# FCC RADIO TEST REPORT

| | | |
|---|---|---|
| Applicant | : | Ubiquiti Networks, Inc. |
| Address | : | 685 Third Avenue, 27th Floor New York, New York 10017 USA |
| Equipment | : | NanoBeam AC |
| Model No. | : | NBE-2AC-13 |
| Trade Name | : | UBIQUITI |
| FCC ID. | : | SWX-NBE2ACN |

**I HEREBY CERTIFY THAT :**

**The sample was received on Aug. 11, 2017 and the testing was carried out on Aug. 18, 2017 at Cerpass Technology Corp. The test result refers exclusively to the test presented test model / sample. Without written approval of Cerpass Technology Corp., the test report shall not be reproduced except in full.**

Approved by:

Mark Liao / Assistant Manager

Tested by:

Spree Yei / Engineer

Laboratory Accreditation:

Cerpass Technology Corporation Test Laboratory

## CONTENTS

History of this test report

| Report No. | Issue Date | Description |
|---|---|---|
| TEFE1707241 | Aug. 23, 2017 | Original |
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# 1. Summary of Test Procedure and Test Results

## 1.1. Applicable Standards

**ANSI C63.4:2014**

**ANSI C63.10:2013**

**FCC Rules and Regulations Part 15 Subpart E §15.407**

**First R&O 14-30**

**KDB662911**

**KDB789033**

**KDB644545**

| FCC Rule | Description of Test | Result |
|---|---|---|
| 15.203 | Antenna Requirement | Pass |
| 15.207(a) | AC Power Line Conducted Emission | Pass |
| 15.407(b)<br>15.209 | Radiated Spurious Emission | Pass |
| 15.407(a) | 26 dB Occupied Bandwidth | N/A |
| 15.407 | 6 dB Bandwidth | Pass |
| 15.407<br>(a) & (a)(3) | Average Power | Pass |
| 15.407(a) | Output and PPSD | Pass |

# 2. Test Configuration of Equipment under Test

## 2.1. Feature of Equipment

| | |
|---|---|
| Frequency Range | 802.11/n/ac: 2412-2462 MHz<br>802.11n: 5725MHz -5850MHz |
| Modulation Type | OFDM |
| Data Rate | 2.4GHz<br>802.11n: MCS0 – MCS15, HT10/20/40<br>802.11ac: MCS0 – MCS9, VHT10/20/40<br>5GHz<br>802.11n: MCS0 – MCS7, HT20 |
| Antenna Type/ gain | Internal antenna<br>2.4G: ANT 0/1: 13dBi, 5G: ANT 0: 2dBi |

Note:
1. For a more detailed features description, please refer to the manufacturer's specifications or the User's Manual.

## 2.2. Carrier Frequency of Channels

Band 4: 5725MHz -5850MHz
802.11n HT20

| Channel | Frequency(MHz) | Channel | Frequency(MHz) |
|---|---|---|---|
| ***149** | **5745** | 161 | 5805 |
| 153 | 5765 | ***165** | **5825** |
| ***157** | **5785** | | |

Note: Channels remarked * are selected to perform test.

## 2.3. Test Mode and Test Software

a. During testing, the interface cables and equipment positions were varied according to ANSI C63.4.
b. The complete test system included EUT for RF test.
c. An executive program, ”RF Tool” under WIN 8 was executed to transmit and receive data via WLAN.
d. The following test mode was performed for the test:
   Test Mode 1: 802.11n HT20 (MCS0)

## 2.4. Description of Test System

No support unit was used during testing.

## 2.5. General Information of Test

| | | |
|---|---|---|
| Test Site | **Cerpass Technology Corporation Test Laboratory**<br>Address: No.10, Ln. 2, Lianfu St., Luzhu Dist., Taoyuan City 33848, Taiwan (R.O.C.)<br>Tel:+886-3-3226-888<br>Fax:+886-3-3226-881<br>Address: No.68-1, Shihbachongsi, Shihding Township, New Taipei City 223, Taiwan, R.O.C.<br>Tel: +886-2-2663-8582 | |
| | FCC | TW1079, TW1061, 390316, 228391, 641184 |
| | IC | 4934E-1, 4934E-2 |
| | VCCI | T-2205 for Telecommunication Test<br>C-4663 for Conducted emission test<br>R-4218, R-4399 for Radiated emission test<br>G-812, G-813 for radiated disturbance above 1GHz |
| Frequency Range Investigated: | Conducted: from 150kHz to 30 MHz<br>Radiation: from 30 MHz to 40,000MHz | |
| Test Distance: | The test distance of radiated emission from antenna to EUT is 3 M. | |

## 2.6. Measurement Uncertainty

| Measurement Item | Measurement Frequency | Polarization | Uncertainty |
|---|---|---|---|
| Conducted Emission | 9 kHz ~ 30 MHz | Line / Neutral | ±2.9076 dB |
| Radiated Emission | 9 kHz ~ 25,000 MHz | Vertical / Horizontal | ±0.948 dB |
| Spurious Emission (Conducted) | - | - | ±4.011 dB |
| Maximum Peak and Average Output Power | - | - | ±0.322 dB |
| Power Spectral Density | - | - | ±0.322 dB |
| Bandwidth | - | - | 74.224Hz |

## 3. Test Equipment and Ancillaries Used for Tests

| Instrument | Manufacturer | Model No. | Serial No. | Calibration Date | Valid Date |
|---|---|---|---|---|---|
| EMI Receiver | R&S | ESCI3 | 100443 | 2017/03/07 | 2018/03/06 |
| LISN | Schwarzbeck | NSLK 8127 | 8127-740 | 2016/08/30 | 2017/08/29 |
| LISN | Schwarzbeck | NSLK 8127 | 8127-516 | 2016/09/06 | 2017/09/05 |
| Pulse Limiter | R&S | ESH3-Z2 | 101934 | 2017/02/14 | 2018/02/13 |
| Bilog Antenna | Schwarzbeck | VULB9168 | 369 | 2017/03/15 | 2018/03/14 |
| Active Loop Antenna | EMCO | 6507 | 40855 | 2017/05/15 | 2018/05/14 |
| Horn Antenna | EMCO | 3115 | 31601 | 2016/09/05 | 2017/09/04 |
| Horn Antenna | EMCO | 3116 | 31970 | 2017/03/29 | 2018/03/28 |
| EXA Signal Analyzer | KEYSIGHT | N9010A | MY54200207 | 2017/03/17 | 2018/03/16 |
| Preamplifier | EM | EM330 | 60660 | 2017/02/25 | 2018/02/24 |
| Preamplifier | EMC INSTRUMENTS | EMC051845SE | 980333 | 2016/09/13 | 2017/09/12 |
| Preamplifier | Agilent | 8449B | 3008A01954 | 2017/02/09 | 2018/02/08 |
| Preamplifier | EMC INSTRUMENTS | EMC184045 | 980065 | 2016/11/04 | 2017/11/03 |
| MXG MW Analog Signal Generator | KEYSIGHT | N5183A | MY50142931 | 2017/03/17 | 2018/03/16 |
| Spectrum Analyzer | R&S | FSP40 | 100219 | 2016/09/01 | 2017/08/31 |
| Bluetooth Tester | R&S | CBT | 101133 | 2017/03/10 | 2018/03/09 |
| Attenuator | KEYSIGHT | 8491B | MY39250703 | 2017/03/07 | 2018/03/06 |
| Rotary Attenuator | Agilent | 8495B | MY42146680 | 2017/03/13 | 2018/03/12 |
| Temp & Humi chamber | T-MACHINE | TMJ-9712 | T-12-040111 | 2016/09/05 | 2017/09/04 |
| Series Power Meter | Anritsu | ML2495A | 1224005 | 2017/03/01 | 2018/02/28 |
| Power Sensor | Anritsu | MA2411B | 1207295 | 2017/03/01 | 2018/02/28 |
| Cable | HUBER SUHNER | SUCOFLEX 102 | 28422/2 | 2017/02/25 | 2018/02/24 |
| Cable | HUBER SUHNER | SUCOFLEX 102 | 28418/2 | 2017/02/25 | 2018/02/24 |
| Software | Farad | Ez-EMC | ver.ct3a1 | N/A | N/A |
| Software | AUDIX | E3 | V8.2014-8-6 | N/A | N/A |
| Software | Keysight | N7607B Signal Studio | v2.0.0.1 | N/A | N/A |
| Software | Keysight | Inservice MonitorUtility | N/A | N/A | N/A |

# 4. Antenna Requirements

## 4.1. Antenna Construction and Directional Gain

| | |
|---|---|
| Antenna Type | Internal Antenna |
| Antenna Gain | 2.4G: ANT 0/1: 13dBi, 5G: ANT 0: 2dBi |

2412-2462MHz
For Power directional gain= $G_{ant}$= 13 dBi
For PSD directional gain = 10 log[$(10^{G1/20} + 10^{G2/20} + \ldots + 10^{GN/20})^2$ /NANT]
= 16.01 (dBi)

5725MHz -5850MHz
For Power directional gain= $G_{ant}$= 2 dBi
For PSD directional gain = 10 log[$(10^{G1/20} + 10^{G2/20} + \ldots + 10^{GN/20})^2$ /NANT]
= 2 (dBi)

# 5. Test of AC Power Line Conducted Emission

## 5.1. Test Limit

Conducted Emissions were measured from 150 kHz to 30 MHz with a bandwidth of 9 KHz, according to the methods defined in ANSI C63.4-2014. The EUT was placed on a nonmetallic stand in a shielded room 0.8 meters above the ground plane. The interface cables and equipment positioning were varied within limits of reasonable applications to determine the position produced maximum conducted emissions.

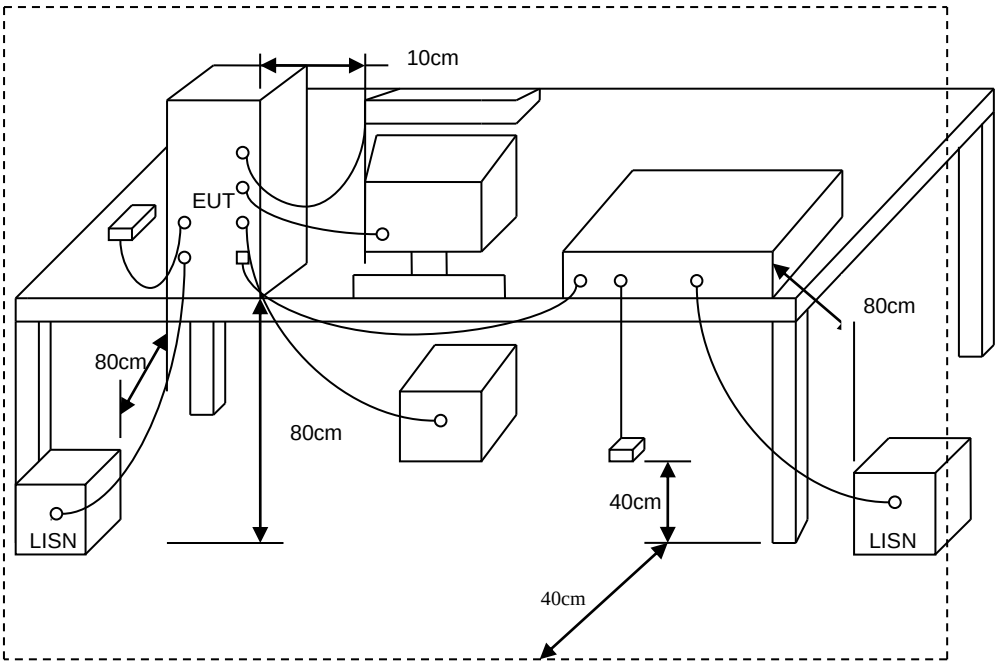
| Frequency (MHz) | Quasi Peak (dBμV) | Average (dBμV) |
|---|---|---|
| 0.15 – 0.5 | 66-56* | 56-46* |
| 0.5 – 5.0 | 56 | 46 |
| 5.0 – 30.0 | 60 | 50 |

*Decreases with the logarithm of the frequency.

## 5.2. Test Procedures

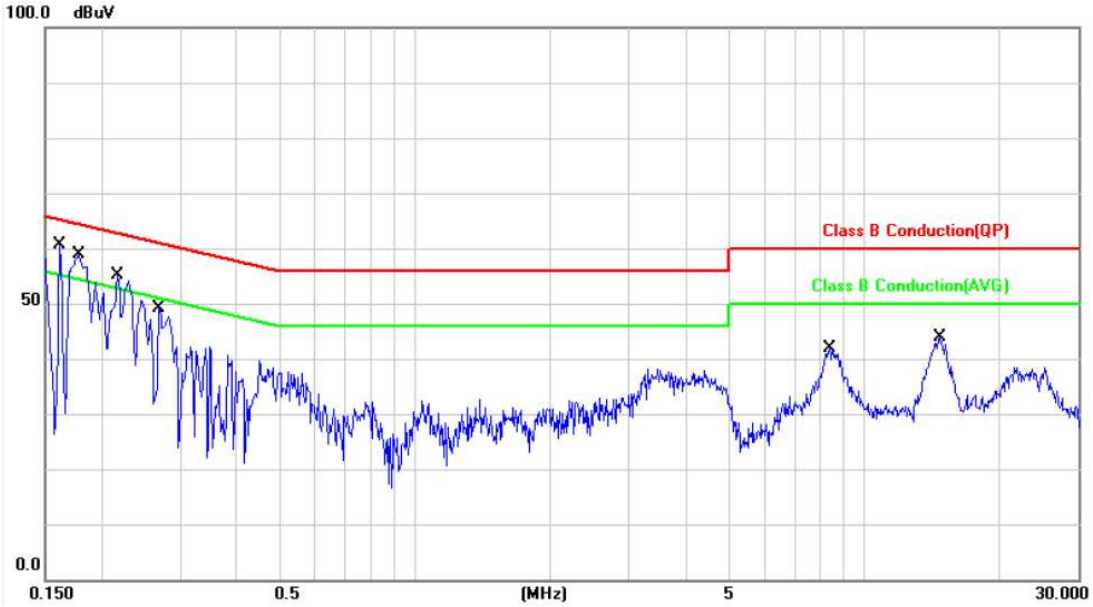
a. The EUT was placed 0.4 meter from the conducting wall of the shielding room was kept at least 80 centimeters from any other grounded conducting surface.
b. Connect EUT to the power mains through a line impedance stabilization network (LISN).
c. All the support units are connecting to the other LISN.
d. The LISN provides 50 ohm coupling impedance for the measuring instrument.
e. The FCC states that a 50 ohm, 50 micro-Henry LISN should be used.
f. Both sides of AC line were checked for maximum conducted interference.
g. The frequency range from 150 kHz to 30 MHz was searched.
h. Set the test-receiver system to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.

## 5.3. Typical Test Setup



## 5.4. Test Result and Data

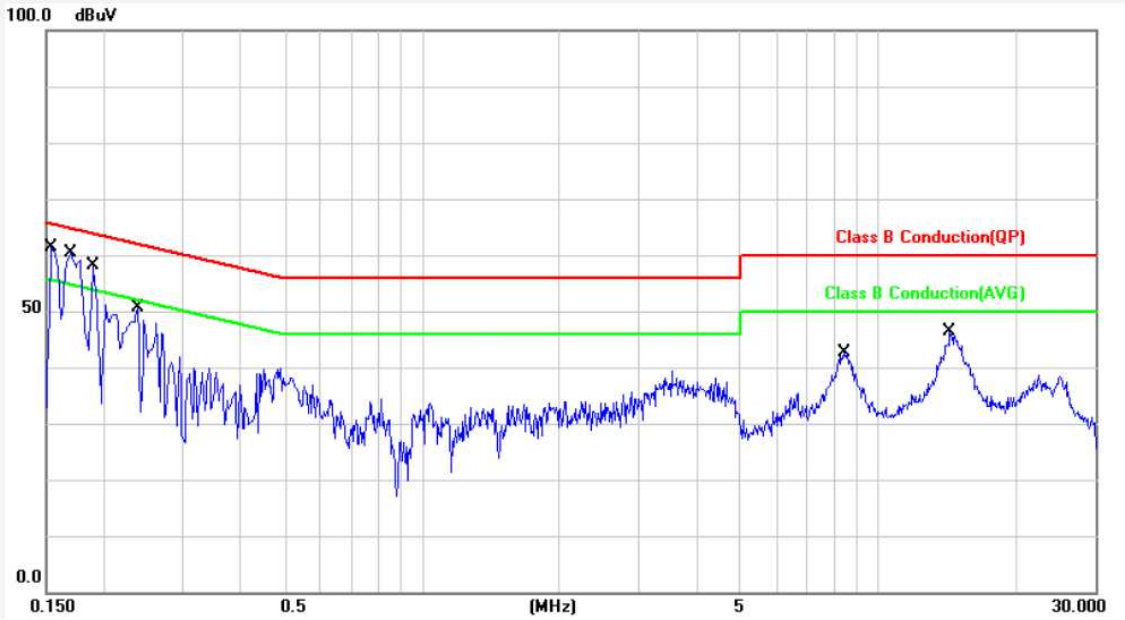
| | | | | | |
|---|---|---|---|---|---|
| Power | : | AC 120V | Pol/Phase | : | LINE |
| Test Mode | : | Mode 1, Band 4 | Temperature | : | 24 °C |
| Test date | : | Aug. 15, 2017 | Humidity | : | 50 % |




| No. | Frequency (MHz) | Factor (dB) | Reading (dBuV) | Level (dBuV) | Limit (dBuV) | Margin (dB) | Detector | P/F |
|---|---|---|---|---|---|---|---|---|
| 1 | 0.1620 | 9.91 | 44.26 | 54.17 | 65.36 | -11.19 | QP | P |
| 2 | 0.1620 | 9.91 | 18.90 | 28.81 | 55.36 | -26.55 | AVG | P |
| 3 | 0.1780 | 9.91 | 48.65 | 58.56 | 64.57 | -6.01 | QP | P |
| 4 | 0.1780 | 9.91 | 29.10 | 39.01 | 54.57 | -15.56 | AVG | P |
| 5 | 0.2180 | 9.91 | 42.29 | 52.20 | 62.89 | -10.69 | QP | P |
| 6 | 0.2180 | 9.91 | 22.15 | 32.06 | 52.89 | -20.83 | AVG | P |
| 7 | 0.2700 | 9.91 | 35.43 | 45.34 | 61.12 | -15.78 | QP | P |
| 8 | 0.2700 | 9.91 | 17.18 | 27.09 | 51.12 | -24.03 | AVG | P |
| 9 | 8.4100 | 10.29 | 27.65 | 37.94 | 60.00 | -22.06 | QP | P |
| 10 | 8.4100 | 10.29 | 22.36 | 32.65 | 50.00 | -17.35 | AVG | P |
| 11 | 14.8020 | 10.47 | 28.49 | 38.96 | 60.00 | -21.04 | QP | P |
| 12 | 14.8020 | 10.47 | 22.66 | 33.13 | 50.00 | -16.87 | AVG | P |

Note: Level = Reading + Factor
Margin = Level – Limit
Factor = (LISN, ISN, PLC or current probe) Factor + Cable Loss+ Attenuator

| | | | | | |
|---|---|---|---|---|---|
| Power | : | AC 120V | Pol/Phase | : | NEUTRAL |
| Test Mode | : | Mode 1, Band 4 | Temperature | : | 24 °C |
| Test date | : | Aug. 15, 2017 | Humidity | : | 50 % |




| No. | Frequency (MHz) | Factor (dB) | Reading (dBuV) | Level (dBuV) | Limit (dBuV) | Margin (dB) | Detector | P/F |
|---|---|---|---|---|---|---|---|---|
| 1 | 0.1539 | 9.88 | 44.85 | 54.73 | 65.78 | -11.05 | QP | P |
| 2 | 0.1539 | 9.88 | 20.02 | 29.90 | 55.78 | -25.88 | AVG | P |
| 3 | 0.1700 | 9.88 | 47.16 | 57.04 | 64.96 | -7.92 | QP | P |
| 4 | 0.1700 | 9.88 | 24.87 | 34.75 | 54.96 | -20.21 | AVG | P |
| 5 | 0.1900 | 9.88 | 46.58 | 56.46 | 64.03 | -7.57 | QP | P |
| 6 | 0.1900 | 9.88 | 26.96 | 36.84 | 54.03 | -17.19 | AVG | P |
| 7 | 0.2380 | 9.88 | 39.40 | 49.28 | 62.16 | -12.88 | QP | P |
| 8 | 0.2380 | 9.88 | 20.83 | 30.71 | 52.16 | -21.45 | AVG | P |
| 9 | 8.4260 | 10.26 | 28.08 | 38.34 | 60.00 | -21.66 | QP | P |
| 10 | 8.4260 | 10.26 | 22.89 | 33.15 | 50.00 | -16.85 | AVG | P |
| 11 | 14.4300 | 10.46 | 30.37 | 40.83 | 60.00 | -19.17 | QP | P |
| 12 | 14.4300 | 10.46 | 24.37 | 34.83 | 50.00 | -15.17 | AVG | P |

Note: Level = Reading + Factor
Margin = Level – Limit
Factor = (LISN, ISN, PLC or current probe) Factor + Cable Loss+ Attenuator

# 6. Test of Spurious Emission (Radiated)

## 6.1. Test Limit

Undesirable emission limits. Except as shown in paragraph (b)(7) of this section, the maximum emissions outside of the frequency bands of operation shall be attenuated in accordance with the following limits:

(1) For transmitters operating in the 5.15-5.25 GHz band: All emissions outside of the 5.15-5.35 GHz band shall not exceed an e.i.r.p. of −27 dBm/MHz.

(2) For transmitters operating in the 5.25-5.35 GHz band: All emissions outside of the 5.15-5.35 GHz band shall not exceed an e.i.r.p. of −27 dBm/MHz.

(3) For transmitters operating in the 5.47-5.725 GHz band: All emissions outside of the 5.47-5.725 GHz band shall not exceed an e.i.r.p. of −27 dBm/MHz.

(4) For transmitters operating in the 5.725-5.85 GHz band:
All emissions shall be limited to a level of -27 dBm/MHz at 75 MHz or more above or below the band edge increasing linearly to 10 dBm/MHz at 25 MHz above or below the band edge, and from 25MHz above or below the band edge increasing linearly to a level of 15.6 dBm/MHz at 5 MHz above or below the band edge, and from 5 MHz above or below the band edge increasing linearly to a level of 27dBm/MHz at the band edge.

(5) The emission measurements shall be performed using a minimum resolution bandwidth of 1 MHz. A lower resolution bandwidth may be employed near the band edge, when necessary, provided the measured energy is integrated to show the total power over 1 MHz.

(6) Unwanted emissions below 1 GHz must comply with the general field strength limits set forth in §15.209. Further, any U-NII devices using an AC power line are required to comply also with the conducted limits set forth in §15.207.

(7) The provisions of §15.205 apply to intentional radiators operating under this section.

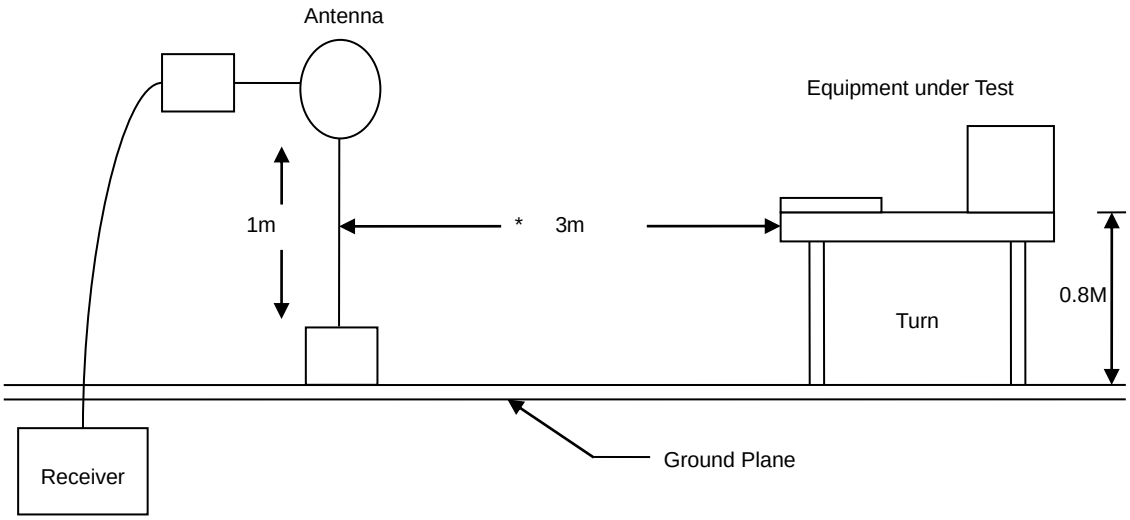
(8) When measuring the emission limits, the nominal carrier frequency shall be adjusted as close to the upper and lower frequency band edges as the design of the equipment permits.

## 6.2. Test Procedures

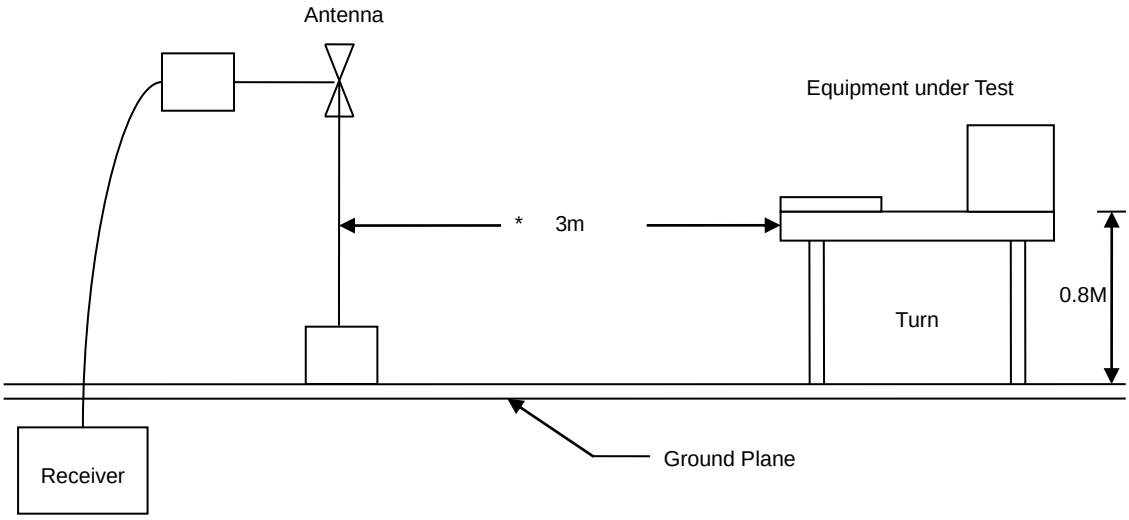
a. The EUT was placed on a rotatable table top 0.8 meter above ground.
b. The EUT was set 3 meters from the interference receiving antenna which was mounted on the top of a variable height antenna tower.
c. The table was rotated 360 degrees to determine the position of the highest radiation.
d. The antenna is a broadband antenna and its height is varied between one meter and four meters above ground to find the maximum value of the field strength both horizontal polarization and vertical polarization of the antenna are set to make the measurement.
e. For each suspected emission the EUT was arranged to its worst case and then tune the antenna tower (from 1 M to 4 M) and turn table (from 0 degree to 360 degrees) to find the maximum reading.
f. Set the test-receiver system to Peak or CISPR quasi-peak Detect Function and specified bandwidth with Maximum Hold Mode.
g. If the emission level of the EUT in peak mode was 3 dB lower than the limit specified, then testing will be stopped and peak values of EUT will be reported, otherwise, the emissions which do not have 3 dB margin will be repeated one by one using the quasi-peak method and reported.
h. For testing above 1GHz, the emission level of the EUT in peak mode was 20dB lower than average limit (that means the emission level in peak mode also complies with the limit in average mode), then testing will be stopped and peak values of EUT will be reported, otherwise, the emissions will be measured in average mode again and reported.
i. “Cone of radiation” has been considered to be 3dB bandwidth of the measurement antenna.

## 6.3. Typical Test Setup

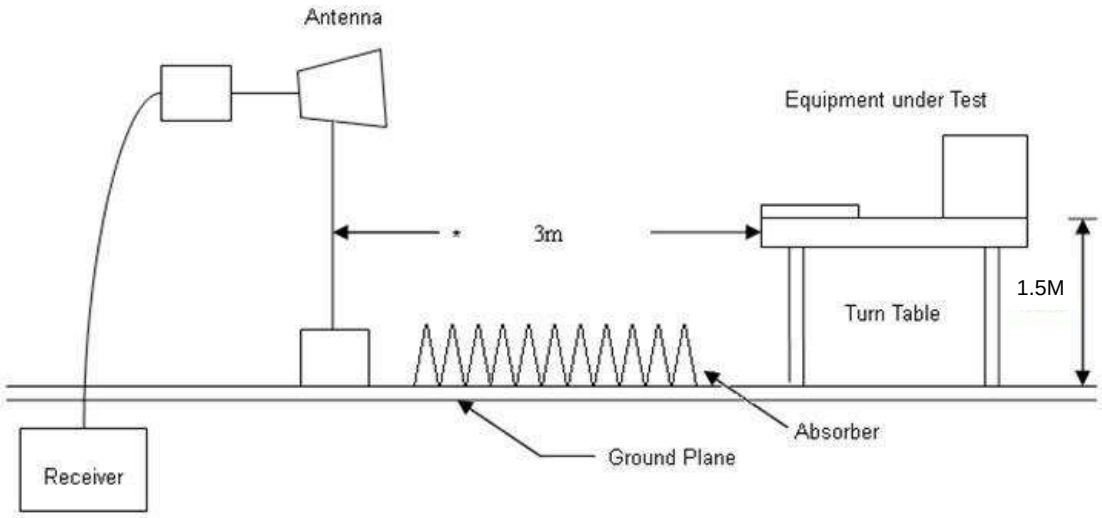
Below 30MHz test setup




30MHz- 1GHz Test Setup




Above 1GHz Test Setup

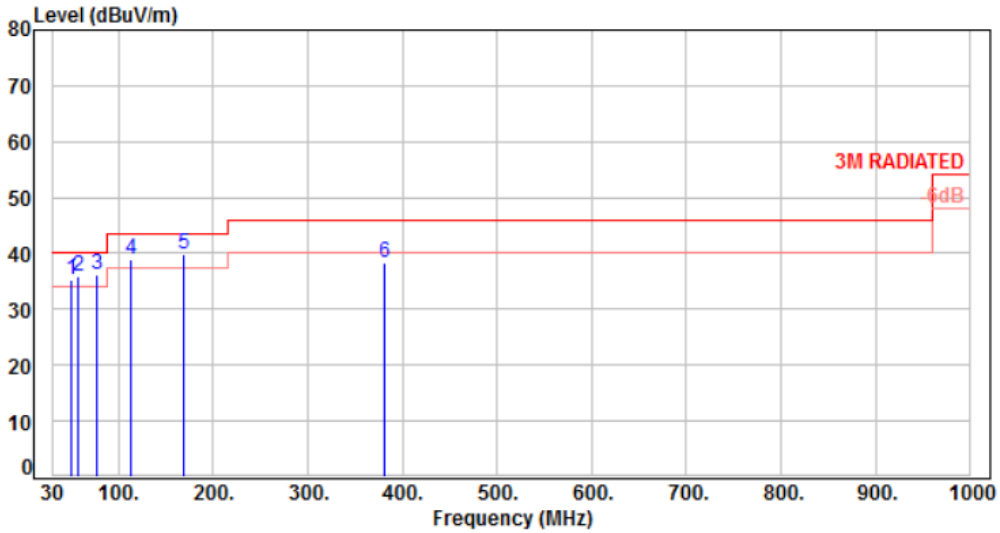


## 6.4. Test Result and Data (9kHz ~ 30MHz)

The 9kHz - 30MHz spurious emission is under limit 20dB more.

## 6.5. Test Result and Data (30MHz ~ 1GHz)

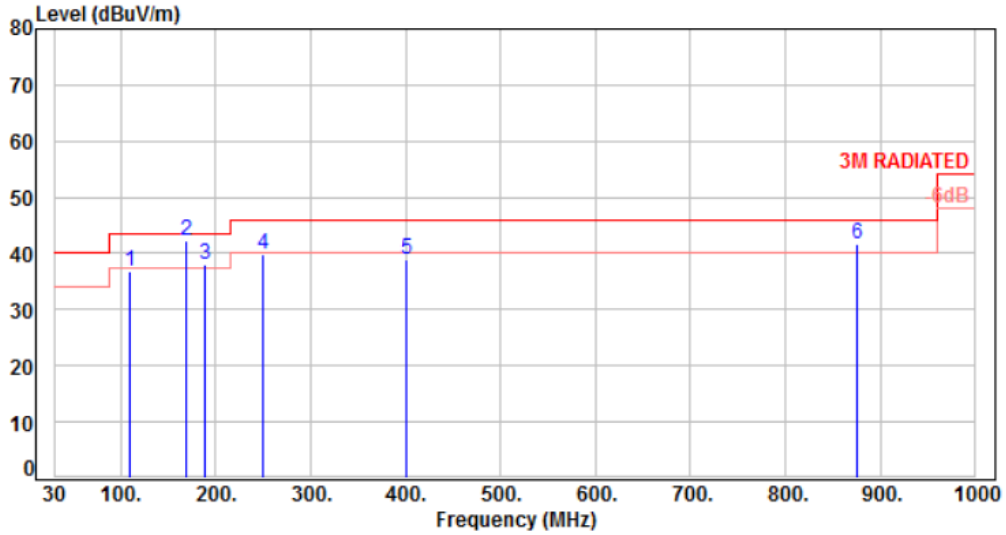
| | | | | | |
|---|---|---|---|---|---|
| Power | : | AC 120V | Pol/Phase | : | VERTICAL |
| Test Mode | : | Mode 1, Band 4 | Temperature | : | 23 °C |
| Test Date | : | Aug. 15, 2017 | Humidity | : | 60 % |




| No. | Frequency (MHz) | Factor (dB) | Reading (dBuV) | Level (dBuV) | Limit (dBuV) | Margin (dB) | Detector | Height (cm) | Azimuth (deg) | P/F |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 50.37 | -10.44 | 45.86 | 35.42 | 40.00 | -4.58 | QP | 100 | 159 | P |
| 2 | 57.16 | -11.12 | 47.01 | 35.89 | 40.00 | -4.11 | QP | 100 | 167 | P |
| 3 | 76.56 | -14.19 | 50.51 | 36.32 | 40.00 | -3.68 | QP | 100 | 166 | P |
| 4 | 113.42 | -13.48 | 52.34 | 38.86 | 43.50 | -4.64 | Peak | 100 | 152 | P |
| 5 | 169.68 | -11.00 | 50.81 | 39.81 | 43.50 | -3.69 | Peak | 100 | 0 | P |
| 6 | 381.14 | -7.55 | 45.81 | 38.26 | 46.00 | -7.74 | Peak | 100 | 0 | P |

Note: Level=Reading+Factor
Margin=Level-Limit
Factor=Antenna Factor + cable loss - Amplifier Factor

| | | | | | |
|---|---|---|---|---|---|
| Power | : | AC 120V | Pol/Phase | : | HORIZONTAL |
| Test Mode | : | Mode 1, Band 4 | Temperature | : | 23 °C |
| Test Date | : | Aug. 15, 2017 | Humidity | : | 60 % |

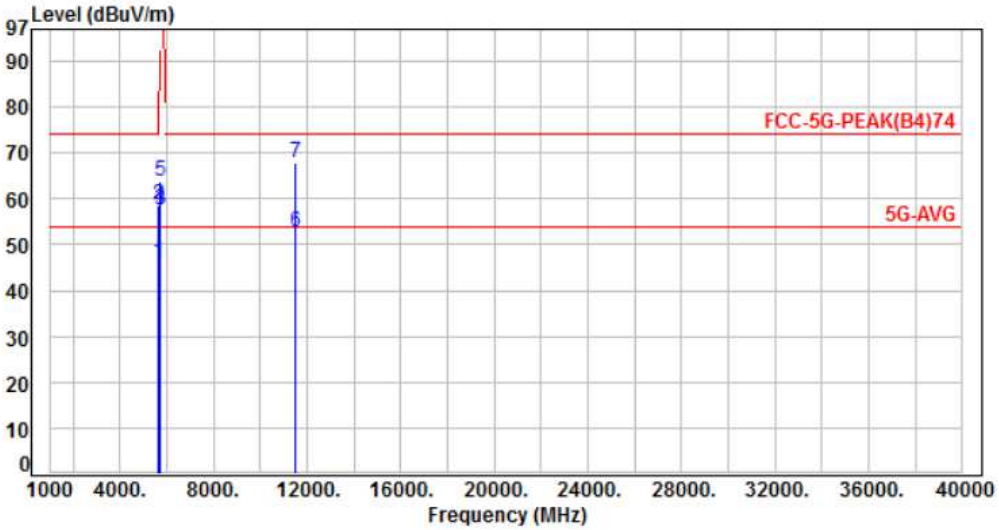



| No. | Frequency (MHz) | Factor (dB) | Reading (dBuV) | Level (dBuV) | Limit (dBuV) | Margin (dB) | Detector | Height (cm) | Azimuth (deg) | P/F |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 109.54 | -13.87 | 50.79 | 36.92 | 43.50 | -6.58 | QP | 100 | 178 | P |
| 2 | 169.68 | -11.00 | 53.24 | 42.24 | 43.50 | -1.26 | QP | 100 | 159 | P |
| 3 | 189.08 | -12.94 | 50.93 | 37.99 | 43.50 | -5.51 | Peak | 100 | 0 | P |
| 4 | 249.22 | -11.47 | 51.21 | 39.74 | 46.00 | -6.26 | Peak | 100 | 0 | P |
| 5 | 400.54 | -7.03 | 46.05 | 39.02 | 46.00 | -6.98 | Peak | 100 | 0 | P |
| 6 | 875.84 | 1.45 | 40.13 | 41.58 | 46.00 | -4.42 | QP | 100 | 166 | P |

Note: Level=Reading+Factor
Margin=Level-Limit
Factor=Antenna Factor + cable loss - Amplifier Factor

## 6.6. Test Result and Data (1GHz ~ 40GHz)

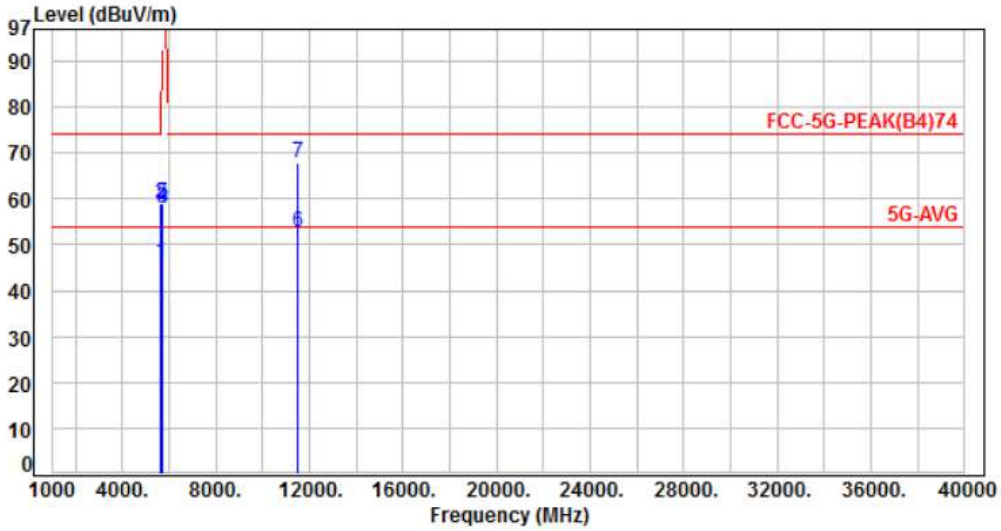
| | | | | | |
|---|---|---|---|---|---|
| Power | : | AC 120V | Pol/Phase | : | VERTICAL |
| Test Mode | : | Mode 1, CH149 | Temperature | : | 23 °C |
| Test Date | : | Aug. 11, 2017 | Humidity | : | 60 % |




| No. | Frequency (MHz) | Factor (dB) | Reading (dBuV) | Level (dBuV) | Limit (dBuV) | Margin (dB) | Detector | Height (cm) | Azimuth (deg) | P/F |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 5650.00 | -12.09 | 58.12 | 46.03 | 54.00 | -7.97 | Average | 124 | 147 | P |
| 2 | 5650.00 | -12.09 | 70.74 | 58.65 | 74.00 | -15.35 | Peak | 124 | 147 | P |
| 3 | 5700.00 | -12.11 | 69.75 | 57.64 | 105.20 | -47.56 | Peak | 124 | 147 | P |
| 4 | 5720.00 | -12.12 | 70.20 | 58.08 | 110.80 | -52.72 | Peak | 124 | 147 | P |
| 5 | 5725.00 | -12.12 | 75.87 | 63.75 | 122.20 | -58.45 | Peak | 124 | 147 | P |
| 6 | 11490.00 | -6.25 | 59.13 | 52.88 | 54.00 | -1.12 | Average | 139 | 180 | P |
| 7 | 11490.00 | -6.25 | 74.25 | 68.00 | 74.00 | -6.00 | Peak | 139 | 180 | P |

Note: Level=Reading+Factor
Margin=Level-Limit
Factor=Antenna Factor + cable loss - Amplifier Factor

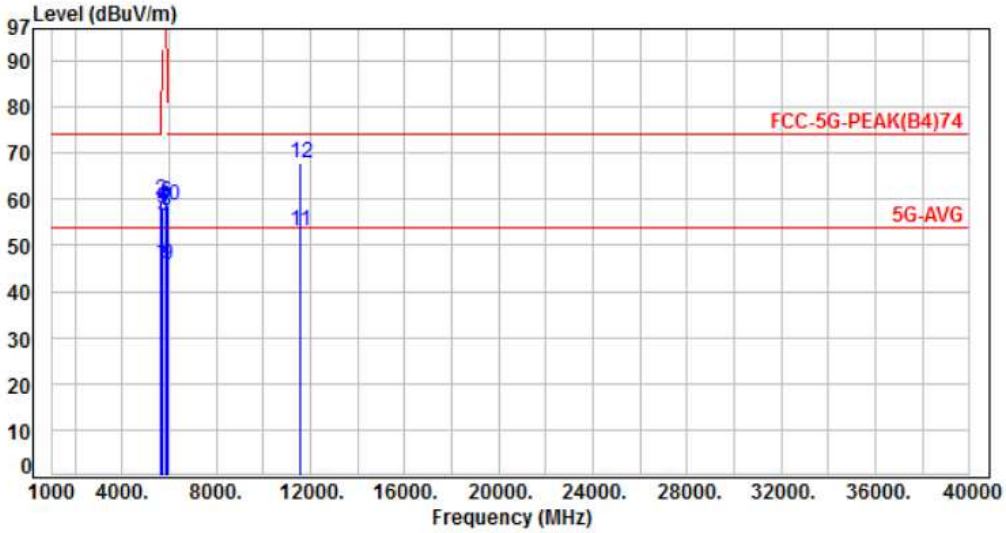
| | | | | | |
|---|---|---|---|---|---|
| Power | : | AC 120V | Pol/Phase | : | HORIZONTAL |
| Test Mode | : | Mode 1, CH149 | Temperature | : | 23 °C |
| Test Date | : | Aug. 11, 2017 | Humidity | : | 60 % |




| No. | Frequency (MHz) | Factor (dB) | Reading (dBuV) | Level (dBuV) | Limit (dBuV) | Margin (dB) | Detector | Height (cm) | Azimuth (deg) | P/F |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 5650.00 | -12.09 | 58.11 | 46.02 | 54.00 | -7.98 | Average | 142 | 185 | P |
| 2 | 5650.00 | -12.09 | 71.28 | 59.19 | 74.00 | -14.81 | Peak | 142 | 185 | P |
| 3 | 5700.00 | -12.11 | 70.14 | 58.03 | 105.20 | -47.17 | Peak | 142 | 185 | P |
| 4 | 5720.00 | -12.12 | 69.95 | 57.83 | 110.80 | -52.97 | Peak | 142 | 185 | P |
| 5 | 5725.00 | -12.12 | 70.96 | 58.84 | 122.20 | -63.36 | Peak | 142 | 185 | P |
| 6 | 11490.00 | -6.25 | 59.09 | 52.84 | 54.00 | -1.16 | Average | 100 | 197 | P |
| 7 | 11490.00 | -6.25 | 73.98 | 67.73 | 74.00 | -6.27 | Peak | 100 | 197 | P |

Note: Level=Reading+Factor
Margin=Level-Limit
Factor=Antenna Factor + cable loss - Amplifier Factor

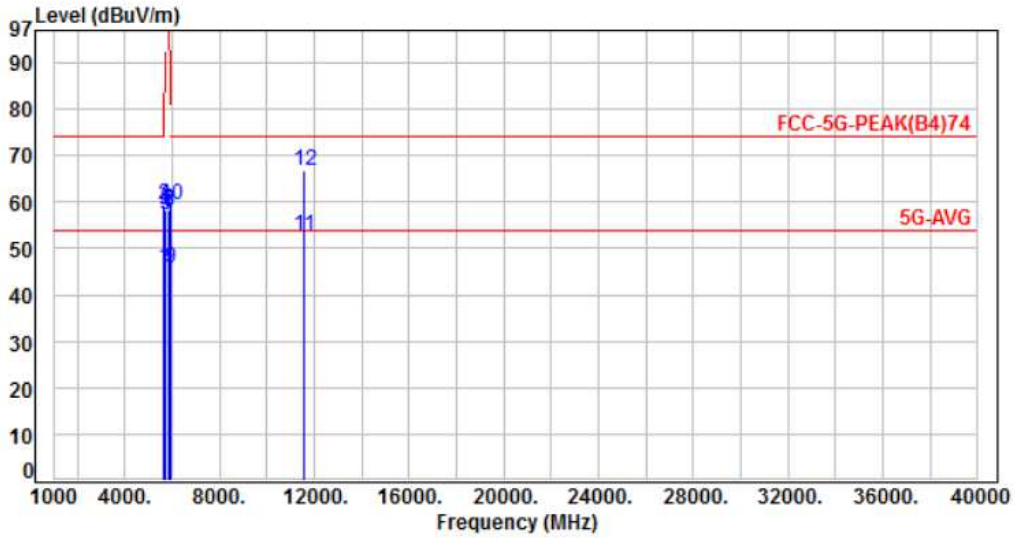
| | | | | | |
|---|---|---|---|---|---|
| Power | : | AC 120V | Pol/Phase | : | VERTICAL |
| Test Mode | : | Mode 1, CH157 | Temperature | : | 23 °C |
| Test Date | : | Aug. 11, 2017 | Humidity | : | 60 % |




| No. | Frequency (MHz) | Factor (dB) | Reading (dBuV) | Level (dBuV) | Limit (dBuV) | Margin (dB) | Detector | Height (cm) | Azimuth (deg) | P/F |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 5650.00 | -12.09 | 58.06 | 45.97 | 54.00 | -8.03 | Average | 129 | 151 | P |
| 2 | 5650.00 | -12.09 | 71.79 | 59.70 | 74.00 | -14.30 | Peak | 129 | 151 | P |
| 3 | 5700.00 | -12.11 | 68.63 | 56.52 | 105.20 | -48.68 | Peak | 129 | 151 | P |
| 4 | 5720.00 | -12.12 | 70.34 | 58.22 | 110.80 | -52.58 | Peak | 129 | 151 | P |
| 5 | 5725.00 | -12.12 | 69.88 | 57.76 | 122.20 | -64.44 | Peak | 129 | 151 | P |
| 6 | 5850.00 | -12.16 | 71.49 | 59.33 | 122.20 | -62.87 | Peak | 129 | 151 | P |
| 7 | 5855.00 | -12.16 | 70.02 | 57.86 | 110.80 | -52.94 | Peak | 129 | 151 | P |
| 8 | 5875.00 | -12.17 | 69.71 | 57.54 | 105.20 | -47.66 | Peak | 129 | 151 | P |
| 9 | 5925.00 | -12.18 | 58.10 | 45.92 | 54.00 | -8.08 | Average | 129 | 151 | P |
| 10 | 5925.00 | -12.18 | 70.93 | 58.75 | 74.00 | -15.25 | Peak | 129 | 151 | P |
| 11 | 11570.00 | -6.23 | 59.31 | 53.08 | 54.00 | -0.92 | Average | 120 | 185 | P |
| 12 | 11570.00 | -6.23 | 74.08 | 67.85 | 74.00 | -6.15 | Peak | 120 | 185 | P |

Note: Level=Reading+Factor
Margin=Level-Limit
Factor=Antenna Factor + cable loss - Amplifier Factor

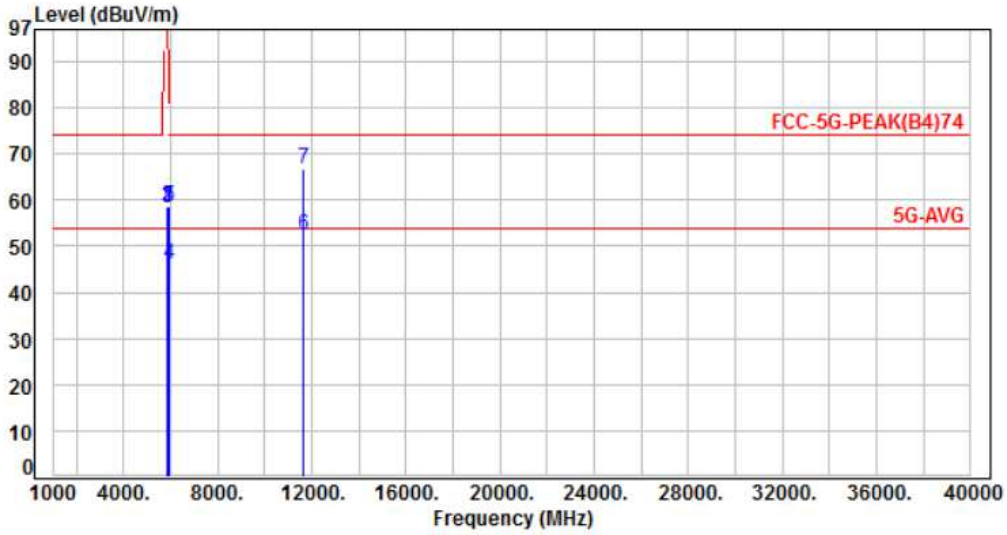
| | | | | | |
|---|---|---|---|---|---|
| Power | : | AC 120V | Pol/Phase | : | HORIZONTAL |
| Test Mode | : | Mode 1, CH157 | Temperature | : | 23 °C |
| Test Date | : | Aug. 11, 2017 | Humidity | : | 60 % |




| No. | Frequency (MHz) | Factor (dB) | Reading (dBuV) | Level (dBuV) | Limit (dBuV) | Margin (dB) | Detector | Height (cm) | Azimuth (deg) | P/F |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 5650.00 | -12.09 | 57.95 | 45.86 | 54.00 | -8.14 | Average | 142 | 179 | P |
| 2 | 5650.00 | -12.09 | 71.33 | 59.24 | 74.00 | -14.76 | Peak | 142 | 179 | P |
| 3 | 5700.00 | -12.11 | 69.14 | 57.03 | 105.20 | -48.17 | Peak | 142 | 179 | P |
| 4 | 5720.00 | -12.12 | 69.75 | 57.63 | 110.80 | -53.17 | Peak | 142 | 179 | P |
| 5 | 5725.00 | -12.12 | 70.32 | 58.20 | 122.20 | -64.00 | Peak | 142 | 179 | P |
| 6 | 5850.00 | -12.16 | 70.50 | 58.34 | 122.20 | -63.86 | Peak | 142 | 179 | P |
| 7 | 5855.00 | -12.16 | 69.96 | 57.80 | 110.80 | -53.00 | Peak | 142 | 179 | P |
| 8 | 5875.00 | -12.17 | 70.04 | 57.87 | 105.20 | -47.33 | Peak | 142 | 179 | P |
| 9 | 5925.00 | -12.18 | 57.93 | 45.75 | 54.00 | -8.25 | Average | 142 | 179 | P |
| 10 | 5925.00 | -12.18 | 71.68 | 59.50 | 74.00 | -14.50 | Peak | 142 | 179 | P |
| 11 | 11570.00 | -6.23 | 59.04 | 52.81 | 54.00 | -1.19 | Average | 131 | 143 | P |
| 12 | 11570.00 | -6.23 | 73.02 | 66.79 | 74.00 | -7.21 | Peak | 131 | 143 | P |

Note: Level=Reading+Factor
Margin=Level-Limit
Factor=Antenna Factor + cable loss - Amplifier Factor

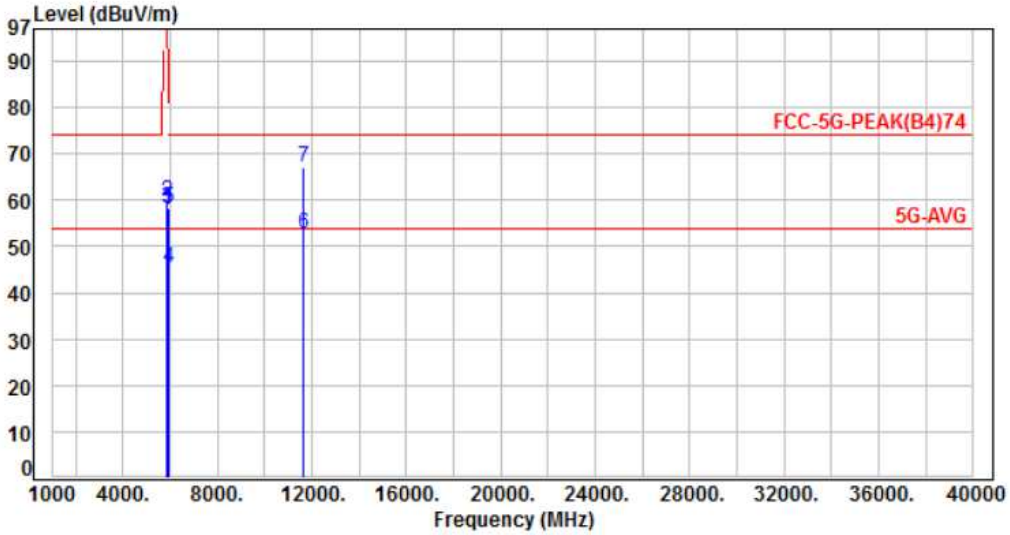
| | | | | | |
|---|---|---|---|---|---|
| Power | : | AC 120V | Pol/Phase | : | VERTICAL |
| Test Mode | : | Mode 1, CH165 | Temperature | : | 23 °C |
| Test Date | : | Aug. 11, 2017 | Humidity | : | 60 % |




| No. | Frequency (MHz) | Factor (dB) | Reading (dBuV) | Level (dBuV) | Limit (dBuV) | Margin (dB) | Detector | Height (cm) | Azimuth (deg) | P/F |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 5850.00 | -12.16 | 70.75 | 58.59 | 122.20 | -63.61 | Peak | 128 | 136 | P |
| 2 | 5855.00 | -12.16 | 70.81 | 58.65 | 110.80 | -52.15 | Peak | 128 | 136 | P |
| 3 | 5875.00 | -12.17 | 70.53 | 58.36 | 105.20 | -46.84 | Peak | 128 | 136 | P |
| 4 | 5925.00 | -12.18 | 58.12 | 45.94 | 54.00 | -8.06 | Average | 128 | 136 | P |
| 5 | 5925.00 | -12.18 | 70.72 | 58.54 | 74.00 | -15.46 | Peak | 128 | 136 | P |
| 6 | 11650.00 | -6.21 | 58.46 | 52.25 | 54.00 | -1.75 | Average | 139 | 195 | P |
| 7 | 11650.00 | -6.21 | 72.95 | 66.74 | 74.00 | -7.26 | Peak | 139 | 195 | P |

Note: Level=Reading+Factor
Margin=Level-Limit
Factor=Antenna Factor + cable loss - Amplifier Factor

| | | | | | |
|---|---|---|---|---|---|
| Power | : | AC 120V | Pol/Phase | : | HORIZONTAL |
| Test Mode | : | Mode 1, CH165 | Temperature | : | 23 °C |
| Test Date | : | Aug. 11, 2017 | Humidity | : | 60 % |




| No. | Frequency (MHz) | Factor (dB) | Reading (dBuV) | Level (dBuV) | Limit (dBuV) | Margin (dB) | Detector | Height (cm) | Azimuth (deg) | P/F |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 5850.00 | -12.16 | 70.14 | 57.98 | 122.20 | -64.22 | Peak | 147 | 177 | P |
| 2 | 5855.00 | -12.16 | 71.86 | 59.70 | 110.80 | -51.10 | Peak | 147 | 177 | P |
| 3 | 5875.00 | -12.17 | 70.55 | 58.38 | 105.20 | -46.82 | Peak | 147 | 177 | P |
| 4 | 5925.00 | -12.18 | 57.49 | 45.31 | 54.00 | -8.69 | Average | 147 | 177 | P |
| 5 | 5925.00 | -12.18 | 70.60 | 58.42 | 74.00 | -15.58 | Peak | 147 | 177 | P |
| 6 | 11650.00 | -6.21 | 58.91 | 52.70 | 54.00 | -1.30 | Average | 100 | 196 | P |
| 7 | 11650.00 | -6.21 | 73.40 | 67.19 | 74.00 | -6.81 | Peak | 100 | 196 | P |

Note: Level=Reading+Factor
Margin=Level-Limit
Factor=Antenna Factor + cable loss - Amplifier Factor

## 6.7. Restricted Bands of Operation

Only spurious emissions are permitted in any of the frequency bands listed below:

| MHz | MHz | MHz | GHz |
|---|---|---|---|
| 0.09000 – 0.11000 | 16.42000 – 16.42300 | 399.9 – 410.0 | 4.500 – 5.150 |
| 0.49500 – 0.505** | 16.69475 – 16.69525 | 608.0 – 614.0 | 5.350 – 5.460 |
| 2.17350 – 2.19050 | 16.80425 – 16.80475 | 960.0 – 1240.0 | 7.250 – 7.750 |
| 4.12500 – 4.12800 | 25.50000 – 25.67000 | 1300.0 – 1427.0 | 8.025 – 8.500 |
| 4.17725 – 4.17775 | 37.50000 – 38.25000 | 1435.0 – 1626.5 | 9.000 – 9.200 |
| 4.20725 – 4.20775 | 73.00000 – 74.60000 | 1645.5 – 1646.5 | 9.300 – 9.500 |
| 6.21500 – 6.21800 | 74.80000 – 75.20000 | 1660.0 – 1710.0 | 10.600 – 12.700 |
| 6.26775 – 6.26825 | 108.00000 – 121.94000 | 1718.8 – 1722.2 | 13.250 – 13.400 |
| 6.31175 – 6.31225 | 123.00000 – 138.00000 | 2200.0 – 2300.0 | 14.470 – 14.500 |
| 8.29100 – 8.29400 | 149.90000 – 150.05000 | 2310.0 – 2390.0 | 15.350 – 16.200 |
| 8.36200 – 8.36600 | 156.52475 – 156.52525 | 2483.5 – 2500.0 | 17.700 – 21.400 |
| 8.37625 – 8.38675 | 156.70000 – 156.90000 | 2655.0 – 2900.0 | 22.010 – 23.120 |
| 8.41425 – 8.41475 | 162.01250 – 167.17000 | 3260.0 – 3267.0 | 23.600 – 24.000 |
| 12.29000 – 12.29300 | 167.72000 – 173.20000 | 3332.0 – 3339.0 | 31.200 – 31.800 |
| 12.51975 – 12.52025 | 240.00000 – 285.00000 | 3345.8 – 3358.0 | 36.430 – 36.500 |
| 12.57675 – 12.57725 | 322.00000 – 335.40000 | 3600.0 – 4400.0 | Above 38.6 |
| 13.36000 – 13.41000 | | | |

**: Until February 1, 1999, this restricted band shall be 0.490-0.510 MHz

# 7. On Time, Duty Cycle and Measurement methods

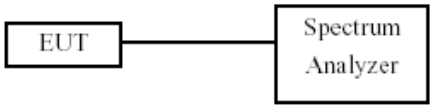
## 7.1. Test Limit

FCC §15.407
The minimum 6 dB bandwidth shall be at least 500 kHz.

## 7.2. Test Procedure

Reference to 789033 D02 General UNII Test Procedures New Rules v01: The transmitter output is connected to a spectrum analyzer with the RBW set to100KHz, the VBW >= 3 x RBW, peak detector and max hold.

## 7.3. Test Setup Layout




## 7.4. Test Result and Data

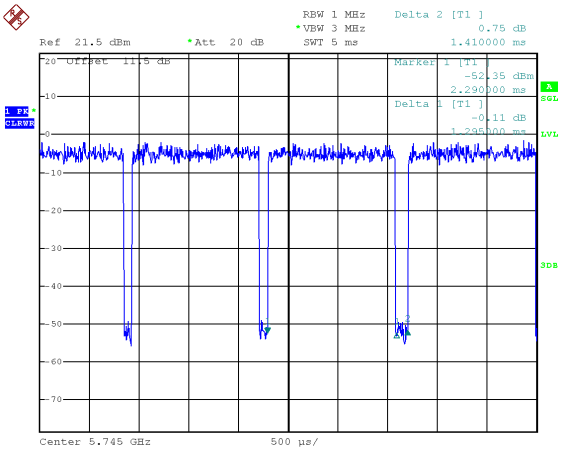
Temperature: 22°C Humidity: 64%
Test Date: Aug. 18, 2017

| Modulation Type | On Time (msec) | Period Time (msec) | Duty Cycle (%) | 1/T Minimum VBW(Hz) | Duty Cycle correction Factor (dB) |
|---|---|---|---|---|---|
| 802.11n HT20 | 1.30 | 1.41 | 91.84% | 772.20 | 0.37 |

## 7.5. Measurement Methods

| | |
|---|---|
| 26 dB and 6dB Emission BW | KDB 789033 D02 v01, Section C |
| 99% Occupied BW | KDB 789033 D02 v01, Section D |
| Conducted Output Power | KDB 789033 D02 v01, Section E.2.d and E.3.b (Method PM-G) |
| Power Spectral Density | KDB 789033 D02 v01, Section F |
| Unwanted emissions in restricted bands | KDB 789033 D02 v01, Sections G and H |
| Unwanted emissions in non-restricted bands | KDB 789033 D02 v01, Sections G and H |

Modulation Standard: 802.11n HT20



# 8. 6dB Bandwidth

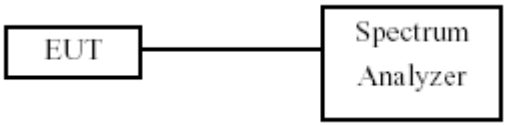
## 8.1. Test Limit

FCC §15.407
The minimum 6 dB bandwidth shall be at least 500 kHz.

## 8.2. Test Procedure

Reference to 789033 D02 General UNII Test Procedures New Rules v01: The transmitter output is connected to a spectrum analyzer with the RBW set to100KHz, the VBW >= 3 x RBW, peak detector and max hold.

## 8.3. Test Setup Layout

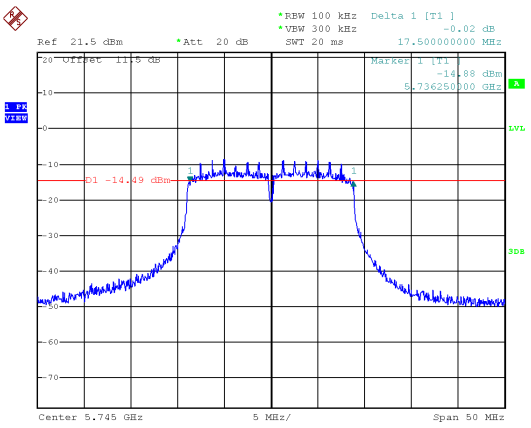



## 8.4. Test Result and Data

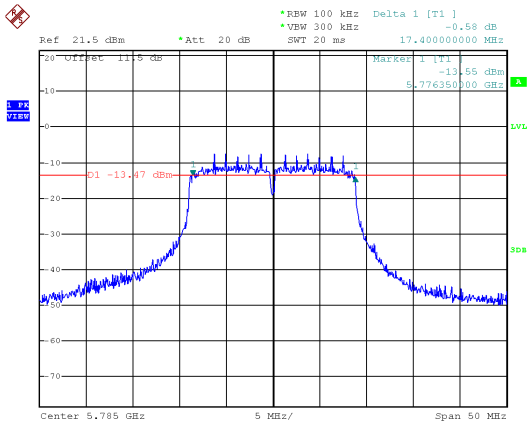
Temperature: 22°C Humidity: 64%
Test Date: Aug. 18, 2017

| Modulation Type | Channel | Frequency (MHz) | 6dB Bandwidth (MHz) | Minimum Limit (MHz) |
|---|---|---|---|---|
| 802.11n HT20 | 149 | 5745 | 17.50 | 0.50 |
| | 157 | 5785 | 17.40 | 0.50 |
| | 165 | 5825 | 17.30 | 0.50 |

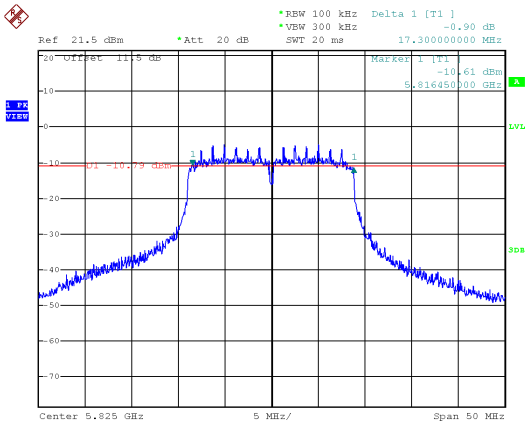
6dB Bandwidth
Modulation Standard: 802.11n HT20
CH149




CH157




CH165



# 9. Average Power

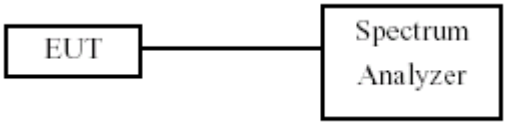
## 9.1. Test Limit

None; for reporting purposes only.

## 9.2. Test Procedure

The transmitter output is connected to a power meter.
The cable assembly insertion loss of 11 dB (including 10 dB pad and 1 dB cable) was entered as an offset in the power meter to allow for direct reading of power.

## 9.3. Test Setup Layout




## 9.4. Test Result and Data

Temperature: 22°C Humidity: 64%
Test Date: Aug. 18, 2017

| Modulation Type | CH | Freq. (MHz) | Avg Power Output (dBm) | Total Power (dBm) | Total Power (mW) | Power Limit (dBm) |
|---|---|---|---|---|---|---|
| 802.11n HT20 | 149 | 5745 | 3.99 | 3.99 | 2.51 | 30.00 |
| | 157 | 5785 | 4.5 | 4.50 | 2.82 | 30.00 |
| | 165 | 5825 | 6.16 | 6.16 | 4.13 | 30.00 |

# 10. PPSD

## 10.1. Test Limit

**Output Power:**

| Frequency Band | | | Limit |
|---|---|---|---|
| ☐ | 5.15~5.25GHz | | |
| | Operating Mode | | |
| | ☐ | Outdoor access point | The maximum conducted output power over the frequency band of operation shall not exceed 1 W (30dBm) provided the maximum antenna gain does not exceed 6 dBi. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi. The maximum e.i.r.p. at any elevation angle above 30degrees as measured from the horizon must not exceed125 mW (21 dBm). |
| | ☐ | Indoor access point | The maximum conducted output power over the frequency band of operation shall not exceed 1 W (30dBm) provided the maximum antenna gain does not exceed 6 dBi. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi. |
| | ☐ | Fixed point-to-point access points | The maximum conducted output power over the frequency band of operation shall not exceed 1 W (30dBm). Fixed point-to-point U-NII devices may employ antennas with directional gain up to 23 dBi without any corresponding reduction in the maximum conducted output power or maximum power spectral density. For fixed point-to-point transmitters that employ a directional antenna gain greater than 23 dBi, a 1 dB reduction in maximum conducted output power and maximum power spectral density is required for each 1 dB of antenna gain in excess of 23 dBi. |
| | ☐ | Mobile and portable client devices | The maximum conducted output power over the frequency band of operation shall not exceed 250 mW (24dBm) provided the maximum antenna gain does not exceed 6 dBi. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi. |

| Frequency Band | | Limit |
|---|---|---|
| ☐ | 5.25-5.35 GHz | The maximum conducted output power over the frequency bands of operation shall not exceed the lesser of 250 mW (24dBm) or 11 dBm 10 log B, where B is the 26 dB emission bandwidth in megahertz. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi. |
| ☐ | 5.470-5.725 GHz | |
| ☒ | 5.725~5.85 GHz | The maximum conducted output power over the frequency band of operation shall not exceed 1 W (30dBm). If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi. However, fixed point-to-point U-NII devices operating in this band may employ transmitting antennas with directional gain greater than 6 dBi without any corresponding reduction in transmitter conducted power. |

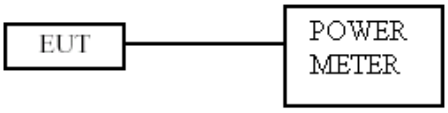
**PSD:**

| Frequency Band | | | Limit |
|---|---|---|---|
| ☐ | 5.15~5.25GHz | | |
| | Operating Mode | | |
| | ☐ | Outdoor access point | 17 dBm/MHz |
| | ☐ | Indoor access point | 17 dBm/MHz |
| | ☐ | Fixed point-to-point access points | 17 dBm/MHz |
| | ☐ | Mobile and portable client devices | 11 dBm/MHz |
| ☐ | 5.725~5.85 GHz | | 11 dBm/MHz |
| ☐ | 5.470-5.725 GHz | | 11 dBm/MHz |
| ☒ | 5.725~5.85 GHz | | 30 dBm/500kHz |

## 10.2. Test Procedure

As an alternative to FCC KDB-789033, the EUT maximum conducted output power was Measured with an average power meter employing a video bandwidth greater than 6dB BW of the emission under test. Maximum conducted output power was read directly from the meter across all data rates, and across three channels within each sub-band. Special care was used to make sure that the EUT was transmitting in continuous mode. This method exceeds the limitations of FCC KDB-789033, and provides more accurate measurements.
802.11an (BW≦40MHz) Maximum conducted output power using KDB 789033 section E)3)b) Method PM-G (Measurement using a gated RF average power meter)
Note: the power meter have a video bandwidth that is greater than or equal to the measurement bandwidth, (Anritsu/ MA2411B video bandwidth: 65MHz)
802.11ac (BW=80MHz) Maximum conducted output power using KDB 789033 section E)2)b) Method SA-1 (trace averaging with the EUT transmitting at full power throughout each sweep).
When transmitted signals consist of two or more non-contiguous spectrum segments (e.g., 80+80 MHz mode) or when a single spectrum segment of a transmission crosses the boundary between two adjacent U-NII bands, KDB 644545 D01 section F) procedure is used for measurements.

## 10.3. Test Setup Layout



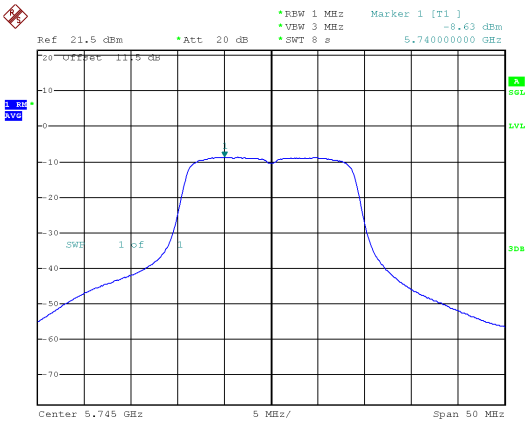

## 10.4. Test Result and Data

Temperature: 22°C Humidity: 64%

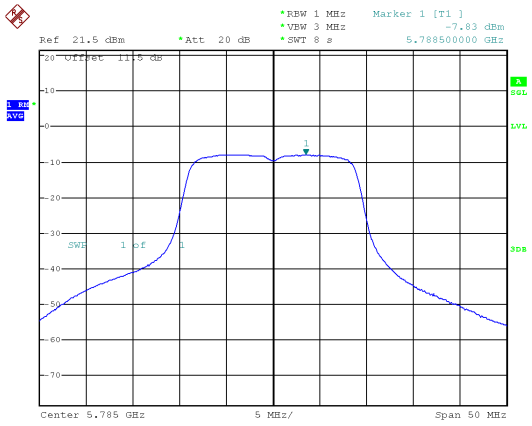
Test Date: Aug. 18, 2017

| Modulation Type | CH | Freq. (MHz) | Meas PPSD (dBm/MHz) | Sum chain (dBm) | Duty Cycle CF(dB) | 10log(500KHz/ RBW) CF (dB) | Total Corr'd PPSD (dBm/MHz) | PPSD Limit (dBm/MHz) |
|---|---|---|---|---|---|---|---|---|
| 802.11n HT20 | 149 | 5745 | -8.63 | -8.63 | 0.37 | -3.01 | -11.27 | 30.00 |
| | 157 | 5785 | -7.83 | -7.83 | 0.37 | -3.01 | -10.47 | 30.00 |
| | 165 | 5825 | -6.04 | -6.04 | 0.37 | -3.01 | -8.68 | 30.00 |

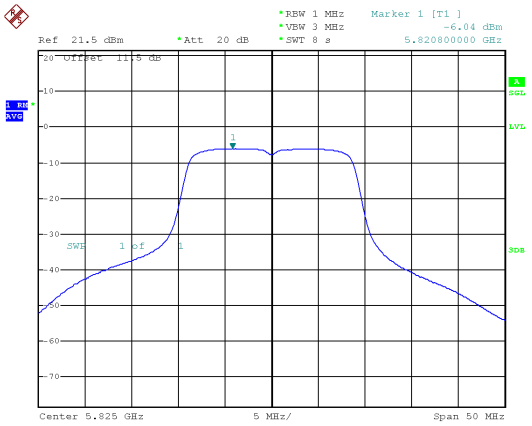
Modulation Standard: 802.11n HT20
CH149




CH157




CH165

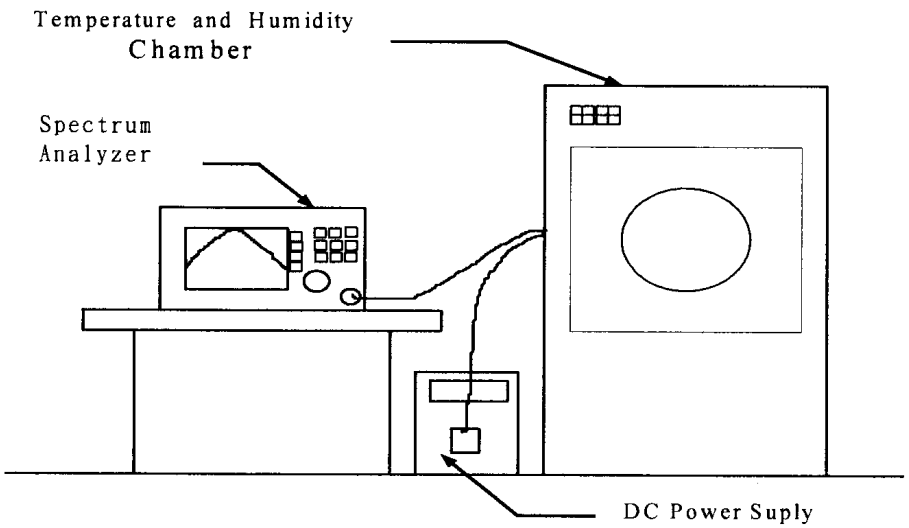


# 11. Frequency Stability

## 11.1.Test Procedure

1. The EUT was placed inside the Temperature and Humidity chamber.
2. The transmitter output was connected to spectrum analyzer.
3. Turn the EUT on and couple its output to a spectrum analyzer.
4. Turn the EUT off and set the chamber to the highest temperature specified.
5. 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.
6. Repeat step 2 and 3 with the temperature chamber set to the lowest temperature.
7. 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.

## 11.2.Test Setup Layout



## 11.3.Test Result and Data

Temperature: 22°C Humidity: 64%

Test Date: Aug. 18, 2017

| Operating frequency: 5825 MHz | | | | | | | |
|---|---|---|---|---|---|---|---|
| Temp | Power supply | 2 minute | | 5 minute | | 10 minute | |
| (℃) | (V) | (MHz) | (%) | (MHz) | (%) | (MHz) | (%) |
| 55 | 102 | 5825.0046 | 0.000080 | 5825.0046 | 0.000079 | 5825.0041 | 0.000705 |
| | 120 | 5825.0066 | 0.000113 | 5825.0067 | 0.000115 | 5825.0064 | 0.001104 |
| | 138 | 5825.0044 | 0.000075 | 5825.0037 | 0.000064 | 5825.0043 | 0.000736 |
| 40 | 102 | 5825.0043 | 0.000074 | 5825.0043 | 0.000074 | 5825.0040 | 0.000695 |
| | 120 | 5825.0042 | 0.000073 | 5825.0037 | 0.000064 | 5825.0041 | 0.000706 |
| | 138 | 5825.0063 | 0.000107 | 5825.0066 | 0.000114 | 5825.0065 | 0.001123 |
| 30 | 102 | 5825.0069 | 0.000118 | 5825.0066 | 0.000113 | 5825.0069 | 0.001181 |
| | 120 | 5825.0055 | 0.000094 | 5825.0051 | 0.000088 | 5825.0051 | 0.000867 |
| | 138 | 5825.0075 | 0.000129 | 5825.0080 | 0.000138 | 5825.0074 | 0.001264 |
| 20 | 102 | 5825.0067 | 0.000116 | 5825.0066 | 0.000113 | 5825.0071 | 0.001222 |
| | 120 | 5825.0078 | 0.000134 | 5825.0079 | 0.000135 | 5825.0079 | 0.001358 |
| | 138 | 5825.0044 | 0.000076 | 5825.0047 | 0.000081 | 5825.0044 | 0.000748 |
| 10 | 102 | 5825.0064 | 0.000111 | 5825.0066 | 0.000113 | 5825.0065 | 0.001121 |
| | 120 | 5825.0039 | 0.000067 | 5825.0043 | 0.000074 | 5825.0041 | 0.000709 |
| | 138 | 5825.0039 | 0.000067 | 5825.0041 | 0.000070 | 5825.0043 | 0.000738 |
| 0 | 102 | 5825.0041 | 0.000070 | 5825.0041 | 0.000070 | 5825.0043 | 0.000742 |
| | 120 | 5825.0065 | 0.000112 | 5825.0066 | 0.000113 | 5825.0065 | 0.001109 |
| | 138 | 5825.0068 | 0.000116 | 5825.0069 | 0.000119 | 5825.0069 | 0.001189 |
| -10 | 102 | 5825.0049 | 0.000083 | 5825.0051 | 0.000087 | 5825.0051 | 0.000881 |
| | 120 | 5825.0075 | 0.000128 | 5825.0075 | 0.000129 | 5825.0080 | 0.001382 |
| | 138 | 5825.0070 | 0.000120 | 5825.0066 | 0.000113 | 5825.0067 | 0.001145 |
| -20 | 102 | 5825.0082 | 0.000141 | 5825.0039 | 0.000066 | 5825.0079 | 0.001352 |
| | 120 | 5825.0075 | 0.000129 | 5825.0044 | 0.000076 | 5825.0044 | 0.000754 |
| | 138 | 5825.0068 | 0.000117 | 5825.0042 | 0.000073 | 5825.0045 | 0.000768 |
| -30 | 102 | 5825.0078 | 0.000134 | 5825.0063 | 0.000109 | 5825.0064 | 0.001105 |
| | 120 | 5825.0046 | 0.000078 | 5825.0068 | 0.000117 | 5825.0068 | 0.001162 |
| | 138 | 5825.0061 | 0.000104 | 5825.0068 | 0.000116 | 5825.0050 | 0.000865 |

Limit:

Manufacturers of U-NII devices are responsible for ensuring frequency stability such that an emission is maintained within the band of operation under all conditions of normal operation as specified in the users manual.

# 12. Automatically Discontinue Transmission

## 12.1. Limit of Automatically Discontinue Transmission

The device shall automatically discontinue transmission in case of either absence of information to transmit or operational failure. These provisions are not intended to preclude the transmission of control or signaling information or the use of repetitive codes used by certain digital technologies to complete frame or burst intervals. Applicants shall include in their application for equipment authorization to describe how this requirement is met.

## 12.2. Test Result of Automatically Discontinue Transmission

While the EUT is not transmitting any information, the EUT can automatically discontinue transmission and become standby mode for power saving. The EUT can detect the controlling signal of ACK message transmitting from remote device and verify whether it shall resend or discontinue transmission.

# 13. Radio Frequency Exposure

## 13.1. Applicable Standards

The measurements shown in this test report were made in accordance with the procedures given in

FCC Part 2 (Section 2.1091)

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## 13.2. EUT Specification

| | |
|---|---|
| **Frequency band (Operating)** | ☐ WLAN: 2412MHz ~ 2462MHz<br>☐ WLAN: 5150MHz ~ 5250MHz<br>☐ WLAN: 5250MHz ~ 5350MHz<br>☐ WLAN: 5470MHz ~ 5725MHz<br>☒ WLAN: 5725MHz ~ 5850MHz<br>☐ Bluetooth: 2402MHz ~ 2480MHz |
| **Device category** | ☐ Portable (<20cm separation)<br>☒ Mobile (>20cm separation) |
| **Exposure classification** | ☐ Occupational/Controlled exposure (S = 5mW/cm$^2$)<br>☒ General Population/Uncontrolled exposure (S=1mW/cm$^2$) |
| **Antenna diversity** | ☒ Single antenna<br>☐ Multiple antennas<br>☐ Tx diversity<br>☐ Rx diversity<br>☐ Tx/Rx diversity |
| **Evaluation applied** | ☒ MPE Evaluation*<br>☐ SAR Evaluation<br>☐ N/A |
| **Remark:**<br>1. The maximum output power is 6.16dBm (4.13mW) at 5825MHz (with numeric 2 antenna gain.)<br>2. DTS device is not subject to routine RF evaluation; MPE estimate is used to justify the compliance.<br>3. For mobile or fixed location transmitters, no SAR consideration applied. The maximum power density is 1.0 mW/cm$^2$ even if the calculation indicates that the power density would be larger. | |

## 13.3. Test Results

No non-compliance noted.

## 13.4. Calculation

Given $E = \frac{\sqrt{30 \times P \times G}}{d}$ & $S = \frac{E^2}{3770}$

Where E = Field strength in Volts / meter

P = Power in Watts
G = Numeric antenna gain

d = Distance in meters

S = Power density in milliwatts / square centimeter

Combining equations and re-arranging the terms to express the distance as a function of the remaining variables yields:

$$S = \frac{30 \times P \times G}{3770 d^2}$$

Changing to units of mW and cm, using:

P (mW) = P (W) / 1000 and
d (cm) = d(m) / 100

Yields

$$S = \frac{30 \times (P/1000) \times G}{3770 \times (d/100)^2} = 0.0796 \times \frac{P \times G}{d^2}$$ **Equation 1**

Where d = Distance in cm
P = Power in mW
G = Numeric antenna gain
S = Power density in mW / $cm^2$

## 13.5. Maximum Permissible Exposure

| Modulation Type | Frequency band (MHz) | Max. Conducted output power(dBm) | Antenna Gain(dBi) | Distance (cm) | Power Density ($mW/cm^2$) | Limit ($mW/cm^2$) |
|---|---|---|---|---|---|---|
| 11n HT20 | 5725-5850 | 6.16 | 2 | 41 | 0.0003 | 1 |