FCC Part 15, Subpart C
Test Report

FCC ID:	2BBQK-MIDTONII
Applicant:	Marshall Group AB
Address:	Centralplan 15 111 20 Stockholm Sweden
Manufacturer:	Marshall Group AB
Address:	Centralplan 15 111 20 Stockholm Sweden
Product:	PORTABLE LOUDSPEAKER
Brand	Marshall
Test Model(s):	MIDDLETON II
Series Model(s):	N/A
Test Date:	Nov. 18, 2024 ~ Dec. 27, 2024
Issued Date:	Dec. 28, 2024
Issued By:	Hwa-Hsing (Dongguan) Testing Co., Ltd.
Address:	No.101, Building N1, Yuyuan 2 Road, Yuyuan Industrial Park, HuangJiang Town, Dongguan City, People's Republic of 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.

Prepared by : Wendy Lee

Wendy Lee

Reviewed by : Sye Yang

Sye Yang

Approved by : Scott He

Scott He

HWA-HSING (DONGGUAN) TESTING CO., LTD. LYNS-TCi

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Release Control Record

Issue No.	Description	Date Issued
2410100384-RF-US-02	Original Release	Dec. 28, 2024

1. Summary of Test Results

47 CFR FCC Part 15, Subpart C (Section 15.247) 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 (sDoC). 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) (±)
Radiated Emissions up to 1 GHz	9KHz ~ 30MHz	2.16 dB
	30MHz ~ 1000MHz	3.56 dB
Radiated Emissions above 1 GHz	1GHz ~ 6GHz	4.71 dB
	6GHz~18GHz	4.84 dB
	18GHz ~ 40GHz	5.73 dB

1.2 Modification Record

There were no modifications required for compliance.

2. General Information

2.1 General Description of EUT

Product(s)	PORTABLE LOUDSPEAKER
Test Model(s)	MIDDLETON II
Sample No.	HS2410100384002, HS2410100384003
Series Model(s)	N/A
Status of EUT	Engineering Prototype
Power Supply Rating	INPUT: DC 5V/9V/12V/20V 3A from USB-C or DC 10.95V from battery
Modulation Type	GFSK for DTS
Transfer Rate	1 Mbps, 2Mbps
Operating Frequency	1M: 2402 ~ 2480MHz 2M: 2404 ~ 2478MHz
Number of Channel	40
Maximum Output Power	4.979dBm (Peak) 4.460dBm (Average)
Antenna Type and Antenna Gain	Internal Antenna; 2.78dBi Gain
Antenna Connector	I-PEX
Accessory Device	USB Cable, Unshielded, Detachable, 100cm

Note:

1. Please refer to the EUT photo document (Reference No.: 2410100384-01&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.
3. For the test results, the EUT had been tested with all conditions, and only the worst case was shown in the test report.

2.2 Description of Test Channels

40 channels are provided to BT-LE (1Mbps):

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

37 channels are provided to BT-LE (2Mbps):

CHANNEL	FREQ. (MHZ)	CHANNEL	FREQ. (MHZ)	CHANNEL	FREQ. (MHZ)	CHANNEL	FREQ. (MHZ)
-	-	10	2422	20	2442	30	2462
1	2404	11	2424	21	2444	31	2464
2	2406	-	-	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	-	-

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	DC input from USB-C via AC120V/60Hz
Radiated	Radiated Emissions	√	√	√	DC 10.95V from battery
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	

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
Radiated Emissions	24.0deg. C, 55%RH	Nov. 29, 2024 ~ Dec. 19, 2024	Aron
Antenna Port Conducted Measurement	25.8deg. C, 56%RH	Dec. 23, 2024 ~ Dec. 26, 2024	Scott

- 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
-	1 to 38	1,19, 38	GFSK	2

Radiated Emission Test (Below 1GHz):

EUT Configure Mode	Available Channel	Tested Channel	Modulation Type	Data Rate (Mbps)
-	0 to 39	0,19, 39	GFSK	1
-	1 to 38	1,19, 38	GFSK	2

Power Line Conducted Emission Test:

EUT Configure Mode	Available Channel	Tested Channel	Modulation Type	Data Rate (Mbps)
-	0 to 39	19	GFSK	1
-	1 to 38	19	GFSK	2

Antenna Port Conducted Measurement:

*This item includes all test value of each mode, but only includes spectrum plot of worst value of each mode.

EUT Configure Mode	Available Channel	Tested Channel	Modulation Type	Data Rate (Mbps)
-	0 to 39	0,19, 39	GFSK	1
-	1 to 38	1,19, 38	GFSK	2

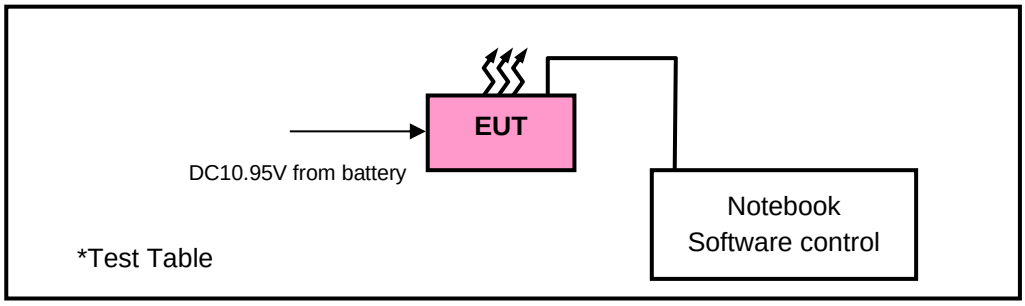
2.4 Description of Support Units

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	HUAWEI	NbD-WFH9	EUEPM21725002655	N/A
2	Notebook	DELL	Inspiron 14R Aluminum Edition	6WPG9-63PV4-RBPF2-T6RHW-W9GBP	N/A

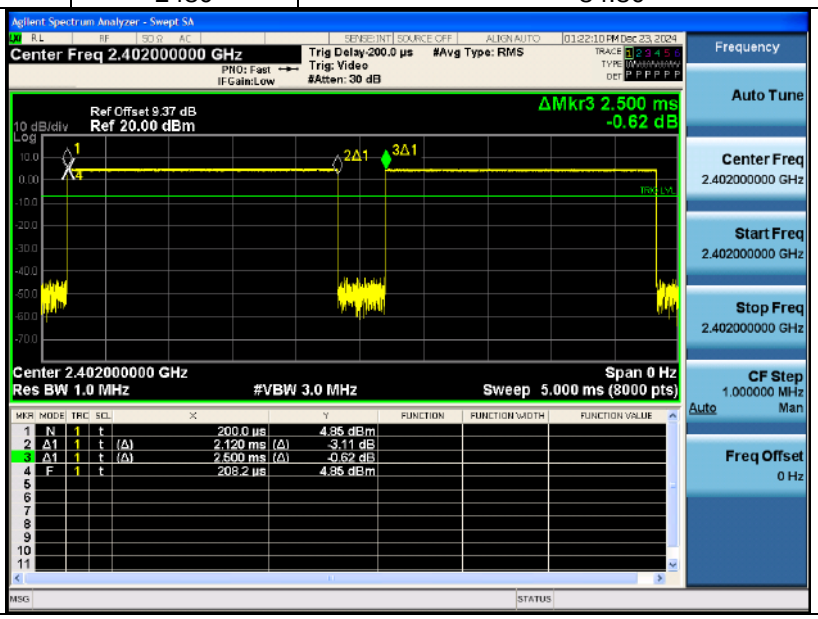
No.	Signal Cable Description of The Above Support Units
1.	USB extension cord: Unshielded, Detachable 1.2m;

2.5 Configuration of System under Test

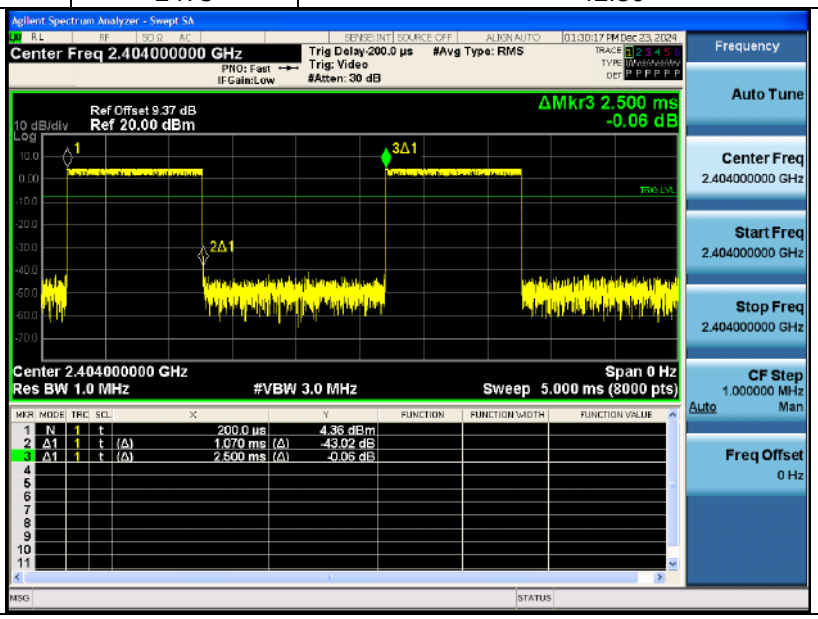


2.6 Duty Cycle of Test Signal

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



Test Mode	Channel	Duty Cycle [%]
GFSK-2MHz	2404	42.80
	2440	42.80
	2478	42.80



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	2025-07-25
3m Semi-anechoic Chamber	MAORUI	9m*6m*6m	NSEMC003	2026-03-12*
Test software	FARAD	FARAD	EZ_EMCV1.1.4.2	N/A
Loop Antenna	EMCI	HLA 6121	56735	2025-05-03
Antenna Tower	MF	MFA-440H	NA	NA
Turn Table	MF	MFT-201SS	NA	NA
Antenna Tower&Turn Table Controller	MF	MF-7802	NA	NA
Test cable	N/A	N/A	HS-EMC-106	2025-12-12
Test cable	N/A	N/A	HS-EMC-109	2025-12-12

Frequency Range below 1GHz:

Equipment	Manufacturer	Model No.	Serial No.	Next Cal.
EMI Test Receiver (9kHz~3GHz)	Rohde&Schwarz	ESPI 7	101978	2025-07-25
Broadband antenna (25MHz~2500MHz)	Schwarzbeck	VULB 9168	937	2025-07-25
3m Semi-anechoic Chamber	MAORUI	9m*6m*6m	HS-2018037	2026-03-12*
Signal Amplifier (30MHz~1000MHz)	Com-power	PAM-103	18020051	2025-07-25
Attenuator	R&S	TS2GA-6dB	18101101	N/A
Test software	FARAD	EZ_EMC V1.1.4.2	N/A	N/A
Broadcast test system	R&S	SFU	100410	2025-07-25
Test cable	N/A	N/A	HS-EMC-100	2025-12-12
Test cable	N/A	N/A	HS-EMC-101/102	2025-12-12

Frequency Range above 1GHz:

Equipment	Manufacturer	Model No.	Serial No.	Next Cal.
EMI Test Receiver	Rohde&Schwarz	ESPI 7	101978	2025-07-25
3m Semi-anechoic Chamber	MAORUI	9m*6m*6m	NSEMC003	2026-03-12*
Test software	FARAD	EZ_EMCV1.1.4.2	N/A	N/A
Digital Multimeter	FLUKE	15B+	43512617WS	2025-07-25
Horn Antenna	Schwarzbeck	BBHA 9120 D	1959	2025-08-15
Spectrum Analyzer	Rohde&Schwarz	FSV-40N	101783	2025-07-25
Broadband Coaxial Preamplifier	Schwarzbeck	BBV 9718	25	2025-07-25
Pre-Amplifier	EMCI	EMC 184045SE	9870709	2025-07-25
Spectrum	Keysight	N9020A	MY51240612	2025-07-25
Broadcast test system	R&S	SFU	100410	2025-07-25
Antenna Tower	MF	MFA-440H	NA	N/A
Turn Table	MF	MFT-201SS	NA	N/A
Antenna Tower&Turn Table Controller	MF	MF-7802	NA	N/A
Test cable	N/A	N/A	HS-EMC-103	2025-12-12
Test cable	N/A	N/A	HS-EMC-104/105	2025-12-12

Note:

1. The calibration interval of the above test instruments is 12 months or 24 months (*) or 36 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 Averaqing 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 ±2%), then the following procedure shall be used:

1) RBW = 1 MHz.
2) VBW ≥ 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 (Above 1GHz) 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 1GHz), which was mounted on the top of a variable-height antenna tower.
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:

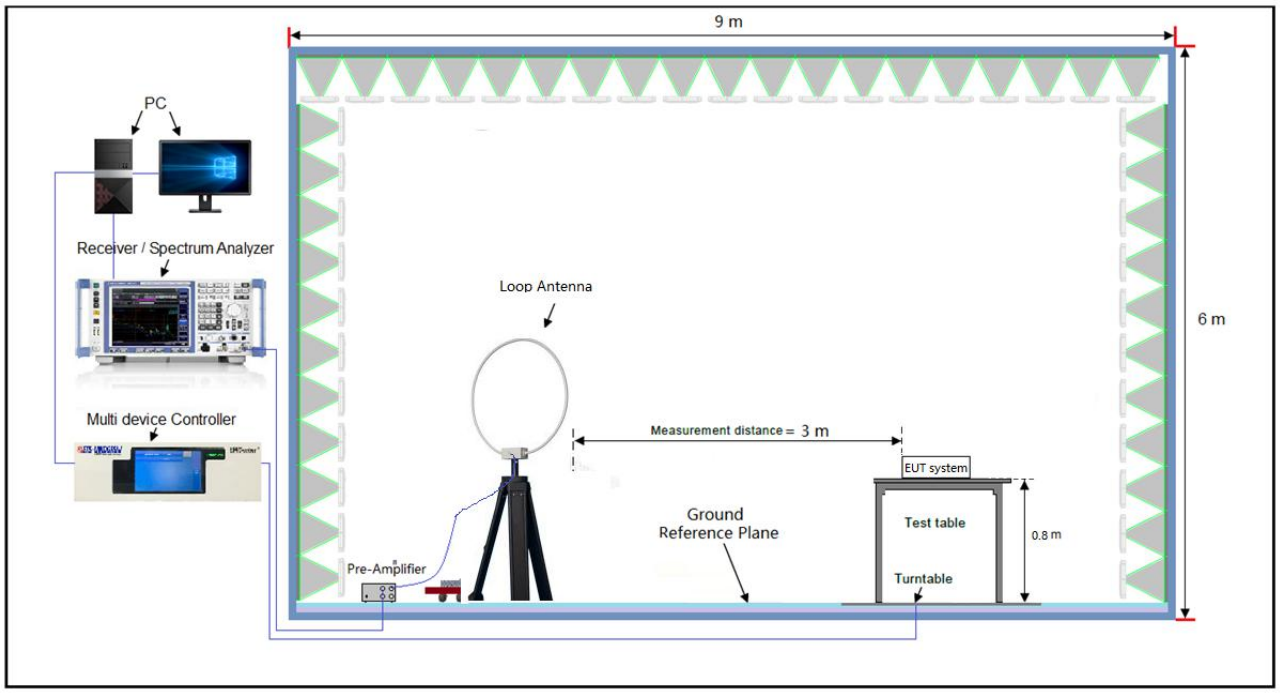
1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120 kHz & 360kHz for Quasi-peak detection (QP) at frequency below 1 GHz.
2. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth =3 MHz for Peak detection (PK) at frequency above 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 ≥ 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

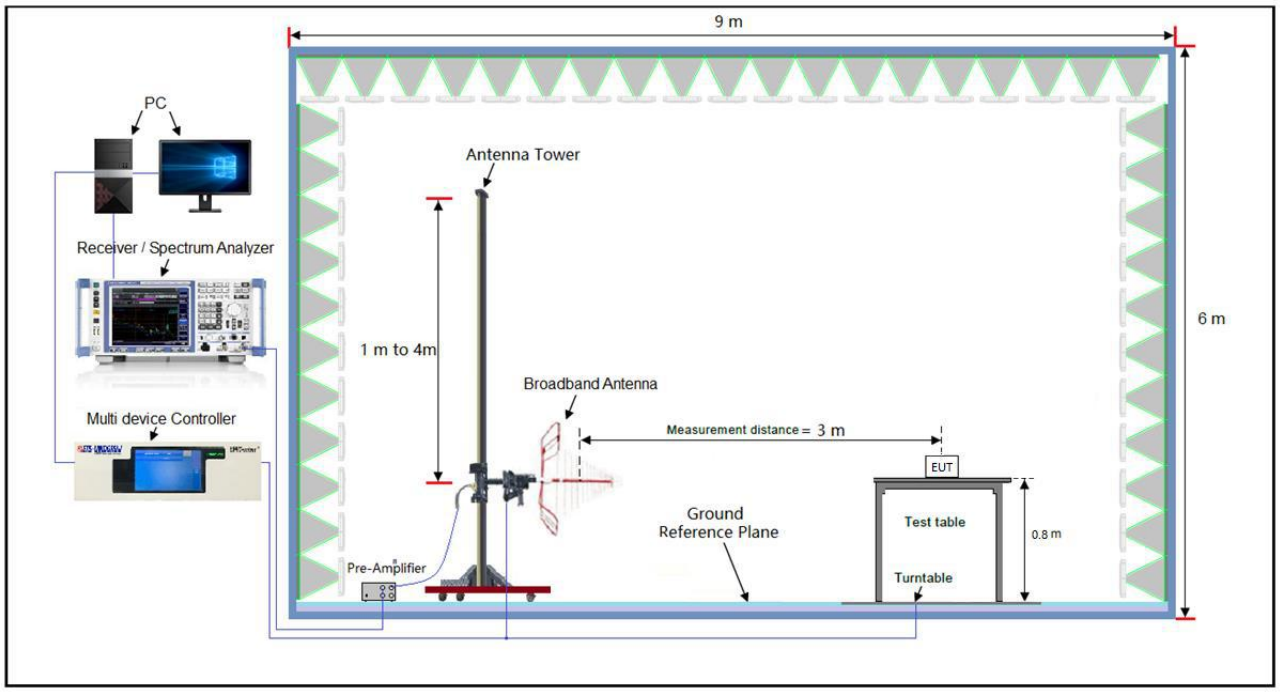
No deviation.

3.1.5 Test Setup

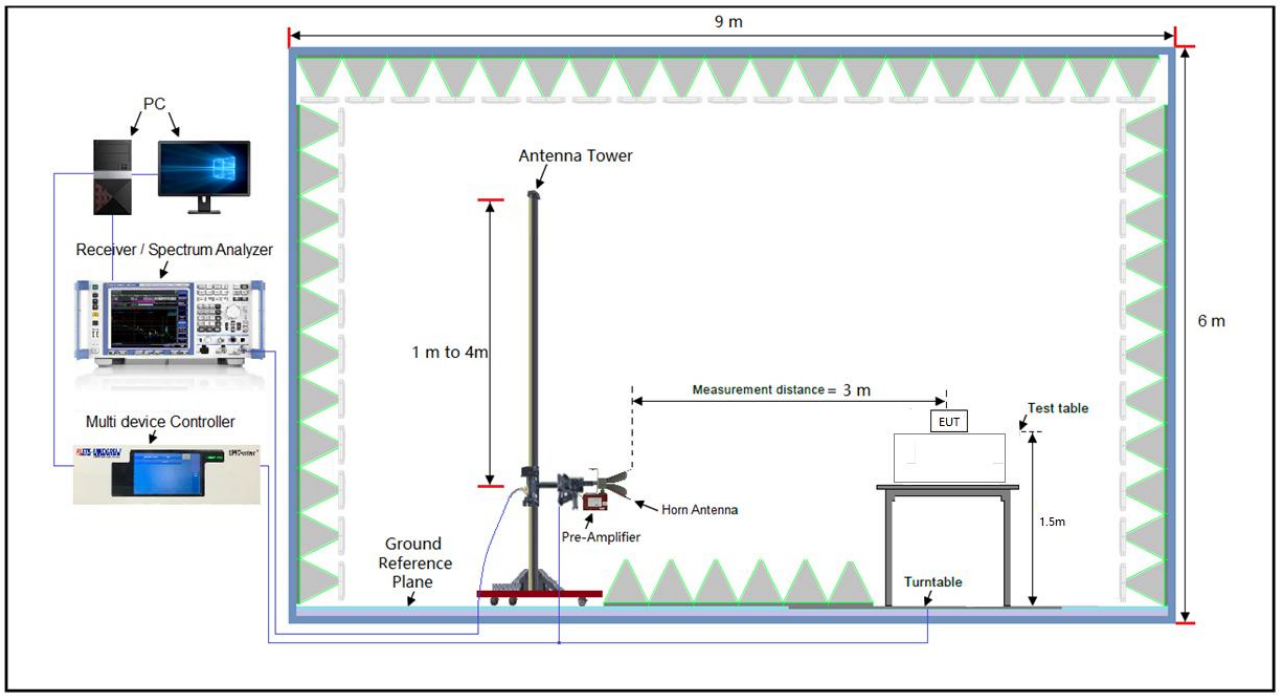
Radiated emission below 30MHz:



Frequency Range below 1GHz:



Frequency Range above 1GHz:



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

3.1.6 EUT Operating Conditions

a. Placed the EUT on the testing table.

b. Set the EUT under transmission condition continuously at specific channel frequency.

3.1.7 Test Results

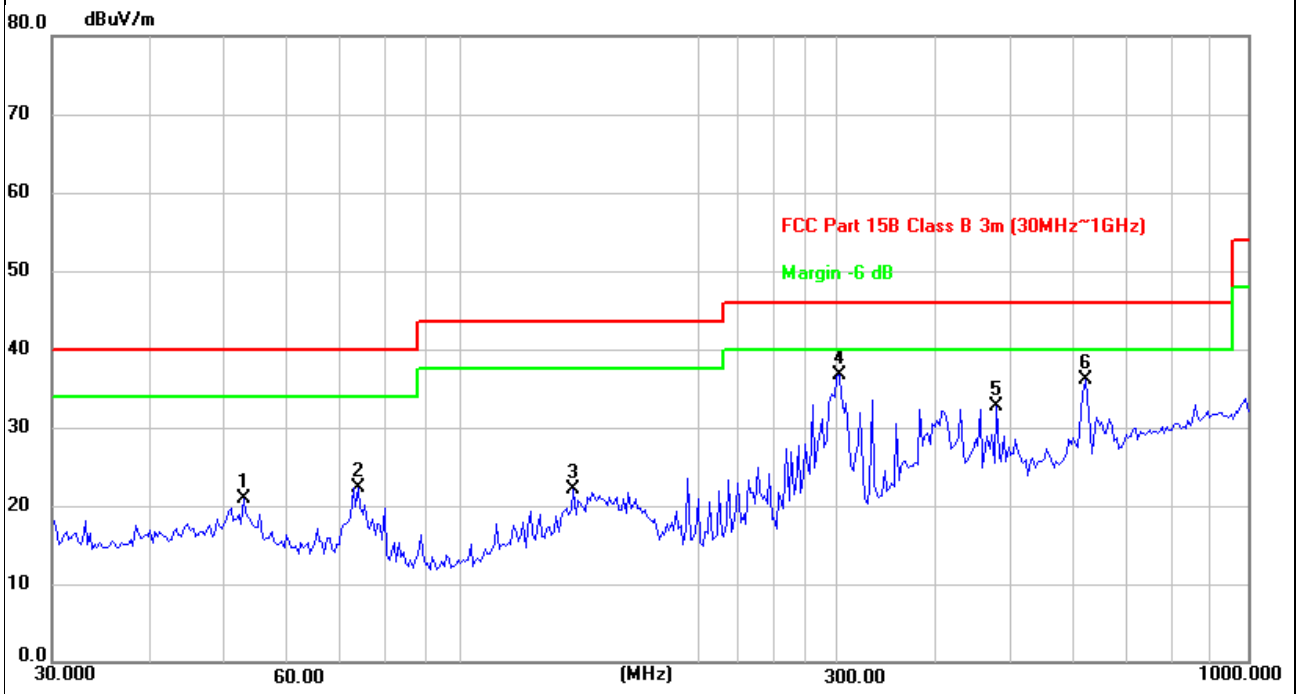
9kHz ~ 30MHz Data:

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

30MHz ~ 1GHz Worst-Case Data:

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

Antennal Polarity &Test Distance: Horizontal at 3m



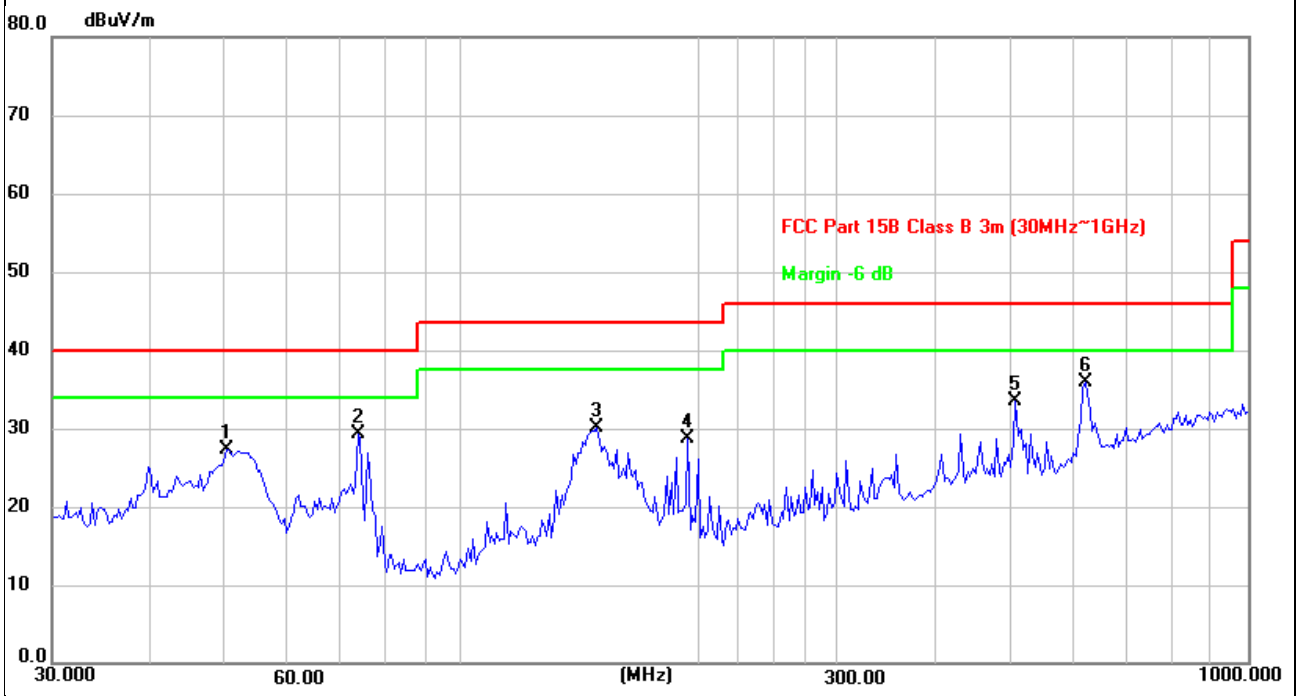
No.	Frequency (MHz)	Reading (dBuV)	Factor (dB)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Antenna Height (cm)	Table Angle (Degree)
1	52.5753	36.06	-15.12	20.94	40.00	-19.06	peak	291	339
2	73.6170	41.23	-18.84	22.39	40.00	-17.61	peak	287	38
3	138.3873	36.15	-14.00	22.15	43.50	-21.35	peak	298	62
4	301.4224	49.35	-12.74	36.61	46.00	-9.39	peak	254	130
5	478.8456	40.29	-7.68	32.61	46.00	-13.39	peak	339	135
6	620.7096	40.40	-4.32	36.08	46.00	-9.92	peak	328	227

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	Aron

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	50.4089	42.36	-15.09	27.27	40.00	-12.73	peak	155	4
2	73.6170	48.16	-18.84	29.32	40.00	-10.68	peak	362	360
3	148.4410	43.48	-13.46	30.02	43.50	-13.48	peak	243	338
4	193.7728	45.50	-16.76	28.74	43.50	-14.76	peak	251	13
5	506.4791	40.50	-6.99	33.51	46.00	-12.49	peak	145	226
6	620.7096	40.29	-4.32	35.97	46.00	-10.03	peak	145	32

Remarks:

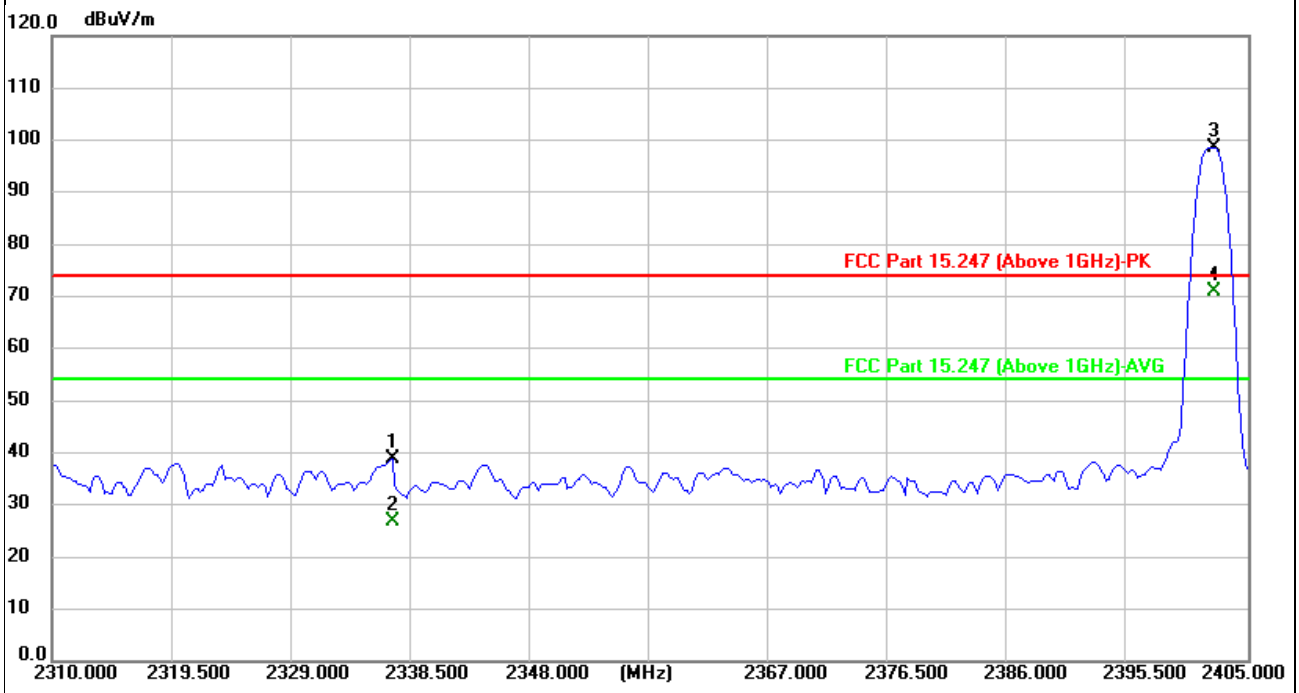
1. Emission Level = Read Level + Factor (Antenna Factor + Cable Loss - Preamp Factor)
2. Margin value = Emission level – Limit value

Above 1GHz Data:

BLE-1Mbps

Test channel	Channel 0	Frequency Range	Above 1GHz
Detector Function	Peak (PK) Average (AVG)	Tested By	Aron

Antennal Polarity& Test distance: Horizontal at 3 M



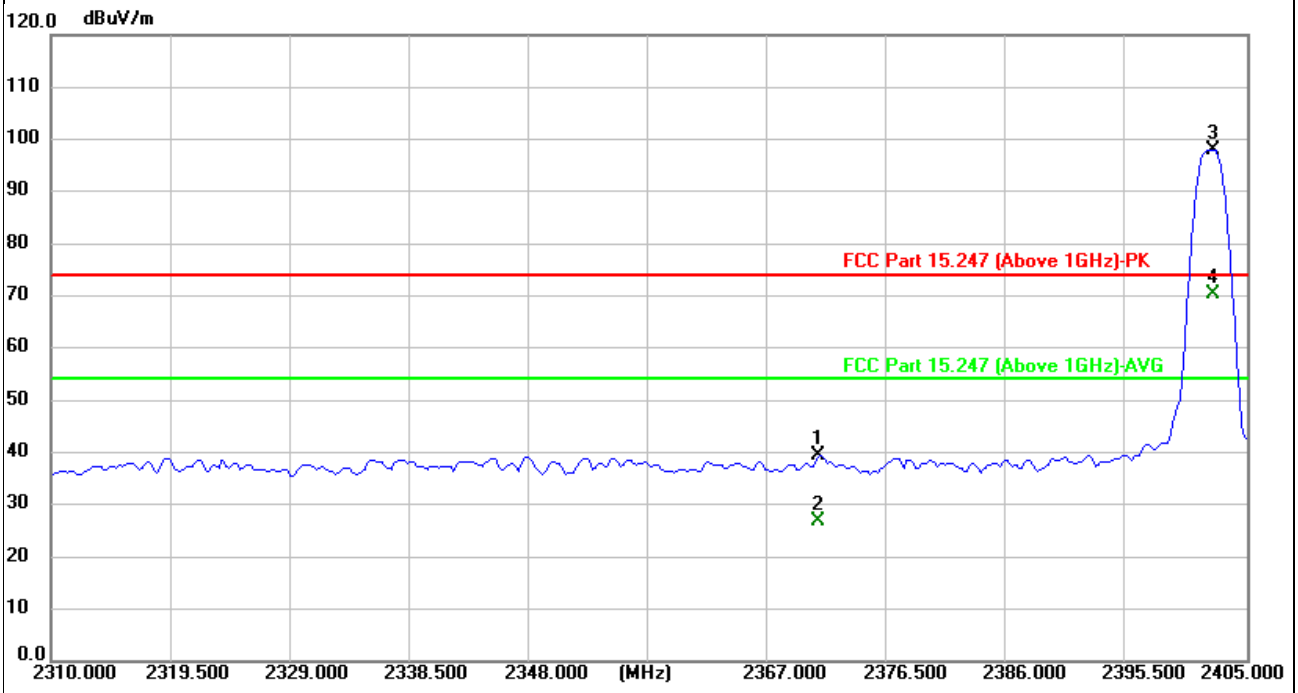
No.	Frequency (MHz)	Reading (dBuV)	Correct Factor (dB)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Antenna Height (cm)	Table Angle (Degree)
1	2337.034	39.46	-0.53	38.93	74.00	-35.07	peak	197	221
2	2337.034	27.39	-0.53	26.86	54.00	-27.14	AVG	197	221
3 #	2402.335	98.97	-0.39	98.58			peak	197	221
4 #	2402.335	71.22	-0.39	70.83			AVG	197	221
5	4804.000	42.48	5.30	47.78	74.00	-26.22	peak	174	195
6	4804.000	28.93	5.30	34.23	54.00	-19.77	AVG	174	195
7	7206.000	41.06	12.40	53.46	74.00	-20.54	peak	305	303
8	7206.000	28.96	12.40	41.36	54.00	-12.64	AVG	305	303

Remarks:

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

Test channel	Channel 0	Frequency Range	Above 1GHz
Detector Function	Peak (PK) Average (AVG)	Tested By	Aron

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	2371.112	39.83	-0.46	39.37	74.00	-34.63	peak	103	75
2	2371.112	27.35	-0.46	26.89	54.00	-27.11	AVG	103	75
3 #	2402.335	98.42	-0.39	98.03			peak	103	75
4 #	2402.335	70.59	-0.39	70.20			AVG	103	75
5	4804.000	42.08	5.30	47.38	74.00	-26.62	peak	224	141
6	4804.000	29.88	5.30	35.18	54.00	-18.82	AVG	224	141
7	7206.000	41.62	12.40	54.02	74.00	-19.98	peak	311	254
8	7206.000	29.04	12.40	41.44	54.00	-12.56	AVG	311	254

Remarks:

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

Test channel	Channel 19	Frequency Range	Above 1GHz
Detector Function	Peak (PK) Average (AVG)	Tested By	Aron

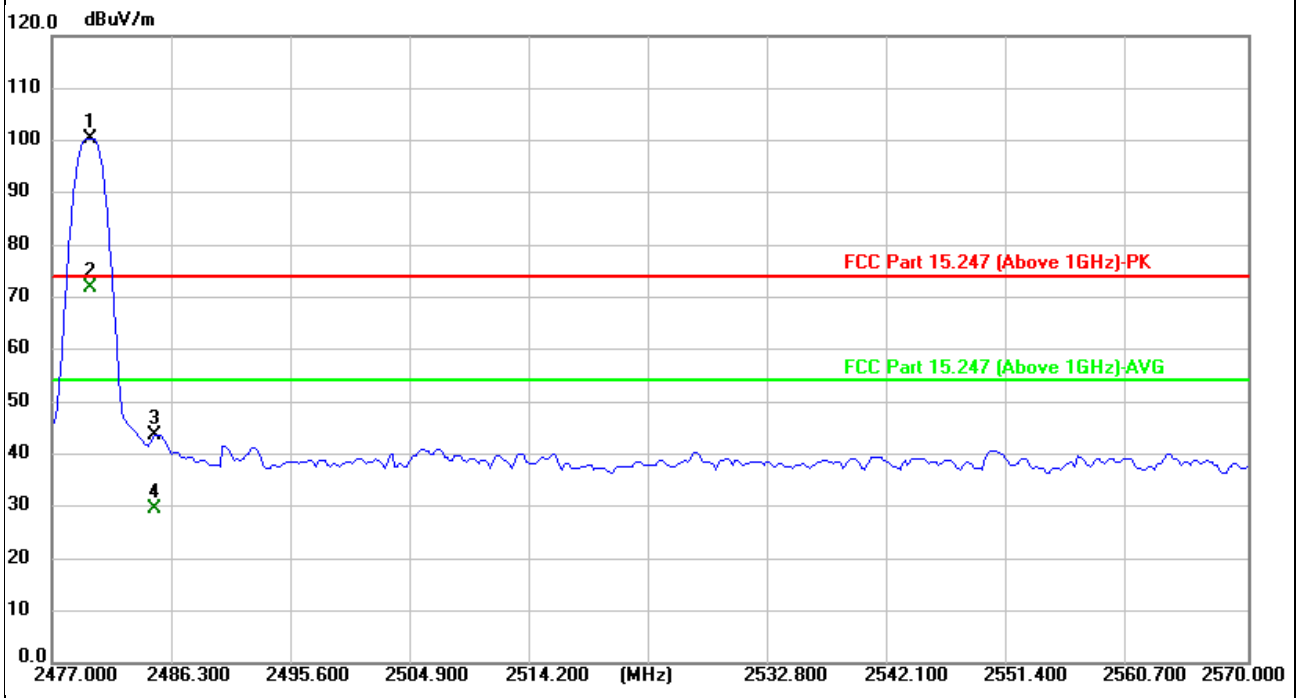
Antennal Polarity& Test Distance: Horizontal at 3m									
No.	Frequency (MHz)	Reading (dBuV)	Correct Factor (dB)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Antenna Height (cm)	Table Angle (Degree)
1#	2440.000	99.40	-0.31	99.09			peak	134	221
2#	2440.000	71.37	-0.31	71.06			AVG	134	221
3	4880.000	42.49	6.25	48.74	74.00	-25.26	peak	149	23
4	4880.000	28.02	6.25	34.27	54.00	-19.73	AVG	149	23
5	7320.000	40.65	12.65	53.30	74.00	-20.70	peak	225	133
6	7320.000	28.81	12.65	41.46	54.00	-12.54	AVG	225	133
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	97.12	-0.31	96.81			peak	209	180
2#	2440.000	69.87	-0.31	69.56			AVG	209	180
3	4880.000	42.55	6.25	48.80	74.00	-25.20	peak	177	201
4	4880.000	28.98	6.25	35.23	54.00	-18.77	AVG	177	201
5	7320.000	41.07	12.65	53.72	74.00	-20.28	peak	116	232
6	7320.000	28.63	12.65	41.28	54.00	-12.72	AVG	116	232

Remarks:

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

Test channel	Channel 39	Frequency Range	Above 1GHz
Detector Function	Peak (PK) Average (AVG)	Tested By	Aron

Antennal Polarity& Test Distance: Horizontal at 3 M



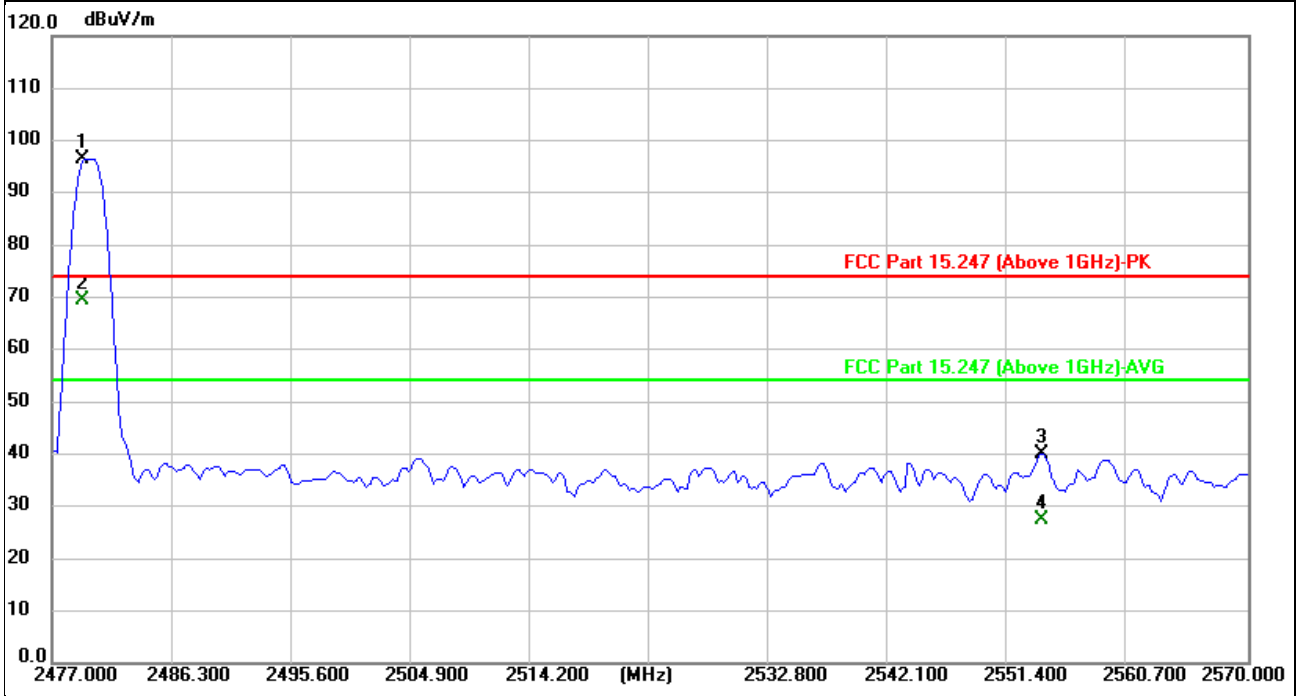
No.	Frequency (MHz)	Reading (dBuV)	Correct Factor (dB)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Antenna Height (cm)	Table Angle (Degree)
1#	2480.168	100.63	-0.21	100.42			peak	381	87
2#	2480.168	72.20	-0.21	71.99			AVG	381	87
3	2485.200	43.84	-0.19	43.65	74.00	-30.35	peak	381	87
4	2485.200	29.83	-0.19	29.64	54.00	-24.36	AVG	381	87
5	4960.000	42.25	6.16	48.41	74.00	-25.59	peak	302	201
6	4960.000	29.38	6.16	35.54	54.00	-18.46	AVG	302	201
7	7440.000	41.59	12.91	54.50	74.00	-19.50	peak	117	88
8	7440.000	28.47	12.91	41.38	54.00	-12.62	AVG	117	88

Remarks:

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

Test channel	Channel 39	Frequency Range	Above 1GHz
Detector Function	Peak (PK) Average (AVG)	Tested By	Aron

Antennal Polarity& Test Distance: Vertical 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#	2479.609	96.77	-0.21	96.56			peak	121	178
2#	2479.609	69.57	-0.21	69.36			AVG	121	178
3	2553.972	40.08	-0.05	40.03	74.00	-33.97	peak	121	178
4	2553.972	27.54	-0.05	27.49	54.00	-26.51	AVG	121	178
5	4960.000	43.01	6.16	49.17	74.00	-24.83	peak	297	202
6	4960.000	30.03	6.16	36.19	54.00	-17.81	AVG	297	202
7	7440.000	40.94	12.91	53.85	74.00	-20.15	peak	121	72
8	7440.000	28.50	12.91	41.41	54.00	-12.59	AVG	121	72

Remarks:

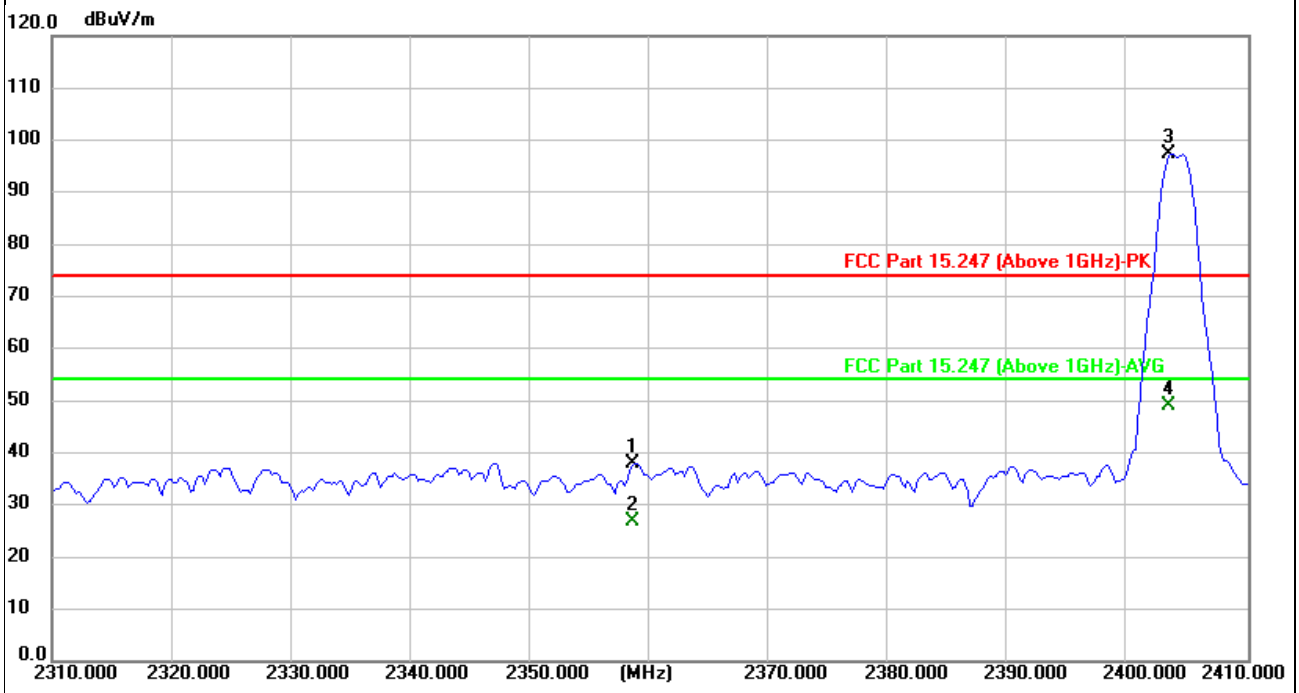
1. Emission Level = Read Level + Factor (Antenna Factor + Cable Loss - Preamp Factor)
2. Margin value = Emission level – Limit value
3. #: Fundamental frequency.

Above 1GHz Data:

BLE-2Mbps

Test channel	Channel 1	Frequency Range	Above 1GHz
Detector Function	Peak (PK) Average (AVG)	Tested By	Aron

Antennal Polarity& Test distance: Horizontal at 3 M



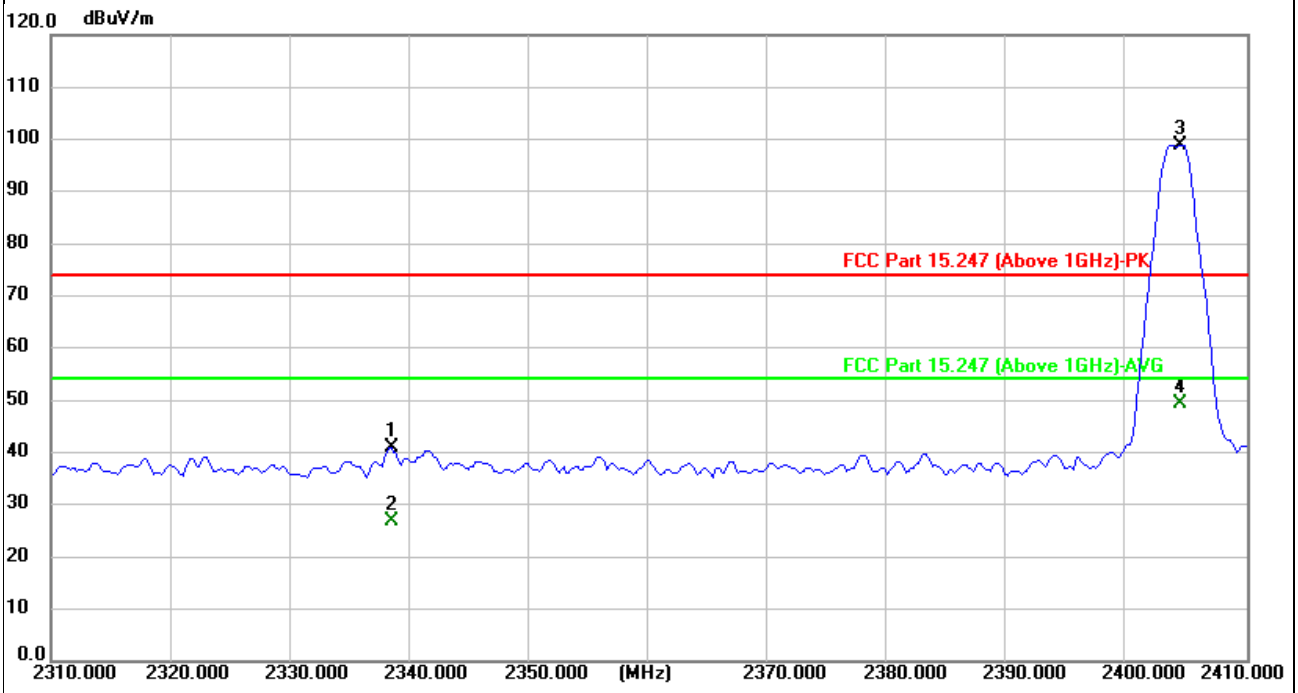
No.	Frequency (MHz)	Reading (dBuV)	Correct Factor (dB)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Antenna Height (cm)	Table Angle (Degree)
1	2358.697	38.56	-0.48	38.08	74.00	-35.92	peak	123	82
2	2358.697	27.29	-0.48	26.81	54.00	-27.19	AVG	123	82
3 #	2403.587	97.75	-0.38	97.37			peak	123	82
4 #	2403.587	49.37	-0.38	48.99			AVG	123	82
5	4808.000	42.46	5.35	47.81	74.00	-26.19	peak	119	161
6	4808.000	29.05	5.35	34.40	54.00	-19.60	AVG	119	161
7	7212.000	41.36	12.42	53.78	74.00	-20.22	peak	102	276
8	7212.000	29.00	12.42	41.42	54.00	-12.58	AVG	102	276

Remarks:

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

Test channel	Channel 1	Frequency Range	Above 1GHz
Detector Function	Peak (PK) Average (AVG)	Tested By	Aron

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	2338.457	41.60	-0.53	41.07	74.00	-32.93	peak	101	219
2	2338.457	27.31	-0.53	26.78	54.00	-27.22	AVG	101	219
3 #	2404.589	99.33	-0.37	98.96			peak	101	219
4 #	2404.589	49.57	-0.37	49.20			AVG	101	219
5	4808.000	42.36	5.35	47.71	74.00	-26.29	peak	246	298
6	4808.000	29.27	5.35	34.62	54.00	-19.38	AVG	246	298
7	7212.000	40.99	12.42	53.41	74.00	-20.59	peak	120	327
8	7212.000	28.91	12.42	41.33	54.00	-12.67	AVG	120	327

Remarks:

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

Test channel	Channel 19	Frequency Range	Above 1GHz
Detector Function	Peak (PK) Average (AVG)	Tested By	Aron

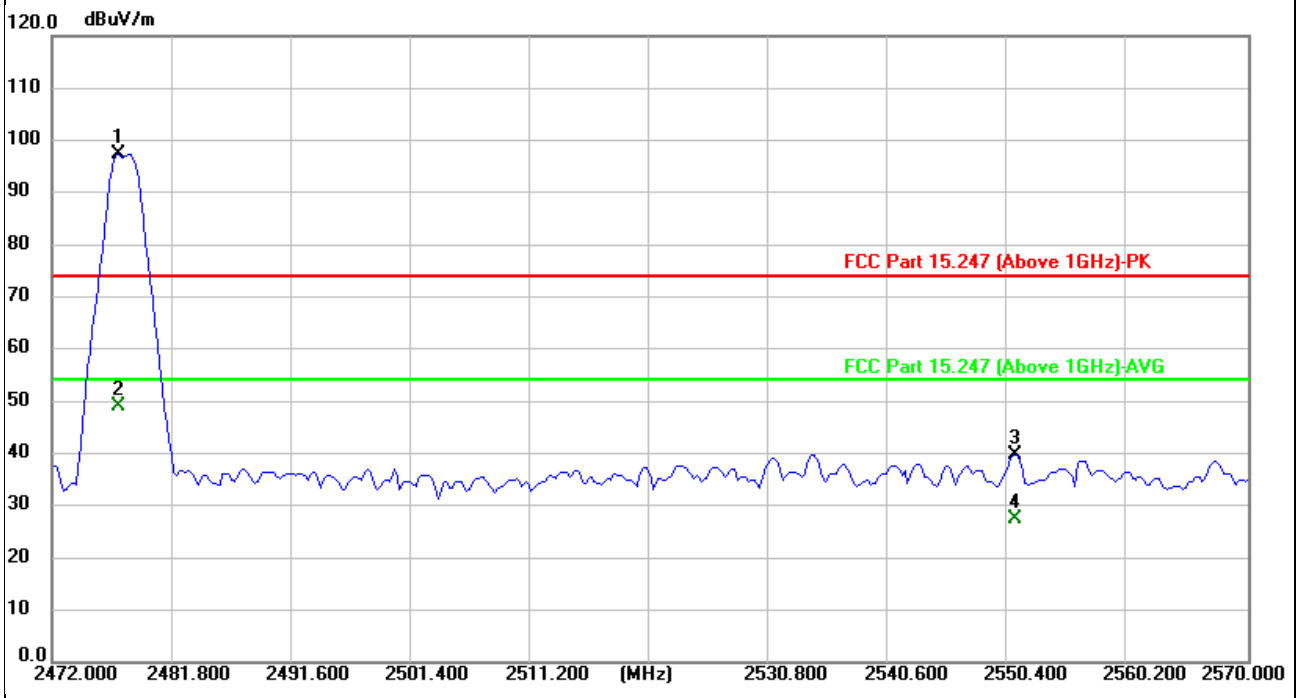
Antennal Polarity& Test Distance: Horizontal at 3m									
No.	Frequency (MHz)	Reading (dBuV)	Correct Factor (dB)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Antenna Height (cm)	Table Angle (Degree)
1#	2440.000	97.06	-0.31	96.75			peak	364	177
2#	2440.000	49.22	-0.31	48.91			AVG	364	177
3	4880.000	41.88	6.25	48.13	74.00	-25.87	peak	162	160
4	4880.000	28.75	6.25	35.00	54.00	-19.00	AVG	162	160
5	7320.000	40.89	12.65	53.54	74.00	-20.46	peak	232	227
6	7320.000	28.65	12.65	41.30	54.00	-12.70	AVG	232	227
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	100.07	-0.31	99.76			peak	118	38
2#	2440.000	50.33	-0.31	50.02			AVG	118	38
3	4880.000	42.25	6.25	48.50	74.00	-25.50	peak	197	78
4	4880.000	29.28	6.25	35.53	54.00	-18.47	AVG	197	78
5	7320.000	41.48	12.65	54.13	74.00	-19.87	peak	113	178
6	7320.000	28.84	12.65	41.49	54.00	-12.51	AVG	113	178

Remarks:

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

Test channel	Channel 38	Frequency Range	Above 1GHz
Detector Function	Peak (PK) Average (AVG)	Tested By	Aron

Antennal Polarity& Test Distance: Horizontal at 3 M



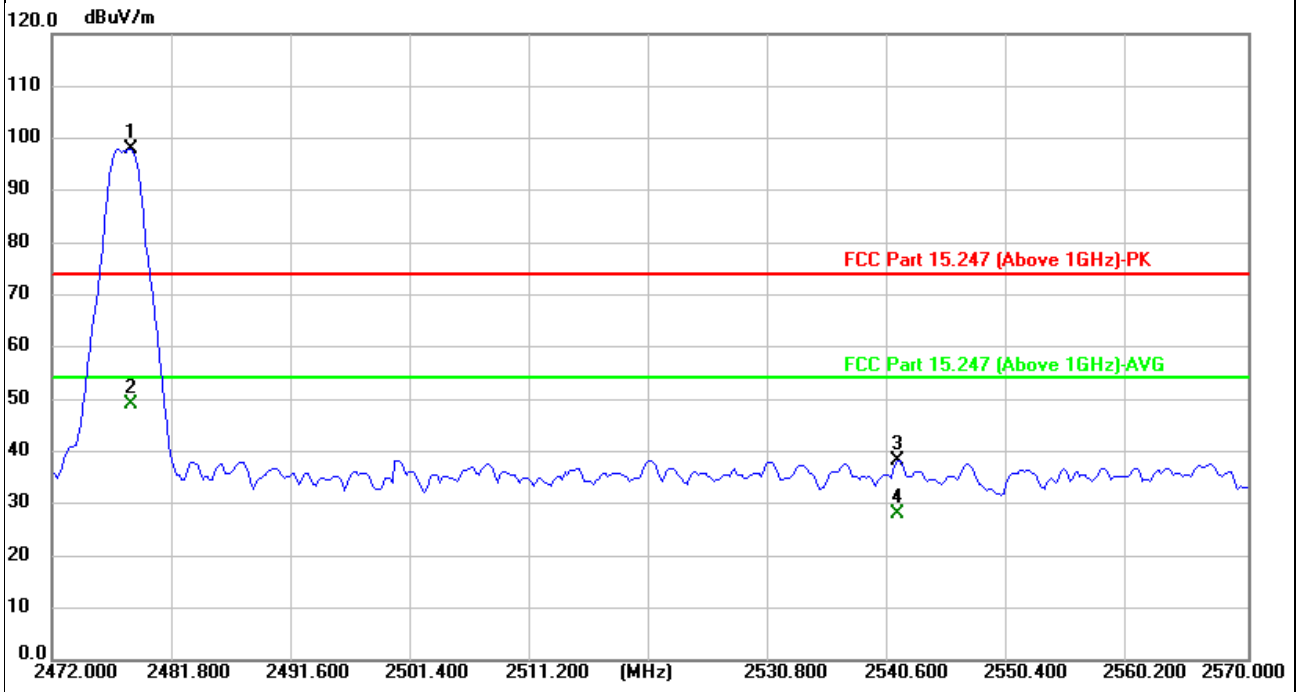
No.	Frequency (MHz)	Reading (dBuV)	Correct Factor (dB)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Antenna Height (cm)	Table Angle (Degree)
1#	2477.499	97.60	-0.22	97.38			peak	118	221
2#	2477.499	49.21	-0.22	48.99			AVG	118	221
3	2550.950	39.86	-0.05	39.81	74.00	-34.19	peak	118	221
4	2550.950	27.46	-0.05	27.41	54.00	-26.59	AVG	118	221
5	4956.000	41.16	6.19	47.35	74.00	-26.65	peak	159	21
6	4956.000	28.46	6.19	34.65	54.00	-19.35	AVG	159	21
7	7434.000	41.47	12.90	54.37	74.00	-19.63	peak	163	239
8	7434.000	28.49	12.90	41.39	54.00	-12.61	AVG	163	239

Remarks:

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

Test channel	Channel 38	Frequency Range	1GHz ~ 25GHz
Detector Function	Peak (PK) Average (AVG)	Tested By	Aron

Antennal Polarity& Test Distance: Vertical 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#	2478.481	98.29	-0.21	98.08			peak	108	69
2#	2478.481	49.33	-0.21	49.12			AVG	108	69
3	2541.327	38.41	-0.08	38.33	74.00	-35.67	peak	108	69
4	2541.327	28.07	-0.08	27.99	54.00	-26.01	AVG	108	69
5	4956.000	41.54	6.19	47.73	74.00	-26.27	peak	126	211
6	4956.000	28.75	6.19	34.94	54.00	-19.06	AVG	126	211
7	7434.000	41.03	12.90	53.93	74.00	-20.07	peak	144	289
8	7434.000	28.50	12.90	41.40	54.00	-12.60	AVG	144	289

Remarks:

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

Equipment	Manufacturer	Model No.	Serial No.	Next Cal. Date
EMI Test Receiver (10kHz~7GHz)	Rohde&Schwarz	ESR7	101961	2025-07-25
2 Line V-Network LISN	Rohde&Schwarz	ENV216	3560.6550.15	2025-07-25
Test software	FARAD	EZ_EMC V1.1.4.2	N/A	N/A
Broadcast test system	R&S	SFU	100410	2025-07-25

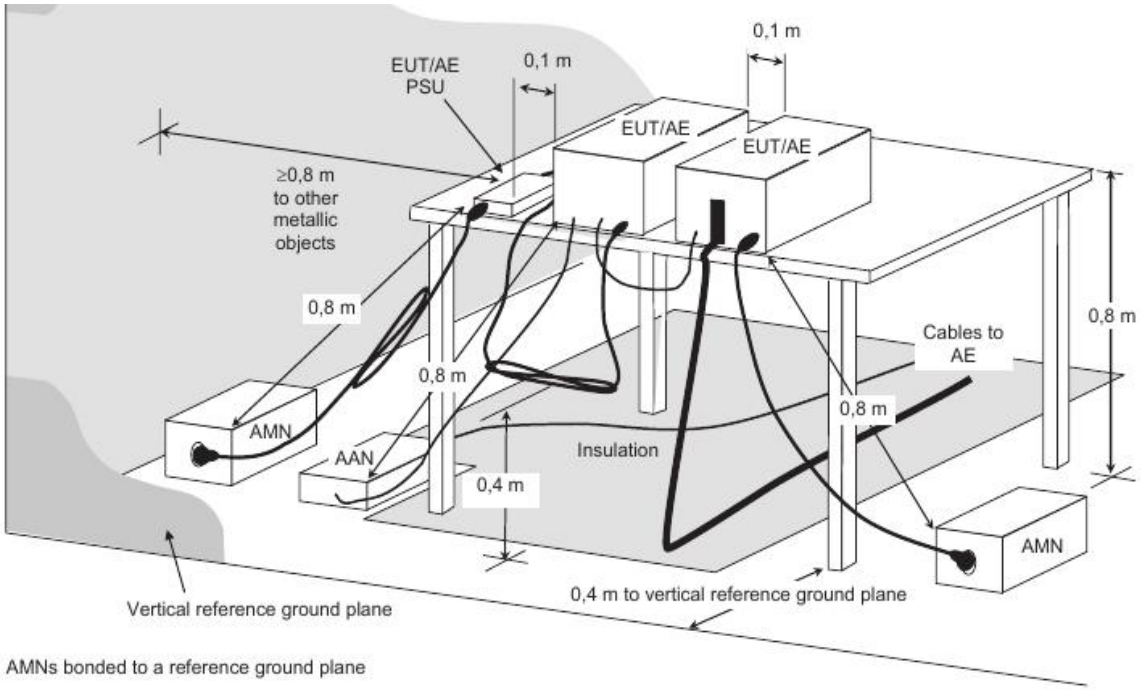
Note:
1. The calibration interval of the above test instruments is 12 months and calibrated by LISAI/CHINA.
2. The test was performed in Shielded Room 743.

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 Test Setup



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

3.2.5 EUT Operating Condition

Set the EUT under transmission condition continuously at specific channel frequency.

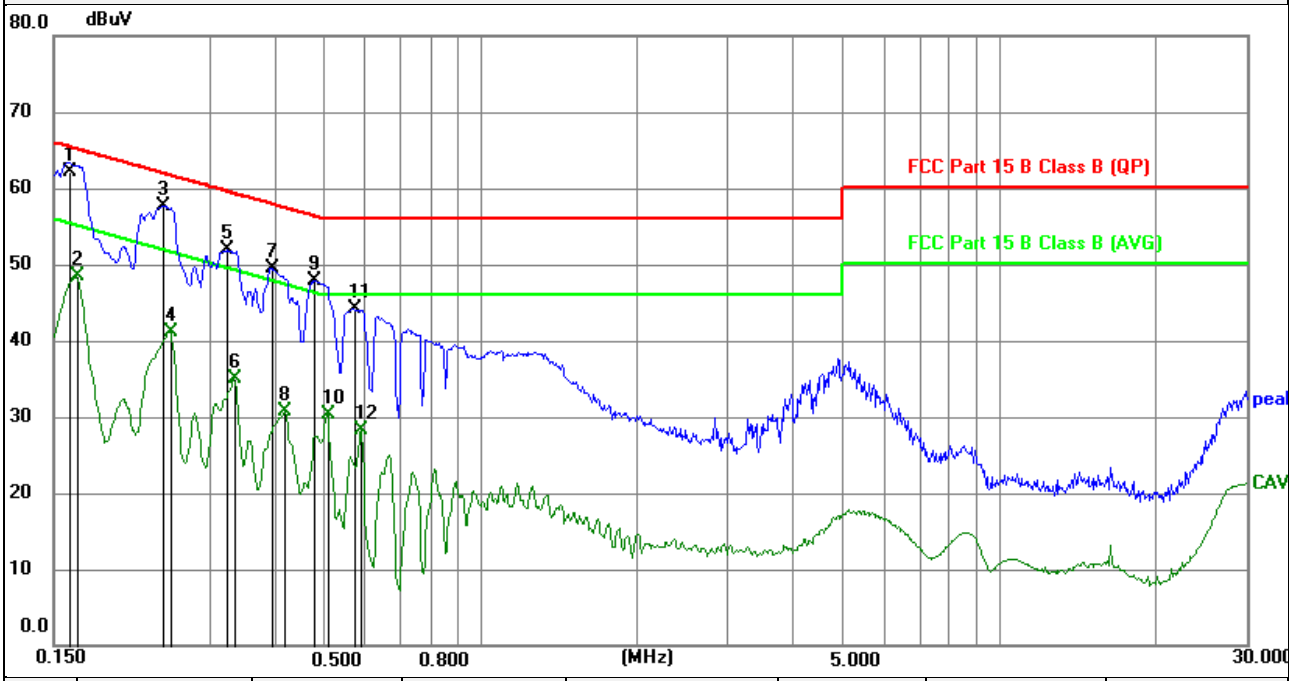
3.2.6 Deviation from Test Standard

No deviation.

3.2.7 Test Results

Frequency Range	150kHz ~ 30MHz	Detector Function & Resolution bandwidth	Quasi-Peak (QP) / Average (AV), 9kHz

Phase of Power: Line (L)



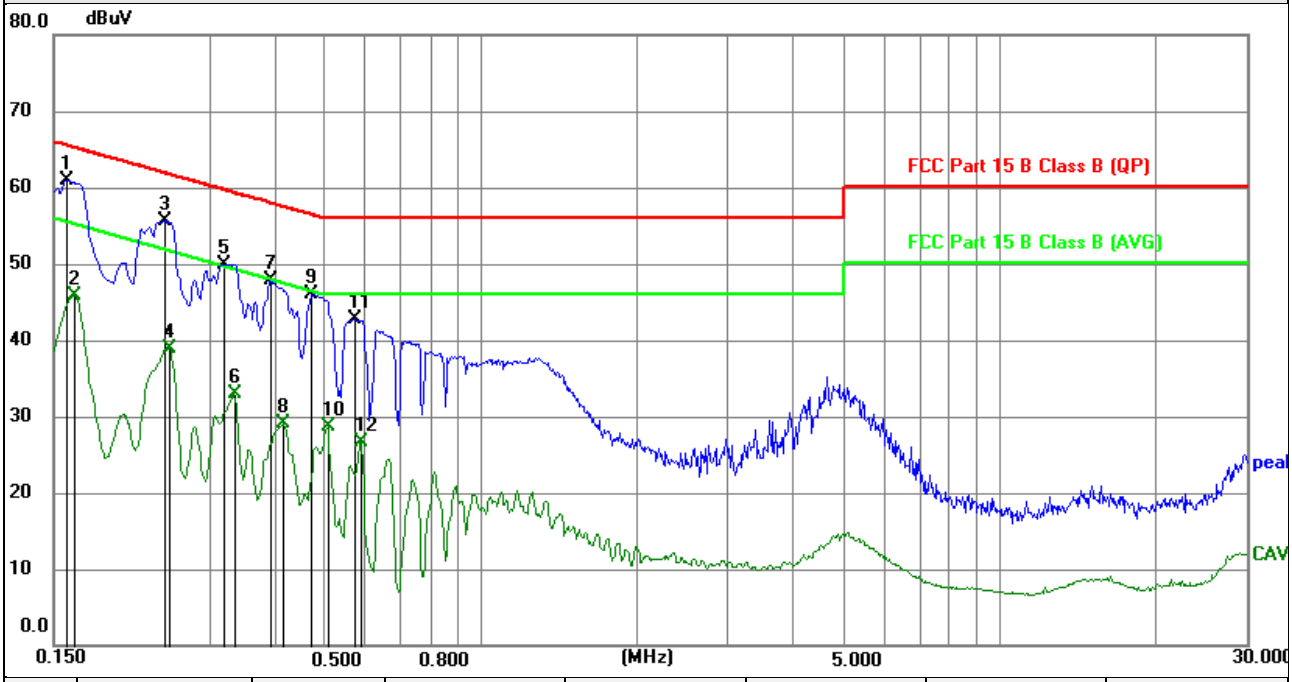
No.	Frequency	Reading	Correct Factor	Emission Level	Limit	Margin	Remark
	(MHz)	(dBuV)	dB	(dBuV)	(dBuV)	(dB)	Det.
1	0.1610	51.91	10.17	62.08	65.41	-3.33	peak
2	0.1658	38.20	10.17	48.37	55.17	-6.80	AVG
3	0.2423	47.41	10.17	57.58	62.02	-4.44	peak
4	0.2513	30.95	10.17	41.12	51.71	-10.59	AVG
5	0.3232	41.71	10.18	51.89	59.62	-7.73	peak
6	0.3345	24.87	10.17	35.04	49.34	-14.30	AVG
7	0.3952	39.40	10.11	49.51	57.95	-8.44	peak
8	0.4200	20.53	10.11	30.64	47.45	-16.81	AVG
9	0.4807	37.76	10.10	47.86	56.33	-8.47	peak
10	0.5076	20.29	10.10	30.39	46.00	-15.61	AVG
11	0.5685	34.06	10.10	44.16	56.00	-11.84	peak
12	0.5887	18.08	10.10	28.18	46.00	-17.82	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

Phase of Power: Neutral (N)



No.	Frequency	Reading	Correct Factor	Emission Level	Limit	Margin	Remark
	(MHz)	(dBuV)	dB	(dBuV)	(dBuV)	(dB)	Det.
1	0.1590	50.81	10.17	60.98	65.52	-4.54	peak
2	0.1635	35.67	10.17	45.84	55.28	-9.44	AVG
3	0.2445	45.38	10.16	55.54	61.94	-6.40	peak
4	0.2490	28.81	10.16	38.97	51.79	-12.82	AVG
5	0.3209	39.79	10.17	49.96	59.68	-9.72	peak
6	0.3345	22.82	10.15	32.97	49.34	-16.37	AVG
7	0.3930	37.75	10.09	47.84	58.00	-10.16	peak
8	0.4177	18.92	10.09	29.01	47.49	-18.48	AVG
9	0.4717	35.85	10.11	45.96	56.48	-10.52	peak
10	0.5076	18.47	10.11	28.58	46.00	-17.42	AVG
11	0.5685	32.63	10.10	42.73	56.00	-13.27	peak
12	0.5865	16.63	10.10	26.73	46.00	-19.27	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.

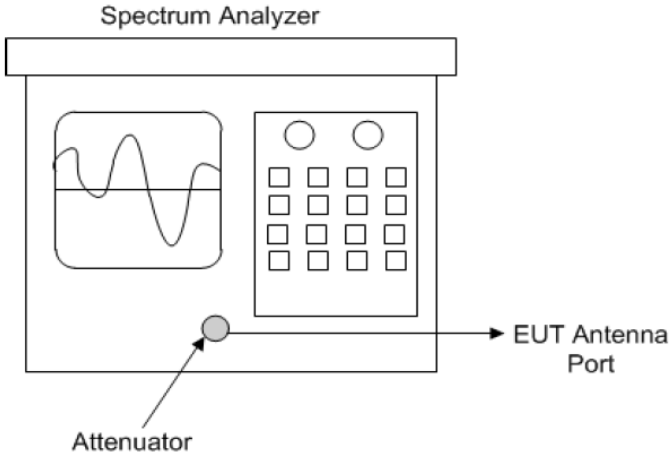
3.3 6dB Bandwidth Measurement

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.



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) ≥ 3 x 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 ≥ 3*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

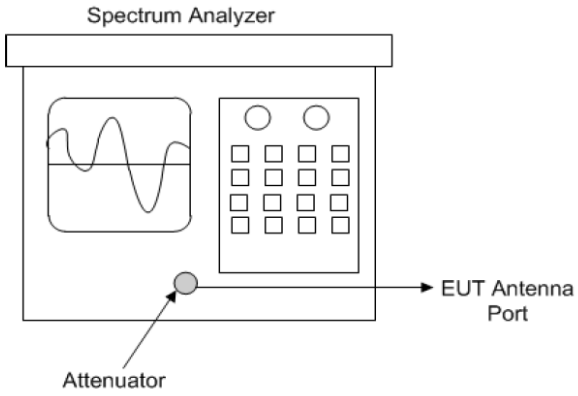
BLE-1Mbps			
Operation Channel	Frequency	Occupied Bandwidth (MHz)	
		Result	Limit
0	2402MHz	0.640	>0.5
19	2440MHz	0.648	>0.5
39	2480MHz	0.656	>0.5

BLE-2Mbps			
Operation Channel	Frequency	Occupied Bandwidth (MHz)	
		Result	Limit
1	2404MHz	1.140	>0.5
19	2440MHz	1.232	>0.5
38	2478MHz	1.256	>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

BLE-1Mbps			
Operation Channel	Frequency	Occupied Bandwidth (MHz)	
		Result	Limit
0	2402MHz	1.0389	2400~2483.5
19	2440MHz	1.0360	2400~2483.5
39	2480MHz	1.0449	2400~2483.5

BLE-2Mbps			
Operation Channel	Frequency	Occupied Bandwidth (MHz)	
		Result	Limit
1	2404MHz	2.0784	2400~2483.5
19	2440MHz	2.0750	2400~2483.5
38	2478MHz	2.0732	2400~2483.5

BLE 1Mbps	BLE 2Mbps
	
CH0	CH0
	
CH19	CH19
	
CH39	CH39

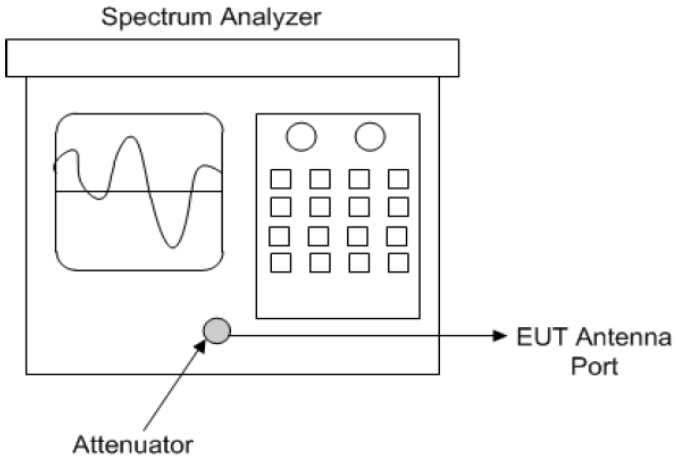
3.5 Conducted Output Power Measurement

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:

a) **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.

b) **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%.

c) **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.

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

☒Maximum peak conducted output power

The following procedure shall be used when an instrument with a resolution bandwidth that is greater than the DTS bandwidth is available to perform the measurement:

a) Set the RBW > DTS bandwidth.

b) Set VBW> [3 x RBW]

c) Set span > [3 x RBW]

d) Sweep time = auto couple.

e) Detector = peak

f) Trace mode = max hold.

g) Allow trace to fully stabilize.

h) Use peak marker function to determine the peak amplitude level.

☒Maximum conducted (average) output power (Method AVGSA-2):

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 ≥ 3 x RBW
5* Number of points in sweep≥ 2 x span /RBW. (This gives bin-to-bin spacing ≤ RBW / 2. so that narrowband signals are not lost between frequency bins).
6* Sweep time ≤ (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.

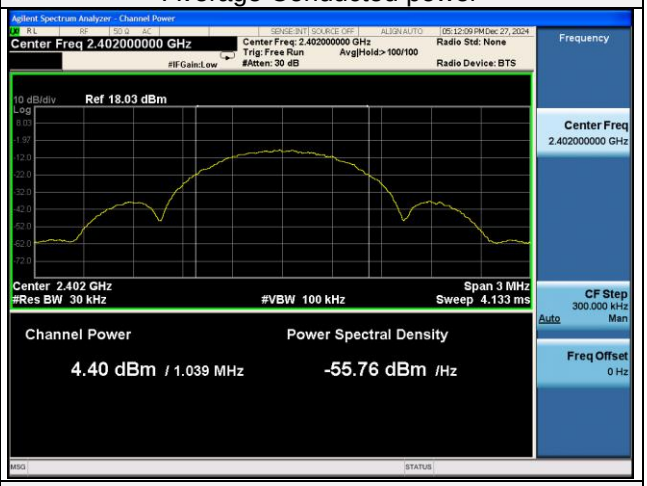
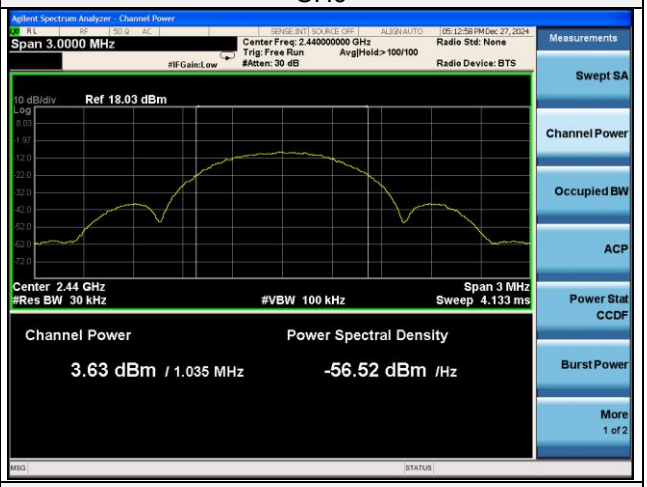
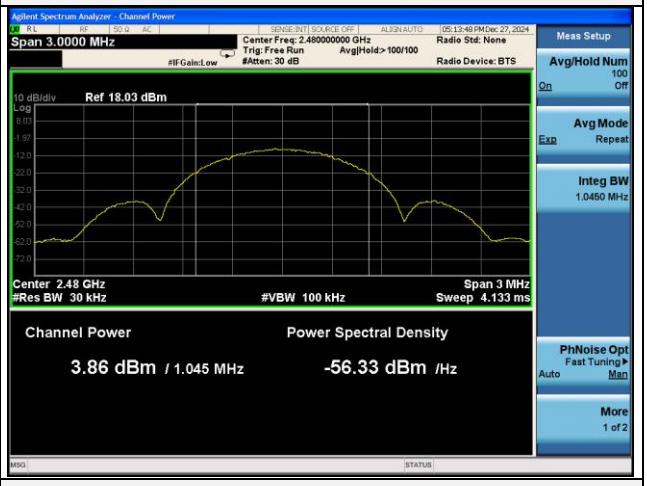
3.5.7 Test Results

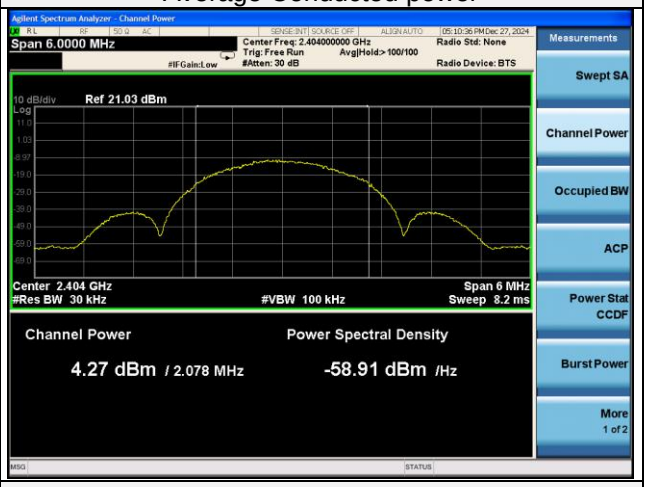
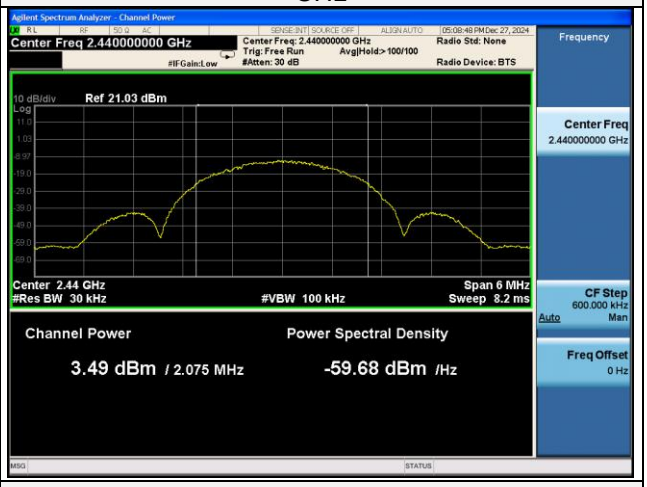
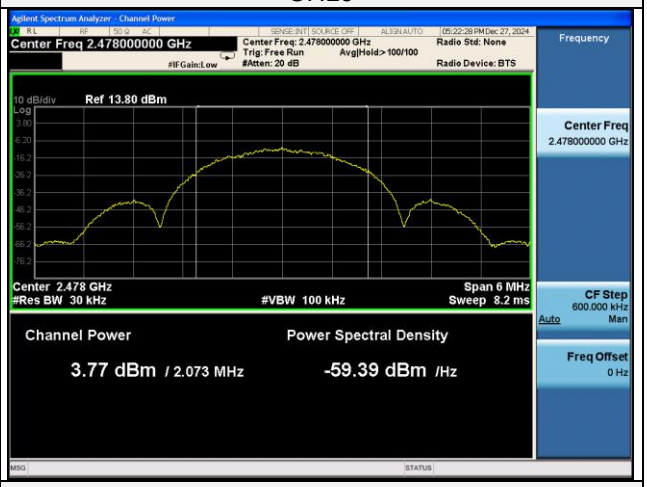
BLE-1Mbps						
Peak Power						
Channel	Freq.	RF Output Power		Limit (mW)		Verdict
No.	(MHz)	(dBm)	(mW)	Rss-247	FCC	
0	2402	**4.979**	**3.147**	<125	<1000	Pass
19	2440	4.073	2.554	<125	<1000	Pass
39	2480	4.185	2.621	<125	<1000	Pass

BLE-1Mbps						
Average Power						
Channel	Freq.	RF Output Power		Limit (mW)		Verdict
No.	(MHz)	(dBm)	(mW)	Rss-247	FCC	
0	2402	**4.400**	**2.754**	<125	<1000	Pass
19	2440	3.630	2.307	<125	<1000	Pass
39	2480	3.860	2.432	<125	<1000	Pass

BLE-2Mbps						
Peak Power						
Channel	Freq.	RF Output Power		Limit (mW)		Verdict
No.	(MHz)	(dBm)	(mW)	Rss-247	FCC	
1	2404	4.845	3.051	<125	<1000	Pass
19	2440	4.023	2.525	<125	<1000	Pass
38	2478	4.124	2.585	<125	<1000	Pass

BLE-2Mbps						
Average Power						
Channel	Freq.	RF Output Power		Limit (mW)		Verdict
No.	(MHz)	(dBm)	(mW)	Rss-247	FCC	
1	2404	4.270	2.673	<125	<1000	Pass
19	2440	3.490	2.234	<125	<1000	Pass
38	2478	3.770	2.382	<125	<1000	Pass

BLE-1Mbps	
Peak Conducted power	Average Conducted power
	
CH0	CH0
	
CH19	CH19
	
CH39	CH39

BLE-2Mbps	
Peak Conducted power	Average Conducted power
	
CH1	CH1
	
CH19	CH19
	
CH38	CH38

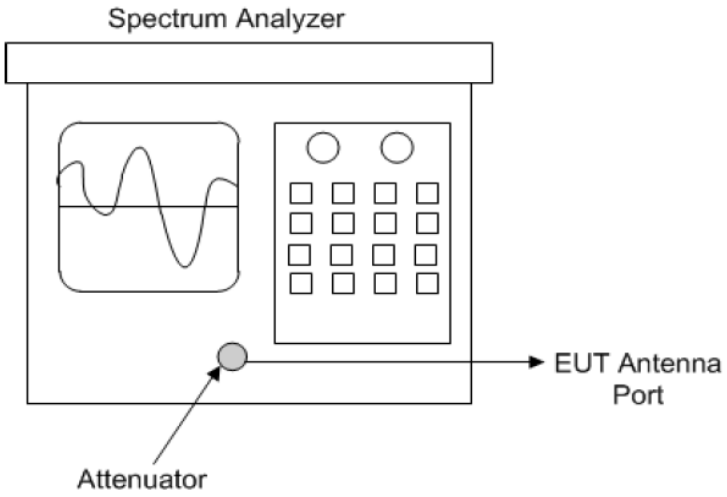
3.6 Power Spectral Density Measurement

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 ≥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 ±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 ±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.

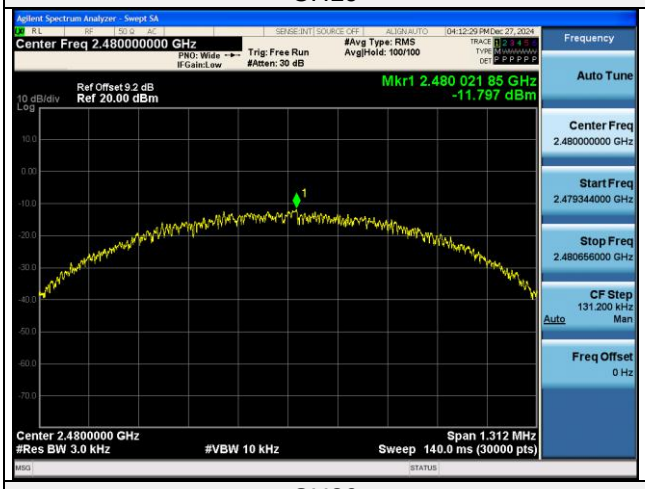
3.6.6 EUT Operating Condition

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

BLE-1Mbps	Power Density		
Test Channel	Channel Frequency	Test Result (dBm/3kHz)	Limit (dBm/3kHz)
0	2402MHz	-11.229	<8
19	2440MHz	-12.036	<8
39	2480MHz	-11.797	<8

BLE-2Mbps	Power Density		
Test Channel	Channel Frequency	Test Result (dBm/3kHz)	Limit (dBm/3kHz)
1	2404MHz	-14.384	<8
19	2440MHz	-15.084	<8
38	2478MHz	-14.969	<8

BLE 1Mbps	BLE 2Mbps
	
CH0	CH1
	
CH19	CH19
	
CH39	CH38

3.7 Conducted Out of Band Emission Measurement

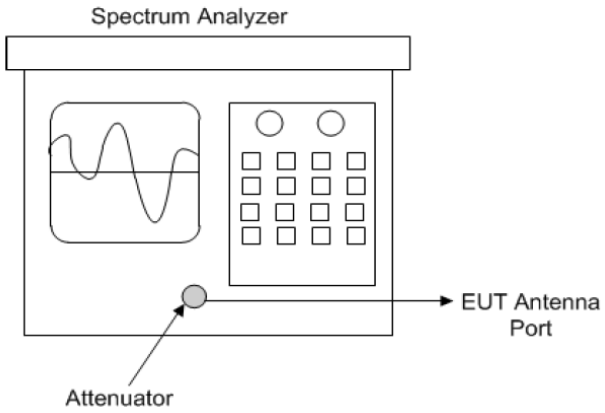
3.7.1 Limits of Conducted Out of Band Emission Measurement

a. **If the maximum peak conducted output power procedure was used to determine compliance as described in 11.9.1**, then the peak output power measured in any 100 kHz bandwidth outside of the authorized frequency band shall be attenuated by at least 20 dB relative to the maximum in-band peak PSD level in 100 kHz (i.e., 20 dBc).

b. **If maximum conducted (average) output power was used to determine compliance as described in 11.9.2**. then the peak power in any 100 kHz bandwidth outside of the authorized frequency band shall be attenuated by at least 30 dB relative to the maximum in-band peak PSD level in 100 kHz (i.e., 30 dBc).

3.7.2 Test Setup

- 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.



Spectrum analyzer test configuration

3.7.3 Test Instruments

Refer to section 5 to get information of above instrument.

3.7.4 Test Procedure

a. Establish a reference level by using the following procedure:

1) Set instrument center frequency to DTS channel center frequency.
2) Set the span to 21.5 times the DTS bandwidth)
3) Set the RBW= 100 kHz)
4) Set the VBW ≥3 x RBW
5) Detector = peak
6) Sweep time = auto coupling
7) Trace mode =max hold
8) Allow trace to fully stabilize
9) Use the peak marker function to determine the maximum PSD level.

Note that the channel found to contain the maximum PSD level can be used to establish the reference level.

b. Establish an emission level by using the following procedure:

1) Set the center frequency and span to encompass frequency range to be measured.
2) Set the RBW = 100 kHz
3) Set the VBW ≥ 300 kHz.
4) Detector = peak.
5) Sweep time = auto couple.
6) Trace mode = max hold.
7) Allow trace to fully stabilize.
8) Use the peak marker function to determine the maximum power level in any 100 kHz band segment within the fundamental EBW.

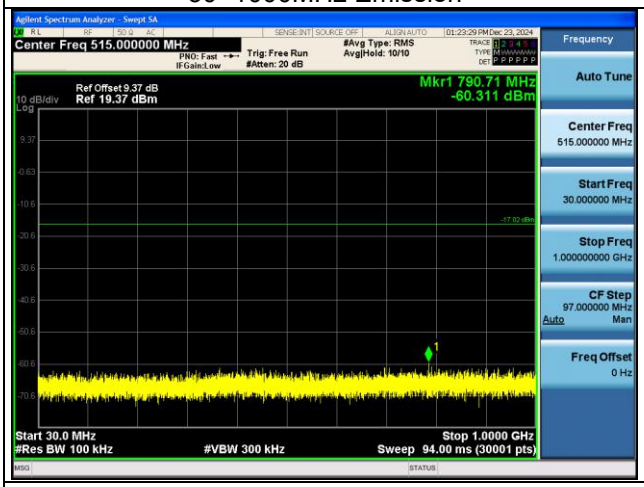
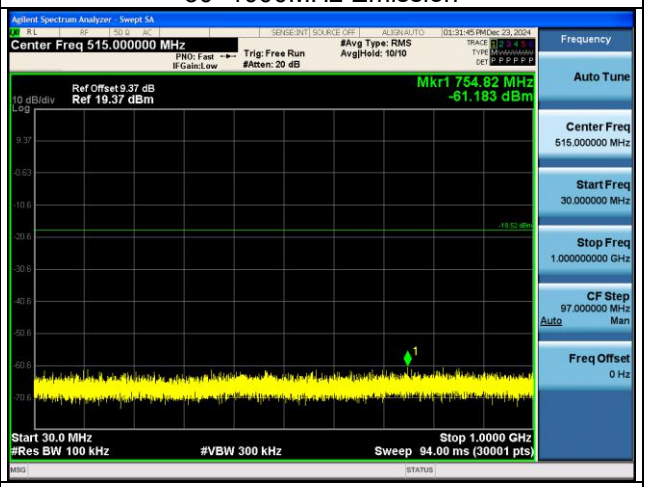
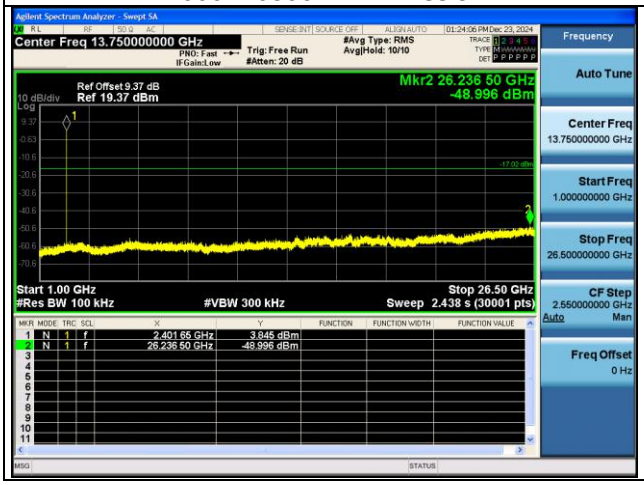
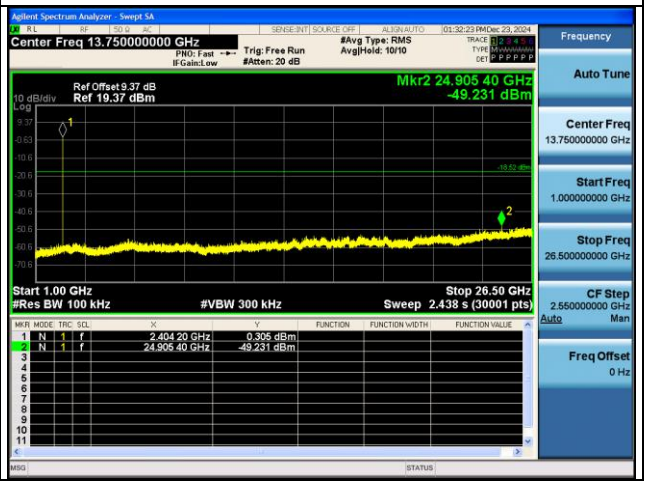
3.7.5 Deviation from Test Standard

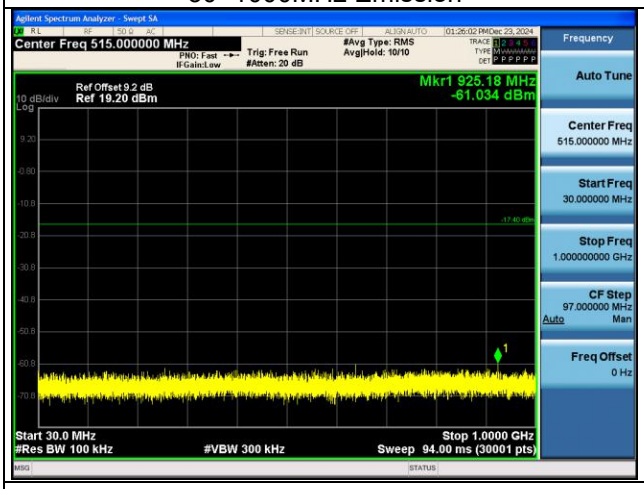
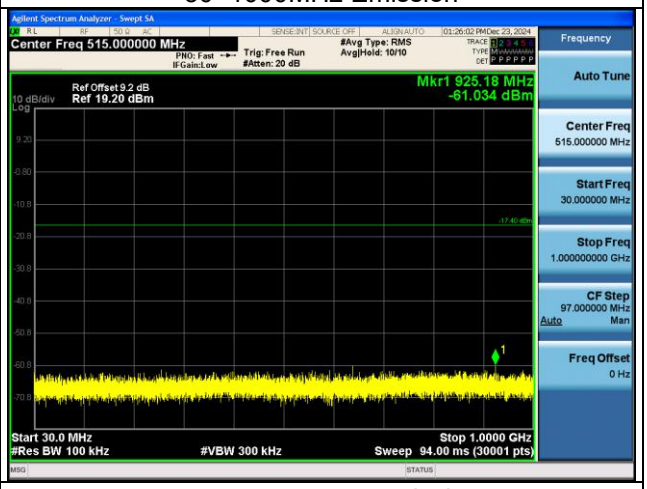
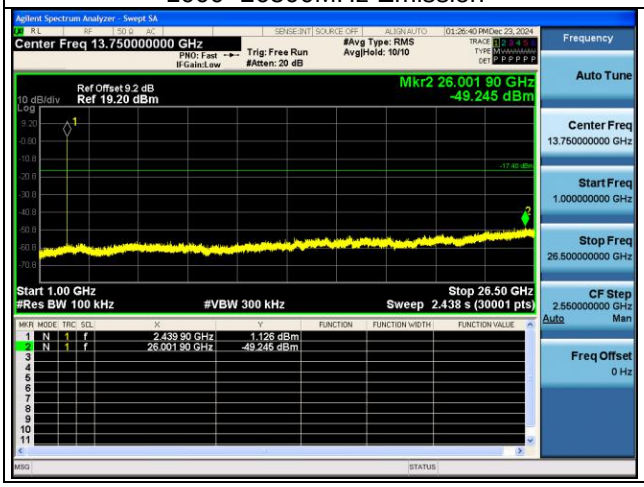
No deviation.

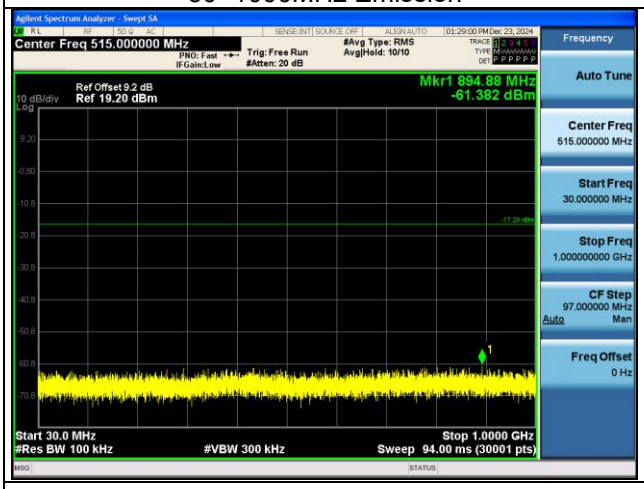
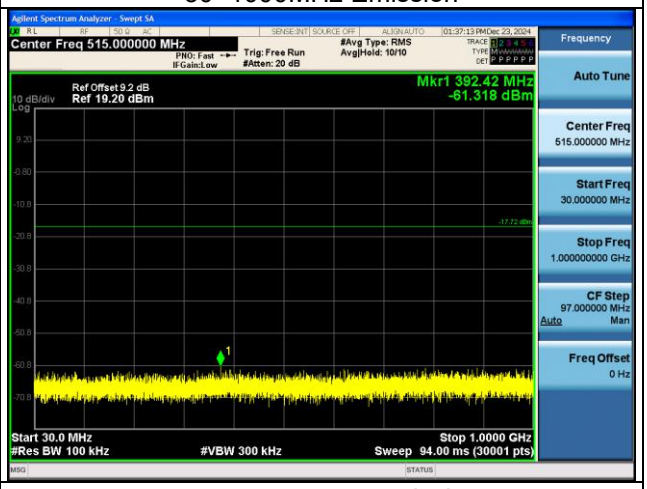
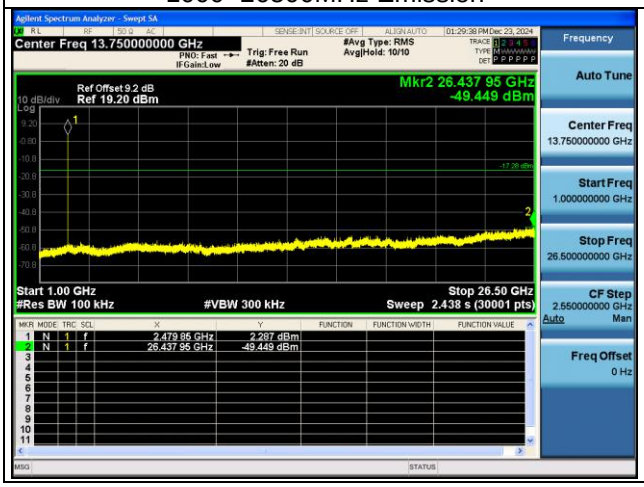
3.7.6 EUT Operating Condition

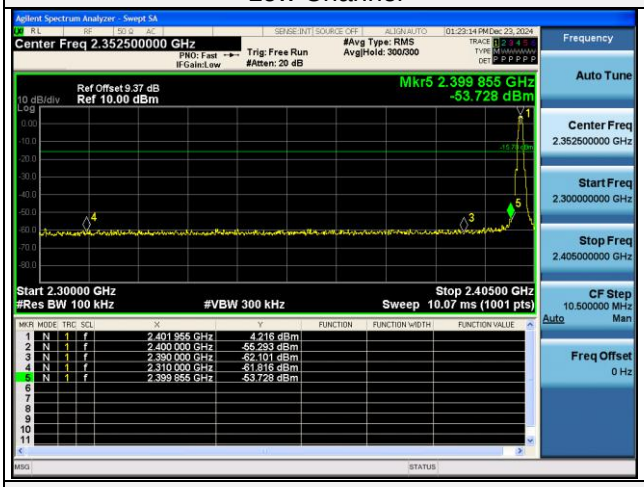
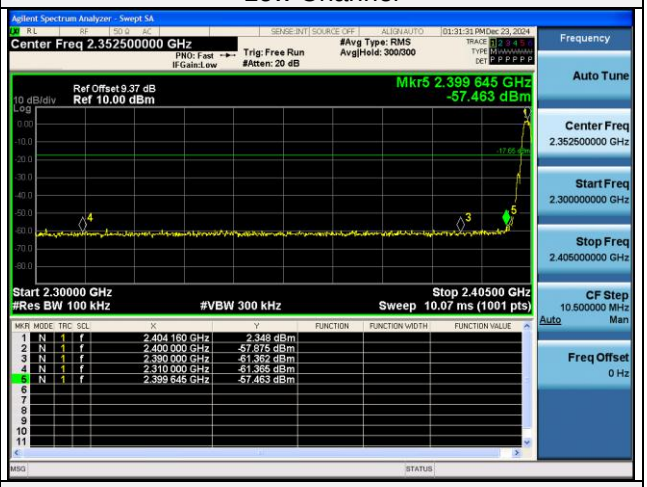
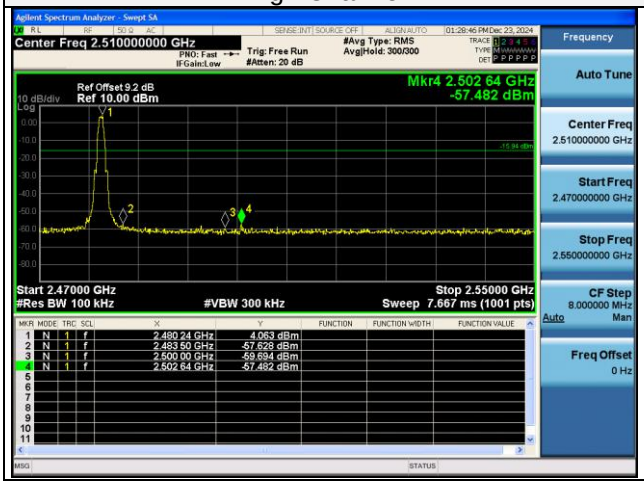
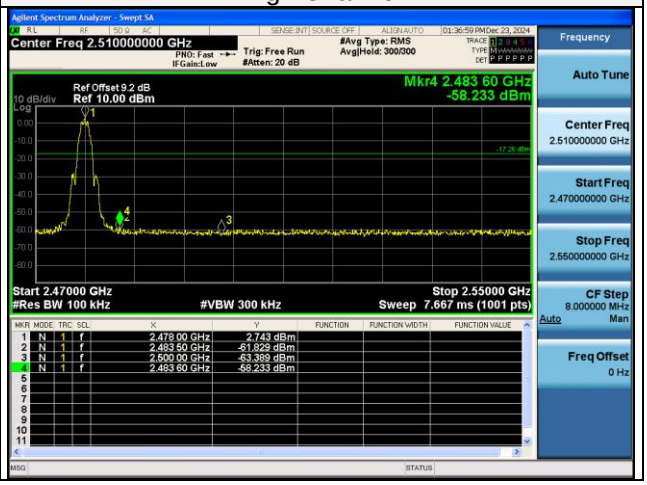
The software provided by client to enable the EUT under transmission condition continuously at lowest, middle and highest channel frequencies individually.

3.7.7 Test results

BLE 1Mbps	BLE 2Mbps
Low Channel	Low Channel
Reference Level	Reference Level
	
30~1000MHz Emission	30~1000MHz Emission
	
1000~26500MHz Emission	1000~26500MHz Emission
	

BLE 1Mbps	BLE 2Mbps
Middle Channel	Middle Channel
Reference Level	Reference Level
	
30~1000MHz Emission	30~1000MHz Emission
	
1000~26500MHz Emission	1000~26500MHz Emission
	

BLE 1Mbps	BLE 2Mbps
High Channel	High Channel
Reference Level	Reference Level
	
30~1000MHz Emission	30~1000MHz Emission
	
1000~26500MHz Emission	1000~26500MHz Emission
	

Band edge	
BLE 1Mbps	BLE 2Mbps
Low Channel	Low Channel
	
High Channel	High Channel
	

4. Pictures of Test Arrangements

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

5. Test Instruments

Equipment	Manufacturer	Model No.	Serial No.	Next Cal. Date
Spectrum	Keysight	N9020A	MY51240612	2025-07-25
Spectrum Analyzer	Rohde&Schwarz	FSV-40N	101783	2025-07-25
Power Meter 10Hz~18GHz	Tonscend	JS0806-2	188060126	2025-07-25
Signal generator	Keysight	E4421B	GB40051020	2025-05-16
Universal Switch Control Unit	Rohde&Schwarz	CMW500	12010002k50	2025-07-25
Test Software	Tonscend	JS0806-2	NA	NA
Humidity tester	Jingchuang	GSP-8A	CMA22B000592	2025-07-29
Test cable	N/A	N/A	HS-EMC-107	2025-12-12
Test cable	N/A	N/A	HS-EMC-108	2025-12-12

Note: 1. The calibration interval of the above test instruments is 12 months.
2. The test was performed in RF Chamber.

Appendix – Information on The Testing Laboratories

We, Hwa-Hsing (Dongguan) Testing Co., Ltd., A global provider of TESTING and CERTIFICATION services for consumer products, electronic products and wireless information technology products. Adhering to the core values “HONEST and TRUSTWORTHY, OBJECTIVE and IMPARTIALITY, RIGOROUS and AFFICIENT”, commitment to provide professional, perfect and efficient comprehensive ONE-STOP solution of TESTING and CERTIFICATION services for Manufacturers, Buyers, Traders, Brands, Retailers. Assist client to better manage risk, protect their brands, reduce costs and cut time to over 150 markets in global. Our laboratories are FCC recognized accredited test firms and accredited and approved according to ISO/IEC 17025.

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

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Contact Tel: 0769-83078199
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