FCC Test Report

FCC ID	:	**2AQ68-AHE7X0C-000U**
Equipment	:	**PoE Anchor**
Model No.	:	**AHE7X0C-000U**
Applicant	:	**HON LIN TECHNOLOGY CO., LTD.**
Address	:	**11F, No.32, Jihu Rd., Neihu Dist., Taipei City,Taiwan 114**
Standard	:	**47 CFR FCC Part 15.247**
Received Date	:	**Dec. 16, 2020**
Tested Date	:	**May 26 ~ May 31, 2021**

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

Reviewed by: **Approved by:**

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

Testing Laboratory 2732

Table of Contents

Release Record

Report No.	Version	Description	Issued Date
FR0D1606	Rev. 01	Initial issue	Jun. 04, 2021

Summary of Test Results

FCC Rules	Test Items	Measured	Result
15.207	AC Power Line Conducted Emissions	[dBuV]: 0.491MHz 36.52 (Margin -9.62dB) - AV	Pass
15.247(d) 15.209	Radiated Emissions	[dBuV/m at 3m]: 155.78MHz 43.10 (Margin -0.40dB) - QP	Pass
15.247(b)(3)	Maximum Output Power	Power [dBm]: 2.96	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	V4.0 LE	2402-2480	0-39 [40]	1 Mbps
Note 1: Bluetooth LE (Low energy) uses GFSK modulation.				

1.1.2 Antenna Details

Ant. No.	Type	Connector	Gain (dBi)	Remarks
1	PIFA	I_PEX 1	4	---

1.1.3 Power Supply Type of Equipment under Test (EUT)

Power Supply Type	12Vdc from adapter 48Vdc from POE

Note: The above power supplies are not bundled in market.

1.1.4 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

1.1.5 Test Tool and Duty Cycle

Test Tool	SmartRF Studio 7, Version: V2.8.0	
Duty Cycle and Duty Factor	Duty Cycle (%)	Duty Factor (dB)
	100	0

1.1.6 Power Index of Test Tool

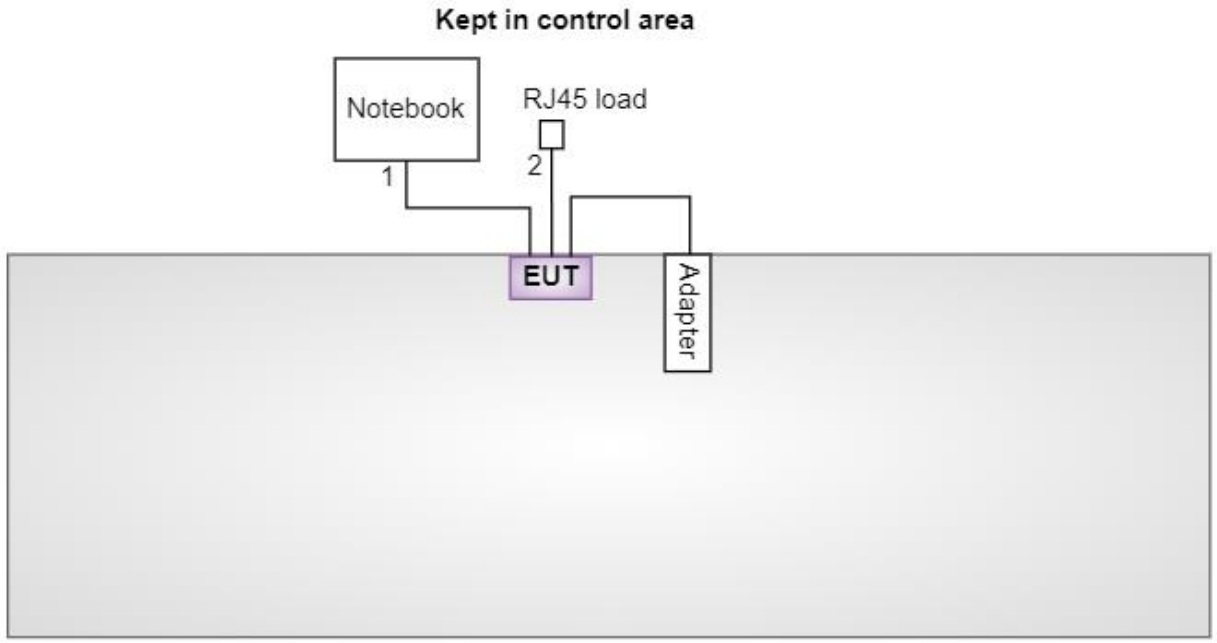
Modulation Mode	Test Frequency (MHz)		
	2402	2440	2480
BT LE-1Mbps	2	2	2

1.2 Local Support Equipment List

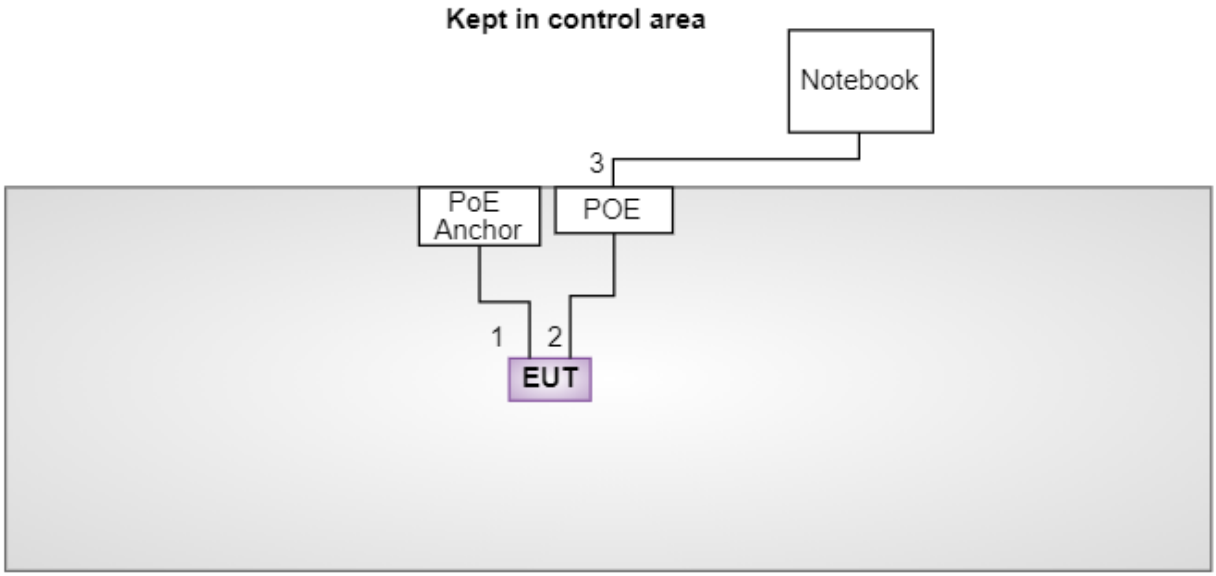
Support Equipment List					
No.	**Equipment**	**Brand**	**Model**	**FCC ID**	**Remarks**
1	Adapter	NETGEAR	AD817F10	---	Provided by applicant.
2	POE	GOSPELL DIGITAL TECHNOLOGY CO.,LTD	---	---	Provided by applicant.
3	PoE Anchor	---	AHE7X0C-000U	---	Provided by applicant.
4	Notebook	DELL	Latitude E5470	BJ5JVF2	---
5	RJ45 load	---	---	---	---

1.3 Test Setup Chart

Test Setup Diagram (Adapter mode)



No.	Signal cable / Length (m)
1	RJ45, 10m non-shielded.
2	RJ45, 1.3m non-shielded with load.

Test Setup Diagram (POE mode)


No.	Signal cable / Length (m)
1-2	RJ45, 10m(x2) non-shielded.
3	RJ45, 1.3m non-shielded.

1.4 Test Equipment List and Calibration Data

Test Item	Conducted Emission				
Test Site	Conduction room 1 / (CO01-WS)				
Tested Date	May 28, 2021				
Instrument	**Brand**	**Model No.**	**Serial No.**	**Calibration Date**	**Calibration Until**
Receiver	R&S	ESR3	101658	Feb. 08, 2021	Feb. 07, 2022
LISN	R&S	ENV216	101579	Mar. 17, 2021	Mar. 16, 2022
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 chamber3 / (03CH03-WS)				
Tested Date	May 26, 2021				
Instrument	**Brand**	**Model No.**	**Serial No.**	**Calibration Date**	**Calibration Until**
Receiver	R&S	ESR3	101657	Mar. 12, 2021	Mar. 11, 2022
Spectrum Analyzer	R&S	FSV40	101499	Mar. 02, 2021	Mar. 01, 2022
Loop Antenna	R&S	HFH2-Z2	100330	Nov. 17, 2020	Nov. 16, 2021
Bilog Antenna	SCHWARZBECK	VULB9168	VULB9168-685	May. 06, 2021	May. 05, 2022
Horn Antenna 1G-18G	SCHWARZBECK	BBHA 9120 D	BBHA 9120 D 1206	Dec. 22, 2020	Dec. 21, 2021
Horn Antenna 18G-40G	SCHWARZBECK	BBHA 9170	BBHA 9170517	Nov. 06, 2020	Nov. 05, 2021
Preamplifier	EMC	EMC02325	980187	Aug. 05, 2020	Aug. 04, 2021
Preamplifier	Agilent	83017A	MY39501309	Sep. 02, 2020	Sep. 01, 2021
Preamplifier	EMC	EMC184045B	980192	Jul. 21, 2020	Jul. 20, 2021
Loop Antenna Cable	KOAX KABEL	101354-BW	101354-BW	Oct. 06, 2020	Oct. 05, 2021
LF cable-0.8M	EMC	EMC8D-NM-NM-800	EMC8D-NM-NM-800 -001	Sep. 26, 2020	Sep. 25, 2021
LF cable-3M	EMC	EMC8D-NM-NM-300 0	131103	Sep. 26, 2020	Sep. 25, 2021
LF cable-13M	EMC	EMC8D-NM-NM-130 00	131104	Sep. 26, 2020	Sep. 25, 2021
RF cable-3M	HUBER+SUHNER	SUCOFLEX104	MY22620/4	Sep. 26, 2020	Sep. 25, 2021
RF cable-8M	EMC	EMC104-SM-SM-80 00	181107	Sep. 26, 2020	Sep. 25, 2021
Note: Calibration Interval of instruments listed above is one year.					

Test Item	RF Conducted				
Test Site	(TH01-WS)				
Tested Date	May 31, 2021				
Instrument	**Brand**	**Model No.**	**Serial No.**	**Calibration Date**	**Calibration Until**
Spectrum Analyzer	R&S	FSV40	101063	Apr. 19, 2021	Apr. 18, 2022
Power Meter	Anritsu	ML2495A	1241002	Nov. 04, 2020	Nov. 03, 2021
Power Sensor	Anritsu	MA2411B	1207366	Nov. 04, 2020	Nov. 03, 2021
Measurement Software	-	SENSE-15247_FS	V5.10.7.11	NA	NA
Note: Calibration Interval of instruments listed above is one year.					

1.5 Test Standards

47 CFR FCC Part 15.247
ANSI C63.10-2013

1.6 Reference Guidance

FCC KDB 558074 D01 15.247 Meas Guidance v05r02

1.7 Deviation from Test Standard and Measurement Procedure

None

1.8 Measurement Uncertainty

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

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

2 Test Configuration

2.1 Testing Facility

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

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

2.2 The Worst Test Modes and Channel Details

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

NOTE:

1. The EUT had been tested by following test configurations.
   1) Configuration 1: Adapter mode
   2) Configuration 2: POE mode

3 Transmitter Test Results

3.1 Conducted Emissions

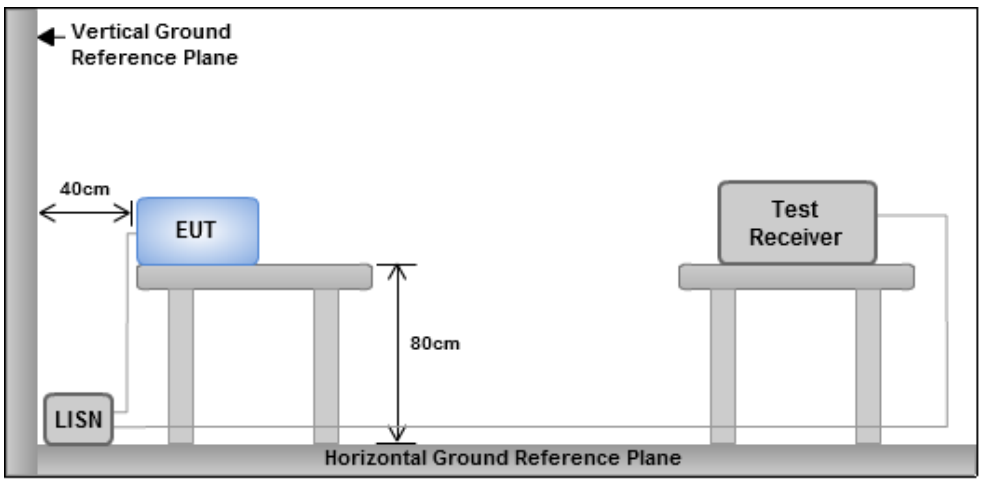
3.1.1 Limit of Conducted Emissions

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



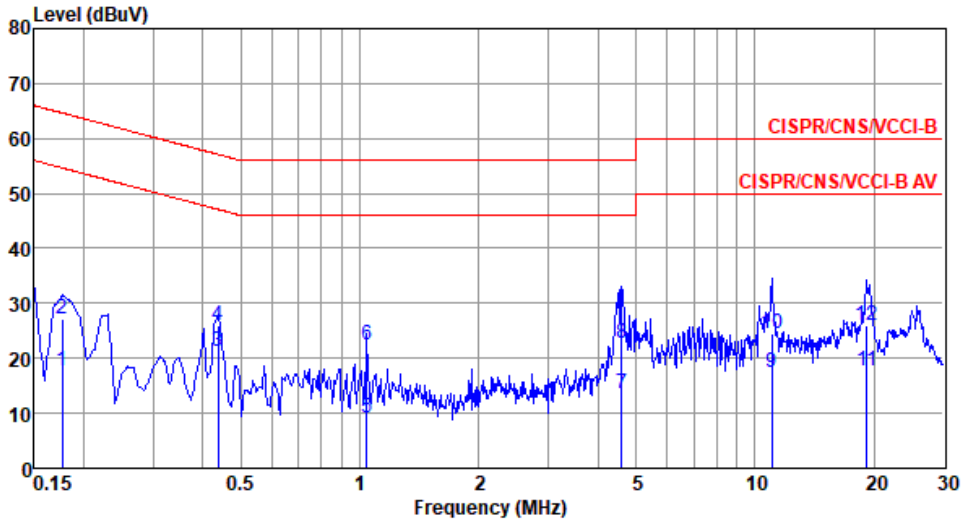
Note: 1. Support units were connected to second LISN.

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

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

Test by : BRAD WU Temperature: 24°C Humidity: 64%

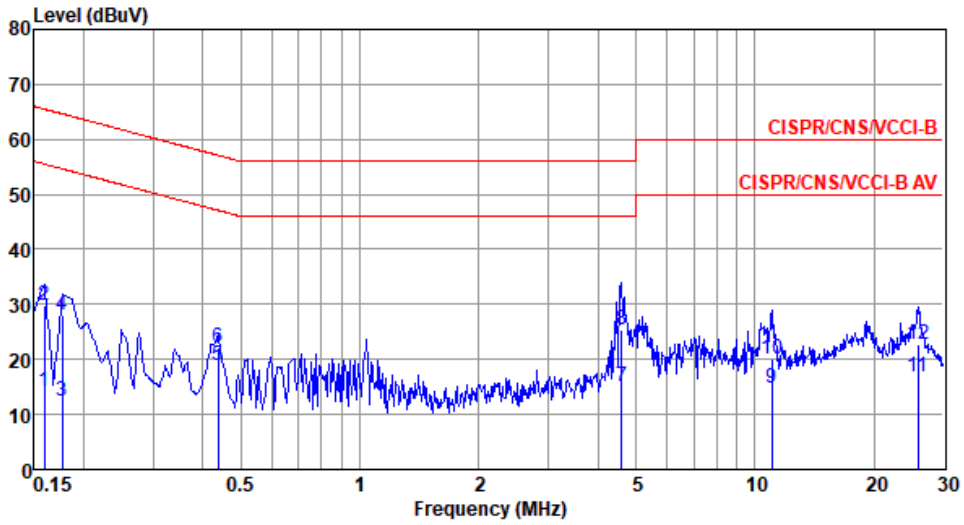


	Freq	Level	Limit Line	Over Limit	Read Level	Factor	Cable loss	Remark
	MHz	dBuV	dBuV	dB	dBuV	dB	dB	
1	0.177	17.71	54.64	-36.93	7.81	9.84	0.06	Average
2	0.177	27.21	64.64	-37.43	17.31	9.84	0.06	QP
3*	0.437	21.23	47.11	-25.88	11.25	9.90	0.08	Average
4	0.437	26.09	57.11	-31.02	16.11	9.90	0.08	QP
5	1.043	9.02	46.00	-36.98	-1.09	9.99	0.12	Average
6	1.043	22.52	56.00	-33.48	12.41	9.99	0.12	QP
7	4.598	13.70	46.00	-32.30	3.34	10.05	0.31	Average
8	4.598	22.80	56.00	-33.20	12.44	10.05	0.31	QP
9	11.021	17.31	50.00	-32.69	6.73	10.13	0.45	Average
10	11.021	24.56	60.00	-35.44	13.98	10.13	0.45	QP
11	19.224	17.64	50.00	-32.36	6.73	10.25	0.66	Average
12	19.224	25.93	60.00	-34.07	15.02	10.25	0.66	QP

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

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

Test by : BRAD WU Temperature: 24°C Humidity: 64%

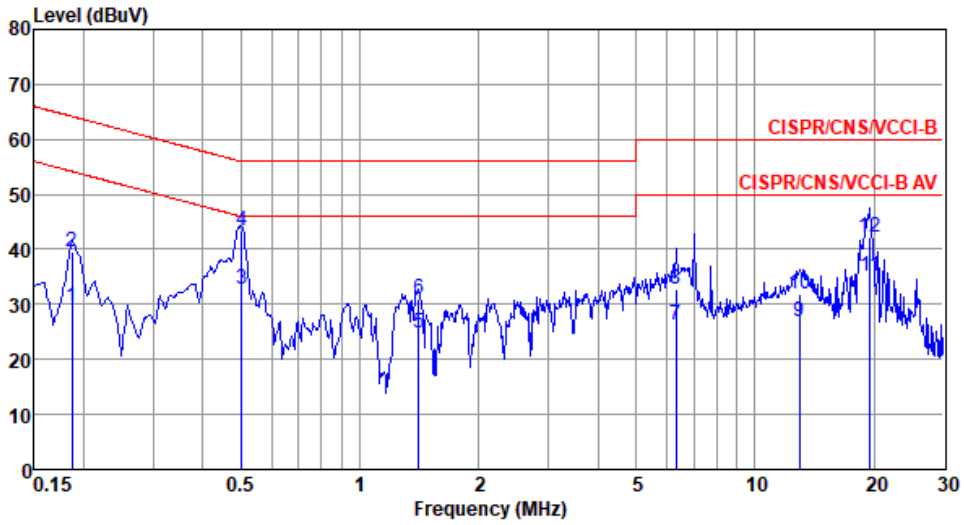


	Freq	Level	Limit Line	Over Limit	Read Level	Factor	Cable loss	Remark
	MHz	dBuV	dBuV	dB	dBuV	dB	dB	
1	0.159	14.06	55.52	-41.46	4.19	9.82	0.05	Average
2	0.159	29.84	65.52	-35.68	19.97	9.82	0.05	QP
3	0.177	12.31	54.64	-42.33	2.42	9.83	0.06	Average
4	0.177	28.06	64.64	-36.58	18.17	9.83	0.06	QP
5*	0.437	19.04	47.11	-28.07	9.11	9.85	0.08	Average
6	0.437	22.11	57.11	-35.00	12.18	9.85	0.08	QP
7	4.598	15.15	46.00	-30.85	4.86	9.98	0.31	Average
8	4.598	25.45	56.00	-30.55	15.16	9.98	0.31	QP
9	11.021	14.70	50.00	-35.30	4.13	10.12	0.45	Average
10	11.021	20.04	60.00	-39.96	9.47	10.12	0.45	QP
11	25.864	16.91	50.00	-33.09	5.70	10.49	0.72	Average
12	25.864	22.83	60.00	-37.17	11.62	10.49	0.72	QP

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

Modulation Mode	BT-LE(1Mbps)	Test Freq. (MHz)	2402
Power Phase	Line	Test Configuration	2

Test by : BRAD WU Temperature: 24°C Humidity: 64%

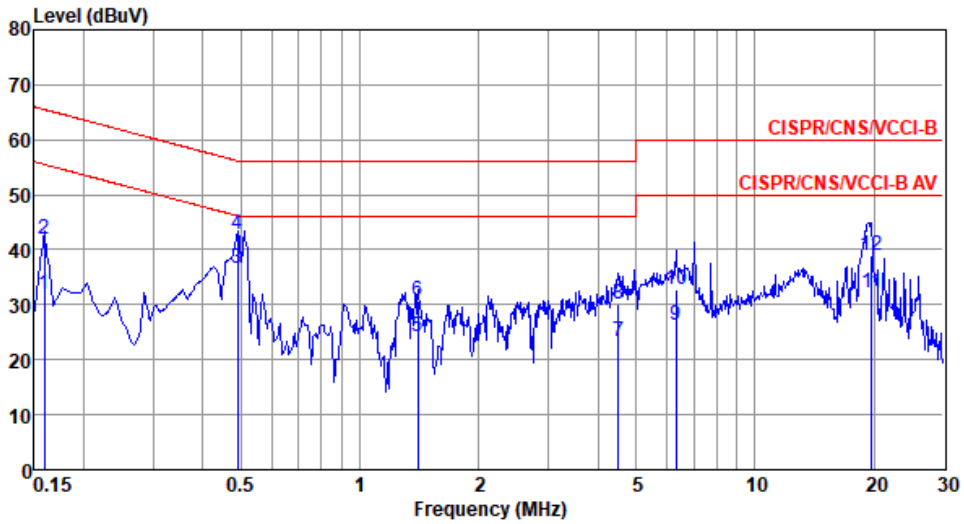


	Freq	Level	Limit Line	Over Limit	Read Level	Factor	Cable loss	Remark
	MHz	dBuV	dBuV	dB	dBuV	dB	dB	
1	0.186	29.58	54.20	-24.62	19.68	9.84	0.06	Average
2	0.186	39.41	64.20	-24.79	29.51	9.84	0.06	QP
3	0.502	32.78	46.00	-13.22	22.78	9.91	0.09	Average
4*	0.502	43.46	56.00	-12.54	33.46	9.91	0.09	QP
5	1.411	24.93	46.00	-21.07	14.79	9.99	0.15	Average
6	1.411	31.02	56.00	-24.98	20.88	9.99	0.15	QP
7	6.319	26.18	50.00	-23.82	15.77	10.07	0.34	Average
8	6.319	32.71	60.00	-27.29	22.30	10.07	0.34	QP
9	12.988	26.72	50.00	-23.28	16.02	10.17	0.53	Average
10	12.988	31.91	60.00	-28.09	21.21	10.17	0.53	QP
11	19.532	35.19	50.00	-14.81	24.27	10.26	0.66	Average
12	19.532	42.20	60.00	-17.80	31.28	10.26	0.66	QP

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

Modulation Mode	BT-LE(1Mbps)	Test Freq. (MHz)	2402
Power Phase	Neutral	Test Configuration	2

Test by : BRAD WU Temperature: 24°C Humidity: 64%



	Freq	Level	Limit Line	Over Limit	Read Level	Factor	Cable loss	Remark
	MHz	dBuV	dBuV	dB	dBuV	dB	dB	
1	0.159	31.94	55.52	-23.58	22.07	9.82	0.05	Average
2	0.159	41.89	65.52	-23.63	32.02	9.82	0.05	QP
3*	0.491	36.52	46.14	-9.62	26.57	9.86	0.09	Average
4	0.491	42.92	56.14	-13.22	32.97	9.86	0.09	QP
5	1.403	24.31	46.00	-21.69	14.25	9.91	0.15	Average
6	1.403	30.72	56.00	-25.28	20.66	9.91	0.15	QP
7	4.501	23.28	46.00	-22.72	13.00	9.98	0.30	Average
8	4.501	30.24	56.00	-25.76	19.96	9.98	0.30	QP
9	6.319	26.34	50.00	-23.66	15.98	10.02	0.34	Average
10	6.319	32.87	60.00	-27.13	22.51	10.02	0.34	QP
11	19.740	32.16	50.00	-17.84	21.17	10.32	0.67	Average
12	19.740	39.00	60.00	-21.00	28.01	10.32	0.67	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

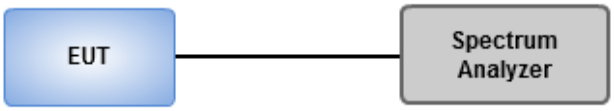
6dB Bandwidth

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	25°C / 66%	Tested By	Aska Huang

Summary

Mode	Max-N dB (Hz)	Max-OBW (Hz)	ITU-Code	Min-N dB (Hz)	Min-OBW (Hz)
2.4-2.4835GHz	-	-	-	-	-
BT-LE(1Mbps)	775.362k	1.075M	1M08F1D	753.623k	1.056M

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

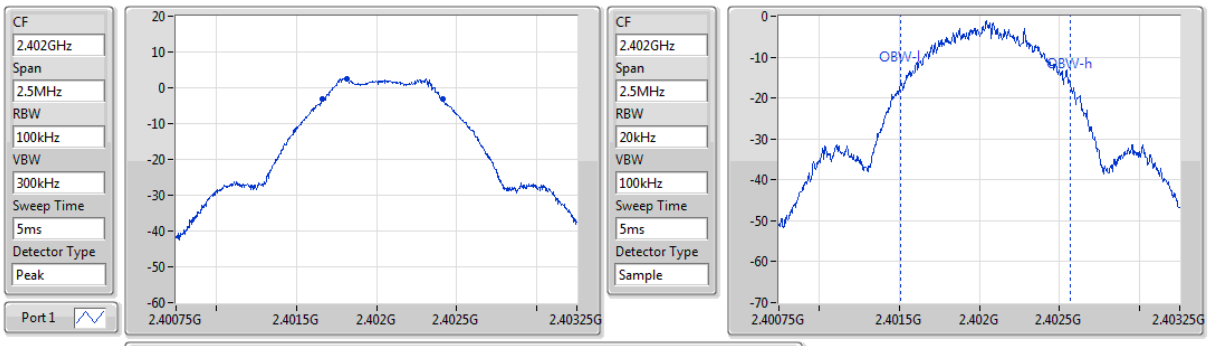
Result

Mode	Result	Limit (Hz)	Port 1-N dB (Hz)	Port 1-OBW (Hz)
BT-LE(1Mbps)	-	-	-	-
2402MHz	Pass	500k	753.623k	1.056M
2440MHz	Pass	500k	757.246k	1.071M
2480MHz	Pass	500k	775.362k	1.075M

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

BT-LE(1Mbps) **EBW-DTS**

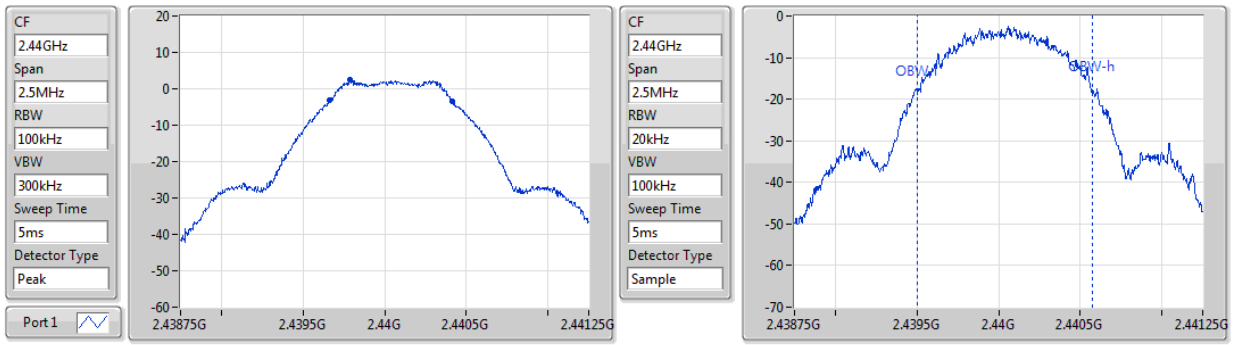
2402MHz



6dB(Hz)	Fl-6dB(Hz)	Fh-6dB(Hz)	OBW(Hz)	Fl-OBW(Hz)	Fh-OBW(Hz)	Limit(Hz)	Port
753.623k	2.401663G	2.402417G	1.056M	2.401512G	2.402568G	500k	1

BT-LE(1Mbps) **EBW-DTS**

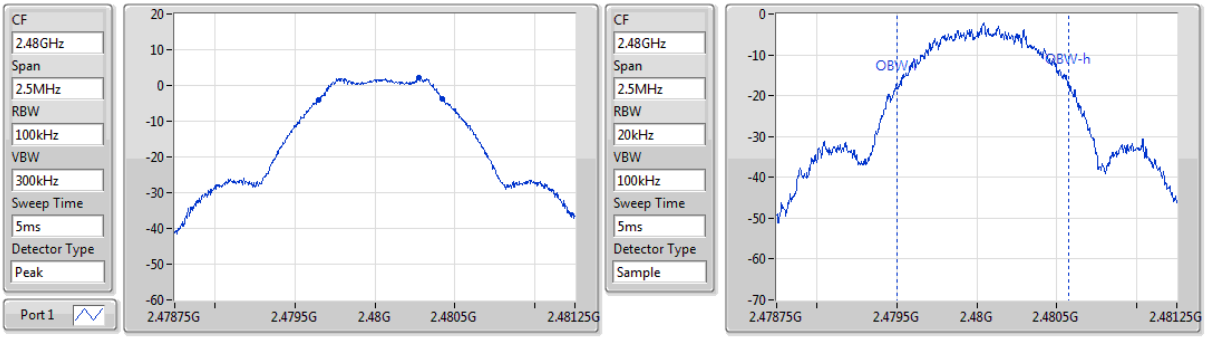
2440MHz



6dB(Hz)	Fl-6dB(Hz)	Fh-6dB(Hz)	OBW(Hz)	Fl-OBW(Hz)	Fh-OBW(Hz)	Limit(Hz)	Port
757.246k	2.439659G	2.440417G	1.071M	2.439504G	2.440575G	500k	1

BT-LE(1Mbps) **EBW-DTS**

2480MHz



6dB(Hz)	Fl-6dB(Hz)	Fh-6dB(Hz)	OBW(Hz)	Fl-OBW(Hz)	Fh-OBW(Hz)	Limit(Hz)	Port
775.362k	2.479649G	2.480424G	1.075M	2.479501G	2.480575G	500k	1

3.3 RF Output Power

3.3.1 Limit of RF Output Power

Conducted power shall not exceed 1Watt.

Antenna gain <= 6dBi, 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	25°C / 66%	Tested By	Aska Huang

Summary of Peak Conducted Output Power

Mode	Power (dBm)	Power (W)
2.4-2.4835GHz	-	-
BT-LE(1Mbps)	2.96	0.00198

Result

Mode	Result	Antenna Gain (dBi)	Power (dBm)	Power Limit (dBm)
BT-LE(1Mbps)	-	-	-	-
2402MHz	Pass	4.00	2.96	30.00
2440MHz	Pass	4.00	2.77	30.00
2480MHz	Pass	4.00	2.64	30.00

Summary of Conducted (Average) Output Power

Mode	Power (dBm)	Power (W)
2.4-2.4835GHz	-	-
BT-LE(1Mbps)	2.84	0.00192

Result

Mode	Result	Antenna Gain (dBi)	Power (dBm)	Power Limit (dBm)
BT-LE(1Mbps)	-	-	-	-
2402MHz	Pass	4.00	2.84	-
2440MHz	Pass	4.00	2.63	-
2480MHz	Pass	4.00	2.50	-

Note: Average power is for reference only.

3.4 Power Spectral Density

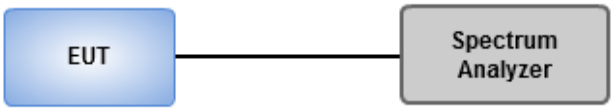
3.4.1 Limit of Power Spectral Density

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	25°C / 66%	Tested By	Aska Huang

Summary

Mode	PD (dBm/3kHz)
2.4-2.4835GHz	-
BT-LE(1Mbps)	-6.21

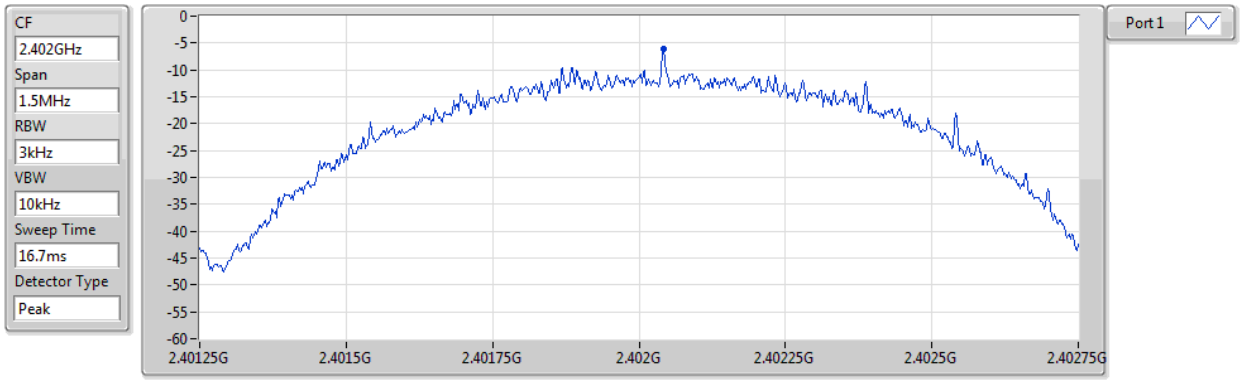
Result

Mode	Result	Antenna Gain (dBi)	PD (dBm/3kHz)	PD Limit (dBm/3kHz)
BT-LE(1Mbps)	-	-	-	-
2402MHz	Pass	4.00	-6.21	8.00
2440MHz	Pass	4.00	-9.48	8.00
2480MHz	Pass	4.00	-9.32	8.00

PD = Power density

BT-LE(1Mbps) **PSD**

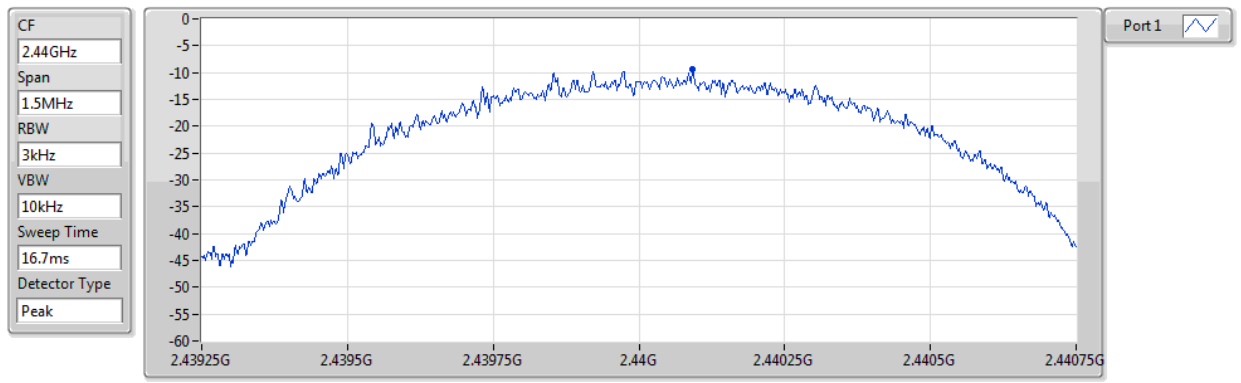
2402MHz



Sum	PD	Port 1
(dBm/RBW)	(dBm/RBW)	(dBm/RBW)
-6.21	-6.21	-6.21

BT-LE(1Mbps) **PSD**

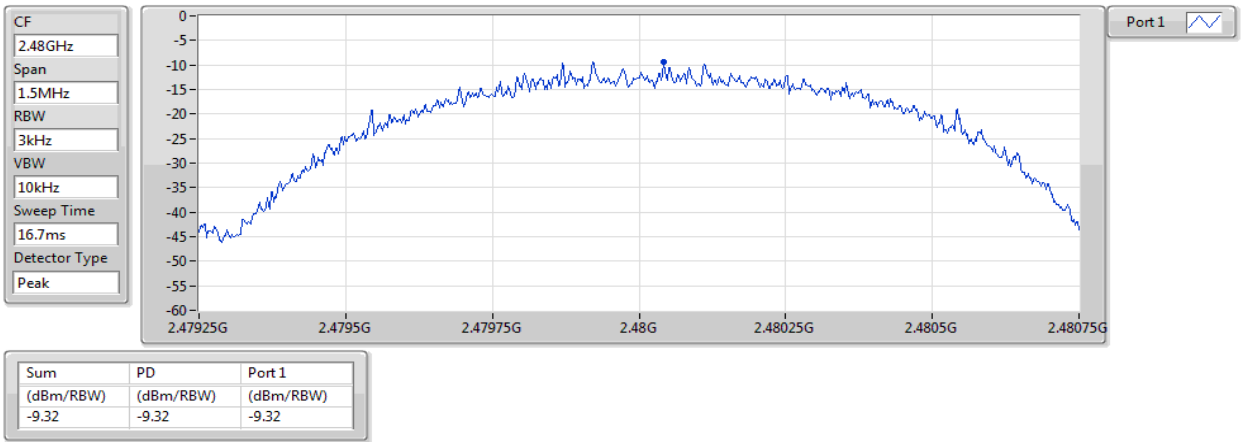
2440MHz



Sum	PD	Port 1
(dBm/RBW)	(dBm/RBW)	(dBm/RBW)
-9.48	-9.48	-9.48

BT-LE(1Mbps) **PSD**

2480MHz



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:
Qusai-Peak value is measured for frequency below 1GHz except for 9–90 kHz, 110–490 kHz frequency band. Peak and average value are measured for frequency above 1GHz. The limit on average radio frequency emission is as above table. The limit on peak radio frequency emissions is 20 dB above the maximum permitted average emission limit
Note 2:
Measurements may be performed at a distance other than what is specified provided. When performing measurements at a distance other than that specified, the results shall be extrapolated to the specified distance using an extrapolation factor as below, Frequency at or above 30 MHz: 20 dB/decade Frequency below 30 MHz: 40 dB/decade.

3.5.2 Test Procedures

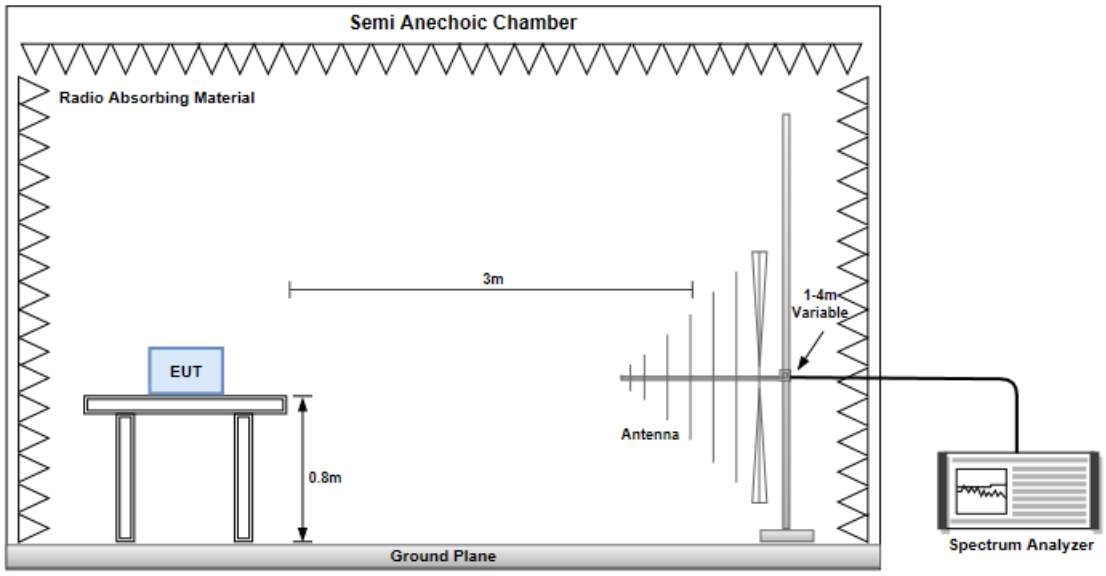
1. Measurement is made at a semi-anechoic chamber that incorporates a turntable allowing a EUT rotation of 360°. A continuously-rotating, remotely-controlled turntable is installed at the test site to support the EUT and facilitate determination of the direction of maximum radiation for each EUT emission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

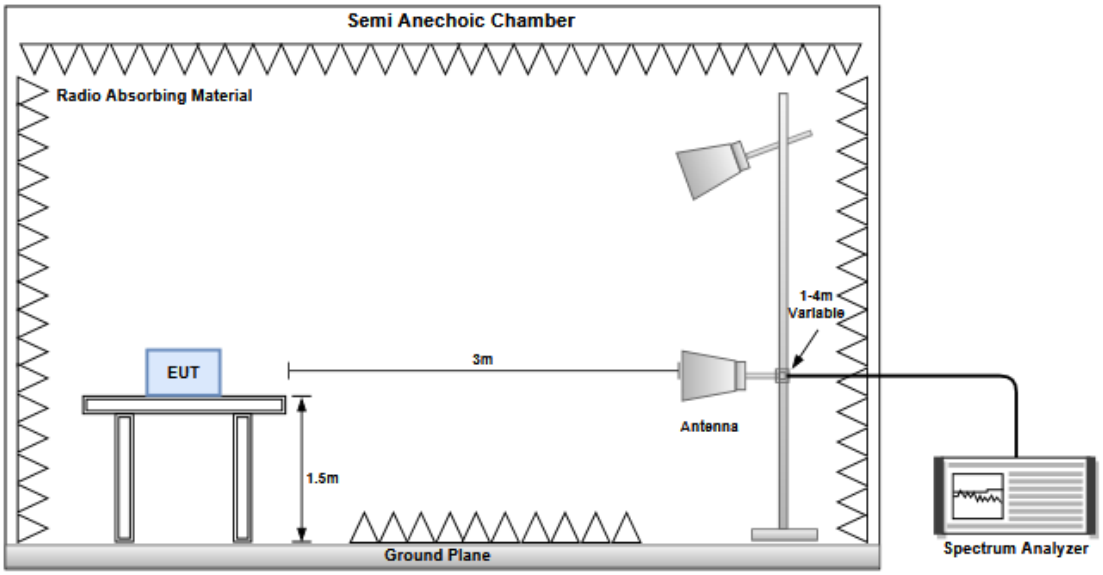
1. 120kHz measurement bandwidth of test receiver and Quasi-peak detector is for radiated emission below 1GHz.
2. RBW=1MHz, VBW=3MHz and Peak detector is for peak measured value of radiated emission above 1GHz.
3. RBW=1MHz, VBW=1/T and Peak detector is for average measured value of radiated emission above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

3.5.3 Test Setup

Radiated Emissions below 1 GHz



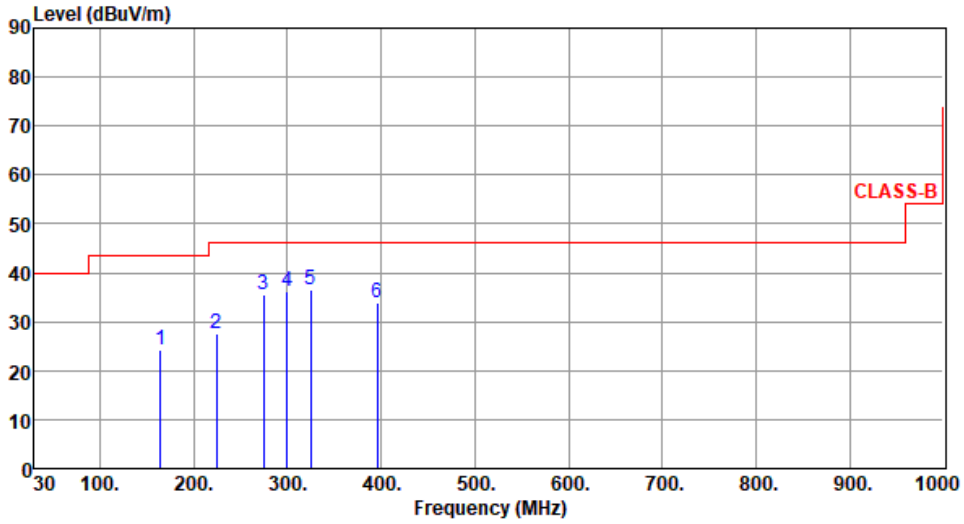
Radiated Emissions above 1 GHz



3.5.4 Transmitter Radiated Unwanted Emissions (Below 1GHz)

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

Test By :Roger Lu Temperature(℃):24 Humidity(%):67

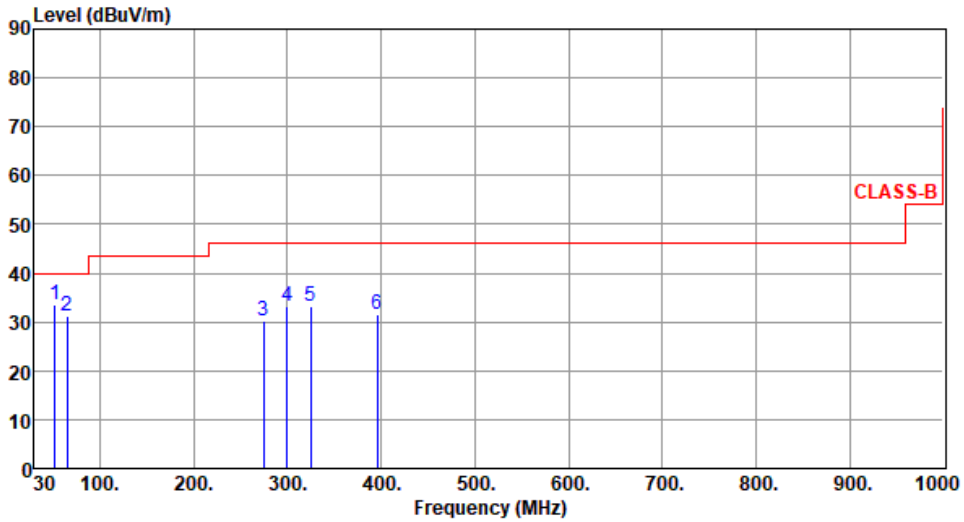


	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB/m	Remark	ANT High cm	Turn Table deg
1	164.83	24.12	43.50	-19.38	32.92	-8.80	Peak	---	---
2	224.00	27.66	46.00	-18.34	39.71	-12.05	Peak	---	---
3	274.44	35.68	46.00	-10.32	44.74	-9.06	Peak	---	---
4	299.66	36.07	46.00	-9.93	44.58	-8.51	Peak	---	---
5	324.88	36.57	46.00	-9.43	44.07	-7.50	Peak	---	---
6	395.69	33.79	46.00	-12.21	39.52	-5.73	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 Configuration	1

Test By :Roger Lu Temperature(℃):24 Humidity(%):67

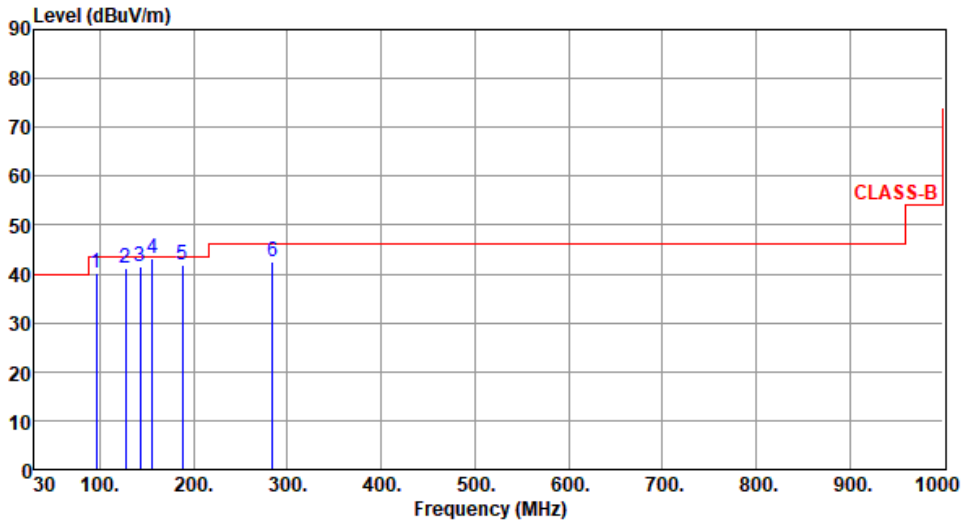


	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB/m	Remark	ANT High cm	Turn Table deg
1	52.31	33.70	40.00	-6.30	42.70	-9.00	Peak	---	---
2	64.92	31.38	40.00	-8.62	41.24	-9.86	Peak	---	---
3	274.44	30.37	46.00	-15.63	39.43	-9.06	Peak	---	---
4	299.66	33.32	46.00	-12.68	41.83	-8.51	Peak	---	---
5	324.88	33.08	46.00	-12.92	40.58	-7.50	Peak	---	---
6	395.69	31.65	46.00	-14.35	37.38	-5.73	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	Horizontal	Test Configuration	2

Test By :Roger Lu Temperature(℃):24 Humidity(%):67

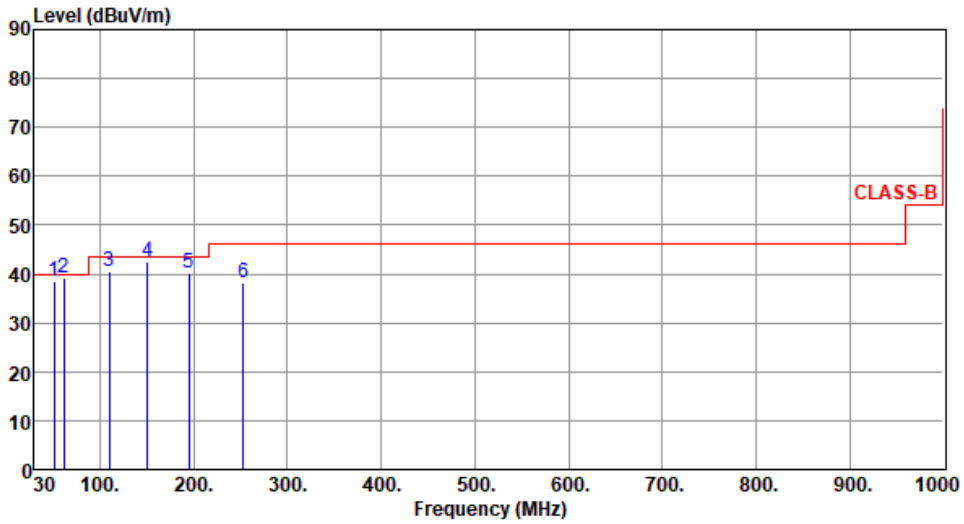


	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB/m	Remark	ANT High cm	Turn Table deg
1	95.83	40.05	43.50	-3.45	54.42	-14.37	QP	200	282
2	127.55	41.08	43.50	-2.42	51.26	-10.18	QP	122	119
3	142.86	41.47	43.50	-2.03	50.45	-8.98	QP	122	100
4	155.78	43.10	43.50	-0.40	51.75	-8.65	QP	160	112
5	188.16	41.86	43.50	-1.64	53.11	-11.25	QP	145	236
6	284.14	42.58	46.00	-3.42	51.33	-8.75	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 Configuration**	2

Test By :Roger Lu Temperature(℃):24 Humidity(%):67



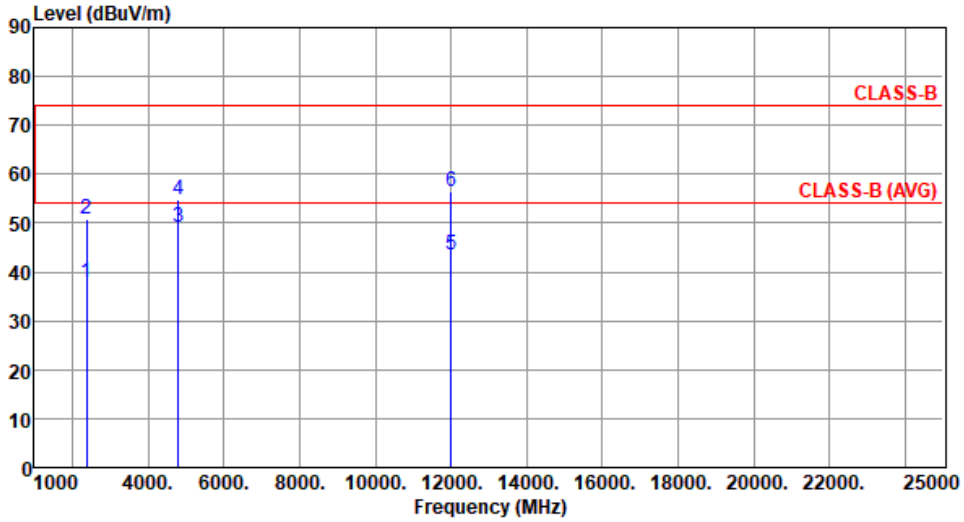
	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB/m	Remark	ANT High cm	Turn Table deg
1	50.75	38.56	40.00	-1.44	47.39	-8.83	QP	100	333
2	61.31	39.32	40.00	-0.68	48.79	-9.47	QP	100	337
3	110.43	40.36	43.50	-3.14	52.27	-11.91	QP	118	280
4	150.83	42.55	43.50	-0.95	51.33	-8.78	QP	109	307
5	194.90	40.05	43.50	-3.45	51.87	-11.82	Peak	---	---
6	253.10	38.06	46.00	-7.94	47.96	-9.90	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 Configuration	2

Test By :Roger Lu Temperature(°C):24 Humidity(%):67

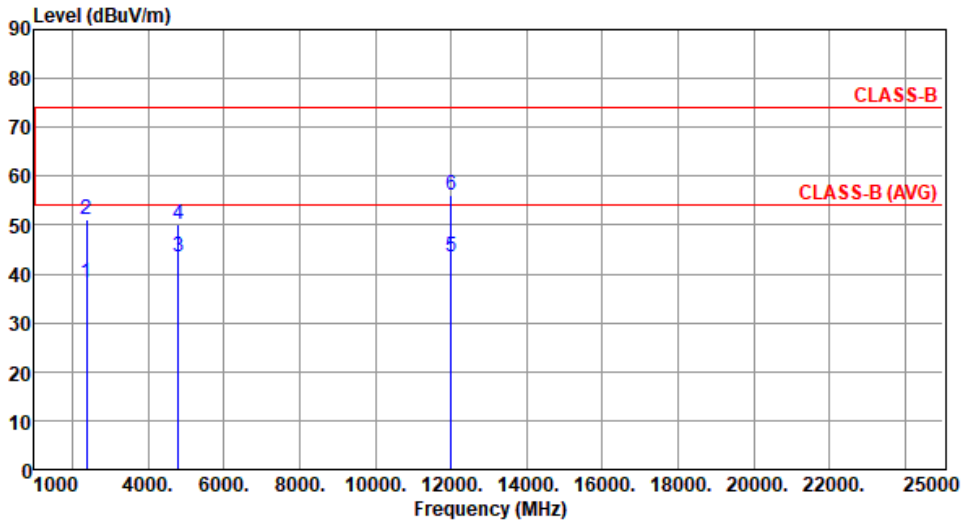


	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB/m	Remark	ANT High cm	Turn Table deg
1	2390.00	38.00	54.00	-16.00	39.66	-1.66	Average	108	66
2	2390.00	50.82	74.00	-23.18	52.48	-1.66	Peak	108	66
3	4804.00	49.22	54.00	-4.78	44.22	5.00	Average	116	174
4	4804.00	54.82	74.00	-19.18	49.82	5.00	Peak	116	174
5	12010.00	43.56	54.00	-10.44	28.88	14.68	Average	100	60
6	12010.00	56.35	74.00	-17.65	41.67	14.68	Peak	100	60

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

Modulation	BT LE-1Mbps	**Test Freq. (MHz)**	2402
Polarization	Vertical	**Test Configuration**	2

Test By :Roger Lu Temperature(℃):24 Humidity(%):67

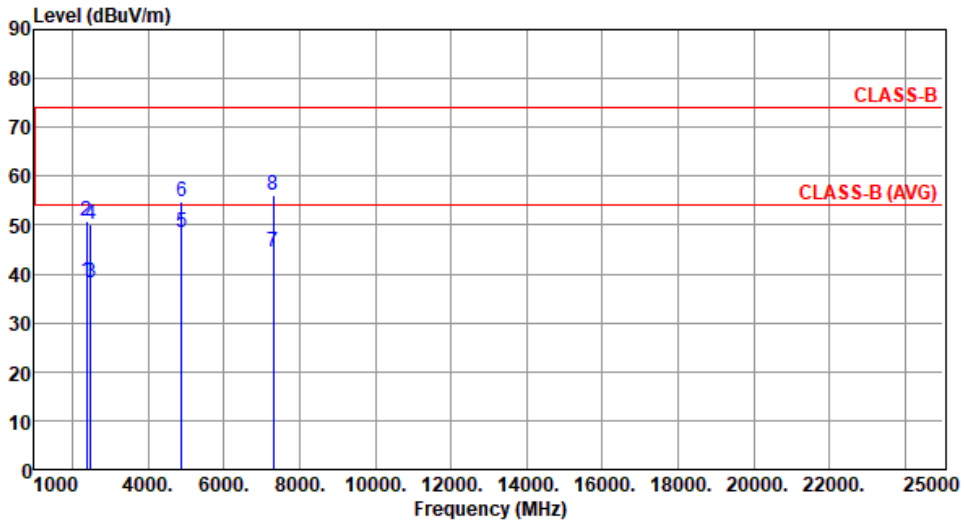


	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB/m	Remark	ANT High cm	Turn Table deg
1	2390.00	38.20	54.00	-15.80	39.86	-1.66	Average	280	316
2	2390.00	51.04	74.00	-22.96	52.70	-1.66	Peak	280	316
3	4804.00	43.45	54.00	-10.55	38.45	5.00	Average	105	311
4	4804.00	50.22	74.00	-23.78	45.22	5.00	Peak	105	311
5	12010.00	43.43	54.00	-10.57	28.75	14.68	Average	100	40
6	12010.00	56.27	74.00	-17.73	41.59	14.68	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-1Mbps	**Test Freq. (MHz)**	2440
Polarization	Horizontal	**Test Configuration**	2

Test By :Roger Lu Temperature(℃):24 Humidity(%):67

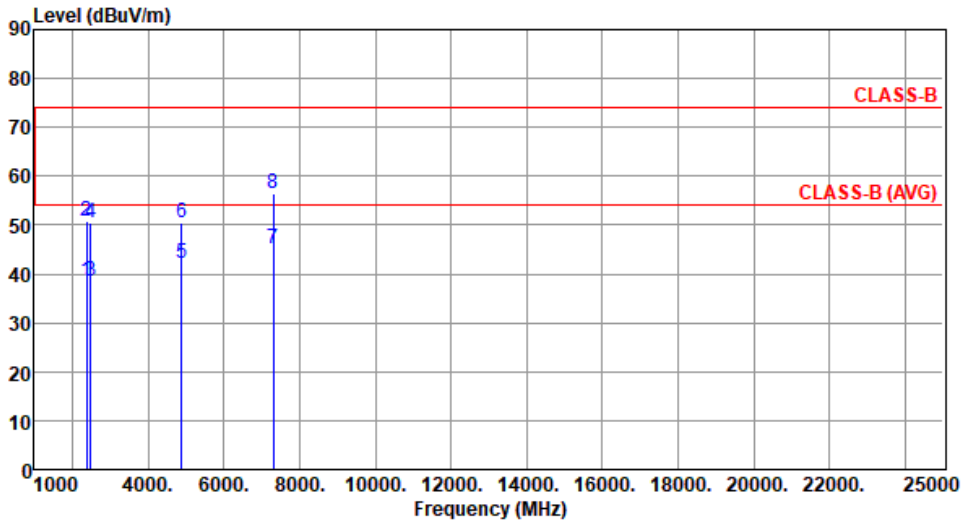


	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB/m	Remark	ANT High cm	Turn Table deg
1	2390.00	38.48	54.00	-15.52	40.14	-1.66	Average	110	68
2	2390.00	50.66	74.00	-23.34	52.32	-1.66	Peak	110	68
3	2483.50	38.32	54.00	-15.68	40.18	-1.86	Average	110	68
4	2483.50	50.28	74.00	-23.72	52.14	-1.86	Peak	110	68
5	4880.00	48.38	54.00	-5.62	43.31	5.07	Average	110	177
6	4880.00	54.69	74.00	-19.31	49.62	5.07	Peak	110	177
7	7320.00	44.38	54.00	-9.62	33.98	10.40	Average	221	149
8	7320.00	56.12	74.00	-17.88	45.72	10.40	Peak	221	149

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 Configuration**	2

Test By :Roger Lu Temperature(℃):24 Humidity(%):67

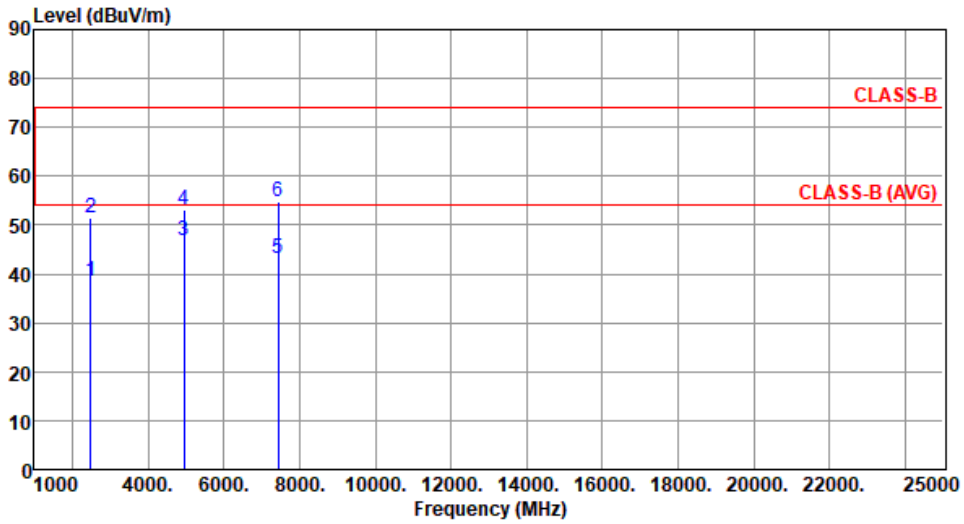


	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB/m	Remark	ANT High cm	Turn Table deg
1	2390.00	38.59	54.00	-15.41	40.25	-1.66	Average	270	315
2	2390.00	50.82	74.00	-23.18	52.48	-1.66	Peak	270	315
3	2483.50	38.47	54.00	-15.53	40.33	-1.86	Average	270	315
4	2483.50	50.60	74.00	-23.40	52.46	-1.86	Peak	270	315
5	4880.00	42.18	54.00	-11.82	37.11	5.07	Average	100	310
6	4880.00	50.48	74.00	-23.52	45.41	5.07	Peak	100	310
7	7320.00	45.13	54.00	-8.87	34.73	10.40	Average	100	336
8	7320.00	56.53	74.00	-17.47	46.13	10.40	Peak	100	336

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 Configuration**	2

Test By :Roger Lu Temperature(℃):24 Humidity(%):67

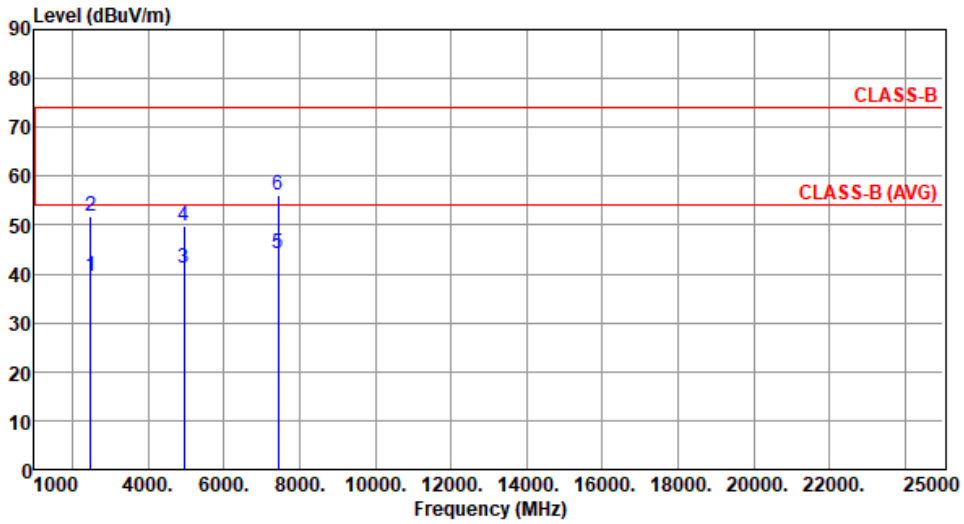


	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB/m	Remark	ANT High cm	Turn Table deg
1	2483.50	38.56	54.00	-15.44	40.42	-1.86	Average	106	64
2	2483.50	51.41	74.00	-22.59	53.27	-1.86	Peak	106	64
3	4960.00	46.98	54.00	-7.02	41.68	5.30	Average	118	140
4	4960.00	53.25	74.00	-20.75	47.95	5.30	Peak	118	140
5	7440.00	43.17	54.00	-10.83	33.02	10.15	Average	222	152
6	7440.00	54.83	74.00	-19.17	44.68	10.15	Peak	222	152

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	Vertical	**Test Configuration**	2

Test By :Roger Lu Temperature(℃):24 Humidity(%):67



	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB/m	Remark	ANT High cm	Turn Table deg
1	2483.50	39.56	54.00	-14.44	41.42	-1.86	Average	265	311
2	2483.50	51.85	74.00	-22.15	53.71	-1.86	Peak	265	311
3	4960.00	41.10	54.00	-12.90	35.80	5.30	Average	100	312
4	4960.00	49.96	74.00	-24.04	44.66	5.30	Peak	100	312
5	7440.00	44.30	54.00	-9.70	34.15	10.15	Average	100	333
6	7440.00	55.99	74.00	-18.01	45.84	10.15	Peak	100	333

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

3.6 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

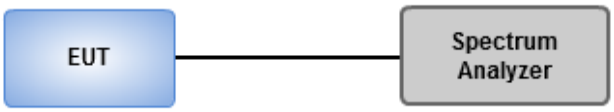
Reference level measurement

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

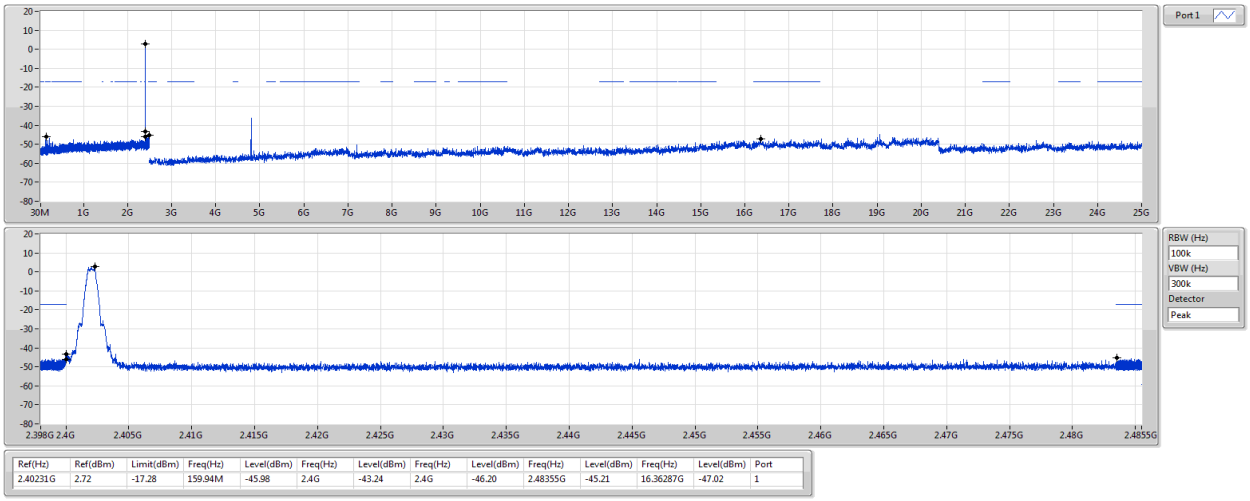


3.6.4 Test Result of Emissions in non-restricted Frequency Bands

Ambient Condition	25°C / 66%	Tested By	Aska Huang

BT-LE(1Mbps) **CSENdB-DTS**

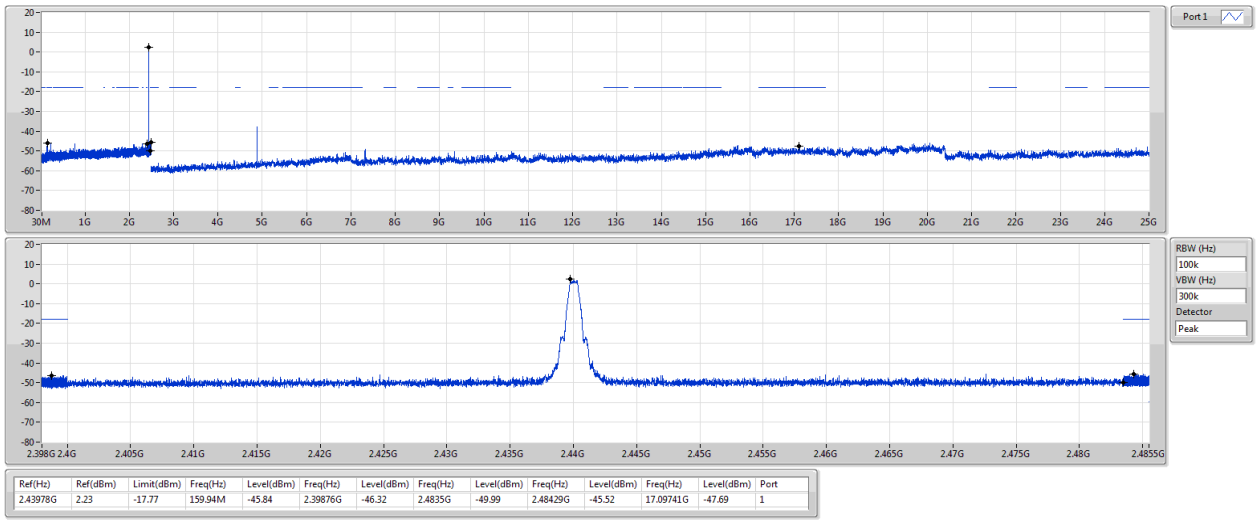
2402MHz



Ref(Hz)	Ref(dBm)	Limit(dBm)	Freq(Hz)	Level(dBm)	Freq(Hz)	Level(dBm)	Freq(Hz)	Level(dBm)	Freq(Hz)	Level(dBm)	Freq(Hz)	Level(dBm)	Port
2.40231G	2.72	-17.28	159.94M	-45.98	2.4G	-43.24	2.4G	-46.20	2.48355G	-45.21	16.36287G	-47.02	1

BT-LE(1Mbps) **CSENdB-DTS**

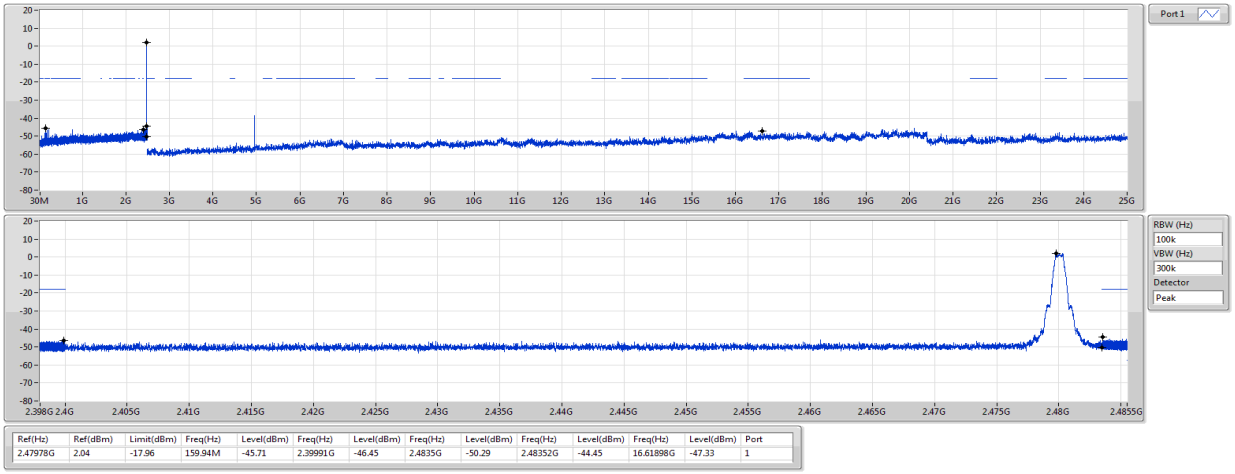
2440MHz



Ref(Hz)	Ref(dBm)	Limit(dBm)	Freq(Hz)	Level(dBm)	Freq(Hz)	Level(dBm)	Freq(Hz)	Level(dBm)	Freq(Hz)	Level(dBm)	Freq(Hz)	Level(dBm)	Port
2.43978G	2.23	-17.77	159.94M	-45.84	2.39876G	-46.32	2.4835G	-49.99	2.48429G	-45.52	17.09741G	-47.69	1

BT-LE(1Mbps) **CSENdB-DTS**

2480MHz



Ref(Hz)	Ref(dBm)	Limit(dBm)	Freq(Hz)	Level(dBm)	Freq(Hz)	Level(dBm)	Freq(Hz)	Level(dBm)	Freq(Hz)	Level(dBm)	Freq(Hz)	Level(dBm)	Port
2.47978G	2.04	-17.96	159.94M	-45.71	2.39991G	-46.45	2.4835G	-50.29	2.48352G	-44.45	16.61898G	-47.33	1

4 Test laboratory information

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

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

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

Linkou	**Kwei Shan**	**Kwei Shan Site II**
Tel: 886-2-2601-1640	Tel: 886-3-271-8666	Tel: 886-3-271-8640
No.30-2, Ding Fwu Tsuen, Lin Kou District, New Taipei City, Taiwan (R.O.C.)	No.3-1, Lane 6, Wen San 3rd St., Kwei Shan Dist., Tao Yuan City 33381, Taiwan (R.O.C.)	No.14-1, Lane 19, Wen San 3rd St., Kwei Shan Dist., Tao Yuan City 333, Taiwan (R.O.C.)

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

Tel: 886-3-271-8666
Fax: 886-3-318-0155
Email: ICC_Service@icertifi.com.tw

==END==