

Partial FCC Test Report

Report No.: RF160526C29-2

FCC ID: PPD-AR5B22

Test Model: AR5B22

Received Date: May 26, 2016

Test Date: Jun. 02, 2016 ~ Jun. 16, 2016

Issued Date: Jun. 24, 2016

Applicant: Qualcomm Atheros, Inc.

Address: 1700 Technology Drive, San Jose, CA95110

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

Lab Address: No. 47-2, 14th Ling, Chia Pau Vil., Lin Kou Dist., New Taipei City, Taiwan
(R.O.C)

Test Location (1): No. 19, Hwa Ya 2nd Rd, Wen Hwa Tsuen, Kwei Shan Hsiang, Taoyuan
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



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Release Control Record

Issue No.	Description	Date Issued
RF160526C29-2	Original Release	Jun. 24, 2016

1 Certificate of Conformity

Product: PCIE 802.11a/b/g/n 2.4GHz/5GHz+USB BT 4.0 card

Brand: Atheros

Test Model: AR5B22

Sample Status: Identical Prototype

Applicant: Qualcomm Atheros, Inc.

Test Date: Jun. 02, 2016 ~ Jun. 16, 2016

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:

Jun. 24, 2016

Evonne Liu / Specialist

Approved by :

Stanley Wu

Date:

Jun. 24, 2016

Stanley Wu / Assistant Manager

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 -20.66 dB at 0.15000 MHz.
15.205 & 209	Radiated Emissions	Pass	Meet the requirement of limit. Minimum passing margin is -2.37 dB at 2360 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	Pass	Meet the requirement of limit.
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 and Radiated Emissions, Conducted power were performed for this report. Other testing data is referring to module report (Test Report No.: RF110907E02-2 R1).

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) ($\pm$)
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	PCIE 802.11a/b/g/n 2.4GHz/5GHz+USB BT 4.0 card
Brand	Atheros
Test Model	AR5B22
Status of EUT	Identical Prototype
Power Supply Rating	19.5 Vdc (adapter)
Modulation Type	GFSK
Transfer Rate	1 Mbps
Operating Frequency	2402 ~ 2480 MHz
Number of Channel	40
Output Power	2.547 mW
Antenna Type	Refer to Note as below
Antenna Connector	N/A
Accessory Device	N/A
Data Cable Supplied	N/A

Note:

1. The antenna information is listed as below.

Antenna Type	Brand Name	Parts Number	Antenna Gain (dBi)
			2.4GHz
Dipole	Laird	WLAN Main Antenna: PDV24515-DE1 WLAN Aux Antenna: PDV24515-DE1	Main: 2.9 Aux: 2.9
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

Note: The EUT antenna is a specified antenna: Professional installation antenna. It complies with the standard requirement.

2. 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

3. 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	√	√	√	-	Dipol Antenna
B	√	√	√	-	Momopole 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 **Z-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, 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	0 to 39	19	GFSK	1
B	0 to 39	0	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	0 to 39	19	GFSK	1
B	0 to 39	0	GFSK	1

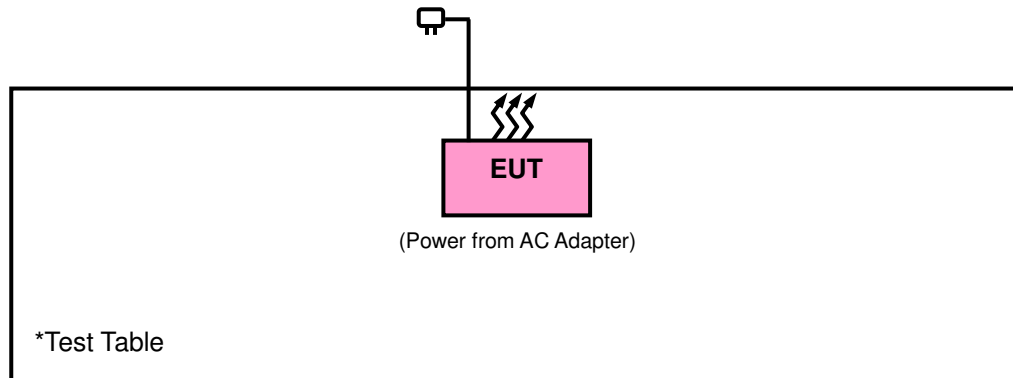
Test Condition:

Applicable To	Environmental Conditions	Input Power	Tested by
RE$\geq$1G	25 deg. C, 65 % RH	120 Vac, 60 Hz	Charles Hsiao
RE<1G	25 deg. C, 65 % RH	120 Vac, 60 Hz	Charles Hsiao
PLC	25 deg. C, 65 % RH	120 Vac, 60 Hz	Toby Tian

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 v03r05

ANSI C63.10-2013

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

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	MY50010135	Jul. 18, 2015	Jul. 17, 2016
Spectrum Analyzer ROHDE & SCHWARZ	FSU43	101261	Dec. 17, 2015	Dec. 16, 2016
BILOG Antenna SCHWARZBECK	VULB9168	9168-472	Jan. 07, 2016	Jan. 06, 2017
HORN Antenna ETS-Lindgren	3117	00143293	Jan. 04, 2016	Jan. 03, 2017
Bluetooth Tester	CBT	100980	Apr. 27, 2015	Apr. 26, 2017
Loop Antenna	EM-6879	269	Jul. 31, 2015	Jul. 30, 2016
Agilent Communications Tester-Wireless	8960 Series 10	MY53201073	Jul. 03, 2015	Jul. 02, 2017
Preamplifier Agilent	310N	187226	Jun. 29, 2015	Jun. 28, 2016
Preamplifier Agilent	83017A	MY39501357	Jun. 29, 2015	Jun. 28, 2016
Power Meter Anritsu	ML2495A	1232002	Sep. 21, 2015	Sep. 20, 2016
Power Sensor Anritsu	MA2411B	1207325	Sep. 21, 2015	Sep. 20, 2016
RF signal cable ETS-LINDGREN	5D-FB	Cable-CH1-01(R FC-SMS-100-SM S-120+RFC-SMS -100-SMS-400)	Jun. 27, 2015	Jun. 26, 2016
RF signal cable ETS-LINDGREN	8D-FB	Cable-CH1-02(R FC-SMS-100-SM S-24)	Jun. 27, 2015	Jun. 26, 2016
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 1 GHz if tested.
4. The FCC Site Registration No. is 149147.
5. 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:

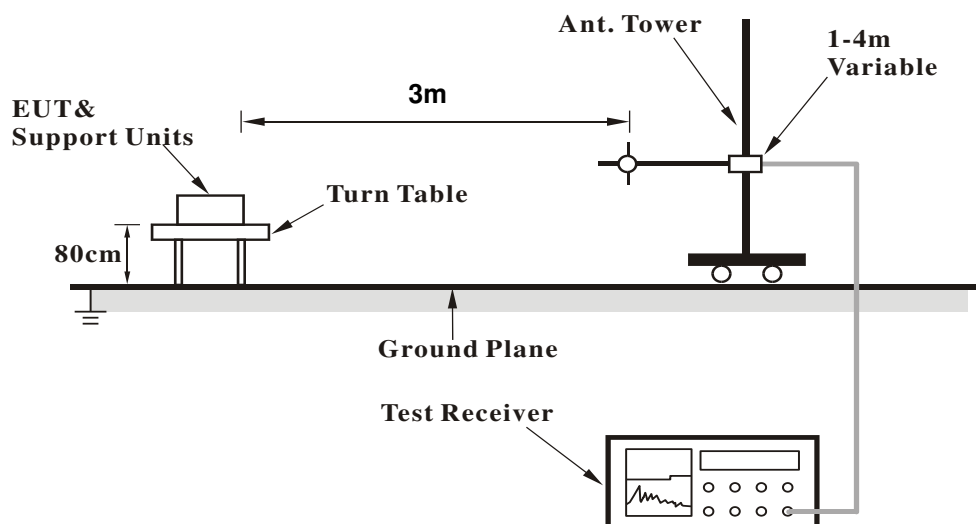
1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120 kHz for Quasi-peak detection (QP) at frequency below 1 GHz.
2. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is 3 MHz for Peak detection (PK) at frequency above 1 GHz.
3. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is 3 MHz for RMS Average (Duty cycle < 98 %) for Average detection (AV) at frequency above 1 GHz, then the measurement results was added to a correction factor ($10 \log(1/\text{duty cycle})$).
4. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is 10 Hz (Duty cycle $\geq 98 \%$) 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

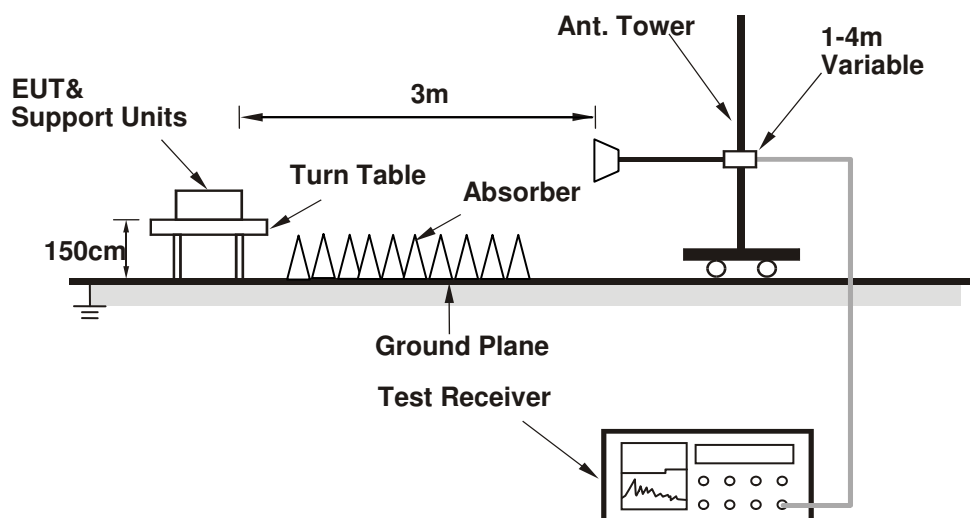
No deviation.

4.1.5 Test Set Up

<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.

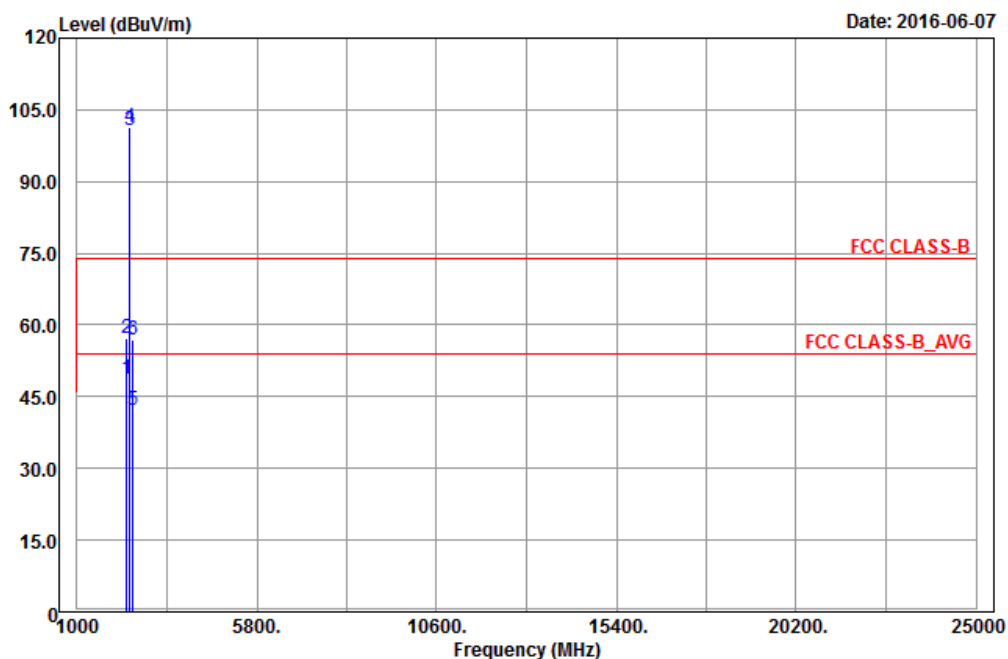
4.1.7 Test Results

ABOVE 1 GHz DATA :

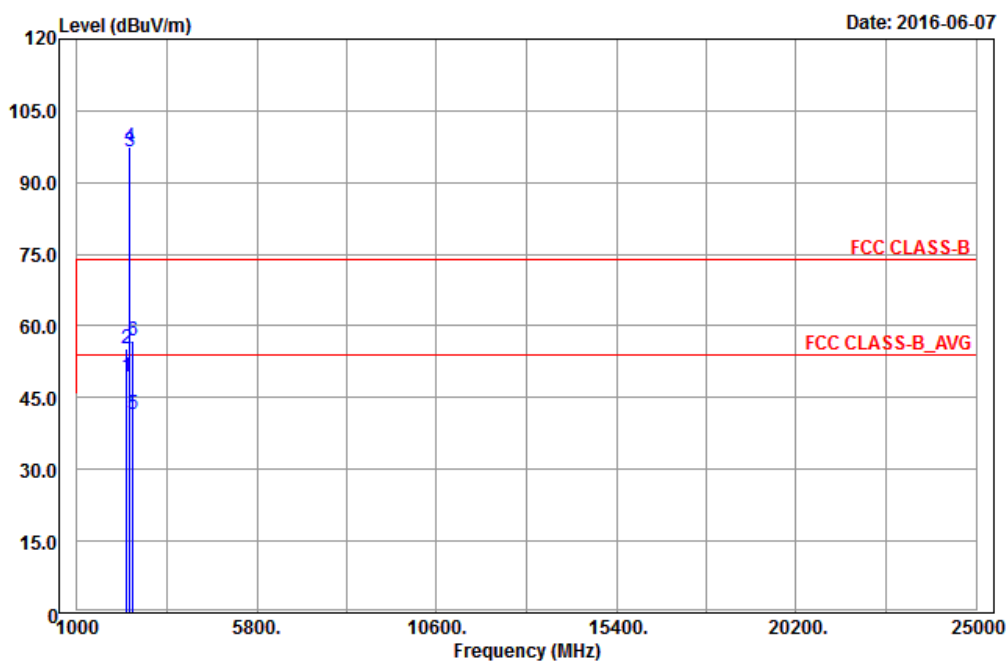
Mode A

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	Charles Hsiao

Horizontal



Vertical



Antenna 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
2322	48.7	47.19	54	-5.3	31.73	5.3	35.52	206	109	Average
2322	57.11	55.6	74	-16.89	31.73	5.3	35.52	206	109	Peak
2402	100.76	99.03			31.8	5.4	35.47	206	109	Average
2402	101.44	99.71			31.8	5.4	35.47	206	109	Peak
2484	42.08	40.12	54	-11.92	31.88	5.5	35.42	206	109	Average
2484	56.79	54.83	74	-17.21	31.88	5.5	35.42	206	109	Peak

Antenna 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
2322	49.48	47.97	54	-4.52	31.73	5.3	35.52	101	119	Average
2322	55.1	53.59	74	-18.9	31.73	5.3	35.52	101	119	Peak
2402	96.5	94.77			31.8	5.4	35.47	117	119	Average
2402	97.43	95.7			31.8	5.4	35.47	117	119	Peak
2492	41.63	39.61	54	-12.37	31.9	5.53	35.41	117	119	Average
2492	56.96	54.94	74	-17.04	31.9	5.53	35.41	117	119	Peak

Remarks:

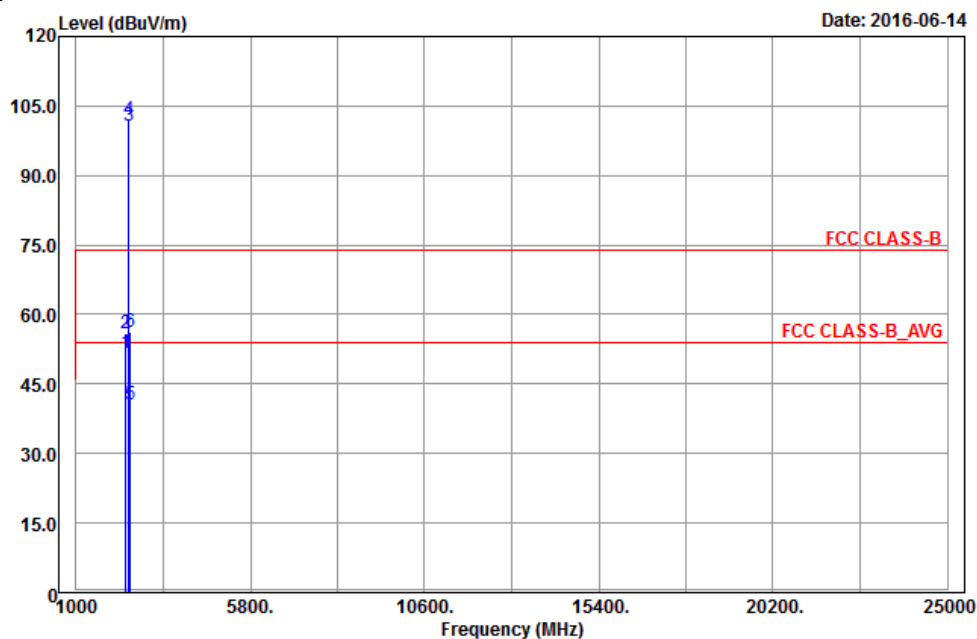
1. Emission Level = Read Level + Antenna Factor + Cable Loss - Preamp Factor

Margin Value = Emission Level – Limit value

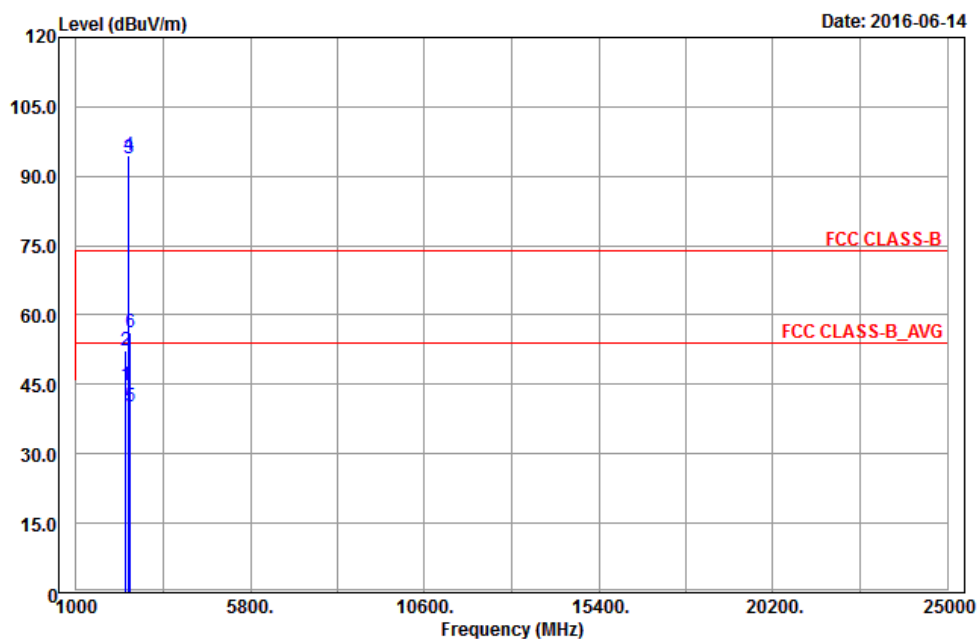
2. 2402 MHz: Fundamental Frequency

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	Charles Hsiao

Horizontal



Vertical



Antenna 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
2360	51.75	50.12	54	-2.25	31.76	5.37	35.5	257	120	Average
2360	55.82	54.19	74	-18.18	31.76	5.37	35.5	257	120	Peak
2440	100.56	98.71			31.85	5.46	35.46	223	120	Average
2440	101.94	100.09			31.85	5.46	35.46	223	120	Peak
2486	40.41	38.42	54	-13.59	31.88	5.53	35.42	223	120	Average
2486	56.21	54.22	74	-17.79	31.88	5.53	35.42	223	120	Peak

Antenna 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
2361	44.83	43.2	54	-9.17	31.76	5.37	35.5	103	148	Average
2361	52.41	50.78	74	-21.59	31.76	5.37	35.5	103	148	Peak
2440	93.74	91.89			31.85	5.46	35.46	100	53	Average
2440	94.4	92.55			31.85	5.46	35.46	100	53	Peak
2492	40.38	38.36	54	-13.62	31.9	5.53	35.41	100	53	Average
2492	56.21	54.19	74	-17.79	31.9	5.53	35.41	100	53	Peak

Remarks:

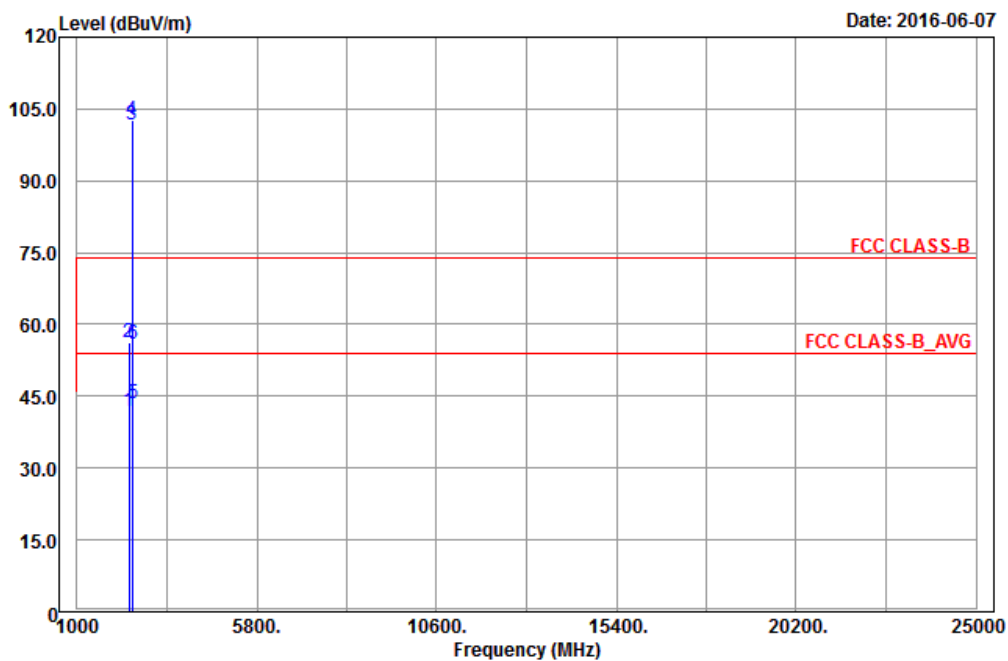
1. Emission Level = Read Level + Antenna Factor + Cable Loss - Preamp Factor

Margin Value = Emission Level – Limit value

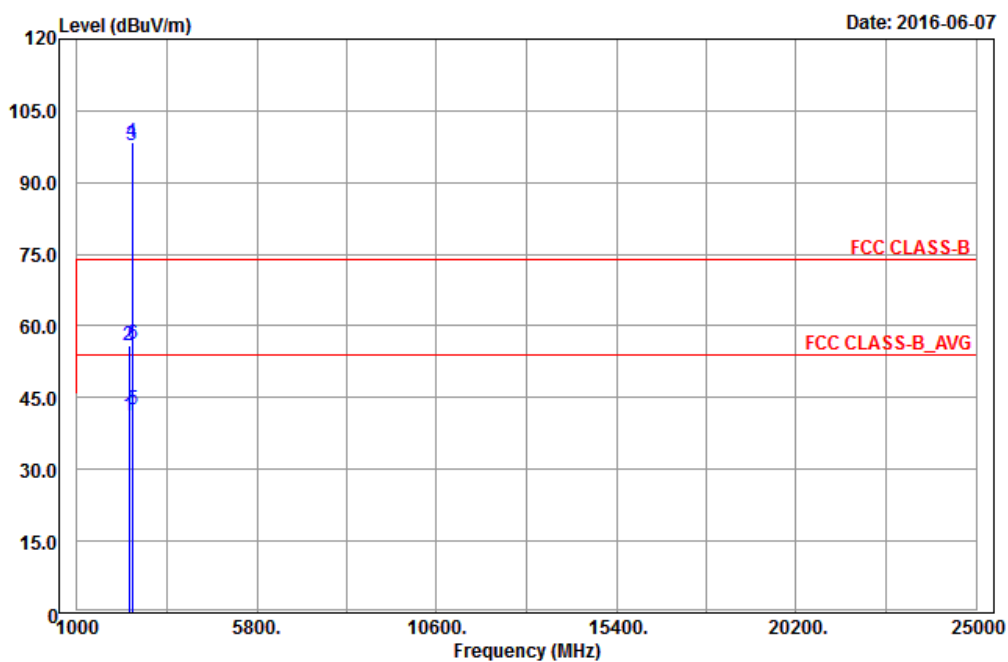
2. 2440 MHz: Fundamental Frequency

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	Charles Hsiao

Horizontal



Vertical



Antenna 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	41.88	40.19	54	-12.12	31.78	5.4	35.49	200	109	Average
2382	56.4	54.71	74	-17.6	31.78	5.4	35.49	200	109	Peak
2480	101.57	99.61			31.88	5.5	35.42	200	109	Average
2480	102.74	100.78			31.88	5.5	35.42	200	109	Peak
2490	43.43	41.42	54	-10.57	31.9	5.53	35.42	200	109	Average
2490	55.98	53.97	74	-18.02	31.9	5.53	35.42	200	109	Peak

Antenna 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	41.26	39.6	54	-12.74	31.78	5.37	35.49	114	119	Average
2378	55.82	54.16	74	-18.18	31.78	5.37	35.49	114	119	Peak
2480	97.74	95.78			31.88	5.5	35.42	114	119	Average
2480	98.51	96.55			31.88	5.5	35.42	114	119	Peak
2492	42.49	40.47	54	-11.51	31.9	5.53	35.41	114	119	Average
2492	56.26	54.24	74	-17.74	31.9	5.53	35.41	114	119	Peak

Remarks:

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

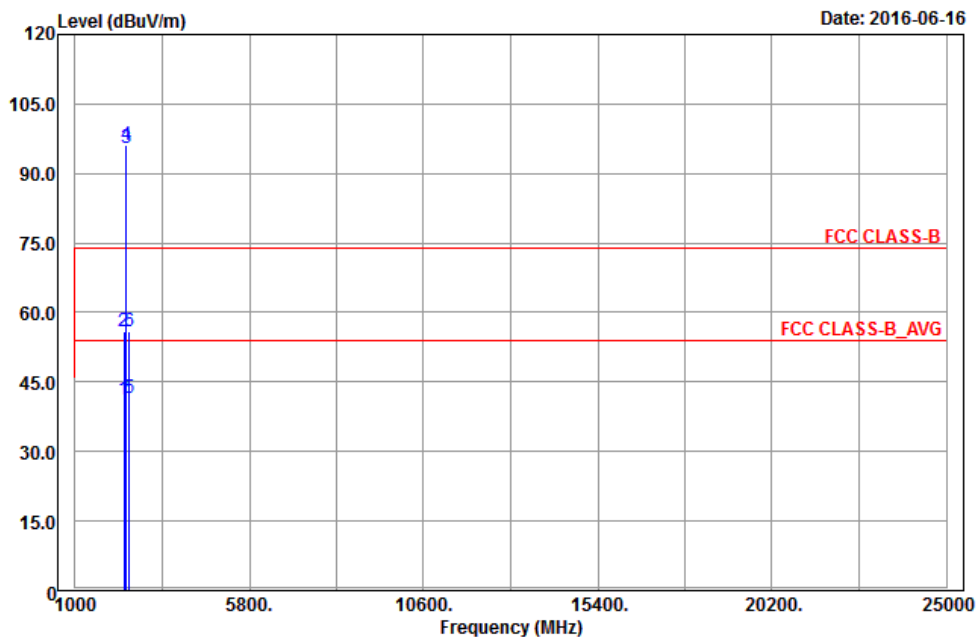
Margin Value = Emission Level – Limit value

2. 2480 MHz: Fundamental Frequency

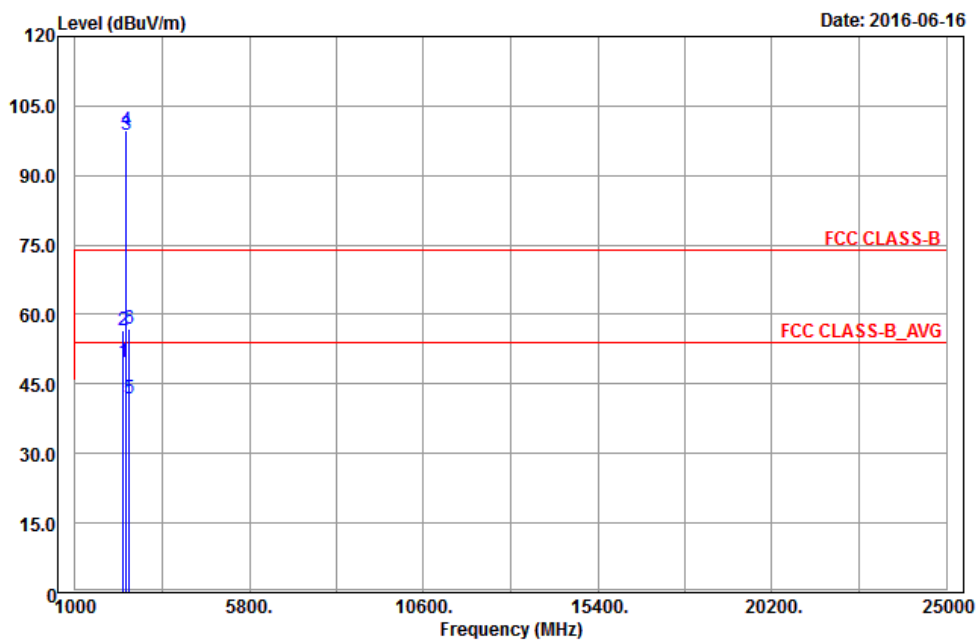
Mode B

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	Charles Hsiao

Horizontal



Vertical



Antenna 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
2354	41.09	39.5	54	-12.91	31.76	5.33	35.5	104	25	Average
2354	55.91	54.32	74	-18.09	31.76	5.33	35.5	104	25	Peak
2402	95.32	93.59			31.8	5.4	35.47	104	25	Average
2402	96.24	94.51			31.8	5.4	35.47	104	25	Peak
2498	41.51	39.49	54	-12.49	31.9	5.53	35.41	104	25	Average
2498	56.06	54.04	74	-17.94	31.9	5.53	35.41	104	25	Peak

Antenna 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
2322	49.86	48.35	54	-4.14	31.73	5.3	35.52	144	0	Average
2322	56.58	55.07	74	-17.42	31.73	5.3	35.52	144	0	Peak
2402	98.86	97.13			31.8	5.4	35.47	144	0	Average
2402	99.74	98.01			31.8	5.4	35.47	144	0	Peak
2484	41.77	39.81	54	-12.23	31.88	5.5	35.42	144	0	Average
2484	56.84	54.88	74	-17.16	31.88	5.5	35.42	144	0	Peak

Remarks:

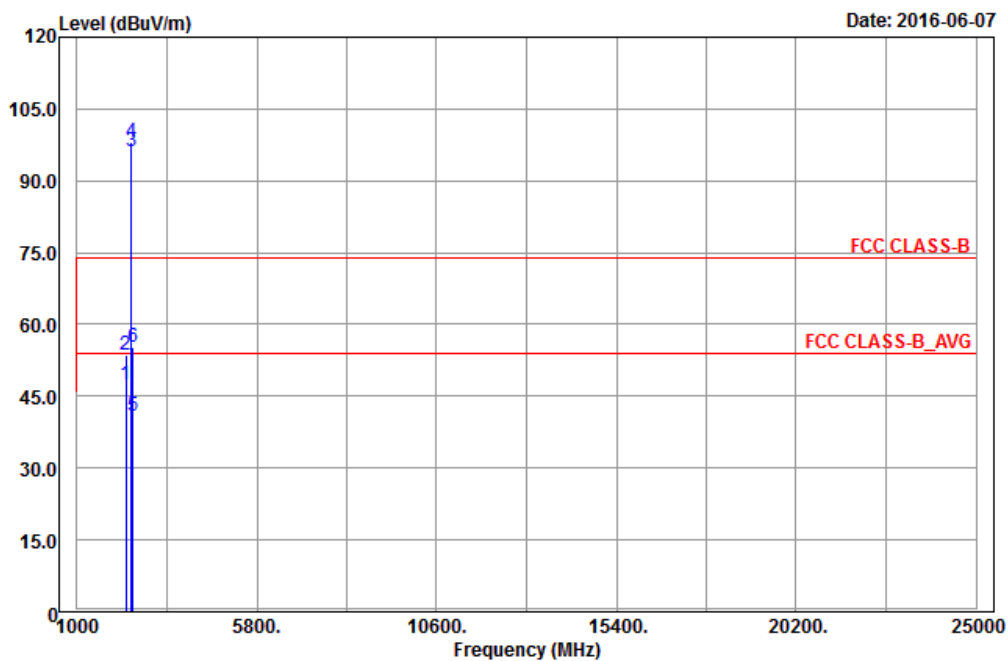
1. Emission Level = Read Level + Antenna Factor + Cable Loss - Preamp Factor

Margin Value = Emission Level – Limit value

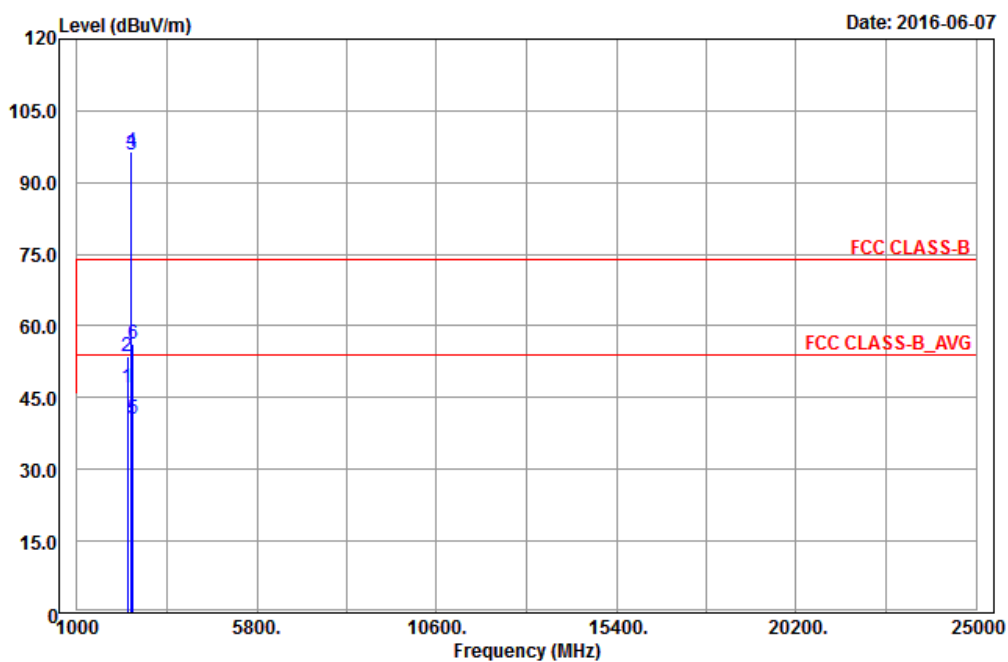
2. 2402 MHz: Fundamental Frequency

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	Charles Hsiao

Horizontal



Vertical



Antenna 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
2310	47.43	45.95	54	-6.57	31.71	5.3	35.53	168	8	Average
2310	53.6	52.12	74	-20.4	31.71	5.3	35.53	168	8	Peak
2440	96.24	94.39			31.85	5.46	35.46	165	8	Average
2440	97.93	96.08			31.85	5.46	35.46	165	8	Peak
2498	40.73	38.71	54	-13.27	31.9	5.53	35.41	165	8	Average
2498	55.1	53.08	74	-18.9	31.9	5.53	35.41	165	8	Peak

Antenna 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
2336	47.17	45.62	54	-6.83	31.74	5.33	35.52	243	152	Average
2336	53.65	52.1	74	-20.35	31.74	5.33	35.52	243	152	Peak
2440	95.79	93.94			31.85	5.46	35.46	192	152	Average
2440	96.3	94.45			31.85	5.46	35.46	192	152	Peak
2496	40.49	38.47	54	-13.51	31.9	5.53	35.41	192	152	Average
2496	56.2	54.18	74	-17.8	31.9	5.53	35.41	192	152	Peak

Remarks:

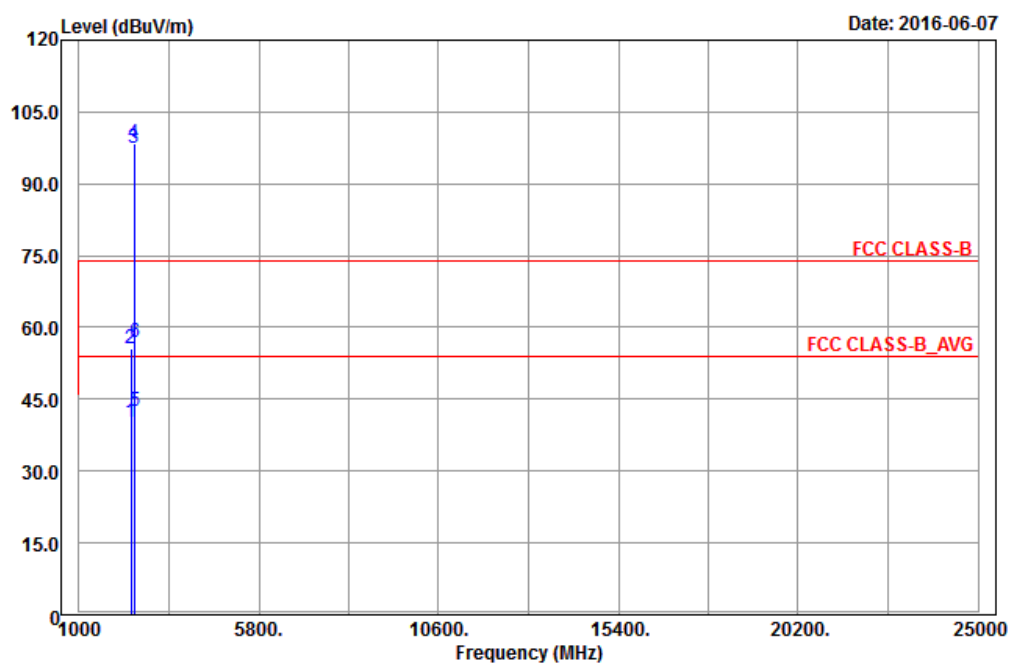
1. Emission Level = Read Level + Antenna Factor + Cable Loss - Preamp Factor

Margin Value = Emission Level – Limit value

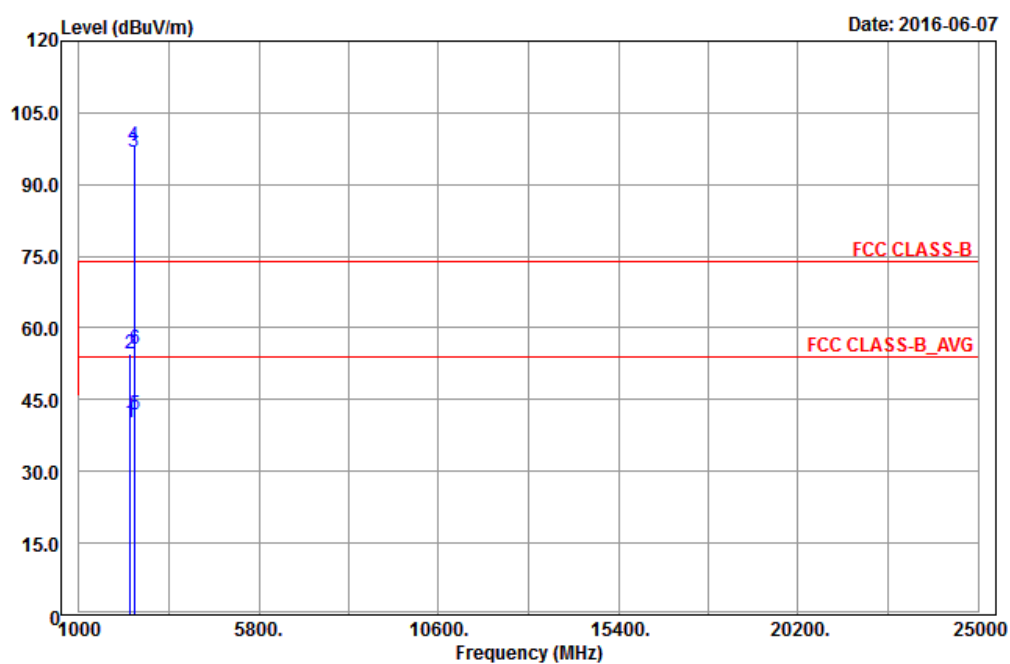
2. 2440 MHz: Fundamental Frequency

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	Charles Hsiao

Horizontal



Vertical



Antenna 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
2386	40.34	38.63	54	-13.66	31.8	5.4	35.49	196	8	Average
2386	55.68	53.97	74	-18.32	31.8	5.4	35.49	196	8	Peak
2480	97.38	95.42			31.88	5.5	35.42	196	8	Average
2480	98.3	96.34			31.88	5.5	35.42	196	8	Peak
2484	42.38	40.42	54	-11.62	31.88	5.5	35.42	196	8	Average
2484	57.01	55.05	74	-16.99	31.88	5.5	35.42	196	8	Peak

Antenna 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
2372	40.2	38.54	54	-13.8	31.78	5.37	35.49	273	152	Average
2372	54.74	53.08	74	-19.26	31.78	5.37	35.49	273	152	Peak
2480	96.82	94.86			31.88	5.5	35.42	273	152	Average
2480	97.95	95.99			31.88	5.5	35.42	273	152	Peak
2500	41.88	39.86	54	-12.12	31.9	5.53	35.41	273	152	Average
2500	55.52	53.5	74	-18.48	31.9	5.53	35.41	273	152	Peak

Remarks:

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

Margin Value = Emission Level – Limit value

2. 2480 MHz: Fundamental Frequency

9 kHz ~ 30 MHz DATA:

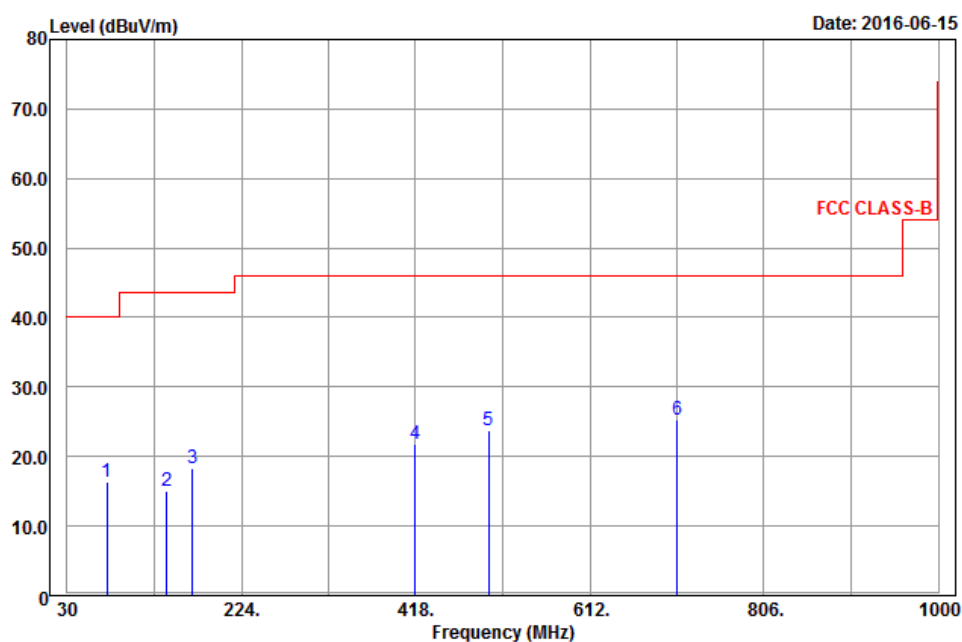
The amplitude of spurious emissions attenuated more than 20 dB below the permissible value is not required to be report.

30 MHz ~ 1 GHz WORST-CASE DATA:

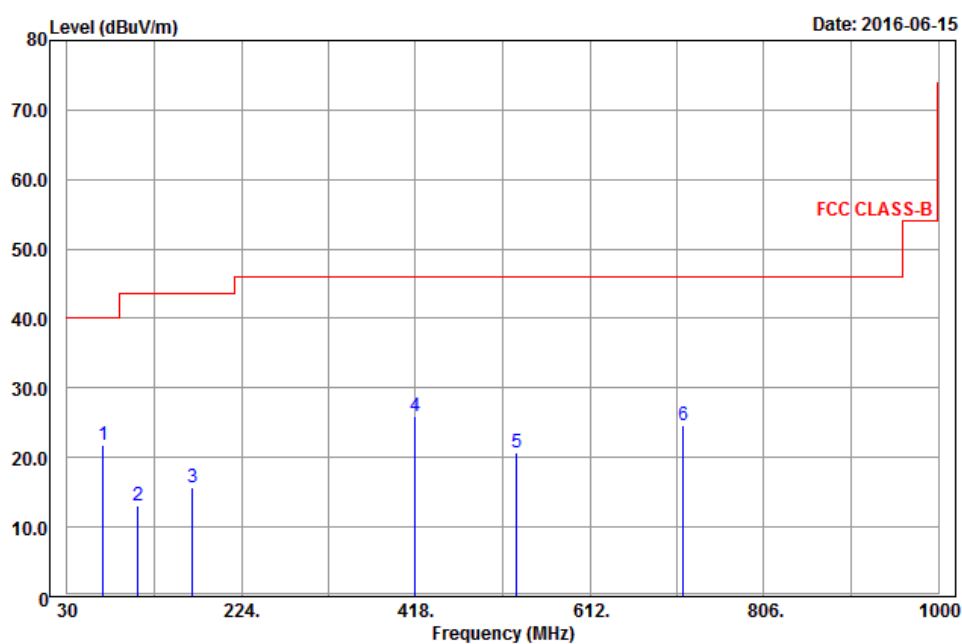
Mode A

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	Charles Hsiao

Horizontal



Vertical



Antenna 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
74.01	16.32	39.21	40	-23.68	8.22	1.11	32.22	111	216	Peak
141.24	15.04	36.51	43.5	-28.46	9.42	1.38	32.27	124	150	Peak
169.86	18.25	38.97	43.5	-25.25	10	1.52	32.24	199	10	Peak
417.6	21.75	33.73	46	-24.25	17.81	2.41	32.2	159	15	Peak
499.5	23.79	34.26	46	-22.21	19	2.63	32.1	136	336	Peak
709.5	25.26	31.02	46	-20.74	23.23	3.11	32.1	180	163	Peak

Antenna 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
70.23	21.89	44.89	40	-18.11	8.11	1.11	32.22	170	177	Peak
108.84	12.97	34.5	43.5	-30.53	9.44	1.28	32.25	147	125	Peak
169.32	15.75	36.4	43.5	-27.75	10.07	1.52	32.24	169	333	Peak
417.6	25.96	37.94	46	-20.04	17.81	2.41	32.2	176	259	Peak
530.3	20.72	29.57	46	-25.28	20.61	2.7	32.16	150	305	Peak
715.8	24.66	30.39	46	-21.34	23.27	3.11	32.11	143	27	Peak

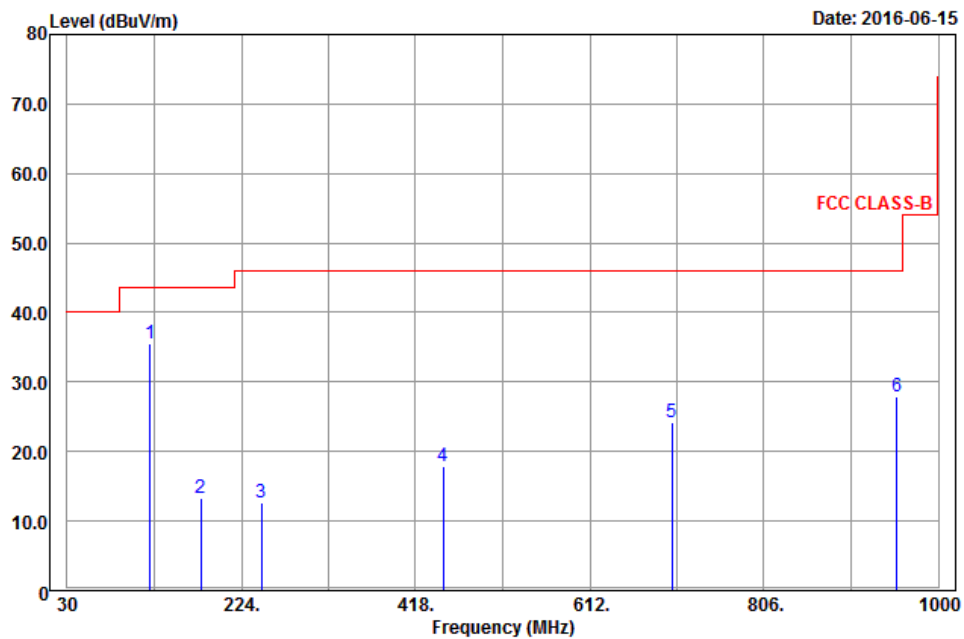
Remarks:

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

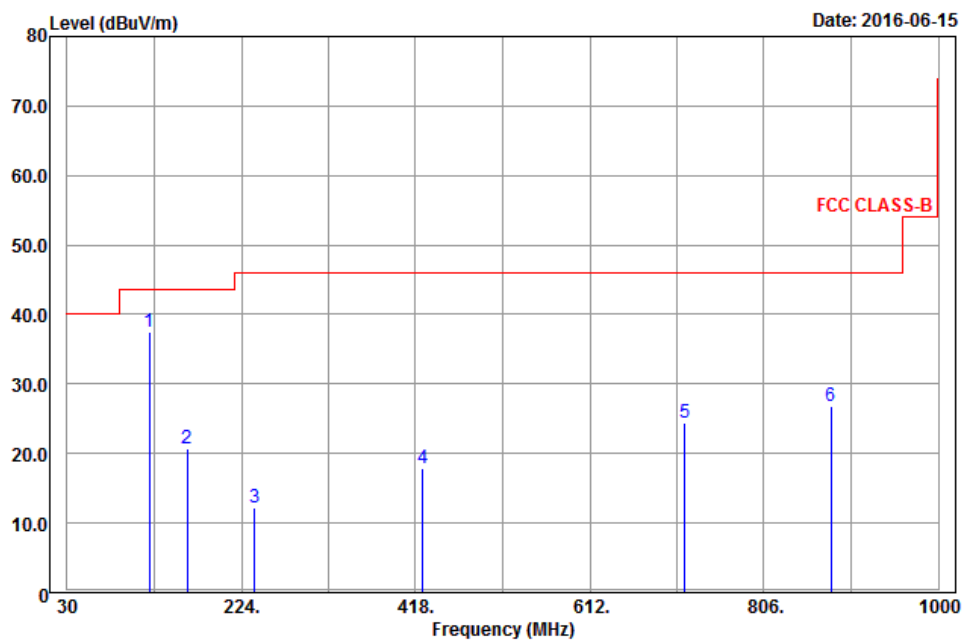
Mode B

EUT Test Condition		Measurement Detail	
Channel	Channel 0	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	Charles Hsiao

Horizontal



Vertical



Antenna 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
122.61	35.52	57.55	43.5	-7.98	8.83	1.38	32.24	108	177	Peak
179.04	13.27	33.54	43.5	-30.23	10.36	1.61	32.24	169	133	Peak
246.27	12.59	30.02	46	-33.41	12.83	1.85	32.11	157	124	Peak
449.1	17.82	29.48	46	-28.18	18	2.49	32.15	139	182	Peak
703.2	24.19	30.03	46	-21.81	23.14	3.11	32.09	175	154	Peak
953.8	27.99	29.25	46	-18.01	26.12	3.67	31.05	136	109	Peak

Antenna 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
121.26	37.47	59.57	43.5	-6.03	8.77	1.38	32.25	147	134	Peak
163.65	20.71	40.94	43.5	-22.79	10.51	1.52	32.26	128	196	Peak
238.71	12.18	29.99	46	-33.82	12.48	1.85	32.14	152	114	Peak
426	17.96	30	46	-28.04	17.73	2.41	32.18	136	128	Peak
717.9	24.32	30.01	46	-21.68	23.31	3.11	32.11	155	164	Peak
881	26.84	30.11	46	-19.16	24.84	3.49	31.6	127	144	Peak

Remarks:

1. 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

4.2.2 Test Instruments

Description & Manufacturer	Model No.	Serial No.	Date Of Calibration	Due Date Of Calibration
Test Receiver ROHDE & SCHWARZ	ESCI	100613	Nov. 16, 2015	Nov. 15, 2016
RF signal cable (with 10dB PAD) Woken	5D-FB	Cable-cond1-01	Dec. 26, 2015	Dec. 25, 2016
LISN ROHDE & SCHWARZ (EUT)	ESH3-Z5	835239/001	Feb. 26, 2016	Feb. 25, 2017
LISN ROHDE & SCHWARZ (Peripheral)	ESH3-Z5	100311	Jul. 24, 2015	Jul. 23, 2016
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

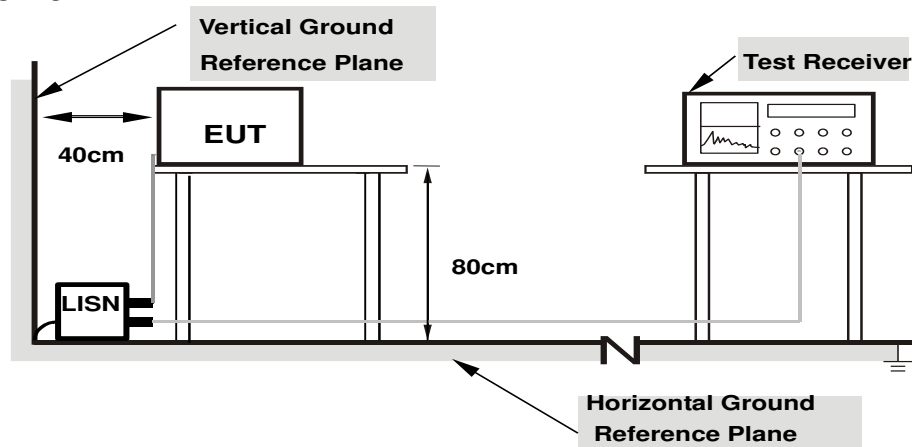
- The EUT was placed 0.4 meters from the conducting wall of the shielded room with EUT being connected to the power mains through a line impedance stabilization network (LISN). Other support units were connected to the power mains through another LISN. The two LISNs provide 50 ohm/50 uH of coupling impedance 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

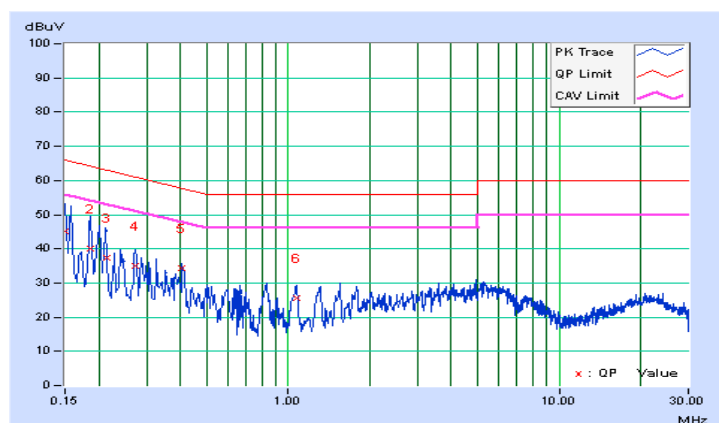
Mode A

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	Toby Tian	Test Date	2016/6/9

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	0.15000	10.01	35.27	18.26	45.28	28.27	66.00	56.00	-20.72	-27.73
2	0.18519	10.03	30.01	12.85	40.04	22.88	64.25	54.25	-24.21	-31.37
3	0.21282	10.04	27.43	13.27	37.47	23.31	63.09	53.09	-25.63	-29.79
4	0.27120	10.06	24.93	10.09	34.99	20.15	61.08	51.08	-26.09	-30.93
5	0.40415	10.12	24.13	12.48	34.25	22.60	57.77	47.77	-23.52	-25.17
6	1.07591	10.21	15.36	7.80	25.57	18.01	56.00	46.00	-30.43	-27.99

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

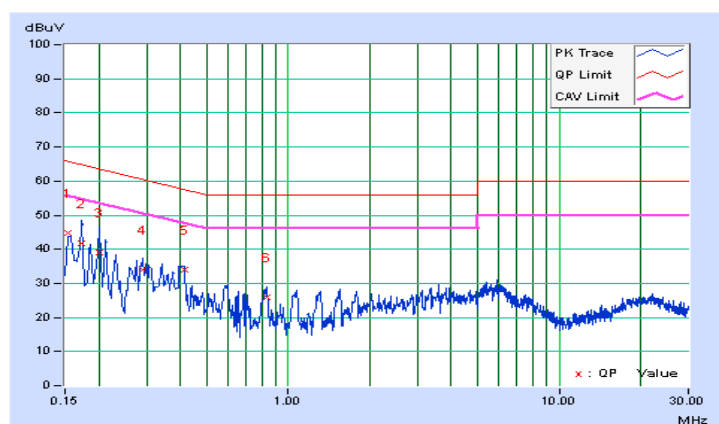


Frequency Range	150kHz ~ 30MHz	Detector Function & Resolution Bandwidth	Quasi-Peak (QP) / Average (AV), 9kHz
Input Power	120Vac, 60Hz	Environmental Conditions	25°C, 65%RH
Tested by	Toby Tian	Test Date	2016/6/9

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	0.15391	10.03	34.76	16.95	44.79	26.98	65.79	55.79	-21.00	-28.81
2	0.17346	10.03	31.72	12.88	41.75	22.91	64.79	54.79	-23.04	-31.88
3	0.20084	10.04	29.13	17.28	39.17	27.32	63.58	53.58	-24.41	-26.26
4	0.29043	10.08	23.87	9.70	33.95	19.78	60.51	50.51	-26.56	-30.73
5	0.41197	10.13	23.96	12.79	34.09	22.92	57.61	47.61	-23.52	-24.69
6	0.83325	10.19	15.62	7.99	25.81	18.18	56.00	46.00	-30.19	-27.82

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



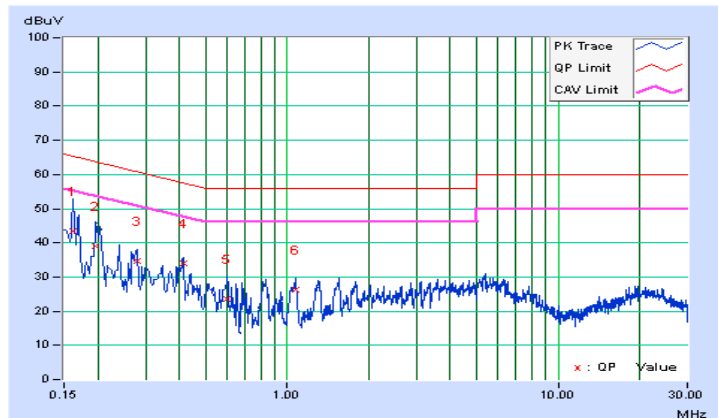
Mode B

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	Toby Tian	Test Date	2016/6/9

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	0.16173	10.02	33.47	15.68	43.49	25.70	65.37	55.37	-21.89	-29.68
2	0.19692	10.03	29.03	15.88	39.06	25.91	63.74	53.74	-24.68	-27.83
3	0.27903	10.07	24.63	10.34	34.70	20.41	60.84	50.84	-26.15	-30.44
4	0.41233	10.12	23.82	11.81	33.94	21.93	57.60	47.60	-23.66	-25.67
5	0.59943	10.15	13.34	5.98	23.49	16.13	56.00	46.00	-32.51	-29.87
6	1.07308	10.21	15.97	8.49	26.18	18.70	56.00	46.00	-29.82	-27.30

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

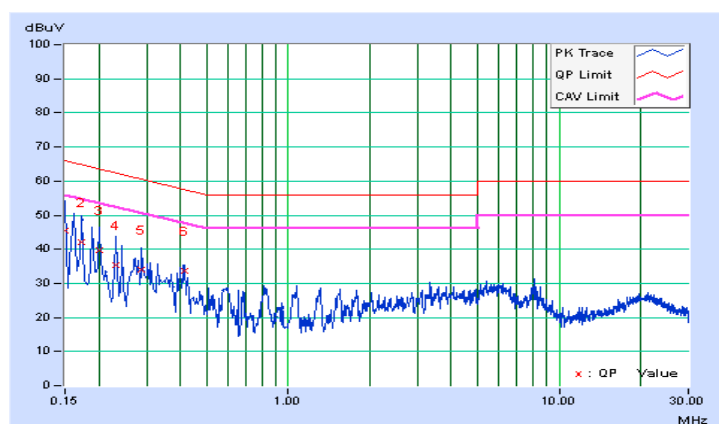


Frequency Range	150kHz ~ 30MHz	Detector Function & Resolution Bandwidth	Quasi-Peak (QP) / Average (AV), 9kHz
Input Power	120Vac, 60Hz	Environmental Conditions	25°C, 65%RH
Tested by	Toby Tian	Test Date	2016/6/9

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	10.03	35.31	18.04	45.34	28.07	66.00	56.00	-20.66	-27.93
2	0.17346	10.03	31.89	12.98	41.92	23.01	64.79	54.79	-22.87	-31.78
3	0.20084	10.04	29.83	17.93	39.87	27.97	63.58	53.58	-23.71	-25.61
4	0.23216	10.05	25.30	10.07	35.35	20.12	62.37	52.37	-27.02	-32.25
5	0.28685	10.08	23.81	9.50	33.89	19.58	60.62	50.62	-26.73	-31.04
6	0.41197	10.13	23.58	11.79	33.71	21.92	57.61	47.61	-23.90	-25.69

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

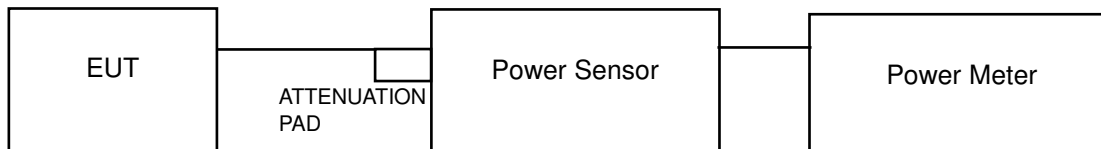


4.3 Conducted Output Power Measurement

4.3.1 Limits of Conducted Output Power Measurement

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

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 Procedures

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

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

Channel	Frequency (MHz)	Peak Power (mW)	Peak Power (dBm)	Limit (dBm)	Pass / Fail
0	2402	2.178	3.38	30	Pass
19	2440	2.455	3.9	30	Pass
39	2480	2.547	4.06	30	Pass

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 accredited and approved according to ISO/IEC 17025.

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

Linko EMC/RF Lab

Tel: 886-2-26052180

Fax: 886-2-26051924

Hsin Chu EMC/RF/Telecom Lab

Tel: 886-3-6668565

Fax: 886-3-6668323

Hwa Ya EMC/RF/Safety

Tel: 886-3-3183232

Fax: 886-3-3270892

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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