

RADIO TEST REPORT

FCC 47 CFR PART 15 SUBPART C

INDUSTRY CANADA RSS-247

Test Standard	FCC Part 15.247 and IC RSS-247 issue 2
FCC ID	A4C-1000CA
ISED ID	10199A-1000CA
Product name	TND™ 740
Brand Name	Rand McNally
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:

A handwritten signature in blue ink that reads "Davis Tseng".

Davis Tseng
Sr. Engineer

Reviewed by:

A handwritten signature in black ink that reads "Zeus Chen".

Zeus Chen
Supervisor

Revision History

Rev.	Issue Date	Revisions	Revised By
00	January 20, 2017	Initial Issue	Angel Cheng
01	March 17, 2017	1. Add Remark in page 34.	Doris Chu
02	April 11, 2017	1. Update to RSS-247 issue 2 in page 1.	Angel Cheng
03	April 12, 2017	1. Update the test result sections in page 17, 20, 22, 25	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	TND™ 740
Model No.	TND 740
Model Discrepancy	N/A
EUT Functions	IEEE 802.11bgn+BT+GPS
Received Date	Jan, 03, 2017
Date of Test	Jan, 06 ~ 12, 2017
Output Power(W)	GFSK : 0.0056 (EIRP : 0.0072) $\pi/4$ -DQPSK :0.0045 (EIRP : 0.0058) 8DPSK :0.0047 (EIRP : 0.0061)
Power Operation	☐ AC 120V/60Hz ☐ Adapter(Not for sale) ☐ PoE(Not for sale) ☒ Host system ☒ DC Type : ☒ Battery ☒ Car Charger ☐ DC Power Supply ☐ External DC adapter

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
☐ 1 MHz or less	1	Middle
☐ 1 MHz to 10 MHz	2	1 near top and 1 near bottom
☒ More than 10 MHz	3	1 near top, 1 near middle, and 1 near bottom

1.3 ANTENNA INFORMATION

Antenna Category	☒ Integral: antenna permanently attached ☐ External dedicated antennas ☐ External Unique antenna connector
Antenna Type	☒ PIFA ☐ PCB ☐ Dipole ☐ Coils
Antenna Gain	2.75 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	David Cheng	
Radiation	Kevin Kuo	
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 Date	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

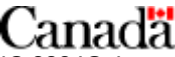
EUT Accessories Equipment					
No.	Equipment	Brand	Model	Series No.	FCC ID
1	Car Charger	N/A	N/A	N/A	N/A
2	Docking	N/A	N/A	N/A	N/A

Support Equipment					
No.	Equipment	Brand	Model	Series No.	FCC ID
1	Notebook	Acer	Z01	N/A	QDS-BRCM1018
2	Battery	YUASA	CMF75D23L	N/A	N/A
3	PS/2 Mouse	hp	M-SBF96	FATSQDC5BYJQKZ	FCC DoC
4	PS/2 Keyboard	Genius	K939	N/A	FCC DoC
5	Microphone & Earphone	INTOPIC	JASS-288	N/A	N/A
6	Monitor	DELL	P2314Ht	CN-0HMJ1V-74445-46S-156S	FCC DoC
7	Host PC	DELL	T5810	8G5NKG2	N/A
8	Modem	GALILEO	AL-56ERM	0MERM04A0212	FCC DoC
9	Printer	HP	SNPRB-1202-01	CN54K182G9	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: TW1039) to perform FCC Part 15 measurements	 FCC MRA: TW0240
Canada	Industry Canada	3M Semi Anechoic Chamber (IC 2324G-1 / IC 2324G-2) to perform	 IC 2324G-1 IC 2324G-2

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	GFSK for BR-1Mbps: 1.Lowest Channel : 2402MHz 2.Middle Channel : 2441MHz 3.Highest Channel : 2480MHz $\pi/4$-DQPSK for EDR-2Mbps: 1.Lowest Channel : 2402MHz 2.Middle Channel : 2441MHz 3.Highest Channel : 2480MHz 8DPSK for EDR-3Mbps: 1.Lowest Channel : 2402MHz 2.Middle Channel : 2441MHz 3.Highest Channel : 2480MHz

Remark:

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

3.2 THE WORST MODE OF MEASUREMENT

Worst Mode of Power			
Bluetooth Mode	Data Rate	Maximum Peak Conducted Output Power (dBm)	Worst Mode
BR(GFSK)	1 Mbps	7.46	V
EDR($\pi/4$ -DQPSK)	2 Mbps	6.54	-
EDR(8DPSK)	3 Mbps	6.73	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	☒ Mode 1 ☐ Mode 2 ☐ Mode 3 ☐ Mode 4

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

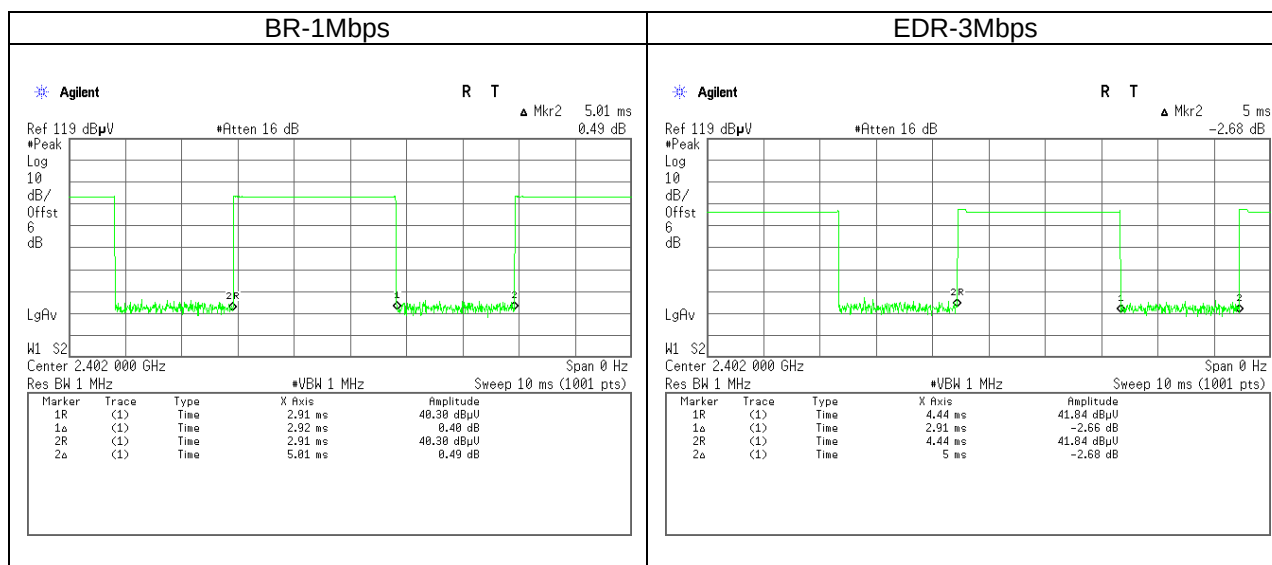
Radiated Emission Measurement Below 1G	
Test Condition	Radiated Emission Below 1G
Voltage/Hz	120V/60Hz
Test Mode	Mode 1:EUT power by host system via USB Cable Mode 2:EUT power by Car charger via Power Board(Charger mode)
Worst Mode	☒ Mode 1 ☒ Mode 2 ☐ Mode 3 ☐ Mode 4

Remark:

1. The worst mode was record in this test report.
2. EUT pre-scanned in three axis ,X ,Y, Z and two polarity, Horizontal and Vertical for radiated measurement. The worst case(Y-Plane and Vertical) were recorded in this report.
3. For below 1G AC power line conducted emission and radiation emission were performed the EUT transmit at the Maximum bandwidth and Middle channel as worse case.
4. EUT power supply had two ways (Car charger, by host system),that EUT pre-scanned two power supply(Car charger and host system) at Radiated below 1G, and the worst case was host system mode.
5. EUT Transmit only can by host system to set, and we tested car Car charger in Charger mode. Therefore EUT used host system 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	2.92	5.01	59	2.29
EDR-3Mbps	2.91	5.00	59	2.29



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

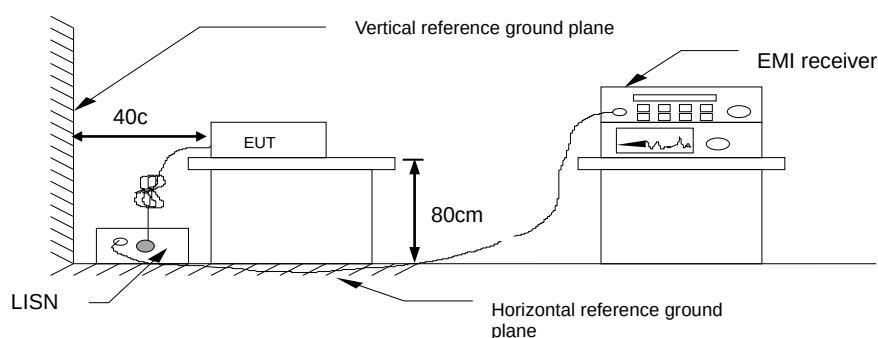
* Decreases with the logarithm of the frequency.

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

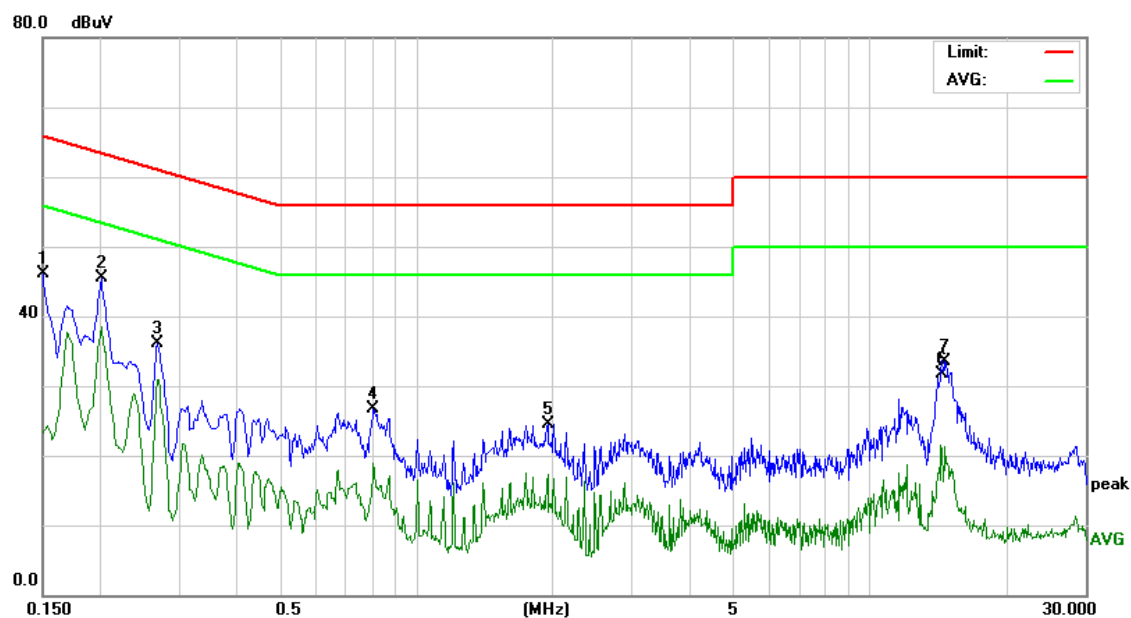


4.1.4 Test Result

PASS

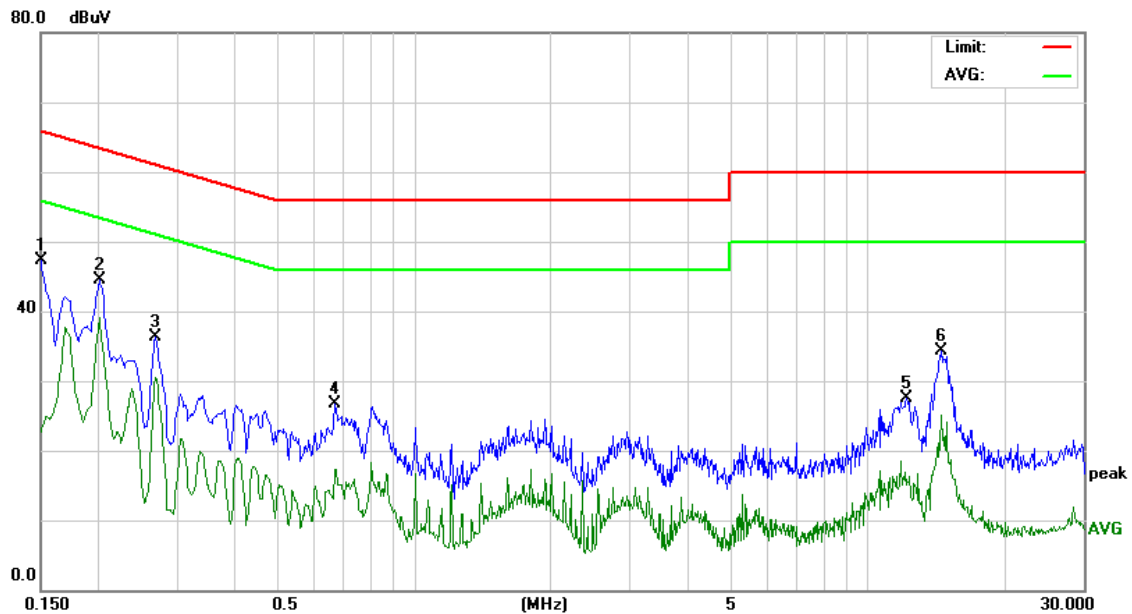
Test Data

Test Mode:	Mode 1	Temp/Hum	27(°C)/ 53%RH
Test Voltage:	120Vac / 60Hz	Test Date	Jan 06, 2017
Phase:	Line	Test Engineer	David Cheng



Frequency (MHz)	Reading (dBuV)	Factor (dB)	Result (dB)	Limit (dBuV)	Margin (dBuV)	Detector (dBuV)
0.1500	36.03	10.09	46.12	65.99	-19.87	Peak
0.2020	35.36	10.10	45.46	63.52	-18.06	Peak
0.2700	25.98	10.11	36.09	61.12	-25.03	Peak
0.8059	16.62	10.12	26.74	56.00	-29.26	Peak
1.9500	14.20	10.29	24.49	56.00	-31.51	Peak
14.3740	20.83	10.80	31.63	60.00	-28.37	Peak

Test Mode:	Mode 1	Temp/Hum	27(°C)/ 53%RH
Test Voltage:	120Vac / 60Hz	Test Date	Jan 06, 2017
Phase:	Neutral	Test Engineer	David Cheng



Frequency (MHz)	Reading (dBuV)	Factor (dB)	Result (dB)	Limit (dBuV)	Margin (dBuV)	Detector (dBuV)
0.1500	37.18	10.05	47.23	65.99	-18.76	Peak
0.2020	34.40	10.01	44.41	63.52	-19.11	Peak
0.2700	26.29	10.04	36.33	61.12	-24.79	Peak
0.6700	16.56	10.13	26.69	56.00	-29.31	Peak
12.2140	16.83	10.74	27.57	60.00	-32.43	Peak
14.5620	23.51	10.85	34.36	60.00	-25.64	Peak

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.

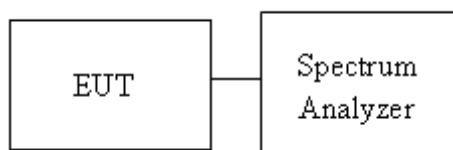
Occupied Bandwidth(99%) : For reporting purposes only.

4.2.2 Test Procedure

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

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

4.2.3 Test Setup

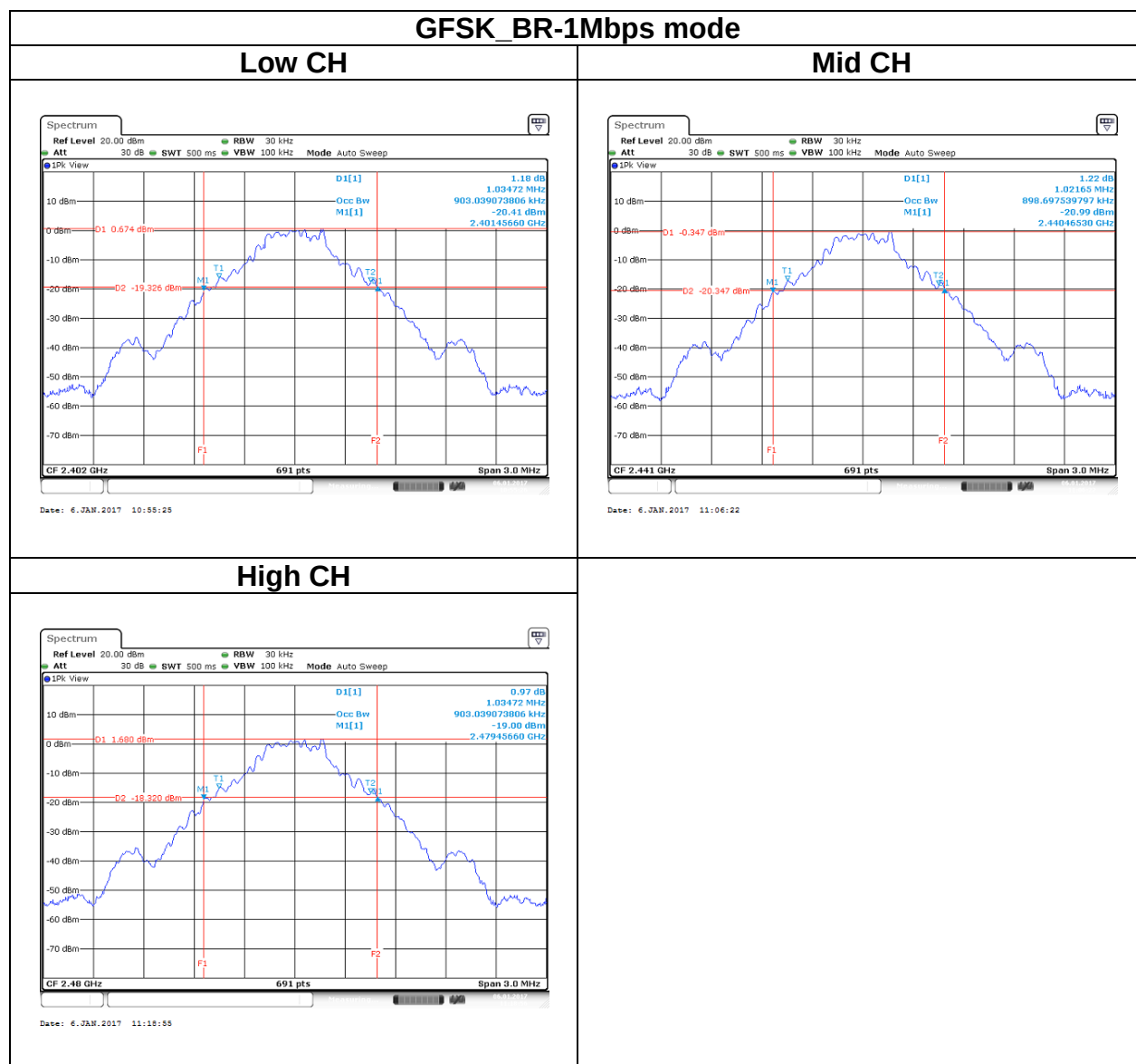


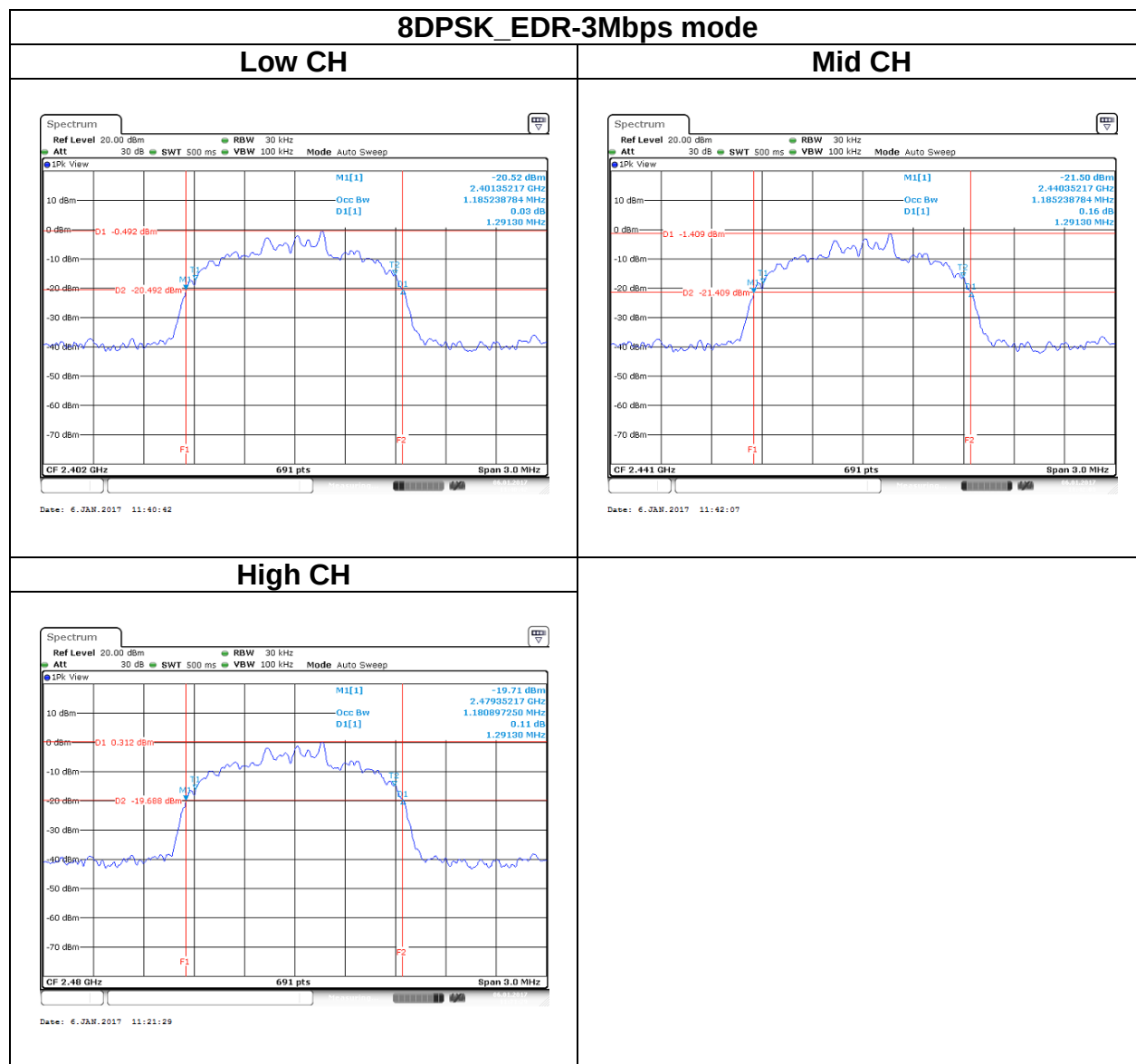
4.2.4 Test Result

Test mode: GFSK_BR-1Mbps mode / 2402-2480 MHz			
Channel	Frequency (MHz)	OBW(99%) (MHz)	20dB BW (MHz)
Low	2402	0.9030	1.0347
Mid	2441	0.8986	1.0216
High	2480	0.9030	1.0347

Test mode: 8DPSK_EDR-3Mbps mode / 2402-2480 MHz			
Channel	Frequency (MHz)	OBW(99%) (MHz)	20dB BW (MHz)
Low	2402	1.1852	1.2913
Mid	2441	1.1852	1.2913
High	2480	1.1808	1.2913

Test Data





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.

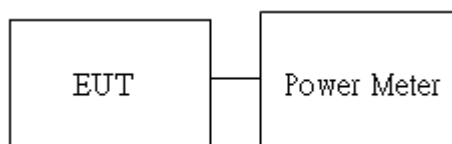
Limit	☒ Antenna not exceed 6 dBi : 21dBm ☐ Antenna with DG greater than 6 dBi : 21dBm [Limit = 30 – (DG – 6)]
-------	---

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)	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	6.32	7.45	0.0043	0.0056	21	27
	39	2441	4.91	6.04	0.0031	0.0040		
	78	2480	7.46	8.59	0.0056	0.0072		
$\pi/4$ -DQPSK EDR-2Mbps (DH5)	0	2402	5.40	6.53	0.0035	0.0045		
	39	2441	4.08	5.21	0.0026	0.0033		
	78	2480	6.54	7.67	0.0045	0.0058		
8DPSK EDR-3Mbps (DH5)	0	2402	5.54	6.67	0.0036	0.0046		
	39	2441	4.27	5.40	0.0027	0.0035		
	78	2480	6.73	7.86	0.0047	0.0061		

Average output power :

BT			
Config.	CH	Freq. (MHz)	AV Power (dBm)
GFSK BR-1Mbps (DH5)	0	2402	6.22
	39	2441	4.81
	78	2480	7.41
$\pi/4$ -DQPSK EDR-2Mbps (DH5)	0	2402	3.52
	39	2441	2.39
	78	2480	4.57
8DPSK EDR-3Mbps (DH5)	0	2402	3.52
	39	2441	2.40
	78	2480	4.58

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.

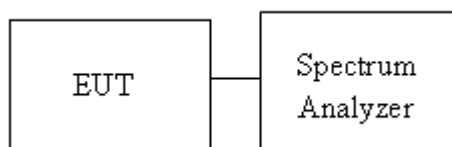
Alternatively, frequency hopping systems operating in the 2400-2483.5 MHz band may have hopping channel carrier frequencies that are separated by 25 kHz or two-thirds of the 20 dB bandwidth of the hopping channel, whichever is greater, provided the systems operate with an output power no greater than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

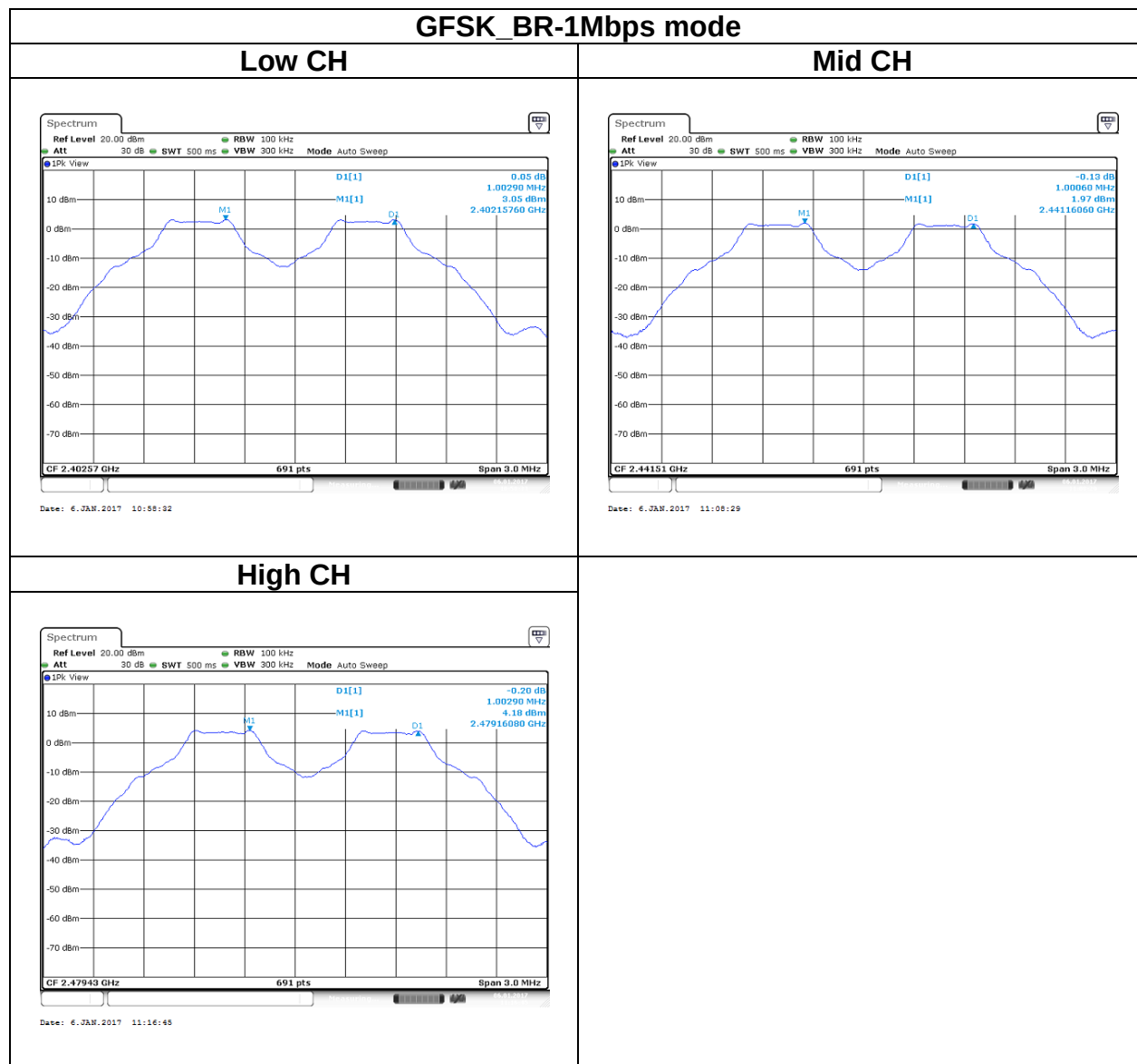


4.4.4 Test Result

Test mode: GFSK_BR-1Mbps mode / 2402-2480 MHz				
Channel	Frequency (MHz)	Channel Separation (MHz)	Channel Separation Limits (MHz)	Result
Low	2402	1.0029	0.690	PASS
Mid	2441	1.0006	0.681	PASS
High	2480	1.0029	0.690	PASS

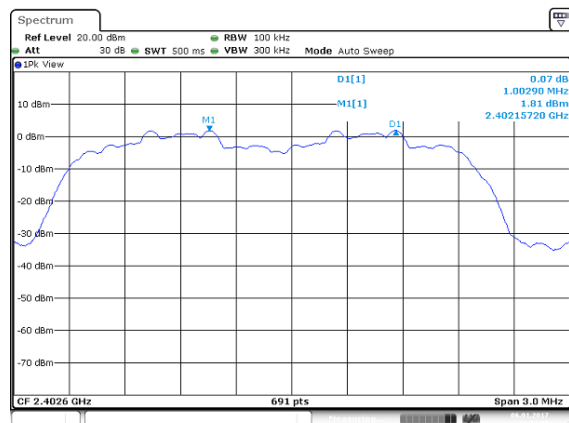
Test mode: 8DPSK_EDR-3Mbps mode / 2402-2480 MHz				
Channel	Frequency (MHz)	Channel Separation (MHz)	Channel Separation Limits (MHz)	Result
Low	2402	1.0029	0.861	PASS
Mid	2441	1.0029	0.861	PASS
High	2480	1.0029	0.861	PASS

Test Data

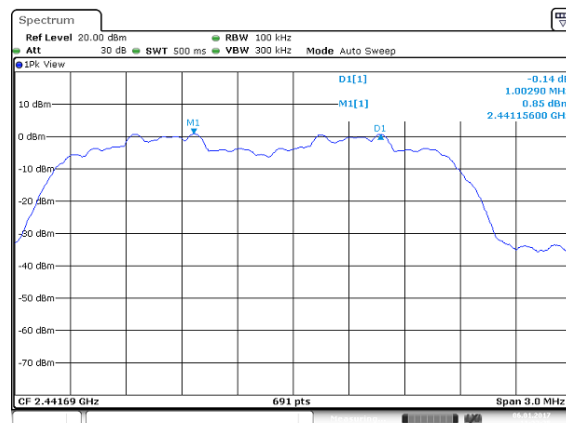


8DPSK EDR-3Mbps mode

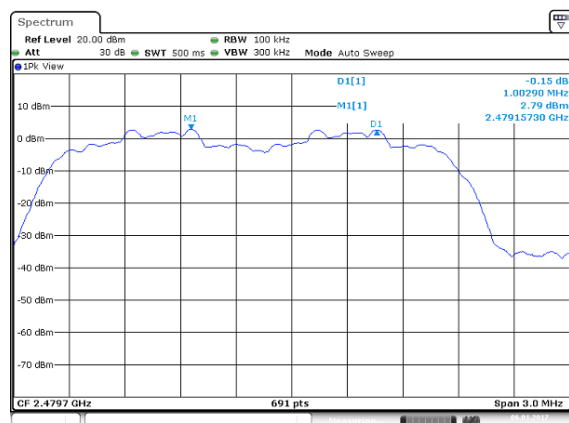
Low CH



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)

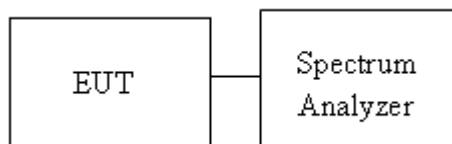
Frequency hopping system in the 2400-2483.5MHz band shall use at least 15 channels.

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

GFSK_BR-1Mbps mode

Spectrum
 Ref Level 20.00 dBm
 Att 30 dB SWT 1 s VBW 300 kHz Mode Auto Sweep
 1% View
 M2[1] 4.37 dBm
 M1[1] 9.31 dBm
 2.402110 GHz
 Start 2.4 GHz 691 pts Stop 2.4835 GHz

8DPSK_EDR-3Mbps mode

Spectrum
 Ref Level 20.00 dBm
 Att 30 dB SWT 1 s VBW 300 kHz Mode Auto Sweep
 1% View
 M2[1] 2.96 dBm
 M1[1] 1.87 dBm
 2.402110 GHz
 Start 2.4 GHz 691 pts Stop 2.4835 GHz

4.6 CONDUCTED BANDEDGE AND SPURIOUS EMISSION

4.6.1 Test Limit

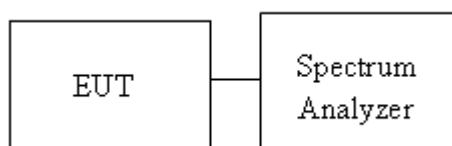
According to §15.247(d) and RSS-247 section 5.5

Limit	-20 dBc
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4.6.2 Test Procedure

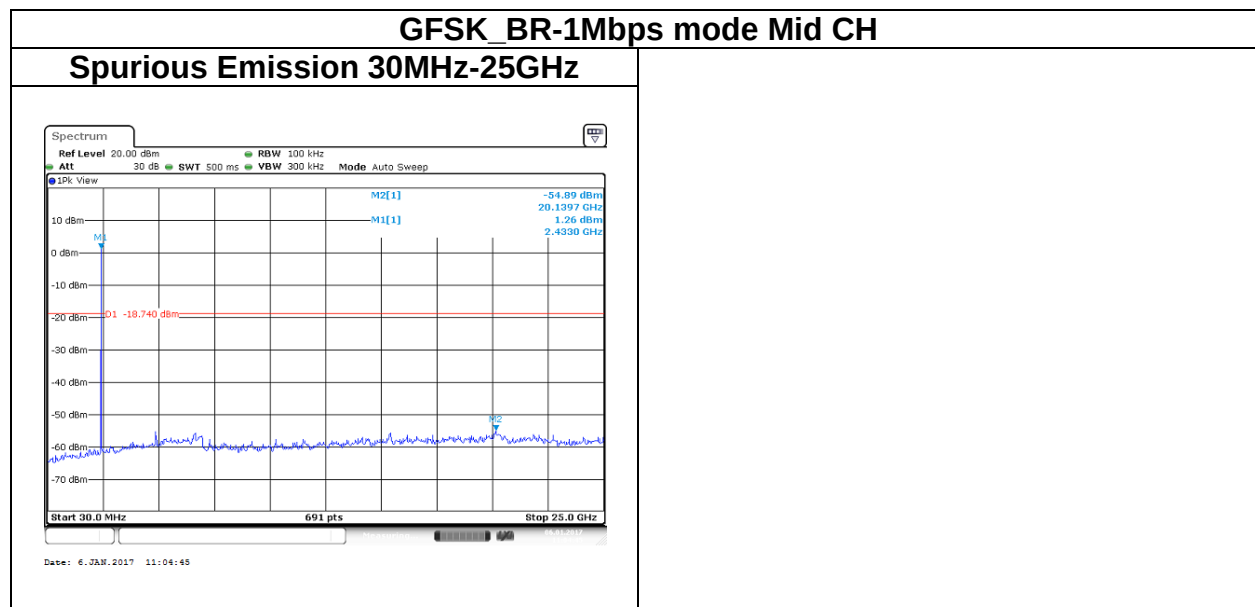
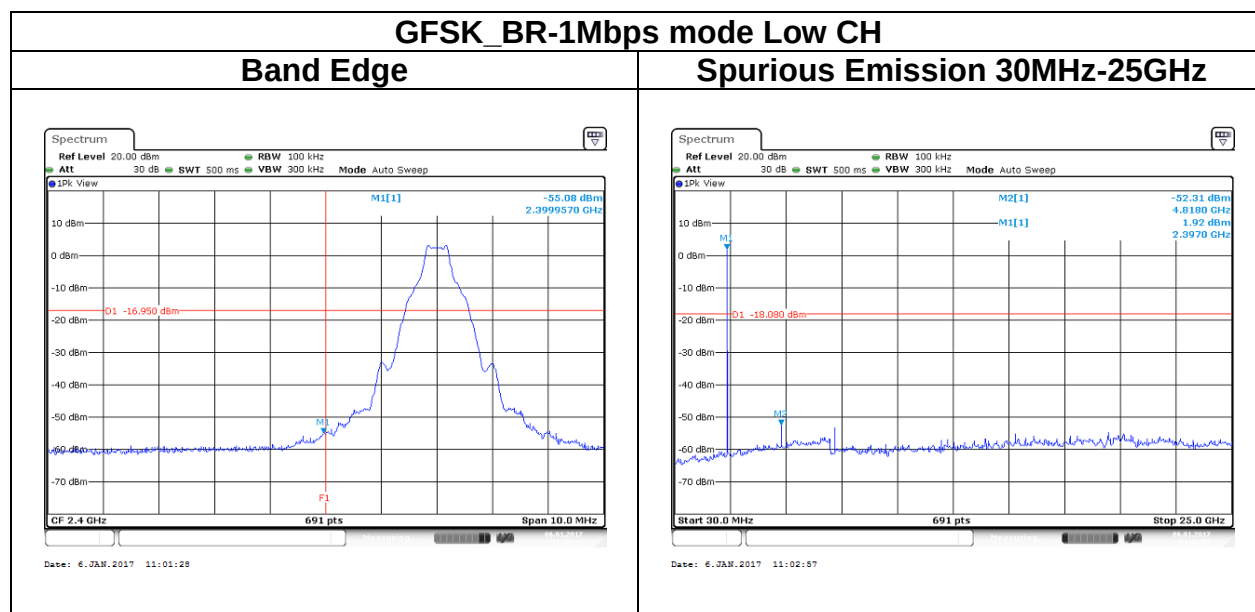
1. EUT RF output port connected to the SA by RF cable, and the path loss was compensated to result.
2. SA setting, RBW=100kHz, VBW=300kHz, Detector=Peak, Trace mode = max hold, SWT = Auto.
3. The Band Edge at 2.4GHz and 2.4835GHz are investigated with normal hopping mode.

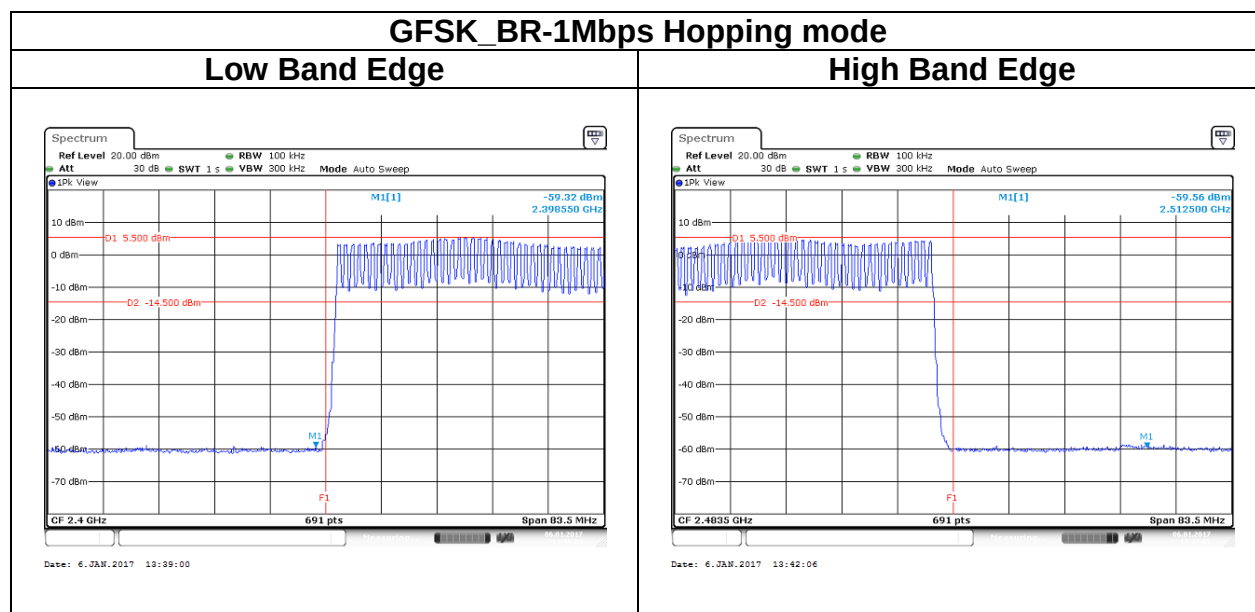
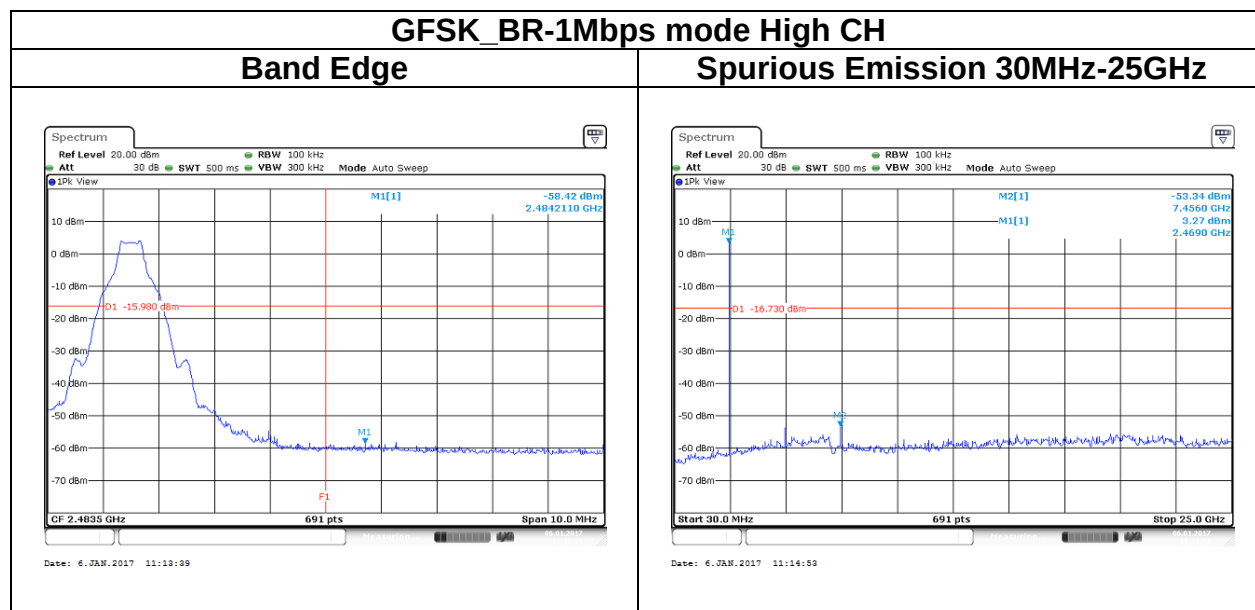
4.6.3 Test Setup

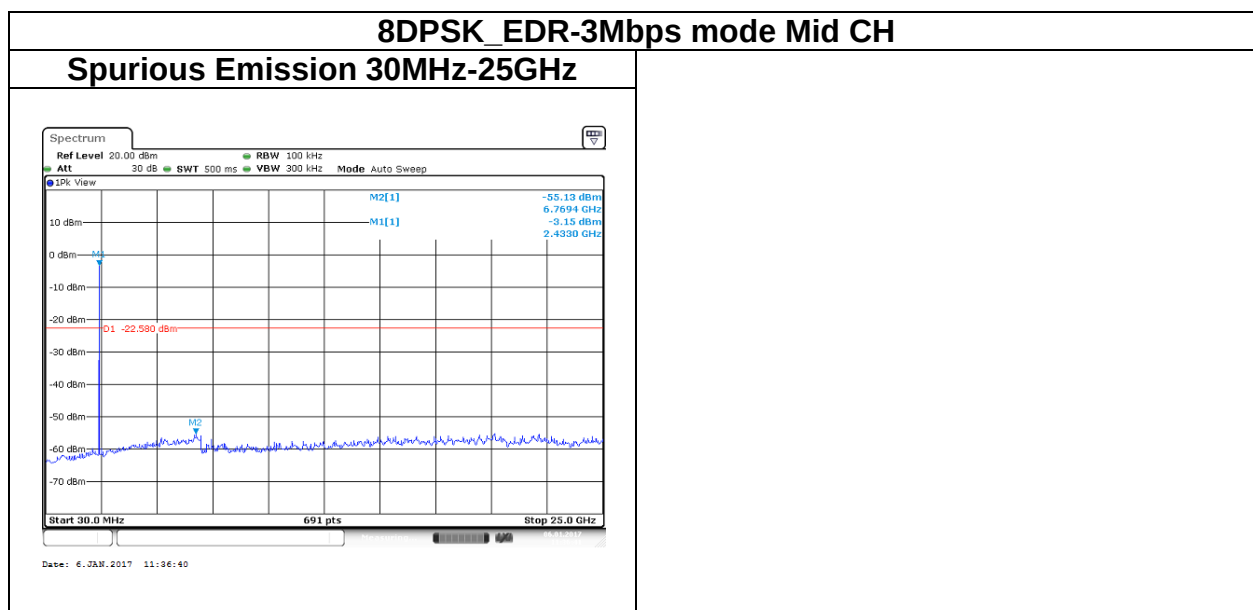
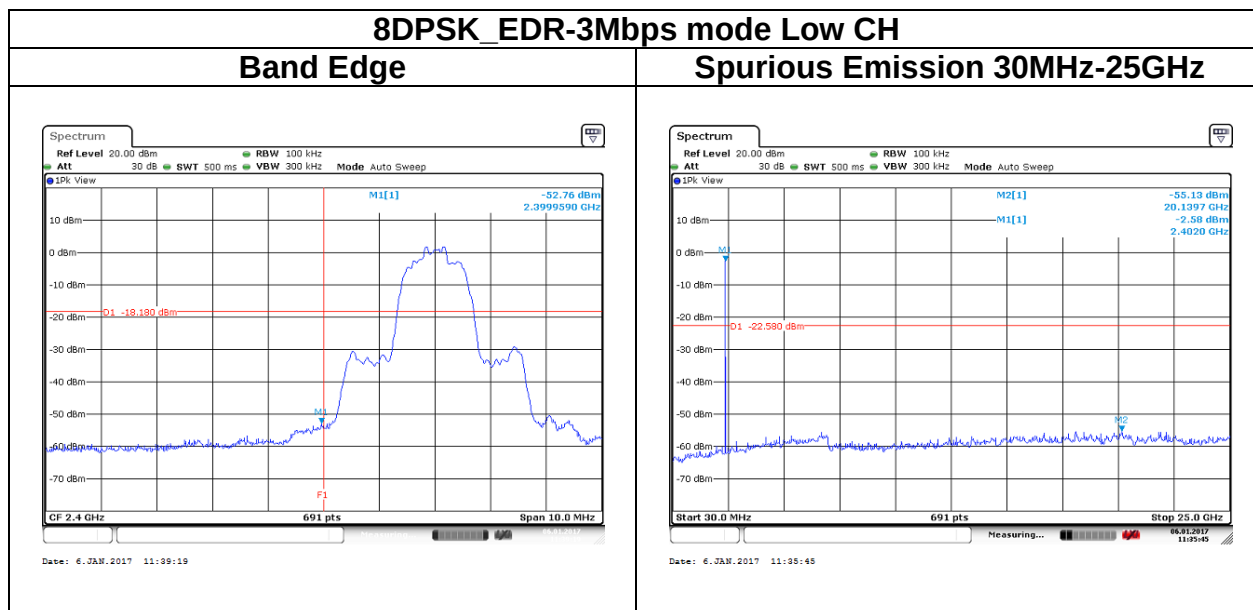


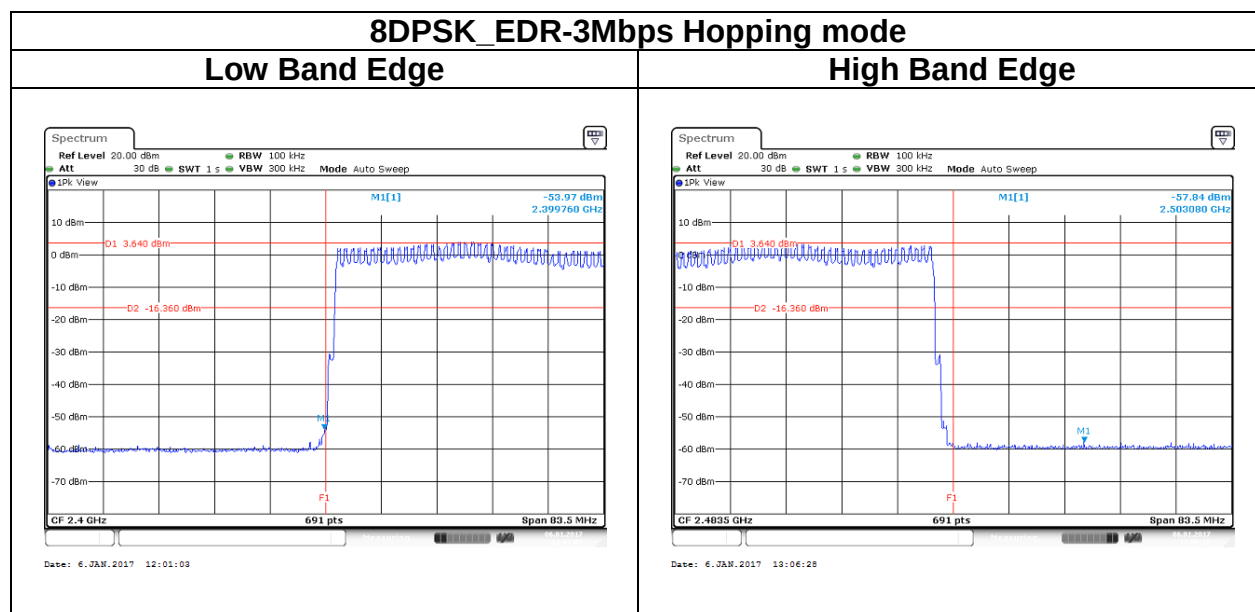
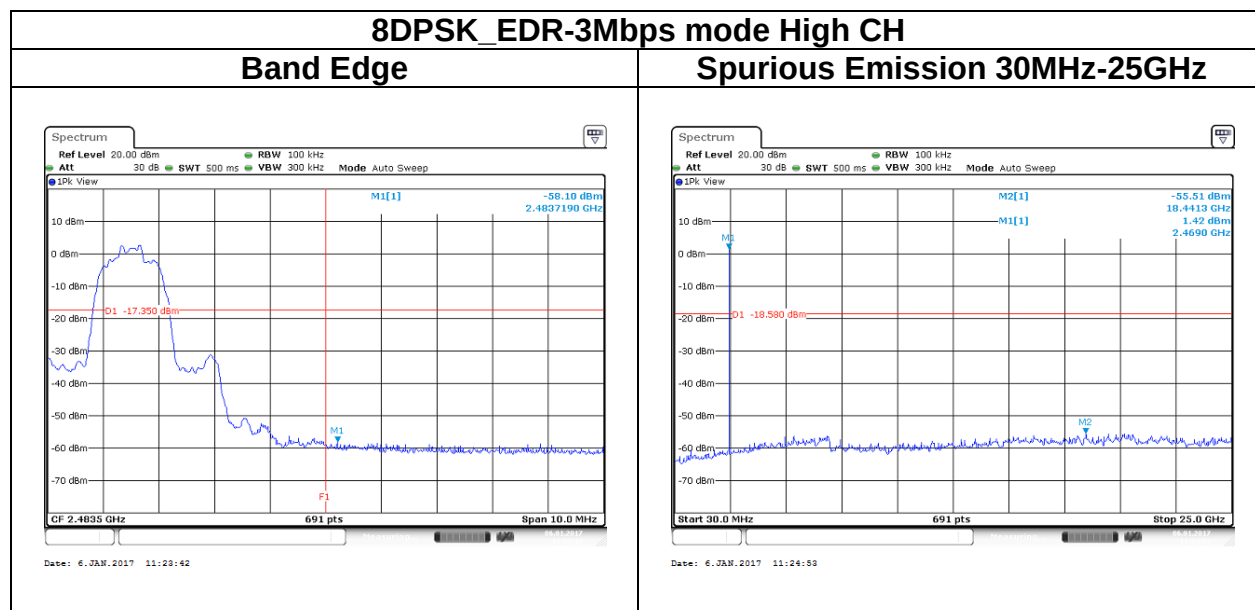
4.6.4 Test Result

Test Data









4.7 TIME OF OCCUPANCY (DWELL TIME)

4.7.1 Test Limit

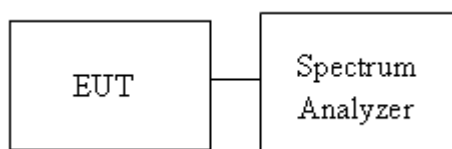
According to §15.247(a)(1)(iii) and RSS-247 section 5.1(4)

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

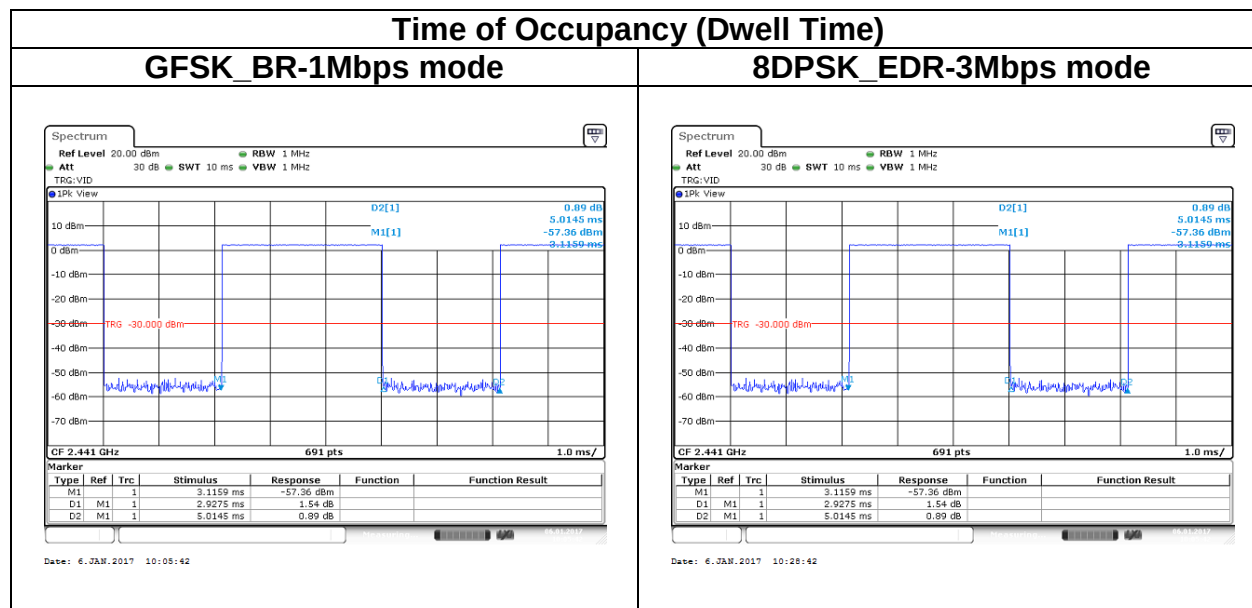
4.7.3 Test Setup



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	2.9275	79	106.67	0.3123	0.4	Pass
EDR-3Mbps	2441	2.9275	79	106.67	0.3123	0.4	
AFH: DH5	2441	2.9275	20	53.33	0.1561	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 BANDEDGE 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)

Remark:

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

4.8.2 Test Procedure

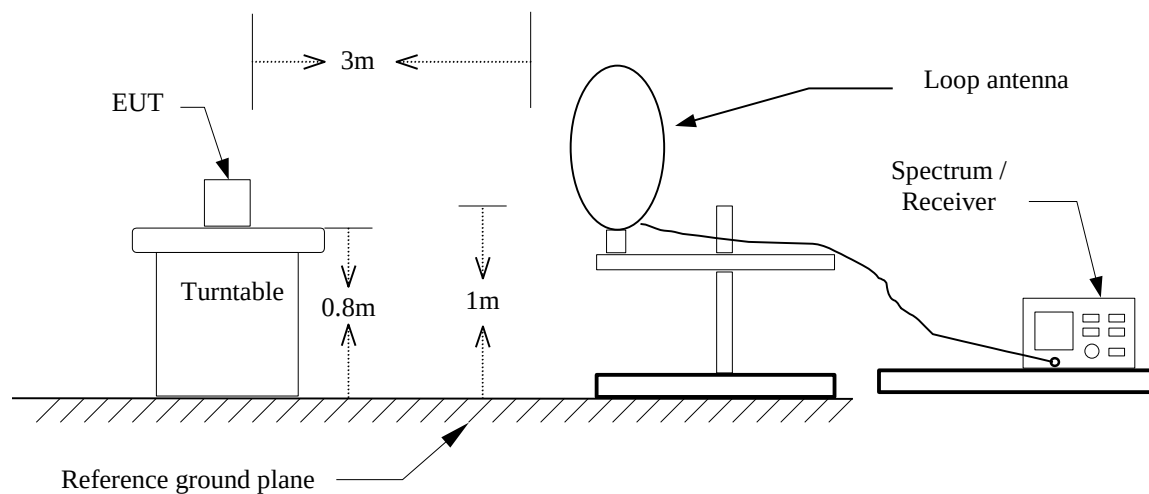
Test method Refer as KDB 558074 D01 v03r05, Section 12.1.

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.

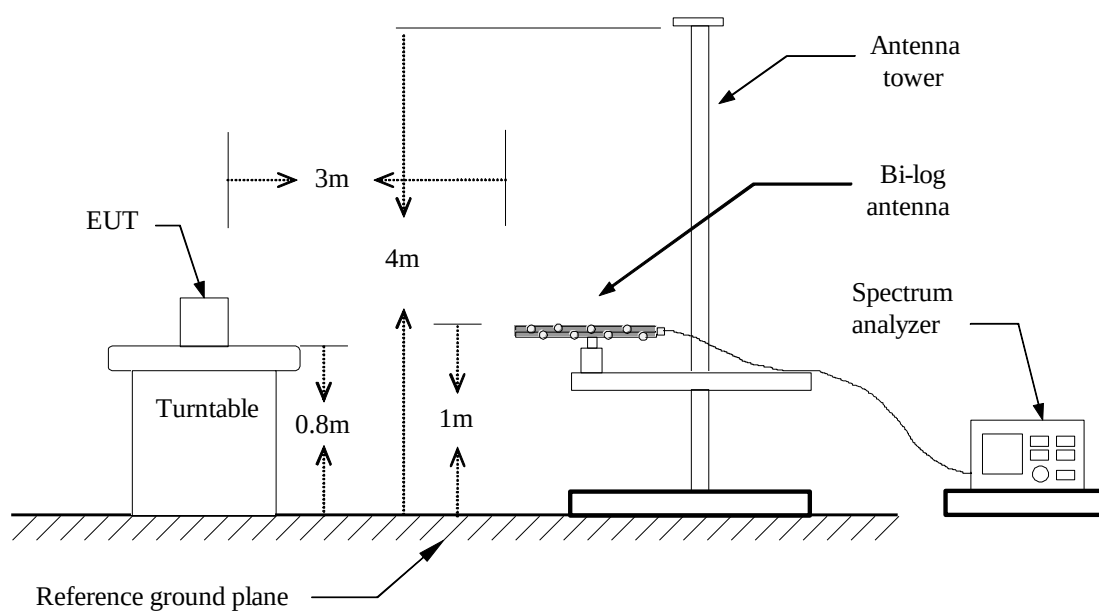
Configuration	Duty Cycle (%)	VBW
GFSK_BR-1Mbps	59	360Hz
8DPSK_EDR-3Mbps	59	360Hz

4.8.3 Test Setup

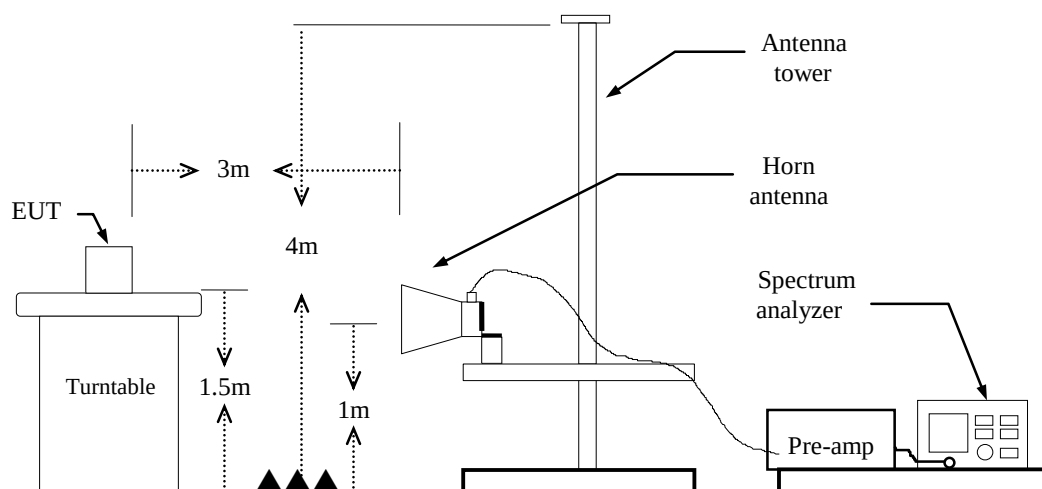
9kHz ~ 30MHz



30MHz ~ 1GHz



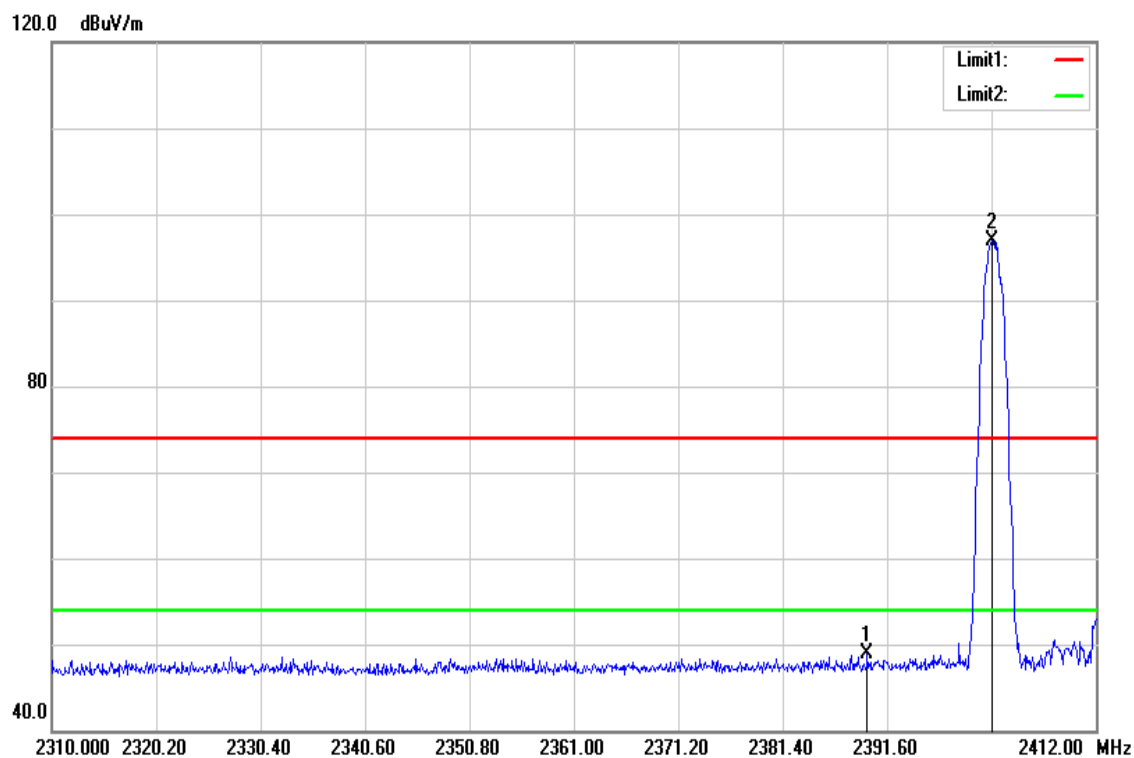
Above 1 GHz



4.8.4 Test Result

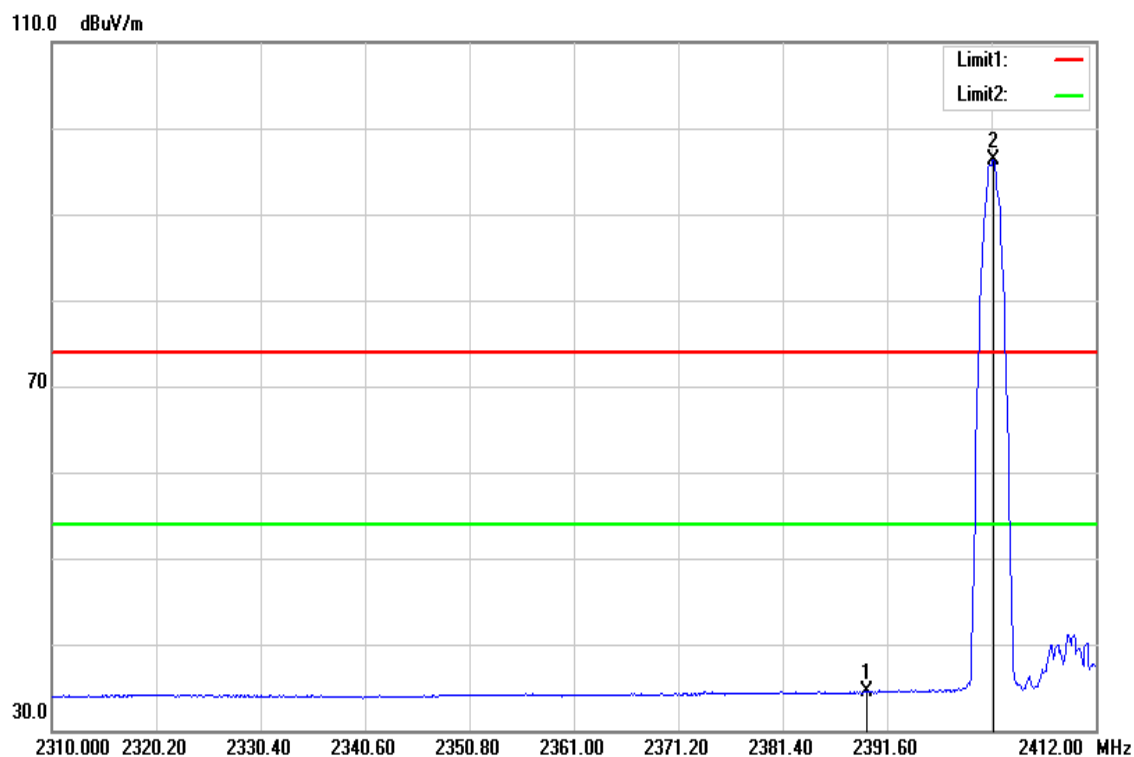
Band Edge Test Data

Test Mode:	GFSK_BR-1Mbps Low CH	Temp/Hum	27(°C)/ 53%RH
Test Item	Band Edge	Test Date	Jan 10, 2017
Polarize	Horizontal	Test Engineer	Kevin Kuo
Detector	Peak	Test Voltage:	120Vac / 60Hz



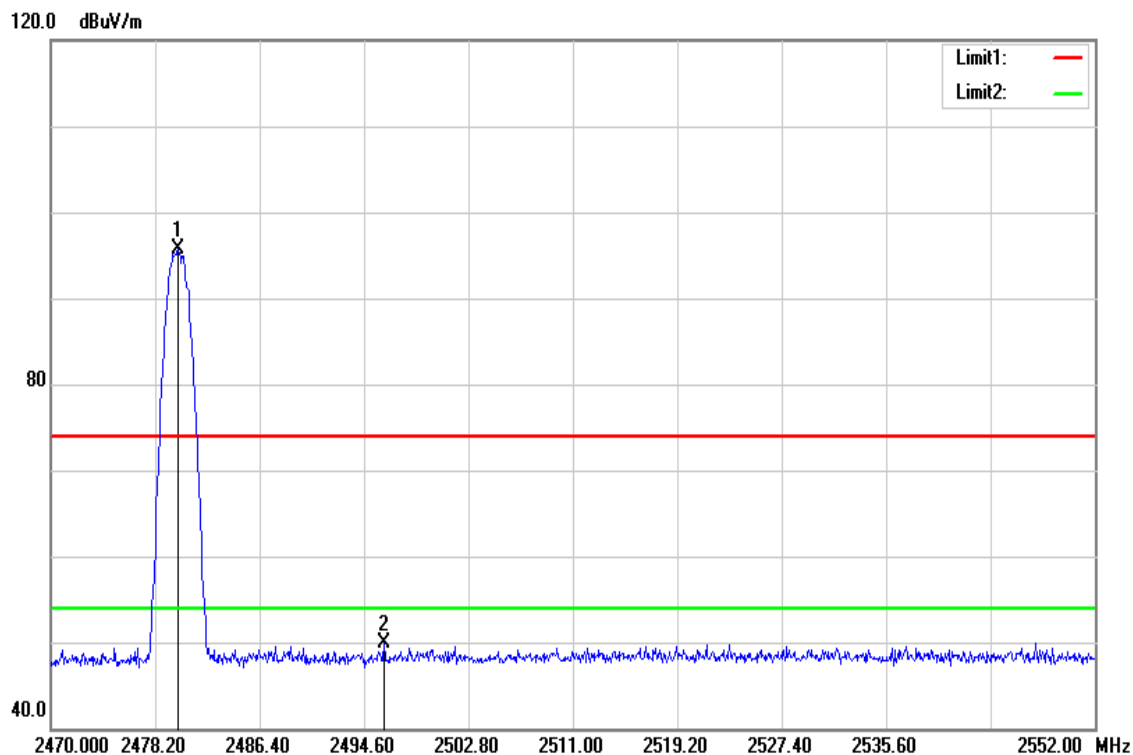
Frequency (MHz)	Reading (dBuV)	Correct Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
2389.662	51.47	-2.49	48.98	74.00	-25.02	Peak
2401.800	99.27	-2.41	96.86	-	-	Peak

Test Mode:	GFSK_BR-1Mbps Low CH	Temp/Hum	27(°C)/ 53%RH
Test Item	Band Edge	Test Date	Jan 10, 2017
Polarize	Horizontal	Test Engineer	Kevin Kuo
Detector	Average	Test Voltage:	120Vac / 60Hz



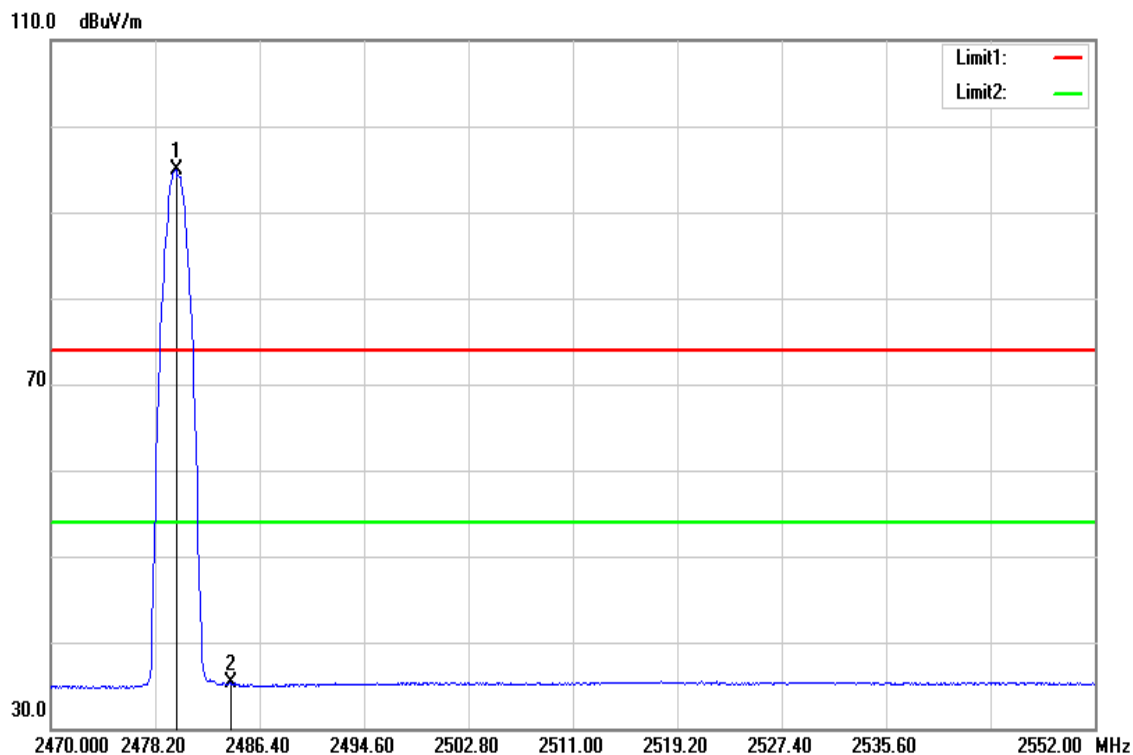
Frequency (MHz)	Reading (dBuV)	Correct Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
2389.560	36.97	-2.49	34.48	54.00	-19.52	AVG
2402.004	98.65	-2.41	96.24	-	-	AVG

Test Mode:	GFSK_BR-1Mbps High CH	Temp/Hum	27(°C)/ 53%RH
Test Item	Band Edge	Test Date	Jan 10, 2017
Polarize	Horizontal	Test Engineer	Kevin Kuo
Detector	Peak	Test Voltage:	120Vac / 60Hz



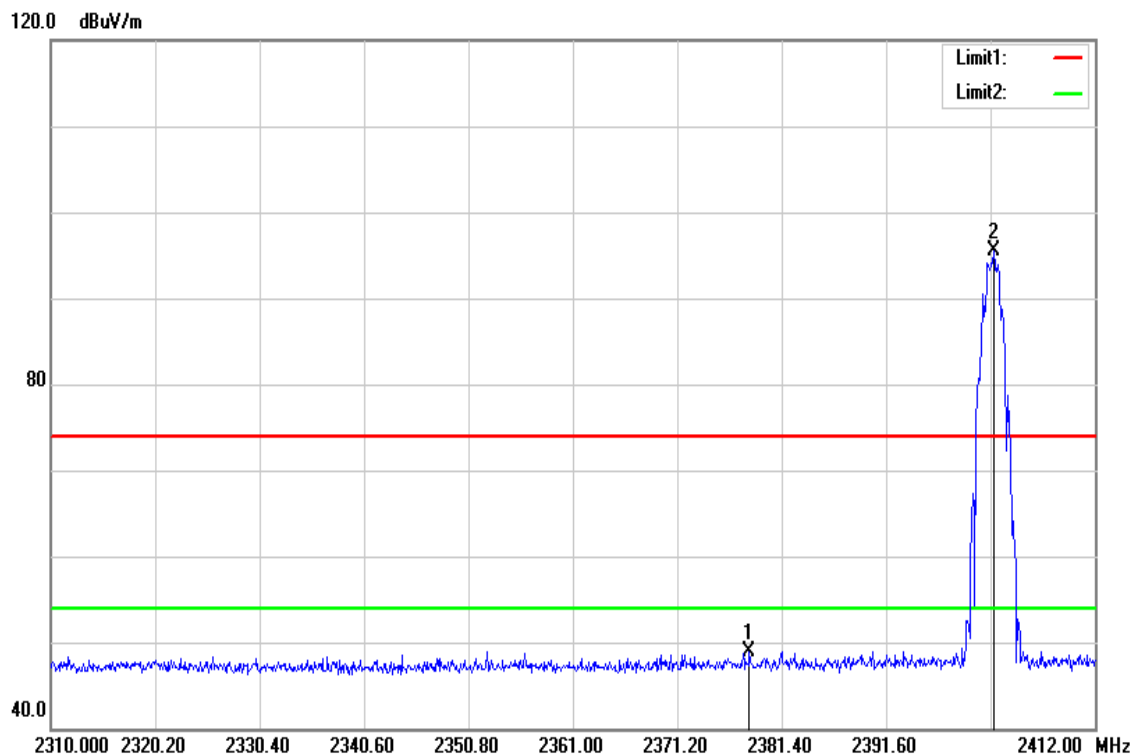
Frequency (MHz)	Reading (dBuV)	Correct Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
2480.004	97.75	-2.03	95.72	-	-	Peak
2496.158	51.75	-1.89	49.86	74.00	-24.14	Peak

Test Mode:	GFSK_BR-1Mbps High CH	Temp/Hum	27(°C)/ 53%RH
Test Item	Band Edge	Test Date	Jan 10, 2017
Polarize	Horizontal	Test Engineer	Kevin Kuo
Detector	Average	Test Voltage:	120Vac / 60Hz



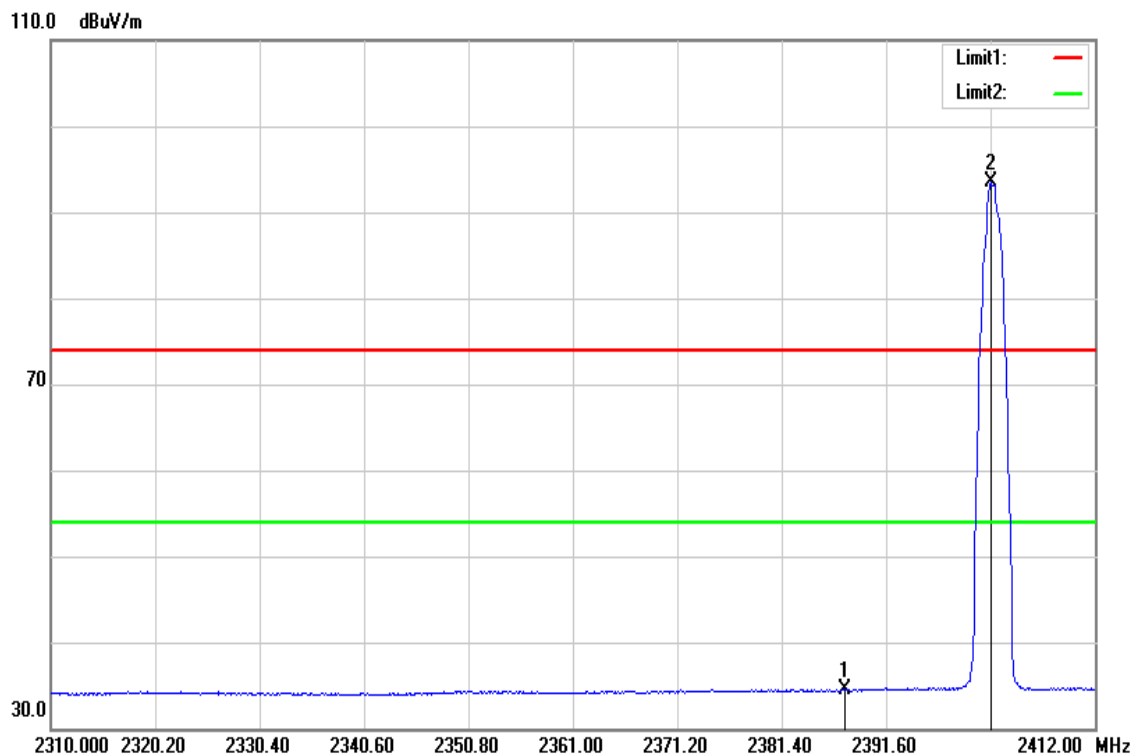
Frequency (MHz)	Reading (dBuV)	Correct Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
2479.840	96.97	-2.03	94.94	-	-	AVG
2484.104	37.26	-1.99	35.27	54.00	-18.73	AVG

Test Mode:	8DPSK_EDR-3Mbps Low CH	Temp/Hum	27(°C)/ 53%RH
Test Item	Band Edge	Test Date	Jan 10, 2017
Polarize	Horizontal	Test Engineer	Kevin Kuo
Detector	Peak	Test Voltage:	120Vac / 60Hz



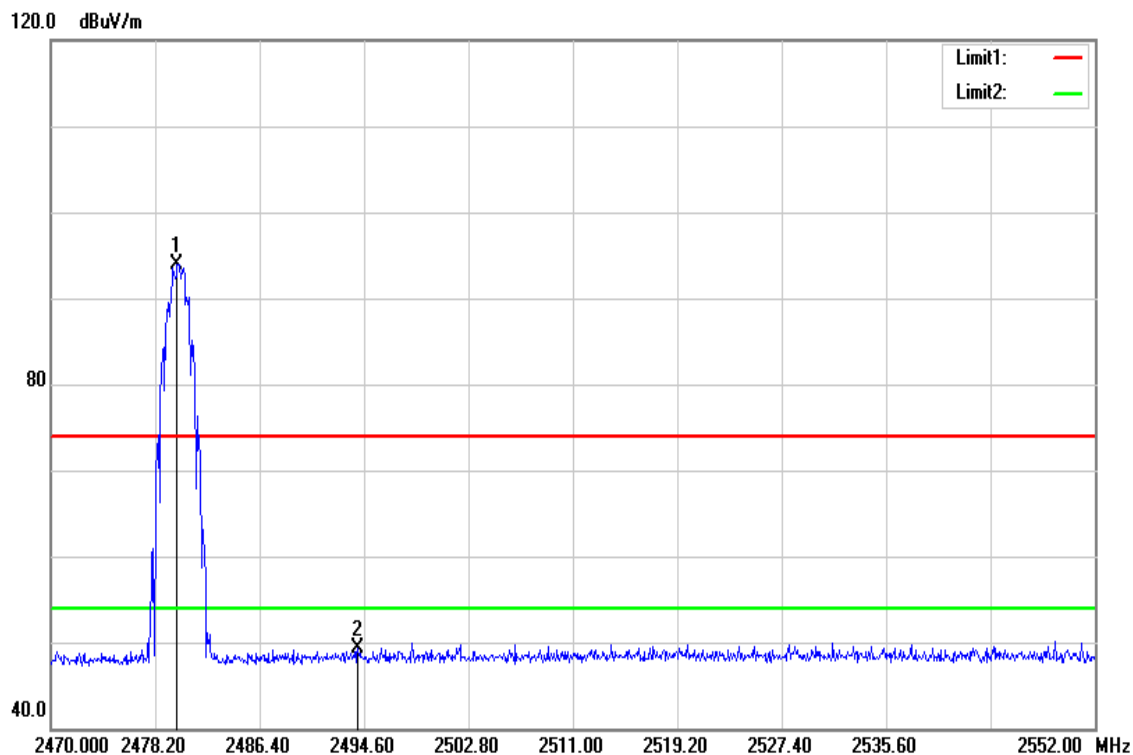
Frequency (MHz)	Reading (dBuV)	Correct Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
2378.238	51.58	-2.59	48.99	74.00	-25.01	Peak
2402.106	97.88	-2.41	95.47	-	-	Peak

Test Mode:	8DPSK_EDR-3Mbps Low CH	Temp/Hum	27(°C)/ 53%RH
Test Item	Band Edge	Test Date	Jan 10, 2017
Polarize	Horizontal	Test Engineer	Kevin Kuo
Detector	Average	Test Voltage:	120Vac / 60Hz



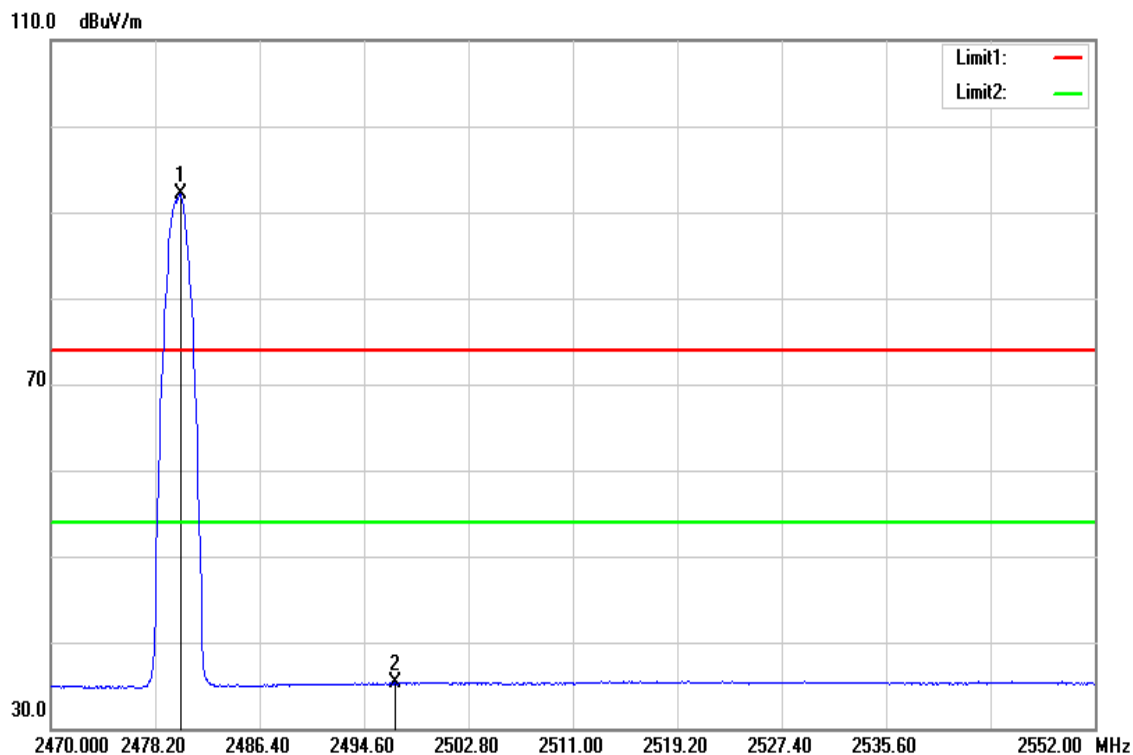
Frequency (MHz)	Reading (dBuV)	Correct Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
2387.520	37.04	-2.51	34.53	54.00	-19.47	AVG
2401.800	95.98	-2.41	93.57	-	-	AVG

Test Mode:	8DPSK_EDR-3Mbps High CH	Temp/Hum	27(°C)/ 53%RH
Test Item	Band Edge	Test Date	Jan 10, 2017
Polarize	Horizontal	Test Engineer	Kevin Kuo
Detector	Peak	Test Voltage:	120Vac / 60Hz



Frequency (MHz)	Reading (dBuV)	Correct Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
2479.922	95.96	-2.03	93.93	-	-	Peak
2494.108	51.12	-1.90	49.22	74.00	-24.78	Peak

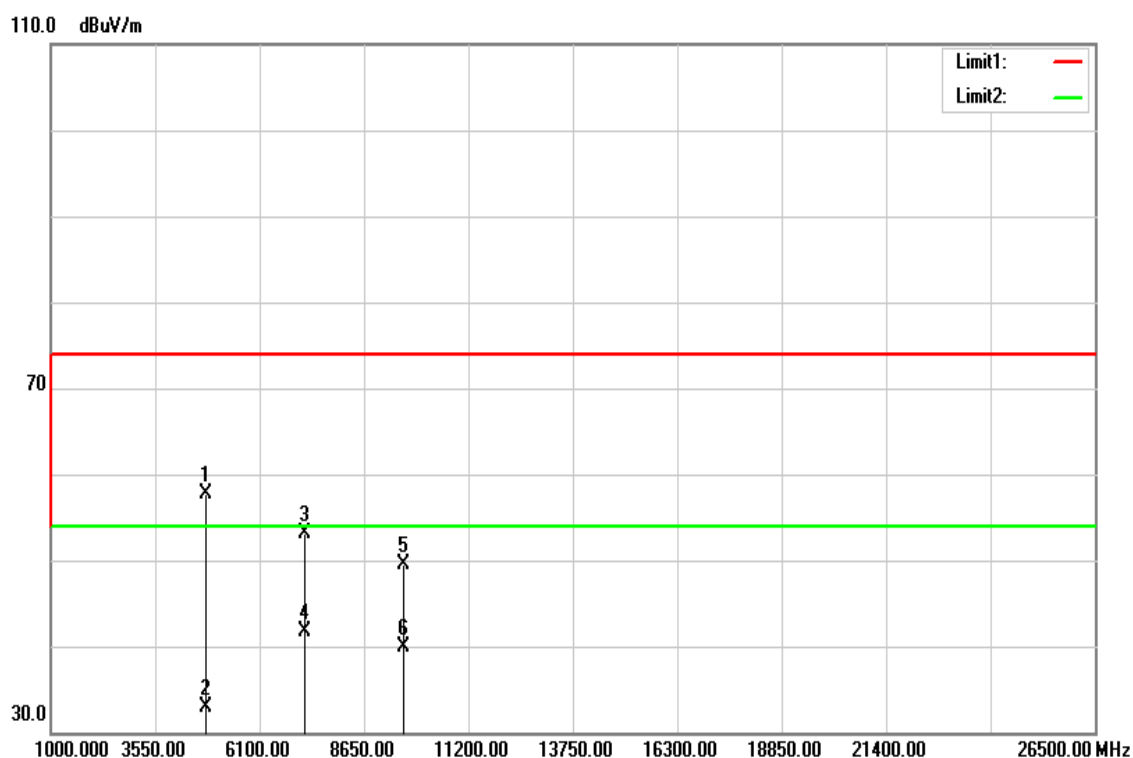
Test Mode:	8DPSK_EDR-3Mbps High CH	Temp/Hum	27(°C)/ 53%RH
Test Item	Band Edge	Test Date	Jan 10, 2017
Polarize	Horizontal	Test Engineer	Kevin Kuo
Detector	Average	Test Voltage:	120Vac / 60Hz



Frequency (MHz)	Reading (dBuV)	Correct Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
2480.168	94.20	-2.03	92.17	-	-	AVG
2497.060	37.24	-1.88	35.36	54.00	-18.64	AVG

Above 1G Test Data

Test Mode:	GFSK_BR-1Mbps Low CH	Temp/Hum	27(°C)/ 53%RH
Test Item	Harmonic	Test Date	Jan 12, 2017
Polarize	Vertical	Test Engineer	Kevin Kuo
Detector	Peak and Average	Test Voltage:	120Vac / 60Hz

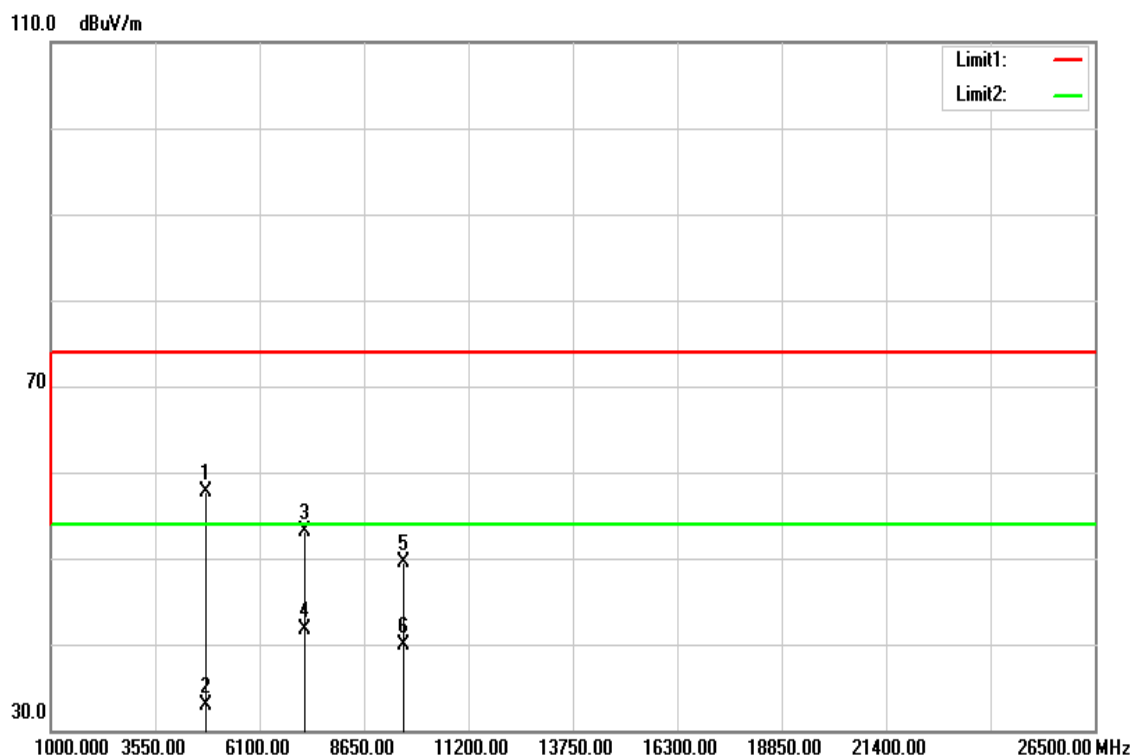


Frequency (MHz)	Reading (dBuV)	Correct Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
4806.000	52.58	5.05	57.63	74.00	-16.37	Peak
4806.000	27.93	5.05	32.98	54.00	-21.02	AVG
7207.000	40.46	12.63	53.09	74.00	-20.91	Peak
7207.000	29.04	12.63	41.67	54.00	-12.33	AVG
9608.000	31.81	17.60	49.41	74.00	-24.59	Peak
9608.000	22.38	17.60	39.98	54.00	-14.02	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 Low CH	Temp/Hum	27(°C)/ 53%RH
Test Item	Harmonic	Test Date	Jan 12, 2017
Polarize	Horizontal	Test Engineer	Kevin Kuo
Detector	Peak and Average	Test Voltage:	120Vac / 60Hz

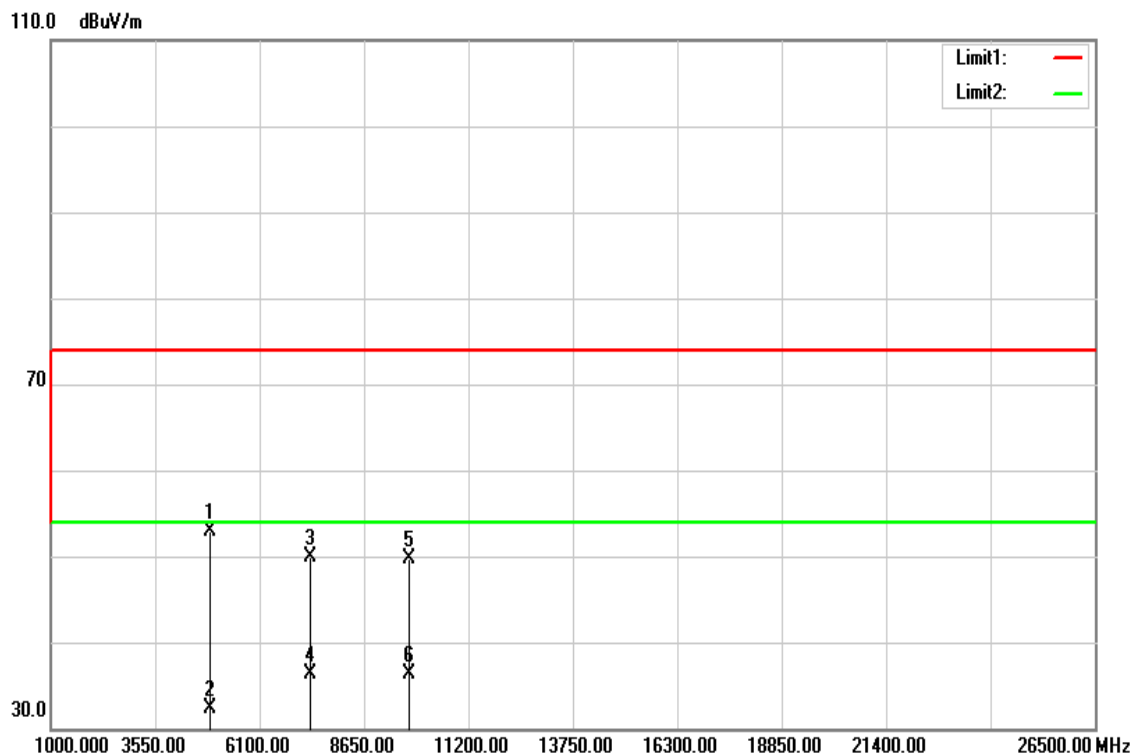


Frequency (MHz)	Reading (dBuV)	Correct Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
4806.000	52.58	5.05	57.63	74.00	-16.37	Peak
4806.000	27.93	5.05	32.98	54.00	-21.02	AVG
7207.000	40.46	12.63	53.09	74.00	-20.91	Peak
7207.000	29.04	12.63	41.67	54.00	-12.33	AVG
9608.000	31.81	17.60	49.41	74.00	-24.59	Peak
9608.000	22.38	17.60	39.98	54.00	-14.02	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 Mid CH	Temp/Hum	27(°C)/ 53%RH
Test Item	Harmonic	Test Date	Jan 12, 2017
Polarize	Vertical	Test Engineer	Kevin Kuo
Detector	Peak and Average	Test Voltage:	120Vac / 60Hz

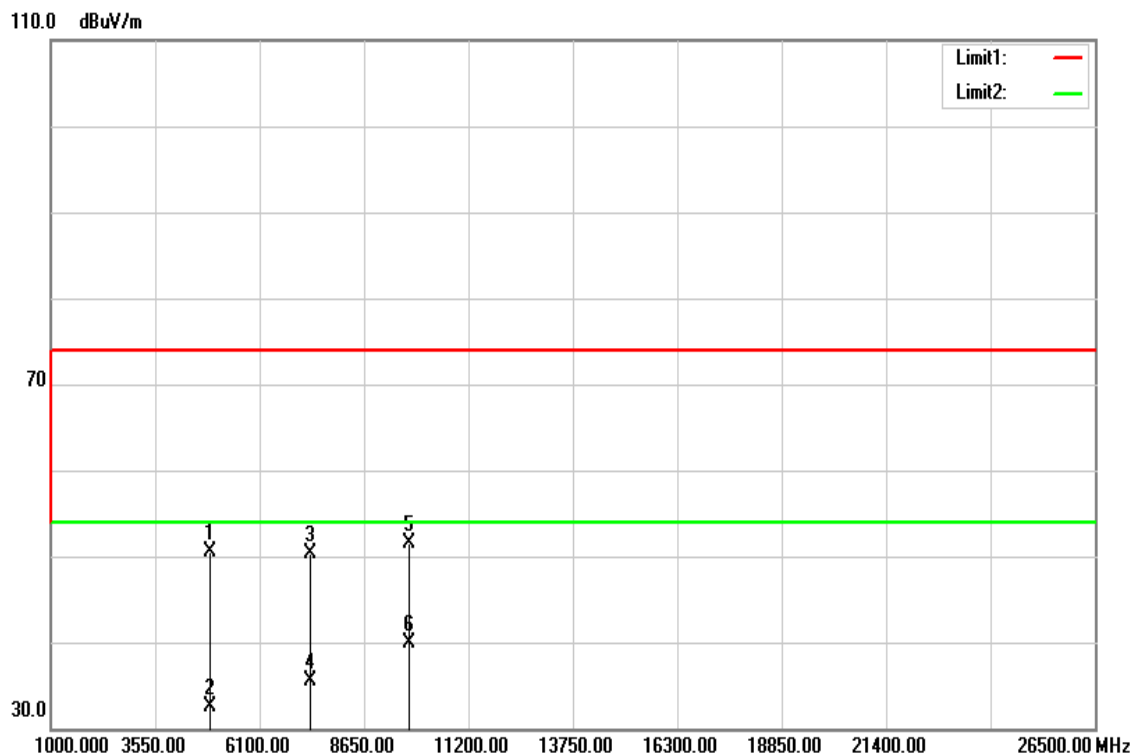


Frequency (MHz)	Reading (dBuV)	Correct Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
4883.000	47.73	5.26	52.99	74.00	-21.01	Peak
4883.000	26.99	5.26	32.25	54.00	-21.75	AVG
7326.000	36.86	12.98	49.84	74.00	-24.16	Peak
7326.000	23.38	12.98	36.36	54.00	-17.64	AVG
9764.000	32.20	17.60	49.80	74.00	-24.20	Peak
9764.000	18.61	17.60	36.21	54.00	-17.79	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 12, 2017
Polarize	Horizontal	Test Engineer	Kevin Kuo
Detector	Peak and Average	Test Voltage:	120Vac / 60Hz

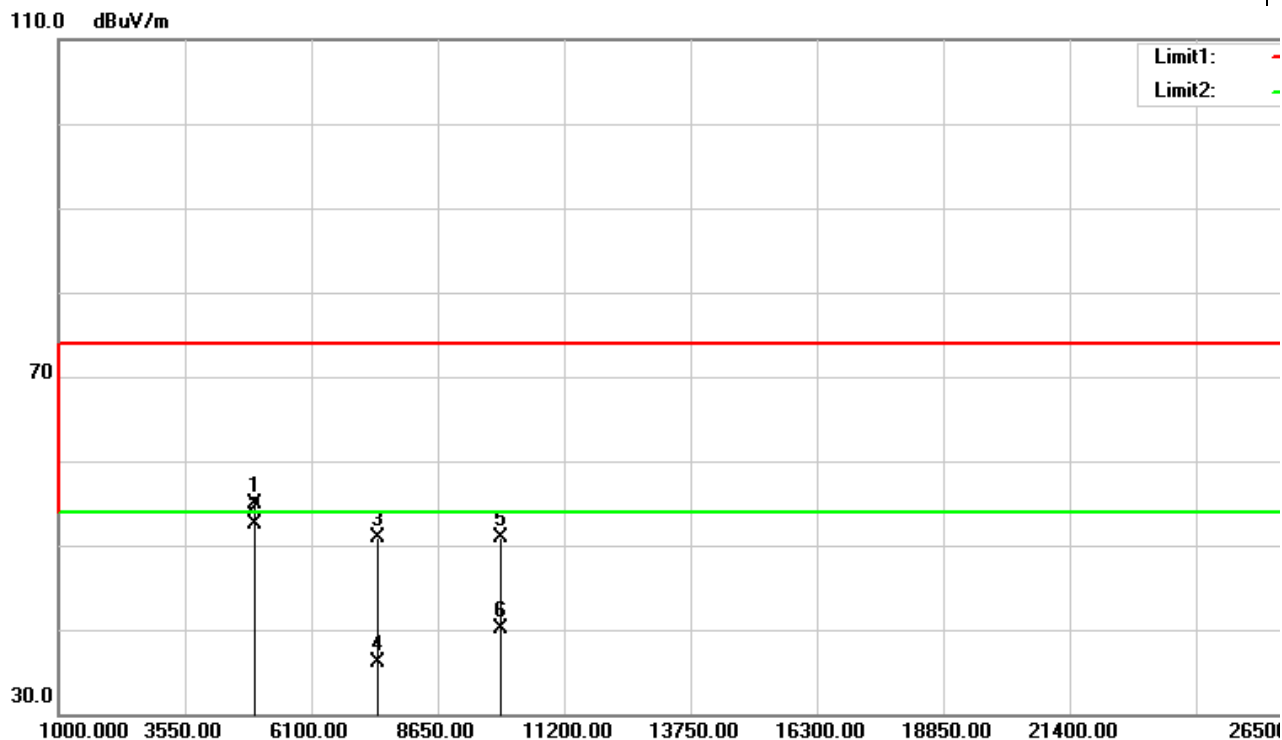


Frequency (MHz)	Reading (dBuV)	Correct Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
4883.000	45.29	5.26	50.55	74.00	-23.45	Peak
4883.000	27.22	5.26	32.48	54.00	-21.52	AVG
7326.000	37.27	12.98	50.25	74.00	-23.75	Peak
7326.000	22.58	12.98	35.56	54.00	-18.44	AVG
9764.000	33.82	17.60	51.42	74.00	-22.58	Peak
9764.000	22.34	17.60	39.94	54.00	-14.06	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 12, 2017
Polarize	Vertical	Test Engineer	Kevin Kuo
Detector	Peak and Average	Test Voltage:	120Vac / 60Hz

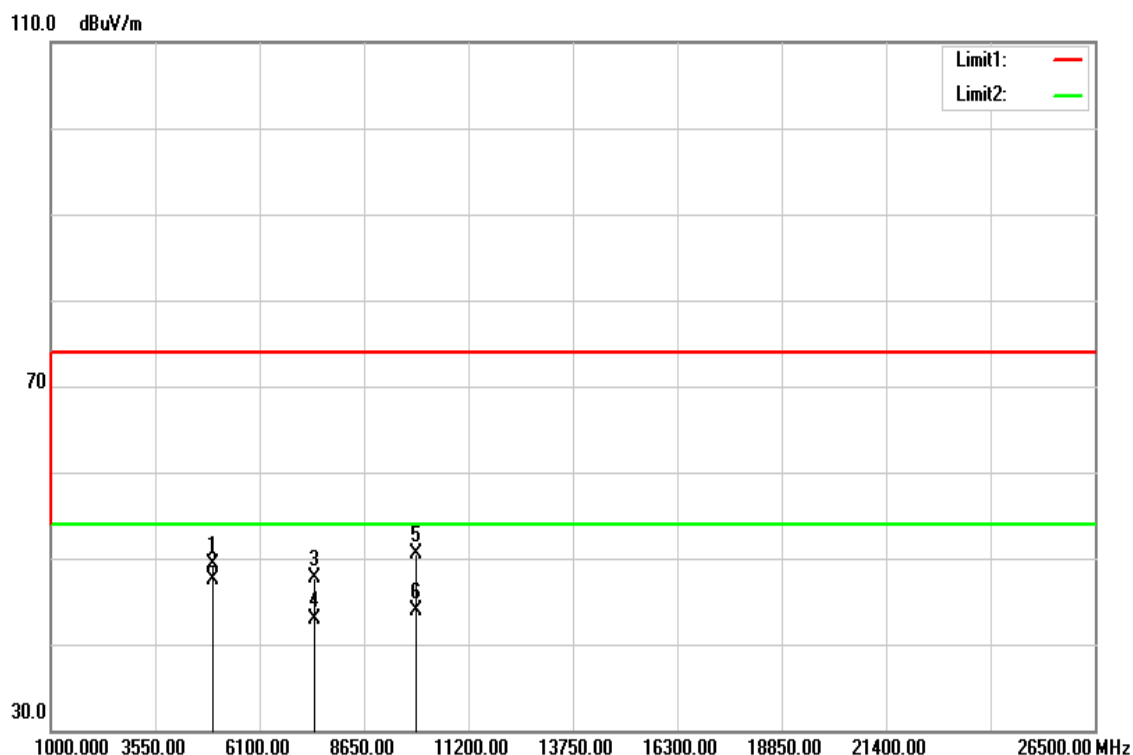


Frequency (MHz)	Reading (dBuV)	Correct Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
4960.000	49.42	5.46	54.88	74.00	-19.12	Peak
4960.000	46.98	5.46	52.44	54.00	-1.56	AVG
7438.000	37.57	13.32	50.89	74.00	-23.11	Peak
7438.000	22.70	13.32	36.02	54.00	-17.98	AVG
9920.000	33.23	17.60	50.83	74.00	-23.17	Peak
9920.000	22.53	17.60	40.13	54.00	-13.87	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 12, 2017
Polarize	Horizontal	Test Engineer	Kevin Kuo
Detector	Peak and Average	Test Voltage:	120Vac / 60Hz



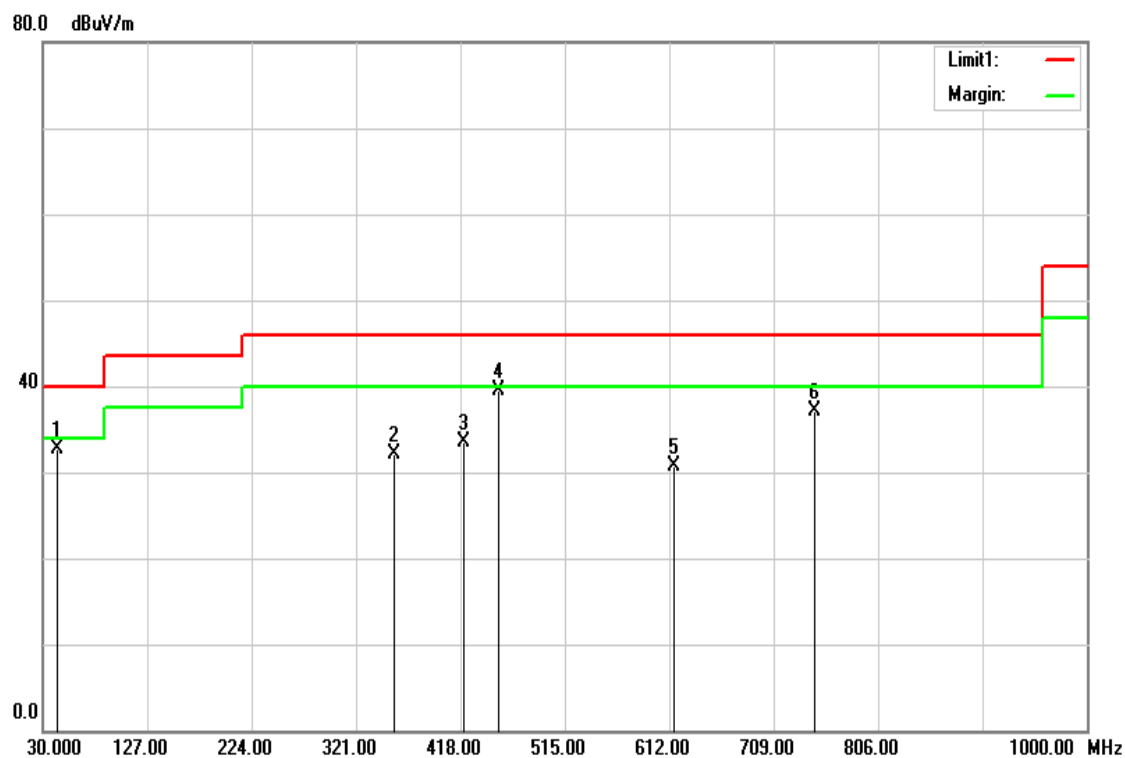
Frequency (MHz)	Reading (dBuV)	Correct Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
4960.000	43.84	5.46	49.30	74.00	-24.70	Peak
4960.000	41.95	5.46	47.41	54.00	-6.59	AVG
7440.000	34.29	13.33	47.62	74.00	-26.38	Peak
7440.000	29.60	13.33	42.93	54.00	-11.07	AVG
9920.000	32.93	17.60	50.53	74.00	-23.47	Peak
9920.000	26.39	17.60	43.99	54.00	-10.01	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

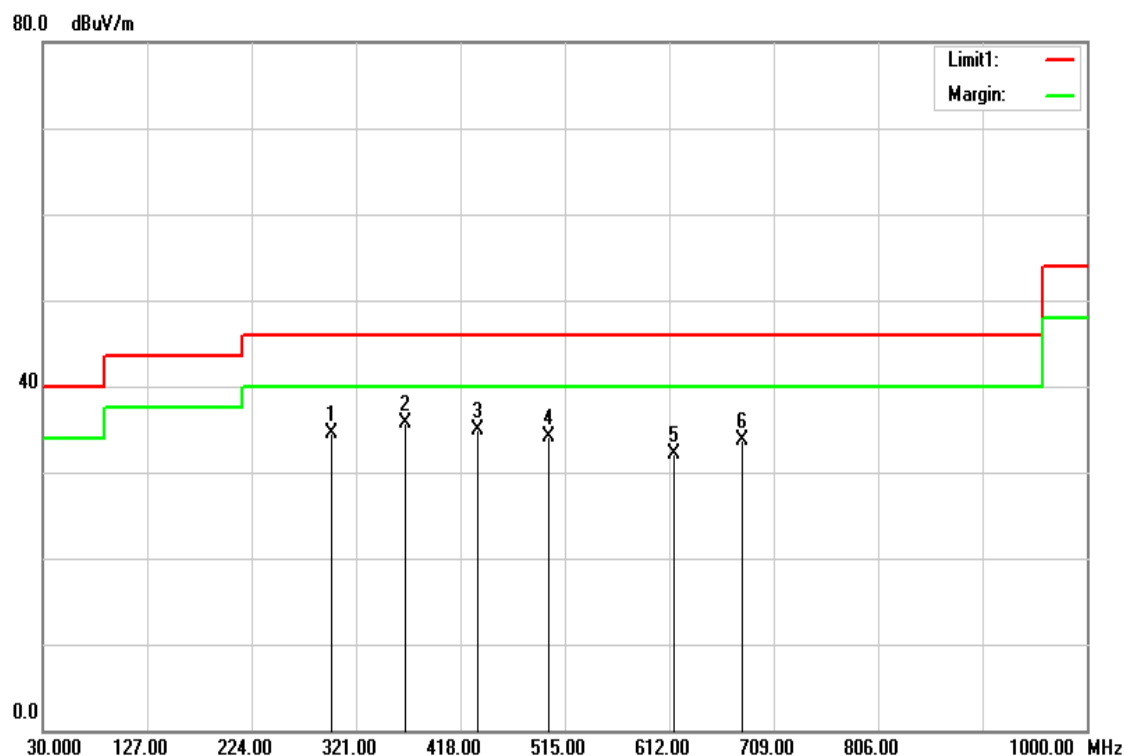
Below 1G Test Data

Test Mode:	BT Mode	Temp/Hum	27(°C)/ 53%RH
Test Item	30MHz-1GHz	Test Date	Jan 19, 2017
Polarize	Vertical	Test Engineer	Kevin Kuo
Detector	Peak and Qusi-peak	Test Voltage:	120Vac / 60Hz



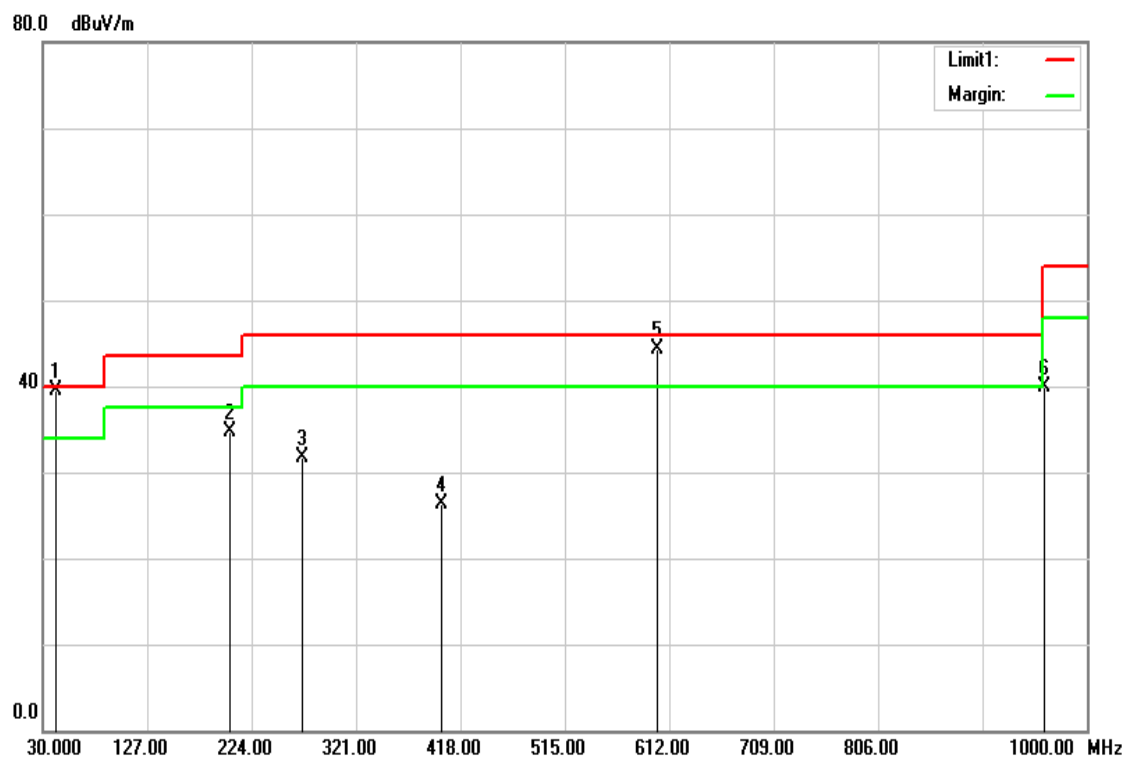
Frequency (MHz)	Reading (dBuV)	Correct Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
43.5800	50.05	-17.39	32.66	40.00	-7.34	QP
356.8900	44.74	-12.73	32.01	46.00	-13.99	Peak
420.9100	44.55	-11.07	33.48	46.00	-12.52	Peak
452.9200	49.70	-10.13	39.57	46.00	-6.43	Peak
615.8800	38.03	-7.38	30.65	46.00	-15.35	Peak
746.8300	42.09	-4.99	37.10	46.00	-8.90	Peak

Test Mode:	BT Mode	Temp/Hum	27(°C)/ 53%RH
Test Item	30MHz-1GHz	Test Date	Jan 10, 2017
Polarize	Horizontal	Test Engineer	Kevin Kuo
Detector	Peak and Qusi-peak	Test Voltage:	120Vac / 60Hz



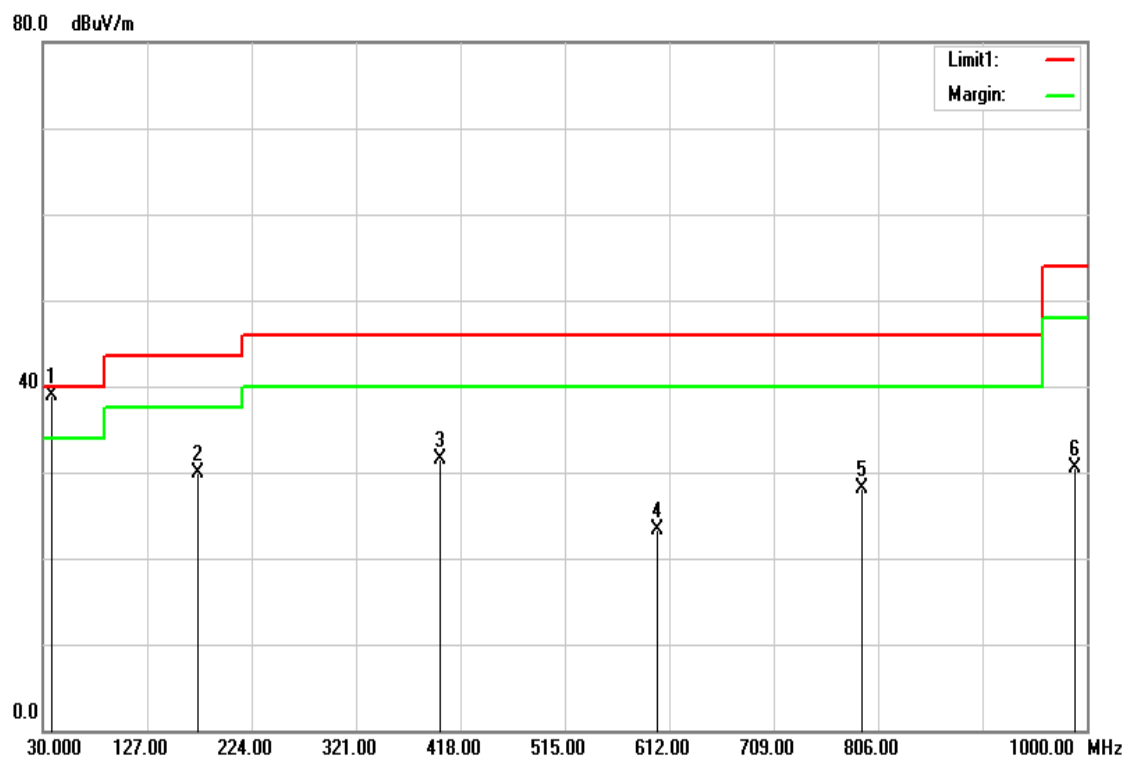
Frequency (MHz)	Reading (dBuV)	Correct Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
298.6900	48.70	-14.26	34.44	46.00	-11.56	Peak
366.5900	48.14	-12.50	35.64	46.00	-10.36	Peak
433.5200	45.66	-10.69	34.97	46.00	-11.03	Peak
499.4800	43.39	-9.25	34.14	46.00	-11.86	Peak
616.8500	39.54	-7.36	32.18	46.00	-13.82	Peak
679.9000	39.88	-6.27	33.61	46.00	-12.39	Peak

Test Mode:	Charger Mode	Temp/Hum	27(°C)/ 53%RH
Test Item	30MHz-1GHz	Test Date	Jan 19, 2017
Polarize	Horizontal	Test Engineer	Kevin Kuo
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
37.7600	52.53	-13.68	38.85	40.00	-1.15	QP
173.5600	46.96	-17.02	29.94	43.50	-13.56	Peak
399.5700	43.13	-11.71	31.42	46.00	-14.58	Peak
600.3600	30.97	-7.75	23.22	46.00	-22.78	Peak
791.4500	32.62	-4.57	28.05	46.00	-17.95	Peak
989.3300	32.28	-1.75	30.53	54.00	-23.47	Peak

Test Mode:	Charger Mode	Temp/Hum	27(°C)/ 53%RH
Test Item	30MHz-1GHz	Test Date	Jan 19, 2017
Polarize	Horizontal	Test Engineer	Kevin Kuo
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
37.7600	52.53	-13.68	38.85	40.00	-1.15	QP
173.5600	46.96	-17.02	29.94	43.50	-13.56	Peak
399.5700	43.13	-11.71	31.42	46.00	-14.58	Peak
600.3600	30.97	-7.75	23.22	46.00	-22.78	Peak
791.4500	32.62	-4.57	28.05	46.00	-17.95	Peak
989.3300	32.28	-1.75	30.53	54.00	-23.47	Peak