



FCC Part 15, Subpart C Test Report

FCC ID: 2AX2R-ZE8000

Applicant: final Inc.

Address: 4-44-1, Nakasaiwai-cho, Saiwai-Ku, Kawasaki-shi, Kanagawa 212-0012, Japan

Manufacturer: final Inc.

Address: 4-44-1, Nakasaiwai-cho, Saiwai-Ku, Kawasaki-shi, Kanagawa 212-0012, Japan

Product: ZE8000

Brand: final

Test Model(s): FI-ZE8DPLTW

Series Model(s): N/A

Test Date: Aug. 17, 2022~ Aug. 24, 2022

Issued Date: Sep. 06, 2022

Issued By: Hwa-Hsing (Dongguan) Testing Co., Ltd.

Address: No.101, Bld. N1, Yuyuan 2Rd, Yuyuan Industrial Park, HuangJiang Town, Dongguan, China

Test Firm Registration No.: 915896

Designation No.: CN1255

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

The above equipment has been tested by **Hwa-Hsing (Dongguan) Testing Co., Ltd.**, 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. W

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Reviewed by :

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Approved by :

Tank Tan

Tank Tan

This report is for your exclusive use. Any copying or replication of this report to or for any other person or entity, or use of our name or trademark, is permitted only with our prior written permission. This report sets forth our findings solely with respect to the test samples identified herein. The results set forth in this report are not indicative or representative of the quality or characteristics of the lot from which a test sample was taken or any similar or identical product unless specifically and expressly noted. Our report includes all of the tests requested by you and the results thereof based upon the information that you provided to us. You have 60 days from date of issuance of this report to notify us of any material error or omission caused by our negligence, provided, however, that such notice shall be in writing and shall specifically address the issue you wish to raise. A failure to raise such issue within the prescribed time shall constitute your unqualified acceptance of the completeness of this report, the tests conducted and the correctness of the report contents. Unless specific mention, the uncertainty of measurement has been explicitly taken into the account to declare the compliance or non-compliance to the specification. The report must not be used by the client to claim product certification, approval, or endorsement by TAF or any government agencies.

Lab: [Hwa-Hsing \(Dongguan\) Testing Co., Ltd.](#)

Tel: [0769-83078199](tel:0769-83078199)

Release

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Ver. 1.5

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HWA-HSING Test Report No.: 220524EL11-RF-US-01

Release Control Record

Issue No.	Description	Date Issued
220524EL11-RF-US-01	Original Release	Sep. 06, 2022

Lab: [Hwa-Hsing \(Dongguan\) Testing Co., Ltd.](#)

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1. Summary of Test Results

47 CFR FCC Part 15, Subpart C (Section 15.247) KDB 558074 D01 15.247 Meas Guidance v05r02 ANSI C63.10:2013			
Clause	Test Item	Result	Remarks
15.207	AC Power Conducted Emission	Pass	Meet the requirement of limit.
15.205 & 209	Radiated Emissions	Pass	Meet the requirement of limit.
15.247(d)	Band Edge Measurement	Pass	Meet the requirement of limit.
15.247(d)	Antenna Port Emission	Pass	Meet the requirement of limit.
15.247(a)(2)	6dB Bandwidth	Pass	Meet the requirement of limit.
---	Occupied Bandwidth Measurement	Pass	Reference only
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	No antenna connector is used. The device is professionally installed

Note: The EUT has been verified to comply with the requirements of FCC Part 15, Subpart B, Class B (DoC).
The test report has been issued separately.

1.1 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:

The listed uncertainties are the worst cases uncertainty for the entire range of measurement. Please note that the uncertainty values are provided for informational purposes only and are not used in determining the PASS/FAIL results.

Measurement	Frequency	Expended Uncertainty (k=2) (±)
Conducted Emissions at mains ports	150kHz ~ 30MHz	2.66 dB
Radiated Emissions up to 1 GHz	9KHz ~ 30MHz	2.16 dB
	30MHz ~ 1000MHz	3.47 dB
Radiated Emissions above 1 GHz	1GHz ~ 18GHz	4.84 dB
	18GHz ~ 40GHz	4.67 dB

1.2 Modification Record

There were no modifications required for compliance.



2. General Information

2.1 General Description of EUT

Product	ZE8000
Test Model(s)	FI-ZE8DPLTW
Sample No.	HS220815-01-14
Series Model(s)	N/A
Status of EUT	Engineering Prototype
Power Supply Rating	DC 3.85V from Battery
Modulation Type	GFSK for DTS
Transfer Rate	1 Mbps, 2Mbps
Operating Frequency	2402 ~ 2480MHz
Number of Channel	40
Maximum Output Power	L: 7.738dBm (Peak) R: 7.486dBm (Peak)
Antenna Type	FPC Antenna
Antenna Gain	L: 0.89dBi R: 1.41dBi
Antenna Connector	N/A
Accessory Device	N/A
Data Cable Supplied	USB Type-C Charging Cable 37cm, Unshielded and detachable

Note:

1. Please refer to the EUT photo document (Reference No.: 220524EL11-01&02) for detailed product photo.
2. 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.



2.2 Description of Test Channels

40 channels are provided to this EUT:

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

2.3 Test Mode Applicability and Tested Channel Detail

EUT Configure Mode	Applicable test items	X-Axis	Y-Axis	Z-Axis	Voltage Supply
Conducted	AC Power Conducted Emission	N/A	N/A	N/A	AC120V/60Hz
Radiated	Radiated Emissions	√	√	√	
Antenna Port Conducted Measurement	Band Edge Measurement	N/A	N/A	N/A	power supply by battery
	Antenna Port Emission	N/A	N/A	N/A	
	6dB Bandwidth	N/A	N/A	N/A	
	Occupied Bandwidth Measurement	N/A	N/A	N/A	
	Conducted power	N/A	N/A	N/A	
	Power Spectral Density	N/A	N/A	N/A	

1. *: The EUT had been pre-tested on the positioned of each 3 Axis. The worst case was found when positioned on **Z-plane**.

2. "N/A" means no effect.

Test Condition:

Applicable test items	Environmental Conditions	Test Date	Tested by
AC Power Conducted Emission	26deg. C, 52%RH	2022-8-19	King Ye
Radiated Emissions	26.5deg. C, 50%RH	2022-8-20	King Ye
Antenna Port Conducted Measurement	26.2deg. C, 60%RH	2022-8-23	Dragon Long

- 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.



Radiated Emission Test (Above 1GHz):

EUT Configure Mode	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):

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

Power Line Conducted Emission Test:

EUT Configure Mode	Available Channel	Tested Channel	Modulation Type	Data Rate (Mbps)
-	0 to 39	39	GFSK	1
-	0 to 39	39	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.

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



2.4 Description of Support Units

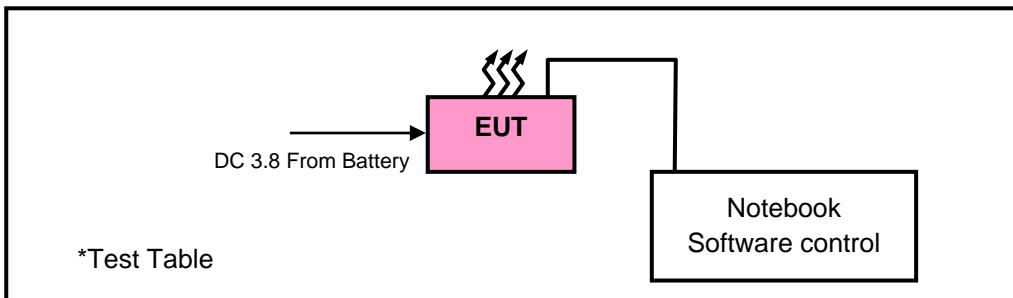
The EUT has been tested as an independent unit together with other necessary accessories or support units. The following support units or accessories were used to form a representative test configuration during the tests.

No.	Product	Brand	Model No.	Serial No.	FCC ID
1.	Notebook	DELL	Latitude 5300	N/A	N/A

Insert Cable Connections to/from EUT provided by test team.

No.	Signal Cable Description of The Above Support Units
1.	USB serial cable Un-shielding 1.2m

2.5 Configuration of System under Test





3. Test Types and Results

3.1 Radiated Emission and Band-edge Measurement

3.1.1 Limits of radiated emission and band-edge 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

* DTS emissions in non-restricted frequency bands Subclause 11.11 of ANSI C63.10 is applicable.
* DTS emissions in restricted frequency bands Subclause 11.12 of ANSI C63.10 is applicable

Note:

1. The lower limit shall apply at the transition frequencies.
2. Emission level (dB_{uV}/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.



3.1.2 Test Instruments

Radiated emission below 30MHz:

Equipment	Manufacturer	Model No.	Serial No.	Next Cal.
EMI Test Receiver	Rohde&Schwarz	ESR7	100962	2023-01-13
3m Semi-anechoic Chamber	MAORUI	9m*6m*6m	NSEMC003	2023-04-15*
Test software	FARAD	FARAD	EZ_EMCV1.1.4.2	N/A
Loop Antenna	EMCI	HLA 6121	45745	2023-04-15*
Preamplifier	EMCI	EMC001340	980201	2022-09-08
Antenna Tower	MF	MFA-440H	NA	NA
Turn Table	MF	MFT-201SS	NA	NA
Antenna Tower&Turn Table Controller	MF	MF-7802	NA	NA

Frequency Range below 1GHz:

Equipment	Manufacturer	Model No.	Serial No.	Next Cal.
EMI Test Receiver	Rohde&Schwarz	ESR7	100962	2023-01-13
Broadband antenna	Schwarzbeck	VULB 9168	00937	2023-09-12*
3m Semi-anechoic Chamber	MAORUI	9m*6m*6m	NSEMC003	2023-04-15*
Signal Amplifier	Com-power	PAM-103	18020051	2022-09-08
Attenuator	Rohde&Schwarz	TS2GA-6dB	18101101	N/A
Test software	FARAD	FARAD	EZ_EMCV1.1.4.2	N/A

Frequency Range 1-18GHz:

Equipment	Manufacturer	Model No.	Serial No.	Next Cal.
3m Semi-anechoic Chamber	MAORUI	9m*6m*6m	NSEMC003	2023-04-15*
Horn Antenna	Schwarzbeck	BBHA 9170	01959	2022-09-12*
Broadband Coaxial Preamplifier	Schwarzbeck	PAM-118A	1804003	2022-09-07
Spectrum	Keysight	N9020A	MY51240612	2022-09-08
Antenna Tower	MF	MFA-440H	NA	NA
Turn Table	MF	MFT-201SS	NA	NA
Antenna Tower&Turn Table Controller	MF	MF-7802	NA	NA

Frequency Range 18-40GHz:

Equipment	Manufacturer	Model No.	Serial No.	Next Cal.
3m Semi-anechoic Chamber	MAORUI	9m*6m*6m	NSEMC003	2023-04-15*
Spectrum Analyzer	Rohde&Schwarz	FSV-40N	101783	2023-01-13
Horn Antenna	Schwarzbeck	BBHA 9170	BBHA9170242	2023-04-10*
Pre-Amplifier	EMCI	EMC 184045	980102	2023-01-12
Antenna Tower	MF	MFA-440H	NA	NA
Turn Table	MF	MFT-201SS	NA	NA
Antenna Tower&Turn Table Controller	MF	MF-7802	NA	NA

Note: 1. The calibration interval of the above test instruments is 12 months or 24 months (*).

2. The test was performed in 966.



3.1.3 Test Procedures

a. **Peak emission levels are measured by setting the instrument as follow:**

- 1) RBW & VBW setting as a function of frequency:

Frequency	RBW	VBW
9kHz~150kHz	200Hz	600Hz
0.15MHz~30MHz	9kHz	30kHz
30MHz~1000MHz	120kHz	300kHz
>1000MHz	1MHz	3MHz

- 2) Detector = peak.
- 3) Sweep time = auto.
- 4) Trace mode = max hold.
- 5) Allow sweeps to continue until the trace stabilizes. (Note that the required measurement time may be lengthened for low-duty-cycle applications.)

Note: If the peak-detected amplitude can be shown to comply with the average limit, then it is not necessary to perform a separate average measurement

b. **Average emission levels are measured by setting the instrument as follow:**● **Trace averaging with continuous EUT transmission at full power**

If the EUT can be configured or modified to transmit continuously ($D \geq 98\%$). then the average emission levels shall be measured using the following method (with EUT transmitting continuously):

- 1) RBW=1 MHz (unless otherwise specified).
- 2) VBW $\geq 3 * \text{RBW}$.
- 3) Detector =RMS
- 4) Sweep time = auto.
- 5) Perform a trace average of at least 100 traces.

● **Trace averaging across ON and OFF times of the EUT transmissions followed by duty cycle correction**

If continuous transmission of the EUT ($D \geq 98\%$) cannot be achieved and the duty cycle is constant (duty cycle variations are less than $\pm 2\%$). then the following procedure shall be used

- 1) The EUT shall be configured to operate at the maximum achievable duty cycle.
- 2) Measure the duty cycle D of the transmitter output signal as described in 11.6.
- 3) RBW=1 MHz (unless otherwise specified).
- 4) VBW $\geq 3 * \text{RBW}$.
- 5) Detector =RMS
- 6) Sweep time = auto.
- 7) Perform a trace average of at least 100 traces.

A correction factor shall be added to the measurement results prior to comparing with the emission limit to compute the emission level that would have been measured had the test been performed at 100% duty cycle. The correction factor is computed as follows:

*If power averaging (rms) mode was used in step 5). then the applicable correction factor is [10 10g (1/ D)], where D is the duty cycle.

**If linear voltage averaging mode was used in step f). then the applicable correction factor is [20 10g (1/D)], where D is the duty cycle.

***If a specific emission is demonstrated to be continuous ($D > 98\%$) rather than turning ON and OFF with the transmit cycle, then no duty cycle correction is required for that



● **Reduced VBW Averaging across ON and OFF times of the EUT transmissions with max hold**

If continuous transmission of the EUT ($D > 98\%$) cannot be achieved and the duty cycle is not constant (duty cycle variations exceed $\pm 2\%$), then the following procedure shall be used:

- 1) RBW = 1 MHz.
 - 2) VBW $\geq 1/T$.
 - 3) Detector =peak
 - 4) Sweep time = auto.
 - 5) Trace mode = max hold.
 - 6) Allow max hold to run for at least [50 x (1/ D)] traces
- c. The EUT was placed on the top of a rotating table 0.8 meters (below 1GHz) / 1.5 meters (1-18GHz) / 1.5 meters (18-40GHz) above the reference ground. The table was rotated 360 degrees to determine the position of the highest radiation.
 - d. The EUT was set 3 meters away from the interference-receiving antenna (Below 1GHz) & (Above 1-18GHz), which was mounted on the top of a variable-height antenna tower. The EUT was set 1meters away from the interference-receiving antenna (18-40GHz).
 - e. 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.
 - f. 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.
 - g. 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.
 - h. The test-receiver system was set to peak and average detected 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 120 kHz & 360kHz for Quasi-peak detection (QP) at frequency below 1 GHz.
2. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth =3 MHz for Peak detection (PK) at frequency above 1GHz.
3. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth = $1/T$ for Average (Duty cycle < 98 %) detection at frequency above 1 GHz.
4. The resolution bandwidth of test receiver/spectrum analyzer is 1MHz and the video bandwidth is =10Hz (Duty cycle $\geq 98\%$) for Average detection (AV) at frequency above 1GHz.
5. All modes of operation were investigated and the worst-case emissions are reported.

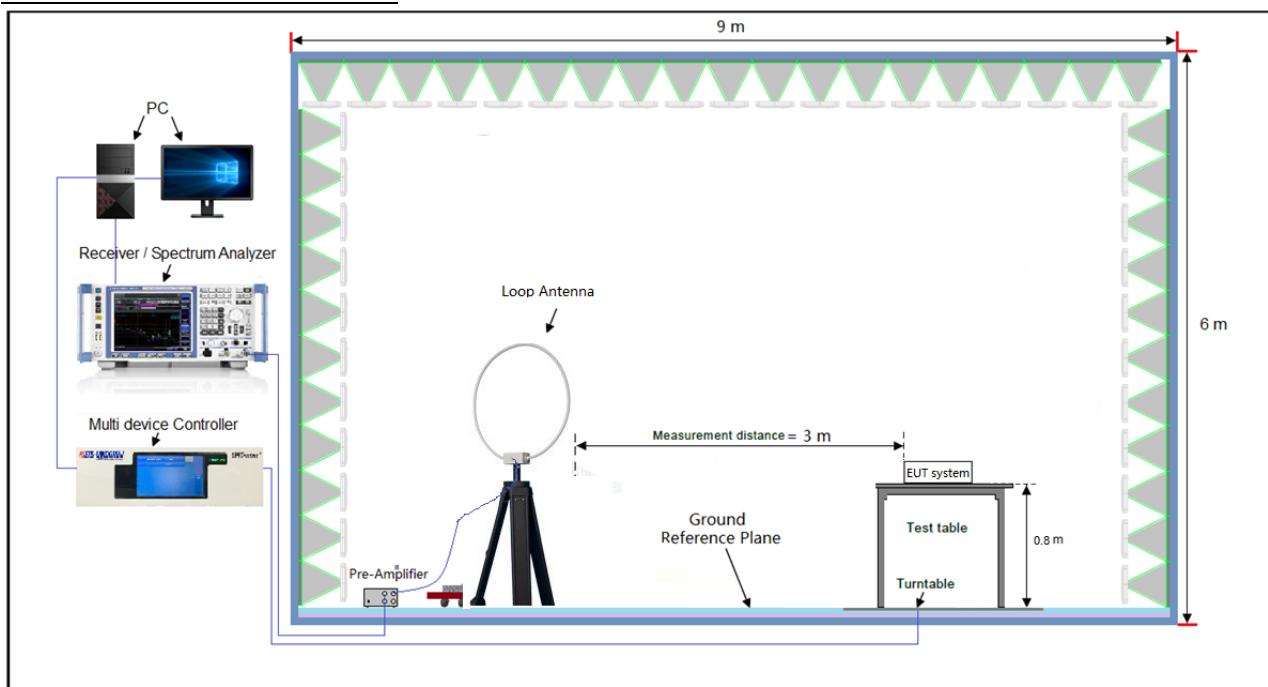
3.1.4 Deviation from Test Standard

No deviation.

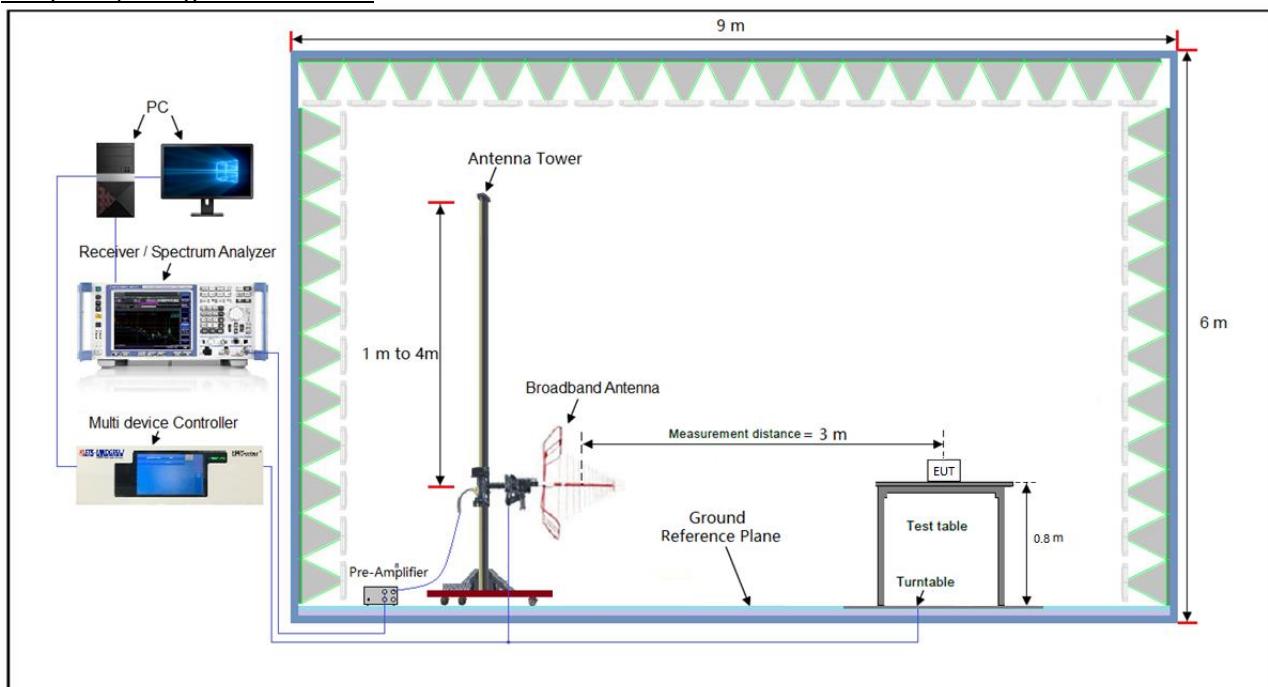


3.1.5 Test Setup

Radiated emission below 30MHz:

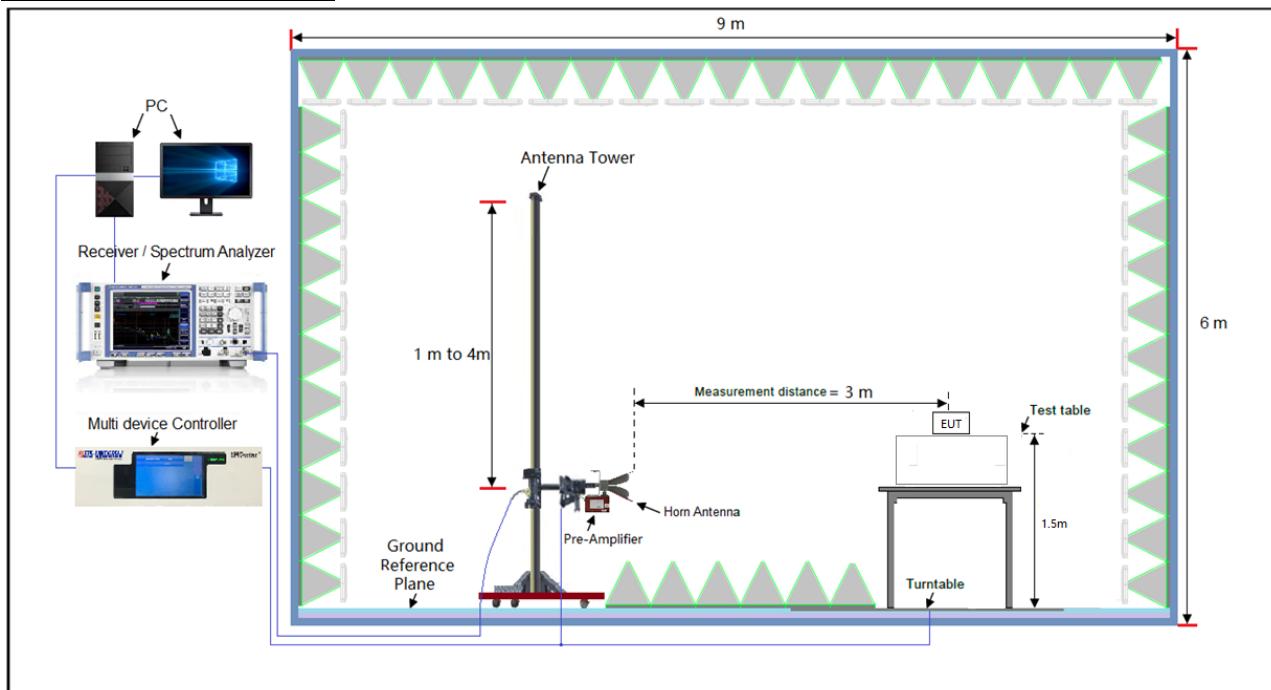


Frequency Range below 1GHz:

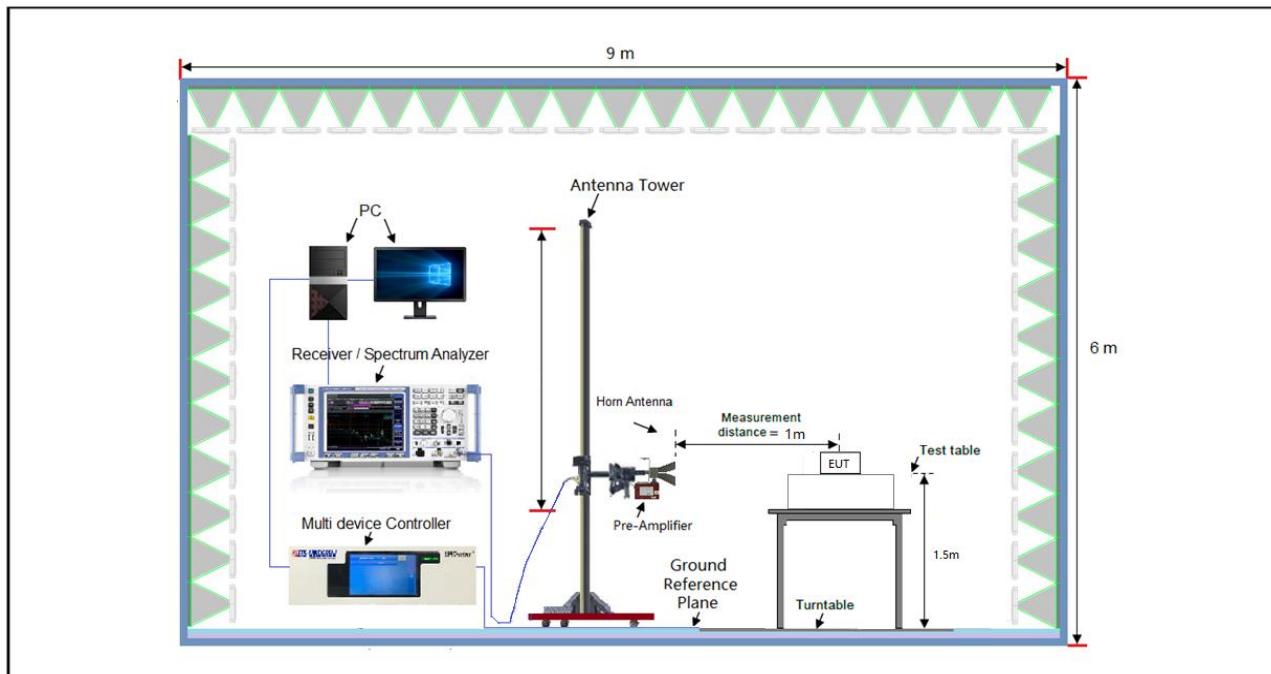




Frequency Range 1-18GHz:



Frequency Range 18-40GHz:



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

3.1.6 EUT Operating Conditions

- Placed the EUT on the testing table.
- Set the EUT under transmission condition continuously at specific channel frequency.



3.1.7 Test Results

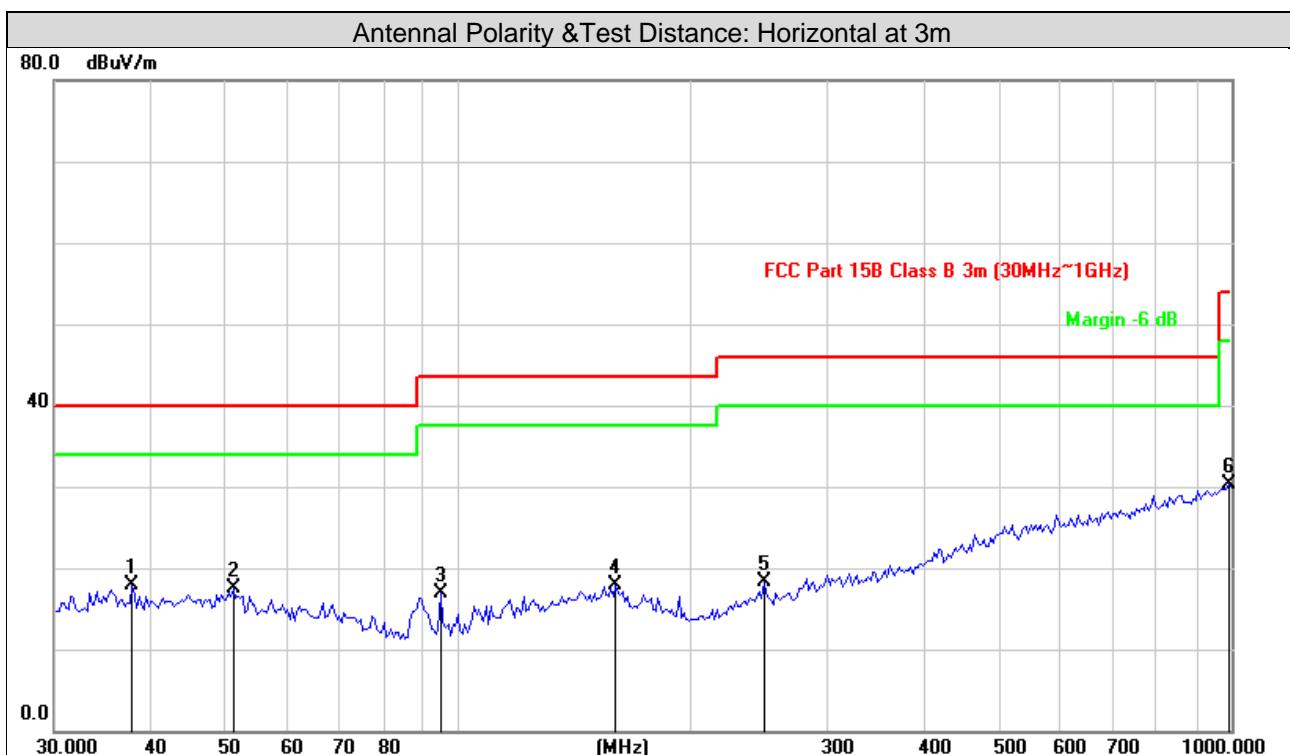
9kHz ~ 30MHz Data:

The amplitude of spurious emissions attenuated more than 20dB below the permissible value is not required to be report.

30MHz ~ 1GHz Worst-Case Data:

Left

Test Channel	Channel 0	Frequency Range	30MHz ~ 1GHz
Detector Function	Peak (PK) Quasi-peak (QP)	Tested By	Jim Xu

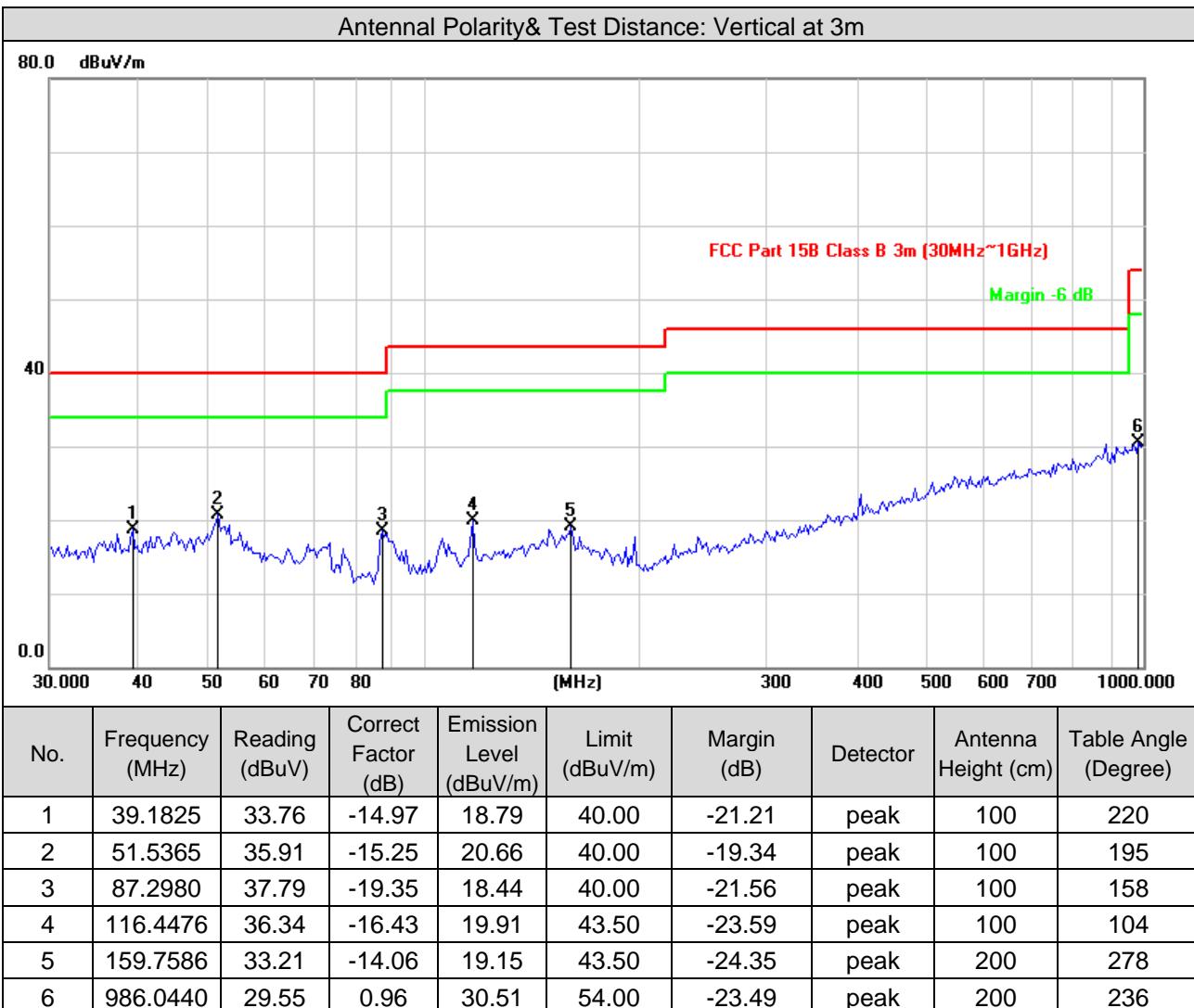


Remarks:

1. Emission Level = Read Level + Factor (Antenna Factor + Cable Loss - Preamp Factor)
2. Margin value = Emission level – Limit value



Test Channel	Channel 0	Frequency Range	30MHz ~ 1GHz
Detector Function	Peak (PK) Quasi-peak (QP)	Tested By	Jim Xu



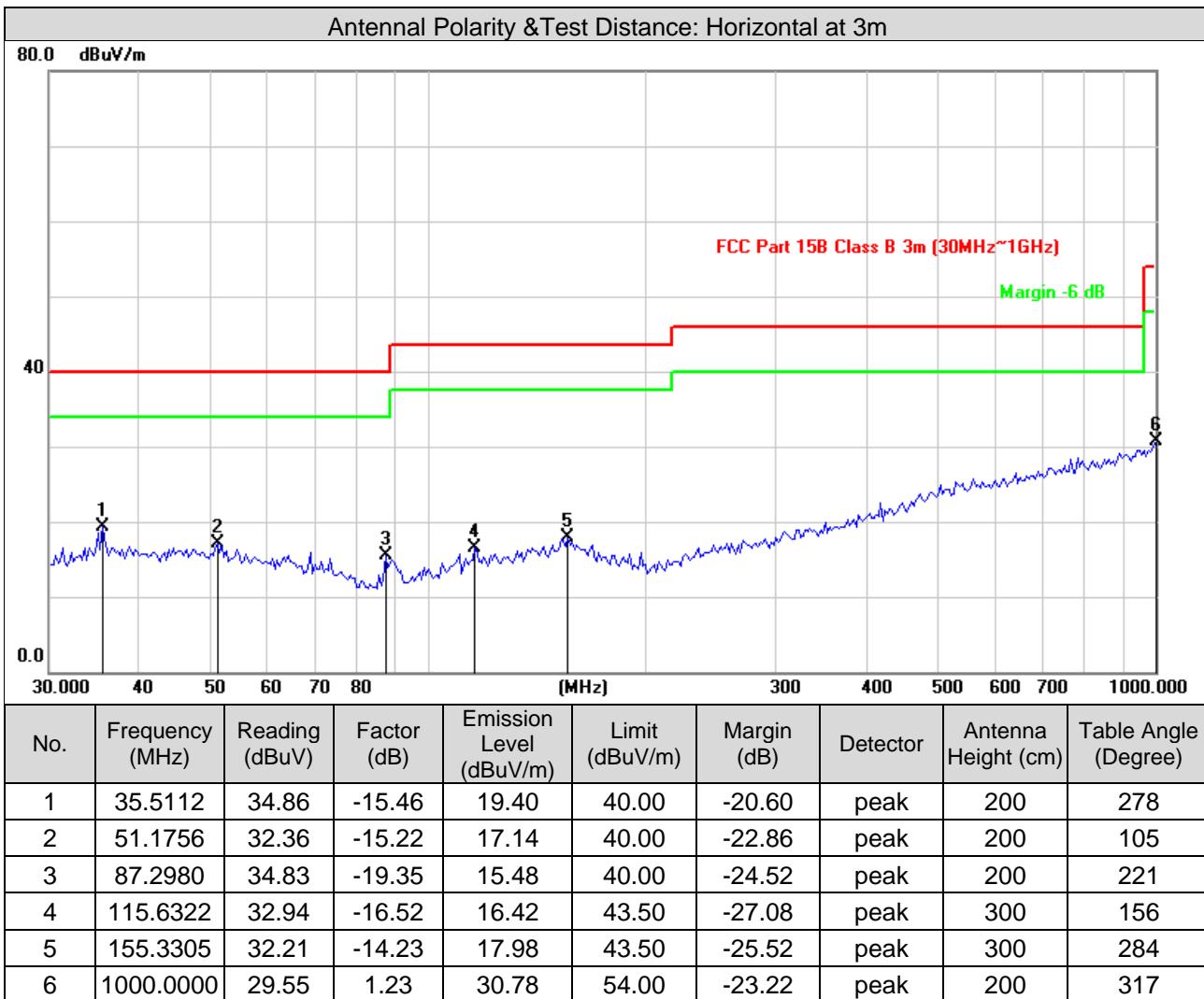
Remarks:

1. Emission Level = Read Level + Factor (Antenna Factor + Cable Loss - Preamp Factor)
2. Margin value = Emission level – Limit value



Right

Test Channel	Channel 0	Frequency Range	30MHz ~ 1GHz
Detector Function	Peak (PK) Quasi-peak (QP)	Tested By	Jim Xu

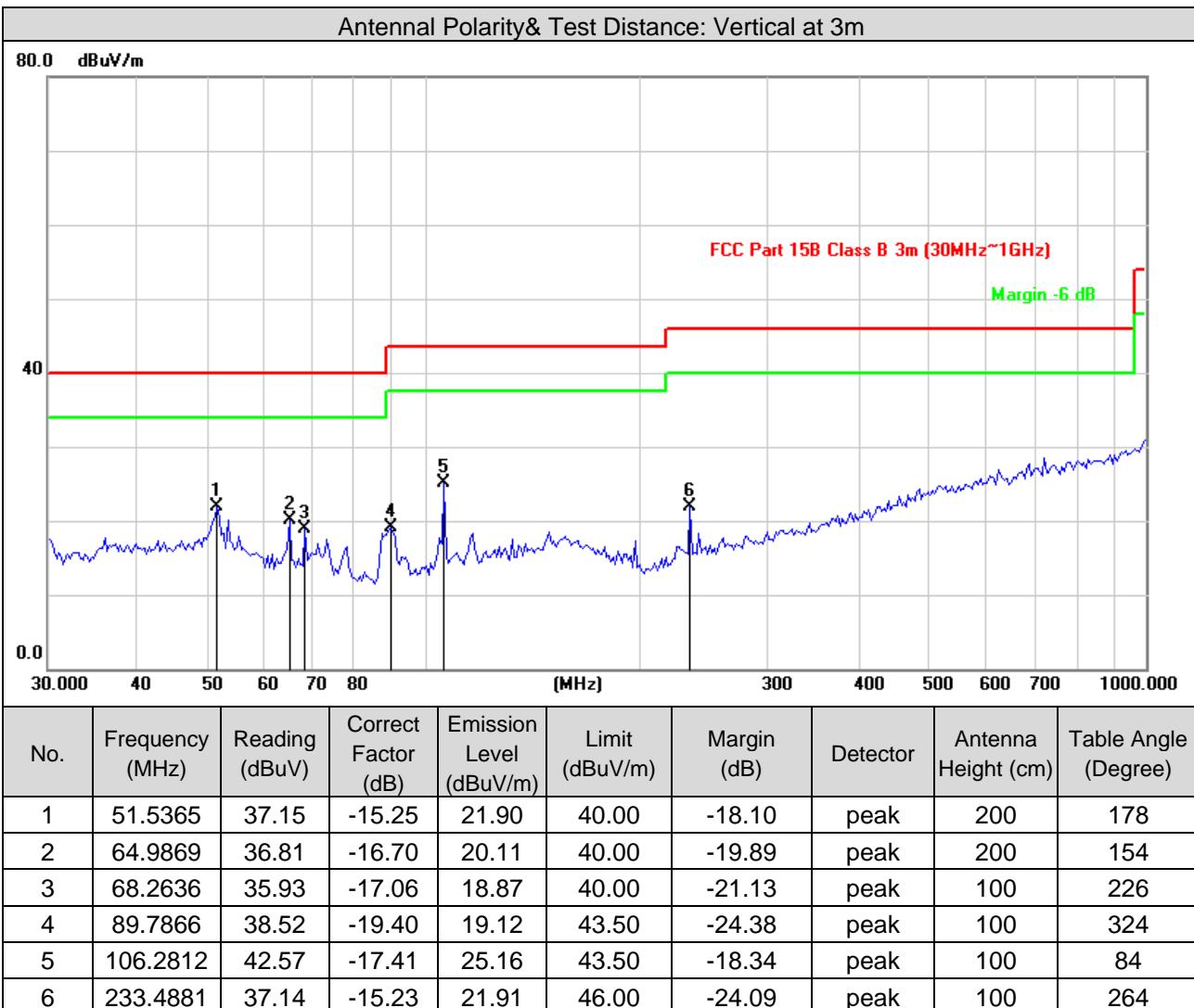


Remarks:

1. Emission Level = Read Level + Factor (Antenna Factor + Cable Loss - Preamp Factor)
2. Margin value = Emission level – Limit value



Test Channel	Channel 0	Frequency Range	30MHz ~ 1GHz
Detector Function	Peak (PK) Quasi-peak (QP)	Tested By	Jim Xu



Remarks:

1. Emission Level = Read Level + Factor (Antenna Factor + Cable Loss - Preamp Factor)
2. Margin value = Emission level – Limit value

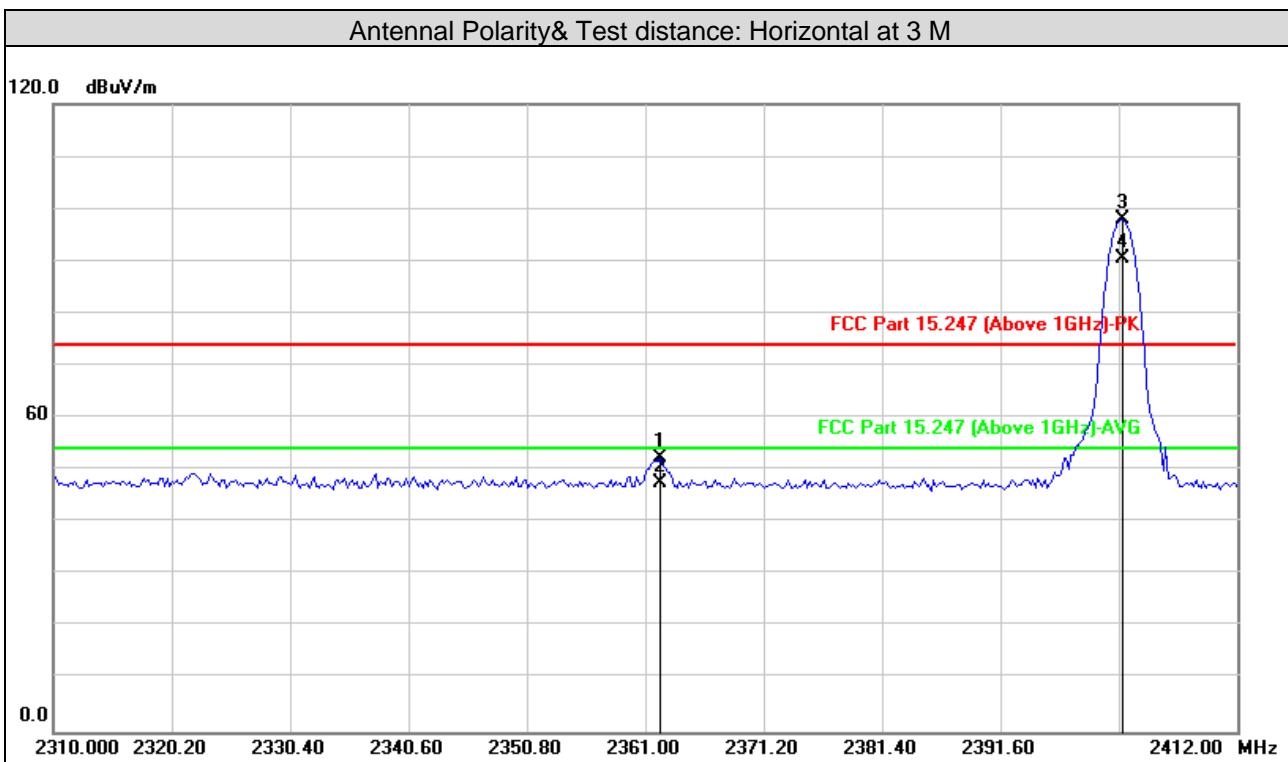


Above 1GHz Data:

Left

BLE-1Mbps

Test channel	Channel 0	Frequency Range	1GHz ~ 25GHz
Detector Function	Peak (PK) Average (AVG)	Tested By	King Ye



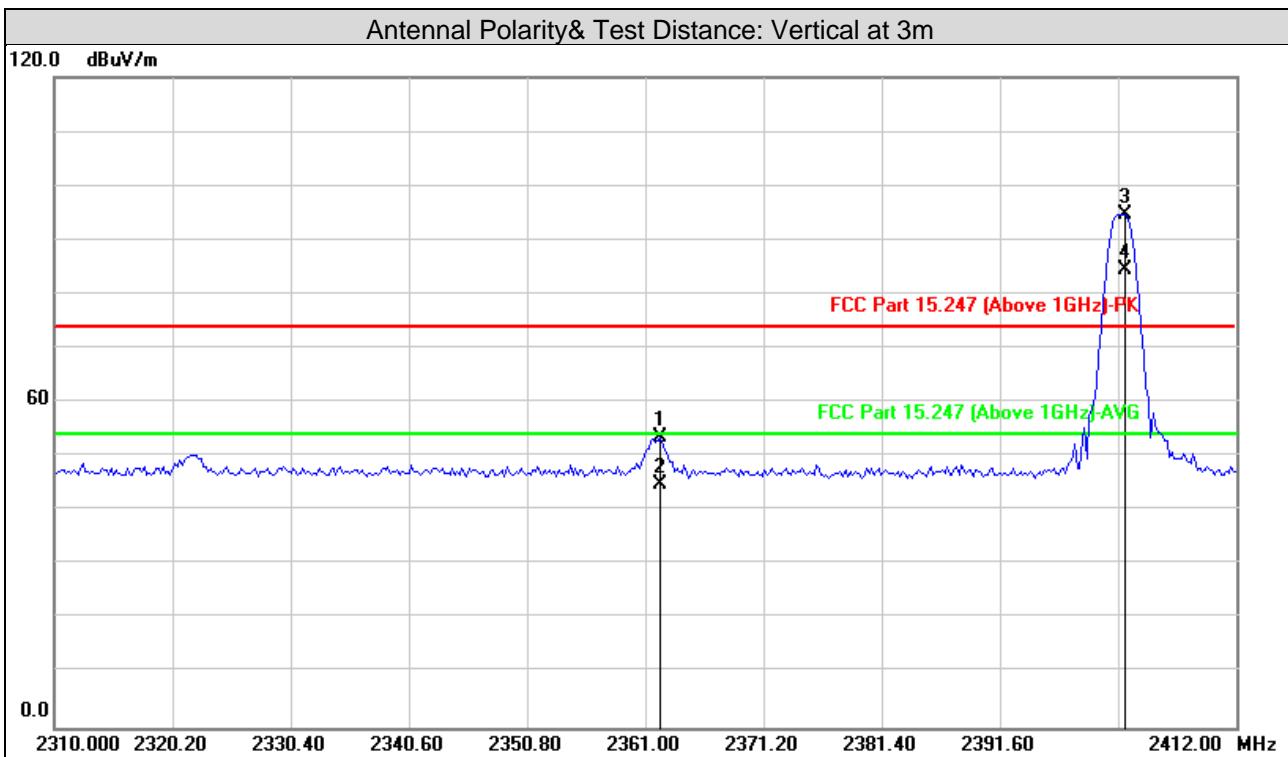
No.	Frequency (MHz)	Reading (dBuV)	Correct Factor (dB)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Antenna Height (cm)	Table Angle (Degree)
1	2362.329	51.69	0.79	52.48	74.00	-21.52	peak	100	240
2	2362.329	46.81	0.79	47.60	54.00	-6.40	AVG	100	240
3 #	2402.188	97.10	0.74	97.84			peak	100	240
4 #	2402.188	89.74	0.74	90.48			AVG	100	240
5	4804.000	39.75	7.27	47.02	74.00	-26.98	peak	100	185
6	4804.000	33.14	7.27	40.41	54.00	-13.59	AVG	100	185
7	7206.000	34.41	10.75	45.16	74.00	-28.84	peak	100	244
8	7206.000	21.81	10.75	32.56	54.00	-21.44	AVG	100	244

Remarks:

1. Emission Level = Read Level + Factor (Antenna Factor + Cable Loss - Preamp Factor)
2. Margin value = Emission level – Limit value
3. #2402MHz: Fundamental frequency.



Test channel	Channel 0	Frequency Range	1GHz ~ 25GHz
Detector Function	Peak (PK) Average (AVG)	Tested By	King Ye



No.	Frequency (MHz)	Reading (dBuV)	Correct Factor (dB)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Antenna Height (cm)	Table Angle (Degree)
1	2362.329	52.62	0.79	53.41	74.00	-20.59	peak	115	353
2	2362.329	44.08	0.79	44.87	54.00	-9.13	Avg	115	353
3 #	2402.393	93.85	0.74	94.59			peak	115	353
4 #	2402.393	83.72	0.74	84.46			Avg	115	353
5	4804.000	40.69	7.27	47.96	74.00	-26.04	peak	100	274
6	4804.000	29.09	7.27	36.36	54.00	-17.64	Avg	100	274
7	7206.000	34.34	10.75	45.09	74.00	-28.91	peak	100	210
8	7206.000	21.42	10.75	32.17	54.00	-21.83	Avg	100	210

Remarks:

1. Emission Level = Read Level + Factor (Antenna Factor + Cable Loss - Preamp Factor)
2. Margin value = Emission level – Limit value
3. #2402MHz: Fundamental frequency.



Test channel	Channel 19	Frequency Range	1GHz ~ 25GHz
Detector Function	Peak (PK) Average (AVG)	Tested By	King Ye

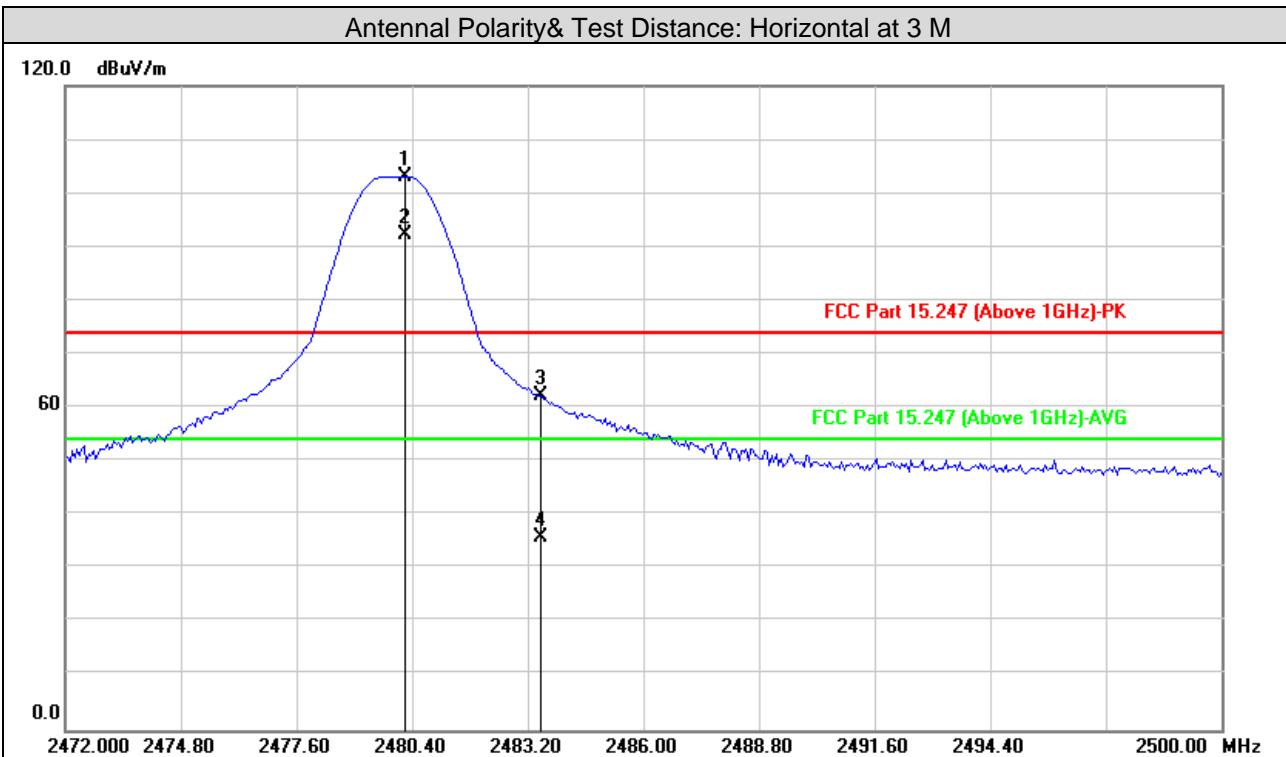
Antennal Polarity& Test Distance: Horizontal at 3m									
No.	Frequency (MHz)	Reading (dBuV)	Correct Factor (dB)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Antenna Height (cm)	Table Angle (Degree)
1#	2440.000	100.07	0.69	100.76			peak	100	284
2#	2440.000	94.75	0.69	95.44			AVG	100	284
3	4880.000	39.72	7.60	47.32	74.00	-26.68	peak	100	64
4	4880.000	29.96	7.60	37.56	54.00	-16.44	AVG	100	64
5	7320.000	33.74	10.92	44.66	74.00	-29.34	peak	100	158
6	7320.000	23.49	10.92	34.41	54.00	-19.59	AVG	100	158
Antennal Polarity& Test Distance: Vertical at 3 M									
No.	Frequency (MHz)	Reading (dBuV)	Factor (dB)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Antenna Height (cm)	Table Angle (Degree)
1#	2440.000	93.05	0.69	93.74			peak	100	220
2#	2440.000	83.37	0.69	84.06			AVG	100	220
3	4880.000	39.62	7.60	47.22	74.00	-26.78	peak	100	133
4	4880.000	28.18	7.60	35.78	54.00	-18.22	AVG	100	133
5	7320.000	34.79	10.92	45.71	74.00	-28.29	peak	100	201
6	7320.000	22.03	10.92	32.95	54.00	-21.05	AVG	100	201

Remarks:

1. Emission Level = Read Level + Factor (Antenna Factor + Cable Loss - Preamp Factor)
2. Margin value = Emission level – Limit value
3. #2440MHz: Fundamental frequency.



Test channel	Channel 39	Frequency Range	1GHz ~ 25GHz
Detector Function	Peak (PK) Average (AVG)	Tested By	King Ye



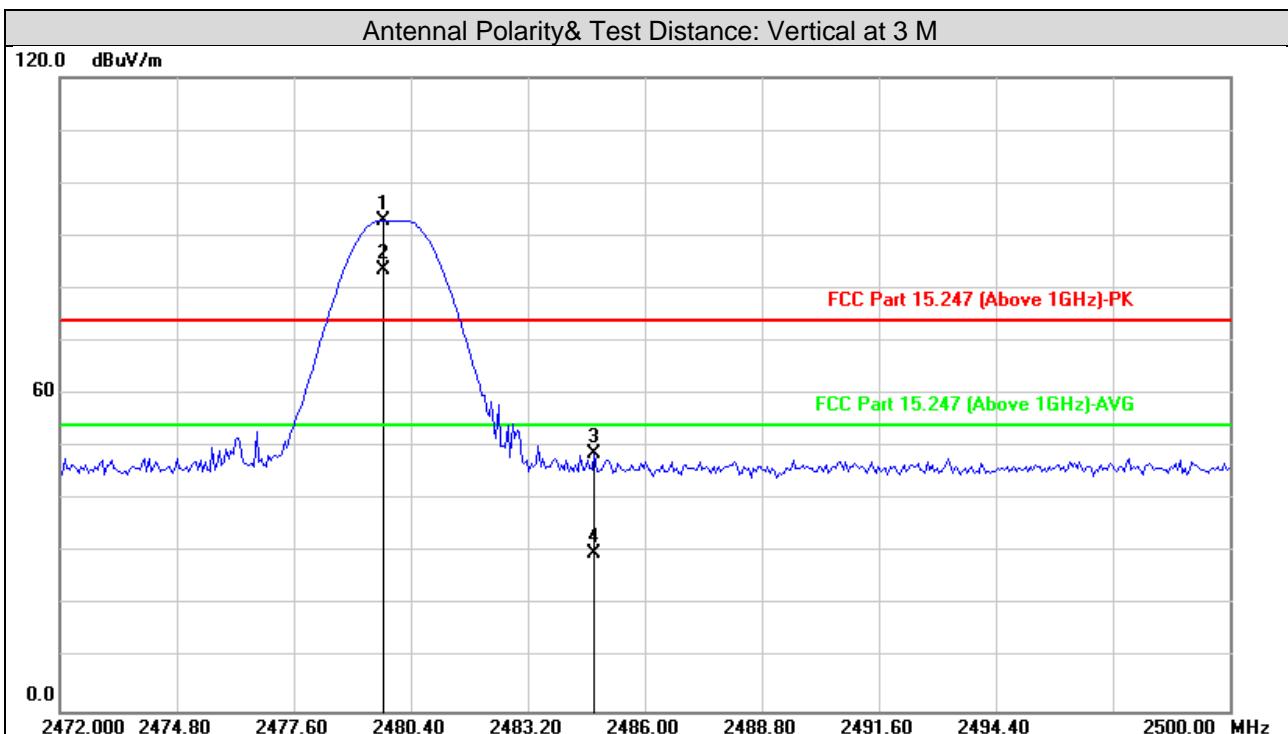
No.	Frequency (MHz)	Reading (dBuV)	Correct Factor (dB)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Antenna Height (cm)	Table Angle (Degree)
1#	2480.249	102.49	0.64	103.13			peak	100	100
2#	2480.249	91.71	0.64	92.35			Avg	100	100
3	2483.500	61.60	0.63	62.23	74.00	-11.77	peak	100	100
4	2483.500	35.36	0.63	35.99	54.00	-18.01	Avg	100	100
5	4960.000	39.27	7.94	47.21	74.00	-26.79	peak	100	228
6	4960.000	27.33	7.94	35.27	54.00	-18.73	Avg	100	228
7	7440.000	33.20	11.09	44.29	74.00	-29.71	peak	100	195
8	7440.000	25.65	11.09	36.74	54.00	-17.26	Avg	100	195

Remarks:

1. Emission Level = Read Level + Factor (Antenna Factor + Cable Loss - Preamp Factor)
2. Margin value = Emission level – Limit value
3. #2480MHz: Fundamental frequency.



Test channel	Channel 39	Frequency Range	1GHz ~ 25GHz
Detector Function	Peak (PK) Average (AVG)	Tested By	King Ye



No.	Frequency (MHz)	Reading (dBuV)	Correct Factor (dB)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Antenna Height (cm)	Table Angle (Degree)
1#	2479.744	92.34	0.64	92.98			peak	115	238
2#	2479.744	83.00	0.64	83.64			Avg	115	238
3	2484.794	48.01	0.63	48.64	74.00	-25.36	peak	115	238
4	2484.794	29.25	0.63	29.88	54.00	-24.12	Avg	115	238
5	4960.000	38.81	7.94	46.75	74.00	-27.25	peak	100	117
6	4960.000	26.15	7.94	34.09	54.00	-19.91	Avg	100	117
7	7440.000	34.89	11.09	45.98	74.00	-28.02	peak	100	199
8	7440.000	22.45	11.09	33.54	54.00	-20.46	Avg	100	199

Remarks:

1. Emission Level = Read Level + Factor (Antenna Factor + Cable Loss - Preamp Factor)

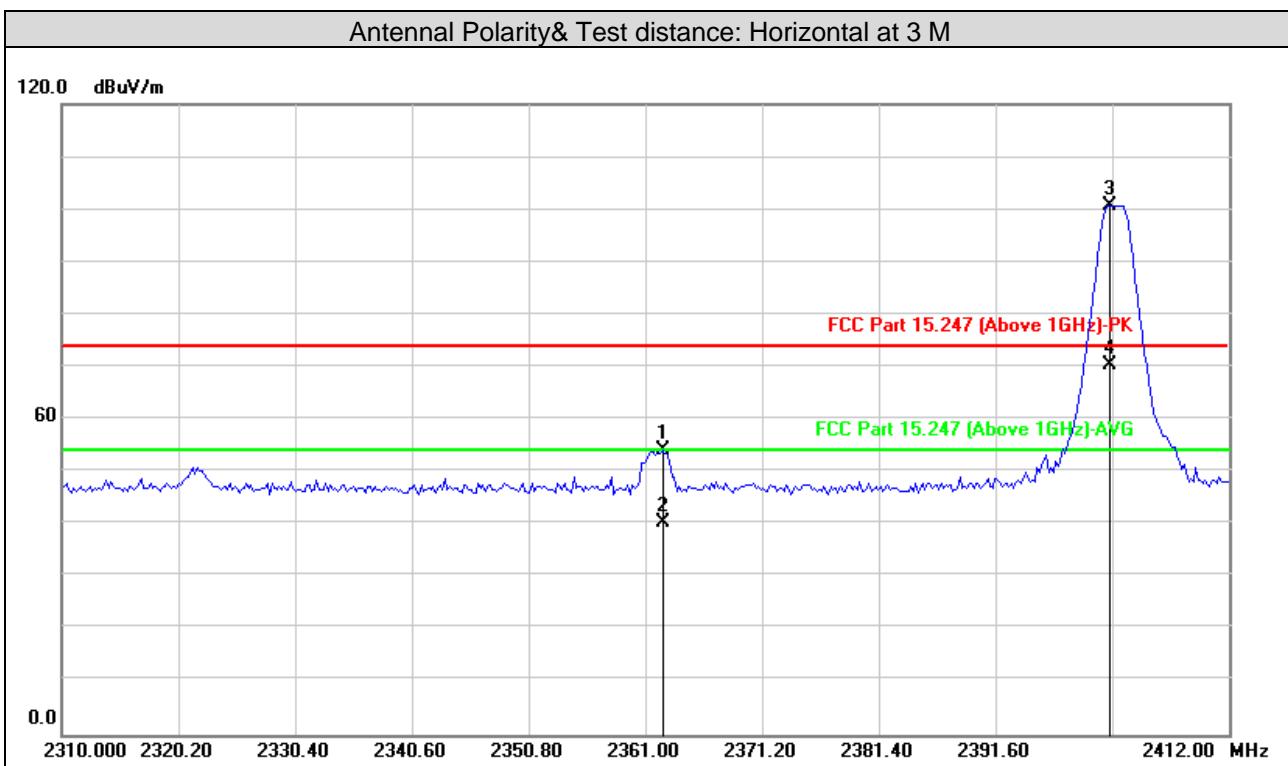
2. Margin value = Emission level – Limit value

3. #2480MHz: Fundamental frequency.



BLE-2Mbps

Test channel	Channel 0	Frequency Range	1GHz ~ 25GHz
Detector Function	Peak (PK) Average (AVG)	Tested By	King Ye



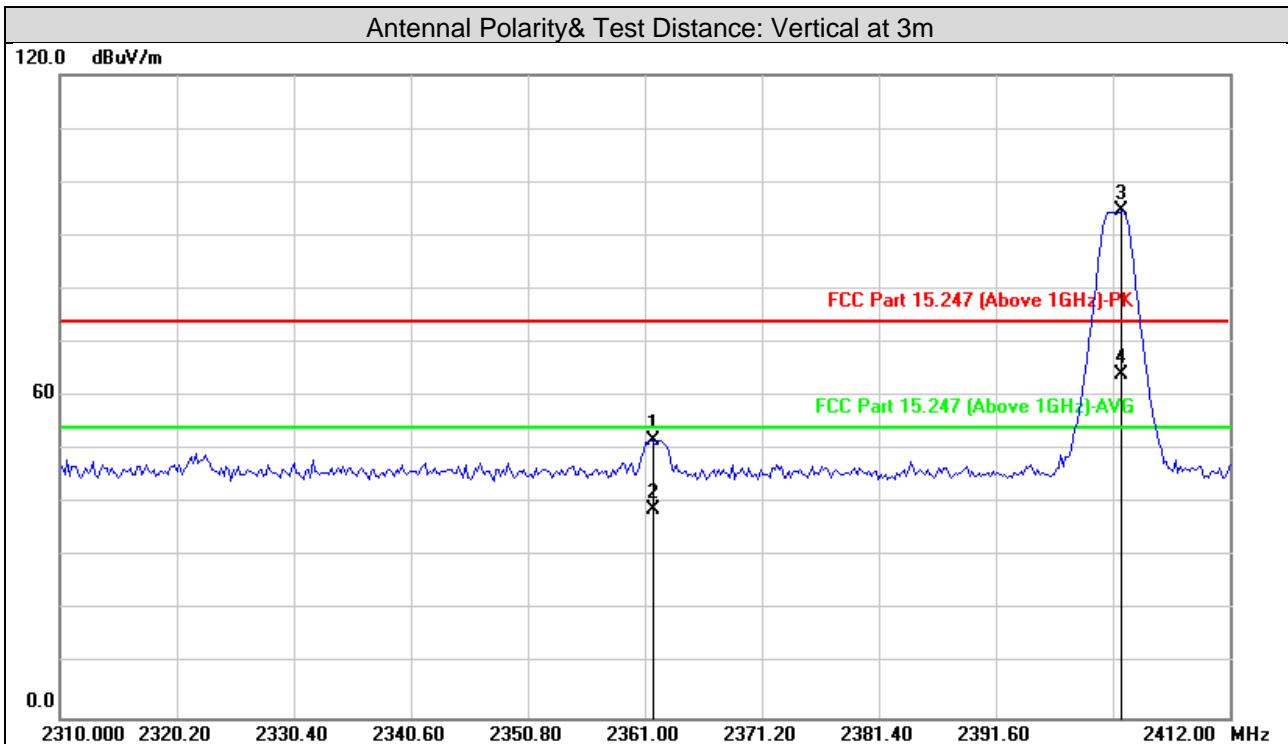
No.	Frequency (MHz)	Reading (dBuV)	Correct Factor (dB)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Antenna Height (cm)	Table Angle (Degree)
1	2362.533	53.38	0.79	54.17	74.00	-19.83	peak	101	240
2	2362.533	39.54	0.79	40.33	54.00	-13.67	AVG	101	240
3 #	2401.575	99.97	0.75	100.72			peak	101	240
4 #	2401.575	69.51	0.75	70.26			AVG	101	240
5	4804.000	39.18	7.27	46.45	74.00	-27.55	peak	100	155
6	4804.000	26.02	7.27	33.29	54.00	-20.71	AVG	100	155
7	7206.000	34.15	10.75	44.90	74.00	-29.10	peak	100	267
8	7206.000	21.69	10.75	32.44	54.00	-21.56	AVG	100	267

Remarks:

1. Emission Level = Read Level + Factor (Antenna Factor + Cable Loss - Preamp Factor)
2. Margin value = Emission level – Limit value
3. #2402MHz: Fundamental frequency.



Test channel	Channel 0	Frequency Range	1GHz ~ 25GHz
Detector Function	Peak (PK) Average (AVG)	Tested By	King Ye



No.	Frequency (MHz)	Reading (dBuV)	Correct Factor (dB)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Antenna Height (cm)	Table Angle (Degree)
1	2361.715	50.97	0.80	51.77	74.00	-22.23	peak	115	353
2	2361.715	37.93	0.80	38.73	54.00	-15.27	Avg	115	353
3 #	2402.597	93.81	0.74	94.55			peak	115	353
4 #	2402.597	63.43	0.74	64.17			Avg	115	353
5	4804.000	41.14	7.27	48.41	74.00	-25.59	peak	100	81
6	4804.000	27.50	7.27	34.77	54.00	-19.23	Avg	100	81
7	7206.000	35.72	10.75	46.47	74.00	-27.53	peak	100	117
8	7206.000	21.69	10.75	32.44	54.00	-21.56	Avg	100	117

Remarks:

1. Emission Level = Read Level + Factor (Antenna Factor + Cable Loss - Preamp Factor)

2. Margin value = Emission level – Limit value

3. #2402MHz: Fundamental frequency.



Test channel	Channel 19	Frequency Range	1GHz ~ 25GHz
Detector Function	Peak (PK) Average (AVG)	Tested By	Jim Xu

Antennal Polarity& Test Distance: Horizontal at 3m									
No.	Frequency (MHz)	Reading (dBuV)	Correct Factor (dB)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Antenna Height (cm)	Table Angle (Degree)
1#	2440.000	100.53	0.69	101.22			peak	100	101
2#	2440.000	70.16	0.69	70.85			AVG	100	101
3	4880.000	39.95	7.60	47.55	74.00	-26.45	peak	100	231
4	4880.000	26.37	7.60	33.97	54.00	-20.03	AVG	100	231
5	7320.000	33.95	10.92	44.87	74.00	-29.13	peak	100	188
6	7320.000	22.77	10.92	33.69	54.00	-20.31	AVG	100	188
Antennal Polarity& Test Distance: Vertical at 3 M									
No.	Frequency (MHz)	Reading (dBuV)	Factor (dB)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Antenna Height (cm)	Table Angle (Degree)
1#	2440.000	94.22	0.69	94.91			peak	100	277
2#	2440.000	64.63	0.69	65.32			AVG	100	277
3	4880.000	40.32	7.60	47.92	74.00	-26.08	peak	100	145
4	4880.000	27.10	7.60	34.70	54.00	-19.30	AVG	100	145
5	7320.000	35.15	10.92	46.07	74.00	-27.93	peak	100	210
6	7320.000	21.53	10.92	32.45	54.00	-21.55	AVG	100	210

Remarks:

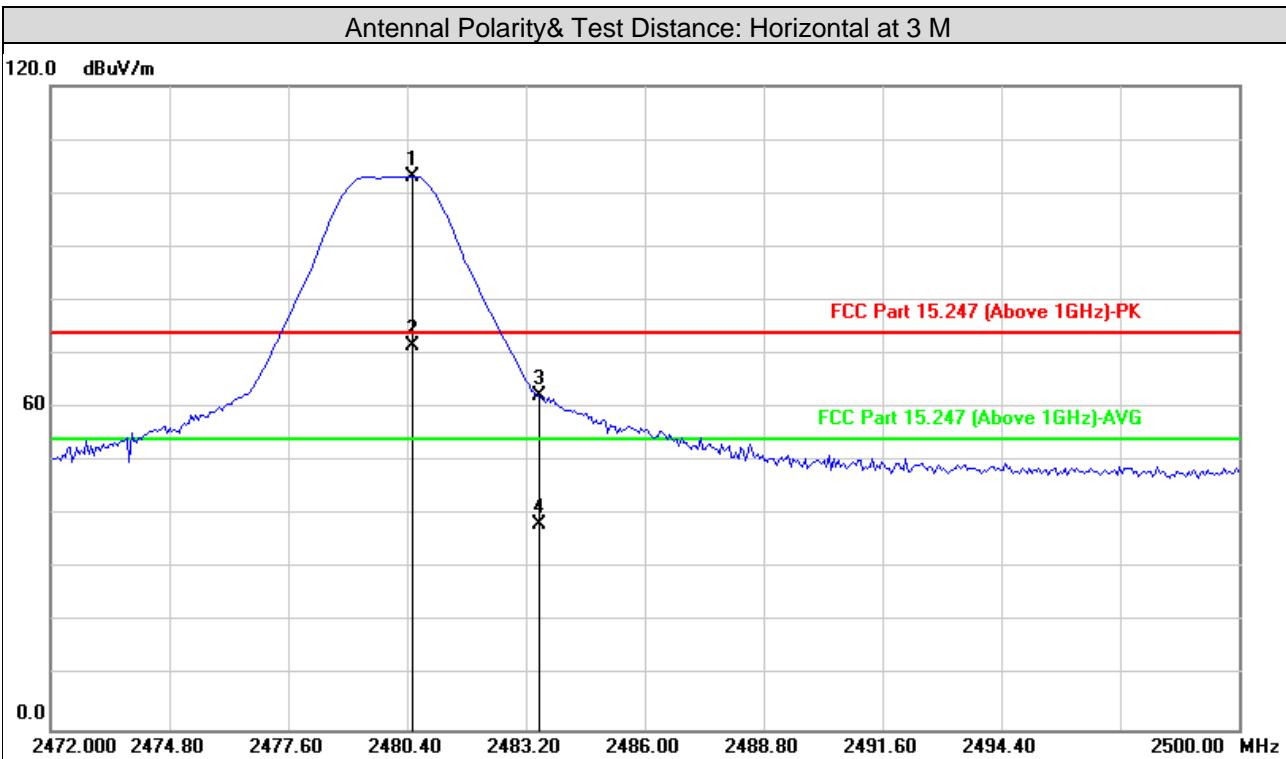
1.Emission Level = Read Level + Factor (Antenna Factor + Cable Loss - Preamp Factor)

2.Margin value = Emission level – Limit value

3.#2440MHz: Fundamental frequency.



Test channel	Channel 39	Frequency Range	1GHz ~ 25GHz
Detector Function	Peak (PK) Average (AVG)	Tested By	King Ye



No.	Frequency (MHz)	Reading (dBuV)	Correct Factor (dB)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Antenna Height (cm)	Table Angle (Degree)
1#	2480.529	102.56	0.64	103.20			peak	100	101
2#	2480.529	70.82	0.64	71.46			Avg	100	101
3	2483.500	61.54	0.63	62.17	74.00	-11.83	peak	100	101
4	2483.500	37.61	0.63	38.24	54.00	-15.76	Avg	100	101
5	4960.000	40.42	7.94	48.36	74.00	-25.64	peak	100	237
6	4960.000	26.17	7.94	34.11	54.00	-19.89	Avg	100	237
7	7440.000	33.06	11.09	44.15	74.00	-29.85	peak	100	202
8	7440.000	24.57	11.09	35.66	54.00	-18.34	Avg	100	202

Remarks:

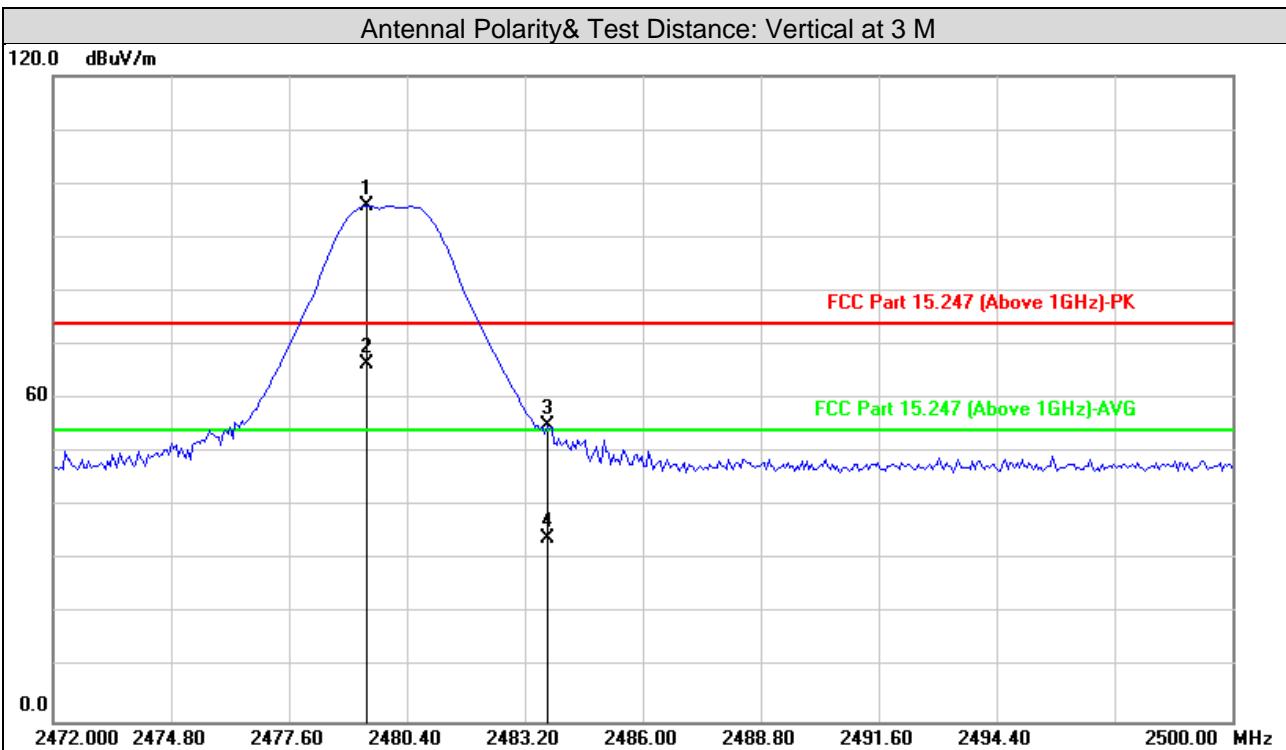
1.Emission Level = Read Level + Factor (Antenna Factor + Cable Loss - Preamp Factor)

2.Margin value = Emission level – Limit value

3.#2480MHz: Fundamental frequency.



Test channel	Channel 39	Frequency Range	1GHz ~ 25GHz
Detector Function	Peak (PK) Average (AVG)	Tested By	King Ye



No.	Frequency (MHz)	Reading (dBuV)	Correct Factor (dB)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Antenna Height (cm)	Table Angle (Degree)
1#	2479.463	95.17	0.64	95.81	74.00	21.81	peak	100	237
2#	2479.463	65.76	0.64	66.40	54.00	12.40	AVG	100	237
3	2483.727	54.50	0.63	55.13	74.00	-18.87	peak	100	237
4	2483.727	33.38	0.63	34.01	54.00	-19.99	AVG	100	237
5	4960.000	39.59	7.94	47.53	74.00	-26.47	peak	100	268
6	4960.000	26.71	7.94	34.65	54.00	-19.35	AVG	100	268
7	7440.000	34.76	11.09	45.85	74.00	-28.15	peak	100	278
8	7440.000	21.39	11.09	32.48	54.00	-21.52	AVG	100	278

Remarks:

1.Emission Level = Read Level + Factor (Antenna Factor + Cable Loss - Preamp Factor)

2.Margin value = Emission level – Limit value

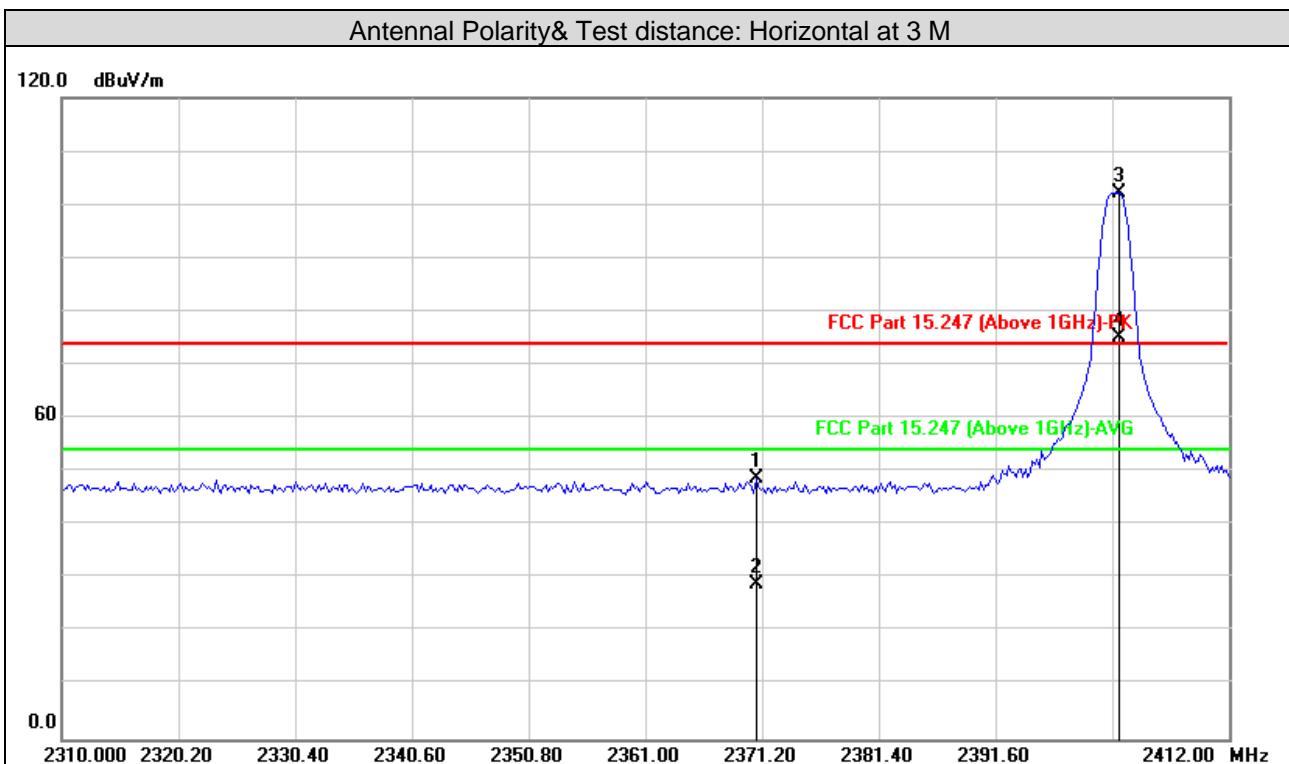
3.#2480MHz: Fundamental frequency.



Right

BLE-1Mbps

Test channel	Channel 0	Frequency Range	1GHz ~ 25GHz
Detector Function	Peak (PK) Average (AVG)	Tested By	King Ye



No.	Frequency (MHz)	Reading (dBuV)	Correct Factor (dB)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Antenna Height (cm)	Table Angle (Degree)
1	2370.709	47.86	0.78	48.64	74.00	-25.36	peak	100	200
2	2370.709	28.31	0.78	29.09	54.00	-24.91	Avg	100	200
3 #	2402.393	101.50	0.74	102.24			peak	100	200
4 #	2402.393	74.51	0.74	75.25			Avg	100	200
5	4804.000	47.23	7.27	54.50	74.00	-19.50	peak	100	239
6	4804.000	40.20	7.27	47.47	54.00	-6.53	Avg	100	239
7	7206.000	35.23	10.75	45.98	74.00	-28.02	peak	100	265
8	7206.000	22.00	10.75	32.75	54.00	-21.25	Avg	100	265

Remarks:

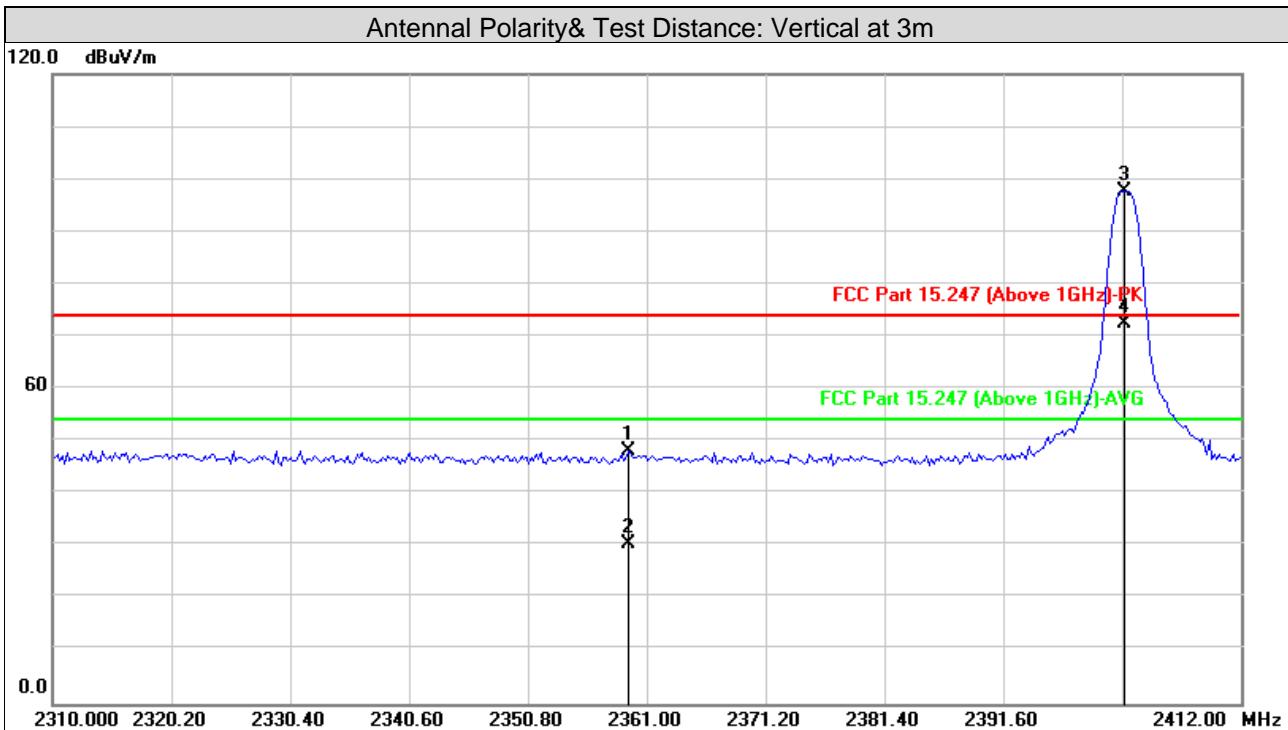
1. Emission Level = Read Level + Factor (Antenna Factor + Cable Loss - Preamp Factor)

2. Margin value = Emission level – Limit value

3. #2402MHz: Fundamental frequency.



Test channel	Channel 0	Frequency Range	1GHz ~ 25GHz
Detector Function	Peak (PK) Average (AVG)	Tested By	King Ye



No.	Frequency (MHz)	Reading (dBuV)	Correct Factor (dB)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Antenna Height (cm)	Table Angle (Degree)
1	2359.467	47.42	0.80	48.22	74.00	-25.78	peak	100	45
2	2359.467	29.63	0.80	30.43	54.00	-23.57	Avg	100	45
3 #	2401.984	96.95	0.75	97.70			peak	100	45
4 #	2401.984	71.83	0.75	72.58			Avg	100	45
5	4804.000	36.68	7.27	43.95	74.00	-30.05	peak	100	210
6	4804.000	32.28	7.27	39.55	54.00	-14.45	Avg	100	210
7	7206.000	35.21	10.75	45.96	74.00	-28.04	peak	100	111
8	7206.000	22.18	10.75	32.93	54.00	-21.07	Avg	100	111

Remarks:

1. Emission Level = Read Level + Factor (Antenna Factor + Cable Loss - Preamp Factor)

2. Margin value = Emission level – Limit value

3. #2402MHz: Fundamental frequency.



Test channel	Channel 19	Frequency Range	1GHz ~ 25GHz
Detector Function	Peak (PK) Average (AVG)	Tested By	Jim Xu

Antennal Polarity& Test Distance: Horizontal at 3m									
No.	Frequency (MHz)	Reading (dBuV)	Correct Factor (dB)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Antenna Height (cm)	Table Angle (Degree)
1#	2440.000	103.72	0.69	104.41			peak	100	188
2#	2440.000	85.22	0.69	85.91			AVG	100	188
3	4880.000	45.18	7.60	52.78	74.00	-21.22	peak	100	210
4	4880.000	38.52	7.60	46.12	54.00	-7.88	AVG	100	210
5	7320.000	35.21	10.92	46.13	74.00	-27.87	peak	100	117
6	7320.000	22.16	10.92	33.08	54.00	-20.92	AVG	100	117
Antennal Polarity& Test Distance: Vertical at 3 M									
No.	Frequency (MHz)	Reading (dBuV)	Factor (dB)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Antenna Height (cm)	Table Angle (Degree)
1#	2440.000	97.57	0.69	98.26			peak	100	101
2#	2440.000	80.05	0.69	80.74			AVG	100	101
3	4880.000	40.06	7.60	47.66	74.00	-26.34	peak	100	263
4	4880.000	32.72	7.60	40.32	54.00	-13.68	AVG	100	263
5	7320.000	40.06	10.92	50.98	74.00	-23.02	peak	100	177
6	7320.000	23.54	10.92	34.46	54.00	-19.54	AVG	100	177

Remarks:

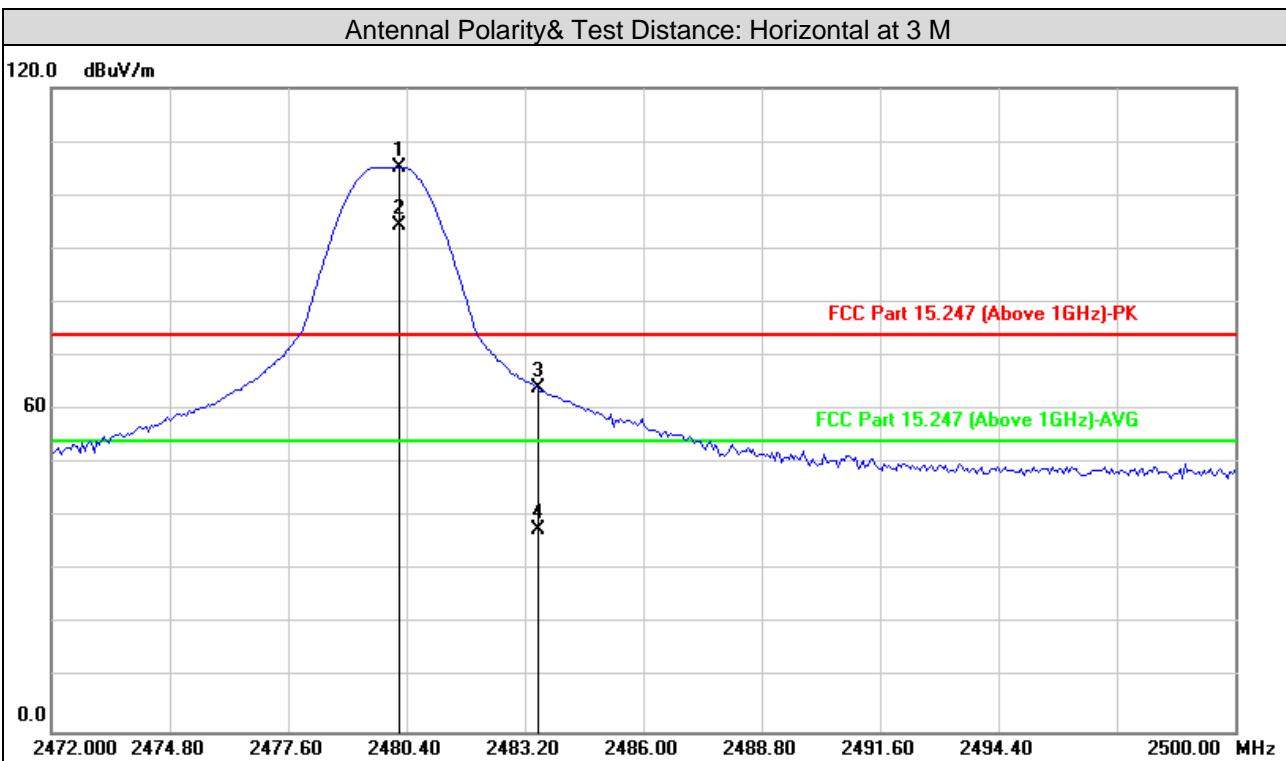
1.Emission Level = Read Level + Factor (Antenna Factor + Cable Loss - Preamp Factor)

2.Margin value = Emission level – Limit value

3.#2440MHz: Fundamental frequency.



Test channel	Channel 39	Frequency Range	1GHz ~ 25GHz
Detector Function	Peak (PK) Average (AVG)	Tested By	King Ye



No.	Frequency (MHz)	Reading (dBuV)	Correct Factor (dB)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Antenna Height (cm)	Table Angle (Degree)
1#	2480.249	104.58	0.64	105.22	74.00	31.22	peak	100	13
2#	2480.249	93.86	0.64	94.50	54.00	40.50	AVG	100	13
3	2483.500	63.54	0.63	64.17	74.00	-9.83	peak	100	13
4	2483.500	37.03	0.63	37.66	54.00	-16.34	AVG	100	13
5	4960.000	43.92	7.94	51.86	74.00	-22.14	peak	100	240
6	4960.000	37.08	7.94	45.02	54.00	-8.98	AVG	100	240
7	7440.000	35.80	11.09	46.89	74.00	-27.11	peak	100	102
8	7440.000	22.20	11.09	33.29	54.00	-20.71	AVG	100	102

Remarks:

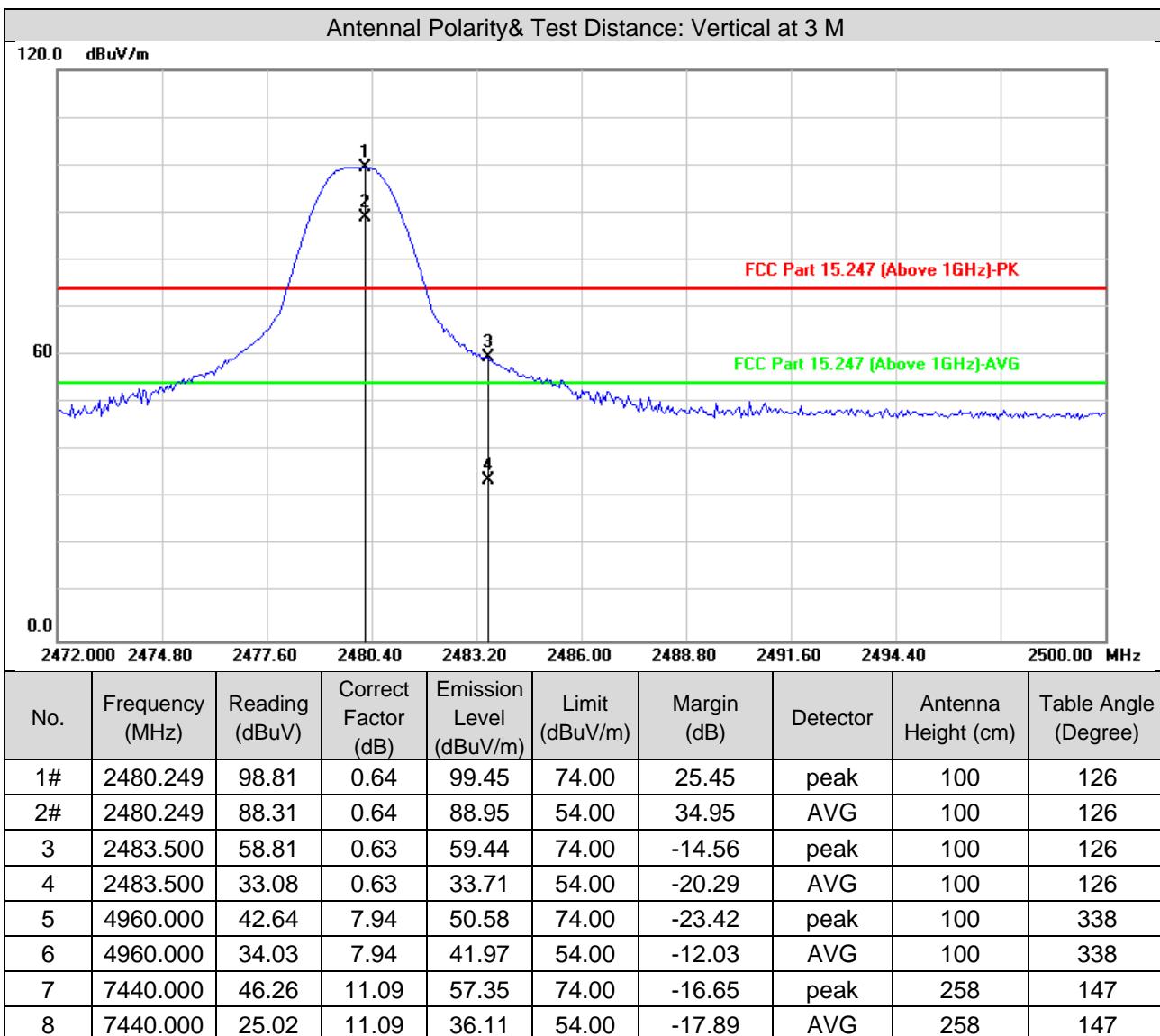
1.Emission Level = Read Level + Factor (Antenna Factor + Cable Loss - Preamp Factor)

2.Margin value = Emission level – Limit value

3.#2480MHz: Fundamental frequency.



Test channel	Channel 39	Frequency Range	1GHz ~ 25GHz
Detector Function	Peak (PK) Average (AVG)	Tested By	King Ye



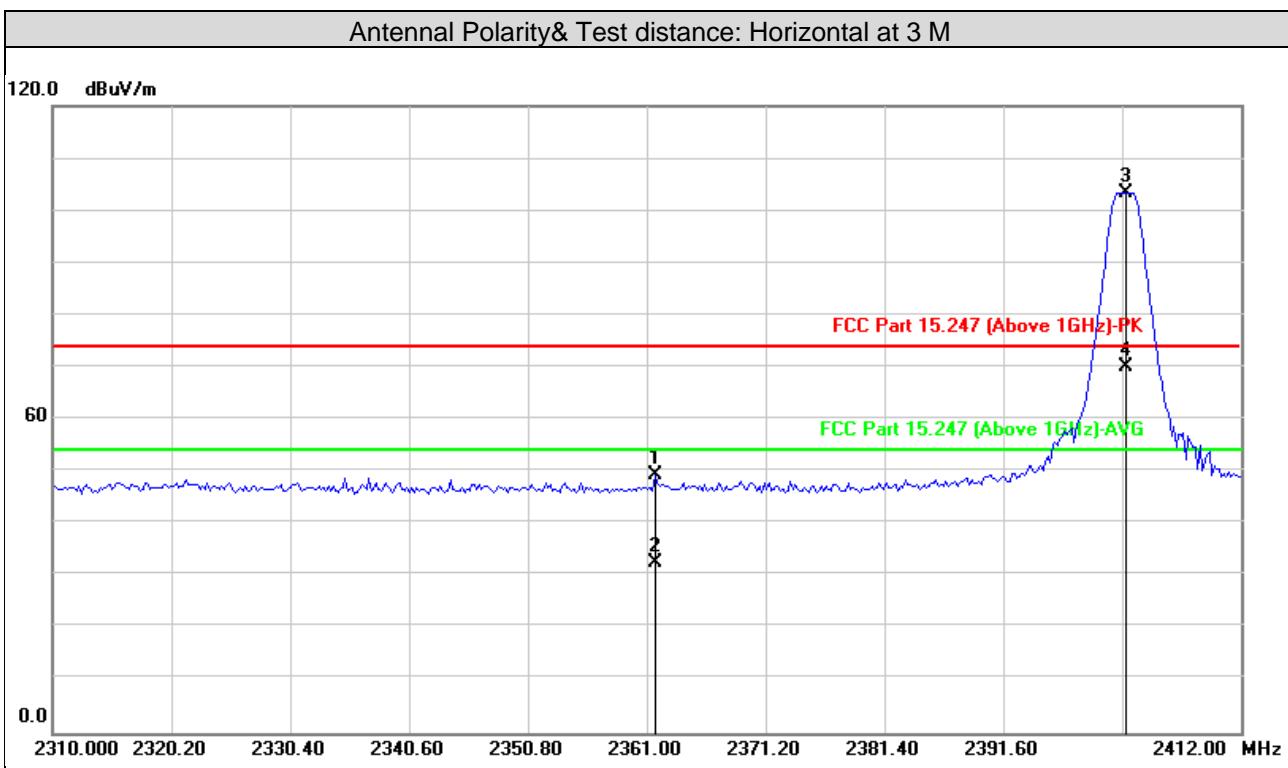
Remarks:

- 1.Emission Level = Read Level + Factor (Antenna Factor + Cable Loss - Preamp Factor)
- 2.Margin value = Emission level – Limit value
- 3.#2480MHz: Fundamental frequency.



BLE-2Mbps

Test channel	Channel 0	Frequency Range	1GHz ~ 25GHz
Detector Function	Peak (PK) Average (AVG)	Tested By	King Ye



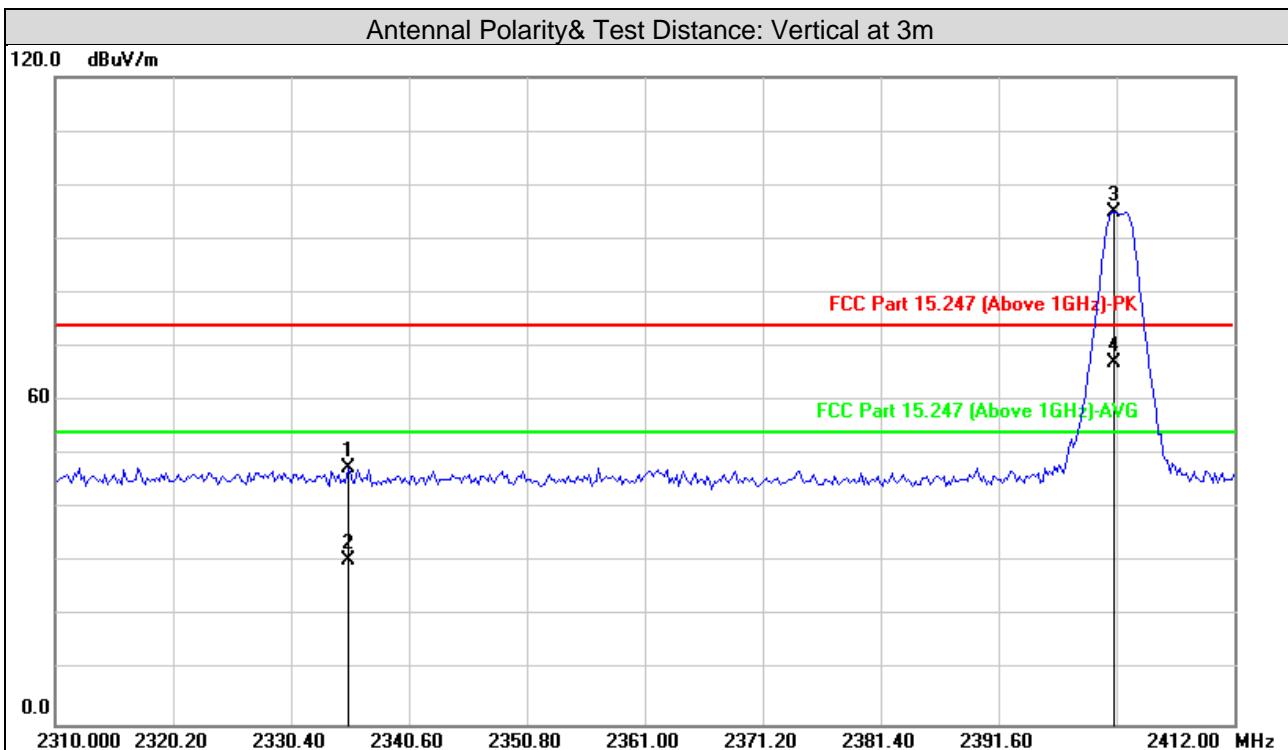
No.	Frequency (MHz)	Reading (dBuV)	Correct Factor (dB)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Antenna Height (cm)	Table Angle (Degree)
1	2361.715	48.43	0.80	49.23	74.00	-24.77	peak	100	199
2	2361.715	31.82	0.80	32.62	54.00	-21.38	AVG	100	199
3 #	2402.188	102.70	0.74	103.44			peak	100	199
4 #	2402.188	69.18	0.74	69.92			AVG	100	199
5	4804.000	46.32	7.27	53.59	74.00	-20.41	peak	120	234
6	4804.000	31.14	7.27	38.41	54.00	-15.59	AVG	120	234
7	7206.000	36.13	10.75	46.88	74.00	-27.12	peak	100	210
8	7206.000	22.93	10.75	33.68	54.00	-20.32	AVG	100	210

Remarks:

- 1.Emission Level = Read Level + Factor (Antenna Factor + Cable Loss - Preamp Factor)
- 2.Margin value = Emission level – Limit value
- 3.#2402MHz: Fundamental frequency.



Test channel	Channel 0	Frequency Range	1GHz ~ 25GHz
Detector Function	Peak (PK) Average (AVG)	Tested By	King Ye



No.	Frequency (MHz)	Reading (dBuV)	Correct Factor (dB)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Antenna Height (cm)	Table Angle (Degree)
1	2335.347	46.73	0.83	47.56	74.00	-26.44	peak	107	131
2	2335.347	29.60	0.83	30.43	54.00	-23.57	Avg	107	131
3 #	2401.575	94.19	0.75	94.94			peak	107	131
4 #	2401.575	66.27	0.75	67.02			Avg	107	131
5	4804.000	42.79	7.27	50.06	74.00	-23.94	peak	100	188
6	4804.000	28.48	7.27	35.75	54.00	-18.25	Avg	100	188
7	7206.000	37.90	10.75	48.65	74.00	-25.35	peak	100	122
8	7206.000	25.20	10.75	35.95	54.00	-18.05	Avg	100	122

Remarks:

- 1.Emission Level = Read Level + Factor (Antenna Factor + Cable Loss - Preamp Factor)
- 2.Margin value = Emission level – Limit value
- 3.#2402MHz: Fundamental frequency.



Test channel	Channel 19	Frequency Range	1GHz ~ 25GHz
Detector Function	Peak (PK) Average (AVG)	Tested By	Jim Xu

Antennal Polarity& Test Distance: Horizontal at 3m									
No.	Frequency (MHz)	Reading (dBuV)	Correct Factor (dB)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Antenna Height (cm)	Table Angle (Degree)
1#	2440.000	103.72	0.69	104.41			peak	100	94
2#	2440.000	70.00	0.69	70.69			AVG	100	94
3	4880.000	44.98	7.60	52.58	74.00	-21.42	peak	100	225
4	4880.000	30.27	7.60	37.87	54.00	-16.13	AVG	100	225
5	7320.000	35.07	10.92	45.99	74.00	-28.01	peak	100	188
6	7320.000	22.10	10.92	33.02	54.00	-20.98	AVG	100	188
Antennal Polarity& Test Distance: Vertical at 3 M									
No.	Frequency (MHz)	Reading (dBuV)	Factor (dB)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Antenna Height (cm)	Table Angle (Degree)
1#	2440.000	95.86	0.69	96.55			peak	100	48
2#	2440.000	68.12	0.69	68.81			AVG	100	48
3	4880.000	42.06	7.60	49.66	74.00	-24.34	peak	100	261
4	4880.000	27.57	7.60	35.17	54.00	-18.83	AVG	100	261
5	7320.000	36.69	10.92	47.61	74.00	-26.39	peak	100	115
6	7320.000	23.86	10.92	34.78	54.00	-19.22	AVG	100	115

Remarks:

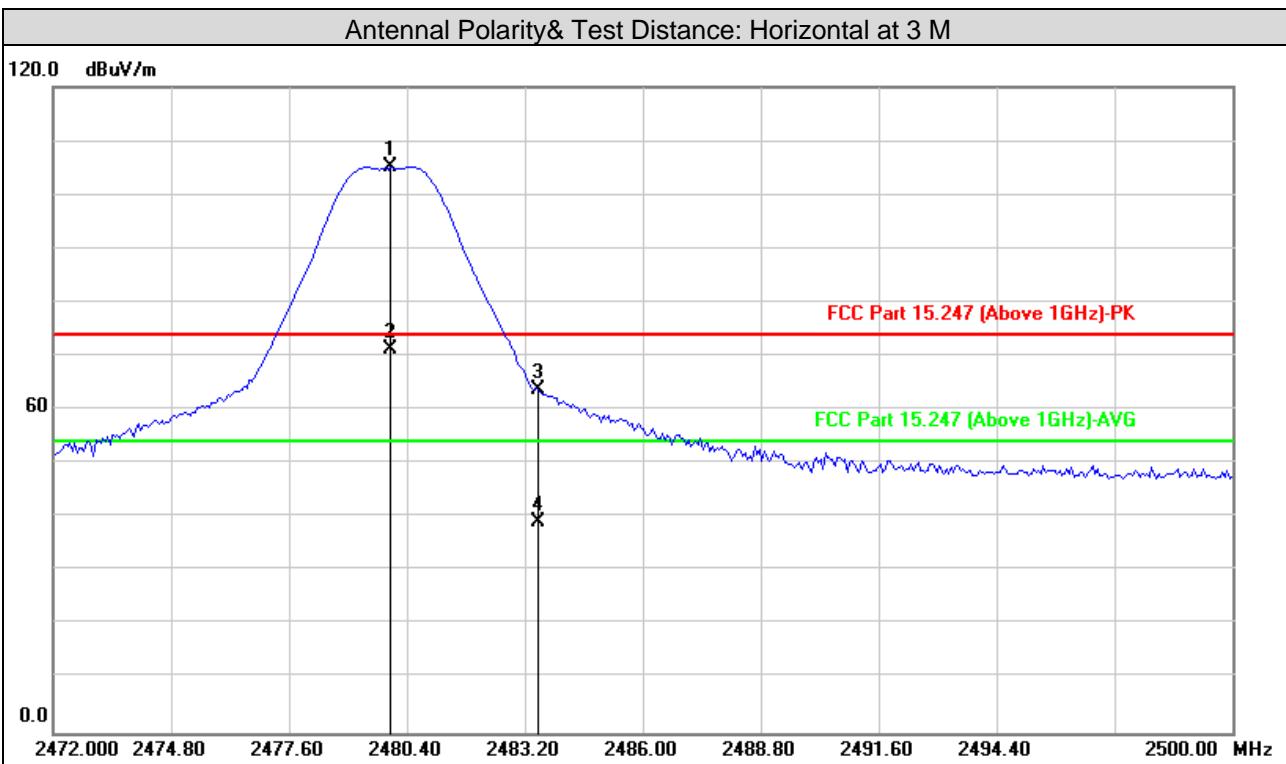
1.Emission Level = Read Level + Factor (Antenna Factor + Cable Loss - Preamp Factor)

2.Margin value = Emission level – Limit value

3.#2440MHz: Fundamental frequency.



Test channel	Channel 39	Frequency Range	1GHz ~ 25GHz
Detector Function	Peak (PK) Average (AVG)	Tested By	King Ye



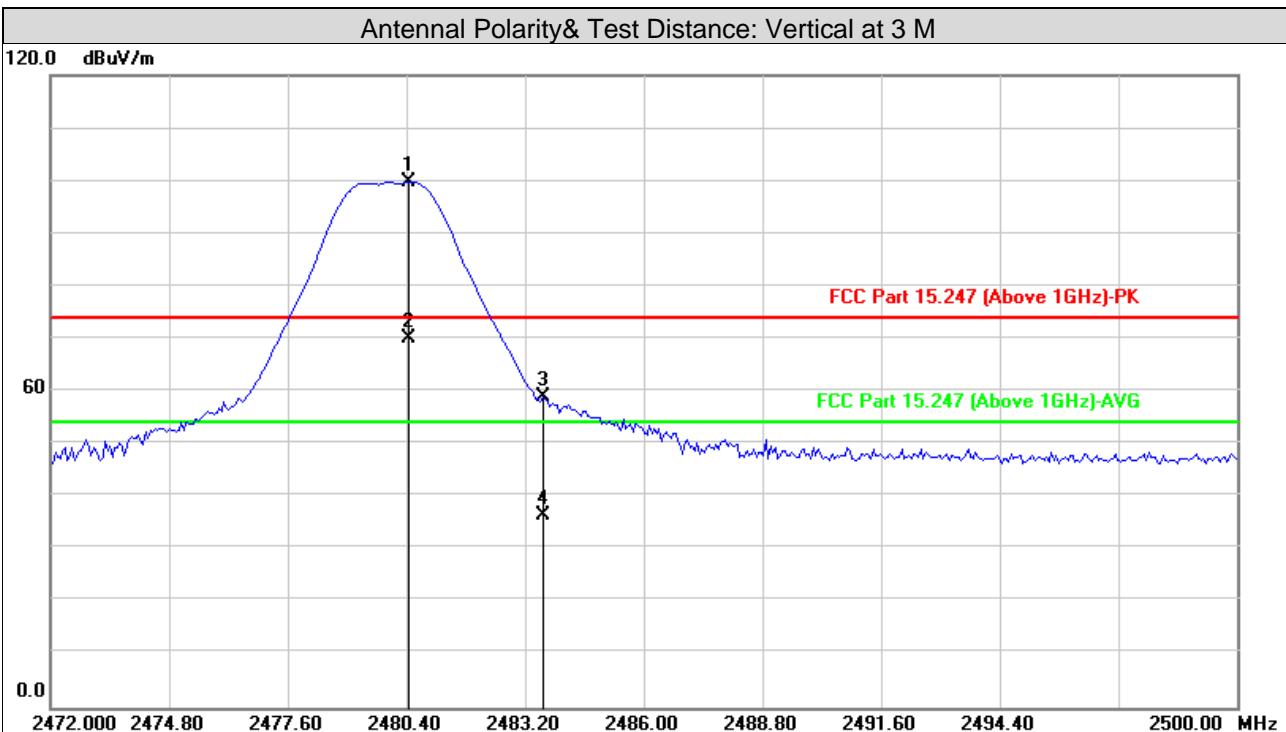
No.	Frequency (MHz)	Reading (dBuV)	Correct Factor (dB)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Antenna Height (cm)	Table Angle (Degree)
1#	2480.024	104.44	0.64	105.08			peak	100	360
2#	2480.024	70.52	0.64	71.16			Avg	100	360
3	2483.500	62.99	0.63	63.62	74.00	-10.38	peak	100	360
4	2483.500	38.39	0.63	39.02	54.00	-14.98	Avg	100	360
5	4960.000	43.96	7.94	51.90	74.00	-22.10	peak	100	242
6	4960.000	29.14	7.94	37.08	54.00	-16.92	Avg	100	242
7	7440.000	34.29	11.09	45.38	74.00	-28.62	peak	100	182
8	7440.000	21.86	11.09	32.95	54.00	-21.05	Avg	100	182

Remarks:

1. Emission Level = Read Level + Factor (Antenna Factor + Cable Loss - Preamp Factor)
2. Margin value = Emission level – Limit value
- 3.#2480MHz: Fundamental frequency.



Test channel	Channel 39	Frequency Range	1GHz ~ 25GHz
Detector Function	Peak (PK) Average (AVG)	Tested By	King Ye



No.	Frequency (MHz)	Reading (dBuV)	Correct Factor (dB)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Antenna Height (cm)	Table Angle (Degree)
1#	2480.473	99.15	0.64	99.79			peak	100	128
2#	2480.473	69.39	0.64	70.03			Avg	100	128
3	2483.615	58.23	0.63	58.86	74.00	-15.14	peak	100	128
4	2483.615	35.69	0.63	36.32	54.00	-17.68	Avg	100	128
5	4960.000	41.61	7.94	49.55	74.00	-24.45	peak	100	165
6	4960.000	26.93	7.94	34.87	54.00	-19.13	Avg	100	165
7	7440.000	35.90	11.09	46.99	74.00	-27.01	peak	100	233
8	7440.000	22.41	11.09	33.50	54.00	-20.50	Avg	100	233

Remarks:

1. Emission Level = Read Level + Factor (Antenna Factor + Cable Loss - Preamp Factor)
2. Margin value = Emission level – Limit value
3. #2480MHz: Fundamental frequency.



3.2 Conducted Emission Measurement

3.2.1 Limits of Conducted Emission Measurement

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

Note: 1. The lower limit shall apply at the transition frequencies.
2. The limit decreases in line with the logarithm of the frequency in the range of 0.15 to 0.50MHz.

3.2.2 Test Instruments

Description & Manufacturer	Model No.	Serial No.	Due Date of Calibration
EMI Test Receiver Rohde&Schwarz	ESCI3	101418	2022/09/12
Artificial Mains Network Rohde&Schwarz	ENV216	3560.6550.15	2022/09/12
Test software FARAD	EZ_EMC V1.1.4.2	N/A	N/A
Hygrothermograph Yuhuaze	HTC-1	NA	2022/09/12
Digital Multimeter FLUKE	15B+	43512617WS	2022/09/12

Note: 1. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to CEPREI/CHINA.
2. The test was performed in Shielded Room 1.

3.2.3 Test Procedures

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

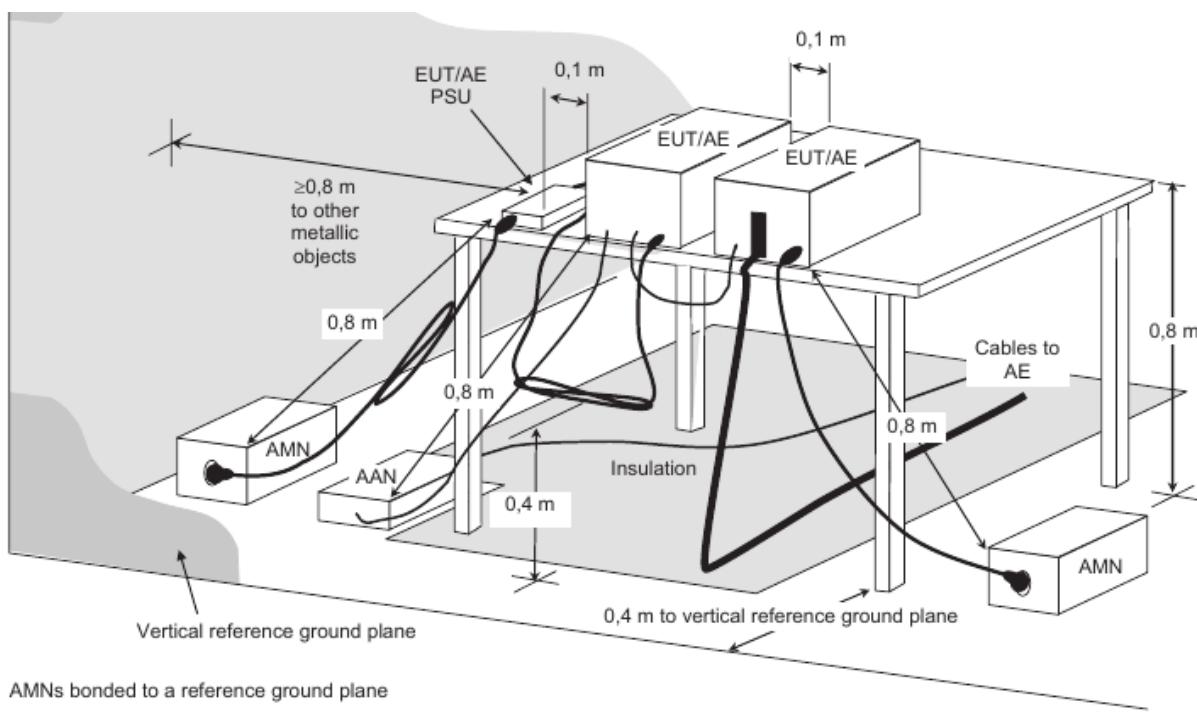
Note: All modes of operation were investigated and the worst-case emissions are reported.

3.2.4 Deviation from Test Standard

No deviation.



3.2.5 Test setup



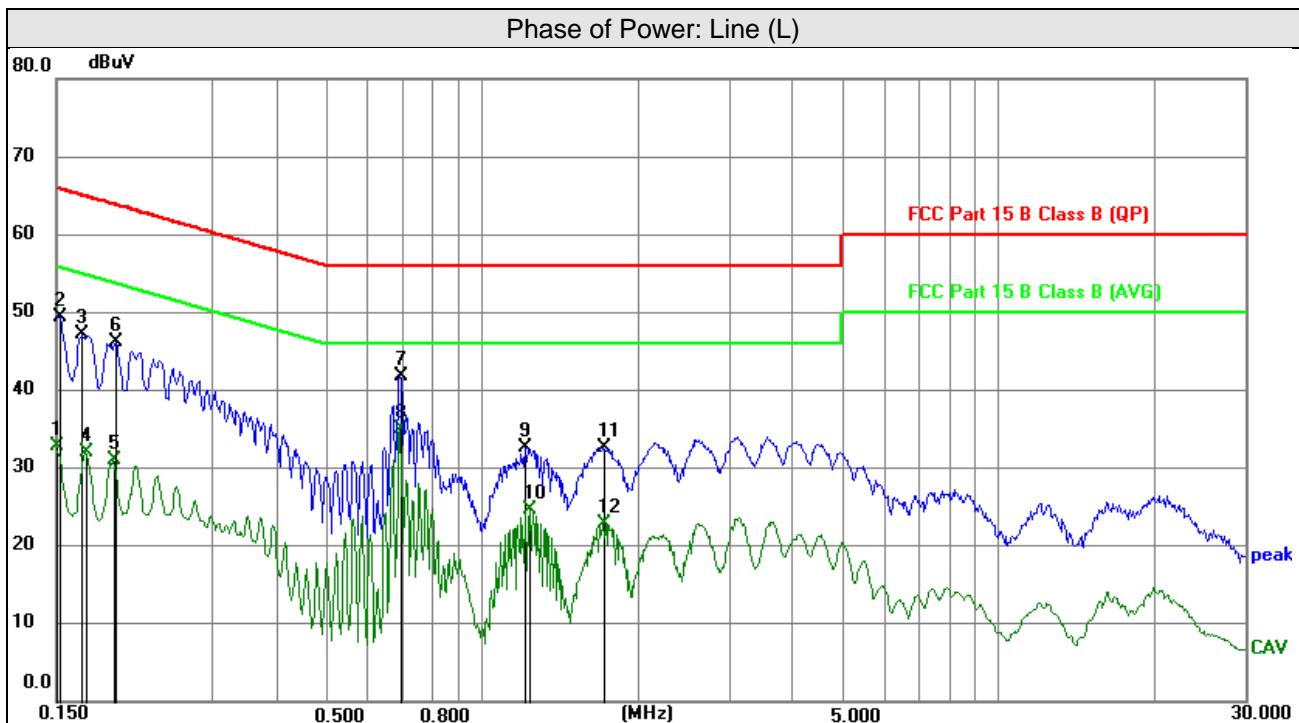
3.2.6 EUT Operating Conditions

- Placed the EUT on the testing table.
- Set the EUT under transmission condition continuously at specific channel frequency.



3.2.7 Test Results

Frequency Range	150kHz ~ 30MHz	Detector Function & Resolution bandwidth	Quasi-Peak (QP) / Average (AV), 9kHz
Power supply	AC 120V/60Hz	Environmental Conditions	26°C, 60%RH



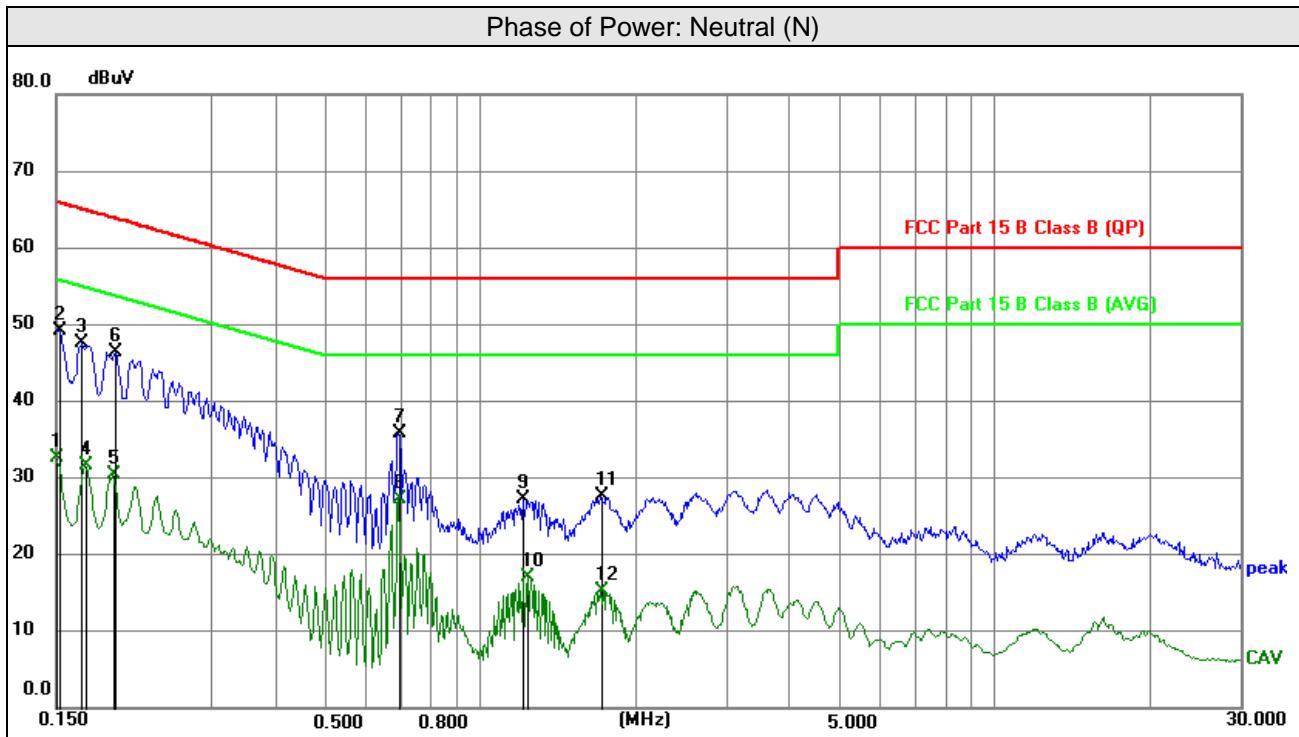
No	Frequency	Reading	Correction Factor	Emission Level	Limit	Margin	Remark
	(MHz)	(dBuV)	dB	(dBuV)	(dBuV)	(dB)	Detector
1	0.1500	22.57	10.19	32.76	56.00	-23.24	AVG
2	0.1522	39.19	10.18	49.37	65.88	-16.51	peak
3	0.1680	37.03	10.17	47.20	65.06	-17.86	peak
4	0.1703	21.90	10.16	32.06	54.95	-22.89	AVG
5	0.1928	20.87	10.15	31.02	53.92	-22.90	AVG
6	0.1949	35.98	10.14	46.12	63.83	-17.71	peak
7	0.6945	31.68	10.10	41.78	56.00	-14.22	peak
8	0.6945	24.93	10.10	35.03	46.00	-10.97	AVG
9	1.2142	22.52	10.06	32.58	56.00	-23.42	peak
10	1.2390	14.65	10.06	24.71	46.00	-21.29	AVG
11	1.7183	22.52	10.09	32.61	56.00	-23.39	peak
12	1.7183	12.84	10.09	22.93	46.00	-23.07	AVG

Remarks:

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



Frequency Range	150kHz ~ 30MHz	Detector Function & Resolution bandwidth	Quasi-Peak (QP) / Average (AV), 9kHz
Power supply	AC 120V/60Hz	Environmental Conditions	26°C, 60%RH



No.	Frequency (MHz)	Reading (dBuV)	Correction Factor dB	Emission Level (dBuV)	Limit (dBuV)	Margin (dB)	Remark
1	0.1500	22.44	10.19	32.63	56.00	-23.37	AVG
2	0.1522	39.08	10.18	49.26	65.88	-16.62	peak
3	0.1680	37.38	10.17	47.55	65.06	-17.51	peak
4	0.1703	21.42	10.16	31.58	54.95	-23.37	AVG
5	0.1928	20.36	10.15	30.51	53.92	-23.41	AVG
6	0.1949	36.26	10.14	46.40	63.83	-17.43	peak
7	0.6945	25.64	10.10	35.74	56.00	-20.26	peak
8	0.6945	17.04	10.10	27.14	46.00	-18.86	AVG
9	1.2142	17.23	10.06	27.29	56.00	-28.71	peak
10	1.2390	7.07	10.06	17.13	46.00	-28.87	AVG
11	1.7183	17.45	10.09	27.54	56.00	-28.46	peak
12	1.7183	5.21	10.09	15.30	46.00	-30.70	AVG

Remarks:

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



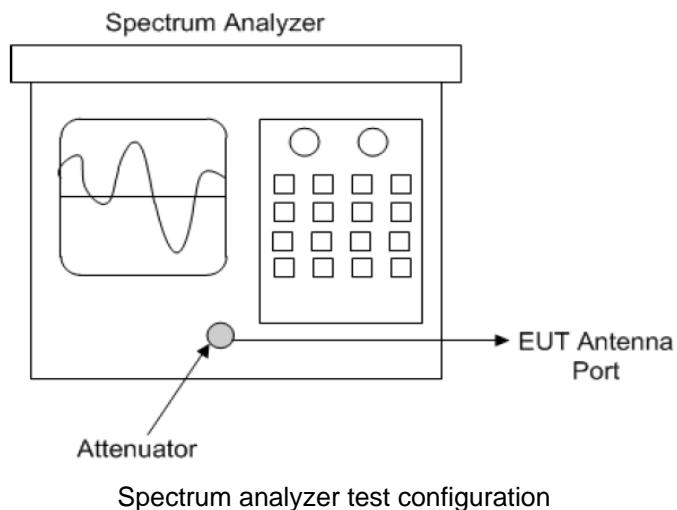
3.3 6dB Bandwidth Measurement

3.3.1 Limits of 6dB Bandwidth Measurement

The minimum of 6dB Bandwidth Measurement is 0.5MHz.

3.3.2 Test Setup

Subclause 11.8 of ANSI C63.10 is applicable.



3.3.3 Test Instruments

Refer to section 5 to get information of above instrument.



3.3.4 Test Procedure

Option 1:

- a. Set resolution bandwidth (RBW) = 30kHz
- b. Set the video bandwidth (VBW) $\geq 3 \times$ RBW
- c. Detector = Peak.
- d. Trace mode = max hold.
- e. Sweep = auto couple.
- f. Allow the trace to stabilize.
- g. 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

Option 2:

The automatic bandwidth measurement capability of an instrument may be employed using the dB bandwidth mode with X set to 6 dB. if the functionality described in 11.8.1 (i.e. RBW= 100 kHz. VBW $\geq 3 \times$ RBW. and peak detector with maximum hold) is implemented by the instrumentation function. When using this capability. care shall be taken so that the bandwidth measurement is not influenced by any intermediate power nulls in the fundamental emission that might be ≥ 6 dB

3.3.5 Deviation from Test Standard

No deviation.

3.3.6 EUT Operating Conditions

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

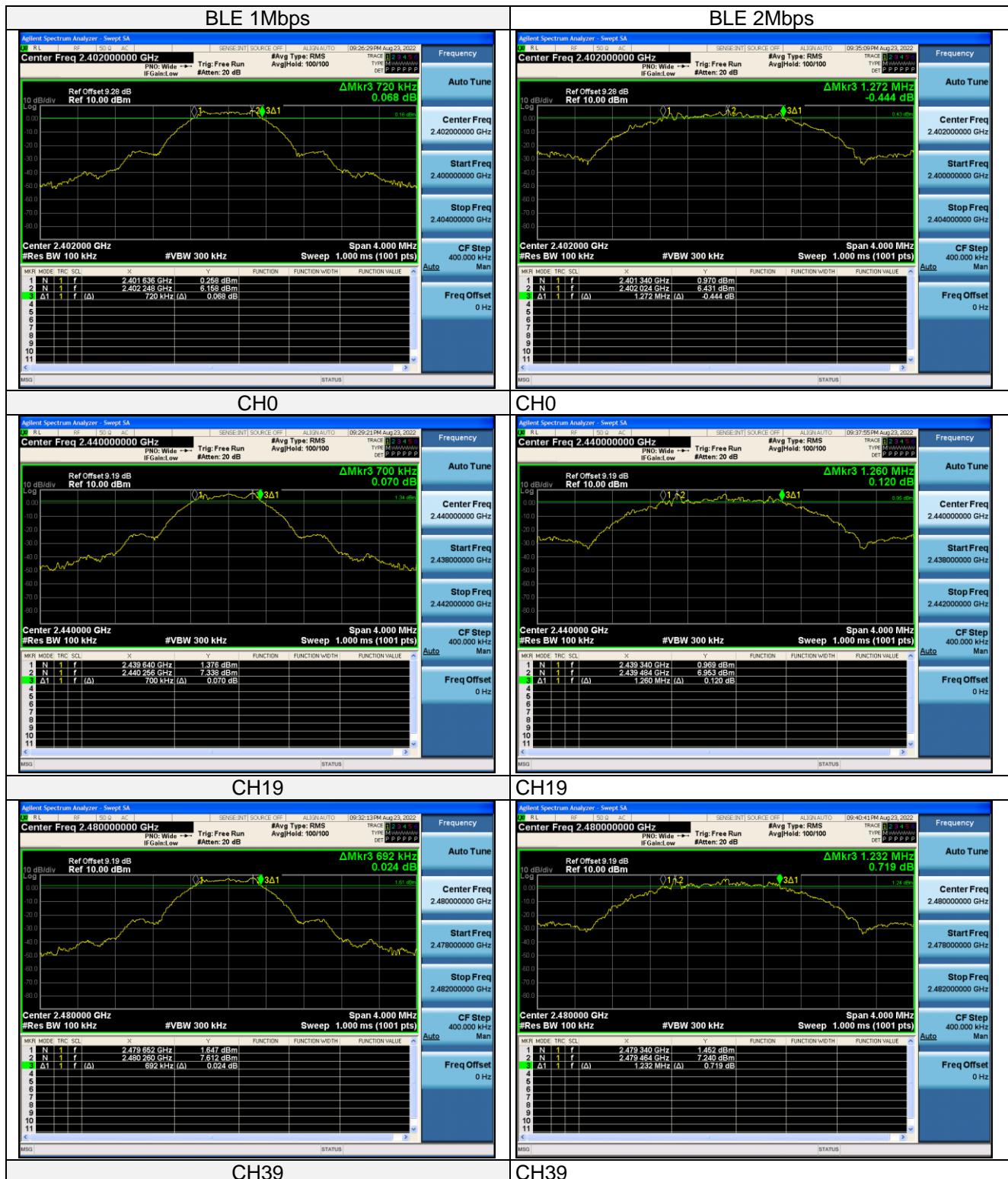


3.3.7 Test Result

Left

BLE-1Mbps			
Operation Channel	Frequency	Occupied Bandwidth (MHz)	
		Result	Limit
0	2402MHz	0.720	>0.5
19	2440MHz	0.700	>0.5
39	2480MHz	0.692	>0.5

BLE-2Mbps			
Operation Channel	Frequency	Occupied Bandwidth (MHz)	
		Result	Limit
0	2402MHz	1.272	>0.5
19	2440MHz	1.260	>0.5
39	2480MHz	1.232	>0.5





Right

BLE-1Mbps			
Operation Channel	Frequency	Occupied Bandwidth (MHz)	
		Result	Limit
0	2402MHz	0.700	>0.5
19	2440MHz	0.684	>0.5
39	2480MHz	0.688	>0.5

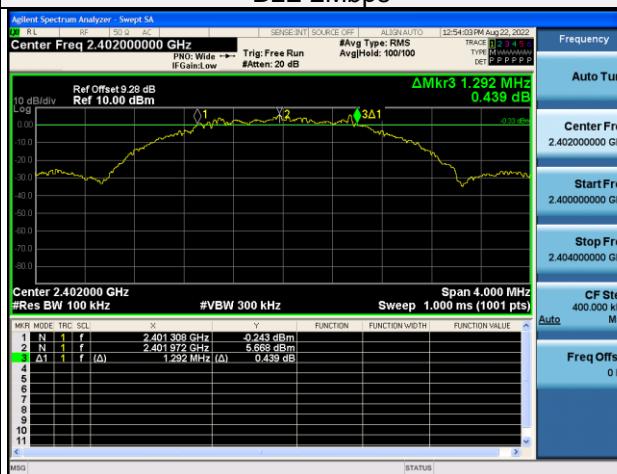
BLE-1Mbps			
Operation Channel	Frequency	Occupied Bandwidth (MHz)	
		Result	Limit
0	2402MHz	1.292	>0.5
19	2440MHz	1.292	>0.5
39	2480MHz	1.288	>0.5



BLE 1Mbps



BLE 2Mbps



CH0



CH0



CH19



CH19



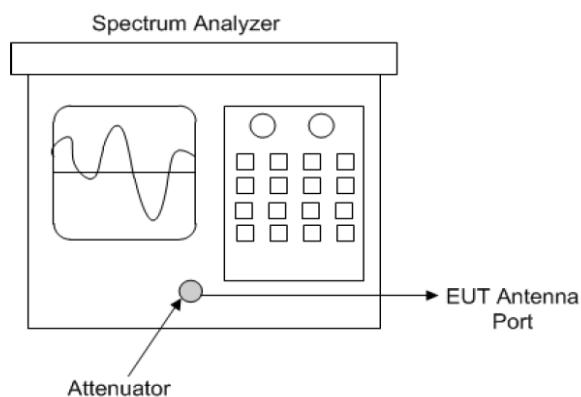
CH39

CH39



3.4 Occupied Bandwidth Measurement

3.4.1 Test Setup



3.4.2 Test Instruments

Refer to section 5 to get information of above instrument.

3.4.3 Test Procedure

The transmitter output was connected to the spectrum analyzer through an attenuator. The bandwidth of the fundamental frequency was measured by spectrum analyzer with resolution bandwidth in the range of 1% to 5% of the anticipated emission bandwidth, and a video bandwidth at least 3x the resolution bandwidth and set the detector to peak. The width of a frequency band such that, below the lower and above the upper frequency limits, the mean powers emitted are each equal to a specified percentage 0.5 % of the total mean power of a given emission.

3.4.4 Deviation from Test Standard

No deviation.

3.4.5 EUT Operating Conditions

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

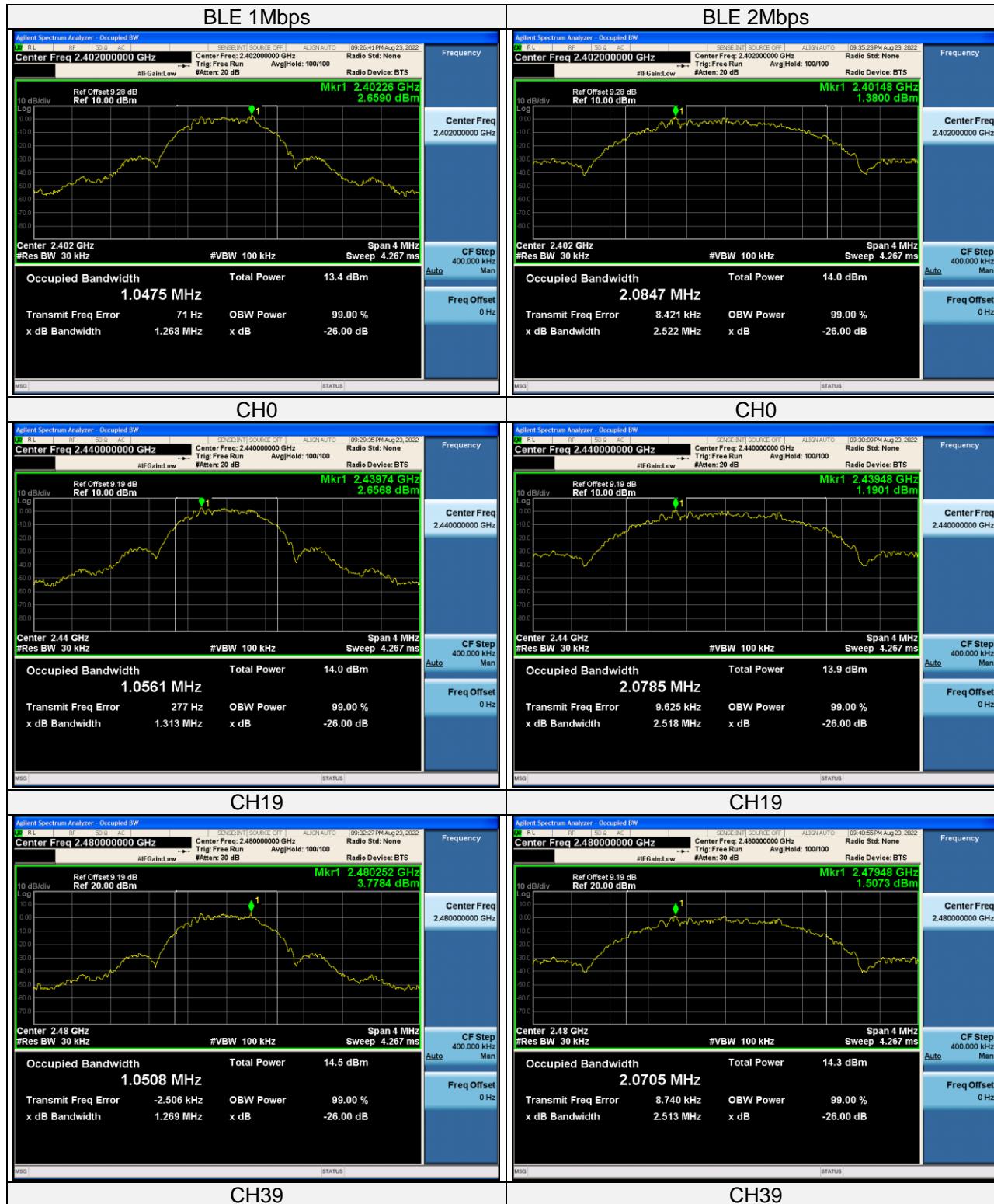


3.4.6 Test Results

Left

BLE-1Mbps			
Operation Channel	Frequency	Occupied Bandwidth (MHz)	
		Result	Limit
0	2402MHz	1.048	2400~2483.5
19	2440MHz	1.056	2400~2483.5
39	2480MHz	1.051	2400~2483.6

BLE-2Mbps			
Operation Channel	Frequency	Occupied Bandwidth (MHz)	
		Result	Limit
0	2402MHz	2.085	2400~2483.5
19	2440MHz	2.079	2400~2483.5
39	2480MHz	2.071	2400~2483.6





Right

BLE-1Mbps			
Operation Channel	Frequency	Occupied Bandwidth (MHz)	
		Result	Limit
0	2402MHz	1.049	2400~2483.5
19	2440MHz	1.050	2400~2483.5
39	2480MHz	1.043	2400~2483.6

BLE-2Mbps			
Operation Channel	Frequency	Occupied Bandwidth (MHz)	
		Result	Limit
0	2402MHz	2.084	2400~2483.5
19	2440MHz	2.078	2400~2483.5
39	2480MHz	2.075	2400~2483.6





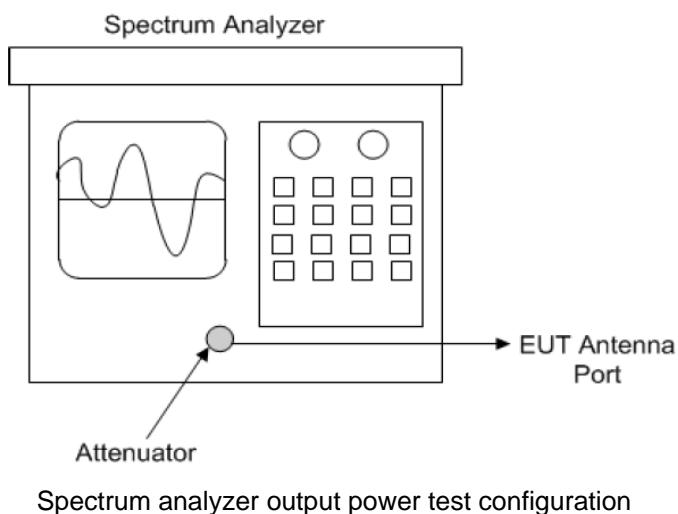
3.5 Conducted Output Power Measurement

3.5.1 Limits of Conducted Output Power Measurement

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

3.5.2 Test Setup

- Measurement using a spectrum analyzer (SA) Subclause 11.9.2.2 of ANSI C63.10 is applicable



Spectrum analyzer output power test configuration

3.5.3 Test Instruments

Refer to section 5 to get information of above instrument.

3.5.4 Test Procedures

Measurement using a spectrum analyzer (SA), Selection of test method:

The proper test method is selected based on the following criteria:

- Method AVGSA-1 or method AVGSA-1A (alternative)** shall be applied if either of the following conditions can be satisfied:
 - 1) The EUT transmits continuously (or with a D > 98%).
 - 2) Sweep triggering can be implemented in such a way that the device transmits at the maximum power control level throughout the duration of each of the instrument sweeps to be averaged. This condition can generally be achieved by triggering the instrument's sweep if the duration of the sweep (with the instrument configured as in method AVGSA-1) is equal to or shorter than the duration T of each transmission from the EUT, and if those transmissions exhibit full power throughout their durations.
- Method AVGSA-2 or method AVGSA-2A (alternative)** shall be applied if the conditions of the preceding item a) cannot be achieved and the transmissions exhibit a constant duty cycle during the measurement duration. Duty cycle will be considered to be constant if variations are less than +2%.
- Method AVGSA-3 or method AVGSA-3A (alternative)** shall be applied if the conditions of the preceding item a) and item b) cannot be achieved.



Method AVGSA-3 or method AVGSA-3A:

- a) Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
- b) Turn on the EUT and connect it to measurement instrument. Then set it to any one convenient frequency within its operating range. Set a reference level on the measuring instrument equal to the highest peak value.
- c) SA Setting:
 - 1* Set span to at least 1.5 times the OBW
 - 2* Set sweep trigger to "free run."
 - 3* Set RBW= 1% to 5% of the OBW. not to exceed 1MHz.
 - 4* Set VBW \geq 3 x RBW
 - 5* Number of points in sweep \geq 2 x span /RBW. (This gives bin-to-bin spacing \leq RBW / 2. so that narrowband signals are not lost between frequency bins).
 - 6* Sweep time \leq (number of points in sweep) x T. where T is defined in 11.6. If this gives a sweep time less than the auto sweep time of the instrument. then method AVGSA-3 shall not be used (use AVGSA-3A). The purpose of this step is so that the averaging time in each bin is less than or equal to the minimum time of a transmission.
 - 7* Detector =RMS (power averaging).
 - 8* Trace mode =max hold.
 - 9* Allow max hold to run for at least 60 s or longer as needed to allow the trace to stabilize.
 - 10* Compute power by integrating the spectrum across the OBW of the signal using the instrument's band power measurement function with band limits set equal to the OBW band edges. If the instrument does not have a band power function. then sum the spectrum levels (in power units) at intervals equal to the RBW extending across the entire OBW
- d. Measure the captured power within the band and recording the plot.
- e. Repeat above procedures until all frequencies required were complete.

3.5.5 Deviation from Test Standard

No deviation.

3.5.6 EUT Operating Conditions

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



3.5.7 Test Results

Left

BLE-1Mbps						
Peak Power						
Channel	Freq.	RF Output Power		Limit (mW)		Verdict
No.	(MHz)	(dBm)	(mW)	Rss-247	FCC	
0	2402	6.487	4.453	<125	<1000	Pass
19	2440	7.375	5.464	<125	<1000	Pass
39	2480	7.733	5.933	<125	<1000	Pass

BLE-1Mbps						
Average Power						
Channel	Freq.	RF Output Power		Limit (mW)		Verdict
No.	(MHz)	(dBm)	(mW)	Rss-247	FCC	
0	2402	-4.221	0.378	<125	<1000	Pass
19	2440	-4.035	0.395	<125	<1000	Pass
39	2480	-4.168	0.383	<125	<1000	Pass

Note: The test result had been added the duty cycle factor.

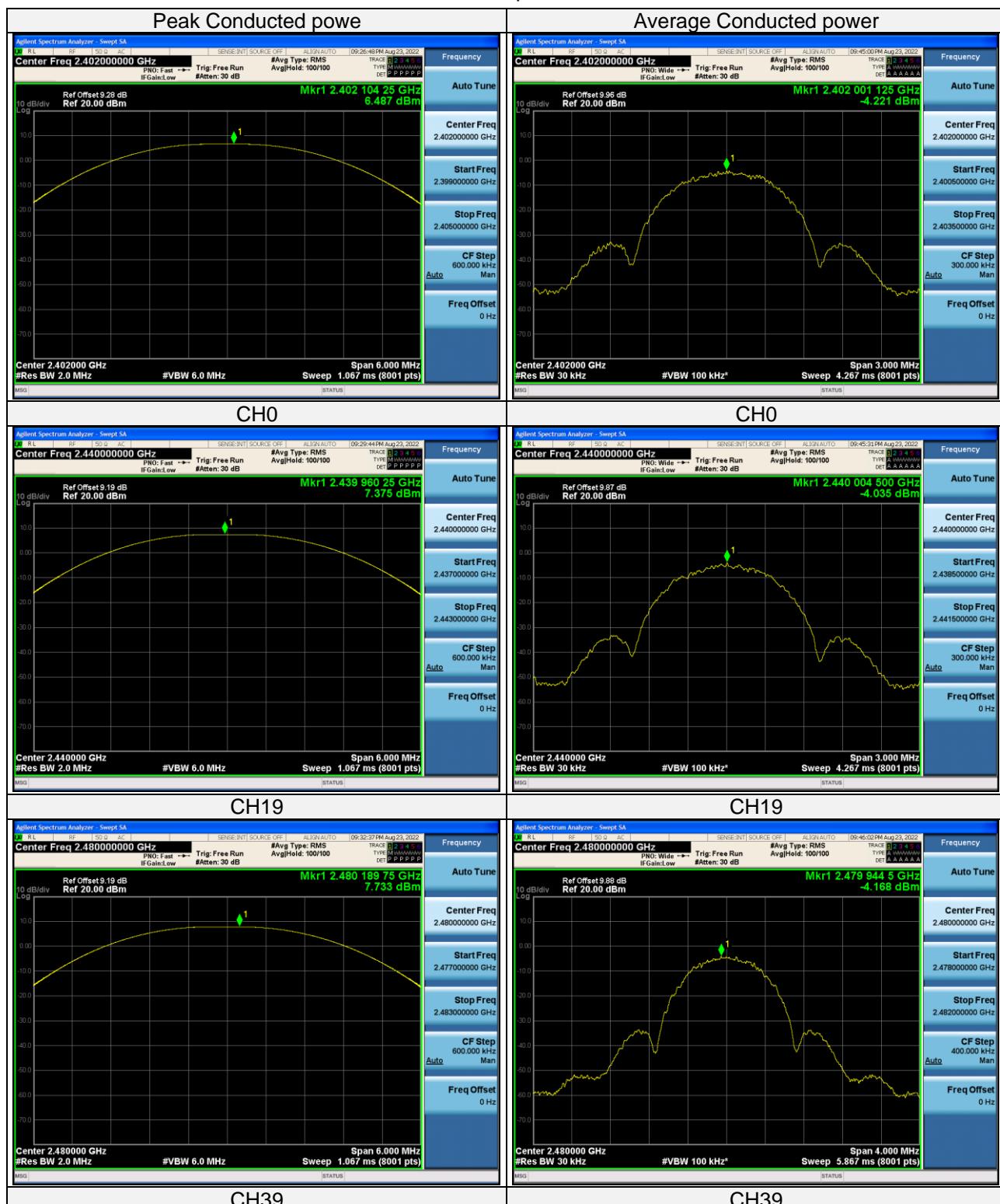
BLE-2Mbps						
Peak Power						
Channel	Freq.	RF Output Power		Limit (mW)		Verdict
No.	(MHz)	(dBm)	(mW)	Rss-247	FCC	
0	2402	7.631	5.796	<125	<1000	Pass
19	2440	7.397	5.492	<125	<1000	Pass
39	2480	7.738	5.940	<125	<1000	Pass

BLE-2Mbps						
Average Power						
Channel	Freq.	RF Output Power		Limit (mW)		Verdict
No.	(MHz)	(dBm)	(mW)	Rss-247	FCC	
0	2402	-6.899	0.204	<125	<1000	Pass
19	2440	-7.199	0.191	<125	<1000	Pass
39	2480	-6.357	0.231	<125	<1000	Pass

Note: The test result had been added the duty cycle factor.

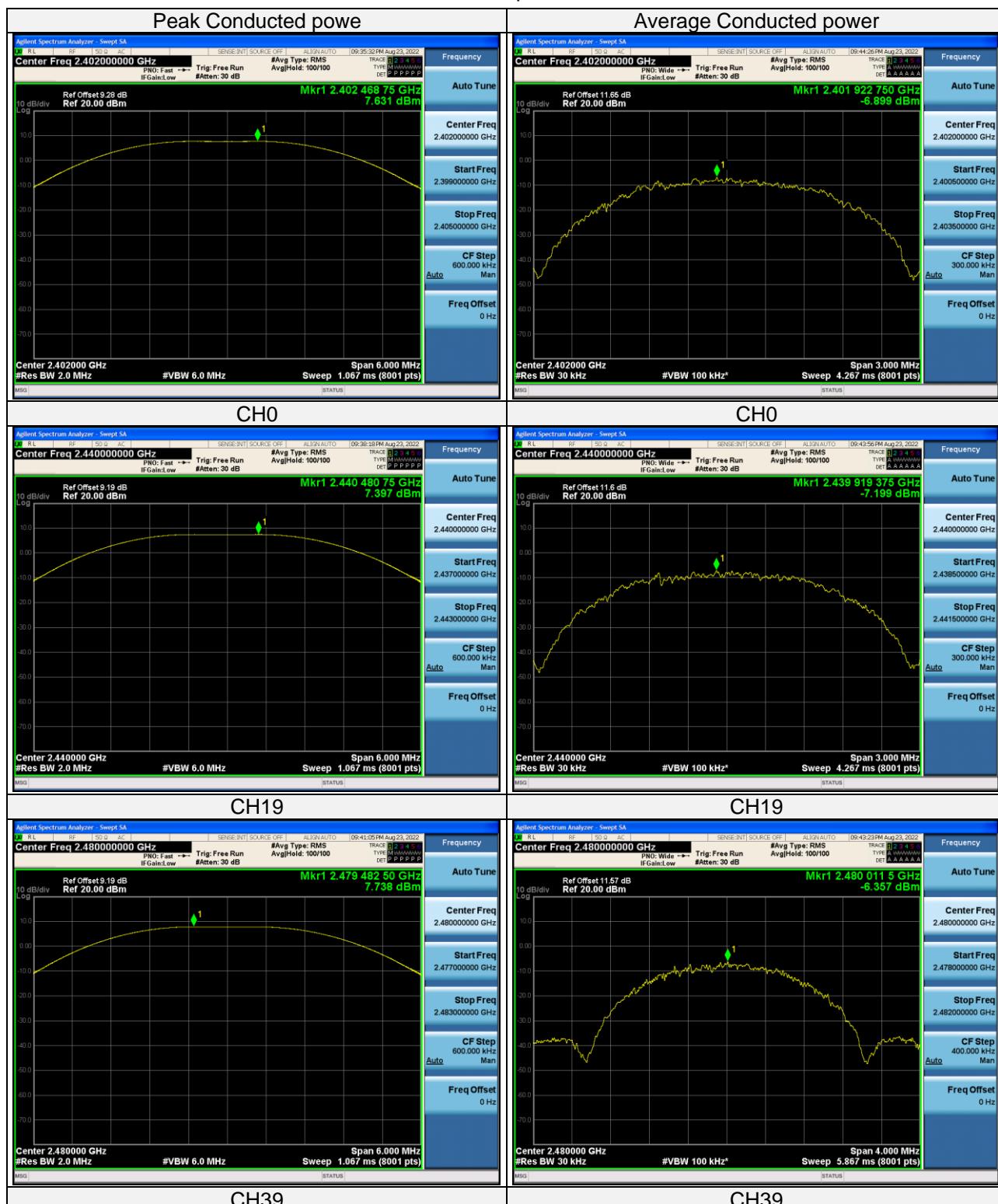


1Mbps





2Mbps





Right

BLE-1Mbps						
Peak Power						
Channel	Freq.	RF Output Power		Limit (mW)		Verdict
No.	(MHz)	(dBm)	(mW)	Rss-247	FCC	
0	2402	7.192	5.238	<125	<1000	Pass
19	2440	7.044	5.063	<125	<1000	Pass
39	2480	7.470	5.585	<125	<1000	Pass

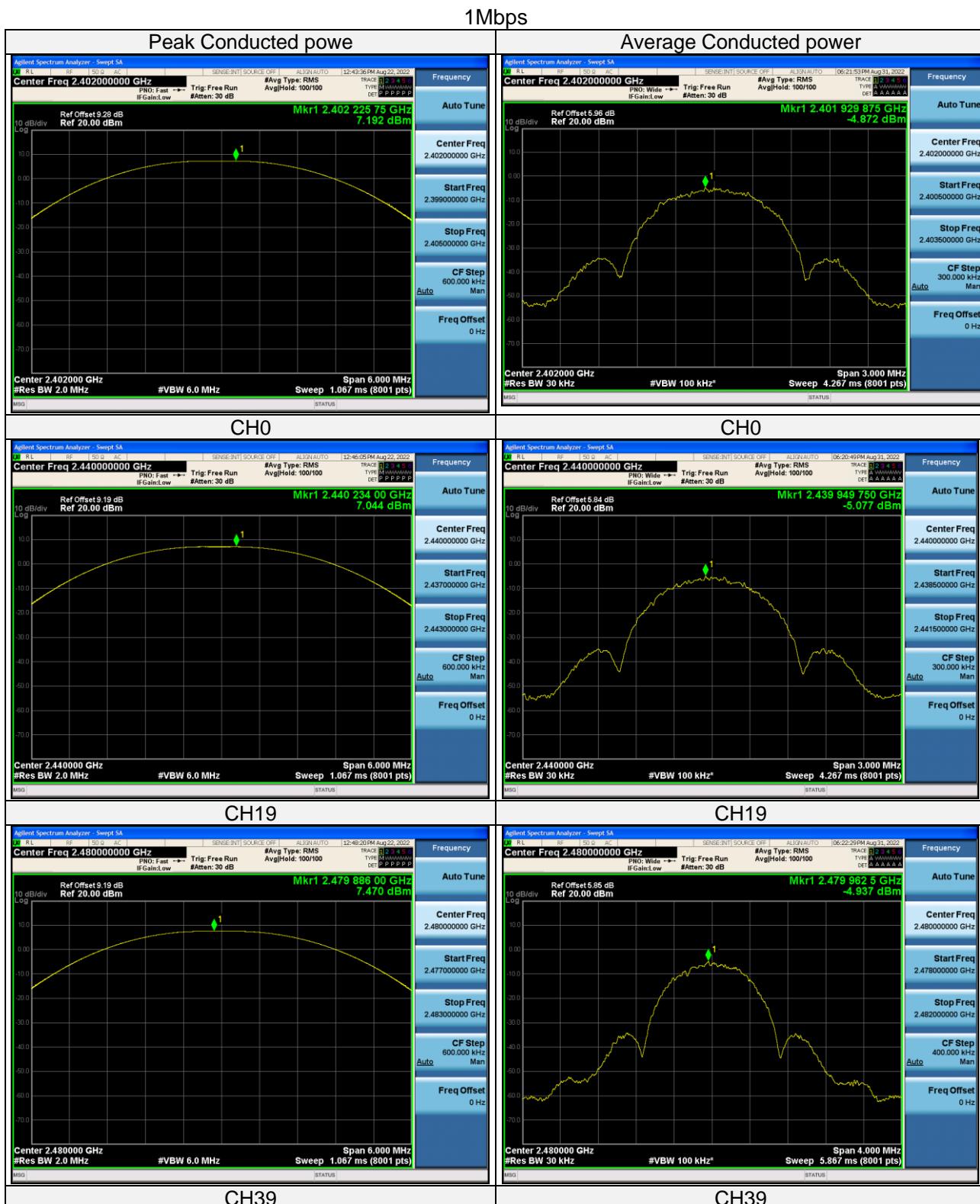
BLE-1Mbps						
Average Power						
Channel	Freq.	RF Output Power		Limit (mW)		Verdict
No.	(MHz)	(dBm)	(mW)	Rss-247	FCC	
0	2402	-4.872	0.326	<125	<1000	Pass
19	2440	-5.077	0.311	<125	<1000	Pass
39	2480	-4.937	0.321	<125	<1000	Pass

Note: The test result had been added the duty cycle factor.

BLE-2Mbps						
Peak Power						
Channel	Freq.	RF Output Power		Limit (mW)		Verdict
No.	(MHz)	(dBm)	(mW)	Rss-247	FCC	
0	2402	7.180	5.224	<125	<1000	Pass
19	2440	7.049	5.069	<125	<1000	Pass
39	2480	7.486	5.605	<125	<1000	Pass

BLE-2Mbps						
Average Power						
Channel	Freq.	RF Output Power		Limit (mW)		Verdict
No.	(MHz)	(dBm)	(mW)	Rss-247	FCC	
0	2402	-6.215	0.239	<125	<1000	Pass
19	2440	-6.884	0.205	<125	<1000	Pass
39	2480	-7.697	0.170	<125	<1000	Pass

Note: The test result had been added the duty cycle factor.





2Mbps

Peak Conducted power



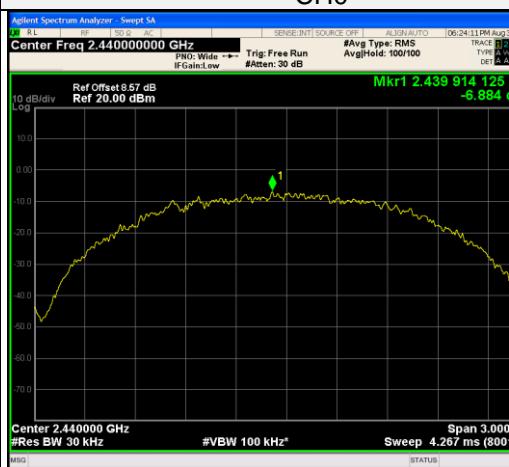
Average Conducted power



CH0



CH0



CH19



CH19



CH39

CH39



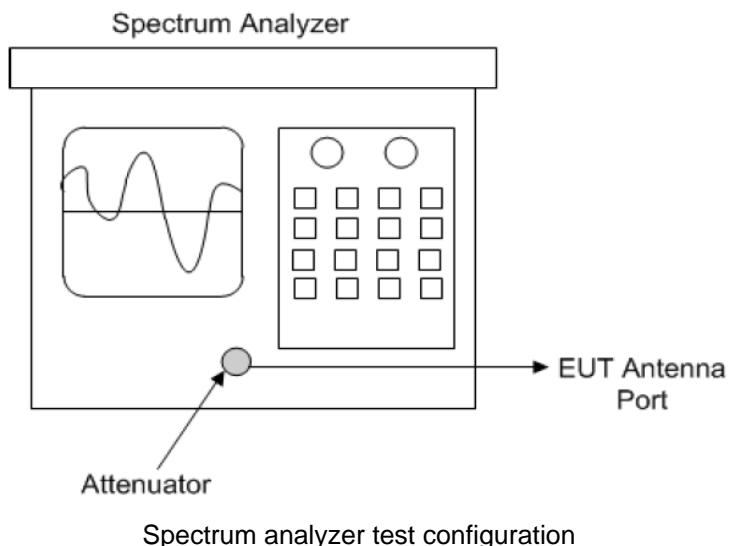
3.6 Power Spectral Density Measurement

3.6.1 Limits of Power Spectral Density Measurement

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

3.6.2 Test Setup

- DTS maximum power spectral density level in the fundamental emission Subclause 11.10 of ANSI C63.10 is applicable



3.6.3 Test Instruments

Refer to section 5 to get information of above instrument.



3.6.4 Test Procedure

- a. **Method AVGPSD-1 or method AVGPSD-1A (alternative)** shall be applied if either of the following conditions can be satisfied:
 - 1) The EUT transmits continuously (or with a D $\geq 98\%$).
 - 2) Sweep triggering can be implemented in such a way that the device transmits at the maximum power control level throughout the duration of each of the instrument sweeps to be averaged. This condition can generally be achieved by triggering the instrument's sweep if the duration of the sweep is equal to or shorter than the duration I of each transmission from the EUT, and if those transmissions exhibit full power throughout these durations.
- b. **Method AVGPSD-2 or method AVGPSD-2A (alternative)** shall be applied if the conditions of the preceding item a) cannot be achieved, and the transmissions exhibit a constant duty cycle during the measurement duration. Duty cycle will be considered to be constant if variations are less than $\pm 2\%$.
- c. **Method AVGPSD-3 or method AVGPSD-3A (alternative)** shall be applied if the conditions of the preceding paragraphs a) and b) cannot be achieved.

Method AVGPSD-3:

Method AVGPSD-3 uses mms detection across ON and OFE times of the EUT with max hold. The following procedure is applicable when the EUT cannot be configured to transmit continuously (i.e. D<98%), when sweep triggering/signal gating cannot be used to measure only when the EUT is transmitting at its maximum power control level, and when the transmission duty cycle is not constant (i.e., duty cycle variations exceed $\pm 2\%$),

SA Setting:

- a. Set the instrument span to a minimum of 1.5 times the OBW.
 - b. Set sweep trigger to "free run."
 - c. Set the RBW = 3 kHz, VBW = 10 kHz,
 - d. Detector = RMS (power averaging).
 - e. Sweep time = Auto couple,
 - f. Allow max hold to run for at least 60 s or longer as needed to allow the trace to stabilize.
 - g. Use the peak marker function to determine the maximum PSD level
- If the measured value exceeds requirement, then reduce RBW (but no less than 3 kHz) and repeat (note that this may require zooming in on the emission of interest and reducing the span to meet the minimum measurement point requirement as the RBW is reduced).

3.6.5 Deviation from Test Standard

No deviation.

3.6.6 EUT Operating Condition

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



3.6.7 Test Results

Left

BLE-1Mbps		Power Density	
Test Channel	Channel Frequency	Test Result (dBm/10kHz)	Limit (dBm/3kHz)
0	2402MHz	-9.47	<8
19	2440MHz	-8.43	<8
39	2480MHz	-8.05	<8

BLE-2Mbps		Power Density	
Test Channel	Channel Frequency	Test Result (dBm/10kHz)	Limit (dBm/3kHz)
0	2402MHz	-11.23	<8
19	2440MHz	-11.50	<8
39	2480MHz	-11.11	<8