

Partial FCC Test Report

Report No.: RF160526C29A-2

FCC ID: PPD-QCNFA324

Test Model: QCNFA324

Received Date: Oct. 20, 2017

Test Date: Nov. 10, 2017 ~ Nov. 20, 2017

Issued Date: Nov. 27, 2017

Applicant: Qualcomm Atheros, Inc.

Address: 1700 Technology Drive, San Jose, CA95110

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

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(R.O.C)

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Hsien 333, Taiwan, R.O.C.

Test Location (2): No.215, Sec. 3, Beixin Rd., Xindian Dist., New Taipei City 231, Taiwan,
R.O.C

FCC Registration / 788550 / TW0003

Designation Number: 427177 / TW0011



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Release Control Record

Issue No.	Description	Date Issued
RF160526C29A-2	Original Release	Nov. 27, 2017

1 Certificate of Conformity

Product: 2x2 802.11A/B/G/N/AC WiFi + Bluetooth Module

Brand: Qualcomm Atheros

Test Model: QCNFA324

Sample Status: Identical Prototype

Applicant: Qualcomm Atheros, Inc.

Test Date: Nov. 10, 2017 ~ Nov. 20, 2017

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 EMC characteristics under the conditions specified in this report.

Prepared by : Evonne Liu, **Date:** Nov. 27, 2017
Evonne Liu / Specialist

Approved by : Dylan Chiou, **Date:** Nov. 27, 2017
Dylan Chiou / 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 -21.29 dB at 1.54200 MHz.
15.205 & 209	Radiated Emissions	Pass	Meet the requirement of limit. Minimum passing margin is -12.19 dB at 2489.48 MHz.
15.247(d)	Band Edge Measurement	N/A	Refer to Note
15.247(d)	Antenna Port Emission	N/A	Refer to Note
15.247(a)(2)	6 dB Bandwidth	N/A	Refer to Note
15.247(b)	Conducted power	N/A	Refer to Note
15.247(e)	Power Spectral Density	N/A	Refer to Note
15.203	Antenna Requirement	N/A	Refer to Note

Note: Only test item of Conducted Emission and Radiated Emissions were performed for this report. For other test data, please refer to BV Report No.: RF140808E04-2 for WLAN/BT module (Brand: Qualcomm Atheros, Model: QCNFA324). The power has been verified and confirmed to be same as the original power, therefore the power test result is not performed in this test report.

2.1 Measurement Uncertainty

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the EUT:

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

Measurement	Frequency	Expanded Uncertainty (k=2) ($\pm$)
Conducted Emissions at mains ports	150 kHz ~ 30 MHz	2.44 dB
Radiated Emissions up to 1 GHz	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

Product	2x2 802.11A/B/G/N/AC WiFi + Bluetooth Module
Brand	Qualcomm Atheros
Test Model	QCNFA324
Status of EUT	Identical Prototype
Power Supply Rating	3.3 Vdc (Host equipment)
Modulation Type	GFSK
Transfer Rate	1 Mbps
Operating Frequency	2402 ~ 2480 MHz
Number of Channel	40
Antenna Type	Refer to Note as below
Antenna Connector	N/A
Accessory Device	N/A
Data Cable Supplied	N/A

Note:

- The EUT is authorized for use in specific End-product. Please refer to below table for more details.

Item	Brand	Model
Industrial Computer	Dell	N02PC

- The antenna information is listed as below.

Antenna Type	Brand Name	Parts Number	Antenna Gain (dBi)		
			2.4GHz	5.15~5.725GHz	5.725~5.85GHz
Dipole	Laird	WLAN Main Antenna: PDV24515-DE1 WLAN Aux Antenna: PDV24515-DE1	Main: 2.9 Aux: 2.9	Main: 4.0 Aux: 4.0	Main: 3.9 Aux: 3.9
Monopole	Taoglas Antenna Solution Ltd.	WLAN Main Antenna: MA761.B.BICG.014 WLAN Aux Antenna: MA761.B.BICG.014	Main: 2.82 Aux: 2.79	Main: 4.11 Aux: 4.51	Main: 4.11 Aux: 4.51

* The EUT antenna is a specific antenna: Professional installation antenna. It complies with the standard requirement.

- The End-product contains following accessory devices.

Product	Brand	Model	Description
Adapter	DELL	DA180PM111	I/P: 100-240 Vac, 50-60 Hz, 2.34 A O/P: 19.5 Vdc, 9.23 A

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

3.2 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

EUT Configure Mode	Applicable To				Description
	RE $\geq$ 1G	RE<1G	PLC	APCM	
A	√	√	√	-	Dipole Antenna
B	√	√	√	-	Monopole Antenna

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 X-plane for Mode A and Z-plan for Mode B.
- "-" 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, B	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	0 to 39	19	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)
A, B	0 to 39	19	GFSK	1

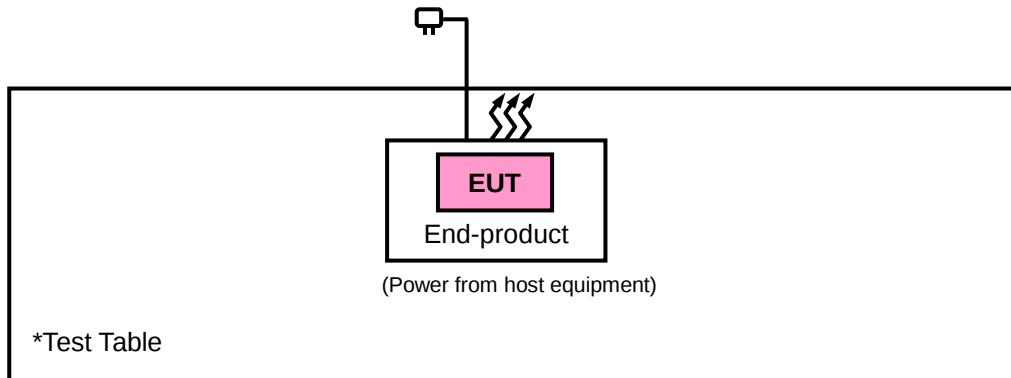
Test Condition:

Applicable To	Environmental Conditions	Input Power	Tested by
RE $\geq$ 1G	25 deg. C, 65 % RH	120 Vac, 60 Hz	Karl Lee
RE<1G	25 deg. C, 65 % RH	120 Vac, 60 Hz	Karl Lee
PLC	25 deg. C, 65 % RH	120 Vac, 60 Hz	Getaz Yang

3.3 Description of Support Units

The EUT has been tested as an independent unit together with other necessary accessories or support units.

3.3.1 Configuration of System under Test



3.4 General Description of Applied Standards

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

FCC Part 15, Subpart C (15.247)

558074 D01 DTS Meas Guidance v04

ANSI C63.10-2013

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

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

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	Jul. 05, 2017	Jul. 04, 2018
Spectrum Analyzer ROHDE & SCHWARZ	FSU43	101261	Dec. 13, 2016	Dec. 12, 2017
BILOG Antenna SCHWARZBECK	VULB9168	9168-472	Dec. 16, 2016	Dec. 15, 2017
HORN Antenna ETS-Lindgren	3117	00143293	Dec. 29, 2016	Dec. 28, 2017
HORN Antenna SCHWARZBECK	BBHA 9170	9170-480	Dec. 14, 2016	Dec. 13, 2017
Fixed Attenuator Mini-Circuits	MDCS18N-10	MDCS18N-10-01	Apr. 17, 2017	Apr. 16, 2018
Bluetooth Tester	CBT	100980	Jun. 28, 2017	Jun. 27, 2019
Loop Antenna	HLA 6121	45745	May 19, 2017	May 18, 2018
Preamplifier Agilent	310N	187226	Jun. 23, 2017	Jun. 22, 2018
Preamplifier Agilent	83017A	MY39501357	Jun. 23, 2017	Jun. 22, 2018
Power Meter Anritsu	ML2495A	1012010	Aug. 15, 2017	Aug. 14, 2018
Power Sensor Anritsu	MA2411B	1315050	Aug. 15, 2017	Aug. 14, 2018
RF signal cable ETS-LINDGREN	5D-FB	Cable-CH1-01(R FC-SMS-100-SM S-120+RFC-SMS -100-SMS-400)	Jun. 23, 2017	Jun. 22, 2018
RF signal cable ETS-LINDGREN	8D-FB	Cable-CH1-02(R FC-SMS-100-SM S-24)	Jun. 23, 2017	Jun. 22, 2018
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.
3. The horn antenna and preamplifier (model: 83017A) are used only for the measurement of emission frequency above 1GHz if tested.
4. The IC Site Registration No. is IC7450I-1.

4.1.3 Test Procedures

- a. The EUT was placed on the top of a rotating table 0.8 meters (for below 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:

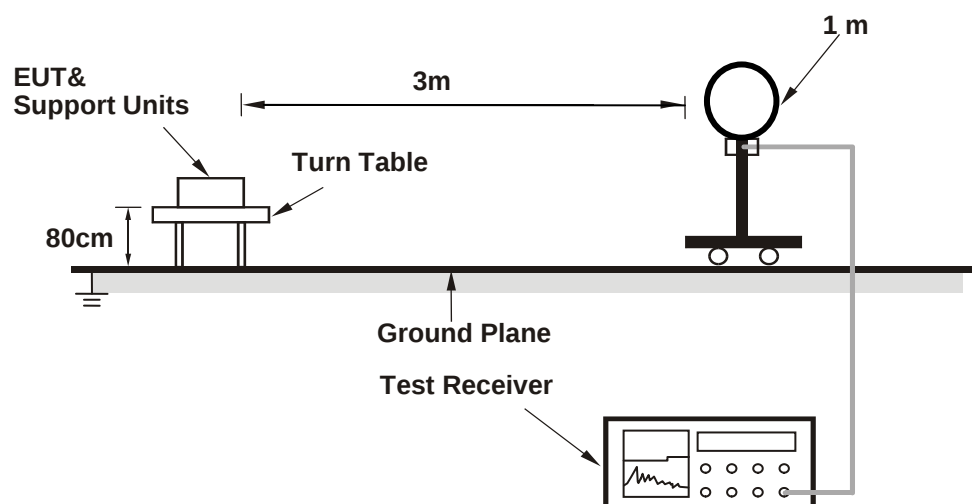
1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120 kHz & 360 kHz for Quasi-peak detection (QP) at frequency below 1 GHz.
2. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is 3 MHz for Peak detection (PK) at frequency above 1 GHz.
3. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is 1/T for Average (Duty cycle < 98 %) detection at frequency above 1 GHz.
4. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is 10 Hz (Duty cycle ≥ 98 %) for Average detection (AV) at frequency above 1 GHz.
5. All modes of operation were investigated and the worst-case emissions are reported.

4.1.4 Deviation from Test Standard

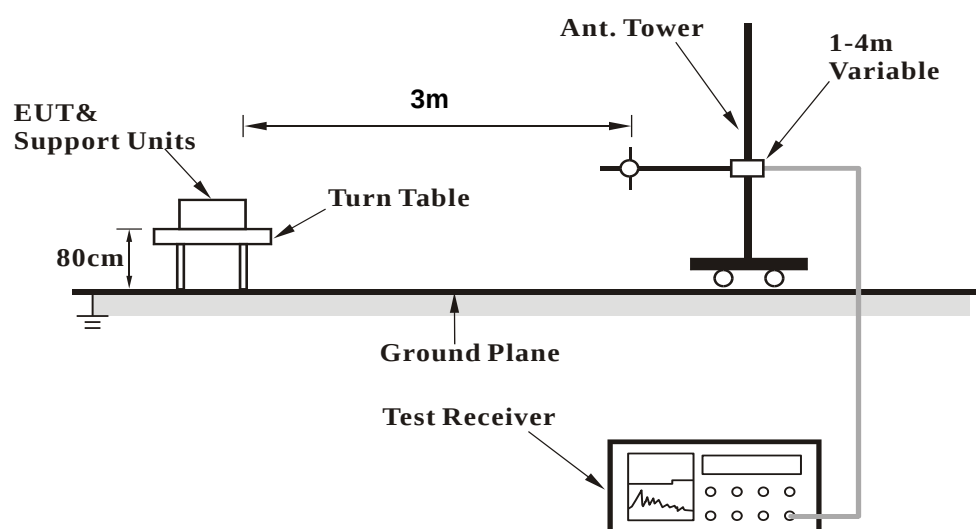
No deviation.

4.1.5 Test Set Up

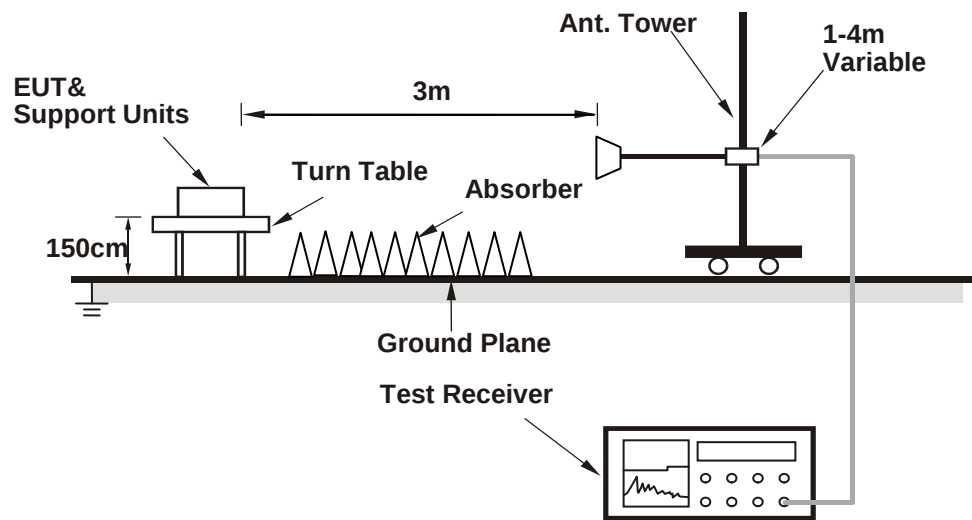
<Radiated emission below 30 MHz>



<Frequency Range below 1 GHz>



<Frequency Range 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.

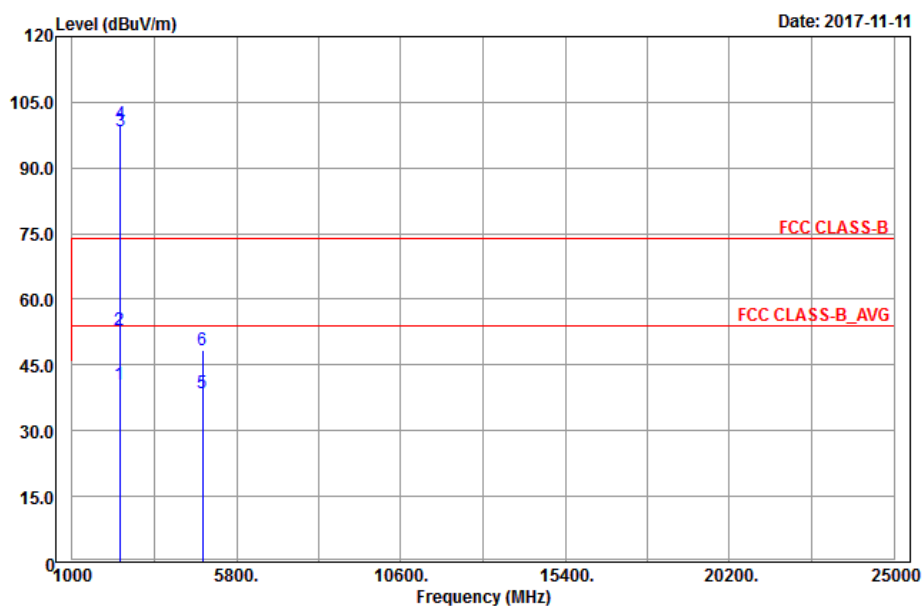
4.1.7 Test Results

Above 1 GHz Data:

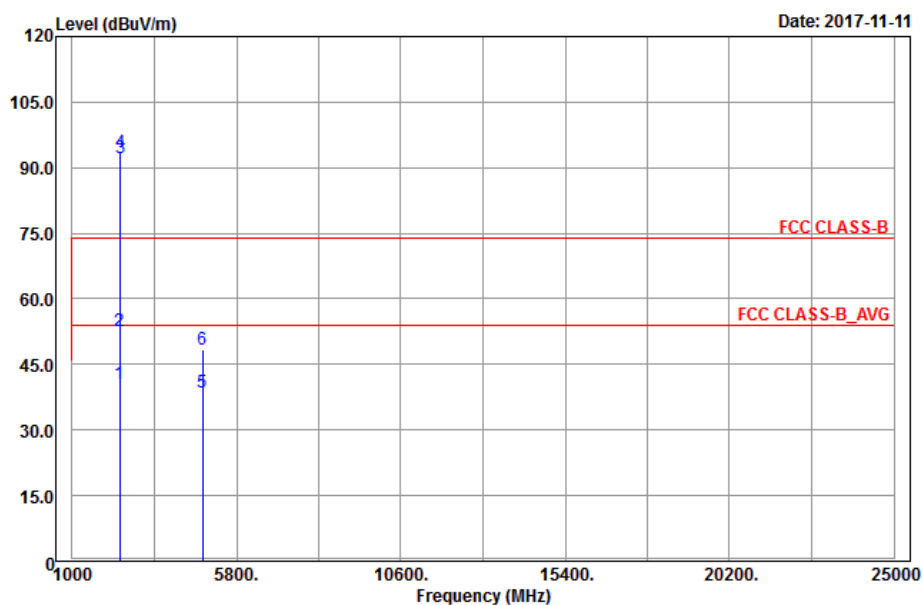
Mode A

EUT Test Condition		Measurement Detail	
Channel	Channel 0	Frequency Range	1 GHz ~ 25 GHz
Input Power	120 Vac, 60 Hz	Detector Function	Peak (PK) Average (AV)
Environmental Conditions	25 deg. C, 65 % RH	Tested By	Karl Lee

Horizontal



Vertical



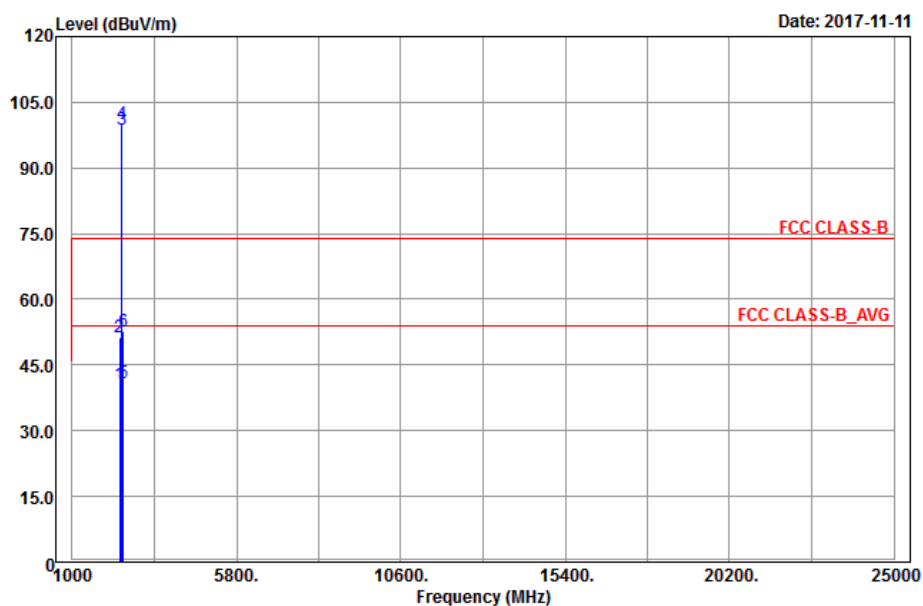
Antennal Polarity & Test Distance: Horizontal at 3 m										
Frequency (MHz)	Emission Level (dBuV/m)	Read Level (dBuV)	Limit (dBuV/m)	Margin (dB)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Antenna Height (cm)	Table Angle (Degree)	Remark
2382.99	40.67	38.98	54	-13.33	31.78	5.4	35.49	245	307	Average
2382.99	52.85	51.16	74	-21.15	31.78	5.4	35.49	245	307	Peak
2402	98.3	96.57			31.8	5.4	35.47	245	307	Average
2402	100.1	98.37			31.8	5.4	35.47	245	307	Peak
4804	38.42	30.33	54	-15.58	33.96	8.25	34.12	162	187	Average
4804	48.27	40.18	74	-25.73	33.96	8.25	34.12	162	187	Peak
Antennal Polarity & Test Distance: Vertical at 3 m										
Frequency (MHz)	Emission Level (dBuV/m)	Read Level (dBuV)	Limit (dBuV/m)	Margin (dB)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Antenna Height (cm)	Table Angle (Degree)	Remark
2384.61	40.53	38.84	54	-13.47	31.78	5.4	35.49	281	0	Average
2384.61	52.72	51.03	74	-21.28	31.78	5.4	35.49	281	0	Peak
2402	92.29	90.56			31.8	5.4	35.47	281	0	Average
2402	93.67	91.94			31.8	5.4	35.47	281	0	Peak
4804	38.61	30.52	54	-15.39	33.96	8.25	34.12	157	63	Average
4804	48.26	40.17	74	-25.74	33.96	8.25	34.12	157	63	Peak

Remarks:

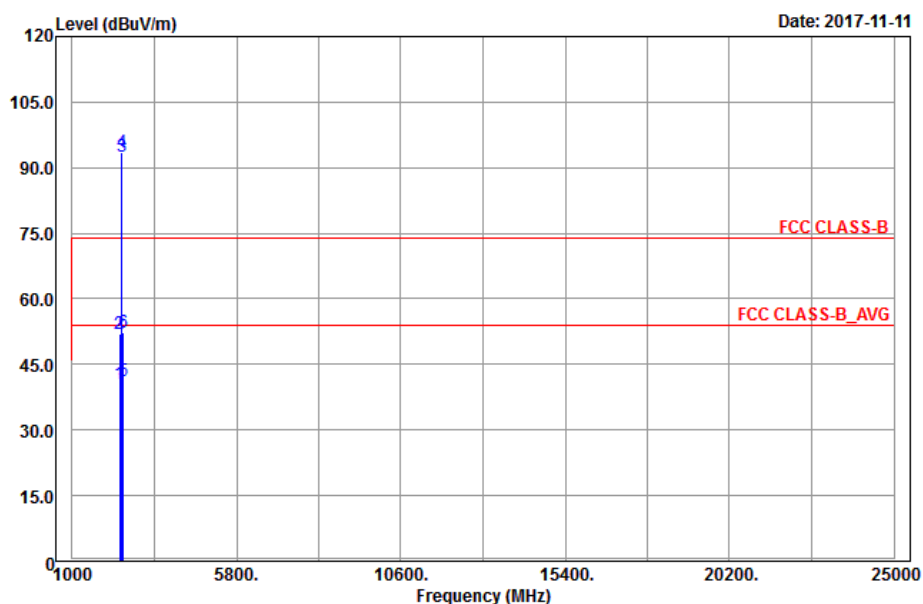
- Emission Level = Read Level + Antenna Factor + Cable Loss - Preamp Factor
Margin value = Emission level – Limit value
- 2402 MHz: Fundamental frequency.

EUT Test Condition		Measurement Detail	
Channel	Channel 19	Frequency Range	1 GHz ~ 25 GHz
Input Power	120 Vac, 60 Hz	Detector Function	Peak (PK) Average (AV)
Environmental Conditions	25 deg. C, 65 % RH	Tested By	Karl Lee

Horizontal



Vertical



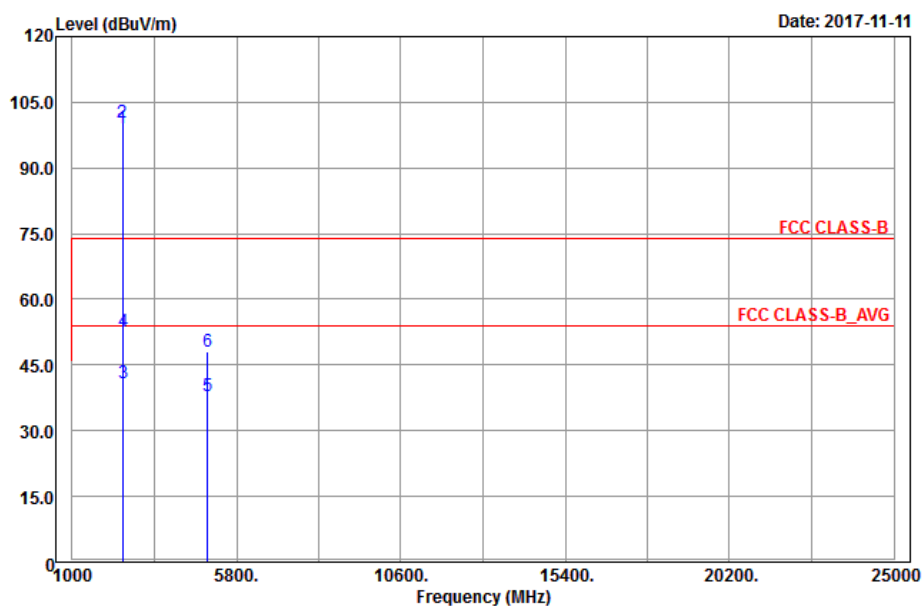
Antennal Polarity & Test Distance: Horizontal at 3 m										
Frequency (MHz)	Emission Level (dBuV/m)	Read Level (dBuV)	Limit (dBuV/m)	Margin (dB)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Antenna Height (cm)	Table Angle (Degree)	Remark
2379.93	40.43	38.77	54	-13.57	31.78	5.37	35.49	245	307	Average
2379.93	51.42	49.76	74	-22.58	31.78	5.37	35.49	245	307	Peak
2440	98.7	96.85			31.85	5.46	35.46	245	307	Average
2440	100.02	98.17			31.85	5.46	35.46	245	307	Peak
2499.56	40.9	38.88	54	-13.1	31.9	5.53	35.41	245	307	Average
2499.56	52.69	50.67	74	-21.31	31.9	5.53	35.41	245	307	Peak
Antennal Polarity & Test Distance: Vertical at 3 m										
Frequency (MHz)	Emission Level (dBuV/m)	Read Level (dBuV)	Limit (dBuV/m)	Margin (dB)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Antenna Height (cm)	Table Angle (Degree)	Remark
2378.85	40.46	38.8	54	-13.54	31.78	5.37	35.49	281	0	Average
2378.85	52.03	50.37	74	-21.97	31.78	5.37	35.49	281	0	Peak
2440	92.5	90.65			31.85	5.46	35.46	281	0	Average
2440	93.54	91.69			31.85	5.46	35.46	281	0	Peak
2497.68	41.04	39.02	54	-12.96	31.9	5.53	35.41	281	0	Average
2497.68	52.16	50.14	74	-21.84	31.9	5.53	35.41	281	0	Peak

Remarks:

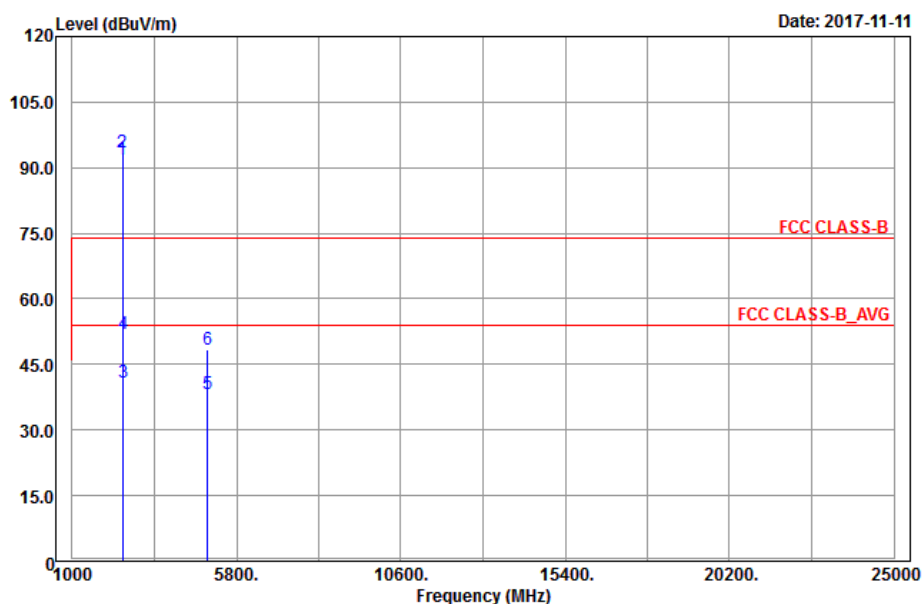
- Emission Level = Read Level + Antenna Factor + Cable Loss - Preamp Factor
Margin value = Emission level – Limit value
- 2440 MHz: Fundamental frequency.

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

Horizontal



Vertical



Antennal Polarity & Test Distance: Horizontal at 3 m

Frequency (MHz)	Emission Level (dBuV/m)	Read Level (dBuV)	Limit (dBuV/m)	Margin (dB)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Antenna Height (cm)	Table Angle (Degree)	Remark
2480	98.95	96.99			31.88	5.5	35.42	245	307	Average
2480	100.23	98.27			31.88	5.5	35.42	245	307	Peak
2486.04	40.93	38.94	54	-13.07	31.88	5.53	35.42	245	307	Average
2486.04	52.72	50.73	74	-21.28	31.88	5.53	35.42	245	307	Peak
4960	37.95	29.68	54	-16.05	33.99	8.29	34.01	145	274	Average
4960	48.19	39.92	74	-25.81	33.99	8.29	34.01	145	274	Peak

Antennal Polarity & Test Distance: Vertical at 3 m

Frequency (MHz)	Emission Level (dBuV/m)	Read Level (dBuV)	Limit (dBuV/m)	Margin (dB)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Antenna Height (cm)	Table Angle (Degree)	Remark
2480	92.02	90.06			31.88	5.5	35.42	281	0	Average
2480	93.4	91.44			31.88	5.5	35.42	281	0	Peak
2498.36	40.95	38.93	54	-13.05	31.9	5.53	35.41	281	0	Average
2498.36	52	49.98	74	-22	31.9	5.53	35.41	281	0	Peak
4960	38.29	30.02	54	-15.71	33.99	8.29	34.01	125	193	Average
4960	48.37	40.1	74	-25.63	33.99	8.29	34.01	125	193	Peak

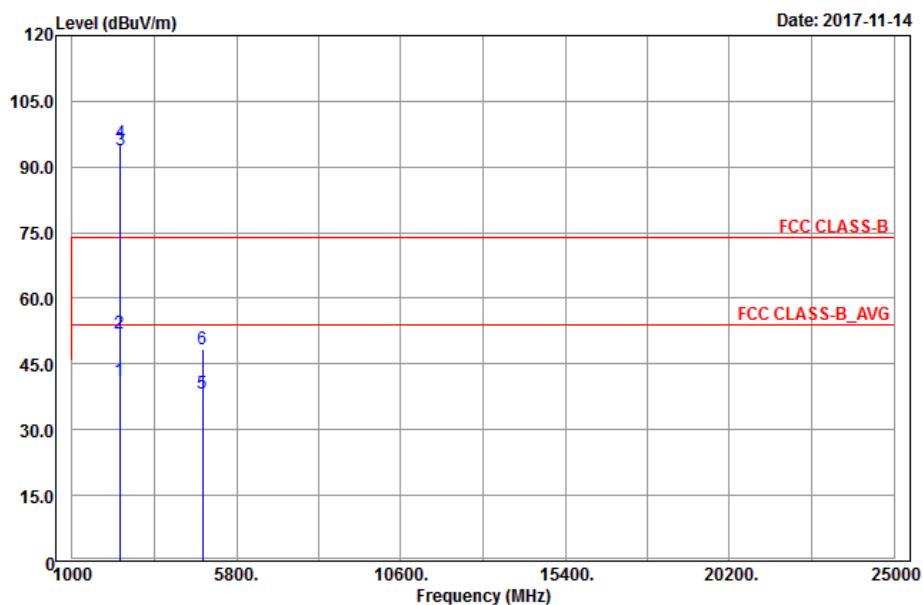
Remarks:

- Emission Level = Read Level + Antenna Factor + Cable Loss - Preamp Factor
Margin value = Emission level – Limit value
- 2480 MHz: Fundamental frequency.

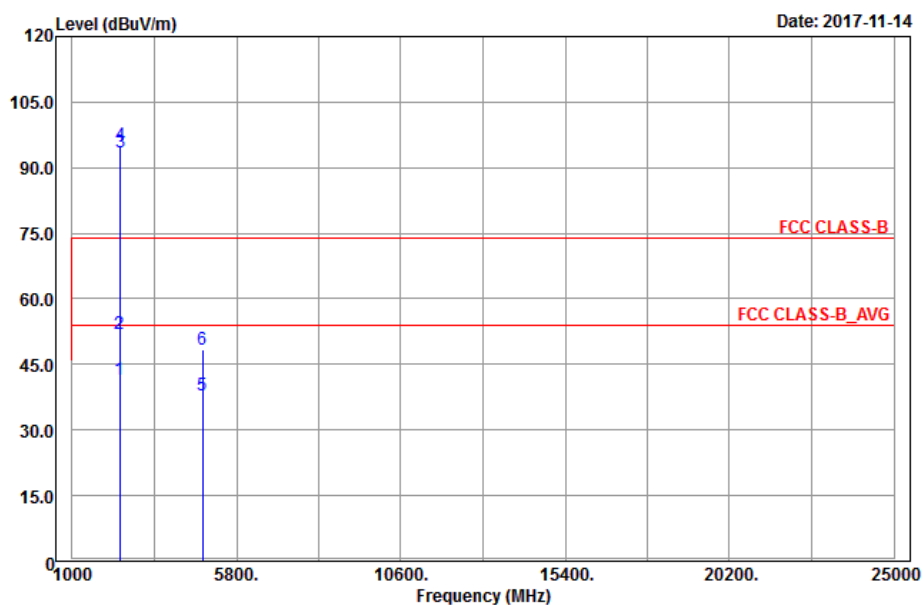
Mode B

EUT Test Condition		Measurement Detail	
Channel	Channel 0	Frequency Range	1 GHz ~ 25 GHz
Input Power	120 Vac, 60 Hz	Detector Function	Peak (PK) Average (AV)
Environmental Conditions	25 deg. C, 65 % RH	Tested By	Karl Lee

Horizontal



Vertical



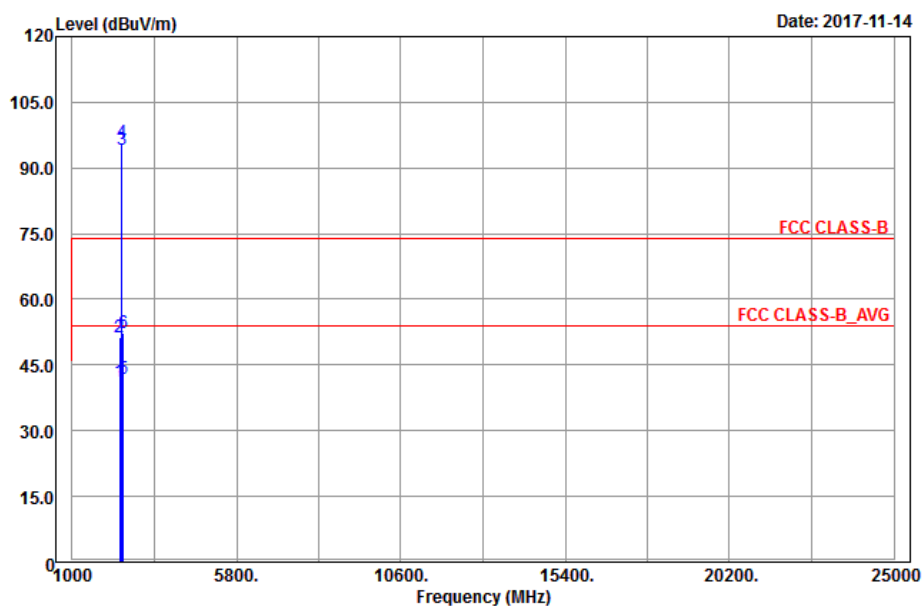
Antennal Polarity & Test Distance: Horizontal at 3 m										
Frequency (MHz)	Emission Level (dBuV/m)	Read Level (dBuV)	Limit (dBuV/m)	Margin (dB)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Antenna Height (cm)	Table Angle (Degree)	Remark
2388.93	41.1	39.39	54	-12.9	31.8	5.4	35.49	218	115	Average
2388.93	51.87	50.16	74	-22.13	31.8	5.4	35.49	218	115	Peak
2402	93.92	92.19			31.8	5.4	35.47	218	115	Average
2402	95.45	93.72			31.8	5.4	35.47	218	115	Peak
4804	38.12	30.03	54	-15.88	33.96	8.25	34.12	154	36	Average
4804	48.28	40.19	74	-25.72	33.96	8.25	34.12	154	36	Peak
Antennal Polarity & Test Distance: Vertical at 3 m										
Frequency (MHz)	Emission Level (dBuV/m)	Read Level (dBuV)	Limit (dBuV/m)	Margin (dB)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Antenna Height (cm)	Table Angle (Degree)	Remark
2382.45	41.42	39.73	54	-12.58	31.78	5.4	35.49	181	0	Average
2382.45	52.05	50.36	74	-21.95	31.78	5.4	35.49	181	0	Peak
2402	93.52	91.79			31.8	5.4	35.47	181	0	Average
2402	95.01	93.28			31.8	5.4	35.47	181	0	Peak
4804	38.09	30	54	-15.91	33.96	8.25	34.12	123	328	Average
4804	48.24	40.15	74	-25.76	33.96	8.25	34.12	123	328	Peak

Remarks:

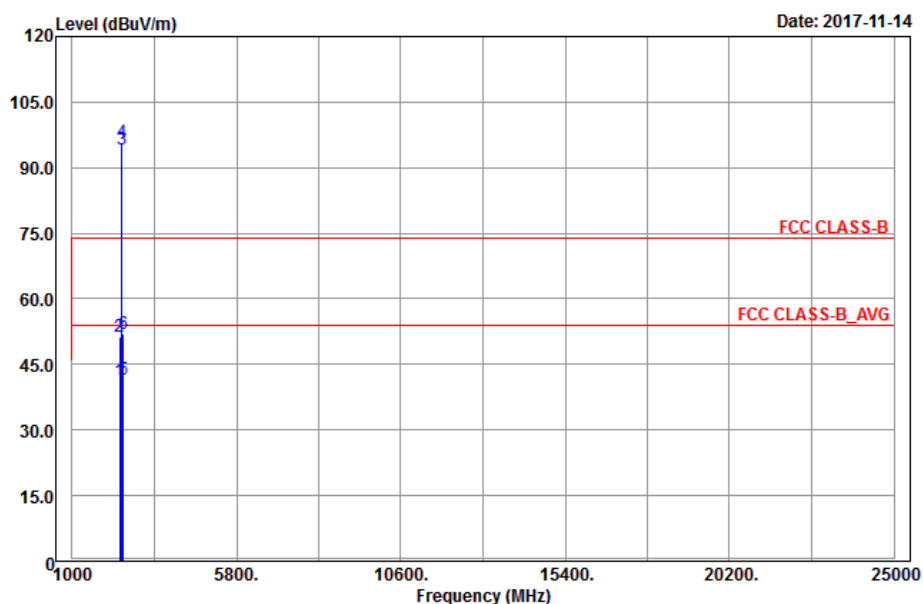
- Emission Level = Read Level + Antenna Factor + Cable Loss - Preamp Factor
Margin value = Emission level – Limit value
- 2402 MHz: Fundamental frequency.

EUT Test Condition		Measurement Detail	
Channel	Channel 19	Frequency Range	1 GHz ~ 25 GHz
Input Power	120 Vac, 60 Hz	Detector Function	Peak (PK) Average (AV)
Environmental Conditions	25 deg. C, 65 % RH	Tested By	Karl Lee

Horizontal



Vertical



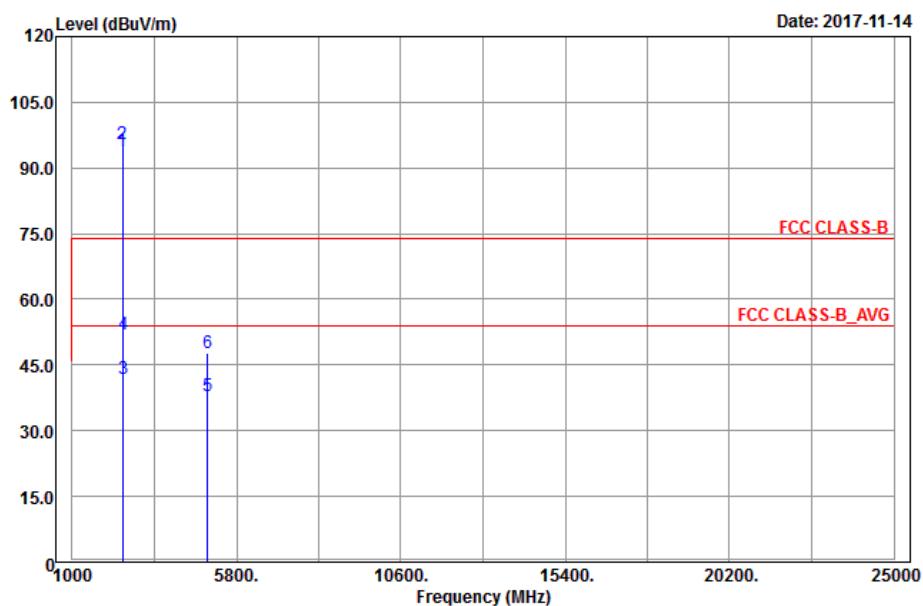
Antennal Polarity & Test Distance: Horizontal at 3 m										
Frequency (MHz)	Emission Level (dBuV/m)	Read Level (dBuV)	Limit (dBuV/m)	Margin (dB)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Antenna Height (cm)	Table Angle (Degree)	Remark
2381.73	41.21	39.52	54	-12.79	31.78	5.4	35.49	218	115	Average
2381.73	51.47	49.78	74	-22.53	31.78	5.4	35.49	218	115	Peak
2440	94.19	92.34			31.85	5.46	35.46	218	115	Average
2440	95.65	93.8			31.85	5.46	35.46	218	115	Peak
2494.24	41.74	39.72	54	-12.26	31.9	5.53	35.41	218	115	Average
2494.24	52.43	50.41	74	-21.57	31.9	5.53	35.41	218	115	Peak
Antennal Polarity & Test Distance: Vertical at 3 m										
Frequency (MHz)	Emission Level (dBuV/m)	Read Level (dBuV)	Limit (dBuV/m)	Margin (dB)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Antenna Height (cm)	Table Angle (Degree)	Remark
2380.56	41.09	39.4	54	-12.91	31.78	5.4	35.49	181	6	Average
2380.56	51.37	49.68	74	-22.63	31.78	5.4	35.49	181	6	Peak
2440	94.17	92.32			31.85	5.46	35.46	181	6	Average
2440	95.64	93.79			31.85	5.46	35.46	181	6	Peak
2488.6	41.67	39.66	54	-12.33	31.9	5.53	35.42	181	6	Average
2488.6	51.97	49.96	74	-22.03	31.9	5.53	35.42	181	6	Peak

Remarks:

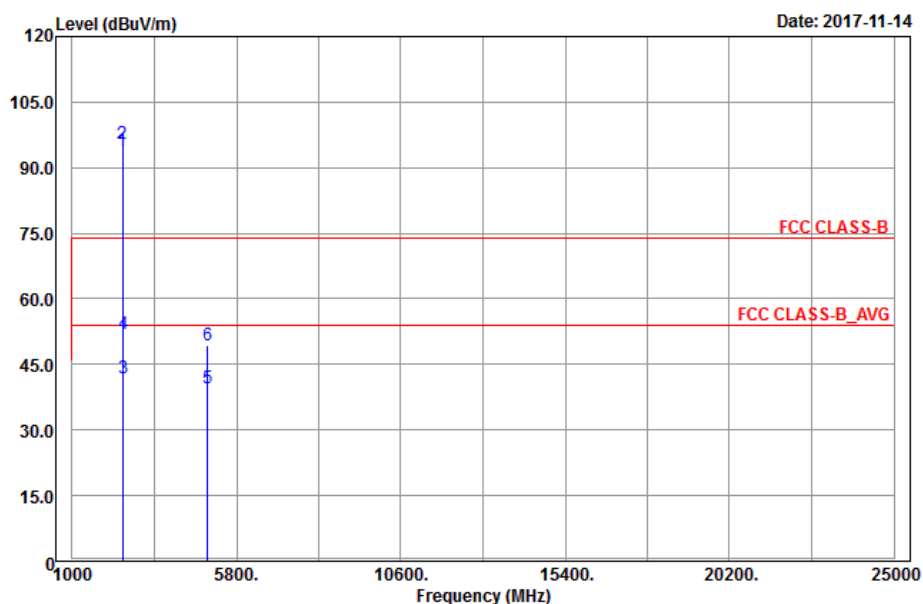
- Emission Level = Read Level + Antenna Factor + Cable Loss - Preamp Factor
Margin value = Emission level – Limit value
- 2440 MHz: Fundamental frequency.

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

Horizontal



Vertical



Antennal Polarity & Test Distance: Horizontal at 3 m										
Frequency (MHz)	Emission Level (dBuV/m)	Read Level (dBuV)	Limit (dBuV/m)	Margin (dB)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Antenna Height (cm)	Table Angle (Degree)	Remark
2480	93.98	92.02			31.88	5.5	35.42	218	115	Average
2480	95.42	93.46			31.88	5.5	35.42	218	115	Peak
2489.48	41.81	39.8	54	-12.19	31.9	5.53	35.42	218	115	Average
2489.48	52.14	50.13	74	-21.86	31.9	5.53	35.42	218	115	Peak
4960	38.06	29.79	54	-15.94	33.99	8.29	34.01	144	127	Average
4960	47.86	39.59	74	-26.14	33.99	8.29	34.01	144	127	Peak
Antennal Polarity & Test Distance: Vertical at 3 m										
Frequency (MHz)	Emission Level (dBuV/m)	Read Level (dBuV)	Limit (dBuV/m)	Margin (dB)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Antenna Height (cm)	Table Angle (Degree)	Remark
2480	93.9	91.94			31.88	5.5	35.42	181	6	Average
2480	95.34	93.38			31.88	5.5	35.42	181	6	Peak
2483.76	41.81	39.85	54	-12.19	31.88	5.5	35.42	181	6	Average
2483.76	51.86	49.9	74	-22.14	31.88	5.5	35.42	181	6	Peak
4960	39.57	31.3	54	-14.43	33.99	8.29	34.01	142	178	Average
4960	49.25	40.98	74	-24.75	33.99	8.29	34.01	142	178	Peak

Remarks:

- Emission Level = Read Level + Antenna Factor + Cable Loss - Preamp Factor
Margin value = Emission level – Limit value
- 2480 MHz: Fundamental frequency.

9 kHz ~ 30 MHz Data:

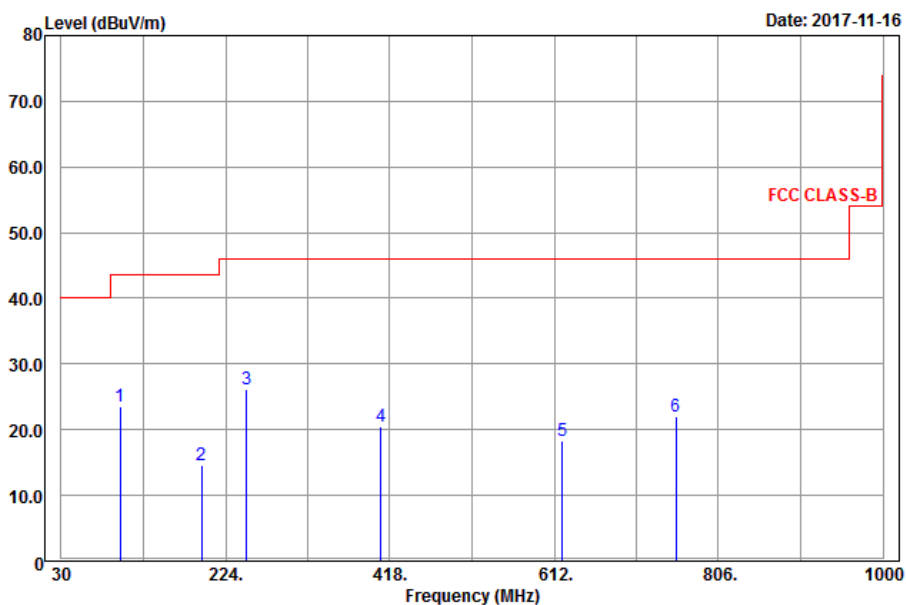
The amplitude of spurious emissions attenuated more than 20 dB below the permissible value is not required to be report.

30 MHz ~ 1 GHz Worst-Case Data:

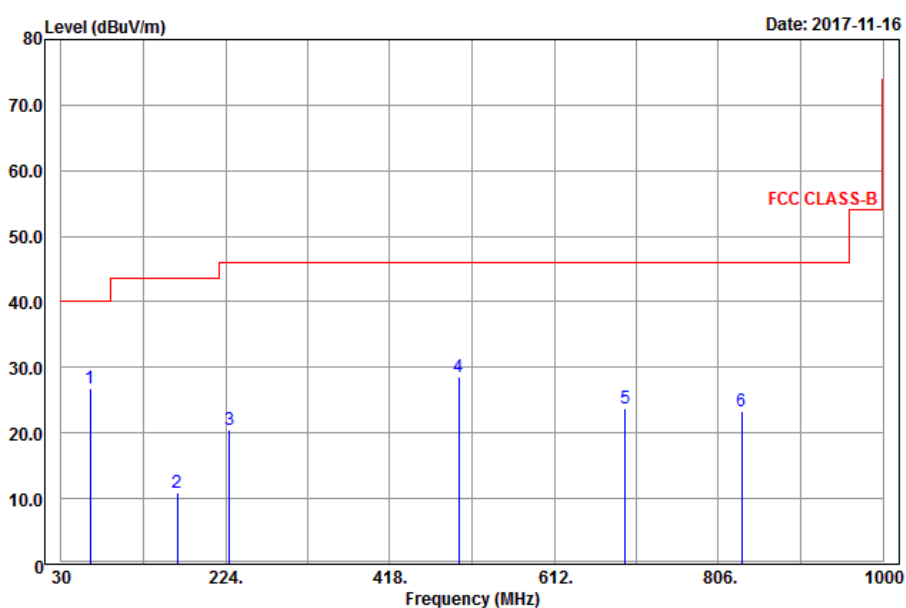
Mode A

EUT Test Condition		Measurement Detail	
Channel	Channel 19	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



Antennal Polarity & Test Distance: Horizontal at 3 m										
Frequency (MHz)	Emission Level (dBuV/m)	Read Level (dBuV)	Limit (dBuV/m)	Margin (dB)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Antenna Height (cm)	Table Angle (Degree)	Remark
99.93	23.63	42.33	43.5	-19.87	12.28	1.28	32.26	124	161	Peak
196.05	14.54	34.24	43.5	-28.96	10.97	1.61	32.28	196	5	Peak
248.7	26.16	44.13	46	-19.84	12.28	1.85	32.1	127	101	Peak
407.8	20.53	35.25	46	-25.47	15.08	2.41	32.21	150	143	Peak
622	18.3	29.39	46	-27.7	18.15	2.93	32.17	181	147	Peak
755.7	22.03	31.08	46	-23.97	19.87	3.22	32.14	198	360	Peak
Antennal Polarity & Test Distance: Vertical at 3 m										
Frequency (MHz)	Emission Level (dBuV/m)	Read Level (dBuV)	Limit (dBuV/m)	Margin (dB)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Antenna Height (cm)	Table Angle (Degree)	Remark
64.29	26.72	45.7	40	-13.28	12.35	0.9	32.23	187	200	Peak
166.89	10.88	32.62	43.5	-32.62	8.99	1.52	32.25	166	205	Peak
228.72	20.53	39.14	46	-25.47	11.72	1.85	32.18	187	117	Peak
499.5	28.45	41.57	46	-17.55	16.35	2.63	32.1	135	36	Peak
696.2	23.84	33.64	46	-22.16	19.18	3.11	32.09	191	160	Peak
833.4	23.26	30.95	46	-22.74	20.81	3.38	31.88	124	206	Peak

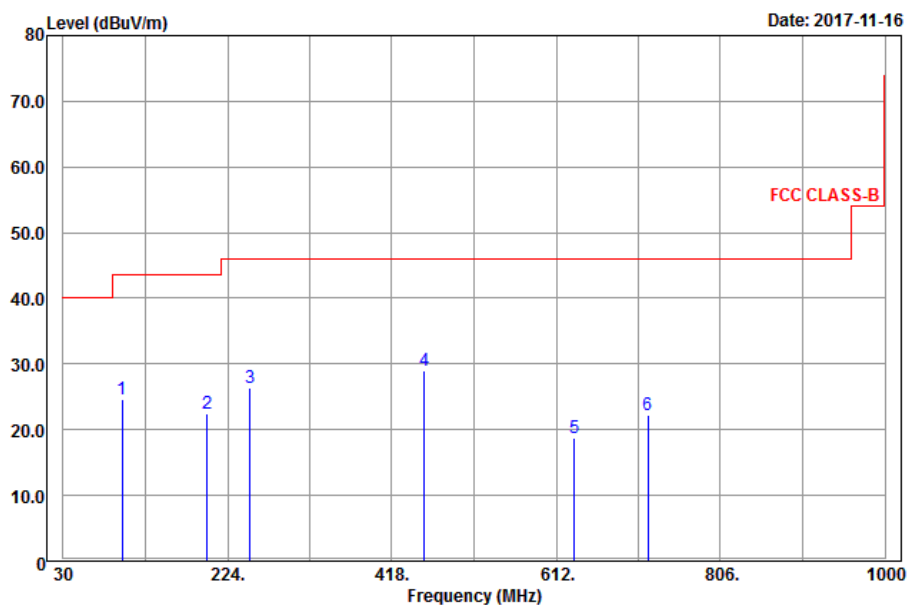
Remarks:

- Emission Level = Read Level + Antenna Factor + Cable Loss - Preamp Factor
Margin value = Emission level – Limit value

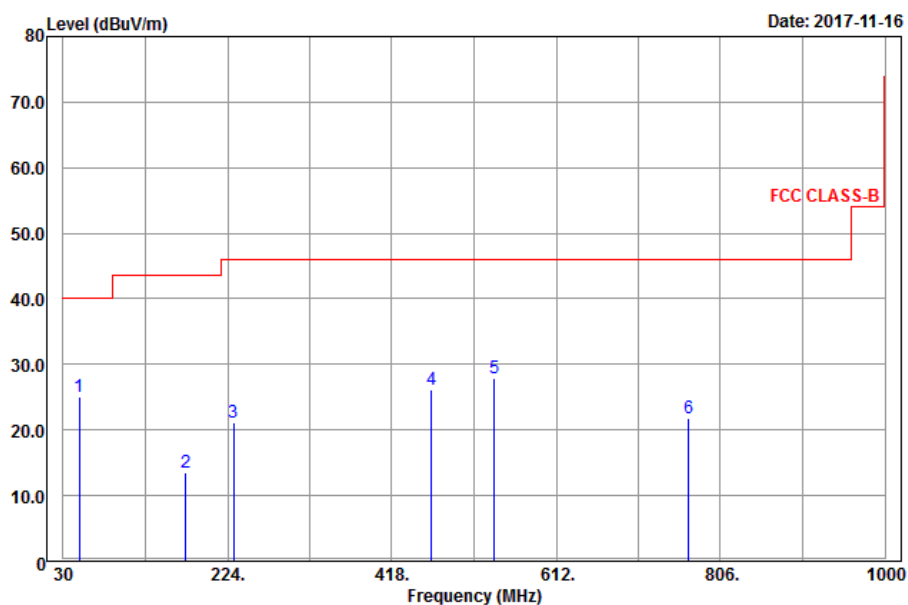
Mode B

EUT Test Condition		Measurement Detail	
Channel	Channel 19	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



Antennal Polarity & Test Distance: Horizontal at 3 m										
Frequency (MHz)	Emission Level (dBuV/m)	Read Level (dBuV)	Limit (dBuV/m)	Margin (dB)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Antenna Height (cm)	Table Angle (Degree)	Remark
99.93	24.68	43.38	43.5	-18.82	12.28	1.28	32.26	183	66	Peak
200.1	22.47	42.04	43.5	-21.03	11.08	1.65	32.3	110	187	Peak
250.32	26.34	44.27	46	-19.66	12.32	1.85	32.1	124	136	Peak
456.8	28.98	42.96	46	-17.02	15.67	2.49	32.14	156	88	Peak
633.2	18.77	29.76	46	-27.23	18.24	2.93	32.16	124	243	Peak
720	22.19	31.63	46	-23.81	19.51	3.16	32.11	159	192	Peak
Antennal Polarity & Test Distance: Vertical at 3 m										
Frequency (MHz)	Emission Level (dBuV/m)	Read Level (dBuV)	Limit (dBuV/m)	Margin (dB)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Antenna Height (cm)	Table Angle (Degree)	Remark
49.17	25.09	41.86	40	-14.91	14.55	0.9	32.22	125	250	Peak
174.45	13.42	34.67	43.5	-30.08	9.38	1.61	32.24	134	156	Peak
231.15	21.06	39.59	46	-24.94	11.79	1.85	32.17	117	192	Peak
464.5	26.12	39.89	46	-19.88	15.8	2.56	32.13	115	195	Peak
538.7	28	40.57	46	-18	16.85	2.76	32.18	175	155	Peak
768.3	21.84	30.73	46	-24.16	20	3.22	32.11	105	253	Peak

Remarks:

- Emission Level = Read Level + Antenna Factor + Cable Loss - Preamp Factor
Margin value = Emission level – Limit value

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	ESCS 30	100288	Aug. 17, 2017	Aug. 16, 2018
RF signal cable (with 10dB PAD) Woken	5D-FB	Cable-cond1-01	Sep. 05, 2017	Sep. 04, 2018
LISN/AMN ROHDE & SCHWARZ (EUT)	ESH3-Z5	835239/001	Mar. 10, 2017	Mar. 09, 2018
LISN/AMN ROHDE & SCHWARZ (Peripheral)	ENV216	101196	Apr. 20, 2017	Apr. 19, 2018
Software ADT	BV ADT_Cond_ V7.3.7.3	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 1.
 3. The VCCI Site Registration No. is C-2040.

4.2.3 Test Procedures

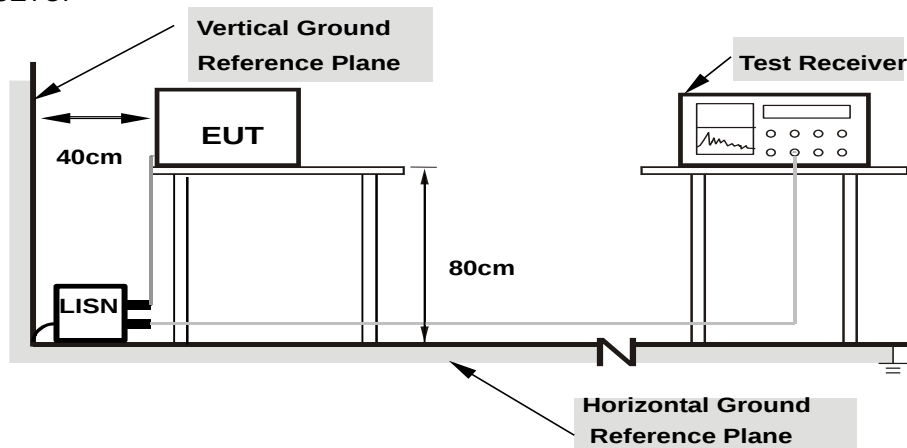
- The EUT was placed 0.4 meters from the conducting wall of the shielded room with EUT being connected to the power mains through a line impedance stabilization network (LISN). Other support units were connected to the power mains through another LISN. The two LISNs provide 50 ohm/50 uH of coupling impedance 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: All modes of operation were investigated and the worst-case emissions are reported.

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

CONDUCTED WORST-CASE DATA

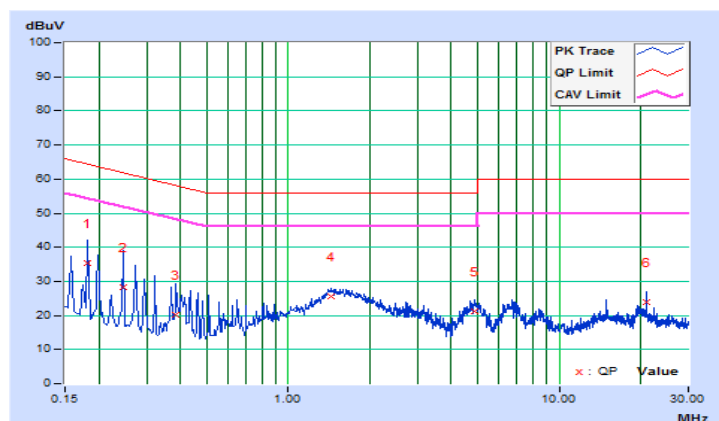
Mode A

Frequency Range	150kHz ~ 30MHz	Detector Function & Resolution Bandwidth	Quasi-Peak (QP) / Average (AV), 9kHz
Input Power	120Vac, 60Hz	Environmental Conditions	25°C, 65%RH
Tested by	Getaz Yang	Test Date	2017/11/20

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	0.18200	10.39	24.88	3.60	35.27	13.99	64.39	54.39	-29.12	-40.40
2	0.24600	10.40	17.96	2.00	28.36	12.40	61.89	51.89	-33.53	-39.49
3	0.38623	10.41	9.79	6.25	20.20	16.66	58.14	48.14	-37.94	-31.48
4	1.44570	10.44	15.24	12.95	25.68	23.39	56.00	46.00	-30.32	-22.61
5	4.88200	10.60	10.77	7.31	21.37	17.91	56.00	46.00	-34.63	-28.09
6	21.01400	11.39	12.47	8.59	23.86	19.98	60.00	50.00	-36.14	-30.02

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

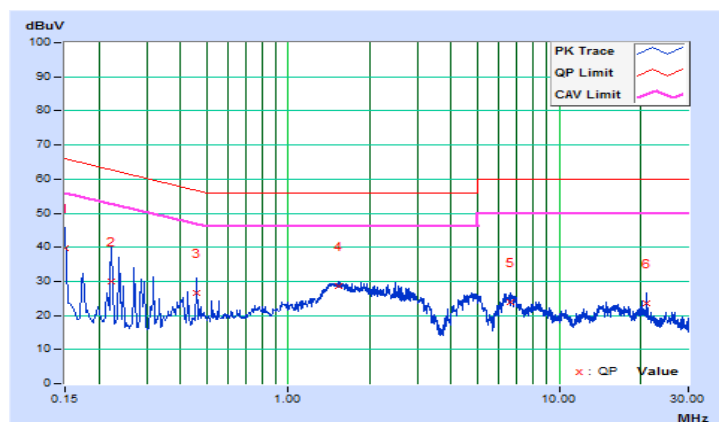


Frequency Range	150kHz ~ 30MHz	Detector Function & Resolution Bandwidth	Quasi-Peak (QP) / Average (AV), 9kHz
Input Power	120Vac, 60Hz	Environmental Conditions	25°C, 65%RH
Tested by	Getaz Yang	Test Date	2017/11/20

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	0.15000	10.15	29.51	7.47	39.66	17.62	66.00	56.00	-26.34	-38.38
2	0.22200	10.16	19.93	2.13	30.09	12.29	62.74	52.74	-32.65	-40.45
3	0.45800	10.17	16.52	3.67	26.69	13.84	56.73	46.73	-30.04	-32.89
4	1.54200	10.22	18.24	14.49	28.46	24.71	56.00	46.00	-27.54	-21.29
5	6.60600	10.44	13.63	7.68	24.07	18.12	60.00	50.00	-35.93	-31.88
6	21.01000	10.99	12.58	8.64	23.57	19.63	60.00	50.00	-36.43	-30.37

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



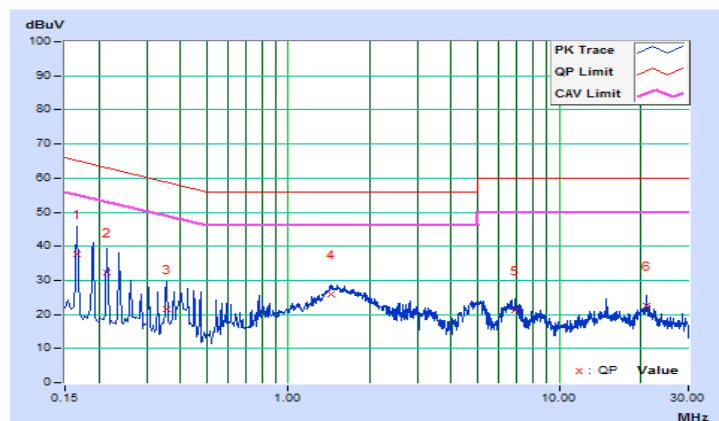
Mode B

Frequency Range	150kHz ~ 30MHz	Detector Function & Resolution Bandwidth	Quasi-Peak (QP) / Average (AV), 9kHz
Input Power	120Vac, 60Hz	Environmental Conditions	25°C, 65%RH
Tested by	Getaz Yang	Test Date	2017/11/20

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	0.16600	10.39	27.30	5.28	37.69	15.67	65.16	55.16	-27.47	-39.49
2	0.21400	10.39	21.78	2.10	32.17	12.49	63.05	53.05	-30.88	-40.56
3	0.35407	10.40	11.16	-0.10	21.56	10.30	58.87	48.87	-37.31	-38.57
4	1.44189	10.44	15.44	13.12	25.88	23.56	56.00	46.00	-30.12	-22.44
5	6.85000	10.70	10.41	6.65	21.11	17.35	60.00	50.00	-38.89	-32.65
6	20.99800	11.39	11.22	6.58	22.61	17.97	60.00	50.00	-37.39	-32.03

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

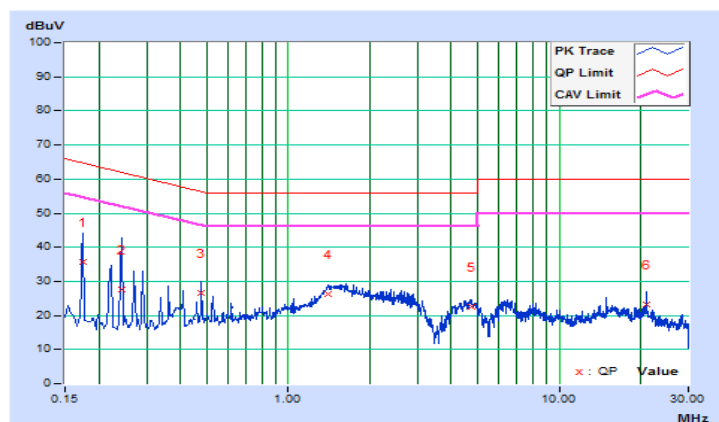


Frequency Range	150kHz ~ 30MHz	Detector Function & Resolution Bandwidth	Quasi-Peak (QP) / Average (AV), 9kHz
Input Power	120Vac, 60Hz	Environmental Conditions	25°C, 65%RH
Tested by	Getaz Yang	Test Date	2017/11/20

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	0.17400	10.16	25.51	3.85	35.67	14.01	64.77	54.77	-29.10	-40.76
2	0.24200	10.16	17.41	1.01	27.57	11.17	62.03	52.03	-34.46	-40.86
3	0.47800	10.17	16.38	3.22	26.55	13.39	56.37	46.37	-29.82	-32.98
4	1.40600	10.21	16.08	14.43	26.29	24.64	56.00	46.00	-29.71	-21.36
5	4.72600	10.36	12.16	9.91	22.52	20.27	56.00	46.00	-33.48	-25.73
6	20.98600	10.99	12.10	8.04	23.09	19.03	60.00	50.00	-36.91	-30.97

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



5 Pictures of Test Arrangements

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

Appendix – Information on 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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Fax: 886-2-26051924

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

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