NCC Test Report

Equipment	:	揚聲器
Model No.	:	**SCBT19**
Brand Name	:	**EPOS**
Applicant	:	**Sennheiser Communications A/S**
Address	:	**Industriparken 27, Ballerup 2750 , Denmark**
Standard	:	**LP0002 Section 3.10.1 (2018-01-10)**
Received Date	:	**Nov. 13, 2019**
Tested Date	:	**May 16 ~ Jun. 26, 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.
The report must not be used by the client to claim product certification, approval, or endorsement by TAF or any agency of government.

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
TR9N1302AD	Rev. 01	Initial issue	Jul. 10, 2020

Summary of Test Results

NCC Rules	Test Items	Measured	Result
2.3	Conducted Emissions	[dBuV]: 0.154MHz 46.18(Margin -19.60dB) - QP	Pass
3.10.1.5 2.8	Radiated Emissions	[dBuV/m at 3m]: 9754.00MHz 47.23 (Margin -6.77dB) - AV	Pass
3.10.1.5	Band Edge	Meet the requirement of limit	Pass
3.10.1.2(1)(B)	Conducted Output Power	Power [dBm]: 8.01	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 Product Details

The following models are provided to this EUT.

Brand Name	Model Name	Product name	Product description	Description
EPOS	SCBT19	EXPAND 80	Bluetooth speakerphone	-
EPOS	SCBT19	EXPAND 80T	Bluetooth speakerphone	SW for MS Teams. Buttons have different icons
✦ The **EXPAND 80** was selected as a representative for the final test and only its data was recorded in this report.				

1.1.2 Specification of the Equipment under Test (EUT)

RF General Information				
Frequency Range (MHz)	**Bluetooth Mode**	**Ch. Frequency (MHz)**	**Channel Number**	**Data Rate**
2400-2483.5	BR	2402-2480	0-78 [79]	1 Mbps
2400-2483.5	EDR	2402-2480	0-78 [79]	2 Mbps
Note 1: RF output power specifies that Maximum Peak Conducted Output Power. Note 2: Bluetooth BR uses a GFSK. Note 3: Bluetooth EDR uses π/4-DQPSK.				

1.1.3 Antenna Details

Ant. No.	Type	Connector	Gain (dBi)	Remarks
1	PIFA	N/A	3.7	---

1.1.4 Power Supply Type of Equipment under Test (EUT)

Power Supply Type	5Vdc from adapter

1.1.5 Accessories

Accessories		
No.	**Equipment**	**Description**
1	Adapter	Brand: EPOS Model: GS5V-2.4C-DC I/P: 100-240Vac, 50/60Hz, 0.5A Max O/P: 5Vdc, 2.4A Power Line: 1.3m shielded without core
2	USB-C cable	Brand: EPOS Model: EP-UC-L150-1 Power Line: 1.5m shielded without core
3	USB-C to -A adapter	Brand: EPOS Model: SCUCL01
4	USB dongle	Brand: EPOS Model: BTD 800 USB

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	CBT Test	
Duty Cycle and Duty Factor	**Duty Cycle (%)**	**Duty Factor (dB)**
DH5	78.61	1.05
2DH5	78.61	1.05

1.1.8 Power Index of Test Tool

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

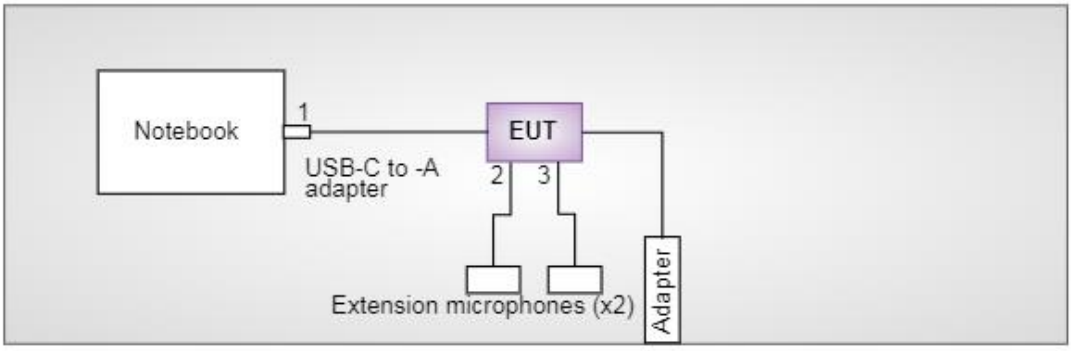
1.2 Local Support Equipment List

Support Equipment List					
No.	**Equipment**	**Brand**	**Model**	**FCC ID**	**Remarks**
1	Notebook	DELL	Latitude E5470	DoC	實驗室提供
2	Extension microphones (x2)	EPOS	EPWD1	---	申請者提供

備註:
本案經申請者切結器材不提供此配件，配件由申請者提供併同檢驗。
本案經申請者切結器材不提供此配件，配件由實驗室提供併同檢驗。

1.3 Test Setup Chart

Test Setup Diagram



No.	Signal cable / Length (m)
1	USB-C cable, 1.5m shielded.
2-3	Extension microphones, 2.89m non-shielded without core

1.4 The Equipment List

Test Item	Conducted Emission				
Test Site	Conduction room 1 / (CO01-WS)				
Tested Date	Jun. 26, 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.					

Test Item	Radiated Emission				
Test Site	966 chamber 1 / (03CH01-WS)				
Tested Date	Jun. 22, 2020				
Instrument	**Manufacturer**	**Model No.**	**Serial No.**	**Calibration Date**	**Calibration Until**
Spectrum Analyzer	R&S	FSV40	101498	Dec. 17, 2019	Dec. 16, 2020
Receiver	R&S	ESR3	101657	Feb. 14, 2020	Feb. 13, 2021
Bilog Antenna	SCHWARZBECK	VULB9168	VULB9168-522	Jul. 12, 2019	Jul. 11, 2020
Horn Antenna 1G-18G	SCHWARZBECK	BBHA 9120 D	BBHA 9120 D 1096	Dec. 12, 2019	Dec. 11, 2020
Horn Antenna 18G-40G	SCHWARZBECK	BBHA 9170	BBHA 9170517	Nov. 15, 2019	Nov. 14, 2020
Loop Antenna	R&S	HFH2-Z2	100330	Nov. 13, 2019	Nov. 12, 2020
Loop Antenna Cable	KOAX KABEL	101354-BW	101354-BW	Oct. 07, 2019	Oct. 06, 2020
Preamplifier	EMC	EMC02325	980225	Jul. 09, 2019	Jul. 08, 2020
Preamplifier	Agilent	83017A	MY39501308	Oct. 08, 2019	Oct. 07, 2020
Preamplifier	EMC	EMC184045B	980192	Aug. 01, 2019	Jul. 31, 2020
RF Cable	EMC	EMC104-SM-SM-8000	181106	Oct. 07, 2019	Oct. 06, 2020
RF Cable	HUBER+SUHNER	SUCOFLEX104	MY16019/4	Oct. 07, 2019	Oct. 06, 2020
RF Cable	HUBER+SUHNER	SUCOFLEX104	MY16014/4	Oct. 07, 2019	Oct. 06, 2020
LF cable 1M	EMC	EMCCFD400-NM-NM-1000	160502	Oct. 07, 2019	Oct. 06, 2020
LF cable 3M	Woken	CFD400NL-LW	CFD400NL-001	Oct. 07, 2019	Oct. 06, 2020
LF cable 10M	Woken	CFD400NL-LW	CFD400NL-002	Oct. 07, 2019	Oct. 06, 2020
Measurement Software	AUDIX	e3	6.120210g	NA	NA
Note: Calibration Interval of instruments listed above is one year.					

Test Item	RF Conducted				
Test Site	(TH01-WS)				
Tested Date	May 16, 2020				
Instrument	**Manufacturer**	**Model No.**	**Serial No.**	**Calibration Date**	**Calibration Until**
Spectrum Analyzer	R&S	FSV40	101063	Apr. 30, 2020	Apr. 29, 2021
Power Meter	Anritsu	ML2495A	1241002	Oct. 23, 2019	Oct. 22, 2020
Power Sensor	Anritsu	MA2411B	1207366	Oct. 23, 2019	Oct. 22, 2020
DC POWER SOURCE	GW INSTEK	GPC-6030D	GES855395	Oct. 29, 2019	Oct. 28, 2020
Measurement Software	Sporton	Sporton_1	1.3.30	NA	NA
Note: Calibration Interval of instruments listed above is one year.					

1.5 Test Standards

LP0002 Section 3.10.1 (2018-01-10)
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

ISO/IEC 17025 requires that an estimate of the measurement uncertainties associated with the emissions test results be included in the report. The measurement uncertainties given below are based on a 95% confidence level (based on a coverage factor (k=2)).

Measurement Uncertainty	
Parameters	**Uncertainty**
Bandwidth	±34.130 Hz
Conducted power	±0.808 dB
Power density	±0.583 dB
Conducted emission	±2.715 dB
AC conducted emission	±2.92 dB
Radiated emission ≤ 1GHz	±3.41 dB
Radiated emission > 1GHz	±4.90 dB
Time	±0.1%

2 Test Configuration

2.1 Testing Condition

Test Item	Test Site	Ambient Condition	Tested By
AC Conduction	CO01-WS	21°C / 69%	Akun Chung
Radiated Emissions	03CH01-WS	23-24°C / 66-68%	Akun Chung
RF Conducted	TH01-WS	24°C / 67%	Aska Huang

- FCC Designation No.: TW2732
- FCC site registration No.: 181692
- ISED#: 10807A
- CAB identifier: TW2732

2.2 Testing Facility

Test Laboratory	International Certification Corp.
Test Site	CO01-WS, 03CH01-WS, TH01-WS
Address of Test Site	No. 3-1, Lane 6, Wen San 3rd St., Kwei Shan District, Tao Yuan City 333, Taiwan, R.O.C.

2.3 The Worst Test Modes and Channel Details

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

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.

Test item	Condition	Modulation	Test Frequency (MHz)	Mode
AC Power Line Conducted Emissions	BT + NFC	л /4 DQPSK + ASK	2441 + 13.56	Rx
Radiated Emissions ≤ 1GHz	BT + NFC	л /4 DQPSK + ASK	2441 + 13.56	Rx
Radiated Emissions > 1GHz	BT	л /4 DQPSK	2441	Rx
NOTE: 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.				

3 Transmitter Test Results

3.1 Conducted Emissions

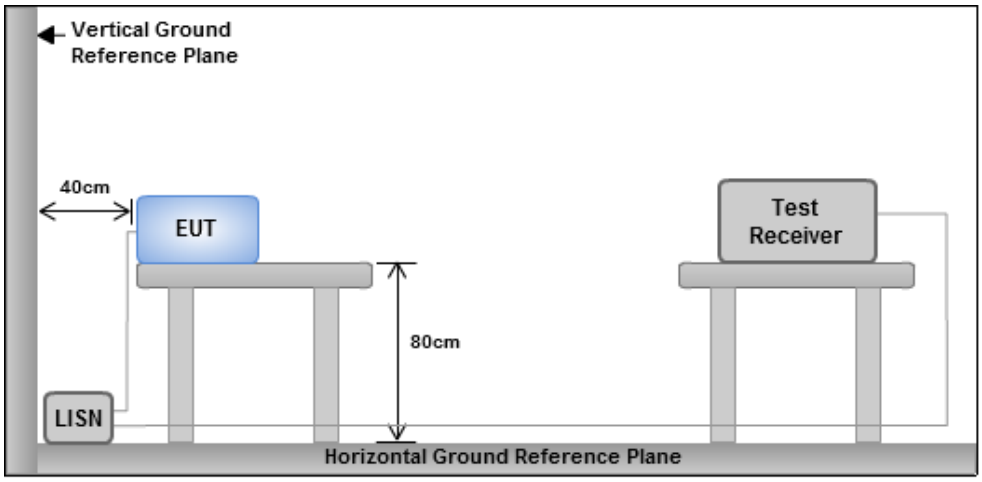
3.1.1 Limit of Conducted Emissions

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

3.1.2 Test Procedures

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

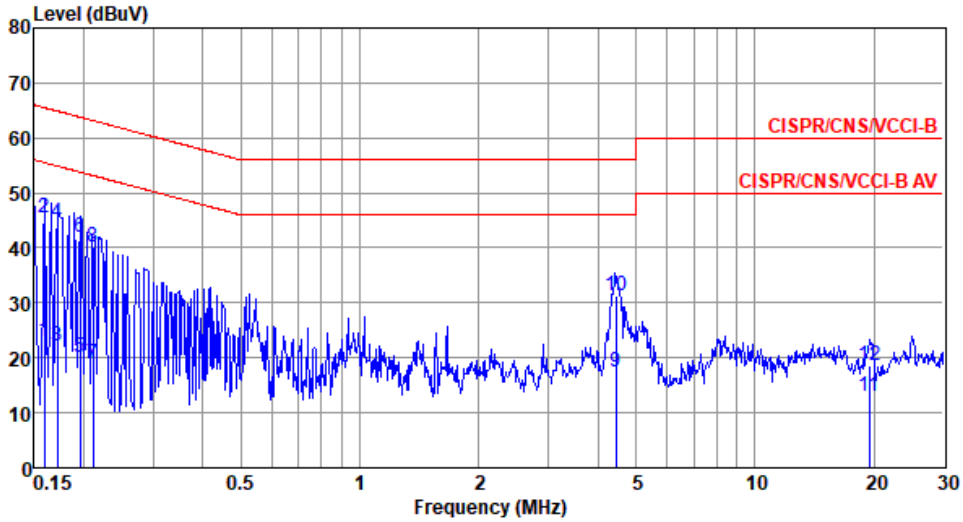
3.1.3 Test Setup



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

3.1.4 Test Result of Conducted Emissions

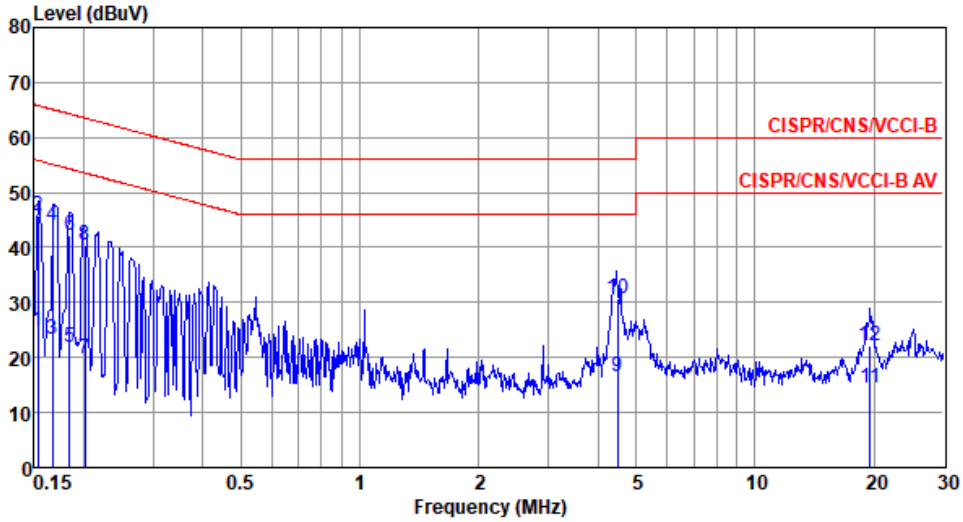
Modulation Mode	π/4-DQPSK	Test Freq. (MHz)	2441
Power Phase	Line		



	Freq MHz	Level dBuV	Limit Line dBuV	Over Limit dB	Read Level dBuV	LISN factor dB	cable loss dB	Remark
1	0.159	23.05	55.52	-32.47	13.19	9.64	0.05	Average
2*	0.159	45.47	65.52	-20.05	35.61	9.64	0.05	QP
3	0.171	22.25	54.89	-32.64	12.39	9.64	0.05	Average
4	0.171	44.47	64.89	-20.42	34.61	9.64	0.05	QP
5	0.196	20.17	53.77	-33.60	10.29	9.63	0.06	Average
6	0.196	41.85	63.77	-21.92	31.97	9.63	0.06	QP
7	0.211	18.77	53.17	-34.40	8.89	9.63	0.06	Average
8	0.211	40.15	63.17	-23.02	30.27	9.63	0.06	QP
9	4.439	17.52	46.00	-28.48	7.20	9.65	0.30	Average
10	4.439	31.25	56.00	-24.75	20.93	9.65	0.30	QP
11	19.444	12.85	50.00	-37.15	1.88	9.72	0.65	Average
12	19.444	18.46	60.00	-41.54	7.49	9.72	0.65	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	π/4-DQPSK	Test Freq. (MHz)	2441
Power Phase	Neutral		



	Freq MHz	Level dBuV	Limit Line dBuV	Over Limit dB	Read Level dBuV	LISN factor dB	cable loss dB	Remark
1	0.153	24.88	55.81	-30.93	15.05	9.66	0.05	Average
2*	0.153	45.66	65.81	-20.15	35.83	9.66	0.05	QP
3	0.167	23.32	55.12	-31.80	13.48	9.66	0.05	Average
4	0.167	43.98	65.12	-21.14	34.14	9.66	0.05	QP
5	0.184	21.85	54.28	-32.43	12.00	9.65	0.06	Average
6	0.184	42.15	64.28	-22.13	32.30	9.65	0.06	QP
7	0.201	19.75	53.56	-33.81	9.89	9.65	0.06	Average
8	0.201	40.56	63.56	-23.00	30.70	9.65	0.06	QP
9	4.482	16.66	46.00	-29.34	6.41	9.68	0.30	Average
10	4.482	30.56	56.00	-25.44	20.31	9.68	0.30	QP
11	19.530	14.44	50.00	-35.56	3.44	9.84	0.65	Average
12	19.530	22.21	60.00	-37.79	11.21	9.84	0.65	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:

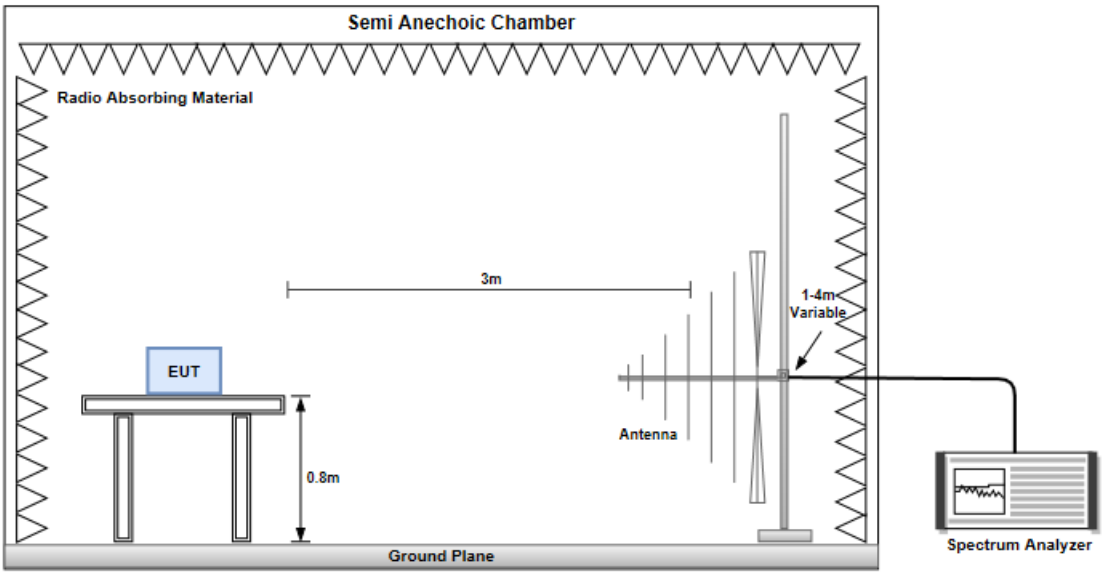
1. 120kHz measurement bandwidth of test receiver and Quasi-peak detector is for radiated emission below 1GHz.
2. Radiated emission above 1GHz / Peak value
   RBW=1MHz, VBW=3MHz and Peak detector
3. Radiated emission above 1GHz / Average value for harmonics
   The average value is: Average = Peak value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

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

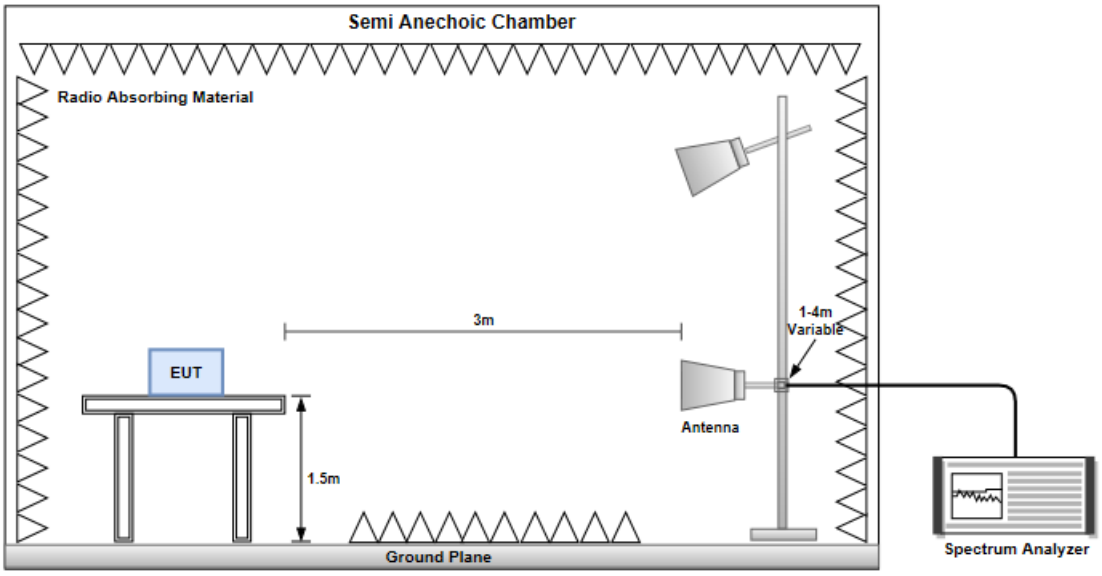
4. Radiated emission above 1GHz / Average value for other emissions
   RBW=1MHz, VBW=1/T and Peak detector

3.2.3 Test Setup

Radiated Emissions below 1 GHz

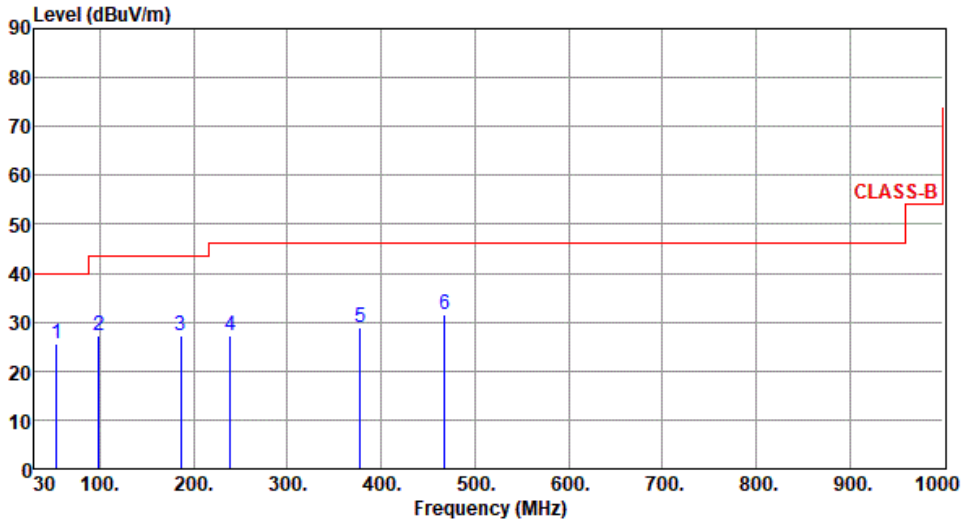


Radiated Emissions above 1 GHz



3.2.4 Transmitter Radiated Unwanted Emissions (Below 1GHz)

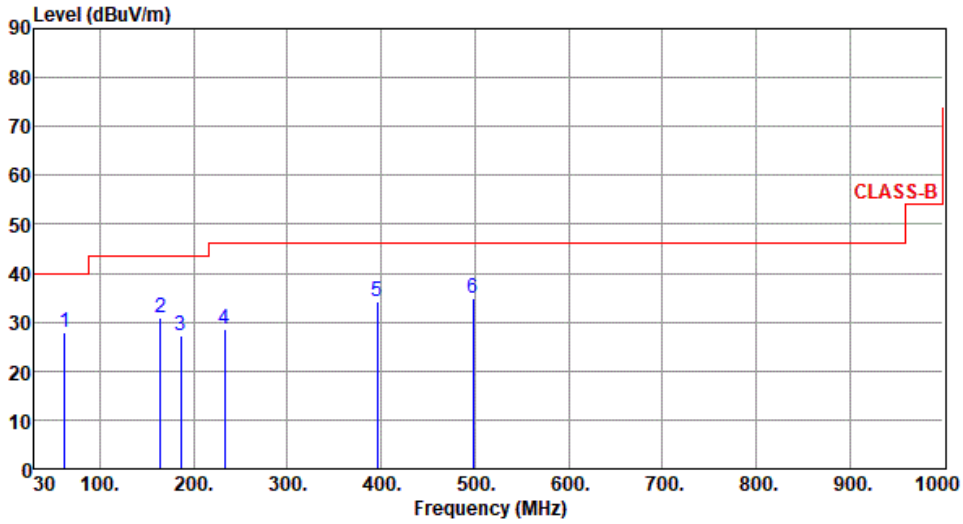
Modulation Mode	π/4-DQPSK	Test Freq. (MHz)	2441
Polarization	Horizontal		



	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
1	53.30	25.46	40.00	-14.54	33.89	-8.43	Peak	---	---
2	98.79	27.25	43.50	-16.25	40.48	-13.23	Peak	---	---
3	186.26	27.31	43.50	-16.19	38.12	-10.81	Peak	---	---
4	239.49	27.39	46.00	-18.61	37.64	-10.25	Peak	---	---
5	377.33	28.84	46.00	-17.16	34.84	-6.00	Peak	---	---
6	467.55	31.56	46.00	-14.44	35.25	-3.69	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 Mode	π /4-DQPSK	Test Freq. (MHz)	2441
Polarization	Vertical		

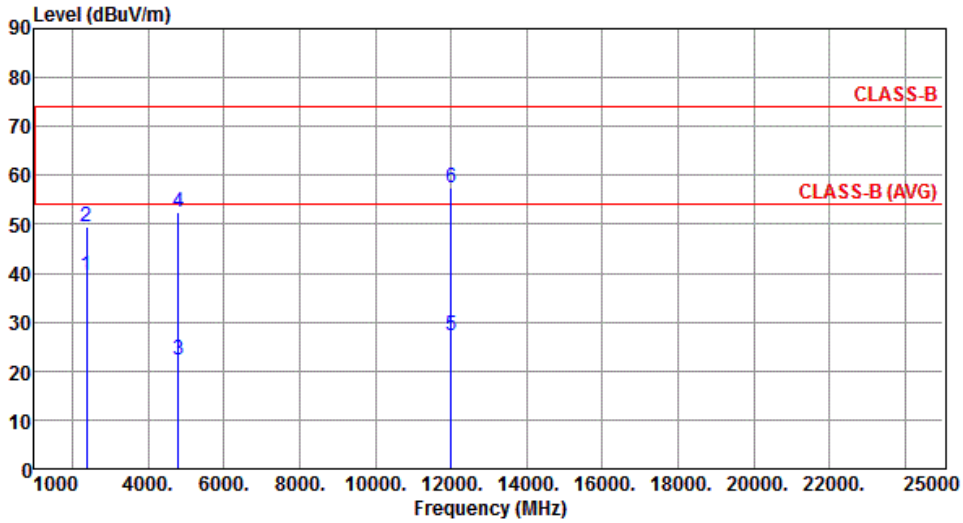


	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
1	62.26	27.79	40.00	-12.21	37.02	-9.23	Peak	---	---
2	164.75	30.85	43.50	-12.65	39.46	-8.61	Peak	---	---
3	186.26	27.35	43.50	-16.15	38.16	-10.81	Peak	---	---
4	232.66	28.49	46.00	-17.51	39.66	-11.17	Peak	---	---
5	395.54	34.31	46.00	-11.69	39.89	-5.58	Peak	---	---
6	498.49	34.85	46.00	-11.15	37.99	-3.14	Peak	---	---

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

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

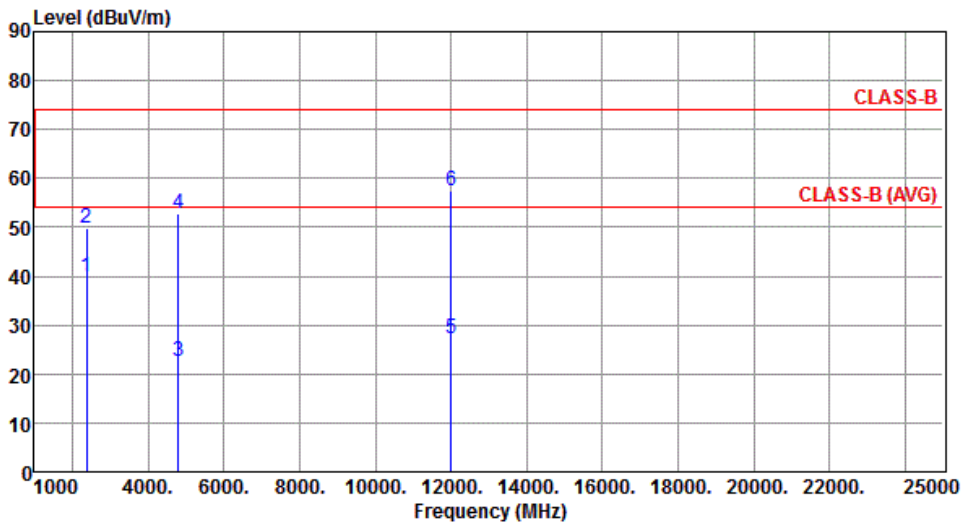
Modulation	GFSK	**Test Freq. (MHz)**	2402
Polarization	Horizontal		



	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
1	2390.00	39.42	54.00	-14.58	42.24	-2.82	Average	100	288
2	2390.00	49.50	74.00	-24.50	52.32	-2.82	Peak	100	288
3	4804.00	22.23	54.00	-31.77	18.71	3.52	Average	102	147
4	4804.00	52.33	74.00	-21.67	48.81	3.52	Peak	102	147
5	12010.00	27.21	54.00	-26.79	13.41	13.80	Average	100	289
6	12010.00	57.31	74.00	-16.69	43.51	13.80	Peak	100	289

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

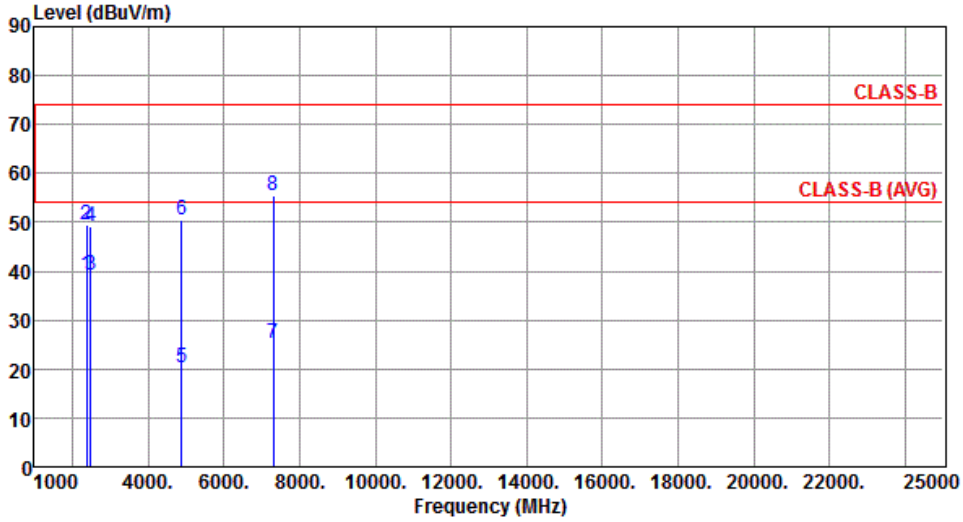
Modulation	GFSK	Test Freq. (MHz)	2402
Polarization	Vertical		



	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
1	2390.00	39.87	54.00	-14.13	42.69	-2.82	Average	253	262
2	2390.00	49.86	74.00	-24.14	52.68	-2.82	Peak	253	262
3	4804.00	22.74	54.00	-31.26	19.22	3.52	Average	102	334
4	4804.00	52.84	74.00	-21.16	49.32	3.52	Peak	102	334
5	12010.00	27.23	54.00	-26.77	13.43	13.80	Average	100	332
6	12010.00	57.33	74.00	-16.67	43.53	13.80	Peak	100	332

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

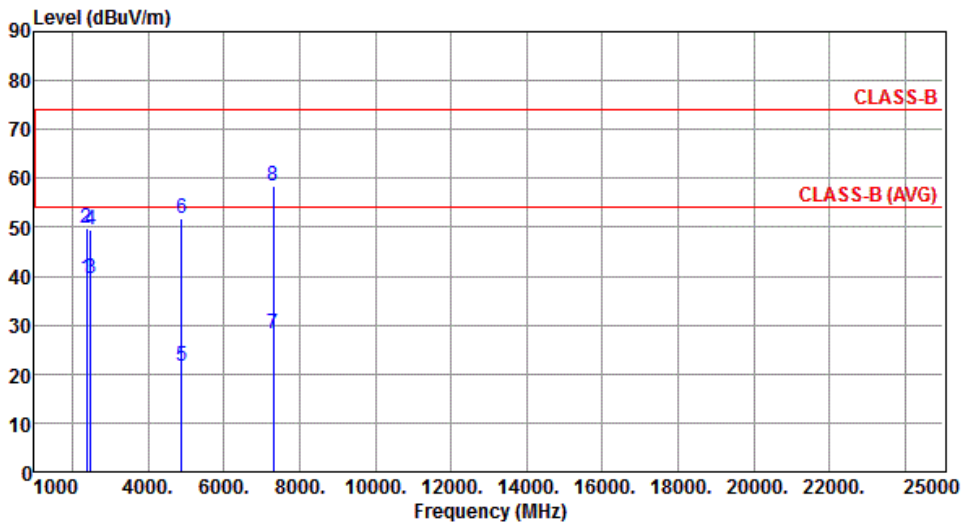
Modulation	GFSK	Test Freq. (MHz)	2441
Polarization	Horizontal		



	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
1	2390.00	39.32	54.00	-14.68	42.14	-2.82	Average	100	282
2	2390.00	49.40	74.00	-24.60	52.22	-2.82	Peak	100	282
3	2483.50	39.24	54.00	-14.76	42.20	-2.96	Average	100	282
4	2483.50	49.29	74.00	-24.71	52.25	-2.96	Peak	100	282
5	4880.00	20.35	54.00	-33.65	16.76	3.59	Average	100	146
6	4880.00	50.45	74.00	-23.55	46.86	3.59	Peak	100	146
7	7320.00	25.38	54.00	-28.62	16.22	9.16	Average	100	289
8	7320.00	55.48	74.00	-18.52	46.32	9.16	Peak	100	289

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

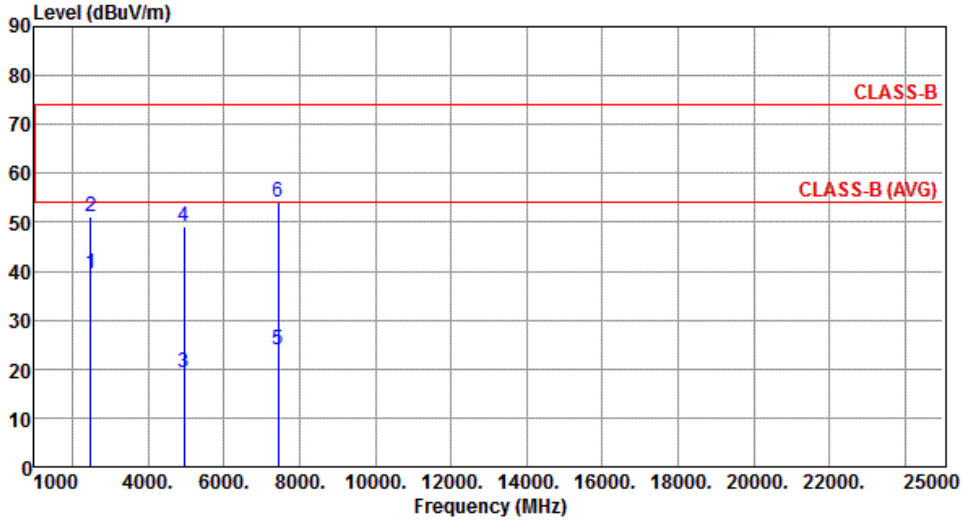
Modulation	GFSK	Test Freq. (MHz)	2441
Polarization	Vertical		



	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
1	2390.00	39.62	54.00	-14.38	42.44	-2.82	Average	258	271
2	2390.00	49.66	74.00	-24.34	52.48	-2.82	Peak	258	271
3	2483.50	39.39	54.00	-14.61	42.35	-2.96	Average	258	271
4	2483.50	49.53	74.00	-24.47	52.49	-2.96	Peak	258	271
5	4880.00	21.75	54.00	-32.25	18.16	3.59	Average	102	336
6	4880.00	51.85	74.00	-22.15	48.26	3.59	Peak	102	336
7	7320.00	28.26	54.00	-25.74	19.10	9.16	Average	100	328
8	7320.00	58.36	74.00	-15.64	49.20	9.16	Peak	100	328

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).

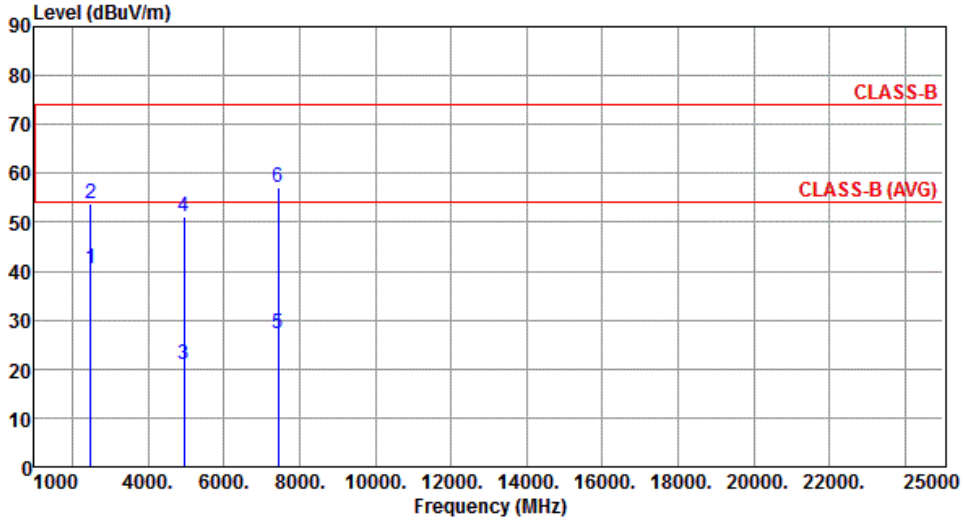
Modulation	GFSK	Test Freq. (MHz)	2480
Polarization	Horizontal		



	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	39.37	54.00	-14.63	42.33	-2.96	Average	100	287
2	2483.50	51.10	74.00	-22.90	54.06	-2.96	Peak	100	287
3	4960.00	19.21	54.00	-34.79	15.40	3.81	Average	100	141
4	4960.00	49.31	74.00	-24.69	45.50	3.81	Peak	100	141
5	7440.00	24.05	54.00	-29.95	15.12	8.93	Average	100	287
6	7440.00	54.15	74.00	-19.85	45.22	8.93	Peak	100	287

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		

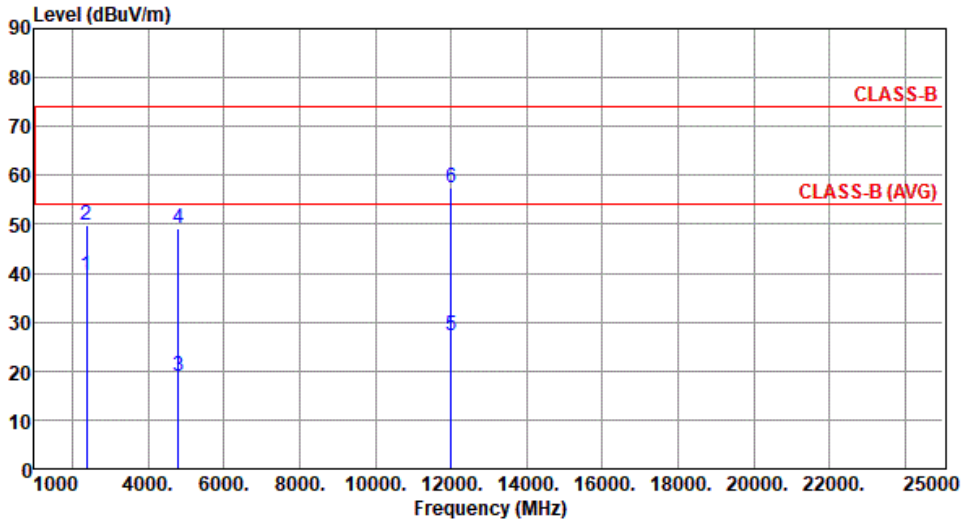


	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
1	2483.50	40.44	54.00	-13.56	43.40	-2.96	Average	251	266
2	2483.50	53.86	74.00	-20.14	56.82	-2.96	Peak	251	266
3	4960.00	20.99	54.00	-33.01	17.18	3.81	Average	110	337
4	4960.00	51.09	74.00	-22.91	47.28	3.81	Peak	110	337
5	7440.00	27.17	54.00	-26.83	18.24	8.93	Average	100	327
6	7440.00	57.27	74.00	-16.73	48.34	8.93	Peak	100	327

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 π/4-DQPSK

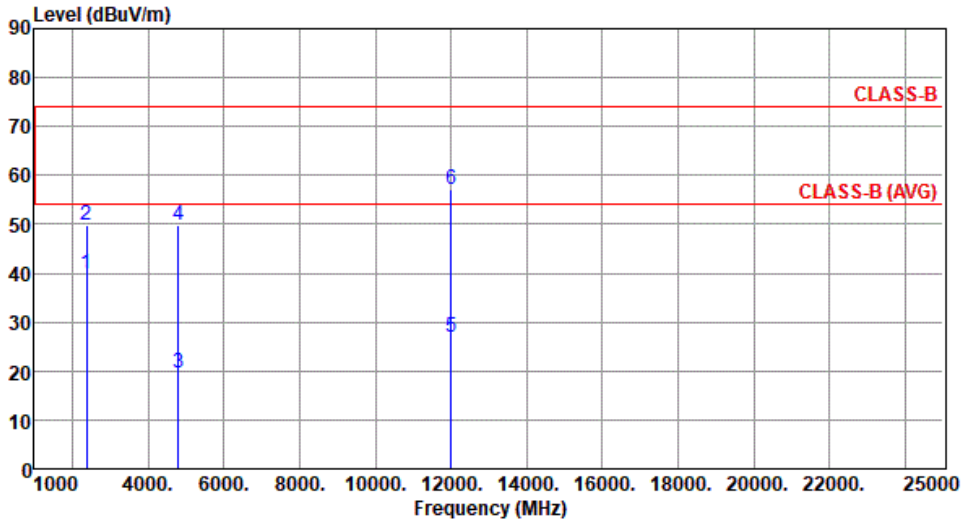
Modulation	π /4-DQPSK	**Test Freq. (MHz)**	2402
Polarization	Horizontal		



	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
1	2390.00	39.56	54.00	-14.44	42.36	-2.80	Average	100	265
2	2390.00	49.66	74.00	-24.34	52.46	-2.80	Peak	100	265
3	4804.00	19.04	54.00	-34.96	15.51	3.53	Average	110	151
4	4804.00	49.14	74.00	-24.86	45.61	3.53	Peak	110	151
5	12010.00	27.25	54.00	-26.75	13.53	13.72	Average	100	279
6	12010.00	57.35	74.00	-16.65	43.63	13.72	Peak	100	279

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).

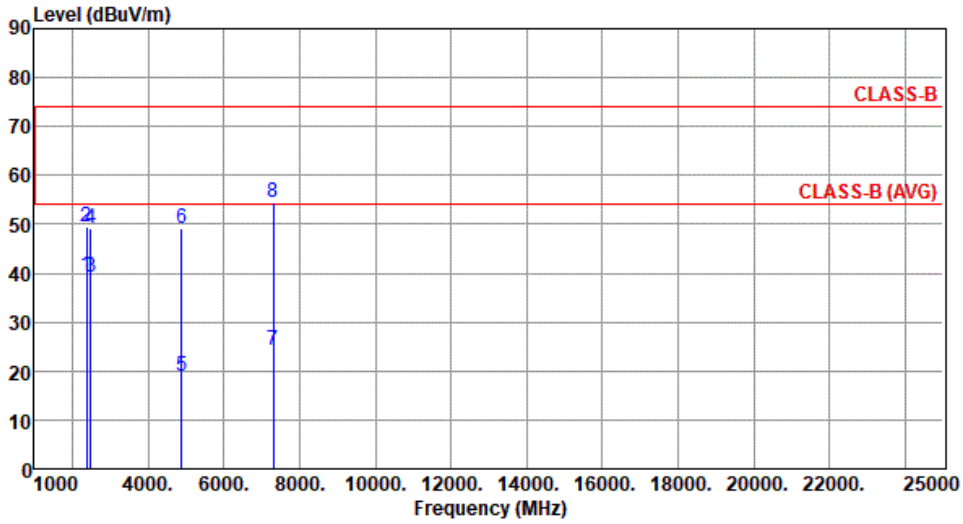
Modulation	π /4-DQPSK	Test Freq. (MHz)	2402
Polarization	Vertical		



	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
1	2390.00	39.71	54.00	-14.29	42.51	-2.80	Average	260	267
2	2390.00	49.68	74.00	-24.32	52.48	-2.80	Peak	260	267
3	4804.00	19.74	54.00	-34.26	16.21	3.53	Average	100	335
4	4804.00	49.84	74.00	-24.16	46.31	3.53	Peak	100	335
5	12010.00	26.88	54.00	-27.12	13.16	13.72	Average	100	339
6	12010.00	56.98	74.00	-17.02	43.26	13.72	Peak	100	339

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).

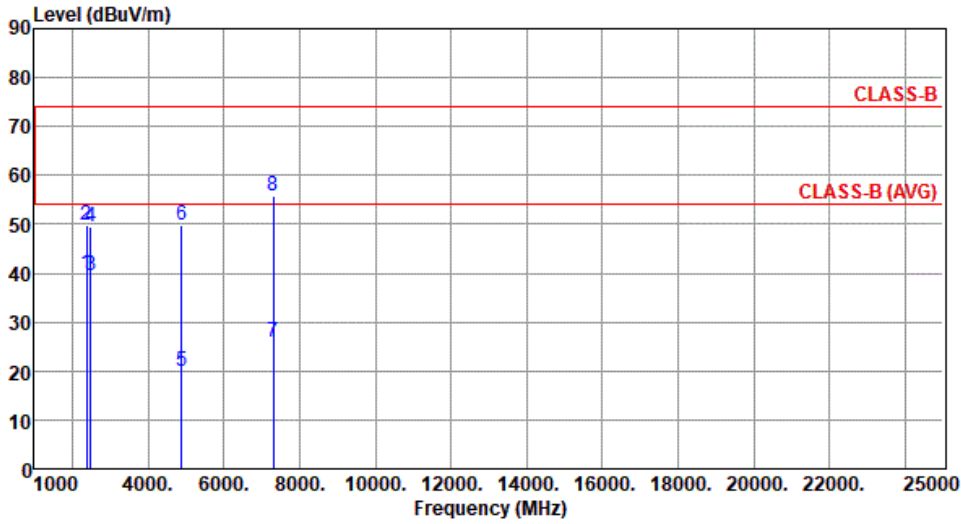
Modulation	π /4-DQPSK	Test Freq. (MHz)	2441
Polarization	Horizontal		



	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
1	2390.00	39.51	54.00	-14.49	42.31	-2.80	Average	100	277
2	2390.00	49.51	74.00	-24.49	52.31	-2.80	Peak	100	277
3	2483.50	39.23	54.00	-14.77	42.26	-3.03	Average	100	277
4	2483.50	49.29	74.00	-24.71	52.32	-3.03	Peak	100	277
5	4880.00	19.00	54.00	-35.00	15.37	3.63	Average	100	151
6	4880.00	49.10	74.00	-24.90	45.47	3.63	Peak	100	151
7	7320.00	24.33	54.00	-29.67	15.11	9.22	Average	100	295
8	7320.00	54.43	74.00	-19.57	45.21	9.22	Peak	100	295

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).

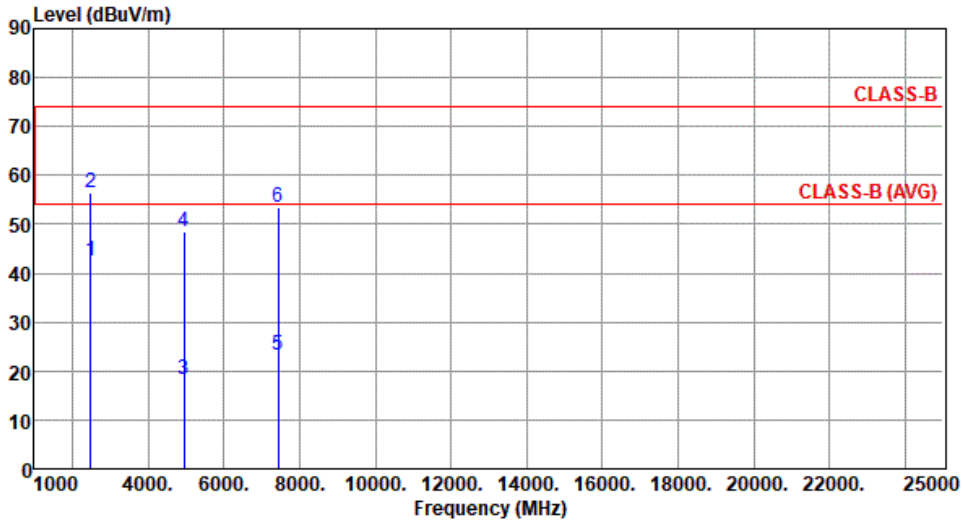
Modulation	π/4-DQPSK	Test Freq. (MHz)	2441
Polarization	Vertical		



	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
1	2390.00	39.81	54.00	-14.19	42.61	-2.80	Average	265	278
2	2390.00	49.66	74.00	-24.34	52.46	-2.80	Peak	265	278
3	2483.50	39.58	54.00	-14.42	42.61	-3.03	Average	265	278
4	2483.50	49.43	74.00	-24.57	52.46	-3.03	Peak	265	278
5	4880.00	19.85	54.00	-34.15	16.22	3.63	Average	105	333
6	4880.00	49.95	74.00	-24.05	46.32	3.63	Peak	105	333
7	7320.00	25.84	54.00	-28.16	16.62	9.22	Average	100	325
8	7320.00	55.94	74.00	-18.06	46.72	9.22	Peak	100	325

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).

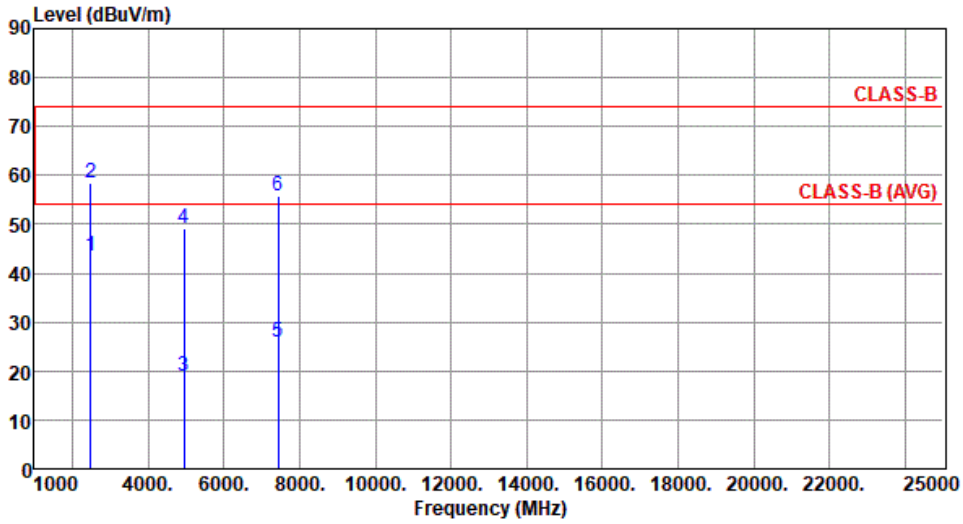
Modulation	π /4-DQPSK	Test Freq. (MHz)	2480
Polarization	Horizontal		



	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	42.43	54.00	-11.57	45.46	-3.03	Average	100	295
2	2483.50	56.43	74.00	-17.57	59.46	-3.03	Peak	100	295
3	4960.00	18.39	54.00	-35.61	14.56	3.83	Average	100	141
4	4960.00	48.49	74.00	-25.51	44.66	3.83	Peak	100	141
5	7440.00	23.33	54.00	-30.67	14.12	9.21	Average	100	281
6	7440.00	53.43	74.00	-20.57	44.22	9.21	Peak	100	281

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	π /4-DQPSK	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	43.55	54.00	-10.45	46.58	-3.03	Average	255	261
2	2483.50	58.61	74.00	-15.39	61.64	-3.03	Peak	255	261
3	4960.00	19.04	54.00	-34.96	15.21	3.83	Average	105	333
4	4960.00	49.14	74.00	-24.86	45.31	3.83	Peak	102	333
5	7440.00	25.76	54.00	-28.24	16.55	9.21	Average	100	330
6	7440.00	55.86	74.00	-18.14	46.65	9.21	Peak	100	330

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

3.3 Unwanted Emissions into Non-Restricted Frequency Bands

3.3.1 Limit of Unwanted Emissions into Non-Restricted Frequency Bands

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

3.3.2 Test Procedures

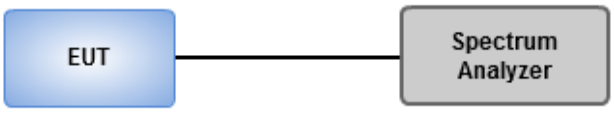
Reference level measurement

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

Emission level measurement

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

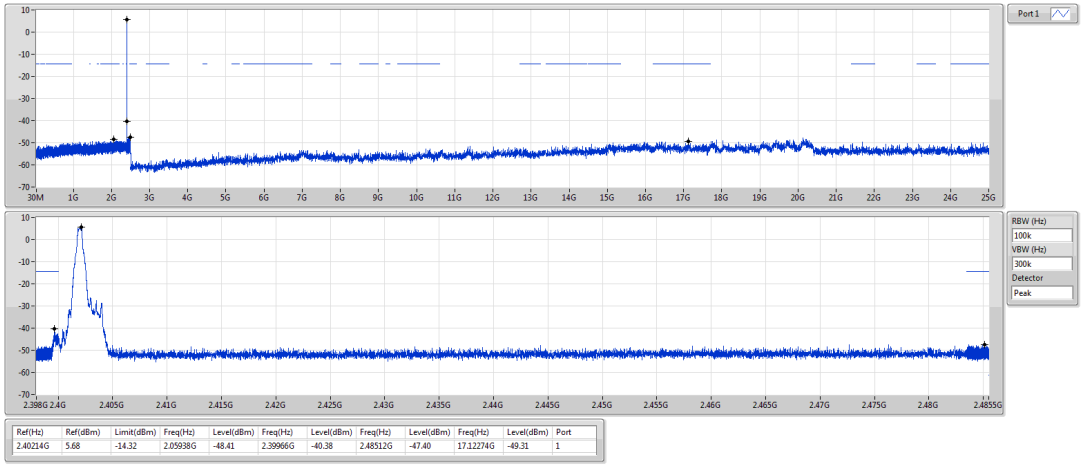
3.3.3 Test Setup



3.3.4 Unwanted Emissions into Non-Restricted Frequency Bands

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

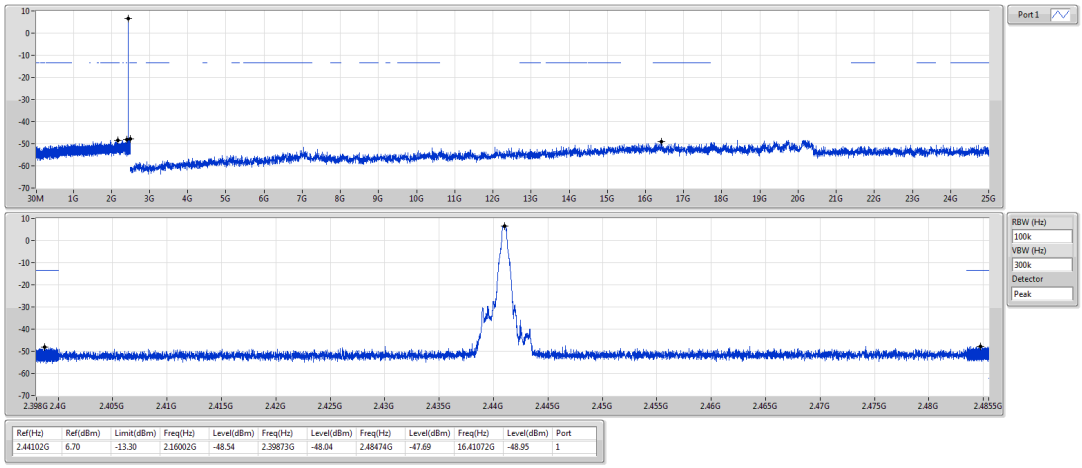
2402MHz



Ref(Hz)	Ref(dBm)	Limit(dBm)	Freq(Hz)	Level(dBm)	Freq(Hz)	Level(dBm)	Freq(Hz)	Level(dBm)	Freq(Hz)	Level(dBm)	Port
2.40214G	5.68	-14.32	2.05938G	-48.41	2.39966G	-40.38	2.48512G	-47.40	17.12274G	-49.31	1

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

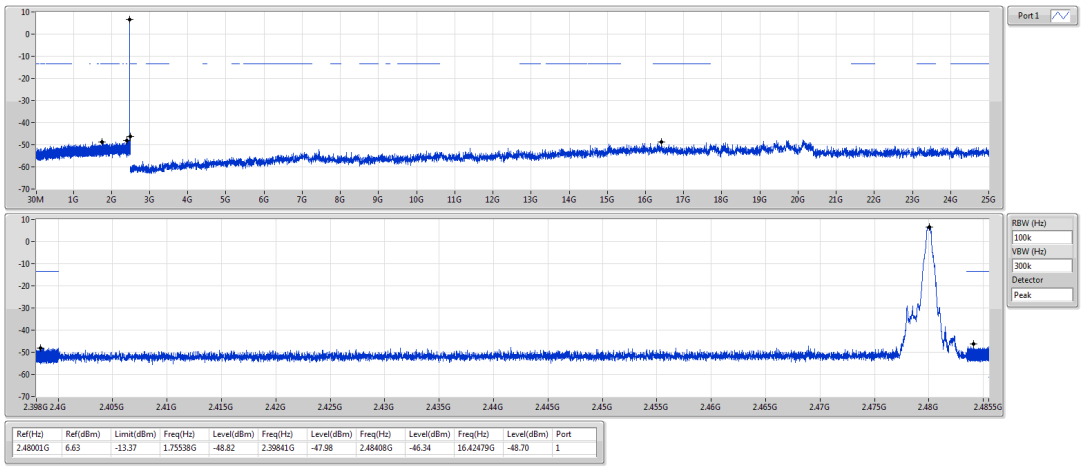
2441MHz



Ref(Hz)	Ref(dBm)	Limit(dBm)	Freq(Hz)	Level(dBm)	Freq(Hz)	Level(dBm)	Freq(Hz)	Level(dBm)	Freq(Hz)	Level(dBm)	Port
2.44102G	6.70	-13.30	2.16002G	-48.54	2.39873G	-48.04	2.48474G	-47.69	16.41072G	-48.95	1

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

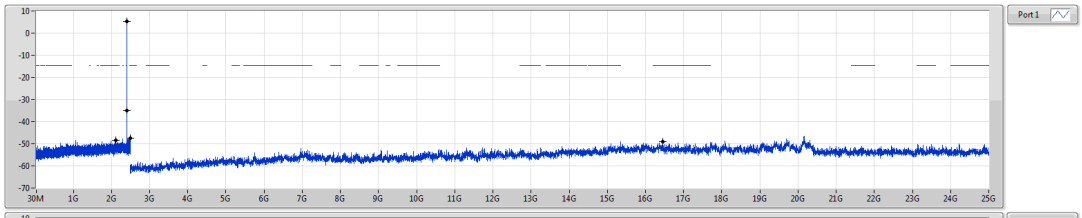
2480MHz

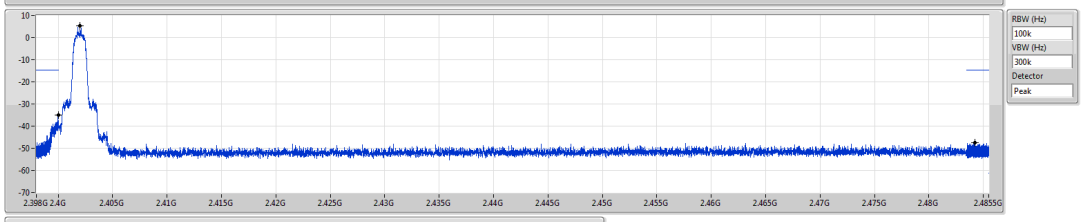


Ref(Hz)	Ref(dBm)	Limit(dBm)	Freq(Hz)	Level(dBm)	Freq(Hz)	Level(dBm)	Freq(Hz)	Level(dBm)	Freq(Hz)	Level(dBm)	Port
2.48001G	6.63	-13.37	1.75538G	-48.82	2.39841G	-47.98	2.48408G	-46.34	16.42479G	-48.70	1

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

2402MHz

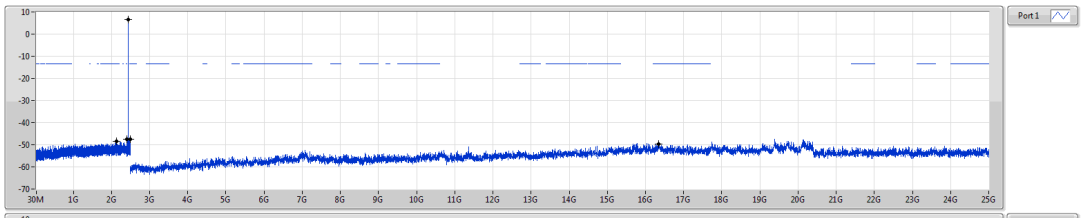


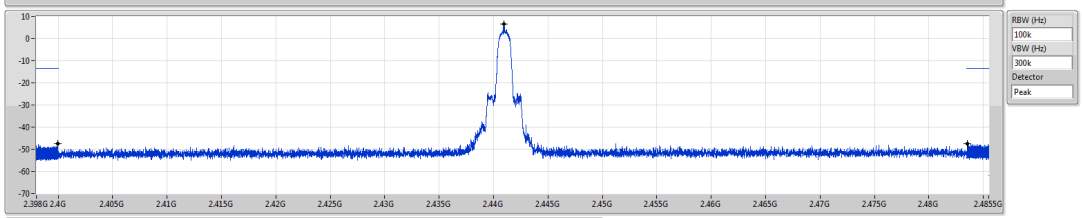


Ref(Hz)	Ref(dBm)	Limit(dBm)	Freq(Hz)	Level(dBm)	Freq(Hz)	Level(dBm)	Freq(Hz)	Level(dBm)	Freq(Hz)	Level(dBm)	Port
2.40198G	5.34	-14.66	2.10674G	-48.29	2.4G	-34.92	2.48423G	-47.59	16.46138G	-49.18	1

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

2441MHz

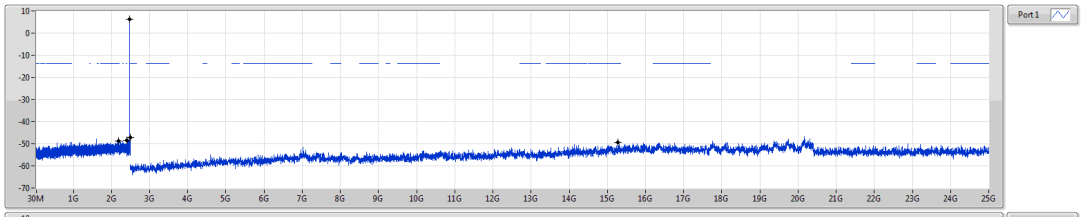


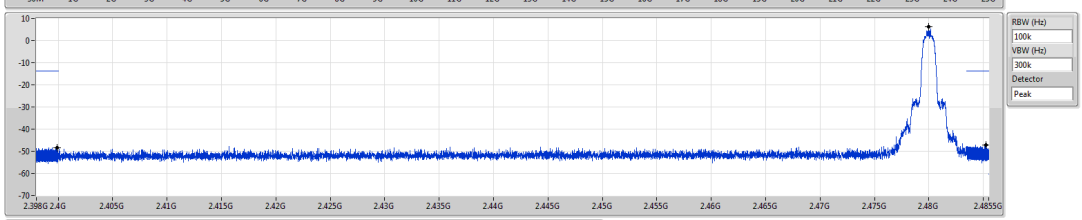


Ref(Hz)	Ref(dBm)	Limit(dBm)	Freq(Hz)	Level(dBm)	Freq(Hz)	Level(dBm)	Freq(Hz)	Level(dBm)	Freq(Hz)	Level(dBm)	Port
2.44098G	6.57	-13.43	2.12213G	-48.35	2.39995G	-47.57	2.48356G	-47.41	16.3488G	-49.60	1

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

2480MHz



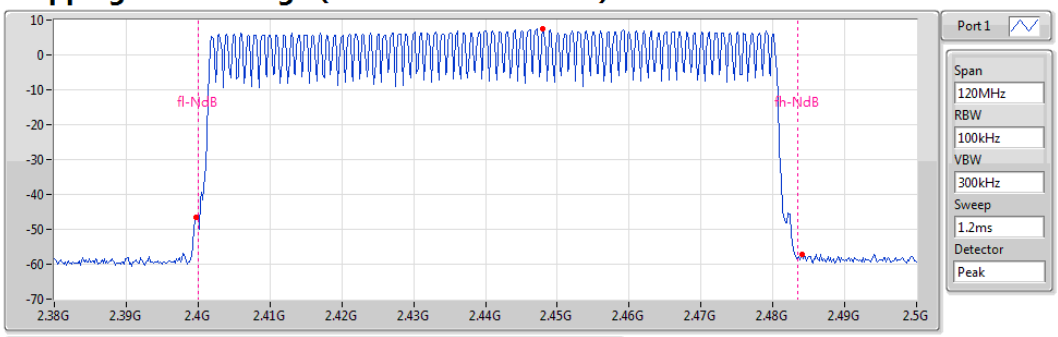


Ref(Hz)	Ref(dBm)	Limit(dBm)	Freq(Hz)	Level(dBm)	Freq(Hz)	Level(dBm)	Freq(Hz)	Level(dBm)	Freq(Hz)	Level(dBm)	Port
2.47999G	6.30	-13.70	2.19287G	-48.86	2.39989G	-48.34	2.48525G	-47.06	15.28218G	-49.50	1

BT-BR(1Mbps)

2441MHz

Hopping Ch Bandedge (Non-restricted Band)

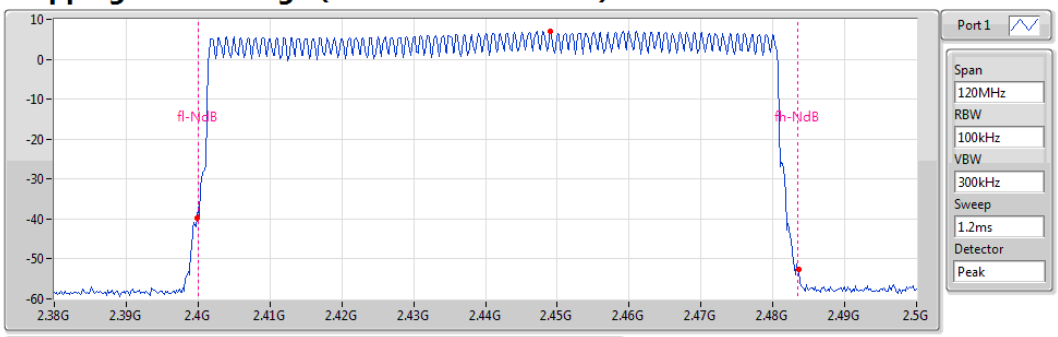


Limit(dBm)	Ref(Hz)	Ref(dBm)	BE-l(Hz)	BE-l(dBm)	BE-h(Hz)	BE-h(dBm)
-12.51	2.448G	7.49	2.399652G	-46.65	2.484G	-57.11

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)
-13	2.449043G	7	2.399826G	-39.73	2.483652G	-52.51

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)	7.96	0.00625
BT-EDR(2Mbps)	8.01	0.00632

Result

Mode	Result	Gain (dBi)	Power (dBm)	Power Limit (dBm)
BT-BR(1Mbps)	-	-	-	-
2402MHz	Pass	3.70	6.18	21.00
2441MHz	Pass	3.70	7.96	21.00
2480MHz	Pass	3.70	7.57	21.00
BT-EDR(2Mbps)	-	-	-	-
2402MHz	Pass	3.70	6.51	21.00
2441MHz	Pass	3.70	8.01	21.00
2480MHz	Pass	3.70	7.75	21.00

Summary of Conducted (Average) Output Power

Mode	Power	Power
	(dBm)	(W)
2.4-2.4835GHz	-	-
BT-BR(1Mbps)	7.69	0.00587
BT-EDR(2Mbps)	6.12	0.00409

Result

Mode	Result	Gain (dBi)	Power (dBm)	Power Limit (dBm)
BT-BR(1Mbps)	-	-	-	-
2402MHz	Pass	3.70	5.80	-
2441MHz	Pass	3.70	7.69	-
2480MHz	Pass	3.70	7.24	-
BT-EDR(2Mbps)	-	-	-	-
2402MHz	Pass	3.70	4.31	-
2441MHz	Pass	3.70	6.12	-
2480MHz	Pass	3.70	5.65	-

Note: Average power is for reference only.

3.5 Number of Hopping Frequency

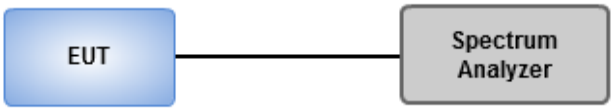
3.5.1 Limit of Number of Hopping Frequency

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

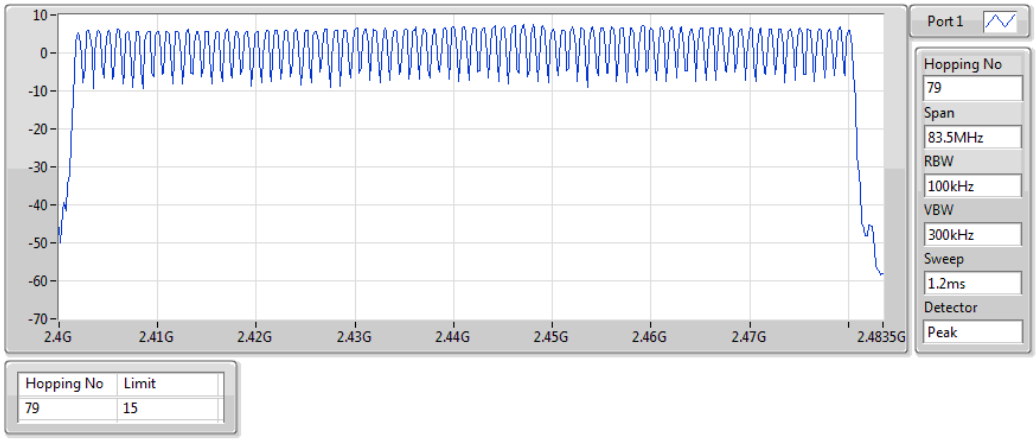
Mode	Max-Hop No
2.4-2.4835GHz	-
BT-BR(1Mbps)	79
BT-EDR(2Mbps)	79

Result

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

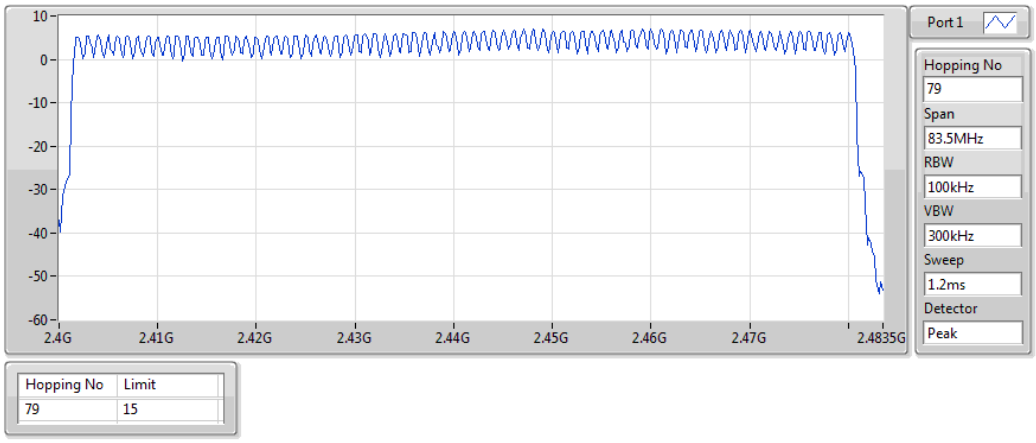
BT-BR(1Mbps) **Hopping Ch**

2441MHz



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

2441MHz



3.6 20dB and Occupied Bandwidth

3.6.1 Test Procedures

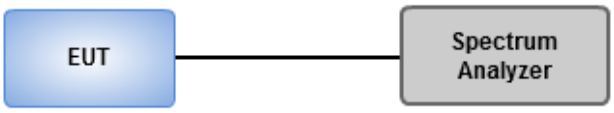
20dB Bandwidth

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

Occupied Bandwidth

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

3.6.2 Test Setup



3.6.3 Test result of 20dB and Occupied Bandwidth

Summary

Mode	Max-N dB (Hz)	Max-OBW (Hz)	ITU-Code	Min-N dB (Hz)	Min-OBW (Hz)
2.4-2.4835GHz	-	-	-	-	-
BT-BR(1Mbps)	920.29k	868.307k	868KF1D	920.29k	864.689k
BT-EDR(2Mbps)	1.373M	1.216M	1M22G1D	1.268M	1.19M

Max-N dB = Maximum20dB downbandwidth;**Max-OBW** = Maximum99% occupied bandwidth;
Min-N dB = Minimum20dB downbandwidth;**Min-OBW** = Minimum99% occupied bandwidth;

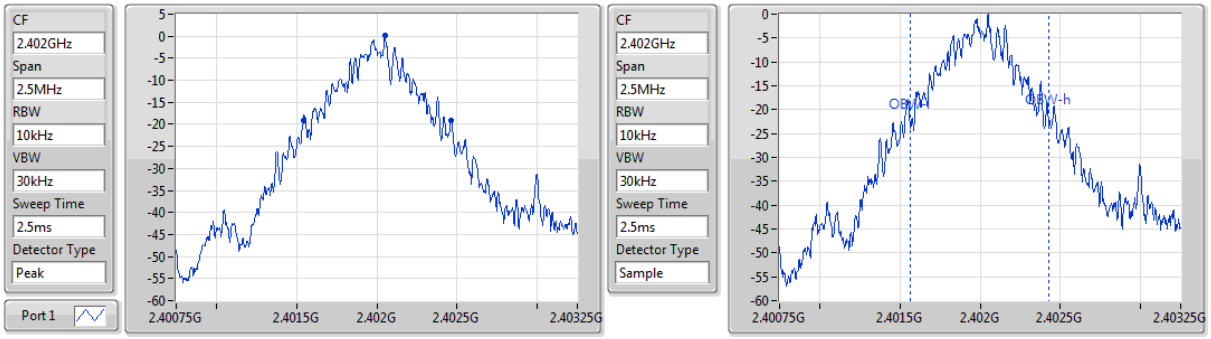
Result

Mode	Result	Limit (Hz)	Port 1-N dB (Hz)	Port 1-OBW (Hz)
BT-BR(1Mbps)	-	-	-	-
2402MHz	Pass	Inf	920.29k	864.689k
2441MHz	Pass	Inf	920.29k	868.307k
2480MHz	Pass	Inf	920.29k	868.307k
BT-EDR(2Mbps)	-	-	-	-
2402MHz	Pass	Inf	1.268M	1.198M
2441MHz	Pass	Inf	1.373M	1.19M
2480MHz	Pass	Inf	1.344M	1.216M

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

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

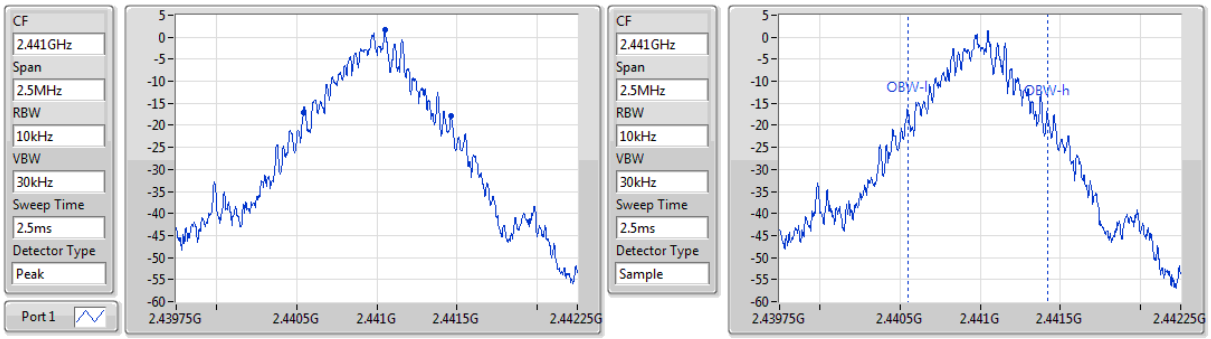
2402MHz



20dB(Hz)	Fl-20dB(Hz)	Fh-20dB(Hz)	OBW(Hz)	Fl-OBW(Hz)	Fh-OBW(Hz)	Limit(Hz)	Port
920.29k	2.401543G	2.402464G	864.689k	2.401562G	2.402427G	Inf	1

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

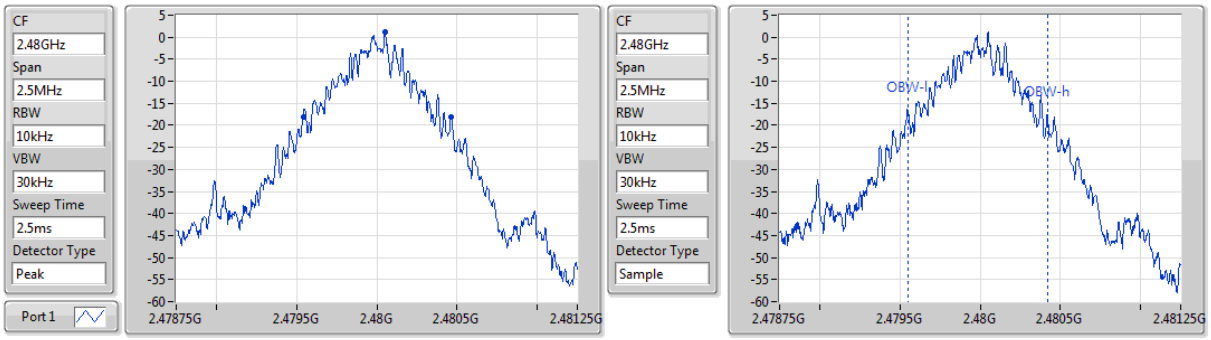
2441MHz



20dB(Hz)	Fl-20dB(Hz)	Fh-20dB(Hz)	OBW(Hz)	Fl-OBW(Hz)	Fh-OBW(Hz)	Limit(Hz)	Port
920.29k	2.440543G	2.441464G	868.307k	2.440551G	2.44142G	Inf	1

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

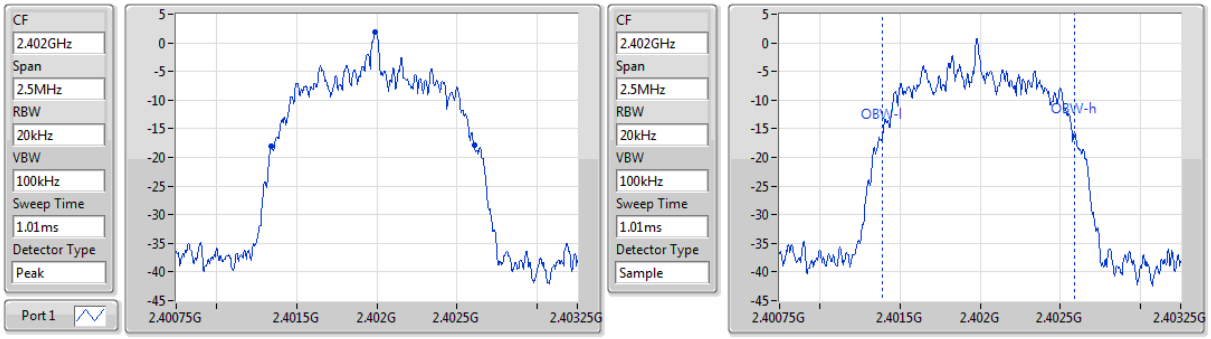
2480MHz



20dB(Hz)	Fl-20dB(Hz)	Fh-20dB(Hz)	OBW(Hz)	Fl-OBW(Hz)	Fh-OBW(Hz)	Limit(Hz)	Port
920.29k	2.479543G	2.480464G	868.307k	2.479551G	2.48042G	Inf	1

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

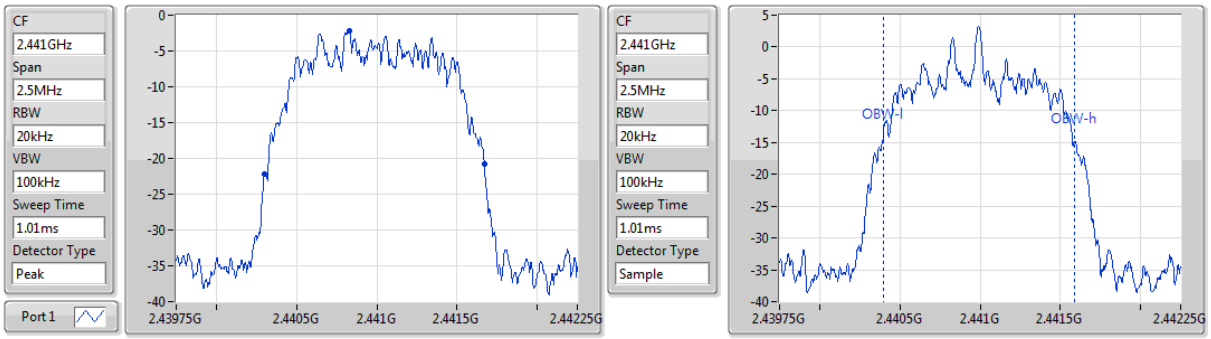
2402MHz



20dB(Hz)	Fl-20dB(Hz)	Fh-20dB(Hz)	OBW(Hz)	Fl-OBW(Hz)	Fh-OBW(Hz)	Limit(Hz)	Port
1.268M	2.401341G	2.402609G	1.198M	2.401392G	2.40259G	Inf	1

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

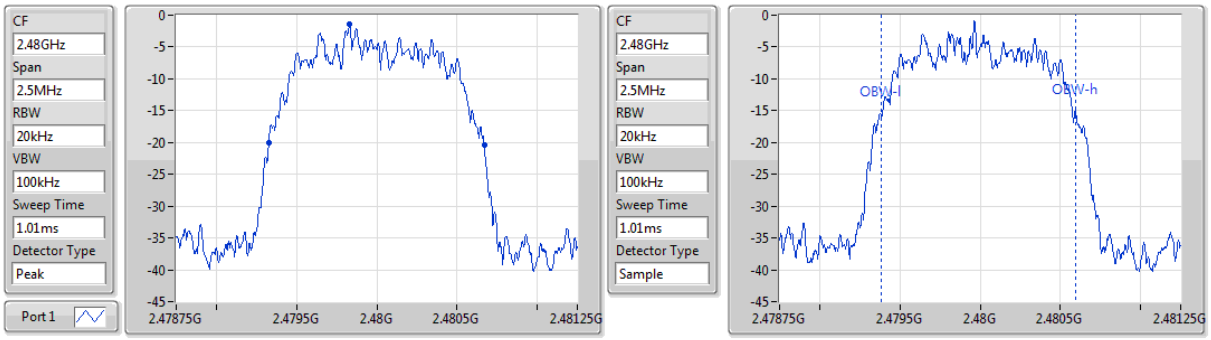
2441MHz



20dB(Hz)	Fl-20dB(Hz)	Fh-20dB(Hz)	OBW(Hz)	Fl-OBW(Hz)	Fh-OBW(Hz)	Limit(Hz)	Port
1.373M	2.440297G	2.44167G	1.19M	2.440396G	2.441586G	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
1.344M	2.479326G	2.48067G	1.216M	2.479381G	2.480597G	Inf	1

3.7 Channel Separation

3.7.1 Limit of Channel Separation

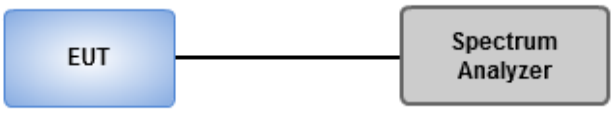
☐ Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hopping channel, whichever is greater.

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

3.7.2 Test Procedures

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

3.7.3 Test Setup



3.7.4 Test result of Channel Separation

Summary

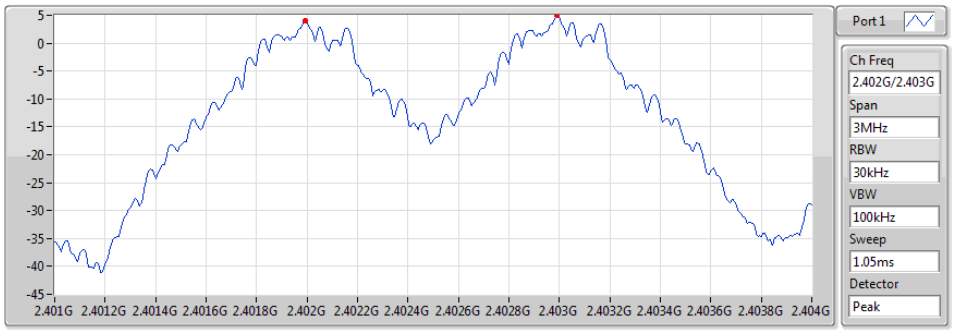
Mode	Max-Space (Hz)	Min-Space (Hz)
2.4-2.4835GHz	-	-
BT-BR(1Mbps)	1M	995.652174k
BT-EDR(2Mbps)	1.004348M	1M

Result

Mode	Result	Fl (Hz)	Fh (Hz)	Ch.Space (Hz)	Limit (Hz)
BT-BR(1Mbps)	-	-	-	-	-
2402MHz	Pass	2.401991G	2.402991G	1M	612.91314k
2441MHz	Pass	2.440991G	2.441991G	1M	612.91314k
2480MHz	Pass	2.478996G	2.479991G	995.652174k	612.91314k
BT-EDR(2Mbps)	-	-	-	-	-
2402MHz	Pass	2.401991G	2.402996G	1.004348M	844.488k
2441MHz	Pass	2.440991G	2.441996G	1.004348M	914.418k
2480MHz	Pass	2.478996G	2.479996G	1M	895.104k

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

2.402G/2.403GHz



Fl(Hz)	Fh(Hz)	Ch.Space(Hz)	Limit(Hz)
2.401991G	2.402991G	1M	612.91314k

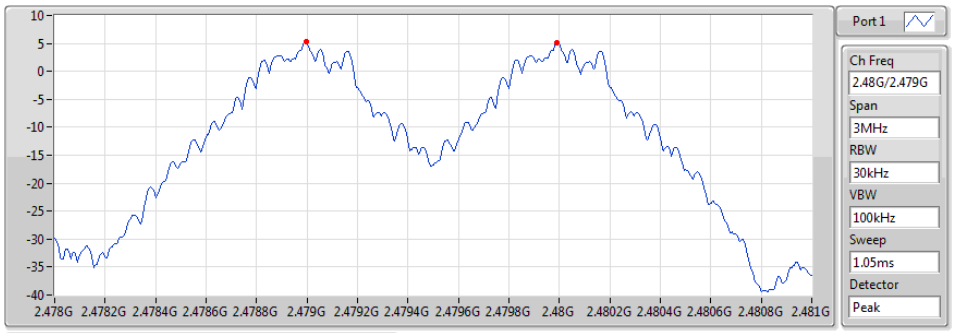
BT-BR(1Mbps) **Channel Separation**

2.441G/2.442GHz

Fl(Hz)	Fh(Hz)	Ch.Space(Hz)	Limit(Hz)
2.440991G	2.441991G	1M	612.91314k

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

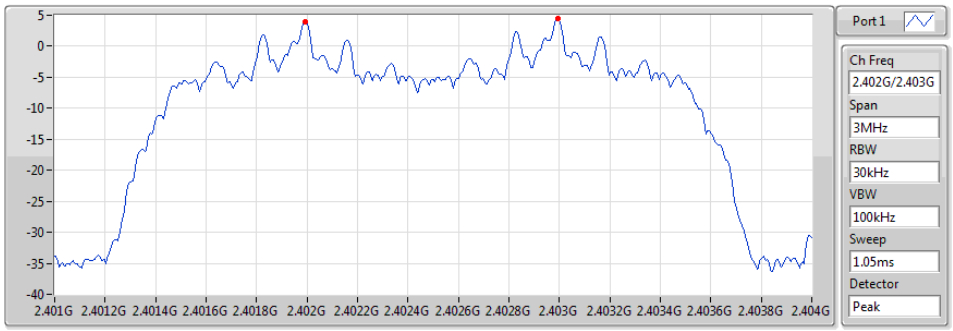
2.48G/2.479GHz



Fl(Hz)	Fh(Hz)	Ch.Space(Hz)	Limit(Hz)
2.478996G	2.479991G	995.652174k	612.91314k

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

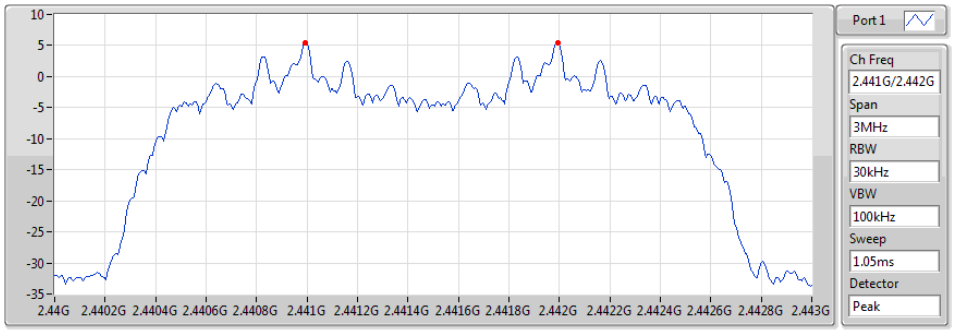
2.402G/2.403GHz



Fl(Hz)	Fh(Hz)	Ch.Space(Hz)	Limit(Hz)
2.401991G	2.402996G	1.004348M	844.488k

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

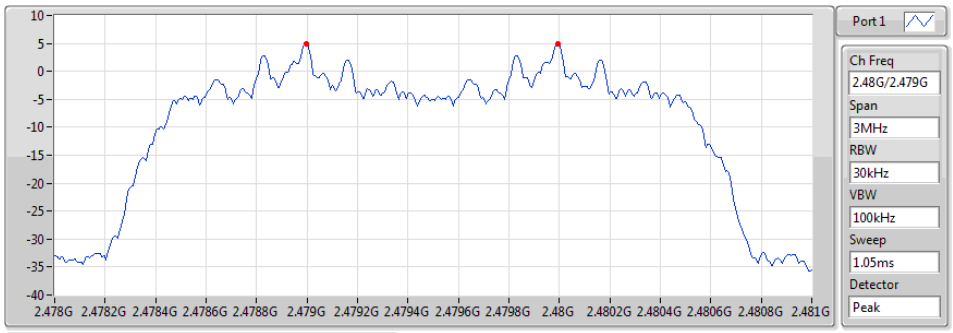
2.441G/2.442GHz



Fl(Hz)	Fh(Hz)	Ch.Space(Hz)	Limit(Hz)
2.440991G	2.441996G	1.004348M	914.418k

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

2.48G/2.479GHz



Fl(Hz)	Fh(Hz)	Ch.Space(Hz)	Limit(Hz)
2.478996G	2.479996G	1M	895.104k

3.8 Number of Dwell Time

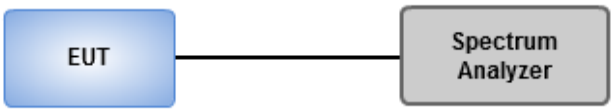
3.8.1 Limit of Dwell time

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=100 kHz, VBW=300 kHz, Sweep time=5 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=100 kHz, VBW=300 kHz, 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=100 kHz, VBW=300 kHz, Sweep time=31.6 s / 8 s, Detector=Peak, Span=0 Hz,Trace max hold.
6 Enable gating and trigger function of spectrum analyzer to measure burst on number of transmission of entire time cycle.

3.8.3 Test Setup



3.8.4 Test Result of Dwell Time

Result/ Non AFH mode

Mode	Result	Period (s)	Dwell (s)	Limit (s)	Tx On (ms)	Number of transmission in a 5 s
BT-BR(1Mbps)	-	-	-	-	-	-
2402MHz-1DH5	PASS	31.6	0.3548364	0.4	2.95500	19
BT-EDR(2Mbps)	-	-	-	-	-	-
2402MHz-2DH5	PASS	31.6	0.3584388	0.4	2.98500	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

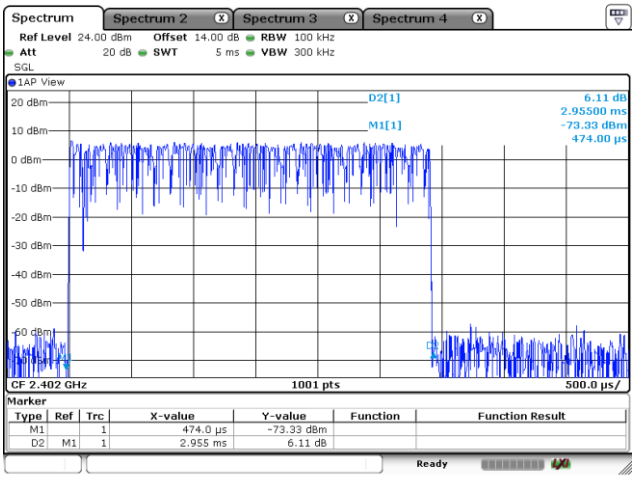
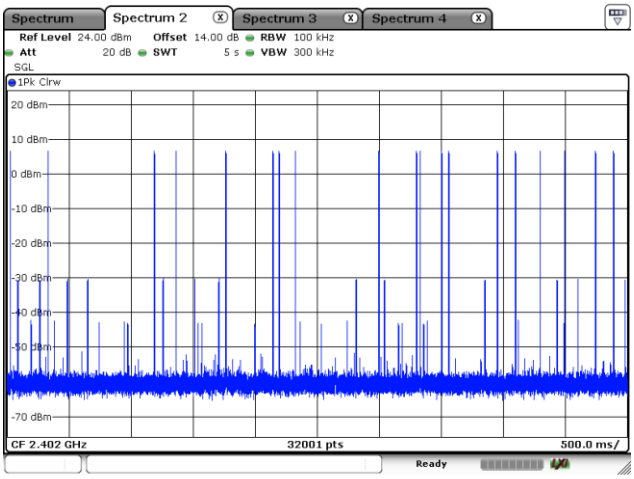
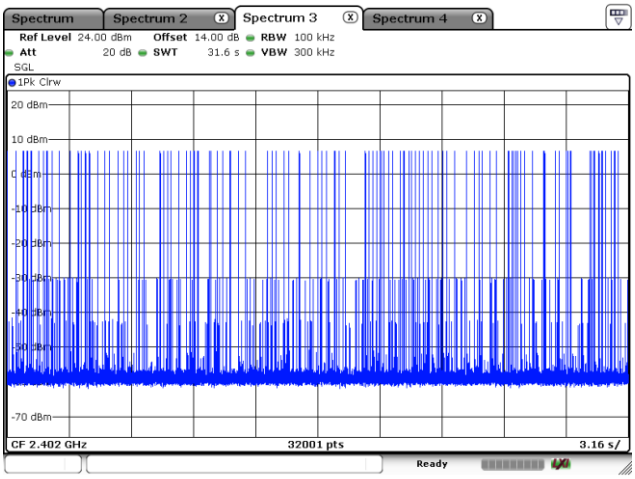
Mode	Result	Period (s)	Dwell (s)	Limit (s)	Tx On (ms)	Number of transmission in a 2 s
BT-BR(1Mbps)	-	-	-	-	-	-
2402MHz-1DH5	PASS	8	0.2832	0.4	2.95000	24
BT-EDR(2Mbps)	-	-	-	-	-	-
2402MHz-2DH5	PASS	8	0.30836	0.4	2.96500	26

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

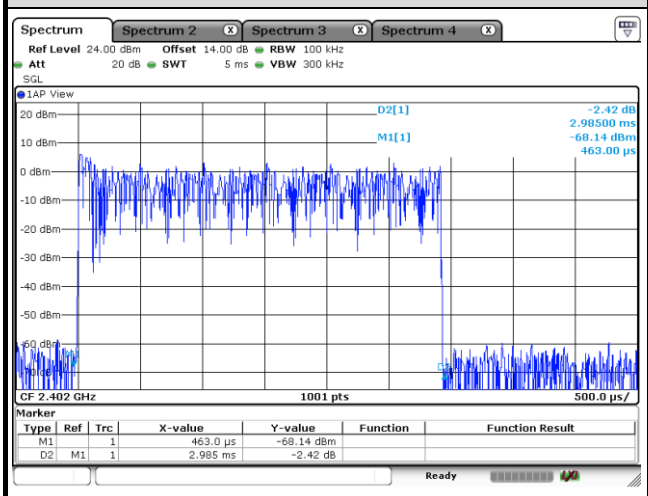
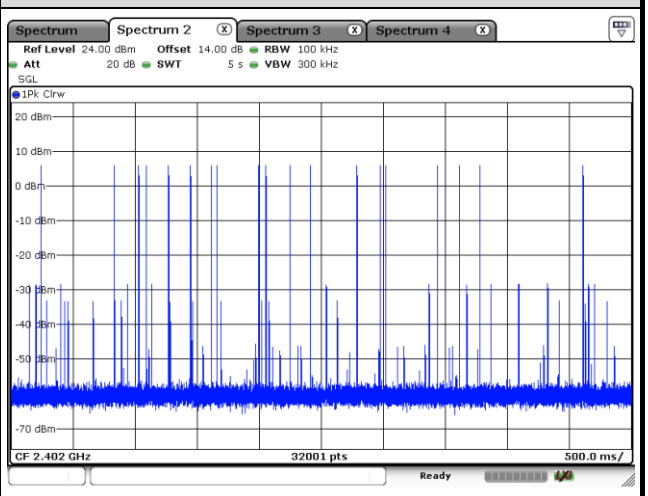
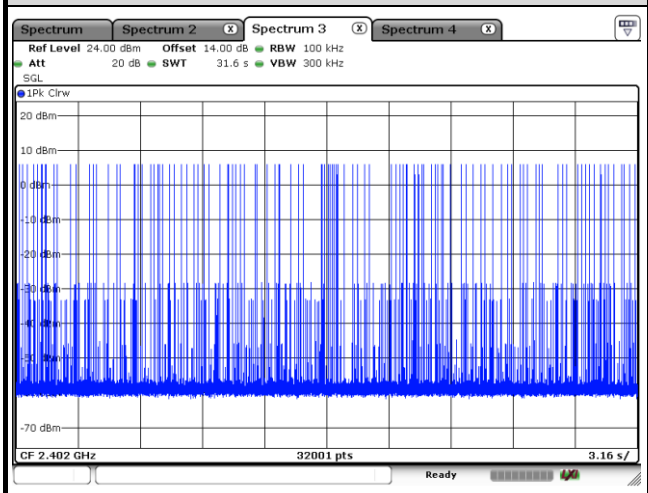
Note 2: DH5 was the worst mode.

Result/ Non AFH mode

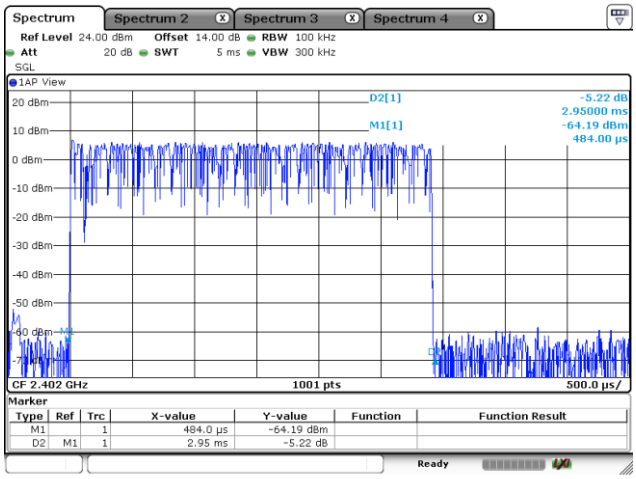
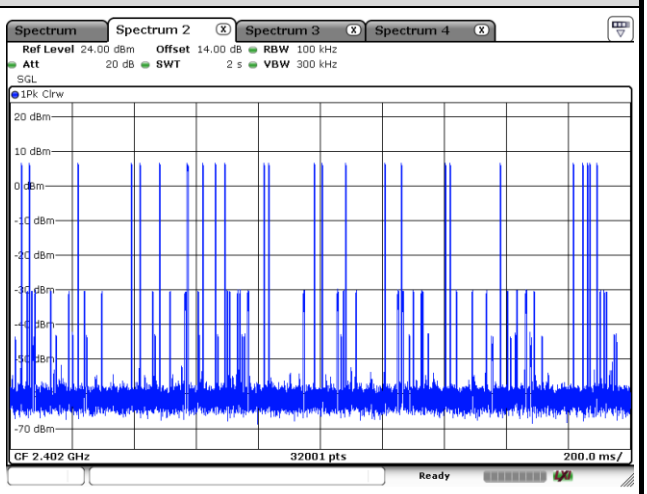
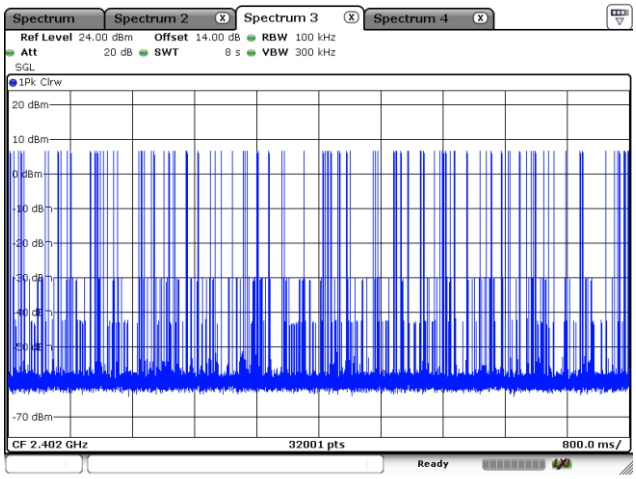
DH5-1Mbps

Tx On Time	Number of transmission in a 5 second
	
Entire time cycle	**-**
	-

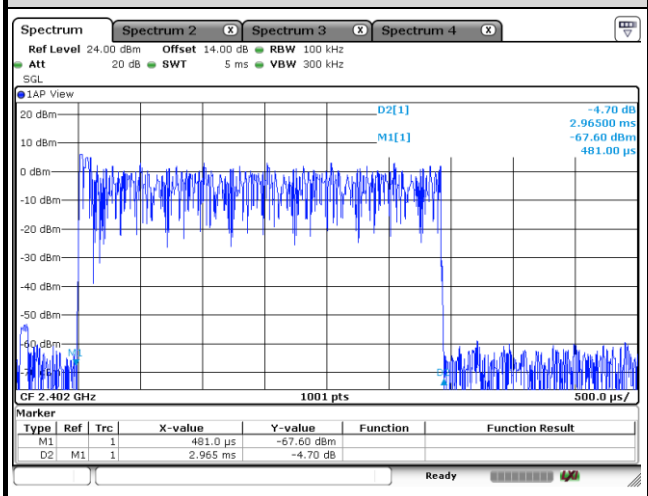
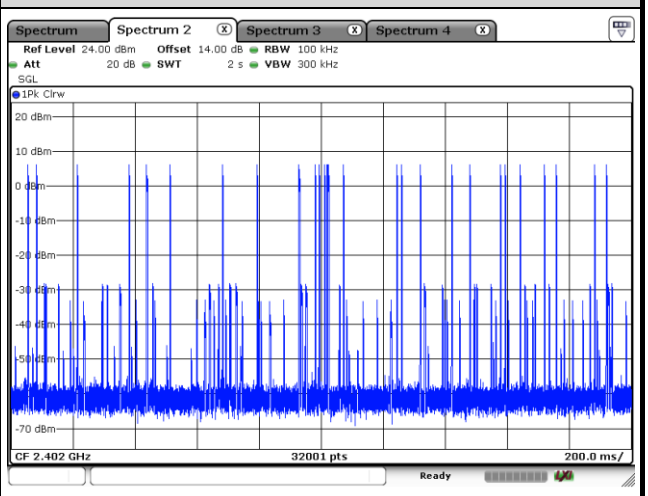
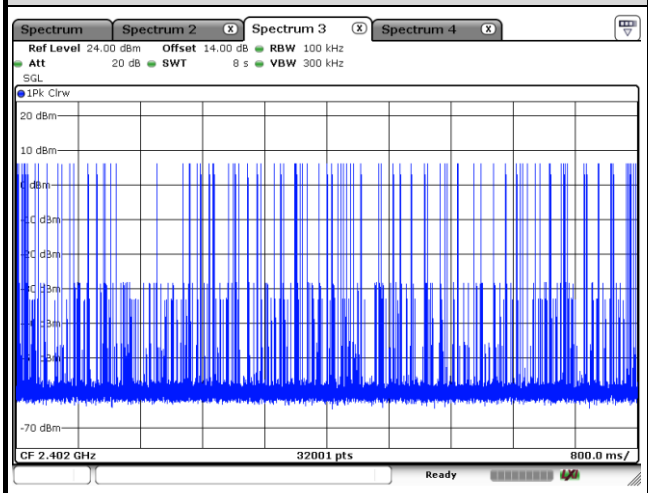
DH5-2Mbps

Tx On Time	Number of transmission in a 5 second
	
Entire time cycle	**-**
	-

Result/ AFH mode
DH5-1Mbps

Tx On Time	Number of transmission in a 2 second
	
Entire time cycle	**-**
	-

DH5-2Mbps

Tx On Time	Number of transmission in a 2 second
	
Entire time cycle	**-**
	-

4 Receiver Test Results

4.1 Conducted Emissions

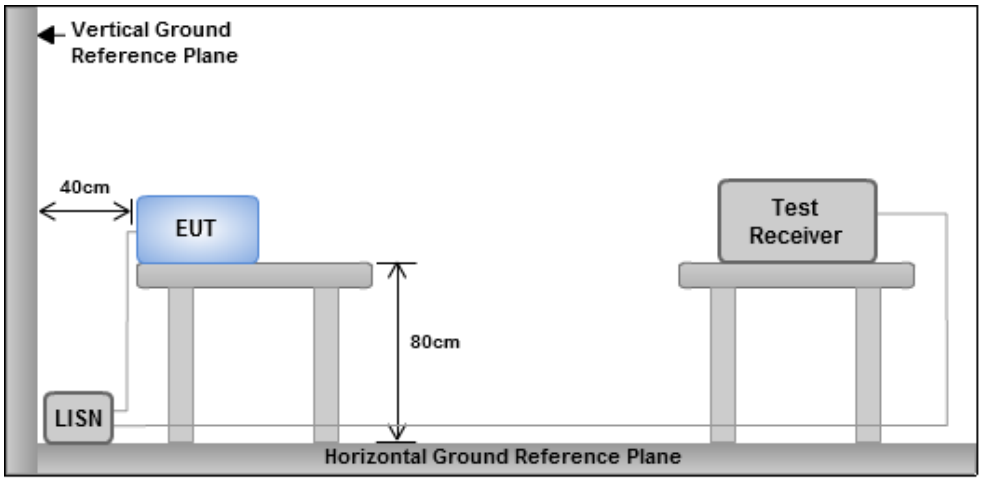
4.1.1 Limit of Conducted Emissions

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.

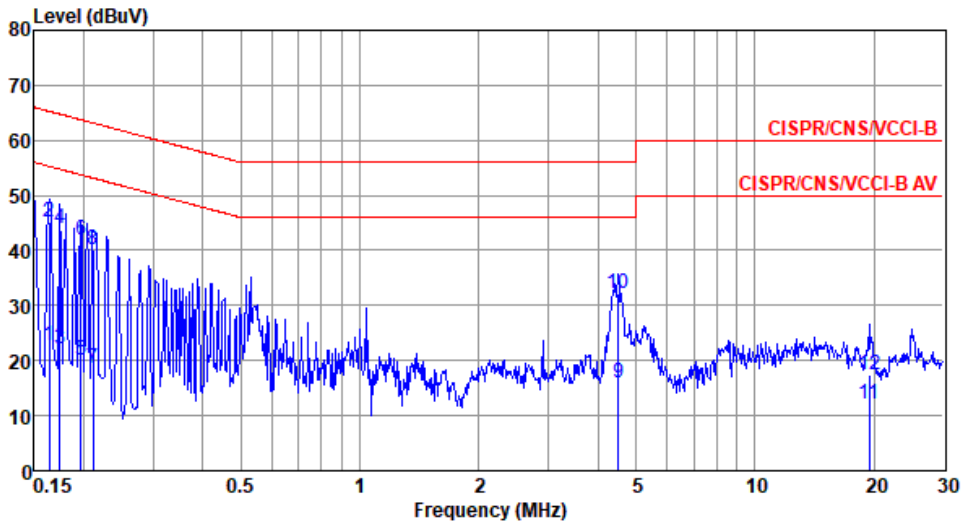
4.1.3 Test Setup



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

4.1.4 Test Result of Conducted Emissions

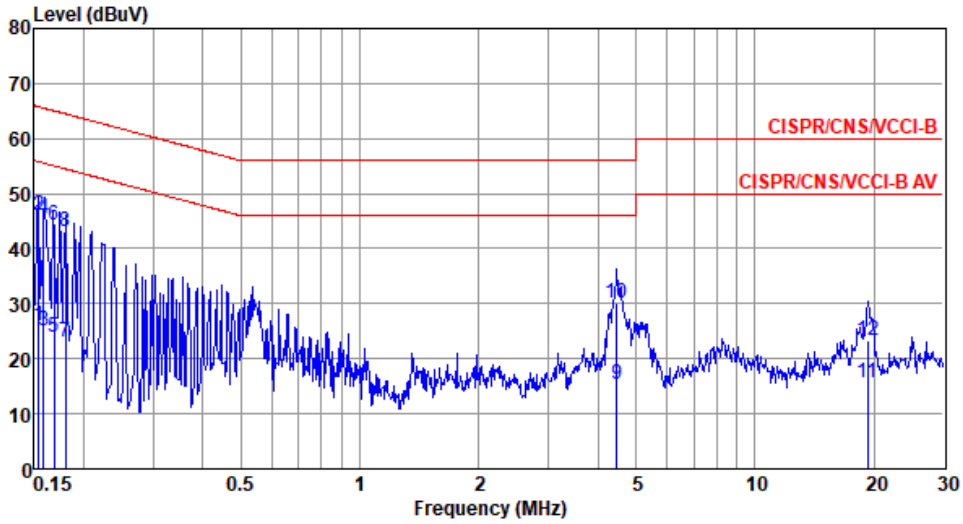
Modulation	π/4-DQPSK + ASK	Test Freq. (MHz)	2441 + 13.56
Power Phase	Line		



	Freq MHz	Level dBuV	Limit Line dBuV	Over Limit dB	Read Level dBuV	LISN factor dB	cable loss dB	Remark
1	0.164	22.66	55.26	-32.60	12.80	9.64	0.05	Average
2*	0.164	45.22	65.26	-20.04	35.36	9.64	0.05	QP
3	0.174	22.06	54.76	-32.70	12.19	9.63	0.06	Average
4	0.174	44.11	64.76	-20.65	34.24	9.63	0.06	QP
5	0.197	20.15	53.75	-33.60	10.27	9.63	0.06	Average
6	0.197	41.87	63.75	-21.88	31.99	9.63	0.06	QP
7	0.211	18.66	53.17	-34.51	8.78	9.63	0.06	Average
8	0.211	40.17	63.17	-23.00	30.29	9.63	0.06	QP
9	4.510	16.02	46.00	-29.98	5.69	9.66	0.30	Average
10	4.510	32.05	56.00	-23.95	21.72	9.66	0.30	QP
11	19.430	12.15	50.00	-37.85	1.18	9.72	0.65	Average
12	19.430	17.55	60.00	-42.45	6.58	9.72	0.65	QP

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

Modulation	π /4-DQPSK + ASK	Test Freq. (MHz)	2441 + 13.56
Power Phase	Neutral		



	Freq MHz	Level dBuV	Limit Line dBuV	Over Limit dB	Read Level dBuV	LISN factor dB	cable loss dB	Remark
1	0.154	25.87	55.78	-29.91	16.04	9.66	0.05	Average
2*	0.154	46.18	65.78	-19.60	36.35	9.66	0.05	QP
3	0.158	25.03	55.57	-30.54	15.19	9.66	0.05	Average
4	0.158	45.33	65.57	-20.24	35.49	9.66	0.05	QP
5	0.168	23.98	55.05	-31.07	14.14	9.66	0.05	Average
6	0.168	44.33	65.05	-20.72	34.49	9.66	0.05	QP
7	0.180	23.15	54.48	-31.33	13.30	9.65	0.06	Average
8	0.180	43.22	64.48	-21.26	33.37	9.65	0.06	QP
9	4.480	15.32	46.00	-30.68	5.07	9.68	0.30	Average
10	4.480	30.15	56.00	-25.85	19.90	9.68	0.30	QP
11	19.330	15.71	50.00	-34.29	4.73	9.83	0.65	Average
12	19.330	23.24	60.00	-36.76	12.26	9.83	0.65	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

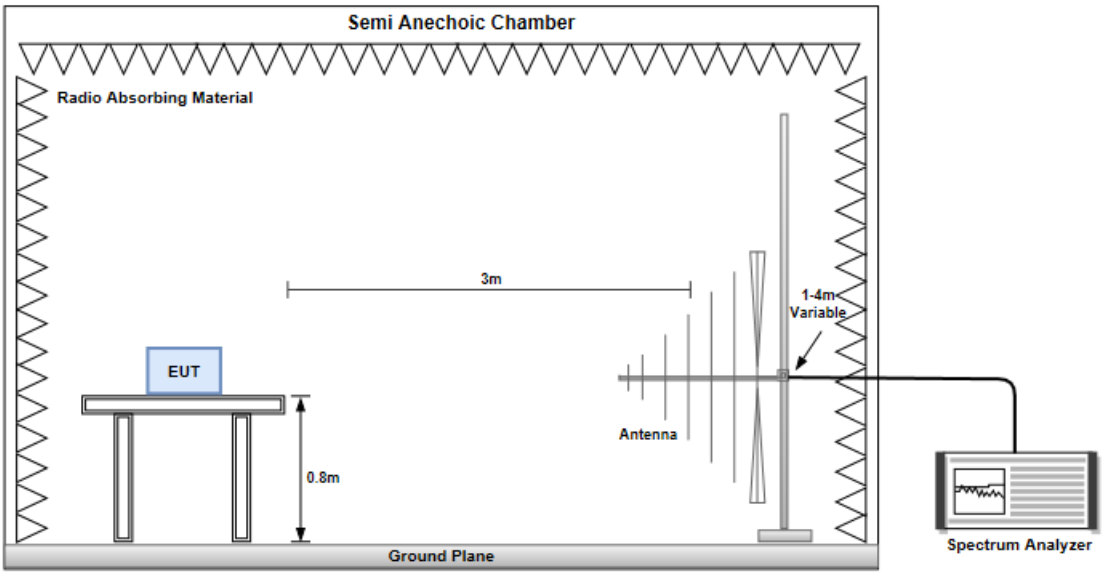
1. Measurement is made at a semi-anechoic chamber that incorporates a turntable allowing a EUT rotation of 360°. A continuously-rotating, remotely-controlled turntable is installed at the test site to support the EUT and facilitate determination of the direction of maximum radiation for each EUT emission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

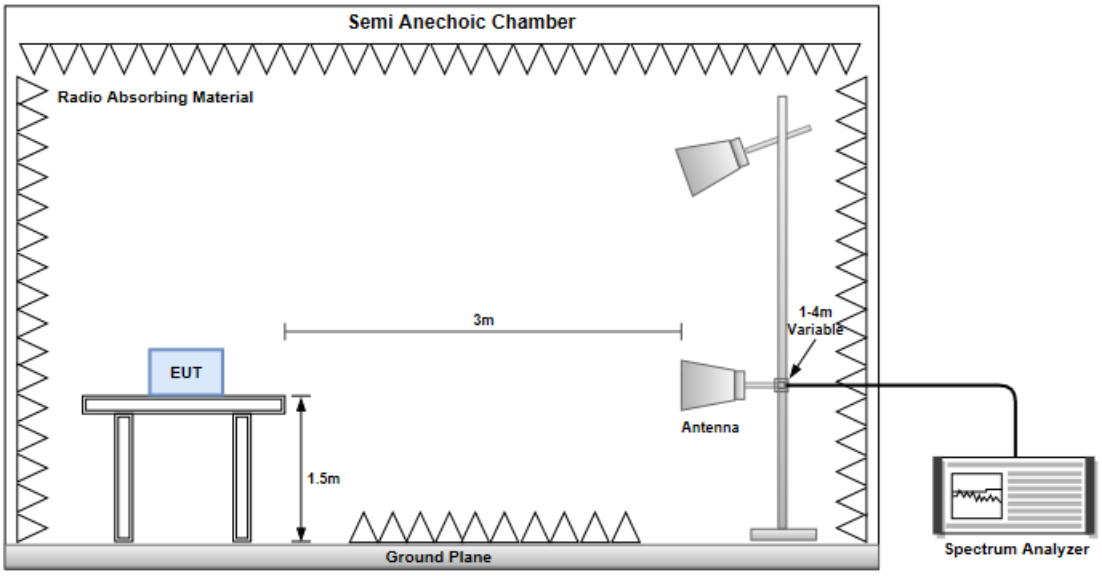
1. 120kHz measurement bandwidth of test receiver and Quasi-peak detector is for radiated emission below 1GHz.
2. RBW=1MHz, VBW=3MHz and Peak detector is for peak measured value of radiated emission above 1GHz.
3. RBW=1MHz, VBW=3MHz and RMS detector is for average measured value of radiated emission above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

4.2.3 Test Setup

Radiated Emissions below 1 GHz

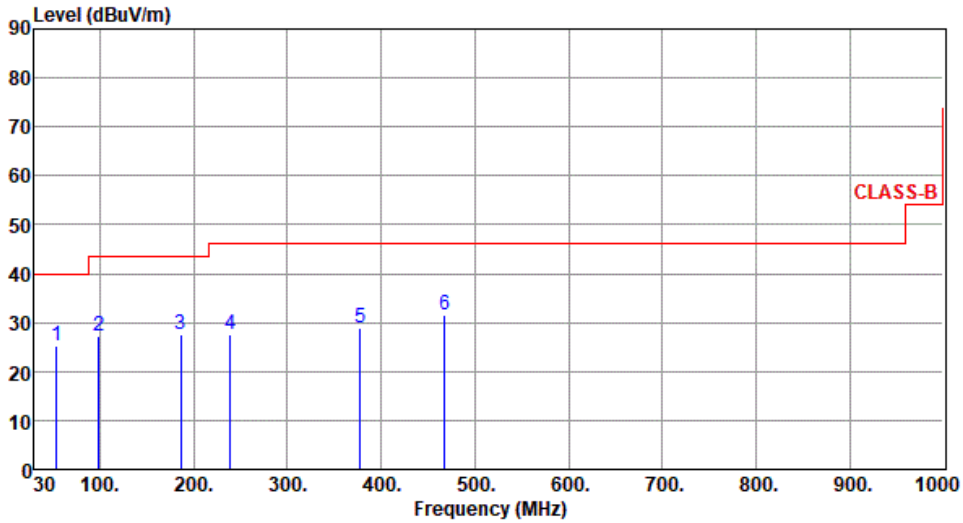


Radiated Emissions above 1 GHz



4.2.4 Receiver Radiated Unwanted Emissions

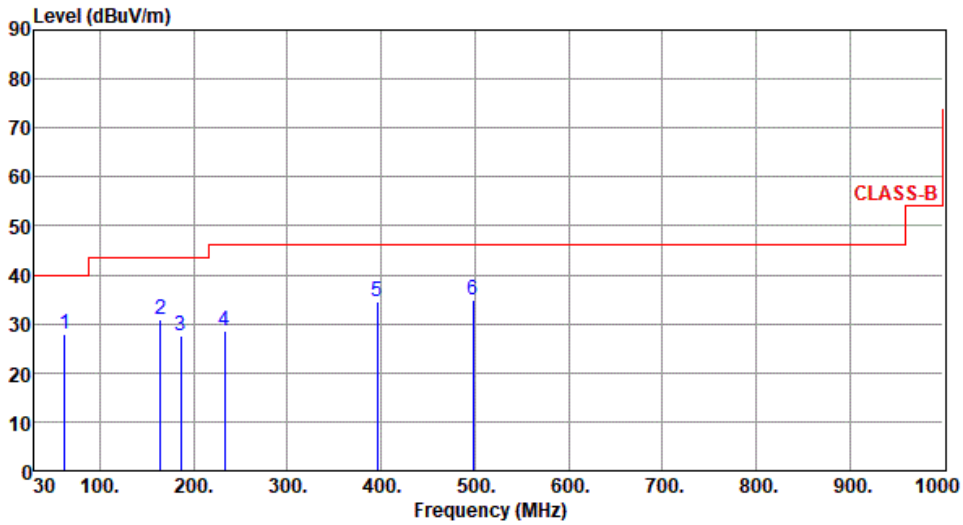
Modulation	π /4-DQPSK + ASK	**Test Freq. (MHz)**	2441 + 13.56
Polarization	Horizontal		



	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
1	53.45	25.36	40.00	-14.64	33.81	-8.45	Peak	---	---
2	98.68	27.31	43.50	-16.19	40.55	-13.24	Peak	---	---
3	186.33	27.46	43.50	-16.04	38.27	-10.81	Peak	---	---
4	239.51	27.48	46.00	-18.52	37.73	-10.25	Peak	---	---
5	377.42	28.79	46.00	-17.21	34.79	-6.00	Peak	---	---
6	467.60	31.48	46.00	-14.52	35.17	-3.69	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	π /4-DQPSK + ASK	Test Freq. (MHz)	2441 + 13.56
Polarization	Vertical		

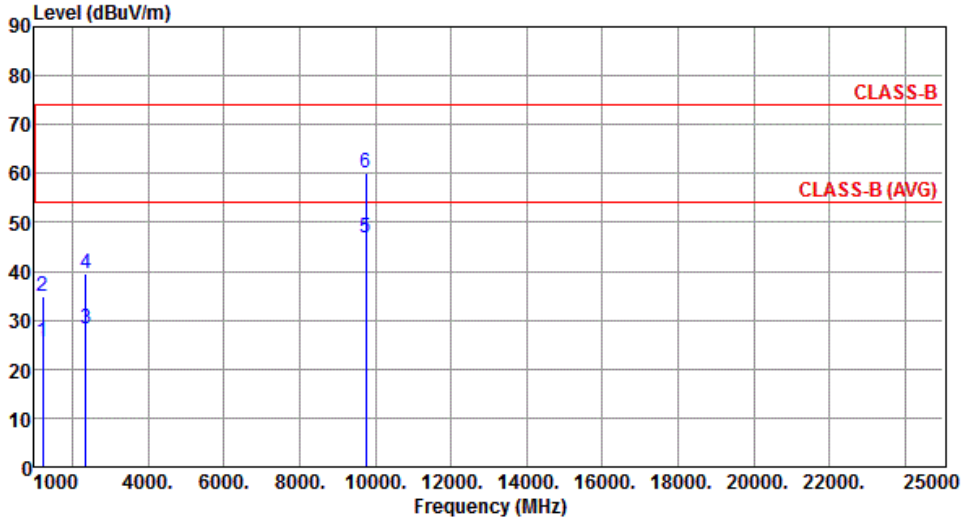


	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
1	62.31	27.86	40.00	-12.14	37.09	-9.23	Peak	---	---
2	164.68	30.74	43.50	-12.76	39.35	-8.61	Peak	---	---
3	186.31	27.46	43.50	-16.04	38.27	-10.81	Peak	---	---
4	232.65	28.53	46.00	-17.47	39.71	-11.18	Peak	---	---
5	395.61	34.45	46.00	-11.55	40.03	-5.58	Peak	---	---
6	498.52	34.94	46.00	-11.06	38.08	-3.14	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)

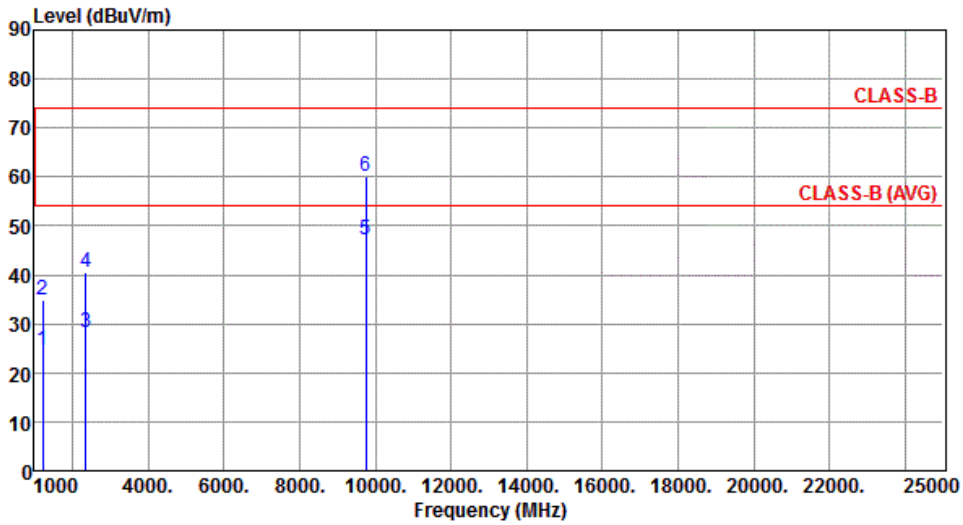
Modulation	π/4-DQPSK	**Test Freq. (MHz)**	2441
Polarization	Horizontal		



	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
1	1216.00	25.57	54.00	-28.43	33.52	-7.95	Average	100	62
2	1216.00	34.79	74.00	-39.21	42.74	-7.95	Peak	100	62
3	2355.00	28.09	54.00	-25.91	30.82	-2.73	Average	100	101
4	2355.00	39.68	74.00	-34.32	42.41	-2.73	Peak	100	101
5	9754.00	46.86	54.00	-7.14	33.15	13.71	Average	100	120
6	9754.00	59.96	74.00	-14.04	46.25	13.71	Peak	100	120

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	π/4-DQPSK	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	1216.00	24.63	54.00	-29.37	32.58	-7.95	Average	100	69
2	1216.00	34.87	74.00	-39.13	42.82	-7.95	Peak	100	69
3	2355.00	28.29	54.00	-25.71	31.02	-2.73	Average	100	257
4	2355.00	40.49	74.00	-33.51	43.22	-2.73	Peak	100	257
5	9754.00	47.23	54.00	-6.77	33.52	13.71	Average	100	341
6	9754.00	59.96	74.00	-14.04	46.25	13.71	Peak	100	341

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).

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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