

# FCC Test Report

**FCC ID** : IPH-03924  
**Equipment** : Hideaway Marine Stereo  
**Model No.** : A03924  
**Brand Name** : FUSION  
**Applicant** : Garmin International, Inc.  
**Address** : 1200 E. 151st Street Olathe, KS 66062 United States  
**Standard** : 47 CFR FCC Part 15.247  
**Received Date** : Nov. 18, 2019  
**Tested Date** : Dec. 12 ~ Dec. 27, 2019

We, International Certification Corp., would like to declare that the tested sample has been evaluated and in compliance with the requirement of the above standards. The test results contained in this report refer exclusively to the product. It may be duplicated completely for legal use with the approval of the applicant. It shall not be reproduced except in full without the written approval of our laboratory.

Reviewed by:

  
Along Chen / Assistant Manager

Approved by:

  
Gary Chang / Manager



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## Release Record

Report No.	Version	Description	Issued Date
FR9N1801AD	Rev. 01	Initial issue	Mar. 11, 2020

## Summary of Test Results

FCC Rules	Test Items	Measured	Result
15.207	Conducted Emissions	Note <sup>1</sup>	N/A
15.247(d) 15.209	Radiated Emissions	[dBuV/m at 3m]: 675.05MHz 42.24 (Margin -3.76dB) - PK	Pass
15.247(d)	Band Edge	Meet the requirement of limit	Pass
15.247(b)(1)	Conducted Output Power	Power [dBm]: 9.98	Pass
15.247(a)(1)(iii)	Number of Hopping Channels	Meet the requirement of limit	Pass
15.247(a)(1)	Hopping Channel Separation	Meet the requirement of limit	Pass
15.247(a)(1)(iii)	Dwell Time	Meet the requirement of limit	Pass
15.203	Antenna Requirement	Meet the requirement of limit	Pass

N/A means Not Applicable.

Note<sup>1</sup>: The EUT consumes DC power, so the test is not required.

### Declaration of Conformity:

The test results with all measurement uncertainty excluded are presented in accordance with the regulation limits or requirements declared by manufacturers.

### Comments and Explanations:

The declared of product specification for EUT presented in the report are provided by the manufacturer, and the manufacturer takes all the responsibilities for the accuracy of product specification.

# 1 General Description

## 1.1 Information

### 1.1.1 Specification of the Equipment under Test (EUT)

RF General Information				
Frequency Range (MHz)	Bluetooth Mode	Ch. Frequency (MHz)	Channel Number	Data Rate
2400-2483.5	BR V4.2	2402-2480	0-78 [79]	1 Mbps
2400-2483.5	EDR V4.2	2402-2480	0-78 [79]	2 Mbps
2400-2483.5	EDR V4.2	2402-2480	0-78 [79]	3 Mbps
Note 1: RF output power specifies that Maximum Peak Conducted Output Power. Note 2: Bluetooth BR uses a GFSK. Note 3: Bluetooth EDR uses a combination of $\pi/4$ -DQPSK and 8DPSK.				

### 1.1.2 Antenna Details

Ant. No.	Type	Gain (dBi)	Connector	Remark
1	PIFA	1.08	---	---

### 1.1.3 Power Supply Type of Equipment under Test (EUT)

Power Supply Type	12Vdc
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### 1.1.4 Accessories

Accessories		
No.	Equipment	Description
1	Power cable	Brand: FUSION Model: Ca Assy, A Port, PWR/SPKR, FusConn 0.2m non-shielded without core
2	Audio cable 1	Brand: FUSION Model: Ca Assy, B Port, RCA, Zone 1, Zone 2, Aux, FusConn 0.2m non-shielded without core
3	Audio cable 2	Brand: FUSION Model: Ca Assy, E Port, Zone 3, FusConn 0.2m non-shielded without core

### 1.1.5 Channel List

Frequency band (MHz)				2400~2483.5			
Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
0	2402	20	2422	40	2442	60	2462
1	2403	21	2423	41	2443	61	2463
2	2404	22	2424	42	2444	62	2464
3	2405	23	2425	43	2445	63	2465
4	2406	24	2426	44	2446	64	2466
5	2407	25	2427	45	2447	65	2467
6	2408	26	2428	46	2448	66	2468
7	2409	27	2429	47	2449	67	2469
8	2410	28	2430	48	2450	68	2470
9	2411	29	2431	49	2451	69	2471
10	2412	30	2432	50	2452	70	2472
11	2413	31	2433	51	2453	71	2473
12	2414	32	2434	52	2454	72	2474
13	2415	33	2435	53	2455	73	2475
14	2416	34	2436	54	2456	74	2476
15	2417	35	2437	55	2457	75	2477
16	2418	36	2438	56	2458	76	2478
17	2419	37	2439	57	2459	77	2479
18	2420	38	2440	58	2460	78	2480
19	2421	39	2441	59	2461	---	---

### 1.1.6 Test Tool and Duty Cycle

EUT mode	BT Test & CBT control	
Duty Cycle and Duty Factor	Duty Cycle (%)	Duty Factor (dB)
DH5	78.66%	1.04
3DH5	79.42%	1.00

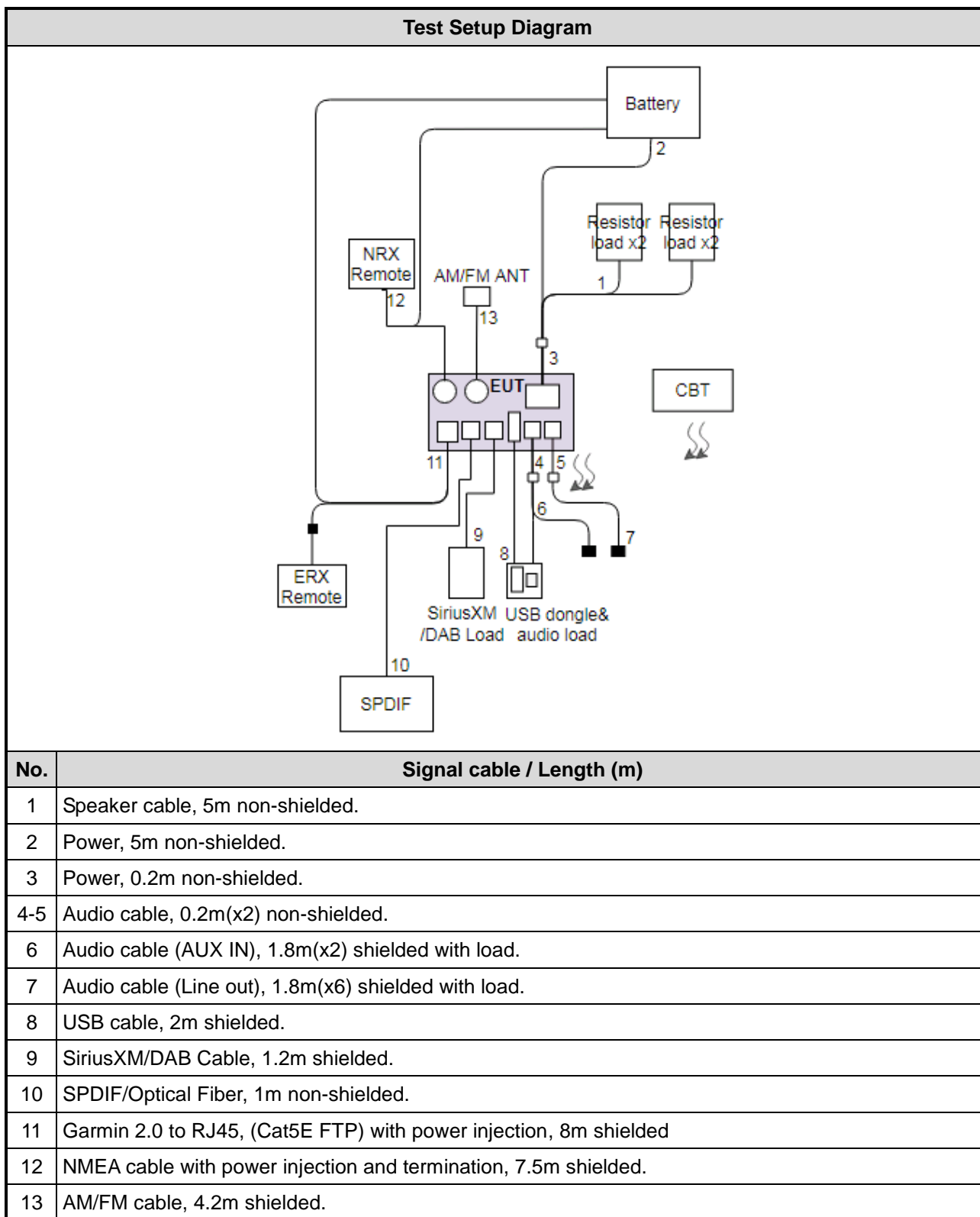
### 1.1.7 Power Index of Test Tool

Modulation Mode	Test Frequency (MHz)		
	2402	2441	2480
GFSK/1Mbps	Default	Default	Default
$\pi/4$ -DQPSK /2Mbps	Default	Default	Default
8DPSK/3Mbps	Default	Default	Default

## 1.2 Local Support Equipment List

Support Equipment List					
No.	Equipment	Brand	Model	FCC ID	Remarks
1	AM/FM ANT	Techbrands	AR-3250	---	Provided by applicant.
2	NRX Remote	FUSION	MS-NRX300	---	Provided by applicant.
3	Resistor load	FUSION	L25J4R0E	---	Provided by applicant.
4	SiriusXM /DAB Load	FUSION	25FBB52	---	Provided by applicant.
5	Audio Load x2	FUSION	H810KFZA	---	Provided by applicant.
6	USB Dongle	Strontium	Pollex 4 G	---	Provided by applicant.
7	power cable	FUSION	842716	---	Provided by applicant.
8	SPDIF / Optical Fiber	FUSION	FC100	---	Provided by applicant.
9	ERX Remote	FUSION	A03775	---	Provided by applicant.
10	USB cable	FUSION	FUC200	---	Provided by applicant.
11	ANT Wireless Stereo Remote	FUSION	A03344	---	Provided by applicant.
12	DC Cable	ICC	DCC-2m-R	---	---
13	DC Cable	ICC	DCC-2m-B	---	---
14	DC Battery	Top Lite	46B24L	---	---

### 1.3 Test Setup Chart



Note: AM/FM ANT and USB dongle & audio load are placed on testing table. The others are on remote testing area.



## 1.4 The Equipment List

<b>Test Item</b>	Radiated Emission				
<b>Test Site</b>	966 chamber1 / (03CH01-WS)				
<b>Test Date</b>	Dec. 12 ~ Dec. 13, 2019				
<b>Instrument</b>	<b>Manufacturer</b>	<b>Model No.</b>	<b>Serial No.</b>	<b>Calibration Date</b>	<b>Calibration Until</b>
Spectrum Analyzer	R&S	FSV40	101498	Dec. 27, 2018	Dec. 26, 2019
Receiver	Agilent	N9038A	MY53290044	Sep. 17, 2019	Sep. 16, 2020
Bilog Antenna	SCHWARZBECK	VULB9168	VULB9168-522	Jul. 12, 2019	Jul. 11, 2020
Horn Antenna 1G-18G	SCHWARZBECK	BBHA 9120 D	BBHA 9120 D 1095	Sep. 26, 2019	Sep. 25, 2020
Horn Antenna 18G-40G	SCHWARZBECK	BBHA 9170	BBHA 9170517	Nov. 15, 2019	Nov. 14, 2020
Loop Antenna	R&S	HFH2-Z2	100330	Nov. 13, 2019	Nov. 12, 2020
Loop Antenna Cable	KOAX KABEL	101354-BW	101354-BW	Oct. 07, 2019	Oct. 06, 2020
Preamplifier	EMC	EMC02325	980225	Jul. 09, 2019	Jul. 08, 2020
Preamplifier	Agilent	83017A	MY39501308	Oct. 08, 2019	Oct. 07, 2020
Preamplifier	EMC	EMC184045B	980192	Aug. 01, 2019	Jul. 31, 2020
RF Cable	EMC	EMC104-SM-SM-80 00	181106	Oct. 07, 2019	Oct. 06, 2020
RF Cable	HUBER+SUHNER	SUCOFLEX104	MY16019/4	Oct. 07, 2019	Oct. 06, 2020
RF Cable	HUBER+SUHNER	SUCOFLEX104	MY16014/4	Oct. 07, 2019	Oct. 06, 2020
LF cable 1M	EMC	EMCCFD400-NM-N M-1000	160502	Oct. 07, 2019	Oct. 06, 2020
LF cable 3M	Woken	CFD400NL-LW	CFD400NL-001	Oct. 07, 2019	Oct. 06, 2020
LF cable 10M	Woken	CFD400NL-LW	CFD400NL-002	Oct. 07, 2019	Oct. 06, 2020
Measurement Software	AUDIX	e3	6.120210g	NA	NA
Note: Calibration Interval of instruments listed above is one year.					

<b>Test Item</b>	RF Conducted				
<b>Test Site</b>	(TH01-WS)				
<b>Test Date</b>	Dec. 27, 2019				
<b>Instrument</b>	<b>Manufacturer</b>	<b>Model No.</b>	<b>Serial No.</b>	<b>Calibration Date</b>	<b>Calibration Until</b>
Spectrum Analyzer	R&S	FSV40	101063	Apr. 17, 2019	Apr. 16, 2020
Power Meter	Anritsu	ML2495A	1241002	Oct. 23, 2019	Oct. 22, 2020
Power Sensor	Anritsu	MA2411B	1207366	Oct. 23, 2019	Oct. 22, 2020
DC POWER SOURCE	GW INSTEK	GPC-6030D	GES855395	Oct. 29, 2019	Oct. 28, 2020
Measurement Software	ICC	SENSE-15247_FS	V5.10.1	NA	NA
Bluetooth Tester	R&S	CBT	100959	Oct. 18, 2019	Oct. 17, 2020
Note: Calibration Interval of instruments listed above is one year.					

## 1.5 Test Standards

According to the specification of EUT, the EUT must comply with following standards and KDB documents.

47 CFR FCC Part 15.247

ANSI C63.10-2013

FCC KDB 558074 D01 15.247 Meas Guidance v05r02

## 1.6 Deviation from Test Standard and Measurement Procedure

None

## 1.7 Measurement Uncertainty

ISO/IEC 17025 requires that an estimate of the measurement uncertainties associated with the emissions test results be included in the report. The measurement uncertainties given below are based on a 95% confidence level (based on a coverage factor ( $k=2$ ))

Measurement Uncertainty	
Parameters	Uncertainty
Bandwidth	$\pm 34.130$ Hz
Conducted power	$\pm 0.808$ dB
Power density	$\pm 0.583$ dB
Conducted emission	$\pm 2.715$ dB
AC conducted emission	$\pm 2.92$ dB
Radiated emission $\leq 1$ GHz	$\pm 3.41$ dB
Radiated emission $> 1$ GHz	$\pm 4.59$ dB

## 2 Test Configuration

### 2.1 Testing Condition

Test Item	Test Site	Ambient Condition	Tested By
Radiated Emissions	03CH01-WS	23-24°C / 62-66%	Akun Chung
RF Conducted	TH01-WS	22°C / 63%	Brad Wu

- FCC Designation No.: TW2732
- FCC site registration No.: 181692
- ISSED#: 10807A
- CAB identifier: TW2732

### 2.2 The Worst Test Modes and Channel Details

Test item	Mode	Test Frequency (MHz)	Data Rate (Mbps)	Test Configuration
Radiated Emissions $\leq$ 1GHz	GFSK	2402	1Mbps	---
Radiated Emissions > 1GHz	GFSK 8DPSK	2402, 2441, 2480 2402, 2441, 2480	1Mbps 3Mbps	---
Conducted Output Power	GFSK π/4 DQPSK 8DPSK	2402, 2441, 2480 2402, 2441, 2480 2402, 2441, 2480	1Mbps 2Mbps 3Mbps	---
Number of Hopping Channels	GFSK π/4 DQPSK 8DPSK	2402~2480 2402~2480 2402~2480	1Mbps 2Mbps 3Mbps	---
Hopping Channel Separation 20dB and Occupied bandwidth	GFSK π/4 DQPSK 8DPSK	2402, 2441, 2480 2402, 2441, 2480 2402, 2441, 2480	1Mbps 2Mbps 3Mbps	---
Dwell Time	GFSK π/4 DQPSK 8DPSK	2441 2441 2441	1Mbps 2Mbps 3Mbps	---

### 3 Transmitter Test Results

#### 3.1 Unwanted Emissions into Restricted Frequency Bands

##### 3.1.1 Limit of Unwanted Emissions into Restricted Frequency Bands

Restricted Band Emissions Limit			
Frequency Range (MHz)	Field Strength (uV/m)	Field Strength (dBuV/m)	Measure Distance (m)
0.009~0.490	2400/F(kHz)	48.5 - 13.8	300
0.490~1.705	24000/F(kHz)	33.8 - 23	30
1.705~30.0	30	29	30
30~88	100	40	3
88~216	150	43.5	3
216~960	200	46	3
Above 960	500	54	3

**Note 1:**  
Qusai-Peak value is measured for frequency below 1GHz except for 9–90 kHz, 110–490 kHz frequency band. Peak and average value are measured for frequency above 1GHz. The limit on average radio frequency emission is as above table. The limit on peak radio frequency emissions is 20 dB above the maximum permitted average emission limit

**Note 2:**  
Measurements may be performed at a distance other than what is specified provided. When performing measurements at a distance other than that specified, the results shall be extrapolated to the specified distance using an extrapolation factor as below, Frequency at or above 30 MHz: 20 dB/decade Frequency below 30 MHz: 40 dB/decade.

### 3.1.2 Test Procedures

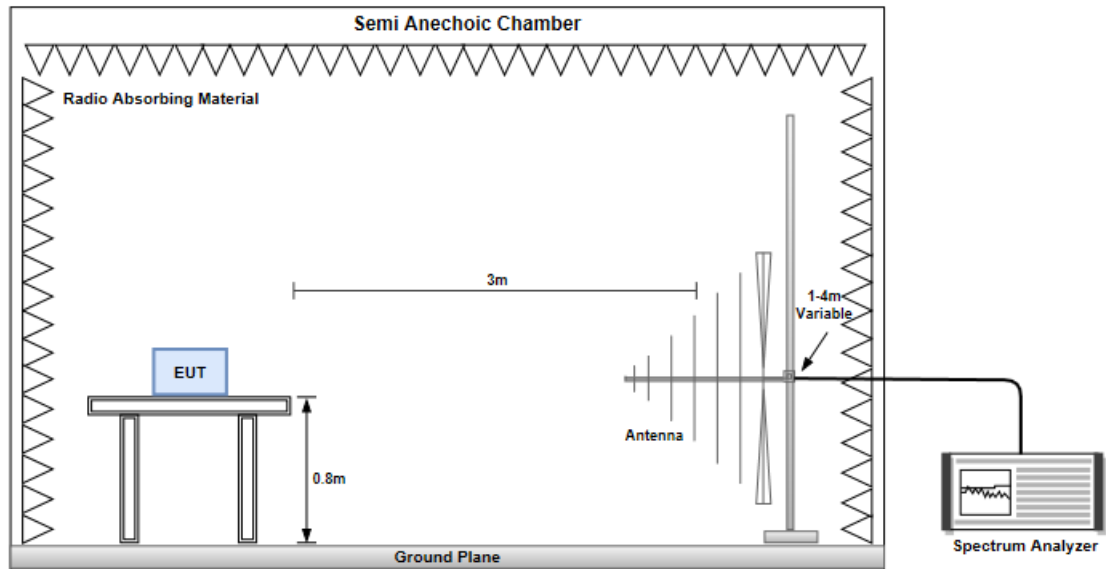
1. Measurement is made at a semi-anechoic chamber that incorporates a turntable allowing a EUT rotation of 360°. A continuously-rotating, remotely-controlled turntable is installed at the test site to support the EUT and facilitate determination of the direction of maximum radiation for each EUT emission frequency. The EUT is placed at test table. For emissions testing at or below 1 GHz, the table height is 80 cm above the reference ground plane. For emission measurements above 1 GHz, the table height is 1.5 m
2. Measurement is made with the antenna positioned in both the horizontal and vertical planes of polarization. The measurement antenna is varied in height (1m ~ 4m) above the reference ground plane to obtain the maximum signal strength. Distance between EUT and antenna is 3 m.
3. This investigation is performed with the EUT rotated 360°, the antenna height scanned between 1 m and 4 m, and the antenna rotated to repeat the measurements for both the horizontal and vertical antenna polarizations.

Note:

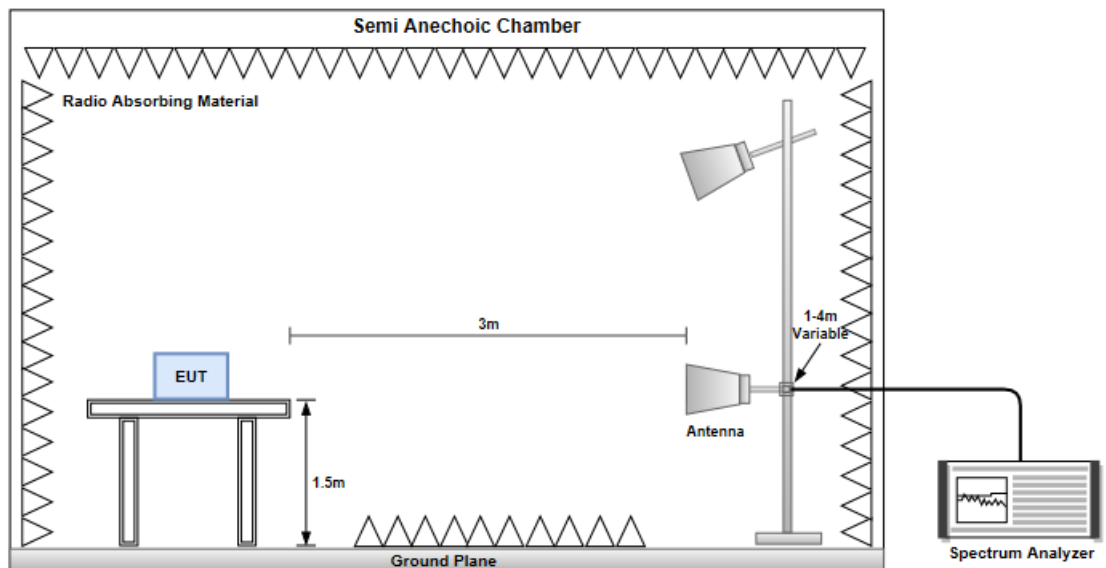
1. 120kHz measurement bandwidth of test receiver and Quasi-peak detector is for radiated emission below 1GHz.
2. Radiated emission above 1GHz / Peak value  
RBW=1MHz, VBW=3MHz and Peak detector  
Radiated emission above 1GHz / Average value for harmonics  
The average value is: Average = Peak value + 20log(Duty cycle) Where the duty factor is calculated from following formula for DH5 packet type which has worst duty factor:
3.
$$20\log (\text{Duty cycle}) = 20\log \frac{1\text{s} / 1600 * 5}{100 \text{ ms}} = -30.1\text{dB}$$
4. Radiated emission above 1GHz / Average value for other emissions  
RBW=1MHz, VBW=1/T and Peak detector

### 3.1.3 Test Setup

#### Radiated Emissions below 1 GHz

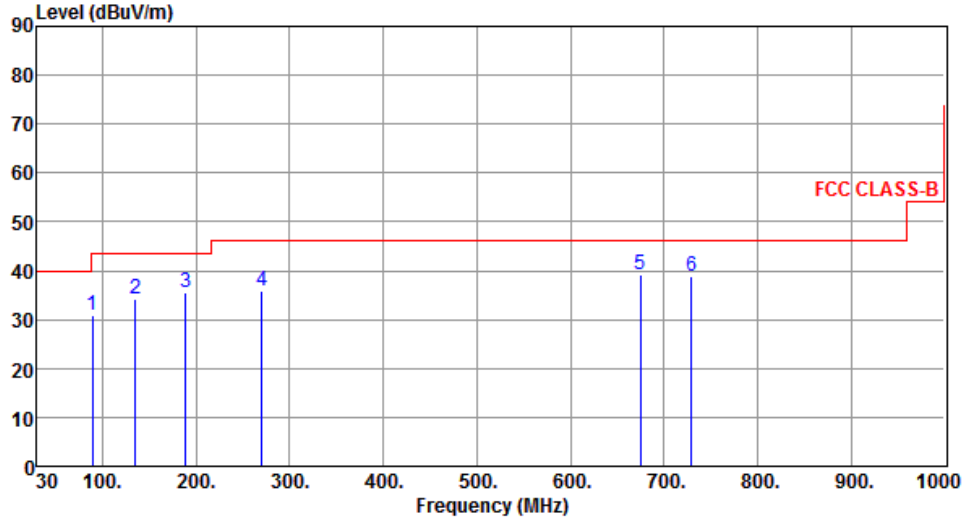


#### Radiated Emissions above 1 GHz



### 3.1.4 Transmitter Radiated Unwanted Emissions (Below 1GHz)

Modulation	GFSK	Test Freq. (MHz)	2402
Polarization	Horizontal		

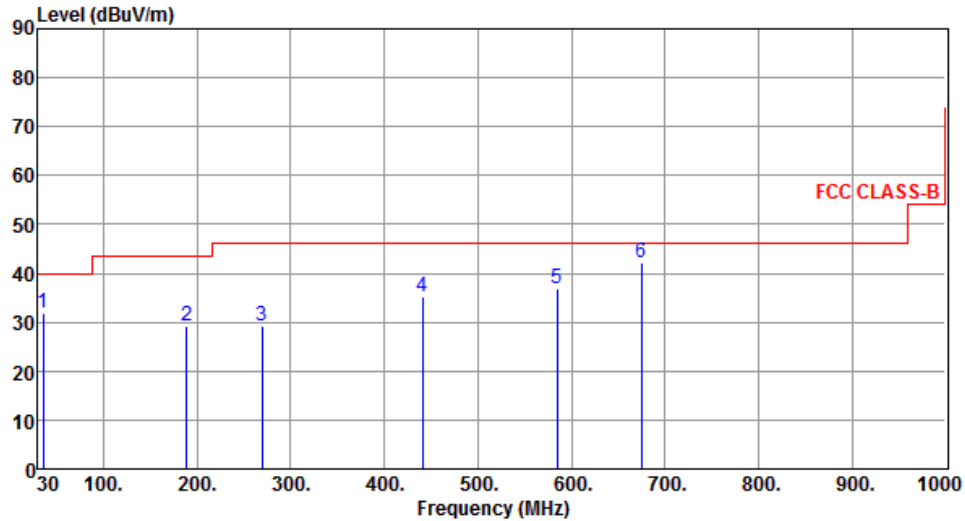
  


The graph displays the radiated unwanted emissions for a transmitter. The y-axis represents the Level in dBUV/m, ranging from 0 to 90. The x-axis represents the Frequency in MHz, ranging from 30 to 1000. A red line indicates the FCC CLASS-B limit, which is 40 dBUV/m from 30 to 100 MHz, 45 dBUV/m from 100 to 1000 MHz. Six measured peaks are labeled with blue numbers 1 through 6. The data for these peaks is provided in the table below.

	Freq. MHz	Emission level dBUV/m	Limit dBUV/m	Margin dB	SA reading dBUV	Factor dB	Remark	ANT High cm	Turn Table deg
1	89.17	30.85	43.50	-12.65	45.12	-14.27	Peak	---	---
2	134.76	34.08	43.50	-9.42	43.27	-9.19	Peak	---	---
3	189.08	35.56	43.50	-7.94	46.75	-11.19	Peak	---	---
4	270.56	35.96	46.00	-10.04	45.01	-9.05	Peak	---	---
5	675.05	39.20	46.00	-6.80	39.09	0.11	Peak	---	---
6	729.37	38.88	46.00	-7.12	37.79	1.09	Peak	---	---

Note 1: Emission Level (dBUV/m) = SA Reading (dBUV/m) + Factor\* (dB)  
\*Factor includes antenna factor , cable loss and amplifier gain  
Note 2: Margin (dB) = Emission level (dBUV/m) – Limit (dBUV/m).  
Note 3: All spurious emissions below 30MHz are more than 20 dB below the limit.

Modulation	GFSK	Test Freq. (MHz)	2402
Polarization	Vertical		



	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
1	35.82	31.75	40.00	-8.25	40.90	-9.15	Peak	---	---
2	189.08	29.20	43.50	-14.30	40.39	-11.19	Peak	---	---
3	269.59	29.16	46.00	-16.84	38.27	-9.11	Peak	---	---
4	441.28	35.28	46.00	-10.72	39.55	-4.27	Peak	---	---
5	584.84	36.76	46.00	-9.24	38.16	-1.40	Peak	---	---
6	675.05	42.24	46.00	-3.76	42.13	0.11	Peak	---	---

Note 1: Emission Level (dBuV/m) = SA Reading (dBuV/m) + Factor\* (dB)

\*Factor includes antenna factor , cable loss and amplifier gain

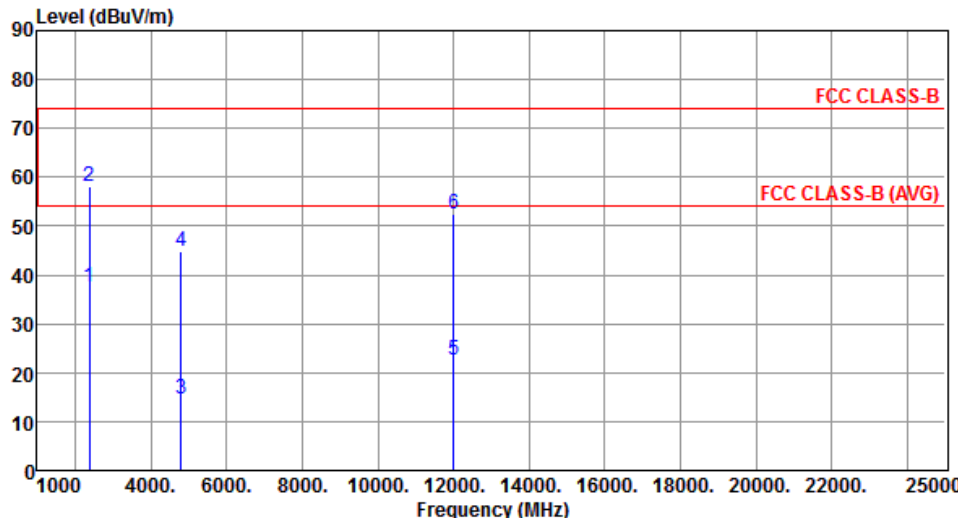
Note 2: Margin (dB) = Emission level (dBuV/m) – Limit (dBuV/m).

Note 3: All spurious emissions below 30MHz are more than 20 dB below the limit.



### 3.1.5 Transmitter Radiated Unwanted Emissions (Above 1GHz) for GFSK

Modulation	GFSK		Test Freq. (MHz)		2402	
Polarization	Horizontal					



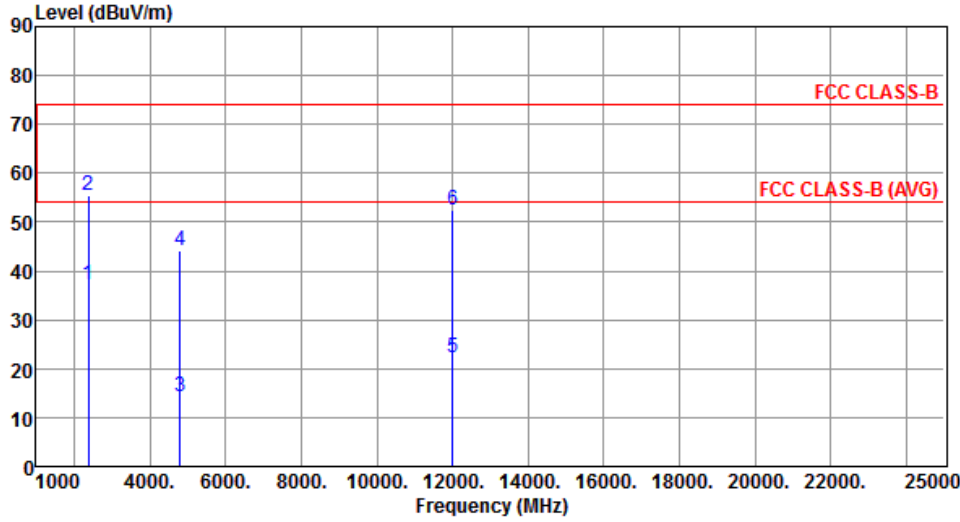
	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
1	2390.00	37.65	54.00	-16.35	40.47	-2.82	Average	306	51
2	2390.00	58.05	74.00	-15.95	60.87	-2.82	Peak	306	51
3	4804.00	14.65	54.00	-39.35	11.14	3.51	Average	100	66
4	4804.00	44.75	74.00	-29.25	41.24	3.51	Peak	100	66
5	12010.00	22.46	54.00	-31.54	8.54	13.92	Average	100	133
6	12010.00	52.56	74.00	-21.44	38.64	13.92	Peak	100	133

Note 1: Emission Level (dBuV/m) = SA Reading (dBuV/m) + Factor\* (dB)

\*Factor includes antenna factor , cable loss and amplifier gain

Note 2: Margin (dB) = Emission level (dBuV/m) – Limit (dBuV/m).

Modulation	GFSK	Test Freq. (MHz)	2402
Polarization	Vertical		

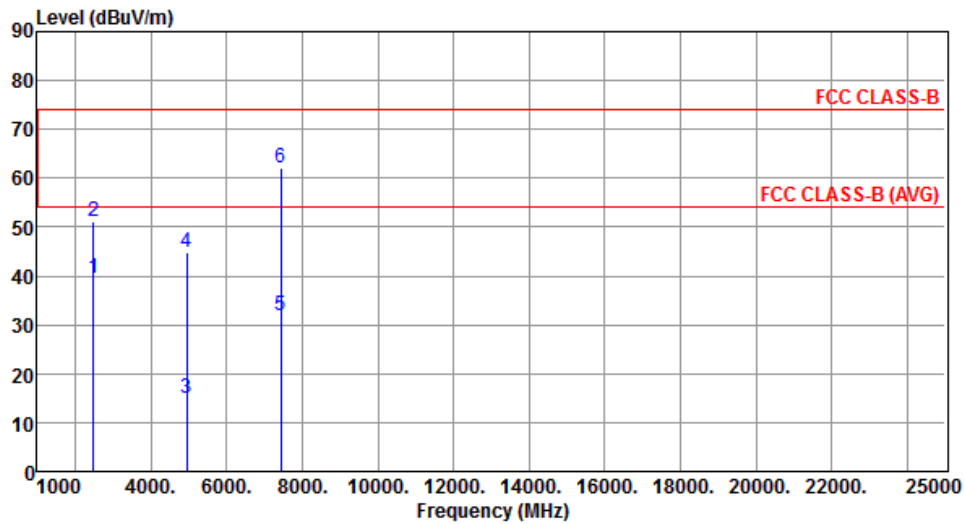
	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
1	2390.00	37.26	54.00	-16.74	40.08	-2.82	Average	148	313
2	2390.00	55.41	74.00	-18.59	58.23	-2.82	Peak	148	313
3	4804.00	14.15	54.00	-39.85	10.64	3.51	Average	100	20
4	4804.00	44.25	74.00	-29.75	40.74	3.51	Peak	100	20
5	12010.00	22.39	54.00	-31.61	8.47	13.92	Average	100	252
6	12010.00	52.49	74.00	-21.51	38.57	13.92	Peak	100	252

Note 1: Emission Level (dBuV/m) = SA Reading (dBuV/m) + Factor\* (dB)  
\*Factor includes antenna factor , cable loss and amplifier gain  
Note 2: Margin (dB) = Emission level (dBuV/m) – Limit (dBuV/m).

Modulation	GFSK	Test Freq. (MHz)	2441
Polarization	Horizontal		
<div><div><div>Level 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Modulation	GFSK	Test Freq. (MHz)	2480
Polarization	Horizontal		



	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
1	2483.50	39.58	54.00	-14.42	42.48	-2.90	Average	290	51
2	2483.50	51.01	74.00	-22.99	53.91	-2.90	Peak	290	51
3	4960.00	14.83	54.00	-39.17	11.02	3.81	Average	100	321
4	4960.00	44.93	74.00	-29.07	41.12	3.81	Peak	100	321
5	7440.00	31.99	54.00	-22.01	22.92	9.07	Average	100	49
6	7440.00	62.09	74.00	-11.91	53.02	9.07	Peak	100	49

Note 1: Emission Level (dBuV/m) = SA Reading (dBuV/m) + Factor\* (dB)

\*Factor includes antenna factor , cable loss and amplifier gain

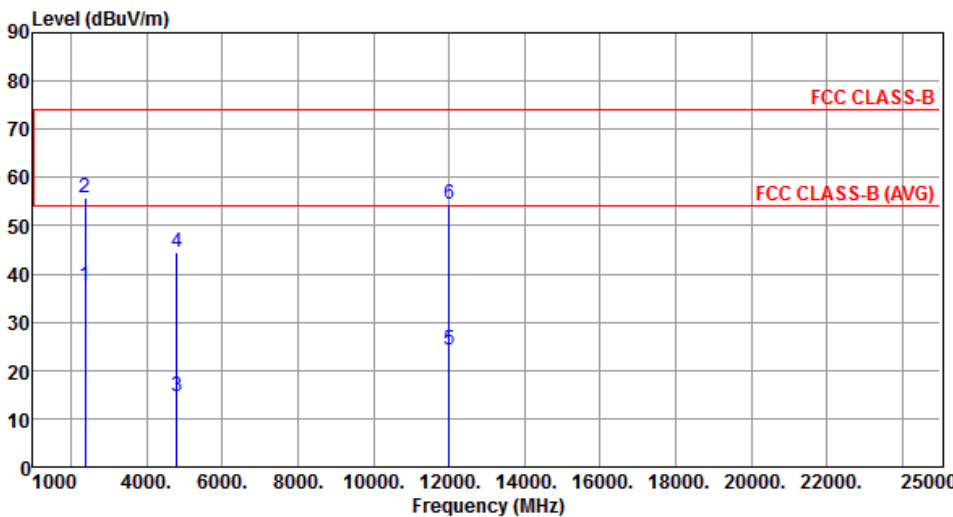
Note 2: Margin (dB) = Emission level (dBuV/m) – Limit (dBuV/m).

Modulation	GFSK	Test Freq. (MHz)	2480																																																																						
Polarization	Vertical																																																																								
<div><div><div>Level (dBuV/m)</div><div><div><div><div><div><div>90</div><div>80</div><div>70</div><div>60</div><div>50</div><div>40</div><div>30</div><div>20</div><div>10</div><div>0</div></div><div><div><div><div>1000</div><div>4000</div><div>6000</div><div>8000</div><div>10000</div><div>12000</div><div>14000</div><div>16000</div><div>18000</div><div>20000</div><div>22000</div><div>25000</div></div></div><div>Frequency (MHz)</div></div></div><div><div><div><div>2</div><div>4</div><div>6</div></div><div><div>1</div><div>3</div><div>5</div></div></div><div><div><div>FCC CLASS-B</div><div>FCC CLASS-B (AVG)</div></div></div></div></div><table><thead><tr><th></th><th>Freq. MHz</th><th>Emission level dBuV/m</th><th>Limit dBuV/m</th><th>Margin dB</th><th>SA reading dBuV</th><th>Factor dB</th><th>Remark</th><th>ANT High cm</th><th>Turn Table deg</th></tr></thead><tbody><tr><td>1</td><td>2483.50</td><td>39.95</td><td>54.00</td><td>-14.05</td><td>42.85</td><td>-2.90</td><td>Average</td><td>128</td><td>306</td></tr><tr><td>2</td><td>2483.50</td><td>53.29</td><td>74.00</td><td>-20.71</td><td>56.19</td><td>-2.90</td><td>Peak</td><td>128</td><td>306</td></tr><tr><td>3</td><td>4960.00</td><td>15.12</td><td>54.00</td><td>-38.88</td><td>11.31</td><td>3.81</td><td>Average</td><td>100</td><td>31</td></tr><tr><td>4</td><td>4960.00</td><td>45.22</td><td>74.00</td><td>-28.78</td><td>41.41</td><td>3.81</td><td>Peak</td><td>100</td><td>31</td></tr><tr><td>5</td><td>7440.00</td><td>30.69</td><td>54.00</td><td>-23.31</td><td>21.62</td><td>9.07</td><td>Average</td><td>100</td><td>81</td></tr><tr><td>6</td><td>7440.00</td><td>60.79</td><td>74.00</td><td>-13.21</td><td>51.72</td><td>9.07</td><td>Peak</td><td>100</td><td>81</td></tr></tbody></table><div><div>Note 1: Emission Level (dBuV/m) = SA Reading (dBuV/m) + Factor* (dB) *Factor includes antenna factor , cable loss and amplifier gain</div><div>Note 2: Margin (dB) = Emission level (dBuV/m) – Limit (dBuV/m).</div></div></div></div></div></div>					Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg	1	2483.50	39.95	54.00	-14.05	42.85	-2.90	Average	128	306	2	2483.50	53.29	74.00	-20.71	56.19	-2.90	Peak	128	306	3	4960.00	15.12	54.00	-38.88	11.31	3.81	Average	100	31	4	4960.00	45.22	74.00	-28.78	41.41	3.81	Peak	100	31	5	7440.00	30.69	54.00	-23.31	21.62	9.07	Average	100	81	6	7440.00	60.79	74.00	-13.21	51.72	9.07	Peak	100	81
	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg																																																																
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5	7440.00	30.69	54.00	-23.31	21.62	9.07	Average	100	81																																																																
6	7440.00	60.79	74.00	-13.21	51.72	9.07	Peak	100	81																																																																

### 3.1.6 Transmitter Radiated Unwanted Emissions (Above 1GHz) for 8DPSK

Modulation	8DPSK	Test Freq. (MHz)	2402																																																																																										
Polarization	Horizontal																																																																																												
<div><div><div>Level (dBuV/m)</div><div><div><div><div><div><div>90</div><div>80</div><div>70</div><div>60</div><div>50</div><div>40</div><div>30</div><div>20</div><div>10</div><div>0</div></div><div><div><div><div>1</div><div>2</div><div>3</div><div>4</div><div>5</div><div>6</div></div><div><div><div><div>1000</div><div>4000</div><div>6000</div><div>8000</div><div>10000</div><div>12000</div><div>14000</div><div>16000</div><div>18000</div><div>20000</div><div>22000</div><div>25000</div></div></div></div><div>Frequency (MHz)</div></div><div><div><div>FCC CLASS-B</div><div>FCC CLASS-B (AVG)</div></div></div></div></div><table><tr><th></th><th>Freq.</th><th>Emission</th><th>Limit</th><th>Margin</th><th>SA</th><th>Factor</th><th>Remark</th><th>ANT</th><th>Turn</th></tr><tr><th></th><th>MHz</th><th>level</th><th>dBuV/m</th><th>dB</th><th>reading</th><th>dB</th><th></th><th>High</th><th>Table</th></tr><tr><th></th><th></th><th>dBuV/m</th><th></th><th></th><th>dBuV</th><th></th><th></th><th>cm</th><th>deg</th></tr><tr><td>1</td><td>2390.00</td><td>37.73</td><td>54.00</td><td>-16.27</td><td>40.55</td><td>-2.82</td><td>Average</td><td>303</td><td>53</td></tr><tr><td>2</td><td>2390.00</td><td>57.60</td><td>74.00</td><td>-16.40</td><td>60.42</td><td>-2.82</td><td>Peak</td><td>303</td><td>53</td></tr><tr><td>3</td><td>4804.00</td><td>14.38</td><td>54.00</td><td>-39.62</td><td>10.87</td><td>3.51</td><td>Average</td><td>100</td><td>67</td></tr><tr><td>4</td><td>4804.00</td><td>44.48</td><td>74.00</td><td>-29.52</td><td>40.97</td><td>3.51</td><td>Peak</td><td>100</td><td>67</td></tr><tr><td>5</td><td>12010.00</td><td>24.26</td><td>54.00</td><td>-29.74</td><td>10.34</td><td>13.92</td><td>Average</td><td>100</td><td>133</td></tr><tr><td>6</td><td>12010.00</td><td>54.36</td><td>74.00</td><td>-19.64</td><td>40.44</td><td>13.92</td><td>Peak</td><td>100</td><td>133</td></tr></table></div></div></div></div></div>					Freq.	Emission	Limit	Margin	SA	Factor	Remark	ANT	Turn		MHz	level	dBuV/m	dB	reading	dB		High	Table			dBuV/m			dBuV			cm	deg	1	2390.00	37.73	54.00	-16.27	40.55	-2.82	Average	303	53	2	2390.00	57.60	74.00	-16.40	60.42	-2.82	Peak	303	53	3	4804.00	14.38	54.00	-39.62	10.87	3.51	Average	100	67	4	4804.00	44.48	74.00	-29.52	40.97	3.51	Peak	100	67	5	12010.00	24.26	54.00	-29.74	10.34	13.92	Average	100	133	6	12010.00	54.36	74.00	-19.64	40.44	13.92	Peak	100	133
	Freq.	Emission	Limit	Margin	SA	Factor	Remark	ANT	Turn																																																																																				
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<div><div>Note 1: Emission Level (dBuV/m) = SA Reading (dBuV/m) + Factor* (dB)</div><div>*Factor includes antenna factor , cable loss and amplifier gain</div><div>Note 2: Margin (dB) = Emission level (dBuV/m) – Limit (dBuV/m).</div></div>																																																																																													

Modulation	8DPSK	Test Freq. (MHz)	2402
Polarization	Vertical		

	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
1	2390.00	37.45	54.00	-16.55	40.27	-2.82	Average	151	312
2	2390.00	55.63	74.00	-18.37	58.45	-2.82	Peak	151	312
3	4804.00	14.54	54.00	-39.46	11.03	3.51	Average	100	27
4	4804.00	44.64	74.00	-29.36	41.13	3.51	Peak	100	27
5	12010.00	24.24	54.00	-29.76	10.32	13.92	Average	100	255
6	12010.00	54.34	74.00	-19.66	40.42	13.92	Peak	100	255

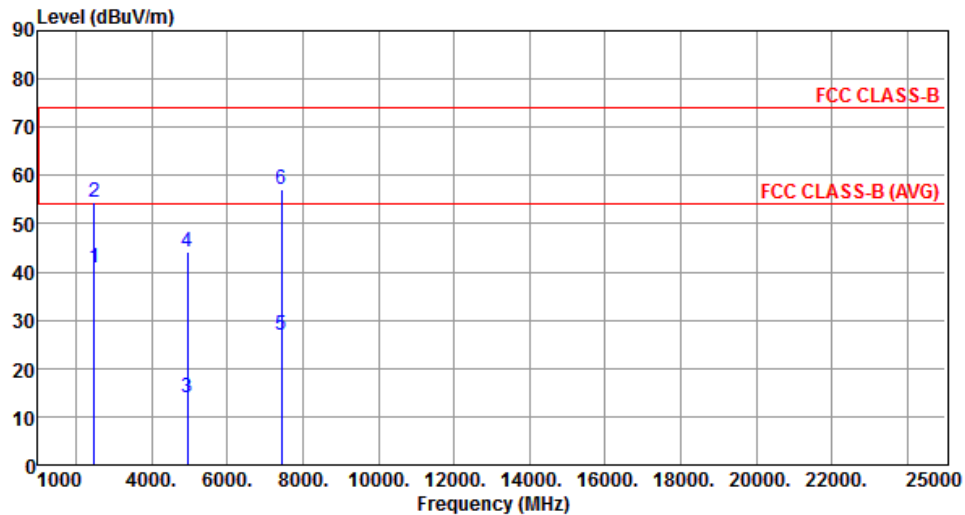
Note 1: Emission Level (dBuV/m) = SA Reading (dBuV/m) + Factor\* (dB)  
\*Factor includes antenna factor , cable loss and amplifier gain  
Note 2: Margin (dB) = Emission level (dBuV/m) – Limit (dBuV/m).



Modulation	8DPSK	Test Freq. (MHz)	2441
Polarization	Horizontal		
<div><div><div>Level (dBuV/m)</div><div><div><div><div><div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div>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Modulation	8DPSK	Test Freq. (MHz)	2441
Polarization	Vertical		
<div><div><div>Level (dBuV/m)</div><div><div><div><div><div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div>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Modulation	8DPSK	Test Freq. (MHz)	2480
Polarization	Horizontal		



	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
1	2483.50	40.70	54.00	-13.30	43.60	-2.90	Average	286	52
2	2483.50	54.35	74.00	-19.65	57.25	-2.90	Peak	286	52
3	4960.00	14.08	54.00	-39.92	10.27	3.81	Average	100	322
4	4960.00	44.18	74.00	-29.82	40.37	3.81	Peak	100	322
5	7440.00	26.88	54.00	-27.12	17.81	9.07	Average	100	47
6	7440.00	56.98	74.00	-17.02	47.91	9.07	Peak	100	47

Note 1: Emission Level (dBuV/m) = SA Reading (dBuV/m) + Factor\* (dB)

\*Factor includes antenna factor , cable loss and amplifier gain

Note 2: Margin (dB) = Emission level (dBuV/m) – Limit (dBuV/m).

Modulation	8DPSK	Test Freq. (MHz)	2480
Polarization	Vertical		
<div><div><div>Level (dBuV/m)</div><div><div><div><div><div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div>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## 3.2 Unwanted Emissions into Non-Restricted Frequency Bands

### 3.2.1 Limit of Unwanted Emissions into Non-Restricted Frequency Bands

Peak power in any 100 kHz bandwidth outside of the authorized frequency band shall be attenuated by at least 20 dB relative to the maximum in-band peak PSD level in 100 kHz.

### 3.2.2 Test Procedures

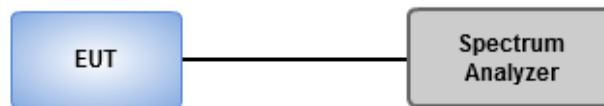
#### Reference level measurement

1. Set RBW=100kHz, VBW = 300kHz , Detector = Peak, Sweep time = Auto
2. Trace = max hold , Allow Trace to fully stabilize
3. Use the peak marker function to determine the maximum PSD level

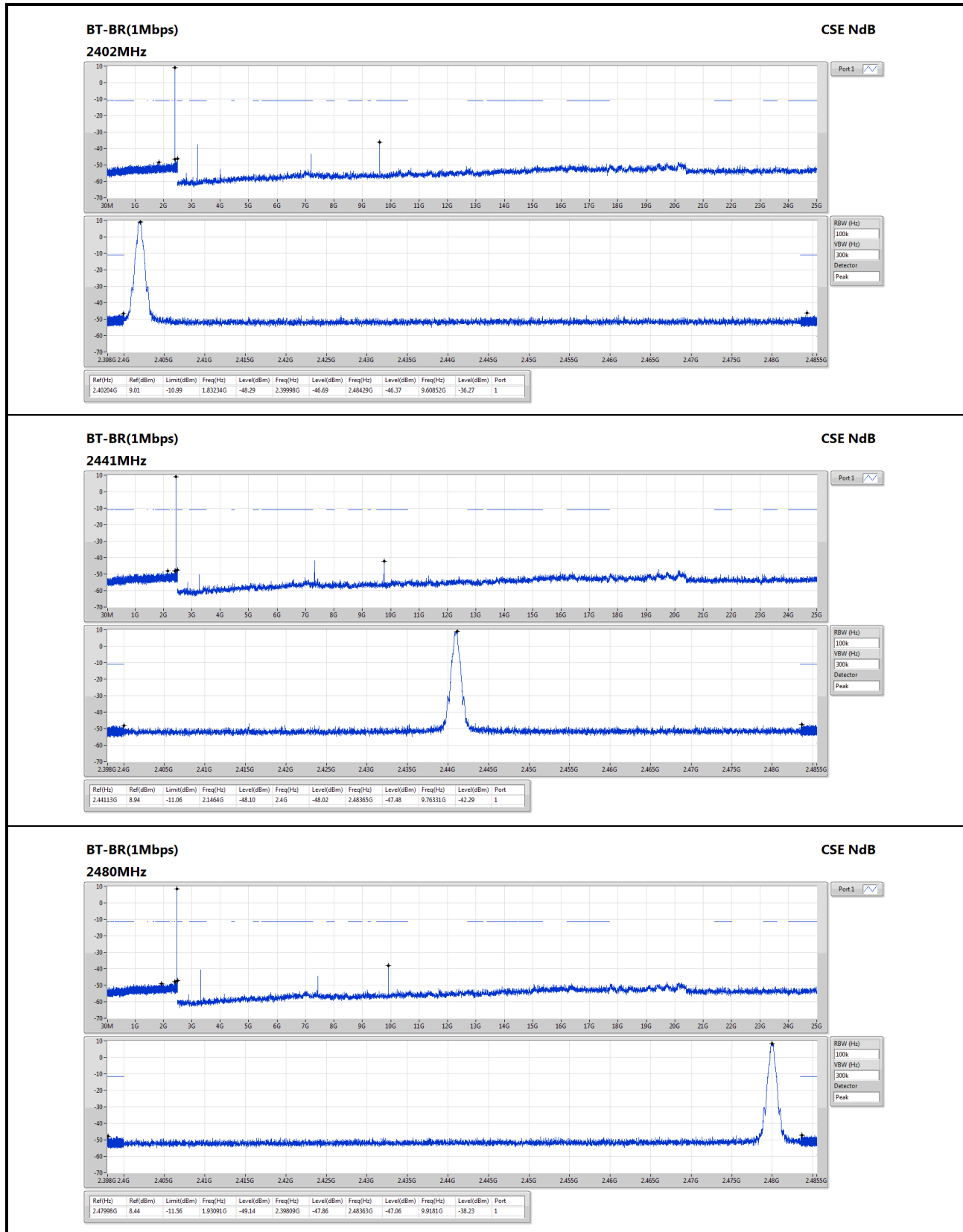
#### Emission level measurement

1. Set RBW=100kHz, VBW = 300kHz , Detector = Peak, Sweep time = Auto
2. Trace = max hold , Allow Trace to fully stabilize
3. Scan Frequency range is up to 25GHz
4. Use the peak marker function to determine the maximum amplitude level

### 3.2.3 Test Setup



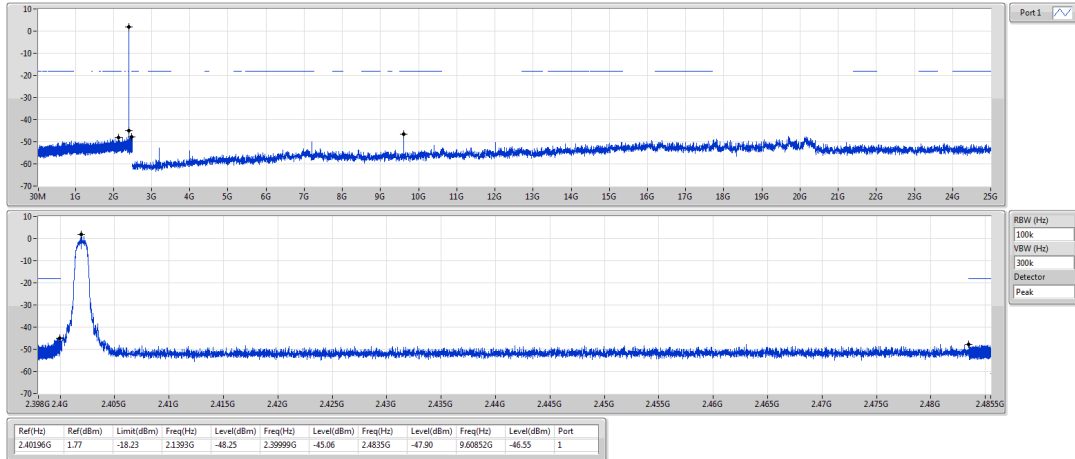
### 3.2.4 Unwanted Emissions into Non-Restricted Frequency Bands



### BT-EDR(2Mbps)

CSE NdB

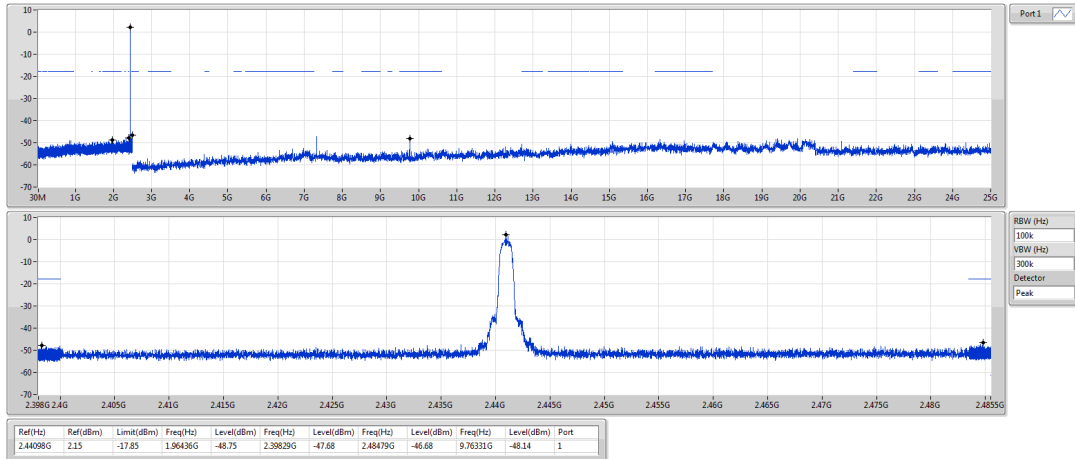
2402MHz



### BT-EDR(2Mbps)

CSE NdB

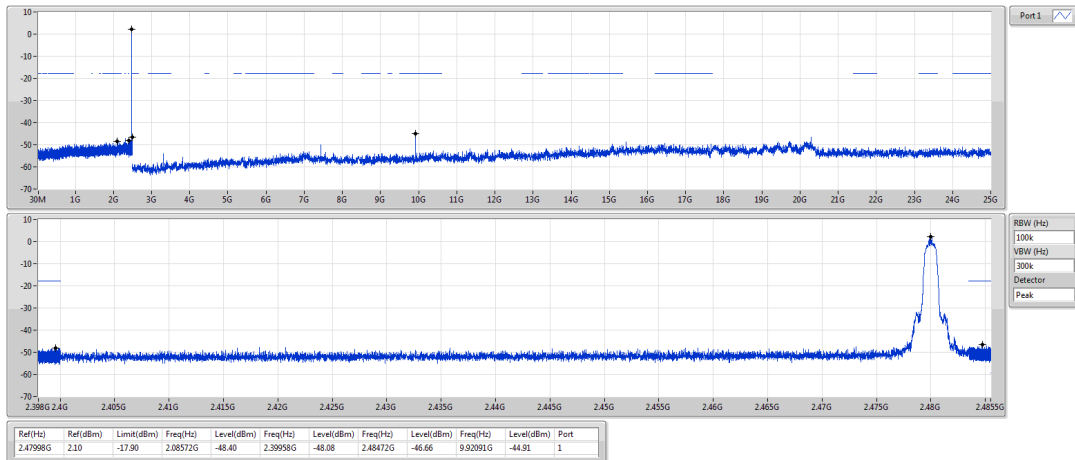
2441MHz



### BT-EDR(2Mbps)

CSE NdB

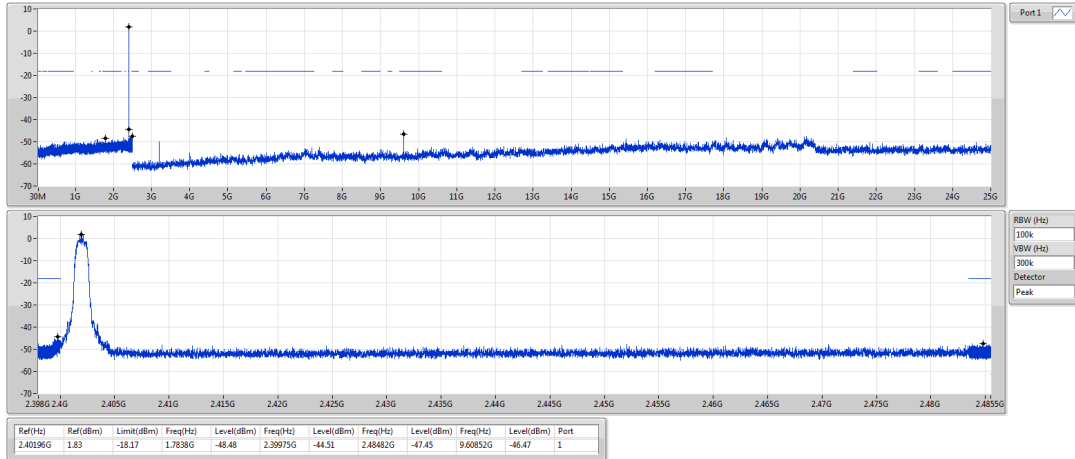
2480MHz



### BT-EDR(3Mbps)

CSE NdB

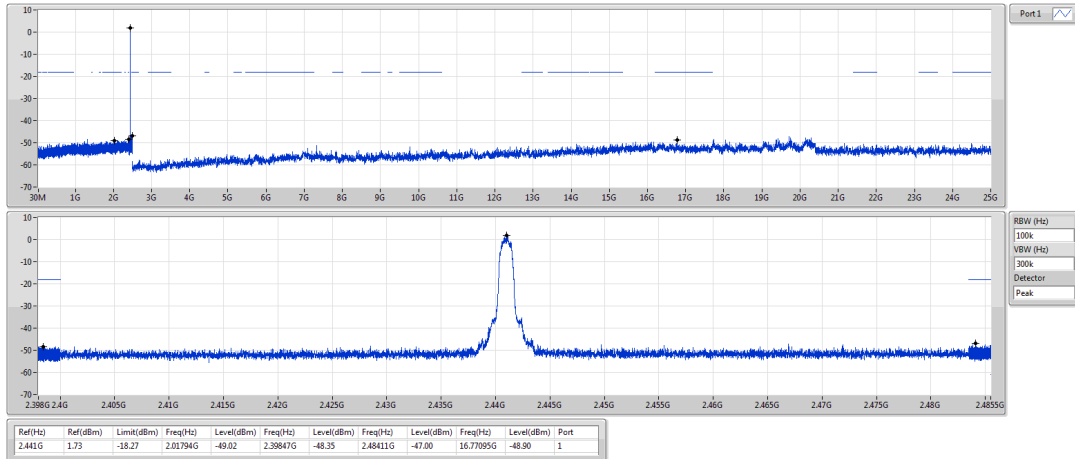
2402MHz



### BT-EDR(3Mbps)

CSE NdB

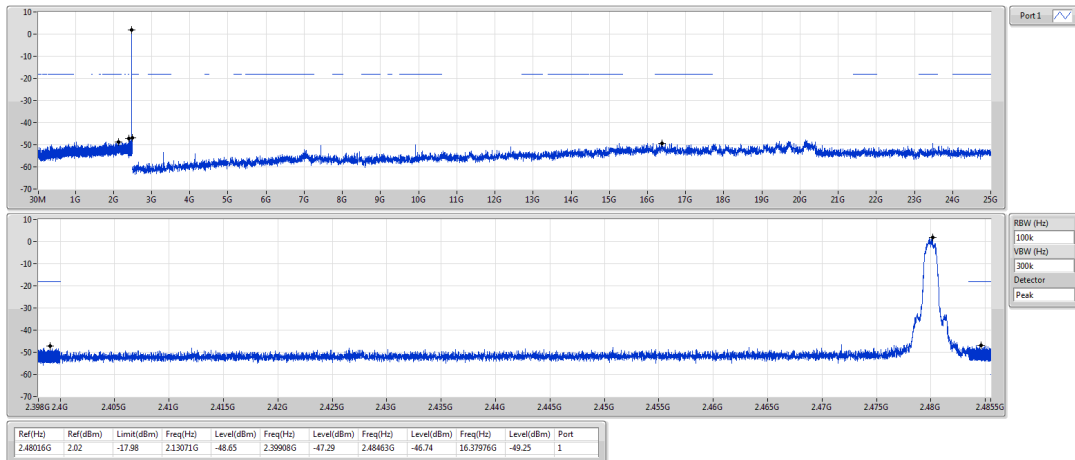
2441MHz



### BT-EDR(3Mbps)

CSE NdB

2480MHz

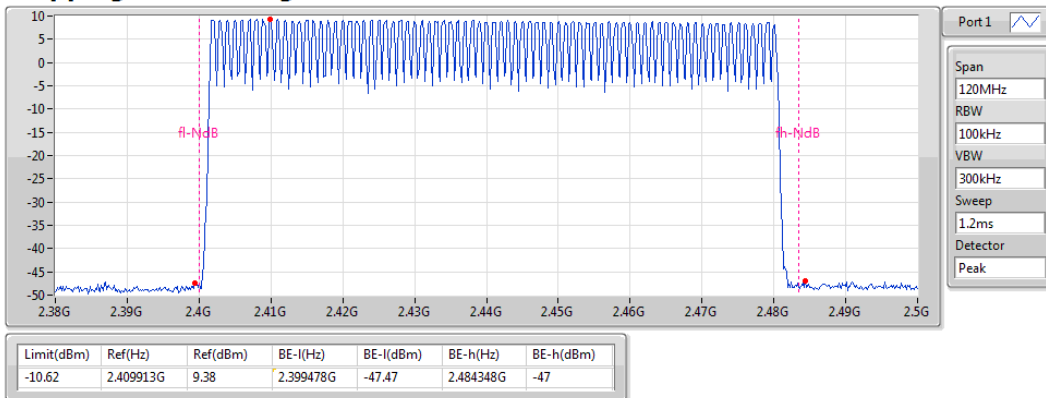




### BT-BR(1Mbps)

2441MHz

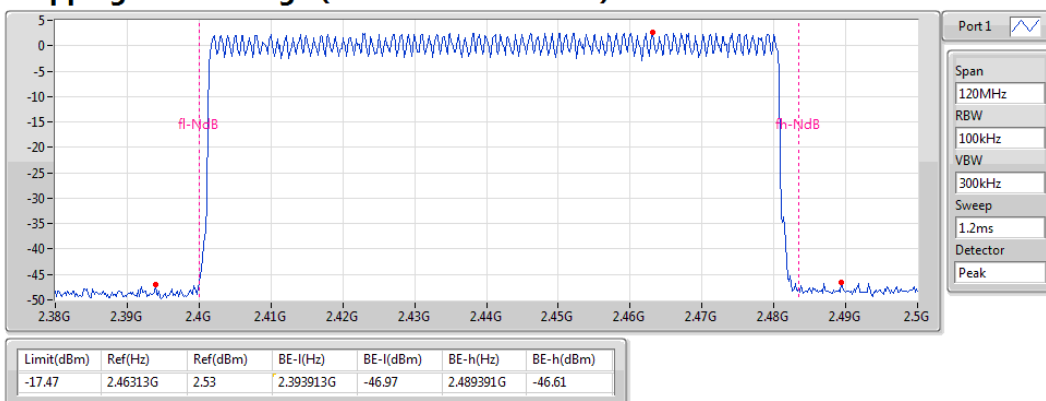
#### Hopping Ch Bandedge (Non-restricted Band)



### BT-EDR(2Mbps)

2441MHz

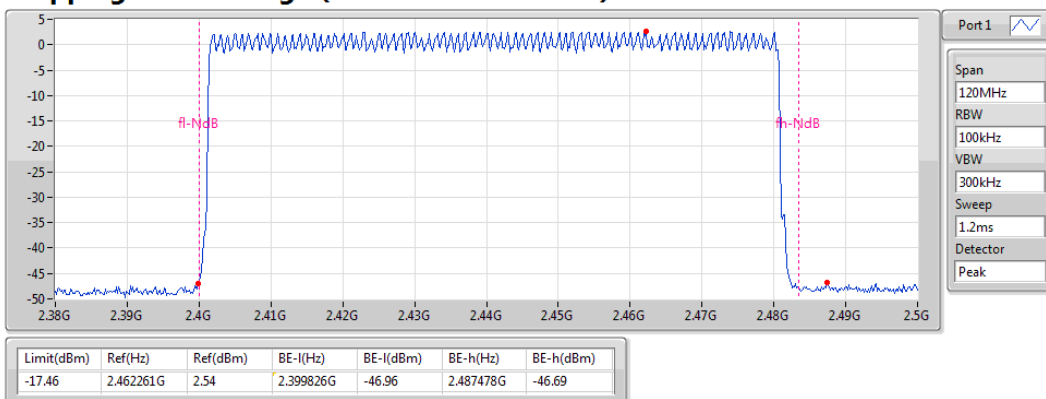
#### Hopping Ch Bandedge (Non-restricted Band)



### BT-EDR(3Mbps)

2441MHz

#### Hopping Ch Bandedge (Non-restricted Band)



### 3.3 Conducted Output Power

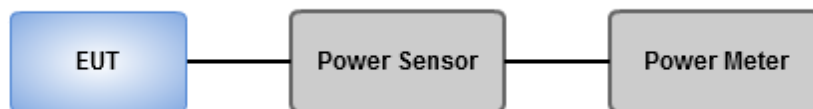
#### 3.3.1 Limit of Conducted Output Power

- ☐ 1 Watt  
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.
- ☒ 0.125 Watt  
For all other frequency hopping systems in the 2400–2483.5 MHz band.
- ☐ 0.125 Watt  
For Frequency hopping systems operating in the 2400–2483.5 MHz band have hopping channel carrier frequencies that are separated by two-thirds of the 20 dB bandwidth of the hopping channel.

#### 3.3.2 Test Procedures

1. A wideband power meter is used for power measurement. Bandwidth of power sensor and meter is 50MHz
2. If duty cycle of test signal is not 100 %, trigger and gating function of power meter will be enabled to capture transmission burst for measuring output power

#### 3.3.3 Test Setup



### 3.3.4 Test Result of Conducted Output Power

#### Summary of Peak Conducted Output Power

Mode	Power (dBm)	Power (W)
2.4-2.4835GHz	-	-
BT-BR(1Mbps)	9.98	0.00995
BT-EDR(2Mbps)	5.99	0.00397
BT-EDR(3Mbps)	6.46	0.00443

#### Result

Mode	Result	Gain (dBi)	Power (dBm)	Power Limit (dBm)
BT-BR(1Mbps)	-	-	-	-
2402MHz	Pass	1.08	9.98	21.00
2441MHz	Pass	1.08	9.81	21.00
2480MHz	Pass	1.08	9.44	21.00
BT-EDR(2Mbps)	-	-	-	-
2402MHz	Pass	1.08	5.90	21.00
2441MHz	Pass	1.08	5.99	21.00
2480MHz	Pass	1.08	5.85	21.00
BT-EDR(3Mbps)	-	-	-	-
2402MHz	Pass	1.08	6.37	21.00
2441MHz	Pass	1.08	6.46	21.00
2480MHz	Pass	1.08	6.25	21.00

### Summary of Conducted (Average) Output Power

Mode	Power	Power
	(dBm)	(W)
2.4-2.4835GHz	-	-
BT-BR(1Mbps)	9.94	0.00986
BT-EDR(2Mbps)	3.44	0.00221
BT-EDR(3Mbps)	3.43	0.00220

### Result

Mode	Result	Gain (dBi)	Power (dBm)	Power Limit (dBm)
BT-BR(1Mbps)	-	-	-	-
2402MHz	Pass	1.08	9.94	-
2441MHz	Pass	1.08	9.77	-
2480MHz	Pass	1.08	9.37	-
BT-EDR(2Mbps)	-	-	-	-
2402MHz	Pass	1.08	3.12	-
2441MHz	Pass	1.08	3.44	-
2480MHz	Pass	1.08	3.40	-
BT-EDR(3Mbps)	-	-	-	-
2402MHz	Pass	1.08	3.21	-
2441MHz	Pass	1.08	3.43	-
2480MHz	Pass	1.08	3.39	-

Note: Average power is for reference only.

### 3.4 Number of Hopping Frequency

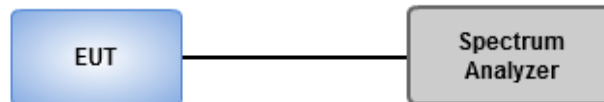
#### 3.4.1 Limit of Number of Hopping Frequency

Frequency hopping systems in the 2400–2483.5 MHz band shall use at least 15 channels.

#### 3.4.2 Test Procedures

1. Set RBW = 100kHz, VBW = 300kHz, Sweep time = Auto, Detector = Peak Trace max hold.
2. Allow trace to stabilize.

#### 3.4.3 Test Setup



### 3.4.4 Test Result of Number of Hopping Frequency

#### Summary

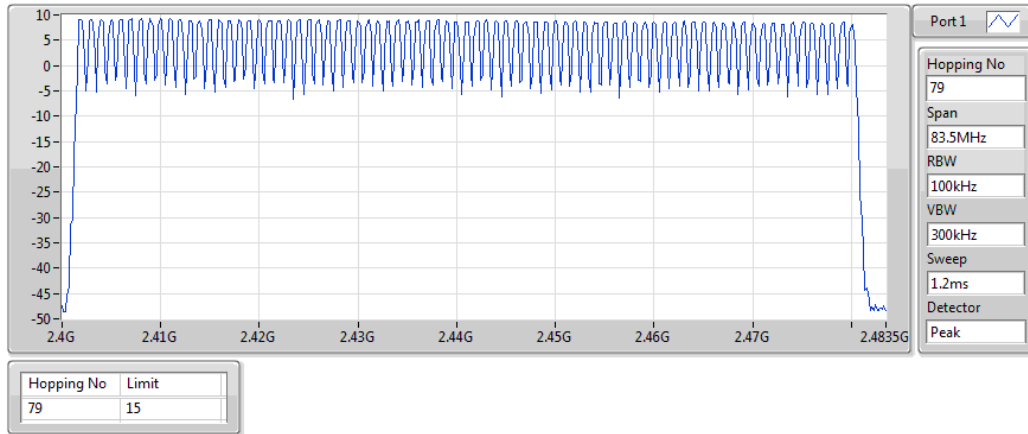
Mode	Max-Hop No
2.4-2.4835GHz	-
BT-BR(1Mbps)	79
BT-EDR(2Mbps)	79
BT-EDR(3Mbps)	79

#### Result

Mode	Result	Hopping No	Limit
BT-BR(1Mbps)	-	-	-
2441MHz	Pass	79	15
BT-EDR(2Mbps)	-	-	-
2441MHz	Pass	79	15
BT-EDR(3Mbps)	-	-	-
2441MHz	Pass	79	15

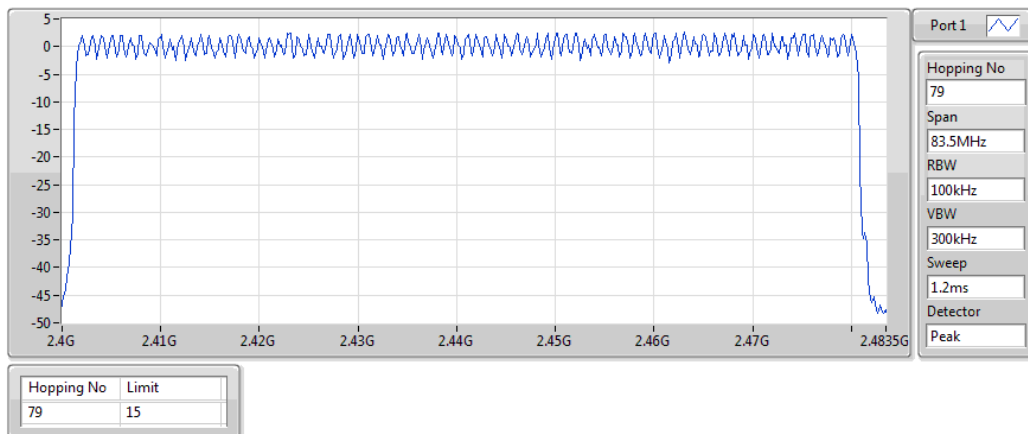
### BT-BR(1Mbps)

2441MHz



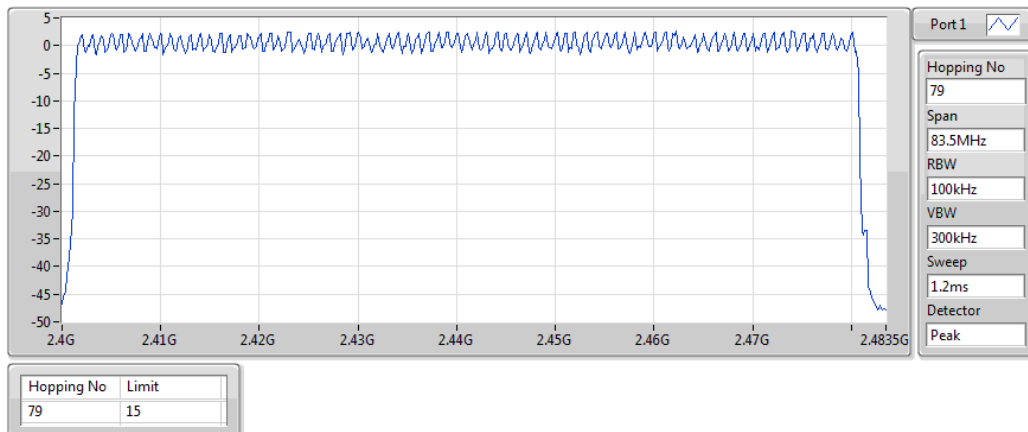
### BT-EDR(2Mbps)

2441MHz



### BT-EDR(3Mbps)

2441MHz



### 3.5 20dB and Occupied Bandwidth

#### 3.5.1 Test Procedures

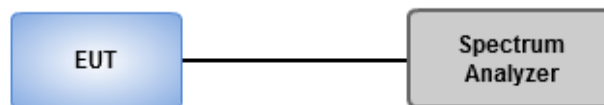
##### 20dB Bandwidth

1. Set RBW=10kHz VBW= 30kHz for BT BR mode, RBW=20kHz, VBW=100kHz for other modes, Sweep time = Auto, Detector=Peak , Trace max hold
2. Allow trace to stabilize
3. Measure the maximum width of the emission that is constrained by the frequencies associated with the two outermost amplitude points (upper and lower) that are attenuated by 20 dB relative to the maximum level measured in the fundamental emission.

##### Occupied Bandwidth

1. Set RBW=10kHz VBW= 30kHz for BT BR mode, RBW=20kHz, VBW=100kHz for other modes, Sweep time = Auto, Detector=Sample , Trace max hold
2. Allow trace to stabilize
3. Use Occupied bandwidth function of spectrum analyzer to measuring 99% occupied bandwidth

#### 3.5.2 Test Setup





### 3.5.3 Test result of 20dB and Occupied Bandwidth

#### Summary

Mode	Max-N dB (Hz)	Max-OBW (Hz)	ITU-Code	Min-N dB (Hz)	Min-OBW (Hz)
2.4-2.4835GHz	-	-	-	-	-
BT-BR(1Mbps)	920.29k	857.453k	857KF1D	913.043k	842.981k
BT-EDR(2Mbps)	1.341M	1.208M	1M21G1D	1.337M	1.198M
BT-EDR(3Mbps)	1.337M	1.212M	1M21G1D	1.315M	1.201M

**Max-N dB** = Maximum 20dB down bandwidth; **Max-OBW** = Maximum 99% occupied bandwidth;

**Min-N dB** = Minimum 20dB down bandwidth; **Min-OBW** = Minimum 99% occupied bandwidth;

#### Result

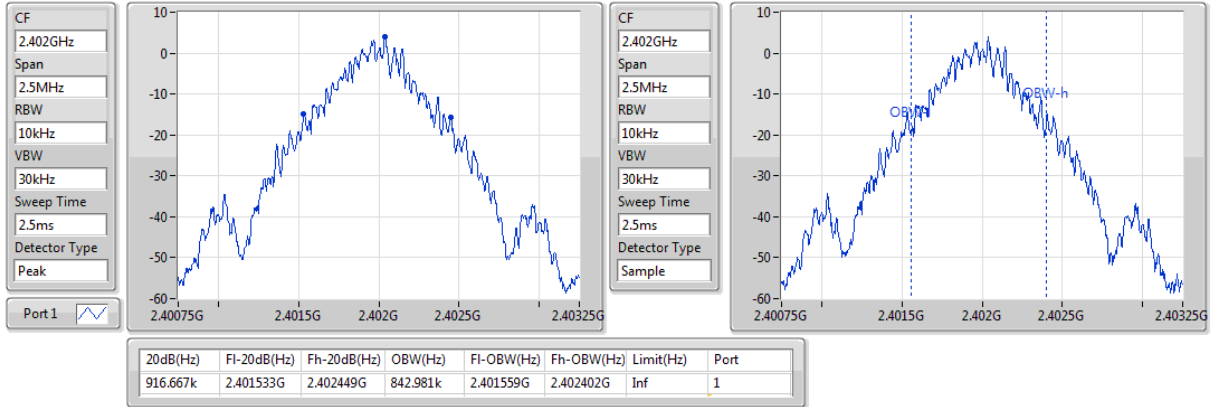
Mode	Result	Limit (Hz)	Port 1-N dB (Hz)	Port 1-OBW (Hz)
BT-BR(1Mbps)	-	-	-	-
2402MHz	Pass	Inf	916.667k	842.981k
2441MHz	Pass	Inf	913.043k	857.453k
2480MHz	Pass	Inf	920.29k	850.217k
BT-EDR(2Mbps)	-	-	-	-
2402MHz	Pass	Inf	1.337M	1.198M
2441MHz	Pass	Inf	1.341M	1.198M
2480MHz	Pass	Inf	1.337M	1.208M
BT-EDR(3Mbps)	-	-	-	-
2402MHz	Pass	Inf	1.315M	1.201M
2441MHz	Pass	Inf	1.337M	1.212M
2480MHz	Pass	Inf	1.319M	1.208M

**Port X-N dB** = Port X 20dB down bandwidth; **Port X-OBW** = Port X 99% occupied bandwidth;

### BT-BR(1Mbps)

EBW

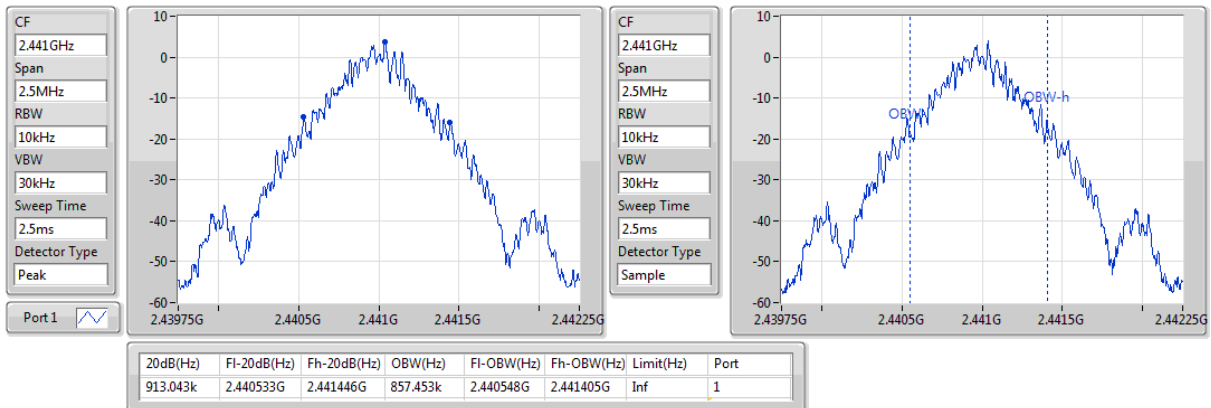
2402MHz



### BT-BR(1Mbps)

EBW

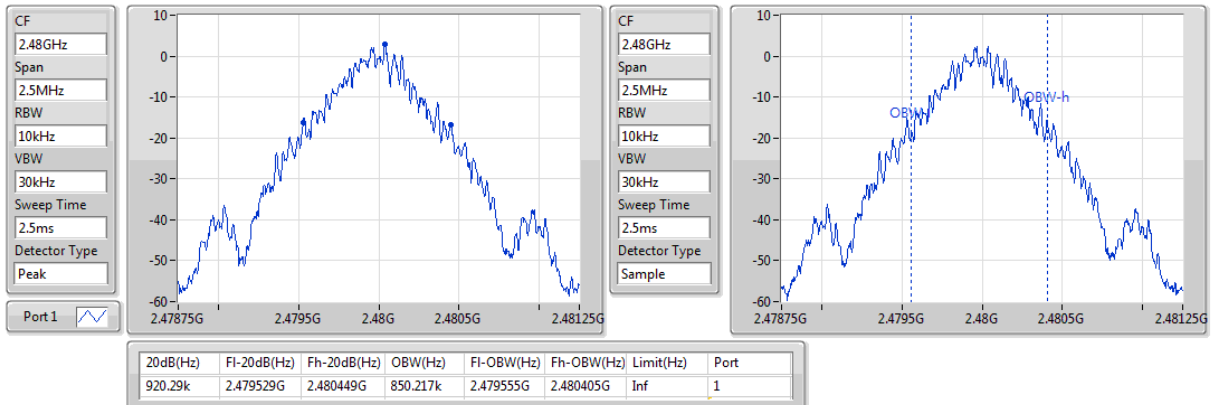
2441MHz



### BT-BR(1Mbps)

EBW

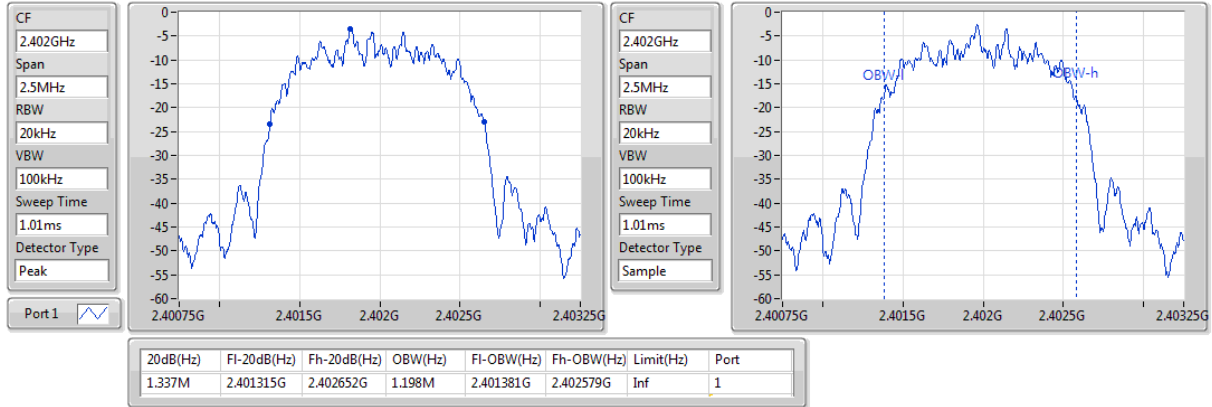
2480MHz



### BT-EDR(2Mbps)

EBW

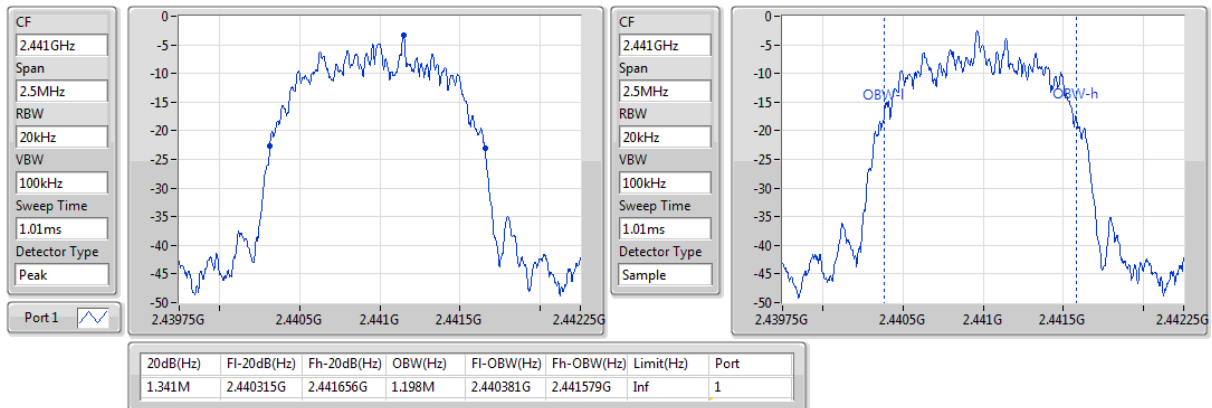
2402MHz



### BT-EDR(2Mbps)

EBW

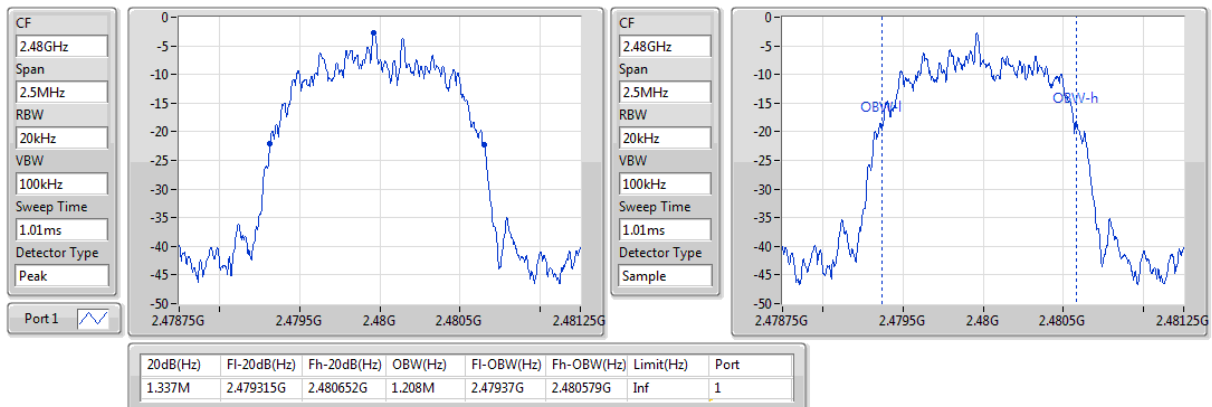
2441MHz



### BT-EDR(2Mbps)

EBW

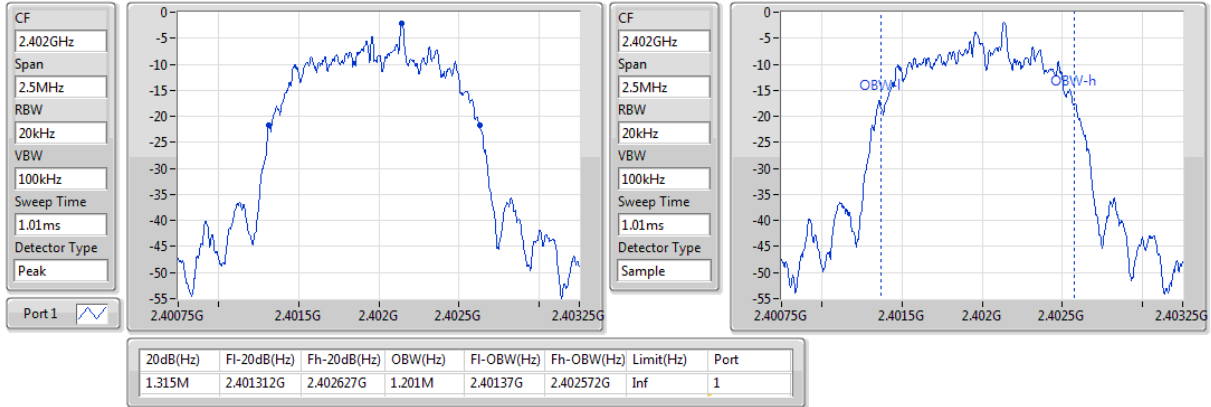
2480MHz



### BT-EDR(3Mbps)

EBW

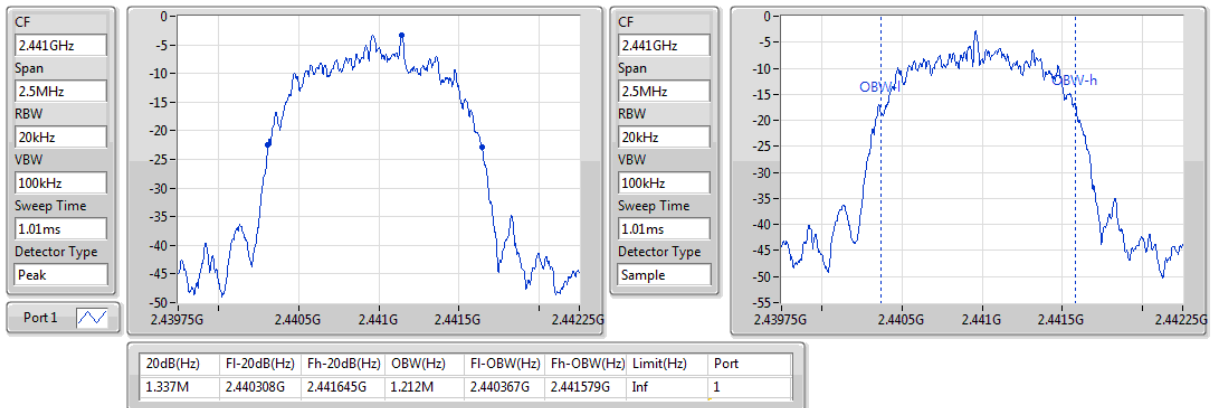
2402MHz



### BT-EDR(3Mbps)

EBW

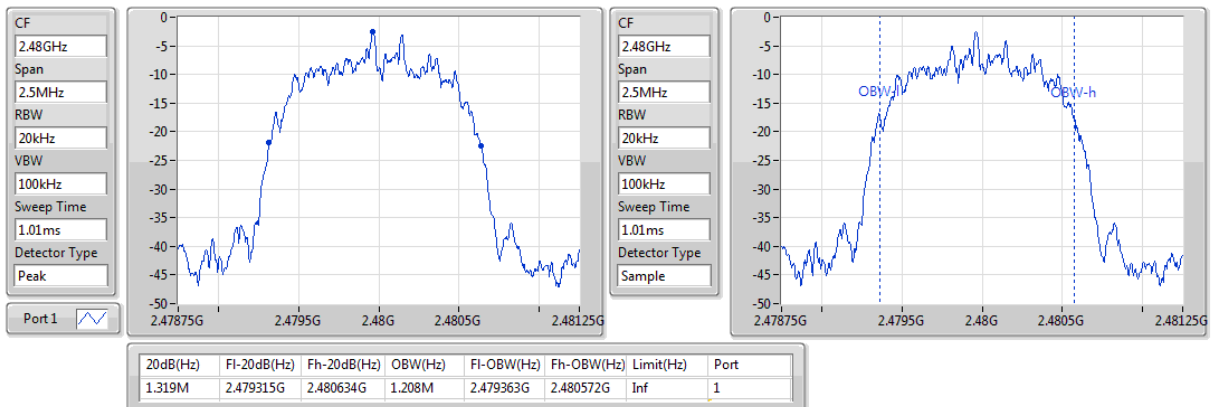
2441MHz



### BT-EDR(3Mbps)

EBW

2480MHz



## 3.6 Channel Separation

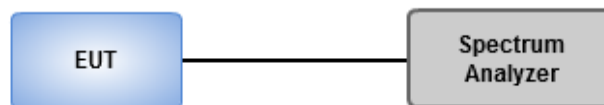
### 3.6.1 Limit of Channel Separation

- ☐ 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.
- ☒ 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.

### 3.6.2 Test Procedures

1. Set RBW=30kHz, VBW=100kHz, Sweep time = Auto, Detector=Peak Trace max hold
2. Allow trace to stabilize
3. Use the marker-delta function to determine the separation between the peaks of the adjacent channels. The EUT shall show compliance with the appropriate regulatory limit

### 3.6.3 Test Setup



### 3.6.4 Test result of Channel Separation

#### Summary

Mode	Max-Space (Hz)	Min-Space (Hz)
2.4-2.4835GHz	-	-
BT-BR(1Mbps)	1M	1M
BT-EDR(2Mbps)	1.004348M	1.004348M
BT-EDR(3Mbps)	1.004348M	1M

#### Result

Mode	Result	Fl (Hz)	Fh (Hz)	Ch.Space (Hz)	Limit (Hz)
BT-BR(1Mbps)	-	-	-	-	-
2402MHz	Pass	2.40197G	2.40297G	1M	610.500222k
2441MHz	Pass	2.441039G	2.442039G	1M	608.086638k
2480MHz	Pass	2.479039G	2.480039G	1M	612.91314k
BT-EDR(2Mbps)	-	-	-	-	-
2402MHz	Pass	2.40197G	2.402974G	1.004348M	890.442k
2441MHz	Pass	2.44097G	2.441974G	1.004348M	893.106k
2480MHz	Pass	2.478965G	2.47997G	1.004348M	890.442k
BT-EDR(3Mbps)	-	-	-	-	-
2402MHz	Pass	2.40197G	2.40297G	1M	875.79k
2441MHz	Pass	2.440965G	2.44197G	1.004348M	890.442k
2480MHz	Pass	2.47897G	2.47997G	1M	878.454k

### BT-BR(1Mbps)

### Channel Separation

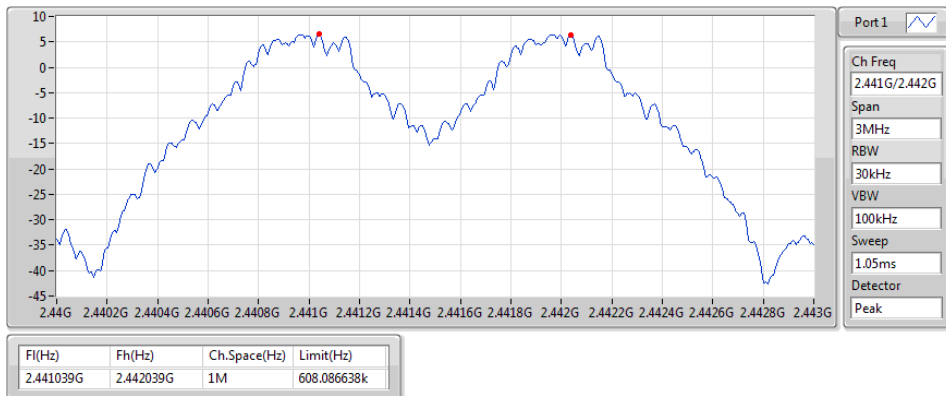
2.402G/2.403GHz



### BT-BR(1Mbps)

### Channel Separation

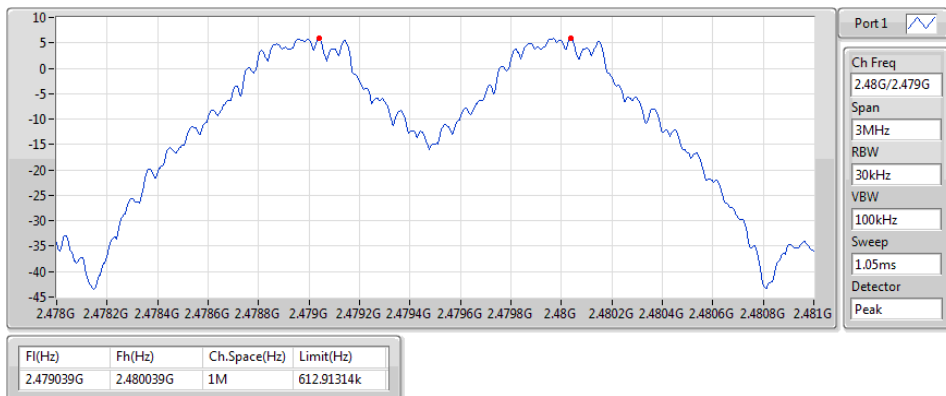
2.441G/2.442GHz



### BT-BR(1Mbps)

### Channel Separation

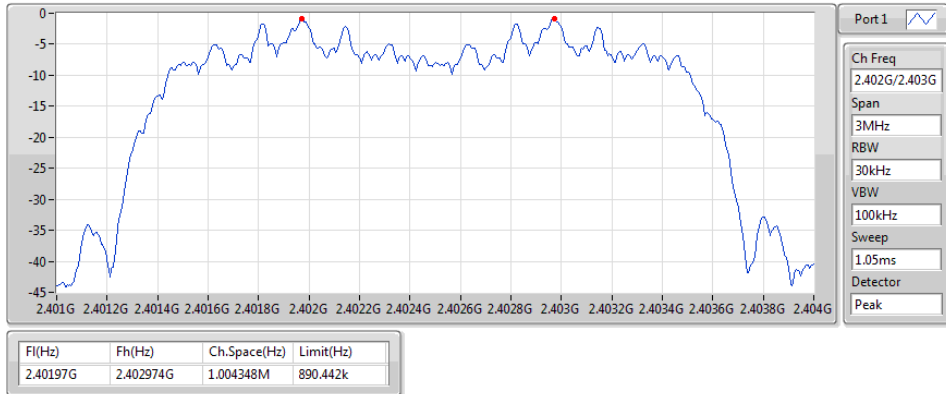
2.48G/2.479GHz



### BT-EDR(2Mbps)

### Channel Separation

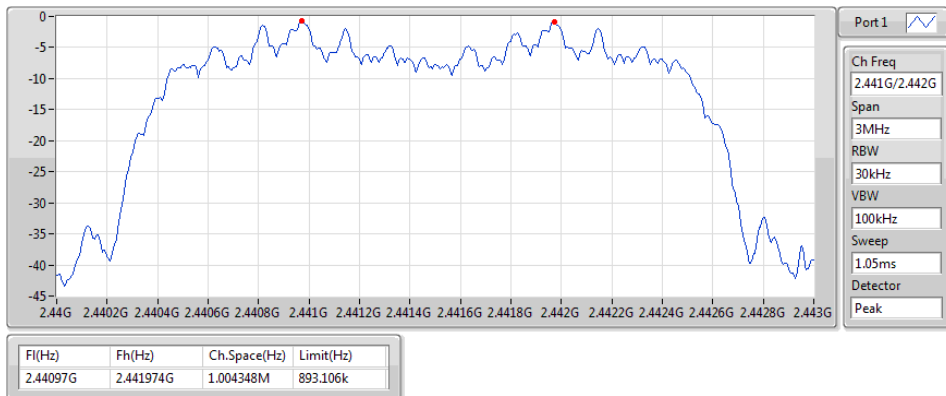
2.402G/2.403GHz



### BT-EDR(2Mbps)

### Channel Separation

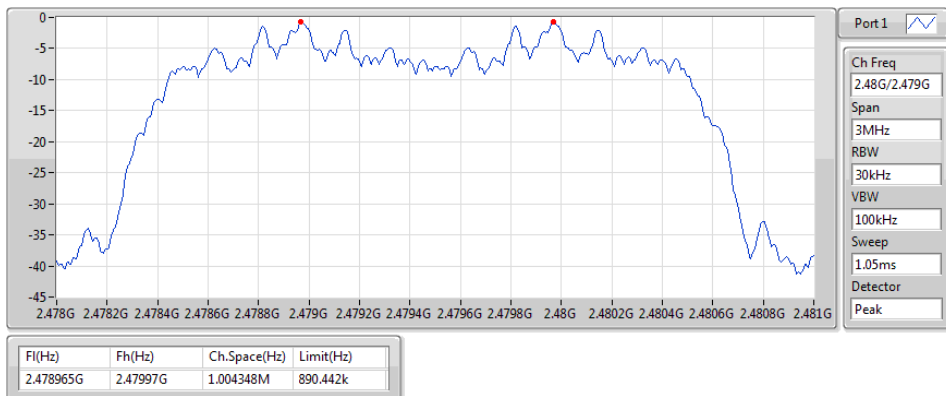
2.441G/2.442GHz



### BT-EDR(2Mbps)

### Channel Separation

2.48G/2.479GHz

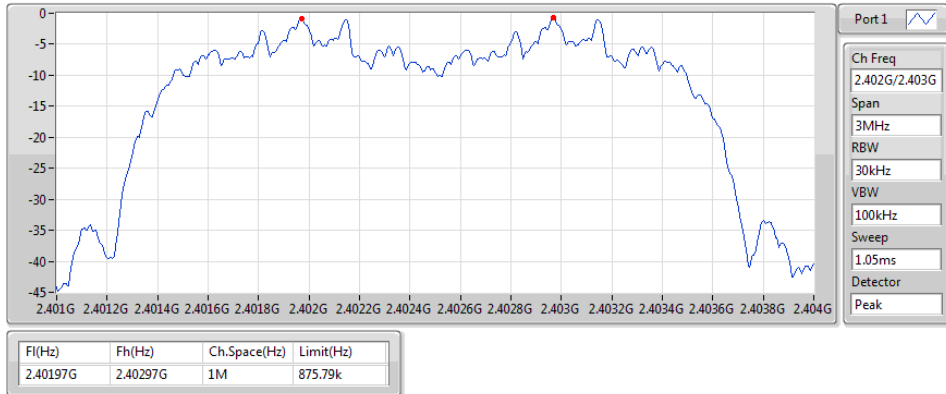




### BT-EDR(3Mbps)

### Channel Separation

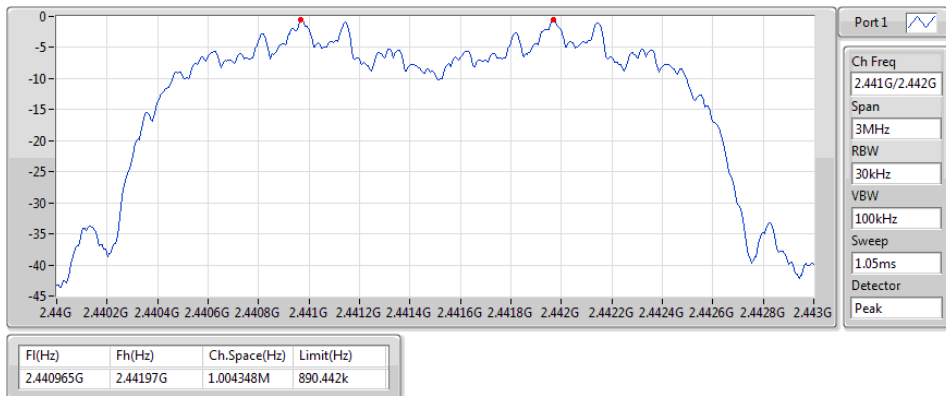
2.402G/2.403GHz



### BT-EDR(3Mbps)

### Channel Separation

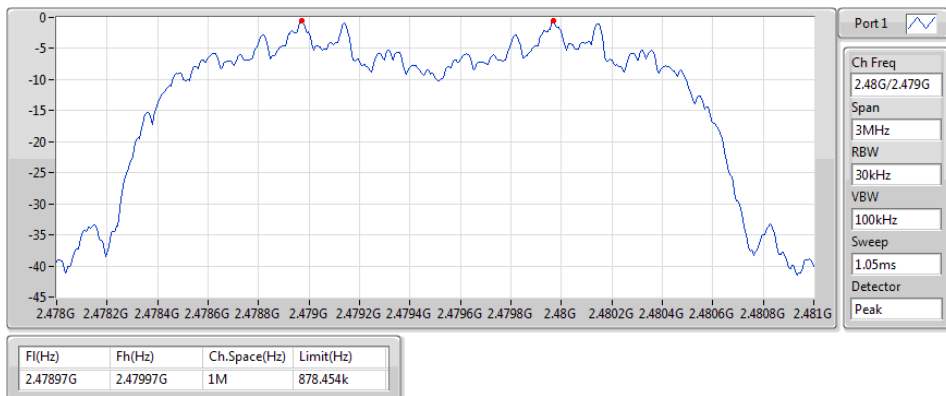
2.441G/2.442GHz



### BT-EDR(3Mbps)

### Channel Separation

2.48G/2.479GHz



## 3.7 Number of Dwell Time

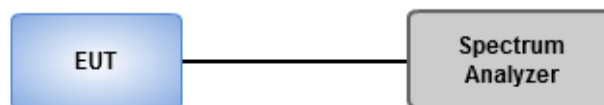
### 3.7.1 Limit of Dwell time

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.

### 3.7.2 Test Procedures

1. Set RBW=300kHz,VBW=1MHz,Sweep time = 10 ms, Detector=Peak, Span=0Hz,Trace max hold
2. Enable gating and trigger function of spectrum analyzer to measure burst on time.
3. The DH1 packet can cover a single time slot. A maximum length packet has duration of 1 time slots.  
Non AFH mode  
The hopping rate is 1600 hops/second so the maximum dwell time is 1/1600 seconds. DH1 Packet permit maximum  $1600 / 79 / 2 = 10.12$  hops per second in each channel (1 time slot TX, 1 time slot RX). So, the dwell time is the time duration of the pulse times  $10.12 \times 31.6 = 320$  within 31.6 seconds.  
AFH mode  
The hopping rate is 800 hops/second so the maximum dwell time is 1/800 seconds. DH1 Packet permit maximum  $800 / 20 / 2 = 20$  hops per second in each channel (1 time slot TX, 1 time slot RX). So, the dwell time is the time duration of the pulse times  $20 \times 8 = 160$  within 8 seconds.
4. The DH3 packet can cover up to 3 time slots. A maximum length packet has duration of 3 time slots.  
Non AFH mode  
The hopping rate is 1600 hops/second so the maximum dwell time is 3/1600 seconds. DH3 Packet permit maximum  $1600 / 79 / 4 = 5.06$  hops per second in each channel (3 time slots TX, 1 time slot RX). So, the dwell time is the time duration of the pulse times  $5.06 \times 31.6 = 160$  within 31.6 seconds.  
AFH mode  
The hopping rate is 800hops/second so the maximum dwell time is 3/800 seconds. DH3 Packet permit maximum  $800 / 20 / 4 = 10$  hops per second in each channel (3 time slots TX, 1 time slot RX). So, the dwell time is the time duration of the pulse times  $10 \times 8 = 80$  within 8 seconds.
5. The DH5 packet can cover up to 5 time slots. Operate DH5 at maximum dwell time and maximum duty cycle. A maximum length packet has duration of 5 time slots.  
Non AFH mode  
The hopping rate is 1600 hops/second so the maximum dwell time is 5/1600 seconds, or 3.125ms. DH5 Packet permit maximum  $1600 / 79 / 6 = 3.37$  hops per second in each channel (5 time slots TX, 1 time slot RX). So, the dwell time is the time duration of the pulse times  $3.37 \times 31.6 = 106.6$  within 31.6 seconds  
AFH mode  
The hopping rate is 800 hops/second so the maximum dwell time is 5/800 seconds. DH5 Packet permit maximum  $800 / 20 / 6 = 6.667$  hops per second in each channel (5 time slots TX, 1 time slot RX). So, the dwell time is the time duration of the pulse times  $6.667 \times 8 = 53.33$  within 8 seconds

### 3.7.3 Test Setup



### 3.7.4 Test Result of Dwell Time

#### Summary

Mode	Max-Dwell (s)
2.4-2.4835GHz	-
BT-BR(1Mbps)	310.530435m_DH5
BT-EDR(2Mbps)	310.530435m_DH5
BT-EDR(3Mbps)	310.530435m_DH5

#### Result/ Non AFH mode

Mode	Result	Period (s)	Dwell (s)	Limit (s)	Tx On (s)
BT-BR(1Mbps)	-	-	-	-	-
2441MHz	Pass	31.6	310.530435m_DH5	400m	2.913043m
2441MHz	Pass	31.6	264.347826m_DH3	400m	1.652174m
2441MHz	Pass	31.6	129.855072m_DH1	400m	405.797101u
BT-EDR(2Mbps)	-	-	-	-	-
2441MHz	Pass	31.6	310.530435m_DH5	400m	2.913043m
2441MHz	Pass	31.6	266.666667m_DH3	400m	1.666667m
2441MHz	Pass	31.6	129.855072m_DH1	400m	405.797101u
BT-EDR(3Mbps)	-	-	-	-	-
2441MHz	Pass	31.6	310.530435m_DH5	400m	2.913043m
2441MHz	Pass	31.6	266.666667m_DH3	400m	1.666667m
2441MHz	Pass	31.6	129.855072m_DH1	400m	405.797101u

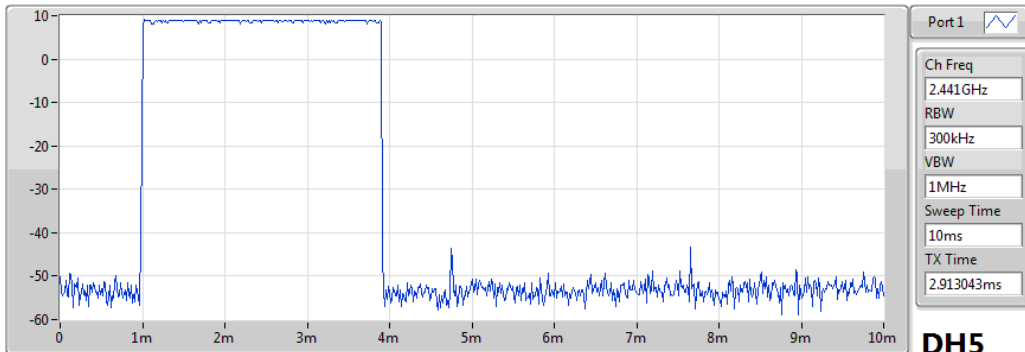
#### Result/ AFH mode

Mode	Result	Period (s)	Dwell (s)	Limit (s)	Tx On (s)
BT-BR(1Mbps)	-	-	-	-	-
2441MHz	Pass	8	155.3526m_DH5	400m	2.913043m
2441MHz	Pass	8	132.1739m_DH3	400m	1.652174m
2441MHz	Pass	8	64.92754m_DH1	400m	405.797101u
BT-EDR(2Mbps)	-	-	-	-	-
2441MHz	Pass	8	155.3526m_DH5	400m	2.913043m
2441MHz	Pass	8	133.3334m_DH3	400m	1.666667m
2441MHz	Pass	8	64.92754m_DH1	400m	405.797101u
BT-EDR(3Mbps)	-	-	-	-	-
2441MHz	Pass	8	155.3526m_DH5	400m	2.913043m
2441MHz	Pass	8	133.3334m_DH3	400m	1.666667m
2441MHz	Pass	8	64.92754m_DH1	400m	405.797101u

### BT-BR(1Mbps)

Dwell

2441MHz



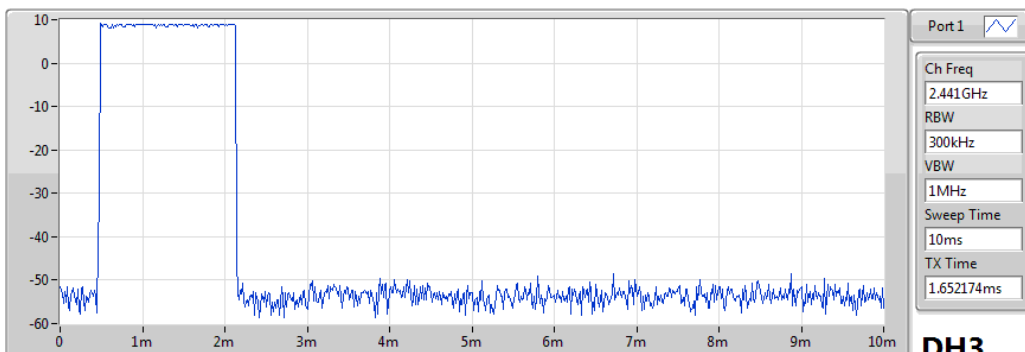
DH5

Period(s)	Dwell(s)	Limit(s)	Tx On(s)
31.6	310.530435m	400m	2.913043m

### BT-BR(1Mbps)

Dwell

2441MHz



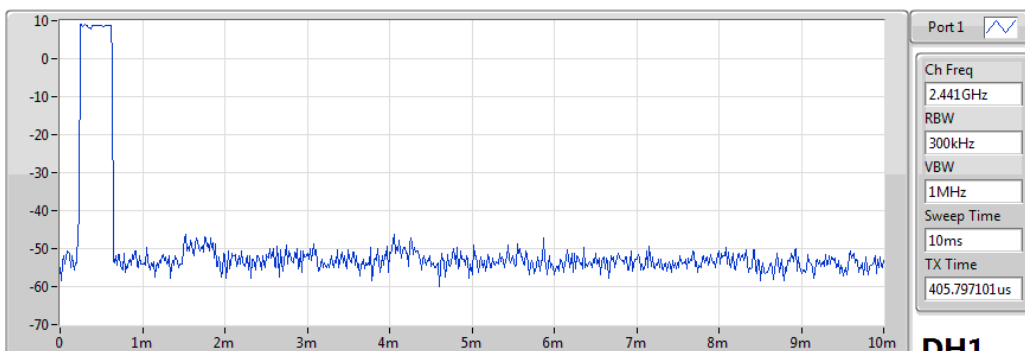
DH3

Period(s)	Dwell(s)	Limit(s)	Tx On(s)
31.6	264.347826m	400m	1.652174m

### BT-BR(1Mbps)

Dwell

2441MHz



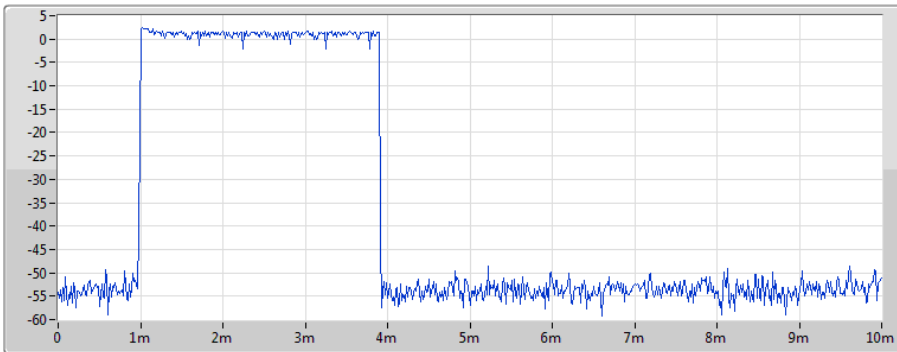
DH1


Period(s)	Dwell(s)	Limit(s)	Tx On(s)
31.6	129.855072m	400m	405.797101u

### BT-EDR(2Mbps)

Dwell

2441MHz



Port 1 

Ch Freq  
2.441GHz

RBW  
300kHz

VBW  
1MHz

Sweep Time  
10ms

TX Time  
2.913043ms

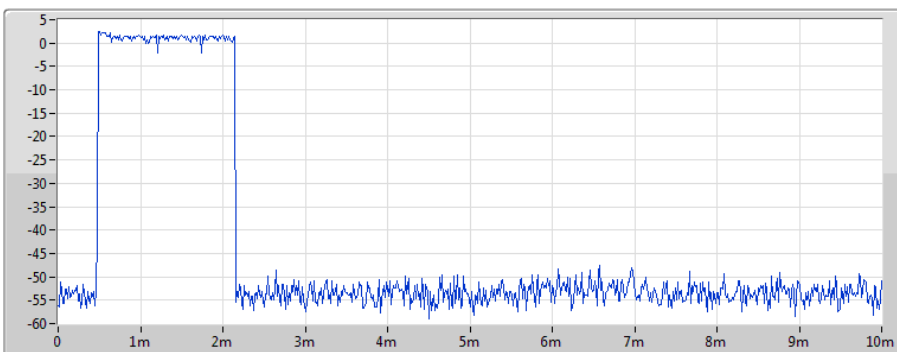
DH5


Period(s)	Dwell(s)	Limit(s)	Tx On(s)
31.6	310.530435m	400m	2.913043m

### BT-EDR(2Mbps)

Dwell

2441MHz



Port 1 

Ch Freq  
2.441GHz

RBW  
300kHz

VBW  
1MHz

Sweep Time  
10ms

TX Time  
1.666667ms

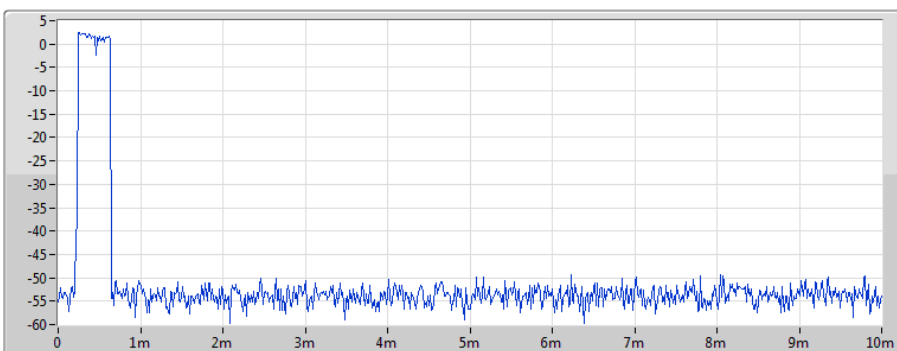
DH3


Period(s)	Dwell(s)	Limit(s)	Tx On(s)
31.6	266.666667m	400m	1.666667m

### BT-EDR(2Mbps)

Dwell

2441MHz



Port 1 

Ch Freq  
2.441GHz

RBW  
300kHz

VBW  
1MHz

Sweep Time  
10ms

TX Time  
405.797101us

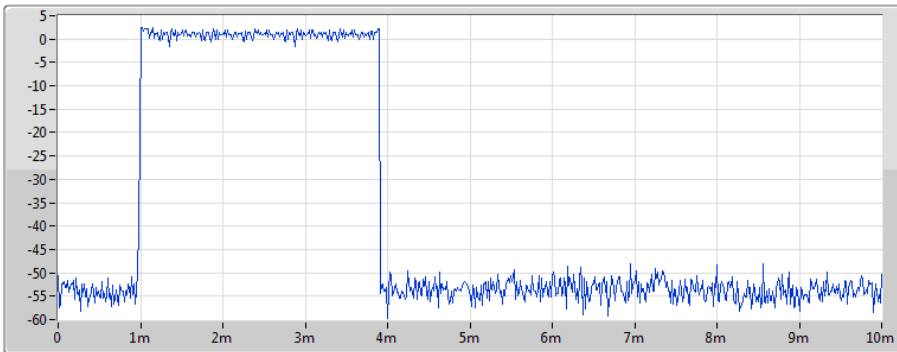
DH1


Period(s)	Dwell(s)	Limit(s)	Tx On(s)
31.6	129.855072m	400m	405.797101u

### BT-EDR(3Mbps)

Dwell

2441MHz



Port 1 

Ch Freq  
2.441GHz

RBW  
300kHz

VBW  
1MHz

Sweep Time  
10ms

TX Time  
2.913043ms

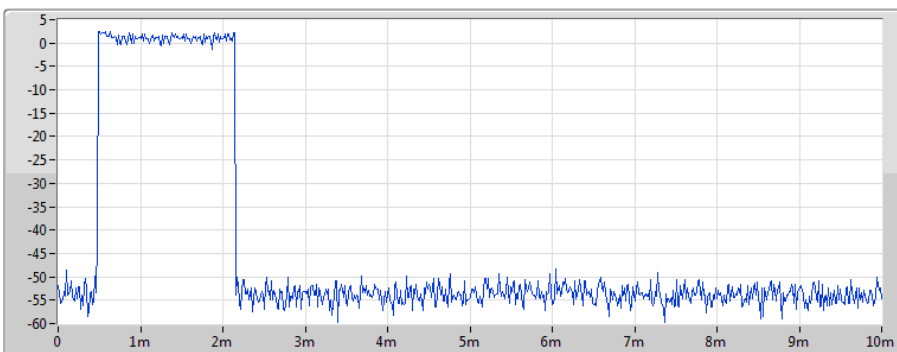
DH5


Period(s)	Dwell(s)	Limit(s)	Tx On(s)
31.6	310.530435m	400m	2.913043m

### BT-EDR(3Mbps)

Dwell

2441MHz



Port 1 

Ch Freq  
2.441GHz

RBW  
300kHz

VBW  
1MHz

Sweep Time  
10ms

TX Time  
1.666667ms

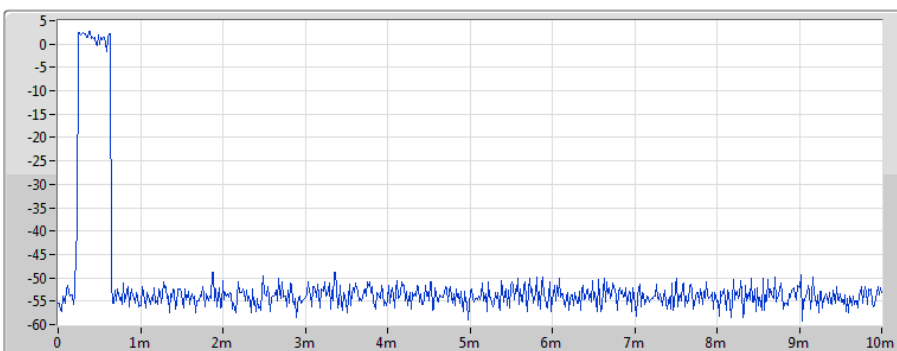
DH3


Period(s)	Dwell(s)	Limit(s)	Tx On(s)
31.6	266.666667m	400m	1.666667m

### BT-EDR(3Mbps)

Dwell

2441MHz



Port 1 

Ch Freq  
2.441GHz

RBW  
300kHz

VBW  
1MHz

Sweep Time  
10ms

TX Time  
405.797101us

DH1

Period(s)	Dwell(s)	Limit(s)	Tx On(s)
31.6	129.855072m	400m	405.797101u

## 4 Test laboratory information

Established in 2012, ICC provides foremost EMC & RF Testing and advisory consultation services by our skilled engineers and technicians. Our services employ a wide variety of advanced edge test equipment and one of the widest certification extents in the business.

International Certification Corp (EMC and Wireless Communication Laboratory), it is our definitive objective is to institute long term, trust-based associations with our clients. The expectation we set up with our clients is based on outstanding service, practical expertise and devotion to a certified value structure. Our passion is to grant our clients with best EMC / RF services by oriented knowledgeable and accommodating staff.

Our Test sites are located at Linkou District and Kwei Shan District. Location map can be found on our website <http://www.icertifi.com.tw>.

### **Linkou**

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Kou District, New Taipei City,  
Taiwan, R.O.C.

### **Kwei Shan**

Tel: 886-3-271-8666

No. 3-1, Lane 6, Wen San 3rd St.,  
Kwei Shan District, Tao Yuan City  
333, Taiwan, R.O.C.

### **Kwei Shan Site II**

Tel: 886-3-271-8640

No. 14-1, Lane 19, Wen San 3rd  
St., Kwei Shan District, Tao Yuan  
City 333, Taiwan, R.O.C.

If you have any suggestion, please feel free to contact us as below information.

Tel: 886-3-271-8666

Fax: 886-3-318-0155

Email: ICC\_Service@icertifi.com.tw

==END==