



FCC Part 15, Subpart C Test Report

FCC ID: 2AAGF-JUNO

Applicant: Zound Industries International AB

Address: Centralplan 15 SE-111 20 Stockholm Sweden

Manufacturer: Zound Industries International AB

Address: Centralplan 15 SE-111 20 Stockholm Sweden

Product: True Wireless Headphones

Brand: URBANEARS

Test Model(s): Urbanears Juno

Series Model(s): N/A

Test Date: Aug. 30, 2022~ Sep. 14, 2022

Issued Date: Sep. 26, 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

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.

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Release
Ver. 1.5



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HWA-HSING Test Report No.: 220818EL08-RF-US-02

Release Control Record

Issue No.	Description	Date Issued
220818EL08-RF-US-02	Original Release	Sep. 26, 2022



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	Expanded 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	True Wireless Headphones
Test Model(s)	Urbanears Juno
Sample No.	HS220819-04-11
Series Model(s)	N/A
Status of EUT	Engineering Prototype
Power Supply Rating	Charge case: Input: DC 5V, 500mA from USB or DC 3.7V from battery; Output: DC 5V, 100mAx2 Each Headphone: Input: DC 5V 100mA from Charge case or 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: 3.730dBm (Peak) R: 3.762dBm (Peak)
Antenna Type	FPC Antenna
Antenna Gain	L: 1.78dBi R: -0.50dBi
Antenna Connector	N/A
Accessory Device	N/A

Note:

1. Please refer to the EUT photo document (Reference No.: 220818EL08-01&-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)	Channel	Freq. (MHz)	Channel	Freq. (MHz)	Channel	Freq. (MHz)
0	2402	10	2422	20	2442	30	2462
1	2404	11	2424	21	2444	31	2464
2	2406	12	2426	22	2446	32	2466
3	2408	13	2428	23	2448	33	2468
4	2410	14	2430	24	2450	34	2470
5	2412	15	2432	25	2452	35	2472
6	2414	16	2434	26	2454	36	2474
7	2416	17	2436	27	2456	37	2476
8	2418	18	2438	28	2458	38	2478
9	2420	19	2440	29	2460	39	2480

2.3 Test Mode Applicability and Tested Channel Detail

EUT Configure Mode	Applicable test items	X-Axis	Y-Axis	Z-Axis	Voltage Supply
Radiated	AC Power Conducted Emission	N/A	N/A	N/A	DC 3.85V from battery
Radiated	Radiated Emissions	√	√	√	
Antenna Port Conducted Measurement	Band Edge Measurement	N/A	N/A	N/A	
	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	

- *: The EUT had been pre-tested on the positioned of each 3 Axis. The worst case was found when positioned on **Z-plane**.
- "N/A" means no effect.

Test Condition:

Applicable test items	Environmental Conditions	Test Date	Tested by
AC Power Conducted Emission	26.2deg. C, 57%RH	2022-08-30	King Ye
Radiated Emissions	26.5deg. C, 50%RH	2022-09-08	King Ye
Antenna Port Conducted Measurement	25deg. C, 58%RH	2022-09-07	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	2
-	0 to 39	0, 19, 39	GFSK	1

Radiated Emission Test (Below 1GHz):

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

Power Line Conducted Emission Test:

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

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	2
-	0 to 39	0, 19, 39	GFSK	1



2.4 Description of Support Units

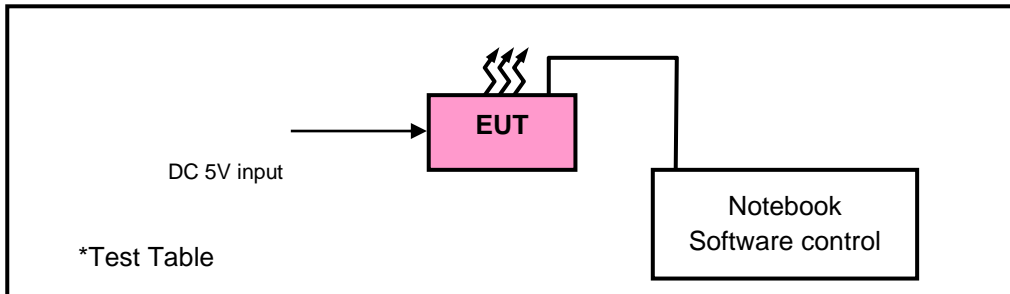
The EUT has been tested as an independent unit together with other necessary accessories or support units. The following support units or accessories were used to form a representative test configuration during the tests.

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

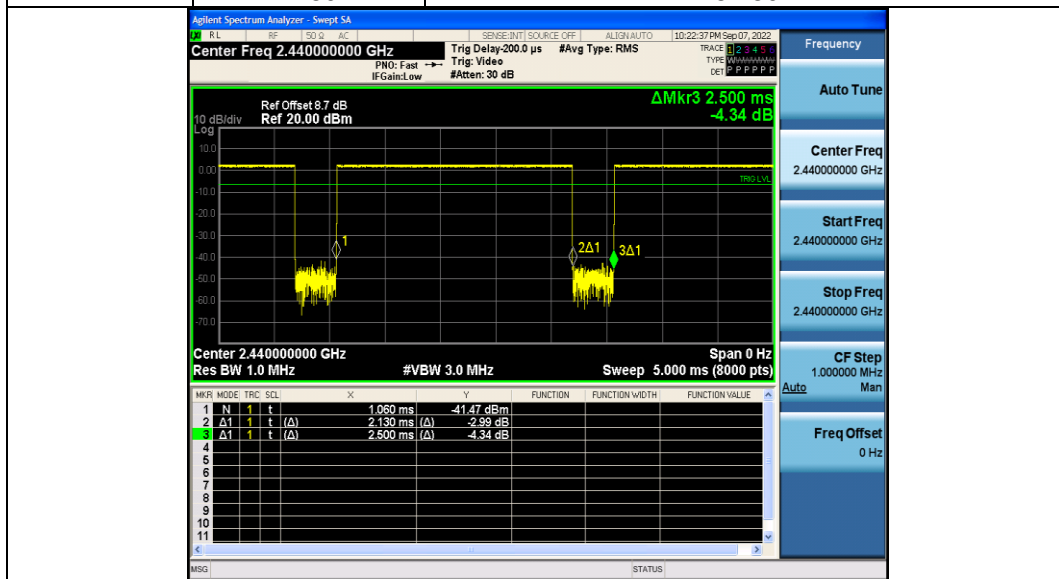
2.5 Configuration of System under Test



2.6 Duty Cycle of Test Signal

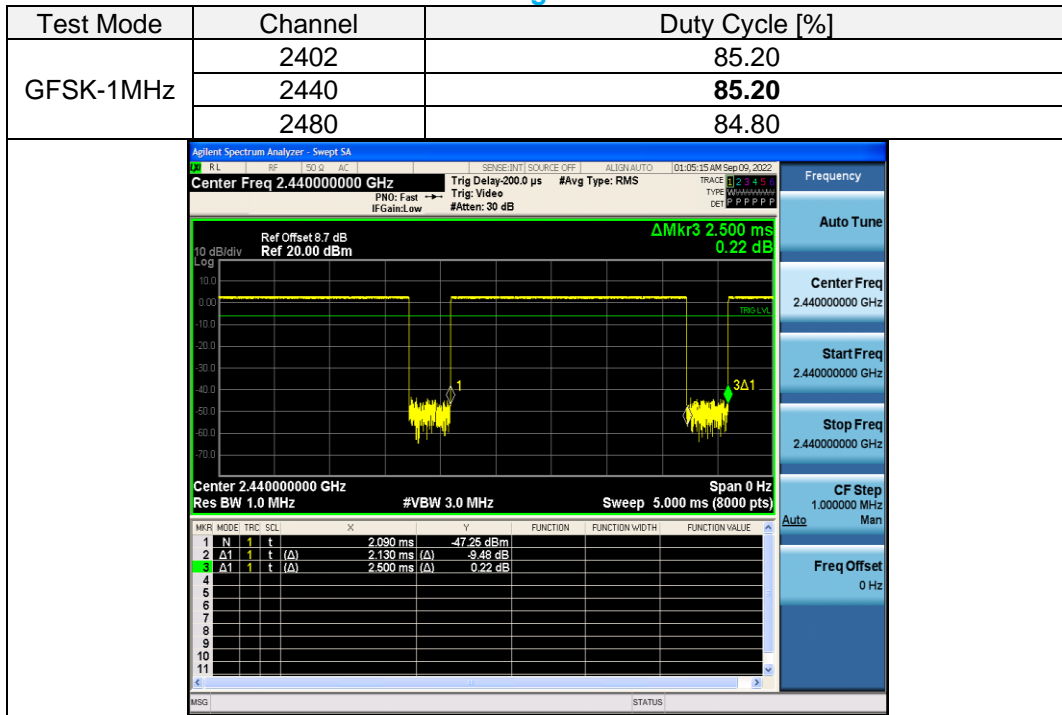
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Test Mode	Channel	Duty Cycle [%]
GFSK-1MHz	2402	84.80
	2440	85.20
	2480	84.80





Right





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



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*
Pre-Amplifier	EMCI	EMC 184045SE	980201	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

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	2023-08-25
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	974	2024-05-04
Broadband Coaxial Preamplifier	Schwarzbeck	PAM-118A	1804003	2023-08-25
Spectrum	Keysight	N9020A	MY51240612	2023-08-25
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 ≥ 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 ≥ 3 *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 ≥ 98%) cannot be achieved and the duty cycle is constant (duty cycle variations are less than ±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 ≥ 3 *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 $[50 \times (1/D)]$ 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 1 meters 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.

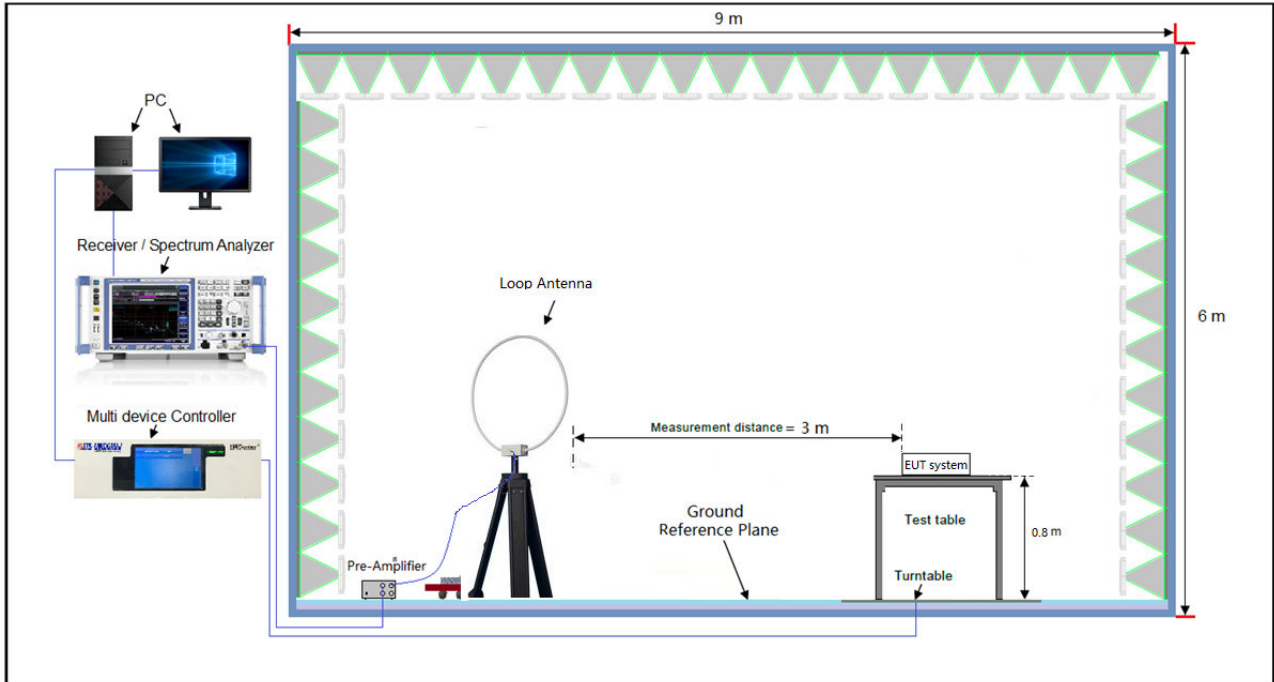
3.1.4 Deviation from Test Standard

No deviation.

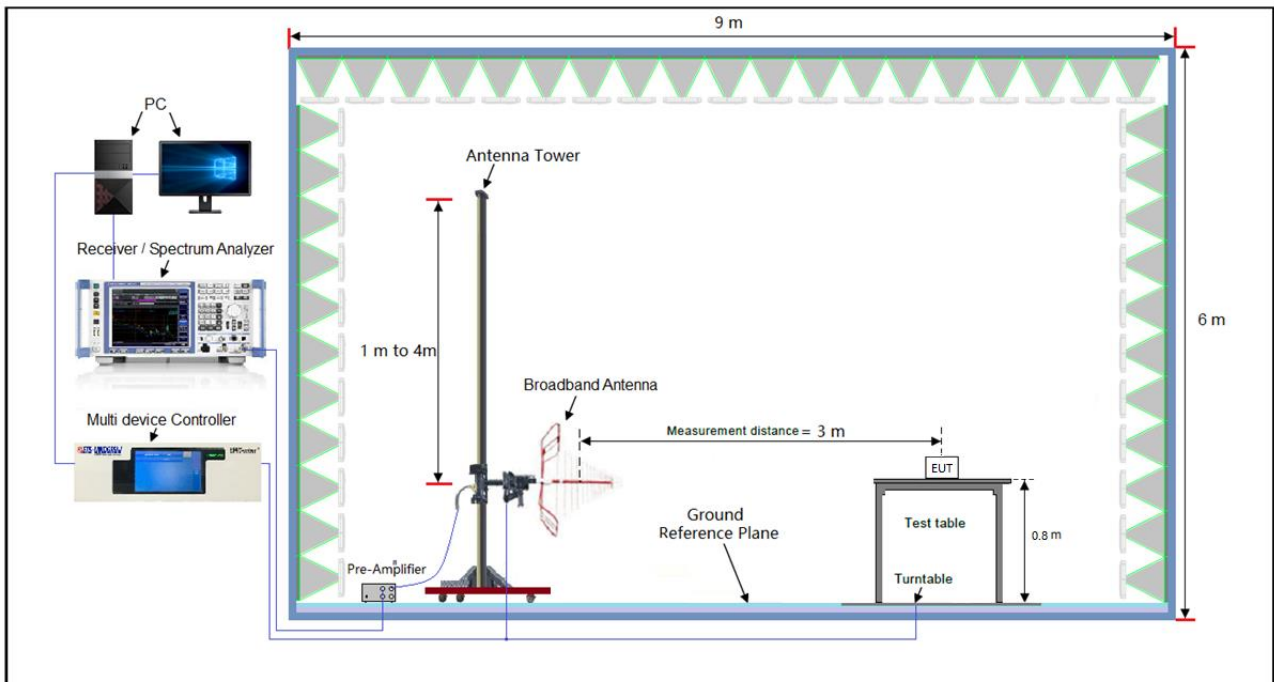


3.1.5 Test Setup

Radiated emission below 30MHz:

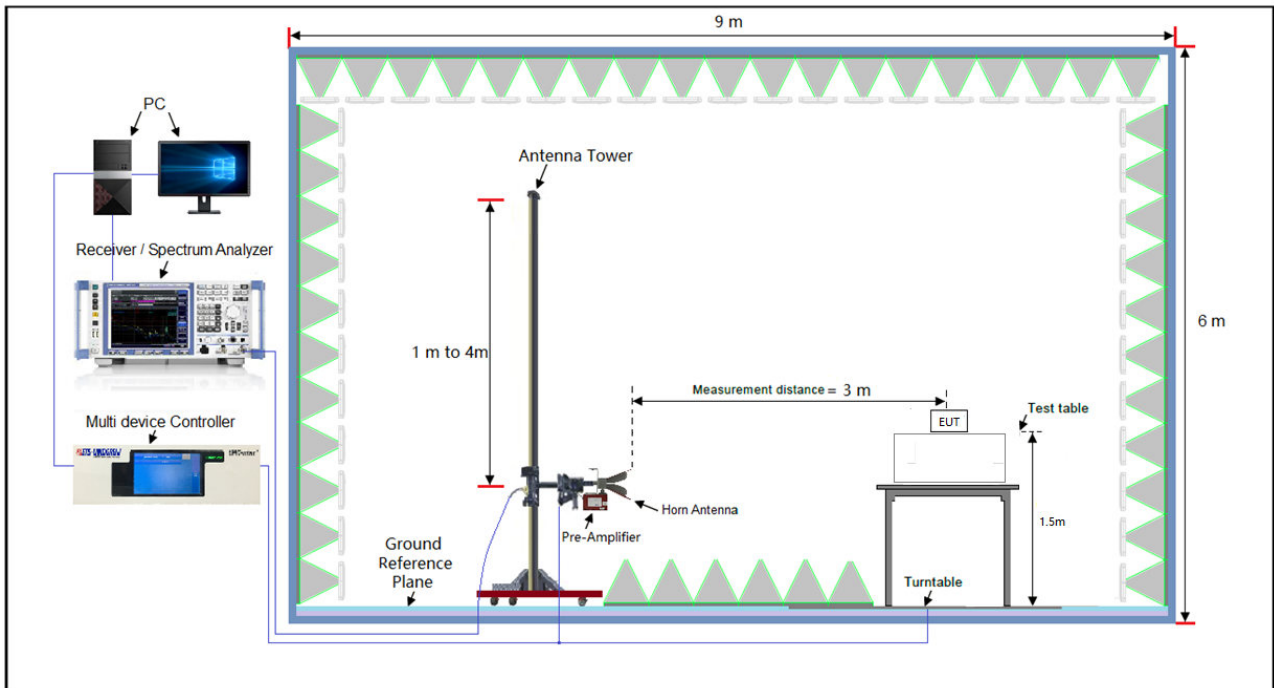


Frequency Range below 1GHz:

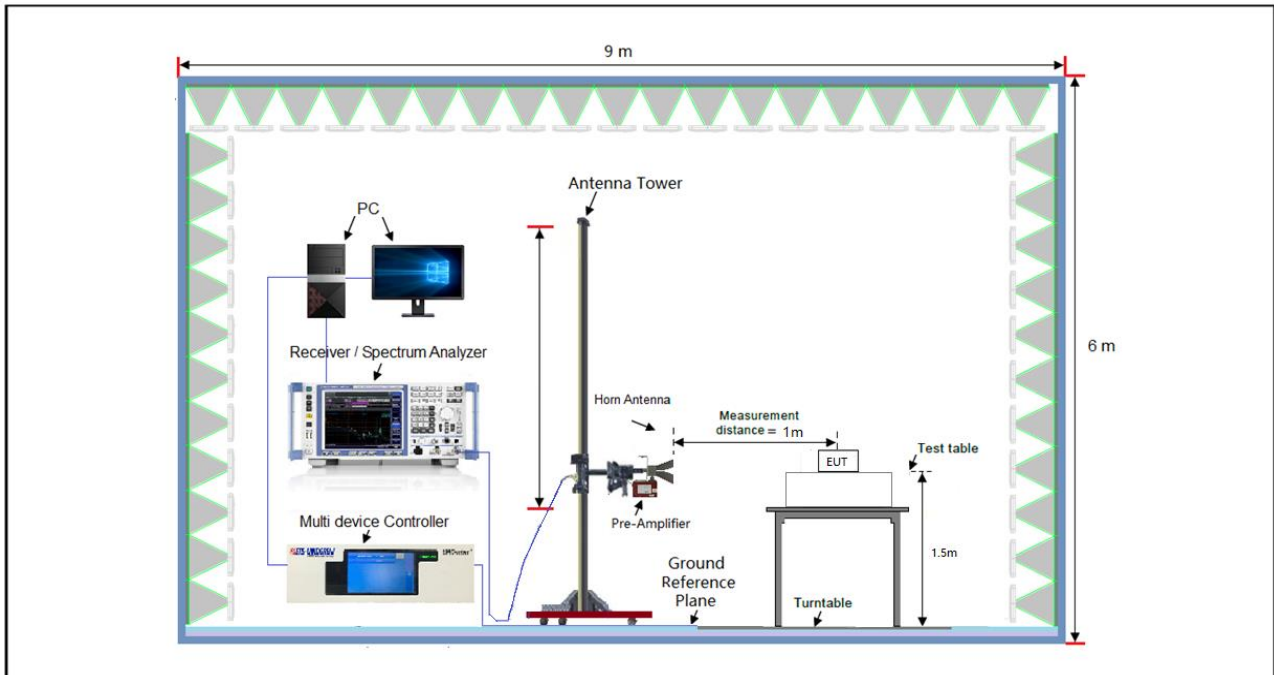




Frequency Range 1-18GHz:



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

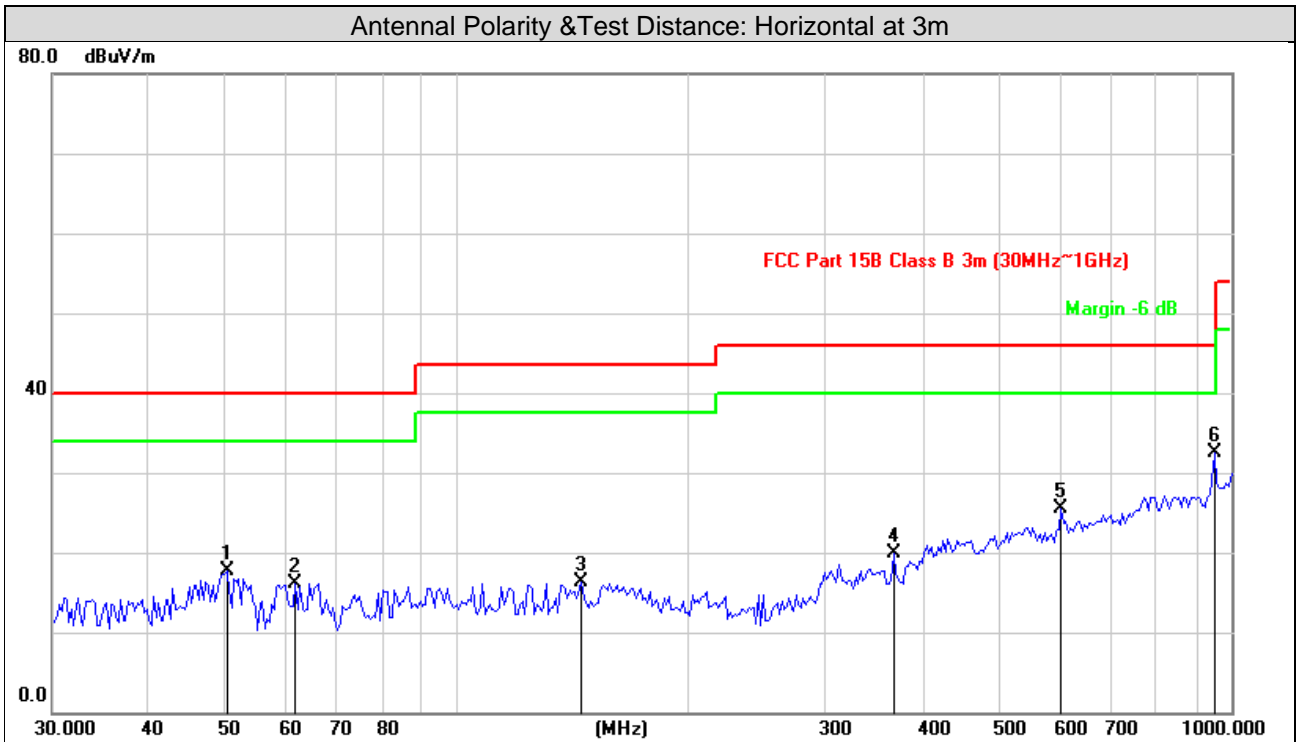
9kHz ~ 30MHz Data:

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

Left

30MHz ~ 1GHz Worst-Case Data:

Test Channel	Channel 39	Frequency Range	30MHz ~ 1GHz
Detector Function	Peak (PK) Quasi-peak (QP)	Tested By	King Ye



No.	Frequency (MHz)	Reading (dBuV)	Factor (dB)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Antenna Height (cm)	Table Angle (Degree)
1	50.4613	32.83	-15.14	17.69	40.00	-22.31	peak	100	174
2	61.8676	32.44	-16.35	16.09	40.00	-23.91	peak	200	108
3	144.7898	30.91	-14.66	16.25	43.50	-27.25	peak	100	188
4	366.0865	31.00	-11.02	19.98	46.00	-26.02	peak	100	26
5	602.9287	30.58	-5.04	25.54	46.00	-20.46	peak	200	206
6	952.0000	32.25	0.26	32.51	46.00	-13.49	peak	100	344

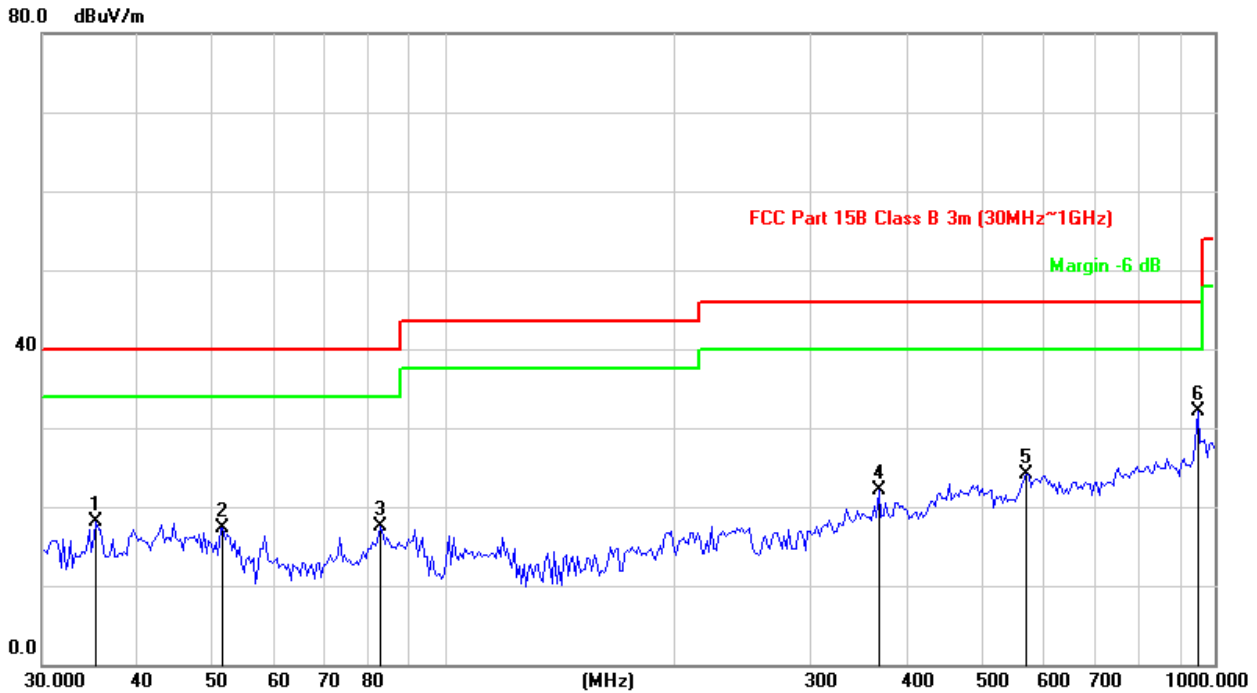
Remarks:

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



Test Channel	Channel 39	Frequency Range	30MHz ~ 1GHz
Detector Function	Peak (PK) Quasi-peak (QP)	Tested By	King Ye

Antennal Polarity& Test Distance: Vertical 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	35.2625	33.54	-15.49	18.05	40.00	-21.95	peak	100	228
2	51.5363	32.58	-15.25	17.33	40.00	-22.67	peak	100	135
3	82.5257	36.71	-19.28	17.43	40.00	-22.57	peak	200	172
4	366.0865	33.18	-11.02	22.16	46.00	-23.84	peak	200	269
5	569.9687	29.56	-5.53	24.03	46.00	-21.97	peak	100	108
6	952.0000	31.92	0.26	32.18	46.00	-13.82	peak	100	344

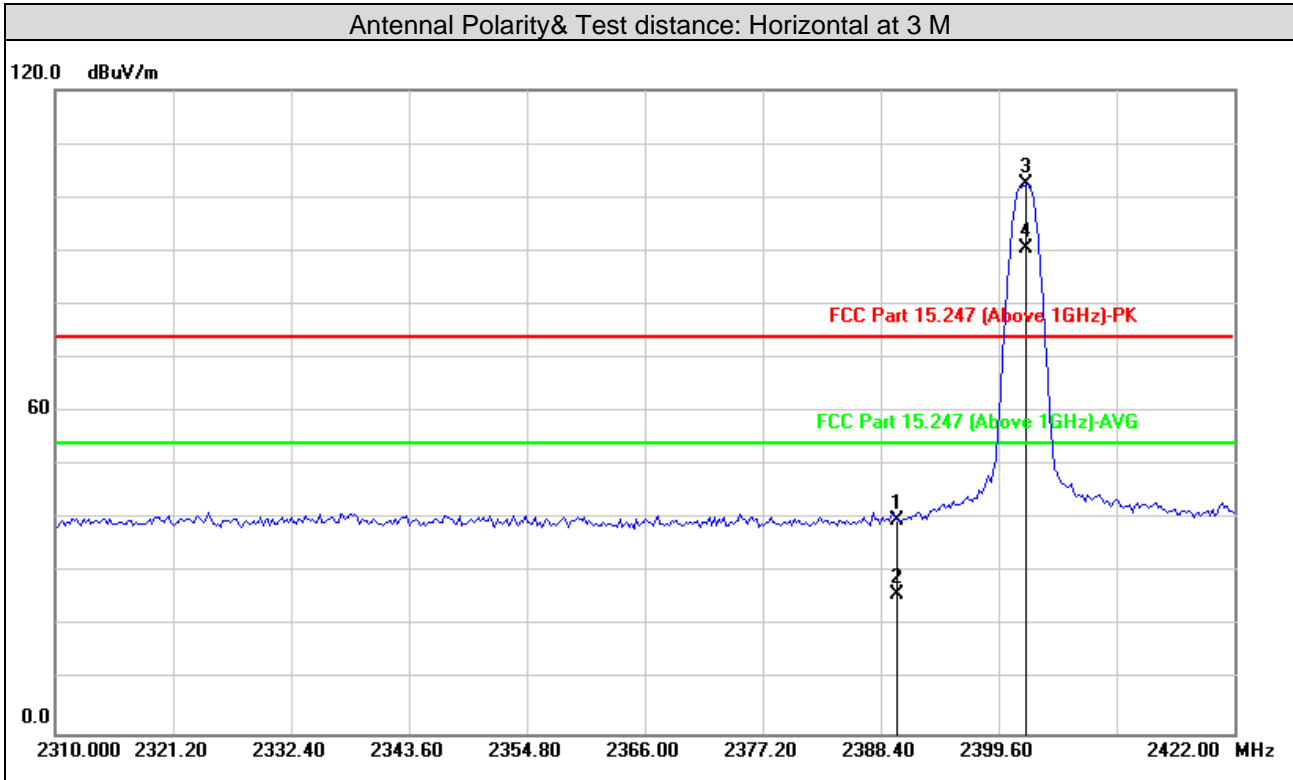
Remarks:

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



Above 1GHz Data:
BLE-1Mbps

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



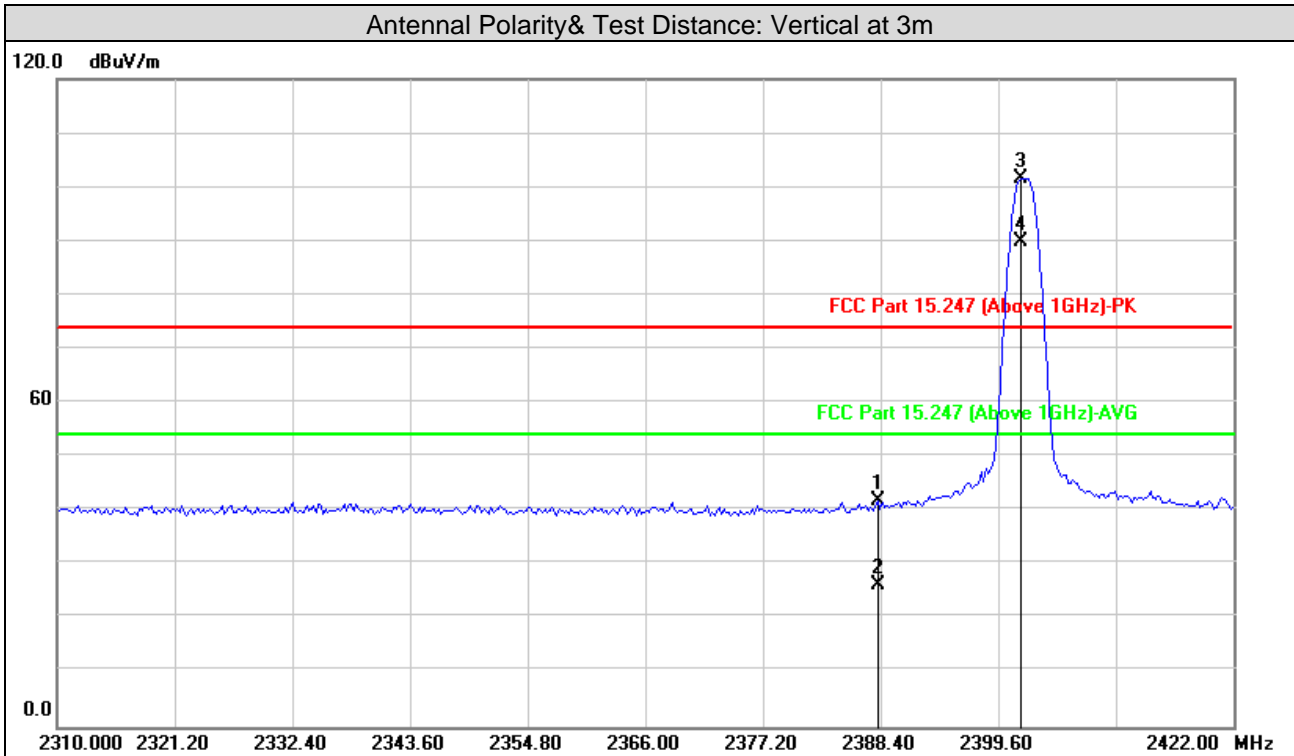
No.	Frequency (MHz)	Reading (dBuV)	Correct Factor (dB)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Antenna Height (cm)	Table Angle (Degree)
1	2390.000	38.94	0.76	39.70	74.00	-34.30	peak	100	107
2	2390.000	25.16	0.76	25.92	54.00	-28.08	AVG	100	107
3 #	2402.249	101.62	0.74	102.36			peak	100	107
4 #	2402.249	89.73	0.74	90.47			AVG	100	107
5	4804.000	45.04	7.27	52.31	74.00	-21.69	peak	100	154
6	4804.000	37.94	7.27	45.21	54.00	-8.79	AVG	100	154
7	7206.000	37.86	10.75	48.61	74.00	-25.39	peak	100	25
8	7206.000	27.72	10.75	38.47	54.00	-15.53	AVG	100	25

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	2388.108	41.08	0.77	41.85	74.00	-32.15	peak	100	39
2	2388.108	25.35	0.77	26.12	54.00	-27.88	AVG	100	39
3 #	2401.800	100.81	0.75	101.56			peak	100	39
4 #	2401.800	89.01	0.75	89.76			AVG	100	39
5	4804.000	44.41	7.27	51.68	74.00	-22.32	peak	100	174
6	4804.000	37.45	7.27	44.72	54.00	-9.28	AVG	100	174
7	7206.000	36.86	10.75	47.61	74.00	-26.39	peak	100	123
8	7206.000	27.46	10.75	38.21	54.00	-15.79	AVG	100	123

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	102.78	0.69	103.47			peak	100	135
2#	2440.000	90.83	0.69	91.52			AVG	100	135
3	4880.000	43.98	7.60	51.58	74.00	-22.42	peak	100	207
4	4880.000	34.12	7.60	41.72	54.00	-12.28	AVG	100	207
5	7320.000	37.39	10.92	48.31	74.00	-25.69	peak	100	166
6	7320.000	24.99	10.92	35.91	54.00	-18.09	AVG	100	166

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	102.15	0.69	102.84			peak	100	118
2#	2440.000	88.57	0.69	89.26			AVG	100	118
3	4880.000	44.87	7.60	52.47	74.00	-21.53	peak	100	294
4	4880.000	35.22	7.60	42.82	54.00	-11.18	AVG	100	294
5	7320.000	36.74	10.92	47.66	74.00	-26.34	peak	100	156
6	7320.000	24.36	10.92	35.28	54.00	-18.72	AVG	100	156

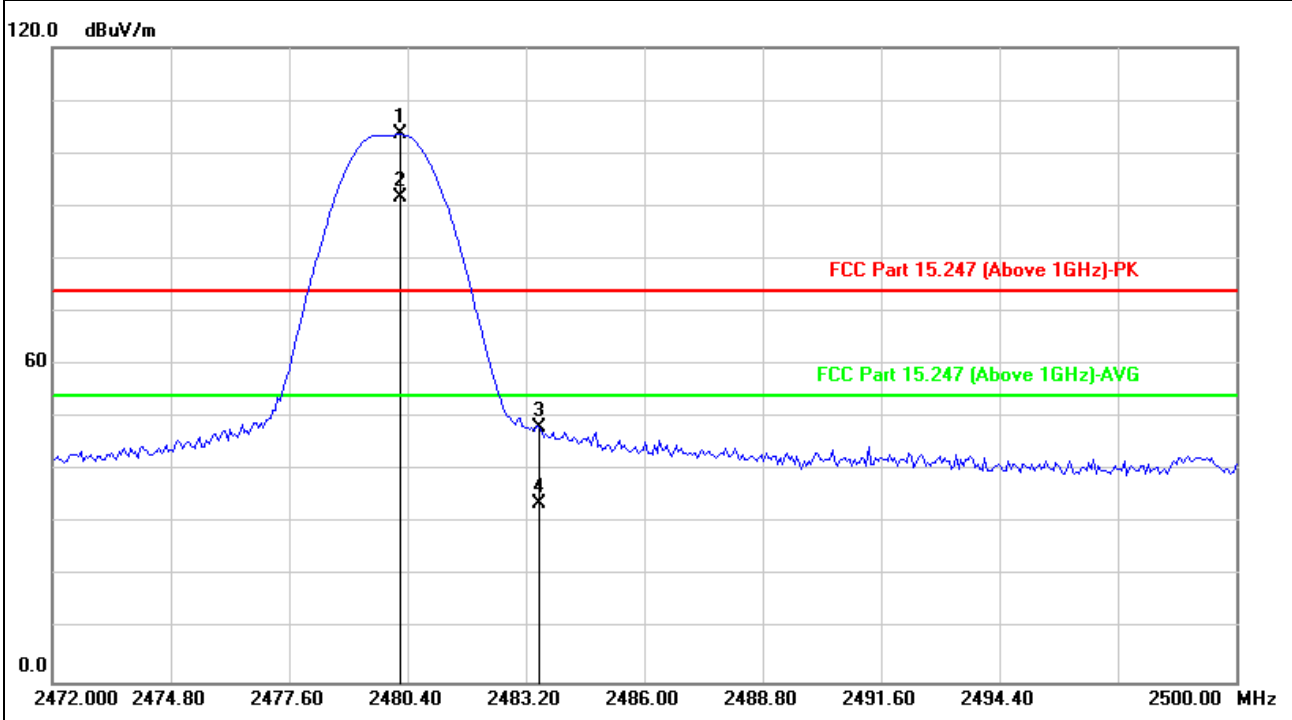
Remarks:

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

Antennal Polarity& Test Distance: Horizontal at 3 M



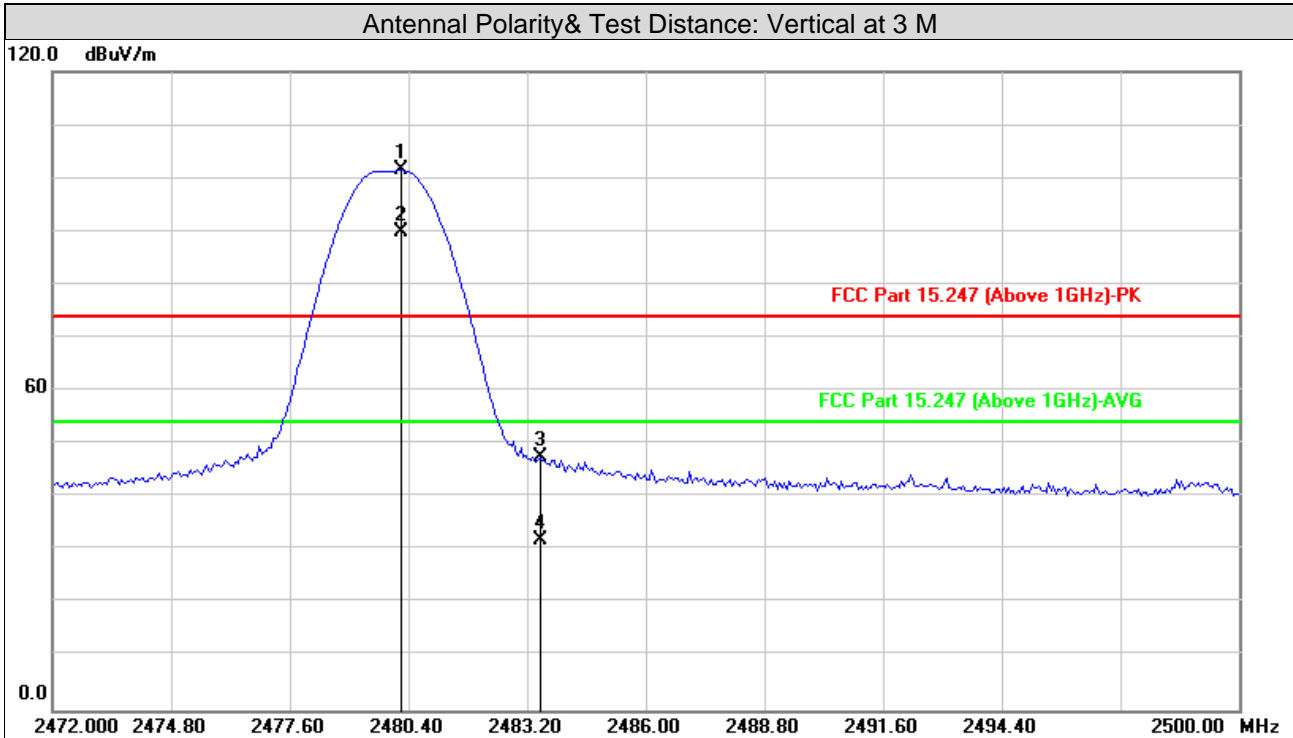
No.	Frequency (MHz)	Reading (dBuV)	Correct Factor (dB)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Antenna Height (cm)	Table Angle (Degree)
1#	2480.249	102.87	0.64	103.51			peak	100	123
2#	2480.249	91.08	0.64	91.72			AVG	100	123
3	2483.500	47.65	0.63	48.28	74.00	-25.72	peak	100	123
4	2483.500	33.17	0.63	33.80	54.00	-20.20	AVG	100	123
5	4960.000	43.77	7.94	51.71	74.00	-22.29	peak	100	169
6	4960.000	36.86	7.94	44.80	54.00	-9.20	AVG	100	169
7	7440.000	37.41	11.09	48.50	74.00	-25.50	peak	100	7
8	7440.000	27.60	11.09	38.69	54.00	-15.31	AVG	100	7

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#	2480.249	100.76	0.64	101.40			peak	100	93
2#	2480.249	89.29	0.64	89.93			AVG	100	93
3	2483.500	46.78	0.63	47.41	74.00	-26.59	peak	100	93
4	2483.500	31.40	0.63	32.03	54.00	-21.97	AVG	100	93
5	4960.000	45.41	7.94	53.35	74.00	-20.65	peak	100	169
6	4960.000	39.11	7.94	47.05	54.00	-6.95	AVG	100	169
7	7440.000	37.48	11.09	48.57	74.00	-25.43	peak	100	126
8	7440.000	25.85	11.09	36.94	54.00	-17.06	AVG	100	126

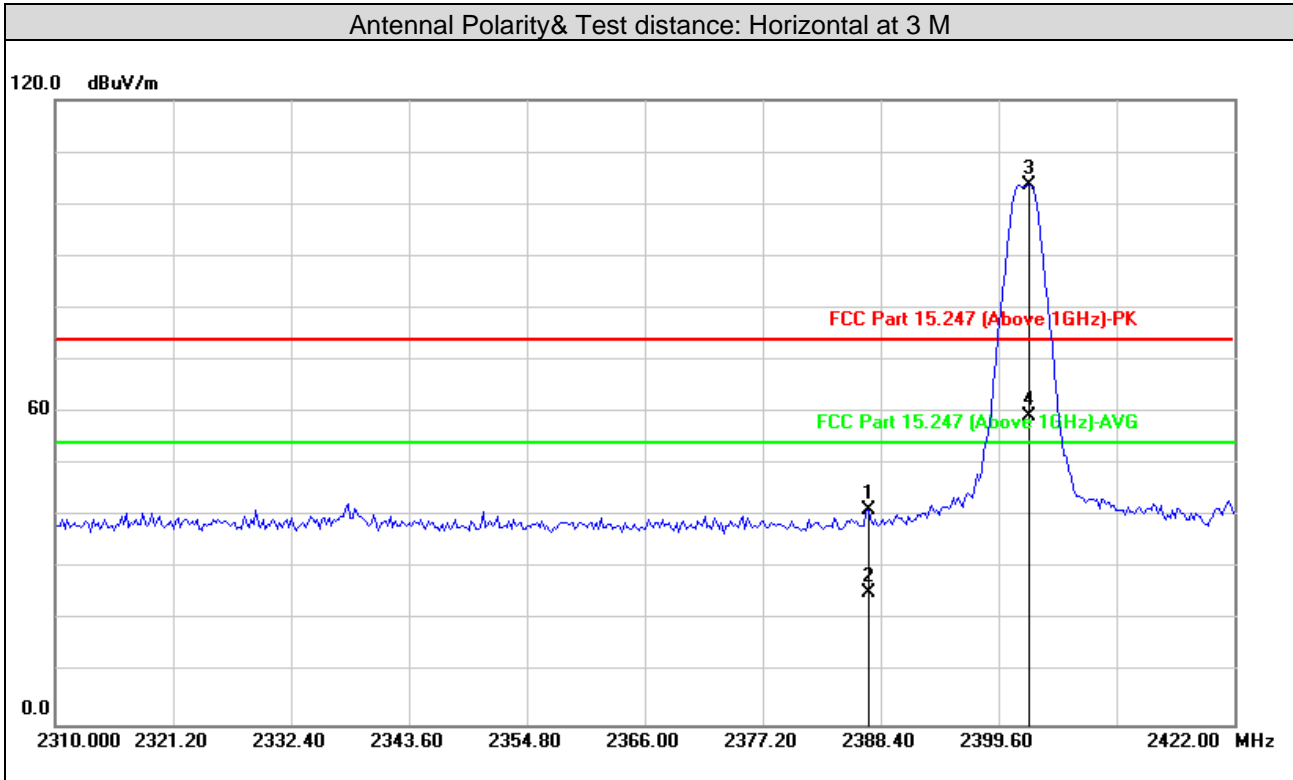
Remarks:

4. Emission Level = Read Level + Factor (Antenna Factor + Cable Loss - Preamp Factor)
5. Margin value = Emission level – Limit value
6. #2480MHz: Fundamental frequency.



Above 1GHz Data:
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	2387.210	40.36	0.77	41.13	74.00	-32.87	peak	100	68
2	2387.210	24.51	0.77	25.28	54.00	-28.72	AVG	100	68
3 #	2402.473	102.79	0.74	103.53			peak	100	68
4 #	2402.473	58.46	0.74	59.20			AVG	100	68
5	4804.000	41.33	7.27	48.60	74.00	-25.40	peak	100	162
6	4804.000	30.21	7.27	37.48	54.00	-16.52	AVG	100	162
7	7206.000	38.00	10.75	48.75	74.00	-25.25	peak	100	231
8	7206.000	24.61	10.75	35.36	54.00	-18.64	AVG	100	231

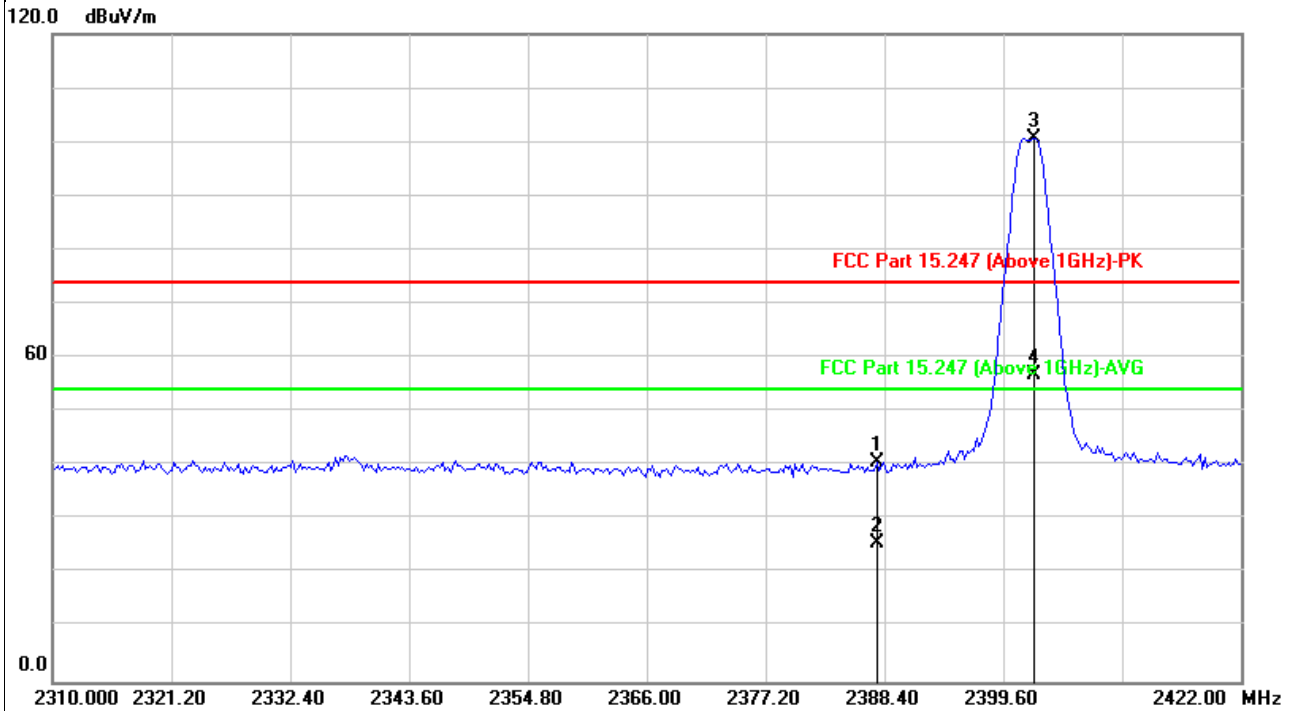
Remarks:

4. Emission Level = Read Level + Factor (Antenna Factor + Cable Loss - Preamp Factor)
5. Margin value = Emission level – Limit value
6. #2402MHz: Fundamental frequency.



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

Antennal Polarity& Test Distance: Vertical 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	2387.659	39.95	0.77	40.72	74.00	-33.28	peak	100	39
2	2387.659	24.91	0.77	25.68	54.00	-28.32	AVG	100	39
3 #	2402.473	100.01	0.74	100.75			peak	100	39
4 #	2402.473	56.22	0.74	56.96			AVG	100	39
5	4804.000	42.93	7.27	50.20	74.00	-23.80	peak	100	168
6	4804.000	31.10	7.27	38.37	54.00	-15.63	AVG	100	168
7	7206.000	37.35	10.75	48.10	74.00	-25.90	peak	100	118
8	7206.000	24.37	10.75	35.12	54.00	-18.88	AVG	100	118

Remarks:

4. Emission Level = Read Level + Factor (Antenna Factor + Cable Loss - Preamp Factor)
5. Margin value = Emission level – Limit value
6. #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	101.65	0.69	102.34			peak	100	266
2#	2440.000	57.44	0.69	58.13			AVG	100	266
3	4880.000	44.84	7.60	52.44	74.00	-21.56	peak	100	132
4	4880.000	35.33	7.60	42.93	54.00	-11.07	AVG	100	132
5	7320.000	36.41	10.92	47.33	74.00	-26.67	peak	100	241
6	7320.000	24.55	10.92	35.47	54.00	-18.53	AVG	100	241

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	100.45	0.69	101.14			peak	100	314
2#	2440.000	56.70	0.69	57.39			AVG	100	314
3	4880.000	44.51	7.60	52.11	74.00	-21.89	peak	100	209
4	4880.000	34.79	7.60	42.39	54.00	-11.61	AVG	100	209
5	7320.000	37.39	10.92	48.31	74.00	-25.69	peak	100	146
6	7320.000	25.30	10.92	36.22	54.00	-17.78	AVG	100	146

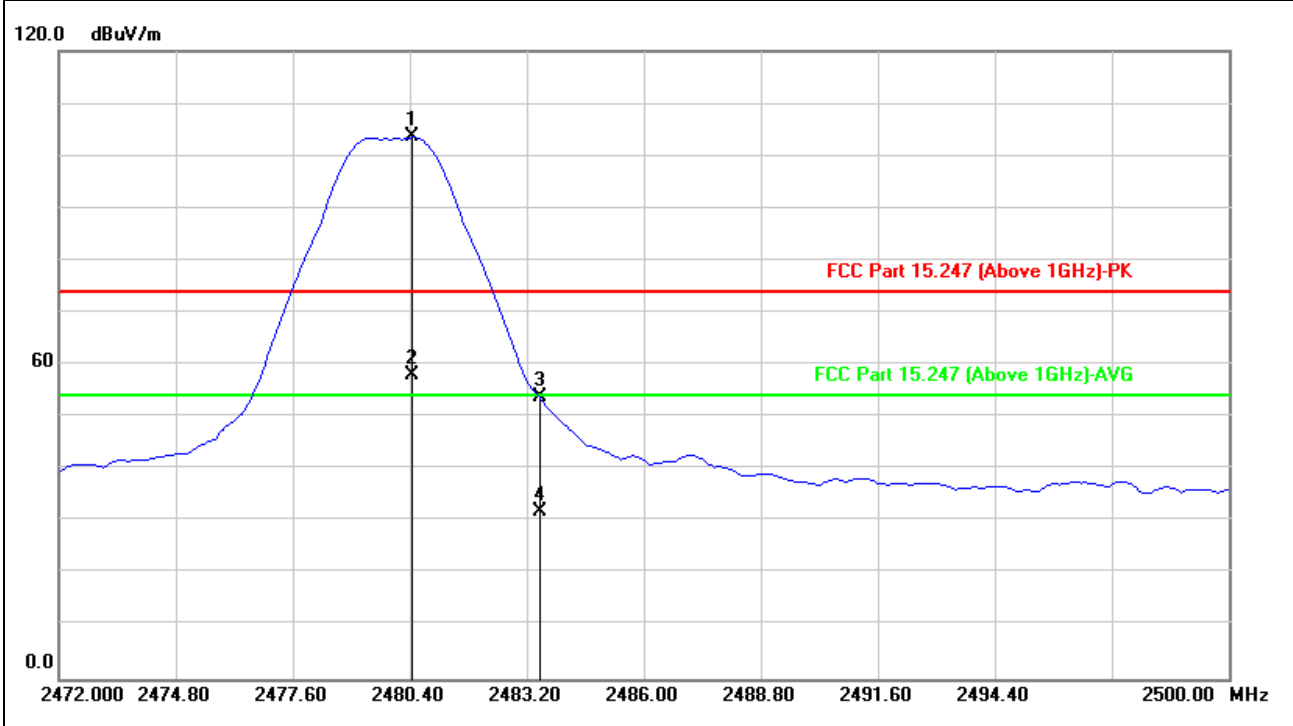
Remarks:

4. Emission Level = Read Level + Factor (Antenna Factor + Cable Loss - Preamp Factor)
5. Margin value = Emission level – Limit value
6. #2440MHz: Fundamental frequency.



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

Antenna Polarity& Test Distance: Horizontal at 3 M



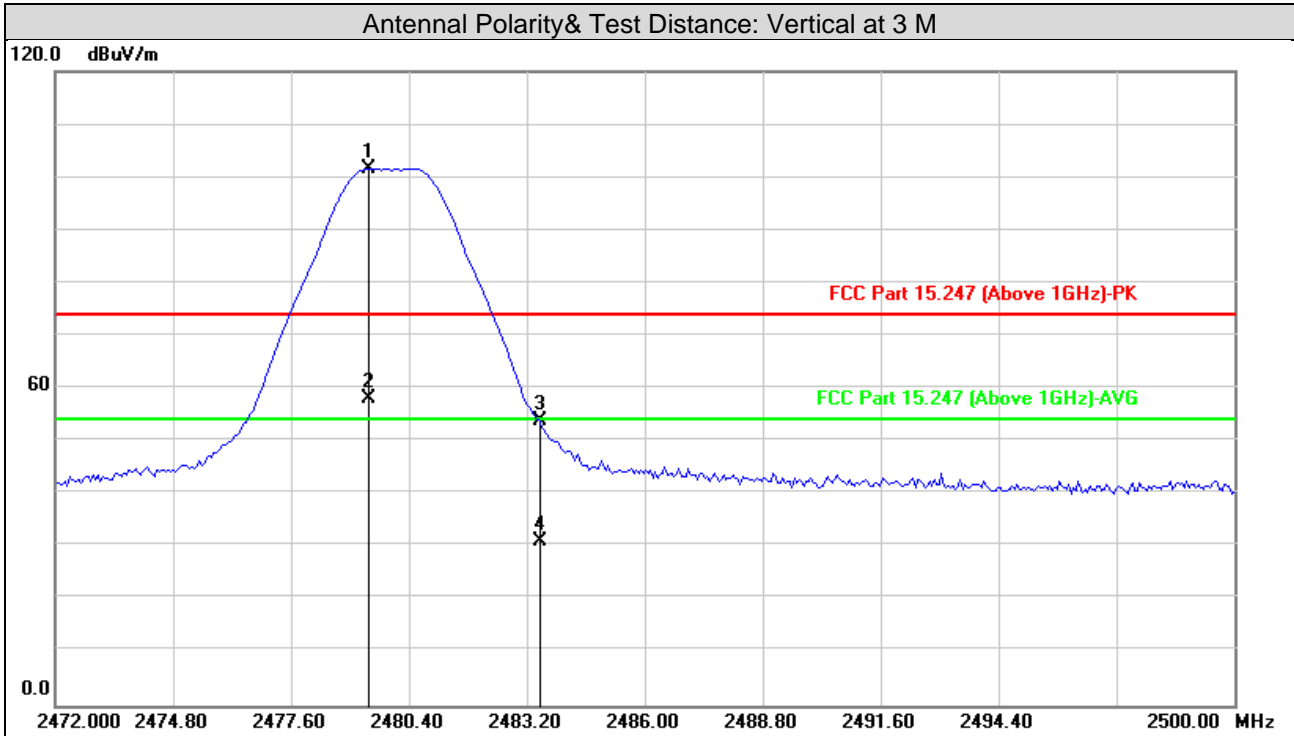
No.	Frequency (MHz)	Reading (dBuV)	Correct Factor (dB)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Antenna Height (cm)	Table Angle (Degree)
1#	2480.473	102.90	0.64	103.54			peak	100	122
2#	2480.473	57.38	0.64	58.02			AVG	100	122
3	2483.500	53.15	0.63	53.78	74.00	-20.22	peak	100	122
4	2483.500	31.26	0.63	31.89	54.00	-22.11	AVG	100	122
5	4960.000	40.77	7.94	48.71	74.00	-25.29	peak	100	158
6	4960.000	29.64	7.94	37.58	54.00	-16.42	AVG	100	158
7	7440.000	37.35	11.09	48.44	74.00	-25.56	peak	100	224
8	7440.000	24.59	11.09	35.68	54.00	-18.32	AVG	100	224

Remarks:

- 7. Emission Level = Read Level + Factor (Antenna Factor + Cable Loss - Preamp Factor)
- 8. Margin value = Emission level – Limit value
- 9. #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	101.05	0.64	101.69			peak	100	104
2#	2479.463	57.51	0.64	58.15			AVG	100	104
3	2483.500	53.09	0.63	53.72	74.00	-20.28	peak	100	104
4	2483.500	30.46	0.63	31.09	54.00	-22.91	AVG	100	104
5	4960.000	41.33	7.94	49.27	74.00	-24.73	peak	100	163
6	4960.000	29.88	7.94	37.82	54.00	-16.18	AVG	100	163
7	7440.000	38.48	11.09	49.57	74.00	-24.43	peak	100	126
8	7440.000	25.63	11.09	36.72	54.00	-17.28	AVG	100	126

Remarks:

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

11. Margin value = Emission level – Limit value

12. #2480MHz: Fundamental frequency.

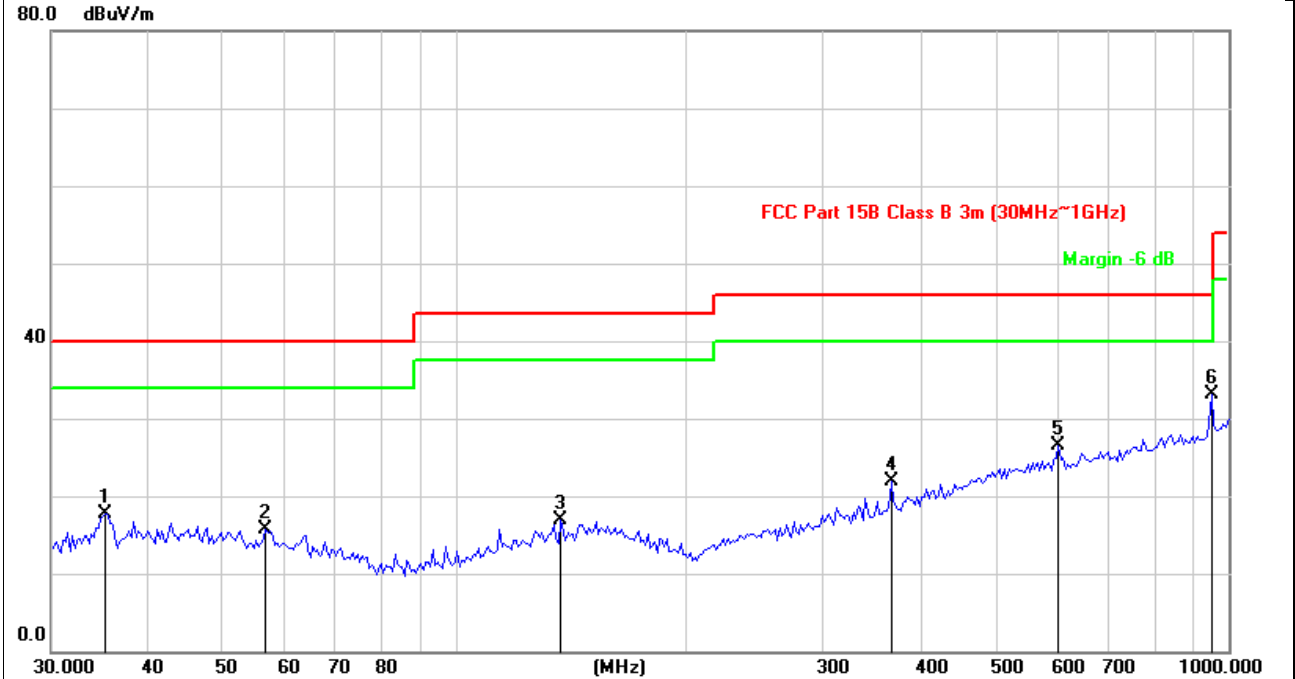


Right

30MHz ~ 1GHz Worst-Case Data:

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

Antennal Polarity & Test Distance: Horizontal at 3m



No.	Frequency (MHz)	Reading (dBuV)	Factor (dB)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Antenna Height (cm)	Table Angle (Degree)
1	35.2626	33.21	-15.49	17.72	40.00	-22.28	peak	300	106
2	56.8644	31.51	-15.82	15.69	40.00	-24.31	peak	200	294
3	136.8747	31.92	-15.08	16.84	43.50	-26.66	peak	200	156
4	366.0866	33.00	-11.02	21.98	46.00	-24.02	peak	200	247
5	602.9287	31.58	-5.04	26.54	46.00	-19.46	peak	200	110
6	952.0001	32.75	0.26	33.01	46.00	-12.99	peak	200	238

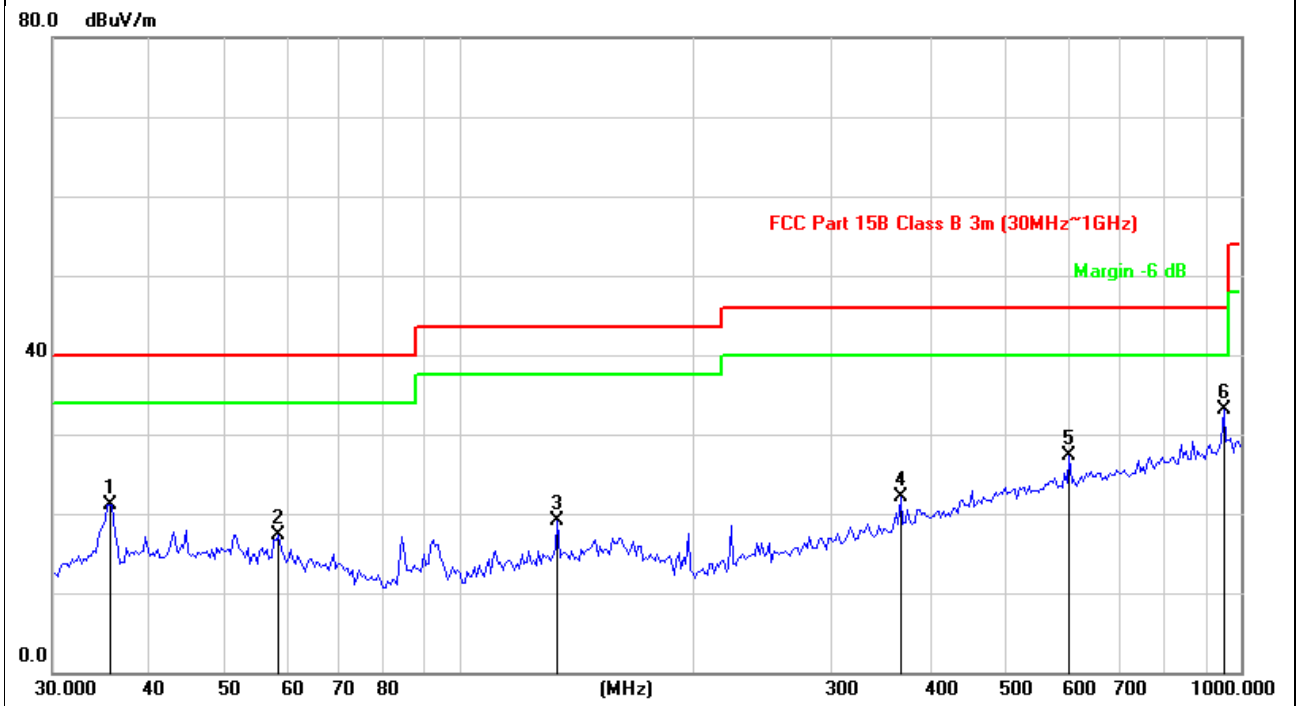
Remarks:

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



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

Antennal Polarity& Test Distance: Vertical 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	35.5112	36.57	-15.46	21.11	40.00	-18.89	peak	200	354
2	58.4855	33.34	-16.00	17.34	40.00	-22.66	peak	100	182
3	133.0809	34.45	-15.31	19.14	43.50	-24.36	peak	100	149
4	366.0866	33.18	-11.02	22.16	46.00	-23.84	peak	200	268
5	602.9287	32.42	-5.04	27.38	46.00	-18.62	peak	100	72
6	952.0001	32.92	0.26	33.18	46.00	-12.82	peak	200	105

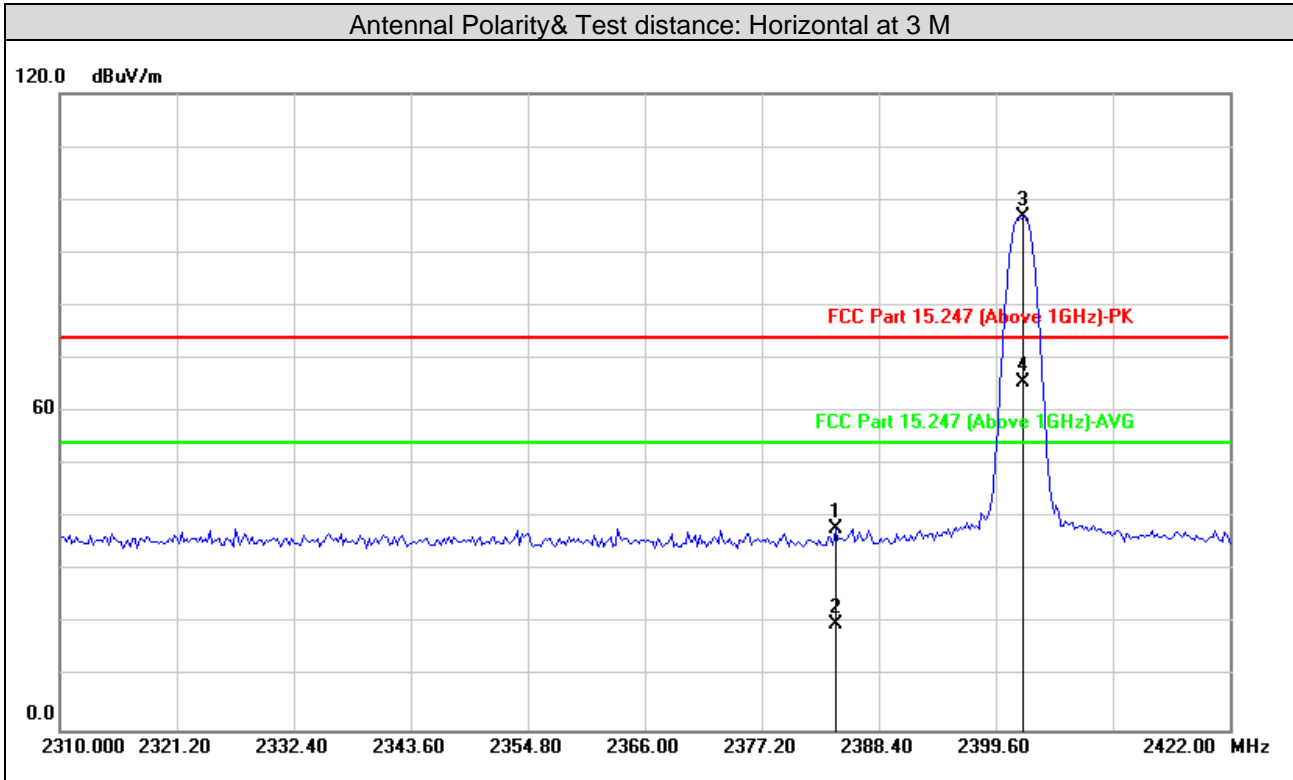
Remarks:

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



Above 1GHz Data:
BLE-1Mbps

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



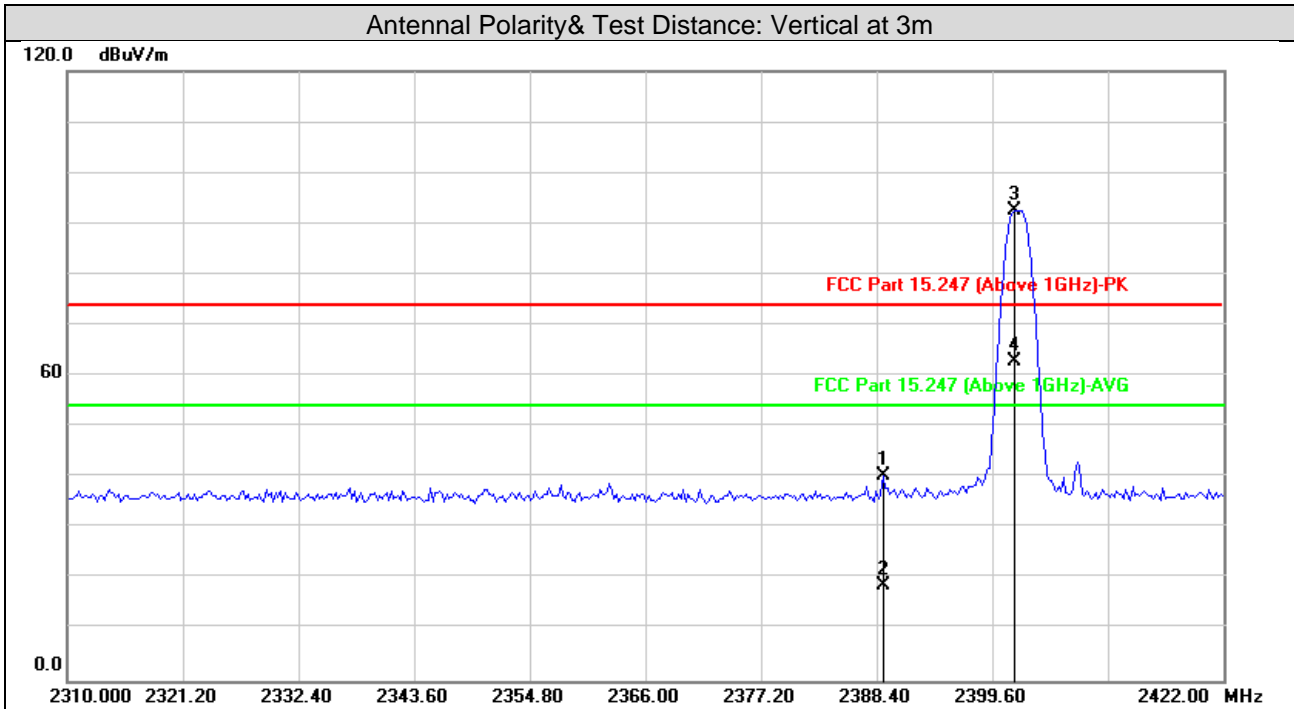
No.	Frequency (MHz)	Reading (dBuV)	Correct Factor (dB)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Antenna Height (cm)	Table Angle (Degree)
1	2384.293	46.93	-8.87	38.06	74.00	-35.94	peak	306	93
2	2384.293	28.92	-8.87	20.05	54.00	-33.95	AVG	306	93
3 #	2402.249	105.53	-8.87	96.66			peak	306	93
4 #	2402.249	74.47	-8.87	65.60			AVG	306	93
5	4804.000	45.11	7.27	52.38	74.00	-21.62	peak	100	277
6	4804.000	38.52	7.27	45.79	54.00	-8.21	AVG	100	277
7	7206.000	35.58	10.75	46.33	74.00	-27.67	peak	100	206
8	7206.000	23.92	10.75	34.67	54.00	-19.33	AVG	100	206

Remarks:

- 7. Emission Level = Read Level + Factor (Antenna Factor + Cable Loss - Preamp Factor)
- 8. Margin value = Emission level – Limit value
- 9. #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	2389.006	49.29	-8.87	40.42	74.00	-33.58	peak	343	352
2	2389.006	27.58	-8.87	18.71	54.00	-35.29	AVG	343	352
3 #	2401.800	101.47	-8.87	92.60			peak	343	352
4 #	2401.800	71.70	-8.87	62.83			AVG	343	352
5	4804.000	46.59	7.27	53.86	74.00	-20.14	peak	100	198
6	4804.000	41.78	7.27	49.05	54.00	-4.95	AVG	100	198
7	7206.000	35.97	10.75	46.72	74.00	-27.28	peak	100	187
8	7206.000	23.83	10.75	34.58	54.00	-19.42	AVG	100	187

Remarks:

- 7. Emission Level = Read Level + Factor (Antenna Factor + Cable Loss - Preamp Factor)
- 8. Margin value = Emission level – Limit value
- 9. #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	95.03	0.69	95.72			peak	100	194
2#	2440.000	63.49	0.69	64.18			AVG	100	194
3	4880.000	46.34	7.60	53.94	74.00	-20.06	peak	100	204
4	4880.000	40.67	7.60	48.27	54.00	-5.73	AVG	100	204
5	7320.000	36.34	10.92	47.26	74.00	-26.74	peak	100	166
6	7320.000	24.12	10.92	35.04	54.00	-18.96	AVG	100	166

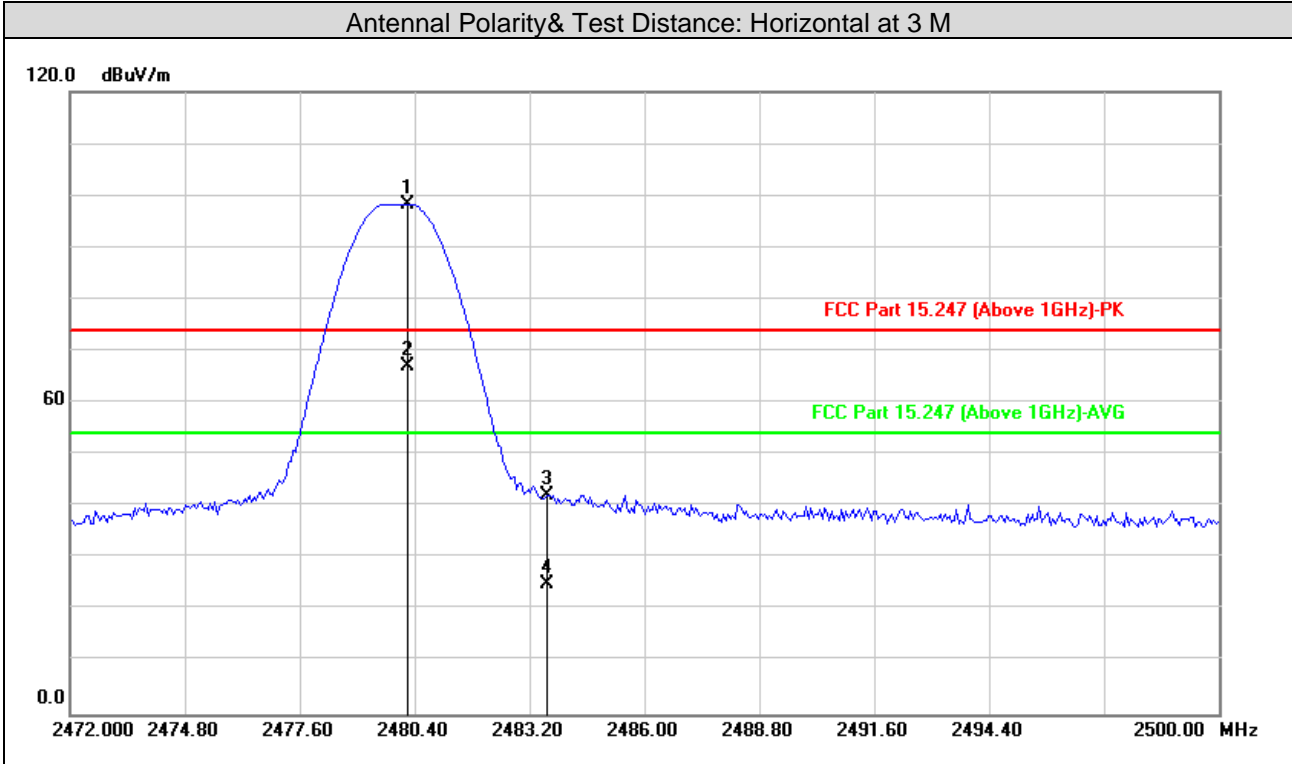
Antennal Polarity& Test Distance: Vertical at 3 M									
No.	Frequency (MHz)	Reading (dBuV)	Factor (dB)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Antenna Height (cm)	Table Angle (Degree)
1#	2440.000	92.67	0.69	93.36			peak	100	219
2#	2440.000	62.48	0.69	63.17			AVG	100	219
3	4880.000	46.62	7.60	54.22	74.00	-19.78	peak	100	263
4	4880.000	41.16	7.60	48.76	54.00	-5.24	AVG	100	263
5	7320.000	36.27	10.92	47.19	74.00	-26.81	peak	100	175
6	7320.000	24.41	10.92	35.33	54.00	-18.67	AVG	100	175

Remarks:

- 7. Emission Level = Read Level + Factor (Antenna Factor + Cable Loss - Preamp Factor)
- 8. Margin value = Emission level – Limit value
- 9. #2440MHz: Fundamental frequency.



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



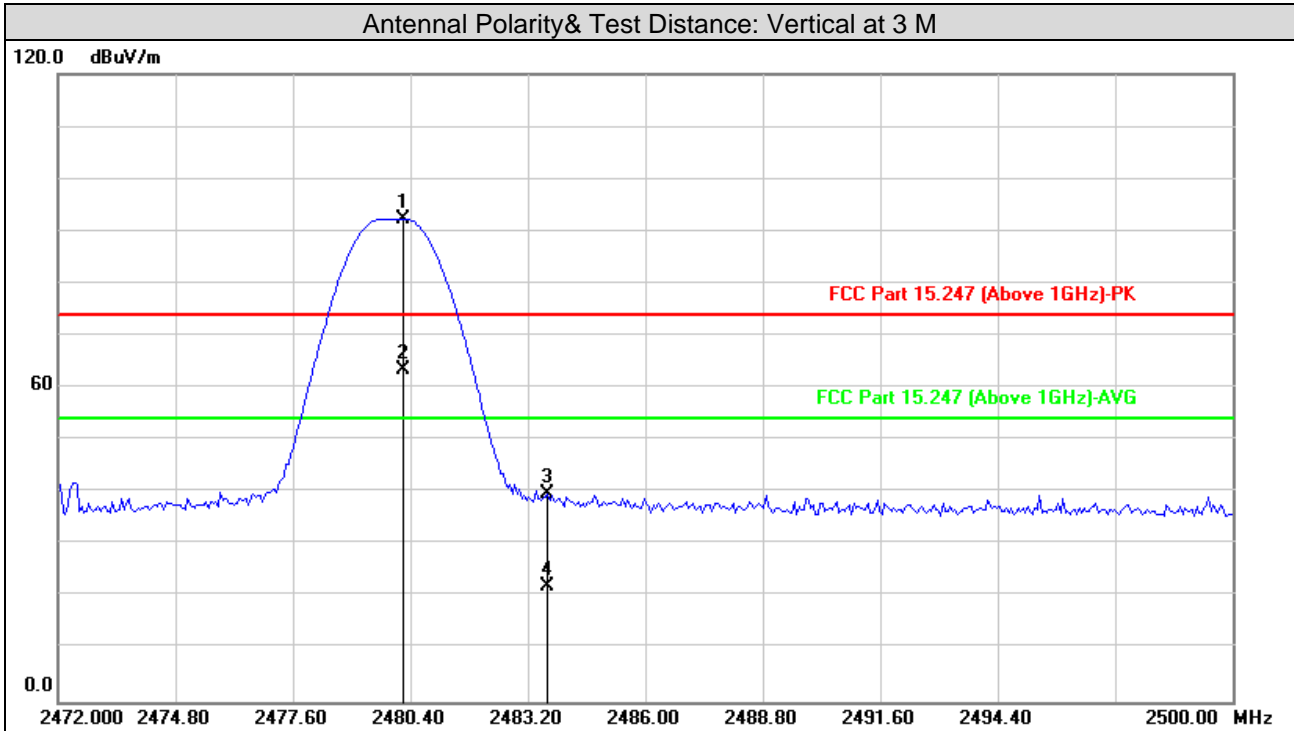
No.	Frequency (MHz)	Reading (dBuV)	Correct Factor (dB)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Antenna Height (cm)	Table Angle (Degree)
1#	2480.249	107.27	-8.88	98.39			peak	354	64
2#	2480.249	76.00	-8.88	67.12			AVG	354	64
3	2483.615	51.19	-8.89	42.30	74.00	-31.70	peak	354	64
4	2483.615	34.08	-8.89	25.19	54.00	-28.81	AVG	354	64
5	4960.000	47.62	7.94	55.56	74.00	-18.44	peak	100	275
6	4960.000	41.70	7.94	49.64	54.00	-4.36	AVG	100	275
7	7440.000	34.69	11.09	45.78	74.00	-28.22	peak	100	227
8	7440.000	24.06	11.09	35.15	54.00	-18.85	AVG	100	227

Remarks:

- 13. Emission Level = Read Level + Factor (Antenna Factor + Cable Loss - Preamp Factor)
- 14. Margin value = Emission level – Limit value
- 15. #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#	2480.249	101.20	-8.88	92.32			peak	354	0
2#	2480.249	72.24	-8.88	63.36			AVG	354	0
3	2483.671	48.64	-8.89	39.75	74.00	-34.25	peak	354	0
4	2483.671	30.89	-8.89	22.00	54.00	-32.00	AVG	354	0
5	4960.000	45.92	7.94	53.86	74.00	-20.14	peak	100	340
6	4960.000	40.47	7.94	48.41	54.00	-5.59	AVG	100	340
7	7440.000	35.13	11.09	46.22	74.00	-27.78	peak	100	193
8	7440.000	24.38	11.09	35.47	54.00	-18.53	AVG	100	193

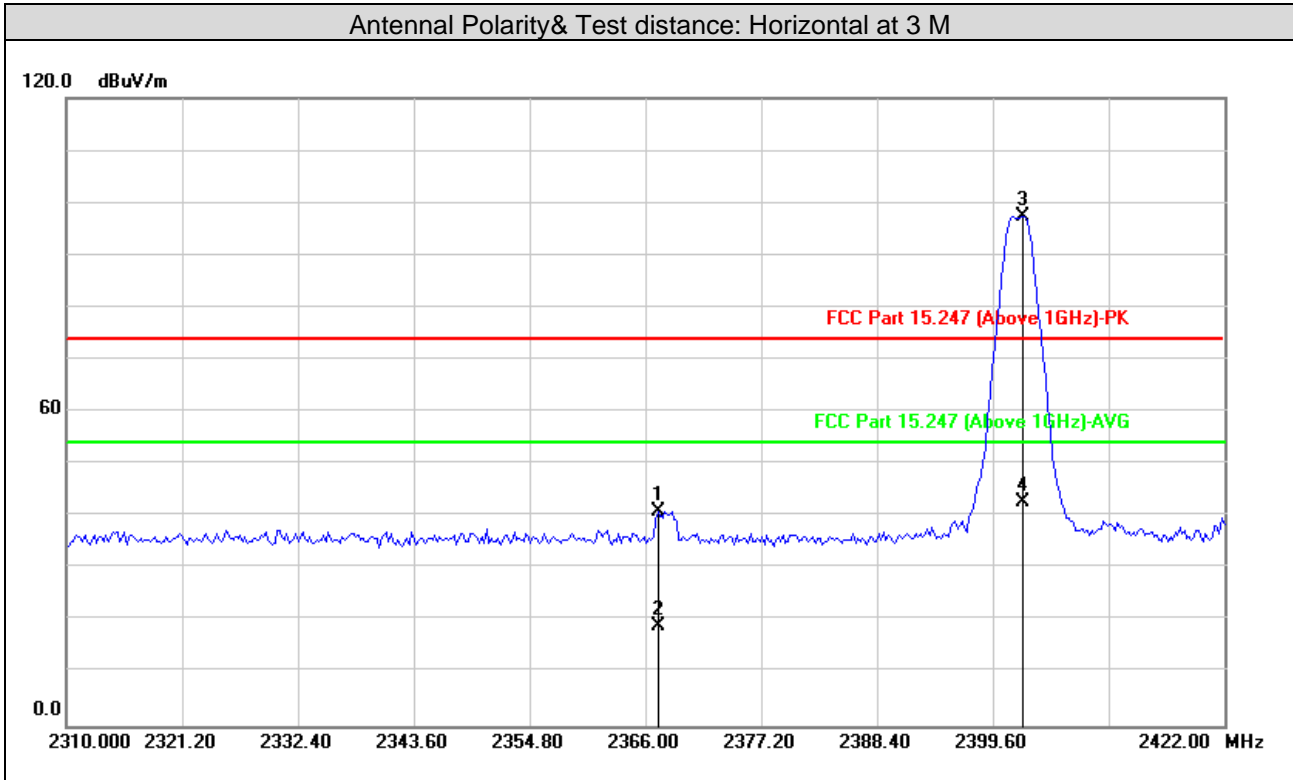
Remarks:

- 16. Emission Level = Read Level + Factor (Antenna Factor + Cable Loss - Preamp Factor)
- 17. Margin value = Emission level – Limit value
- 18. #2480MHz: Fundamental frequency.



Above 1GHz Data:
BLE-2Mbps

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



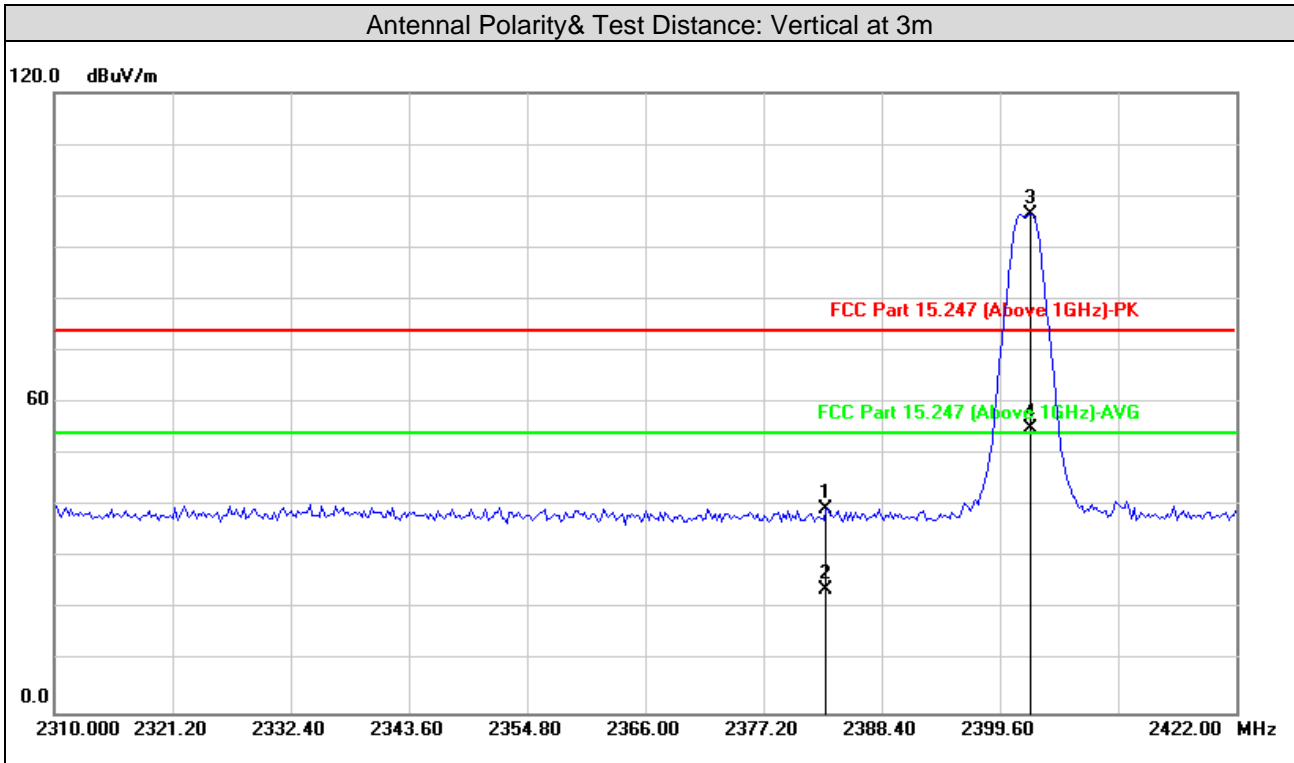
No.	Frequency (MHz)	Reading (dBuV)	Correct Factor (dB)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Antenna Height (cm)	Table Angle (Degree)
1	2367.235	49.92	-8.87	41.05	74.00	-32.95	peak	307	90
2	2367.235	27.80	-8.87	18.93	54.00	-35.07	AVG	307	90
3 #	2402.473	106.16	-8.87	97.29			peak	307	90
4 #	2402.473	51.66	-8.87	42.79			AVG	307	90
5	4804.000	44.50	7.27	51.77	74.00	-22.23	peak	100	275
6	4804.000	30.99	7.27	38.26	54.00	-15.74	AVG	100	275
7	7206.000	34.26	10.75	45.01	74.00	-28.99	peak	100	126
8	7206.000	22.99	10.75	33.74	54.00	-20.26	AVG	100	126

Remarks:

- 10. Emission Level = Read Level + Factor (Antenna Factor + Cable Loss - Preamp Factor)
- 11. Margin value = Emission level – Limit value
- 12. #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	2383.170	38.78	0.77	39.55	74.00	-34.45	peak	100	137
2	2383.170	23.09	0.77	23.86	54.00	-30.14	AVG	100	137
3 #	2402.473	95.71	0.74	96.45			peak	100	137
4 #	2402.473	54.37	0.74	55.11			AVG	100	137
5	4804.000	46.94	7.27	54.21	74.00	-19.79	peak	100	195
6	4804.000	32.65	7.27	39.92	54.00	-14.08	AVG	100	195
7	7206.000	34.98	10.75	45.73	74.00	-28.27	peak	100	149
8	7206.000	23.52	10.75	34.27	54.00	-19.73	AVG	100	149

Remarks:

- 10. Emission Level = Read Level + Factor (Antenna Factor + Cable Loss - Preamp Factor)
- 11. Margin value = Emission level – Limit value
- 12. #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	96.32	0.69	97.01			peak	100	271
2#	2440.000	42.47	0.69	43.16			AVG	100	271
3	4880.000	44.73	7.60	52.33	74.00	-21.67	peak	100	115
4	4880.000	30.82	7.60	38.42	54.00	-15.58	AVG	100	115
5	7320.000	34.37	10.92	45.29	74.00	-28.71	peak	100	75
6	7320.000	23.02	10.92	33.94	54.00	-20.06	AVG	100	75

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	92.59	0.69	93.28			peak	100	108
2#	2440.000	41.50	0.69	42.19			AVG	100	108
3	4880.000	45.33	7.60	52.93	74.00	-21.07	peak	100	264
4	4880.000	30.55	7.60	38.15	54.00	-15.85	AVG	100	264
5	7320.000	34.36	10.92	45.28	74.00	-28.72	peak	100	113
6	7320.000	23.24	10.92	34.16	54.00	-19.84	AVG	100	113

Remarks:

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

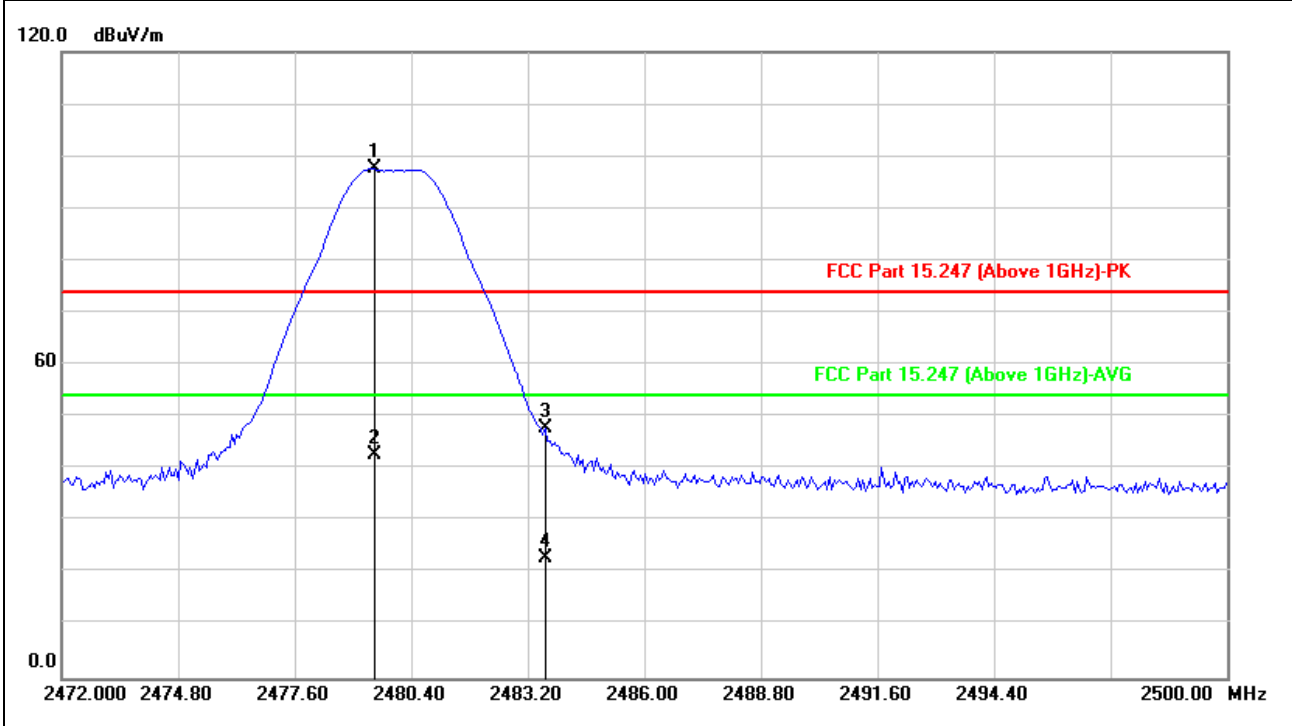
11.Margin value = Emission level – Limit value

12.#2440MHz: Fundamental frequency.



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

Antennal Polarity& Test Distance: Horizontal at 3 M



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#	2479.519	106.41	-8.88	97.53			peak	100	76
2#	2479.519	51.75	-8.88	42.87			AVG	100	76
3	2483.615	56.84	-8.89	47.95	74.00	-26.05	peak	100	76
4	2483.615	31.95	-8.89	23.06	54.00	-30.94	AVG	100	76
5	4960.000	47.04	7.94	54.98	74.00	-19.02	peak	100	275
6	4960.000	32.58	7.94	40.52	54.00	-13.48	AVG	100	275
7	7440.000	34.08	11.09	45.17	74.00	-28.83	peak	100	175
8	7440.000	23.19	11.09	34.28	54.00	-19.72	AVG	100	175

Remarks:

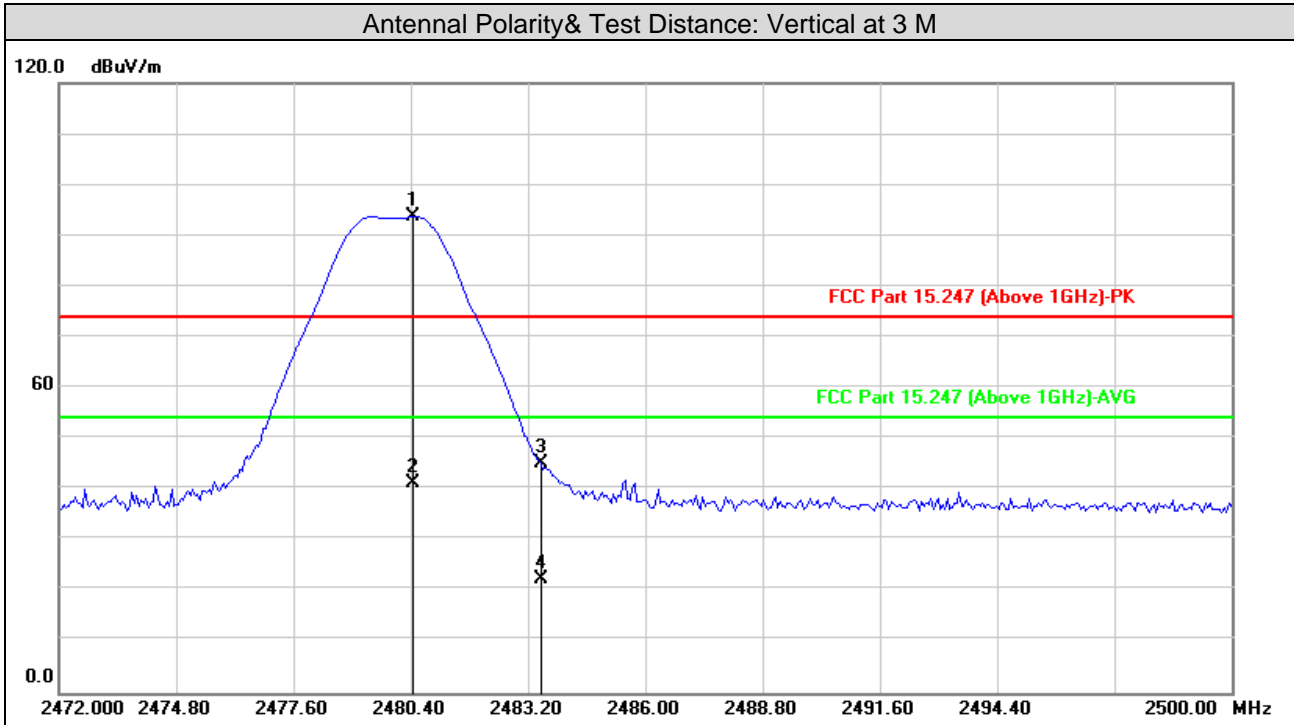
19. Emission Level = Read Level + Factor (Antenna Factor + Cable Loss - Preamp Factor)

20. Margin value = Emission level – Limit value

21. #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	102.64	-8.88	93.76			peak	354	353
2#	2480.473	50.17	-8.88	41.29			AVG	354	353
3	2483.500	54.18	-8.89	45.29	74.00	-28.71	peak	354	353
4	2483.500	31.31	-8.89	22.42	54.00	-31.58	AVG	354	353
5	4960.000	45.29	7.94	53.23	74.00	-20.77	peak	100	77
6	4960.000	31.33	7.94	39.27	54.00	-14.73	AVG	100	77
7	7440.000	33.28	11.09	44.37	74.00	-29.63	peak	100	126
8	7440.000	22.39	11.09	33.48	54.00	-20.52	AVG	100	126

Remarks:

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

23.Margin value = Emission level – Limit value

24.#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	ESR 7	101961	2023-01-13
Artificial Mains Network Rohde&Schwarz	ENV216	3560.6550.15	2023-01-12
Test software FARAD	EZ_EMC V1.1.4.2	N/A	N/A
Hygrothermograph YuhuaZe	HTC-1	NA	2023-08-25
Digital Multimeter FLUKE	15B+	43512617WS	2023-08-25

- 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

- a. 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.
- b. Both lines of the power mains connected to the EUT were checked for maximum conducted interference.
- c. 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.

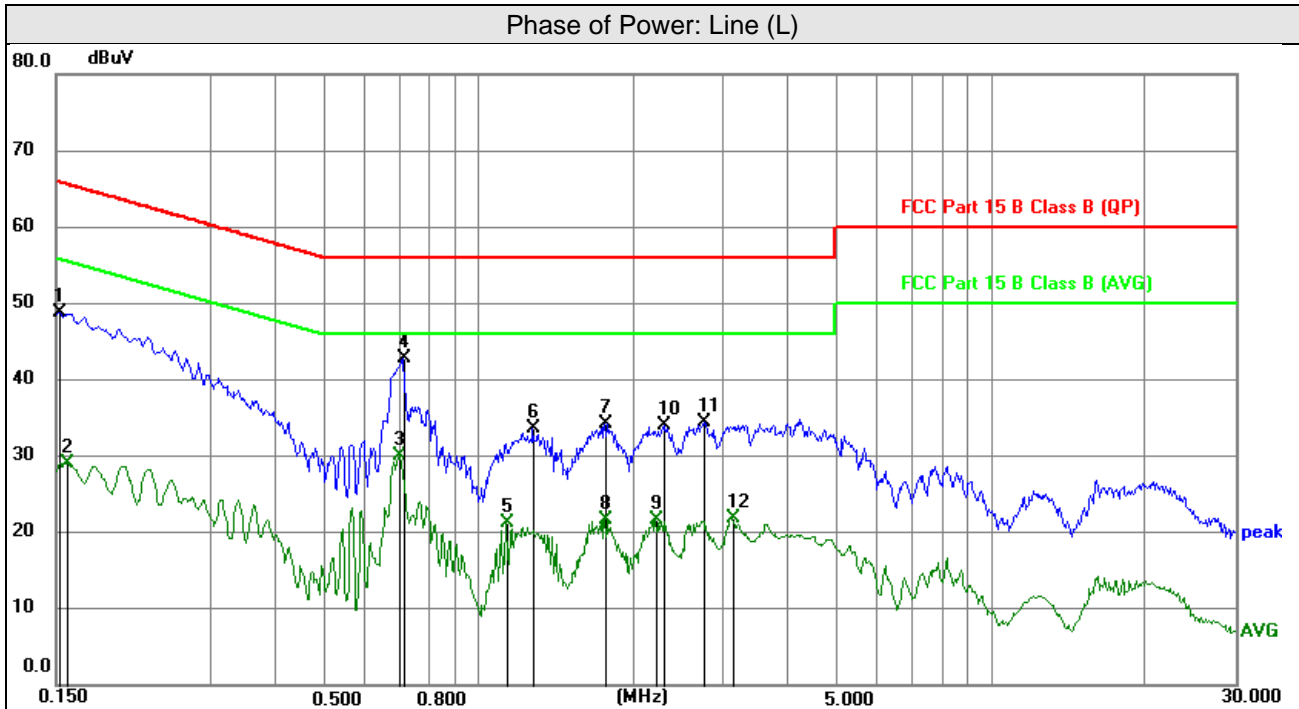
3.2.4 Deviation from Test Standard

No deviation.



3.2.7 Test Results

Frequency Range	150kHz ~ 30MHz	Detector Function & Resolution bandwidth	Quasi-Peak (QP) / Average (AV), 9kHz
Power supply	AC 120V/60Hz	Environmental Conditions	26.2°C, 57%RH



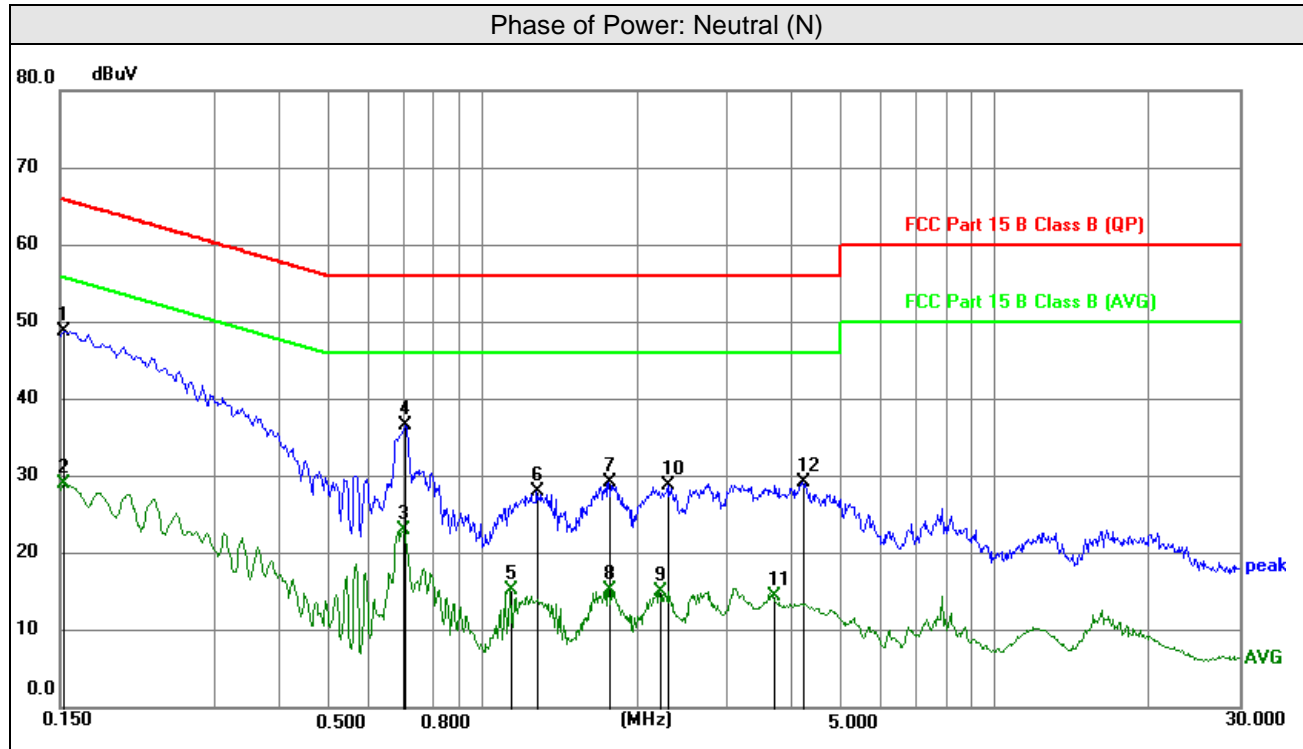
No	Frequency (MHz)	Reading (dBuV)	Correction Factor (dB)	Emission Level (dBuV)	Limit (dBuV)	Margin (dB)	Remark
1	0.1522	38.63	10.18	48.81	65.88	-17.07	peak
2	0.1568	18.92	10.17	29.09	55.63	-26.54	AVG
3	0.7056	19.96	10.11	30.07	46.00	-15.93	AVG
4	0.7125	32.65	10.11	42.76	56.00	-13.24	peak
5	1.1355	11.18	10.05	21.23	46.00	-24.77	AVG
6	1.2818	23.47	10.05	33.52	56.00	-22.48	peak
7	1.7633	24.16	10.08	34.24	56.00	-21.76	peak
8	1.7633	11.52	10.08	21.60	46.00	-24.40	AVG
9	2.2177	11.60	10.09	21.69	46.00	-24.31	AVG
10	2.3055	23.99	10.09	34.08	56.00	-21.92	peak
11	2.7623	24.23	10.09	34.32	56.00	-21.68	peak
12	3.1245	11.76	10.09	21.85	46.00	-24.15	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	26.2°C, 57%RH



No.	Frequency (MHz)	Reading (dBuV)	Correction Factor (dB)	Emission Level (dBuV)	Limit (dBuV)	Margin (dB)	Remark
1	0.1522	38.69	10.18	48.87	65.88	-17.01	peak
2	0.1522	18.81	10.18	28.99	55.88	-26.89	AVG
3	0.7056	12.95	10.10	23.05	46.00	-22.95	AVG
4	0.7102	26.42	10.10	36.52	56.00	-19.48	peak
5	1.1355	5.15	10.06	15.21	46.00	-30.79	AVG
6	1.2818	17.94	10.06	28.00	56.00	-28.00	peak
7	1.7633	19.09	10.09	29.18	56.00	-26.82	peak
8	1.7633	5.22	10.09	15.31	46.00	-30.69	AVG
9	2.2177	5.01	10.10	15.11	46.00	-30.89	AVG
10	2.3055	18.66	10.10	28.76	56.00	-27.24	peak
11	3.6938	4.30	10.10	14.40	46.00	-31.60	AVG
12	4.2135	19.05	10.08	29.13	56.00	-26.87	peak

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.



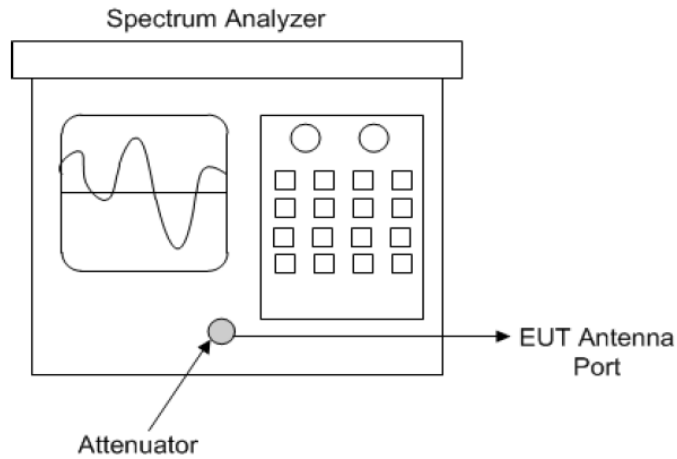
3.3 6dB Bandwidth Measurement

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.



Spectrum analyzer test configuration

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	0.672	>0.5
19	2440MHz	0.704	>0.5
39	2480MHz	0.688	>0.5

BLE-2Mbps			
Operation Channel	Frequency	Occupied Bandwidth (MHz)	
		Result	Limit
0	2402MHz	1.232	>0.5
19	2440MHz	1.228	>0.5
39	2480MHz	1.232	>0.5

Right

BLE-1Mbps			
Operation Channel	Frequency	Occupied Bandwidth (MHz)	
		Result	Limit
0	2402MHz	0.672	>0.5
19	2440MHz	0.680	>0.5
39	2480MHz	0.672	>0.5

BLE-2Mbps			
Operation Channel	Frequency	Occupied Bandwidth (MHz)	
		Result	Limit
0	2402MHz	1.268	>0.5
19	2440MHz	1.136	>0.5
39	2480MHz	1.292	>0.5



Left





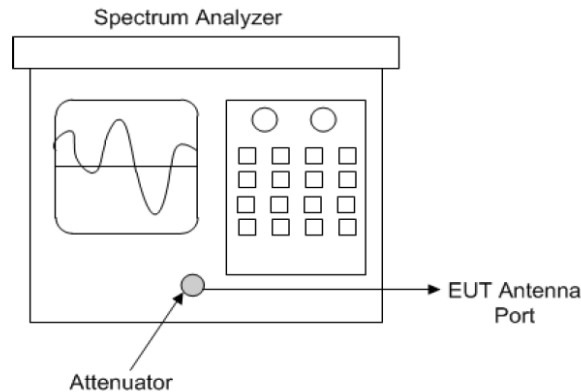
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3.4 Occupied Bandwidth Measurement

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	1.043	2400~2483.5
19	2440MHz	1.051	2400~2483.5
39	2480MHz	1.042	2400~2483.6

BLE-2Mbps			
Operation Channel	Frequency	Occupied Bandwidth (MHz)	
		Result	Limit
0	2402MHz	2.084	2400~2483.5
19	2440MHz	2.079	2400~2483.5
39	2480MHz	2.081	2400~2483.6

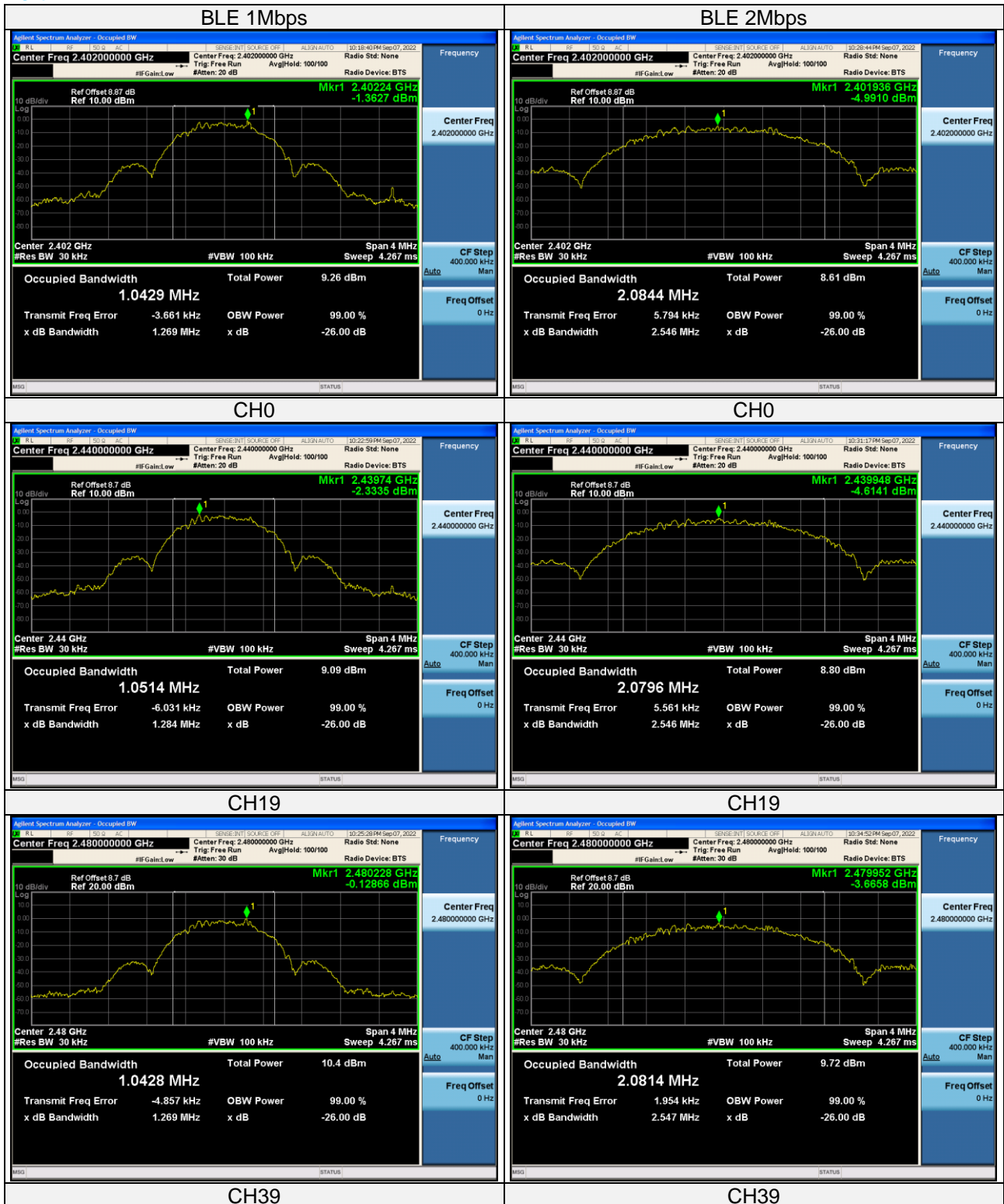
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BLE-1Mbps			
Operation Channel	Frequency	Occupied Bandwidth (MHz)	
		Result	Limit
0	2402MHz	1.043	2400~2483.5
19	2440MHz	1.044	2400~2483.5
39	2480MHz	1.043	2400~2483.6

BLE-2Mbps			
Operation Channel	Frequency	Occupied Bandwidth (MHz)	
		Result	Limit
0	2402MHz	2.061	2400~2483.5
19	2440MHz	2.086	2400~2483.5
39	2480MHz	2.086	2400~2483.6

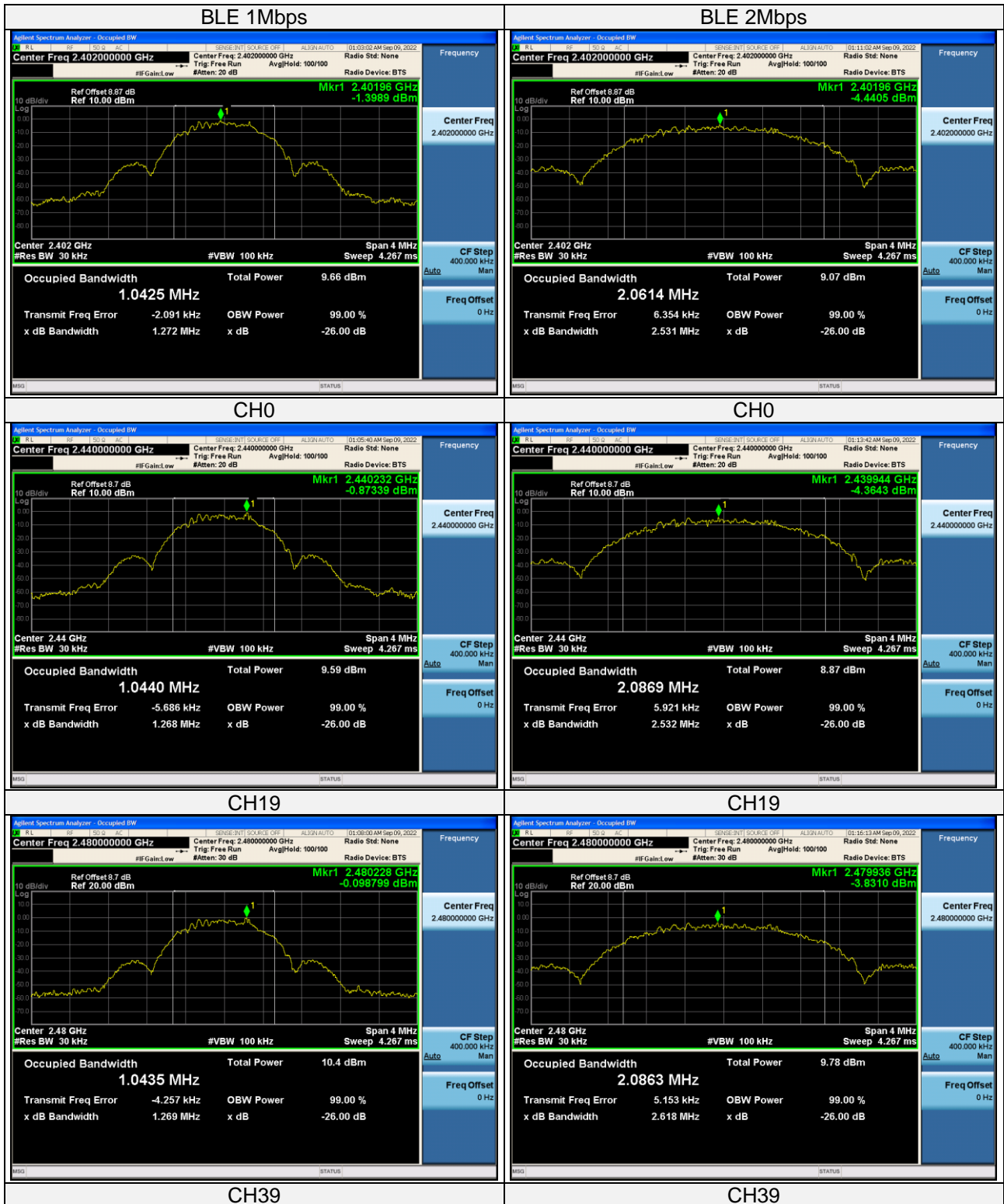


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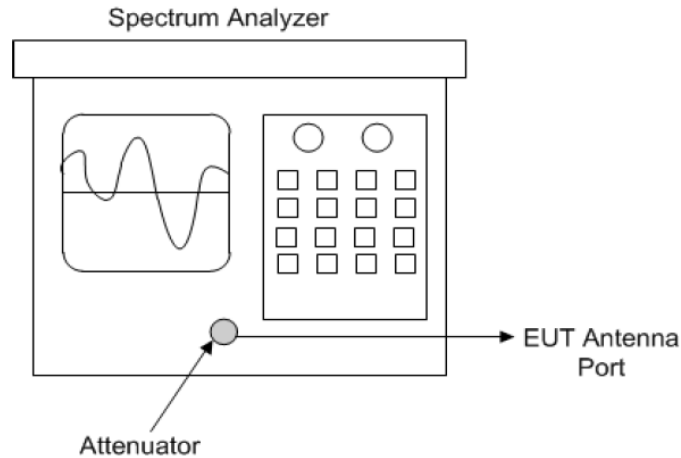
3.5 Conducted Output Power Measurement

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 $\geq 3 \times$ RBW
 - 5* Number of points in sweep $\geq 2 \times$ 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) \times 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	2.638	1.836	<125	<1000	Pass
19	2440	2.719	1.870	<125	<1000	Pass
39	2480	3.730	2.360	<125	<1000	Pass

BLE-1Mbps						
Average Power						
Channel	Freq.	RF Output Power		Limit (mW)		Verdict
No.	(MHz)	(dBm)	(mW)	Rss-247	FCC	
0	2402	-1.374	0.729	<125	<1000	Pass
19	2440	-1.097	0.777	<125	<1000	Pass
39	2480	-0.167	0.962	<125	<1000	Pass

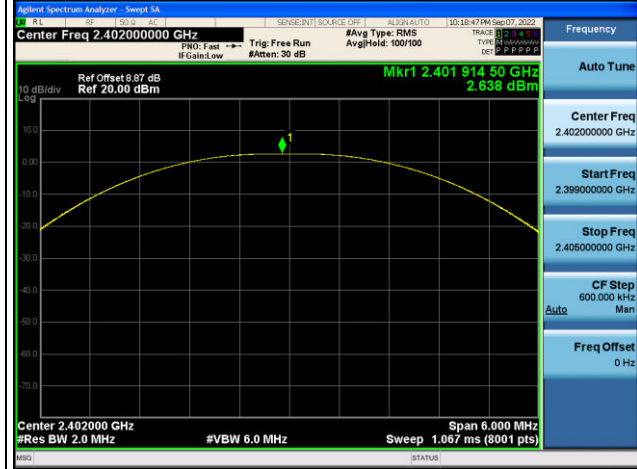
BLE-2Mbps						
Peak Power						
Channel	Freq.	RF Output Power		Limit (mW)		Verdict
No.	(MHz)	(dBm)	(mW)	Rss-247	FCC	
0	2402	2.530	1.791	<125	<1000	Pass
19	2440	2.672	1.850	<125	<1000	Pass
39	2480	3.680	2.333	<125	<1000	Pass

BLE-2Mbps						
Average Power						
Channel	Freq.	RF Output Power		Limit (mW)		Verdict
No.	(MHz)	(dBm)	(mW)	Rss-247	FCC	
0	2402	-4.740	0.336	<125	<1000	Pass
19	2440	-4.647	0.343	<125	<1000	Pass
39	2480	-3.600	0.437	<125	<1000	Pass



1Mbps

Peak Conducted power



CH0

Average Conducted power



CH0

CH19



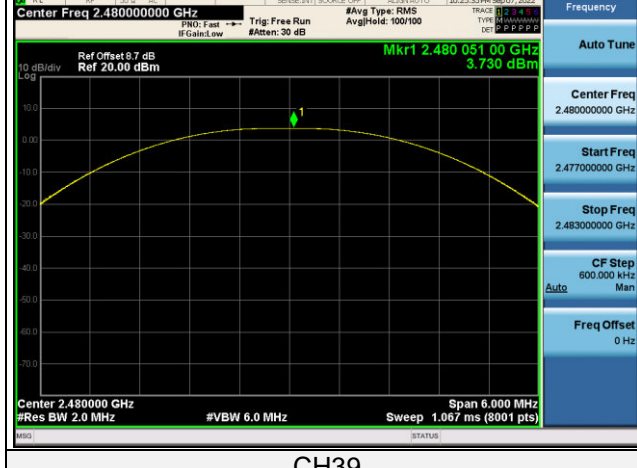
CH19

CH19



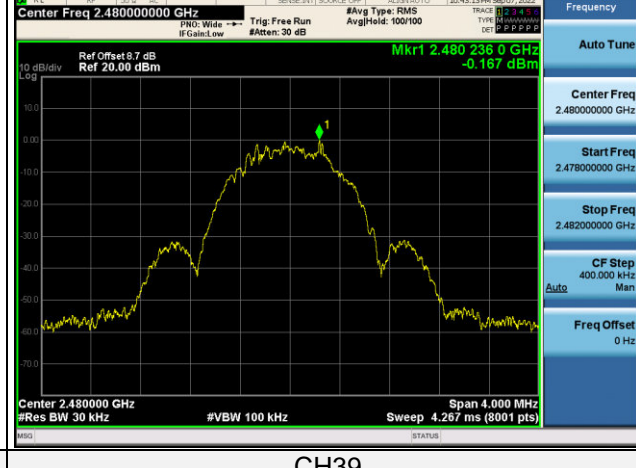
CH19

CH39



CH39

CH39

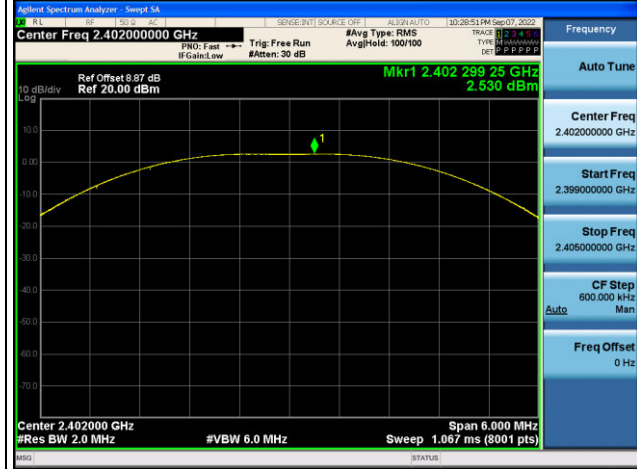


CH39



2Mbps

Peak Conducted power



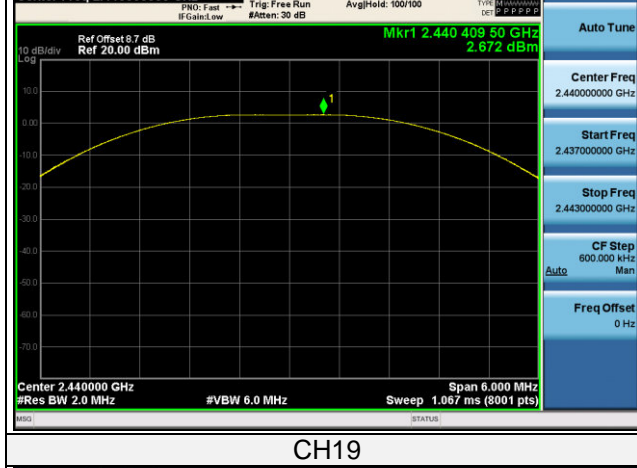
Average Conducted power



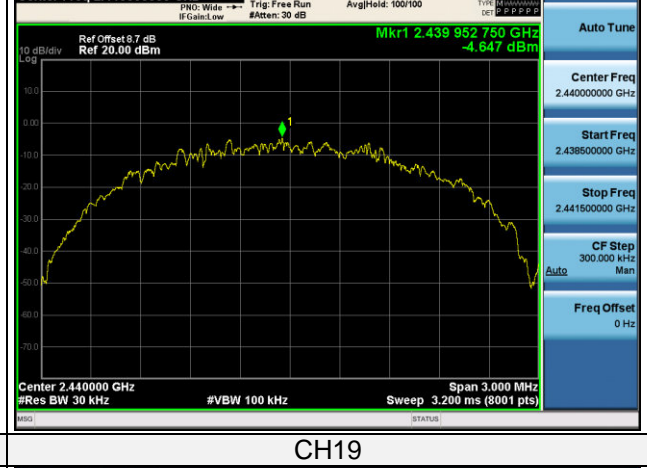
CH0

CH0

Peak Conducted power



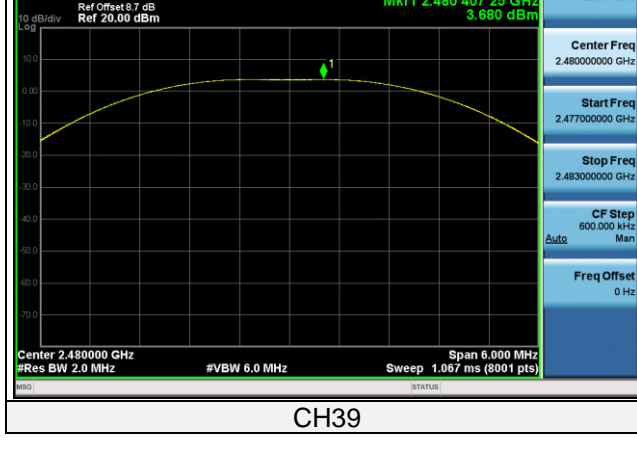
Average Conducted power



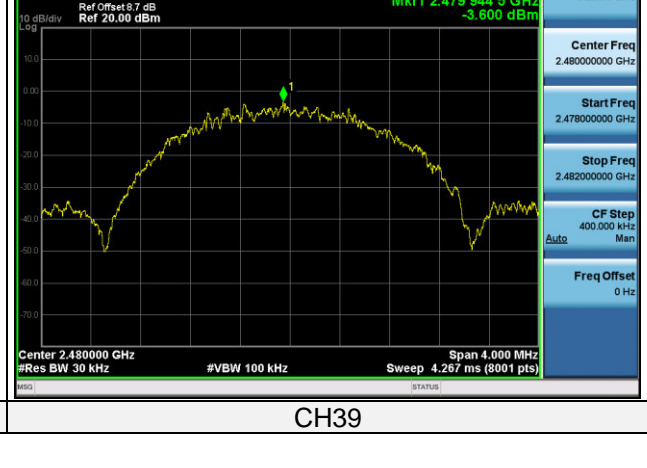
CH19

CH19

Peak Conducted power



Average Conducted power



CH39

CH39



Right

BLE-1Mbps						
Peak Power						
Channel	Freq.	RF Output Power		Limit (mW)		Verdict
No.	(MHz)	(dBm)	(mW)	Rss-247	FCC	
0	2402	3.024	2.006	<125	<1000	Pass
19	2440	2.961	1.977	<125	<1000	Pass
39	2480	3.718	2.354	<125	<1000	Pass

BLE-1Mbps						
Average Power						
Channel	Freq.	RF Output Power		Limit (mW)		Verdict
No.	(MHz)	(dBm)	(mW)	Rss-247	FCC	
0	2402	-1.327	0.737	<125	<1000	Pass
19	2440	-0.919	0.809	<125	<1000	Pass
39	2480	-0.299	0.933	<125	<1000	Pass

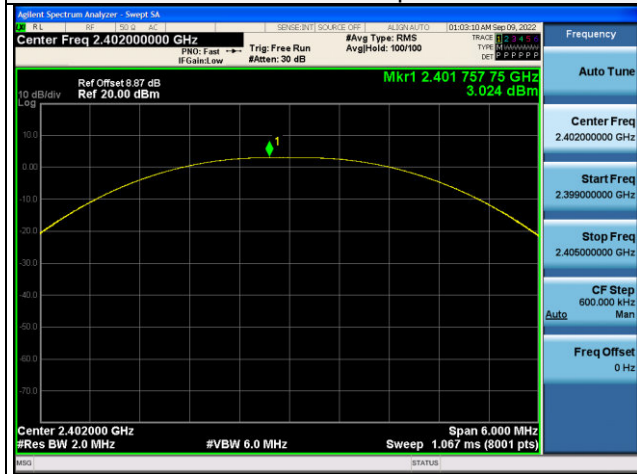
BLE-2Mbps						
Peak Power						
Channel	Freq.	RF Output Power		Limit (mW)		Verdict
No.	(MHz)	(dBm)	(mW)	Rss-247	FCC	
0	2402	2.98	1.986	<125	<1000	Pass
19	2440	2.929	1.963	<125	<1000	Pass
39	2480	3.762	2.378	<125	<1000	Pass

BLE-2Mbps						
Average Power						
Channel	Freq.	RF Output Power		Limit (mW)		Verdict
No.	(MHz)	(dBm)	(mW)	Rss-247	FCC	
0	2402	-4.531	0.352	<125	<1000	Pass
19	2440	-4.549	0.351	<125	<1000	Pass
39	2480	-3.537	0.443	<125	<1000	Pass



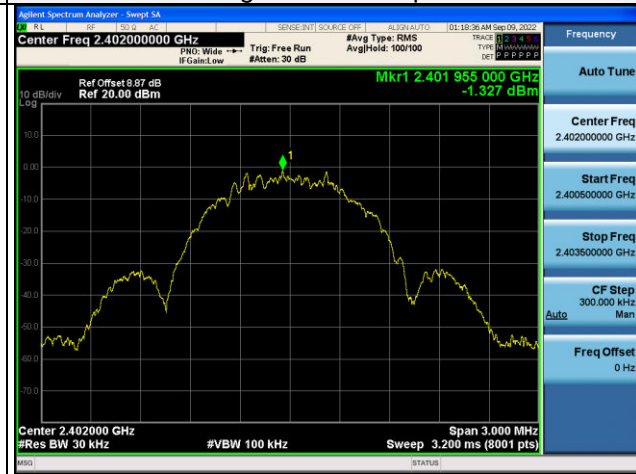
1Mbps

Peak Conducted power



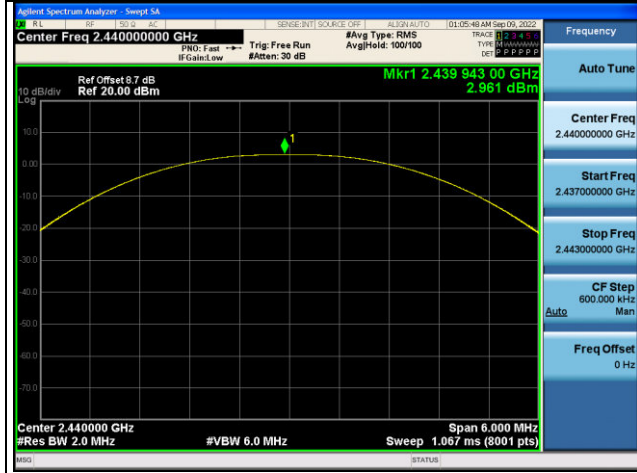
CH0

Average Conducted power



CH0

CH19



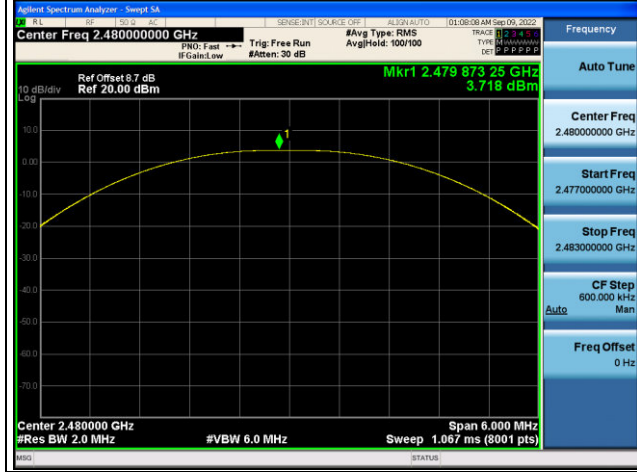
CH19

CH19



CH19

CH39



CH39

CH39

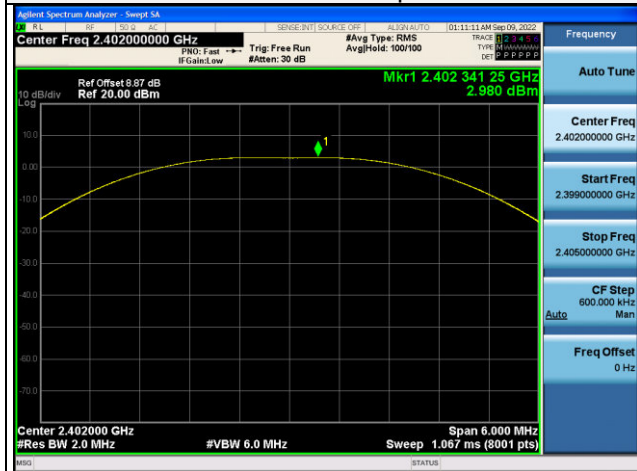


CH39



2Mbps

Peak Conducted power



Average Conducted power



CH0

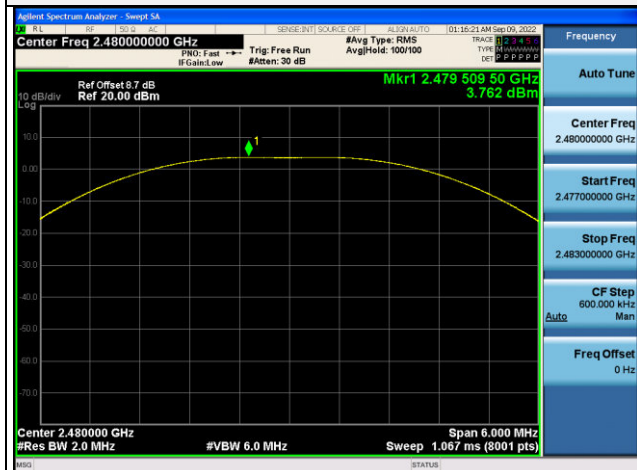
CH0

CH19

CH19

CH39

CH39





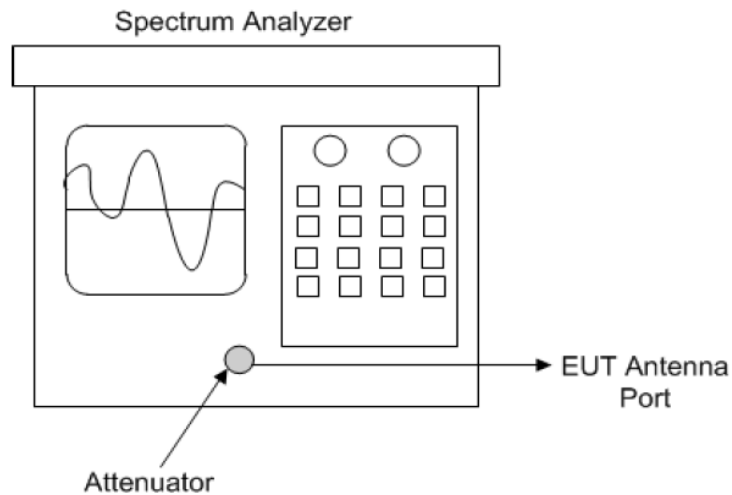
3.6 Power Spectral Density Measurement

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



Spectrum analyzer test configuration

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	-13.64	<8
19	2440MHz	-13.51	<8
39	2480MHz	-12.68	<8

BLE-2Mbps		Power Density	
Test Channel	Channel Frequency	Test Result (dBm/10kHz)	Limit (dBm/3kHz)
0	2402MHz	-16.79	<8
19	2440MHz	-16.51	<8
39	2480MHz	-15.55	<8

Right

BLE-1Mbps		Power Density	
Test Channel	Channel Frequency	Test Result (dBm/10kHz)	Limit (dBm/3kHz)
0	2402MHz	-13.21	<8
19	2440MHz	-13.09	<8
39	2480MHz	-12.33	<8

BLE-2Mbps		Power Density	
Test Channel	Channel Frequency	Test Result (dBm/10kHz)	Limit (dBm/3kHz)
0	2402MHz	-16.24	<8
19	2440MHz	-16.31	<8
39	2480MHz	-15.49	<8