

Partial FCC Test Report

Report No.: RF151109C30

FCC ID: VPYLB1EN

Test Model: LBEE5ZZ1EN

Received Date: Nov. 09, 2015

Test Date: Nov. 18, 2015 ~ Nov. 21, 2015

Issued Date: Dec. 07, 2015

Applicant: Murata Manufacturing Co., Ltd.

Address: 10-1, Higashikotari 1-chome, Nagaokakyo-shi, Kyoto 617-8555, Japan

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.



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Release Control Record

| Issue No. | Description | Date Issued |
|-------------|------------------|---------------|
| RF151109C30 | Original Release | Dec. 07, 2015 |

1 Certificate of Conformity

Product: Communication Module

Brand: Murata

Test Model: LBEE5ZZ1EN

Sample Status: Identical Prototype

Applicant: Murata Manufacturing Co., Ltd.

Test Date: Nov. 18, 2015 ~ Nov. 21, 2015

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 :

Vera Huang

Date:

Dec. 07, 2015

Vera Huang / Specialist

Approved by :

Stanley Wu

Date:

Dec. 07, 2015

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 -18.51 dB at 0.16569 MHz. |
| 15.205 / 15.209 / 15.247(d) | Radiated Emissions and Band Edge Measurement | Pass | Meet the requirement of limit. Minimum passing margin is -1.16 dB at 2390 MHz. |
| 15.247(d) | Antenna Port Emission | N/A | Refer to Note ad below. |
| 15.247(a)(2) | 6 dB Bandwidth | N/A | Refer to Note ad below. |
| 15.247(b) | Conducted power | N/A | Refer to Note ad below. |
| 15.247(e) | Power Spectral Density | N/A | Refer to Note ad below. |
| 15.203 | Antenna Requirement | N/A | Refer to Note ad below. |

Note: Only test items for AC Power Conducted Emission and Radiated Emissions and Band Edge Measurement were performed for this report. Refer to module (Model: LBEE5ZZ1EN, FCC ID: VPYLB1EN) Report No.: 10689818H-A-R2 for other testing data.

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) (±) |
|------------------------------------|-------------------|--------------------------------|
| Conducted Emissions at mains ports | 150 kHz ~ 30 MHz | 2.44 dB |
| Radiated Emissions up to 1 GHz | 30 MHz ~ 200 MHz | 2.93 dB |
| | 200 MHz ~1000 MHz | 2.95 dB |
| Radiated Emissions above 1 GHz | 1 GHz ~ 18 GHz | 2.26 dB |
| | 18 GHz ~ 40 GHz | 1.94 dB |

2.2 Modification Record

There were no modifications required for compliance.

3 General Information

3.1 General Description of EUT

| | | |
|------------------------------|--|---------------|
| Product | Communication Module | |
| Brand | Murata | |
| Test Model | LBEE5ZZ1EN | |
| Power Supply Rating | 19.5 Vdc (adapter) | |
| Modulation Type | CCK, DQPSK, DBPSK for DSSS 64QAM, 16QAM, QPSK, BPSK for OFDM | |
| Modulation Technology | DSSS, OFDM | |
| Transfer Rate | 802.11b: 11.0 / 5.5 / 2.0 / 1.0 Mbps 802.11g: 54.0 / 48.0 / 36.0 / 24.0 / 18.0 / 12.0 / 9.0 / 6.0 Mbps 802.11n: up to MCS7 | |
| Operating Frequency | 2412 ~ 2462 MHz | |
| Number of Channel | 11 for 802.11b, 802.11g, 802.11n (HT20) | |
| Antenna Type | Antenna 1 (Monopole Antenna) | 2.52 dBi gain |
| | Antenna 2 (Dipole Antenna) | 3.5 dBi gain |
| Antenna Connector | N/A | |
| Accessory Device | Refer to Note as below | |
| Data Cable Supplied | Refer to Note as below | |

Note:

- The EUT incorporates a MIMO function. Physically, the EUT provides two completed transmitters and two receivers.

| Modulation Mode | TX Function |
|-----------------|-------------|
| 802.11b | 1TX |
| 802.11g | 1TX |
| 802.11n (HT20) | 2TX |

- The EUT contains following accessory devices.

| Product | Brand | Model | Description |
|---------------------------------|---------|------------------|---|
| Adapter | DELL | HK65NM130 | I/P: 100-240Vac, 50-60Hz, 1.7A O/P: 19.5Vdc, 3.34A |
| Platform | DELL | N01G | -- |
| Antenna 1 (Monopole Antenna) | taoglas | MA761.B.B1CG.014 | Pantheon Antenna 4in1 MA761 |
| Antenna 2 (Dipole Antenna) | Laird | PVD24515-DE1 | PCB Dipole Antenna |

- Since the module report was also verified with dipole antenna and the antenna gain was the same as antenna 2 (Brand: Laird). Therefore, only the test data for monopole antenna was presented in the report.
- 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

11 channels are provided for 802.11b, 802.11g and 802.11n (HT20):

| Channel | Frequency (MHz) | Channel | Frequency (MHz) |
|---------|-----------------|---------|-----------------|
| 1 | 2412 | 7 | 2442 |
| 2 | 2417 | 8 | 2447 |
| 3 | 2422 | 9 | 2452 |
| 4 | 2427 | 10 | 2457 |
| 5 | 2432 | 11 | 2462 |
| 6 | 2437 | | |

3.2.1 Test Mode Applicability and Tested Channel Detail

| EUT Configure Mode | Applicable To | | | Description |
|--------------------|---------------|-------|-----|-------------|
| | RE \geq 1G | RE<1G | PLC | |
| A | √ | √ | √ | 1 Tx |
| B | √ | √ | - | 2 Tx |

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

PLC: Power Line Conducted Emission

NOTE: The EUT had been pre-tested on the positioned of each 3 axis. The worst case was found when positioned on **X-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 | Mode | Available Channel | Tested Channel | Modulation Technology | Modulation Type | Data Rate (Mbps) |
|--------------------|----------------|-------------------|----------------|-----------------------|-----------------|------------------|
| A | 802.11b | 1 to 11 | 1, 6, 11 | DSSS | DBPSK | 1.0 |
| A | 802.11g | 1 to 11 | 1, 6, 11 | OFDM | BPSK | 6.0 |
| A, B | 802.11n (HT20) | 1 to 11 | 1, 6, 11 | OFDM | BPSK | MCS0 |

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 | Mode | Available Channel | Tested Channel | Modulation Technology | Modulation Type | Data Rate (Mbps) |
|--------------------|----------------|-------------------|----------------|-----------------------|-----------------|------------------|
| A | 802.11n (HT20) | 1 to 11 | 1 | OFDM | BPSK | MCS0 |
| B | 802.11n (HT20) | 1 to 11 | 11 | OFDM | BPSK | MCS0 |

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 | Mode | Available Channel | Tested Channel | Modulation Technology | Modulation Type | Data Rate (Mbps) |
|--------------------|----------------|-------------------|----------------|-----------------------|-----------------|------------------|
| A | 802.11n (HT20) | 1 to 11 | 1 | OFDM | BPSK | MCS0 |

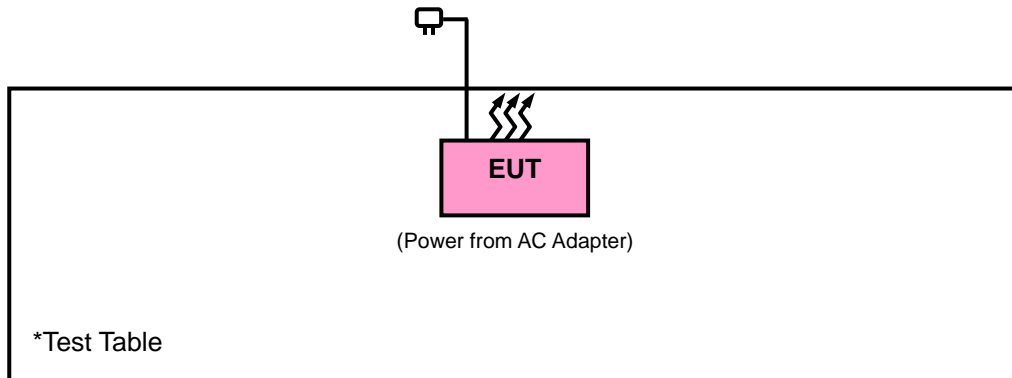
Test Condition:

| Applicable To | Environmental Conditions | Input Power | Tested by |
|---------------|--------------------------|----------------|-----------|
| RE \geq 1G | 25 deg. C, 65 % RH | 120 Vac, 60 Hz | Gavin Wu |
| RE<1G | 25 deg. C, 65 % RH | 120 Vac, 60 Hz | Gavin Wu |
| 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 v03r03

662911 D01 Multiple Transmitter Output v02r01

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 | N9038A | MY51210203 | Jan. 21, 2015 | Jan. 21, 2016 |
| Spectrum Analyzer Agilent | N9010A | MY52220314 | Sep. 03, 2015 | Sep. 02, 2016 |
| BILOG Antenna SCHWARZBECK | VULB9168 | 9168-472 | Feb. 04, 2015 | Feb. 04, 2016 |
| HORN Antenna SCHWARZBECK | BBHA 9120 D | 9120D-969 | Feb. 09, 2015 | Feb. 09, 2016 |
| HORN Antenna SCHWARZBECK | BBHA 9170 | 9170-480 | Feb. 04, 2015 | Feb. 04, 2016 |
| Loop Antenna | EM-6879 | 269 | Jul. 31, 2015 | Jul. 30, 2016 |
| Preamplifier EMCI | EMC 012645 | 980115 | Dec. 12, 2014 | Dec. 11, 2015 |
| Preamplifier EMCI | EMC 184045 | 980116 | Jan. 09, 2015 | Jan. 08, 2016 |
| Preamplifier EMCI | EMC 330H | 980112 | Dec. 27, 2014 | Dec. 26, 2015 |
| RF signal cable HUBER+SUHNNER | SUCOFLEX 104 | 309219/4 2950114 | Oct. 12, 2015 | Oct. 11, 2016 |
| RF signal cable HUBER+SUHNNER | SUCOFLEX 104 | 250130/4 | Oct. 12, 2015 | Oct. 11, 2016 |
| RF Coaxial Cable Worken | 8D-FB | Cable-Ch10-01 | Oct. 12, 2015 | Oct. 11, 2016 |
| Software BV ADT | E3 6.120103 | NA | NA | NA |
| Antenna Tower MF | MFA-440H | NA | NA | NA |
| Turn Table MF | MFT-201SS | 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 HwaYa Chamber 10.

3. The horn antenna and preamplifier (model: EMC 184045) are used only for the measurement of emission frequency above 1 GHz if tested.

4. The FCC Site Registration No. is 690701.

5. The IC Site Registration No. is IC7450F-10.

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:

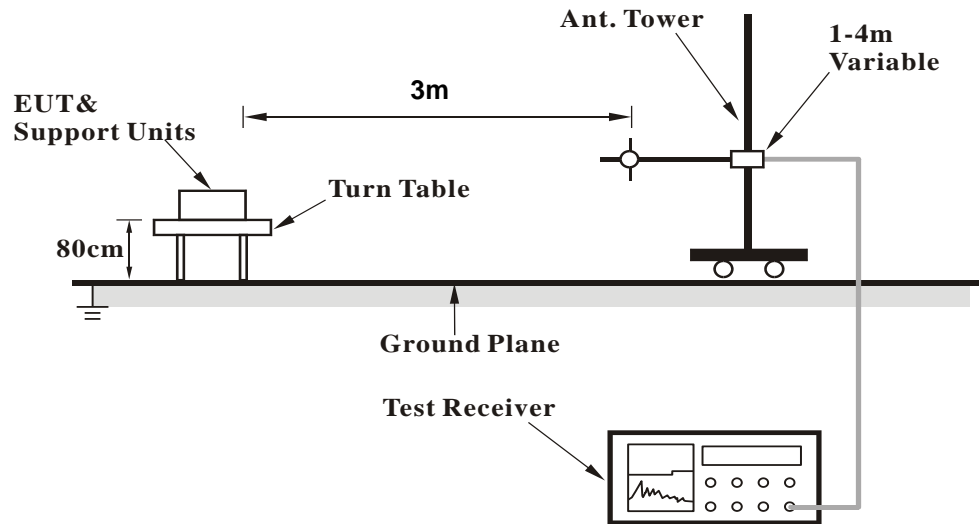
1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120 kHz for Quasi-peak detection (QP) at frequency below 1 GHz.
2. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is 3 MHz for Peak detection (PK) at frequency above 1 GHz.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

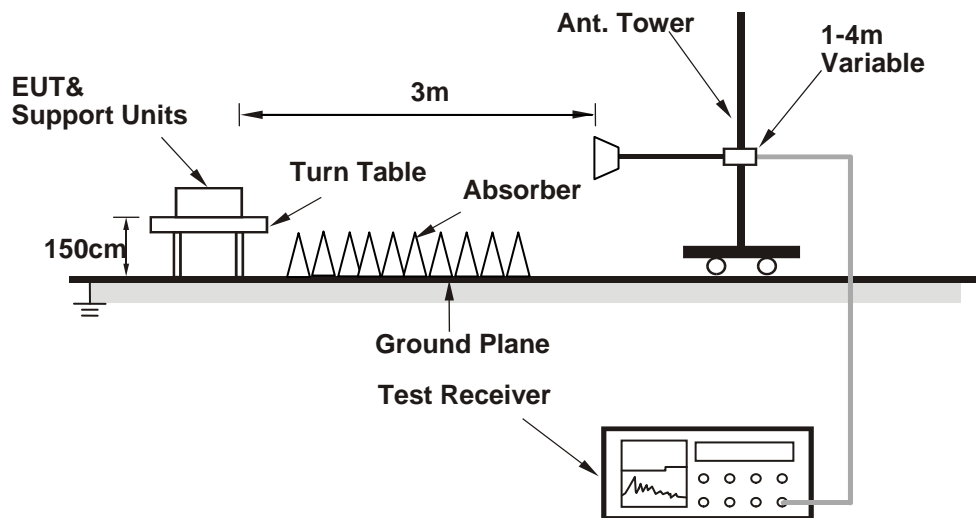
No deviation.

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 a testing table.
- Use the software to control the EUT under transmission condition continuously at specific channel frequency.

4.1.7 Test Results

Mode A

Above 1 GHz Data :

802.11b

| EUT TEST CONDITION | | MEASUREMENT DETAIL | |
|--------------------------|--------------------|--------------------|---------------------------|
| CHANNEL | Channel 1 | 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 | Gavin Wu |

| ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M | | | | | | | | | | |
|---|-------------------------------|-------------------------|-------------------|----------------|-----------------------------|-----------------------|--------------------------|---------------------------|----------------------------|---------|
| FREQ. (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 | 44.27 | 50.78 | 54 | -9.73 | 26.91 | 4.08 | 37.5 | 179 | 216 | Average |
| 2386 | 57.87 | 64.38 | 74 | -16.13 | 26.91 | 4.08 | 37.5 | 179 | 216 | Peak |
| 2412 | 101.86 | 108.33 | | | 26.96 | 4.09 | 37.52 | 179 | 216 | Average |
| 2412 | 106 | 112.47 | | | 26.96 | 4.09 | 37.52 | 179 | 216 | Peak |
| 2498 | 34.08 | 39.97 | 54 | -19.92 | 27.2 | 4.16 | 37.25 | 179 | 216 | Average |
| 2498 | 57.04 | 62.93 | 74 | -16.96 | 27.2 | 4.16 | 37.25 | 179 | 216 | Peak |
| 4824 | 46.97 | 62.27 | 54 | -7.03 | 30.99 | 6.79 | 53.08 | 185 | 158 | Average |
| 4824 | 49.05 | 64.35 | 74 | -24.95 | 30.99 | 6.79 | 53.08 | 185 | 158 | Peak |
| ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M | | | | | | | | | | |
| FREQ. (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 | 48.25 | 54.76 | 54 | -5.75 | 26.91 | 4.08 | 37.5 | 176 | 11 | Average |
| 2386 | 59.45 | 65.96 | 74 | -14.55 | 26.91 | 4.08 | 37.5 | 176 | 11 | Peak |
| 2412 | 105.37 | 111.84 | | | 26.96 | 4.09 | 37.52 | 176 | 11 | Average |
| 2412 | 109.57 | 116.04 | | | 26.96 | 4.09 | 37.52 | 176 | 11 | Peak |
| 2494 | 34.4 | 40.29 | 54 | -19.6 | 27.2 | 4.16 | 37.25 | 176 | 11 | Average |
| 2494 | 56.84 | 62.73 | 74 | -17.16 | 27.2 | 4.16 | 37.25 | 176 | 11 | Peak |
| 4824 | 47.79 | 63.09 | 54 | -6.21 | 30.99 | 6.79 | 53.08 | 201 | 317 | Average |
| 4824 | 50.23 | 65.53 | 74 | -23.77 | 30.99 | 6.79 | 53.08 | 201 | 317 | Peak |

REMARKS:

- Emission Level = Read Level + Antenna Factor + Cable Loss - Preamp Factor
Margin value = Emission level – Limit value
- 2412 MHz: Fundamental frequency.



| EUT TEST CONDITION | | MEASUREMENT DETAIL | |
|--------------------------|--------------------|--------------------|---------------------------|
| CHANNEL | Channel 6 | 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 | Gavin Wu |

| ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M | | | | | | | | | | |
|---|-------------------------------|-------------------------|-------------------|----------------|-----------------------------|-----------------------|--------------------------|---------------------------|----------------------------|---------|
| FREQ. (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 |
| 2340 | 34.28 | 40.96 | 54 | -19.72 | 26.77 | 4.04 | 37.49 | 196 | 214 | Average |
| 2340 | 56.19 | 62.87 | 74 | -17.81 | 26.77 | 4.04 | 37.49 | 196 | 214 | Peak |
| 2437 | 101.83 | 108.11 | | | 27.06 | 4.12 | 37.46 | 196 | 214 | Average |
| 2437 | 106.04 | 112.32 | | | 27.06 | 4.12 | 37.46 | 196 | 214 | Peak |
| 2486 | 34.42 | 40.44 | 54 | -19.58 | 27.15 | 4.15 | 37.32 | 196 | 214 | Average |
| 2486 | 56.42 | 62.44 | 74 | -17.58 | 27.15 | 4.15 | 37.32 | 196 | 214 | Peak |
| 4874 | 44.53 | 59.67 | 54 | -9.47 | 31.06 | 6.85 | 53.05 | 202 | 148 | Average |
| 4874 | 47.48 | 62.62 | 74 | -26.52 | 31.06 | 6.85 | 53.05 | 202 | 148 | Peak |
| ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M | | | | | | | | | | |
| FREQ. (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 | 36.09 | 42.65 | 54 | -17.91 | 26.86 | 4.08 | 37.5 | 178 | 9 | Average |
| 2382 | 56.96 | 63.52 | 74 | -17.04 | 26.86 | 4.08 | 37.5 | 178 | 9 | Peak |
| 2437 | 105.41 | 111.69 | | | 27.06 | 4.12 | 37.46 | 178 | 9 | Average |
| 2437 | 109.51 | 115.79 | | | 27.06 | 4.12 | 37.46 | 178 | 9 | Peak |
| 2490 | 35.24 | 41.2 | 54 | -18.76 | 27.2 | 4.16 | 37.32 | 178 | 9 | Average |
| 2490 | 57.71 | 63.67 | 74 | -16.29 | 27.2 | 4.16 | 37.32 | 178 | 9 | Peak |
| 4874 | 45.12 | 60.26 | 54 | -8.88 | 31.06 | 6.85 | 53.05 | 198 | 318 | Average |
| 4874 | 48.35 | 63.49 | 74 | -25.65 | 31.06 | 6.85 | 53.05 | 198 | 318 | Peak |

REMARKS:

- Emission Level = Read Level + Antenna Factor + Cable Loss - Preamp Factor
Margin value = Emission level – Limit value
- 2437 MHz: Fundamental frequency.



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| EUT TEST CONDITION | | MEASUREMENT DETAIL | |
|--------------------------|--------------------|--------------------|---------------------------|
| CHANNEL | Channel 11 | 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 | Gavin Wu |

| ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M | | | | | | | | | | |
|---|-------------------------|-------------------|----------------|-------------|-----------------------|-----------------|--------------------|---------------------|----------------------|---------|
| FREQ. (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 | 33.75 | 40.41 | 54 | -20.25 | 26.77 | 4.04 | 37.47 | 193 | 211 | Average |
| 2336 | 57.43 | 64.09 | 74 | -16.57 | 26.77 | 4.04 | 37.47 | 193 | 211 | Peak |
| 2462 | 102.81 | 108.97 | | | 27.1 | 4.13 | 37.39 | 193 | 211 | Average |
| 2462 | 106.91 | 113.07 | | | 27.1 | 4.13 | 37.39 | 193 | 211 | Peak |
| 2498 | 40.6 | 46.49 | 54 | -13.4 | 27.2 | 4.16 | 37.25 | 193 | 211 | Average |
| 2498 | 56.88 | 62.77 | 74 | -17.12 | 27.2 | 4.16 | 37.25 | 193 | 211 | Peak |
| 4924 | 44.84 | 59.87 | 54 | -9.16 | 31.12 | 6.88 | 53.03 | 183 | 161 | Average |
| 4924 | 47.53 | 62.56 | 74 | -26.47 | 31.12 | 6.88 | 53.03 | 183 | 161 | Peak |
| ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M | | | | | | | | | | |
| FREQ. (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 |
| 2334 | 34.67 | 41.38 | 54 | -19.33 | 26.72 | 4.04 | 37.47 | 190 | 12 | Average |
| 2334 | 56.26 | 62.97 | 74 | -17.74 | 26.72 | 4.04 | 37.47 | 190 | 12 | Peak |
| 2462 | 105.66 | 111.82 | | | 27.1 | 4.13 | 37.39 | 190 | 12 | Average |
| 2462 | 109.84 | 116 | | | 27.1 | 4.13 | 37.39 | 190 | 12 | Peak |
| 2496 | 45.29 | 51.18 | 54 | -8.71 | 27.2 | 4.16 | 37.25 | 190 | 12 | Average |
| 2496 | 57.15 | 63.04 | 74 | -16.85 | 27.2 | 4.16 | 37.25 | 190 | 12 | Peak |
| 4924 | 45.02 | 60.05 | 54 | -8.98 | 31.12 | 6.88 | 53.03 | 206 | 114 | Average |
| 4924 | 48.92 | 63.95 | 74 | -25.08 | 31.12 | 6.88 | 53.03 | 206 | 114 | Peak |

REMARKS:

- Emission Level = Read Level + Antenna Factor + Cable Loss - Preamp Factor
Margin value = Emission level – Limit value
- 2462 MHz: Fundamental frequency.

802.11g

| EUT TEST CONDITION | | MEASUREMENT DETAIL | |
|--------------------------|--------------------|--------------------|---------------------------|
| CHANNEL | Channel 1 | 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 | Gavin Wu |

| ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M | | | | | | | | | | |
|---|-------------------------|-------------------|----------------|-------------|-----------------------|-----------------|--------------------|---------------------|----------------------|---------|
| FREQ. (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 | 44.84 | 51.35 | 54 | -9.16 | 26.91 | 4.08 | 37.5 | 181 | 215 | Average |
| 2388 | 64.1 | 70.61 | 74 | -9.9 | 26.91 | 4.08 | 37.5 | 181 | 215 | Peak |
| 2412 | 94.33 | 100.8 | | | 26.96 | 4.09 | 37.52 | 181 | 215 | Average |
| 2412 | 104.44 | 110.91 | | | 26.96 | 4.09 | 37.52 | 181 | 215 | Peak |
| 2500 | 35.13 | 41.02 | 54 | -18.87 | 27.2 | 4.16 | 37.25 | 181 | 215 | Average |
| 2500 | 57.01 | 62.9 | 74 | -16.99 | 27.2 | 4.16 | 37.25 | 181 | 215 | Peak |
| ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M | | | | | | | | | | |
| FREQ. (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 |
| 2390 | 48.5 | 55.03 | 54 | -5.5 | 26.91 | 4.08 | 37.52 | 193 | 11 | Average |
| 2390 | 62.68 | 69.21 | 74 | -11.32 | 26.91 | 4.08 | 37.52 | 193 | 11 | Peak |
| 2412 | 96.9 | 103.37 | | | 26.96 | 4.09 | 37.52 | 193 | 11 | Average |
| 2412 | 106.42 | 112.89 | | | 26.96 | 4.09 | 37.52 | 193 | 11 | Peak |
| 2492 | 36.39 | 42.28 | 54 | -17.61 | 27.2 | 4.16 | 37.25 | 193 | 11 | Average |
| 2492 | 56.73 | 62.62 | 74 | -17.27 | 27.2 | 4.16 | 37.25 | 193 | 11 | Peak |

REMARKS:

- Emission Level = Read Level + Antenna Factor + Cable Loss - Preamp Factor
Margin value = Emission level – Limit value
- 2412 MHz: Fundamental frequency.



| EUT TEST CONDITION | | MEASUREMENT DETAIL | |
|--------------------------|--------------------|--------------------|---------------------------|
| CHANNEL | Channel 6 | 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 | Gavin Wu |

| ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M | | | | | | | | | | |
|---|-------------------------------|-------------------------|-------------------|----------------|-----------------------------|-----------------------|--------------------------|---------------------------|----------------------------|---------|
| FREQ. (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 |
| 2356 | 34.52 | 41.15 | 54 | -19.48 | 26.81 | 4.05 | 37.49 | 160 | 217 | Average |
| 2356 | 56.14 | 62.77 | 74 | -17.86 | 26.81 | 4.05 | 37.49 | 160 | 217 | Peak |
| 2437 | 94.37 | 100.65 | | | 27.06 | 4.12 | 37.46 | 160 | 217 | Average |
| 2437 | 104.2 | 110.48 | | | 27.06 | 4.12 | 37.46 | 160 | 217 | Peak |
| 2500 | 35.21 | 41.1 | 54 | -18.79 | 27.2 | 4.16 | 37.25 | 160 | 217 | Average |
| 2500 | 56.04 | 61.93 | 74 | -17.96 | 27.2 | 4.16 | 37.25 | 160 | 217 | Peak |
| ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M | | | | | | | | | | |
| FREQ. (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 |
| 2318 | 36.37 | 43.09 | 54 | -17.63 | 26.72 | 4.03 | 37.47 | 207 | 18 | Average |
| 2318 | 56.67 | 63.39 | 74 | -17.33 | 26.72 | 4.03 | 37.47 | 207 | 18 | Peak |
| 2437 | 97.22 | 103.5 | | | 27.06 | 4.12 | 37.46 | 207 | 18 | Average |
| 2437 | 107.36 | 113.64 | | | 27.06 | 4.12 | 37.46 | 207 | 18 | Peak |
| 2486 | 35.73 | 41.75 | 54 | -18.27 | 27.15 | 4.15 | 37.32 | 207 | 18 | Average |
| 2486 | 56.87 | 62.89 | 74 | -17.13 | 27.15 | 4.15 | 37.32 | 207 | 18 | Peak |

REMARKS:

- Emission Level = Read Level + Antenna Factor + Cable Loss - Preamp Factor
Margin value = Emission level – Limit value
- 2437 MHz: Fundamental frequency.



| EUT TEST CONDITION | | MEASUREMENT DETAIL | |
|--------------------------|--------------------|--------------------|---------------------------|
| CHANNEL | Channel 11 | 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 | Gavin Wu |

| ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M | | | | | | | | | | |
|---|-------------------------------|-------------------------|-------------------|----------------|-----------------------------|-----------------------|--------------------------|---------------------------|----------------------------|---------|
| FREQ. (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 | 35.3 | 41.87 | 54 | -18.7 | 26.86 | 4.07 | 37.5 | 192 | 217 | Average |
| 2372 | 55.83 | 62.4 | 74 | -18.17 | 26.86 | 4.07 | 37.5 | 192 | 217 | Peak |
| 2462 | 94.73 | 100.89 | | | 27.1 | 4.13 | 37.39 | 192 | 217 | Average |
| 2462 | 104.34 | 110.5 | | | 27.1 | 4.13 | 37.39 | 192 | 217 | Peak |
| 2484 | 45.91 | 51.93 | 54 | -8.09 | 27.15 | 4.15 | 37.32 | 192 | 217 | Average |
| 2484 | 60.12 | 66.14 | 74 | -13.88 | 27.15 | 4.15 | 37.32 | 192 | 217 | Peak |
| ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M | | | | | | | | | | |
| FREQ. (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 |
| 2376 | 36.09 | 42.66 | 54 | -17.91 | 26.86 | 4.07 | 37.5 | 225 | 19 | Average |
| 2376 | 56.32 | 62.89 | 74 | -17.68 | 26.86 | 4.07 | 37.5 | 225 | 19 | Peak |
| 2462 | 96.25 | 102.41 | | | 27.1 | 4.13 | 37.39 | 225 | 19 | Average |
| 2462 | 106.09 | 112.25 | | | 27.1 | 4.13 | 37.39 | 225 | 19 | Peak |
| 2484 | 47.5 | 53.52 | 54 | -6.5 | 27.15 | 4.15 | 37.32 | 225 | 19 | Average |
| 2484 | 68.18 | 74.2 | 74 | -5.82 | 27.15 | 4.15 | 37.32 | 225 | 19 | Peak |

REMARKS:

- Emission Level = Read Level + Antenna Factor + Cable Loss - Preamp Factor
Margin value = Emission level – Limit value
- 2462 MHz: Fundamental frequency.

802.11n (HT20)

| EUT TEST CONDITION | | MEASUREMENT DETAIL | |
|--------------------------|--------------------|--------------------|---------------------------|
| CHANNEL | Channel 1 | 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 | Gavin Wu |

| ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M | | | | | | | | | | |
|---|-------------------------|-------------------|----------------|--------------|-----------------------|-----------------|--------------------|---------------------|----------------------|-------------|
| FREQ. (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 | 44.86 | 51.37 | 54 | -9.14 | 26.91 | 4.08 | 37.5 | 175 | 206 | Average |
| 2386 | 65.28 | 71.79 | 74 | -8.72 | 26.91 | 4.08 | 37.5 | 175 | 206 | Peak |
| 2412 | 94.97 | 101.44 | | | 26.96 | 4.09 | 37.52 | 175 | 206 | Average |
| 2412 | 104.06 | 110.53 | | | 26.96 | 4.09 | 37.52 | 175 | 206 | Peak |
| 2498 | 35.51 | 41.4 | 54 | -18.49 | 27.2 | 4.16 | 37.25 | 175 | 206 | Average |
| 2498 | 56.51 | 62.4 | 74 | -17.49 | 27.2 | 4.16 | 37.25 | 175 | 206 | Peak |
| ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M | | | | | | | | | | |
| FREQ. (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 |
| 2390 | 49.14 | 55.67 | 54 | -4.86 | 26.91 | 4.08 | 37.52 | 192 | 15 | Average |
| 2390 | 72.84 | 79.37 | 74 | -1.16 | 26.91 | 4.08 | 37.52 | 192 | 15 | Peak |
| 2412 | 96.31 | 102.78 | | | 26.96 | 4.09 | 37.52 | 192 | 15 | Average |
| 2412 | 106.14 | 112.61 | | | 26.96 | 4.09 | 37.52 | 192 | 15 | Peak |
| 2496 | 36.54 | 42.43 | 54 | -17.46 | 27.2 | 4.16 | 37.25 | 192 | 15 | Average |
| 2496 | 56.51 | 62.4 | 74 | -17.49 | 27.2 | 4.16 | 37.25 | 192 | 15 | Peak |

REMARKS:

- Emission Level = Read Level + Antenna Factor + Cable Loss - Preamp Factor
Margin value = Emission level – Limit value
- 2412 MHz: Fundamental frequency.



| EUT TEST CONDITION | | MEASUREMENT DETAIL | |
|--------------------------|--------------------|--------------------|---------------------------|
| CHANNEL | Channel 6 | 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 | Gavin Wu |

| ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M | | | | | | | | | | |
|---|-------------------------------|-------------------------|-------------------|----------------|-----------------------------|-----------------------|--------------------------|---------------------------|----------------------------|---------|
| FREQ. (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 |
| 2328 | 34.65 | 41.36 | 54 | -19.35 | 26.72 | 4.04 | 37.47 | 214 | 206 | Average |
| 2328 | 56.83 | 63.54 | 74 | -17.17 | 26.72 | 4.04 | 37.47 | 214 | 206 | Peak |
| 2437 | 95.28 | 101.56 | | | 27.06 | 4.12 | 37.46 | 214 | 206 | Average |
| 2437 | 105.88 | 112.16 | | | 27.06 | 4.12 | 37.46 | 214 | 206 | Peak |
| 2486 | 34.87 | 40.89 | 54 | -19.13 | 27.15 | 4.15 | 37.32 | 214 | 206 | Average |
| 2486 | 56.57 | 62.59 | 74 | -17.43 | 27.15 | 4.15 | 37.32 | 214 | 206 | Peak |
| ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M | | | | | | | | | | |
| FREQ. (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 |
| 2350 | 37.54 | 44.21 | 54 | -16.46 | 26.77 | 4.05 | 37.49 | 174 | 10 | Average |
| 2350 | 56.68 | 63.35 | 74 | -17.32 | 26.77 | 4.05 | 37.49 | 174 | 10 | Peak |
| 2437 | 98.73 | 105.01 | | | 27.06 | 4.12 | 37.46 | 174 | 10 | Average |
| 2437 | 108.39 | 114.67 | | | 27.06 | 4.12 | 37.46 | 174 | 10 | Peak |
| 2484 | 36 | 42.02 | 54 | -18 | 27.15 | 4.15 | 37.32 | 174 | 10 | Average |
| 2484 | 57.96 | 63.98 | 74 | -16.04 | 27.15 | 4.15 | 37.32 | 174 | 10 | Peak |

REMARKS:

- Emission Level = Read Level + Antenna Factor + Cable Loss - Preamp Factor
Margin value = Emission level – Limit value
- 2437 MHz: Fundamental frequency.

| EUT TEST CONDITION | | MEASUREMENT DETAIL | |
|--------------------------|--------------------|--------------------|---------------------------|
| CHANNEL | Channel 11 | 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 | Gavin Wu |

| ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M | | | | | | | | | | |
|---|-------------------------|-------------------|----------------|-------------|-----------------------|-----------------|--------------------|---------------------|----------------------|---------|
| FREQ. (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 | 35.56 | 42.13 | 54 | -18.44 | 26.86 | 4.07 | 37.5 | 215 | 220 | Average |
| 2378 | 57.35 | 63.92 | 74 | -16.65 | 26.86 | 4.07 | 37.5 | 215 | 220 | Peak |
| 2462 | 94.25 | 100.41 | | | 27.1 | 4.13 | 37.39 | 215 | 220 | Average |
| 2462 | 104.92 | 111.08 | | | 27.1 | 4.13 | 37.39 | 215 | 220 | Peak |
| 2484 | 44.01 | 50.03 | 54 | -9.99 | 27.15 | 4.15 | 37.32 | 215 | 220 | Average |
| 2484 | 66.41 | 72.43 | 74 | -7.59 | 27.15 | 4.15 | 37.32 | 215 | 220 | Peak |
| ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M | | | | | | | | | | |
| FREQ. (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 |
| 2390 | 37.49 | 44.02 | 54 | -16.51 | 26.91 | 4.08 | 37.52 | 189 | 9 | Average |
| 2390 | 56.52 | 63.05 | 74 | -17.48 | 26.91 | 4.08 | 37.52 | 189 | 9 | Peak |
| 2462 | 96.47 | 102.63 | | | 27.1 | 4.13 | 37.39 | 189 | 9 | Average |
| 2462 | 106.43 | 112.59 | | | 27.1 | 4.13 | 37.39 | 189 | 9 | Peak |
| 2484 | 46.84 | 52.86 | 54 | -7.16 | 27.15 | 4.15 | 37.32 | 189 | 9 | Average |
| 2484 | 68.6 | 74.62 | 74 | -5.4 | 27.15 | 4.15 | 37.32 | 189 | 9 | Peak |

REMARKS:

- Emission Level = Read Level + Antenna Factor + Cable Loss - Preamp Factor
Margin value = Emission level – Limit value
- 2462 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:

802.11n (HT20)

| EUT TEST CONDITION | | MEASUREMENT DETAIL | |
|--------------------------|--------------------|--------------------|------------------------------|
| CHANNEL | Channel 1 | 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 | Gavin Wu |

| ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M | | | | | | | | | | |
|---|-------------------------------|-------------------------|-------------------|----------------|-----------------------------|-----------------------|--------------------------|---------------------------|----------------------------|--------|
| FREQ. (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 |
| 124.09 | 26.01 | 45.47 | 43.5 | -17.49 | 11.28 | 1.15 | 31.89 | 131 | 207 | Peak |
| 184.23 | 24.85 | 44.93 | 43.5 | -18.65 | 10.46 | 1.23 | 31.77 | 140 | 105 | Peak |
| 333.61 | 21.21 | 37.55 | 46 | -24.79 | 13.75 | 1.72 | 31.81 | 113 | 53 | Peak |
| 604.24 | 21.97 | 32.22 | 46 | -24.03 | 19.66 | 2.27 | 32.18 | 116 | 298 | Peak |
| 665.35 | 22.59 | 31.67 | 46 | -23.41 | 20.4 | 2.39 | 31.87 | 133 | 184 | Peak |
| 750.71 | 24.78 | 32.03 | 46 | -21.22 | 21.53 | 2.53 | 31.31 | 121 | 270 | Peak |
| ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M | | | | | | | | | | |
| FREQ. (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 |
| 67.83 | 24.17 | 44.05 | 40 | -15.83 | 11 | 0.85 | 31.73 | 105 | 282 | Peak |
| 196.84 | 24.65 | 45.54 | 43.5 | -18.85 | 9.57 | 1.28 | 31.74 | 136 | 236 | Peak |
| 230.79 | 20.05 | 39.82 | 46 | -25.95 | 10.66 | 1.42 | 31.85 | 121 | 209 | Peak |
| 540.22 | 20.01 | 31.34 | 46 | -25.99 | 18.24 | 2.16 | 31.73 | 134 | 333 | Peak |
| 625.58 | 21.3 | 31.23 | 46 | -24.7 | 19.92 | 2.3 | 32.15 | 124 | 125 | Peak |
| 716.76 | 23.68 | 31.83 | 46 | -22.32 | 21.05 | 2.48 | 31.68 | 102 | 241 | Peak |

REMARKS:

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

Mode B

Above 1 GHz Data :

802.11n (HT20)

| EUT TEST CONDITION | | MEASUREMENT DETAIL | |
|--------------------------|--------------------|--------------------|---------------------------|
| CHANNEL | Channel 1 | 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 | Gavin Wu |

| ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M | | | | | | | | | | |
|---|-------------------------|-------------------|----------------|-------------|-----------------------|-----------------|--------------------|---------------------|----------------------|---------|
| FREQ. (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 |
| 2390 | 42.15 | 48.68 | 54 | -11.85 | 26.91 | 4.08 | 37.52 | 224 | 304 | Average |
| 2390 | 59.56 | 66.09 | 74 | -14.44 | 26.91 | 4.08 | 37.52 | 224 | 304 | Peak |
| 2412 | 95.83 | 102.3 | | | 26.96 | 4.09 | 37.52 | 224 | 304 | Average |
| 2412 | 105.45 | 111.92 | | | 26.96 | 4.09 | 37.52 | 224 | 304 | Peak |
| 2486 | 35.46 | 41.48 | 54 | -18.54 | 27.15 | 4.15 | 37.32 | 224 | 304 | Average |
| 2486 | 58.2 | 64.22 | 74 | -15.8 | 27.15 | 4.15 | 37.32 | 224 | 304 | Peak |
| ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M | | | | | | | | | | |
| FREQ. (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 |
| 2390 | 42.25 | 48.78 | 54 | -11.75 | 26.91 | 4.08 | 37.52 | 169 | 210 | Average |
| 2390 | 59.19 | 65.72 | 74 | -14.81 | 26.91 | 4.08 | 37.52 | 169 | 210 | Peak |
| 2412 | 96.76 | 103.23 | | | 26.96 | 4.09 | 37.52 | 169 | 210 | Average |
| 2412 | 106.26 | 112.73 | | | 26.96 | 4.09 | 37.52 | 169 | 210 | Peak |
| 2500 | 36.78 | 42.67 | 54 | -17.22 | 27.2 | 4.16 | 37.25 | 169 | 210 | Average |
| 2500 | 56.76 | 62.65 | 74 | -17.24 | 27.2 | 4.16 | 37.25 | 169 | 210 | Peak |

REMARKS:

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

Margin value = Emission level – Limit value

2. 2412 MHz: Fundamental frequency.



| EUT TEST CONDITION | | MEASUREMENT DETAIL | |
|--------------------------|--------------------|--------------------|---------------------------|
| CHANNEL | Channel 6 | 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 | Gavin Wu |

| ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M | | | | | | | | | | |
|---|-------------------------------|-------------------------|-------------------|----------------|-----------------------------|-----------------------|--------------------------|---------------------------|----------------------------|---------|
| FREQ. (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 | 36.58 | 43.14 | 54 | -17.42 | 26.86 | 4.08 | 37.5 | 216 | 311 | Average |
| 2380 | 56.09 | 62.65 | 74 | -17.91 | 26.86 | 4.08 | 37.5 | 216 | 311 | Peak |
| 2437 | 97.74 | 104.02 | | | 27.06 | 4.12 | 37.46 | 216 | 311 | Average |
| 2437 | 107.45 | 113.73 | | | 27.06 | 4.12 | 37.46 | 216 | 311 | Peak |
| 2500 | 35.36 | 41.25 | 54 | -18.64 | 27.2 | 4.16 | 37.25 | 216 | 311 | Average |
| 2500 | 57.38 | 63.27 | 74 | -16.62 | 27.2 | 4.16 | 37.25 | 216 | 311 | Peak |
| ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M | | | | | | | | | | |
| FREQ. (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 |
| 2366 | 36.6 | 43.22 | 54 | -17.4 | 26.81 | 4.07 | 37.5 | 204 | 204 | Average |
| 2366 | 56.74 | 63.36 | 74 | -17.26 | 26.81 | 4.07 | 37.5 | 204 | 204 | Peak |
| 2437 | 99.07 | 105.35 | | | 27.06 | 4.12 | 37.46 | 204 | 204 | Average |
| 2437 | 108.4 | 114.68 | | | 27.06 | 4.12 | 37.46 | 204 | 204 | Peak |
| 2490 | 35.45 | 41.41 | 54 | -18.55 | 27.2 | 4.16 | 37.32 | 204 | 204 | Average |
| 2490 | 57.41 | 63.37 | 74 | -16.59 | 27.2 | 4.16 | 37.32 | 204 | 204 | Peak |

REMARKS:

- Emission Level = Read Level + Antenna Factor + Cable Loss - Preamp Factor
Margin value = Emission level – Limit value
- 2437 MHz: Fundamental frequency.



A D T

| EUT TEST CONDITION | | MEASUREMENT DETAIL | |
|--------------------------|--------------------|--------------------|---------------------------|
| CHANNEL | Channel 11 | 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 | Gavin Wu |

| ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M | | | | | | | | | | |
|---|-------------------------------|-------------------------|-------------------|----------------|-----------------------------|-----------------------|--------------------------|---------------------------|----------------------------|---------|
| FREQ. (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 | 35.32 | 41.89 | 54 | -18.68 | 26.86 | 4.07 | 37.5 | 193 | 304 | Average |
| 2378 | 56.34 | 62.91 | 74 | -17.66 | 26.86 | 4.07 | 37.5 | 193 | 304 | Peak |
| 2462 | 96.07 | 102.23 | | | 27.1 | 4.13 | 37.39 | 193 | 304 | Average |
| 2462 | 105.44 | 111.6 | | | 27.1 | 4.13 | 37.39 | 193 | 304 | Peak |
| 2484 | 41.12 | 47.14 | 54 | -12.88 | 27.15 | 4.15 | 37.32 | 193 | 304 | Average |
| 2484 | 67.24 | 73.26 | 74 | -6.76 | 27.15 | 4.15 | 37.32 | 193 | 304 | Peak |
| ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M | | | | | | | | | | |
| FREQ. (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 |
| 2362 | 35.03 | 41.66 | 54 | -18.97 | 26.81 | 4.05 | 37.49 | 202 | 210 | Average |
| 2362 | 57.31 | 63.94 | 74 | -16.69 | 26.81 | 4.05 | 37.49 | 202 | 210 | Peak |
| 2462 | 97.15 | 103.31 | | | 27.1 | 4.13 | 37.39 | 202 | 210 | Average |
| 2462 | 106.41 | 112.57 | | | 27.1 | 4.13 | 37.39 | 202 | 210 | Peak |
| 2484 | 42.76 | 48.78 | 54 | -11.24 | 27.15 | 4.15 | 37.32 | 202 | 210 | Average |
| 2484 | 67.97 | 73.99 | 74 | -6.03 | 27.15 | 4.15 | 37.32 | 202 | 210 | Peak |

REMARKS:

- Emission Level = Read Level + Antenna Factor + Cable Loss - Preamp Factor
Margin value = Emission level – Limit value
- 2462 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:

802.11n (HT20)

| EUT TEST CONDITION | | MEASUREMENT DETAIL | |
|--------------------------|--------------------|--------------------|------------------------------|
| CHANNEL | Channel 11 | 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 | Gavin Wu |

| ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M | | | | | | | | | | |
|---|-------------------------------|-------------------------|-------------------|----------------|-----------------------------|-----------------------|--------------------------|---------------------------|----------------------------|--------|
| FREQ. (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 |
| 130.88 | 23.09 | 42.06 | 43.5 | -20.41 | 11.75 | 1.14 | 31.86 | 104 | 343 | Peak |
| 178.41 | 25.21 | 44.92 | 43.5 | -18.29 | 10.92 | 1.19 | 31.82 | 110 | 219 | Peak |
| 216.24 | 25.62 | 45.87 | 46 | -20.38 | 10.05 | 1.36 | 31.66 | 117 | 122 | Peak |
| 594.54 | 21.73 | 32.19 | 46 | -24.27 | 19.48 | 2.25 | 32.19 | 114 | 120 | Peak |
| 685.72 | 23.21 | 31.98 | 46 | -22.79 | 20.64 | 2.43 | 31.84 | 124 | 342 | Peak |
| 722.58 | 24.46 | 32.48 | 46 | -21.54 | 21.13 | 2.49 | 31.64 | 101 | 62 | Peak |
| ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M | | | | | | | | | | |
| FREQ. (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 |
| 66.86 | 26.83 | 46.54 | 40 | -13.17 | 11.12 | 0.85 | 31.68 | 108 | 214 | Peak |
| 191.99 | 24.27 | 44.78 | 43.5 | -19.23 | 9.91 | 1.27 | 31.69 | 129 | 117 | Peak |
| 340.4 | 19.54 | 35.71 | 46 | -26.46 | 13.91 | 1.74 | 31.82 | 117 | 183 | Peak |
| 478.14 | 18.42 | 31.34 | 46 | -27.58 | 16.89 | 2.05 | 31.86 | 127 | 264 | Peak |
| 589.69 | 21.56 | 32.09 | 46 | -24.44 | 19.37 | 2.24 | 32.14 | 136 | 80 | Peak |
| 685.72 | 23.23 | 32 | 46 | -22.77 | 20.64 | 2.43 | 31.84 | 137 | 248 | 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 |

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 | ESCI | 100613 | Nov. 16, 2015 | Nov. 15, 2016 |
| RF signal cable (with 10dB PAD) Woken | 5D-FB | Cable-cond1-01 | Dec. 26, 2014 | Dec. 25, 2015 |
| LISN ROHDE & SCHWARZ (EUT) | ESH3-Z5 | 835239/001 | Feb. 26, 2015 | Feb. 25, 2016 |
| 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

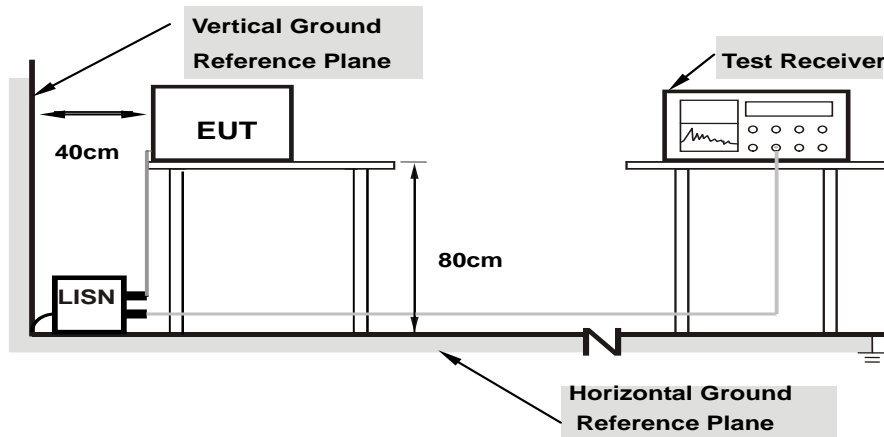
- The EUT was placed 0.4 meters from the conducting wall of the shielded room with EUT being connected to the power mains through a line impedance stabilization network (LISN). Other support units were connected to the power mains through another LISN. The two LISNs provide 50 ohm/50 uH of coupling impedance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

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

4.2.6 EUT Operating Conditions

- Placed the EUT on a testing table.
- Use the software to control the EUT under transmission condition continuously at specific channel frequency.

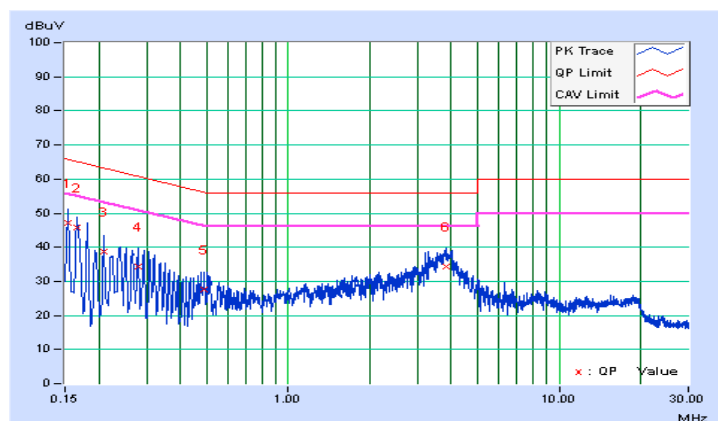
4.2.7 Test Results

| | | | |
|-----------------|----------------|--|--------------------------------------|
| 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 | 2015/11/21 |

| 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 | 0.15391 | 9.82 | 37.25 | 24.52 | 47.07 | 34.34 | 65.79 | 55.79 | -18.71 | -21.44 |
| 2 | 0.16569 | 9.83 | 36.01 | 20.48 | 45.84 | 30.31 | 65.17 | 55.17 | -19.34 | -24.87 |
| 3 | 0.20865 | 9.84 | 28.72 | 13.81 | 38.56 | 23.65 | 63.26 | 53.26 | -24.70 | -29.61 |
| 4 | 0.27903 | 9.86 | 24.51 | 10.49 | 34.37 | 20.35 | 60.84 | 50.84 | -26.48 | -30.50 |
| 5 | 0.49017 | 9.89 | 17.82 | 8.02 | 27.71 | 17.91 | 56.16 | 46.16 | -28.46 | -28.26 |
| 6 | 3.82931 | 10.12 | 24.23 | 13.88 | 34.35 | 24.00 | 56.00 | 46.00 | -21.65 | -22.00 |

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

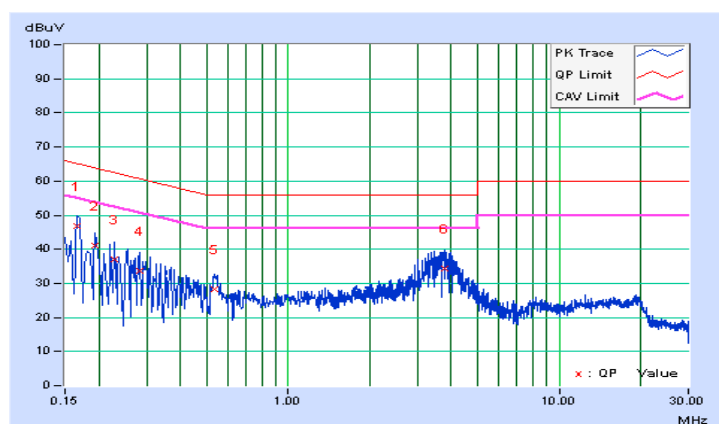


| | | | |
|-----------------|----------------|--|--------------------------------------|
| Frequency Range | 150kHz ~ 30MHz | Detector Function & Resolution Bandwidth | Quasi-Peak (QP) / Average (AV), 9kHz |
| Input Power | 120Vac, 60Hz | Environmental Conditions | 25°C, 65%RH |
| Tested by | Toby Tian | Test Date | 2015/11/21 |

| 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 | 0.16569 | 9.82 | 36.84 | 21.51 | 46.66 | 31.33 | 65.17 | 55.17 | -18.51 | -23.84 |
| 2 | 0.19305 | 9.83 | 31.28 | 16.23 | 41.11 | 26.06 | 63.90 | 53.90 | -22.80 | -27.85 |
| 3 | 0.22820 | 9.84 | 27.15 | 16.02 | 36.99 | 25.86 | 62.51 | 52.51 | -25.53 | -26.66 |
| 4 | 0.28288 | 9.85 | 23.75 | 9.58 | 33.60 | 19.43 | 60.73 | 50.73 | -27.13 | -31.30 |
| 5 | 0.53709 | 9.89 | 18.46 | 12.10 | 28.35 | 21.99 | 56.00 | 46.00 | -27.65 | -24.01 |
| 6 | 3.78630 | 10.12 | 24.27 | 14.27 | 34.39 | 24.39 | 56.00 | 46.00 | -21.61 | -21.61 |

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 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: 886-3-5935343

Fax: 886-3-5935342

Hwa Ya EMC/RF/Safety Lab

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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