TEST REPORT

CERTIFICATE OF CONFORMITY

Standard: **47 CFR FCC Part 15, Subpart C (Section 15.247)**

Report No.: RFBEIH-WTW-P23060517-3

FCC ID: 2BBDG-CHPU-NS-A01

Product: Canopy Hub

Brand: CANOPY

Model No.: CHPU-NS-A01

Received Date: 2023/6/20

Test Date: 2023/6/27 ~ 2023/7/27

Issued Date: 2023/8/11

Applicant: SNTNL LLC

Address: 1 American Road, Detroit, Michigan, United States 48126

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

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Test Location: No. 47-2, 14th Ling, Chia Pau Vil., Lin Kou Dist., New Taipei City, Taiwan

FCC Registration / Designation Number: 198487 / TW2021

Approved by: Jeremy Lin , **Date:** 2023/8/11

Jeremy Lin / Project Engineer

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Prepared by : Annie Chang / Senior Specialist

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Release Control Record

Issue No.	Description	Date Issued
RFBEIH-WTW-P23060517-3	Original release.	2023/8/11

1 Certificate

Product:	Canopy Hub
Brand:	CANOPY
Test Model:	CHPU-NS-A01
Sample Status:	Engineering sample
Applicant:	SNTNL LLC
Test Date:	2023/6/27 ~ 2023/7/27
Standard:	47 CFR FCC Part 15, Subpart C (Section 15.247)
Measurement procedure:	ANSI C63.10-2013 KDB 558074 D01 15.247 Meas Guidance v05r02

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.

2 Summary of Test Results

47 CFR FCC Part 15, Subpart C (Section 15.247)			
Standard / Clause	Test Item	Result	Remark
15.247(b)	RF Output Power	Pass	Meet the requirement of limit.
15.247(e)	Power Spectral Density	Pass	Meet the requirement of limit.
15.247(a)(2)	6 dB Bandwidth	Pass	Meet the requirement of limit.
15.247(d)	Conducted Out of Band Emissions	Pass	Meet the requirement of limit.
15.207	AC Power Conducted Emissions	N/A	Power supply is 12Vdc from battery.
15.205 / 15.209 / 15.247(d)	Unwanted Emissions below 1 GHz	Pass	Minimum passing margin is -8.2 dB at 34.07 MHz
15.205 / 15.209 / 15.247(d)	Unwanted Emissions above 1 GHz	Pass	Minimum passing margin is -3.5 dB at 2483.50 MHz
15.203	Antenna Requirement	Pass	Antenna connector is ipex not a standard connector.

Note: 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	Specification	Expanded Uncertainty (k=2) (±)
Conducted Out of Band Emissions	9 kHz ~ 40 GHz	2.63 dB
Unwanted Emissions below 1 GHz	9 kHz ~ 30 MHz	2.38 dB
	30 MHz ~ 1 GHz	5.7 dB
Unwanted Emissions above 1 GHz	1 GHz ~ 6 GHz	4.83 dB
	6 GHz ~ 18 GHz	5.37 dB
	18 GHz ~ 40 GHz	5.24 dB

The other instruments specified are routine verified to remain within the calibrated levels, no measurement uncertainty is required to be calculated.

2.2 Supplementary Information

There is not any deviation from the test standards for the test method, and no modifications required for compliance.

3 General Information

3.1 General Description

Product	Canopy Hub
Brand	CANOPY
Test Model	CHPU-NS-A01
Status of EUT	Engineering sample
Power Supply Rating	12.8Vdc from internal battery or 12-24Vdc from Car battery
Modulation Type	GFSK
Modulation Technology	DTS
Transfer Rate	125k, 500k, 1M, 2M
Operating Frequency	2.402 GHz ~ 2.48 GHz
Number of Channel	40
Output Power	4.909 mW (6.91 dBm)

Note:

1. There are Bluetooth, WLAN (2.4 GHz & 5 GHz) and WWAN technologies used for the EUT.
2. Simultaneously transmission condition.

Condition	Technology	
1	WLAN (5 GHz)	Bluetooth
2	WLAN (2.4 GHz)	Bluetooth
3	WWAN (LTE Band 12)	Bluetooth
Note: The emission of the simultaneous operation has been evaluated and no non-compliance was found.		

3. The above EUT information is declared by manufacturer and for more detailed features description, please refer to the manufacturer's specifications or user's manual.

3.2 Antenna Description of EUT

The antenna information is listed as below.

Gain (dBi)	Antenna Type	Connector Type
3.1	Dipole	ipex

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

3.3 Channel List

40 channels are provided for BT-LE:

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

3.4 Test Mode Applicability and Tested Channel Detail

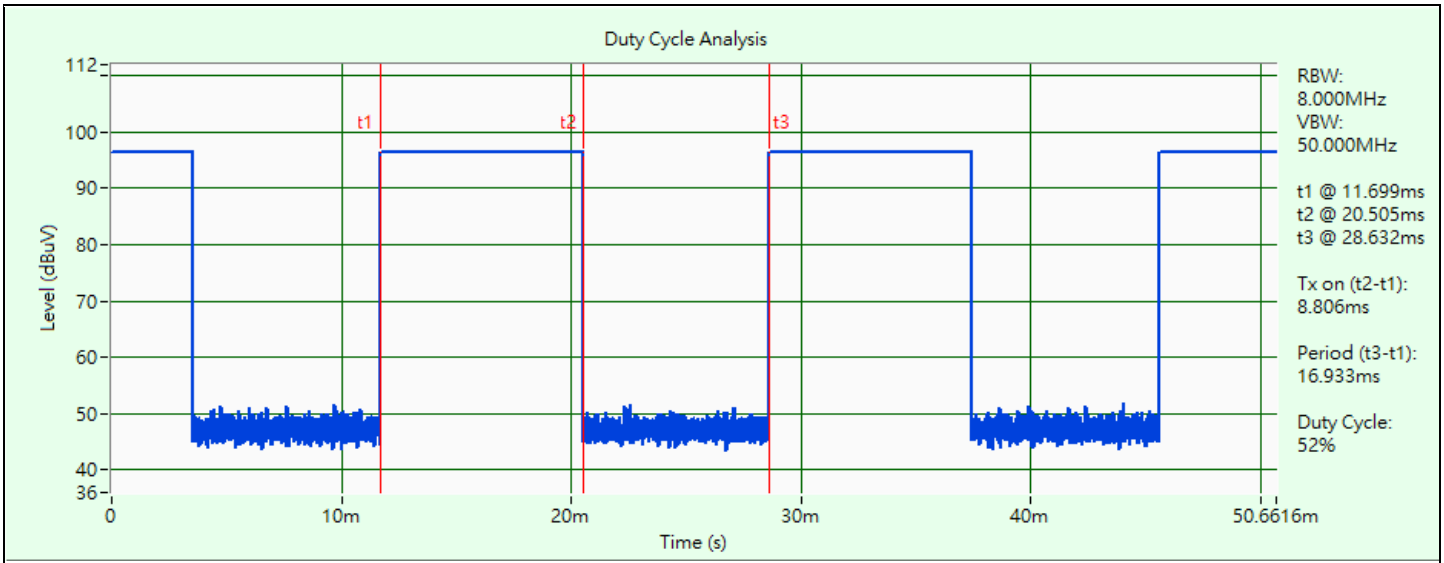
Pre-Scan:	1. EUT can be used in the following ways: XYZ 3-axis. Pre-scan in these ways and find the worst case as a representative test condition. 2. For Unwanted Emission below/ above 1 GHz has Input 12V=5A / Input 24V=2.5A of power supply. Pre-scan these modes and find the worst case as a representative test condition.
Worst Case:	1. X/ Y/ Z Worst Condition: X Axis for Unwanted Emission above 1GHz and Unwanted Emission below 1GHz. 2. For Unwanted Emission below/above 1 GHz Input 12V=5A is the worst case of power supply.

Following channel(s) was (were) selected for the final test as listed below:

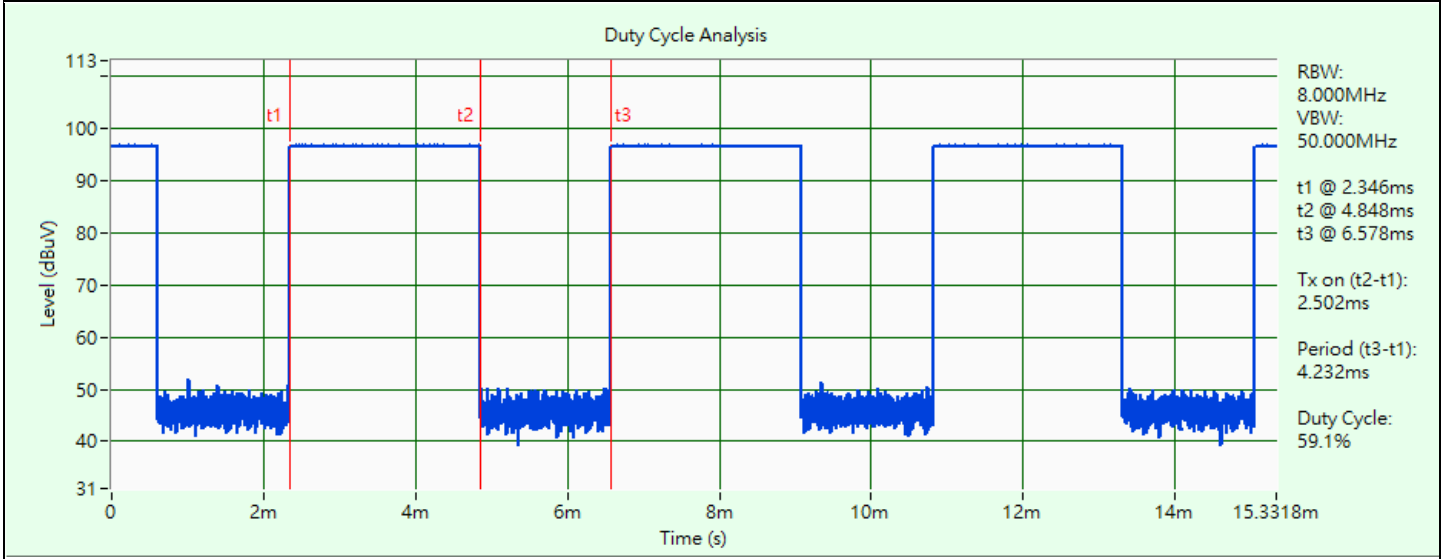
Test Item	Mode	Tested Channel	Modulation	Data Rate Parameter
RF Output Power / Power Spectral Density	BT-LE 1M	0, 19, 39	GFSK	1Mb/s
	BT-LE 2M	0, 19, 39	GFSK	2Mb/s
	BT-LE 125k	0, 19, 39	GFSK	125kb/s
	BT-LE 500k	0, 19, 39	GFSK	500kb/s
6 dB Bandwidth / Conducted Out of Band Emissions	BT-LE 1M	0, 19, 39	GFSK	1Mb/s
	BT-LE 2M	0, 19, 39	GFSK	2Mb/s
	BT-LE 125k	0, 19, 39	GFSK	125kb/s
	BT-LE 500k	0, 19, 39	GFSK	500kb/s
Unwanted Emissions below 1 GHz	BT-LE 2M	0	GFSK	2Mb/s
Unwanted Emissions above 1 GHz	BT-LE 1M	0, 19, 39	GFSK	1Mb/s
	BT-LE 2M	0, 19, 39	GFSK	2Mb/s
	BT-LE 125k	0, 19, 39	GFSK	125kb/s
	BT-LE 500k	0, 19, 39	GFSK	500kb/s

3.5 Duty Cycle of Test Signal

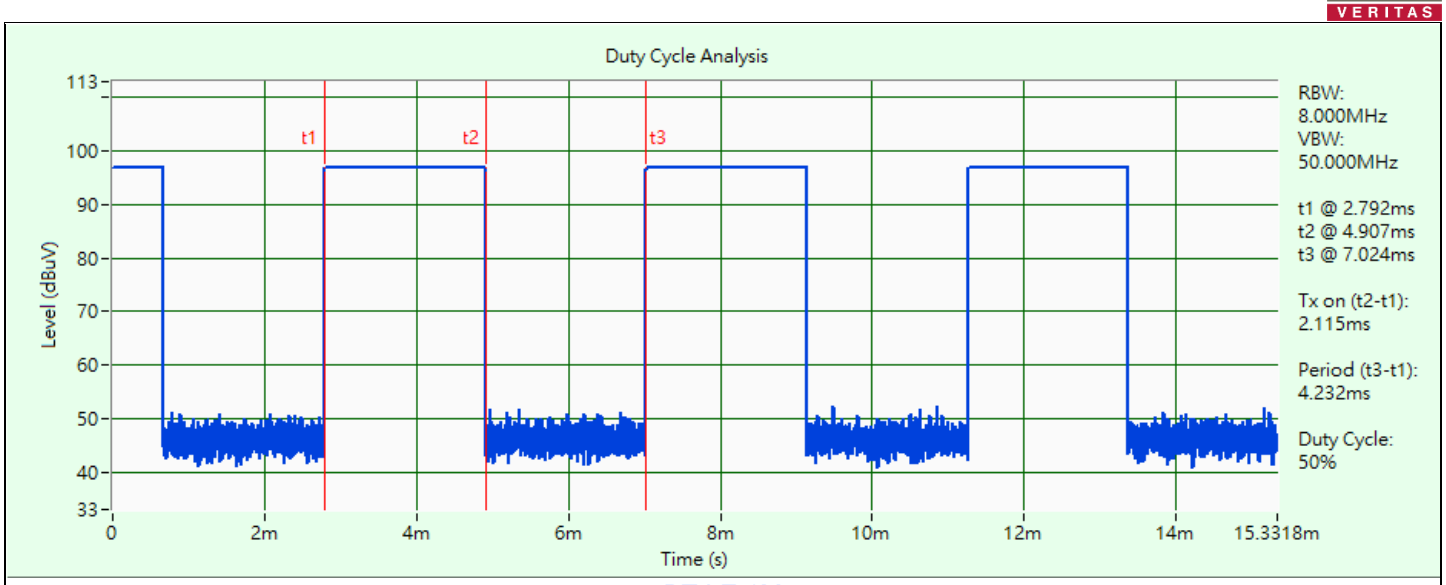
BT-LE 125k: Duty cycle = 8.806 ms / 16.933 ms x 100% = 52.0%, duty factor = 10 * log (1/Duty cycle) = 2.84 dB
BT-LE 500k: Duty cycle = 2.502 ms / 4.232 ms x 100% = 59.1%, duty factor = 10 * log (1/Duty cycle) = 2.28 dB
BT-LE 1M: Duty cycle = 2.115 ms / 4.232 ms x 100% = 50.0%, duty factor = 10 * log (1/Duty cycle) = 3.01 dB
BT-LE 2M: Duty cycle = 1.068 ms / 2.115 ms x 100% = 50.5%, duty factor = 10 * log (1/Duty cycle) = 2.97 dB



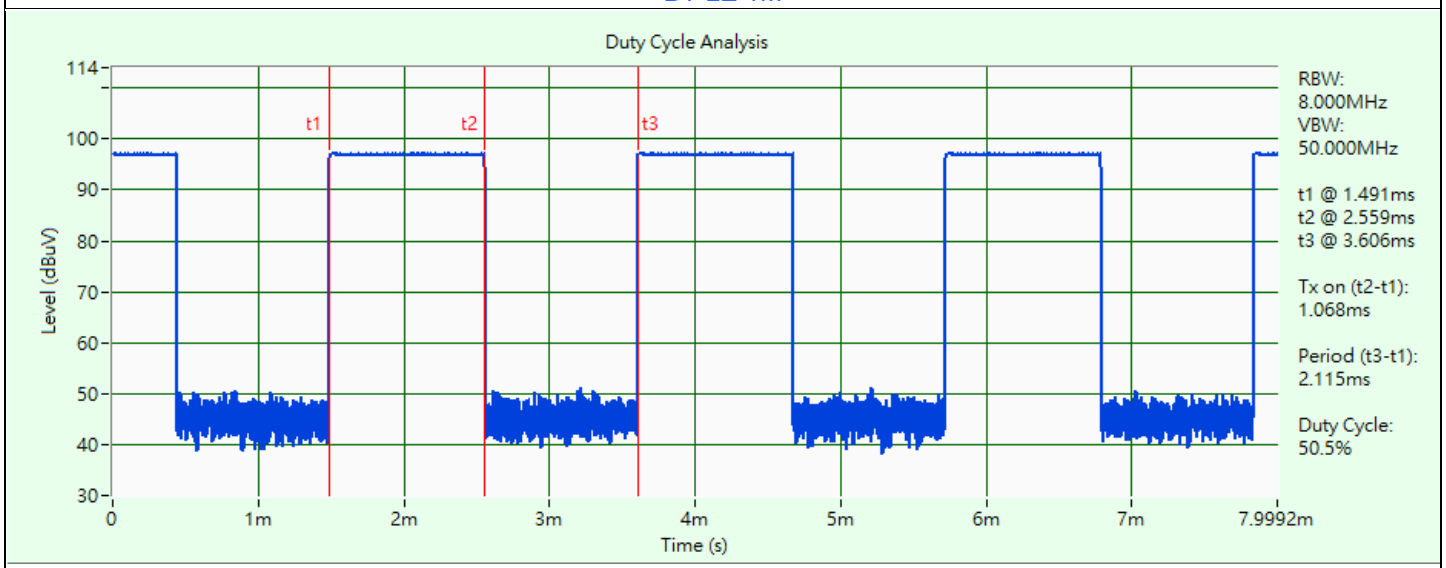
BT-LE 125k



BT-LE 500k



BT-LE 1M

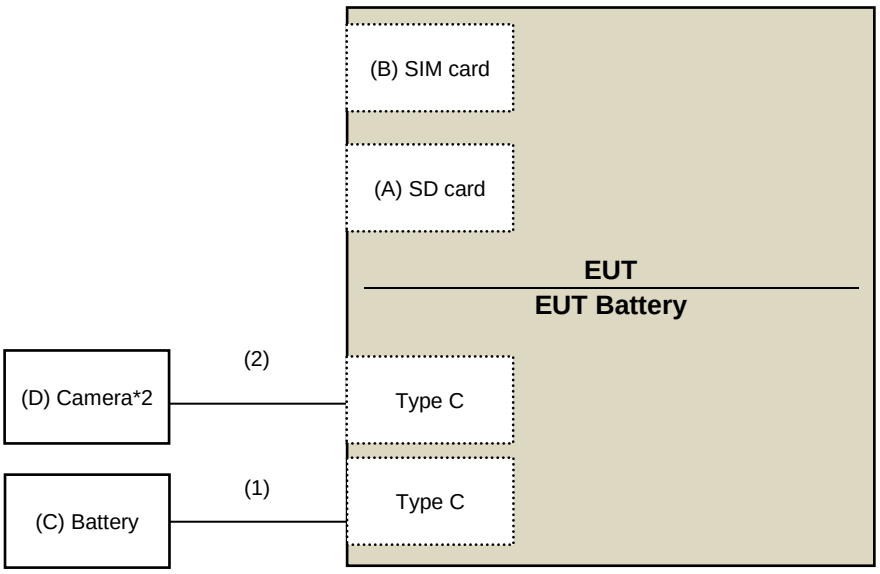


BT-LE 2M

3.6 Test Program Used and Operation Descriptions

Controlling software (teraterm v4.80) has been activated to set the EUT under transmission condition continuously at specific channel frequency.

3.7 Connection Diagram of EUT and Peripheral Devices



3.8 Configuration of Peripheral Devices and Cable Connections

ID	Product	Brand	Model No.	Serial No.	FCC ID	Remarks
A	SD card	SanDisk	256G	N/A	N/A	Provided by Lab
B	SIM card	N/A	N/A	N/A	N/A	Provided by Lab
C	Battery	GS	GG20LH2	N/A	N/A	Provided by Lab
D	Camera*2	CANOPY	CSSU-TS-A01	N/A	N/A	Supplied by applicant

ID	Cable Descriptions	Qty.	Length (m)	Shielding (Yes/No)	Cores (Qty.)	Remarks
1	Battery DC cable	1	3	Y	0	Supplied by applicant
2	Type C cable	2	2.9	N	0	Supplied by applicant

4 Test Instruments

The calibration interval of the all test instruments are 12 months and the calibrations are traceable to NML/ROC and NIST/USA.

4.1 RF Output Power

Description Manufacturer	Model No.	Serial No.	Calibrated Date	Calibrated Until
Power Meter Anritsu	ML2495A	0842014	2023/5/5	2024/5/4
Pulse Power Sensor Anritsu	MA2411B	0738404	2023/5/5	2024/5/4
PXA Signal Analyzer Keysight	N9030A	MY54490260	2023/7/13	2024/7/12
Signal Analyzer R&S	FSV40	101042	2022/9/5	2023/9/4
		101544	2023/5/9	2024/5/8
Temperature & Humidity Chamber Terchy	MHU-225AU	920409	2023/6/26	2024/6/25
True RMS Multimeter FLUKE	179	89610322	2022/10/3	2023/10/2
USB Wideband Power Sensor Keysight	U2021XA	U2021XA_001	2023/6/6	2024/6/5

Notes:

1. The test was performed in LK - Oven
2. Tested Date: 2023/7/27

4.2 Power Spectral Density

Refer to section 4.1 to get information of the instruments.

4.3 6 dB Bandwidth

Refer to section 4.1 to get information of the instruments.

4.4 Conducted Out of Band Emissions

Refer to section 4.1 to get information of the instruments.

4.5 Unwanted Emissions below 1 GHz

Description Manufacturer	Model No.	Serial No.	Calibrated Date	Calibrated Until
* Loop Antenna EMCI	LPA600	270	2021/9/2	2023/9/1
Bi_Log Antenna Schwarzbeck	VULB 9168	137	2022/10/21	2023/10/20
Coupling / Decoupling Network Schwarzbeck	CDNE-M2	00097	2023/5/25	2024/5/24
	CDNE-M3	00091	2023/5/25	2024/5/24
MXE EMI Receiver Agilent	N9038A	MY51210129	2023/3/24	2024/3/23
		MY51210137	2023/6/5	2024/6/4
Preamplifier EMCI	EMC001340	980269	2023/6/27	2024/6/26
Preamplifier HP	8447D	2432A03504	2023/2/16	2024/2/15
RF Coaxial Cable Pacific	8D-FB	Cable-CH6-02	2023/6/27	2024/6/26
Signal Analyzer R&S	FSV40	101544	2023/5/9	2024/5/8
Software BVADT	Radiated_V7.7.1.1.1	N/A	N/A	N/A
	Radiated_V8.7.08	N/A	N/A	N/A
Tower ADT	AT100	0306	N/A	N/A
Turn Table ADT	TT100	0306	N/A	N/A

Notes:

1. * The calibration interval of the above test instruments is 24 months and the calibrations are traceable to NML/ROC and NIST/USA
2. The test was performed in Linkou 966 Chamber 6 (CH 6).
3. Tested Date: 2023/7/3

4.6 Unwanted Emissions above 1 GHz

Description Manufacturer	Model No.	Serial No.	Calibrated Date	Calibrated Until
Band Pass Filter Micro-Tronics	BRM17690	005	2023/5/25	2024/5/24
Boresight antenna tower fixture BV	BAF-02	6	N/A	N/A
High Pass Filter Wainwright	WHK 3.1/18G-10SS	SN 8	2023/5/25	2024/5/24
Horn Antenna EMCO	3115	00028257	2022/11/13	2023/11/12
Horn Antenna ETS-Lindgren	3117-PA	00215857	2022/11/13	2023/11/12
Horn Antenna Schwarzbeck	BBHA 9170	212	2022/10/20	2023/10/19
MXE EMI Receiver Agilent	N9038A	MY51210129	2023/3/24	2024/3/23
		MY51210137	2023/6/5	2024/6/4
Notch Filter Micro-Tronics	BRC50703-01	010	2023/5/25	2024/5/24
Preamplifier EMCI	EMC0126545	980076	2023/2/16	2024/2/15
	EMC184045B	980175	2022/9/3	2023/9/2
		980235	2023/2/16	2024/2/15
Preamplifier HP	8449B	3008A01201	2023/2/16	2024/2/15
RF Coaxial Cable EM	EM102-KMKM-3.5+1M	EM102-KMKM-3.5+1M-01	2022/7/7	2023/7/6
RF Coaxial Cable EMCI	EMC104	190801	2022/7/7	2023/7/6
		190804	2022/7/7	2023/7/6
RF Coaxial Cable HUBER+SUHNER	SF-104	Cable-CH6-01	2022/7/7	2023/7/6
Signal Analyzer R&S	FSV40	101042	2022/9/5	2023/9/4
		101544	2023/5/9	2024/5/8
Software BVADT	Radiated_V7.7.1.1.1	N/A	N/A	N/A
	Radiated_V8.7.08	N/A	N/A	N/A
Tower ADT	AT100	0306	N/A	N/A
Turn Table ADT	TT100	0306	N/A	N/A

Notes:

1. The test was performed in Linkou 966 Chamber 6 (CH 6).
2. Tested Date: 2023/6/27 ~ 2023/6/28

5 Limits of Test Items

5.1 RF Output Power

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

5.2 Power Spectral Density

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

5.3 6 dB Bandwidth

The minimum of 6 dB Bandwidth Measurement is 0.5 MHz.

5.4 Conducted Out of Band Emissions

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

5.5 Unwanted Emissions below 1 GHz

Radiated emissions up to 1 GHz which fall in the restricted bands must comply with the radiated emission limits specified as below table. Other emissions shall be at least 20 dB 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

Notes:

1. The lower limit shall apply at the transition frequencies.
2. Emission level (dBuV/m) = 20 log Emission level (uV/m).

5.6 Unwanted Emissions above 1 GHz

Radiated emissions above 1 GHz which fall in the restricted bands must comply with the radiated emission limits specified as below table. Other emissions shall be at least 20 dB below the highest level of the desired power:

Frequencies (MHz)	Field Strength (microvolts/meter)	Measurement Distance (meters)
Above 960	500	3

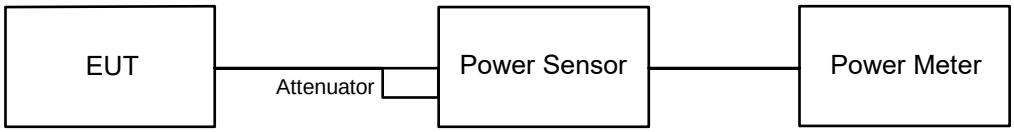
Notes:

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 1000 MHz, 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 20 dB under any condition of modulation.

6 Test Arrangements

6.1 RF Output Power

6.1.1 Test Setup



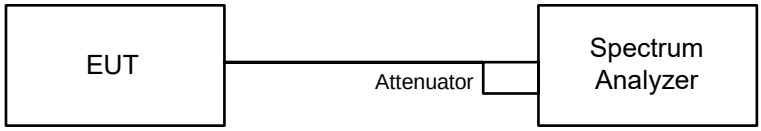
6.1.2 Test Procedure

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.

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.

6.2 Power Spectral Density

6.2.1 Test Setup

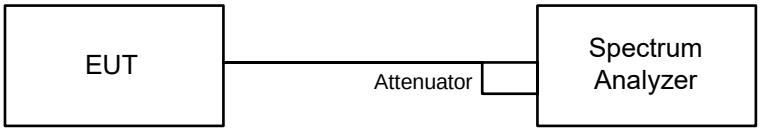


6.2.2 Test Procedure

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 kHz.
d. Set the VBW ≥ 3 × 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.

6.3 6 dB Bandwidth

6.3.1 Test Setup

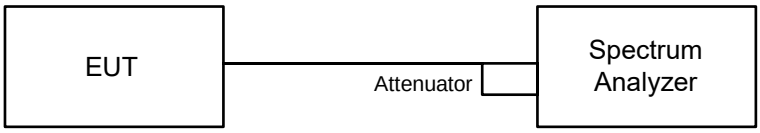


6.3.2 Test Procedure

a. Set resolution bandwidth (RBW) = 100 kHz.
b. Set the video bandwidth (VBW) ≥ 3 x 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.

6.4 Conducted Out of Band Emissions

6.4.1 Test Setup



6.4.2 Test Procedure

MEASUREMENT PROCEDURE REF

a. Set the RBW = 100 kHz.
b. Set the VBW ≥ 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.

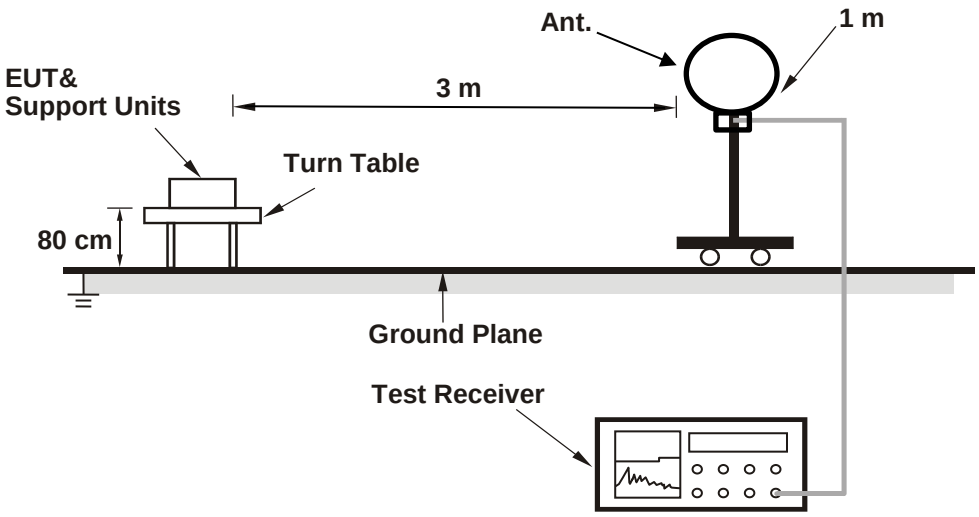
MEASUREMENT PROCEDURE OOBE

a. Set RBW = 100 kHz.
b. Set VBW ≥ 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.

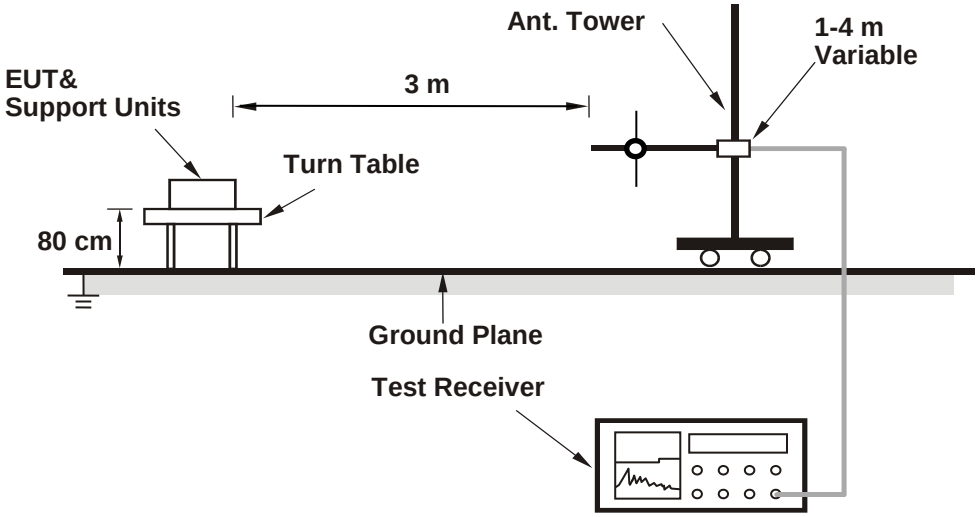
6.5 Unwanted Emissions below 1 GHz

6.5.1 Test Setup

For Radiated emission below 30 MHz



For Radiated emission above 30 MHz



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

6.5.2 Test Procedure

For Radiated emission below 30 MHz

a. The EUT was placed on the top of a rotating table 0.8 meters 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. 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, except for the frequency band (9 kHz to 90 kHz and 110 kHz to 490 kHz) set to average detect function and peak detect function.

Notes:

1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 200 Hz at frequency below 150 kHz.
2. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 9 kHz or 10 kHz at frequency (150 kHz to 30 MHz).
3. All modes of operation were investigated and the worst-case emissions are reported.

For Radiated emission above 30 MHz

a. The EUT was placed on the top of a rotating table 0.8 meters 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.

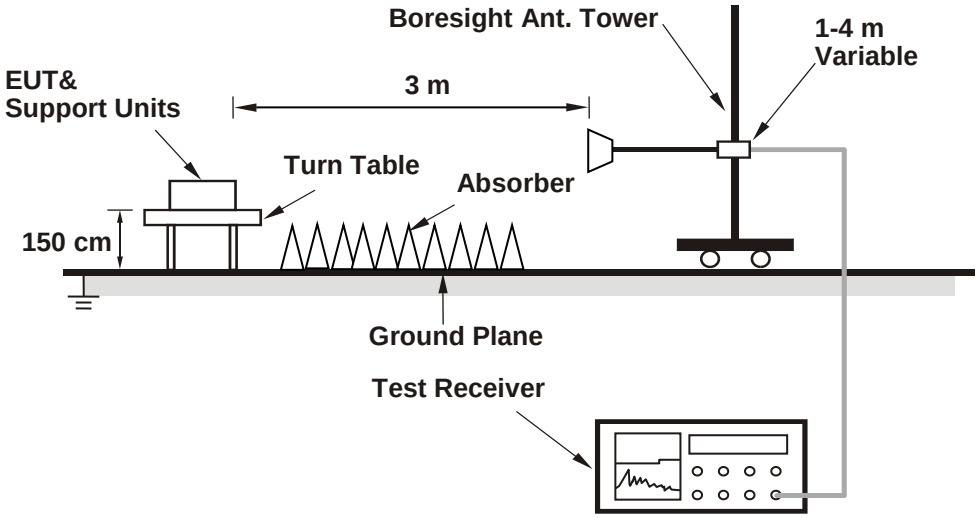
e. The test-receiver system was set to quasi-peak detect function and specified bandwidth with maximum hold mode when the test frequency is below 1 GHz.

Notes:

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

6.6 Unwanted Emissions above 1 GHz

6.6.1 Test Setup



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

6.6.2 Test Procedure

a. The EUT was placed on the top of a rotating table 1.5 meters 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 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.

Notes:

1. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is 3 MHz for Peak detection (PK) and Average detection (AV) at frequency above 1 GHz.
2. For fundamental and harmonic signal measurement, the resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is ≥ 1/T (Duty cycle < 98%) or 10 Hz (Duty cycle ≥ 98%) for Average detection (AV) at frequency above 1 GHz.
3. All modes of operation were investigated and the worst-case emissions are reported.

7 Test Results of Test Item

7.1 RF Output Power

Input Power:	12 Vdc	Environmental Conditions:	25°C, 76% RH	Tested By:	Dalen Dai

For Peak Power

BT-LE 125k

Chan.	Chan. Freq. (MHz)	Peak Power (mW)	Peak Power (dBm)	Power Limit (dBm)	Test Result
0	2402	4.875	6.88	30	Pass
19	2440	4.677	6.70	30	Pass
39	2480	4.345	6.38	30	Pass

Note: The antenna gain is 3.1 dBi < 6 dBi, so the output power limit shall not be reduced.

BT-LE 500k

Chan.	Chan. Freq. (MHz)	Peak Power (mW)	Peak Power (dBm)	Power Limit (dBm)	Test Result
0	2402	4.898	6.90	30	Pass
19	2440	4.721	6.74	30	Pass
39	2480	4.335	6.37	30	Pass

Note: The antenna gain is 3.1 dBi < 6 dBi, so the output power limit shall not be reduced.

BT-LE 1M

Chan.	Chan. Freq. (MHz)	Peak Power (mW)	Peak Power (dBm)	Power Limit (dBm)	Test Result
0	2402	4.898	6.90	30	Pass
19	2440	4.721	6.74	30	Pass
39	2480	4.335	6.37	30	Pass

Note: The antenna gain is 3.1 dBi < 6 dBi, so the output power limit shall not be reduced.

BT-LE 2M

Chan.	Chan. Freq. (MHz)	Peak Power (mW)	Peak Power (dBm)	Power Limit (dBm)	Test Result
0	2402	4.909	6.91	30	Pass
19	2440	4.742	6.76	30	Pass
39	2480	4.335	6.37	30	Pass

Note: The antenna gain is 3.1 dBi < 6 dBi, so the output power limit shall not be reduced.

For Average Power

BT-LE 125k

Chan.	Chan. Freq. (MHz)	Average Power (mW)	Average Power (dBm)
0	2402	4.797	6.81
19	2440	4.592	6.62
39	2480	4.276	6.31

BT-LE 500k

Chan.	Chan. Freq. (MHz)	Average Power (mW)	Average Power (dBm)
0	2402	4.842	6.85
19	2440	4.656	6.68
39	2480	4.266	6.30

BT-LE 1M

Chan.	Chan. Freq. (MHz)	Average Power (mW)	Average Power (dBm)
0	2402	4.831	6.84
19	2440	4.656	6.68
39	2480	4.266	6.30

BT-LE 2M

Chan.	Chan. Freq. (MHz)	Average Power (mW)	Average Power (dBm)
0	2402	4.842	6.85
19	2440	4.656	6.68
39	2480	4.276	6.31

7.2 Power Spectral Density

Input Power:	12 Vdc	Environmental Conditions:	25°C, 76% RH	Tested By:	Dalen Dai

BT-LE 125k

Channel	Freq. (MHz)	PSD (dBm/3kHz)	PSD Limit (dBm/3kHz)	Pass / Fail
0	2402	0.53	8	Pass
19	2440	0.38	8	Pass
39	2480	0.13	8	Pass

Note: The antenna gain is 3.1 dBi < 6 dBi, so the power density limit shall not be reduced.

BT-LE 500k

Channel	Freq. (MHz)	PSD (dBm/3kHz)	PSD Limit (dBm/3kHz)	Pass / Fail
0	2402	0.2	8	Pass
19	2440	0.03	8	Pass
39	2480	-0.26	8	Pass

Note: The antenna gain is 3.1 dBi < 6 dBi, so the power density limit shall not be reduced.

BT-LE 1M

Channel	Freq. (MHz)	PSD (dBm/3kHz)	PSD Limit (dBm/3kHz)	Pass / Fail
0	2402	-7	8	Pass
19	2440	-5.65	8	Pass
39	2480	-7.21	8	Pass

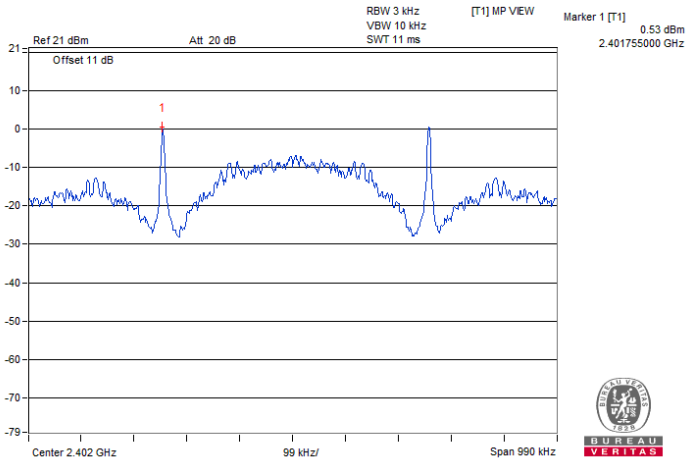
Note: The antenna gain is 3.1 dBi < 6 dBi, so the power density limit shall not be reduced.

BT-LE 2M

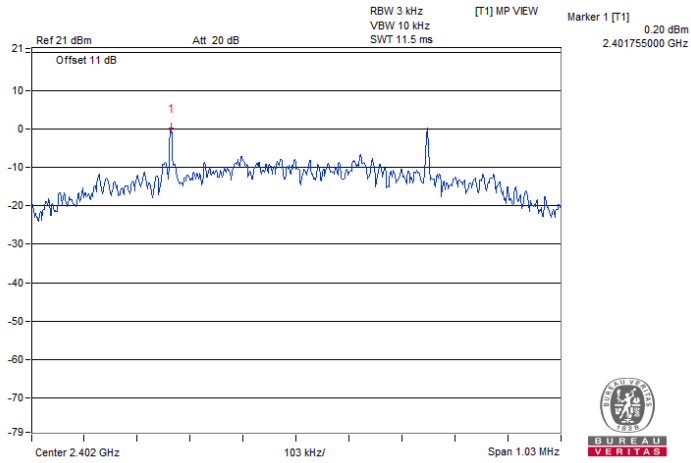
Channel	Freq. (MHz)	PSD (dBm/3kHz)	PSD Limit (dBm/3kHz)	Pass / Fail
0	2402	-9.86	8	Pass
19	2440	-8.17	8	Pass
39	2480	-10.47	8	Pass

Note: The antenna gain is 3.1 dBi < 6 dBi, so the power density limit shall not be reduced.

Spectrum Plot of Maximum Value



BT-LE 125k : CH 0



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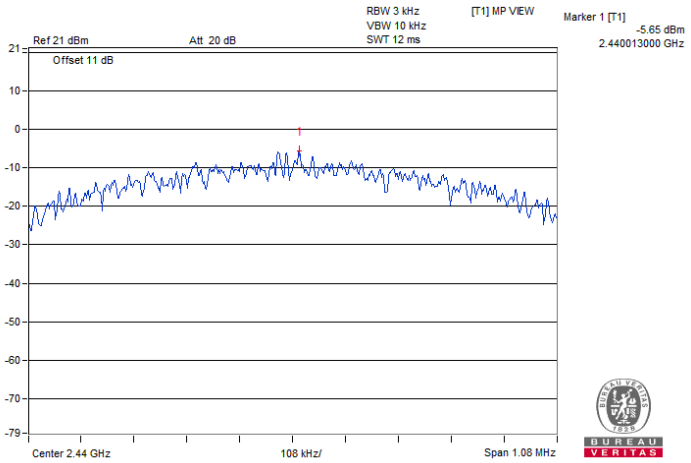
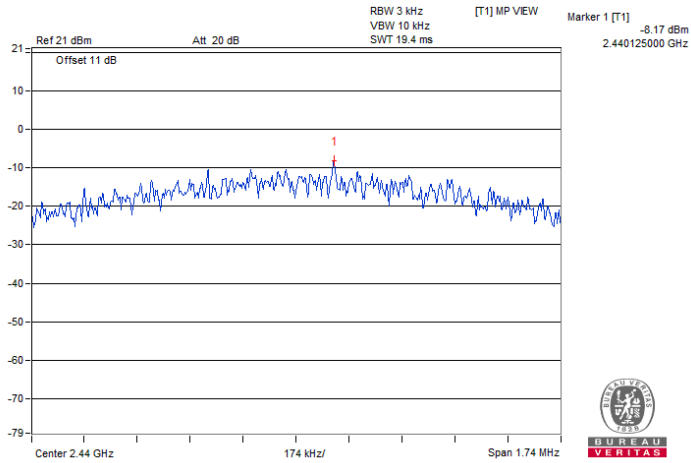


BT-LE 1M : CH 19



BT-LE 2M : CH 19

7.3 6 dB Bandwidth

Input Power:	12 Vdc	Environmental Conditions:	25°C, 76% RH	Tested By:	Dalen Dai

BT-LE 125k

Channel	Frequency (MHz)	6dB Bandwidth (MHz)	Minimum Limit (MHz)	Test Result
0	2402	0.66	0.5	Pass
19	2440	0.62	0.5	Pass
39	2480	0.63	0.5	Pass

BT-LE 500k

Channel	Frequency (MHz)	6dB Bandwidth (MHz)	Minimum Limit (MHz)	Test Result
0	2402	0.69	0.5	Pass
19	2440	0.73	0.5	Pass
39	2480	0.71	0.5	Pass

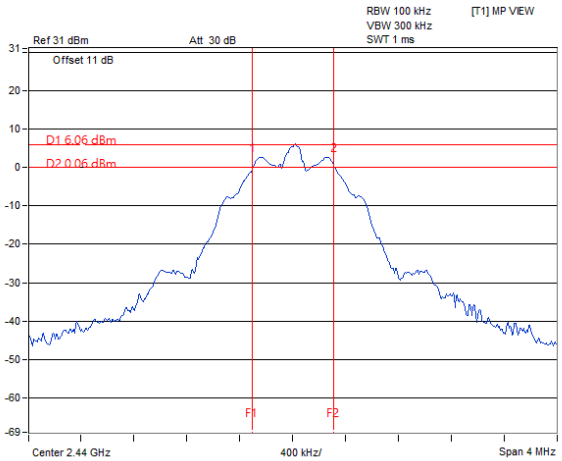
BT-LE 1M

Channel	Frequency (MHz)	6dB Bandwidth (MHz)	Minimum Limit (MHz)	Test Result
0	2402	0.72	0.5	Pass
19	2440	0.72	0.5	Pass
39	2480	0.72	0.5	Pass

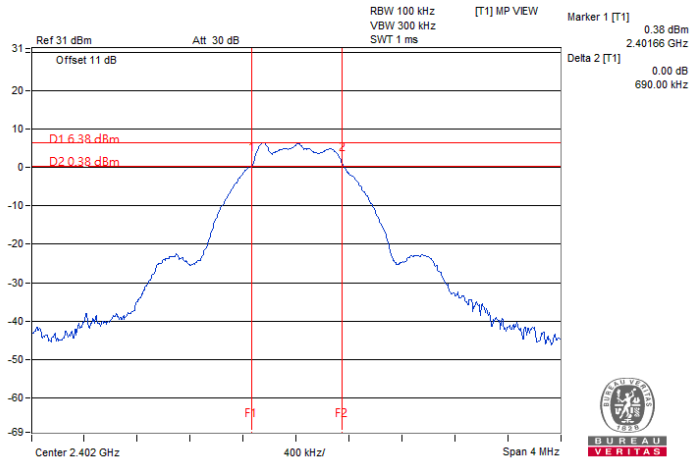
BT-LE 2M

Channel	Frequency (MHz)	6dB Bandwidth (MHz)	Minimum Limit (MHz)	Test Result
0	2402	1.23	0.5	Pass
19	2440	1.16	0.5	Pass
39	2480	1.19	0.5	Pass

Spectrum Plot of Minimum Value



BT-LE 125k : CH 19



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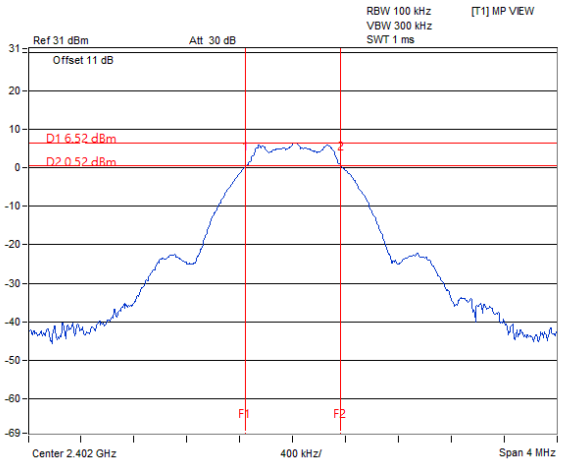
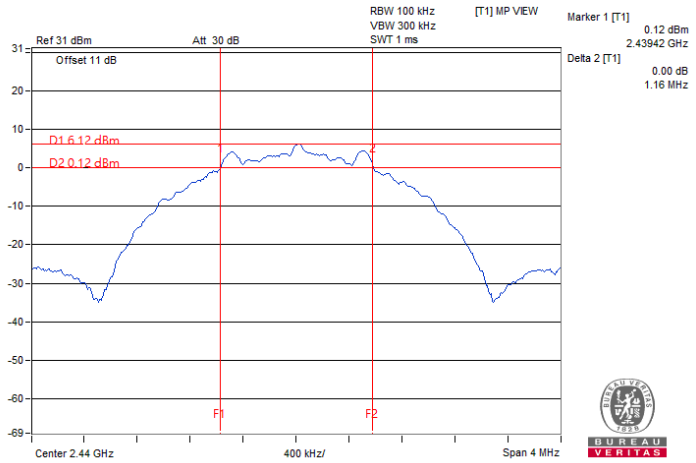


BT-LE 1M : CH 0

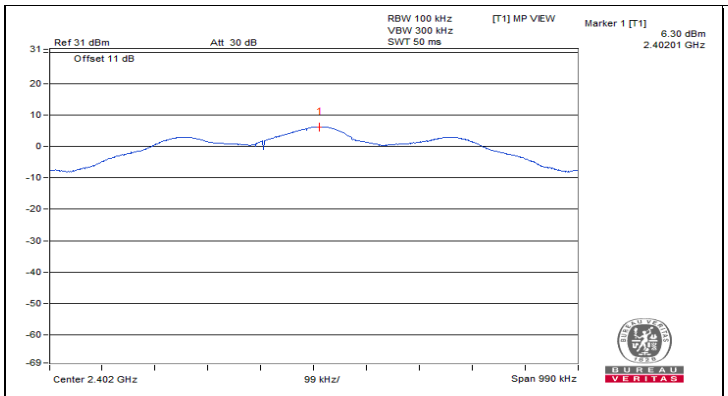


BT-LE 2M : CH 19

7.4 Conducted Out of Band Emissions

Input Power:	12 Vdc	Environmental Conditions:	25°C, 76% RH	Tested By:	Dalen Dai

BT-LE 125k



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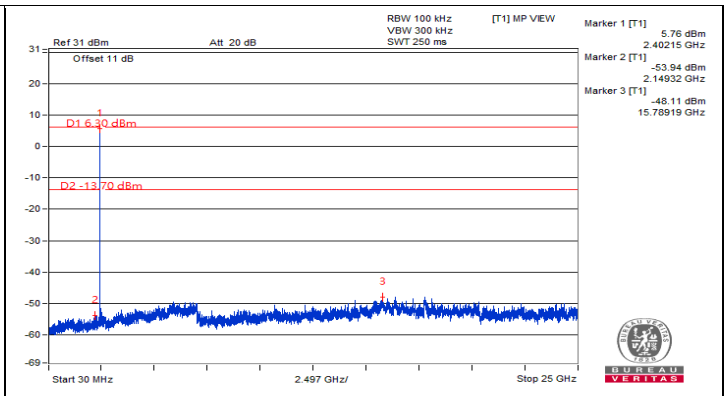

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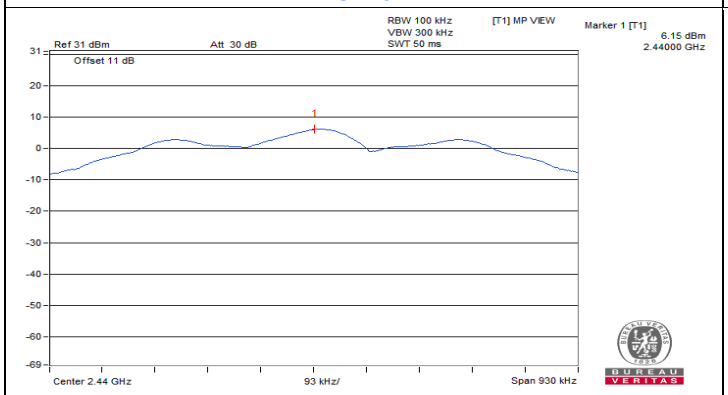
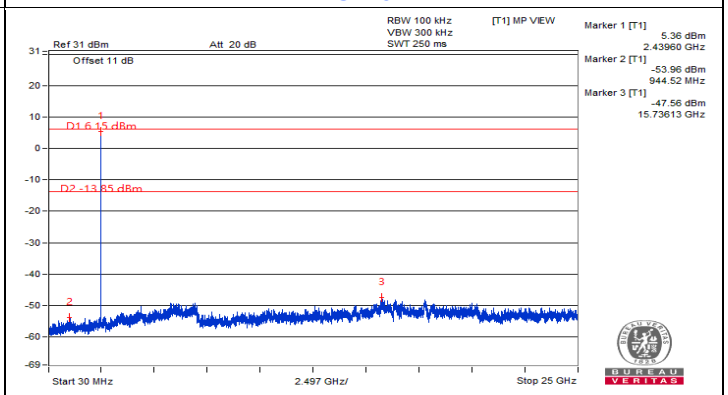


CH 19



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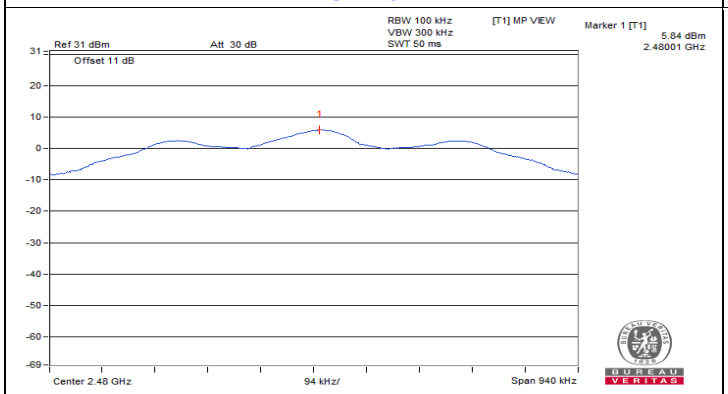
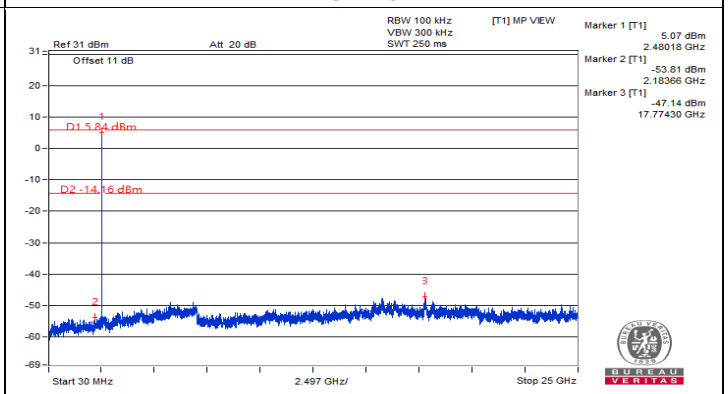
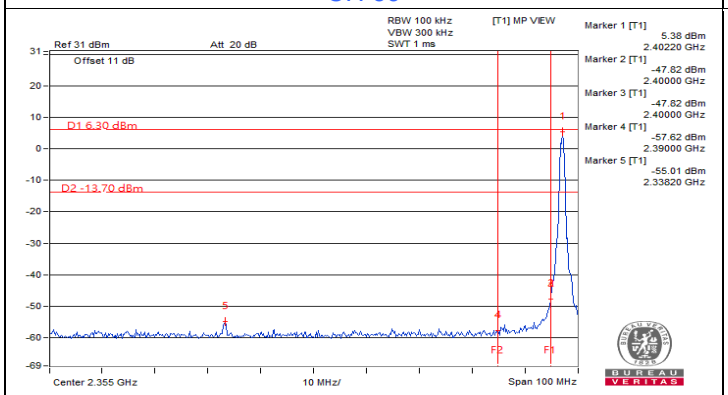


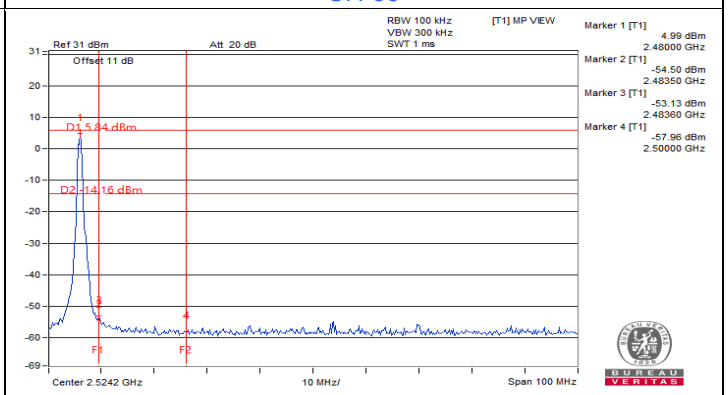
CH 39



CH 39

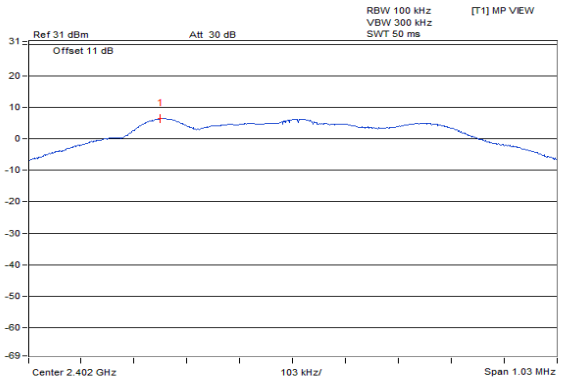


CH 0 Band edge



CH 39 Band edge

BT-LE 500k



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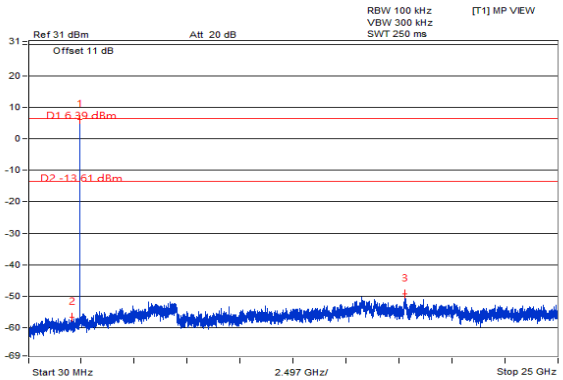

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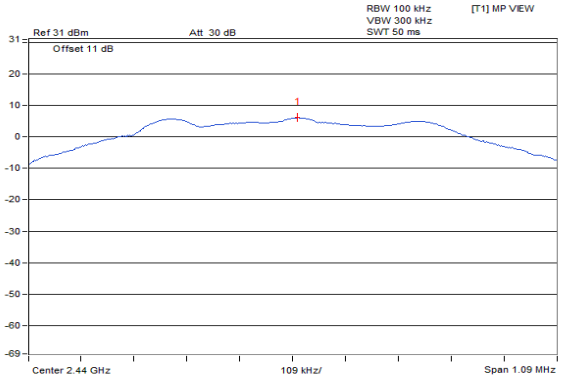

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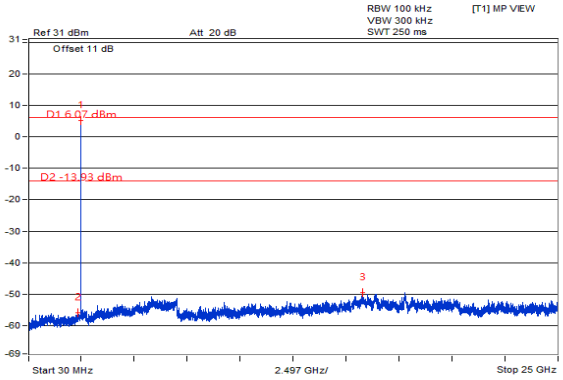

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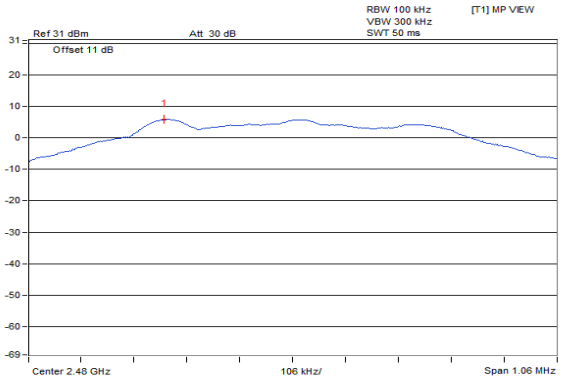

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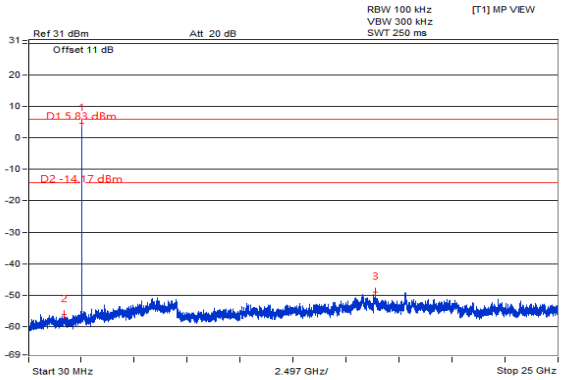

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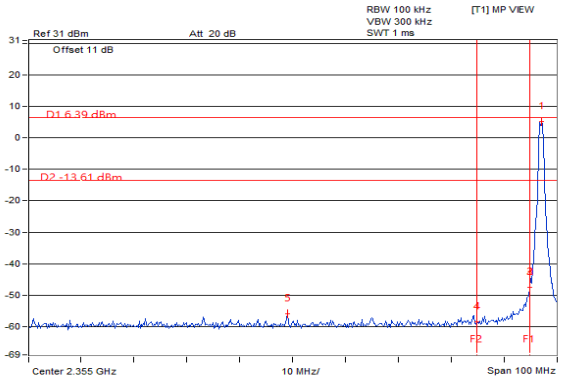
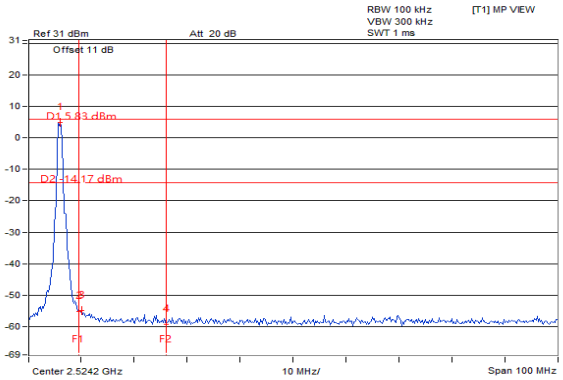
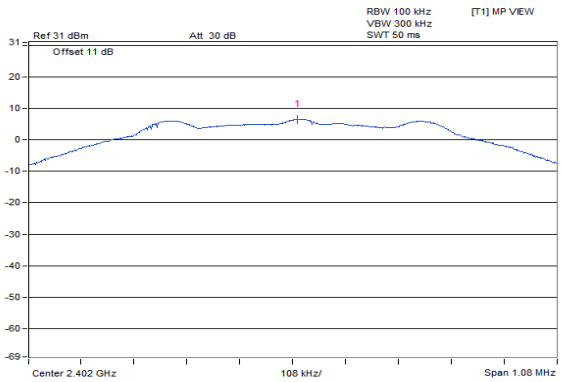


CH 0 Band edge



CH 39 Band edge

BT-LE 1M



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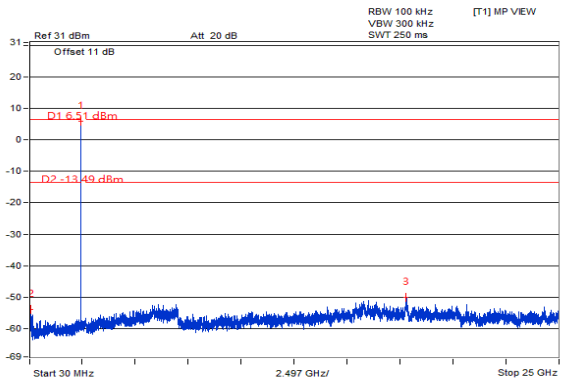

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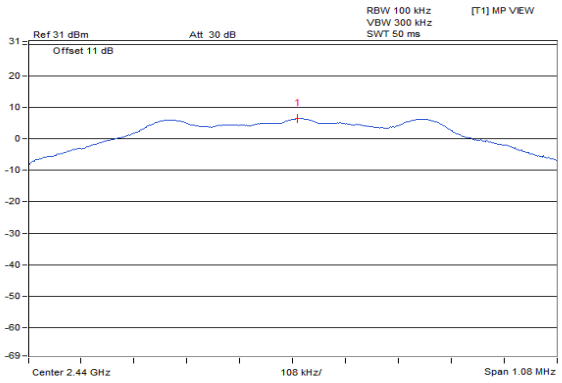

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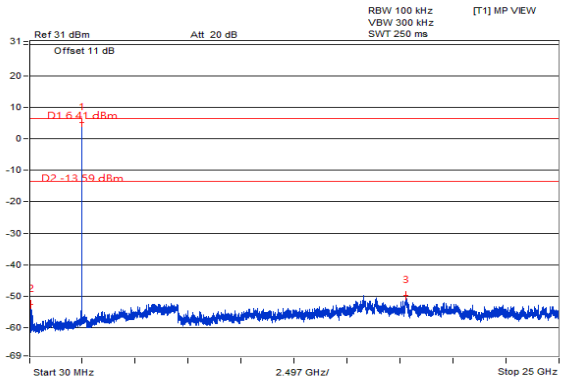
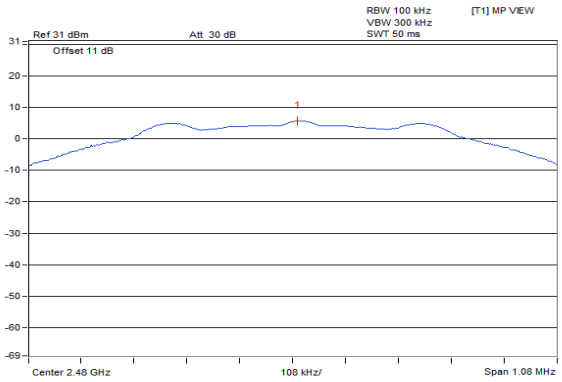


CH 19



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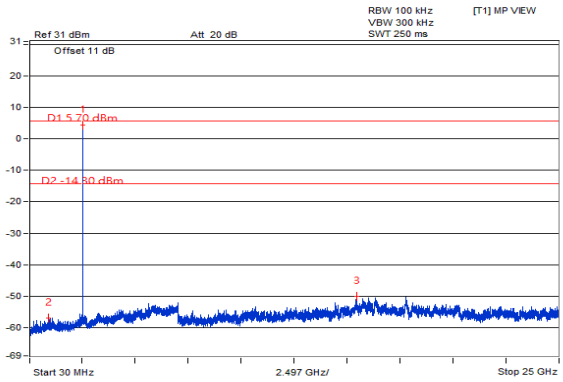

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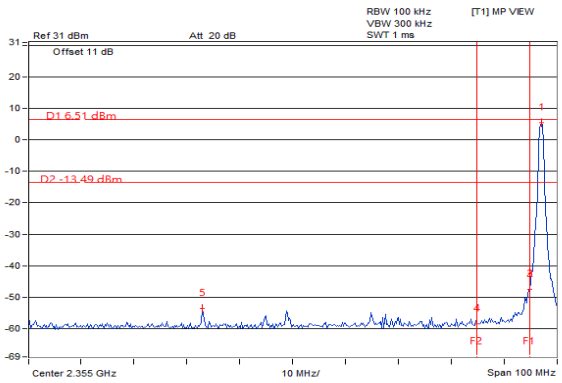
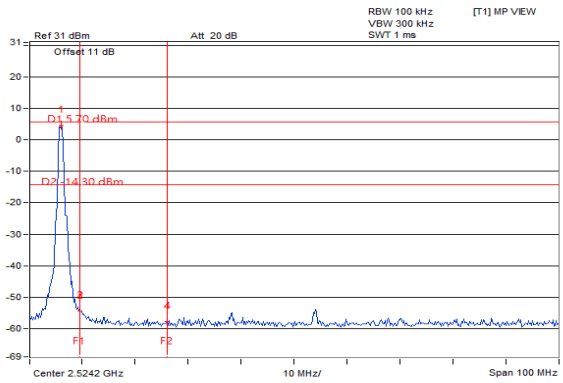
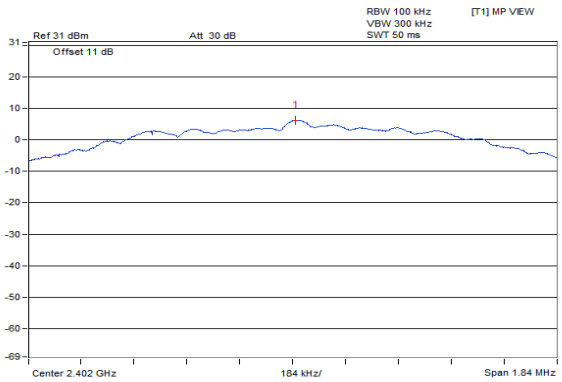


CH 0 Band edge



CH 39 Band edge

BT-LE 2M



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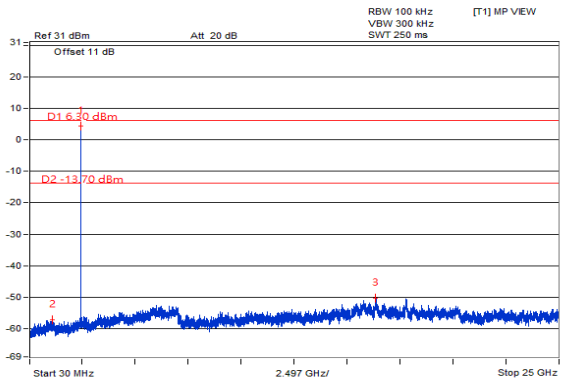

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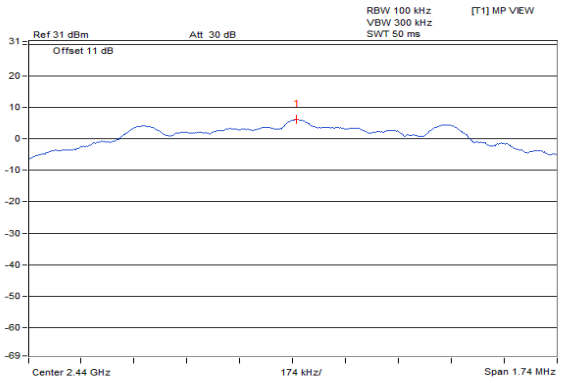
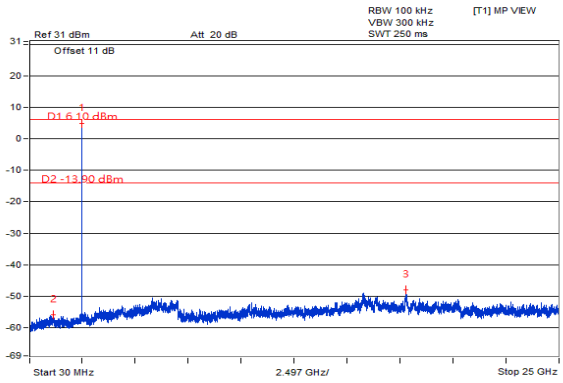
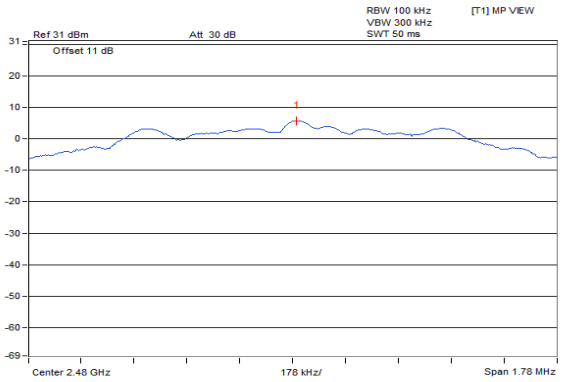


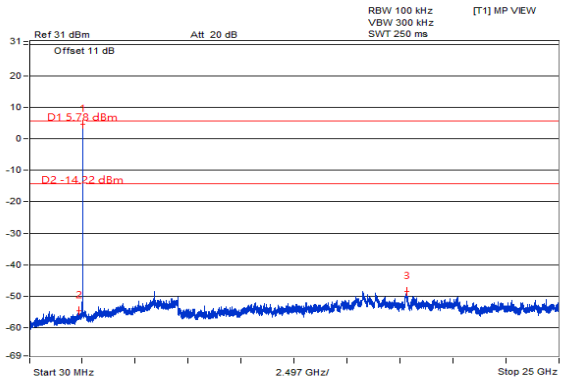
CH 19



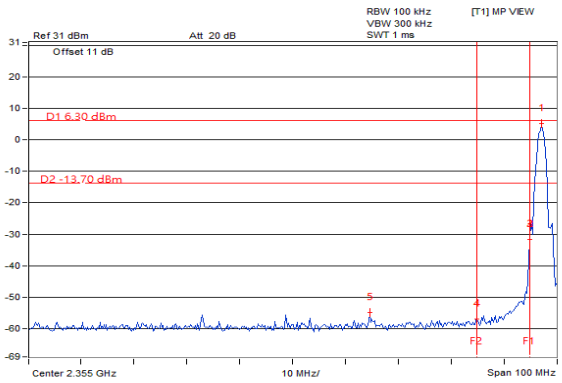
CH 19



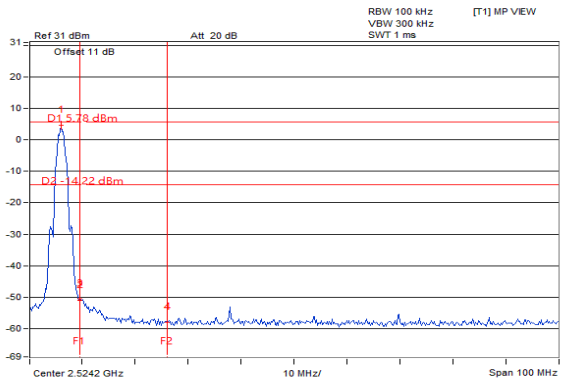
CH 39



CH 39



CH 0 Band edge



CH 39 Band edge

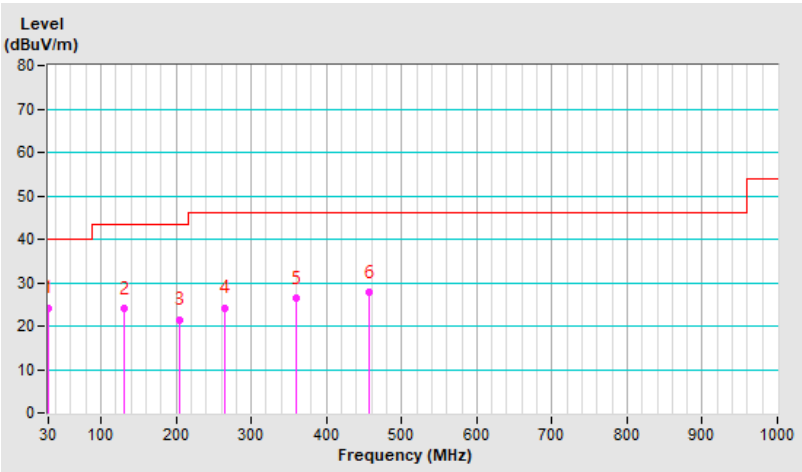
7.5 Unwanted Emissions below 1 GHz

RF Mode	BT-LE 2M	**Channel**	CH 0：2402 MHz
Frequency Range	30 MHz ~ 1 GHz	**Detector Function & Bandwidth**	QP: RB=120kHz, DET=Quasi-Peak
Input Power	12 Vdc	**Environmental Conditions**	22°C, 67% RH
Tested By	Jed Wu		

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	30.58	24.0 QP	40.0	-16.0	1.98 H	137	34.6	-10.6
2	130.15	23.9 QP	43.5	-19.6	1.11 H	106	33.7	-9.8
3	205.28	21.3 QP	43.5	-22.2	1.57 H	229	32.1	-10.8
4	263.96	24.0 QP	46.0	-22.0	1.69 H	234	31.5	-7.5
5	359.99	26.3 QP	46.0	-19.7	1.28 H	78	31.3	-5.0
6	456.36	27.7 QP	46.0	-18.3	1.46 H	59	30.2	-2.5

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 of frequency range 30 MHz ~ 1 GHz.
5. The frequency range 9 kHz ~ 30 MHz: all emissions are more than 20 dB below the limit, therefore do not be recorded in this report.

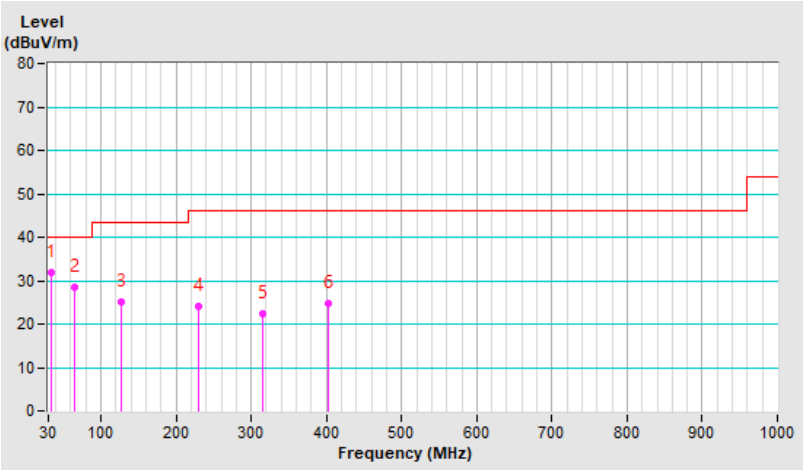


RF Mode	BT-LE 2M	Channel	CH 0：2402 MHz
Frequency Range	30 MHz ~ 1 GHz	Detector Function & Bandwidth	QP: RB=120kHz, DET=Quasi-Peak
Input Power	12 Vdc	Environmental Conditions	22°C, 67% RH
Tested By	Jed Wu		

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	**34.07**	**31.8 QP**	**40.0**	**-8.2**	**1.25 V**	**83**	**42.1**	**-10.3**
2	64.24	28.6 QP	40.0	-11.4	1.18 V	214	38.5	-9.9
3	126.13	25.1 QP	43.5	-18.4	1.36 V	164	35.2	-10.1
4	228.90	24.2 QP	46.0	-21.8	1.06 V	360	34.7	-10.5
5	314.65	22.4 QP	46.0	-23.6	1.48 V	347	27.9	-5.5
6	403.26	24.8 QP	46.0	-21.2	1.73 V	309	28.9	-4.1

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. Margin value = Emission Level – Limit value
4. The other emission levels were very low against the limit of frequency range 30 MHz ~ 1 GHz.
5. The frequency range 9 kHz ~ 30 MHz: all emissions are more than 20 dB below the limit, therefore do not be recorded in this report.



7.6 Unwanted Emissions above 1 GHz

RF Mode	BT-LE 125KLE	**Channel**	CH 0：2402 MHz
Frequency Range	1 GHz ~ 25 GHz	**Detector Function & Bandwidth**	PK: RB=1 MHz, VB=3 MHz, DET=Peak AV: RB=1 MHz, VB=200 Hz, DET=Peak
Input Power	12 Vdc	**Environmental Conditions**	18.1°C, 65.2% RH
Tested By	Jed Wu		

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	57.7 PK	74.0	-16.3	1.51 H	72	55.4	2.3
2	2390.00	38.9 AV	54.0	-15.1	1.51 H	72	36.6	2.3
3	*2402.00	107.4 PK			1.51 H	72	104.9	2.5
4	*2402.00	106.9 AV			1.51 H	72	104.4	2.5
5	4804.00	52.7 PK	74.0	-21.3	1.30 H	95	39.6	13.1
6	4804.00	38.9 AV	54.0	-15.1	1.30 H	95	25.8	13.1
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	50.1 PK	74.0	-23.9	2.86 V	150	47.8	2.3
2	2390.00	33.8 AV	54.0	-20.2	2.86 V	150	31.5	2.3
3	*2402.00	98.6 PK			2.86 V	150	96.1	2.5
4	*2402.00	98.0 AV			2.86 V	150	95.5	2.5
5	4804.00	51.6 PK	74.0	-22.4	2.40 V	149	39.2	12.4
6	4804.00	37.8 AV	54.0	-16.2	2.40 V	149	25.4	12.4

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, the limit was restricted at the RF Output Power.

RF Mode	BT-LE 125KLE	Channel	CH 19：2440 MHz
Frequency Range	1 GHz ~ 25 GHz	Detector Function & Bandwidth	PK: RB=1 MHz, VB=3 MHz, DET=Peak AV: RB=1 MHz, VB=200 Hz, DET=Peak
Input Power	12 Vdc	Environmental Conditions	18.1°C, 65.2% RH
Tested By	Jed Wu		

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	107.5 PK			1.85 H	81	104.9	2.6
2	*2440.00	106.9 AV			1.85 H	81	104.3	2.6
3	4880.00	53.4 PK	74.0	-20.6	1.64 H	104	39.7	13.7
4	4880.00	39.6 AV	54.0	-14.4	1.64 H	104	25.9	13.7
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	*2440.00	98.8 PK			3.20 V	141	96.2	2.6
2	*2440.00	97.9 AV			3.20 V	141	95.3	2.6
3	4880.00	53.0 PK	74.0	-21.0	2.74 V	166	39.3	13.7
4	4880.00	39.2 AV	54.0	-14.8	2.74 V	166	25.5	13.7

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, the limit was restricted at the RF Output Power.

RF Mode	BT-LE 125KLE	Channel	CH 39：2480 MHz
Frequency Range	1 GHz ~ 25 GHz	Detector Function & Bandwidth	PK: RB=1 MHz, VB=3 MHz, DET=Peak AV: RB=1 MHz, VB=200 Hz, DET=Peak
Input Power	12 Vdc	Environmental Conditions	18.1°C, 65.2% RH
Tested By	Jed Wu		

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	106.8 PK			2.43 H	76	104.1	2.7
2	*2480.00	106.2 AV			2.43 H	76	103.5	2.7
3	2483.50	61.1 PK	74.0	-12.9	2.43 H	76	58.4	2.7
4	2483.50	44.1 AV	54.0	-9.9	2.43 H	76	41.4	2.7
5	4960.00	53.8 PK	74.0	-20.2	2.21 H	117	40.2	13.6
6	4960.00	40.0 AV	54.0	-14.0	2.21 H	117	26.4	13.6
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	98.0 PK			3.78 V	146	95.3	2.7
2	*2480.00	97.3 AV			3.78 V	146	94.6	2.7
3	2483.50	53.3 PK	74.0	-20.7	3.78 V	146	50.6	2.7
4	2483.50	36.6 AV	54.0	-17.4	3.78 V	146	33.9	2.7
5	4960.00	53.4 PK	74.0	-20.6	3.54 V	171	39.8	13.6
6	4960.00	39.6 AV	54.0	-14.4	3.54 V	171	26.0	13.6

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, the limit was restricted at the RF Output Power.

RF Mode	BT-LE 500KLE	Channel	CH 0：2402 MHz
Frequency Range	1 GHz ~ 25 GHz	Detector Function & Bandwidth	PK: RB=1 MHz, VB=3 MHz, DET=Peak AV: RB=1 MHz, VB=510 Hz, DET=Peak
Input Power	12 Vdc	Environmental Conditions	18.1°C, 65.2% RH
Tested By	Jed Wu		

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	57.5 PK	74.0	-16.5	1.18 H	86	55.2	2.3
2	2390.00	39.6 AV	54.0	-14.4	1.18 H	86	37.3	2.3
3	*2402.00	107.9 PK			1.18 H	86	105.4	2.5
4	*2402.00	107.4 AV			1.18 H	86	104.9	2.5
5	4804.00	53.2 PK	74.0	-20.8	1.00 H	109	40.1	13.1
6	4804.00	39.4 AV	54.0	-14.6	1.00 H	109	26.3	13.1
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	50.8 PK	74.0	-23.2	2.53 V	138	48.5	2.3
2	2390.00	34.1 AV	54.0	-19.9	2.53 V	138	31.8	2.3
3	*2402.00	98.8 PK			2.53 V	138	96.3	2.5
4	*2402.00	98.4 AV			2.53 V	138	95.9	2.5
5	4804.00	52.8 PK	74.0	-21.2	2.07 V	161	39.7	13.1
6	4804.00	39.0 AV	54.0	-15.0	2.07 V	161	25.9	13.1

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. Margin value = Emission Level – Limit value
4. The other emission levels were very low against the limit.
5. " * ": Fundamental frequency, the limit was restricted at the RF Output Power.

RF Mode	BT-LE 500KLE	Channel	CH 19：2440 MHz
Frequency Range	1 GHz ~ 25 GHz	Detector Function & Bandwidth	PK: RB=1 MHz, VB=3 MHz, DET=Peak AV: RB=1 MHz, VB=510 Hz, DET=Peak
Input Power	12 Vdc	Environmental Conditions	18.1°C, 65.2% RH
Tested By	Jed Wu		

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	107.3 PK			1.17 H	75	104.7	2.6
2	*2440.00	106.8 AV			1.17 H	75	104.2	2.6
3	4880.00	54.3 PK	74.0	-19.7	1.01 H	98	40.6	13.7
4	4880.00	40.5 AV	54.0	-13.5	1.01 H	98	26.8	13.7
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	*2440.00	98.6 PK			2.52 V	127	96.0	2.6
2	*2440.00	98.1 AV			2.52 V	127	95.5	2.6
3	4880.00	53.9 PK	74.0	-20.1	2.06 V	152	40.2	13.7
4	4880.00	40.1 AV	54.0	-13.9	2.06 V	152	26.4	13.7

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, the limit was restricted at the RF Output Power.

RF Mode	BT-LE 500KLE	Channel	CH 39：2480 MHz
Frequency Range	1 GHz ~ 25 GHz	Detector Function & Bandwidth	PK: RB=1 MHz, VB=3 MHz, DET=Peak AV: RB=1 MHz, VB=510 Hz, DET=Peak
Input Power	12 Vdc	Environmental Conditions	18.1°C, 65.2% RH
Tested By	Jed Wu		

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	106.5 PK			2.43 H	76	103.8	2.7
2	*2480.00	106.0 AV			2.43 H	76	103.3	2.7
3	2483.50	61.1 PK	74.0	-12.9	2.43 H	76	58.4	2.7
4	2483.50	44.1 AV	54.0	-9.9	2.43 H	76	41.4	2.7
5	4960.00	54.1 PK	74.0	-19.9	2.23 H	99	40.5	13.6
6	4960.00	40.3 AV	54.0	-13.7	2.23 H	99	26.7	13.6
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	97.8 PK			3.77 V	146	95.1	2.7
2	*2480.00	97.4 AV			3.77 V	146	94.7	2.7
3	2483.50	52.8 PK	74.0	-21.2	3.77 V	146	50.1	2.7
4	2483.50	37.0 AV	54.0	-17.0	3.77 V	146	34.3	2.7
5	4960.00	53.6 PK	74.0	-20.4	3.31 V	153	40.0	13.6
6	4960.00	39.8 AV	54.0	-14.2	3.31 V	153	26.2	13.6

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, the limit was restricted at the RF Output Power.

RF Mode	BT-LE 1M	Channel	CH 0：2402 MHz
Frequency Range	1 GHz ~ 25 GHz	Detector Function & Bandwidth	PK: RB=1 MHz, VB=3 MHz, DET=Peak AV: RB=1 MHz, VB=510 Hz, DET=Peak
Input Power	12 Vdc	Environmental Conditions	18.1°C, 65.2% RH
Tested By	Jed Wu		

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	56.8 PK	74.0	-17.2	2.54 H	85	54.5	2.3
2	2390.00	37.2 AV	54.0	-16.8	2.54 H	85	34.9	2.3
3	*2402.00	107.8 PK			2.54 H	85	105.3	2.5
4	*2402.00	107.1 AV			2.54 H	85	104.6	2.5
5	4804.00	53.1 PK	74.0	-20.9	2.33 H	108	40.0	13.1
6	4804.00	39.3 AV	54.0	-14.7	2.33 H	108	26.2	13.1
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	50.0 PK	74.0	-24.0	3.89 V	137	47.7	2.3
2	2390.00	33.2 AV	54.0	-20.8	3.89 V	137	30.9	2.3
3	*2402.00	99.0 PK			3.89 V	137	96.5	2.5
4	*2402.00	98.2 AV			3.89 V	137	95.7	2.5
5	4804.00	52.7 PK	74.0	-21.3	3.43 V	162	39.6	13.1
6	4804.00	38.9 AV	54.0	-15.1	3.43 V	162	25.8	13.1

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. Margin value = Emission Level – Limit value
4. The other emission levels were very low against the limit.
5. " * ": Fundamental frequency, the limit was restricted at the RF Output Power.

RF Mode	BT-LE 1M	Channel	CH 19：2440 MHz
Frequency Range	1 GHz ~ 25 GHz	Detector Function & Bandwidth	PK: RB=1 MHz, VB=3 MHz, DET=Peak AV: RB=1 MHz, VB=510 Hz, DET=Peak
Input Power	12 Vdc	Environmental Conditions	18.1°C, 65.2% RH
Tested By	Jed Wu		

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	107.9 PK			1.17 H	77	105.3	2.6
2	*2440.00	107.1 AV			1.17 H	77	104.5	2.6
3	4880.00	53.8 PK	74.0	-20.2	3.70 H	100	40.1	13.7
4	4880.00	40.0 AV	54.0	-14.0	3.70 H	100	26.3	13.7
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	*2440.00	99.2 PK			2.52 V	129	96.6	2.6
2	*2440.00	98.4 AV			2.52 V	129	95.8	2.6
3	4880.00	53.4 PK	74.0	-20.6	2.06 V	156	39.7	13.7
4	4880.00	39.6 AV	54.0	-14.4	2.06 V	156	25.9	13.7

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, the limit was restricted at the RF Output Power.

RF Mode	BT-LE 1M	Channel	CH 39：2480 MHz
Frequency Range	1 GHz ~ 25 GHz	Detector Function & Bandwidth	PK: RB=1 MHz, VB=3 MHz, DET=Peak AV: RB=1 MHz, VB=510 Hz, DET=Peak
Input Power	12 Vdc	Environmental Conditions	18.1°C, 65.2% RH
Tested By	Jed Wu		

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	106.8 PK			2.43 H	77	104.1	2.7
2	*2480.00	106.2 AV			2.43 H	77	103.5	2.7
3	2483.50	62.2 PK	74.0	-11.8	2.43 H	77	59.5	2.7
4	2483.50	44.1 AV	54.0	-9.9	2.43 H	77	41.4	2.7
5	4960.00	53.5 PK	74.0	-20.5	2.22 H	100	39.9	13.6
6	4960.00	39.7 AV	54.0	-14.3	2.22 H	100	26.1	13.6
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	98.2 PK			3.78 V	129	95.5	2.7
2	*2480.00	97.5 AV			3.78 V	129	94.8	2.7
3	2483.50	54.2 PK	74.0	-19.8	3.78 V	129	51.5	2.7
4	2483.50	37.0 AV	54.0	-17.0	3.78 V	129	34.3	2.7
5	4960.00	53.1 PK	74.0	-20.9	3.32 V	154	39.5	13.6
6	4960.00	39.3 AV	54.0	-14.7	3.32 V	154	25.7	13.6

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, the limit was restricted at the RF Output Power.

RF Mode	BT-LE 2M	Channel	CH 0：2402 MHz
Frequency Range	1 GHz ~ 25 GHz	Detector Function & Bandwidth	PK: RB=1 MHz, VB=3 MHz, DET=Peak AV: RB=1 MHz, VB=1 kHz, DET=Peak
Input Power	12 Vdc	Environmental Conditions	18.1°C, 65.2% RH
Tested By	Jed Wu		

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	58.7 PK	74.0	-15.3	1.19 H	85	56.4	2.3
2	2390.00	40.1 AV	54.0	-13.9	1.19 H	85	37.8	2.3
3	*2402.00	107.7 PK			1.19 H	85	105.2	2.5
4	*2402.00	106.2 AV			1.19 H	85	103.7	2.5
5	4804.00	53.1 PK	74.0	-20.9	3.68 H	108	40.0	13.1
6	4804.00	39.2 AV	54.0	-14.8	3.68 H	108	26.1	13.1
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	52.3 PK	74.0	-21.7	2.54 V	136	50.0	2.3
2	2390.00	34.6 AV	54.0	-19.4	2.54 V	136	32.3	2.3
3	*2402.00	98.9 PK			2.54 V	136	96.4	2.5
4	*2402.00	97.5 AV			2.54 V	136	95.0	2.5
5	4804.00	52.7 PK	74.0	-21.3	2.08 V	162	39.6	13.1
6	4804.00	38.8 AV	54.0	-15.2	2.08 V	162	25.7	13.1

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. Margin value = Emission Level – Limit value
4. The other emission levels were very low against the limit.
5. " * ": Fundamental frequency, the limit was restricted at the RF Output Power.

RF Mode	BT-LE 2M	Channel	CH 19：2440 MHz
Frequency Range	1 GHz ~ 25 GHz	Detector Function & Bandwidth	PK: RB=1 MHz, VB=3 MHz, DET=Peak AV: RB=1 MHz, VB=1 kHz, DET=Peak
Input Power	12 Vdc	Environmental Conditions	18.1°C, 65.2% RH
Tested By	Jed Wu		

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	108.1 PK			1.17 H	76	105.5	2.6
2	*2440.00	106.3 AV			1.17 H	76	103.7	2.6
3	4880.00	53.8 PK	74.0	-20.2	3.70 H	99	40.1	13.7
4	4880.00	40.0 AV	54.0	-14.0	3.70 H	99	26.3	13.7
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	*2440.00	99.3 PK			2.52 V	128	96.7	2.6
2	*2440.00	97.7 AV			2.52 V	128	95.1	2.6
3	4880.00	53.4 PK	74.0	-20.6	2.06 V	153	39.7	13.7
4	4880.00	39.6 AV	54.0	-14.4	2.06 V	153	25.9	13.7

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, the limit was restricted at the RF Output Power.

RF Mode	BT-LE 2M	Channel	CH 39：2480 MHz
Frequency Range	1 GHz ~ 25 GHz	Detector Function & Bandwidth	PK: RB=1 MHz, VB=3 MHz, DET=Peak AV: RB=1 MHz, VB=1 kHz, DET=Peak
Input Power	12 Vdc	Environmental Conditions	18.1°C, 65.2% RH
Tested By	Jed Wu		

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	106.7 PK			2.43 H	78	104.0	2.7
2	*2480.00	105.2 AV			2.43 H	78	102.5	2.7
3	2483.50	62.1 PK	74.0	-11.9	2.43 H	78	59.4	2.7
4	**2483.50**	**50.5 AV**	**54.0**	**-3.5**	**2.43 H**	**78**	**47.8**	**2.7**
5	4960.00	53.3 PK	74.0	-20.7	2.22 H	101	39.7	13.6
6	4960.00	39.5 AV	54.0	-14.5	2.22 H	101	25.9	13.6
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	98.2 PK			3.78 V	130	95.5	2.7
2	*2480.00	96.6 AV			3.78 V	130	93.9	2.7
3	2483.50	54.1 PK	74.0	-19.9	3.78 V	130	51.4	2.7
4	2483.50	42.3 AV	54.0	-11.7	3.78 V	130	39.6	2.7
5	4960.00	52.9 PK	74.0	-21.1	3.32 V	155	39.3	13.6
6	4960.00	39.1 AV	54.0	-14.9	3.32 V	155	25.5	13.6

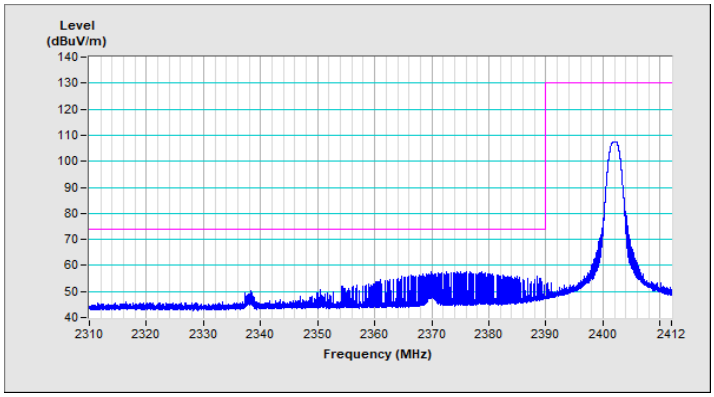
Remarks:

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, the limit was restricted at the RF Output Power.

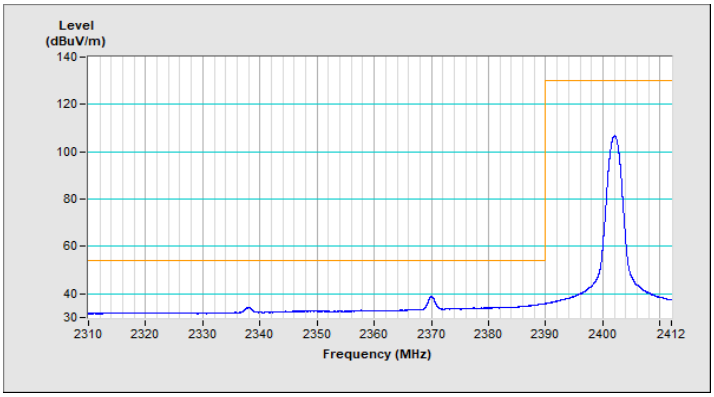
Plot of Band Edge

Frequency Range	2.31 GHz ~ 2.412 GHz	Detector Function & Bandwidth	PK: RB=1 MHz, VB=3 MHz, DET=Peak AV: RB=1 MHz, VB=200 Hz, DET=Peak

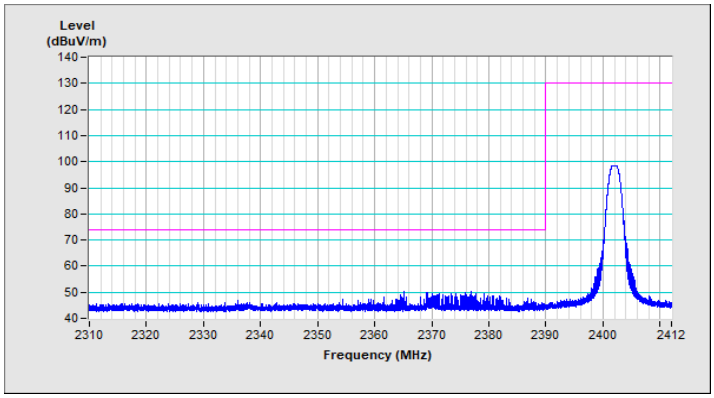
BT-LE 125KLE Channel 0



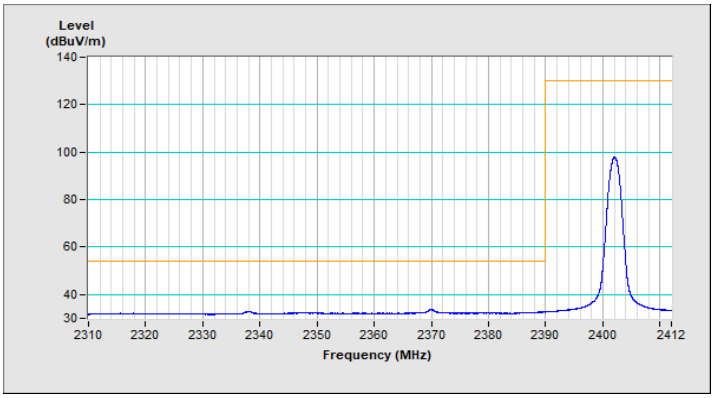
Horizontal (Peak)



Horizontal (Average)



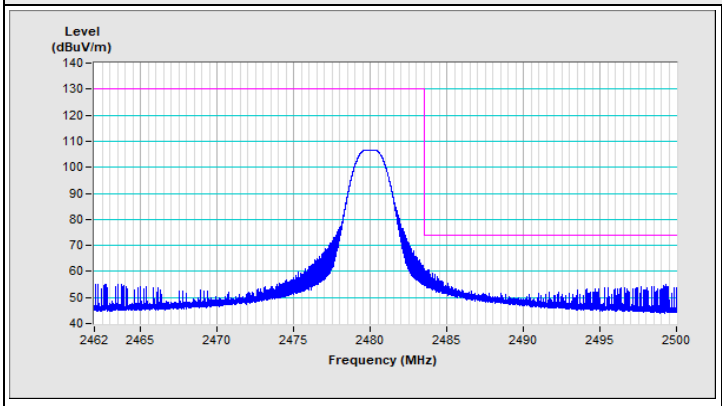
Vertical (Peak)



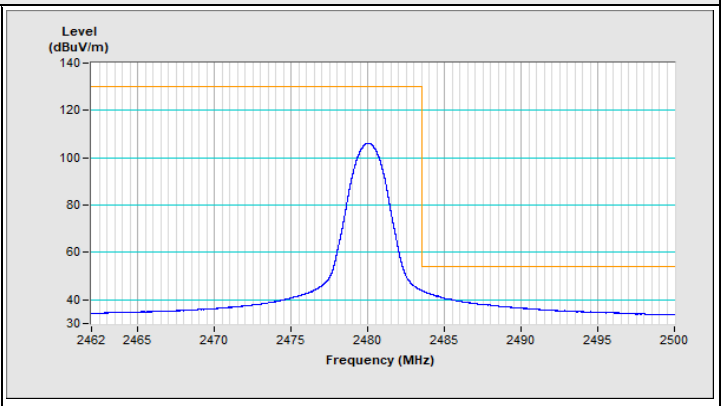
Vertical (Average)

Frequency Range	2.462 GHz ~ 2.5 GHz	Detector Function & Bandwidth	PK: RB=1 MHz, VB=3 MHz, DET=Peak AV: RB=1 MHz, VB=200 Hz, DET=Peak

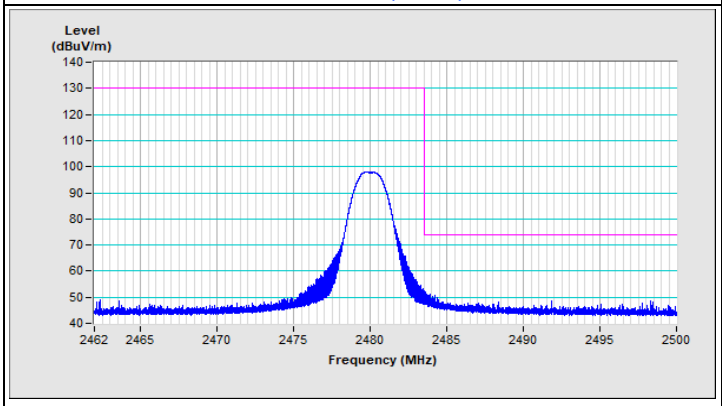
BT-LE 125KLE Channel 39



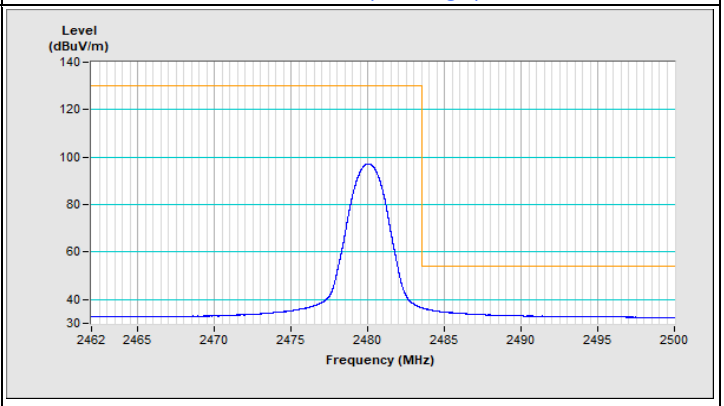
Horizontal (Peak)



Horizontal (Average)



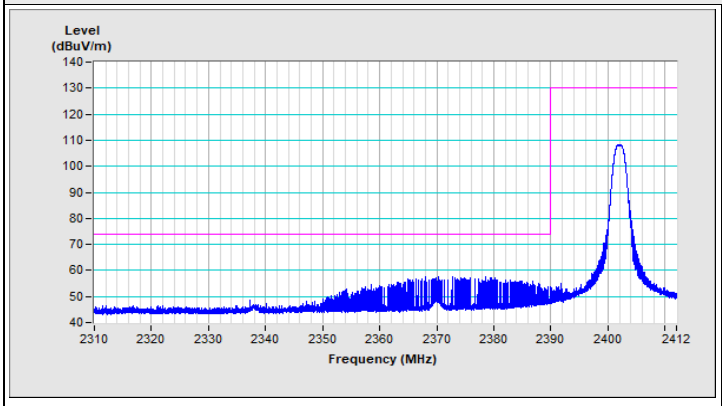
Vertical (Peak)



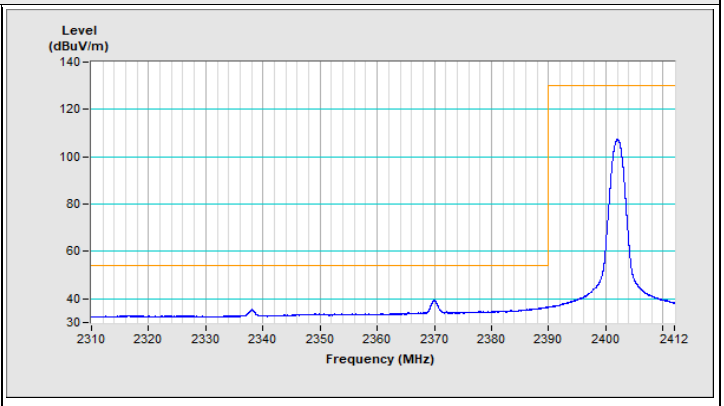
Vertical (Average)

Frequency Range	2.31 GHz ~ 2.412 GHz	Detector Function & Bandwidth	PK: RB=1 MHz, VB=3 MHz, DET=Peak AV: RB=1 MHz, VB=510 Hz, DET=Peak

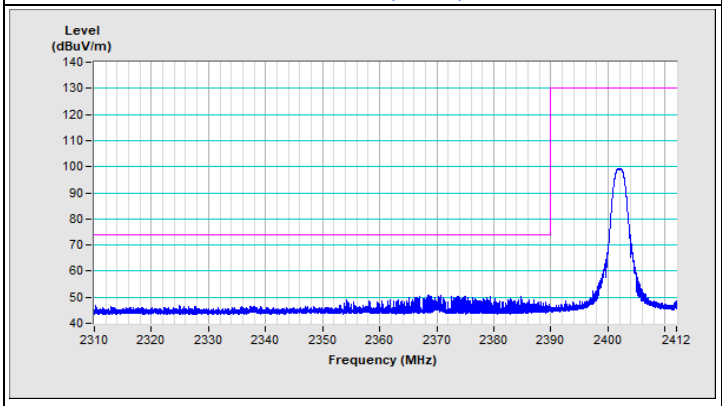
BT-LE 500KLE Channel 0



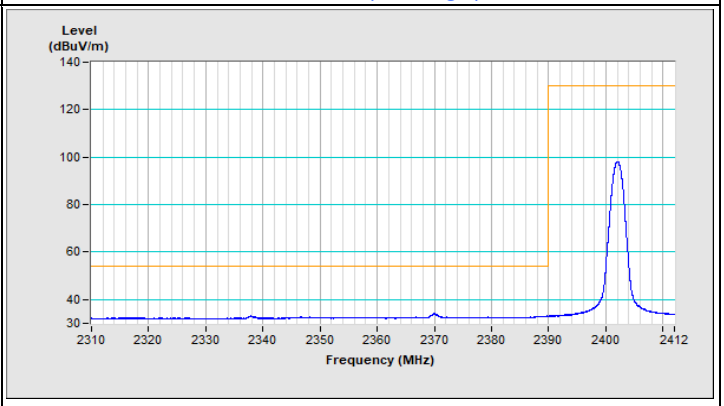
Horizontal (Peak)



Horizontal (Average)



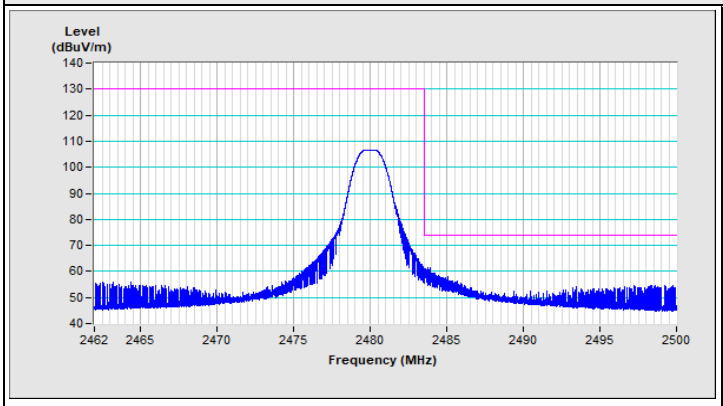
Vertical (Peak)



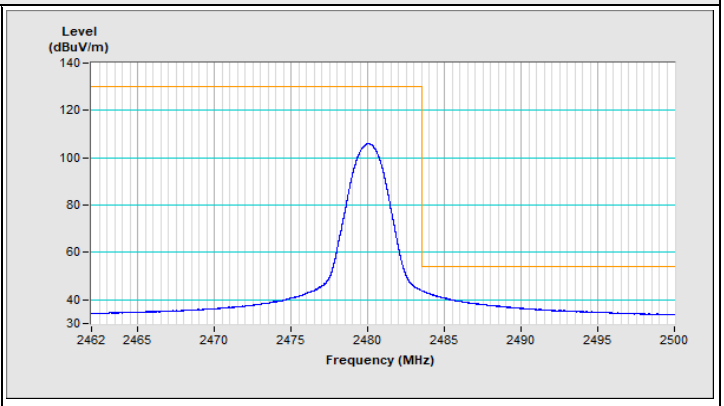
Vertical (Average)

Frequency Range	2.462 GHz ~ 2.5 GHz	Detector Function & Bandwidth	PK: RB=1 MHz, VB=3 MHz, DET=Peak AV: RB=1 MHz, VB=510 Hz, DET=Peak

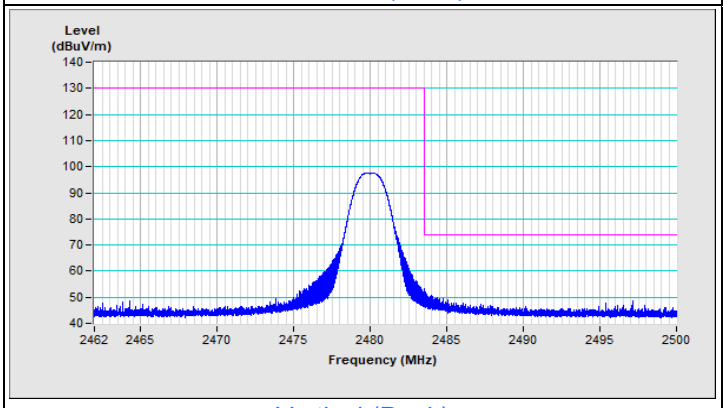
BT-LE 500KLE Channel 39



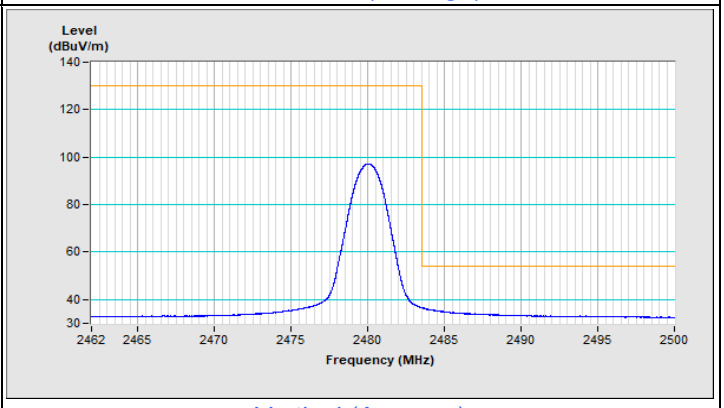
Horizontal (Peak)



Horizontal (Average)



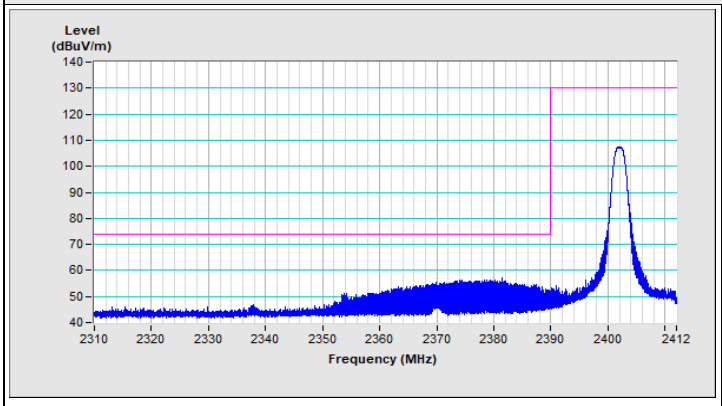
Vertical (Peak)



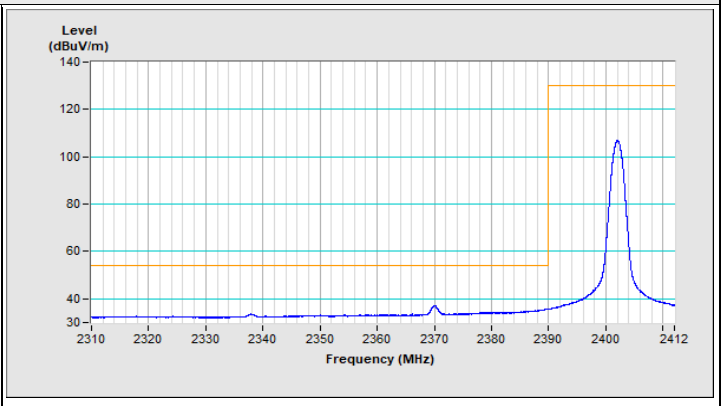
Vertical (Average)

Frequency Range	2.31 GHz ~ 2.412 GHz	Detector Function & Bandwidth	PK: RB=1 MHz, VB=3 MHz, DET=Peak AV: RB=1 MHz, VB=510 Hz, DET=Peak

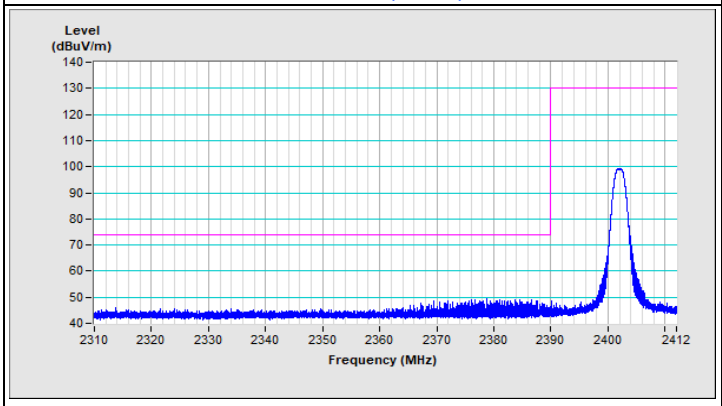
BT-LE 1M Channel 0



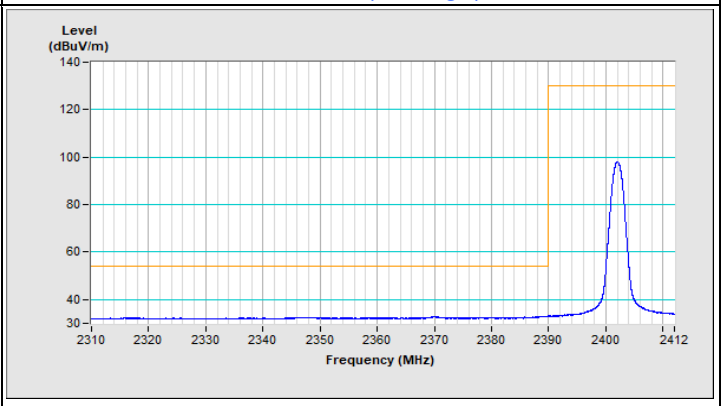
Horizontal (Peak)



Horizontal (Average)



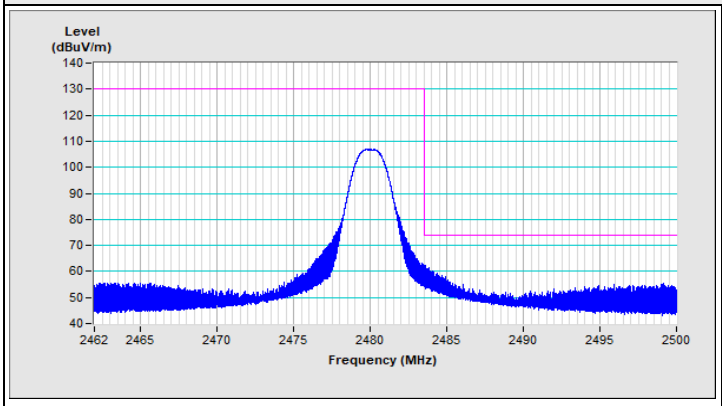
Vertical (Peak)



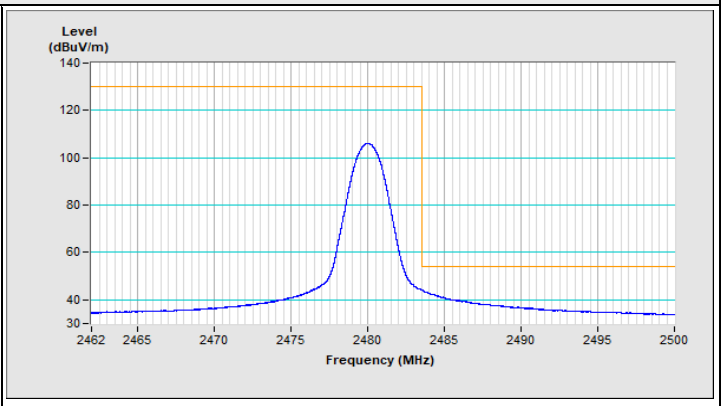
Vertical (Average)

Frequency Range	2.462 GHz ~ 2.5 GHz	Detector Function & Bandwidth	PK: RB=1 MHz, VB=3 MHz, DET=Peak AV: RB=1 MHz, VB=510 Hz, DET=Peak

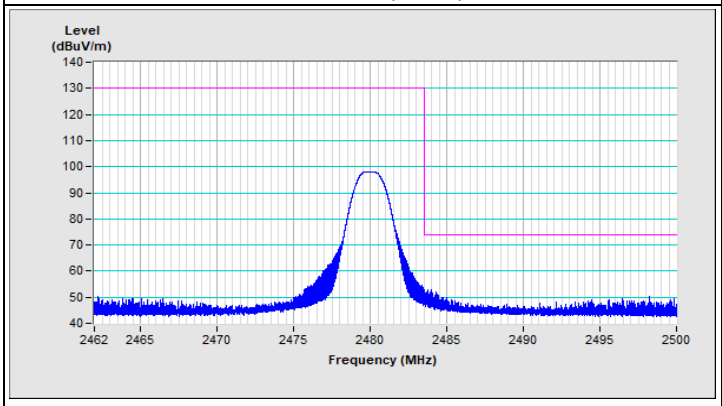
BT-LE 1M Channel 39



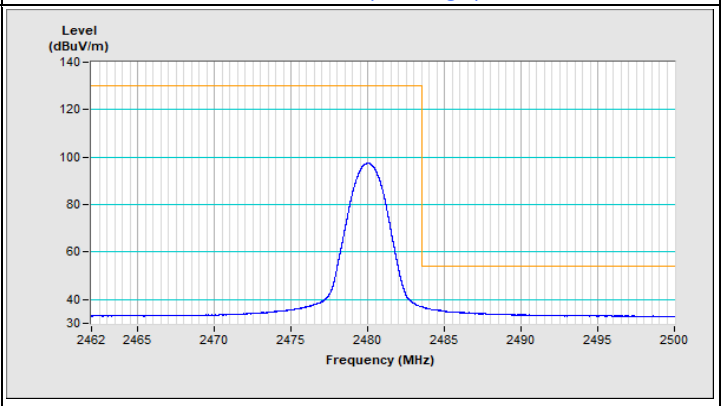
Horizontal (Peak)



Horizontal (Average)



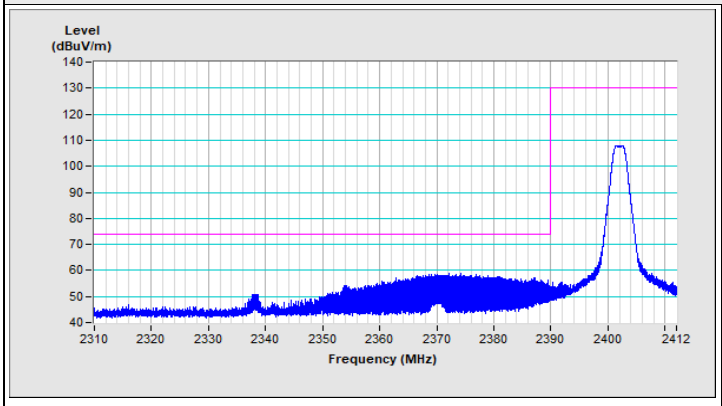
Vertical (Peak)



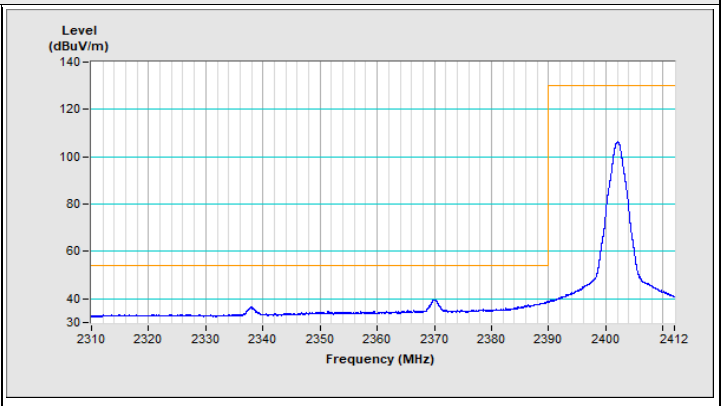
Vertical (Average)

Frequency Range	2.31 GHz ~ 2.412 GHz	Detector Function & Bandwidth	PK: RB=1 MHz, VB=3 MHz, DET=Peak AV: RB=1 MHz, VB=1 kHz, DET=Peak

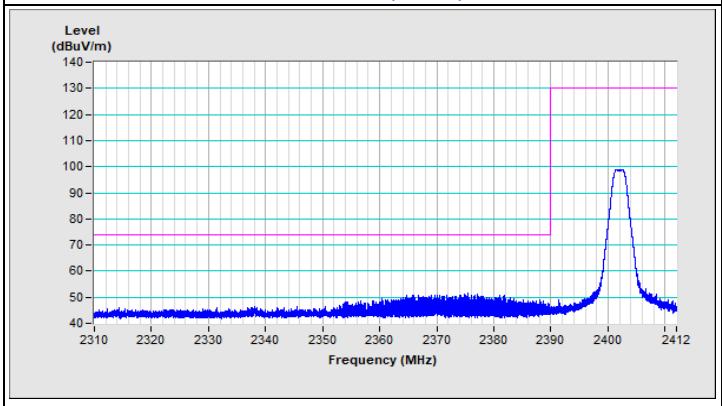
BT-LE 2M Channel 0



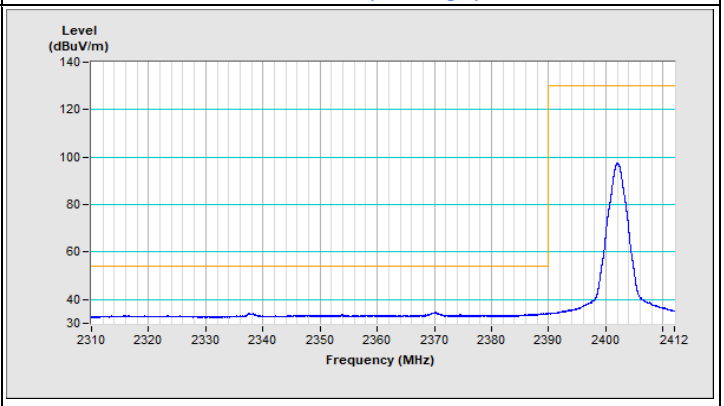
Horizontal (Peak)



Horizontal (Average)



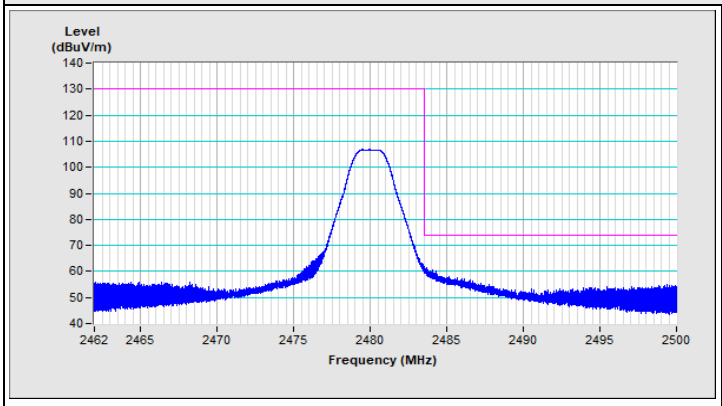
Vertical (Peak)



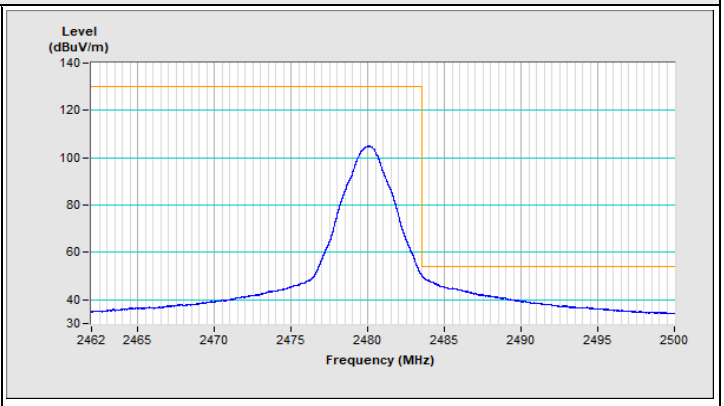
Vertical (Average)

Frequency Range	2.462 GHz ~ 2.5 GHz	Detector Function & Bandwidth	PK: RB=1 MHz, VB=3 MHz, DET=Peak AV: RB=1 MHz, VB=1 kHz, DET=Peak

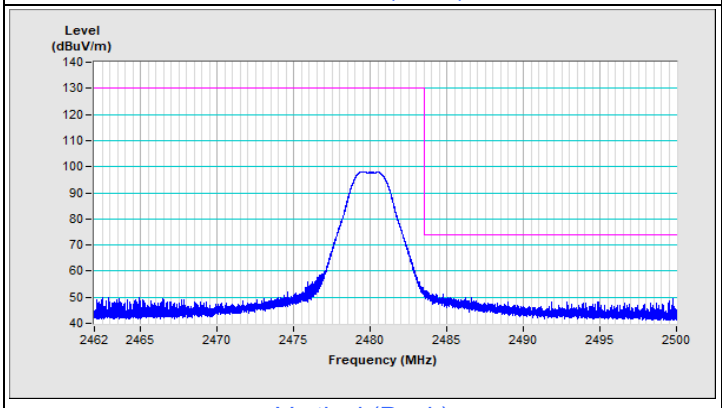
BT-LE 2M Channel 39



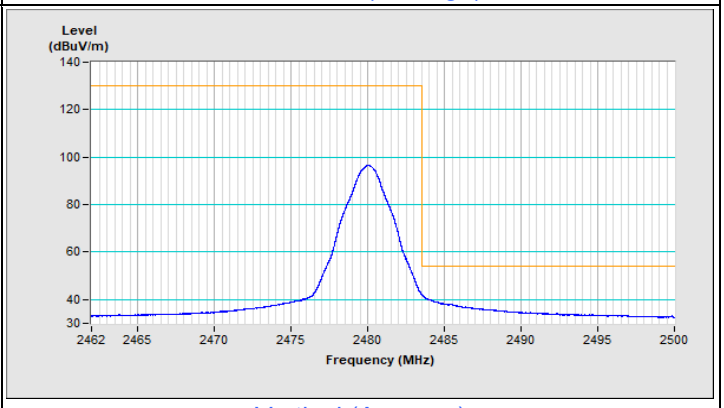
Horizontal (Peak)



Horizontal (Average)



Vertical (Peak)



Vertical (Average)

8 Pictures of Test Arrangements

Please refer to the attached file (Test Setup Photo)

9 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:

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

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