# FCC 47 CFR PART 15 SUBPART E

| | | |
|---|---|---|
| Product Type | : | Wireless Mobile HotSpot |
| Applicant | : | Netgear Incorporated |
| Address | : | 350 East Plumeria Drive, San Jose, CA 95134 |
| Trade Name | : | Netgear |
| Model Number | : | AirCard 781S |
| Test Specification | : | FCC 47 CFR PART 15 SUBPART E: Oct., 2012<br>ANSI C63.10-2009<br>ANSI C63.4-2009 |
| Application Purpose | : | Original |
| Receive Date | : | Aug. 09, 2013 |
| Test Period | : | Aug. 31 ~ Sep. 03, 2013 |
| Issue Date | : | Oct. 01, 2013 |

**Issue by**

A Test Lab Techno Corp.
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Taiwan Accreditation Foundation accreditation number: 1330

## Revision History

| Rev. | Issue Date | Revisions | Revised By |
|---|---|---|---|
| 00 | Sep. 16, 2013 | Initial Issue | |
| 01 | Oct. 01, 2013 | Revised report information. | Joyce Liao |
| | | | |
| | | | |

# Verification of Compliance

Issued Date: 10/01/2013

| | | |
|---|---|---|
| Product Type | : | Wireless Mobile HotSpot |
| Applicant | : | Netgear Incorporated |
| Address | : | 350 East Plumeria Drive, San Jose, CA 95134 |
| Trade Name | : | Netgear |
| Model Number | : | AirCard 781S |
| FCC ID | : | PY3AC781S |
| Applicable Standard | : | FCC 47 CFR PART 15 SUBPART E: Oct., 2012<br>ANSI C63.10-2009<br>ANSI C63.4-2009 |
| Test Result | : | Complied |
| Application Purpose | : | Original |
| Performing Lab. | : | A Test Lab Techno Corp.<br>No. 140-1, Changan Street, Bade City,<br>Taoyuan County 334, Taiwan R.O.C.<br>Tel：+86-3-2710188 / Fax：+86-3-2710190<br>Taiwan Accreditation Foundation accreditation number: 1330<br>http://www.atl-lab.com.tw/e-index.htm |

A Test Lab Techno Corp. tested the above equipment in accordance with the requirements set forth in the above standards. All indications of Pass/Fail in this report are opinions expressed by A Test Lab Techno Corp. based on interpretations and/or observations of test results. Measurement Uncertainties were not taken into account and are published for informational purposes only. The test results show that the equipment tested is capable of demonstrating compliance with the requirements as documented in this report.

| | | | | | |
|---|---|---|---|---|---|
| Approved By | : | Cran Yang | Reviewed By | : | Fly Lu |
| (Manager) | | (Cran Yang) | (Testing Engineer) | | (Fly Lu) |

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# 1 General Information

## 1.1. Summary of Test Result

| Standard<br>FCC | Item | Result | Remark |
|---|---|---|---|
| 15.407(b)(6)<br>15.207 | AC Power Conducted Emission | PASS | --- |
| 15.407(b)<br>15.205 / 15.209 | Radiated Emission | PASS | --- |
| 15.407(a) | Maximum Conducted Output Power | PASS | --- |
| 15.407(a) | 26dB RF Bandwidth | Reference | --- |
| 15.215(c) | -20dB Bandwidth | PASS | --- |
| 15.407(a)(6) | Peak Excursion Ratio | PASS | --- |
| 15.407(a) | Peak Power Spectral Density | PASS | --- |
| 15.407(g) | Frequency Stability | PASS | --- |
| 15.407(a)<br>15.203 | Antenna Requirement | PASS | --- |

The test results of this report relate only to the tested sample(s) identified in this report. Manufacturer or whom it may concern should recognize the pass or fail of the test result.

## 1.2. Measurement Uncertainty

| Measurement Item | Frequency Range | | Uncertainty (dB) |
|---|---|---|---|
| Conducted Emission | 9kHz ~ 30MHz | | ± 2.020 |
| Radiated Emission | 30MHz ~ 1000MHz | Horizontal | ± 3.960 |
| | | Vertical | ± 3.570 |
| | 1000MHz ~ 18000MHz | Horizontal | ± 3.072 |
| | | Vertical | ± 3.028 |
| | 18000MHz ~ 40000MHz | Horizontal | ± 3.622 |
| | | Vertical | ± 3.506 |

# 2 EUT Description

| | | | | |
|---|---|---|---|---|
| Product Type | Wireless Mobile HotSpot | | | |
| Trade Name | Netgear | | | |
| Model No. | AirCard 781S | | | |
| Applicant | Netgear Incorporated<br>350 East Plumeria Drive, San Jose, CA 95134 | | | |
| Manufacturer | Netgear Incorporated<br>350 East Plumeria Drive, San Jose, CA 95134 | | | |
| FCC ID | PY3AC781S | | | |
| Frequency Range | Band | Mode | Frequency Range (MHz) | Number of Channels |
| | U-NII Band I | IEEE 802.11a | 5180 – 5220 | 4 Channels |
| | | IEEE 802.11n 20 MHz | 5180 – 5220 | 4 Channels |
| | | IEEE 802.11n 40 MHz | 5190 – 5210 | 2 Channels |
| Modulation Type | OFDM | | | |
| Antenna Type | Chip dielectric antennas | | | |
| Antenna Gain | 0 dBi | | | |
| RF Output Power | IEEE 802.11a U-NII Band I : 0.058 W / 17.65 dBm<br>IEEE 802.11n 20MHz U-NII Band I: 0.052 W / 17.19 dBm<br>IEEE 802.11n 40MHz U-NII Band I: 0.053 W / 17.24 dBm | | | |

# 3 Test Methodology

## 3.1. Mode of Operation

Decision of Test ATL has verified the construction and function in typical operation. All the test modes were carried out with the EUT in normal operation, which was shown in this test report and defined as:

| Test Mode |
|---|
| Mode 1: Normal Operation Mode |
| Mode 2: IEEE 802.11a Link Mode |
| Mode 3: IEEE 802.11n 20MHz Link Mode |
| Mode 4: IEEE 802.11n 40MHz Link Mode |
| Mode 5: Receiver Mode |

By preliminary testing and verifying three axis (X, Y and Z) position of EUT transmitted status, it was found that “X axis” position was the worst, then the final test was executed the worst condition and test data were recorded in this report.

Software used to control the EUT for staying in continuous transmitting mode was programmed.
After verification, all tests were carried out with the worst case test modes as shown below except radiated spurious emission below 1GHz and power line conducted emissions below 30MHz, which worst case was in normal link mode only.

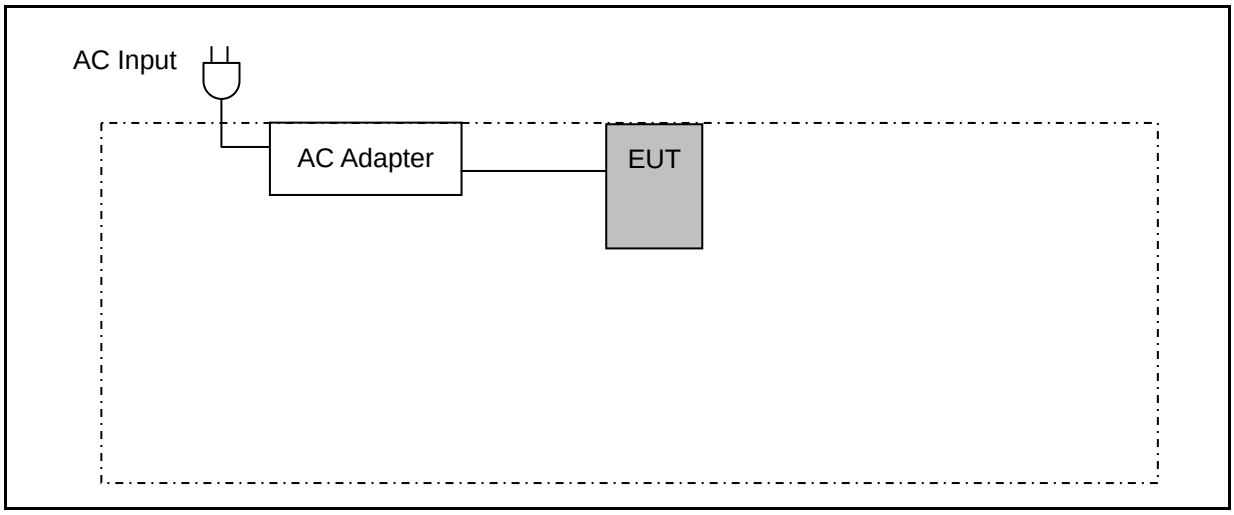
**IEEE 802.11a mode / 5180 ~ 5220MHz (ANT1+ANT2):**
Channel Low (5180MHz), Channel Mid (5200MHz) and Channel High (5220MHz) with 6Mbps data rate were chosen for full testing.
**IEEE 802.11n 20 MHz Channel mode / 5180 ~ 5220MHz (ANT1+ANT2):**
Channel Low (5180MHz), Channel Mid (5200MHz) and Channel High (5220MHz) with 6.5Mbps data rate were chosen for full testing.
**IEEE 802.11n 40 MHz Channel mode / 5190 ~ 5210MHz (ANT1+ANT2):**
Channel Low (5190MHz) and Channel High (5210MHz) with 6.5Mbps data rate were chosen for full testing.

## 3.2. EUT Exercise Software

The EUT is operated in the engineering mode to fix the TX frequency for the purposes of measurement. According to its specifications, the EUT must comply with the requirements of Section 15.407 under the FCC Rules Part 15 Subpart E.

| | |
|---|---|
| 1. | Setup the EUT shown on 3.3. |
| 2. | Turn on the power of all equipment. |
| 3. | Turn on Wi-Fi function link to Notebook. |
| 4. | EUT run test program. |

## 3.3. Configuration of Test System Details




## 3.4. Test Site Environment

| Items | Required (IEC 68-1) | Actual |
|---|---|---|
| Temperature (°C) | 15-35 | 26 |
| Humidity (%RH) | 25-75 | 60 |
| Barometric pressure (mbar) | 860-1060 | 950 |

# 4 AC Power Conducted Emission Measurement

## 4.1. Limit

| Frequency (MHz) | Quasi-peak | Average |
|---|---|---|
| 0.15 - 0.5 | 66 to 56 | 56 to 46 |
| 0.50 - 5.0 | 56 | 46 |
| 5.0 - 30.0 | 60 | 50 |

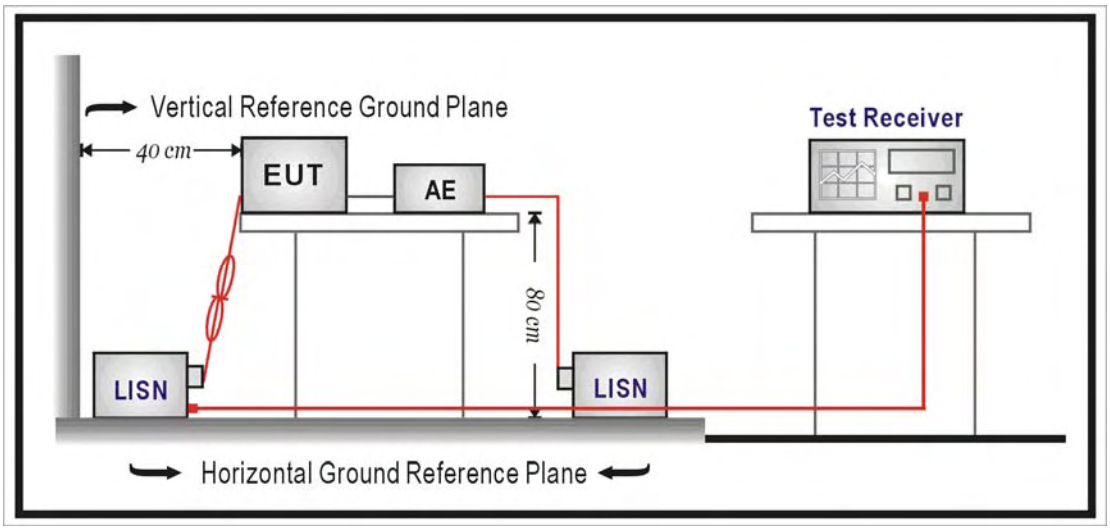
## 4.2. Test Instruments

| Describe | Manufacturer | Model Number | Serial Number | Cal. Date | Remark |
|---|---|---|---|---|---|
| Test Receiver | R&S | ESCI | 100367 | 06/06/2013 | (1) |
| LISN | R&S | ENV216 | 101040 | 03/04/2013 | (1) |
| LISN | R&S | ENV216 | 101041 | 03/04/2013 | (1) |
| Test Site | ATL | TE05 | TE05 | N.C.R. | ----- |

Remark: (1) Calibration period 1 year. (2) Calibration period 2 years.

Note: N.C.R. = No Calibration Request.

## 4.3. Test Setup



## 4.4. Test Procedure

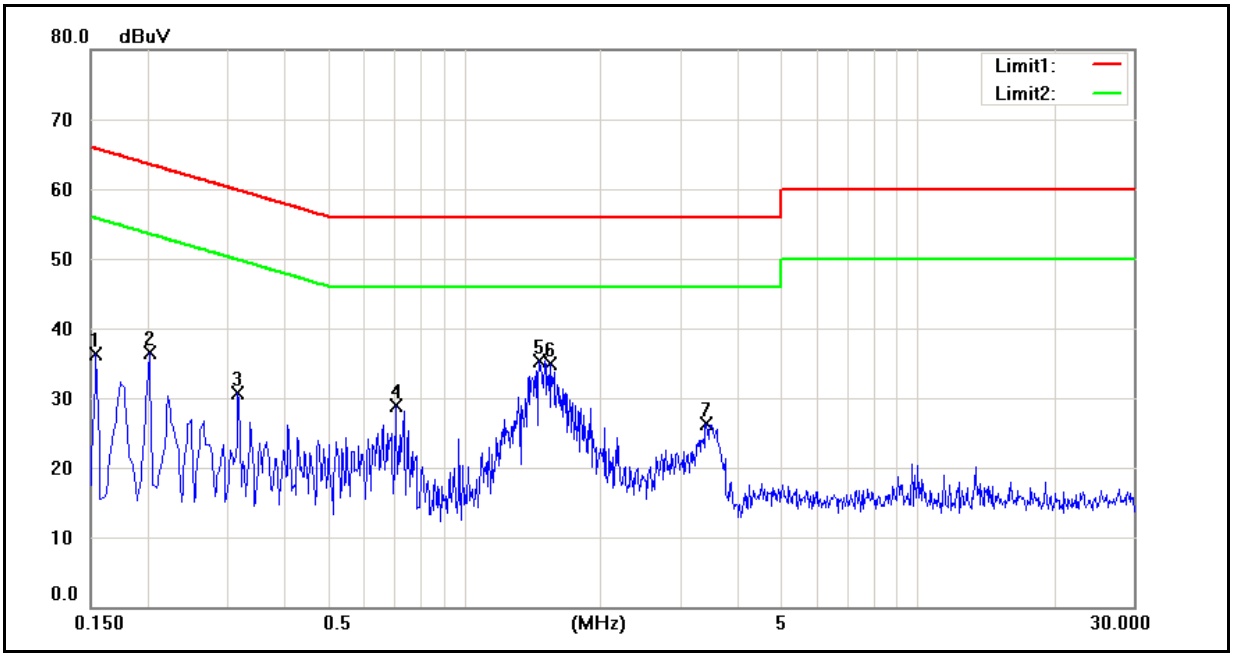
The power line conducted emission measurements were performed in a shielded enclosure. The EUT was assembled on a wooden table which is 80 centimeters high, was placed 40 centimeters from the back wall and at least 1 meter from the sidewall.

Power was fed to the EUT from the public utility power grid through a line filter and EMCO Model 3162/2 SH Line Impedance Stabilization Networks (LISN). The LISN housing, measuring instrumentation case, ground plane, etc., were electrically bonded together at the same RF potential. The Spectrum analyzer was connected to the AC line through an isolation transformer. The 50-ohm output of the LISN was connected to the spectrum analyzer directly. Conducted emission levels were in the CISPR quasi-peak detection mode. The analyzer's 6 dB bandwidth was set to 9 KHz. No post-detector video filter was used.

The spectrum was scanned from 150 KHz to 30 MHz. The physical arrangement of the test system and associated cabling was varied (within the scope of arrangements likely to be encountered in actual use) to determine the effect on the unit's emanations in amplitude and frequency. All spurious emission frequencies were observed. The highest emission amplitudes relative to the appropriate limit were measured and have been recorded in paragraph 4.1.

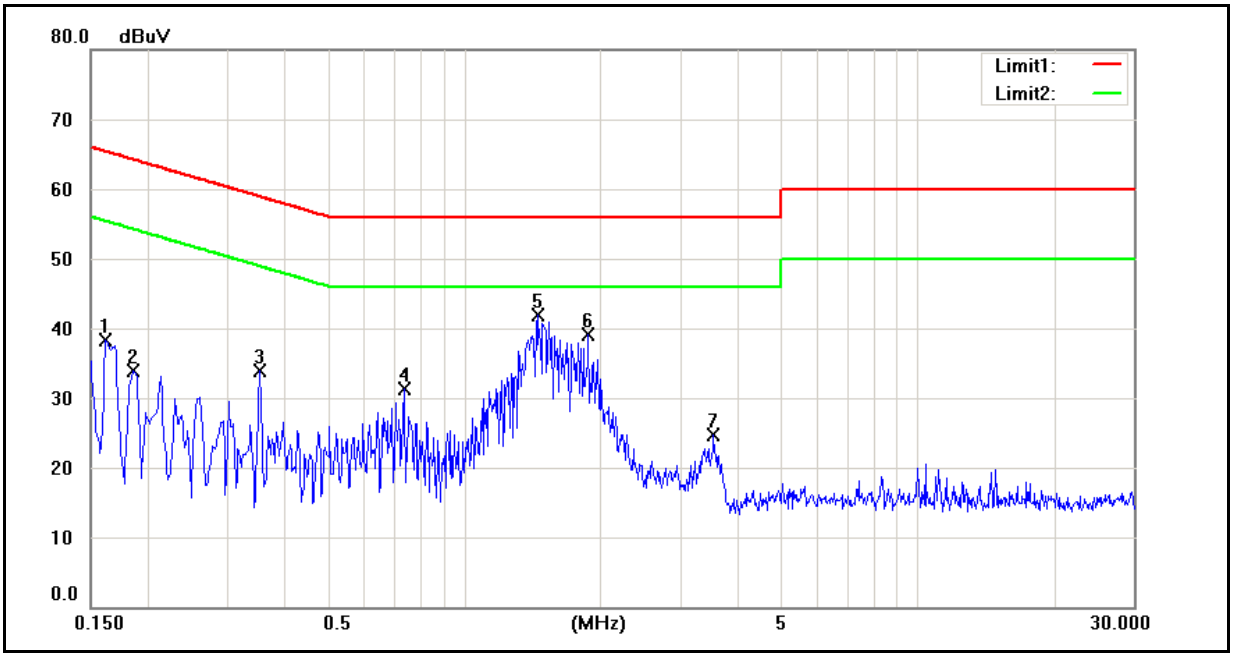
## 4.5. Test Result

| | | | |
|---|---|---|---|
| Standard: | FCC Part 15E | Line: | L1 |
| Test item: | Conducted Emission | Power: | AC 120V/60Hz |
| Model Number: | AirCard 781S | Temp.(℃)/Hum.(%RH): | 26(℃)/60%RH |
| Test Mode: | Mode 1 | Date: | 09/03/2013 |
| | | Test By: | Fly Lu |
| Description: | | | |




| No. | Frequency (MHz) | QP reading (dBuV) | AVG reading (dBuV) | Correction factor (dB) | QP result (dBuV) | AVG result (dBuV) | QP limit (dBuV) | AVG limit (dBuV) | QP margin (dB) | AVG margin (dB) | Remark |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 0.1540 | 20.92 | 8.23 | 9.62 | 30.54 | 17.85 | 65.78 | 55.78 | -35.24 | -37.93 | Pass |
| 2 | 0.2020 | 15.32 | 6.99 | 9.62 | 24.94 | 16.61 | 63.53 | 53.53 | -38.59 | -36.92 | Pass |
| 3 | 0.3180 | 8.50 | 1.24 | 9.62 | 18.12 | 10.86 | 59.76 | 49.76 | -41.64 | -38.90 | Pass |
| 4 | 0.7060 | 14.75 | 9.04 | 9.64 | 24.39 | 18.68 | 56.00 | 46.00 | -31.61 | -27.32 | Pass |
| 5 | 1.4660 | 19.17 | 10.66 | 9.68 | 28.85 | 20.34 | 56.00 | 46.00 | -27.15 | -25.66 | Pass |
| 6 | 1.5580 | 12.85 | 9.65 | 9.68 | 22.53 | 19.33 | 56.00 | 46.00 | -33.47 | -26.67 | Pass |
| 7 | 3.4180 | 13.04 | 6.63 | 9.72 | 22.76 | 16.35 | 56.00 | 46.00 | -33.24 | -29.65 | Pass |

| | | | |
|---|---|---|---|
| Standard: | FCC Part 15E | Line: | N |
| Test item: | Conducted Emission | Power: | AC 120V/60Hz |
| Model Number: | AirCard 781S | Temp.(℃)/Hum.(%RH): | 26(℃)/60%RH |
| Test Mode: | Mode 1 | Date: | 09/03/2013 |
| | | Test By: | Fly Lu |
| Description: | | | |




| No. | Frequency (MHz) | QP reading (dBuV) | AVG reading (dBuV) | Correction factor (dB) | QP result (dBuV) | AVG result (dBuV) | QP limit (dBuV) | AVG limit (dBuV) | QP margin (dB) | AVG margin (dB) | Remark |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 0.1620 | 20.42 | 3.42 | 9.63 | 30.05 | 13.05 | 65.36 | 55.36 | -35.31 | -42.31 | Pass |
| 2 | 0.1860 | 17.49 | 9.32 | 9.63 | 27.12 | 18.95 | 64.21 | 54.21 | -37.09 | -35.26 | Pass |
| 3 | 0.3540 | 13.29 | 7.87 | 9.63 | 22.92 | 17.50 | 58.87 | 48.87 | -35.95 | -31.37 | Pass |
| 4 | 0.7380 | 18.29 | 11.92 | 9.64 | 27.93 | 21.56 | 56.00 | 46.00 | -28.07 | -24.44 | Pass |
| 5 | 1.4500 | 21.13 | 16.05 | 9.67 | 30.80 | 25.72 | 56.00 | 46.00 | -25.20 | -20.28 | Pass |
| 6 | 1.8820 | 23.65 | 14.11 | 9.70 | 33.35 | 23.81 | 56.00 | 46.00 | -22.65 | -22.19 | Pass |
| 7 | 3.5620 | 7.73 | 2.12 | 9.73 | 17.46 | 11.85 | 56.00 | 46.00 | -38.54 | -34.15 | Pass |

# 5 Radiated Emission Measurement

## 5.1. Limit

Limits of Radiated Emission Measurement

Emissions radiated outside of the specified bands, shall be according to the general radiated limits in 15.209 as following:

| Frequency Range (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 | 10 | 3 |
| 88 ~ 216 | 150 | 3 |
| 216 ~ 960 | 200 | 3 |
| Above 960 | 500 | 3 |

Note: 1. The lower limit shall apply at the transition frequencies.

2. Emission level (dBuV/m) = 20 log Emission level (uV/m).

3. As shown in 15.35(b), 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.

## 5.2. Test Instruments

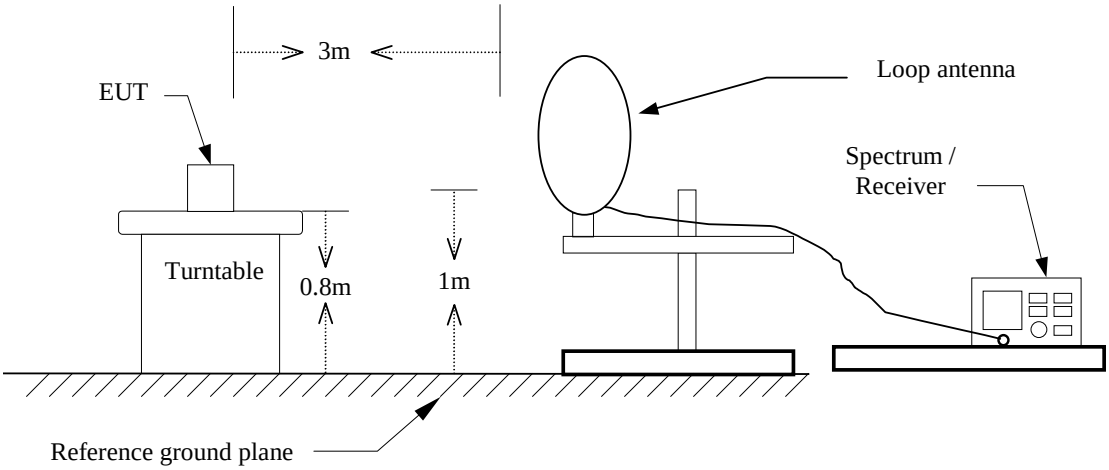
| 3 Meter Chamber | | | | | |
|---|---|---|---|---|---|
| Equipment | Manufacturer | Model Number | Serial Number | Cal. Date | Remark |
| RF Pre-selector | Agilent | N9039A | MY46520256 | 01/21/2013 | (1) |
| Spectrum Analyzer | Agilent | E4446A | MY46180578 | 01/21/2013 | (1) |
| Pre Amplifier | Agilent | 8449B | 3008A02237 | 02/21/2013 | (1) |
| Pre Amplifier | Agilent | 8447D | 2944A10961 | 02/21/2013 | (1) |
| Broadband Antenna (30MHz~1GHz) | SCHWARZBECK MESS-ELEKTRONIK | VULB9163 | 9163-270 | 07/16/2013 | (1) |
| Horn Antenna (1~18GHz) | SCHWARZBECK MESS-ELEKTRONIK | BBHA9120D | 9120D-550 | 06/10/2013 | (1) |
| Horn Antenna (18~40GHz) | SCHWARZBECK MESS-ELEKTRONIK | BBHA9170 | 9170-320 | 06/13/2013 | (1) |
| Test Site | ATL | TE01 | 888001 | 08/27/2013 | (1) |

Remark: (1) Calibration period 1 year. (2) Calibration period 2 years.

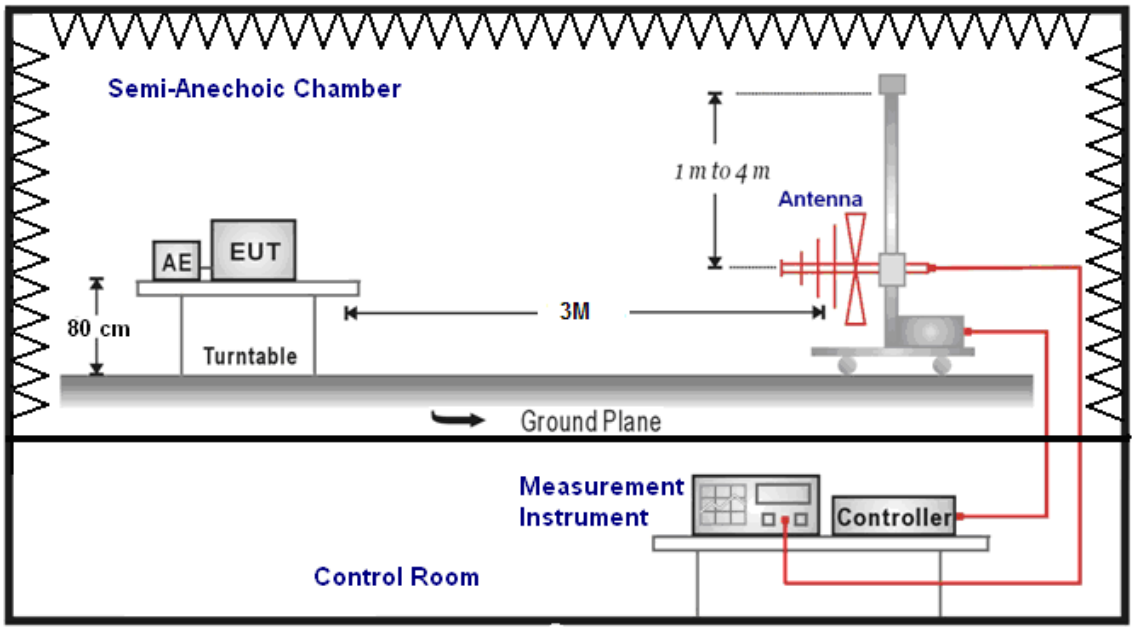
Note: N.C.R. = No Calibration Request.

## 5.3. Setup

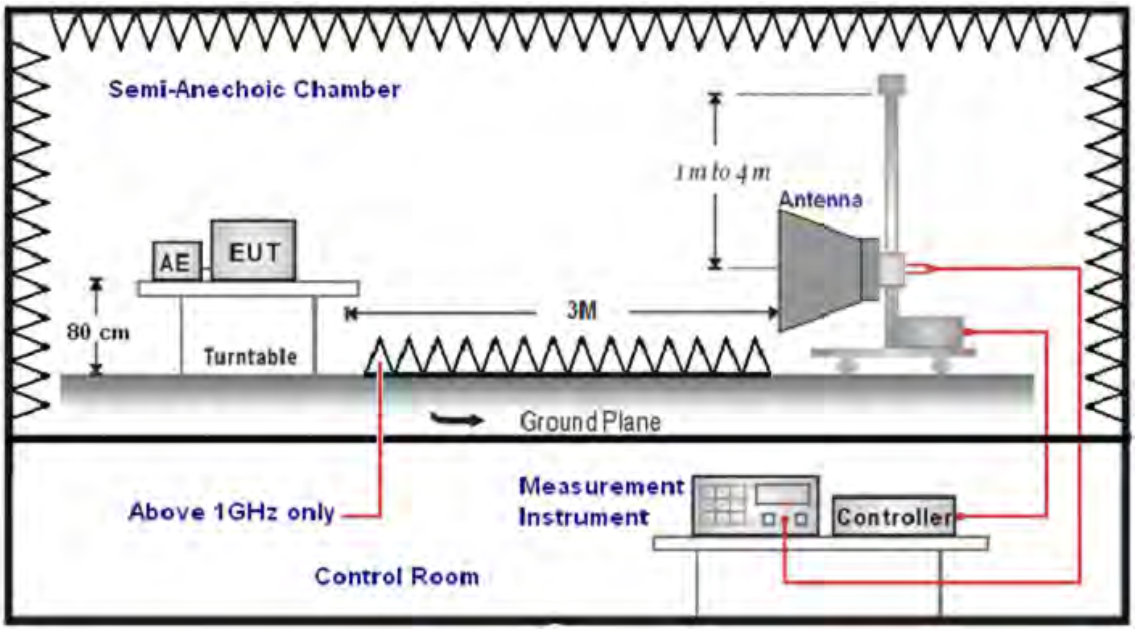
9kHz ~ 30MHz




30MHz ~ 1GHz



Above 1GHz


Semi-Anechoic Chamber
1 m to 4 m
Antenna
AE
EUT
80 cm
Turntable
3M
Ground Plane
Above 1GHz only
Measurement
Instrument
Controller
Control Room

## 5.4. Test Procedure

Final radiation measurements were made on a three-meter, Semi Anechoic Chamber. The EUT system was placed on a nonconductive turntable which is 0.8 meters height, top surface 1.0 x 1.5 meter. The spectrum was examined from 250 MHz to 2.5 GHz in order to cover the whole spectrum below 10th harmonic which could generate from the EUT. During the test, EUT was set to transmit continuously & Measurements spectrum range from 9 kHz to 40 GHz is investigated.

For measurements below 1 GHz the resolution bandwidth is set to 100 kHz for peak detection measurements or 120 kHz for quasi-peak detection measurements. Peak detection is used unless otherwise noted as quasi-peak.

For measurements above 1 GHz the resolution bandwidth is set to 1 MHz, and then the video bandwidth is set to 3 MHz for peak measurements and 3 MHz for average measurements.

A nonconductive material surrounded the EUT to supporting the EUT for standing on tree orthogonal planes. At each condition, the EUT was rotated 360 degrees, and the antenna was raised and lowered from one to four meters to find the maximum emission levels. Measurements were taken using both horizontal and vertical antenna polarization.

SCHWARZBECK MESS-ELEKTRONIK Trilog-Broadband Antenna (mode SB AC VULB) at 3 Meter and the ETS-Lindgren Double-Ridged Waveguide Horn antnna (model 3117) Schwarzbeck Mess-Elektronik Broadband Horn Antenna (BBHA 9170) was used in frequencies 1 – 40 GHz at a distance of 1 meter. All test results were extrapolated to equivalent signal at 3 meters utilizing an inverse linear distance extrapolation Factor (20dB/decade).

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.

Appropriate preamplifiers were used for improving sensitivity and precautions were taken to avoid overloading or desensitizing the spectrum analyzer. No post – detector video filters were used in the test.

The spectrum analyzer's 6 dB bandwidth was set to 1 MHz, and the analyzer was operated in the peak detection mode, for frequencies both below and up 1 GHz. The average levels were obtained by subtracting the duty cycle correction factor from the peak readings.

The following procedures were used to convert the emission levels measured in decibels referenced to 1 microvolt (dBuV) into field intensity in micro volts pre meter (uV/m).

The actual field intensity in decibels referenced to 1 microvolt in to field intensity in micro colts per meter (dBuV/m).

The actual field is intensity in referenced to 1 microvolt per meter (dBuV/m) is determined by algebraically adding the measured reading in dBuV, the antenna factor (dB), and cable loss (dB) and Subtracting the gain of preamplifier (dB) is auto calculate in spectrum analyzer.

(1) Amplitude (dBuV/m) = FI (dBuV) +AF (dBuV) +CL (dBuV)-Gain (dB)
FI= Reading of the field intensity.
AF= Antenna factor.
CL= Cable loss.
P.S Amplitude is auto calculate in spectrum analyzer.

(2) Actual Amplitude (dBuV/m) = Amplitude (dBuV)-Dis(dB)
The FCC specified emission limits were calculated according the EUT operating frequency and by following linear interpolation equations:
(a) For fundamental frequency : Transmitter Output < +30dBm
(b) For spurious frequency : Spurious emission limits = fundamental emission limit /10

## 5.5. Test Result

Below 1GHz

| | | | |
|---|---|---|---|
| Standard: | FCC Part 15E | Test Distance: | 3m |
| Test item: | Radiated Emission | Power: | AC 120V/60Hz |
| Model Number: | AirCard 781S | Temp.(℃)/Hum.(%RH): | 26(℃)/60%RH |
| Test Mode: | Mode 1 | Date: | 08/31/2013 |
| Ant.Polar.: | Horizontal | Test By: | Fly Lu |

| Frequency (MHz) | Reading (dBuV) | Correct Factor (dB/m) | Result (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Remark | Ant.Polar. H / V |
|---|---|---|---|---|---|---|---|
| 111.0000 | 28.53 | -14.53 | 14.00 | 43.50 | -29.50 | QP | H |
| 281.5000 | 29.27 | -11.12 | 18.15 | 46.00 | -27.85 | QP | H |
| 503.0000 | 27.34 | -6.77 | 20.57 | 46.00 | -25.43 | QP | H |
| 651.0000 | 27.20 | -4.06 | 23.14 | 46.00 | -22.86 | QP | H |
| 808.5000 | 26.50 | -1.41 | 25.09 | 46.00 | -20.91 | QP | H |
| 890.0000 | 26.40 | 0.10 | 26.50 | 46.00 | -19.50 | QP | H |
| | | | | | | | |
| 92.5000 | 34.18 | -15.49 | 18.69 | 43.50 | -24.81 | QP | V |
| 253.5000 | 26.10 | -11.96 | 14.14 | 46.00 | -31.86 | QP | V |
| 420.0000 | 28.48 | -8.37 | 20.11 | 46.00 | -25.89 | QP | V |
| 552.5000 | 28.10 | -6.50 | 21.60 | 46.00 | -24.40 | QP | V |
| 708.0000 | 27.74 | -3.51 | 24.23 | 46.00 | -21.77 | QP | V |
| 870.5000 | 26.93 | -0.38 | 26.55 | 46.00 | -19.45 | QP | V |

Note: No emission found between lowest internal used/generated frequency to 30MHz (9kHz~30MHz).

Above 1GHz

| | | | |
|---|---|---|---|
| Standard: | FCC Part 15E | Test Distance: | 3m |
| Test item: | Radiated Emission | Power: | AC 120V/60Hz |
| Model Number: | AirCard 781S | Temp.(℃)/Hum.(%RH): | 26(℃)/60%RH |
| Test Mode: | Mode 2 | Date: | 09/03/2013 |
| Frequency: | 5180MHz | Test By: | Fly Lu |

| Frequency (MHz) | Reading (dBuV) | Correct Factor (dB/m) | Result (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Remark | Ant.Polar. H / V |
|---|---|---|---|---|---|---|---|
| 2771.000 | 32.80 | 5.32 | 38.12 | 74.00 | -35.88 | peak | H |
| 4661.000 | 30.93 | 11.29 | 42.22 | 74.00 | -31.78 | peak | H |
| 7573.000 | 27.79 | 20.84 | 48.63 | 74.00 | -25.37 | peak | H |
| 2841.000 | 33.29 | 5.49 | 38.78 | 74.00 | -35.22 | peak | V |
| 4675.000 | 30.83 | 11.33 | 42.16 | 74.00 | -31.84 | peak | V |
| 7622.000 | 27.79 | 20.86 | 48.65 | 74.00 | -25.35 | peak | V |

| | | | |
|---|---|---|---|
| Standard: | FCC Part 15E | Test Distance: | 3m |
| Test item: | Radiated Emission | Power: | AC 120V/60Hz |
| Model Number: | AirCard 781S | Temp.(℃)/Hum.(%RH): | 26(℃)/60%RH |
| Test Mode: | Mode 2 | Date: | 09/03/2013 |
| Frequency: | 5200MHz | Test By: | Fly Lu |

| Frequency (MHz) | Reading (dBuV) | Correct Factor (dB/m) | Result (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Remark | Ant.Polar. H / V |
|---|---|---|---|---|---|---|---|
| 2778.000 | 32.33 | 5.34 | 37.67 | 74.00 | -36.33 | peak | H |
| 4703.000 | 29.96 | 11.40 | 41.36 | 74.00 | -32.64 | peak | H |
| 7629.000 | 27.66 | 20.87 | 48.53 | 74.00 | -25.47 | peak | H |
| 2785.000 | 33.34 | 5.36 | 38.70 | 74.00 | -35.30 | peak | V |
| 4661.000 | 31.70 | 11.29 | 42.99 | 74.00 | -31.01 | peak | V |
| 7643.000 | 25.95 | 20.88 | 46.83 | 74.00 | -27.17 | peak | V |

| | | | |
|---|---|---|---|
| Standard: | FCC Part 15E | Test Distance: | 3m |
| Test item: | Radiated Emission | Power: | AC 120V/60Hz |
| Model Number: | AirCard 781S | Temp.(℃)/Hum.(%RH): | 26(℃)/60%RH |
| Test Mode: | Mode 2 | Date: | 09/03/2013 |
| Frequency: | 5220MHz | Test By: | Fly Lu |

| Frequency (MHz) | Reading (dBuV) | Correct Factor (dB/m) | Result (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Remark | Ant.Polar. H / V |
|---|---|---|---|---|---|---|---|
| 2806.000 | 33.86 | 5.41 | 39.27 | 74.00 | -34.73 | peak | H |
| 4654.000 | 30.63 | 11.27 | 41.90 | 74.00 | -32.10 | peak | H |
| 7615.000 | 27.26 | 20.87 | 48.13 | 74.00 | -25.87 | peak | H |
| 2771.000 | 32.96 | 5.32 | 38.28 | 74.00 | -35.72 | peak | V |
| 4661.000 | 29.67 | 11.29 | 40.96 | 74.00 | -33.04 | peak | V |
| 7594.000 | 28.18 | 20.85 | 49.03 | 74.00 | -24.97 | peak | V |

| | | | |
|---|---|---|---|
| Standard: | FCC Part 15E | Test Distance: | 3m |
| Test item: | Radiated Emission | Power: | AC 120V/60Hz |
| Model Number: | AirCard 781S | Temp.(℃)/Hum.(%RH): | 26(℃)/60%RH |
| Test Mode: | Mode 3 | Date: | 09/03/2013 |
| Frequency: | 5180MHz | Test By: | Fly Lu |

| Frequency (MHz) | Reading (dBuV) | Correct Factor (dB/m) | Result (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Remark | Ant.Polar. H / V |
|---|---|---|---|---|---|---|---|
| 2778.000 | 33.98 | 5.34 | 39.32 | 74.00 | -34.68 | peak | H |
| 4654.000 | 29.44 | 11.27 | 40.71 | 74.00 | -33.29 | peak | H |
| 7643.000 | 26.66 | 20.88 | 47.54 | 74.00 | -26.46 | peak | H |
| 2799.000 | 32.93 | 5.40 | 38.33 | 74.00 | -35.67 | peak | V |
| 4675.000 | 29.60 | 11.33 | 40.93 | 74.00 | -33.07 | peak | V |
| 7629.000 | 27.43 | 20.87 | 48.30 | 74.00 | -25.70 | peak | V |

| | | | |
|---|---|---|---|
| Standard: | FCC Part 15E | Test Distance: | 3m |
| Test item: | Radiated Emission | Power: | AC 120V/60Hz |
| Model Number: | AirCard 781S | Temp.(℃)/Hum.(%RH): | 26(℃)/60%RH |
| Test Mode: | Mode 3 | Date: | 09/03/2013 |
| Frequency: | 5200MHz | Test By: | Fly Lu |

| Frequency (MHz) | Reading (dBuV) | Correct Factor (dB/m) | Result (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Remark | Ant.Polar. H / V |
|---|---|---|---|---|---|---|---|
| 2743.000 | 32.63 | 5.25 | 37.88 | 74.00 | -36.12 | peak | H |
| 4619.000 | 30.06 | 11.19 | 41.25 | 74.00 | -32.75 | peak | H |
| 7566.000 | 27.85 | 20.85 | 48.70 | 74.00 | -25.30 | peak | H |
| 2799.000 | 32.91 | 5.40 | 38.31 | 74.00 | -35.69 | peak | V |
| 4626.000 | 31.67 | 11.20 | 42.87 | 74.00 | -31.13 | peak | V |
| 7587.000 | 28.80 | 20.85 | 49.65 | 74.00 | -24.35 | peak | V |

| | | | |
|---|---|---|---|
| Standard: | FCC Part 15E | Test Distance: | 3m |
| Test item: | Radiated Emission | Power: | AC 120V/60Hz |
| Model Number: | AirCard 781S | Temp.(℃)/Hum.(%RH): | 26(℃)/60%RH |
| Test Mode: | Mode 3 | Date: | 09/03/2013 |
| Frequency: | 5220MHz | Test By: | Fly Lu |

| Frequency (MHz) | Reading (dBuV) | Correct Factor (dB/m) | Result (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Remark | Ant.Polar. H / V |
|---|---|---|---|---|---|---|---|
| 2771.000 | 33.44 | 5.32 | 38.76 | 74.00 | -35.24 | peak | H |
| 4654.000 | 30.76 | 11.27 | 42.03 | 74.00 | -31.97 | peak | H |
| 7615.000 | 28.01 | 20.87 | 48.88 | 74.00 | -25.12 | peak | H |
| 2799.000 | 32.35 | 5.40 | 37.75 | 74.00 | -36.25 | peak | V |
| 4605.000 | 31.70 | 11.15 | 42.85 | 74.00 | -31.15 | peak | V |
| 7587.000 | 29.40 | 20.85 | 50.25 | 74.00 | -23.75 | peak | V |

| | | | |
|---|---|---|---|
| Standard: | FCC Part 15E | Test Distance: | 3m |
| Test item: | Radiated Emission | Power: | AC 120V/60Hz |
| Model Number: | AirCard 781S | Temp.(℃)/Hum.(%RH): | 26(℃)/60%RH |
| Test Mode: | Mode 4 | Date: | 09/03/2013 |
| Frequency: | 5190MHz | Test By: | Fly Lu |

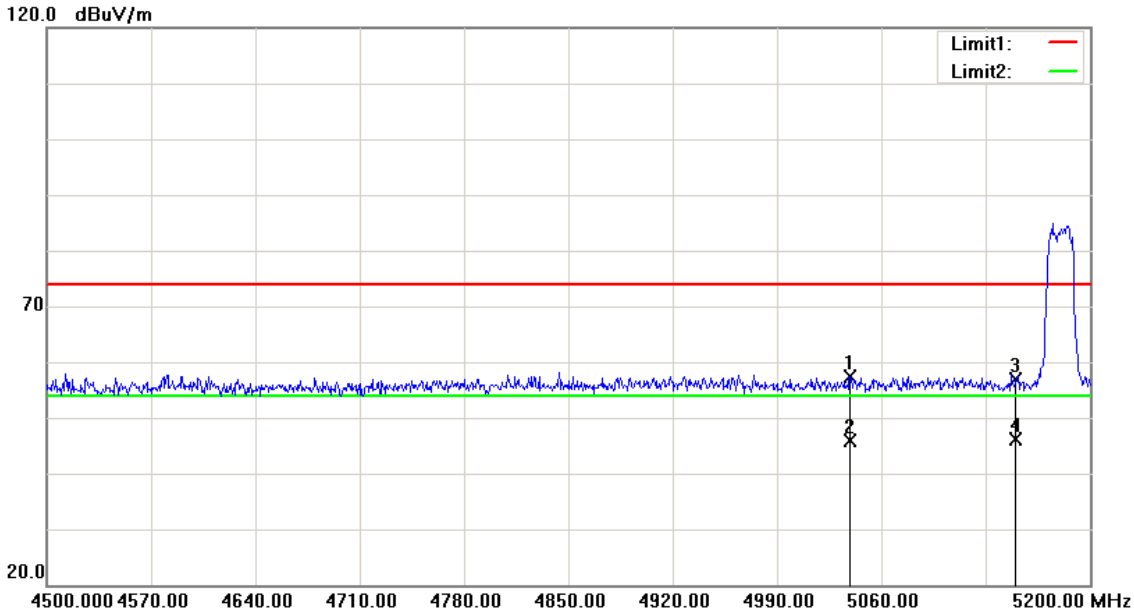
| Frequency (MHz) | Reading (dBuV) | Correct Factor (dB/m) | Result (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Remark | Ant.Polar. H / V |
|---|---|---|---|---|---|---|---|
| 2743.000 | 33.95 | 5.25 | 39.20 | 74.00 | -34.80 | peak | H |
| 4661.000 | 31.35 | 11.29 | 42.64 | 74.00 | -31.36 | peak | H |
| 7482.000 | 28.24 | 20.78 | 49.02 | 74.00 | -24.98 | peak | H |
| 2785.000 | 33.17 | 5.36 | 38.53 | 74.00 | -35.47 | peak | V |
| 4619.000 | 31.12 | 11.19 | 42.31 | 74.00 | -31.69 | peak | V |
| 7657.000 | 27.35 | 20.89 | 48.24 | 74.00 | -25.76 | peak | V |

| | | | |
|---|---|---|---|
| Standard: | FCC Part 15E | Test Distance: | 3m |
| Test item: | Radiated Emission | Power: | AC 120V/60Hz |
| Model Number: | AirCard 781S | Temp.(℃)/Hum.(%RH): | 26(℃)/60%RH |
| Test Mode: | Mode 4 | Date: | 09/03/2013 |
| Frequency: | 5210MHz | Test By: | Fly Lu |

| Frequency (MHz) | Reading (dBuV) | Correct Factor (dB/m) | Result (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Remark | Ant.Polar. H / V |
|---|---|---|---|---|---|---|---|
| 2785.000 | 33.04 | 5.36 | 38.40 | 74.00 | -35.60 | peak | H |
| 4647.000 | 30.44 | 11.25 | 41.69 | 74.00 | -32.31 | peak | H |
| 7622.000 | 27.60 | 20.86 | 48.46 | 74.00 | -25.54 | peak | H |
| 2778.000 | 33.47 | 5.34 | 38.81 | 74.00 | -35.19 | peak | V |
| 4661.000 | 32.23 | 11.29 | 43.52 | 74.00 | -30.48 | peak | V |
| 7566.000 | 29.13 | 20.85 | 49.98 | 74.00 | -24.02 | peak | V |

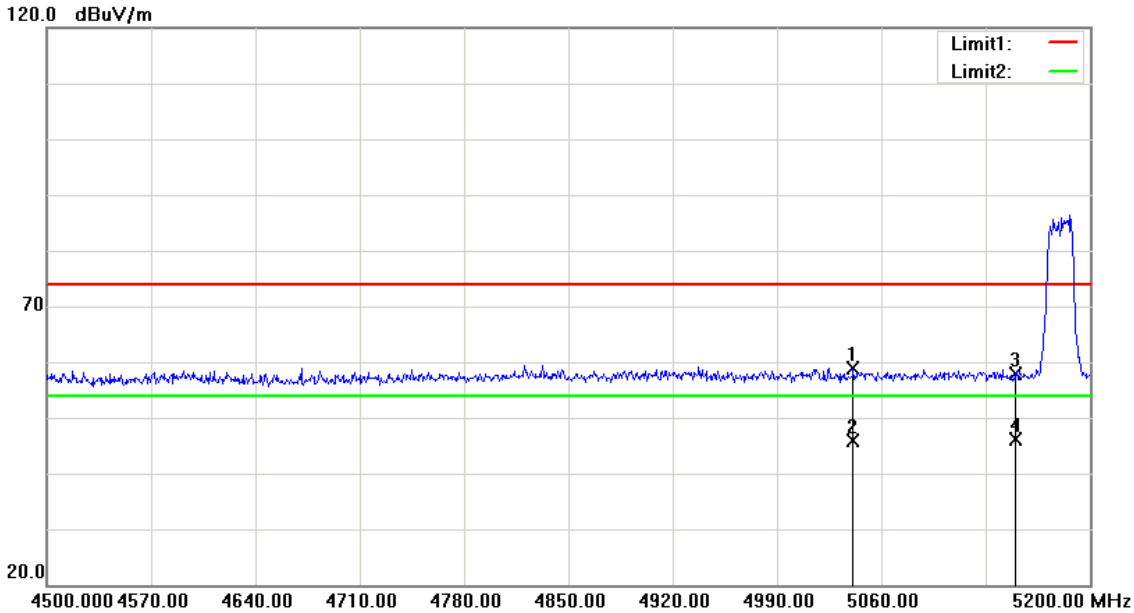
**Band Edge**

| | | | |
|---|---|---|---|
| Standard: | FCC Part 15E | Test Distance: | 3m |
| Test item: | Radiated Emission | Power: | AC 120V/60Hz |
| Model Number: | AirCard 781S | Temp.(℃)/Hum.(%RH): | 26(℃)/60%RH |
| Test Mode: | Mode 2 | Date: | 09/02/2013 |
| Frequency: | 5180 MHz | Test By: | Fly Lu |
| Ant.Polar.: | Horizontal | | |



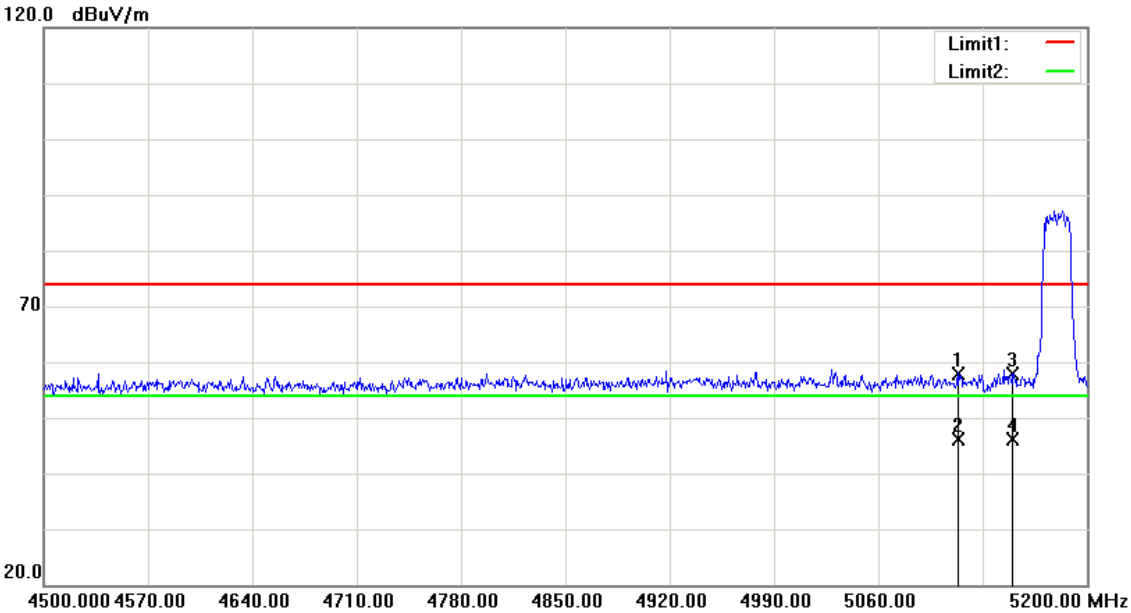

| No. | Frequency (MHz) | Reading (dBuV) | Correct Factor(dB/m) | Result (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Remark |
|---|---|---|---|---|---|---|---|
| 1 | 5039.000 | 45.07 | 12.33 | 57.40 | 74.00 | -16.60 | peak |
| 2 | 5039.000 | 33.46 | 12.33 | 45.79 | 54.00 | -8.21 | AVG |
| 3 | 5150.000 | 44.05 | 12.81 | 56.86 | 74.00 | -17.14 | peak |
| 4 | 5150.000 | 33.21 | 12.81 | 46.02 | 54.00 | -7.98 | AVG |

| | | | |
|---|---|---|---|
| Standard: | FCC Part 15E | Test Distance: | 3m |
| Test item: | Radiated Emission | Power: | AC 120V/60Hz |
| Model Number: | AirCard 781S | Temp.(℃)/Hum.(%RH): | 26(℃)/60%RH |
| Test Mode: | Mode 2 | Date: | 09/02/2013 |
| Frequency: | 5180 MHz | Test By: | Fly Lu |
| Ant.Polar.: | Vertical | | |



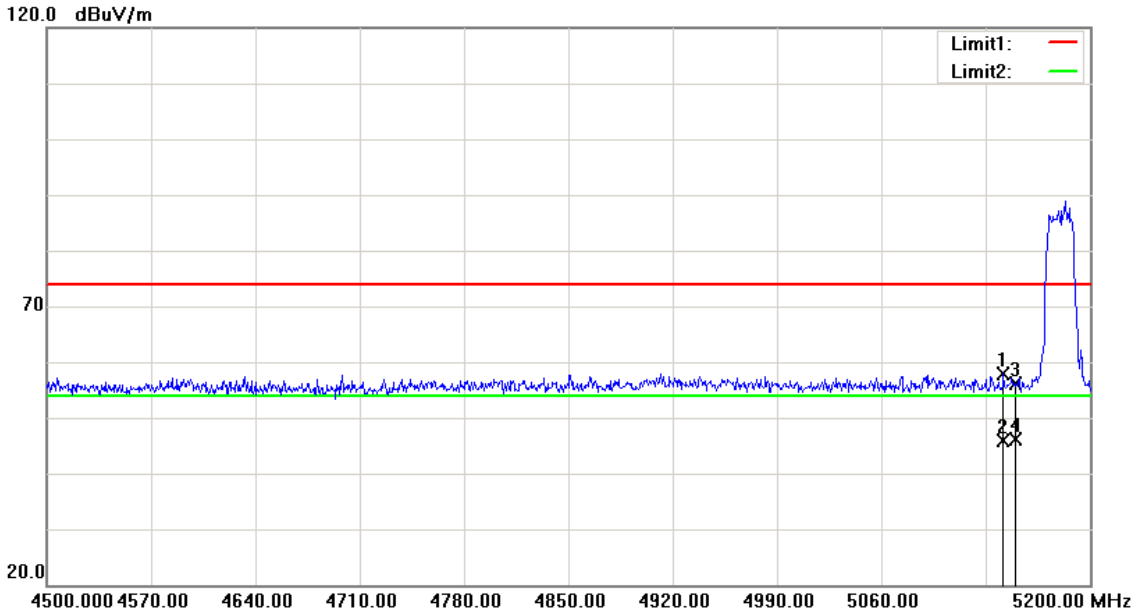

| No. | Frequency (MHz) | Reading (dBuV) | Correct Factor(dB/m) | Result (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Remark |
|---|---|---|---|---|---|---|---|
| 1 | 5041.100 | 46.63 | 12.34 | 58.97 | 74.00 | -15.03 | peak |
| 2 | 5041.100 | 33.55 | 12.34 | 45.89 | 54.00 | -8.11 | AVG |
| 3 | 5150.000 | 45.05 | 12.81 | 57.86 | 74.00 | -16.14 | peak |
| 4 | 5150.000 | 33.24 | 12.81 | 46.05 | 54.00 | -7.95 | AVG |

| | | | |
|---|---|---|---|
| Standard: | FCC Part 15E | Test Distance: | 3m |
| Test item: | Radiated Emission | Power: | AC 120V/60Hz |
| Model Number: | AirCard 781S | Temp.(℃)/Hum.(%RH): | 26(℃)/60%RH |
| Test Mode: | Mode 3 | Date: | 09/02/2013 |
| Frequency: | 5180 MHz | Test By: | Fly Lu |
| Ant.Polar.: | Horizontal | | |



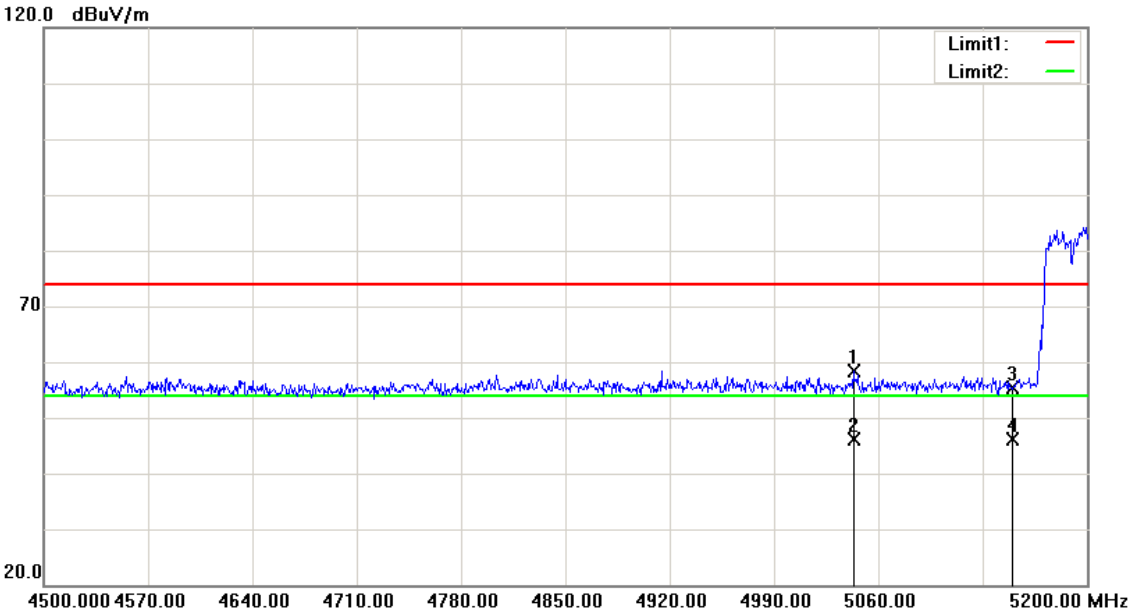

| No. | Frequency (MHz) | Reading (dBuV) | Correct Factor(dB/m) | Result (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Remark |
|---|---|---|---|---|---|---|---|
| 1 | 5113.200 | 45.34 | 12.66 | 58.00 | 74.00 | -16.00 | peak |
| 2 | 5113.200 | 33.40 | 12.66 | 46.06 | 54.00 | -7.94 | AVG |
| 3 | 5150.000 | 44.99 | 12.81 | 57.80 | 74.00 | -16.20 | peak |
| 4 | 5150.000 | 33.34 | 12.81 | 46.15 | 54.00 | -7.85 | AVG |

| | | | |
|---|---|---|---|
| Standard: | FCC Part 15E | Test Distance: | 3m |
| Test item: | Radiated Emission | Power: | AC 120V/60Hz |
| Model Number: | AirCard 781S | Temp.(℃)/Hum.(%RH): | 26(℃)/60%RH |
| Test Mode: | Mode 3 | Date: | 09/02/2013 |
| Frequency: | 5180 MHz | Test By: | Fly Lu |
| Ant.Polar.: | Vertical | | |



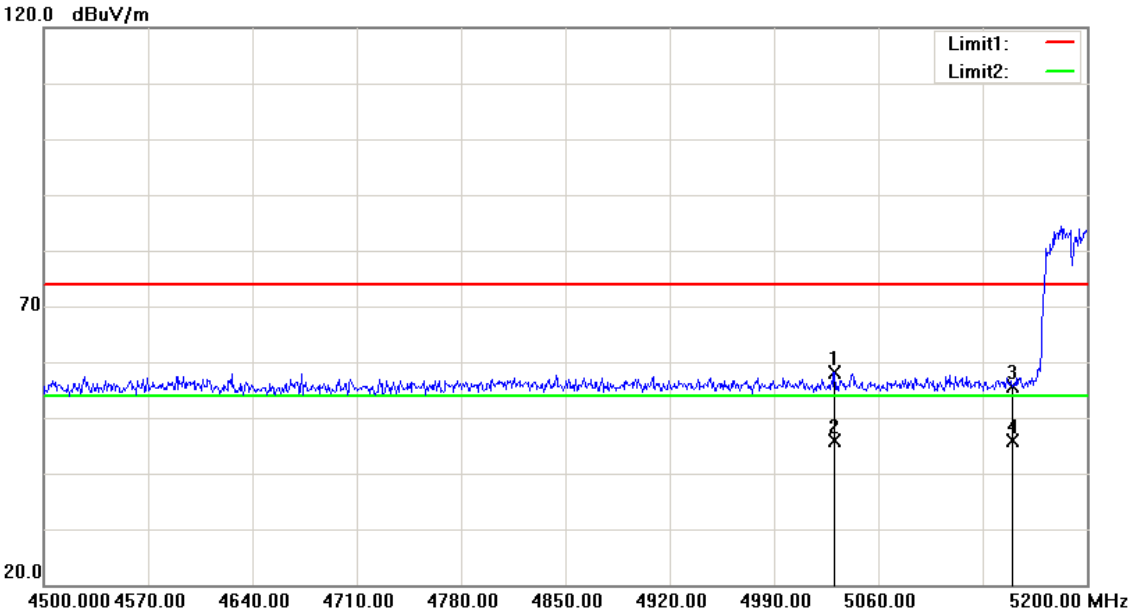

| No. | Frequency (MHz) | Reading (dBuV) | Correct Factor(dB/m) | Result (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Remark |
|---|---|---|---|---|---|---|---|
| 1 | 5141.900 | 45.21 | 12.78 | 57.99 | 74.00 | -16.01 | peak |
| 2 | 5141.900 | 33.20 | 12.78 | 45.98 | 54.00 | -8.02 | AVG |
| 3 | 5150.000 | 43.24 | 12.81 | 56.05 | 74.00 | -17.95 | peak |
| 4 | 5150.000 | 33.30 | 12.81 | 46.11 | 54.00 | -7.89 | AVG |

| | | | |
|---|---|---|---|
| Standard: | FCC Part 15E | Test Distance: | 3m |
| Test item: | Radiated Emission | Power: | AC 120V/60Hz |
| Model Number: | AirCard 781S | Temp.(℃)/Hum.(%RH): | 26(℃)/60%RH |
| Test Mode: | Mode 4 | Date: | 09/02/2013 |
| Frequency: | 5190 MHz | Test By: | Fly Lu |
| Ant.Polar.: | Horizontal | | |




| No. | Frequency (MHz) | Reading (dBuV) | Correct Factor(dB/m) | Result (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Remark |
|---|---|---|---|---|---|---|---|
| 1 | 5043.200 | 46.03 | 12.35 | 58.38 | 74.00 | -15.62 | peak |
| 2 | 5043.200 | 33.82 | 12.35 | 46.17 | 54.00 | -7.83 | AVG |
| 3 | 5150.000 | 42.53 | 12.81 | 55.34 | 74.00 | -18.66 | peak |
| 4 | 5150.000 | 33.41 | 12.81 | 46.22 | 54.00 | -7.78 | AVG |

| | | | |
|---|---|---|---|
| Standard: | FCC Part 15E | Test Distance: | 3m |
| Test item: | Radiated Emission | Power: | AC 120V/60Hz |
| Model Number: | AirCard 781S | Temp.(℃)/Hum.(%RH): | 26(℃)/60%RH |
| Test Mode: | Mode 4 | Date: | 09/02/2013 |
| Frequency: | 5190 MHz | Test By: | Fly Lu |
| Ant.Polar.: | Vertical | | |




| No. | Frequency (MHz) | Reading (dBuV) | Correct Factor(dB/m) | Result (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Remark |
|---|---|---|---|---|---|---|---|
| 1 | 5030.600 | 45.75 | 12.29 | 58.04 | 74.00 | -15.96 | peak |
| 2 | 5030.600 | 33.59 | 12.29 | 45.88 | 54.00 | -8.12 | AVG |
| 3 | 5150.000 | 42.78 | 12.81 | 55.59 | 74.00 | -18.41 | peak |
| 4 | 5150.000 | 33.11 | 12.81 | 45.92 | 54.00 | -8.08 | AVG |

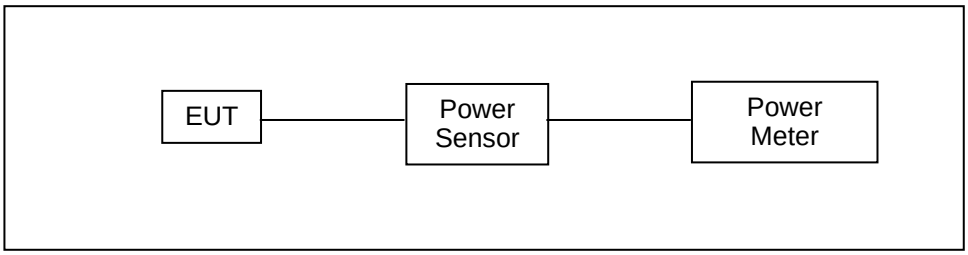
# 6 Maximum Conducted Output Power Measurement

## 6.1. Limit

| Frequency Range (MHz) | Limit |
|---|---|
| 5.150 ~ 5.250 GHz | The lesser of 50mW (17dBm) or 4dBm + 10logB |
| 5.250 ~ 5.350 GHz | The lesser of 250mW (24dBm) or 11dBm + 10logB |
| 5.470 ~ 5.725 GHz | The lesser of 250mW (24dBm) or 11dBm + 10logB |

Note: Where B is the 26dB emission bandwidth in MHz.

## 6.2. Test Setup




## 6.3. Test Instruments

| Equipment | Manufacturer | Model Number | Serial Number | Cal. Date | Remark |
|---|---|---|---|---|---|
| Power Sensor | Anritsu | MA2411B | 1126022 | 08/14/2012 | (1) |
| Power Meter | Anritsu | ML2495A | 1135009 | 08/14/2012 | (1) |
| Test Site | ATL | TE05 | TE05 | N.C.R. | ----- |

Remark: (1) Calibration period 1 year. (2) Calibration period 2 years.

Note: N.C.R. = No Calibration Request.

## 6.4. Test Procedure

The test is performed in accordance with KDB789033 D01 General UNII Test Procedures v01r03 , Guidelines for Compliance Testing of Unlicensed National Information Infrastructure (U-NII) Devices - Part 15, Subpart E.

## 6.5. Test Result

| Model Number | AirCard 781S | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Test Item | Maximum Conducted Output Power | | | | | | | | | | | | |
| Test Mode | Mode 2: IEEE 802.11a Link Mode | | | | | | | | | | | | |
| Date of Test | 09/02/2013 | | | | | | | | Test Site | TE05 | | | |

| Frequency (MHz) | Data Rate | ANT1 | | | | ANT2 | | | | ANT1+ANT2 | | | | Limit (dBm) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Average Power | | Peak Power | | Average Power | | Peak Power | | Average Power | | Peak Power | | |
| | | (dBm) | (W) | (dBm) | (W) | (dBm) | (W) | (dBm) | (W) | (dBm) | (W) | (dBm) | (W) | |
| 5180.0 | 6M | 6.41 | 0.004 | 16.37 | 0.043 | 0.58 | 0.001 | 11.72 | 0.015 | 7.42 | 0.006 | 17.65 | 0.058 | < 17 |
| 5200.0 | | 6.23 | 0.004 | 15.68 | 0.037 | 0.49 | 0.001 | 11.29 | 0.013 | 7.26 | 0.005 | 17.03 | 0.050 | |
| 5220.0 | | 6.10 | 0.004 | 15.52 | 0.036 | 0.37 | 0.001 | 11.20 | 0.013 | 7.13 | 0.005 | 16.89 | 0.049 | |
| 5180.0 | 54M | 6.34 | 0.004 | 15.84 | 0.038 | 0.53 | 0.001 | 11.25 | 0.013 | 7.35 | 0.005 | 17.14 | 0.052 | < 17 |
| 5200.0 | | 6.18 | 0.004 | 15.67 | 0.037 | 0.39 | 0.001 | 10.70 | 0.012 | 7.20 | 0.005 | 16.87 | 0.049 | |
| 5220.0 | | 6.08 | 0.004 | 15.53 | 0.036 | 0.33 | 0.001 | 10.43 | 0.011 | 7.10 | 0.005 | 16.70 | 0.047 | |

| Model Number | AirCard 781S | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Test Item | Maximum Conducted Output Power | | | | | | | | | | | | |
| Test Mode | Mode 3: IEEE 802.11n 20MHz Link Mode | | | | | | | | | | | | |
| Date of Test | 09/02/2013 | | | | | | | | Test Site | TE05 | | | |

| Frequency (MHz) | Data Rate | ANT1 | | | | ANT2 | | | | ANT1+ANT2 | | | | Limit (dBm) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Average Power | | Peak Power | | Average Power | | Peak Power | | Average Power | | Peak Power | | |
| | | (dBm) | (W) | (dBm) | (W) | (dBm) | (W) | (dBm) | (W) | (dBm) | (W) | (dBm) | (W) | |
| 5180.0 | 6M | 6.19 | 0.004 | 15.69 | 0.037 | 0.33 | 0.001 | 11.84 | 0.015 | 7.19 | 0.005 | 17.19 | 0.052 | < 17 |
| 5200.0 | | 6.01 | 0.004 | 15.55 | 0.036 | 0.28 | 0.001 | 11.05 | 0.013 | 7.04 | 0.005 | 16.87 | 0.049 | |
| 5220.0 | | 5.93 | 0.004 | 15.42 | 0.035 | 0.10 | 0.001 | 10.85 | 0.012 | 6.94 | 0.005 | 16.72 | 0.047 | |
| 5180.0 | 54M | 6.15 | 0.004 | 15.86 | 0.039 | 0.28 | 0.001 | 10.64 | 0.012 | 7.15 | 0.005 | 17.00 | 0.050 | < 17 |
| 5200.0 | | 6.00 | 0.004 | 15.61 | 0.036 | 0.23 | 0.001 | 10.52 | 0.011 | 7.02 | 0.005 | 16.78 | 0.048 | |
| 5220.0 | | 5.97 | 0.004 | 15.51 | 0.036 | 0.18 | 0.001 | 10.42 | 0.011 | 6.99 | 0.005 | 16.68 | 0.047 | |

| Model Number | AirCard 781S | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Test Item | Maximum Conducted Output Power | | | | | | | | | | | | |
| Test Mode | Mode 4: IEEE 802.11n 40MHz Link Mode | | | | | | | | | | | | |
| Date of Test | 04/29/2013 | | | | | | | | Test Site | TE05 | | | |

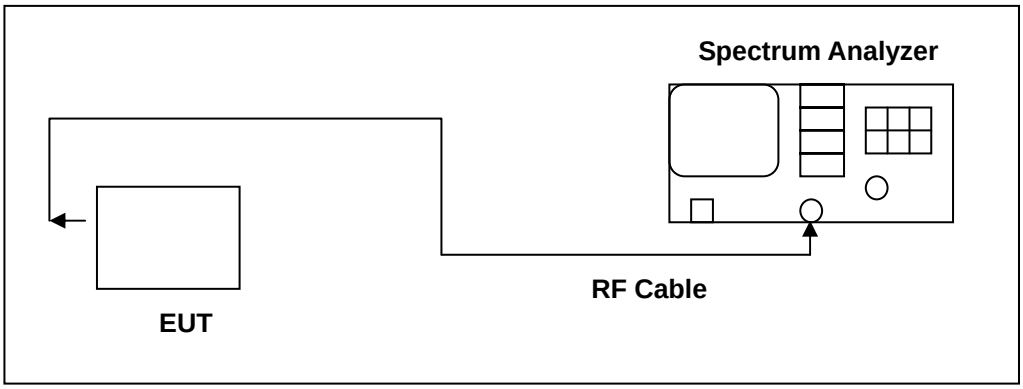
| Frequency (MHz) | Data Rate | ANT1 | | | | ANT2 | | | | ANT1+ANT2 | | | | Limit (dBm) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Average Power | | Peak Power | | Average Power | | Peak Power | | Average Power | | Peak Power | | |
| | | (dBm) | (W) | (dBm) | (W) | (dBm) | (W) | (dBm) | (W) | (dBm) | (W) | (dBm) | (W) | |
| 5190.0 | 6M | 6.16 | 0.004 | 15.76 | 0.038 | 0.48 | 0.001 | 11.67 | 0.015 | 7.20 | 0.005 | 17.19 | 0.052 | < 17 |
| 5210.0 | | 6.08 | 0.004 | 15.87 | 0.039 | 0.43 | 0.001 | 11.55 | 0.014 | 7.13 | 0.005 | 17.24 | 0.053 | |
| 5190.0 | 54M | 6.13 | 0.004 | 15.72 | 0.037 | 0.38 | 0.001 | 11.33 | 0.014 | 7.15 | 0.005 | 17.07 | 0.051 | < 17 |
| 5210.0 | | 6.07 | 0.004 | 15.85 | 0.038 | 0.31 | 0.001 | 11.21 | 0.013 | 7.09 | 0.005 | 17.13 | 0.052 | |

# 7 RF Bandwidth Measurement

## 7.1. Limit

N/A

## 7.2. Test Setup




## 7.3. Test Instruments

| Equipment | Manufacturer | Model Number | Serial Number | Cal. Date | Remark |
|---|---|---|---|---|---|
| Spectrum Analyzer | Agilent | E4445A | MY45300744 | 12/19/2012 | (1) |
| Test Site | ATL | TE05 | TE05 | N.C.R. | ----- |

Remark: (1) Calibration period 1 year. (2) Calibration period 2 years.

Note: N.C.R. = No Calibration Request.

## 7.4. Test Procedure

The test is performed in accordance with KDB789033 D01 General UNII Test Procedures v01r03 , Guidelines for Compliance Testing of Unlicensed National Information Infrastructure (U-NII) Devices - Part 15, Subpart E.

## 7.5. Test Result

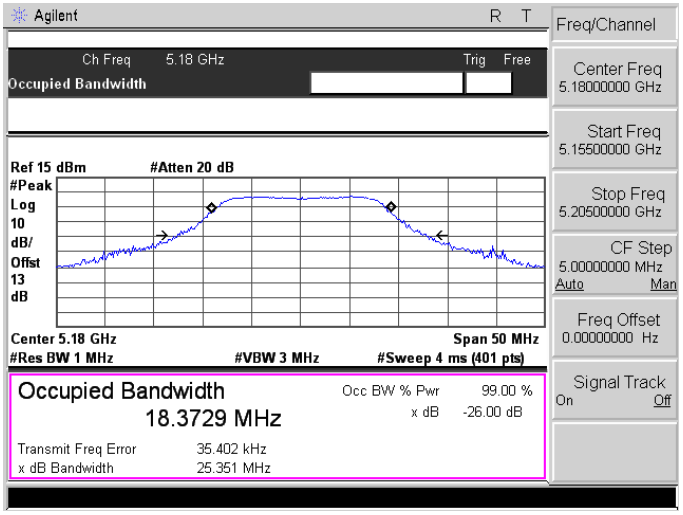
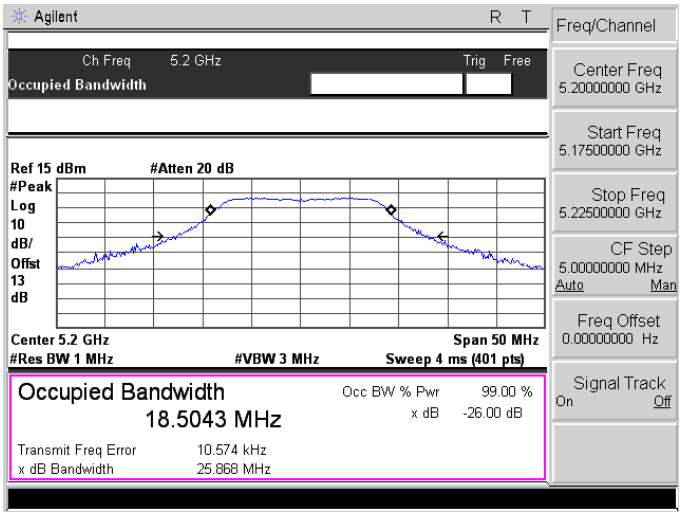
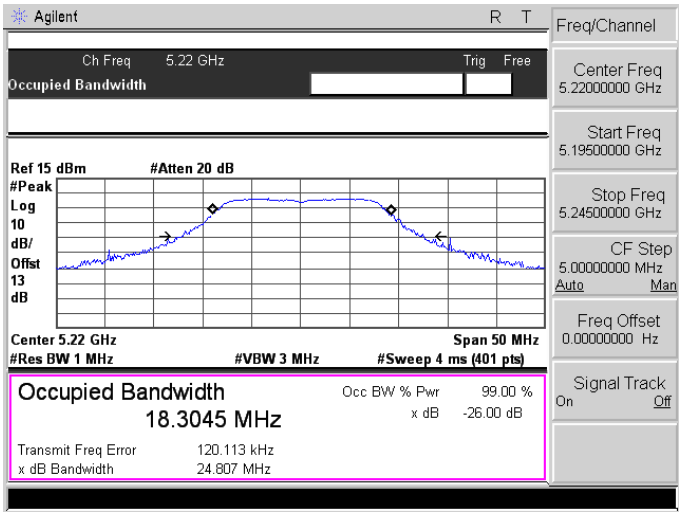
| Model Number | AirCard 781S | | | |
|---|---|---|---|---|
| Test Item | 26dB RF Bandwidth / 99% Occupied Bandwidth | | | |
| Test Mode | Mode 2: IEEE 802.11a Link Mode | | | |
| Date of Test | 09/03/2013 | | Test Site | TE05 |
| Frequency (MHz) | ANT1 | | ANT2 | |
| | 26dB RF Bandwidth (MHz) | 99% Occupied Bandwidth (MHz) | 26dB RF Bandwidth (MHz) | 99% Occupied Bandwidth (MHz) |
| 5180 | 25.352 | 18.3729 | 23.877 | 18.5503 |
| 5200 | 25.868 | 18.5043 | 24.455 | 18.5970 |
| 5220 | 24.807 | 18.3045 | 24.701 | 18.7170 |

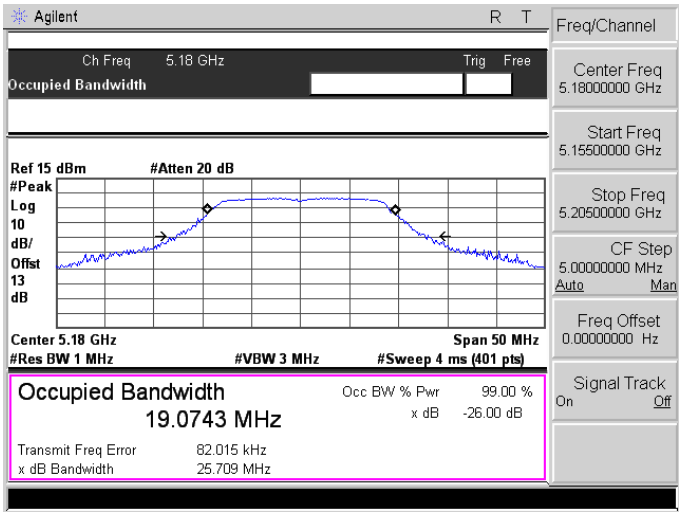
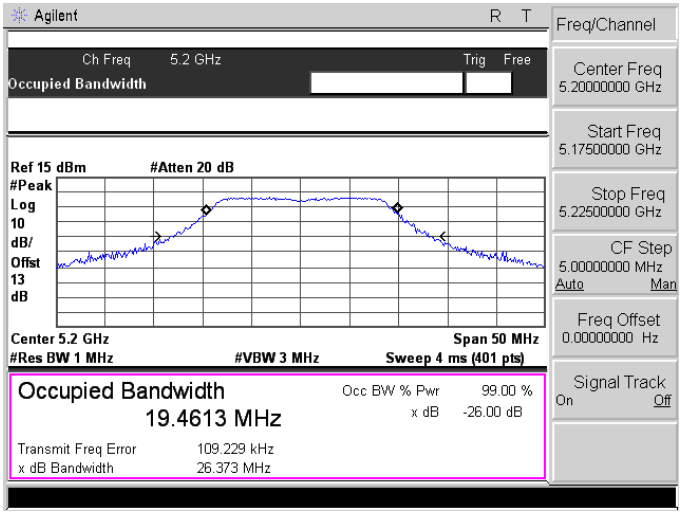
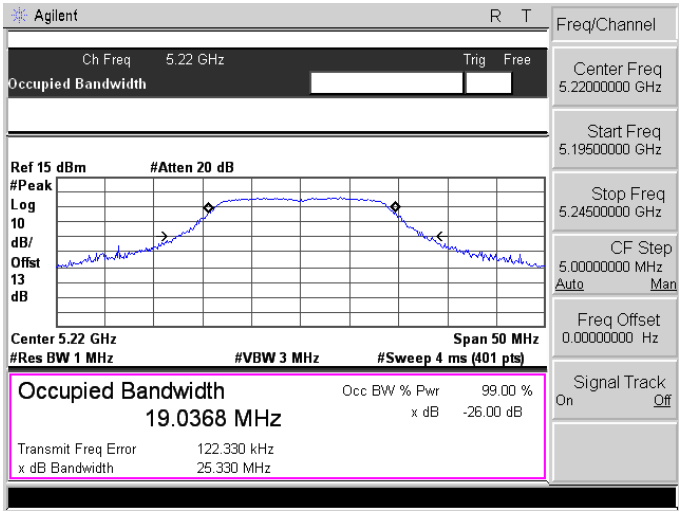
| Model Number | AirCard 781S | | | |
|---|---|---|---|---|
| Test Item | 26dB RF Bandwidth / 99% Occupied Bandwidth | | | |
| Test Mode | Mode 3: IEEE 802.11n 20MHz Link Mode | | | |
| Date of Test | 09/03/2013 | | Test Site | TE05 |
| Frequency (MHz) | ANT1 | | ANT2 | |
| | 26dB RF Bandwidth (MHz) | 99% Occupied Bandwidth (MHz) | 26dB RF Bandwidth (MHz) | 99% Occupied Bandwidth (MHz) |
| 5180 | 25.709 | 19.0743 | 25.661 | 20.0411 |
| 5200 | 26.373 | 19.4613 | 25.426 | 19.8418 |
| 5220 | 25.330 | 19.0368 | 25.386 | 19.8476 |

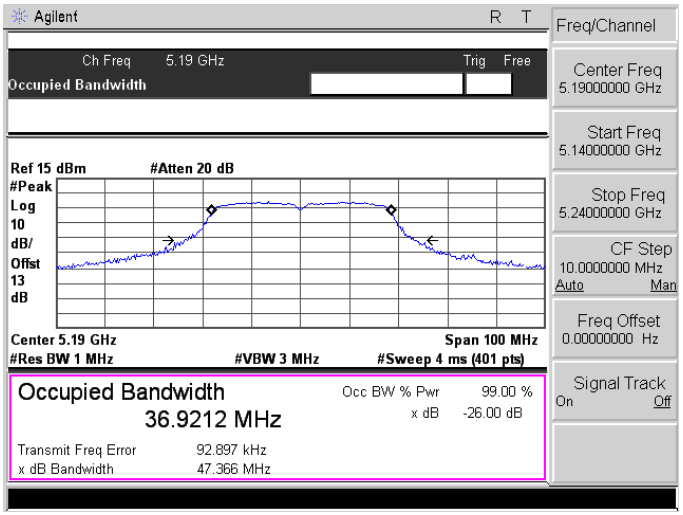
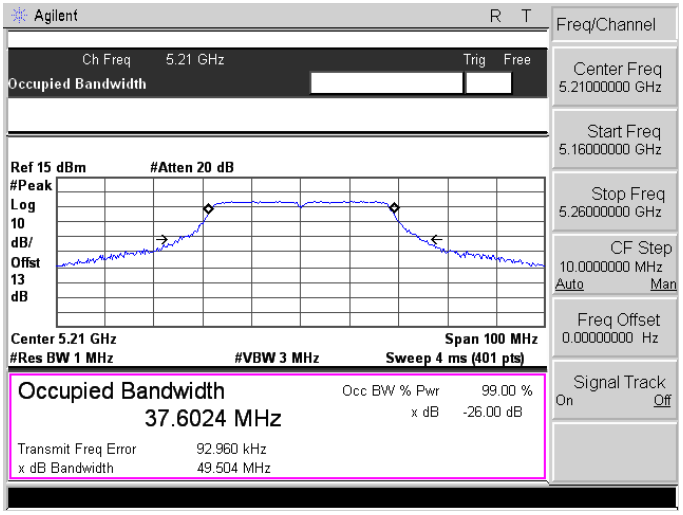
| Model Number | AirCard 781S | | | |
|---|---|---|---|---|
| Test Item | 26dB RF Bandwidth / 99% Occupied Bandwidth | | | |
| Test Mode | Mode 4: IEEE 802.11n 40MHz Link Mode | | | |
| Date of Test | 09/03/2013 | | Test Site | TE06 |
| Frequency (MHz) | ANT1 | | ANT2 | |
| | 26dB RF Bandwidth (MHz) | 99% Occupied Bandwidth (MHz) | 26dB RF Bandwidth (MHz) | 99% Occupied Bandwidth (MHz) |
| 5190 | 47.366 | 36.9212 | 45.160 | 35.5754 |
| 5210 | 49.504 | 37.6024 | 44.141 | 35.6783 |

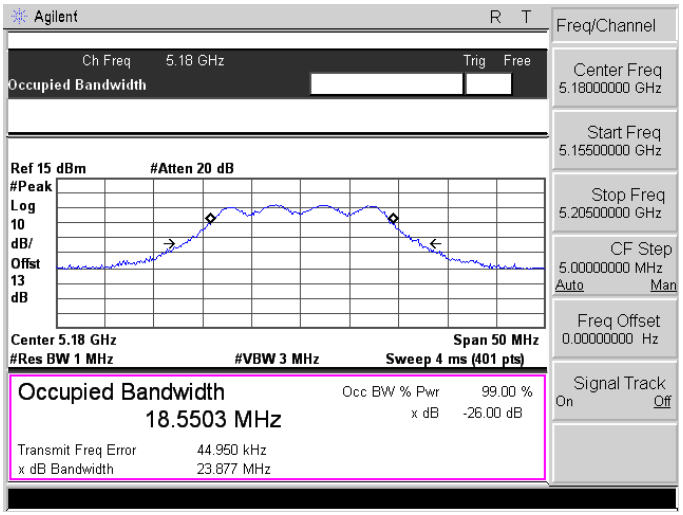
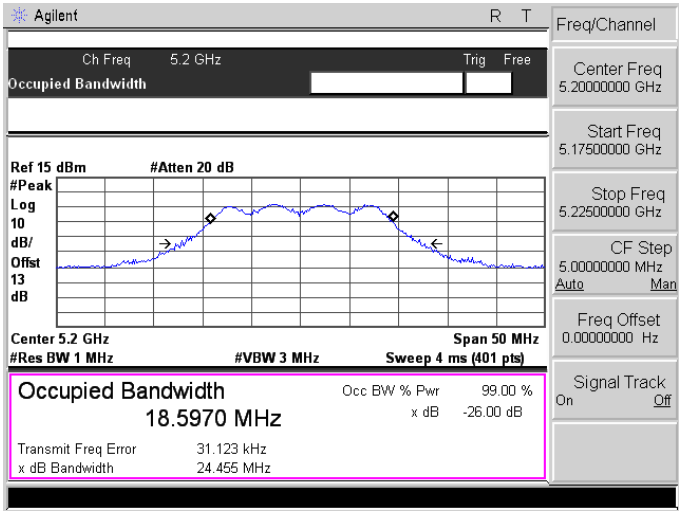
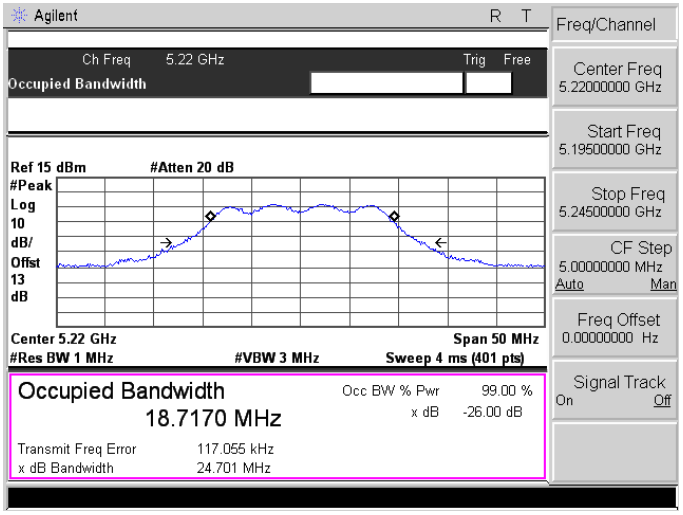
## 7.6. Test Graphs

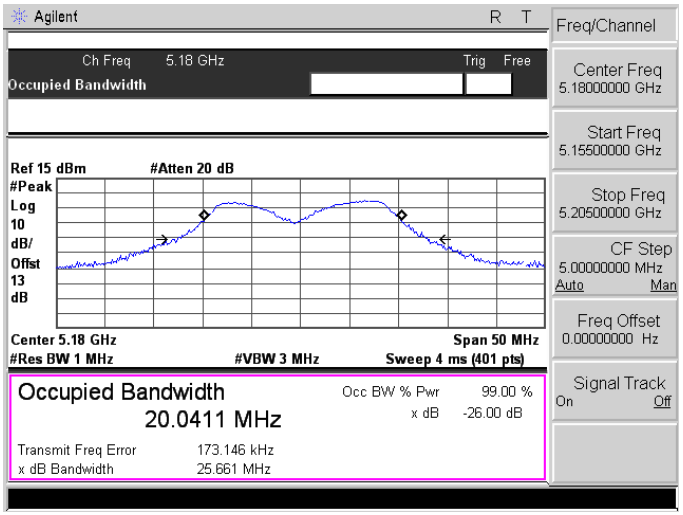
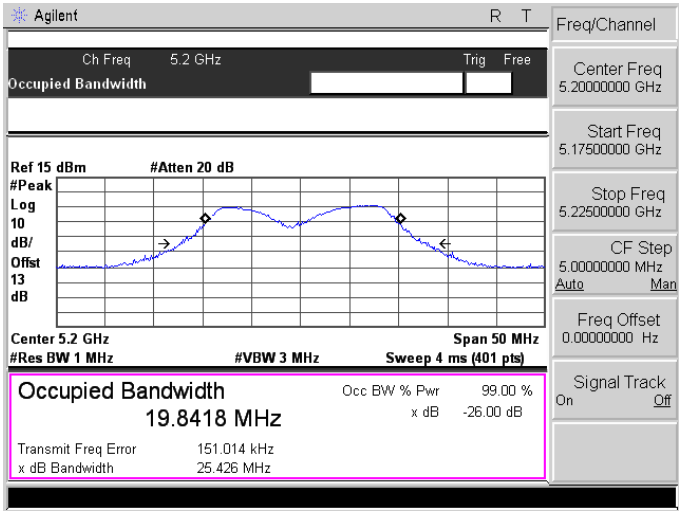
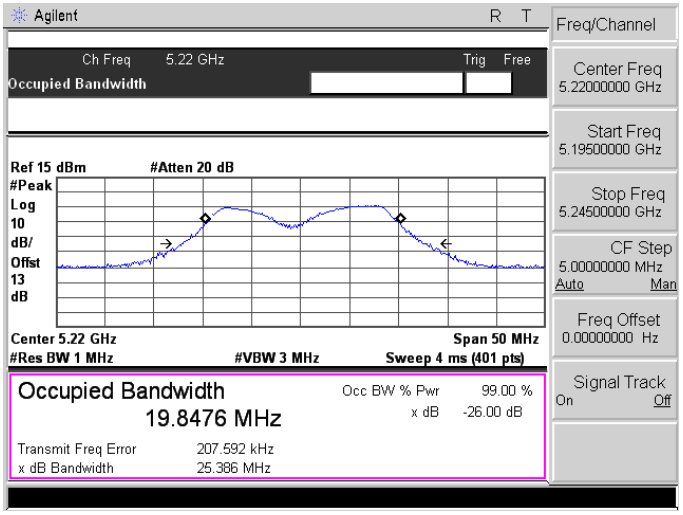
**26dB RF Bandwidth / 99% Occupied Bandwidth**

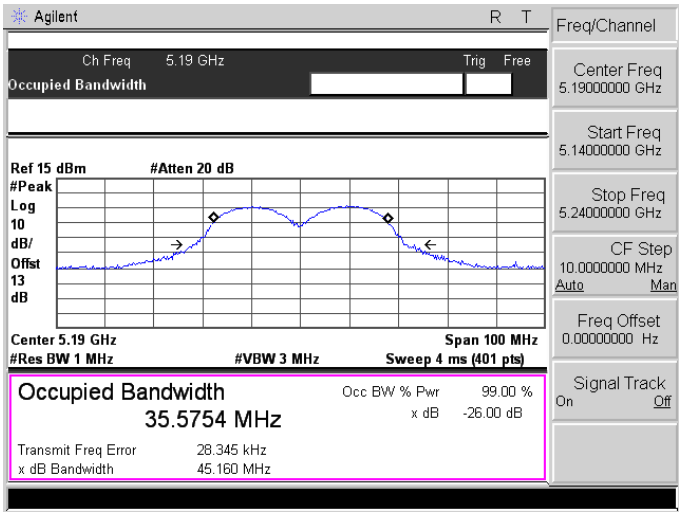
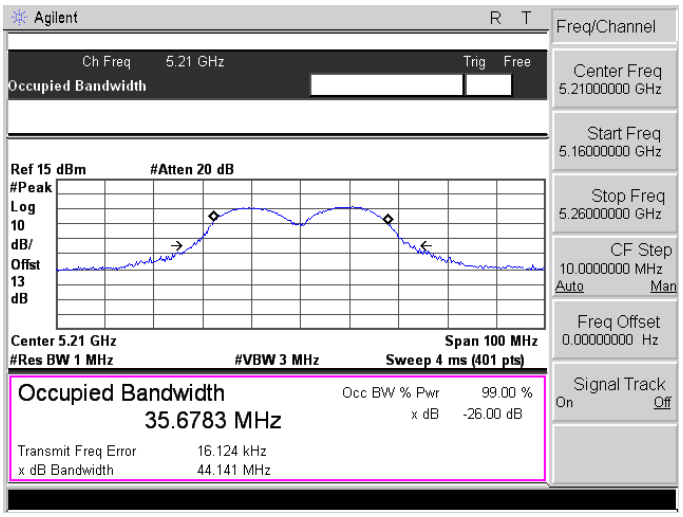
| Mode 2: IEEE 802.11a Link Mode _ ANT 1 | |
|---|---|
| 5180 |  |
| 5200 |  |
| 5220 |  |

| Mode 3: IEEE 802.11n 20MHz Link Mode _ ANT 1 | |
|---|---|
| 5180 |  |
| 5200 |  |
| 5220 |  |

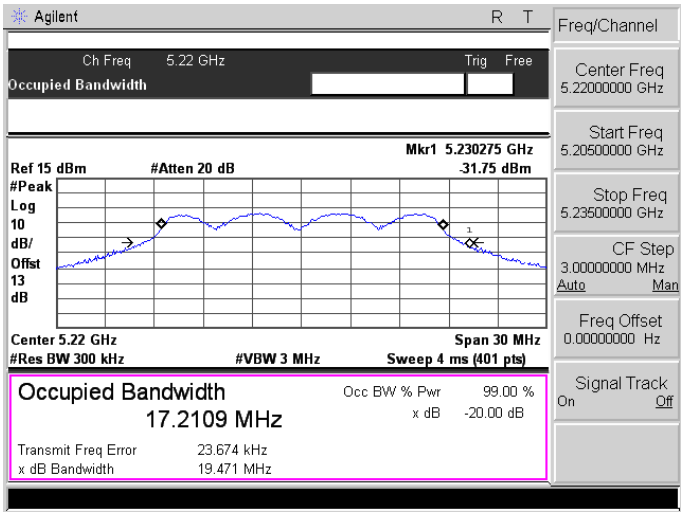
| Mode 4: IEEE 802.11n 40MHz Link Mode _ ANT 1 | |
|---|---|
| 5190 |  |
| 5210 |  |

| Mode 2: IEEE 802.11a Link Mode _ ANT 2 | |
|---|---|
| 5180 |  |
| 5200 |  |
| 5220 |  |

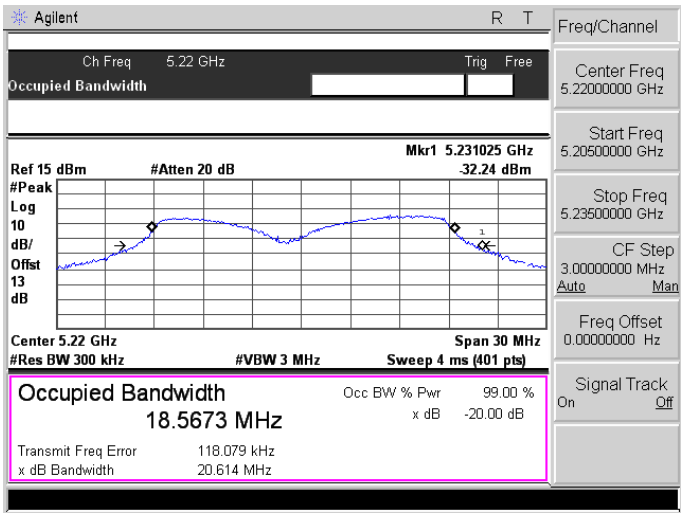
| Mode 3: IEEE 802.11n 20MHz Link Mode _ ANT 2 | |
|---|---|
| 5180 |  |
| 5200 |  |
| 5220 |  |

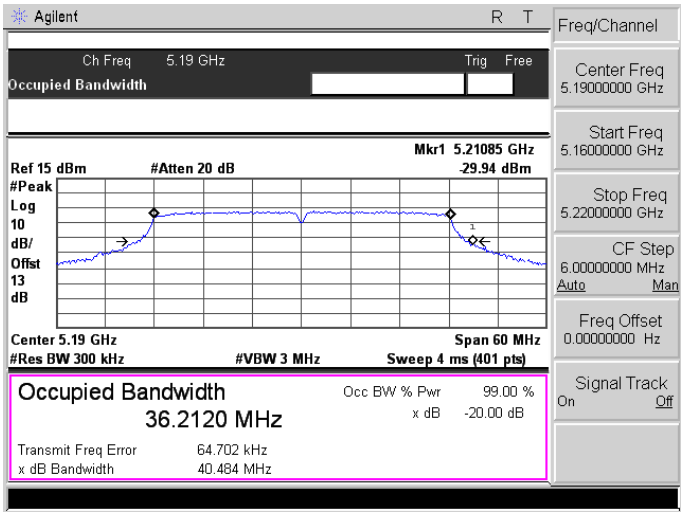
| Mode 4: IEEE 802.11n 40MHz Link Mode _ ANT 2 | |
|---|---|
| 5190 |  |
| 5210 |  |

**-20dB Bandwidth**

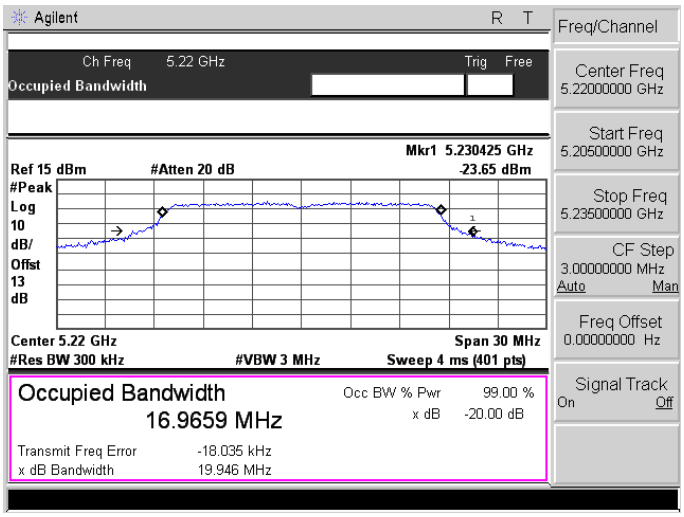
| Mode 2: IEEE 802.11a Link Mode _ ANT 1 | |
|---|---|
| 5220 |  |

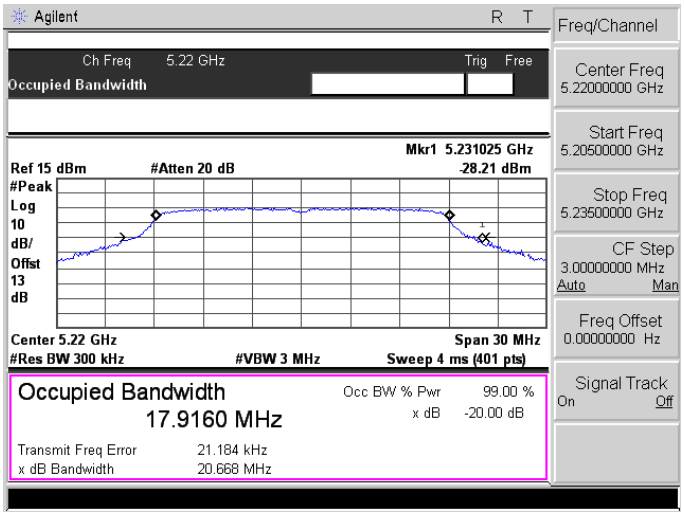


| Mode 3: IEEE 802.11n 20MHz Link Mode _ ANT 1 | |
|---|---|
| 5220 |  |

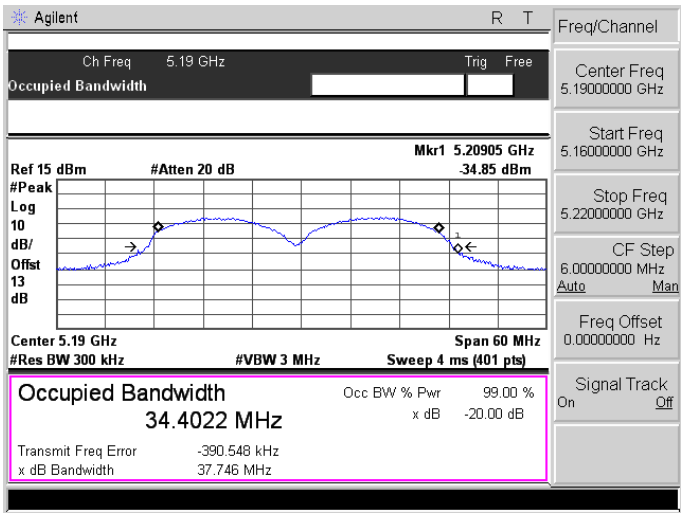
| Mode 4: IEEE 802.11n 40MHz Link Mode _ ANT 1 | |
|---|---|
| 5190 |  |



| Mode 2: IEEE 802.11a Link Mode _ ANT 2 | |
|---|---|
| 5220 |  |

| Mode 3: IEEE 802.11n 20MHz Link Mode _ ANT 2 | |
|---|---|
| 5220 |  |



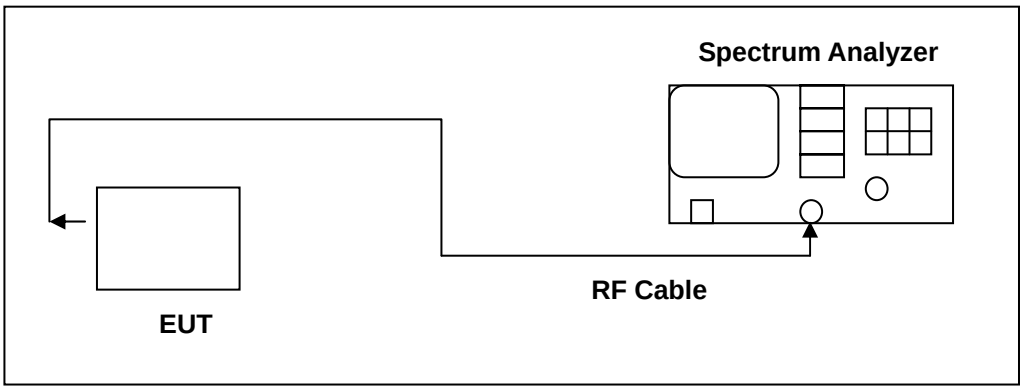
| Mode 4: IEEE 802.11n 40MHz Link Mode _ ANT 2 | |
|---|---|
| 5190 |  |

# 8 Peak Excursion Ratio Measurement

## 8.1. Limit

| Frequency Range (MHz) | Limit |
|---|---|
| 5.150 ~ 5.250 GHz | 13 dB |
| 5.250 ~ 5.350 GHz | 13 dB |
| 5.470 ~ 5.725 GHz | 13 dB |

## 8.2. Test Setup




## 8.3. Test Instruments

| Equipment | Manufacturer | Model Number | Serial Number | Cal. Date | Remark |
|---|---|---|---|---|---|
| Spectrum Analyzer | Agilent | E4445A | MY45300744 | 12/19/2012 | (1) |
| Test Site | ATL | TE05 | TE05 | N.C.R. | ----- |

Remark: (1) Calibration period 1 year. (2) Calibration period 2 years.

Note: N.C.R. = No Calibration Request.

## 8.4. Test Procedure

The test is performed in accordance with KDB789033 D01 General UNII Test Procedures v01r03 , Guidelines for Compliance Testing of Unlicensed National Information Infrastructure (U-NII) Devices - Part 15, Subpart E.

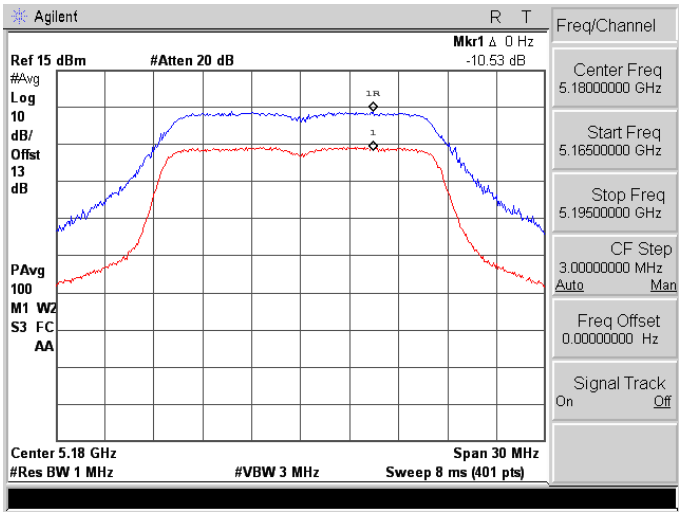
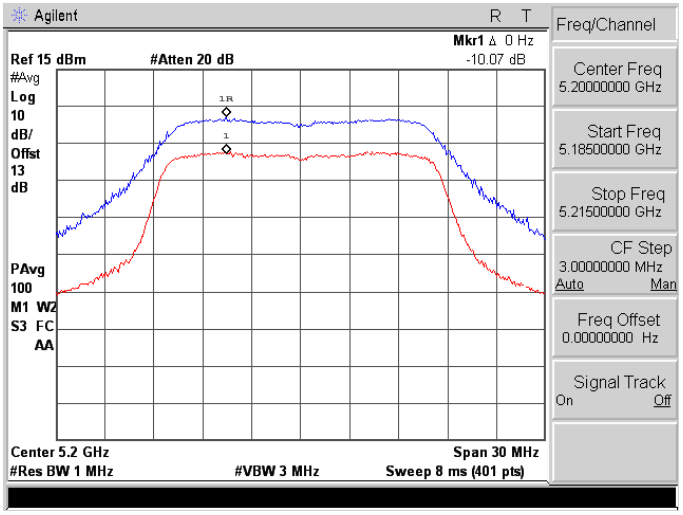
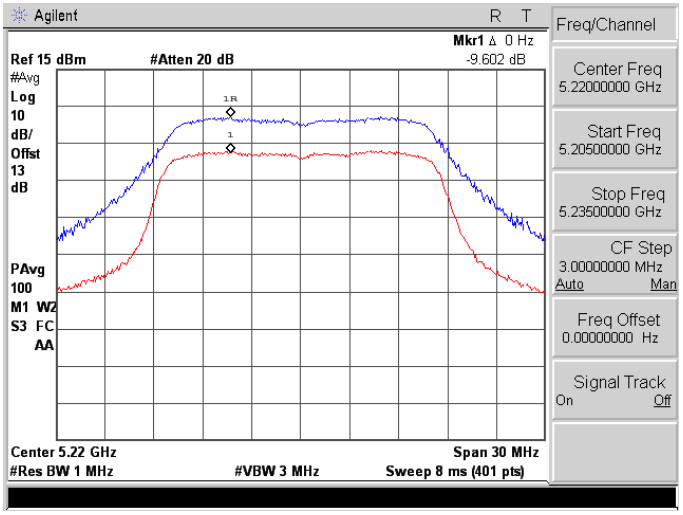
## 8.5. Test Result

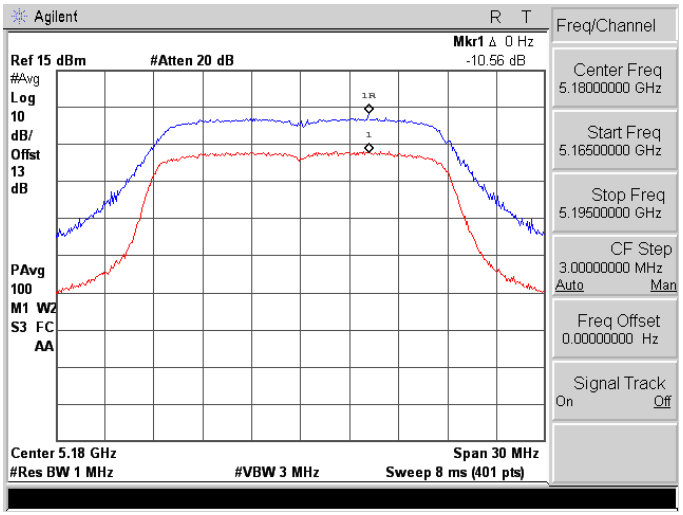
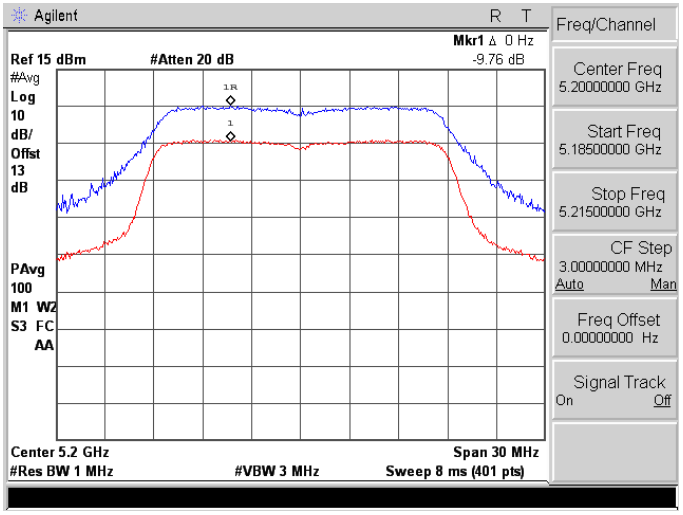
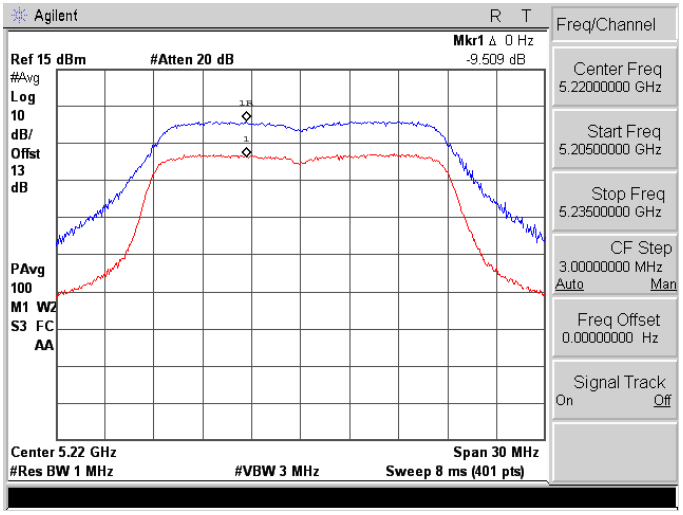
| Model Number | AirCard 781S | | |
|---|---|---|---|
| Test Item | Peak Excursion Ratio | | |
| Test Mode | Mode 2: IEEE 802.11a Link Mode | | |
| Date of Test | 09/03/2013 | Test Site | TE05 |
| Frequency (MHz) | ANT1 (dB) | ANT2 (dB) | Limit (dB) |
| 5180 | -10.530 | -9.789 | < 13 |
| 5200 | -10.070 | -8.844 | |
| 5220 | -9.602 | -9.234 | |

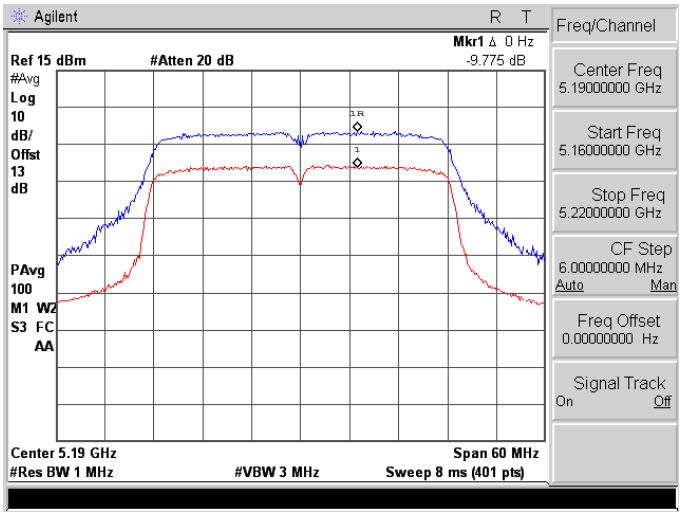
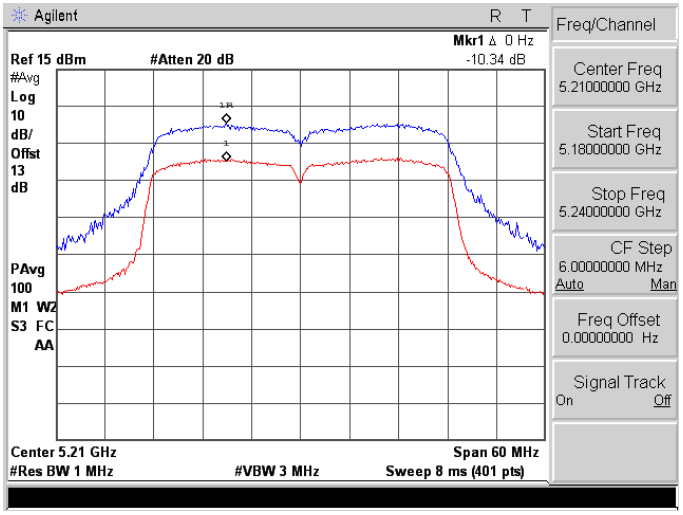
| Model Number | AirCard 781S | | |
|---|---|---|---|
| Test Item | Peak Excursion Ratio | | |
| Test Mode | Mode 3: IEEE 802.11n 20MHz Link Mode | | |
| Date of Test | 09/03/2013 | Test Site | TE05 |
| Frequency (MHz) | ANT1 (dB) | ANT2 (dB) | Limit (dB) |
| 5180 | -10.560 | -9.670 | < 13 |
| 5200 | -9.760 | -9.734 | |
| 5220 | -9.509 | -9.209 | |

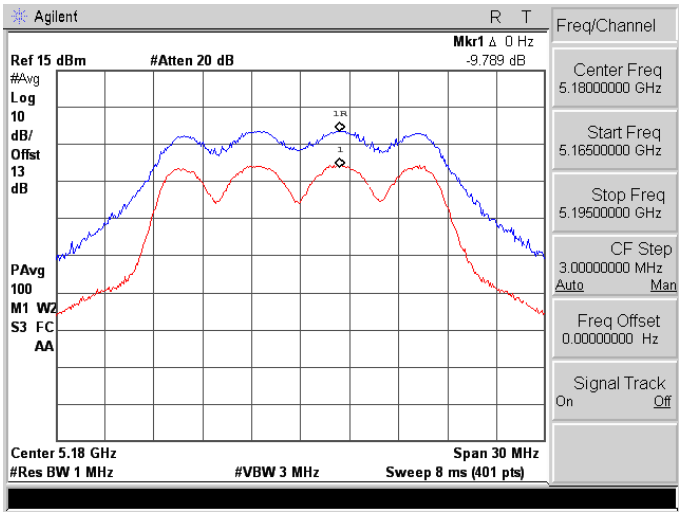
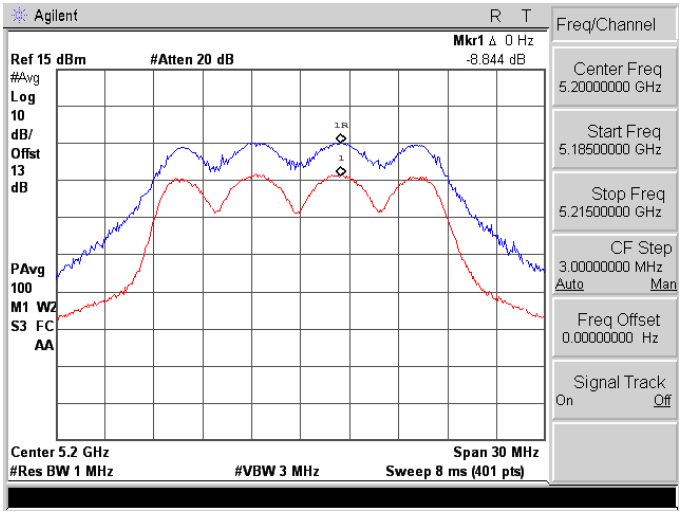
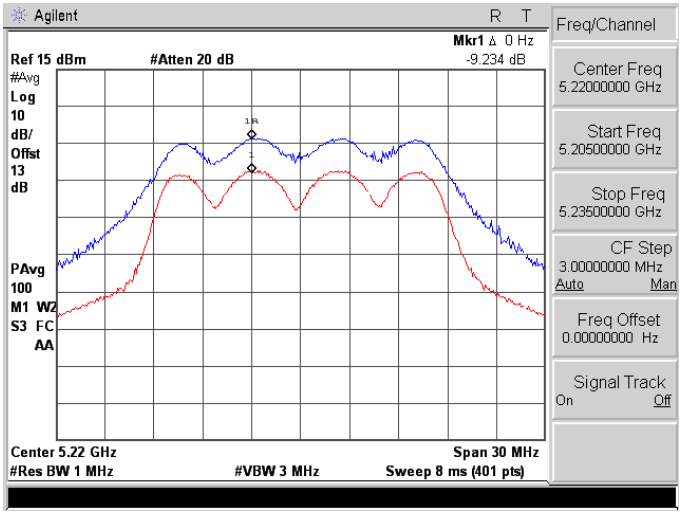
| Model Number | AirCard 781S | | |
|---|---|---|---|
| Test Item | Peak Excursion Ratio | | |
| Test Mode | Mode 4: IEEE 802.11n 40MHz Link Mode | | |
| Date of Test | 09/03/2013 | Test Site | TE06 |
| Frequency (MHz) | ANT1 (dB) | ANT2 (dB) | Limit (dB) |
| 5190 | -9.775 | -9.380 | < 13 |
| 5210 | -10.340 | -9.606 | |

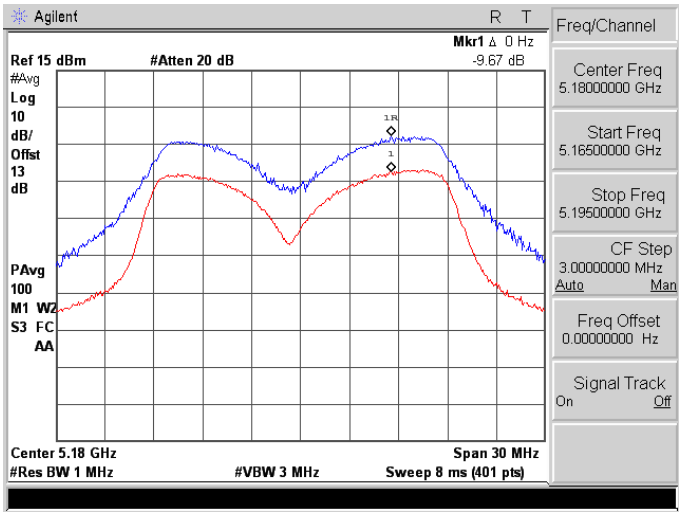
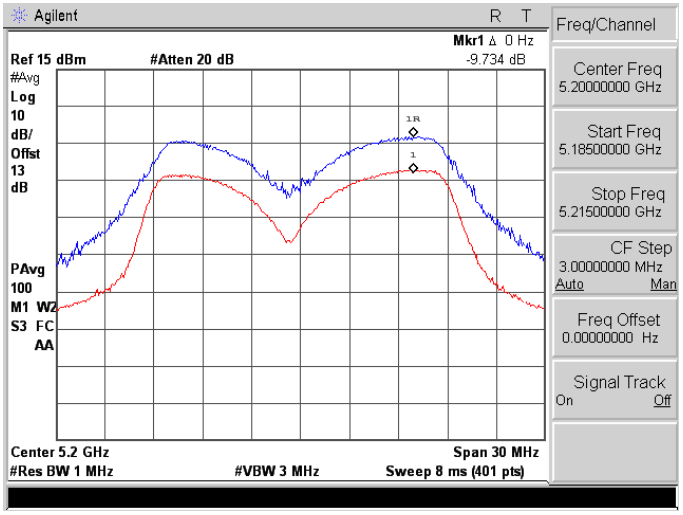
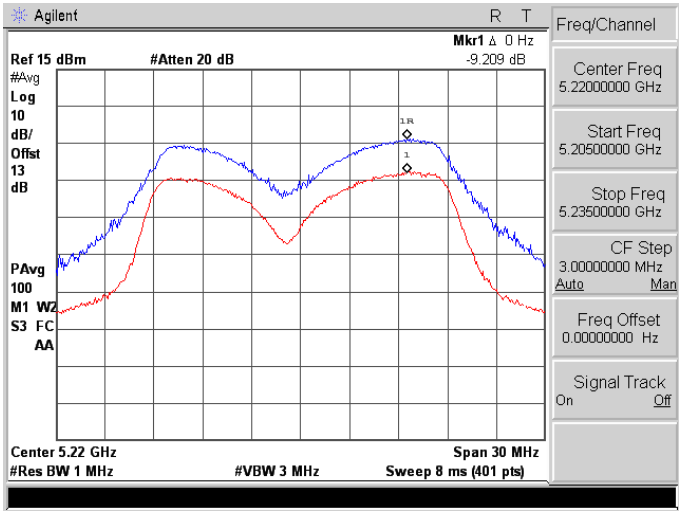
## 8.6. Test Graphs

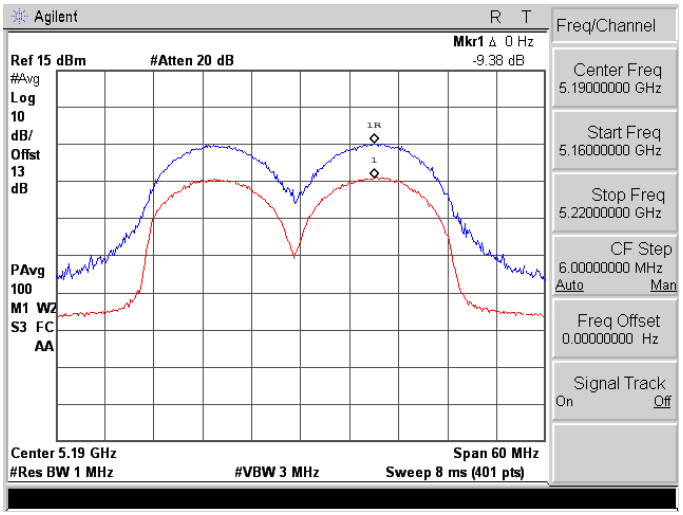
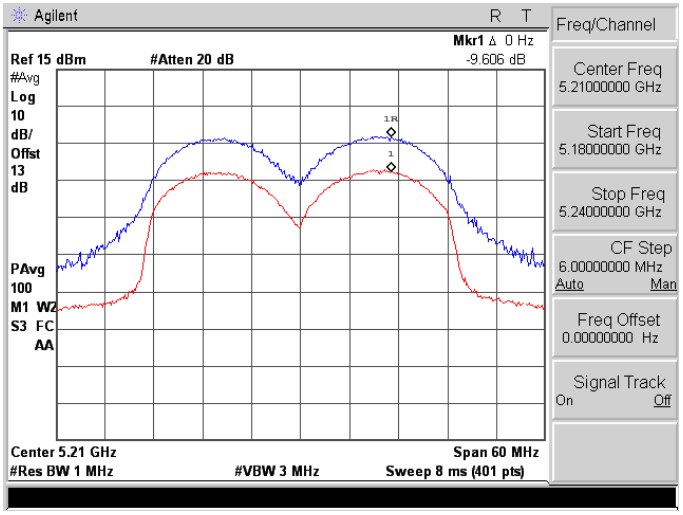
| Mode 2: IEEE 802.11a Link Mode _ ANT1 | |
|---|---|
| 5180 |  |
| 5200 |  |
| 5220 |  |

| Mode 3: IEEE 802.11n 20MHz Link Mode _ ANT1 | |
|---|---|
| 5180 |  |
| 5200 |  |
| 5220 |  |

| Mode 4: IEEE 802.11n 40MHz Link Mode _ ANT1 | |
|---|---|
| 5190 |  |
| 5210 |  |

| Mode 2: IEEE 802.11a Link Mode _ ANT2 | |
|---|---|
| 5180 |  |
| 5200 |  |
| 5220 |  |

| Mode 3: IEEE 802.11n 20MHz Link Mode _ ANT2 | |
|---|---|
| 5180 |  |
| 5200 |  |
| 5220 |  |

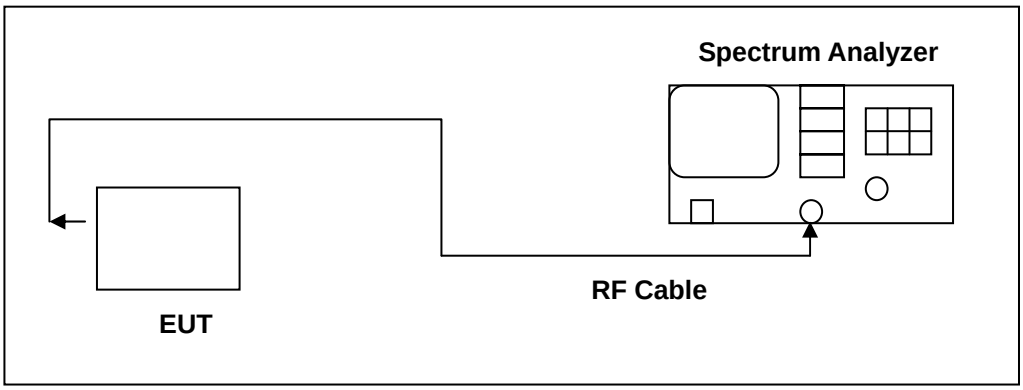
| Mode 4: IEEE 802.11n 40MHz Link Mode _ ANT2 | |
|---|---|
| 5190 |  |
| 5210 |  |

# 9 Peak Power Spectral Density Measurement

## 9.1. Limit

| Frequency Range (MHz) | Limit |
|---|---|
| 5.150 ~ 5.250 GHz | 4 dB |
| 5.250 ~ 5.350 GHz | 11 dB |
| 5.470 ~ 5.725 GHz | 11 dB |

## 9.2. Test Setup




## 9.3. Test Instruments

| Equipment | Manufacturer | Model Number | Serial Number | Cal. Date | Remark |
|---|---|---|---|---|---|
| Spectrum Analyzer | Agilent | E4445A | MY45300744 | 12/19/2012 | (1) |
| Test Site | ATL | TE05 | TE05 | N.C.R. | ----- |

Remark: (1) Calibration period 1 year. (2) Calibration period 2 years.
Note: N.C.R. = No Calibration Request.

## 9.4. Test Procedure

The test is performed in accordance with KDB789033 D01 General UNII Test Procedures v01r03 , Guidelines for Compliance Testing of Unlicensed National Information Infrastructure (U-NII) Devices - Part 15, Subpart E.

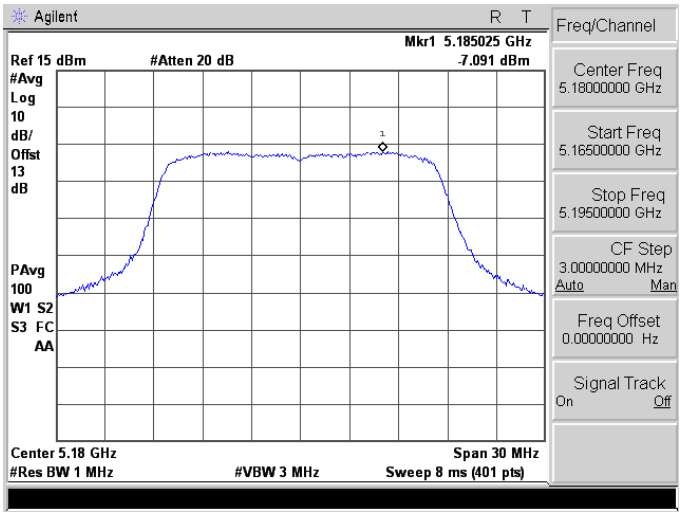
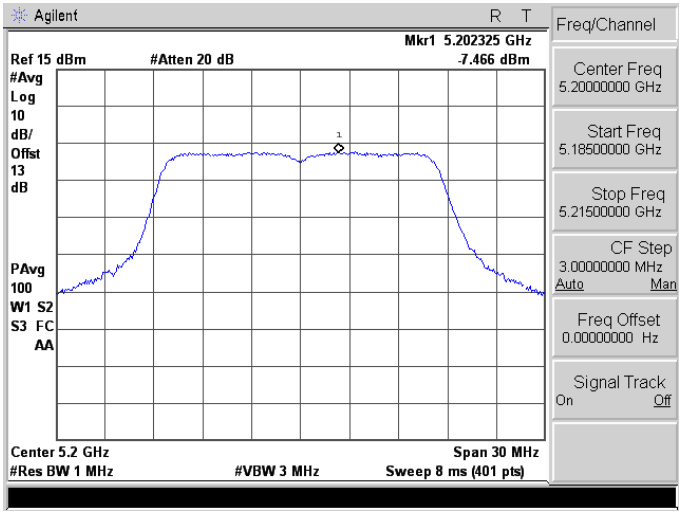
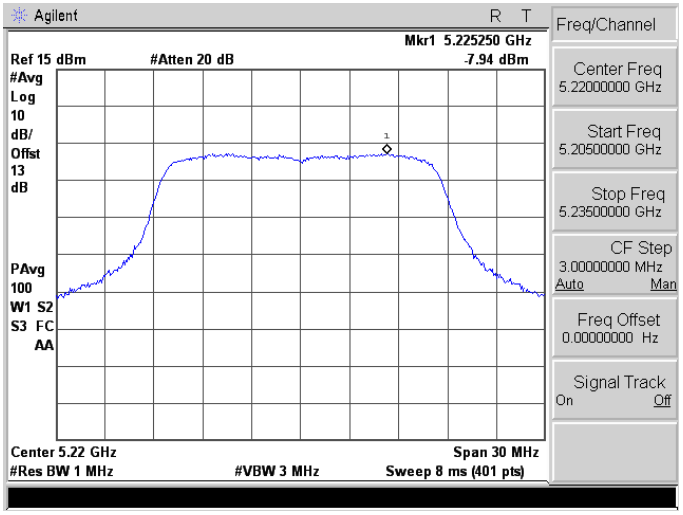
## 9.5. Test Result

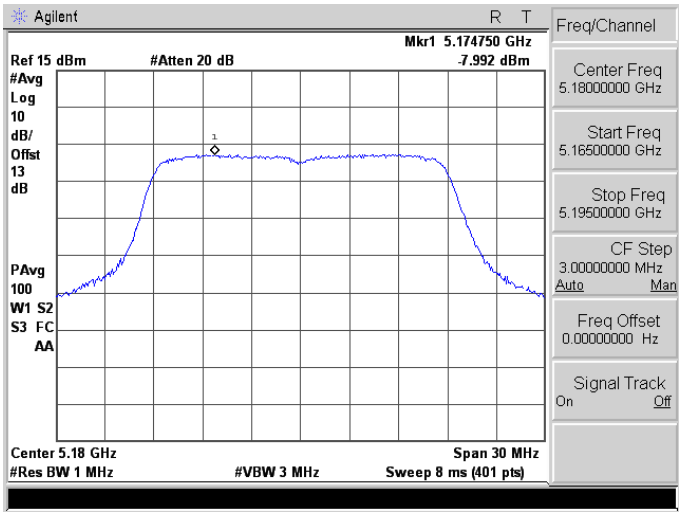
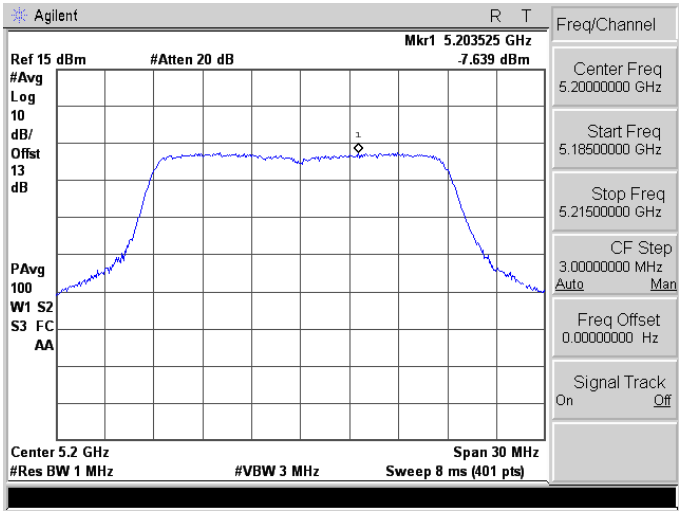
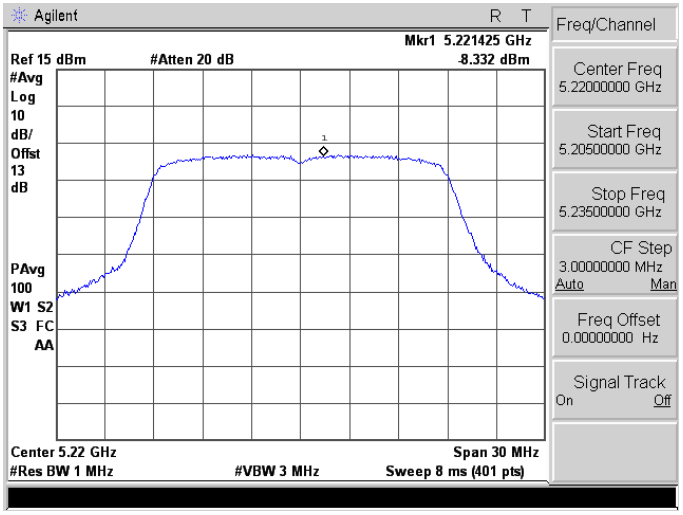
| Model Number | AirCard 781S | | | |
|---|---|---|---|---|
| Test Item | Peak Power Spectral Density | | | |
| Test Mode | Mode 2: IEEE 802.11a Link Mode | | | |
| Date of Test | 09/03/2013 | | Test Site | TE05 |
| Frequency (MHz) | ANT1 (dBm) | ANT2 (dBm) | ANT+ANT2 (dBm) | Limit (dBm) |
| 5180 | -7.09 | -11.03 | -5.62 | < 4 |
| 5210 | -7.47 | -10.52 | -5.72 | |
| 5220 | -7.94 | -11.60 | -6.39 | |

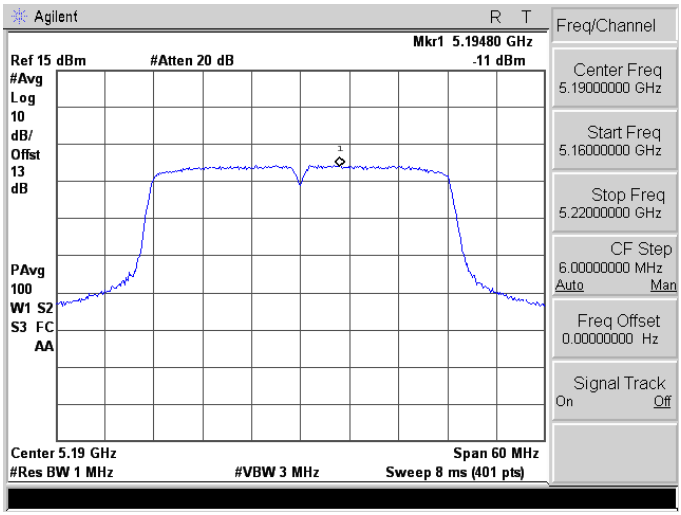
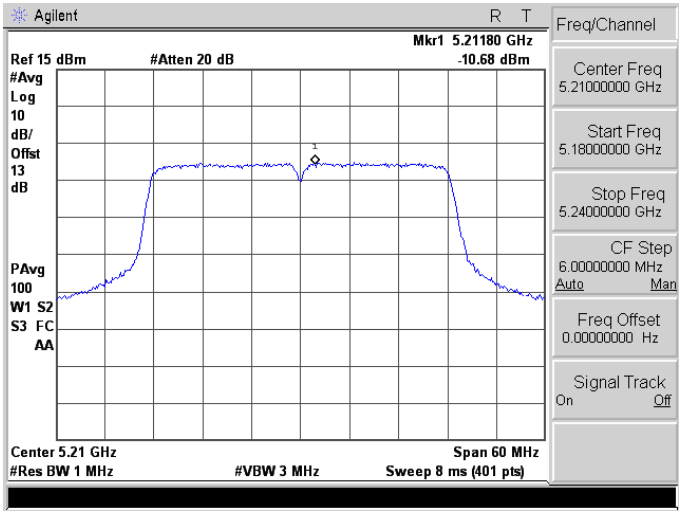
| Model Number | AirCard 781S | | | |
|---|---|---|---|---|
| Test Item | Peak Power Spectral Density | | | |
| Test Mode | Mode 3: IEEE 802.11n 20MHz Link Mode | | | |
| Date of Test | 09/03/2013 | | Test Site | TE05 |
| Frequency (MHz) | ANT1 (dBm) | ANT2 (dBm) | ANT+ANT2 (dBm) | Limit (dBm) |
| 5180 | -7.99 | -12.80 | -6.75 | < 4 |
| 5210 | -7.64 | -12.64 | -6.45 | |
| 5220 | -8.33 | -13.51 | -7.18 | |

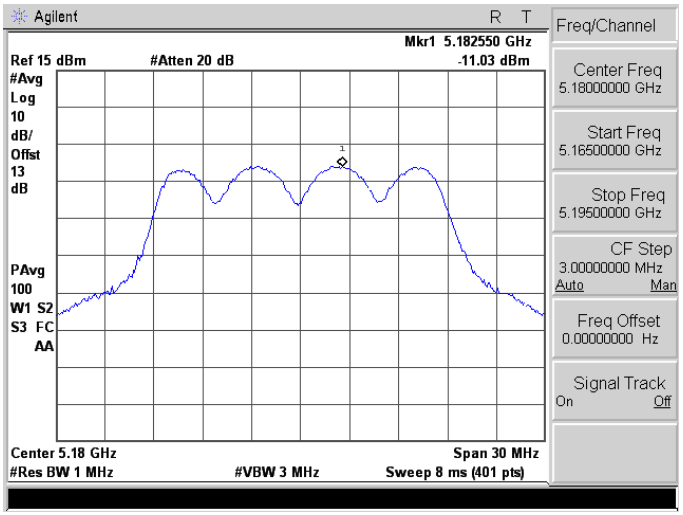
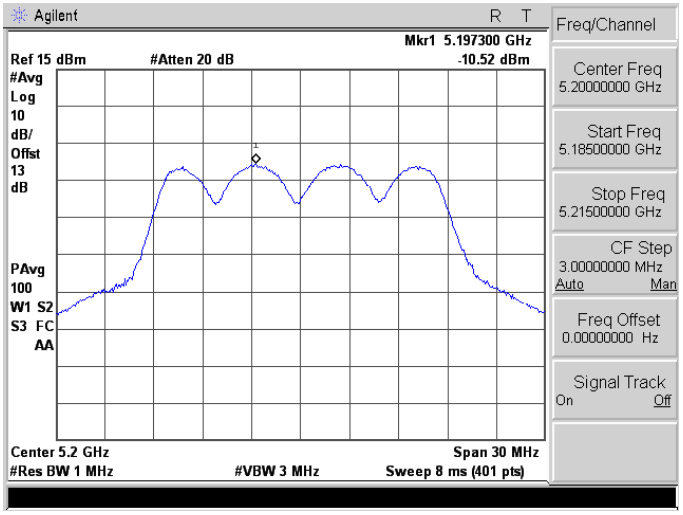
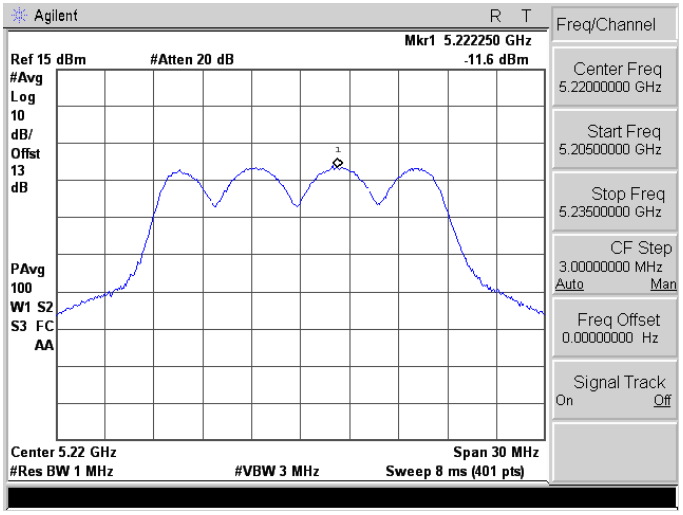
| Model Number | AirCard 781S | | | |
|---|---|---|---|---|
| Test Item | Peak Power Spectral Density | | | |
| Test Mode | Mode 4: IEEE 802.11n 40MHz Link Mode | | | |
| Date of Test | 09/03/2013 | | Test Site | TE05 |
| Frequency (MHz) | ANT1 (dBm) | ANT2 (dBm) | ANT+ANT2 (dBm) | Limit (dBm) |
| 5190 | -7.99 | -12.80 | -6.75 | < 4 |
| 5210 | -7.64 | -12.64 | -6.45 | |

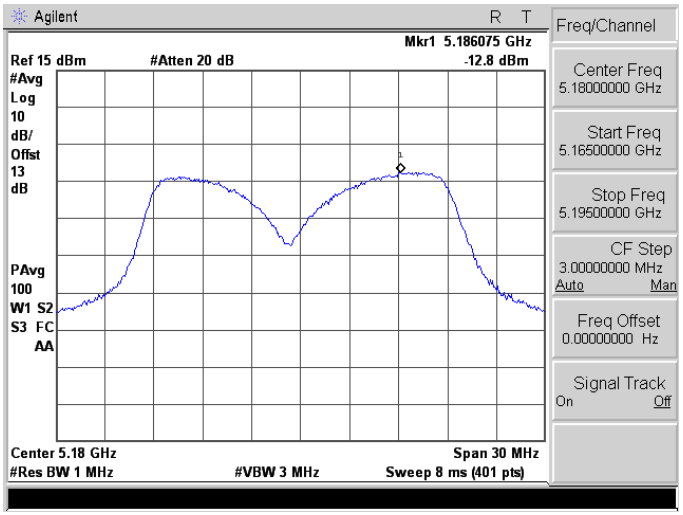
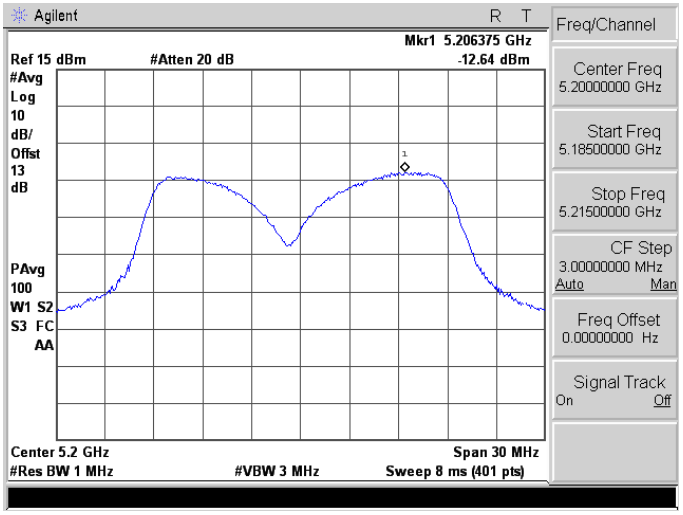
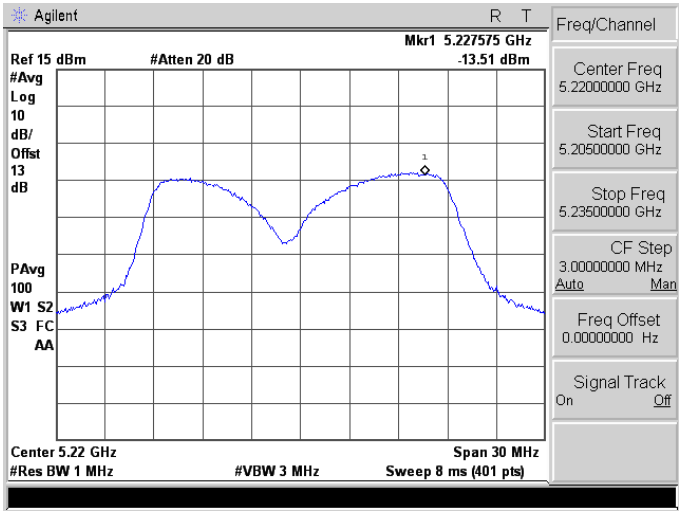
## 9.6. Test Graphs

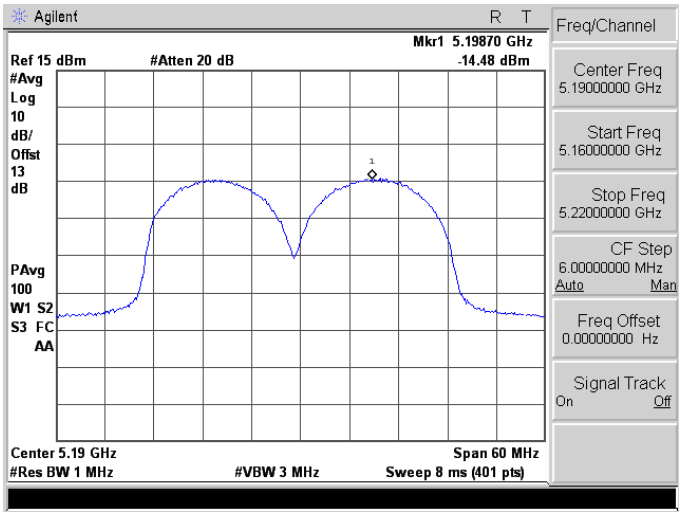
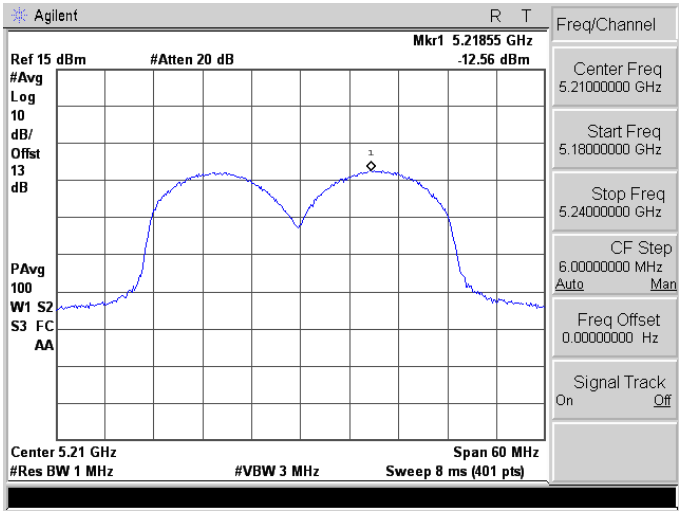
| Mode 2: IEEE 802.11a Link Mode _ ANT1 | |
|---|---|
| 5180 |  |
| 5200 |  |
| 5220 |  |

| Mode 3: IEEE 802.11n 20MHz Link Mode _ ANT1 | |
|---|---|
| 5180 |  |
| 5200 |  |
| 5220 |  |

| Mode 4: IEEE 802.11n 40MHz Link Mode _ ANT1 | |
|---|---|
| 5190 |  |
| 5210 |  |

| Mode 2: IEEE 802.11a Link Mode _ ANT2 | |
|---|---|
| 5180 |  |
| 5200 |  |
| 5220 |  |

| Mode 3: IEEE 802.11n 20MHz Link Mode _ ANT2 | |
|---|---|
| 5180 |  |
| 5200 |  |
| 5220 |  |

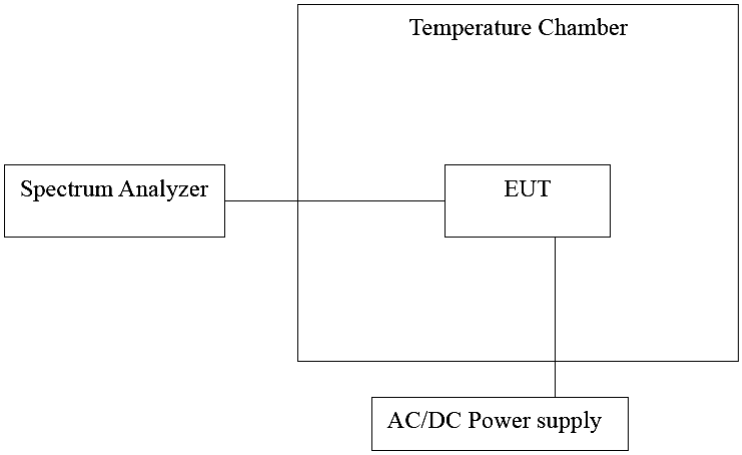
| Mode 4: IEEE 802.11n 40MHz Link Mode _ ANT2 | |
|---|---|
| 5190 |  |
| 5210 |  |

# 10 Frequency Stability Measurement

## 10.1. Limit

The frequency tolerance of the carrier signal shall be maintained within the band of operation frequency over a temperature variation of –30 degrees to 50 degrees C at normal supply voltage, and for a variation in the primary supply voltage from 85% to 115% of the rated supply voltage at a temperature of 20 degrees C.

## 10.2. Test Setup




## 10.3. Test Instruments

| Equipment | Manufacturer | Model Number | Serial Number | Cal. Date | Remark |
|---|---|---|---|---|---|
| Spectrum Analyzer | Agilent | E4408B | MY45107753 | 07/11/2013 | (1) |
| Temperature & Humidity Chamber | TAICHY | MHU-225LA | 980729 | 08/07/2013 | (1) |
| Test Site | ATL | TE05 | TE05 | N.C.R. | ----- |

Remark: (1) Calibration period 1 year. (2) Calibration period 2 years.

Note: N.C.R. = No Calibration Request.

## 10.4. Test Procedure

1. The EUT was placed inside the environmental test chamber and powered by nominal DC voltage.
2. Turn the EUT on and couple its output to a spectrum analyzer.
3. Turn the EUT off and set the chamber to the highest temperature specified.
4. Allow sufficient time (approximately 30 min) for the temperature of the chamber to stabilize.
5. Repeat step 2 and 3 with the temperature chamber set to the lowest temperature.
6. 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.

## 10.5. Test Result

**Temperature Variations**

| Model Number | AirCard 781S | | | | |
|---|---|---|---|---|---|
| Test Mode | Mode 2 | | | | |
| Frequency | 5200 MHz | | | | |
| Date of Test | 09/03/2013 | | | Test Site | TE05 |
| Temp. ($^{o}$C) | Voltage (VAC) | Measured Frequency (MHz) | Delta Frequency (Hz) | Tolerance (ppm) | Result (Pass/Fail) |
| -30 | 120 | 5200.0105 | 10500 | -2.011 | Pass |
| -20 | | 5200.0236 | 23600 | -4.521 | Pass |
| -10 | | 5200.0349 | 34900 | -6.686 | Pass |
| 0 | | 5199.9795 | -20500 | 3.927 | Pass |
| 10 | | 5199.9577 | -42300 | 8.103 | Pass |
| 20 | | 5200.0315 | 31500 | -6.034 | Pass |
| 30 | | 5199.9744 | -25600 | 4.904 | Pass |
| 40 | | 5199.9772 | -22800 | 4.368 | Pass |
| 50 | | 5200.0148 | 14800 | -2.835 | Pass |

| Model Number | AirCard 781S | | | | |
|---|---|---|---|---|---|
| Test Mode | Mode 3 | | | | |
| Frequency | 5200 MHz | | | | |
| Date of Test | 09/03/2013 | | | Test Site | TE05 |
| Temp. (°C) | Voltage (VAC) | Measured Frequency (MHz) | Delta Frequency (Hz) | Tolerance (ppm) | Result (Pass/Fail) |
| -30 | 120 | 5220.0165 | 16500 | -3.161 | Pass |
| -20 | | 5219.9813 | -18700 | 3.582 | Pass |
| -10 | | 5220.0312 | 31200 | -5.977 | Pass |
| 0 | | 5220.0125 | 12500 | -2.395 | Pass |
| 10 | | 5219.9652 | -34800 | 6.667 | Pass |
| 20 | | 5220.0675 | 67500 | -12.931 | Pass |
| 30 | | 5220.0352 | 35200 | -6.743 | Pass |
| 40 | | 5220.0469 | 46900 | -8.985 | Pass |
| 50 | | 5219.9877 | -12300 | 2.356 | Pass |

| Model Number | AirCard 781S | | | | |
|---|---|---|---|---|---|
| Test Mode | Mode 4 | | | | |
| Frequency | 5190 MHz | | | | |
| Date of Test | 09/03/2013 | | | Test Site | TE05 |
| Temp. (°C) | Voltage (VAC) | Measured Frequency (MHz) | Delta Frequency (Hz) | Tolerance (ppm) | Result (Pass/Fail) |
| -30 | 120 | 5189.9853 | -14700 | 2.832 | Pass |
| -20 | | 5190.0358 | 35800 | -6.898 | Pass |
| -10 | | 5189.9404 | -59600 | 11.484 | Pass |
| 0 | | 5189.9582 | -41800 | 8.054 | Pass |
| 10 | | 5190.0325 | 32500 | -6.262 | Pass |
| 20 | | 5189.9795 | -20500 | 3.950 | Pass |
| 30 | | 5189.9633 | -36700 | 7.071 | Pass |
| 40 | | 5190.0279 | 27900 | -5.376 | Pass |
| 50 | | 5190.0105 | 10500 | -2.023 | Pass |

**Voltage Variations**

| Model Number | AirCard 781S | | | | |
|---|---|---|---|---|---|
| Test Mode | Mode 2 | | | | |
| Frequency | 5200 MHz | | | | |
| Date of Test | 09/03/2013 | | | Test Site | TE05 |
| Temp. (°(°C)) | Voltage (VAC) | Measured Frequency (MHz) | Delta Frequency (Hz) | Tolerance (ppm) | Result (Pass/Fail) |
| 20 | 115.00 | 5220.0395 | 39500 | -7.567 | Pass |
| | 100.00 | 5220.0315 | 31500 | -6.034 | Pass |
| | 85.00 | 5220.0135 | 13500 | -2.586 | Pass |

| Model Number | AirCard 781S | | | | |
|---|---|---|---|---|---|
| Test Mode | Mode 3 | | | | |
| Frequency | 5200 MHz | | | | |
| Date of Test | 09/03/2013 | | | Test Site | TE05 |
| Temp. (°(°C)) | Voltage (VAC) | Measured Frequency (MHz) | Delta Frequency (Hz) | Tolerance (ppm) | Result (Pass/Fail) |
| 20 | 115.00 | 5219.9893 | -10700 | 2.050 | Pass |
| | 100.00 | 5220.0275 | 27500 | -5.268 | Pass |
| | 85.00 | 5220.0317 | 31700 | -6.073 | Pass |

| Model Number | AirCard 781S | | | | |
|---|---|---|---|---|---|
| Test Mode | Mode 4 | | | | |
| Frequency | 5190 MHz | | | | |
| Date of Test | 09/03/2013 | | | Test Site | TE05 |
| Temp. (°(°C)) | Voltage (VAC) | Measured Frequency (MHz) | Delta Frequency (Hz) | Tolerance (ppm) | Result (Pass/Fail) |
| 20 | 115.00 | 5190.0472 | 47200 | -9.094 | Pass |
| | 100.00 | 5190.0239 | 23900 | -4.605 | Pass |
| | 85.00 | 5190.0317 | 31700 | -6.108 | Pass |

# 11 Antenna Requirement

## 11.1. Limit

For intentional device, according to 15.203, an intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device.
And According to 15.407 (a), if transmitting antennas of directional gain greater than 6 dBi are used, the power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6dBi.

## 11.2. Antenna Connector Construction

The antenna used in this product is Chip dielectric antennas. And the maximum gain of the antenna is 0 dBi.