



FCC PART 15.407  
IC RSS-210, ISSUE 8, DEC 2010  
TEST AND MEASUREMENT REPORT

For

**PayPal**

2211 North First Street,  
San Jose, CA 95131, USA

**FCC ID: 2AB8CDCBNEE01**  
**IC: 11927A-DCBNEE01**  
**Model: DCBNEE01**

|                                        |                                                                                                                                            |
|----------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Report Type:</b><br>Original Report | <b>Product Type:</b><br>802.11a/b/g/n USB sticker                                                                                          |
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| <b>Report Number</b>                   | R1404102-407 W52                                                                                                                           |
| <b>Report Date</b>                     | 2014-06-30                                                                                                                                 |
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\* This report may contain data that are not covered by the A2LA accreditation and are marked with an asterisk "\*" (Rev.3)

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**DOCUMENT REVISION HISTORY**

| Revision Number | Report Number    | Description of Revision | Date of Revision |
|-----------------|------------------|-------------------------|------------------|
| 0               | R1404102-407 W52 | Original Report         | 2014-06-30       |

## 1 General Description

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### 1.1 Product Description for Equipment Under Test (EUT)

This test and measurement report was prepared on behalf of *PayPal* and their product FCC ID: 2AB8CDCBNEE01, IC: 11927A-DCBNEE01, model: DCBNEE01 which will henceforth be referred to as the EUT (Equipment Under Testing). The EUT is a USB sticker with 2.4GHz & 5GHz 802.11 a/b/g/n and Bluetooth.

### 1.2 Mechanical Description of EUT

The EUT measures approximately 9.8 cm (L) x 2.2 cm (W) x 1.0 cm (H) and weighs 18.5 g.

*The test data gathered are from typical production sample, serial number: P6H2CK assigned by Client.*

### 1.3 Objective

This report is prepared on behalf of *PayPal* in accordance with FCC CFR47 §15.407 and IC RSS- 210 Issue 8, Dec 2010.

The objective is to determine compliance with FCC Part 15.407 and IC RSS-210 rules for Antenna Requirements, Conducted Emissions, Occupied Bandwidth, Output Power, Power Spectral Density, Peak Excursion, Radiated and Conducted Spurious Emissions, and Band Edge. Please refer to the detail antenna list in the antenna requirement section.

### 1.4 Related Submittal(s)/Grant(s)

FCC Part 15.247, RSS-210 Annex 8 of DTS with FCC ID: 2AB8CDCBNEE01, IC: 11927A-DCBNEE01.

### 1.5 Test Methodology

All measurements contained in this report were conducted in accordance with ANSI C63.4-2009, American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the range of 9 kHz to 40 GHz and FCC KDB 789033 D01 General UNII Test Procedures v01r03: Guidelines for Compliance Testing of Unlicensed National Information Infrastructure (U-NII) Devices Part 15, Subpart E

### 1.6 Measurement Uncertainty

All measurements involve certain levels of uncertainties, especially in the field of EMC. The factors contributing to uncertainties are spectrum analyzer, cable loss, antenna factor calibration, antenna directivity, antenna factor variation with height, antenna phase center variation, antenna factor frequency interpolation, measurement distance variation, site imperfections, mismatch (average), and system repeatability.

Based on CISPR16-4-2: 2011, The Treatment of Uncertainty in EMC Measurements, the values ranging from  $\pm 2.0$  dB for Conducted Emissions tests and  $\pm 4.0$  dB for Radiated Emissions tests are the most accurate estimates pertaining to uncertainty of EMC measurements at BACL Corp.

All radiated and conducted emissions measurement was performed at Bay Area Compliance Laboratory, Corp. The radiated testing was performed at an antenna-to-EUT distance of 3 meters.

## 1.7 Test Facility

Bay area compliance Laboratories Corp. (BACL) is:

1- An independent Commercial Test Laboratory accredited to **ISO 17025: 2005** by **A2LA**, in the fields of: Electromagnetic Compatibility & Telecommunications covering Emissions, Immunity, Radio, RF Exposure, Safety and Telecom. This includes NEBS (Network Equipment Building System), Wireless RF, Telecommunications Terminal Equipment (TTE); Network Equipment; Information Technology Equipment (ITE); Medical Electrical Equipment; Industrial, Commercial, and Medical Test Equipment; Professional Audio and Video Equipment; Electronic (Digital) Products; Industrial and Scientific Instruments; Cabled Distribution Systems and Energy Efficiency Lighting.

2- An ENERGY STAR Recognized Laboratory, for the LM80 Testing, a wide variety of Luminaires and Computers.

3- A NIST Designated Phase-I and Phase-II CAB including: ACMA (Australian Communication and Media Authority), BSMI (Bureau of Standards, Metrology and Inspection of Taiwan), IDA (Infocomm Development Authority of Singapore), IC(Industry Canada), Korea (Ministry of Communications Radio Research Laboratory), NCC (Formerly DGT; Directorate General of Telecommunication of Chinese Taipei) OFTA (Office of the Telecommunications Authority of Hong Kong), Vietnam, VCCI - Voluntary Control Council for Interference of Japan and a designated EU CAB (Conformity Assessment Body) (Notified Body) for the EMC and R&TTE Directives.

4- A Product Certification Body accredited to **ISO Guide 65: 1996** by **A2LA** to certify:

1- Unlicensed, Licensed radio frequency devices and Telephone Terminal Equipment for the FCC. Scope A1, A2, A3, A4, B1, B2, B3, B4 & C.

2. Radio Standards Specifications (RSS) in the Category I Equipment Standards List and All Broadcasting Technical Standards (BETS) in Category I Equipment Standards List for Industry Canada.

3. Radio Communication Equipment for Singapore.

4. Radio Equipment Specifications, GMDSS Marine Radio Equipment Specifications, and Fixed Network Equipment Specifications for Hong Kong.

5. Japan MIC Telecommunication Business Law (A1, A2) and Radio Law (B1, B2 and B3).

6. Audio/Video, Battery Charging Systems, Computers, Displays, Enterprise Servers, Imaging Equipment, Set-Top Boxes, Telephony, Televisions, Ceiling Fans, CFLs (Including GU24s), Decorative Light Strings, Integral LED Lamps, Luminaires, Residential Ventilating Fans.

The test site used by BACL Corp. to collect radiated and conducted emissions measurement data is located at its facility in Sunnyvale, California, USA.

The test site at BACL Corp. has been fully described in reports submitted to the Federal Communication Commission (FCC) and Voluntary Control Council for Interference (VCCI). The details of these reports have been found to be in compliance with the requirements of Section 2.948 of the FCC Rules on February 11 and December 10, 1997, and Article 8 of the VCCI regulations on December 25, 1997. The test site also complies with the test methods and procedures set forth in CISPR 22:2008 §10.4 for measurements below 1 GHz and §10.6 for measurements above 1 GHz as well as ANSI C63.4-2009, ANSI C63.4-2009, TIA/EIA-603 & CISPR 24:2010.

The Federal Communications Commission and Voluntary Control Council for Interference have the reports on file and they are listed under FCC registration number: 90464 and VCCI Registration No.: A-0027. The test site has been approved by the FCC and VCCI for public use and is listed in the FCC Public Access Link (PAL) database.

Additionally, BACL Corp. is an American Association for Laboratory Accreditation (A2LA) accredited laboratory (Lab Code 3297-02). The current scope of accreditations can be found at

<http://www.a2la.org/scopepdf/3297-02.pdf?CFID=1132286&CFTOKEN=e42a3240dac3f6ba-6DE17DCB-1851-9E57-477422F667031258&jsessionid=8430d44f1f47cf2996124343c704b367816b>

## 2 EUT Test Configuration

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### 2.1 Justification

The EUT was configured for testing according to ANSI C63.4-2009 and FCC KDB 789033 D01 General UNII Test Procedures v01r03

The EUT was tested in a testing mode to represent worst-case results during the final qualification test.

The worst-case data rates are determined to be as follows for each mode based upon investigation by measuring the average power, peak power and PPSD across all data rates bandwidths, and modulations.

### 2.2 EUT Exercise Software

The test utility used was *Terminal* was provided by Whizz System Inc., and was verified by *Chen Ge* to comply with the standard requirements being tested against.

### 2.3 Special Equipment

There were no special accessories were required, included, or intended for use with EUT during these tests.

### 2.4 Equipment Modifications

No modifications were made to the EUT.

### 2.5 Local Support Equipment

| Manufacturer | Description | Model  | Serial Number |
|--------------|-------------|--------|---------------|
| HP           | Laptop      | NX6110 | CNU5130969    |

### 2.6 EUT Internal Configuration Details

N/A

### 3 Summary of Test Results

Results reported relate only to the product tested.

| FCC & IC Rules                                | Description of Test                     | Result    |
|-----------------------------------------------|-----------------------------------------|-----------|
| FCC §15.407(f), §2.1093<br>IC RSS-102         | RF Exposure                             | Compliant |
| FCC §15.203<br>IC RSS-Gen §7.1.2              | Antenna Requirement                     | Compliant |
| FCC §15.207<br>IC RSS-Gen §7.2.4              | AC Power Line Conducted Emissions       | Compliant |
| FCC §15.209(a), 15.407(b)<br>IC RSS-210 §A9.2 | Spurious Radiated Emissions             | Compliant |
| FCC §15.407(a)<br>IC RSS-210 §A9.2            | 26 dB and 99% Emission Bandwidth        | Compliant |
| FCC §407(a)(1)<br>IC RSS-210 §A9.2            | Peak Output Power Measurement           | Compliant |
| FCC §2.1051, §15.407(b)<br>IC RSS-210 §A9.2   | Band Edges                              | Compliant |
| FCC §15.407(a)(1)<br>IC RSS-210 §A9.2         | Power Spectral Density                  | Compliant |
| FCC §15.407(a)(6)                             | Peak Excursion Ratio                    | Compliant |
| FCC §2.1051, §15.407(b)<br>IC RSS-210 §A9.2   | Spurious Emissions at Antenna Terminals | Compliant |

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## **4 FCC §15.407(f), §2.1093 & IC RSS-102 - RF Exposure**

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### **4.1 Applicable Standards**

FCC §15.407(f) and §1.1307(b)(1).  
IC RSS-102.

### **4.2 Test result**

Compliant, please refer to SAR report.

## 5 FCC §15.203 & IC RSS-Gen §7.1.2 – Antenna Requirements

### 5.1 Applicable Standards

According to FCC §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. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this Section. The manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited.

As per IC RSS-Gen §7.1.2: Transmitter Antenna

A transmitter can only be sold or operated with antennas with which it was certified. A transmitter may be certified with multiple antenna types. An antenna type comprises antennas having similar in-band and out-of-band radiation patterns. Testing shall be performed using the highest-gain antenna of each combination of transmitter and antenna type for which certification is being sought, with the transmitter output power set at the maximum level. Any antenna of the same type and having equal or lesser gain as an antenna that had been successfully tested for certification with the transmitter, will also be considered certified with the transmitter, and may be used and marketed with the transmitter. The manufacturer shall include with the application for certification a list of acceptable antenna types to be used with the transmitter.

When a measurement at the antenna connector is used to determine RF output power, the effective gain of the device's antenna shall be stated, based on measurement or on data from the antenna manufacturer. Any antenna gain in excess of 6 dBi (6 dB above isotropic gain) shall be added to the measured RF output power before using the power limits specified in RSS-210 or RSS-310 for devices of RF output powers of 10 milliwatts or less. For devices of output powers greater than 10 milliwatts, except devices subject to RSS-210 Annex 8 (Frequency Hopping and Digital Modulation Systems Operating in the 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz Bands) or RSS-210 Annex 9 (Local Area Network Devices), the total antenna gain shall be added to the measured RF output power before using the specified power limits. For devices subject to RSS-210 Annex 8 or Annex 9, the antenna gain shall not be added.

### 5.2 Antenna List

| Antenna Type/Pattern | Antenna Gain (dBi)<br>@ 5 GHz |
|----------------------|-------------------------------|
| Integrated           | 4.2                           |

The antenna consists of non-standard (UFL) connectors with less 6 dBi gain; therefore, it complies with the antenna requirement. Please refer to the internal photos.

## 6 FCC §15.207 & IC RSS-Gen §7.2.4 - AC Power Line Conducted Emissions

### 6.1 Applicable Standards

As per FCC §15.207 and IC RSS-Gen §7.2.4 Conducted limits:

For an intentional radiator that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies within the band 150 kHz to 30 MHz shall not exceed the limits in the following table, as measured using a 50  $\mu$ H/50 ohms line impedance stabilization network (LISN). Compliance with the provisions of this paragraph shall be based on the measurement of the radio frequency voltage between each power line and ground at the power terminal. The lower limit applies at the boundary between the frequencies ranges.

| Frequency of Emission<br>(MHz) | Conducted Limit (dBuV) |            |
|--------------------------------|------------------------|------------|
|                                | Quasi-Peak             | Average    |
| 0.15-0.5                       | 66 to 56 *             | 56 to 46 * |
| 0.5-5                          | 56                     | 46         |
| 5-30                           | 60                     | 50         |

*\*Decreases with the logarithm of the frequency.*

### 6.2 Test Setup

The measurement was performed at shield room, using the setup per ANSI C63.4-2009 measurement procedure. The specification used was FCC §15.207 and IC RSS-Gen §7.2.4 limits.

External I/O cables were draped along the edge of the test table and bundle when necessary.

The AC/DC power adapter of the EUT was connected with LISN-1 which provided 120 V / 60 Hz AC power.

### 6.3 Test Procedure

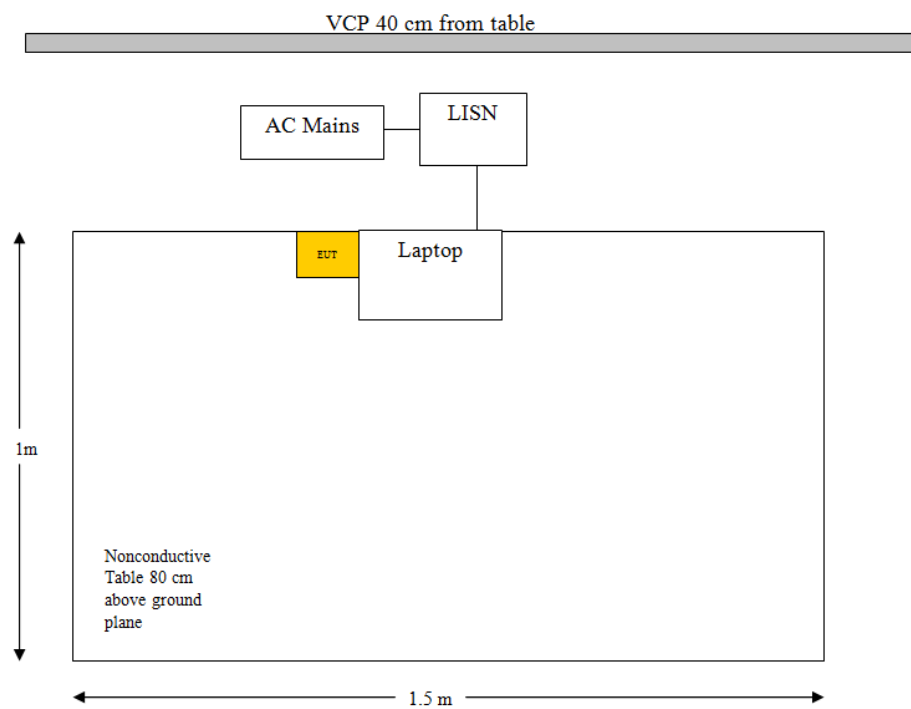
During the conducted emissions test, the power cord of the EUT host system was connected to the mains outlet of the LISN-1 and the power cord of the support equipment was connected to LISN-2.

Maximizing procedure was performed on the six (6) highest emissions of the EUT.

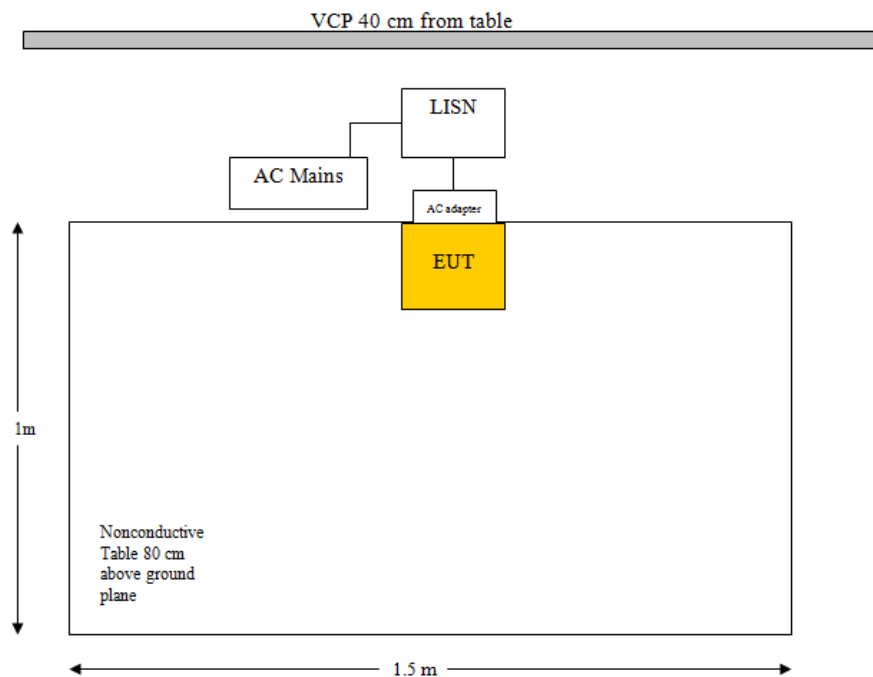
All data was recorded in the peak detection mode, quasi-peak and average. Quasi-Peak readings are distinguished with a "QP." Average readings are distinguished with an "Ave".

## 6.4 Test Setup Block Diagram

With Laptop:



With AC/DC power Adapter:



## 6.5 Corrected Amplitude & Margin Calculation

The Corrected Amplitude (CA) is calculated by adding the Cable Loss (CL), the Attenuator Factor (Atten) to indicated Amplitude (Ai) reading. The basic equation is as follows:

$$CA = Ai + CL + Atten$$

For example, a corrected amplitude of 46.2 dBuV = Indicated Reading (32.5 dBuV) + Cable Loss (3.7 dB) + Attenuator (10 dB)

The “**Margin**” column of the following data tables indicates the degree of compliance within the applicable limit. For example, a margin of -7 dB means the emission is 7 dB below the maximum limit. The equation for margin calculation is as follows:

$$\text{Margin} = \text{Corrected Amplitude} - \text{Limit}$$

## 6.6 Test Equipment List and Details

| Manufacturer      | Description       | Model No.           | Serial No. | Calibration Date | Calibration Interval |
|-------------------|-------------------|---------------------|------------|------------------|----------------------|
| Rohde & Schwarz   | EMI Test Receiver | ESCI 1166.5950K03   | 100337     | 2014-03-28       | 1 year               |
| Solar Electronics | LISN              | 9252-50-R-24-N      | 511213     | 2013-06-25       | 1 year               |
| TTE               | Filter, High Pass | H9962-150K-50-21378 | K7133      | 2013-05-30       | 1 year               |

**Statement of Traceability:** *BACL Corp.* attests that all calibrations have been performed per the A2LA requirements, traceable to the NIST.

## 6.7 Test Environmental Conditions

|                    |            |
|--------------------|------------|
| Temperature:       | 22 °C      |
| Relative Humidity: | 52 %       |
| ATM Pressure:      | 101.89 kPa |

The testing was performed by Chen Ge on 2014-05-13 in 5 m chamber 3.

## 6.8 Summary of Test Results

According to the recorded data in following table, the EUT complied with the FCC/IC standard's conducted emissions limits, with the margin reading of:

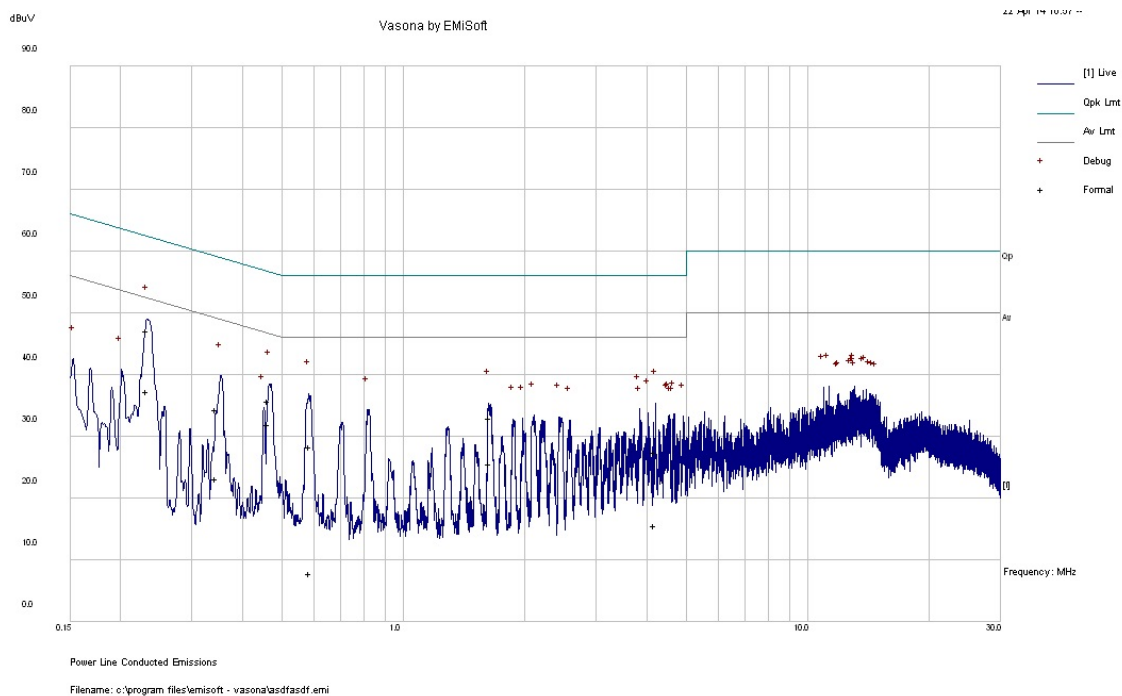
| Connection: EUT connected to the laptop |                 |                               |             |
|-----------------------------------------|-----------------|-------------------------------|-------------|
| Margin (dB)                             | Frequency (MHz) | Conductor Mode (Line/Neutral) | Range (MHz) |
| -13.93                                  | 0.465078        | Line                          | 0.15-30     |

| Connection: EUT connected to the AC/DC power adapter |                 |                               |             |
|------------------------------------------------------|-----------------|-------------------------------|-------------|
| Margin (dB)                                          | Frequency (MHz) | Conductor Mode (Line/Neutral) | Range (MHz) |
| -14.45                                               | 0.224199        | Neutral                       | 0.15-30     |

## 6.9 Conducted Emissions Test Plots and Data

With Laptop:

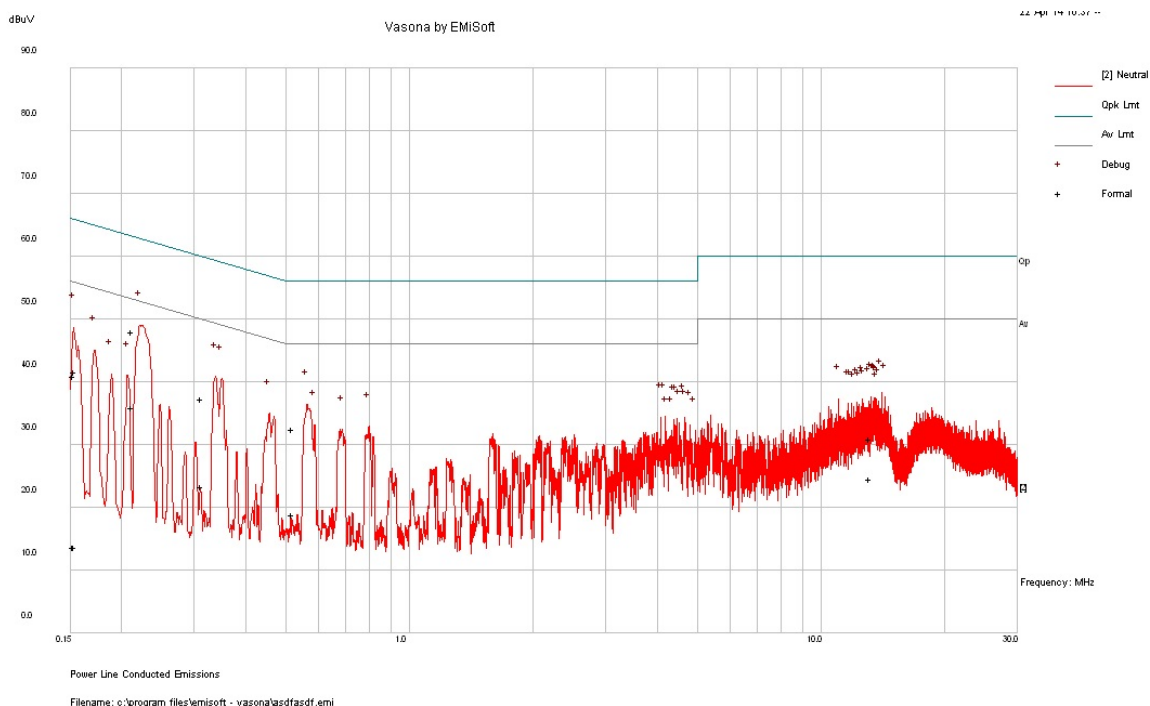
120 V, 60 Hz –Line



| Frequency (MHz) | Corrected Amplitude (dBμV) | Conductor (Line/Neutral) | Limit (dBμV) | Margin (dB) | Detector (QP/Ave.) |
|-----------------|----------------------------|--------------------------|--------------|-------------|--------------------|
| 0.232212        | 48.07                      | Line                     | 62.37        | -14.30      | QP                 |
| 0.465078        | 36.49                      | Line                     | 56.6         | -20.11      | QP                 |
| 0.587862        | 28.93                      | Line                     | 56           | -27.07      | QP                 |
| 0.344214        | 35.07                      | Line                     | 59.1         | -24.03      | QP                 |
| 1.63953         | 33.64                      | Line                     | 56           | -22.36      | QP                 |
| 4.183547        | 28.10                      | Line                     | 56           | -27.90      | QP                 |

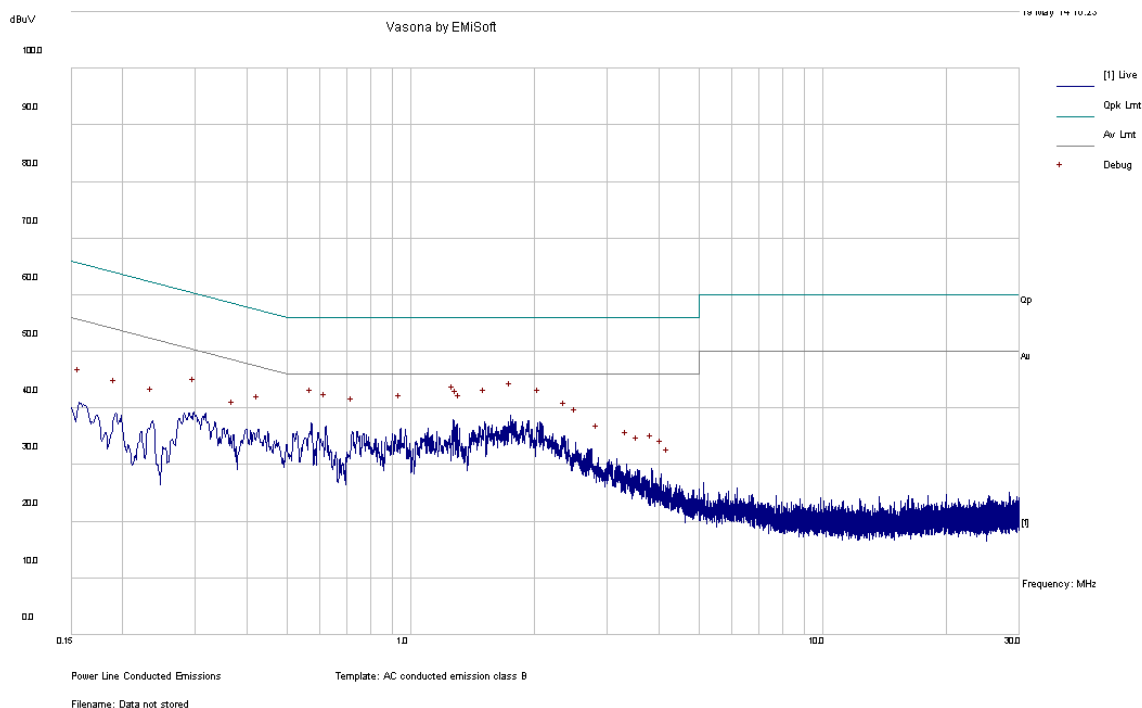
| Frequency (MHz) | Corrected Amplitude (dBμV) | Conductor (Line/Neutral) | Limit (dBμV) | Margin (dB) | Detector (QP/Ave.) |
|-----------------|----------------------------|--------------------------|--------------|-------------|--------------------|
| 0.232212        | 38.07                      | Line                     | 52.37        | -14.30      | Ave.               |
| 0.465078        | 32.67                      | Line                     | 46.6         | -13.93      | Ave.               |
| 0.587862        | 8.02                       | Line                     | 46           | -37.98      | Ave.               |
| 0.344214        | 23.69                      | Line                     | 49.1         | -25.41      | Ave.               |
| 1.63953         | 26.15                      | Line                     | 46           | -19.85      | Ave.               |
| 4.183547        | 15.93                      | Line                     | 46           | -30.07      | Ave.               |

## 120 V, 60 Hz – Neutral



| Frequency (MHz) | Corrected Amplitude (dBμV) | Conductor (Line/Neutral) | Limit (dBμV) | Margin (dB) | Detector (QP/Ave.) |
|-----------------|----------------------------|--------------------------|--------------|-------------|--------------------|
| 0.224199        | 48.21                      | Neutral                  | 62.66        | -14.45      | QP                 |
| 0.154347        | 42.13                      | Neutral                  | 65.76        | -23.63      | QP                 |
| 0.349374        | 39.16                      | Neutral                  | 58.98        | -19.83      | QP                 |
| 0.343884        | 37.18                      | Neutral                  | 59.11        | -21.93      | QP                 |
| 0.576495        | 33.62                      | Neutral                  | 56           | -22.38      | QP                 |
| 0.155259        | 41.74                      | Neutral                  | 65.71        | -23.97      | QP                 |

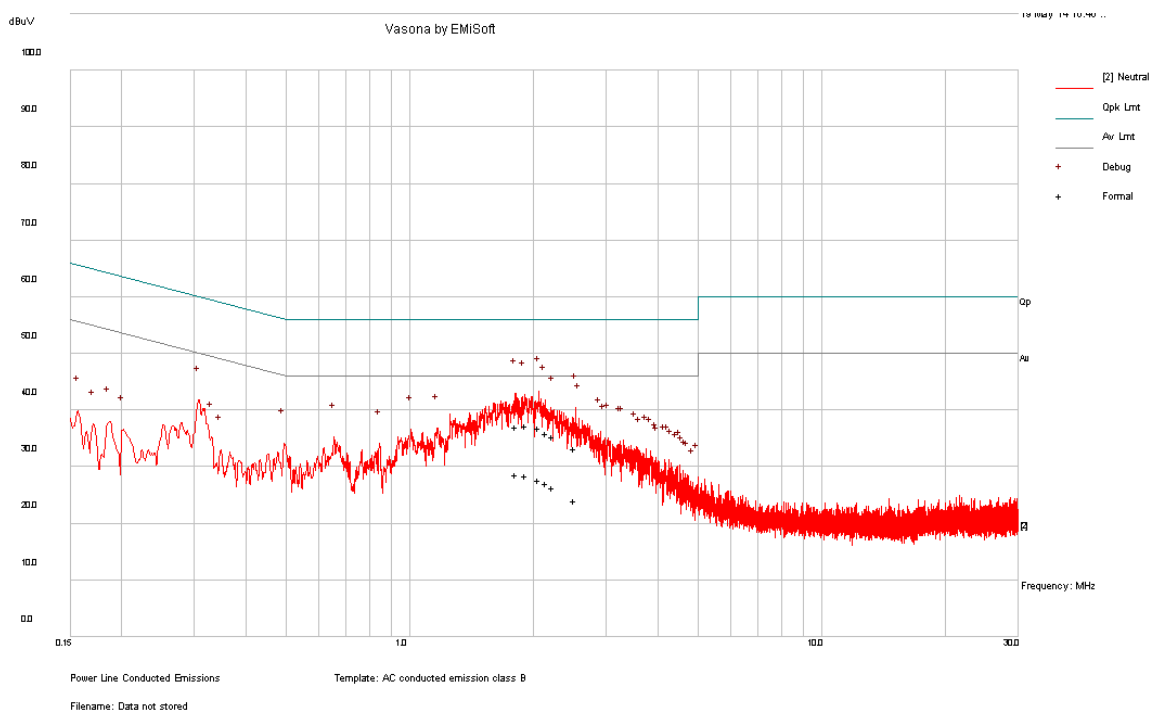
| Frequency (MHz) | Corrected Amplitude (dBμV) | Conductor (Line/Neutral) | Limit (dBμV) | Margin (dB) | Detector (QP/Ave.) |
|-----------------|----------------------------|--------------------------|--------------|-------------|--------------------|
| 0.224199        | 35.34                      | Neutral                  | 52.66        | -17.32      | Ave.               |
| 0.154347        | 17.13                      | Neutral                  | 55.76        | -38.63      | Ave.               |
| 0.349374        | 31.17                      | Neutral                  | 48.98        | -17.81      | Ave.               |
| 0.343884        | 25.24                      | Neutral                  | 49.11        | -23.87      | Ave.               |
| 0.576495        | 25.10                      | Neutral                  | 46           | -20.90      | Ave.               |
| 0.155259        | 16.38                      | Neutral                  | 55.71        | -39.33      | Ave.               |

**With AC power Adapter:****120 V, 60 Hz – Line**

| Frequency (MHz) | Corrected Amplitude (dBμV) | Conductor (Line/Neutral) | Limit (dBμV) | Margin (dB) | Detector (QP/Ave.) |
|-----------------|----------------------------|--------------------------|--------------|-------------|--------------------|
| 1.749798        | 32.93                      | Line                     | 56           | -23.07      | QP                 |
| 1.26501         | 31.21                      | Line                     | 56           | -24.79      | QP                 |
| 1.523685        | 31.52                      | Line                     | 56           | -24.48      | QP                 |
| 2.061245        | 31.56                      | Line                     | 56           | -24.44      | QP                 |
| 0.58026         | 30.74                      | Line                     | 56           | -25.26      | QP                 |
| 1.30653         | 30.82                      | Line                     | 56           | -25.18      | QP                 |

| Frequency (MHz) | Corrected Amplitude (dBμV) | Conductor (Line/Neutral) | Limit (dBμV) | Margin (dB) | Detector (QP/Ave.) |
|-----------------|----------------------------|--------------------------|--------------|-------------|--------------------|
| 1.749798        | 27.43                      | Line                     | 46           | -18.57      | Ave.               |
| 1.26501         | 25.08                      | Line                     | 46           | -20.92      | Ave.               |
| 1.523685        | 25.28                      | Line                     | 46           | -20.72      | Ave.               |
| 2.061245        | 25.95                      | Line                     | 46           | -20.05      | Ave.               |
| 0.58026         | 23.24                      | Line                     | 46           | -22.76      | Ave.               |
| 1.30653         | 24.95                      | Line                     | 46           | -21.05      | Ave.               |

## 120 V, 60 Hz – Neutral



| Frequency (MHz) | Corrected Amplitude (dBμV) | Conductor (Line/Neutral) | Limit (dBμV) | Margin (dB) | Detector (QP/Ave.) |
|-----------------|----------------------------|--------------------------|--------------|-------------|--------------------|
| 2.058805        | 36.84                      | Neutral                  | 56           | -19.16      | QP                 |
| 1.815873        | 37.12                      | Neutral                  | 56           | -18.88      | QP                 |
| 1.910256        | 37.22                      | Neutral                  | 56           | -18.78      | QP                 |
| 2.146455        | 35.98                      | Neutral                  | 56           | -20.02      | QP                 |
| 2.511908        | 33.33                      | Neutral                  | 56           | -22.67      | QP                 |
| 2.224262        | 35.33                      | Neutral                  | 56           | -20.67      | QP                 |

| Frequency (MHz) | Corrected Amplitude (dBμV) | Conductor (Line/Neutral) | Limit (dBμV) | Margin (dB) | Detector (QP/Ave.) |
|-----------------|----------------------------|--------------------------|--------------|-------------|--------------------|
| 2.058805        | 27.65                      | Neutral                  | 46           | -18.35      | Ave.               |
| 1.815873        | 28.56                      | Neutral                  | 46           | -17.44      | Ave.               |
| 1.910256        | 28.52                      | Neutral                  | 46           | -17.48      | Ave.               |
| 2.146455        | 27.09                      | Neutral                  | 46           | -18.91      | Ave.               |
| 2.511908        | 24.07                      | Neutral                  | 46           | -21.93      | Ave.               |
| 2.224262        | 26.27                      | Neutral                  | 46           | -19.73      | Ave.               |

## 7 FCC §15.209, §15.407(b) & IC RSS-210 §A9.2 - Spurious Radiated Emissions

### 7.1 Applicable Standards

As per FCC §15.35(d): Unless otherwise specified, on any frequency or frequencies above 1000 MHz, the radiated emission limits are based on the use of measurement instrumentation employing an average detector function. Unless otherwise specified, measurements above 1000 MHz shall be performed using a minimum resolution bandwidth of 1 MHz.

As per FCC §15.209(a) and IC RSS-210: Except as provided elsewhere in this Subpart, the emissions from an intentional radiator shall not exceed the field strength levels specified in the following table

| Frequency (MHz) | Field Strength (micro volts/meter) | Measurement Distance (meters) |
|-----------------|------------------------------------|-------------------------------|
| 0.009 - 0.490   | 2400/F(kHz)                        | 300                           |
| 0.490 - 1.705   | 24000/F(kHz)                       | 30                            |
| 1.705 - 30.0    | 30                                 | 30                            |
| 30 - 88         | 100 Note 1                         | 3                             |
| 88 - 216        | 150 Note 1                         | 3                             |
| 216 - 960       | 200 Note 1                         | 3                             |
| Above 960       | 500                                | 3                             |

Note 1: Except as provided in paragraph (g), fundamental emissions from intentional radiators operating under this Section shall not be located in the frequency bands 54-72 MHz, 76-88 MHz, 174-216 MHz or 470-806 MHz. However, operation within these frequency bands is permitted under other sections of this Part, e.g., Sections 15.231 and 15.241.

As Per FCC §15.205(a) except as show in paragraph (d) of this section, only spurious emissions are permitted in any of the frequency bands listed below:

| MHz                 | MHz                   | MHz             | GHz           |
|---------------------|-----------------------|-----------------|---------------|
| 0.090 – 0.110       | 16.42 – 16.423        | 960 – 1240      | 4.5 – 5.15    |
| 0.495 – 0.505       | 16.69475 – 16.69525   | 1300 – 1427     | 5.35 – 5.46   |
| 2.1735 – 2.1905     | 25.5 – 25.67          | 1435 – 1626.5   | 7.25 – 7.75   |
| 4.125 – 4.128       | 37.5 – 38.25          | 1645.5 – 1646.5 | 8.025 – 8.5   |
| 4.17725 – 4.17775   | 73 – 74.6             | 1660 – 1710     | 9.0 – 9.2     |
| 4.20725 – 4.20775   | 74.8 – 75.2           | 1718.8 – 1722.2 | 9.3 – 9.5     |
| 6.215 – 6.218       | 108 – 121.94          | 2200 – 2300     | 10.6 – 12.7   |
| 6.26775 – 6.26825   | 123 – 138             | 2310 – 2390     | 13.25 – 13.4  |
| 6.31175 – 6.31225   | 149.9 – 150.05        | 2483.5 – 2500   | 14.47 – 14.5  |
| 8.291 – 8.294       | 156.52475 – 156.52525 | 2690 – 2900     | 15.35 – 16.2  |
| 8.362 – 8.366       | 156.7 – 156.9         | 3260 – 3267     | 17.7 – 21.4   |
| 8.37625 – 8.38675   | 162.0125 – 167.17     | 3.332 – 3.339   | 22.01 – 23.12 |
| 8.41425 – 8.41475   | 167.72 – 173.2        | 3.3458 – 3.358  | 23.6 – 24.0   |
| 12.29 – 12.293      | 240 – 285             | 3.600 – 4.400   | 31.2 – 31.8   |
| 12.51975 – 12.52025 | 322 – 335.4           |                 | 36.43 – 36.5  |
| 12.57675 – 12.57725 | 399.9 – 410           |                 | Above 38.6    |
| 13.36 – 13.41       | 608 – 614             |                 |               |

As per FCC §15.407(b)(1) and IC RSS-210, 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 EIRP of -27 dBm/MHz.

## 7.2 Test Setup

The radiated emissions tests were performed in the 5-meter Chamber, using the setup in accordance with ANSI C63.4-2009. The specification used was the FCC 15C/15E and IC RSS-210/RSS-Gen limits.

The spacing between the peripherals was 10 centimeters.

External I/O cables were draped along the edge of the test table and bundle when necessary.

## 7.3 Test Procedure

The measurements are base on FCC KDB 789033 D01 General UNII Test Procedures v01r03: Guidelines for Compliance Testing of Unlicensed National Information Infrastructure (U-NII) Devices Part 15, Subpart E Section H: Unwanted emissions measurement as well as ANSI C63.4: 2009 as described below:

For the radiated emissions test, the EUT host, and all support equipment power cords was connected to the AC floor outlet.

Maximizing procedure was performed on the highest emissions to ensure that the EUT complied with all installation combinations.

The EUT is set 3 meter away from the testing antenna, which is varied from 1-4 meter, and the EUT is placed on a turntable, which is 0.8 meter above ground plane, the table shall be rotated for 360 degrees to find out the highest emission. The receiving antenna should be changed the polarization both of horizontal and vertical.

The spectrum analyzer or receiver is set as:

Below 1000 MHz:

$$\text{RBW} = 100 \text{ kHz} / \text{VBW} = 300 \text{ kHz} / \text{Sweep} = \text{Auto}$$

Above 1000 MHz:

- (1) Peak:  $\text{RBW} = 1\text{MHz} / \text{VBW} = 1\text{MHz} / \text{Sweep} = \text{Auto}$
- (2) Average:  $\text{RBW} = 1\text{MHz} / \text{VBW} = 10\text{Hz} / \text{Sweep} = \text{Auto}$

## 7.4 Corrected Amplitude & Margin Calculation

The Corrected Amplitude (CA) is calculated by adding the Cable Loss (CL), the Attenuator Factor (Atten) to indicated Amplitude (Ai) reading. The basic equation is as follows:

$$\text{CA} = \text{Ai} + \text{CL} + \text{Atten}$$

For example, a corrected amplitude of 46.2 dBuV = Indicated Reading (32.5 dBuV) + Cable Loss (3.7 dB) + Attenuator (10 dB)

The “**Margin**” column of the following data tables indicates the degree of compliance within the applicable limit. For example, a margin of -7 dB means the emission is 7 dB below the maximum limit. The equation for margin calculation is as follows:

$$\text{Margin} = \text{Corrected Amplitude} - \text{Limit}$$

## 7.5 Test Equipment List and Details

| Manufacturer       | Description         | Model No.         | Serial No. | Calibration Date | Calibration Interval |
|--------------------|---------------------|-------------------|------------|------------------|----------------------|
| Sunol Science Corp | System Controller   | SC99V             | 122303-1   | N/R              | N/R                  |
| Sunol Science Corp | Combination Antenna | JB3               | A020106-3  | 2013-06-18       | 1 year               |
| Hewlett Packard    | Pre-amplifier       | 8447D             | 2944A06639 | 2013-06-09       | 1 year               |
| Agilent            | Pre-amplifier       | 8449B             | 3008A01978 | 2014-02-04       | 1 year               |
| Agilent            | Spectrum Analyzer   | E4446A            | US44300386 | 2013-09-29       | 1 year               |
| EMCO               | Horn Antenna        | 3315              | 9511-4627  | 2013-10-17       | 1 year               |
| Rohde & Schwarz    | EMI Test Receiver   | ESCI 1166.5950K03 | 100337     | 2014-03-28       | 1 year               |

**Statement of Traceability:** *BACL attests that all calibrations have been performed per the A2LA requirements, traceable to NIST.*

## 7.6 Test Environmental Conditions

|                           |           |
|---------------------------|-----------|
| <b>Temperature:</b>       | 22 °C     |
| <b>Relative Humidity:</b> | 52 %      |
| <b>ATM Pressure:</b>      | 101.9 kPa |

*The testing was performed by Chen Ge on 2014-05-14 in 5 m chamber 3.*

## 7.7 Summary of Test Results

According to the data hereinafter, the EUT complied with the FCC Part 15.209, 15.407 & IC RSS-210, RSS-Gen standard's radiated emissions limits, and had the worst margin of:

| Mode: Transmitting |                 |                                    |             |
|--------------------|-----------------|------------------------------------|-------------|
| Margin (dB)        | Frequency (MHz) | Polarization (Horizontal/Vertical) | Range       |
| -2.57              | 899.0253        | Horizontal                         | Below 1 GHz |
| -1.59              | 5350            | Horizontal                         | Above 1 GHz |

## 7.8 Radiated Emissions Test Results

### 1) 30 MHz – 1 GHz, Measured at 3 meters, EUT antenna port was terminated

#### Quasi-Peak Measurements @ 3m, worst case

| Frequency (MHz) | Corrected Amplitude (dB $\mu$ V/m) | Antenna Height (cm) | Antenna Polarity (H/V) | Turntable Azimuth (degrees) | Limit (dB $\mu$ V/m) | Margin (dB) |
|-----------------|------------------------------------|---------------------|------------------------|-----------------------------|----------------------|-------------|
| 802.11a mode    |                                    |                     |                        |                             |                      |             |
| 499.914         | 41.49                              | 100                 | V                      | 247                         | 46                   | -4.51       |
| 899.0253        | 43.43                              | 100                 | H                      | 50                          | 46                   | -2.57       |
| 566.521         | 42.75                              | 100                 | V                      | 66                          | 46                   | -3.25       |
| 687.2785        | 41.77                              | 100                 | V                      | 285                         | 46                   | -4.23       |
| 432.003         | 41.54                              | 117                 | V                      | 245                         | 46                   | -4.46       |

## 2) 1–40 GHz, Measured at 3 meters, EUT antenna port was terminated

802.11a mode

| Frequency<br>(MHz)                            | S.A.<br>Reading<br>(dBμV) | Turntable<br>Azimuth<br>(degrees) | Test Antenna   |                   |                  | Cable<br>Loss<br>(dB) | Pre-<br>Amp.<br>(dB) | Cord.<br>Reading<br>(dBμV/m) | FCC/IC            |                | Comments |
|-----------------------------------------------|---------------------------|-----------------------------------|----------------|-------------------|------------------|-----------------------|----------------------|------------------------------|-------------------|----------------|----------|
|                                               |                           |                                   | Height<br>(cm) | Polarity<br>(H/V) | Factor<br>(dB/m) |                       |                      |                              | Limit<br>(dBμV/m) | Margin<br>(dB) |          |
| Low Channel 5180 MHz, measured at 3 meters    |                           |                                   |                |                   |                  |                       |                      |                              |                   |                |          |
| 5180                                          | 65.19                     | 152                               | 100            | V                 | 34.256           | 4.55                  | 0                    | 103.996                      | -                 | -              | Peak     |
| 5180                                          | 69.87                     | 135                               | 100            | H                 | 34.256           | 4.55                  | 0                    | 108.676                      | -                 | -              | Peak     |
| 5180                                          | 56.32                     | 152                               | 100            | V                 | 34.256           | 4.55                  | 0                    | 95.126                       | -                 | -              | Ave      |
| 5180                                          | 57.05                     | 135                               | 100            | H                 | 34.256           | 4.55                  | 0                    | 95.856                       | -                 | -              | Ave      |
| 5150                                          | 27.5                      | 0                                 | 100            | V                 | 33.097           | 4.42                  | 0                    | 65.017                       | 74                | -8.983         | Peak     |
| 5150                                          | 27.65                     | 0                                 | 100            | H                 | 32.585           | 4.35                  | 0                    | 64.585                       | 74                | -9.415         | Peak     |
| 5150                                          | 12.07                     | 0                                 | 100            | V                 | 33.097           | 4.42                  | 0                    | 49.587                       | 54                | -4.413         | Ave      |
| 5150                                          | 12.36                     | 0                                 | 100            | H                 | 32.585           | 4.35                  | 0                    | 49.295                       | 54                | -4.705         | Ave      |
| 10360                                         | 46.5                      | 0                                 | 100            | V                 | 38.329           | 7.02                  | 34.93                | 56.919                       | 74                | -17.081        | Peak     |
| 10360                                         | 46.98                     | 0                                 | 100            | H                 | 38.329           | 7.02                  | 34.93                | 57.399                       | 74                | -16.601        | Peak     |
| 10360                                         | 32.4                      | 0                                 | 100            | V                 | 38.329           | 7.02                  | 34.93                | 42.819                       | 54                | -11.181        | Ave      |
| 10360                                         | 32.37                     | 0                                 | 100            | H                 | 38.329           | 7.02                  | 34.93                | 42.789                       | 54                | -11.211        | Ave      |
| 15540                                         | 35.06                     | 0                                 | 100            | V                 | 38.432           | 8.38                  | 34.34                | 47.532                       | 74                | -26.468        | Peak     |
| 15540                                         | 33.67                     | 0                                 | 100            | H                 | 38.432           | 8.38                  | 34.34                | 46.142                       | 74                | -27.858        | Peak     |
| 15540                                         | 19.54                     | 0                                 | 100            | V                 | 38.432           | 8.38                  | 34.34                | 32.012                       | 54                | -21.988        | Ave      |
| 15540                                         | 19.58                     | 0                                 | 100            | H                 | 38.432           | 8.38                  | 34.34                | 32.052                       | 54                | -21.948        | Ave      |
| Middle Channel 5200 MHz, measured at 3 meters |                           |                                   |                |                   |                  |                       |                      |                              |                   |                |          |
| 5200                                          | 65.37                     | 143                               | 100            | V                 | 34.256           | 4.55                  | 0                    | 104.176                      | -                 | -              | Peak     |
| 5200                                          | 69.74                     | 126                               | 100            | H                 | 34.256           | 4.55                  | 0                    | 108.546                      | -                 | -              | Peak     |
| 5200                                          | 56.44                     | 143                               | 100            | V                 | 34.256           | 4.55                  | 0                    | 95.246                       | -                 | -              | Ave      |
| 5200                                          | 57.99                     | 126                               | 100            | H                 | 34.256           | 4.55                  | 0                    | 96.796                       | -                 | -              | Ave      |
| 10400                                         | 45.57                     | 0                                 | 100            | V                 | 38.329           | 6.99                  | 34.93                | 55.959                       | 74                | -18.041        | Peak     |
| 10400                                         | 46.69                     | 0                                 | 100            | H                 | 38.329           | 6.99                  | 34.93                | 57.079                       | 74                | -16.921        | Peak     |
| 10400                                         | 31.09                     | 0                                 | 100            | V                 | 38.329           | 6.99                  | 34.93                | 41.479                       | 54                | -12.521        | Ave      |
| 10400                                         | 31.11                     | 0                                 | 100            | H                 | 38.329           | 6.99                  | 34.93                | 41.499                       | 54                | -12.501        | Ave      |
| 15600                                         | 32.55                     | 0                                 | 100            | V                 | 38.325           | 8.4                   | 34.34                | 44.935                       | 74                | -29.065        | Peak     |
| 15600                                         | 32.75                     | 0                                 | 100            | H                 | 38.325           | 8.4                   | 34.34                | 45.135                       | 74                | -28.865        | Peak     |
| 15600                                         | 19.01                     | 0                                 | 100            | V                 | 38.325           | 8.4                   | 34.34                | 31.395                       | 54                | -22.605        | Ave      |
| 15600                                         | 18.95                     | 0                                 | 100            | H                 | 38.325           | 8.4                   | 34.34                | 31.335                       | 54                | -22.665        | Ave      |

| Frequency<br>(MHz)                          | S.A.<br>Reading<br>(dBμV) | Turntable<br>Azimuth<br>(degrees) | Test Antenna   |                   |                  | Cable<br>Loss<br>(dB) | Pre-<br>Amp.<br>(dB) | Cord.<br>Reading<br>(dBμV/m) | FCC/IC            |                | Comments |
|---------------------------------------------|---------------------------|-----------------------------------|----------------|-------------------|------------------|-----------------------|----------------------|------------------------------|-------------------|----------------|----------|
|                                             |                           |                                   | Height<br>(cm) | Polarity<br>(H/V) | Factor<br>(dB/m) |                       |                      |                              | Limit<br>(dBμV/m) | Margin<br>(dB) |          |
| High Channel 5240 MHz, measured at 3 meters |                           |                                   |                |                   |                  |                       |                      |                              |                   |                |          |
| 5240                                        | 65.14                     | 58                                | 100            | V                 | 34.256           | 4.6                   | 0                    | 103.996                      | -                 | -              | Peak     |
| 5240                                        | 69.81                     | 144                               | 118            | H                 | 34.256           | 4.6                   | 0                    | 108.666                      | -                 | -              | Peak     |
| 5240                                        | 48.94                     | 58                                | 100            | V                 | 34.256           | 4.6                   | 0                    | 87.796                       | -                 | -              | Ave      |
| 5240                                        | 53.95                     | 144                               | 118            | H                 | 34.256           | 4.6                   | 0                    | 92.806                       | -                 | -              | Ave      |
| 5350                                        | 27.09                     | 0                                 | 100            | V                 | 34.821           | 4.76                  | 0                    | 66.671                       | 74                | -7.329         | Peak     |
| 5350                                        | 27.32                     | 0                                 | 100            | H                 | 35               | 4.71                  | 0                    | 67.03                        | 74                | -6.97          | Peak     |
| 5350                                        | 12.32                     | 0                                 | 100            | V                 | 34.821           | 4.76                  | 0                    | 51.901                       | 54                | -2.099         | Ave      |
| 5350                                        | 12.52                     | 0                                 | 100            | H                 | 35               | 4.71                  | 0                    | 52.23                        | 54                | -1.77          | Ave      |
| 10480                                       | 45.7                      | 0                                 | 100            | V                 | 38.343           | 7                     | 34.93                | 56.113                       | 74                | -17.887        | Peak     |
| 10480                                       | 46.03                     | 0                                 | 100            | H                 | 38.343           | 7                     | 34.93                | 56.443                       | 74                | -17.557        | Peak     |
| 10480                                       | 31.98                     | 0                                 | 100            | V                 | 38.343           | 7                     | 34.93                | 42.393                       | 54                | -11.607        | Ave      |
| 10480                                       | 32.02                     | 0                                 | 100            | H                 | 38.343           | 7                     | 34.93                | 42.433                       | 54                | -11.567        | Ave      |
| 15720                                       | 34.87                     | 0                                 | 100            | H                 | 38.188           | 8.38                  | 34.34                | 47.098                       | 74                | -26.902        | Peak     |
| 15720                                       | 35.28                     | 0                                 | 100            | H                 | 38.188           | 8.38                  | 34.34                | 47.508                       | 74                | -26.492        | Peak     |
| 15720                                       | 20.48                     | 0                                 | 100            | V                 | 38.188           | 8.38                  | 34.34                | 32.708                       | 54                | -21.292        | Ave      |
| 15720                                       | 20.51                     | 0                                 | 100            | H                 | 38.188           | 8.38                  | 34.34                | 32.738                       | 54                | -21.262        | Ave      |

## 802.11n-HT 20 mode

| Frequency<br>(MHz)                            | S.A.<br>Reading<br>(dBμV) | Turntable<br>Azimuth<br>(degrees) | Test Antenna   |                   |                  | Cable<br>Loss<br>(dB) | Pre-<br>Amp.<br>(dB) | Cord.<br>Reading<br>(dBμV/m) | FCC/IC            |                | Comments |
|-----------------------------------------------|---------------------------|-----------------------------------|----------------|-------------------|------------------|-----------------------|----------------------|------------------------------|-------------------|----------------|----------|
|                                               |                           |                                   | Height<br>(cm) | Polarity<br>(H/V) | Factor<br>(dB/m) |                       |                      |                              | Limit<br>(dBμV/m) | Margin<br>(dB) |          |
| Low Channel 5180 MHz, measured at 3 meters    |                           |                                   |                |                   |                  |                       |                      |                              |                   |                |          |
| 5180                                          | 65.47                     | 136                               | 100            | V                 | 34.256           | 4.55                  | 0                    | 104.276                      | -                 | -              | Peak     |
| 5180                                          | 69.55                     | 145                               | 100            | H                 | 34.256           | 4.55                  | 0                    | 108.356                      | -                 | -              | Peak     |
| 5180                                          | 48.36                     | 136                               | 100            | V                 | 34.256           | 4.55                  | 0                    | 87.166                       | -                 | -              | Ave      |
| 5180                                          | 53.21                     | 145                               | 100            | H                 | 34.256           | 4.55                  | 0                    | 92.016                       | -                 | -              | Ave      |
| 5150                                          | 27.14                     | 0                                 | 100            | V                 | 34.256           | 4.56                  | 0                    | 65.956                       | 74                | -8.044         | Peak     |
| 5150                                          | 27.36                     | 0                                 | 100            | H                 | 32.547           | 4.36                  | 0                    | 64.267                       | 74                | -9.733         | Peak     |
| 5150                                          | 11.33                     | 0                                 | 100            | V                 | 34.256           | 4.56                  | 0                    | 50.146                       | 54                | -3.854         | Ave      |
| 5150                                          | 12.24                     | 0                                 | 100            | H                 | 32.547           | 4.36                  | 0                    | 49.147                       | 54                | -4.853         | Ave      |
| 10360                                         | 45.79                     | 0                                 | 100            | V                 | 38.329           | 7.02                  | 34.93                | 56.209                       | 74                | -17.791        | Peak     |
| 10360                                         | 46.13                     | 0                                 | 100            | H                 | 38.329           | 7.02                  | 34.93                | 56.549                       | 74                | -17.451        | Peak     |
| 10360                                         | 32.19                     | 0                                 | 100            | V                 | 38.329           | 7.02                  | 34.93                | 42.609                       | 54                | -11.391        | Ave      |
| 10360                                         | 32.27                     | 0                                 | 100            | H                 | 38.329           | 7.02                  | 34.93                | 42.689                       | 54                | -11.311        | Ave      |
| 15540                                         | 40.52                     | 0                                 | 100            | V                 | 38.432           | 8.38                  | 34.34                | 52.992                       | 74                | -21.008        | Peak     |
| 15540                                         | 41.82                     | 0                                 | 100            | H                 | 38.432           | 8.38                  | 34.34                | 54.292                       | 74                | -19.708        | Peak     |
| 15540                                         | 26.71                     | 0                                 | 100            | V                 | 38.432           | 8.38                  | 34.34                | 39.182                       | 54                | -14.818        | Ave      |
| 15540                                         | 26.66                     | 0                                 | 100            | H                 | 38.432           | 8.38                  | 34.34                | 39.132                       | 54                | -14.868        | Ave      |
| Middle Channel 5200 MHz, measured at 3 meters |                           |                                   |                |                   |                  |                       |                      |                              |                   |                |          |
| 5200                                          | 64.36                     | 152                               | 100            | V                 | 34.256           | 4.55                  | 0                    | 103.166                      | -                 | -              | Peak     |
| 5200                                          | 68.71                     | 136                               | 100            | H                 | 34.256           | 4.55                  | 0                    | 107.516                      | -                 | -              | Peak     |
| 5200                                          | 55.32                     | 152                               | 100            | V                 | 34.256           | 4.55                  | 0                    | 94.126                       | -                 | -              | Ave      |
| 5200                                          | 57.12                     | 136                               | 100            | H                 | 34.256           | 4.55                  | 0                    | 95.926                       | -                 | -              | Ave      |
| 10400                                         | 45.51                     | 0                                 | 100            | V                 | 38.329           | 6.99                  | 34.93                | 55.899                       | 74                | -18.101        | Peak     |
| 10400                                         | 45.43                     | 0                                 | 100            | H                 | 38.329           | 6.99                  | 34.93                | 55.819                       | 74                | -18.181        | Peak     |
| 10400                                         | 31.01                     | 0                                 | 100            | V                 | 38.329           | 6.99                  | 34.93                | 41.399                       | 54                | -12.601        | Ave      |
| 10400                                         | 31.25                     | 0                                 | 100            | H                 | 38.329           | 6.99                  | 34.93                | 41.639                       | 54                | -12.361        | Ave      |
| 15600                                         | 38.41                     | 0                                 | 100            | V                 | 38.325           | 8.4                   | 34.34                | 50.795                       | 74                | -23.205        | Peak     |
| 15600                                         | 37.93                     | 0                                 | 100            | H                 | 38.325           | 8.4                   | 34.34                | 50.315                       | 74                | -23.685        | Peak     |
| 15600                                         | 24.92                     | 0                                 | 100            | V                 | 38.325           | 8.4                   | 34.34                | 37.305                       | 54                | -16.695        | Ave      |
| 15600                                         | 24.85                     | 0                                 | 100            | H                 | 38.325           | 8.4                   | 34.34                | 37.235                       | 54                | -16.765        | Ave      |

| Frequency<br>(MHz)                          | S.A.<br>Reading<br>(dBμV) | Turntable<br>Azimuth<br>(degrees) | Test Antenna   |                   |                  | Cable<br>Loss<br>(dB) | Pre-<br>Amp.<br>(dB) | Cord.<br>Reading<br>(dBμV/m) | FCC/IC            |                | Comments |
|---------------------------------------------|---------------------------|-----------------------------------|----------------|-------------------|------------------|-----------------------|----------------------|------------------------------|-------------------|----------------|----------|
|                                             |                           |                                   | Height<br>(cm) | Polarity<br>(H/V) | Factor<br>(dB/m) |                       |                      |                              | Limit<br>(dBμV/m) | Margin<br>(dB) |          |
| High Channel 5240 MHz, measured at 3 meters |                           |                                   |                |                   |                  |                       |                      |                              |                   |                |          |
| 5240                                        | 65.36                     | 69                                | 100            | V                 | 34.256           | 4.6                   | 0                    | 104.216                      | -                 | -              | Peak     |
| 5240                                        | 68.33                     | 102                               | 121            | H                 | 34.256           | 4.6                   | 0                    | 107.186                      | -                 | -              | Peak     |
| 5240                                        | 50.21                     | 69                                | 100            | V                 | 34.256           | 4.6                   | 0                    | 89.066                       | -                 | -              | Ave      |
| 5240                                        | 54.36                     | 102                               | 121            | H                 | 34.256           | 4.6                   | 0                    | 93.216                       | -                 | -              | Ave      |
| 5350                                        | 27.07                     | 0                                 | 100            | V                 | 34.821           | 4.76                  | 0                    | 66.651                       | 74                | -7.349         | Peak     |
| 5350                                        | 27.41                     | 0                                 | 100            | H                 | 35               | 4.76                  | 0                    | 67.17                        | 74                | -6.83          | Peak     |
| 5350                                        | 12.02                     | 0                                 | 100            | V                 | 34.821           | 4.76                  | 0                    | 51.601                       | 54                | -2.399         | Ave      |
| 5350                                        | 12.65                     | 0                                 | 100            | H                 | 35               | 4.76                  | 0                    | 52.41                        | 54                | -1.59          | Ave      |
| 10480                                       | 47.14                     | 0                                 | 100            | V                 | 38.343           | 7                     | 34.93                | 57.553                       | 74                | -16.447        | Peak     |
| 10480                                       | 46.07                     | 0                                 | 100            | H                 | 38.343           | 7                     | 34.93                | 56.483                       | 74                | -17.517        | Peak     |
| 10480                                       | 32.26                     | 0                                 | 100            | V                 | 38.343           | 7                     | 34.93                | 42.673                       | 54                | -11.327        | Ave      |
| 10480                                       | 32.21                     | 0                                 | 100            | H                 | 38.343           | 7                     | 34.93                | 42.623                       | 54                | -11.377        | Ave      |
| 15720                                       | 37.9                      | 0                                 | 100            | V                 | 38.188           | 8.38                  | 34.34                | 50.128                       | 74                | -23.872        | Peak     |
| 15720                                       | 37.49                     | 0                                 | 100            | H                 | 38.188           | 8.38                  | 34.34                | 49.718                       | 74                | -24.282        | Peak     |
| 15720                                       | 24.40                     | 0                                 | 100            | V                 | 38.188           | 8.38                  | 34.34                | 36.628                       | 54                | -17.372        | Ave      |
| 15720                                       | 23.49                     | 0                                 | 100            | H                 | 38.188           | 8.38                  | 34.34                | 35.718                       | 54                | -18.282        | Ave      |

## 8 FCC §15.407(a) & IC RSS-210 §A9.2 – 26 dB & 99% Emission Bandwidth

### 8.1 Applicable Standards

FCC §15.407(a) and IC RSS-210 §A9.2.

### 8.2 Measurement Procedure

The measurements are based on FCC KDB 789033 D01 General UNII Test Procedures v01r03: Guidelines for Compliance Testing of Unlicensed National Information Infrastructure (U-NII) Devices section C: Emission bandwidth and section D: 99 Percent Occupied Bandwidth

### 8.3 Test Equipment List and Details

| Manufacturer | Description       | Model No. | Serial No. | Calibration Date | Calibration Interval |
|--------------|-------------------|-----------|------------|------------------|----------------------|
| Agilent      | Spectrum Analyzer | E4446A    | US44300386 | 2013-09-29       | 1 year               |

**Statement of Traceability:** *BACL Corp.* attests that all calibrations have been performed according to A2LA requirements, traceable to the NIST.

### 8.4 Test Environmental Conditions

|                    |             |
|--------------------|-------------|
| Temperature:       | 21-25 °C    |
| Relative Humidity: | 41-46 %     |
| ATM Pressure:      | 101-102 kPa |

The testing was performed by Chen Ge from 2014-05-14 and 2014-05-16 at RF site.

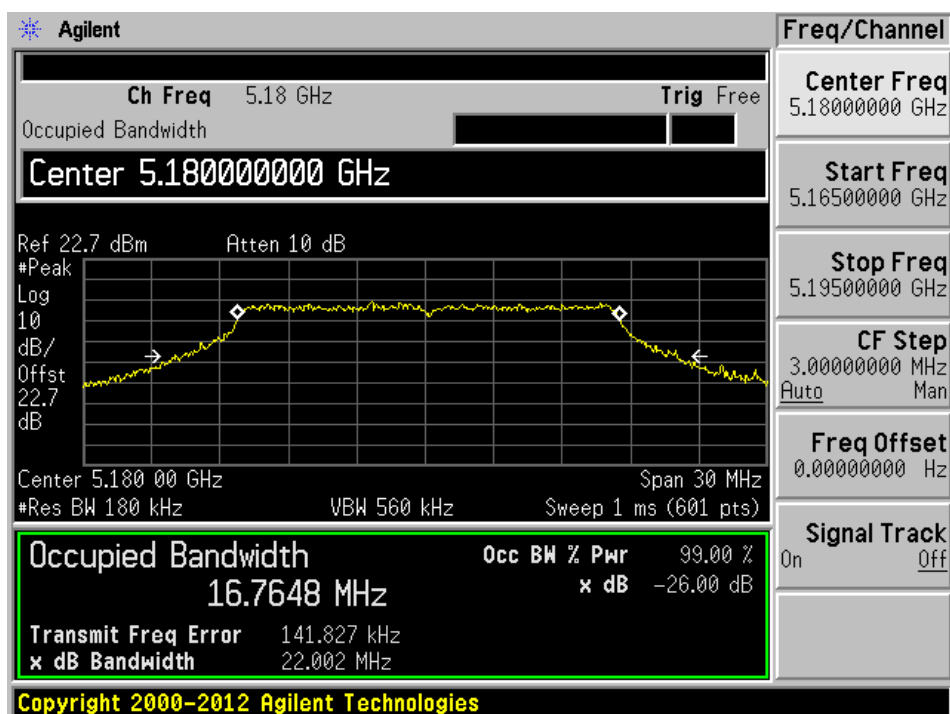
## 8.5 Test Results

Please refer to the following tables and plots.

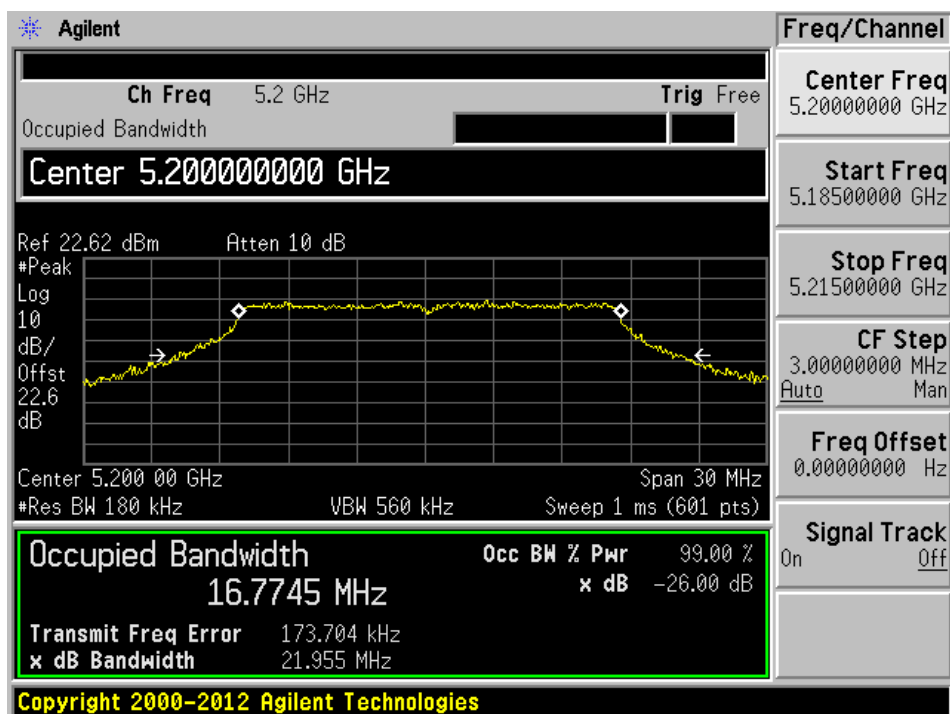
| Channel           | Frequency (MHz) | 26 dB Emission Bandwidth (MHz) | 99% Emission Bandwidth (MHz) |
|-------------------|-----------------|--------------------------------|------------------------------|
| 802.11a mode      |                 |                                |                              |
| Low               | 5180            | 22.002                         | 16.7648                      |
| Middle            | 5200            | 21.955                         | 16.7745                      |
| High              | 5240            | 22.217                         | 16.7502                      |
| 802.11n HT20 mode |                 |                                |                              |
| Low               | 5180            | 22.762                         | 17.8812                      |
| Middle            | 5200            | 22.378                         | 17.8818                      |
| High              | 5240            | 22.132                         | 17.8484                      |

## 802.11a mode

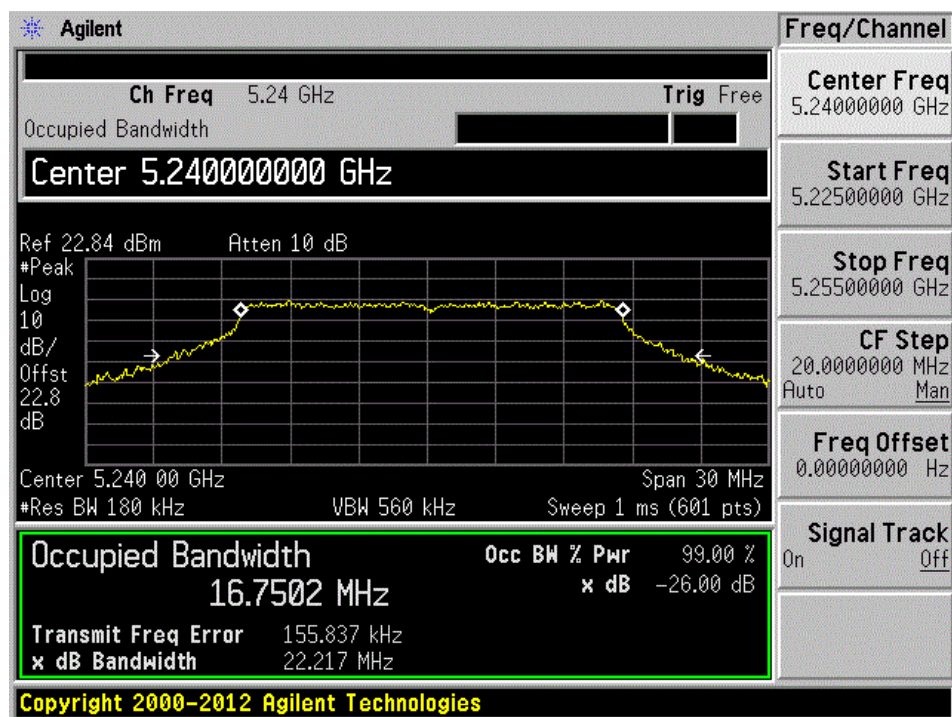
Low channel: 5180 MHz



Middle channel: 5200 MHz

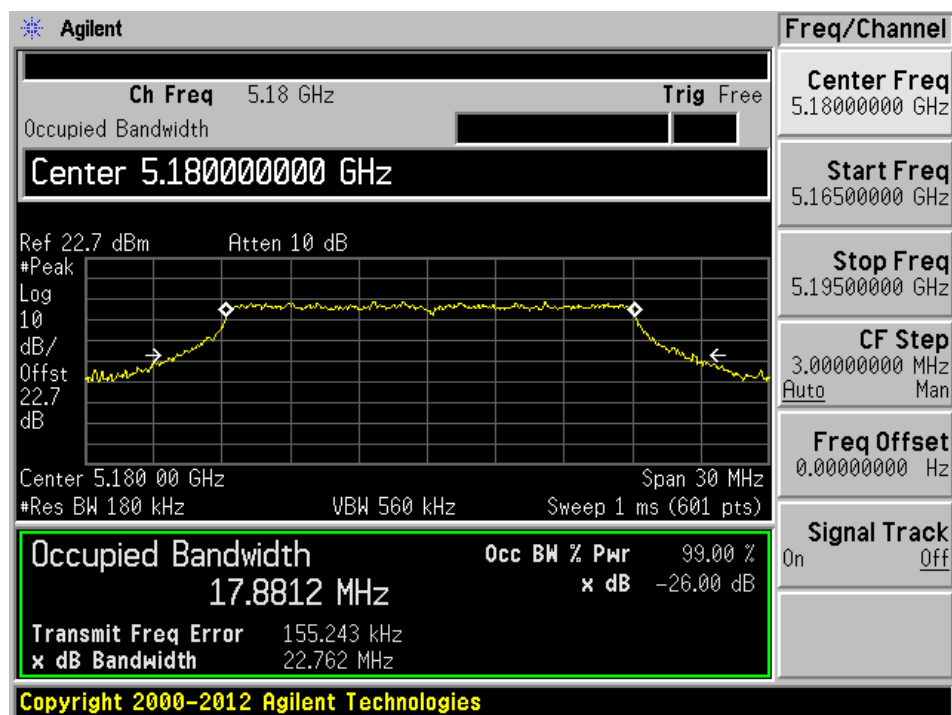


High channel: 5240 MHz

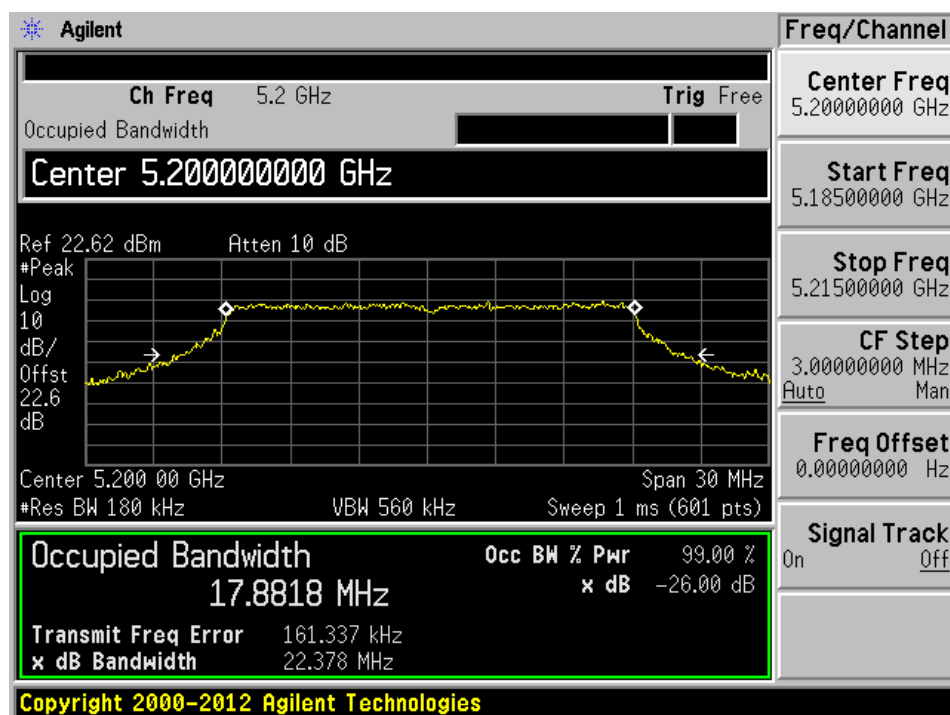


802.11n-HT20 mode

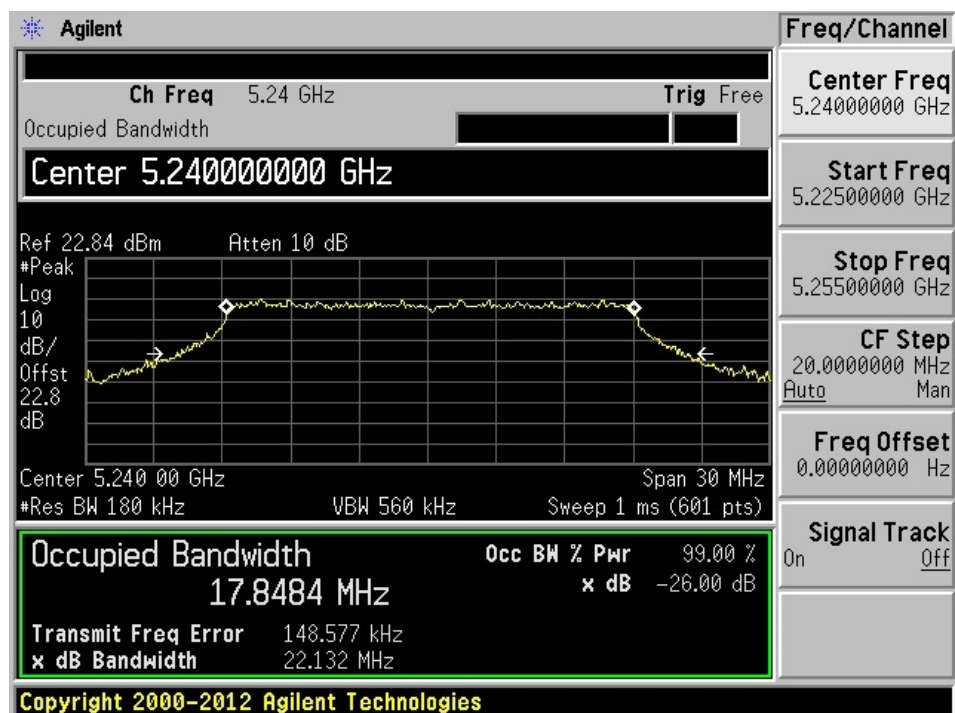
Low channel: 5180 MHz



Middle channel: 5200 MHz



High channel: 5240 MHz



## 9 FCC §407(a)(1) & IC RSS-210 §A9.2 - Peak Output Power Measurement

### 9.1 Applicable Standards

#### According to FCC §15.407(a)(1)

For the band 5.15–5.25 GHz, the maximum conducted output power over the frequency band of operation shall not exceed the lesser of 50 mW or  $4 \text{ dBm} + 10 \log B$ , where  $B$  is the 26-dB emission bandwidth in MHz. In addition, the peak power spectral density shall not exceed 4 dBm in any 1-MHz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the peak power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

For the 5.25–5.35 GHz and 5.47–5.725 GHz bands, the maximum conducted output power over the frequency bands of operation shall not exceed the lesser of 250 mW or  $11 \text{ dBm} + 10 \log B$ , where  $B$  is the 26 dB emission bandwidth in megahertz. In addition, the peak power spectral density shall not exceed 11 dBm in any 1 megahertz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the peak power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

#### According to IC RSS-210 §A9.2:

For the 5.15–5.250 GHz bands, the maximum e.i.r.p shall not exceed 200 mW or  $10 + 10 \log B$ , whichever power is less.  $B$  is the 99% emission bandwidth in MHz. The e.i.r.p spectral density shall not exceed 10 dBm in any 1.0 MHz band.

### 9.2 Measurement Procedure

The measurements are based on FCC KDB 789033 D01 General UNII Test Procedures v01r03: Guidelines for Compliance Testing of Unlicensed National Information Infrastructure (U-NII) Devices section E: Maximum conducted output power

### 9.3 Test Equipment List and Details

| Manufacturer | Description       | Model No. | Serial No. | Calibration Date | Calibration Interval |
|--------------|-------------------|-----------|------------|------------------|----------------------|
| Agilent      | Spectrum Analyzer | E4446A    | US44300386 | 2013-09-29       | 1 year               |

**Statement of Traceability:** *BACL Corp.* attests that all calibrations have been performed according to A2LA requirements, traceable to the NIST.

### 9.4 Test Environmental Conditions

|                    |             |
|--------------------|-------------|
| Temperature:       | 21-25 °C    |
| Relative Humidity: | 41-46 %     |
| ATM Pressure:      | 101-102 kPa |

The testing was performed by Chen Ge from 2014-05-14 and 2014-05-16 at RF site.

## 9.5 Test Results

### For FCC:

| Channel           | Frequency (MHz) | Conducted Output Power (dBm) | Limit (dBm) | Margin (dB) |
|-------------------|-----------------|------------------------------|-------------|-------------|
| 802.11a mode      |                 |                              |             |             |
| Low               | 5180            | 11.84                        | 17          | -1.27       |
| Mid               | 5200            | 12.24                        | 17          | -1.08       |
| High              | 5240            | 12.44                        | 17          | -1.21       |
| 802.11n HT20 mode |                 |                              |             |             |
| Low               | 5180            | 12.00                        | 17          | -0.54       |
| Mid               | 5200            | 12.17                        | 17          | -0.6        |
| High              | 5240            | 12.54                        | 17          | -0.89       |

### For IC :

| Channel           | Frequency (MHz) | E.I.R.P. (dBm) | Limit (dBm) | Margin (dB) |
|-------------------|-----------------|----------------|-------------|-------------|
| 802.11a mode      |                 |                |             |             |
| Low               | 5180            | 19.93          | 23          | -3.07       |
| Mid               | 5200            | 20.12          | 23          | -2.88       |
| High              | 5240            | 20.17          | 23          | -2.83       |
| 802.11n HT20 mode |                 |                |             |             |
| Low               | 5180            | 20.66          | 23          | -2.34       |
| Mid               | 5200            | 20.60          | 23          | -2.40       |
| High              | 5240            | 20.76          | 23          | -2.24       |

## 10 FCC §15.407(b) & IC RSS-210 §A9.2 - Out of Band Emissions

### 10.1 Applicable Standard

#### According to FCC §15.407(b) and IC RSS-210 §A9.2

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 EIRP of –27 dBm/MHz

### 10.2 Measurement Procedure

The measurements are based on FCC KDB 789033 D01 General UNII Test Procedures v01r03: Guidelines for Compliance Testing of Unlicensed National Information Infrastructure (U-NII) Devices section H: Unwanted emissions measurement

### 10.3 Test Equipment List and Details

| Manufacturer | Description       | Model No. | Serial No. | Calibration Date | Calibration Interval |
|--------------|-------------------|-----------|------------|------------------|----------------------|
| Agilent      | Spectrum Analyzer | E4446A    | US44300386 | 2013-09-29       | 1 year               |

**Statement of Traceability:** *BACL Corp.* attests that all calibrations have been performed per the A2LA requirements, traceable to the NIST.

### 10.4 Test Environmental Conditions

|                    |             |
|--------------------|-------------|
| Temperature:       | 22-24 °C    |
| Relative Humidity: | 42-45 %     |
| ATM Pressure:      | 101-102 kPa |

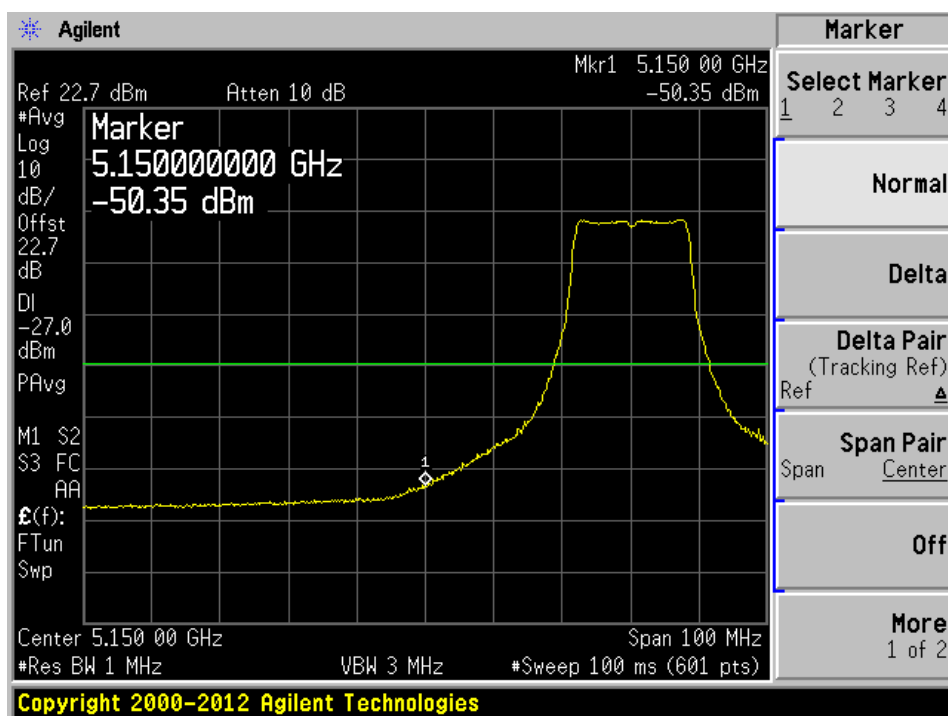
The testing was performed by Chen Ge from 2014-04-07 and 2014-05-09 at RF site.

### 10.5 Test Results

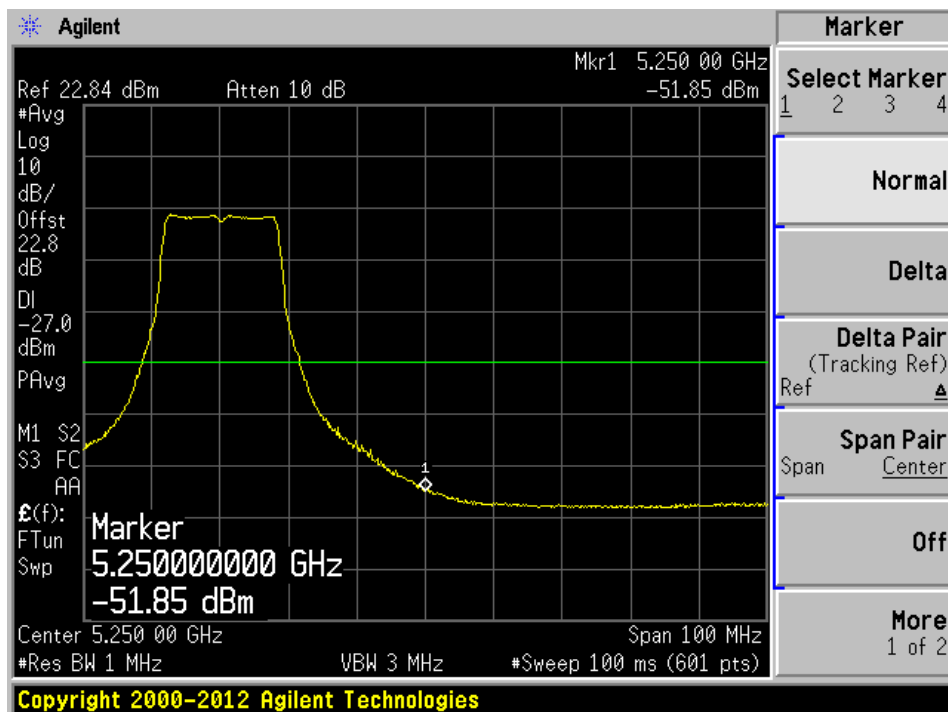
Please refer to following pages for plots of band edge.

## 802.11a mode

Low channel: 5180 MHz

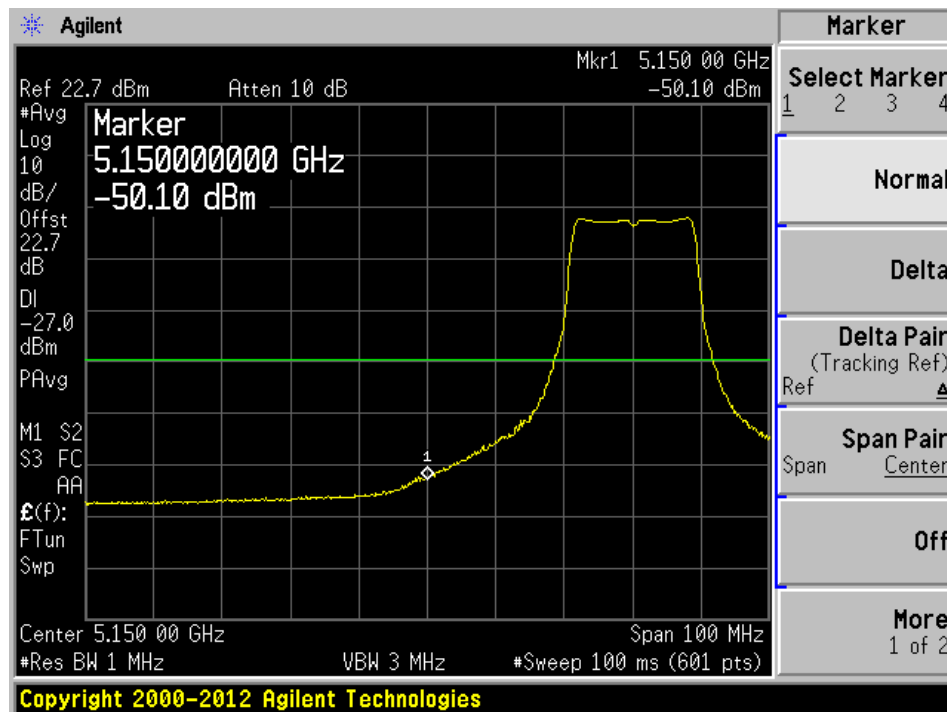


High channel: 5240 MHz

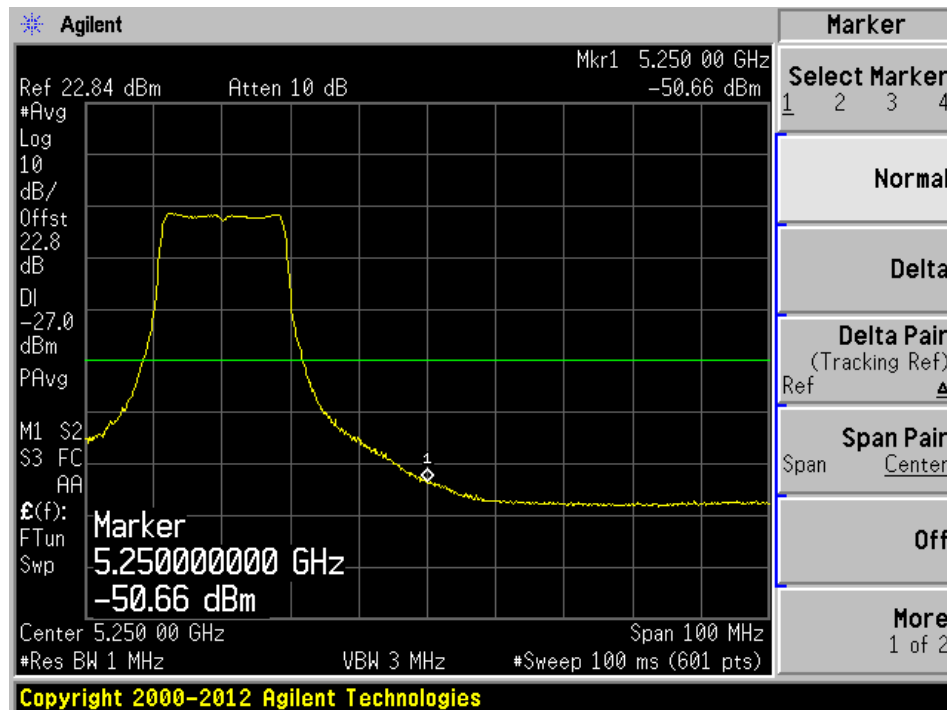


**802.11n-HT20 mode**

Low channel: 5180 MHz



High channel: 5240 MHz



## 11 FCC §15.407(a)(1) & IC RSS-210 §A9.2 - Power Spectral Density

### 11.1 Applicable Standards

#### According to FCC §15.407(a)(1)

For the band 5.15-5.25 GHz, the maximum conducted output power over the frequency band of operation shall not exceed the lesser of 50 mW or 4 dBm + 10 log B, where B is the 26-dB emission bandwidth in MHz. In addition, the peak power spectral density shall not exceed 4 dBm in any 1-MHz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the peak power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

#### According to IC RSS-210 §A9.2:

5150-5250 MHz the maximum e.i.r.p. shall not exceed 200 mW or 10 + 10 log10 B, dBm, whichever power is less. B is the 99% emission bandwidth in MHz. The e.i.r.p. spectral density shall not exceed 10 dBm in any 1.0 MHz band.

### 11.2 Measurement Procedure

The measurements are based on FCC KDB 789033 D01 General UNII Test Procedures v01r03: Guidelines for Compliance Testing of Unlicensed National Information Infrastructure (U-NII) Devices section F: Peak power spectral density (PPSD)

### 11.3 Test Equipment List and Details

| Manufacturer | Description       | Model No. | Serial No. | Calibration Date | Calibration Interval |
|--------------|-------------------|-----------|------------|------------------|----------------------|
| Agilent      | Spectrum Analyzer | E4446A    | US44300386 | 2013-09-29       | 1 year               |

**Statement of Traceability:** *BACL Corp.* attests that all calibrations have been performed per the A2LA requirements, traceable to the NIST.

### 11.4 Test Environmental Conditions

|                    |             |
|--------------------|-------------|
| Temperature:       | 22-24° C    |
| Relative Humidity: | 42-45 %     |
| ATM Pressure:      | 101-102 kPa |

The testing was performed by Chen Ge from 2014-05-07 and 2014-05-09 at RF site.

## 11.5 Test Results

### For FCC:

| Channel           | Frequency (MHz) | PSD (dBm) | Limit (dBm) | Margin (dB) |
|-------------------|-----------------|-----------|-------------|-------------|
| 802.11a mode      |                 |           |             |             |
| Low               | 5180            | 0.483     | 4           | -3.517      |
| Middle            | 5200            | 1.028     | 4           | -2.972      |
| High              | 5240            | 1.397     | 4           | -2.603      |
| 802.11n HT20 mode |                 |           |             |             |
| Low               | 5180            | 0.632     | 4           | -3.368      |
| Middle            | 5200            | 0.951     | 4           | -3.049      |
| High              | 5240            | 1.420     | 4           | -2.580      |

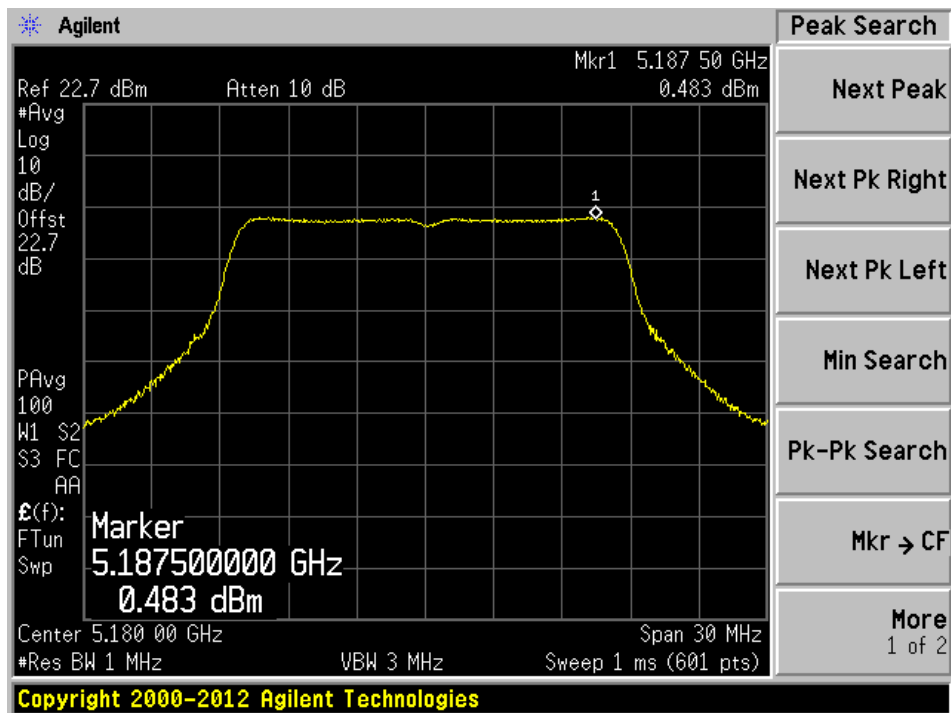
### For IC:

| Channel           | Frequency (MHz) | e.i.r.p Density (dBm) | Limit (dBm) | Margin (dB) |
|-------------------|-----------------|-----------------------|-------------|-------------|
| 802.11a mode      |                 |                       |             |             |
| Low               | 5180            | 4.683                 | 10          | -5.317      |
| Middle            | 5200            | 5.228                 | 10          | -4.772      |
| High              | 5240            | 5.597                 | 10          | -4.403      |
| 802.11n HT20 mode |                 |                       |             |             |
| Low               | 5180            | 4.832                 | 10          | -5.168      |
| Middle            | 5200            | 5.151                 | 10          | -4.849      |
| High              | 5240            | 5.620                 | 10          | -4.380      |

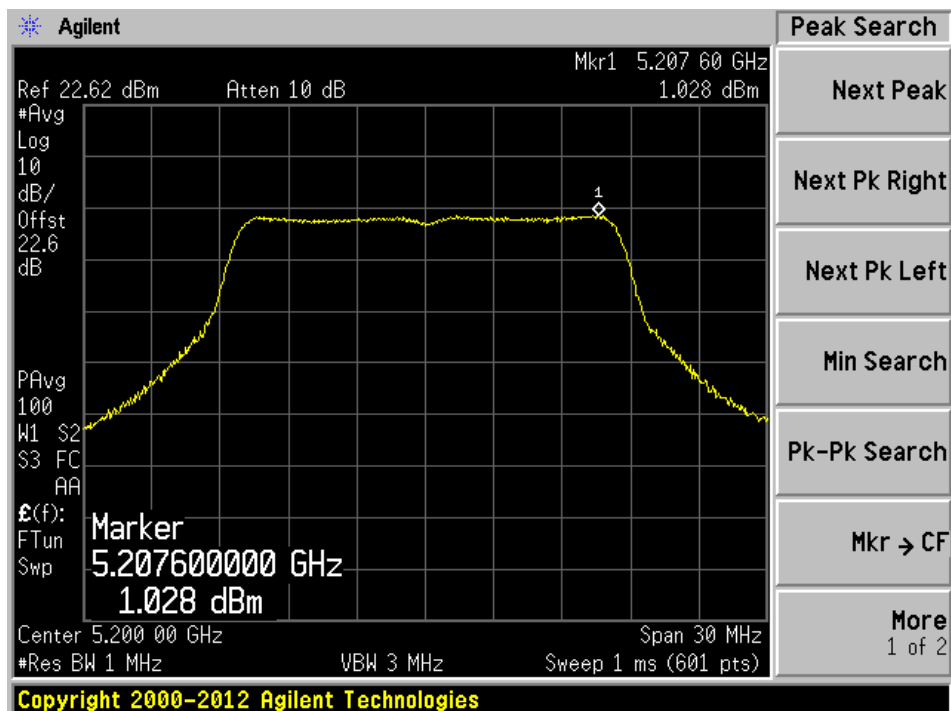
Please refer to the following plots.

## 802.11a mode

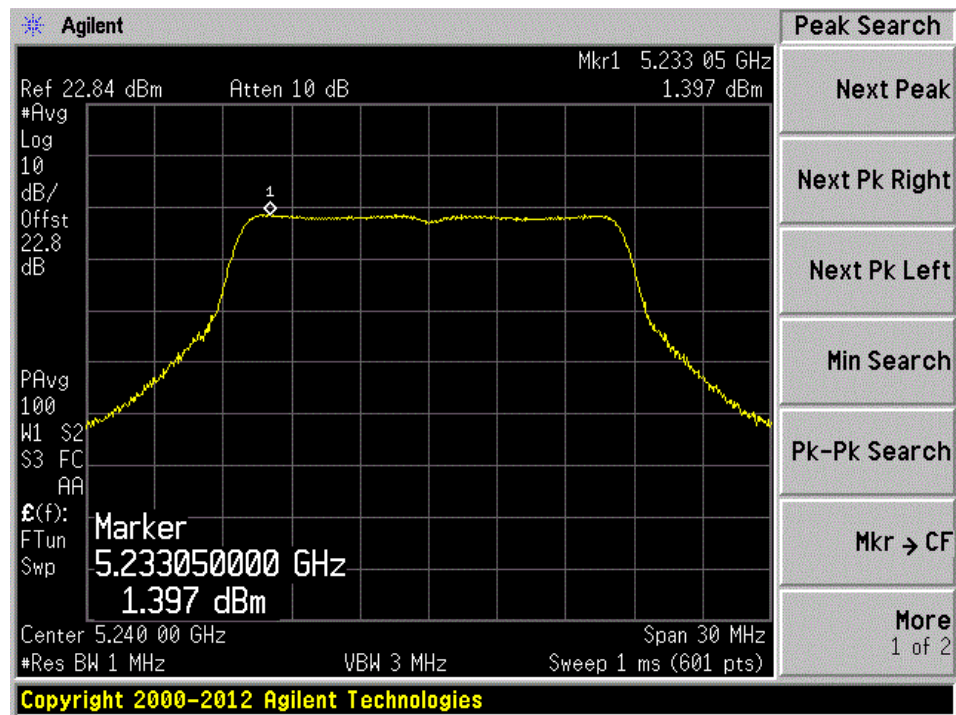
Low channel: 5180 MHz



Middle channel: 5200 MHz

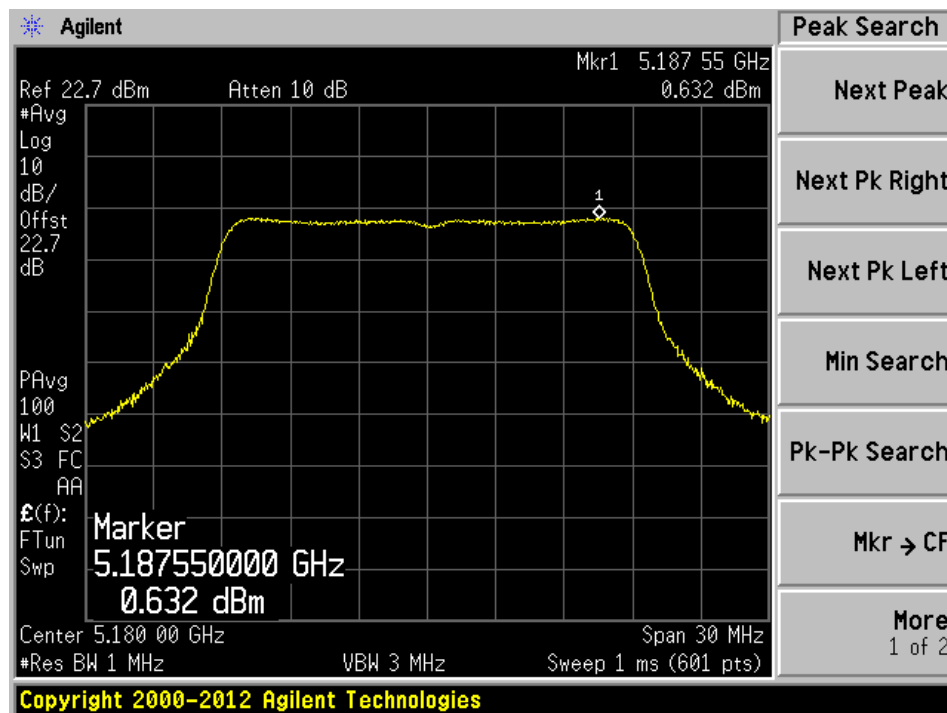


High channel: 5240 MHz

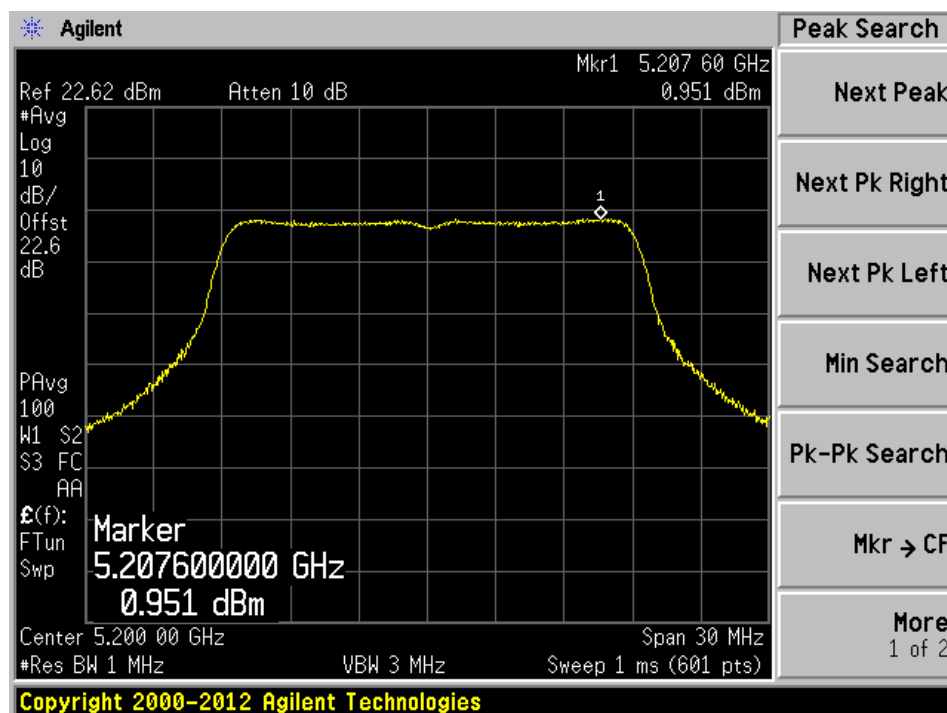


**802.11n-HT20 mode**

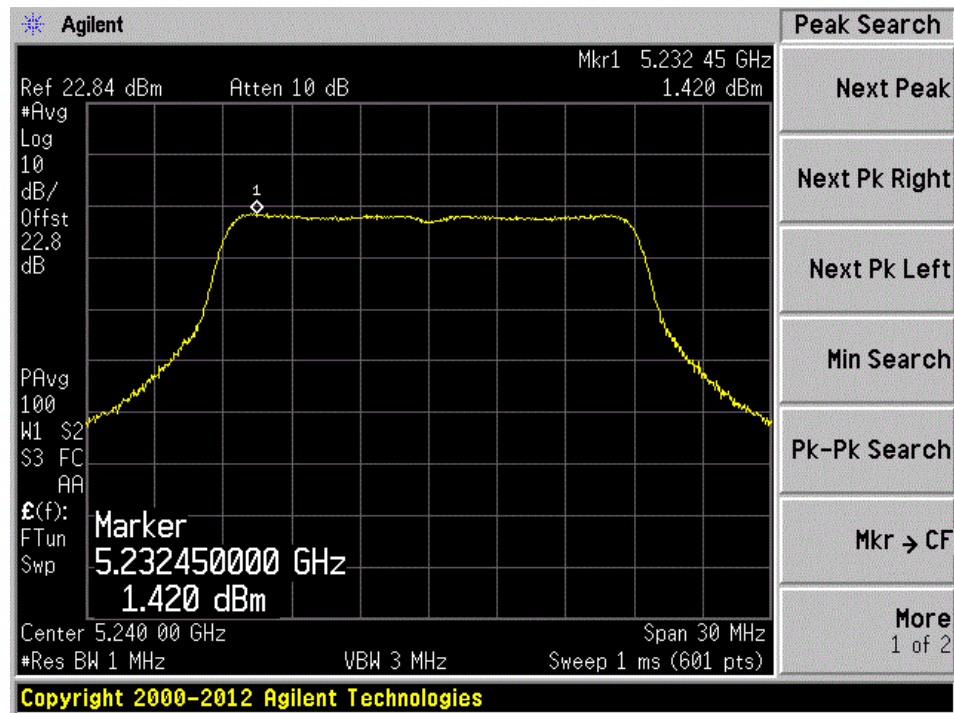
Low channel: 5180 MHz



Middle channel: 5200 MHz



High channel: 5240 MHz



## 12 FCC §15.407(a)(6) – Peak Excursion Ratio

### 12.1 Applicable Standard

According to FCC §15.407(a) (6), the ratio of the peak excursion of the modulation envelope (measured using a peak hold function) to the maximum conducted output power (measured as specified above) shall not exceed 13 dB across any 1 MHz bandwidth or the emission bandwidth whichever is less.

### 12.2 Test Procedure

The measurements are base on FCC KDB 789033 D01 General UNII Test Procedures v01r03: Guidelines for Compliance Testing of Unlicensed National Information Infrastructure (U-NII) Devices section G: Peak excursion measurement

### 12.3 Test Equipment List and Details

| Manufacturer | Description       | Model No. | Serial No. | Calibration Date | Calibration Interval |
|--------------|-------------------|-----------|------------|------------------|----------------------|
| Agilent      | Spectrum Analyzer | E4446A    | US44300386 | 2013-09-29       | 1 year               |

**Statement of Traceability:** *BACL Corp.* attests that all calibrations have been performed per the A2LA requirements, traceable to the NIST.

### 12.4 Test Environmental Conditions

|                    |             |
|--------------------|-------------|
| Temperature:       | 21-25 °C    |
| Relative Humidity: | 41-45 %     |
| ATM Pressure:      | 101-102 kPa |

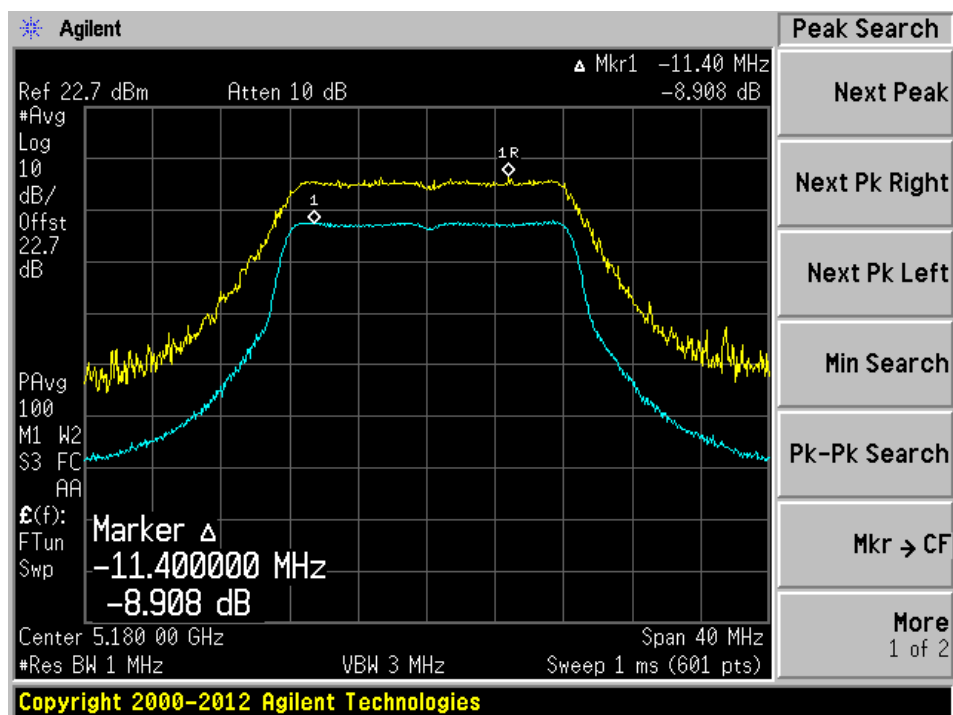
The testing was performed by Chen Ge from 2014-05-14 and 2014-05-16 at RF site.

### 12.5 Test Results

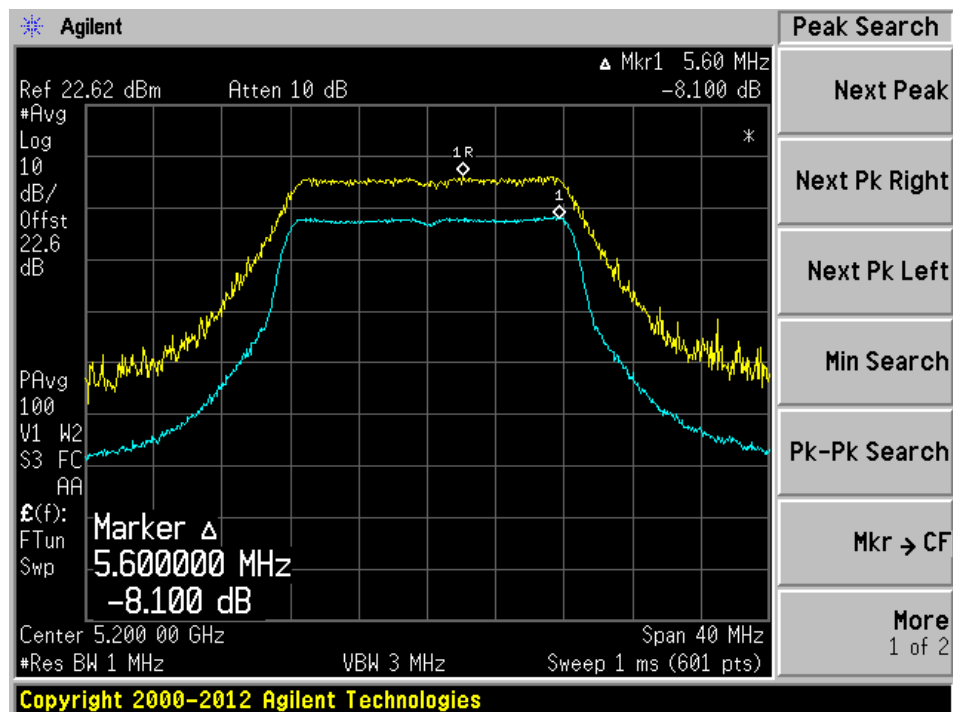
Please refer to the following plots for detailed test results:

## 802.11a mode

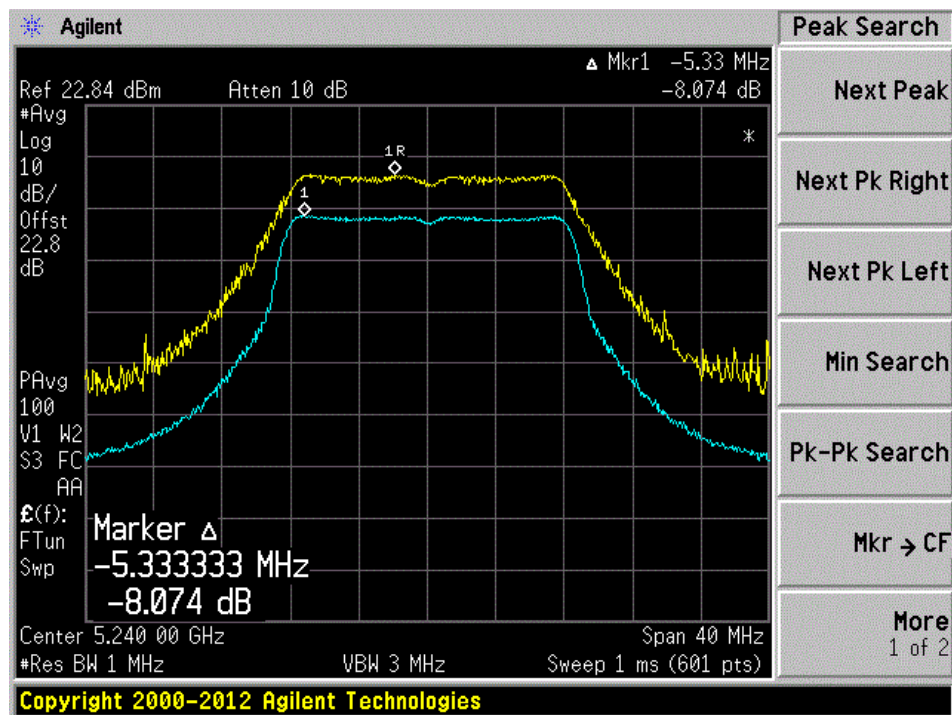
Low channel: 5180 MHz



Middle channel: 5200 MHz

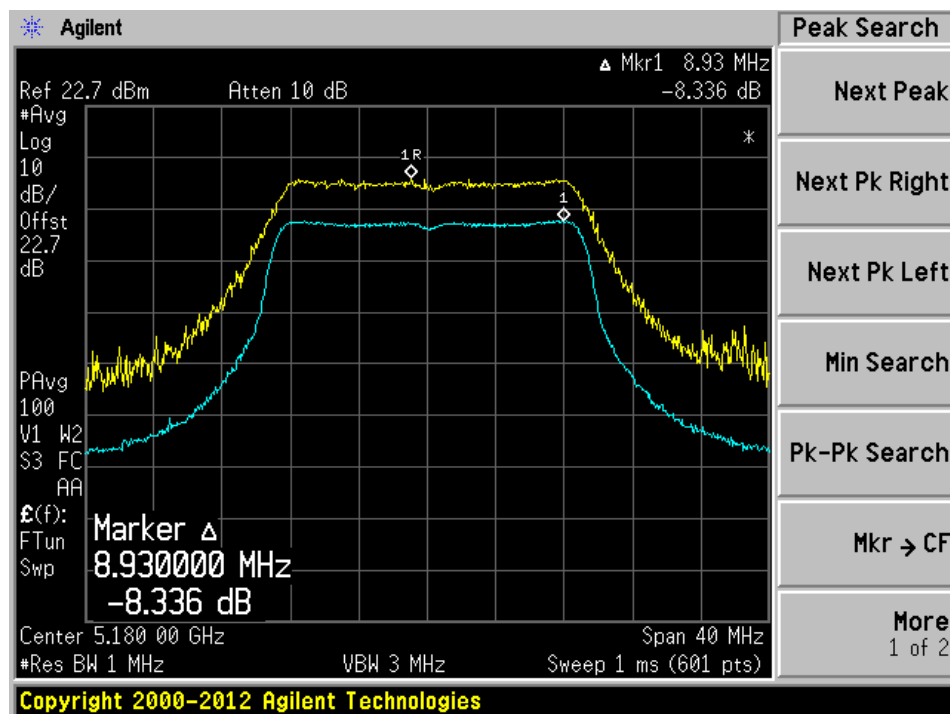


High channel: 5240 MHz

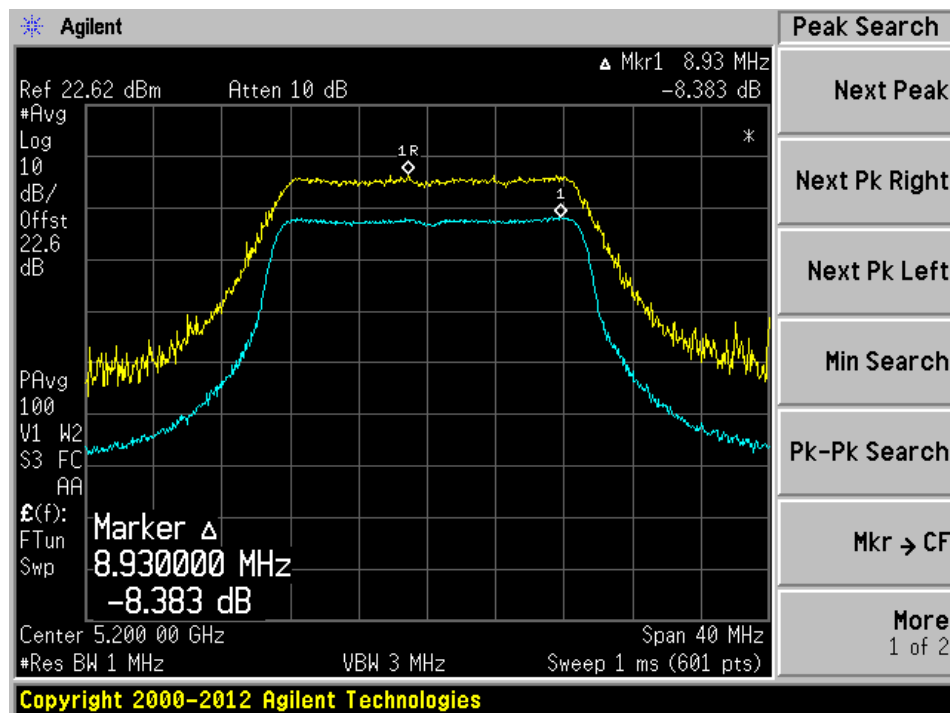


**802.11n-HT20 mode**

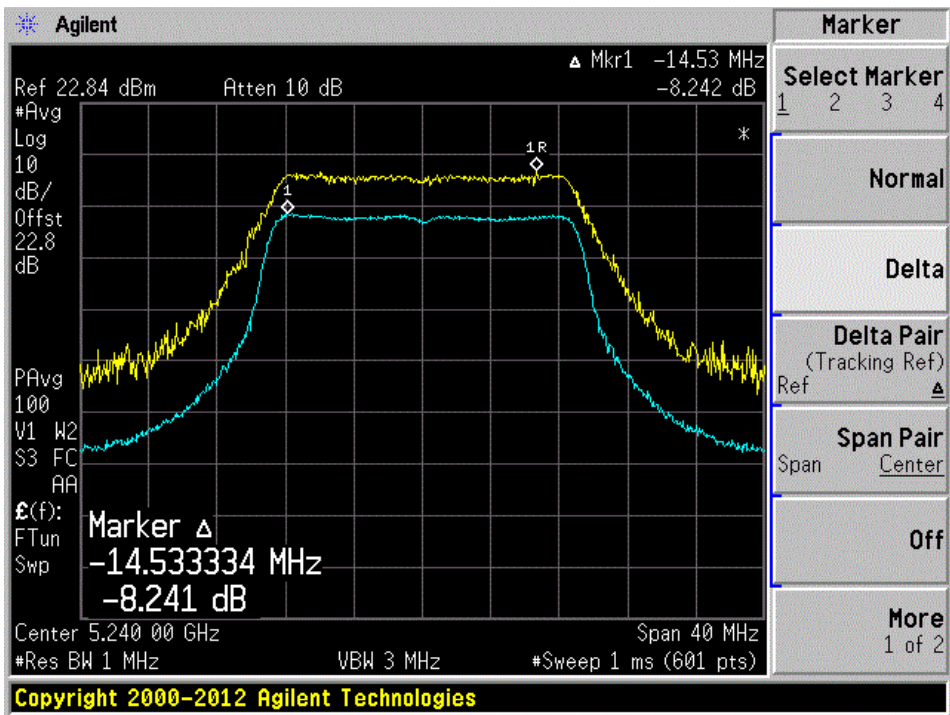
Low channel: 5180 MHz



Middle channel: 5200 MHz



High channel: 5240 MHz



## 13 FCC §15.407(b) & IC RSS-210 §A9.2 - Spurious Emissions at Antenna Terminals

### 13.1 Applicable Standards

According to FCC §15.407(b) and IC RSS-210 §A9.2

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 EIRP of –27 dBm/MHz

### 13.2 Measurement Procedure

The measurements are based on FCC KDB 789033 D01 General UNII Test Procedures v01r03: Guidelines for Compliance Testing of Unlicensed National Information Infrastructure (U-NII) Devices section H: Unwanted emissions measurement

### 13.3 Test Equipment List and Details

| Manufacturer | Description       | Model No. | Serial No. | Calibration Date | Calibration Interval |
|--------------|-------------------|-----------|------------|------------------|----------------------|
| Agilent      | Spectrum Analyzer | E4446A    | US44300386 | 2013-09-29       | 1 year               |

**Statement of Traceability:** *BACL Corp.* attests that all calibrations have been performed per the A2LA requirements, traceable to the NIST.

### 13.4 Test Environmental Conditions

|                    |            |
|--------------------|------------|
| Temperature:       | 22-24 °C   |
| Relative Humidity: | 42-45 %    |
| ATM Pressure:      | 101-102kPa |

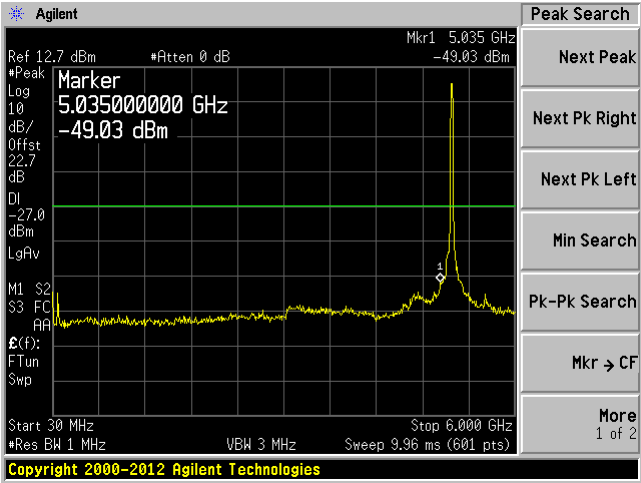
The testing was performed by Chen Ge from 2014-05-07 and 2014-05-09 at RF site.

### 13.5 Test Results

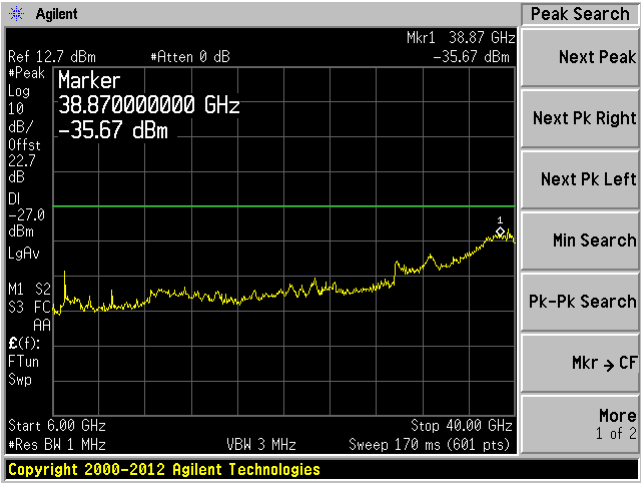
Please refer to following plots of spurious emissions.

802.11a, Low Channel, 5180 MHz

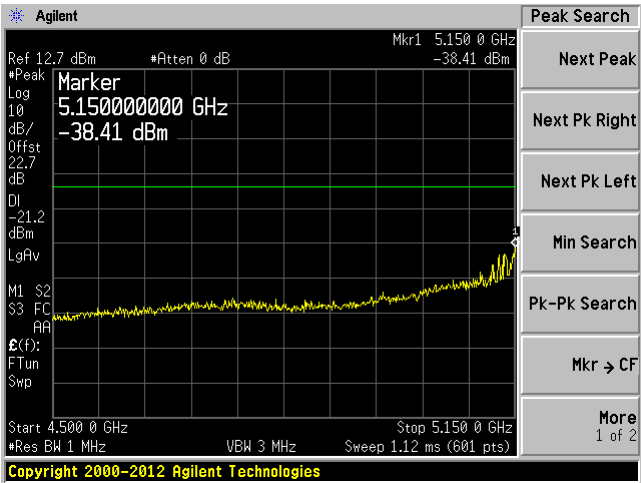
Plot: 30 MHz – 6 GHz



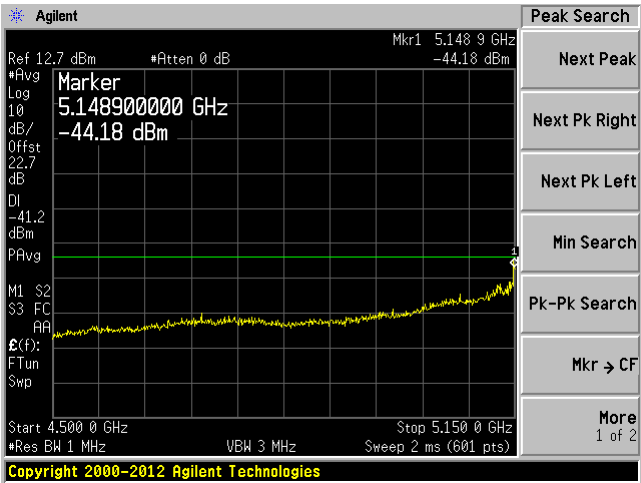
Plot: 6 GHz – 40 GHz



Plot: 4500 MHz – 5150 MHz Peak

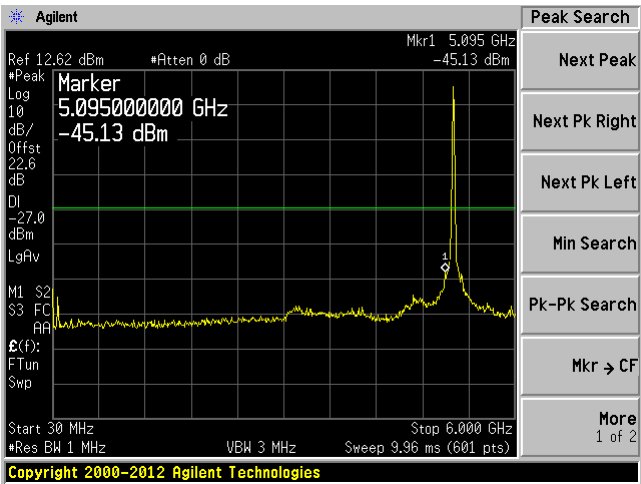


Plot: 4500 MHz – 5150 MHz Ave

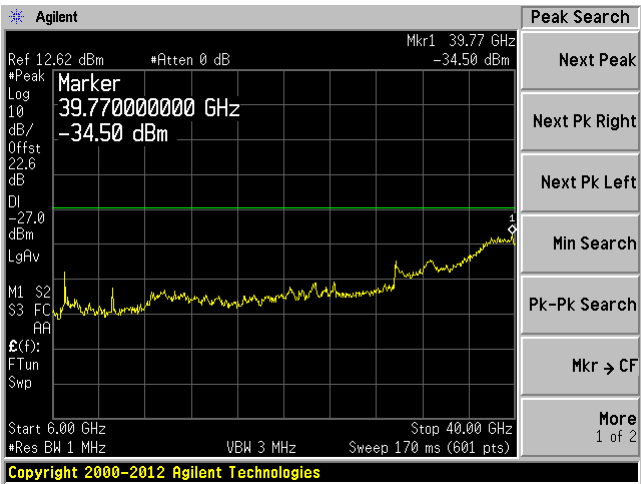


802.11a, Middle Channel, 5200 MHz

Plot: 30 MHz – 6 GHz

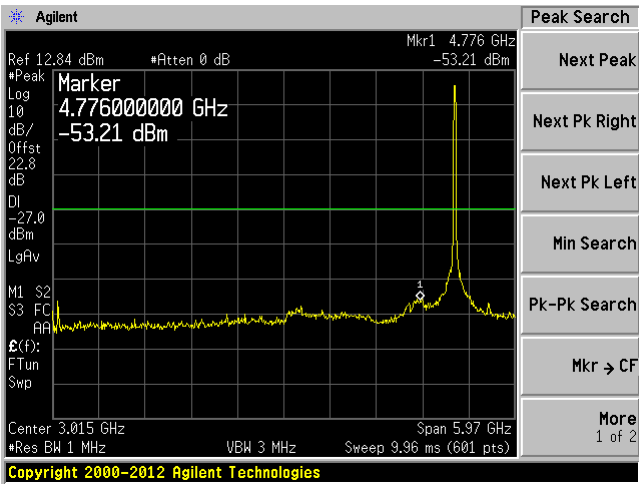


Plot: 6 GHz – 40 GHz

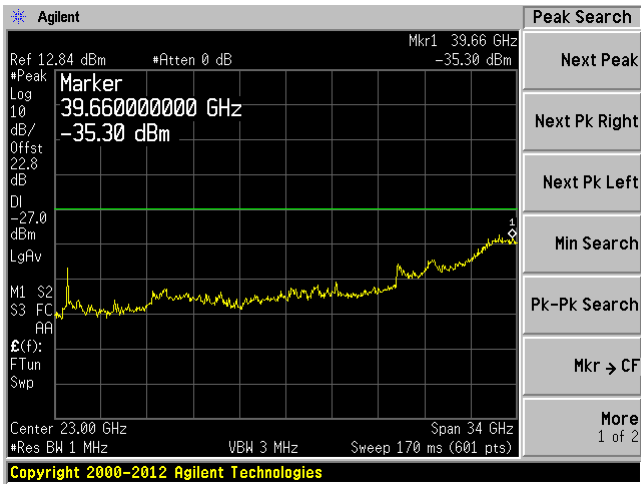


802.11a, High Channel, 5240 MHz

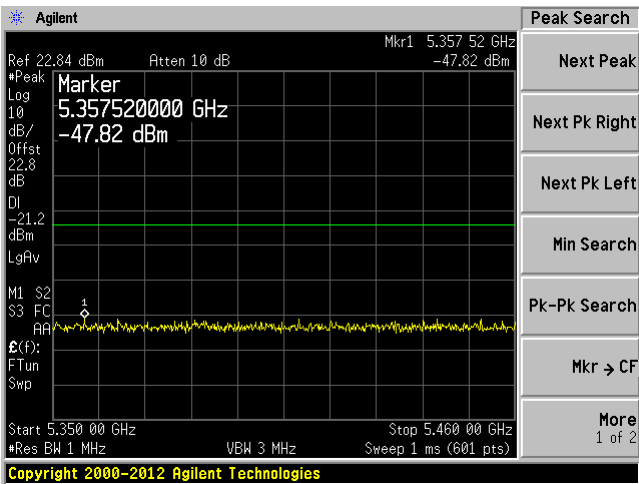
Plot: 30 MHz – 6 GHz



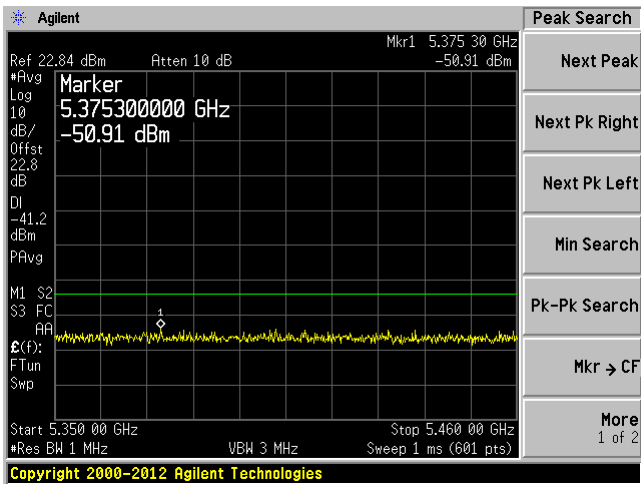
Plot: 6 GHz – 40 GHz



Plot: 5350MHz – 5460 MHz Peak

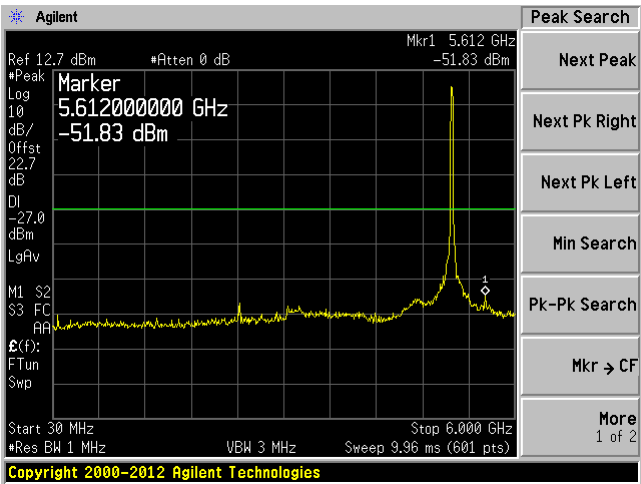


Plot: 5350MHz – 5460 MHz Ave

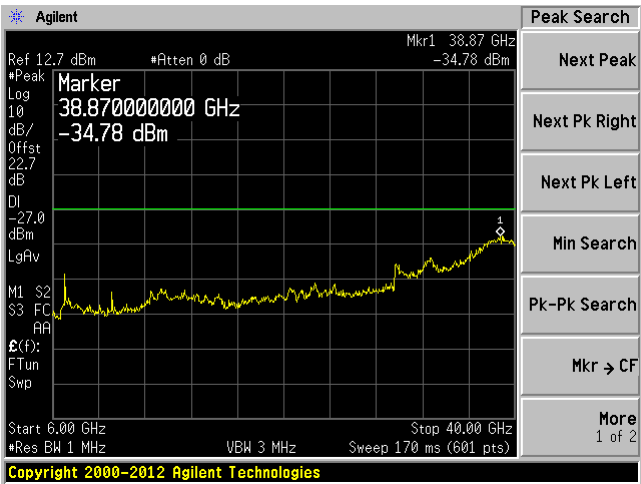


802.11n-HT 20, Low Channel 5180 MHz

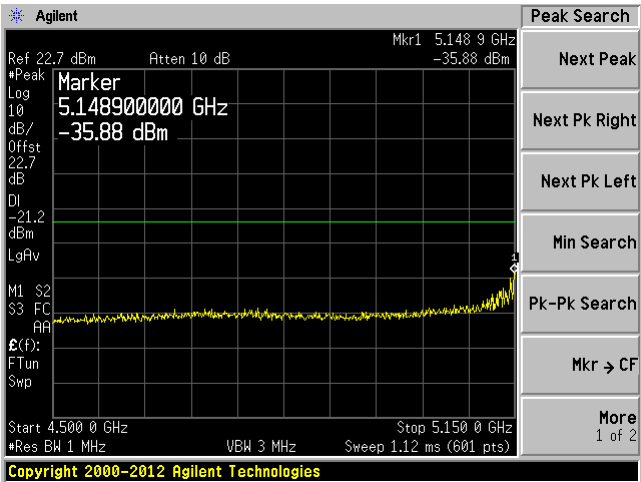
Plot: 30 MHz – 6 GHz



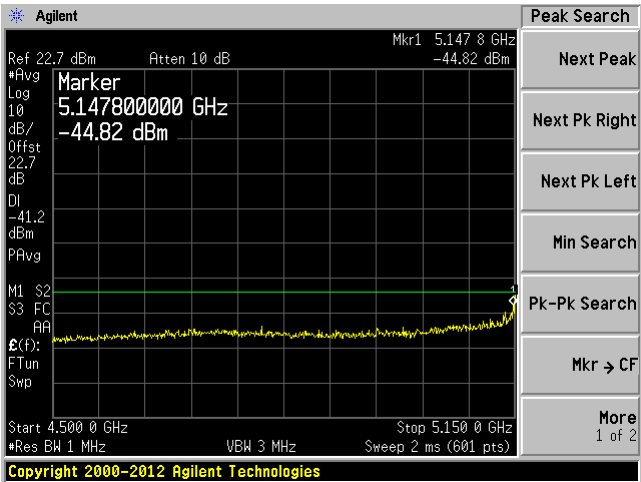
Plot: 6 GHz – 40 GHz



Plot: 4500 MHz – 5150 MHz Peak

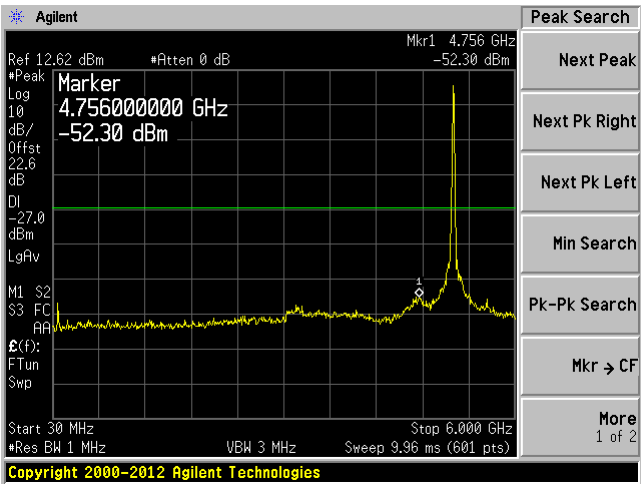


Plot: 4500 MHz – 5150 MHz Ave

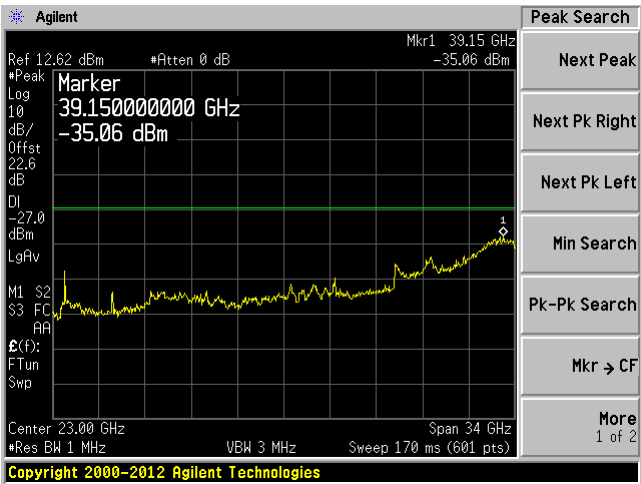


802.11n-HT20, Middle Channel 5200 MHz

Plot: 30 MHz – 6 GHz

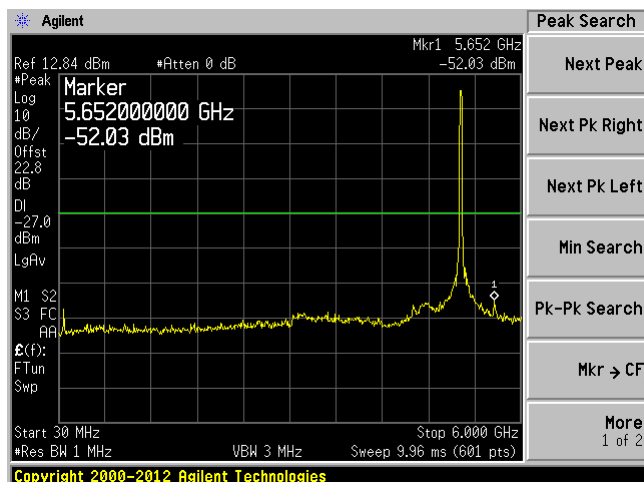


Plot: 6 GHz – 40 GHz

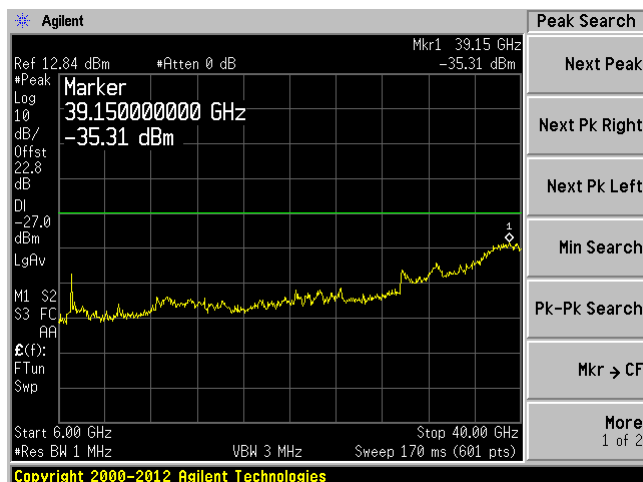


**802.11n-HT 20, High Channel 5240 MHz**

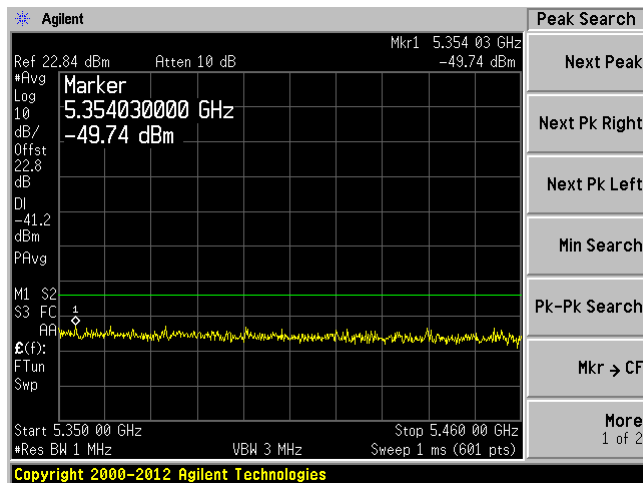
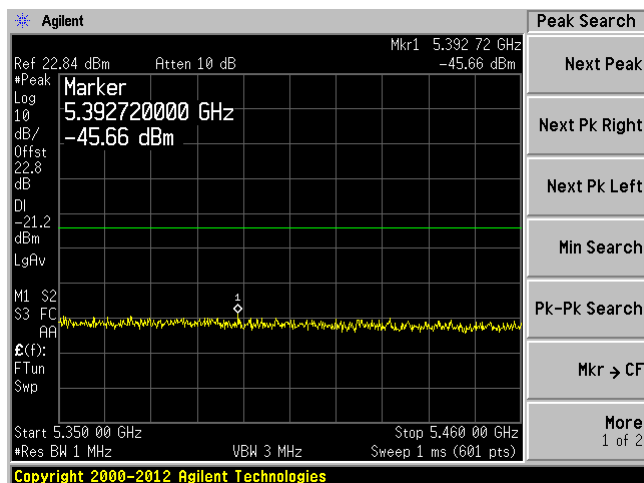
Plot: 30 MHz – 6 GHz



Plot: 6 GHz – 40 GHz



Plot: 5350MHz – 5460 MHz Peak



Note: Offset= Attenuator + cable loss+ Antenna gain