

FCC Test Report

FCC ID : 2AV5ZGTG21
Equipment : Gen 2.1 Tracker
Model No. : GTG21
Brand Name : Cox2M
Applicant : Cox Communications, Inc.
Address : 6205 Peachtree Dunwoody Rd Attn Legal
Regulatory, Atlanta, Georgia United States.
30328
Standard : 47 CFR FCC Part 15.247
Received Date : Dec. 10, 2021
Tested Date : Jan. 05 ~ Jan. 06, 2022

We, International Certification Corporation, would like to declare that the tested sample has been evaluated and in compliance with the requirement of the above standards. The test results contained in this report refer exclusively to the product. It 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

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Release Record

Report No.	Version	Description	Issued Date
FR1D1001AE	Rev. 01	Initial issue	Jan. 27, 2022

Summary of Test Results

FCC Rules	Test Items	Measured	Result
15.207	AC Power Line Conducted Emissions	Note	N/A
15.247(d) 15.209	Radiated Emissions	[dBuV/m at 3m]: 4960.00MHz 47.90 (Margin -6.10dB) - AV	Pass
15.247(b)(3)	Maximum Output Power	Power [dBm]: 8.35	Pass
15.247(a)(2)	6dB Bandwidth	Meet the requirement of limit	Pass
15.247(e)	Power Spectral Density	Meet the requirement of limit	Pass
15.203	Antenna Requirement	Meet the requirement of limit	Pass

Note: The EUT consumes DC power from battery, so the test is not required.

Declaration of Conformity:

The test results with all measurement uncertainty excluded are presented in accordance with the regulation limits or requirements declared by manufacturers.

Comments and Explanations:

The declared of product specification for EUT presented in the report are provided by the manufacturer, and the manufacturer takes all the responsibilities for the accuracy of product specification.

1 General Description

1.1 Information

1.1.1 Specification of the Equipment under Test (EUT)

RF General Information				
Frequency Range (MHz)	Bluetooth Mode	Ch. Freq. (MHz)	Channel Number	Data Rate
2400-2483.5	V5.0 LE	2402-2480	0-39 [40]	125 kbps
				500 kbps
				1 Mbps
				2 Mbps
Note: Bluetooth LE (Low energy) uses GFSK modulation.				

1.1.2 Antenna Details

Ant. No.	Type	Connector	Gain (dBi)	Remarks
1	Monopole	No	0.79	---

1.1.3 Power Supply Type of Equipment under Test (EUT)

Power Supply Type	3.6Vdc from battery
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1.1.4 Accessories

Accessories		
No.	Equipment	Description
1	Battery	Brand: EVE Model: ER14505 I/P: 3.6V/2.7Ah O/P: 3.6V

1.1.5 Channel List

Frequency band (MHz)				2400~2483.5			
Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
37	2402	9	2422	18	2442	28	2462
0	2404	10	2424	19	2444	29	2464
1	2406	38	2426	20	2446	30	2466
2	2408	11	2428	21	2448	31	2468
3	2410	12	2430	22	2450	32	2470
4	2412	13	2432	23	2452	33	2472
5	2414	14	2434	24	2454	34	2474
6	2416	15	2436	25	2456	35	2476
7	2418	16	2438	26	2458	36	2478
8	2420	17	2440	27	2460	39	2480

1.1.6 Test Tool and Duty Cycle

Test Tool	Tera Term, Version: V4.89	
Modulation Mode	Duty Cycle Of Test Signal (%)	Duty Factor (dB)
BT-LE(125kbps)	100.00%	0.00
BT-LE(500kbps)	100.00%	0.00
BT-LE(1Mbps)	100.00%	0.00
BT-LE(2Mbps)	100.00%	0.00

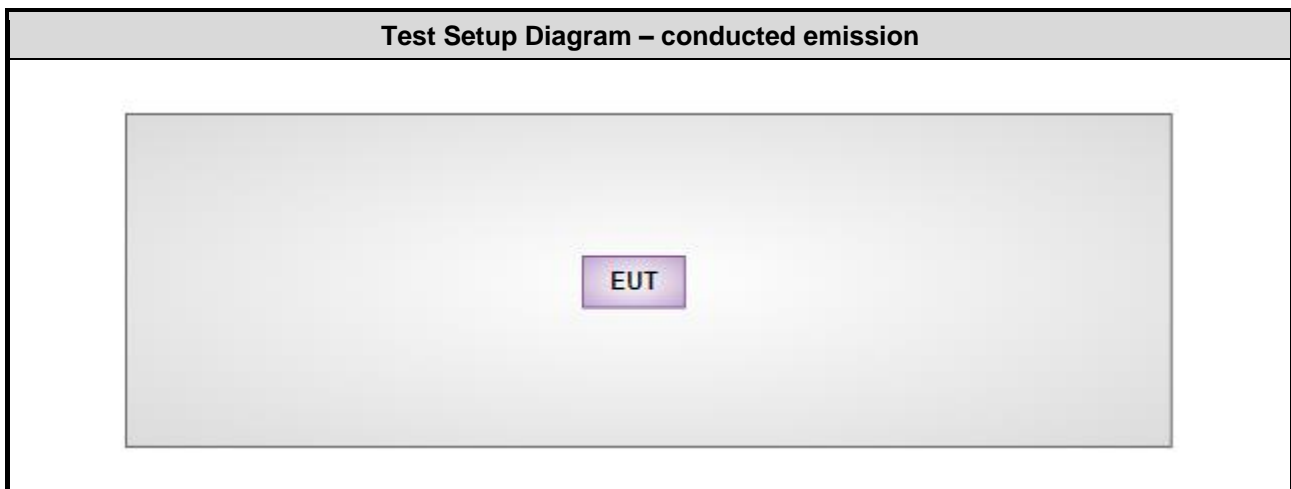
1.1.7 Power Index of Test Tool

Modulation Mode	Test Frequency (MHz)		
	2402	2440	2480
BT-LE(125kbps)	pos8dBm	pos8dBm	pos8dBm
BT-LE(500kbps)	pos8dBm	pos8dBm	pos8dBm
BT-LE(1Mbps)	pos8dBm	pos8dBm	pos8dBm
BT-LE(2Mbps)	pos8dBm	pos8dBm	pos8dBm

1.2 Local Support Equipment List

Support Equipment List					
No.	Equipment	Brand	Model	FCC ID	Remarks
1	console board with cable	---	---	---	Provided by applicant.
2	Notebook	DELL	Latitude E5470	3J5JVF2	---

1.3 Test Setup Chart



Note: The console board with cable and notebook is disconnected from EUT and removed from test table after sending commend from notebook to control EUT to transmit continuously.

1.4 Test Equipment List and Calibration Data

Test Item	Radiated Emission				
Test Site	966 chamber3 / (03CH03-WS)				
Tested Date	Jan. 06, 2022				
Instrument	Brand	Model No.	Serial No.	Calibration Date	Calibration Until
Receiver	R&S	ESR3	101657	Mar. 12, 2021	Mar. 11, 2022
Spectrum Analyzer	R&S	FSV40	101499	Mar. 02, 2021	Mar. 01, 2022
Loop Antenna	R&S	HFH2-Z2	100330	Nov. 08, 2021	Nov. 07, 2022
Bilog Antenna	SCHWARZBECK	VULB9168	VULB9168-685	May 06, 2021	May 05, 2022
Horn Antenna 1G-18G	SCHWARZBECK	BBHA 9120 D	BBHA 9120 D 1206	Dec. 20, 2021	Dec. 19, 2022
Horn Antenna 18G-40G	SCHWARZBECK	BBHA 9170	BBHA 9170517	Nov. 04, 2021	Nov. 03, 2022
Preamplifier	EMC	EMC02325	980187	Jul. 26, 2021	Jul. 25, 2022
Preamplifier	Agilent	83017A	MY39501309	Sep. 06, 2021	Sep. 05, 2022
Preamplifier	EMC	EMC184045B	980192	Jul. 14, 2021	Jul. 13, 2022
Loop Antenna Cable	KOAX KABEL	101354-BW	101354-BW	Oct. 05, 2021	Oct. 04, 2022
LF cable-0.8M	EMC	EMC8D-NM-NM-800	EMC8D-NM-NM-800-001	Sep. 24, 2021	Sep. 23, 2022
LF cable-3M	EMC	EMC8D-NM-NM-3000	131103	Sep. 24, 2021	Sep. 23, 2022
LF cable-13M	EMC	EMC8D-NM-NM-13000	131104	Sep. 24, 2021	Sep. 23, 2022
RF cable-3M	HUBER+SUHNER	SUCOFLEX104	MY22620/4	Sep. 24, 2021	Sep. 23, 2022
RF cable-8M	EMC	EMC104-SM-SM-8000	181107	Sep. 24, 2021	Sep. 23, 2022
Measurement Software	AUDIX	e3	6.120210g	NA	NA

Note: Calibration Interval of instruments listed above is one year.

Test Item	RF Conducted				
Test Site	(TH01-WS)				
Tested Date	Jan. 05, 2022				
Instrument	Brand	Model No.	Serial No.	Calibration Date	Calibration Until
Spectrum Analyzer	R&S	FSV40	101063	Apr. 19, 2021	Apr. 18, 2022
Power Meter	Anritsu	ML2495A	1241002	Nov. 07, 2021	Nov. 06, 2022
Power Sensor	Anritsu	MA2411B	1207366	Nov. 07, 2021	Nov. 06, 2022
Measurement Software	Sporton	SENSE-15247_FS	V5.10.7.11	NA	NA

Note: Calibration Interval of instruments listed above is one year.

1.5 Test Standards

47 CFR FCC Part 15.247

ANSI C63.10-2013

1.6 Reference Guidance

FCC KDB 558074 D01 15.247 Meas Guidance v05r02

1.7 Deviation from Test Standard and Measurement Procedure

None

1.8 Measurement Uncertainty

The measurement uncertainties given below are based on a 95% confidence level (based on a coverage factor ($k=2$)).

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

2 Test Configuration

2.1 Testing Facility

Test Laboratory	International Certification Corporation
Test Site	CO01-WS, TH01-WS
Address of Test Site	No.3-1, Lane 6, Wen San 3rd St., Kwei Shan Dist., Tao Yuan City 33381, Taiwan (R.O.C.)
Test Site	03CH03-WS
Address of Test Site	No.14-1, Lane 19, Wen San 3rd St., Kwei Shan Dist., Tao Yuan City 333, Taiwan (R.O.C.)

- FCC Designation No.: TW0009
- FCC site registration No.: 207696
- ISED#: 10807A
- CAB identifier: TW2732

2.2 The Worst Test Modes and Channel Details

Test item	Mode	Test Frequency (MHz)	Test Configuration
AC Power Line Conducted Emissions Radiated Emissions \leq 1GHz	BT-LE(1Mbps)	2402	---
Maximum Output Power 6dB bandwidth Power spectral density	BT-LE(125kbps) BT-LE(500kbps) BT-LE(1Mbps) BT-LE(2Mbps)	2402, 2440, 2480	---
Radiated Emissions > 1GHz	BT-LE(1Mbps) BT-LE(2Mbps)	2402, 2440, 2480	---

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. The EUT comes in two sources of buck-boost regulator (Ricoh, and TI), and found that **Ricoh** was the worst case and was selected for final test.

3 Transmitter Test Results

3.1 6dB and Occupied Bandwidth

3.1.1 Limit of 6dB Bandwidth

The minimum 6dB bandwidth shall be at least 500 kHz.

3.1.2 Test Procedures

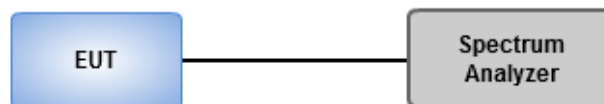
6dB Bandwidth

1. Set resolution bandwidth (RBW) = 100 kHz, Video bandwidth = 300 kHz.
2. Detector = Peak, Trace mode = max hold.
3. Sweep = auto couple, Allow the trace to stabilize.
4. 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 6dB relative to the maximum level measured in the fundamental emission.

Occupied Bandwidth

1. Set resolution bandwidth (RBW) = 1% ~ 5 % of OBW, Video bandwidth = 3 x RBW.
2. Detector = Sample, Trace mode = max hold.
3. Sweep = auto couple, Allow the trace to stabilize.
4. Use the OBW measurement function of spectrum analyzer to measure the occupied bandwidth.

3.1.3 Test Setup



3.1.4 Test Result of 6dB and Occupied Bandwidth

Ambient Condition	24°C / 67%	Tested By	Aska Huang
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Summary

Mode	Max-N dB (Hz)	Max-OBW (Hz)	ITU-Code	Min-N dB (Hz)	Min-OBW (Hz)
2.4-2.4835GHz	-	-	-	-	-
BT-LE(125kbps)	724.638k	1.089M	1M09F1D	652.174k	1.078M
BT-LE(500kbps)	706.522k	1.056M	1M06F1D	688.406k	1.049M
BT-LE(1Mbps)	706.522k	1.067M	1M07F1D	699.275k	1.06M
BT-LE(2Mbps)	1.283M	2.077M	2M08F1D	1.174M	2.055M

Max-N dB = Maximum 6dB down bandwidth; Max-OBW = Maximum 99% occupied bandwidth;
Min-N dB = Minimum 6dB down bandwidth; Min-OBW = Minimum 99% occupied bandwidth

Result

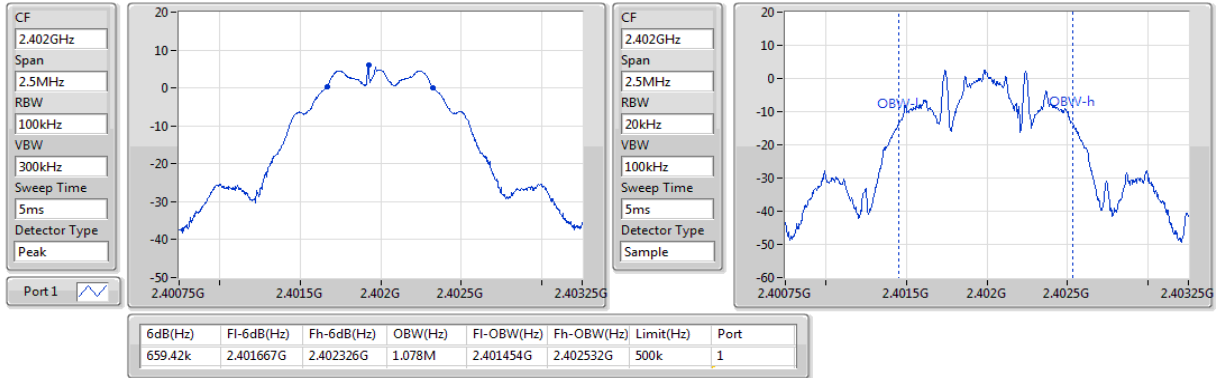
Mode	Result	Limit (Hz)	Port 1-N dB (Hz)	Port 1-OBW (Hz)
BT-LE(125kbps)	-	-	-	-
2402MHz	Pass	500k	659.42k	1.078M
2440MHz	Pass	500k	724.638k	1.089M
2480MHz	Pass	500k	652.174k	1.085M
BT-LE(500kbps)	-	-	-	-
2402MHz	Pass	500k	688.406k	1.049M
2440MHz	Pass	500k	706.522k	1.056M
2480MHz	Pass	500k	692.029k	1.049M
BT-LE(1Mbps)	-	-	-	-
2402MHz	Pass	500k	699.275k	1.06M
2440MHz	Pass	500k	706.522k	1.067M
2480MHz	Pass	500k	706.522k	1.067M
BT-LE(2Mbps)	-	-	-	-
2402MHz	Pass	500k	1.283M	2.055M
2440MHz	Pass	500k	1.174M	2.069M
2480MHz	Pass	500k	1.203M	2.077M

Port X-N dB = Port X 6dB down bandwidth;
Port X-OBW = Port X 99% occupied bandwidth

BT-LE(125kbps)

EBW-DTS

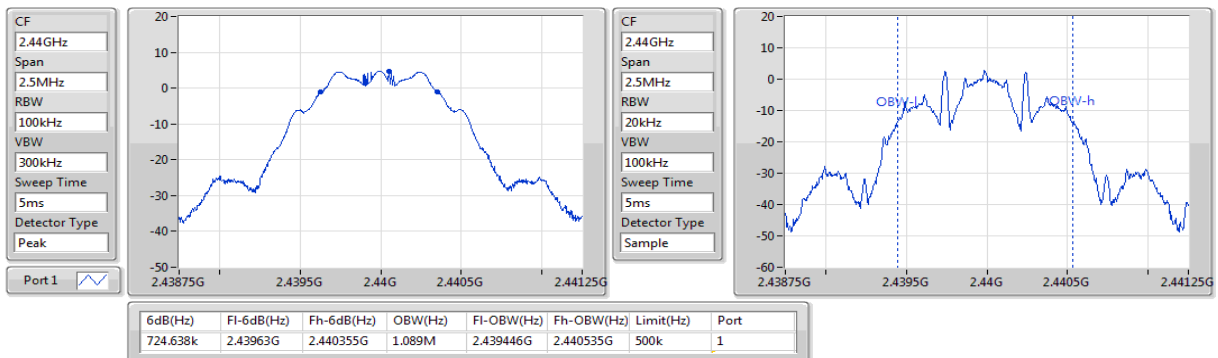
2402MHz



BT-LE(125kbps)

EBW-DTS

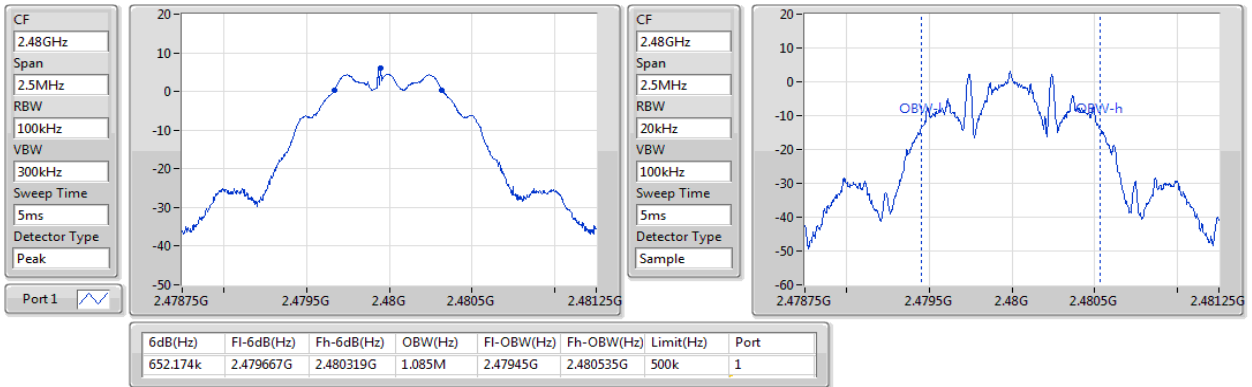
2440MHz



BT-LE(125kbps)

EBW-DTS

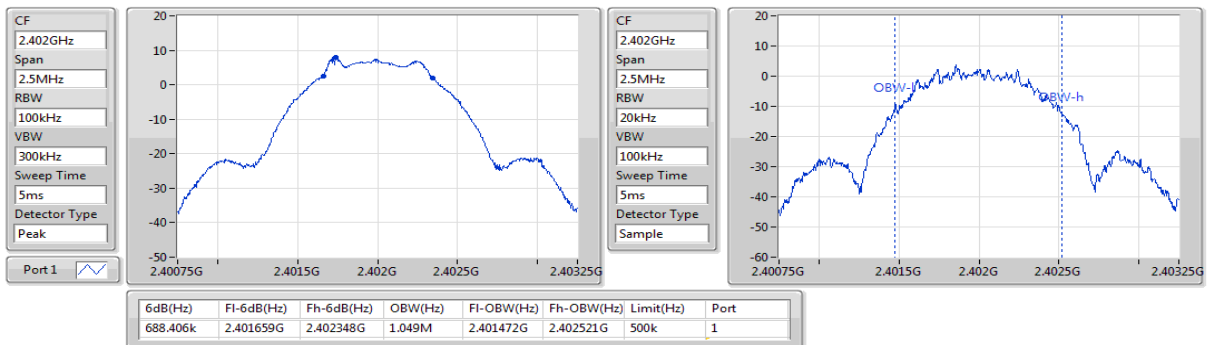
2480MHz



BT-LE(500kbps)

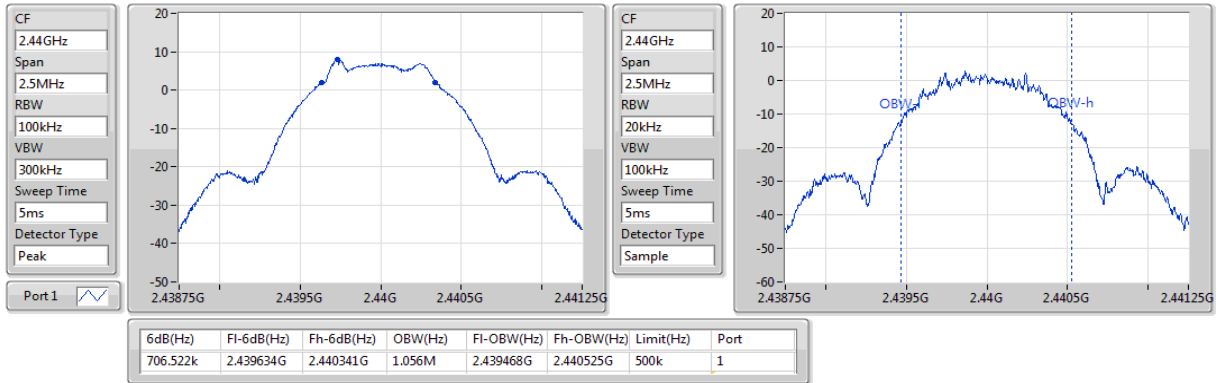
EBW-DTS

2402MHz



BT-LE(500kbps)

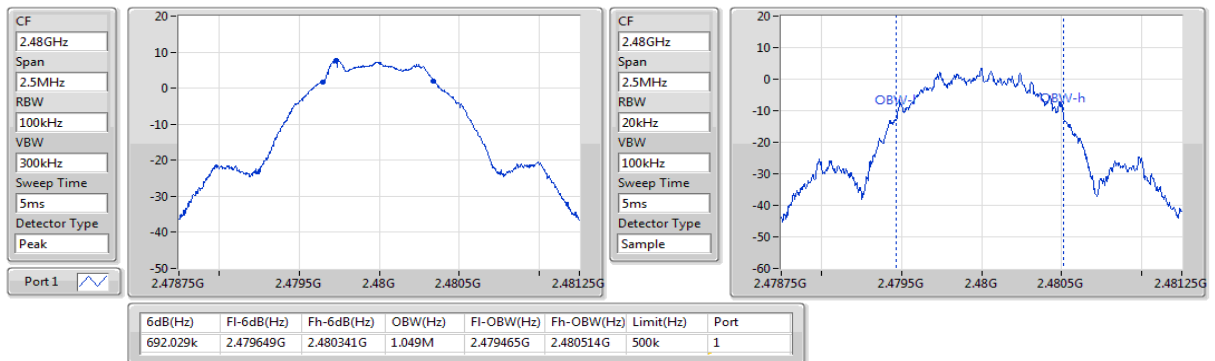
2440MHz



EBW-DTS

BT-LE(500kbps)

2480MHz

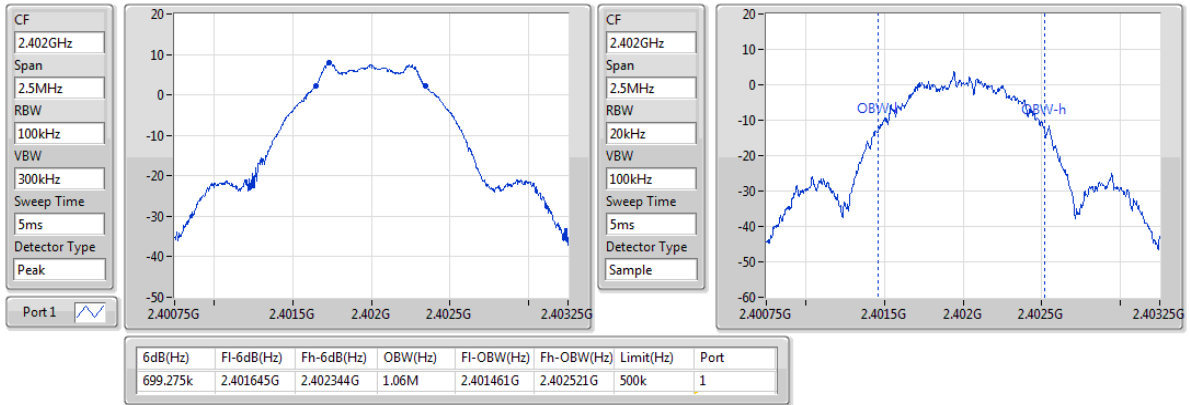


EBW-DTS

BT-LE(1Mbps)

EBW-DTS

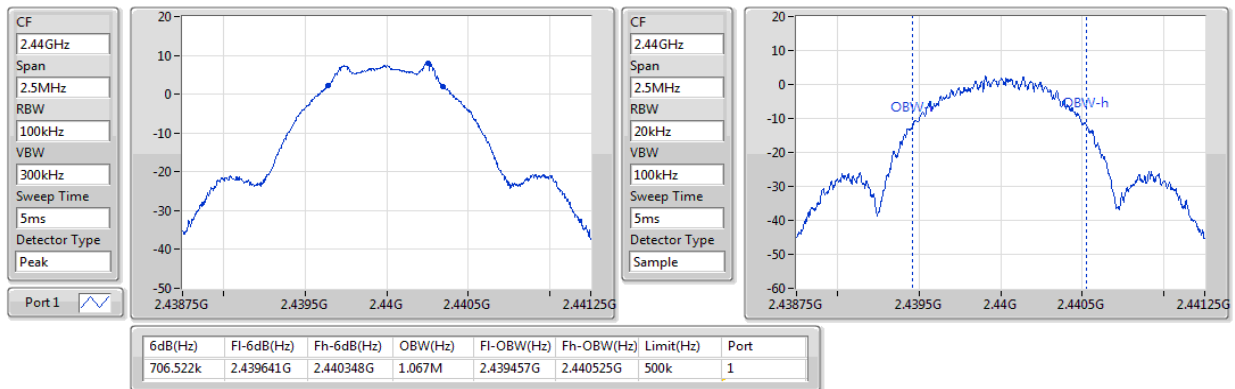
2402MHz



BT-LE(1Mbps)

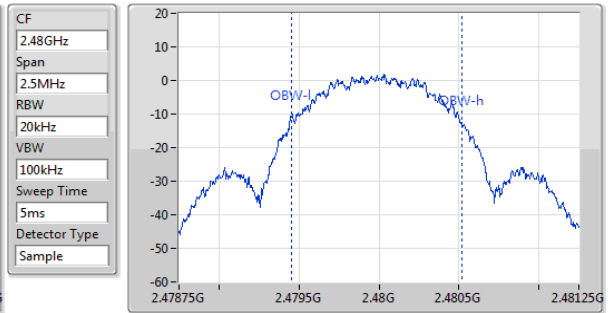
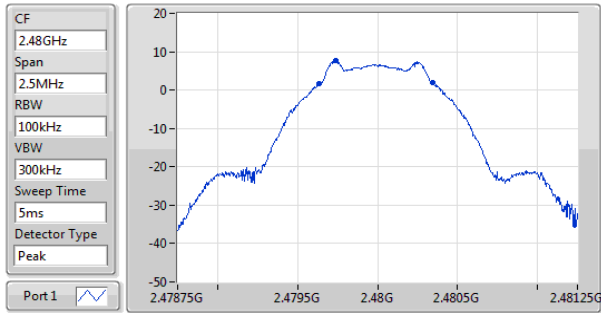
EBW-DTS

2440MHz



BT-LE(1Mbps)

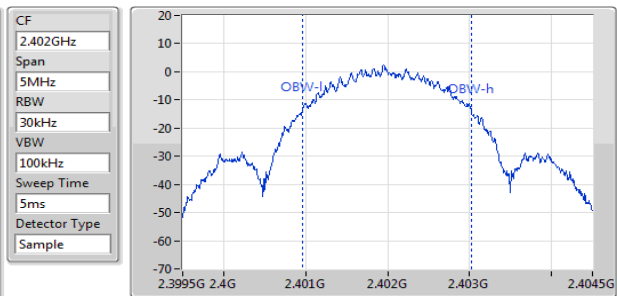
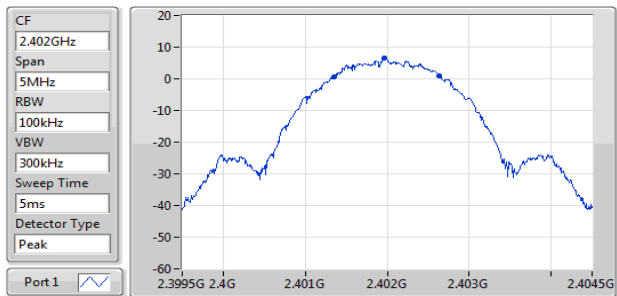
2480MHz



6dB(Hz)	Fl-6dB(Hz)	Fh-6dB(Hz)	OBW(Hz)	Fl-OBW(Hz)	Fh-OBW(Hz)	Limit(Hz)	Port
706.522k	2.479638G	2.480344G	1.067M	2.479454G	2.480521G	500k	1

BT-LE(2Mbps)

2402MHz

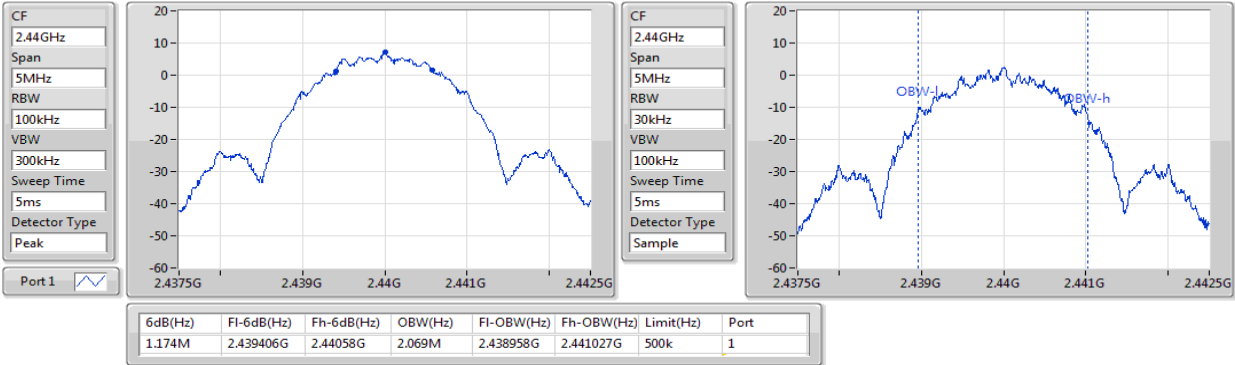


6dB(Hz)	Fl-6dB(Hz)	Fh-6dB(Hz)	OBW(Hz)	Fl-OBW(Hz)	Fh-OBW(Hz)	Limit(Hz)	Port
1.283M	2.401355G	2.402638G	2.055M	2.400965G	2.40302G	500k	1

BT-LE(2Mbps)

EBW-DTS

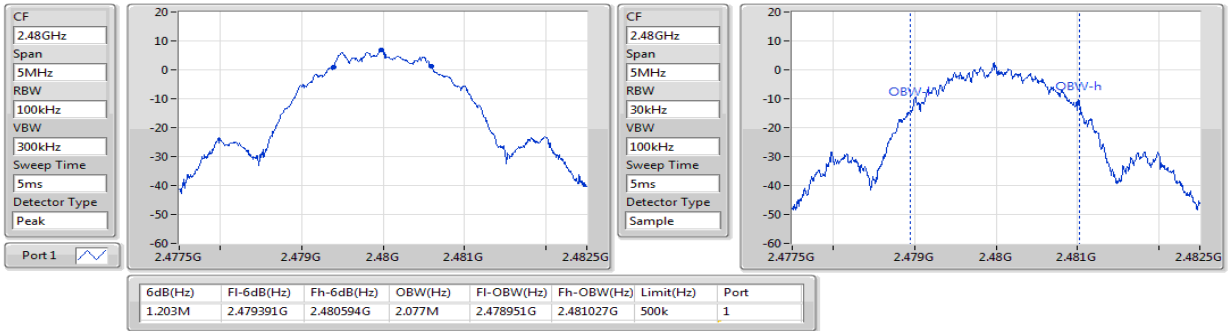
2440MHz



BT-LE(2Mbps)

EBW-DTS

2480MHz



3.2 RF Output Power

3.2.1 Limit of RF Output Power

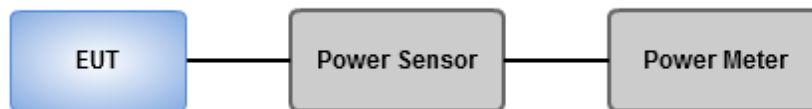
Conducted power shall not exceed 1 Watt.

Antenna gain $\leq 6\text{dBi}$, no any corresponding reduction is in output power limit.

3.2.2 Test Procedures

A broadband RF power meter is used for output power measurement. The video bandwidth of power meter is greater than DTS bandwidth of EUT. 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.

3.2.3 Test Setup



3.2.4 Test Result of Maximum Output Power

Ambient Condition	24°C / 67%	Tested By	Aska Huang
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Summary of Peak Conducted Output Power

Mode	Power (dBm)	Power (W)
2.4-2.4835GHz	-	-
BT-LE(125kbps)	8.33	0.00681
BT-LE(500kbps)	8.33	0.00681
BT-LE(1Mbps)	8.35	0.00684
BT-LE(2Mbps)	8.34	0.00682

Result

Mode	Result	Antenna Gain (dBi)	Power (dBm)	Power Limit (dBm)
BT-LE(125kbps)	-	-	-	-
2402MHz	Pass	0.79	8.33	30.00
2440MHz	Pass	0.79	8.28	30.00
2480MHz	Pass	0.79	8.14	30.00
BT-LE(500kbps)	-	-	-	-
2402MHz	Pass	0.79	8.33	30.00
2440MHz	Pass	0.79	8.28	30.00
2480MHz	Pass	0.79	8.14	30.00
BT-LE(1Mbps)	-	-	-	-
2402MHz	Pass	0.79	8.35	30.00
2440MHz	Pass	0.79	8.30	30.00
2480MHz	Pass	0.79	8.17	30.00
BT-LE(2Mbps)	-	-	-	-
2402MHz	Pass	0.79	8.34	30.00
2440MHz	Pass	0.79	8.29	30.00
2480MHz	Pass	0.79	8.16	30.00

Summary of Conducted (Average) Output Power

Mode	Power (dBm)	Power (W)
2.4-2.4835GHz	-	-
BT-LE(125kbps)	8.25	0.00668
BT-LE(500kbps)	8.25	0.00668
BT-LE(1Mbps)	8.27	0.00671
BT-LE(2Mbps)	8.26	0.00670

Result

Mode	Result	Gain (dBi)	Power (dBm)	Power Limit (dBm)
BT-LE(125kbps)	-	-	-	-
2402MHz	Pass	0.79	8.25	-
2440MHz	Pass	0.79	8.20	-
2480MHz	Pass	0.79	8.05	-
BT-LE(500kbps)	-	-	-	-
2402MHz	Pass	0.79	8.25	-
2440MHz	Pass	0.79	8.20	-
2480MHz	Pass	0.79	8.04	-
BT-LE(1Mbps)	-	-	-	-
2402MHz	Pass	0.79	8.27	-
2440MHz	Pass	0.79	8.22	-
2480MHz	Pass	0.79	8.07	-
BT-LE(2Mbps)	-	-	-	-
2402MHz	Pass	0.79	8.26	-
2440MHz	Pass	0.79	8.21	-
2480MHz	Pass	0.79	8.06	-

Note: Average power is for reference only.

3.3 Power Spectral Density

3.3.1 Limit of Power Spectral Density

Power spectral density shall not be greater than 8 dBm in any 3 kHz band.

3.3.2 Test Procedures

Peak PSD

1. Set the RBW = 3 kHz, VBW = 10 kHz.
2. Detector = Peak, Sweep time = auto couple.
3. Trace mode = max hold, allow trace to fully stabilize.
4. Use the peak marker function to determine the maximum amplitude level.

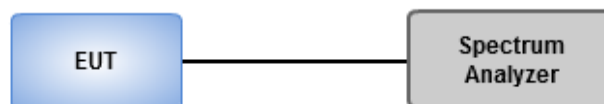
Average PSD, duty cycle \geq 98%

1. Set the RBW = 30 kHz, VBW = 100 kHz.
2. Detector = RMS, Sweep time = auto couple.
3. Sweep time = auto couple.
4. Employ trace averaging (RMS) mode over a minimum of 100 traces.
5. Use the peak marker function to determine the maximum amplitude level.

Average PSD, duty cycle $<$ 98%

1. Set the RBW = 30 kHz, VBW = 100 kHz. Detector = RMS.
2. Set the sweep time to: ≥ 10 (number of measurement points in sweep) x (total on/off period of the transmitted signal).
3. Perform the measurement over a single sweep.
4. Use the peak marker function to determine the maximum amplitude level.
5. Add $10 \log (1/x)$, where x is the duty cycle.

3.3.3 Test Setup



3.3.4 Test Result of Power Spectral Density

Ambient Condition	24°C / 67%	Tested By	Aska Huang
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Summary

Mode	PD (dBm/3kHz)
2.4-2.4835GHz	-
BT-LE(125kbps)	2.18
BT-LE(500kbps)	1.81
BT-LE(1Mbps)	-4.71
BT-LE(2Mbps)	-6.80

Result

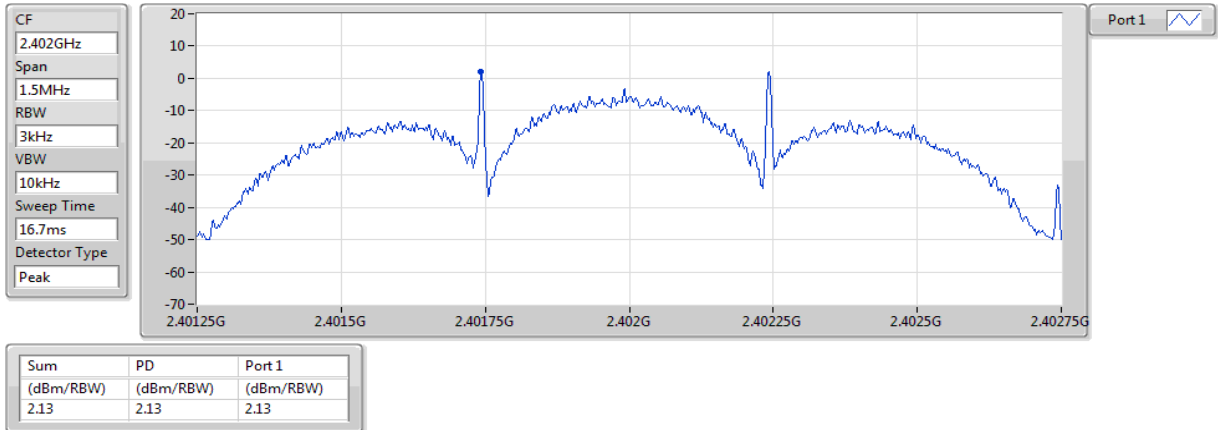
Mode	Result	Antenna Gain (dBi)	PD (dBm/3kHz)	PD Limit (dBm/3kHz)
BT-LE(125kbps)	-	-	-	-
2402MHz	Pass	0.79	2.13	8.00
2440MHz	Pass	0.79	2.18	8.00
2480MHz	Pass	0.79	1.95	8.00
BT-LE(500kbps)	-	-	-	-
2402MHz	Pass	0.79	1.65	8.00
2440MHz	Pass	0.79	1.81	8.00
2480MHz	Pass	0.79	1.50	8.00
BT-LE(1Mbps)	-	-	-	-
2402MHz	Pass	0.79	-4.71	8.00
2440MHz	Pass	0.79	-4.74	8.00
2480MHz	Pass	0.79	-5.83	8.00
BT-LE(2Mbps)	-	-	-	-
2402MHz	Pass	0.79	-7.69	8.00
2440MHz	Pass	0.79	-7.37	8.00
2480MHz	Pass	0.79	-6.80	8.00

PD = Power density

BT-LE(125kbps)

PSD

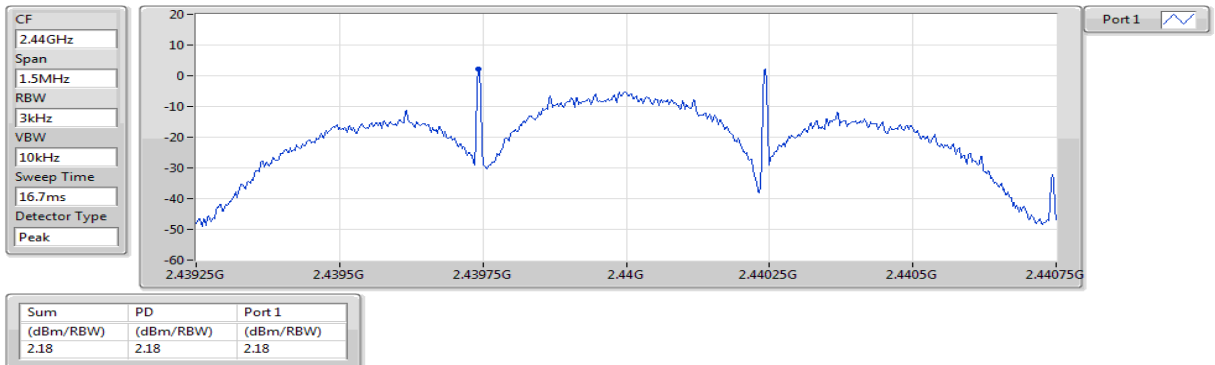
2402MHz



BT-LE(125kbps)

PSD

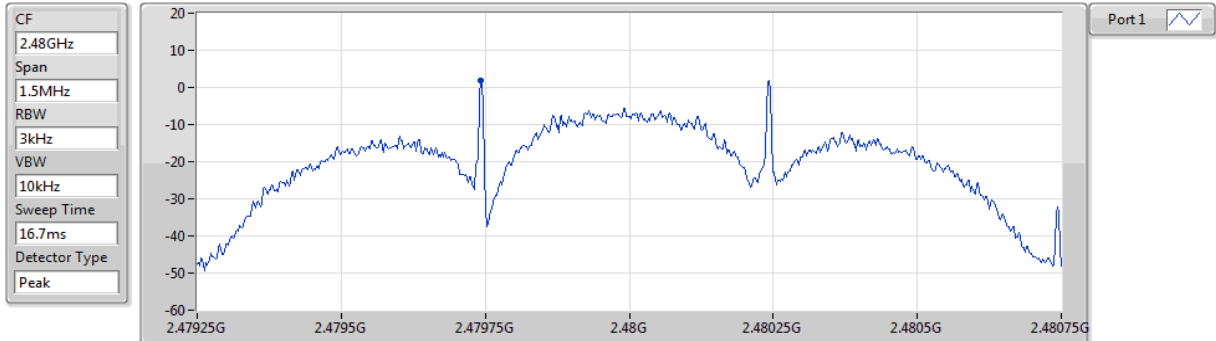
2440MHz



BT-LE(125kbps)

PSD

2480MHz

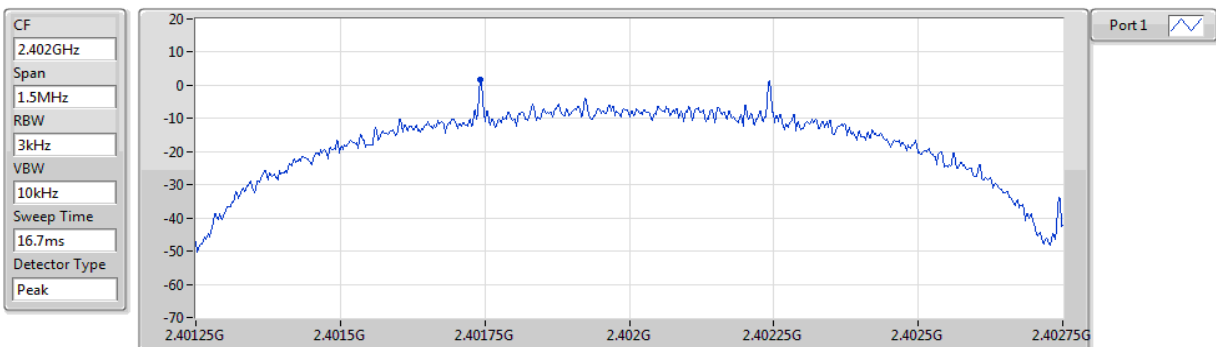


Sum	PD	Port 1
(dBm/RBW)	(dBm/RBW)	(dBm/RBW)
1.95	1.95	1.95

BT-LE(500kbps)

PSD

2402MHz

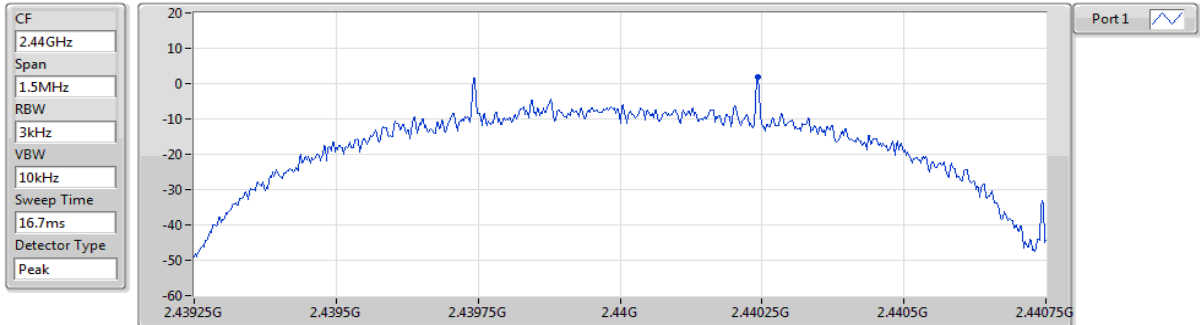


Sum	PD	Port 1
(dBm/RBW)	(dBm/RBW)	(dBm/RBW)
1.65	1.65	1.65

BT-LE(500kbps)

PSD

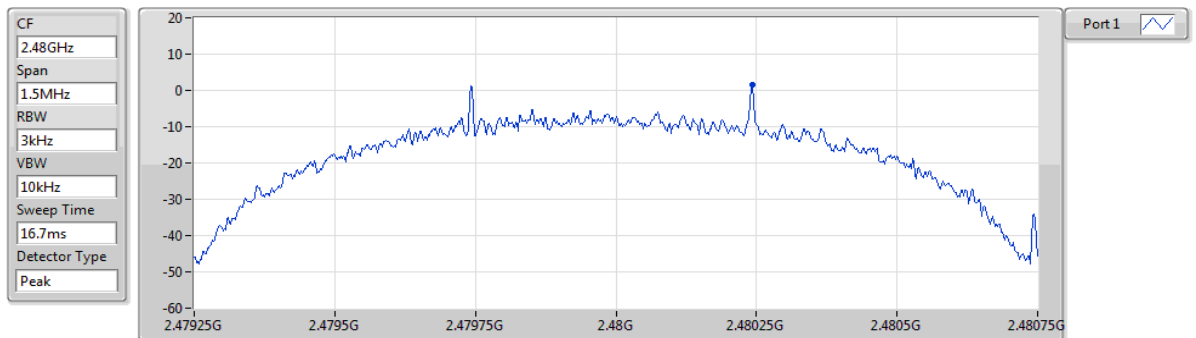
2440MHz



BT-LE(500kbps)

PSD

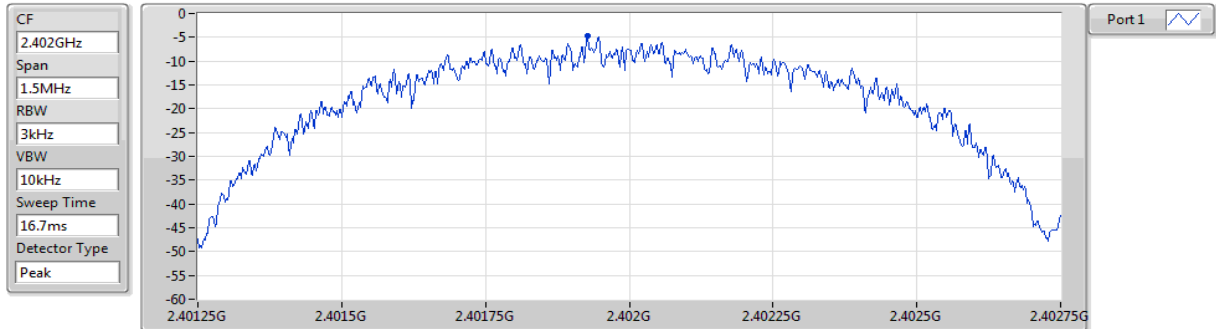
2480MHz



BT-LE(1Mbps)

PSD

2402MHz

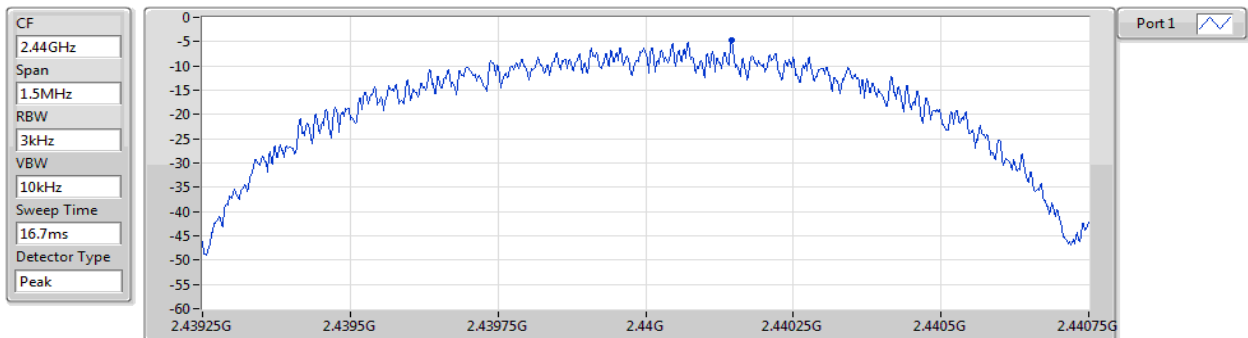


Sum	PD	Port 1
(dBm/RBW)	(dBm/RBW)	(dBm/RBW)
-4.71	-4.71	-4.71

BT-LE(1Mbps)

PSD

2440MHz

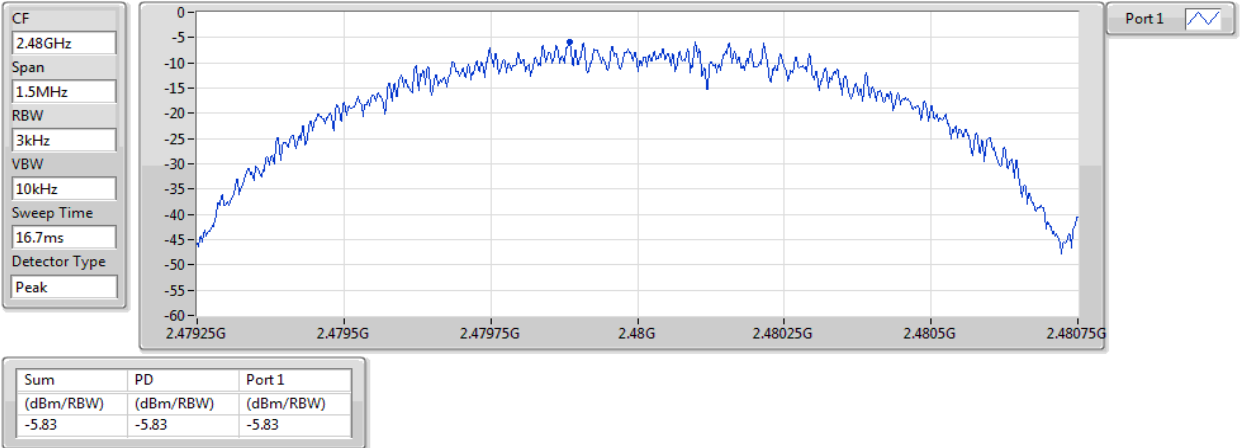


Sum	PD	Port 1
(dBm/RBW)	(dBm/RBW)	(dBm/RBW)
-4.74	-4.74	-4.74

BT-LE(1Mbps)

PSD

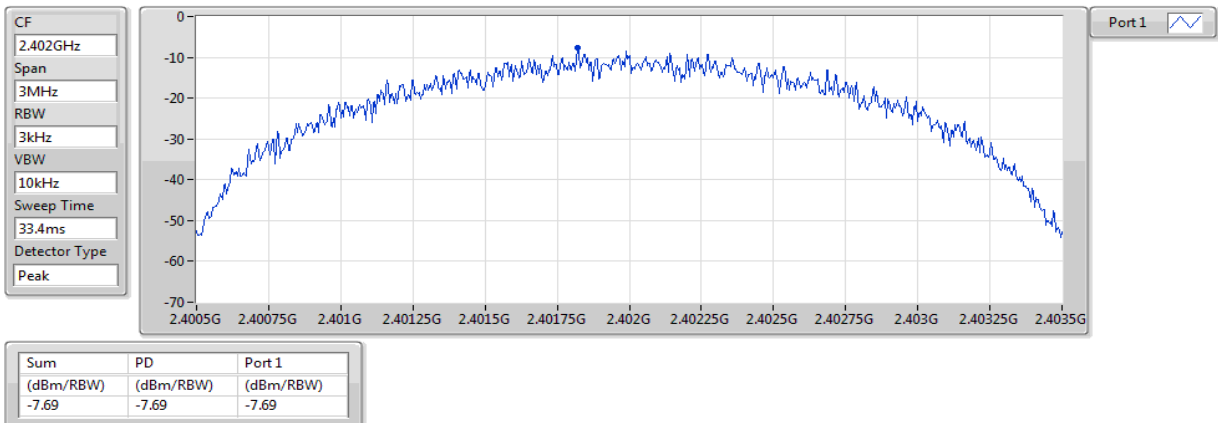
2480MHz



BT-LE(2Mbps)

PSD

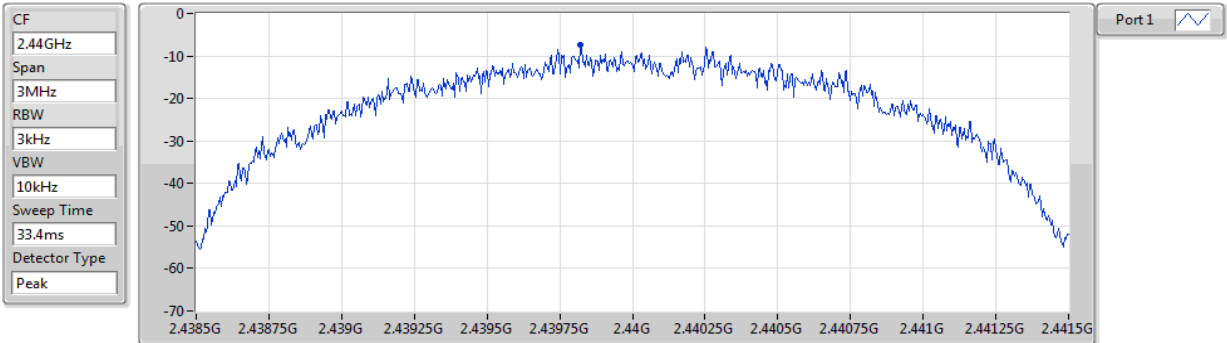
2402MHz



BT-LE(2Mbps)

PSD

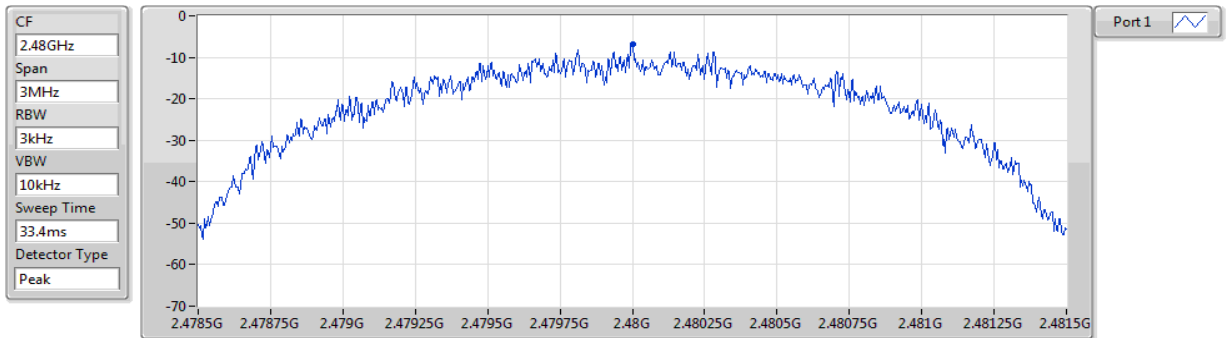
2440MHz



BT-LE(2Mbps)

PSD

2480MHz



3.4 Emissions in Restricted Frequency Bands

3.4.1 Limit of Emissions in 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.

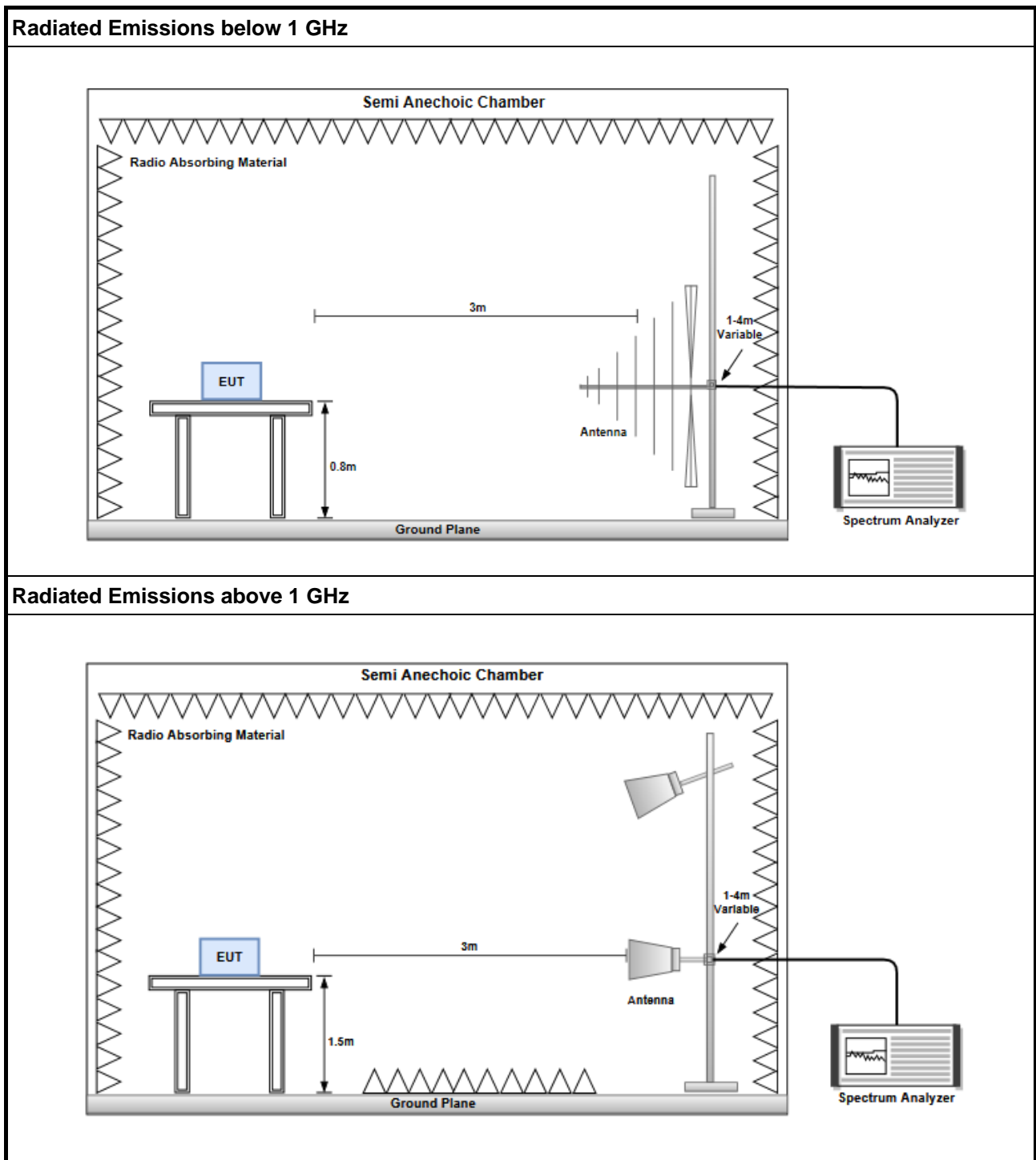
3.4.2 Test Procedures

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.

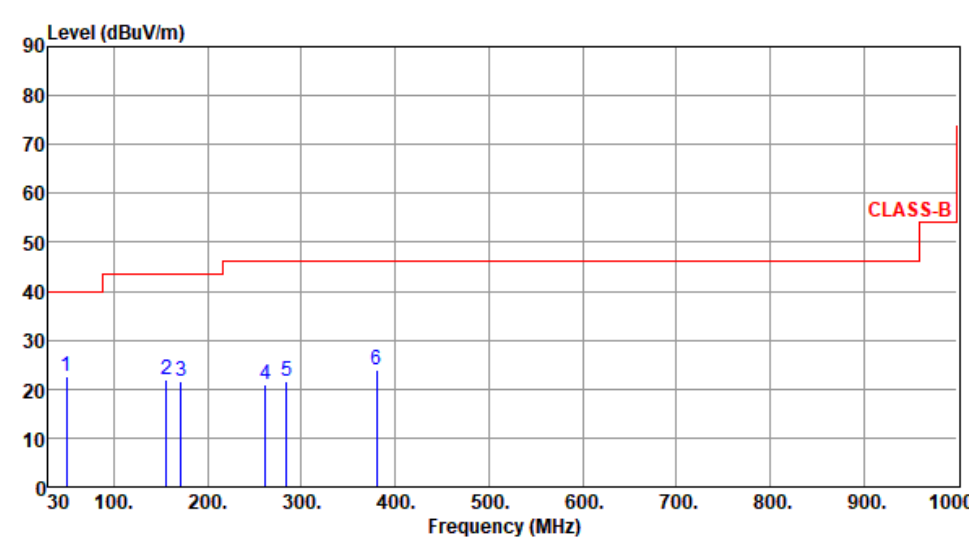
Note:

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=1/T and Peak detector is for average measured value of radiated emission above 1GHz.

3.4.3 Test Setup



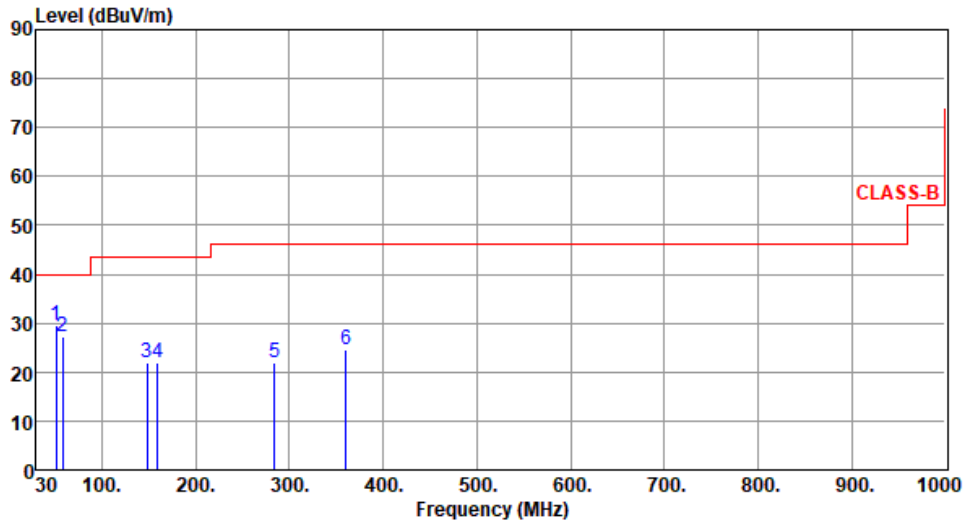
3.4.4 Transmitter Radiated Unwanted Emissions (Below 1GHz)

Modulation	BT-LE (1Mbps)	Test Freq. (MHz)	2402						
Polarization	Horizontal								
Test By :Akun Chung Temperature(°C):24 Humidity(%):65									
									
	Freq.	Emission level	Limit	Margin	SA reading	Factor	Remark	ANT High	Turn Table
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB/m		cm	deg
1	49.40	22.62	40.00	-17.38	31.51	-8.89	Peak	---	---
2	156.10	21.78	43.50	-21.72	30.28	-8.50	Peak	---	---
3	171.62	21.44	43.50	-22.06	30.39	-8.95	Peak	---	---
4	261.83	20.88	46.00	-25.12	30.45	-9.57	Peak	---	---
5	284.14	21.68	46.00	-24.32	30.17	-8.49	Peak	---	---
6	380.17	23.92	46.00	-22.08	29.99	-6.07	Peak	---	---

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

Modulation	BT-LE (1Mbps)	Test Freq. (MHz)	2402
Polarization	Vertical		

Test By : Akun Chung Temperature(°C): 24 Humidity(%): 65



	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB/m	Remark	ANT High cm	Turn Table deg
1	51.34	29.46	40.00	-10.54	38.53	-9.07	Peak	---	---
2	58.13	27.40	40.00	-12.60	36.82	-9.42	Peak	---	---
3	148.34	21.88	43.50	-21.62	30.55	-8.67	Peak	---	---
4	159.01	21.77	43.50	-21.73	30.16	-8.39	Peak	---	---
5	284.14	21.97	46.00	-24.03	30.46	-8.49	Peak	---	---
6	360.77	24.63	46.00	-21.37	31.26	-6.63	Peak	---	---

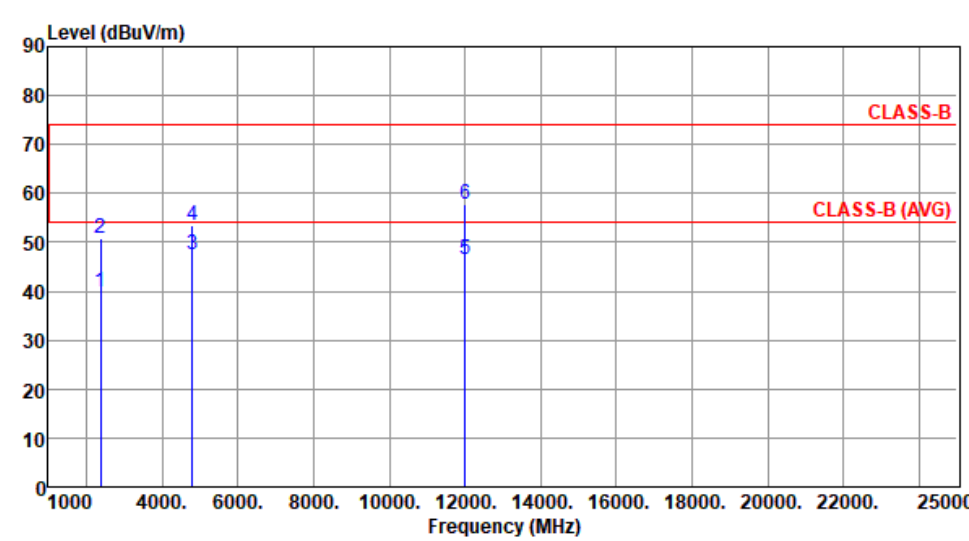
Note 1: Emission Level (dBuV/m) = SA Reading (dBuV) + Factor* (dB/m)

*Factor includes antenna factor , cable loss and amplifier gain

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

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

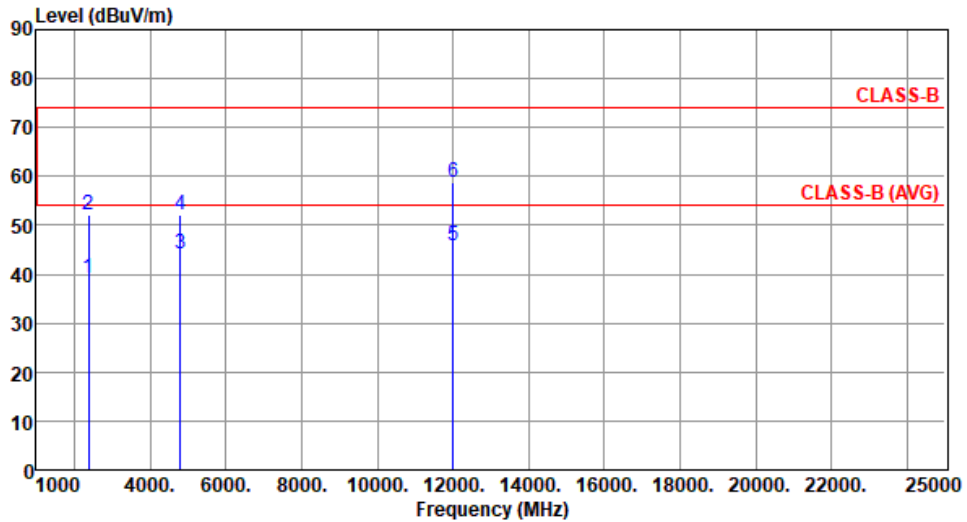
3.4.5 Transmitter Radiated Unwanted Emissions (Above 1GHz)

Modulation	BT-LE (1Mbps)	Test Freq. (MHz)	2402						
Polarization	Horizontal								
Test By : Akun Chung Temperature(°C):24 Humidity(%):65									
									
	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB/m	Remark	ANT High cm	Turn Table deg
1	2390.00	39.94	54.00	-14.06	41.43	-1.49	Average	275	299
2	2390.00	50.96	74.00	-23.04	52.45	-1.49	Peak	275	299
3	4804.00	47.52	54.00	-6.48	42.32	5.20	Average	282	320
4	4804.00	53.62	74.00	-20.38	48.42	5.20	Peak	282	320
5	12010.00	46.39	54.00	-7.61	31.65	14.74	Average	100	328
6	12010.00	57.80	74.00	-16.20	43.06	14.74	Peak	100	328

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

Modulation	BT-LE (1Mbps)	Test Freq. (MHz)	2402
Polarization	Vertical		

Test By :Akun Chung Temperature(°C):24 Humidity(%):65



	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB/m	Remark	ANT High cm	Turn Table deg
1	2390.00	39.35	54.00	-14.65	40.84	-1.49	Average	100	178
2	2390.00	52.28	74.00	-21.72	53.77	-1.49	Peak	100	178
3	4804.00	44.24	54.00	-9.76	39.04	5.20	Average	227	332
4	4804.00	52.23	74.00	-21.77	47.03	5.20	Peak	227	332
5	12010.00	45.99	54.00	-8.01	31.25	14.74	Average	100	11
6	12010.00	58.76	74.00	-15.24	44.02	14.74	Peak	100	11

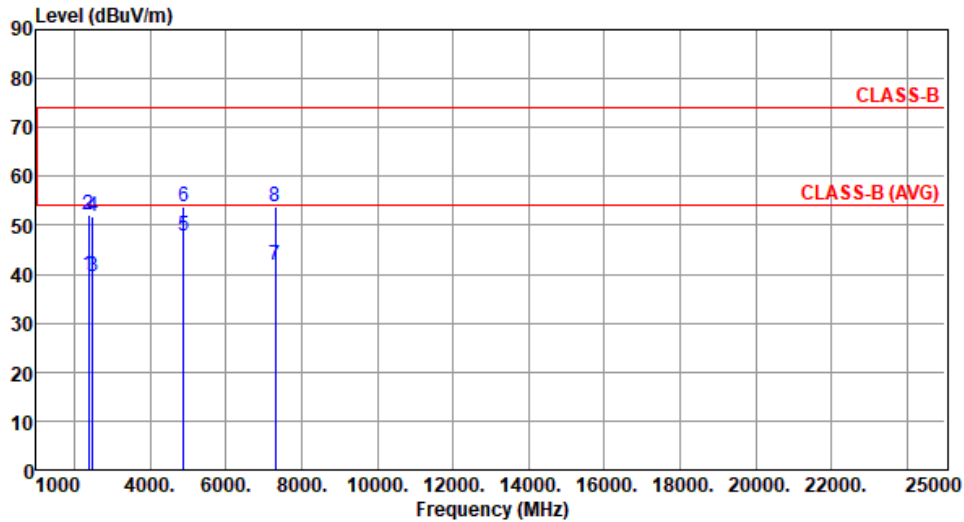
Note 1: Emission Level (dBuV/m) = SA Reading (dBuV) + Factor* (dB/m)

*Factor includes antenna factor , cable loss and amplifier gain

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

Modulation	BT-LE (1Mbps)	Test Freq. (MHz)	2440
Polarization	Horizontal		

Test By :Akun Chung Temperature(°C):24 Humidity(%):65



	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB/m	Remark	ANT High cm	Turn Table deg
1	2390.00	39.84	54.00	-14.16	41.33	-1.49	Average	261	301
2	2390.00	51.98	74.00	-22.02	53.47	-1.49	Peak	261	301
3	2483.50	39.63	54.00	-14.37	41.21	-1.58	Average	261	301
4	2483.50	51.90	74.00	-22.10	53.48	-1.58	Peak	261	301
5	4880.00	47.82	54.00	-6.18	42.50	5.32	Average	273	318
6	4880.00	53.78	74.00	-20.22	48.46	5.32	Peak	273	318
7	7320.00	41.74	54.00	-12.26	30.91	10.83	Average	100	315
8	7320.00	53.64	74.00	-20.36	42.81	10.83	Peak	100	315

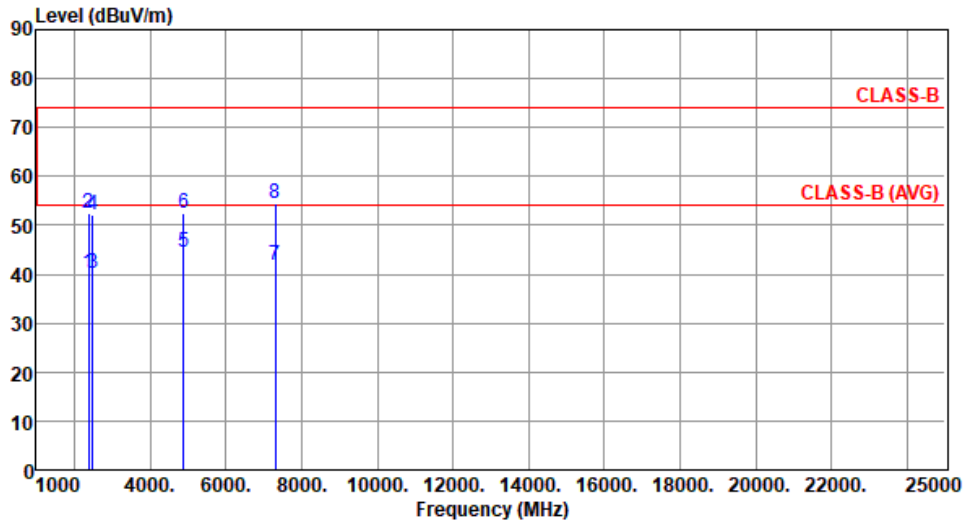
Note 1: Emission Level (dBuV/m) = SA Reading (dBuV) + Factor* (dB/m)

*Factor includes antenna factor , cable loss and amplifier gain

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

Modulation	BT-LE (1Mbps)	Test Freq. (MHz)	2440
Polarization	Vertical		

Test By :Akun Chung Temperature(°C):24 Humidity(%):65



	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB/m	Remark	ANT High cm	Turn Table deg
1	2390.00	40.17	54.00	-13.83	41.66	-1.49	Average	100	190
2	2390.00	52.36	74.00	-21.64	53.85	-1.49	Peak	100	190
3	2483.50	40.06	54.00	-13.94	41.64	-1.58	Average	100	190
4	2483.50	52.17	74.00	-21.83	53.75	-1.58	Peak	100	190
5	4880.00	44.35	54.00	-9.65	39.03	5.32	Average	224	337
6	4880.00	52.48	74.00	-21.52	47.16	5.32	Peak	224	337
7	7320.00	41.82	54.00	-12.18	30.99	10.83	Average	100	8
8	7320.00	54.58	74.00	-19.42	43.75	10.83	Peak	100	8

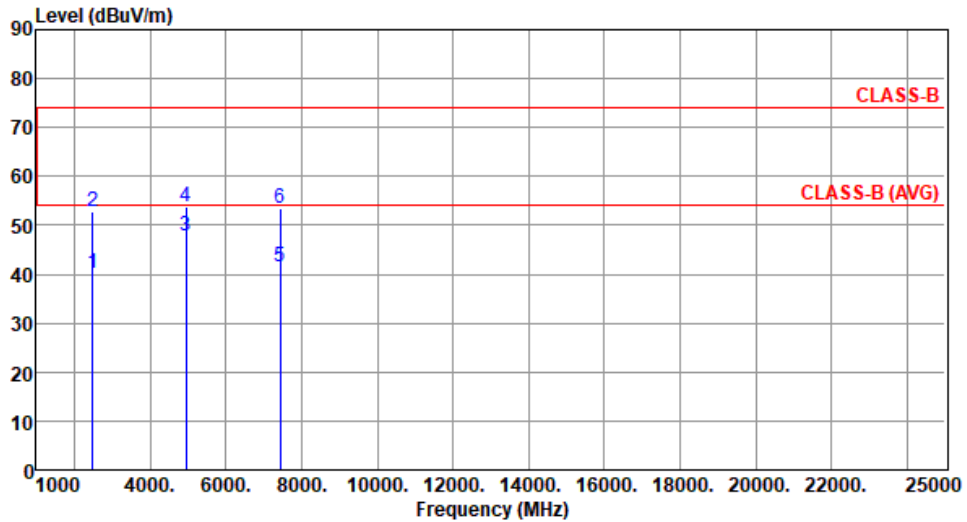
Note 1: Emission Level (dBuV/m) = SA Reading (dBuV) + Factor* (dB/m)

*Factor includes antenna factor , cable loss and amplifier gain

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

Modulation	BT-LE (1Mbps)	Test Freq. (MHz)	2480
Polarization	Horizontal		

Test By :Akun Chung Temperature(°C):24 Humidity(%):65



	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB/m	Remark	ANT High cm	Turn Table deg
1	2483.50	40.06	54.00	-13.94	41.64	-1.58	Average	182	286
2	2483.50	52.76	74.00	-21.24	54.34	-1.58	Peak	182	286
3	4960.00	47.90	54.00	-6.10	42.19	5.71	Average	277	320
4	4960.00	53.95	74.00	-20.05	48.24	5.71	Peak	277	320
5	7440.00	41.47	54.00	-12.53	30.82	10.65	Average	100	317
6	7440.00	53.33	74.00	-20.67	42.68	10.65	Peak	100	317

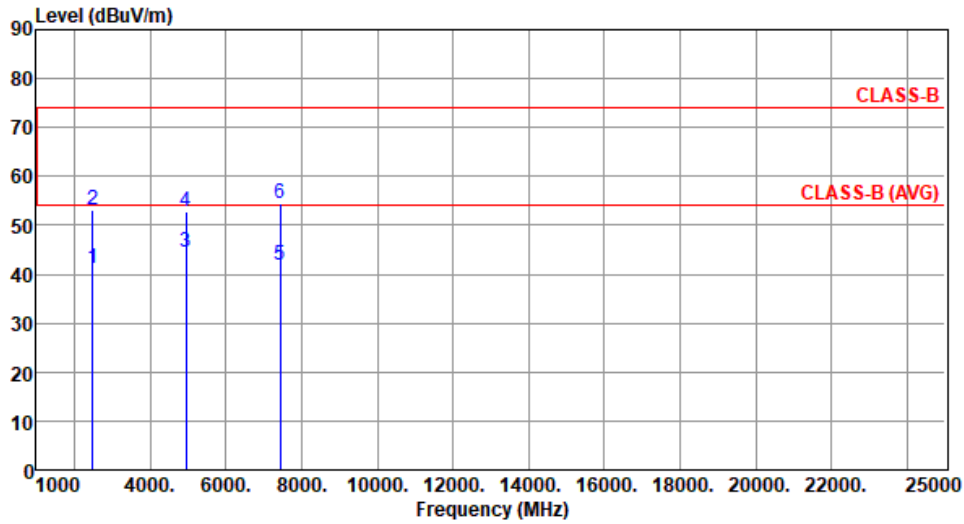
Note 1: Emission Level (dBuV/m) = SA Reading (dBuV) + Factor* (dB/m)

*Factor includes antenna factor , cable loss and amplifier gain

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

Modulation	BT-LE (1Mbps)	Test Freq. (MHz)	2480
Polarization	Vertical		

Test By :Akun Chung Temperature(°C):24 Humidity(%):65



	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB/m	Remark	ANT High cm	Turn Table deg
1	2483.50	41.16	54.00	-12.84	42.74	-1.58	Average	100	192
2	2483.50	53.05	74.00	-20.95	54.63	-1.58	Peak	100	192
3	4960.00	44.49	54.00	-9.51	38.78	5.71	Average	229	335
4	4960.00	52.66	74.00	-21.34	46.95	5.71	Peak	229	335
5	7440.00	41.84	54.00	-12.16	31.19	10.65	Average	100	7
6	7440.00	54.39	74.00	-19.61	43.74	10.65	Peak	100	7

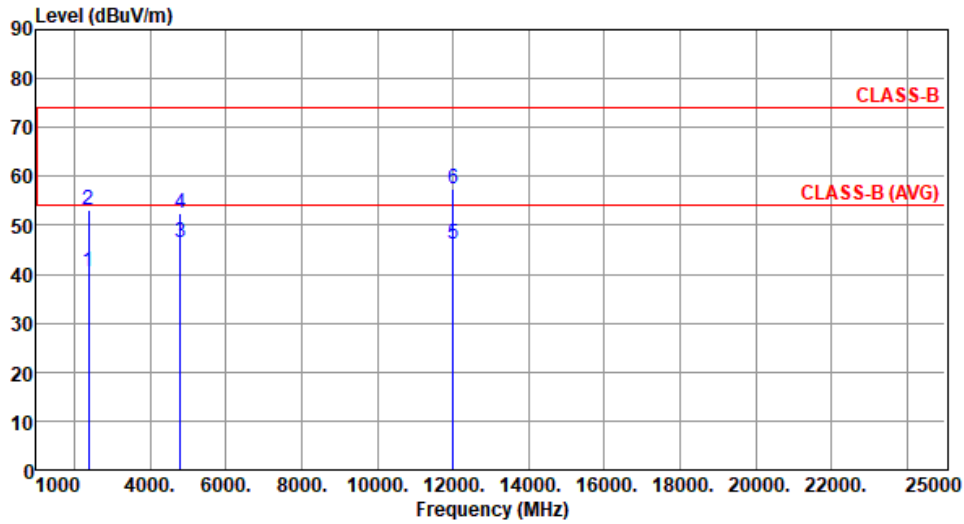
Note 1: Emission Level (dBuV/m) = SA Reading (dBuV) + Factor* (dB/m)

*Factor includes antenna factor , cable loss and amplifier gain

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

Modulation	BT-LE (2Mbps)	Test Freq. (MHz)	2402
Polarization	Horizontal		

Test By :Akun Chung Temperature(°C):24 Humidity(%):65



	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB/m	Remark	ANT High cm	Turn Table deg
1	2390.00	40.38	54.00	-13.62	41.87	-1.49	Average	280	293
2	2390.00	53.28	74.00	-20.72	54.77	-1.49	Peak	280	293
3	4804.00	46.34	54.00	-7.66	41.14	5.20	Average	281	318
4	4804.00	52.52	74.00	-21.48	47.32	5.20	Peak	281	318
5	12010.00	46.23	54.00	-7.77	31.49	14.74	Average	100	317
6	12010.00	57.56	74.00	-16.44	42.82	14.74	Peak	100	317

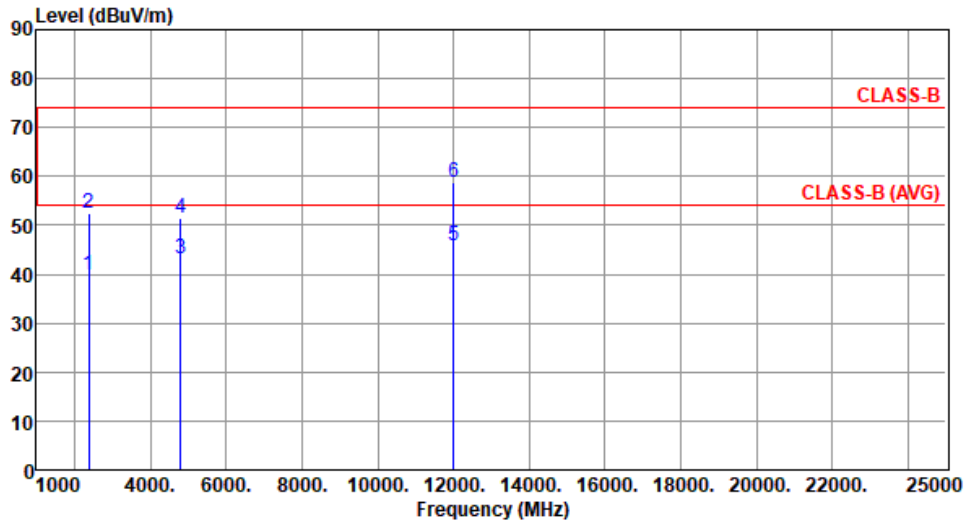
Note 1: Emission Level (dBuV/m) = SA Reading (dBuV) + Factor* (dB/m)

*Factor includes antenna factor , cable loss and amplifier gain

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

Modulation	BT-LE (2Mbps)	Test Freq. (MHz)	2402
Polarization	Vertical		

Test By : Akun Chung Temperature(°C): 24 Humidity(%): 65



	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB/m	Remark	ANT High cm	Turn Table deg
1	2390.00	39.94	54.00	-14.06	41.43	-1.49	Average	102	181
2	2390.00	52.38	74.00	-21.62	53.87	-1.49	Peak	102	181
3	4804.00	43.30	54.00	-10.70	38.10	5.20	Average	225	319
4	4804.00	51.44	74.00	-22.56	46.24	5.20	Peak	225	319
5	12010.00	45.83	54.00	-8.17	31.09	14.74	Average	100	15
6	12010.00	58.66	74.00	-15.34	43.92	14.74	Peak	100	15

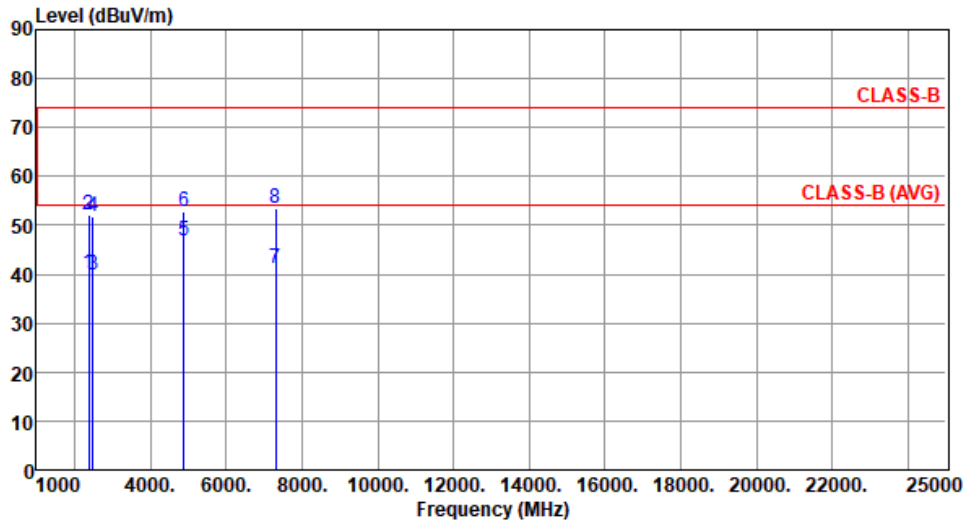
Note 1: Emission Level (dBuV/m) = SA Reading (dBuV) + Factor* (dB/m)

*Factor includes antenna factor , cable loss and amplifier gain

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

Modulation	BT-LE (2Mbps)	Test Freq. (MHz)	2440
Polarization	Horizontal		

Test By :Akun Chung Temperature(°C):24 Humidity(%):65



	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB/m	Remark	ANT High cm	Turn Table deg
1	2390.00	40.06	54.00	-13.94	41.55	-1.49	Average	257	307
2	2390.00	52.09	74.00	-21.91	53.58	-1.49	Peak	257	307
3	2483.50	39.85	54.00	-14.15	41.43	-1.58	Average	257	307
4	2483.50	51.88	74.00	-22.12	53.46	-1.58	Peak	257	307
5	4880.00	46.88	54.00	-7.12	41.56	5.32	Average	279	312
6	4880.00	52.94	74.00	-21.06	47.62	5.32	Peak	279	312
7	7320.00	41.32	54.00	-12.68	30.49	10.83	Average	100	311
8	7320.00	53.32	74.00	-20.68	42.49	10.83	Peak	100	311

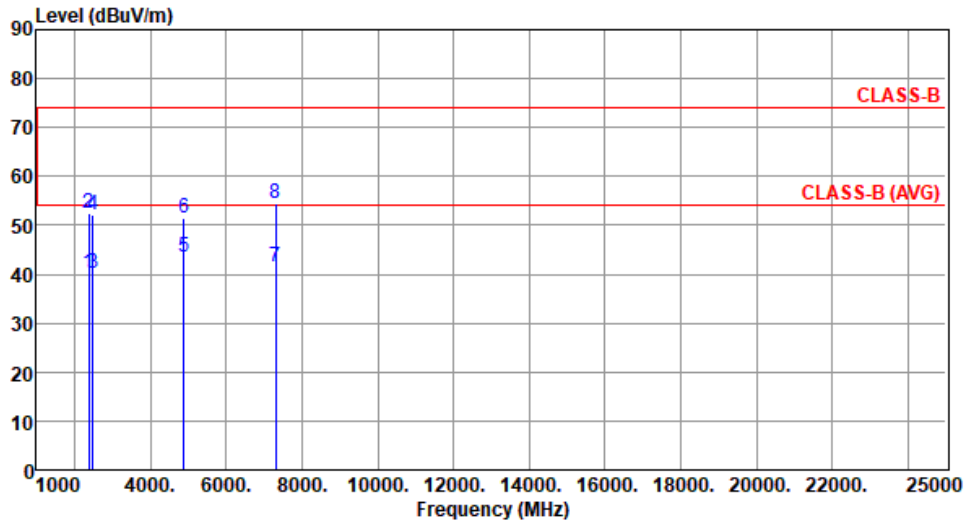
Note 1: Emission Level (dBuV/m) = SA Reading (dBuV) + Factor* (dB/m)

*Factor includes antenna factor , cable loss and amplifier gain

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

Modulation	BT-LE (2Mbps)	Test Freq. (MHz)	2440
Polarization	Vertical		

Test By :Akun Chung Temperature(°C):24 Humidity(%):65

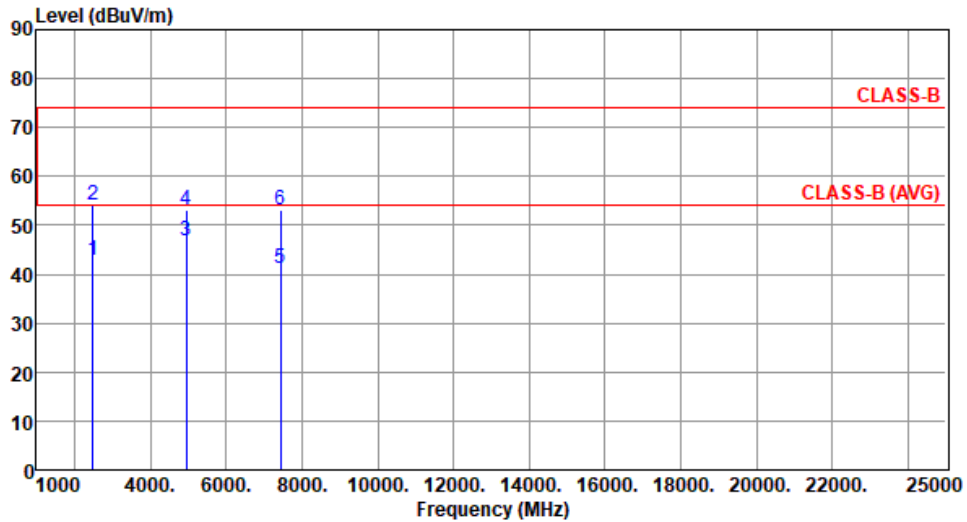


	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB/m	Remark	ANT High cm	Turn Table deg
1	2390.00	40.30	54.00	-13.70	41.79	-1.49	Average	100	197
2	2390.00	52.35	74.00	-21.65	53.84	-1.49	Peak	100	197
3	2483.50	40.12	54.00	-13.88	41.70	-1.58	Average	100	197
4	2483.50	52.07	74.00	-21.93	53.65	-1.58	Peak	100	197
5	4880.00	43.45	54.00	-10.55	38.13	5.32	Average	221	332
6	4880.00	51.43	74.00	-22.57	46.11	5.32	Peak	221	332
7	7320.00	41.64	54.00	-12.36	30.81	10.83	Average	100	4
8	7320.00	54.31	74.00	-19.69	43.48	10.83	Peak	100	4

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

Modulation	BT-LE (2Mbps)	Test Freq. (MHz)	2480
Polarization	Horizontal		

Test By :Akun Chung Temperature(°C):24 Humidity(%):65



	Freq. MHz	Emission level dBUV/m	Limit dBUV/m	Margin dB	SA reading dBUV	Factor dB/m	Remark	ANT High cm	Turn Table deg
1	2483.50	42.73	54.00	-11.27	44.31	-1.58	Average	188	289
2	2483.50	54.06	74.00	-19.94	55.64	-1.58	Peak	188	289
3	4960.00	46.95	54.00	-7.05	41.24	5.71	Average	280	314
4	4960.00	53.17	74.00	-20.83	47.46	5.71	Peak	280	314
5	7440.00	41.33	54.00	-12.67	30.68	10.65	Average	100	312
6	7440.00	53.06	74.00	-20.94	42.41	10.65	Peak	100	312

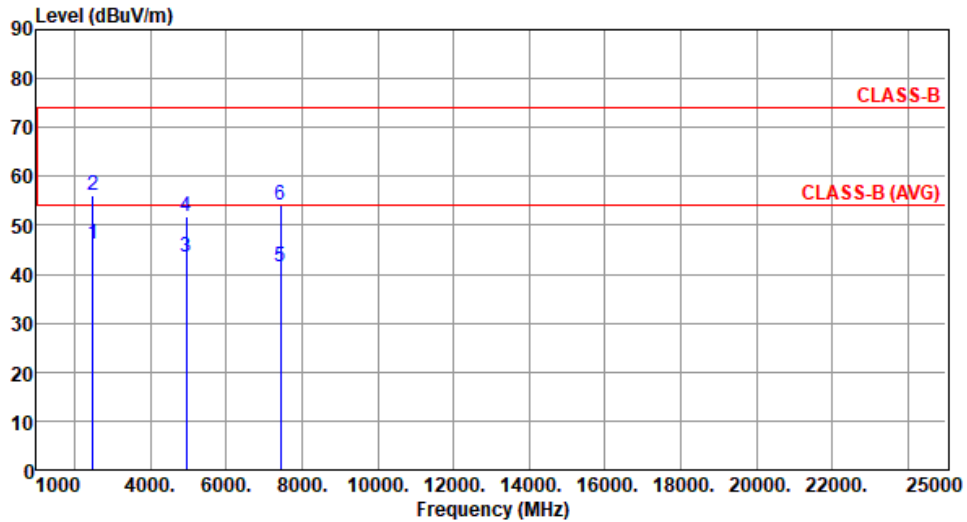
Note 1: Emission Level (dBUV/m) = SA Reading (dBUV) + Factor* (dB/m)

*Factor includes antenna factor , cable loss and amplifier gain

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

Modulation	BT-LE (2Mbps)	Test Freq. (MHz)	2480
Polarization	Vertical		

Test By :Akun Chung Temperature(°C):24 Humidity(%):65



	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB/m	Remark	ANT High cm	Turn Table deg
1	2483.50	46.13	54.00	-7.87	47.71	-1.58	Average	100	195
2	2483.50	56.06	74.00	-17.94	57.64	-1.58	Peak	100	197
3	4960.00	43.56	54.00	-10.44	37.85	5.71	Average	237	334
4	4960.00	51.74	74.00	-22.26	46.03	5.71	Peak	237	334
5	7440.00	41.65	54.00	-12.35	31.00	10.65	Average	100	8
6	7440.00	54.22	74.00	-19.78	43.57	10.65	Peak	100	8

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

*Factor includes antenna factor , cable loss and amplifier gain

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

3.5 Emissions in non-restricted Frequency Bands

3.5.1 Emissions in non-restricted frequency bands limit

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

3.5.2 Test Procedures

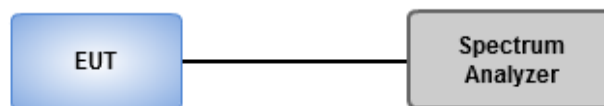
Reference level measurement

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

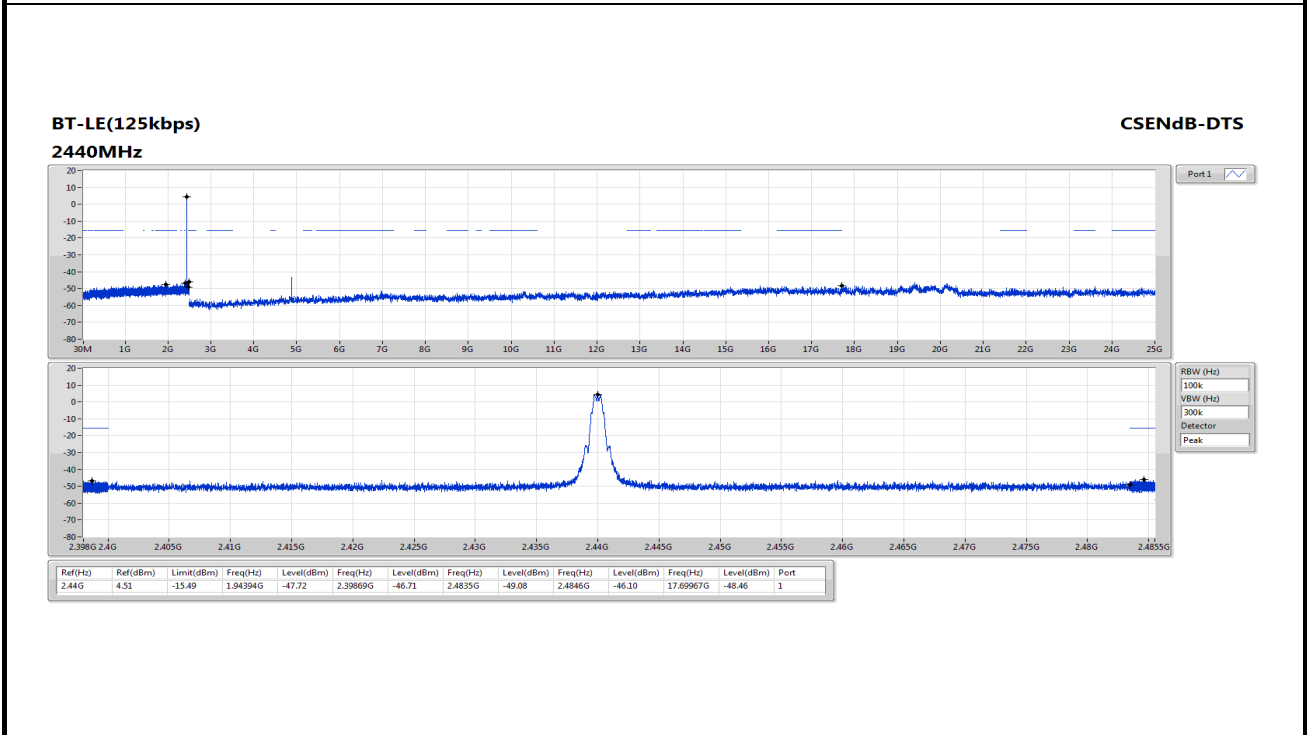
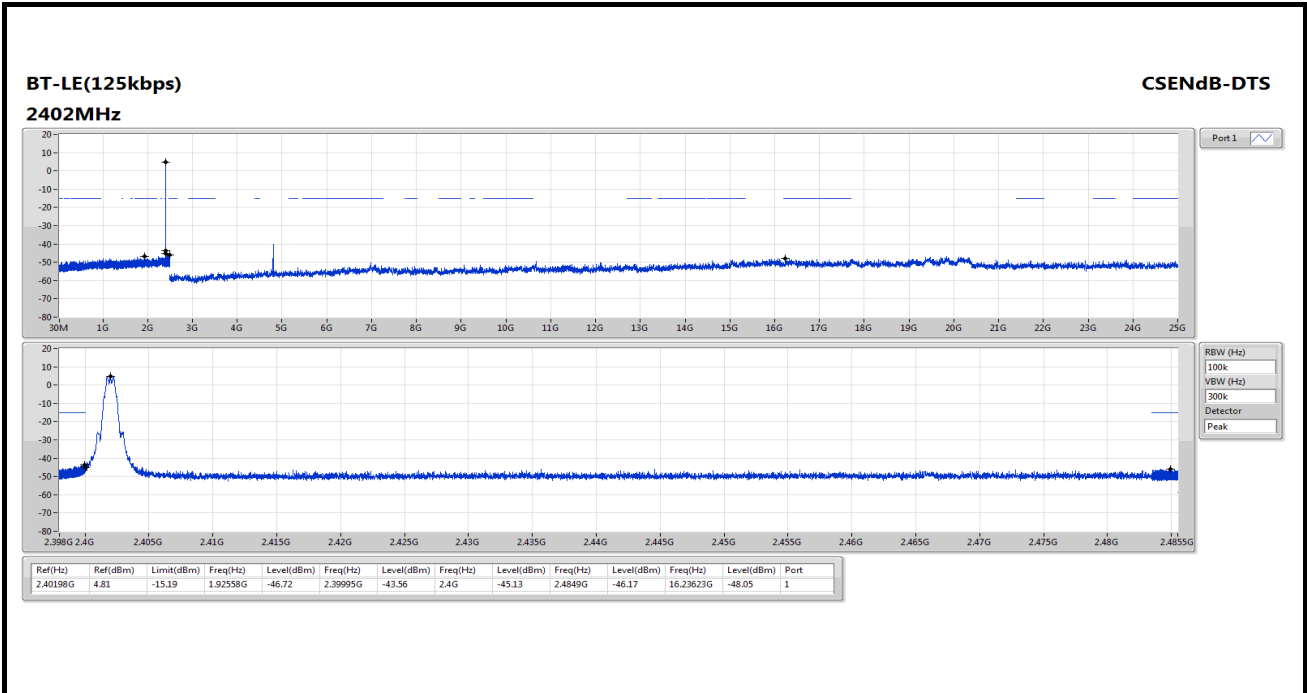
1. Set RBW=100kHz, VBW = 300kHz , Detector = Peak, Sweep time = Auto
2. Trace = max hold , Allow Trace to fully stabilize
3. Scan Frequency range is up to 25GHz
4. Use the peak marker function to determine the maximum amplitude level

3.5.3 Test Setup



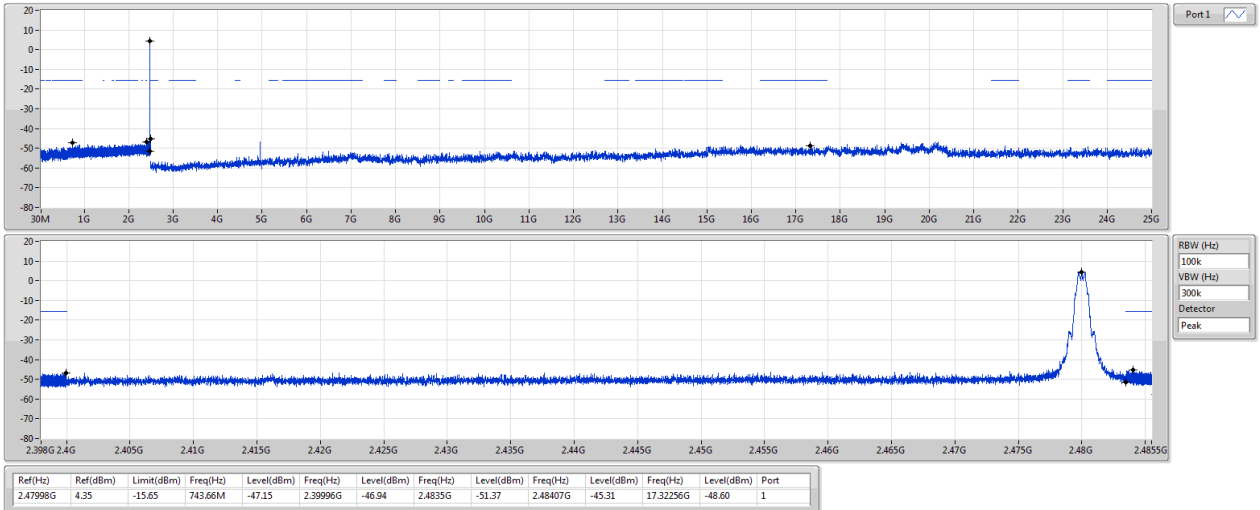
3.5.4 Test Result of Emissions in non-restricted Frequency Bands

Ambient Condition	24°C / 67%	Tested By	Aska Huang
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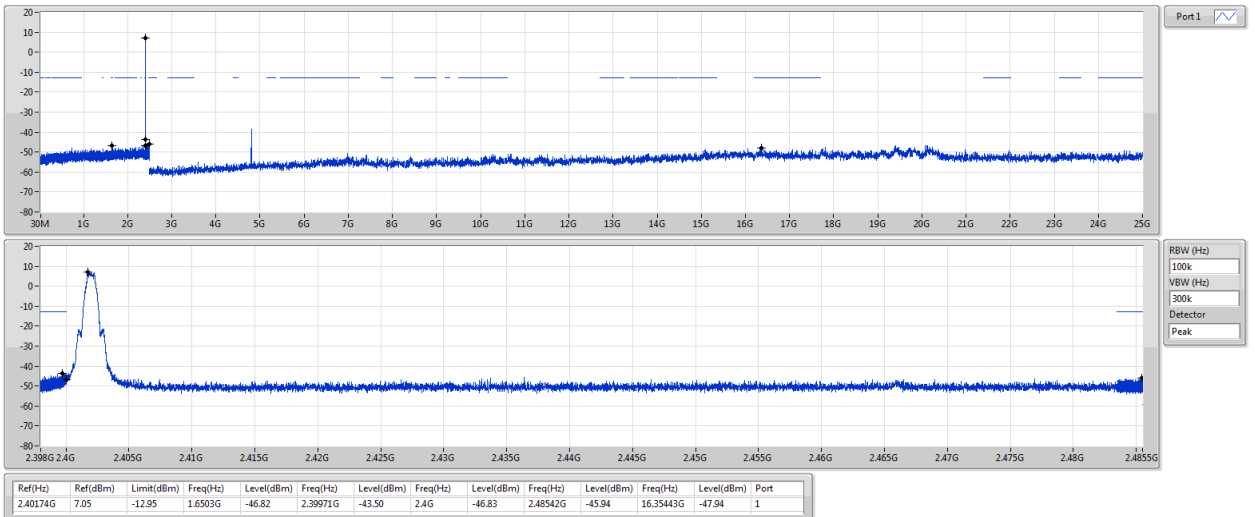
BT-LE(125kbps)
2480MHz

CSEndB-DTS



BT-LE(500kbps)
2402MHz

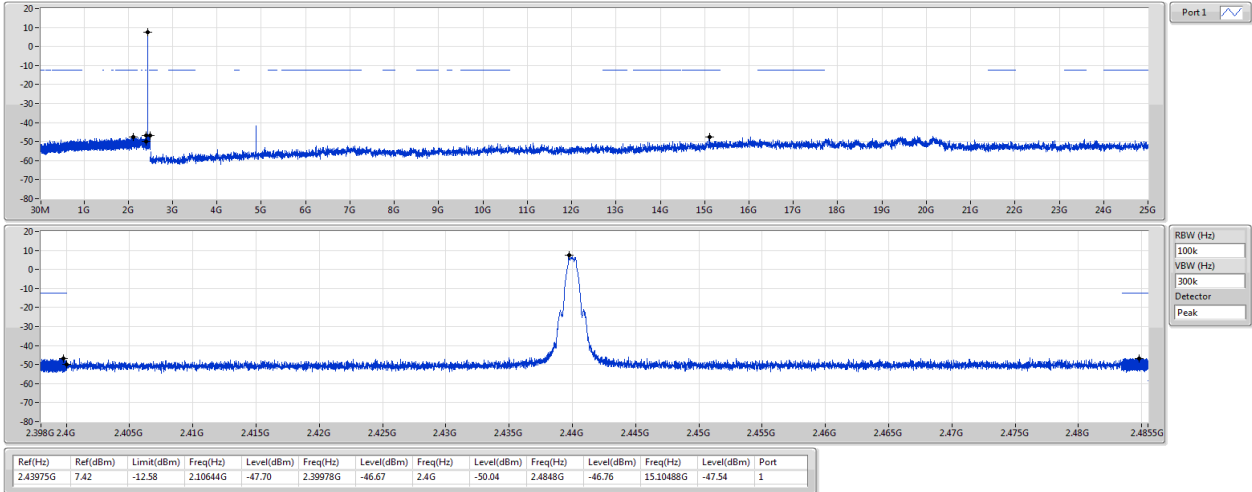
CSEndB-DTS



BT-LE(500kbps)

CSEndB-DTS

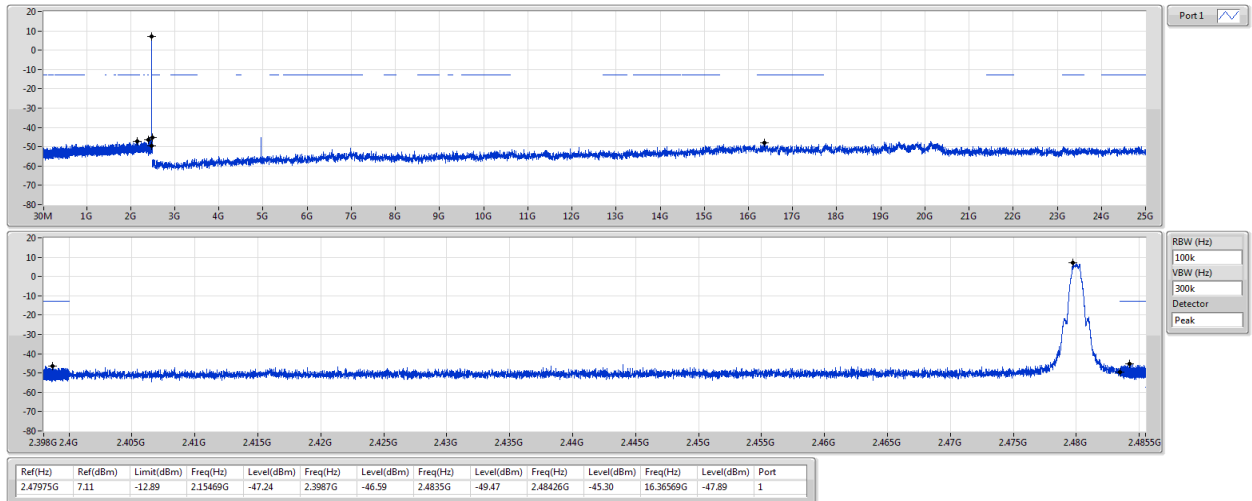
2440MHz



BT-LE(500kbps)

CSEndB-DTS

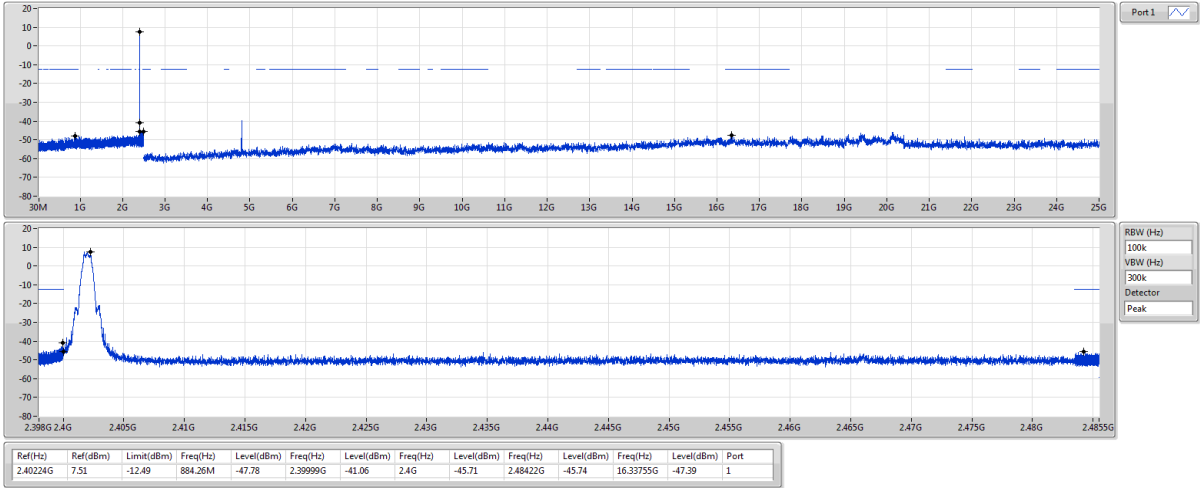
2480MHz



BT-LE(1Mbps)

CSEndB-DTS

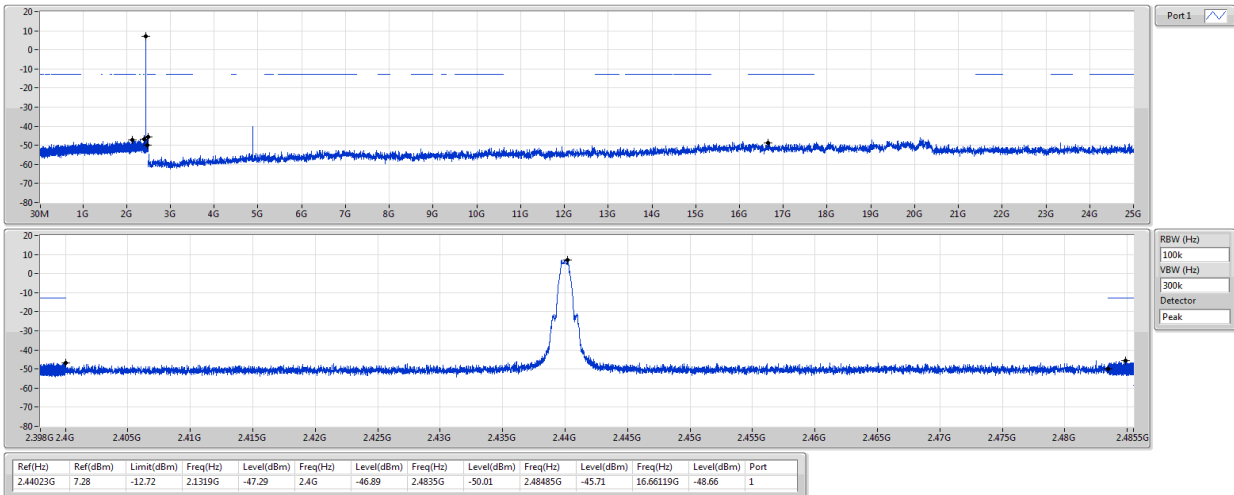
2402MHz



BT-LE(1Mbps)

CSEndB-DTS

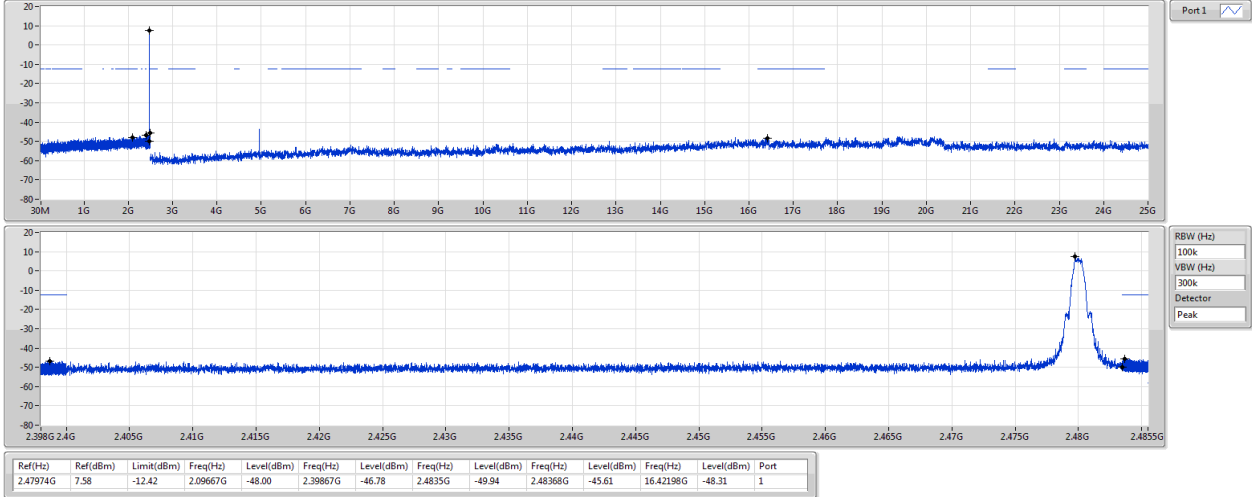
2440MHz



BT-LE(1Mbps)

CSEndB-DTS

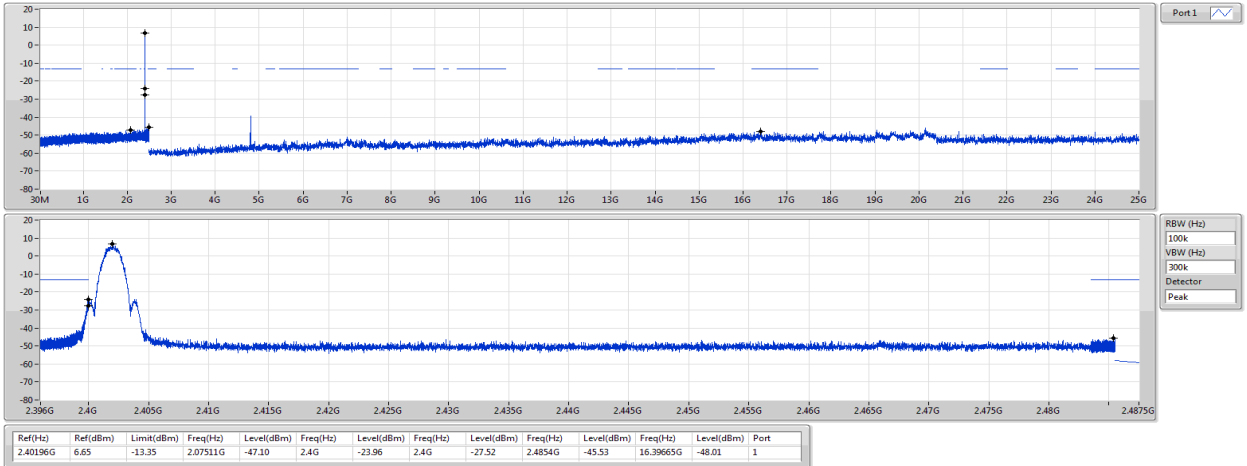
2480MHz



BT-LE(2Mbps)

CSEndB-DTS

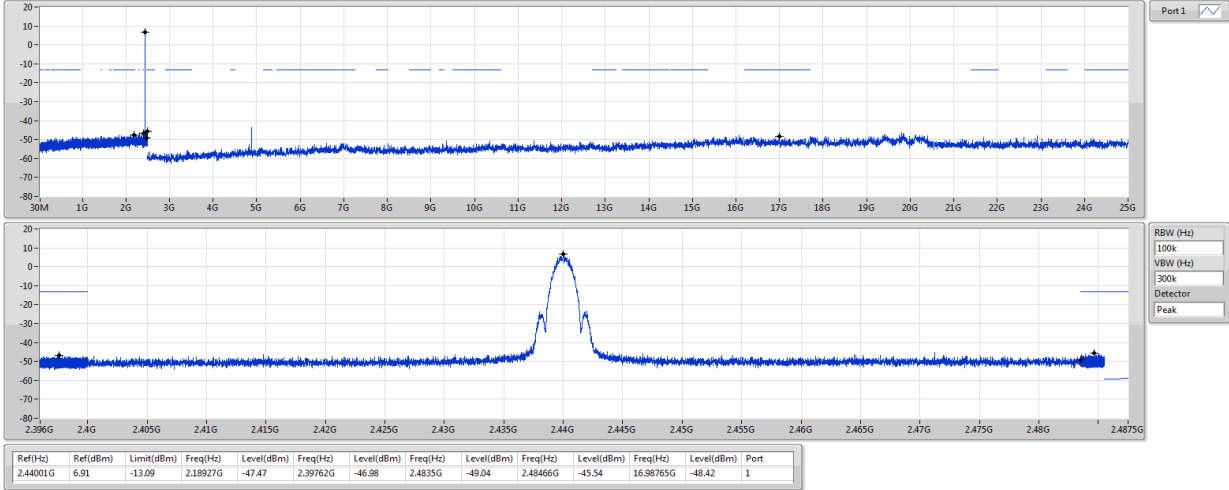
2402MHz



BT-LE(2Mbps)

CSEndB-DTS

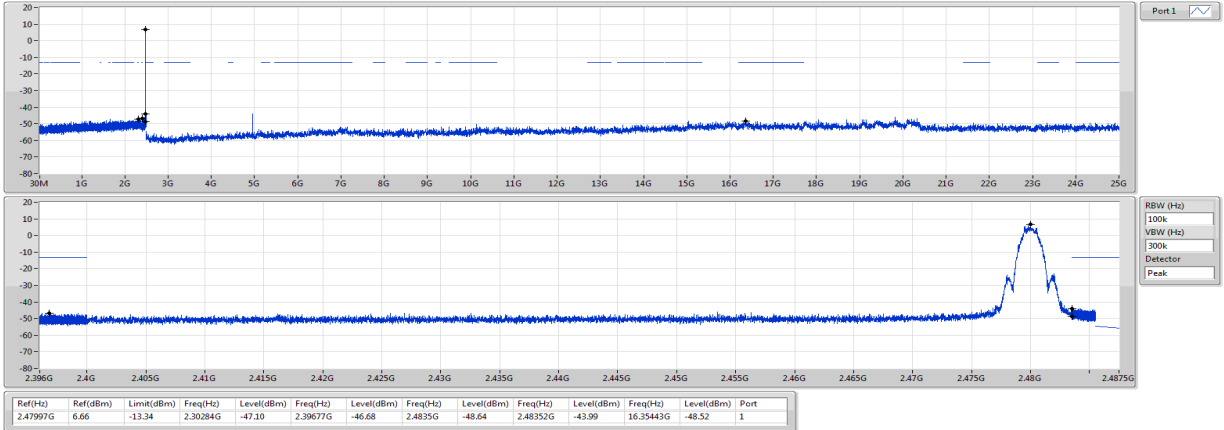
2440MHz



BT-LE(2Mbps)

CSEndB-DTS

2480MHz



4 Test laboratory information

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

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

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

Linkou

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Kwei Shan

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St., Kwei Shan Dist., Tao Yuan
City 33381, Taiwan (R.O.C.)

Kwei Shan Site II

Tel: 886-3-271-8640

No.14-1, Lane 19, Wen San 3rd
St., Kwei Shan Dist., Tao Yuan
City 333, Taiwan (R.O.C.)

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

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Fax: 886-3-318-0345

Email: ICC_Service@icertifi.com.tw

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