

FCC Test Report (BT-LE)

Report No.: RFBEMI-WTW-P20080078

FCC ID: NOI-H3750B

Test Model: H3750B

Received Date: 2021/8/6

Test Date: 2021/9/16 ~ 2021/10/4

Issued Date: 2021/11/12

Applicant: NETRONIX, INC.

Address: No 945, Boai St, Jubei City, Hsinchu, 30265 Taiwan

Issued By: Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch
Hsin Chu Laboratory

Lab Address: E-2, No.1, Li Hsin 1st Road, Hsinchu Science Park, Hsinchu City 300,
Taiwan

Test Location: E-2, No.1, Li Hsin 1st Road, Hsinchu Science Park, Hsinchu City 300,
Taiwan

**FCC Registration /
Designation Number:** 723255 / TW2022



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Table of Contents

Release Control Record	4
1 Certificate of Conformity	5
2 Summary of Test Results	6
2.1 Measurement Uncertainty.....	6
2.2 Modification Record	6
3 General Information	7
3.1 General Description of EUT (BT-LE).....	7
3.2 Description of Test Modes.....	8
3.2.1 Test Mode Applicability and Tested Channel Detail.....	9
3.3 Duty Cycle of Test Signal	11
3.4 Description of Support Units	12
3.4.1 Configuration of System under Test	13
3.5 General Description of Applied Standards and References	14
4 Test Types and Results	15
4.1 Radiated Emission and Bandedge Measurement.....	15
4.1.1 Limits of Radiated Emission and Bandedge Measurement	15
4.1.2 Test Instruments	16
4.1.3 Test Procedures.....	18
4.1.4 Deviation from Test Standard	18
4.1.5 Test Setup.....	19
4.1.6 EUT Operating Conditions.....	20
4.1.7 Test Results	21
4.2 6dB Bandwidth Measurement	29
4.2.1 Limits of 6dB Bandwidth Measurement.....	29
4.2.2 Test Setup.....	29
4.2.3 Test Instruments	29
4.2.4 Test Procedure	29
4.2.5 Deviation from Test Standard	29
4.2.6 EUT Operating Conditions.....	29
4.2.7 Test Results	30
4.3 Conducted Output Power Measurement.....	31
4.3.1 Limits of Conducted Output Power Measurement	31
4.3.2 Test Setup.....	31
4.3.3 Test Instruments	31
4.3.4 Test Procedures.....	31
4.3.5 Deviation from Test Standard	31
4.3.6 EUT Operating Conditions.....	31
4.3.7 Test Results	32
4.4 Power Spectral Density Measurement.....	33
4.4.1 Limits of Power Spectral Density Measurement	33
4.4.2 Test Setup.....	33
4.4.3 Test Instruments	33
4.4.4 Test Procedure	33
4.4.5 Deviation from Test Standard	33
4.4.6 EUT Operating Condition	33
4.4.7 Test Results	34
4.5 Conducted Out of Band Emission Measurement.....	35
4.5.1 Limits of Conducted Out of Band Emission Measurement	35
4.5.2 Test Setup.....	35
4.5.3 Test Instruments	35
4.5.4 Test Procedure	35
4.5.5 Deviation from Test Standard	35
4.5.6 EUT Operating Condition	35

4.5.7 Test Results	35
5 Pictures of Test Arrangements.....	38
Annex A - Band-Edge Measurement.....	39
Appendix – Information of the Testing Laboratories	41

Release Control Record

Issue No.	Description	Date Issued
RFBEMI-WTW-P20080078	Original release.	2021/11/12

1 Certificate of Conformity

Product: Electronic Bag Tag (EBT)

Brand: NETRONIX, BAGTAG

Test Model: H3750B

Sample Status: Engineering sample

Applicant: NETRONIX, INC.

Test Date: 2021/9/16 ~ 2021/10/4

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 EMC characteristics under the conditions specified in this report.

Prepared by : Vivian Huang , **Date:** 2021/11/12
Vivian Huang / Specialist

Approved by : Clark Lin , **Date:** 2021/11/12
Clark Lin / Technical Manager

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	NA	Without AC power port of the EUT.
15.205 / 15.209 / 15.247(d)	Radiated Emissions and Band Edge Measurement	PASS	Meet the requirement of limit. Minimum passing margin is -0.1 dB at 4804.00 MHz and 4880.00 MHz.
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 soldering terminal not a standard connector.

Note:

- For 2.4 GHz band compliance with rule 15.247(d) of the band-edge items, the test plots were recorded in Annex A.
- 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)
Radiated Emissions up to 1 GHz	9kHz ~ 30MHz	3.1 dB
	30MHz ~ 1GHz	5.5 dB
Radiated Emissions above 1 GHz	1GHz ~ 18GHz	5.1 dB
	18GHz ~ 40GHz	5.3 dB

2.2 Modification Record

There were no modifications required for compliance.

3 General Information

3.1 General Description of EUT (BT-LE)

Product	Electronic Bag Tag (EBT)
Brand	NETRONIX, BAGTAG
Test Model	H3750B
Status of EUT	Engineering sample
Power Supply Rating	Wireless NFC-Powered
Modulation Type	GFSK
Modulation Technology	DTS
Transfer Rate	Up to 2 Mbps
Operating Frequency	2.402 ~ 2.480 GHz
Number of Channel	40
Output Power	BT-LE 1M: 0.05715 mW BT-LE 2M: 0.1291 mW
Antenna Type	Refer to Note
Antenna Connector	Refer to Note
Accessory Device	NA
Cable Supplied	NA

Note:

1. There are Bluetooth, NFC (Passive), RFID (Tag function) technology used for the EUT.
2. The antenna provided to the EUT, please refer to the following table:

For Bluetooth used					
Brand	Model	Antenna Net Gain (dBi)	Frequency Range (GHz)	Antenna Type	Connector Type
Walsin Technology Corporation	RFECA3216060AAT	2	2.4~2.4835	Ceramic antenna	soldering terminal
For RFID (Passive) used					
Brand	Model	Antenna Net Gain (dBi)	Frequency Range (MHz)	Antenna Type	Connector Type
Read Tag Technology	DICU7065-001	NA	865.7~928	PIFA	none (like solder)
For NFC (Passive) used					
Frequency Range (MHz)		Antenna Type		Connector Type	
13.56		Loop Ant.		none (like solder)	

3. The above EUT information is declared by manufacturer and for more detailed features description, please refers to the manufacturer's specifications or user's manual.
4. The above Antenna information is declared by manufacturer and for more detailed features description, please refer to the manufacturer's specifications, the laboratory shall not be held responsible.

3.2 Description of Test Modes

40 channels are provided to this EUT:

Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (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	
-	√	√	-	√	-

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 had been pre-tested on the positioned of each 3 axis. The worst case was found when positioned on **X-plane**.
2. No need to concern of Conducted Emission due to the EUT without AC power port

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.

AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION TYPE	DATA RATE (Mbps)
0 to 39	0, 19, 39	GFSK	1
0 to 39	0, 19, 39	GFSK	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.

AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION TYPE	DATA RATE (Mbps)
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.

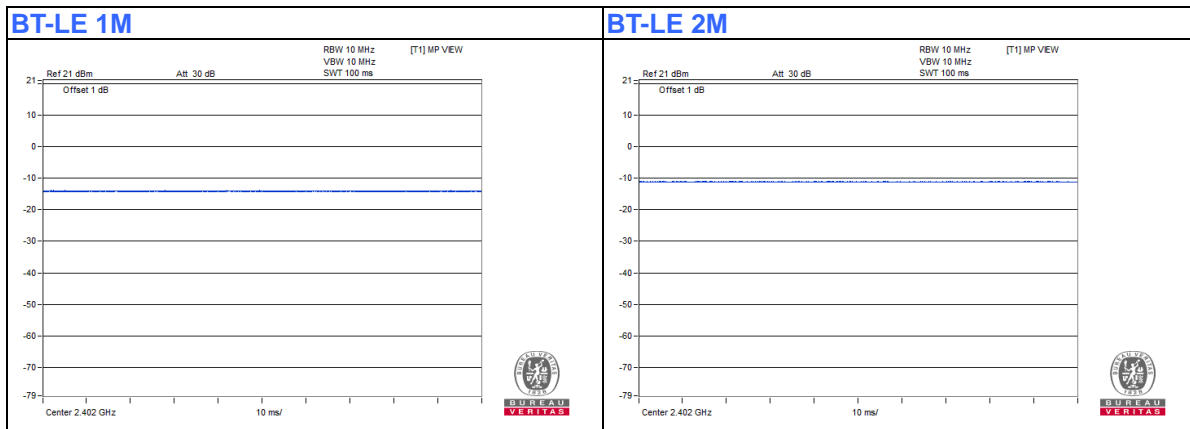
AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION TYPE	DATA RATE (Mbps)
0 to 39	0, 19, 39	GFSK	1
0 to 39	0, 19, 39	GFSK	2

Test Condition:

APPLICABLE TO	ENVIRONMENTAL CONDITIONS	INPUT POWER (System)	TESTED BY
RE \geq 1G	25deg. C, 75%RH	120Vac, 60Hz	Ryan Du
RE<1G	25deg. C, 69%RH	120Vac, 60Hz	Sampson Chen
APCM	25deg. C, 60%RH	120Vac, 60Hz	Leon Dai

3.3 Duty Cycle of Test Signal

Duty cycle of test signal is 100 %, duty factor is not required.



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.

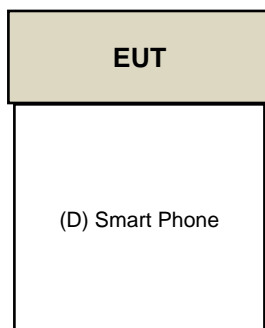
ID	Product	Brand	Model No.	Serial No.	FCC ID	Remarks
A.	Adapter	DELL	LA65NS2-01	NA	NA	Provided by Lab
B.	Laptop	DELL	P70F	DW3CSJ2	NA	Provided by Lab
C.	Test Tool	Netronix	NA	NA	NA	Supplied by client
D.	Smart Phone	Sony	XPERLA	NA	NA	Supplied by client

ID	Descriptions	Qty.	Length (m)	Shielding (Yes/No)	Cores (Qty.)	Remarks
1.	DC Cable	1	1.8	No	1	Provided by Lab
2.	AC Cable	1	0.9	No	0	Provided by Lab
3.	USB Type B Cable	1	1	No	0	Supplied by client

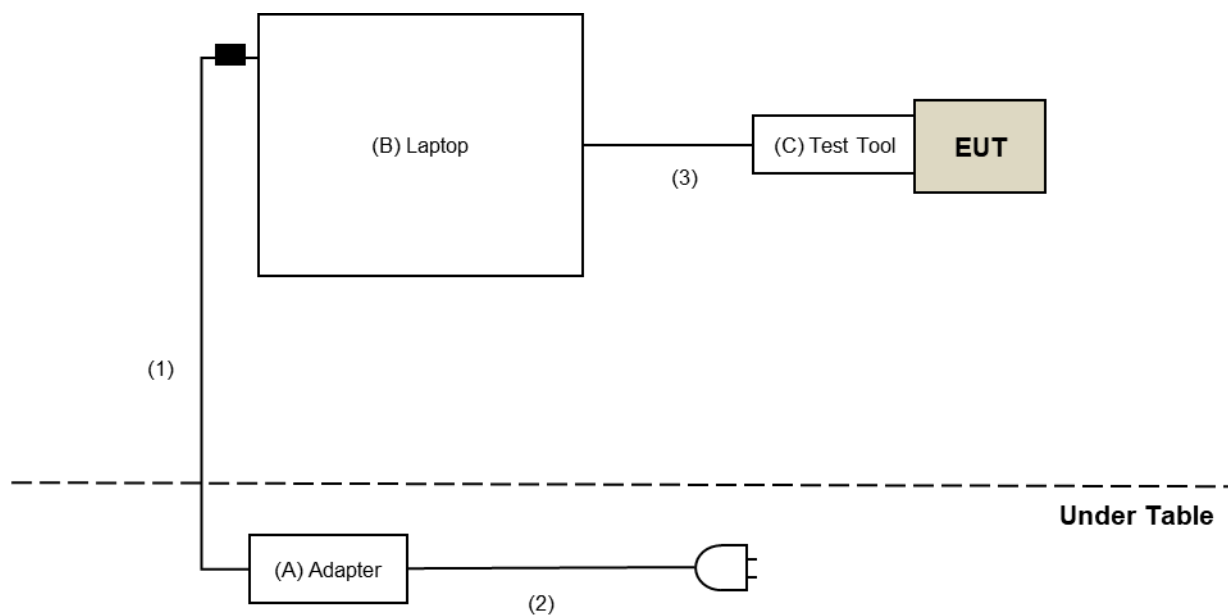
Note: The core(s) is(are) originally attached to the cable(s).

3.4.1 Configuration of System under Test

For Radiated Emissions test (below 1 GHz):



For Radiated Emissions test (above 1 GHz):



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

For Radiated Emission and Bandedge test:

Description & Manufacturer	Model No.	Serial No.	Calibrated Date	Calibrated Until
Test Receiver Agilent	N9038A	MY51210202	2020/12/1	2021/11/30
Software	ADT_Radiated_V8.7.08	NA	NA	NA
Boresight Antenna Tower & Turn Table Max-Full	MF-7802BS	MF780208530	NA	NA
Pre_Amplifier EMCI	EMC001340	980142	2021/5/24	2022/5/23
LOOP ANTENNA Electro-Metrics	EM-6879	264	2021/3/5	2022/3/4
RF Coaxial Cable JYEBO	5D-FB	LOOPCAB-001	2021/1/7	2022/1/6
RF Coaxial Cable JYEBO	5D-FB	LOOPCAB-002	2021/1/7	2022/1/6
Pre_Amplifier EMCI	EMC330N	980701	2021/3/10	2022/3/9
Trilog Broadband Antenna Schwarzbeck	VULB 9168	9168-406	2020/11/6	2021/11/5
RF Coaxial Cable COMMATE/PEWC	8D	966-4-1	2021/3/17	2022/3/16
RF Coaxial Cable COMMATE/PEWC	8D	966-4-2	2021/3/17	2022/3/16
RF Coaxial Cable COMMATE/PEWC	8D	966-4-3	2021/3/17	2022/3/16
Fixed attenuator Mini-Circuits	UNAT-5+	PAD-ATT5-03	2021/1/11	2022/1/10
Horn Antenna SCHWARZBECK	BBHA 9120D	9120D-783	2020/11/22	2021/11/21
Pre_Amplifier EMCI	EMC 12630 SE	980638	2021/4/7	2022/4/6
RF Cable-Frequency Range : 1-26.5GHz EMCI	EMC104-SM-SM-1200	160922	2020/12/25	2021/12/24
RF Coaxial Cable EMCI	EMC104-SM-SM-2000	180502	2021/4/26	2022/4/25
RF Coaxial Cable EMCI	EMC104-SM-SM-6000	180418	2021/4/26	2022/4/25
Pre_Amplifier EMCI	EMC184045SE	980387	2021/1/11	2022/1/10
Horn Antenna Schwarzbeck	BBHA 9170	BBHA9170519	2020/11/22	2021/11/21
RF Cable-Frequency range: 1-40GHz EMCI	EMC102-KM-KM-1200	160924	2021/1/11	2022/1/10
RF cable (40GHz) EMCI	EMC-KM-KM-4000	200214	2021/3/10	2022/3/9

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 966 Chamber No. 4.
3. Tested Date: 2021/9/16 ~ 2021/9/29

For other test:

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	CALIBRATED DATE	CALIBRATED UNTIL
Spectrum Analyzer R&S	FSV40	101516	2021/3/8	2022/3/7
Power Meter Anritsu	ML2495A	1529002	2021/6/21	2022/6/20
Pulse Power Sensor Anritsu	MA2411B	1339443	2021/5/31	2022/5/30
Attenuator WOKEN	MDCS18N-10	MDCS18N-10-01	2021/4/13	2022/4/12
Software	ADT_RF Test Software V6.6.5.4	NA	NA	NA

- NOTE:**
1. The test was performed in Oven room 2.
 2. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.
 3. Tested Date: 2021/10/4

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 detects 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:

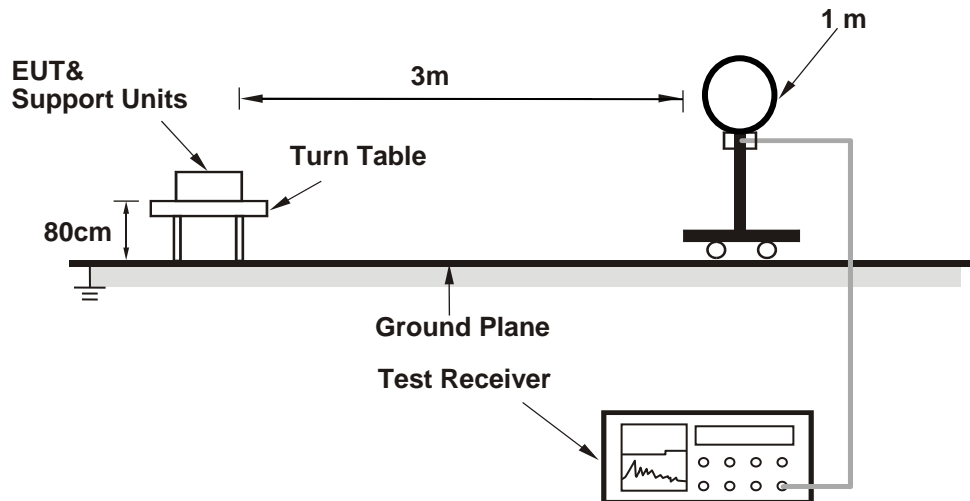
1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120kHz for Quasi-peak detection (QP) at frequency below 1GHz.
2. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is 3 MHz for Peak detection (PK) at frequency above 1GHz.
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.
4. All modes of operation were investigated and the worst-case emissions are reported.

4.1.4 Deviation from Test Standard

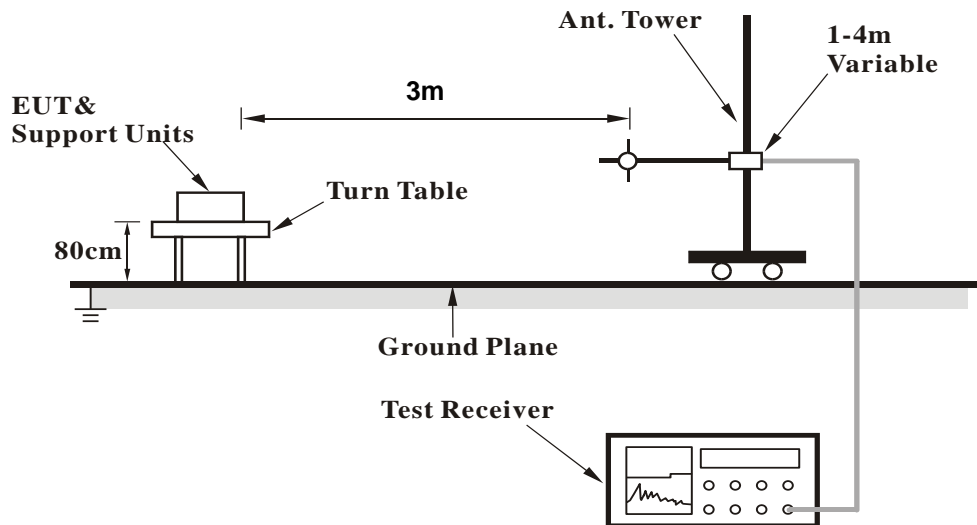
No deviation.

4.1.5 Test Setup

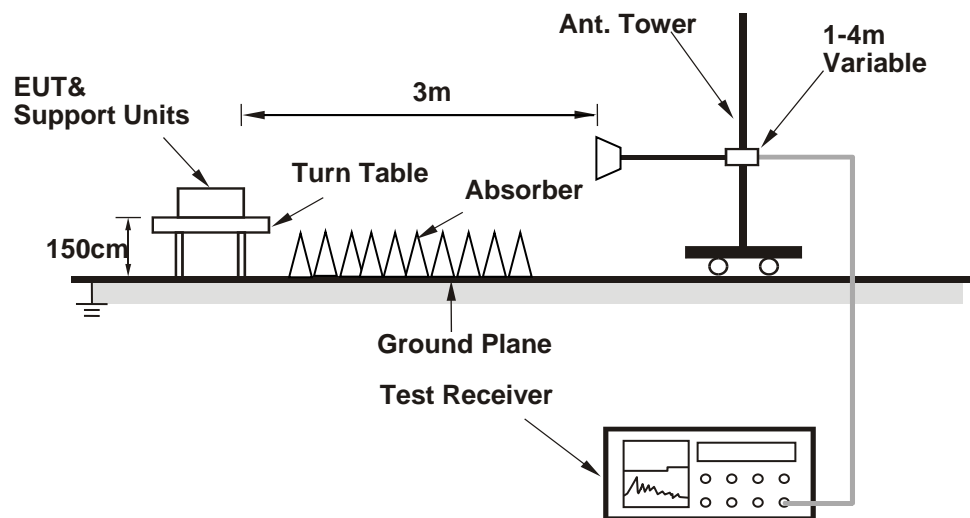
For Radiated emission below 30MHz



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

- Placed the EUT on the testing table.
- Controlling software (SmartRF Studio 2.13.1) has been activated to set the EUT under transmission condition continuously.

4.1.7 Test Results

Above 1GHz 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	53.2 PK	74.0	-20.8	1.21 H	111	57.5	-4.3
2	2390.00	41.2 AV	54.0	-12.8	1.21 H	111	45.5	-4.3
3	*2402.00	76.0 PK			1.21 H	111	80.3	-4.3
4	*2402.00	74.6 AV			1.21 H	111	78.9	-4.3
5	4804.00	58.6 PK	74.0	-15.4	1.00 H	63	58.2	0.4
6	4804.00	53.9 AV	54.0	-0.1	1.00 H	63	53.5	0.4
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	54.0 PK	74.0	-20.0	1.14 V	193	58.3	-4.3
2	2390.00	42.8 AV	54.0	-11.2	1.14 V	193	47.1	-4.3
3	*2402.00	67.8 PK			1.14 V	193	72.1	-4.3
4	*2402.00	65.9 AV			1.14 V	193	70.2	-4.3
5	4804.00	57.2 PK	74.0	-16.8	2.74 V	334	56.8	0.4
6	4804.00	52.8 AV	54.0	-1.2	2.74 V	334	52.4	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. 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	76.3 PK			1.20 H	123	80.6	-4.3
2	*2440.00	74.9 AV			1.20 H	123	79.2	-4.3
3	4880.00	57.0 PK	74.0	-17.0	1.00 H	62	56.5	0.5
4	4880.00	52.4 AV	54.0	-1.6	1.00 H	62	51.9	0.5
5	7320.00	58.1 PK	74.0	-15.9	1.45 H	251	51.3	6.8
6	7320.00	47.3 AV	54.0	-6.7	1.45 H	251	40.5	6.8

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	*2440.00	68.0 PK			1.14 V	188	72.3	-4.3
2	*2440.00	66.3 AV			1.14 V	188	70.6	-4.3
3	4880.00	56.7 PK	74.0	-17.3	2.71 V	350	56.2	0.5
4	4880.00	51.4 AV	54.0	-2.6	2.71 V	350	50.9	0.5
5	7320.00	58.4 PK	74.0	-15.6	1.58 V	349	51.6	6.8
6	7320.00	47.9 AV	54.0	-6.1	1.58 V	349	41.1	6.8

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 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	78.4 PK			1.06 H	111	82.8	-4.4
2	*2480.00	77.1 AV			1.06 H	111	81.5	-4.4
3	2483.50	54.3 PK	74.0	-19.7	1.06 H	111	58.7	-4.4
4	2483.50	41.3 AV	54.0	-12.7	1.06 H	111	45.7	-4.4
5	4960.00	57.7 PK	74.0	-16.3	1.13 H	64	56.8	0.9
6	4960.00	52.7 AV	54.0	-1.3	1.13 H	64	51.8	0.9
7	7440.00	58.4 PK	74.0	-15.6	1.43 H	245	51.1	7.3
8	7440.00	47.9 AV	54.0	-6.1	1.43 H	245	40.6	7.3

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	70.6 PK			1.10 V	189	75.0	-4.4
2	*2480.00	68.7 AV			1.10 V	189	73.1	-4.4
3	2483.50	54.3 PK	74.0	-19.7	1.10 V	189	58.7	-4.4
4	2483.50	41.4 AV	54.0	-12.6	1.10 V	189	45.8	-4.4
5	4960.00	56.6 PK	74.0	-17.4	2.68 V	338	55.7	0.9
6	4960.00	51.3 AV	54.0	-2.7	2.68 V	338	50.4	0.9
7	7440.00	58.6 PK	74.0	-15.4	1.56 V	346	51.3	7.3
8	7440.00	48.0 AV	54.0	-6.0	1.56 V	346	40.7	7.3

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. 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	53.2 PK	74.0	-20.8	1.25 H	111	57.5	-4.3
2	2390.00	41.4 AV	54.0	-12.6	1.25 H	111	45.7	-4.3
3	*2402.00	78.3 PK			1.25 H	111	82.6	-4.3
4	*2402.00	75.2 AV			1.25 H	111	79.5	-4.3
5	4804.00	61.8 PK	74.0	-12.2	1.00 H	64	61.4	0.4
6	4804.00	53.3 AV	54.0	-0.7	1.00 H	64	52.9	0.4

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	54.8 PK	74.0	-19.2	1.00 V	183	59.1	-4.3
2	2390.00	41.4 AV	54.0	-12.6	1.00 V	183	45.7	-4.3
3	*2402.00	69.5 PK			1.00 V	183	73.8	-4.3
4	*2402.00	65.8 AV			1.00 V	183	70.1	-4.3
5	4804.00	60.8 PK	74.0	-13.2	2.66 V	338	60.4	0.4
6	4804.00	52.4 AV	54.0	-1.6	2.66 V	338	52.0	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. 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	80.9 PK			1.06 H	116	85.2	-4.3
2	*2440.00	77.8 AV			1.06 H	116	82.1	-4.3
3	4880.00	63.4 PK	74.0	-10.6	1.13 H	65	62.9	0.5
4	4880.00	53.9 AV	54.0	-0.1	1.13 H	65	53.4	0.5
5	7320.00	59.0 PK	74.0	-15.0	1.42 H	230	52.2	6.8
6	7320.00	48.4 AV	54.0	-5.6	1.42 H	230	41.6	6.8

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	*2440.00	71.2 PK			1.04 V	195	75.5	-4.3
2	*2440.00	68.2 AV			1.04 V	195	72.5	-4.3
3	4880.00	61.0 PK	74.0	-13.0	2.69 V	341	60.5	0.5
4	4880.00	52.6 AV	54.0	-1.4	2.69 V	341	52.1	0.5
5	7320.00	58.4 PK	74.0	-15.6	1.59 V	358	51.6	6.8
6	7320.00	47.7 AV	54.0	-6.3	1.59 V	358	40.9	6.8

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 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	80.6 PK			1.03 H	109	85.0	-4.4
2	*2480.00	77.5 AV			1.03 H	109	81.9	-4.4
3	2483.50	53.6 PK	74.0	-20.4	1.03 H	109	58.0	-4.4
4	2483.50	41.3 AV	54.0	-12.7	1.03 H	109	45.7	-4.4
5	4960.00	61.1 PK	74.0	-12.9	1.15 H	65	60.2	0.9
6	4960.00	51.5 AV	54.0	-2.5	1.15 H	65	50.6	0.9
7	7440.00	58.3 PK	74.0	-15.7	1.47 H	249	51.0	7.3
8	7440.00	47.6 AV	54.0	-6.4	1.47 H	249	40.3	7.3

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	71.5 PK			1.01 V	192	75.9	-4.4
2	*2480.00	68.7 AV			1.01 V	192	73.1	-4.4
3	2483.50	54.3 PK	74.0	-19.7	1.01 V	192	58.7	-4.4
4	2483.50	41.5 AV	54.0	-12.5	1.01 V	192	45.9	-4.4
5	4960.00	59.3 PK	74.0	-14.7	2.72 V	342	58.4	0.9
6	4960.00	50.4 AV	54.0	-3.6	2.72 V	342	49.5	0.9
7	7440.00	58.3 PK	74.0	-15.7	1.56 V	344	51.0	7.3
8	7440.00	47.8 AV	54.0	-6.2	1.56 V	344	40.5	7.3

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. Margin value = Emission Level – Limit value
4. The other emission levels were very low against the limit.
5. " * ": Fundamental frequency.

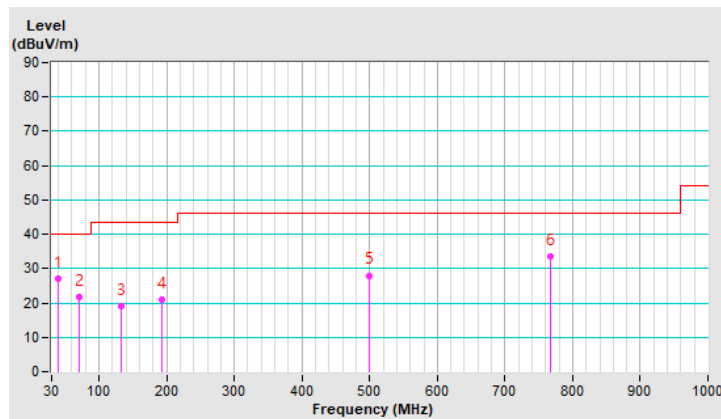
Below 1GHz Data:

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	39.97	27.2 QP	40.0	-12.8	1.00 H	195	35.9	-8.7
2	71.67	21.7 QP	40.0	-18.3	1.50 H	205	32.6	-10.9
3	133.46	19.2 QP	43.5	-24.3	2.00 H	170	27.7	-8.5
4	193.69	21.0 QP	43.5	-22.5	1.00 H	265	31.4	-10.4
5	500.40	28.0 QP	46.0	-18.0	1.50 H	110	29.0	-1.0
6	767.37	33.6 QP	46.0	-12.4	2.00 H	343	28.8	4.8

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 of frequency range 30MHz~1000MHz.
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.

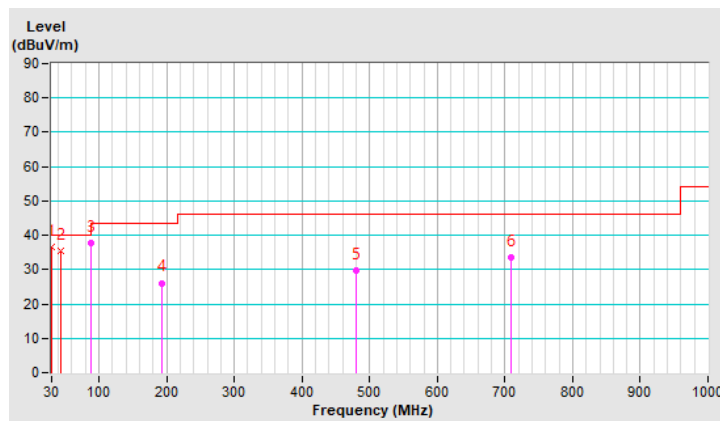


RF Mode	TX BT_LE-2M	Channel	CH 19 : 2440 MHz
Frequency Range	9kHz ~ 1GHz	Detector Function	Quasi-Peak (QP)

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	30.73	36.6 QP	40.0	-3.4	1.00 V	360	46.1	-9.5
2	44.53	35.6 QP	40.0	-4.4	1.50 V	347	43.9	-8.3
3	88.42	37.9 QP	43.5	-5.6	3.00 V	311	51.7	-13.8
4	192.38	26.1 QP	43.5	-17.4	3.00 V	247	36.5	-10.4
5	479.74	29.8 QP	46.0	-16.2	3.00 V	300	31.4	-1.6
6	708.83	33.5 QP	46.0	-12.5	3.00 V	112	30.3	3.2

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. Margin value = Emission Level – Limit value
4. The other emission levels were very low against the limit of frequency range 30MHz~1000MHz.
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.

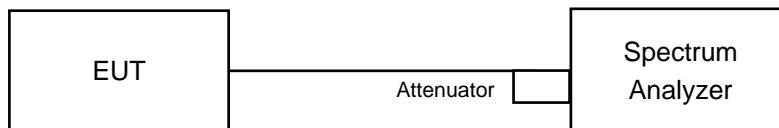


4.2 6dB Bandwidth Measurement

4.2.1 Limits of 6dB Bandwidth Measurement

The minimum of 6dB Bandwidth Measurement is 0.5 MHz.

4.2.2 Test Setup



4.2.3 Test Instruments

Refer to section 4.1.2 to get information of above instrument.

4.2.4 Test Procedure

- a. Set resolution bandwidth (RBW) = 100kHz
- b. Set the video bandwidth (VBW) $\geq 3 \times$ RBW, Detector = Peak.
- c. Trace mode = max hold.
- d. Sweep = auto couple.
- e. 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

4.2.5 Deviation from Test Standard

No deviation.

4.2.6 EUT Operating Conditions

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

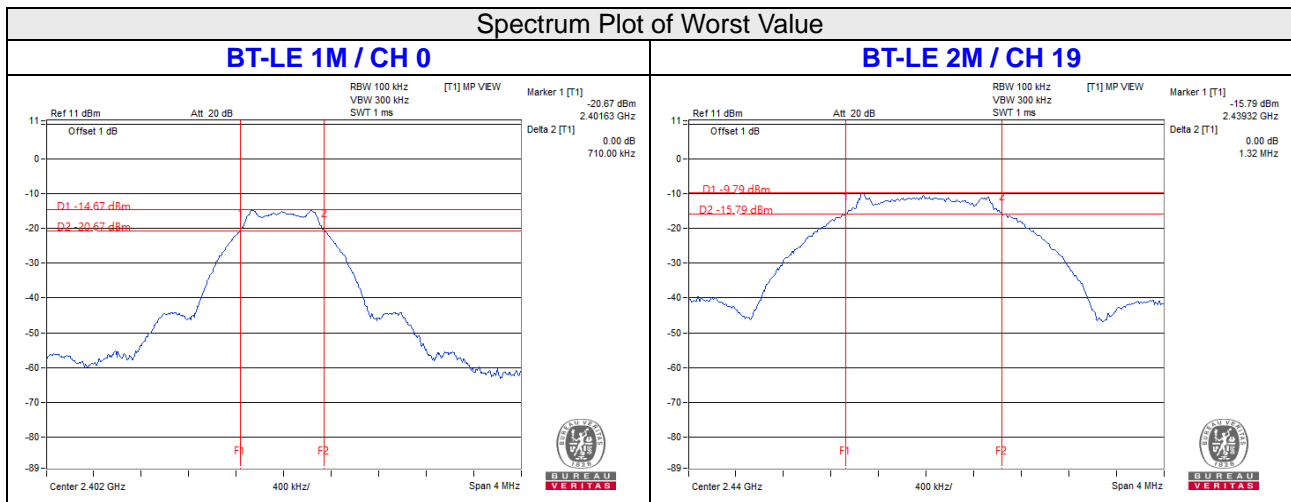
4.2.7 Test Results

BT-LE 1M

Channel	Frequency (MHz)	6dB Bandwidth (MHz)	Minimum Limit (MHz)	Pass / Fail
0	2402	0.71	0.5	Pass
19	2440	0.72	0.5	Pass
39	2480	0.74	0.5	Pass

BT-LE 2M

Channel	Frequency (MHz)	6dB Bandwidth (MHz)	Minimum Limit (MHz)	Pass / Fail
0	2402	1.47	0.5	Pass
19	2440	1.32	0.5	Pass
39	2480	1.45	0.5	Pass

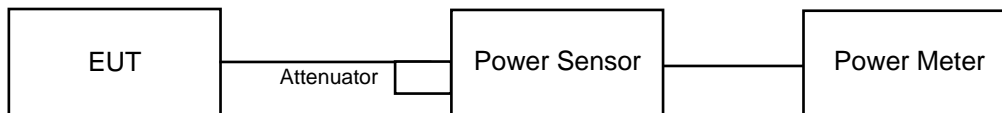


4.3 Conducted Output Power Measurement

4.3.1 Limits of Conducted Output Power Measurement

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

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 Procedures

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.

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.

4.3.5 Deviation from Test Standard

No deviation.

4.3.6 EUT Operating Conditions

Same as Item 4.2.6.

4.3.7 Test Results

FOR PEAK POWER BT-LE 1M

Channel	Frequency (MHz)	Peak Power (mW)	Peak Power (dBm)	Limit (dBm)	Pass/Fail
0	2402	0.04217	-13.75	30	Pass
19	2440	0.03589	-14.45	30	Pass
39	2480	0.05715	-12.43	30	Pass

BT-LE 2M

Channel	Frequency (MHz)	Peak Power (mW)	Peak Power (dBm)	Limit (dBm)	Pass/Fail
0	2402	0.07798	-11.08	30	Pass
19	2440	0.1291	-8.89	30	Pass
39	2480	0.1112	-9.54	30	Pass

FOR AVERAGE POWER BT-LE 1M

Channel	Frequency (MHz)	Average Power (mW)	Average Power (dBm)
0	2402	0.03597	-14.44
19	2440	0.03034	-15.18
39	2480	0.0507	-12.95

BT-LE 2M

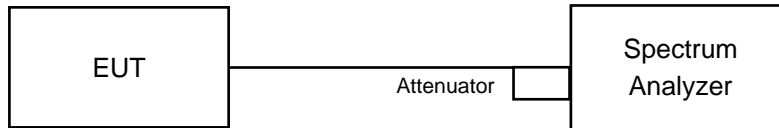
Channel	Frequency (MHz)	Average Power (mW)	Average Power (dBm)
0	2402	0.07129	-11.47
19	2440	0.1219	-9.14
39	2480	0.1045	-9.81

4.4 Power Spectral Density Measurement

4.4.1 Limits of Power Spectral Density Measurement

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

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 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.

4.4.5 Deviation from Test Standard

No deviation.

4.4.6 EUT Operating Condition

Same as Item 4.2.6.

4.4.7 Test Results

BT-LE 1M

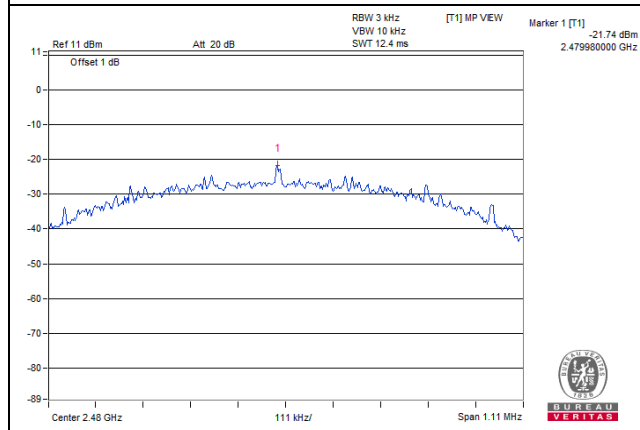
Channel	Freq. (MHz)	PSD (dBm/3kHz)	Limit (dBm/3kHz)	Pass /Fail
0	2402	-23.80	8	Pass
19	2440	-24.17	8	Pass
39	2480	-21.74	8	Pass

BT-LE 2M

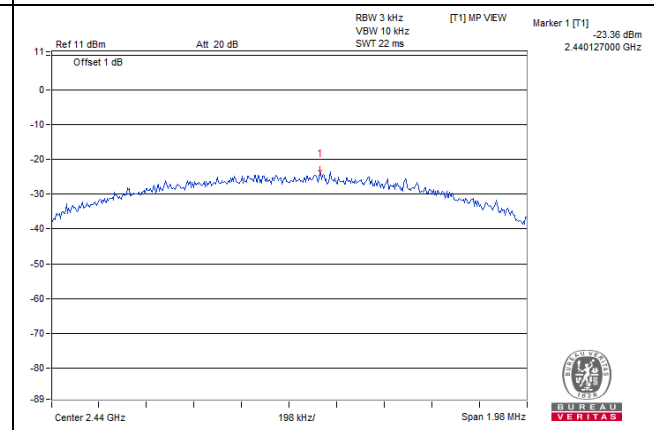
Channel	Freq. (MHz)	PSD (dBm/3kHz)	Limit (dBm/3kHz)	Pass /Fail
0	2402	-26.05	8	Pass
19	2440	-23.36	8	Pass
39	2480	-25.21	8	Pass

Spectrum Plot of Worst Value

BT-LE 1M / CH 39



BT-LE 2M / CH 19

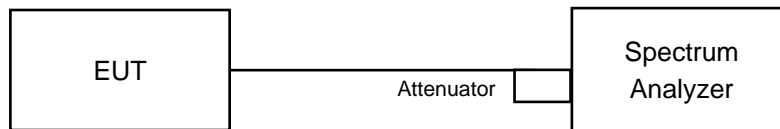


4.5 Conducted Out of Band Emission Measurement

4.5.1 Limits of Conducted Out of Band Emission Measurement

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

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

MEASUREMENT PROCEDURE REF

1. Set the RBW = 100 kHz.
2. Set the VBW \geq 300 kHz.
3. Detector = peak.
4. Sweep time = auto couple.
5. Trace mode = max hold.
6. Allow trace to fully stabilize.
7. Use the peak marker function to determine the maximum power level in any 100 kHz band segment within the fundamental EBW.

MEASUREMENT PROCEDURE OOBE

1. Set RBW = 100 kHz.
2. Set VBW \geq 300 kHz.
3. Detector = peak.
4. Sweep = auto couple.
5. Trace Mode = max hold.
6. Allow trace to fully stabilize.
7. Use the peak marker function to determine the maximum amplitude level.

4.5.5 Deviation from Test Standard

No deviation.

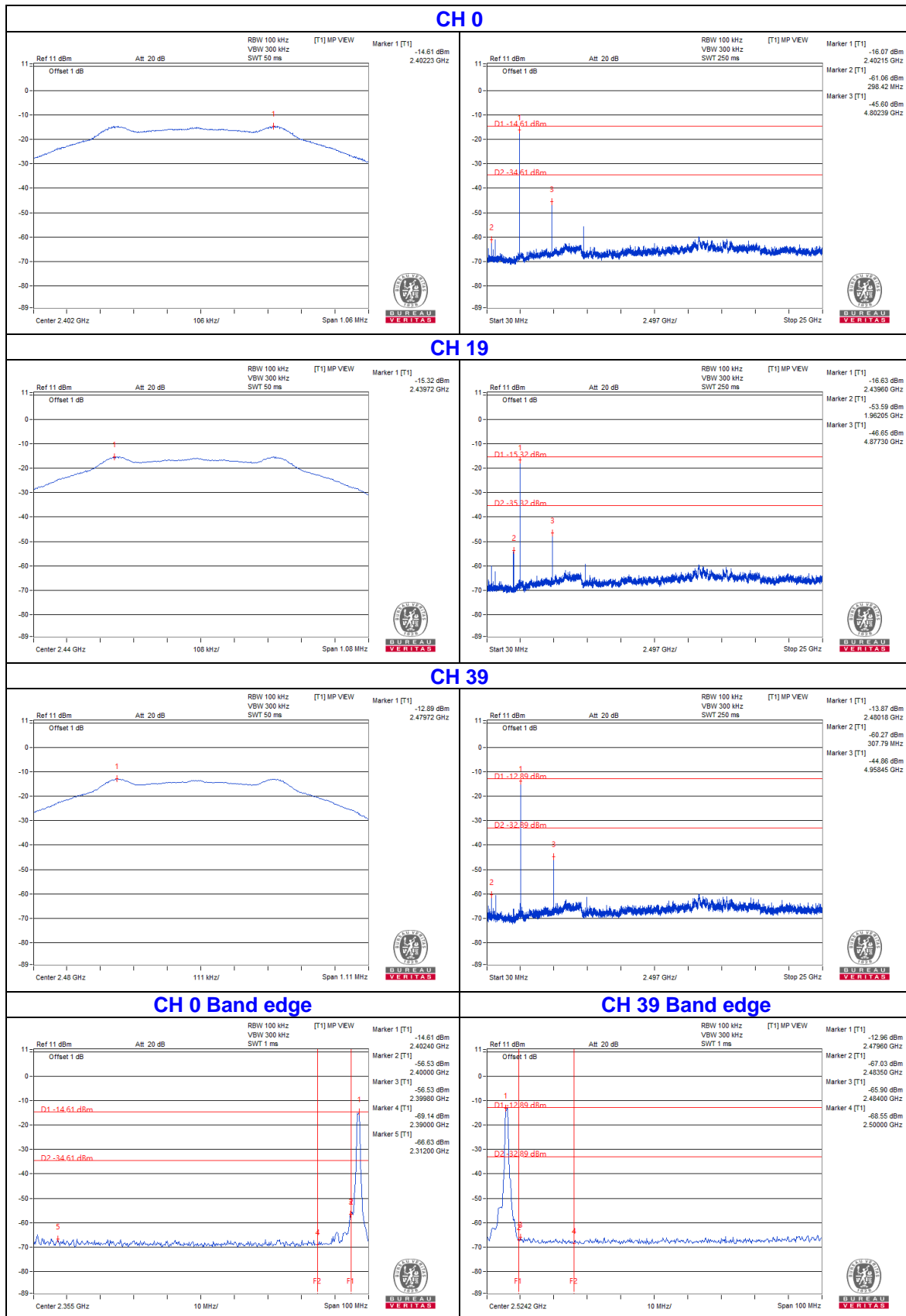
4.5.6 EUT Operating Condition

The software provided by client enabled the EUT to transmit and receive data at lowest and highest channel frequencies individually.

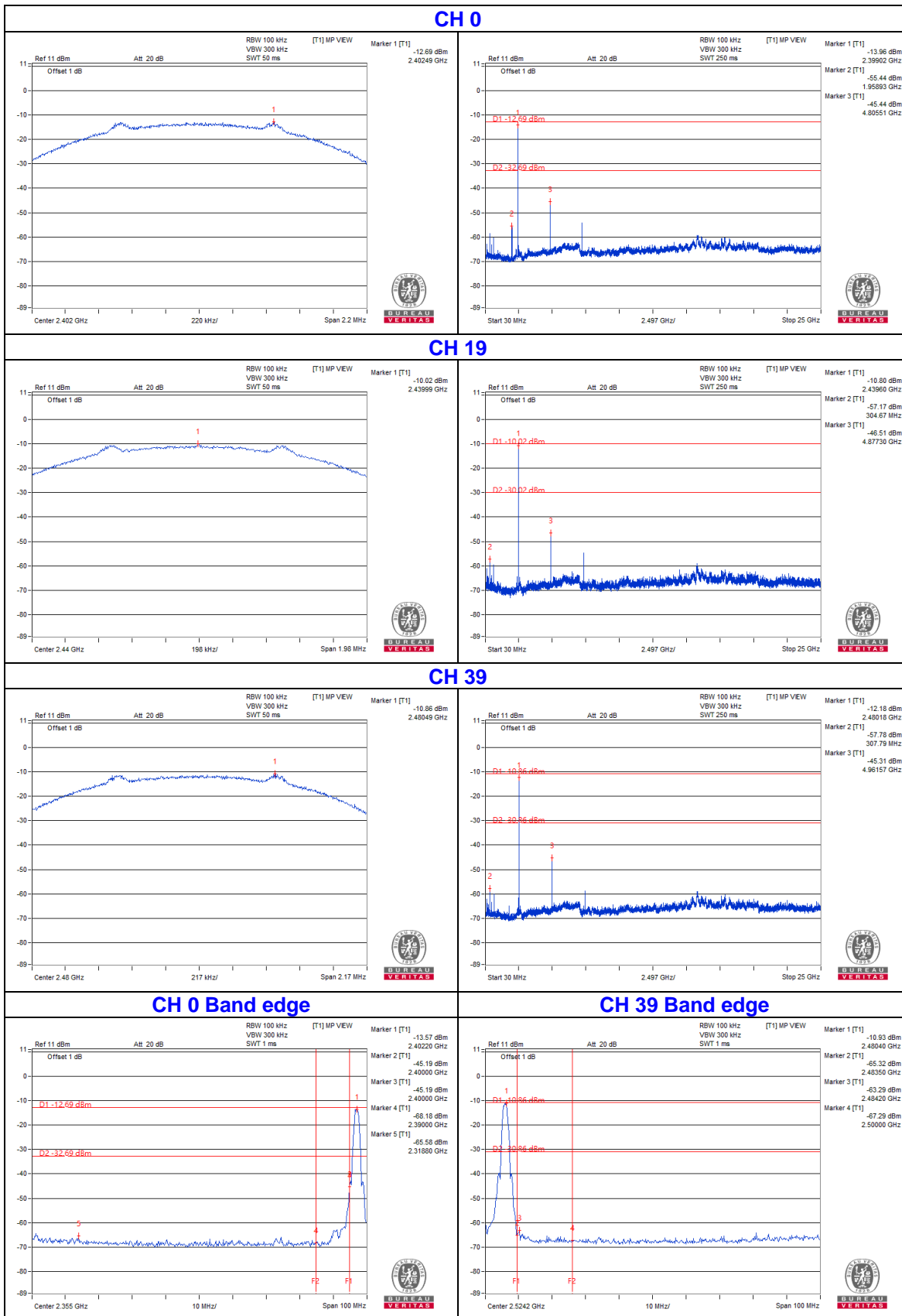
4.5.7 Test Results

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.

BT-LE 1M



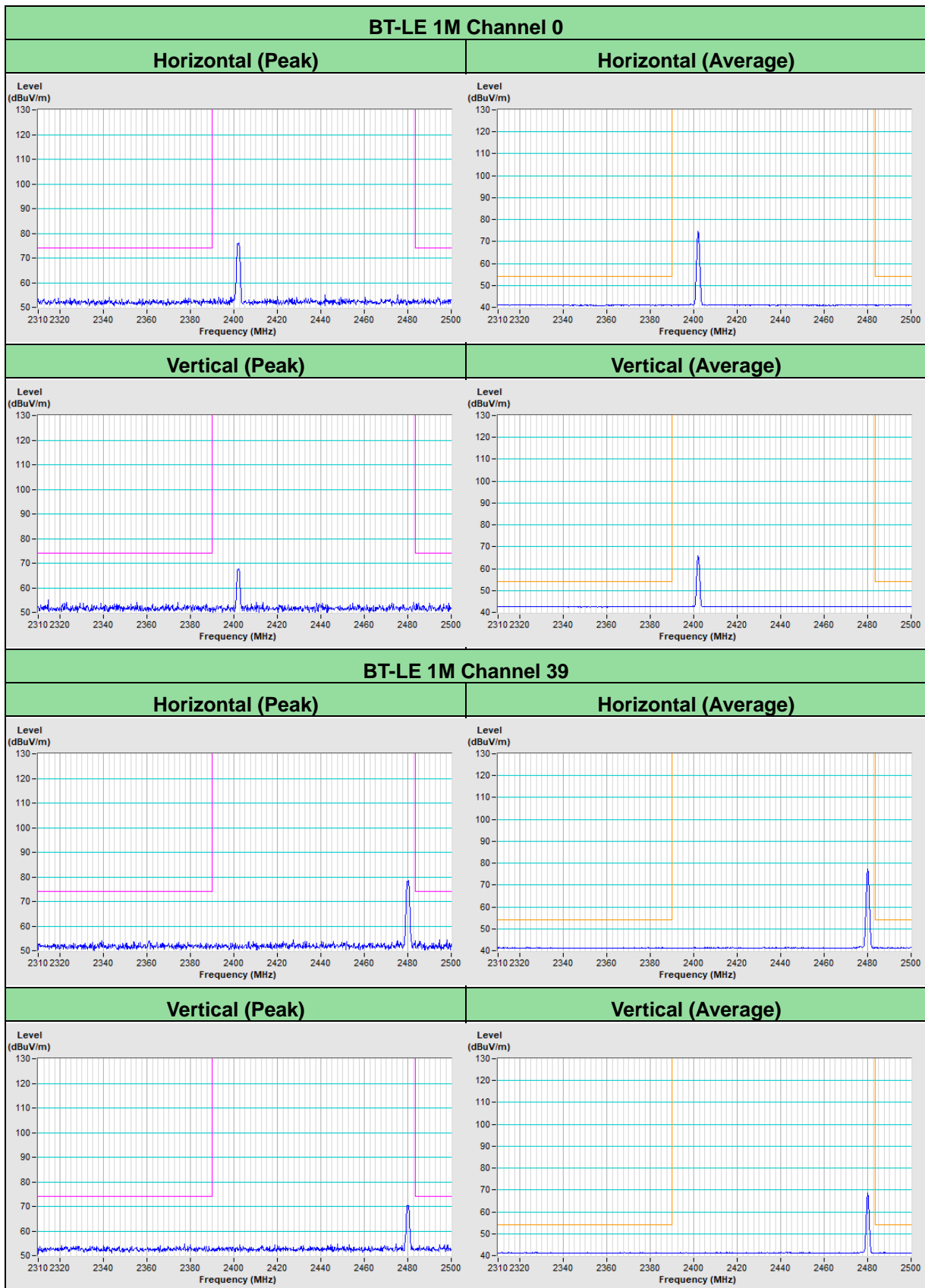
BT-LE 2M

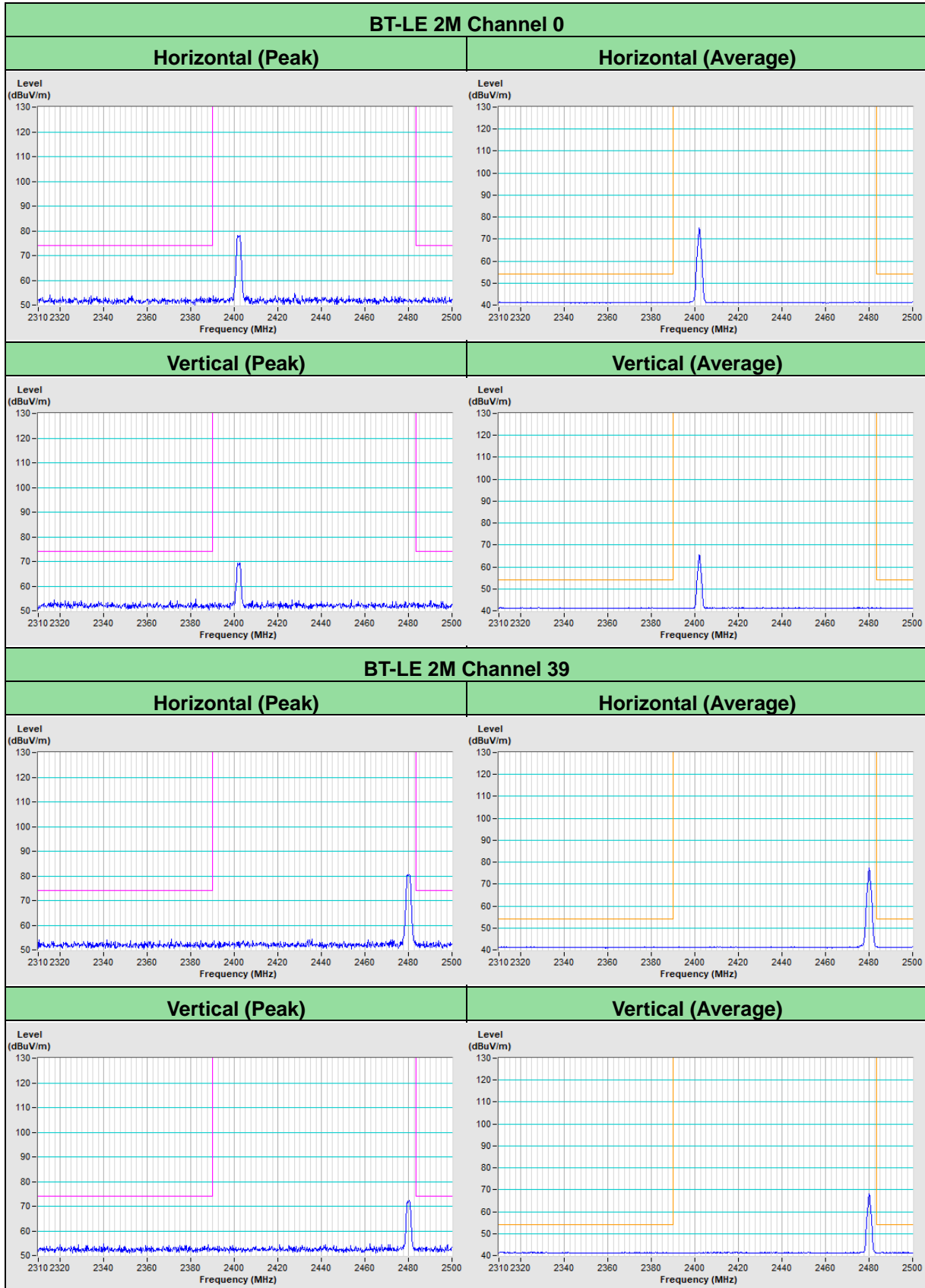


5 Pictures of Test Arrangements

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

Annex A - Band-Edge Measurement





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 according to ISO/IEC 17025.

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

Lin Kou EMC/RF Lab

Tel: 886-2-26052180

Fax: 886-2-26051924

Hsin Chu EMC/RF/Telecom Lab

Tel: 886-3-6668565

Fax: 886-3-6668323

Hwa Ya EMC/RF/Safety Lab

Tel: 886-3-3183232

Fax: 886-3-3270892

Email: service.adt@tw.bureauveritas.com

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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