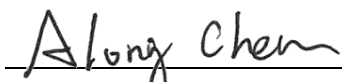


# FCC Test Report

**FCC ID** : 2AAS9-BW1257  
**Equipment** : Tri-Band Wi-Fi AC3000 Indoor Access Point  
**Model No.** : BW1257  
**Brand Name** : BROWAN  
**Applicant** : BROWAN COMMUNICATIONS Co., Ltd.  
**Address** : No.15-1, Zhoughua Rd, Hsinchu Industrial  
Park, Hukou, Hsinchu, Taiwan, R.O.C. 333  
**Standard** : 47 CFR FCC Part 15.247  
**Received Date** : Dec. 18, 2018  
**Tested Date** : Dec. 28 ~ Apr. 03, 2019

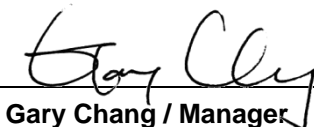
We, International Certification Corp., would like to declare that the tested sample has been evaluated and in compliance with the requirement of the above standards. The test results contained in this report refer exclusively to the product. It may be duplicated completely for legal use with the approval 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
FR8D1801AD	Rev. 01	Initial issue	Jun. 19, 2019

## Summary of Test Results

FCC Rules	Test Items	Measured	Result
15.207	Conducted Emissions	[dBuV]: 18.726MHz 44.63 (Margin -5.37dB) - AV	Pass
15.247(d) 15.209	Radiated Emissions	[dBuV/m at 3m]: 67.34MHz 38.95 (Margin -1.05dB) - QP	Pass
15.247(d)	Band Edge	Meet the requirement of limit	Pass
15.247(b)(1)	Conducted Output Power	Power [dBm]: 8.62	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

### 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 values of gain for EUT presented in the report are provided by the manufacturer, and the manufacturer takes all the responsibilities for the accuracy of the gain.

# 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 V4.1	2402-2480	0-78 [79]	1 Mbps
2400-2483.5	EDR V4.1	2402-2480	0-78 [79]	2 Mbps
2400-2483.5	EDR V4.1	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	Connector	Gain (dBi)	Remarks
1	Dipole	R-SMA	3.4	---
2	Dipole	R-SMA	2.8	---

Note: The antenna with highest gain was selected for final testing in this test report.

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

<b>Power Supply Type</b>	12Vdc from adapter 55Vdc from POE
--------------------------	--------------------------------------

Note: The POE power supplies are not bundled in market.

### 1.1.4 Accessories

Accessories		
No.	Equipment	Description
1	Adapter	Brand: APD Model: WA-36A12FU Power Rating: I/P: 100-240Vac, 50-60Hz, 0.9A Max O/P: 12Vdc, 3A Power Line: 1.2m non-shielded without core
2	RJ45 (EEKSONG)	1.95m non-shielded without core
3	Core	Brand: King core Mode:KCF-130

### 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

Test Tool	CBT Test	
Duty Cycle and Duty Factor	Duty Cycle (%)	Duty Factor (dB)
DH5	78.76%	1.04
3DH5	80.16%	0.96

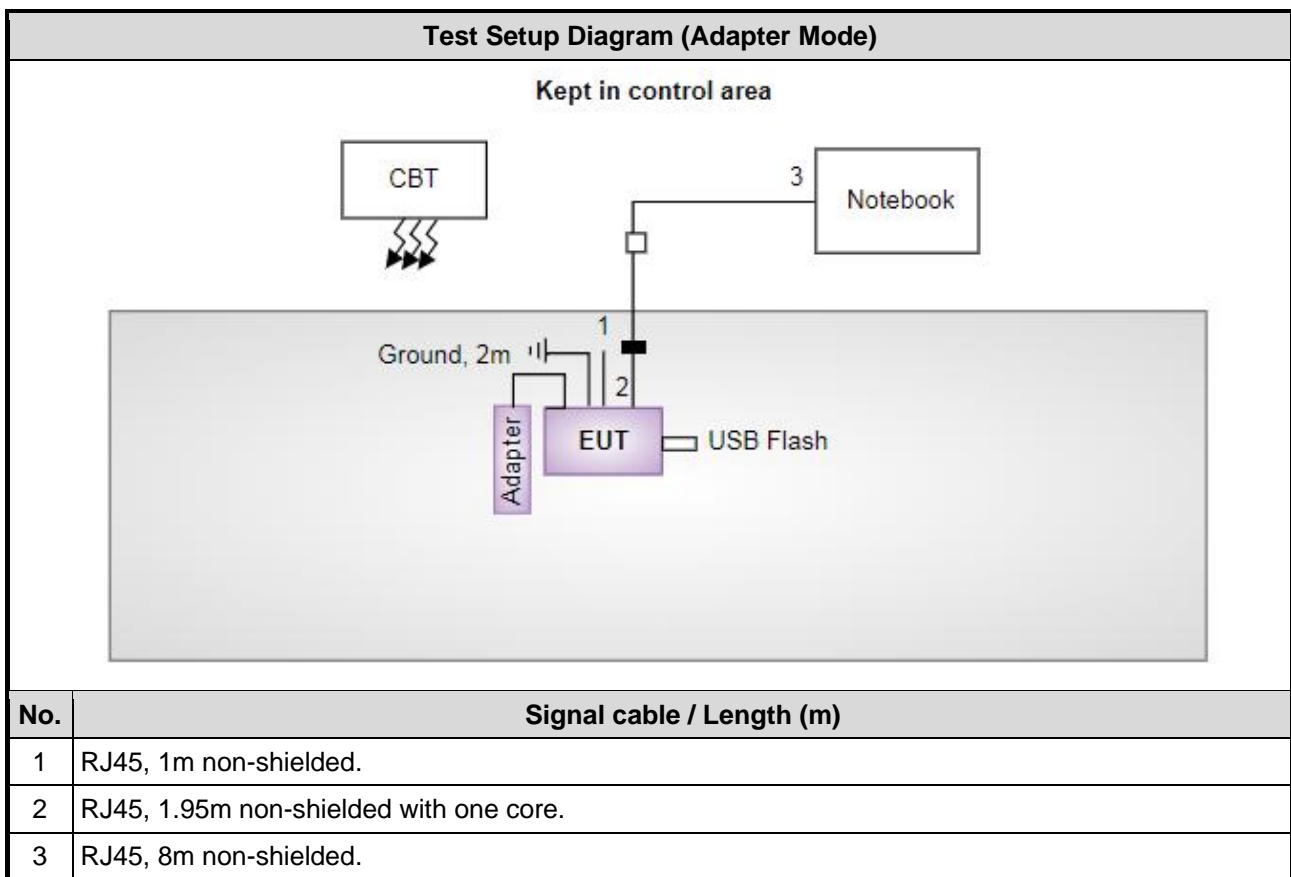
### 1.1.7 Power Index of Test Tool

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	Notebook	Latitude E5470	R33002	DoC	---
2	Notebook	Latitude E6430	R33002	DoC	---
3	USB Flash	Kingston	DTSE9	---	---

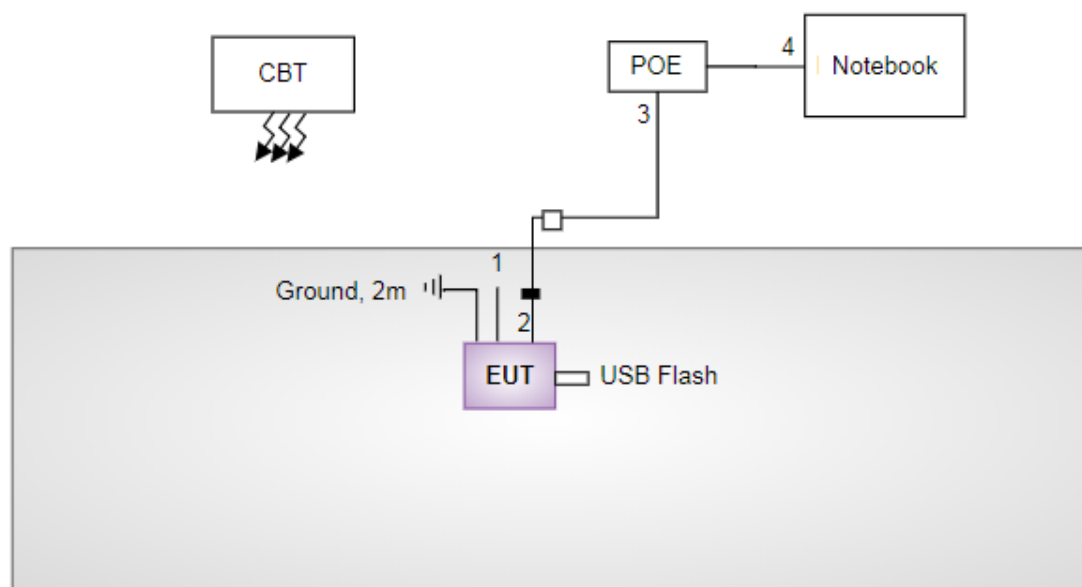
## 1.3 Test Setup Chart





### Test Setup Diagram (POE Mode)

Kept in control area



No.	Signal cable / Length (m)
1	RJ45, 1m non-shielded.
2	RJ45, 1.95m non-shielded with one core..
3	RJ45, 8m non-shielded.
4	RJ45, 1m non-shielded.

## 1.4 The Equipment List

<b>Test Item</b>	Conducted Emission				
<b>Test Site</b>	Conduction room 1 / (CO01-WS)				
<b>Tested Date</b>	Mar. 19, 2019				
<b>Instrument</b>	<b>Manufacturer</b>	<b>Model No.</b>	<b>Serial No.</b>	<b>Calibration Date</b>	<b>Calibration Until</b>
Receiver	R&S	ESR3	101657	Jan. 08, 2019	Jan. 07, 2020
LISN	R&S	ENV216	101579	Mar. 08, 2019	Mar. 07, 2020
RF Cable-CON	Woken	CFD200-NL	CFD200-NL-001	Oct. 23, 2018	Oct. 23, 2019
Measurement Software	AUDIX	e3	6.120210k	NA	NA
Bluetooth Tester	R&S	CBT	100959	Sep. 24, 2018	Sep. 23, 2019
Note: Calibration Interval of instruments listed above is one year.					

<b>Test Item</b>	Radiated Emission				
<b>Test Site</b>	966 chamber 3 / (03CH03-WS)				
<b>Tested Date</b>	Feb. 01, 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	101499	Jan. 07, 2019	Jan. 06, 2020
Receiver	R&S	ESR3	101658	Dec. 11, 2018	Dec. 10, 2019
Bilog Antenna	SCHWARZBECK	VULB9168	VULB9168-685	Apr. 19, 2018	Apr. 18, 2019
Horn Antenna 1G-18G	SCHWARZBECK	BBHA 9120 D	BBHA 9120 D 1206	Jan. 07, 2019	Jan. 06, 2020
Horn Antenna 18G-40G	SCHWARZBECK	BBHA 9170	BBHA 9170517	Nov. 15, 2018	Nov. 14, 2019
Loop Antenna	R&S	HFH2-Z2	100330	Nov. 09, 2018	Nov. 08, 2019
Loop Antenna Cable	KOAX KABEL	101354-BW	101354-BW	Oct. 08, 2018	Oct. 07, 2019
Preamplifier	EMC	EMC02325	980187	Aug. 24, 2018	Aug. 23, 2019
Preamplifier	Agilent	83017A	MY53270014	Aug. 09, 2018	Aug. 08, 2019
Preamplifier	EMC	EMC184045B	980192	Aug. 09, 2018	Aug. 08, 2019
RF cable-3M	HUBER+SUHNER	SUCOFLEX104	MY22620/4	Oct. 01, 2018	Sep. 30, 2019
RF cable-8M	EMC	EMC104-SM-SM-8000	181107	Oct. 01, 2018	Sep. 30, 2019
RF cable-1M	HUBER+SUHNER	SUCOFLEX104	MY22624/4	Oct. 01, 2018	Sep. 30, 2019
LF cable-0.8M	EMC	EMC8D-NM-NM-8000	EMC8D-NM-NM-800-001	Oct. 01, 2018	Sep. 30, 2019
LF cable-3M	EMC	EMC8D-NM-NM-3000	131103	Oct. 01, 2018	Sep. 30, 2019
LF cable-13M	EMC	EMC8D-NM-NM-13000	131104	Oct. 01, 2018	Sep. 30, 2019
Measurement Software	AUDIX	e3	6.120210g	NA	NA
Bluetooth Tester	R&S	CBT	100959	Sep. 24, 2018	Sep. 23, 2019
Note: Calibration Interval of instruments listed above is one year.					

<b>Test Item</b>	Radiated Emission				
<b>Test Site</b>	966 chamber 3 / (03CH03-WS)				
<b>Tested Date</b>	Dec. 28, 2018				
<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	101499	Jan. 03, 2018	Jan. 02, 2019
Receiver	R&S	ESR3	101658	Dec. 11, 2018	Dec. 10, 2019
Bilog Antenna	SCHWARZBECK	VULB9168	VULB9168-685	Apr. 19, 2018	Apr. 18, 2019
Horn Antenna 1G-18G	SCHWARZBECK	BBHA 9120 D	BBHA 9120 D 1206	Jan. 18, 2018	Jan. 17, 2019
Horn Antenna 18G-40G	SCHWARZBECK	BBHA 9170	BBHA 9170517	Nov. 15, 2018	Nov. 14, 2019
Loop Antenna	R&S	HFH2-Z2	100330	Nov. 09, 2018	Nov. 08, 2019
Loop Antenna Cable	KOAX KABEL	101354-BW	101354-BW	Oct. 08, 2018	Oct. 07, 2019
Preamplifier	EMC	EMC02325	980187	Aug. 24, 2018	Aug. 23, 2019
Preamplifier	Agilent	83017A	MY53270014	Aug. 09, 2018	Aug. 08, 2019
Preamplifier	EMC	EMC184045B	980192	Aug. 09, 2018	Aug. 08, 2019
RF cable-3M	HUBER+SUHNER	SUCOFLEX104	MY22620/4	Oct. 01, 2018	Sep. 30, 2019
RF cable-8M	EMC	EMC104-SM-SM-8000	181107	Oct. 01, 2018	Sep. 30, 2019
RF cable-1M	HUBER+SUHNER	SUCOFLEX104	MY22624/4	Oct. 01, 2018	Sep. 30, 2019
LF cable-0.8M	EMC	EMC8D-NM-NM-800	EMC8D-NM-NM-800-001	Oct. 01, 2018	Sep. 30, 2019
LF cable-3M	EMC	EMC8D-NM-NM-3000	131103	Oct. 01, 2018	Sep. 30, 2019
LF cable-13M	EMC	EMC8D-NM-NM-13000	131104	Oct. 01, 2018	Sep. 30, 2019
Measurement Software	AUDIX	e3	6.120210g	NA	NA
Bluetooth Tester	R&S	CBT	100959	Sep. 24, 2018	Sep. 23, 2019
Note: Calibration Interval of instruments listed above is one year.					

<b>Test Item</b>	RF Conducted				
<b>Test Site</b>	(TH01-WS)				
<b>Tested Date</b>	Apr. 02 ~ Apr. 03, 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. 16, 2018	Apr. 15, 2019
Power Meter	Anritsu	ML2495A	1241002	Oct. 09, 2018	Oct. 08, 2019
Power Sensor	Anritsu	MA2411B	1207366	Oct. 09, 2018	Oct. 08, 2019
DC POWER SOURCE	GW INSTEK	GPC-6030D	EM892433	Oct. 25, 2018	Oct. 24, 2019
AC POWER SOURCE	APC	AFC-500W	F312060012	Nov. 29, 2018	Nov. 28, 2019
Measurement Software	Sporton	SENSE-15247_FS	V5.10.1	NA	NA
Bluetooth Tester	R&S	CBT	100959	Sep. 24, 2018	Sep. 23, 2019
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	$\pm 3.96$ dB
Radiated emission $> 1$ GHz	$\pm 4.51$ dB

## 2 Test Configuration

### 2.1 Testing Condition

Test Item	Test Site	Ambient Condition	Tested By
AC Conduction	CO01-WS	21°C / 62%	Akun Chung
Radiated Emissions	03CH03-WS	23-24°C / 63-65%	Roger Lu Akun Chung
RF Conducted	TH01-WS	21°C / 64%	Roger Lu

- FCC Designation No.: TW0009
- FCC site registration No.: 207696
- ISED#: 10807A
- CAB identifier: TW2732

### 2.2 The Worst Test Modes and Channel Details

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

**NOTE:**

1. The EUT was pretested with 3 orientations placed on the table for the radiated emission measurement – X, Y, and Z-plane. The **X-plane** results were found as the worst case and were shown in this report.
2. The EUT had been tested by following test configurations.
  - 1) Configuration 1 : Adapter mode
  - 2) Configuration 2 : POE mode

### 3 Transmitter Test Results

#### 3.1 Conducted Emissions

##### 3.1.1 Limit of Conducted Emissions

Conducted Emissions Limit		
Frequency Emission (MHz)	Quasi-Peak	Average
0.15-0.5	66 - 56 *	56 - 46 *
0.5-5	56	46
5-30	60	50

Note 1: \* Decreases with the logarithm of the frequency.

##### 3.1.2 Test Procedures

1. The device is placed on a test table, raised 80 cm above the reference ground plane. The vertical conducting plane is located 40 cm to the rear of the device.
2. The device is connected to line impedance stabilization network (LISN) and other accessories are connected to other LISN. Measured levels of AC power line conducted emission are across the 50  $\Omega$  LISN port.
3. AC conducted emission measurements is made over frequency range from 150 kHz to 30 MHz.
4. This measurement was performed with AC 120V/60Hz

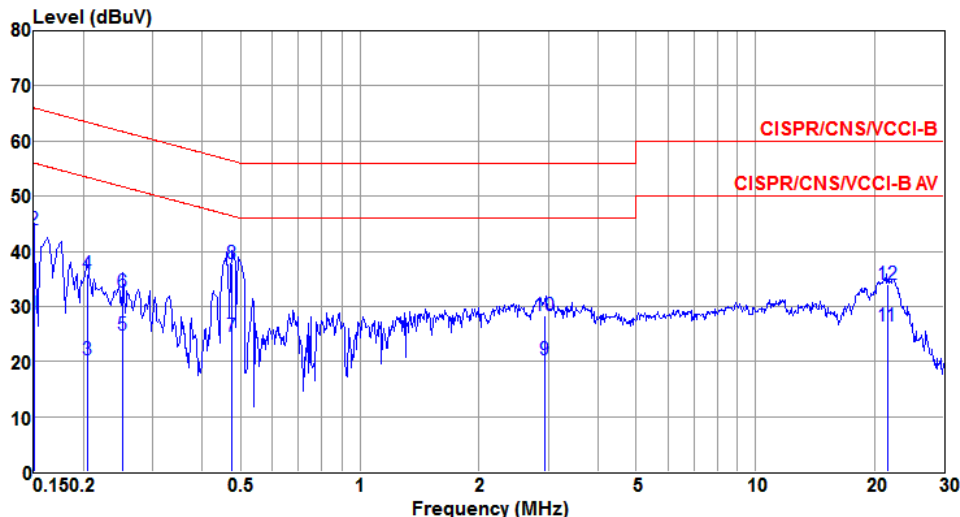
##### 3.1.3 Test Setup



- Note: 1. Support units were connected to second LISN.  
 2. Both of LISNs (AMN) are 80 cm from EUT and at least 80 cm from other units and other metal planes

### 3.1.4 Test Result of Conducted Emissions

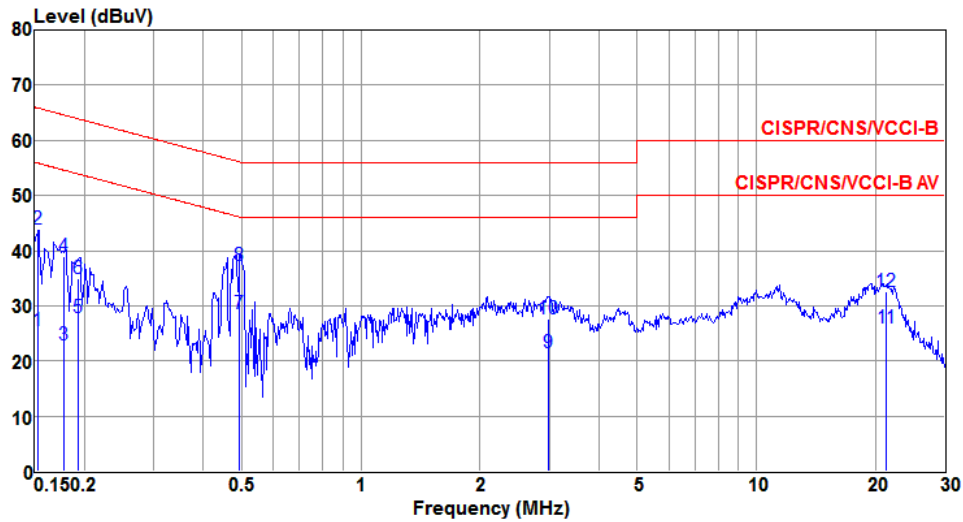
Modulation Mode	GFSK	Test Freq. (MHz)	2480
Power Phase	Line	Test Configuration	1

	Freq MHz	Level dBuV	Limit Line dBuV	Over Limit dB	Read Level dBuV	LISN factor dB	cable loss dB	Remark
1	0.150	28.59	56.00	-27.41	28.35	0.07	0.05	Average
2	0.150	43.88	66.00	-22.12	43.64	0.07	0.05	QP
3	0.205	20.30	53.41	-33.11	19.98	0.06	0.07	Average
4	0.205	35.96	63.41	-27.45	35.64	0.06	0.07	QP
5	0.252	24.88	51.70	-26.82	24.54	0.06	0.07	Average
6	0.252	32.57	61.70	-29.13	32.23	0.06	0.07	QP
7	0.476	24.58	46.41	-21.83	24.17	0.06	0.08	Average
8*	0.476	37.85	56.41	-18.56	37.44	0.06	0.08	QP
9	2.945	20.22	46.00	-25.78	19.52	0.10	0.23	Average
10	2.945	28.26	56.00	-27.74	27.56	0.10	0.23	QP
11	21.547	26.55	50.00	-23.45	25.03	0.25	0.63	Average
12	21.547	33.88	60.00	-26.12	32.36	0.25	0.63	QP

Note 1: Level (dBuV) = Read Level (dBuV) + LISN Factor (dB) + Cable Loss (dB).  
 2: Over Limit (dB) = Level (dBuV) – Limit Line (dBuV).

Modulation Mode	GFSK	Test Freq. (MHz)	2480
Power Phase	Neutral	Test Configuration	1

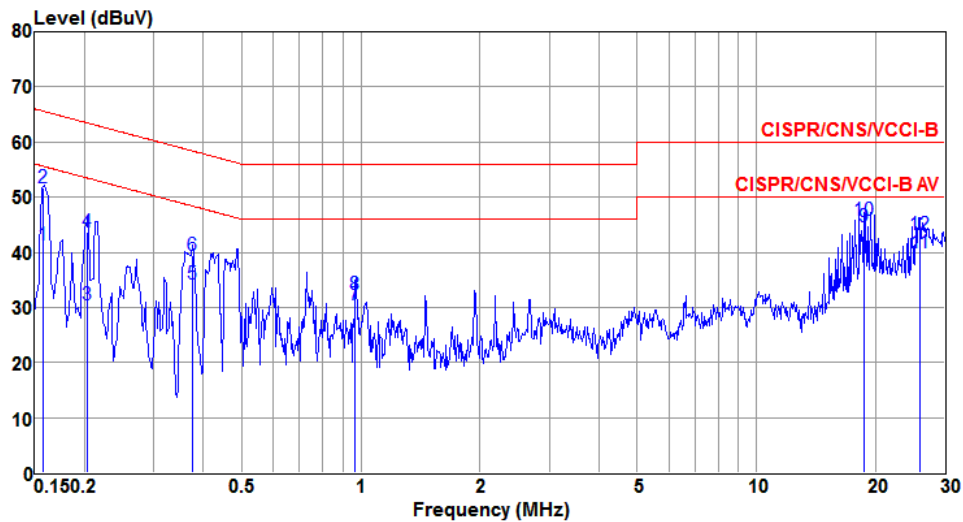


	Freq MHz	Level dBuV	Limit Line dBuV	Over Limit dB	Read Level dBuV	LISN factor dB	cable loss dB	Remark
1	0.152	25.48	55.86	-30.38	25.27	0.05	0.05	Average
2	0.152	43.85	65.86	-22.01	43.64	0.05	0.05	QP
3	0.177	22.85	54.62	-31.77	22.62	0.04	0.06	Average
4	0.177	38.96	64.62	-25.66	38.73	0.04	0.06	QP
5	0.192	27.95	53.93	-25.98	27.70	0.04	0.07	Average
6	0.192	34.82	63.93	-29.11	34.57	0.04	0.07	QP
7*	0.494	28.52	46.10	-17.58	28.24	0.05	0.08	Average
8	0.494	37.32	56.10	-18.78	37.04	0.05	0.08	QP
9	2.985	21.58	46.00	-24.42	21.01	0.08	0.23	Average
10	2.985	27.71	56.00	-28.29	27.14	0.08	0.23	QP
11	21.357	25.88	50.00	-24.12	24.48	0.27	0.62	Average
12	21.357	32.57	60.00	-27.43	31.17	0.27	0.62	QP

Note 1: Level (dBuV) = Read Level (dBuV) + LISN Factor (dB) + Cable Loss (dB).  
 2: Over Limit (dB) = Level (dBuV) – Limit Line (dBuV).



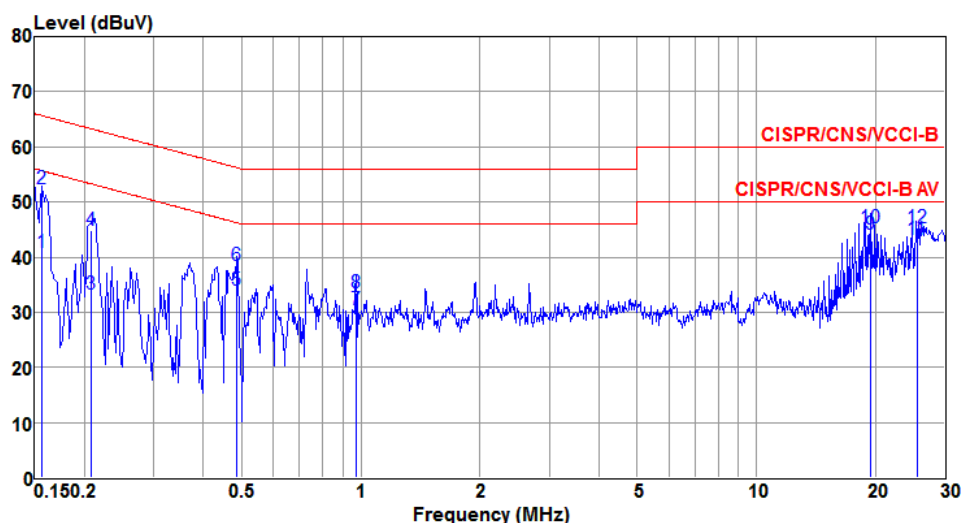
Modulation Mode	GFSK	Test Freq. (MHz)	2480
Power Phase	Line	Test Configuration	2



	Freq MHz	Level dBUV	Limit Line dBUV	Over Limit dB	Read Level dBUV	LISN factor dB	cable loss dB	Remark
1	0.157	41.23	55.61	-14.38	41.11	0.07	0.05	Average
2	0.157	51.76	65.61	-13.85	51.64	0.07	0.05	QP
3	0.203	30.56	53.49	-22.93	30.43	0.06	0.07	Average
4	0.203	43.68	63.49	-19.81	43.55	0.06	0.07	QP
5	0.375	34.21	48.39	-14.18	34.07	0.06	0.08	Average
6	0.375	39.44	58.39	-18.95	39.30	0.06	0.08	QP
7	0.968	30.55	46.00	-15.45	30.37	0.08	0.10	Average
8	0.968	32.44	56.00	-23.56	32.26	0.08	0.10	QP
9*	18.726	44.63	50.00	-5.37	43.81	0.23	0.59	Average
10	18.726	45.76	60.00	-14.24	44.94	0.23	0.59	QP
11	26.001	39.93	50.00	-10.07	38.96	0.27	0.70	Average
12	26.001	43.20	60.00	-16.80	42.23	0.27	0.70	QP

Note 1: Level (dBUV) = Read Level (dBUV) + LISN Factor (dB) + Cable Loss (dB).  
 2: Over Limit (dB) = Level (dBUV) – Limit Line (dBUV).

Modulation Mode	GFSK	Test Freq. (MHz)	2480
Power Phase	Neutral	Test Configuration	2



	Freq MHz	Level dBuV	Limit Line dBuV	Over Limit dB	Read Level dBuV	LISN factor dB	cable loss dB	Remark
1	0.156	40.80	55.66	-14.86	40.70	0.05	0.05	Average
2	0.156	52.44	65.66	-13.22	52.34	0.05	0.05	QP
3	0.208	33.21	53.27	-20.06	33.10	0.04	0.07	Average
4	0.208	44.89	63.27	-18.38	44.78	0.04	0.07	QP
5	0.485	34.11	46.25	-12.14	33.98	0.05	0.08	Average
6	0.485	38.42	56.25	-17.83	38.29	0.05	0.08	QP
7	0.972	30.52	46.00	-15.48	30.36	0.06	0.10	Average
8	0.972	33.41	56.00	-22.59	33.25	0.06	0.10	QP
9*	19.430	44.08	50.00	-5.92	43.22	0.26	0.60	Average
10	19.430	45.24	60.00	-14.76	44.38	0.26	0.60	QP
11	25.470	43.11	50.00	-6.89	42.12	0.30	0.69	Average
12	25.470	45.38	60.00	-14.62	44.39	0.30	0.69	QP

Note 1: Level (dBuV) = Read Level (dBuV) + LISN Factor (dB) + Cable Loss (dB).  
 2: Over Limit (dB) = Level (dBuV) – Limit Line (dBuV).

## 3.2 Unwanted Emissions into Restricted Frequency Bands

### 3.2.1 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.

### 3.2.2 Test Procedures

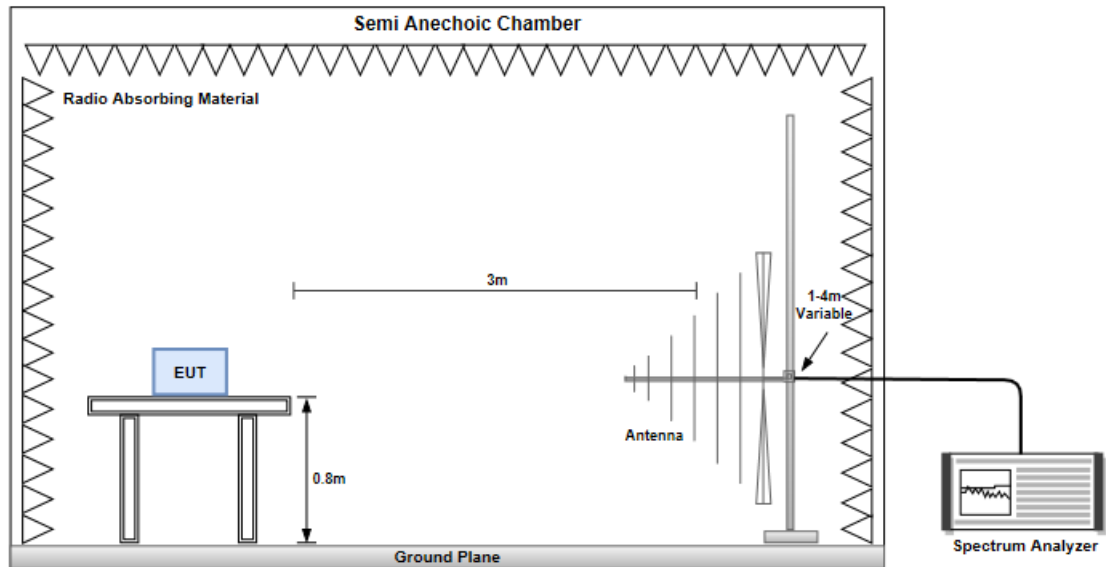
1. Measurement is made at a semi-anechoic chamber that incorporates a turntable allowing a EUT rotation of 360°. A continuously-rotating, remotely-controlled turntable is installed at the test site to support the EUT and facilitate determination of the direction of maximum radiation for each EUT emission 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:

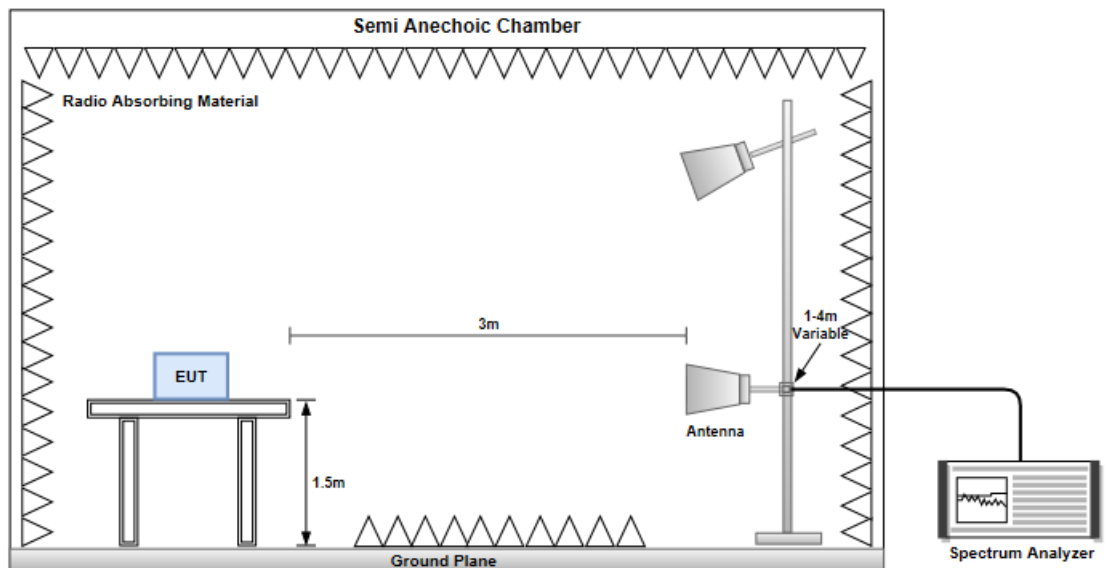
1. 120kHz measurement bandwidth of test receiver and Quasi-peak detector is for radiated emission below 1GHz.
2. Radiated emission above 1GHz / Peak value  
RBW=1MHz, VBW=3MHz and Peak detector  
Radiated emission above 1GHz / Average value for harmonics  
The average value is: Average = Peak value + 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

### 3.2.3 Test Setup

#### Radiated Emissions below 1 GHz

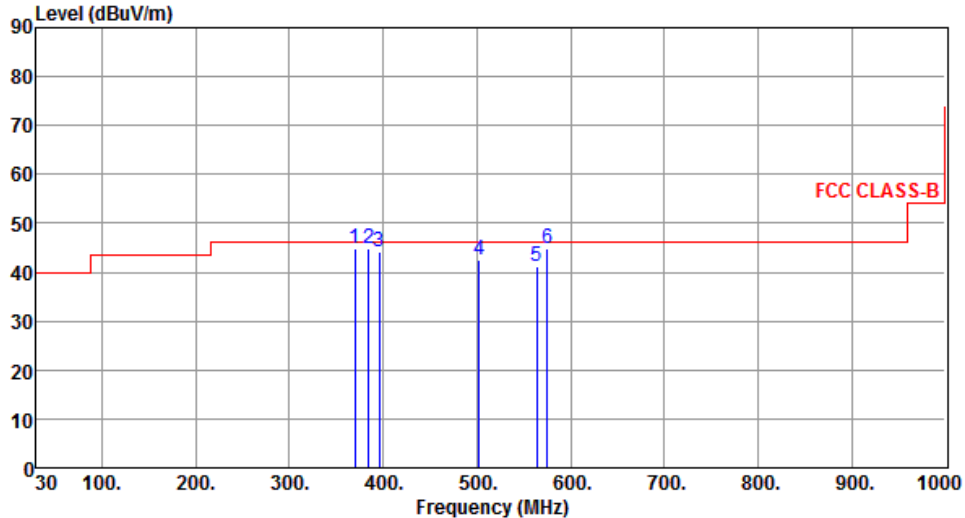


#### Radiated Emissions above 1 GHz



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

Modulation	GFSK	Test Freq. (MHz)	2480
Polarization	Horizontal	Test Configuration	1

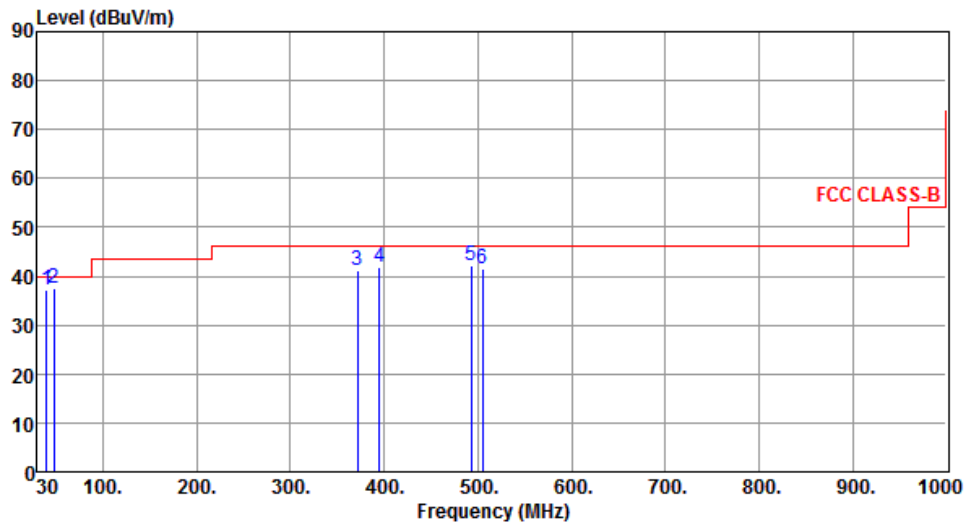
  


	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
1	369.54	44.94	46.00	-1.06	50.72	-5.78	QP	100	121
2	384.88	44.88	46.00	-1.12	50.22	-5.34	QP	100	126
3	395.78	44.10	46.00	-1.90	49.14	-5.04	QP	100	225
4	502.63	42.41	46.00	-3.59	45.16	-2.75	Peak	---	---
5	563.88	41.28	46.00	-4.72	42.67	-1.39	QP	150	143
6	575.10	44.71	46.00	-1.29	45.76	-1.05	QP	141	139

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)	2480
Polarization	Vertical	Test Configuration	1



	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
1	39.98	37.21	40.00	-2.79	45.67	-8.46	QP	100	105
2	47.52	37.41	40.00	-2.59	45.40	-7.99	QP	100	110
3	371.58	41.08	46.00	-4.92	46.80	-5.72	Peak	---	---
4	395.41	41.74	46.00	-4.26	46.79	-5.05	Peak	---	---
5	492.55	42.19	46.00	-3.81	45.12	-2.93	Peak	---	---
6	504.96	41.42	46.00	-4.58	44.12	-2.70	Peak	---	---

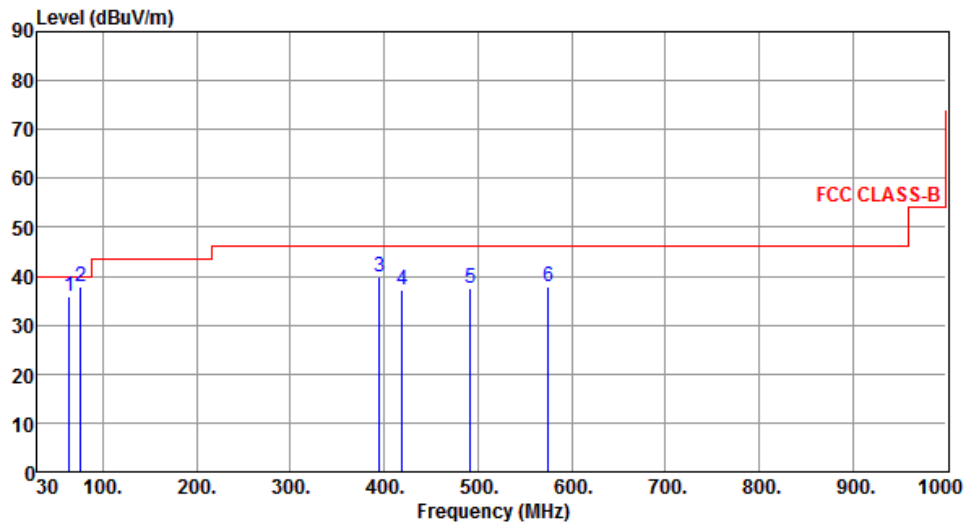
Note 1: Emission Level (dBuV/m) = SA Reading (dBuV/m) + Factor\* (dB)

\*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)	2480
Polarization	Horizontal	Test Configuration	2



	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
1	64.37	35.82	40.00	-4.18	45.29	-9.47	QP	100	59
2	76.41	37.72	40.00	-2.28	49.75	-12.03	QP	135	155
3	394.85	39.89	46.00	-6.11	44.95	-5.06	Peak	---	---
4	418.85	37.26	46.00	-8.74	41.70	-4.44	Peak	---	---
5	491.89	37.58	46.00	-8.42	40.52	-2.94	Peak	---	---
6	575.25	37.92	46.00	-8.08	38.96	-1.04	Peak	---	---

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

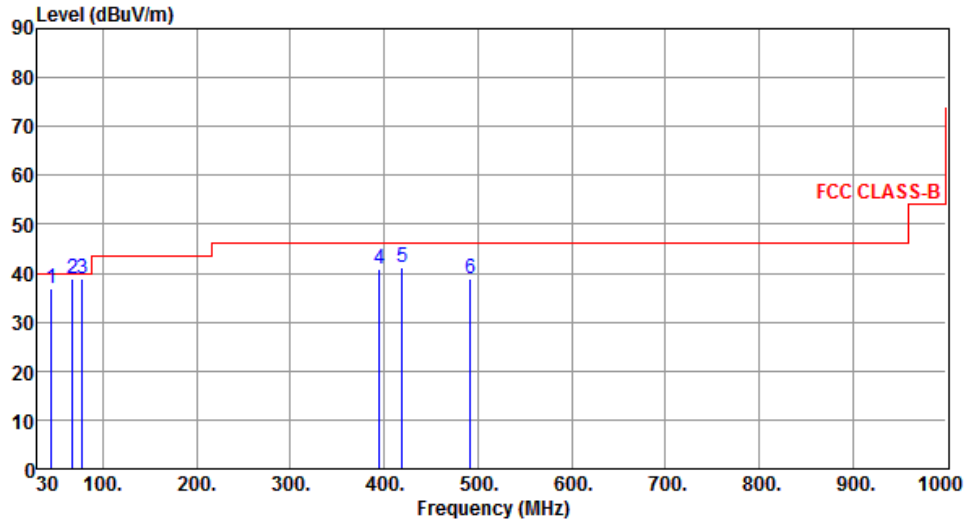
\*Factor includes antenna factor , cable loss and amplifier gain

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)	2480
Polarization	Vertical	Test Configuration	2



	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
1	45.32	36.85	40.00	-3.15	44.95	-8.10	QP	100	91
2	67.34	38.95	40.00	-1.05	48.96	-10.01	QP	100	2
3	78.21	38.81	40.00	-1.19	51.24	-12.43	QP	160	177
4	394.85	40.69	46.00	-5.31	45.75	-5.06	Peak	---	---
5	419.24	41.05	46.00	-4.95	45.48	-4.43	Peak	---	---
6	491.85	38.95	46.00	-7.05	41.89	-2.94	Peak	---	---

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

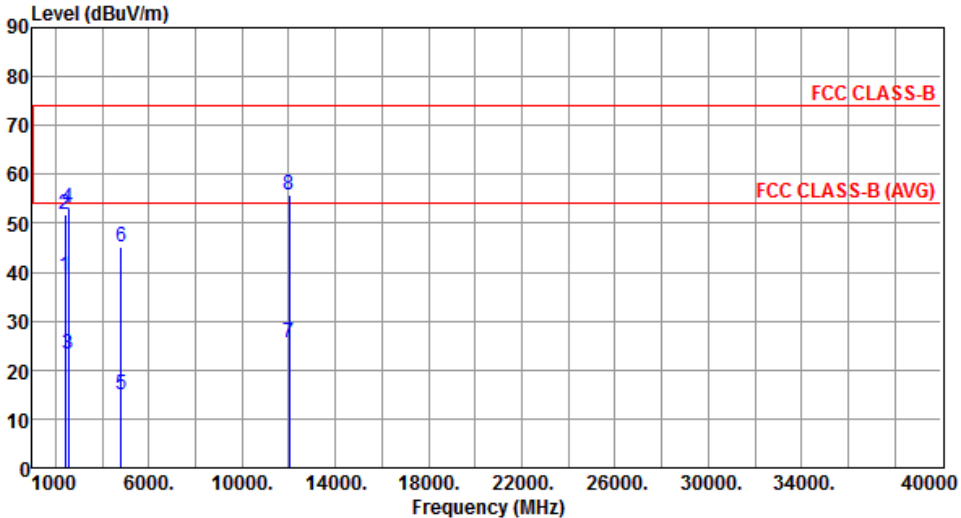
\*Factor includes antenna factor , cable loss and amplifier gain

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.

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

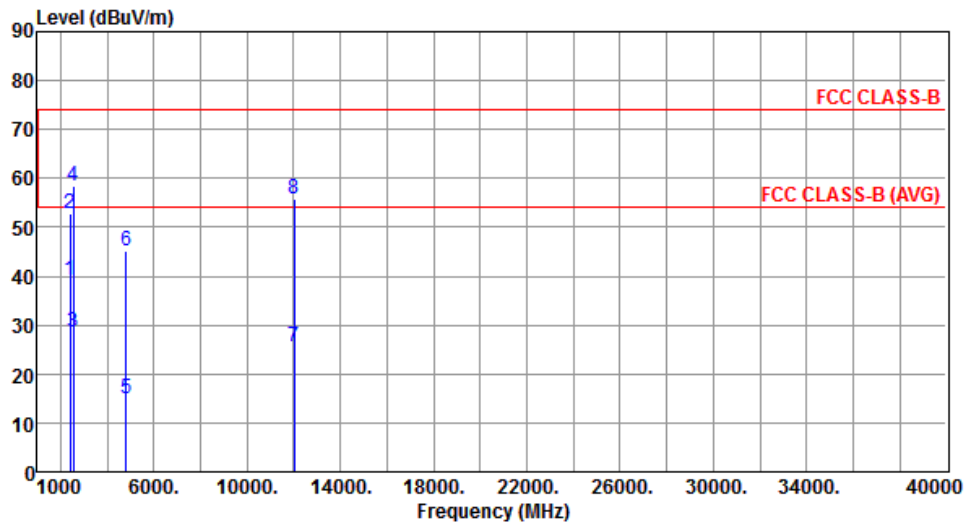
Modulation	GFSK	Test Freq. (MHz)	2402
Polarization	Horizontal	Test Configuration	2

	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	39.30	54.00	-14.70	40.56	-1.26	Average	103	220
2	2390.00	51.88	74.00	-22.12	53.14	-1.26	Peak	103	220
3	2558.00	23.10	54.00	-30.90	24.41	-1.31	Average	103	220
4	2558.00	53.20	74.00	-20.80	54.51	-1.31	Peak	103	220
5	4804.00	14.97	54.00	-39.03	10.18	4.79	Average	100	60
6	4804.00	45.07	74.00	-28.93	40.28	4.79	Peak	100	60
7	12010.00	25.69	54.00	-28.31	11.19	14.50	Average	100	80
8	12010.00	55.79	74.00	-18.21	41.29	14.50	Peak	100	80

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	Test Configuration	2



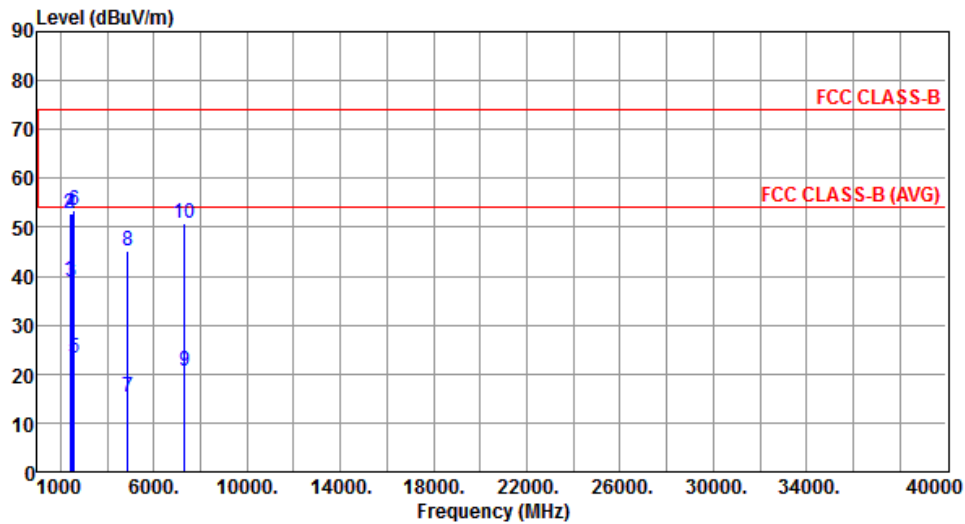
	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
1	2390.00	39.31	54.00	-14.69	40.57	-1.26	Average	179	273
2	2390.00	52.95	74.00	-21.05	54.21	-1.26	Peak	179	273
3	2558.00	28.49	54.00	-25.51	29.80	-1.31	Average	167	269
4	2558.00	58.59	74.00	-15.41	59.90	-1.31	Peak	167	269
5	4804.00	14.96	54.00	-39.04	10.17	4.79	Average	100	50
6	4804.00	45.06	74.00	-28.94	40.27	4.79	Peak	100	50
7	12010.00	25.68	54.00	-28.32	11.18	14.50	Average	100	90
8	12010.00	55.78	74.00	-18.22	41.28	14.50	Peak	100	90

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	Test Configuration	2



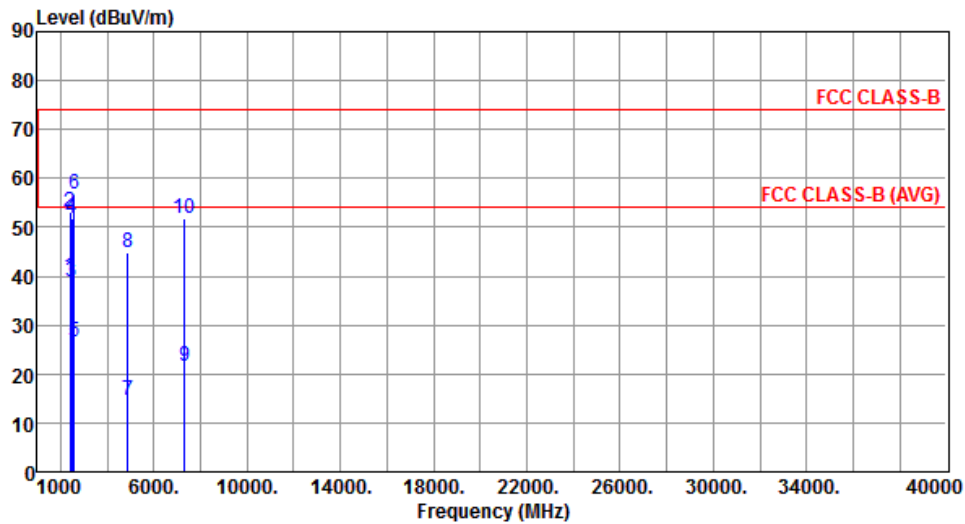
	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
1	2390.00	39.06	54.00	-14.94	40.32	-1.26	Average	100	219
2	2390.00	52.86	74.00	-21.14	54.12	-1.26	Peak	100	219
3	2483.50	39.02	54.00	-14.98	40.38	-1.36	Average	100	219
4	2483.50	52.91	74.00	-21.09	54.27	-1.36	Peak	100	219
5	2597.00	23.31	54.00	-30.69	24.59	-1.28	Average	100	219
6	2597.00	53.41	74.00	-20.59	54.69	-1.28	Peak	100	219
7	4882.00	15.22	54.00	-38.78	10.41	4.81	Average	100	146
8	4882.00	45.32	74.00	-28.68	40.51	4.81	Peak	100	146
9	7323.00	20.57	54.00	-33.43	10.66	9.91	Average	100	234
10	7323.00	50.67	74.00	-23.33	40.76	9.91	Peak	100	234

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	Vertical	Test Configuration	2



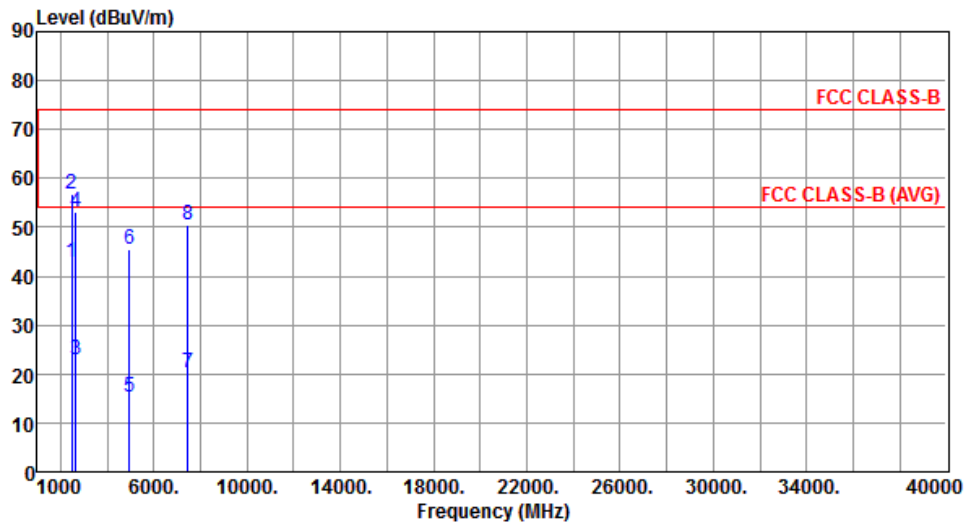
	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
1	2390.00	39.77	54.00	-14.23	41.03	-1.26	Average	173	272
2	2390.00	53.03	74.00	-20.97	54.29	-1.26	Peak	173	272
3	2483.50	38.86	54.00	-15.14	40.22	-1.36	Average	173	272
4	2483.50	51.89	74.00	-22.11	53.25	-1.36	Peak	173	272
5	2597.00	26.58	54.00	-27.42	27.86	-1.28	Average	172	255
6	2597.00	56.68	74.00	-17.32	57.96	-1.28	Peak	172	255
7	4882.00	14.77	54.00	-39.23	9.96	4.81	Average	100	50
8	4882.00	44.87	74.00	-29.13	40.06	4.81	Peak	100	50
9	7323.00	21.65	54.00	-32.35	11.74	9.91	Average	102	173
10	7323.00	51.75	74.00	-22.25	41.84	9.91	Peak	102	173

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	Horizontal	Test Configuration	2



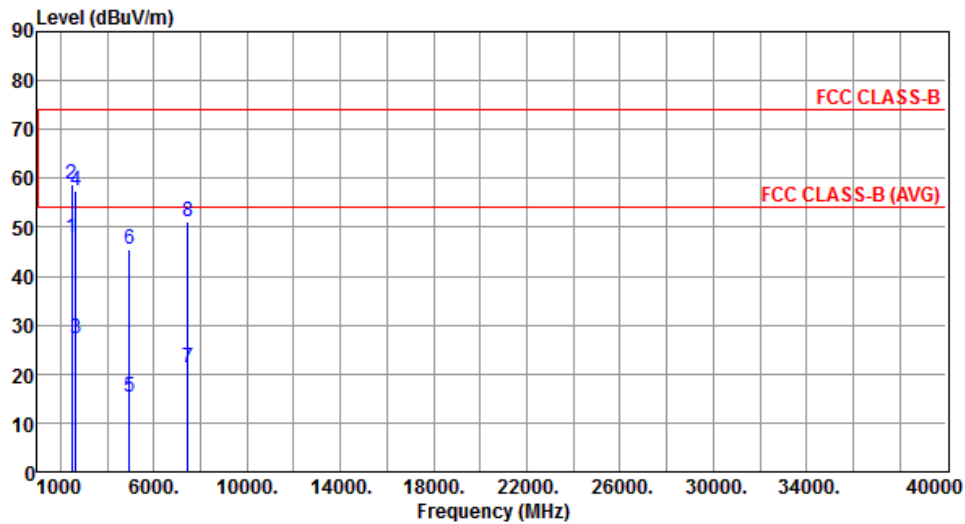
	Freq. MHz	Emission level dBUV/m	Limit dBUV/m	Margin dB	SA reading dBUV	Factor dB	Remark	ANT High cm	Turn Table deg
1	2483.50	42.77	54.00	-11.23	44.13	-1.36	Average	100	217
2	2483.50	56.86	74.00	-17.14	58.22	-1.36	Peak	100	217
3	2636.00	23.03	54.00	-30.97	24.04	-1.01	Average	100	217
4	2636.00	53.13	74.00	-20.87	54.14	-1.01	Peak	100	217
5	4960.00	15.26	54.00	-38.74	10.17	5.09	Average	100	20
6	4960.00	45.36	74.00	-28.64	40.27	5.09	Peak	100	20
7	7440.00	20.24	54.00	-33.76	10.35	9.89	Average	100	60
8	7440.00	50.34	74.00	-23.66	40.45	9.89	Peak	100	60

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	Test Configuration	2



	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	47.70	54.00	-6.30	49.06	-1.36	Average	187	271
2	2483.50	58.83	74.00	-15.17	60.19	-1.36	Peak	187	271
3	2636.00	27.21	54.00	-26.79	28.22	-1.01	Average	144	258
4	2636.00	57.31	74.00	-16.69	58.32	-1.01	Peak	144	258
5	4960.00	15.23	54.00	-38.77	10.14	5.09	Average	100	30
6	4960.00	45.33	74.00	-28.67	40.24	5.09	Peak	100	30
7	7440.00	21.16	54.00	-32.84	11.27	9.89	Average	100	175
8	7440.00	51.26	74.00	-22.74	41.37	9.89	Peak	100	175

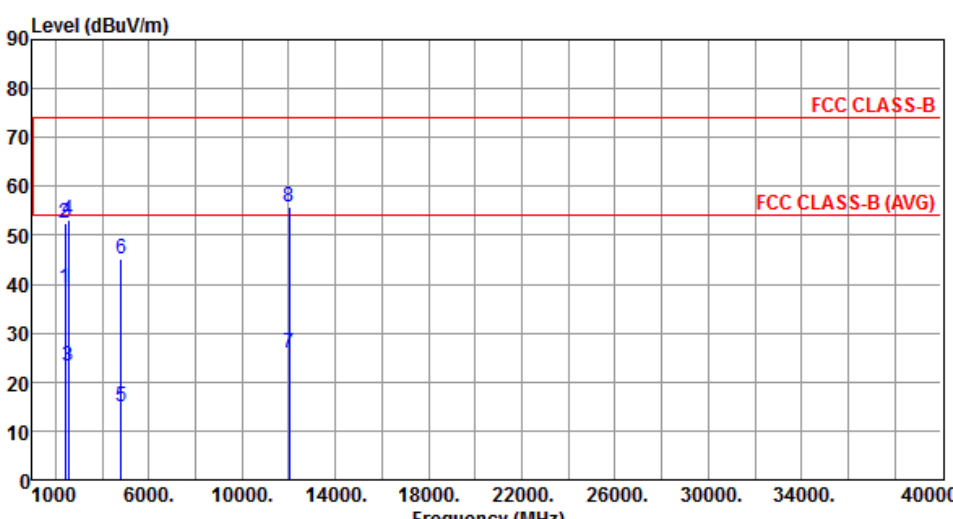
Note 1: Emission Level (dBuV/m) = SA Reading (dBuV/m) + Factor\* (dB)

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

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

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

Modulation	8DPSK	Test Freq. (MHz)	2402
Polarization	Horizontal	Test Configuration	2

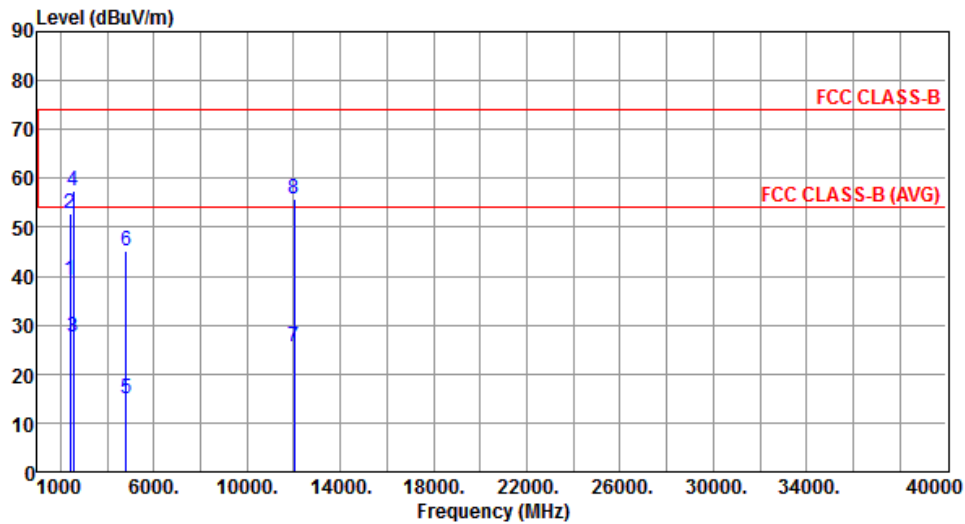
  


	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
1	2390.00	39.15	54.00	-14.85	40.41	-1.26	Average	103	217
2	2390.00	52.31	74.00	-21.69	53.57	-1.26	Peak	103	217
3	2558.00	23.10	54.00	-30.90	24.41	-1.31	Average	103	217
4	2558.00	53.20	74.00	-20.80	54.51	-1.31	Peak	103	217
5	4804.00	15.05	54.00	-38.95	10.26	4.79	Average	100	60
6	4804.00	45.15	74.00	-28.85	40.36	4.79	Peak	100	60
7	12010.00	25.76	54.00	-28.24	11.26	14.50	Average	100	80
8	12010.00	55.86	74.00	-18.14	41.36	14.50	Peak	100	80

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)	2402
Polarization	Vertical	Test Configuration	2



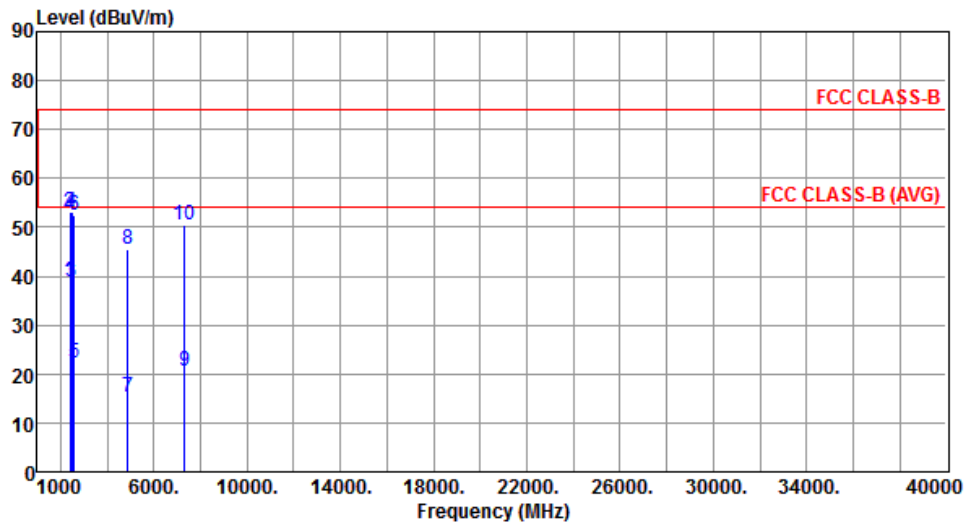
	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
1	2390.00	39.16	54.00	-14.84	40.42	-1.26	Average	180	273
2	2390.00	52.95	74.00	-21.05	54.21	-1.26	Peak	180	273
3	2558.00	27.40	54.00	-26.60	28.71	-1.31	Average	170	266
4	2558.00	57.50	74.00	-16.50	58.81	-1.31	Peak	170	266
5	4804.00	14.96	54.00	-39.04	10.17	4.79	Average	100	60
6	4804.00	45.06	74.00	-28.94	40.27	4.79	Peak	100	60
7	12010.00	25.73	54.00	-28.27	11.23	14.50	Average	100	100
8	12010.00	55.83	74.00	-18.17	41.33	14.50	Peak	100	100

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	Test Configuration	2



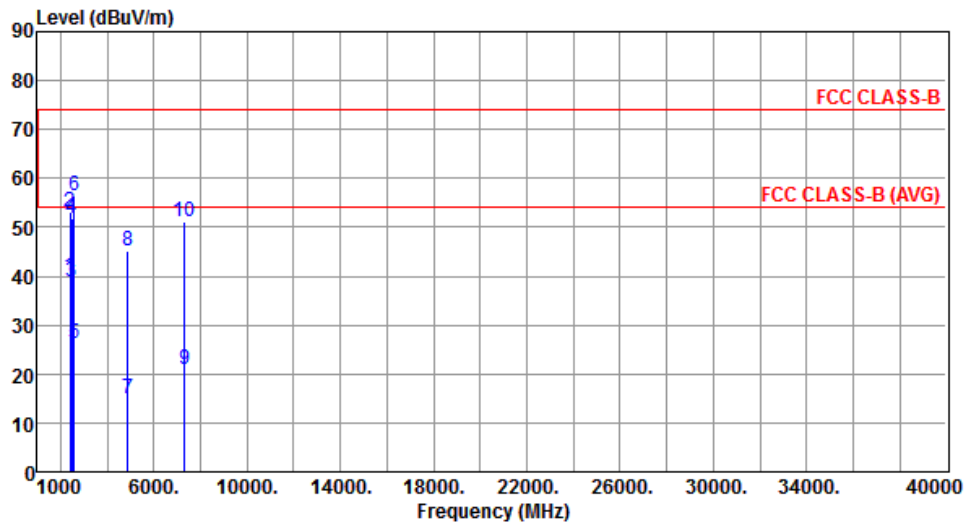
	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
1	2390.00	38.99	54.00	-15.01	40.25	-1.26	Average	100	220
2	2390.00	53.00	74.00	-21.00	54.26	-1.26	Peak	100	220
3	2483.50	38.90	54.00	-15.10	40.26	-1.36	Average	100	220
4	2483.50	52.98	74.00	-21.02	54.34	-1.36	Peak	100	220
5	2597.00	22.27	54.00	-31.73	23.55	-1.28	Average	100	220
6	2597.00	52.37	74.00	-21.63	53.65	-1.28	Peak	100	220
7	4882.00	15.38	54.00	-38.62	10.57	4.81	Average	100	150
8	4882.00	45.48	74.00	-28.52	40.67	4.81	Peak	100	150
9	7323.00	20.50	54.00	-33.50	10.59	9.91	Average	100	250
10	7323.00	50.60	74.00	-23.40	40.69	9.91	Peak	100	250

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	Vertical	Test Configuration	2



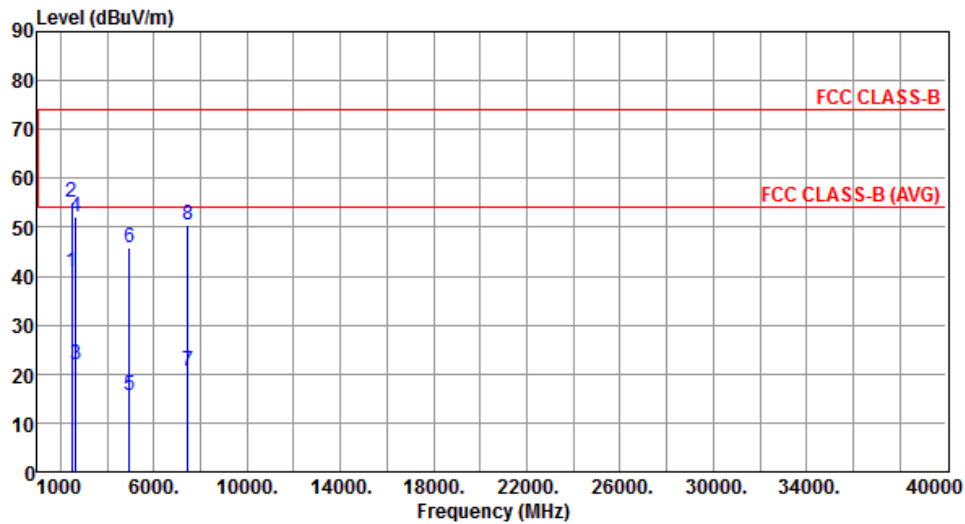
	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
1	2390.00	39.95	54.00	-14.05	41.21	-1.26	Average	186	272
2	2390.00	53.10	74.00	-20.90	54.36	-1.26	Peak	186	272
3	2483.50	38.91	54.00	-15.09	40.27	-1.36	Average	186	272
4	2483.50	51.89	74.00	-22.11	53.25	-1.36	Peak	186	272
5	2597.00	26.26	54.00	-27.74	27.54	-1.28	Average	145	250
6	2597.00	56.36	74.00	-17.64	57.64	-1.28	Peak	145	250
7	4882.00	15.04	54.00	-38.96	10.23	4.81	Average	100	60
8	4882.00	45.14	74.00	-28.86	40.33	4.81	Peak	100	60
9	7323.00	21.06	54.00	-32.94	11.15	9.91	Average	100	170
10	7323.00	51.16	74.00	-22.84	41.25	9.91	Peak	100	170

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	Horizontal	Test Configuration	2



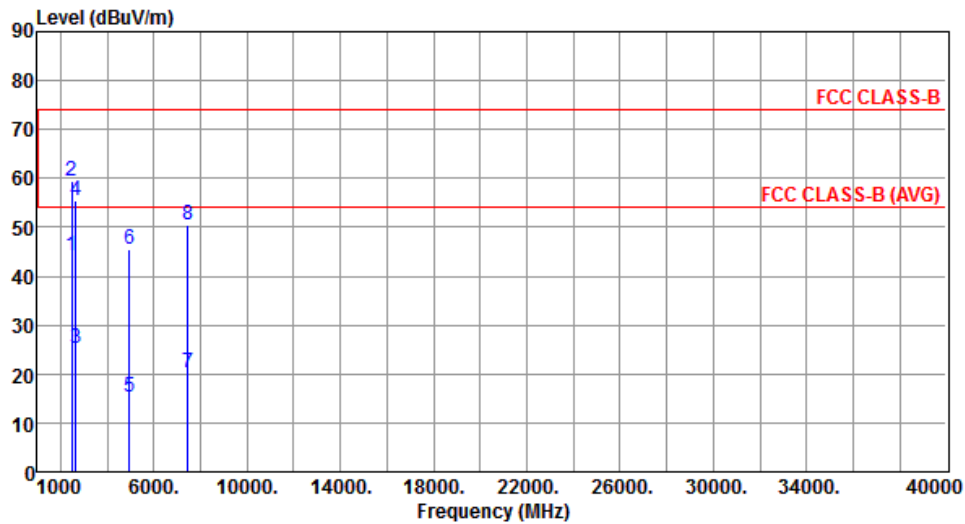
	Freq. MHz	Emission level dBUV/m	Limit dBUV/m	Margin dB	SA reading dBUV	Factor dB	Remark	ANT High cm	Turn Table deg
1	2483.50	40.90	54.00	-13.10	42.26	-1.36	Average	100	217
2	2483.50	54.98	74.00	-19.02	56.34	-1.36	Peak	100	217
3	2636.00	22.03	54.00	-31.97	23.04	-1.01	Average	100	217
4	2636.00	52.13	74.00	-21.87	53.14	-1.01	Peak	100	217
5	4960.00	15.62	54.00	-38.38	10.53	5.09	Average	100	20
6	4960.00	45.72	74.00	-28.28	40.63	5.09	Peak	100	20
7	7440.00	20.44	54.00	-33.56	10.55	9.89	Average	100	60
8	7440.00	50.54	74.00	-23.46	40.65	9.89	Peak	100	60

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	Test Configuration	2



	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	44.08	54.00	-9.92	45.44	-1.36	Average	190	271
2	2483.50	59.51	74.00	-14.49	60.87	-1.36	Peak	190	271
3	2636.00	25.21	54.00	-28.79	26.22	-1.01	Average	145	260
4	2636.00	55.31	74.00	-18.69	56.32	-1.01	Peak	145	260
5	4960.00	15.23	54.00	-38.77	10.14	5.09	Average	100	30
6	4960.00	45.33	74.00	-28.67	40.24	5.09	Peak	100	30
7	7440.00	20.27	54.00	-33.73	10.38	9.89	Average	100	70
8	7440.00	50.37	74.00	-23.63	40.48	9.89	Peak	100	70

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).

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

#### 3.3.1 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.

#### 3.3.2 Test Procedures

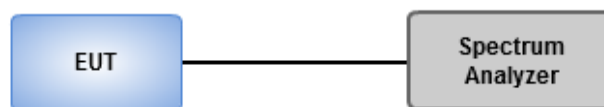
##### Reference level measurement

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

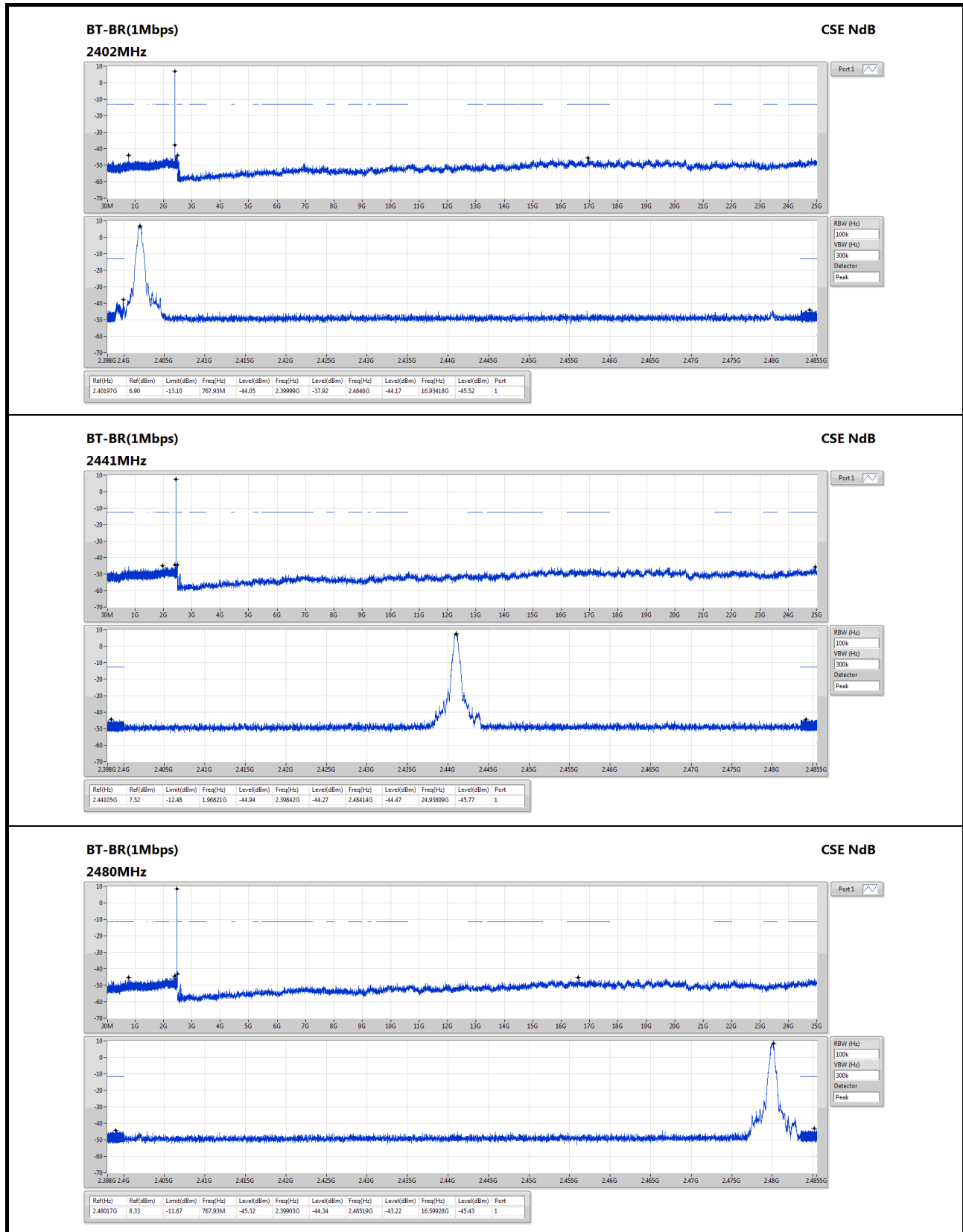
##### Emission level measurement

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

#### 3.3.3 Test Setup



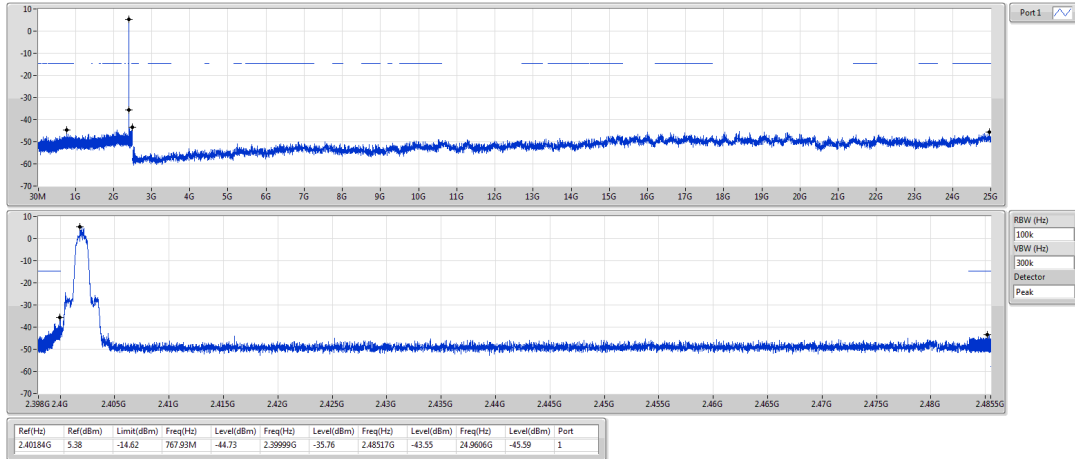
### 3.3.4 Unwanted Emissions into Non-Restricted Frequency Bands



### BT-EDR(2Mbps)

CSE NdB

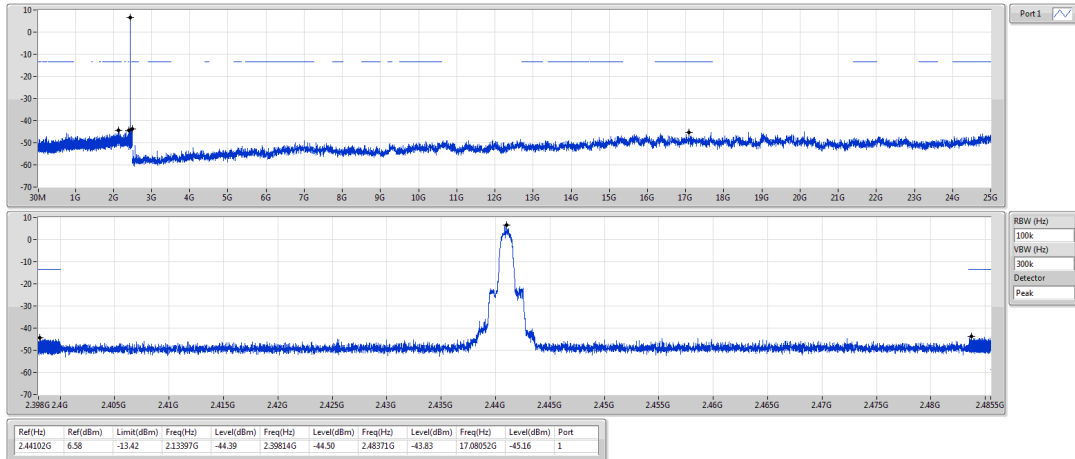
2402MHz



### BT-EDR(2Mbps)

CSE NdB

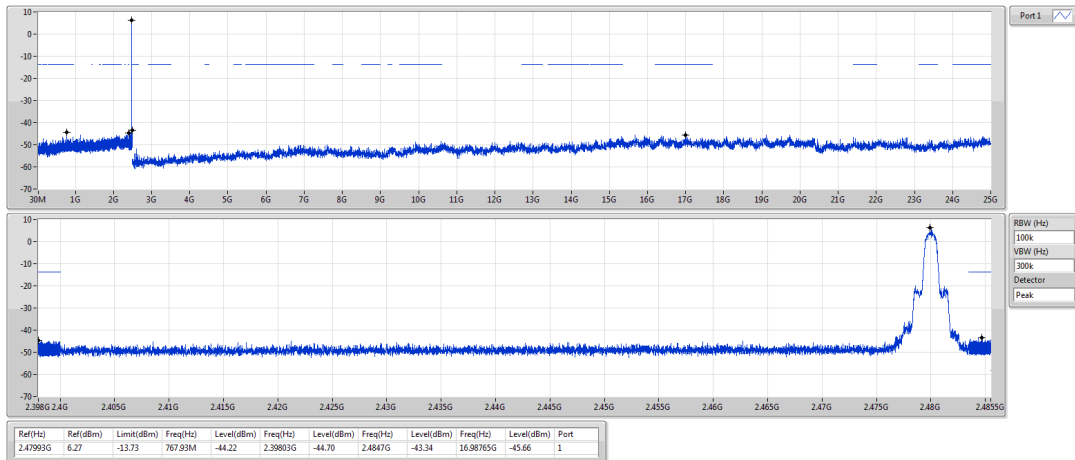
2441MHz



### BT-EDR(2Mbps)

CSE NdB

2480MHz

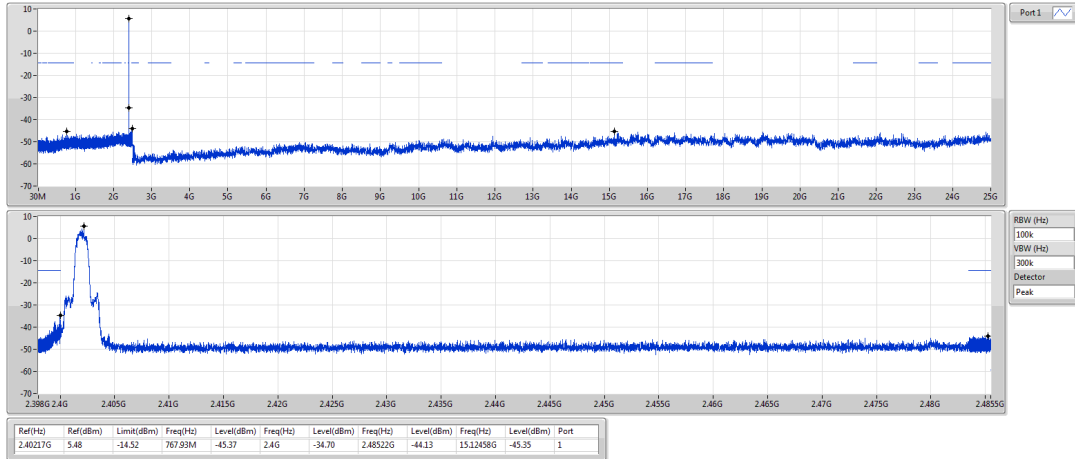




### BT-EDR(3Mbps)

CSE NdB

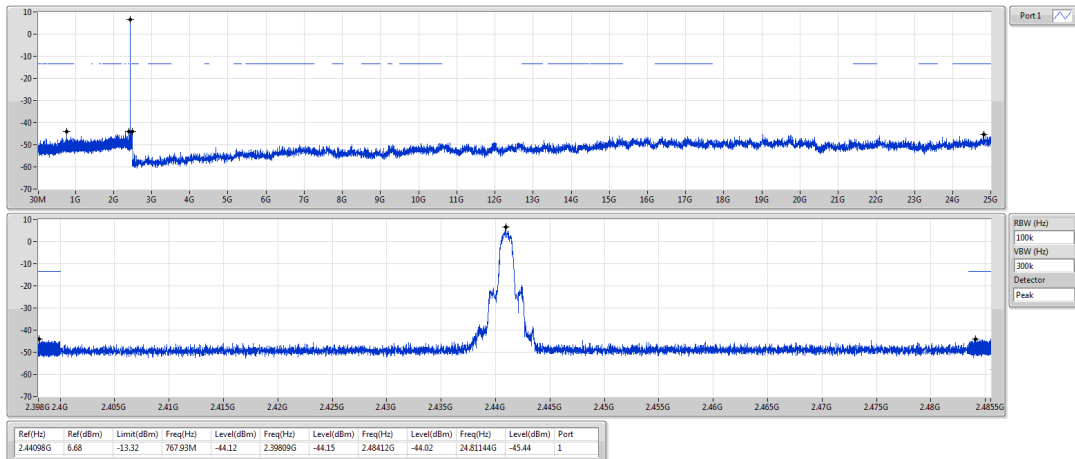
2402MHz



### BT-EDR(3Mbps)

CSE NdB

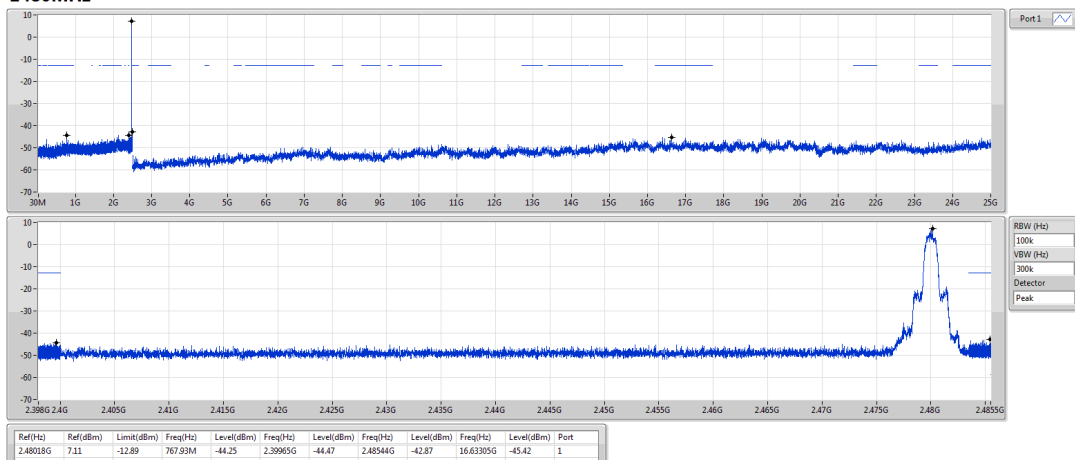
2441MHz



### BT-EDR(3Mbps)

CSE NdB

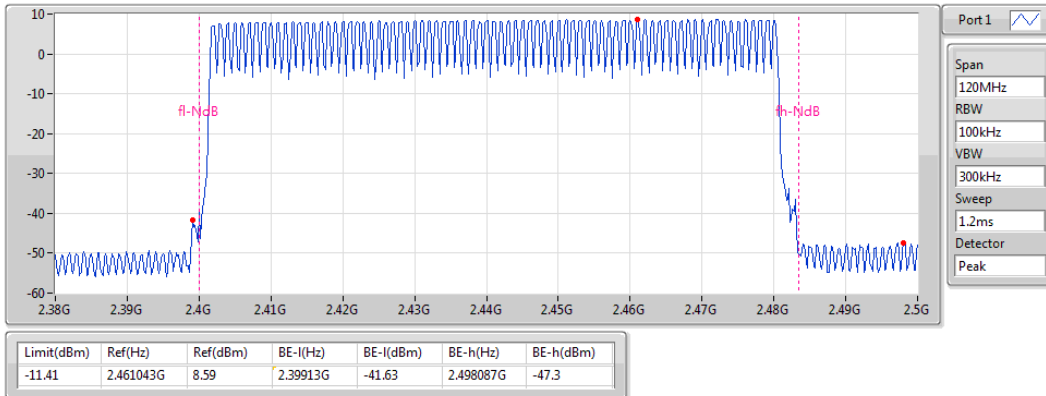
2480MHz



### BT-BR(1Mbps)

2441MHz

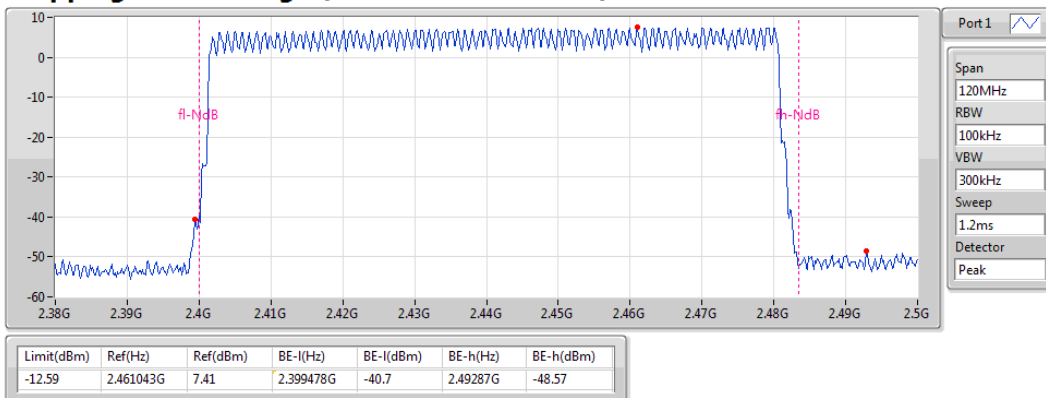
#### Hopping Ch Bandedge (Non-restricted Band)



### BT-EDR(2Mbps)

2441MHz

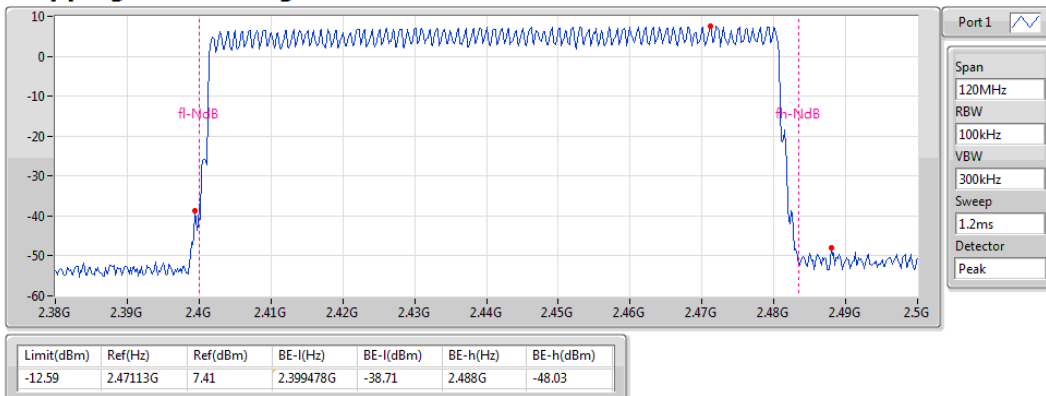
#### Hopping Ch Bandedge (Non-restricted Band)



### BT-EDR(3Mbps)

2441MHz

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



### 3.4 Conducted Output Power

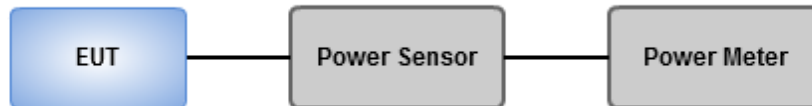
#### 3.4.1 Limit of Conducted Output Power

- ☐ 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.

#### 3.4.2 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

#### 3.4.3 Test Setup



### 3.4.4 Test Result of Conducted Output Power

#### Summary of Peak Conducted Output Power

Mode	Power (dBm)	Power (W)
2.4-2.4835GHz	-	-
BT-BR(1Mbps)	8.62	0.00728
BT-EDR(2Mbps)	8.02	0.00634
BT-EDR(3Mbps)	8.18	0.00658

#### Result

Mode	Result	Gain (dBi)	Power (dBm)	Power Limit (dBm)
BT-BR(1Mbps)	-	-	-	-
2402MHz	Pass	3.40	7.73	21.00
2441MHz	Pass	3.40	8.44	21.00
2480MHz	Pass	3.40	8.62	21.00
BT-EDR(2Mbps)	-	-	-	-
2402MHz	Pass	3.40	6.73	21.00
2441MHz	Pass	3.40	7.78	21.00
2480MHz	Pass	3.40	8.02	21.00
BT-EDR(3Mbps)	-	-	-	-
2402MHz	Pass	3.40	6.86	21.00
2441MHz	Pass	3.40	7.90	21.00
2480MHz	Pass	3.40	8.18	21.00

### Summary of Conducted (Average) Output Power

Mode	Power	Power
	(dBm)	(W)
2.4-2.4835GHz	-	-
BT-BR(1Mbps)	8.54	0.00714
BT-EDR(2Mbps)	6.63	0.00460
BT-EDR(3Mbps)	6.64	0.00461

### Result

Mode	Result	Gain (dBi)	Power (dBm)	Power Limit (dBm)
BT-BR(1Mbps)	-	-	-	-
2402MHz	Pass	3.40	7.60	-
2441MHz	Pass	3.40	8.34	-
2480MHz	Pass	3.40	8.54	-
BT-EDR(2Mbps)	-	-	-	-
2402MHz	Pass	3.40	4.78	-
2441MHz	Pass	3.40	6.29	-
2480MHz	Pass	3.40	6.63	-
BT-EDR(3Mbps)	-	-	-	-
2402MHz	Pass	3.40	4.80	-
2441MHz	Pass	3.40	6.30	-
2480MHz	Pass	3.40	6.64	-

Note: Average power is for reference only.

### 3.5 Number of Hopping Frequency

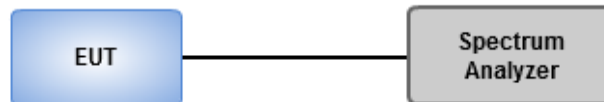
#### 3.5.1 Limit of Number of Hopping Frequency

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

#### 3.5.2 Test Procedures

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

#### 3.5.3 Test Setup



### 3.5.4 Test Result of Number of Hopping Frequency

#### Summary

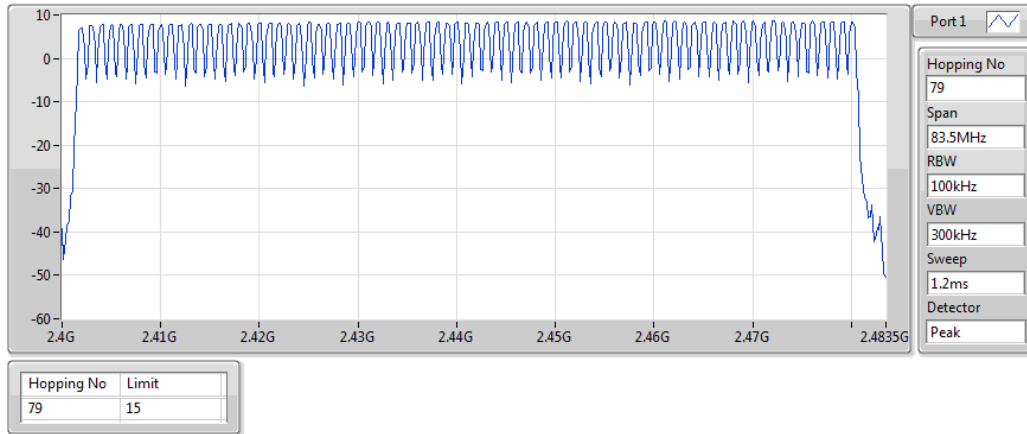
Mode	Max-Hop No
2.4-2.4835GHz	-
BT-BR(1Mbps)	79
BT-EDR(2Mbps)	79
BT-EDR(3Mbps)	79

#### 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

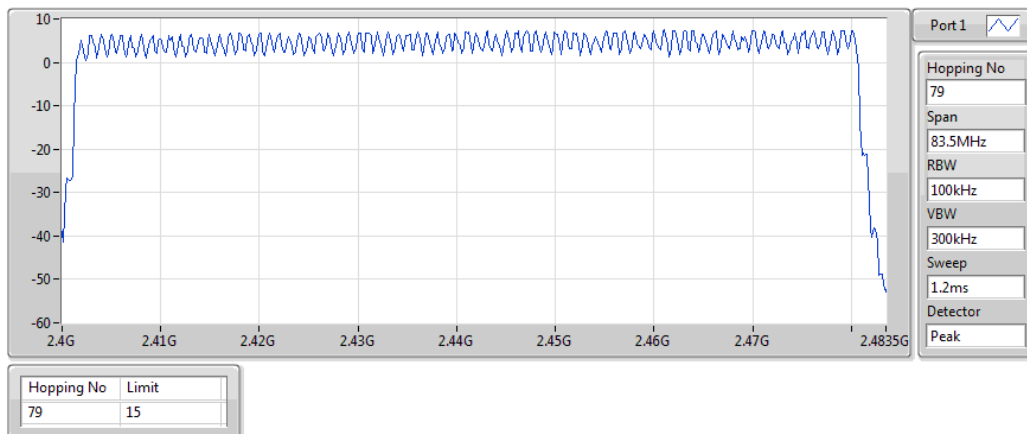
### BT-BR(1Mbps)

2441MHz



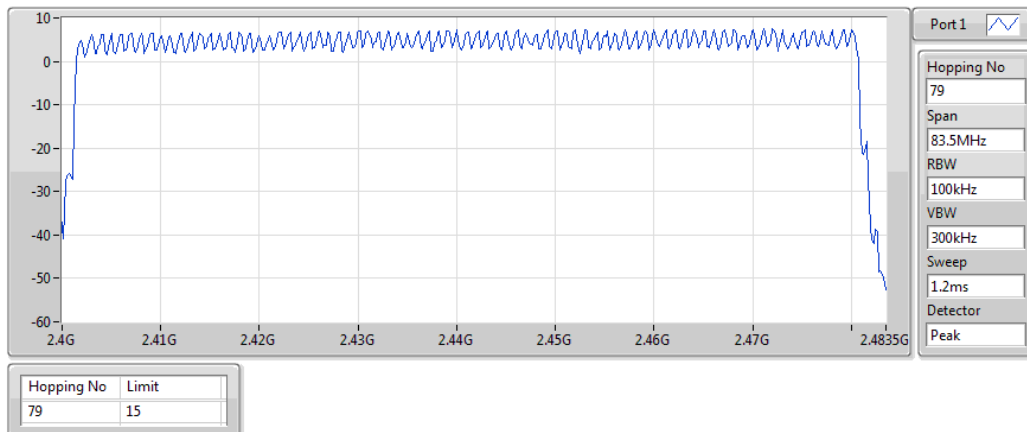
### BT-EDR(2Mbps)

2441MHz



### BT-EDR(3Mbps)

2441MHz





## 3.6 20dB and Occupied Bandwidth

### 3.6.1 Test Procedures

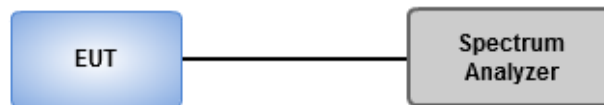
#### 20dB Bandwidth

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

### 3.6.2 Test Setup



### 3.6.3 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)	923.913k	871.925k	872KF1D	920.29k	864.689k
BT-EDR(2Mbps)	1.337M	1.23M	1M23G1D	1.319M	1.205M
BT-EDR(3Mbps)	1.312M	1.219M	1M22G1D	1.283M	1.205M

**Max-N dB** = Maximum20dB downbandwidth;**Max-OBW** = Maximum99% occupied bandwidth;

**Min-N dB** = Minimum20dB downbandwidth;**Min-OBW** = Minimum99% occupied bandwidth;

#### Result

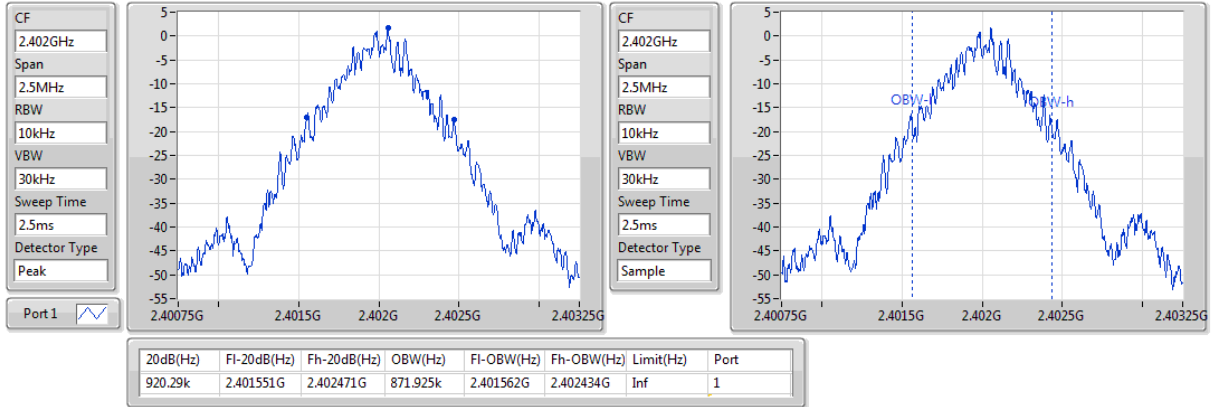
Mode	Result	Limit (Hz)	Port 1-N dB (Hz)	Port 1-OBW (Hz)
BT-BR(1Mbps)	-	-	-	-
2402MHz	Pass	Inf	920.29k	871.925k
2441MHz	Pass	Inf	923.913k	864.689k
2480MHz	Pass	Inf	920.29k	868.307k
BT-EDR(2Mbps)	-	-	-	-
2402MHz	Pass	Inf	1.322M	1.205M
2441MHz	Pass	Inf	1.319M	1.219M
2480MHz	Pass	Inf	1.337M	1.23M
BT-EDR(3Mbps)	-	-	-	-
2402MHz	Pass	Inf	1.283M	1.205M
2441MHz	Pass	Inf	1.312M	1.216M
2480MHz	Pass	Inf	1.308M	1.219M

**Port X-N dB** = Port X20dB downbandwidth; **Port X-OBW** = Port X99% occupied bandwidth;

### BT-BR(1Mbps)

EBW

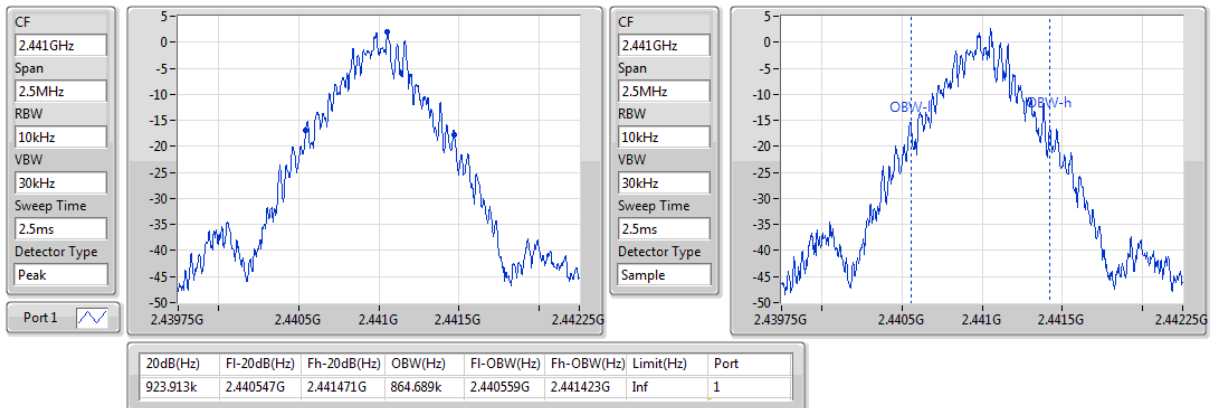
2402MHz



### BT-BR(1Mbps)

EBW

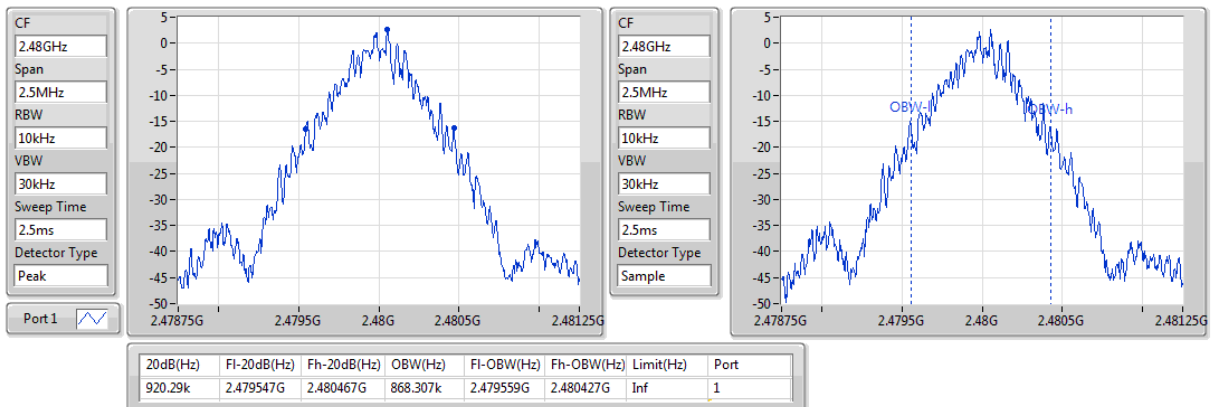
2441MHz



### BT-BR(1Mbps)

EBW

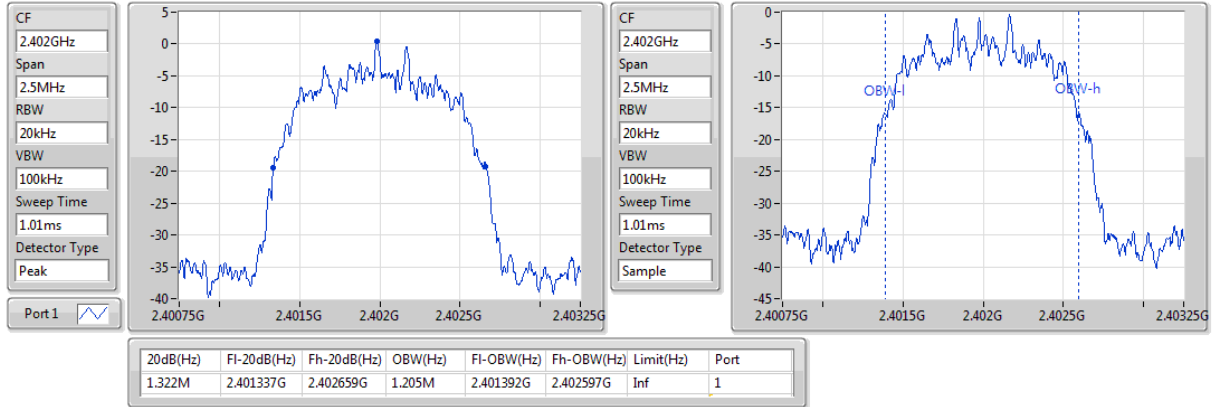
2480MHz



### BT-EDR(2Mbps)

EBW

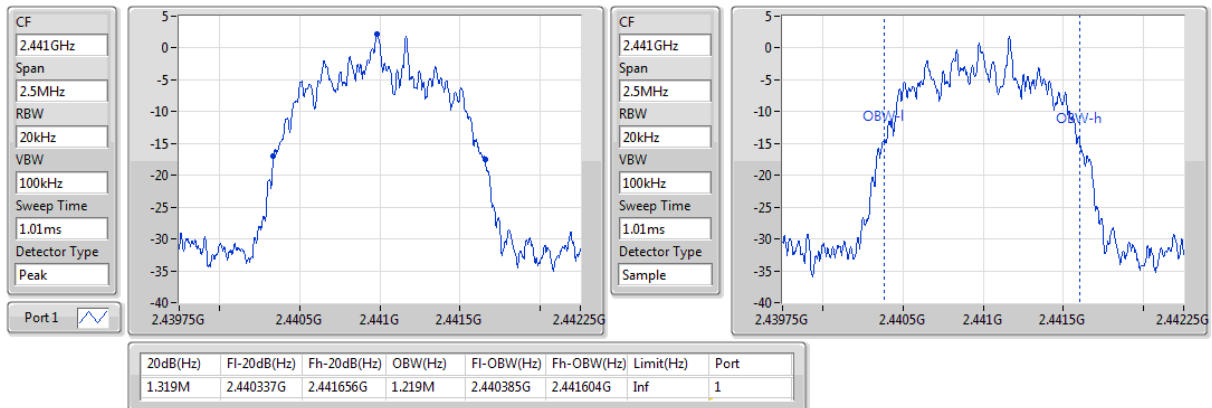
2402MHz



### BT-EDR(2Mbps)

EBW

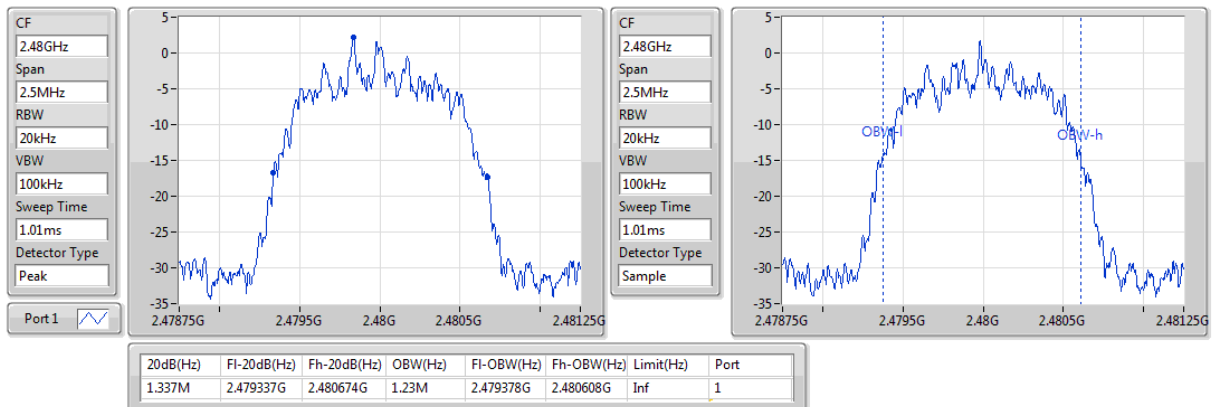
2441MHz



### BT-EDR(2Mbps)

EBW

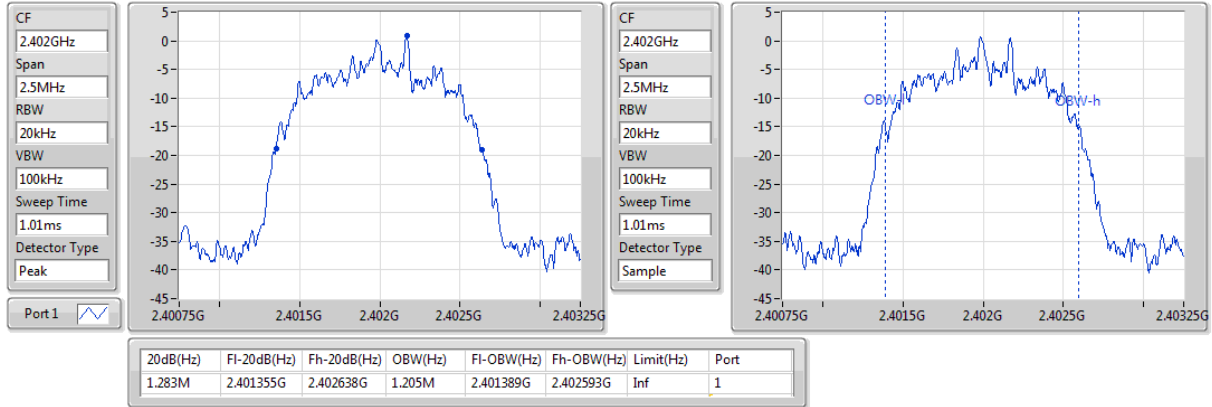
2480MHz



### BT-EDR(3Mbps)

EBW

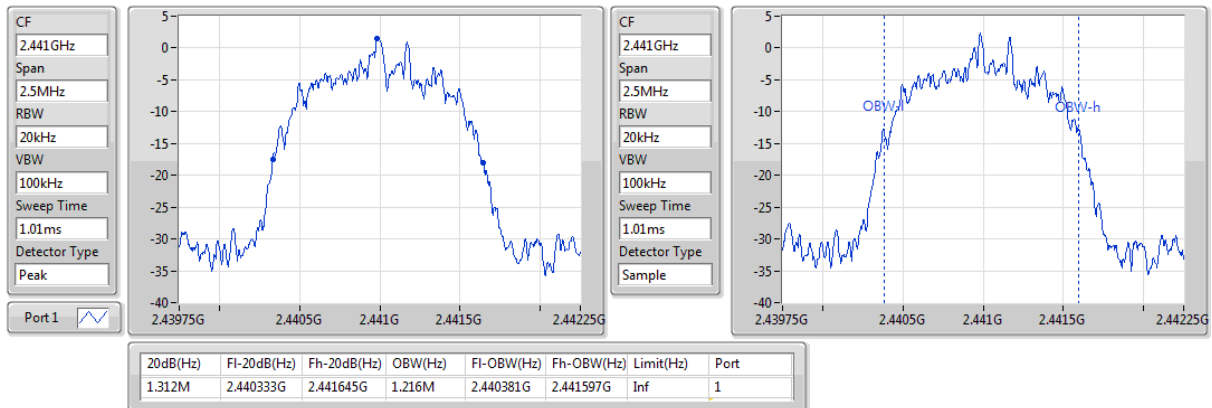
2402MHz



### BT-EDR(3Mbps)

EBW

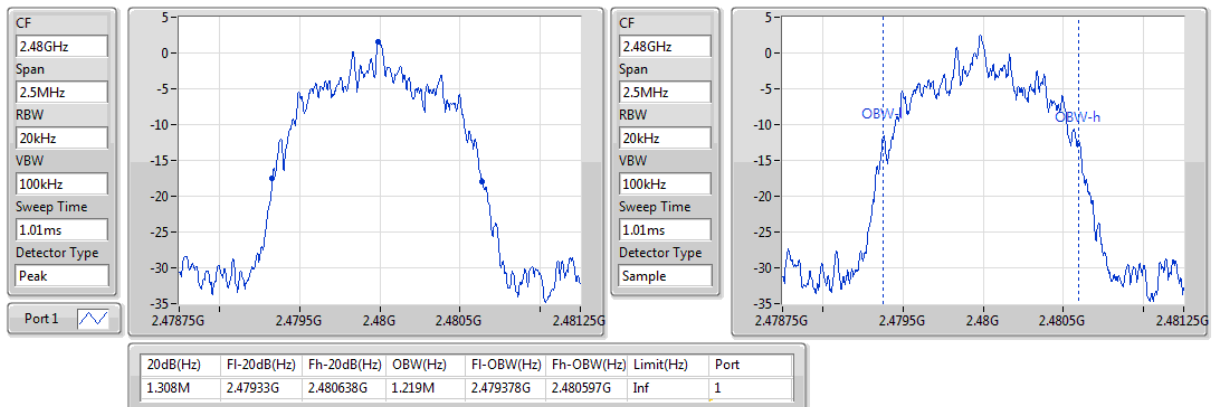
2441MHz



### BT-EDR(3Mbps)

EBW

2480MHz



### 3.7 Channel Separation

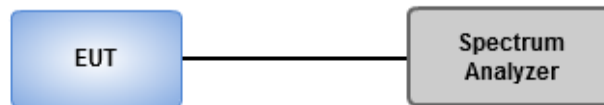
#### 3.7.1 Limit of Channel Separation

- ☐ 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.

#### 3.7.2 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

#### 3.7.3 Test Setup



### 3.7.4 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)	1.008696M	1M
BT-EDR(3Mbps)	1.03913M	1M

#### Result

Mode	Result	Fl (Hz)	Fh (Hz)	Ch.Space (Hz)	Limit (Hz)
BT-BR(1Mbps)	-	-	-	-	-
2402MHz	Pass	2.402057G	2.403057G	1M	612.91314k
2441MHz	Pass	2.441057G	2.442057G	1M	615.326058k
2480MHz	Pass	2.478987G	2.479987G	1M	612.91314k
BT-EDR(2Mbps)	-	-	-	-	-
2402MHz	Pass	2.401991G	2.402991G	1M	880.452k
2441MHz	Pass	2.440987G	2.441996G	1.008696M	878.454k
2480MHz	Pass	2.478987G	2.479991G	1.004348M	890.442k
BT-EDR(3Mbps)	-	-	-	-	-
2402MHz	Pass	2.401952G	2.402991G	1.03913M	854.478k
2441MHz	Pass	2.440996G	2.441996G	1M	873.792k
2480MHz	Pass	2.478991G	2.479991G	1M	871.128k

### BT-BR(1Mbps)

### Channel Separation

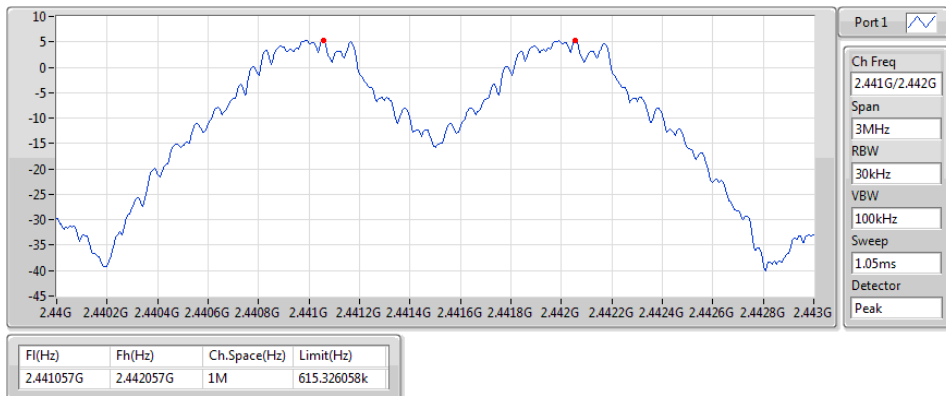
2.402G/2.403GHz



### BT-BR(1Mbps)

### Channel Separation

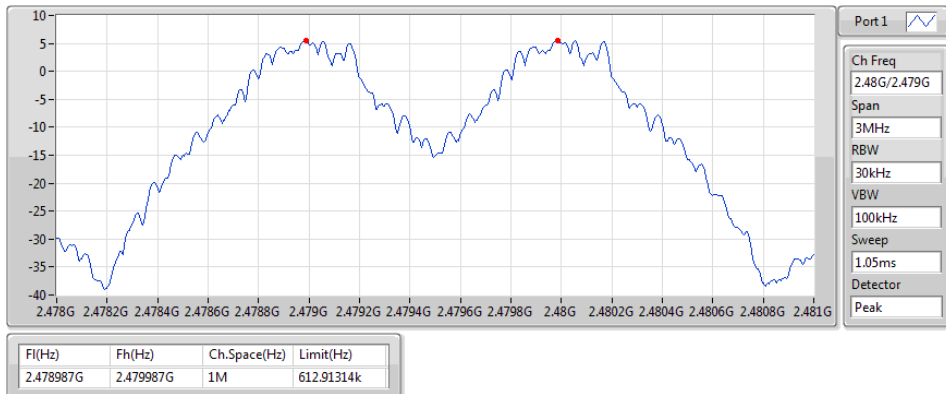
2.441G/2.442GHz



### BT-BR(1Mbps)

### Channel Separation

2.48G/2.479GHz

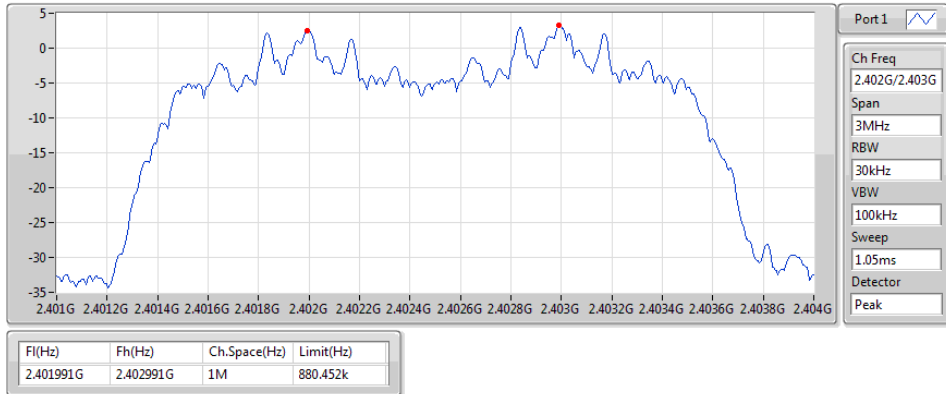




### BT-EDR(2Mbps)

### Channel Separation

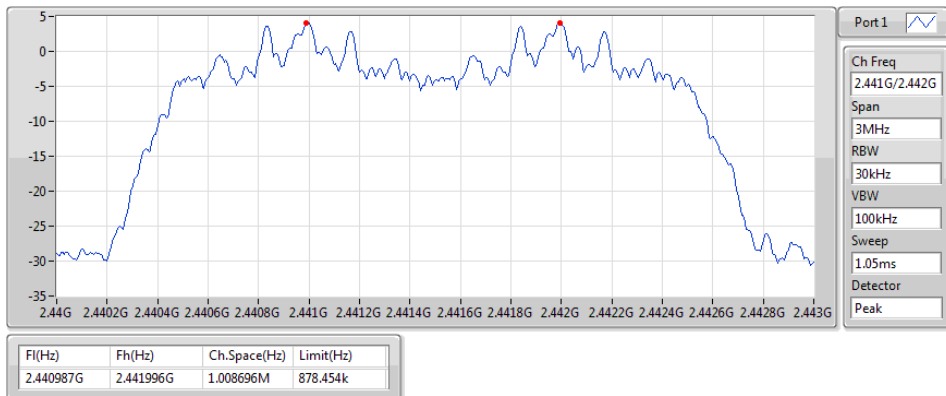
2.402G/2.403GHz



### BT-EDR(2Mbps)

### Channel Separation

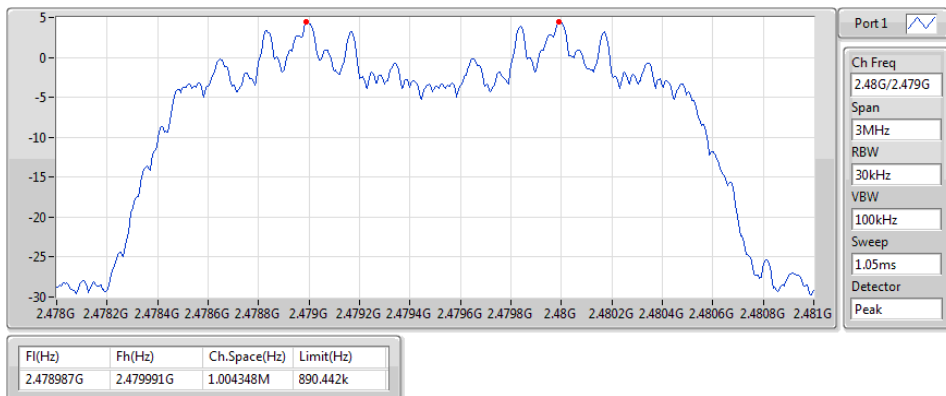
2.441G/2.442GHz



### BT-EDR(2Mbps)

### Channel Separation

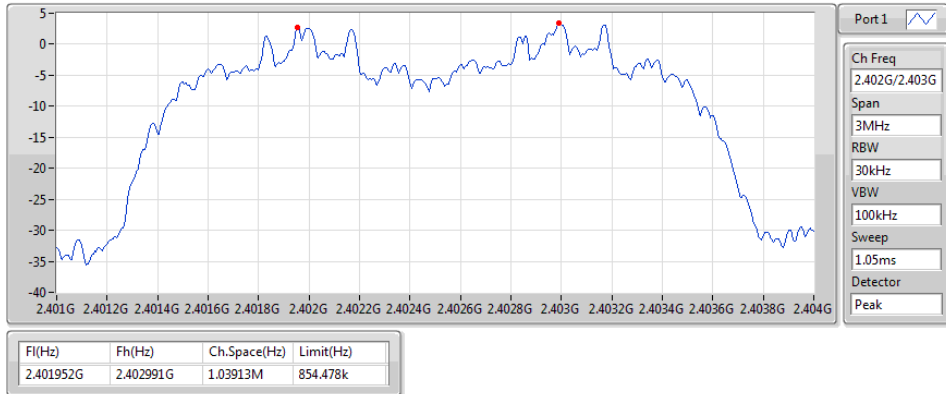
2.48G/2.479GHz



### BT-EDR(3Mbps)

### Channel Separation

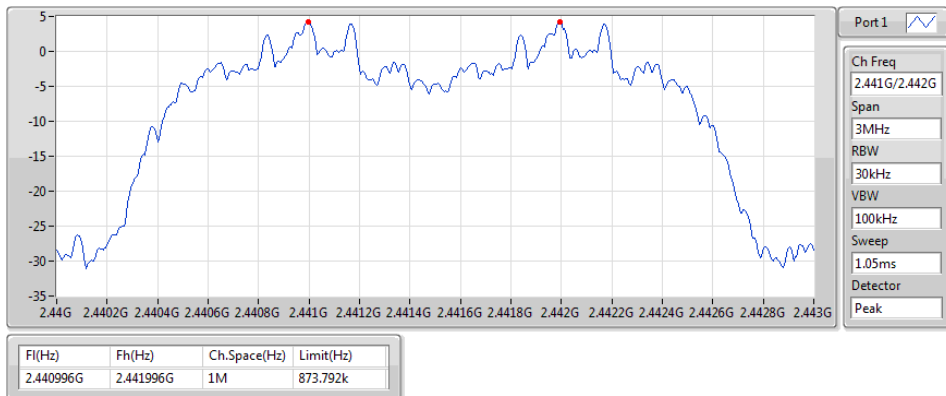
2.402G/2.403GHz



### BT-EDR(3Mbps)

### Channel Separation

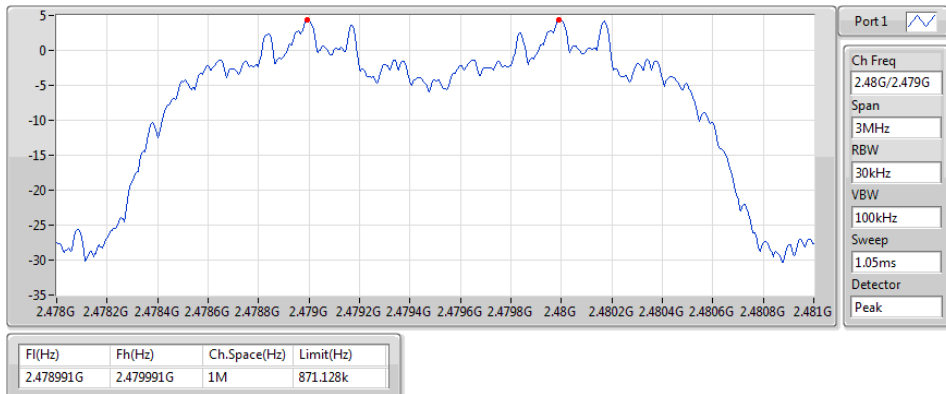
2.441G/2.442GHz



### BT-EDR(3Mbps)

### Channel Separation

2.48G/2.479GHz



## 3.8 Number of Dwell Time

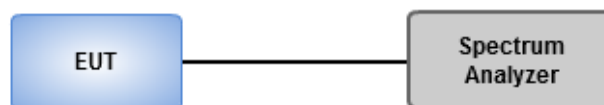
### 3.8.1 Limit of Dwell time

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.

### 3.8.2 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

### 3.8.3 Test Setup



### 3.8.4 Test Result of Dwell Time

#### Summary

Mode	Max-Dwell (s)
2.4-2.4835GHz	-
BT-BR(1Mbps)	312.075362m_DH5
BT-EDR(2Mbps)	312.075362m_DH5
BT-EDR(3Mbps)	312.075362m_DH5

#### Result/ Non AFH mode

Mode	Result	Period (s)	Dwell (s)	Limit (s)	Tx On (s)
BT-BR(1Mbps)	-	-	-	-	-
2441MHz	Pass	31.6	312.075362m_DH5	400m	2.927536m
2441MHz	Pass	31.6	268.985507m_DH3	400m	1.681159m
2441MHz	Pass	31.6	134.492754m_DH1	400m	420.289855u
BT-EDR(2Mbps)	-	-	-	-	-
2441MHz	Pass	31.6	312.075362m_DH5	400m	2.927536m
2441MHz	Pass	31.6	268.985507m_DH3	400m	1.681159m
2441MHz	Pass	31.6	134.492754m_DH1	400m	420.289855u
BT-EDR(3Mbps)	-	-	-	-	-
2441MHz	Pass	31.6	312.075362m_DH5	400m	2.927536m
2441MHz	Pass	31.6	268.985507m_DH3	400m	1.681159m
2441MHz	Pass	31.6	134.492754m_DH1	400m	420.289855u

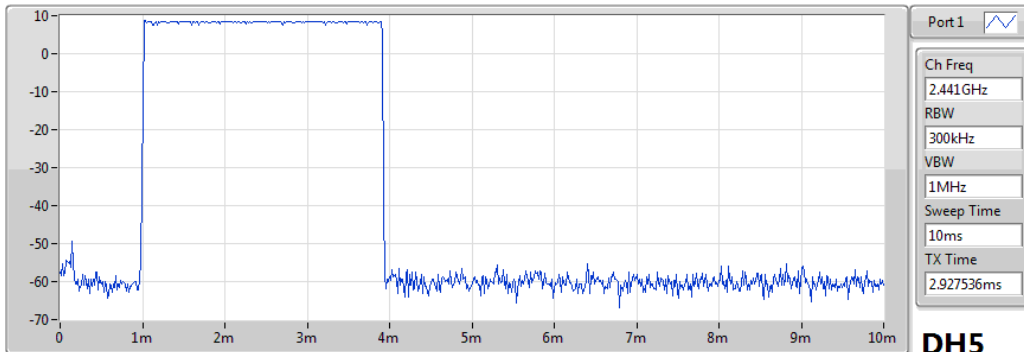
**Result/ AFH mode**

Mode	Result	Period (s)	Dwell (s)	Limit (s)	Tx On (s)
BT-BR(1Mbps)	-	-	-	-	-
2441MHz	Pass	8	156.1255m_DH5	400m	2.927536m
2441MHz	Pass	8	134.4927m_DH3	400m	1.681159m
2441MHz	Pass	8	67.24638m_DH1	400m	420.289855u
BT-EDR(2Mbps)	-	-	-	-	-
2441MHz	Pass	8	156.1255m_DH5	400m	2.927536m
2441MHz	Pass	8	134.4927m_DH3	400m	1.681159m
2441MHz	Pass	8	67.24638m_DH1	400m	420.289855u
BT-EDR(3Mbps)	-	-	-	-	-
2441MHz	Pass	8	156.1255m_DH5	400m	2.927536m
2441MHz	Pass	8	134.4927m_DH3	400m	1.681159m
2441MHz	Pass	8	67.24638m_DH1	400m	420.289855u

### BT-BR(1Mbps)

Dwell

2441MHz



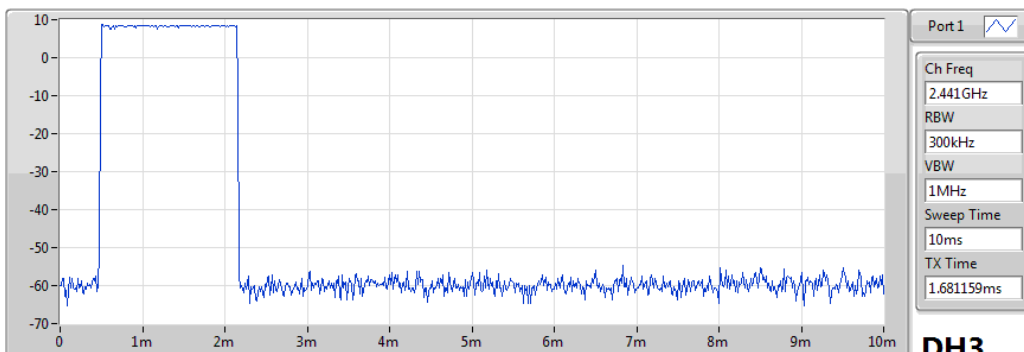
DH5

Period(s)	Dwell(s)	Limit(s)	Tx On(s)
31.6	312.075362m	400m	2.927536m

### BT-BR(1Mbps)

Dwell

2441MHz



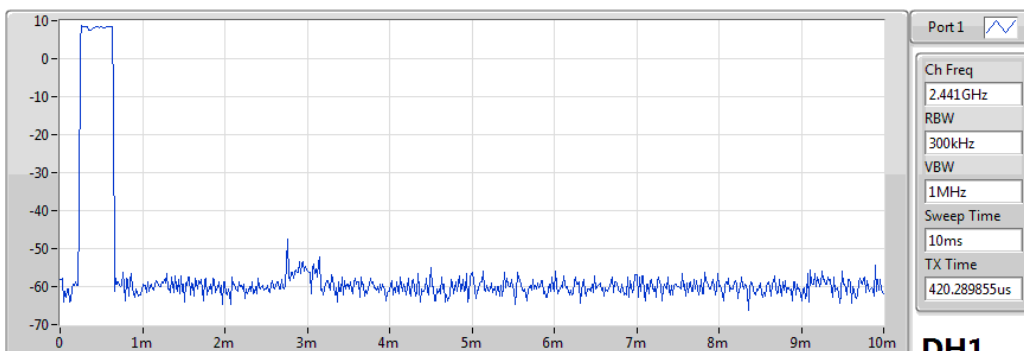
DH3

Period(s)	Dwell(s)	Limit(s)	Tx On(s)
31.6	268.985507m	400m	1.681159m

### BT-BR(1Mbps)

Dwell

2441MHz



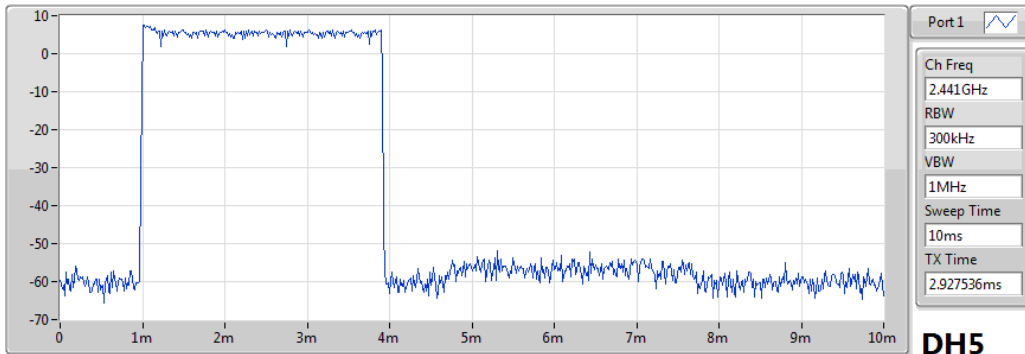
DH1

Period(s)	Dwell(s)	Limit(s)	Tx On(s)
31.6	134.492754m	400m	420.289855u

### BT-EDR(2Mbps)

Dwell

2441MHz



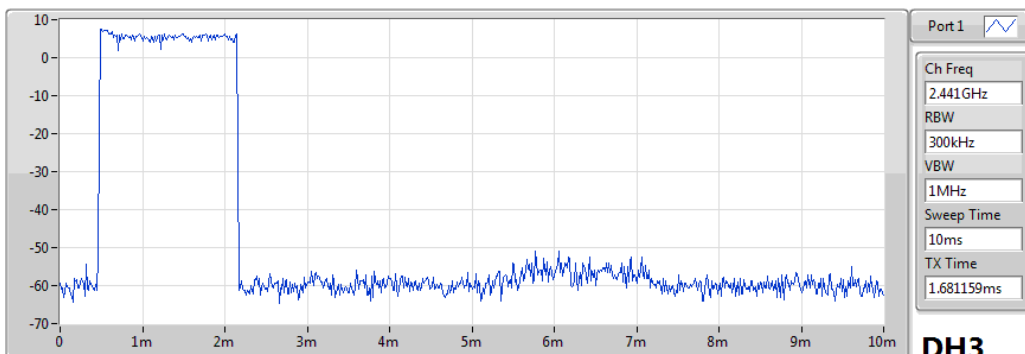
DH5

Period(s)	Dwell(s)	Limit(s)	Tx On(s)
31.6	312.075362m	400m	2.927536m

### BT-EDR(2Mbps)

Dwell

2441MHz



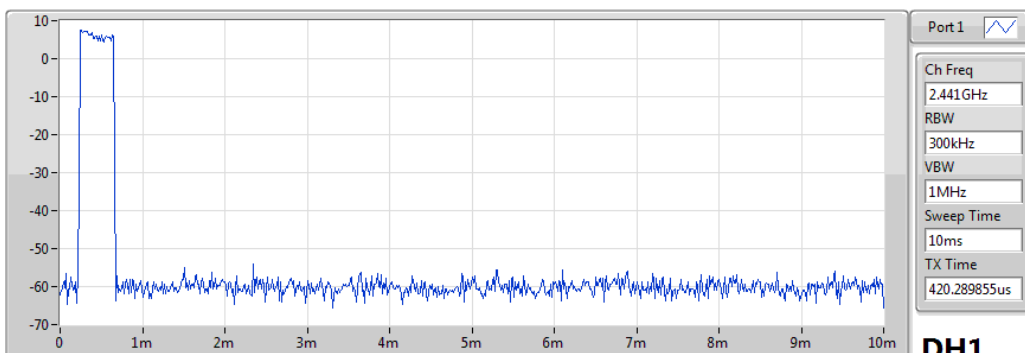
DH3

Period(s)	Dwell(s)	Limit(s)	Tx On(s)
31.6	268.985507m	400m	1.681159m

### BT-EDR(2Mbps)

Dwell

2441MHz



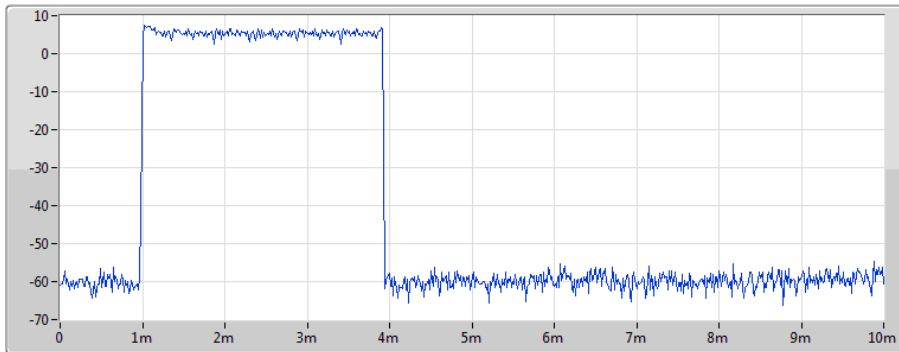
DH1


Period(s)	Dwell(s)	Limit(s)	Tx On(s)
31.6	134.492754m	400m	420.289855u

### BT-EDR(3Mbps)

Dwell

2441MHz



Port 1 

Ch Freq  
2.441GHz

RBW  
300kHz

VBW  
1MHz

Sweep Time  
10ms

TX Time  
2.927536ms

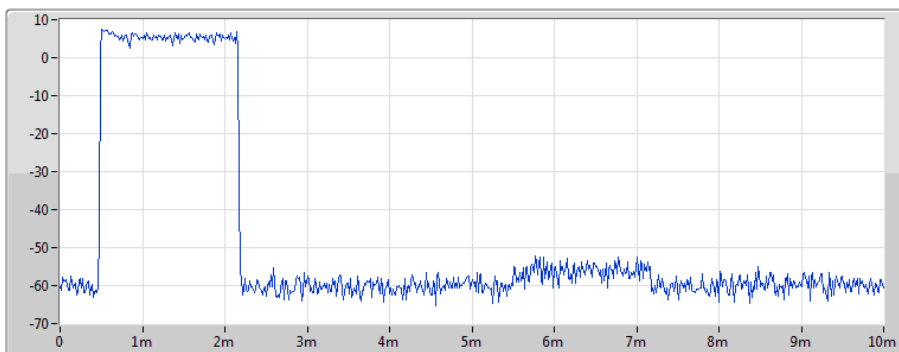
DH5


Period(s)	Dwell(s)	Limit(s)	Tx On(s)
31.6	312.075362m	400m	2.927536m

### BT-EDR(3Mbps)

Dwell

2441MHz



Port 1 

Ch Freq  
2.441GHz

RBW  
300kHz

VBW  
1MHz

Sweep Time  
10ms

TX Time  
1.681159ms

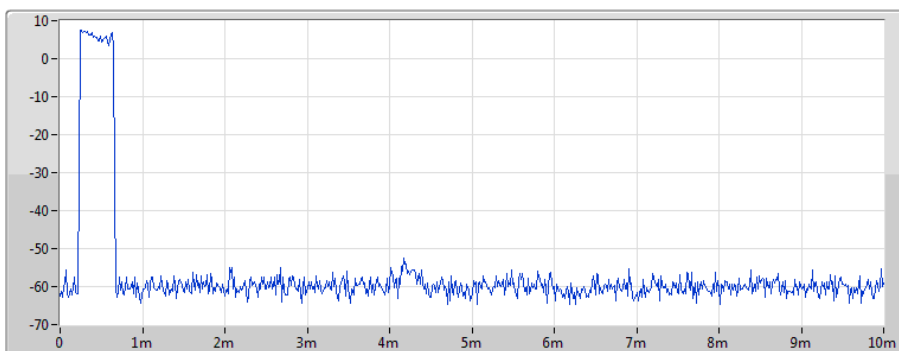
DH3

Period(s)	Dwell(s)	Limit(s)	Tx On(s)
31.6	268.985507m	400m	1.681159m

### BT-EDR(3Mbps)

Dwell

2441MHz



Port 1 

Ch Freq  
2.441GHz

RBW  
300kHz

VBW  
1MHz

Sweep Time  
10ms

TX Time  
420.289855us

DH1

Period(s)	Dwell(s)	Limit(s)	Tx On(s)
31.6	134.492754m	400m	420.289855u



## 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>.

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

### **Kwei Shan**

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Kwei Shan District, Tao Yuan City  
333, Taiwan, R.O.C.

### **Kwei Shan Site II**

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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.

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Email: ICC\_Service@icertifi.com.tw

==END==