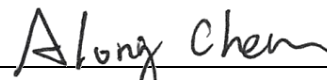


FCC Test Report

FCC ID : SQGBT710
Equipment : Sentrius™ BT710 Bluetooth Tracker
(Refer to item 1.1.1 for more details)
Model No. : Sentrius™ BT710
(Refer to item 1.1.1 for more details)
Brand Name : Laird Connectivity
Applicant : Laird Connectivity
Address : W66N220 Commerce Court, Cedarburg, WI
53012 United States Of America
Standard : 47 CFR FCC Part 15.247
Received Date : Aug. 27, 2020
Tested Date : Oct. 05, 2020

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

Reviewed by:


Along Chen / Assistant Manager

Approved by:

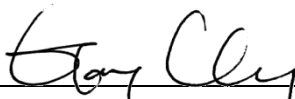

Gary Chang / Manager



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Release Record

Report No.	Version	Description	Issued Date
FR082702	Rev. 01	Initial issue	Nov. 26, 2020
FR082702	Rev. 02	Modified product and model name.	Dec. 04, 2020

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]: 12010.00MHz 43.48 (Margin -10.52dB) - AV	Pass
15.247(b)(3)	Maximum Output Power	Power [dBm]: 7.59	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
N/A means Not Applicable. 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 Product Details

The following models are provided to this EUT.

Brand Name	Model Name	Product Name	Description	
Laird Connectivity	Sentrius™ BT710	Sentrius™ BT710 Bluetooth Tracker	No Vibe	Tracker hardware is the same on each, just different firmware. Both versions also an alternative variant which includes a vibe motor
		Sentrius™ BT710 Bluetooth Tracker with Vibration	With Vibe	
Laird Connectivity	Sentrius™ BT720	Sentrius™ BT720 Bluetooth Tag	No Vibe	
		Sentrius™ BT720 Bluetooth Tag with Vibration	With Vibe	
✦ The above models, model BT710 was selected as a representative one 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. 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.				

1.1.3 Antenna Details

Ant. No.	Type	Connector	Gain (dBi)	Remarks
1	Chip	No	2.48	---

1.1.4 Power Supply Type of Equipment under Test (EUT)

Power Supply Type	3Vdc from battery
-------------------	-------------------

1.1.5 Accessories

Accessories		
No.	Equipment	Description
1	Battery	Brand: Panasonic Model: CR2477 Rating:3Vdc

1.1.6 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

1.1.7 Test Tool and Duty Cycle

Lower power_ vibrated version

Test Tool	Uwterminal, V7.94	
Modulation Mode	Duty Cycle Of Test Signal (%)	Duty Factor (dB)
GFSK-125kbps	83.73%	0.77
GFSK-500kbps	58.69%	2.31
GFSK-1Mbps	64.06%	1.93
GFSK-2Mbps	35.19%	4.54

High power_ vibrated version

Test Tool	Uwterminal, V7.94	
Modulation Mode	Duty Cycle Of Test Signal (%)	Duty Factor (dB)
GFSK-125kbps	83.73%	0.77
GFSK-500kbps	58.69%	2.31
GFSK-1Mbps	64.06%	1.93
GFSK-2Mbps	35.19%	4.54

1.1.8 Power Index of Test Tool

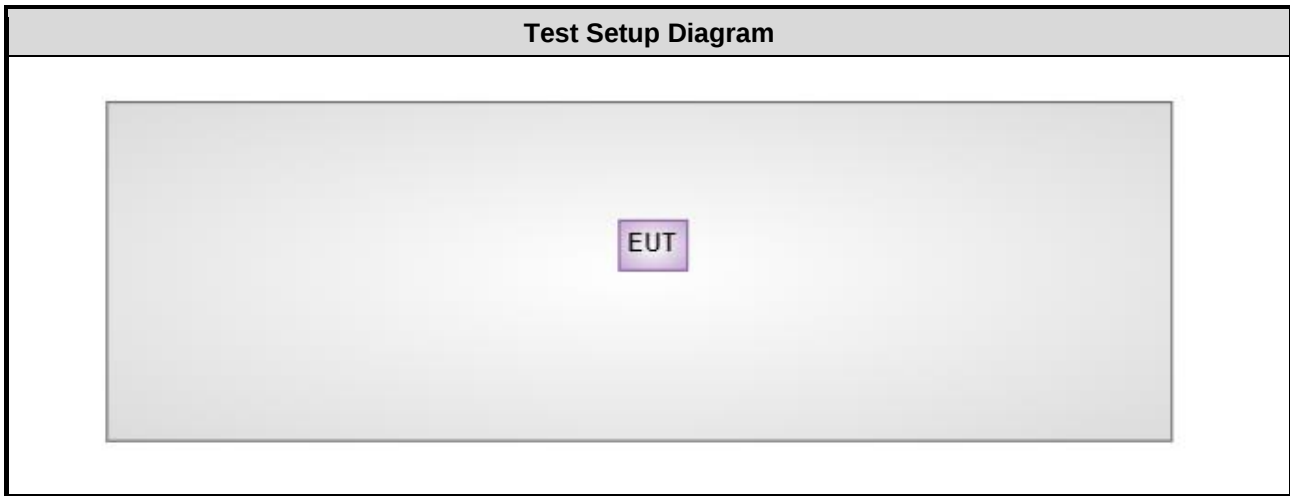
Lower power_ vibrated version

Modulation Mode	Test Frequency (MHz)		
	2402	2440	2480
GFSK/125kbps	-40	-40	-40
GFSK/500kbps	-40	-40	-40
GFSK/1Mbps	-40	-40	-40
GFSK/2Mbps	-40	-40	-40

High power_ vibrated version

Modulation Mode	Test Frequency (MHz)		
	2402	2440	2480
GFSK/125kbps	8	8	8
GFSK/500kbps	8	8	8
GFSK/1Mbps	8	8	8
GFSK/2Mbps	8	8	8

1.2 Test Setup Chart



Note: The support notebook and console cable was disconnected from EUT and removed from test table when EUT is set to transmit continuously.

1.3 Test Equipment List and Calibration Data

Test Item	Radiated Emission				
Test Site	966 chamber1 / (03CH01-WS)				
Tested Date	Sep. 09 ~ Sep. 10, 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. 10, 2020	Jul. 09, 2021
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. 03, 2020	Jul. 02, 2021
Preamplifier	Agilent	83017A	MY39501308	Oct. 08, 2019	Oct. 07, 2020
Preamplifier	EMC	EMC184045B	980192	Jul. 21, 2020	Jul. 20, 2021
RF Cable	EMC	EMC104-SM-SM-80 00	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-N M-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	Oct. 05, 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
AC POWER SOURCE	APC	AFC-500W	F312060012	Dec. 02, 2019	Dec. 01, 2020
Measurement Software	--	SENSE-15247_FS	V5.10.1	NA	NA
Note: Calibration Interval of instruments listed above is one year.					

1.4 Test Standards

47 CFR FCC Part 15.247
ANSI C63.10-2013

1.5 Reference Guidance

FCC KDB 558074 D01 15.247 Meas Guidance v05r02

1.6 Deviation from Test Standard and Measurement Procedure

None

1.7 Measurement Uncertainty

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

Measurement Uncertainty	
Parameters	Uncertainty
Bandwidth	± 34.130 Hz
Conducted power	± 0.808 dB
Power density	± 0.583 dB
Conducted emission	± 2.715 dB
AC conducted emission	± 2.92 dB
Radiated emission ≤ 1 GHz	± 3.41 dB
Radiated emission > 1 GHz	± 4.59 dB

2 Test Configuration

2.1 Testing Facility

Test Laboratory	International Certification Corp.
Test Site	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.

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

2.2 The Worst Test Modes and Channel Details

Test item	Mode	Test Frequency (MHz)	Data Rate	Test Configuration
Radiated Emissions $\leq$ 1GHz	BT LE	2402	2Mbps	2, 3
Maximum Output Power 6dB bandwidth Power spectral density	BT LE	2402, 2440, 2480	125kbps 500kbps 1Mbps 2Mbps	1, 2
Radiated Emissions $>$ 1GHz	BT LE	2402, 2440, 2480	1Mbps 2Mbps	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 X-plane result was found as the worst case and was shown in this report. 2. Test configurations are as below 1) Lower power_ vibrated version 2) High power_ vibrated version 3) High power_ without vibrated version				

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

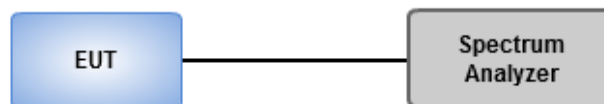
6dB Bandwidth

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	22°C / 66%	Tested By	Aska Huang
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Test Configuration 1

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)	612.319k	1.08M	1M08F1D	608.696k	1.077M
BT-LE(500kbps)	713.768k	1.054M	1M05F1D	706.522k	1.048M
BT-LE(1Mbps)	717.391k	1.054M	1M05F1D	699.275k	1.051M
BT-LE(2Mbps)	1.13M	2.043M	2M04F1D	1.123M	2.043M

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;

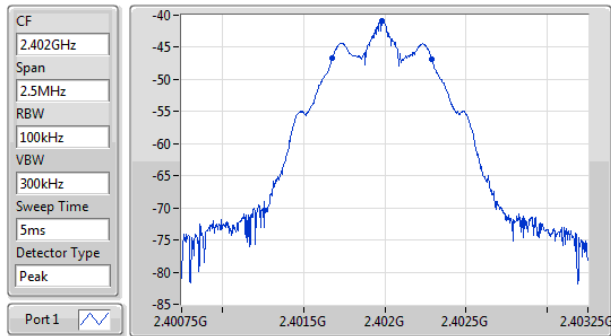
Result

Mode	Result	Limit (Hz)	Port 1-N dB (Hz)	Port 1-OBW (Hz)
BT-LE(125kbps)	-	-	-	-
2402MHz	Pass	500k	612.319k	1.077M
2440MHz	Pass	500k	612.319k	1.077M
2480MHz	Pass	500k	608.696k	1.08M
BT-LE(500kbps)	-	-	-	-
2402MHz	Pass	500k	713.768k	1.048M
2440MHz	Pass	500k	706.522k	1.051M
2480MHz	Pass	500k	706.522k	1.054M
BT-LE(1Mbps)	-	-	-	-
2402MHz	Pass	500k	699.275k	1.051M
2440MHz	Pass	500k	699.275k	1.054M
2480MHz	Pass	500k	717.391k	1.054M
BT-LE(2Mbps)	-	-	-	-
2402MHz	Pass	500k	1.13M	2.043M
2440MHz	Pass	500k	1.13M	2.043M
2480MHz	Pass	500k	1.123M	2.043M

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

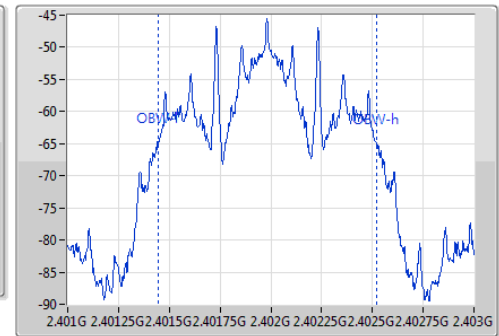
BT-LE(125kbps)

2402MHz



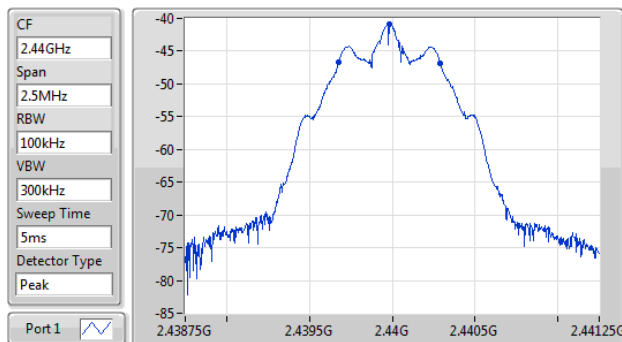
6dB(Hz)	FI-6dB(Hz)	Fh-6dB(Hz)	OBW(Hz)	FI-OBW(Hz)	Fh-OBW(Hz)	Limit(Hz)	Port
612.319k	2.401678G	2.40229G	1.077M	2.401444G	2.402521G	500k	1

EBW-DTS



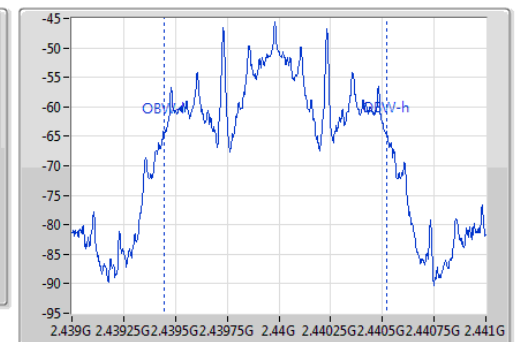
BT-LE(125kbps)

2440MHz



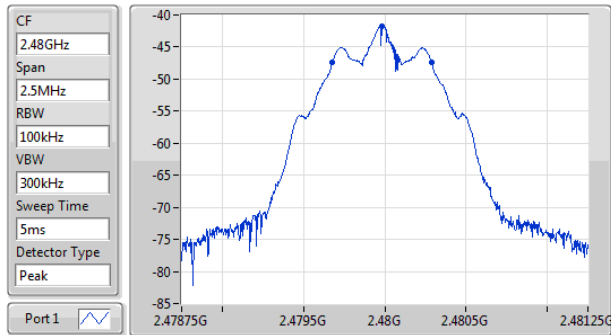
6dB(Hz)	FI-6dB(Hz)	Fh-6dB(Hz)	OBW(Hz)	FI-OBW(Hz)	Fh-OBW(Hz)	Limit(Hz)	Port
612.319k	2.439678G	2.44029G	1.077M	2.439444G	2.440521G	500k	1

EBW-DTS



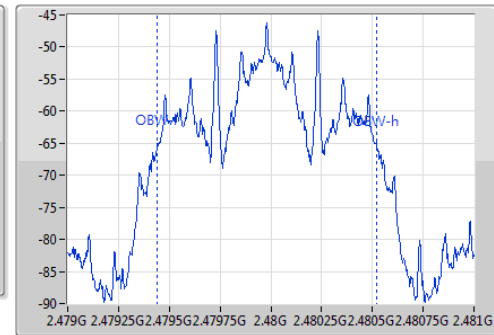
BT-LE(125kbps)

2480MHz



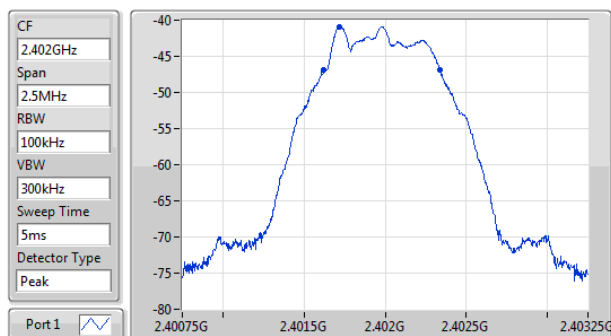
6dB(Hz)	Fl-6dB(Hz)	Fh-6dB(Hz)	OBW(Hz)	Fl-OBW(Hz)	Fh-OBW(Hz)	Limit(Hz)	Port
608.696k	2.479678G	2.480286G	1.08M	2.479441G	2.480521G	500k	1

EBW-DTS



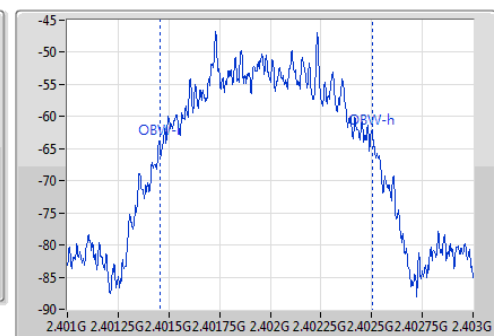
BT-LE(500kbps)

2402MHz



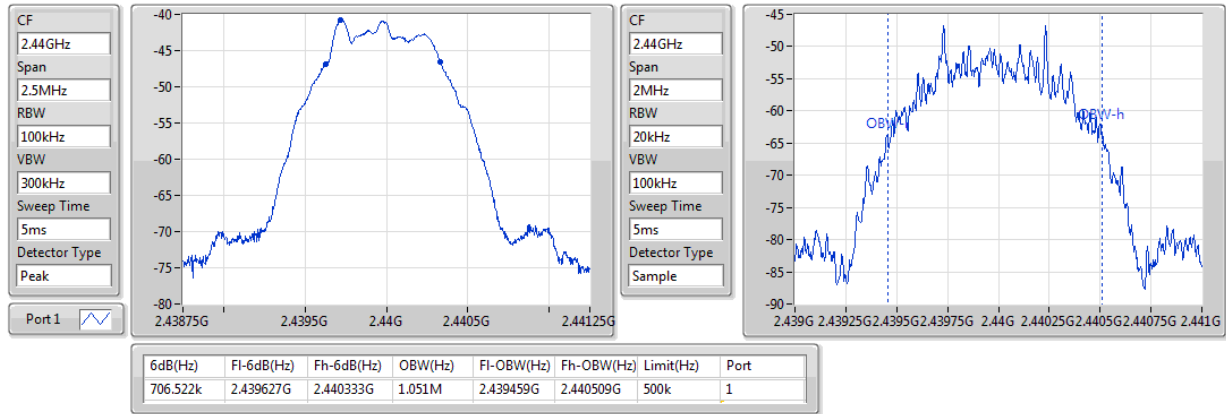
6dB(Hz)	Fl-6dB(Hz)	Fh-6dB(Hz)	OBW(Hz)	Fl-OBW(Hz)	Fh-OBW(Hz)	Limit(Hz)	Port
713.768k	2.401623G	2.402337G	1.048M	2.401459G	2.402507G	500k	1

EBW-DTS



BT-LE(500kbps)

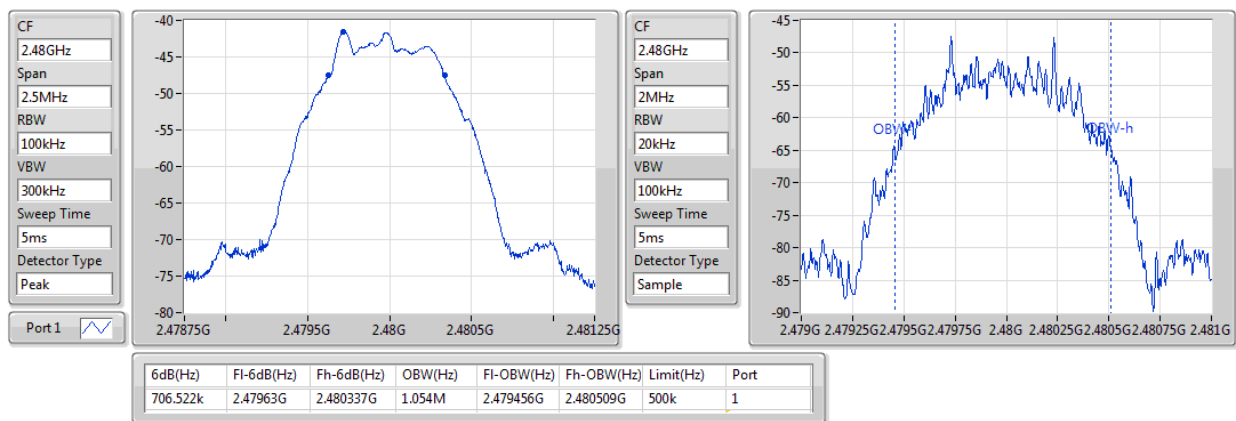
2440MHz



EBW-DTS

BT-LE(500kbps)

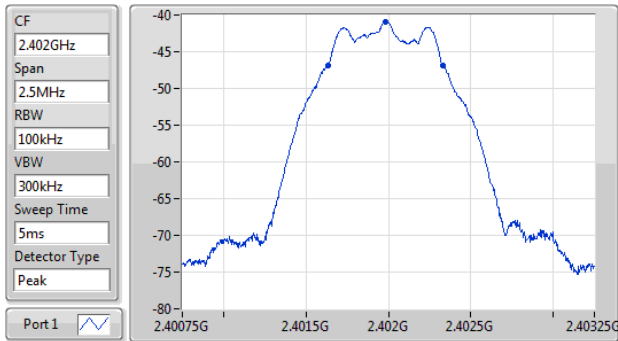
2480MHz



EBW-DTS

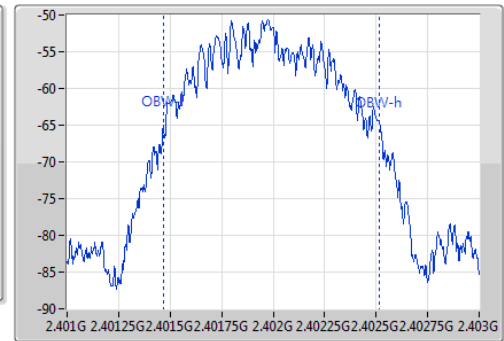
BT-LE(1Mbps)

2402MHz



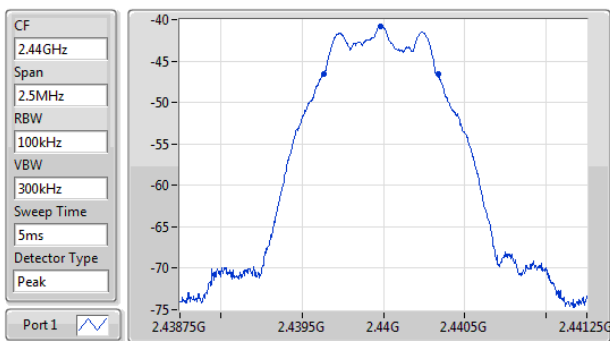
6dB(Hz)	Fl-6dB(Hz)	Fh-6dB(Hz)	OBW(Hz)	Fl-OBW(Hz)	Fh-OBW(Hz)	Limit(Hz)	Port
699.275k	2.401634G	2.402333G	1.051M	2.401467G	2.402518G	500k	1

EBW-DTS



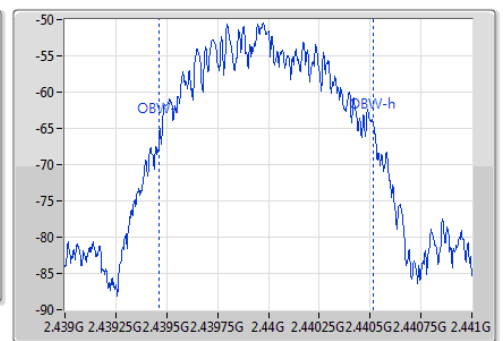
BT-LE(1Mbps)

2440MHz



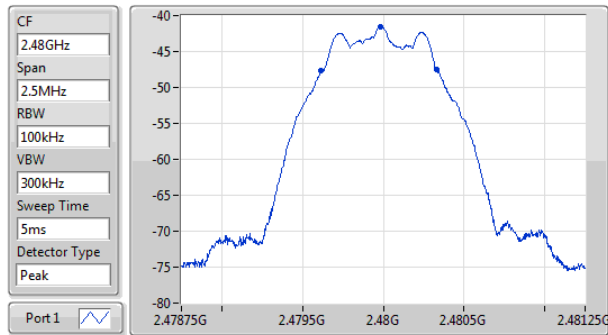
6dB(Hz)	Fl-6dB(Hz)	Fh-6dB(Hz)	OBW(Hz)	Fl-OBW(Hz)	Fh-OBW(Hz)	Limit(Hz)	Port
699.275k	2.439638G	2.440337G	1.054M	2.439465G	2.440518G	500k	1

EBW-DTS



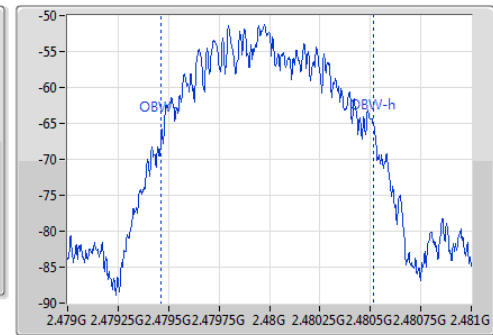
BT-LE(1Mbps)

2480MHz



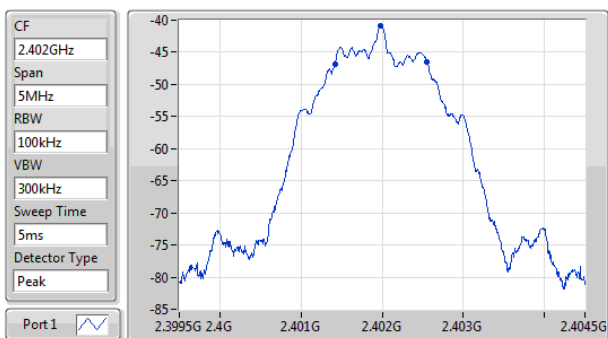
6dB(Hz)	Fl-6dB(Hz)	Fh-6dB(Hz)	OBW(Hz)	Fl-OBW(Hz)	Fh-OBW(Hz)	Limit(Hz)	Port
717.391k	2.479616G	2.480333G	1.054M	2.479465G	2.480518G	500k	1

EBW-DTS



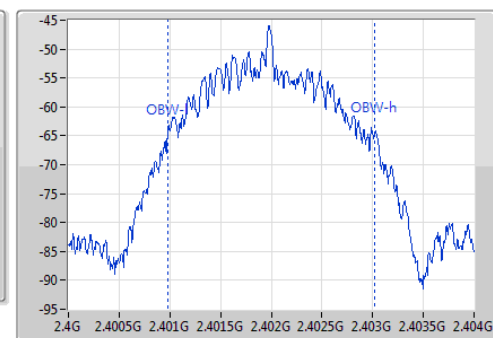
BT-LE(2Mbps)

2402MHz



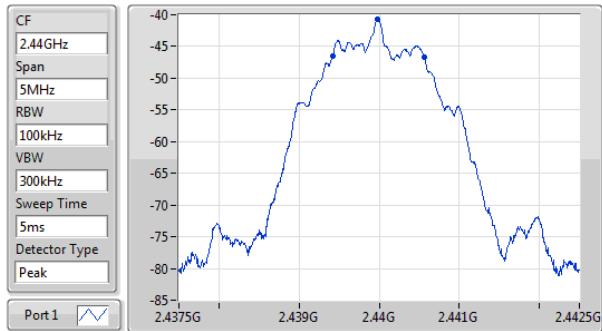
6dB(Hz)	Fl-6dB(Hz)	Fh-6dB(Hz)	OBW(Hz)	Fl-OBW(Hz)	Fh-OBW(Hz)	Limit(Hz)	Port
1.13M	2.40142G	2.402551G	2.043M	2.400981G	2.403025G	500k	1

EBW-DTS



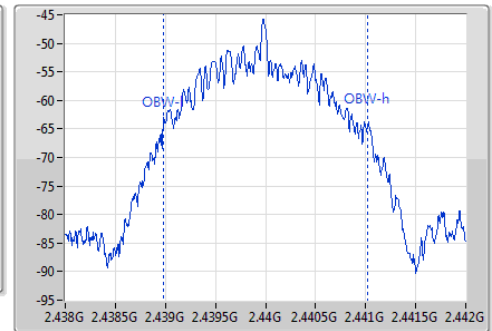
BT-LE(2Mbps)

2440MHz



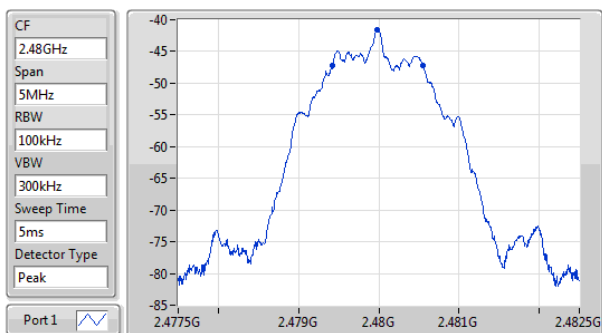
6dB(Hz)	Fl-6dB(Hz)	Fh-6dB(Hz)	OBW(Hz)	Fl-OBW(Hz)	Fh-OBW(Hz)	Limit(Hz)	Port
1.13M	2.439428G	2.440558G	2.043M	2.438981G	2.441025G	500k	1

EBW-DTS



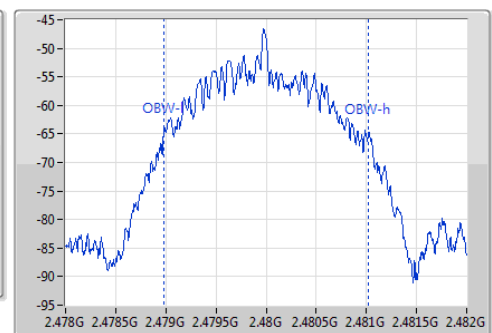
BT-LE(2Mbps)

2480MHz



6dB(Hz)	Fl-6dB(Hz)	Fh-6dB(Hz)	OBW(Hz)	Fl-OBW(Hz)	Fh-OBW(Hz)	Limit(Hz)	Port
1.123M	2.479428G	2.480551G	2.043M	2.478981G	2.481025G	500k	1

EBW-DTS



Test Configuration 2

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)	615.942k	1.077M	1M08F1D	612.319k	1.074M
BT-LE(500kbps)	706.522k	1.054M	1M05F1D	699.275k	1.051M
BT-LE(1Mbps)	721.014k	1.054M	1M05F1D	713.768k	1.051M
BT-LE(2Mbps)	1.152M	2.043M	2M04F1D	1.138M	2.038M

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;

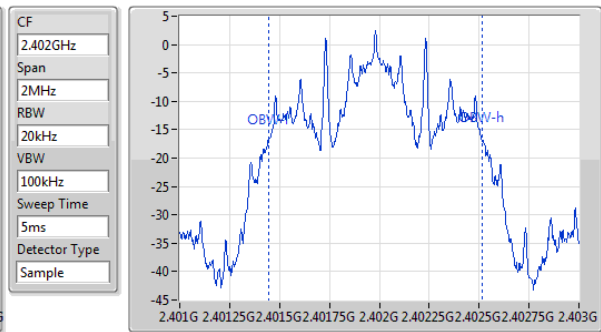
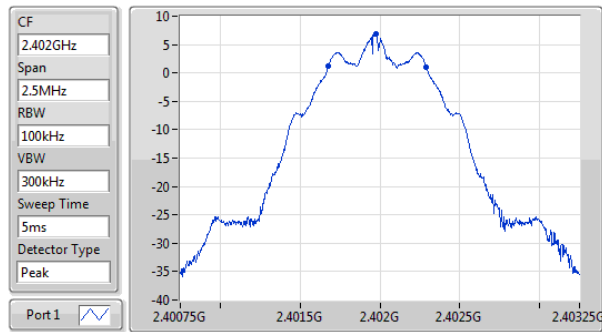
Result

Mode	Result	Limit (Hz)	Port 1-N dB (Hz)	Port 1-OBW (Hz)
BT-LE(125kbps)	-	-	-	-
2402MHz	Pass	500k	612.319k	1.074M
2440MHz	Pass	500k	615.942k	1.077M
2480MHz	Pass	500k	612.319k	1.077M
BT-LE(500kbps)	-	-	-	-
2402MHz	Pass	500k	706.522k	1.051M
2440MHz	Pass	500k	699.275k	1.051M
2480MHz	Pass	500k	702.899k	1.054M
BT-LE(1Mbps)	-	-	-	-
2402MHz	Pass	500k	717.391k	1.051M
2440MHz	Pass	500k	713.768k	1.051M
2480MHz	Pass	500k	721.014k	1.054M
BT-LE(2Mbps)	-	-	-	-
2402MHz	Pass	500k	1.138M	2.038M
2440MHz	Pass	500k	1.152M	2.043M
2480MHz	Pass	500k	1.138M	2.043M

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

BT-LE(125kbps)

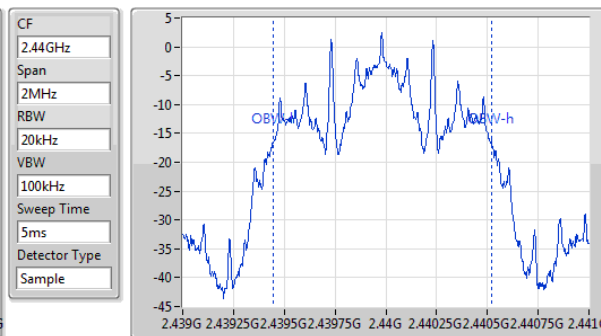
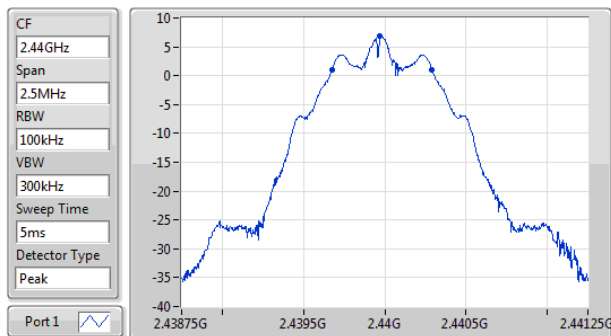
2402MHz



6dB(Hz)	Fl-6dB(Hz)	Fh-6dB(Hz)	OBW(Hz)	Fl-OBW(Hz)	Fh-OBW(Hz)	Limit(Hz)	Port
612.319k	2.401678G	2.40229G	1.074M	2.401444G	2.402518G	500k	1

BT-LE(125kbps)

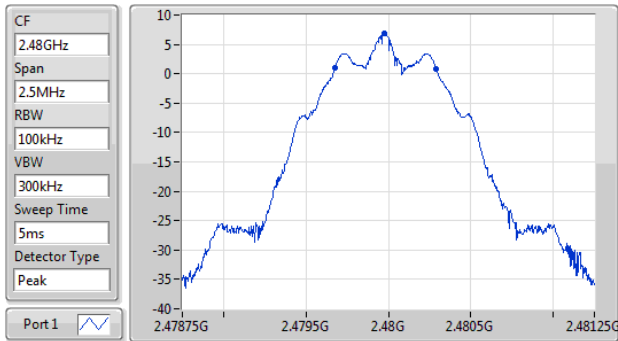
2440MHz



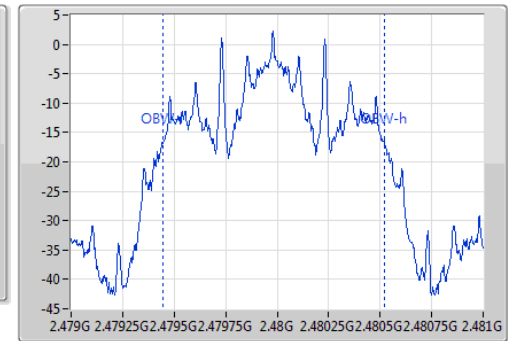
6dB(Hz)	Fl-6dB(Hz)	Fh-6dB(Hz)	OBW(Hz)	Fl-OBW(Hz)	Fh-OBW(Hz)	Limit(Hz)	Port
615.942k	2.439674G	2.44029G	1.077M	2.439444G	2.440521G	500k	1

BT-LE(125kbps)

2480MHz



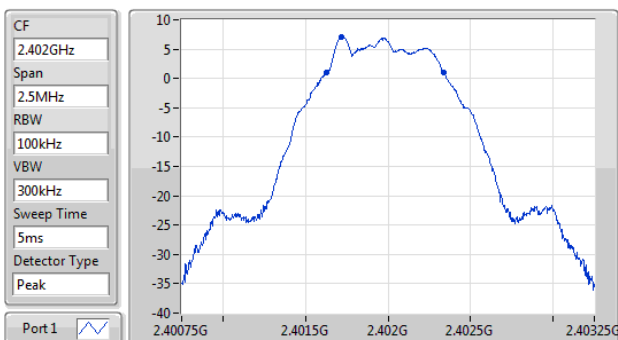
CF
2.48GHz
Span
2.5MHz
RBW
100kHz
VBW
300kHz
Sweep Time
5ms
Detector Type
Peak



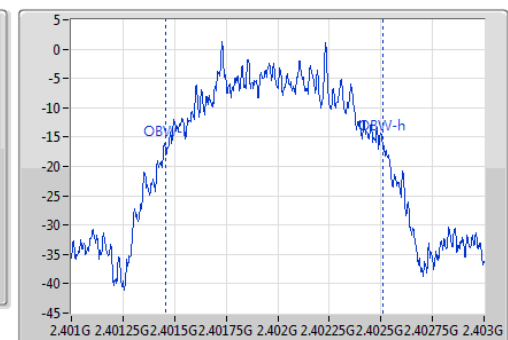
6dB(Hz)	Fl-6dB(Hz)	Fh-6dB(Hz)	OBW(Hz)	Fl-OBW(Hz)	Fh-OBW(Hz)	Limit(Hz)	Port
612.319k	2.479678G	2.48029G	1.077M	2.479444G	2.480521G	500k	1

BT-LE(500kbps)

2402MHz



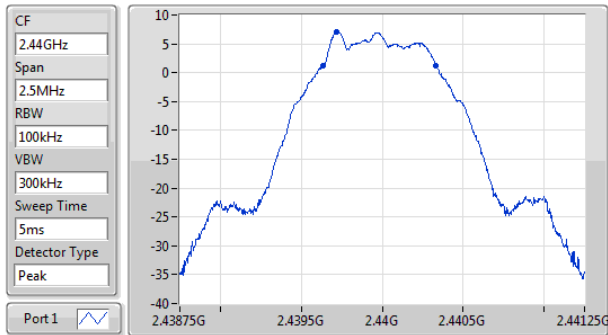
CF
2.402GHz
Span
2.5MHz
RBW
100kHz
VBW
300kHz
Sweep Time
5ms
Detector Type
Peak



6dB(Hz)	Fl-6dB(Hz)	Fh-6dB(Hz)	OBW(Hz)	Fl-OBW(Hz)	Fh-OBW(Hz)	Limit(Hz)	Port
706.522k	2.40163G	2.402337G	1.051M	2.401459G	2.402509G	500k	1

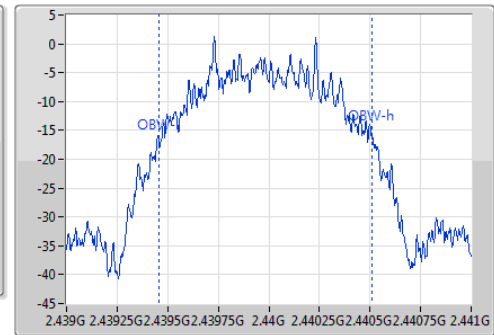
BT-LE(500kbps)

2440MHz



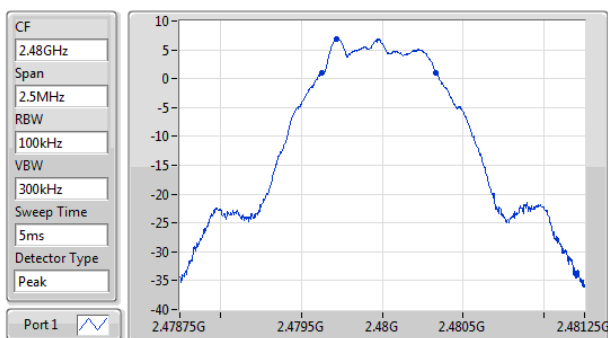
6dB(Hz)	Fl-6dB(Hz)	Fh-6dB(Hz)	OBW(Hz)	Fl-OBW(Hz)	Fh-OBW(Hz)	Limit(Hz)	Port
699.275k	2.439634G	2.440333G	1.051M	2.439459G	2.440509G	500k	1

EBW-DTS



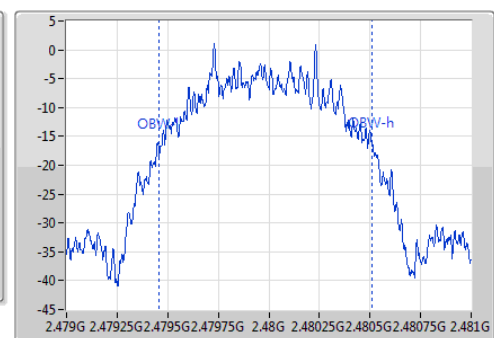
BT-LE(500kbps)

2480MHz



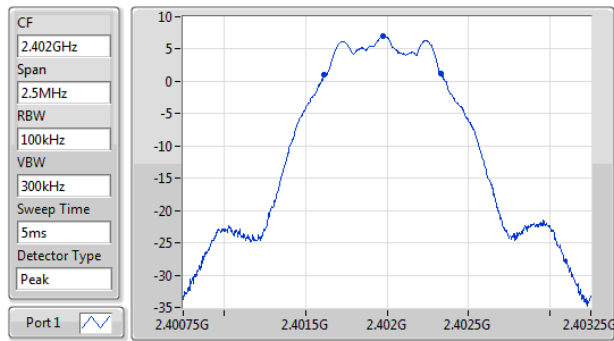
6dB(Hz)	Fl-6dB(Hz)	Fh-6dB(Hz)	OBW(Hz)	Fl-OBW(Hz)	Fh-OBW(Hz)	Limit(Hz)	Port
702.899k	2.47963G	2.480333G	1.054M	2.479456G	2.480509G	500k	1

EBW-DTS



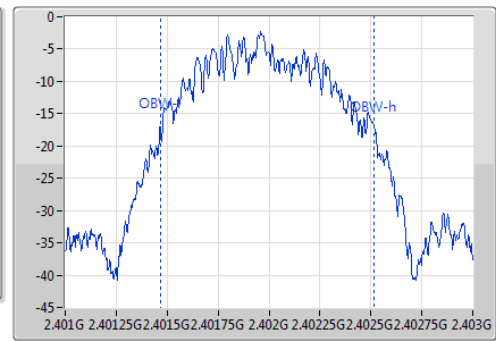
BT-LE(1Mbps)

2402MHz



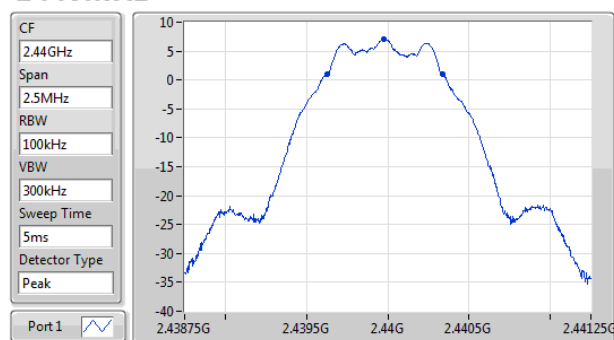
6dB(Hz)	Fl-6dB(Hz)	Fh-6dB(Hz)	OBW(Hz)	Fl-OBW(Hz)	Fh-OBW(Hz)	Limit(Hz)	Port
717.391k	2.401616G	2.402333G	1.051M	2.401467G	2.402518G	500k	1

EBW-DTS



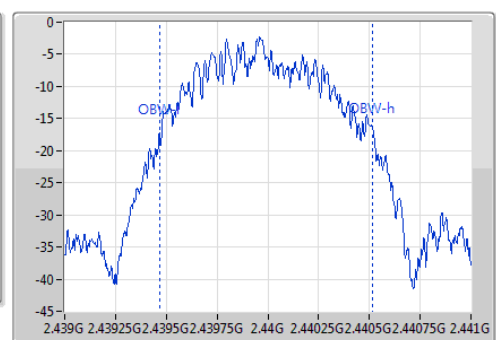
BT-LE(1Mbps)

2440MHz



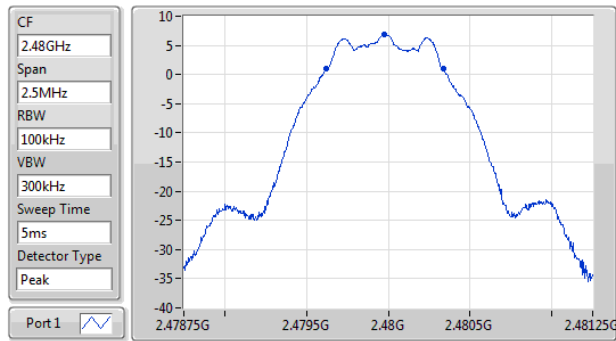
6dB(Hz)	Fl-6dB(Hz)	Fh-6dB(Hz)	OBW(Hz)	Fl-OBW(Hz)	Fh-OBW(Hz)	Limit(Hz)	Port
713.768k	2.439627G	2.440341G	1.051M	2.439467G	2.440518G	500k	1

EBW-DTS



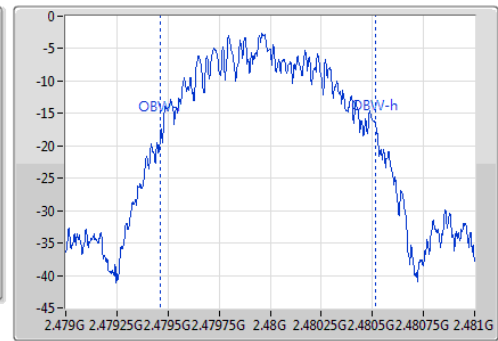
BT-LE(1Mbps)

2480MHz



6dB(Hz)	Fl-6dB(Hz)	Fh-6dB(Hz)	OBW(Hz)	Fl-OBW(Hz)	Fh-OBW(Hz)	Limit(Hz)	Port
721.014k	2.47962G	2.480341G	1.054M	2.479465G	2.480518G	500k	1

EBW-DTS



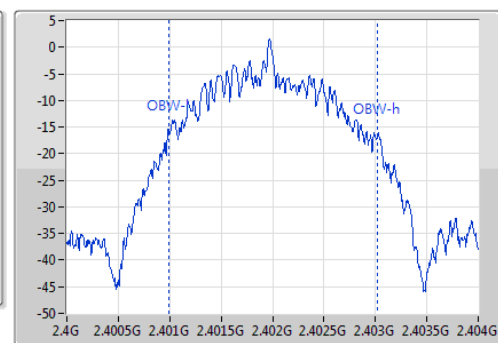
BT-LE(2Mbps)

2402MHz



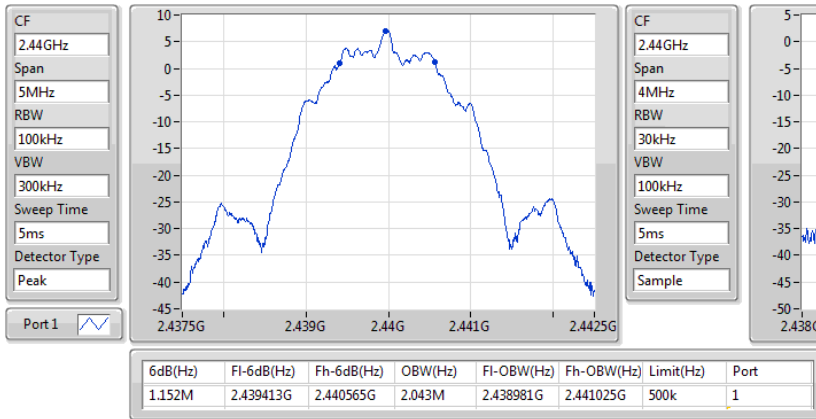
6dB(Hz)	Fl-6dB(Hz)	Fh-6dB(Hz)	OBW(Hz)	Fl-OBW(Hz)	Fh-OBW(Hz)	Limit(Hz)	Port
1.138M	2.40142G	2.402558G	2.038M	2.400987G	2.403025G	500k	1

EBW-DTS

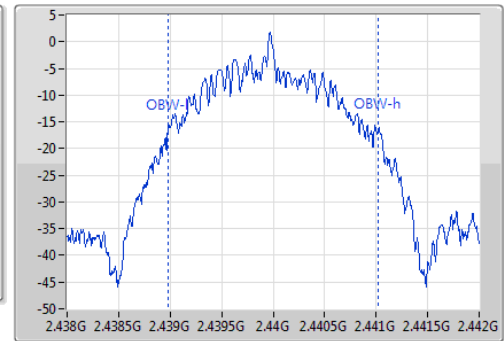


BT-LE(2Mbps)

2440MHz

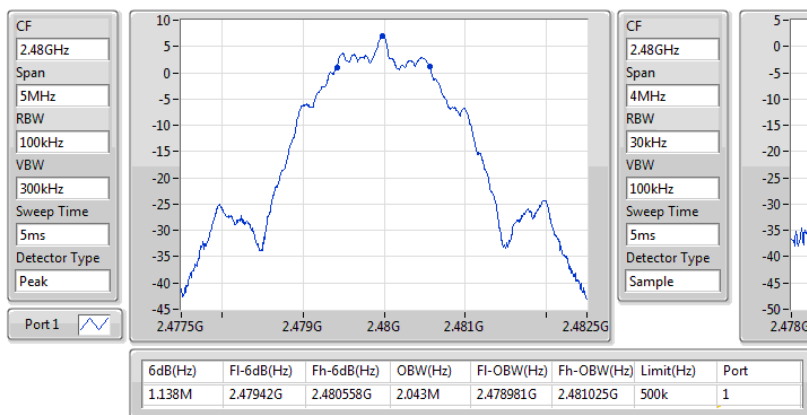


EBW-DTS

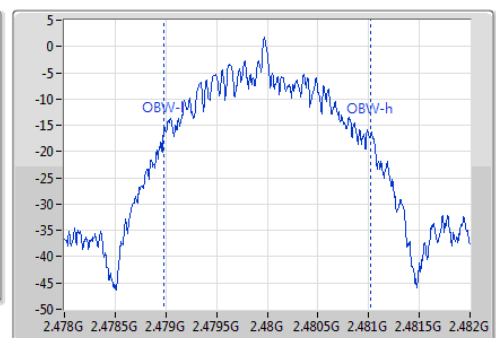


BT-LE(2Mbps)

2480MHz



EBW-DTS



3.2 RF Output Power

3.2.1 Limit of RF Output Power

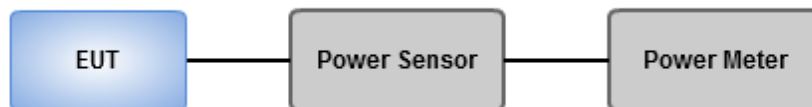
Conducted power shall not exceed 1 Watt.

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	22°C / 66%	Tested By	Aska Huang
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Test Configuration 1

Summary of Peak Conducted Output Power

Mode	Power (dBm)	Power (W)
2.4-2.4835GHz	-	-
BT-LE(125kbps)	-39.62	0.0000001
BT-LE(500kbps)	-39.62	0.0000001
BT-LE(1Mbps)	-39.47	0.0000001
BT-LE(2Mbps)	-39.57	0.0000001

Result

Mode	Result	Gain (dBi)	Power (dBm)	Power Limit (dBm)
BT-LE(125kbps)	-	-	-	-
2402MHz	Pass	2.48	-39.62	30.00
2440MHz	Pass	2.48	-40.11	30.00
2480MHz	Pass	2.48	-40.68	30.00
BT-LE(500kbps)	-	-	-	-
2402MHz	Pass	2.48	-39.62	30.00
2440MHz	Pass	2.48	-40.13	30.00
2480MHz	Pass	2.48	-40.76	30.00
BT-LE(1Mbps)	-	-	-	-
2402MHz	Pass	2.48	-39.47	30.00
2440MHz	Pass	2.48	-40.00	30.00
2480MHz	Pass	2.48	-40.58	30.00
BT-LE(2Mbps)	-	-	-	-
2402MHz	Pass	2.48	-39.57	30.00
2440MHz	Pass	2.48	-40.04	30.00
2480MHz	Pass	2.48	-40.68	30.00

Summary of Conducted (Average) Output Power

Mode	Power (dBm)	Power (W)
2.4-2.4835GHz	-	-
BT-LE(125kbps)	-39.72	0.0000001
BT-LE(500kbps)	-39.74	0.0000001
BT-LE(1Mbps)	-39.59	0.0000001
BT-LE(2Mbps)	-39.67	0.0000001

Result

Mode	Result	Gain (dBi)	Power (dBm)	Power Limit (dBm)
BT-LE(125kbps)	-	-	-	-
2402MHz	Pass	2.48	-39.72	-
2440MHz	Pass	2.48	-40.23	-
2480MHz	Pass	2.48	-40.82	-
BT-LE(500kbps)	-	-	-	-
2402MHz	Pass	2.48	-39.74	-
2440MHz	Pass	2.48	-40.28	-
2480MHz	Pass	2.48	-40.90	-
BT-LE(1Mbps)	-	-	-	-
2402MHz	Pass	2.48	-39.59	-
2440MHz	Pass	2.48	-40.14	-
2480MHz	Pass	2.48	-40.71	-
BT-LE(2Mbps)	-	-	-	-
2402MHz	Pass	2.48	-39.67	-
2440MHz	Pass	2.48	-40.17	-
2480MHz	Pass	2.48	-40.80	-

Note: Average power is for reference only.

Test Configuration 2

Summary of Peak Conducted Output Power

Mode	Power (dBm)	Power (W)
2.4-2.4835GHz	-	-
BT-LE(125kbps)	7.58	0.00573
BT-LE(500kbps)	7.58	0.00573
BT-LE(1Mbps)	7.59	0.00574
BT-LE(2Mbps)	7.59	0.00574

Result

Mode	Result	Gain (dBi)	Power (dBm)	Power Limit (dBm)
BT-LE(125kbps)	-	-	-	-
2402MHz	Pass	2.48	7.58	30.00
2440MHz	Pass	2.48	7.50	30.00
2480MHz	Pass	2.48	7.35	30.00
BT-LE(500kbps)	-	-	-	-
2402MHz	Pass	2.48	7.58	30.00
2440MHz	Pass	2.48	7.50	30.00
2480MHz	Pass	2.48	7.35	30.00
BT-LE(1Mbps)	-	-	-	-
2402MHz	Pass	2.48	7.59	30.00
2440MHz	Pass	2.48	7.51	30.00
2480MHz	Pass	2.48	7.36	30.00
BT-LE(2Mbps)	-	-	-	-
2402MHz	Pass	2.48	7.59	30.00
2440MHz	Pass	2.48	7.51	30.00
2480MHz	Pass	2.48	7.36	30.00

Summary of Conducted (Average) Output Power

Mode	Power (dBm)	Power (W)
2.4-2.4835GHz	-	-
BT-LE(125kbps)	7.53	0.00566
BT-LE(500kbps)	7.53	0.00566
BT-LE(1Mbps)	7.54	0.00568
BT-LE(2Mbps)	7.53	0.00566

Result

Mode	Result	Gain (dBi)	Power (dBm)	Power Limit (dBm)
BT-LE(125kbps)	-	-	-	-
2402MHz	Pass	2.48	7.53	-
2440MHz	Pass	2.48	7.45	-
2480MHz	Pass	2.48	7.30	-
BT-LE(500kbps)	-	-	-	-
2402MHz	Pass	2.48	7.53	-
2440MHz	Pass	2.48	7.45	-
2480MHz	Pass	2.48	7.30	-
BT-LE(1Mbps)	-	-	-	-
2402MHz	Pass	2.48	7.54	-
2440MHz	Pass	2.48	7.46	-
2480MHz	Pass	2.48	7.31	-
BT-LE(2Mbps)	-	-	-	-
2402MHz	Pass	2.48	7.53	-
2440MHz	Pass	2.48	7.45	-
2480MHz	Pass	2.48	7.30	-

Note: Average power is for reference only.

3.3 Power Spectral Density

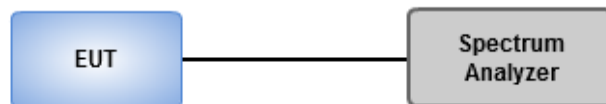
3.3.1 Limit of Power Spectral Density

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

3.3.2 Test Procedures

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.

3.3.3 Test Setup



3.3.4 Test Result of Power Spectral Density

Ambient Condition	22°C / 66%	Tested By	Aska Huang
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Test Configuration 1

Summary

Mode	PD (dBm/3kHz)
2.4-2.4835GHz	-
BT-LE(125kbps)	-46.69
BT-LE(500kbps)	-46.95
BT-LE(1Mbps)	-55.92
BT-LE(2Mbps)	-58.29

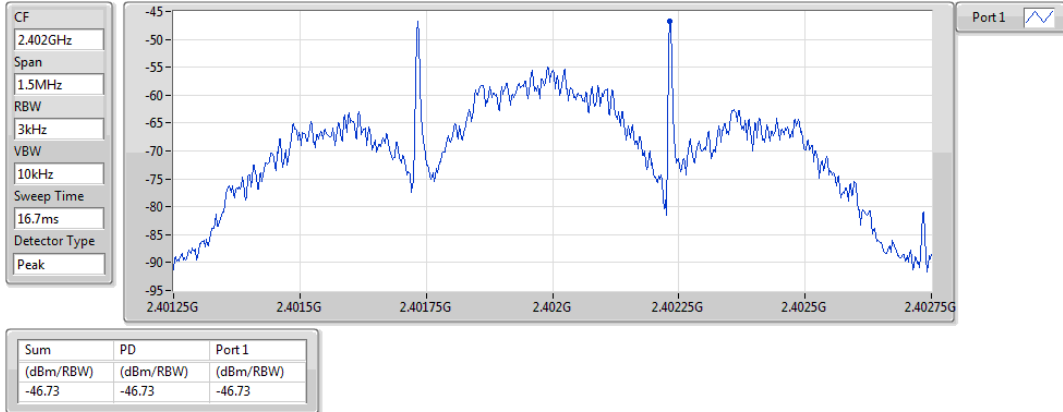
Result

Mode	Result	Gain (dBi)	PD (dBm/3kHz)	PD Limit (dBm/3kHz)
BT-LE(125kbps)	-	-	-	-
2402MHz	Pass	2.48	-46.73	8.00
2440MHz	Pass	2.48	-46.69	8.00
2480MHz	Pass	2.48	-47.37	8.00
BT-LE(500kbps)	-	-	-	-
2402MHz	Pass	2.48	-46.96	8.00
2440MHz	Pass	2.48	-46.95	8.00
2480MHz	Pass	2.48	-47.64	8.00
BT-LE(1Mbps)	-	-	-	-
2402MHz	Pass	2.48	-55.92	8.00
2440MHz	Pass	2.48	-56.01	8.00
2480MHz	Pass	2.48	-56.69	8.00
BT-LE(2Mbps)	-	-	-	-
2402MHz	Pass	2.48	-58.29	8.00
2440MHz	Pass	2.48	-58.33	8.00
2480MHz	Pass	2.48	-59.18	8.00

BT-LE(125kbps)

PSD

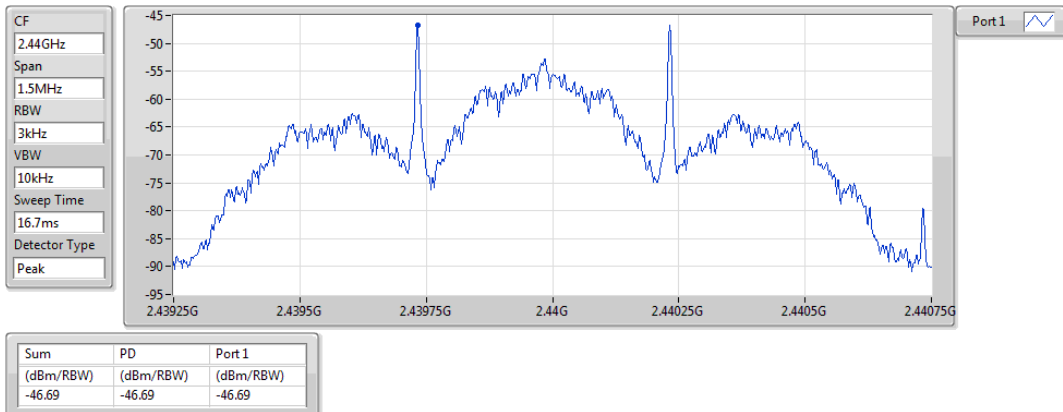
2402MHz



BT-LE(125kbps)

PSD

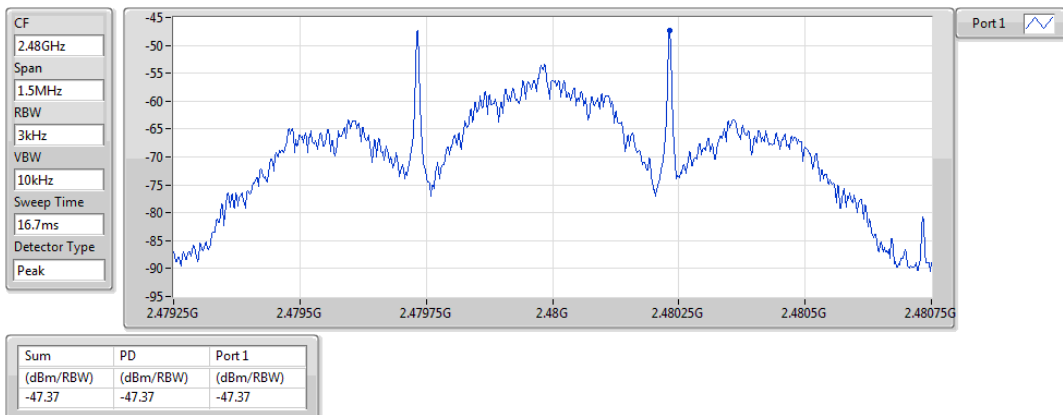
2440MHz



BT-LE(125kbps)

PSD

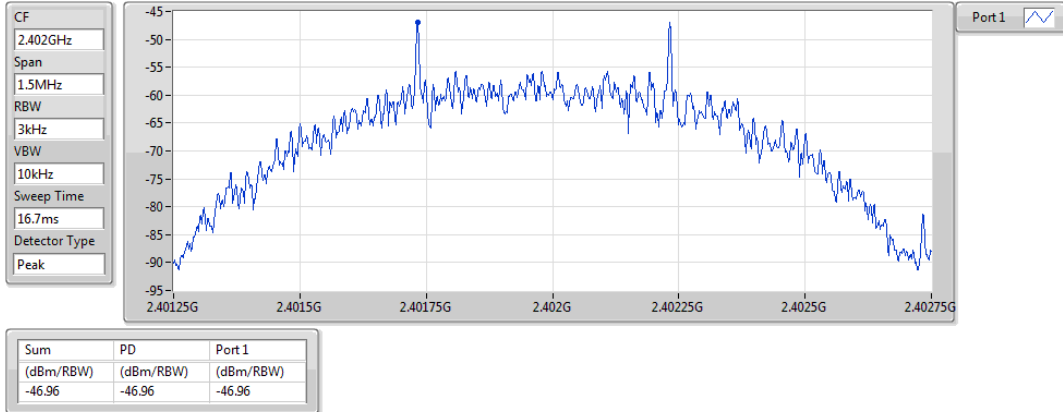
2480MHz



BT-LE(500kbps)

PSD

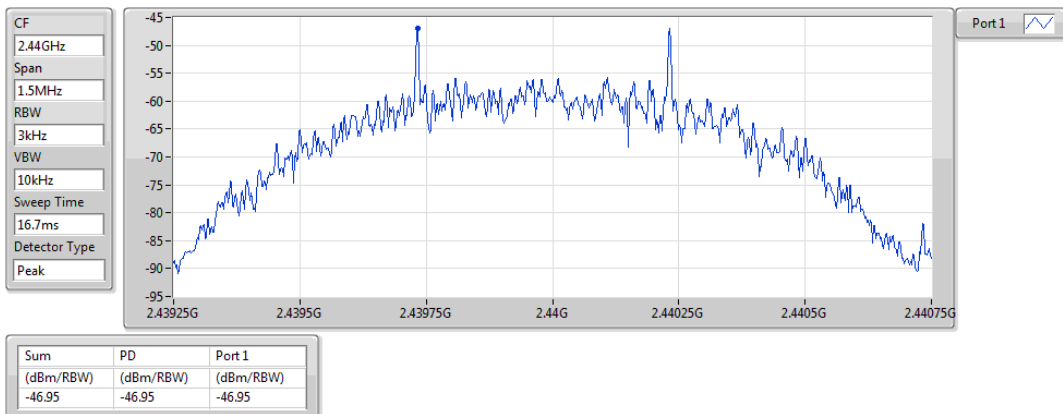
2402MHz



BT-LE(500kbps)

PSD

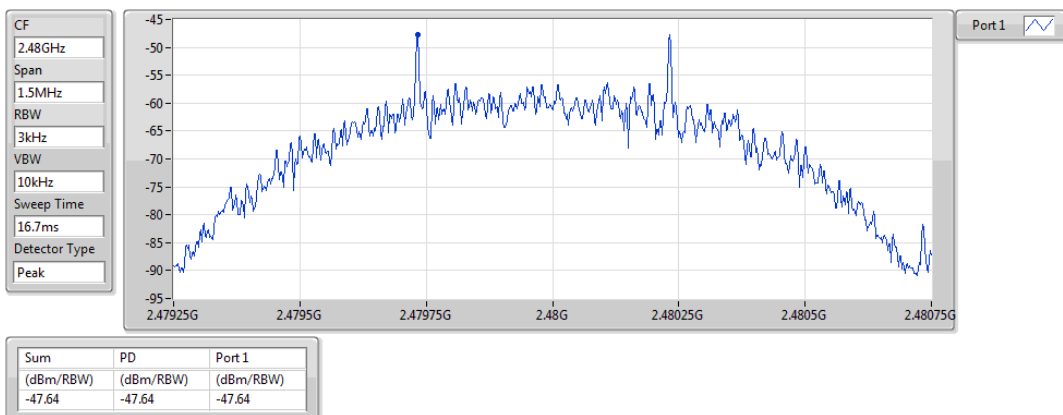
2440MHz



BT-LE(500kbps)

PSD

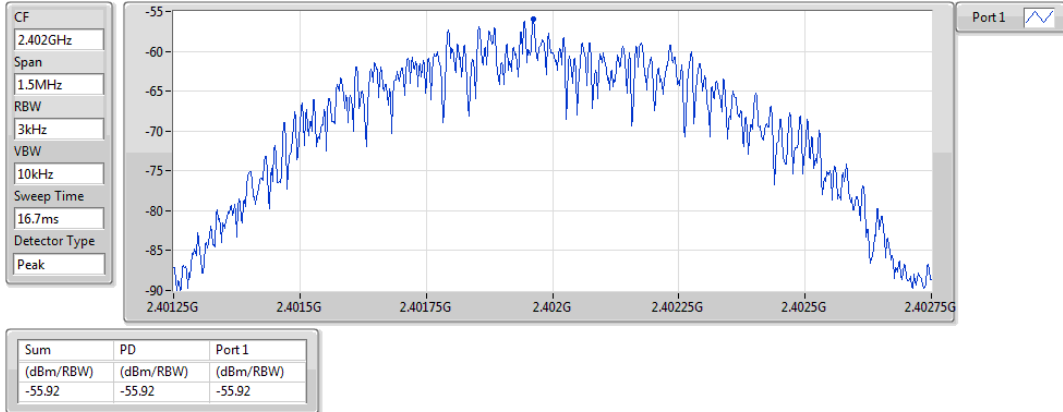
2480MHz



BT-LE(1Mbps)

PSD

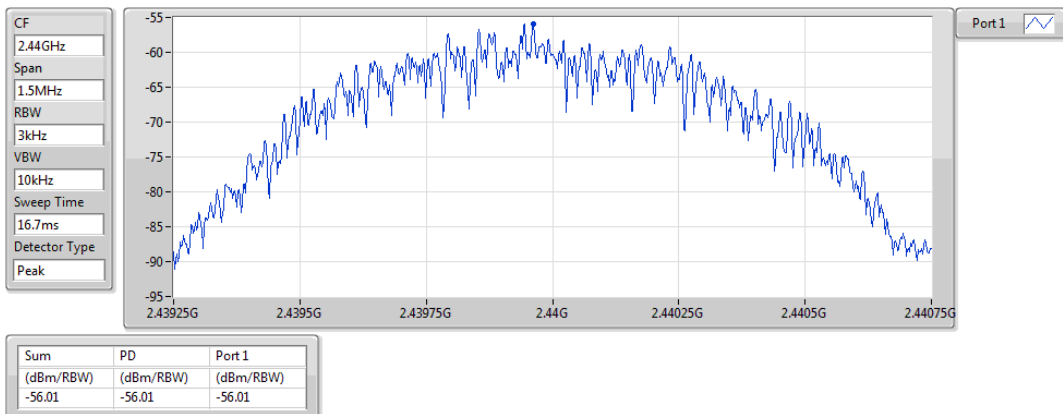
2402MHz



BT-LE(1Mbps)

PSD

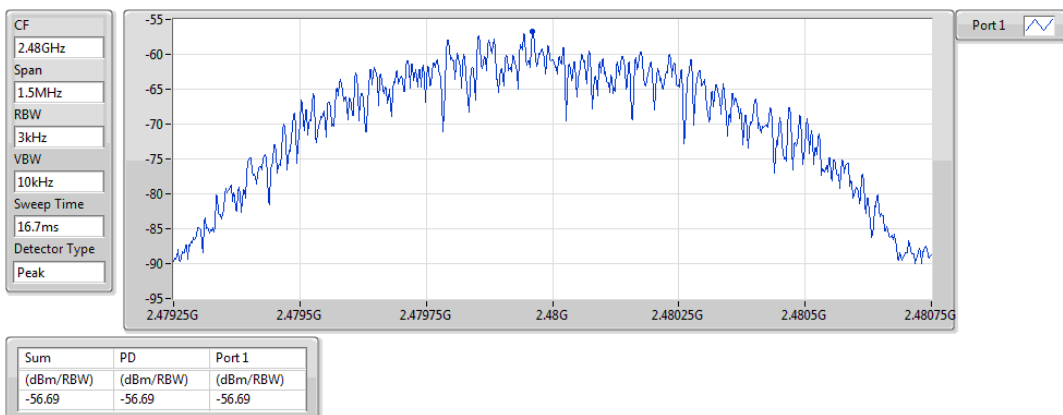
2440MHz



BT-LE(1Mbps)

PSD

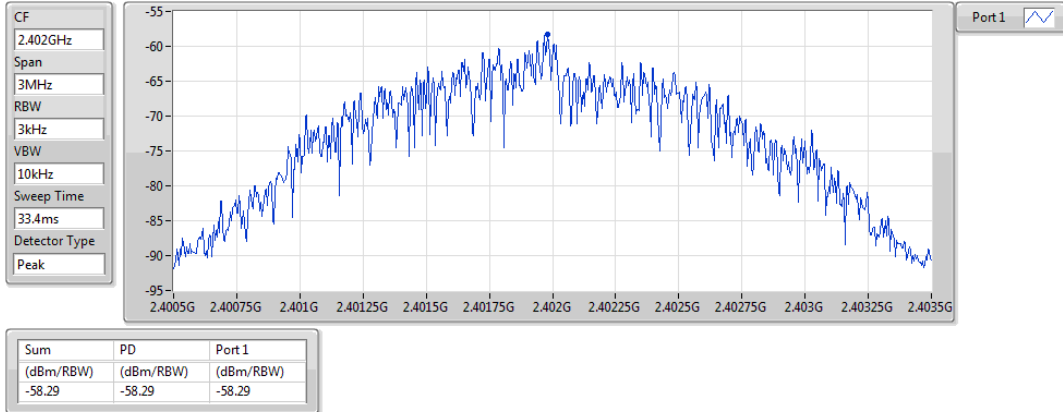
2480MHz



BT-LE(2Mbps)

PSD

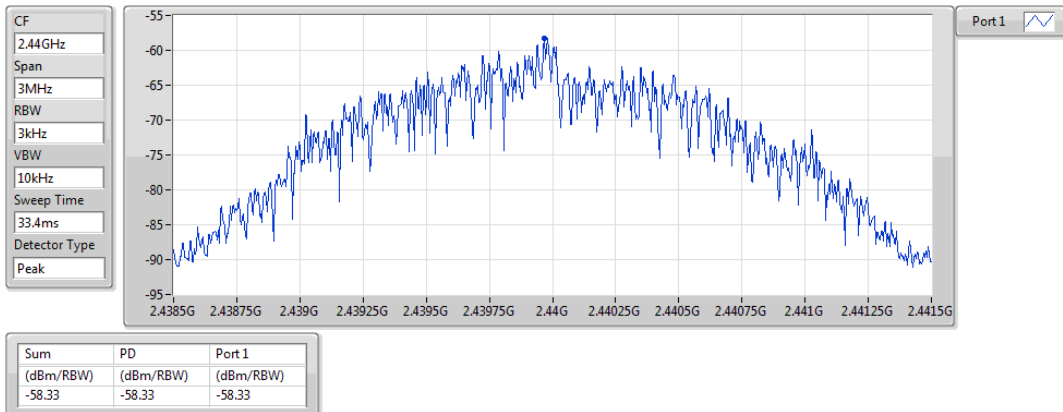
2402MHz



BT-LE(2Mbps)

PSD

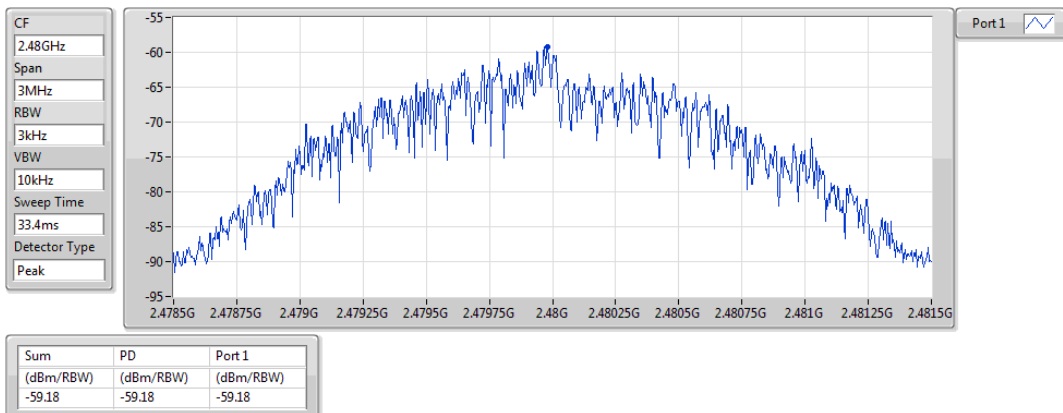
2440MHz



BT-LE(2Mbps)

PSD

2480MHz



Test Configuration 2

Summary

Mode	PD (dBm/3kHz)
2.4-2.4835GHz	-
BT-LE(125kbps)	1.21
BT-LE(500kbps)	0.97
BT-LE(1Mbps)	-7.67
BT-LE(2Mbps)	-10.36

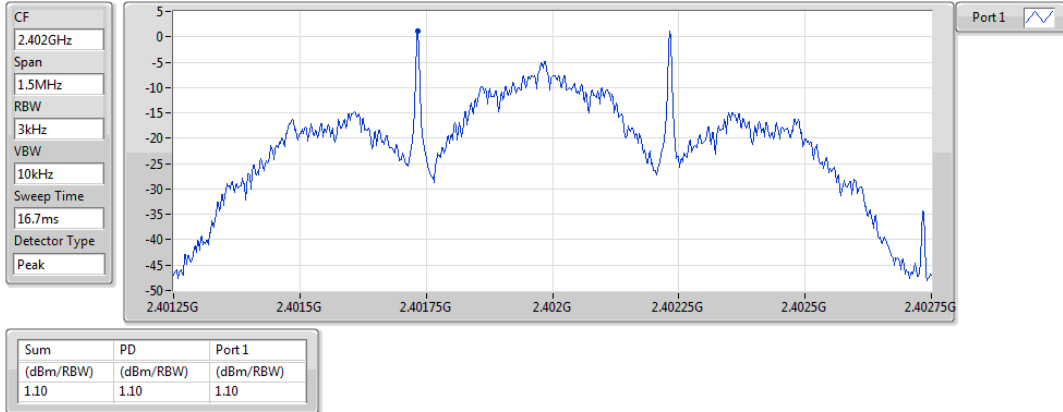
Result

Mode	Result	Gain (dBi)	PD (dBm/3kHz)	PD Limit (dBm/3kHz)
BT-LE(125kbps)	-	-	-	-
2402MHz	Pass	2.48	1.10	8.00
2440MHz	Pass	2.48	1.21	8.00
2480MHz	Pass	2.48	1.07	8.00
BT-LE(500kbps)	-	-	-	-
2402MHz	Pass	2.48	0.91	8.00
2440MHz	Pass	2.48	0.97	8.00
2480MHz	Pass	2.48	0.56	8.00
BT-LE(1Mbps)	-	-	-	-
2402MHz	Pass	2.48	-7.67	8.00
2440MHz	Pass	2.48	-8.07	8.00
2480MHz	Pass	2.48	-7.68	8.00
BT-LE(2Mbps)	-	-	-	-
2402MHz	Pass	2.48	-10.47	8.00
2440MHz	Pass	2.48	-10.36	8.00
2480MHz	Pass	2.48	-10.57	8.00

BT-LE(125kbps)

PSD

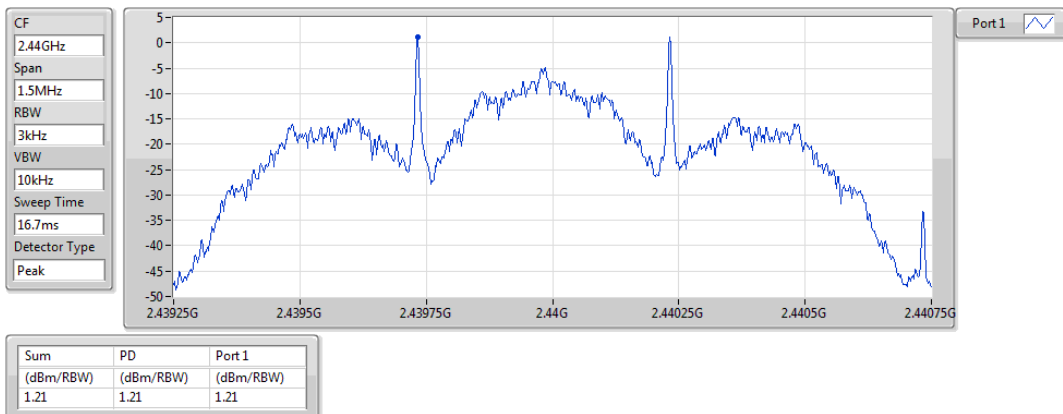
2402MHz



BT-LE(125kbps)

PSD

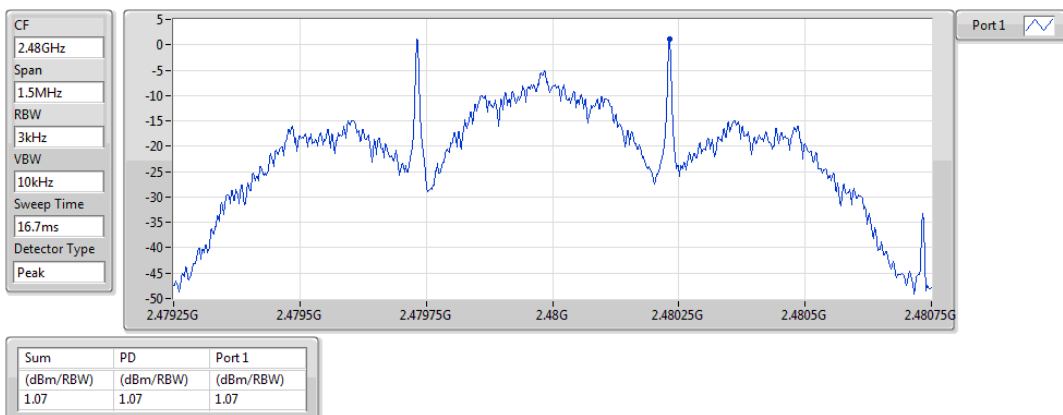
2440MHz



BT-LE(125kbps)

PSD

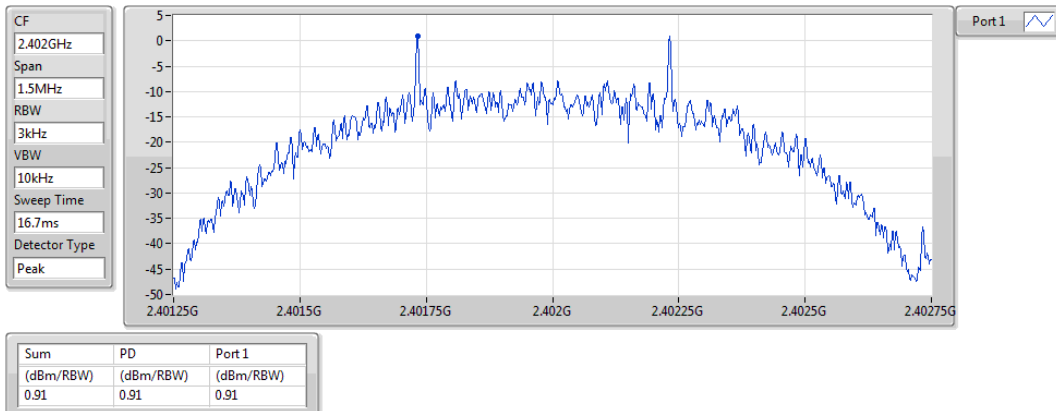
2480MHz



BT-LE(500kbps)

PSD

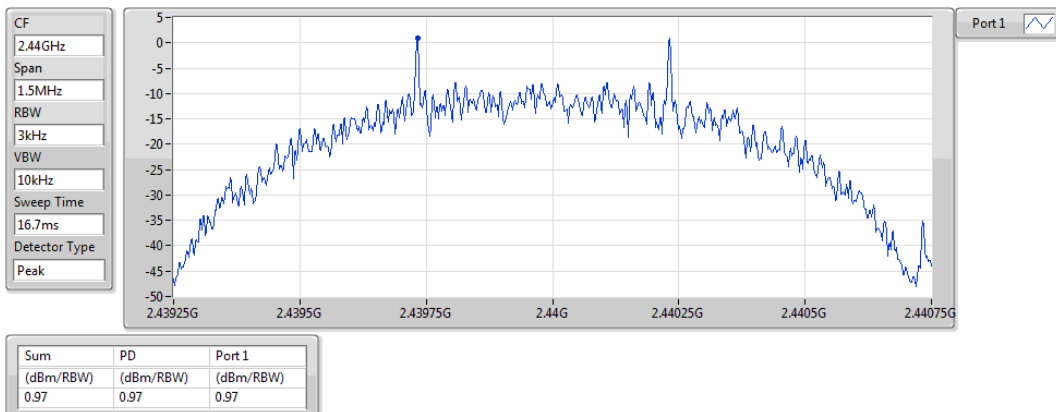
2402MHz



BT-LE(500kbps)

PSD

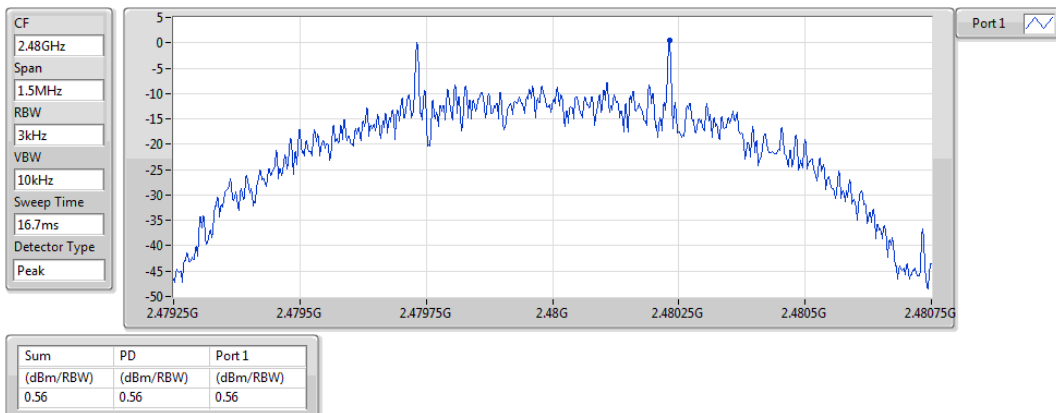
2440MHz



BT-LE(500kbps)

PSD

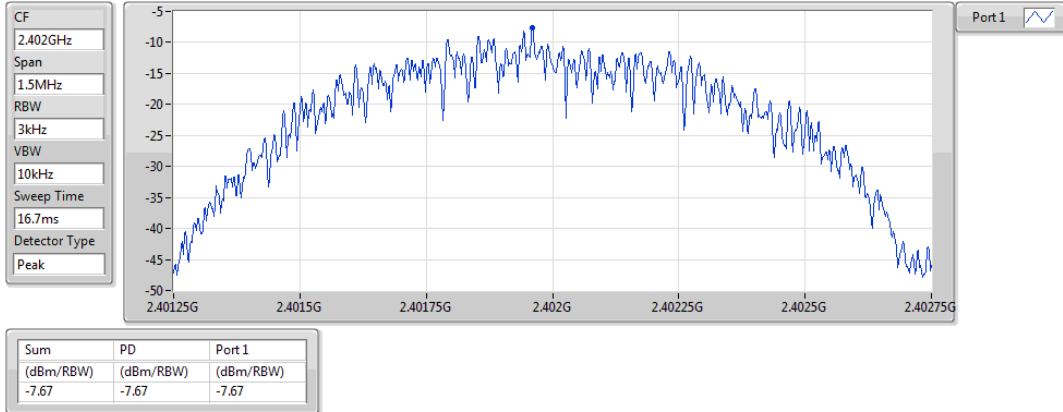
2480MHz



BT-LE(1Mbps)

PSD

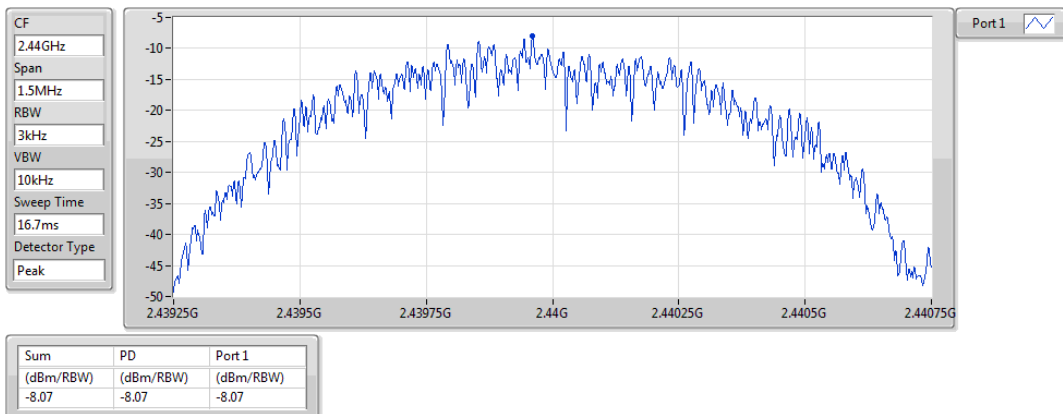
2402MHz



BT-LE(1Mbps)

PSD

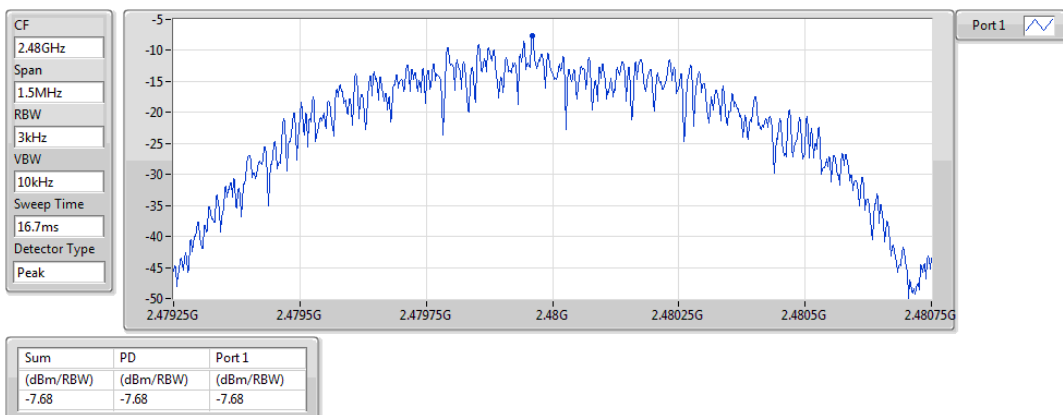
2440MHz



BT-LE(1Mbps)

PSD

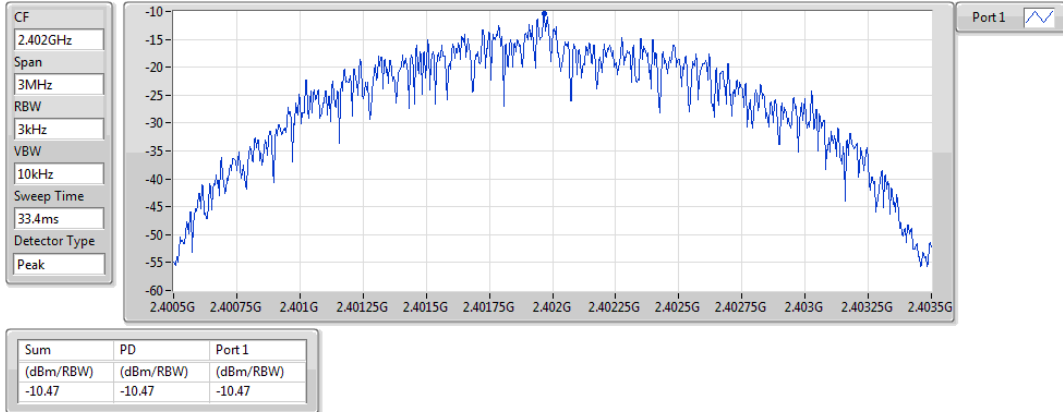
2480MHz



BT-LE(2Mbps)

PSD

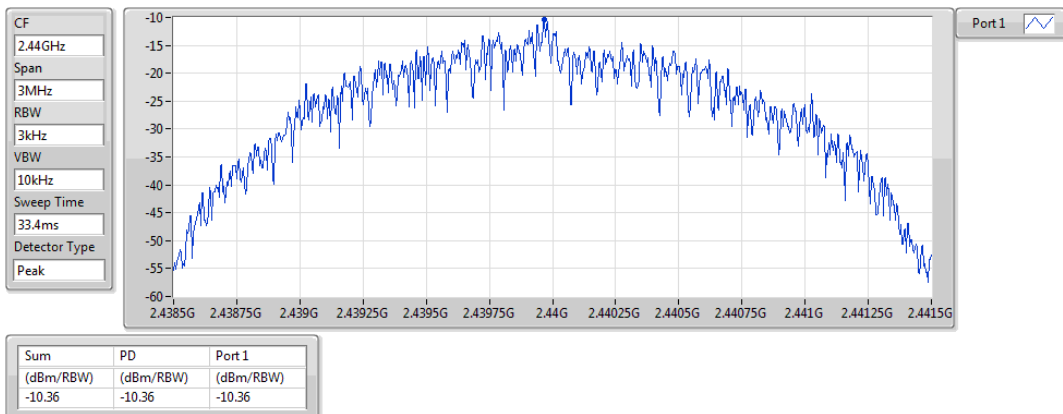
2402MHz



BT-LE(2Mbps)

PSD

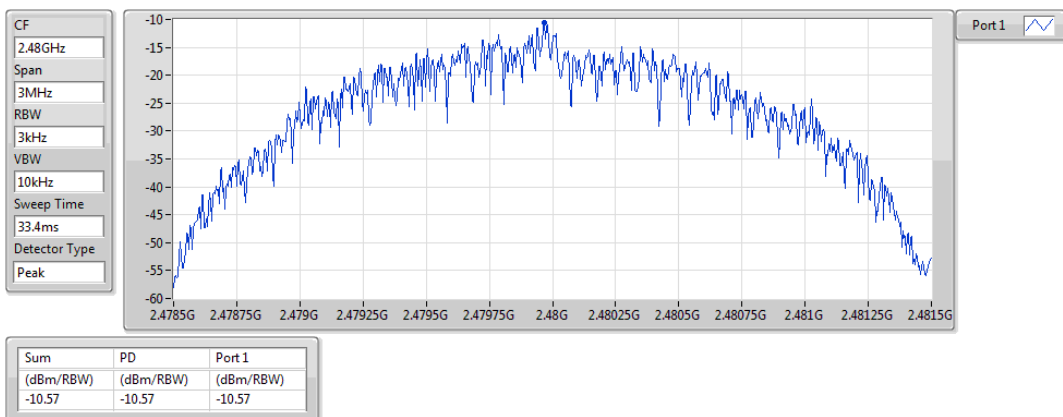
2440MHz



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:
Quasi-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

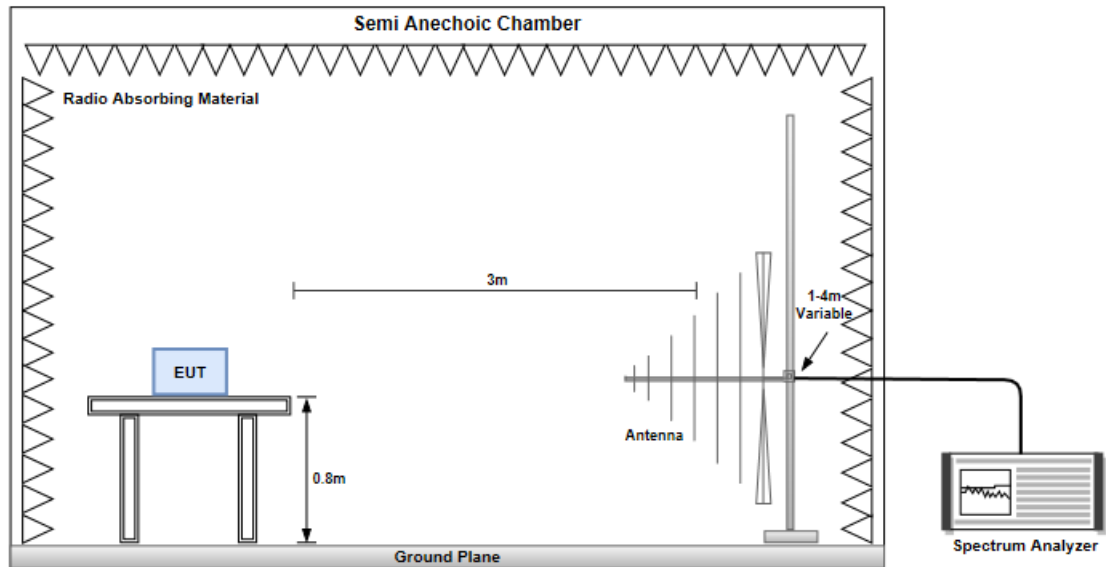
1. Measurement is made at a semi-anechoic chamber that incorporates a turntable allowing a EUT rotation of 360°. A continuously-rotating, remotely-controlled turntable is installed at the test site to support the EUT and facilitate determination of the direction of maximum radiation for each EUT emission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

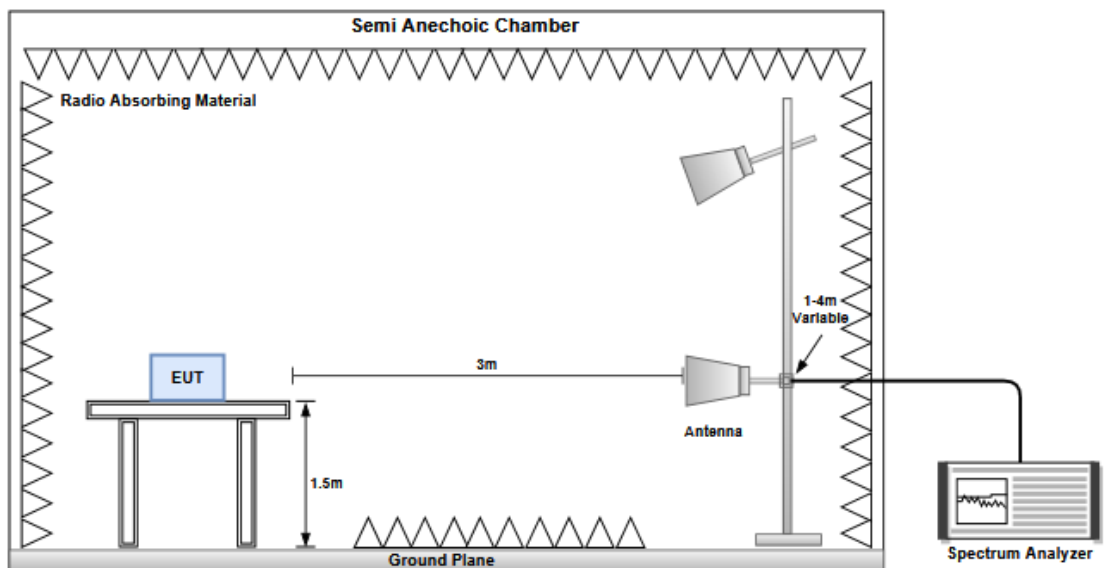
1. 120kHz measurement bandwidth of test receiver and Quasi-peak detector is for radiated emission below 1GHz.
2. RBW=1MHz, VBW=3MHz and Peak detector is for peak measured value of radiated emission above 1GHz.
3. RBW=1MHz, VBW=1/T and Peak detector is for average measured value of radiated emission above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

3.4.3 Test Setup

Radiated Emissions below 1 GHz



Radiated Emissions above 1 GHz



Test Configuration 2

3.4.4 Transmitter Radiated Unwanted Emissions (Below 1GHz)

Modulation	BT-LE (2Mbps)	Test Freq. (MHz)	2402
Polarization	Horizontal		
Test By :Roger Lu Temperature(°C):24 Humidity(%):64			
Level (dBuV/m) </			

Modulation	BT-LE (2Mbps)	Test Freq. (MHz)	2402
Polarization	Vertical		
Test By :Roger Lu Temperature(°C):24 Humidity(%):64			
Level (dBuV/m)			

3.4.5 Transmitter Radiated Unwanted Emissions (Above 1GHz)

Modulation	BT-LE (1Mbps)	Test Freq. (MHz)	2402
Polarization	Horizontal		
Test By :Roger Lu Temperature(°C):24 Humidity(%):69			
Level (dBuV/m) </			

Modulation	BT-LE (1Mbps)	Test Freq. (MHz)	2402
Polarization	Vertical		
Test By :Roger Lu Temperature(°C):24 Humidity(%):69			
Level (dBUV/m)			

Modulation	BT-LE (1Mbps)	Test Freq. (MHz)	2440
Polarization	Horizontal		
Test By :Roger Lu Temperature(°C):24 Humidity(%):69			
Level (dBuV/m)			

Modulation	BT-LE (1Mbps)	Test Freq. (MHz)	2440
Polarization	Vertical		
Test By :Roger Lu Temperature(°C):24 Humidity(%):69			
Level (dBuV/m)			

Modulation	BT-LE (1Mbps)	Test Freq. (MHz)	2480
Polarization	Horizontal		
Test By :Roger Lu Temperature(°C):24 Humidity(%):69			
Level (dBUV/m) <			

Modulation	BT-LE (1Mbps)	Test Freq. (MHz)	2480
Polarization	Vertical		
Test By :Roger Lu Temperature(°C):24 Humidity(%):69			
Level (dBuV/m)			

Modulation	BT-LE (2Mbps)	Test Freq. (MHz)	2402
Polarization	Horizontal		
Test By :Roger Lu Temperature(°C):24 Humidity(%):69			
Level (dBuV/m) </			

Modulation	BT-LE (2Mbps)	Test Freq. (MHz)	2402
Polarization	Vertical		
Test By :Roger Lu Temperature(°C):24 Humidity(%):69			
Level (dBuV/m)			

Modulation	BT-LE (2Mbps)		Test Freq. (MHz)		2440		
Polarization	Horizontal						
Test By		:Roger Lu		Temperature(°C):24		Humidity(%):69	
Level (dBuV/m)							

Modulation	BT-LE (2Mbps)	Test Freq. (MHz)	2440
Polarization	Vertical		
Test By :Roger Lu Temperature(°C):24 Humidity(%):69			
Level (dBuV/m) <			

Modulation	BT-LE (2Mbps)	Test Freq. (MHz)	2480
Polarization	Horizontal		
Test By :Roger Lu Temperature(°C):24 Humidity(%):69			
Level (dBUV/m) </			

Modulation	BT-LE (2Mbps)	Test Freq. (MHz)	2480
Polarization	Vertical		
Test By :Roger Lu Temperature(°C):24 Humidity(%):69			
Level (dBUV/m)			

Test Configuration 3

3.4.6 Transmitter Radiated Unwanted Emissions (Below 1GHz)

Modulation	BT-LE (2Mbps)	Test Freq. (MHz)	2402
Polarization	Horizontal		
Test By :Roger Lu Temperature(°C):25 Humidity(%):61			
Level (dBuV/m) <			

Modulation	BT-LE (2Mbps)	Test Freq. (MHz)	2402
Polarization	Vertical		
Test By :Roger Lu Temperature(°C):25 Humidity(%):61			
Level (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

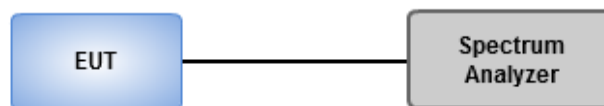
Reference level measurement

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

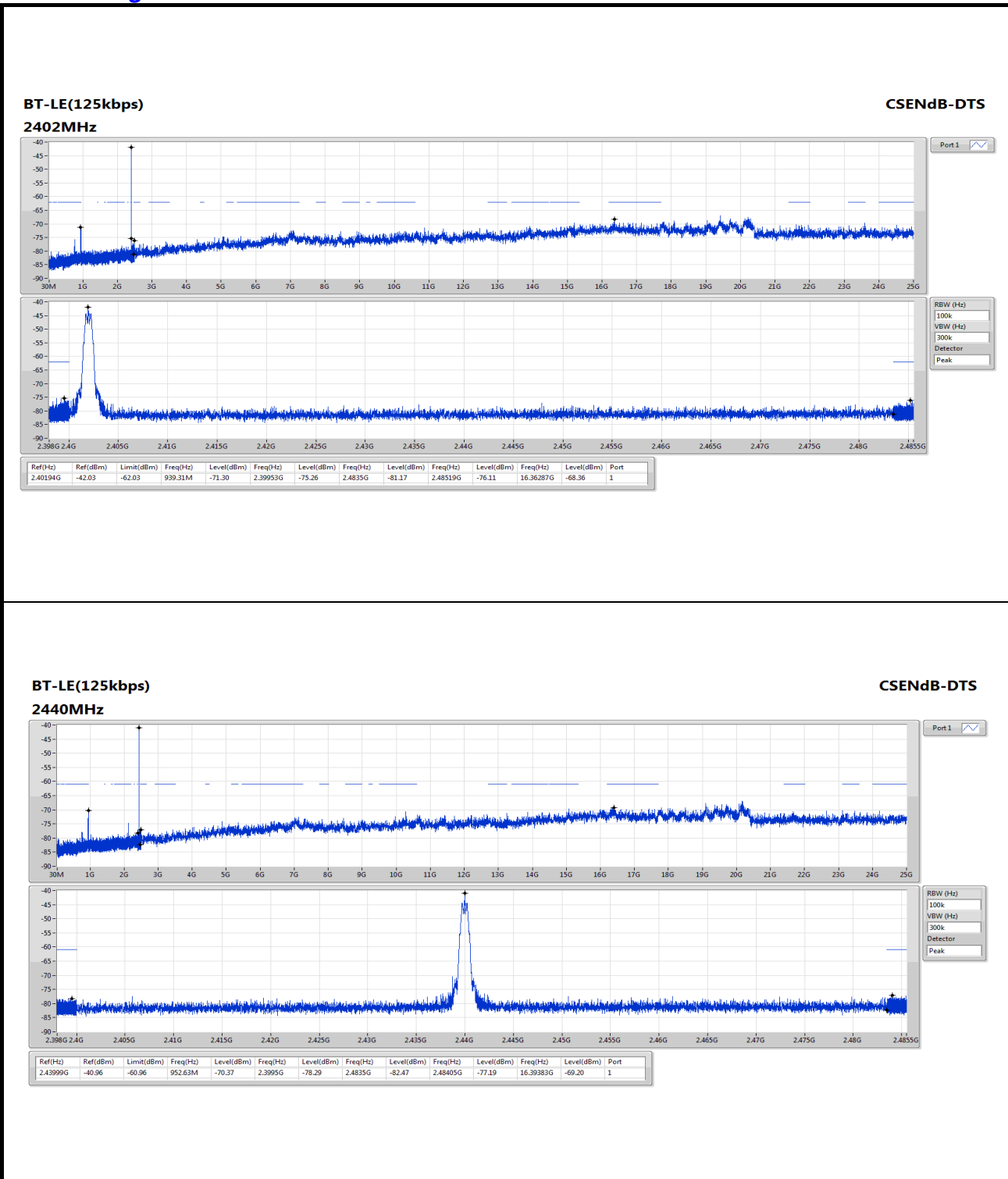
3.5.3 Test Setup



3.5.4 Test Result of Emissions in non-restricted Frequency Bands

Ambient Condition	22°C / 66%	Tested By	Aska Huang
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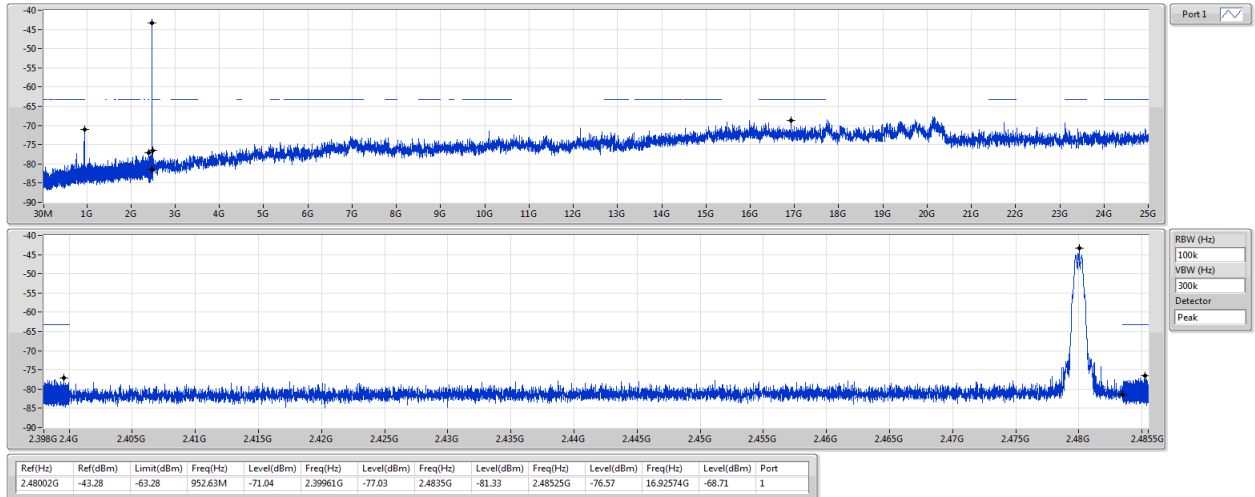
Test Configuration 1



BT-LE(125kbps)

CSEndB-DTS

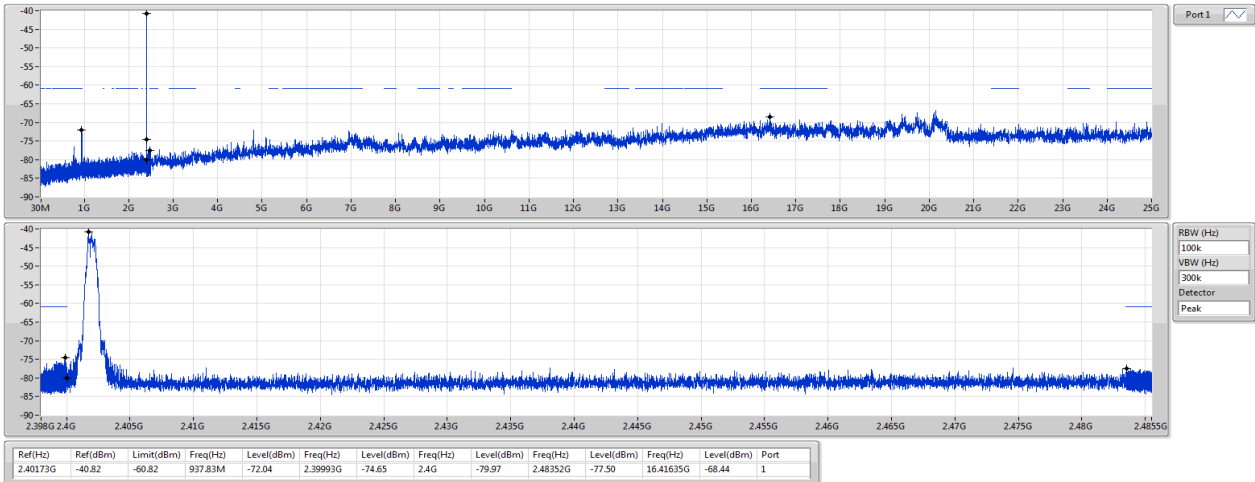
2480MHz



BT-LE(500kbps)

CSEndB-DTS

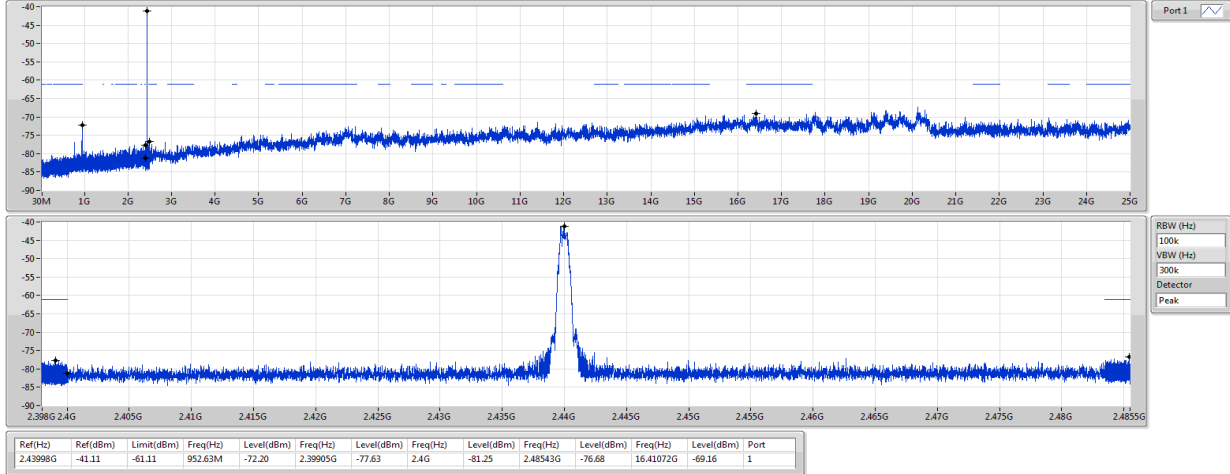
2402MHz



BT-LE(500kbps)

CSEndB-DTS

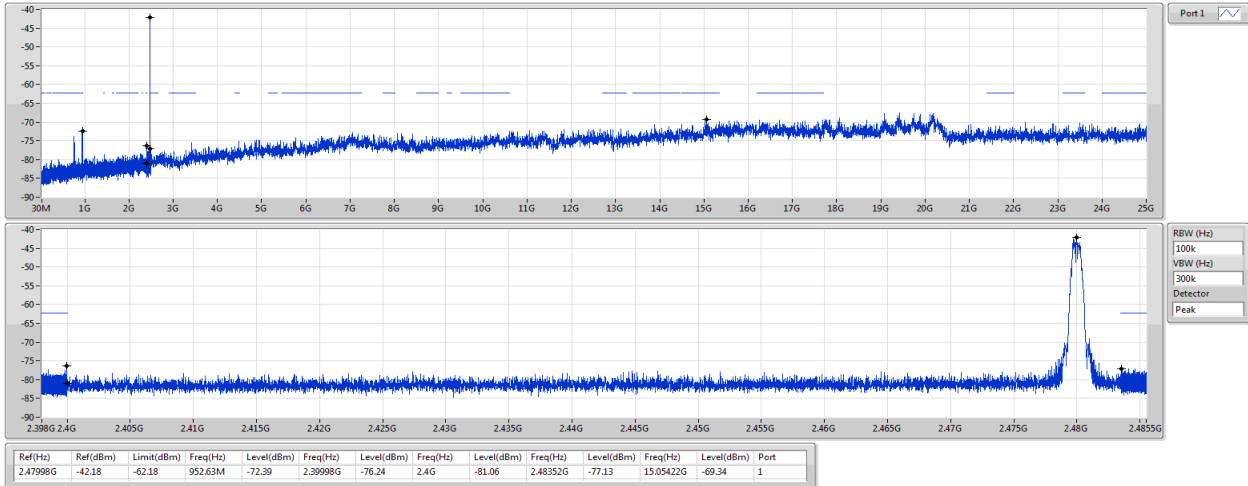
2440MHz



BT-LE(500kbps)

CSEndB-DTS

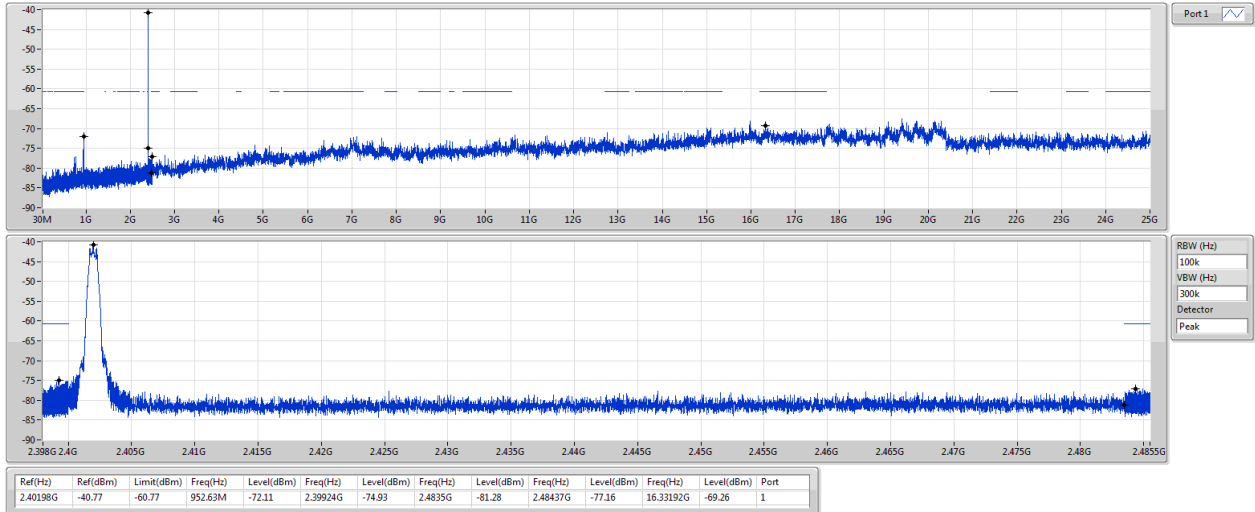
2480MHz



BT-LE(1Mbps)

CSEndB-DTS

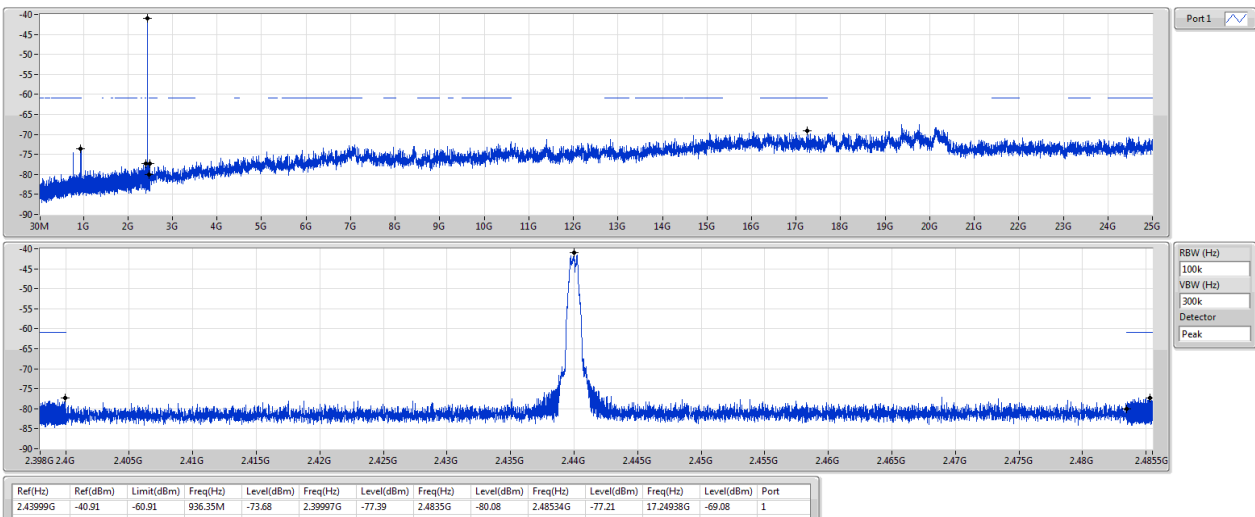
2402MHz



BT-LE(1Mbps)

CSEndB-DTS

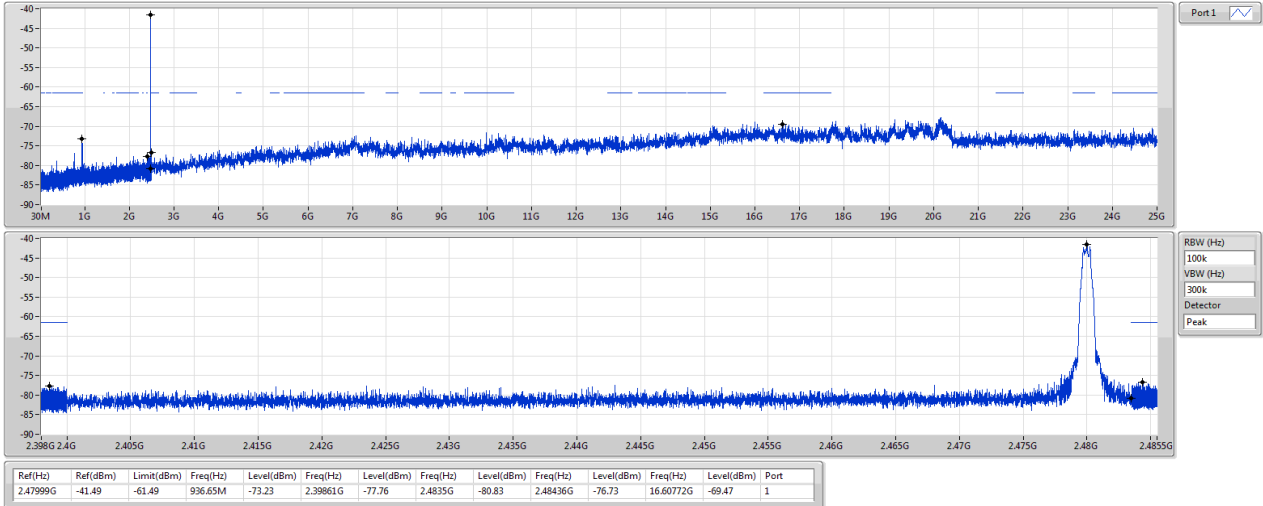
2440MHz



BT-LE(1Mbps)

CSEndB-DTS

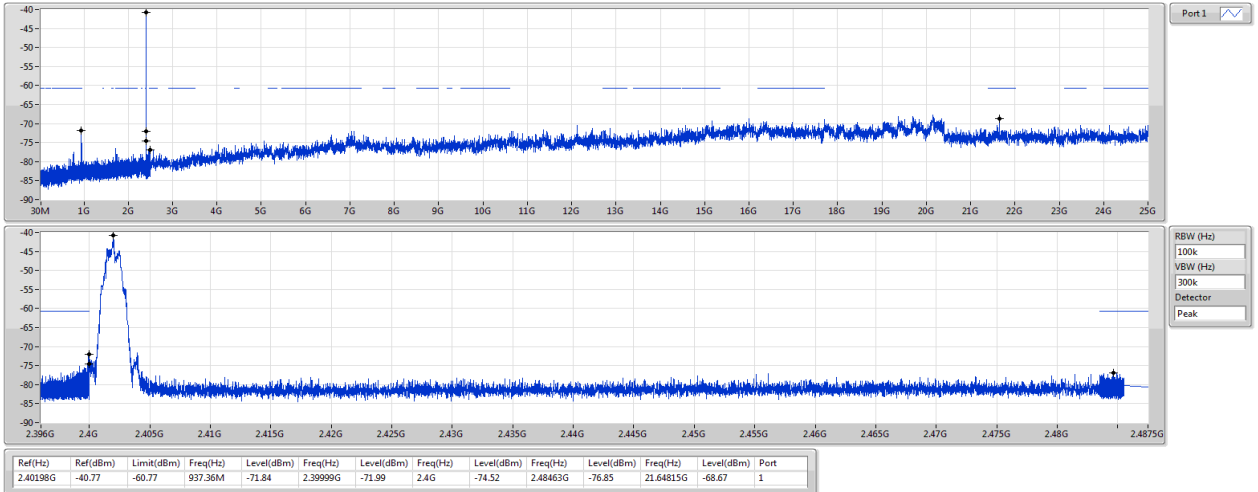
2480MHz



BT-LE(2Mbps)

CSEndB-DTS

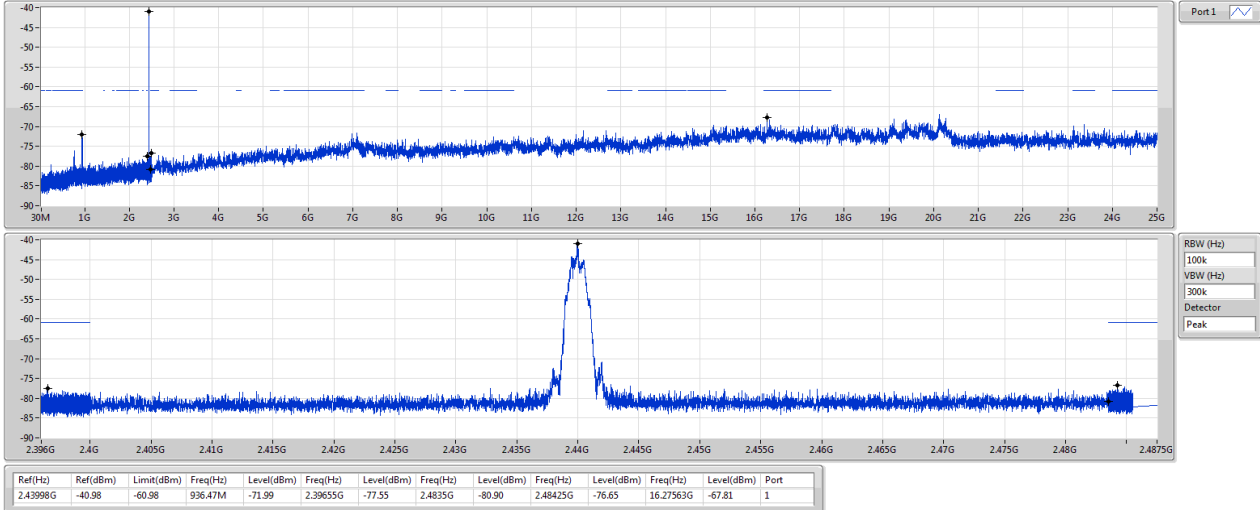
2402MHz



BT-LE(2Mbps)

CSEndB-DTS

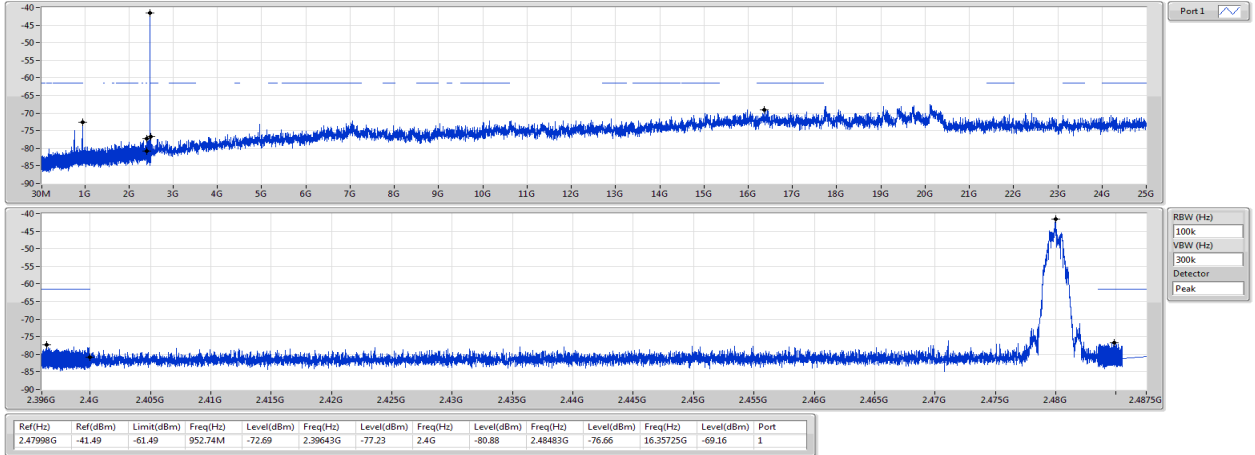
2440MHz



BT-LE(2Mbps)

CSEndB-DTS

2480MHz

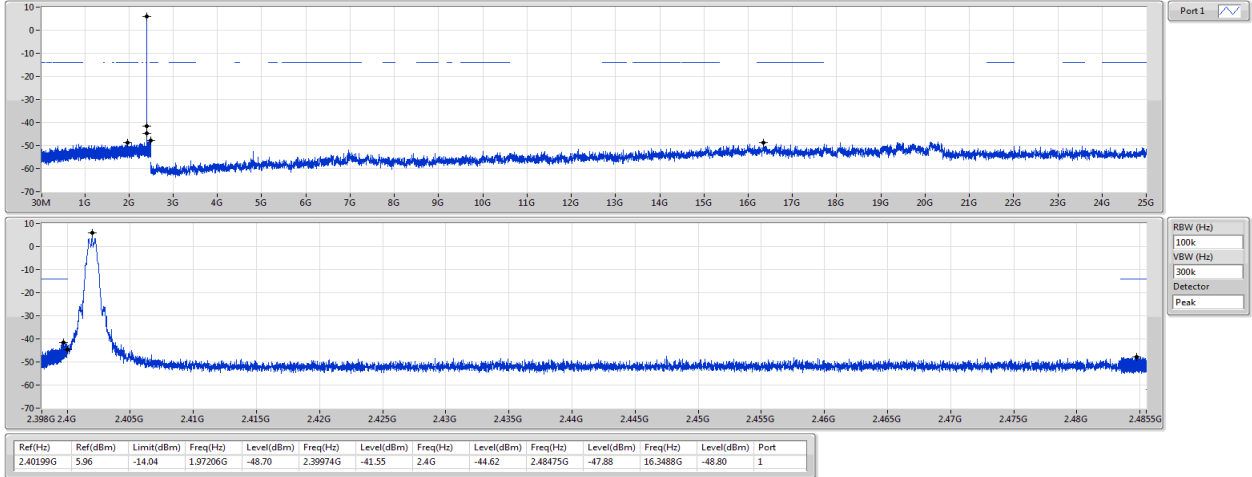


Test Configuration 2

BT-LE(125kbps)

CSEndB-DTS

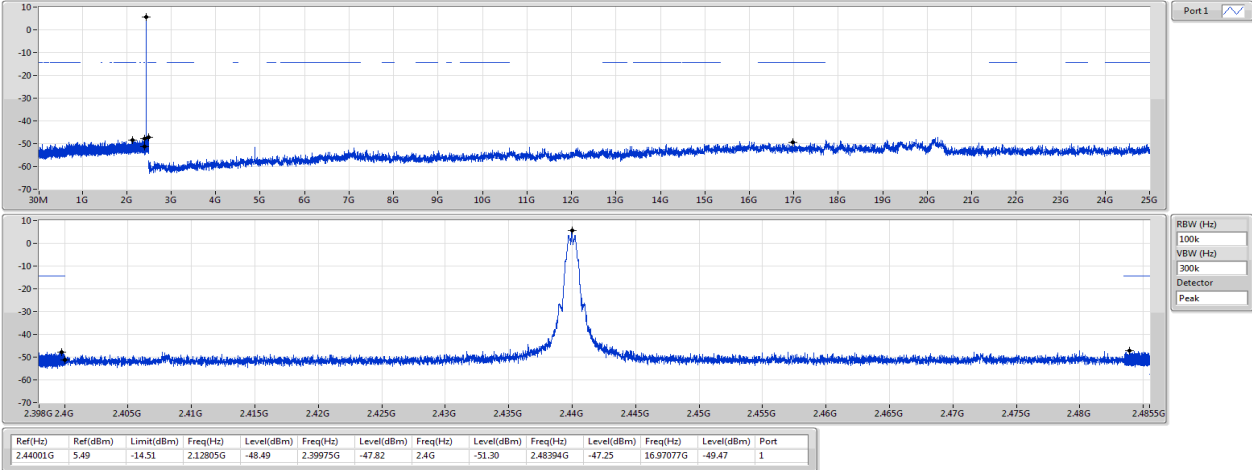
2402MHz



BT-LE(125kbps)

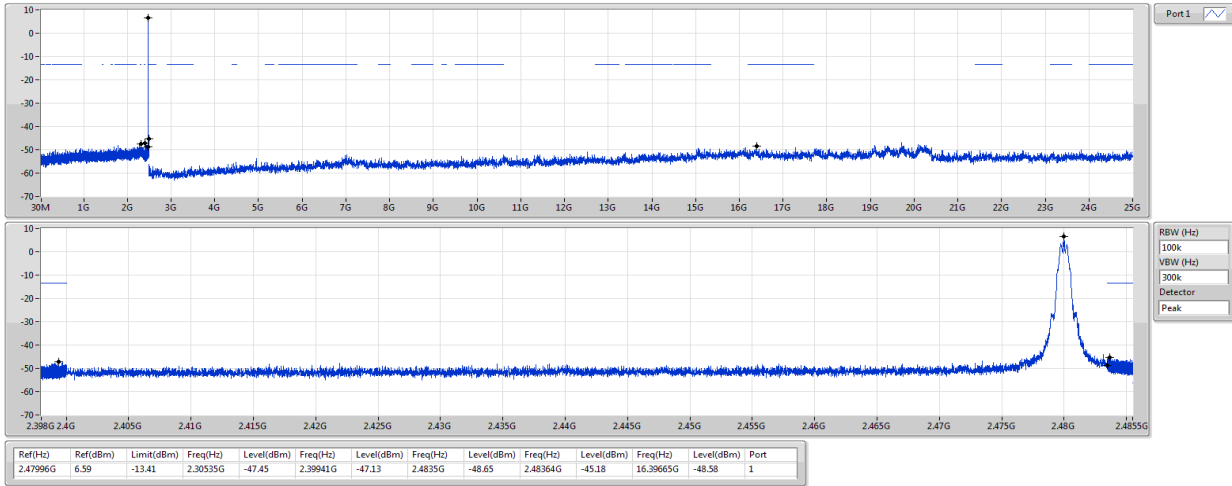
CSEndB-DTS

2440MHz



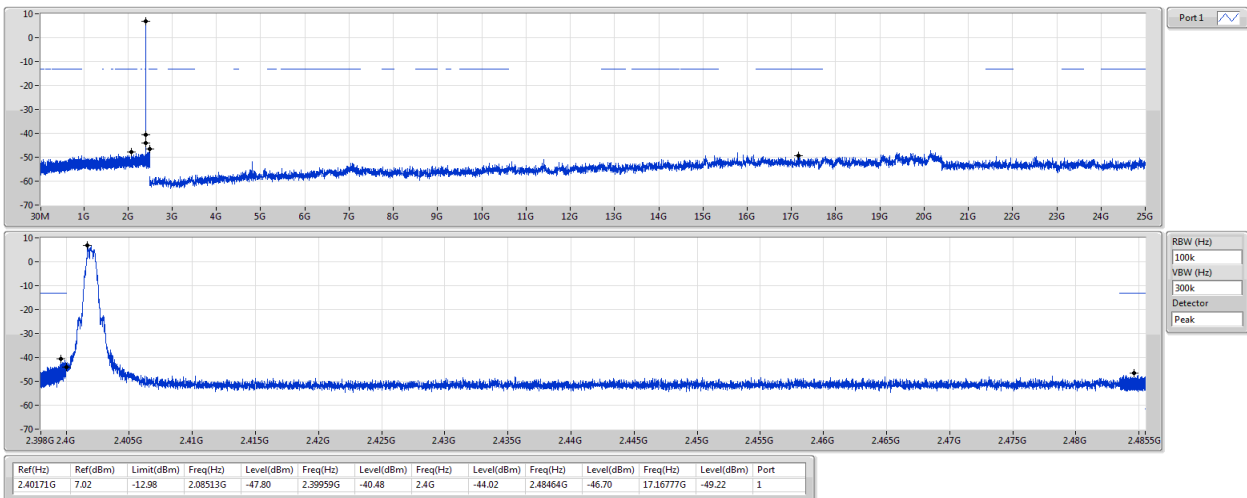
BT-LE(125kbps)
2480MHz

CSENdB-DTS



BT-LE(500kbps)
2402MHz

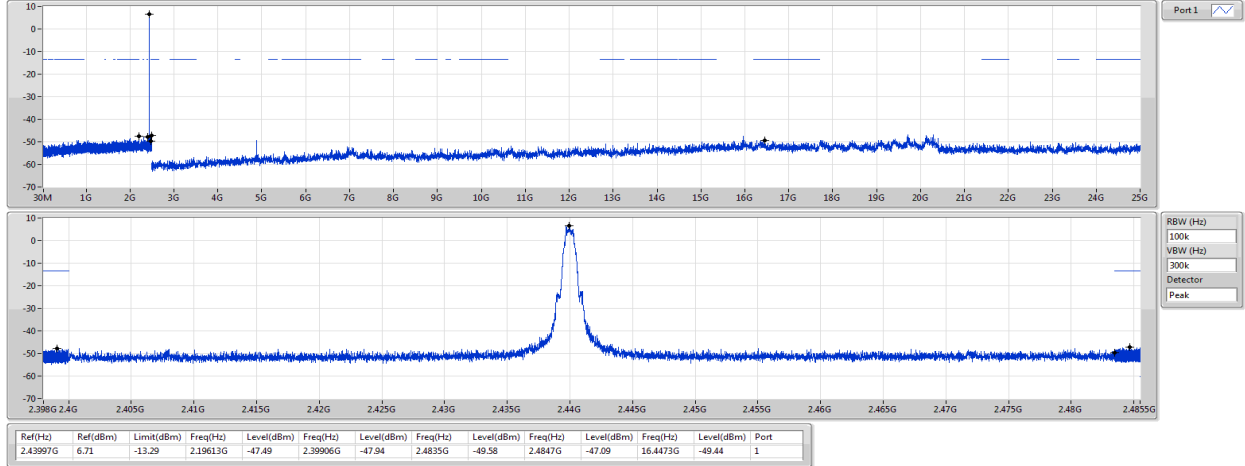
CSENdB-DTS



BT-LE(500kbps)

CSEndB-DTS

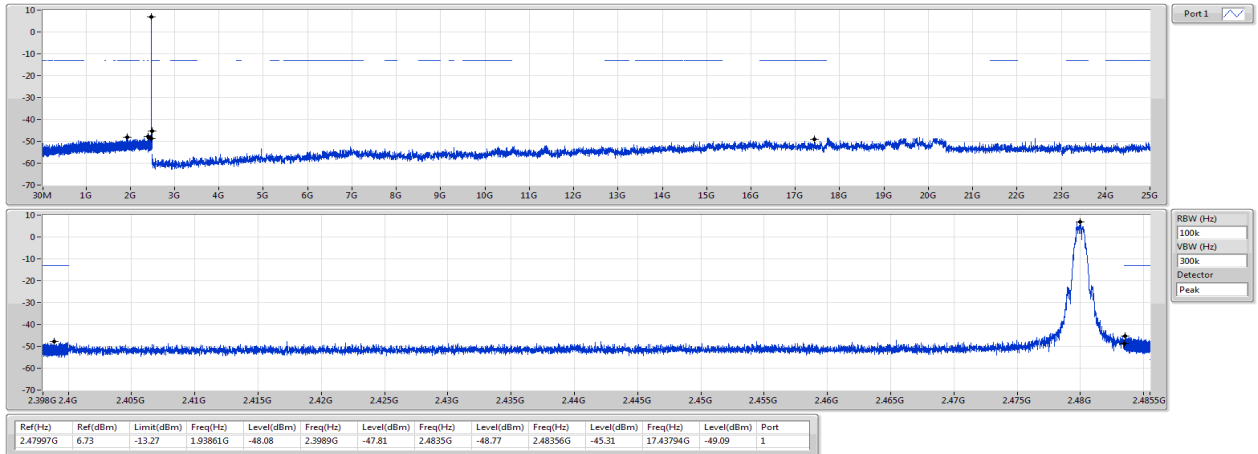
2440MHz



BT-LE(500kbps)

CSEndB-DTS

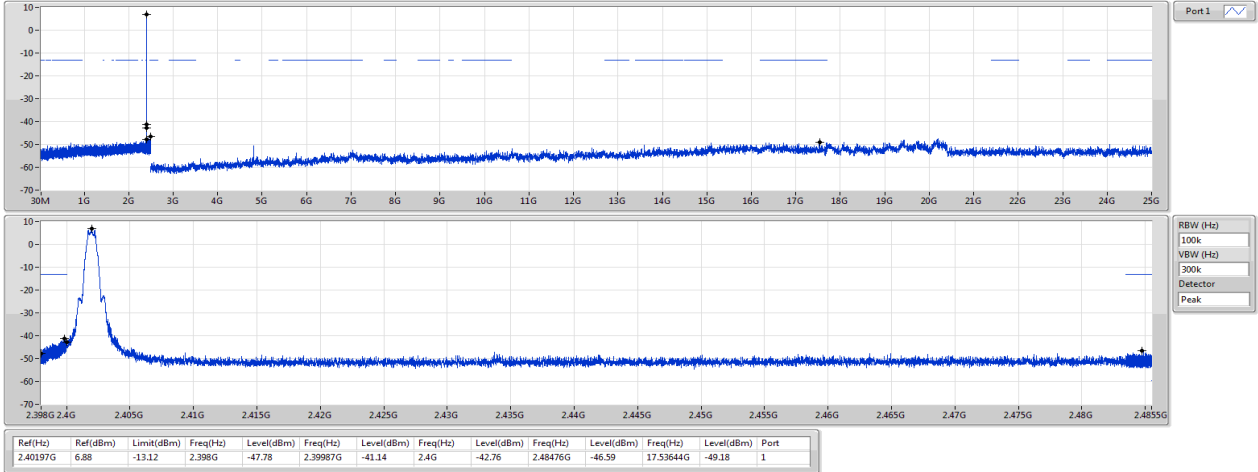
2480MHz



BT-LE(1Mbps)

CSEndB-DTS

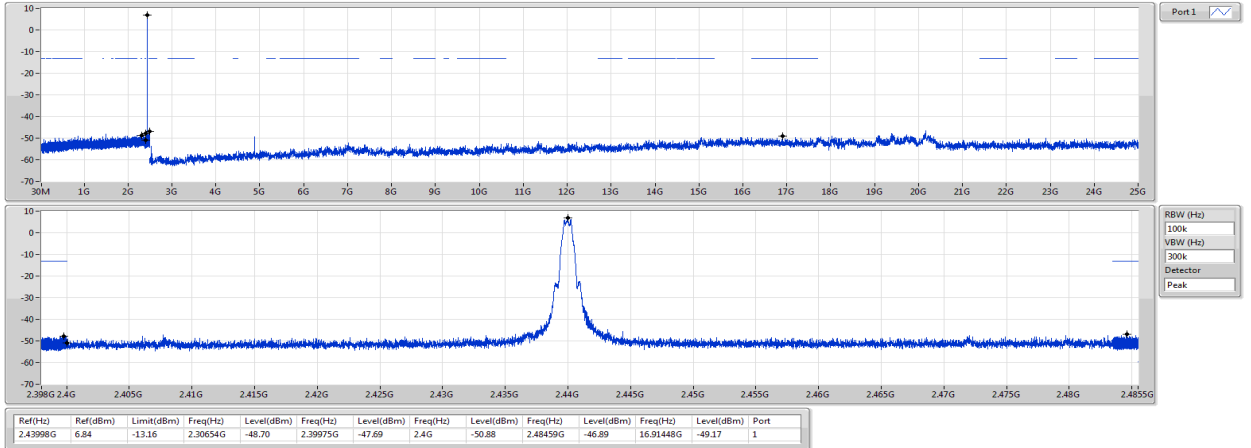
2402MHz



BT-LE(1Mbps)

CSEndB-DTS

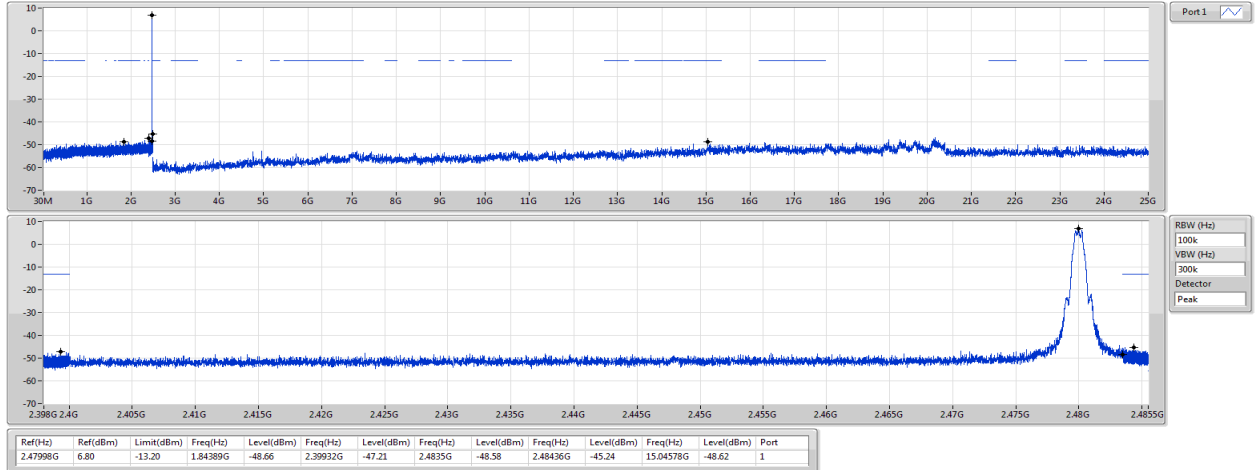
2440MHz



BT-LE(1Mbps)

CSEndB-DTS

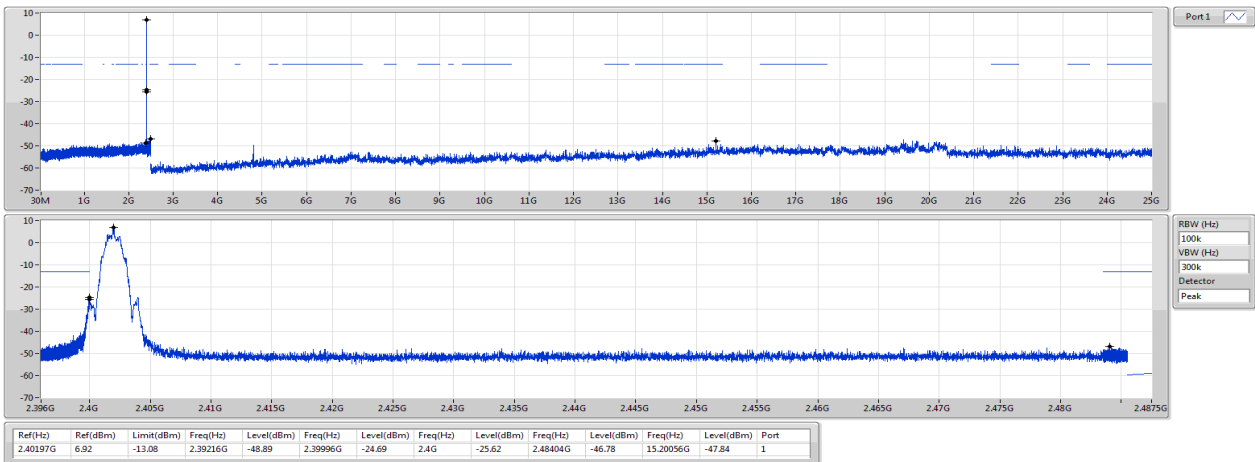
2480MHz



BT-LE(2Mbps)

CSEndB-DTS

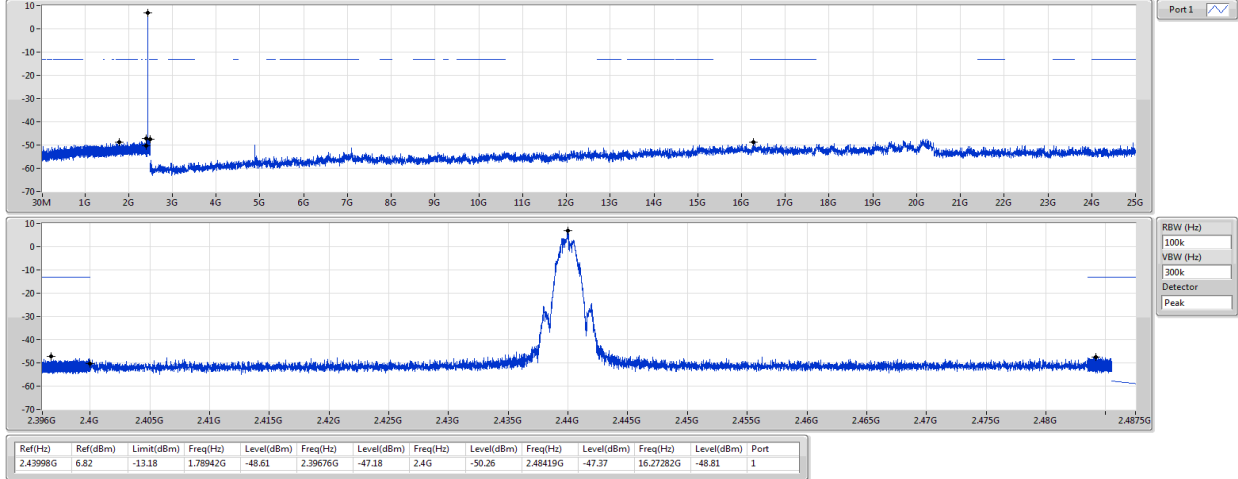
2402MHz



BT-LE(2Mbps)

CSENdB-DTS

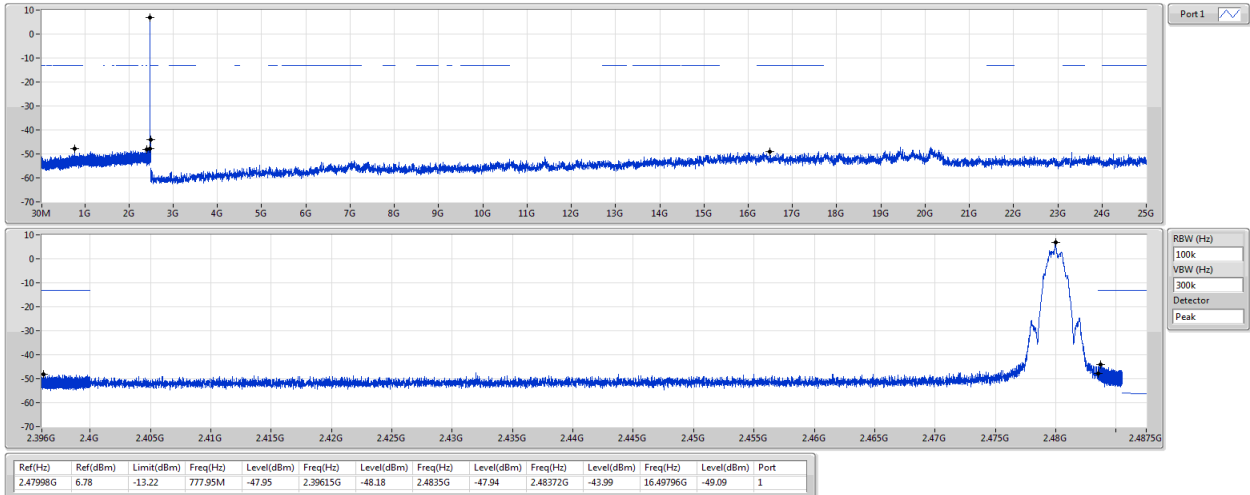
2440MHz



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 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

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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

==END==