

FCC Test Report

FCC ID : MXF-C6500XK
Equipment : C6500XK Modem
Model No. : C6500XK
Brand Name : Q Fiber, LLC
Applicant : Gemtek Technology Co., Ltd.
Address : No.15-1 Zhonghua Rd, Hsinchu Industrial
Park, Hukou, Hsinchu, Taiwan.
Standard : 47 CFR FCC Part 15.247
Received Date : Dec. 24, 2021
Tested Date : Jan. 12 ~ Jan. 20, 2022

We, International Certification Corporation, 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 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

Table of Contents

1	GENERAL DESCRIPTION	5
1.1	Information.....	5
1.2	Local Support Equipment List	8
1.3	Test Setup Chart	8
1.4	The Equipment List	9
1.5	Test Standards	10
1.6	Reference Guidance	10
1.7	Deviation from Test Standard and Measurement Procedure.....	10
1.8	Measurement Uncertainty	10
2	TEST CONFIGURATION	11
2.1	Testing Facility.....	11
2.2	The Worst Test Modes and Channel Details	11
3	TRANSMITTER TEST RESULTS.....	12
3.1	Conducted Emissions.....	12
3.2	Unwanted Emissions into Restricted Frequency Bands	15
3.3	Unwanted Emissions into Non-Restricted Frequency Bands	32
3.4	Conducted Output Power	40
3.5	Number of Hopping Frequency	43
3.6	20dB and Occupied Bandwidth	47
3.7	Channel Separation.....	54
3.8	Number of Dwell Time.....	61
4	TEST LABORATORY INFORMATION	67

Release Record

Report No.	Version	Description	Issued Date
FR1D2402AD	Rev. 01	Initial issue	Feb. 25, 2022

Summary of Test Results

FCC Rules	Test Items	Measured	Result
15.207	Conducted Emissions	[dBuV]: 0.510MHz 37.05 (Margin -8.95dB) - AV	Pass
15.247(d) 15.209	Radiated Emissions	[dBuV/m at 3m]: 2483.50MHz 71.45 (Margin -2.55dB) - PK	Pass
15.247(d)	Band Edge	Meet the requirement of limit	Pass
15.247(b)(1)	Conducted Output Power	Power [dBm]: 9.55	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 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 $\pi/4$ -DQPSK and 8DPSK.

1.1.2 Antenna Details

Ant. No.	Type	Connector	Gain (dBi)	Remarks
1	Dipole	UFL	4.75	---

1.1.3 Power Supply Type of Equipment under Test (EUT)

Power Supply Type	12.0Vdc from AC adapter
--------------------------	-------------------------

1.1.4 Accessories

Accessories		
No.	Equipment	Description
1	AC adapter	Brand: MOSO Model: MS-V1500R120-018H0-US I/P: 100-240Vac, 50/60Hz, 0.6A Max O/P: 12.0V= 1.5A Power Line: 1.8m non-shielded without core
2	AC adapter	Brand: Frecom Model: F18L16-120150SPAU I/P: 100-240Vac, 50/60Hz, 0.6A O/P: 12.0V= 1.5A 18.0W Power Line: 1.8m non-shielded without core
3	RJ45 cable	1.8m non-shielded without core
4	Fiber Storage Box (Optional)	Included Bracket, fiber connector & 0.2m fiber cable.

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	Airoha Tool Kit, Version: V2.3.13	
Modulation Mode	Duty Cycle Of Test Signal (%)	Duty Factor (dB)
DH5	78.44%	1.05
2DH5	79.21%	1.01
3DH5	79.21%	1.01

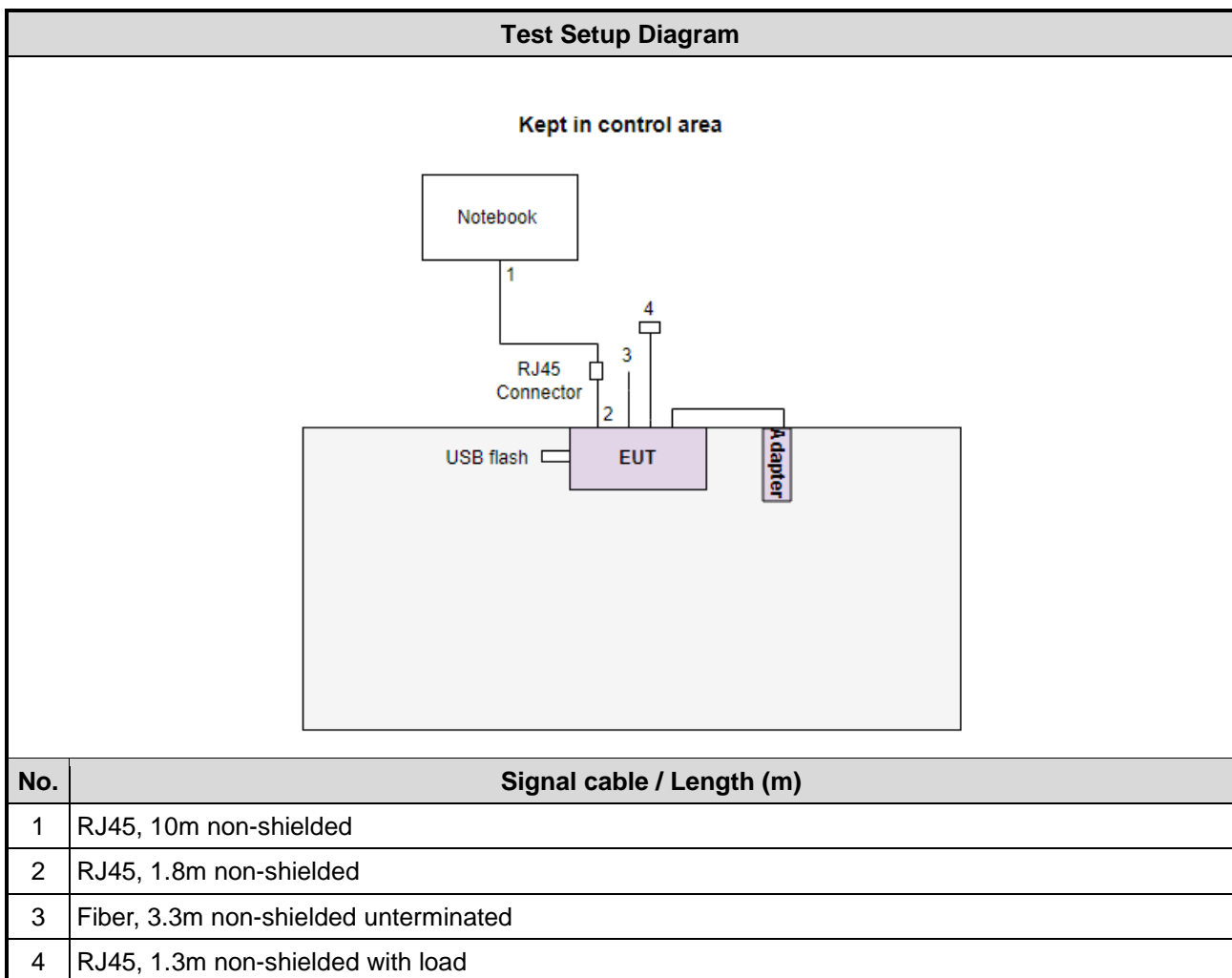
1.1.7 Power Index of Test Tool

Modulation Mode	Test Frequency (MHz)		
	2402	2441	2480
GFSK/1Mbps	57	58	59
$\pi/4$ -DQPSK /2Mbps	58	59	61
8DPSK/3Mbps	58	59	61

1.2 Local Support Equipment List

Support Equipment List					
No.	Equipment	Brand	Model	FCC ID	Remarks
1	RJ45	ICC	RJ45-10m	---	---
2	RJ45	ICC	RJ45-1.3m	---	---
3	RJ45 load	ICC	--	---	---
4	RJ45 Connector	ICC	RJ45 Connector	---	---
5	Notebook	DELL	Latitude E5470	DoC	---
6	Fiber (yellow) x1	---	---	---	Provided by applicant.
7	USB 3.0 Flash	Transcend	JetFlash 700	---	---

1.3 Test Setup Chart



1.4 The Equipment List

Test Item	Conducted Emission				
Test Site	Conduction room 1 / (CO01-WS)				
Tested Date	Jan. 20, 2022				
Instrument	Brand	Model No.	Serial No.	Calibration Date	Calibration Until
Receiver	R&S	ESR3	101658	Feb. 08, 2021	Feb. 07, 2022
LISN	R&S	ENV216	101579	Mar. 17, 2021	Mar. 16, 2022
LISN (Support Unit)	SCHWARZBECK MESS-ELEKTRONIK	NSLK 8127	8127477	Feb. 25, 2021	Feb. 24, 2022
RF Cable-CON	Woken	CFD200-NL	CFD200-NL-001	Oct. 19, 2021	Oct. 18, 2022
50 ohm terminal (Support Unit)	NA	50	04	May 25, 2021	May 24, 2022
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 chamber1 / (03CH01-WS)				
Tested Date	Jan. 12 ~ Jan. 17, 2022				
Instrument	Brand	Model No.	Serial No.	Calibration Date	Calibration Until
Receiver	R&S	ESR3	101657	Mar. 12, 2021	Mar. 11, 2022
Spectrum Analyzer	R&S	FSV40	101063	Apr. 19, 2021	Apr. 18, 2022
Loop Antenna	R&S	HFH2-Z2	100330	Nov. 08, 2021	Nov. 07, 2022
Bilog Antenna	SCHWARZBECK	VULB9168	VULB9168-522	Jun. 30, 2021	Jun. 29, 2022
Horn Antenna 1G-18G	SCHWARZBECK	BBHA 9120 D	BBHA 9120 D 1096	Dec. 03, 2021	Dec. 02, 2022
Horn Antenna 18G-40G	SCHWARZBECK	BBHA 9170	BBHA 9170517	Nov. 04, 2021	Nov. 03, 2022
Preamplifier	EMC	EMC02325	980225	Jun. 29, 2021	Jun. 28, 2022
Preamplifier	Agilent	83017A	MY39501308	Sep. 28, 2021	Sep. 27, 2022
Preamplifier	EMC	EMC184045B	980192	Jul. 14, 2021	Jul. 13, 2022
Loop Antenna Cable	KOAX KABEL	101354-BW	101354-BW	Oct. 05, 2021	Oct. 04, 2022
LF cable 3M	Woken	CFD400NL-LW	CFD400NL-001	Oct. 05, 2021	Oct. 04, 2022
LF cable 11M	EMC	EMCCFD400-NW-N W-11000	200801	Oct. 05, 2021	Oct. 04, 2022
LF cable 1M	EMC	EMCCFD400-NM-N M-1000	160502	Oct. 05, 2021	Oct. 04, 2022
RF Cable	EMC	EMC104-35M-35M- 8000	210920	Oct. 05, 2021	Oct. 04, 2022
RF Cable	HUBER+SUHNER	SUCOFLEX104	MY16019/4	Oct. 05, 2021	Oct. 04, 2022
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)				
Tested Date	Jan. 18, 2022				
Instrument	Brand	Model No.	Serial No.	Calibration Date	Calibration Until
Spectrum Analyzer	R&S	FSV40	101498	Nov. 29, 2021	Nov. 28, 2022
Power Meter	Anritsu	ML2495A	1241002	Nov. 07, 2021	Nov. 06, 2022
Power Sensor	Anritsu	MA2411B	1207366	Nov. 07, 2021	Nov. 06, 2022
Measurement Software	Sporton	SENSE-15247_FS	V5.10.7.11	NA	NA
Note: Calibration Interval of instruments listed above is one year.					

1.5 Test Standards

47 CFR FCC Part 15.247
ANSI C63.10-2013

1.6 Reference Guidance

FCC KDB 558074 D01 15.247 Meas Guidance v05r02

1.7 Deviation from Test Standard and Measurement Procedure

None

1.8 Measurement Uncertainty

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 ≤ 1 GHz	± 3.41 dB
Radiated emission > 1 GHz	± 4.59 dB
Time	$\pm 0.1\%$

2 Test Configuration

2.1 Testing Facility

Test Laboratory	International Certification Corporation
Test Site	CO01-WS, 03CH01-WS, TH01-WS
Address of Test Site	No.3-1, Lane 6, Wen San 3rd St., Kwei Shan Dist., Tao Yuan City 33381, Taiwan (R.O.C.)

- FCC Designation No.: TW2732
- FCC site registration No.: 181692
- 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 Radiated Emissions ≤ 1GHz	8DPSK	2480	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	2402 2402 2402	1Mbps 2Mbps 3Mbps	---

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. Adapter 1 (Brand: MOSO) and Adapter 2 (Brand: Frecom) had been covered during the pretest. The worst adapter is **Adapter 2 (Brand: Frecom)**, and only its data was record in this test report.

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

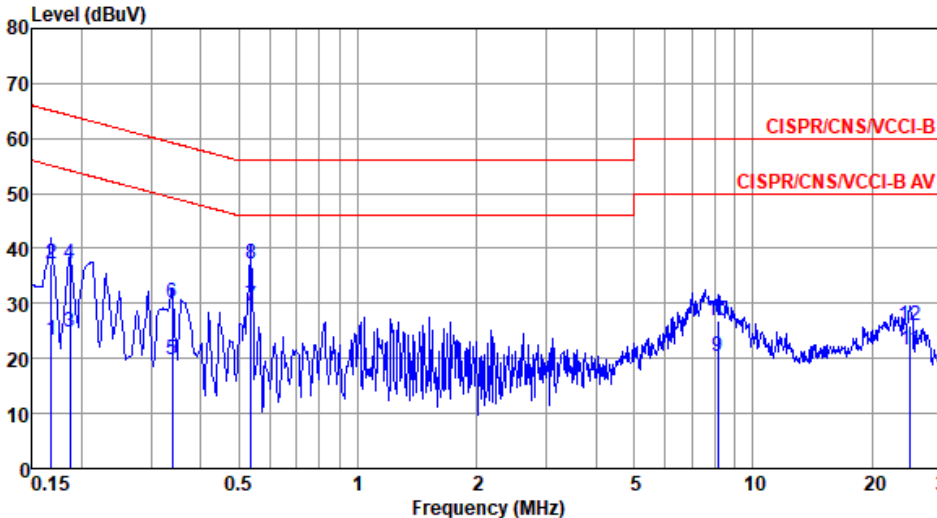
3.1.3 Test Setup



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

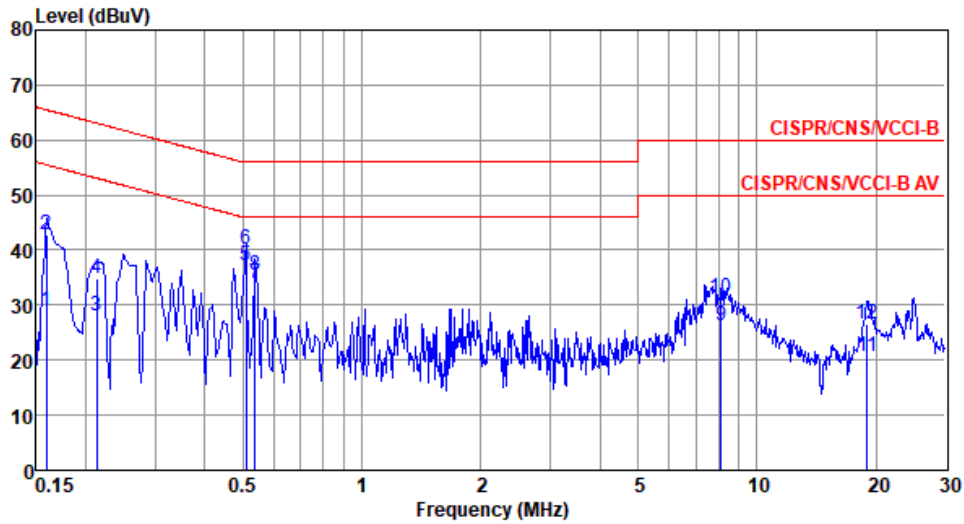
2. Both of LISNs (AMN) are 80 cm from EUT and at least 80 cm from other units and other metal planes

3.1.4 Test Result of Conducted Emissions

Modulation	8DPSK	Test Freq. (MHz)	2480																																																																																																																																		
Power Phase	Line																																																																																																																																				
<p>Test by : Joe Liao Temperature: 23°C Humidity: 63%</p>																																																																																																																																					
																																																																																																																																					
<table border="1"> <thead> <tr> <th></th> <th>Freq MHz</th> <th>Level dBuV</th> <th>Limit Line dBuV</th> <th>Over Limit dB</th> <th>Read Level dBuV</th> <th>Factor dB</th> <th>Cable loss dB</th> <th>Aux dB</th> <th>Remark</th> </tr> </thead> <tbody> <tr><td>1</td><td>0.168</td><td>23.41</td><td>55.08</td><td>-31.67</td><td>13.46</td><td>9.66</td><td>0.08</td><td>0.21</td><td>Average</td></tr> <tr><td>2</td><td>0.168</td><td>37.25</td><td>65.08</td><td>-27.83</td><td>27.30</td><td>9.66</td><td>0.08</td><td>0.21</td><td>QP</td></tr> <tr><td>3</td><td>0.186</td><td>24.79</td><td>54.20</td><td>-29.41</td><td>14.85</td><td>9.65</td><td>0.08</td><td>0.21</td><td>Average</td></tr> <tr><td>4</td><td>0.186</td><td>37.23</td><td>64.20</td><td>-26.97</td><td>27.29</td><td>9.65</td><td>0.08</td><td>0.21</td><td>QP</td></tr> <tr><td>5</td><td>0.339</td><td>19.80</td><td>49.22</td><td>-29.42</td><td>9.75</td><td>9.64</td><td>0.08</td><td>0.33</td><td>Average</td></tr> <tr><td>6</td><td>0.339</td><td>30.24</td><td>59.22</td><td>-28.98</td><td>20.19</td><td>9.64</td><td>0.08</td><td>0.33</td><td>QP</td></tr> <tr><td>7*</td><td>0.538</td><td>29.53</td><td>46.00</td><td>-16.47</td><td>19.42</td><td>9.64</td><td>0.11</td><td>0.36</td><td>Average</td></tr> <tr><td>8</td><td>0.538</td><td>37.24</td><td>56.00</td><td>-18.76</td><td>27.13</td><td>9.64</td><td>0.11</td><td>0.36</td><td>QP</td></tr> <tr><td>9</td><td>8.148</td><td>20.46</td><td>50.00</td><td>-29.54</td><td>9.93</td><td>9.70</td><td>0.39</td><td>0.44</td><td>Average</td></tr> <tr><td>10</td><td>8.148</td><td>26.95</td><td>60.00</td><td>-33.05</td><td>16.42</td><td>9.70</td><td>0.39</td><td>0.44</td><td>QP</td></tr> <tr><td>11</td><td>25.055</td><td>21.44</td><td>50.00</td><td>-28.56</td><td>10.41</td><td>9.66</td><td>0.69</td><td>0.68</td><td>Average</td></tr> <tr><td>12</td><td>25.055</td><td>26.02</td><td>60.00</td><td>-33.98</td><td>14.99</td><td>9.66</td><td>0.69</td><td>0.68</td><td>QP</td></tr> </tbody> </table>					Freq MHz	Level dBuV	Limit Line dBuV	Over Limit dB	Read Level dBuV	Factor dB	Cable loss dB	Aux dB	Remark	1	0.168	23.41	55.08	-31.67	13.46	9.66	0.08	0.21	Average	2	0.168	37.25	65.08	-27.83	27.30	9.66	0.08	0.21	QP	3	0.186	24.79	54.20	-29.41	14.85	9.65	0.08	0.21	Average	4	0.186	37.23	64.20	-26.97	27.29	9.65	0.08	0.21	QP	5	0.339	19.80	49.22	-29.42	9.75	9.64	0.08	0.33	Average	6	0.339	30.24	59.22	-28.98	20.19	9.64	0.08	0.33	QP	7*	0.538	29.53	46.00	-16.47	19.42	9.64	0.11	0.36	Average	8	0.538	37.24	56.00	-18.76	27.13	9.64	0.11	0.36	QP	9	8.148	20.46	50.00	-29.54	9.93	9.70	0.39	0.44	Average	10	8.148	26.95	60.00	-33.05	16.42	9.70	0.39	0.44	QP	11	25.055	21.44	50.00	-28.56	10.41	9.66	0.69	0.68	Average	12	25.055	26.02	60.00	-33.98	14.99	9.66	0.69	0.68	QP
	Freq MHz	Level dBuV	Limit Line dBuV	Over Limit dB	Read Level dBuV	Factor dB	Cable loss dB	Aux dB	Remark																																																																																																																												
1	0.168	23.41	55.08	-31.67	13.46	9.66	0.08	0.21	Average																																																																																																																												
2	0.168	37.25	65.08	-27.83	27.30	9.66	0.08	0.21	QP																																																																																																																												
3	0.186	24.79	54.20	-29.41	14.85	9.65	0.08	0.21	Average																																																																																																																												
4	0.186	37.23	64.20	-26.97	27.29	9.65	0.08	0.21	QP																																																																																																																												
5	0.339	19.80	49.22	-29.42	9.75	9.64	0.08	0.33	Average																																																																																																																												
6	0.339	30.24	59.22	-28.98	20.19	9.64	0.08	0.33	QP																																																																																																																												
7*	0.538	29.53	46.00	-16.47	19.42	9.64	0.11	0.36	Average																																																																																																																												
8	0.538	37.24	56.00	-18.76	27.13	9.64	0.11	0.36	QP																																																																																																																												
9	8.148	20.46	50.00	-29.54	9.93	9.70	0.39	0.44	Average																																																																																																																												
10	8.148	26.95	60.00	-33.05	16.42	9.70	0.39	0.44	QP																																																																																																																												
11	25.055	21.44	50.00	-28.56	10.41	9.66	0.69	0.68	Average																																																																																																																												
12	25.055	26.02	60.00	-33.98	14.99	9.66	0.69	0.68	QP																																																																																																																												
<p>Note 1: Level (dBuV) = Read Level (dBuV) + LISN Factor (dB) + Cable Loss (dB) + Aux (dB). 2: Over Limit (dB) = Level (dBuV) – Limit Line (dBuV).</p>																																																																																																																																					

Modulation	8DPSK	Test Freq. (MHz)	2480
Power Phase	Neutral		

Test by : Joe Liao Temperature: 23°C Humidity: 63%



	Freq MHz	Level dBuV	Limit Line dBuV	Over Limit dB	Read Level dBuV	Factor dB	Cable loss dB	Aux dB	Remark
1	0.159	28.92	55.52	-26.60	18.99	9.69	0.08	0.16	Average
2	0.159	42.74	65.52	-22.78	32.81	9.69	0.08	0.16	QP
3	0.213	28.18	53.10	-24.92	18.24	9.68	0.08	0.18	Average
4	0.213	34.90	63.10	-28.20	24.96	9.68	0.08	0.18	QP
5*	0.510	37.05	46.00	-8.95	27.07	9.67	0.10	0.21	Average
6	0.510	40.12	56.00	-15.88	30.14	9.67	0.10	0.21	QP
7	0.538	33.94	46.00	-12.06	23.94	9.67	0.11	0.22	Average
8	0.538	35.57	56.00	-20.43	25.57	9.67	0.11	0.22	QP
9	8.105	26.33	50.00	-23.67	15.83	9.75	0.39	0.36	Average
10	8.105	31.40	60.00	-28.60	20.90	9.75	0.39	0.36	QP
11	19.021	20.68	50.00	-29.32	9.76	9.83	0.64	0.45	Average
12	19.021	26.44	60.00	-33.56	15.52	9.83	0.64	0.45	QP

Note 1: Level (dBuV) = Read Level (dBuV) + LISN Factor (dB) + Cable Loss (dB) + Aux (dB).
 Note 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

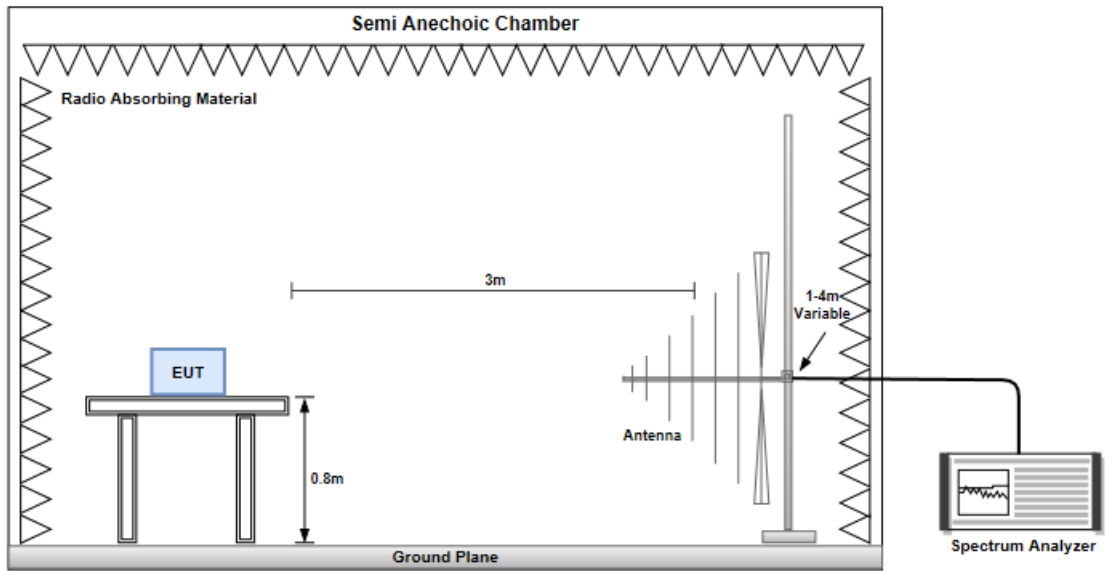
The average value is: Average = Peak value + 20log(Duty cycle) Where the duty factor is calculated from following formula for DH5 packet type which has worst duty factor:

3.
$$20\log(\text{Duty cycle}) = 20\log \frac{1\text{s} / 1600 * 5}{100\text{ ms}} = -30.1\text{dB}$$

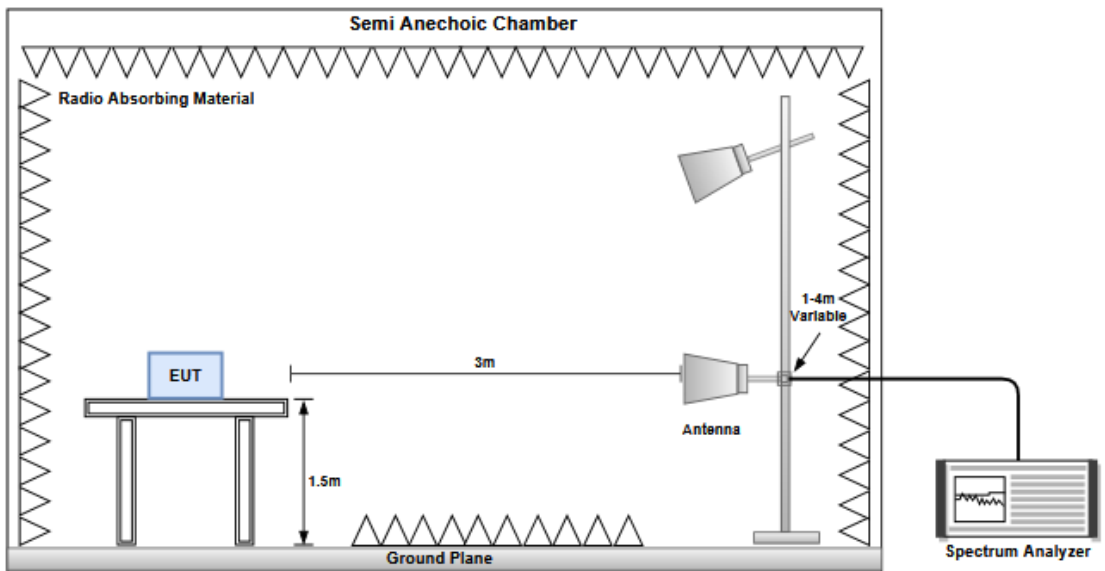
4. Radiated emission above 1GHz / Average value for other emissions
RBW=1MHz, VBW=1/T and Peak detector

3.2.3 Test Setup

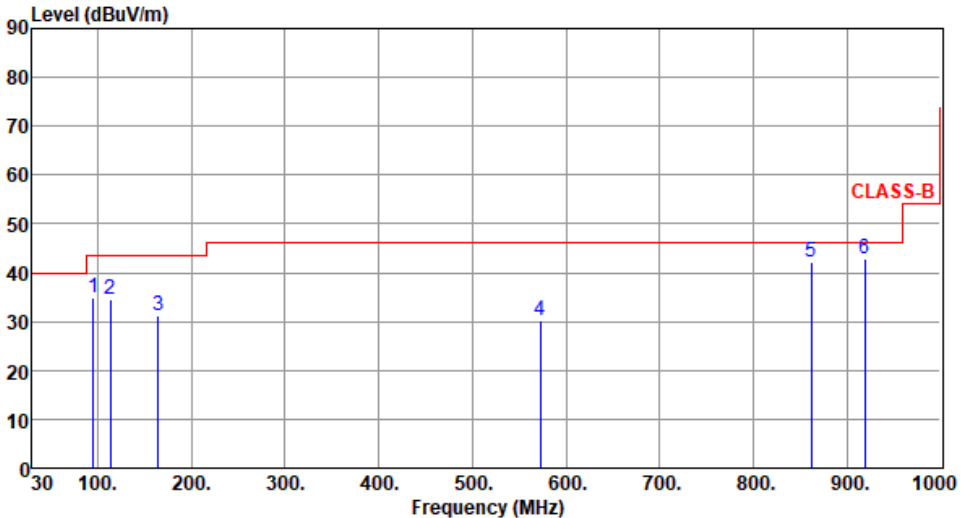
Radiated Emissions below 1 GHz



Radiated Emissions above 1 GHz

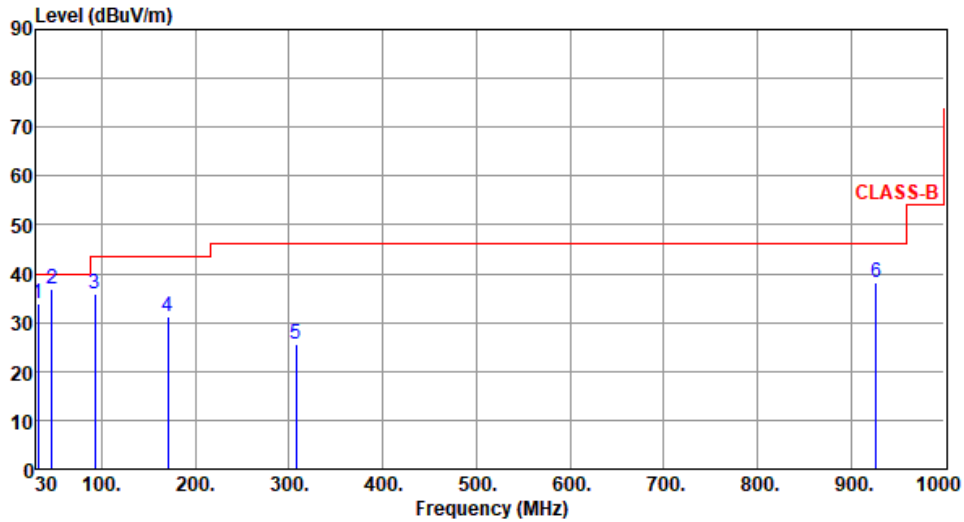


3.2.4 Transmitter Radiated Unwanted Emissions (Below 1GHz)

Modulation	8DPSK	Test Freq. (MHz)	2480						
Polarization	Horizontal								
Test By : Roger Lu Temperature(°C):23 Humidity(%):68									
 <p>The graph plots Level (dBuV/m) on the y-axis (0 to 90) against Frequency (MHz) on the x-axis (30 to 1000). A red line represents the CLASS-B limit, which is constant at 40 dBuV/m until 200 MHz, then steps up to 46 dBuV/m until 900 MHz, and finally to 55 dBuV/m at 1000 MHz. Six blue vertical lines indicate emission peaks at 94.99 MHz (1), 113.42 MHz (2), 164.83 MHz (3), 572.23 MHz (4), 862.26 MHz (5), and 919.49 MHz (6).</p>									
	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB/m	Remark	ANT High cm	Turn Table deg
1	94.99	34.88	43.50	-8.62	49.16	-14.28	Peak	---	---
2	113.42	34.47	43.50	-9.03	45.81	-11.34	Peak	---	---
3	164.83	31.22	43.50	-12.28	40.07	-8.85	Peak	---	---
4	572.23	30.13	46.00	-15.87	31.98	-1.85	Peak	---	---
5	862.26	42.28	46.00	-3.72	39.40	2.88	Peak	---	---
6	919.49	42.89	46.00	-3.11	38.93	3.96	Peak	---	---
<p>Note 1: Emission Level (dBuV/m) = SA Reading (dBuV) + Factor* (dB/m) *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.</p>									

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

Test By :Roger Lu Temperature(°C):23 Humidity(%):68



	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB/m	Remark	ANT High cm	Turn Table deg
1	32.41	34.01	40.00	-5.99	43.71	-9.70	QP	100	211
2	47.21	36.92	40.00	-3.08	45.35	-8.43	QP	100	2
3	93.05	36.01	43.50	-7.49	50.49	-14.48	Peak	---	---
4	170.65	31.11	43.50	-12.39	40.24	-9.13	Peak	---	---
5	307.42	25.54	46.00	-20.46	33.44	-7.90	Peak	---	---
6	927.25	38.34	46.00	-7.66	34.30	4.04	Peak	---	---

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

*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.

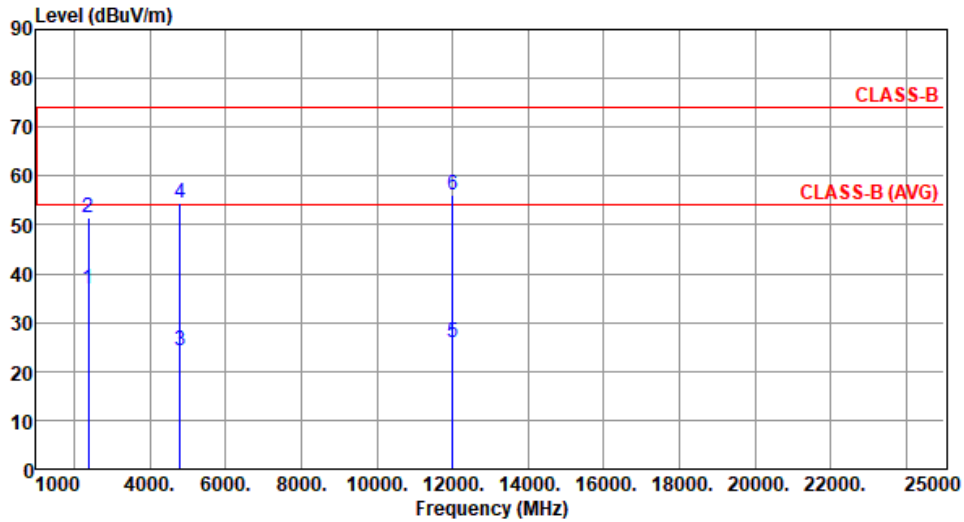
3.2.5 Transmitter Radiated Unwanted Emissions (Above 1GHz) for GFSK

Modulation	GFSK	Test Freq. (MHz)	2402						
Polarization	Horizontal								
Test By : Roger Lu Temperature(°C):22 Humidity(%):65									
	Freq.	Emission level	Limit	Margin	SA reading	Factor	Remark	ANT High	Turn Table
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB/m		cm	deg
1	2390.00	37.51	54.00	-16.49	40.26	-2.75	Average	100	356
2	2390.00	52.70	74.00	-21.30	55.45	-2.75	Peak	100	356
3	4804.00	30.78	54.00	-23.22	26.65	4.13	Average	100	346
4	4804.00	60.88	74.00	-13.12	56.75	4.13	Peak	100	346
5	12010.00	25.98	54.00	-28.02	12.36	13.62	Average	100	60
6	12010.00	56.08	74.00	-17.92	42.46	13.62	Peak	100	60

Note 1: Emission Level (dBuV/m) = SA Reading (dBuV) + Factor* (dB/m)
*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 By :Roger Lu Temperature(°C):22 Humidity(%):65



	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB/m	Remark	ANT High cm	Turn Table deg
1	2390.00	36.93	54.00	-17.07	39.68	-2.75	Average	100	206
2	2390.00	51.51	74.00	-22.49	54.26	-2.75	Peak	100	206
3	4804.00	24.28	54.00	-29.72	20.15	4.13	Average	345	285
4	4804.00	54.38	74.00	-19.62	50.25	4.13	Peak	345	285
5	12010.00	25.87	54.00	-28.13	12.25	13.62	Average	100	30
6	12010.00	55.97	74.00	-18.03	42.35	13.62	Peak	100	30

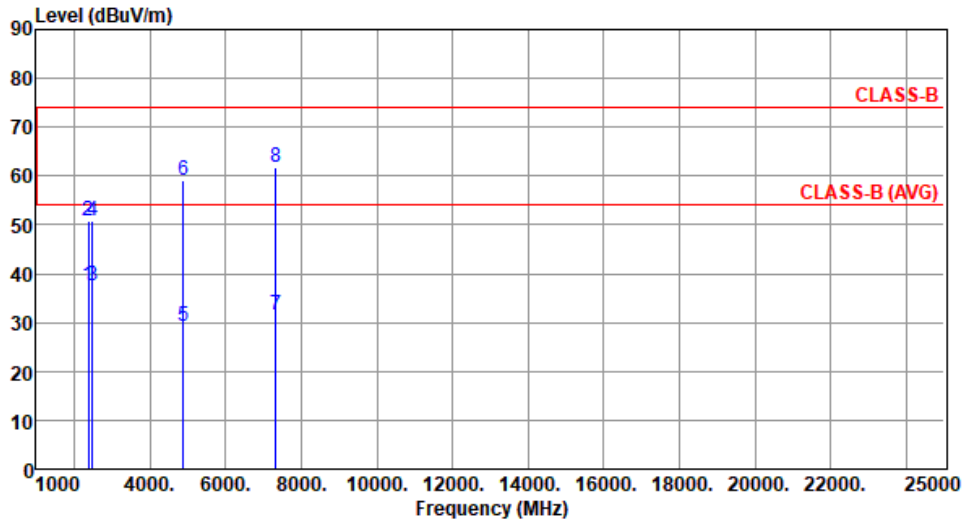
Note 1: Emission Level (dBuV/m) = SA Reading (dBuV) + Factor* (dB/m)

*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 By :Roger Lu Temperature(°C):22 Humidity(%):65



	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB/m	Remark	ANT High cm	Turn Table deg
1	2390.00	37.50	54.00	-16.50	40.25	-2.75	Average	100	359
2	2390.00	50.84	74.00	-23.16	53.59	-2.75	Peak	100	359
3	2483.50	37.68	54.00	-16.32	40.38	-2.70	Average	100	359
4	2483.50	50.94	74.00	-23.06	53.64	-2.70	Peak	100	359
5	4882.00	29.17	54.00	-24.83	25.05	4.12	Average	100	348
6	4882.00	59.27	74.00	-14.73	55.15	4.12	Peak	100	348
7	7323.00	31.71	54.00	-22.29	22.44	9.27	Average	100	300
8	7323.00	61.81	74.00	-12.19	52.54	9.27	Peak	100	300

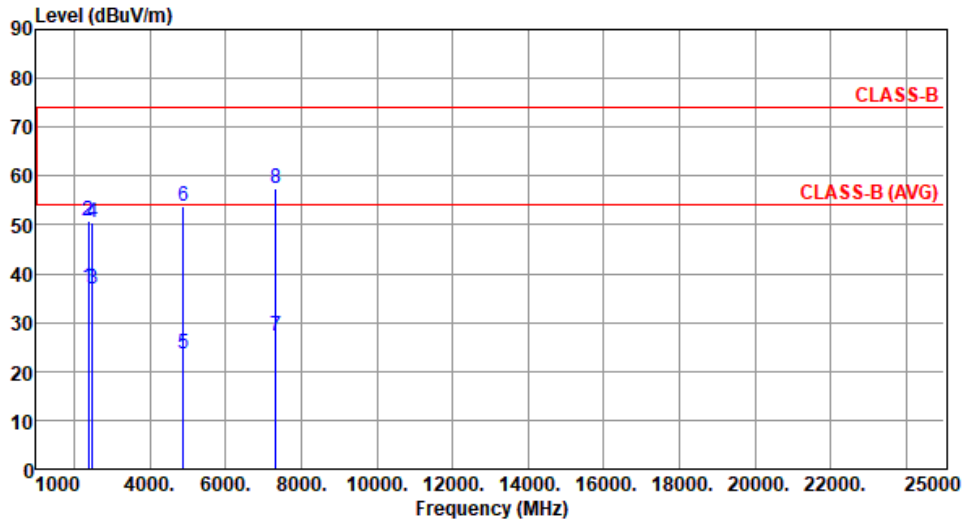
Note 1: Emission Level (dBuV/m) = SA Reading (dBuV) + Factor* (dB/m)

*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 By :Roger Lu Temperature(°C):22 Humidity(%):65



	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB/m	Remark	ANT High cm	Turn Table deg
1	2390.00	37.14	54.00	-16.86	39.89	-2.75	Average	100	206
2	2390.00	50.69	74.00	-23.31	53.44	-2.75	Peak	100	206
3	2483.50	36.97	54.00	-17.03	39.67	-2.70	Average	100	206
4	2483.50	50.45	74.00	-23.55	53.15	-2.70	Peak	100	206
5	4882.00	23.58	54.00	-30.42	19.46	4.12	Average	340	288
6	4882.00	53.68	74.00	-20.32	49.56	4.12	Peak	340	288
7	7323.00	27.33	54.00	-26.67	18.06	9.27	Average	100	136
8	7323.00	57.43	74.00	-16.57	48.16	9.27	Peak	100	136

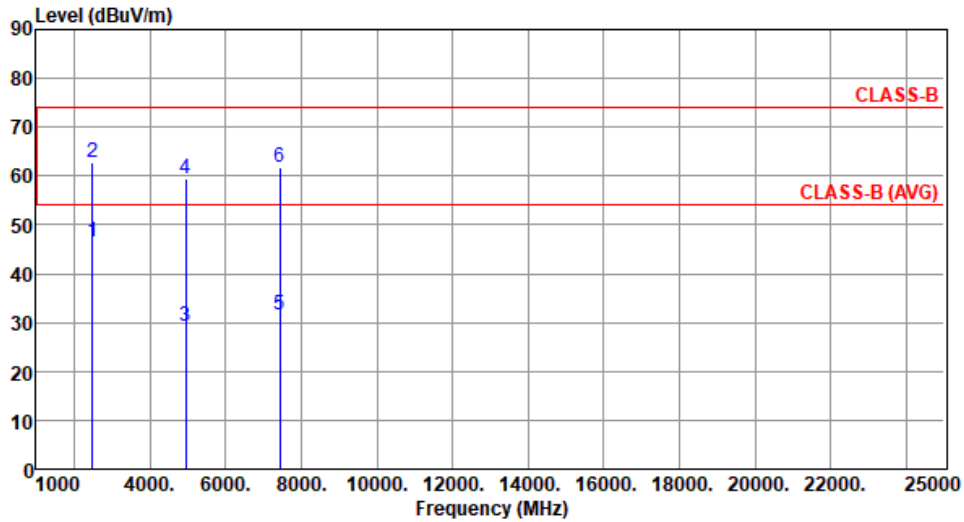
Note 1: Emission Level (dBuV/m) = SA Reading (dBuV) + Factor* (dB/m)

*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 By :Roger Lu Temperature(°C):22 Humidity(%):65



	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB/m	Remark	ANT High cm	Turn Table deg
1	2483.50	46.59	54.00	-7.41	49.29	-2.70	Average	100	1
2	2483.50	62.67	74.00	-11.33	65.37	-2.70	Peak	100	1
3	4960.00	29.19	54.00	-24.81	25.16	4.03	Average	100	345
4	4960.00	59.29	74.00	-14.71	55.26	4.03	Peak	100	345
5	7440.00	31.54	54.00	-22.46	22.17	9.37	Average	100	299
6	7440.00	61.64	74.00	-12.36	52.27	9.37	Peak	100	299

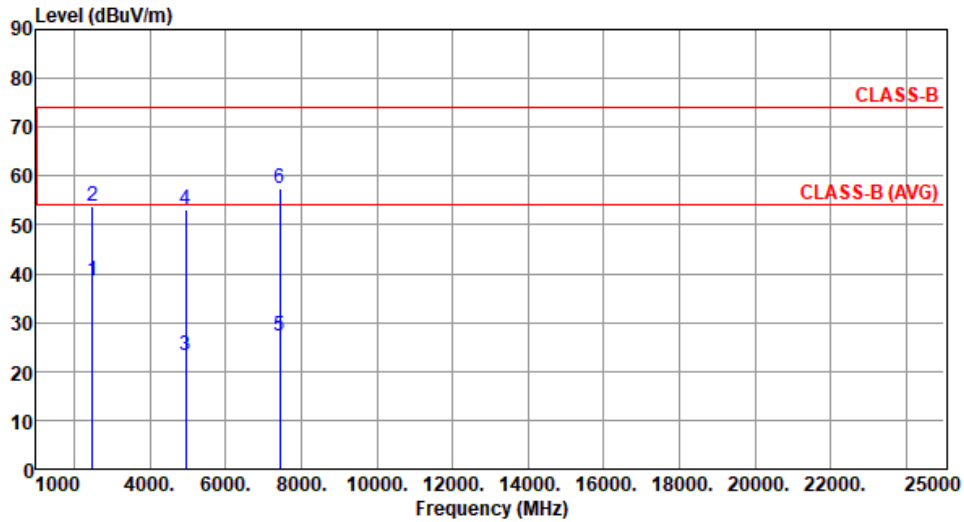
Note 1: Emission Level (dBuV/m) = SA Reading (dBuV) + Factor* (dB/m)

*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 By :Roger Lu Temperature(°C):22 Humidity(%):65



	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB/m	Remark	ANT High cm	Turn Table deg
1	2483.50	38.61	54.00	-15.39	41.31	-2.70	Average	100	202
2	2483.50	53.68	74.00	-20.32	56.38	-2.70	Peak	100	202
3	4960.00	23.11	54.00	-30.89	19.08	4.03	Average	345	292
4	4960.00	53.21	74.00	-20.79	49.18	4.03	Peak	345	292
5	7440.00	27.31	54.00	-26.69	17.94	9.37	Average	100	135
6	7440.00	57.41	74.00	-16.59	48.04	9.37	Peak	100	135

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

*Factor includes antenna factor , cable loss and amplifier gain

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

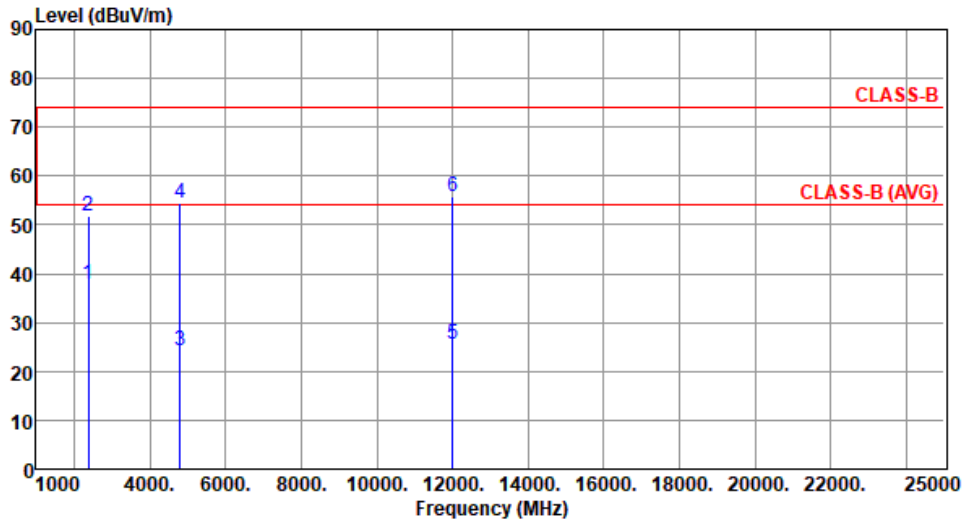
3.2.6 Transmitter Radiated Unwanted Emissions (Above 1GHz) for 8DPSK

Modulation	8DPSK	Test Freq. (MHz)	2402						
Polarization	Horizontal								
Test By : Roger Lu Temperature(°C):22 Humidity(%):65									
	Freq.	Emission level	Limit	Margin	SA reading	Factor	Remark	ANT High	Turn Table
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB/m		cm	deg
1	2390.00	38.70	54.00	-15.30	41.45	-2.75	Average	100	349
2	2390.00	57.88	74.00	-16.12	60.63	-2.75	Peak	100	349
3	4804.00	30.71	54.00	-23.29	26.58	4.13	Average	100	345
4	4804.00	60.81	74.00	-13.19	56.68	4.13	Peak	100	345
5	12010.00	25.84	54.00	-28.16	12.22	13.62	Average	100	50
6	12010.00	55.94	74.00	-18.06	42.32	13.62	Peak	100	50

Note 1: Emission Level (dBuV/m) = SA Reading (dBuV) + Factor* (dB/m)
*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 By :Roger Lu Temperature(°C):22 Humidity(%):65



	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB/m	Remark	ANT High cm	Turn Table deg
1	2390.00	37.81	54.00	-16.19	40.56	-2.75	Average	100	201
2	2390.00	51.84	74.00	-22.16	54.59	-2.75	Peak	100	201
3	4804.00	24.25	54.00	-29.75	20.12	4.13	Average	345	292
4	4804.00	54.35	74.00	-19.65	50.22	4.13	Peak	345	292
5	12010.00	25.65	54.00	-28.35	12.03	13.62	Average	100	40
6	12010.00	55.75	74.00	-18.25	42.13	13.62	Peak	100	40

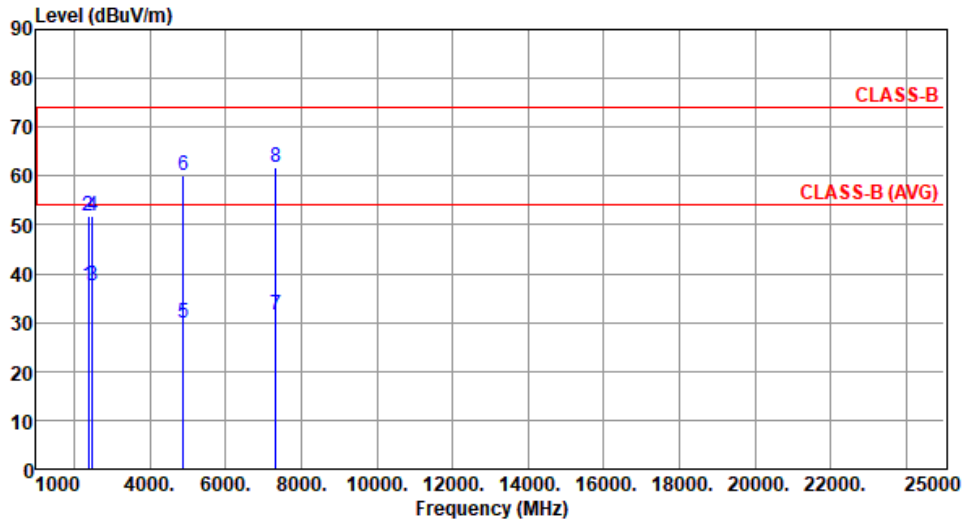
Note 1: Emission Level (dBuV/m) = SA Reading (dBuV) + Factor* (dB/m)

*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 By :Roger Lu Temperature(°C):22 Humidity(%):65



	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB/m	Remark	ANT High cm	Turn Table deg
1	2390.00	37.51	54.00	-16.49	40.26	-2.75	Average	100	351
2	2390.00	51.84	74.00	-22.16	54.59	-2.75	Peak	100	351
3	2483.50	37.48	54.00	-16.52	40.18	-2.70	Average	100	351
4	2483.50	51.92	74.00	-22.08	54.62	-2.70	Peak	100	351
5	4882.00	29.97	54.00	-24.03	25.85	4.12	Average	100	346
6	4882.00	60.07	74.00	-13.93	55.95	4.12	Peak	100	346
7	7323.00	31.55	54.00	-22.45	22.28	9.27	Average	100	305
8	7323.00	61.65	74.00	-12.35	52.38	9.27	Peak	100	305

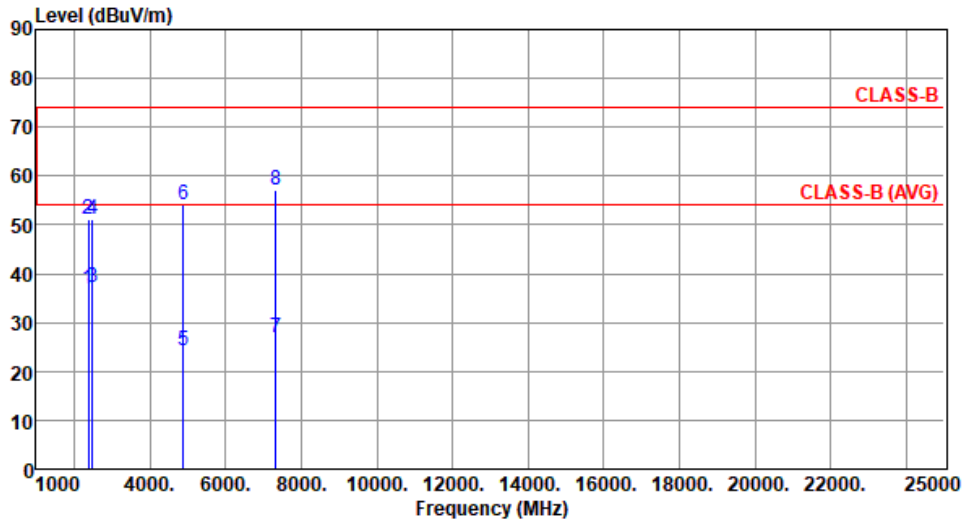
Note 1: Emission Level (dBuV/m) = SA Reading (dBuV) + Factor* (dB/m)

*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 By :Roger Lu Temperature(°C):22 Humidity(%):65



	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB/m	Remark	ANT High cm	Turn Table deg
1	2390.00	36.90	54.00	-17.10	39.65	-2.75	Average	100	205
2	2390.00	51.23	74.00	-22.77	53.98	-2.75	Peak	100	205
3	2483.50	37.19	54.00	-16.81	39.89	-2.70	Average	100	205
4	2483.50	51.14	74.00	-22.86	53.84	-2.70	Peak	100	205
5	4882.00	24.14	54.00	-29.86	20.02	4.12	Average	340	287
6	4882.00	54.24	74.00	-19.76	50.12	4.12	Peak	340	287
7	7323.00	26.86	54.00	-27.14	17.59	9.27	Average	100	130
8	7323.00	56.96	74.00	-17.04	47.69	9.27	Peak	100	130

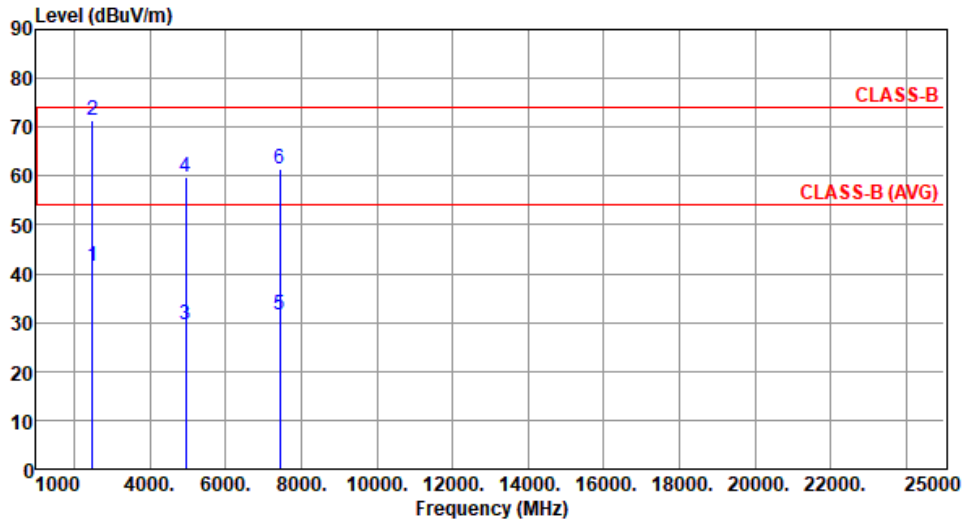
Note 1: Emission Level (dBuV/m) = SA Reading (dBuV) + Factor* (dB/m)

*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 By :Roger Lu Temperature(°C):22 Humidity(%):65



	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB/m	Remark	ANT High cm	Turn Table deg
1	2483.50	41.35	54.00	-12.65	44.05	-2.70	Average	100	1
2	2483.50	71.45	74.00	-2.55	74.15	-2.70	Peak	100	1
3	4960.00	29.68	54.00	-24.32	25.65	4.03	Average	100	343
4	4960.00	59.78	74.00	-14.22	55.75	4.03	Peak	100	343
5	7440.00	31.40	54.00	-22.60	22.03	9.37	Average	100	306
6	7440.00	61.50	74.00	-12.50	52.13	9.37	Peak	100	306

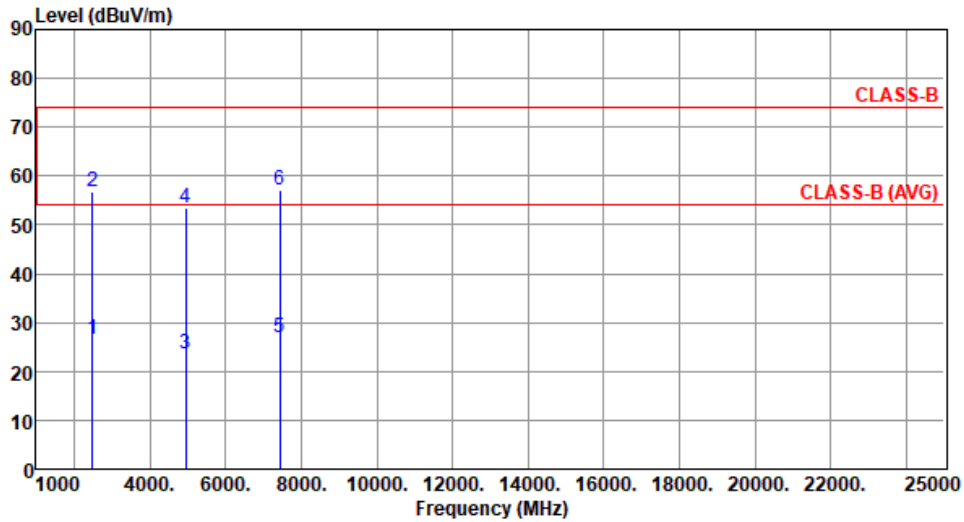
Note 1: Emission Level (dBuV/m) = SA Reading (dBuV) + Factor* (dB/m)

*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 By :Roger Lu Temperature(°C):22 Humidity(%):65



	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB/m	Remark	ANT High cm	Turn Table deg
1	2483.50	26.54	54.00	-27.46	29.24	-2.70	Average	100	206
2	2483.50	56.64	74.00	-17.36	59.34	-2.70	Peak	100	206
3	4960.00	23.52	54.00	-30.48	19.49	4.03	Average	344	292
4	4960.00	53.62	74.00	-20.38	49.59	4.03	Peak	344	292
5	7440.00	26.97	54.00	-27.03	17.60	9.37	Average	100	132
6	7440.00	57.07	74.00	-16.93	47.70	9.37	Peak	100	132

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

*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

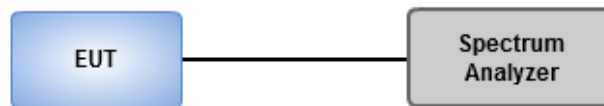
Reference level measurement

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

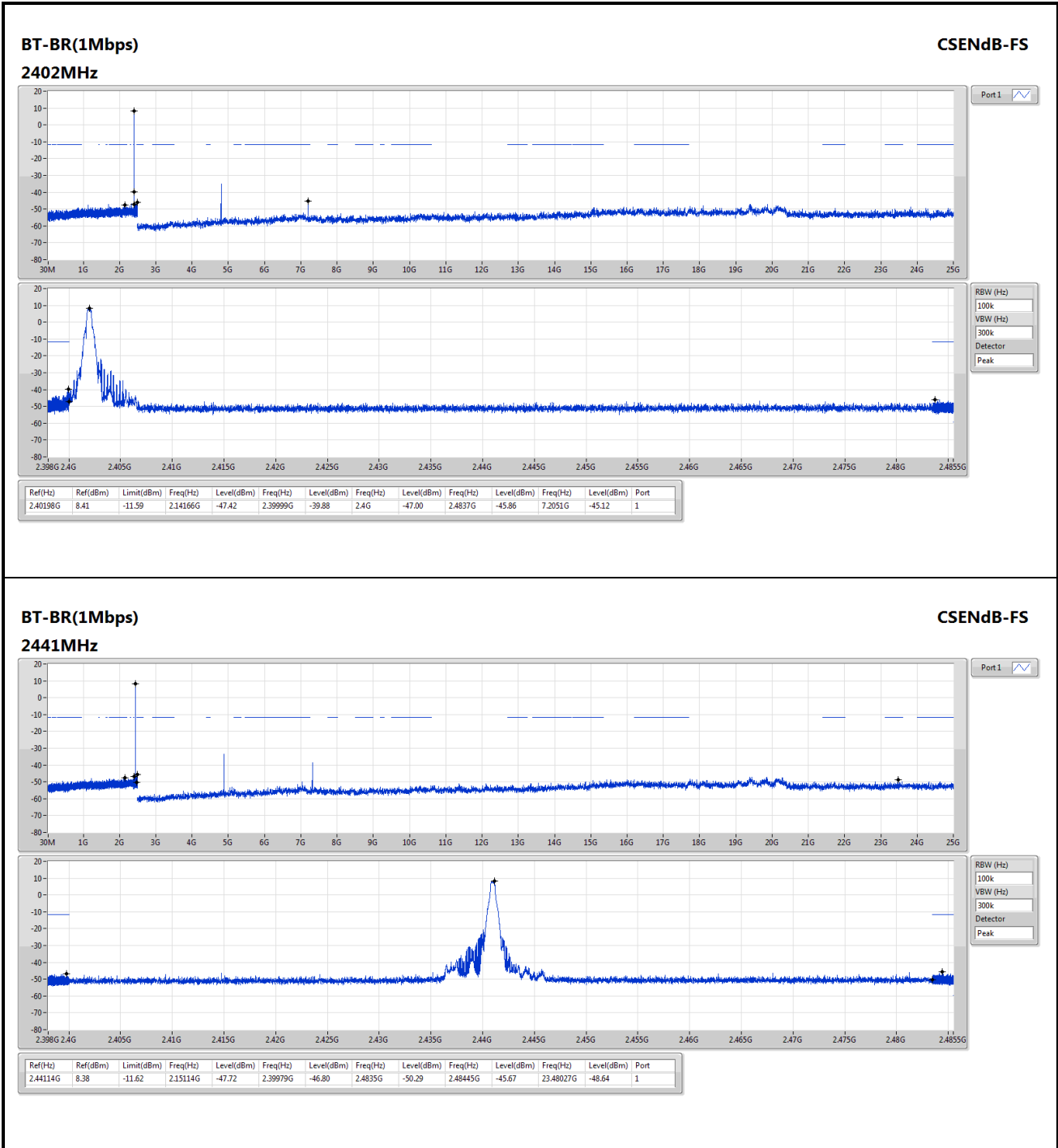
1. Set RBW=100kHz, VBW = 300kHz , Detector = Peak, Sweep time = Auto
2. Trace = max hold , Allow Trace to fully stabilize
3. Scan Frequency range is up to 25GHz
4. Use the peak marker function to determine the maximum amplitude level

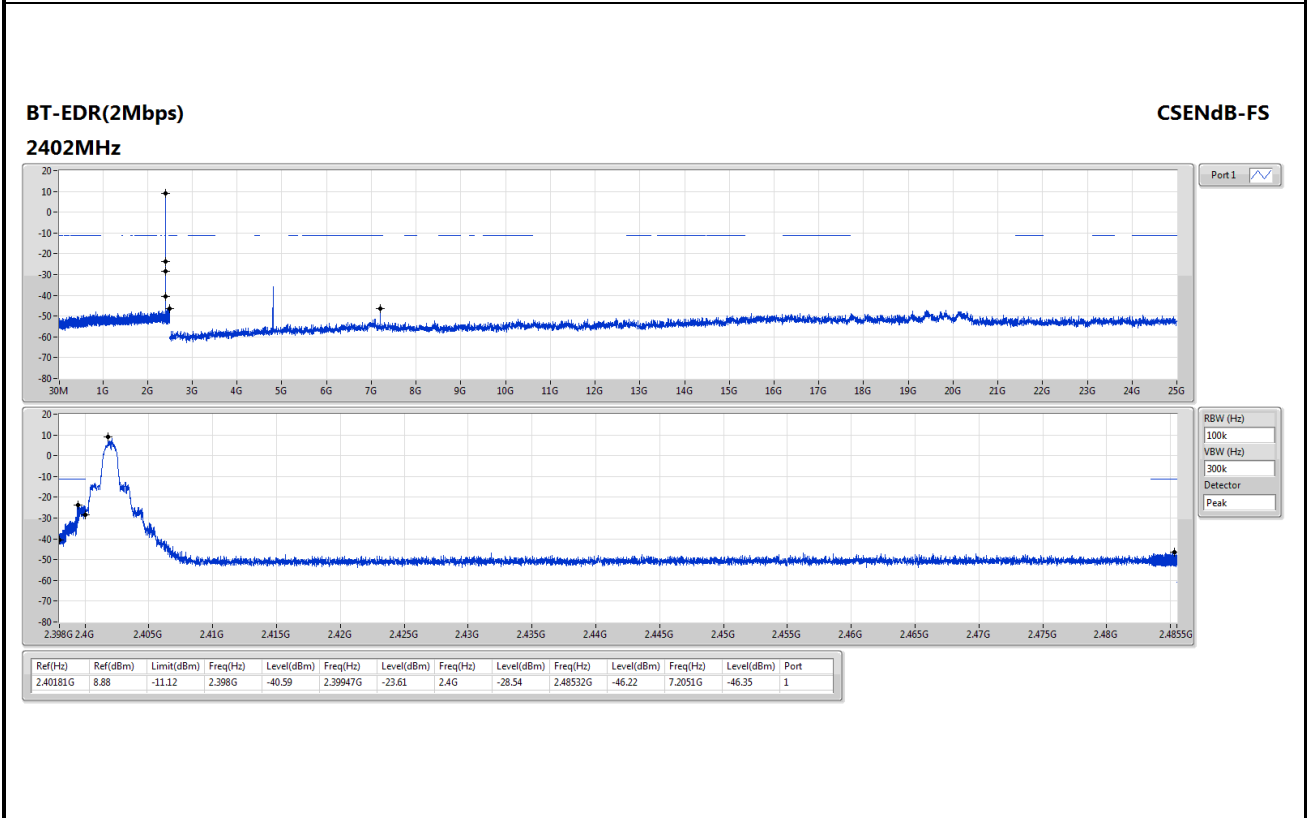
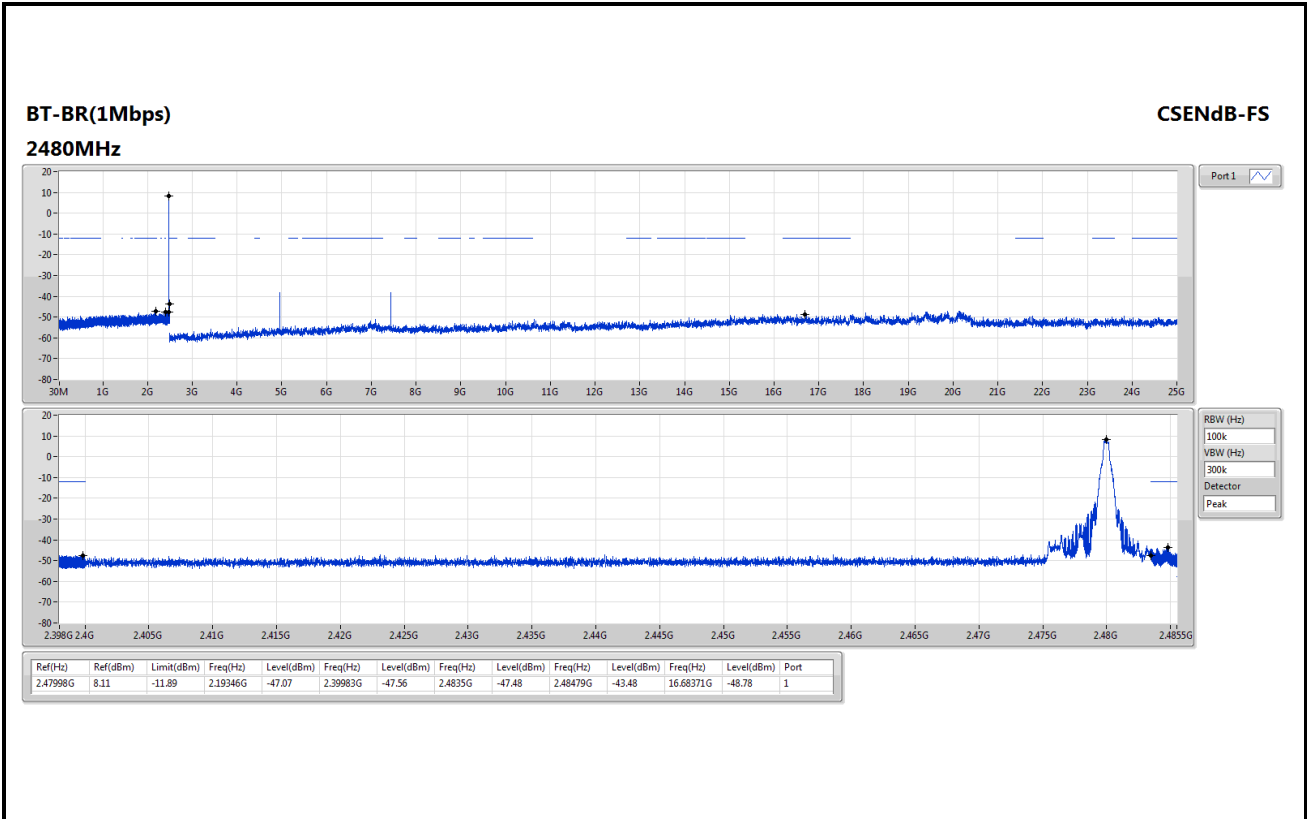
3.3.3 Test Setup

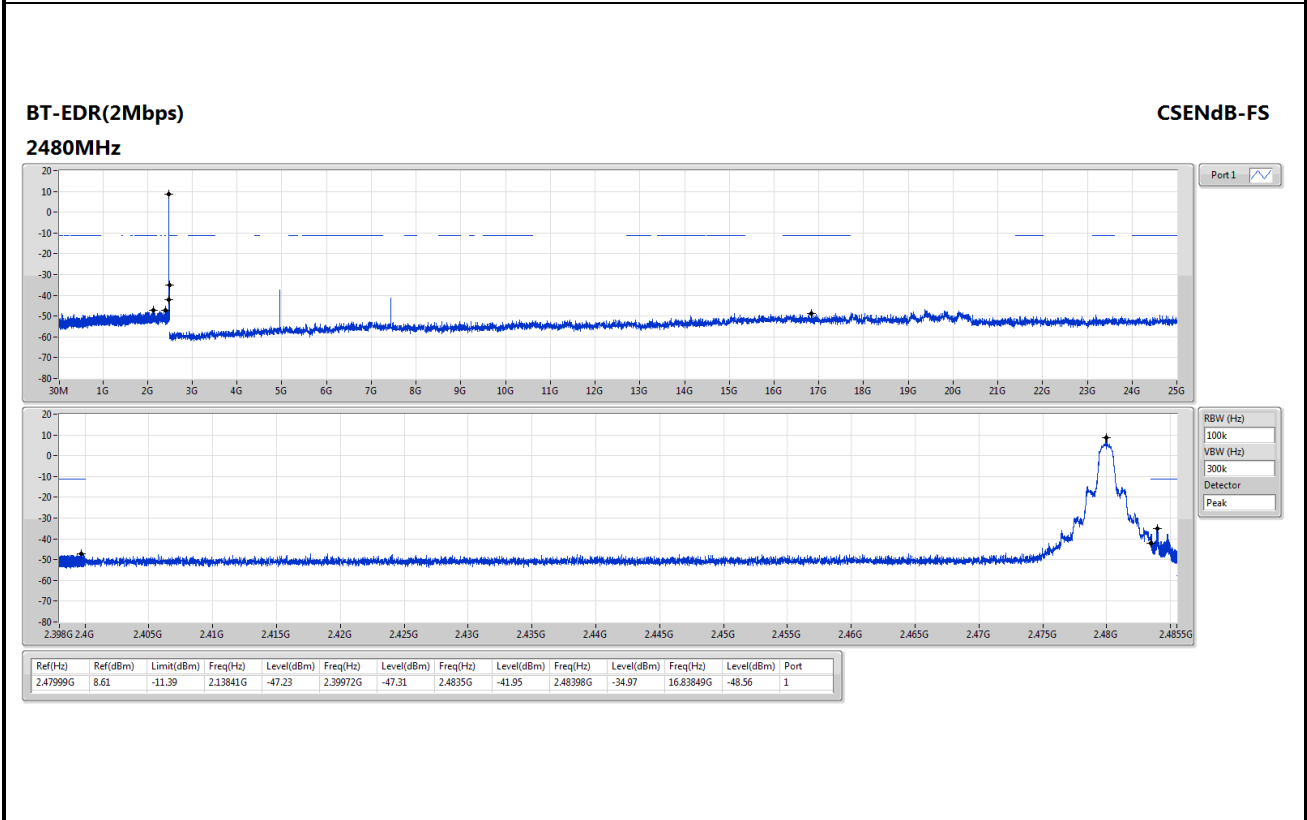
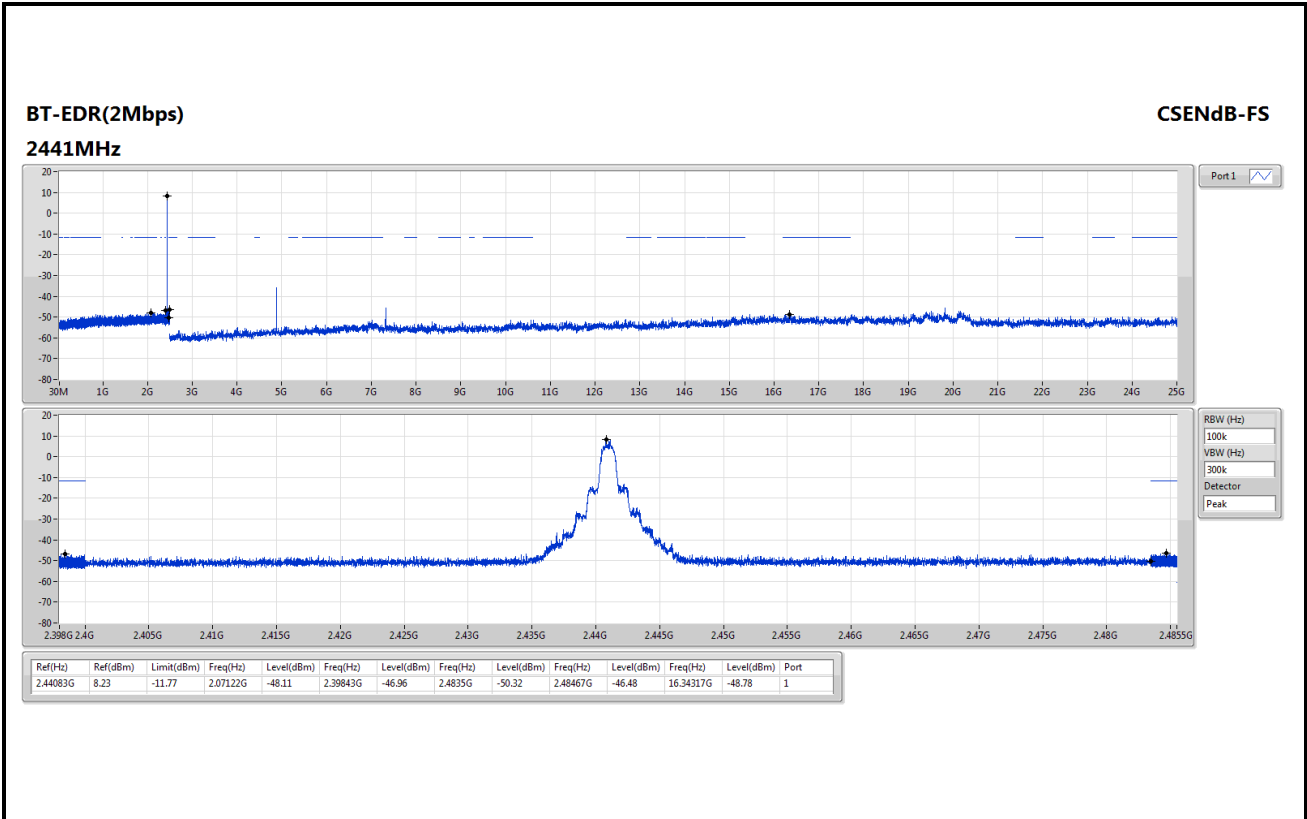


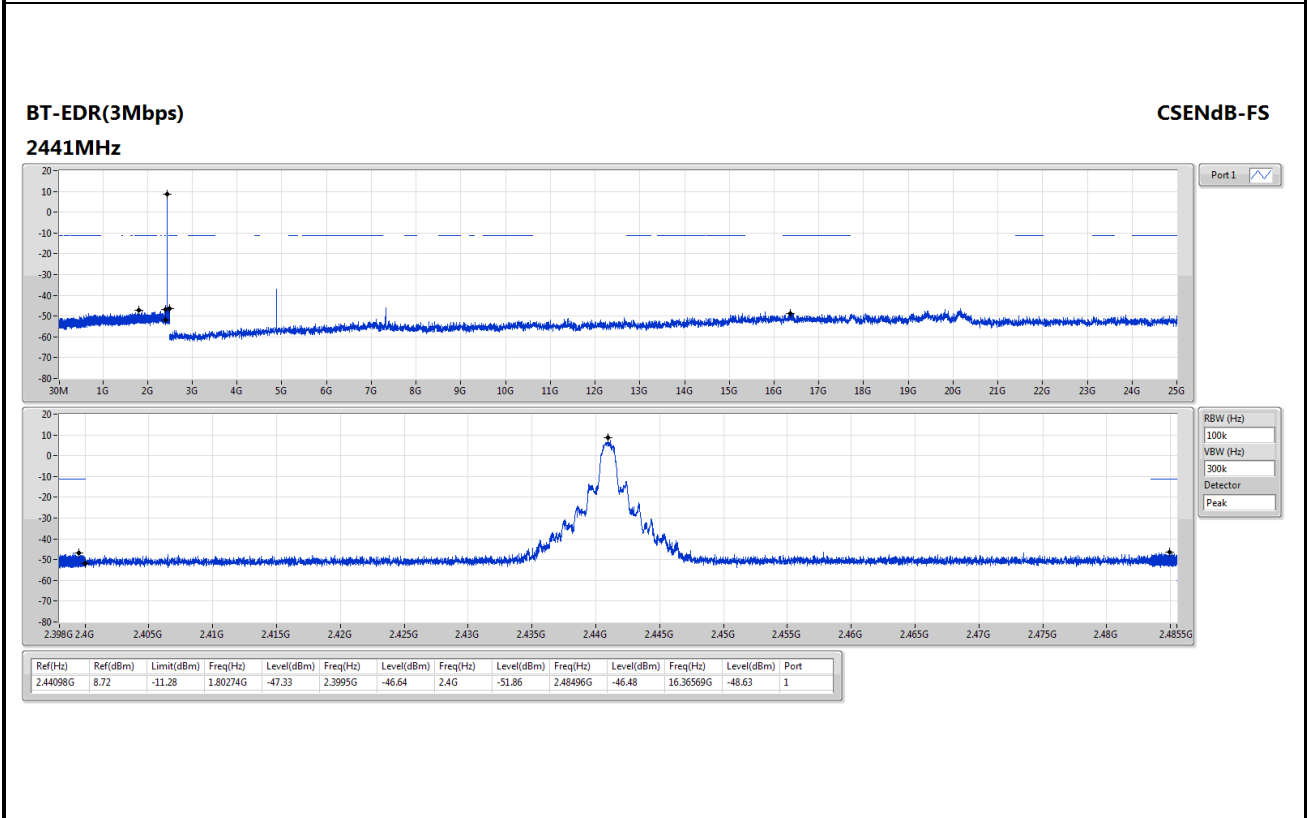
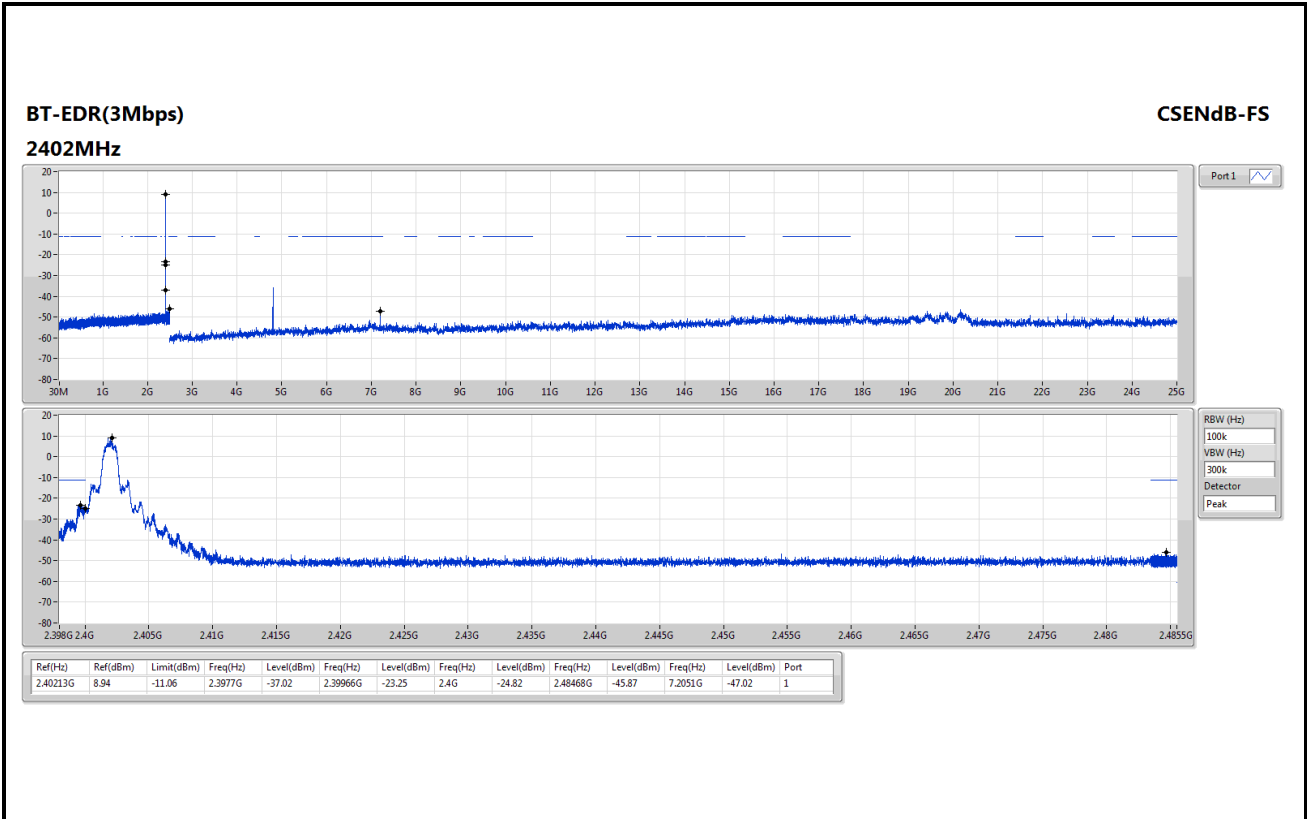
3.3.4 Unwanted Emissions into Non-Restricted Frequency Bands

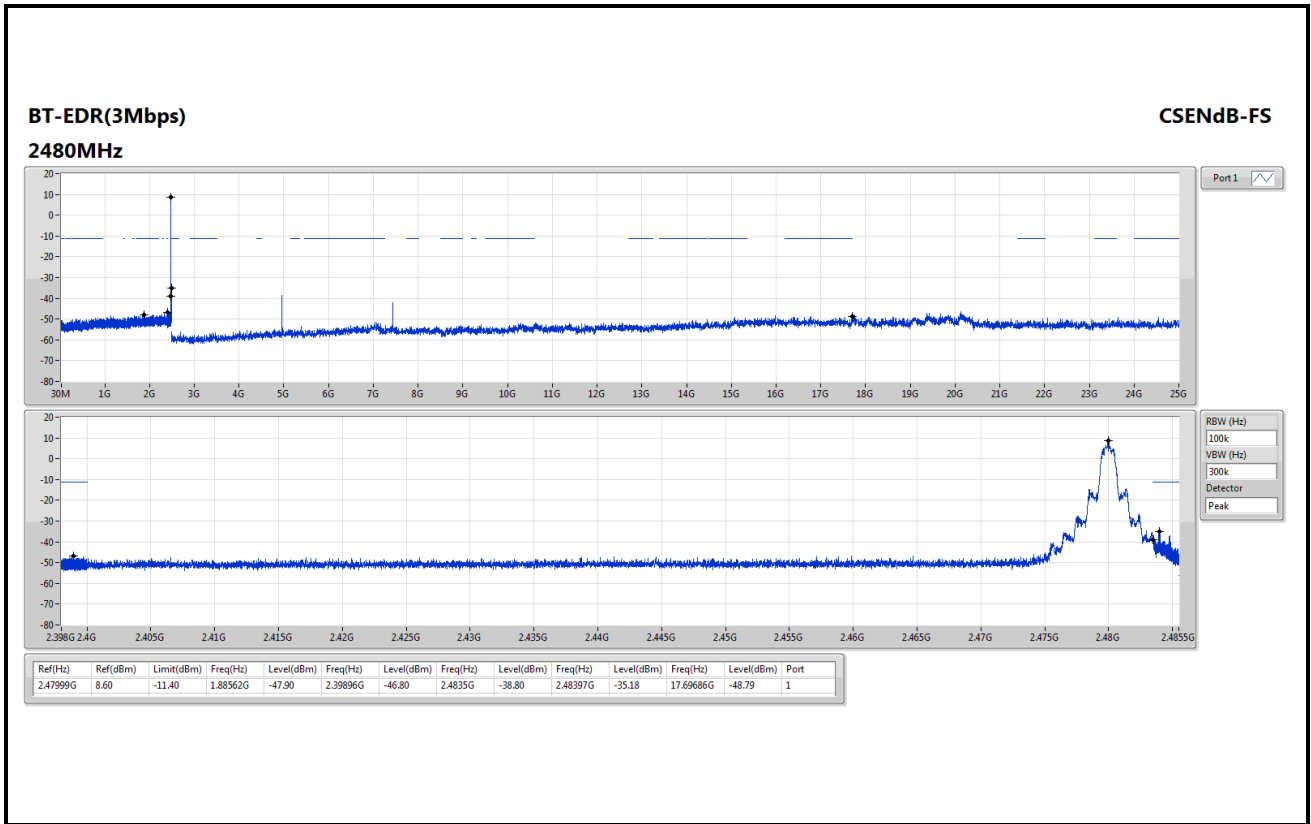
Ambient Condition	20°C / 67%	Tested By	Aska Huang
-------------------	------------	-----------	------------







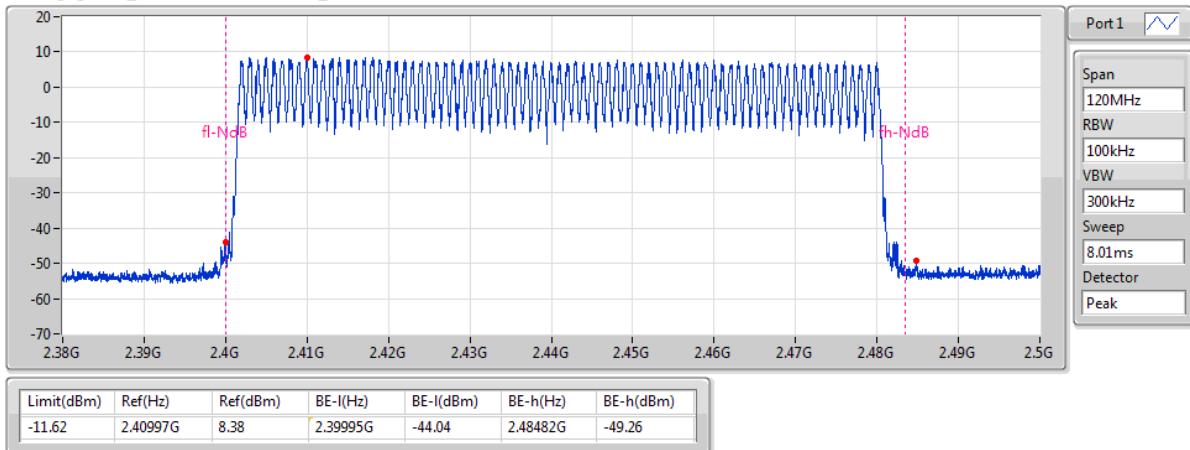




BT-BR(1Mbps)

2402MHz

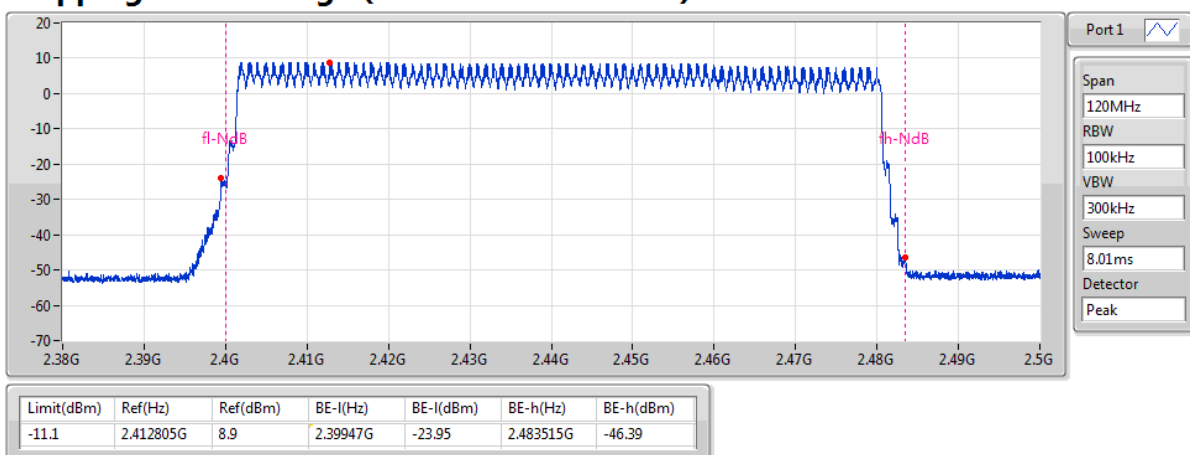
Hopping Ch Bandedge (Non-restricted Band)



BT-EDR(2Mbps)

2402MHz

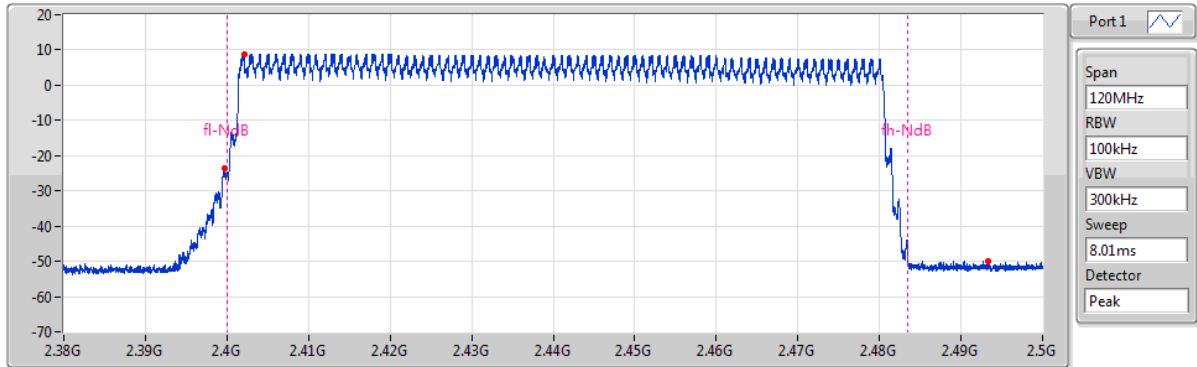
Hopping Ch Bandedge (Non-restricted Band)



BT-EDR(3Mbps)

2402MHz

Hopping Ch Bandedge (Non-restricted Band)



Limit(dBm)	Ref(Hz)	Ref(dBm)	BE-l(Hz)	BE-l(dBm)	BE-h(Hz)	BE-h(dBm)
-11.1	2.402125G	8.9	2.399695G	-23.6	2.493385G	-49.88

3.4 Conducted Output Power

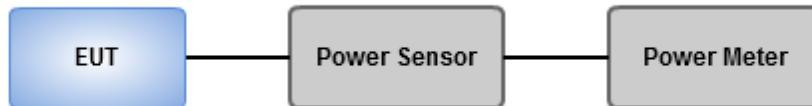
3.4.1 Limit of Conducted Output Power

- 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

Ambient Condition	20°C / 67%	Tested By	Aska Huang
--------------------------	------------	------------------	------------

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)	9.45	0.00881
BT-EDR(3Mbps)	9.55	0.00902

Result

Mode	Result	Antenna Gain (dBi)	Power (dBm)	Power Limit (dBm)
BT-BR(1Mbps)	-	-	-	-
2402MHz	Pass	4.75	8.62	21.00
2441MHz	Pass	4.75	8.55	21.00
2480MHz	Pass	4.75	8.31	21.00
BT-EDR(2Mbps)	-	-	-	-
2402MHz	Pass	4.75	9.32	21.00
2441MHz	Pass	4.75	9.21	21.00
2480MHz	Pass	4.75	9.45	21.00
BT-EDR(3Mbps)	-	-	-	-
2402MHz	Pass	4.75	9.37	21.00
2441MHz	Pass	4.75	9.28	21.00
2480MHz	Pass	4.75	9.55	21.00

Summary of Conducted (Average) Output Power

Mode	Power (dBm)	Power (W)
2.4-2.4835GHz	-	-
BT-BR(1Mbps)	8.50	0.00708
BT-EDR(2Mbps)	8.49	0.00706
BT-EDR(3Mbps)	8.50	0.00708

Result

Mode	Result	Antenna Gain (dBi)	Power (dBm)	Power Limit (dBm)
BT-BR(1Mbps)	-	-	-	-
2402MHz	Pass	4.75	8.50	-
2441MHz	Pass	4.75	8.44	-
2480MHz	Pass	4.75	8.17	-
BT-EDR(2Mbps)	-	-	-	-
2402MHz	Pass	4.75	8.49	-
2441MHz	Pass	4.75	8.26	-
2480MHz	Pass	4.75	8.15	-
BT-EDR(3Mbps)	-	-	-	-
2402MHz	Pass	4.75	8.50	-
2441MHz	Pass	4.75	8.26	-
2480MHz	Pass	4.75	8.16	-

Note: Average power is for reference only.

3.5 Number of Hopping Frequency

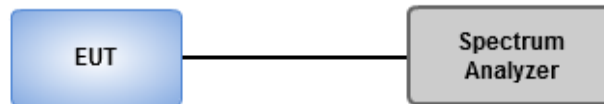
3.5.1 Limit of Number of Hopping Frequency

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

Ambient Condition	20°C / 67%	Tested By	Aska Huang
--------------------------	------------	------------------	------------

Summary

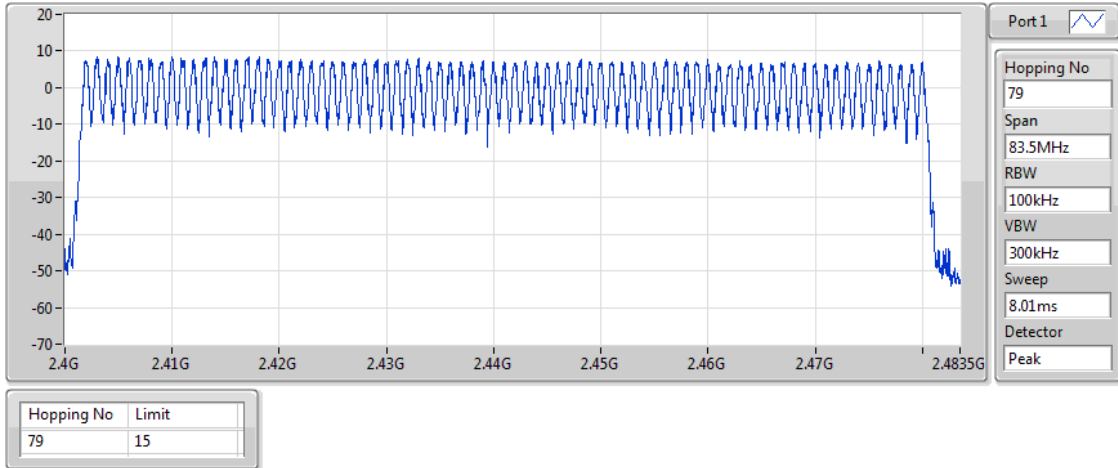
Mode	Max-Hop No
2.4-2.4835GHz	-
BT-BR(1Mbps)	79
BT-EDR(2Mbps)	79
BT-EDR(3Mbps)	79

Result

Mode	Result	Hopping No	Limit
BT-BR(1Mbps)	-	-	-
2402MHz	Pass	79	15
BT-EDR(2Mbps)	-	-	-
2402MHz	Pass	79	15
BT-EDR(3Mbps)	-	-	-
2402MHz	Pass	79	15

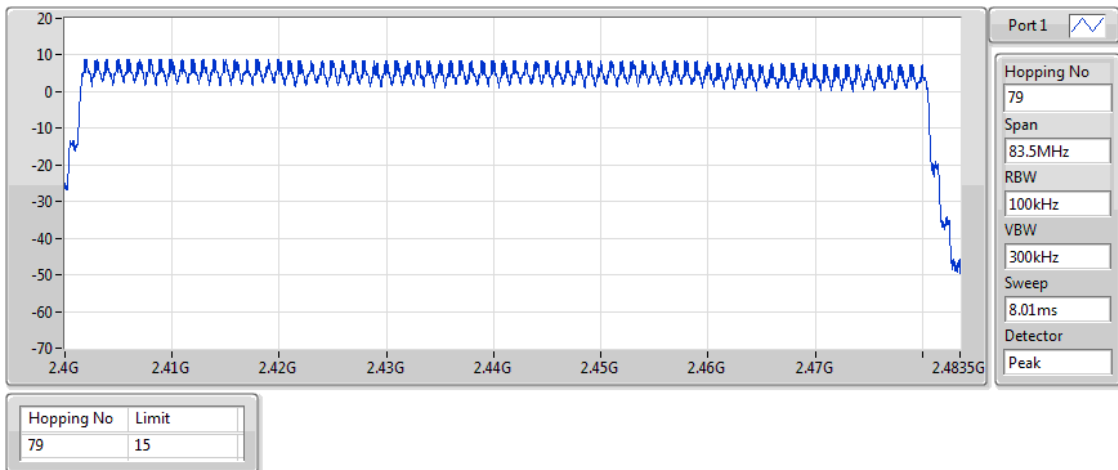
BT-BR(1Mbps)
2402MHz

Hopping-FS



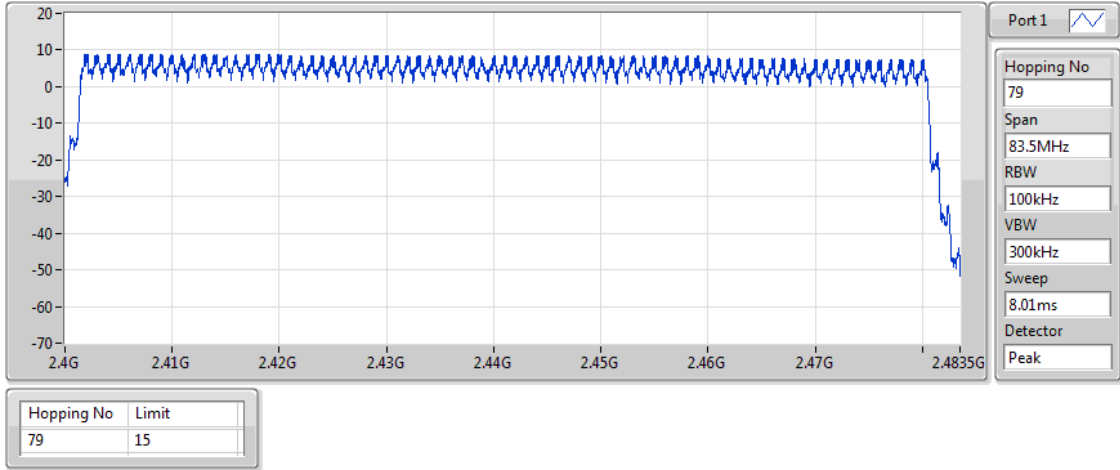
BT-EDR(2Mbps)
2402MHz

Hopping-FS



BT-EDR(3Mbps)
2402MHz

Hopping-FS



3.6 20dB and Occupied Bandwidth

3.6.1 Test Procedures

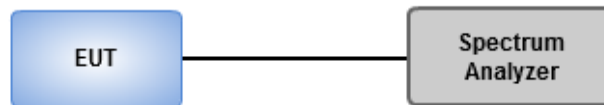
20dB Bandwidth

1. Set RBW=20kHz, VBW=100kHz, 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=20kHz, VBW=100kHz, 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

Ambient Condition	20°C / 67%	Tested By	Aska Huang
--------------------------	------------	------------------	------------

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)	934.783k	875.543k	876KF1D	855.072k	875.543k
BT-EDR(2Mbps)	1.341M	1.331M	1M33G1D	1.239M	1.252M
BT-EDR(3Mbps)	1.322M	1.306M	1M31G1D	1.246M	1.259M

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

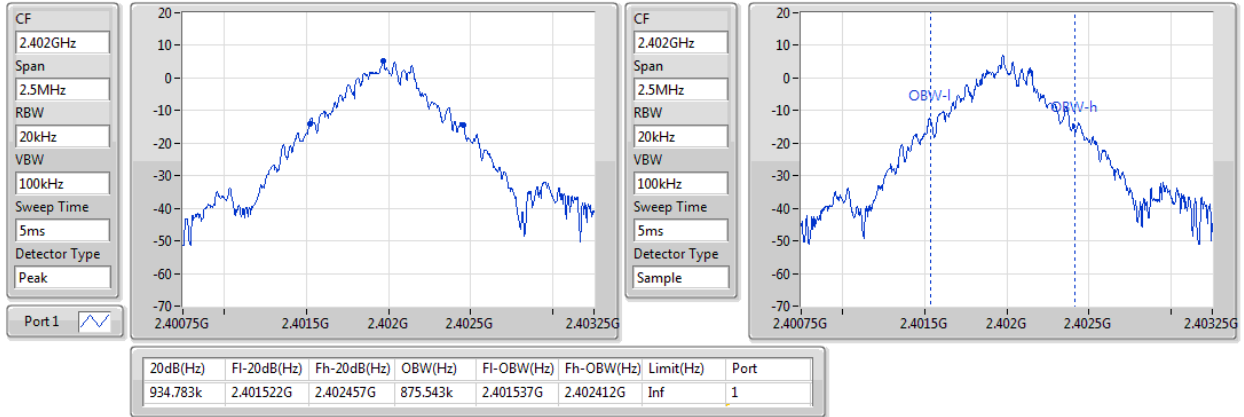
Mode	Result	Limit (Hz)	Port 1-N dB (Hz)	Port 1-OBW (Hz)
BT-BR(1Mbps)	-	-	-	-
2402MHz	Pass	Inf	934.783k	875.543k
2441MHz	Pass	Inf	855.072k	875.543k
2480MHz	Pass	Inf	855.072k	875.543k
BT-EDR(2Mbps)	-	-	-	-
2402MHz	Pass	Inf	1.326M	1.331M
2441MHz	Pass	Inf	1.341M	1.321M
2480MHz	Pass	Inf	1.239M	1.252M
BT-EDR(3Mbps)	-	-	-	-
2402MHz	Pass	Inf	1.322M	1.306M
2441MHz	Pass	Inf	1.257M	1.299M
2480MHz	Pass	Inf	1.246M	1.259M

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

BT-BR(1Mbps)

EBW-FS

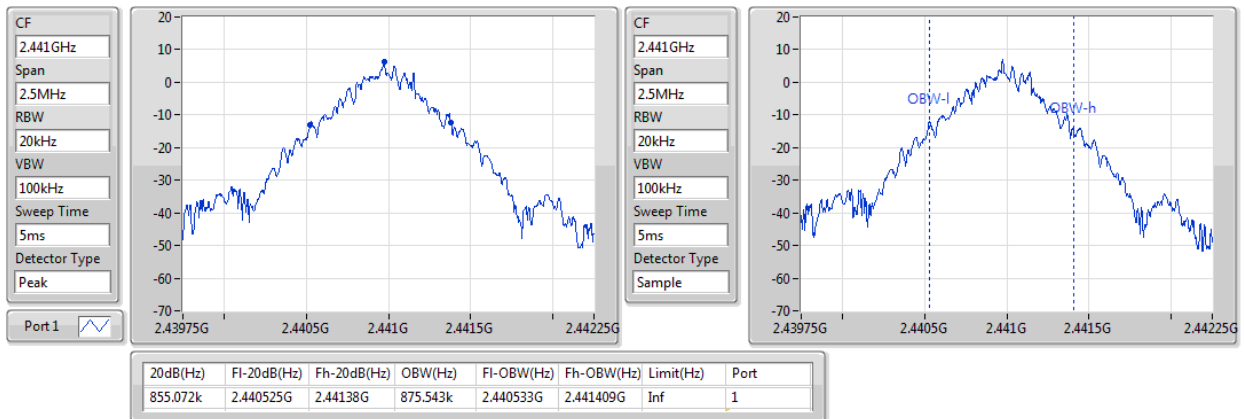
2402MHz



BT-BR(1Mbps)

EBW-FS

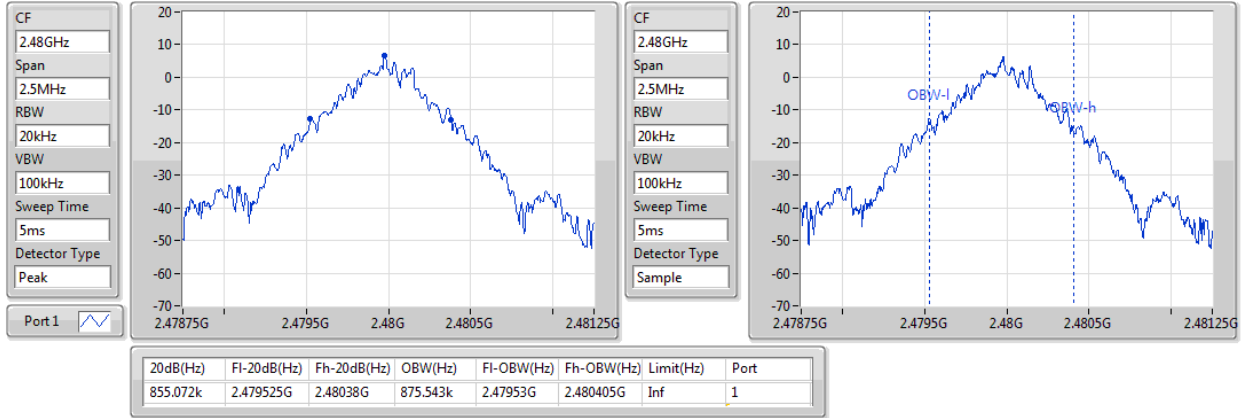
2441MHz



BT-BR(1Mbps)

EBW-FS

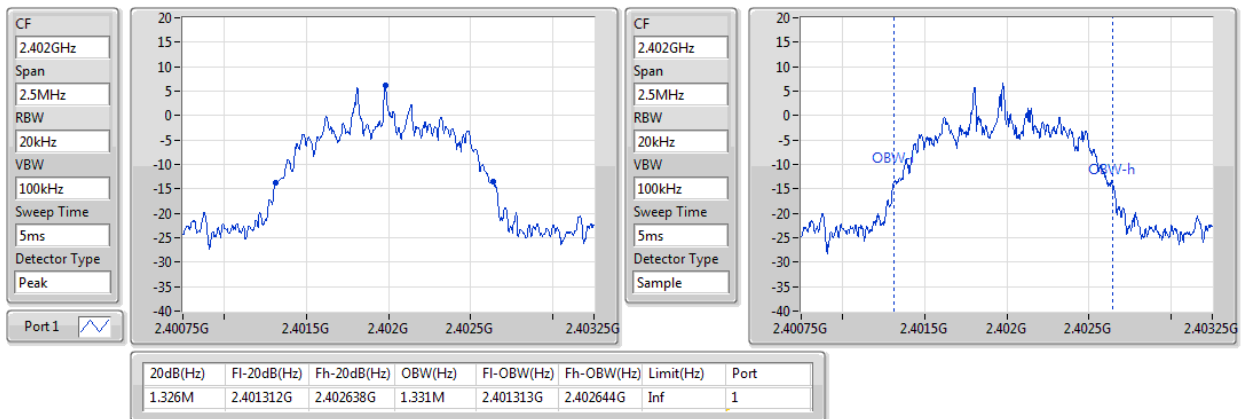
2480MHz



BT-EDR(2Mbps)

EBW-FS

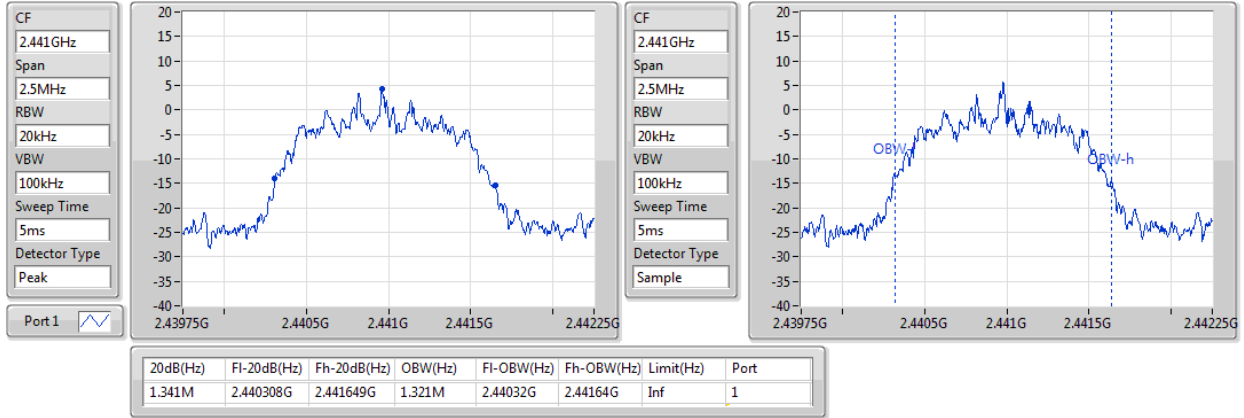
2402MHz



BT-EDR(2Mbps)

EBW-FS

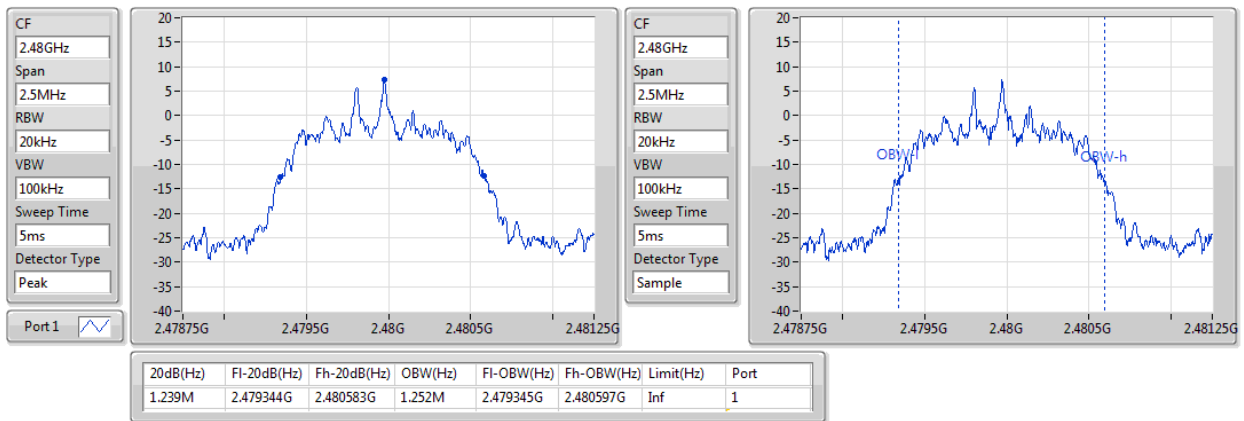
2441MHz



BT-EDR(2Mbps)

EBW-FS

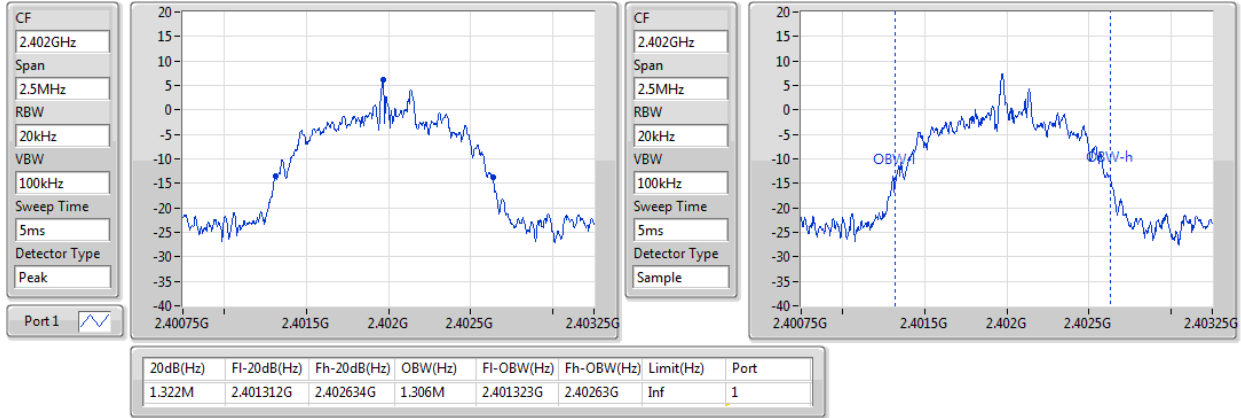
2480MHz



BT-EDR(3Mbps)

EBW-FS

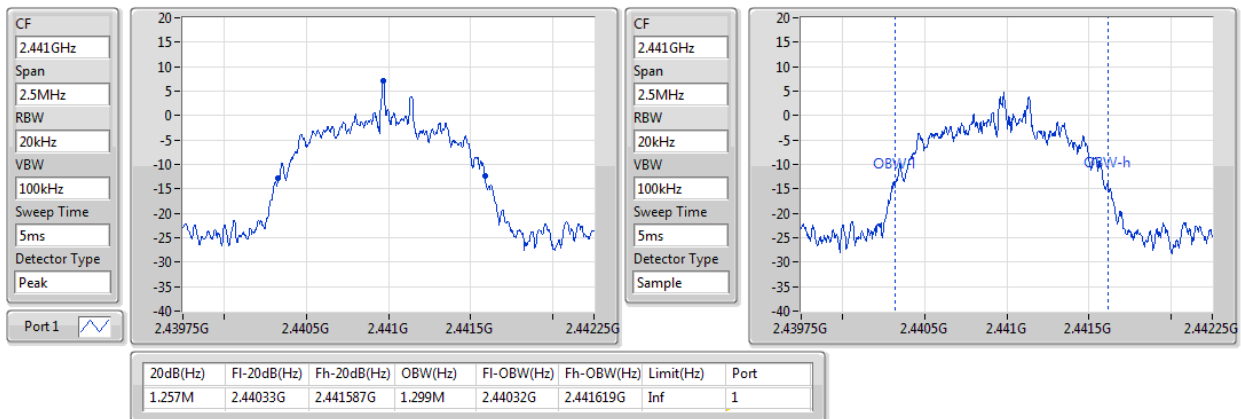
2402MHz



BT-EDR(3Mbps)

EBW-FS

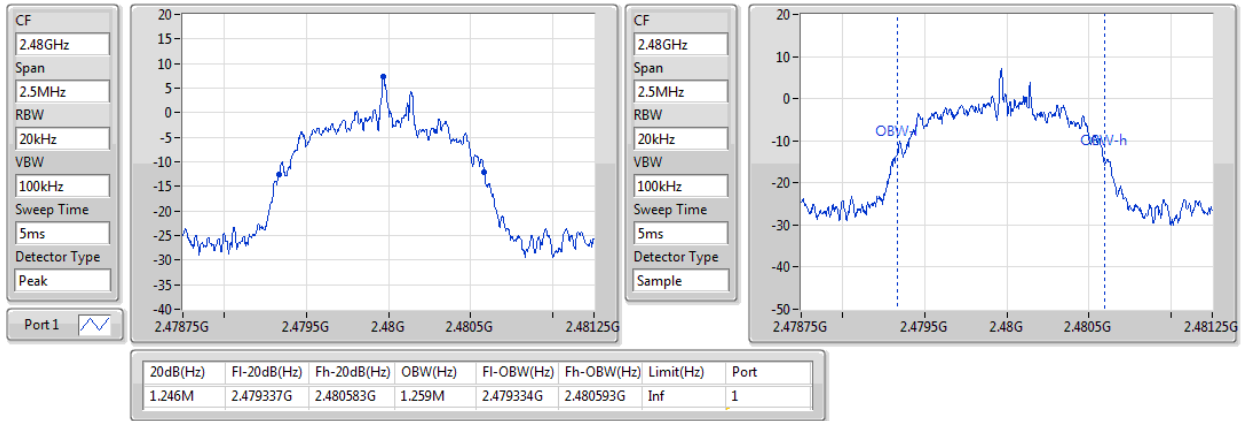
2441MHz



BT-EDR(3Mbps)

EBW-FS

2480MHz



3.7 Channel Separation

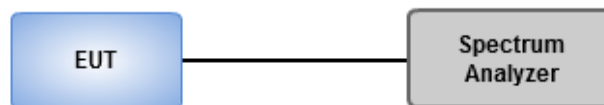
3.7.1 Limit of Channel Separation

- 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

Ambient Condition	20°C / 67%	Tested By	Aska Huang
--------------------------	------------	------------------	------------

Summary

Mode	Max-Space (Hz)	Min-Space (Hz)
2.4-2.4835GHz	-	-
BT-BR(1Mbps)	1.004348M	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	2.401978G	2.402983G	1.004348M	622.565478k
2441MHz	Pass	2.440978G	2.441978G	1M	569.477952k
2480MHz	Pass	2.478978G	2.479978G	1M	569.477952k
BT-EDR(2Mbps)	-	-	-	-	-
2402MHz	Pass	2.40197G	2.402974G	1.004348M	883.116k
2441MHz	Pass	2.44097G	2.441974G	1.004348M	893.106k
2480MHz	Pass	2.47897G	2.47997G	1M	825.174k
BT-EDR(3Mbps)	-	-	-	-	-
2402MHz	Pass	2.40197G	2.402974G	1.004348M	880.452k
2441MHz	Pass	2.440974G	2.441974G	1M	837.162k
2480MHz	Pass	2.47897G	2.479974G	1.004348M	829.836k

BT-BR(1Mbps)

Channel Separation-FS

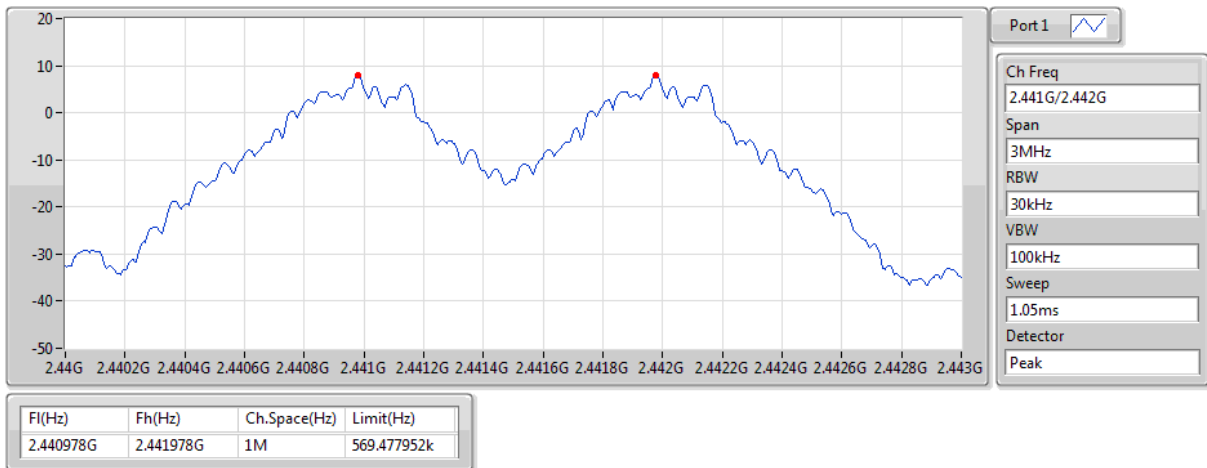
2.402G/2.403GHz



BT-BR(1Mbps)

Channel Separation-FS

2.441G/2.442GHz



BT-BR(1Mbps)

Channel Separation-FS

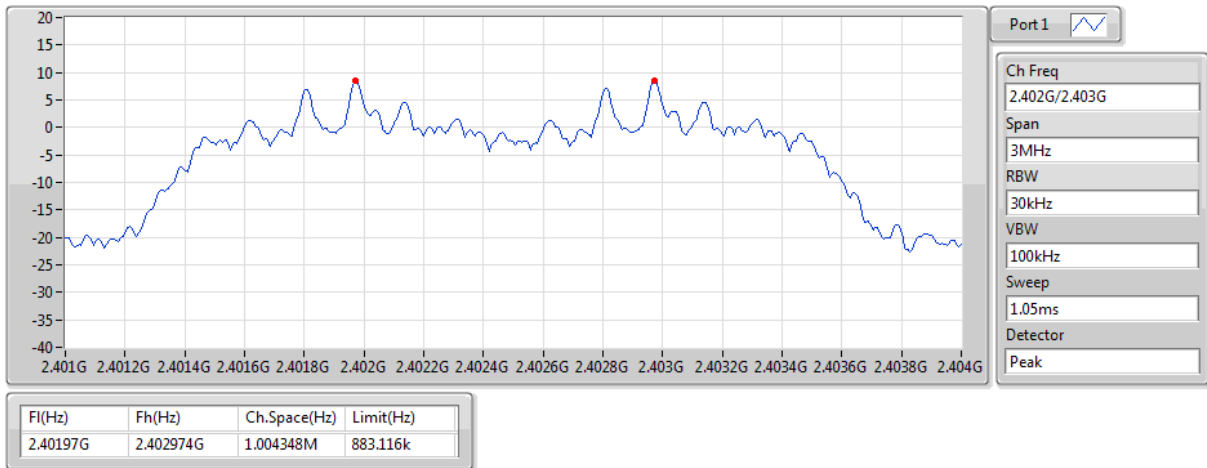
2.48G/2.479GHz



BT-EDR(2Mbps)

Channel Separation-FS

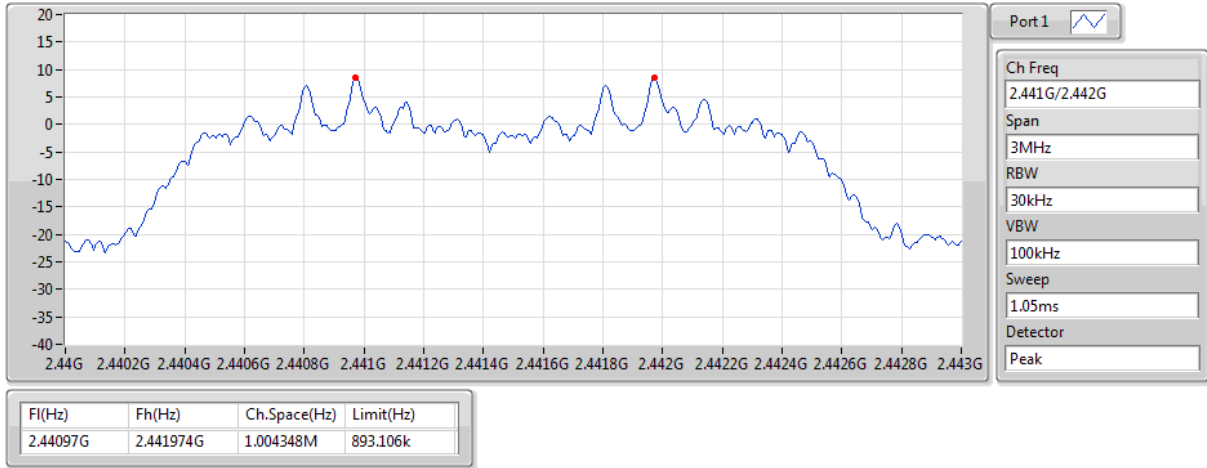
2.402G/2.403GHz



BT-EDR(2Mbps)

Channel Separation-FS

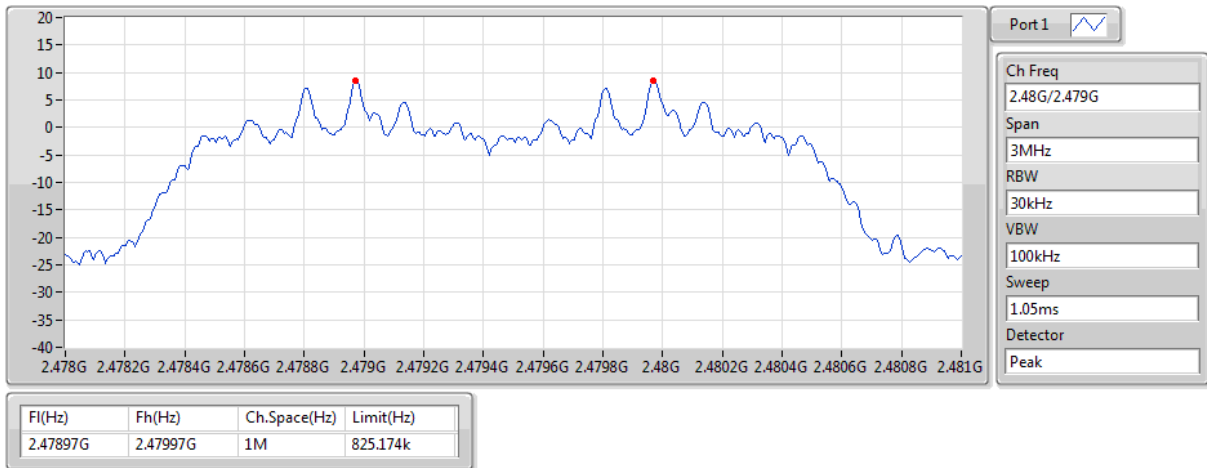
2.441G/2.442GHz



BT-EDR(2Mbps)

Channel Separation-FS

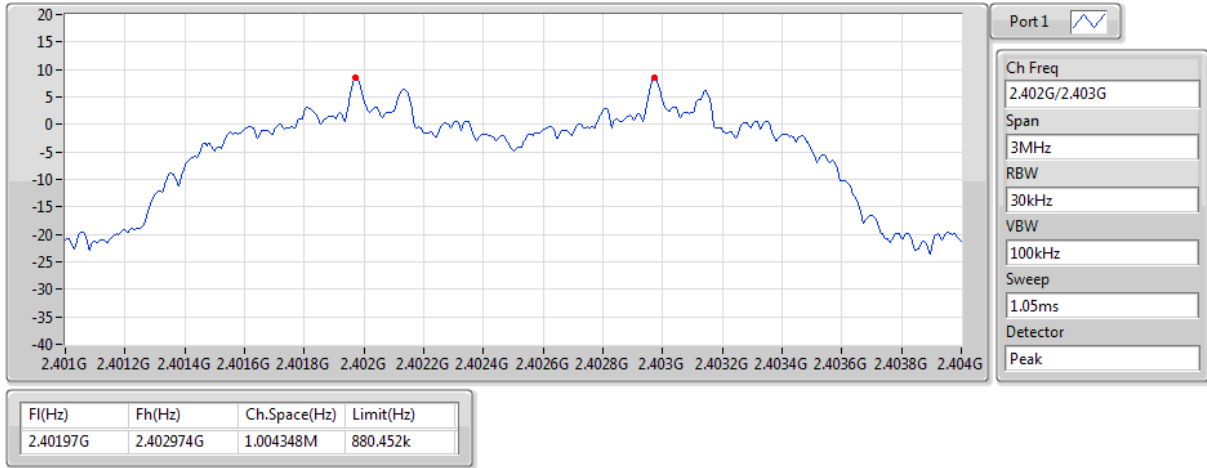
2.48G/2.479GHz



BT-EDR(3Mbps)

Channel Separation-FS

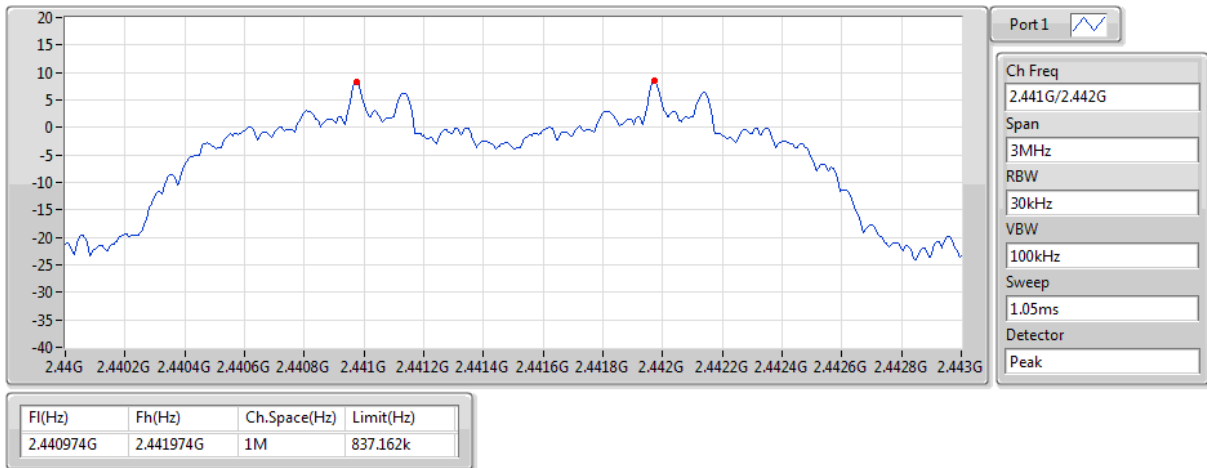
2.402G/2.403GHz



BT-EDR(3Mbps)

Channel Separation-FS

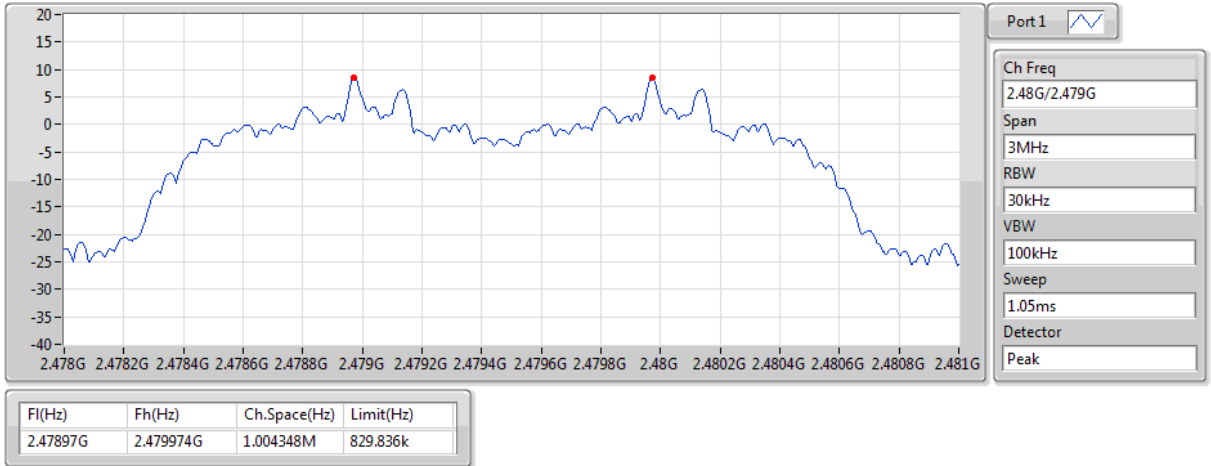
2.441G/2.442GHz



BT-EDR(3Mbps)

Channel Separation-FS

2.48G/2.479GHz



3.8 Number of Dwell Time

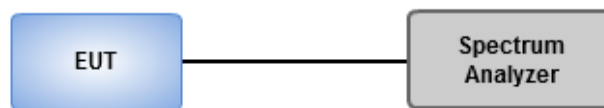
3.8.1 Limit of Dwell time

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=300 kHz, VBW=1 MHz, Sweep time=8 ms, Detector=Peak, Span=0 Hz, Trace max hold.
2. Enable gating and trigger function of spectrum analyzer to measure burst on time.
3. Set RBW=300 kHz, VBW=1 MHz, Sweep time=5 s / 2 s, Detector=Peak, Span=0 Hz, Trace max hold.
4. Enable gating and trigger function of spectrum analyzer to measure burst on number of transmission.
5. Set RBW=300 kHz, VBW=1 MHz, Sweep time=31.6 s / 8 s, Detector=Peak, Span=0 Hz, Trace max hold.
6. Enable gating and trigger function of spectrum analyzer to measure burst on number of transmission of entire time cycle.

3.8.3 Test Setup



3.8.4 Test Result of Dwell Time

Ambient Condition	20°C / 67%	Tested By	Aska Huang
--------------------------	------------	------------------	------------

Summary

Mode	Max-Dwell (s)
2.4-2.4835GHz	-
BT-BR(1Mbps)	312.3818m_DH5
BT-EDR(2Mbps)	313.10702m_DH5
BT-EDR(3Mbps)	313.5905m_DH5
BT-BR-AFH(1Mbps)	302.588m_DH5-AFH
BT-EDR-AFH(2Mbps)	314.739m_DH5-AFH
BT-EDR-AFH(3Mbps)	315.252m_DH5-AFH

Result/ Non AFH mode						
Mode	Result	Period (s)	Dwell (s)	Limit (s)	Tx On (ms)	Number of transmission in a 5 s
BT-BR(1Mbps)	-	-	-	-	-	-
2402MHz_DH5	PASS	31.6	0.31238	0.4	2.90750	17
BT-EDR(2Mbps)	-	-	-	-	-	-
2402MHz_DH5	PASS	31.6	0.31311	0.4	2.91425	17
BT-EDR(3Mbps)	-	-	-	-	-	-
2402MHz_DH5	PASS	31.6	0.31359	0.4	2.91875	17

Note 1: Dwell time =Number of transmission in a 5 second x Tx On Time x 6.32

Note 2: DH5 was the worst mode.

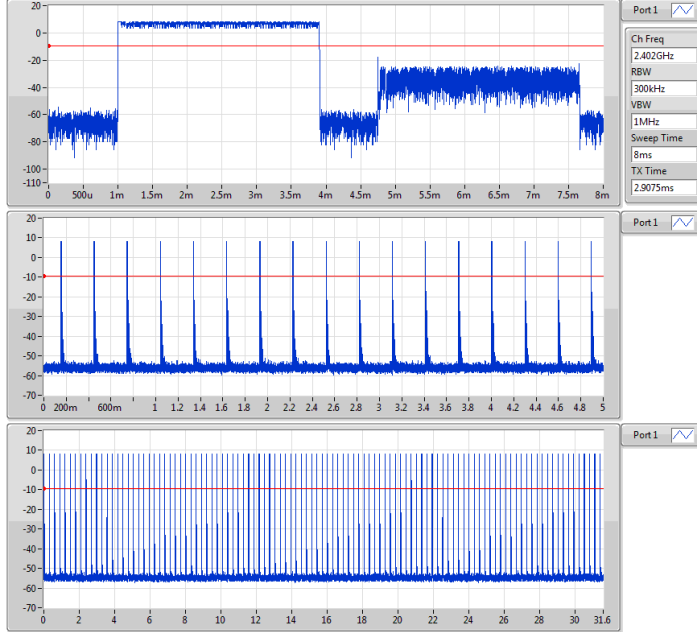
Result/ AFH mode						
Mode	Result	Period (s)	Dwell (s)	Limit (s)	Tx On (ms)	Number of transmission in a 2 s
BT-BR-AFH(1Mbps)	-	-	-	-	-	-
2402MHz_DH5	PASS	8	0.30259	0.4	2.90950	26
BT-EDR-AFH(2Mbps)	-	-	-	-	-	-
2402MHz_DH5	PASS	8	0.31474	0.4	2.91425	27
BT-EDR-AFH(3Mbps)	-	-	-	-	-	-
2402MHz_DH5	PASS	8	0.31525	0.4	2.91900	27

Note 1: Dwell time =Number of transmission in a 2 second x Tx On Time x 4

Note 2: DH5 was the worst mode.

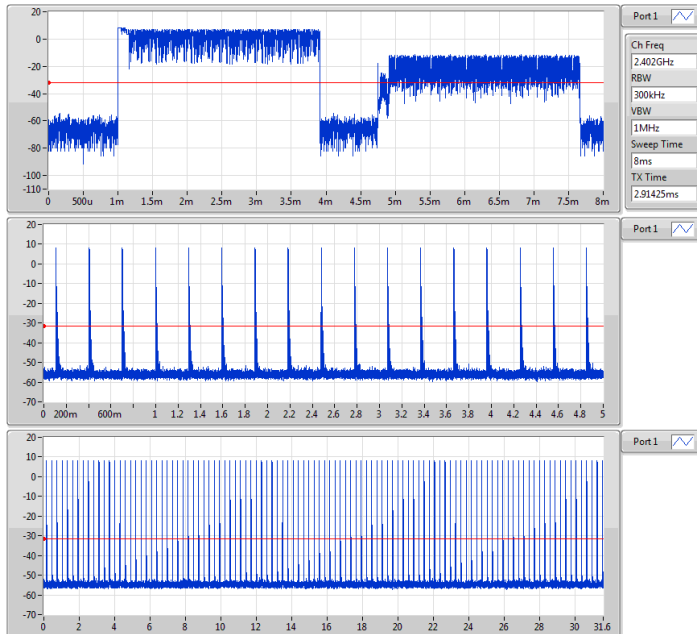
BT-BR(1Mbps)
2402MHz

Dwell-FS



BT-EDR(2Mbps)
2402MHz

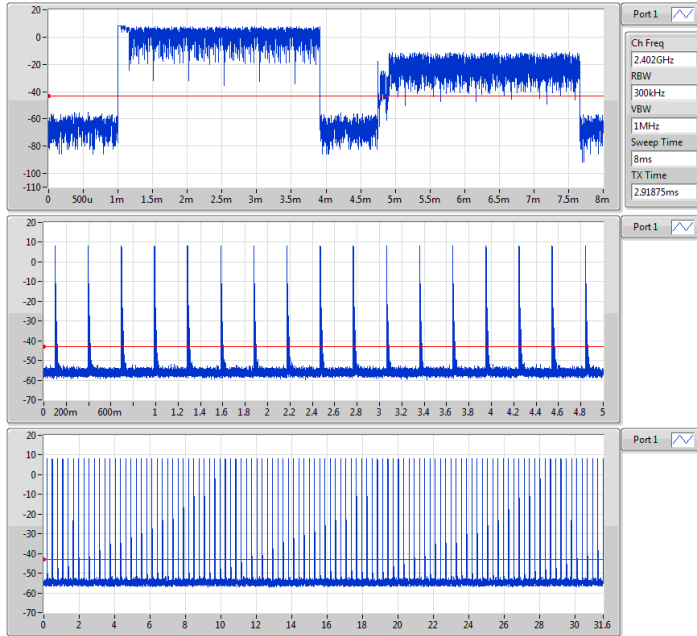
Dwell-FS



BT-EDR(3Mbps)

Dwell-FS

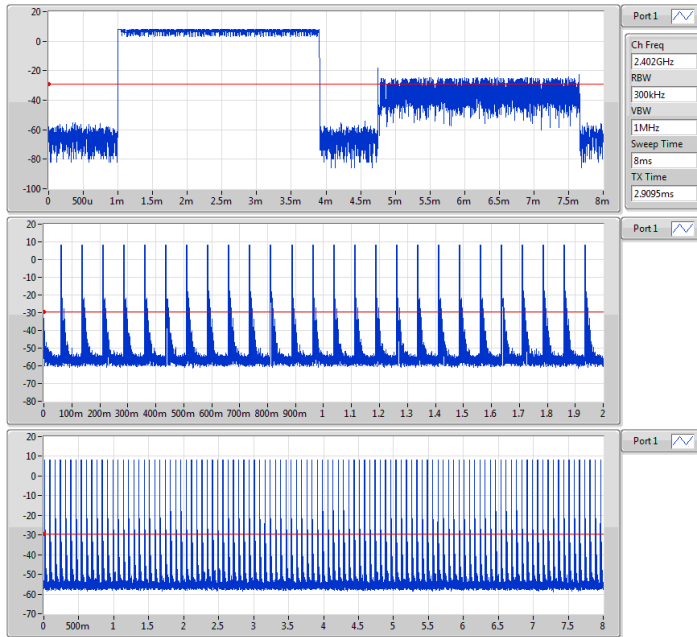
2402MHz



BT-BR-AFH(1Mbps)

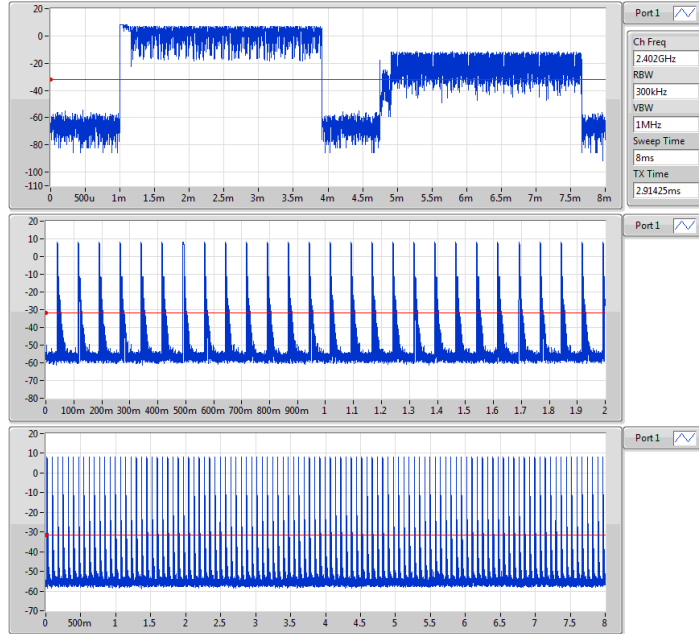
Dwell-FS

2402MHz



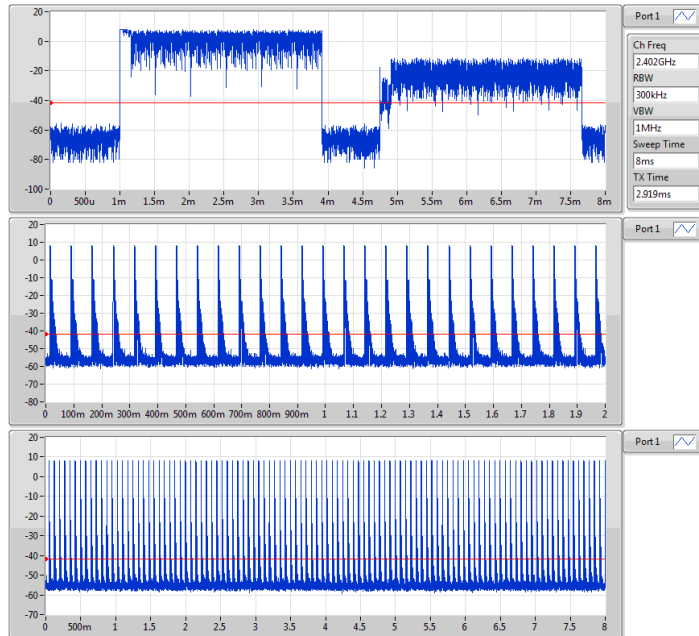
BT-EDR-AFH(2Mbps)
2402MHz

Dwell-FS



BT-EDR-AFH(3Mbps)
2402MHz

Dwell-FS



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 Corporation (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

Tel: 886-2-2601-1640

No.30-2, Ding Fwu Tsuen, Lin Kou
District, New Taipei City, Taiwan
(R.O.C.)

Kwei Shan

Tel: 886-3-271-8666

No.3-1, Lane 6, Wen San 3rd
St., Kwei Shan Dist., Tao Yuan
City 33381, Taiwan (R.O.C.)
No.2-1, Lane 6, Wen San 3rd
St., Kwei Shan Dist., Tao Yuan
City 33381, Taiwan (R.O.C.)

Kwei Shan Site II

Tel: 886-3-271-8640

No.14-1, Lane 19, Wen San 3rd
St., Kwei Shan Dist., 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: 886-3-318-0345

Email: ICC_Service@icertifi.com.tw

==END==