

FCC Test Report

Report No.: RFBCEE-WTW-P21050412-1

FCC ID: DMOCXPLUSTW1L

Model No.: CXPLUSTW1 L

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Test Date: May 21 ~ Jun. 29, 2021

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Release Control Record

Issue No.	Description	Date Issued
RFBCEE-WTW-P21050412-1	Original Release	Jul. 02, 2021

1 Certificate of Conformity

Product Name: CX Plus True Wireless (CXPLUSTW1)

Brand Name: SENNHEISER

Model No.: CXPLUSTW1 L

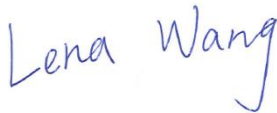
Sample Status: Engineering Sample

Applicant: Sennheiser electronic GmbH & Co. KG

Test Date: May 21 ~ Jun. 29, 2021

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

The above equipment has been tested by **Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch**, and found compliance with the requirement of the above standards. The test record, data evaluation & Equipment Under Test (EUT) configurations represented herein are true and accurate accounts of the measurements of the sample's RF characteristics under the conditions specified in this report.


Prepared by : _____, **Date:** Jul. 02, 2021
Lena Wang / Specialist


Approved by : _____, **Date:** Jul. 02, 2021
Dylan Chiou / Senior Project Engineer

2 Summary of Test Results

47 CFR FCC Part 15, Subpart C (Section 15.247)			
FCC Clause	Test Item	Result	Remarks
15.207	AC Power Conducted Emission	Pass	Meet the requirement of limit. Minimum passing margin is -5.59 dB at 0.46280 MHz.
15.205 & 209	Radiated Emissions	Pass	Meet the requirement of limit. Minimum passing margin is -9.81 dB at 454.7 MHz.
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)	6 dB 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.

Note:

- For 2.4G band compliance with rule 15.247(d) of the band-edge items, the test plots were recorded in Annex A. Test Procedures refer to report 4.1.3.
- Determining compliance based on the results of the compliance measurement, not taking into account measurement instrumentation uncertainty.

2.1 Measurement Uncertainty

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the EUT as specified in CISPR 16-4-2:

Measurement	Frequency	Expanded Uncertainty (k=2) ($\pm$)
Conducted Emissions at mains ports	150 kHz ~ 30 MHz	2.79 dB
Radiated Emissions up to 1 GHz	9 kHz ~ 30 MHz	3.04 dB
	30 MHz ~ 200 MHz	2.0153 dB
	200 MHz ~ 1000 MHz	2.0224 dB
Radiated Emissions above 1 GHz	1 GHz ~ 18 GHz	1.0121 dB
	18 GHz ~ 40 GHz	1.1508 dB

2.2 Modification Record

There were no modifications required for compliance.

3 General Information

3.1 General Description of EUT

Test Item Description	True Wireless Earphones
Product Name	CX Plus True Wireless (CXPLUSTW1)
Brand Name	SENNHEISER
Model No.	CXPLUSTW1 L (refer to note for more details)
Status of EUT	Engineering Sample
Power Ratings	Left earbud& Right earbud: 3.7Vdc, 55mAh (from battery) Charging Case: 5Vdc, 600 mA (from Type-C USB interface) 3.7Vdc, 400-420mAh (from battery)
Power Supply (Nominal & Testing)	5Vdc, 600 mA (from Type-C USB interface)
Operating Temperature range	0°C - +40°C
Modulation Type	GFSK
Transmission Technology	DTS
Technology	Bluetooth
Operating Frequency	2402 - 2480MHz (for Frequency Band: 2400-2483.5MHz)
Channel Spacing	2MHz
Channel Bandwidth	80MHz
Data Transfer Rate	LE 4.0: 1Mbps LE 5.2: 2Mbps
Number of Channel	40
Maximum Output Power	LE 4.0: 9.594 mW LE 5.2: 9.462 mW
Antenna Type	Monopole antenna
Antenna Gain	Max -2.26 dBi
HW Version	Earbuds: R1 Charging case: R1
SW Version	Earbuds: V1.3.20 Charging case: 1.4.0
Antenna Connector	N/A
Cable Supplied	0.2 m Shielded USB cable without core

Note:

- The EUT system CX Plus True Wireless (CXPLUSTW1), contain the following devices:

Item	Brand	Device Model No.
Right Earbud	SENNHEISER	CXPLUSTW1 R
Left Earbud	SENNHEISER	CXPLUSTW1 L
Charging Case	SENNHEISER	CXPLUSTW1 C

* CXPLUSTW1 R and CXPLUSTW1 L with BT & BT LE TX/RX function

* Charging case is solely used for charging CXPLUSTW1 R and CXPLUSTW1 L only

* There are two appearance colors: Black, and White.

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

3.2 Description of Test Modes

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

3.2.1 Test Mode Applicability and Tested Channel Detail

<LE 4.0>

EUT Configure Mode	Applicable To				Description
	RE $\geq$ 1G	RE<1G	PLC	APCM	
A	√	√	-	√	EUT (Left Earbud)
B	-	√	√	-	EUT (Left Earbud + Right Earbud + Charging case (Main Battery))
C	-	√	√	-	EUT (Left Earbud + Right Earbud + Charging case (Alternative Battery))

Where **RE $\geq$ 1G**: Radiated Emission above 1 GHz

RE<1G: Radiated Emission below 1 GHz

PLC: Power Line Conducted Emission

APCM: Antenna Port Conducted Measurement

Note: The EUT had been pre-tested on the positioned of each 3 axis. The worst case was found when positioned on **Y-plane**.

Note: “-” means no effect.

Radiated Emission Test (Above 1 GHz):

- ☒ 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.

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

Radiated Emission Test (Below 1 GHz):

- ☒ 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.

EUT Configure Mode	Available Channel	Tested Channel	Modulation Type	Data Rate (Mbps)
A, B, C	0 to 39	39	GFSK	1

Power Line Conducted Emission Test:

- ☒ 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.

EUT Configure Mode	Available Channel	Tested Channel	Modulation Type	Data Rate (Mbps)
B, C	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.
- ☒ 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.

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

<LE 5.2>

EUT Configure Mode	Applicable To				Description
	RE≥1G	RE<1G	PLC	APCM	
A	√	√	-	√	EUT (Left Earbud)
B	-	√	√	-	EUT (Left Earbud + Right Earbud + Charging case (Main Battery))
C	-	√	√	-	EUT (Left Earbud + Right Earbud + Charging case (Alternative Battery))

Where **RE≥1G**: Radiated Emission above 1 GHz

RE<1G: Radiated Emission below 1 GHz

PLC: Power Line Conducted Emission

APCM: Antenna Port Conducted Measurement

Note: The EUT had been pre-tested on the positioned of each 3 axis. The worst case was found when positioned on **Y-plane**.

Note: “-” means no effect.

Radiated Emission Test (Above 1 GHz):

- ☒ 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.

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

Radiated Emission Test (Below 1 GHz):

- ☒ 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.

EUT Configure Mode	Available Channel	Tested Channel	Modulation Type	Data Rate (Mbps)
A, B, C	0 to 39	39	GFSK	2

Power Line Conducted Emission Test:

- ☒ 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.

EUT Configure Mode	Available Channel	Tested Channel	Modulation Type	Data Rate (Mbps)
B, C	0 to 39	39	GFSK	2

Antenna Port Conducted Measurement:

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

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

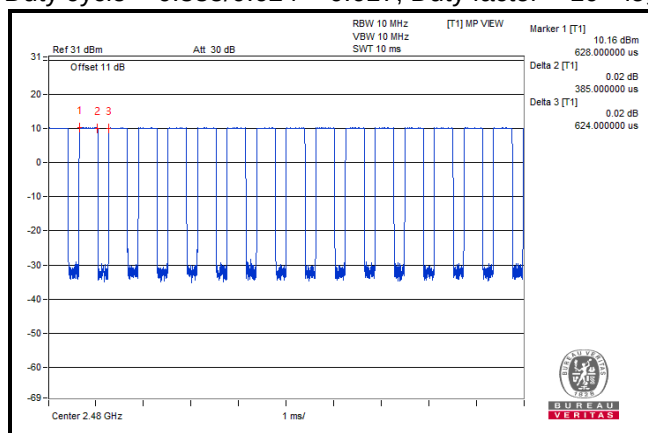
Test Condition:

Applicable To	Environmental Conditions	Input Power	Tested by
RE $\geq$ 1G	25 deg. C, 65 % RH	3.7 Vdc	Karl Lee
RE<1G	25 deg. C, 65 % RH	3.7 Vdc, 120 Vac, 60Hz	Karl Lee
PLC	25 deg. C, 65 % RH	120 Vac, 60 Hz	Edison Lee
APCM	25 deg. C, 65 % RH	3.7 Vdc	Chris Lin

3.3 Duty Cycle of Test Signal

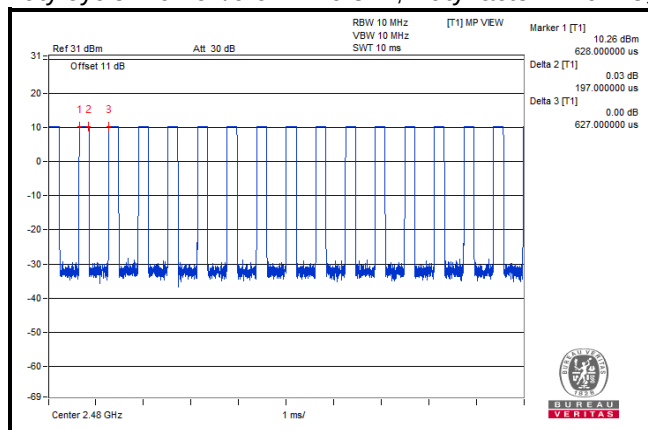
<LE 4.0>

Duty cycle = $0.385/0.624 = 0.617$, Duty factor = $10 * \log(1/0.617) = 2.10$



<LE 5.2>

Duty cycle = $0.197/0.627 = 0.314$, Duty factor = $10 * \log(1/0.314) = 5.03$



3.4 Description of Support Units

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

ID	Product	Brand	Model No.	Serial No.	FCC ID	Remarks
A	Adapter	ASUS	AD827M	NA	NA	-

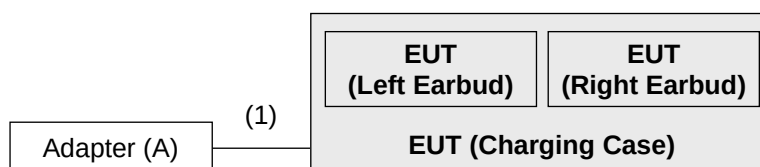
No.	Cable Descriptions	Qty.	Length (m)	Shielded (Yes/ No)	Cores (Qty.)	Remark
1.	USB Cable	1	0.2	Y	0	Supplied by client

3.4.1 Configuration of System under Test

Test Mode A



Test Mode B, C



3.5 General Description of Applied Standards and References

The EUT is a RF Product. According to the specifications of the manufacturer, it must comply with the requirements of the following standards and references:

Test Standard:

FCC Part 15, Subpart C (15.247)

ANSI C63.10-2013

All test items have been performed and recorded as per the above standards.

References Test Guidance:

KDB 558074 D01 15.247 Meas Guidance v05r02

All test items have been performed as a reference to the above KDB test guidance.

4 Test Types and Results

4.1 Radiated Emission and Bandedge Measurement

4.1.1 Limits of Radiated Emission and Bandedge Measurement

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

Frequencies (MHz)	Field Strength (microvolts/meter)	Measurement Distance (meters)
0.009 ~ 0.490	2400/F (kHz)	300
0.490 ~ 1.705	24000/F (kHz)	30
1.705 ~ 30.0	30	30
30 ~ 88	100	3
88 ~ 216	150	3
216 ~ 960	200	3
Above 960	500	3

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 1000 MHz, the field strength limits are based on average detector, however, the peak field strength of any emission shall not exceed the maximum permitted average limits, specified above by more than 20 dB under any condition of modulation.

4.1.2 Test Instruments

Description & Manufacturer	Model No.	Serial No.	Date of Calibration	Due Date of Calibration
Test Receiver Agilent Technologies	N9038A	MY52260177	Aug. 24, 2020	Aug. 23, 2021
Spectrum Analyzer ROHDE & SCHWARZ	FSU43	101261	Apr. 12, 2021	Apr. 11, 2022
HORN Antenna ETS-Lindgren	3117	00143293	Nov. 22, 2020	Nov. 21, 2021
BILOG Antenna SCHWARZBECK	VULB 9168	9168-616	Nov. 09, 2020	Nov. 08, 2021
Fixed Attenuator Mini-Circuits	MDCS18N-10	MDCS18N-10-01	Apr. 13, 2021	Apr. 12, 2022
Loop Antenna	EM-6879	269	Sep. 17, 2020	Sep. 16, 2021
Preamplifier Agilent	310N	187226	Jun. 17, 2020	Jun. 16, 2021
			Jun. 17, 2021	Jun. 16, 2022
Preamplifier Agilent	83017A	MY39501357	Jun. 17, 2020	Jun. 16, 2021
			Jun. 17, 2021	Jun. 16, 2022
Preamplifier EMCI	EMC 184045	980116	Oct. 07, 2020	Oct. 06, 2021
Power Meter Anritsu	ML2495A	1012010	Sep. 01, 2020	Aug. 31, 2021
Power Sensor Anritsu	MA2411B	1315050	Sep. 01, 2020	Aug. 31, 2021
RF signal cable ETS-LINDGREN	5D-FB	Cable-CH1-01(RFC-SMS-100-SMS-120+RFC-SMS-100-SMS-400)	Jun. 17, 2020	Jun. 16, 2021
			Jun. 17, 2021	Jun. 16, 2022
RF signal cable ETS-LINDGREN	8D-FB	Cable-CH1-02(RFC-SMS-100-SMS-24)	Jun. 17, 2020	Jun. 16, 2021
			Jun. 17, 2021	Jun. 16, 2022
Boresight Antenna Fixture	FBA-01	FBA-SIP01	NA	NA
Software BV ADT	E3 8.130425b	NA	NA	NA
Antenna Tower MF	NA	NA	NA	NA
Turn Table MF	NA	NA	NA	NA
Antenna Tower & Turn Table Controller MF	MF-7802	NA	NA	NA

Note: 1. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.

2. The test was performed in HsinTien Chamber 1.

4.1.3 Test Procedures

For Radiated Emission below 30 MHz

- a. The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter chamber room. The table was rotated 360 degrees to determine the position of the highest radiation.
- b. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
- c. Parallel, perpendicular, and ground-parallel orientations of the antenna are set to make the measurement.
- d. For each suspected emission, the EUT was arranged to its worst case and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.
- e. The test-receiver system was set to Quasi-Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.

Note:

1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 9 kHz at frequency below 30 MHz.

For Radiated Emission above 30 MHz

- a. The EUT was placed on the top of a rotating table 0.8 meters (for 30 MHz ~ 1 GHz) / 1.5 meters (for above 1 GHz) above the ground at 3 meter chamber room for test. The table was rotated 360 degrees to determine the position of the highest radiation.
- b. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
- c. The height of antenna is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
- d. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.
- e. The test-receiver system was set to quasi-peak detect function and specified bandwidth with maximum hold mode when the test frequency is below 1 GHz.
- f. The test-receiver system was set to peak and average 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:

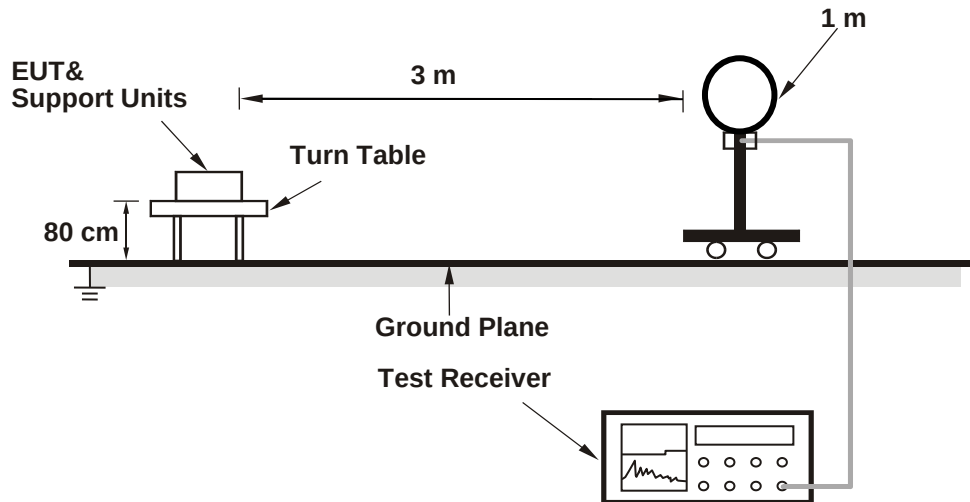
1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120 kHz for Quasi-peak detection (QP) or Peak detection (PK) at frequency below 1 GHz.
2. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is 3 MHz for Peak detection (PK) at frequency above 1 GHz.
3. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is $\geq 1/T$ (Duty cycle $< 98\%$) or 10 Hz (Duty cycle $\geq 98\%$) for Average detection (AV) at frequency above 1 GHz. (LE 4.0: RBW = 1 MHz, VBW = 3 kHz ; LE 5.2: RBW = 1 MHz, VBW = 5.1 kHz)
4. All modes of operation were investigated and the worst-case emissions are reported.

4.1.4 Deviation from Test Standard

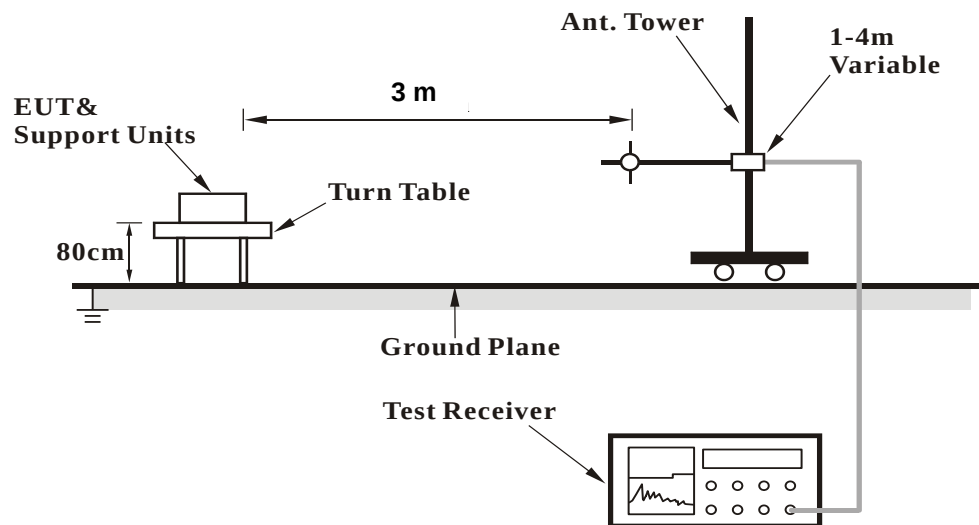
No deviation.

4.1.5 Test Set Up

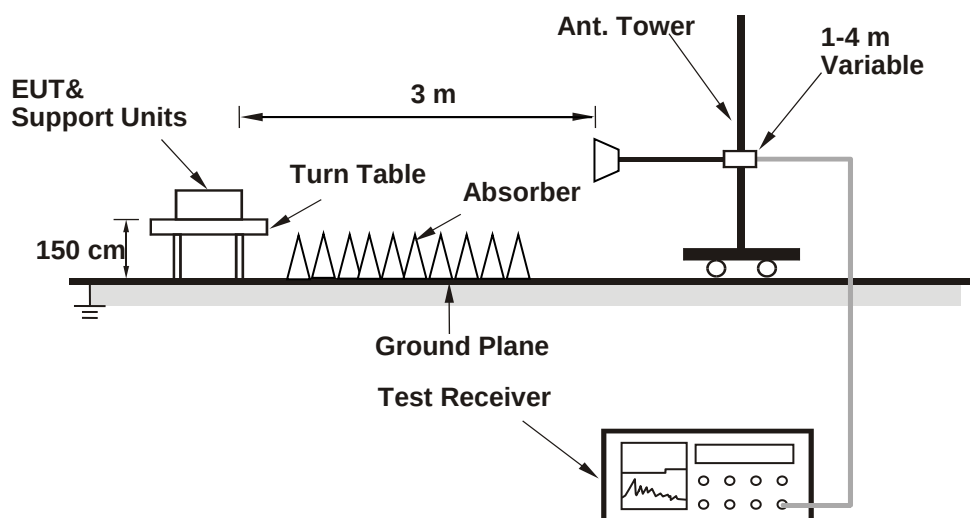
<Radiated Emission below 30 MHz>



<Radiated Emission 30 MHz to 1 GHz>



<Radiated Emission above 1 GHz>



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

4.1.6 EUT Operating Conditions

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

4.1.7 Test Results

Above 1 GHz Data:

<LE 4.0>

EUT Test Condition		Measurement Detail	
Channel	Channel 0	Frequency Range	1 GHz ~ 25 GHz
Input Power	3.7 Vdc	Detector Function	Peak (PK) Average (AV)
Environmental Conditions	25 deg. C, 65 % RH	Tested By	Karl Lee

Antenna Polarity & Test Distance: Horizontal at 3 m								
Frequency (MHz)	Emission Level (dBuV/m)	Read Level (dBuV)	Factor (dB/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (cm)	Table Angle (Degree)	Remark
2390	42.02	37.52	4.5	54	-11.98	178	96	Average
2390	51.58	47.08	4.5	74	-22.42	178	96	Peak
2402	96.8	92.28	4.52			178	96	Average
2402	97.58	93.06	4.52			178	96	Peak
4804	41.09	30.74	10.35	54	-12.91	246	78	Average
4804	48.27	37.92	10.35	74	-25.73	246	78	Peak
Antenna Polarity & Test Distance: Vertical at 3 m								
Frequency (MHz)	Emission Level (dBuV/m)	Read Level (dBuV)	Factor (dB/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (cm)	Table Angle (Degree)	Remark
2390	41.94	37.44	4.5	54	-12.06	143	255	Average
2390	51.38	46.88	4.5	74	-22.62	143	255	Peak
2402	97.67	93.15	4.52			143	255	Average
2402	98.43	93.91	4.52			143	255	Peak
4804	41.08	30.73	10.35	54	-12.92	191	116	Average
4804	48.12	37.77	10.35	74	-25.88	191	116	Peak

Remarks:

- Emission Level = Read Level + Factor
Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB).
Margin value = Emission level – Limit value
- 2402 MHz: Fundamental frequency.
- The emission levels of other frequencies were very low against the limit.

EUT Test Condition		Measurement Detail	
Channel	Channel 19	Frequency Range	1 GHz ~ 25 GHz
Input Power	3.7 Vdc	Detector Function	Peak (PK) Average (AV)
Environmental Conditions	25 deg. C, 65 % RH	Tested By	Karl Lee

Antenna Polarity & Test Distance: Horizontal at 3 m								
Frequency (MHz)	Emission Level (dBuV/m)	Read Level (dBuV)	Factor (dB/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (cm)	Table Angle (Degree)	Remark
2390	41.93	37.43	4.5	54	-12.07	178	96	Average
2390	51.91	47.41	4.5	74	-22.09	178	96	Peak
2440	96.6	92.01	4.59			178	96	Average
2440	97.37	92.78	4.59			178	96	Peak
2483.5	42.37	37.71	4.66	54	-11.63	178	96	Average
2483.5	51.81	47.15	4.66	74	-22.19	178	96	Peak
4880	40.68	30.47	10.21	54	-13.32	182	124	Average
4880	46.89	36.68	10.21	74	-27.11	182	124	Peak
Antenna Polarity & Test Distance: Vertical at 3 m								
Frequency (MHz)	Emission Level (dBuV/m)	Read Level (dBuV)	Factor (dB/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (cm)	Table Angle (Degree)	Remark
2390	42.3	37.8	4.5	54	-11.7	143	255	Average
2390	51.56	47.06	4.5	74	-22.44	143	255	Peak
2440	97.51	92.92	4.59			143	255	Average
2440	98.26	93.67	4.59			143	255	Peak
2483.5	42.46	37.8	4.66	54	-11.54	143	255	Average
2483.5	51.55	46.89	4.66	74	-22.45	143	255	Peak
4880	41.16	30.95	10.21	54	-12.84	226	64	Average
4880	47.33	37.12	10.21	74	-26.67	226	64	Peak

Remarks:

- Emission Level = Read Level + Factor
Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB).
Margin value = Emission level – Limit value
- 2440 MHz: Fundamental frequency.
- The emission levels of other frequencies were very low against the limit.

EUT Test Condition		Measurement Detail	
Channel	Channel 39	Frequency Range	1 GHz ~ 25 GHz
Input Power	3.7 Vdc	Detector Function	Peak (PK) Average (AV)
Environmental Conditions	25 deg. C, 65 % RH	Tested By	Karl Lee

Antenna Polarity & Test Distance: Horizontal at 3 m								
Frequency (MHz)	Emission Level (dBuV/m)	Read Level (dBuV)	Factor (dB/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (cm)	Table Angle (Degree)	Remark
2480	95.37	90.73	4.64			178	100	Average
2480	96.18	91.54	4.64			178	100	Peak
2483.5	42.8	38.14	4.66	54	-11.2	178	100	Average
2483.5	53.75	49.09	4.66	74	-20.25	178	100	Peak
4960	40.74	30.38	10.36	54	-13.26	179	112	Average
4960	46.83	36.47	10.36	74	-27.17	179	112	Peak
Antenna Polarity & Test Distance: Vertical at 3 m								
Frequency (MHz)	Emission Level (dBuV/m)	Read Level (dBuV)	Factor (dB/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (cm)	Table Angle (Degree)	Remark
2480	96.85	92.21	4.64			143	255	Average
2480	97.67	93.03	4.64			143	255	Peak
2483.5	42.54	37.88	4.66	54	-11.46	143	255	Average
2483.5	52.49	47.83	4.66	74	-21.51	143	255	Peak
4960	41.43	31.07	10.36	54	-12.57	206	115	Average
4960	47.6	37.24	10.36	74	-26.4	206	115	Peak

Remarks:

- Emission Level = Read Level + Factor
Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB).
Margin value = Emission level – Limit value
- 2480 MHz: Fundamental frequency.
- The emission levels of other frequencies were very low against the limit.

<LE 5.2>

EUT Test Condition		Measurement Detail	
Channel	Channel 0	Frequency Range	1 GHz ~ 25 GHz
Input Power	3.7 Vdc	Detector Function	Peak (PK) Average (AV)
Environmental Conditions	25 deg. C, 65 % RH	Tested By	Karl Lee

Antenna Polarity & Test Distance: Horizontal at 3 m								
Frequency (MHz)	Emission Level (dBuV/m)	Read Level (dBuV)	Factor (dB/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (cm)	Table Angle (Degree)	Remark
2390	42.01	37.51	4.5	54	-11.99	178	100	Average
2390	51.73	47.23	4.5	74	-22.27	178	100	Peak
2402	94.29	89.77	4.52			178	100	Average
2402	96.68	92.16	4.52			178	100	Peak
4804	41.14	30.79	10.35	54	-12.86	169	115	Average
4804	48.3	37.95	10.35	74	-25.7	169	115	Peak
Antenna Polarity & Test Distance: Vertical at 3 m								
Frequency (MHz)	Emission Level (dBuV/m)	Read Level (dBuV)	Factor (dB/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (cm)	Table Angle (Degree)	Remark
2390	42.23	37.73	4.5	54	-11.77	143	255	Average
2390	51.71	47.21	4.5	74	-22.29	143	255	Peak
2402	94.98	90.46	4.52			143	255	Average
2402	97.43	92.91	4.52			143	255	Peak
4804	41.06	30.71	10.35	54	-12.94	245	68	Average
4804	48.17	37.82	10.35	74	-25.83	245	68	Peak

Remarks:

- Emission Level = Read Level + Factor
Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB).
Margin value = Emission level – Limit value
- 2402 MHz: Fundamental frequency.
- The emission levels of other frequencies were very low against the limit.

EUT Test Condition		Measurement Detail	
Channel	Channel 19	Frequency Range	1 GHz ~ 25 GHz
Input Power	3.7 Vdc	Detector Function	Peak (PK) Average (AV)
Environmental Conditions	25 deg. C, 65 % RH	Tested By	Karl Lee

Antenna Polarity & Test Distance: Horizontal at 3 m								
Frequency (MHz)	Emission Level (dBuV/m)	Read Level (dBuV)	Factor (dB/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (cm)	Table Angle (Degree)	Remark
2390	42.06	37.56	4.5	54	-11.94	178	102	Average
2390	51.5	47	4.5	74	-22.5	178	102	Peak
2440	94.26	89.67	4.59			178	102	Average
2440	96.47	91.88	4.59			178	102	Peak
2483.5	42.53	37.87	4.66	54	-11.47	178	102	Average
2483.5	51.75	47.09	4.66	74	-22.25	178	102	Peak
4880	42.56	32.35	10.21	54	-11.44	165	121	Average
4880	48.72	38.51	10.21	74	-25.28	165	121	Peak
Antenna Polarity & Test Distance: Vertical at 3 m								
Frequency (MHz)	Emission Level (dBuV/m)	Read Level (dBuV)	Factor (dB/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (cm)	Table Angle (Degree)	Remark
2390	42.14	37.64	4.5	54	-11.86	143	255	Average
2390	51.11	46.61	4.5	74	-22.89	143	255	Peak
2440	94.82	90.23	4.59			143	255	Average
2440	97.34	92.75	4.59			143	255	Peak
2483.5	42.52	37.86	4.66	54	-11.48	143	255	Average
2483.5	51.71	47.05	4.66	74	-22.29	143	255	Peak
4880	41.26	31.05	10.21	54	-12.74	105	228	Average
4880	47.48	37.27	10.21	74	-26.52	105	228	Peak

Remarks:

- Emission Level = Read Level + Factor
Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB).
Margin value = Emission level – Limit value
- 2440 MHz: Fundamental frequency.
- The emission levels of other frequencies were very low against the limit.

EUT Test Condition		Measurement Detail	
Channel	Channel 39	Frequency Range	1 GHz ~ 25 GHz
Input Power	3.7 Vdc	Detector Function	Peak (PK) Average (AV)
Environmental Conditions	25 deg. C, 65 % RH	Tested By	Karl Lee

Antenna Polarity & Test Distance: Horizontal at 3 m								
Frequency (MHz)	Emission Level (dBuV/m)	Read Level (dBuV)	Factor (dB/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (cm)	Table Angle (Degree)	Remark
2480	93.49	88.85	4.64			178	102	Average
2480	96.02	91.38	4.64			178	102	Peak
2483.5	43.48	38.82	4.66	54	-10.52	178	102	Average
2483.5	51.72	47.06	4.66	74	-22.28	178	102	Peak
4960	41.6	31.24	10.36	54	-12.4	194	153	Average
4960	47.74	37.38	10.36	74	-26.26	194	153	Peak
Antenna Polarity & Test Distance: Vertical at 3 m								
Frequency (MHz)	Emission Level (dBuV/m)	Read Level (dBuV)	Factor (dB/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (cm)	Table Angle (Degree)	Remark
2480	95.04	90.4	4.64			143	32	Average
2480	97.4	92.76	4.64			143	32	Peak
2483.5	46.05	41.39	4.66	54	-7.95	143	32	Average
2483.5	54.97	50.31	4.66	74	-19.03	143	32	Peak
4960	41.4	31.04	10.36	54	-12.6	215	74	Average
4960	47.52	37.16	10.36	74	-26.48	215	74	Peak

Remarks:

- Emission Level = Read Level + Factor
Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB).
Margin value = Emission level – Limit value
- 2480 MHz: Fundamental frequency.
- The emission levels of other frequencies were very low against the limit.

9 kHz ~ 30 MHz Data:

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

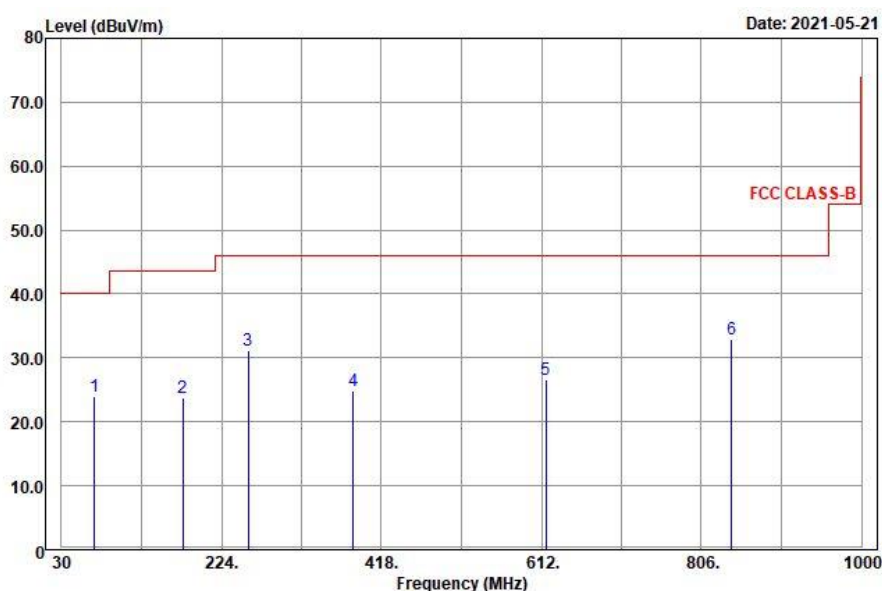
30 MHz ~ 1 GHz Worst-Case Data:

Mode A

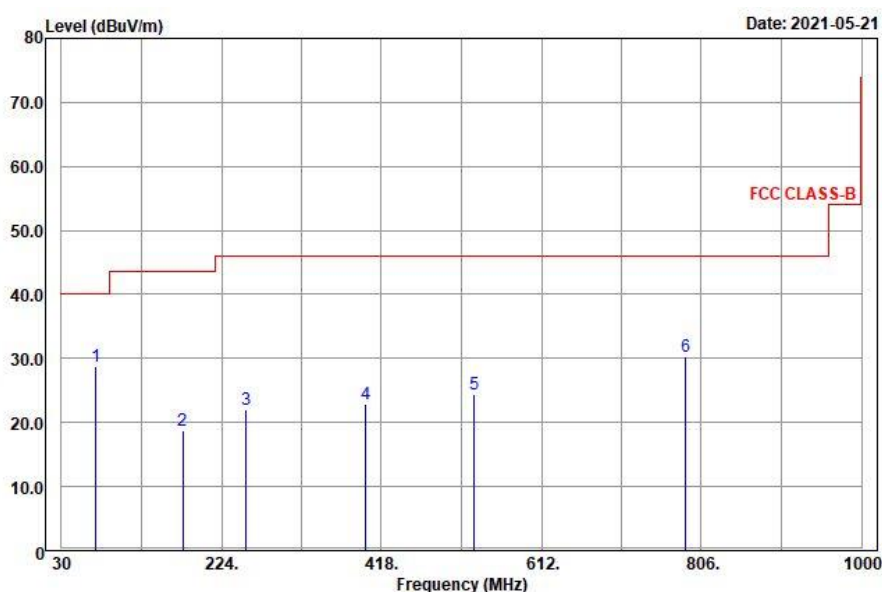
<LE 4.0>

EUT Test Condition		Measurement Detail	
Channel	Channel 39	Frequency Range	30 MHz ~ 1 GHz
Input Power	3.7 Vdc	Detector Function	Peak (PK) Quasi-peak (QP)
Environmental Conditions	25 deg. C, 65 % RH	Tested By	Karl Lee

Horizontal



Vertical



Antenna Polarity & Test Distance: Horizontal at 3 m								
Frequency (MHz)	Emission Level (dBuV/m)	Read Level (dBuV)	Factor (dB/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (cm)	Table Angle (Degree)	Remark
69.96	23.9	43.45	-19.55	40	-16.1	162	80	Peak
177.42	23.85	43.68	-19.83	43.5	-19.65	195	127	Peak
256.26	31.23	47.96	-16.73	46	-14.77	233	121	Peak
384	24.91	39.09	-14.18	46	-21.09	205	173	Peak
617.1	26.7	37.04	-10.34	46	-19.3	192	155	Peak
842.5	32.9	39.82	-6.92	46	-13.1	263	121	Peak
Antenna Polarity & Test Distance: Vertical at 3 m								
Frequency (MHz)	Emission Level (dBuV/m)	Read Level (dBuV)	Factor (dB/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (cm)	Table Angle (Degree)	Remark
71.85	28.7	48.91	-20.21	40	-11.3	104	126	Peak
177.15	18.82	38.65	-19.83	43.5	-24.68	197	125	Peak
253.56	22.09	38.89	-16.8	46	-23.91	154	263	Peak
398.7	22.8	36.75	-13.95	46	-23.2	199	127	Peak
531	24.38	36.24	-11.86	46	-21.62	154	273	Peak
787.2	30.27	38.18	-7.91	46	-15.73	162	183	Peak

Remarks:

1. Emission Level = Read Level + Factor

Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB).

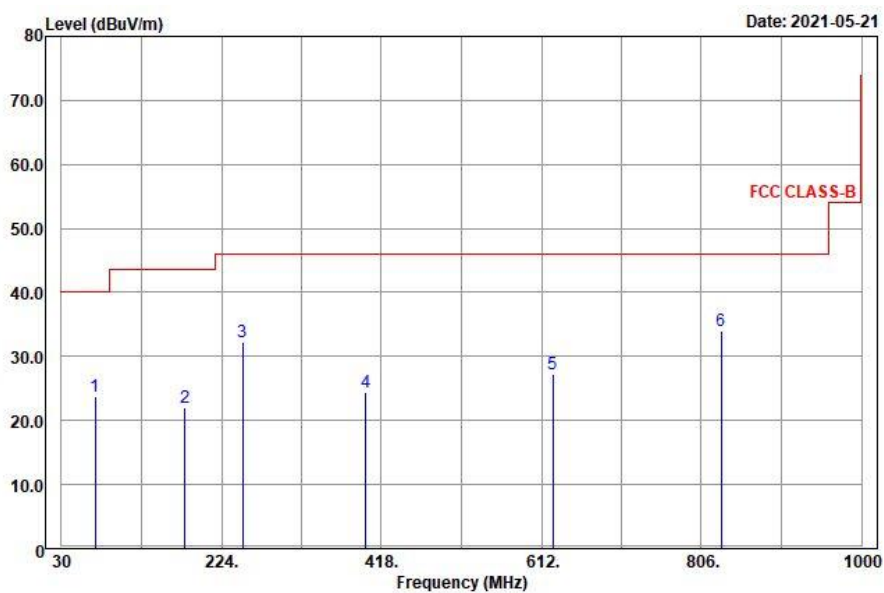
Margin value = Emission level – Limit value

2. The emission levels of other frequencies were very low against the limit.

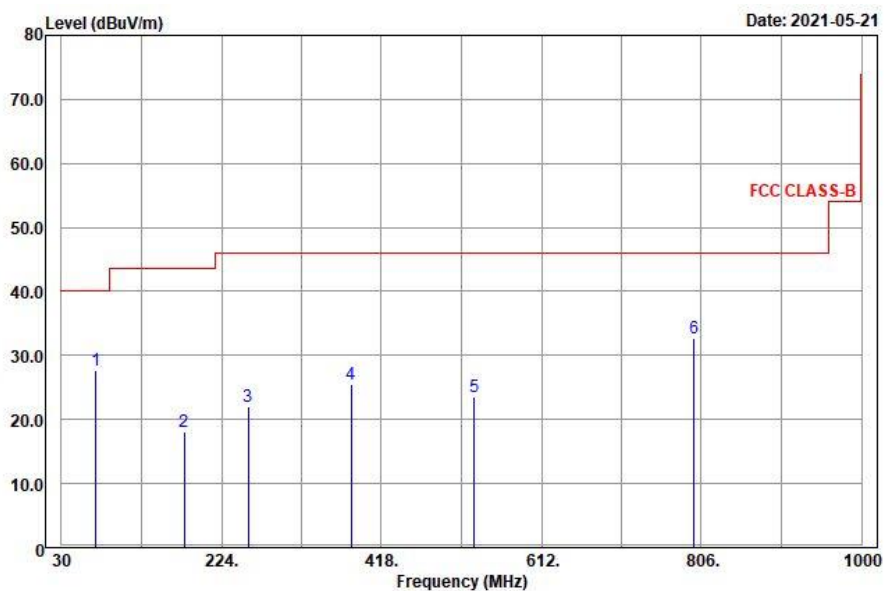
<LE 5.2>

EUT Test Condition		Measurement Detail	
Channel	Channel 39	Frequency Range	30 MHz ~ 1 GHz
Input Power	3.7 Vdc	Detector Function	Peak (PK) Quasi-peak (QP)
Environmental Conditions	25 deg. C, 65 % RH	Tested By	Karl Lee

Horizontal



Vertical



Antenna Polarity & Test Distance: Horizontal at 3 m								
Frequency (MHz)	Emission Level (dBuV/m)	Read Level (dBuV)	Factor (dB/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (cm)	Table Angle (Degree)	Remark
71.31	23.7	43.91	-20.21	40	-16.3	251	32	Peak
179.58	21.99	41.69	-19.7	43.5	-21.51	196	254	Peak
249.51	32.25	49.1	-16.85	46	-13.75	107	132	Peak
398.7	24.35	38.3	-13.95	46	-21.65	183	6	Peak
625.5	27.17	37.53	-10.36	46	-18.83	192	271	Peak
829.9	34.11	41.16	-7.05	46	-11.89	204	163	Peak
Antenna Polarity & Test Distance: Vertical at 3 m								
Frequency (MHz)	Emission Level (dBuV/m)	Read Level (dBuV)	Factor (dB/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (cm)	Table Angle (Degree)	Remark
72.12	27.79	48	-20.21	40	-12.21	228	241	Peak
178.5	18.13	37.9	-19.77	43.5	-25.37	192	174	Peak
256.53	21.99	38.7	-16.71	46	-24.01	208	131	Peak
381.2	25.42	39.64	-14.22	46	-20.58	182	161	Peak
530.3	23.55	35.41	-11.86	46	-22.45	149	263	Peak
797	32.77	40.42	-7.65	46	-13.23	150	78	Peak

Remarks:

1. Emission Level = Read Level + Factor

Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB).

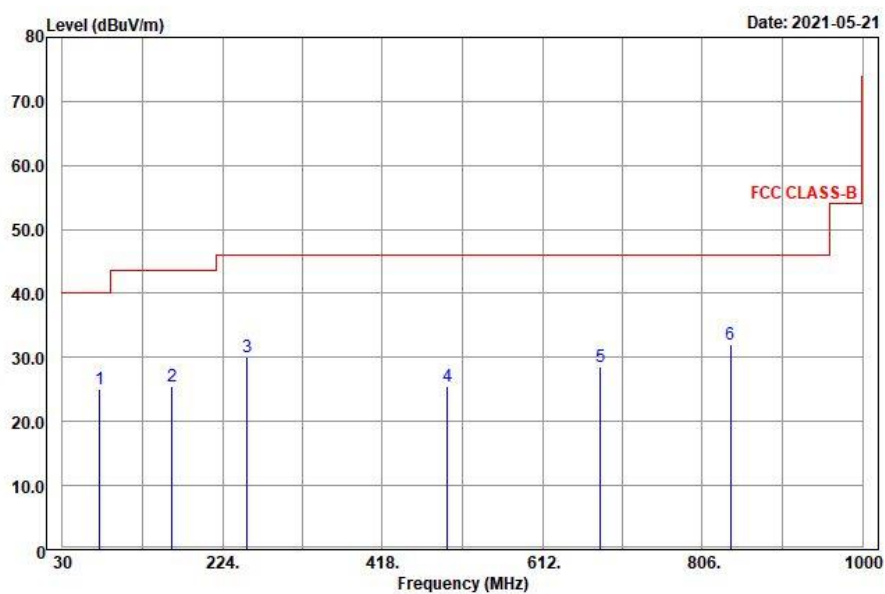
Margin value = Emission level – Limit value

2. The emission levels of other frequencies were very low against the limit.

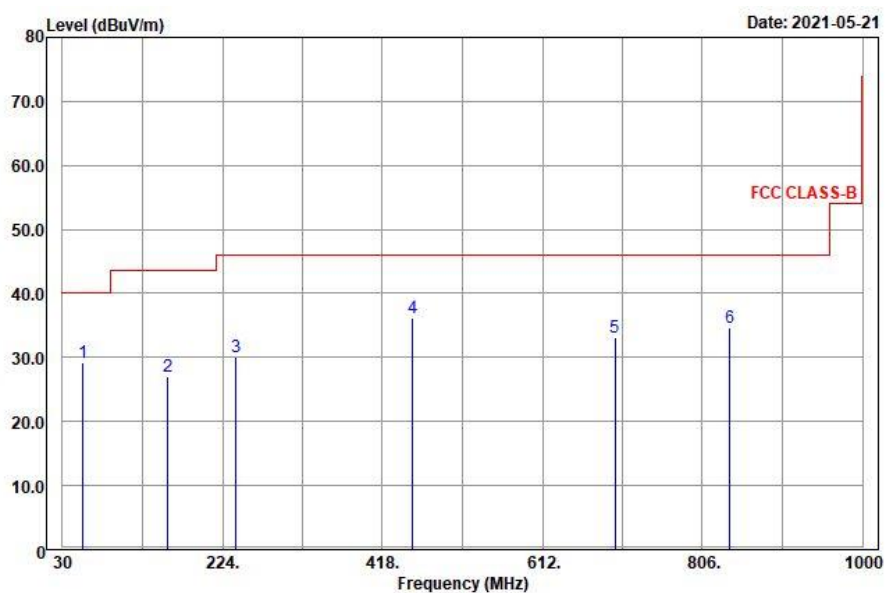
Mode B
<LE 4.0>

EUT Test Condition		Measurement Detail	
Channel	Channel 39	Frequency Range	30 MHz ~ 1 GHz
Input Power	120 Vac, 60 Hz	Detector Function	Peak (PK) Quasi-peak (QP)
Environmental Conditions	25 deg. C, 65 % RH	Tested By	Karl Lee

Horizontal



Vertical



Antenna Polarity & Test Distance: Horizontal at 3 m								
Frequency (MHz)	Emission Level (dBuV/m)	Read Level (dBuV)	Factor (dB/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (cm)	Table Angle (Degree)	Remark
75.36	25.03	46.26	-21.23	40	-14.97	197	226	Peak
162.84	25.54	46.07	-20.53	43.5	-17.96	165	274	Peak
253.56	30.05	46.85	-16.8	46	-15.95	183	123	Peak
496.7	25.43	37.81	-12.38	46	-20.57	188	164	Peak
682.2	28.5	37.98	-9.48	46	-17.5	196	236	Peak
840.4	32.07	39.04	-6.97	46	-13.93	154	172	Peak
Antenna Polarity & Test Distance: Vertical at 3 m								
Frequency (MHz)	Emission Level (dBuV/m)	Read Level (dBuV)	Factor (dB/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (cm)	Table Angle (Degree)	Remark
54.84	29.25	44.74	-15.49	40	-10.75	261	174	Peak
157.98	27.13	47.81	-20.68	43.5	-16.37	175	181	Peak
240.06	30.06	47.09	-17.03	46	-15.94	131	28	Peak
454.7	36.19	49.38	-13.19	46	-9.81	246	198	Peak
700.4	33.04	42.27	-9.23	46	-12.96	215	175	Peak
839	34.77	41.75	-6.98	46	-11.23	162	329	Peak

Remarks:

1. Emission Level = Read Level + Factor

Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB).

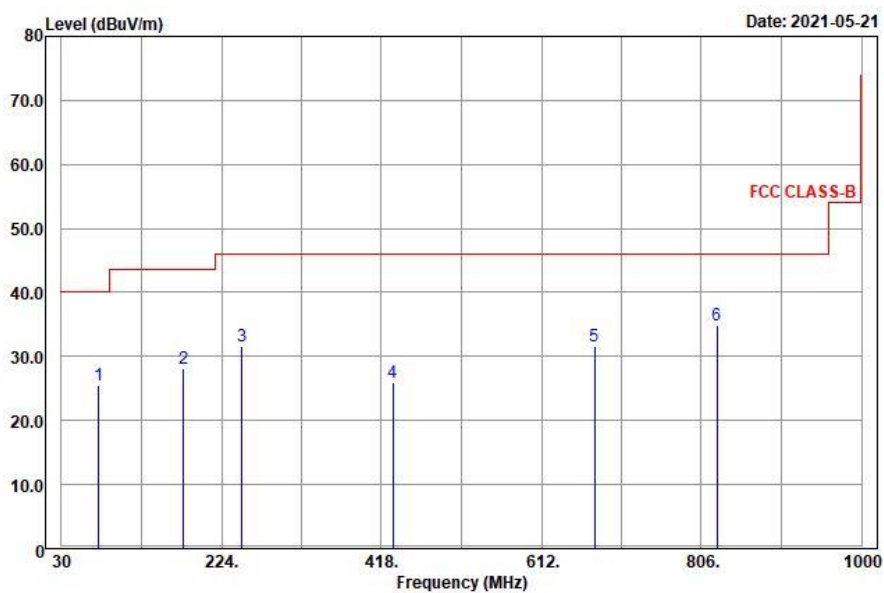
Margin value = Emission level – Limit value

2. The emission levels of other frequencies were very low against the limit.

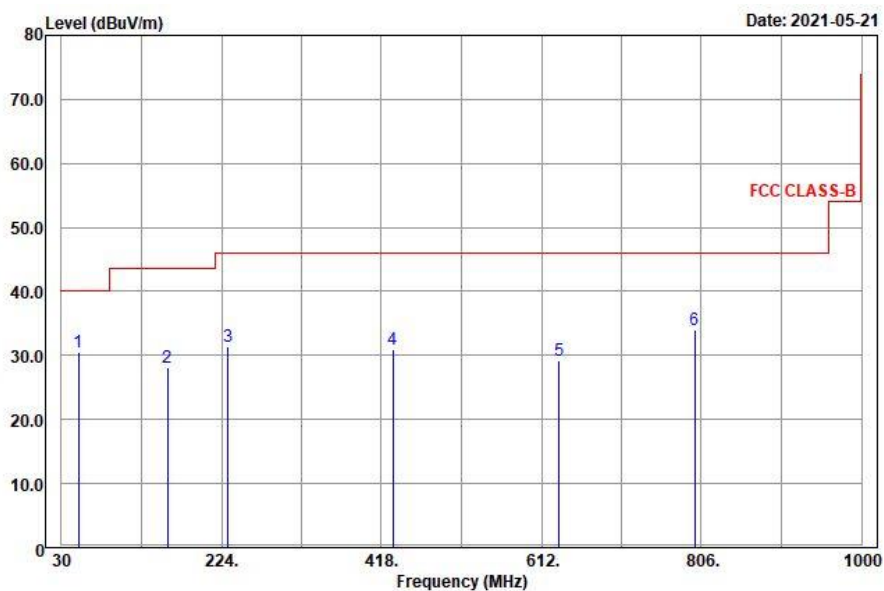
<LE 5.2>

EUT Test Condition		Measurement Detail	
Channel	Channel 39	Frequency Range	30 MHz ~ 1 GHz
Input Power	120 Vac, 60 Hz	Detector Function	Peak (PK) Quasi-peak (QP)
Environmental Conditions	25 deg. C, 65 % RH	Tested By	Karl Lee

Horizontal



Vertical



Antenna Polarity & Test Distance: Horizontal at 3 m								
Frequency (MHz)	Emission Level (dBuV/m)	Read Level (dBuV)	Factor (dB/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (cm)	Table Angle (Degree)	Remark
75.09	25.59	46.78	-21.19	40	-14.41	188	13	Peak
177.96	28.04	47.81	-19.77	43.5	-15.46	190	358	Peak
249.24	31.54	48.39	-16.85	46	-14.46	164	122	Peak
431.6	26.04	39.56	-13.52	46	-19.96	214	118	Peak
676.6	31.51	41.06	-9.55	46	-14.49	195	236	Peak
825	34.97	42.2	-7.23	46	-11.03	155	272	Peak
Antenna Polarity & Test Distance: Vertical at 3 m								
Frequency (MHz)	Emission Level (dBuV/m)	Read Level (dBuV)	Factor (dB/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (cm)	Table Angle (Degree)	Remark
50.25	30.56	45.72	-15.16	40	-9.44	156	128	Peak
158.52	28.12	48.8	-20.68	43.5	-15.38	174	239	Peak
232.23	31.47	48.81	-17.34	46	-14.53	105	138	Peak
431.6	30.96	44.48	-13.52	46	-15.04	125	187	Peak
633.2	29.28	39.64	-10.36	46	-16.72	163	226	Peak
797.7	33.94	41.59	-7.65	46	-12.06	154	229	Peak

Remarks:

1. Emission Level = Read Level + Factor

Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB).

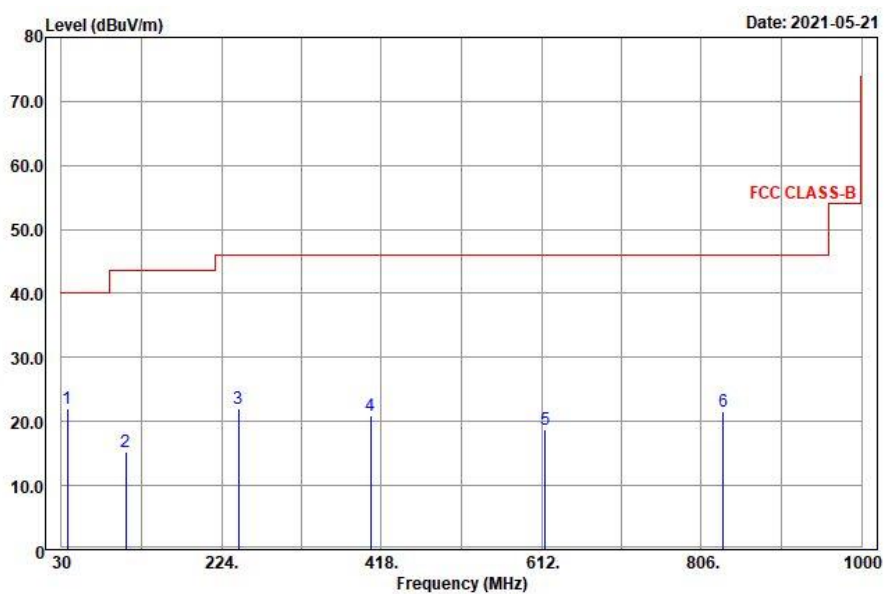
Margin value = Emission level – Limit value

2. The emission levels of other frequencies were very low against the limit.

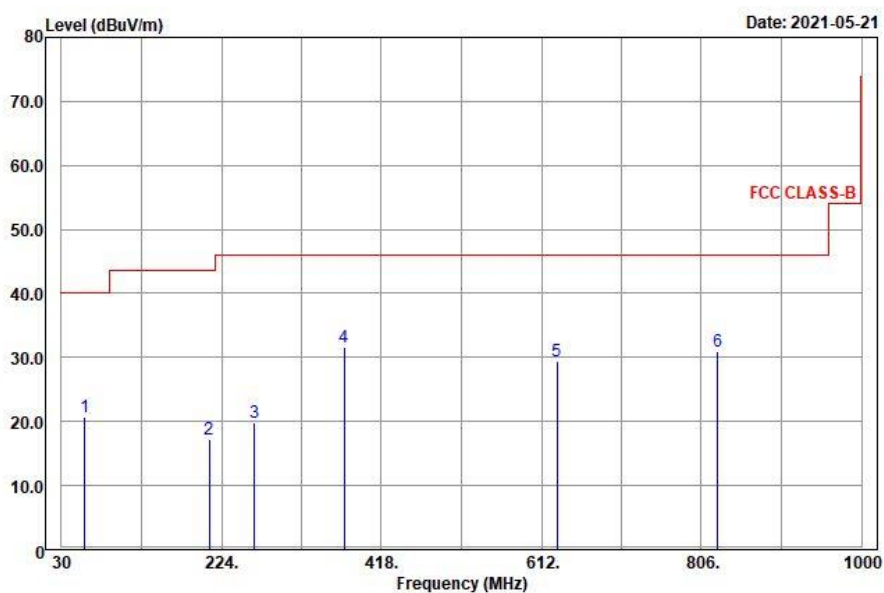
Mode C
<LE 4.0>

EUT Test Condition		Measurement Detail	
Channel	Channel 39	Frequency Range	30 MHz ~ 1 GHz
Input Power	120 Vac, 60 Hz	Detector Function	Peak (PK) Quasi-peak (QP)
Environmental Conditions	25 deg. C, 65 % RH	Tested By	Karl Lee

Horizontal



Vertical



Antenna Polarity & Test Distance: Horizontal at 3 m								
Frequency (MHz)	Emission Level (dBuV/m)	Read Level (dBuV)	Factor (dB/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (cm)	Table Angle (Degree)	Remark
37.56	22.01	38.79	-16.78	40	-17.99	142	327	Peak
108.03	15.28	32.65	-17.37	43.5	-28.22	190	228	Peak
244.38	22.12	39.07	-16.95	46	-23.88	263	234	Peak
405	20.92	34.76	-13.84	46	-25.08	172	115	Peak
616.4	18.71	29.05	-10.34	46	-27.29	162	149	Peak
832.7	21.64	28.66	-7.02	46	-24.36	150	273	Peak
Antenna Polarity & Test Distance: Vertical at 3 m								
Frequency (MHz)	Emission Level (dBuV/m)	Read Level (dBuV)	Factor (dB/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (cm)	Table Angle (Degree)	Remark
58.35	20.66	36.52	-15.86	40	-19.34	194	263	Peak
209.01	17.26	35.41	-18.15	43.5	-26.24	174	122	Peak
264.09	19.9	36.52	-16.62	46	-26.1	192	177	Peak
372.8	31.69	46.05	-14.36	46	-14.31	184	176	Peak
631.1	29.33	39.74	-10.41	46	-16.67	182	175	Peak
825.7	30.99	38.22	-7.23	46	-15.01	153	214	Peak

Remarks:

1. Emission Level = Read Level + Factor

Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB).

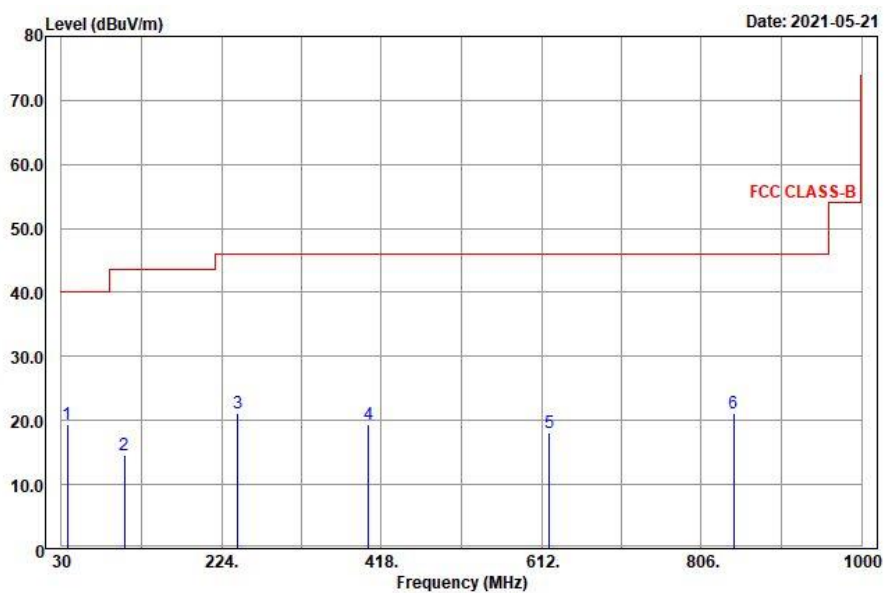
Margin value = Emission level – Limit value

2. The emission levels of other frequencies were very low against the limit.

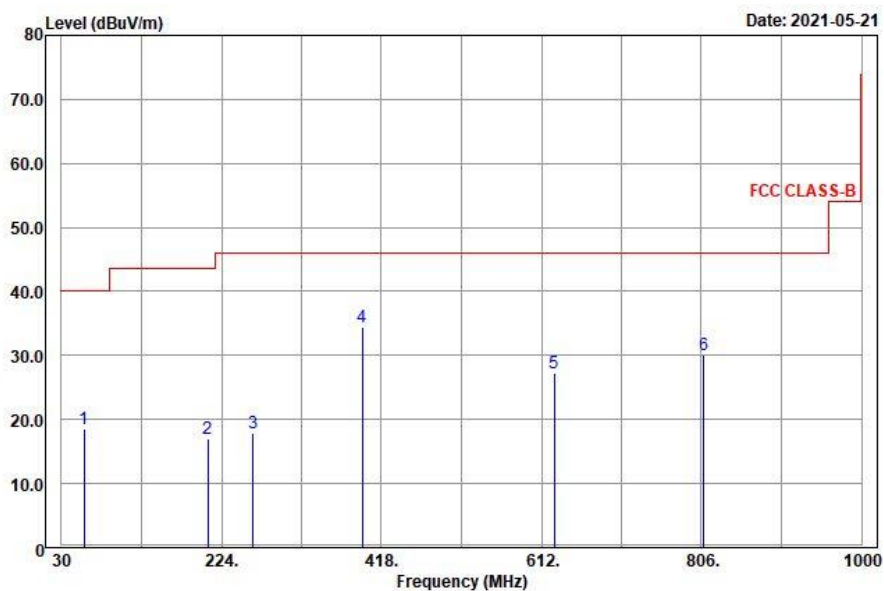
<LE 5.2>

EUT Test Condition		Measurement Detail	
Channel	Channel 39	Frequency Range	30 MHz ~ 1 GHz
Input Power	120 Vac, 60 Hz	Detector Function	Peak (PK) Quasi-peak (QP)
Environmental Conditions	25 deg. C, 65 % RH	Tested By	Karl Lee

Horizontal



Vertical



Antenna Polarity & Test Distance: Horizontal at 3 m								
Frequency (MHz)	Emission Level (dBuV/m)	Read Level (dBuV)	Factor (dB/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (cm)	Table Angle (Degree)	Remark
37.02	19.49	36.57	-17.08	40	-20.51	189	147	Peak
106.41	14.64	31.93	-17.29	43.5	-28.86	155	70	Peak
243.57	21.09	38.06	-16.97	46	-24.91	164	235	Peak
402.2	19.35	33.24	-13.89	46	-26.65	187	26	Peak
621.3	18.15	28.47	-10.32	46	-27.85	149	187	Peak
845.3	21.21	28.08	-6.87	46	-24.79	152	141	Peak
Antenna Polarity & Test Distance: Vertical at 3 m								
Frequency (MHz)	Emission Level (dBuV/m)	Read Level (dBuV)	Factor (dB/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (cm)	Table Angle (Degree)	Remark
57.27	18.45	34.17	-15.72	40	-21.55	133	225	Peak
207.93	17.05	35.21	-18.16	43.5	-26.45	192	175	Peak
262.2	17.94	34.59	-16.65	46	-28.06	163	236	Peak
394.5	34.45	48.49	-14.04	46	-11.55	226	273	Peak
627.6	27.3	37.69	-10.39	46	-18.7	194	173	Peak
808.9	30.09	37.58	-7.49	46	-15.91	164	112	Peak

Remarks:

1. Emission Level = Read Level + Factor

Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB).

Margin value = Emission level – Limit value

2. The emission levels of other frequencies were very low against the limit.

4.2 Conducted Emission Measurement

4.2.1 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 0.50 MHz.

4.2.2 Test Instruments

Description & Manufacturer	Model No.	Serial No.	Date of Calibration	Due Date of Calibration
Test Receiver ROHDE & SCHWARZ	ESR3	102783	Dec. 21, 2020	Dec. 20, 2021
RF signal cable (with 10dB PAD) Woken	5D-FB	Cable-cond2-01	Sep. 04, 2020	Sep. 03, 2021
LISN ROHDE & SCHWARZ (EUT)	ESH2-Z5	100100	Jan. 28, 2021	Jan. 27, 2022
LISN ROHDE & SCHWARZ (Peripheral)	ESH3-Z5	100312	Aug. 18, 2020	Aug. 17, 2021
Software ADT	BV ADT_Cond_ V7.3.7.4	NA	NA	NA

- Note: 1. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.
 2. The test was performed in HwaYa Shielded Room 2 (Conduction 2).
 3. The VCCI Site Registration No. is C-12047.

4.2.3 Test Procedures

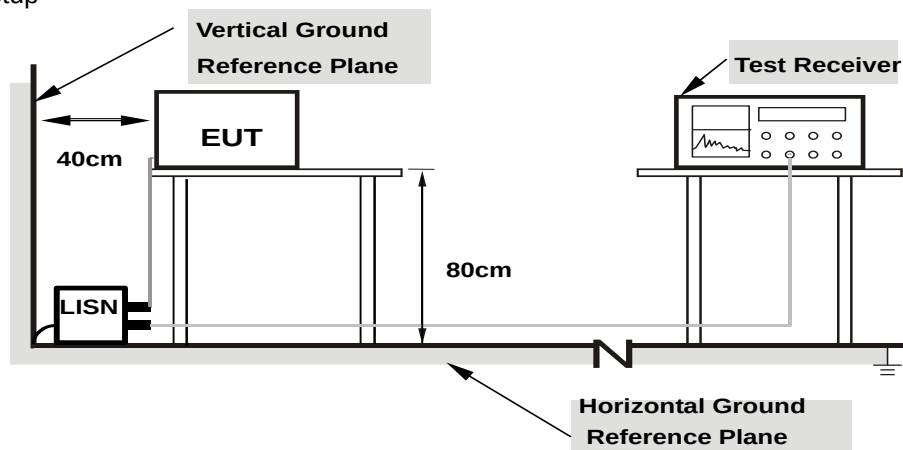
- The EUT was placed 0.4 meters from the conducting wall of the shielded room with EUT being connected to the power mains through a line impedance stabilization network (LISN). Other support units were connected to the power mains through another LISN. The two LISNs provide 50 ohm/50 uH of coupling impedance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

Note: The resolution bandwidth and video bandwidth of test receiver is 9 kHz for quasi-peak detection (QP) and average detection (AV) at frequency 0.15 MHz - 30 MHz.

4.2.4 Deviation from Test Standard

No deviation.

4.2.5 Test Setup



Note: 1.Support units were connected to second LISN.
2.Both of LISNs (AMN) are 80 cm from EUT and at least 80 from other units and other metal planes

4.2.6 EUT Operating Conditions

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

4.2.7 Test Results

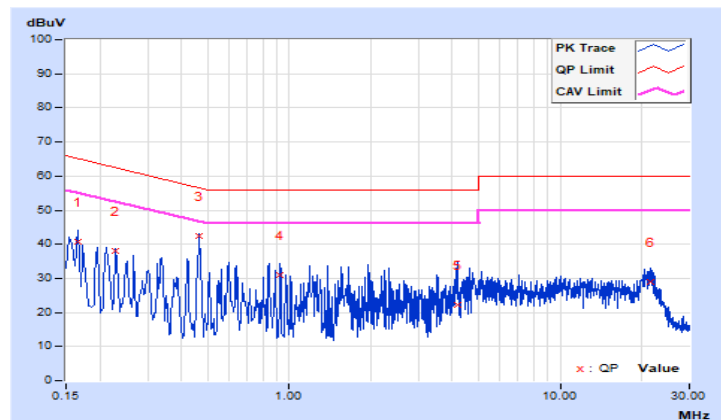
Mode B

Frequency Range	150kHz ~ 30MHz	Detector Function & Resolution Bandwidth	Quasi-Peak (QP) / Average (AV), 9kHz
Input Power	120Vac, 60Hz	Environmental Conditions	25°C, 75%RH
Tested by	Edison Lee	Test Date	2021/6/29

Phase Of Power : Line (L)										
No	Frequency (MHz)	Correction Factor (dB)	Reading Value (dBuV)		Emission Level (dBuV)		Limit (dBuV)		Margin (dB)	
			Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.16564	10.10	30.79	18.88	40.89	28.98	65.18	55.18	-24.29	-26.20
2	0.22820	10.13	28.03	5.96	38.16	16.09	62.51	52.51	-24.35	-36.42
3	0.46669	10.19	32.27	28.04	42.46	38.23	56.57	46.57	-14.11	-8.34
4	0.92809	10.25	20.87	15.41	31.12	25.66	56.00	46.00	-24.88	-20.34
5	4.16557	10.37	11.79	1.36	22.16	11.73	56.00	46.00	-33.84	-34.27
6	21.66673	10.62	18.22	4.59	28.84	15.21	60.00	50.00	-31.16	-34.79

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

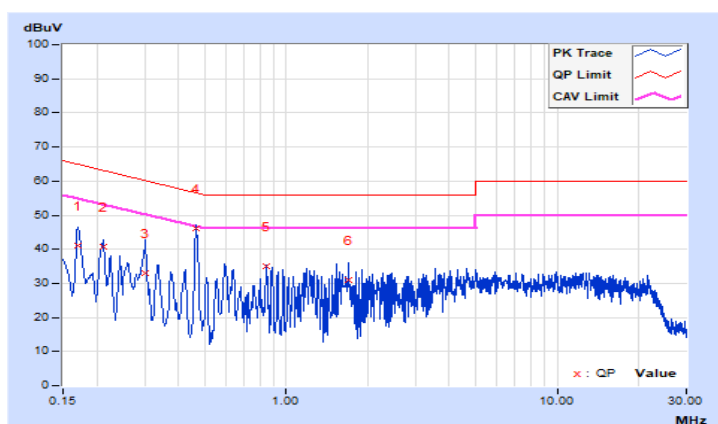


Frequency Range	150kHz ~ 30MHz	Detector Function & Resolution Bandwidth	Quasi-Peak (QP) / Average (AV), 9kHz
Input Power	120Vac, 60Hz	Environmental Conditions	25°C, 75%RH
Tested by	Edison Lee	Test Date	2021/6/29

Phase Of Power : Neutral (N)										
No	Frequency (MHz)	Correction Factor (dB)	Reading Value (dBuV)		Emission Level (dBuV)		Limit (dBuV)		Margin (dB)	
			Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.16955	10.10	30.83	25.26	40.93	35.36	64.98	54.98	-24.05	-19.62
2	0.21226	10.12	30.67	22.25	40.79	32.37	63.12	53.12	-22.33	-20.75
3	0.30249	10.16	22.95	12.22	33.11	22.38	60.17	50.17	-27.06	-27.79
4	0.46280	10.21	36.05	30.27	46.26	40.48	56.64	46.64	-10.38	-6.16
5	0.84207	10.26	24.60	19.09	34.86	29.35	56.00	46.00	-21.14	-16.65
6	1.69445	10.31	20.67	12.76	30.98	23.07	56.00	46.00	-25.02	-22.93

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



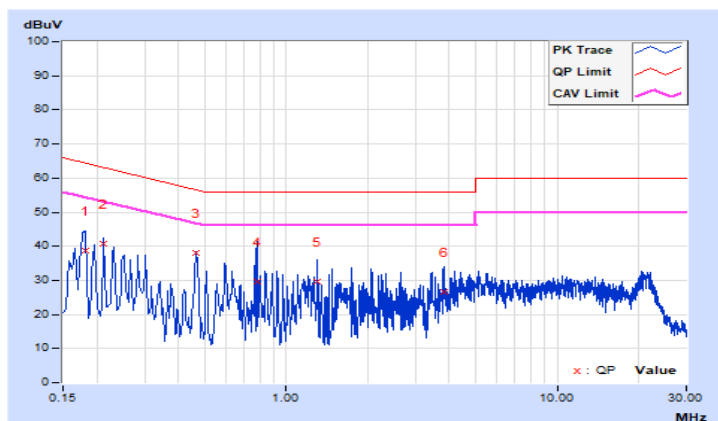
Mode C

Frequency Range	150kHz ~ 30MHz	Detector Function & Resolution Bandwidth	Quasi-Peak (QP) / Average (AV), 9kHz
Input Power	120Vac, 60Hz	Environmental Conditions	25°C, 75%RH
Tested by	Edison Lee	Test Date	2021/6/29

Phase Of Power : Line (L)										
No	Frequency (MHz)	Correction Factor (dB)	Reading Value (dBuV)		Emission Level (dBuV)		Limit (dBuV)		Margin (dB)	
			Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.18075	10.11	28.66	10.89	38.77	21.00	64.45	54.45	-25.68	-33.45
2	0.21256	10.12	30.69	17.42	40.81	27.54	63.10	53.10	-22.29	-25.56
3	0.46280	10.19	27.84	26.85	38.03	37.04	56.64	46.64	-18.61	-9.60
4	0.78342	10.23	19.54	2.01	29.77	12.24	56.00	46.00	-26.23	-33.76
5	1.30736	10.27	19.26	11.68	29.53	21.95	56.00	46.00	-26.47	-24.05
6	3.83713	10.36	16.33	3.14	26.69	13.50	56.00	46.00	-29.31	-32.50

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

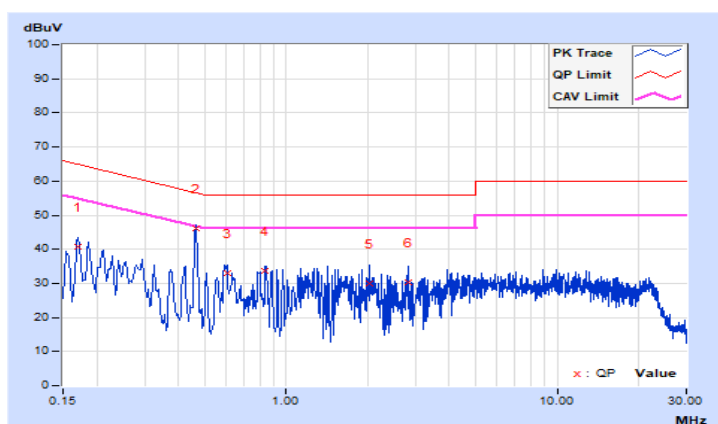


Frequency Range	150kHz ~ 30MHz	Detector Function & Resolution Bandwidth	Quasi-Peak (QP) / Average (AV), 9kHz
Input Power	120Vac, 60Hz	Environmental Conditions	25°C, 75%RH
Tested by	Edison Lee	Test Date	2021/6/29

Phase Of Power : Neutral (N)										
No	Frequency (MHz)	Correction Factor (dB)	Reading Value (dBuV)		Emission Level (dBuV)		Limit (dBuV)		Margin (dB)	
			Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.16955	10.10	30.58	23.30	40.68	33.40	64.98	54.98	-24.30	-21.58
2	0.46280	10.21	35.87	30.84	46.08	41.05	56.64	46.64	-10.56	-5.59
3	0.60356	10.23	22.86	11.63	33.09	21.86	56.00	46.00	-22.91	-24.14
4	0.83425	10.26	23.27	13.02	33.53	23.28	56.00	46.00	-22.47	-22.72
5	2.02680	10.32	19.62	11.37	29.94	21.69	56.00	46.00	-26.06	-24.31
6	2.82835	10.37	20.10	12.14	30.47	22.51	56.00	46.00	-25.53	-23.49

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

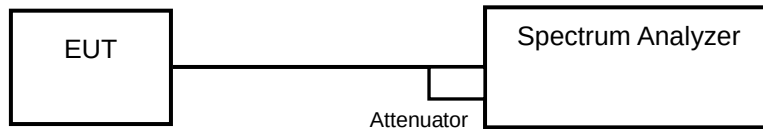


4.3 6 dB Bandwidth Measurement

4.3.1 Limits of 6 dB Bandwidth Measurement

The minimum of 6 dB Bandwidth Measurement is 0.5 MHz.

4.3.2 Test Setup



4.3.3 Test Instruments

Refer to section 4.1.2 to get information of above instrument.

4.3.4 Test Procedure

- Set resolution bandwidth (RBW) = 100 kHz
- Set the video bandwidth (VBW) $\geq 3 \times$ RBW, Detector = Peak.
- Trace mode = max hold.
- Sweep = auto couple.
- Measure the maximum width of the emission that is constrained by the frequencies associated with the two amplitude points (upper and lower) that are attenuated by 6 dB relative to the maximum level measured in the fundamental emission

4.3.5 Deviation from Test Standard

No deviation.

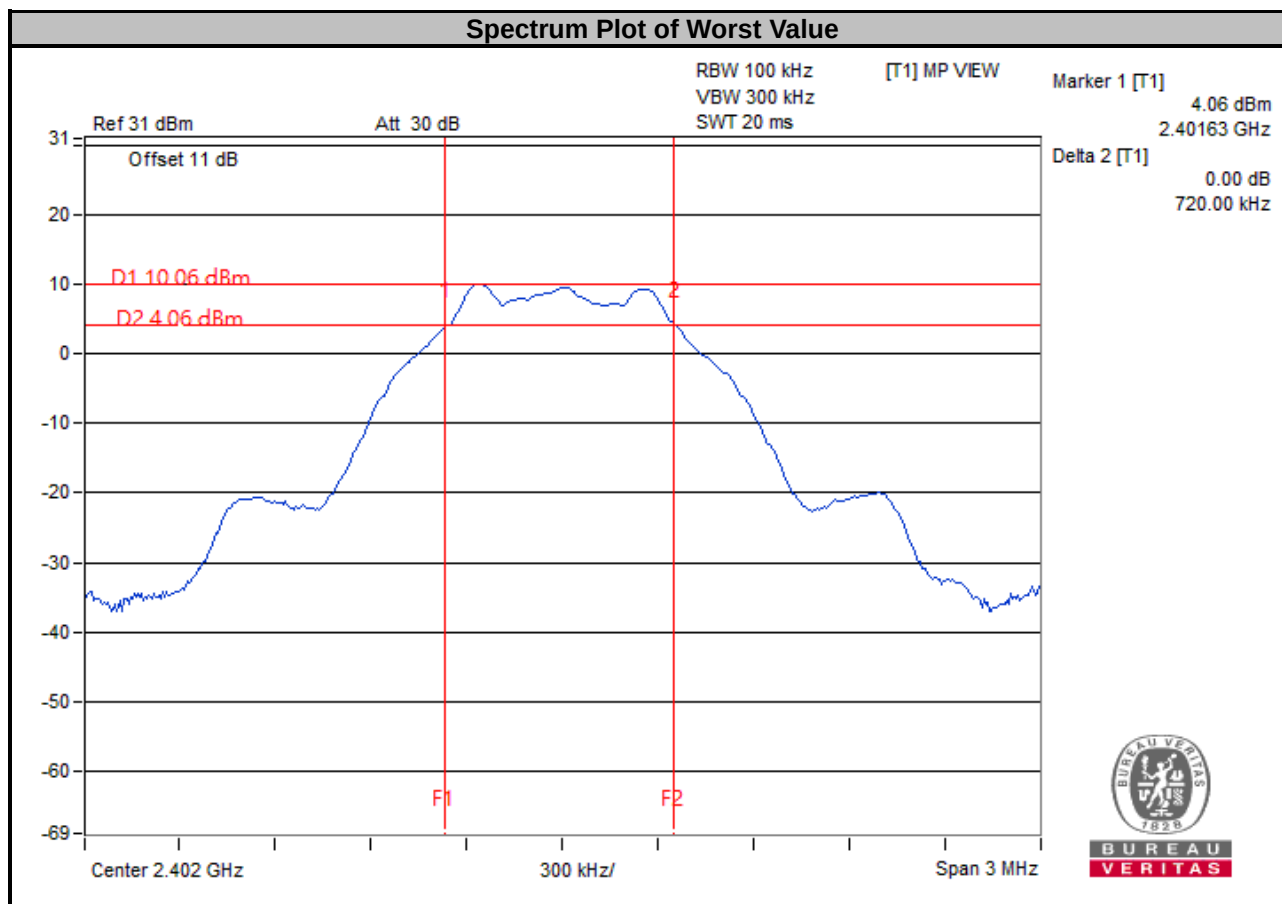
4.3.6 EUT Operating Conditions

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

4.3.7 Test Results

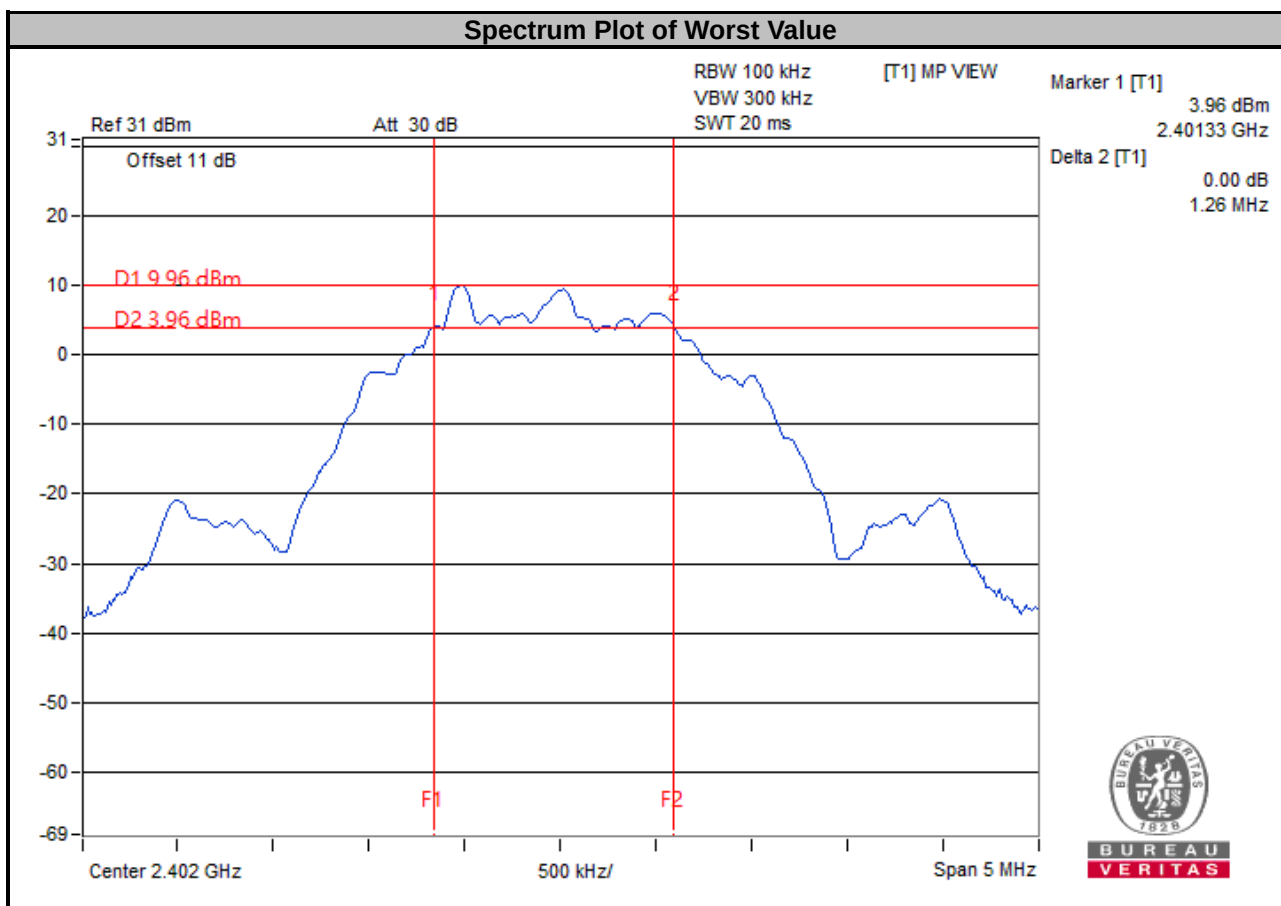
<LE 4.0>

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



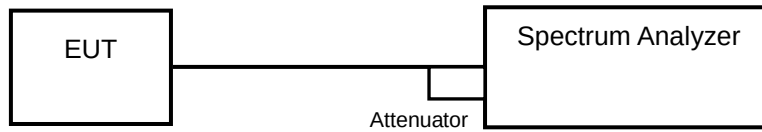
<LE 5.2>

Channel	Frequency (MHz)	6 dB Bandwidth (MHz)	Minimum Limit (MHz)	Pass / Fail
0	2402	1.26	0.5	Pass
19	2440	1.27	0.5	Pass
39	2480	1.28	0.5	Pass



4.4 Occupied Bandwidth Measurement

4.4.1 Test Setup



4.4.2 Test Instruments

Refer to section 4.1.2 to get information of above instrument.

4.4.3 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 sampling. 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.

4.4.4 Deviation from Test Standard

No deviation.

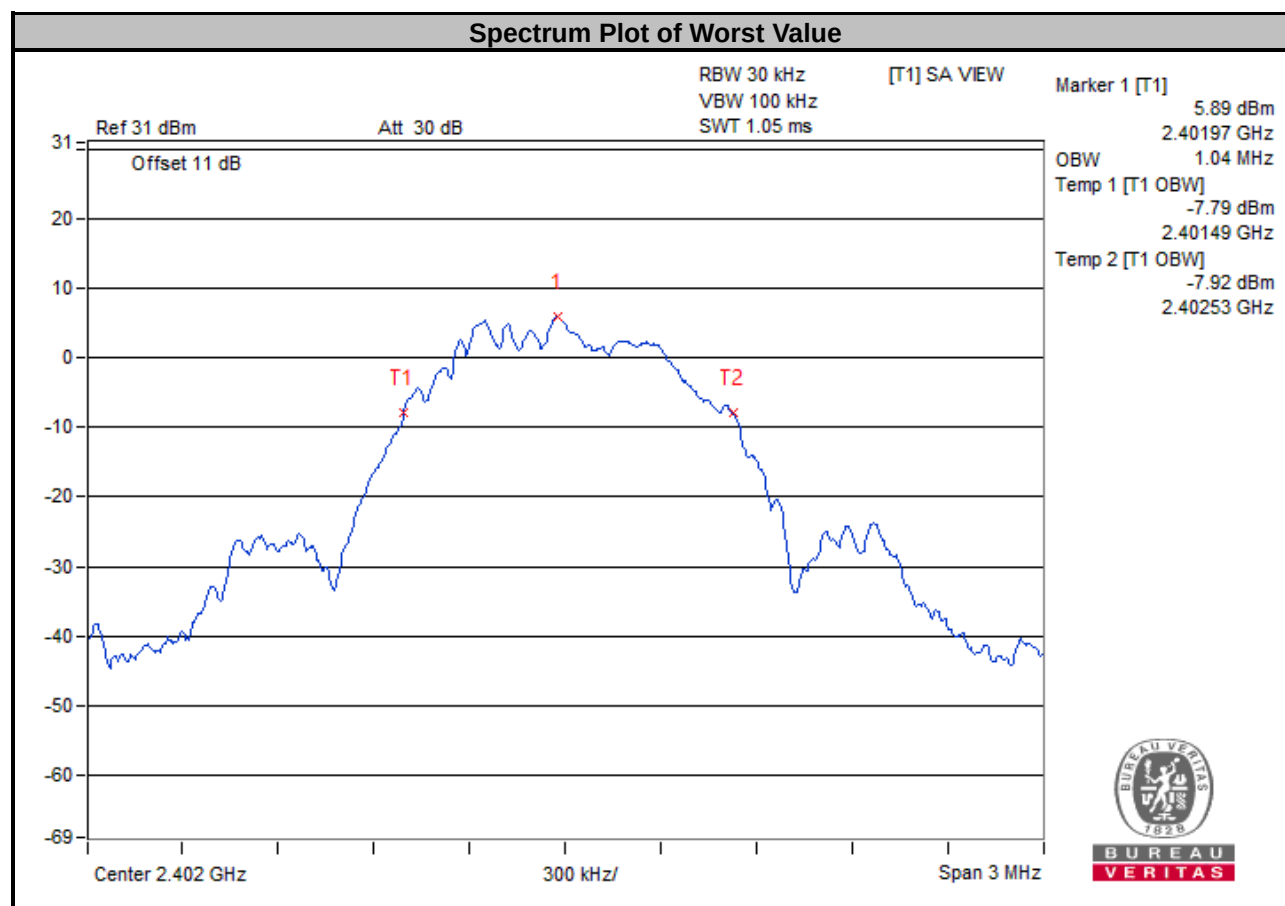
4.4.5 EUT Operating Conditions

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

4.4.6 Test Results

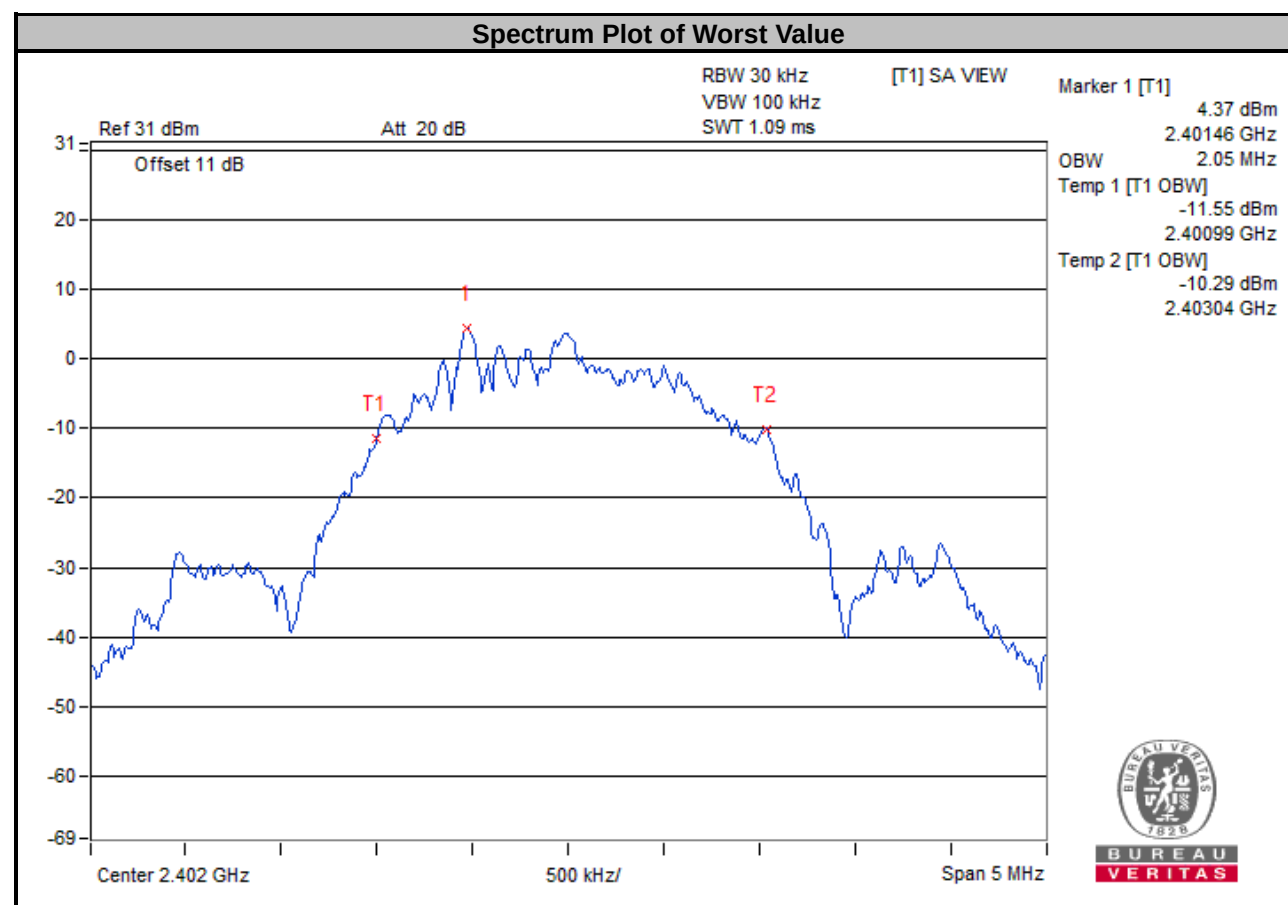
<LE 4.0>

Channel	Frequency (MHz)	Occupied Bandwidth (MHz)	Pass / Fail
0	2402	1.04	Pass
19	2440	1.04	Pass
39	2480	1.03	Pass



<LE 5.2>

Channel	Frequency (MHz)	Occupied Bandwidth (MHz)	Pass / Fail
0	2402	2.05	Pass
19	2440	2.04	Pass
39	2480	2.04	Pass

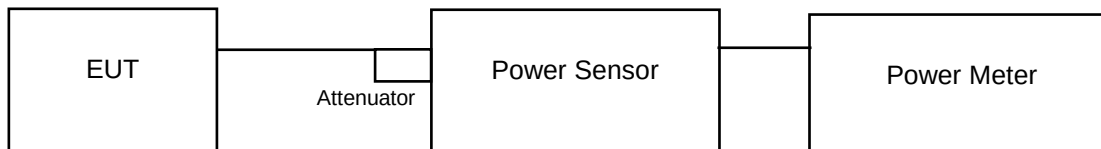


4.5 Conducted Output Power Measurement

4.5.1 Limits of Conducted Output Power Measurement

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

4.5.2 Test Setup



4.5.3 Test Instruments

Refer to section 4.1.2 to get information of above instrument.

4.5.4 Test Procedures

A peak power sensor was used on the output port of the EUT. A power meter was used to read the response of the peak power sensor. Record the power level.

Average power sensor was used to perform output power measurement, trigger and gating function of wide band power meter is enabled to measure max output power of TX on burst. Duty factor is not added to measured value.

4.5.5 Deviation from Test Standard

No deviation.

4.5.6 EUT Operating Conditions

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

4.5.7 Test Results

<LE 4.0>

Channel	Freq. (MHz)	Peak Power		Average Power		Power Limit (dBm)	Pass / Fail
		(mW)	(dBm)	(mW)	(dBm)		
0	2402	9.462	9.76	9.29	9.68	30	Pass
19	2440	9.594	9.82	9.333	9.70	30	Pass
39	2480	9.419	9.74	9.268	9.67	30	Pass

<LE 5.2>

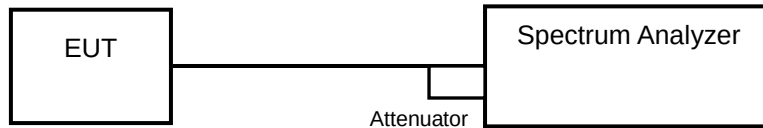
Channel	Freq. (MHz)	Peak Power		Average Power		Power Limit (dBm)	Pass / Fail
		(mW)	(dBm)	(mW)	(dBm)		
0	2402	9.354	9.71	9.247	9.66	30	Pass
19	2440	9.462	9.76	9.268	9.67	30	Pass
39	2480	9.311	9.69	9.204	9.64	30	Pass

4.6 Power Spectral Density Measurement

4.6.1 Limits of Power Spectral Density Measurement

The Maximum of Power Spectral Density Measurement is 8 dBm in any 3 kHz band during any time interval of continuous transmission.

4.6.2 Test Setup



4.6.3 Test Instruments

Refer to section 4.1.2 to get information of above instrument.

4.6.4 Test Procedure

- Set analyzer center frequency to DTS channel center frequency.
- Set the span to 1.5 times the DTS bandwidth.
- Set the RBW to: $3 \text{ kHz} \leq \text{RBW} \leq 100 \text{ kHz}$.
- Set the VBW $\geq 3 \times \text{RBW}$.
- Detector = peak.
- Sweep time = auto couple.
- Trace mode = max hold.
- Allow trace to fully stabilize.
- Use the peak marker function to determine the maximum amplitude level within the RBW.

4.6.5 Deviation from Test Standard

No deviation.

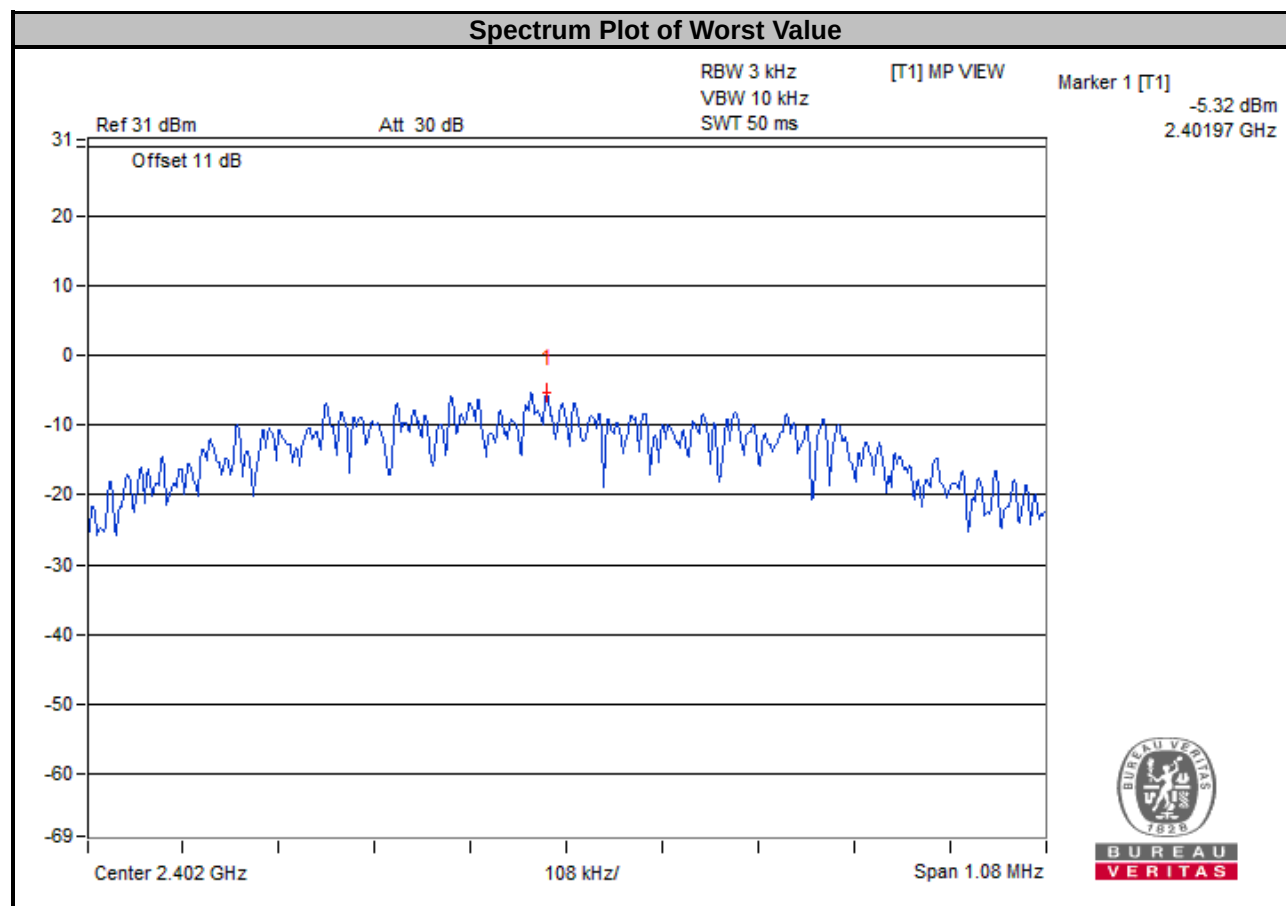
4.6.6 EUT Operating Condition

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

4.6.7 Test Results

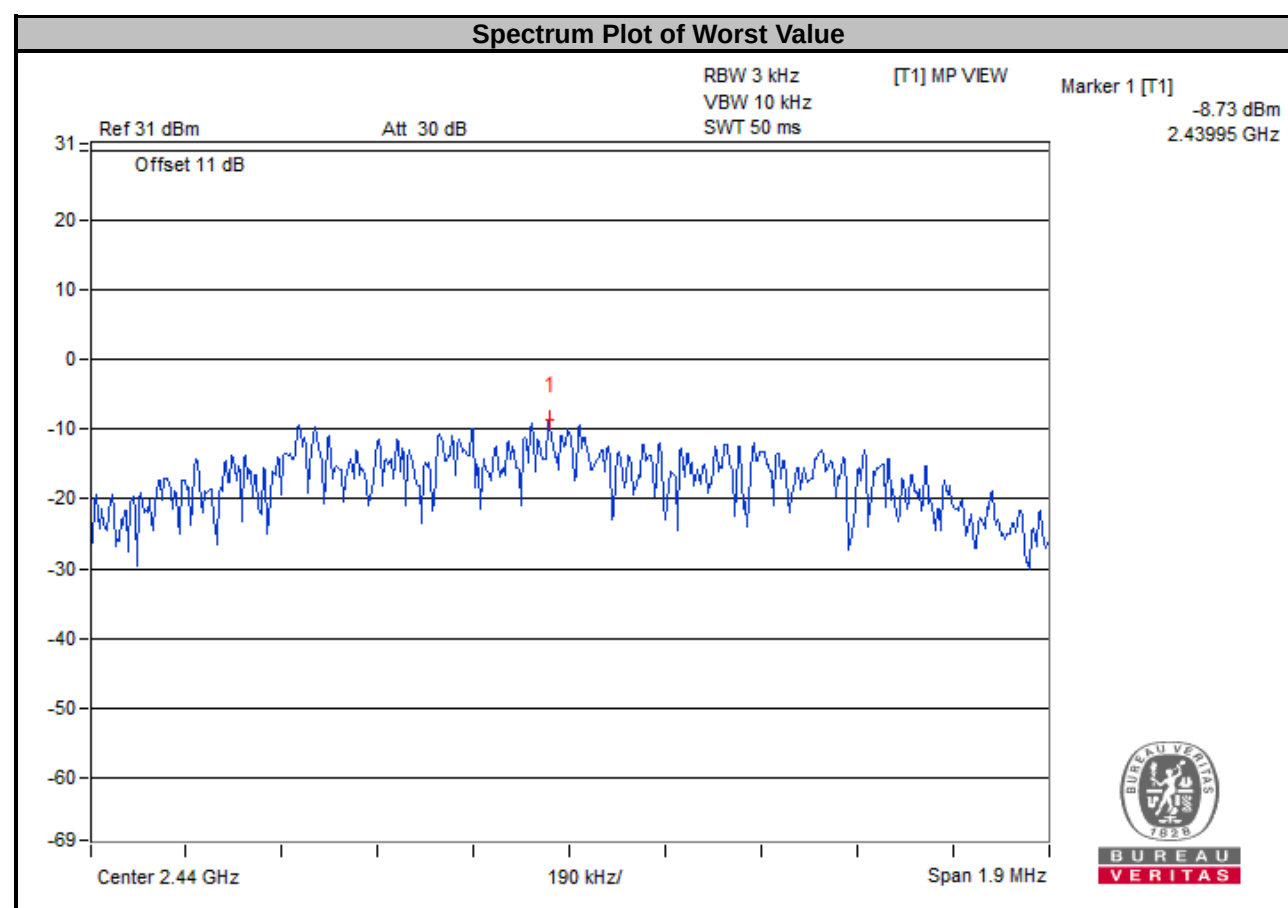
<LE 4.0>

Channel	Frequency (MHz)	PSD (dBm/3 kHz)	Limit (dBm/3 kHz)	Pass / Fail
0	2402	-5.32	8	Pass
19	2440	-5.44	8	Pass
39	2480	-5.51	8	Pass



<LE 5.2>

Channel	Frequency (MHz)	PSD (dBm/3 kHz)	Limit (dBm/3 kHz)	Pass / Fail
0	2402	-8.95	8	Pass
19	2440	-8.73	8	Pass
39	2480	-8.89	8	Pass

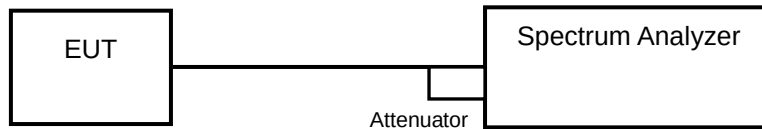


4.7 Conducted Out of Band Emission Measurement

4.7.1 Limits of Conducted Out of Band Emission Measurement

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

4.7.2 Test Setup



4.7.3 Test Instruments

Refer to section 4.1.2 to get information of above instrument.

4.7.4 Test Procedure

MEASUREMENT PROCEDURE REF

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

MEASUREMENT PROCEDURE OOBE

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

4.7.5 Deviation from Test Standard

No deviation.

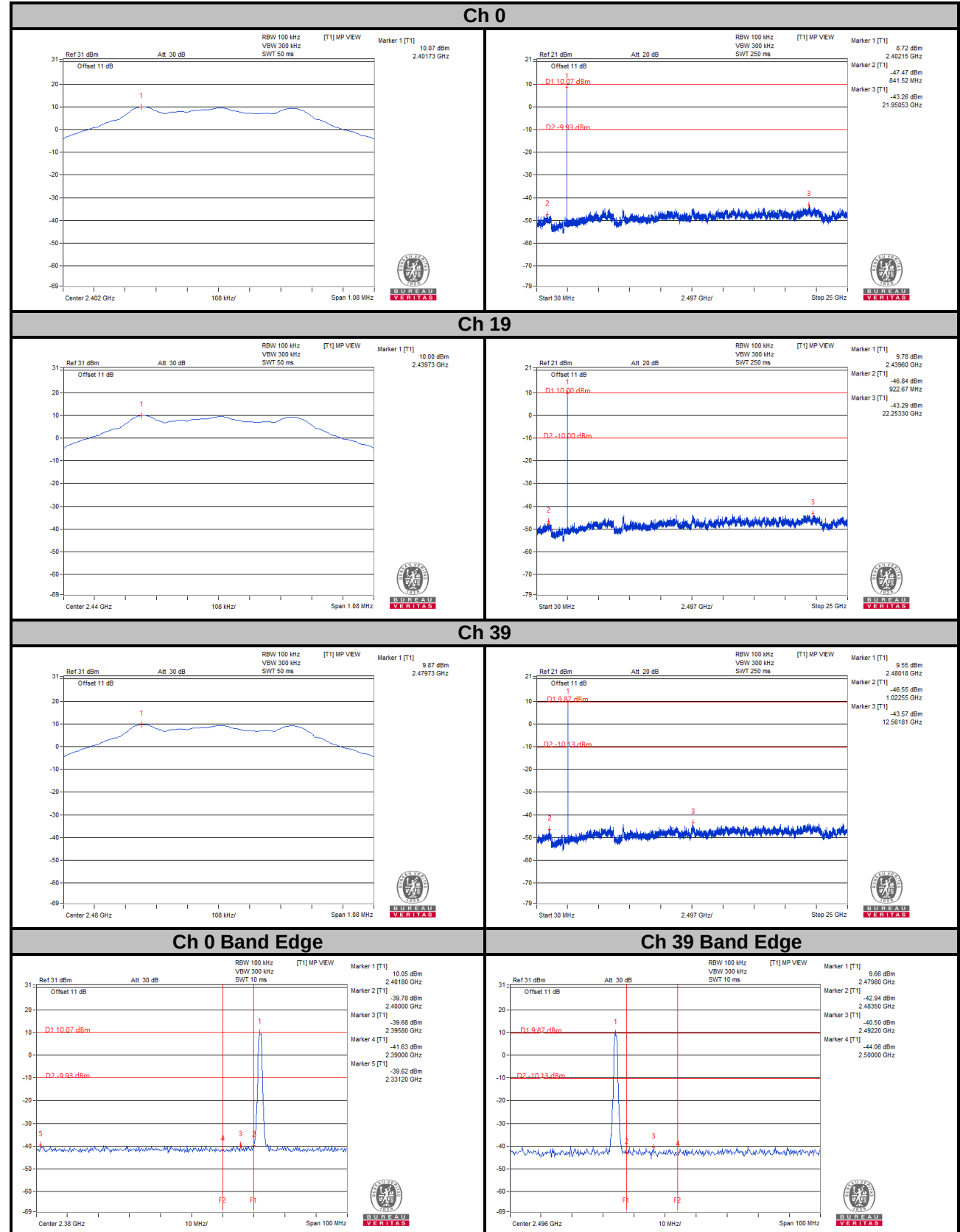
4.7.6 EUT Operating Condition

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

4.7.7 Test Results

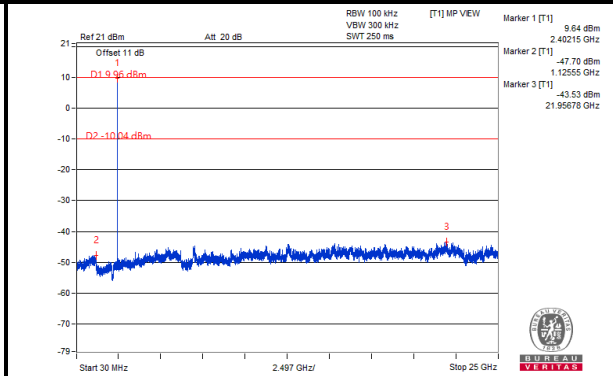
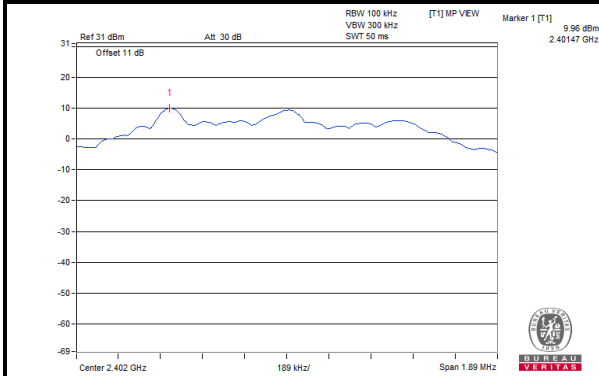
The spectrum plots are attached on the following images. D1 line indicates the highest level, D2 line indicates the 20 dB offset below D1. It shows compliance with the requirement.

<LE 4.0>

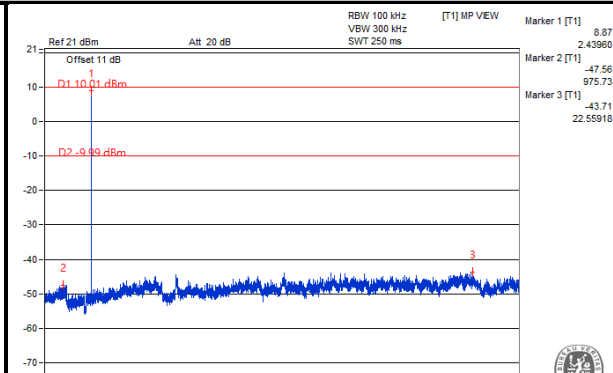
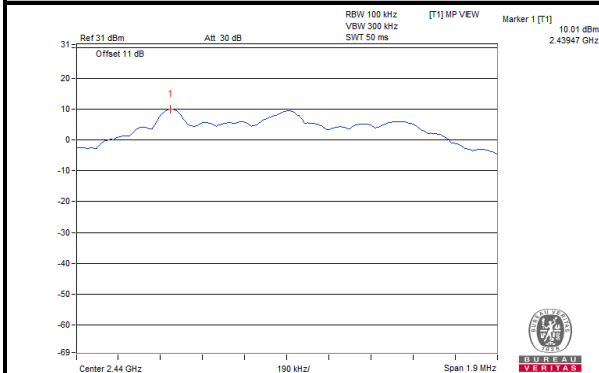


<LE 5.2>

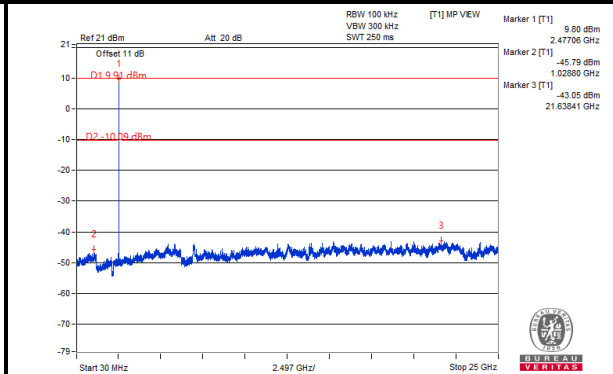
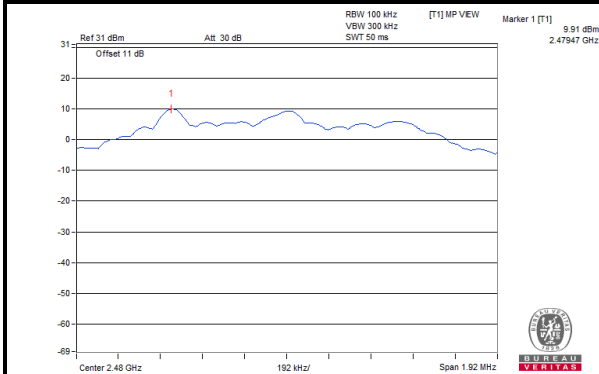
Ch 0



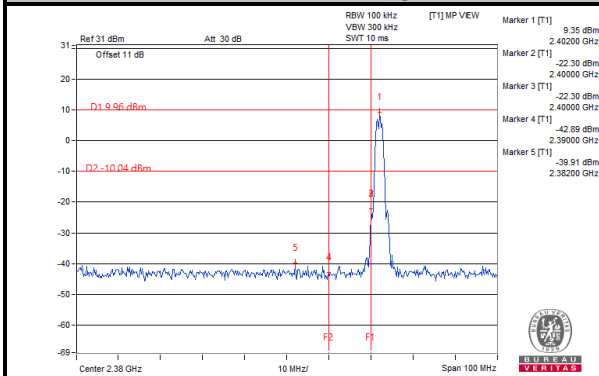
Ch 19



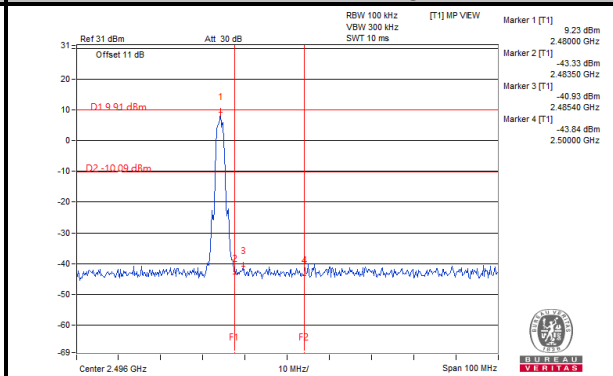
Ch 39



Ch 0 Band Edge



Ch 39 Band Edge



5 Photographs of the Test Configuration

Please refer to the attached file (Reference no.: RFBCEE-WTW-P21050412 (TSup photo_left earbud)).

6 Construction Photos of EUT

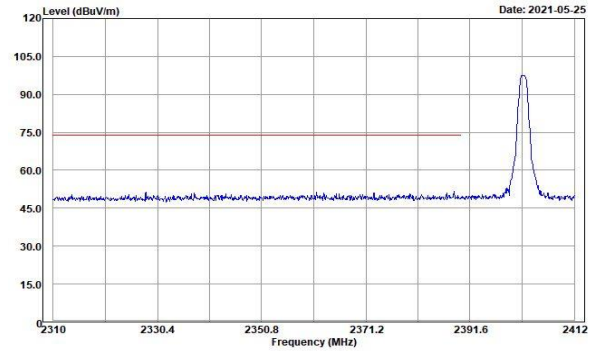
Please refer to the attached file (BCEE-WTW-P21050412 (EUT photo)).

Annex A- Band Edge Measurement

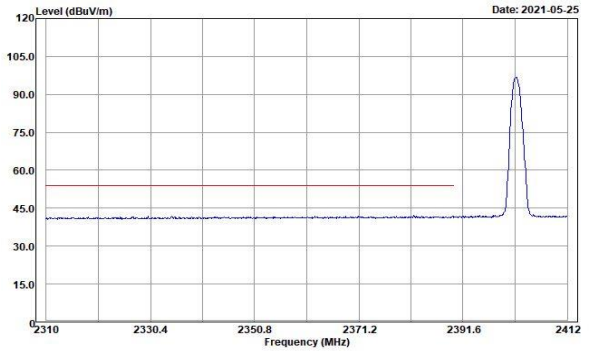
<LE 4.0>

BT_LE-1M Channel 0

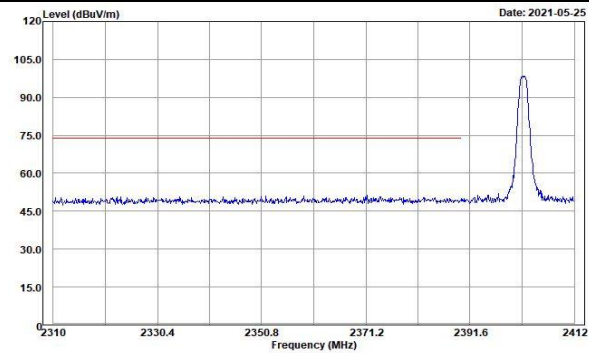
Horizontal (Peak)



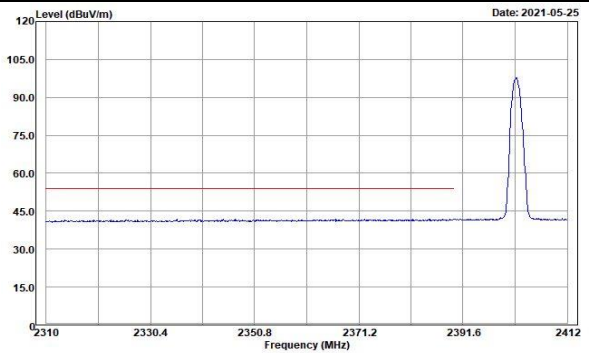
Horizontal (Average)



Vertical (Peak)

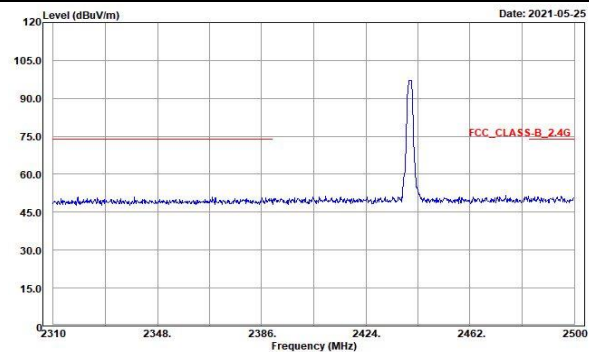


Vertical (Average)

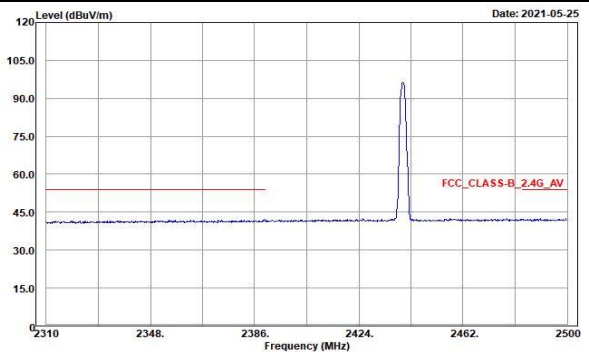


BT_LE-1M Channel 19

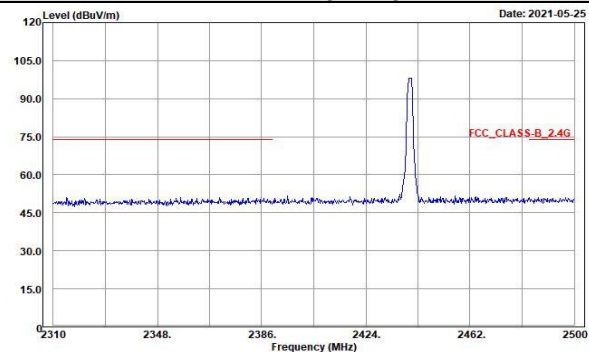
Horizontal (Peak)



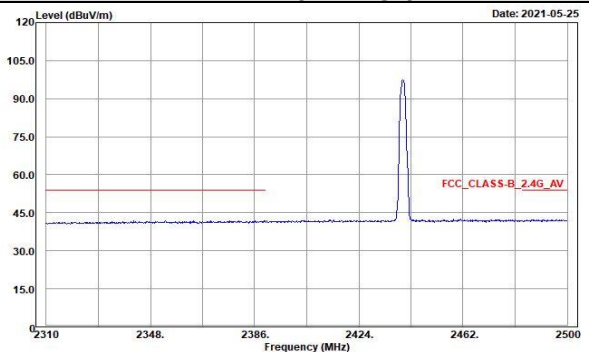
Horizontal (Average)



Vertical (Peak)

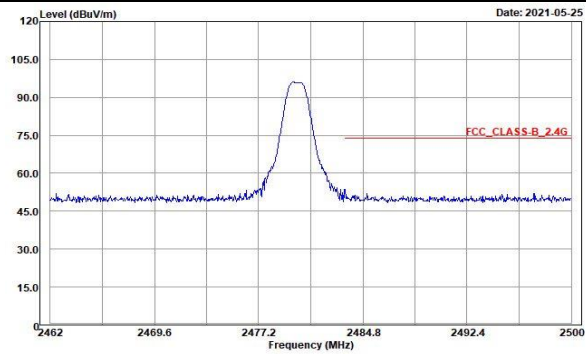


Vertical (Average)

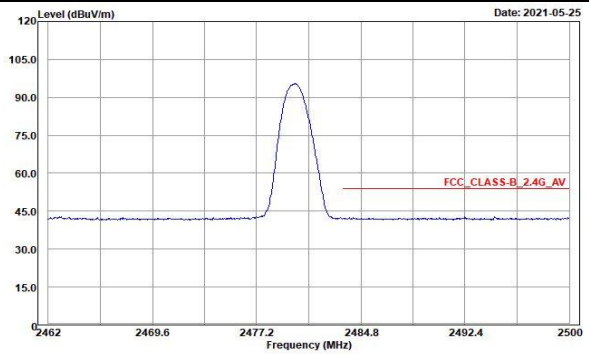


BT_LE-1M Channel 39

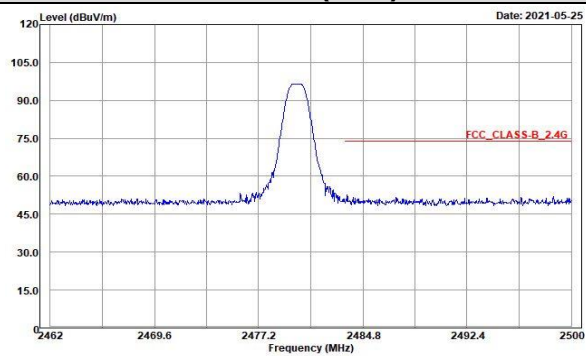
Horizontal (Peak)



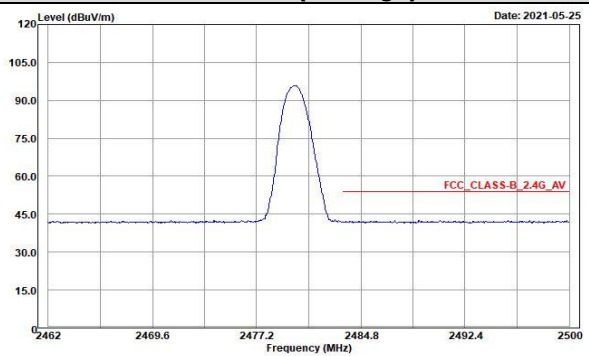
Horizontal (Average)



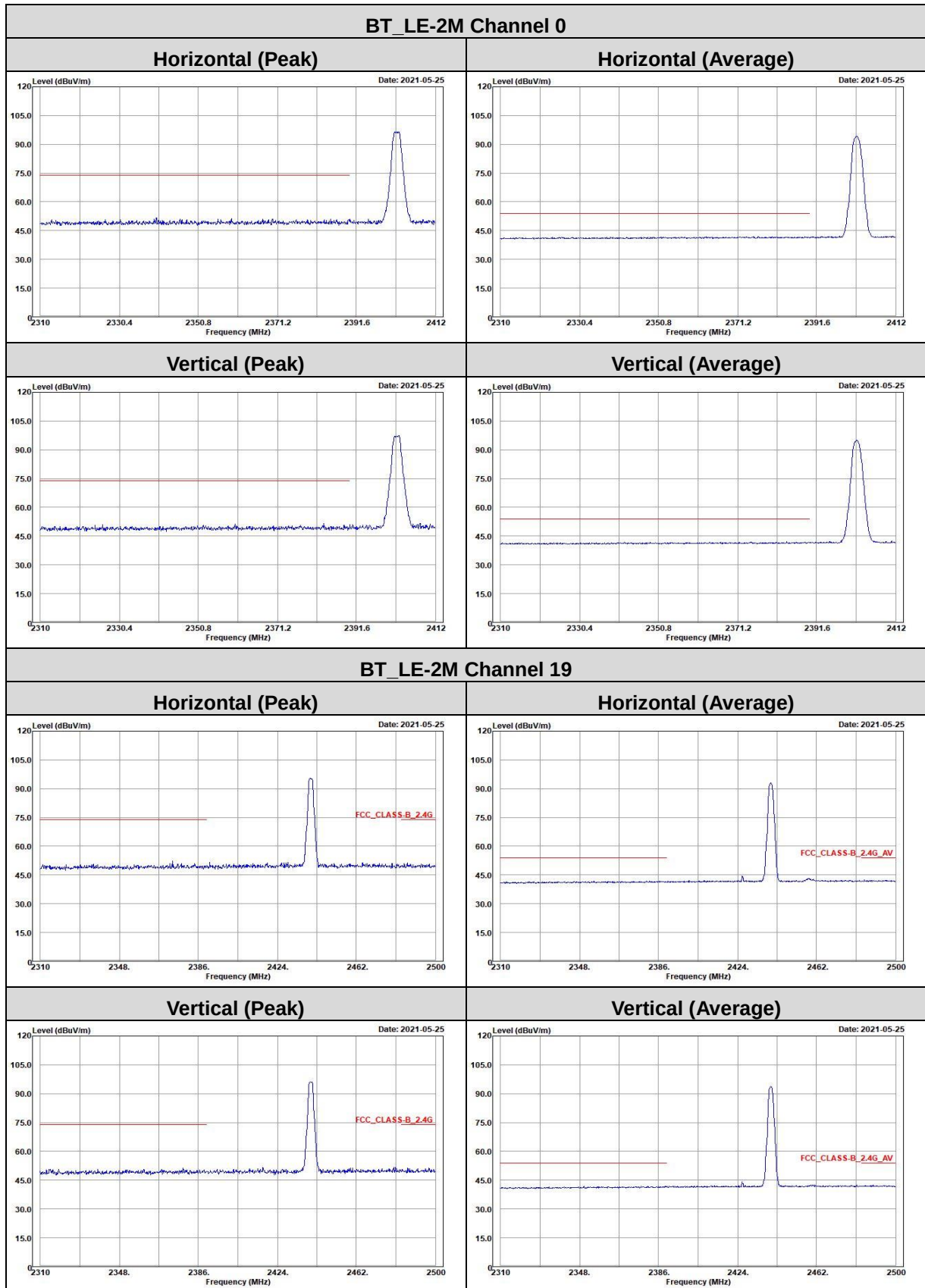
Vertical (Peak)

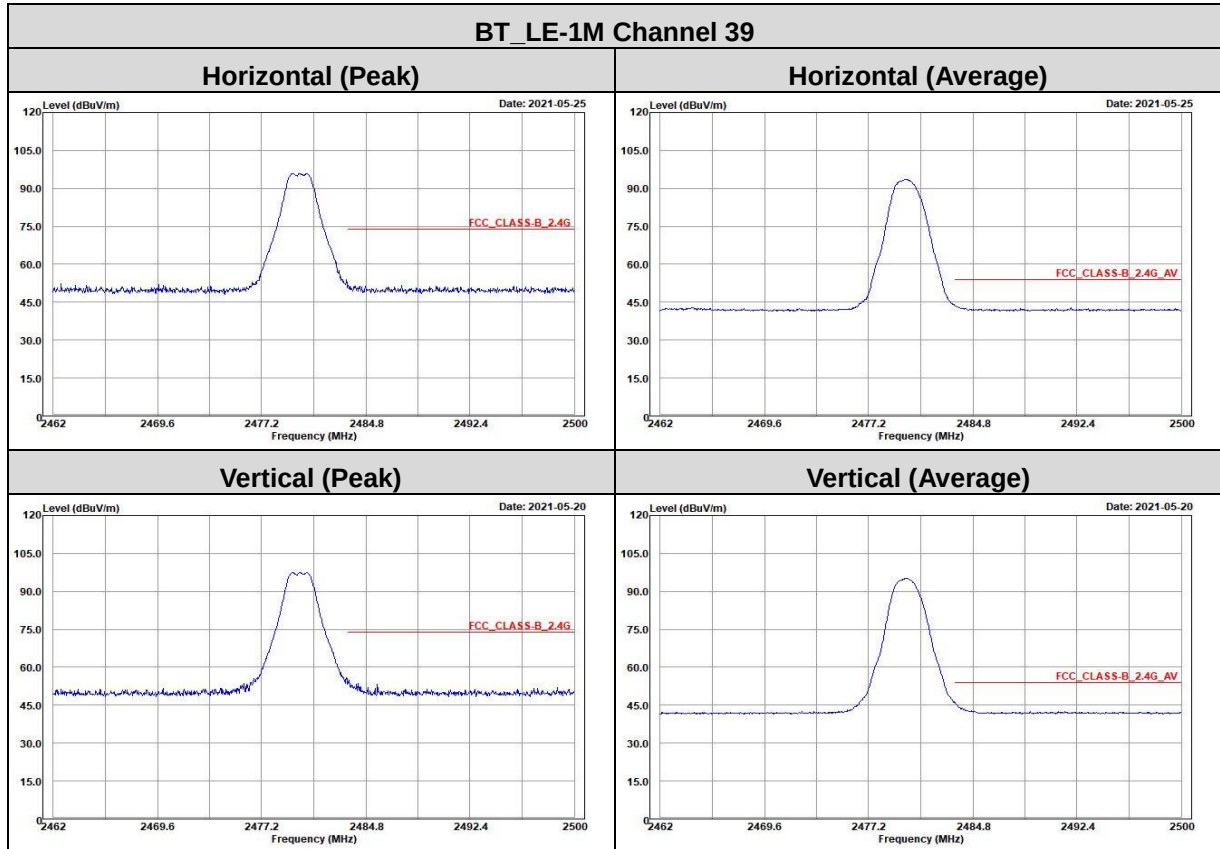


Vertical (Average)



<LE 5.2>





Appendix – Information of the Testing Laboratories

We, Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch, were founded in 1988 to provide our best service in EMC, Radio, Telecom and Safety consultation. Our laboratories are FCC recognized accredited test firms and accredited according to ISO/IEC 17025.

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

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Email: service.adt@tw.bureauveritas.com

Web Site: www.bureauveritas-adt.com

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

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