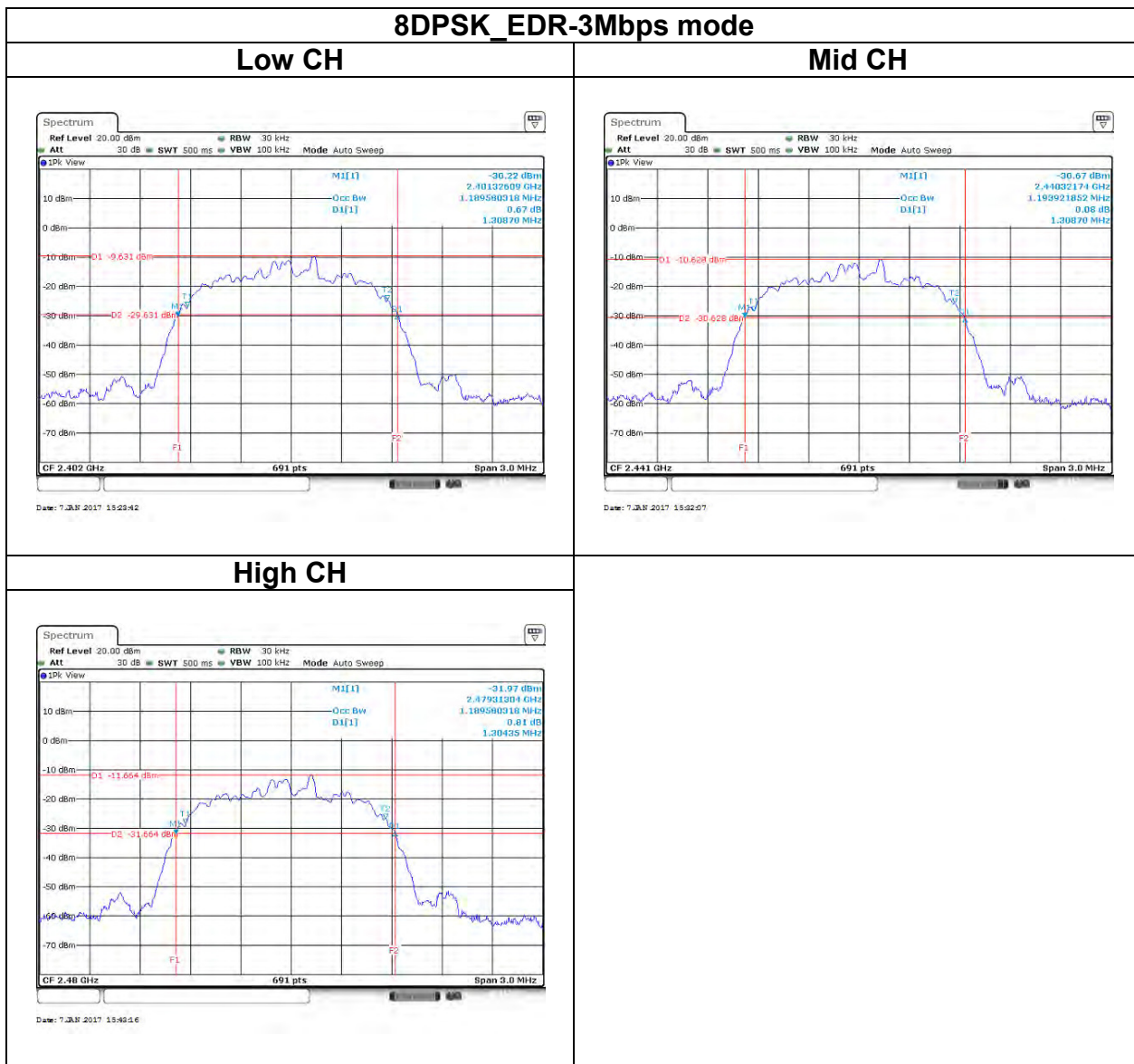
Test mode: 8DPSK_EDR-3Mbps mode / 2402-2480 MHz			
Channel	Frequency (MHz)	OBW(99%) (MHz)	20dB BW (MHz)
Low	2402	1.1895	1.3087
Mid	2441	1,1939	1.3087
High	2480	1.1895	1.3043



**Test Data**

**GFSK\_BR-1Mbps mode**





### 4.3 OUTPUT POWER MEASUREMENT

#### 4.3.1 Test Limit

According to §15.247(b)(1) and RSS-247 section 5.4(b)

**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.

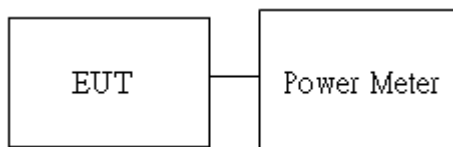
Limit	<input checked="" type="checkbox"/> Antenna not exceed 6 dBi : 21dBm <input type="checkbox"/> Antenna with DG greater than 6 dBi : 21dBm [ Limit = 30 – (DG – 6)]
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**Average output power :** For reporting purposes only.

#### 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)	IC EIRP Limit (dBm)
GFSK BR-1Mbps (DH5)	0	2402	-3.21	-2.58	0.0005	0.0006	21	27
	39	2441	-4.07	-3.44	0.0004	0.0005		
	78	2480	-4.84	-4.21	0.0003	0.0004		
$\pi/4$ -DQPSK EDR-2Mbps (DH5)	0	2402	-3.56	-2.93	0.0004	0.0005		
	39	2441	-4.78	-4.15	0.0003	0.0004		
	78	2480	-3.77	-3.14	0.0004	0.0005		
8DPSK EDR-3Mbps (DH5)	0	2402	-3.44	-2.81	0.0005	0.0005		
	39	2441	-4.53	-3.90	0.0004	0.0004		
	78	2480	-3.61	-2.98	0.0004	0.0005		

**Average output power :**

BT			
Config.	CH	Freq. (MHz)	AV Power (dBm)
GFSK BR-1Mbps (DH5)	0	2402	-3.37
	39	2441	-4.20
	78	2480	-5.13
$\pi/4$ -DQPSK EDR-2Mbps (DH5)	0	2402	-7.52
	39	2441	-8.95
	78	2480	-7.77
8DPSK EDR-3Mbps (DH5)	0	2402	-6.32
	39	2441	-7.36
	78	2480	-6.51

## 4.4 FREQUENCY SEPARATION

### 4.4.1 Test Limit

According to §15.247(a)(1) and RSS-247 section 5.1(b)

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.

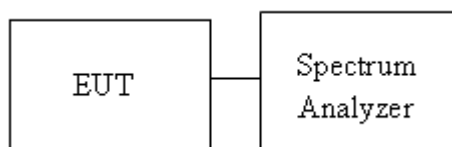
Alternatively, frequency hopping systems operating in the 2400-2483.5 MHz band may have hopping channel carrier frequencies that are separated by 25 kHz or two-thirds of the 20 dB bandwidth of the hopping channel, whichever is greater, provided the systems operate with an output power no greater than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

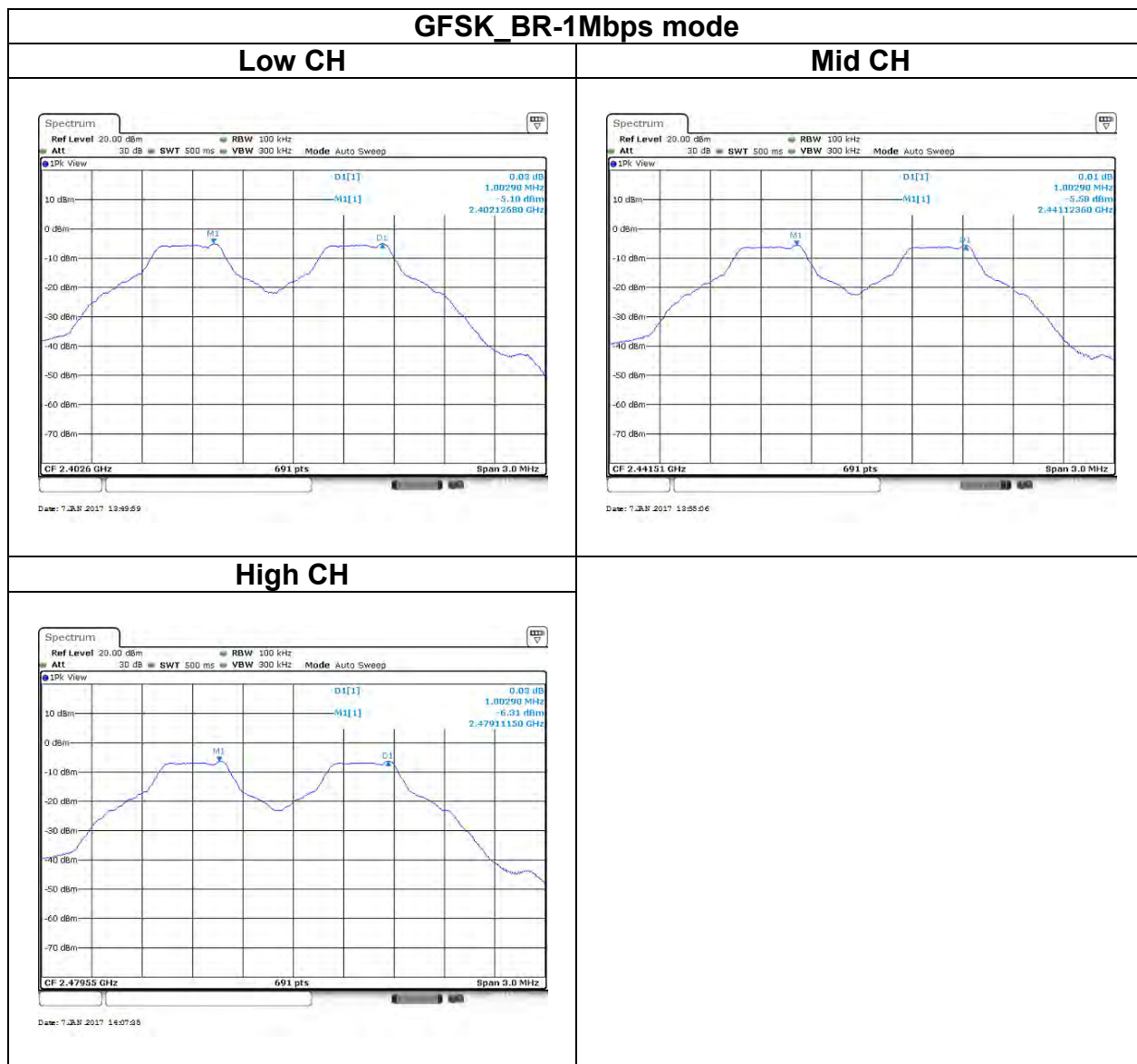


### 4.4.4 Test Result

Test mode: GFSK_BR-1Mbps mode / 2402-2480 MHz				
Channel	Frequency (MHz)	Channel Separation (MHz)	Channel Separation Limits (MHz)	Result
Low	2402	1.0029	0.626	PASS
Mid	2441	1.0029	0.623	PASS
High	2480	1.0029	0.626	PASS

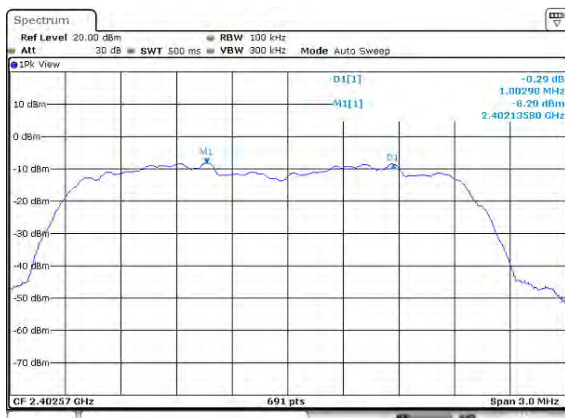
Test mode: 8DPSK_EDR-3Mbps mode / 2402-2480 MHz				
Channel	Frequency (MHz)	Channel Separation (MHz)	Channel Separation Limits (MHz)	Result
Low	2402	1.0029	0.872	PASS
Mid	2441	0.9986	0.872	PASS
High	2480	0.9986	0.870	PASS

**Test Data**

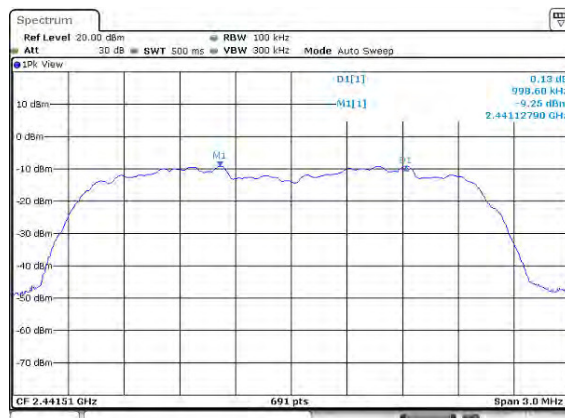


**8DPSK\_EDR-3Mbps mode**

**Low CH**



**Mid CH**



**High CH**



## 4.5 NUMBER OF HOPPING

### 4.5.1 Test Limit

According to §15.247(a)(1)(iii) and RSS-247 section 5.1(d)

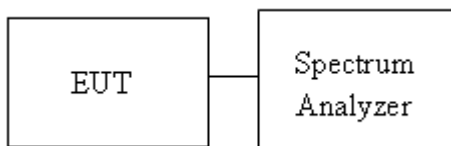
Frequency hopping system in the 2400-2483.5MHz band shall use at least 15 channels.

### 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

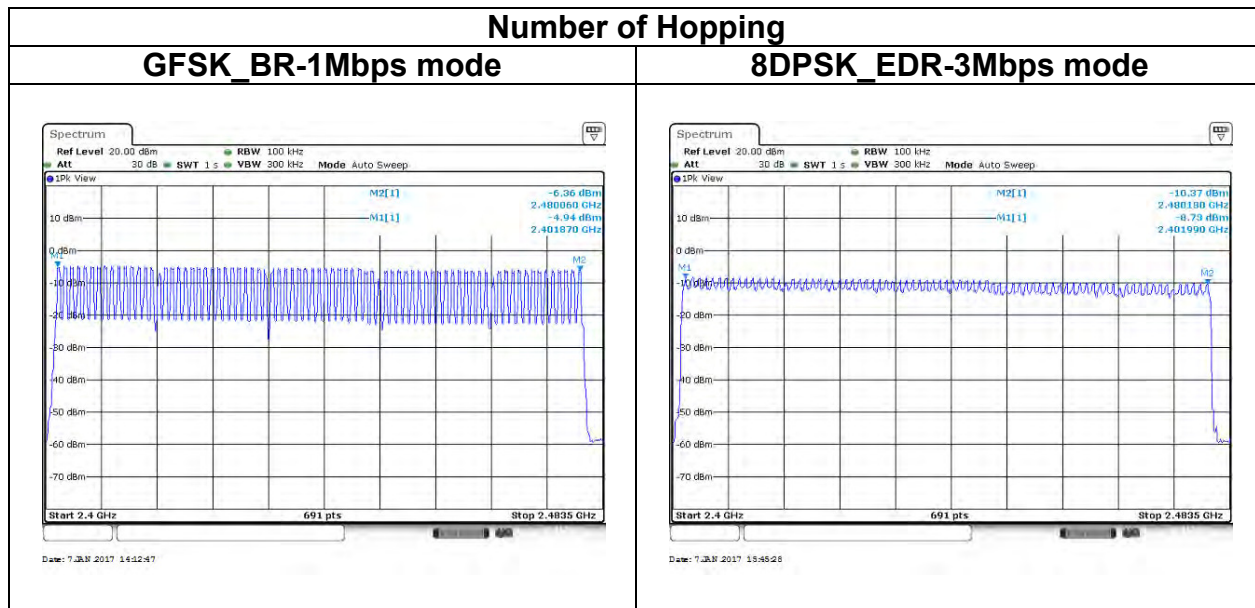
Number of Hopping				
Mode	Frequency (MHz)	Hopping Channel Number	Hopping Channel Number Limits	Result
BR-1Mbps	2402-2480	79	15	Pass
EDR-3Mbps	2402-2480	79	15	

**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

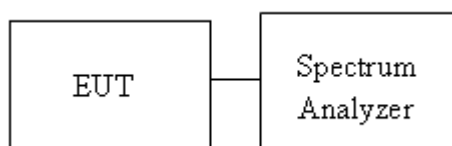
According to §15.247(d) and RSS-247 section 5.5

Limit	-20 dBc
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### 4.6.2 Test Procedure

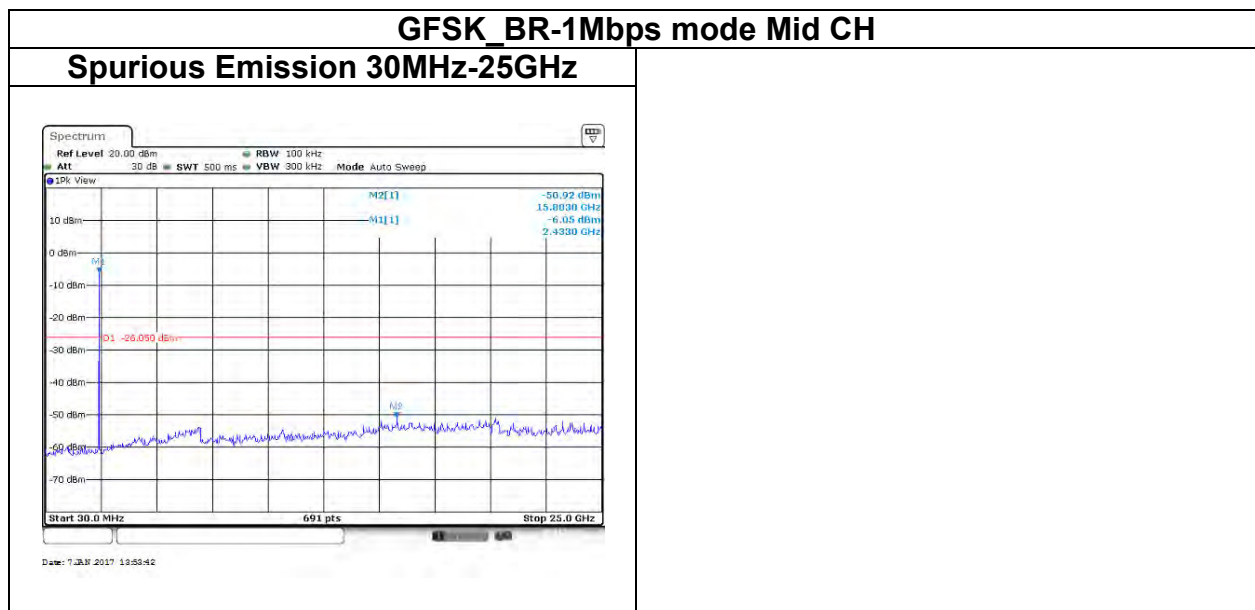
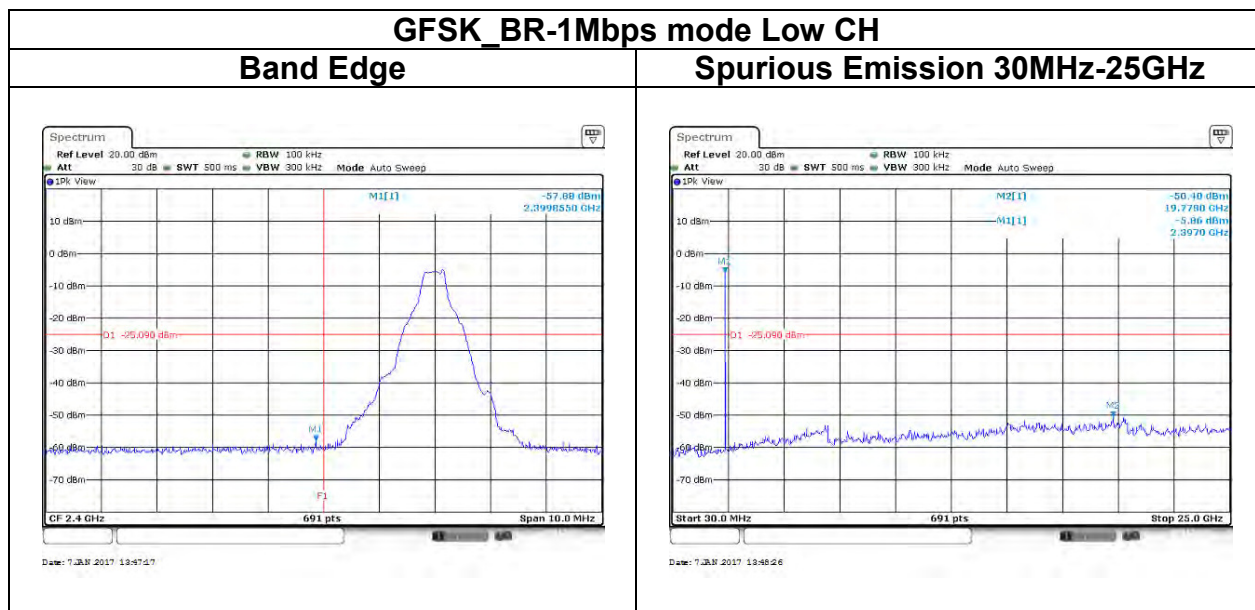
1. EUT RF output port connected to the SA by RF cable, and the path loss was compensated to result.
2. SA setting, RBW=100kHz, VBW=300kHz, Detector=Peak, Trace mode = max hold, SWT = Auto.
3. The Band Edge at 2.4GHz and 2.4835GHz are investigated with normal hopping mode.

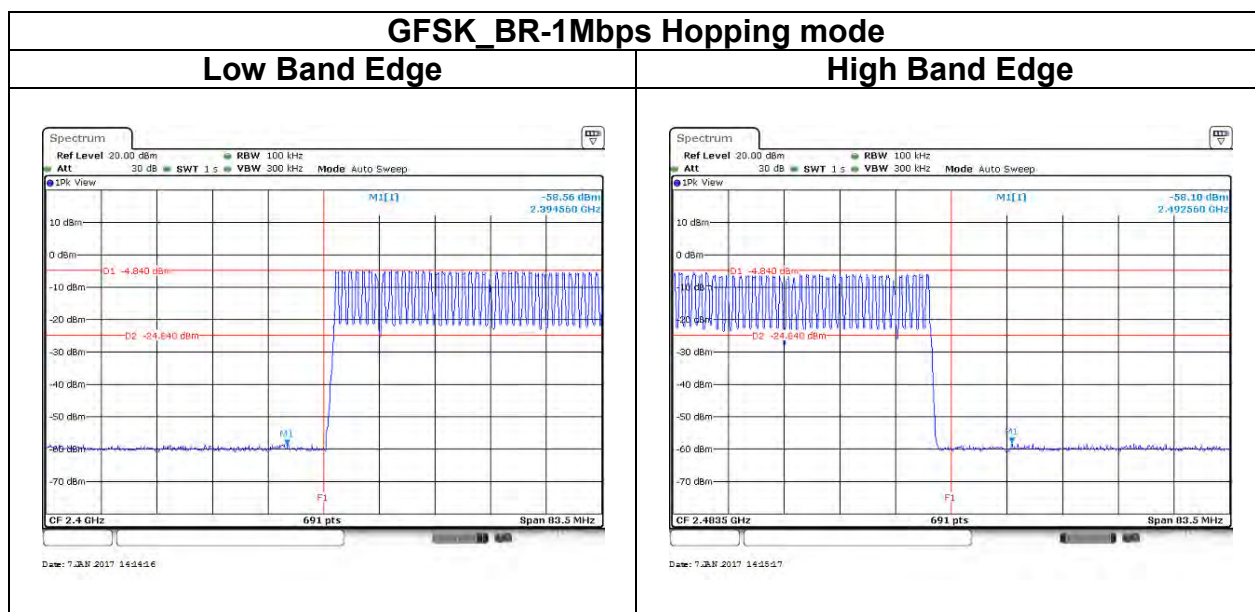
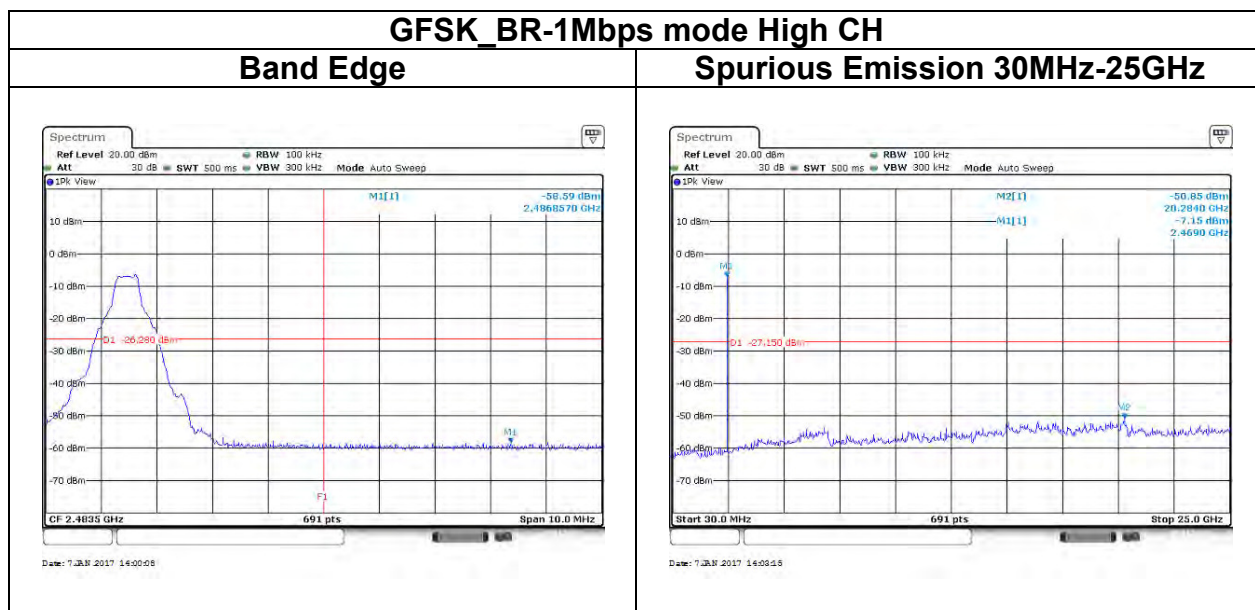
### 4.6.3 Test Setup

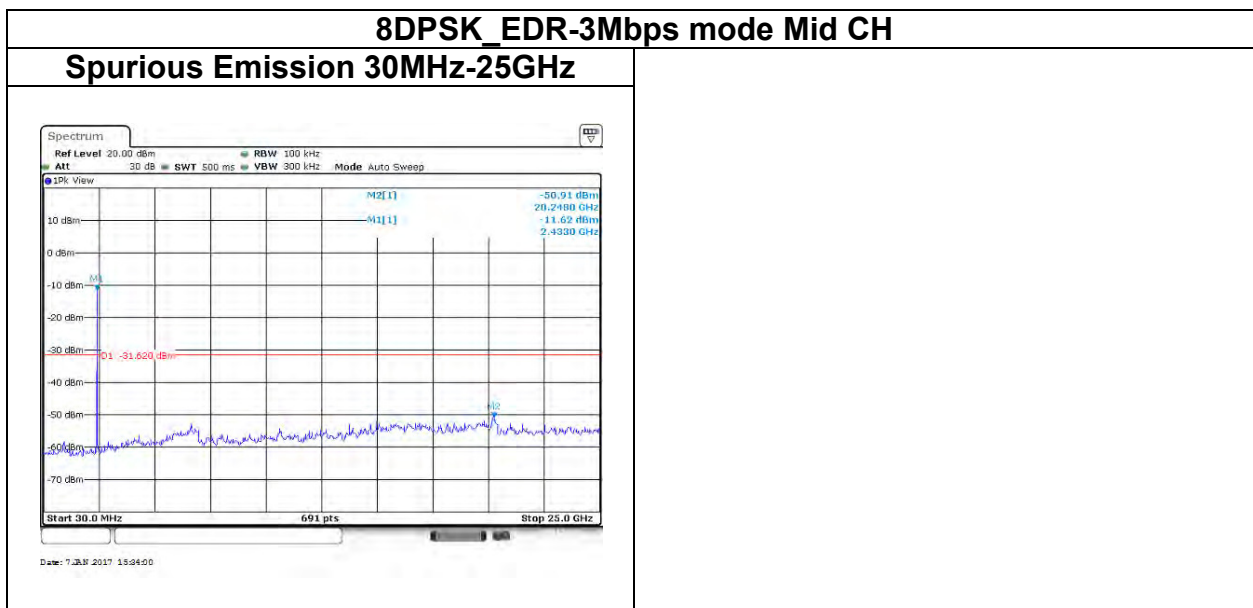
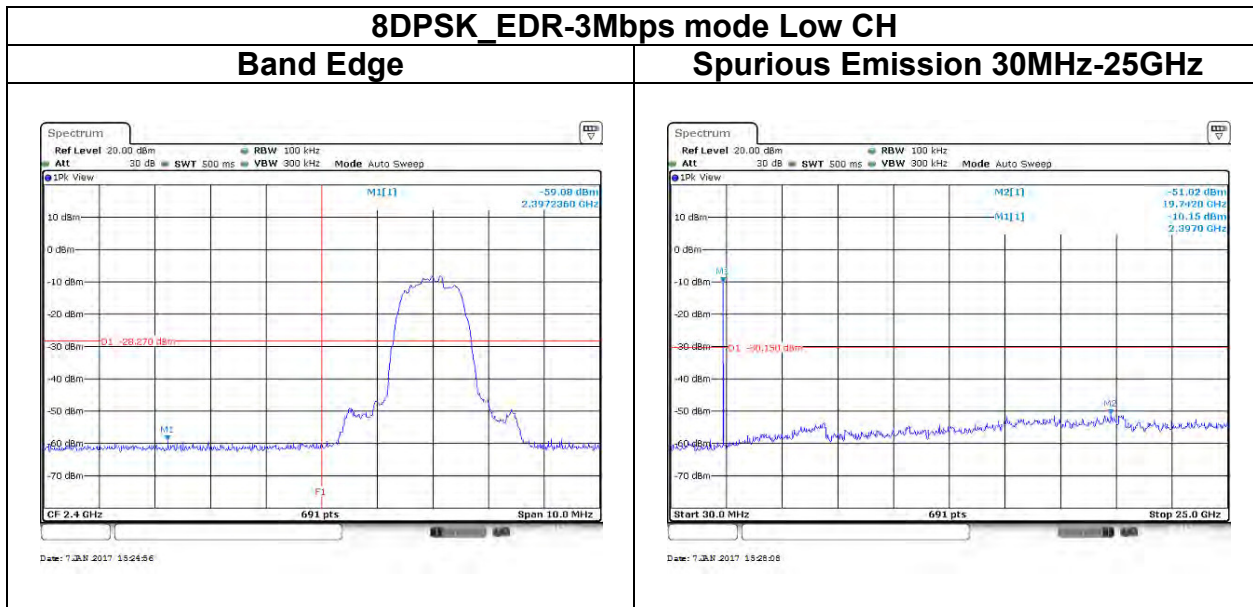


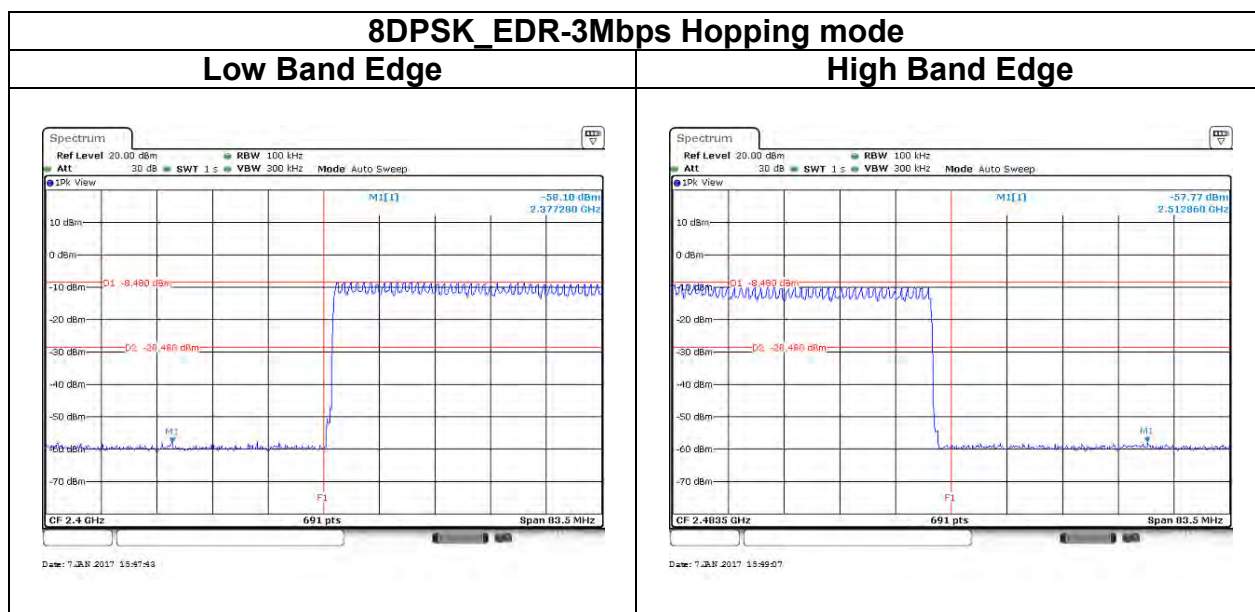
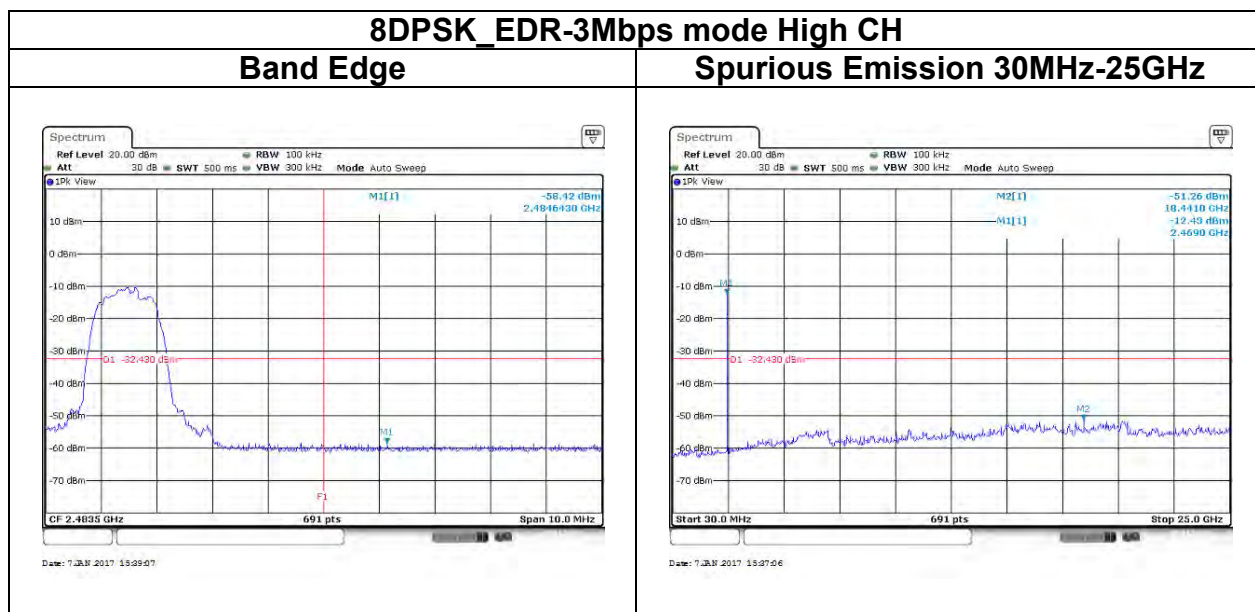
### 4.6.4 Test Result

#### Test Data











## 4.7 TIME OF OCCUPANCY (DWELL TIME)

### 4.7.1 Test Limit

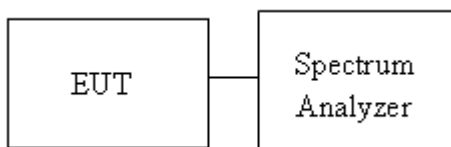
According to §15.247(a)(1)(iii) and RSS-247 section 5.1(d)

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

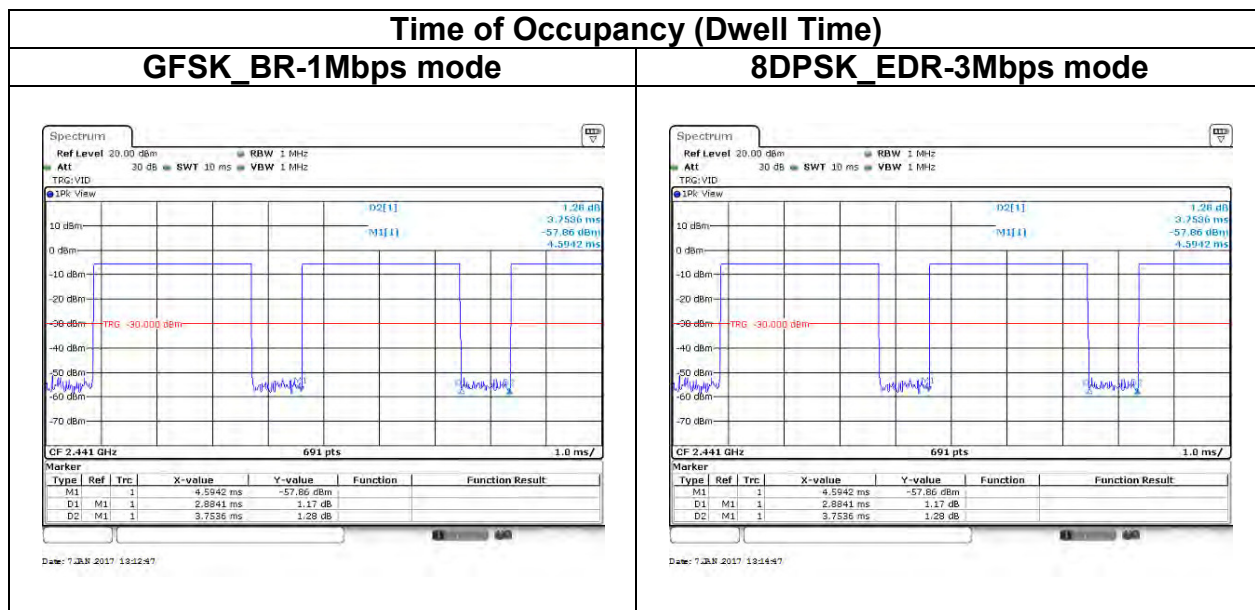
### 4.7.3 Test Setup



### 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	2.8841	79	106.67	0.3076	0.4	Pass
EDR-3Mbps	2441	2.8841	79	106.67	0.3076	0.4	
AFH: DH5	2441	2.8841	20	53.33	0.1538	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 $6.666 * 0.4 * 20 = 53.33$							

**Test Data**





## 4.8 RADIATION BANDEGE AND SPURIOUS EMISSION

### 4.8.1 Test Limit

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

IC according to RSS-247 section 5.5, RSS-Gen, Section 8.9 and 8.10

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)

### 4.8.2 Test Procedure

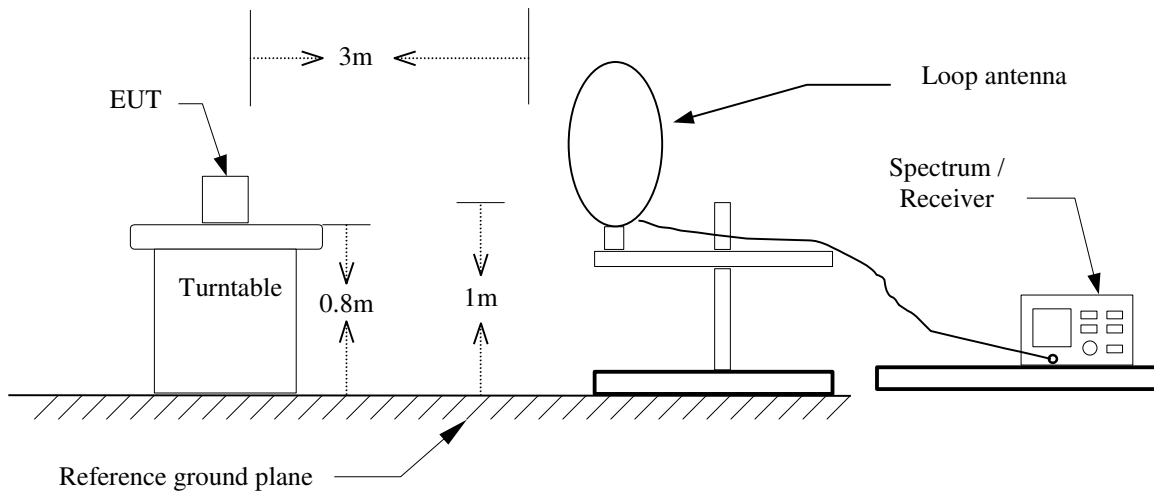
Test method Refer as KDB 558074 D01 v03r05, Section 12.1.

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.

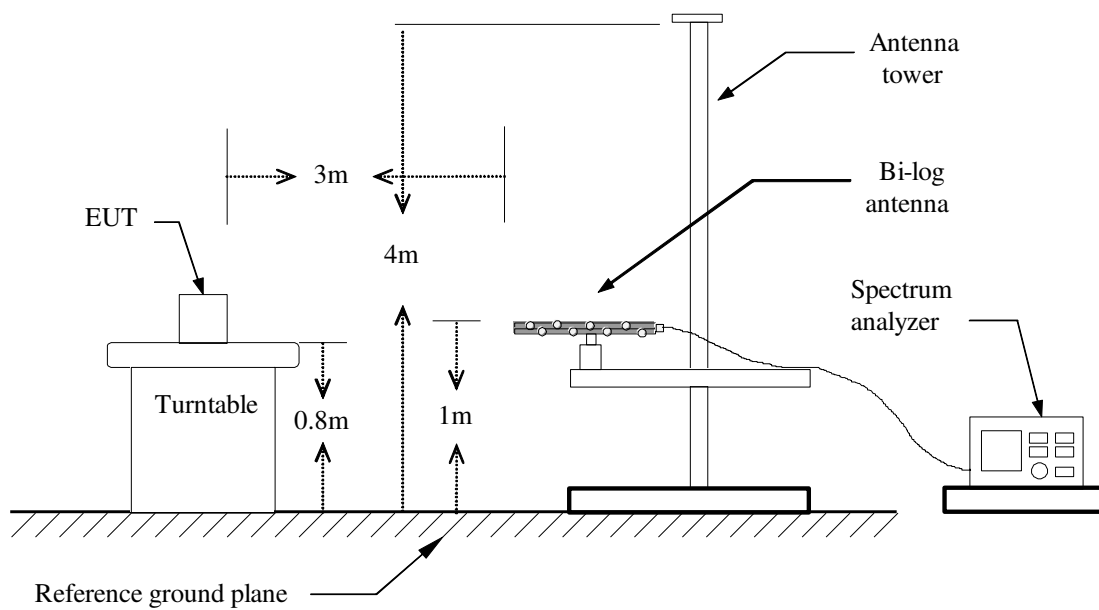
Configuration	Duty Cycle (%)	VBW
GFSK_BR-1Mbps	78.67	360Hz
8DPSK_EDR-3Mbps	78.88	360Hz

### 4.8.3 Test Setup

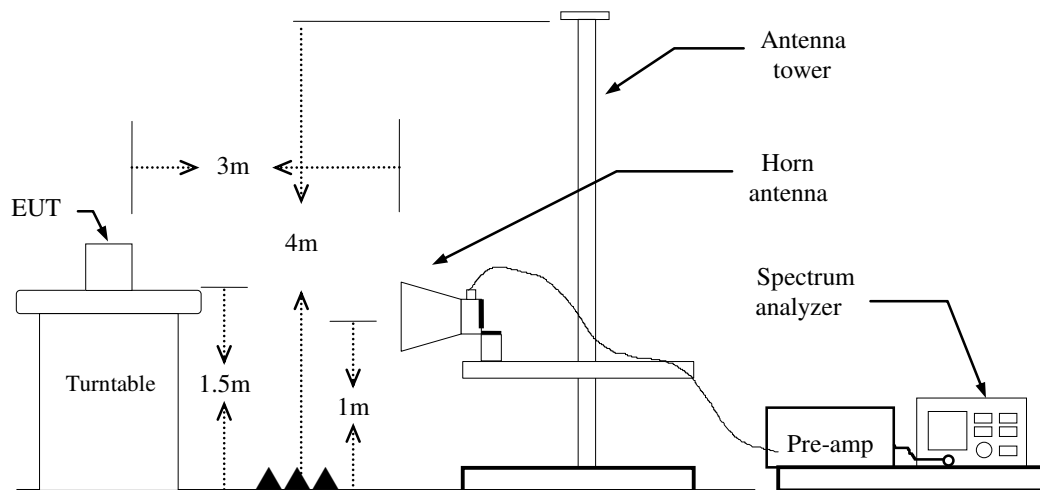
#### 9kHz ~ 30MHz



#### 30MHz ~ 1GHz



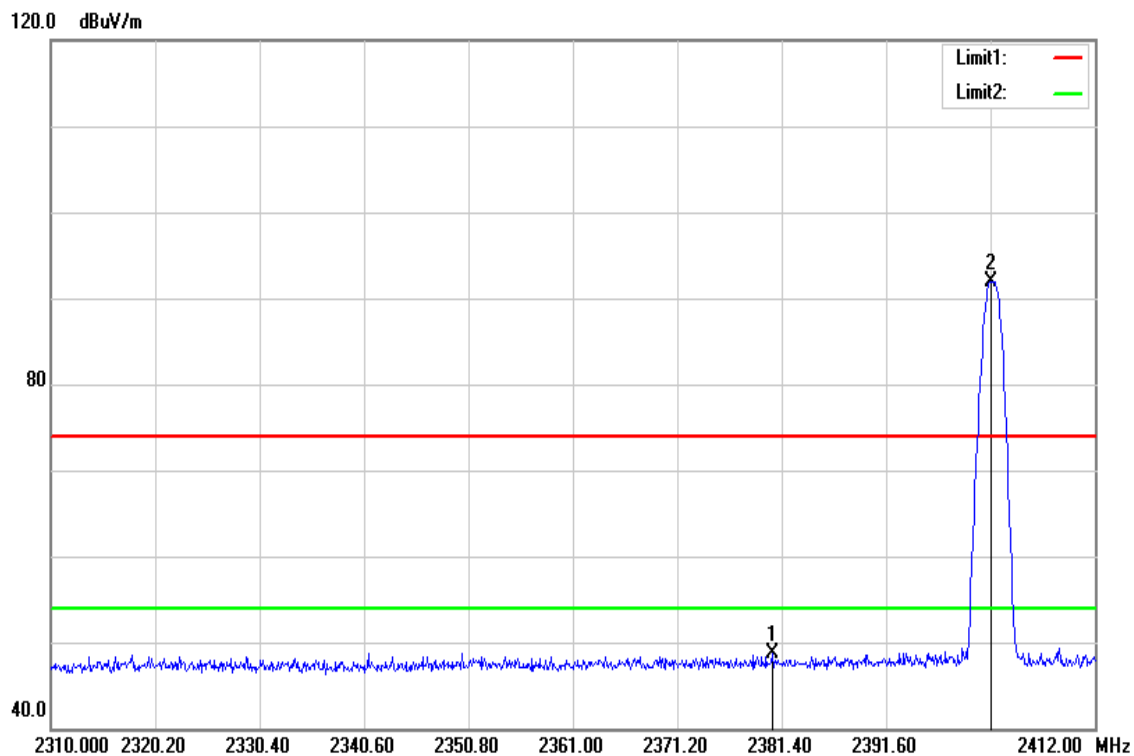
**Above 1 GHz**



### 4.8.4 Test Result

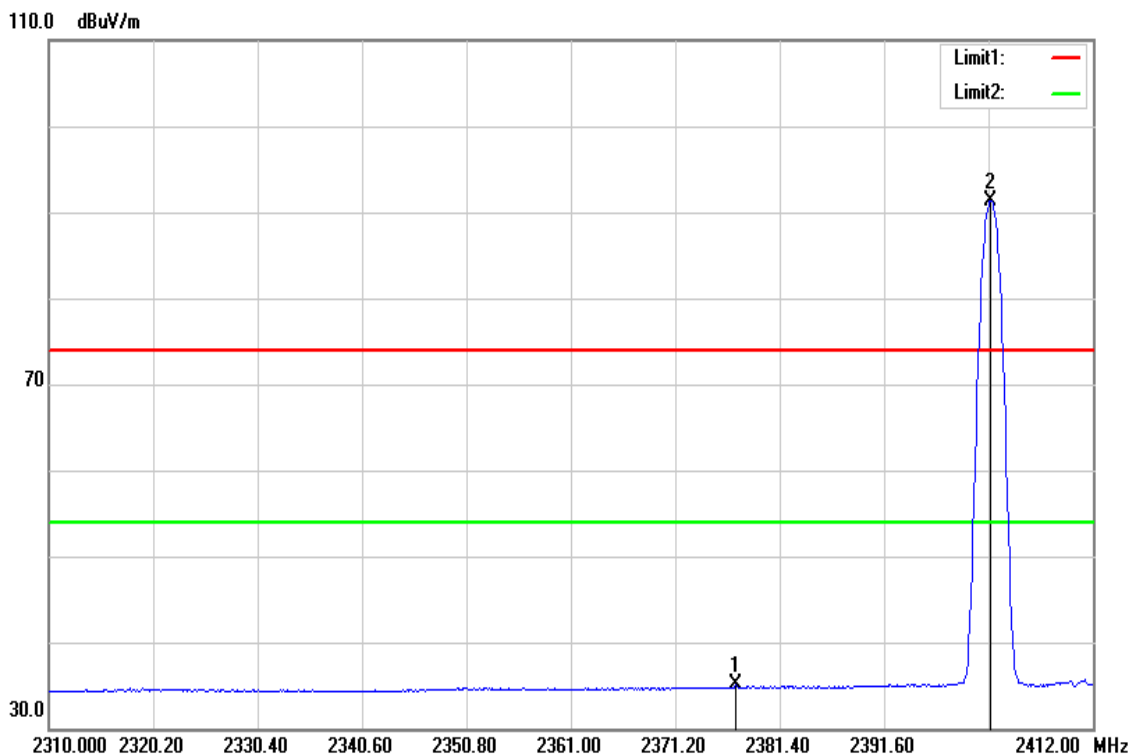
#### Band Edge Test Data

Test Mode:	GFSK_BR-1Mbps Low CH	Temp/Hum	27(°C)/ 53%RH
Test Item	Band Edge	Test Date	Jan 18, 2017
Polarize	Horizontal	Test Engineer	Ed Chiang
Detector	Peak	Test Voltage:	120Vac / 60Hz



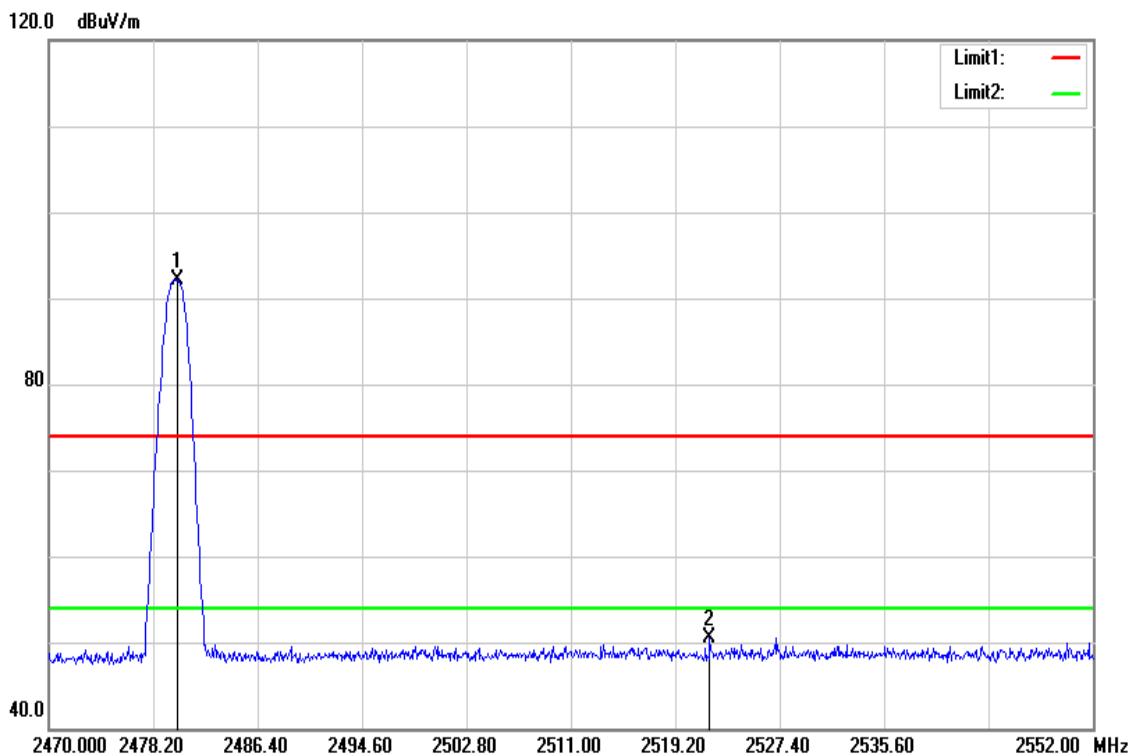
Frequency (MHz)	Reading (dBuV)	Correct Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
2380.482	51.26	-2.58	48.68	74.00	-25.32	Peak
2401.902	94.37	-2.41	91.96	-	-	Peak

Test Mode:	GFSK_BR-1Mbps Low CH	Temp/Hum	27(°C)/ 53%RH
Test Item	Band Edge	Test Date	Jan 18, 2017
Polarize	Horizontal	Test Engineer	Ed Chiang
Detector	Average	Test Voltage:	120Vac / 60Hz



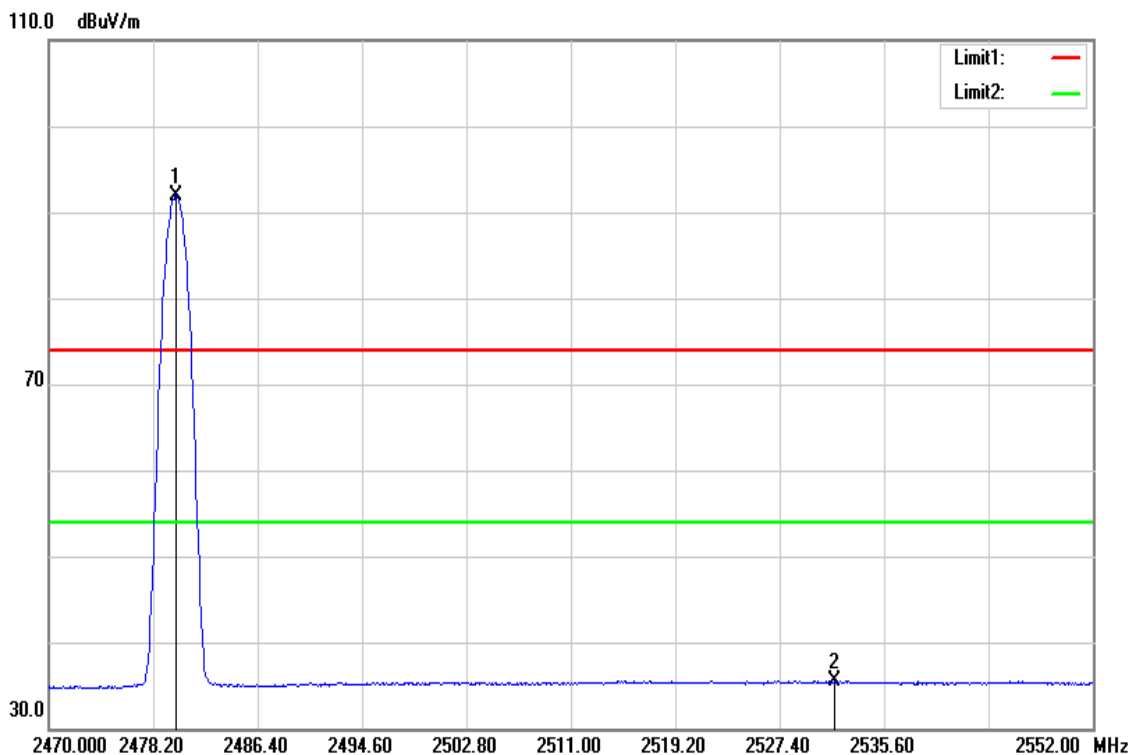
Frequency (MHz)	Reading (dBuV)	Correct Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
2377.116	37.63	-2.60	35.03	54.00	-18.97	AVG
2402.004	93.75	-2.41	91.34	-	-	AVG

Test Mode:	GFSK_BR-1Mbps High CH	Temp/Hum	27(°C) / 53%RH
Test Item	Band Edge	Test Date	Jan 18, 2017
Polarize	Horizontal	Test Engineer	Ed Chiang
Detector	Peak	Test Voltage:	120Vac / 60Hz



Frequency (MHz)	Reading (dBuV)	Correct Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
2480.086	94.21	-2.03	92.18	-	-	Peak
2521.906	52.31	-1.80	50.51	74.00	-23.49	Peak

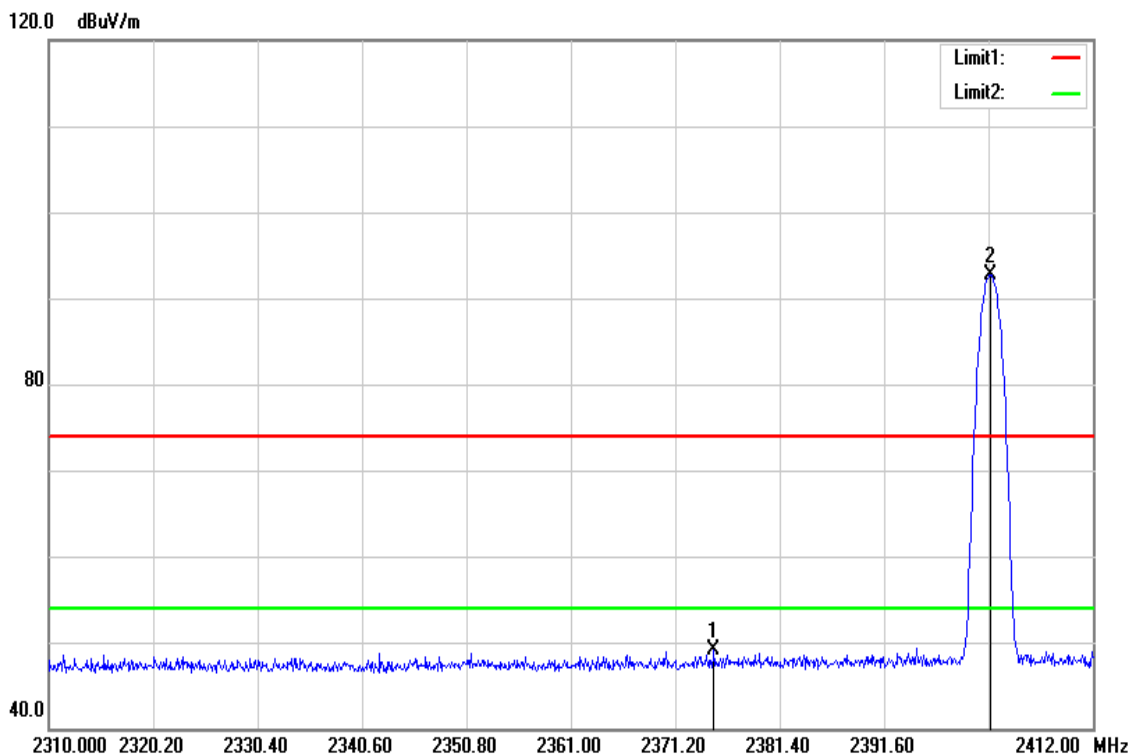
Test Mode:	GFSK_BR-1Mbps High CH	Temp/Hum	27(°C) / 53%RH
Test Item	Band Edge	Test Date	Jan 18, 2017
Polarize	Horizontal	Test Engineer	Ed Chiang
Detector	Average	Test Voltage:	120Vac / 60Hz



Frequency (MHz)	Reading (dBuV)	Correct Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
2480.004	93.93	-2.03	91.90	-	-	AVG
2531.746	37.30	-1.78	35.52	54.00	-18.48	AVG

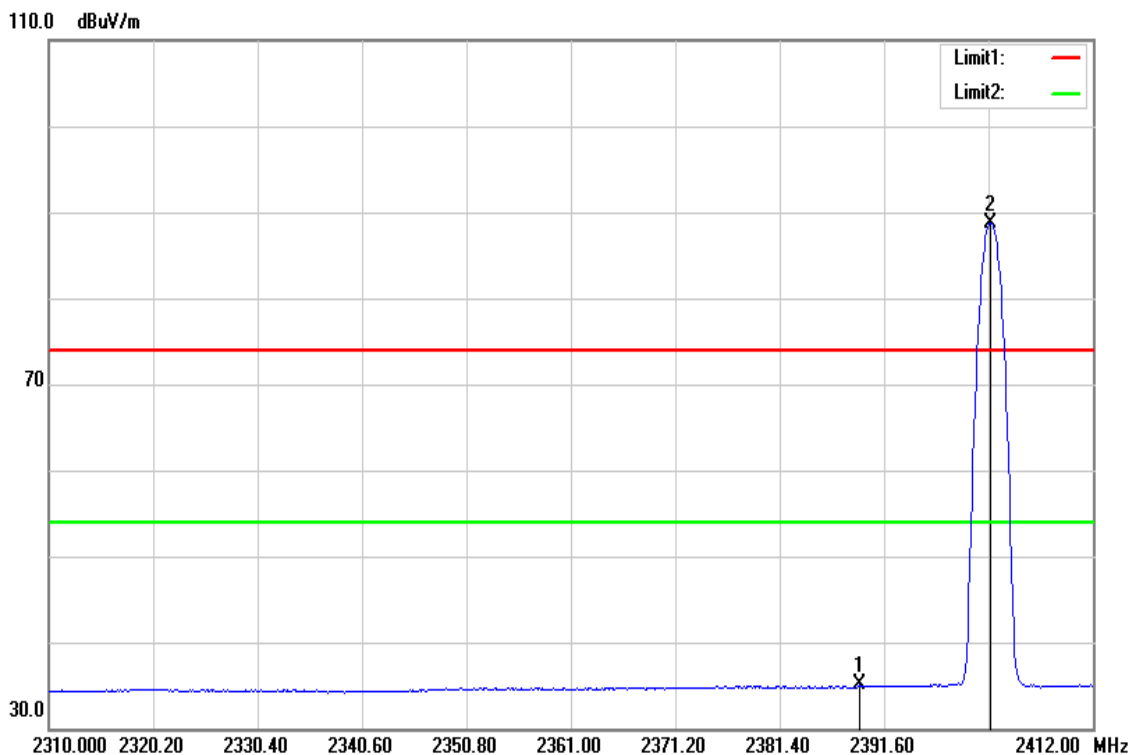


Test Mode:	8DPSK_EDR-3Mbps Low CH	Temp/Hum	27(°C) / 53%RH
Test Item	Band Edge	Test Date	Jan 18, 2017
Polarize	Horizontal	Test Engineer	Ed Chiang
Detector	Peak	Test Voltage:	120Vac / 60Hz



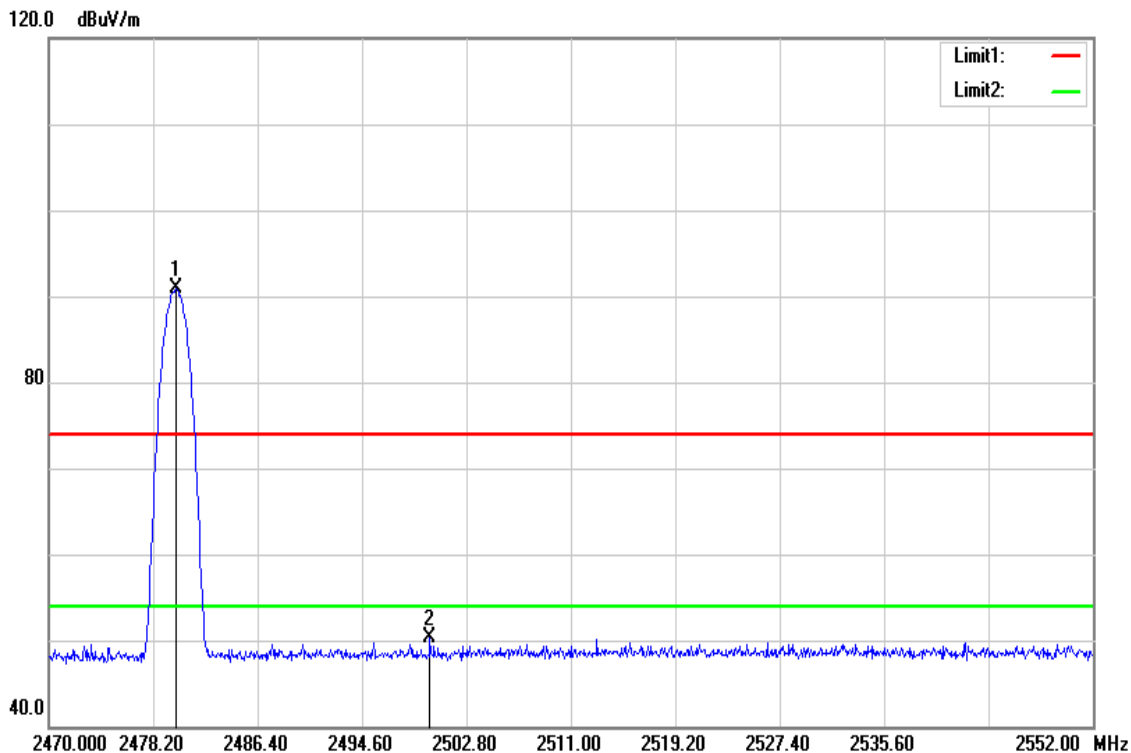
Frequency (MHz)	Reading (dBuV)	Correct Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
2374.974	51.74	-2.62	49.12	74.00	-24.88	Peak
2402.004	95.19	-2.41	92.78	-	-	Peak

Test Mode:	8DPSK_EDR-3Mbps Low CH	Temp/Hum	27(°C) / 53%RH
Test Item	Band Edge	Test Date	Jan 18, 2017
Polarize	Horizontal	Test Engineer	Ed Chiang
Detector	Average	Test Voltage:	120Vac / 60Hz



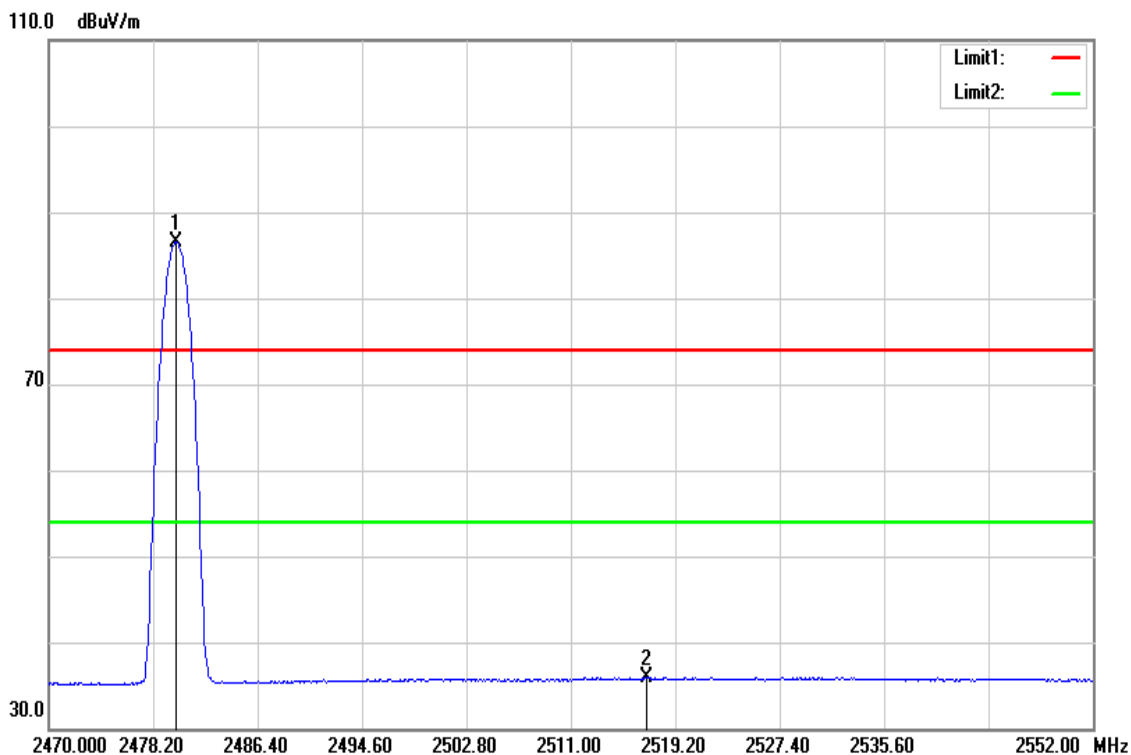
Frequency (MHz)	Reading (dBuV)	Correct Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
2389.254	37.53	-2.50	35.03	54.00	-18.97	AVG
2402.004	91.18	-2.41	88.77	-	-	AVG

Test Mode:	8DPSK_EDR-3Mbps High CH	Temp/Hum	27(°C) / 53%RH
Test Item	Band Edge	Test Date	Jan 18, 2017
Polarize	Horizontal	Test Engineer	Ed Chiang
Detector	Peak	Test Voltage:	120Vac / 60Hz



Frequency (MHz)	Reading (dBuV)	Correct Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
2480.004	92.89	-2.03	90.86	-	-	Peak
2499.930	52.19	-1.86	50.33	74.00	-23.67	Peak

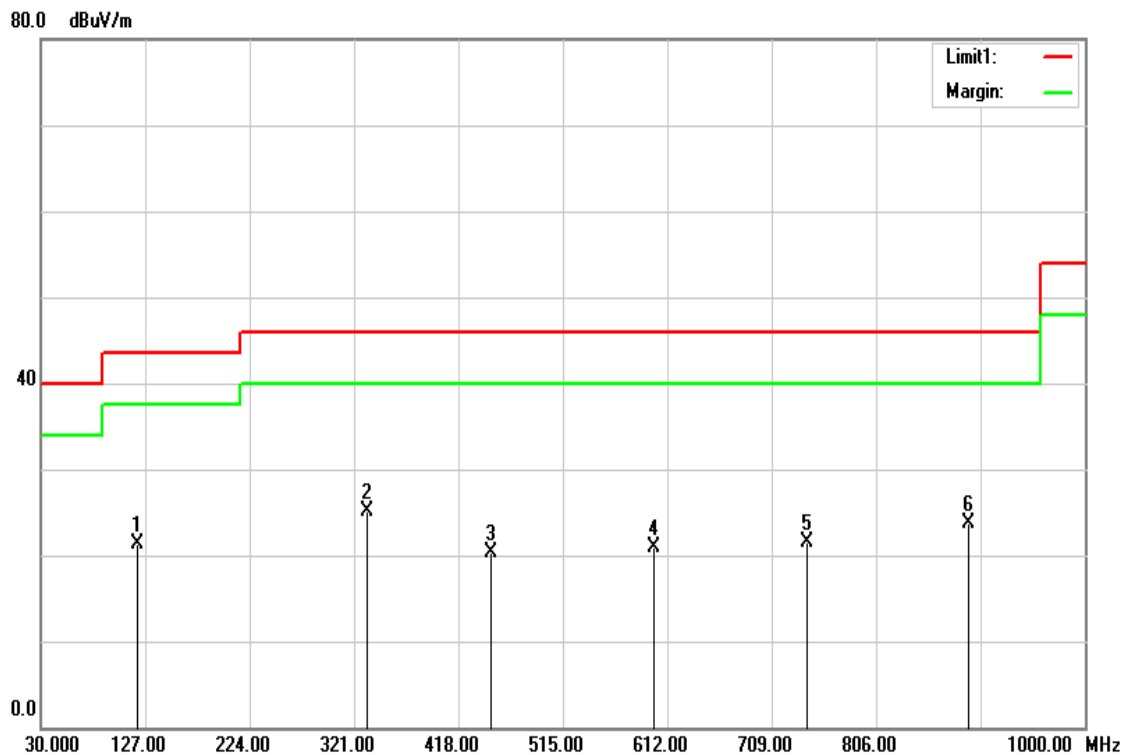
Test Mode:	8DPSK_EDR-3Mbps High CH	Temp/Hum	27(°C) / 53%RH
Test Item	Band Edge	Test Date	Jan 18, 2017
Polarize	Horizontal	Test Engineer	Ed Chiang
Detector	Average	Test Voltage:	120Vac / 60Hz



Frequency (MHz)	Reading (dBuV)	Correct Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
2480.004	88.48	-2.03	86.45	-	-	AVG
2516.904	37.76	-1.82	35.94	54.00	-18.06	AVG

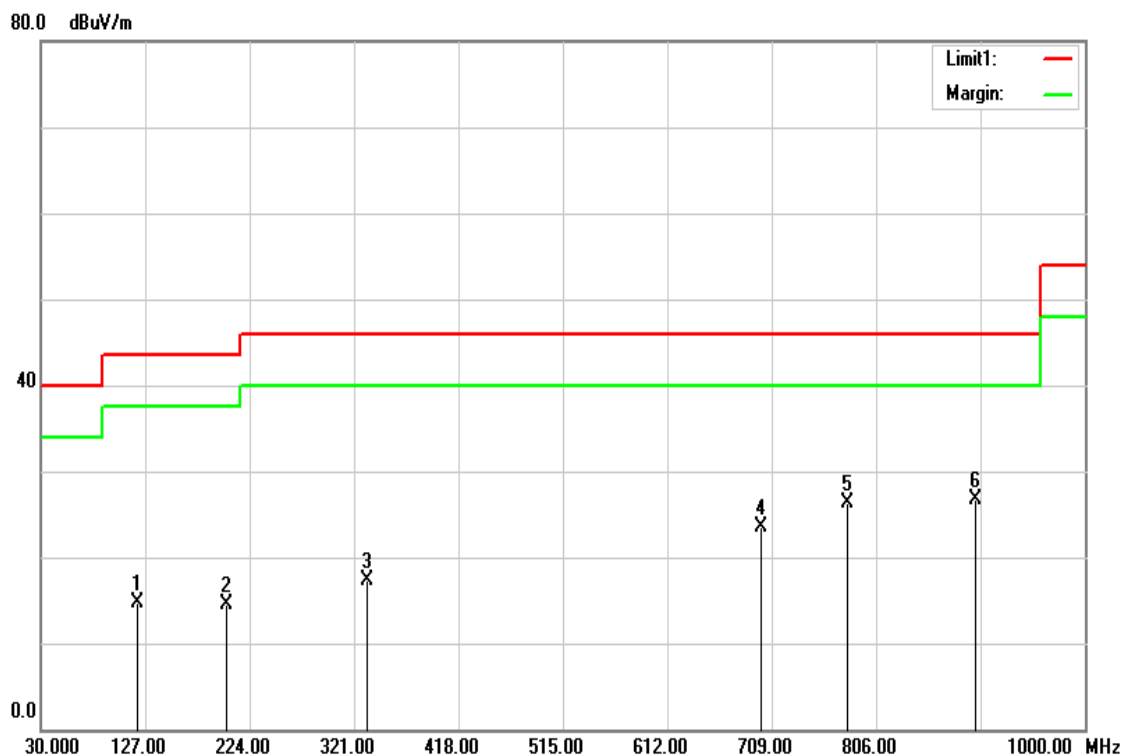
**Below 1G Test Data**

Test Mode:	BT Mode	Temp/Hum	27(°C) / 53%RH
Test Item	30MHz-1GHz	Test Date	Jan 18, 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
120.2100	36.78	-15.50	21.28	43.50	-22.22	Peak
333.6100	38.40	-13.33	25.07	46.00	-20.93	Peak
448.0700	30.61	-10.25	20.36	46.00	-25.64	Peak
599.3900	28.61	-7.77	20.84	46.00	-25.16	Peak
741.9800	26.55	-5.10	21.45	46.00	-24.55	Peak
892.3300	26.93	-3.28	23.65	46.00	-22.35	Peak

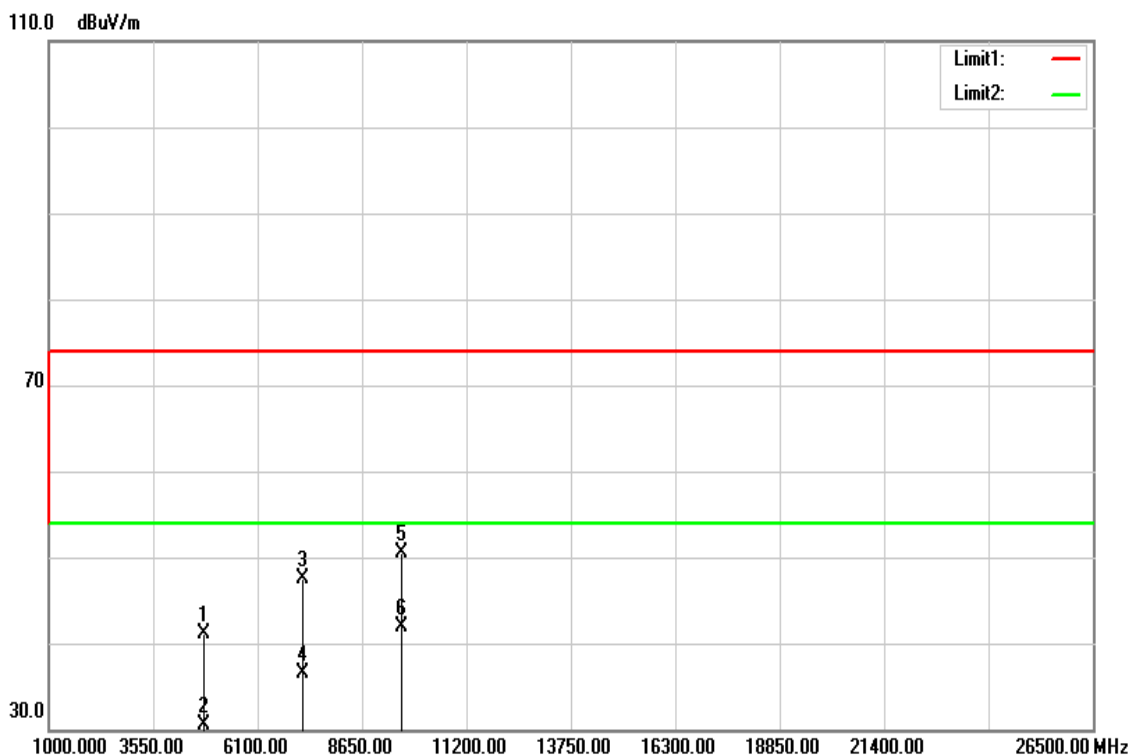
Test Mode:	BT Mode	Temp/Hum	27(°C) / 53%RH
Test Item	30MHz-1GHz	Test Date	Jan 18, 2017
Polarize	Horizontal	Test Engineer	Ed Chiang
Detector	Peak and Qusi-peak	Test Voltage:	120Vac / 60Hz



Frequency (MHz)	Reading (dBuV)	Correct Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
120.2100	30.23	-15.50	14.73	43.50	-28.77	Peak
202.6600	30.34	-15.74	14.60	43.50	-28.90	Peak
333.6100	30.58	-13.33	17.25	46.00	-28.75	Peak
699.3000	29.52	-6.08	23.44	46.00	-22.56	Peak
779.8100	31.01	-4.67	26.34	46.00	-19.66	Peak
898.1500	29.87	-3.21	26.66	46.00	-19.34	Peak

**Above 1G Test Data**

Test Mode:	GFSK_BR-1Mbps Low CH	Temp/Hum	27(°C)/ 53%RH
Test Item	Harmonic	Test Date	Jan 18, 2017
Polarize	Vertical	Test Engineer	Ed Chiang
Detector	Peak and Average	Test Voltage:	120Vac / 60Hz

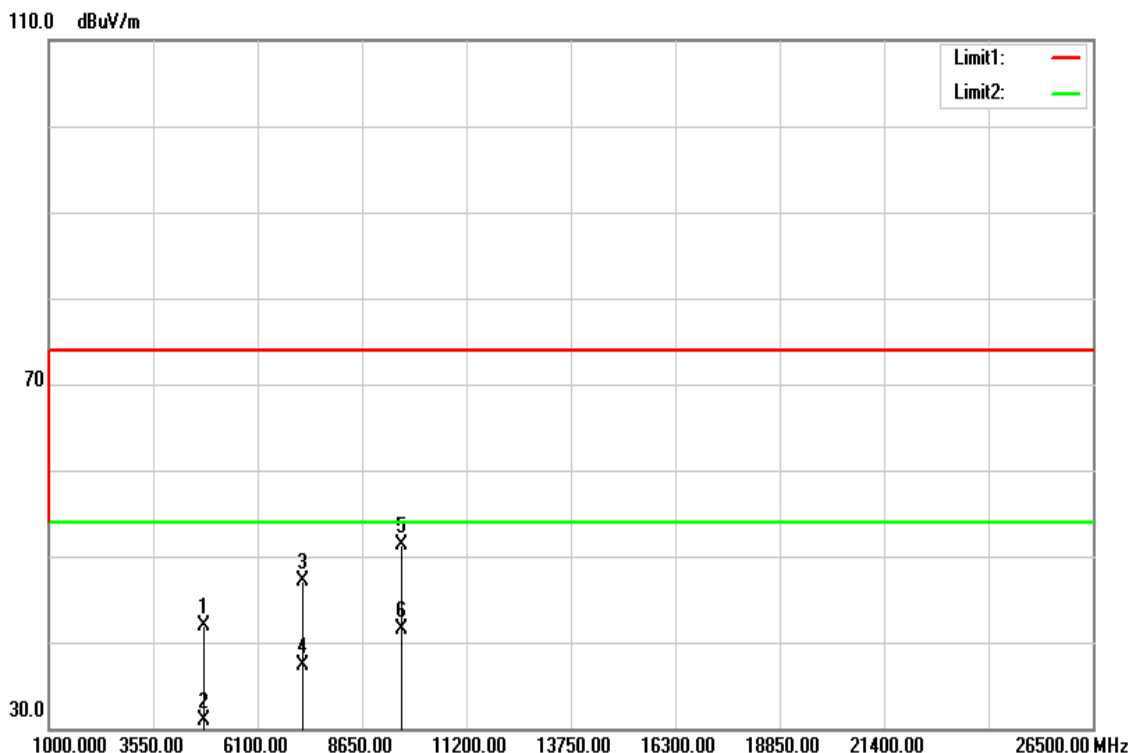


Frequency (MHz)	Reading (dBuV)	Correct Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
4804.000	36.01	5.04	41.05	74.00	-32.95	Peak
4804.000	25.44	5.04	30.48	54.00	-23.52	AVG
7206.000	34.98	12.62	47.60	74.00	-26.40	Peak
7206.000	23.96	12.62	36.58	54.00	-17.42	AVG
9608.000	32.90	17.60	50.50	74.00	-23.50	Peak
9608.000	24.35	17.60	41.95	54.00	-12.05	AVG

**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	27(°C)/ 53%RH
Test Item	Harmonic	Test Date	Jan 18, 2017
Polarize	Horizontal	Test Engineer	Ed Chiang
Detector	Peak and Average	Test Voltage:	120Vac / 60Hz



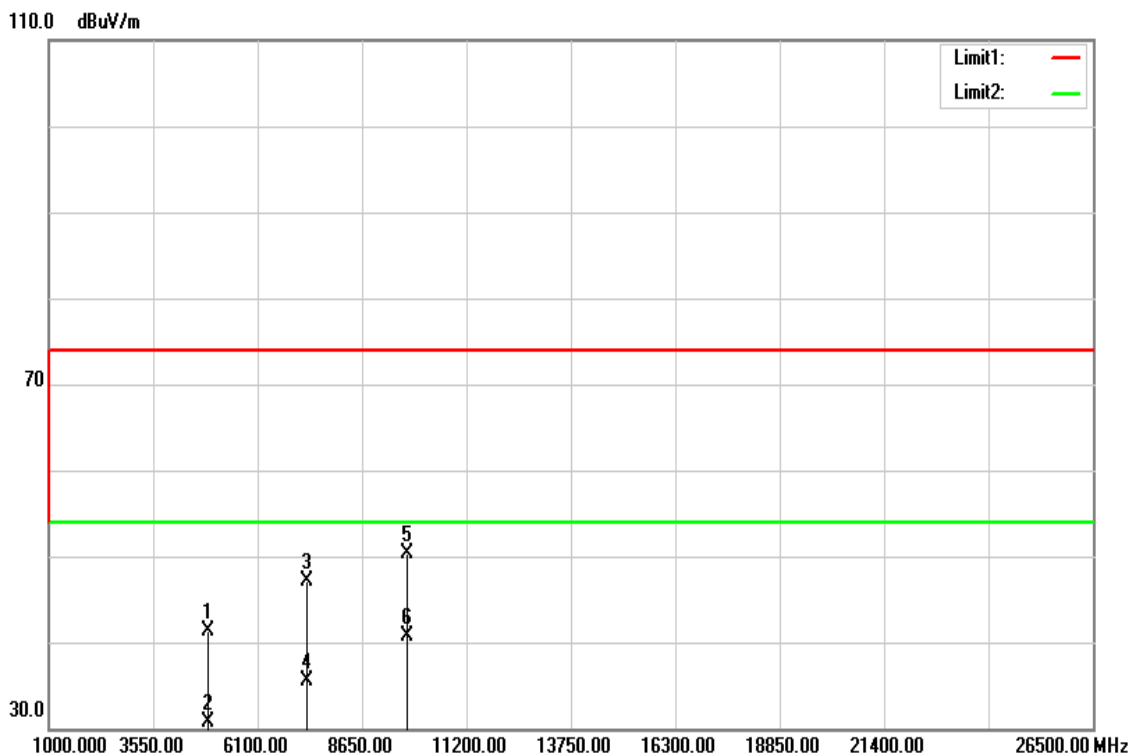
Frequency (MHz)	Reading (dBuV)	Correct Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
4804.000	36.78	5.04	41.82	74.00	-32.18	Peak
4804.000	25.85	5.04	30.89	54.00	-23.11	AVG
7206.000	34.53	12.62	47.15	74.00	-26.85	Peak
7206.000	24.67	12.62	37.29	54.00	-16.71	AVG
9608.000	33.80	17.60	51.40	74.00	-22.60	Peak
9608.000	23.85	17.60	41.45	54.00	-12.55	AVG

**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	27(°C)/ 53%RH
Test Item	Harmonic	Test Date	Jan 18, 2017
Polarize	Vertical	Test Engineer	Ed Chiang
Detector	Peak and Average	Test Voltage:	120Vac / 60Hz

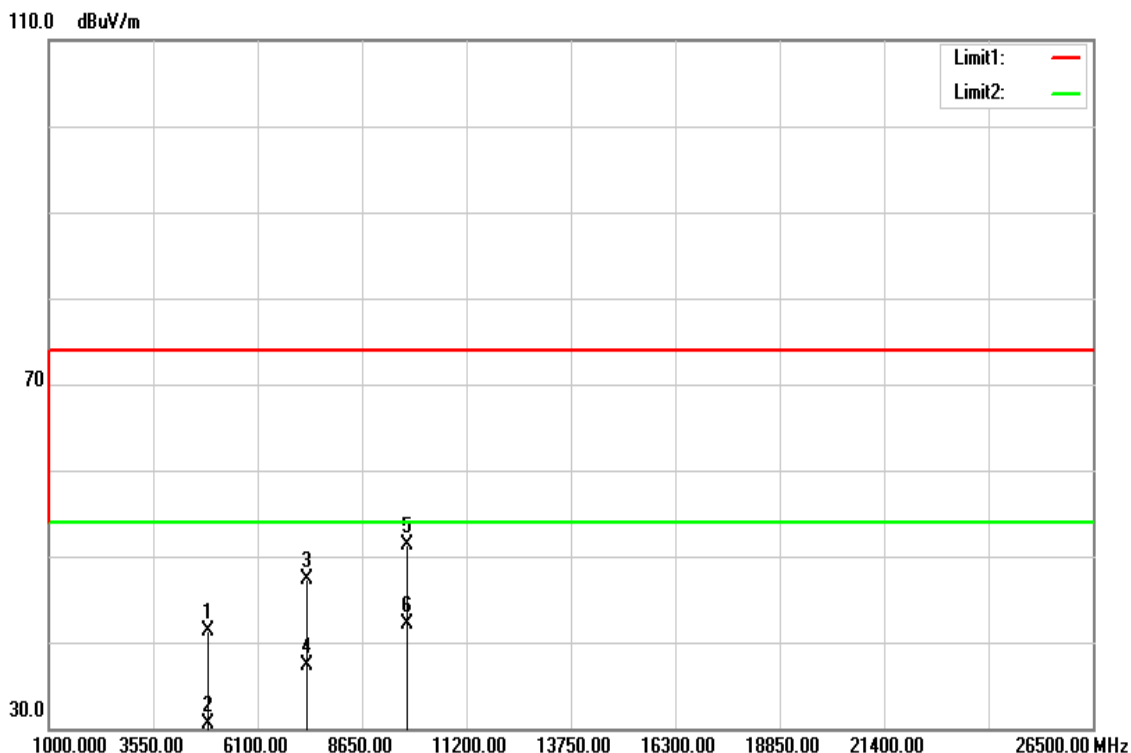


Frequency (MHz)	Reading (dBuV)	Correct Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
4880.000	36.11	5.25	41.36	74.00	-32.64	Peak
4880.000	25.49	5.25	30.74	54.00	-23.26	AVG
7320.000	34.09	12.97	47.06	74.00	-26.94	Peak
7320.000	22.61	12.97	35.58	54.00	-18.42	AVG
9760.000	32.73	17.60	50.33	74.00	-23.67	Peak
9760.000	23.13	17.60	40.73	54.00	-13.27	AVG

**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	27(°C)/ 53%RH
Test Item	Harmonic	Test Date	Jan 18, 2017
Polarize	Horizontal	Test Engineer	Ed Chiang
Detector	Peak and Average	Test Voltage:	120Vac / 60Hz

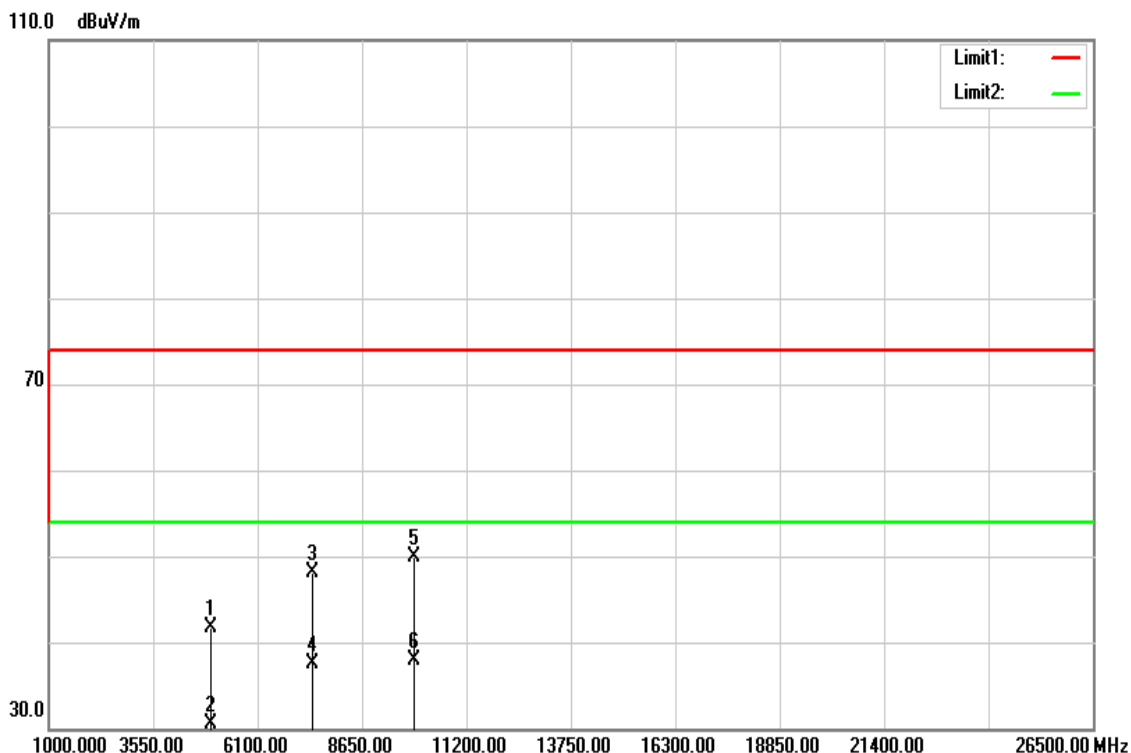


Frequency (MHz)	Reading (dBuV)	Correct Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
4880.000	36.10	5.25	41.35	74.00	-32.65	Peak
4880.000	25.21	5.25	30.46	54.00	-23.54	AVG
7320.000	34.30	12.97	47.27	74.00	-26.73	Peak
7320.000	24.31	12.97	37.28	54.00	-16.72	AVG
9760.000	33.64	17.60	51.24	74.00	-22.76	Peak
9760.000	24.55	17.60	42.15	54.00	-11.85	AVG

**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	27(°C)/ 53%RH
Test Item	Harmonic	Test Date	Jan 18, 2017
Polarize	Vertical	Test Engineer	Ed Chiang
Detector	Peak and Average	Test Voltage:	120Vac / 60Hz

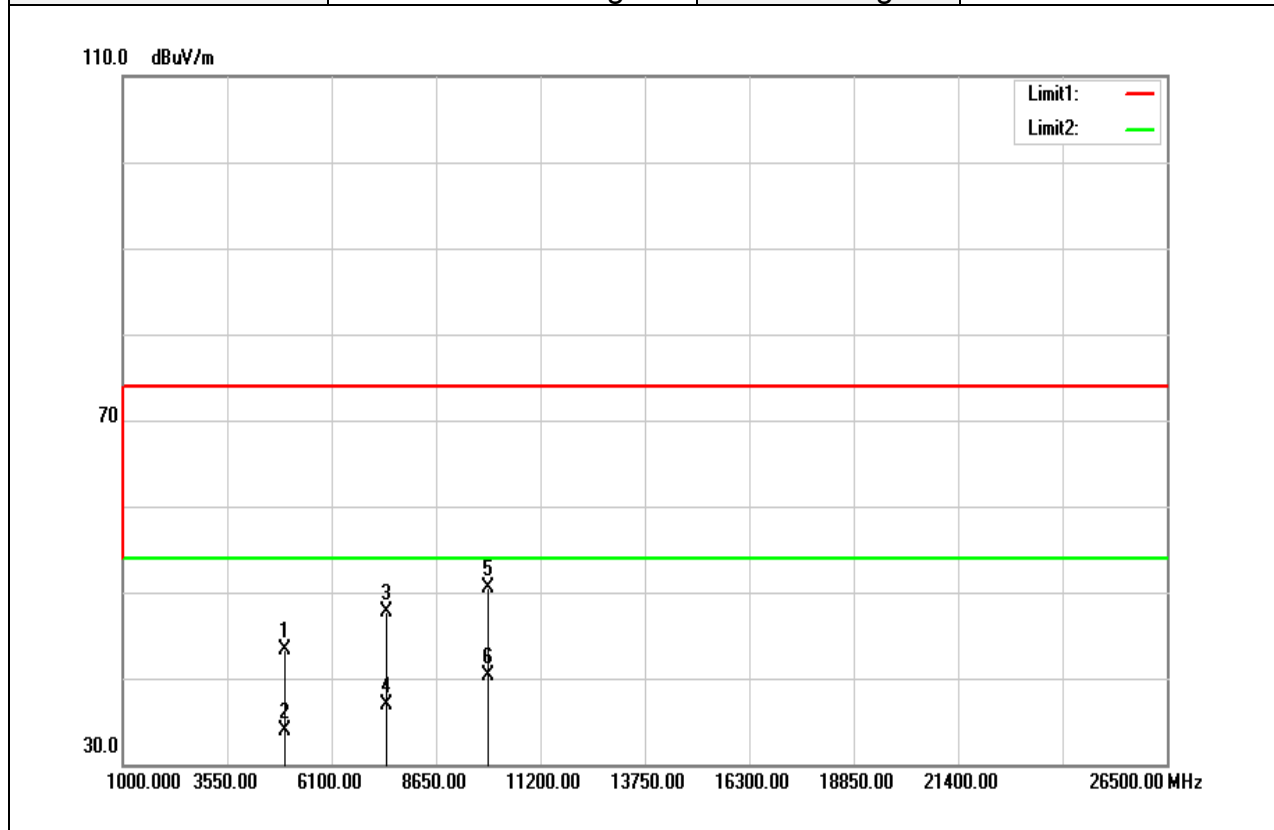


Frequency (MHz)	Reading (dBuV)	Correct Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
4960.000	36.29	5.46	41.75	74.00	-32.25	Peak
4960.000	24.95	5.46	30.41	54.00	-23.59	AVG
7440.000	34.72	13.33	48.05	74.00	-25.95	Peak
7440.000	24.22	13.33	37.55	54.00	-16.45	AVG
9920.000	32.26	17.60	49.86	74.00	-24.14	Peak
9920.000	20.38	17.60	37.98	54.00	-16.02	AVG

**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	27(°C)/ 53%RH
Test Item	Harmonic	Test Date	Jan 18, 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
4960.000	37.74	5.46	43.20	74.00	-30.80	Peak
4960.000	28.45	5.46	33.91	54.00	-20.09	AVG
7440.000	34.42	13.33	47.75	74.00	-26.25	Peak
7440.000	23.52	13.33	36.85	54.00	-17.15	AVG
9920.000	32.84	17.60	50.44	74.00	-23.56	Peak
9920.000	22.68	17.60	40.28	54.00	-13.72	AVG

**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