

FCC Test Report

FCC ID : 2AXXQMLBADA
Equipment : Location Bridge
Model No. : MLB-AD-A
Brand Name : MACHINEQ
Applicant : Humax Networks, INC.
Address : 216, Hwangsaеul-ro, Bundang-gu,
Seongnam-si, South Korea
Standard : 47 CFR FCC Part 15.247
Received Date : Dec. 28, 2020
Tested Date : Jan. 21 ~ Jan. 26, 2021

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
FR0D2803AE	Rev. 01	Initial issue	Feb. 03, 2021

Summary of Test Results

FCC Rules	Test Items	Measured	Result
15.207	AC Power Line Conducted Emissions	[dBuV]: 0.165MHz 61.95 (Margin -3.26dB) - QP	Pass
15.247(d) 15.209	Radiated Emissions	[dBuV/m at 3m]: 30.36MHz 35.63 (Margin -4.37dB) - PK	Pass
15.247(b)(3)	Maximum Output Power	Power [dBm]: 1.21	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

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	DIPOLE	MHF IPEX	6.14	V02
2	DIPOLE	MHF IPEX	6.96	V03

1.1.3 Power Supply Type of Equipment under Test (EUT)

Power Supply Type	55Vdc from PoE 5Vdc from USB adapter
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1.1.4 Accessories

N/A

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: 4.8	
Modulation Mode	Duty Cycle Of Test Signal (%)	Duty Factor (dB)
GFSK-125kbps	100.00%	0.00
GFSK-500kbps	100.00%	0.00
GFSK-1Mbps	100.00%	0.00
GFSK-2Mbps	100.00%	0.00

1.1.7 Power Index of Test Tool

Modulation Mode	Test Frequency (MHz)		
	2402	2440	2480
GFSK/125kbps	0	0	0
GFSK/500kbps	0	0	0
GFSK/1Mbps	0	0	0
GFSK/2Mbps	0	0	0

1.2 Local Support Equipment List

POE Mode

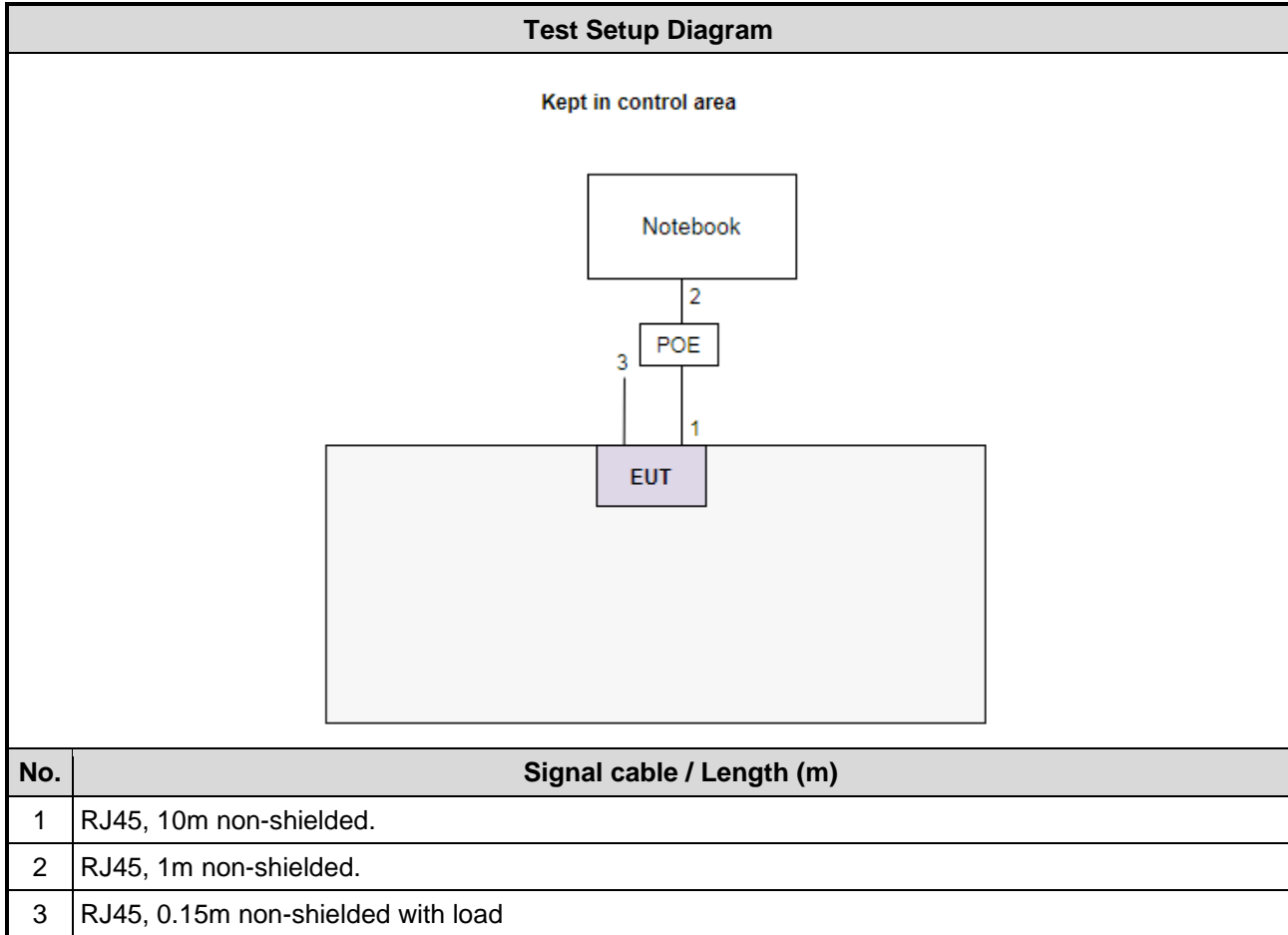
Support Equipment List					
No.	Equipment	Brand	Model	FCC ID	Remarks
1	RJ45	ICC	RJ45-10m	---	---
2	RJ45	ICC	RJ45-1m	---	---
3	RJ45	---	---	---	Provided by applicant.
4	Notebook	DELL	Latitude E5470	DoC	---
5	USB cable	---	---	---	Provided by applicant.
6	Fixture	---	HLCB_V00	---	Provided by applicant.
7	POE	Microsemi	PD-9001GR/AC	---	Provided by applicant.

Adapter Mode

Support Equipment List					
No.	Equipment	Brand	Model	FCC ID	Remarks
1	RJ45	ICC	RJ45-10m	---	---
2	RJ45	---	---	---	Provided by applicant.
3	Notebook	DELL	Latitude E5470	DoC	---
4	USB Cable	I-Gota	micro to A	---	---
5	Adapter	Samsung	ETA-U90JWS	---	---
6	USB cable	---	---	---	Provided by applicant.
7	Fixture	---	HLCB_V00	---	Provided by applicant.

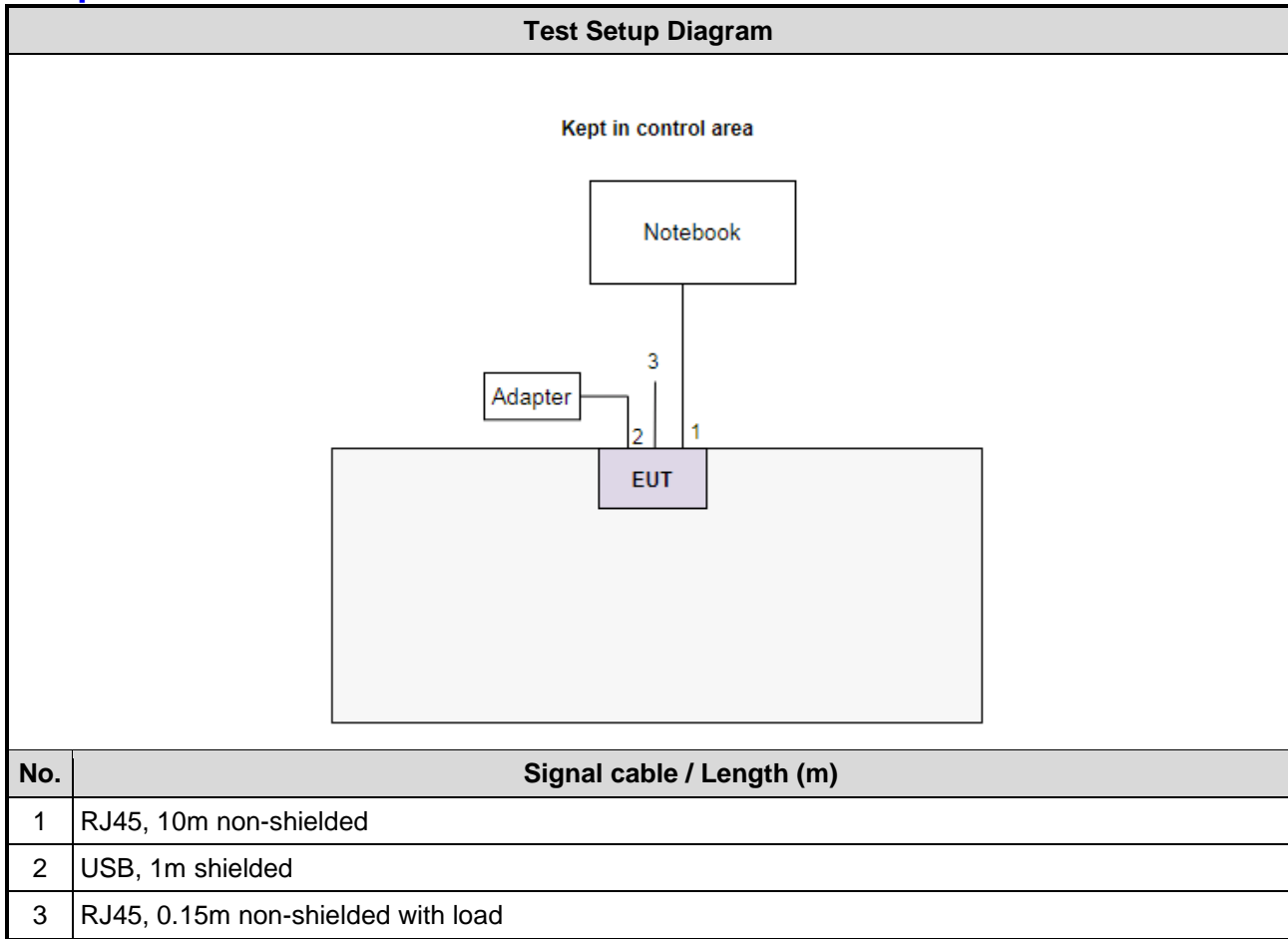
1.3 Test Setup Chart

POE Mode



Note: The USB cable and fixture are disconnected from EUT and removed from test table when EUT is set to transmit continuously.

Adapter Mode



Note: The USB cable and fixture are disconnected from EUT and removed from test table when EUT is set to transmit continuously.

1.4 Test Equipment List and Calibration Data

Test Item	Conducted Emission				
Test Site	Conduction room 1 / (CO01-WS)				
Instrument	Brand	Model No.	Serial No.	Calibration Date	Calibration Until
Receiver	R&S	ESR3	101657	Feb. 14, 2020	Feb. 13, 2021
LISN	R&S	ENV216	101579	Mar. 12, 2020	Mar. 11, 2021
RF Cable-CON	Woken	CFD200-NL	CFD200-NL-001	Oct. 21, 2020	Oct. 20, 2021
Measurement Software	AUDIX	e3	6.120210k	NA	NA

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

Test Item	Radiated Emission				
Test Site	966 chamber1 / (03CH01-WS)				
Instrument	Brand	Model No.	Serial No.	Calibration Date	Calibration Until
Spectrum Analyzer	R&S	FSV40	101498	Dec. 04, 2020	Dec. 03, 2021
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. 11, 2020	Dec. 10, 2021
Horn Antenna 18G-40G	SCHWARZBECK	BBHA 9170	BBHA 9170517	Nov. 06, 2020	Nov. 05, 2021
Loop Antenna	R&S	HFH2-Z2	100330	Nov. 17, 2020	Nov. 16, 2021
Loop Antenna Cable	KOAX KABEL	101354-BW	101354-BW	Oct. 06, 2020	Oct. 05, 2021
Preamplifier	EMC	EMC02325	980225	Jul. 03, 2020	Jul. 02, 2021
Preamplifier	Agilent	83017A	MY39501308	Sep. 26, 2020	Sep. 25, 2021
Preamplifier	EMC	EMC184045B	980192	Jul. 21, 2020	Jul. 20, 2021
RF Cable	EMC	EMCCFD400-SM-SM-8000	181106	Oct. 06, 2020	Oct. 05, 2021
RF Cable	HUBER+SUHNER	SUCOFLEX104	MY16019/4	Oct. 06, 2020	Oct. 05, 2021
RF Cable	HUBER+SUHNER	SUCOFLEX104	MY16014/4	Oct. 06, 2020	Oct. 05, 2021
LF cable 1M	EMC	EMCCFD400-NM-NM-1000	160502	Oct. 06, 2020	Oct. 05, 2021
LF cable 3M	Woken	CFD400NL-LW	CFD400NL-001	Oct. 06, 2020	Oct. 05, 2021
LF cable 11M	EMC	EMCCFD400-NW-NW-11000	200801	Oct. 06, 2020	Oct. 05, 2021
Measurement Software	AUDIX	e3	6.120210g	NA	NA

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

Test Item	RF Conducted				
Test Site	(TH01-WS)				
Instrument	Brand	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	Nov. 04, 2020	Nov. 03, 2021
Power Sensor	Anritsu	MA2411B	1207366	Nov. 04, 2020	Nov. 03, 2021
AC POWER SOURCE	APC	AFC-500W	F312060012	Dec. 04, 2020	Dec. 03, 2021
Measurement Software	--	SENSE-15247_DTS	V5.10.7	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 ≤ 1GHz	±3.41 dB
Radiated emission > 1GHz	±4.59 dB

2 Test Configuration

2.1 Testing Facility

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

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

2.2 The Worst Test Modes and Channel Details

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

NOTE:

1. The EUT was pretested with 3 orientations placed on the table for the radiated emission measurement – X, Y, and Z-plane. The **X-plane** results were found as the worst case and were shown in this report.
2. The test configurations are listed as follows:
 - Configuration 1: POE Mode
 - Configuration 2 : Adapter Mode

3 Transmitter Test Results

3.1 Conducted Emissions

3.1.1 Limit of Conducted Emissions

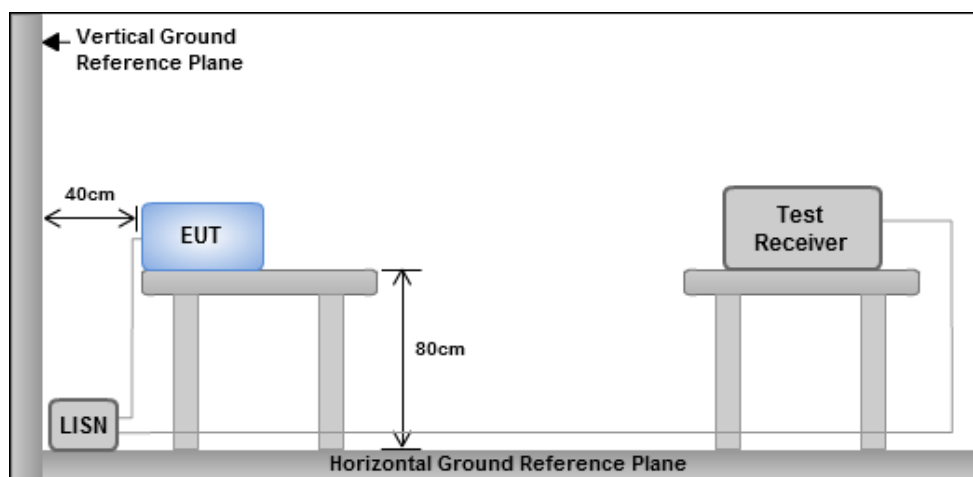
Conducted Emissions Limit		
Frequency Emission (MHz)	Quasi-Peak	Average
0.15-0.5	66 - 56 *	56 - 46 *
0.5-5	56	46
5-30	60	50

Note 1: * Decreases with the logarithm of the frequency.

3.1.2 Test Procedures

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

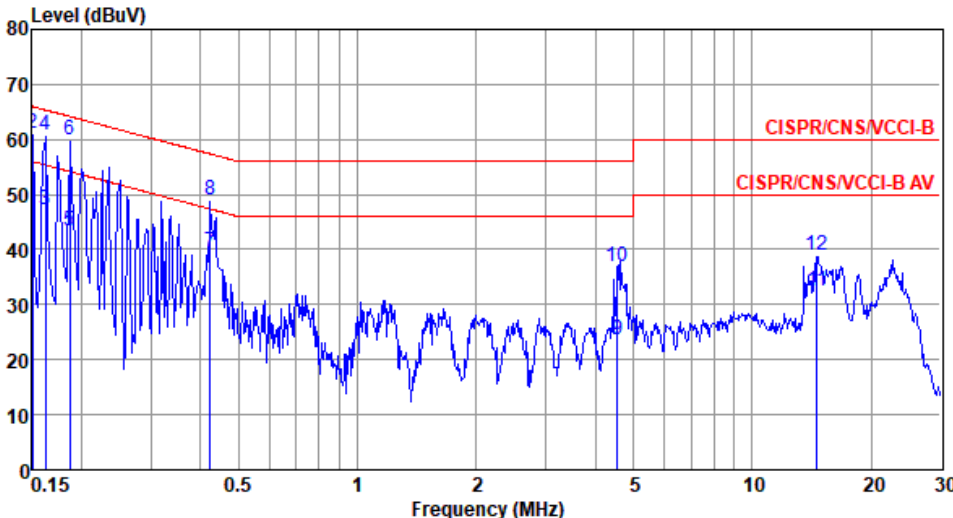
3.1.3 Test Setup



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

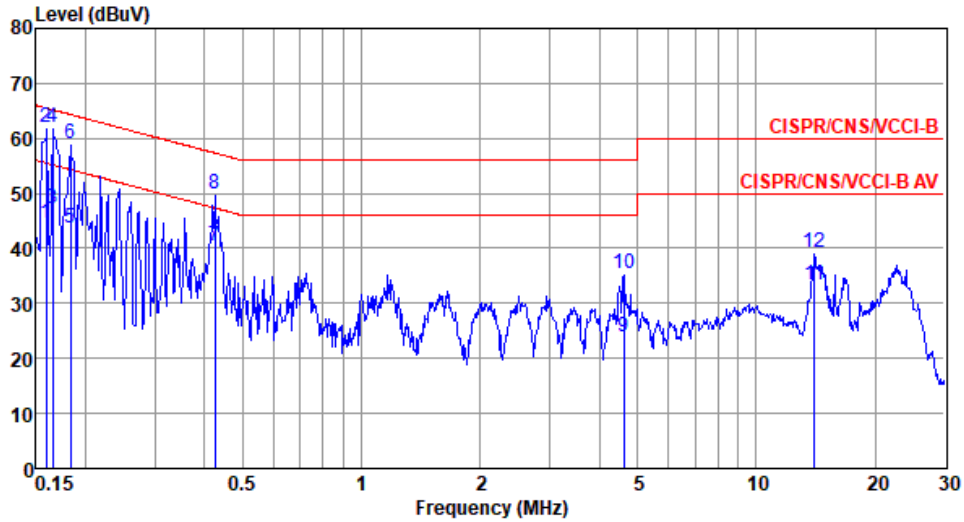
3.1.4 Test Result of Conducted Emissions

Configuration 1 : POE Mode

Modulation Mode	BT LE-1Mbps	Test Freq. (MHz)	2402																																																																																																																					
Power Phase	Line																																																																																																																							
<p>Test by : Alex Tsai Temperature: 22°C Humidity: 61%</p>																																																																																																																								
																																																																																																																								
<table border="1"> <thead> <tr> <th></th> <th>Freq MHz</th> <th>Level dBuV</th> <th>Limit Line dBuV</th> <th>Over Limit dB</th> <th>Read Level dBuV</th> <th>Factor dB</th> <th>Cable loss dB</th> <th>Remark</th> </tr> </thead> <tbody> <tr><td>1</td><td>0.150</td><td>44.13</td><td>56.00</td><td>-11.87</td><td>34.44</td><td>9.64</td><td>0.05</td><td>Average</td></tr> <tr><td>2</td><td>0.150</td><td>61.22</td><td>66.00</td><td>-4.78</td><td>51.53</td><td>9.64</td><td>0.05</td><td>QP</td></tr> <tr><td>3</td><td>0.162</td><td>47.38</td><td>55.34</td><td>-7.96</td><td>37.69</td><td>9.64</td><td>0.05</td><td>Average</td></tr> <tr><td>4</td><td>0.162</td><td>60.72</td><td>65.34</td><td>-4.62</td><td>51.03</td><td>9.64</td><td>0.05</td><td>QP</td></tr> <tr><td>5</td><td>0.186</td><td>43.39</td><td>54.20</td><td>-10.81</td><td>33.70</td><td>9.63</td><td>0.06</td><td>Average</td></tr> <tr><td>6*</td><td>0.186</td><td>59.94</td><td>64.20</td><td>-4.26</td><td>50.25</td><td>9.63</td><td>0.06</td><td>QP</td></tr> <tr><td>7</td><td>0.424</td><td>39.54</td><td>47.37</td><td>-7.83</td><td>29.83</td><td>9.63</td><td>0.08</td><td>Average</td></tr> <tr><td>8</td><td>0.424</td><td>48.90</td><td>57.37</td><td>-8.47</td><td>39.19</td><td>9.63</td><td>0.08</td><td>QP</td></tr> <tr><td>9</td><td>4.549</td><td>23.49</td><td>46.00</td><td>-22.51</td><td>13.52</td><td>9.66</td><td>0.31</td><td>Average</td></tr> <tr><td>10</td><td>4.549</td><td>36.76</td><td>56.00</td><td>-19.24</td><td>26.79</td><td>9.66</td><td>0.31</td><td>QP</td></tr> <tr><td>11</td><td>14.594</td><td>32.46</td><td>50.00</td><td>-17.54</td><td>22.16</td><td>9.71</td><td>0.59</td><td>Average</td></tr> <tr><td>12</td><td>14.594</td><td>38.91</td><td>60.00</td><td>-21.09</td><td>28.61</td><td>9.71</td><td>0.59</td><td>QP</td></tr> </tbody> </table>					Freq MHz	Level dBuV	Limit Line dBuV	Over Limit dB	Read Level dBuV	Factor dB	Cable loss dB	Remark	1	0.150	44.13	56.00	-11.87	34.44	9.64	0.05	Average	2	0.150	61.22	66.00	-4.78	51.53	9.64	0.05	QP	3	0.162	47.38	55.34	-7.96	37.69	9.64	0.05	Average	4	0.162	60.72	65.34	-4.62	51.03	9.64	0.05	QP	5	0.186	43.39	54.20	-10.81	33.70	9.63	0.06	Average	6*	0.186	59.94	64.20	-4.26	50.25	9.63	0.06	QP	7	0.424	39.54	47.37	-7.83	29.83	9.63	0.08	Average	8	0.424	48.90	57.37	-8.47	39.19	9.63	0.08	QP	9	4.549	23.49	46.00	-22.51	13.52	9.66	0.31	Average	10	4.549	36.76	56.00	-19.24	26.79	9.66	0.31	QP	11	14.594	32.46	50.00	-17.54	22.16	9.71	0.59	Average	12	14.594	38.91	60.00	-21.09	28.61	9.71	0.59	QP
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Modulation Mode	BT LE-1Mbps	Test Freq. (MHz)	2402
Power Phase	Neutral		

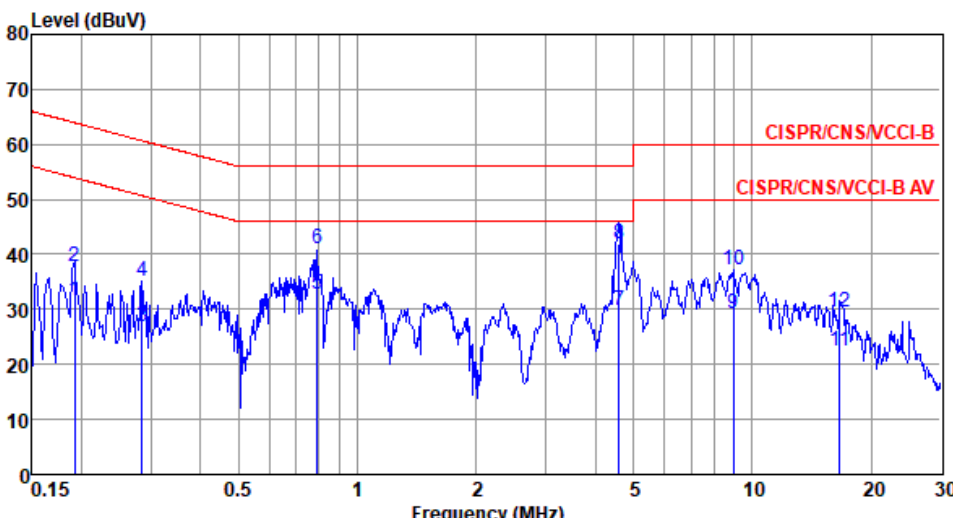
Test by : Alex Tsai Temperature: 22°C Humidity: 61%



	Freq MHz	Level dBuV	Limit Line dBuV	Over Limit dB	Read Level dBuV	Factor dB	Cable loss dB	Remark
1	0.159	44.71	55.52	-10.81	35.00	9.66	0.05	Average
2	0.159	62.01	65.52	-3.51	52.30	9.66	0.05	QP
3	0.165	47.18	55.21	-8.03	37.47	9.66	0.05	Average
4*	0.165	61.95	65.21	-3.26	52.24	9.66	0.05	QP
5	0.183	43.80	54.33	-10.53	34.09	9.65	0.06	Average
6	0.183	59.00	64.33	-5.33	49.29	9.65	0.06	QP
7	0.426	40.59	47.33	-6.74	30.86	9.65	0.08	Average
8	0.426	49.76	57.33	-7.57	40.03	9.65	0.08	QP
9	4.622	23.79	46.00	-22.21	13.80	9.68	0.31	Average
10	4.622	35.30	56.00	-20.70	25.31	9.68	0.31	QP
11	14.063	33.27	50.00	-16.73	22.92	9.78	0.57	Average
12	14.063	39.30	60.00	-20.70	28.95	9.78	0.57	QP

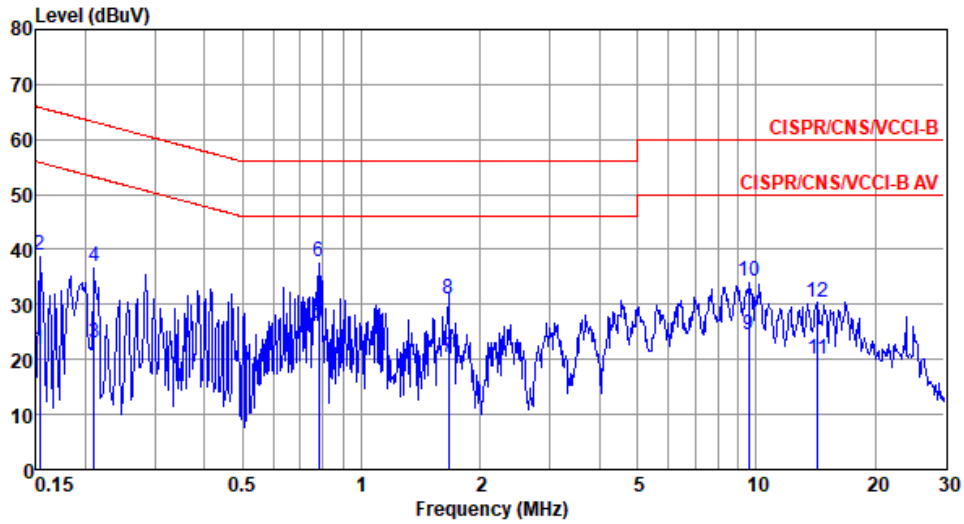
Note 1: Level (dBuV) = Read Level (dBuV) + LISN Factor (dB) + Cable Loss (dB).
 Note 2: Over Limit (dB) = Level (dBuV) – Limit Line (dBuV).

Configuration 2 : Adapter Mode

Modulation Mode	BT LE-1Mbps	Test Freq. (MHz)	2402																																																																																																																					
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<p>Test by : Alex Tsai Temperature: 22°C Humidity: 61%</p>																																																																																																																								
 <p>The plot shows the measured EMI level in dBuV versus frequency in MHz. The y-axis ranges from 0 to 80 dBuV, and the x-axis ranges from 0.15 to 30 MHz. Two red lines represent the limits: CISPR/CNS/VCCI-B (upper) and CISPR/CNS/VCCI-B AV (lower). A blue line shows the measured signal with several peaks labeled 2 through 12. The measured signal generally stays below the limits, with some peaks near 0.2 MHz and 0.8 MHz.</p>																																																																																																																								
<table border="1"> <thead> <tr> <th></th> <th>Freq MHz</th> <th>Level dBuV</th> <th>Limit Line dBuV</th> <th>Over Limit dB</th> <th>Read Level dBuV</th> <th>Factor dB</th> <th>Cable loss dB</th> <th>Remark</th> </tr> </thead> <tbody> <tr><td>1</td><td>0.192</td><td>31.69</td><td>53.93</td><td>-22.24</td><td>21.81</td><td>9.82</td><td>0.06</td><td>Average</td></tr> <tr><td>2</td><td>0.192</td><td>37.90</td><td>63.93</td><td>-26.03</td><td>28.02</td><td>9.82</td><td>0.06</td><td>QP</td></tr> <tr><td>3</td><td>0.285</td><td>27.01</td><td>50.68</td><td>-23.67</td><td>17.09</td><td>9.85</td><td>0.07</td><td>Average</td></tr> <tr><td>4</td><td>0.285</td><td>35.23</td><td>60.68</td><td>-25.45</td><td>25.31</td><td>9.85</td><td>0.07</td><td>QP</td></tr> <tr><td>5*</td><td>0.792</td><td>32.70</td><td>46.00</td><td>-13.30</td><td>22.64</td><td>9.95</td><td>0.11</td><td>Average</td></tr> <tr><td>6</td><td>0.792</td><td>41.09</td><td>56.00</td><td>-14.91</td><td>31.03</td><td>9.95</td><td>0.11</td><td>QP</td></tr> <tr><td>7</td><td>4.598</td><td>29.81</td><td>46.00</td><td>-16.19</td><td>19.47</td><td>10.03</td><td>0.31</td><td>Average</td></tr> <tr><td>8</td><td>4.598</td><td>41.84</td><td>56.00</td><td>-14.16</td><td>31.50</td><td>10.03</td><td>0.31</td><td>QP</td></tr> <tr><td>9</td><td>8.964</td><td>29.20</td><td>50.00</td><td>-20.80</td><td>18.73</td><td>10.08</td><td>0.39</td><td>Average</td></tr> <tr><td>10</td><td>8.964</td><td>37.11</td><td>60.00</td><td>-22.89</td><td>26.64</td><td>10.08</td><td>0.39</td><td>QP</td></tr> <tr><td>11</td><td>16.661</td><td>22.57</td><td>50.00</td><td>-27.43</td><td>11.71</td><td>10.23</td><td>0.63</td><td>Average</td></tr> <tr><td>12</td><td>16.661</td><td>29.47</td><td>60.00</td><td>-30.53</td><td>18.61</td><td>10.23</td><td>0.63</td><td>QP</td></tr> </tbody> </table>					Freq MHz	Level dBuV	Limit Line dBuV	Over Limit dB	Read Level dBuV	Factor dB	Cable loss dB	Remark	1	0.192	31.69	53.93	-22.24	21.81	9.82	0.06	Average	2	0.192	37.90	63.93	-26.03	28.02	9.82	0.06	QP	3	0.285	27.01	50.68	-23.67	17.09	9.85	0.07	Average	4	0.285	35.23	60.68	-25.45	25.31	9.85	0.07	QP	5*	0.792	32.70	46.00	-13.30	22.64	9.95	0.11	Average	6	0.792	41.09	56.00	-14.91	31.03	9.95	0.11	QP	7	4.598	29.81	46.00	-16.19	19.47	10.03	0.31	Average	8	4.598	41.84	56.00	-14.16	31.50	10.03	0.31	QP	9	8.964	29.20	50.00	-20.80	18.73	10.08	0.39	Average	10	8.964	37.11	60.00	-22.89	26.64	10.08	0.39	QP	11	16.661	22.57	50.00	-27.43	11.71	10.23	0.63	Average	12	16.661	29.47	60.00	-30.53	18.61	10.23	0.63	QP
	Freq MHz	Level dBuV	Limit Line dBuV	Over Limit dB	Read Level dBuV	Factor dB	Cable loss dB	Remark																																																																																																																
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<p>Note 1: Level (dBuV) = Read Level (dBuV) + LISN Factor (dB) + Cable Loss (dB). 2: Over Limit (dB) = Level (dBuV) – Limit Line (dBuV).</p>																																																																																																																								

Modulation Mode	BT LE-1Mbps	Test Freq. (MHz)	2402
Power Phase	Neutral		

Test by : Alex Tsai Temperature: 22°C Humidity: 61%



	Freq MHz	Level dBuV	Limit Line dBuV	Over Limit dB	Read Level dBuV	Factor dB	Cable loss dB	Remark
1	0.153	21.72	55.82	-34.10	11.88	9.79	0.05	Average
2	0.153	38.89	65.82	-26.93	29.05	9.79	0.05	QP
3	0.211	22.93	53.18	-30.25	13.07	9.80	0.06	Average
4	0.211	36.88	63.18	-26.30	27.02	9.80	0.06	QP
5	0.779	26.68	46.00	-19.32	16.73	9.84	0.11	Average
6*	0.779	37.65	56.00	-18.35	27.70	9.84	0.11	QP
7	1.662	20.45	46.00	-25.55	10.39	9.90	0.16	Average
8	1.662	31.05	56.00	-24.95	20.99	9.90	0.16	QP
9	9.552	24.46	50.00	-25.54	14.02	10.05	0.39	Average
10	9.552	34.29	60.00	-25.71	23.85	10.05	0.39	QP
11	14.288	20.16	50.00	-29.84	9.43	10.15	0.58	Average
12	14.288	30.42	60.00	-29.58	19.69	10.15	0.58	QP

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

3.2 6dB and Occupied Bandwidth

3.2.1 Limit of 6dB Bandwidth

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

3.2.2 Test Procedures

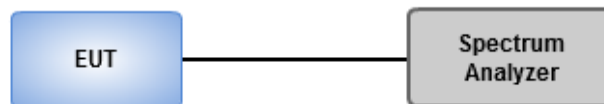
6dB Bandwidth

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.

3.2.3 Test Setup



3.2.4 Test Result of 6dB and Occupied Bandwidth

Ambient Condition	23°C / 63%	Tested By	Brad Wu
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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)	731.884k	1.085M	1M09F1D	673.913k	1.078M
BT-LE(500kbps)	746.377k	1.056M	1M06F1D	688.406k	1.049M
BT-LE(1Mbps)	721.014k	1.078M	1M08F1D	706.522k	1.067M
BT-LE(2Mbps)	1.391M	2.098M	2M10F1D	1.246M	2.084M

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

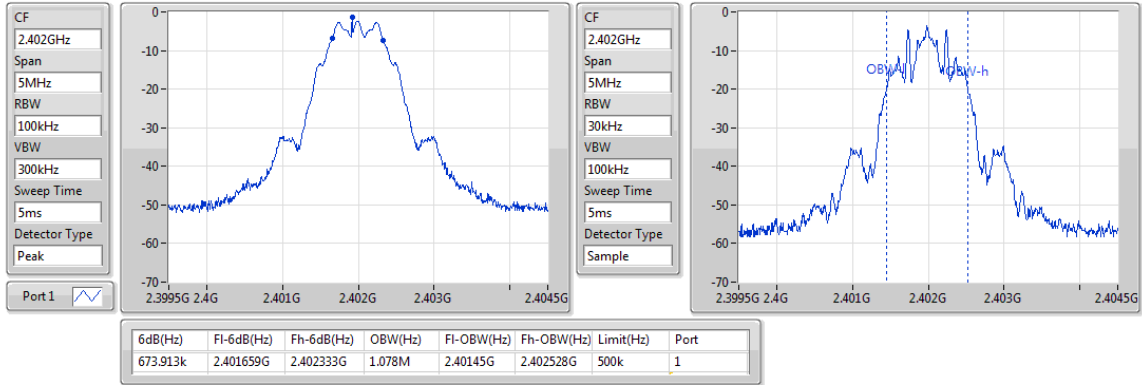
Mode	Result	Limit (Hz)	Port 1-N dB (Hz)	Port 1-OBW (Hz)
BT-LE(125kbps)	-	-	-	-
2402MHz	Pass	500k	673.913k	1.078M
2440MHz	Pass	500k	731.884k	1.085M
2480MHz	Pass	500k	717.391k	1.085M
BT-LE(500kbps)	-	-	-	-
2402MHz	Pass	500k	688.406k	1.056M
2440MHz	Pass	500k	710.145k	1.049M
2480MHz	Pass	500k	746.377k	1.049M
BT-LE(1Mbps)	-	-	-	-
2402MHz	Pass	500k	713.768k	1.067M
2440MHz	Pass	500k	721.014k	1.078M
2480MHz	Pass	500k	706.522k	1.071M
BT-LE(2Mbps)	-	-	-	-
2402MHz	Pass	500k	1.391M	2.084M
2440MHz	Pass	500k	1.246M	2.098M
2480MHz	Pass	500k	1.29M	2.084M

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

BT-LE(125kbps)

EBW-DTS

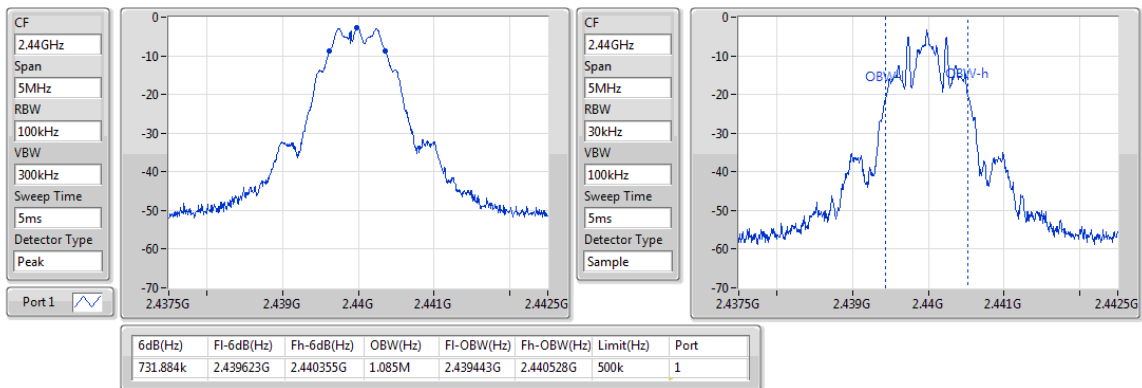
2402MHz



BT-LE(125kbps)

EBW-DTS

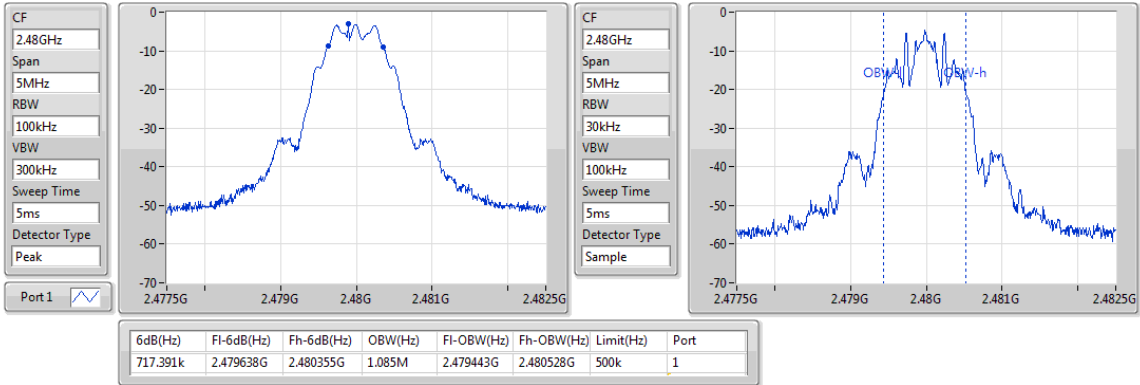
2440MHz



BT-LE(125kbps)

EBW-DTS

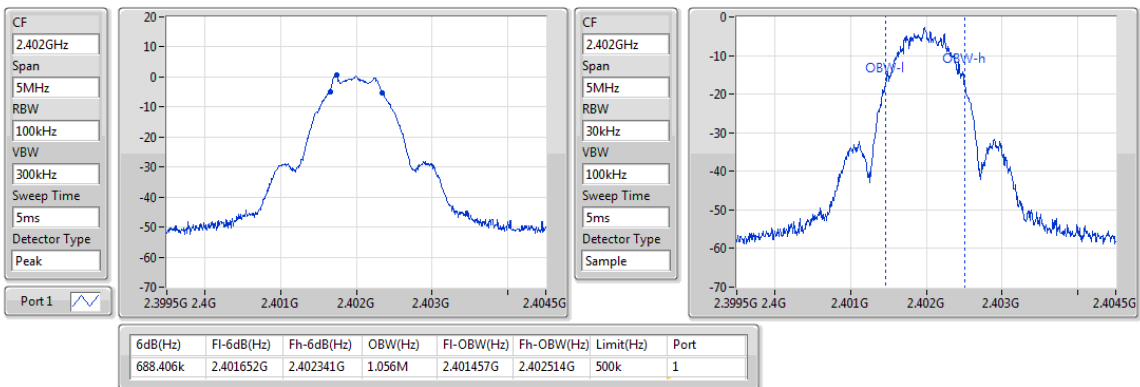
2480MHz



BT-LE(500kbps)

EBW-DTS

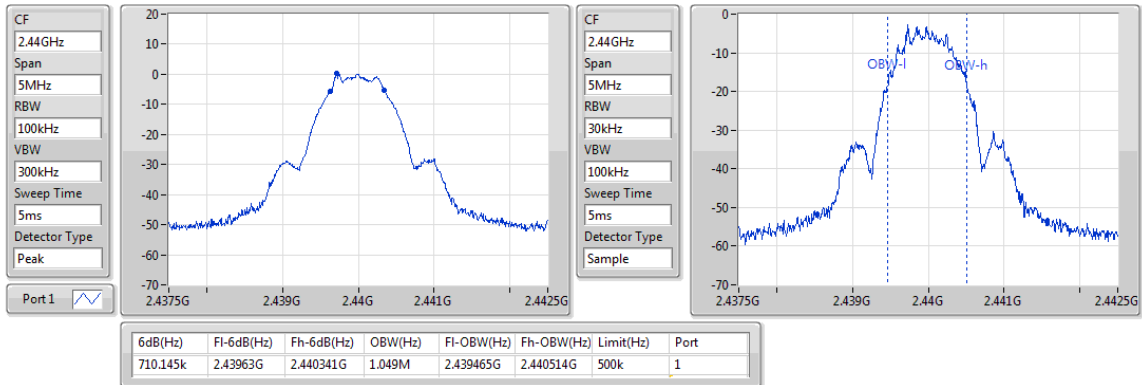
2402MHz



BT-LE(500kbps)

EBW-DTS

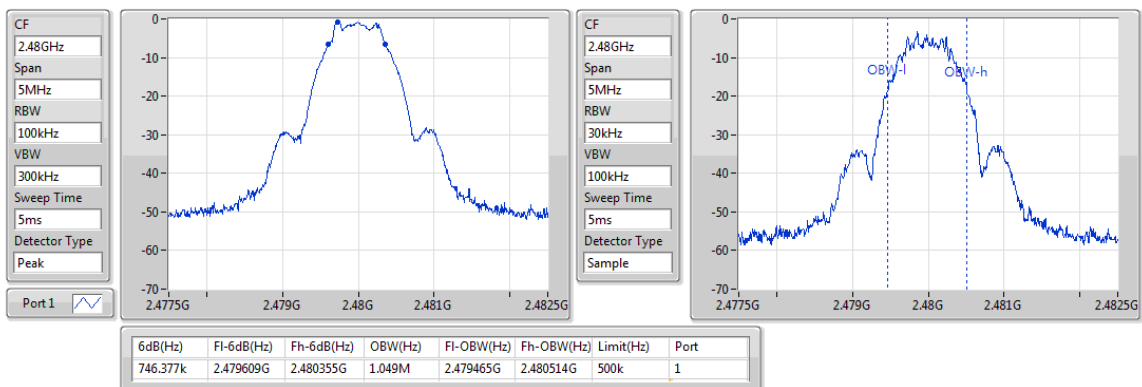
2440MHz



BT-LE(500kbps)

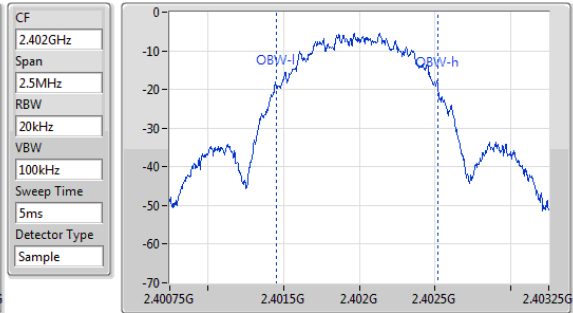
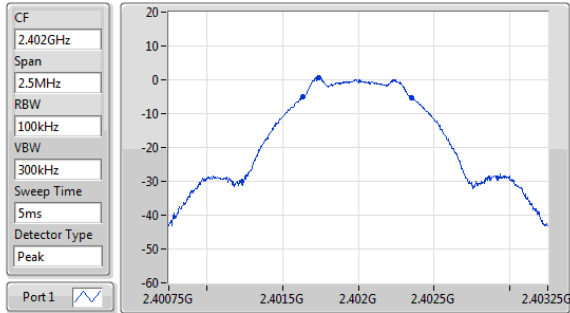
EBW-DTS

2480MHz



BT-LE(1Mbps)

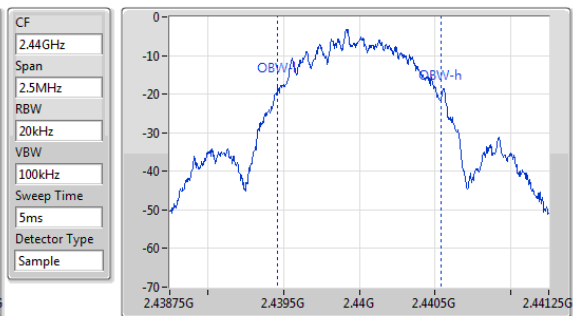
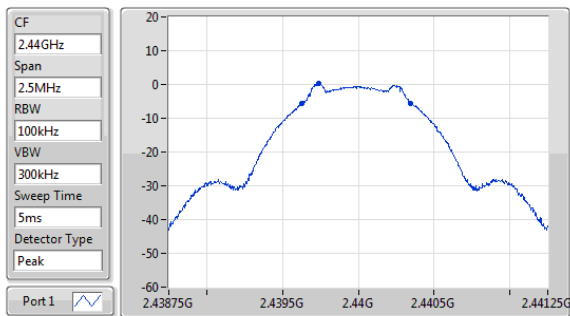
2402MHz



6dB(Hz)	Fl-6dB(Hz)	Fh-6dB(Hz)	OBW(Hz)	Fl-OBW(Hz)	Fh-OBW(Hz)	Limit(Hz)	Port
713.768k	2.401638G	2.402351G	1.067M	2.40145G	2.402517G	500k	1

BT-LE(1Mbps)

2440MHz

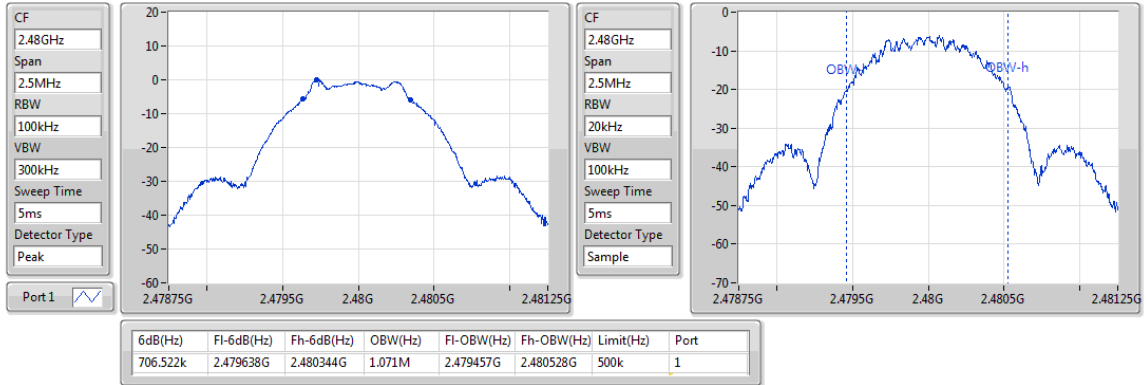


6dB(Hz)	Fl-6dB(Hz)	Fh-6dB(Hz)	OBW(Hz)	Fl-OBW(Hz)	Fh-OBW(Hz)	Limit(Hz)	Port
721.014k	2.439627G	2.440348G	1.078M	2.439461G	2.440539G	500k	1

BT-LE(1Mbps)

EBW-DTS

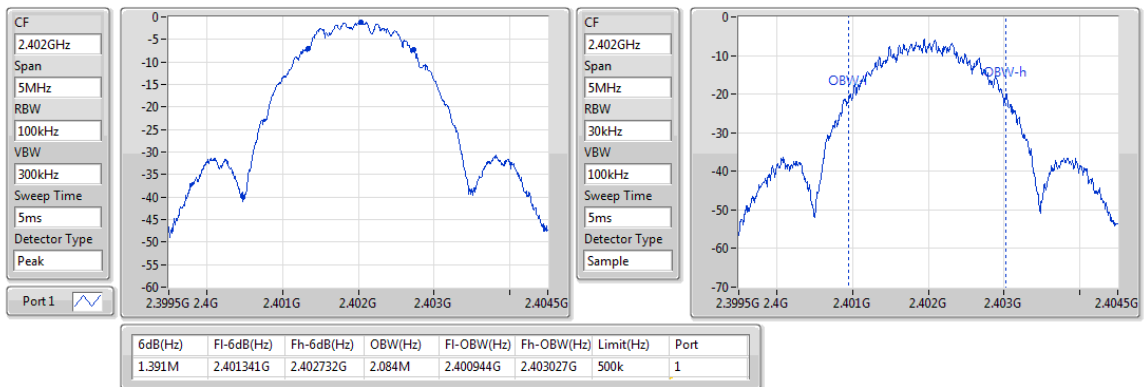
2480MHz



BT-LE(2Mbps)

EBW-DTS

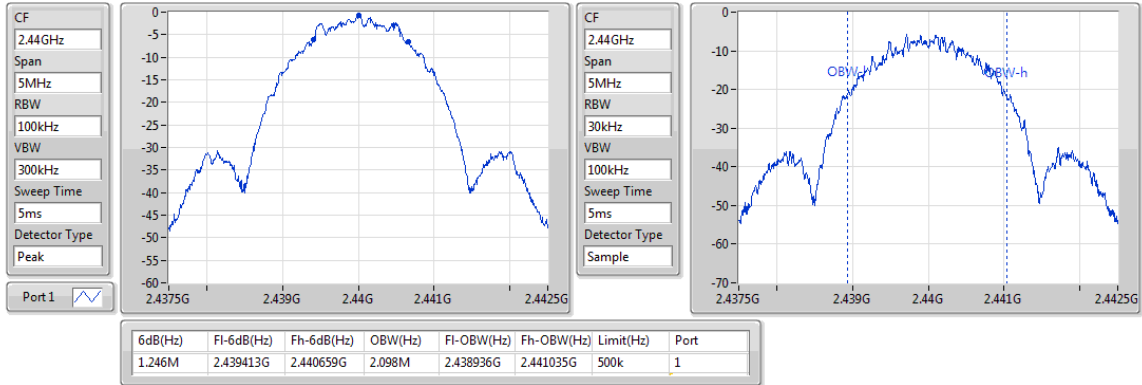
2402MHz



BT-LE(2Mbps)

EBW-DTS

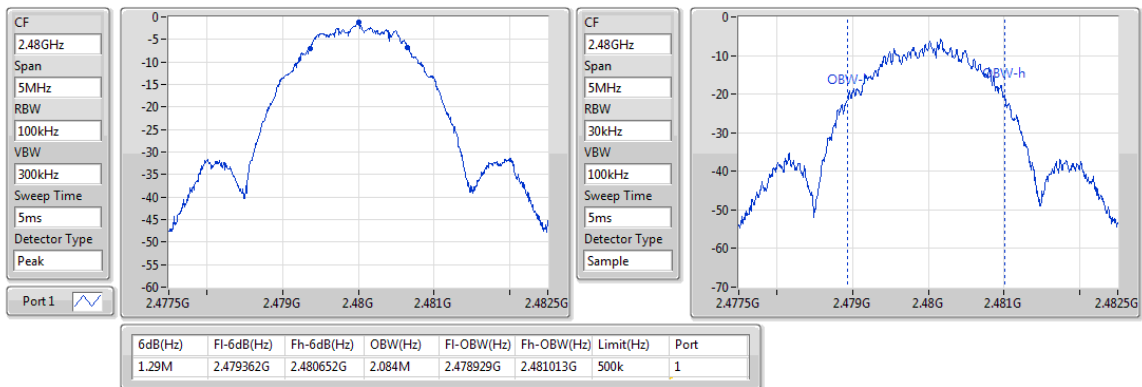
2440MHz



BT-LE(2Mbps)

EBW-DTS

2480MHz



3.3 RF Output Power

3.3.1 Limit of RF Output Power

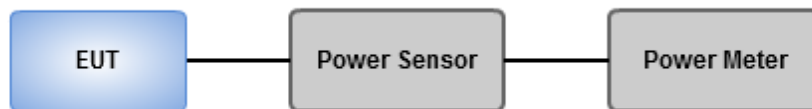
Conducted power shall not exceed 1Watt.

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

3.3.2 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.

3.3.3 Test Setup



3.3.4 Test Result of Maximum Output Power

Ambient Condition	23°C / 63%	Tested By	Brad Wu
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Summary of Peak Conducted Output Power

Mode	Power (dBm)	Power (W)
2.4-2.4835GHz	-	-
BT-LE(125kbps)	1.16	0.00131
BT-LE(500kbps)	1.17	0.00131
BT-LE(1Mbps)	1.21	0.00132
BT-LE(2Mbps)	1.18	0.00131

Result

Mode	Result	Gain (dBi)	Power (dBm)	Power Limit (dBm)
BT-LE(125kbps)	-	-	-	-
2402MHz	Pass	6.96	1.16	29.04
2440MHz	Pass	6.96	0.96	29.04
2480MHz	Pass	6.96	0.73	29.04
BT-LE(500kbps)	-	-	-	-
2402MHz	Pass	6.96	1.17	29.04
2440MHz	Pass	6.96	0.97	29.04
2480MHz	Pass	6.96	0.73	29.04
BT-LE(1Mbps)	-	-	-	-
2402MHz	Pass	6.96	1.21	29.04
2440MHz	Pass	6.96	0.98	29.04
2480MHz	Pass	6.96	0.74	29.04
BT-LE(2Mbps)	-	-	-	-
2402MHz	Pass	6.96	1.18	29.04
2440MHz	Pass	6.96	0.98	29.04
2480MHz	Pass	6.96	0.74	29.04

DG = Directional Gain; Port X = Port X output power

Summary of Conducted (Average) Output Power

Mode	Power (dBm)	Power (W)
2.4-2.4835GHz	-	-
BT-LE(125kbps)	0.64	0.00116
BT-LE(500kbps)	0.63	0.00116
BT-LE(1Mbps)	0.69	0.00117
BT-LE(2Mbps)	0.66	0.00116

Result

Mode	Result	Gain (dBi)	Power (dBm)	Power Limit (dBm)
BT-LE(125kbps)	-	-	-	-
2402MHz	Pass	6.96	0.64	-
2440MHz	Pass	6.96	0.41	-
2480MHz	Pass	6.96	0.13	-
BT-LE(500kbps)	-	-	-	-
2402MHz	Pass	6.96	0.63	-
2440MHz	Pass	6.96	0.41	-
2480MHz	Pass	6.96	0.13	-
BT-LE(1Mbps)	-	-	-	-
2402MHz	Pass	6.96	0.69	-
2440MHz	Pass	6.96	0.44	-
2480MHz	Pass	6.96	0.16	-
BT-LE(2Mbps)	-	-	-	-
2402MHz	Pass	6.96	0.66	-
2440MHz	Pass	6.96	0.44	-
2480MHz	Pass	6.96	0.15	-

Note: Average power is for reference only.

3.4 Power Spectral Density

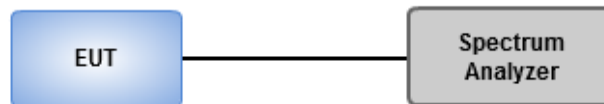
3.4.1 Limit of Power Spectral Density

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

3.4.2 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.

3.4.3 Test Setup



3.4.4 Test Result of Power Spectral Density

Ambient Condition	23°C / 63%	Tested By	Brad Wu
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Summary

Mode	PD (dBm/3kHz)
2.4-2.4835GHz	-
BT-LE(125kbps)	-5.09
BT-LE(500kbps)	-5.37
BT-LE(1Mbps)	-11.91
BT-LE(2Mbps)	-14.19

Result

Mode	Result	Gain (dBi)	PD (dBm/3kHz)	PD Limit (dBm/3kHz)
BT-LE(125kbps)	-	-	-	-
2402MHz	Pass	6.96	-5.09	7.04
2440MHz	Pass	6.96	-5.43	7.04
2480MHz	Pass	6.96	-5.77	7.04
BT-LE(500kbps)	-	-	-	-
2402MHz	Pass	6.96	-5.37	7.04
2440MHz	Pass	6.96	-5.78	7.04
2480MHz	Pass	6.96	-5.95	7.04
BT-LE(1Mbps)	-	-	-	-
2402MHz	Pass	6.96	-13.04	7.04
2440MHz	Pass	6.96	-11.91	7.04
2480MHz	Pass	6.96	-12.10	7.04
BT-LE(2Mbps)	-	-	-	-
2402MHz	Pass	6.96	-14.19	7.04
2440MHz	Pass	6.96	-14.85	7.04
2480MHz	Pass	6.96	-14.81	7.04

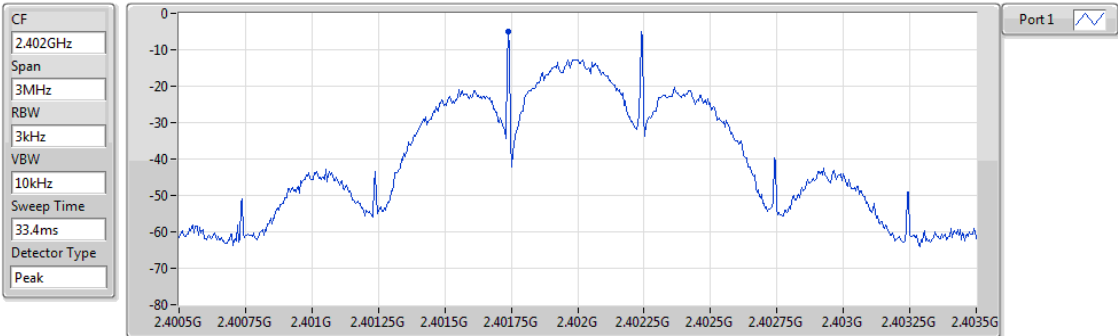
DG = Directional Gain;

PD = maximum power density; Port X = Port X Power Density;

BT-LE(125kbps)

PSD

2402MHz

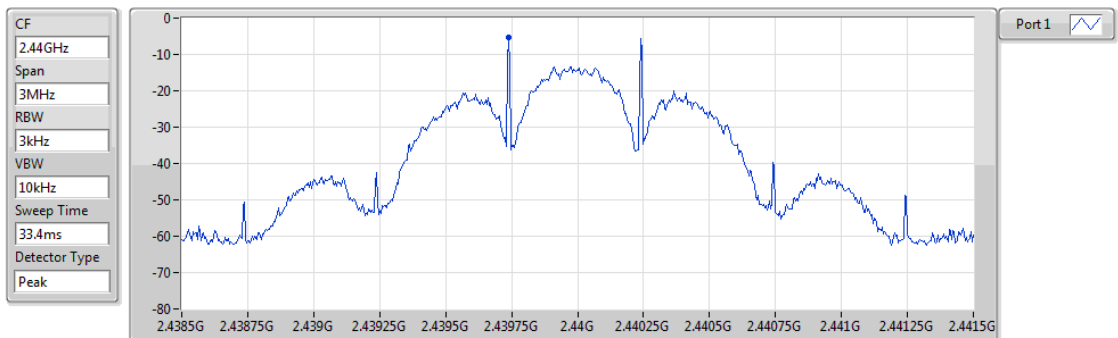


Sum	PD	Port 1
(dBm/RBW)	(dBm/RBW)	(dBm/RBW)
-5.09	-5.09	-5.09

BT-LE(125kbps)

PSD

2440MHz

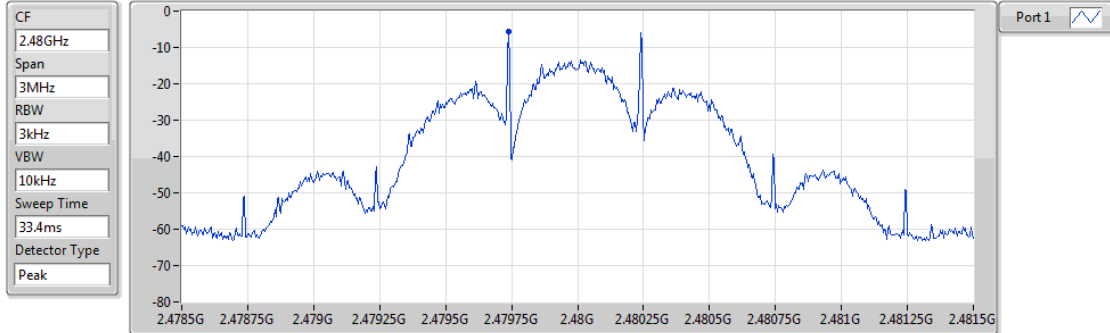


Sum	PD	Port 1
(dBm/RBW)	(dBm/RBW)	(dBm/RBW)
-5.43	-5.43	-5.43

BT-LE(125kbps)

PSD

2480MHz

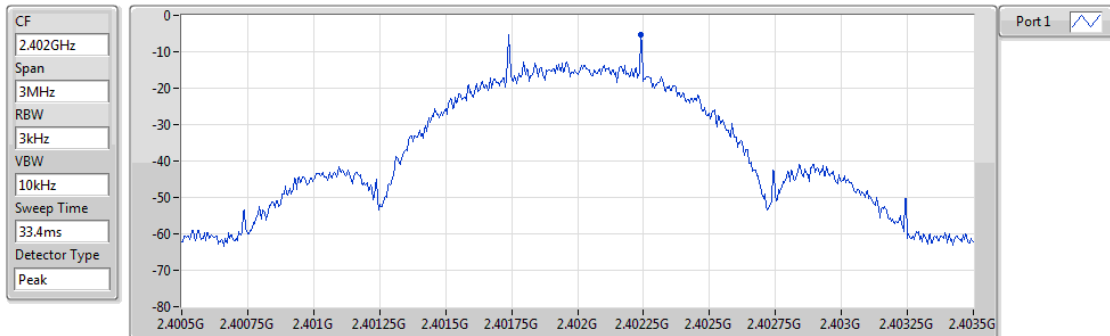


Sum	PD	Port 1
(dBm/RBW)	(dBm/RBW)	(dBm/RBW)
-5.77	-5.77	-5.77

BT-LE(500kbps)

PSD

2402MHz

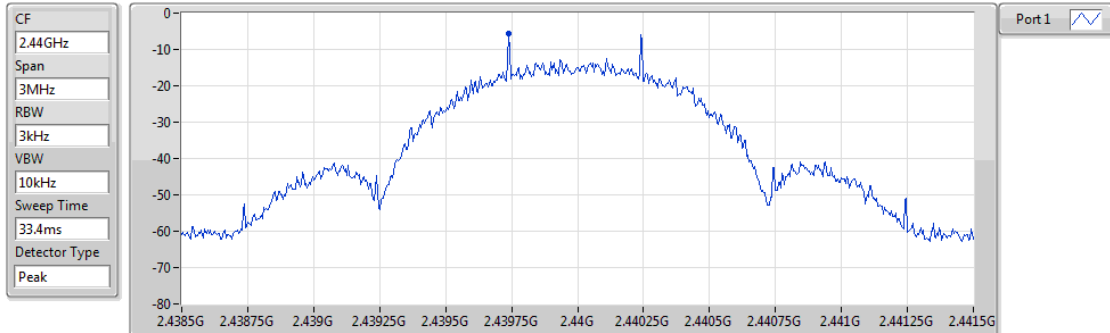


Sum	PD	Port 1
(dBm/RBW)	(dBm/RBW)	(dBm/RBW)
-5.37	-5.37	-5.37

BT-LE(500kbps)

PSD

2440MHz

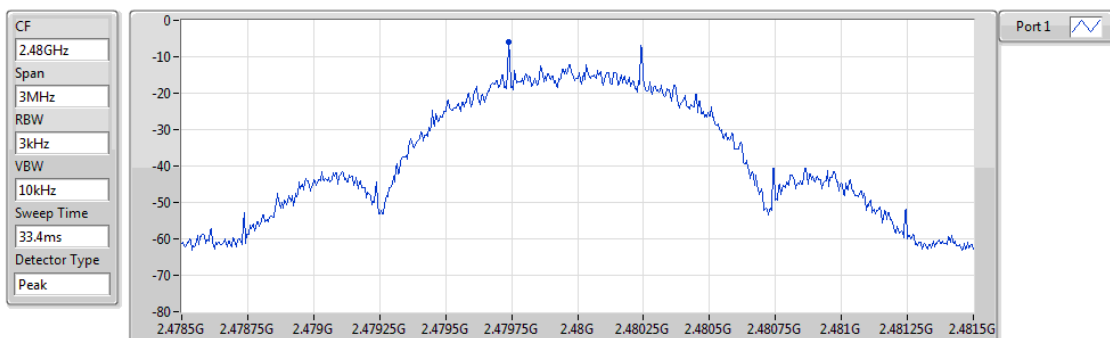


Sum	PD	Port 1
(dBm/RBW)	(dBm/RBW)	(dBm/RBW)
-5.78	-5.78	-5.78

BT-LE(500kbps)

PSD

2480MHz

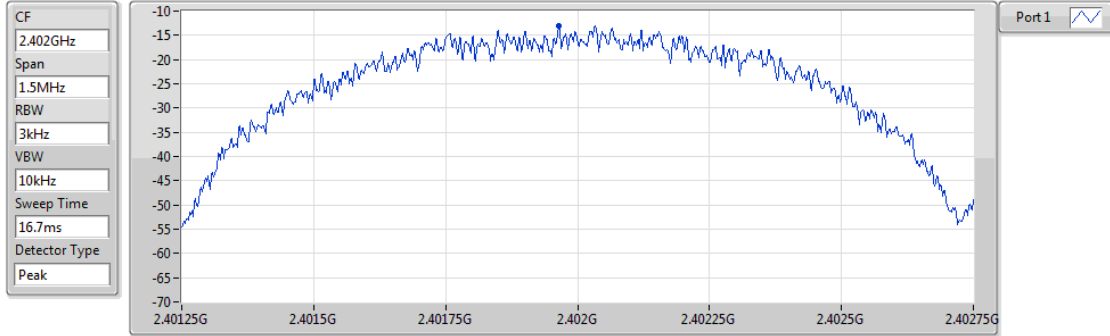


Sum	PD	Port 1
(dBm/RBW)	(dBm/RBW)	(dBm/RBW)
-5.95	-5.95	-5.95

BT-LE(1Mbps)

PSD

2402MHz

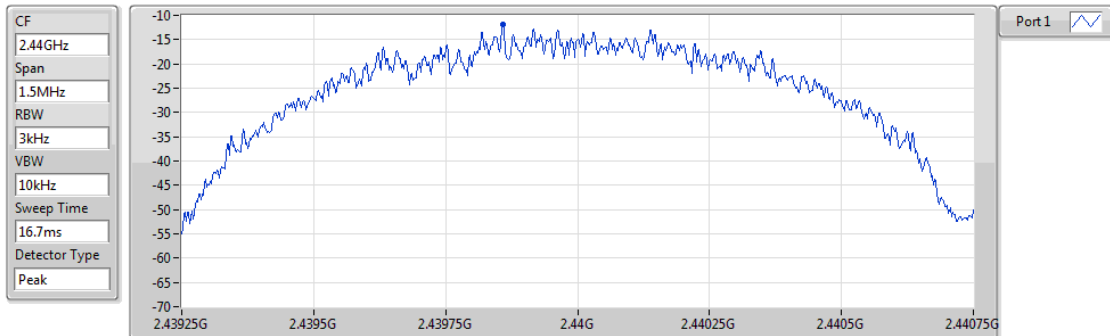


Sum	PD	Port 1
(dBm/RBW)	(dBm/RBW)	(dBm/RBW)
-13.04	-13.04	-13.04

BT-LE(1Mbps)

PSD

2440MHz

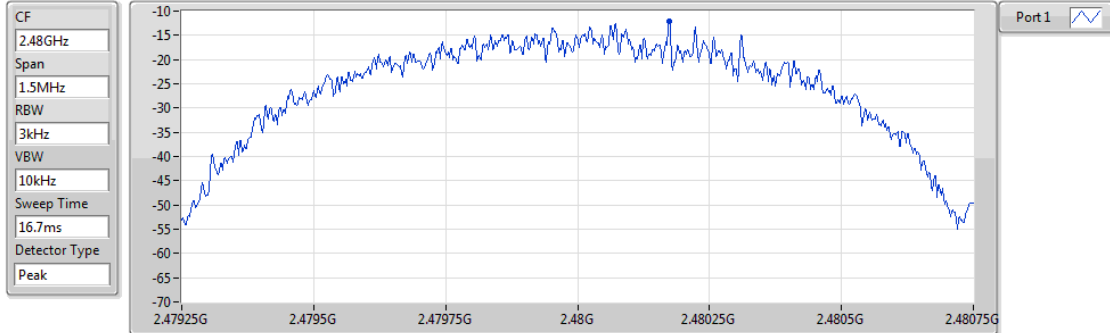


Sum	PD	Port 1
(dBm/RBW)	(dBm/RBW)	(dBm/RBW)
-11.91	-11.91	-11.91

BT-LE(1Mbps)

PSD

2480MHz

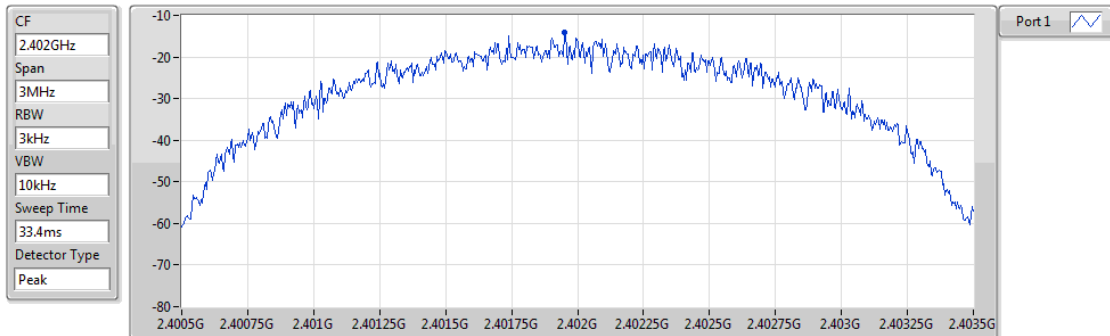


Sum	PD	Port 1
(dBm/RBW)	(dBm/RBW)	(dBm/RBW)
-12.10	-12.10	-12.10

BT-LE(2Mbps)

PSD

2402MHz

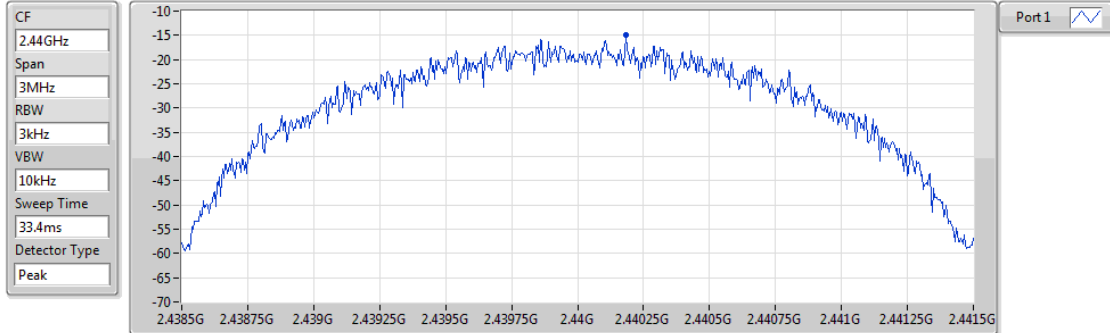


Sum	PD	Port 1
(dBm/RBW)	(dBm/RBW)	(dBm/RBW)
-14.19	-14.19	-14.19

BT-LE(2Mbps)

PSD

2440MHz

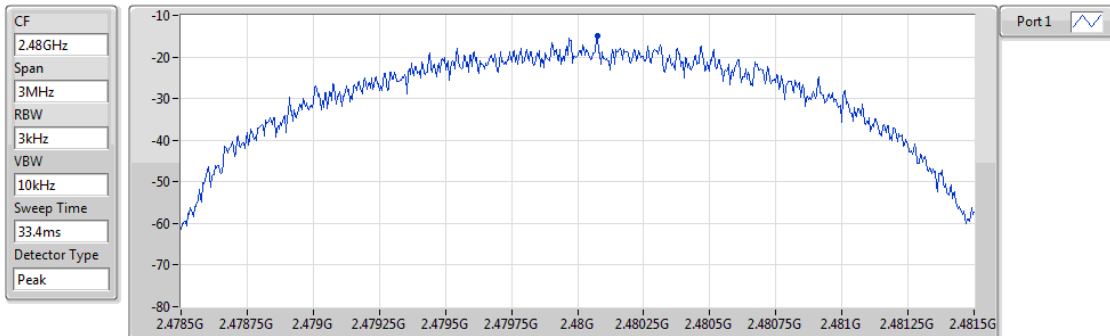


Sum	PD	Port 1
(dBm/RBW)	(dBm/RBW)	(dBm/RBW)
-14.85	-14.85	-14.85

BT-LE(2Mbps)

PSD

2480MHz



Sum	PD	Port 1
(dBm/RBW)	(dBm/RBW)	(dBm/RBW)
-14.81	-14.81	-14.81

3.5 Emissions in Restricted Frequency Bands

3.5.1 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.

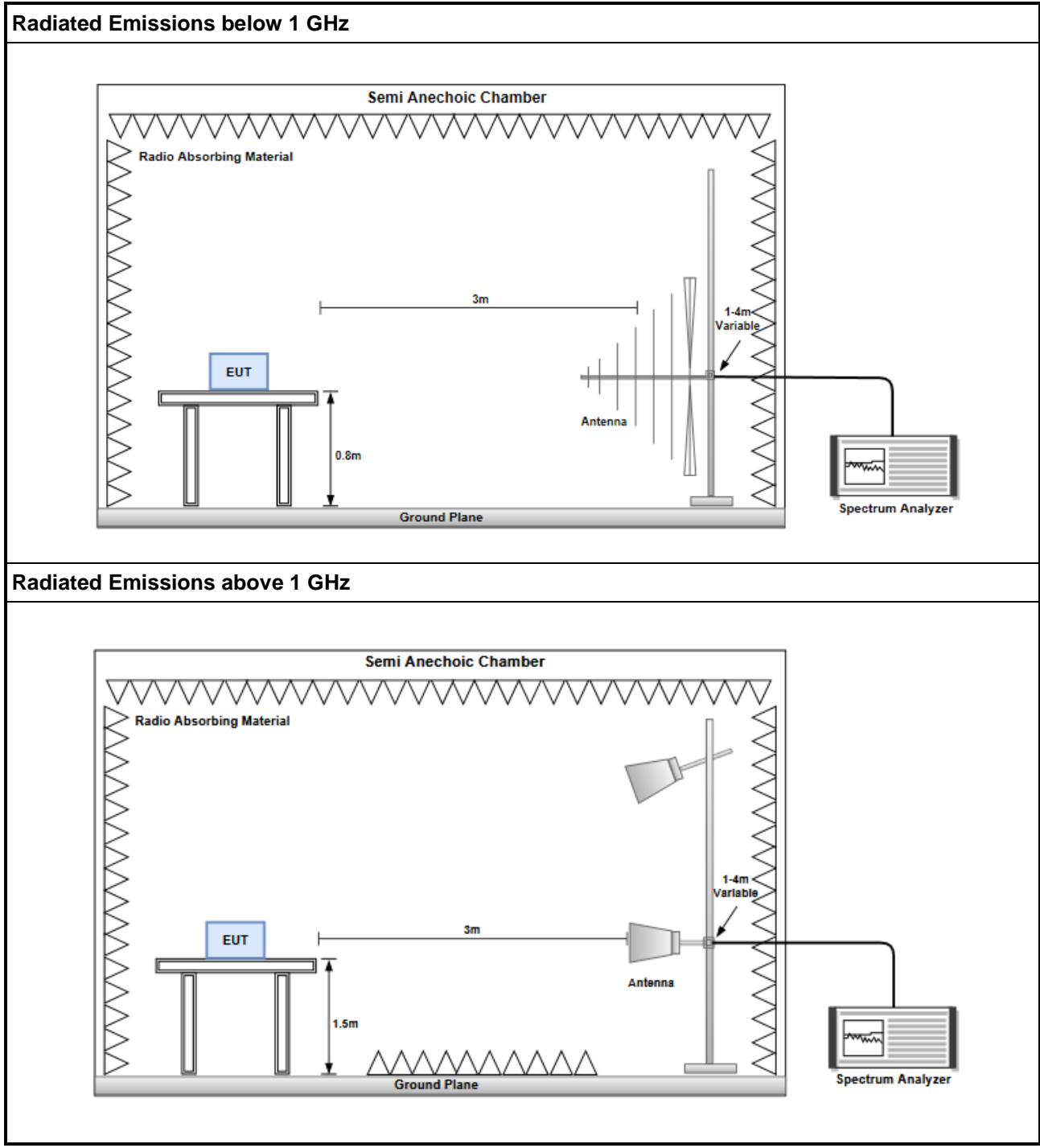
3.5.2 Test Procedures

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:

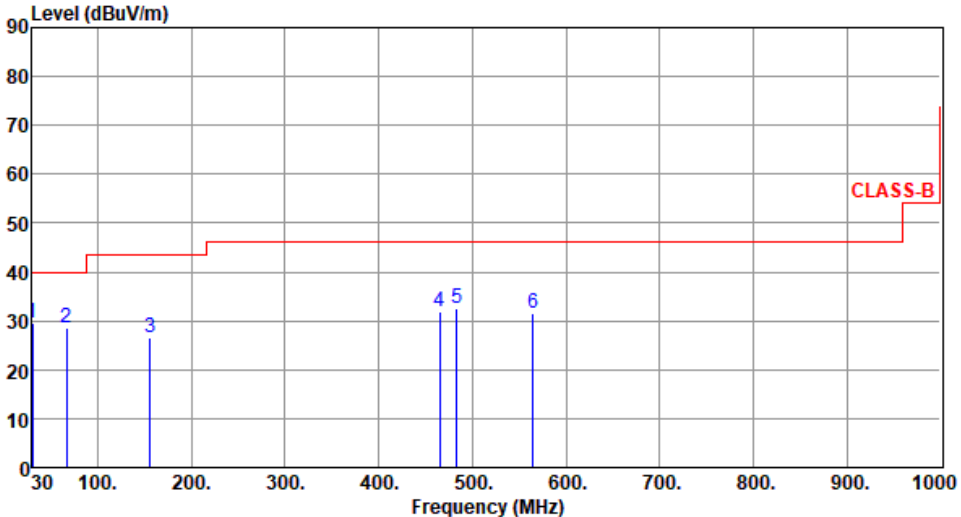
1. 120kHz measurement bandwidth of test receiver and Quasi-peak detector is for radiated emission below 1GHz.
2. RBW=1MHz, VBW=3MHz and Peak detector is for peak measured value of radiated emission above 1GHz.
3. RBW=1MHz, VBW=1/T and Peak detector is for average measured value of radiated emission above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

3.5.3 Test Setup



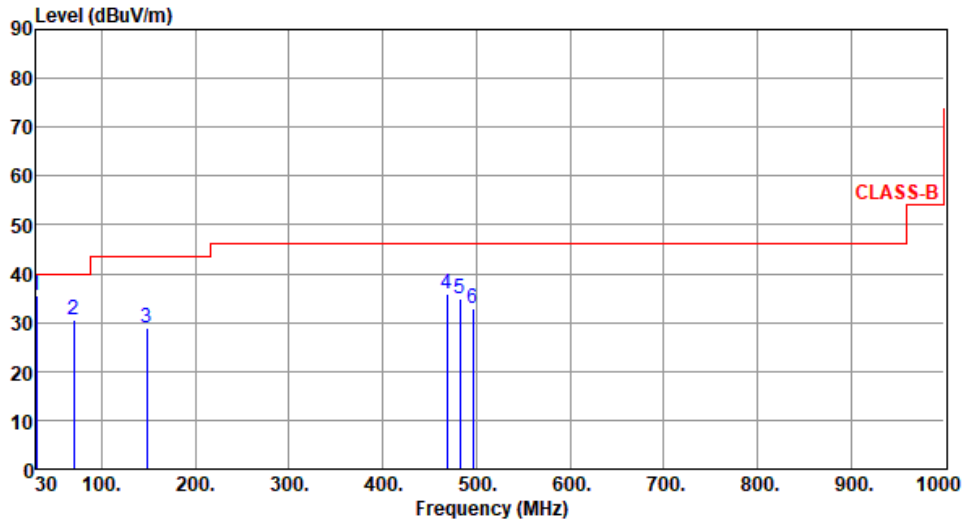
Configuration 1: POE Mode

3.5.4 Transmitter Radiated Unwanted Emissions (Below 1GHz)

Modulation	BT-LE (1Mbps)	Test Freq. (MHz)	2402																																																																
Polarization	Horizontal																																																																		
Test By :Akun Chung Temperature(°C):25 Humidity(%):64																																																																			
 <p>The graph displays the radiated unwanted emissions for a BT-LE transmitter in POE mode. The y-axis represents the emission level in dBuV/m, ranging from 0 to 90. The x-axis represents the frequency in MHz, ranging from 30 to 1000. A red step function line indicates the CLASS-B emission limit. Several peaks are identified and numbered 1 through 6. Peak 1 is at 30.58 MHz, peak 2 at 66.95 MHz, peak 3 at 155.52 MHz, peak 4 at 465.52 MHz, peak 5 at 483.63 MHz, and peak 6 at 564.88 MHz. All peaks are well below the CLASS-B limit.</p>																																																																			
	<table border="1"> <thead> <tr> <th>Freq. MHz</th> <th>Emission level dBuV/m</th> <th>Limit dBuV/m</th> <th>Margin dB</th> <th>SA reading dBuV</th> <th>Factor dB</th> <th>Remark</th> <th>ANT High cm</th> <th>Turn Table deg</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>30.58</td> <td>29.65</td> <td>40.00</td> <td>-10.35</td> <td>39.30</td> <td>-9.65</td> <td>Peak</td> <td>---</td> </tr> <tr> <td>2</td> <td>66.95</td> <td>28.55</td> <td>40.00</td> <td>-11.45</td> <td>38.79</td> <td>-10.24</td> <td>Peak</td> <td>---</td> </tr> <tr> <td>3</td> <td>155.52</td> <td>26.66</td> <td>43.50</td> <td>-16.84</td> <td>35.45</td> <td>-8.79</td> <td>Peak</td> <td>---</td> </tr> <tr> <td>4</td> <td>465.52</td> <td>31.94</td> <td>46.00</td> <td>-14.06</td> <td>35.84</td> <td>-3.90</td> <td>Peak</td> <td>---</td> </tr> <tr> <td>5</td> <td>483.63</td> <td>32.58</td> <td>46.00</td> <td>-13.42</td> <td>36.23</td> <td>-3.65</td> <td>Peak</td> <td>---</td> </tr> <tr> <td>6</td> <td>564.88</td> <td>31.69</td> <td>46.00</td> <td>-14.31</td> <td>33.71</td> <td>-2.02</td> <td>Peak</td> <td>---</td> </tr> </tbody> </table>	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg	1	30.58	29.65	40.00	-10.35	39.30	-9.65	Peak	---	2	66.95	28.55	40.00	-11.45	38.79	-10.24	Peak	---	3	155.52	26.66	43.50	-16.84	35.45	-8.79	Peak	---	4	465.52	31.94	46.00	-14.06	35.84	-3.90	Peak	---	5	483.63	32.58	46.00	-13.42	36.23	-3.65	Peak	---	6	564.88	31.69	46.00	-14.31	33.71	-2.02	Peak	---			
Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg																																																											
1	30.58	29.65	40.00	-10.35	39.30	-9.65	Peak	---																																																											
2	66.95	28.55	40.00	-11.45	38.79	-10.24	Peak	---																																																											
3	155.52	26.66	43.50	-16.84	35.45	-8.79	Peak	---																																																											
4	465.52	31.94	46.00	-14.06	35.84	-3.90	Peak	---																																																											
5	483.63	32.58	46.00	-13.42	36.23	-3.65	Peak	---																																																											
6	564.88	31.69	46.00	-14.31	33.71	-2.02	Peak	---																																																											
Note 1: Emission Level (dBuV/m) = SA Reading (dBuV/m) + Factor* (dB) *Factor includes antenna factor , cable loss and amplifier gain Note 2: Margin (dB) = Emission level (dBuV/m) – Limit (dBuV/m). Note 3: All spurious emissions below 30MHz are more than 20 dB below the limit.																																																																			

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

Test By :Akun Chung Temperature(°C):25 Humidity(%):64



	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
1	30.36	35.63	40.00	-4.37	45.22	-9.59	Peak	---	---
2	70.55	30.66	40.00	-9.34	41.67	-11.01	Peak	---	---
3	147.86	28.89	43.50	-14.61	37.74	-8.85	Peak	---	---
4	468.85	35.85	46.00	-10.15	39.74	-3.89	Peak	---	---
5	482.56	34.95	46.00	-11.05	38.60	-3.65	Peak	---	---
6	496.52	32.88	46.00	-13.12	36.16	-3.28	Peak	---	---

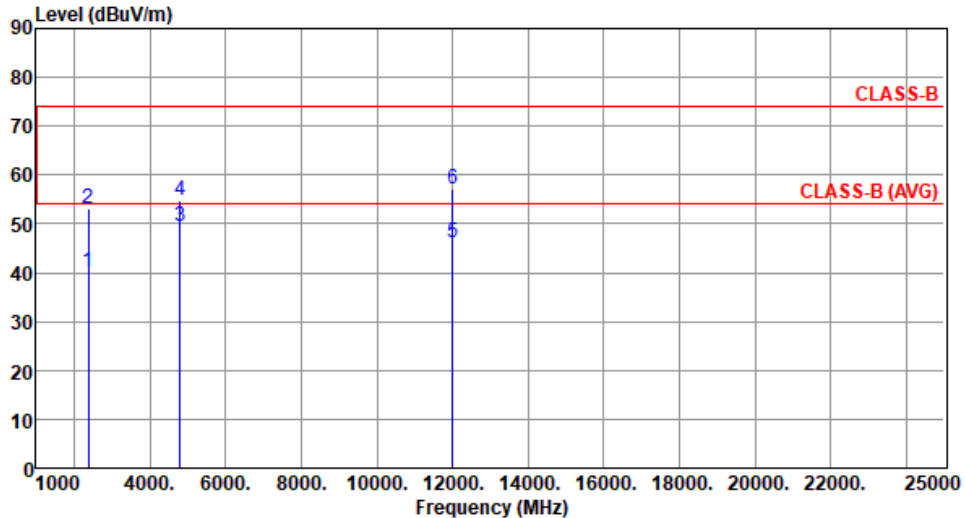
Note 1: Emission Level (dBuV/m) = SA Reading (dBuV/m) + Factor* (dB)

*Factor includes antenna factor , cable loss and amplifier gain

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

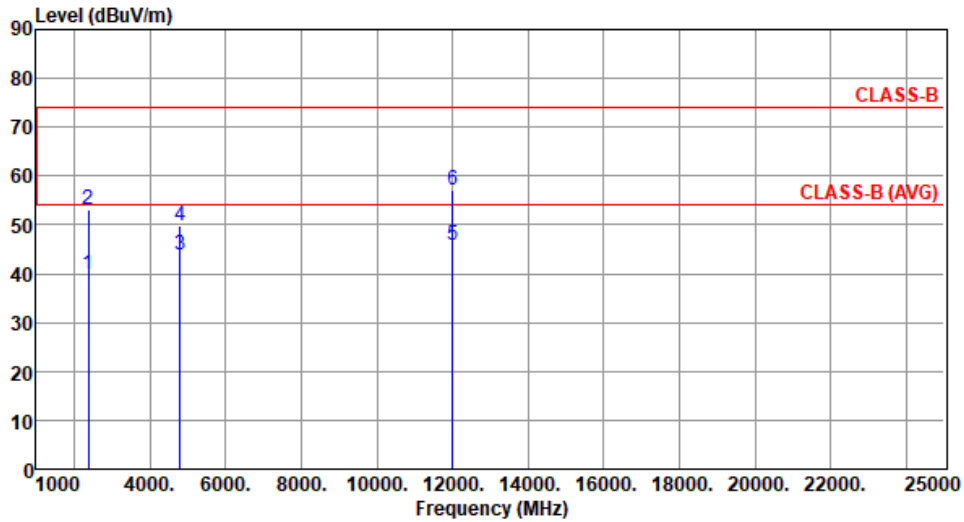
Note 3: All spurious emissions below 30MHz are more than 20 dB below the limit.

3.5.5 Transmitter Radiated Unwanted Emissions (Above 1GHz)

Modulation	BT-LE (1Mbps)	Test Freq. (MHz)	2402						
Polarization	Horizontal								
Test By : Akun Chung Temperature(°C): 25 Humidity(%): 64									
									
	Freq.	Emission level	Limit	Margin	SA reading	Factor	Remark	ANT High	Turn Table
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB		cm	deg
1	2390.00	40.10	54.00	-13.90	42.89	-2.79	Average	231	28
2	2390.00	53.16	74.00	-20.84	55.95	-2.79	Peak	231	28
3	4804.00	49.59	54.00	-4.41	46.09	3.50	Average	273	31
4	4804.00	54.88	74.00	-19.12	51.38	3.50	Peak	273	31
5	12010.00	46.13	54.00	-7.87	31.86	14.27	Average	100	39
6	12010.00	57.25	74.00	-16.75	42.98	14.27	Peak	100	39
<p>Note 1: Emission Level (dBuV/m) = SA Reading (dBuV/m) + Factor* (dB) *Factor includes antenna factor , cable loss and amplifier gain Note 2: Margin (dB) = Emission level (dBuV/m) – Limit (dBuV/m).</p>									

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

Test By : Akun Chung Temperature(°C): 25 Humidity(%): 64



	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
1	2390.00	40.01	54.00	-13.99	42.80	-2.79	Average	379	324
2	2390.00	53.07	74.00	-20.93	55.86	-2.79	Peak	379	324
3	4804.00	43.71	54.00	-10.29	40.21	3.50	Average	101	119
4	4804.00	49.72	74.00	-24.28	46.22	3.50	Peak	101	119
5	12010.00	45.72	54.00	-8.28	31.45	14.27	Average	100	329
6	12010.00	57.12	74.00	-16.88	42.85	14.27	Peak	100	329

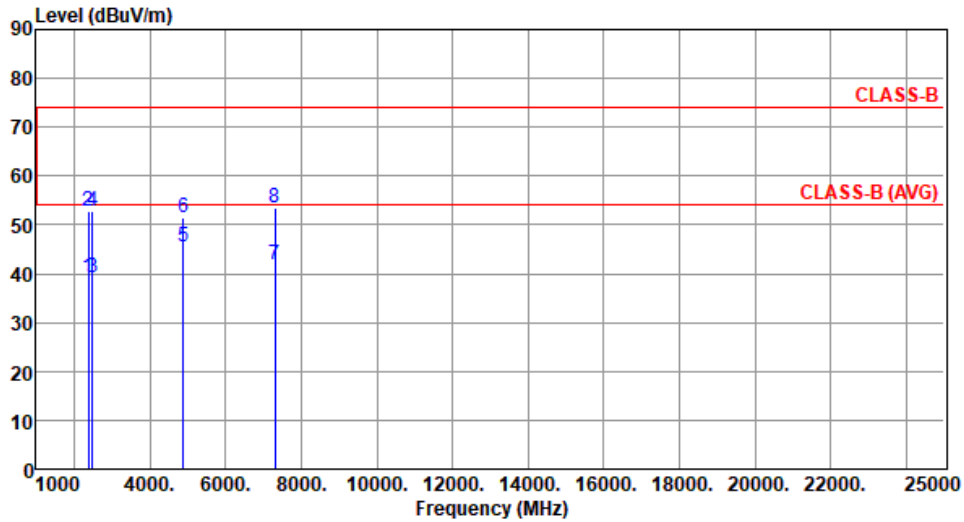
Note 1: Emission Level (dBuV/m) = SA Reading (dBuV/m) + Factor* (dB)

*Factor includes antenna factor , cable loss and amplifier gain

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

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

Test By : Akun Chung Temperature(°C): 25 Humidity(%): 64



	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
1	2390.00	39.07	54.00	-14.93	41.86	-2.79	Average	235	33
2	2390.00	52.90	74.00	-21.10	55.69	-2.79	Peak	235	33
3	2483.50	39.15	54.00	-14.85	41.89	-2.74	Average	235	33
4	2483.50	52.89	74.00	-21.11	55.63	-2.74	Peak	235	33
5	4880.00	45.42	54.00	-8.58	41.95	3.47	Average	276	37
6	4880.00	51.37	74.00	-22.63	47.90	3.47	Peak	276	37
7	7320.00	41.87	54.00	-12.13	32.85	9.02	Average	100	42
8	7320.00	53.60	74.00	-20.40	44.58	9.02	Peak	100	42

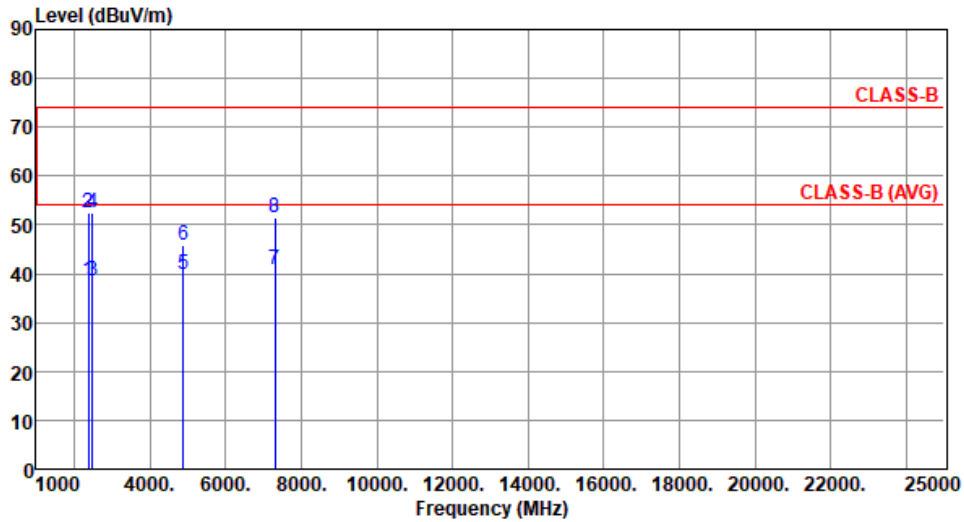
Note 1: Emission Level (dBuV/m) = SA Reading (dBuV/m) + Factor* (dB)

*Factor includes antenna factor , cable loss and amplifier gain

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

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

Test By : Akun Chung Temperature(°C): 25 Humidity(%): 64

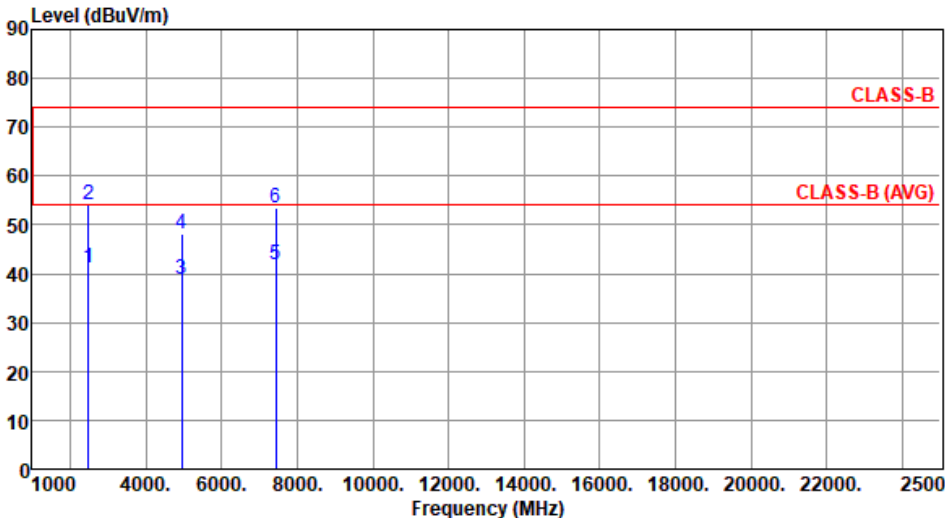


	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
1	2390.00	38.54	54.00	-15.46	41.33	-2.79	Average	382	325
2	2390.00	52.46	74.00	-21.54	55.25	-2.79	Peak	382	325
3	2483.50	38.65	54.00	-15.35	41.39	-2.74	Average	382	325
4	2483.50	52.59	74.00	-21.41	55.33	-2.74	Peak	382	325
5	4880.00	39.98	54.00	-14.02	36.51	3.47	Average	100	121
6	4880.00	45.98	74.00	-28.02	42.51	3.47	Peak	100	121
7	7320.00	40.71	54.00	-13.29	31.69	9.02	Average	100	125
8	7320.00	51.58	74.00	-22.42	42.56	9.02	Peak	100	125

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

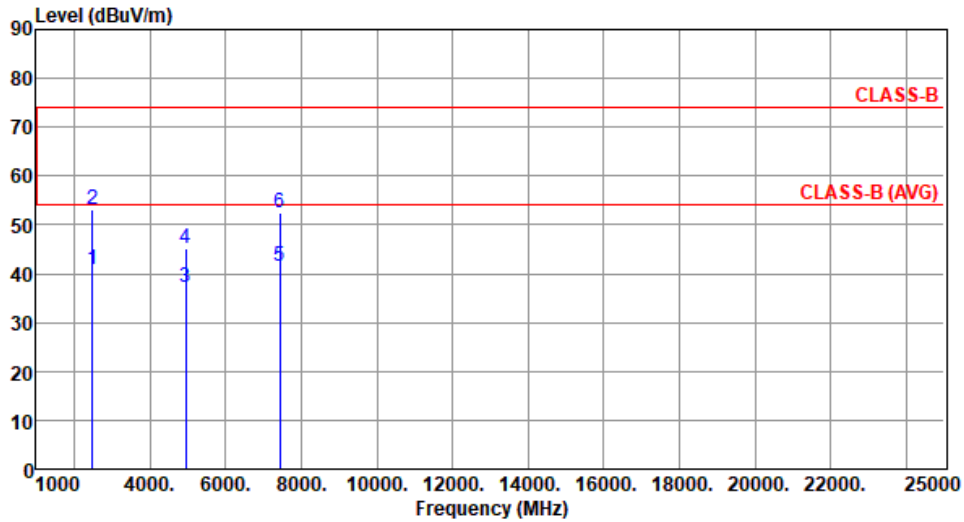
*Factor includes antenna factor , cable loss and amplifier gain

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

Modulation	BT-LE (1Mbps)	Test Freq. (MHz)	2480						
Polarization	Horizontal								
Test By : Akun Chung		Temperature(°C): 25			Humidity(%): 64				
									
	Freq.	Emission	Limit	Margin	SA	Factor	Remark	ANT	Turn
	MHz	level	dBuV/m	dB	reading	dB		High	Table
		dBuV/m			dBuV			cm	deg
1	2483.50	41.21	54.00	-12.79	43.95	-2.74	Average	353	12
2	2483.50	54.13	74.00	-19.87	56.87	-2.74	Peak	353	12
3	4960.00	39.00	54.00	-15.00	35.32	3.68	Average	289	36
4	4960.00	48.01	74.00	-25.99	44.33	3.68	Peak	289	36
5	7440.00	41.83	54.00	-12.17	32.85	8.98	Average	100	40
6	7440.00	53.50	74.00	-20.50	44.52	8.98	Peak	100	40
<p>Note 1: Emission Level (dBUV/m) = SA Reading (dBUV/m) + Factor* (dB) *Factor includes antenna factor , cable loss and amplifier gain Note 2: Margin (dB) = Emission level (dBUV/m) – Limit (dBUV/m).</p>									

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

Test By : Akun Chung Temperature(°C): 25 Humidity(%): 64



	Freq. MHz	Emission level dBUV/m	Limit dBUV/m	Margin dB	SA reading dBUV	Factor dB	Remark	ANT High cm	Turn Table deg
1	2483.50	40.74	54.00	-13.26	43.48	-2.74	Average	384	322
2	2483.50	53.10	74.00	-20.90	55.84	-2.74	Peak	384	322
3	4960.00	37.11	54.00	-16.89	33.43	3.68	Average	100	123
4	4960.00	45.25	74.00	-28.75	41.57	3.68	Peak	100	123
5	7440.00	41.56	54.00	-12.44	32.58	8.98	Average	100	121
6	7440.00	52.50	74.00	-21.50	43.52	8.98	Peak	100	121

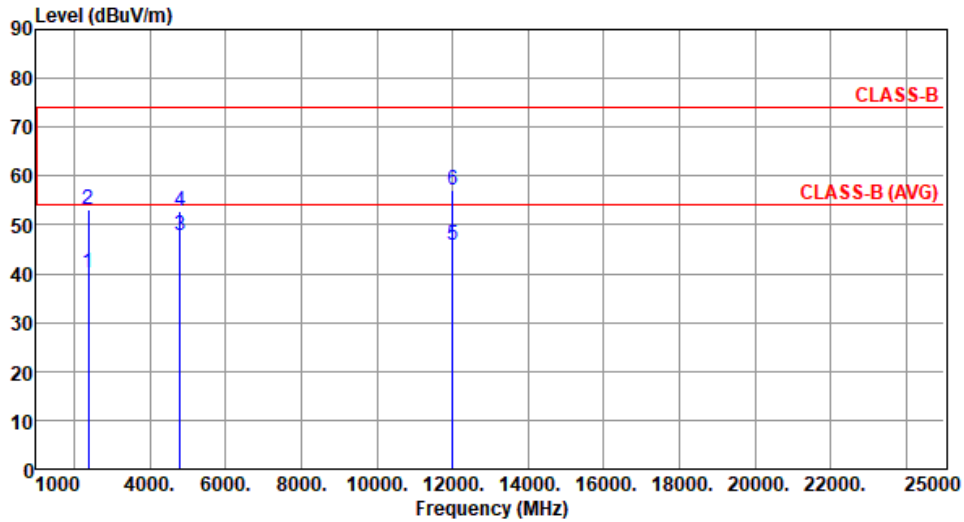
Note 1: Emission Level (dBUV/m) = SA Reading (dBUV/m) + Factor* (dB)

*Factor includes antenna factor , cable loss and amplifier gain

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

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

Test By :Akun Chung Temperature(°C):25 Humidity(%):64

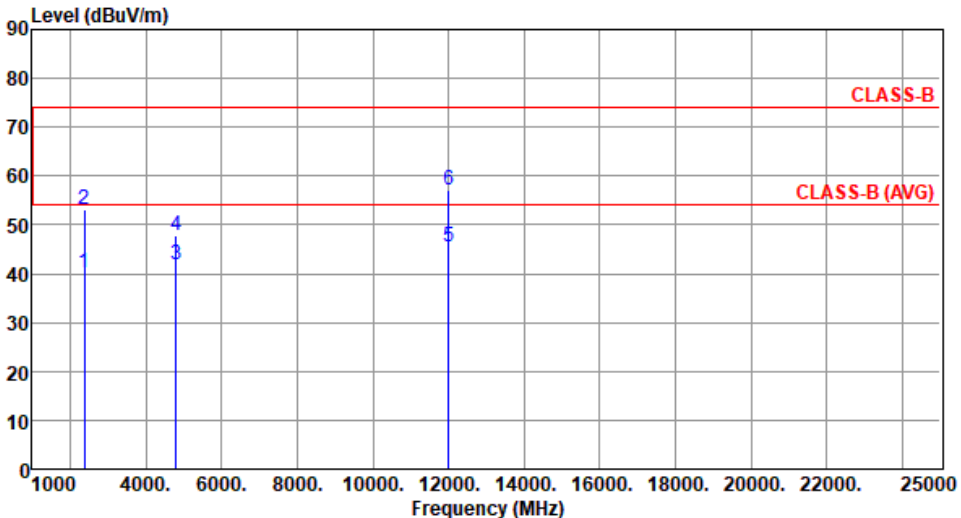


	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
1	2390.00	40.19	54.00	-13.81	42.98	-2.79	Average	236	35
2	2390.00	53.19	74.00	-20.81	55.98	-2.79	Peak	236	35
3	4804.00	47.75	54.00	-6.25	44.25	3.50	Average	275	33
4	4804.00	52.75	74.00	-21.25	49.25	3.50	Peak	275	33
5	12010.00	45.95	54.00	-8.05	31.68	14.27	Average	100	40
6	12010.00	57.12	74.00	-16.88	42.85	14.27	Peak	100	40

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

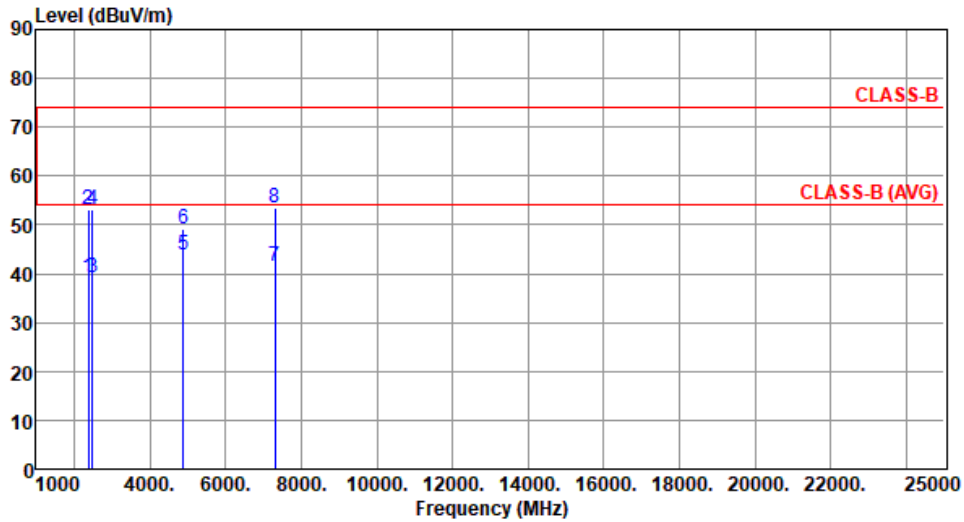
*Factor includes antenna factor , cable loss and amplifier gain

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

Modulation	BT-LE (2Mbps)	Test Freq. (MHz)	2402						
Polarization	Vertical								
Test By : Akun Chung		Temperature(°C): 25		Humidity(%): 64					
									
	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
1	2390.00	40.16	54.00	-13.84	42.95	-2.79	Average	382	326
2	2390.00	53.19	74.00	-20.81	55.98	-2.79	Peak	382	326
3	4804.00	41.73	54.00	-12.27	38.23	3.50	Average	100	125
4	4804.00	47.83	74.00	-26.17	44.33	3.50	Peak	100	125
5	12010.00	45.66	54.00	-8.34	31.39	14.27	Average	100	325
6	12010.00	56.97	74.00	-17.03	42.70	14.27	Peak	100	325
<p>Note 1: Emission Level (dBuV/m) = SA Reading (dBuV/m) + Factor* (dB) *Factor includes antenna factor , cable loss and amplifier gain Note 2: Margin (dB) = Emission level (dBuV/m) – Limit (dBuV/m).</p>									

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

Test By : Akun Chung Temperature(°C): 25 Humidity(%): 64



	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
1	2390.00	39.16	54.00	-14.84	41.95	-2.79	Average	233	32
2	2390.00	53.01	74.00	-20.99	55.80	-2.79	Peak	233	32
3	2483.50	39.21	54.00	-14.79	41.95	-2.74	Average	233	32
4	2483.50	53.01	74.00	-20.99	55.75	-2.74	Peak	233	32
5	4880.00	43.68	54.00	-10.32	40.21	3.47	Average	277	35
6	4880.00	49.31	74.00	-24.69	45.84	3.47	Peak	277	35
7	7320.00	41.58	54.00	-12.42	32.56	9.02	Average	100	39
8	7320.00	53.37	74.00	-20.63	44.35	9.02	Peak	100	39

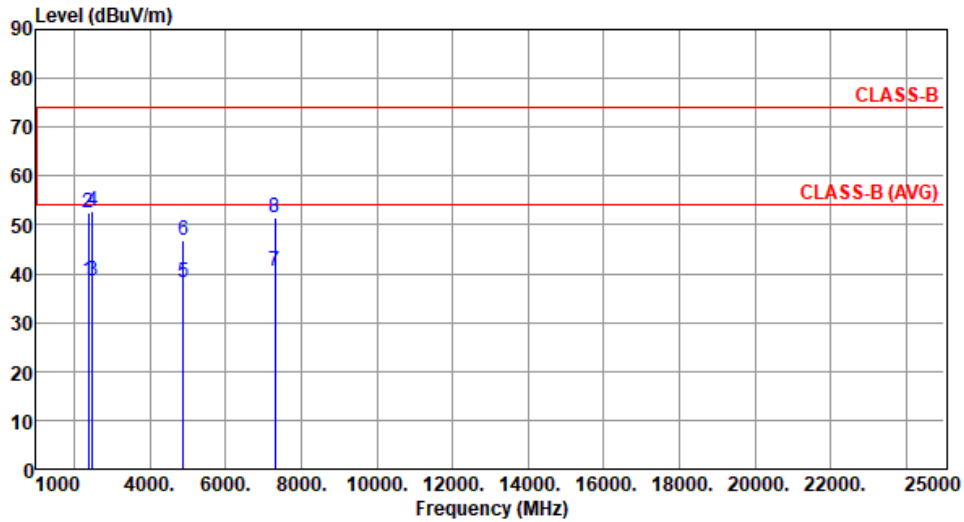
Note 1: Emission Level (dBuV/m) = SA Reading (dBuV/m) + Factor* (dB)

*Factor includes antenna factor , cable loss and amplifier gain

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

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

Test By : Akun Chung Temperature(°C): 25 Humidity(%): 64



	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
1	2390.00	38.66	54.00	-15.34	41.45	-2.79	Average	387	328
2	2390.00	52.60	74.00	-21.40	55.39	-2.79	Peak	387	328
3	2483.50	38.68	54.00	-15.32	41.42	-2.74	Average	387	328
4	2483.50	52.84	74.00	-21.16	55.58	-2.74	Peak	387	328
5	4880.00	38.31	54.00	-15.69	34.84	3.47	Average	100	127
6	4880.00	46.68	74.00	-27.32	43.21	3.47	Peak	100	127
7	7320.00	40.54	54.00	-13.46	31.52	9.02	Average	100	129
8	7320.00	51.41	74.00	-22.59	42.39	9.02	Peak	100	129

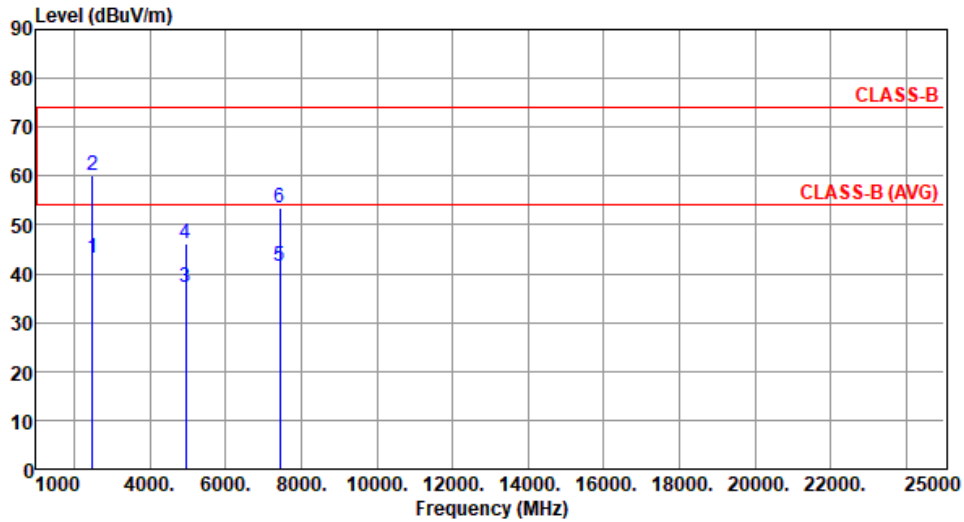
Note 1: Emission Level (dBuV/m) = SA Reading (dBuV/m) + Factor* (dB)

*Factor includes antenna factor , cable loss and amplifier gain

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

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

Test By : Akun Chung Temperature(°C): 25 Humidity(%): 64



	Freq. MHz	Emission level dBUV/m	Limit dBUV/m	Margin dB	SA reading dBUV	Factor dB	Remark	ANT High cm	Turn Table deg
1	2483.50	43.13	54.00	-10.87	45.87	-2.74	Average	352	11
2	2483.50	60.21	74.00	-13.79	62.95	-2.74	Peak	352	11
3	4960.00	37.27	54.00	-16.73	33.59	3.68	Average	293	37
4	4960.00	46.31	74.00	-27.69	42.63	3.68	Peak	293	37
5	7440.00	41.61	54.00	-12.39	32.63	8.98	Average	100	42
6	7440.00	53.33	74.00	-20.67	44.35	8.98	Peak	100	42

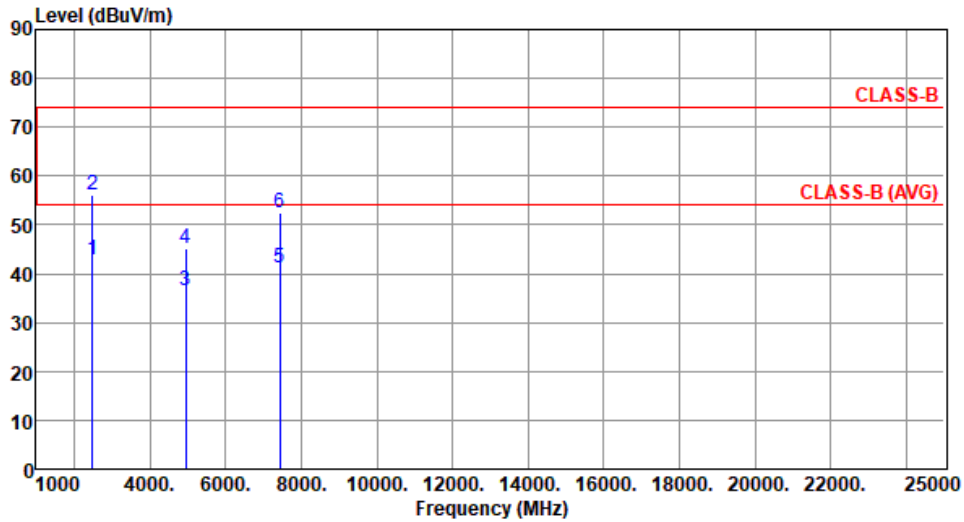
Note 1: Emission Level (dBUV/m) = SA Reading (dBUV/m) + Factor* (dB)

*Factor includes antenna factor , cable loss and amplifier gain

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

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

Test By :Akun Chung Temperature(°C):25 Humidity(%):64



	Freq. MHz	Emission level dBUV/m	Limit dBUV/m	Margin dB	SA reading dBUV	Factor dB	Remark	ANT High cm	Turn Table deg
1	2483.50	42.84	54.00	-11.16	45.58	-2.74	Average	381	325
2	2483.50	56.11	74.00	-17.89	58.85	-2.74	Peak	381	325
3	4960.00	36.66	54.00	-17.34	32.98	3.68	Average	100	128
4	4960.00	45.13	74.00	-28.87	41.45	3.68	Peak	100	128
5	7440.00	41.28	54.00	-12.72	32.30	8.98	Average	100	123
6	7440.00	52.38	74.00	-21.62	43.40	8.98	Peak	100	123

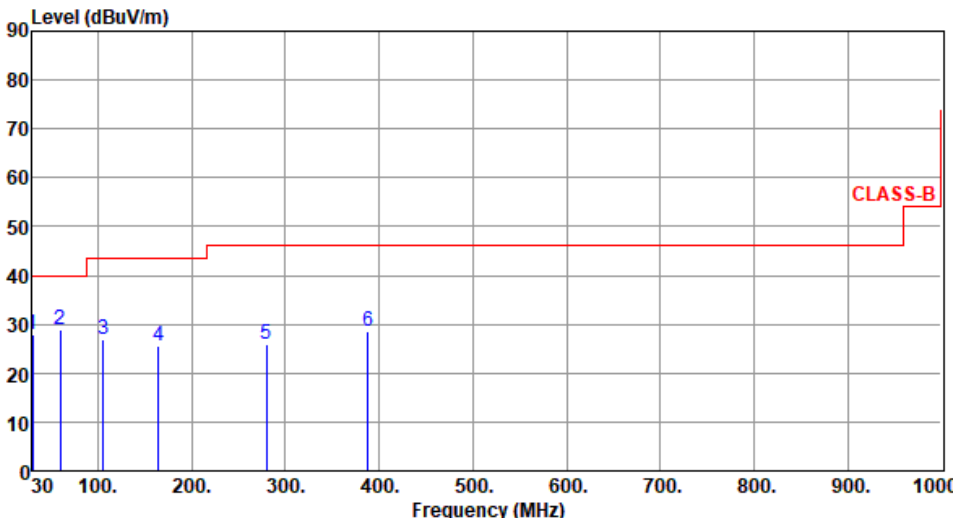
Note 1: Emission Level (dBUV/m) = SA Reading (dBUV/m) + Factor* (dB)

*Factor includes antenna factor , cable loss and amplifier gain

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

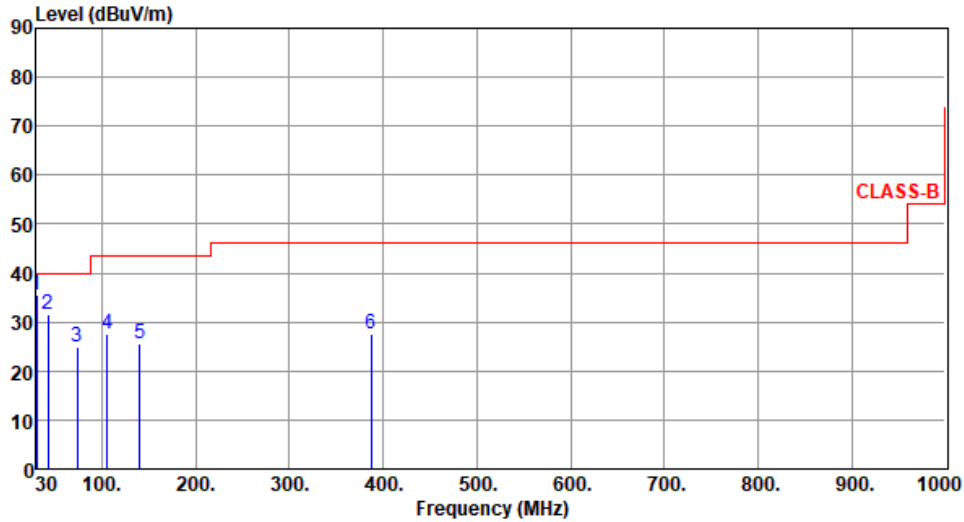
Configuration 2 : Adapter Mode

3.5.6 Transmitter Radiated Unwanted Emissions (Below 1GHz)

Modulation	BT-LE (1Mbps)	Test Freq. (MHz)	2402						
Polarization	Horizontal								
Test By : Akun Chung Temperature(°C):25 Humidity(%):64									
									
	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
1	30.39	27.88	40.00	-12.12	37.48	-9.60	Peak	---	---
2	59.65	28.95	40.00	-11.05	38.02	-9.07	Peak	---	---
3	105.88	26.78	43.50	-16.72	39.24	-12.46	Peak	---	---
4	164.89	25.55	43.50	-17.95	34.57	-9.02	Peak	---	---
5	279.86	25.85	46.00	-20.15	34.51	-8.66	Peak	---	---
6	388.48	28.69	46.00	-17.31	34.67	-5.98	Peak	---	---
Note 1: Emission Level (dBuV/m) = SA Reading (dBuV/m) + Factor* (dB) *Factor includes antenna factor , cable loss and amplifier gain Note 2: Margin (dB) = Emission level (dBuV/m) – Limit (dBuV/m). Note 3: All spurious emissions below 30MHz are more than 20 dB below the limit.									

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

Test By : Akun Chung Temperature(°C): 25 Humidity(%): 64



	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
1	30.58	35.45	40.00	-4.55	45.10	-9.65	Peak	---	---
2	42.85	31.63	40.00	-8.37	39.88	-8.25	Peak	---	---
3	73.66	24.87	40.00	-15.13	36.68	-11.81	Peak	---	---
4	105.52	27.71	43.50	-15.79	40.14	-12.43	Peak	---	---
5	140.63	25.52	43.50	-17.98	34.74	-9.22	Peak	---	---
6	386.92	27.63	46.00	-18.37	33.64	-6.01	Peak	---	---

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

*Factor includes antenna factor, cable loss and amplifier gain

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

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

3.6 Emissions in non-restricted Frequency Bands

3.6.1 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.

3.6.2 Test Procedures

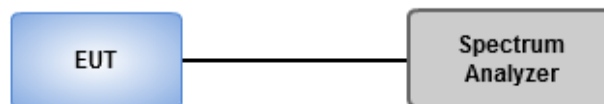
Reference level measurement

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

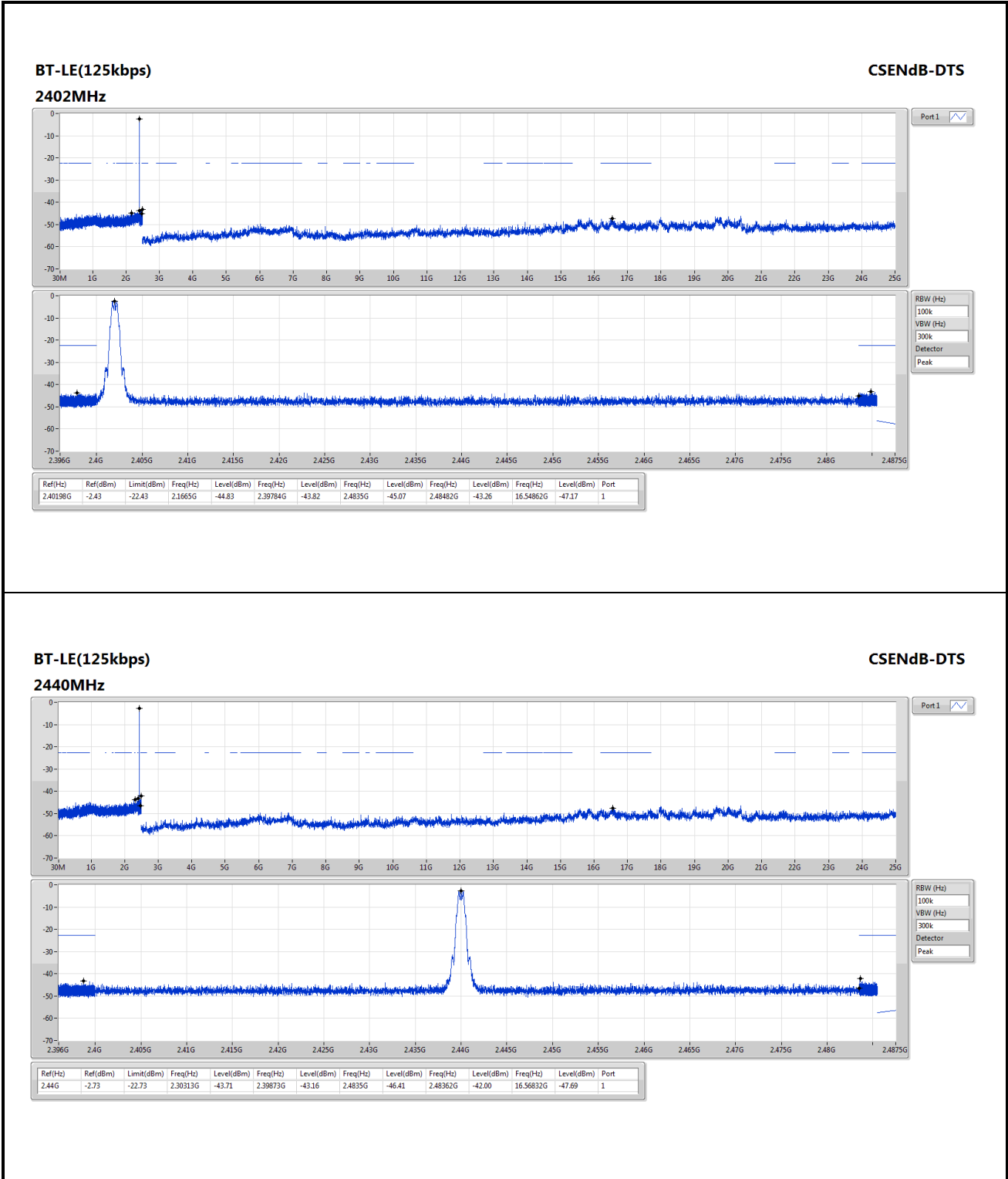
1. Set RBW=100kHz, VBW = 300kHz , Detector = Peak, Sweep time = Auto
2. Trace = max hold , Allow Trace to fully stabilize
3. Scan Frequency range is up to 25GHz
4. Use the peak marker function to determine the maximum amplitude level

3.6.3 Test Setup



3.6.4 Test Result of Emissions in non-restricted Frequency Bands

Ambient Condition	23°C / 63%	Tested By	Brad Wu
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BT-LE(125kbps)

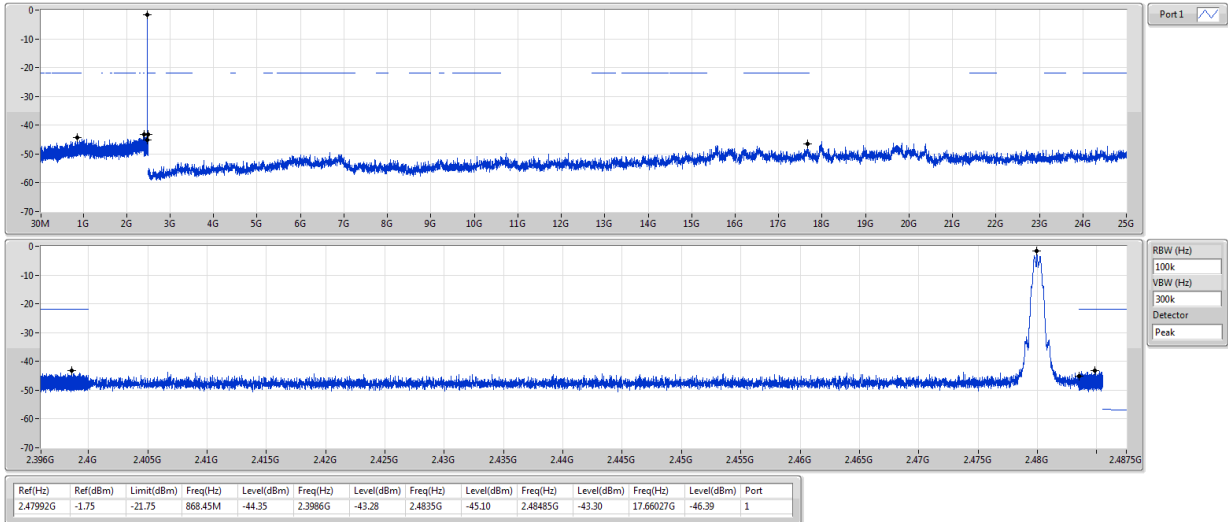
2440MHz

CSEndB-DTS

BT-LE(125kbps)

CSENdB-DTS

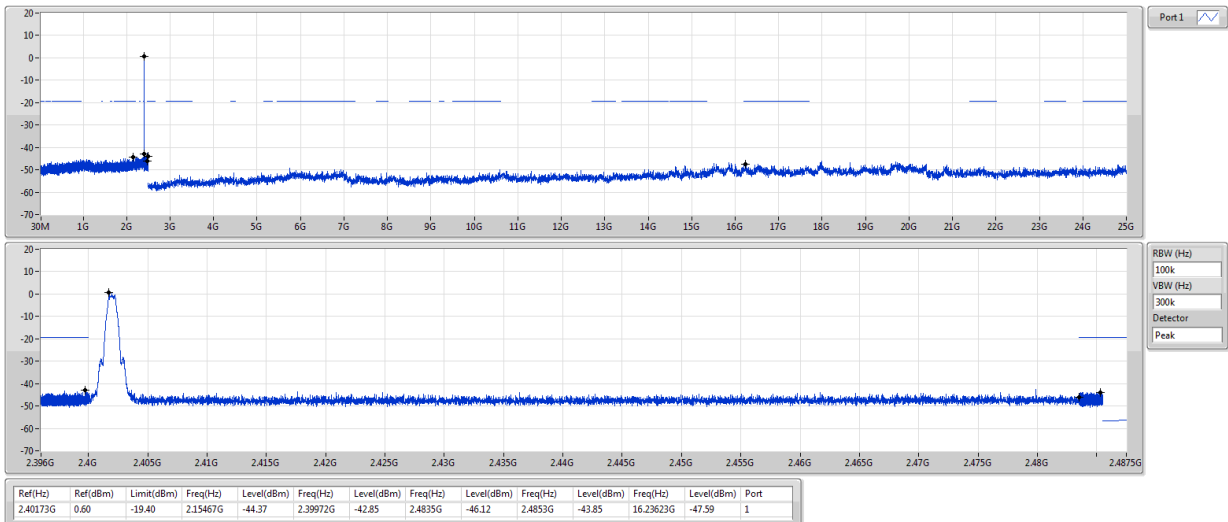
2480MHz



BT-LE(500kbps)

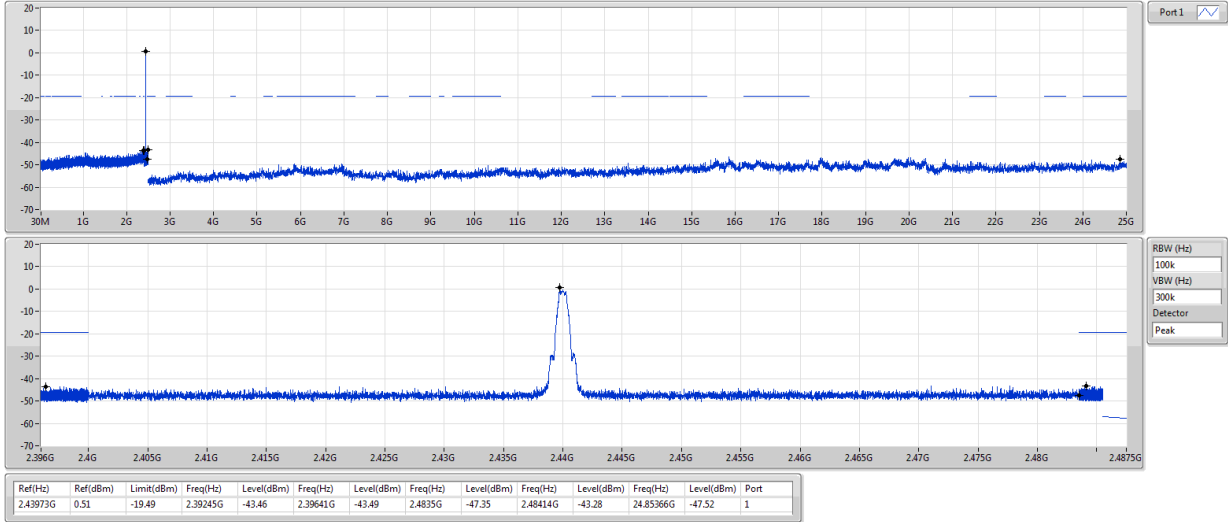
CSENdB-DTS

2402MHz



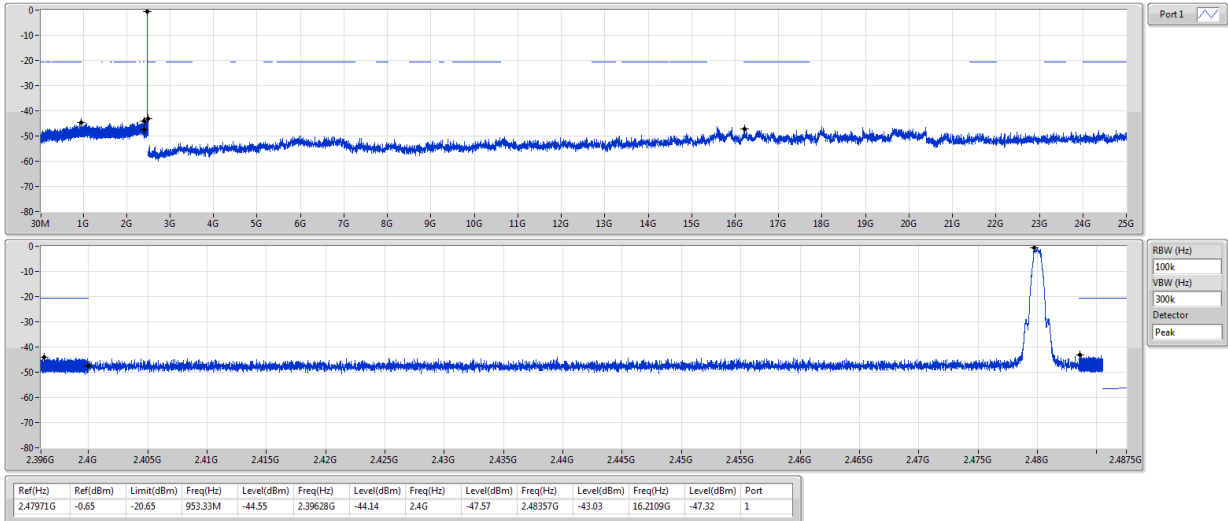
BT-LE(500kbps)
2440MHz

CSENdB-DTS



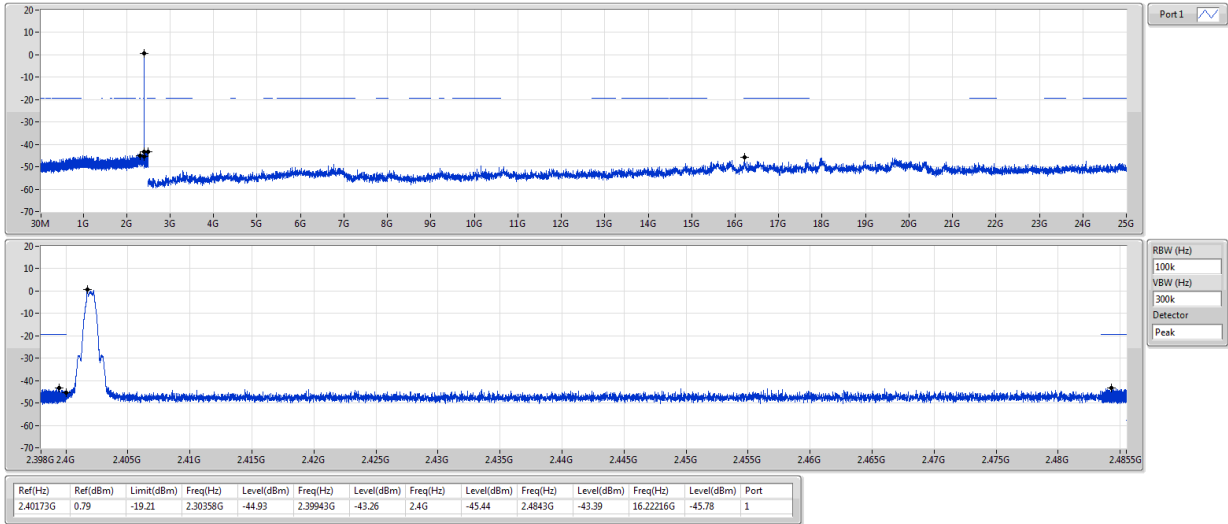
BT-LE(500kbps)
2480MHz

CSENdB-DTS



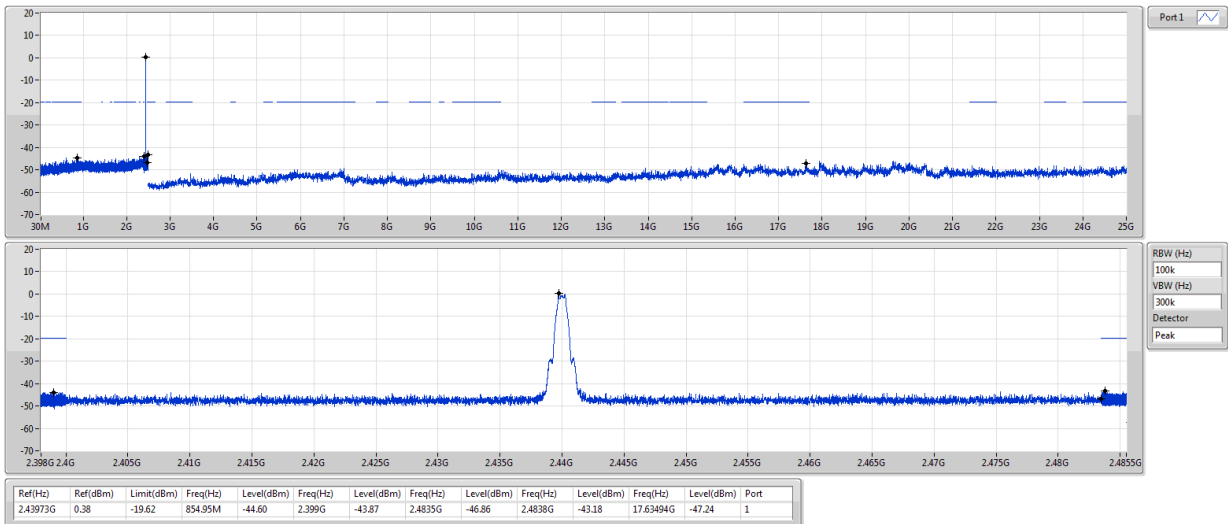
BT-LE(1Mbps)
2402MHz

CSENdB-DTS



BT-LE(1Mbps)
2440MHz

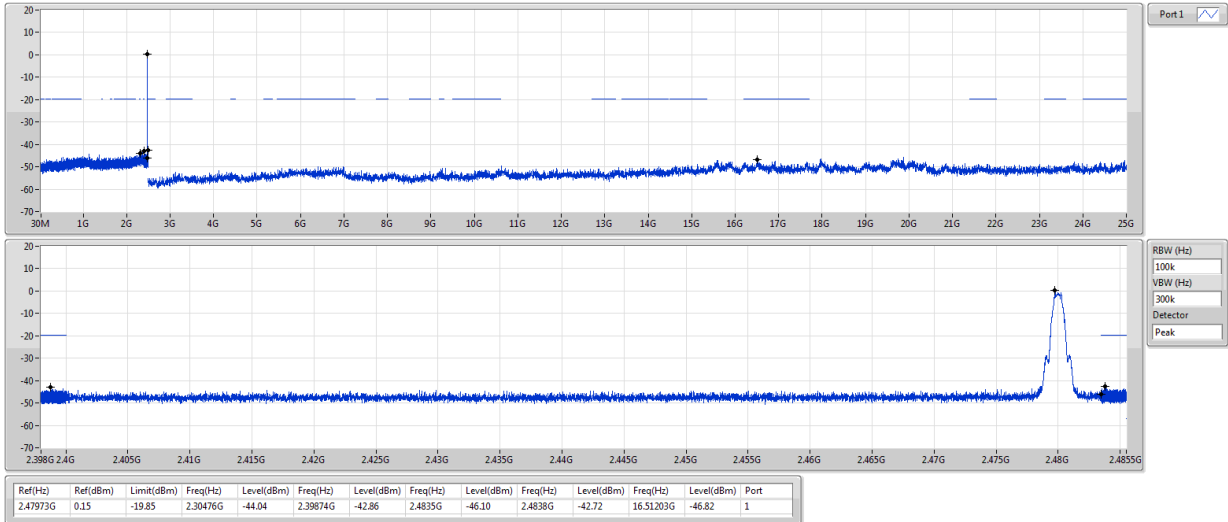
CSENdB-DTS



BT-LE(1Mbps)

CSENdB-DTS

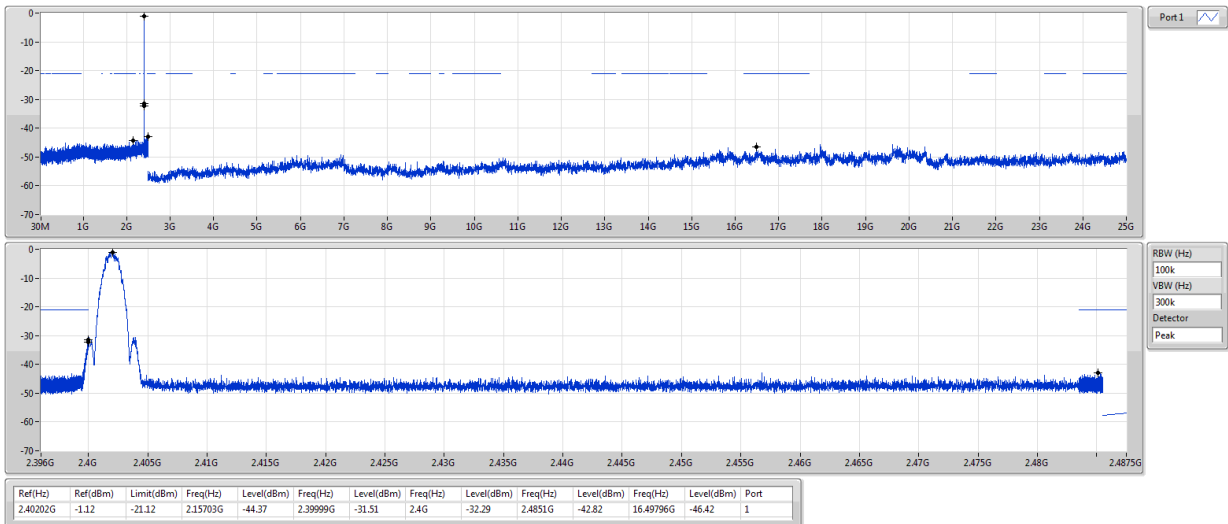
2480MHz

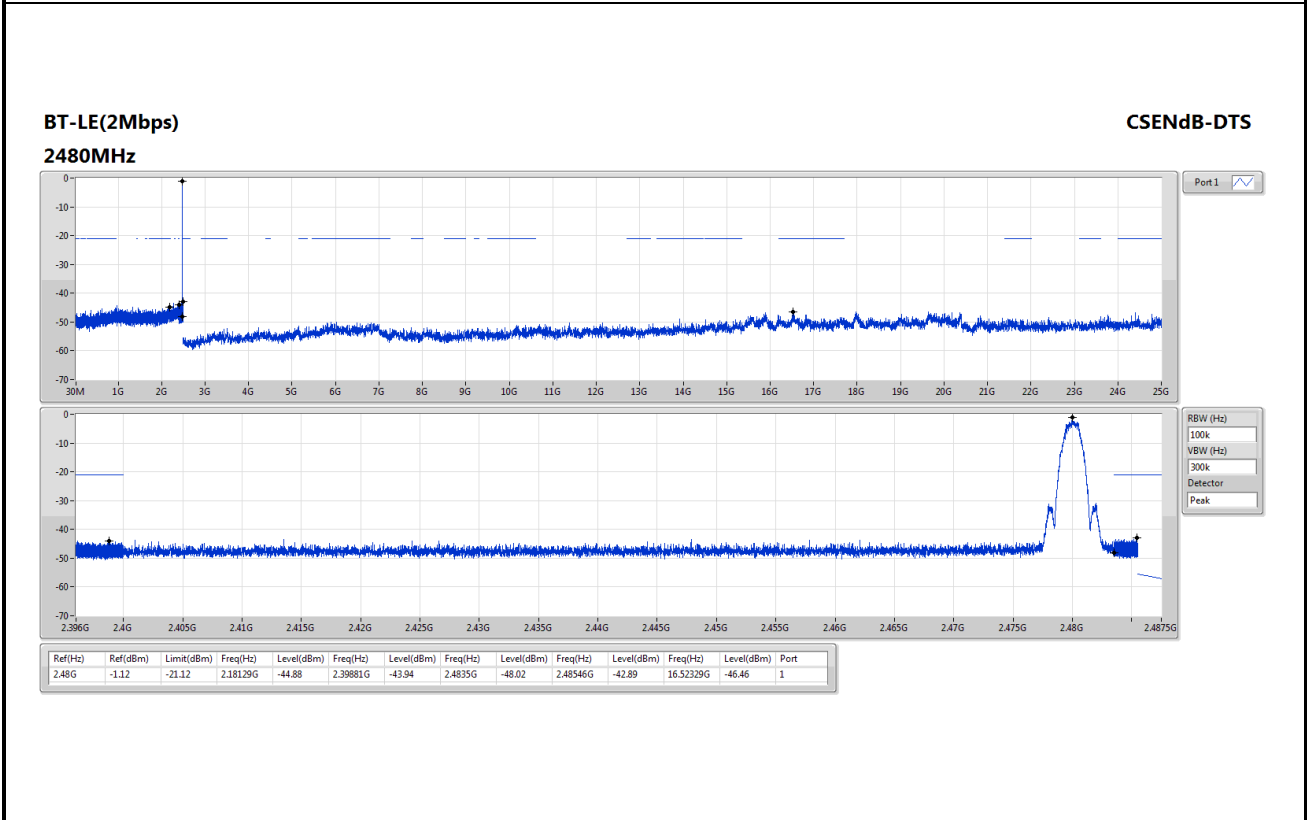
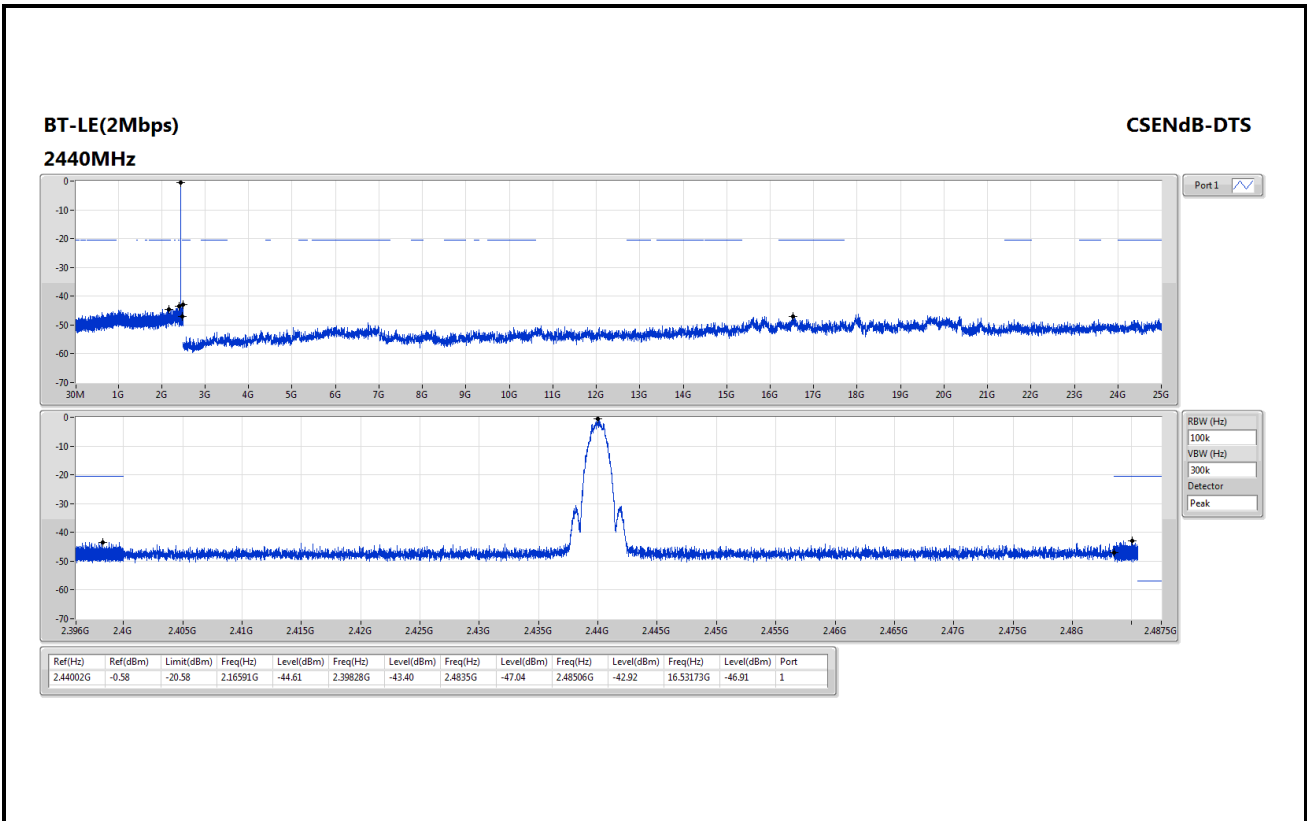


BT-LE(2Mbps)

CSENdB-DTS

2402MHz





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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Kou District, New Taipei City,
Taiwan, R.O.C.

Kwei Shan

Tel: 886-3-271-8666

No. 3-1, Lane 6, Wen San 3rd St.,
Kwei Shan District, Tao Yuan City
333, Taiwan, R.O.C.

Kwei Shan Site II

Tel: 886-3-271-8640

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==