FCC Test Report

FCC ID	:	**U28N01**
Equipment	:	**EduMic**
Model No.	:	**N01**
Brand Name	:	**Oticon**
Applicant	:	**Oticon A/S**
Address	:	**Kongebakken 9 DK-2765 Smorum, Denmark**
Standard	:	**47 CFR FCC Part 15.247**
Received Date	:	**Jun. 27, 2019**
Tested Date	:	**Jul. 04 ~ Jul. 10, 2019**

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

Reviewed by: **Approved by:**

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

Testing Laboratory 2732

Table of Contents

Release Record

Report No.	Version	Description	Issued Date
FR962701-1	Rev. 01	Initial issue	Oct. 16, 2019

Summary of Test Results

FCC Rules	Test Items	Measured	Result
15.207	Conducted Emissions	[dBuV]: 0.507MHz 31.65 (Margin -14.35dB) - AV	Pass
15.247(d) 15.209	Radiated Emissions	[dBuV/m at 3m]: 2483.50MHz 44.17 (Margin -9.83dB) - AV	Pass
15.247(d)	Band Edge	Meet the requirement of limit	Pass
15.247(b)(1)	Conducted Output Power	Power [dBm]: 11.29	Pass
15.247(a)(1)(iii)	Number of Hopping Channels	Meet the requirement of limit	Pass
15.247(a)(1)	Hopping Channel Separation	Meet the requirement of limit	Pass
15.247(a)(1)(iii)	Dwell Time	Meet the requirement of limit	Pass
15.203	Antenna Requirement	Meet the requirement of limit	Pass

Declaration of Conformity:
The test results with all measurement uncertainty excluded are presented in accordance with the regulation limits or requirements declared by manufacturers.
Comments and Explanations:
The declared of product specification for EUT presented in the report are provided by the manufacturer, and the manufacturer takes all the responsibilities for the accuracy of product specification.

1 General Description

1.1 Information

RF General Information					
Frequency Range (MHz)	**Bluetooth Mode**	**Ch. Freq. (MHz)**	**Channel Number**	**Data Rate**	**Radio Chipset**
2400-2483.5	FHSS	2404-2476	0-35 [36]	2 Mbps	Aurora
Note: Modulation TYPE is 2FSK.					

1.1.1 Antenna Details

Ant. No.	Type	Connector	Gain (dBi)	Remarks
1	PIFA	NA	0.9	---

1.1.2 Power Supply Type of Equipment under Test (EUT)

Power Supply Type	5Vdc from adapter 5Vdc from host 3.7Vdc from battery

1.1.3 Accessories

Accessories		
No.	**Equipment**	**Description**
1	AC adapter	Brand: PHIHONG Model: AM05A-050A I/P: 100-240Vac, 50/60Hz, 0.2A O/P: 5Vdc, 1A Power Line: 1.8m non-shielded without core
2	Battery	Brand: SYNergy ScienTech Corp. Model: AHB651935PC Power Rating: 3.7Vdc, 420mAh
3	USB cable	1m shielded without core
4	Audio cable 1	1.05m shielded with two cores.
5	Audio cable 2	1.05m shielded with two cores.

1.1.4 Channel List

Channel No.	Frequency (MHz)	Channel No.	Frequency (MHz)
0	2404	18	2442
1	2406	19	2444
2	2408	20	2446
3	2410	21	2448
4	2412	22	2450
5	2414	23	2452
6	2416	24	2454
7	2418	25	2456
8	2420	26	2458
9	2422	27	2460
10	2424	28	2462
11	2428	29	2464
12	2430	30	2466
13	2432	31	2468
14	2434	32	2470
15	2436	33	2472
16	2438	34	2474
17	2440	35	2476

1.1.5 Test Tool and Duty Cycle

Test Tool	Nebula Developer, Version: 3.4.10.0	
Modulation Mode	**Duty Cycle Of Test Signal (%)**	**Duty Factor (dB)**
FHSS/2Mbps	100	0

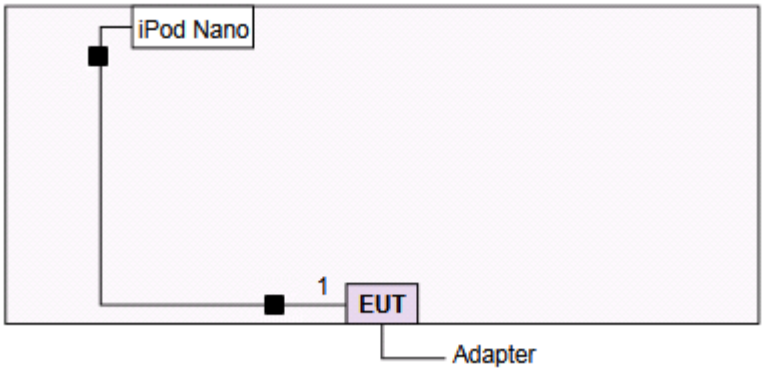
1.1.6 Power Index of Test Tool

Modulation Mode	Test Frequency (MHz)		
	2404	**2440**	**2476**
FHSS/2Mbps	Default	Default	Default

1.2 Local Support Equipment List

Support Equipment List					
No.	**Equipment**	**Brand**	**Model**	**FCC ID**	**Remarks**
1	iPod Nano	Apple	A1446	---	---

1.3 Test Setup Chart

Test Setup Diagram	
	
No.	**Signal cable / Length (m)**
1	Audio, 1.05m shielded with two cores

1.4 Test Equipment List and Calibration Data

Test Item	Conducted Emission				
Test Site	Conduction room 1 / (CO01-WS)				
Instrument	**Manufacturer**	**Model No.**	**Serial No.**	**Calibration Date**	**Calibration Until**
Receiver	R&S	ESR3	101657	Jan. 08, 2019	Jan. 07, 2020
LISN	R&S	ENV216	101579	Mar. 08, 2019	Mar. 07, 2020
RF Cable-CON	Woken	CFD200-NL	CFD200-NL-001	Oct. 23, 2018	Oct. 22, 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 chamber 3 / (03CH03-WS)				
Instrument	**Manufacturer**	**Model No.**	**Serial No.**	**Calibration Date**	**Calibration Until**
Spectrum Analyzer	R&S	FSV40	101499	Jan. 07, 2019	Jan. 06, 2020
Receiver	R&S	ESR3	101658	Dec. 11, 2018	Dec. 10, 2019
Bilog Antenna	SCHWARZBECK	VULB9168	VULB9168-685	Apr. 17, 2019	Apr. 16, 2020
Horn Antenna 1G-18G	SCHWARZBECK	BBHA 9120 D	BBHA 9120 D 1206	Jan. 07, 2019	Jan. 06, 2020
Horn Antenna 18G-40G	SCHWARZBECK	BBHA 9170	BBHA 9170517	Nov. 15, 2018	Nov. 14, 2019
Loop Antenna	R&S	HFH2-Z2	100330	Nov. 09, 2018	Nov. 08, 2019
Loop Antenna Cable	KOAX KABEL	101354-BW	101354-BW	Oct. 08, 2018	Oct. 07, 2019
Preamplifier	EMC	EMC02325	980187	Aug. 24, 2018	Aug. 23, 2019
Preamplifier	Agilent	83017A	MY53270014	Aug. 09, 2018	Aug. 08, 2019
Preamplifier	EMC	EMC184045B	980192	Aug. 09, 2018	Aug. 08, 2019
RF cable-3M	HUBER+SUHNER	SUCOFLEX104	MY22620/**4**	Oct. 01, 2018	Sep. 30, 2019
RF cable-8M	EMC	EMC104-SM-SM-8000	181107	Oct. 01, 2018	Sep. 30, 2019
RF cable-1M	HUBER+SUHNER	SUCOFLEX104	MY22624/4	Oct. 01, 2018	Sep. 30, 2019
LF cable-0.8M	EMC	EMC8D-NM-NM-800	EMC8D-NM-NM-800-001	Oct. 01, 2018	Sep. 30, 2019
LF cable-3M	EMC	EMC8D-NM-NM-3000	131103	Oct. 01, 2018	Sep. 30, 2019
LF cable-13M	EMC	EMC8D-NM-NM-13000	131104	Oct. 01, 2018	Sep. 30, 2019
Measurement Software	AUDIX	e3	6.120210g	NA	NA
Note: Calibration Interval of instruments listed above is one year.					

Test Item	RF Conducted				
Test Site	(TH01-WS)				
Instrument	**Manufacturer**	**Model No.**	**Serial No.**	**Calibration Date**	**Calibration Until**
Spectrum Analyzer	R&S	FSV40	101063	Apr. 17, 2019	Apr. 16, 2020
Spectrum Analyzer	R&**S**	FSV40	101499	Jan. 07, 2019	Jan. 06, 2020
TEMP&HUMIDITY CHAMBER	GIANT FORCE	GCT-225-40-SP-SD	MAF1212-002	Dec. 05, 2018	Dec. 04, 2019
Power Meter	Anritsu	ML2495A	1241002	Oct. 09, 2018	Oct. 08, 2019
Power Sensor	Anritsu	MA2411B	1207366	Oct. 09, 2018	Oct. 08, 2019
DC POWER SOURCE	GW INSTEK	GPC-6030D	EM892433	Oct. 25, 2018	Oct. 24, 2019
AC POWER SOURCE	APC	AFC-500W	F312060012	Nov. 29, 2018	Nov. 28, 2019
Measurement Software	Sporton	Sporton_1	1.3.30	NA	NA
Note: Calibration Interval of instruments listed above is one year.					

1.5 Test Standards

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

47 CFR FCC Part 15.247
ANSI C63.10-2013
FCC KDB 558074 D01 15.247 Meas Guidance v05r02

1.6 Deviation from Test Standard and Measurement Procedure

None

1.7 Measurement Uncertainty

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

Measurement Uncertainty	
Parameters	**Uncertainty**
Bandwidth	±34.130 Hz
Conducted power	±0.808 dB
Power density	±0.583 dB
Conducted emission	±2.715 dB
AC conducted emission	±2.92 dB
Radiated emission ≤ 1GHz	±3.96 dB
Radiated emission > 1GHz	±4.51 dB

2 Test Configuration

2.1 Testing Condition

Test Item	Test Site	Ambient Condition	Tested By
AC Conduction	CO01-WS	24°C / 65%	Alex Tsai
Radiated Emissions	03CH03-WS	24-25°C / 60-63%	Roger Lu
RF Conducted	TH01-WS	22°C / 63%	Brad Wu

- FCC Designation No.: TW0009
- FCC site registration No.: 207696
- ISED#: 10807C-1
- CAB identifier: TW0009

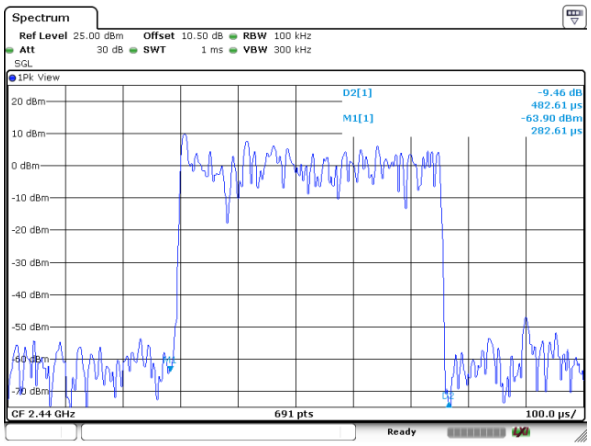
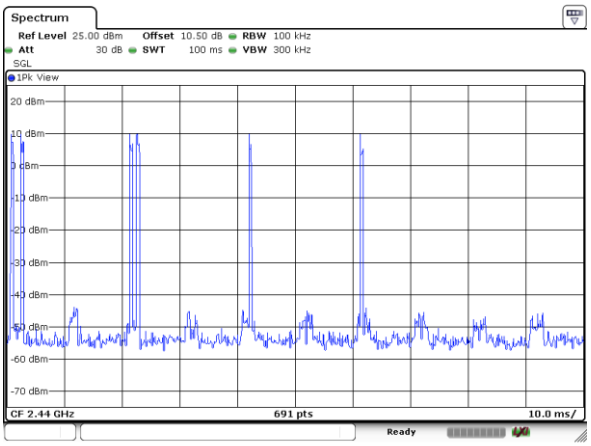
2.2 The Worst Test Modes and Channel Details

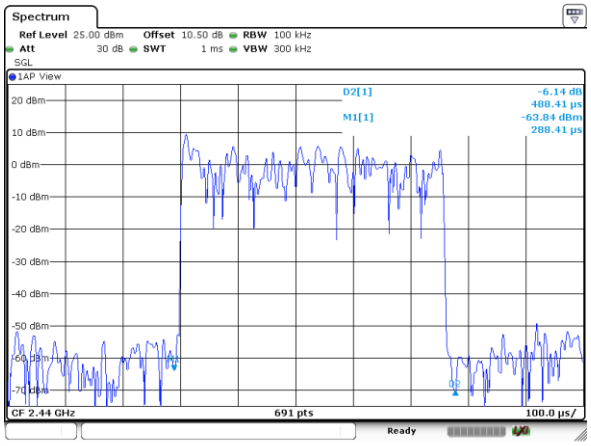
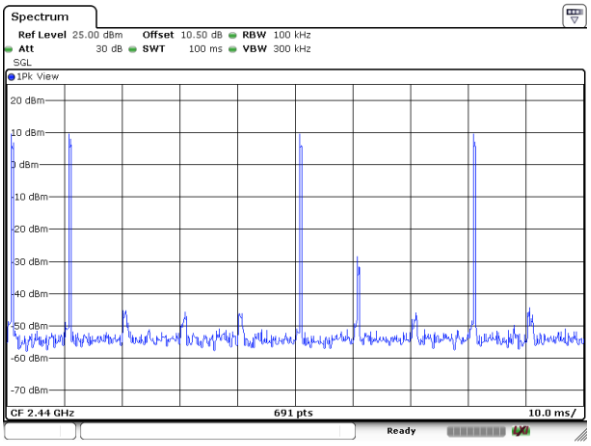
Test item	Mode	Test Frequency (MHz)	Data Rate (Mbps)	Test Configuration
Conducted Emissions	FHSS	2440	2 Mbps	2
Radiated Emissions ≤ 1GHz	FHSS	2440	2 Mbps	2
Radiated Emissions > 1GHz	FHSS	2404, 2440, 2476	2 Mbps	2
Conducted Output Power	FHSS	2404, 2440, 2476	2 Mbps	2
Number of Hopping Channels	FHSS	2404, 2440, 2476	2 Mbps	2
Hopping Channel Separation	FHSS	2404, 2440, 2476	2 Mbps	2
20dB and Occupied bandwidth	FHSS	2404, 2440, 2476	2 Mbps	2
Dwell Time	FHSS	2440	2 Mbps	1, 2

NOTE:

1. The EUT was pretested with 3 orientations placed on the table for the radiated emission measurement – X, Y, and Z-plane. The **Y-plane** results were found as the worst case and were shown in this report.
2. Test Configurations are listed as follows:
   1) Test Configuration 1: Mono / Duty cycle of normal operation: 1.95 %
   2) Test Configuration 2: Stereo / Duty cycle of normal operation: 2.90 %

Duty cycle of Normal Operation

Stereo mode	
	
Duty cycle = 0.48261 ms * 6 / 100 ms x 100 = 2.9 % Duty factor = 20 * log(duty cycle) = -30.77 dB	

Mono mode	
	
Duty cycle: 0.48841 ms * 4 / 100 ms x 100 = 1.95 % Duty factor = 20 * log(duty cycle) = -34.18 dB	

3 Transmitter Test Results

3.1 Conducted Emissions

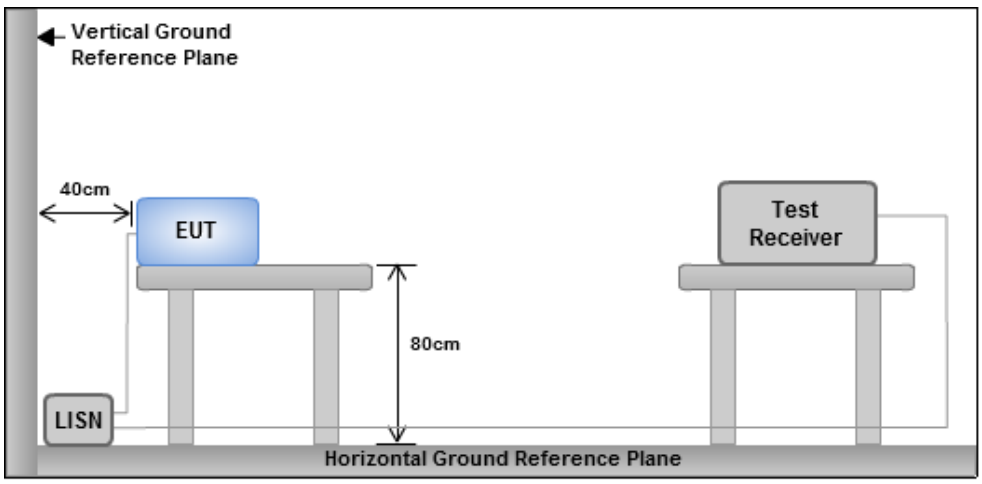
3.1.1 Limit of Conducted Emissions

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

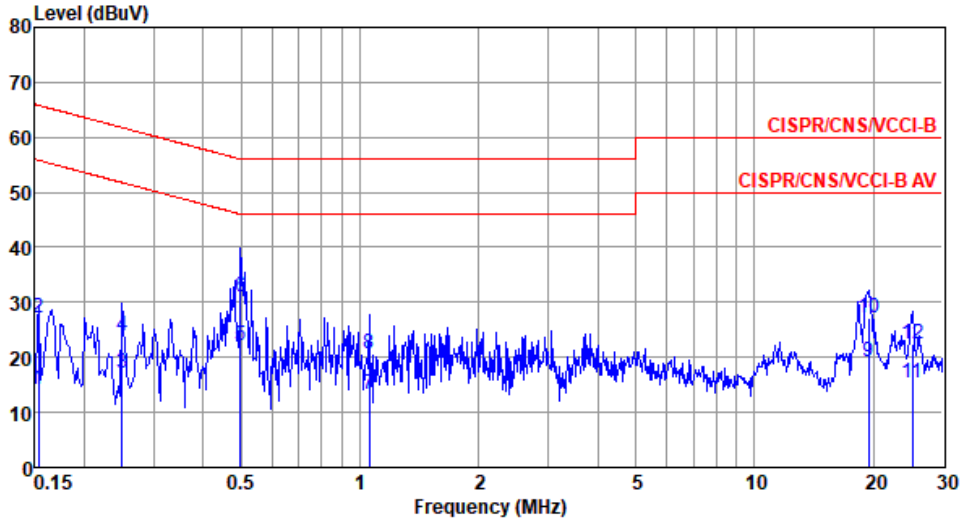


Note: 1. Support units were connected to second LISN.

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

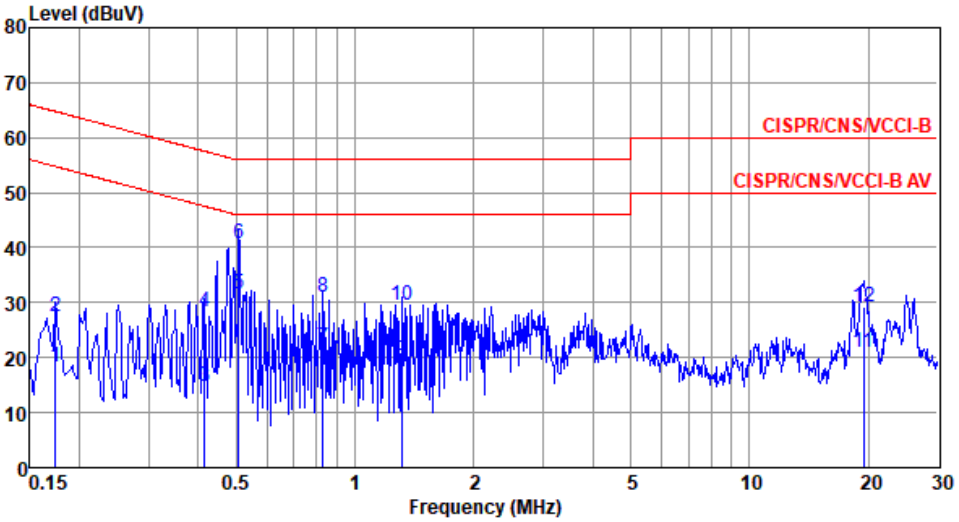
Modulation Mode	FHSS	Test Freq. (MHz)	2440
Power Phase	Line		



	Freq	Level	Limit Line	Over Limit	Read Level	LISN factor	cable loss	Remark
	MHz	dBuV	dBuV	dB	dBuV	dB	dB	
1	0.153	14.29	55.82	-41.53	4.58	9.53	0.05	Average
2	0.153	27.15	65.82	-38.67	17.44	9.53	0.05	QP
3	0.249	17.01	51.78	-34.77	7.18	9.55	0.07	Average
4	0.249	23.93	61.78	-37.85	14.10	9.55	0.07	QP
5*	0.497	22.15	46.05	-23.90	12.22	9.58	0.08	Average
6	0.497	31.09	56.05	-24.96	21.16	9.58	0.08	QP
7	1.054	13.42	46.00	-32.58	3.42	9.60	0.10	Average
8	1.054	20.76	56.00	-35.24	10.76	9.60	0.10	QP
9	19.428	19.27	50.00	-30.73	8.41	9.66	0.60	Average
10	19.428	27.18	60.00	-32.82	16.32	9.66	0.60	QP
11	25.188	15.43	50.00	-34.57	4.43	9.64	0.68	Average
12	25.188	22.45	60.00	-37.55	11.45	9.64	0.68	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	FHSS	Test Freq. (MHz)	2440
Power Phase	Neutral		



	Freq	Level	Limit Line	Over Limit	Read Level	LISN factor	cable loss	Remark
	MHz	dBuV	dBuV	dB	dBuV	dB	dB	
1	0.174	18.22	54.77	-36.55	8.45	9.58	0.06	Average
2	0.174	27.36	64.77	-37.41	17.59	9.58	0.06	QP
3	0.415	14.75	47.55	-32.80	4.94	9.61	0.08	Average
4	0.415	28.40	57.55	-29.15	18.59	9.61	0.08	QP
5*	0.507	31.65	46.00	-14.35	21.79	9.62	0.09	Average
6	0.507	40.72	56.00	-15.28	30.86	9.62	0.09	QP
7	0.830	21.96	46.00	-24.04	12.02	9.63	0.10	Average
8	0.830	31.00	56.00	-25.00	21.06	9.63	0.10	QP
9	1.310	19.53	46.00	-26.47	9.53	9.64	0.12	Average
10	1.310	29.44	56.00	-26.56	19.44	9.64	0.12	QP
11	19.428	20.89	50.00	-29.11	10.03	9.81	0.60	Average
12	19.428	29.09	60.00	-30.91	18.23	9.81	0.60	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:

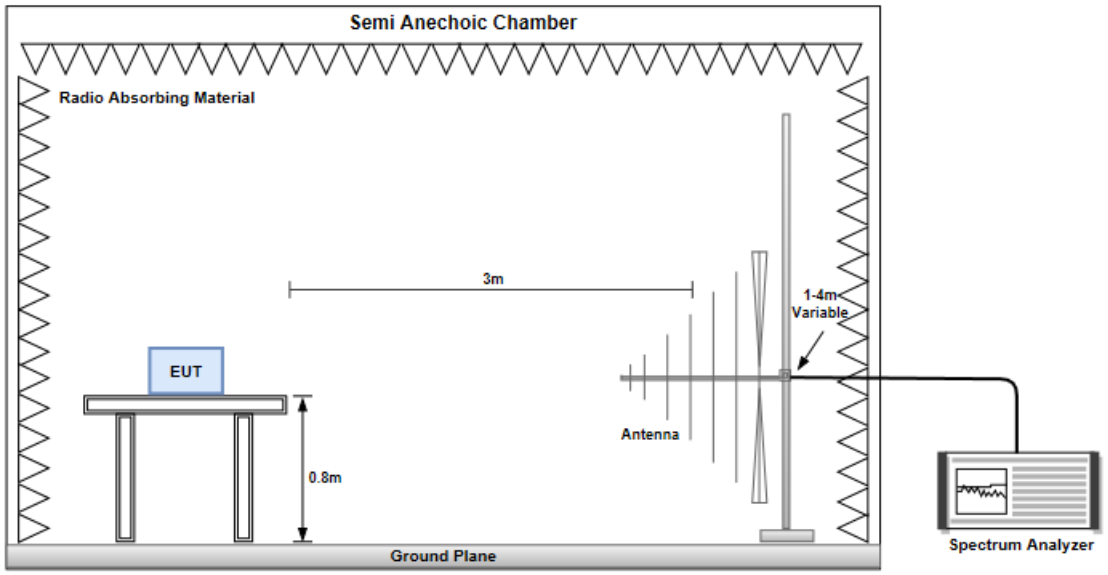
1. 120kHz measurement bandwidth of test receiver and Quasi-peak detector is for radiated emission below 1GHz.
2. Radiated emission above 1GHz / Peak value
   RBW=1MHz, VBW=3MHz and Peak detector
3. Radiated emission above 1GHz / Average value for harmonics
   The average value is: Average = Peak value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

$$20\log(\text{Duty cycle}) = 20\log\frac{0.48261\text{ms} * 6}{100\text{ ms}} = -30.77\text{ dB}$$

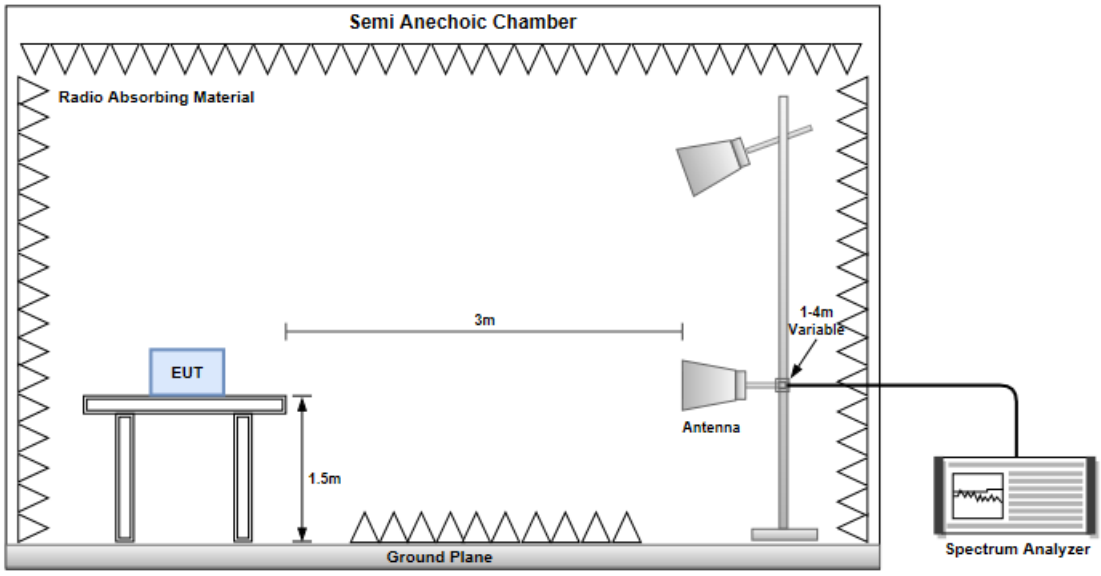
4. Radiated emission above 1GHz / Average value for other emissions
   RBW=1MHz, VBW=1/T and Peak detector

3.2.3 Test Setup

Radiated Emissions below 1 GHz

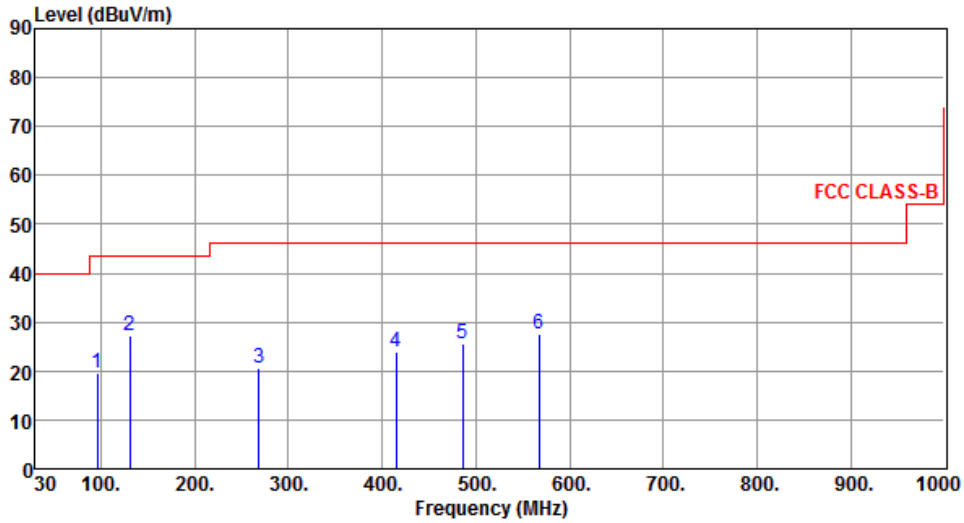


Radiated Emissions above 1 GHz



3.2.4 Transmitter Radiated Unwanted Emissions (Below 1GHz)

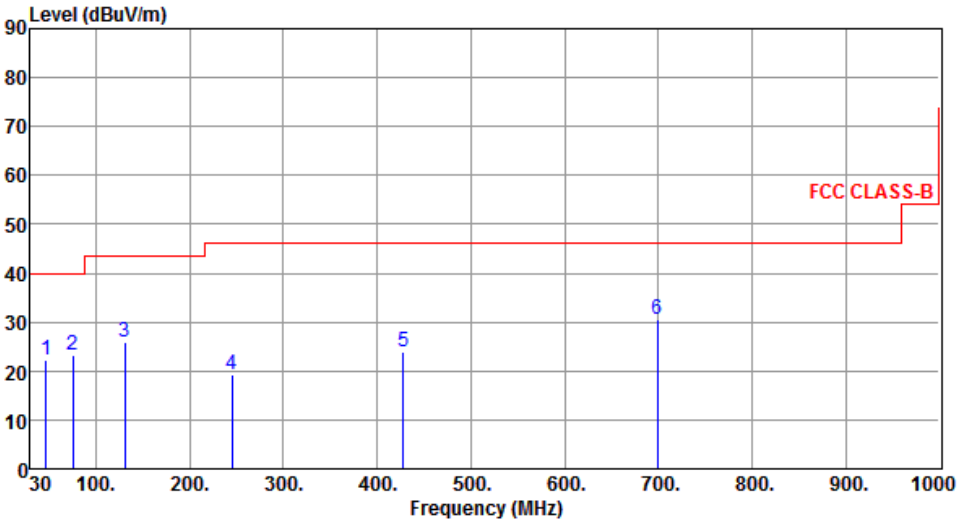
Modulation Mode	FHSS	Test Freq. (MHz)	2440
Polarization	Horizontal		



	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
1	95.87	19.75	43.50	-23.75	34.05	-14.30	Peak	---	---
2	130.67	27.34	43.50	-16.16	37.44	-10.10	Peak	---	---
3	268.55	20.69	46.00	-25.31	30.18	-9.49	Peak	---	---
4	415.18	23.79	46.00	-22.21	29.24	-5.45	Peak	---	---
5	485.81	25.64	46.00	-20.36	29.28	-3.64	Peak	---	---
6	567.42	27.58	46.00	-18.42	29.66	-2.08	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	FHSS	Test Freq. (MHz)	2440
Polarization	Vertical		

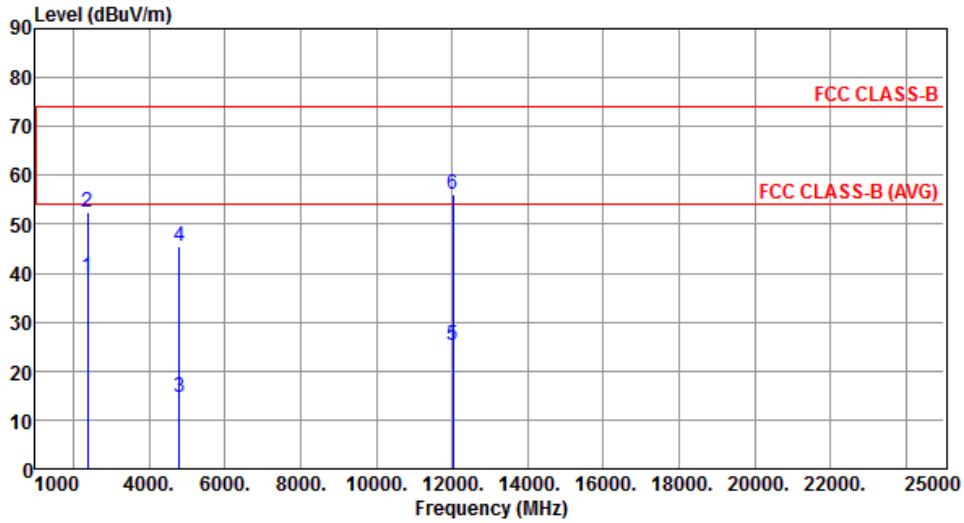


	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
1	46.51	22.38	40.00	-17.62	31.03	-8.65	Peak	---	---
2	75.62	23.37	40.00	-16.63	35.52	-12.15	Peak	---	---
3	130.75	26.03	43.50	-17.47	36.12	-10.09	Peak	---	---
4	245.22	19.42	46.00	-26.58	29.60	-10.18	Peak	---	---
5	427.65	23.84	46.00	-22.16	28.85	-5.01	Peak	---	---
6	699.27	30.66	46.00	-15.34	30.05	0.61	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

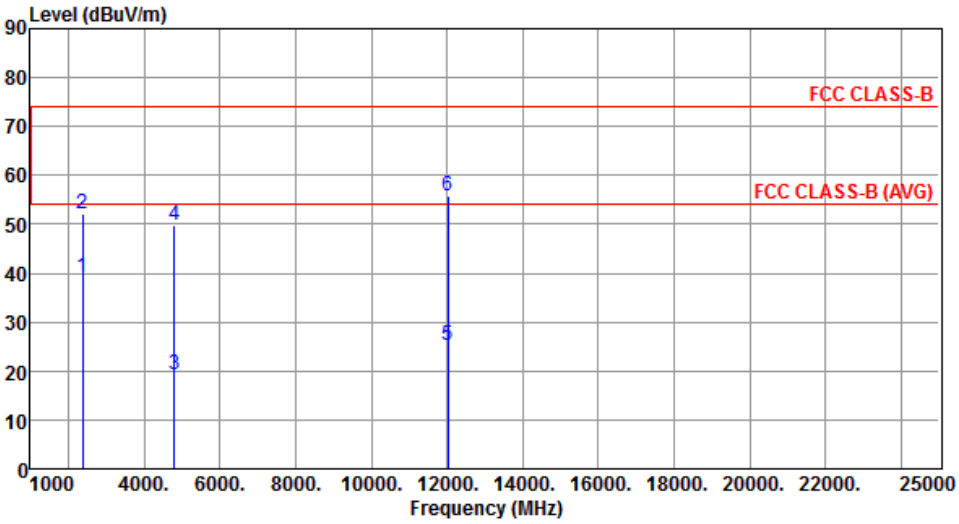
Modulation Mode	FHSS	Test Freq. (MHz)	2404
Polarization	Horizontal		



	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
1	2390.00	39.30	54.00	-14.70	40.26	-0.96	Average	125	171
2	2390.00	52.49	74.00	-21.51	53.45	-0.96	Peak	125	171
3	4808.00	14.73	54.00	-39.27	9.91	4.82	Average	100	224
4	4808.00	45.50	74.00	-28.50	40.68	4.82	Peak	100	224
5	12020.00	25.28	54.00	-28.72	10.46	14.82	Average	100	100
6	12020.00	56.05	74.00	-17.95	41.23	14.82	Peak	100	100

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).

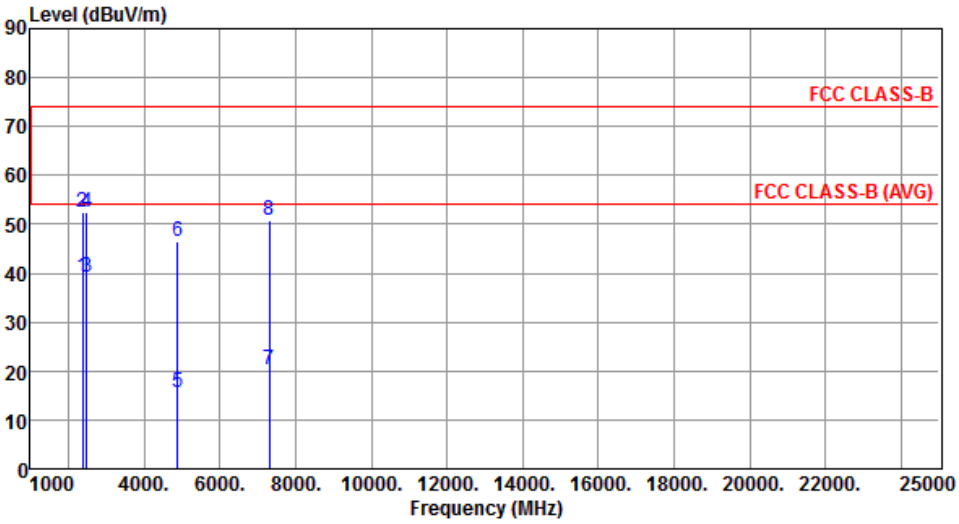
Modulation Mode	FHSS	Test Freq. (MHz)	2404
Polarization	Vertical		



	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	39.28	54.00	-14.72	40.24	-0.96	Average	113	262
2	2390.00	52.27	74.00	-21.73	53.23	-0.96	Peak	113	262
3	4808.00	19.18	54.00	-34.82	14.36	4.82	Average	126	173
4	4808.00	49.95	74.00	-24.05	45.13	4.82	Peak	126	173
5	12020.00	25.18	54.00	-28.82	10.36	14.82	Average	100	30
6	12020.00	55.95	74.00	-18.05	41.13	14.82	Peak	100	30

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

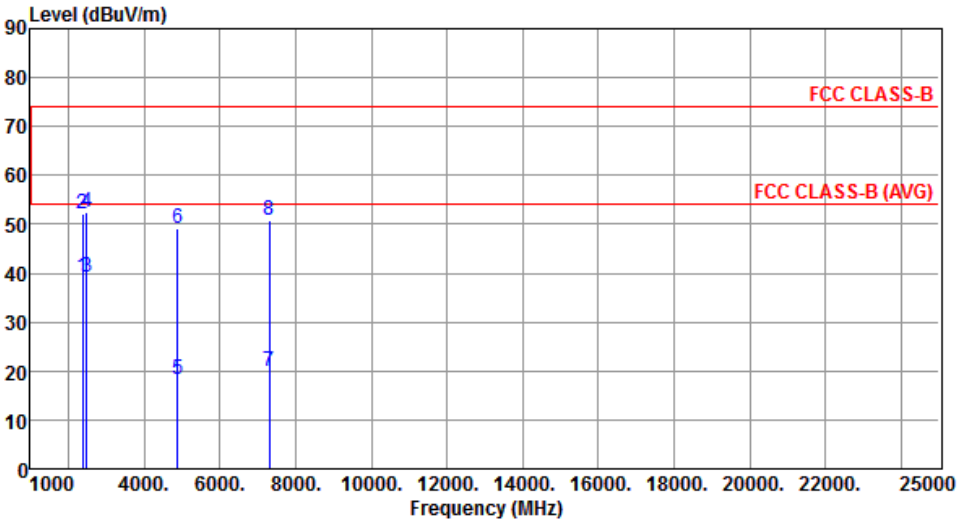
Modulation Mode	FHSS	Test Freq. (MHz)	2440
Polarization	Horizontal		



	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	39.16	54.00	-14.84	40.12	-0.96	Average	115	170
2	2390.00	52.49	74.00	-21.51	53.45	-0.96	Peak	115	170
3	2483.50	39.14	54.00	-14.86	40.26	-1.12	Average	115	170
4	2483.50	52.33	74.00	-21.67	53.45	-1.12	Peak	115	170
5	4880.00	15.67	54.00	-38.33	10.76	4.91	Average	100	226
6	4880.00	46.44	74.00	-27.56	41.53	4.91	Peak	100	226
7	7320.00	20.12	54.00	-33.88	9.80	10.32	Average	100	60
8	7320.00	50.89	74.00	-23.11	40.57	10.32	Peak	100	60

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

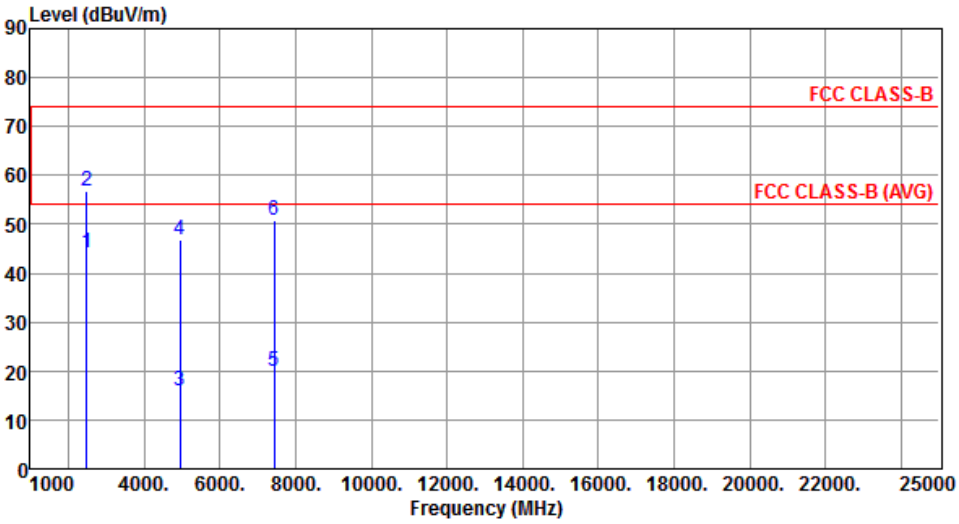
Modulation Mode	FHSS	Test Freq. (MHz)	2440
Polarization	Vertical		



	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	39.27	54.00	-14.73	40.23	-0.96	Average	110	262
2	2390.00	52.25	74.00	-21.75	53.21	-0.96	Peak	110	262
3	2483.50	39.19	54.00	-14.81	40.31	-1.12	Average	110	262
4	2483.50	52.49	74.00	-21.51	53.61	-1.12	Peak	110	262
5	4880.00	18.43	54.00	-35.57	13.52	4.91	Average	125	175
6	4880.00	49.20	74.00	-24.80	44.29	4.91	Peak	125	175
7	7320.00	20.08	54.00	-33.92	9.76	10.32	Average	100	60
8	7320.00	50.85	74.00	-23.15	40.53	10.32	Peak	100	60

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

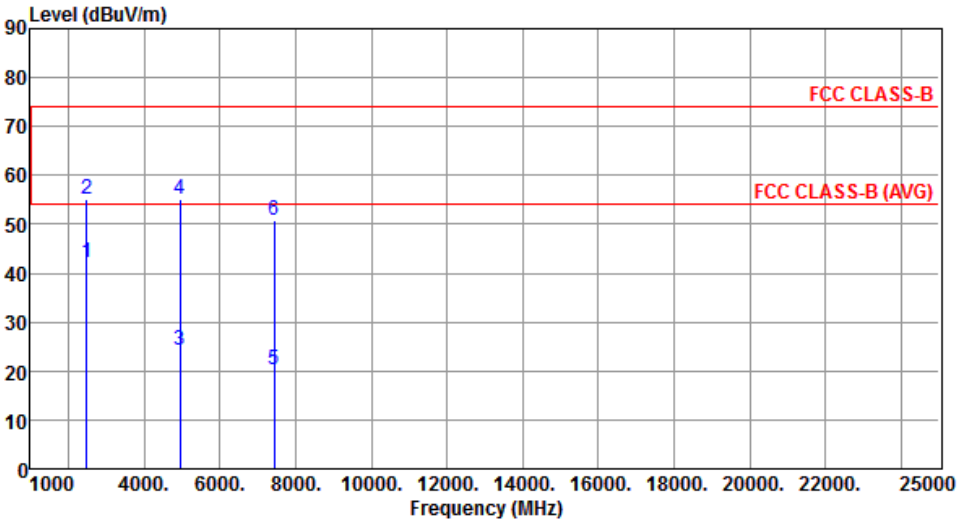
Modulation Mode	FHSS	Test Freq. (MHz)	2476
Polarization	Horizontal		



	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	44.17	54.00	-9.83	45.29	-1.12	Average	110	172
2	2483.50	56.80	74.00	-17.20	57.92	-1.12	Peak	110	172
3	4952.00	15.93	54.00	-38.07	10.78	5.15	Average	100	225
4	4952.00	46.70	74.00	-27.30	41.55	5.15	Peak	100	225
5	7428.00	20.04	54.00	-33.96	9.76	10.28	Average	100	90
6	7428.00	50.81	74.00	-23.19	40.53	10.28	Peak	100	90

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

Modulation Mode	FHSS	Test Freq. (MHz)	2476
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	42.27	54.00	-11.73	43.39	-1.12	Average	115	256
2	2483.50	55.00	74.00	-19.00	56.12	-1.12	Peak	115	256
3	4952.00	24.23	54.00	-29.77	19.08	5.15	Average	124	169
4	4952.00	55.00	74.00	-19.00	49.85	5.15	Peak	124	169
5	7428.00	20.10	54.00	-33.90	9.82	10.28	Average	100	30
6	7428.00	50.87	74.00	-23.13	40.59	10.28	Peak	100	30

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

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

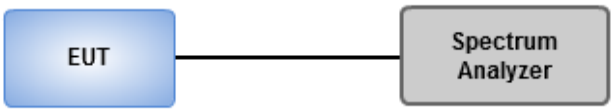
Reference level measurement

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

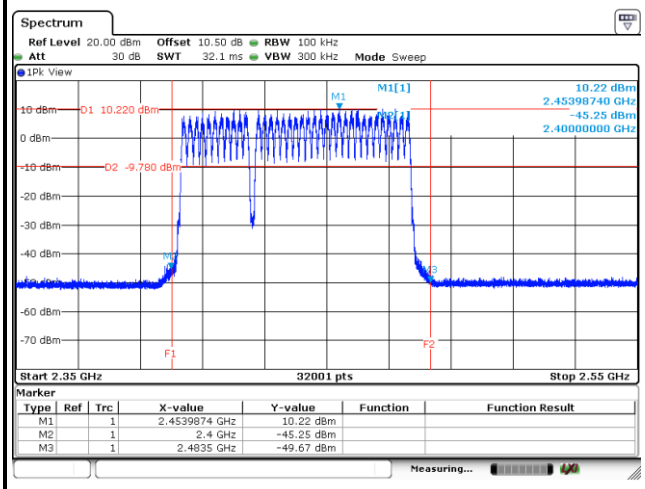
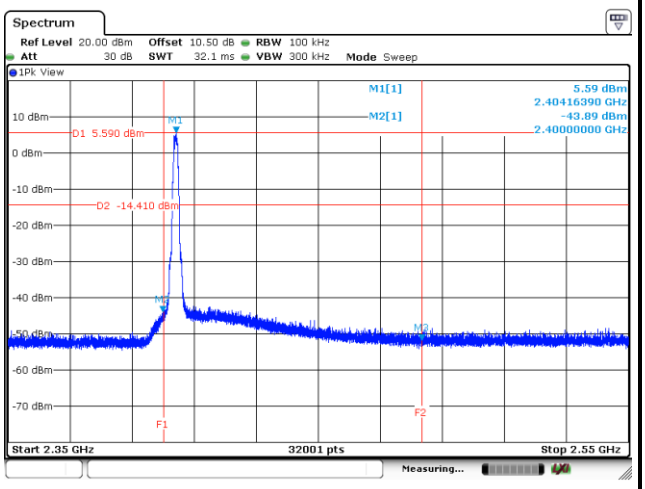
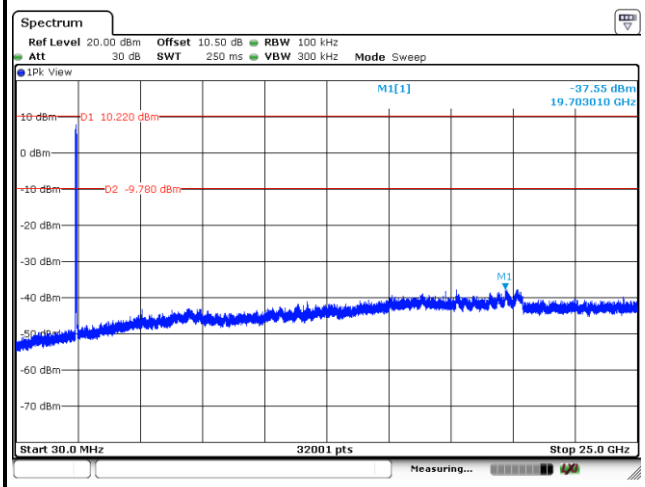
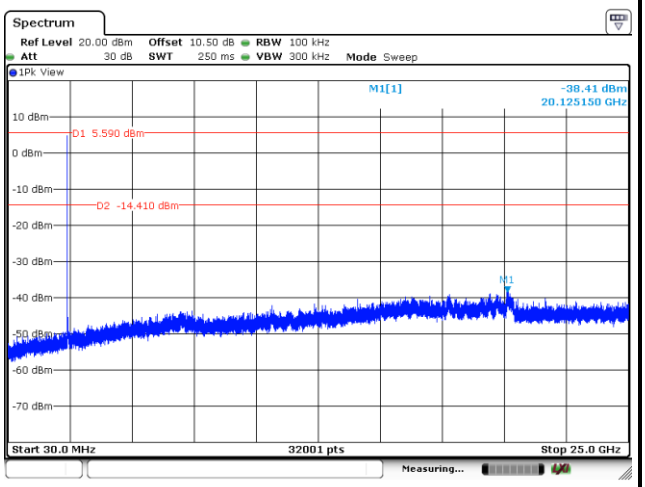
Emission level measurement

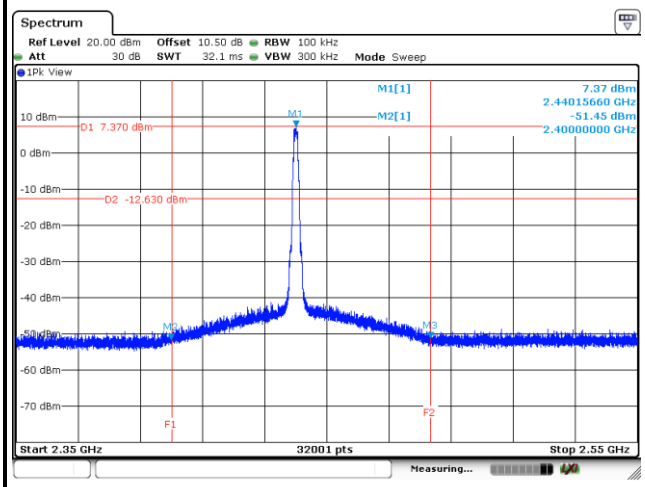
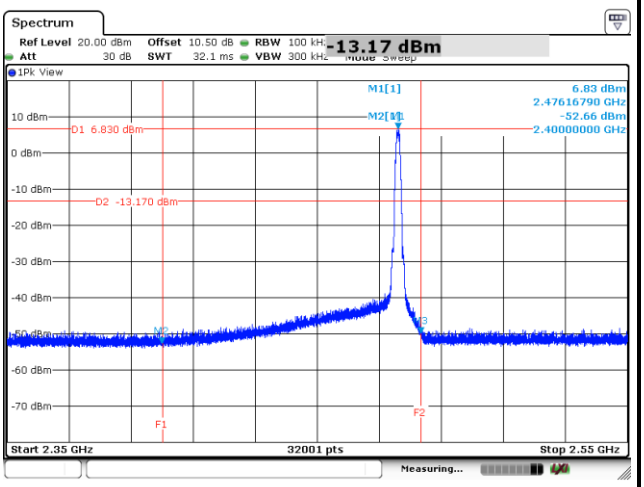
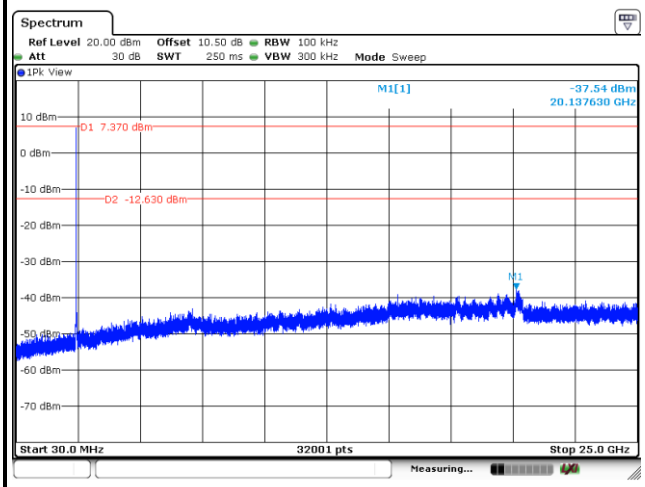
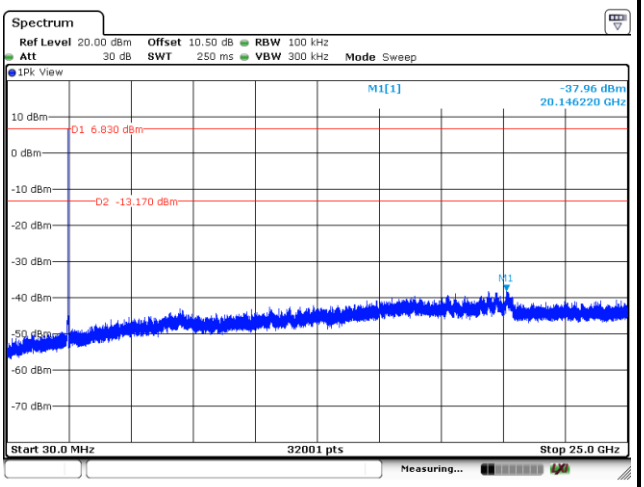
1. Set RBW=100kHz, VBW = 300kHz , Detector = Peak, Sweep time = Auto
2. Trace = max hold , Allow Trace to fully stabilize
3. Scan Frequency range is up to 25GHz
4. Use the peak marker function to determine the maximum amplitude level

3.3.3 Test Setup



3.3.4 Unwanted Emissions into Non-Restricted Frequency Bands

Hopping on	Hopping off
30MHz~25GHz (down 20dBc)	TX Freq 2404MHz / 30MHz~25GHz (down 20dBc)
	
	

Hopping off	Hopping off
TX Freq 2440MHz / 30MHz~25GHz (down 20dBc)	TX Freq 2476MHz / 30MHz~25GHz (down 20dBc)
	
	

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

Modulation Mode	Freq. (MHz)	Output Power (mW)	Output Power (dBm)	Limit (mW)
FHSS	2404	8.77	9.43	125
FHSS	2440	13.46	**11.29**	125
FHSS	2476	12.25	10.88	125

Modulation Mode	Freq. (MHz)	AV Output Power (mW)	AV Output Power (dBm)
FHSS	2404	8.43	9.26
FHSS	2440	12.91	11.11
FHSS	2476	11.53	10.62

Note: Average power is for reference only.

3.5 Number of Hopping Frequency

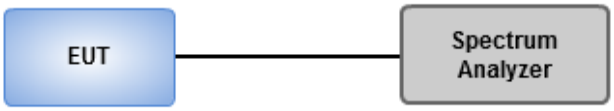
3.5.1 Limit of Number of Hopping Frequency

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

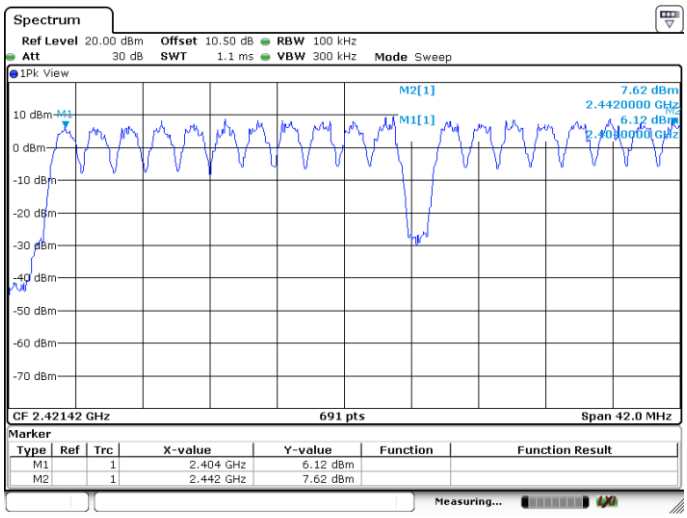
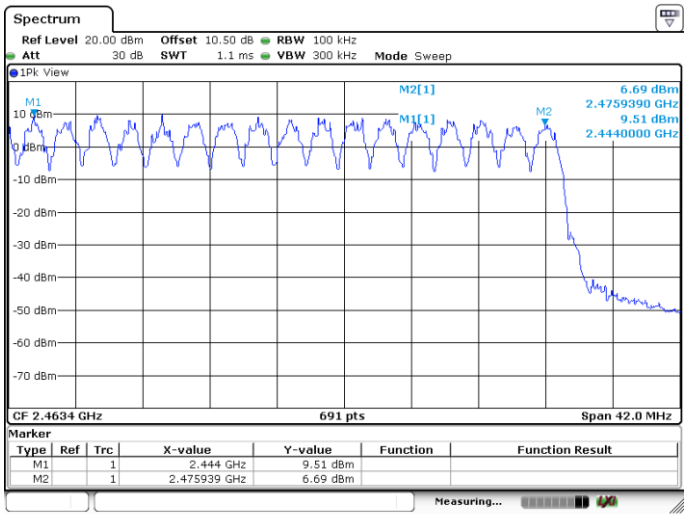
3.5.2 Test Procedures

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

FHSS



3.6 20dB and Occupied Bandwidth

3.6.1 Test Procedures

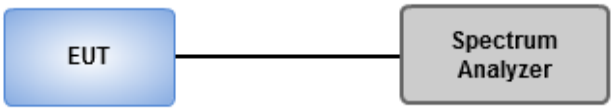
20dB Bandwidth

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

Occupied Bandwidth

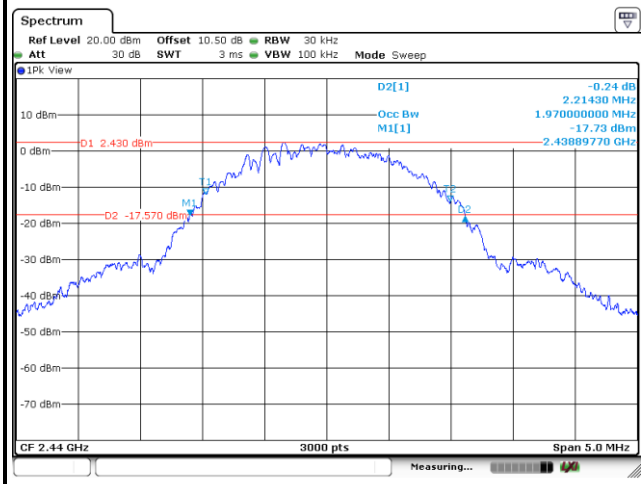
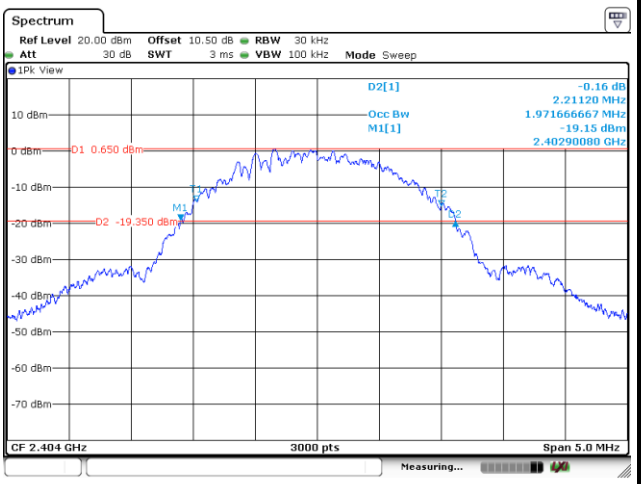
1. Set RBW=30kHz VBW= 100kHz, Sweep time = Auto, Detector=Peak , Trace max hold
2 Allow trace to stabilize
3. Use Occupied bandwidth function of spectrum analyzer to measuring 99% occupied bandwidth

3.6.2 Test Setup



3.6.3 Test result of 20dB and Occupied Bandwidth

Modulation Mode	Freq. (MHz)	20dB Bandwidth (MHz)	Occupied Bandwidth (MHz)
FHSS	2404	2.211	1.972
FHSS	2440	2.214	1.970
FHSS	2476	2.213	1.957

Worst Plot of 20dB Bandwidth	Worst Plot of Occupied Bandwidth
	

3.7 Channel Separation

3.7.1 Limit of Channel Separation

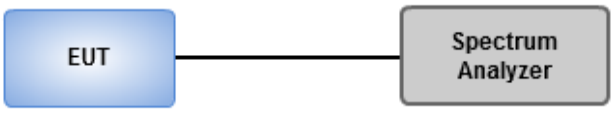
☐ Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hopping channel, whichever is greater.

☒ 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

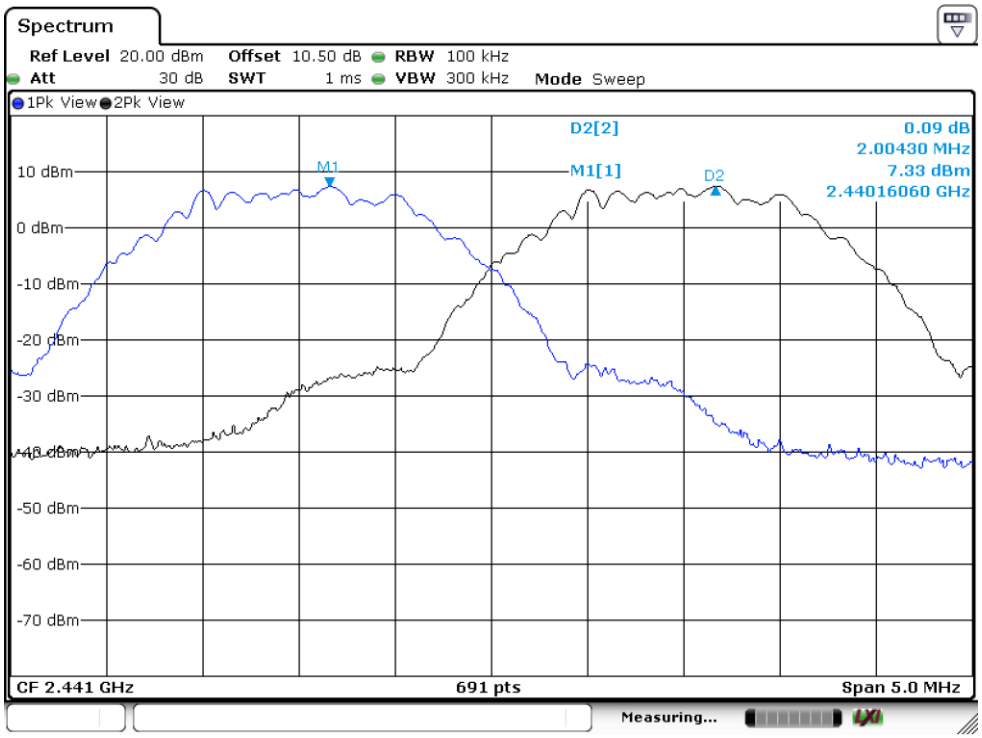
3.7.3 Test Setup



3.7.4 Test result of Channel Separation

Modulation Mode	Freq. (MHz)	Channel Separation (MHz)	20dB Bandwidth (MHz)	Minimum Limit (MHz)
FHSS	2404	1.997	2.211	1.474
FHSS	2440	2.004	2.214	1.476
FHSS	2476	1.997	2.213	1.475

Worst Plot



3.8 Number of Dwell Time

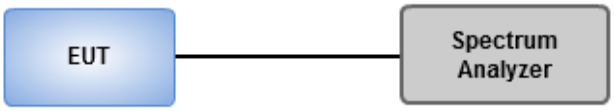
3.8.1 Limit of Dwell time

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 = 1 ms, Detector=Peak, Span=0Hz,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 = 1 s, Detector=Peak, Span=0Hz,Trace max hold
4. Enable gating and trigger function of spectrum analyzer to measure burst on number.
5

3.8.3 Test Setup

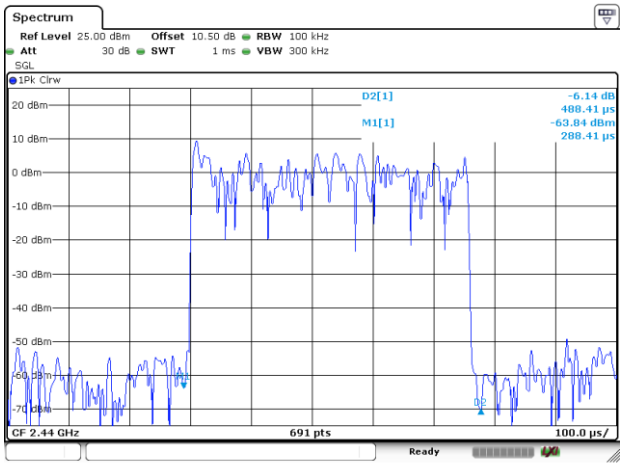
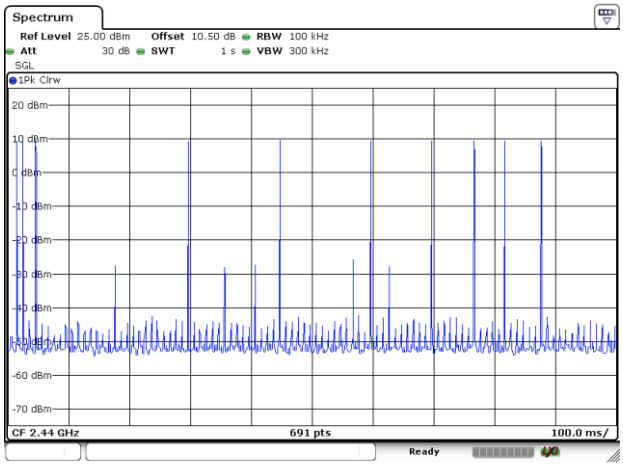


3.8.4 Test Result of Dwell Time

Test Configuration 1: Mono

Modulation Mode	Freq. (MHz)	Length of Transmission Time (msec)	Number of Transmission in a 14.4 (36 Hopping*0.4)	Result (s)	Limit (s)
FHSS	2440	0.48841	144	0.070	0.4

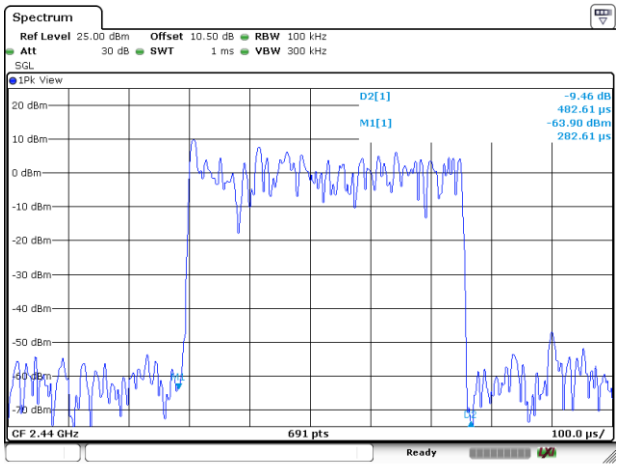
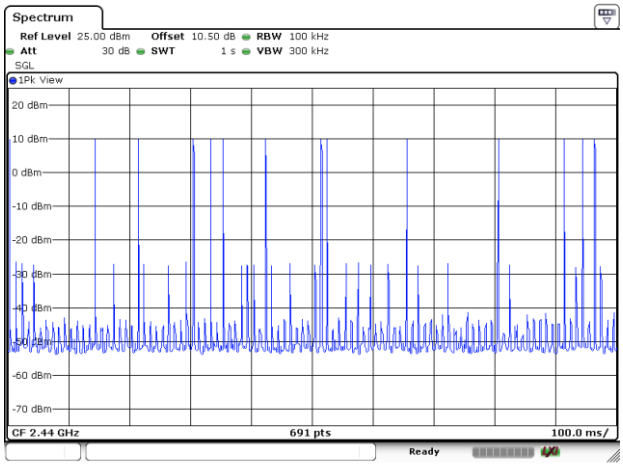
Note: 144 = 10 pulses / 1s * 14.4

FHSS



Test Configuration 2: Stereo

Modulation Mode	Freq. (MHz)	Length of Transmission Time (msec)	Number of Transmission in a 14.4 (36 Hopping*0.4)	Result (s)	Limit (s)
FHSS	2440	0.48261	201.6	0.097	0.4

Note: 201.6 = 14 pulses / 1s * 14.4

FHSS



4 Test laboratory information

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

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

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

Linkou	**Kwei Shan**	**Kwei Shan Site II**
Tel: 886-2-2601-1640	Tel: 886-3-271-8666	Tel: 886-3-271-8640
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If you have any suggestion, please feel free to contact us as below information.

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