

## FCC Test Report

**Report No.:** RF150415D03-1

**FCC ID:** PY315200306

**Test Model:** D7000

**Received Date:** Apr. 15, 2015

**Test Date:** Apr. 22 ~ May 14, 2015

**Issued Date:** May 18, 2015

**Applicant:** NETGEAR INC.

**Address:** 350 East Plumeria Drive, San Jose, CA 95134, USA

**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.)



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## Table of Contents

|                                                                  |           |
|------------------------------------------------------------------|-----------|
| <b>Release Control Record.....</b>                               | <b>4</b>  |
| <b>1 Certificate of Conformity.....</b>                          | <b>5</b>  |
| <b>2 Summary of Test Results .....</b>                           | <b>6</b>  |
| 2.1 Measurement Uncertainty.....                                 | 6         |
| 2.2 Modification Record.....                                     | 6         |
| <b>3 General Information.....</b>                                | <b>7</b>  |
| 3.1 General Description of EUT .....                             | 7         |
| 3.2 Description of Test Modes .....                              | 9         |
| 3.2.1 Test Mode Applicability and Tested Channel Detail.....     | 10        |
| 3.3 Duty Cycle of Test Signal.....                               | 12        |
| 3.4 Description of Support Units.....                            | 13        |
| 3.4.1 Configuration of System under Test .....                   | 14        |
| 3.5 General Description of Applied Standard .....                | 15        |
| <b>4 Test Types and Results.....</b>                             | <b>16</b> |
| 4.1 Radiated Emission and Bandedge Measurement.....              | 16        |
| 4.1.1 Limits of Radiated Emission and Bandedge Measurement ..... | 16        |
| 4.1.2 Test Instruments .....                                     | 17        |
| 4.1.3 Test Procedure .....                                       | 18        |
| 4.1.4 Deviation from Test Standard .....                         | 18        |
| 4.1.5 Test Setup .....                                           | 19        |
| 4.1.6 EUT Operating Condition.....                               | 19        |
| 4.1.7 Test Results.....                                          | 20        |
| 4.2 Conducted Emission Measurement .....                         | 30        |
| 4.2.1 Limits of Conducted Emission Measurement.....              | 30        |
| 4.2.2 Test Instruments .....                                     | 30        |
| 4.2.3 Test Procedure .....                                       | 31        |
| 4.2.4 Deviation from Test Standard .....                         | 31        |
| 4.2.5 Test Setup .....                                           | 31        |
| 4.2.6 EUT Operating Condition.....                               | 31        |
| 4.2.7 Test Results.....                                          | 32        |
| 4.3 Transmit Power Measurement.....                              | 34        |
| 4.3.1 Limits of Transmit Power Measurement .....                 | 34        |
| 4.3.2 Test Setup .....                                           | 34        |
| 4.3.3 Test Instruments.....                                      | 34        |
| 4.3.4 Test Procedure .....                                       | 35        |
| 4.3.5 Deviation from Test Standard .....                         | 35        |
| 4.3.6 EUT Operating Condition.....                               | 35        |
| 4.3.7 Test Result .....                                          | 36        |
| 4.4 Peak Power Spectral Density Measurement .....                | 40        |
| 4.4.1 Limits of Peak Power Spectral Density Measurement.....     | 40        |
| 4.4.2 Test Setup .....                                           | 40        |
| 4.4.3 Test Instruments.....                                      | 40        |
| 4.4.4 Test Procedure .....                                       | 40        |
| 4.4.5 Deviation from Test Standard .....                         | 40        |
| 4.4.6 EUT Operating Condition.....                               | 40        |
| 4.4.7 Test Results.....                                          | 41        |
| 4.5 Frequency Stability Measurement.....                         | 43        |
| 4.5.1 Limits of Frequency Stability Measurement .....            | 43        |
| 4.5.2 Test Setup .....                                           | 43        |
| 4.5.3 Test Instruments.....                                      | 43        |
| 4.5.4 Test Procedure .....                                       | 43        |
| 4.5.5 Deviation from Test Standard .....                         | 43        |

|                                                                |           |
|----------------------------------------------------------------|-----------|
| 4.5.6 EUT Operating Condition.....                             | 43        |
| 4.5.7 Test Results.....                                        | 44        |
| <b>5 Pictures of Test Arrangements.....</b>                    | <b>45</b> |
| <b>Appendix – Information on the Testing Laboratories.....</b> | <b>46</b> |



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### Release Control Record

| Issue No.     | Description       | Date Issued  |
|---------------|-------------------|--------------|
| RF150415D03-1 | Original release. | May 18, 2015 |

## 1 Certificate of Conformity

**Product:** AC1900 WiFi VDSL/ADSL Modem Router

**Brand:** NETGEAR

**Test Model:** D7000

**Sample Status:** Engineering sample

**Applicant:** NETGEAR INC.

**Test Date:** Apr. 22 ~ May 14, 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.

**Prepared by :**



**Date:**

May 18, 2015

Celia Chen / Senior Specialist

**Approved by :**



**Date:**

May 18, 2015

Rex Lai / Assistant Manager

## 2 Summary of Test Results

| 47 CFR FCC Part 15, Subpart E (SECTION 15.407) |                                            |        |                                                                                                                       |
|------------------------------------------------|--------------------------------------------|--------|-----------------------------------------------------------------------------------------------------------------------|
| FCC Clause                                     | Test Item                                  | Result | Remarks                                                                                                               |
| 15.407(b)(6)                                   | AC Power Conducted Emissions               | PASS   | Meet the requirement of limit.<br>Minimum passing margin is -11.36dB at 0.16283MHz.                                   |
| 15.407(b)<br>(1/2/3/4/6)                       | Radiated Emissions & Band Edge Measurement | PASS   | Meet the requirement of limit.<br>Minimum passing margin is -0.2dB at 5101.00MHz, 5150.00MHz, 5350.00MHz, 5393.00MHz. |
| 15.407(a)<br>(1/2/3)                           | Max Average Transmit Power                 | PASS   | Meet the requirement of limit.                                                                                        |
| 15.407(a)<br>(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 R-SMA not a standard connector.                                                                  |

### 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       | Expended Uncertainty (k=2) (±) |
|------------------------------------|-----------------|--------------------------------|
| Conducted Emissions at mains ports | 150kHz ~ 30MHz  | 3.43 dB                        |
| Radiated Emissions up to 1 GHz     | 30MHz ~ 1000MHz | 4.00 dB                        |
| Radiated Emissions above 1 GHz     | 1GHz ~ 40GHz    | 3.36 dB                        |

### 2.2 Modification Record

There were no modifications required for compliance.

### 3 General Information

#### 3.1 General Description of EUT

|                       |                                                                                                                                                                |
|-----------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Product               | AC1900 WiFi VDSL/ADSL Modem Router                                                                                                                             |
| Brand                 | NETGEAR                                                                                                                                                        |
| Test Model            | D7000                                                                                                                                                          |
| Status of EUT         | Engineering sample                                                                                                                                             |
| Power Supply Rating   | 12Vdc from Adapter                                                                                                                                             |
| Modulation Type       | 64QAM, 16QAM, QPSK, BPSK<br>256QAM for 11ac mode only.                                                                                                         |
| Modulation Technology | OFDM                                                                                                                                                           |
| Transfer Rate         | 802.11a: 54/48/36/24/18/12/9/6Mbps<br>802.11n: up to 450Mbps<br>802.11ac: up to 1299.9Mbps                                                                     |
| Operating Frequency   | 5180 ~ 5240MHz                                                                                                                                                 |
| Number of Channel     | 4 for 802.11a, 802.11n (HT20), 802.11ac (VHT20)<br>2 for 802.11n (HT40), 802.11ac (VHT40)<br>1 for 802.11ac (VHT80)                                            |
| Output Power          | <b>CDD Mode:</b><br>802.11a: 281.89mW<br><b>Beamforming Mode:</b><br>802.11ac (VHT20): 272.252mW<br>802.11ac (VHT40): 539.057mW<br>802.11ac (VHT80): 147.055mW |
| Antenna Type          | Dipole antenna with 2dBi gain                                                                                                                                  |
| Antenna Connector     | R-SMA connector                                                                                                                                                |
| Accessory Device      | Adapter                                                                                                                                                        |
| Data Cable Supplied   | Non-shielded DC cable (1.8m)<br>Non-shielded RJ11 cable (1.5m)<br>Non-shielded RJ45 cable (1.5m)                                                               |

Note:

1. The EUT provides 3 completed transmitters and 3 receivers.

| Modulation Mode  | TX Function                 |                         |
|------------------|-----------------------------|-------------------------|
|                  | 5.0GHz<br>(Non-Beamforming) | 5.0GHz<br>(Beamforming) |
| 802.11a          | 3TX                         | -                       |
| 802.11n (HT20)   | 3TX                         | -                       |
| 802.11n (HT40)   | 3TX                         | -                       |
| 802.11ac (VHT20) | 3TX                         | 3TX                     |
| 802.11ac (VHT40) | 3TX                         | 3TX                     |
| 802.11ac (VHT80) | 3TX                         | 3TX                     |

Note: The modulation and bandwidth are similar for 802.11n mode for HT20 (HT40) and 802.11ac mode for VHT20 (VHT40), therefore investigated worst case to representative mode in test report. (Final test mode refer section 3.2.1)

2. The EUT uses following adapter.

| Adapter                                                                             | 1                       | 2                       | 3                       |
|-------------------------------------------------------------------------------------|-------------------------|-------------------------|-------------------------|
| Brand                                                                               | NETGEAR                 | NETGEAR                 | NETGEAR                 |
| Model                                                                               | AD898020                | AD898220                | AD898120                |
| AC Input Power                                                                      | 100-240V, 50/60Hz, 1.0A | 100-240V, 50/60Hz, 1.0A | 100-240V, 50/60Hz, 1.0A |
| DC Output Power                                                                     | 12V, 3.5A               | 12V, 3.5A               | 12V, 3.5A               |
| Plug Type                                                                           | EU Plug                 | UK Plug                 | AU Plug                 |
| The adapter 1-3 are identical with each other except for their plug type difference |                         |                         |                         |

|                 |                         |
|-----------------|-------------------------|
| Adapter         | 4                       |
| Brand           | NETGEAR                 |
| Model           | MU42-3120350-A1         |
| AC Input Power  | 100-240V, 50/60Hz, 1.5A |
| DC Output Power | 12V, 3.5A               |
| Plug Type       | US Plug                 |

| Adapter                                                                             | 5                          | 6                          | 7                          | 8                          |
|-------------------------------------------------------------------------------------|----------------------------|----------------------------|----------------------------|----------------------------|
| Brand                                                                               | NETGEAR                    | NETGEAR                    | NETGEAR                    | NETGEAR                    |
| Model                                                                               | 2ABN42F NA                 | 2AAF042F GE                | 2AAF042F AU                | 2AAF042F UK                |
| AC Input Power                                                                      | 100-240V,<br>50/60Hz, 1.3A | 100-240V,<br>50/60Hz, 1.3A | 100-240V,<br>50/60Hz, 1.3A | 100-240V,<br>50/60Hz, 1.3A |
| DC Output Power                                                                     | 12.0V, 3.5A                | 12.0V, 3.5A                | 12.0V, 3.5A                | 12.0V, 3.5A                |
| Plug Type                                                                           | US Plug                    | EU Plug                    | AU Plug                    | UK Plug                    |
| The adapter 5-8 are identical with each other except for their plug type difference |                            |                            |                            |                            |

After pre-tested above adapters, **adapter 1** was selected as a representative one and therefore only its test data was recorded in this report.

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



### 3.2 Description of Test Modes

#### 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<br>CONFIGURE<br>MODE | APPLICABLE TO      |       |     |      | DESCRIPTION |
|--------------------------|--------------------|-------|-----|------|-------------|
|                          | RE <sup>3</sup> 1G | RE<1G | PLC | APCM |             |
| -                        | √                  | √     | √   | √    | -           |

Where **RE<sup>3</sup>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 3 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                 |                  |                     |                      |                   |                          |                    |                        |
|--------------------------|------------------|---------------------|----------------------|-------------------|--------------------------|--------------------|------------------------|
| EUT<br>CONFIGURE<br>MODE | MODE             | FREQ. BAND<br>(MHz) | AVAILABLE<br>CHANNEL | TESTED<br>CHANNEL | MODULATION<br>TECHNOLOGY | MODULATION<br>TYPE | DATA<br>RATE<br>(Mbps) |
| -                        | 802.11a          | 5180-5240           | 36 to 48             | 36, 40, 48        | OFDM                     | BPSK               | 6.0                    |
| Beamforming MODE         |                  |                     |                      |                   |                          |                    |                        |
| EUT<br>CONFIGURE<br>MODE | MODE             | FREQ. BAND<br>(MHz) | AVAILABLE<br>CHANNEL | TESTED<br>CHANNEL | MODULATION<br>TECHNOLOGY | MODULATION<br>TYPE | DATA<br>RATE<br>(Mbps) |
| -                        | 802.11ac (VHT20) | 5180-5240           | 36 to 48             | 36, 40, 48        | OFDM                     | BPSK               | 19.5                   |
| -                        | 802.11ac (VHT40) |                     | 38 to 46             | 38, 46            | OFDM                     | BPSK               | 40.5                   |
| -                        | 802.11ac (VHT80) |                     | 42                   | 42                | OFDM                     | BPSK               | 87.9                   |

#### 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.

| Beamforming MODE         |                  |                     |                      |                   |                          |                    |                        |
|--------------------------|------------------|---------------------|----------------------|-------------------|--------------------------|--------------------|------------------------|
| EUT<br>CONFIGURE<br>MODE | MODE             | FREQ. BAND<br>(MHz) | AVAILABLE<br>CHANNEL | TESTED<br>CHANNEL | MODULATION<br>TECHNOLOGY | MODULATION<br>TYPE | DATA<br>RATE<br>(Mbps) |
| -                        | 802.11ac (VHT20) | 5180-5240           | 36 to 48             | 48                | OFDM                     | BPSK               | 19.5                   |

### 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.

| Beamforming MODE   |                  |                  |                   |                |                       |                 |                  |
|--------------------|------------------|------------------|-------------------|----------------|-----------------------|-----------------|------------------|
| EUT CONFIGURE MODE | MODE             | FREQ. BAND (MHz) | AVAILABLE CHANNEL | TESTED CHANNEL | MODULATION TECHNOLOGY | MODULATION TYPE | DATA RATE (Mbps) |
| -                  | 802.11ac (VHT20) | 5180-5240        | 36 to 48          | 48             | OFDM                  | BPSK            | 19.5             |

### 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.

| CDD MODE           |                  |                  |                   |                |                       |                 |                  |
|--------------------|------------------|------------------|-------------------|----------------|-----------------------|-----------------|------------------|
| EUT CONFIGURE 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            | 6.0              |
| Beamforming MODE   |                  |                  |                   |                |                       |                 |                  |
| EUT CONFIGURE 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            | 19.5             |
| -                  | 802.11ac (VHT40) |                  | 38 to 46          | 38, 46         | OFDM                  | BPSK            | 40.5             |
| -                  | 802.11ac (VHT80) |                  | 42                | 42             | OFDM                  | BPSK            | 87.9             |

### Test Condition:

| APPLICABLE TO      | ENVIRONMENTAL CONDITIONS | INPUT POWER  | TESTED BY |
|--------------------|--------------------------|--------------|-----------|
| RE <sup>3</sup> 1G | 23deg. C, 70%RH          | 120Vac, 60Hz | Dalen Dai |
| RE<1G              | 24deg. C, 72%RH          | 120Vac, 60Hz | Dalen Dai |
| PLC                | 24deg. C, 70%RH          | 120Vac, 60Hz | Aaron You |
| APCM               | 25deg. C, 60%RH          | 120Vac, 60Hz | Saxon Lee |

### 3.3 Duty Cycle of Test Signal

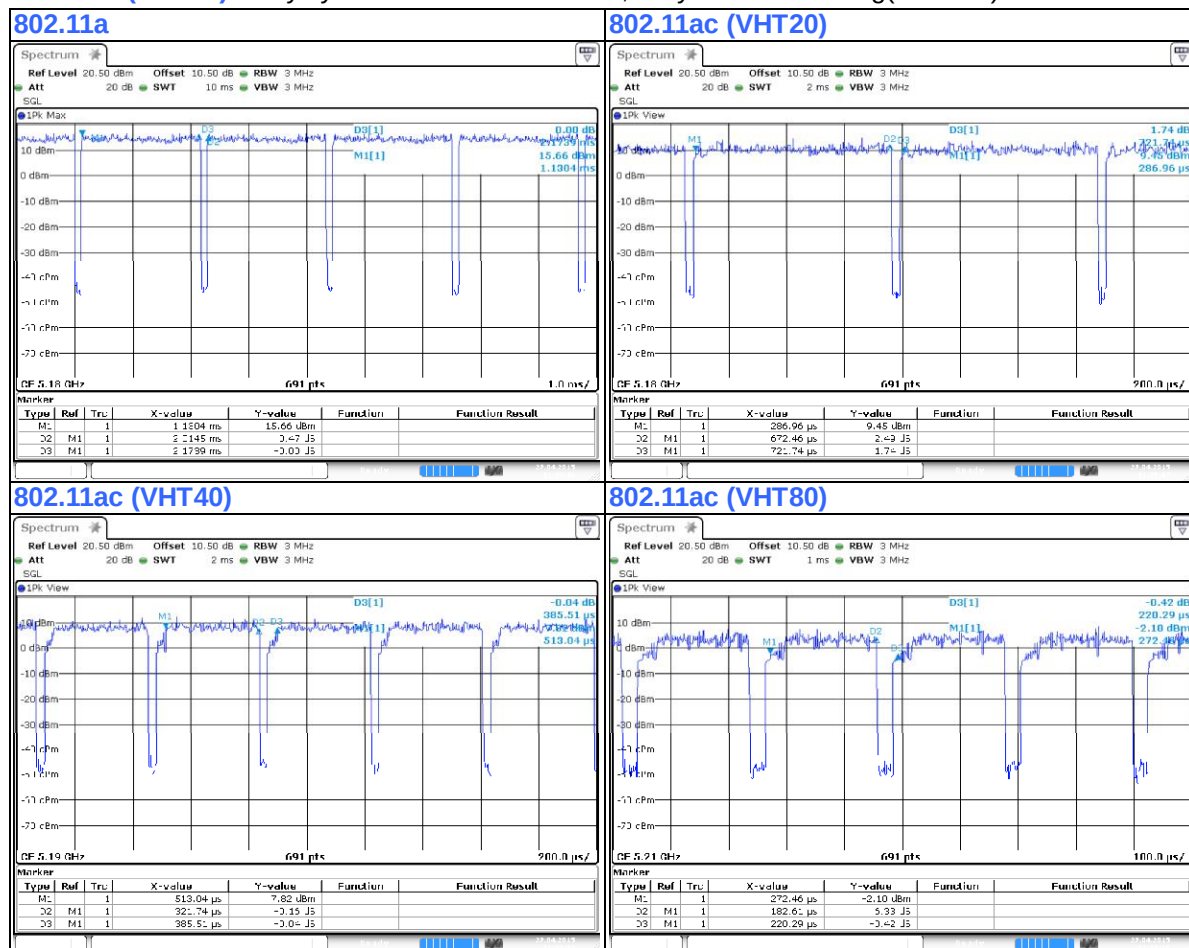
If duty cycle of test signal is < 98%, duty factor shall be considered.

**802.11a:** Duty cycle =  $2.014/2.173 = 0.927$ , Duty factor =  $10 * \log(1/0.927) = 0.33$

**802.11ac (VHT20):** Duty cycle =  $0.672/0.721 = 0.932$ , Duty factor =  $10 * \log(1/0.932) = 0.31$

**802.11ac (VHT40):** Duty cycle =  $0.321/0.385 = 0.834$ , Duty factor =  $10 * \log(1/0.834) = 0.79$

**802.11ac (VHT80):** Duty cycle =  $0.182/0.22 = 0.827$ , Duty factor =  $10 * \log(1/0.827) = 0.82$



### 3.4 Description of Support Units

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

| ID | Product           | Brand   | Model No. | Serial No. | FCC ID           | Remarks            |
|----|-------------------|---------|-----------|------------|------------------|--------------------|
| A. | EUT               | NETGEAR | D7000     | -          | -                | -                  |
| B. | AC ADAPTER        | NETGEAR | AD898020  | N/A        | FCC DoC Approved | Supplied by client |
| C. | LOAD              | N/A     | N/A       | N/A        | N/A              | Provided by Lab    |
| D. | NOTEBOOK COMPUTER | DELL    | PP27L     | 8SNZ12S    | FCC DoC Approved | Provided by Lab    |

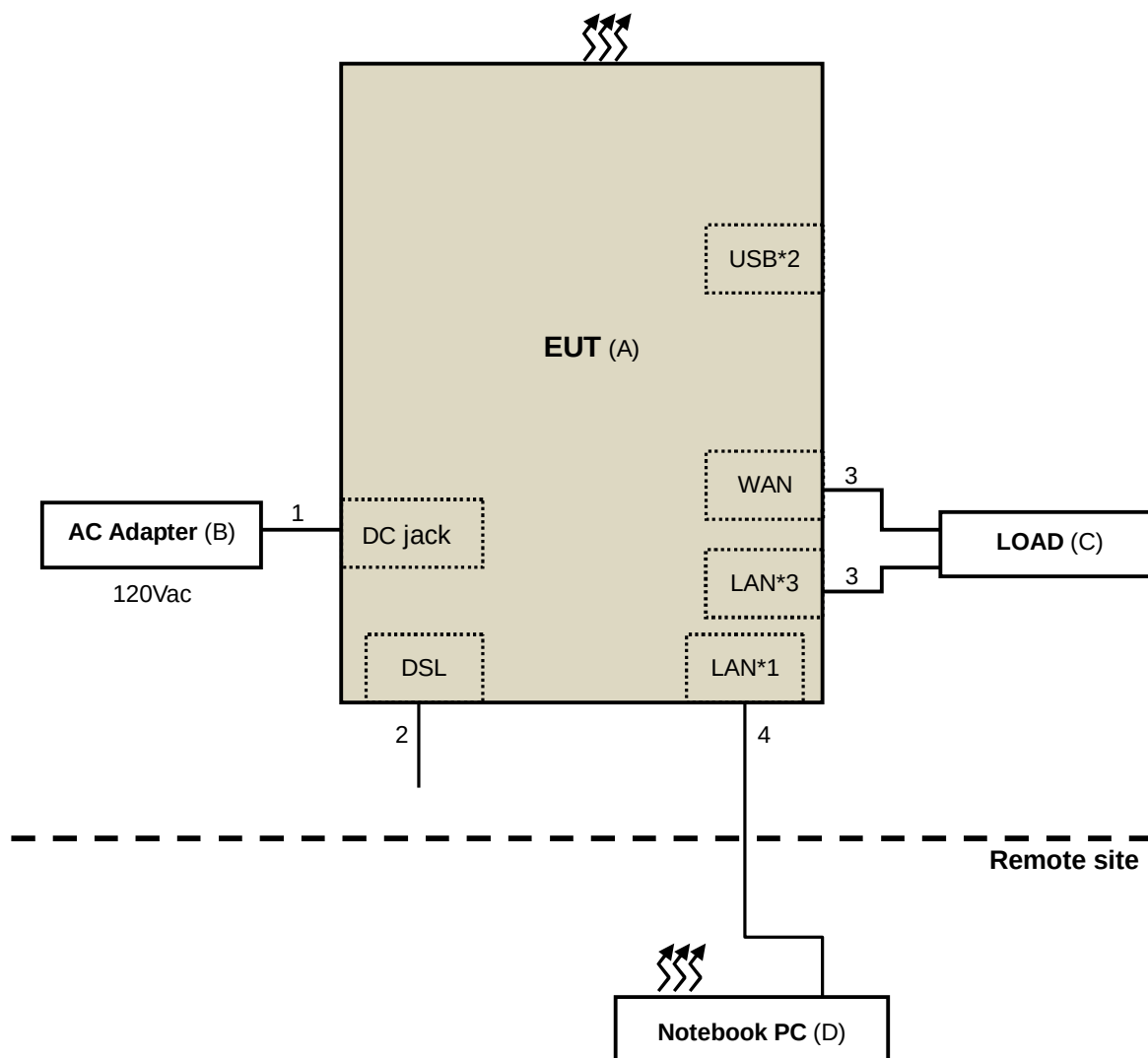
Note:

1. All power cords of the above support units are non-shielded (1.8m).
2. Item D acted as communication partners to transfer data.

| ID | Descriptions | Qty. | Length (m) | Shielding (Yes/No) | Cores (Qty.) | Remarks            |
|----|--------------|------|------------|--------------------|--------------|--------------------|
| 1. | DC cable     | 1    | 1.8        | N                  | 0            | Supplied by client |
| 2. | RJ11 cable   | 1    | 1.5        | N                  | 0            | Supplied by client |
| 3. | RJ45 cable   | 4    | 1.8        | N                  | 0            | Provided by Lab    |
| 4. | RJ45 cable   | 1    | 10         | N                  | 0            | Provided by Lab    |

Note: The core(s) is(are) originally attached to the cable(s).

### 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:

- The lower limit shall apply at the transition frequencies.
- Emission level (dBuV/m) = 20 log Emission level (uV/m).
- 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) <sup>*1</sup><br>PK:-17 (dBm/MHz) <sup>*2</sup> | PK: 68.2(dBuV/m) <sup>*1</sup><br>PK:78.2 (dBuV/m) <sup>*2</sup> |

**NOTE:** <sup>\*1</sup> beyond 10MHz of the band edge <sup>\*2</sup> 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

| DESCRIPTION & MANUFACTURER                | MODEL NO.                    | SERIAL NO.     | CALIBRATED DATE | CALIBRATED UNTIL |
|-------------------------------------------|------------------------------|----------------|-----------------|------------------|
| HP Preamplifier                           | 8447D                        | 2432A03504     | Feb. 26, 2015   | Feb. 25, 2016    |
| HP Preamplifier                           | 8449B                        | 3008A01201     | Feb. 26, 2015   | Feb. 25, 2016    |
| MITEQ Preamplifier                        | AMF-6F-260400-3<br>3-8P      | 892164         | Mar. 01, 2015   | Feb. 28, 2016    |
| Agilent Spectrum                          | E4446A                       | MY51100050     | Oct. 24, 2014   | Oct. 23, 2015    |
| Agilent<br>TEST RECEIVER                  | N9038A                       | MY51210129     | Jan. 20, 2015   | Jan. 19, 2016    |
| Schwarzbeck Antenna                       | VULB 9168                    | 139            | Feb. 04, 2015   | Feb. 03, 2016    |
| Schwarzbeck Antenna                       | VHBA 9123                    | 480            | May 29, 2013    | May 28, 2015     |
| Schwarzbeck Horn<br>Antenna               | BBHA-9170                    | 212            | Feb. 09, 2015   | Feb. 08, 2016    |
| Schwarzbeck Horn<br>Antenna               | BBHA 9120-D1                 | D130           | Feb. 10, 2015   | Feb. 09, 2016    |
| ADT. Turn Table                           | TT100                        | 0306           | NA              | NA               |
| ADT. Tower                                | AT100                        | 0306           | NA              | NA               |
| Software                                  | ADT_Radiated_V7.<br>6.15.9.4 | NA             | NA              | NA               |
| SUHNER RF cable                           | SF104                        | CABLE-CH6      | Aug. 15, 2014   | Aug. 14, 2015    |
| SUHNER RF cable                           | SF102                        | Cable-CH8-3.6m | Aug. 15, 2014   | Aug. 14, 2015    |
| EMCO Horn Antenna                         | 3115                         | 00028257       | Feb. 05, 2015   | Feb. 04, 2016    |
| Highpass filter<br>Wainwright Instruments | WHK<br>3.1/18G-10SS          | SN 8           | NA              | NA               |
| ROHDE & SCHWARZ<br>Spectrum Analyzer      | FSV40                        | 101042         | Sep. 29, 2014   | Sep. 28, 2015    |
| Anritsu<br>Power Sensor                   | MA2411B                      | 0738404        | Apr. 21, 2015   | Apr. 20, 2016    |
| Anritsu<br>Power Meter                    | ML2495A                      | 0842014        | Apr. 21, 2015   | Apr. 20, 2016    |

- NOTE:**
1. The calibration interval of the above test instruments is 12/24 months. And the calibrations are traceable to NML/ROC and NIST/USA.
  2. The horn antenna and HP preamplifier (model: 8449B) are used only for the measurement of emission frequency above 1GHz if tested.
  3. The test was performed in Chamber No. 6.
  4. The Industry Canada Reference No. IC 7450E-6.
  5. The FCC Site Registration No. is 447212.

#### 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:**

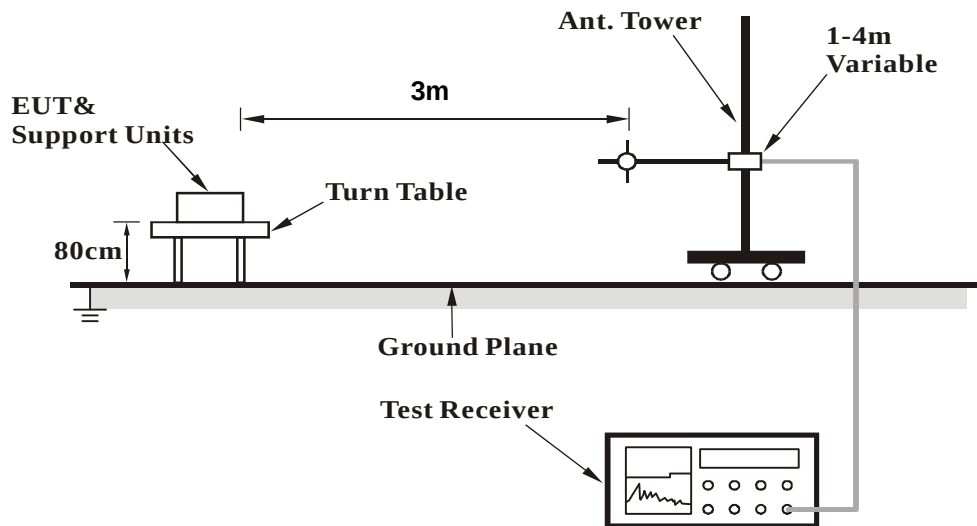
1. For emission measurements above 1 GHz, the EUT shall be placed at a height of 1.5 m above the ground at 3 meter chamber room for test
2. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120kHz for Quasi-peak detection (QP) at frequency below 1GHz.
3. The resolution 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

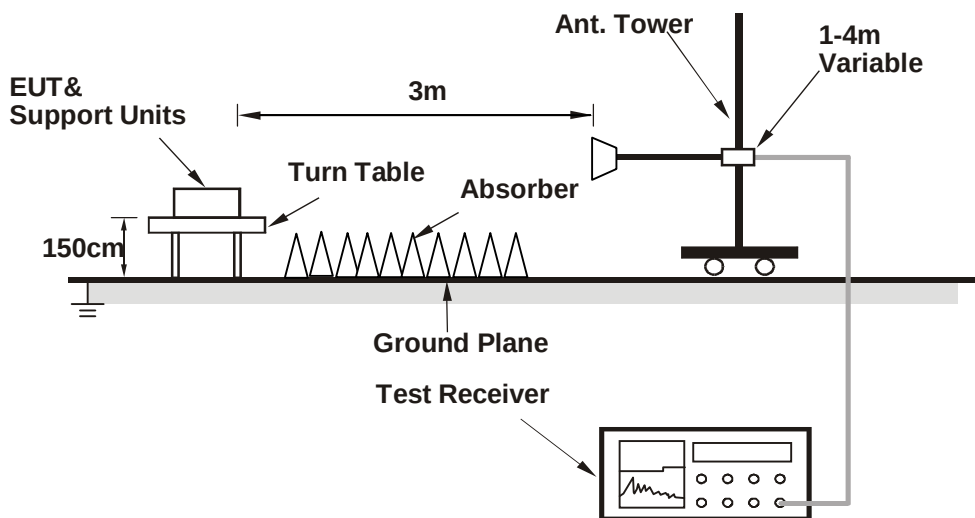
No deviation.

#### 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

- Placed the EUT on the testing table.
- Prepared notebooks to act as communication partner and placed it outside of testing area.
- The communication partner connected with EUT via RJ45 cable and ran a test program (provided by manufacturer) to enable EUT under transmission condition continuously at specific channel frequency.
- The communication partner sent data to EUT by command "PING".
- The necessary accessories enable the system in full functions.

#### 4.1.7 Test Results

#### ABOVE 1GHz DATA :

#### 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                                                   | 5100.00     | 60.1 PK                 | 74.0           | -13.9       | 1.00 H             | 341                  | 56.48            | 3.59                     |
| 2                                                   | 5100.00     | 46.6 AV                 | 54.0           | -7.5        | 1.00 H             | 341                  | 42.96            | 3.59                     |
| 3                                                   | 5150.00     | 59.7 PK                 | 74.0           | -14.3       | 1.00 H             | 341                  | 56.14            | 3.60                     |
| 4                                                   | 5150.00     | 46.2 AV                 | 54.0           | -7.8        | 1.00 H             | 341                  | 42.58            | 3.60                     |
| 5                                                   | *5180.00    | 104.9 PK                |                |             | 1.00 H             | 341                  | 101.23           | 3.62                     |
| 6                                                   | *5180.00    | 94.7 AV                 |                |             | 1.00 H             | 341                  | 91.08            | 3.62                     |
| 7                                                   | #10360.00   | 55.5 PK                 | 74.0           | -18.5       | 1.39 H             | 217                  | 42.58            | 12.90                    |
| 8                                                   | #10360.00   | 41.6 AV                 | 54.0           | -12.4       | 1.39 H             | 217                  | 28.73            | 12.90                    |
| 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                                                   | 5100.00     | 66.2 PK                 | 74.0           | -7.8        | 1.88 V             | 336                  | 62.61            | 3.59                     |
| 2                                                   | 5100.00     | 53.7 AV                 | 54.0           | -0.3        | 1.88 V             | 336                  | 50.09            | 3.59                     |
| 3                                                   | 5150.00     | 65.1 PK                 | 74.0           | -8.9        | 1.88 V             | 336                  | 61.47            | 3.60                     |
| 4                                                   | 5150.00     | 51.2 AV                 | 54.0           | -2.8        | 1.88 V             | 336                  | 47.62            | 3.60                     |
| 5                                                   | *5180.00    | 118.9 PK                |                |             | 1.88 V             | 336                  | 115.27           | 3.62                     |
| 6                                                   | *5180.00    | 108.7 AV                |                |             | 1.88 V             | 336                  | 105.09           | 3.62                     |
| 7                                                   | #10360.00   | 59.2 PK                 | 74.0           | -14.8       | 2.27 V             | 327                  | 46.29            | 12.90                    |
| 8                                                   | #10360.00   | 45.6 AV                 | 54.0           | -8.5        | 2.27 V             | 327                  | 32.65            | 12.90                    |

#### 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    | 104.5 PK                |                |             | 1.00 H             | 239                  | 100.86           | 3.63                     |
| 2                                                   | *5200.00    | 94.4 AV                 |                |             | 1.00 H             | 239                  | 90.77            | 3.63                     |
| 3                                                   | 5350.00     | 60.4 PK                 | 74.0           | -13.7       | 1.00 H             | 239                  | 56.43            | 3.92                     |
| 4                                                   | 5350.00     | 48.5 AV                 | 54.0           | -5.5        | 1.00 H             | 239                  | 44.57            | 3.92                     |
| 5                                                   | #10400.00   | 54.3 PK                 | 74.0           | -19.7       | 1.26 H             | 208                  | 41.25            | 13.01                    |
| 6                                                   | #10400.00   | 40.9 AV                 | 54.0           | -13.2       | 1.26 H             | 208                  | 27.84            | 13.01                    |
| 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    | 118.0 PK                |                |             | 1.90 V             | 337                  | 114.38           | 3.63                     |
| 2                                                   | *5200.00    | 107.8 AV                |                |             | 1.90 V             | 337                  | 104.21           | 3.63                     |
| 3                                                   | 5350.00     | 65.2 PK                 | 74.0           | -8.8        | 1.90 V             | 337                  | 61.28            | 3.92                     |
| 4                                                   | 5350.00     | 53.9 AV                 | 54.0           | -0.2        | 1.90 V             | 337                  | 49.93            | 3.92                     |
| 5                                                   | #10400.00   | 58.0 PK                 | 74.0           | -16.1       | 2.34 V             | 297                  | 44.94            | 13.01                    |
| 6                                                   | #10400.00   | 44.9 AV                 | 54.0           | -9.1        | 2.34 V             | 297                  | 31.88            | 13.01                    |

#### 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 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    | 104.1 PK                |                |             | 1.16 H             | 243                  | 100.33           | 3.72                     |
| 2                                                   | *5240.00    | 93.9 AV                 |                |             | 1.16 H             | 243                  | 90.15            | 3.72                     |
| 3                                                   | 5350.00     | 58.1 PK                 | 74.0           | -15.9       | 1.16 H             | 243                  | 54.19            | 3.92                     |
| 4                                                   | 5350.00     | 49.5 AV                 | 54.0           | -4.5        | 1.16 H             | 243                  | 45.62            | 3.92                     |
| 5                                                   | 5400.00     | 60.1 PK                 | 74.0           | -13.9       | 1.16 H             | 243                  | 56.08            | 3.99                     |
| 6                                                   | 5400.00     | 50.9 AV                 | 54.0           | -3.1        | 1.16 H             | 243                  | 46.95            | 3.99                     |
| 7                                                   | #10480.00   | 55.5 PK                 | 74.0           | -18.5       | 1.49 H             | 199                  | 42.31            | 13.19                    |
| 8                                                   | #10480.00   | 41.7 AV                 | 54.0           | -12.3       | 1.49 H             | 199                  | 28.50            | 13.19                    |

| 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    | 118.6 PK                |                |             | 1.96 V             | 337                  | 114.83           | 3.72                     |
| 2                                                 | *5240.00    | 108.5 AV                |                |             | 1.96 V             | 337                  | 104.76           | 3.72                     |
| 3                                                 | 5350.00     | 62.7 PK                 | 74.0           | -11.3       | 1.96 V             | 337                  | 58.77            | 3.92                     |
| 4                                                 | 5350.00     | 50.4 AV                 | 54.0           | -3.6        | 1.96 V             | 337                  | 46.48            | 3.92                     |
| 5                                                 | 5400.00     | 65.5 PK                 | 74.0           | -8.6        | 1.96 V             | 337                  | 61.46            | 3.99                     |
| 6                                                 | 5400.00     | 53.8 AV                 | 54.0           | -0.3        | 1.96 V             | 337                  | 49.76            | 3.99                     |
| 7                                                 | #10480.00   | 58.9 PK                 | 74.0           | -15.1       | 2.21 V             | 264                  | 45.69            | 13.19                    |
| 8                                                 | #10480.00   | 45.3 AV                 | 54.0           | -8.7        | 2.21 V             | 264                  | 32.07            | 13.19                    |

#### 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.

## Beamforming MODE

### 802.11ac (VHT20)

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

| ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M |                |                               |                   |                |                          |                            |                        |                                |
|-----------------------------------------------------|----------------|-------------------------------|-------------------|----------------|--------------------------|----------------------------|------------------------|--------------------------------|
| NO.                                                 | FREQ.<br>(MHz) | EMISSION<br>LEVEL<br>(dBuV/m) | LIMIT<br>(dBuV/m) | MARGIN<br>(dB) | ANTENNA<br>HEIGHT<br>(m) | TABLE<br>ANGLE<br>(Degree) | RAW<br>VALUE<br>(dBuV) | CORRECTION<br>FACTOR<br>(dB/m) |
| 1                                                   | 5101.00        | 57.2 PK                       | 74.0              | -16.8          | 1.00 H                   | 355                        | 53.61                  | 3.59                           |
| 2                                                   | 5101.00        | 45.2 AV                       | 54.0              | -8.8           | 1.00 H                   | 355                        | 41.57                  | 3.59                           |
| 3                                                   | 5150.00        | 56.4 PK                       | 74.0              | -17.6          | 1.00 H                   | 335                        | 52.81                  | 3.60                           |
| 4                                                   | 5150.00        | 45.0 AV                       | 54.0              | -9.0           | 1.00 H                   | 335                        | 41.38                  | 3.60                           |
| 5                                                   | *5180.00       | 105.6 PK                      |                   |                | 1.00 H                   | 335                        | 101.95                 | 3.62                           |
| 6                                                   | *5180.00       | 94.6 AV                       |                   |                | 1.00 H                   | 335                        | 91.00                  | 3.62                           |
| 7                                                   | #10360.00      | 53.4 PK                       | 74.0              | -20.6          | 1.53 H                   | 221                        | 40.47                  | 12.90                          |
| 8                                                   | #10360.00      | 40.2 AV                       | 54.0              | -13.8          | 1.53 H                   | 221                        | 27.28                  | 12.90                          |
| ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M   |                |                               |                   |                |                          |                            |                        |                                |
| NO.                                                 | FREQ.<br>(MHz) | EMISSION<br>LEVEL<br>(dBuV/m) | LIMIT<br>(dBuV/m) | MARGIN<br>(dB) | ANTENNA<br>HEIGHT<br>(m) | TABLE<br>ANGLE<br>(Degree) | RAW<br>VALUE<br>(dBuV) | CORRECTION<br>FACTOR<br>(dB/m) |
| 1                                                   | 5101.00        | 64.5 PK                       | 74.0              | -9.6           | 1.89 V                   | 340                        | 60.86                  | 3.59                           |
| 2                                                   | 5101.00        | 53.8 AV                       | 54.0              | -0.2           | 1.89 V                   | 340                        | 50.25                  | 3.59                           |
| 3                                                   | 5150.00        | 66.5 PK                       | 74.0              | -7.6           | 1.89 V                   | 340                        | 62.85                  | 3.60                           |
| 4                                                   | 5150.00        | 50.2 AV                       | 54.0              | -3.8           | 1.89 V                   | 340                        | 46.58                  | 3.60                           |
| 5                                                   | *5180.00       | 119.6 PK                      |                   |                | 1.89 V                   | 340                        | 116.02                 | 3.62                           |
| 6                                                   | *5180.00       | 108.7 AV                      |                   |                | 1.89 V                   | 340                        | 105.08                 | 3.62                           |
| 7                                                   | #10360.00      | 61.3 PK                       | 74.0              | -12.7          | 2.46 V                   | 349                        | 48.43                  | 12.90                          |
| 8                                                   | #10360.00      | 46.8 AV                       | 54.0              | -7.3           | 2.46 V                   | 349                        | 33.85                  | 12.90                          |

#### 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 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    | 104.5 PK                |                |             | 1.00 H             | 234                  | 100.90           | 3.63                     |
| 2                                                   | *5200.00    | 94.4 AV                 |                |             | 1.00 H             | 234                  | 90.73            | 3.63                     |
| 3                                                   | 5350.00     | 58.0 PK                 | 74.0           | -16.0       | 1.00 H             | 234                  | 54.07            | 3.92                     |
| 4                                                   | 5350.00     | 45.5 AV                 | 54.0           | -8.5        | 1.00 H             | 234                  | 41.61            | 3.92                     |
| 5                                                   | #10400.00   | 53.4 PK                 | 74.0           | -20.6       | 1.49 H             | 218                  | 40.38            | 13.01                    |
| 6                                                   | #10400.00   | 40.7 AV                 | 54.0           | -13.3       | 1.49 H             | 218                  | 27.66            | 13.01                    |
| 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    | 118.5 PK                |                |             | 1.96 V             | 331                  | 114.88           | 3.63                     |
| 2                                                   | *5200.00    | 107.0 AV                |                |             | 1.96 V             | 331                  | 103.35           | 3.63                     |
| 3                                                   | 5350.00     | 64.5 PK                 | 74.0           | -9.5        | 1.96 V             | 331                  | 60.55            | 3.92                     |
| 4                                                   | 5350.00     | 53.7 AV                 | 54.0           | -0.3        | 1.96 V             | 331                  | 49.78            | 3.92                     |
| 5                                                   | #10400.00   | 61.7 PK                 | 74.0           | -12.3       | 2.39 V             | 348                  | 48.66            | 13.01                    |
| 6                                                   | #10400.00   | 46.7 AV                 | 54.0           | -7.3        | 2.39 V             | 348                  | 33.69            | 13.01                    |

#### 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    | 105.4 PK                |                |             | 1.00 H             | 332                  | 101.70           | 3.72                     |
| 2                                                   | *5240.00    | 94.6 AV                 |                |             | 1.00 H             | 332                  | 90.92            | 3.72                     |
| 3                                                   | 5350.00     | 57.7 PK                 | 74.0           | -16.3       | 1.00 H             | 332                  | 53.79            | 3.92                     |
| 4                                                   | 5350.00     | 44.5 AV                 | 54.0           | -9.5        | 1.00 H             | 332                  | 40.56            | 3.92                     |
| 5                                                   | 5392.00     | 57.7 PK                 | 74.0           | -16.3       | 1.00 H             | 332                  | 53.74            | 3.98                     |
| 6                                                   | 5392.00     | 44.5 AV                 | 54.0           | -9.5        | 1.00 H             | 332                  | 40.48            | 3.98                     |
| 7                                                   | #10480.00   | 53.4 PK                 | 74.0           | -20.6       | 1.62 H             | 219                  | 40.18            | 13.19                    |
| 8                                                   | #10480.00   | 40.3 AV                 | 54.0           | -13.7       | 1.62 H             | 219                  | 27.11            | 13.19                    |
| 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    | 117.0 PK                |                |             | 1.87 V             | 329                  | 113.30           | 3.72                     |
| 2                                                   | *5240.00    | 108.0 AV                |                |             | 1.87 V             | 329                  | 104.26           | 3.72                     |
| 3                                                   | 5350.00     | 63.3 PK                 | 74.0           | -10.7       | 1.87 V             | 329                  | 59.36            | 3.92                     |
| 4                                                   | 5350.00     | 51.5 AV                 | 54.0           | -2.5        | 1.87 V             | 329                  | 47.55            | 3.92                     |
| 5                                                   | 5392.00     | 64.9 PK                 | 74.0           | -9.1        | 1.87 V             | 329                  | 60.94            | 3.98                     |
| 6                                                   | 5392.00     | 53.7 AV                 | 54.0           | -0.3        | 1.87 V             | 329                  | 49.73            | 3.98                     |
| 7                                                   | #10480.00   | 61.1 PK                 | 74.0           | -13.0       | 2.33 V             | 340                  | 47.86            | 13.19                    |
| 8                                                   | #10480.00   | 46.2 AV                 | 54.0           | -7.8        | 2.33 V             | 340                  | 32.97            | 13.19                    |

#### 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<br>FUNCTION | Peak (PK)    |
| FREQUENCY RANGE | 1GHz ~ 40GHz  |                      | Average (AV) |

| ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M |                |                               |                   |                |                          |                            |                        |                                |
|-----------------------------------------------------|----------------|-------------------------------|-------------------|----------------|--------------------------|----------------------------|------------------------|--------------------------------|
| NO.                                                 | FREQ.<br>(MHz) | EMISSION<br>LEVEL<br>(dBuV/m) | LIMIT<br>(dBuV/m) | MARGIN<br>(dB) | ANTENNA<br>HEIGHT<br>(m) | TABLE<br>ANGLE<br>(Degree) | RAW<br>VALUE<br>(dBuV) | CORRECTION<br>FACTOR<br>(dB/m) |
| 1                                                   | 5150.00        | 58.1 PK                       | 74.0              | -15.9          | 1.21 H                   | 234                        | 54.54                  | 3.60                           |
| 2                                                   | 5150.00        | 45.5 AV                       | 54.0              | -8.5           | 1.21 H                   | 234                        | 41.86                  | 3.60                           |
| 3                                                   | *5190.00       | 100.6 PK                      |                   |                | 1.21 H                   | 234                        | 97.01                  | 3.63                           |
| 4                                                   | *5190.00       | 91.3 AV                       |                   |                | 1.21 H                   | 234                        | 87.69                  | 3.63                           |
| 5                                                   | 5350.00        | 58.3 PK                       | 74.0              | -15.8          | 1.21 H                   | 234                        | 54.33                  | 3.92                           |
| 6                                                   | 5350.00        | 44.4 AV                       | 54.0              | -9.7           | 1.21 H                   | 234                        | 40.43                  | 3.92                           |
| 7                                                   | #10380.00      | 53.2 PK                       | 74.0              | -20.8          | 1.55 H                   | 232                        | 40.27                  | 12.94                          |
| 8                                                   | #10380.00      | 40.1 AV                       | 54.0              | -13.9          | 1.55 H                   | 232                        | 27.13                  | 12.94                          |
| ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M   |                |                               |                   |                |                          |                            |                        |                                |
| NO.                                                 | FREQ.<br>(MHz) | EMISSION<br>LEVEL<br>(dBuV/m) | LIMIT<br>(dBuV/m) | MARGIN<br>(dB) | ANTENNA<br>HEIGHT<br>(m) | TABLE<br>ANGLE<br>(Degree) | RAW<br>VALUE<br>(dBuV) | CORRECTION<br>FACTOR<br>(dB/m) |
| 1                                                   | 5150.00        | 70.5 PK                       | 74.0              | -3.5           | 1.89 V                   | 19                         | 66.92                  | 3.60                           |
| 2                                                   | 5150.00        | 53.5 AV                       | 54.0              | -0.5           | 1.89 V                   | 19                         | 49.93                  | 3.60                           |
| 3                                                   | *5190.00       | 117.5 PK                      |                   |                | 1.89 V                   | 19                         | 113.89                 | 3.63                           |
| 4                                                   | *5190.00       | 107.2 AV                      |                   |                | 1.89 V                   | 19                         | 103.55                 | 3.63                           |
| 5                                                   | 5350.00        | 65.6 PK                       | 74.0              | -8.4           | 1.89 V                   | 360                        | 61.66                  | 3.92                           |
| 6                                                   | 5350.00        | 53.6 AV                       | 54.0              | -0.4           | 1.89 V                   | 360                        | 49.69                  | 3.92                           |
| 7                                                   | #10380.00      | 59.8 PK                       | 74.0              | -14.2          | 2.45 V                   | 346                        | 46.83                  | 12.94                          |
| 8                                                   | #10380.00      | 44.2 AV                       | 54.0              | -9.8           | 2.45 V                   | 346                        | 31.27                  | 12.94                          |

## 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.

|                        |               |                          |              |
|------------------------|---------------|--------------------------|--------------|
| <b>CHANNEL</b>         | TX Channel 46 | <b>DETECTOR FUNCTION</b> | Peak (PK)    |
| <b>FREQUENCY RANGE</b> | 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     | 58.1 PK                 | 74.0           | -15.9       | 1.00 H             | 331                  | 54.54            | 3.60                     |
| 2                                                   | 5150.00     | 45.1 AV                 | 54.0           | -8.9        | 1.00 H             | 331                  | 41.51            | 3.60                     |
| 3                                                   | *5230.00    | 104.3 PK                |                |             | 1.00 H             | 331                  | 100.60           | 3.69                     |
| 4                                                   | *5230.00    | 94.3 AV                 |                |             | 1.00 H             | 331                  | 90.60            | 3.69                     |
| 5                                                   | 5350.00     | 55.3 PK                 | 74.0           | -18.7       | 1.00 H             | 331                  | 51.39            | 3.92                     |
| 6                                                   | 5350.00     | 44.1 AV                 | 54.0           | -9.9        | 1.00 H             | 331                  | 40.22            | 3.92                     |
| 7                                                   | 5393.00     | 58.5 PK                 | 74.0           | -15.5       | 1.00 H             | 331                  | 54.56            | 3.98                     |
| 8                                                   | 5393.00     | 44.4 AV                 | 54.0           | -9.6        | 1.00 H             | 331                  | 40.45            | 3.98                     |
| 9                                                   | #10460.00   | 54.1 PK                 | 74.0           | -19.9       | 1.48 H             | 220                  | 41.00            | 13.14                    |
| 10                                                  | #10460.00   | 41.5 AV                 | 54.0           | -12.5       | 1.48 H             | 220                  | 28.36            | 13.14                    |
| 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     | 64.2 PK                 | 74.0           | -9.8        | 1.94 V             | 333                  | 60.57            | 3.60                     |
| 2                                                   | 5150.00     | 51.6 AV                 | 54.0           | -2.4        | 1.94 V             | 333                  | 48.01            | 3.60                     |
| 3                                                   | *5230.00    | 118.5 PK                |                |             | 1.94 V             | 333                  | 114.85           | 3.69                     |
| 4                                                   | *5230.00    | 108.3 AV                |                |             | 1.94 V             | 333                  | 104.57           | 3.69                     |
| 5                                                   | 5350.00     | 61.0 PK                 | 74.0           | -13.1       | 1.94 V             | 333                  | 57.03            | 3.92                     |
| 6                                                   | 5350.00     | 49.7 AV                 | 54.0           | -4.3        | 1.94 V             | 333                  | 45.76            | 3.92                     |
| 7                                                   | 5393.00     | 64.5 PK                 | 74.0           | -9.5        | 1.94 V             | 333                  | 60.51            | 3.98                     |
| 8                                                   | 5393.00     | 53.9 AV                 | 54.0           | -0.2        | 1.94 V             | 333                  | 49.87            | 3.98                     |
| 9                                                   | #10460.00   | 62.3 PK                 | 74.0           | -11.7       | 2.29 V             | 347                  | 49.20            | 13.14                    |
| 10                                                  | #10460.00   | 47.3 AV                 | 54.0           | -6.7        | 2.29 V             | 347                  | 34.17            | 13.14                    |

#### 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 (VHT80)

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

| ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M |                |                               |                   |                |                          |                            |                        |                                |
|-----------------------------------------------------|----------------|-------------------------------|-------------------|----------------|--------------------------|----------------------------|------------------------|--------------------------------|
| NO.                                                 | FREQ.<br>(MHz) | EMISSION<br>LEVEL<br>(dBuV/m) | LIMIT<br>(dBuV/m) | MARGIN<br>(dB) | ANTENNA<br>HEIGHT<br>(m) | TABLE<br>ANGLE<br>(Degree) | RAW<br>VALUE<br>(dBuV) | CORRECTION<br>FACTOR<br>(dB/m) |
| 1                                                   | 5150.00        | 58.5 PK                       | 74.0              | -15.5          | 1.02 H                   | 331                        | 54.90                  | 3.60                           |
| 2                                                   | 5150.00        | 45.4 AV                       | 54.0              | -8.6           | 1.02 H                   | 331                        | 41.76                  | 3.60                           |
| 3                                                   | *5210.00       | 96.7 PK                       |                   |                | 1.02 H                   | 331                        | 93.02                  | 3.65                           |
| 4                                                   | *5210.00       | 85.1 AV                       |                   |                | 1.02 H                   | 331                        | 81.42                  | 3.65                           |
| 5                                                   | 5350.00        | 47.7 PK                       | 74.0              | -26.3          | 1.02 H                   | 331                        | 43.78                  | 3.92                           |
| 6                                                   | 5350.00        | 44.2 AV                       | 54.0              | -9.8           | 1.02 H                   | 331                        | 40.27                  | 3.92                           |
| 7                                                   | #10420.00      | 53.1 PK                       | 74.0              | -20.9          | 1.37 H                   | 240                        | 40.08                  | 13.05                          |
| 8                                                   | #10420.00      | 40.3 AV                       | 54.0              | -13.7          | 1.37 H                   | 240                        | 27.22                  | 13.05                          |
| ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M   |                |                               |                   |                |                          |                            |                        |                                |
| NO.                                                 | FREQ.<br>(MHz) | EMISSION<br>LEVEL<br>(dBuV/m) | LIMIT<br>(dBuV/m) | MARGIN<br>(dB) | ANTENNA<br>HEIGHT<br>(m) | TABLE<br>ANGLE<br>(Degree) | RAW<br>VALUE<br>(dBuV) | CORRECTION<br>FACTOR<br>(dB/m) |
| 1                                                   | 5150.00        | 72.5 PK                       | 74.0              | -1.5           | 1.81 V                   | 18                         | 68.94                  | 3.60                           |
| 2                                                   | 5150.00        | 53.8 AV                       | 54.0              | -0.2           | 1.81 V                   | 18                         | 50.17                  | 3.60                           |
| 3                                                   | *5210.00       | 110.0 PK                      |                   |                | 1.81 V                   | 18                         | 106.30                 | 3.65                           |
| 4                                                   | *5210.00       | 99.4 AV                       |                   |                | 1.81 V                   | 18                         | 95.79                  | 3.65                           |
| 5                                                   | 5350.00        | 62.0 PK                       | 74.0              | -12.0          | 1.81 V                   | 18                         | 58.11                  | 3.92                           |
| 6                                                   | 5350.00        | 53.6 AV                       | 54.0              | -0.4           | 1.81 V                   | 18                         | 49.65                  | 3.92                           |
| 7                                                   | #10420.00      | 58.8 PK                       | 74.0              | -15.2          | 2.29 V                   | 360                        | 45.77                  | 13.05                          |
| 8                                                   | #10420.00      | 43.9 AV                       | 54.0              | -10.1          | 2.29 V                   | 360                        | 30.86                  | 13.05                          |

## 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.

# Below 1GHz Data:

## Beamforming MODE

### 802.11ac (VHT20)

|                 |               |                      |                 |
|-----------------|---------------|----------------------|-----------------|
| CHANNEL         | TX Channel 48 | DETECTOR<br>FUNCTION | Quasi-Peak (QP) |
| FREQUENCY RANGE | 30MHz ~ 1GHz  |                      |                 |

| ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M |                |                               |                   |                |                          |                            |                        |                                |
|-----------------------------------------------------|----------------|-------------------------------|-------------------|----------------|--------------------------|----------------------------|------------------------|--------------------------------|
| NO.                                                 | FREQ.<br>(MHz) | EMISSION<br>LEVEL<br>(dBuV/m) | LIMIT<br>(dBuV/m) | MARGIN<br>(dB) | ANTENNA<br>HEIGHT<br>(m) | TABLE<br>ANGLE<br>(Degree) | RAW<br>VALUE<br>(dBuV) | CORRECTION<br>FACTOR<br>(dB/m) |
| 1                                                   | 106.44         | 33.5 QP                       | 43.5              | -10.0          | 1.53 H                   | 267                        | 51.01                  | -17.52                         |
| 2                                                   | 169.97         | 27.4 QP                       | 43.5              | -16.1          | 1.49 H                   | 190                        | 41.28                  | -13.86                         |
| 3                                                   | 201.11         | 28.5 QP                       | 43.5              | -15.0          | 2.17 H                   | 110                        | 44.79                  | -16.30                         |
| 4                                                   | 334.68         | 26.2 QP                       | 46.0              | -19.8          | 2.08 H                   | 142                        | 37.80                  | -11.61                         |
| 5                                                   | 532.46         | 37.2 QP                       | 46.0              | -8.8           | 1.77 H                   | 172                        | 45.12                  | -7.95                          |
| 6                                                   | 861.69         | 27.2 QP                       | 46.0              | -18.8          | 1.65 H                   | 43                         | 29.42                  | -2.20                          |
| ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M   |                |                               |                   |                |                          |                            |                        |                                |
| NO.                                                 | FREQ.<br>(MHz) | EMISSION<br>LEVEL<br>(dBuV/m) | LIMIT<br>(dBuV/m) | MARGIN<br>(dB) | ANTENNA<br>HEIGHT<br>(m) | TABLE<br>ANGLE<br>(Degree) | RAW<br>VALUE<br>(dBuV) | CORRECTION<br>FACTOR<br>(dB/m) |
| 1                                                   | 34.96          | 36.4 QP                       | 40.0              | -3.6           | 1.85 V                   | 182                        | 51.72                  | -15.28                         |
| 2                                                   | 107.45         | 34.2 QP                       | 43.5              | -9.3           | 1.73 V                   | 215                        | 51.69                  | -17.47                         |
| 3                                                   | 147.52         | 27.4 QP                       | 43.5              | -16.1          | 1.94 V                   | 79                         | 41.14                  | -13.74                         |
| 4                                                   | 329.18         | 31.4 QP                       | 46.0              | -14.6          | 1.66 V                   | 138                        | 42.99                  | -11.63                         |
| 5                                                   | 532.46         | 37.3 QP                       | 46.0              | -8.7           | 1.71 V                   | 118                        | 45.29                  | -7.95                          |
| 6                                                   | 828.73         | 27.2 QP                       | 46.0              | -18.8          | 1.22 V                   | 88                         | 29.74                  | -2.56                          |

## 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.   | Cal. Date     | Cal. Due      |
|------------------------------------------------------------------|-----------------|--------------|---------------|---------------|
| ROHDE & SCHWARZ<br>TEST RECEIVER                                 | ESCS 30         | 100292       | Dec. 18, 2014 | Dec. 17, 2015 |
| ROHDE & SCHWARZ<br>Artificial Mains Network<br>(for EUT)         | ESH2-Z5         | 100104       | Dec. 04, 2014 | Dec. 03, 2015 |
| LISN With Adapter (for EUT)                                      | AD10            | C09Ada-001   | Dec. 04, 2014 | Dec. 03, 2015 |
| ROHDE & SCHWARZ<br>Artificial Mains Network<br>(for peripherals) | ESH3-Z5         | 847265/023   | Oct. 21, 2014 | Oct. 20, 2015 |
| SCHWARZBECK<br>Artificial Mains Network (For<br>EUT)             | NNLK8129        | 8129229      | May 08, 2014  | May 07, 2015  |
| Software                                                         | ADT_Cond_V7.3.7 | NA           | NA            | NA            |
| RF cable (JYEBAO)                                                | 5D-FB           | Cable-C09.01 | Feb. 24, 2015 | Feb. 23, 2016 |
| SUHNER Terminator<br>(For ROHDE & SCHWARZ<br>LISN)               | 65BNC-5001      | E1-010789    | May 20, 2014  | May 19, 2015  |
| ROHDE & SCHWARZ<br>Artificial Mains Network (For<br>TV EUT)      | ESH3-Z5         | 100220       | Nov. 20, 2014 | Nov. 19, 2015 |
| LISN With Adapter<br>(for TV EUT)                                | 100220          | N/A          | Nov. 20, 2014 | Nov. 19, 2015 |

Notes: 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. 9.

3. The VCCI Site Registration No. C-1312.

#### 4.2.3 Test Procedure

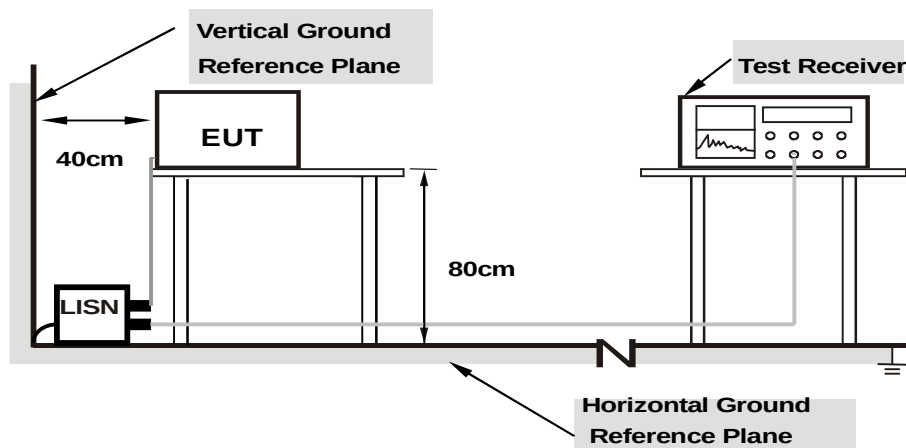
- The EUT was placed 0.4 meters from the conducting wall of the shielded room with EUT being connected to the power mains through a line impedance stabilization network (LISN). Other support units were connected to the power mains through another LISN. The two LISNs provide 50 ohm/ 50uH of coupling impedance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



**Note: 1.Support units were connected to second LISN.**

**2.Both of LISNs (AMN) are 80 cm from EUT and at least 80 from other units and other metal planes**

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

#### 4.2.6 EUT Operating Condition

Same as item 4.1.6.

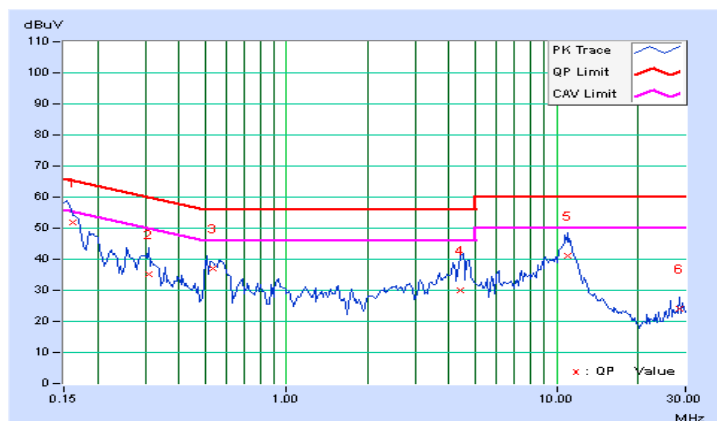
#### 4.2.7 Test Results

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

| 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  | 0.16283         | 0.21                   | 51.62                | 43.75 | 51.83                 | 43.96 | 65.32        | 55.32 | -13.49      | -11.36 |
| 2  | 0.31011         | 0.25                   | 34.88                | 23.43 | 35.13                 | 23.68 | 59.97        | 49.97 | -24.84      | -26.29 |
| 3  | 0.53155         | 0.29                   | 36.71                | 31.22 | 37.00                 | 31.51 | 56.00        | 46.00 | -19.00      | -14.49 |
| 4  | 4.40629         | 0.57                   | 29.43                | 20.31 | 30.00                 | 20.88 | 56.00        | 46.00 | -26.00      | -25.12 |
| 5  | 11.00786        | 0.80                   | 40.22                | 35.02 | 41.02                 | 35.82 | 60.00        | 50.00 | -18.98      | -14.18 |
| 6  | 28.62473        | 1.13                   | 22.91                | 20.55 | 24.04                 | 21.68 | 60.00        | 50.00 | -35.96      | -28.32 |

#### 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



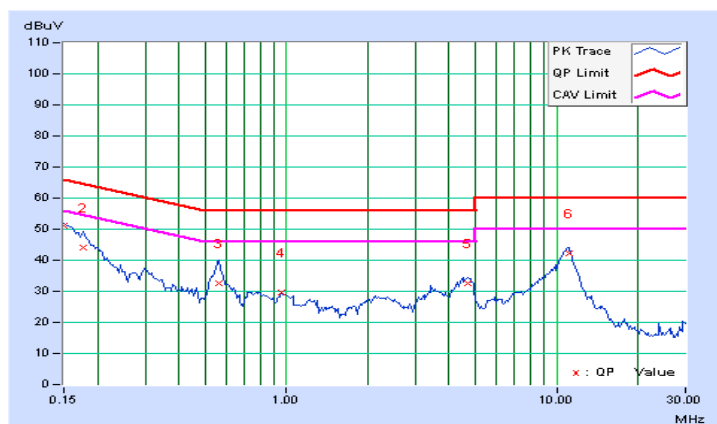


| Phase | Neutral (N) | Detector Function | Quasi-Peak (QP) / Average (AV) |
|-------|-------------|-------------------|--------------------------------|
|-------|-------------|-------------------|--------------------------------|

| No | 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  | 0.15005         | 0.21                   | 50.77                | 43.72 | 50.98                 | 43.93 | 66.00        | 56.00 | -15.02      | -12.07 |
| 2  | 0.17711         | 0.22                   | 44.01                | 27.55 | 44.23                 | 27.77 | 64.62        | 54.62 | -20.39      | -26.85 |
| 3  | 0.56021         | 0.31                   | 32.33                | 28.12 | 32.64                 | 28.43 | 56.00        | 46.00 | -23.36      | -17.57 |
| 4  | 0.96259         | 0.37                   | 29.25                | 24.51 | 29.62                 | 24.88 | 56.00        | 46.00 | -26.38      | -21.12 |
| 5  | 4.69135         | 0.59                   | 31.89                | 23.66 | 32.48                 | 24.25 | 56.00        | 46.00 | -23.52      | -21.75 |
| 6  | 11.10128        | 0.77                   | 41.37                | 35.89 | 42.14                 | 36.66 | 60.00        | 50.00 | -17.86      | -13.34 |

#### 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)<br>(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,

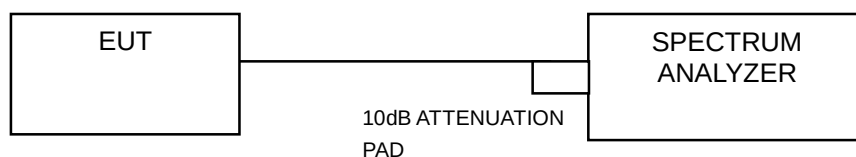
Array Gain = 0 dB (i.e., no array gain) for  $N_{ANT} \leq 4$ ;

Array Gain = 0 dB (i.e., no array gain) for channel widths  $\geq 40$  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

Refer to section 4.1.2 to get information of above instrument.

#### 4.3.4 Test Procedure

##### FOR AVERAGE POWER MEASUREMENT

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.

##### FOR 26dB BANDWIDTH

- 1) Set RBW = approximately 1% of the emission bandwidth.
- 2) Set the VBW > RBW.
- 3) Detector = Peak.
- 4) Trace mode = max hold.
- 5) Measure the maximum width of the emission that is 26 dB down from the peak of the emission. Compare this with the RBW setting of the analyzer. Readjust RBW and repeat measurement as needed until the RBW/EBW ratio is approximately 1%.

##### FOR 99% BANDWIDTH

The transmitter output was connected to the spectrum analyzer through an attenuator. The bandwidth of the fundamental frequency was measured by spectrum analyzer with resolution bandwidth in the range of 1% to 5% of the anticipated emission bandwidth, and a video bandwidth at least 3x the resolution bandwidth and set the detector to PEAK. The width of a frequency band such that, below the lower and above the upper frequency limits, the mean powers emitted are each equal to a specified percentage 0.5 %of the total mean power of a given emission.

#### 4.3.5 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

##### POWER OUTPUT:

##### CDD Mode

| CHAN.   | CHAN. FREQ.<br>(MHz) | MAXIMUM CONDUCTED<br>POWER (dBm) |         |         | TOTAL<br>POWER<br>(mW) | TOTAL<br>POWER<br>(dBm) | POWER<br>LIMIT<br>(dBm) | PASS / FAIL |
|---------|----------------------|----------------------------------|---------|---------|------------------------|-------------------------|-------------------------|-------------|
|         |                      | CHAIN 0                          | CHAIN 1 | CHAIN 2 |                        |                         |                         |             |
| 802.11a |                      |                                  |         |         |                        |                         |                         |             |
| 36      | 5180                 | 20.18                            | 19.70   | 19.26   | 281.89                 | 24.50                   | 30                      | PASS        |
| 40      | 5200                 | 18.22                            | 17.74   | 17.28   | 179.259                | 22.53                   | 30                      | PASS        |
| 48      | 5240                 | 18.19                            | 17.65   | 17.27   | 177.46                 | 22.49                   | 30                      | PASS        |

##### Beamforming Mode

| CHAN.            | CHAN. FREQ. (MHz) | MAXIMUM CONDUCTED POWER (dBm) |         |         | TOTAL POWER (mW) | TOTAL POWER (dBm) | POWER LIMIT (dBm) | PASS / FAIL |
|------------------|-------------------|-------------------------------|---------|---------|------------------|-------------------|-------------------|-------------|
|                  |                   | CHAIN 0                       | CHAIN 1 | CHAIN 2 |                  |                   |                   |             |
| 802.11ac (VHT20) |                   |                               |         |         |                  |                   |                   |             |
| 36               | 5180              | 20.02                         | 19.62   | 19.04   | 272.252          | 24.35             | 29.23             | PASS        |
| 40               | 5200              | 18.11                         | 17.73   | 17.15   | 175.887          | 22.45             | 29.23             | PASS        |
| 48               | 5240              | 18.07                         | 17.71   | 17.13   | 174.783          | 22.42             | 29.23             | PASS        |
| 802.11ac (VHT40) |                   |                               |         |         |                  |                   |                   |             |
| 38               | 5190              | 18.62                         | 18.19   | 17.89   | 200.213          | 23.01             | 29.23             | PASS        |
| 46               | 5230              | 22.59                         | 22.18   | 22.84   | 539.057          | 27.32             | 29.23             | PASS        |
| 802.11ac (VHT80) |                   |                               |         |         |                  |                   |                   |             |
| 42               | 5210              | 17.42                         | 16.91   | 16.31   | 147.055          | 21.67             | 29.23             | PASS        |

**NOTE:** Directional gain =  $2\text{dBi} + 10\log(3) = 6.77\text{dBi} > 6\text{dBi}$  , so the conducted power limit shall be reduced to  $30 - (6.77 - 6) = 29.23\text{dBm}$ .

## 26dB BANDWIDTH:

### CDD Mode

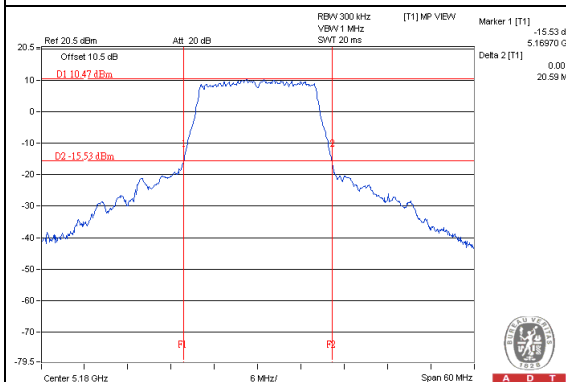
| CHANNEL | CHANNEL<br>FREQUENCY<br>(MHz) | 26dBc BANDWIDTH (MHz) |         |         | PASS / FAIL |
|---------|-------------------------------|-----------------------|---------|---------|-------------|
|         |                               | CHAIN 0               | CHAIN 1 | CHAIN 2 |             |
| 802.11a |                               |                       |         |         |             |
| 36      | 5180                          | 20.52                 | 20.37   | 20.59   | PASS        |
| 40      | 5200                          | 20.51                 | 20.43   | 20.38   | PASS        |
| 48      | 5240                          | 20.45                 | 20.39   | 20.47   | PASS        |

### Beamforming Mode

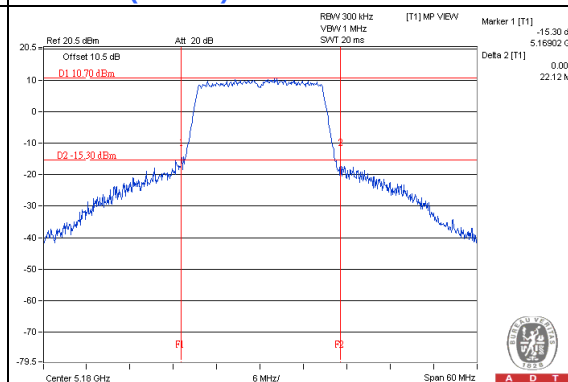
| CHANNEL          | CHANNEL<br>FREQUENCY<br>(MHz) | 26dBc BANDWIDTH (MHz) |         |         | PASS / FAIL |
|------------------|-------------------------------|-----------------------|---------|---------|-------------|
|                  |                               | CHAIN 0               | CHAIN 1 | CHAIN 2 |             |
| 802.11ac (VHT20) |                               |                       |         |         |             |
| 36               | 5180                          | 21.33                 | 22.12   | 20.83   | PASS        |
| 40               | 5200                          | 20.88                 | 20.81   | 20.92   | PASS        |
| 48               | 5240                          | 20.83                 | 20.91   | 20.77   | PASS        |
| 802.11ac (VHT40) |                               |                       |         |         |             |
| 38               | 5190                          | 40.47                 | 40.41   | 40.27   | PASS        |
| 46               | 5230                          | 55.39                 | 47.96   | 43.59   | PASS        |
| 802.11ac (VHT80) |                               |                       |         |         |             |
| 42               | 5210                          | 82.65                 | 83.32   | 83.30   | PASS        |

# SPECTRUM PLOT OF WORST VALUE

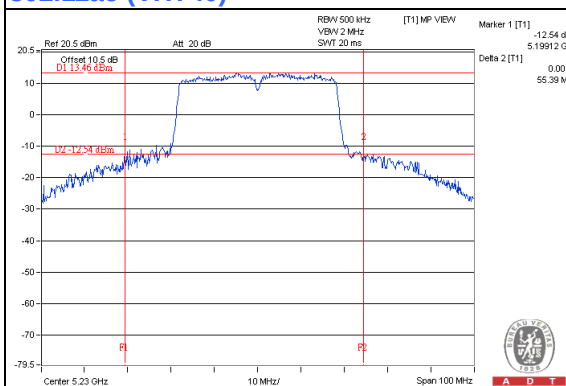
802.11a



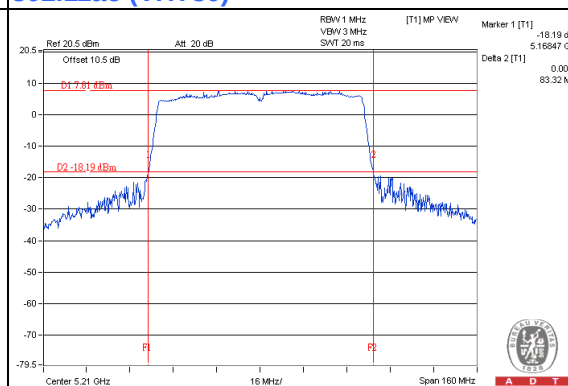
802.11ac (VHT20)



802.11ac (VHT40)



802.11ac (VHT80)



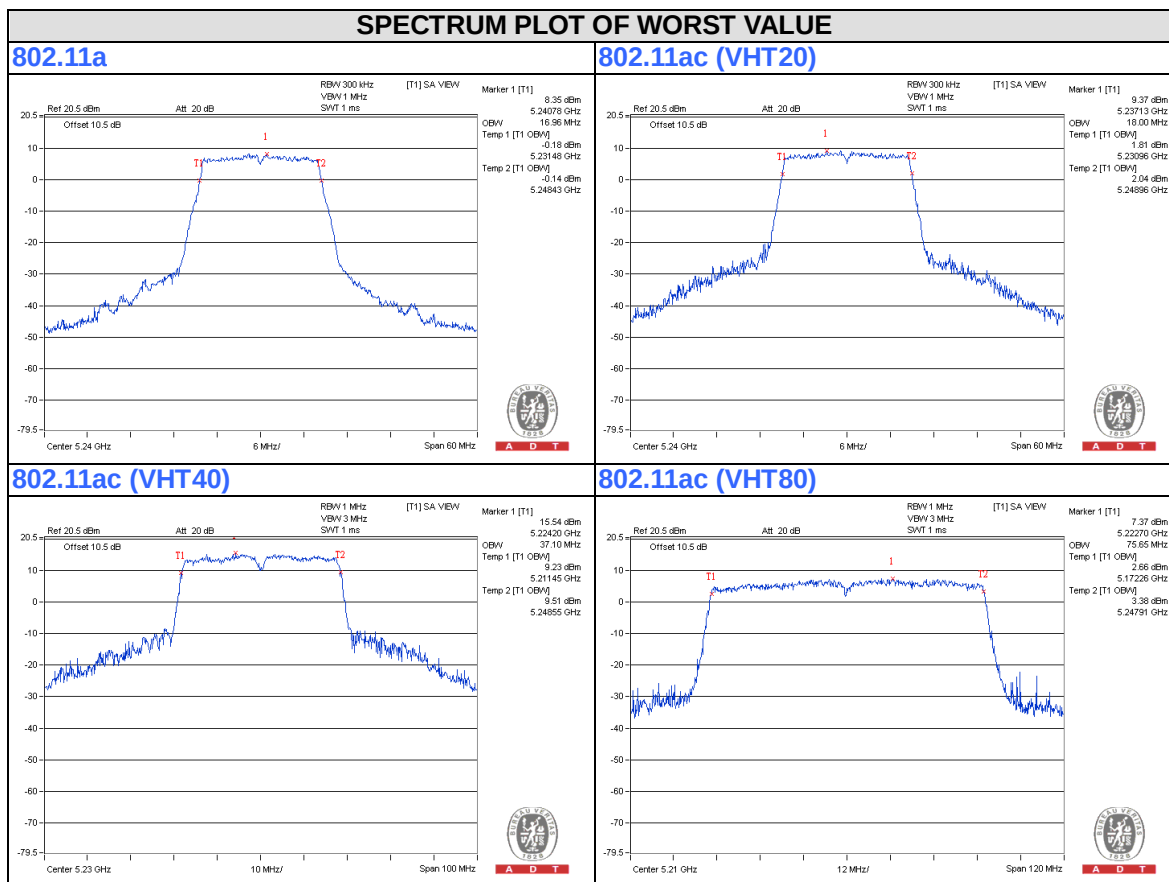
## 99% BANDWIDTH:

### CDD Mode

| CHANNEL | CHANNEL<br>FREQUENCY<br>(MHz) | 99% BANDWIDTH (MHz) |         |         | PASS / FAIL |
|---------|-------------------------------|---------------------|---------|---------|-------------|
|         |                               | CHAIN 0             | CHAIN 1 | CHAIN 2 |             |
| 802.11a |                               |                     |         |         |             |
| 48      | 5240                          | 16.96               | 16.96   | 16.96   | PASS        |

### Beamforming Mode

| CHANNEL          | CHANNEL<br>FREQUENCY<br>(MHz) | 99% BANDWIDTH (MHz) |         |         | PASS / FAIL |
|------------------|-------------------------------|---------------------|---------|---------|-------------|
|                  |                               | CHAIN 0             | CHAIN 1 | CHAIN 2 |             |
| 802.11ac (VHT20) |                               |                     |         |         |             |
| 48               | 5240                          | 18.00               | 18.00   | 17.91   | PASS        |
| 802.11ac (VHT40) |                               |                     |         |         |             |
| 46               | 5230                          | 36.96               | 36.96   | 37.10   | PASS        |
| 802.11ac (VHT80) |                               |                     |         |         |             |
| 42               | 5210                          | 75.65               | 75.65   | 75.65   | PASS        |

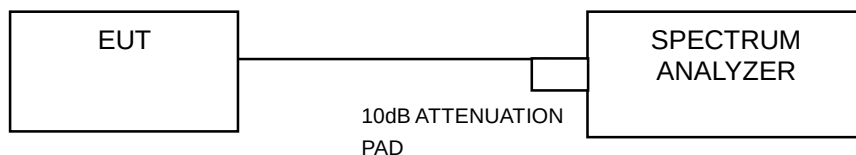


#### 4.4 Peak Power Spectral Density Measurement

##### 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

Refer to section 4.1.2 to get information of above instrument.

##### 4.4.4 Test Procedure

Using method SA-2

- 1) Set span to encompass the entire emission bandwidth (EBW) of the signal.
- 2) Set RBW = 30 kHz, Set VBW ≥ 1 MHz, Detector = RMS
- 3) Set Channel power measure = 1MHz
- 4) Sweep time = auto, trigger set to “free run”.
- 5) Trace average at least 100 traces in power averaging mode.
- 6) Record the max value and add 10 log (1/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 PSD W/O DUTY FACTOR (dBm) | DUTY FACTOR | TOTAL PSD WITH DUTY FACTOR (dBm) | MAX. LIMIT (dBm) | PASS / FAIL |
|---------|-------------------|-----------|---------|---------|---------------------------------|-------------|----------------------------------|------------------|-------------|
|         |                   | CHAIN 0   | CHAIN 1 | CHAIN 2 |                                 |             |                                  |                  |             |
| 802.11a |                   |           |         |         |                                 |             |                                  |                  |             |
| 36      | 5180              | 5.88      | 5.67    | 4.33    | 10.12                           | 0.33        | 10.45                            | 16.23            | PASS        |
| 40      | 5200              | 4.00      | 3.79    | 2.95    | 8.37                            | 0.33        | 8.70                             | 16.23            | PASS        |
| 48      | 5240              | 3.85      | 3.67    | 3.36    | 8.40                            | 0.33        | 8.73                             | 16.23            | PASS        |

##### NOTE:

- Method 1 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.
- Directional gain =  $2\text{dBi} + 10\log(3) = 6.77\text{dBi} > 6\text{dBi}$ , so the power density limit shall be reduced to  $17-(6.77-6) = 16.23\text{dBm}$ .
- Refer to section 3.3 for duty cycle spectrum plot.

##### Beamforming Mode

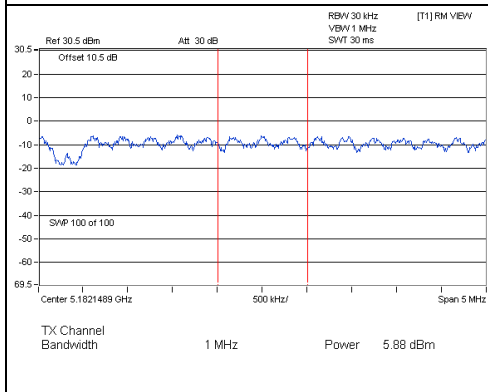
| CHAN.            | CHAN. FREQ. (MHz) | PSD (dBm) |         |         | TOTAL PSD W/O DUTY FACTOR (dBm) | DUTY FACTOR | TOTAL PSD WITH DUTY FACTOR (dBm) | MAX. LIMIT (dBm) | PASS / FAIL |
|------------------|-------------------|-----------|---------|---------|---------------------------------|-------------|----------------------------------|------------------|-------------|
|                  |                   | CHAIN 0   | CHAIN 1 | CHAIN 2 |                                 |             |                                  |                  |             |
| 802.11ac (VHT20) |                   |           |         |         |                                 |             |                                  |                  |             |
| 36               | 5180              | 6.17      | 6.03    | 5.53    | 10.69                           | 0.31        | 11.00                            | 16.23            | PASS        |
| 40               | 5200              | 4.72      | 4.19    | 3.78    | 9.01                            | 0.31        | 9.32                             | 16.23            | PASS        |
| 48               | 5240              | 4.92      | 4.24    | 3.84    | 9.12                            | 0.31        | 9.43                             | 16.23            | PASS        |
| 802.11ac (VHT40) |                   |           |         |         |                                 |             |                                  |                  |             |
| 38               | 5190              | 0.45      | -0.12   | -0.54   | 4.72                            | 0.79        | 5.51                             | 16.23            | PASS        |
| 46               | 5230              | 4.25      | 4.29    | 3.36    | 8.76                            | 0.79        | 9.55                             | 16.23            | PASS        |
| 802.11ac (VHT80) |                   |           |         |         |                                 |             |                                  |                  |             |
| 42               | 5210              | -3.23     | -3.08   | -4.02   | 1.35                            | 0.82        | 2.17                             | 16.23            | PASS        |

##### NOTE:

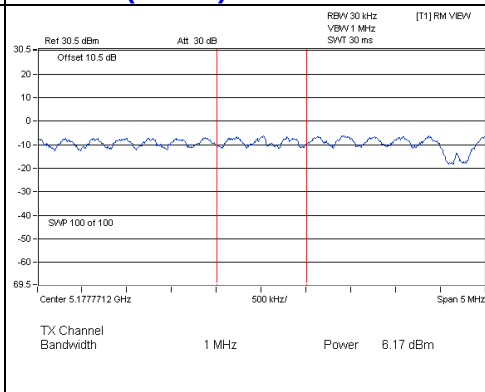
- Method 1 of power density measurement of KDB 662911 is using for calculating total power density. Total power density is summing entire spectra across corresponding frequency bins on the various outputs by computer.
- Directional gain =  $2\text{dBi} + 10\log(3) = 6.77\text{dBi} > 6\text{dBi}$ , so the power density limit shall be reduced to  $17-(6.77-6) = 16.23\text{dBm}$ .
- Refer to section 3.3 for duty cycle spectrum plot.

# SPECTRUM PLOT OF WORST VALUE

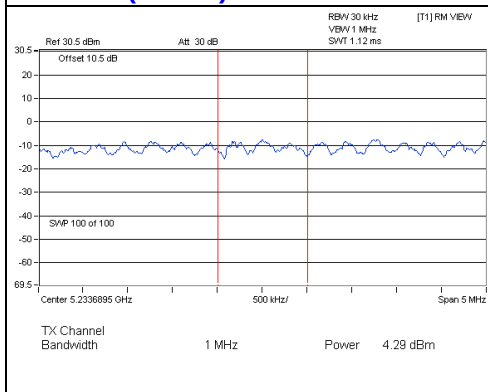
## 802.11a



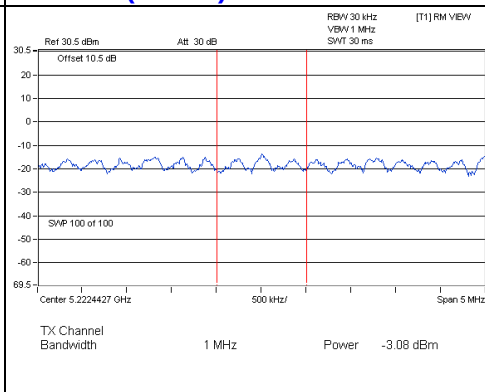
## 802.11ac (VHT20)



## 802.11ac (VHT40)



## 802.11ac (VHT80)

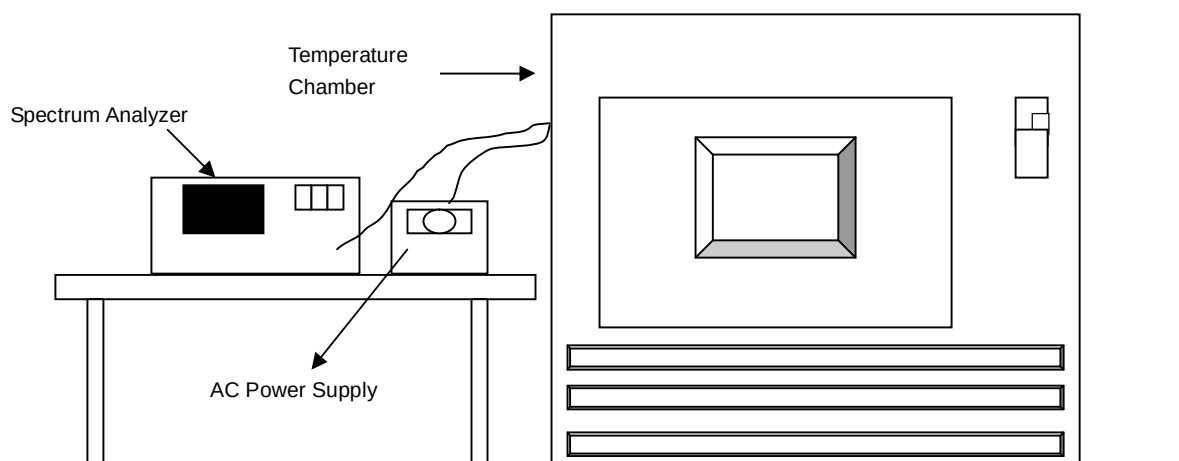


## 4.5 Frequency Stability Measurement

### 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

Refer to section 4.1.2 to get information of above instrument.

### 4.5.4 Test Procedure

- The EUT was placed inside the environmental test chamber and powered by nominal AC voltage.
- Turn the EUT on and couple its output to a spectrum analyzer.
- Turn the EUT off and set the chamber to the highest temperature specified.
- 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.
- Repeat step 2 and 3 with the temperature chamber set to the lowest temperature.
- 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.<br>(°C)                    | POWER<br>SUPPLY<br>(Vac) | 0 MINUTE                       |                             | 2 MINUTE                       |                             | 5 MINUTE                       |                             | 10 MINUTE                      |                             |
|                                  |                          | Measured<br>Frequency<br>(MHz) | Frequency<br>Drift<br>(ppm) | Measured<br>Frequency<br>(MHz) | Frequency<br>Drift<br>(ppm) | Measured<br>Frequency<br>(MHz) | Frequency<br>Drift<br>(ppm) | Measured<br>Frequency<br>(MHz) | Frequency<br>Drift<br>(ppm) |
| 50                               | 120                      | 5180.042616                    | 8.2270925                   | 5180.04275                     | 8.2528958                   | 5180.042879                    | 8.2777945                   | 5180.042987                    | 8.2986486                   |
| 40                               | 120                      | 5180.043039                    | 8.3087623                   | 5180.042705                    | 8.2442085                   | 5180.042925                    | 8.2867706                   | 5180.04288                     | 8.2779923                   |
| 30                               | 120                      | 5180.043631                    | 8.4229943                   | 5180.043681                    | 8.4326255                   | 5180.043535                    | 8.4045079                   | 5180.04347                     | 8.3918919                   |
| 20                               | 120                      | 5180.042764                    | 8.2555735                   | 5180.042755                    | 8.2538610                   | 5180.042981                    | 8.2975505                   | 5180.043003                    | 8.3017375                   |
| 10                               | 120                      | 5180.042655                    | 8.2346482                   | 5180.042626                    | 8.2289575                   | 5180.042569                    | 8.2180498                   | 5180.042665                    | 8.2364865                   |
| 0                                | 120                      | 5180.043233                    | 8.3461434                   | 5180.043364                    | 8.3714286                   | 5180.043017                    | 8.3044208                   | 5180.043132                    | 8.3266409                   |
| -10                              | 120                      | 5180.043463                    | 8.3905138                   | 5180.042979                    | 8.2971042                   | 5180.043066                    | 8.3139267                   | 5180.0431                      | 8.3204633                   |
| -20                              | 120                      | 5180.043182                    | 8.3362928                   | 5180.042768                    | 8.2564668                   | 5180.043497                    | 8.3970857                   | 5180.04297                     | 8.2953750                   |

| FREQUENCY STABILITY VERSUS VOLTAGE |                          |                                |                             |                                |                             |                                |                             |                                |                             |
|------------------------------------|--------------------------|--------------------------------|-----------------------------|--------------------------------|-----------------------------|--------------------------------|-----------------------------|--------------------------------|-----------------------------|
| OPERATING FREQUENCY: 5180MHz       |                          |                                |                             |                                |                             |                                |                             |                                |                             |
| TEMP.<br>(°C)                      | POWER<br>SUPPLY<br>(Vac) | 0 MINUTE                       |                             | 2 MINUTE                       |                             | 5 MINUTE                       |                             | 10 MINUTE                      |                             |
|                                    |                          | Measured<br>Frequency<br>(MHz) | Frequency<br>Drift<br>(ppm) | Measured<br>Frequency<br>(MHz) | Frequency<br>Drift<br>(ppm) | Measured<br>Frequency<br>(MHz) | Frequency<br>Drift<br>(ppm) | Measured<br>Frequency<br>(MHz) | Frequency<br>Drift<br>(ppm) |
| 20                                 | 138                      | 5180.043238                    | 8.3470697                   | 5180.043274                    | 8.3540541                   | 5180.043390                    | 8.3763912                   | 5180.043285                    | 8.3561776                   |
|                                    | 120                      | 5180.042764                    | 8.2555735                   | 5180.042755                    | 8.2538610                   | 5180.042981                    | 8.2975505                   | 5180.043003                    | 8.3017375                   |
|                                    | 102                      | 5180.042159                    | 8.1388545                   | 5180.042142                    | 8.1355212                   | 5180.042303                    | 8.1665179                   | 5180.042364                    | 8.1783784                   |

## 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 Lab/Telecom Lab**

Tel: 886-3-5935343

Fax: 886-3-5935342

**Hwa Ya EMC/RF/Safety**

Tel: 886-3-3183232

Fax: 886-3-3270892

**Email:** [service.adt@tw.bureauveritas.com](mailto:service.adt@tw.bureauveritas.com)

**Web Site:** [www.bureauveritas-adt.com](http://www.bureauveritas-adt.com)

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

--- END ---