

FCC RADIO TEST REPORT

FCC 47 CFR PART 15 SUBPART C

Test Standard	FCC Part 15.247 and RSS-247 Issue 1
FCC ID	M82-AIM37
ISED No.	9404A-AIM37
Trade name	Advantech Co., Ltd
Product name	Computer
IC Model No.	AIM-37AT
FCC Model No.	AIM-37AT ; AIM-37ATxxxxxxxxxxxxxxxxxxx ; AIM37ATxxxxxxxxxxxxxxxxxxx (where "x" may be any alphanumeric character, "-" or blank for marketing purpose and no impact safety related critical components and constructions)
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 CCS. Inc.

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



Approved by:

Handwritten signature of Sam Chuang in black ink.

Sam Chuang
Manager

Reviewed by:

Handwritten signature of Zeus Chen in black ink.

Zeus Chen
Supervisor

Revision History

Rev.	Issue Date	Revisions	Revised By
00	November 21, 2016	Initial Issue	Doris Chu

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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.					
Equipment	Computer					
IC Model Name	AIM-37AT					
IC Model Discrepancy		barcode scan	Card Reader,	OS		
	SKU 1	V	V	Win10 IoT Enterprise		
	SKU 2	X	X	Win10 IoT Enterprise		
	SKU 3	X	X	Android 6.0		
FCC Model Name	AIM-37AT ; AIM-37ATxxxxxxxxxxxxxxxx ; AIM37ATxxxxxxxxxxxxxxxx (where "x" may be any alphanumeric character, "-" or blank for marketing purpose and no impact safety related critical components and constructions)					
FCC Model Discrepancy	Model Name		Model Discrepancy			
	-		-	barcode scan	Card Reader,	OS
	AIM-37AT	SKU 1	V	V	Win10 IoT Enterprise	
		SKU 2	X	X	Win10 IoT Enterprise	
		SKU 3	X	X	Android 6.0	
AIM-37ATxxxxxxxxxxxxxxxx ; AIM37ATxxxxxxxxxxxxxxxx (where "x" may be any alphanumeric character, "-" or blank for marketing purpose and no impact safety related critical components and constructions)		All the model number was just for marketing purpose only.				
EUT Functions	IEEE 802.11bgn+BT+NFC					
Received Date	Nov. 01, 2016					
Date of Test	Nov 5, 2016 ~ Nov 15, 2016					
Output Power(W)	GFSK : 0.029 $\pi/4$ -DQPSK :0.023 8DPSK :0.042					

Power Operation	<input checked="" type="checkbox"/> AC <input checked="" type="checkbox"/> Adapter : 120V/60Hz <input type="checkbox"/> DC Type : <input type="checkbox"/> Battery <input type="checkbox"/> DC Power Supply <input type="checkbox"/> External DC adapter
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Remark:

All listed models are using an identical RF module with the only differences on number of key buttons mounted for additional functions.

Due to similarity of RF product constructions of given model series, only dedicated model as described in test report with the most complexity constructions was selected for testing and record.

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

Antenna Category	<input checked="" type="checkbox"/> Integral: antenna permanently attached <input type="checkbox"/> External dedicated antennas <input type="checkbox"/> External Unique antenna connector
Antenna Type	<input checked="" type="checkbox"/> PIFA <input type="checkbox"/> PCB <input type="checkbox"/> Dipole <input type="checkbox"/> Printed <input type="checkbox"/> Coils
Antenna Gain	1.13 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	Anderson Kuo.	
Radiation	Ed Chiang	
RF Conducted	Ian Tu	

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 Due
Spectrum Analyzer	R&S	FSV 40	101073	07/31/2017

3M 966 Chamber Test Site				
Equipment	Manufacturer	Model	S/N	Cal Due
Spectrum Analyzer	Agilent	E4446A	US42510252	12/07/2016
Loop Ant	COM-POWER	AL-130	121051	02/24/2017
Bilog Antenna	Sunol Sciences	JB3	A030105	07/02/2017
Pre-Amplifier	EMEC	EM330	60609	06/07/2017
Horn Antenna	ETC	MCTD 1209	DRH13M02003	09/01/2017
Pre-Amplifier	MITEQ	AMF-6F-260400-40-8P	985646	01/13/2017
Horn Antenna	EMCO	3116	26370	01/14/2017
Antenna Tower	CCS	CC-A-1F	N/A	N.C.R
Controller	CCS	CC-C-1F	N/A	N.C.R
Turn Table	CCS	CC-T-1F	N/A	N.C.R

AC Conducted Emissions Test Site				
Equipment	Manufacturer	Model	S/N	Cal Due
LISN	R&S	ENV216	101054	05/10/2017
Receiver	R&S	ESCI	101073	08/19/2017

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
1	Adapter	APD	WA-15105R	N/A	N/A

Support Equipment					
No.	Equipment	Brand	Model	Series No.	FCC ID
1	Ear phone	Logitech	H150	N/A	N/A
2	SD Card	Kingston	4GB	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, KDB 558074 D01 v03r05, RSS-247 Issue 1 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: TW1039) 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)(1)	4.2	20 dB Bandwidth	Pass
-	RSS-GEN 6.6	4.2	Occupied Bandwidth(99%)	Pass
15.247(b)(1)	RSS-247(5.4)(2)	4.3	Output Power Measurement	Pass
15.247(a)(1)	RSS-247(5.1)(2)	4.4	Frequency Separation	Pass
15.247(a)(1)(iii)	RSS-247(5.1)(4)	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)(4)	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	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.
2. Baseline testing was performed on the two variants(MP60 and MP60S) to determine the worst case on all conducted test and radiated test. Therefore worst case is MP60.

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	4.65	V
EDR($\pi/4$ -DQPSK)	2 Mbps	3.64	-
EDR(8DPSK)	3 Mbps	6.23	V

AC Power Line Conducted Emission	
Test Condition	AC Power line conducted emission for line and neutral
Voltage/Hz	120V/60Hz
Test Mode	<input checked="" type="checkbox"/> Mode 1:EUT power by AC adapter 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	<input checked="" type="checkbox"/> Mode 1:EUT power by AC adapter 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
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

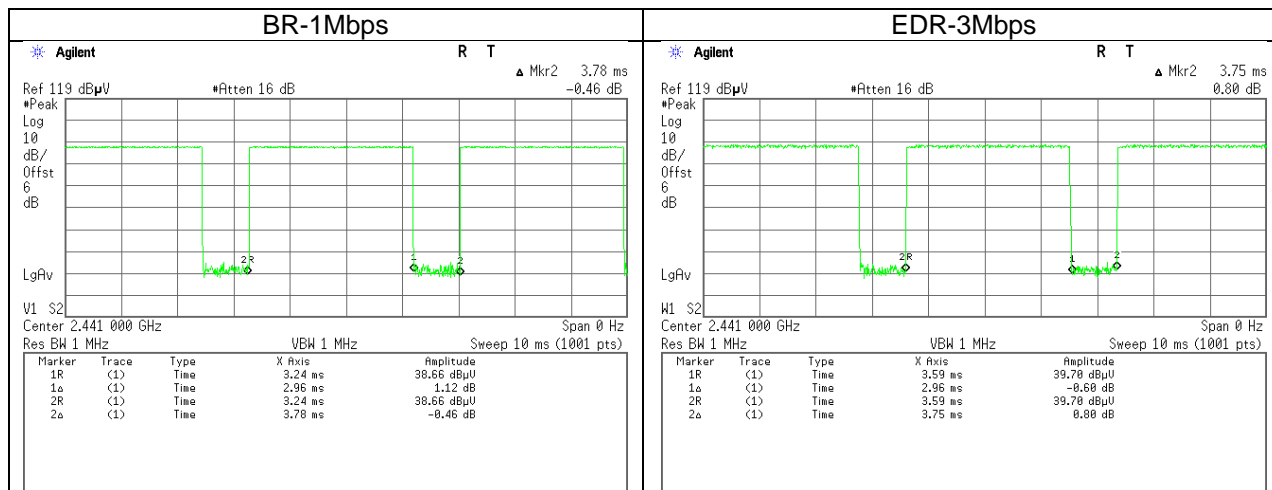
Radiated Emission Measurement Below 1G	
Test Condition	Radiated Emission Below 1G
Voltage/Hz	120V/60Hz
Test Mode	<input checked="" type="checkbox"/> Mode 1:EUT power by AC adapter via USB cable.
Worst Mode	<input checked="" type="checkbox"/> Mode 1 <input type="checkbox"/> Mode 2 <input type="checkbox"/>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

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	2.96	3.78	78%	1.06
EDR-3Mbps	2.96	3.75	79%	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

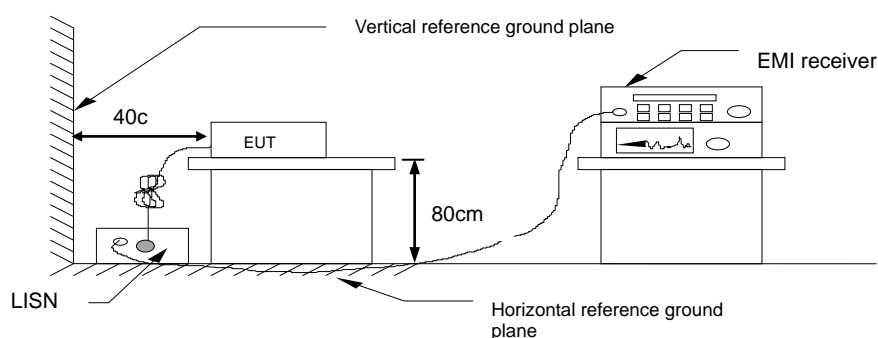
* Decreases with the logarithm of the frequency.

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

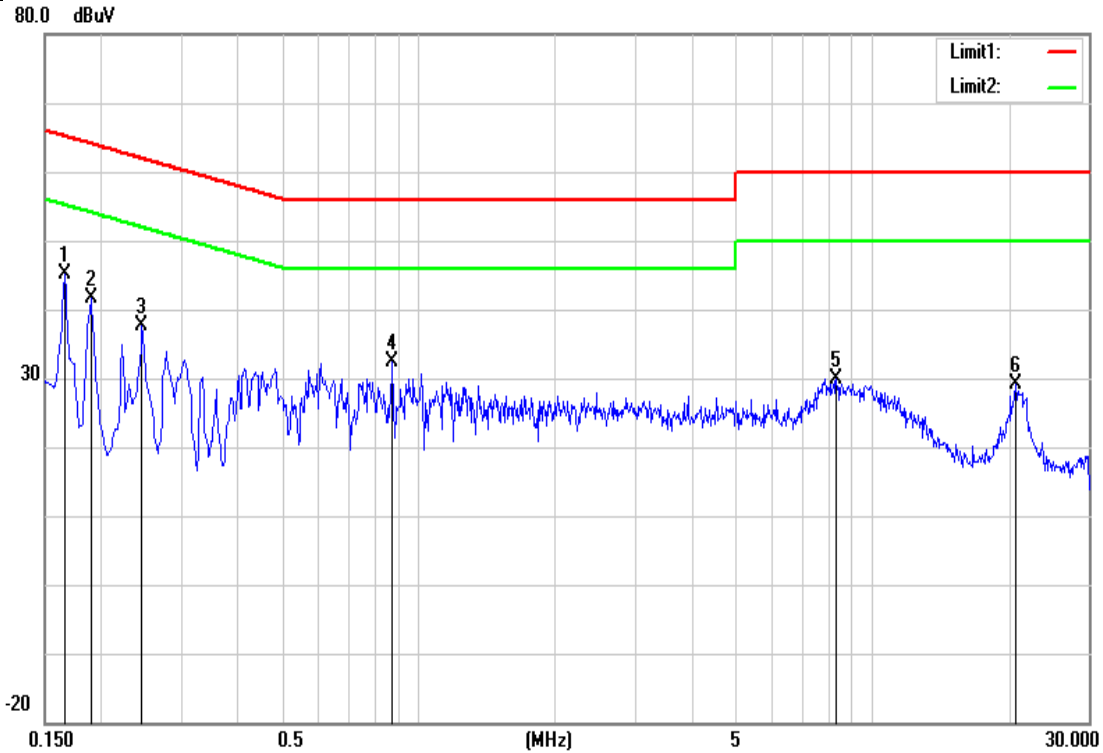


4.1.4 Test Result

PASS

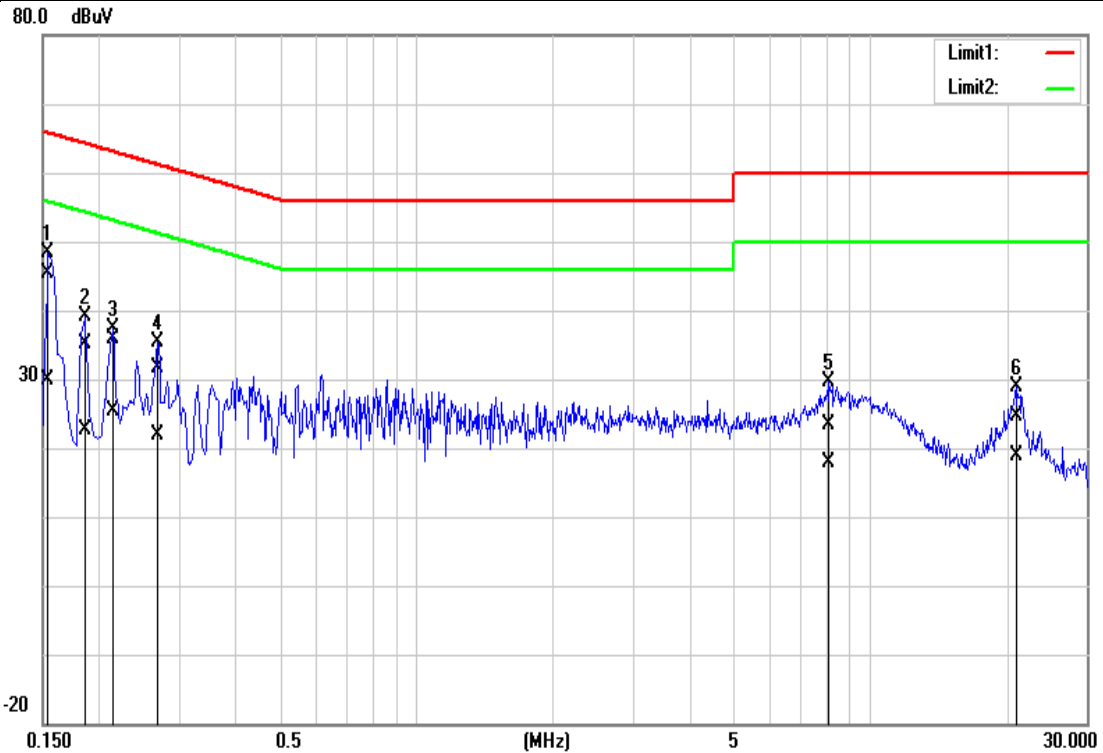
Test Data

Test Mode:	Mode 1	Temp/Hum	24(°C)/ 50%RH
Test Voltage:	120Vac / 60Hz	Test Date	Nov 15, 2016
Phase:	Line	Test Engineer	Anderson Kuo



Frequency (MHz)	Quasi Peak reading (dBuV)	Average reading (dBuV)	Correction factor (dB)	Quasi Peak result (dBuV)	Average result (dBuV)	Quasi Peak limit (dBuV)	Average limit (dBuV)	Quasi Peak margin (dB)	Average margin (dB)	Remark
0.1660	32.89	19.48	9.71	42.60	29.19	65.16	55.16	-22.56	-25.97	Pass
0.1900	26.23	11.29	9.70	35.93	20.99	64.04	54.04	-28.11	-33.05	Pass
0.2460	23.59	12.66	9.70	33.29	22.36	61.89	51.89	-28.60	-29.53	Pass
0.8780	13.34	6.30	9.71	23.05	16.01	56.00	46.00	-32.95	-29.99	Pass
8.3380	15.49	10.30	9.78	25.27	20.08	60.00	50.00	-34.73	-29.92	Pass
20.7980	12.91	7.06	9.87	22.78	16.93	60.00	50.00	-37.22	-33.07	Pass

Test Mode:	Mode 1	Temp/Hum	24(°C)/ 50%RH
Test Voltage:	120Vac / 60Hz	Test Date	Nov 15, 2016
Phase:	Neutral	Test Engineer	Anderson Kuo



Frequency (MHz)	Quasi Peak reading (dBuV)	Average reading (dBuV)	Correction factor (dB)	Quasi Peak result (dBuV)	Average result (dBuV)	Quasi Peak limit (dBuV)	Average limit (dBuV)	Quasi Peak margin (dB)	Average margin (dB)	Remark
0.1540	35.54	20.16	9.78	45.32	29.94	65.78	55.78	-20.46	-25.84	Pass
0.1860	25.30	12.75	9.77	35.07	22.52	64.21	54.21	-29.14	-31.69	Pass
0.2140	26.17	15.56	9.77	35.94	25.33	63.05	53.05	-27.11	-27.72	Pass
0.2700	21.74	12.17	9.77	31.51	21.94	61.12	51.12	-29.61	-29.18	Pass
8.1060	13.42	7.94	9.96	23.38	17.90	60.00	50.00	-36.62	-32.10	Pass
20.9580	14.39	8.67	10.28	24.67	18.95	60.00	50.00	-35.33	-31.05	Pass

4.2 20DB BANDWIDTH AND OCCUPIED BANDWIDTH(99%)

4.2.1 Test Limit

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

20 dB Bandwidth : For reporting purposes only.

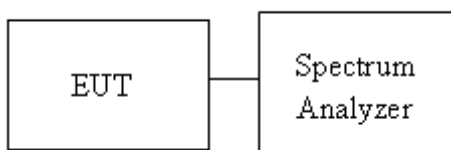
Occupied Bandwidth(99%) : For reporting purposes only.

4.2.2 Test Procedure

Test method Refer as ANSI 63.10:2013 clause 6.9.2,

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



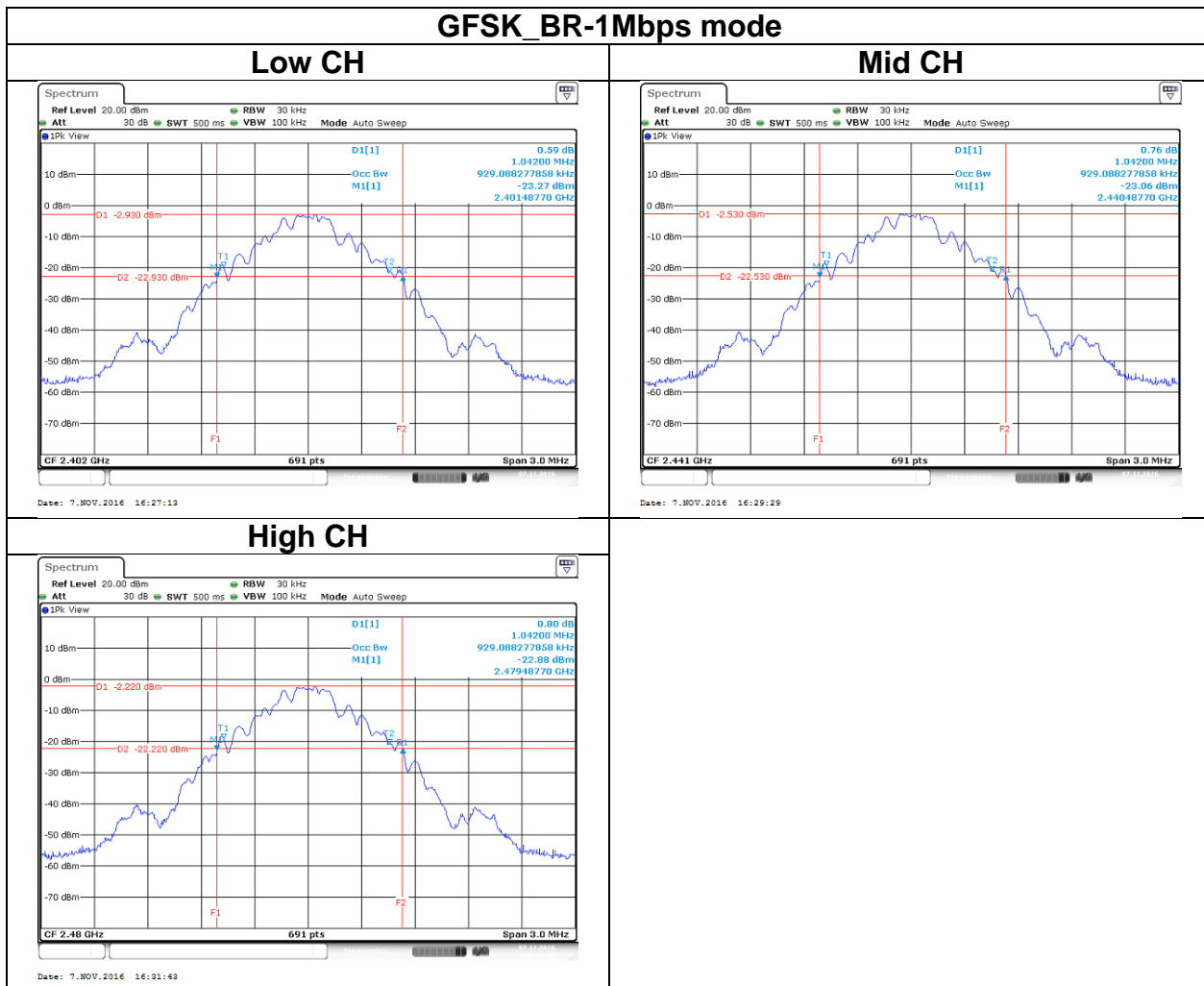
4.2.4 Test Result

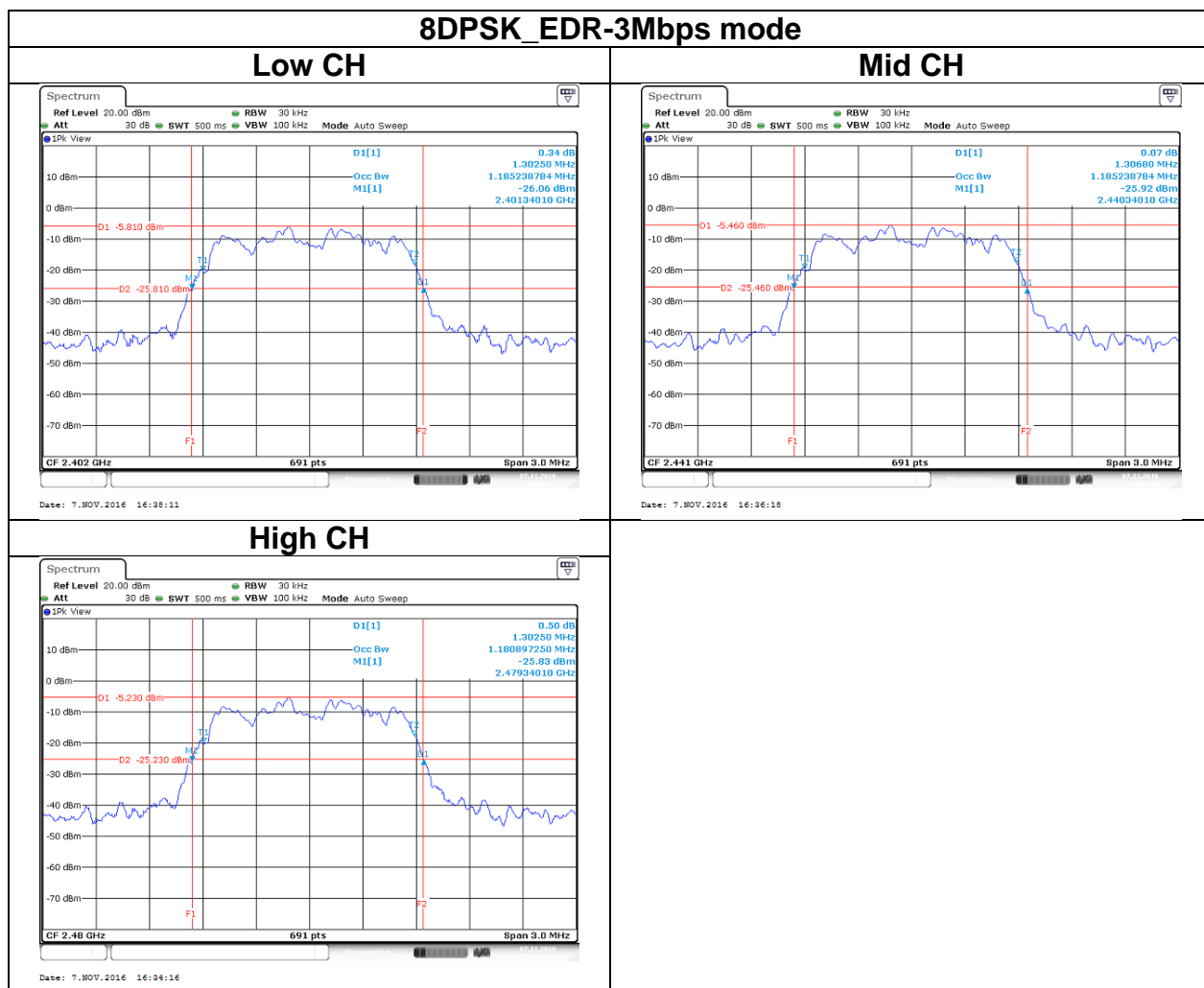
Test mode: GFSK_BR-1Mbps mode / 2402-2480 MHz			
Channel	Frequency (MHz)	OBW(99%) (MHz)	20dB BW (MHz)
Low	2402	0.9290	1.0420
Mid	2441	0.9290	1.0420
High	2480	0.9290	1.0420

Test mode: 8DPSK_EDR-3Mbps mode / 2402-2480 MHz			
Channel	Frequency (MHz)	OBW(99%) (MHz)	20dB BW (MHz)
Low	2402	1.1852	1.3250
Mid	2441	1.1852	1.3068
High	2480	1.1808	1.3250

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(2)

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.

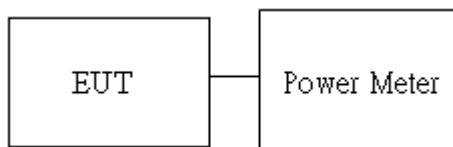
Limit	<input checked="" type="checkbox"/> Antenna not exceed 6 dBi : 21dBm <input type="checkbox"/> Antenna with DG greater than 6 dBi : 21dBm [Limit = 30 – (DG – 6)]
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Average output power : For reporting purposes only.

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	3.97	5.10	0.0025	0.0032	21	27
	39	2441	4.60	5.73	0.0029	0.0037		
	78	2480	4.65	5.78	0.0029	0.0038		
$\pi/4$ -DQPSK EDR-2Mbps (DH5)	0	2402	2.92	4.05	0.0020	0.0025		
	39	2441	3.42	4.55	0.0022	0.0028		
	78	2480	3.64	4.77	0.0023	0.0030		
8DPSK EDR-3Mbps (DH5)	0	2402	5.62	6.75	0.0036	0.0047		
	39	2441	6.15	7.28	0.0041	0.0053		
	78	2480	6.23	7.36	0.0042	0.0054		

Average output power :

BT			
Config.	CH	Freq. (MHz)	AV Power (dBm)
GFSK BR-1Mbps (DH5)	0	2402	3.30
	39	2441	3.88
	78	2480	3.98
$\pi/4$ -DQPSK EDR-2Mbps (DH5)	0	2402	1.86
	39	2441	2.36
	78	2480	2.58
8DPSK EDR-3Mbps (DH5)	0	2402	2.50
	39	2441	3.06
	78	2480	3.15

4.4 FREQUENCY SEPARATION

4.4.1 Test Limit

According to §15.247(a)(1) and RSS-247 section 5.1(2)

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.

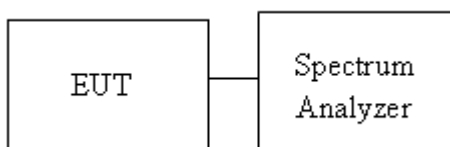
Alternatively, frequency hopping systems operating in the 2400-2483.5 MHz band may have hopping channel carrier frequencies that are separated by 25 kHz or two-thirds of the 20 dB bandwidth of the hopping channel, whichever is greater, provided the systems operate with an output power no greater than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

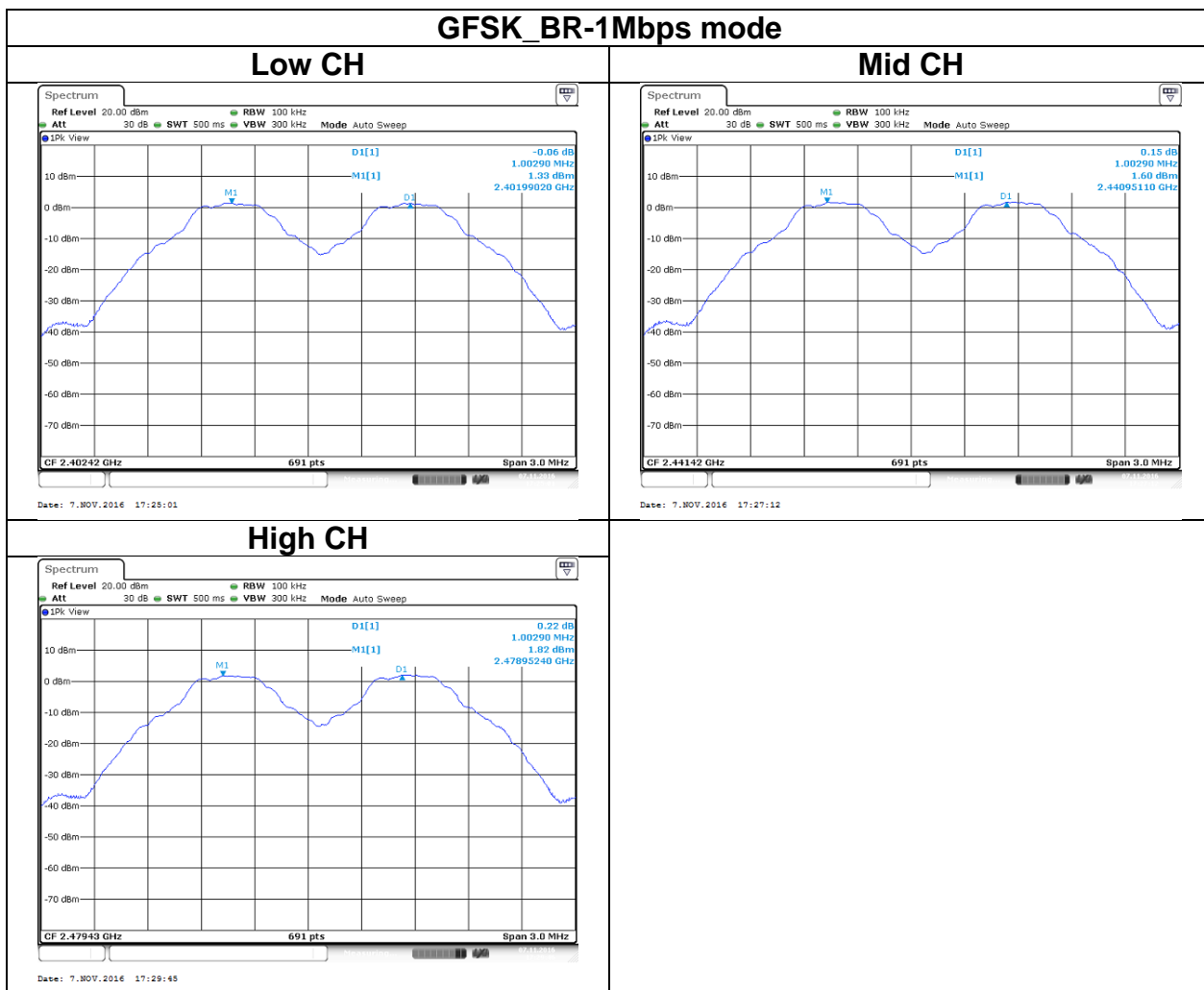


4.4.4 Test Result

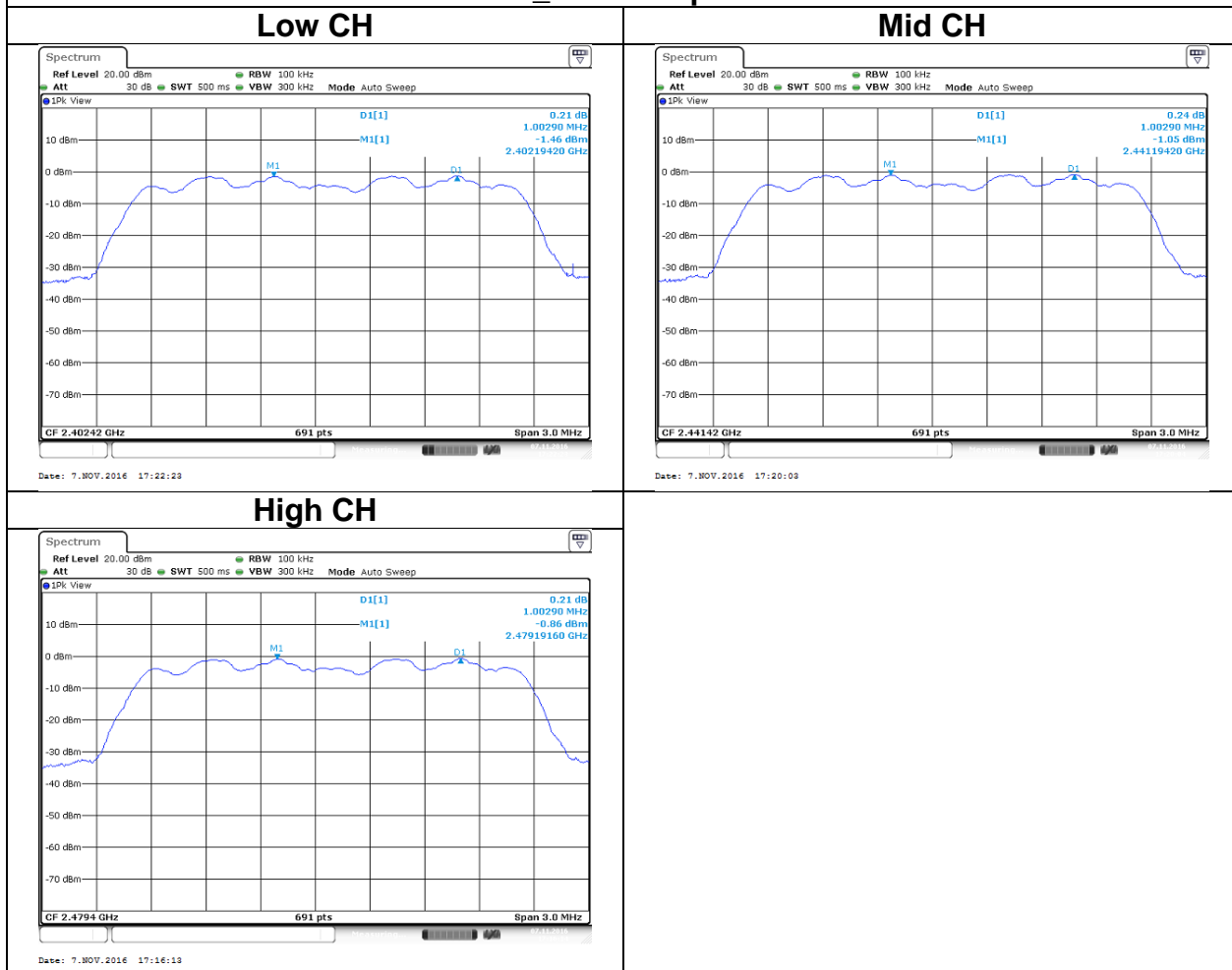
Test mode: GFSK_BR-1Mbps mode / 2402-2480 MHz				
Channel	Frequency (MHz)	Channel Separation (MHz)	Channel Separation Limits (MHz)	Result
Low	2402	1.0029	0.695	PASS
Mid	2441	1.0029	0.695	PASS
High	2480	1.0029	0.695	PASS

Test mode: 8DPSK_EDR-3Mbps mode / 2402-2480 MHz				
Channel	Frequency (MHz)	Channel Separation (MHz)	Channel Separation Limits (MHz)	Result
Low	2402	1.0029	0.868	PASS
Mid	2441	1.0029	0.871	PASS
High	2480	1.0029	0.868	PASS

Test Data



8DPSK_EDR-3Mbps mode



4.5 NUMBER OF HOPPING

4.5.1 Test Limit

According to §15.247(a)(1)(iii) and RSS-247 section 5.1(4)

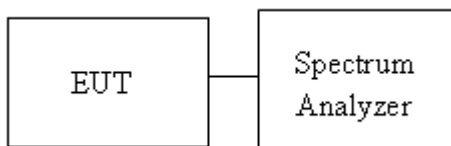
Frequency hopping system in the 2400-2483.5MHz band shall use at least 15 channels.

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



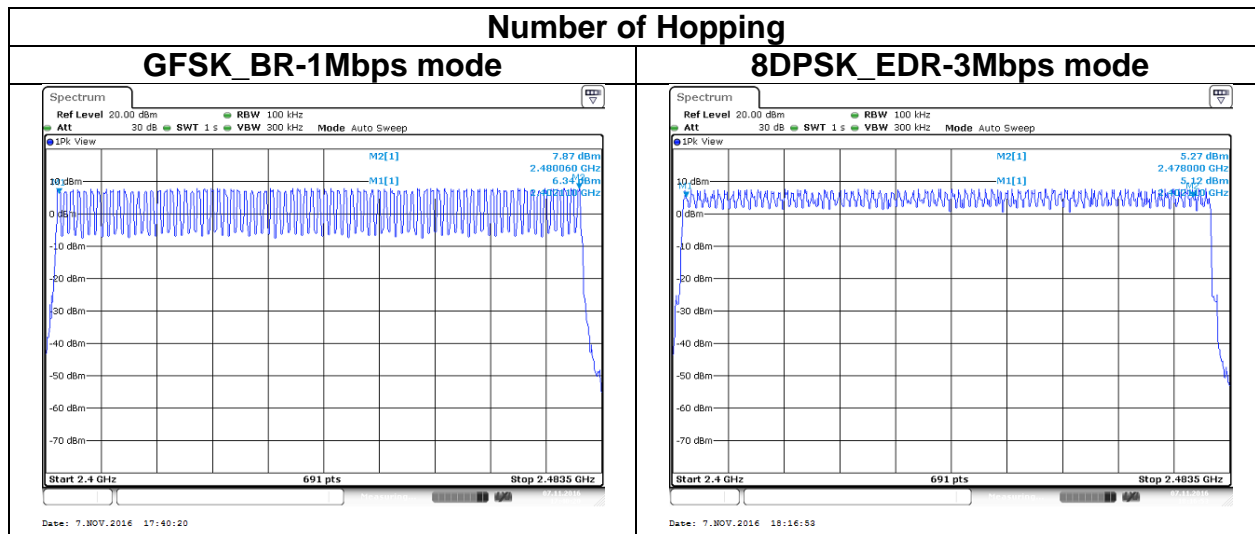
4.5.4 Test Result

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

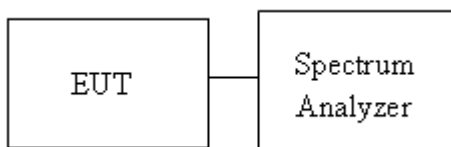
According to §15.247(d) and RSS-247 section 5.5

Limit	-20 dBc
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4.6.2 Test Procedure

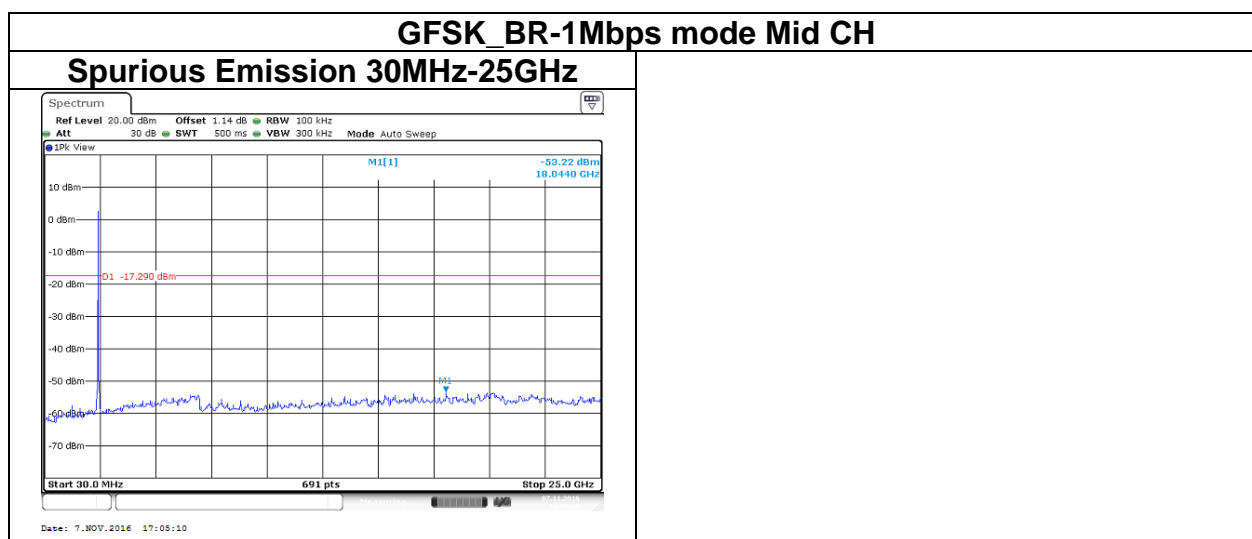
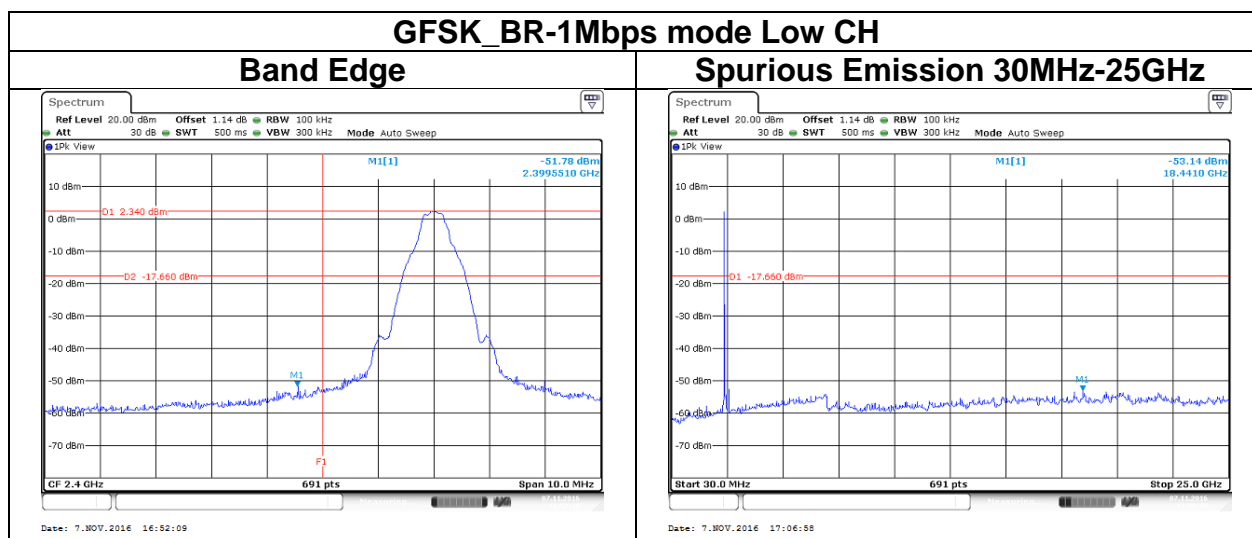
1. EUT RF output port connected to the SA by RF cable, and the path loss was compensated to result.
2. SA setting, RBW=100kHz, VBW=300kHz, Detector=Peak, Trace mode = max hold, SWT = Auto.
3. The Band Edge at 2.4GHz and 2.4835GHz are investigated with normal hopping mode.

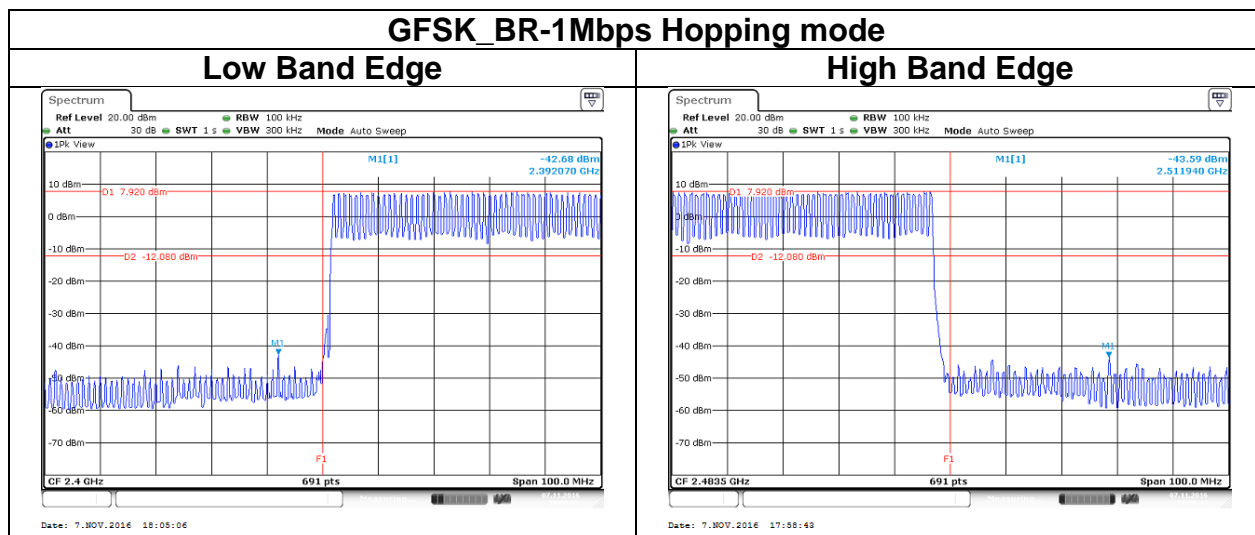
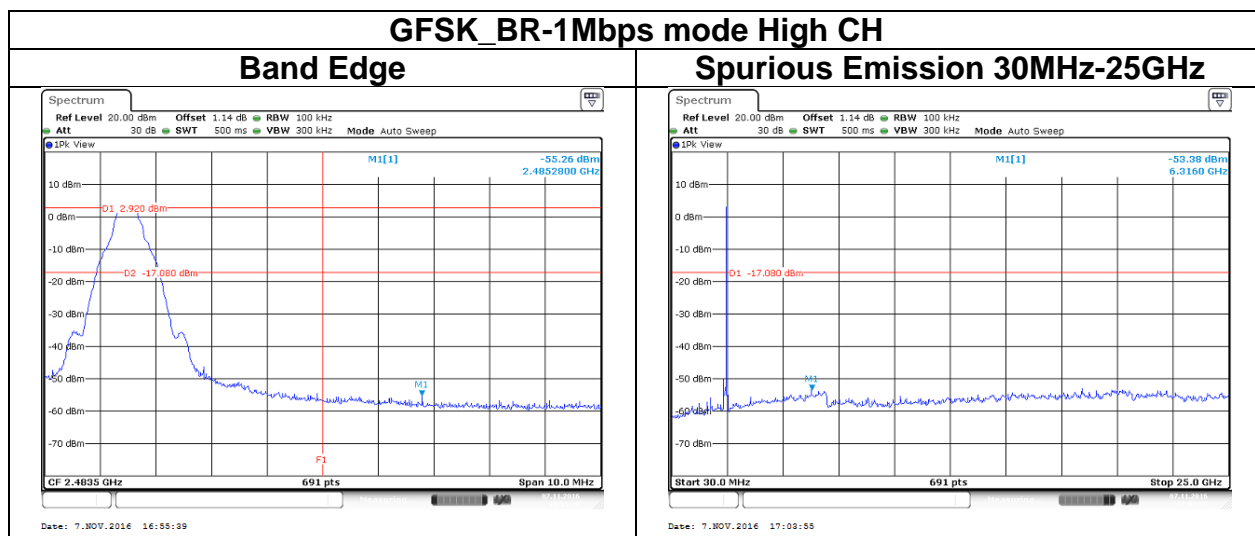
4.6.3 Test Setup

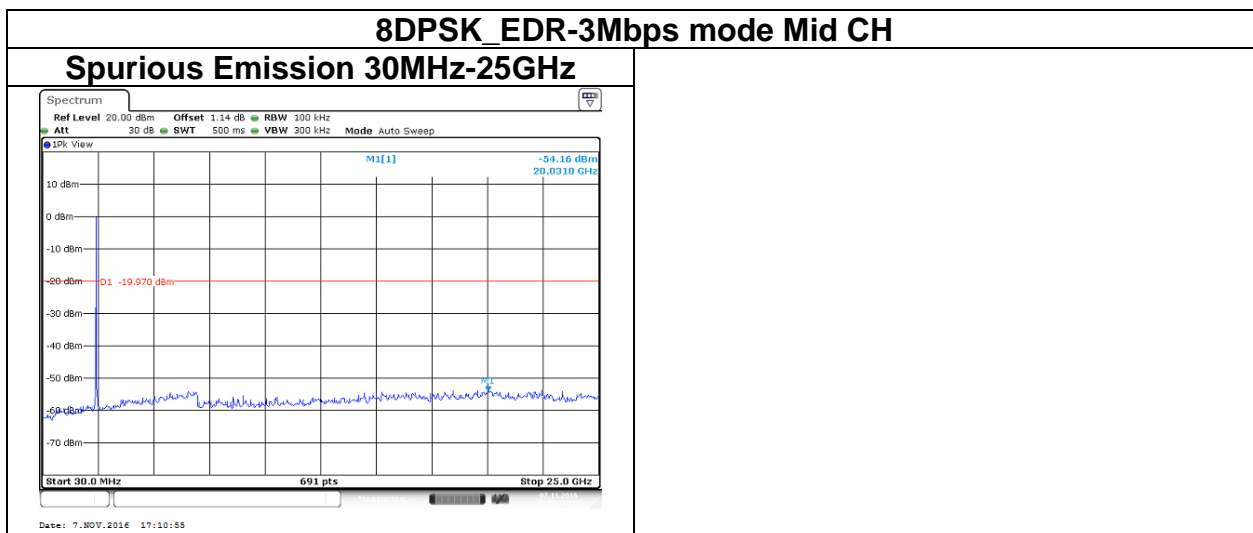
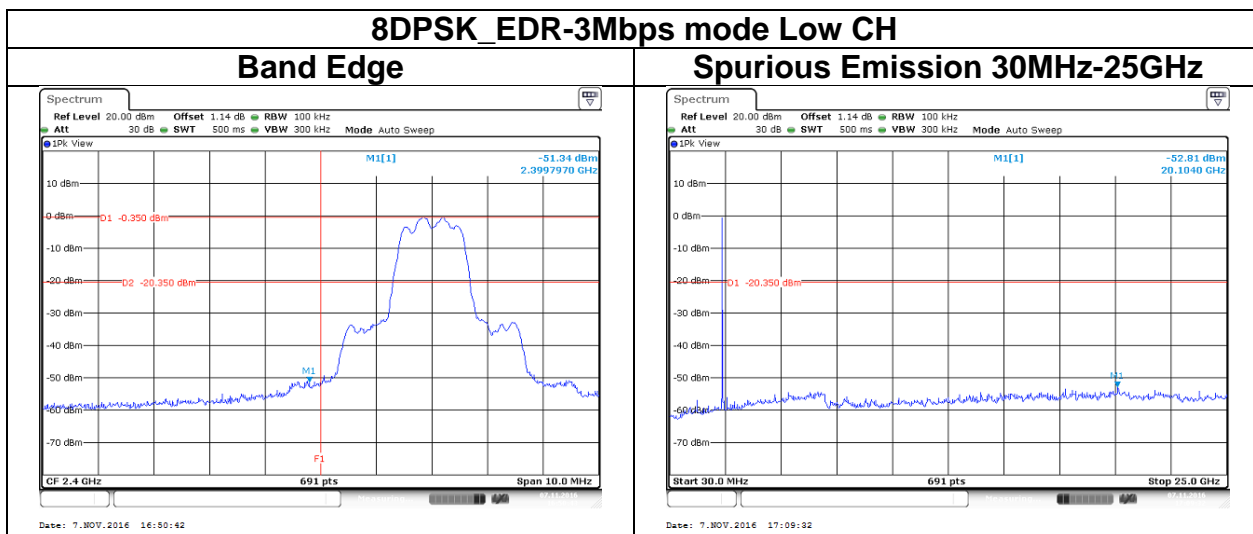


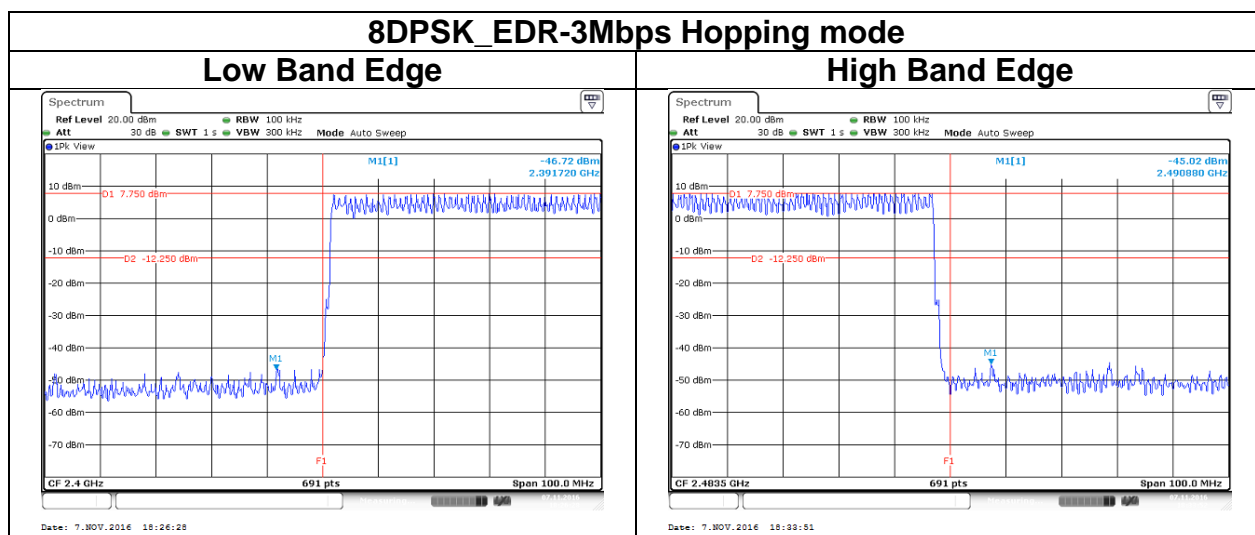
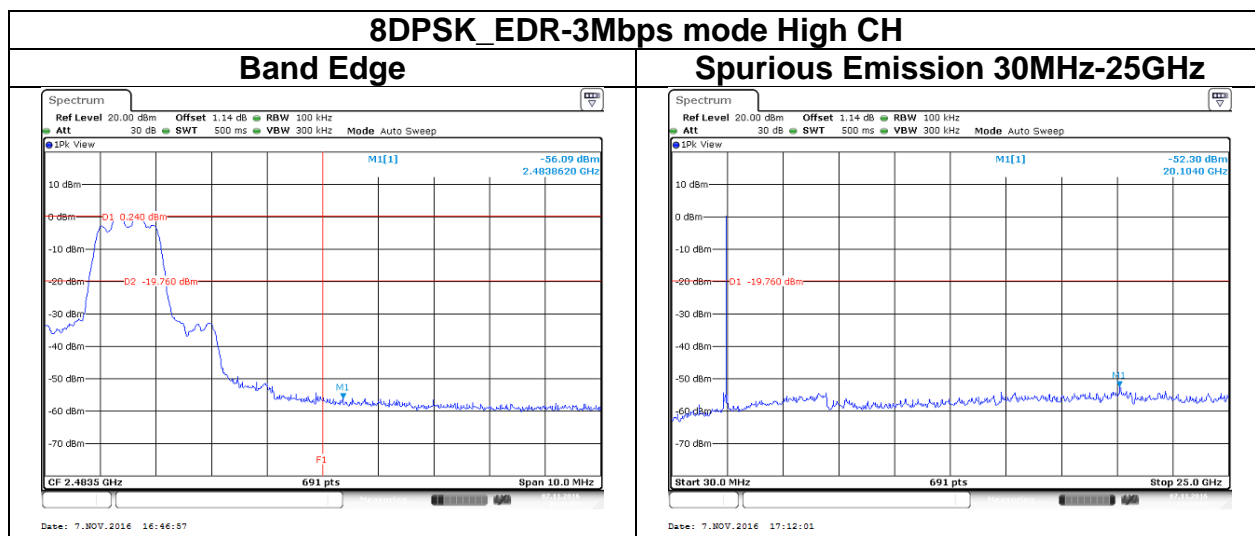
4.6.4 Test Result

Test Data









4.7 TIME OF OCCUPANCY (DWELL TIME)

4.7.1 Test Limit

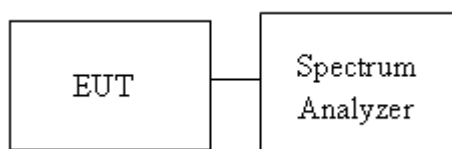
According to §15.247(a)(1)(iii) and RSS-247 section 5.1(4)

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

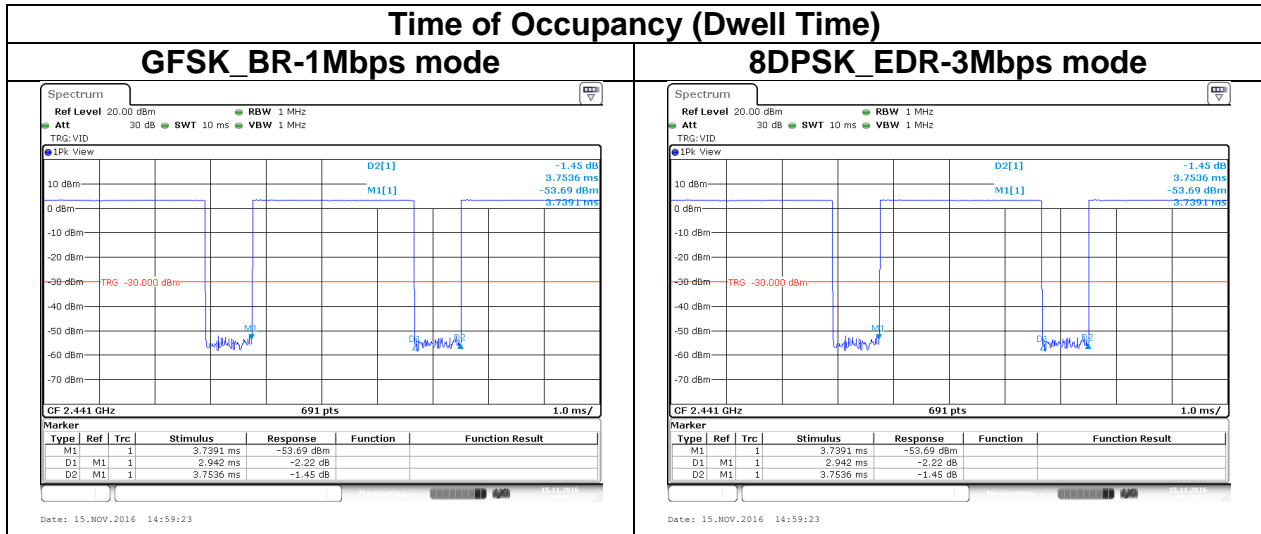
4.7.3 Test Setup



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	2.942	79	106.67	0.3138	0.4	Pass
EDR-3Mbps	2441	2.942	79	106.67	0.3138	0.4	
AFH: DH5	2441	2.942	20	53.33	0.1569	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

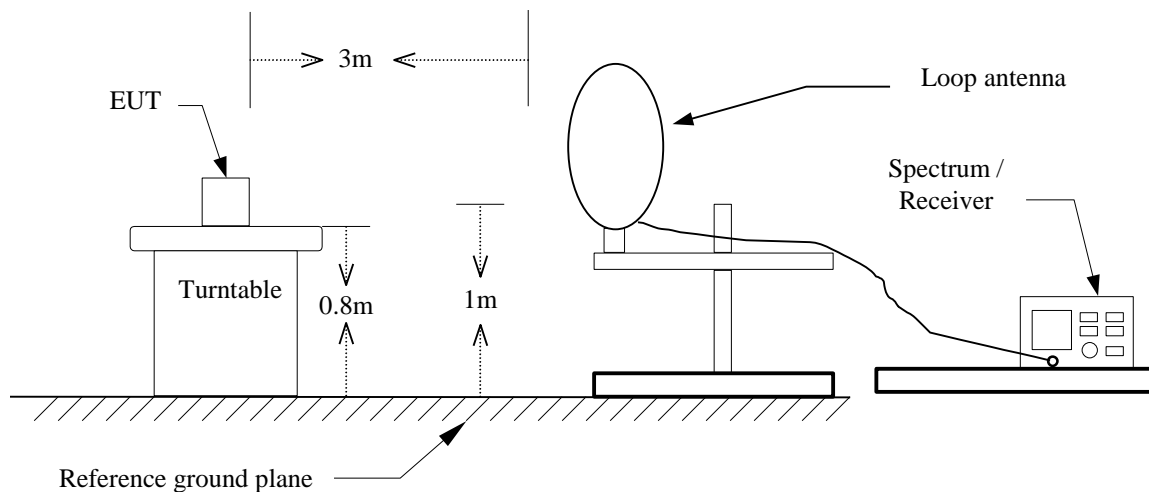
Test method Refer as KDB 558074 D01 v03r05, Section 12.1.

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.

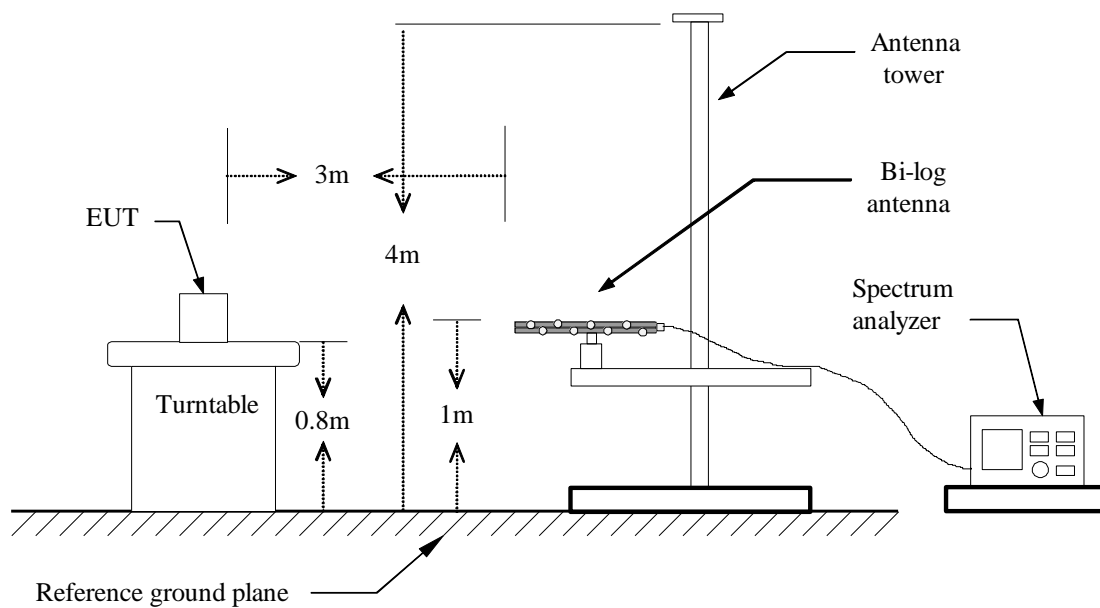
Configuration	Duty Cycle (%)	VBW
GFSK_BR-1Mbps	78%	360Hz
8DPSK_EDR-3Mbps	79%	360Hz

4.8.3 Test Setup

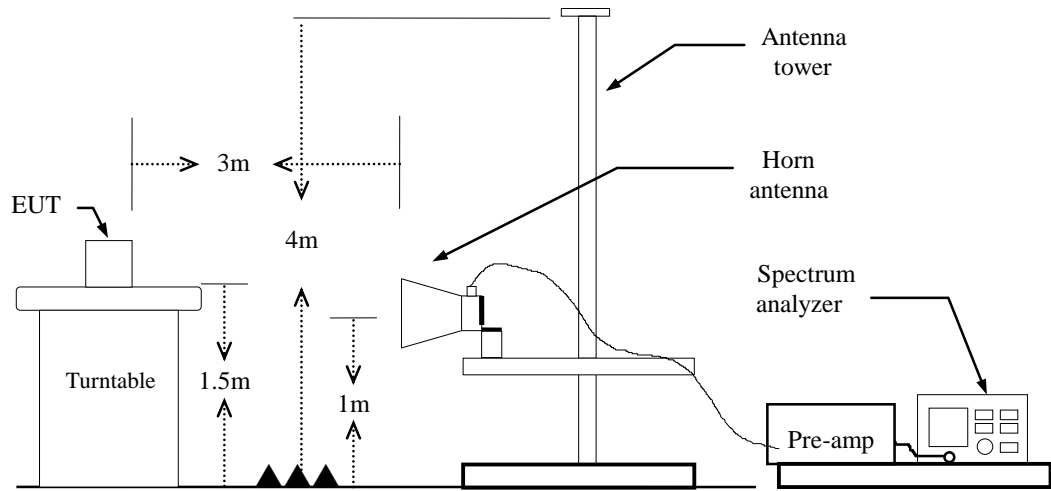
9kHz ~ 30MHz



30MHz ~ 1GHz



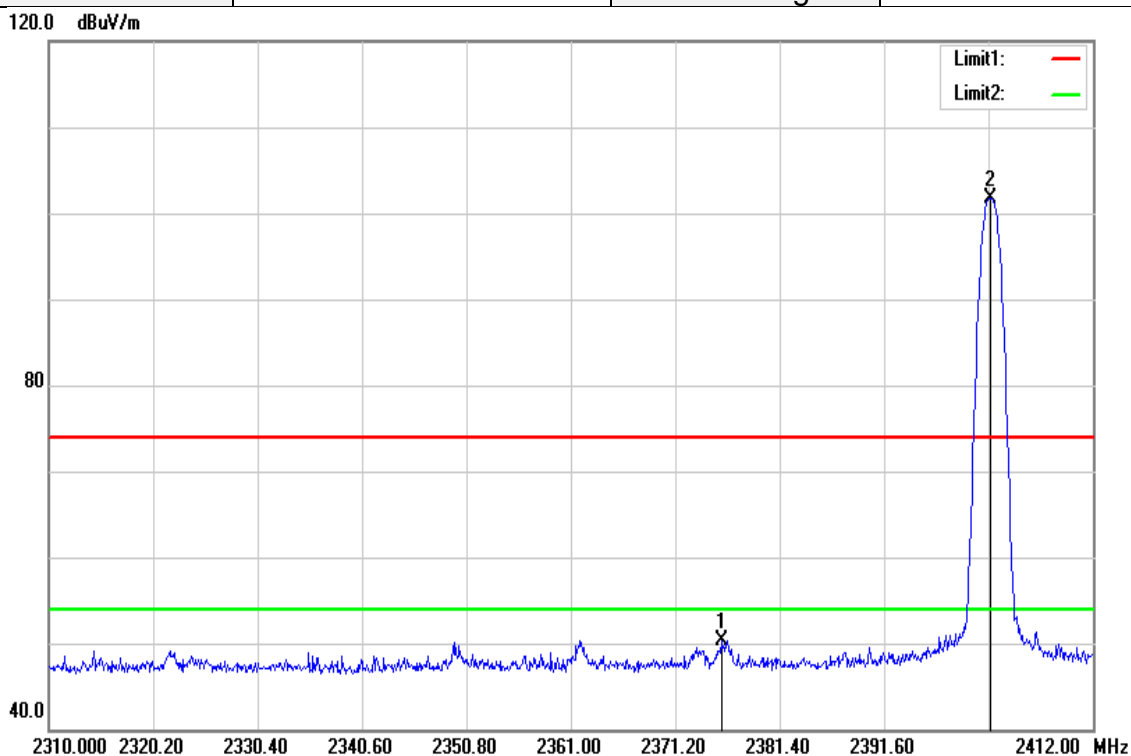
Above 1 GHz



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	Nov 05, 2016
Polarize	Horizontal	Test Engineer	Ed Chiang
Detector	Peak	Test Voltage:	120Vac / 60Hz



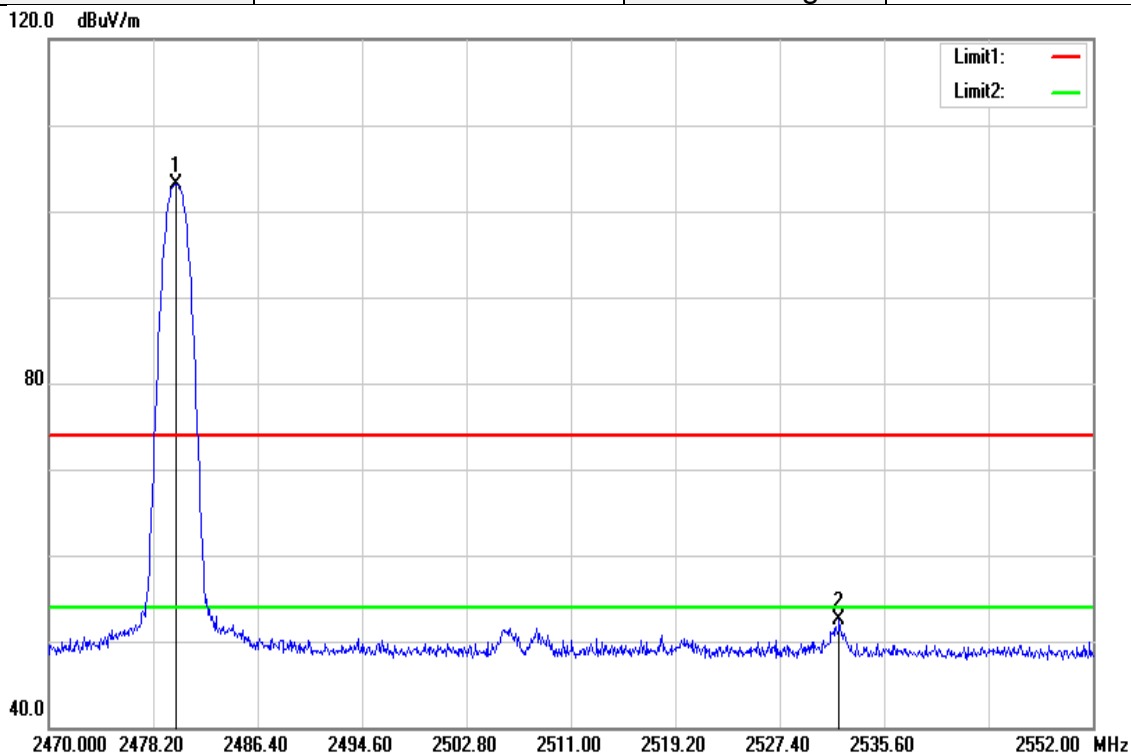
Frequency (MHz)	Reading (dBuV)	Correct Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
2375.688	52.94	-2.61	50.33	74.00	-23.67	peak
2402.004	104.04	-2.41	101.63	-	-	peak

Test Mode:	GFSK_BR-1Mbps Low CH	Temp/Hum	27(°C)/ 53%RH
Test Item	Band Edge	Test Date	Nov 05, 2016
Polarize	Horizontal	Test Engineer	Ed Chiang
Detector	Average	Test Voltage:	120Vac / 60Hz



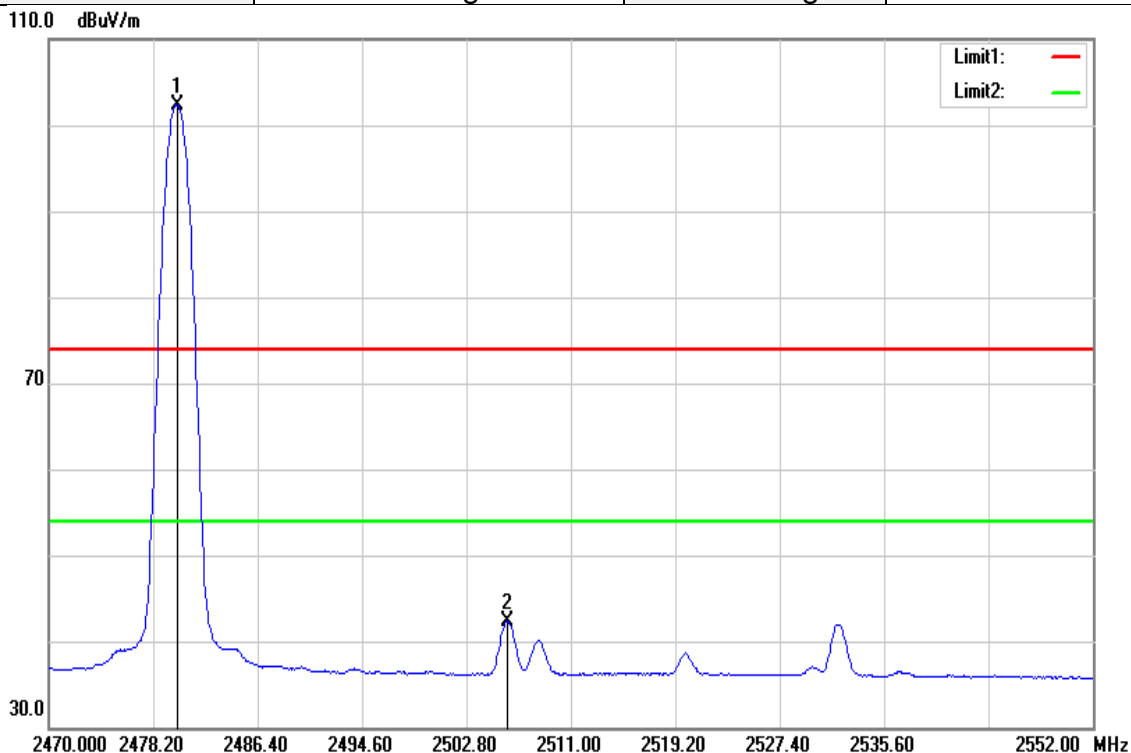
Frequency (MHz)	Reading (dBuV)	Correct Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
2375.994	42.92	-2.61	40.31	54.00	-13.69	AVG
2402.004	103.40	-2.41	100.99	-	-	AVG

Test Mode:	GFSK_BR-1Mbps High CH	Temp/Hum	27(°C)/ 53%RH
Test Item	Band Edge	Test Date	Nov 05, 2016
Polarize	Horizontal	Test Engineer	Ed Chiang
Detector	Peak	Test Voltage:	120Vac / 60Hz



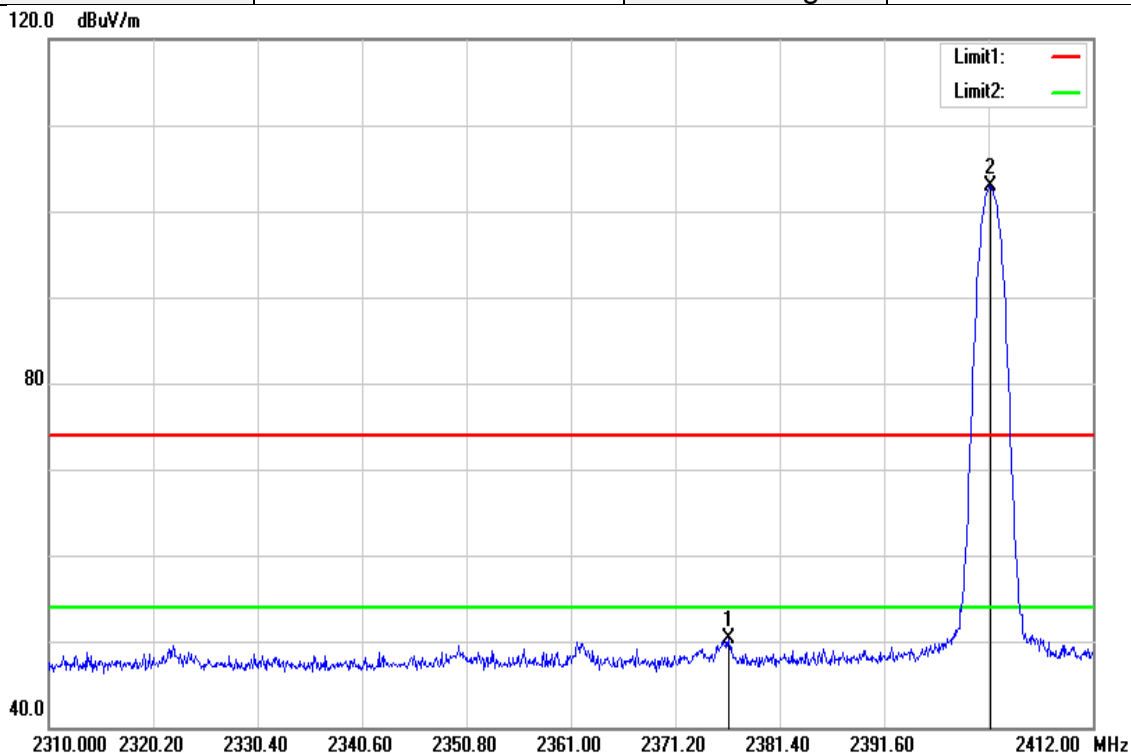
Frequency (MHz)	Reading (dBuV)	Correct Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
2480.004	105.06	-2.03	103.03	-	-	peak
2532.074	54.29	-1.78	52.51	74.00	-21.49	peak

Test Mode:	GFSK_BR-1Mbps High CH	Temp/Hum	27(°C)/ 53%RH
Test Item	Band Edge	Test Date	Nov 05, 2016
Polarize	Horizontal	Test Engineer	Ed Chiang
Detector	Average	Test Voltage:	120Vac / 60Hz



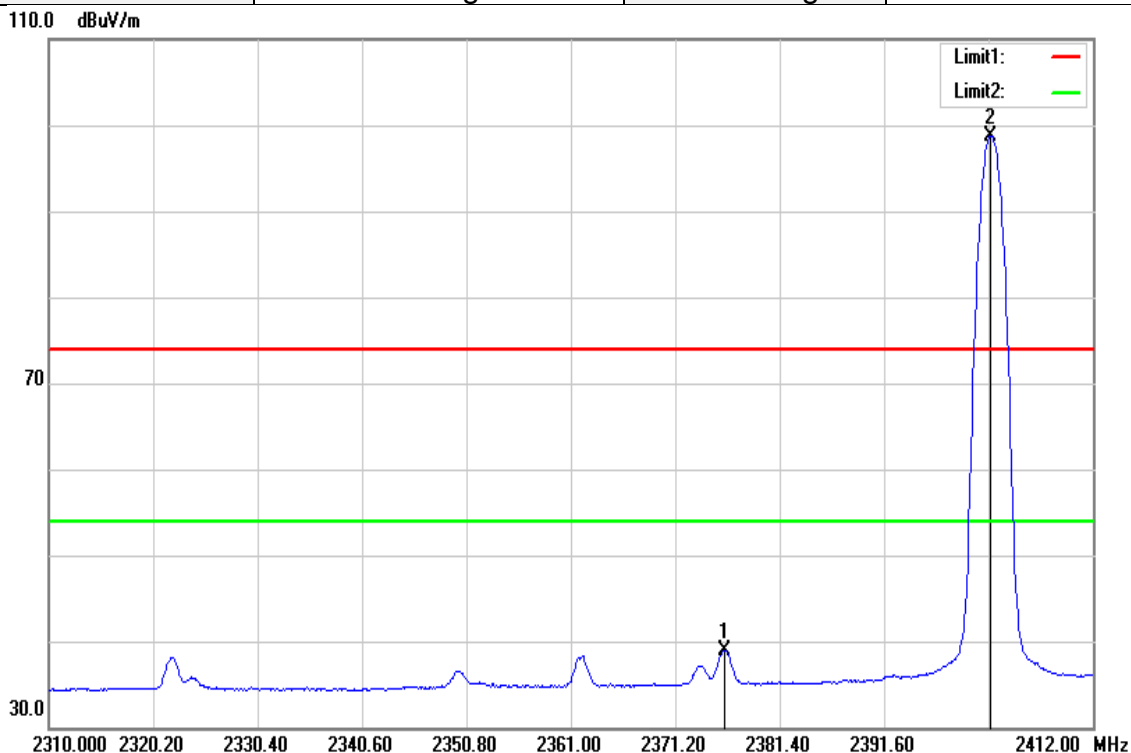
Frequency (MHz)	Reading (dBuV)	Correct Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
2480.086	104.41	-2.03	102.38	-	-	AVG
2505.998	44.10	-1.84	42.26	54.00	-11.74	AVG

Test Mode:	8DPSK_EDR-3Mbps Low CH	Temp/Hum	27(°C)/ 53%RH
Test Item	Band Edge	Test Date	Nov 05, 2016
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
2376.402	52.95	-2.61	50.34	74.00	-23.66	peak
2402.004	105.28	-2.41	102.87	-	-	peak

Test Mode:	8DPSK_EDR-3Mbps Low CH	Temp/Hum	27(°C)/ 53%RH
Test Item	Band Edge	Test Date	Nov 05, 2016
Polarize	Horizontal	Test Engineer	Ed Chiang
Detector	Average	Test Voltage:	120Vac / 60Hz



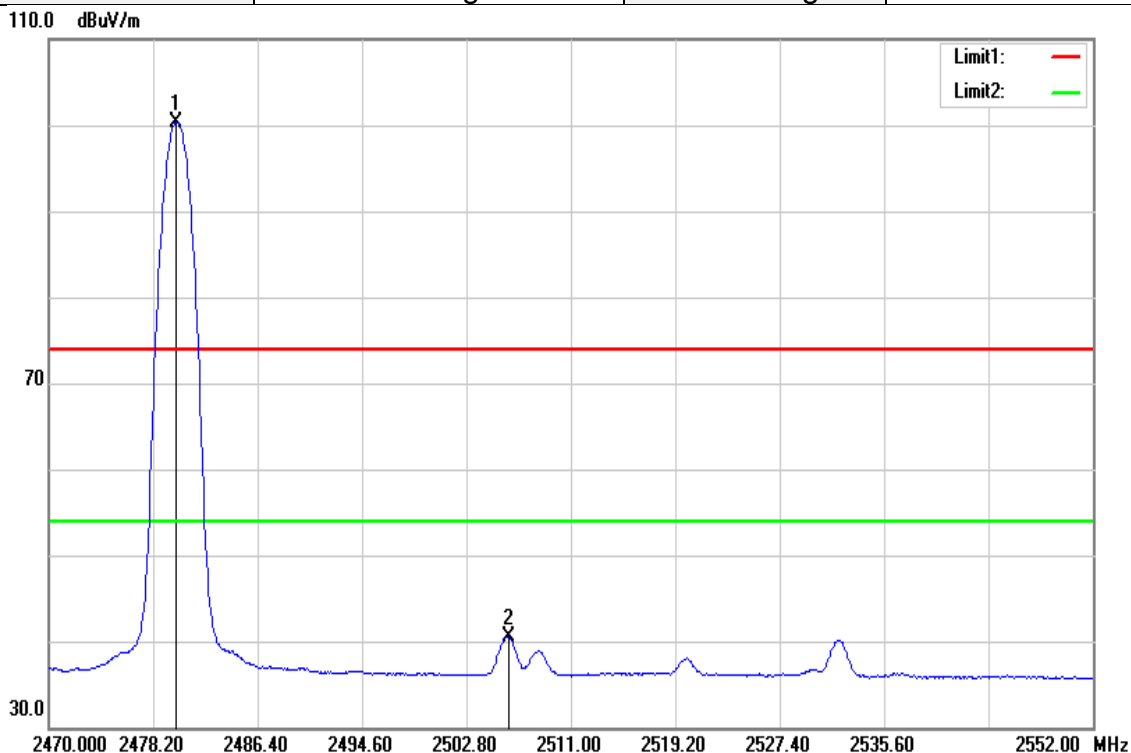
Frequency (MHz)	Reading (dBuV)	Correct Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
2375.994	41.48	-2.61	38.87	54.00	-15.13	AVG
2402.004	101.19	-2.41	98.78	-	-	AVG

Test Mode:	8DPSK_EDR-3Mbps High CH	Temp/Hum	27(°C)/ 53%RH
Test Item	Band Edge	Test Date	Nov 05, 2016
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	106.37	-2.03	104.34	-	-	peak
2484.350	54.62	-1.99	52.63	74.00	-21.37	peak

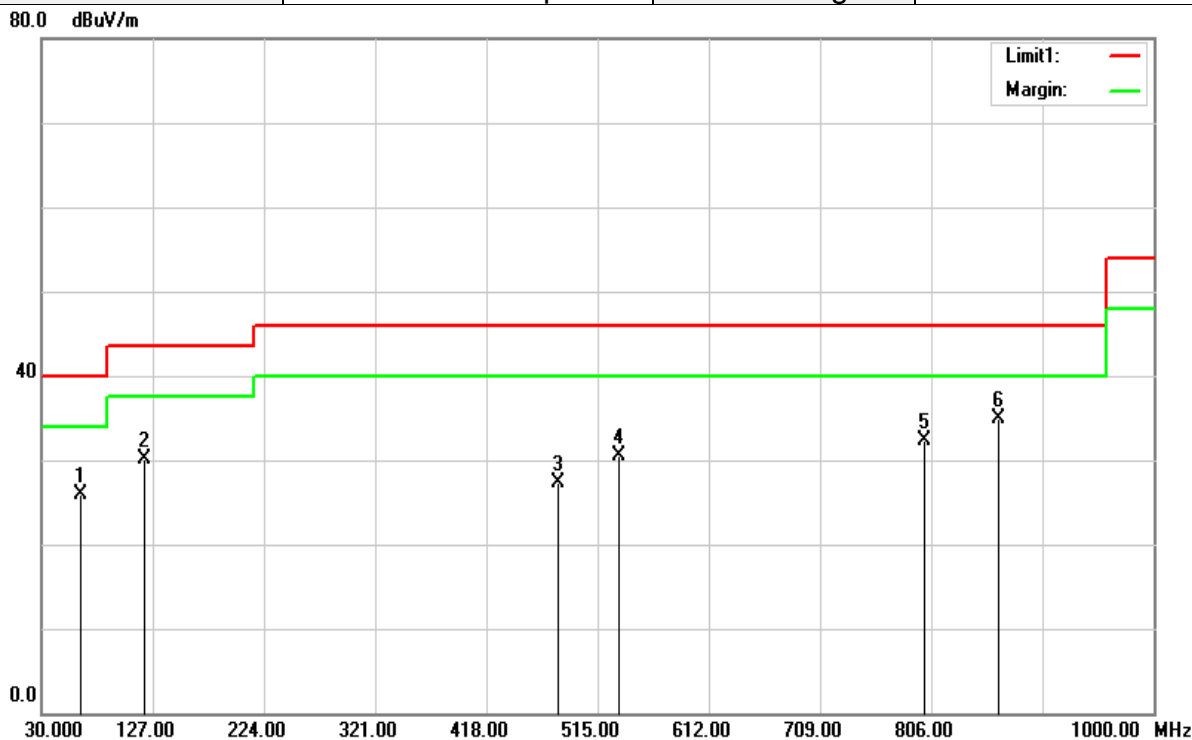
Test Mode:	8DPSK_EDR-3Mbps High CH	Temp/Hum	27(°C)/ 53%RH
Test Item	Band Edge	Test Date	Nov 05, 2016
Polarize	Horizontal	Test Engineer	Ed Chiang
Detector	Average	Test Voltage:	120Vac / 60Hz



Frequency (MHz)	Reading (dBuV)	Correct Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
2480.004	102.39	-2.03	100.36	-	-	AVG
2506.080	42.42	-1.84	40.58	54.00	-13.42	AVG

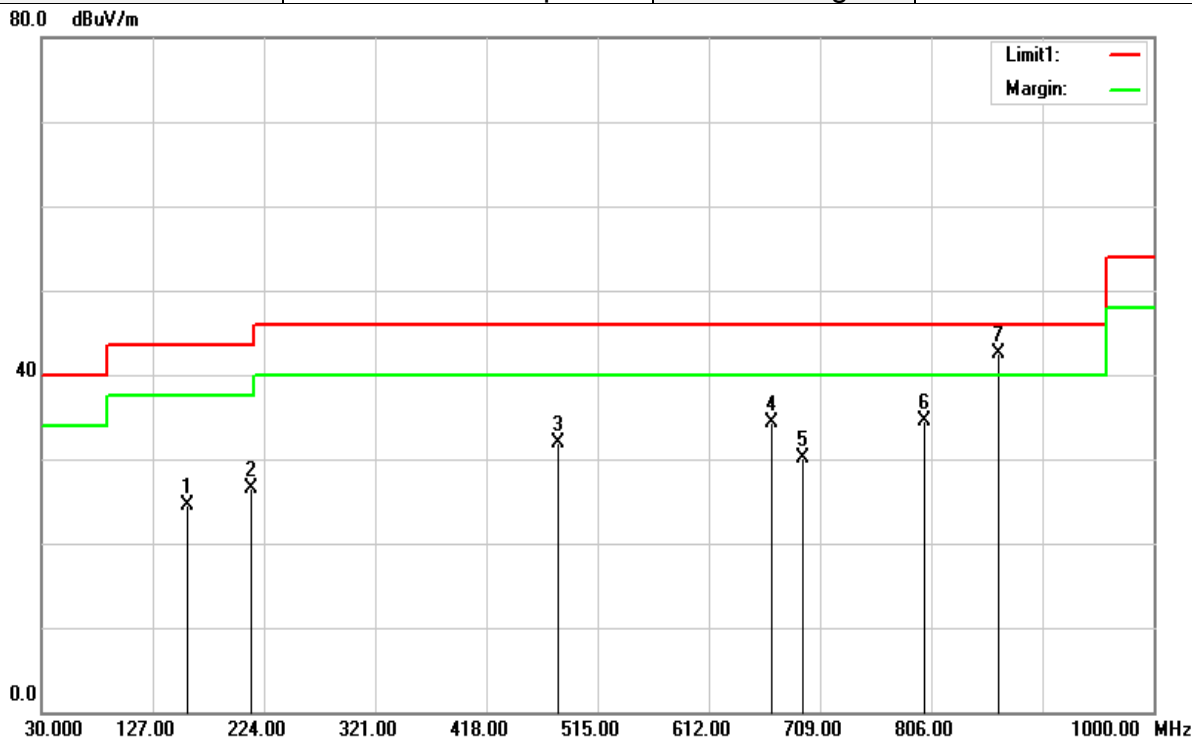
Below 1G Test Data

Test Mode:	BT Mode	Temperature:	27(°C)
Test Item	30MHz-1GHz	Humidity:	53%RH
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
63.9500	47.41	-21.56	25.85	40.00	-14.15	peak
120.2100	45.59	-15.50	30.09	43.50	-13.41	peak
480.0800	36.88	-9.62	27.26	46.00	-18.74	peak
533.4300	39.30	-8.74	30.56	46.00	-15.44	peak
800.1800	36.71	-4.50	32.21	46.00	-13.79	peak
864.2000	38.46	-3.61	34.85	46.00	-11.15	peak

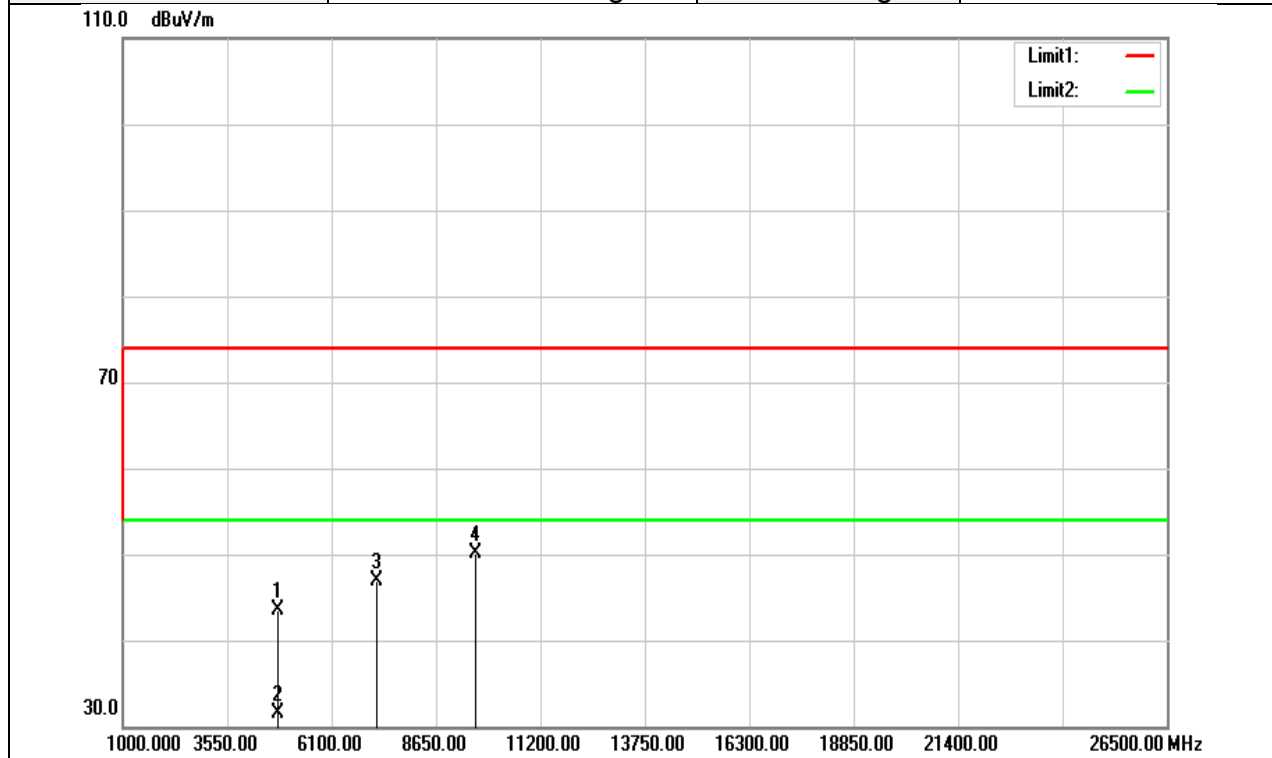
Test Mode:	BT Mode	Temperature:	27(°C)
Test Item	30MHz-1GHz	Humidity:	53%RH
Polarize	Horizontal	Test Engineer	Ed Chiang
Detector	Peak and Qusi-peak	Test Voltage:	120Vac / 60Hz



Frequency (MHz)	Reading (dBuV)	Correct Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
157.0700	40.76	-16.28	24.48	43.50	-19.02	peak
213.3300	42.94	-16.49	26.45	43.50	-17.05	peak
480.0800	41.49	-9.62	31.87	46.00	-14.13	peak
666.3200	40.77	-6.41	34.36	46.00	-11.64	peak
693.4800	36.23	-6.14	30.09	46.00	-15.91	peak
800.1800	39.04	-4.50	34.54	46.00	-11.46	peak
864.2000	46.15	-3.61	42.54	46.00	-3.46	QP

Above 1G Test Data

Test Mode:	8DPSK_EDR-3Mbps Low CH	Temp/Hum	27(°C)/ 53%RH
Test Item	Harmonic	Test Date	Nov 05, 2016
Polarize	Vertical	Test Engineer	Ed Chiang
Detector	Peak and Average	Test Voltage:	120Vac / 60Hz

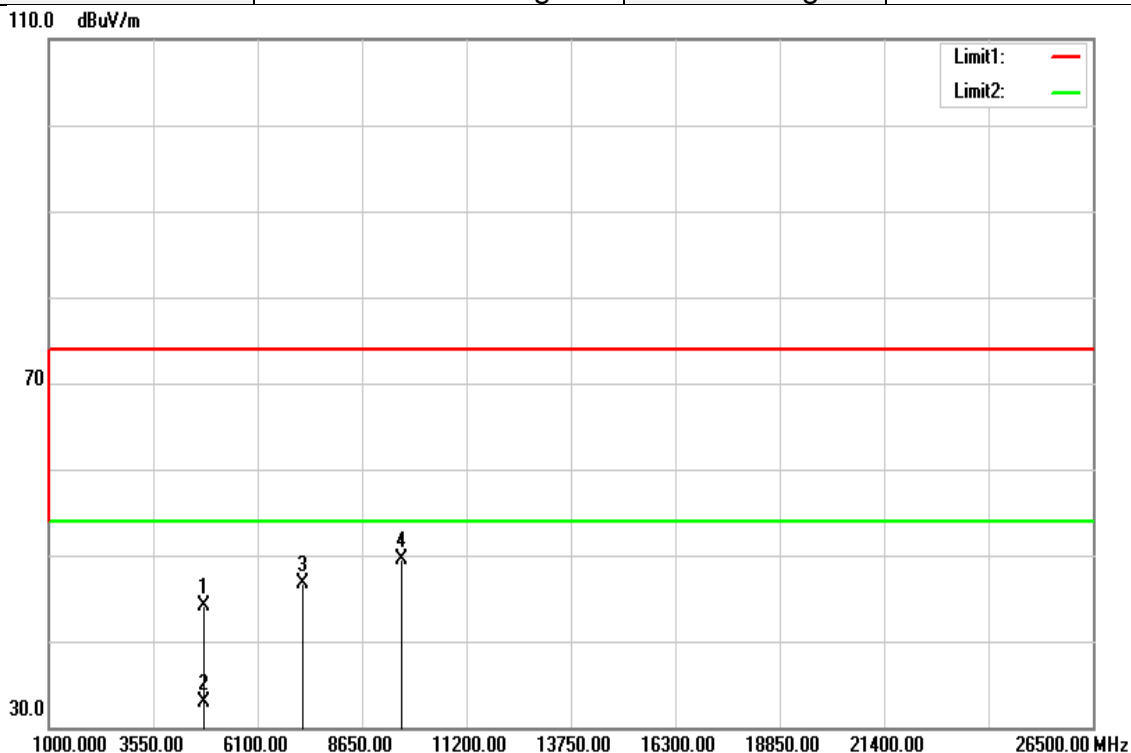


Frequency (MHz)	Reading (dBuV)	Correct Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
4804.000	38.55	5.04	43.59	74.00	-30.41	peak
4804.000	26.45	5.04	31.49	54.00	-22.51	AVG
7206.000	34.36	12.62	46.98	74.00	-27.02	peak
9608.000	32.49	17.60	50.09	74.00	-23.91	peak

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	27(°C)/ 53%RH
Test Item	Harmonic	Test Date	Nov 05, 2016
Polarize	Horizontal	Test Engineer	Ed Chiang
Detector	Peak and Average	Test Voltage:	120Vac / 60Hz

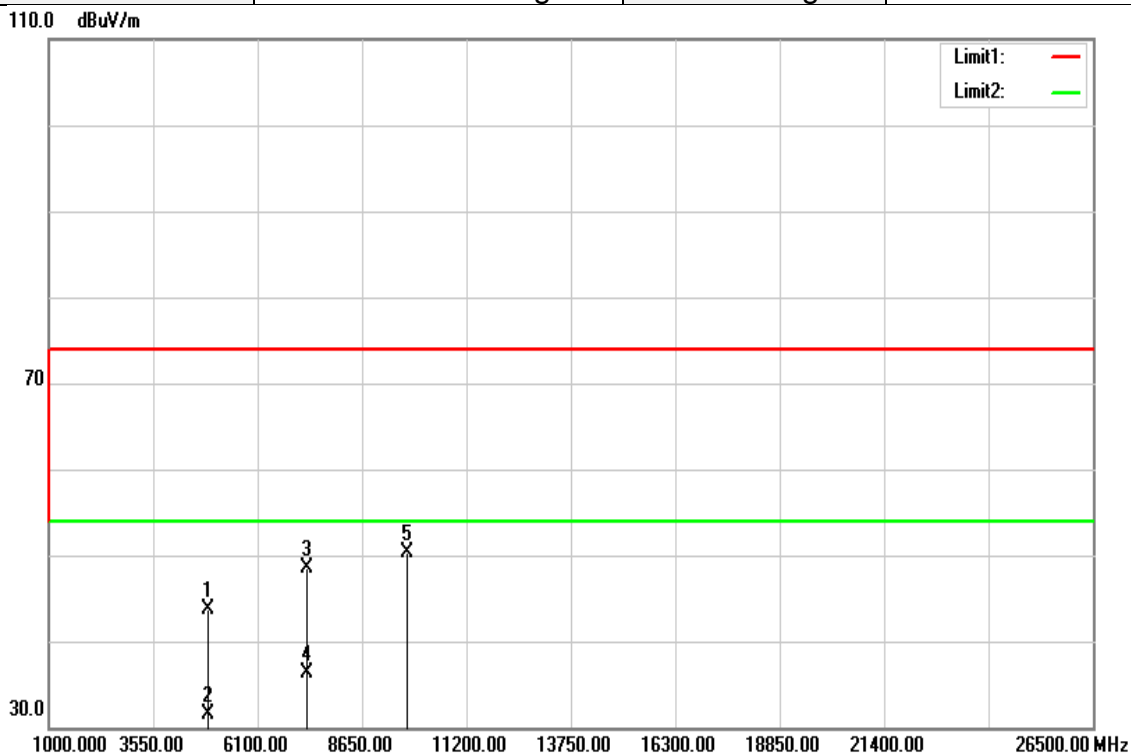


Frequency (MHz)	Reading (dBuV)	Correct Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
4804.000	39.01	5.04	44.05	74.00	-29.95	peak
4804.000	27.80	5.04	32.84	54.00	-21.16	AVG
7206.000	34.11	12.62	46.73	74.00	-27.27	peak
9608.000	31.97	17.60	49.57	74.00	-24.43	peak

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	27(°C)/ 53%RH
Test Item	Harmonic	Test Date	Nov 05, 2016
Polarize	Vertical	Test Engineer	Ed Chiang
Detector	Peak and Average	Test Voltage:	120Vac / 60Hz

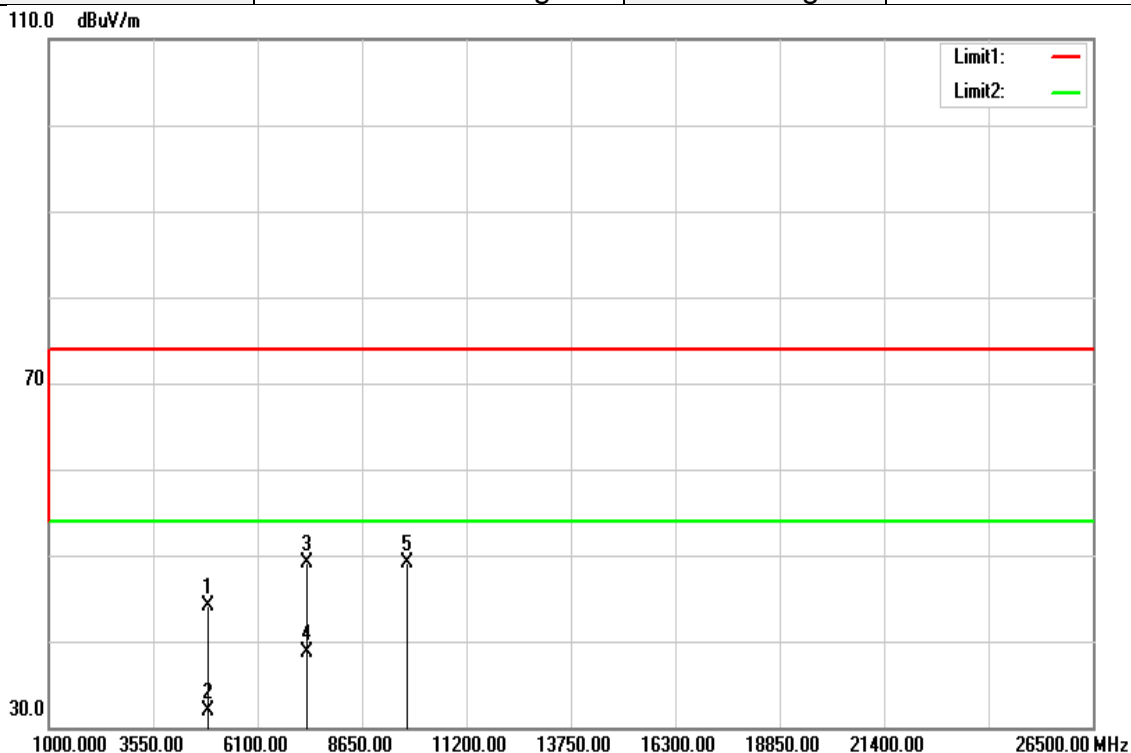


Frequency (MHz)	Reading (dBuV)	Correct Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
4882.000	38.45	5.25	43.70	74.00	-30.30	peak
4882.000	26.23	5.25	31.48	54.00	-22.52	AVG
7322.000	35.53	12.97	48.50	74.00	-25.50	peak
7322.000	23.41	12.97	36.38	54.00	-17.62	AVG
9762.000	32.63	17.60	50.23	74.00	-23.77	peak

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	27(°C)/ 53%RH
Test Item	Harmonic	Test Date	Nov 05, 2016
Polarize	Horizontal	Test Engineer	Ed Chiang
Detector	Peak and Average	Test Voltage:	120Vac / 60Hz

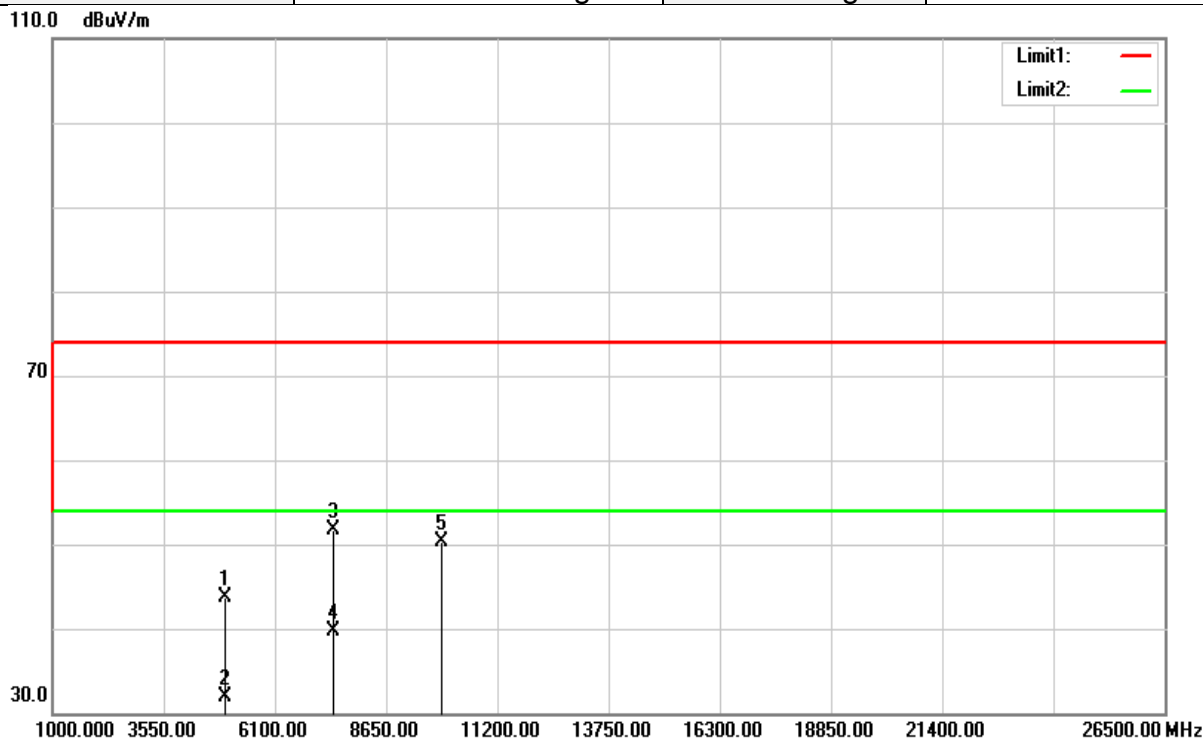


Frequency (MHz)	Reading (dBuV)	Correct Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
4882.000	38.91	5.25	44.16	74.00	-29.84	peak
4882.000	26.67	5.25	31.92	54.00	-22.08	AVG
7322.000	36.19	12.97	49.16	74.00	-24.84	peak
7322.000	25.67	12.97	38.64	54.00	-15.36	AVG
9762.000	31.56	17.60	49.16	74.00	-24.84	peak

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	27(°C)/ 53%RH
Test Item	Harmonic	Test Date	Nov 05, 2016
Polarize	Vertical	Test Engineer	Ed Chiang
Detector	Peak and Average	Test Voltage:	120Vac / 60Hz

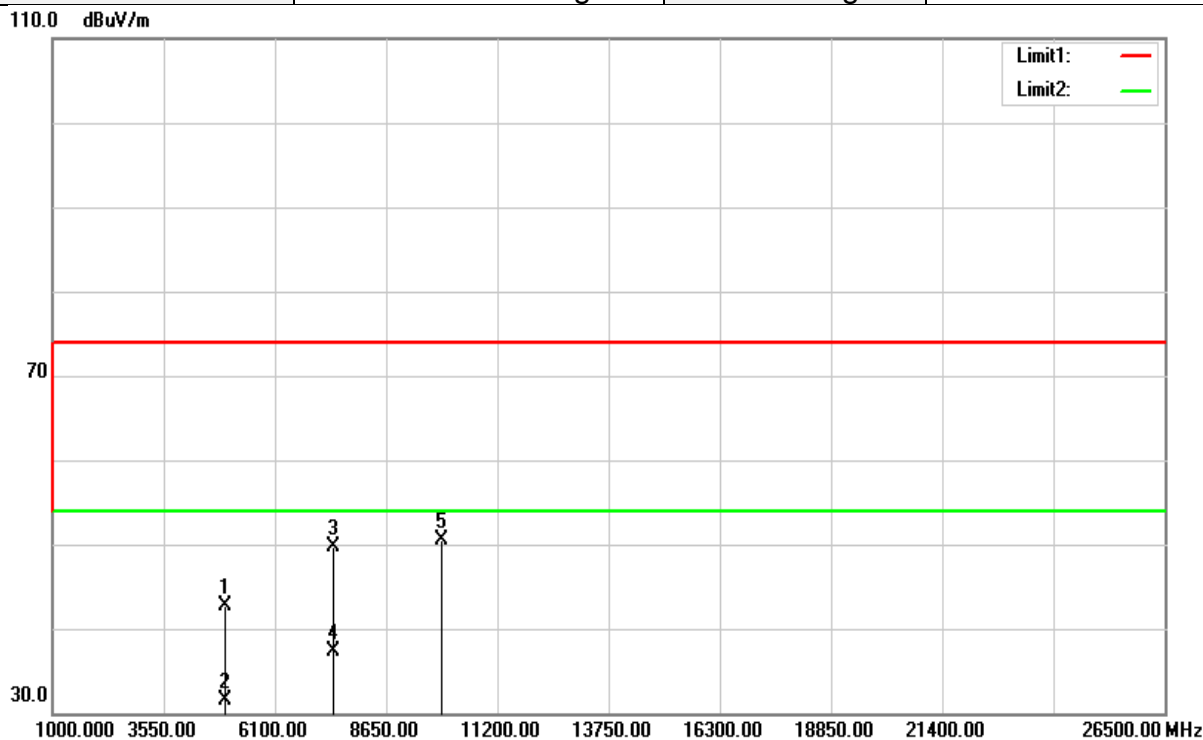


Frequency (MHz)	Reading (dBuV)	Correct Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
4960.000	38.28	5.46	43.74	74.00	-30.26	peak
4960.000	26.39	5.46	31.85	54.00	-22.15	AVG
7440.000	38.47	13.33	51.80	74.00	-22.20	peak
7440.000	26.41	13.33	39.74	54.00	-14.26	AVG
9920.000	32.66	17.60	50.26	74.00	-23.74	peak

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	27(°C)/ 53%RH
Test Item	Harmonic	Test Date	Nov 05, 2016
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	37.34	5.46	42.80	74.00	-31.20	peak
4960.000	26.00	5.46	31.46	54.00	-22.54	AVG
7440.000	36.40	13.33	49.73	74.00	-24.27	peak
7440.000	23.88	13.33	37.21	54.00	-16.79	AVG
9920.000	32.97	17.60	50.57	74.00	-23.43	peak

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