





FCC Test Report

FCC ID : 2AWC2-SRDT101

Equipment : NUWA Service Robot - Collibot

Model No. : SR-DT101

Brand Name : NUWA ROBOTICS

Applicant : NUWA ROBOTICS (HK) LIMITED TAIWAN

BRANCH

Address : 6F., No. 102, Dunhua N. Rd., Songshan Dist.,

Taipei City

Standard : 47 CFR FCC Part 15.247

Received Date : Nov. 20, 2023

Tested Date : Nov. 20 ~ Dec. 08, 2023

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 Cheld/ Assistant Manager Gary Chang / Manager

Report No.: FR3O3001-02AD Page: 1 of 22



Table of Contents

1	GENERAL DESCRIPTION	5
1.1	Information	5
1.2	Local Support Equipment List	8
1.3	Test Setup Chart	
1.4	The Equipment List	g
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	Unwanted Emissions into Restricted Frequency Bands	12
3.2	Unwanted Emissions into Non-Restricted Frequency Bands	15
3.3	Conducted Output Power	16
3.4	Number of Hopping Frequency	17
3.5	20dB and Occupied Bandwidth	18
3.6	Channel Separation	19
3.7	Number of Dwell Time	20
3.8	AC Power Line Conducted Emissions	21
1	TEST I ARODATODY INFORMATION	22

- Appendix A. Unwanted Emissions into Restricted Frequency Bands
- **Appendix B. Unwanted Emissions into Non-Restricted Frequency Bands**
- **Appendix C. Conducted Output Power**
- **Appendix D. Number of Hopping Frequency**
- Appendix E. 20dB and Occupied Bandwidth
- **Appendix F. Channel Separation**
- Appendix G. Number of Dwell Time
- **Appendix H. AC Power Line Conducted Emissions**



Release Record

Report No.	Version	Description	Issued Date
FR3O3001-02AD	Rev. 01	Initial issue	Sep. 23, 2024

Report No.: FR3O3001-02AD Page: 3 of 22



Summary of Test Results

FCC Rules	Test Items	Measured	Result	
15.207	AC Power Line Conducted Emission	[dBuV]: 0.354MHz 35.49 (Margin -13.38dB) - AV	Pass	
15.247(d)	Unwanted Emissions	[dBuV/m at 3m]: 487.66MHz	Pass	
15.209	Offwarted Effissions	42.67 (Margin -3.33dB) - PK	F 455	
15.247(d)	Band Edge	Meet the requirement of limit	Pass	
15.247(b)(1)	Conducted Output Power	Power [dBm]: 11.78	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.

Report No.: FR3O3001-02AD Page: 4 of 22



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

nt. lo.	Brand	Model	Туре	Connector	Gain (dBi)
1	INPAQ	WA-P-LB-03-162	PCB	No	2.47

1.1.3 Power Supply Type of Equipment under Test (EUT)

POWER SHIPPING LYPE	28.0Vdc from adapter
· one capping type	25.6Vdc from battery

1.1.4 Accessories

	Accessories					
No.	Equipment	Description				
1	AC adapter	Brand: TC-TEK Model: FY28010000 I/P: 100-240V~50/60Hz 4A 350VA O/P: 28.0V=10.0A 280.0W Power Line: DC 1m non-shielded with one core AC 1.2m non-shielded without core				
2	charging cradle	Brand: Matsutek Model: RVDS-NW01BK				
3	Li-ion Battery	Brand: Moai Model: NW-8S5P Battery rated capacity: 30Ah/768Wh Battery nominal voltage: 25.6V				

Report No.: FR3O3001-02AD Page: 5 of 22



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		

Report No.: FR3O3001-02AD Page: 6 of 22



1.1.6 Test Tool and Duty Cycle

Test Tool	QRCT, v4.0	RCT, v4.0		
Modulation Mode	Duty Cycle Of Test Signal (%)	Duty Factor (dB)		
DH5	79.71%	0.98		
2DH5	79.94%	0.97		
3DH5	78.56%	1.05		

1.1.7 Power Index of Test Tool

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

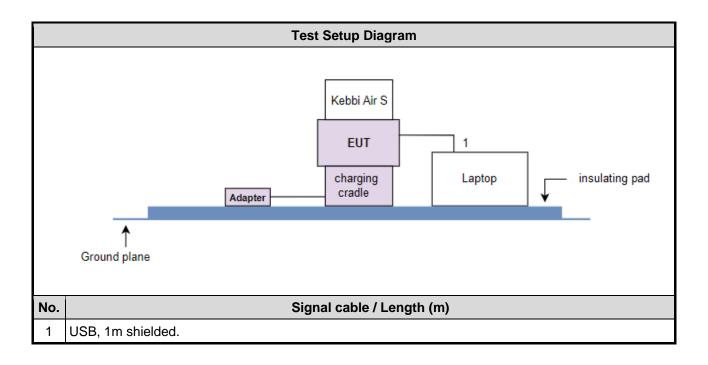
Report No.: FR3O3001-02AD Page: 7 of 22



1.2 Local Support Equipment List

	Support Equipment List						
No.	No. Equipment Brand Model FCC ID Remarks						
1	Kebbi Air S	NUWAROBOTICS	AIR-H203		Provided by applicant.		
2	Laptop	DELL	Latitude E5470	DoC			

1.3 Test Setup Chart



Report No.: FR3O3001-02AD Page : 8 of 22



1.4 The Equipment List

Test Item	Test Item Conducted Emission						
Test Site	Conduction room 1 / ((CO01-WS)					
Tested Date	Tested Date Dec. 08, 2023						
Instrument Brand Model No. Serial No. Calibration Date Calibration Until							
Receiver	R&S	ESR3	101658	Feb. 17, 2023	Feb. 16, 2024		
LISN	R&S	ENV216	101579	May 09, 2023	May 08, 2024		
RF Cable-CON	Woken	CFD200-NL	CFD200-NL-001	Oct. 11, 2023	Oct. 10, 2024		
LISN (Support Unit)	SCHWARZBECK	Schwarzbeck 8127	8127667	Jan. 03, 2023	Jan. 02, 2024		
50 ohm terminal (Support Unit)	NA	50	01	Jun. 14, 2023	Jun. 13, 2024		
Measurement Software Sporton SENSE-EMI V5.11.6 NA NA							

Test Item	Radiated Emission					
Test Site	966 chamber1 / (03CH01-WS)					
Tested Date	Nov. 20 ~ Dec. 05, 20	Nov. 20 ~ Dec. 05, 2023				
Instrument	Brand	Model No.	Serial No.	Calibration Date	Calibration Until	
Receiver	R&S	ESR3	101657	Mar. 03, 2023	Mar. 02, 2024	
Spectrum Analyzer	R&S	FSV40	101910	Apr. 14, 2023	Apr. 13, 2024	
Loop Antenna	R&S	HFH2-Z2	100330	Oct. 31, 2023	Oct. 30, 2024	
Bilog Antenna	SCHWARZBECK	VULB9168	VULB9168-522	Jul. 31, 2023	Jul. 30, 2024	
Horn Antenna 1G-18G	SCHWARZBECK	BBHA 9120 D	BBHA 9120 D 1095	Sep. 01, 2023	Aug. 31, 2024	
Horn Antenna 18G-40G	SCHWARZBECK	BBHA 9170	BBHA 9170517	Oct. 30, 2023	Oct. 29, 2024	
Preamplifier	EMC	EMC02325	980225	Jun. 28, 2023	Jun. 27, 2024	
Preamplifier	EMC	EMC118A45SE	980898	Jul. 14, 2023	Jul. 13, 2024	
Preamplifier	EMC	EMC184045SE	980903	Jul. 17, 2023	Jul. 16, 2024	
Loop Antenna Cable	KOAX KABEL	101354-BW	101354-BW	Oct. 03, 2023	Oct. 02, 2024	
LF cable 3M	Woken	CFD400NL-LW	CFD400NL-001	Oct. 03, 2023	Oct. 02, 2024	
LF cable 11M	EMC	EMCCFD400-NW-N W-11000	200801	Oct. 03, 2023	Oct. 02, 2024	
LF cable 1M	EMC	EMCCFD400-NM-N M-1000	160502	Oct. 03, 2023	Oct. 02, 2024	
RF Cable	EMC	EMC104-35M-35M- 8000	210920	Oct. 03, 2023	Oct. 02, 2024	
RF Cable	EMC	EMC104-35M-35M- 3000	210922	Oct. 03, 2023	Oct. 02, 2024	
Attenuator	Pasternack	PE7005-10	10-1	Oct. 05, 2023	Oct. 04, 2024	
HIGHPASS FILTER 3.1-18G	WHK	WHK3.1/18G-10SS	39	Oct. 05, 2023	Oct. 04, 2024	
Measurement Software	AUDIX	e3	6.120210g	NA	NA	
Note: Calibration Inter	rval of instruments liste	d above is one year.				

Report No.: FR3O3001-02AD Page: 9 of 22



Test Item	RF Conducted				
Test Site	(TH01-WS)				
Tested Date	Dec. 06 ~ Dec. 07, 20	23			
Instrument	Brand	Model No.	Serial No.	Calibration Date	Calibration Until
Spectrum Analyzer	R&S	FSV40	101910	Apr. 14, 2023	Apr. 13, 2024
Power Meter	Anritsu	ML2495A	1241001	Jan. 11, 2023	Jan. 10, 2024
Power Sensor	Anritsu	MA2411B	1911228	Jan. 11, 2023	Jan. 10, 2024
Attenuator	Pasternack	PE7005-10	10-2	Oct. 05, 2023	Oct. 04, 2024
Measurement Software	Sporton	SENSE-15247_FS	V5.10.8	NA	NA
Wireless connectivity tester	R&S	CMW270	100856	Nov. 14, 2023	Nov. 13, 2024
Note: Calibration Inter	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		
Unwanted Emission ≤ 1GHz	±3.41 dB		
Unwanted Emission > 1GHz	±4.59 dB		
Time	±0.1%		

Report No.: FR3O3001-02AD Page: 10 of 22



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.: TW2732FCC site registration No.: 181692

➤ ISED#: 10807A

➤ CAB identifier: TW2732

2.2 The Worst Test Modes and Channel Details

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

Report No.: FR3O3001-02AD Page: 11 of 22



3 Transmitter Test Results

3.1 Unwanted Emissions into Restricted Frequency Bands

3.1.1 Limit of Unwanted Emissions into Restricted Frequency Bands

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

Note 1:

Qusai-Peak value is measured for frequency below 1GHz except for 9–90 kHz, 110–490 kHz frequency band. Peak and average value are measured for frequency above 1GHz. The limit on average radio frequency emission is as above table. The limit on peak radio frequency emissions is 20 dB above the maximum permitted average emission limit **Note 2:**

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

Report No.: FR3O3001-02AD Page: 12 of 22



3.1.2 Test Procedures

- 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:

3.

- 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:

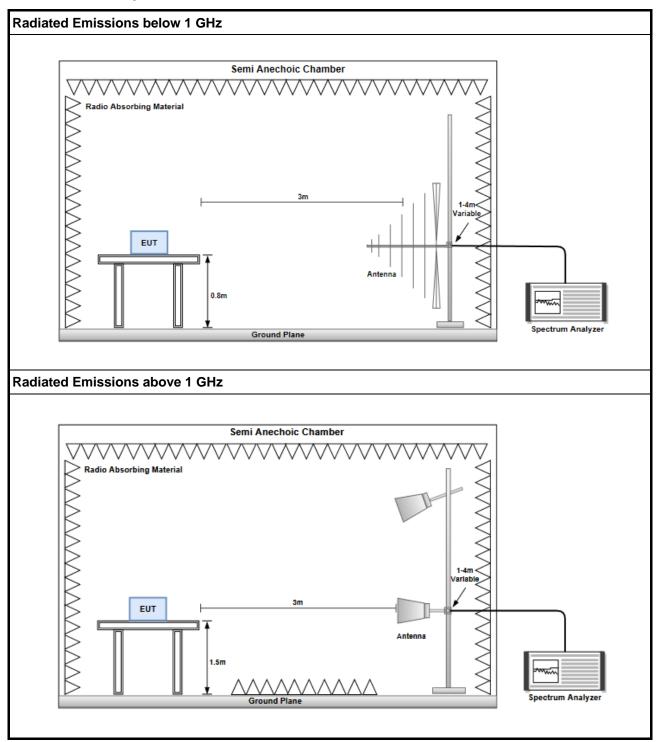
20log (Duty cycle) = 20log
$$\frac{1s / 1600 * 5}{100 \text{ ms}}$$
 = -30.1dB

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

Report No.: FR3O3001-02AD Page: 13 of 22 Report Version: Rev. 01



3.1.3 Test Setup



3.1.4 Test Results

Refer to Appendix A.

Report No.: FR3O3001-02AD Page: 14 of 22



3.2 Unwanted Emissions into Non-Restricted Frequency Bands

3.2.1 Limit of Unwanted Emissions into Non-Restricted Frequency Bands

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

3.2.2 Test Procedures

Reference level measurement

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

Emission level measurement

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

3.2.3 Test Setup



3.2.4 Test Results

Ambient Condition	21 ~ 22°C / 63 ~ 68%	Tested By	Roger Lu
-------------------	----------------------	-----------	----------

Refer to Appendix B.

Report No.: FR3O3001-02AD Page: 15 of 22



3.3 Conducted Output Power

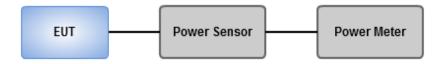
3.3.1 Limit of Conducted Output Power

1 Watt For frequency hopping systems operating in the 2400–2483.5 MHz band employing at least 75 non overlapping hopping channels, and all frequency hopping systems in the 5725–5850 MHz band.
0.125 Watt For all other frequency hopping systems in the 2400–2483.5 MHz band.
0.125 Watt For Frequency hopping systems operating in the 2400–2483.5 MHz band have hopping channel carrier frequencies that are separated by two-thirds of the 20 dB bandwidth of the hopping channel.

3.3.2 Test Procedures

- 1. A wideband power meter is used for power measurement. Bandwidth of power 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

3.3.3 Test Setup



3.3.4 Test Results

Ambient Condition	21 ~ 22°C / 63 ~ 68%	Tested By	Roger Lu
-------------------	----------------------	-----------	----------

Refer to Appendix C.

Report No.: FR3O3001-02AD Page: 16 of 22



3.4 Number of Hopping Frequency

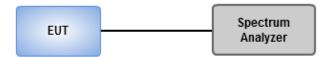
3.4.1 Limit of Number of Hopping Frequency

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

3.4.2 Test Procedures

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

3.4.3 Test Setup



3.4.4 Test Results

Ambient Condition	21 ~ 22°C / 63 ~ 68%	Tested By	Roger Lu
-------------------	----------------------	-----------	----------

Refer to Appendix D.

Report No.: FR3O3001-02AD Page: 17 of 22



3.5 20dB and Occupied Bandwidth

3.5.1 Test Procedures

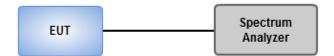
20dB Bandwidth

- 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

3.5.2 Test Setup



3.5.3 Test Results

Ambient Condition 21 ~ 22°C / 63 ~ 68%	Tested By	Roger Lu
---	-----------	----------

Refer to Appendix E.

Report No.: FR3O3001-02AD Page: 18 of 22



3.6 Channel Separation

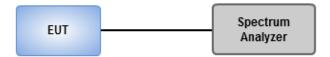
3.6.1 Limit of Channel Separation

- Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hopping channel, whichever is greater.
- Frequency hopping systems operating in the 2400–2483.5 MHz band may have hopping channel carrier frequencies that are separated by 25 kHz or two-thirds of the 20 dB bandwidth of the hopping channel, whichever is greater.

3.6.2 Test Procedures

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

3.6.3 Test Setup



3.6.4 Test Results

	ı	ı	1
Ambient Condition	21 ~ 22°C / 63 ~ 68%	Tested By	Roger Lu

Refer to Appendix F.

Report No.: FR3O3001-02AD Page : 19 of 22



3.7 Number of Dwell Time

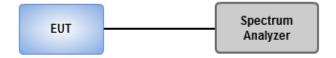
3.7.1 Limit of Dwell time

The average time of occupancy on any channel shall not be greater than 0.4 seconds within a period of 0.4 seconds multiplied by the number of hopping channels employed.

3.7.2 Test Procedures

- 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.

3.7.3 Test Setup



3.7.4 Test Results

	Ambient Condition	21 ~ 22°C / 63 ~ 68%	Tested By	Roger Lu
--	-------------------	----------------------	-----------	----------

Refer to Appendix G.

Report No.: FR3O3001-02AD Page: 20 of 22



3.8 AC Power Line Conducted Emissions

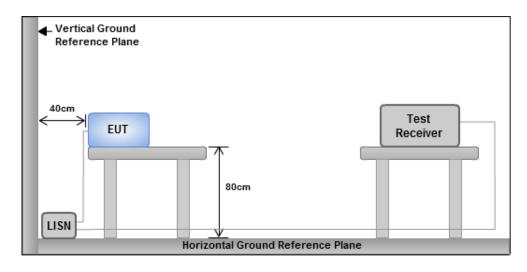
3.8.1 Limit of AC Power Line Conducted Emissions

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.				

3.8.2 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

3.8.3 Test Setup



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

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

3.8.4 Test Results

Refer to Appendix H.

Report No.: FR3O3001-02AD Page: 21 of 22



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 33381, 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

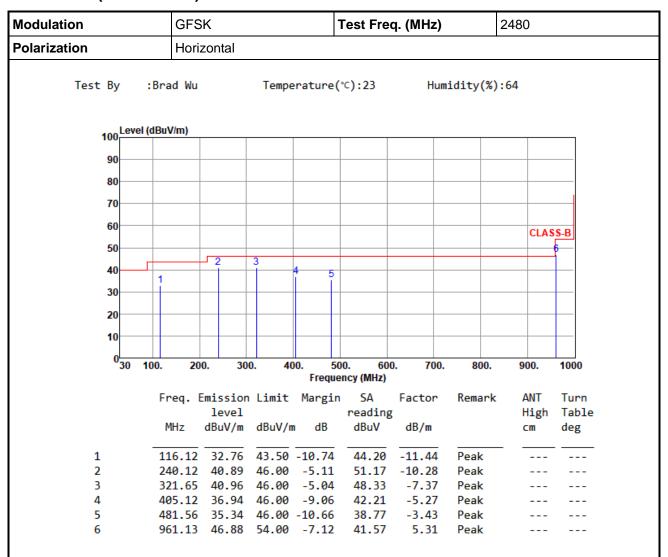
Email: ICC_Service@icertifi.com.tw

==END==

Report No.: FR3O3001-02AD Page : 22 of 22



Emissions (Below 1GHz)



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

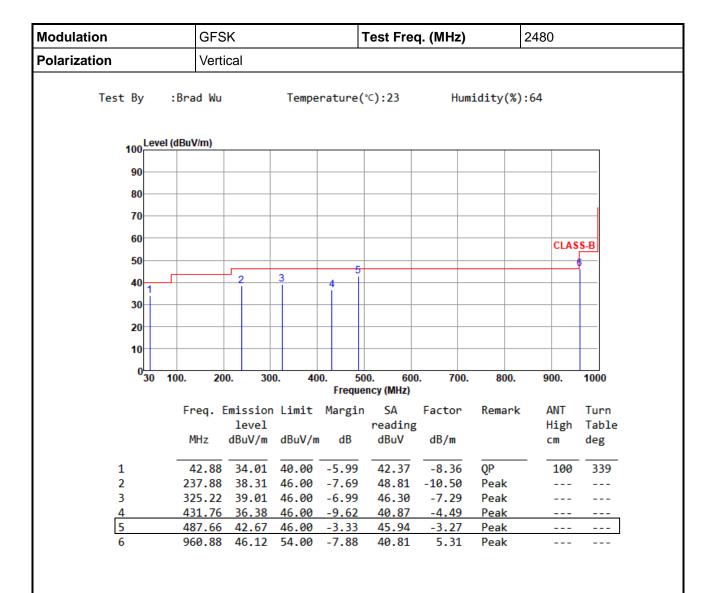
*Factor includes antenna factor, cable loss and amplifier gain

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.

Report No.: FR3O3001-02AD Page No. : 1 of 14





*Factor includes antenna factor, cable loss and amplifier gain

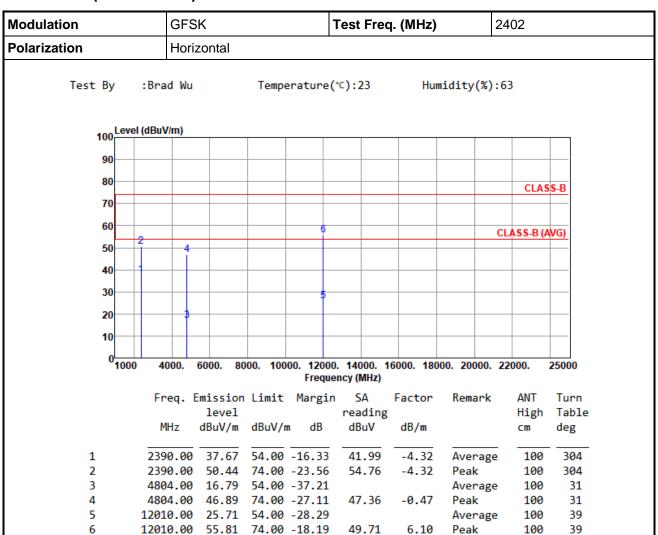
Note 2: Margin (dB) = Emission level (dBuV/m) – Limit (dBuV/m).

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

Report No.: FR3O3001-02AD Page No. : 2 of 14



Emissions (Above 1GHz) for GFSK



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

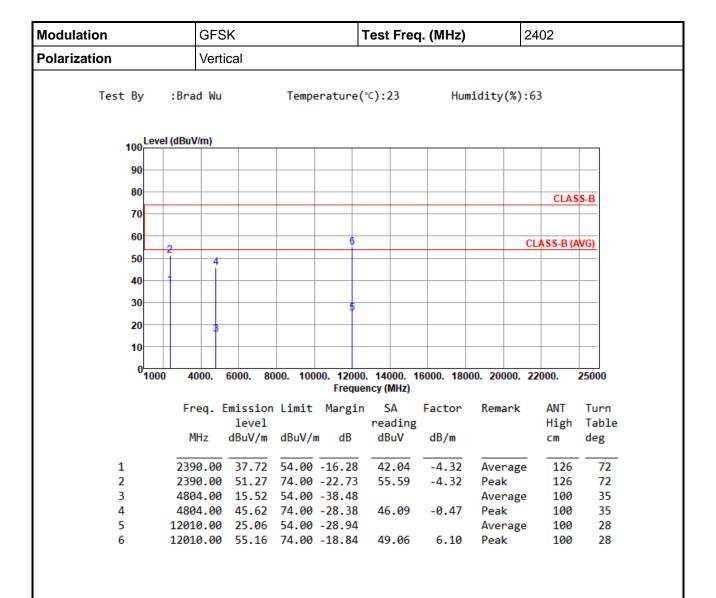
*Factor includes antenna factor, cable loss and amplifier gain

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

Note 3: When average value is calculated not measured, no SA reading and factor value are listed.

Report No.: FR3O3001-02AD Page No. : 3 of 14





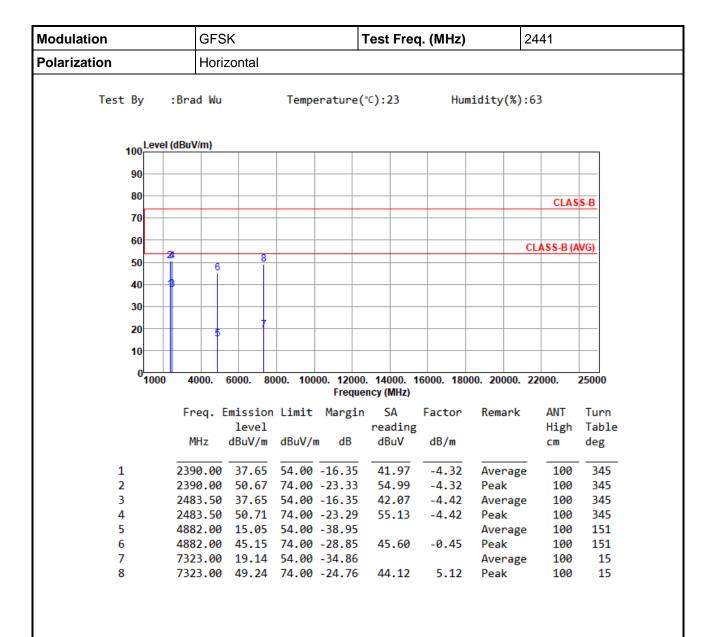
*Factor includes antenna factor, cable loss and amplifier gain

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

Note 3: When average value is calculated not measured, no SA reading and factor value are listed.

Report No.: FR3O3001-02AD Page No. : 4 of 14





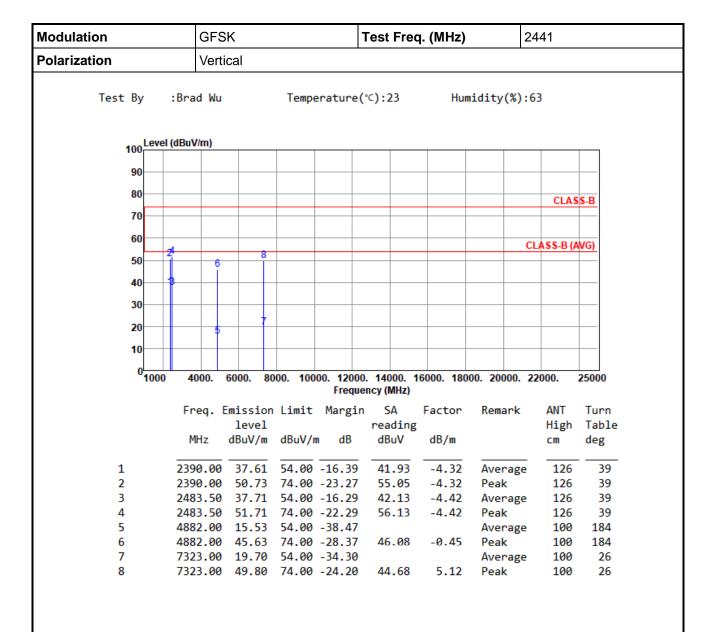
*Factor includes antenna factor, cable loss and amplifier gain

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

Note 3: When average value is calculated not measured, no SA reading and factor value are listed.

Report No.: FR3O3001-02AD Page No. : 5 of 14





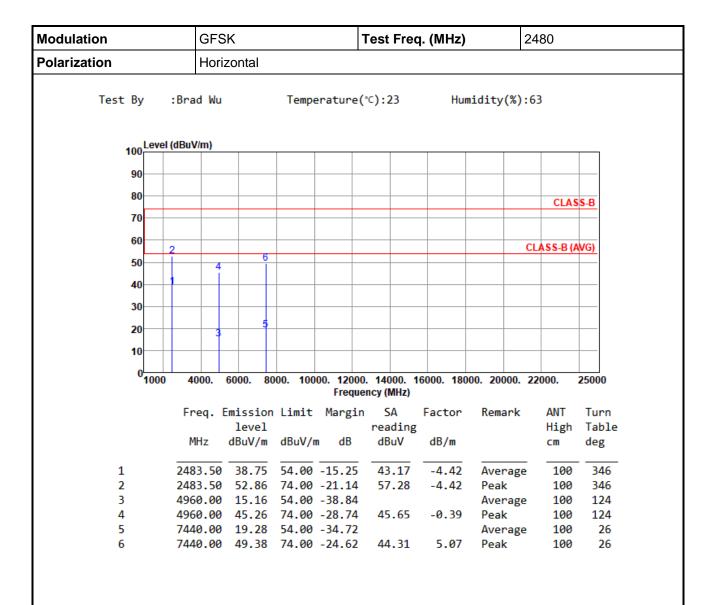
*Factor includes antenna factor, cable loss and amplifier gain

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

Note 3: When average value is calculated not measured, no SA reading and factor value are listed.

Report No.: FR3O3001-02AD Page No. : 6 of 14





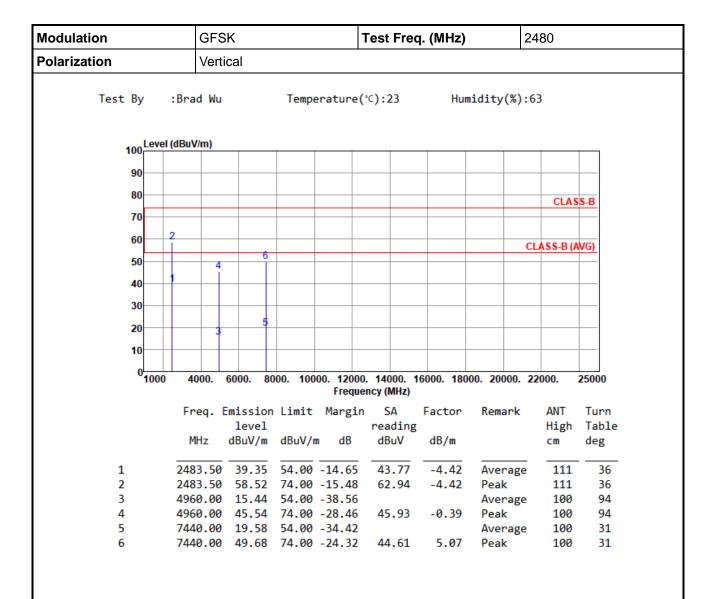
*Factor includes antenna factor, cable loss and amplifier gain

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

Note 3: When average value is calculated not measured, no SA reading and factor value are listed.

Report No.: FR3O3001-02AD Page No. : 7 of 14





*Factor includes antenna factor, cable loss and amplifier gain

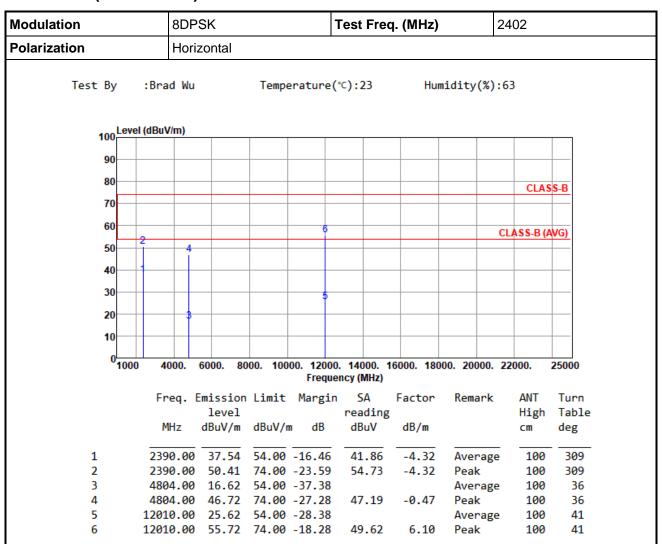
Note 2: Margin (dB) = Emission level (dBuV/m) – Limit (dBuV/m).

Note 3: When average value is calculated not measured, no SA reading and factor value are listed.

Report No.: FR3O3001-02AD Page No. : 8 of 14



Emissions (Above 1GHz) for 8DPSK



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

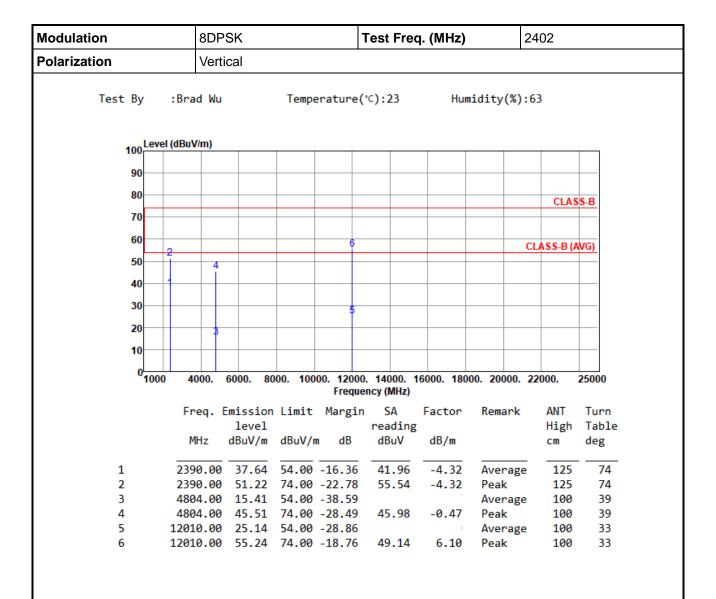
*Factor includes antenna factor, cable loss and amplifier gain

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

Note 3: When average value is calculated not measured, no SA reading and factor value are listed.

Report No.: FR3O3001-02AD Page No. : 9 of 14





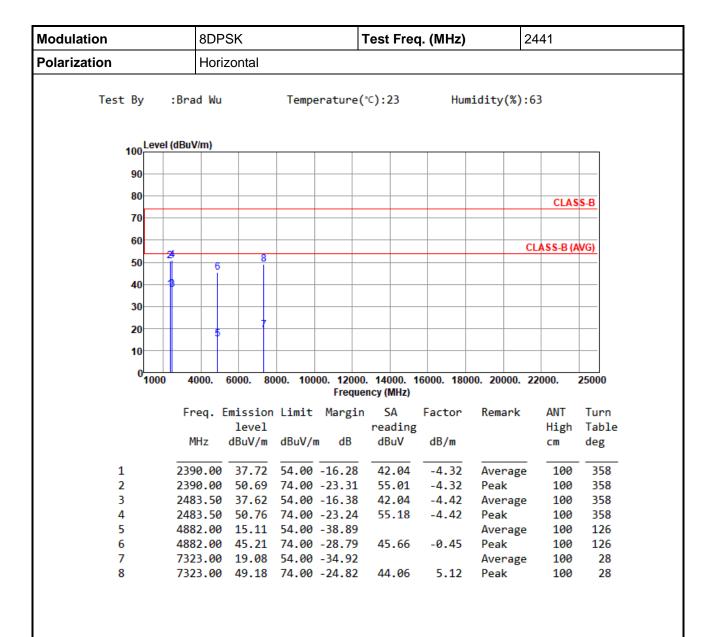
*Factor includes antenna factor, cable loss and amplifier gain

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

Note 3: When average value is calculated not measured, no SA reading and factor value are listed.

Report No.: FR3O3001-02AD Page No. : 10 of 14





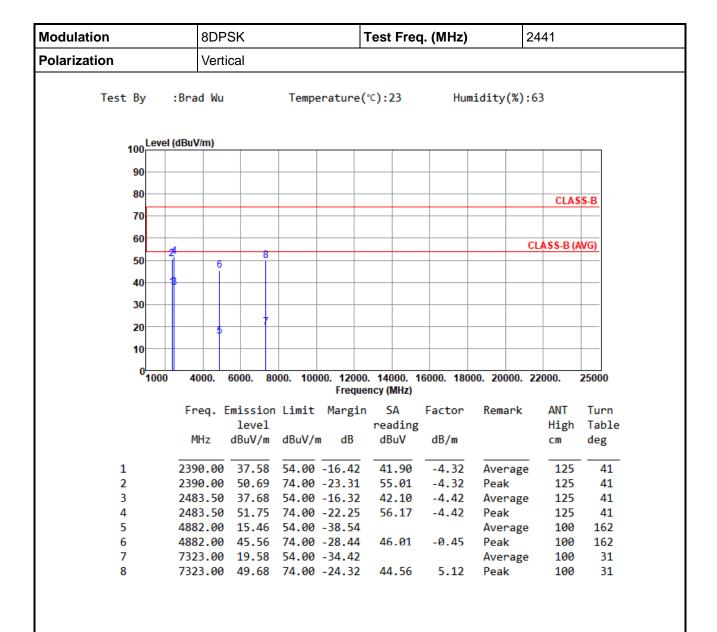
*Factor includes antenna factor, cable loss and amplifier gain

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

Note 3: When average value is calculated not measured, no SA reading and factor value are listed.

Report No.: FR3O3001-02AD Page No. : 11 of 14





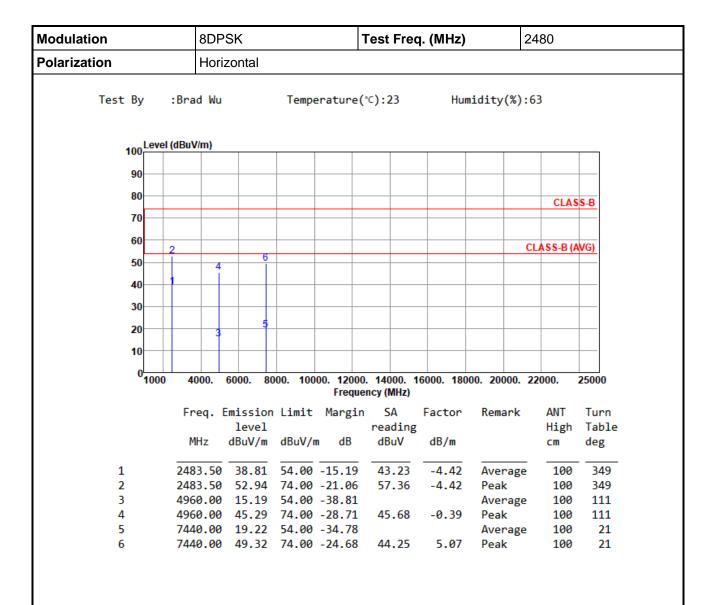
*Factor includes antenna factor, cable loss and amplifier gain

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

Note 3: When average value is calculated not measured, no SA reading and factor value are listed.

Report No.: FR3O3001-02AD Page No. : 12 of 14





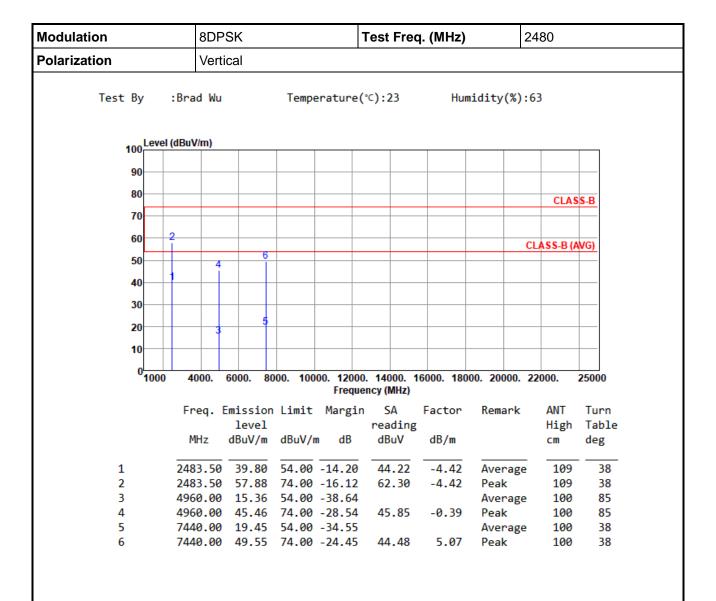
*Factor includes antenna factor, cable loss and amplifier gain

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

Note 3: When average value is calculated not measured, no SA reading and factor value are listed.

Report No.: FR3O3001-02AD Page No. : 13 of 14





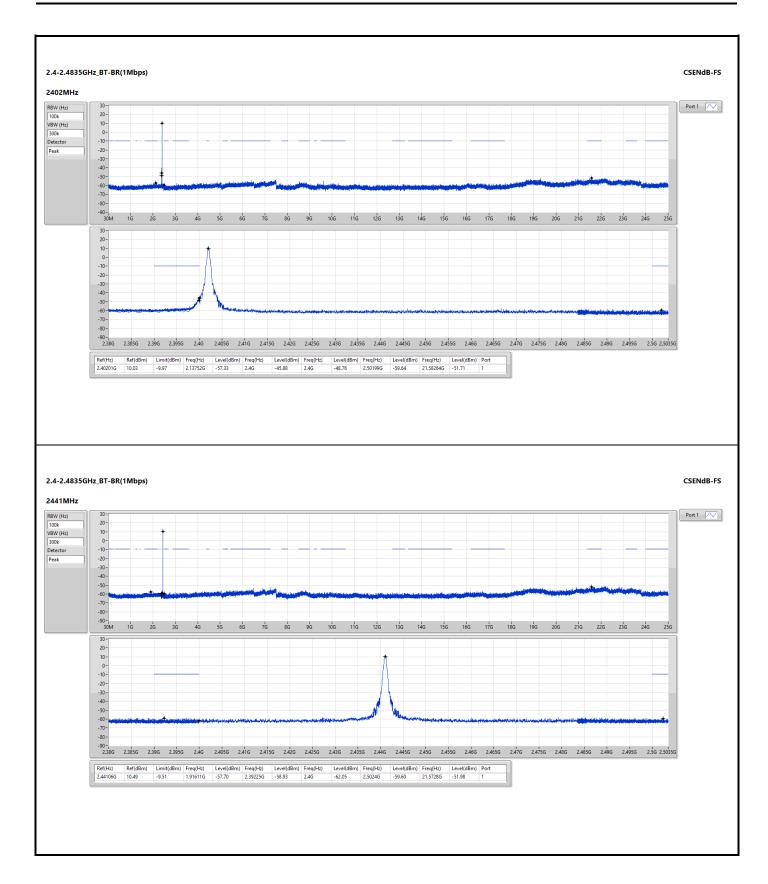
*Factor includes antenna factor, cable loss and amplifier gain

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

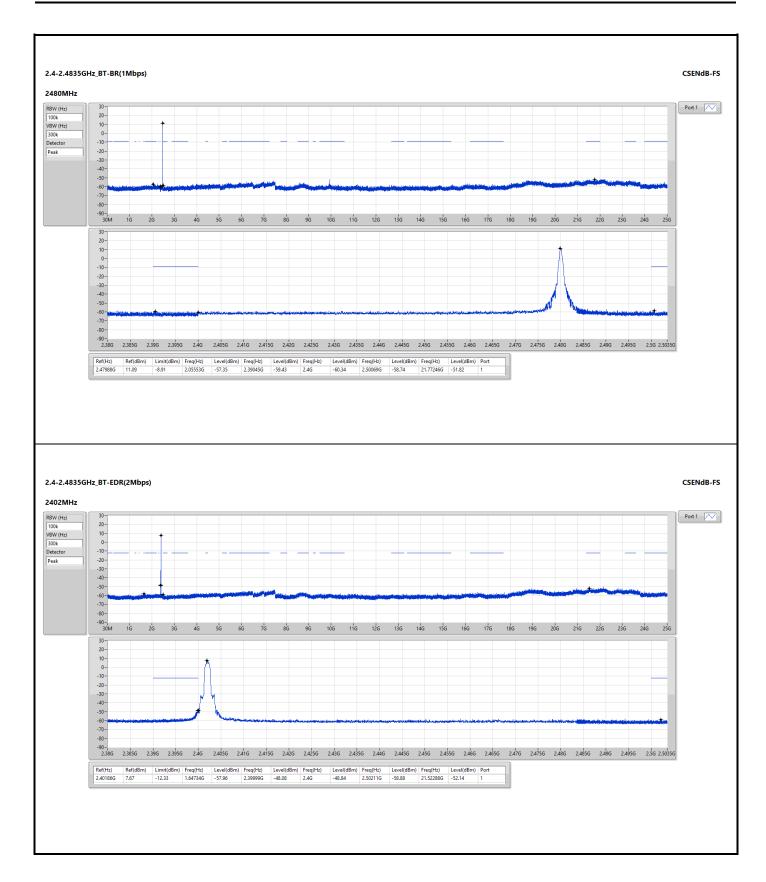
Note 3: When average value is calculated not measured, no SA reading and factor value are listed.

Report No.: FR3O3001-02AD Page No. : 14 of 14

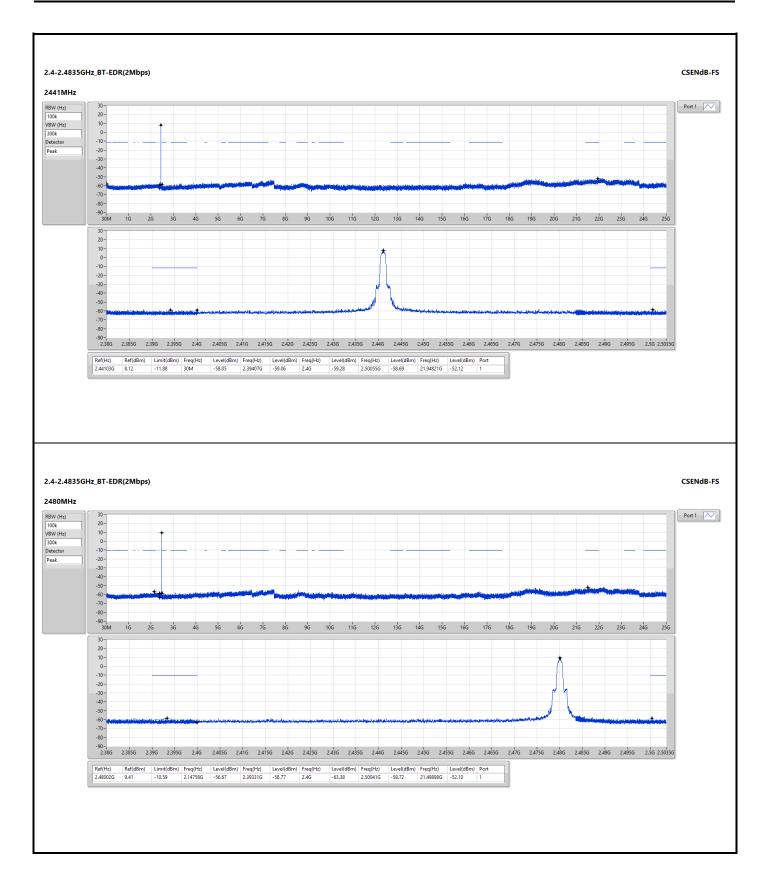




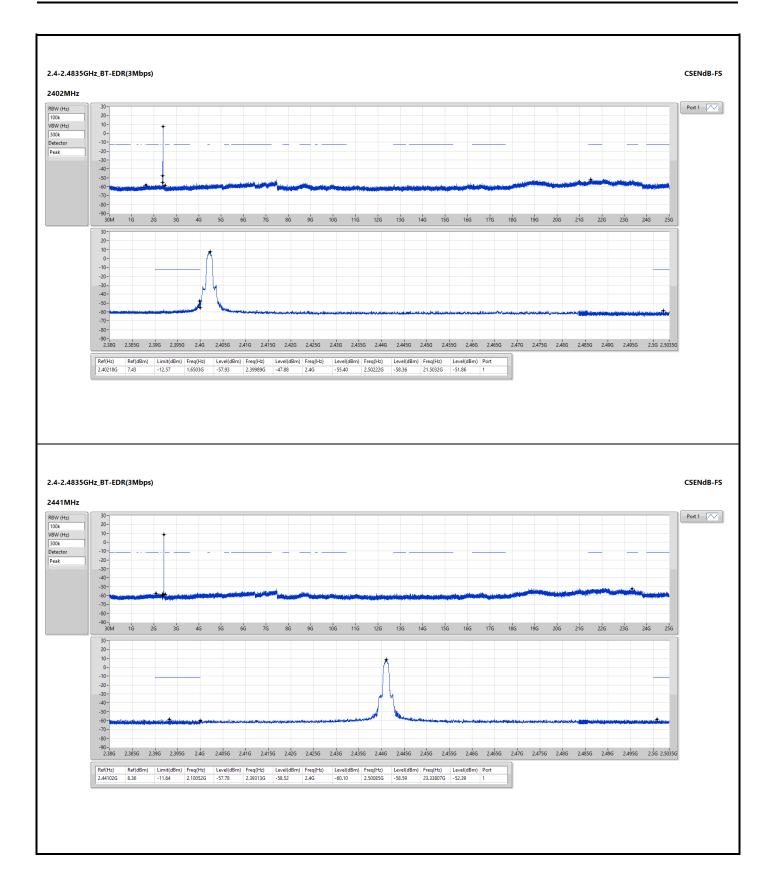




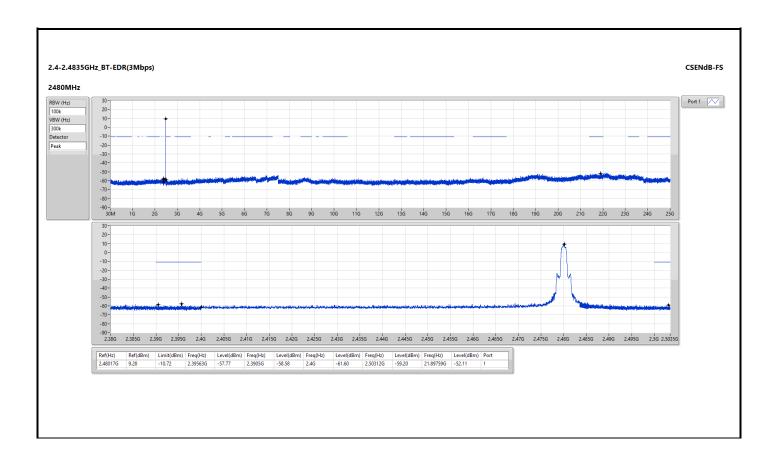




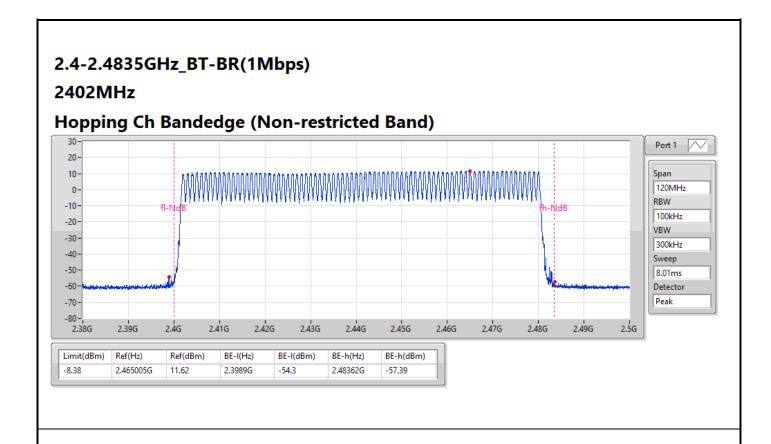








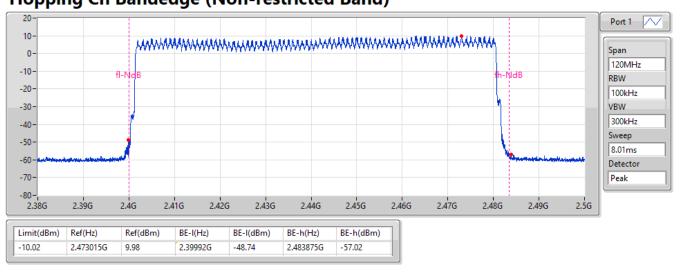




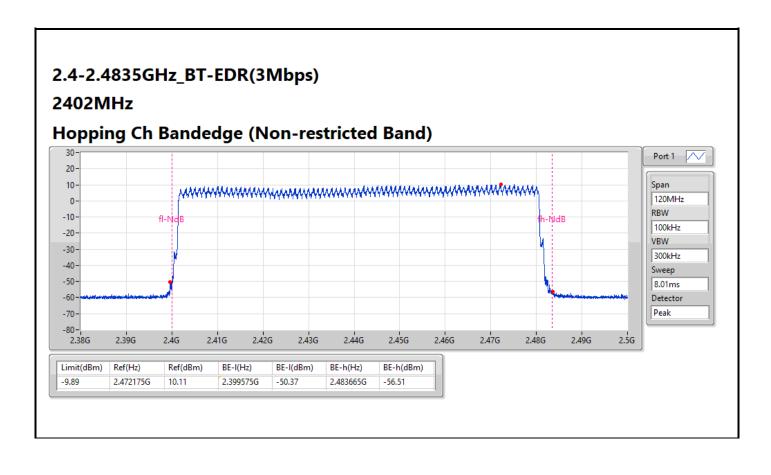
2.4-2.4835GHz_BT-EDR(2Mbps)

2402MHz

Hopping Ch Bandedge (Non-restricted Band)









Conducted Output Power(Peak)

Appendix C.1

Summary

Mode	Total Power (dBm)	Power (W)
2.4-2.4835GHz	-	-
BT-BR(1Mbps)	11.78	0.01507
BT-EDR(2Mbps)	11.35	0.01365
BT-EDR(3Mbps)	11.54	0.01426

Result

Mode	Result	Antenna Gain	Total Power	Power Limit	EIRP	EIRP Limit
		(dBi)	(dBm)	(dBm)	(dBm)	(dBm)
BT-BR(1Mbps)	-	-	-	-	-	-
2402MHz	Pass	2.47	10.46	21.00	12.93	27.00
2441MHz	Pass	2.47	11.34	21.00	13.81	27.00
2480MHz	Pass	2.47	11.78	21.00	14.25	27.00
BT-EDR(2Mbps)	-	-	-	-	-	-
2402MHz	Pass	2.47	9.86	21.00	12.33	27.00
2441MHz	Pass	2.47	10.61	21.00	13.08	27.00
2480MHz	Pass	2.47	11.35	21.00	13.82	27.00
BT-EDR(3Mbps)	-	-	-	-	-	-
2402MHz	Pass	2.47	10.09	21.00	12.56	27.00
2441MHz	Pass	2.47	10.85	21.00	13.32	27.00
2480MHz	Pass	2.47	11.54	21.00	14.01	27.00

DG = Directional Gain; Port X = Port X output power



Conducted Output Power(Average)

Appendix C.2

Summary

Mode	Total Power (dBm)	Power (W)
2.4-2.4835GHz	-	-
BT-BR(1Mbps)	11.65	0.01462
BT-EDR(2Mbps)	9.26	0.00843
BT-EDR(3Mbps)	9.28	0.00847

Result

Mode	Result	Antenna Gain	Total Power	Power Limit	EIRP	EIRP Limit
		(dBi)	(dBm)	(dBm)	(dBm)	(dBm)
BT-BR(1Mbps)	-	-	-	-	-	-
2402MHz	Pass	2.47	10.32	-	12.79	-
2441MHz	Pass	2.47	11.20	-	13.67	-
2480MHz	Pass	2.47	11.65	-	14.12	-
BT-EDR(2Mbps)	-	-	-	-	-	-
2402MHz	Pass	2.47	7.43	-	9.90	-
2441MHz	Pass	2.47	8.16	-	10.63	-
2480MHz	Pass	2.47	9.26	-	11.73	-
BT-EDR(3Mbps)	-	-	-	-	-	-
2402MHz	Pass	2.47	7.43	-	9.90	-
2441MHz	Pass	2.47	8.17	-	10.64	-
2480MHz	Pass	2.47	9.28	-	11.75	-

Note: Average power is for reference only



Number of Hopping Frequency

Appendix D

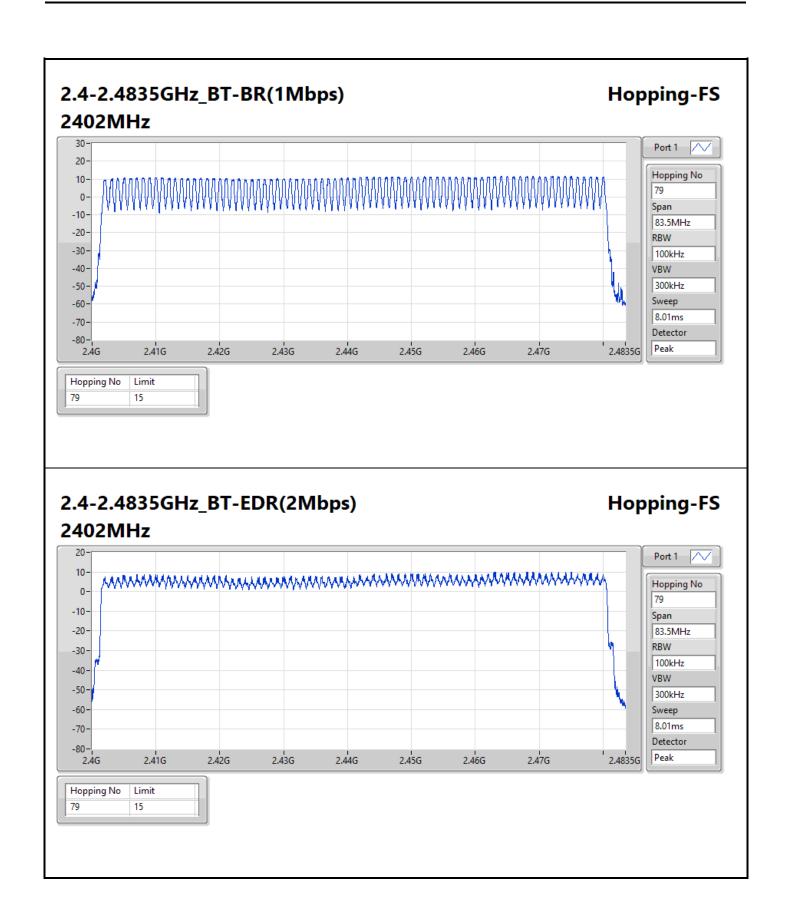
Summary

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

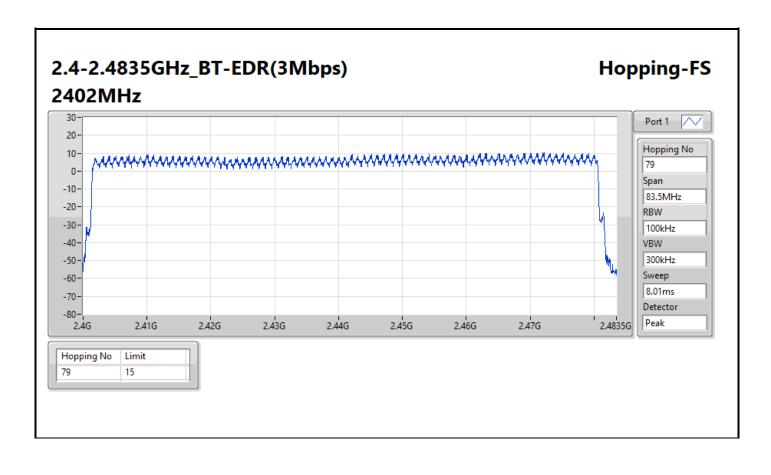
Result

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











20dB and Occupied Bandwidth

Appendix E

Summary

Mode	Max-N dB	Max-OBW	ITU-Code	Min-N dB	Min-OBW
	(Hz)	(Hz)		(Hz)	(Hz)
2.4-2.4835GHz	-	-	-	-	-
BT-BR(1Mbps)	921.25k	837.782k	838KF1D	882.75k	829.59k
BT-EDR(2Mbps)	1.306M	1.184M	1M18G1D	1.279M	1.173M
BT-EDR(3Mbps)	1.262M	1.185M	1M19G1D	1.257M	1.174M

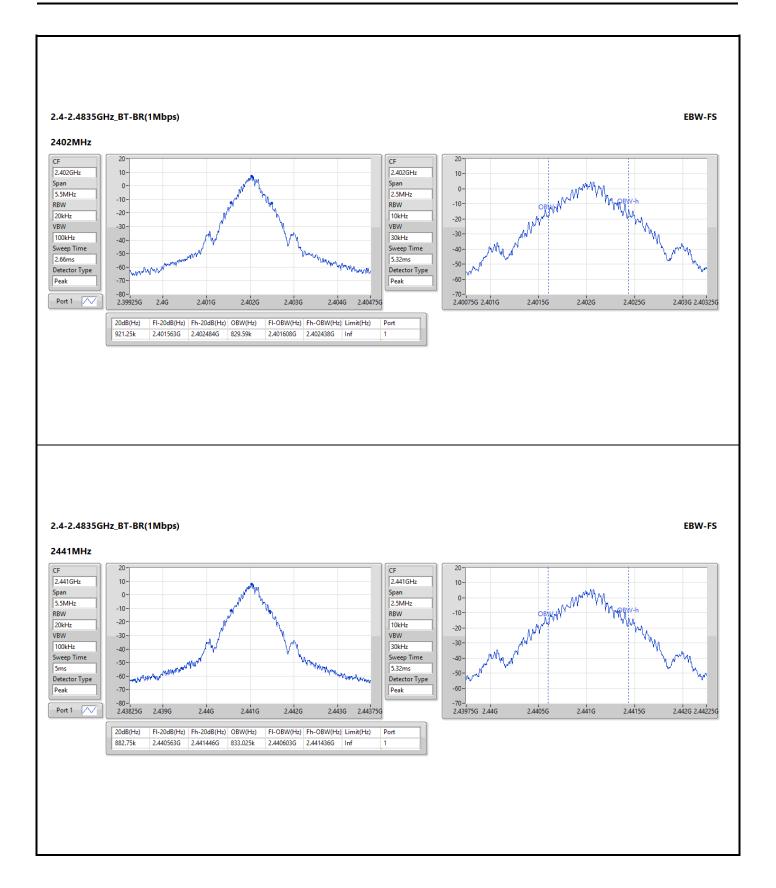
Max-N dB = Maximum 20dB down bandwidth; Max-OBW = Maximum 99% occupied bandwidth; Min-N dB = Minimum 20dB down bandwidth; Min-OBW = Minimum 99% occupied bandwidth

Result

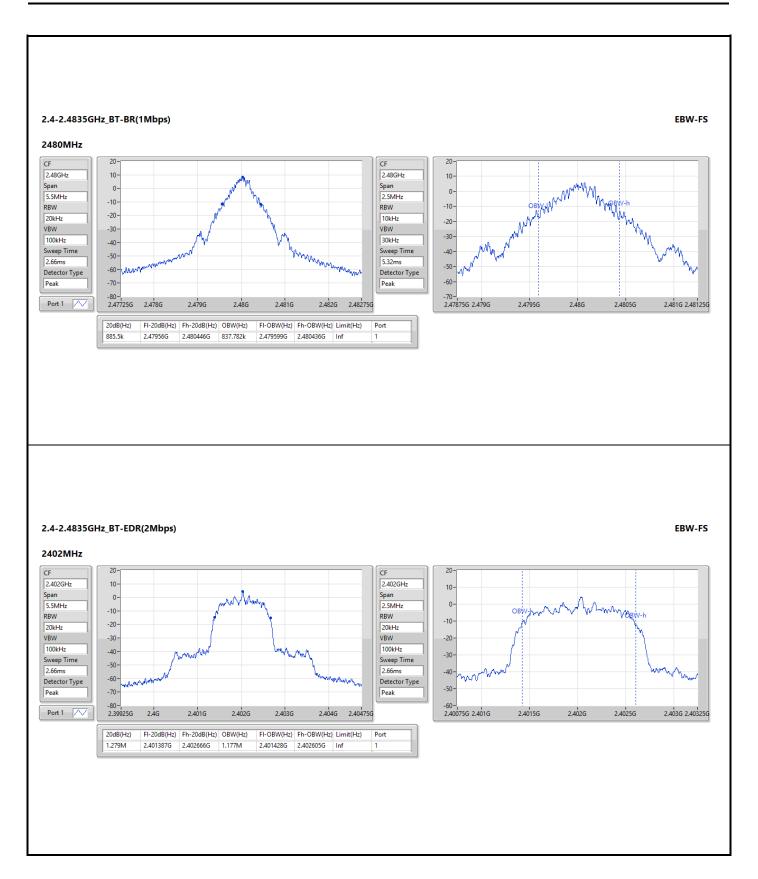
Mode	Result	Limit	Port 1-N dB	Port 1-OBW
		(Hz)	(Hz)	(Hz)
BT-BR(1Mbps)	-	-	-	-
2402MHz	Pass	Inf	921.25k	829.59k
2441MHz	Pass	Inf	882.75k	833.025k
2480MHz	Pass	Inf	885.5k	837.782k
BT-EDR(2Mbps)	-	-	-	-
2402MHz	Pass	Inf	1.279M	1.177M
2441MHz	Pass	Inf	1.284M	1.173M
2480MHz	Pass	Inf	1.306M	1.184M
BT-EDR(3Mbps)	-	-	-	-
2402MHz	Pass	Inf	1.257M	1.174M
2441MHz	Pass	Inf	1.257M	1.174M
2480MHz	Pass	Inf	1.262M	1.185M

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

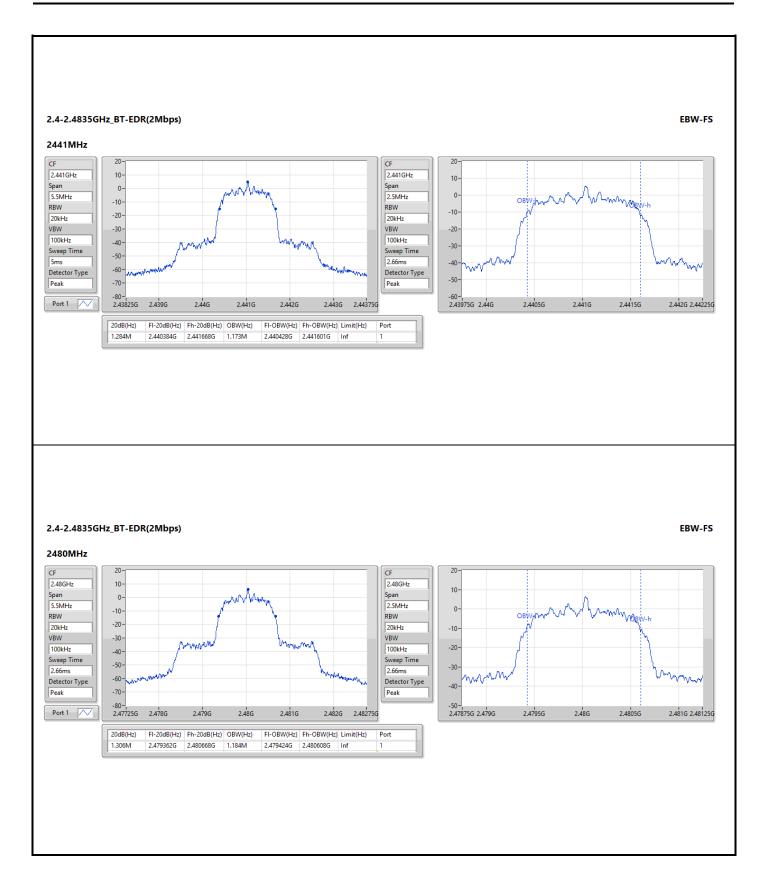




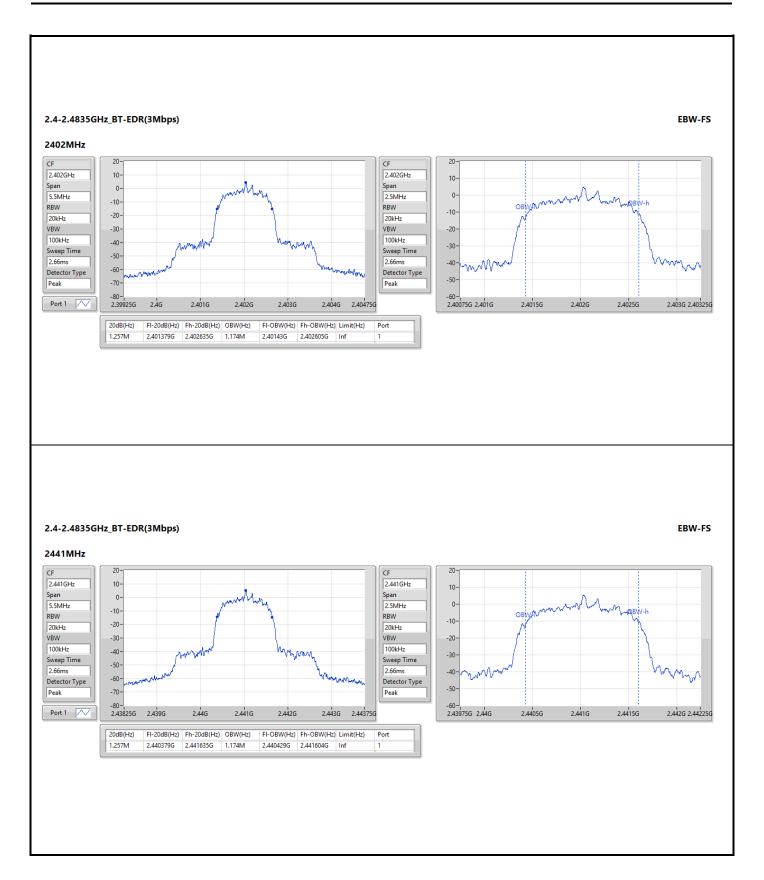




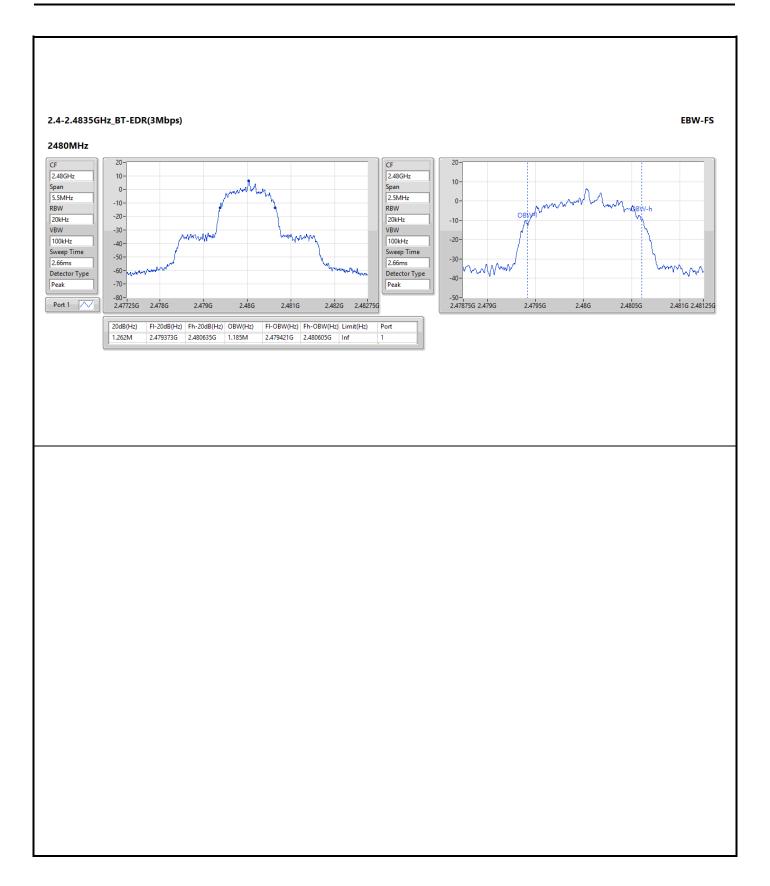














Channel Separation

Appendix F

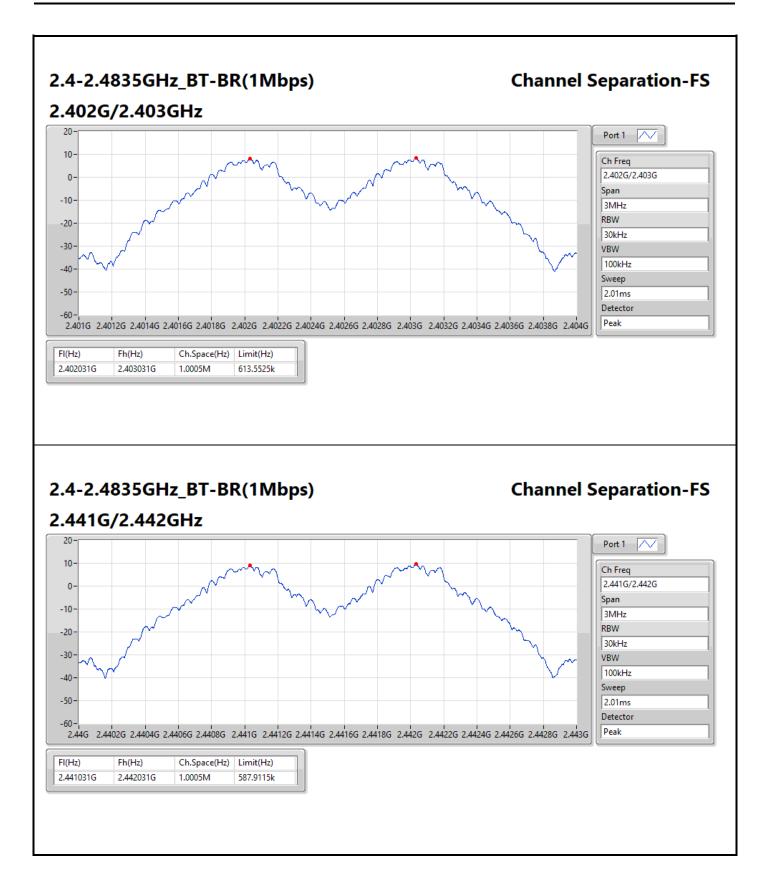
Summary

Mode	Max-Space	Min-Space
	(Hz)	(Hz)
2.4-2.4835GHz	-	-
BT-BR(1Mbps)	1.0005M	1.0005M
BT-EDR(2Mbps)	1.0005M	1.0005M
BT-EDR(3Mbps)	1.002M	1.0005M

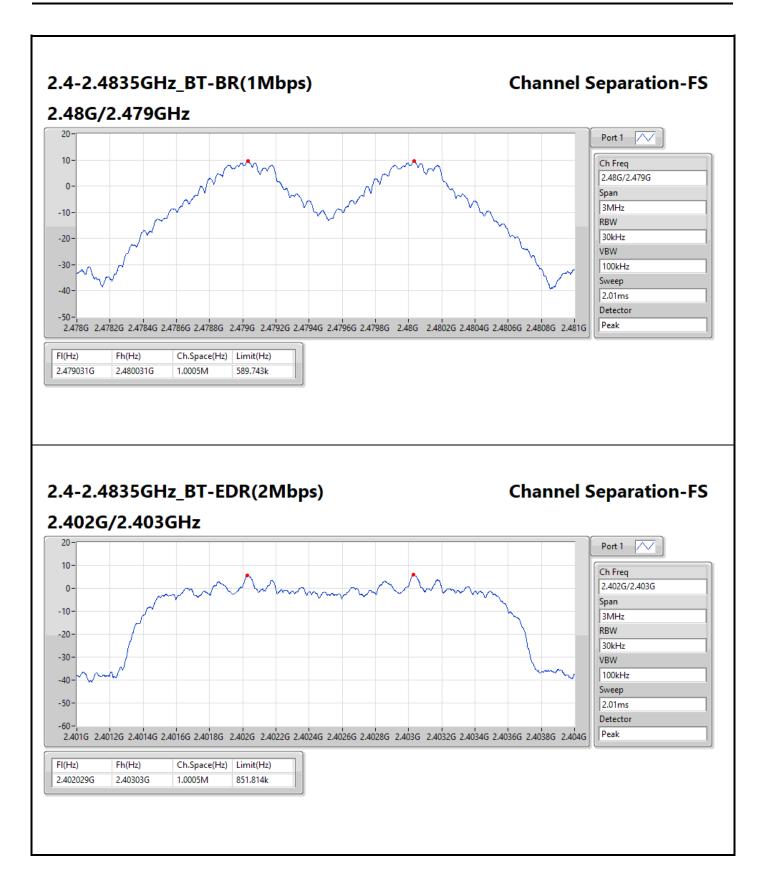
Result

Mode	Result	FI	Fh	Ch.Space	Limit
		(Hz)	(Hz)	(Hz)	(Hz)
BT-BR(1Mbps)	-	-	-	-	-
2402MHz	Pass	2.402031G	2.403031G	1.0005M	613.5525k
2441MHz	Pass	2.441031G	2.442031G	1.0005M	587.9115k
2480MHz	Pass	2.479031G	2.480031G	1.0005M	589.743k
BT-EDR(2Mbps)	-	-	-	-	-
2402MHz	Pass	2.402029G	2.40303G	1.0005M	851.814k
2441MHz	Pass	2.441031G	2.442031G	1.0005M	855.144k
2480MHz	Pass	2.479031G	2.480031G	1.0005M	869.796k
BT-EDR(3Mbps)	-	-	-	-	-
2402MHz	Pass	2.402029G	2.403031G	1.002M	837.162k
2441MHz	Pass	2.441031G	2.442031G	1.0005M	837.162k
2480MHz	Pass	2.479031G	2.480031G	1.0005M	840.492k

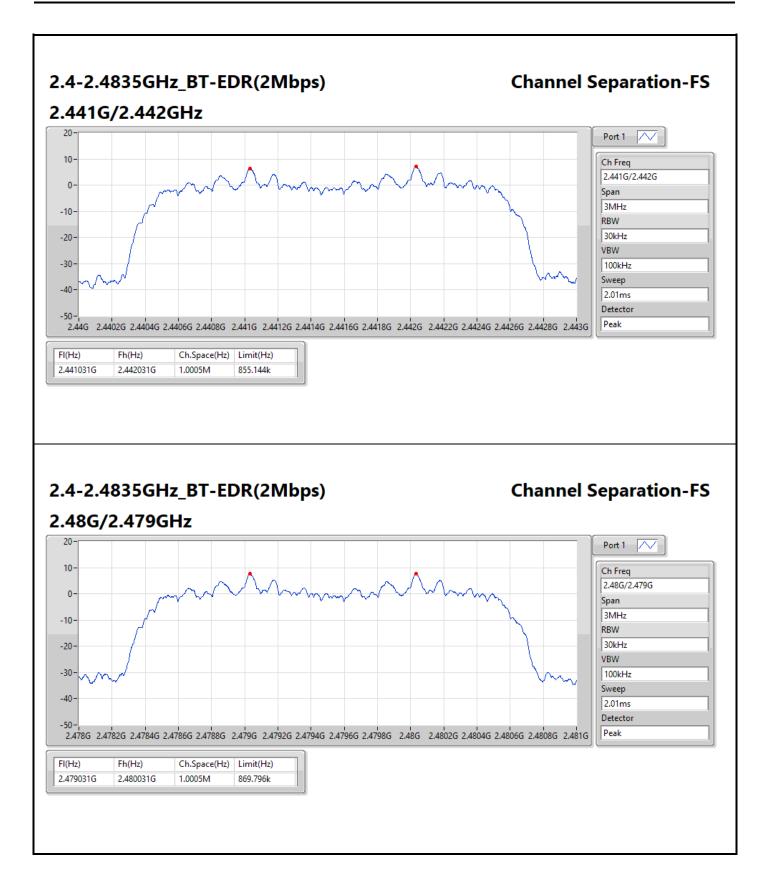




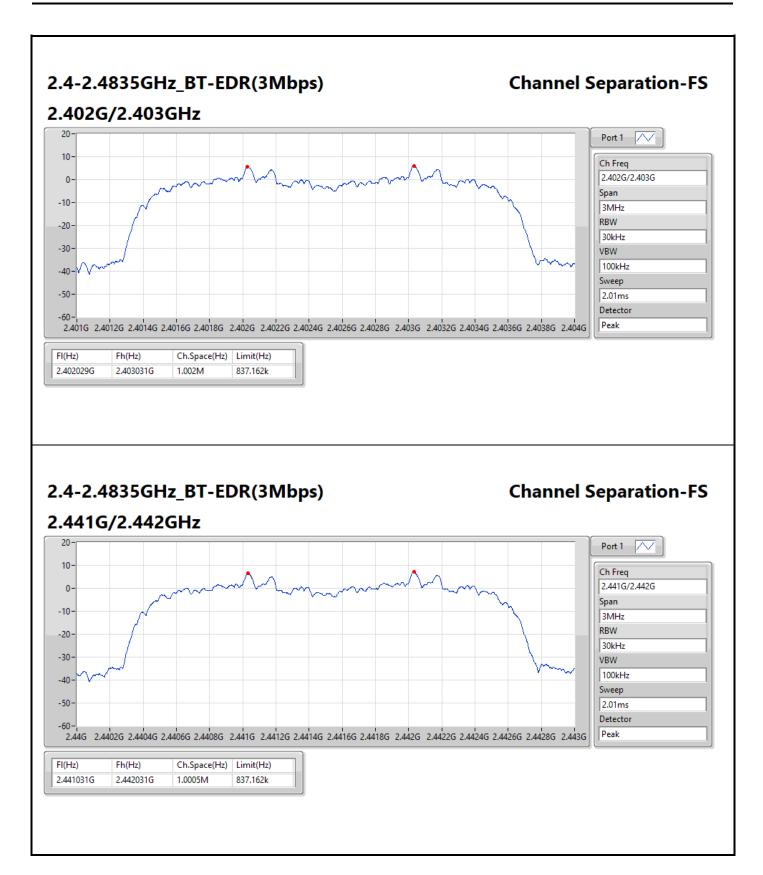




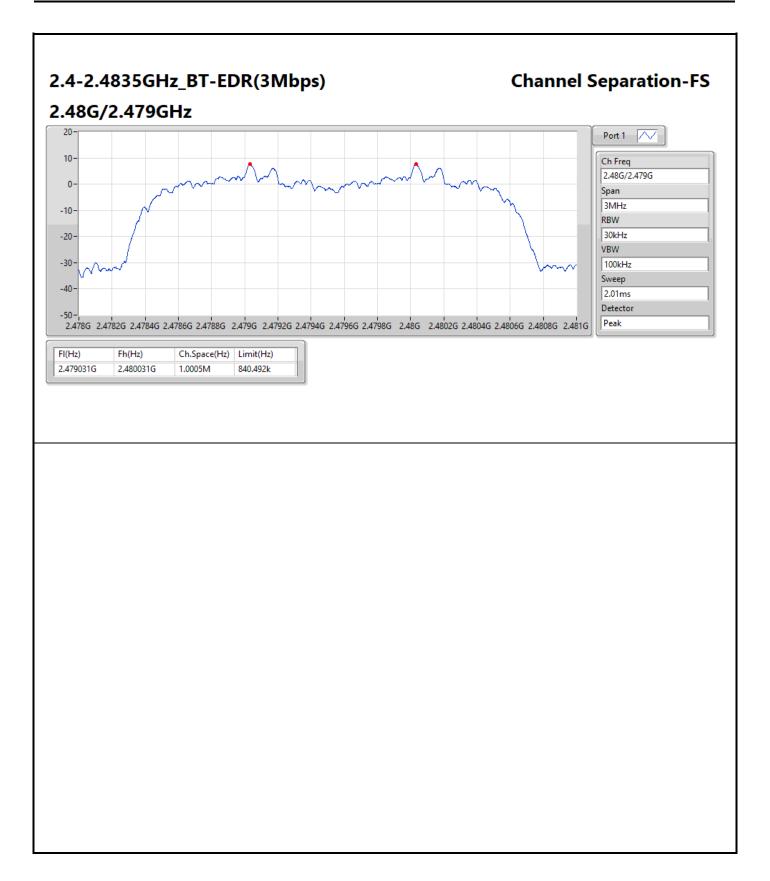
















Summary

Mode	Max-Dwell
	(s)
2.4-2.4835GHz	-
BT-BR(1Mbps)	310.42102m_DH5
BT-BR-AFH(1Mbps)	288.875m_DH5-AFH
BT-EDR(2Mbps)	311.41484m_DH5
BT-EDR-AFH(2Mbps)	314.334m_DH5-AFH
BT-EDR(3Mbps)	349.82306m_DH5
BT-EDR-AFH(3Mbps)	290.1m_DH5-AFH

Result/ Non AFH mode

Mode	Result	Period	Dwell	Limit	Tx On	Number of
		(s)	(s)	(s)	(ms)	transmission in a 5 s
BT-BR(1Mbps)	-	-	-	-	-	-
2402MHz_DH5	PASS	31.6	0.31042	0.4	2.88925	17
BT-EDR(2Mbps)	-	-	-	-	-	-
2402MHz_DH5	PASS	31.6	0.31141	0.4	2.89850	17
BT-EDR(3Mbps)	-	-	-	-	-	-
2402MHz_DH5	PASS	31.6	0.34982	0.4	2.91325	19

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	Dwell	Limit	Tx On	Number of
		(s)	(s)	(s)	(ms)	transmission in a 2 s
BT-BR-AFH(1Mbps)	-	-	-	-	-	-
2402MHz_DH5	PASS	8	0.28888	0.4	2.88875	25
BT-EDR-AFH(2Mbps)	-	-	-	-	-	-
2402MHz_DH5	PASS	8	0.31433	0.4	2.91050	27
BT-EDR-AFH(3Mbps)	-	-	-	-	-	-
2402MHz_DH5	PASS	8	0.29010	0.4	2.90100	25

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

Note 2: DH5 was the worst mode.



