

FCC Test Report (15.407)

Report No.: RF150430E10-1

FCC ID: PY315200310

Test Model: R7800

Received Date: Mar. 25, 2015

Test Date: May 07 to 15, 2015

Issued Date: May 21, 2015

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

| Issue No. | Description | Date Issued |
|---------------|-------------------|--------------|
| RF150430E10-1 | Original release. | May 21, 2015 |




1 Certificate of Conformity

Product: Nighthawk X4S Smart WIFI Router
Brand: NETGEAR
Test Model: R7800
Sample Status: ENGINEERING SAMPLE
Applicant: NETGEAR, Inc.
Test Date: May 07 to 15, 2015
Standard: 47 CFR FCC Part 15, Subpart E (Section 15.407)
ANSI C63.10:2009

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. This report contains Radiated Emissions & Band Edge Measurement (above 1GHz) test data that were produced under subcontract by Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch Lin Kou Laboratories.

Prepared by :  , **Date:** May 21, 2015
Lori Chung / Specialist

Approved by :  , **Date:** May 21, 2015
May Chen / Manager

2 Summary of Test Results

| 47 CFR FCC Part 15, Subpart E (SECTION 15.407 Under New Rule) | | | |
|---|--|--------|---|
| FCC Clause | Test Item | Result | Remarks |
| 15.407(b)(6) | AC Power Conducted Emissions | PASS | Meet the requirement of limit. Minimum passing margin is -10.33dB at 11.67969MHz. |
| 15.407(b)(1/2/3/4/6) | Radiated Emissions & Band Edge Measurement | PASS | Meet the requirement of limit. Minimum passing margin is -0.1dB at 15720.00MHz & 15600.00MHz. |
| 15.407(a)(1/2/3) | Max Average Transmit Power | PASS | Meet the requirement of limit. |
| 15.407(a)(1/2/3) | Peak Power Spectral Density | PASS | Meet the requirement of limit. |
| 15.407(g) | Frequency Stability | PASS | Meet the requirement of limit. |
| 15.203 | Antenna Requirement | PASS | Antenna connector is i-pex(MHF) not a standard connector. |

NOTE: The EUT was operating in 2.400 ~ 2.4835GHz, 5.15~5.25GHz and 5.725~5.850GHz frequencies band. This report was recorded the RF parameters including 5.15~5.25GHz. For the 2.400 ~ 2.4835GHz and 5.725~5.850GHz RF parameters was recorded in another test report.

2.1 Measurement Uncertainty

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

| Measurement | Frequency | Expanded Uncertainty (k=2) (±) |
|------------------------------------|----------------|--------------------------------|
| Conducted Emissions at mains ports | 150kHz ~ 30MHz | 2.86 dB |
| Radiated Emissions up to 1 GHz | 30MHz ~ 1GHz | 5.43 dB |
| Radiated Emissions above 1 GHz | 1GHz ~ 18GHz | 2.29 dB |
| | 18GHz ~ 40GHz | 2.29 dB |

2.2 Modification Record

There were no modifications required for compliance.

3 General Information

3.1 General Description of EUT

| | |
|-----------------------|---|
| Product | Nighthawk X4S Smart WIFI Router |
| Brand | NETGEAR |
| Test Model | R7800 |
| Status of EUT | ENGINEERING SAMPLE |
| Power Supply Rating | 19Vdc from power adapter |
| Modulation Type | CCK, DQPSK, DBPSK for DSSS 64QAM, 16QAM, QPSK, BPSK for OFDM 256QAM for OFDM in 11ac mode |
| Modulation Technology | DSSS, OFDM |
| Transfer Rate | 802.11b: up to 11Mbps 802.11a: up to 54Mbps 802.11n: up to 600Mbps 802.11ac: up to 1733.3Mbps |
| Operating Frequency | For 15.407 5.18 ~ 5.24GHz |
| | For 15.247 2.4GHz: 2.412 ~ 2.462GHz 5GHz: 5.745 ~ 5.825GHz |
| Number of Channel | For 15.407 4 for 802.11a, 802.11n (HT20), 802.11ac (VHT20) 2 for 802.11n (HT40), 802.11ac (VHT40) 1 for 802.11ac (VHT80) |
| | For 15.247 (2.4GHz) 11 for 802.11b For 15.247 (5GHz) 5 for 802.11a, 802.11n (HT20), 802.11ac (VHT20) 2 for 802.11n (HT40), 802.11ac (VHT40) 1 for 802.11ac (VHT80) |
| Output Power | For 15.407 CDD Mode: 802.11a: 918.069mW 802.11ac (VHT20): 951.947mW 802.11ac (VHT40): 711.113mW 802.11ac (VHT80): 238.875mW Beamforming Mode: 802.11ac (VHT20): 744.333mW 802.11ac (VHT40): 711.113mW 802.11ac (VHT80): 238.875mW |
| | For 15.247 (2.4GHz) CDD Mode: 802.11b: 962.497mW For 15.247 (5GHz) CDD Mode: 802.11a: 944.69mW Beamforming Mode: 802.11ac (VHT20): 936.896mW 802.11ac (VHT40): 937.418mW 802.11ac (VHT80): 658.63mW |
| Antenna Type | Refer to Note |
| Antenna Connector | Refer to Note |
| Accessory Device | Adapter x 1 |
| Data Cable Supplied | Ethernet cable (shielded, 1.5m) |

Note:

1. The emission of the simultaneous operation (2.4GHz & 5GHz) has been evaluated and no non-compliance was found.
2. The EUT must be supplied with a power adapter as following table:

| | |
|--------------|-----------------------------------|
| Brand | NETGEAR |
| Model | AD2003F10 |
| P/N | 332-10631-01 |
| Input Power | 100-120Vac, 50/60Hz, 1.5A |
| Output Power | 19Vdc, 3.16A |
| Power Line | DC output cable: Unshielded, 1.8m |

3. The antennas provided to the EUT, please refer to the following table:

| Antenna No. | Ant. Gain(dBi) | Frequency range (GHz to GHz) | Antenna Type | Connector Type |
|--------------|----------------|------------------------------|--------------|----------------|
| External (1) | 0.67 | 2.4~2.4835 | Dipole | i-pex(MHF) |
| | 1.16 | 5.15~5.25 | Dipole | i-pex(MHF) |
| | 0.62 | 5.25~5.35 | Dipole | i-pex(MHF) |
| | 0.4 | 5.47~5.725 | Dipole | i-pex(MHF) |
| | 0.21 | 5.725~5.85 | Dipole | i-pex(MHF) |
| External (2) | 0.67 | 2.4~2.4835 | Dipole | i-pex(MHF) |
| | 1.16 | 5.15~5.25 | Dipole | i-pex(MHF) |
| | 0.62 | 5.25~5.35 | Dipole | i-pex(MHF) |
| | 0.4 | 5.47~5.725 | Dipole | i-pex(MHF) |
| | 0.21 | 5.725~5.85 | Dipole | i-pex(MHF) |
| External (3) | 0.67 | 2.4~2.4835 | Dipole | i-pex(MHF) |
| | 1.16 | 5.15~5.25 | Dipole | i-pex(MHF) |
| | 0.62 | 5.25~5.35 | Dipole | i-pex(MHF) |
| | 0.4 | 5.47~5.725 | Dipole | i-pex(MHF) |
| | 0.21 | 5.725~5.85 | Dipole | i-pex(MHF) |
| External (4) | 0.67 | 2.4~2.4835 | Dipole | i-pex(MHF) |
| | 1.16 | 5.15~5.25 | Dipole | i-pex(MHF) |
| | 0.62 | 5.25~5.35 | Dipole | i-pex(MHF) |
| | 0.4 | 5.47~5.725 | Dipole | i-pex(MHF) |
| | 0.21 | 5.725~5.85 | Dipole | i-pex(MHF) |

4. The EUT incorporates a MIMO function with beamforming for 5GHz (802.11n & 802.11ac mode).

| For 2.4GHz Band | | | |
|-------------------------|------------------------|----------------------------------|-----|
| MODULATION MODE | DATA RATE (MCS) | TX & RX CONFIGURATION | |
| 802.11b | 1 ~ 11Mbps | 4TX | 4RX |
| For 5GHz Band | | | |
| MODULATION MODE | DATA RATE (MCS) | TX & RX CONFIGURATION | |
| 802.11a | 6 ~ 54Mbps | 4TX | 4RX |
| 802.11n (HT20) | MCS 0~7 | 4TX | 4RX |
| | MCS 8~15 | 4TX | 4RX |
| | MCS 16~23 | 4TX | 4RX |
| | MCS 24~31 | 4TX | 4RX |
| 802.11n (HT40) | MCS 0~7 | 4TX | 4RX |
| | MCS 8~15 | 4TX | 4RX |
| | MCS 16~23 | 4TX | 4RX |
| | MCS 24~31 | 4TX | 4RX |
| 802.11ac (VHT20) | MCS 0~8, Nss=1 | 4TX | 4RX |
| | MCS 0~8, Nss=2 | 4TX | 4RX |
| | MCS 0~9, Nss=3 | 4TX | 4RX |
| | MCS 0~9, Nss=4 | 4TX | 4RX |
| 802.11ac (VHT40) | MCS 0~9, Nss=1 | 4TX | 4RX |
| | MCS 0~9, Nss=2 | 4TX | 4RX |
| | MCS 0~9, Nss=3 | 4TX | 4RX |
| | MCS 0~9, Nss=4 | 4TX | 4RX |
| 802.11ac (VHT80) | MCS 0~9, Nss=1 | 4TX | 4RX |
| | MCS 0~9, Nss=2 | 4TX | 4RX |
| | MCS 0~9, Nss=3 | 4TX | 4RX |
| | MCS 0~9, Nss=4 | 4TX | 4RX |

Note: The modulation and bandwidth are similar for 802.11n mode for 20MHz (40MHz) and 802.11ac mode for 20MHz (40MHz), therefore investigated worst case to representative mode in test report. (Final test mode refer section 3.2.1)

5. 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

For 5180 ~ 5240MHz

4 channels are provided for 802.11a, 802.11n (HT20), 802.11ac (VHT20):

| Channel | Frequency | Channel | Frequency |
|---------|-----------|---------|-----------|
| 36 | 5180 MHz | 44 | 5220 MHz |
| 40 | 5200 MHz | 48 | 5240 MHz |

2 channels are provided for 802.11n (HT40), 802.11ac (VHT40):

| Channel | Frequency | Channel | Frequency |
|---------|-----------|---------|-----------|
| 38 | 5190 MHz | 46 | 5230 MHz |

1 channel is provided for 802.11ac (VHT80):

| Channel | Frequency |
|---------|-----------|
| 42 | 5210MHz |

3.2.1 Test Mode Applicability and Tested Channel Detail

| EUT CONFIGURE MODE | APPLICABLE TO | | | | DESCRIPTION |
|--------------------|---------------|-------|-----|------|-------------|
| | RE≥1G | RE<1G | PLC | APCM | |
| - | √ | √ | √ | √ | - |

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

RE<1G: Radiated Emission below 1GHz

PLC: Power Line Conducted Emission

APCM: Antenna Port Conducted Measurement

NOTE: The EUT had been pre-tested on the positioned of each 2 axis. The worst case was found when positioned on **X plane**.

Radiated Emission Test (Above 1GHz):

- 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.

| CDD MODE | | | | | | |
|------------------|------------------|-------------------|----------------|-----------------------|-----------------|------------------|
| MODE | FREQ. BAND (MHz) | AVAILABLE CHANNEL | TESTED CHANNEL | MODULATION TECHNOLOGY | MODULATION TYPE | DATA RATE (Mbps) |
| 802.11a | 5180-5240 | 36 to 48 | 36, 40, 48 | OFDM | BPSK | 6 |
| 802.11ac (VHT20) | | 36 to 48 | 36, 40, 48 | OFDM | BPSK | 6.5 |
| 802.11ac (VHT40) | | 38 to 46 | 38, 46 | OFDM | BPSK | 13.5 |
| 802.11ac (VHT80) | | 42 | 42 | OFDM | BPSK | 29.3 |

Radiated Emission Test (Below 1GHz):

- 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.

| CDD MODE | | | | | | |
|------------------|------------------|-------------------|----------------|-----------------------|-----------------|------------------|
| MODE | FREQ. BAND (MHz) | AVAILABLE CHANNEL | TESTED CHANNEL | MODULATION TECHNOLOGY | MODULATION TYPE | DATA RATE (Mbps) |
| 802.11ac (VHT20) | 5180-5240 | 36 to 48 | 40 | OFDM | BPSK | 6.5 |

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.

| CDD MODE | | | | | | |
|------------------|------------------|-------------------|----------------|-----------------------|-----------------|------------------|
| MODE | FREQ. BAND (MHz) | AVAILABLE CHANNEL | TESTED CHANNEL | MODULATION TECHNOLOGY | MODULATION TYPE | DATA RATE (Mbps) |
| 802.11ac (VHT20) | 5180-5240 | 36 to 48 | 40 | OFDM | BPSK | 6.5 |

Antenna Port Conducted Measurement:

- This item includes all test value of each mode, but only includes spectrum plot of worst value of each mode.
- Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates and antenna ports (if EUT with antenna diversity architecture).
- Following channel(s) was (were) selected for the final test as listed below.

| For Transmit Power Measurement | | | | | | |
|--|------------------|-------------------|----------------|-----------------------|-----------------|------------------|
| CDD MODE | | | | | | |
| MODE | FREQ. BAND (MHz) | AVAILABLE CHANNEL | TESTED CHANNEL | MODULATION TECHNOLOGY | MODULATION TYPE | DATA RATE (Mbps) |
| 802.11a | 5180-5240 | 36 to 48 | 36, 40, 48 | OFDM | BPSK | 6 |
| 802.11ac (VHT20) | | 36 to 48 | 36, 40, 48 | OFDM | BPSK | 6.5 |
| 802.11ac (VHT40) | | 38 to 46 | 38, 46 | OFDM | BPSK | 13.5 |
| 802.11ac (VHT80) | | 42 | 42 | OFDM | BPSK | 29.3 |
| Beamforming MODE | | | | | | |
| MODE | FREQ. BAND (MHz) | AVAILABLE CHANNEL | TESTED CHANNEL | MODULATION TECHNOLOGY | MODULATION TYPE | DATA RATE (Mbps) |
| 802.11ac (VHT20) | 5180-5240 | 36 to 48 | 36, 40, 48 | OFDM | BPSK | 6.5 |
| 802.11ac (VHT40) | | 38 to 46 | 38, 46 | OFDM | BPSK | 13.5 |
| 802.11ac (VHT80) | | 42 | 42 | OFDM | BPSK | 29.3 |
| For Peak Power Spectral Density Measurement | | | | | | |
| CDD MODE | | | | | | |
| MODE | FREQ. BAND (MHz) | AVAILABLE CHANNEL | TESTED CHANNEL | MODULATION TECHNOLOGY | MODULATION TYPE | DATA RATE (Mbps) |
| 802.11a | 5180-5240 | 36 to 48 | 36, 40, 48 | OFDM | BPSK | 6 |
| 802.11ac (VHT20) | | 36 to 48 | 36, 40, 48 | OFDM | BPSK | 6.5 |
| 802.11ac (VHT40) | | 38 to 46 | 38, 46 | OFDM | BPSK | 13.5 |
| 802.11ac (VHT80) | | 42 | 42 | OFDM | BPSK | 29.3 |

Test Condition:

| APPLICABLE TO | ENVIRONMENTAL CONDITIONS | INPUT POWER | TESTED BY |
|---------------|--------------------------|--------------|---------------|
| RE≥1G | 25deg. C, 69%RH | 120Vac, 60Hz | Gary Cheng |
| RE<1G | 25deg. C, 68%RH | 120Vac, 60Hz | Robert Cheng |
| PLC | 25deg. C, 70%RH | 120Vac, 60Hz | Mike Hsieh |
| APCM | 25deg. C, 60%RH | 120Vac, 60Hz | Anderson Chen |

3.3 Duty Cycle of Test Signal

If duty cycle of test signal is $\geq 98\%$, duty factor is not required.

If duty cycle of test signal is $< 98\%$, duty factor shall be considered.

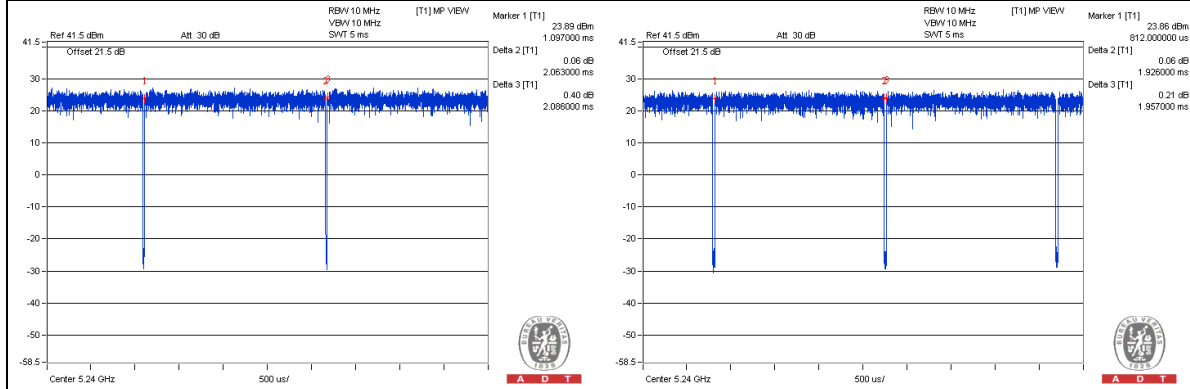
802.11a: Duty cycle = $2.063 \text{ ms} / 2.086 \text{ ms} = 0.989$

802.11ac (VHT20): Duty cycle = $1.926 \text{ ms} / 1.957 \text{ ms} = 0.984$

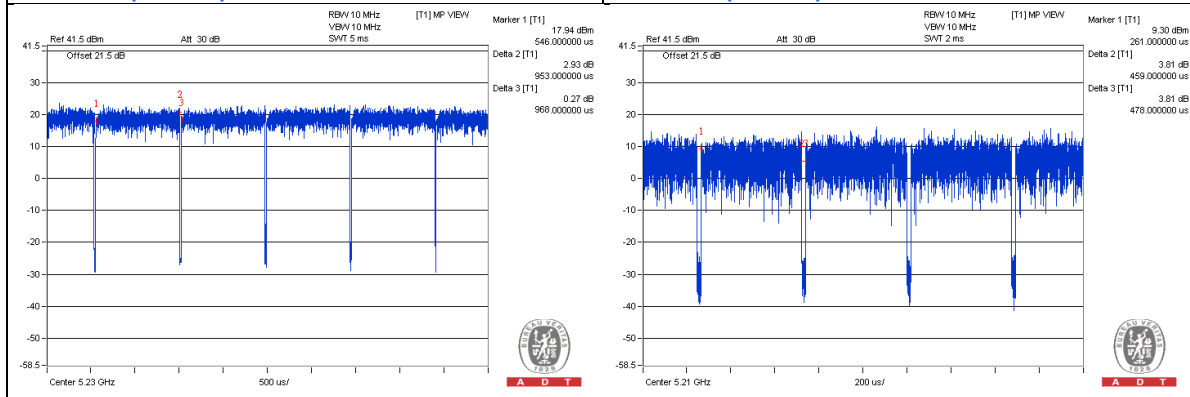
802.11ac (VHT40): Duty cycle = $0.953 \text{ ms} / 0.968 \text{ ms} = 0.985$

802.11ac (VHT80): Duty cycle = $0.459 \text{ ms} / 0.478 \text{ ms} = 0.96$, Duty factor = $10 * \log(1/0.96) = 0.18$

802.11a 802.11ac (VHT20)



802.11ac (VHT40) 802.11ac (VHT80)



3.4 Description of Support Units

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

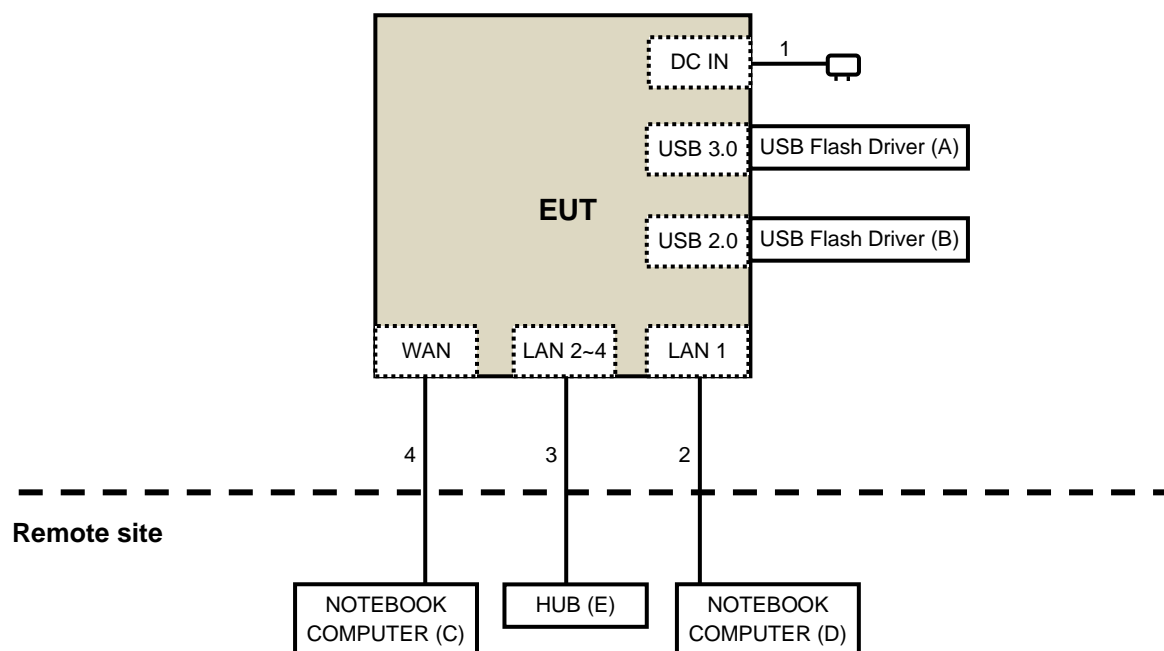
| No. | Product | Brand | Model No. | Serial No. | FCC ID | Remark |
|-----|-------------------|-----------|--------------|---------------|---------|-----------------|
| A | USB Flash Driver | Transcend | JetFlash 790 | NA | NA | Provided by Lab |
| B | USB Flash Driver | Transcend | JetFlash 790 | NA | NA | Provided by Lab |
| C | NOTEBOOK COMPUTER | DELL | PP32LA | HSLB32S | FCC DoC | Provided by Lab |
| D | NOTEBOOK COMPUTER | DELL | E5430 | 4YV4VY1 | FCC DoC | Provided by Lab |
| E | HUB | ZyXEL | ES-116P | S060H02000215 | FCC DoC | Provided by Lab |

NOTE:

- All power cords of the above support units are non-shielded (1.8 m).

| No. | Cable | Qty. | Length (m) | Shielded (Yes/ No) | Cores (Number) | Remark |
|-----|-------|------|------------|--------------------|----------------|--------------------|
| 1 | DC | 1 | 1.8 | No | 0 | Supplied by Client |
| 2 | RJ45 | 1 | 10 | No | 0 | Provided by Lab |
| 3 | RJ45 | 3 | 10 | No | 0 | Provided by Lab |
| 4 | RJ45 | 1 | 10 | No | 0 | Provided by Lab |

3.4.1 Configuration of System under Test



3.5 General Description of Applied Standard

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 E (15.407)
789033 D02 General UNII Test Procedure New Rules v01
662911 D01 Multiple Transmitter Output v02r01
ANSI C63.10-2009

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.

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

LIMITS OF UNWANTED EMISSION OUT OF THE RESTRICTED BANDS

| APPLICABLE TO | LIMIT | |
|--|--|--|
| 789033 D02 General UNII Test Procedure New Rules v01 | FIELD STRENGTH AT 3m | |
| | PK:74 (dBuV/m) | AV:54 (dBuV/m) |
| APPLICABLE TO | EIRP LIMIT | EQUIVALENT FIELD STRENGTH AT 3m |
| 15.407(b)(1) | PK:-27 (dBm/MHz) | PK:68.2(dBuV/m) |
| 15.407(b)(2) | | |
| 15.407(b)(3) | | |
| 15.407(b)(4) | PK:-27 (dBm/MHz) ^{*1} PK:-17 (dBm/MHz) ^{*2} | PK: 68.2(dBuV/m) ^{*1} PK:78.2 (dBuV/m) ^{*2} |

NOTE: ^{*1} beyond 10MHz of the band edge ^{*2} within 10 MHz of band edge

The following formula is used to convert the equipment isotropic radiated power (eirp) to field strength:

$$E = \frac{1000000\sqrt{30P}}{3} \mu\text{V/m, where P is the eirp (Watts).}$$



4.1.2 Test Instruments

For above 1GHz

| DESCRIPTION & MANUFACTURER | MODEL NO. | SERIAL NO. | CALIBRATED DATE | CALIBRATED UNTIL |
|---|------------------------------|-------------|-----------------|------------------|
| Test Receiver ROHDE & SCHWARZ | ESCI | 100424 | Oct. 06, 2014 | Oct. 05, 2015 |
| Spectrum Analyzer ROHDE & SCHWARZ | FSP40 | 100040 | July 25, 2014 | July 24, 2015 |
| BILOG Antenna SCHWARZBECK | VULB9168 | 9168-155 | Feb. 06, 2015 | Feb. 05, 2016 |
| HORN Antenna SCHWARZBECK | BBHA 9120D | 9120D-1170 | Feb. 05, 2015 | Feb. 04, 2016 |
| HORN Antenna SCHWARZBECK | BBHA 9170 | BBHA9170241 | Feb. 09, 2015 | Feb. 08, 2016 |
| Preamplifier Agilent | 8449B | 3008A01961 | Oct. 18, 2014 | Oct. 17, 2015 |
| Preamplifier Agilent | 8447D | 2944A10738 | Oct. 18, 2014 | Oct. 17, 2015 |
| RF signal cable HUBER+SUHNNER | SUCOFLEX 104 | 309220/4 | Aug. 09, 2014 | Aug. 08, 2015 |
| RF signal cable HUBER+SUHNNER | SUCOFLEX 104 | 250724/4 | Aug. 09, 2014 | Aug. 08, 2015 |
| RF signal cable HUBER+SUHNNER | SUCOFLEX 104 | 295012/4 | Aug. 09, 2014 | Aug. 08, 2015 |
| Software BV ADT | ADT_Radiated_ V7.6.15.9.4 | NA | NA | NA |
| Antenna Tower inn-co GmbH | MA 4000 | 010303 | NA | NA |
| Antenna Tower Controller inn-co GmbH | CO2000 | 019303 | NA | NA |
| Turn Table BV ADT | TT100 | TT93021704 | NA | NA |
| Turn Table Controller BV ADT | SC100 | SC93021704 | NA | NA |
| 26GHz ~ 40GHz Amplifier | EM26400 | 815221 | Oct. 18, 2014 | Oct. 17, 2015 |

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 4.
3. The horn antenna and HP preamplifier (model: 8449B) are used only for the measurement of emission frequency above 1GHz if tested.
4. The FCC Site Registration No. is 460141.
5. The IC Site Registration No. is IC7450F-4.
6. Tested Date: May 11, 2015

For below 1GHz

| DESCRIPTION & MANUFACTURER | MODEL NO. | SERIAL NO. | CALIBRATED DATE | CALIBRATED UNTIL |
|---|--------------------------|---|-----------------|------------------|
| Test Receiver Agilent | N9038A | MY50010156 | Aug. 11, 2014 | Aug. 10, 2015 |
| Pre-Amplifier Mini-Circuits | ZFL-1000VH2 B | AMP-ZFL-04 | Nov. 12, 2014 | Nov. 11, 2015 |
| Trilog Broadband Antenna SCHWARZBECK | VULB 9168 | 9168-361 | Feb. 06, 2015 | Feb. 05, 2016 |
| RF Cable | NA | CHHCAB_001 | Oct. 05, 2014 | Oct. 04, 2015 |
| Horn_Antenna AISI | AIH.8018 | 0000220091110 | Feb. 06, 2015 | Feb. 05, 2016 |
| Pre-Amplifier Agilent | 8449B | 300801923 | Oct. 28, 2014 | Oct. 27, 2015 |
| RF Cable | NA | 131206 131213 131215 SNMY23685/4 | Jan. 16, 2015 | Jan. 15, 2016 |
| Spectrum Analyzer R&S | FSV40 | 100964 | July 05, 2014 | July 04, 2015 |
| Pre-Amplifier SPACEK LABS | SLKKa-48-6 | 9K16 | Dec. 12, 2014 | Dec. 11, 2015 |
| Horn_Antenna SCHWARZBECK | BBHA 9170 | 9170-424 | Feb. 05, 2015 | Feb. 04, 2016 |
| RF Cable | NA | 329751/4 RF104-204 | Dec. 11, 2014 | Dec. 10, 2015 |
| Software | ADT_Radiated _V8.7.07 | NA | NA | NA |
| Antenna Tower & Turn Table CT | NA | 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 horn antenna, preamplifier (model: 8449B) are used only for the measurement of emission frequency above 1GHz if tested.
3. The test was performed in 966 Chamber No. H.
4. The FCC Site Registration No. is 797305.
5. The CANADA Site Registration No. is IC 7450H-3.
6. Tested Date: May 12, 2015

4.1.3 Test Procedure

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

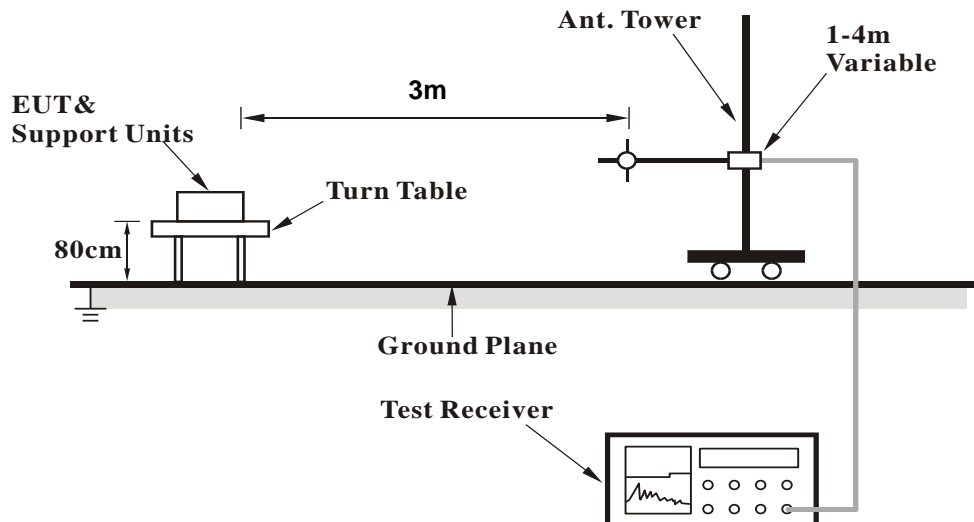
1. For emission measurements above 1 GHz, the EUT shall be placed at a height of 1.5 m above the ground at 3 meter chamber room for test
2. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120kHz for Quasi-peak detection (QP) at frequency below 1GHz.
3. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is 3 MHz for Peak detection (PK) at frequency above 1GHz.
4. The resolution bandwidth of test receiver/spectrum analyzer is 1MHz and the video bandwidth is 3MHz for RMS Average (Duty cycle < 98%) for Average detection (AV) at frequency above 1GHz, then the measurement results was added to a correction factor ($10 \log(1/\text{duty cycle})$).
5. The resolution bandwidth of test receiver/spectrum analyzer is 1MHz and the video bandwidth is 10Hz (Duty cycle $\geq 98\%$) for Average detection (AV) at frequency above 1GHz.
6. All modes of operation were investigated and the worst-case emissions are reported.

4.1.4 Deviation from Test Standard

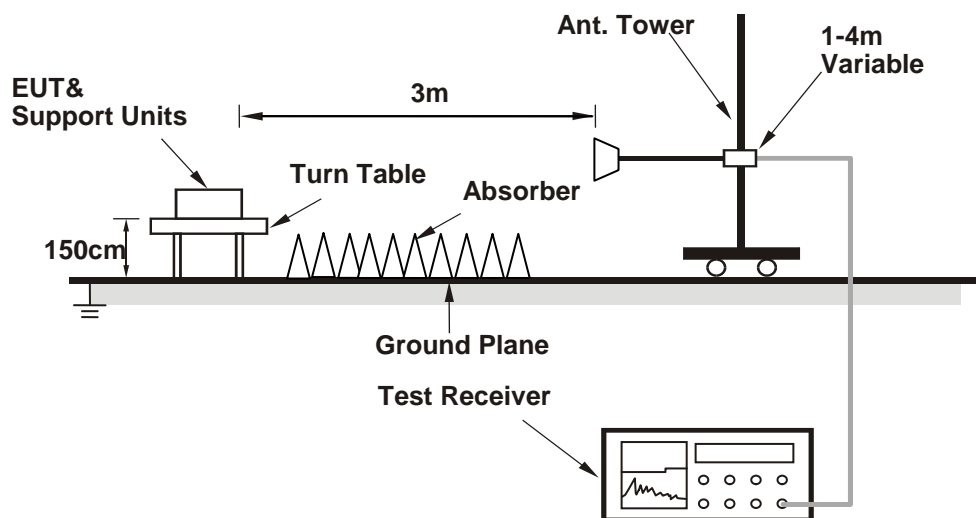
No deviation.

4.1.5 Test Setup

<Frequency Range below 1GHz>



<Frequency Range above 1GHz>



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

4.1.6 EUT Operating Condition

1. Connect the EUT with the support units C-D (NOTEBOOK COMPUTER) which is placed on remote site.
2. Controlling software (Mtool.exe_2_0_2_7) has been activated to set the EUT on specific status.

4.1.7 Test Results

Above 1GHz Data (Subcontract Item):

CDD Mode

802.11a

| | | | |
|------------------------|---------------|------------------------------|--------------|
| CHANNEL | TX Channel 36 | DETECTOR FUNCTION | Peak (PK) |
| FREQUENCY RANGE | 1GHz ~ 40GHz | | Average (AV) |

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M

| NO. | FREQ. (MHz) | EMISSION LEVEL (dBuV/m) | LIMIT (dBuV/m) | MARGIN (dB) | ANTENNA HEIGHT (m) | TABLE ANGLE (Degree) | RAW VALUE (dBuV) | CORRECTION FACTOR (dB/m) |
|-----|----------------|-------------------------------|-------------------|----------------|--------------------------|----------------------------|------------------------|--------------------------------|
| 1 | 5150.00 | 57.1 PK | 74.0 | -16.9 | 1.00 H | 45 | 47.13 | 9.97 |
| 2 | 5150.00 | 40.3 AV | 54.0 | -13.7 | 1.00 H | 45 | 30.33 | 9.97 |
| 3 | *5180.00 | 104.2 PK | | | 1.00 H | 45 | 94.04 | 10.16 |
| 4 | *5180.00 | 95.1 AV | | | 1.00 H | 45 | 84.94 | 10.16 |
| 5 | #10360.00 | 57.0 PK | 74.0 | -17.0 | 1.00 H | 278 | 40.02 | 16.98 |
| 6 | #10360.00 | 44.7 AV | 54.0 | -9.3 | 1.00 H | 278 | 27.72 | 16.98 |
| 7 | 15540.00 | 64.6 PK | 74.0 | -9.4 | 1.00 H | 145 | 42.67 | 21.93 |
| 8 | 15540.00 | 48.8 AV | 54.0 | -5.2 | 1.00 H | 145 | 26.87 | 21.93 |

ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M

| NO. | FREQ. (MHz) | EMISSION LEVEL (dBuV/m) | LIMIT (dBuV/m) | MARGIN (dB) | ANTENNA HEIGHT (m) | TABLE ANGLE (Degree) | RAW VALUE (dBuV) | CORRECTION FACTOR (dB/m) |
|-----|----------------|-------------------------------|-------------------|----------------|--------------------------|----------------------------|------------------------|--------------------------------|
| 1 | 5150.00 | 71.0 PK | 74.0 | -3.0 | 1.64 V | 51 | 61.03 | 9.97 |
| 2 | 5150.00 | 53.5 AV | 54.0 | -0.5 | 1.64 V | 51 | 43.53 | 9.97 |
| 3 | *5180.00 | 119.6 PK | | | 1.64 V | 51 | 109.44 | 10.16 |
| 4 | *5180.00 | 110.1 AV | | | 1.64 V | 51 | 99.94 | 10.16 |
| 5 | #10360.00 | 59.1 PK | 74.0 | -14.9 | 1.65 V | 341 | 42.12 | 16.98 |
| 6 | #10360.00 | 46.7 AV | 54.0 | -7.3 | 1.65 V | 341 | 29.72 | 16.98 |
| 7 | 15540.00 | 66.0 PK | 74.0 | -8.0 | 1.14 V | 37 | 44.07 | 21.93 |
| 8 | 15540.00 | 51.1 AV | 54.0 | -2.9 | 1.14 V | 37 | 29.17 | 21.93 |

REMARKS:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. The other emission levels were very low against the limit.
4. Margin value = Emission Level – Limit value
5. " * ": Fundamental frequency.
6. " # ": The radiated frequency is out of the restricted band.



| | | | |
|------------------------|---------------|------------------------------|--------------|
| CHANNEL | TX Channel 40 | DETECTOR FUNCTION | Peak (PK) |
| FREQUENCY RANGE | 1GHz ~ 40GHz | | Average (AV) |

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M

| NO. | FREQ. (MHz) | EMISSION LEVEL (dBuV/m) | LIMIT (dBuV/m) | MARGIN (dB) | ANTENNA HEIGHT (m) | TABLE ANGLE (Degree) | RAW VALUE (dBuV) | CORRECTION FACTOR (dB/m) |
|-----|----------------|-------------------------------|-------------------|----------------|--------------------------|----------------------------|------------------------|--------------------------------|
| 1 | *5200.00 | 106.8 PK | | | 1.00 H | 48 | 96.54 | 10.26 |
| 2 | *5200.00 | 97.3 AV | | | 1.00 H | 48 | 87.04 | 10.26 |
| 3 | #10400.00 | 57.4 PK | 74.0 | -16.6 | 1.03 H | 299 | 40.34 | 17.06 |
| 4 | #10400.00 | 44.8 AV | 54.0 | -9.2 | 1.03 H | 299 | 27.74 | 17.06 |
| 5 | 15600.00 | 64.8 PK | 74.0 | -9.2 | 1.02 H | 156 | 42.52 | 22.28 |
| 6 | 15600.00 | 48.9 AV | 54.0 | -5.1 | 1.02 H | 156 | 26.62 | 22.28 |

ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M

| NO. | FREQ. (MHz) | EMISSION LEVEL (dBuV/m) | LIMIT (dBuV/m) | MARGIN (dB) | ANTENNA HEIGHT (m) | TABLE ANGLE (Degree) | RAW VALUE (dBuV) | CORRECTION FACTOR (dB/m) |
|-----|----------------|-------------------------------|-------------------|----------------|--------------------------|----------------------------|------------------------|--------------------------------|
| 1 | *5200.00 | 122.7 PK | | | 1.70 V | 145 | 112.44 | 10.26 |
| 2 | *5200.00 | 113.0 AV | | | 1.70 V | 145 | 102.74 | 10.26 |
| 3 | #10400.00 | 60.1 PK | 74.0 | -13.9 | 1.19 V | 173 | 43.04 | 17.06 |
| 4 | #10400.00 | 48.0 AV | 54.0 | -6.0 | 1.19 V | 173 | 30.94 | 17.06 |
| 5 | 15600.00 | 69.2 PK | 74.0 | -4.8 | 1.34 V | 121 | 46.92 | 22.28 |
| 6 | 15600.00 | 53.7 AV | 54.0 | -0.3 | 1.34 V | 121 | 31.42 | 22.28 |

REMARKS:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. The other emission levels were very low against the limit.
4. Margin value = Emission Level – Limit value
5. " * ": Fundamental frequency.
6. " # ": The radiated frequency is out of the restricted band.



| | | | |
|------------------------|---------------|--------------------------|--------------|
| CHANNEL | TX Channel 48 | DETECTOR FUNCTION | Peak (PK) |
| FREQUENCY RANGE | 1GHz ~ 40GHz | | Average (AV) |

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M

| NO. | FREQ. (MHz) | EMISSION LEVEL (dBuV/m) | LIMIT (dBuV/m) | MARGIN (dB) | ANTENNA HEIGHT (m) | TABLE ANGLE (Degree) | RAW VALUE (dBuV) | CORRECTION FACTOR (dB/m) |
|-----|-------------|-------------------------|----------------|-------------|--------------------|----------------------|------------------|--------------------------|
| 1 | *5240.00 | 106.6 PK | | | 1.00 H | 31 | 96.27 | 10.33 |
| 2 | *5240.00 | 97.3 AV | | | 1.00 H | 31 | 86.97 | 10.33 |
| 3 | 5406.00 | 57.5 PK | 74.0 | -16.5 | 1.03 H | 43 | 46.78 | 10.72 |
| 4 | 5406.00 | 40.7 AV | 54.0 | -13.3 | 1.03 H | 43 | 29.98 | 10.72 |
| 5 | #10480.00 | 57.5 PK | 74.0 | -16.5 | 1.00 H | 292 | 40.77 | 16.73 |
| 6 | #10480.00 | 45.0 AV | 54.0 | -9.0 | 1.00 H | 292 | 28.27 | 16.73 |
| 7 | 15720.00 | 64.7 PK | 74.0 | -9.3 | 1.00 H | 149 | 42.07 | 22.63 |
| 8 | 15720.00 | 49.1 AV | 54.0 | -4.9 | 1.00 H | 149 | 26.47 | 22.63 |

ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M

| NO. | FREQ. (MHz) | EMISSION LEVEL (dBuV/m) | LIMIT (dBuV/m) | MARGIN (dB) | ANTENNA HEIGHT (m) | TABLE ANGLE (Degree) | RAW VALUE (dBuV) | CORRECTION FACTOR (dB/m) |
|-----|-------------|-------------------------|----------------|-------------|--------------------|----------------------|------------------|--------------------------|
| 1 | *5240.00 | 123.1 PK | | | 1.48 V | 131 | 112.77 | 10.33 |
| 2 | *5240.00 | 113.2 AV | | | 1.48 V | 131 | 102.87 | 10.33 |
| 3 | 5406.00 | 61.2 PK | 74.0 | -12.8 | 1.48 V | 131 | 50.48 | 10.72 |
| 4 | 5406.00 | 50.4 AV | 54.0 | -3.6 | 1.48 V | 131 | 39.68 | 10.72 |
| 5 | #10480.00 | 60.3 PK | 74.0 | -13.7 | 1.14 V | 159 | 43.57 | 16.73 |
| 6 | #10480.00 | 47.7 AV | 54.0 | -6.3 | 1.14 V | 159 | 30.97 | 16.73 |
| 7 | 15720.00 | 68.7 PK | 74.0 | -5.3 | 1.64 V | 115 | 46.07 | 22.63 |
| 8 | 15720.00 | 53.9 AV | 54.0 | -0.1 | 1.64 V | 115 | 31.27 | 22.63 |

REMARKS:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. The other emission levels were very low against the limit.
4. Margin value = Emission Level – Limit value
5. " * ": Fundamental frequency.
6. " # ": The radiated frequency is out of the restricted band.

802.11ac (VHT20)

| | | | |
|------------------------|---------------|------------------------------|--------------|
| CHANNEL | TX Channel 36 | DETECTOR FUNCTION | Peak (PK) |
| FREQUENCY RANGE | 1GHz ~ 40GHz | | Average (AV) |

| ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M | | | | | | | | |
|--|------------------------|--|---------------------------|------------------------|-----------------------------------|-------------------------------------|---------------------------------|---|
| NO. | FREQ. (MHz) | EMISSION LEVEL (dBuV/m) | LIMIT (dBuV/m) | MARGIN (dB) | ANTENNA HEIGHT (m) | TABLE ANGLE (Degree) | RAW VALUE (dBuV) | CORRECTION FACTOR (dB/m) |
| 1 | 5147.00 | 57.3 PK | 74.0 | -16.7 | 1.02 H | 34 | 47.35 | 9.95 |
| 2 | 5147.00 | 40.5 AV | 54.0 | -13.5 | 1.02 H | 34 | 30.55 | 9.95 |
| 3 | *5180.00 | 104.6 PK | | | 1.00 H | 44 | 94.44 | 10.16 |
| 4 | *5180.00 | 95.6 AV | | | 1.00 H | 44 | 85.44 | 10.16 |
| 5 | #10360.00 | 57.0 PK | 74.0 | -17.0 | 1.09 H | 292 | 40.02 | 16.98 |
| 6 | #10360.00 | 44.7 AV | 54.0 | -9.3 | 1.09 H | 292 | 27.72 | 16.98 |
| 7 | 15540.00 | 64.6 PK | 74.0 | -9.4 | 1.04 H | 155 | 42.67 | 21.93 |
| 8 | 15540.00 | 49.1 AV | 54.0 | -4.9 | 1.04 H | 155 | 27.17 | 21.93 |
| ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M | | | | | | | | |
| NO. | FREQ. (MHz) | EMISSION LEVEL (dBuV/m) | LIMIT (dBuV/m) | MARGIN (dB) | ANTENNA HEIGHT (m) | TABLE ANGLE (Degree) | RAW VALUE (dBuV) | CORRECTION FACTOR (dB/m) |
| 1 | 5147.00 | 69.7 PK | 74.0 | -4.3 | 1.72 V | 49 | 59.75 | 9.95 |
| 2 | 5147.00 | 53.5 AV | 54.0 | -0.5 | 1.72 V | 49 | 43.55 | 9.95 |
| 3 | *5180.00 | 119.0 PK | | | 1.72 V | 49 | 108.84 | 10.16 |
| 4 | *5180.00 | 108.7 AV | | | 1.72 V | 49 | 98.54 | 10.16 |
| 5 | #10360.00 | 59.0 PK | 74.0 | -15.0 | 1.11 V | 69 | 42.02 | 16.98 |
| 6 | #10360.00 | 46.6 AV | 54.0 | -7.4 | 1.11 V | 69 | 29.62 | 16.98 |
| 7 | 15540.00 | 66.1 PK | 74.0 | -7.9 | 1.11 V | 40 | 44.17 | 21.93 |
| 8 | 15540.00 | 51.4 AV | 54.0 | -2.6 | 1.11 V | 40 | 29.47 | 21.93 |

REMARKS:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. The other emission levels were very low against the limit.
4. Margin value = Emission Level – Limit value
5. " * ": Fundamental frequency.
6. " # ": The radiated frequency is out of the restricted band.



| | | | |
|------------------------|---------------|--------------------------|--------------|
| CHANNEL | TX Channel 40 | DETECTOR FUNCTION | Peak (PK) |
| FREQUENCY RANGE | 1GHz ~ 40GHz | | Average (AV) |

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M

| NO. | FREQ. (MHz) | EMISSION LEVEL (dBuV/m) | LIMIT (dBuV/m) | MARGIN (dB) | ANTENNA HEIGHT (m) | TABLE ANGLE (Degree) | RAW VALUE (dBuV) | CORRECTION FACTOR (dB/m) |
|-----|-------------|-------------------------|----------------|-------------|--------------------|----------------------|------------------|--------------------------|
| 1 | *5200.00 | 107.2 PK | | | 1.01 H | 32 | 96.94 | 10.26 |
| 2 | *5200.00 | 97.5 AV | | | 1.01 H | 32 | 87.24 | 10.26 |
| 3 | #10400.00 | 56.7 PK | 74.0 | -17.3 | 1.09 H | 302 | 39.64 | 17.06 |
| 4 | #10400.00 | 44.5 AV | 54.0 | -9.5 | 1.09 H | 302 | 27.44 | 17.06 |
| 5 | 15600.00 | 64.9 PK | 74.0 | -9.1 | 1.06 H | 140 | 42.62 | 22.28 |
| 6 | 15600.00 | 49.1 AV | 54.0 | -4.9 | 1.06 H | 140 | 26.82 | 22.28 |

ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M

| NO. | FREQ. (MHz) | EMISSION LEVEL (dBuV/m) | LIMIT (dBuV/m) | MARGIN (dB) | ANTENNA HEIGHT (m) | TABLE ANGLE (Degree) | RAW VALUE (dBuV) | CORRECTION FACTOR (dB/m) |
|-----|-------------|-------------------------|----------------|-------------|--------------------|----------------------|------------------|--------------------------|
| 1 | *5200.00 | 122.5 PK | | | 1.68 V | 145 | 112.24 | 10.26 |
| 2 | *5200.00 | 111.8 AV | | | 1.68 V | 145 | 101.54 | 10.26 |
| 3 | #10400.00 | 60.2 PK | 74.0 | -13.8 | 1.11 V | 34 | 43.14 | 17.06 |
| 4 | #10400.00 | 47.6 AV | 54.0 | -6.4 | 1.11 V | 34 | 30.54 | 17.06 |
| 5 | 15600.00 | 68.2 PK | 74.0 | -5.8 | 1.14 V | 140 | 45.92 | 22.28 |
| 6 | 15600.00 | 53.9 AV | 54.0 | -0.1 | 1.14 V | 140 | 31.62 | 22.28 |

REMARKS:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. The other emission levels were very low against the limit.
4. Margin value = Emission Level – Limit value
5. " * ": Fundamental frequency.
6. " # ": The radiated frequency is out of the restricted band.



| | | | |
|------------------------|---------------|------------------------------|--------------|
| CHANNEL | TX Channel 48 | DETECTOR FUNCTION | Peak (PK) |
| FREQUENCY RANGE | 1GHz ~ 40GHz | | Average (AV) |

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M

| NO. | FREQ. (MHz) | EMISSION LEVEL (dBuV/m) | LIMIT (dBuV/m) | MARGIN (dB) | ANTENNA HEIGHT (m) | TABLE ANGLE (Degree) | RAW VALUE (dBuV) | CORRECTION FACTOR (dB/m) |
|-----|----------------|-------------------------------|-------------------|----------------|--------------------------|----------------------------|------------------------|--------------------------------|
| 1 | *5240.00 | 106.2 PK | | | 1.05 H | 51 | 95.87 | 10.33 |
| 2 | *5240.00 | 96.9 AV | | | 1.05 H | 51 | 86.57 | 10.33 |
| 3 | 5392.00 | 56.7 PK | 74.0 | -17.3 | 1.00 H | 57 | 46.03 | 10.67 |
| 4 | 5392.00 | 40.0 AV | 54.0 | -14.0 | 1.00 H | 57 | 29.33 | 10.67 |
| 5 | #10480.00 | 56.5 PK | 74.0 | -17.5 | 1.05 H | 284 | 39.77 | 16.73 |
| 6 | #10480.00 | 44.2 AV | 54.0 | -9.8 | 1.05 H | 284 | 27.47 | 16.73 |
| 7 | 15720.00 | 64.6 PK | 74.0 | -9.4 | 1.00 H | 151 | 41.97 | 22.63 |
| 8 | 15720.00 | 49.1 AV | 54.0 | -4.9 | 1.00 H | 151 | 26.47 | 22.63 |

ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M

| NO. | FREQ. (MHz) | EMISSION LEVEL (dBuV/m) | LIMIT (dBuV/m) | MARGIN (dB) | ANTENNA HEIGHT (m) | TABLE ANGLE (Degree) | RAW VALUE (dBuV) | CORRECTION FACTOR (dB/m) |
|-----|----------------|-------------------------------|-------------------|----------------|--------------------------|----------------------------|------------------------|--------------------------------|
| 1 | *5240.00 | 123.7 PK | | | 1.76 V | 133 | 113.37 | 10.33 |
| 2 | *5240.00 | 112.8 AV | | | 1.76 V | 133 | 102.47 | 10.33 |
| 3 | 5392.00 | 61.4 PK | 74.0 | -12.6 | 1.76 V | 133 | 50.73 | 10.67 |
| 4 | 5392.00 | 49.6 AV | 54.0 | -4.4 | 1.76 V | 133 | 38.93 | 10.67 |
| 5 | #10480.00 | 58.3 PK | 74.0 | -15.7 | 1.02 V | 21 | 41.57 | 16.73 |
| 6 | #10480.00 | 46.0 AV | 54.0 | -8.0 | 1.02 V | 21 | 29.27 | 16.73 |
| 7 | 15720.00 | 68.2 PK | 74.0 | -5.8 | 1.57 V | 115 | 45.57 | 22.63 |
| 8 | 15720.00 | 53.6 AV | 54.0 | -0.4 | 1.57 V | 115 | 30.97 | 22.63 |

REMARKS:

- Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
- Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
- The other emission levels were very low against the limit.
- Margin value = Emission Level – Limit value
- " * ": Fundamental frequency.
- " # ": The radiated frequency is out of the restricted band.

802.11ac (VHT40)

| | | | |
|------------------------|---------------|------------------------------|--------------|
| CHANNEL | TX Channel 38 | DETECTOR FUNCTION | Peak (PK) |
| FREQUENCY RANGE | 1GHz ~ 40GHz | | Average (AV) |

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M

| NO. | FREQ. (MHz) | EMISSION LEVEL (dBuV/m) | LIMIT (dBuV/m) | MARGIN (dB) | ANTENNA HEIGHT (m) | TABLE ANGLE (Degree) | RAW VALUE (dBuV) | CORRECTION FACTOR (dB/m) |
|-----|----------------|-------------------------------|-------------------|----------------|--------------------------|----------------------------|------------------------|--------------------------------|
| 1 | 5150.00 | 56.8 PK | 74.0 | -17.2 | 1.00 H | 46 | 46.83 | 9.97 |
| 2 | 5150.00 | 40.3 AV | 54.0 | -13.7 | 1.00 H | 46 | 30.33 | 9.97 |
| 3 | *5190.00 | 99.8 PK | | | 1.01 H | 54 | 89.60 | 10.20 |
| 4 | *5190.00 | 89.6 AV | | | 1.01 H | 54 | 79.40 | 10.20 |
| 5 | #10380.00 | 56.6 PK | 74.0 | -17.4 | 1.11 H | 289 | 39.58 | 17.02 |
| 6 | #10380.00 | 44.7 AV | 54.0 | -9.3 | 1.11 H | 289 | 27.68 | 17.02 |
| 7 | 15570.00 | 65.0 PK | 74.0 | -9.0 | 1.00 H | 141 | 42.90 | 22.10 |
| 8 | 15570.00 | 49.0 AV | 54.0 | -5.0 | 1.00 H | 141 | 26.90 | 22.10 |

ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M

| NO. | FREQ. (MHz) | EMISSION LEVEL (dBuV/m) | LIMIT (dBuV/m) | MARGIN (dB) | ANTENNA HEIGHT (m) | TABLE ANGLE (Degree) | RAW VALUE (dBuV) | CORRECTION FACTOR (dB/m) |
|-----|----------------|-------------------------------|-------------------|----------------|--------------------------|----------------------------|------------------------|--------------------------------|
| 1 | 5150.00 | 72.6 PK | 74.0 | -1.4 | 1.57 V | 146 | 62.63 | 9.97 |
| 2 | 5150.00 | 53.2 AV | 54.0 | -0.8 | 1.57 V | 146 | 43.23 | 9.97 |
| 3 | *5190.00 | 115.2 PK | | | 1.79 V | 132 | 105.00 | 10.20 |
| 4 | *5190.00 | 104.6 AV | | | 1.79 V | 132 | 94.40 | 10.20 |
| 5 | #10380.00 | 58.7 PK | 74.0 | -15.3 | 1.00 V | 30 | 41.68 | 17.02 |
| 6 | #10380.00 | 46.5 AV | 54.0 | -7.5 | 1.00 V | 30 | 29.48 | 17.02 |
| 7 | 15570.00 | 64.2 PK | 74.0 | -9.8 | 1.50 V | 100 | 42.10 | 22.10 |
| 8 | 15570.00 | 48.6 AV | 54.0 | -5.4 | 1.50 V | 100 | 26.50 | 22.10 |

REMARKS:

- Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
- Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
- The other emission levels were very low against the limit.
- Margin value = Emission Level – Limit value
- " * ": Fundamental frequency.
- " # ": The radiated frequency is out of the restricted band.

| | | | |
|------------------------|---------------|--------------------------|--------------|
| CHANNEL | TX Channel 46 | DETECTOR FUNCTION | Peak (PK) |
| FREQUENCY RANGE | 1GHz ~ 40GHz | | Average (AV) |

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M

| NO. | FREQ. (MHz) | EMISSION LEVEL (dBuV/m) | LIMIT (dBuV/m) | MARGIN (dB) | ANTENNA HEIGHT (m) | TABLE ANGLE (Degree) | RAW VALUE (dBuV) | CORRECTION FACTOR (dB/m) |
|-----|-------------|-------------------------|----------------|-------------|--------------------|----------------------|------------------|--------------------------|
| 1 | 5150.00 | 57.2 PK | 74.0 | -16.8 | 1.03 H | 48 | 47.23 | 9.97 |
| 2 | 5150.00 | 40.5 AV | 54.0 | -13.5 | 1.03 H | 48 | 30.53 | 9.97 |
| 3 | *5230.00 | 113.2 PK | | | 1.02 H | 53 | 102.88 | 10.32 |
| 4 | *5230.00 | 92.4 AV | | | 1.02 H | 53 | 82.08 | 10.32 |
| 5 | 5375.00 | 59.1 PK | 74.0 | -14.9 | 1.03 H | 48 | 48.47 | 10.63 |
| 6 | 5375.00 | 42.3 AV | 54.0 | -11.7 | 1.03 H | 48 | 31.67 | 10.63 |
| 7 | #10460.00 | 56.6 PK | 74.0 | -17.4 | 1.06 H | 301 | 39.78 | 16.82 |
| 8 | #10460.00 | 44.7 AV | 54.0 | -9.3 | 1.06 H | 301 | 27.88 | 16.82 |
| 9 | 15690.00 | 64.2 PK | 74.0 | -9.8 | 1.06 H | 139 | 41.68 | 22.52 |
| 10 | 15690.00 | 48.5 AV | 54.0 | -5.5 | 1.06 H | 139 | 25.98 | 22.52 |

ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M

| NO. | FREQ. (MHz) | EMISSION LEVEL (dBuV/m) | LIMIT (dBuV/m) | MARGIN (dB) | ANTENNA HEIGHT (m) | TABLE ANGLE (Degree) | RAW VALUE (dBuV) | CORRECTION FACTOR (dB/m) |
|----------|----------------|-------------------------|----------------|-------------|--------------------|----------------------|------------------|--------------------------|
| 1 | 5150.00 | 61.6 PK | 74.0 | -12.4 | 1.56 V | 101 | 51.63 | 9.97 |
| 2 | 5150.00 | 49.9 AV | 54.0 | -4.1 | 1.56 V | 101 | 39.93 | 9.97 |
| 3 | *5230.00 | 118.6 PK | | | 1.77 V | 129 | 108.28 | 10.32 |
| 4 | *5230.00 | 107.8 AV | | | 1.77 V | 129 | 97.48 | 10.32 |
| 5 | 5375.00 | 65.8 PK | 74.0 | -8.2 | 1.56 V | 101 | 55.17 | 10.63 |
| 6 | 5375.00 | 53.9 AV | 54.0 | -0.1 | 1.56 V | 101 | 43.27 | 10.63 |
| 7 | #10460.00 | 58.1 PK | 74.0 | -15.9 | 1.07 V | 19 | 41.28 | 16.82 |
| 8 | #10460.00 | 45.7 AV | 54.0 | -8.3 | 1.07 V | 19 | 28.88 | 16.82 |
| 9 | 15690.00 | 65.1 PK | 74.0 | -8.9 | 1.59 V | 111 | 42.58 | 22.52 |
| 10 | 15690.00 | 49.2 AV | 54.0 | -4.8 | 1.59 V | 111 | 26.68 | 22.52 |

REMARKS:

- Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
- Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
- The other emission levels were very low against the limit.
- Margin value = Emission Level – Limit value
- " * ": Fundamental frequency.
- " # ": The radiated frequency is out of the restricted band.



802.11ac (VHT80)

| | | | |
|------------------------|---------------|--------------------------|--------------|
| CHANNEL | TX Channel 42 | DETECTOR FUNCTION | Peak (PK) |
| FREQUENCY RANGE | 1GHz ~ 40GHz | | Average (AV) |

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M

| NO. | FREQ. (MHz) | EMISSION LEVEL (dBuV/m) | LIMIT (dBuV/m) | MARGIN (dB) | ANTENNA HEIGHT (m) | TABLE ANGLE (Degree) | RAW VALUE (dBuV) | CORRECTION FACTOR (dB/m) |
|-----|-------------|-------------------------|----------------|-------------|--------------------|----------------------|------------------|--------------------------|
| 1 | 5150.00 | 57.8 PK | 74.0 | -16.2 | 1.00 H | 35 | 47.83 | 9.97 |
| 2 | 5150.00 | 40.4 AV | 54.0 | -13.6 | 1.00 H | 35 | 30.43 | 9.97 |
| 3 | *5210.00 | 94.3 PK | | | 1.00 H | 52 | 84.03 | 10.27 |
| 4 | *5210.00 | 84.2 AV | | | 1.00 H | 52 | 73.93 | 10.27 |
| 5 | 5350.00 | 56.7 PK | 74.0 | -17.3 | 1.00 H | 35 | 46.15 | 10.55 |
| 6 | 5350.00 | 39.9 AV | 54.0 | -14.1 | 1.00 H | 35 | 29.35 | 10.55 |
| 7 | #10420.00 | 57.3 PK | 74.0 | -16.7 | 1.07 H | 302 | 40.32 | 16.98 |
| 8 | #10420.00 | 44.8 AV | 54.0 | -9.2 | 1.07 H | 302 | 27.82 | 16.98 |
| 9 | 15630.00 | 64.2 PK | 74.0 | -9.8 | 1.04 H | 141 | 41.83 | 22.37 |
| 10 | 15630.00 | 48.4 AV | 54.0 | -5.6 | 1.04 H | 141 | 26.03 | 22.37 |

ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M

| NO. | FREQ. (MHz) | EMISSION LEVEL (dBuV/m) | LIMIT (dBuV/m) | MARGIN (dB) | ANTENNA HEIGHT (m) | TABLE ANGLE (Degree) | RAW VALUE (dBuV) | CORRECTION FACTOR (dB/m) |
|-----|-------------|-------------------------|----------------|-------------|--------------------|----------------------|------------------|--------------------------|
| 1 | 5150.00 | 65.0 PK | 74.0 | -9.0 | 1.62 V | 146 | 55.03 | 9.97 |
| 2 | 5150.00 | 53.7 AV | 54.0 | -0.3 | 1.62 V | 146 | 43.73 | 9.97 |
| 3 | *5210.00 | 109.7 PK | | | 1.73 V | 120 | 99.43 | 10.27 |
| 4 | *5210.00 | 99.6 AV | | | 1.73 V | 120 | 89.33 | 10.27 |
| 5 | 5350.00 | 60.6 PK | 74.0 | -13.4 | 1.73 V | 123 | 50.05 | 10.55 |
| 6 | 5350.00 | 49.1 AV | 54.0 | -4.9 | 1.73 V | 123 | 38.55 | 10.55 |
| 7 | #10420.00 | 57.6 PK | 74.0 | -16.4 | 1.05 V | 33 | 40.62 | 16.98 |
| 8 | #10420.00 | 45.6 AV | 54.0 | -8.4 | 1.05 V | 33 | 28.62 | 16.98 |
| 9 | 15630.00 | 64.3 PK | 74.0 | -9.7 | 1.48 V | 105 | 41.93 | 22.37 |
| 10 | 15630.00 | 48.7 AV | 54.0 | -5.3 | 1.48 V | 105 | 26.33 | 22.37 |

REMARKS:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. The other emission levels were very low against the limit.
4. Margin value = Emission Level – Limit value
5. " * ": Fundamental frequency.
6. " # ": The radiated frequency is out of the restricted band.

Below 1GHz Data:
CDD MODE
802.11ac (VHT20)

| | | | |
|------------------------|---------------|--------------------------|-----------------|
| CHANNEL | TX Channel 40 | DETECTOR FUNCTION | Quasi-Peak (QP) |
| FREQUENCY RANGE | Below 1GHz | | |

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M

| NO. | FREQ. (MHz) | EMISSION LEVEL (dBuV/m) | LIMIT (dBuV/m) | MARGIN (dB) | ANTENNA HEIGHT (m) | TABLE ANGLE (Degree) | RAW VALUE (dBuV) | CORRECTION FACTOR (dB/m) |
|-----|-------------|-------------------------|----------------|-------------|--------------------|----------------------|------------------|--------------------------|
| 1 | 219.68 | 41.8 QP | 46.0 | -4.2 | 1.50 H | 198 | 57.83 | -16.05 |
| 2 | 318.96 | 42.0 QP | 46.0 | -4.1 | 1.00 H | 127 | 53.07 | -11.12 |
| 3 | 331.58 | 43.0 QP | 46.0 | -3.0 | 1.00 H | 129 | 53.74 | -10.78 |
| 4 | 379.83 | 41.6 QP | 46.0 | -4.4 | 1.00 H | 109 | 51.73 | -10.11 |
| 5 | 392.10 | 41.2 QP | 46.0 | -4.8 | 1.00 H | 303 | 50.98 | -9.81 |
| 6 | 750.03 | 42.0 QP | 46.0 | -4.1 | 1.00 H | 0 | 43.94 | -1.99 |

ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M

| NO. | FREQ. (MHz) | EMISSION LEVEL (dBuV/m) | LIMIT (dBuV/m) | MARGIN (dB) | ANTENNA HEIGHT (m) | TABLE ANGLE (Degree) | RAW VALUE (dBuV) | CORRECTION FACTOR (dB/m) |
|-----|-------------|-------------------------|----------------|-------------|--------------------|----------------------|------------------|--------------------------|
| 1 | 51.92 | 36.4 QP | 40.0 | -3.6 | 1.00 V | 336 | 49.74 | -13.36 |
| 2 | 62.25 | 35.1 QP | 40.0 | -4.9 | 1.00 V | 193 | 49.52 | -14.41 |
| 3 | 340.13 | 42.9 QP | 46.0 | -3.1 | 1.50 V | 360 | 53.63 | -10.77 |
| 4 | 368.00 | 41.9 QP | 46.0 | -4.1 | 1.50 V | 125 | 52.16 | -10.28 |
| 5 | 404.18 | 41.3 QP | 46.0 | -4.7 | 1.00 V | 360 | 50.79 | -9.51 |
| 6 | 749.98 | 41.3 QP | 46.0 | -4.7 | 1.50 V | 360 | 43.28 | -1.99 |

REMARKS:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. The other emission levels were very low against the limit.
4. 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 0.50MHz.

4.2.2 Test Instruments

| DESCRIPTION & MANUFACTURER | MODEL NO. | SERIAL NO. | CALIBRATED DATE | CALIBRATED UNTIL |
|--|-------------------------|------------|-----------------|------------------|
| Test Receiver ROHDE & SCHWARZ | ESCS 30 | 100375 | May 06, 2015 | May 05, 2016 |
| Line-Impedance Stabilization Network (for EUT) SCHWARZBECK | NSLK-8127 | 8127-522 | Sep. 15, 2014 | Sep. 14, 2015 |
| Line-Impedance Stabilization Network (for Peripheral) ROHDE & SCHWARZ | ENV216 | 100071 | Nov. 10, 2014 | Nov. 09, 2015 |
| RF Cable (JYEBAO) | 5D-FB | COCCAB-001 | Mar. 09, 2015 | Mar. 08, 2016 |
| 50 ohms Terminator | N/A | EMC-03 | Sep. 22, 2014 | Sep. 21, 2015 |
| 50 ohms Terminator | N/A | EMC-02 | Sep. 30, 2014 | Sep. 29, 2015 |
| 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 Shielded Room No. C.
3. The VCCI Con C Registration No. is C-3611.
4. Tested Date: May 07, 2015

4.2.3 Test Procedure

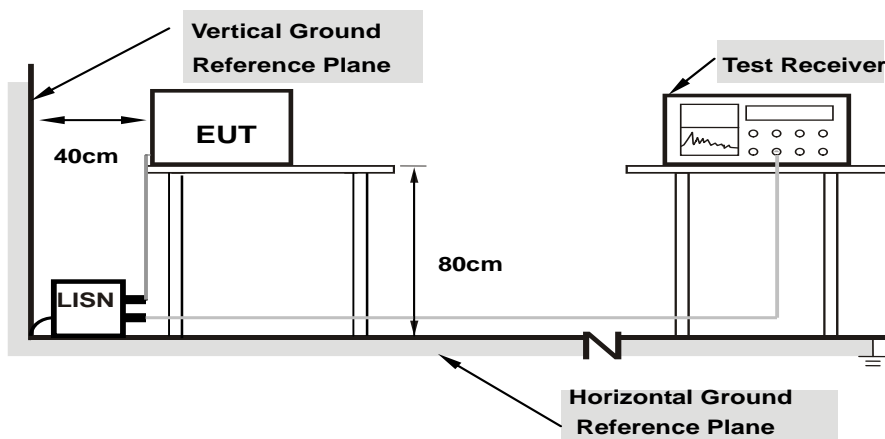
- a. The EUT was placed 0.4 meters from the conducting wall of the shielded room with EUT being connected to the power mains through a line impedance stabilization network (LISN). Other support units were connected to the power mains through another LISN. The two LISNs provide 50 ohm/ 50uH of coupling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

NOTE: All modes of operation were investigated and the worst-case emissions are reported.

4.2.4 Deviation from Test Standard

No deviation.

4.2.5 Test Setup



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

4.2.6 EUT Operating Condition

Same as 4.1.6.

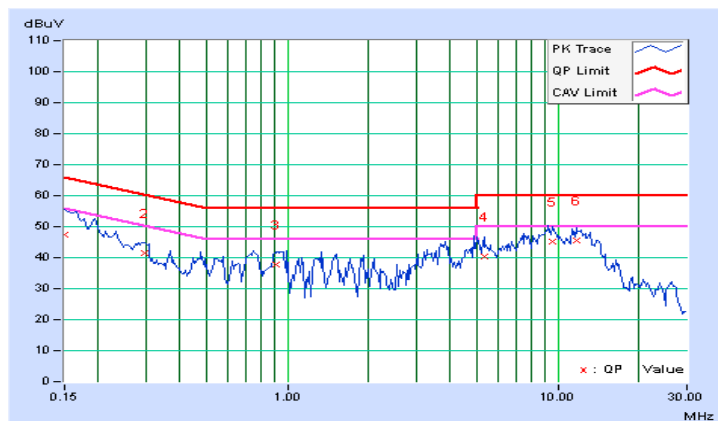
4.2.7 Test Results

| Phase | Line (L) | Detector Function | Quasi-Peak (QP) / Average (AV) |
|-------|----------|-------------------|--------------------------------|
|-------|----------|-------------------|--------------------------------|

| No | Freq. [MHz] | Corr. | Reading Value | | Emission Level | | Limit | | Margin | |
|----------|-----------------|-------------|---------------|--------------|----------------|--------------|--------------|--------------|---------------|---------------|
| | | Factor | [dB (uV)] | | [dB (uV)] | | [dB (uV)] | | (dB) | |
| | (dB) | Q.P. | AV. | Q.P. | AV. | Q.P. | AV. | Q.P. | AV. | |
| 1 | 0.15000 | 0.08 | 47.15 | 23.07 | 47.23 | 23.15 | 66.00 | 56.00 | -18.77 | -32.85 |
| 2 | 0.29844 | 0.09 | 41.33 | 32.53 | 41.42 | 32.62 | 60.29 | 50.29 | -18.86 | -17.66 |
| 3 | 0.91172 | 0.13 | 37.69 | 27.46 | 37.82 | 27.59 | 56.00 | 46.00 | -18.18 | -18.41 |
| 4 | 5.33984 | 0.27 | 40.13 | 33.63 | 40.40 | 33.90 | 60.00 | 50.00 | -19.60 | -16.10 |
| 5 | 9.55469 | 0.43 | 44.68 | 38.64 | 45.11 | 39.07 | 60.00 | 50.00 | -14.89 | -10.93 |
| 6 | 11.67969 | 0.49 | 44.96 | 39.18 | 45.45 | 39.67 | 60.00 | 50.00 | -14.55 | -10.33 |

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.

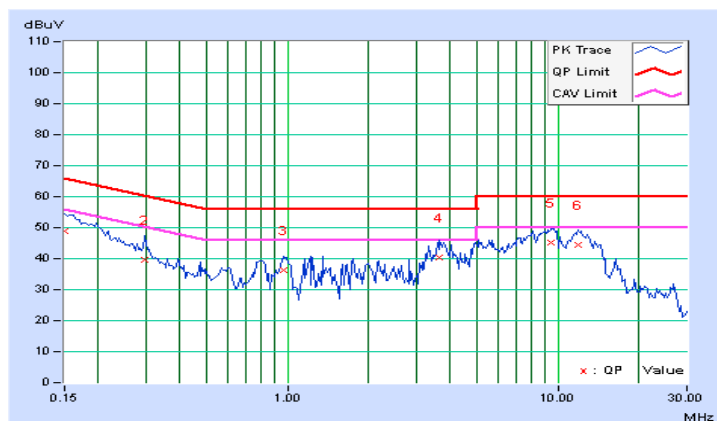


| | | | |
|-------|-------------|-------------------|--------------------------------|
| Phase | Neutral (N) | Detector Function | Quasi-Peak (QP) / Average (AV) |
|-------|-------------|-------------------|--------------------------------|

| No | Freq. [MHz] | Corr. | Reading Value | | Emission Level | | Limit | | Margin | |
|----|----------------|--------|---------------|-------|----------------|-------|-----------|-------|--------|--------|
| | | Factor | [dB (uV)] | | [dB (uV)] | | [dB (uV)] | | (dB) | |
| | (dB) | Q.P. | AV. | Q.P. | AV. | Q.P. | AV. | Q.P. | AV. | |
| 1 | 0.15000 | 0.08 | 48.87 | 26.24 | 48.95 | 26.32 | 66.00 | 56.00 | -17.05 | -29.68 |
| 2 | 0.29844 | 0.09 | 39.63 | 32.03 | 39.72 | 32.12 | 60.29 | 50.29 | -20.57 | -18.17 |
| 3 | 0.96250 | 0.13 | 36.29 | 24.94 | 36.42 | 25.07 | 56.00 | 46.00 | -19.58 | -20.93 |
| 4 | 3.65625 | 0.22 | 40.06 | 31.80 | 40.28 | 32.02 | 56.00 | 46.00 | -15.72 | -13.98 |
| 5 | 9.48438 | 0.44 | 44.84 | 39.02 | 45.28 | 39.46 | 60.00 | 50.00 | -14.72 | -10.54 |
| 6 | 11.93359 | 0.51 | 43.87 | 38.49 | 44.38 | 39.00 | 60.00 | 50.00 | -15.62 | -11.00 |

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.



4.3 Transmit Power Measurement

4.3.1 Limits of Transmit Power Measurement

| Operation Band | EUT Category | | LIMIT |
|----------------|--------------|-----------------------------------|---|
| U-NII-1 | | Outdoor Access Point | 1 Watt (30 dBm) (Max. e.i.r.p \leq 125mW(21 dBm) at any elevation angle above 30 degrees as measured from the horizon) |
| | | Fixed point-to-point Access Point | 1 Watt (30 dBm) |
| | √ | Indoor Access Point | 1 Watt (30 dBm) |
| | | Mobile and Portable client device | 250mW (24 dBm) |
| U-NII-2A | | | 250mW (24 dBm) or 11 dBm+10 log B* |
| U-NII-2C | | | 250mW (24 dBm) or 11 dBm+10 log B* |
| U-NII-3 | | | 1 Watt (30 dBm) |

*B is the 26 dB emission bandwidth in megahertz

Per KDB 662911 Method of conducted output power measurement on IEEE 802.11 devices,

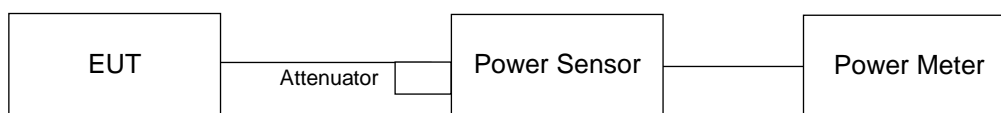
Array Gain = 0 dB (i.e., no array gain) for $N_{ANT} \leq 4$;

Array Gain = 0 dB (i.e., no array gain) for channel widths ≥ 40 MHz for any N_{ANT} ;

Array Gain = $5 \log(N_{ANT}/N_{SS})$ dB or 3 dB, whichever is less for 20-MHz channel widths with $N_{ANT} \geq 5$.

For power measurements on all other devices: Array Gain = $10 \log(N_{ANT}/N_{SS})$ dB.

4.3.2 Test Setup



4.3.3 Test Instruments

| DESCRIPTION & MANUFACTURER | MODEL NO. | SERIAL NO. | CALIBRATED DATE | CALIBRATED UNTIL |
|----------------------------|-----------|------------|-----------------|------------------|
| Power Meter Anritsu | ML2495A | 0824006 | May 22, 2014 | May 21, 2015 |
| Power Sensor Anritsu | MA2411B | 0738172 | May 22, 2014 | May 21, 2015 |

- NOTE:**
1. The test was performed in Oven room B.
 2. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.
 3. Tested Date: May 15, 2015

4.3.4 Test Procedure

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

4.3.5 Deviation from Test Standard

No deviation.

4.3.6 EUT Operating Condition

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

4.3.7 Test Result
CDD Mode

| Chan. | Chan. Freq. (MHz) | Average Power (dBm) | | | | Total Power (mW) | Total Power (dBm) | Limit (dBm) | Pass / Fail |
|-------------------------|-------------------|---------------------|---------|---------|---------|------------------|-------------------|-------------|-------------|
| | | Chain 0 | Chain 1 | Chain 2 | Chain 3 | | | | |
| 802.11a | | | | | | | | | |
| 36 | 5180 | 21.26 | 20.84 | 21.12 | 21.50 | 525.673 | 27.21 | 30 | Pass |
| 40 | 5200 | 23.50 | 23.63 | 23.79 | 23.28 | 906.693 | 29.57 | 30 | Pass |
| 48 | 5240 | 23.56 | 23.40 | 23.86 | 23.60 | 918.069 | 29.63 | 30 | Pass |
| 802.11ac (VHT20) | | | | | | | | | |
| 36 | 5180 | 20.91 | 20.92 | 21.06 | 21.53 | 516.782 | 27.13 | 30 | Pass |
| 40 | 5200 | 23.82 | 23.40 | 23.82 | 24.00 | 951.947 | 29.79 | 30 | Pass |
| 48 | 5240 | 23.59 | 23.39 | 24.02 | 23.83 | 940.727 | 29.73 | 30 | Pass |
| 802.11ac (VHT40) | | | | | | | | | |
| 38 | 5190 | 19.35 | 19.17 | 19.49 | 19.83 | 353.784 | 25.49 | 30 | Pass |
| 46 | 5230 | 22.44 | 22.26 | 22.31 | 22.95 | 711.113 | 28.52 | 30 | Pass |
| 802.11ac (VHT80) | | | | | | | | | |
| 42 | 5210 | 17.61 | 17.18 | 17.90 | 18.28 | 238.875 | 23.78 | 30 | Pass |

Beamforming Mode

| Chan. | Chan. Freq. (MHz) | Average Power (dBm) | | | | Total Power (mW) | Total Power (dBm) | Limit (dBm) | Pass / Fail |
|-------------------------|-------------------|---------------------|---------|---------|---------|------------------|-------------------|-------------|-------------|
| | | Chain 0 | Chain 1 | Chain 2 | Chain 3 | | | | |
| 802.11ac (VHT20) | | | | | | | | | |
| 36 | 5180 | 20.91 | 20.92 | 21.06 | 21.53 | 516.782 | 27.13 | 28.82 | Pass |
| 40 | 5200 | 22.75 | 22.30 | 22.60 | 23.10 | 744.333 | 28.72 | 28.82 | Pass |
| 48 | 5240 | 22.58 | 22.36 | 23.10 | 22.50 | 735.323 | 28.66 | 28.82 | Pass |
| 802.11ac (VHT40) | | | | | | | | | |
| 38 | 5190 | 19.35 | 19.17 | 19.49 | 19.83 | 353.784 | 25.49 | 28.82 | Pass |
| 46 | 5230 | 22.44 | 22.26 | 22.31 | 22.95 | 711.113 | 28.52 | 28.82 | Pass |
| 802.11ac (VHT80) | | | | | | | | | |
| 42 | 5210 | 17.61 | 17.18 | 17.90 | 18.28 | 238.875 | 23.78 | 28.82 | Pass |

Note: Directional gain = $1.16\text{dBi} + 10\log(4) = 7.18\text{dBi} > 6\text{dBi}$, so the power limit shall be reduced to $30 - (7.18 - 6) = 28.82$.

4.4 Peak Power Spectral Density Measurement

4.4.1 Limits of Peak Power Spectral Density Measurement

| Operation Band | EUT Category | | LIMIT |
|----------------|--------------|-----------------------------------|---------------|
| U-NII-1 | | Outdoor Access Point | 17dBm/ MHz |
| | | Fixed point-to-point Access Point | |
| | √ | Indoor Access Point | |
| | | Mobile and Portable client device | 11dBm/ MHz |
| U-NII-2A | | | 11dBm/ MHz |
| U-NII-2C | | | 11dBm/ MHz |
| U-NII-3 | | | 30dBm/ 500kHz |

4.4.2 Test Setup



4.4.3 Test Instruments

| DESCRIPTION & MANUFACTURER | MODEL NO. | SERIAL NO. | CALIBRATED DATE | CALIBRATED UNTIL |
|----------------------------|-----------|------------|-----------------|------------------|
| SPECTRUM ANALYZER R&S | FSV 40 | 100964 | July 05, 2014 | July 04, 2015 |

- NOTE:**
1. The test was performed in Oven room B.
 2. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.
 3. Tested Date: May 15, 2015

4.4.4 Test Procedure

For 802.11a, 802.11ac (VHT20) & 802.11ac (VHT40)

Using method SA-1

1. Set span to encompass the entire emission bandwidth (EBW) of the signal.
2. Set RBW = 1 MHz, Set VBW \geq 3 MHz, Detector = RMS
3. Sweep time = auto, trigger set to "free run".
4. Trace average at least 100 traces in power averaging mode.
5. Record the max value

For 802.11ac (VHT80)

Using method SA-2

1. Set span to encompass the entire emission bandwidth (EBW) of the signal.
2. Set RBW = 1 MHz, Set VBW \geq 3 MHz, Detector = RMS
3. Sweep time = auto, trigger set to "free run".
4. Trace average at least 100 traces in power averaging mode.
5. Record the max value and add $10 \log (1/\text{duty cycle})$

4.4.5 Deviation from Test Standard

No deviation.

4.4.6 EUT Operating Condition

Same as Item 4.3.6.

4.4.7 Test Results

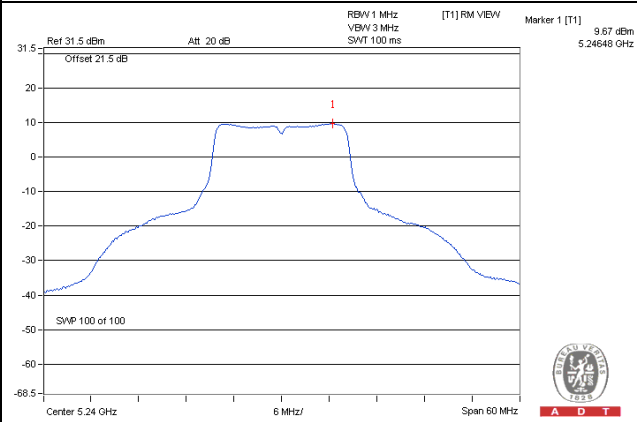
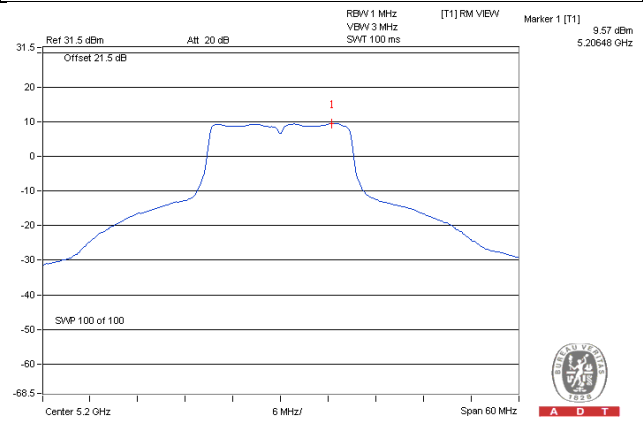
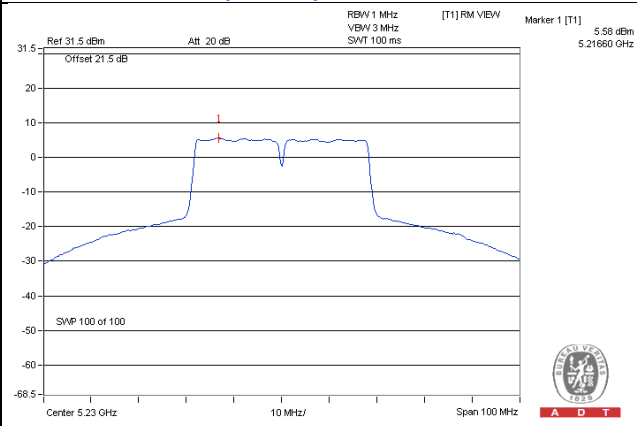
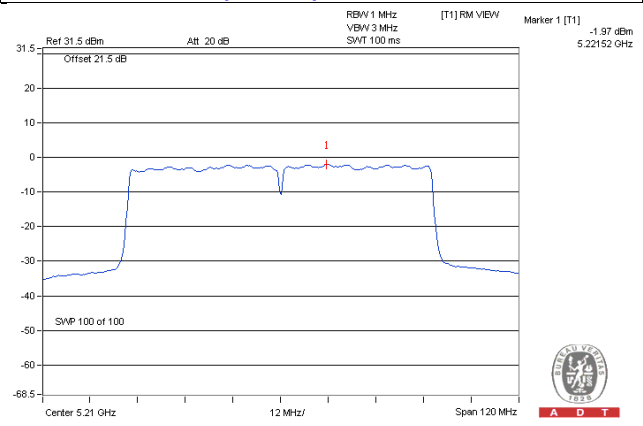
CDD Mode

| Chan. | Chan. Freq. (MHz) | PSD (dBm) | | | | Total Power Density (dBm) | MAX. Limit (dBm) | Pass / Fail |
|-------------------------|-------------------|-----------|---------|---------|---------|---------------------------|------------------|-------------|
| | | Chain 0 | Chain 1 | Chain 2 | Chain 3 | | | |
| 802.11a | | | | | | | | |
| 36 | 5180 | 6.07 | 6.27 | 7.38 | 7.13 | 12.77 | 15.82 | Pass |
| 40 | 5200 | 8.85 | 8.92 | 9.43 | 9.20 | 15.13 | 15.82 | Pass |
| 48 | 5240 | 9.53 | 8.80 | 9.50 | 9.53 | 15.37 | 15.82 | Pass |
| 802.11ac (VHT20) | | | | | | | | |
| 36 | 5180 | 6.17 | 6.02 | 6.49 | 7.17 | 12.51 | 15.82 | Pass |
| 40 | 5200 | 9.02 | 8.50 | 9.15 | 9.57 | 15.10 | 15.82 | Pass |
| 48 | 5240 | 8.40 | 8.78 | 9.47 | 9.37 | 15.05 | 15.82 | Pass |
| 802.11ac (VHT40) | | | | | | | | |
| 38 | 5190 | 1.88 | 1.60 | 2.28 | 2.56 | 8.12 | 15.82 | Pass |
| 46 | 5230 | 4.91 | 4.95 | 4.92 | 5.54 | 11.11 | 15.82 | Pass |

- Note: 1. Method a) of power density measurement of KDB 662911 is using for calculating total power density. Total power density is summing entire spectra across corresponding frequency bins on the various outputs by computer.
2. Directional gain = $1.16\text{dBi} + 10\log(4) = 7.18\text{dBi} > 6\text{dBi}$, so the power density limit shall be reduced to $17-(7.18-6) = 15.82\text{dBm}$.

| Chan. | Chan. Freq. (MHz) | PSD w/o duty factor (dBm) | | | | Duty Factor (dB) | Total PSD with Duty Factor (dBm) | MAX. Limit (dBm) | Pass / Fail |
|-------------------------|-------------------|---------------------------|---------|---------|---------|------------------|----------------------------------|------------------|-------------|
| | | Chain 0 | Chain 1 | Chain 2 | Chain 3 | | | | |
| 802.11ac (VHT80) | | | | | | | | | |
| 42 | 5210 | -2.28 | -2.76 | -2.39 | -2.00 | 0.18 | 3.85 | 15.82 | Pass |

- Note: 1. Method a) of power density measurement of KDB 662911 is using for calculating total power density. Total power density is summing entire spectra across corresponding frequency bins on the various outputs by computer.
2. Directional gain = $1.16\text{dBi} + 10\log(4) = 7.18\text{dBi} > 6\text{dBi}$, so the power density limit shall be reduced to $17-(7.18-6) = 15.82\text{dBm}$.
3. Refer to section 3.3 for duty cycle spectrum plot.

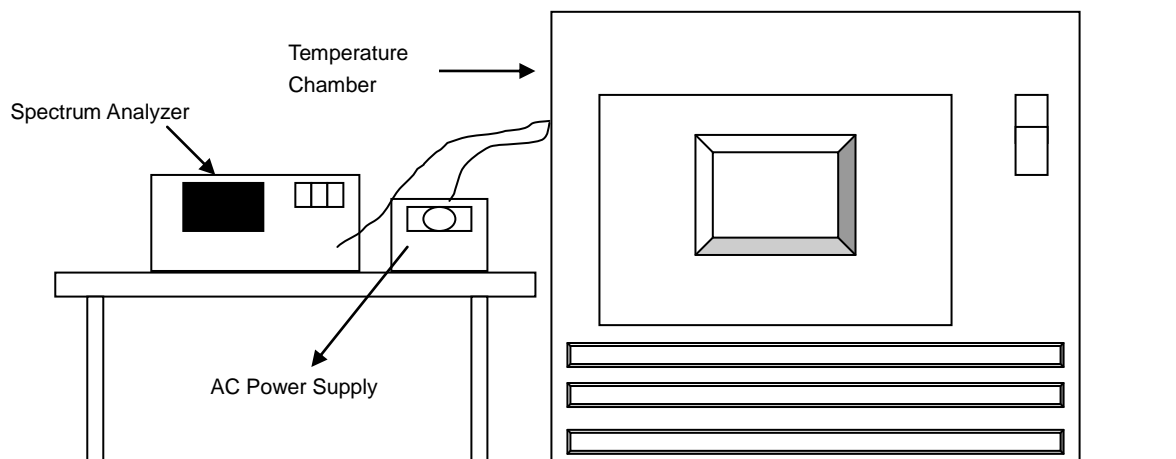
Spectrum Plot of Worst Value**802.11a – Chain 3: CH 48****802.11ac (VHT20) – Chain 3: CH 40****802.11ac (VHT40) – Chain 3: CH 46****802.11ac (VHT80) – Chain 3: CH 42**

4.5 Frequency Stability Measurement

4.5.1 Limits of Frequency Stability Measurement

The frequency of the carrier signal shall be maintained within band of operation

4.5.2 Test Setup



4.5.3 Test Instruments

| DESCRIPTION & MANUFACTURER | MODEL NO. | SERIAL NO. | CALIBRATED DATE | CALIBRATED UNTIL |
|--|----------------------|-----------------|-----------------|------------------|
| SPECTRUM ANALYZER R&S | FSV 40 | 100964 | July 05, 2014 | July 04, 2015 |
| Temperature & Humidity Chamber GIANTFORCE | GTH-150-40-S P-AR | MAA0812-0 08 | Jan. 12, 2015 | Jan. 11, 2016 |

- NOTE:**
1. The test was performed in Oven room B.
 2. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.
 3. Tested Date: May 15, 2015

4.5.4 Test Procedure

- a. The EUT was placed inside the environmental test chamber and powered by nominal AC voltage.
- b. Turn the EUT on and couple its output to a spectrum analyzer.
- c. Turn the EUT off and set the chamber to the highest temperature specified.
- d. Allow sufficient time (approximately 30 min) for the temperature of the chamber to stabilize, turn the EUT on and measure the operating frequency after 2, 5, and 10 minutes.
- e. Repeat step 2 and 3 with the temperature chamber set to the lowest temperature.
- f. The test chamber was allowed to stabilize at +20 degree C for a minimum of 30 minutes. The supply voltage was then adjusted on the EUT from 85% to 115% and the frequency record.

4.5.5 Deviation from Test Standard

No deviation.

4.5.6 EUT Operating Condition

Set the EUT transmit at un-modulation mode to test frequency stability.

4.5.7 Test Results

| FREQUENCY STABILITY VERSUS TEMP. | | | | | | | | | |
|---|---------------------------|---------------------------------|----------------------------|---------------------------------|----------------------------|---------------------------------|----------------------------|---------------------------------|----------------------------|
| OPERATING FREQUENCY: 5180MHz | | | | | | | | | |
| TEMP. (°C) | POWER SUPPLY (Vac) | 0 MINUTE | | 2 MINUTE | | 5 MINUTE | | 10 MINUTE | |
| | | Measured Frequency (MHz) | Frequency Drift (%) | Measured Frequency (MHz) | Frequency Drift (%) | Measured Frequency (MHz) | Frequency Drift (%) | Measured Frequency (MHz) | Frequency Drift (%) |
| 50 | 120 | 5179.9925 | -0.00014 | 5179.9925 | -0.00014 | 5179.9945 | -0.00011 | 5179.997 | -0.00006 |
| 40 | 120 | 5180.0025 | 0.00005 | 5180.0004 | 0.00001 | 5180.0003 | 0.00001 | 5179.9983 | -0.00003 |
| 30 | 120 | 5180.0188 | 0.00036 | 5180.0173 | 0.00033 | 5180.0206 | 0.00040 | 5180.0204 | 0.00039 |
| 20 | 120 | 5180.0182 | 0.00035 | 5180.0195 | 0.00038 | 5180.0204 | 0.00039 | 5180.0207 | 0.00040 |
| 10 | 120 | 5179.999 | -0.00002 | 5180.0008 | 0.00002 | 5180.0001 | 0.00000 | 5179.9969 | -0.00006 |
| 0 | 120 | 5180.0231 | 0.00045 | 5180.0201 | 0.00039 | 5180.0199 | 0.00038 | 5180.0222 | 0.00043 |
| -10 | 120 | 5180.0009 | 0.00002 | 5180 | 0.00000 | 5180.0036 | 0.00007 | 5180.0013 | 0.00003 |
| -20 | 120 | 5179.9917 | -0.00016 | 5179.9908 | -0.00018 | 5179.9916 | -0.00016 | 5179.9921 | -0.00015 |
| -30 | 120 | 5179.9846 | -0.00030 | 5179.9884 | -0.00022 | 5179.9868 | -0.00025 | 5179.9868 | -0.00025 |

| FREQUENCY STABILITY VERSUS VOLTAGE | | | | | | | | | |
|---|---------------------------|---------------------------------|----------------------------|---------------------------------|----------------------------|---------------------------------|----------------------------|---------------------------------|----------------------------|
| OPERATING FREQUENCY: 5180MHz | | | | | | | | | |
| TEMP. (°C) | POWER SUPPLY (Vac) | 0 MINUTE | | 2 MINUTE | | 5 MINUTE | | 10 MINUTE | |
| | | Measured Frequency (MHz) | Frequency Drift (%) | Measured Frequency (MHz) | Frequency Drift (%) | Measured Frequency (MHz) | Frequency Drift (%) | Measured Frequency (MHz) | Frequency Drift (%) |
| 20 | 138 | 5180.0179 | 0.00035 | 5180.0193 | 0.00037 | 5180.0211 | 0.00041 | 5180.0212 | 0.00041 |
| | 120 | 5180.0182 | 0.00035 | 5180.0195 | 0.00038 | 5180.0204 | 0.00039 | 5180.0207 | 0.00040 |
| | 102 | 5180.0181 | 0.00035 | 5180.0196 | 0.00038 | 5180.0195 | 0.00038 | 5180.0205 | 0.00040 |



5 Pictures of Test Arrangements

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





A D T

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:

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Fax: 886-2-26051924

Hsin Chu EMC/RF Lab/Telecom Lab

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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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