FCC Test Report

FCC ID	:	**ACQ-MG3OTA**
Equipment	:	**Set Top Box**
Model No.	:	**MG3-OTA-H, MG3-OTA-L**
Brand Name	:	**TiVo**
Applicant	:	**ARRIS**
Address	:	**101 Tournament Drive, Horsham Pennsylvania, United States, 19044**
Standard	:	**47 CFR FCC Part 15.247**
Received Date	:	**May 20, 2019**
Tested Date	:	**May 27 ~ Jun. 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: **Approved by:**

Along Chen / Assistant Manager **Gary Chang / Manager**

Testing Laboratory 2732

Table of Contents

1 GENERAL DESCRIPTION 5

1.1 Information 5
1.2 Local Support Equipment List 9
1.3 Test Setup Chart 9
1.4 The Equipment List 10
1.5 Test Standards 11
1.6 Deviation from Test Standard and Measurement Procedure 11
1.7 Measurement Uncertainty 11

2 TEST CONFIGURATION 12

2.1 Testing Condition 12
2.2 The Worst Test Modes and Channel Details 12

3 TRANSMITTER TEST RESULTS 13

3.1 Conducted Emissions 13
3.2 Unwanted Emissions into Restricted Frequency Bands 16
3.3 Unwanted Emissions into Non-Restricted Frequency Bands 32
3.4 Conducted Output Power 37
3.5 Number of Hopping Frequency 40
3.6 20dB and Occupied Bandwidth 43
3.7 Channel Separation 48
3.8 Number of Dwell Time 53

4 TEST LABORATORY INFORMATION 58

Release Record

Report No.	Version	Description	Issued Date
FR932003-02AD	Rev. 01	Initial issue	Jun. 14, 2019

Summary of Test Results

FCC Rules	Test Items	Measured	Result
15.207	Conducted Emissions	[dBuV]: 0.162MHz 46.85 (Margin -8.49dB) - AV	Pass
15.247(d) 15.209	Radiated Emissions	[dBuV/m at 3m]: 2483.50MHz 73.50 (Margin -0.50dB) - PK	Pass
15.247(d)	Band Edge	Meet the requirement of limit	Pass
15.247(b)(1)	Conducted Output Power	Power [dBm]: 1.99	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 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 Product Details

The following models are provided to this EUT.

Model Name	Difference
MG3-OTA-H	ATSC tuner*4, 2TB HDD
MG3-OTA-L	ATSC tuner*2, 500GB HDD
✦ The above models had been covered during the pretest and found that model **MG3-OTA-H** was the worst one and selected for final test and only its data was recorded in this report.	

1.1.2 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	2402-2480	0-78 [79]	1 Mbps
2400-2483.5	EDR	2402-2480	0-78 [79]	2 Mbps
2400-2483.5	EDR	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 π/4-DQPSK and 8DPSK.				

1.1.3 Antenna Details

Ant. No.	Type	Connector	Gain (dBi)	Remarks
1	Printing	N/A	3.6	---

1.1.4 Power Supply Type of Equipment under Test (EUT)

Power Supply Type	12Vdc from adapter

1.1.5 Accessories

Accessories		
No.	**Equipment**	**Description**
1	Adapter	Brand: TiVo Manufacturer: LITE-ON INC Model: PB-1300-3AR5 Power Rating: I/P: 100-120Vac, 1.0A, 60Hz O/P: 12Vdc, 2.5A Power Line: 1.8m non-shielded without core
2	Adapter	Brand: TiVo Manufacturer: NETBIT ELECTRONICS LTD. Model: NBS36E120250VU Power Rating: I/P: 100-120Vac, 60Hz, 0.8A O/P: 12.0Vdc, 2.5A Power Line: 1.8m non-shielded without core
3	HDMI cable	1.8m shielded without core
4	HDD	Brand: SEAGATE Model: ST2000VT000 Product: Video 2.5 HDD
5	HDD	Brand: SEAGATE Model: ST500VT003 Product: Video 2.5 HDD
6	Remote Control	Brand: REMOTESOLUTION CO.,LTD Model: SBOM_03031_000
7	AA Battery for Remote Control	1.5Vdc *2

1.1.6 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	---	---

1.1.7 Test Tool and Duty Cycle

Test Tool	Putty, V0.6	
Mode	**Duty Cycle (%)**	**Duty Factor (dB)**
DH5	79.23%	1.01
3DH5	77.99%	1.08

1.1.8 Power Index of Test Tool

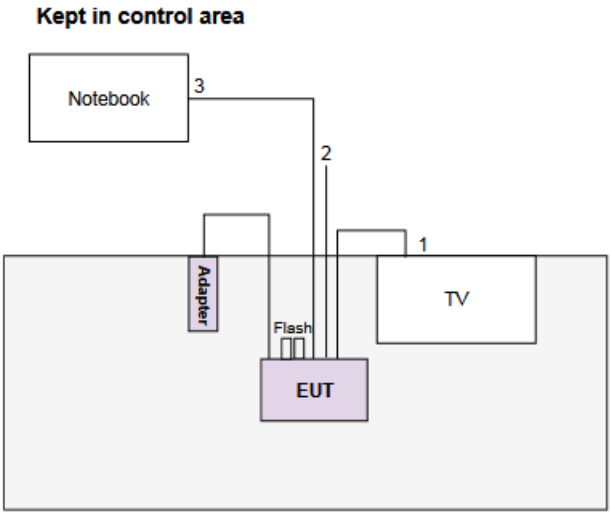
Modulation Mode	Test Frequency (MHz)		
	2402	**2441**	**2480**
GFSK/1Mbps	Default	Default	Default
π/4-DQPSK /2Mbps	Default	Default	Default
8DPSK/3Mbps	Default	Default	Default

1.2 Local Support Equipment List

Support Equipment List					
No.	**Equipment**	**Brand**	**Model**	**FCC ID**	**Remarks**
1	Notebook	DELL	Latitude E6440	DoC	---
2	TV	CHIMEI	TL-24LF500D	---	---
3	USB Flash	Kingston	DTSE9	---	---
4	USB Flash	Kingston	DTSE9	---	---

1.3 Test Setup Chart

Test Setup Diagram



No.	Signal cable / Length (m)
1	HDMI, 1.8m shielded.
2	Fiber, 1.2m non-shielded.
3	RJ45, 10m non-shielded.

1.4 The Equipment List

Test Item	Conducted Emission				
Test Site	Conduction room 1 / (CO01-WS)				
Instrument	**Manufacturer**	**Model No.**	**Serial No.**	**Calibration Date**	**Calibration Until**
Receiver	R&S	ESR3	101657	Jan. 08, 2019	Jan. 07, 2020
LISN	SCHWARZBECK	Schwarzbeck 8127	8127-667	Nov. 05, 2018	Nov. 04, 2019
LISN (Support Unit)	SCHWARZBECK	Schwarzbeck 8127	8127-666	Nov. 29, 2018	Nov. 28, 2019
RF Cable-CON	Woken	CFD200-NL	CFD200-NL-001	Oct. 23, 2018	Oct. 23, 2019
50 ohm terminal (Support Unit)	NA	50	02	Apr. 19, 2019	Apr. 18, 2020
Measurement Software	AUDIX	e3	6.120210k	NA	NA
Note: Calibration Interval of instruments listed above is one year.					

Test Item	Radiated Emission				
Test Site	966 chamber 3 / (03CH03-WS)				
Instrument	**Manufacturer**	**Model No.**	**Serial No.**	**Calibration Date**	**Calibration Until**
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. 17, 2019	Apr. 16, 2020
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-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
Note: Calibration Interval of instruments listed above is one year.					

Test Item	RF Conducted				
Test Site	(TH01-WS)				
Instrument	**Manufacturer**	**Model No.**	**Serial No.**	**Calibration Date**	**Calibration Until**
Spectrum Analyzer	R&S	FSV40	101063	Apr. 17, 2019	Apr. 16, 2020
Power Meter	Anritsu	ML2495A	1241002	Oct. 09, 2018	Oct. 08, 2019
Power Sensor	Anritsu	MA2411B	1207366	Oct. 09, 2018	Oct. 08, 2019
AC POWER SOURCE	APC	AFC-500W	F312060012	Nov. 29, 2018	Nov. 28, 2019
Measurement Software	SENSE-15247_FS	SENSE-15247_FS	V5.10.1	NA	NA
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	±34.130 Hz
Conducted power	±0.808 dB
Power density	±0.583 dB
Conducted emission	±2.715 dB
AC conducted emission	±2.92 dB
Radiated emission ≤ 1GHz	±3.96 dB
Radiated emission > 1GHz	±4.51 dB

2 Test Configuration

2.1 Testing Condition

Test Item	Test Site	Ambient Condition	Tested By
AC Conduction	CO01-WS	24°C / 65%	Alex Tsai
Radiated Emissions	03CH03-WS	24°C / 63-68%	Roger Lu
RF Conducted	TH01-WS	24°C / 66%	Aska Huang

- 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	2402	1Mbps	---
Radiated Emissions ≤ 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	---
NOTE: Two adapters (LITE-ON & NETBIT) had been covered during the pretest and found that **NETBIT** adapter was the worst case for radiated emission test and **LITE-ON** adapter was the worst case for conducted emission test.				

3 Transmitter Test Results

3.1 Conducted Emissions

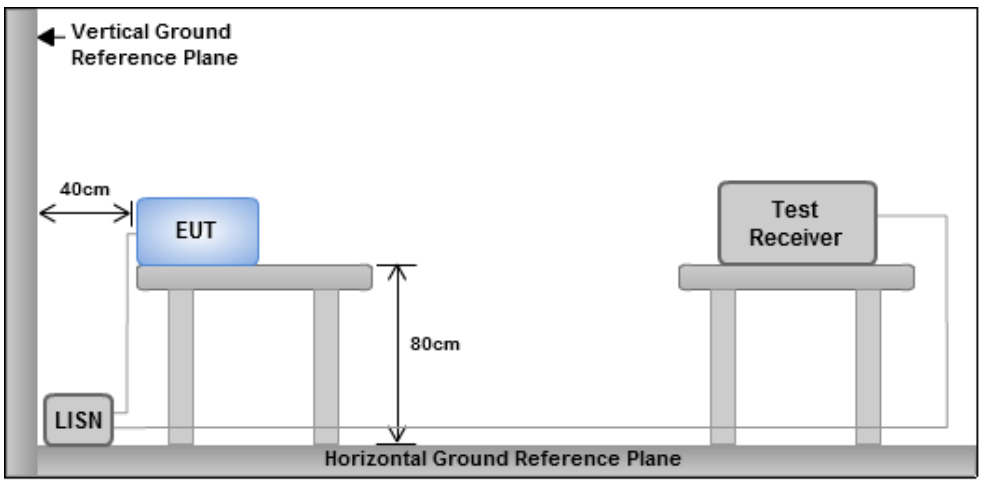
3.1.1 Limit of Conducted Emissions

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 Ω 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

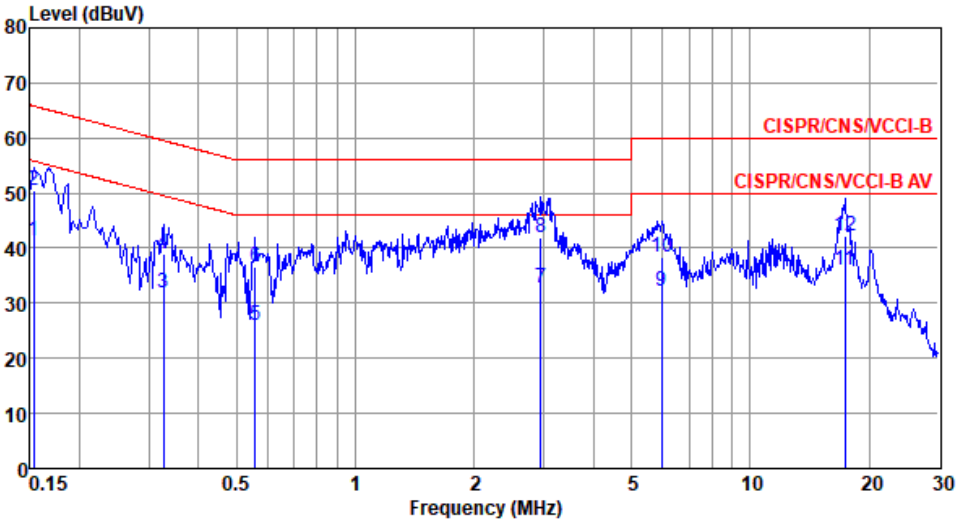


Note: 1. Support units were connected to second LISN.

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

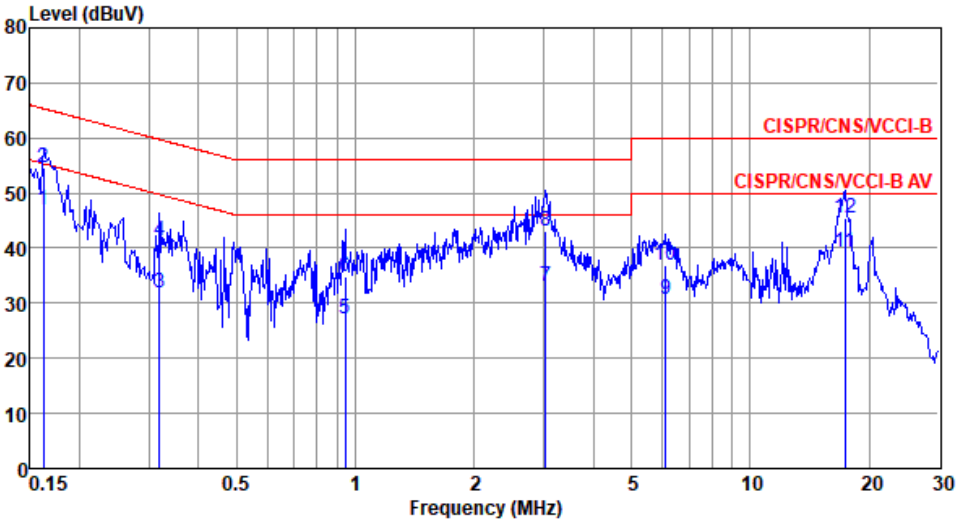
Modulation Mode	GFSK	Test Freq. (MHz)	2402
Power Phase	Line		



	Freq	Level	Limit Line	Over Limit	Read Level	LISN factor	cable loss	Remark
	MHz	dBuV	dBuV	dB	dBuV	dB	dB	
1	0.153	41.21	55.82	-14.61	31.50	9.53	0.05	Average
2	0.153	50.46	65.82	-15.36	40.75	9.53	0.05	QP
3	0.327	31.89	49.53	-17.64	22.01	9.56	0.08	Average
4	0.327	39.01	59.53	-20.52	29.13	9.56	0.08	QP
5	0.558	25.99	46.00	-20.01	16.05	9.58	0.09	Average
6	0.558	36.66	56.00	-19.34	26.72	9.58	0.09	QP
7*	2.946	32.78	46.00	-13.22	22.57	9.61	0.23	Average
8	2.946	41.78	56.00	-14.22	31.57	9.61	0.23	QP
9	5.961	32.29	50.00	-17.71	21.92	9.63	0.35	Average
10	5.961	38.48	60.00	-21.52	28.11	9.63	0.35	QP
11	17.383	35.96	50.00	-14.04	25.18	9.66	0.58	Average
12	17.383	42.13	60.00	-17.87	31.35	9.66	0.58	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)	2402
Power Phase	Neutral		



	Freq	Level	Limit Line	Over Limit	Read Level	LISN factor	cable loss	Remark
	MHz	dBuV	dBuV	dB	dBuV	dB	dB	
1*	0.162	46.85	55.34	-8.49	37.10	9.57	0.06	Average
2	0.162	54.71	65.34	-10.63	44.96	9.57	0.06	QP
3	0.318	31.79	49.75	-17.96	21.98	9.60	0.08	Average
4	0.318	41.40	59.75	-18.35	31.59	9.60	0.08	QP
5	0.943	27.01	46.00	-18.99	17.05	9.64	0.10	Average
6	0.943	34.94	56.00	-21.06	24.98	9.64	0.10	QP
7	3.025	33.07	46.00	-12.93	22.92	9.66	0.23	Average
8	3.025	43.20	56.00	-12.80	33.05	9.66	0.23	QP
9	6.121	30.59	50.00	-19.41	20.28	9.68	0.35	Average
10	6.121	36.76	60.00	-23.24	26.45	9.68	0.35	QP
11	17.383	39.14	50.00	-10.86	28.37	9.79	0.58	Average
12	17.383	45.33	60.00	-14.67	34.56	9.79	0.58	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:

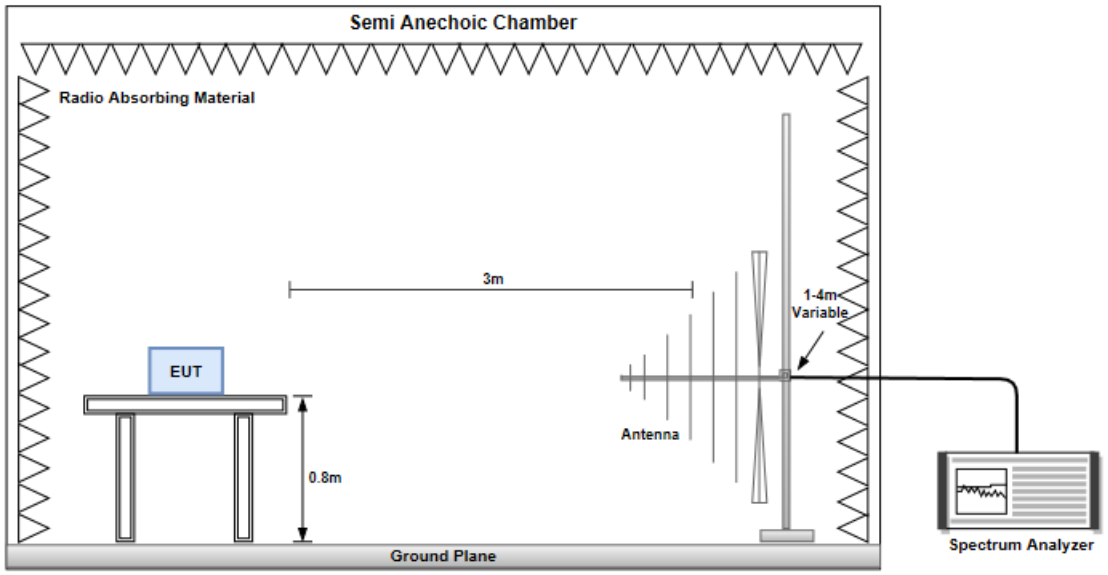
1. 120kHz measurement bandwidth of test receiver and Quasi-peak detector is for radiated emission below 1GHz.
2. Radiated emission above 1GHz / Peak value
   RBW=1MHz, VBW=3MHz and Peak detector
3. Radiated emission above 1GHz / Average value for harmonics
   The average value is: Average = Peak value + 20log(Duty cycle) Where the duty factor is calculated from following formula for DH5 packet type which has worst duty factor:

$$20\log(\text{Duty cycle}) = 20\log\frac{1\text{s} / 1600 * 5}{100\text{ ms}} = -30.1\text{dB}$$

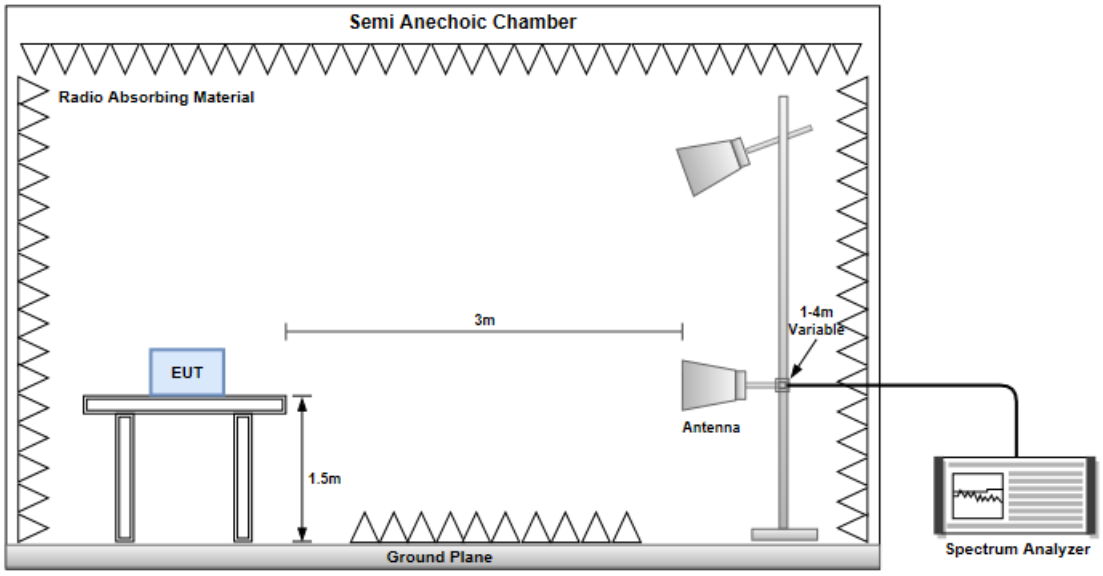
4. Radiated emission above 1GHz / Average value for other emissions
   RBW=1MHz, VBW=1/T and Peak detector

3.2.3 Test Setup

Radiated Emissions below 1 GHz

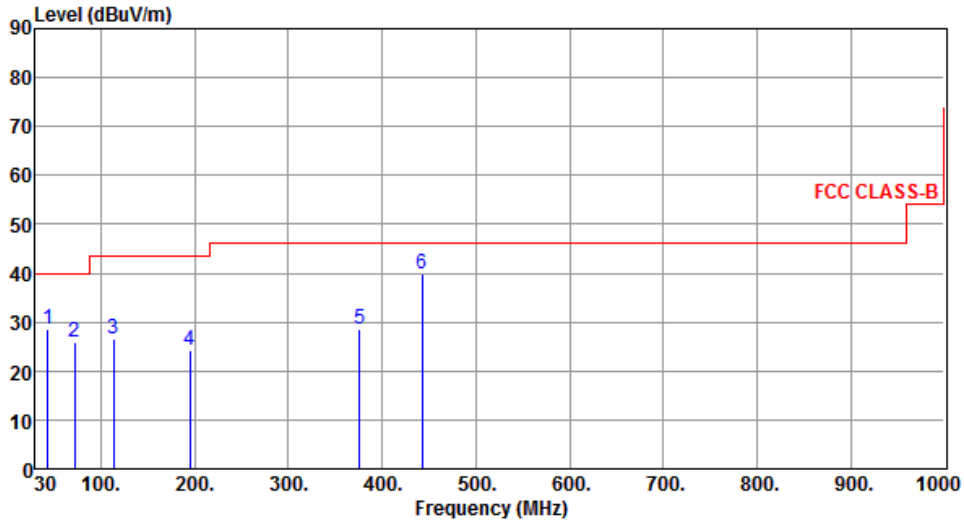


Radiated Emissions above 1 GHz



3.2.4 Transmitter Radiated Unwanted Emissions (Below 1GHz)

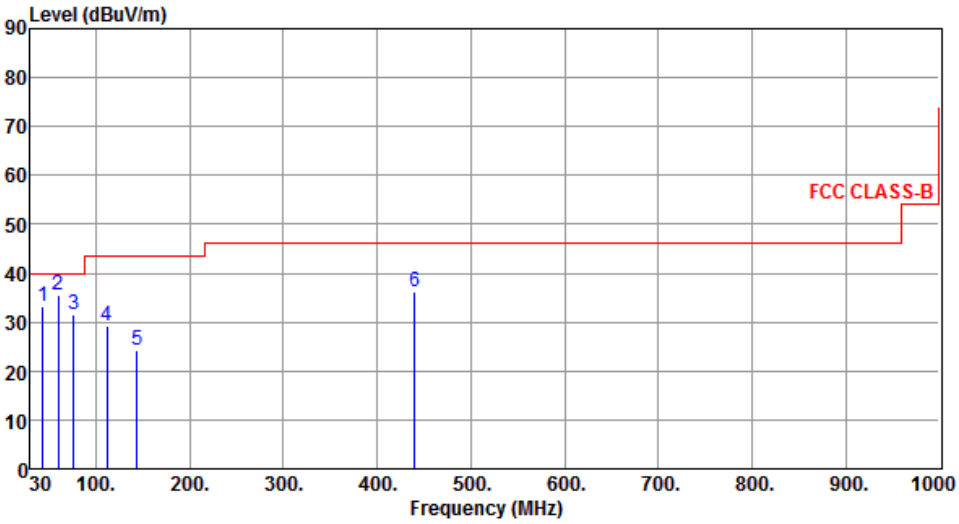
Modulation	GFSK	**Test Freq. (MHz)**	2402
Polarization	Horizontal		



	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
1	43.39	28.65	40.00	-11.35	37.57	-8.92	Peak	---	---
2	71.55	25.75	40.00	-14.25	36.71	-10.96	Peak	---	---
3	113.48	26.46	43.50	-17.04	38.25	-11.79	Peak	---	---
4	194.88	24.36	43.50	-19.14	36.21	-11.85	Peak	---	---
5	376.22	28.41	46.00	-17.59	34.81	-6.40	Peak	---	---
6	442.31	39.77	46.00	-6.23	44.18	-4.41	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		

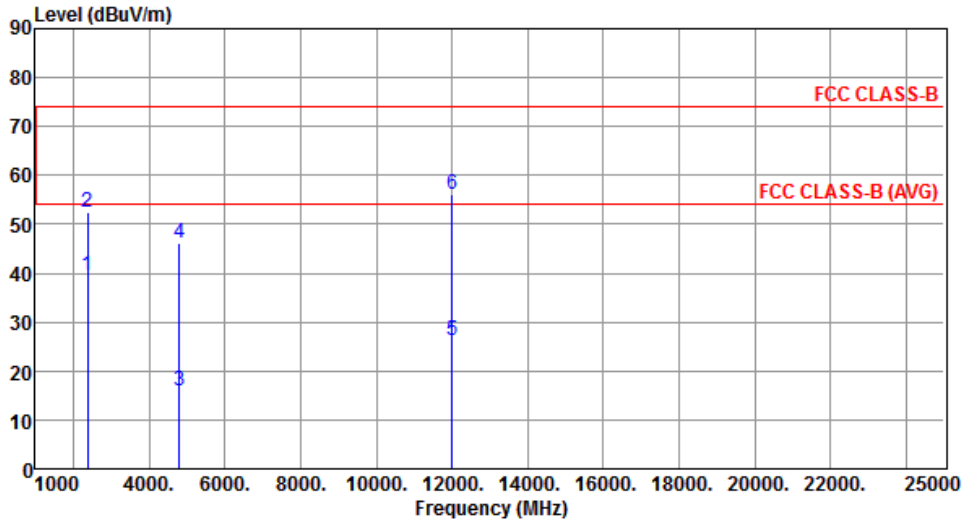


	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
1	43.41	33.31	40.00	-6.69	42.23	-8.92	Peak	---	---
2	59.39	35.48	40.00	-4.52	44.74	-9.26	Peak	---	---
3	76.42	31.53	40.00	-8.47	43.99	-12.46	Peak	---	---
4	111.47	29.15	43.50	-14.35	41.20	-12.05	Peak	---	---
5	143.45	24.31	43.50	-19.19	33.30	-8.99	Peak	---	---
6	440.38	36.27	46.00	-9.73	40.73	-4.46	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

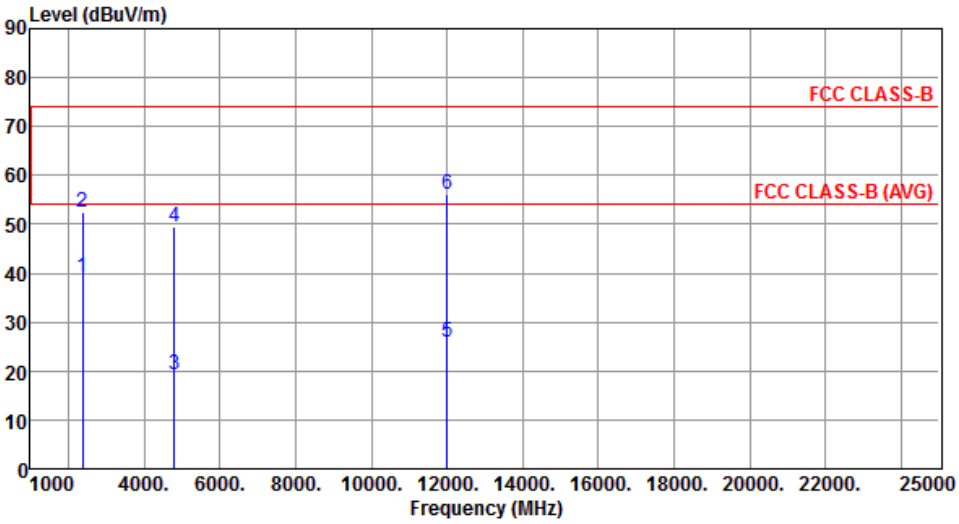
Modulation	GFSK	Test Freq. (MHz)	2402
Polarization	Horizontal		



	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	39.40	54.00	-14.60	40.36	-0.96	Average	193	317
2	2390.00	52.60	74.00	-21.40	53.56	-0.96	Peak	193	317
3	4804.00	15.97	54.00	-38.03	11.17	4.80	Average	100	66
4	4804.00	46.07	74.00	-27.93	41.27	4.80	Peak	100	66
5	12010.00	26.09	54.00	-27.91	11.29	14.80	Average	100	20
6	12010.00	56.19	74.00	-17.81	41.39	14.80	Peak	100	20

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).

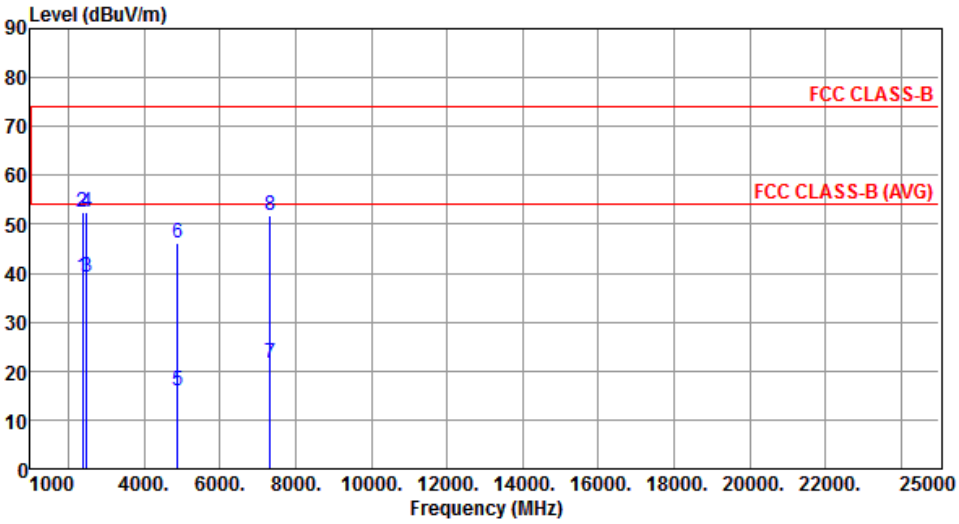
Modulation	GFSK	**Test Freq. (MHz)**	2402
Polarization	Vertical		



	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	39.30	54.00	-14.70	40.26	-0.96	Average	311	265
2	2390.00	52.46	74.00	-21.54	53.42	-0.96	Peak	311	265
3	4804.00	19.24	54.00	-34.76	14.44	4.80	Average	270	95
4	4804.00	49.34	74.00	-24.66	44.54	4.80	Peak	270	95
5	12010.00	25.98	54.00	-28.02	11.18	14.80	Average	100	60
6	12010.00	56.08	74.00	-17.92	41.28	14.80	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).

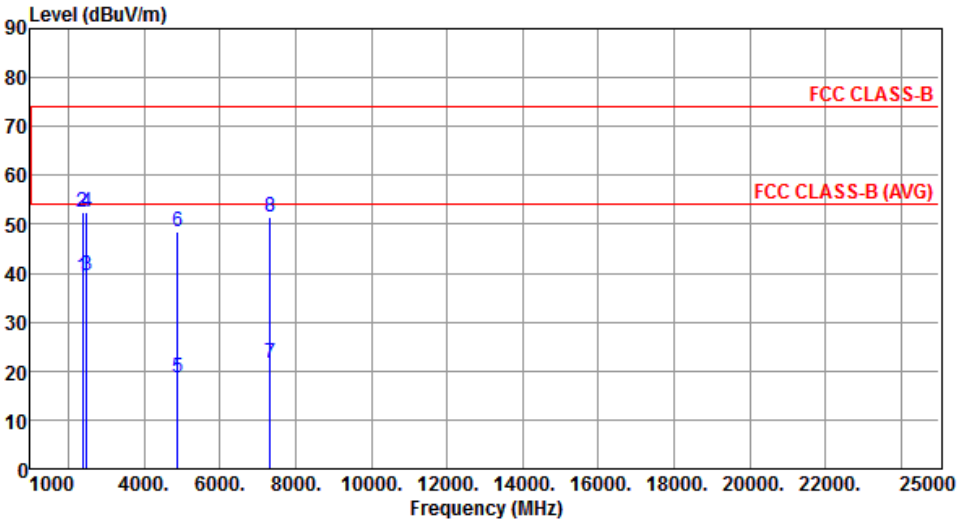
Modulation	GFSK	Test Freq. (MHz)	2441
Polarization	Horizontal		



	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	39.30	54.00	-14.70	40.26	-0.96	Average	192	316
2	2390.00	52.58	74.00	-21.42	53.54	-0.96	Peak	192	316
3	2483.50	39.23	54.00	-14.77	40.35	-1.12	Average	192	316
4	2483.50	52.50	74.00	-21.50	53.62	-1.12	Peak	192	316
5	4882.00	16.02	54.00	-37.98	11.11	4.91	Average	100	65
6	4882.00	46.12	74.00	-27.88	41.21	4.91	Peak	100	65
7	7323.00	21.57	54.00	-32.43	11.26	10.31	Average	100	20
8	7323.00	51.67	74.00	-22.33	41.36	10.31	Peak	100	20

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).

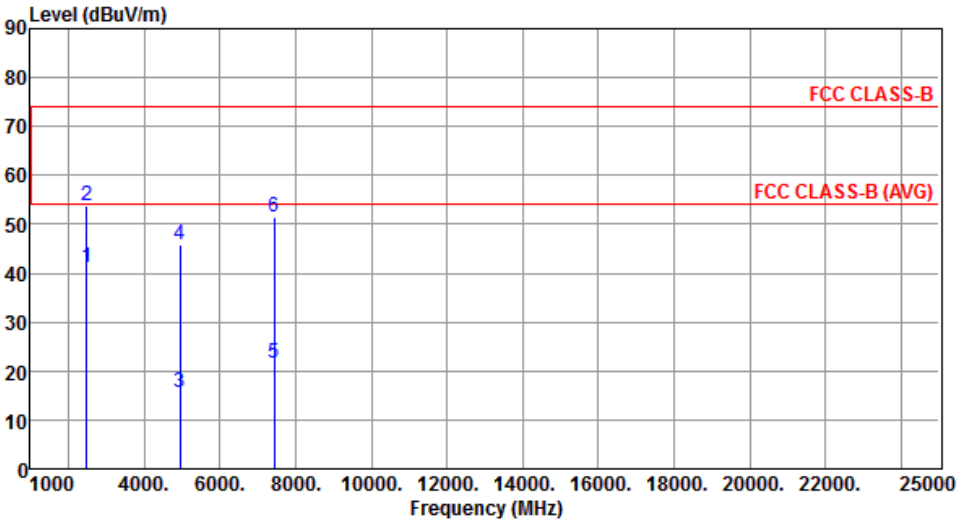
Modulation	GFSK	Test Freq. (MHz)	2441
Polarization	Vertical		



	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	39.26	54.00	-14.74	40.22	-0.96	Average	310	261
2	2390.00	52.46	74.00	-21.54	53.42	-0.96	Peak	310	261
3	2483.50	39.40	54.00	-14.60	40.52	-1.12	Average	310	261
4	2483.50	52.44	74.00	-21.56	53.56	-1.12	Peak	310	261
5	4882.00	18.49	54.00	-35.51	13.58	4.91	Average	269	96
6	4882.00	48.59	74.00	-25.41	43.68	4.91	Peak	269	96
7	7323.00	21.46	54.00	-32.54	11.15	10.31	Average	100	30
8	7323.00	51.56	74.00	-22.44	41.25	10.31	Peak	100	30

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).

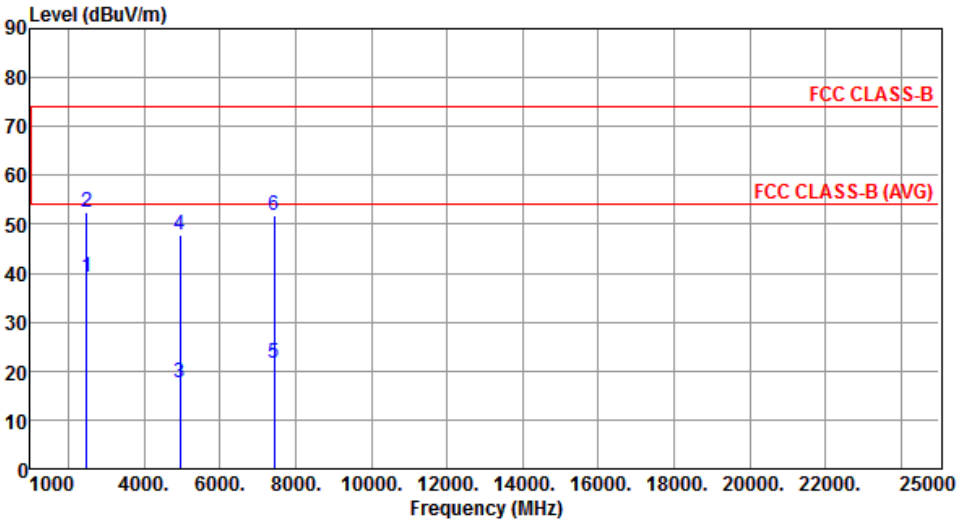
Modulation	GFSK	**Test Freq. (MHz)**	2480
Polarization	Horizontal		



	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	41.20	54.00	-12.80	42.32	-1.12	Average	195	313
2	2483.50	53.76	74.00	-20.24	54.88	-1.12	Peak	195	313
3	4960.00	15.76	54.00	-38.24	10.57	5.19	Average	100	68
4	4960.00	45.86	74.00	-28.14	40.67	5.19	Peak	100	68
5	7440.00	21.46	54.00	-32.54	11.11	10.35	Average	100	80
6	7440.00	51.56	74.00	-22.44	41.21	10.35	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)**	2480
Polarization	Vertical		

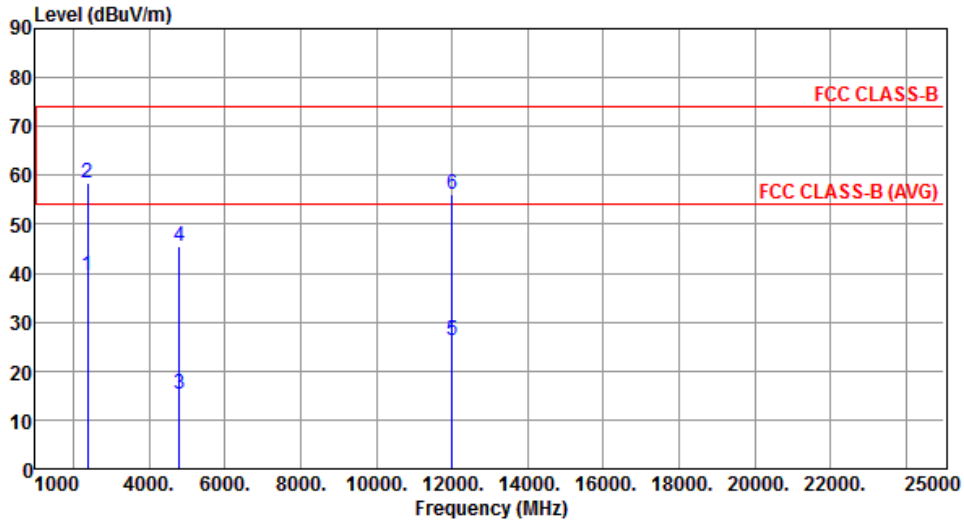


	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
1	2483.50	39.24	54.00	-14.76	40.36	-1.12	Average	316	267
2	2483.50	52.44	74.00	-21.56	53.56	-1.12	Peak	316	267
3	4960.00	17.60	54.00	-36.40	12.41	5.19	Average	271	95
4	4960.00	47.70	74.00	-26.30	42.51	5.19	Peak	271	95
5	7440.00	21.54	54.00	-32.46	11.19	10.35	Average	100	20
6	7440.00	51.64	74.00	-22.36	41.29	10.35	Peak	100	20

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

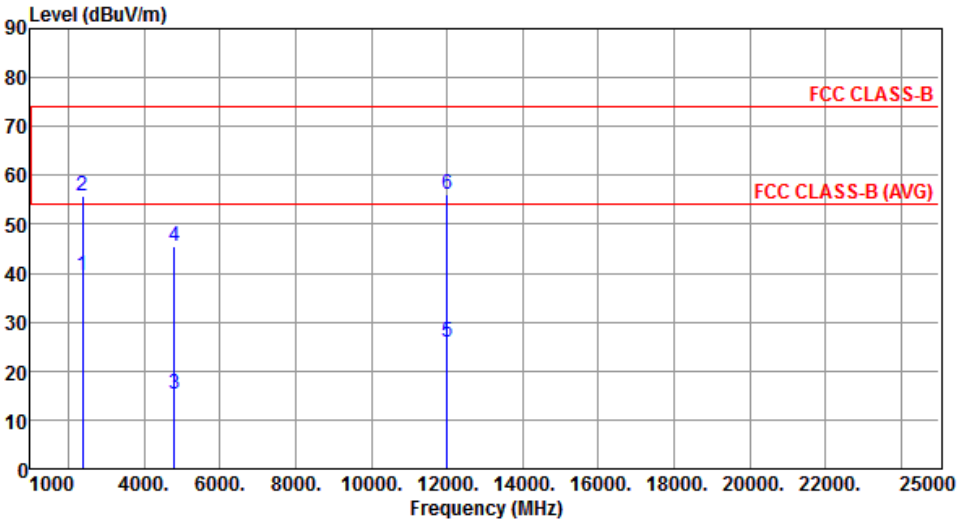
Modulation	8DPSK	Test Freq. (MHz)	2402
Polarization	Horizontal		



	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	39.42	54.00	-14.58	40.38	-0.96	Average	202	315
2	2390.00	58.58	74.00	-15.42	59.54	-0.96	Peak	202	315
3	4804.00	15.36	54.00	-38.64	10.56	4.80	Average	100	80
4	4804.00	45.46	74.00	-28.54	40.66	4.80	Peak	100	80
5	12010.00	26.12	54.00	-27.88	11.32	14.80	Average	100	20
6	12010.00	56.22	74.00	-17.78	41.42	14.80	Peak	100	20

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).

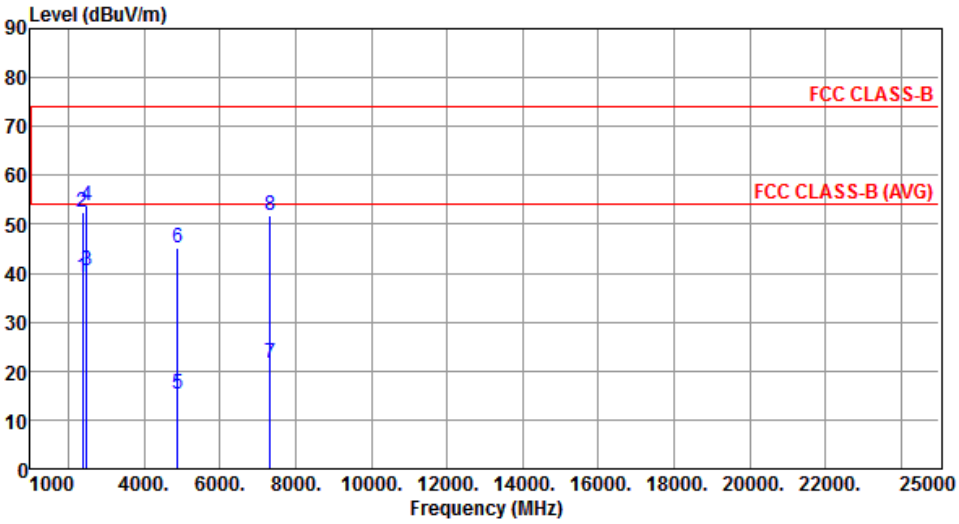
Modulation	8DPSK	**Test Freq. (MHz)**	2402
Polarization	Vertical		



	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	39.37	54.00	-14.63	40.33	-0.96	Average	312	263
2	2390.00	55.73	74.00	-18.27	56.69	-0.96	Peak	312	263
3	4804.00	15.24	54.00	-38.76	10.44	4.80	Average	100	50
4	4804.00	45.34	74.00	-28.66	40.54	4.80	Peak	100	50
5	12010.00	26.03	54.00	-27.97	11.23	14.80	Average	100	90
6	12010.00	56.13	74.00	-17.87	41.33	14.80	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).

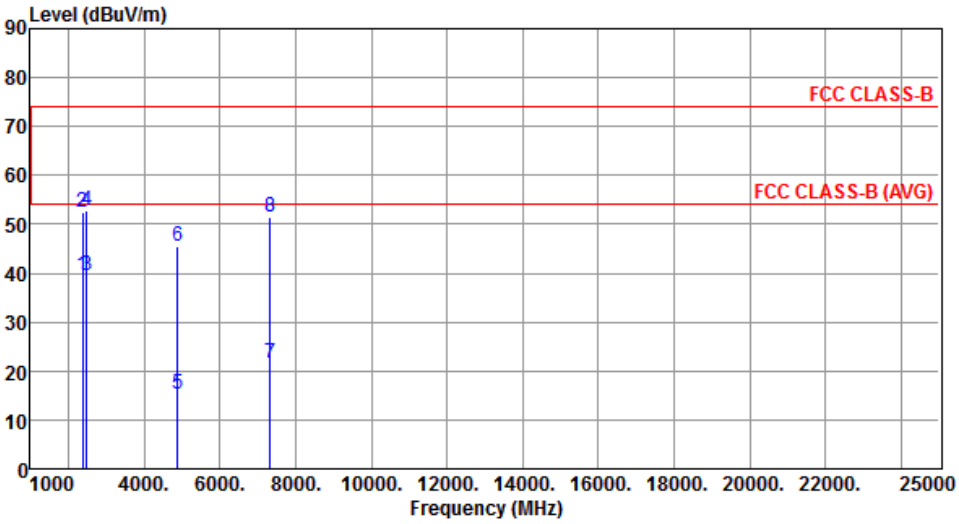
Modulation	8DPSK	Test Freq. (MHz)	2441
Polarization	Horizontal		



	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	39.29	54.00	-14.71	40.25	-0.96	Average	206	314
2	2390.00	52.49	74.00	-21.51	53.45	-0.96	Peak	206	314
3	2483.50	40.40	54.00	-13.60	41.52	-1.12	Average	206	314
4	2483.50	53.78	74.00	-20.22	54.90	-1.12	Peak	206	314
5	4882.00	15.16	54.00	-38.84	10.25	4.91	Average	100	60
6	4882.00	45.26	74.00	-28.74	40.35	4.91	Peak	100	60
7	7323.00	21.68	54.00	-32.32	11.37	10.31	Average	100	55
8	7323.00	51.78	74.00	-22.22	41.47	10.31	Peak	100	55

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).

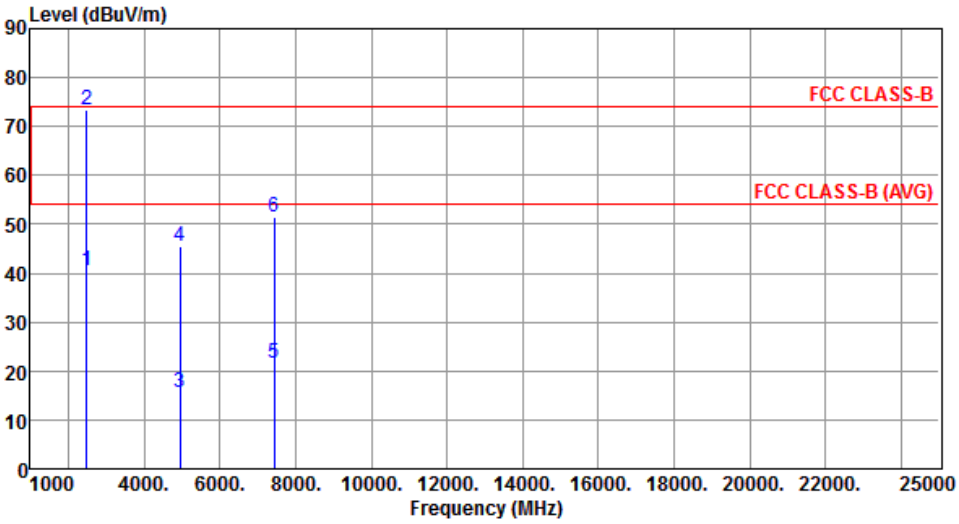
Modulation	8DPSK	Test Freq. (MHz)	2441
Polarization	Vertical		



	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	39.43	54.00	-14.57	40.39	-0.96	Average	315	263
2	2390.00	52.62	74.00	-21.38	53.58	-0.96	Peak	315	263
3	2483.50	39.56	54.00	-14.44	40.68	-1.12	Average	315	263
4	2483.50	52.94	74.00	-21.06	54.06	-1.12	Peak	315	263
5	4882.00	15.40	54.00	-38.60	10.49	4.91	Average	100	50
6	4882.00	45.50	74.00	-28.50	40.59	4.91	Peak	100	50
7	7323.00	21.46	54.00	-32.54	11.15	10.31	Average	100	60
8	7323.00	51.56	74.00	-22.44	41.25	10.31	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).

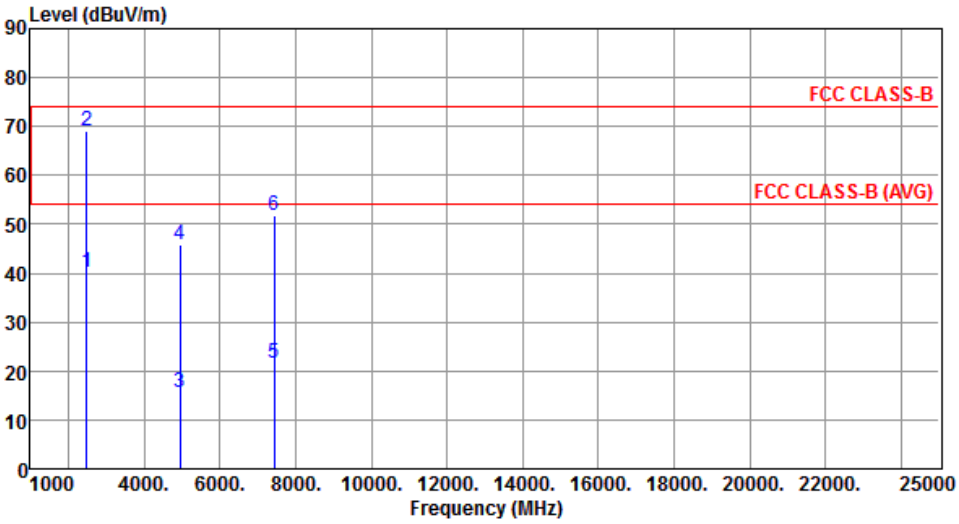
Modulation	8DPSK	Test Freq. (MHz)	2480
Polarization	Horizontal		



	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	40.63	54.00	-13.37	41.75	-1.12	Average	195	312
2	2483.50	73.50	74.00	-0.50	74.62	-1.12	Peak	195	312
3	4960.00	15.56	54.00	-38.44	10.37	5.19	Average	100	50
4	4960.00	45.66	74.00	-28.34	40.47	5.19	Peak	100	50
5	7440.00	21.48	54.00	-32.52	11.13	10.35	Average	100	20
6	7440.00	51.58	74.00	-22.42	41.23	10.35	Peak	100	20

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		



	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	40.29	54.00	-13.71	41.41	-1.12	Average	307	263
2	2483.50	69.04	74.00	-4.96	70.16	-1.12	Peak	307	263
3	4960.00	15.65	54.00	-38.35	10.46	5.19	Average	100	90
4	4960.00	45.75	74.00	-28.25	40.56	5.19	Peak	100	90
5	7440.00	21.61	54.00	-32.39	11.26	10.35	Average	100	50
6	7440.00	51.71	74.00	-22.29	41.36	10.35	Peak	100	50

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

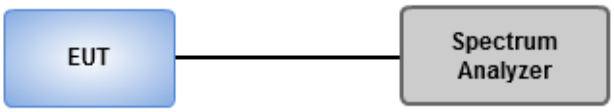
Reference level measurement

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

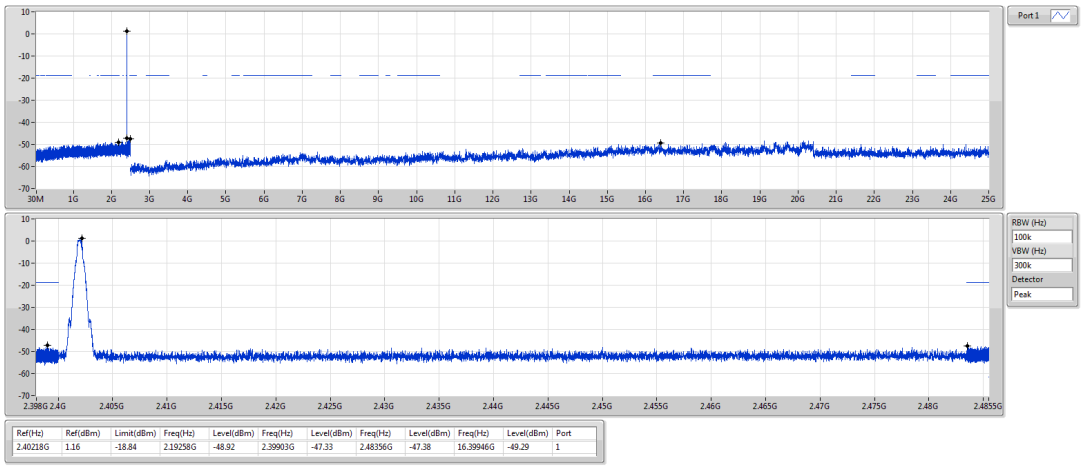
3.3.3 Test Setup



3.3.4 Unwanted Emissions into Non-Restricted Frequency Bands

BT-BR(1Mbps) **CSE NdB**

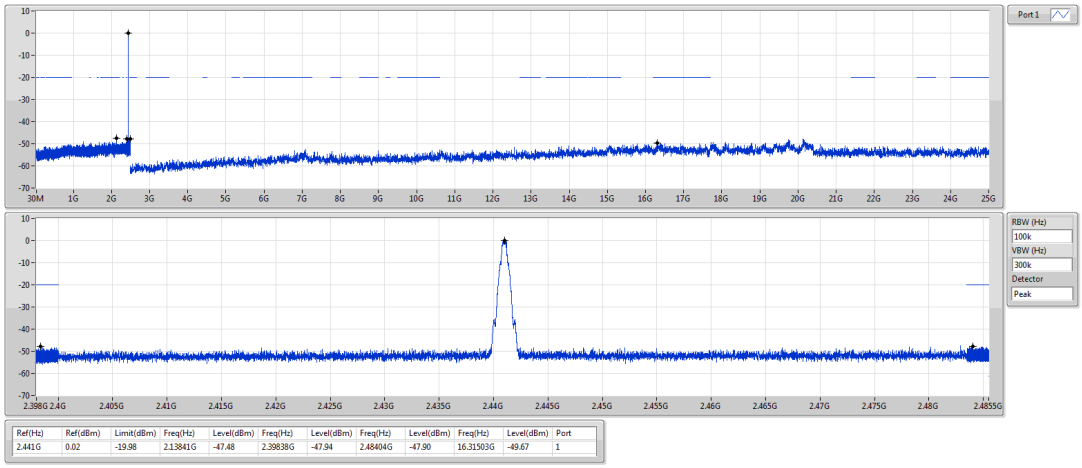
2402MHz



Ref(Hz)	Ref(dBm)	Limit(dBm)	Freq(Hz)	Level(dBm)	Freq(Hz)	Level(dBm)	Freq(Hz)	Level(dBm)	Freq(Hz)	Level(dBm)	Port
2.40218G	1.16	-18.84	2.19258G	-48.92	2.39903G	-47.33	2.48356G	-47.38	16.39946G	-49.29	1

BT-BR(1Mbps) **CSE NdB**

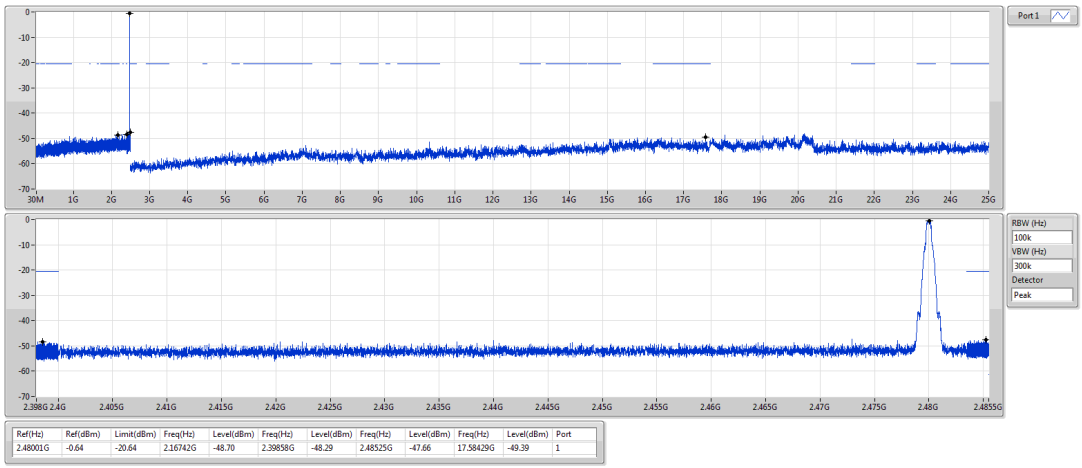
2441MHz



Ref(Hz)	Ref(dBm)	Limit(dBm)	Freq(Hz)	Level(dBm)	Freq(Hz)	Level(dBm)	Freq(Hz)	Level(dBm)	Freq(Hz)	Level(dBm)	Port
2.441G	0.02	-19.98	2.13841G	-47.48	2.39838G	-47.94	2.48404G	-47.90	16.31503G	-49.67	1

BT-BR(1Mbps) **CSE NdB**

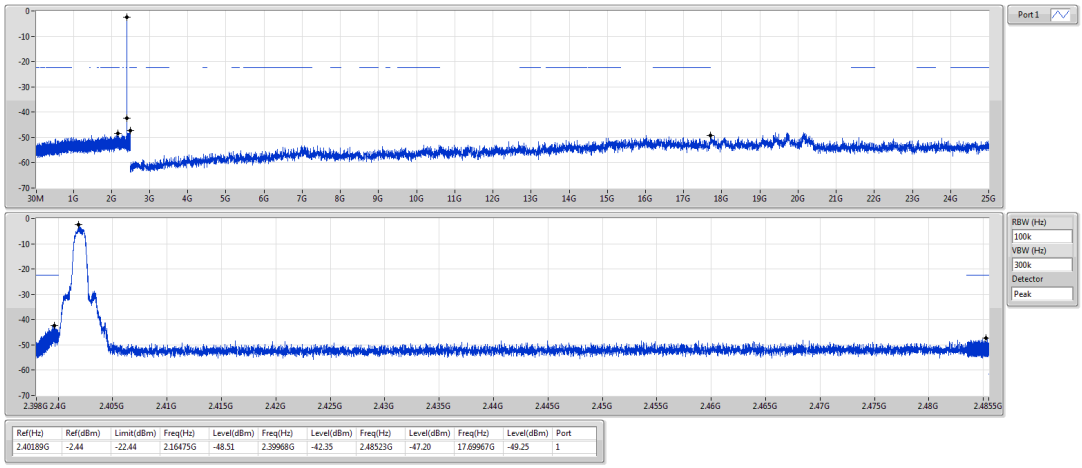
2480MHz



Ref(Hz)	Ref(dBm)	Limit(dBm)	Freq(Hz)	Level(dBm)	Freq(Hz)	Level(dBm)	Freq(Hz)	Level(dBm)	Freq(Hz)	Level(dBm)	Port
2.48001G	-0.64	-20.64	2.16742G	-48.70	2.39858G	-48.29	2.48525G	-47.66	17.58429G	-49.39	1

BT-EDR(2Mbps) **CSE NdB**

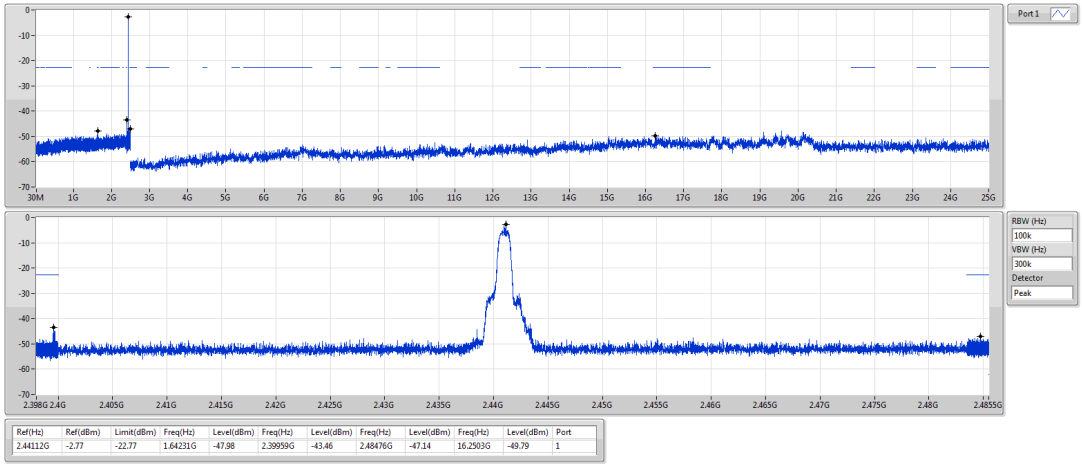
2402MHz



Ref(Hz)	Ref(dBm)	Limit(dBm)	Freq(Hz)	Level(dBm)	Freq(Hz)	Level(dBm)	Freq(Hz)	Level(dBm)	Freq(Hz)	Level(dBm)	Port
2.40189G	-2.44	-22.44	2.16475G	-48.51	2.39968G	-42.35	2.48523G	-47.20	17.69967G	-49.25	1

BT-EDR(2Mbps) **CSE NdB**

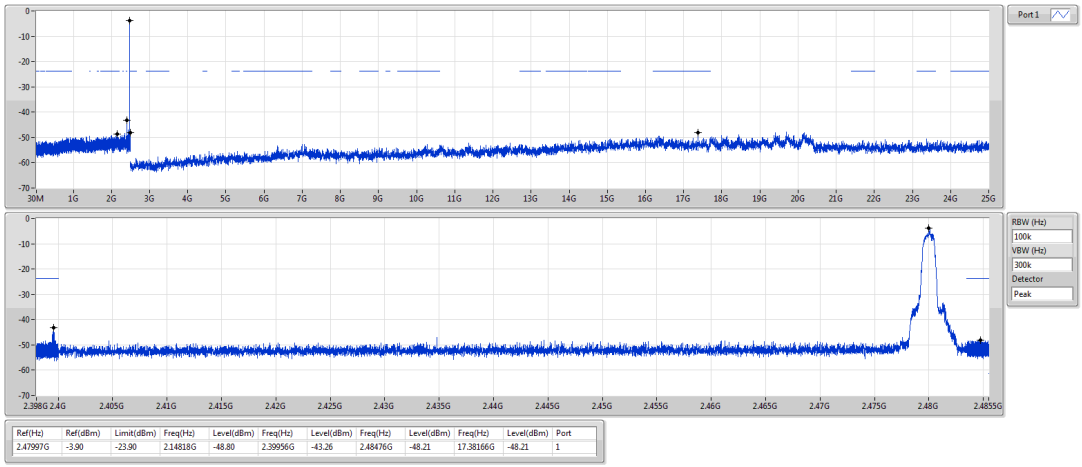
2441MHz



Ref(Hz)	Ref(dBm)	Limit(dBm)	Freq(Hz)	Level(dBm)	Freq(Hz)	Level(dBm)	Freq(Hz)	Level(dBm)	Freq(Hz)	Level(dBm)	Port
2.44112G	-2.77	-22.77	1.64231G	-47.98	2.39959G	-43.46	2.48476G	-47.14	16.2503G	-49.79	1

BT-EDR(2Mbps) **CSE NdB**

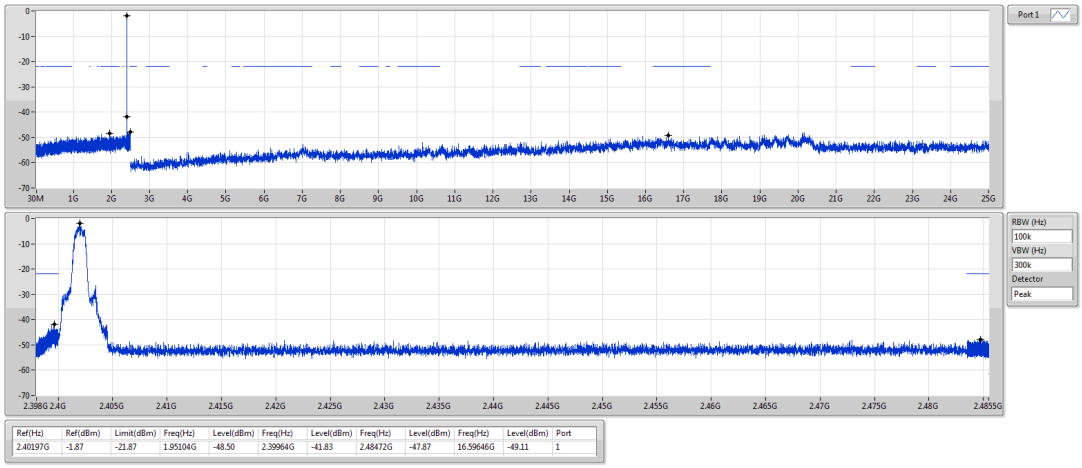
2480MHz



Ref(Hz)	Ref(dBm)	Limit(dBm)	Freq(Hz)	Level(dBm)	Freq(Hz)	Level(dBm)	Freq(Hz)	Level(dBm)	Freq(Hz)	Level(dBm)	Port
2.47997G	-3.90	-23.90	2.14818G	-48.80	2.39956G	-43.26	2.48476G	-48.21	17.38166G	-48.21	1

BT-EDR(3Mbps) **CSE NdB**

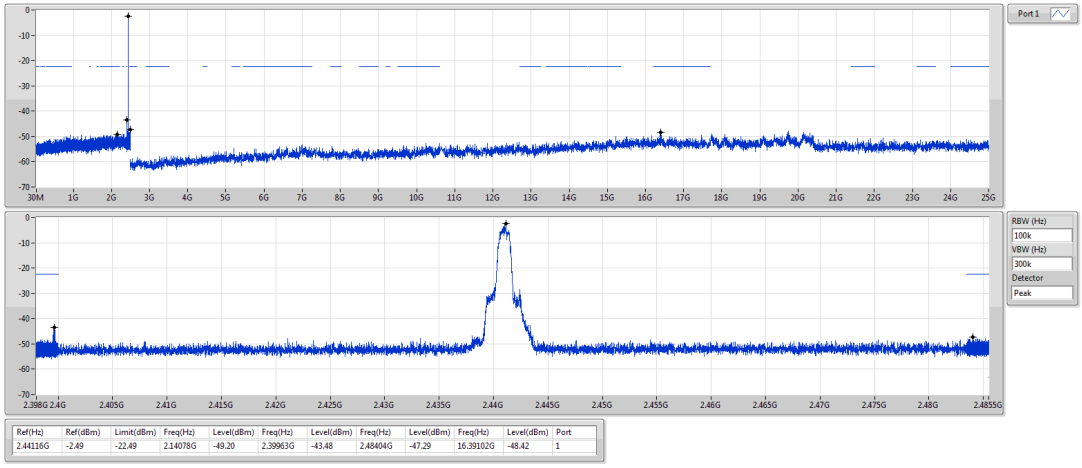
2402MHz



Ref(Hz)	Ref(dBm)	Limit(dBm)	Freq(Hz)	Level(dBm)	Freq(Hz)	Level(dBm)	Freq(Hz)	Level(dBm)	Freq(Hz)	Level(dBm)	Port
2.40197G	-1.87	-21.87	1.95104G	-48.50	2.39964G	-41.83	2.48472G	-47.87	16.59646G	-49.11	1

BT-EDR(3Mbps) **CSE NdB**

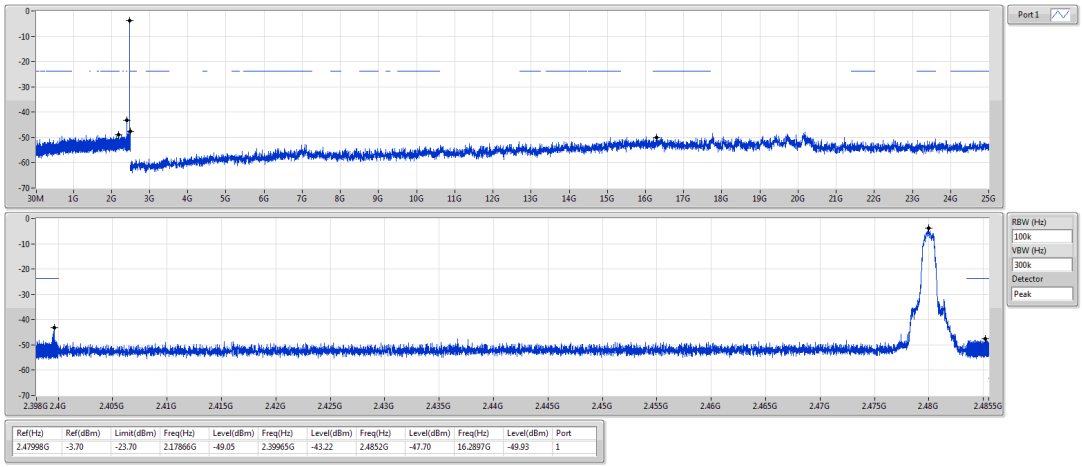
2441MHz



Ref(Hz)	Ref(dBm)	Limit(dBm)	Freq(Hz)	Level(dBm)	Freq(Hz)	Level(dBm)	Freq(Hz)	Level(dBm)	Freq(Hz)	Level(dBm)	Port
2.44116G	-2.49	-22.49	2.14078G	-49.20	2.39963G	-43.48	2.48404G	-47.29	16.39102G	-48.42	1

BT-EDR(3Mbps) **CSE NdB**

2480MHz

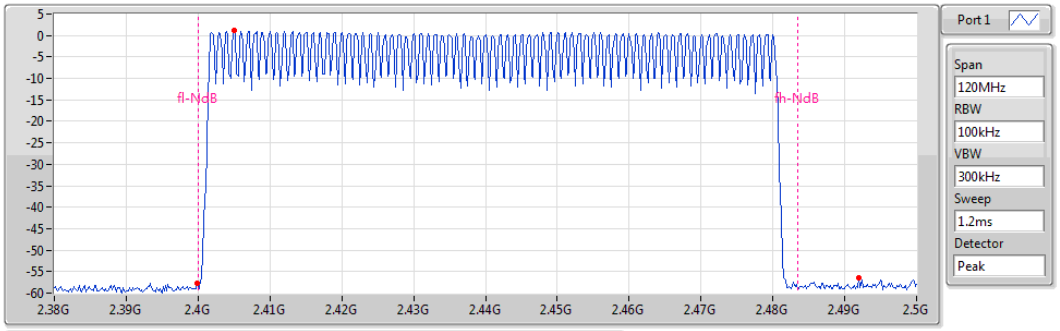


Ref(Hz)	Ref(dBm)	Limit(dBm)	Freq(Hz)	Level(dBm)	Freq(Hz)	Level(dBm)	Freq(Hz)	Level(dBm)	Freq(Hz)	Level(dBm)	Port
2.47998G	-3.70	-23.70	2.17866G	-49.05	2.39965G	-43.22	2.4852G	-47.70	16.2897G	-49.93	1

BT-BR(1Mbps)

2441MHz

Hopping Ch Bandedge (Non-restricted Band)

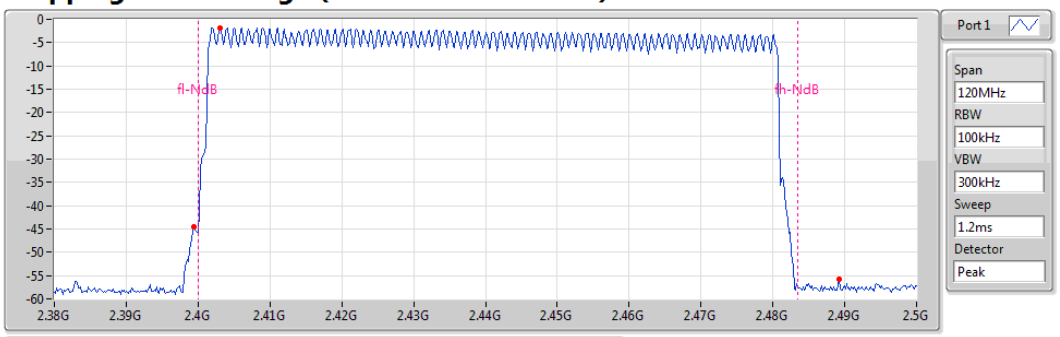


Limit(dBm)	Ref(Hz)	Ref(dBm)	BE-l(Hz)	BE-l(dBm)	BE-h(Hz)	BE-h(dBm)
-18.93	2.405043G	1.07	2.399826G	-57.64	2.492G	-56.47

BT-EDR(2Mbps)

2441MHz

Hopping Ch Bandedge (Non-restricted Band)

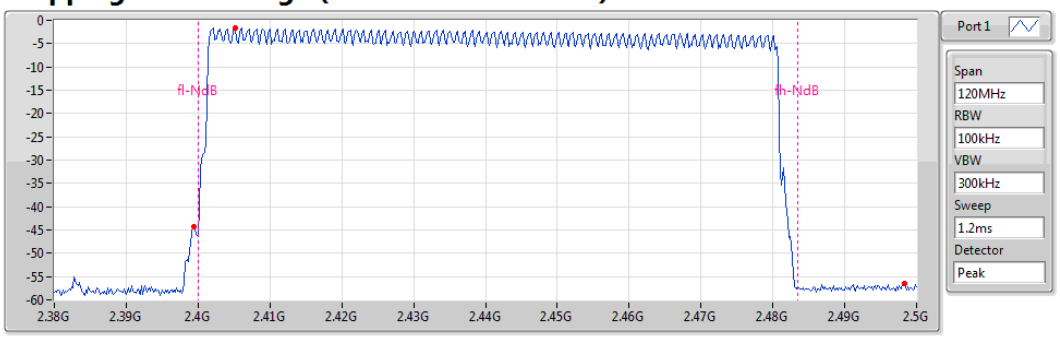


Limit(dBm)	Ref(Hz)	Ref(dBm)	BE-l(Hz)	BE-l(dBm)	BE-h(Hz)	BE-h(dBm)
-21.77	2.40313G	-1.77	2.399478G	-44.62	2.489217G	-55.88

BT-EDR(3Mbps)

2441MHz

Hopping Ch Bandedge (Non-restricted Band)



Limit(dBm)	Ref(Hz)	Ref(dBm)	BE-l(Hz)	BE-l(dBm)	BE-h(Hz)	BE-h(dBm)
-21.72	2.405217G	-1.72	2.399478G	-44.28	2.498261G	-56.49

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 senor 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)	1.99	0.00158
BT-EDR(2Mbps)	0.13	0.00103
BT-EDR(3Mbps)	0.29	0.00107

Result

Mode	Result	Gain (dBi)	Power (dBm)	Power Limit (dBm)
BT-BR(1Mbps)	-	-	-	-
2402MHz	Pass	3.60	1.99	21.00
2441MHz	Pass	3.60	1.05	21.00
2480MHz	Pass	3.60	0.85	21.00
BT-EDR(2Mbps)	-	-	-	-
2402MHz	Pass	3.60	0.13	21.00
2441MHz	Pass	3.60	-0.02	21.00
2480MHz	Pass	3.60	-0.29	21.00
BT-EDR(3Mbps)	-	-	-	-
2402MHz	Pass	3.60	0.29	21.00
2441MHz	Pass	3.60	0.15	21.00
2480MHz	Pass	3.60	-0.12	21.00

Summary of Conducted (Average) Output Power

Mode	Power	Power
	(dBm)	(W)
2.4-2.4835GHz	-	-
BT-BR(1Mbps)	1.70	0.00148
BT-EDR(2Mbps)	-1.89	0.00065
BT-EDR(3Mbps)	-1.95	0.00064

Result

Mode	Result	Gain (dBi)	Power (dBm)	Power Limit (dBm)
BT-BR(1Mbps)	-	-	-	-
2402MHz	Pass	3.60	1.70	-
2441MHz	Pass	3.60	0.90	-
2480MHz	Pass	3.60	0.70	-
BT-EDR(2Mbps)	-	-	-	-
2402MHz	Pass	3.60	-1.89	-
2441MHz	Pass	3.60	-2.08	-
2480MHz	Pass	3.60	-2.47	-
BT-EDR(3Mbps)	-	-	-	-
2402MHz	Pass	3.60	-1.95	-
2441MHz	Pass	3.60	-2.08	-
2480MHz	Pass	3.60	-2.49	-

Note: Average power is for reference only.

3.5 Number of Hopping Frequency

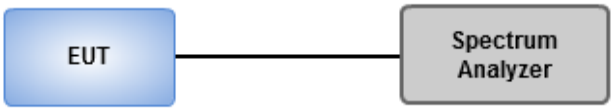
3.5.1 Limit of Number of Hopping Frequency

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

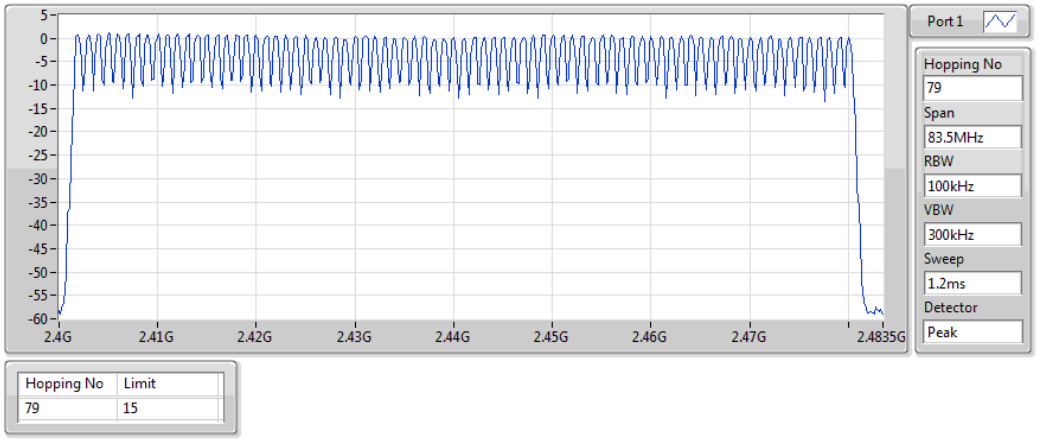
Mode	Max-Hop No
2.4-2.4835GHz	-
BT-BR(1Mbps)	79
BT-EDR(2Mbps)	79
BT-EDR(3Mbps)	79

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) **Hopping Ch**

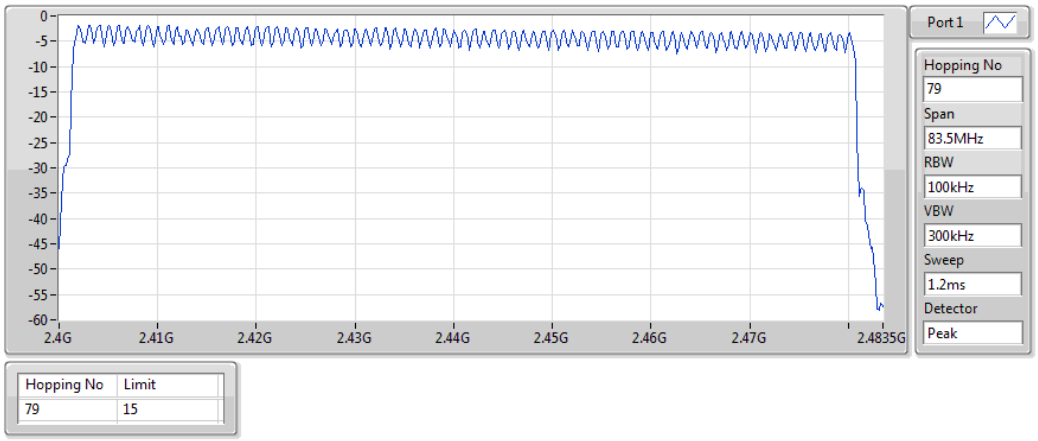
2441MHz



Hopping No	Limit
79	15

BT-EDR(2Mbps) **Hopping Ch**

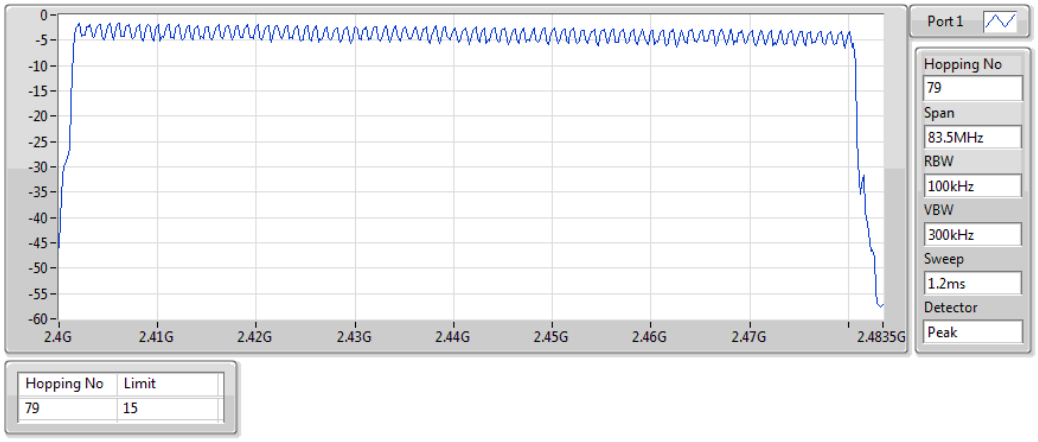
2441MHz



Hopping No	Limit
79	15

BT-EDR(3Mbps) **Hopping Ch**

2441MHz



Hopping No	Limit
79	15

3.6 20dB and Occupied Bandwidth

3.6.1 Test Procedures

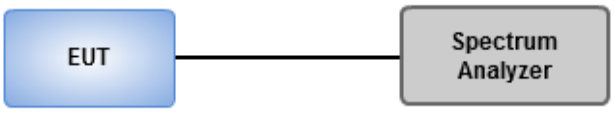
20dB Bandwidth

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	940.666k	941KF1D	916.667k	915.34k
BT-EDR(2Mbps)	1.373M	1.274M	1M27G1D	1.344M	1.245M
BT-EDR(3Mbps)	1.391M	1.259M	1M26G1D	1.366M	1.23M

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;

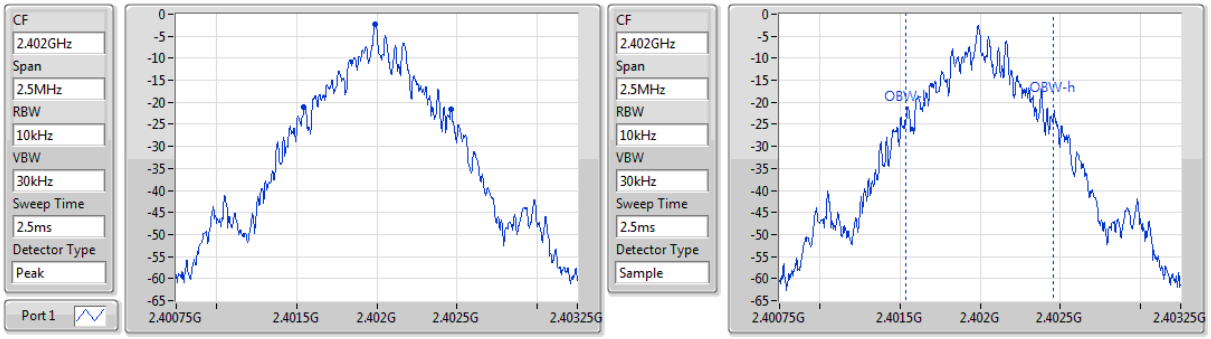
Result

Mode	Result	Limit (Hz)	Port 1-N dB (Hz)	Port 1-OBW (Hz)
BT-BR(1Mbps)	-	-	-	-
2402MHz	Pass	Inf	916.667k	922.576k
2441MHz	Pass	Inf	916.667k	915.34k
2480MHz	Pass	Inf	923.913k	940.666k
BT-EDR(2Mbps)	-	-	-	-
2402MHz	Pass	Inf	1.344M	1.274M
2441MHz	Pass	Inf	1.373M	1.263M
2480MHz	Pass	Inf	1.351M	1.245M
BT-EDR(3Mbps)	-	-	-	-
2402MHz	Pass	Inf	1.366M	1.245M
2441MHz	Pass	Inf	1.391M	1.259M
2480MHz	Pass	Inf	1.384M	1.23M

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

BT-BR(1Mbps) **EBW**

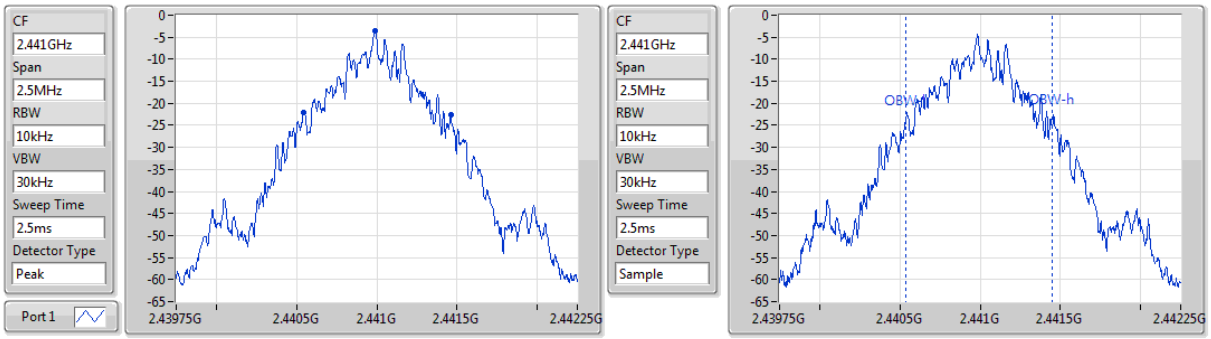
2402MHz



20dB(Hz)	Fl-20dB(Hz)	Fh-20dB(Hz)	OBW(Hz)	Fl-OBW(Hz)	Fh-OBW(Hz)	Limit(Hz)	Port
916.667k	2.401547G	2.402464G	922.576k	2.401537G	2.402459G	Inf	1

BT-BR(1Mbps) **EBW**

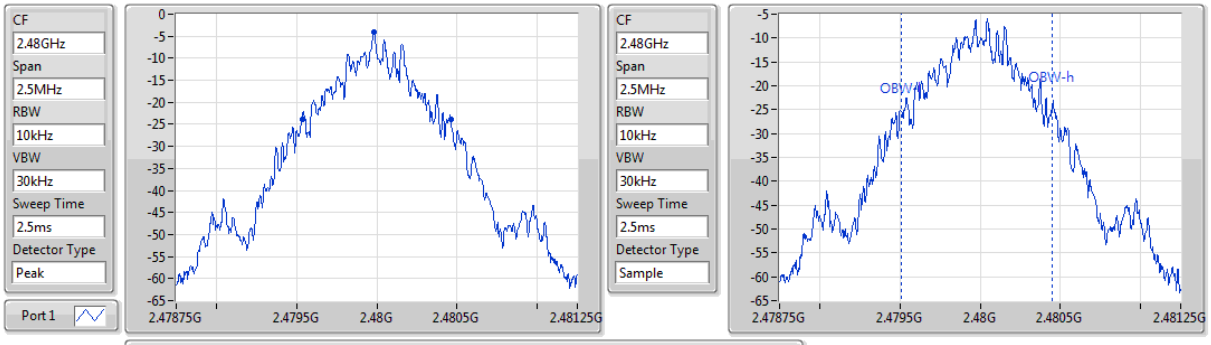
2441MHz



20dB(Hz)	Fl-20dB(Hz)	Fh-20dB(Hz)	OBW(Hz)	Fl-OBW(Hz)	Fh-OBW(Hz)	Limit(Hz)	Port
916.667k	2.440543G	2.44146G	915.34k	2.440537G	2.441452G	Inf	1

BT-BR(1Mbps) **EBW**

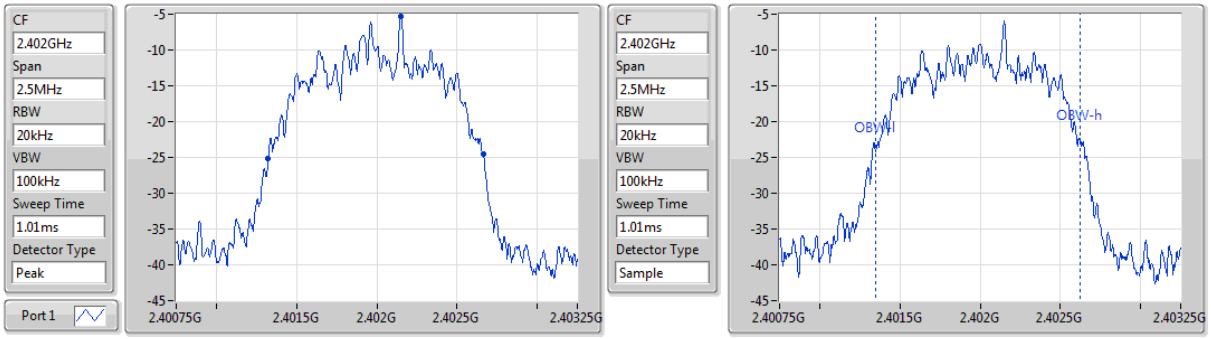
2480MHz



20dB(Hz)	Fl-20dB(Hz)	Fh-20dB(Hz)	OBW(Hz)	Fl-OBW(Hz)	Fh-OBW(Hz)	Limit(Hz)	Port
923.913k	2.479536G	2.48046G	940.666k	2.479512G	2.480452G	Inf	1

BT-EDR(2Mbps) **EBW**

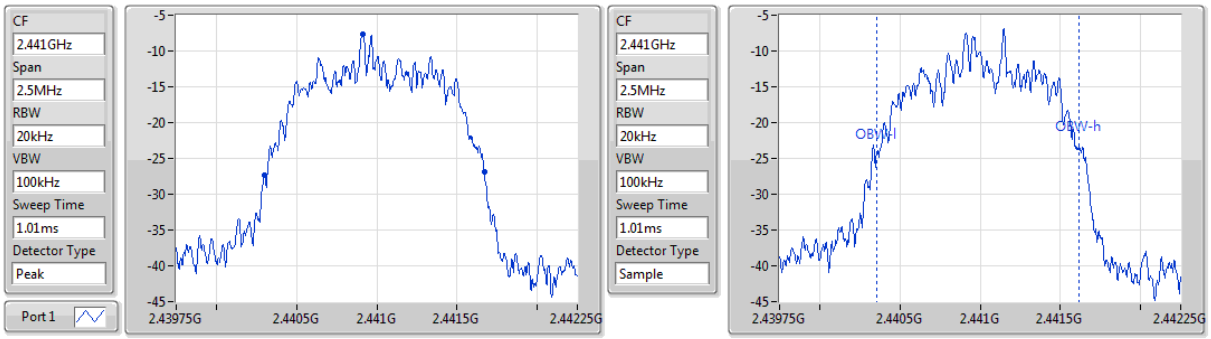
2402MHz



20dB(Hz)	Fl-20dB(Hz)	Fh-20dB(Hz)	OBW(Hz)	Fl-OBW(Hz)	Fh-OBW(Hz)	Limit(Hz)	Port
1.344M	2.401322G	2.402667G	1.274M	2.401349G	2.402622G	Inf	1

BT-EDR(2Mbps) **EBW**

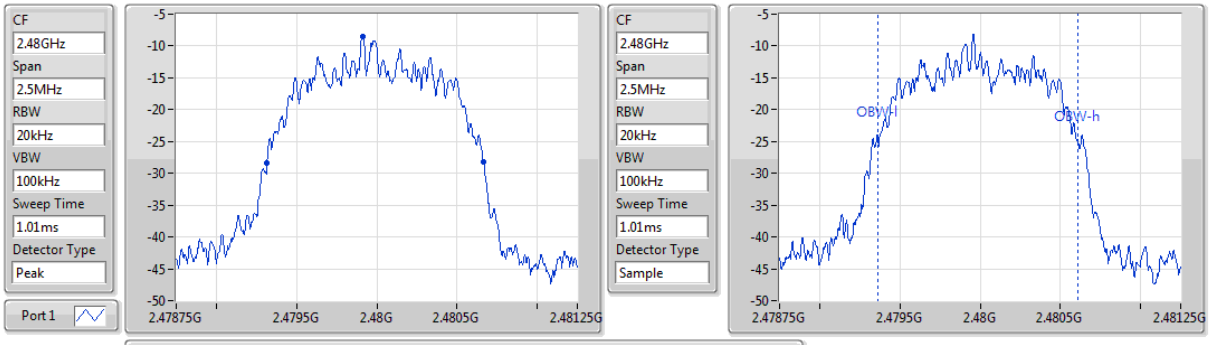
2441MHz



20dB(Hz)	Fl-20dB(Hz)	Fh-20dB(Hz)	OBW(Hz)	Fl-OBW(Hz)	Fh-OBW(Hz)	Limit(Hz)	Port
1.373M	2.440297G	2.44167G	1.263M	2.440352G	2.441615G	Inf	1

BT-EDR(2Mbps) **EBW**

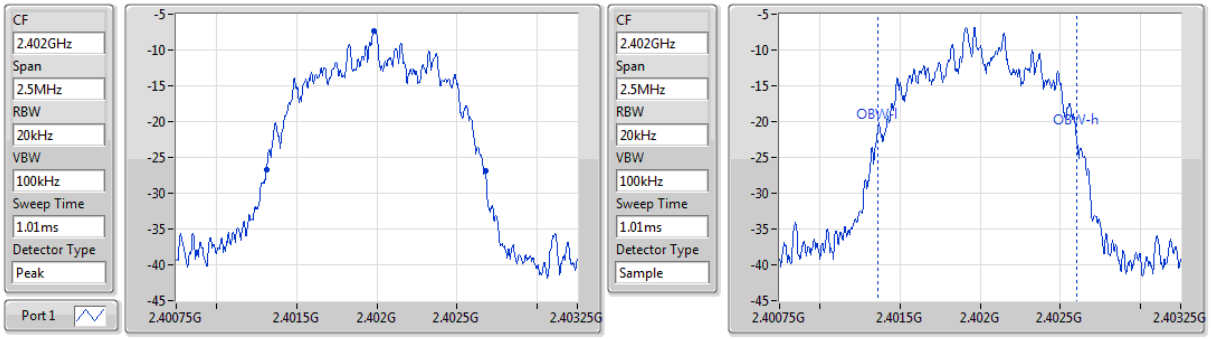
2480MHz



20dB(Hz)	Fl-20dB(Hz)	Fh-20dB(Hz)	OBW(Hz)	Fl-OBW(Hz)	Fh-OBW(Hz)	Limit(Hz)	Port
1.351M	2.479315G	2.480667G	1.245M	2.479363G	2.480608G	Inf	1

BT-EDR(3Mbps) **EBW**

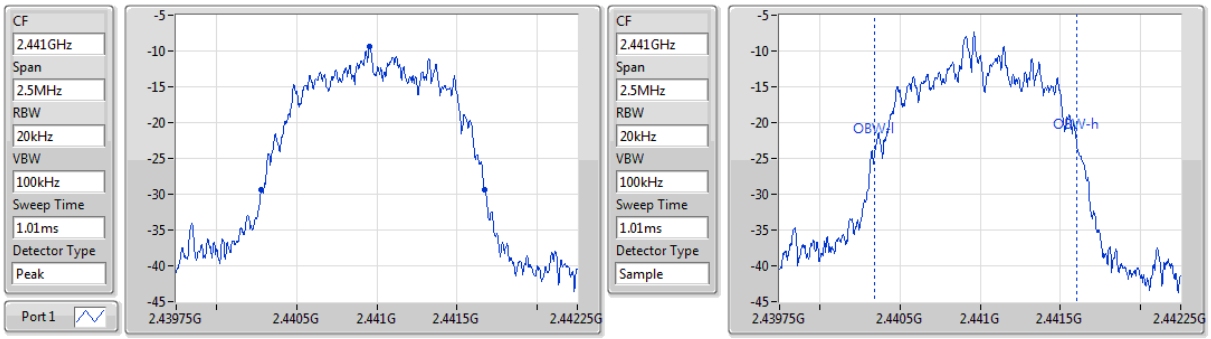
2402MHz



20dB(Hz)	Fl-20dB(Hz)	Fh-20dB(Hz)	OBW(Hz)	Fl-OBW(Hz)	Fh-OBW(Hz)	Limit(Hz)	Port
1.366M	2.401312G	2.402678G	1.245M	2.40136G	2.402604G	Inf	1

BT-EDR(3Mbps) **EBW**

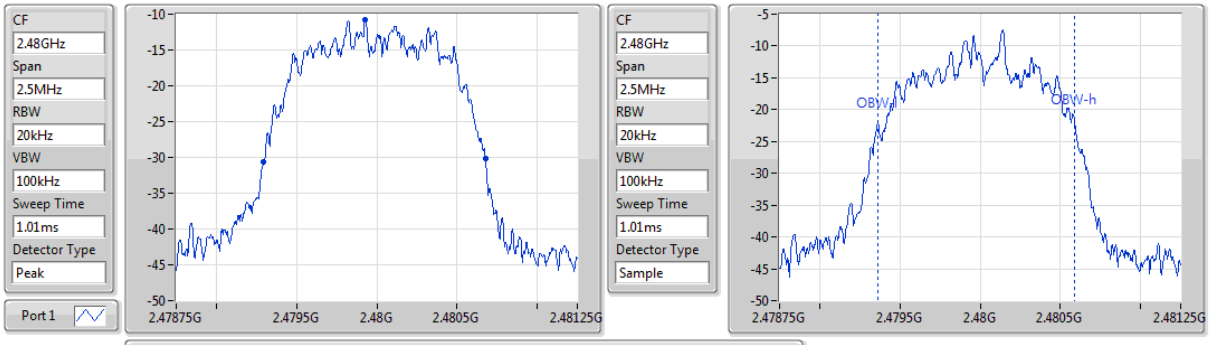
2441MHz



20dB(Hz)	Fl-20dB(Hz)	Fh-20dB(Hz)	OBW(Hz)	Fl-OBW(Hz)	Fh-OBW(Hz)	Limit(Hz)	Port
1.391M	2.440283G	2.441674G	1.259M	2.440345G	2.441604G	Inf	1

BT-EDR(3Mbps) **EBW**

2480MHz



20dB(Hz)	Fl-20dB(Hz)	Fh-20dB(Hz)	OBW(Hz)	Fl-OBW(Hz)	Fh-OBW(Hz)	Limit(Hz)	Port
1.384M	2.479293G	2.480678G	1.23M	2.47936G	2.48059G	Inf	1

3.7 Channel Separation

3.7.1 Limit of Channel Separation

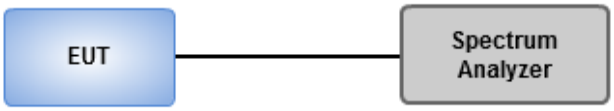
☐ Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hopping channel, whichever is greater.

☒ 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)	1.004348M	1M
BT-EDR(3Mbps)	1.004348M	1M

Result

Mode	Result	Fl (Hz)	Fh (Hz)	Ch.Space (Hz)	Limit (Hz)
BT-BR(1Mbps)	-	-	-	-	-
2402MHz	Pass	2.401996G	2.402996G	1M	610.500222k
2441MHz	Pass	2.440991G	2.441991G	1M	610.500222k
2480MHz	Pass	2.478987G	2.479987G	1M	615.326058k
BT-EDR(2Mbps)	-	-	-	-	-
2402MHz	Pass	2.402148G	2.403152G	1.004348M	895.104k
2441MHz	Pass	2.441148G	2.442148G	1M	914.418k
2480MHz	Pass	2.479143G	2.480143G	1M	899.766k
BT-EDR(3Mbps)	-	-	-	-	-
2402MHz	Pass	2.402143G	2.403148G	1.004348M	909.756k
2441MHz	Pass	2.441143G	2.442143G	1M	926.406k
2480MHz	Pass	2.479139G	2.480139G	1M	921.744k

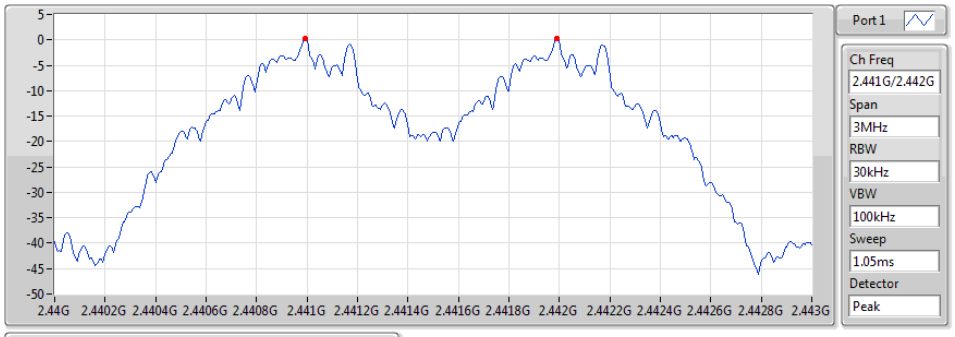
BT-BR(1Mbps) **Channel Separation**

2.402G/2.403GHz

Fl(Hz)	Fh(Hz)	Ch.Space(Hz)	Limit(Hz)
2.401996G	2.402996G	1M	610.500222k

BT-BR(1Mbps) **Channel Separation**

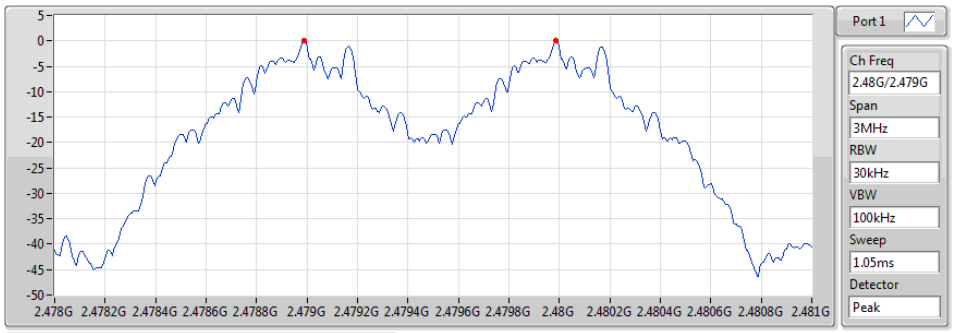
2.441G/2.442GHz



Fl(Hz)	Fh(Hz)	Ch.Space(Hz)	Limit(Hz)
2.440991G	2.441991G	1M	610.500222k

BT-BR(1Mbps) **Channel Separation**

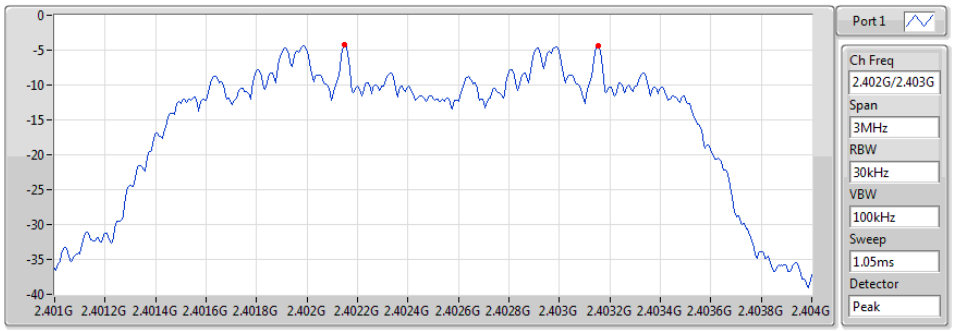
2.48G/2.479GHz



Fl(Hz)	Fh(Hz)	Ch.Space(Hz)	Limit(Hz)
2.478987G	2.479987G	1M	615.326058k

BT-EDR(2Mbps) **Channel Separation**

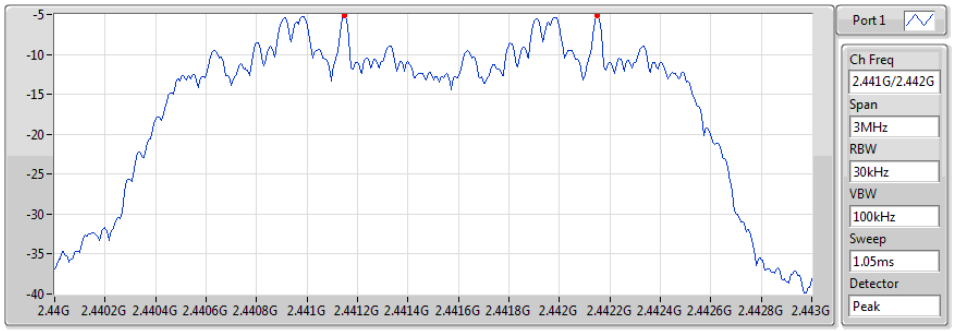
2.402G/2.403GHz



Fl(Hz)	Fh(Hz)	Ch.Space(Hz)	Limit(Hz)
2.402148G	2.403152G	1.004348M	895.104k

BT-EDR(2Mbps) **Channel Separation**

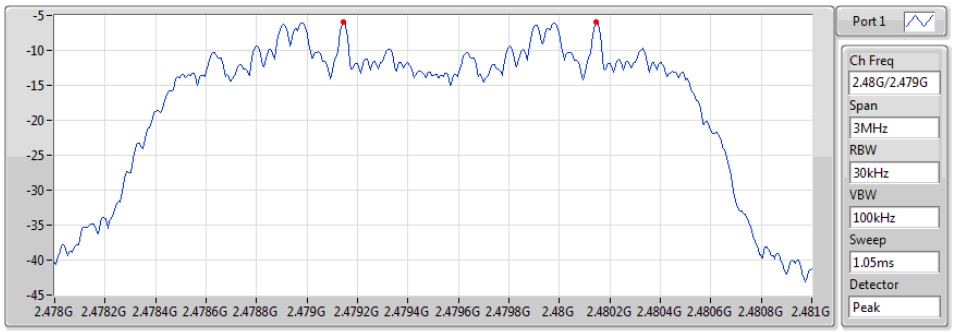
2.441G/2.442GHz



Fl(Hz)	Fh(Hz)	Ch.Space(Hz)	Limit(Hz)
2.441148G	2.442148G	1M	914.418k

BT-EDR(2Mbps) **Channel Separation**

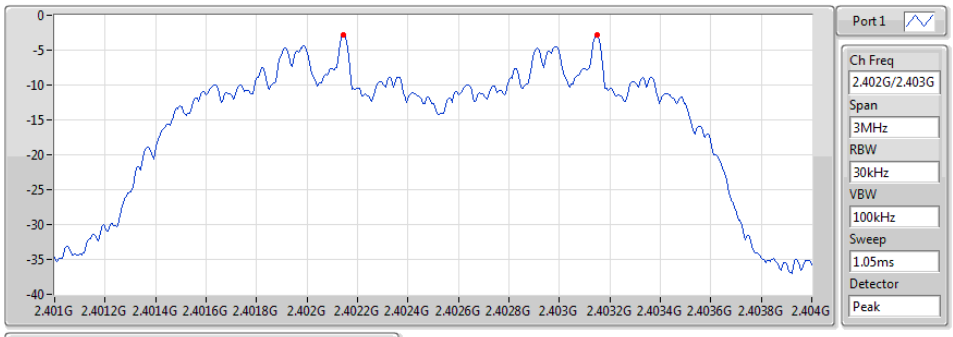
2.48G/2.479GHz



Fl(Hz)	Fh(Hz)	Ch.Space(Hz)	Limit(Hz)
2.479143G	2.480143G	1M	899.766k

BT-EDR(3Mbps) **Channel Separation**

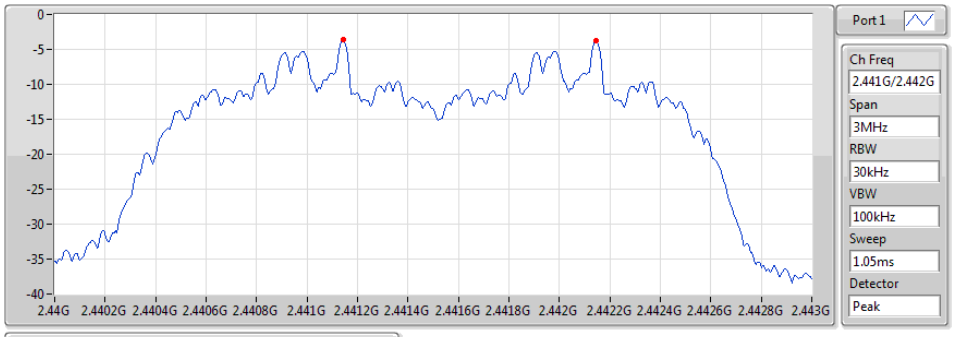
2.402G/2.403GHz



Fl(Hz)	Fh(Hz)	Ch.Space(Hz)	Limit(Hz)
2.402143G	2.403148G	1.004348M	909.756k

BT-EDR(3Mbps) **Channel Separation**

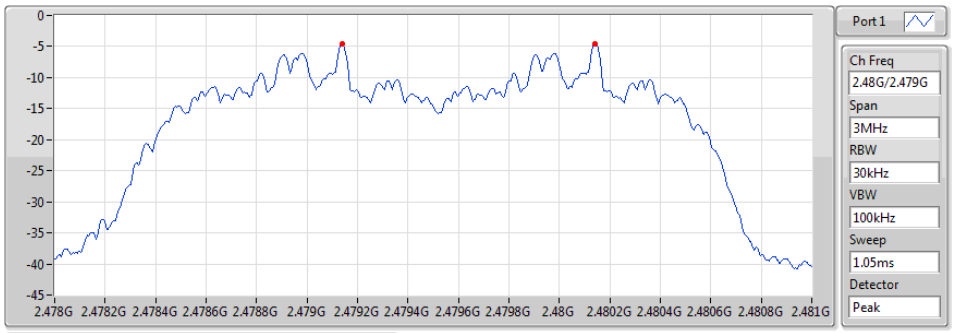
2.441G/2.442GHz



Fl(Hz)	Fh(Hz)	Ch.Space(Hz)	Limit(Hz)
2.441143G	2.442143G	1M	926.406k

BT-EDR(3Mbps) **Channel Separation**

2.48G/2.479GHz



Fl(Hz)	Fh(Hz)	Ch.Space(Hz)	Limit(Hz)
2.479139G	2.480139G	1M	921.744k

3.8 Number of Dwell Time

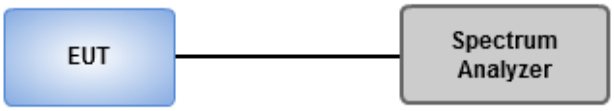
3.8.1 Limit of Dwell time

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 x 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 x 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 x 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 x 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 x 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 times6.667 x 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)	316.710145m_DH5
BT-EDR(2Mbps)	310.530435m_DH5
BT-EDR(3Mbps)	304.350725m_DH5

Result/ Non AFH mode

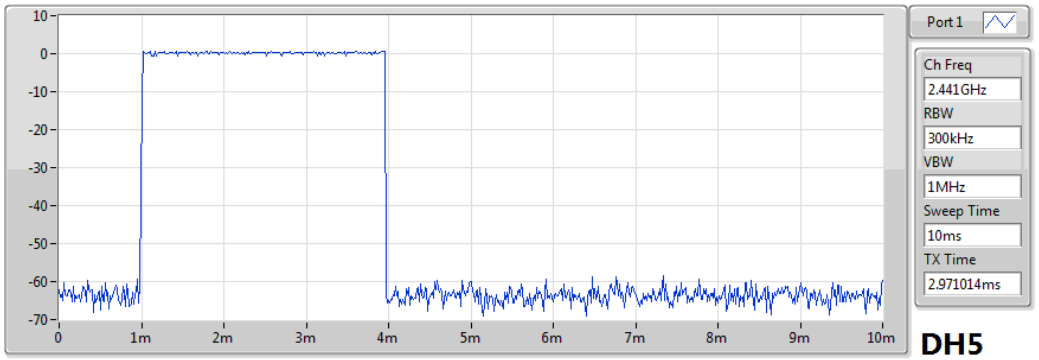
Mode	Result	Period (s)	Dwell (s)	Limit (s)	Tx On (s)
BT-BR(1Mbps)	-	-	-	-	-
2441MHz	Pass	31.6	316.710145m_DH5	400m	2.971014m
2441MHz	Pass	31.6	273.623188m_DH3	400m	1.710145m
2441MHz	Pass	31.6	143.768116m_DH1	400m	449.275362u
BT-EDR(2Mbps)	-	-	-	-	-
2441MHz	Pass	31.6	310.530435m_DH5	400m	2.913043m
2441MHz	Pass	31.6	264.347826m_DH3	400m	1.652174m
2441MHz	Pass	31.6	129.855072m_DH1	400m	405.797101u
BT-EDR(3Mbps)	-	-	-	-	-
2441MHz	Pass	31.6	304.350725m_DH5	400m	2.855072m
2441MHz	Pass	31.6	264.347826m_DH3	400m	1.652174m
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	158.4442m_DH5	400m	2.971014m
2441MHz	Pass	8	136.8116m_DH3	400m	1.710145m
2441MHz	Pass	8	71.88406m_DH1	400m	449.275362u
BT-EDR(2Mbps)	-	-	-	-	-
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(3Mbps)	-	-	-	-	-
2441MHz	Pass	8	152.261m_DH5	400m	2.855072m
2441MHz	Pass	8	132.1739m_DH3	400m	1.652174m
2441MHz	Pass	8	64.92754m_DH1	400m	405.797101u

BT-BR(1Mbps) **Dwell**

2441MHz

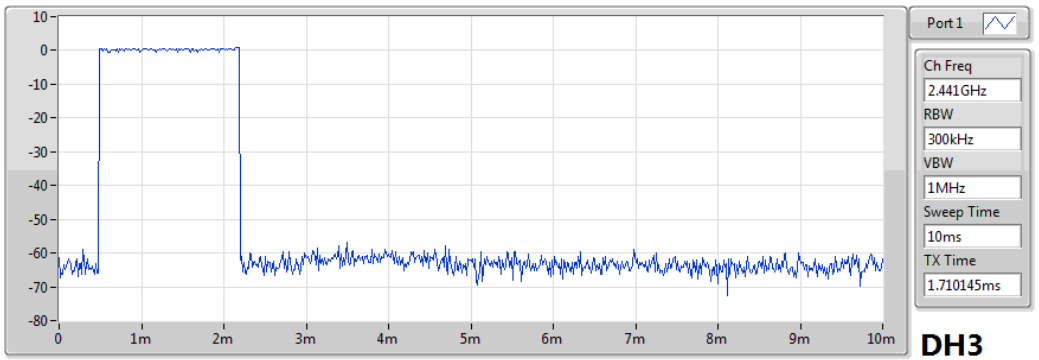


DH5

Period(s)	Dwell(s)	Limit(s)	Tx On(s)
31.6	316.710145m_D	400m	2.971014m

BT-BR(1Mbps) **Dwell**

2441MHz

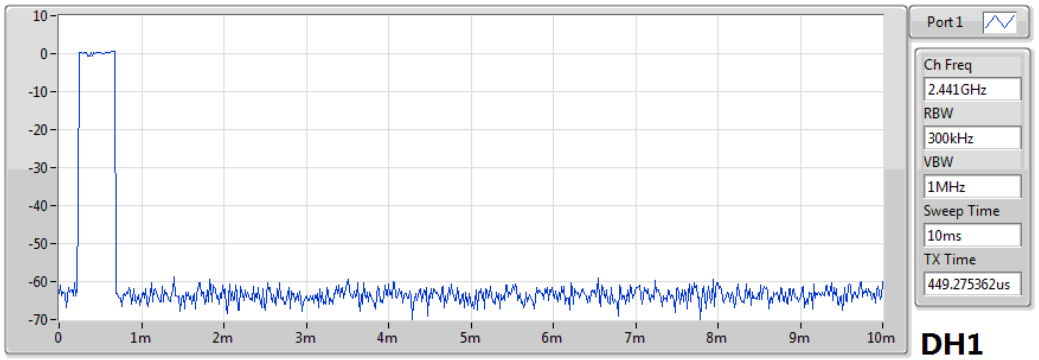


DH3

Period(s)	Dwell(s)	Limit(s)	Tx On(s)
31.6	273.623188m_D	400m	1.710145m

BT-BR(1Mbps) **Dwell**

2441MHz

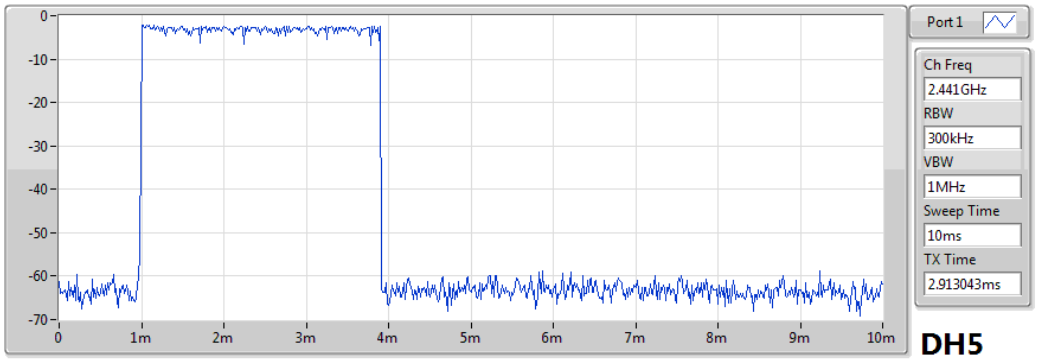


DH1

Period(s)	Dwell(s)	Limit(s)	Tx On(s)
31.6	143.768116m_D	400m	449.275362u

BT-EDR(2Mbps) **Dwell**

2441MHz

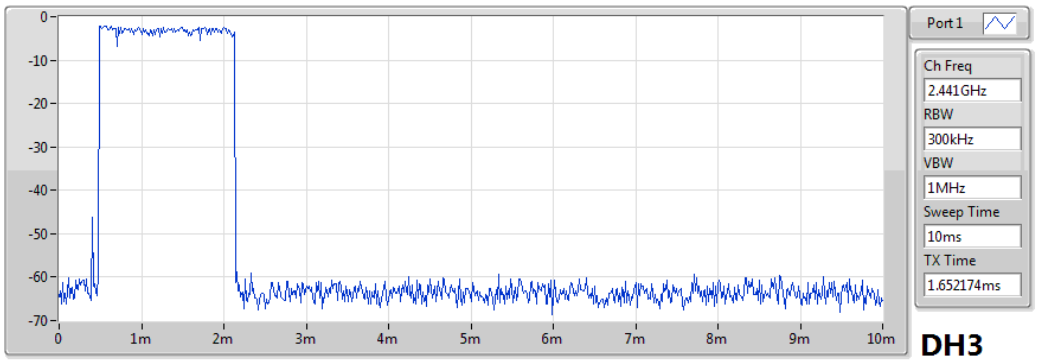


DH5

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

BT-EDR(2Mbps) **Dwell**

2441MHz

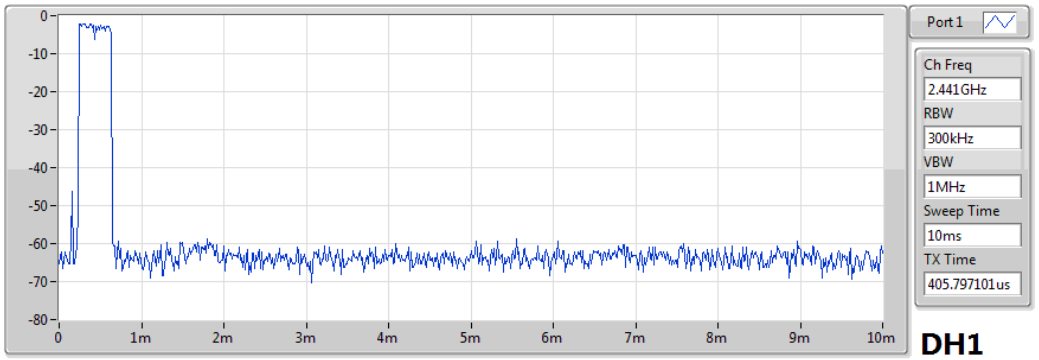


DH3

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

BT-EDR(2Mbps) **Dwell**

2441MHz

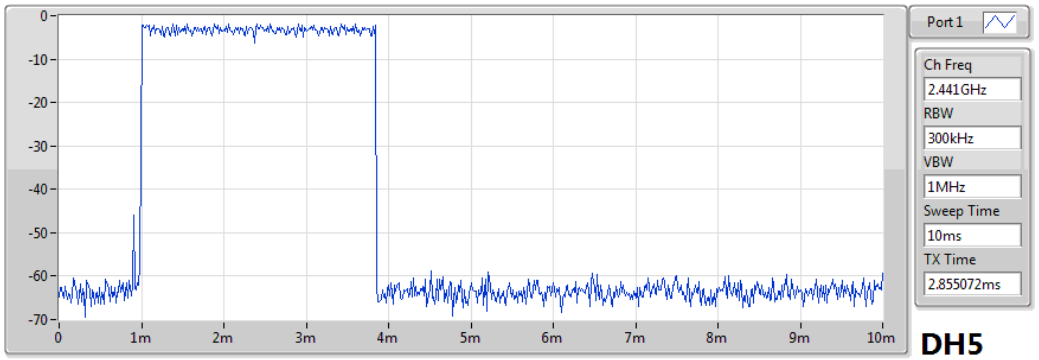


DH1

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

BT-EDR(3Mbps) **Dwell**

2441MHz

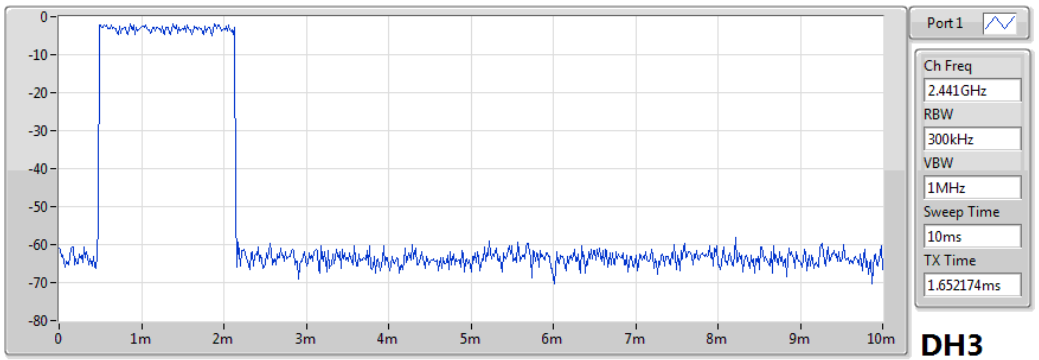


DH5

Period(s)	Dwell(s)	Limit(s)	Tx On(s)
31.6	304.350725m_D	400m	2.855072m

BT-EDR(3Mbps) **Dwell**

2441MHz

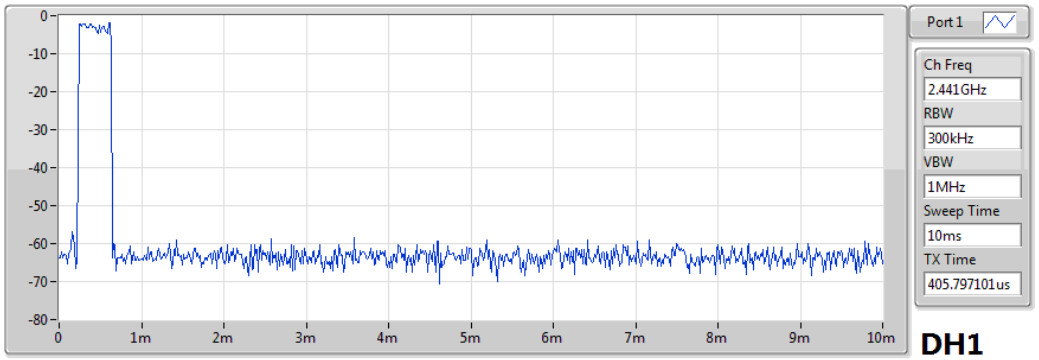


DH3

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

BT-EDR(3Mbps) **Dwell**

2441MHz



DH1

Period(s)	Dwell(s)	Limit(s)	Tx On(s)
31.6	129.855072m_D	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	**Kwei Shan**	**Kwei Shan Site II**
Tel: 886-2-2601-1640	Tel: 886-3-271-8666	Tel: 886-3-271-8640
No. 30-2, Ding Fwu Tsuen, Lin Kou District, New Taipei City, Taiwan, R.O.C.	No. 3-1, Lane 6, Wen San 3rd St., Kwei Shan District, Tao Yuan City 333, Taiwan, R.O.C.	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==