

FCC Test Report

Report No.: RFBCKS-WTW-P22040223-2

FCC ID: UXX-S5A235A

Test Model: S5A235A

Received Date: Apr. 08, 2022

Test Date: Apr. 19 ~ Aug. 04, 2022

Issued Date: Aug. 10, 2022

Applicant: Cradlepoint, Inc.

Address: 1111 West Jefferson Street ,Boise ,Idaho, United States 83702

Issued By: Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch
Lin Kou Laboratories

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Test Location: No. 19, Hwa Ya 2nd Rd., Wen Hwa Vil., Kwei Shan Dist., Taoyuan City
33383, TAIWAN

**FCC Registration /
Designation Number:** 788550 / TW0003



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Release Control Record

Issue No.	Description	Date Issued
RFBCKS-WTW-P22040223-2	Original release	Aug. 10, 2022

1 Certificate of Conformity

Product: Ruggedized LTE Router

Brand: Cradlepoint, Inc.

Test Model: S5A235A

Sample Status: Engineering sample


Applicant: Cradlepoint, Inc.

Test Date: Apr. 19 ~ Aug. 04, 2022

Standards: 47 CFR FCC Part 15, Subpart C (Section 15.247)
ANSI C63.10:2013

The above equipment has been tested by **Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch**, and found compliance with the requirement of the above standards. The test record, data evaluation & Equipment Under Test (EUT) configurations represented herein are true and accurate accounts of the measurements of the sample's RF characteristics under the conditions specified in this report.

Prepared by : , **Date:** Aug. 10, 2022
Polly Chien / Specialist

Approved by : , **Date:** Aug. 10, 2022
Jeremy Lin / Project Engineer

2 Summary of Test Results

47 CFR FCC Part 15, Subpart C (Section 15.247)			
FCC Clause	Test Item	Result	Remarks
15.207	AC Power Conducted Emission	Pass	Meet the requirement of limit. Minimum passing margin is -10.29dB at 0.34550MHz.
15.205 / 15.209 / 15.247(d)	Radiated Emissions and Band Edge Measurement	Pass	Meet the requirement of limit. Minimum passing margin is -0.7dB at 2483.50MHz.
15.247(d)	Antenna Port Emission	Pass	Meet the requirement of limit.
15.247(a)(2)	6dB bandwidth	Pass	Meet the requirement of limit.
15.247(b)	Conducted power	Pass	Meet the requirement of limit.
15.247(e)	Power Spectral Density	Pass	Meet the requirement of limit.
15.203	Antenna Requirement	Pass	Antenna connector is R-SMA and SMA not a standard connector.

Note:

- For 2.4G band compliance with rule 15.247(d) of the band-edge items, the test plots were recorded in Annex A. Test Procedures refer to report 4.1.3.
- Determining compliance based on the results of the compliance measurement, not taking into account measurement instrumentation uncertainty.

2.1 Measurement Uncertainty

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the EUT as specified in CISPR 16-4-2:

Measurement	Frequency	Expanded Uncertainty (k=2) (\pm)
Conducted Emissions at mains ports	150kHz ~ 30MHz	2.79 dB
Radiated Emissions up to 1 GHz	9kHz ~ 30MHz	3.04 dB
	30MHz ~ 200MHz	3.59 dB
	200MHz ~ 1000MHz	3.60 dB
Radiated Emissions above 1 GHz	1GHz ~ 18GHz	2.29 dB
	18GHz ~ 40GHz	2.29 dB

2.2 Modification Record

There were no modifications required for compliance.

3 General Information

3.1 General Description of EUT

Product	Ruggedized LTE Router
Brand	Cradlepoint, Inc.
Test Model	S5A235A
Sample Status	Engineering sample
Power Supply Rating	12Vdc from adapter
Modulation Type	GFSK
Transfer Rate	Bluetooth LE 1M: 1Mbps Bluetooth LE 2M: 2Mbps
Operating Frequency	2402 ~ 2480MHz
Number of Channel	40
Channel Spacing	2MHz
Output Power	Bluetooth LE 1M: 61.235mW Bluetooth LE 2M: 61.660mW
Antenna Type	Refer to Note
Antenna Connector	Refer to Note
Accessory Device	Refer to Note
Cable Supplied	Refer to Note
Contains FCC ID (WWAN module)	N7NEM74B

Note:

1. The following antennas were provided to the EUT.

Ant. No.	RF Chain No.	Brand	Model	Antenna Net Gain (dBi)	Frequency Range (MHz)	Antenna Type	Connector Type
Wi-Fi Set1	1	Cradlepoint	test antenna 1	5.5069	2400-2483.5	Monopole	R-SMA
				5.8125	5150-5250	Monopole	R-SMA
				5.7725	5250-5350	Monopole	R-SMA
				5.7133	5425-5725	Monopole	R-SMA
				5.9957	5725-5850	Monopole	R-SMA
	2	Cradlepoint	test antenna 1	5.5069	2400-2483.5	Monopole	R-SMA
				5.8125	5150-5250	Monopole	R-SMA
				5.7725	5250-5350	Monopole	R-SMA
				5.7133	5425-5725	Monopole	R-SMA
				5.9957	5725-5850	Monopole	R-SMA
Wi-Fi Set2	1	PANORAMA	LG-IN2457	2	2400-2483.5	Monopole	R-SMA
				1.1	5150-5250	Monopole	R-SMA
				2.4	5250-5350	Monopole	R-SMA
				3.1	5425-5725	Monopole	R-SMA
				3.5	5725-5850	Monopole	R-SMA
	2	PANORAMA	LG-IN2457	2.4	2400-2483.5	Monopole	R-SMA
				0.9	5150-5250	Monopole	R-SMA
				1.7	5250-5350	Monopole	R-SMA
				2.9	5425-5725	Monopole	R-SMA
				3.5	5725-5850	Monopole	R-SMA

Ant. No.	RF Chain No.	Brand	Model	Antenna Net Gain (dBi)	Frequency Range (MHz)	Antenna Type	Connector Type
Wi-Fi Set3	1	WNC	170836-000	2.47	2400-2483.5	Dipole	R-SMA
				2.18	5150-5250	Dipole	R-SMA
				2.19	5250-5350	Dipole	R-SMA
				2.14	5425-5725	Dipole	R-SMA
				2.47	5725-5850	Dipole	R-SMA
	2	WNC	170836-000	2.47	2400-2483.5	Dipole	R-SMA
				2.18	5150-5250	Dipole	R-SMA
				2.19	5250-5350	Dipole	R-SMA
				2.14	5425-5725	Dipole	R-SMA
				2.47	5725-5850	Dipole	R-SMA
BT	1	Cradlepoint	170847-000	2.16	2400-2500	Dipole	R-SMA
GPS	1	PANORAMA	LG-IN2457	26	1562-1612	Dipole	SMA
GPS	2	Taoglas	AA.162	30	1562-1612	Dipole	SMA
LTE Set1	1	Cradlepoint	170801-000	1.42	619-790	Dipole	SMA
				0.88	1445-1515	Dipole	SMA
				2.69	1710-2700	Dipole	SMA
				4.13	3400-3700	Dipole	SMA
				4.29	5150-5925	Dipole	SMA
LTE Set2	2	Cradlepoint	170801-000	1.42	619-790	Dipole	SMA
				0.88	1445-1515	Dipole	SMA
				2.69	1710-2700	Dipole	SMA
				4.13	3400-3700	Dipole	SMA
				4.29	5150-5925	Dipole	SMA
LTE Set1	1	PANORAMA	LG-IN2457	0.5	617-698	Monopole	SMA
				1.3	699-798	Monopole	SMA
				1.9	807-862	Monopole	SMA
				1.6	880-960	Monopole	SMA
				1.5	1427-1518	Monopole	SMA
				2	1625-1661	Monopole	SMA
				1.6	1710-1920	Monopole	SMA
				2.2	1920-2170	Monopole	SMA
				1.2	2300-2400	Monopole	SMA
				1.3	2496-2690	Monopole	SMA
				2.2	3300-4200	Monopole	SMA
1.9	4400-5000	Monopole	SMA				
LTE Set2	2	PANORAMA	LG-IN2457	0.15	617-698	Monopole	SMA
				1.5	699-798	Monopole	SMA
				2	807-862	Monopole	SMA
				2	880-960	Monopole	SMA
				2.6	1427-1518	Monopole	SMA
				1.8	1625-1661	Monopole	SMA
				1.6	1710-1920	Monopole	SMA
				2	1920-2170	Monopole	SMA
				1.5	2300-2400	Monopole	SMA
				1.4	2496-2690	Monopole	SMA
				2.6	3300-4200	Monopole	SMA
				1.7	4400-5000	Monopole	SMA

* Detail antenna specification please refer to antenna datasheet and/or antenna measurement report.

2. The EUT contains following accessory devices.

Product	Brand	Model	Description
Adapter 1	ADP	WA-36N12R	I/P: 100-240Vac, 50-60Hz, 0.9A O/P: 12.0Vdc, 3.0A Power cable: 1.5m without core
Adapter 2	Ktec	KSA-36W-120300D5	I/P: 100-240V~50/60Hz, 1.0A O/P: 12.0Vdc, 3.0A, 36.0W Power cable: 1.42m without core
Nebula dock (Expansion dock) Support Unit	Cradlepoint, Inc.	S0A235A	-

3. The EUT has two different configuration, after pretest the original one was the worst case for final test.

Configuration		
PCBA	PHY IC	eMMC
Original	QCA-8081	MTFC8GAMALGT-AAT
2nd Source	QCA-8080	THGBMJG6C1LBAU7

3.2 Description of Test Modes

40 channels are provided to this EUT:

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

3.2.1 Test Mode Applicability and Tested Channel Detail

EUT Configure Mode	Applicable to				Description
	RE \geq 1G	RE<1G	PLC	APCM	
A	√	√	√	√	EUT + Adapter 1
B	-	√	√	-	EUT + Adapter 2

Where RE \geq 1G: Radiated Emission above 1GHz & Bandedge Measurement
 RE<1G: Radiated Emission below 1GHz
 PLC: Power Line Conducted Emission
 APCM: Antenna Port Conducted Measurement

Note:

1. The EUT's antenna was positioned and tested under the listed conditions:
 - a.) The Monopole Antenna Parallel(A)
 - b.) The Dipole Antenna's angle of 90 degrees(B)
2. Radiated emission (below 1GHz) and power line conducted emission test items chosen the worst maximum power.
3. "-" means no effect.

Radiated Emission Test (Above 1GHz):

- Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates and antenna ports (if EUT with antenna diversity architecture).
- Following channel(s) was (were) selected for the final test as listed below.

EUT Configure Mode	Available Channel	Tested Channel	Modulation Type	Data Rate (Mbps)
A	0 to 39	0, 19, 39	GFSK	1, 2

Radiated Emission Test (Below 1GHz):

- Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates and antenna ports (if EUT with antenna diversity architecture).
- Following channel(s) was (were) selected for the final test as listed below.

EUT Configure Mode	Available Channel	Tested Channel	Modulation Type	Data Rate (Mbps)
A, B	0 to 39	19	GFSK	2

Power Line Conducted Emission Test:

- Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates and antenna ports (if EUT with antenna diversity architecture).
- Following channel(s) was (were) selected for the final test as listed below.

EUT Configure Mode	Available Channel	Tested Channel	Modulation Type	Data Rate (Mbps)
A, B	0 to 39	19	GFSK	2

Antenna Port Conducted Measurement:

- This item includes all test value of each mode, but only includes spectrum plot of worst value of each mode.
- Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates and antenna ports (if EUT with antenna diversity architecture).
- Following channel(s) was (were) selected for the final test as listed below.

EUT Configure Mode	Available Channel	Tested Channel	Modulation Type	Data Rate (Mbps)
A	0 to 39	0, 19, 39	GFSK	1, 2

Test Condition:

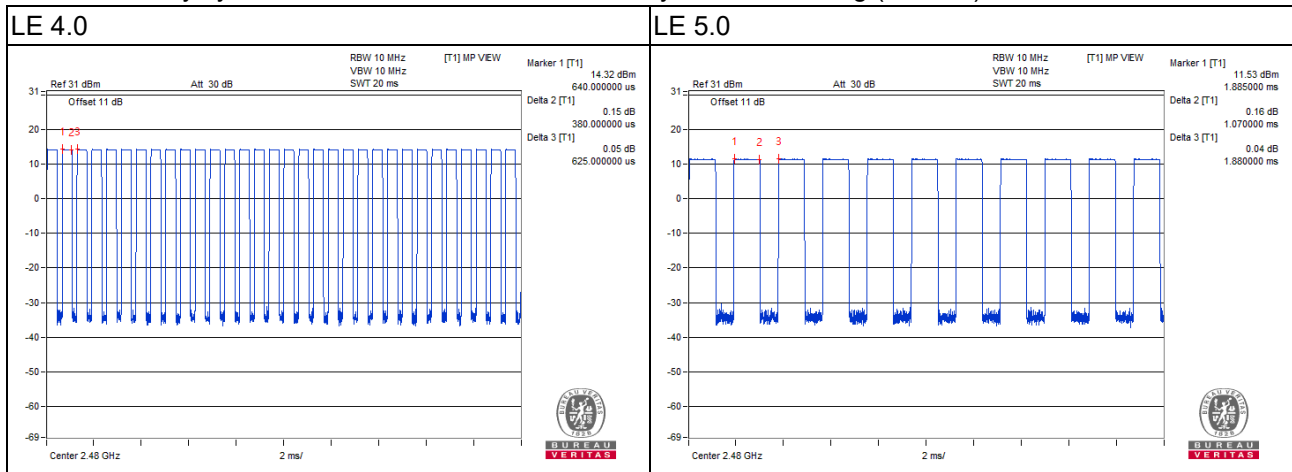
Applicable to	Environmental Conditions	Input Power (System)	Tested by
RE \geq 1G	22 deg. C, 70% RH	120Vac, 60Hz	Greg Lin,
RE<1G	23 deg. C, 67% RH	120Vac, 60Hz	Adair Peng, Rex Wang
PLC	25 deg. C, 75% RH	120Vac, 60Hz	Rex Wang
APCM	25 deg. C, 60% RH	120Vac, 60Hz	Ivan Tseng, Chun Wu

3.3 Duty Cycle of Test Signal

Duty cycle of test signal is < 98%.

BT LE 4.0: Duty cycle = 0.380ms/0.625ms = 0.608, Duty factor = $10 * \log (1/0.608) = 2.16$

BT LE 5.0: Duty cycle = 1.070ms/1.880ms = 0.569, Duty factor = $10 * \log (1/0.569) = 2.45$



3.4 Description of Support Units

The EUT has been tested as an independent unit together with other necessary accessories or support units. The following support units or accessories were used to form a representative test configuration during the tests.

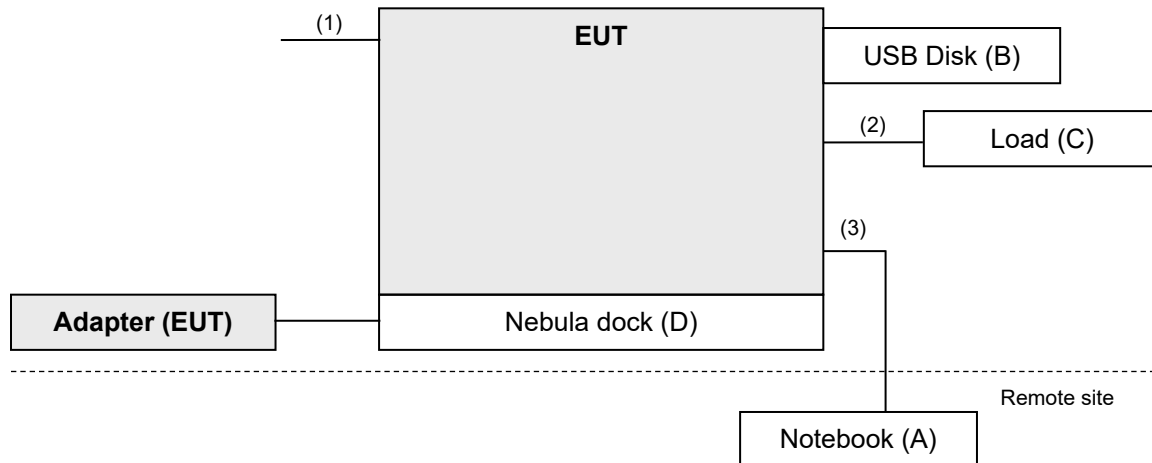
ID	Product	Brand	Model No.	Serial No.	FCC ID	Remarks
A.	Notebook	DELL	Inspiron 14R	8LRKKW1	FCC DoC Approved	Provided by Lab
B.	USB Disk	SanDisk	SDDDC3	NA	NA	Provided by Lab
C.	Load	NA	NA	NA	NA	Provided by Lab
D.	Nebula dock (Expansion dock)	Cradlepoint, Inc.	S0A235A	NA	NA	Provided by client

Note:

1. All power cords of the above support units are non-shielded (1.8m).
2. Item A acted as a communication partner to transfer data.

ID	Cable Descriptions	Qty.	Length (m)	Shielding (Yes/No)	Cores (Qty.)	Remarks
1.	RS232 Cable	1	1	N	0	Provided by Lab
2.	LAN Cable	1	1.5	N	0	Provided by Lab RJ45, Cat.5e
3.	LAN Cable	1	10	N	0	Provided by Lab RJ45, Cat.5e

3.4.1 Configuration of System under Test



3.5 General Description of Applied Standards and References

The EUT is a RF Product. According to the specifications of the manufacturer, it must comply with the requirements of the following standards and references:

Test standard:

FCC Part 15, Subpart C (15.247)

ANSI C63.10:2013

All test items have been performed and recorded as per the above standards.

References Test Guidance:

KDB 558074 D01 15.247 Meas Guidance v05r02

All test items have been performed as a reference to the above KDB test guidance.

4 Test Types and Results

4.1 Radiated Emission and Bandedge Measurement

4.1.1 Limits of Radiated Emission and Bandedge Measurement

Radiated emissions which fall in the restricted bands must comply with the radiated emission limits specified as below table. Other emissions shall be at least 20dB below the highest level of the desired power:

Frequencies (MHz)	Field Strength (microvolts/meter)	Measurement Distance (meters)
0.009 ~ 0.490	2400/F(kHz)	300
0.490 ~ 1.705	24000/F(kHz)	30
1.705 ~ 30.0	30	30
30 ~ 88	100	3
88 ~ 216	150	3
216 ~ 960	200	3
Above 960	500	3

Note:

1. The lower limit shall apply at the transition frequencies.
2. Emission level (dBuV/m) = 20 log Emission level (uV/m).
3. For frequencies above 1000MHz, the field strength limits are based on average detector, however, the peak field strength of any emission shall not exceed the maximum permitted average limits, specified above by more than 20dB under any condition of modulation.

4.1.2 Test Instruments

Description & Manufacturer	Model No.	Serial No.	Cal. Date	Cal. Due
Spectrum Analyzer ROHDE & SCHWARZ	FSV40	100979	Mar. 25, 2022	Mar. 24, 2023
Test Receiver KEYSIGHT	N9038A	MY55420137	Apr. 27, 2022	Apr. 26, 2023
Spectrum Analyzer ROHDE & SCHWARZ	FSW43	101867	Jan. 07, 2022	Jan. 06, 2023
HORN Antenna SCHWARZBECK	BBHA 9120 D	9120D-1169	Nov. 14, 2021	Nov. 13, 2022
HORN Antenna SCHWARZBECK	BBHA 9170	BBHA9170241	Oct. 26, 2021	Oct. 25, 2022
Loop Antenna TESEQ	HLA 6121	45745	Jul. 21, 2021	Jul. 20, 2022
			Jul. 27, 2022	Jul. 26, 2023
Preamplifier Agilent (Below 1GHz)	8447D	2944A10638	Jun. 05, 2021	Jun. 04, 2022
			May 14, 2022	May 13, 2023
Preamplifier Agilent (Above 1GHz)	8449B	3008A01962	Oct. 05, 2021	Oct. 04, 2022
RF signal cable HUBER+SUHNER&EMCI	SUCOFLEX 104 & EMC104-SM-SM8 000	CABLE-CH9-02 (248780+171006)	Jan. 15, 2022	Jan. 14, 2023
RF signal cable HUBER+SUHNER	SUCOFLEX 104	CABLE-CH9-(250795/4)	Jan. 15, 2022	Jan. 14, 2023
RF signal cable Woken	8D-FB	Cable-CH9-01	Jun. 05, 2021	Jun. 04, 2022
			May 14, 2022	May 13, 2023
Software BV ADT	ADT_Radiated_ V7.6.15.9.5	NA	NA	NA
Antenna Tower & Turn BV ADT	AT100	AT93021705	NA	NA
Turn Table BV ADT	TT100	TT93021705	NA	NA
Turn Table Controller BV ADT	SC100	SC93021705	NA	NA
Boresight Antenna Fixture	FBA-01	FBA-SIP01	NA	NA
Peak Power Analyzer KEYSIGHT	8990B	MY51000485	Jan. 18, 2022	Jan. 17, 2023
Wideband Power Sensor KEYSIGHT	N1923A	MY58020002	Jan. 17, 2022	Jan. 16, 2023

- Note: 1. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.
 2. The test was performed in HwaYa Chamber 9.
 3. Tested data: Apr. 19 ~ Jun. 10, 2022 & Aug. 04, 2022

4.1.3 Test Procedures

For Radiated emission below 30MHz

- a. The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter chamber room. The table was rotated 360 degrees to determine the position of the highest radiation.
- b. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
- c. Parallel, perpendicular, and ground-parallel orientations of the antenna are set to make the measurement.
- d. For each suspected emission, the EUT was arranged to its worst case and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.
- e. The test-receiver system was set to Quasi-Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.

Note:

1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 9kHz at frequency below 30MHz.

For Radiated emission above 30MHz

- a. The EUT was placed on the top of a rotating table 0.8 meters (for 30MHz ~ 1GHz) / 1.5 meters (for above 1GHz) above the ground at 3 meter chamber room for test. The table was rotated 360 degrees to determine the position of the highest radiation.
- b. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
- c. The height of antenna is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
- d. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.
- e. The test-receiver system was set to quasi-peak detect function and specified bandwidth with maximum hold mode when the test frequency is below 1 GHz.
- f. The test-receiver system was set to peak and average detect function and specified bandwidth with maximum hold mode when the test frequency is above 1 GHz. If the peak reading value also meets average limit, measurement with the average detector is unnecessary.

Note:

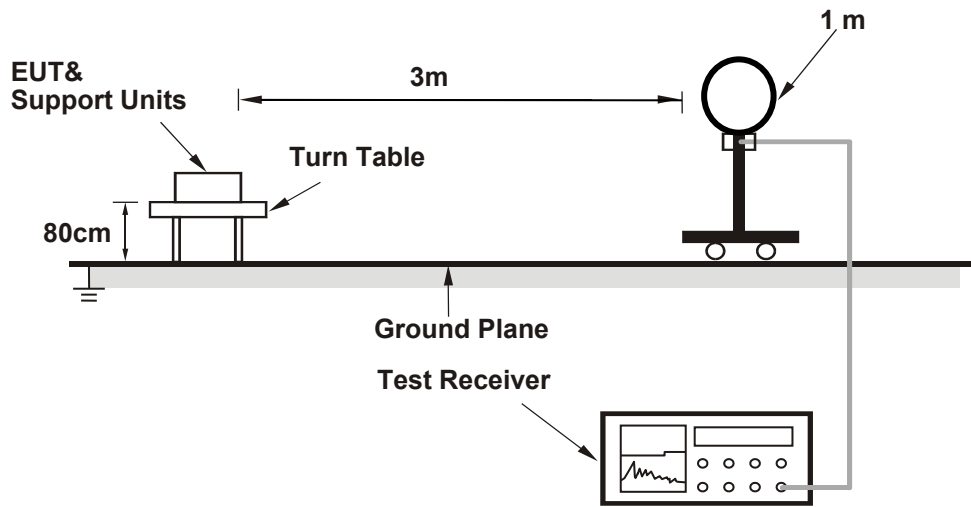
1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120kHz for Quasi-peak detection (QP) at frequency below 1GHz.
2. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is 3 MHz for Peak detection (PK) at frequency above 1GHz.
3. The resolution bandwidth of test receiver/spectrum analyzer is 1MHz and the video bandwidth is $\geq 1/T$ (Duty cycle < 98%) or 10Hz (Duty cycle $\geq 98\%$) for Average detection (AV) at frequency above 1GHz. (BT LE 1M: RBW = 1MHz, VBW = 3kHz, BT LE 2M: RBW = 1MHz, VBW = 1kHz)
4. All modes of operation were investigated and the worst-case emissions are reported.

4.1.4 Deviation from Test Standard

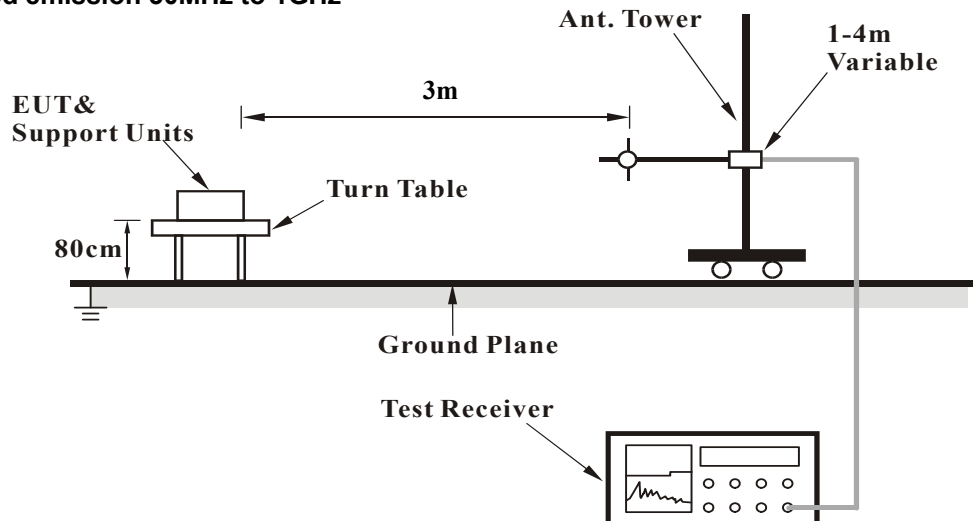
No deviation.

4.1.5 Test Setup

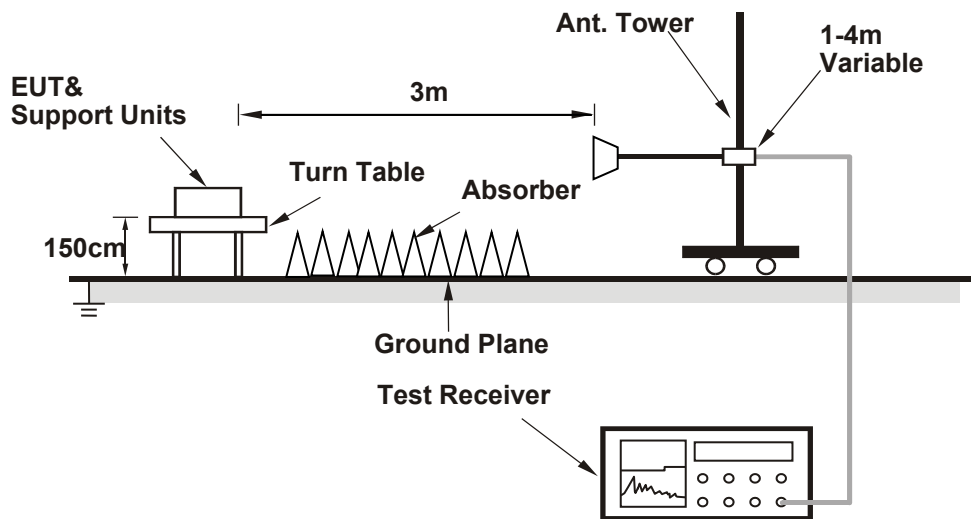
For Radiated emission below 30MHz



For Radiated emission 30MHz to 1GHz



For Radiated emission above 1GHz



For the actual test configuration, please refer to the attached file (Test Setup Photo).

4.1.6 EUT Operating Conditions

- a. Placed the EUT on the testing table.
- b. Prepared a notebook to act as a communication partner and placed it outside of testing area.
- c. The communication partner connected with EUT via a RJ45 cable and ran a test program (provided by manufacturer) to enable EUT under transmission condition continuously at specific channel frequency.

4.1.7 Test Results

Above 1 GHz Data:

RF Mode	TX BT-LE 1M	Channel	CH 0 : 2402 MHz
Frequency Range	1GHz ~ 25GHz	Detector Function	Peak (PK) Average (AV)

Antenna Polarity & Test Distance : Horizontal at 3 m								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	2390.00	57.4 PK	74.0	-16.6	1.18 H	279	24.6	32.8
2	2390.00	44.6 AV	54.0	-9.4	1.18 H	279	11.8	32.8
3	*2402.00	107.1 PK			1.18 H	279	74.3	32.8
4	*2402.00	106.1 AV			1.18 H	279	73.3	32.8
5	4804.00	48.9 PK	74.0	-25.1	2.72 H	331	43.1	5.8
6	4804.00	35.9 AV	54.0	-18.1	2.72 H	331	30.1	5.8

Antenna Polarity & Test Distance : Vertical at 3 m								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	2390.00	57.9 PK	74.0	-16.1	2.27 V	145	25.1	32.8
2	2390.00	45.2 AV	54.0	-8.8	2.27 V	145	12.4	32.8
3	*2402.00	115.3 PK			2.27 V	145	82.5	32.8
4	*2402.00	114.4 AV			2.27 V	145	81.6	32.8
5	4804.00	51.2 PK	74.0	-22.8	1.73 V	205	45.4	5.8
6	4804.00	41.2 AV	54.0	-12.8	1.73 V	205	35.4	5.8

Remarks:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. Margin value = Emission Level – Limit value
4. The other emission levels were very low against the limit.
5. " * ": Fundamental frequency.

RF Mode	TX BT-LE 1M	Channel	CH 19 : 2440 MHz
Frequency Range	1GHz ~ 25GHz	Detector Function	Peak (PK) Average (AV)

Antenna Polarity & Test Distance : Horizontal at 3 m

No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	*2440.00	108.7 PK			1.19 H	284	75.9	32.8
2	*2440.00	107.8 AV			1.19 H	284	75.0	32.8
3	4880.00	48.7 PK	74.0	-25.3	2.63 H	338	43.2	5.5
4	4880.00	35.6 AV	54.0	-18.4	2.63 H	338	30.1	5.5

Antenna Polarity & Test Distance : Vertical at 3 m

No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	*2440.00	117.4 PK			2.27 V	153	84.6	32.8
2	*2440.00	116.4 AV			2.27 V	153	83.6	32.8
3	4880.00	51.3 PK	74.0	-22.7	1.70 V	208	45.8	5.5
4	4880.00	41.1 AV	54.0	-12.9	1.70 V	208	35.6	5.5

Remarks:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. Margin value = Emission Level – Limit value
4. The other emission levels were very low against the limit.
5. " * " : Fundamental frequency.

RF Mode	TX BT-LE 1M	Channel	CH 39 : 2480 MHz
Frequency Range	1GHz ~ 25GHz	Detector Function	Peak (PK) Average (AV)

Antenna Polarity & Test Distance : Horizontal at 3 m

No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	*2480.00	104.0 PK			1.24 H	282	71.1	32.9
2	*2480.00	103.1 AV			1.24 H	282	70.2	32.9
3	2483.50	58.7 PK	74.0	-15.3	1.24 H	282	25.8	32.9
4	2483.50	48.5 AV	54.0	-5.5	1.24 H	282	15.6	32.9
5	4960.00	48.1 PK	74.0	-25.9	2.71 H	342	42.4	5.7
6	4960.00	35.4 AV	54.0	-18.6	2.71 H	342	29.7	5.7

Antenna Polarity & Test Distance : Vertical at 3 m

No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	*2480.00	115.6 PK			2.17 V	152	82.7	32.9
2	*2480.00	114.7 AV			2.17 V	152	81.8	32.9
3	2483.50	63.5 PK	74.0	-10.5	2.17 V	152	30.6	32.9
4	2483.50	53.2 AV	54.0	-0.8	2.17 V	152	20.3	32.9
5	4960.00	50.6 PK	74.0	-23.4	1.79 V	214	44.9	5.7
6	4960.00	40.9 AV	54.0	-13.1	1.79 V	214	35.2	5.7

Remarks:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. Margin value = Emission Level – Limit value
4. The other emission levels were very low against the limit.
5. " * ": Fundamental frequency.

RF Mode	TX BT-LE 2M	Channel	CH 0 : 2402 MHz
Frequency Range	1GHz ~ 25GHz	Detector Function	Peak (PK) Average (AV)

Antenna Polarity & Test Distance : Horizontal at 3 m

No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	2390.00	57.2 PK	74.0	-16.8	1.13 H	279	24.4	32.8
2	2390.00	44.5 AV	54.0	-9.5	1.13 H	279	11.7	32.8
3	*2402.00	107.9 PK			1.13 H	279	75.1	32.8
4	*2402.00	105.1 AV			1.13 H	279	72.3	32.8
5	4804.00	48.5 PK	74.0	-25.5	2.59 H	327	42.7	5.8
6	4804.00	35.6 AV	54.0	-18.4	2.59 H	327	29.8	5.8

Antenna Polarity & Test Distance : Vertical at 3 m

No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	2390.00	57.7 PK	74.0	-16.3	2.13 V	151	24.9	32.8
2	2390.00	45.2 AV	54.0	-8.8	2.13 V	151	12.4	32.8
3	*2402.00	116.3 PK			2.13 V	151	83.5	32.8
4	*2402.00	113.5 AV			2.13 V	151	80.7	32.8
5	4804.00	50.7 PK	74.0	-23.3	1.82 V	199	44.9	5.8
6	4804.00	40.9 AV	54.0	-13.1	1.82 V	199	35.1	5.8

Remarks:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. Margin value = Emission Level – Limit value
4. The other emission levels were very low against the limit.
5. " * ": Fundamental frequency.

RF Mode	TX BT-LE 2M	Channel	CH 19 : 2440 MHz
Frequency Range	1GHz ~ 25GHz	Detector Function	Peak (PK) Average (AV)

Antenna Polarity & Test Distance : Horizontal at 3 m

No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	*2440.00	109.4 PK			1.17 H	287	76.6	32.8
2	*2440.00	106.7 AV			1.17 H	287	73.9	32.8
3	4880.00	48.4 PK	74.0	-25.6	2.57 H	331	42.9	5.5
4	4880.00	35.3 AV	54.0	-18.7	2.57 H	331	29.8	5.5

Antenna Polarity & Test Distance : Vertical at 3 m

No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	*2440.00	117.8 PK			2.31 V	154	85.0	32.8
2	*2440.00	115.1 AV			2.31 V	154	82.3	32.8
3	4880.00	50.7 PK	74.0	-23.3	1.67 V	201	45.2	5.5
4	4880.00	40.8 AV	54.0	-13.2	1.67 V	201	35.3	5.5

Remarks:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. Margin value = Emission Level – Limit value
4. The other emission levels were very low against the limit.
5. " * " : Fundamental frequency.

RF Mode	TX BT-LE 2M	Channel	CH 39 : 2480 MHz
Frequency Range	1GHz ~ 25GHz	Detector Function	Peak (PK) Average (AV)

Antenna Polarity & Test Distance : Horizontal at 3 m

No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	*2480.00	101.6 PK			1.17 H	287	68.7	32.9
2	*2480.00	98.8 AV			1.17 H	287	65.9	32.9
3	2483.50	59.1 PK	74.0	-14.9	1.17 H	287	26.2	32.9
4	2483.50	48.1 AV	54.0	-5.9	1.17 H	287	15.2	32.9
5	4960.00	48.3 PK	74.0	-25.7	2.68 H	329	42.6	5.7
6	4960.00	35.4 AV	54.0	-18.6	2.68 H	329	29.7	5.7

Antenna Polarity & Test Distance : Vertical at 3 m

No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	*2480.00	110.0 PK			2.20 V	153	77.1	32.9
2	*2480.00	107.4 AV			2.20 V	153	74.5	32.9
3	2483.50	64.7 PK	74.0	-9.3	2.20 V	153	31.8	32.9
4	2483.50	53.3 AV	54.0	-0.7	2.20 V	153	20.4	32.9
5	4960.00	50.0 PK	74.0	-24.0	1.79 V	215	44.3	5.7
6	4960.00	40.3 AV	54.0	-13.7	1.79 V	215	34.6	5.7

Remarks:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. Margin value = Emission Level – Limit value
4. The other emission levels were very low against the limit.
5. " * ": Fundamental frequency.

Below 1GHz worst-case data:

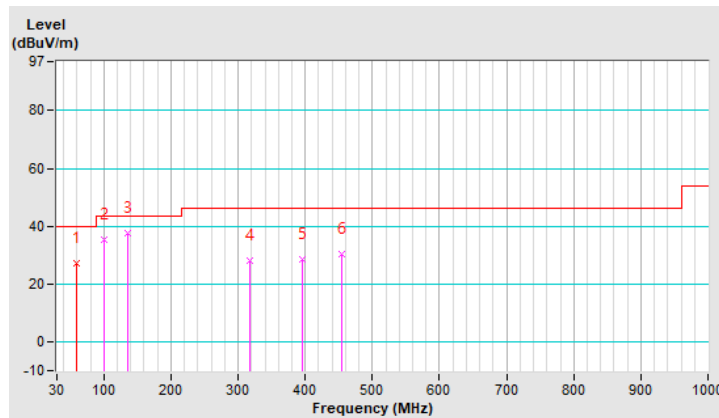
Mode A

RF Mode	TX BT-LE 2M	Channel	CH 19 : 2440 MHz
Frequency Range	9kHz ~ 1GHz	Detector Function	Quasi-Peak (QP)

Antenna Polarity & Test Distance : Horizontal at 3 m								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	58.76	27.0 QP	40.0	-13.0	1.00 H	167	36.4	-9.4
2	99.84	35.3 QP	43.5	-8.2	2.00 H	306	49.0	-13.7
3	135.73	37.7 QP	43.5	-5.8	2.00 H	14	47.4	-9.7
4	318.09	28.2 QP	46.0	-17.8	1.00 H	117	34.6	-6.4
5	396.66	28.4 QP	46.0	-17.6	2.00 H	191	33.5	-5.1
6	453.89	30.2 QP	46.0	-15.8	1.00 H	314	33.5	-3.3

Remarks:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m).
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB).
3. The other emission levels were very low against the limit of frequency range 30MHz ~ 1000MHz.
4. Margin value = Emission Level – Limit value.
5. The emission levels were very low against the limit of frequency range 9kHz ~ 30MHz: the amplitude of spurious emissions attenuated more than 20 dB below the permissible value to be report.

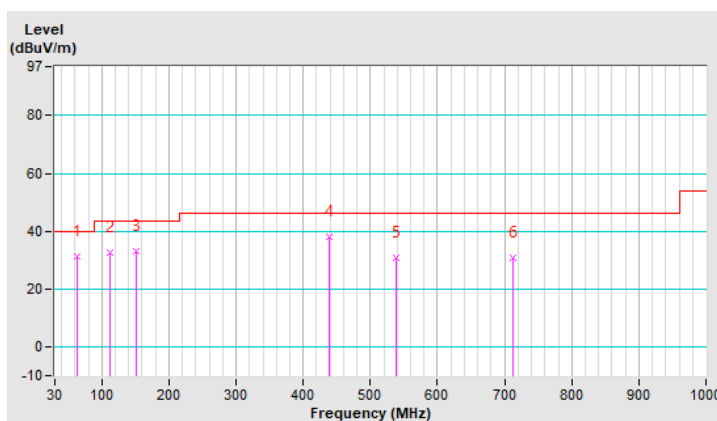


RF Mode	TX BT-LE 2M	Channel	CH 19 : 2440 MHz
Frequency Range	9kHz ~ 1GHz	Detector Function	Quasi-Peak (QP)

Antenna Polarity & Test Distance : Vertical at 3 m								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	63.95	31.1 QP	40.0	-8.9	1.00 V	7	41.1	-10.0
2	112.45	32.8 QP	43.5	-10.7	1.50 V	17	44.7	-11.9
3	152.22	33.1 QP	43.5	-10.4	1.50 V	162	42.0	-8.9
4	439.34	38.1 QP	46.0	-7.9	1.00 V	229	41.8	-3.7
5	539.25	31.0 QP	46.0	-15.0	2.00 V	102	32.8	-1.8
6	711.91	31.0 QP	46.0	-15.0	1.00 V	30	29.8	1.2

Remarks:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m).
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB).
3. The other emission levels were very low against the limit of frequency range 30MHz ~ 1000MHz.
4. Margin value = Emission Level – Limit value.
5. The emission levels were very low against the limit of frequency range 9kHz ~ 30MHz: the amplitude of spurious emissions attenuated more than 20 dB below the permissible value to be report.



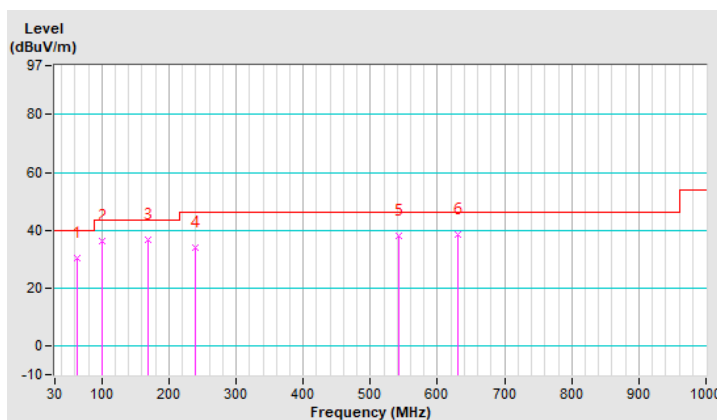
Mode B

RF Mode	TX BT-LE 2M	Channel	CH 19 : 2440 MHz
Frequency Range	9kHz ~ 1GHz	Detector Function	Quasi-Peak (QP)

Antenna Polarity & Test Distance : Horizontal at 3 m								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	63.95	30.2 QP	40.0	-9.8	1.25 H	24	40.2	-10.0
2	100.81	36.3 QP	43.5	-7.2	1.50 H	70	49.7	-13.4
3	169.68	36.8 QP	43.5	-6.7	1.00 H	33	45.9	-9.1
4	238.55	33.9 QP	46.0	-12.1	2.00 H	138	43.5	-9.6
5	543.13	37.9 QP	46.0	-8.1	1.00 H	243	39.6	-1.7
6	630.43	38.6 QP	46.0	-7.4	1.25 H	113	38.5	0.1

Remarks:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m).
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB).
3. The other emission levels were very low against the limit of frequency range 30MHz ~ 1000MHz.
4. Margin value = Emission Level – Limit value.
5. The emission levels were very low against the limit of frequency range 9kHz ~ 30MHz: the amplitude of spurious emissions attenuated more than 20 dB below the permissible value to be report.

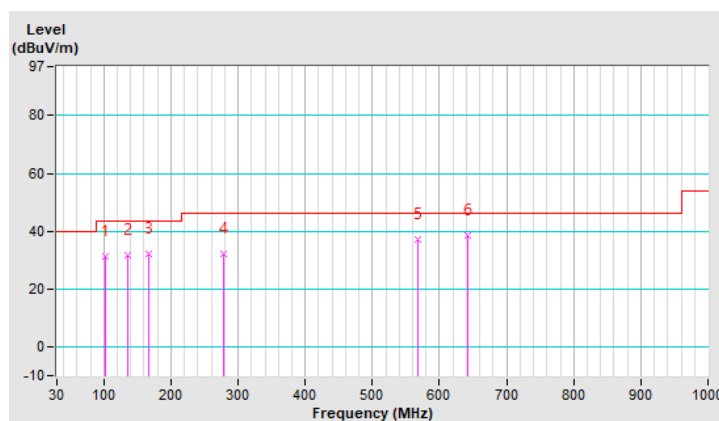


RF Mode	TX BT-LE 2M	Channel	CH 19 : 2440 MHz
Frequency Range	9kHz ~ 1GHz	Detector Function	Quasi-Peak (QP)

Antenna Polarity & Test Distance : Vertical at 3 m								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	101.78	31.4 QP	43.5	-12.1	1.00 V	155	44.8	-13.4
2	135.73	31.6 QP	43.5	-11.9	1.00 V	14	41.3	-9.7
3	167.74	32.0 QP	43.5	-11.5	1.25 V	126	40.9	-8.9
4	278.32	32.0 QP	46.0	-14.0	1.50 V	207	39.5	-7.5
5	567.38	37.0 QP	46.0	-9.0	1.00 V	230	38.3	-1.3
6	643.04	38.3 QP	46.0	-7.7	1.25 V	351	37.9	0.4

Remarks:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m).
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB).
3. The other emission levels were very low against the limit of frequency range 30MHz ~ 1000MHz.
4. Margin value = Emission Level – Limit value.
5. The emission levels were very low against the limit of frequency range 9kHz ~ 30MHz: the amplitude of spurious emissions attenuated more than 20 dB below the permissible value to be report.



4.2 Conducted Emission Measurement

4.2.1 Limits of Conducted Emission Measurement

Frequency (MHz)	Conducted Limit (dBuV)	
	Quasi-peak	Average
0.15 - 0.5	66 - 56	56 - 46
0.50 - 5.0	56	46
5.0 - 30.0	60	50

Note: 1. The lower limit shall apply at the transition frequencies.

2. The limit decreases in line with the logarithm of the frequency in the range of 0.15 to 0.50MHz.

4.2.2 Test Instruments

Description & Manufacturer	Model No.	Serial No.	Cal. Date	Cal. Due
Test Receiver ROHDE & SCHWARZ	ESR3	102412	Jan. 22, 2022	Jan. 21, 2023
RF signal cable Woken	5D-FB	Cable-cond2-01	Sep. 04, 2021	Sep. 03, 2022
LISN ROHDE & SCHWARZ (EUT)	ESH2-Z5	100100	Feb. 17, 2022	Feb. 16, 2023
V-LISN ROHDE & SCHWARZ (Peripheral)	ESH3-Z5	100312	Sep. 17, 2021	Sep. 16, 2022
Software ADT	BV ADT_Cond_ V7.3.7.4	NA	NA	NA

Note: 1. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.

2. The test was performed in HwaYa Shielded Room 2 (Conduction 2).

3. The VCCI Site Registration No. is C-12047.

4. Tested date: May 17 ~ Jun. 10, 2022

4.2.3 Test Procedures

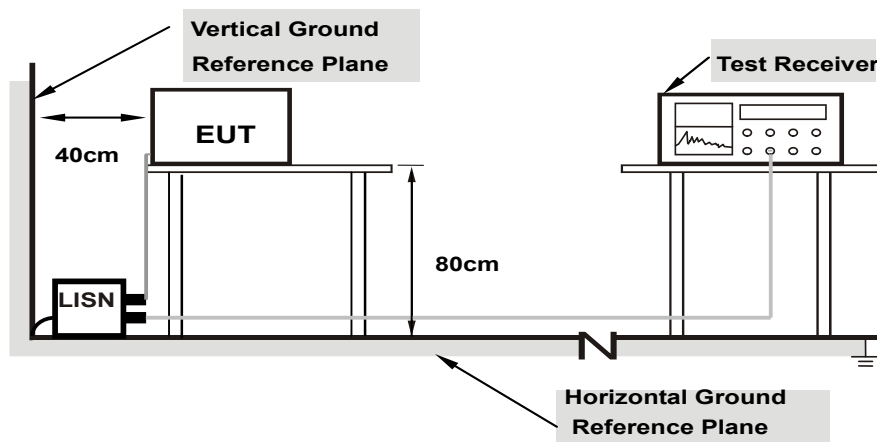
- The EUT was placed 0.4 meters from the conducting wall of the shielded room with EUT being connected to the power mains through a line impedance stabilization network (LISN). Other support units were connected to the power mains through another LISN. The two LISNs provide 50 ohm/ 50uH of coupling impedance for the measuring instrument.
- Both lines of the power mains connected to the EUT were checked for maximum conducted interference.
- The frequency range from 150kHz to 30MHz was searched. Emission levels under (Limit - 20dB) was not recorded.

Note: The resolution bandwidth and video bandwidth of test receiver is 9kHz for quasi-peak detection (QP) and average detection (AV) at frequency 0.15MHz-30MHz.

4.2.4 Deviation from Test Standard

No deviation.

4.2.5 Test Setup



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

For the actual test configuration, please refer to the attached file (Test Setup Photo).

4.2.6 EUT Operating Conditions

Same as 4.1.6.

4.2.7 Test Results

Worst-case data:

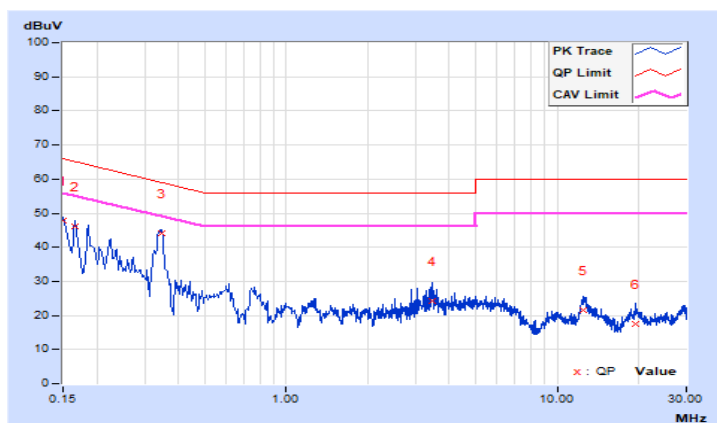
BT-LE 2M

Phase	Line (L)	Detector Function	Quasi-Peak (QP) / Average (AV)
Test Mode	A		

No	Freq. [MHz]	Corr. Factor (dB)	Reading Value [dB (uV)]		Emission Level [dB (uV)]		Limit [dB (uV)]		Margin (dB)	
			Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
			1	0.15000	10.13	37.59	21.18	47.72	31.31	66.00
2	0.16564	10.14	36.12	23.93	46.26	34.07	65.18	55.18	-18.92	-21.11
3	0.34550	10.22	33.93	28.56	44.15	38.78	59.07	49.07	-14.92	-10.29
4	3.47350	10.39	13.97	3.96	24.36	14.35	56.00	46.00	-31.64	-31.65
5	12.52906	10.49	10.96	4.58	21.45	15.07	60.00	50.00	-38.55	-34.93
6	19.51232	10.60	6.99	1.16	17.59	11.76	60.00	50.00	-42.41	-38.24

Remarks:

1. Q.P. and AV. are abbreviations of quasi-peak and average individually.
2. The emission levels of other frequencies were very low against the limit.
3. Margin value = Emission level - Limit value
4. Correction factor = Insertion loss + Cable loss
5. Emission Level = Correction Factor + Reading Value.

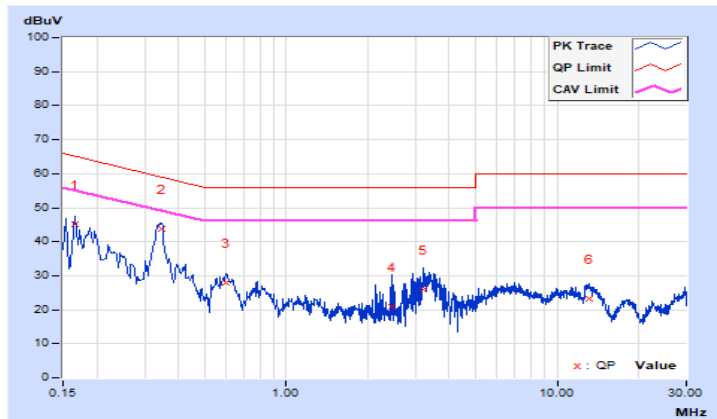


Phase	Neutral (N)	Detector Function	Quasi-Peak (QP) / Average (AV)
Test Mode	A		

No	Freq. [MHz]	Corr. Factor (dB)	Reading Value [dB (uV)]		Emission Level [dB (uV)]		Limit [dB (uV)]		Margin (dB)	
			Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
			1	0.16564	10.16	34.86	24.74	45.02	34.90	65.18
2	0.34550	10.24	33.65	26.58	43.89	36.82	59.07	49.07	-15.18	-12.25
3	0.59943	10.28	17.62	10.04	27.90	20.32	56.00	46.00	-28.10	-25.68
4	2.44908	10.37	10.61	1.24	20.98	11.61	56.00	46.00	-35.02	-34.39
5	3.21153	10.38	15.47	3.56	25.85	13.94	56.00	46.00	-30.15	-32.06
6	13.15466	10.58	12.52	7.11	23.10	17.69	60.00	50.00	-36.90	-32.31

Remarks:

1. Q.P. and AV. are abbreviations of quasi-peak and average individually.
2. The emission levels of other frequencies were very low against the limit.
3. Margin value = Emission level - Limit value
4. Correction factor = Insertion loss + Cable loss
5. Emission Level = Correction Factor + Reading Value.

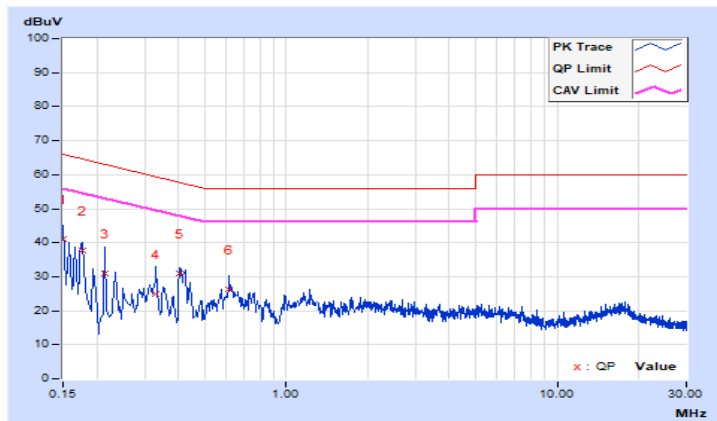


Phase	Line (L)	Detector Function	Quasi-Peak (QP) / Average (AV)
Test Mode	B		

No	Freq. [MHz]	Corr. Factor (dB)	Reading Value [dB (uV)]		Emission Level [dB (uV)]		Limit [dB (uV)]		Margin (dB)	
			Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
			1	0.15000	10.13	30.81	14.30	40.94	24.43	66.00
2	0.17615	10.15	27.64	12.95	37.79	23.10	64.67	54.67	-26.88	-31.57
3	0.21400	10.17	20.86	5.06	31.03	15.23	63.05	53.05	-32.02	-37.82
4	0.33000	10.21	14.78	10.81	24.99	21.02	59.45	49.45	-34.46	-28.43
5	0.40498	10.24	20.58	15.55	30.82	25.79	57.75	47.75	-26.93	-21.96
6	0.61400	10.26	15.91	8.93	26.17	19.19	56.00	46.00	-29.83	-26.81

Remarks:

1. Q.P. and AV. are abbreviations of quasi-peak and average individually.
2. The emission levels of other frequencies were very low against the limit.
3. Margin value = Emission level - Limit value
4. Correction factor = Insertion loss + Cable loss
5. Emission Level = Correction Factor + Reading Value.

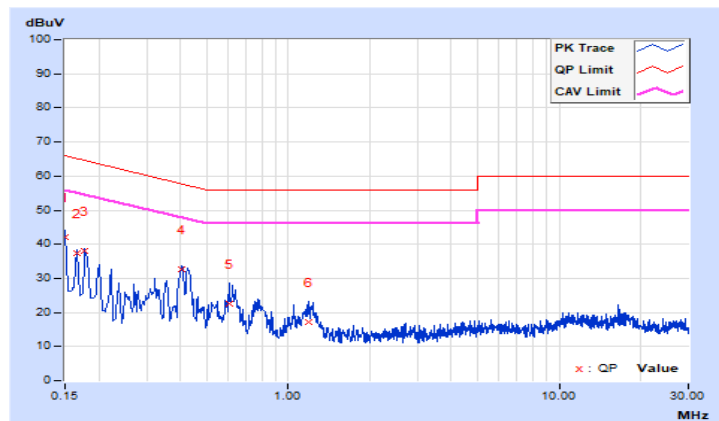


Phase	Neutral (N)	Detector Function	Quasi-Peak (QP) / Average (AV)
Test Mode	B		

No	Freq. [MHz]	Corr. Factor (dB)	Reading Value [dB (uV)]		Emission Level [dB (uV)]		Limit [dB (uV)]		Margin (dB)	
			Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
			1	0.15000	10.14	31.91	15.55	42.05	25.69	66.00
2	0.16600	10.16	27.32	12.61	37.48	22.77	65.16	55.16	-27.68	-32.39
3	0.17800	10.17	27.76	12.42	37.93	22.59	64.58	54.58	-26.65	-31.99
4	0.40600	10.26	22.34	16.73	32.60	26.99	57.73	47.73	-25.13	-20.74
5	0.60600	10.28	12.14	6.23	22.42	16.51	56.00	46.00	-33.58	-29.49
6	1.18600	10.32	6.88	1.52	17.20	11.84	56.00	46.00	-38.80	-34.16

Remarks:

1. Q.P. and AV. are abbreviations of quasi-peak and average individually.
2. The emission levels of other frequencies were very low against the limit.
3. Margin value = Emission level - Limit value
4. Correction factor = Insertion loss + Cable loss
5. Emission Level = Correction Factor + Reading Value.

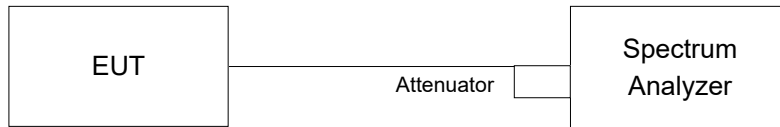


4.3 6dB Bandwidth Measurement

4.3.1 Limits of 6dB Bandwidth Measurement

The minimum of 6dB Bandwidth Measurement is 0.5 MHz.

4.3.2 Test Setup



4.3.3 Test Instruments

Refer to section 4.1.2 to get information of above instrument.

4.3.4 Test Procedure

- Set resolution bandwidth (RBW) = 100kHz.
- Set the video bandwidth (VBW) $\geq 3 \times$ RBW, Detector = peak.
- Trace mode = max hold.
- Sweep = auto couple.
- Measure the maximum width of the emission that is constrained by the frequencies associated with the two amplitude points (upper and lower) that are attenuated by 6 dB relative to the maximum level measured in the fundamental emission.

4.3.5 Deviation from Test Standard

No deviation.

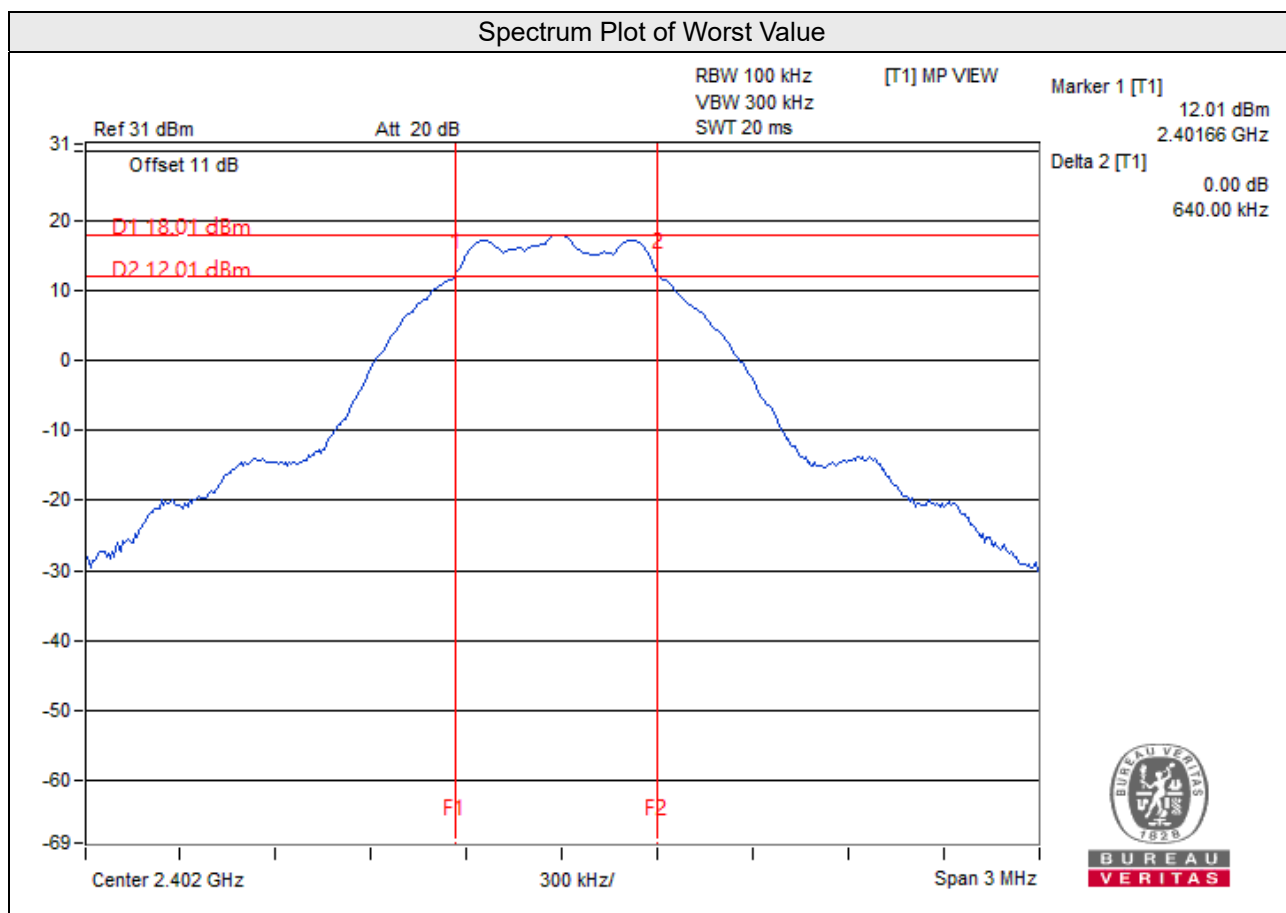
4.3.6 EUT Operating Conditions

The software provided by client to enable the EUT under transmission condition continuously at lowest, middle and highest channel frequencies individually.

4.3.7 Test Result

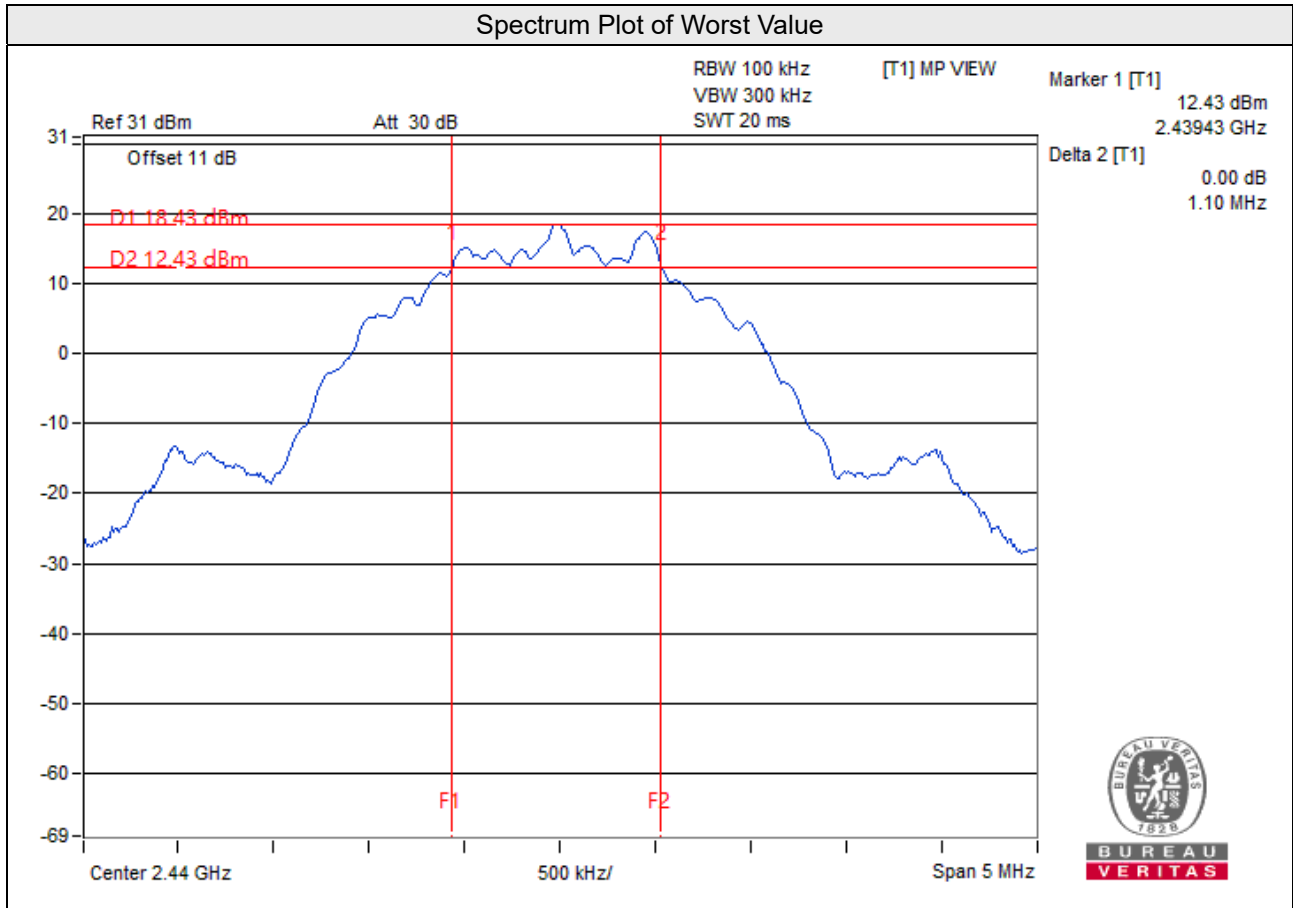
BT LE 1M

Channel	Frequency (MHz)	6dB Bandwidth (MHz)	Minimum Limit (MHz)	Pass / Fail
0	2402	0.64	0.5	Pass
19	2440	0.65	0.5	Pass
39	2480	0.64	0.5	Pass



BT LE 2M

Channel	Frequency (MHz)	6dB Bandwidth (MHz)	Minimum Limit (MHz)	Pass / Fail
0	2402	1.10	0.5	Pass
19	2440	1.10	0.5	Pass
39	2480	1.10	0.5	Pass

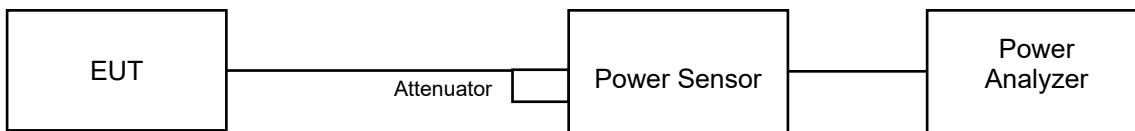


4.4 Conducted Output Power Measurement

4.4.1 Limits of Conducted Output Power Measurement

For systems using digital modulation in the 2400–2483.5 MHz bands: 1 Watt (30dBm)

4.4.2 Test Setup



4.4.3 Test Instruments

Refer to section 4.1.2 to get information of above instrument.

4.4.4 Test Procedures

For Peak Power

A peak power sensor was used on the output port of the EUT. A power meter was used to read the response of the peak power sensor. Record the power level.

For Average Power

Average power sensor was used to perform output power measurement, trigger and gating function of wide band power meter is enabled to measure max output power of TX on burst. Duty factor is not added to measured value.

4.4.5 Deviation from Test Standard

No deviation.

4.4.6 EUT Operating Conditions

Same as item 4.3.6.

4.4.7 Test Results

Peak Power

BT LE 1M

Channel	Frequency (MHz)	Peak Power (mW)	Peak Power (dBm)	Limit (dBm)	Pass/Fail
0	2402	55.847	17.47	30.00	Pass
19	2440	61.235	17.87	30.00	Pass
39	2480	23.550	13.72	30.00	Pass

BT LE 2M

Channel	Frequency (MHz)	Peak Power (mW)	Peak Power (dBm)	Limit (dBm)	Pass/Fail
0	2402	56.364	17.51	30.00	Pass
19	2440	61.660	17.90	30.00	Pass
39	2480	13.366	11.26	30.00	Pass

Average Power

BT LE 1M

Channel	Frequency (MHz)	Average Power (mW)	Average Power (dBm)
0	2402	55.335	17.43
19	2440	60.814	17.84
39	2480	23.121	13.64

BT LE 2M

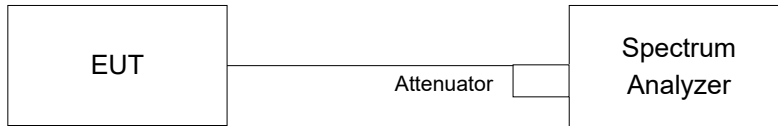
Channel	Frequency (MHz)	Average Power (mW)	Average Power (dBm)
0	2402	55.590	17.45
19	2440	60.954	17.85
39	2480	13.062	11.16

4.5 Power Spectral Density Measurement

4.5.1 Limits of Power Spectral Density Measurement

The Maximum of Power Spectral Density Measurement is 8dBm per 3kHz.

4.5.2 Test Setup



4.5.3 Test Instruments

Refer to section 4.1.2 to get information of above instrument.

4.5.4 Test Procedure

- a. Set analyzer center frequency to DTS channel center frequency.
- b. Set the span to 1.5 times the DTS bandwidth.
- c. Set the RBW to: $3 \text{ kHz} \leq \text{RBW} \leq 100 \text{ kHz}$.
- d. Set the VBW $\geq 3 \times \text{RBW}$.
- e. Detector = peak.
- f. Sweep time = auto couple.
- g. Trace mode = max hold.
- h. Allow trace to fully stabilize.
- i. Use the peak marker function to determine the maximum amplitude level within the RBW.

4.5.5 Deviation from Test Standard

No deviation.

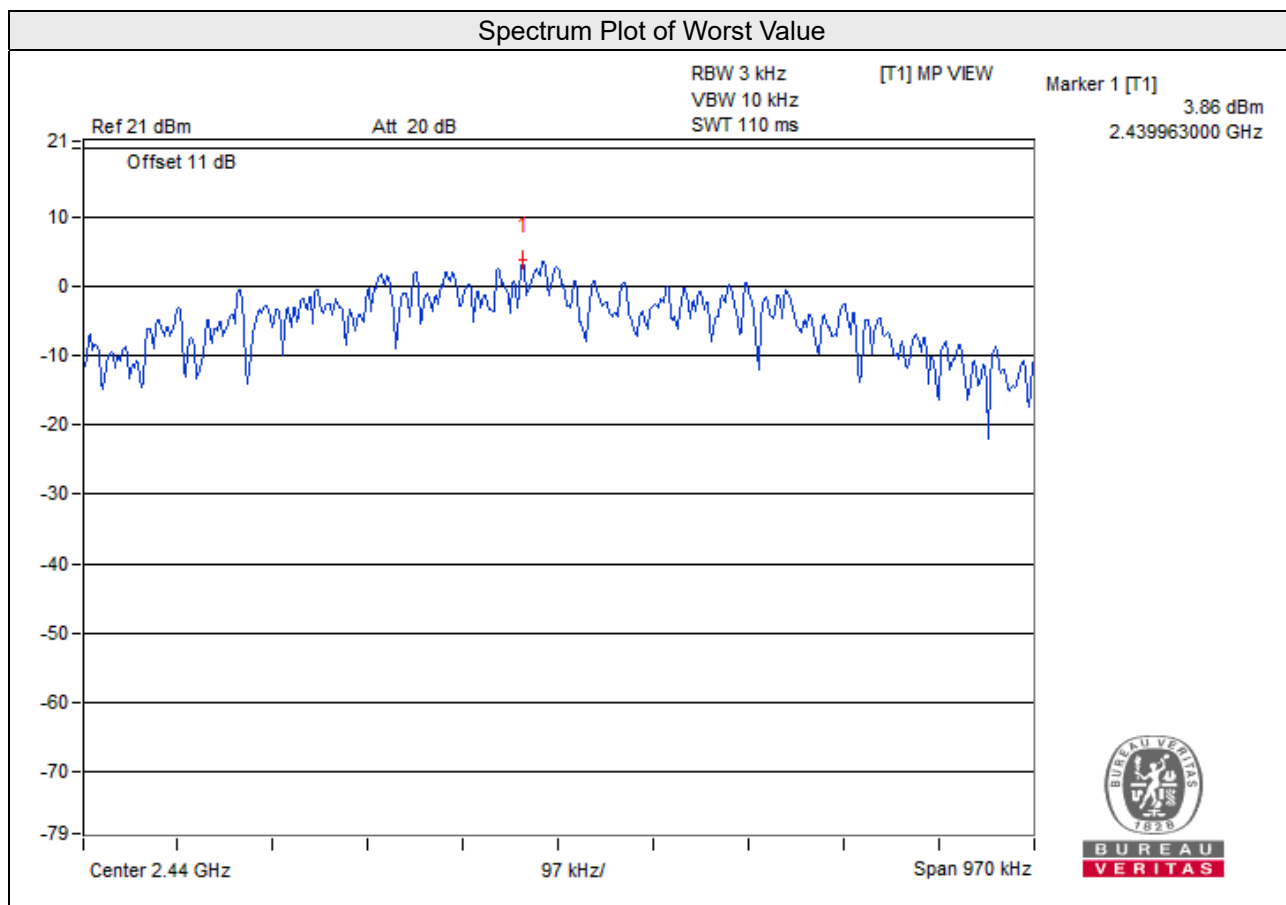
4.5.6 EUT Operating Condition

Same as item 4.3.6

4.5.7 Test Results

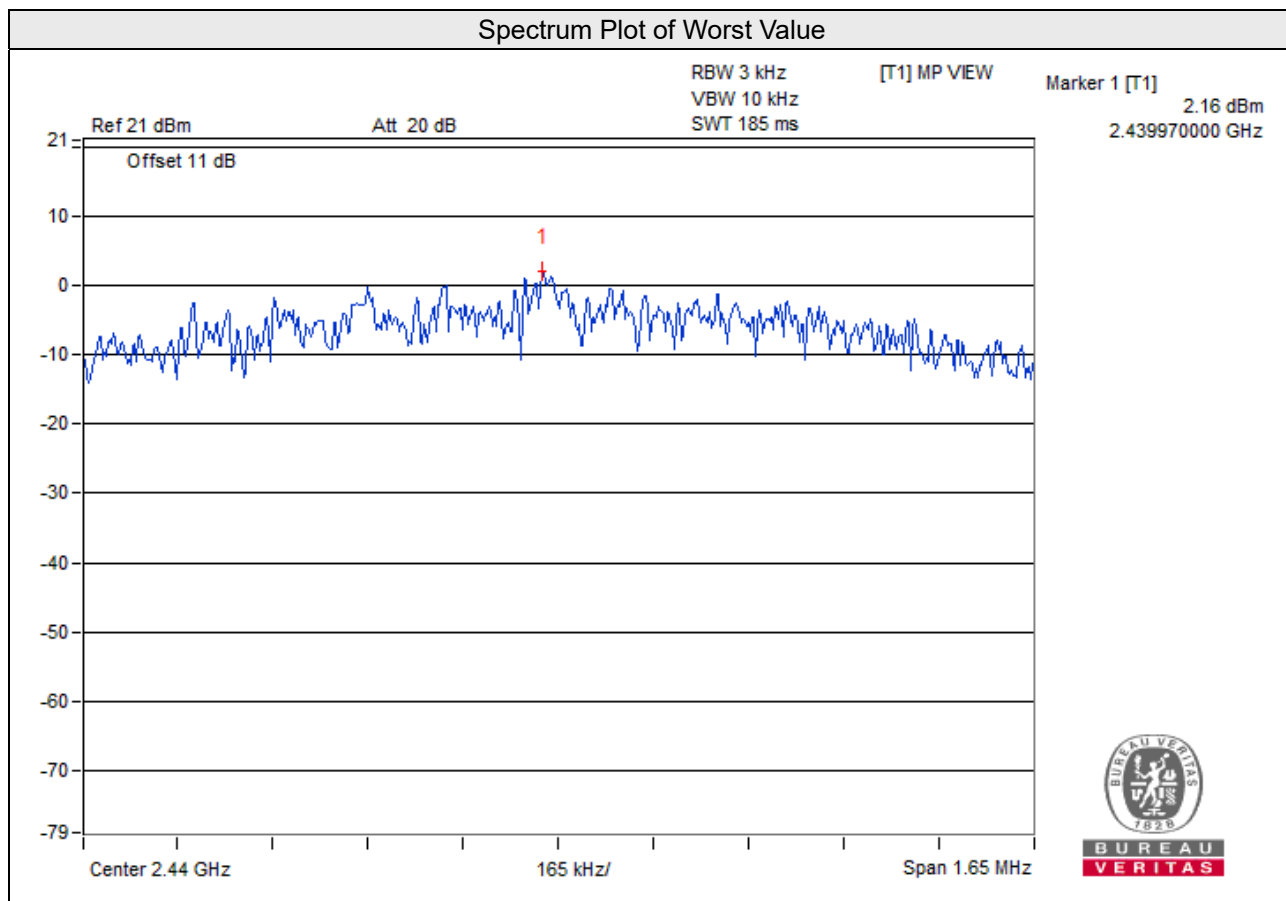
BT LE 1M

Channel	Freq. (MHz)	PSD (dBm/3kHz)	Limit (dBm/3kHz)	Pass / Fail
0	2402	3.47	8.00	Pass
19	2440	3.86	8.00	Pass
39	2480	-0.62	8.00	Pass



BT LE 2M

Channel	Freq. (MHz)	PSD (dBm/3kHz)	Limit (dBm/3kHz)	Pass / Fail
0	2402	1.55	8.00	Pass
19	2440	2.16	8.00	Pass
39	2480	-5.07	8.00	Pass

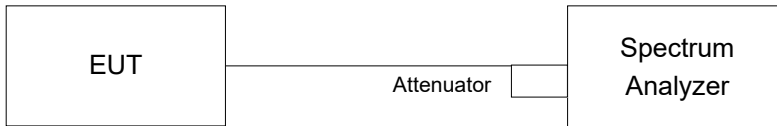


4.6 Conducted Out of Band Emission Measurement

4.6.1 Limits of Conducted Out of Band Emission Measurement

Below 20dB of the highest emission level of operating band (in 100kHz Resolution Bandwidth).

4.6.2 Test Setup



4.6.3 Test Instruments

Refer to section 4.1.2 to get information of above instrument.

4.6.4 Test Procedure

MEASUREMENT PROCEDURE REF

- a. Set the RBW = 100 kHz.
- b. Set the VBW \geq 300 kHz.
- c. Detector = peak.
- d. Sweep time = auto couple.
- e. Trace mode = max hold.
- f. Allow trace to fully stabilize.
- g. Use the peak marker function to determine the maximum power level in any 100 kHz band segment within the fundamental EBW.

MEASUREMENT PROCEDURE OOB

- a. Set RBW = 100 kHz.
- b. Set VBW \geq 300 kHz.
- c. Detector = peak.
- d. Sweep = auto couple.
- e. Trace Mode = max hold.
- f. Allow trace to fully stabilize.
- g. Use the peak marker function to determine the maximum amplitude level.

4.6.5 Deviation from Test Standard

No deviation.

4.6.6 EUT Operating Condition

Same as item 4.3.6

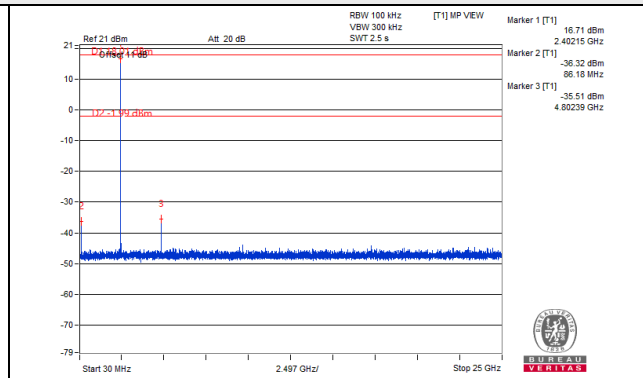
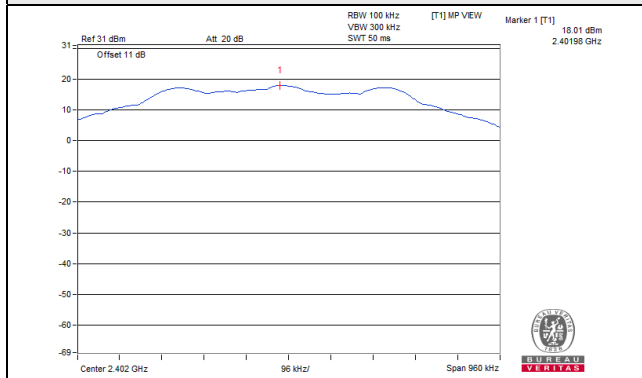
4.6.7 Test Results

The conducted emission test is performed on each TX port of operating mode without summing or adding 10log (N) since the limit is relative emission limit.

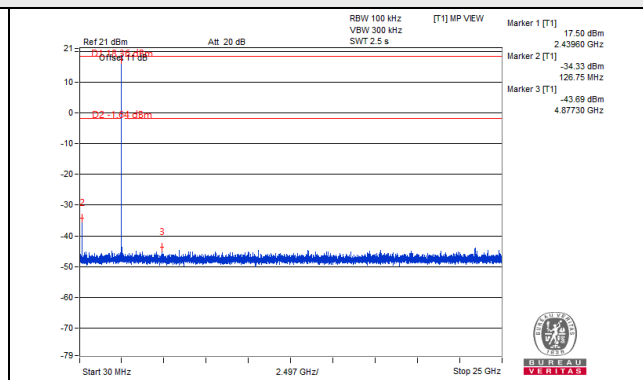
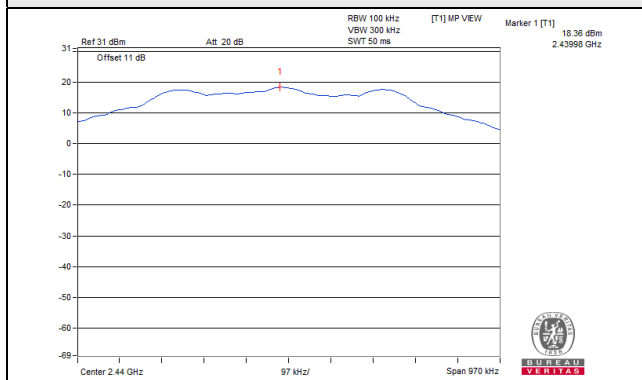
The spectrum plots are attached on the following pages. D1 line indicates the highest level, and D2 line indicates the 20dB offset below D1. It shows compliance with the requirement.

BTLE 1M

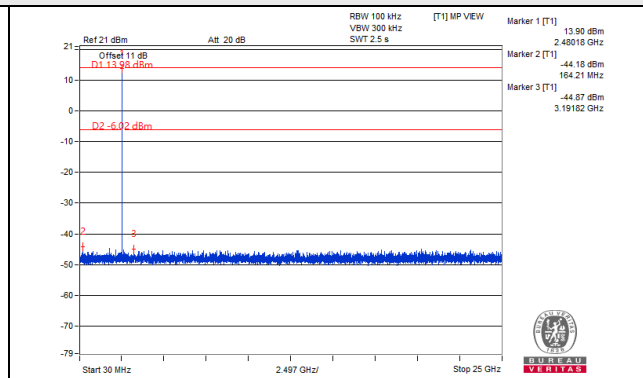
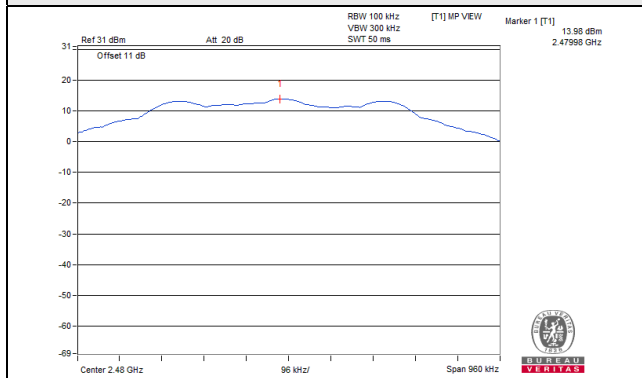
CH 0



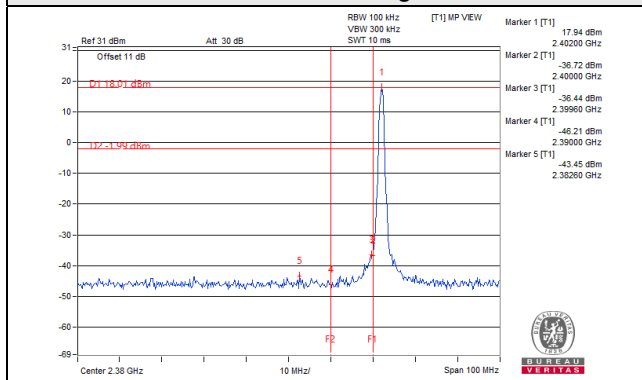
CH 19



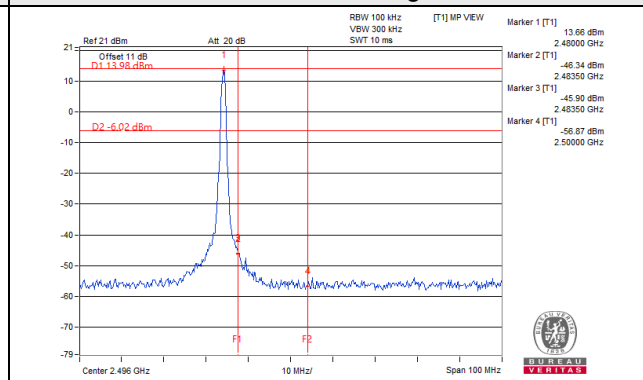
CH 39



CH 0 Band edge

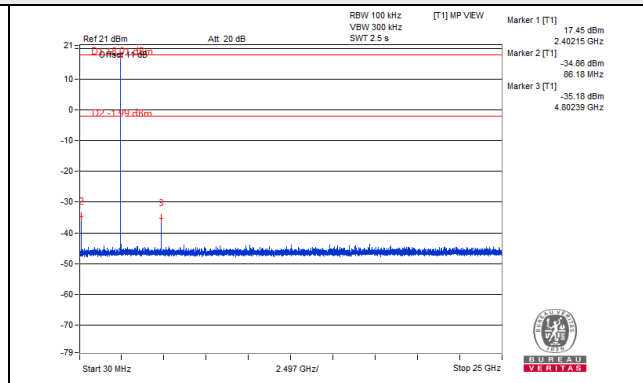
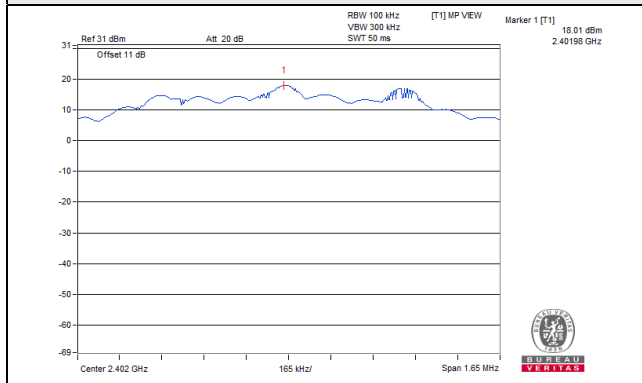


CH 39 Band edge

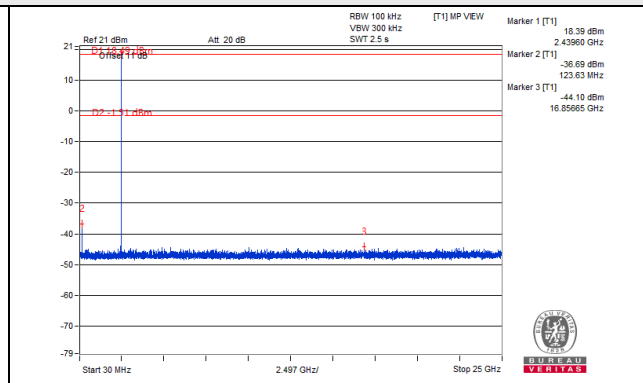
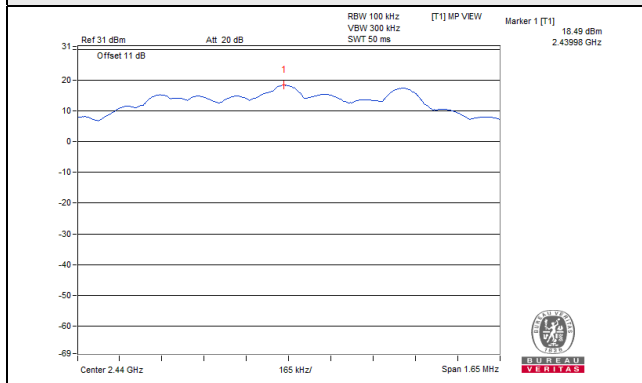


BT LE 2M

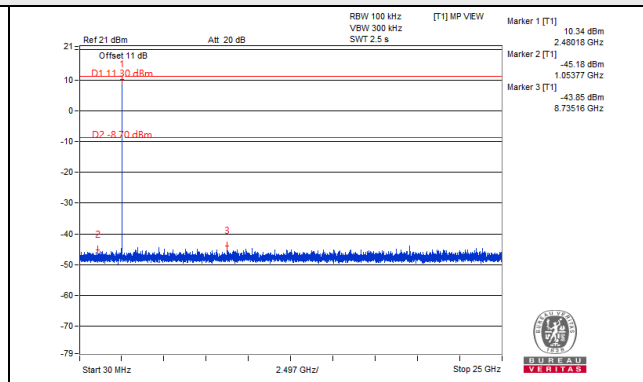
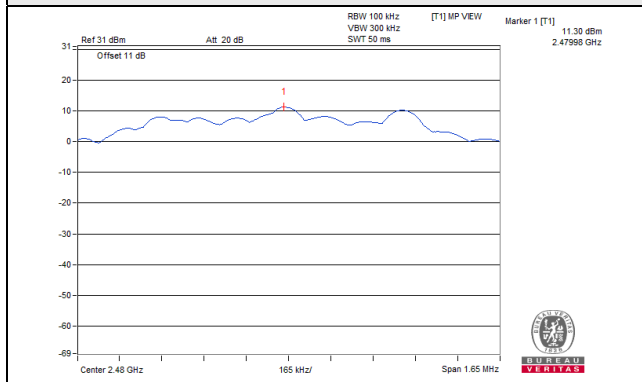
CH 0



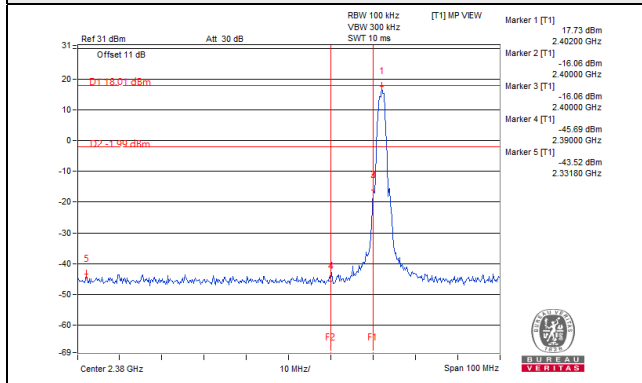
CH 19



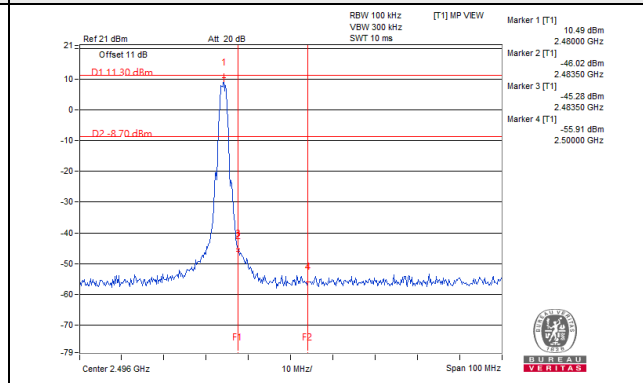
CH 39



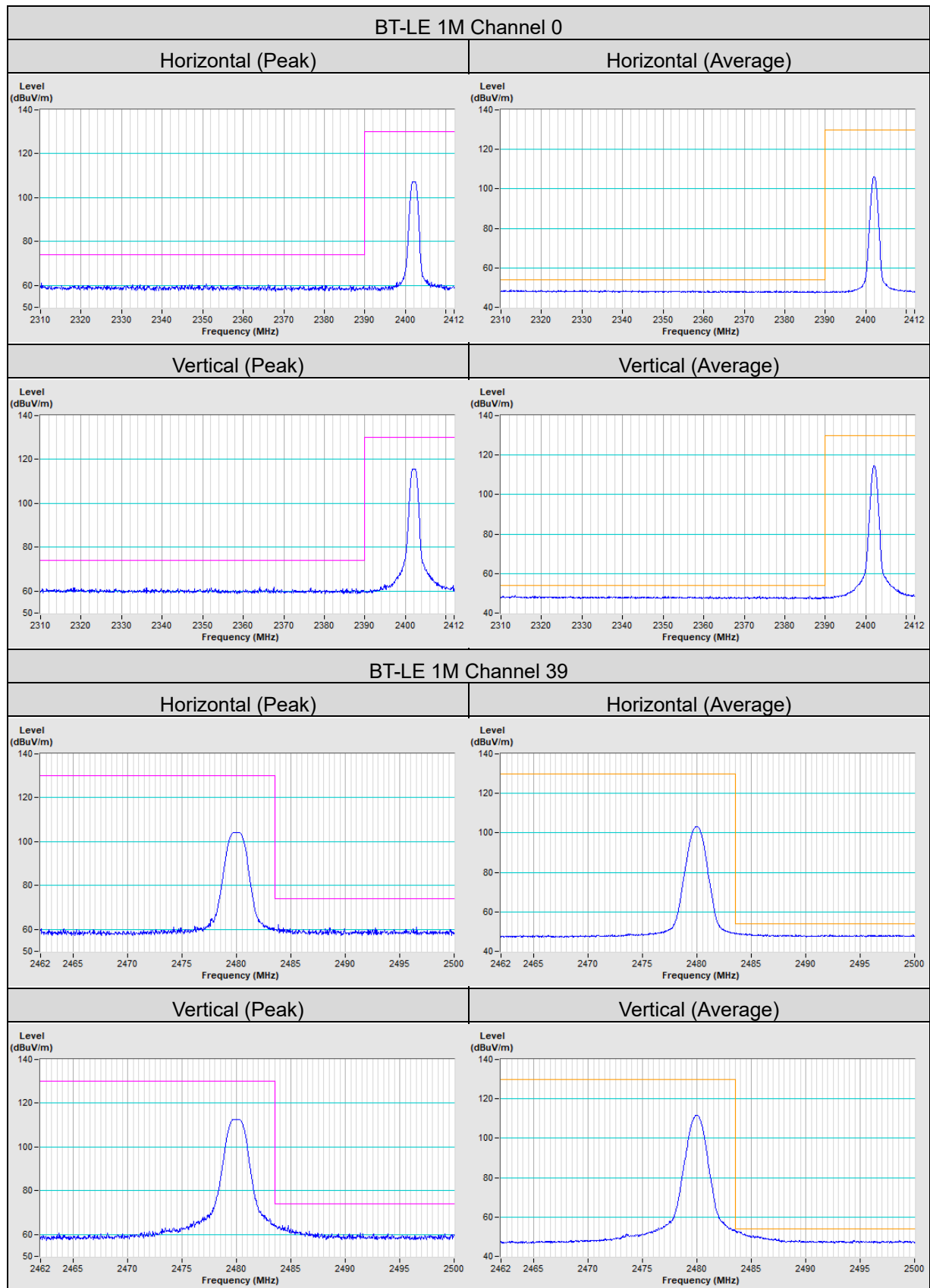
CH 0 Band edge

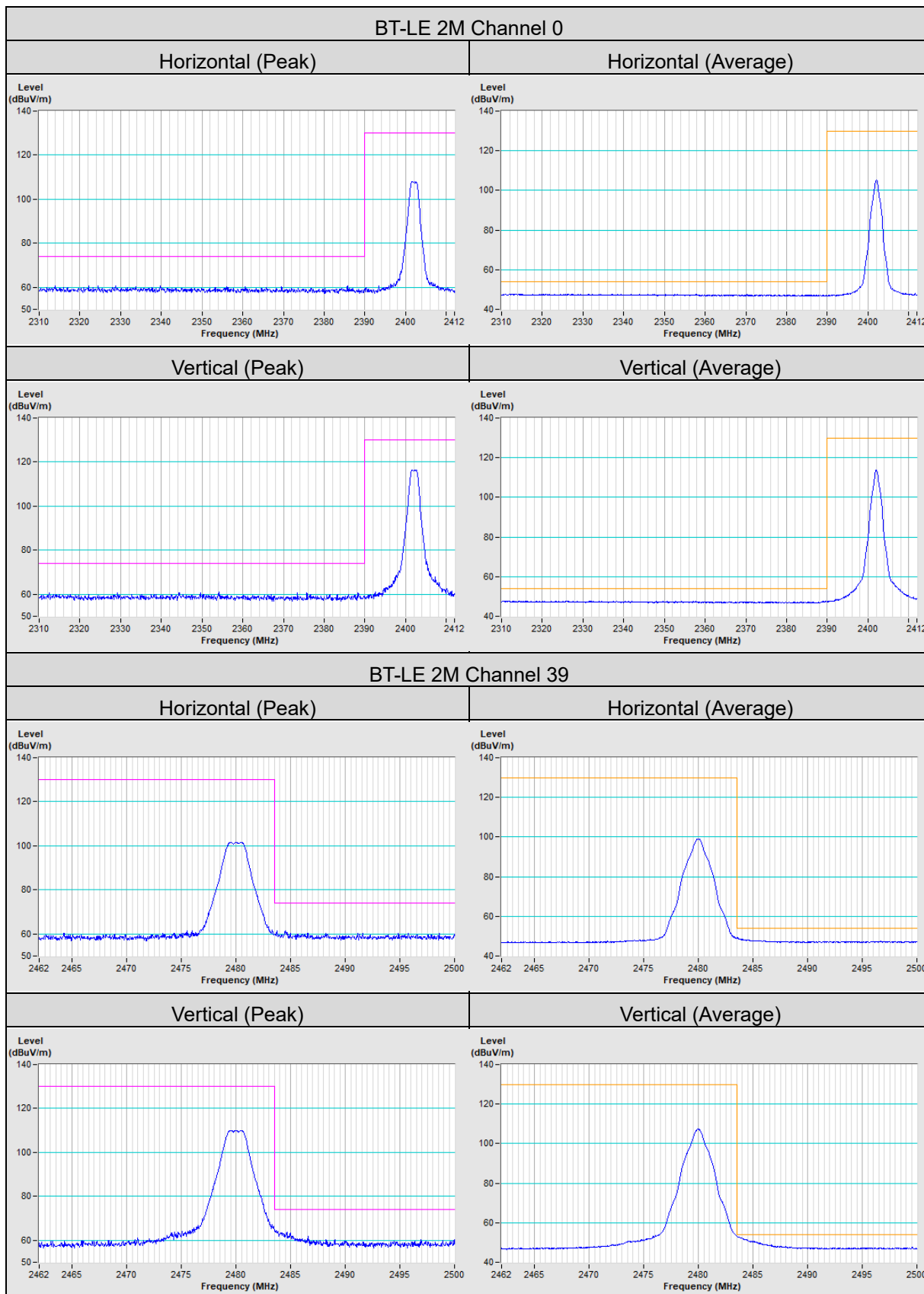


CH 39 Band edge



Annex A- Band Edge Measurement





5 Pictures of Test Arrangements

Please refer to the attached file (Test Setup Photo).

Appendix – Information of the Testing Laboratories

We, Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch, were founded in 1988 to provide our best service in EMC, Radio, Telecom and Safety consultation. Our laboratories are FCC recognized accredited test firms and accredited and approved according to ISO/IEC 17025.

If you have any comments, please feel free to contact us at the following:

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Web Site: www.bureauveritas-adt.com

The address and road map of all our labs can be found in our web site also.

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