NCC Test Report

Equipment	:	**BPM Connect**
Model No.	:	**WPM05**
Brand Name	:	**Withings**
Applicant	:	**Withings SA**
Address	:	**2 rue Maurice Hartmann 92130 Issy-Les-Moulineaux France**
Standard	:	**LP0002 Section 3.10.1 (2018-01-10)**
Received Date	:	**Apr. 18, 2019**
Tested Date	:	**May 07 ~ May 13, 2019 May 01, 2020**

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

Reviewed by:	**Approved by:**
Along Chen / Assistant Manager	**Gary Chang / Manager**

Testing Laboratory 2732

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Release Record

Report No.	Version	Description	Issued Date
TR941802-01AD	Rev. 01	Initial issue	Jun. 09, 2020

Summary of Test Results

NCC Rules	Test Items	Measured	Result
2.3	Conducted Emissions	[dBuV]: 0.186MHz 51.88 (Margin -12.32dB) - QP	Pass
3.10.1.5 2.8	Radiated Emissions	[dBuV/m at 3m]: 46.49MHz 35.59 (Margin -4.41dB) - PK	Pass
3.10.1.5	Band Edge	Meet the requirement of limit	Pass
3.10.1.2(1)(B)	Conducted Output Power	Power [dBm]: 9.98	Pass
3.10.1.6(1)(A)	Number of Hopping Channels	Meet the requirement of limit	Pass
3.10.1.6(1)(A)	Hopping Channel Separation	Meet the requirement of limit	Pass
3.10.1.6(1)(A)	Dwell Time	Meet the requirement of limit	Pass
3.10.1.4	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 π/4-DQPSK and 8DPSK.				

1.1.2 Antenna Details

Ant. No.	Brand	Model	Type	Connector	Gain (dBi)
1	BROADCOM	BCM9Fractal	PCB	NA	2.8

1.1.3 EUT Operational Condition

Power Supply Type	3.7Vdc from battery Brand: CEL Model: 652265-1000mAh 5Vdc from host

1.1.4 Accessories

N/A

1.1.5 Test Sample Information

MAC ID	1. 00:24:e4:8f:99:8e 2. 00:24:e4:94:94:ba

1.1.6 Channel List

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

1.1.7 Test Tool and Duty Cycle

Test Tool	tera term, V4.101	
Modulation Mode	**Duty Cycle (%)**	**Duty Factor (dB)**
DH5	77.99%	1.08
3DH5	78.29%	1.06

1.1.8 Power Index of Test Tool

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

1.2 Local Support Equipment List

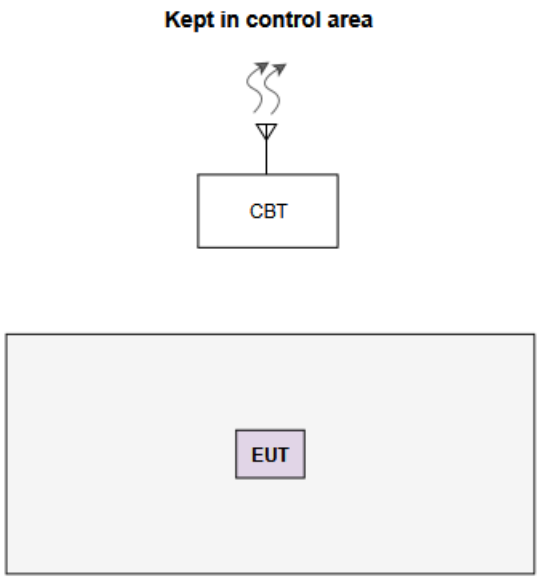
Support Equipment List					
No.	**Equipment**	**Brand**	**Model**	**S/N**	**Remarks**
1	Notebook	DELL	Latitude E6440	JPXMD12	---
2	Adapter	Apple	A1265	AD-02	---
3	USB Cable	ICC	micro to A	01	---
4	Notebook	DELL	Latitude E6440	4NF4Z52	實驗室提供(見備註 1)
5	USB 治具板	FTDI	FT232	---	申請者提供(見備註 2)

備註 1: 本案經申請者切結器材不提供隨貨配件，配件由實驗室提供併同檢驗。

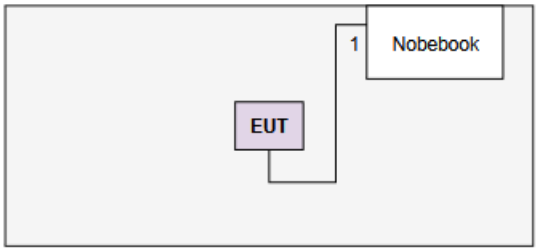
備註 2: 本案經申請者切結器材不提供隨貨配件，配件由申請者提供併同檢驗。

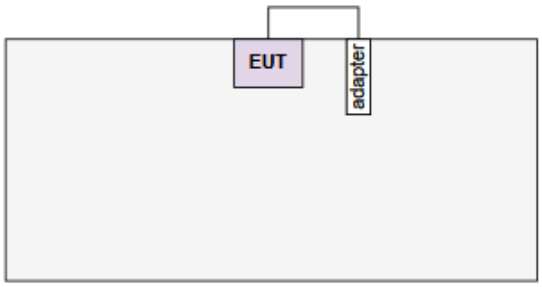
1.3 Test Setup Chart

Test Setup Diagram (Battery mode)



Note: The support notebook is connected to fixture by console cable and is disconnected from EUT and removed from test table after sending command to link EUT to CBT.

Test Setup Diagram (Charger mode)	
	
No.	**Signal cable / Length (m)**
1	USB, 1m shielded.

Test Setup Diagram (Charger mode with adapter)	
	
No.	**Signal cable / Length (m)**
1	USB, 1m shielded.

1.4 The Equipment List

Tested Date: May 07 ~ May 13, 2019

Test Item	Conducted Emission				
Test Site	Conduction room 1 / (CO01-WS)				
Tested Date	May 13, 2019				
Instrument	**Manufacturer**	**Model No.**	**Serial No.**	**Calibration Date**	**Calibration Until**
Receiver	R&S	ESR3	101657	Jan. 08, 2019	Jan. 07, 2020
LISN	SCHWARZBECK	Schwarzbeck 8127	8127-667	Nov. 05, 2018	Nov. 04, 2019
RF Cable-CON	Woken	CFD200-NL	CFD200-NL-001	Oct. 23, 2018	Oct. 23, 2019
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	May 07, 2019				
Instrument	**Manufacturer**	**Model No.**	**Serial No.**	**Calibration Date**	**Calibration Until**
Spectrum Analyzer	R&S	FSV40	101498	Dec. 27, 2018	Dec. 26, 2019
Receiver	R&S	ESR3	101658	Dec. 11, 2018	Dec. 10, 2019
Bilog Antenna	SCHWARZBECK	VULB9168	VULB9168-522	Jul. 18, 2018	Jul. 17, 2019
Horn Antenna 1G-18G	SCHWARZBECK	BBHA 9120 D	BBHA 9120 D 1096	Dec. 18, 2018	Dec. 17, 2019
Horn Antenna 18G-40G	SCHWARZBECK	BBHA 9170	BBHA 9170517	Nov. 15, 2018	Nov. 14, 2019
Loop Antenna	R&S	HFH2-Z2	100330	Nov. 09, 2018	Nov. 08, 2019
Loop Antenna Cable	KOAX KABEL	101354-BW	101354-BW	Oct. 08, 2018	Oct. 07, 2019
Preamplifier	EMC	EMC02325	980225	Jul. 20, 2018	Jul. 19, 2019
Preamplifier	Agilent	83017A	MY39501308	Oct. 04, 2018	Oct. 03, 2019
Preamplifier	EMC	EMC184045B	980192	Aug. 09, 2018	Aug. 08, 2019
RF Cable	EMC	EMC104-SM-SM-8000	181106	Oct. 08, 2018	Oct. 07, 2019
RF Cable	HUBER+SUHNER	SUCOFLEX104	MY16019/4	Oct. 08, 2018	Oct. 07, 2019
RF Cable	HUBER+SUHNER	SUCOFLEX104	MY16014/4	Oct. 08, 2018	Oct. 07, 2019
LF cable 1M	EMC	EMCCFD400-NM-NM-1000	160502	Oct. 08, 2018	Oct. 07, 2019
LF cable 3M	Woken	CFD400NL-LW	CFD400NL-001	Oct. 08, 2018	Oct. 07, 2019
LF cable 10M	Woken	CFD400NL-LW	CFD400NL-002	Oct. 08, 2018	Oct. 07, 2019
Measurement Software	SENSE-15247_DTS	V5.10	NA	NA	NA
Note: Calibration Interval of instruments listed above is one year.					

Test Item	RF Conducted				
Test Site	(TH01-WS)				
Tested Date	May 09, 2019				
Instrument	**Manufacturer**	**Model No.**	**Serial No.**	**Calibration Date**	**Calibration Until**
Spectrum Analyzer	R&S	FSV40	101063	Apr. 17, 2019	Apr. 16, 2020
Power Meter	Anritsu	ML2495A	1241002	Oct. 09, 2018	Oct. 08, 2019
Power Sensor	Anritsu	MA2411B	1207366	Oct. 09, 2018	Oct. 08, 2019
Bluetooth Tester	R&S	CBT	100959	Sep. 24, 2018	Sep. 23, 2019
DC POWER SOURCE	GW INSTEK	GPC-6030D	EM892433	Oct. 25, 2018	Oct. 24, 2019
Measurement Software	Sporton	Sporton_1	1.3.30	NA	NA
Note: Calibration Interval of instruments listed above is one year.					

Tested Date: May 01, 2020

Test Item	Conducted Emission				
Test Site	Conduction room 1 / (CO01-WS)				
Tested Date	May 01, 2020				
Instrument	**Manufacturer**	**Model No.**	**Serial No.**	**Calibration Date**	**Calibration Until**
Receiver	R&S	ESR3	101658	Dec. 12, 2019	Dec. 11, 2020
LISN	R&S	ENV216	101579	Mar. 12, 2020	Mar. 11, 2021
RF Cable-CON	Woken	CFD200-NL	CFD200-NL-001	Oct. 22, 2019	Oct. 21, 2020
Measurement Software	AUDIX	e3	6.120210k	NA	NA
Note: Calibration Interval of instruments listed above is one year.					

1.5 Test Standards

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

LP0002 Section 3.10.1 (2018-01-10)
ANSI C63.10-2013
ANSI C63.4-2014
FCC KDB 558074 D01 15.247 Meas Guidance v05r02

1.6 Deviation from Test Standard and Measurement Procedure

None

1.7 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 ≤ 1GHz	±3.41 dB
Radiated emission > 1GHz	±4.59 dB

2 Test Configuration

2.1 Testing Condition

Test Item	Test Site	Ambient Condition	Tested By
AC Conduction	CO01-WS	24-25°C / 62-65%	Alex Tsai
Radiated Emissions	03CH01-WS	22°C / 62%	Akun Chung
RF Conducted	TH01-WS	20°C / 66%	Aska Huang

- 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	Mode
Conducted Emissions	GFSK	2480	1Mbps	2, 3	TX
Radiated Emissions ≤ 1GHz	GFSK	2480	1Mbps	1, 2	TX
Radiated Emissions > 1GHz	GFSK 8DPSK	2402, 2441, 2480 2402, 2441, 2480	1Mbps 3Mbps	1	TX
Conducted Output Power	GFSK π/4 DQPSK 8DPSK	2402, 2441, 2480 2402, 2441, 2480 2402, 2441, 2480	1Mbps 2Mbps 3Mbps	1	TX
Number of Hopping Channels	GFSK π/4 DQPSK 8DPSK	2402~2480 2402~2480 2402~2480	1Mbps 2Mbps 3Mbps	1	TX
Hopping Channel Separation 20dB and Occupied bandwidth	GFSK π/4 DQPSK 8DPSK	2402, 2441, 2480 2402, 2441, 2480 2402, 2441, 2480	1Mbps 2Mbps 3Mbps	1	TX
Dwell Time	GFSK π/4 DQPSK 8DPSK	2441 2441 2441	1Mbps 2Mbps 3Mbps	1	TX
Conducted Emissions	GFSK	2480	1Mbps	2, 3	RX
Radiated Emissions ≤ 1GHz	GFSK	2480	1Mbps	1, 2	RX
Radiated Emissions ≤ 1GHz	GFSK	2480	1Mbps	1	RX

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. Test configurations are listed as below:
   1) Test Configuration 1: Battery mode
   2) Test Configuration 2: Charger mode with notebook
   3) Test Configuration 3: Charger mode with adapter
3. Charge mode 2 & mode 3 had been cover during the pre-test in radiation emission below 1GHz test and found that mode 2 had the worst emission value and was selected for final test.

3 Transmitter Test Results

3.1 Conducted Emissions

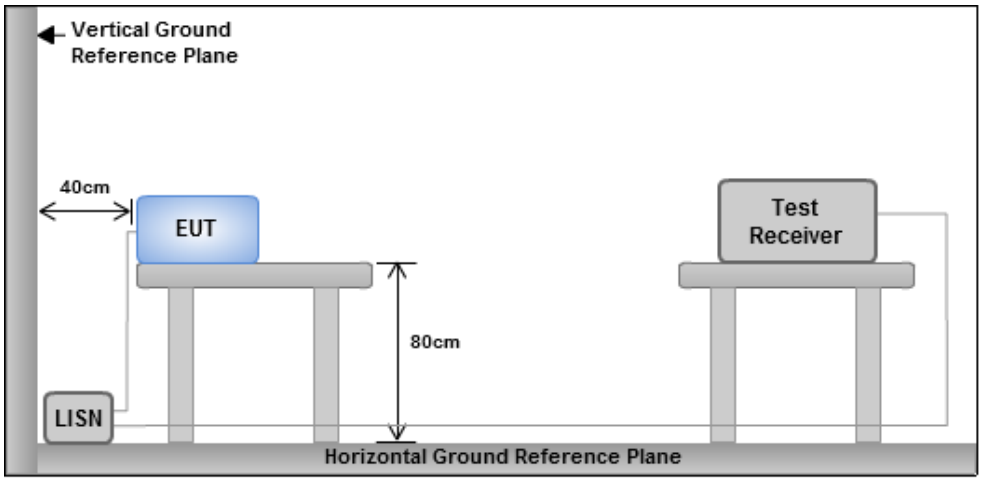
3.1.1 Limit of Conducted Emissions

Conducted Emissions Limit		
Frequency Emission (MHz)	**Quasi-Peak**	**Average**
0.15-0.5	66 - 56 *	56 - 46 *
0.5-5	56	46
5-30	60	50
Note 1: * Decreases with the logarithm of the frequency.		

3.1.2 Test Procedures

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

3.1.3 Test Setup

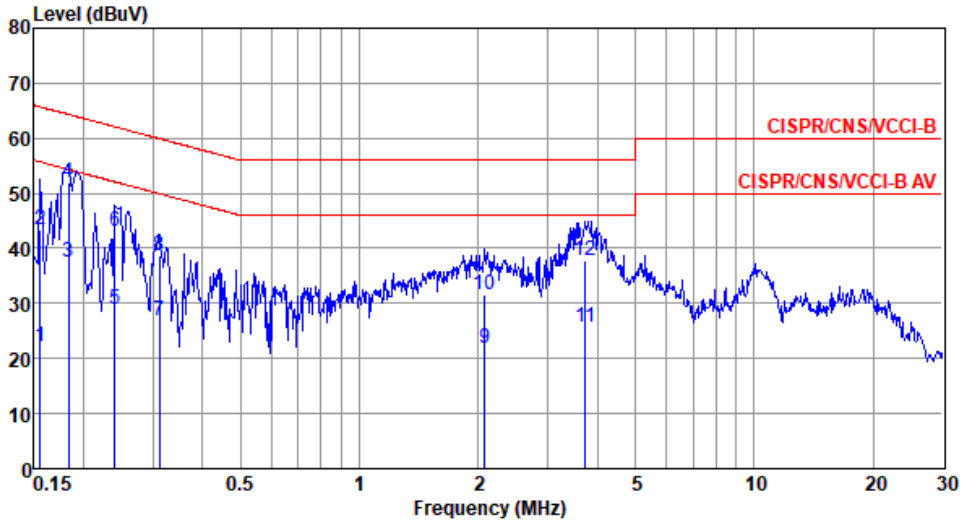


Note: 1. Support units were connected to second LISN.
2. Both of LISNs (AMN) are 80 cm from EUT and at least 80 cm from other units and other metal planes

Test Configuration 2: Charger mode with notebook

3.1.4 Test Result of Conducted Emissions

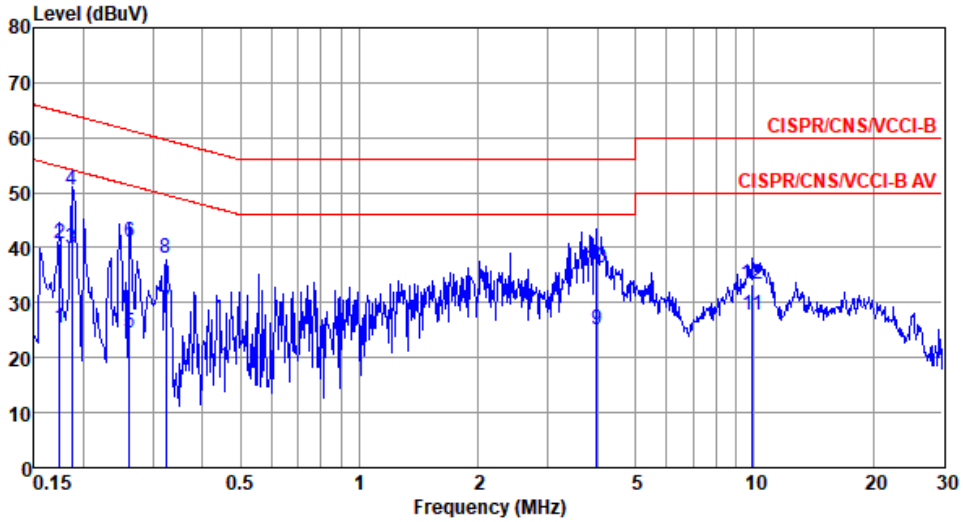
Modulation Mode	GFSK	Test Freq. (MHz)	2480
Power Phase	Line		



	Freq MHz	Level dBuV	Limit Line dBuV	Over Limit dB	Read Level dBuV	LISN factor dB	cable loss dB	Remark
1	0.156	22.15	55.69	-33.54	12.57	9.53	0.05	Average
2	0.156	43.39	65.69	-22.30	33.81	9.53	0.05	QP
3	0.183	37.49	54.33	-16.84	27.89	9.54	0.06	Average
4*	0.183	51.98	64.33	-12.35	42.38	9.54	0.06	QP
5	0.240	28.95	52.08	-23.13	19.33	9.55	0.07	Average
6	0.240	43.23	62.08	-18.85	33.61	9.55	0.07	QP
7	0.312	26.98	49.93	-22.95	17.34	9.56	0.08	Average
8	0.312	38.77	59.93	-21.16	29.13	9.56	0.08	QP
9	2.077	21.96	46.00	-24.04	12.19	9.60	0.17	Average
10	2.077	31.58	56.00	-24.42	21.81	9.60	0.17	QP
11	3.740	25.56	46.00	-20.44	15.68	9.61	0.27	Average
12	3.740	37.75	56.00	-18.25	27.87	9.61	0.27	QP

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

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



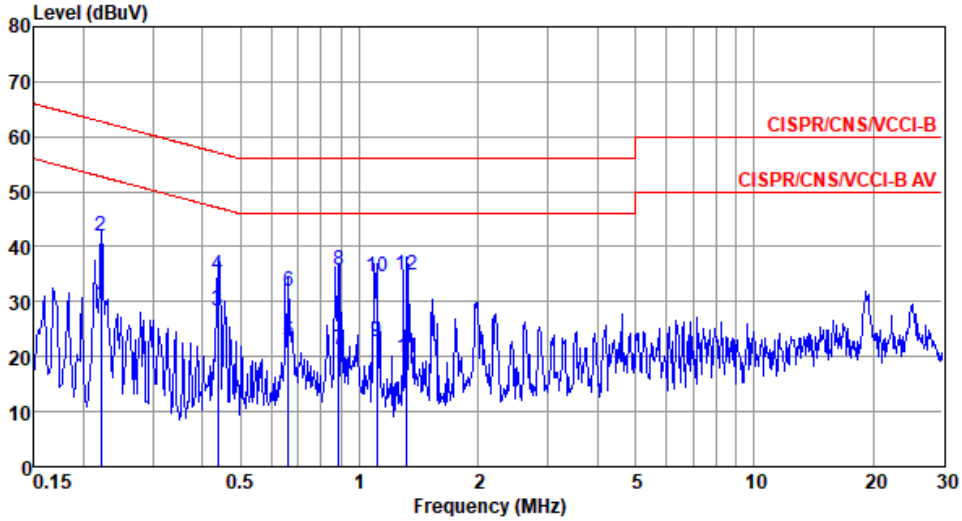
	Freq MHz	Level dBuV	Limit Line dBuV	Over Limit dB	Read Level dBuV	LISN factor dB	cable loss dB	Remark
1	0.174	25.46	54.77	-29.31	15.82	9.58	0.06	Average
2	0.174	40.73	64.77	-24.04	31.09	9.58	0.06	QP
3	0.186	39.71	54.20	-14.49	30.06	9.58	0.07	Average
4*	0.186	50.56	64.20	-13.64	40.91	9.58	0.07	QP
5	0.262	24.47	51.38	-26.91	14.81	9.59	0.07	Average
6	0.262	40.97	61.38	-20.41	31.31	9.59	0.07	QP
7	0.323	28.71	49.62	-20.91	19.03	9.60	0.08	Average
8	0.323	37.96	59.62	-21.66	28.28	9.60	0.08	QP
9	3.985	25.22	46.00	-20.78	15.28	9.66	0.28	Average
10	3.985	36.22	56.00	-19.78	26.28	9.66	0.28	QP
11	9.913	27.72	50.00	-22.28	17.57	9.71	0.44	Average
12	9.913	33.32	60.00	-26.68	23.17	9.71	0.44	QP

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

Test Configuration 3: Charger mode with adapter

3.1.5 Test Result of Conducted Emissions

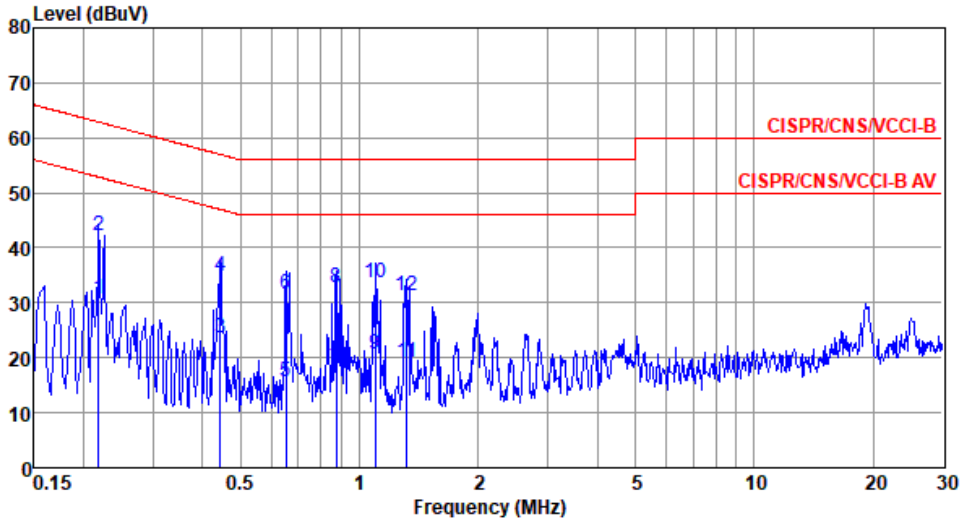
Modulation Mode	GFSK	**Test Freq. (MHz)**	2480
Power Phase	Line		



	Freq MHz	Level dBuV	Limit Line dBuV	Over Limit dB	Read Level dBuV	LISN factor dB	cable loss dB	Remark
1	0.222	29.55	52.74	-23.19	19.66	9.63	0.06	Average
2	0.222	41.80	62.74	-20.94	31.91	9.63	0.06	QP
3*	0.437	28.28	47.11	-18.83	18.31	9.63	0.08	Average
4	0.437	34.76	57.11	-22.35	24.79	9.63	0.08	QP
5	0.661	22.71	46.00	-23.29	12.69	9.63	0.10	Average
6	0.661	31.94	56.00	-24.06	21.92	9.63	0.10	QP
7	0.885	21.27	46.00	-24.73	11.22	9.63	0.11	Average
8	0.885	35.63	56.00	-20.37	25.58	9.63	0.11	QP
9	1.106	22.73	46.00	-23.27	12.65	9.63	0.13	Average
10	1.106	34.51	56.00	-21.49	24.43	9.63	0.13	QP
11	1.317	19.90	46.00	-26.10	9.80	9.63	0.14	Average
12	1.317	34.73	56.00	-21.27	24.63	9.63	0.14	QP

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

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



	Freq MHz	Level dBuV	Limit Line dBuV	Over Limit dB	Read Level dBuV	LISN factor dB	cable loss dB	Remark
1	0.219	30.60	52.88	-22.28	20.74	9.65	0.06	Average
2*	0.219	42.21	62.88	-20.67	32.35	9.65	0.06	QP
3	0.444	23.51	46.98	-23.47	13.61	9.65	0.08	Average
4	0.444	34.85	56.98	-22.13	24.95	9.65	0.08	QP
5	0.651	15.59	46.00	-30.41	5.65	9.65	0.10	Average
6	0.651	31.49	56.00	-24.51	21.55	9.65	0.10	QP
7	0.876	18.09	46.00	-27.91	8.13	9.65	0.11	Average
8	0.876	32.78	56.00	-23.22	22.82	9.65	0.11	QP
9	1.094	20.59	46.00	-25.41	10.60	9.65	0.13	Average
10	1.094	33.69	56.00	-22.31	23.70	9.65	0.13	QP
11	1.317	19.14	46.00	-26.86	9.13	9.65	0.14	Average
12	1.317	31.26	56.00	-24.74	21.25	9.65	0.14	QP

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

3.2 Unwanted Emissions into Restricted Frequency Bands

3.2.1 Limit of Unwanted Emissions into Restricted Frequency Bands

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

Note 1:
Qusai-Peak value is measured for frequency below 1GHz except for 9–90 kHz, 110–490 kHz frequency band. Peak and average value are measured for frequency above 1GHz. The limit on average radio frequency emission is as above table. The limit on peak radio frequency emissions is 20 dB above the maximum permitted average emission limit
Note 2:
Measurements may be performed at a distance other than what is specified provided. When performing measurements at a distance other than that specified, the results shall be extrapolated to the specified distance using an extrapolation factor as below, Frequency at or above 30 MHz: 20 dB/decade Frequency below 30 MHz: 40 dB/decade.

3.2.2 Test Procedures

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

Note:

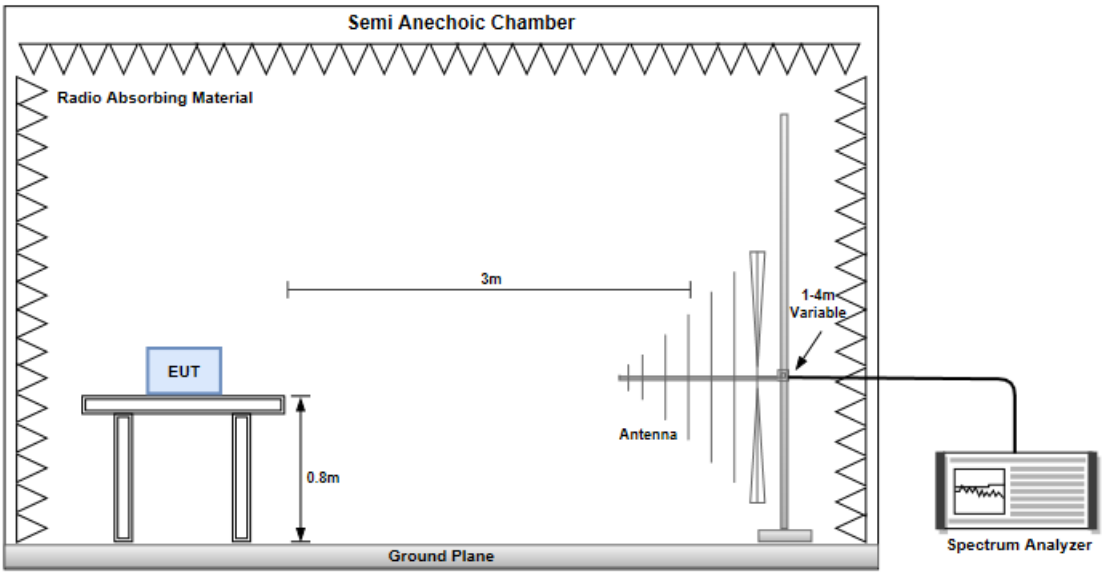
1. 120kHz measurement bandwidth of test receiver and Quasi-peak detector is for radiated emission below 1GHz.
2. Radiated emission above 1GHz / Peak value
   RBW=1MHz, VBW=3MHz and Peak detector
3. Radiated emission above 1GHz / Average value for harmonics
   The average value is: Average = Peak value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

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

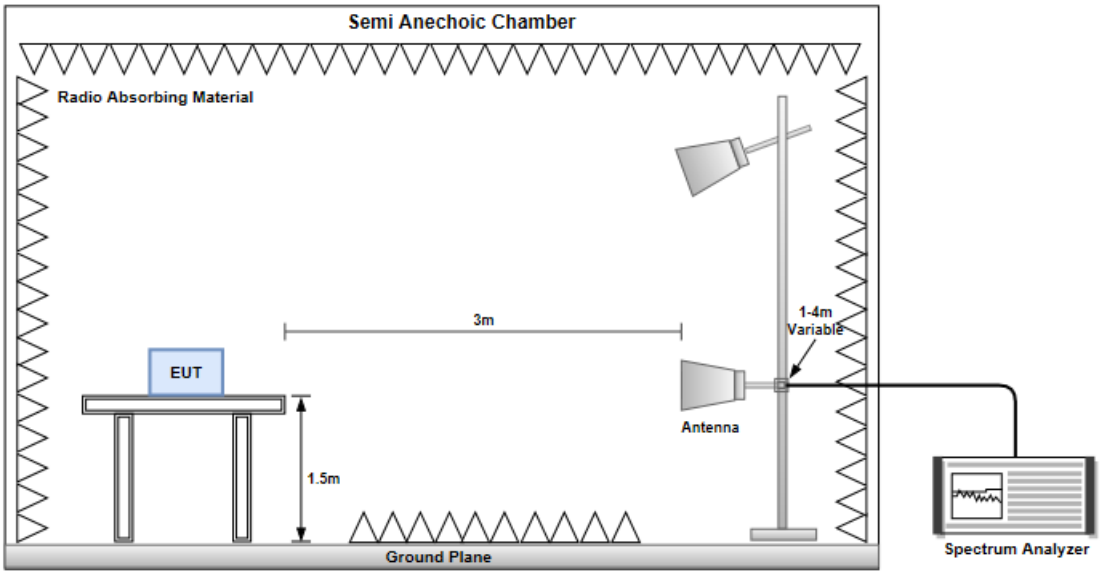
4. Radiated emission above 1GHz / Average value for other emissions
   RBW=1MHz, VBW=1/T and Peak detector

3.2.3 Test Setup

Radiated Emissions below 1 GHz



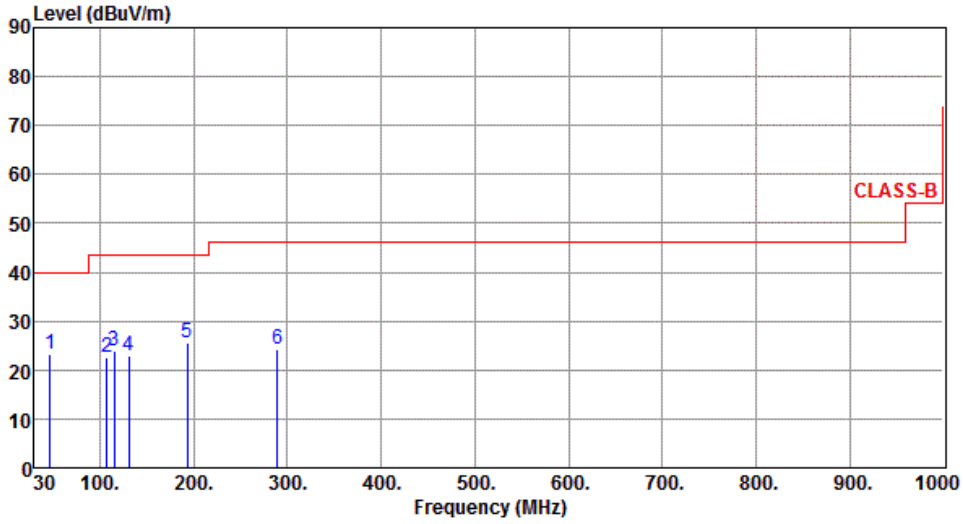
Radiated Emissions above 1 GHz



Test Configuration 1: Battery mode

3.2.4 Transmitter Radiated Unwanted Emissions (Below 1GHz)

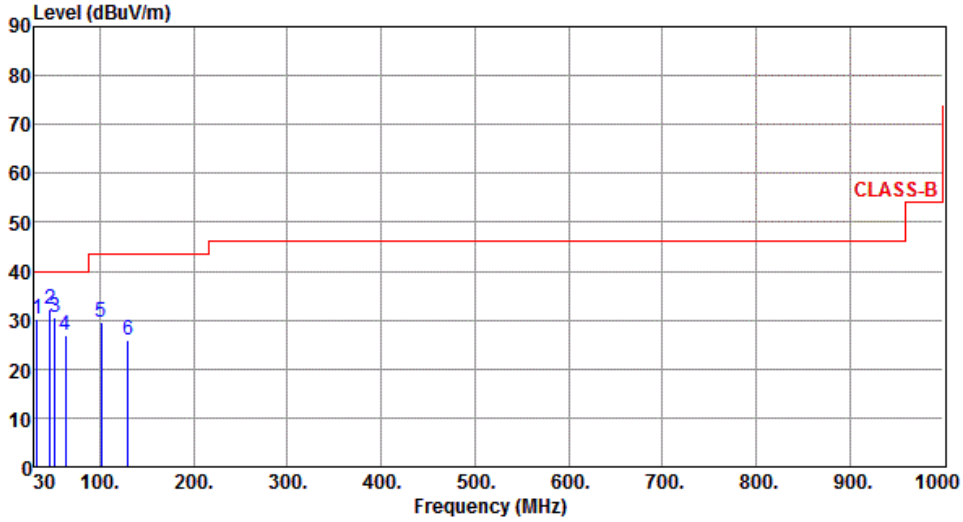
Modulation	GFSK	**Test Freq. (MHz)**	2480
Polarization	Horizontal		



	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
1	46.49	23.24	40.00	-16.76	31.02	-7.78	Peak	---	---
2	107.60	22.62	43.50	-20.88	34.41	-11.79	Peak	---	---
3	115.36	24.03	43.50	-19.47	35.02	-10.99	Peak	---	---
4	130.88	23.08	43.50	-20.42	32.49	-9.41	Peak	---	---
5	192.96	25.52	43.50	-17.98	36.14	-10.62	Peak	---	---
6	288.99	24.10	46.00	-21.90	32.14	-8.04	Peak	---	---

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

Modulation	GFSK	Test Freq. (MHz)	2480
Polarization	Vertical		

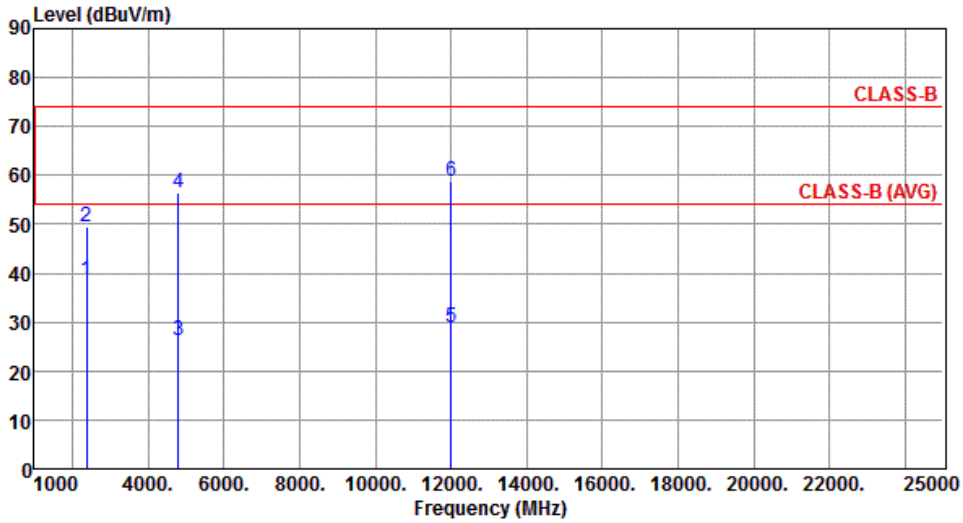


	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
1	32.91	30.06	40.00	-9.94	38.82	-8.76	Peak	---	---
2	46.49	32.34	40.00	-7.66	40.12	-7.78	Peak	---	---
3	52.31	30.47	40.00	-9.53	38.36	-7.89	Peak	---	---
4	62.98	26.95	40.00	-13.05	36.15	-9.20	Peak	---	---
5	101.78	29.67	43.50	-13.83	42.27	-12.60	Peak	---	---
6	129.91	26.02	43.50	-17.48	35.62	-9.60	Peak	---	---

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

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

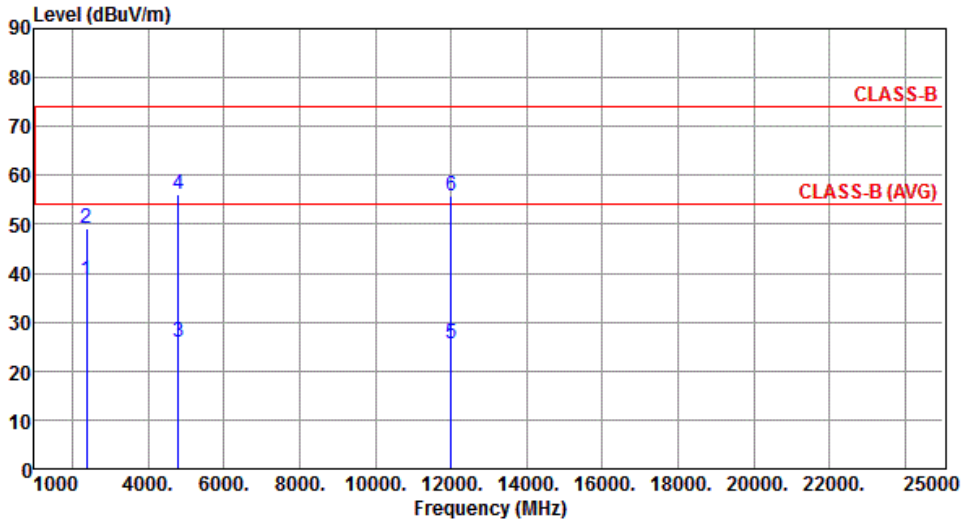
Modulation	GFSK	**Test Freq. (MHz)**	2402
Polarization	Horizontal		



	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
1	2390.00	38.51	54.00	-15.49	41.58	-3.07	Average	100	134
2	2390.00	49.32	74.00	-24.68	52.39	-3.07	Peak	100	134
3	4804.00	26.29	54.00	-27.71	22.79	3.50	Average	100	192
4	4804.00	56.39	74.00	-17.61	52.89	3.50	Peak	100	192
5	12010.00	28.79	54.00	-25.21	15.53	13.26	Average	100	198
6	12010.00	58.89	74.00	-15.11	45.63	13.26	Peak	100	198

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

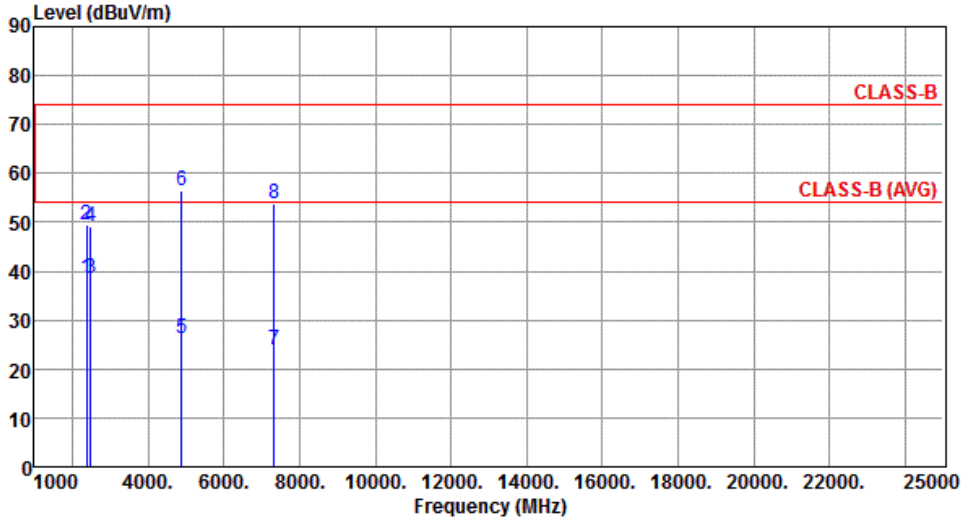
Modulation	GFSK	Test Freq. (MHz)	2402
Polarization	Vertical		



	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
1	2390.00	38.51	54.00	-15.49	41.58	-3.07	Average	301	177
2	2390.00	49.26	74.00	-24.74	52.33	-3.07	Peak	301	177
3	4804.00	26.07	54.00	-27.93	22.57	3.50	Average	152	256
4	4804.00	56.17	74.00	-17.83	52.67	3.50	Peak	152	256
5	12010.00	25.55	54.00	-28.45	12.29	13.26	Average	100	24
6	12010.00	55.65	74.00	-18.35	42.39	13.26	Peak	100	24

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

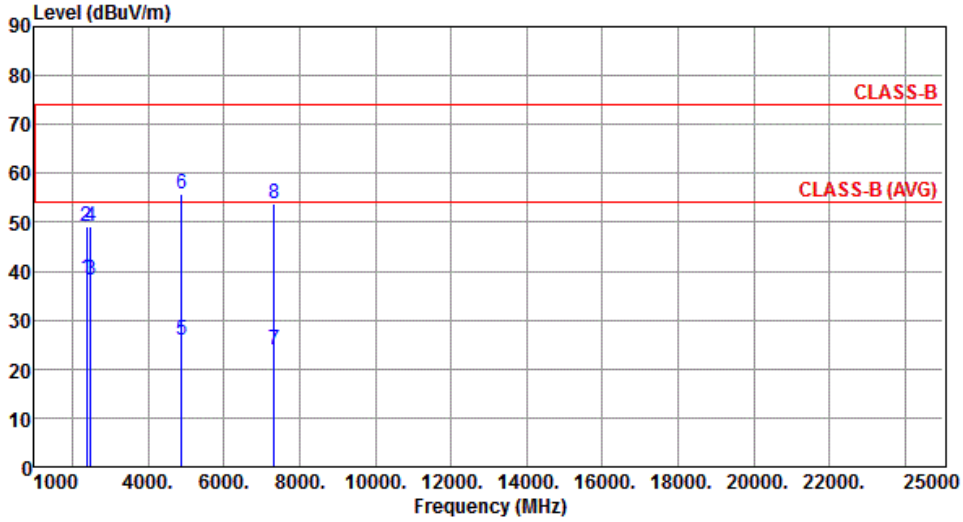
Modulation	GFSK	Test Freq. (MHz)	2441
Polarization	Horizontal		



	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
1	2390.00	38.51	54.00	-15.49	41.58	-3.07	Average	100	125
2	2390.00	49.32	74.00	-24.68	52.39	-3.07	Peak	100	125
3	2483.50	38.63	54.00	-15.37	41.85	-3.22	Average	100	125
4	2483.50	49.25	74.00	-24.75	52.47	-3.22	Peak	100	125
5	4882.00	26.20	54.00	-27.80	22.59	3.61	Average	100	198
6	4882.00	56.30	74.00	-17.70	52.69	3.61	Peak	100	198
7	7323.00	23.85	54.00	-30.15	15.06	8.79	Average	100	197
8	7323.00	53.95	74.00	-20.05	45.16	8.79	Peak	100	197

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

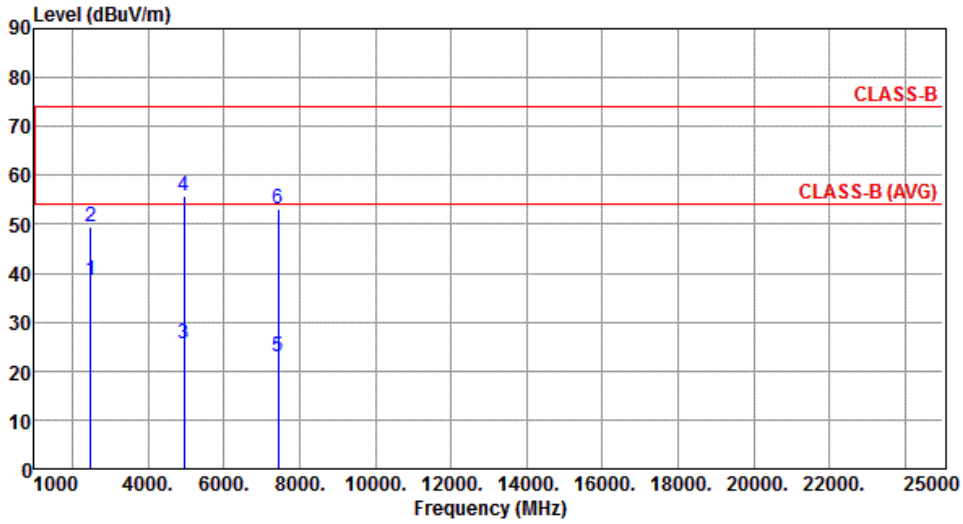
Modulation	GFSK	Test Freq. (MHz)	2441
Polarization	Vertical		



	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
1	2390.00	38.51	54.00	-15.49	41.58	-3.07	Average	301	178
2	2390.00	49.10	74.00	-24.90	52.17	-3.07	Peak	301	178
3	2483.50	38.36	54.00	-15.64	41.58	-3.22	Average	301	178
4	2483.50	49.16	74.00	-24.84	52.38	-3.22	Peak	301	178
5	4882.00	25.78	54.00	-28.22	22.17	3.61	Average	100	96
6	4882.00	55.88	74.00	-18.12	52.27	3.61	Peak	100	96
7	7323.00	23.75	54.00	-30.25	14.96	8.79	Average	154	251
8	7323.00	53.85	74.00	-20.15	45.06	8.79	Peak	154	251

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

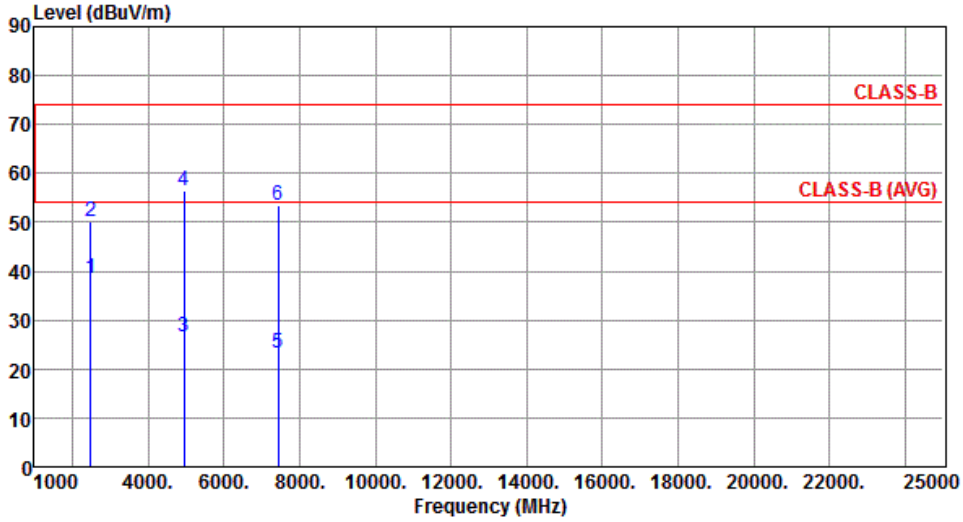
Modulation	GFSK	Test Freq. (MHz)	2480
Polarization	Horizontal		



	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
1	2483.50	38.59	54.00	-15.41	41.81	-3.22	Average	100	121
2	2483.50	49.35	74.00	-24.65	52.57	-3.22	Peak	100	121
3	4960.00	25.65	54.00	-28.35	21.79	3.86	Average	100	185
4	4960.00	55.75	74.00	-18.25	51.89	3.86	Peak	100	185
5	7440.00	23.00	54.00	-31.00	14.46	8.54	Average	100	190
6	7440.00	53.10	74.00	-20.90	44.56	8.54	Peak	100	190

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

Modulation	GFSK	Test Freq. (MHz)	2480
Polarization	Vertical		

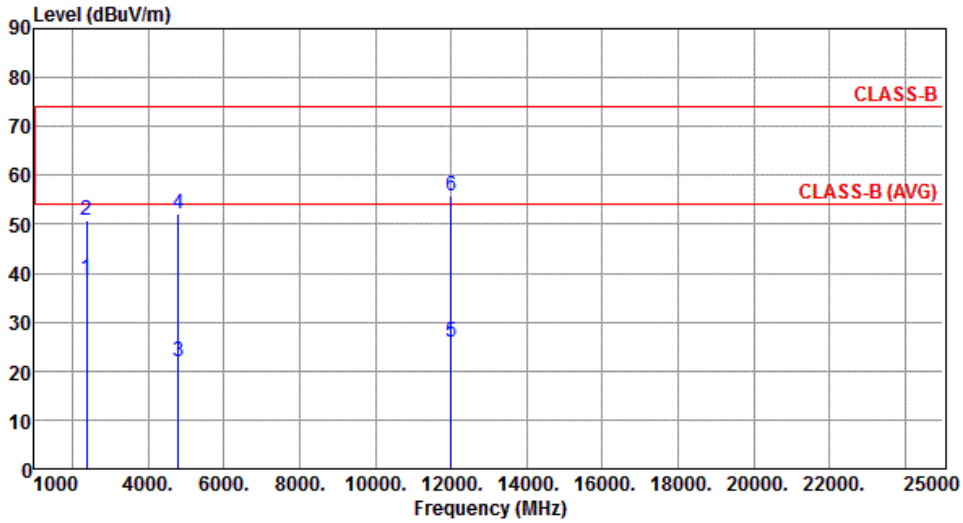


	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
1	2483.50	38.63	54.00	-15.37	41.85	-3.22	Average	308	176
2	2483.50	50.24	74.00	-23.76	53.46	-3.22	Peak	308	176
3	4960.00	26.42	54.00	-27.58	22.56	3.86	Average	100	97
4	4960.00	56.52	74.00	-17.48	52.66	3.86	Peak	100	97
5	7440.00	23.32	54.00	-30.68	14.78	8.54	Average	153	244
6	7440.00	53.42	74.00	-20.58	44.88	8.54	Peak	153	244

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

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

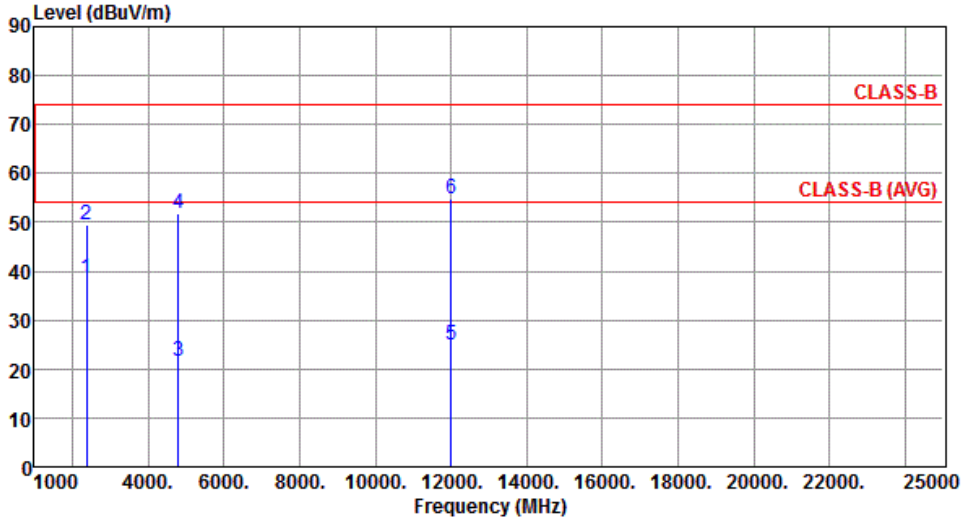
Modulation	8DPSK	**Test Freq. (MHz)**	2402
Polarization	Horizontal		



	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
1	2390.00	38.71	54.00	-15.29	41.78	-3.07	Average	318	89
2	2390.00	50.79	74.00	-23.21	53.86	-3.07	Peak	318	89
3	4804.00	22.05	54.00	-31.95	18.55	3.50	Average	100	186
4	4804.00	52.15	74.00	-21.85	48.65	3.50	Peak	100	186
5	12010.00	25.74	54.00	-28.26	12.48	13.26	Average	100	25
6	12010.00	55.84	74.00	-18.16	42.58	13.26	Peak	100	25

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

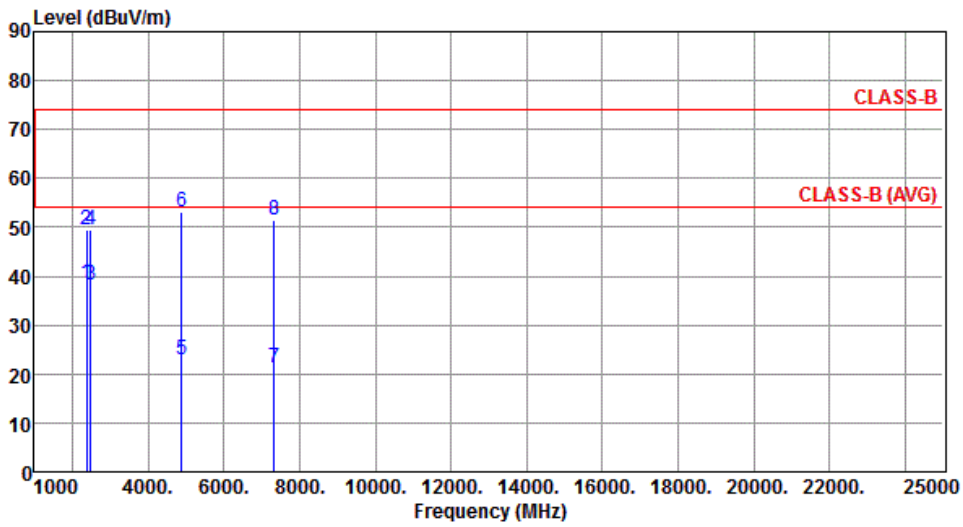
Modulation	8DPSK	Test Freq. (MHz)	2402
Polarization	Vertical		



	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
1	2390.00	38.51	54.00	-15.49	41.58	-3.07	Average	299	182
2	2390.00	49.62	74.00	-24.38	52.69	-3.07	Peak	299	182
3	4804.00	21.55	54.00	-32.45	18.05	3.50	Average	100	102
4	4804.00	51.65	74.00	-22.35	48.15	3.50	Peak	100	102
5	12010.00	24.75	54.00	-29.25	11.49	13.26	Average	100	33
6	12010.00	54.85	74.00	-19.15	41.59	13.26	Peak	100	33

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

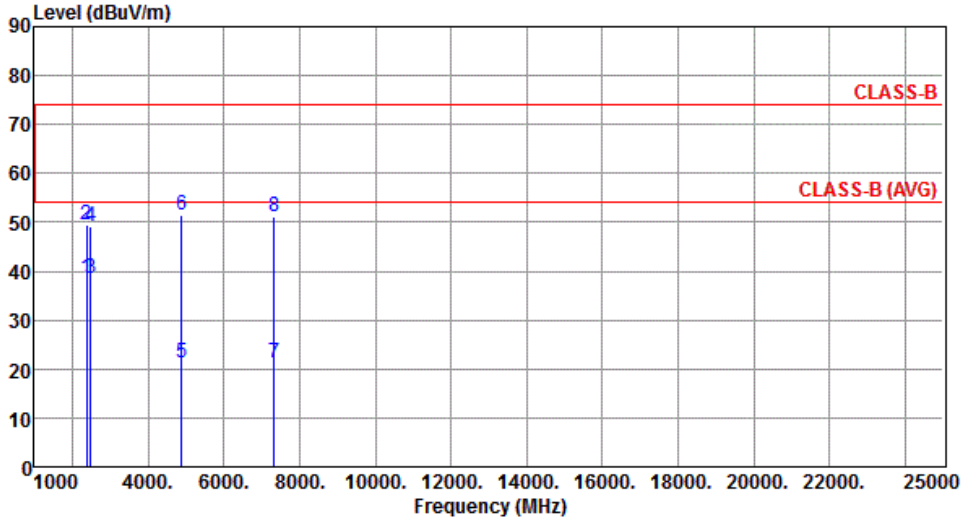
Modulation	8DPSK	Test Freq. (MHz)	2441
Polarization	Horizontal		



	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
1	2390.00	38.46	54.00	-15.54	41.53	-3.07	Average	323	84
2	2390.00	49.32	74.00	-24.68	52.39	-3.07	Peak	323	84
3	2483.50	38.14	54.00	-15.86	41.36	-3.22	Average	323	84
4	2483.50	49.35	74.00	-24.65	52.57	-3.22	Peak	323	84
5	4882.00	23.08	54.00	-30.92	19.47	3.61	Average	100	189
6	4882.00	53.18	74.00	-20.82	49.57	3.61	Peak	100	189
7	7323.00	21.38	54.00	-32.62	12.59	8.79	Average	100	192
8	7323.00	51.48	74.00	-22.52	42.69	8.79	Peak	100	192

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

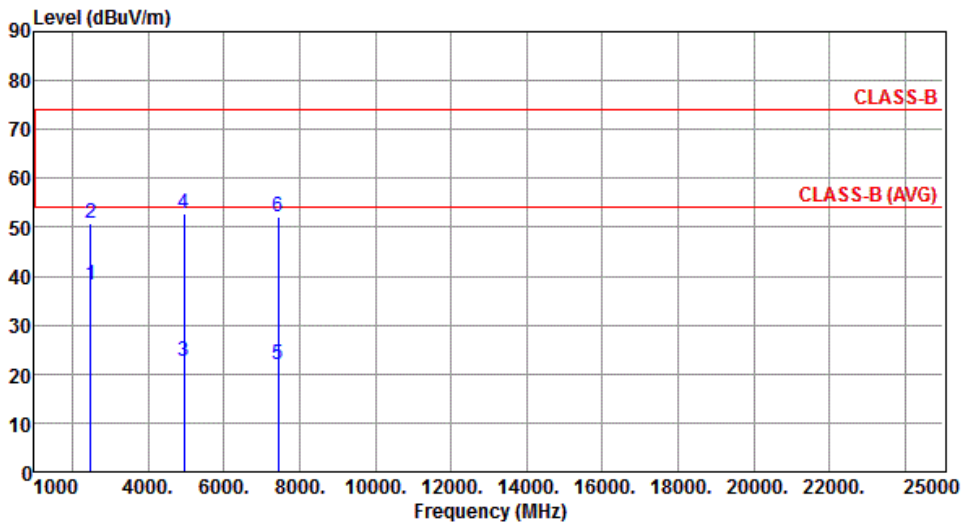
Modulation	8DPSK	Test Freq. (MHz)	2441
Polarization	Vertical		



	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
1	2390.00	38.45	54.00	-15.55	41.52	-3.07	Average	317	186
2	2390.00	49.58	74.00	-24.42	52.65	-3.07	Peak	317	186
3	2483.50	38.58	54.00	-15.42	41.80	-3.22	Average	317	186
4	2483.50	49.17	74.00	-24.83	52.39	-3.22	Peak	317	186
5	4882.00	21.36	54.00	-32.64	17.75	3.61	Average	100	105
6	4882.00	51.46	74.00	-22.54	47.85	3.61	Peak	100	105
7	7323.00	21.16	54.00	-32.84	12.37	8.79	Average	100	256
8	7323.00	51.26	74.00	-22.74	42.47	8.79	Peak	100	256

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

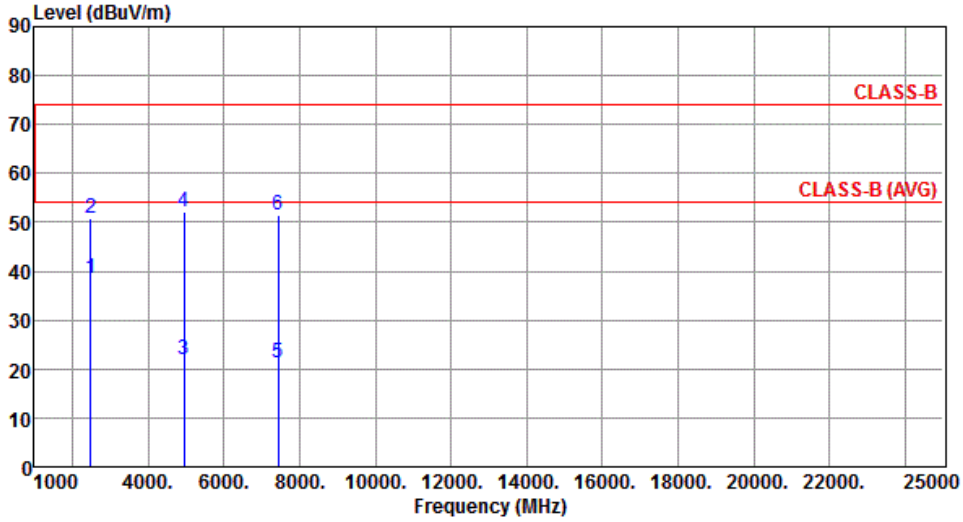
Modulation	8DPSK	Test Freq. (MHz)	2480
Polarization	Horizontal		



	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
1	2483.50	38.36	54.00	-15.64	41.58	-3.22	Average	312	85
2	2483.50	50.98	74.00	-23.02	54.20	-3.22	Peak	312	85
3	4960.00	22.58	54.00	-31.42	18.72	3.86	Average	100	186
4	4960.00	52.68	74.00	-21.32	48.82	3.86	Peak	100	186
5	7440.00	22.01	54.00	-31.99	13.47	8.54	Average	100	193
6	7440.00	52.11	74.00	-21.89	43.57	8.54	Peak	100	193

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

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



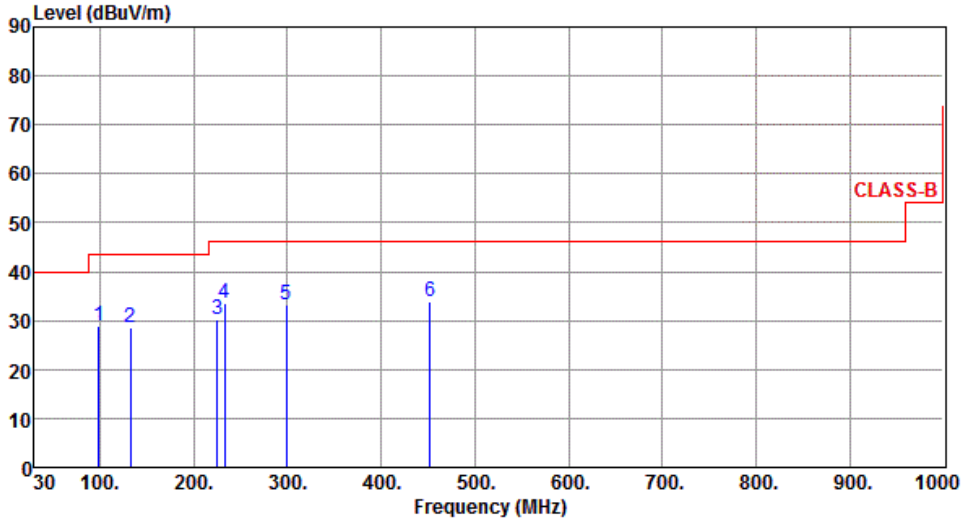
	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
1	2483.50	38.63	54.00	-15.37	41.85	-3.22	Average	313	181
2	2483.50	50.95	74.00	-23.05	54.17	-3.22	Peak	313	181
3	4960.00	21.93	54.00	-32.07	18.07	3.86	Average	100	95
4	4960.00	52.03	74.00	-21.97	48.17	3.86	Peak	100	95
5	7440.00	21.32	54.00	-32.68	12.78	8.54	Average	144	259
6	7440.00	51.42	74.00	-22.58	42.88	8.54	Peak	144	259

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

Test Configuration 2: Charger mode with notebook

3.2.7 Transmitter Radiated Unwanted Emissions (Below 1GHz)

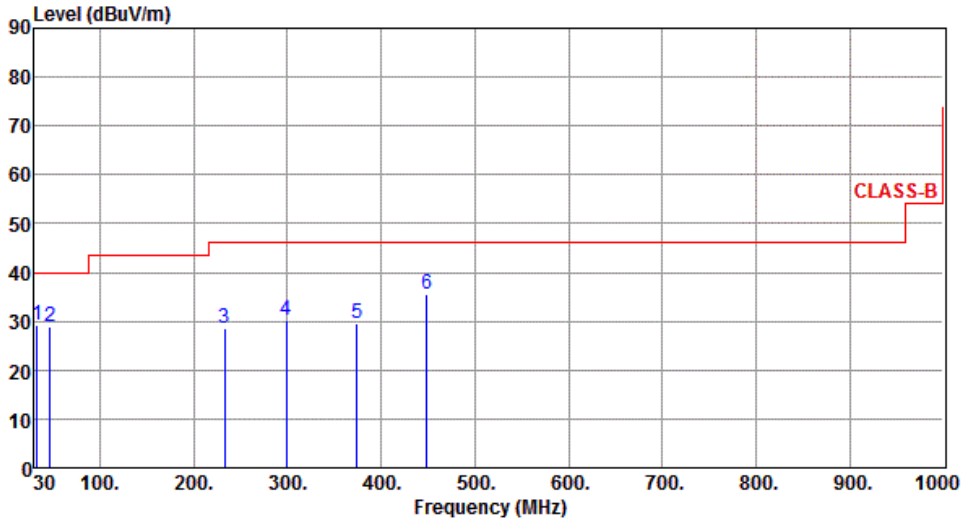
Modulation	GFSK	**Test Freq. (MHz)**	2480
Polarization	Horizontal		



	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
1	98.87	28.78	43.50	-14.72	41.98	-13.20	Peak	---	---
2	132.82	28.44	43.50	-15.06	37.74	-9.30	Peak	---	---
3	224.97	30.23	46.00	-15.77	41.08	-10.85	Peak	---	---
4	232.73	33.45	46.00	-12.55	43.55	-10.10	Peak	---	---
5	298.69	33.18	46.00	-12.82	41.01	-7.83	Peak	---	---
6	451.95	33.72	46.00	-12.28	37.58	-3.86	Peak	---	---

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

Modulation	GFSK	Test Freq. (MHz)	2480
Polarization	Vertical		



	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
1	32.91	29.20	40.00	-10.80	37.96	-8.76	Peak	---	---
2	46.49	28.73	40.00	-11.27	36.51	-7.78	Peak	---	---
3	232.73	28.49	46.00	-17.51	38.59	-10.10	Peak	---	---
4	298.69	30.31	46.00	-15.69	38.14	-7.83	Peak	---	---
5	374.35	29.46	46.00	-16.54	35.15	-5.69	Peak	---	---
6	449.04	35.53	46.00	-10.47	39.46	-3.93	Peak	---	---

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

3.3 Unwanted Emissions into Non-Restricted Frequency Bands

3.3.1 Limit of Unwanted Emissions into Non-Restricted Frequency Bands

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

3.3.2 Test Procedures

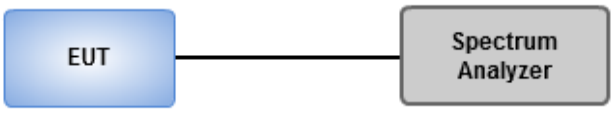
Reference level measurement

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

Emission level measurement

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

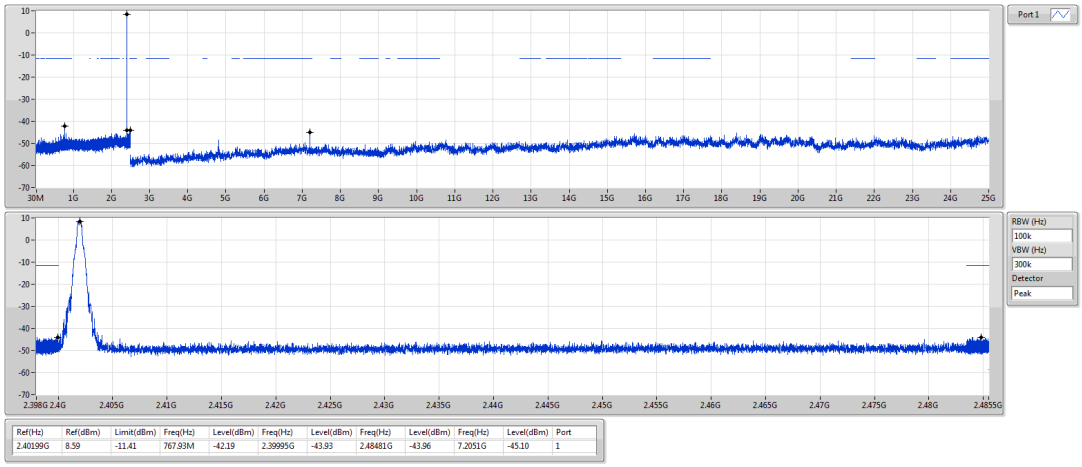
3.3.3 Test Setup



3.3.4 Unwanted Emissions into Non-Restricted Frequency Bands

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

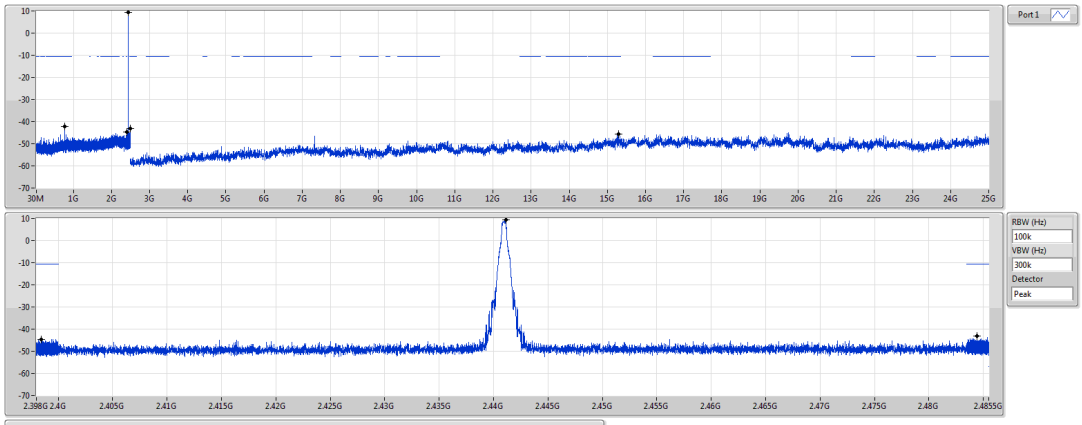
2402MHz



Ref(Hz)	Ref(dBm)	Limit(dBm)	Freq(Hz)	Level(dBm)	Freq(Hz)	Level(dBm)	Freq(Hz)	Level(dBm)	Freq(Hz)	Level(dBm)	Port
2.40199G	8.59	-11.41	767.93M	-42.19	2.39995G	-43.93	2.48481G	-43.96	7.2051G	-45.10	1

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

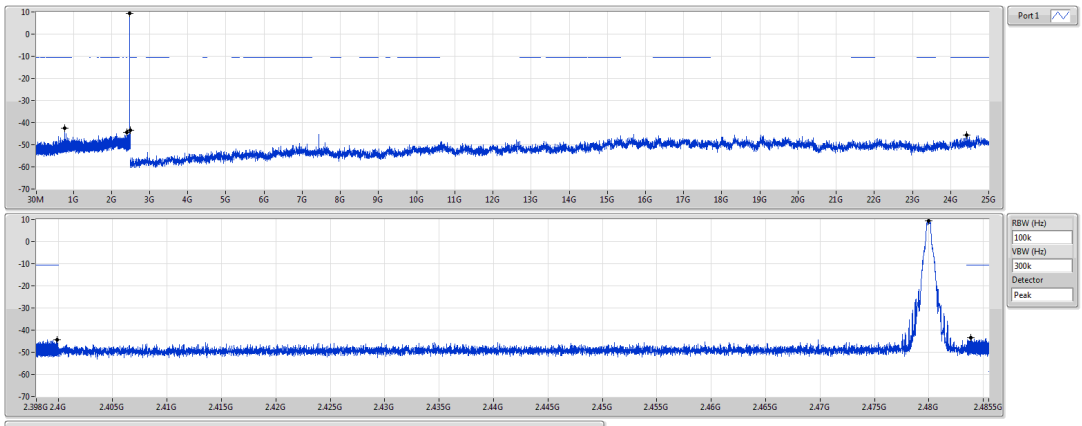
2441MHz



Ref(Hz)	Ref(dBm)	Limit(dBm)	Freq(Hz)	Level(dBm)	Freq(Hz)	Level(dBm)	Freq(Hz)	Level(dBm)	Freq(Hz)	Level(dBm)	Port
2.44112G	9.27	-10.73	767.93M	-42.27	2.39842G	-44.57	2.48439G	-43.27	15.29906G	-45.57	1

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

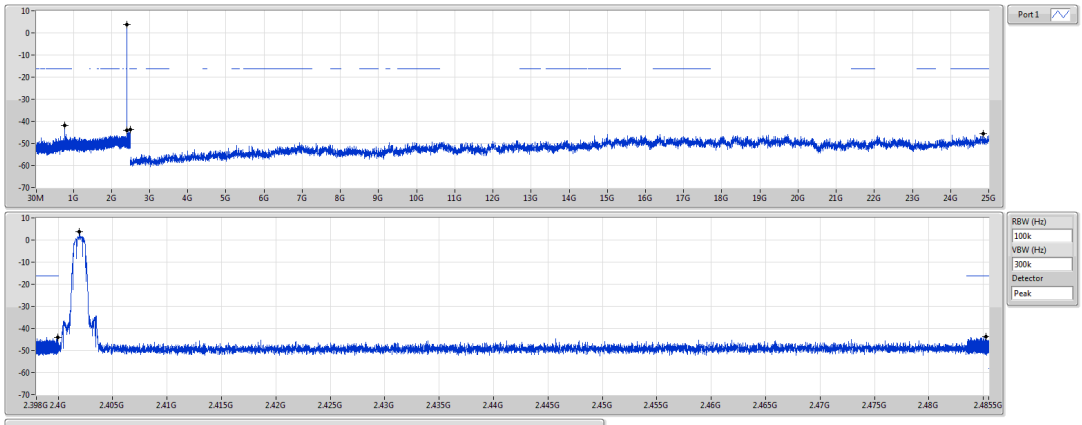
2480MHz



Ref(Hz)	Ref(dBm)	Limit(dBm)	Freq(Hz)	Level(dBm)	Freq(Hz)	Level(dBm)	Freq(Hz)	Level(dBm)	Freq(Hz)	Level(dBm)	Port
2.48G	9.29	-10.71	767.93M	-42.56	2.3999G	-44.25	2.48388G	-43.59	24.42307G	-45.70	1

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

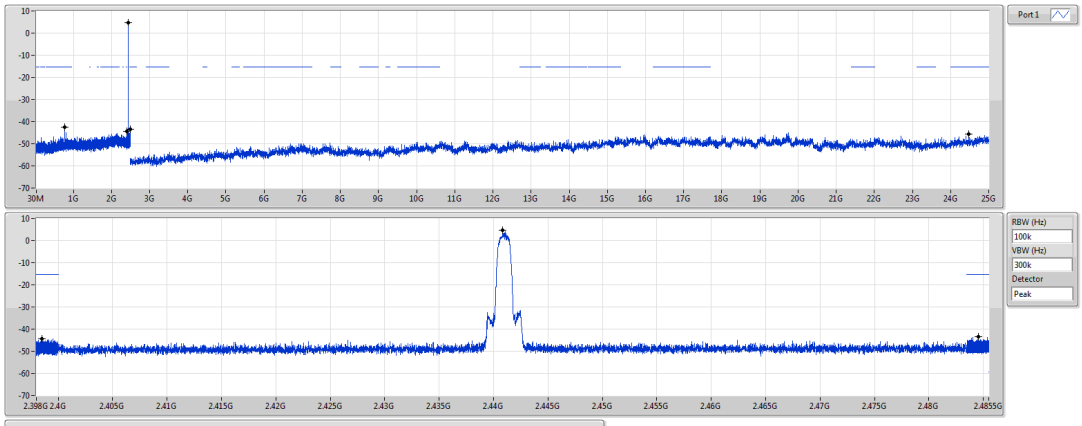
2402MHz



Ref(Hz)	Ref(dBm)	Limit(dBm)	Freq(Hz)	Level(dBm)	Freq(Hz)	Level(dBm)	Freq(Hz)	Level(dBm)	Freq(Hz)	Level(dBm)	Port
2.40196G	3.78	-16.22	767.93M	-42.02	2.39994G	-44.02	2.48527G	-43.73	24.84803G	-45.52	1

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

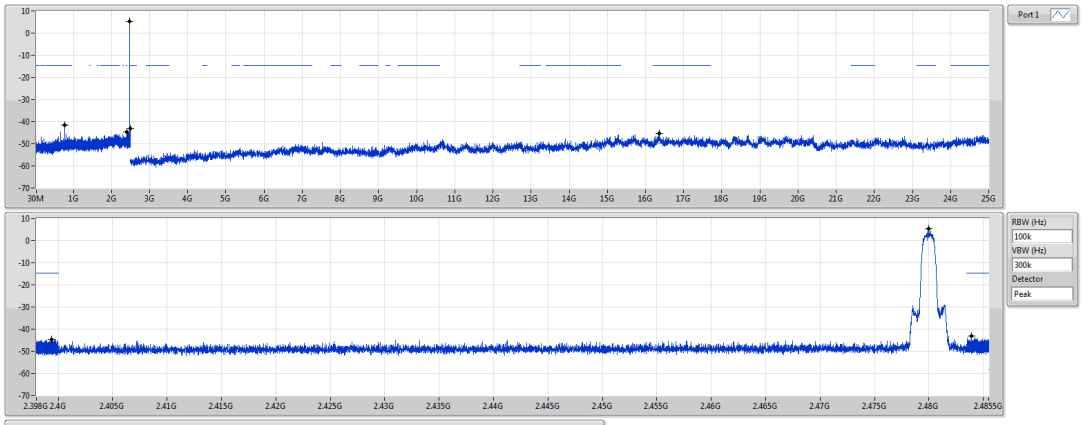
2441MHz



Ref(Hz)	Ref(dBm)	Limit(dBm)	Freq(Hz)	Level(dBm)	Freq(Hz)	Level(dBm)	Freq(Hz)	Level(dBm)	Freq(Hz)	Level(dBm)	Port
2.44081G	4.65	-15.35	767.93M	-42.36	2.39849G	-44.43	2.48456G	-43.36	24.47654G	-45.75	1

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

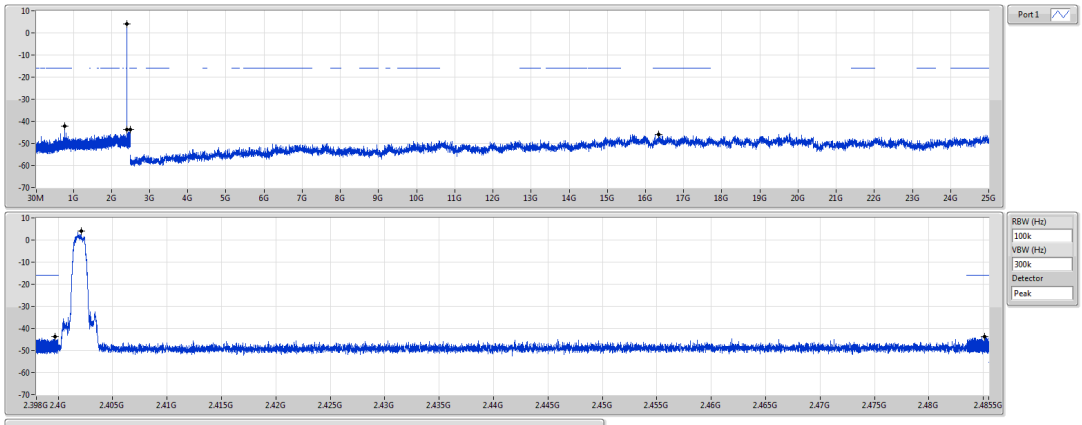
2480MHz



Ref(Hz)	Ref(dBm)	Limit(dBm)	Freq(Hz)	Level(dBm)	Freq(Hz)	Level(dBm)	Freq(Hz)	Level(dBm)	Freq(Hz)	Level(dBm)	Port
2.47998G	5.33	-14.67	767.93M	-41.71	2.39938G	-44.80	2.48391G	-42.98	16.37132G	-45.17	1

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

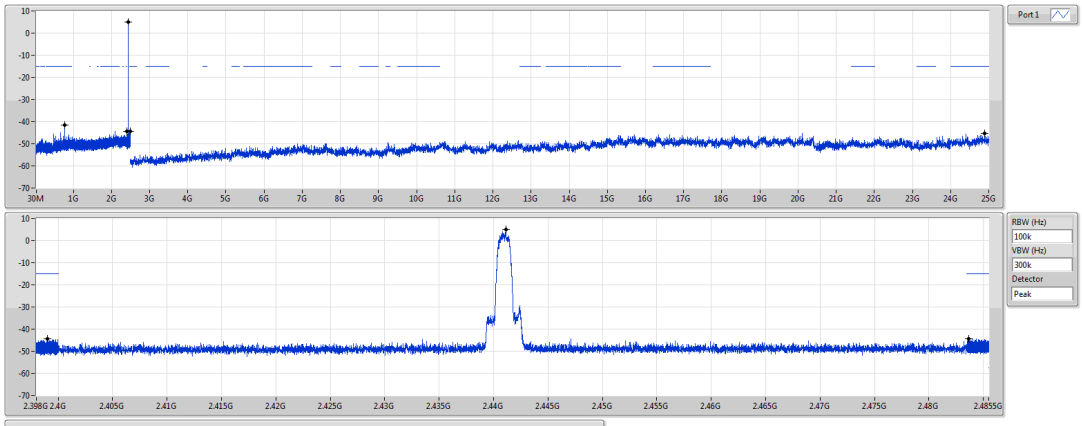
2402MHz



Ref(Hz)	Ref(dBm)	Limit(dBm)	Freq(Hz)	Level(dBm)	Freq(Hz)	Level(dBm)	Freq(Hz)	Level(dBm)	Freq(Hz)	Level(dBm)	Port
2.40212G	3.98	-16.02	767.93M	-42.28	2.39974G	-43.81	2.48514G	-43.74	16.35162G	-45.92	1

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

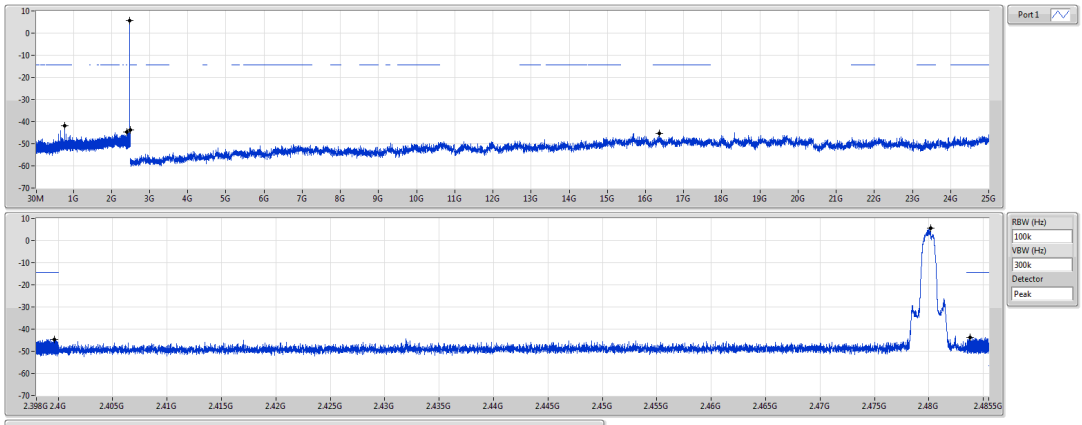
2441MHz



Ref(Hz)	Ref(dBm)	Limit(dBm)	Freq(Hz)	Level(dBm)	Freq(Hz)	Level(dBm)	Freq(Hz)	Level(dBm)	Freq(Hz)	Level(dBm)	Port
2.44113G	4.88	-15.12	767.93M	-41.52	2.399G	-44.22	2.48366G	-44.36	24.89306G	-45.23	1

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

2480MHz

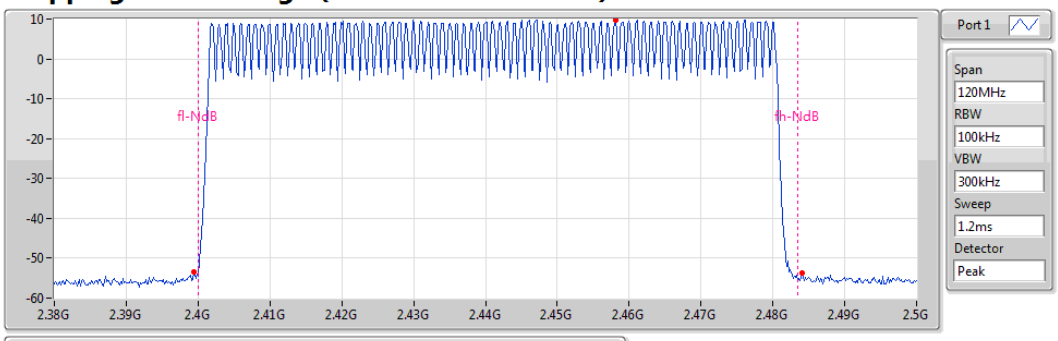


Ref(Hz)	Ref(dBm)	Limit(dBm)	Freq(Hz)	Level(dBm)	Freq(Hz)	Level(dBm)	Freq(Hz)	Level(dBm)	Freq(Hz)	Level(dBm)	Port
2.48014G	5.57	-14.43	767.93M	-41.93	2.39962G	-44.54	2.4838G	-43.71	16.35725G	-45.37	1

BT-BR(1Mbps)

2441MHz

Hopping Ch Bandedge (Non-restricted Band)

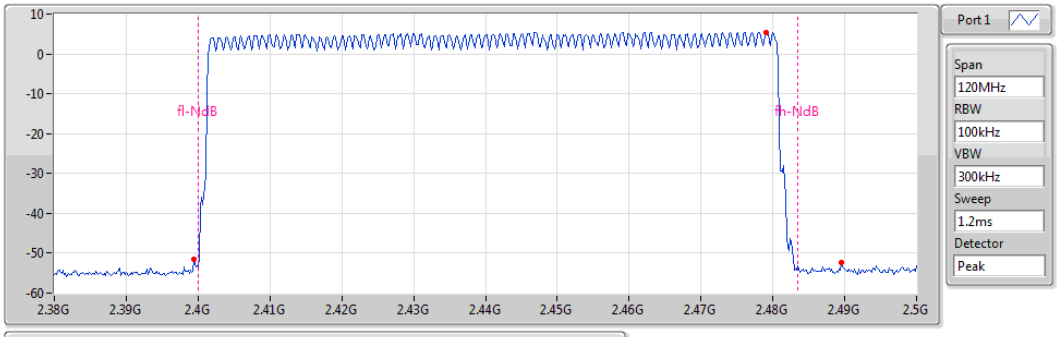


Limit(dBm)	Ref(Hz)	Ref(dBm)	BE-l(Hz)	BE-l(dBm)	BE-h(Hz)	BE-h(dBm)
-10.22	2.458087G	9.78	2.399478G	-53.5	2.484G	-53.7

BT-EDR(2Mbps)

2441MHz

Hopping Ch Bandedge (Non-restricted Band)

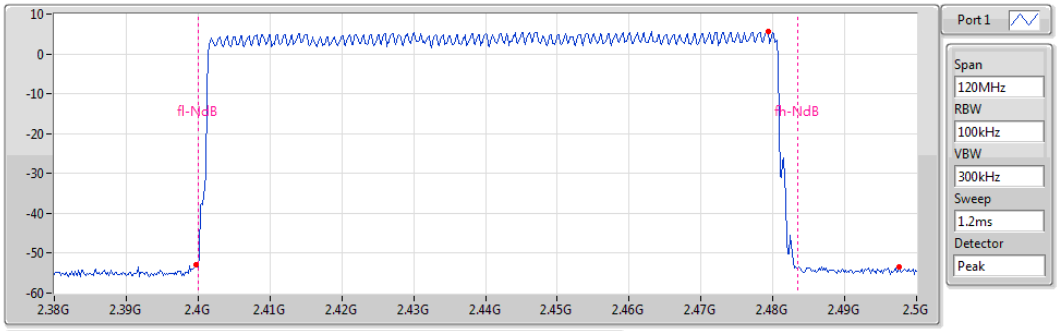


Limit(dBm)	Ref(Hz)	Ref(dBm)	BE-l(Hz)	BE-l(dBm)	BE-h(Hz)	BE-h(dBm)
-14.55	2.47913G	5.45	2.399478G	-51.58	2.489565G	-52.33

BT-EDR(3Mbps)

2441MHz

Hopping Ch Bandedge (Non-restricted Band)



Limit(dBm)	Ref(Hz)	Ref(dBm)	BE-l(Hz)	BE-l(dBm)	BE-h(Hz)	BE-h(dBm)
-14.42	2.479304G	5.58	2.399652G	-52.83	2.497565G	-53.52

3.4 Conducted Output Power

3.4.1 Limit of Conducted Output Power

☐ 1 Watt
For frequency hopping systems operating in the 2400–2483.5 MHz band employing at least 75 non overlapping hopping channels, and all frequency hopping systems in the 5725–5850 MHz band.

☒ 0.125 Watt
For all other frequency hopping systems in the 2400–2483.5 MHz band.

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

3.4.2 Test Procedures

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

3.4.3 Test Setup

3.4.4 Test Result of Conducted Output Power

Summary of Peak Conducted Output Power

Mode	Power (dBm)	Power (W)
2.4-2.4835GHz	-	-
BT-BR(1Mbps)	9.98	0.00995
BT-EDR(2Mbps)	8.45	0.00700
BT-EDR(3Mbps)	8.72	0.00745

Result

Mode	Result	Gain (dBi)	Power (dBm)	Power Limit (dBm)
BT-BR(1Mbps)	-	-	-	-
2402MHz	Pass	2.80	9.95	21.00
2441MHz	Pass	2.80	9.67	21.00
2480MHz	Pass	2.80	9.98	21.00
BT-EDR(2Mbps)	-	-	-	-
2402MHz	Pass	2.80	7.20	21.00
2441MHz	Pass	2.80	7.89	21.00
2480MHz	Pass	2.80	8.45	21.00
BT-EDR(3Mbps)	-	-	-	-
2402MHz	Pass	2.80	7.52	21.00
2441MHz	Pass	2.80	8.14	21.00
2480MHz	Pass	2.80	8.72	21.00

Summary of Conducted (Average) Output Power

Mode	Power	Power
	(dBm)	(W)
2.4-2.4835GHz	-	-
BT-BR(1Mbps)	9.91	0.00979
BT-EDR(2Mbps)	5.86	0.00385
BT-EDR(3Mbps)	5.90	0.00389

Result

Mode	Result	Gain (dBi)	Power (dBm)	Power Limit (dBm)
BT-BR(1Mbps)	-	-	-	-
2402MHz	Pass	2.80	9.86	-
2441MHz	Pass	2.80	9.60	-
2480MHz	Pass	2.80	9.91	-
BT-EDR(2Mbps)	-	-	-	-
2402MHz	Pass	2.80	4.53	-
2441MHz	Pass	2.80	5.22	-
2480MHz	Pass	2.80	5.86	-
BT-EDR(3Mbps)	-	-	-	-
2402MHz	Pass	2.80	4.54	-
2441MHz	Pass	2.80	5.23	-
2480MHz	Pass	2.80	5.90	-

Note: Average power is for reference only.

3.5 Number of Hopping Frequency

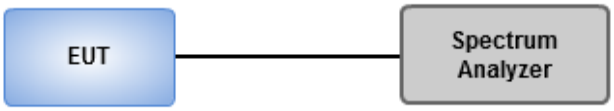
3.5.1 Limit of Number of Hopping Frequency

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

3.5.2 Test Procedures

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

3.5.3 Test Setup



3.5.4 Test Result of Number of Hopping Frequency

Summary

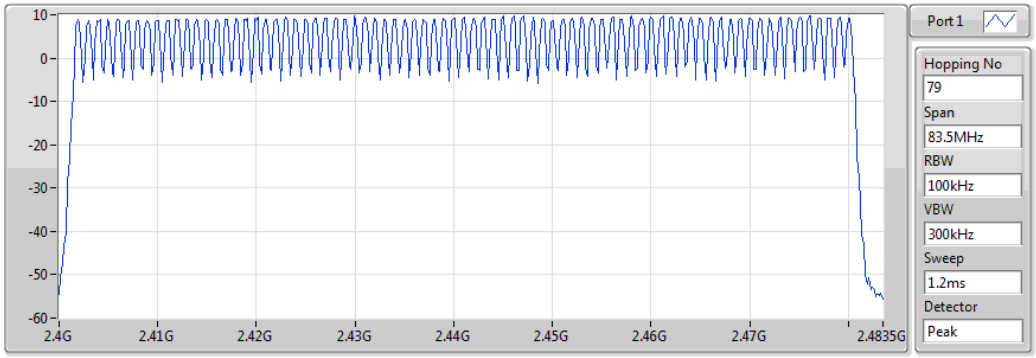
Mode	Max-Hop No
2.4-2.4835GHz	-
BT-BR(1Mbps)	79
BT-EDR(2Mbps)	79
BT-EDR(3Mbps)	79

Result

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

BT-BR(1Mbps) **Hopping Ch**

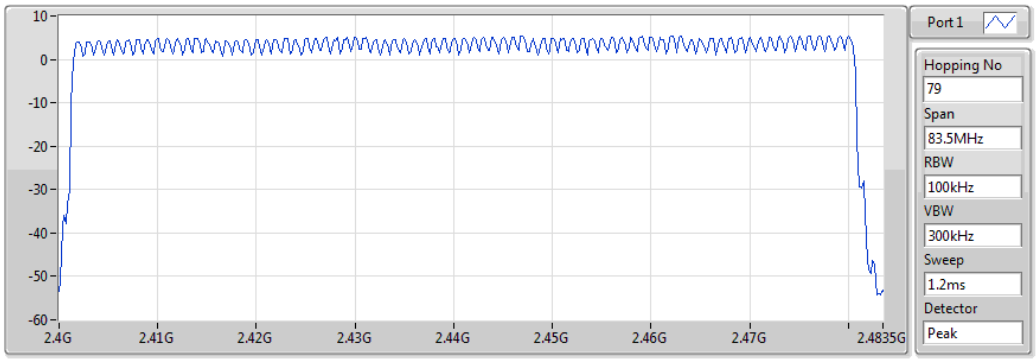
2441MHz



Hopping No	Limit
79	15

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

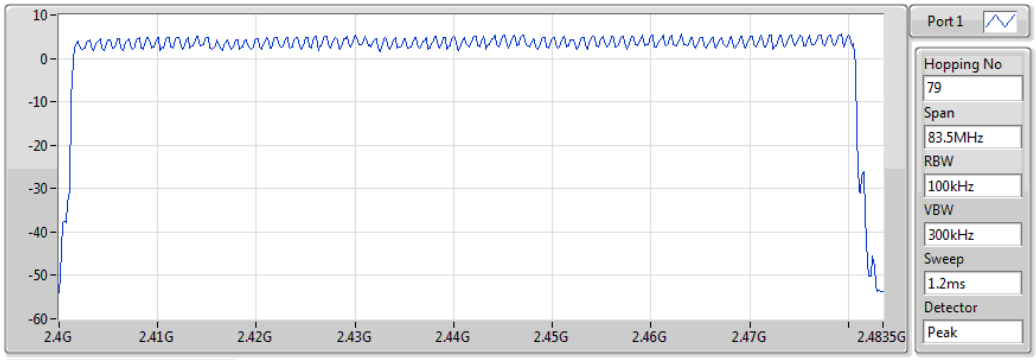
2441MHz



Hopping No	Limit
79	15

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

2441MHz



Hopping No	Limit
79	15

3.6 20dB and Occupied Bandwidth

3.6.1 Test Procedures

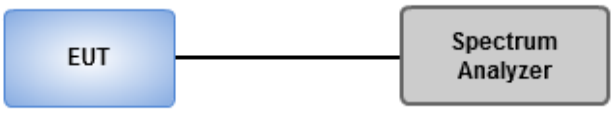
20dB Bandwidth

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

Occupied Bandwidth

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

3.6.2 Test Setup



3.6.3 Test result of 20dB and Occupied Bandwidth

Summary

Mode	Max-N dB (Hz)	Max-OBW (Hz)	ITU-Code	Min-N dB (Hz)	Min-OBW (Hz)
2.4-2.4835GHz	-	-	-	-	-
BT-BR(1Mbps)	923.913k	897.25k	897KF1D	920.29k	893.632k
BT-EDR(2Mbps)	1.351M	1.226M	1M23G1D	1.348M	1.212M
BT-EDR(3Mbps)	1.366M	1.219M	1M22G1D	1.333M	1.216M

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;

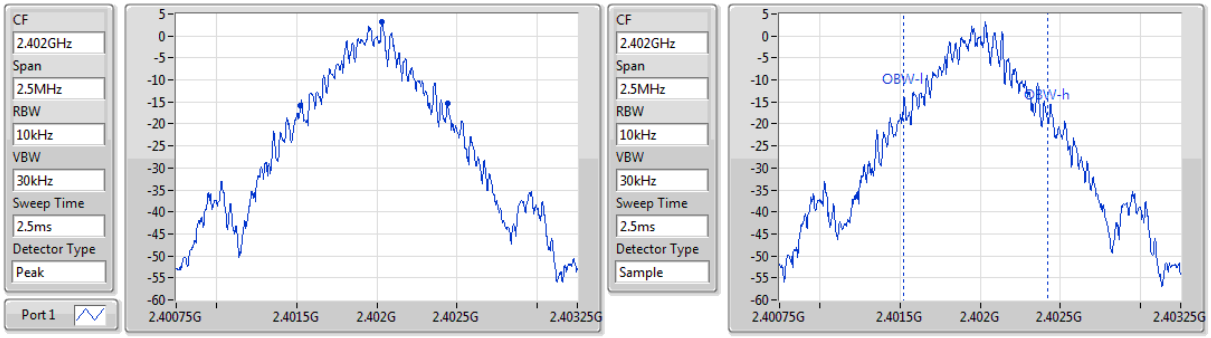
Result

Mode	Result	Limit (Hz)	Port 1-N dB (Hz)	Port 1-OBW (Hz)
BT-BR(1Mbps)	-	-	-	-
2402MHz	Pass	Inf	920.29k	893.632k
2441MHz	Pass	Inf	920.29k	893.632k
2480MHz	Pass	Inf	923.913k	897.25k
BT-EDR(2Mbps)	-	-	-	-
2402MHz	Pass	Inf	1.351M	1.223M
2441MHz	Pass	Inf	1.348M	1.212M
2480MHz	Pass	Inf	1.348M	1.226M
BT-EDR(3Mbps)	-	-	-	-
2402MHz	Pass	Inf	1.366M	1.216M
2441MHz	Pass	Inf	1.341M	1.216M
2480MHz	Pass	Inf	1.333M	1.219M

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

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

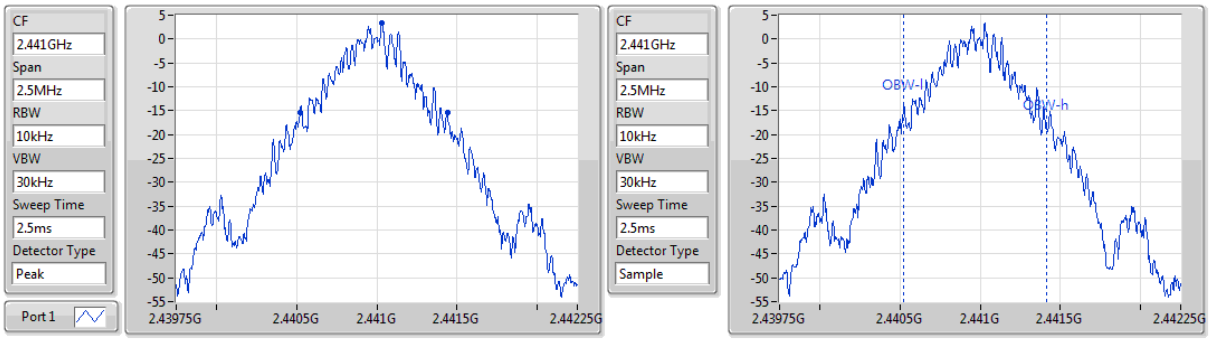
2402MHz



20dB(Hz)	Fl-20dB(Hz)	Fh-20dB(Hz)	OBW(Hz)	Fl-OBW(Hz)	Fh-OBW(Hz)	Limit(Hz)	Port
920.29k	2.401525G	2.402446G	893.632k	2.401526G	2.40242G	Inf	1

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

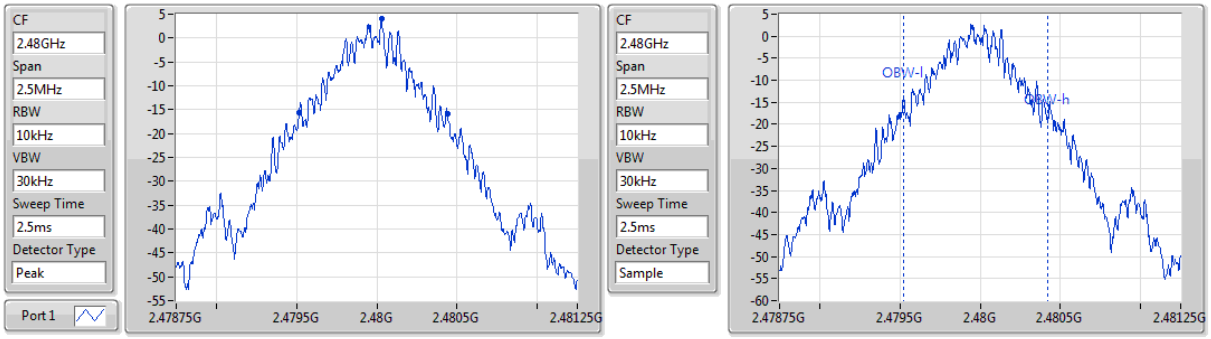
2441MHz



20dB(Hz)	Fl-20dB(Hz)	Fh-20dB(Hz)	OBW(Hz)	Fl-OBW(Hz)	Fh-OBW(Hz)	Limit(Hz)	Port
920.29k	2.440522G	2.441442G	893.632k	2.440522G	2.441416G	Inf	1

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

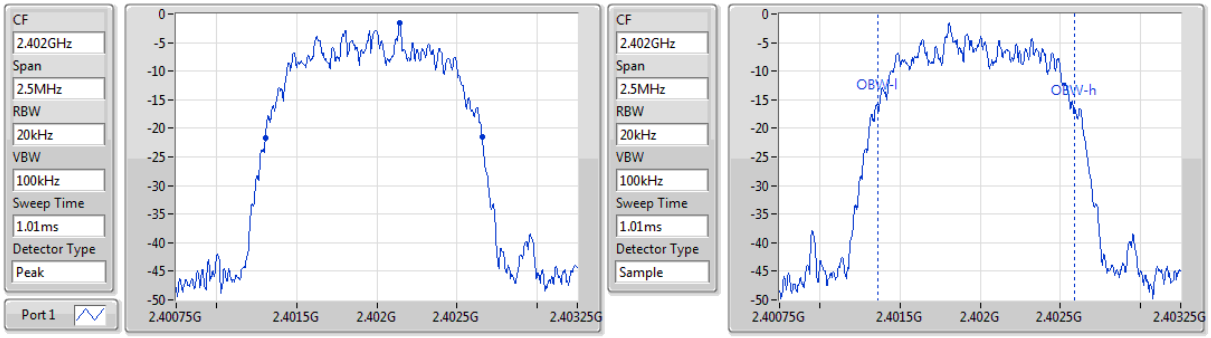
2480MHz



20dB(Hz)	Fl-20dB(Hz)	Fh-20dB(Hz)	OBW(Hz)	Fl-OBW(Hz)	Fh-OBW(Hz)	Limit(Hz)	Port
923.913k	2.479518G	2.480442G	897.25k	2.479522G	2.48042G	Inf	1

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

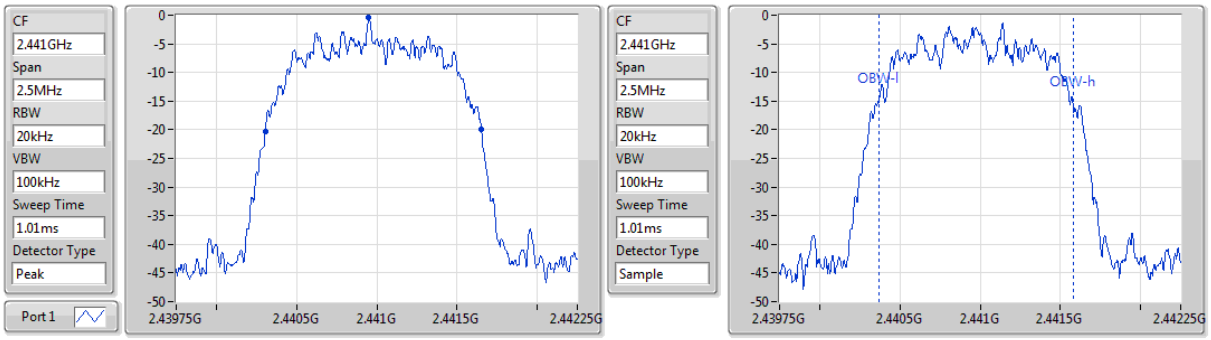
2402MHz



20dB(Hz)	Fl-20dB(Hz)	Fh-20dB(Hz)	OBW(Hz)	Fl-OBW(Hz)	Fh-OBW(Hz)	Limit(Hz)	Port
1.351M	2.401304G	2.402656G	1.223M	2.401363G	2.402586G	Inf	1

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

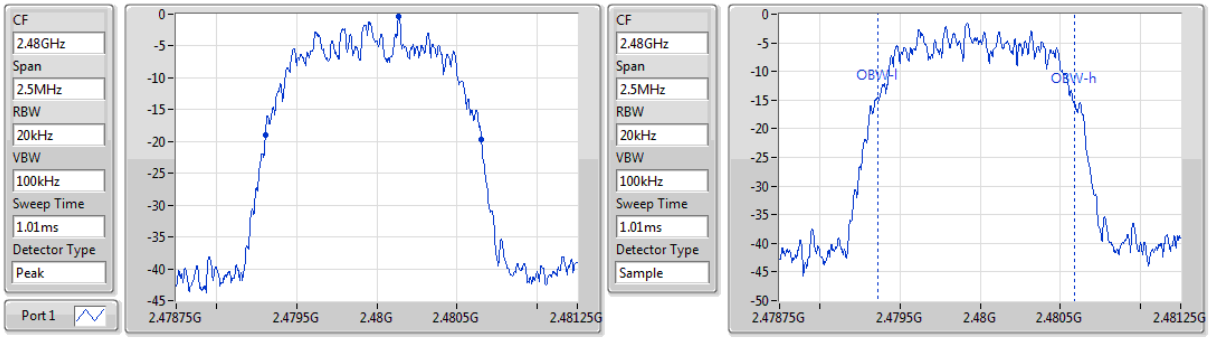
2441MHz



20dB(Hz)	Fl-20dB(Hz)	Fh-20dB(Hz)	OBW(Hz)	Fl-OBW(Hz)	Fh-OBW(Hz)	Limit(Hz)	Port
1.348M	2.440304G	2.441652G	1.212M	2.440367G	2.441579G	Inf	1

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

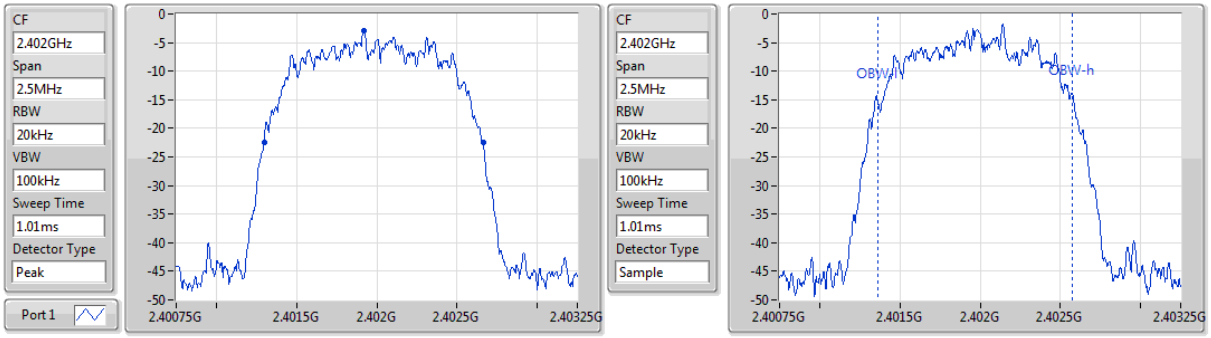
2480MHz



20dB(Hz)	Fl-20dB(Hz)	Fh-20dB(Hz)	OBW(Hz)	Fl-OBW(Hz)	Fh-OBW(Hz)	Limit(Hz)	Port
1.348M	2.479304G	2.480652G	1.226M	2.47936G	2.480586G	Inf	1

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

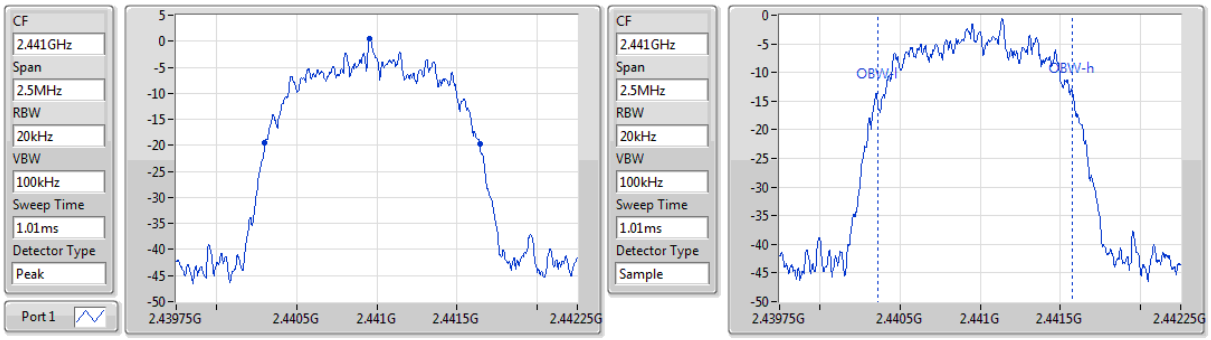
2402MHz



20dB(Hz)	Fl-20dB(Hz)	Fh-20dB(Hz)	OBW(Hz)	Fl-OBW(Hz)	Fh-OBW(Hz)	Limit(Hz)	Port
1.366M	2.401297G	2.402663G	1.216M	2.40136G	2.402575G	Inf	1

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

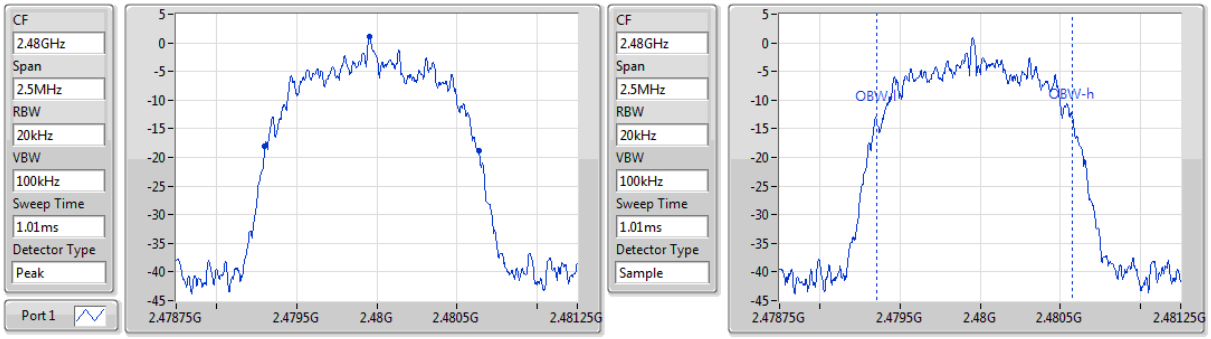
2441MHz



20dB(Hz)	Fl-20dB(Hz)	Fh-20dB(Hz)	OBW(Hz)	Fl-OBW(Hz)	Fh-OBW(Hz)	Limit(Hz)	Port
1.341M	2.440301G	2.441641G	1.216M	2.44036G	2.441575G	Inf	1

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

2480MHz



20dB(Hz)	Fl-20dB(Hz)	Fh-20dB(Hz)	OBW(Hz)	Fl-OBW(Hz)	Fh-OBW(Hz)	Limit(Hz)	Port
1.333M	2.479301G	2.480634G	1.219M	2.479356G	2.480575G	Inf	1

3.7 Channel Separation

3.7.1 Limit of Channel Separation

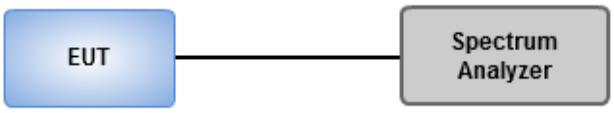
☐ Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hopping channel, whichever is greater.

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

3.7.2 Test Procedures

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

3.7.3 Test Setup



3.7.4 Test result of Channel Separation

Summary

Mode	Max-Space (Hz)	Min-Space (Hz)
2.4-2.4835GHz	-	-
BT-BR(1Mbps)	1.16087M	934.782609k
BT-EDR(2Mbps)	1.034783M	1M
BT-EDR(3Mbps)	1M	986.956522k

Result

Mode	Result	Fl (Hz)	Fh (Hz)	Ch.Space (Hz)	Limit (Hz)
BT-BR(1Mbps)	-	-	-	-	-
2402MHz	Pass	2.40203G	2.40303G	1M	612.91314k
2441MHz	Pass	2.440961G	2.442122G	1.16087M	612.91314k
2480MHz	Pass	2.479026G	2.479961G	934.782609k	615.326058k
BT-EDR(2Mbps)	-	-	-	-	-
2402MHz	Pass	2.401965G	2.402965G	1M	899.766k
2441MHz	Pass	2.440961G	2.441965G	1.004348M	897.768k
2480MHz	Pass	2.478926G	2.479961G	1.034783M	897.768k
BT-EDR(3Mbps)	-	-	-	-	-
2402MHz	Pass	2.401965G	2.402965G	1M	909.756k
2441MHz	Pass	2.440961G	2.441961G	1M	893.106k
2480MHz	Pass	2.478961G	2.479948G	986.956522k	887.778k

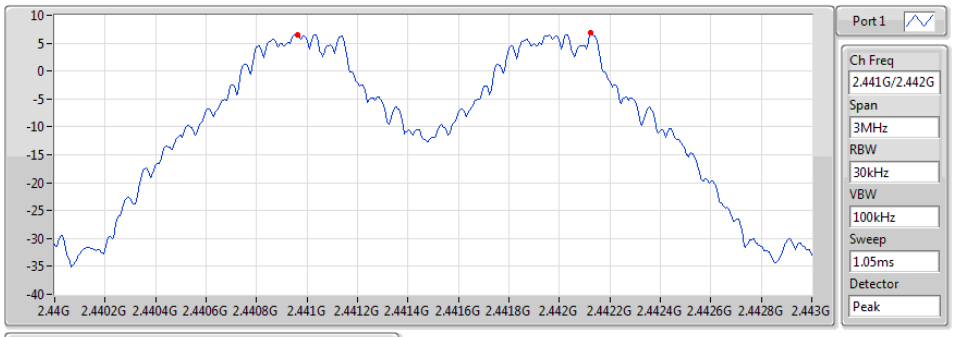
BT-BR(1Mbps) **Channel Separation**

2.402G/2.403GHz

Fl(Hz)	Fh(Hz)	Ch.Space(Hz)	Limit(Hz)
2.40203G	2.40303G	1M	612.91314k

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

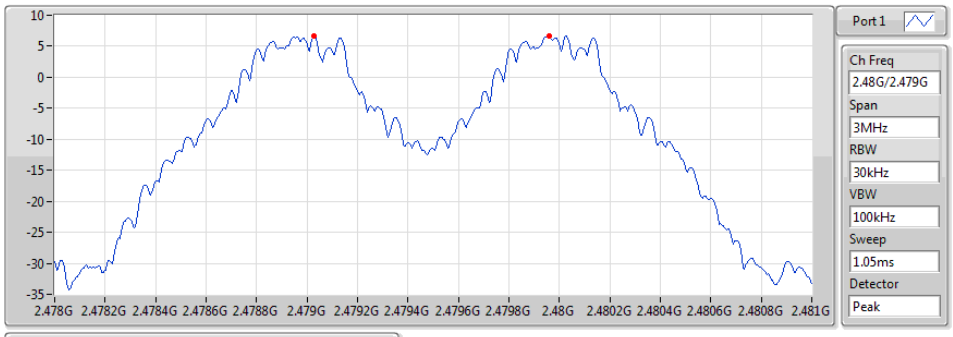
2.441G/2.442GHz



Fl(Hz)	Fh(Hz)	Ch.Space(Hz)	Limit(Hz)
2.440961G	2.442122G	1.16087M	612.91314k

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

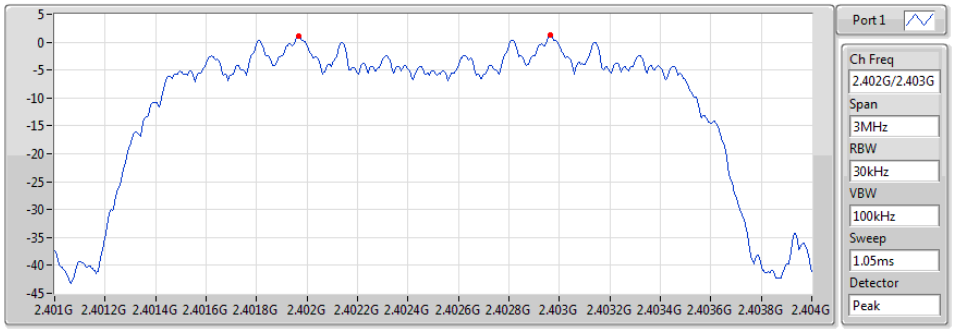
2.48G/2.479GHz



Fl(Hz)	Fh(Hz)	Ch.Space(Hz)	Limit(Hz)
2.479026G	2.479961G	934.782609k	615.326058k

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

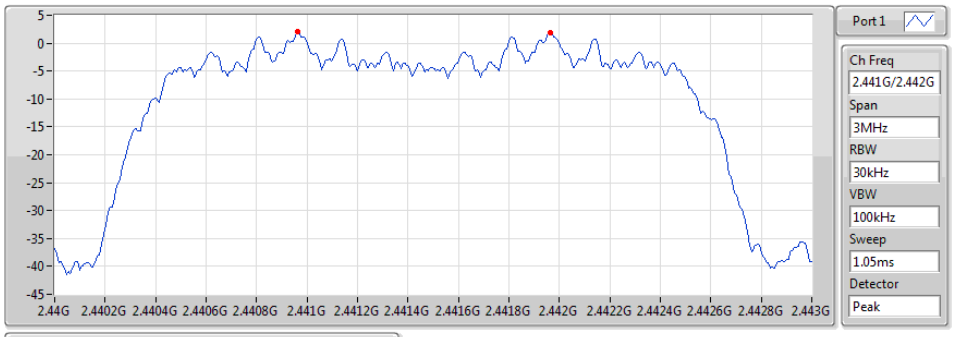
2.402G/2.403GHz



Fl(Hz)	Fh(Hz)	Ch.Space(Hz)	Limit(Hz)
2.401965G	2.402965G	1M	899.766k

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

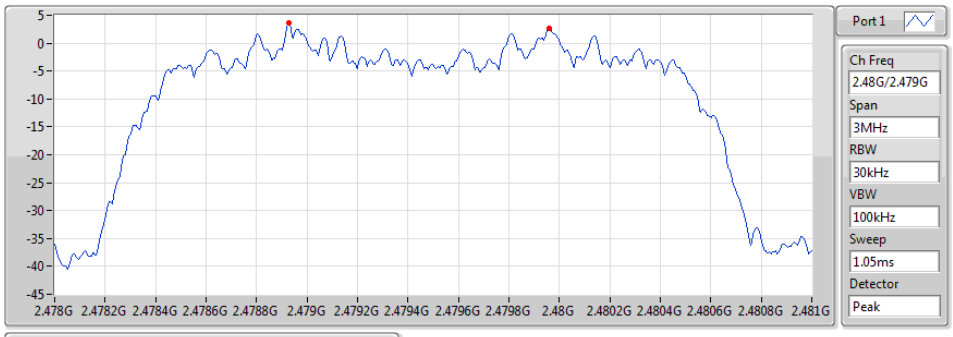
2.441G/2.442GHz



Fl(Hz)	Fh(Hz)	Ch.Space(Hz)	Limit(Hz)
2.440961G	2.441965G	1.004348M	897.768k

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

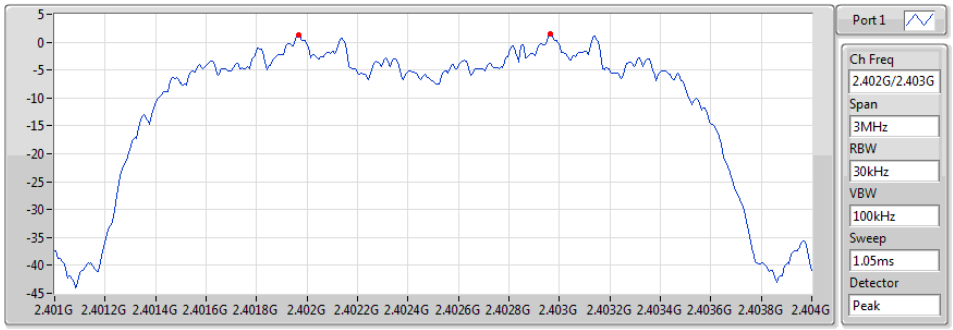
2.48G/2.479GHz



Fl(Hz)	Fh(Hz)	Ch.Space(Hz)	Limit(Hz)
2.478926G	2.479961G	1.034783M	897.768k

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

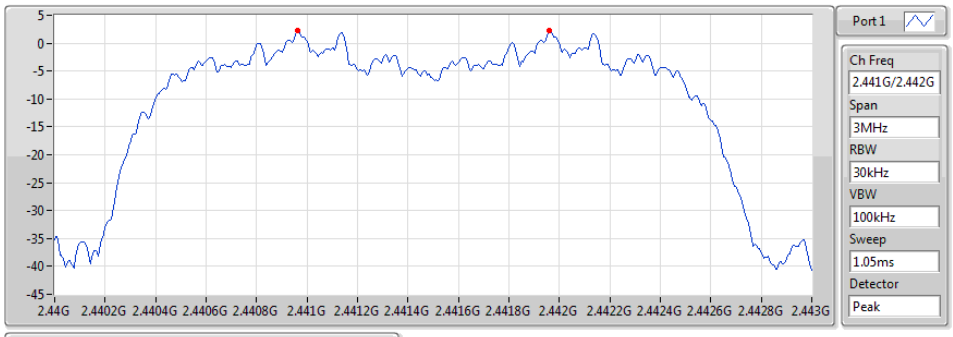
2.402G/2.403GHz



Fl(Hz)	Fh(Hz)	Ch.Space(Hz)	Limit(Hz)
2.401965G	2.402965G	1M	909.756k

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

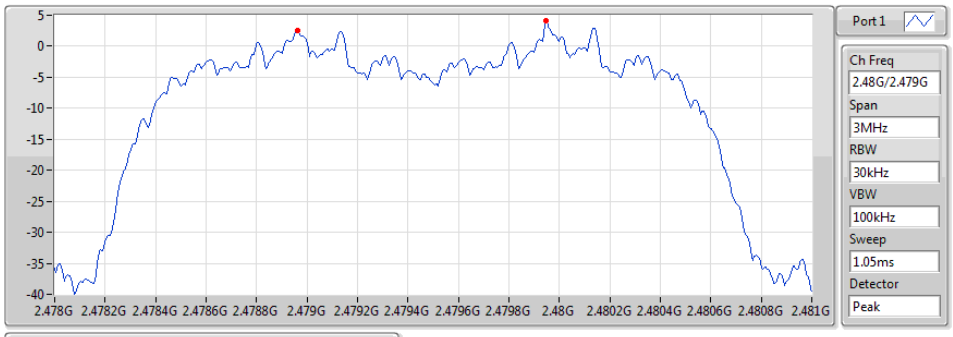
2.441G/2.442GHz



Fl(Hz)	Fh(Hz)	Ch.Space(Hz)	Limit(Hz)
2.440961G	2.441961G	1M	893.106k

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

2.48G/2.479GHz



Fl(Hz)	Fh(Hz)	Ch.Space(Hz)	Limit(Hz)
2.478961G	2.479948G	986.956522k	887.778k

3.8 Number of Dwell Time

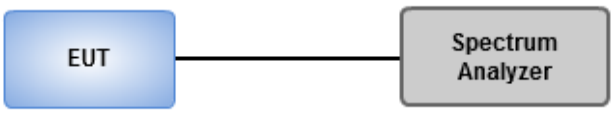
3.8.1 Limit of Dwell time

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

3.8.2 Test Procedures

1. Set RBW=300kHz,VBW=1MHz,Sweep time = 10 ms, Detector=Peak, Span=0Hz,Trace max hold
2 Enable gating and trigger function of spectrum analyzer to measure burst on time.
3. The DH1 packet can cover a single time slot. A maximum length packet has duration of 1 time slots.
   Non AFH mode
   The hopping rate is 1600 hops/second so the maximum dwell time is 1/1600 seconds. DH1 Packet permit maximum 1600 / 79 /2 = 10.12 hops per second in each channel (1 time slot TX, 1 time slot RX). So, the dwell time is the time duration of the pulse times 10.12 x 31.6 = 320 within 31.6 seconds.
   AFH mode
   The hopping rate is 800 hops/second so the maximum dwell time is 1/800 seconds. DH1 Packet permit maximum 800 /20/2 = 20 hops per second in each channel (1 time slot TX, 1 time slot RX). So, the dwell time is the time duration of the pulse times 20 x 8 = 160 within 8 seconds.
4. The DH3 packet can cover up to 3 time slots. A maximum length packet has duration of 3 time slots.
   Non AFH mode
   The hopping rate is 1600 hops/second so the maximum dwell time is 3/1600 seconds. DH3 Packet permit maximum 1600 / 79 / 4 = 5.06 hops per second in each channel (3 time slots TX, 1 time slot RX). So, the dwell time is the time duration of the pulse times 5.06 x 31.6 = 160 within 31.6 seconds.
   AFH mode
   The hopping rate is 800hops/second so the maximum dwell time is 3/800 seconds. DH3 Packet permit maximum 800 / 20 / 4 = 10 hops per second in each channel (3 time slots TX, 1 time slot RX). So, the dwell time is the time duration of the pulse times 10 x 8 = 80 within 8 seconds.
5 The DH5 packet can cover up to 5 time slots. Operate DH5 at maximum dwell time and maximum duty cycle. A maximum length packet has duration of 5 time slots.
   Non AFH mode
   The hopping rate is 1600 hops/second so the maximum dwell time is 5/1600 seconds, or 3.125ms. DH5 Packet permit maximum 1600/ 79 / 6 = 3.37 hops per second in each channel (5 time slots TX, 1 time slot RX). So, the dwell time is the time duration of the pulse times 3.37 x 31.6 = 106.6 within 31.6 seconds
   AFH mode
   The hopping rate is 800 hops/second so the maximum dwell time is 5/800 seconds. DH5 Packet permit maximum 800/20 / 6 =6.667 hops per second in each channel (5 time slots TX, 1 time slot RX). So, the dwell time is the time duration of the pulse times6.667 x 8 = 53.33 within 8 seconds

3.8.3 Test Setup



3.8.4 Test Result of Dwell Time

Summary

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

Result/ Non AFH mode

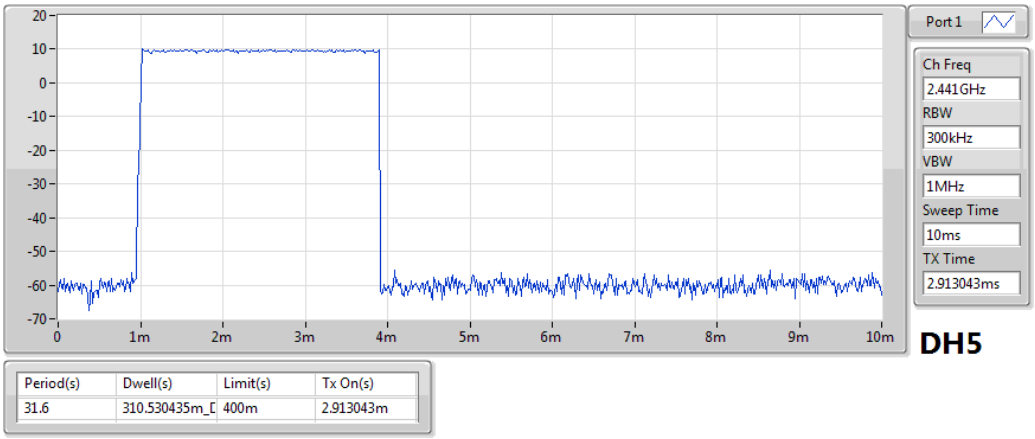
Mode	Result	Period (s)	Dwell (s)	Limit (s)	Tx On (s)
BT-BR(1Mbps)	-	-	-	-	-
2441MHz	Pass	31.6	310.530435m_DH5	400m	2.913043m
2441MHz	Pass	31.6	266.666667m_DH3	400m	1.666667m
2441MHz	Pass	31.6	129.855072m_DH1	400m	405.797101u
BT-EDR(2Mbps)	-	-	-	-	-
2441MHz	Pass	31.6	310.530435m_DH5	400m	2.913043m
2441MHz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

Result/ AFH mode

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

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

2441MHz

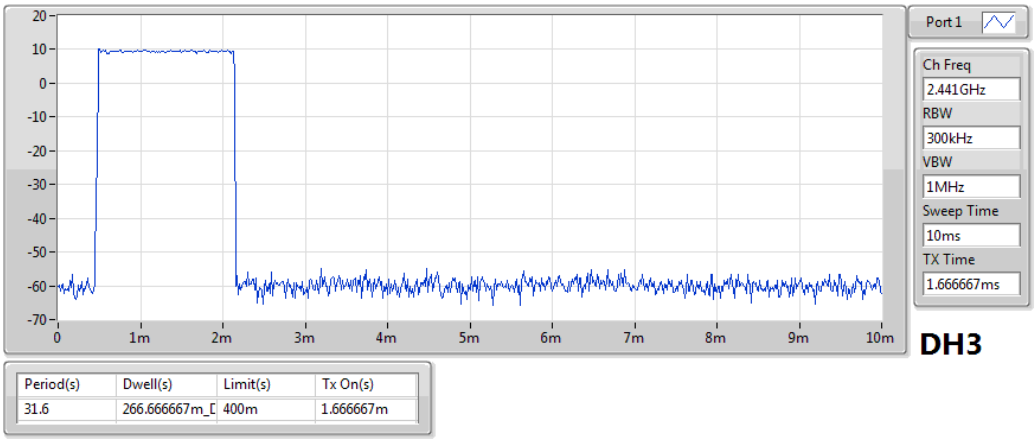


DH5

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

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

2441MHz

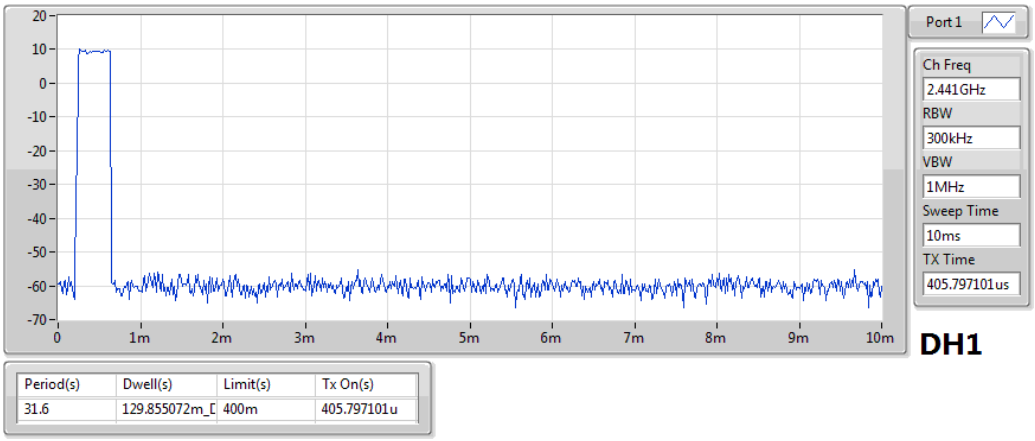


DH3

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

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

2441MHz

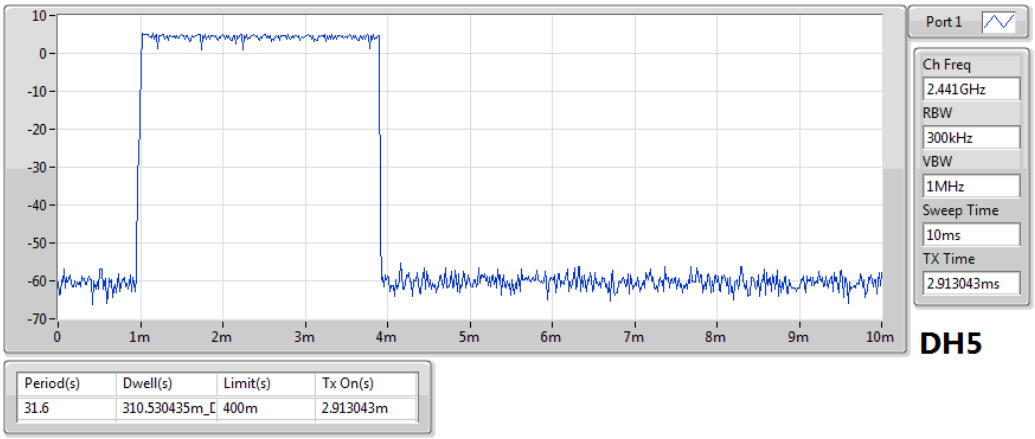


DH1

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

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

2441MHz

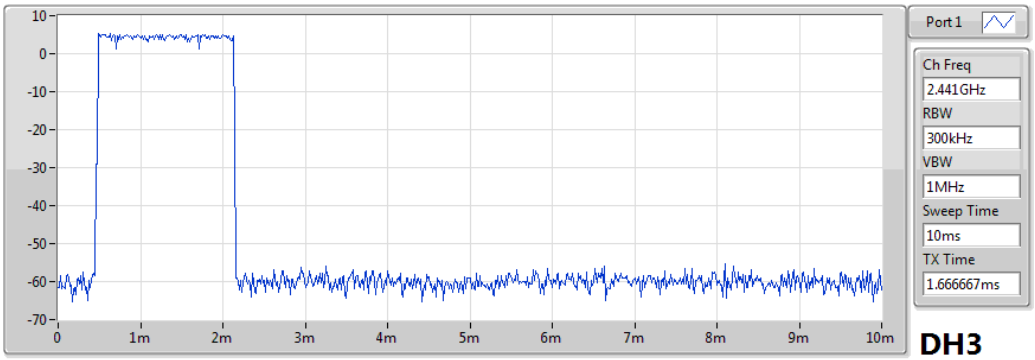


DH5

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

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

2441MHz

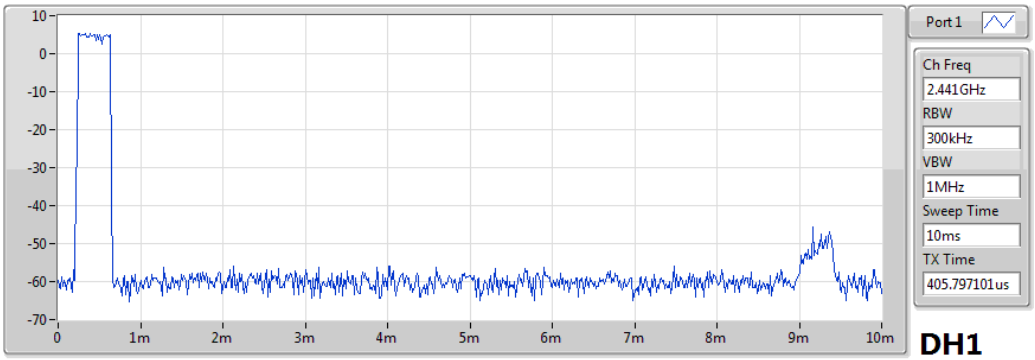


DH3

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

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

2441MHz

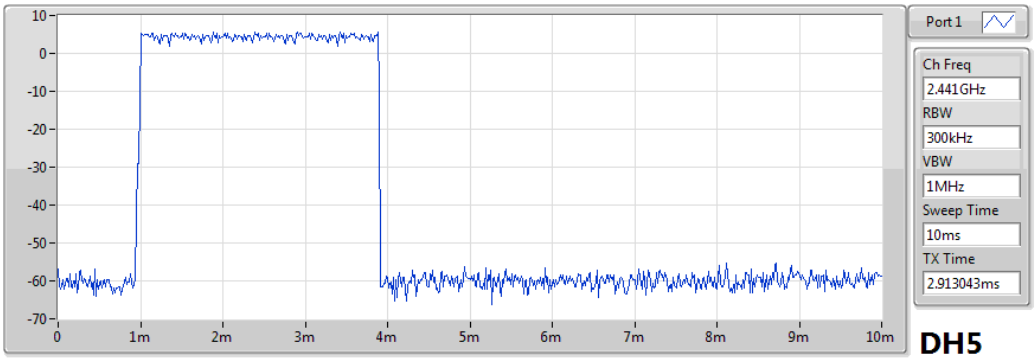


DH1

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

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

2441MHz

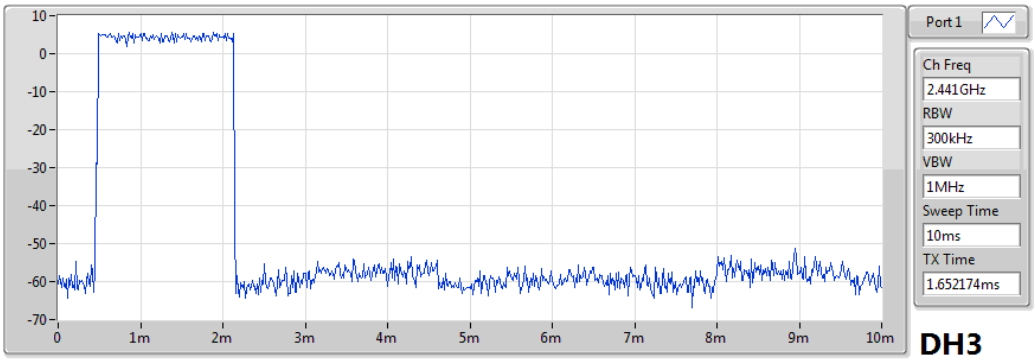


DH5

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

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

2441MHz

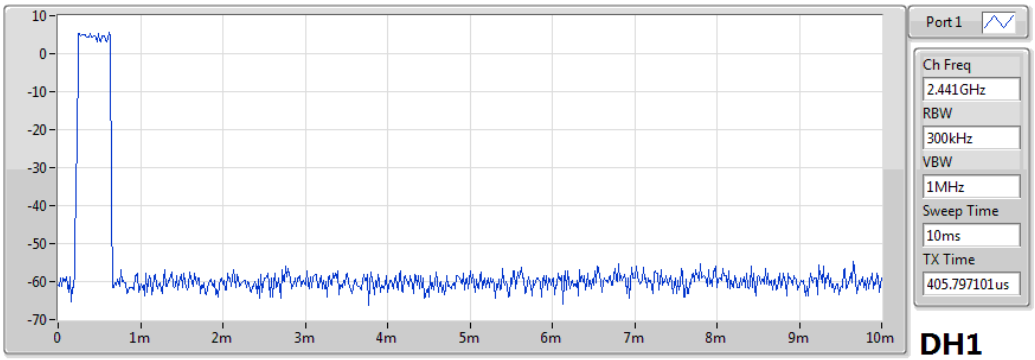


DH3

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

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

2441MHz



DH1

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

4 Receiver Test Results

4.1 Conducted Emissions

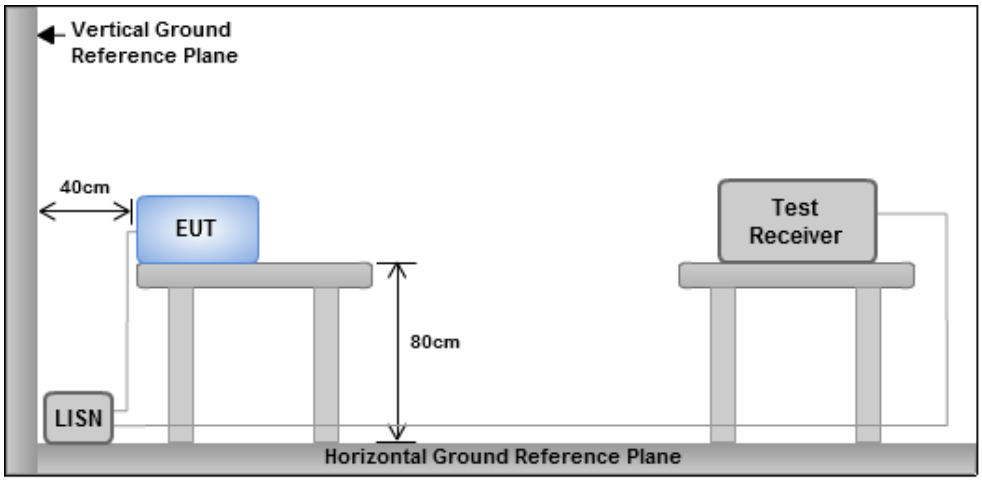
4.1.1 Limit of Conducted Emissions

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.		

4.1.2 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.

4.1.3 Test Setup

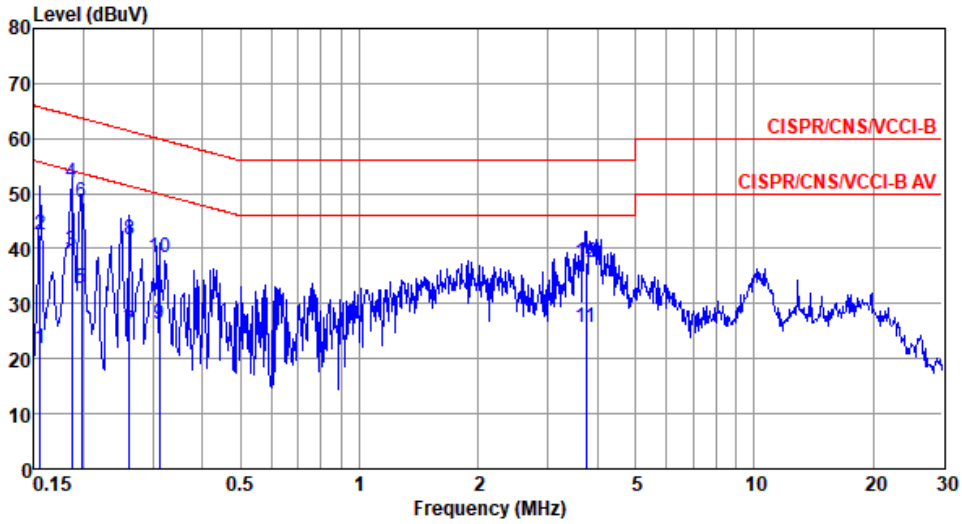


Note: 1. Support units were connected to second LISN.
2. Both of LISNs (AMN) are 80 cm from EUT and at least 80 cm from other units and other metal planes

Test Configuration 2: Charger mode with notebook

4.1.4 Test Result of Conducted Emissions

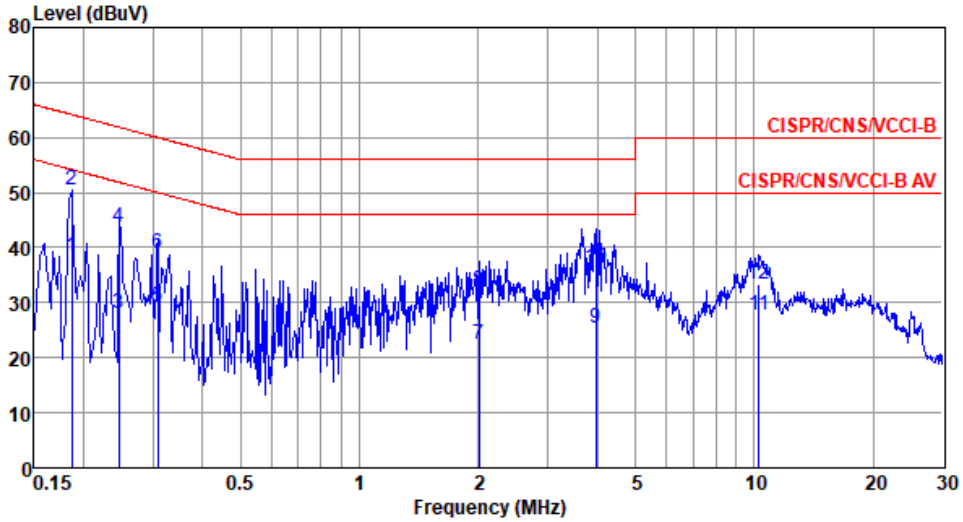
Modulation Mode	GFSK	**Test Freq. (MHz)**	2480
Power Phase	Line		



	Freq MHz	Level dBuV	Limit Line dBuV	Over Limit dB	Read Level dBuV	LISN factor dB	cable loss dB	Remark
1	0.156	21.76	55.69	-33.93	12.18	9.53	0.05	Average
2	0.156	42.58	65.69	-23.11	33.00	9.53	0.05	QP
3	0.186	39.43	54.20	-14.77	29.82	9.54	0.07	Average
4*	0.186	51.88	64.20	-12.32	42.27	9.54	0.07	QP
5	0.198	32.75	53.71	-20.96	23.14	9.54	0.07	Average
6	0.198	48.42	63.71	-15.29	38.81	9.54	0.07	QP
7	0.262	25.15	51.38	-26.23	15.53	9.55	0.07	Average
8	0.262	41.60	61.38	-19.78	31.98	9.55	0.07	QP
9	0.312	26.21	49.93	-23.72	16.57	9.56	0.08	Average
10	0.312	38.30	59.93	-21.63	28.66	9.56	0.08	QP
11	3.759	25.80	46.00	-20.20	15.92	9.61	0.27	Average
12	3.759	37.37	56.00	-18.63	27.49	9.61	0.27	QP

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

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



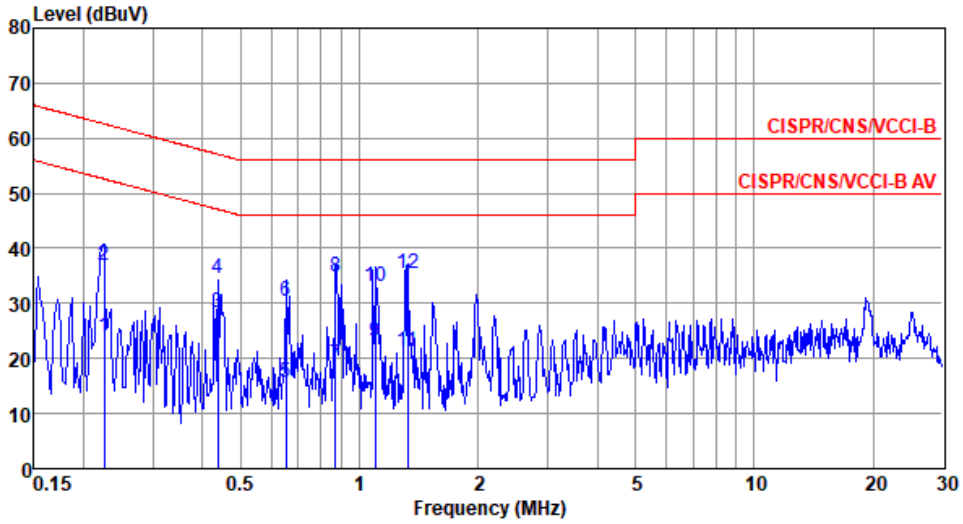
	Freq MHz	Level dBuV	Limit Line dBuV	Over Limit dB	Read Level dBuV	LISN factor dB	cable loss dB	Remark
1	0.186	38.44	54.20	-15.76	28.79	9.58	0.07	Average
2*	0.186	50.58	64.20	-13.62	40.93	9.58	0.07	QP
3	0.246	28.06	51.91	-23.85	18.40	9.59	0.07	Average
4	0.246	43.72	61.91	-18.19	34.06	9.59	0.07	QP
5	0.308	29.16	50.02	-20.86	19.48	9.60	0.08	Average
6	0.308	38.99	60.02	-21.03	29.31	9.60	0.08	QP
7	2.012	22.42	46.00	-23.58	12.61	9.65	0.16	Average
8	2.012	32.22	56.00	-23.78	22.41	9.65	0.16	QP
9	3.964	25.44	46.00	-20.56	15.50	9.66	0.28	Average
10	3.964	36.33	56.00	-19.67	26.39	9.66	0.28	QP
11	10.288	27.75	50.00	-22.25	17.59	9.71	0.45	Average
12	10.288	33.49	60.00	-26.51	23.33	9.71	0.45	QP

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

Test Configuration 3: Charger mode with adapter

4.1.5 Test Result of Conducted Emissions

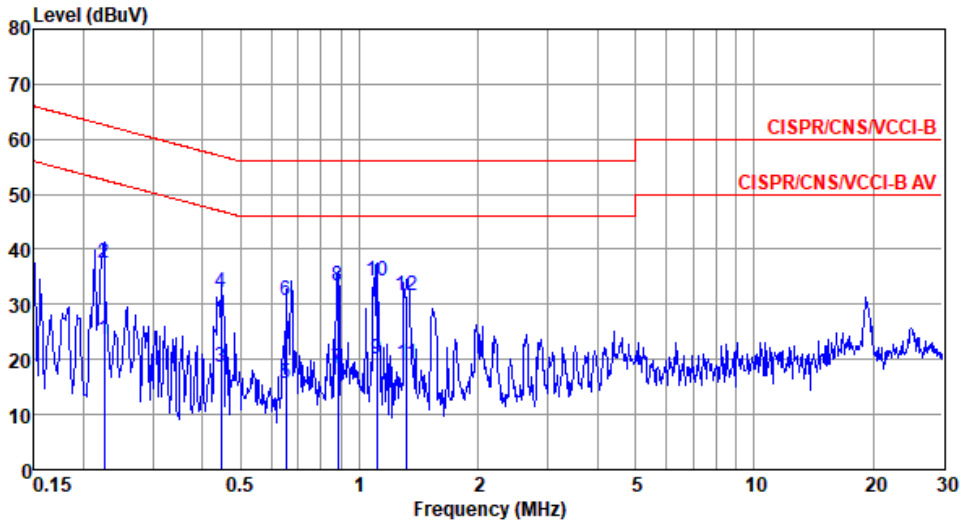
Modulation Mode	GFSK	**Test Freq. (MHz)**	2480
Power Phase	Line		



	Freq MHz	Level dBuV	Limit Line dBuV	Over Limit dB	Read Level dBuV	LISN factor dB	cable loss dB	Remark
1	0.226	23.85	52.61	-28.76	13.96	9.63	0.06	Average
2	0.226	36.83	62.61	-25.78	26.94	9.63	0.06	QP
3*	0.437	28.24	47.11	-18.87	18.27	9.63	0.08	Average
4	0.437	34.66	57.11	-22.45	24.69	9.63	0.08	QP
5	0.651	15.75	46.00	-30.25	5.73	9.63	0.10	Average
6	0.651	30.43	56.00	-25.57	20.41	9.63	0.10	QP
7	0.871	18.87	46.00	-27.13	8.82	9.63	0.11	Average
8	0.871	34.85	56.00	-21.15	24.80	9.63	0.11	QP
9	1.094	22.89	46.00	-23.11	12.81	9.63	0.13	Average
10	1.094	32.99	56.00	-23.01	22.91	9.63	0.13	QP
11	1.324	21.26	46.00	-24.74	11.16	9.63	0.14	Average
12	1.324	35.37	56.00	-20.63	25.27	9.63	0.14	QP

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

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



	Freq MHz	Level dBuV	Limit Line dBuV	Over Limit dB	Read Level dBuV	LISN factor dB	cable loss dB	Remark
1	0.226	23.48	52.61	-29.13	13.62	9.65	0.06	Average
2	0.226	37.42	62.61	-25.19	27.56	9.65	0.06	QP
3	0.447	18.59	46.93	-28.34	8.69	9.65	0.08	Average
4	0.447	32.06	56.93	-24.87	22.16	9.65	0.08	QP
5	0.651	15.52	46.00	-30.48	5.58	9.65	0.10	Average
6	0.651	30.83	56.00	-25.17	20.89	9.65	0.10	QP
7	0.880	18.37	46.00	-27.63	8.41	9.65	0.11	Average
8	0.880	33.24	56.00	-22.76	23.28	9.65	0.11	QP
9	1.106	19.96	46.00	-26.04	9.97	9.65	0.13	Average
10*	1.106	34.18	56.00	-21.82	24.19	9.65	0.13	QP
11	1.317	19.19	46.00	-26.81	9.18	9.65	0.14	Average
12	1.317	31.57	56.00	-24.43	21.56	9.65	0.14	QP

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

4.2 Unwanted Emissions into Restricted Frequency Bands

4.2.1 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.

4.2.2 Test Procedures

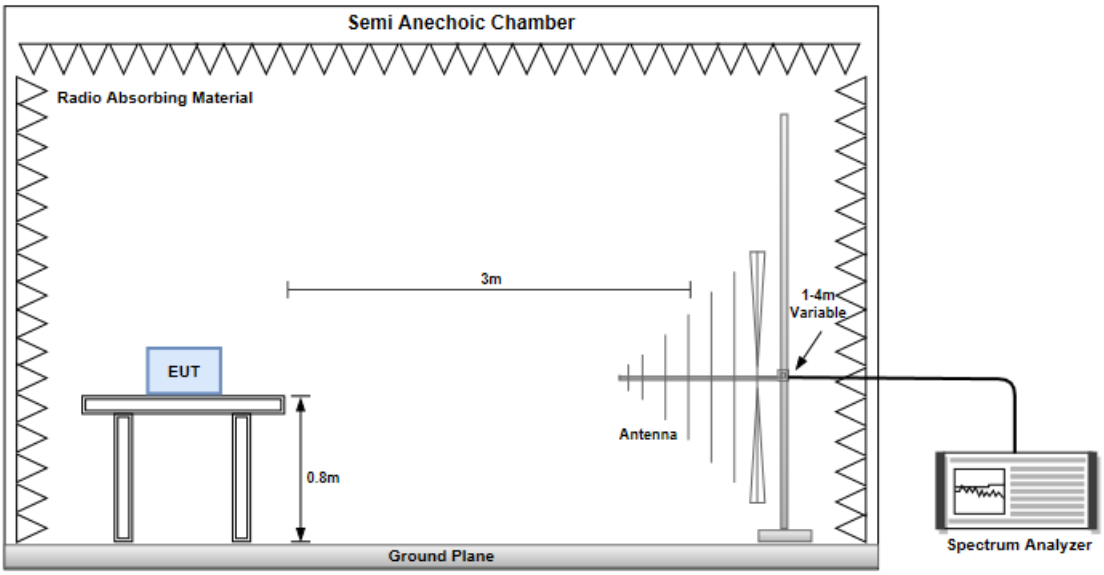
1. Measurement is made at a semi-anechoic chamber that incorporates a turntable allowing a EUT rotation of 360°. A continuously-rotating, remotely-controlled turntable is installed at the test site to support the EUT and facilitate determination of the direction of maximum radiation for each EUT emission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

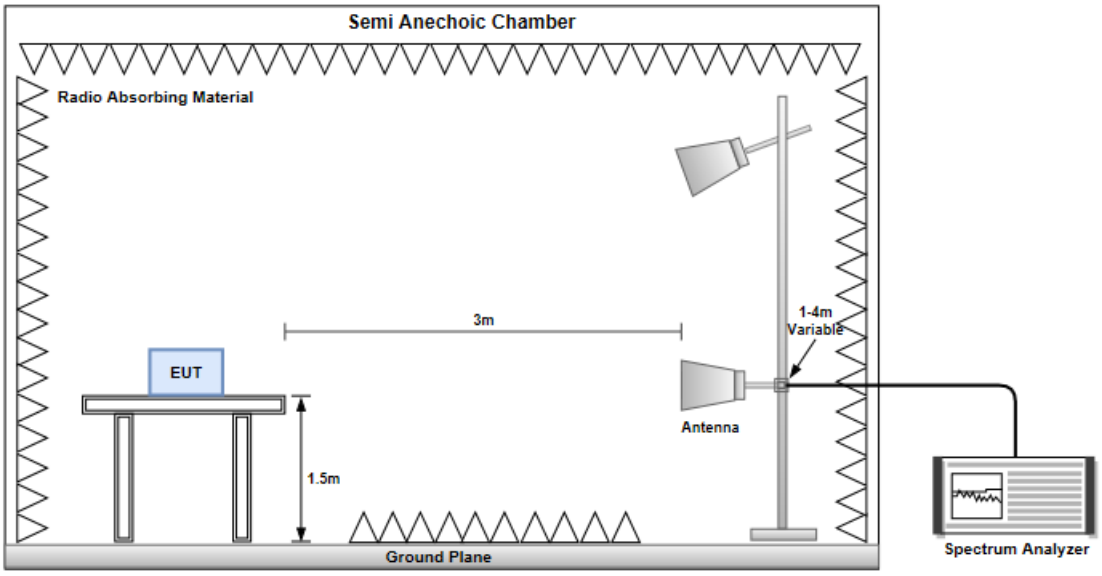
1. 120kHz measurement bandwidth of test receiver and Quasi-peak detector is for radiated emission below 1GHz.
2. RBW=1MHz, VBW=3MHz and Peak detector is for peak measured value of radiated emission above 1GHz.
3. RBW=1MHz, VBW=3MHz and RMS detector is for average measured value of radiated emission above 1GHz.

4.2.3 Test Setup

Radiated Emissions below 1 GHz



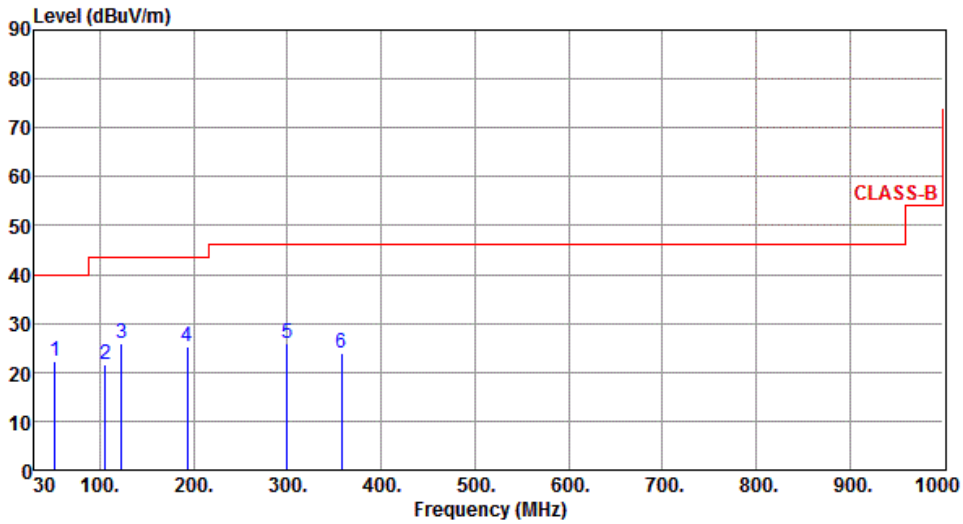
Radiated Emissions above 1 GHz



Test Configuration 1: Battery mode

4.2.4 Receiver Radiated Unwanted Emissions

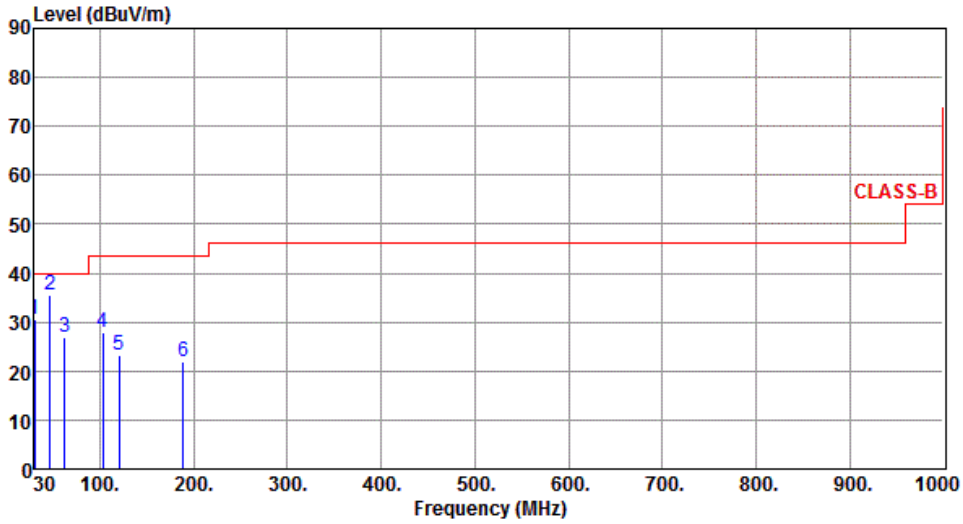
Modulation	GFSK	**Test Freq. (MHz)**	2480
Polarization	Horizontal		



	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
1	52.31	22.33	40.00	-17.67	30.22	-7.89	Peak	---	---
2	105.66	21.73	43.50	-21.77	33.72	-11.99	Peak	---	---
3	123.12	25.85	43.50	-17.65	36.15	-10.30	Peak	---	---
4	192.96	25.31	43.50	-18.19	35.93	-10.62	Peak	---	---
5	299.66	26.03	46.00	-19.97	33.84	-7.81	Peak	---	---
6	357.86	23.91	46.00	-22.09	30.14	-6.23	Peak	---	---

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

Modulation	GFSK	Test Freq. (MHz)	2480
Polarization	Vertical		

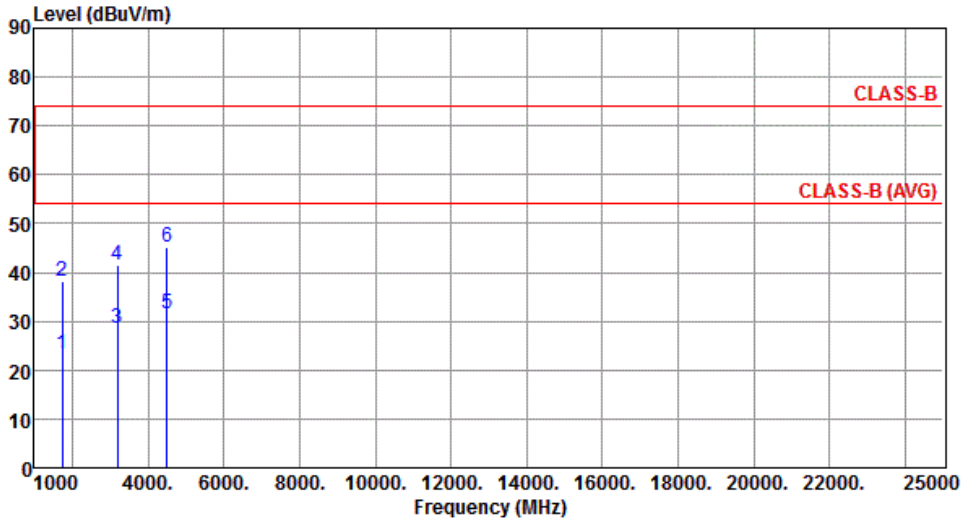


	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
1	30.00	30.51	40.00	-9.49	39.35	-8.84	Peak	---	---
2	46.49	35.59	40.00	-4.41	43.37	-7.78	Peak	---	---
3	62.01	26.90	40.00	-13.10	36.00	-9.10	Peak	---	---
4	102.75	28.00	43.50	-15.50	40.49	-12.49	Peak	---	---
5	120.21	23.24	43.50	-20.26	33.84	-10.60	Peak	---	---
6	189.08	21.90	43.50	-21.60	32.23	-10.33	Peak	---	---

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

4.2.5 Receiver Radiated Unwanted Emissions (Above 1GHz)

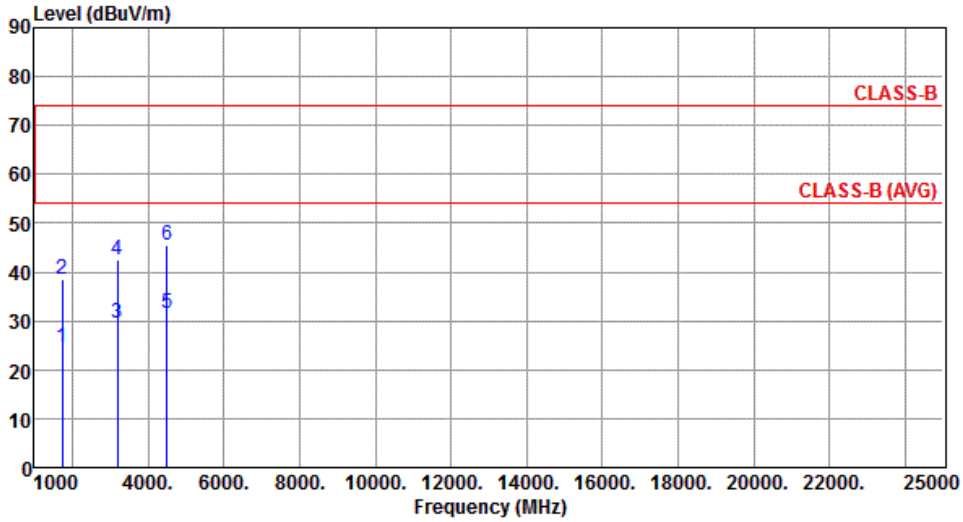
Modulation	GFSK	**Test Freq. (MHz)**	2480
Polarization	Horizontal		



	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
1	1735.00	23.33	54.00	-30.67	30.15	-6.82	Average	100	69
2	1735.00	38.15	74.00	-35.85	44.97	-6.82	Peak	100	69
3	3205.00	28.58	54.00	-25.42	29.41	-0.83	Average	100	124
4	3205.00	41.40	74.00	-32.60	42.23	-0.83	Peak	100	124
5	4500.00	31.69	54.00	-22.31	28.97	2.72	Average	100	255
6	4500.00	45.23	74.00	-28.77	42.51	2.72	Peak	100	255

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

Modulation	GFSK	Test Freq. (MHz)	2480
Polarization	Vertical		



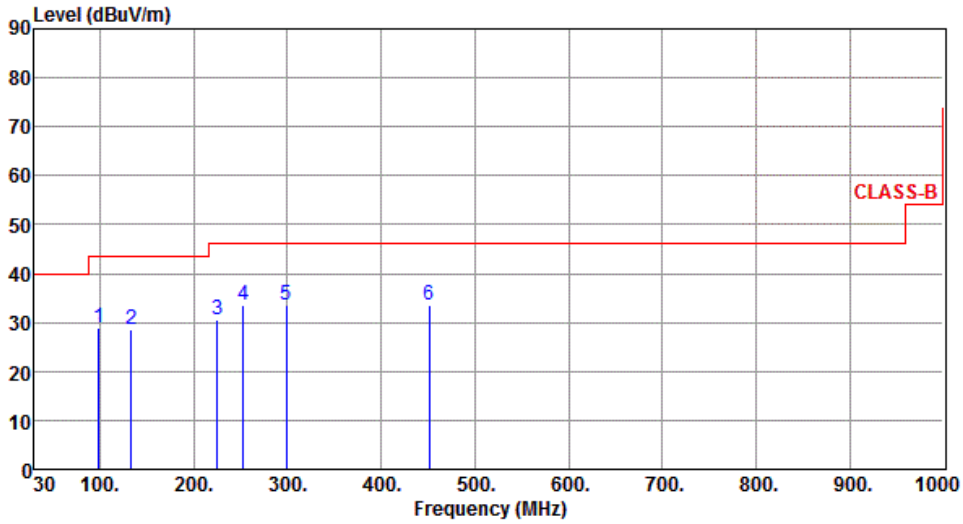
	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
1	1735.00	24.54	54.00	-29.46	31.36	-6.82	Average	100	95
2	1735.00	38.36	74.00	-35.64	45.18	-6.82	Peak	100	95
3	3205.00	29.58	54.00	-24.42	30.41	-0.83	Average	100	262
4	3205.00	42.47	74.00	-31.53	43.30	-0.83	Peak	100	262
5	4500.00	31.57	54.00	-22.43	28.85	2.72	Average	100	253
6	4500.00	45.36	74.00	-28.64	42.64	2.72	Peak	100	253

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

Test Configuration 2: Charger mode with notebook

4.2.6 Receiver Radiated Unwanted Emissions

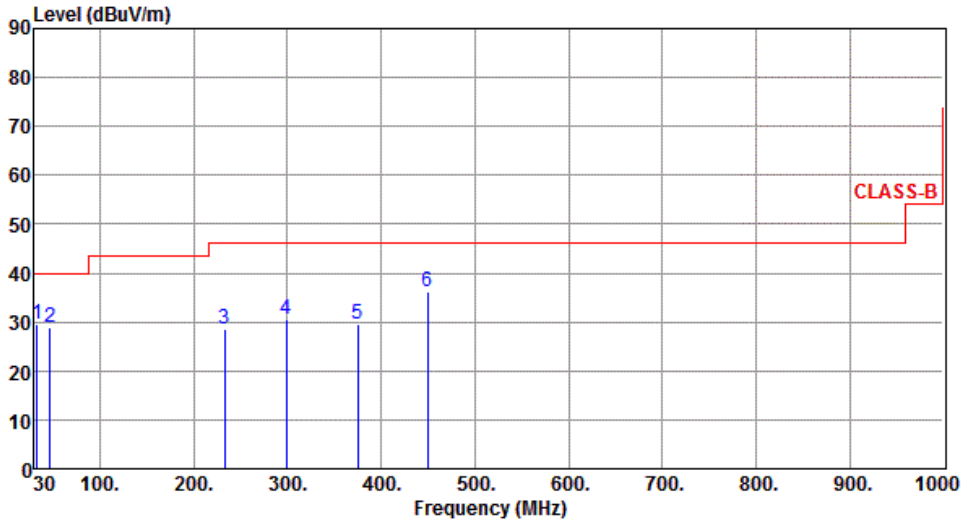
Modulation	GFSK	**Test Freq. (MHz)**	2480
Polarization	Horizontal		



	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
1	98.66	28.74	43.50	-14.76	41.98	-13.24	Peak	---	---
2	133.25	28.63	43.50	-14.87	37.89	-9.26	Peak	---	---
3	225.24	30.57	46.00	-15.43	41.39	-10.82	Peak	---	---
4	253.14	33.59	46.00	-12.41	42.81	-9.22	Peak	---	---
5	299.24	33.41	46.00	-12.59	41.23	-7.82	Peak	---	---
6	451.25	33.54	46.00	-12.46	37.42	-3.88	Peak	---	---

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

Modulation	GFSK	Test Freq. (MHz)	2480
Polarization	Vertical		



	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
1	32.58	29.54	40.00	-10.46	38.33	-8.79	Peak	---	---
2	46.58	28.96	40.00	-11.04	36.75	-7.79	Peak	---	---
3	233.21	28.67	46.00	-17.33	38.73	-10.06	Peak	---	---
4	299.21	30.58	46.00	-15.42	38.40	-7.82	Peak	---	---
5	375.25	29.69	46.00	-16.31	35.36	-5.67	Peak	---	---
6	449.58	36.21	46.00	-9.79	40.13	-3.92	Peak	---	---

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

5 Test laboratory information

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

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

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

Linkou	**Kwei Shan**	**Kwei Shan Site II**
Tel: 886-2-2601-1640	Tel: 886-3-271-8666	Tel: 886-3-271-8640
No. 30-2, Ding Fwu Tsuen, Lin Kou District, New Taipei City, Taiwan, R.O.C.	No. 3-1, Lane 6, Wen San 3rd St., Kwei Shan District, Tao Yuan City 333, Taiwan, R.O.C.	No. 14-1, Lane 19, Wen San 3rd St., Kwei Shan District, Tao Yuan City 333, Taiwan, R.O.C.

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

Tel: 886-3-271-8666
Fax: 886-3-318-0155
Email: ICC_Service@icertifi.com.tw

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