LABCODE: 500069-0

# FCC PART 15.247

# TEST REPORT

For

## Lierda Science& Technology Group Co., Ltd

Lierda Building, 425 Dengyun Rd, Hangzhou, 310011 China

## FCC ID: N8NLSD3WF-2011X

| Report Type: | Product Type: |
|---|---|
| Original Report | WiFi Module |

| | |
|---|---|
| **Test Engineer:** | Allen Qiao |
| **Report Number:** | R2SH140404054-00 |
| **Report Date:** | 2014-04-10 |
| **Reviewed By:** | Ivan Cao<br>RF Leader |
| **Test Laboratory:** | Bay Area Compliance Laboratories Corp. (Dongguan)<br>No.69 Pulongcun, Puxinhu Industrial Zone,<br>Tangxia, Dongguan, Guangdong, China<br>Tel: +86-769-86858888<br>Fax: +86-769-86858891<br>www.baclcorp.com.cn |

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# GENERAL INFORMATION

## Product Description for Equipment under Test (EUT)

The *Lierda Science& Technology Group Co., Ltd*'s product, model number: *LSD3WF-2011X (FCC ID: N8NLSD3WF-2011X)* (the "EUT") in this report was a *WiFi Module,* which was measured approximately: 4.8 cm (L) x 2.0 cm (W) x 0.3 cm (H), rated input voltage: DC 5V.

** All measurement and test data in this report was gathered from production sample serial number: 140404054 (Assigned by BACL.Dongguan). The EUT was received on 2014-04-04.*

## Objective

This report is prepared on behalf of *Lierda Science& Technology Group Co., Ltd* in accordance with Part 2-Subpart J, Part 15-Subparts A, B and C of the Federal Communications Commission's rules.

The tests were performed in order to determine the compliance of the EUT with FCC Part 15-Subpart C, section 15.203, 15.205, 15.207, 15.209 and 15.247 rules.

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

No related submittal(s)/grant(s).

## Test Methodology

All measurements contained in this report were conducted with ANSI C63.4-2003, 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.

All emissions measurement was performed and Bay Area Compliance Laboratories Corp. (Dongguan).

## Test Facility

The Test site used by Bay Area Compliance Laboratories Corp. (Dongguan) to collect test data is located on the No.69 Pulongcun, Puxinhu Industrial Zone, Tangxia, Dongguan, Guangdong, China

Test site at Bay Area Compliance Laboratories Corp. (Dongguan) has been fully described in reports submitted to the Federal Communications Commission (FCC). 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 02, 2012. The facility also complies with the radiated and AC line conducted test site criteria set forth in ANSI C63.4-2003.

The Federal Communications Commission has the reports on file and is listed under FCC Registration No.: 273710. The test site has been approved by the FCC for public use and is listed in the FCC Public Access Link (PAL) database.

Additionally, Bay Area Compliance Laboratories Corp. (Dongguan) is an ISO/IEC 17025 accredited laboratory, and is accredited by National Voluntary Laboratory Accredited Program (Lab Code 500069-0).


The current scope of accreditations can be found at http://ts.nist.gov/standards/scopes/5000690.htm

# SYSTEM TEST CONFIGURATION

## Description of Test Configuration

The system was configured for testing in an engineering mode, which was provided by manufacturer. For 2.4G band, 11 channels are provided to testing:

| Channel | Frequency (MHz) | Channel | Frequency (MHz) |
|---|---|---|---|
| 1 | 2412 | 7 | 2442 |
| 2 | 2417 | 8 | 2447 |
| 3 | 2422 | 9 | 2452 |
| 4 | 2427 | 10 | 2457 |
| 5 | 2432 | 11 | 2462 |
| 6 | 2437 | / | / |

For 802.11b, 802.11g, and 802.11n20 modes were tested with Channel 1, 6 and 11.For 802.11n40 mode were tested with Channel 3, 6 and 9.

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

## EUT Exercise Software

The engineering mode was a build in software entered with engineering code, which was provided by manufacturer, and the test configured as following table:

| Test Mode | Test Software Version | Ralink QA Test Program for RT5370 | | |
|---|---|---|---|---|
| 802.11b | Test Frequency | 2412MHz | 2437MHz | 2462MHz |
| | Data Rate | 1Mbps | 1Mbps | 1Mbps |
| | Power Level Setting | 13 | 14 | 15 |
| 802.11g | Test Frequency | 2412MHz | 2437MHz | 2462MHz |
| | Data Rate | 6Mbps | 6Mbps | 6Mbps |
| | Power Level Setting | 0B | 0C | 0C |
| 802.11n20 | Test Frequency | 2412MHz | 2437MHz | 2462MHz |
| | Data Rate | MCS0 | MCS0 | MCS0 |
| | Power Level Setting | 0B | 0C | 0E |
| 802.11n40 | Test Frequency | 2422MHz | 2437MHz | 2452MHz |
| | Data Rate | MCS0 | MCS0 | MCS0 |
| | Power Level Setting | 0C | 0D | 0E |

## Equipment Modifications

No modification was made to the EUT.

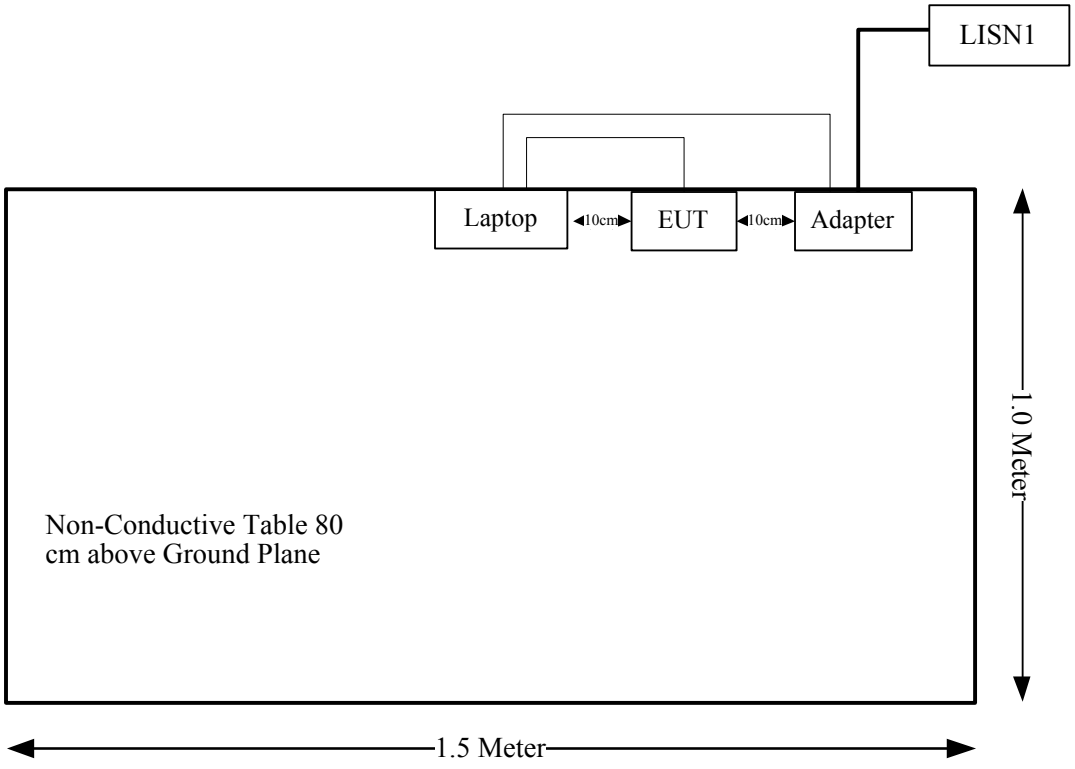
## Support Equipment List and Details

| Manufacturer | Description | Model | Serial Number |
|---|---|---|---|
| DELL | Laptop | PP11L | QDS-BRCM1017 |

## External Cable

| Cable Description | Shielding Type | Ferrite Core | Length (m) | From Port | To |
|---|---|---|---|---|---|
| USB Cable | Yes | No | 2.0 | USB Port of Laptop | EUT |

## Block Diagram of Test Setup



# SUMMARY OF TEST RESULTS

| FCC Rules | Description of Test | Result |
|---|---|---|
| FCC §15.247 (i) & §1.1310 & §2.1091 | Maximum Permissible exposure (MPE) | Compliance |
| §15.203 | Antenna Requirement | Compliance |
| §15.207 (a) | AC Line Conducted Emissions | Compliance |
| §15.247(d) | Spurious Emissions at Antenna Port | Compliance |
| §15.205, §15.209, §15.247(d) | Spurious Emissions | Compliance |
| §15.247 (a)(2) | 6 dB Emission Bandwidth | Compliance |
| §15.247(b)(3) | Maximum Peak Output Power | Compliance |
| §15.247(d) | 100 kHz Bandwidth of Frequency Band Edge | Compliance |
| §15.247(e) | Power Spectral Density | Compliance |

# FCC §15.247 (i) & §1.1310 & §2.1091- MAXIMUM PERMISSIBLE EXPOSURE (MPE)

## Applicable Standard

According to subpart 15.247(i)and subpart §1.1310, systems operating under the provisions of this section shall be operated in a manner that ensures that the public is not exposed to radio frequency energy level in excess of the Commission's guidelines.

Limits for Maximum Permissible Exposure (MPE) (§1.1310, §2.1091)

| (B) Limits for General Population/Uncontrolled Exposure | | | | |
|---|---|---|---|---|
| Frequency Range (MHz) | **Electric Field Strength (V/m)** | **Magnetic Field Strength (A/m)** | **Power Density ($mW/cm^2$)** | **Averaging Time (minutes)** |
| 0.3–1.34 | 614 | 1.63 | *(100) | 30 |
| 1.34–30 | 824/f | 2.19/f | *(180/f²) | 30 |
| 30–300 | 27.5 | 0.073 | 0.2 | 30 |
| 300–1500 | / | / | f/1500 | 30 |
| 1500–100,000 | / | / | 1.0 | 30 |

f = frequency in MHz; * = Plane-wave equivalent power density;

According to §1.1310 and §2.1091 RF exposure is calculated.

**Calculated Formulary:**

Predication of MPE limit at a given distance
$S = PG/4\pi R^2$ = power density (in appropriate units, e.g. $mW/cm^2$);
P = power input to the antenna (in appropriate units, e.g., mW);
G = power gain of the antenna in the direction of interest relative to an isotropic radiator, the power gain factor, is normally numeric gain;
R = distance to the center of radiation of the antenna (appropriate units, e.g., cm);

**Calculated Data:**

| **Mode** | **Frequency (MHz)** | **Antenna Gain** | | **Conducted Power** | | **Evaluation Distance (cm)** | **Power Density ($mW/cm^2$)** | **MPE Limit ($mW/cm^2$)** |
|---|---|---|---|---|---|---|---|---|
| | | **(dBi)** | **(numeric)** | **(dBm)** | **(mW)** | | | |
| 802.11b | 2412 | 2 | 1.58 | 17.61 | 57.68 | 20.00 | 0.01819 | 1.0 |
| 802.11g | 2437 | 2 | 1.58 | 15.06 | 32.06 | 20.00 | 0.01011 | 1.0 |
| 802.11n20 | 3437 | 2 | 1.58 | 14.57 | 28.64 | 20.00 | 0.00904 | 1.0 |
| 802.11n40 | 2437 | 2 | 1.58 | 14.69 | 29.44 | 20.00 | 0.00929 | 1.0 |

**Result:** The device meet FCC MPE at 20 cm distance

# FCC §15.203 - ANTENNA REQUIREMENT

## Applicable Standard

According to § 15.203, an intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. 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 user of a standard antenna jack or electrical connector is prohibited. The structure and application of the EUT were analyzed to determine compliance with section §15.203 of the rules. §15.203 state that the subject device must meet the following criteria:

a. Antenna must be permanently attached to the unit.
b. Antenna must use a unique type of connector to attach to the EUT.

Unit must be professionally installed, and installer shall be responsible for verifying that the correct antenna is employed with the unit.

## Antenna Connector Construction

The antenna use a unique type of connector to attach to the EUT, and the maximum gain is 2.0dBi, please refer to the internal photos.

**Result:** Compliance.

# FCC §15.207 (a) – AC LINE CONDUCTED EMISSIONS

## Applicable Standard

FCC§15.207

## Measurement Uncertainty

Compliance or non- compliance with a disturbance limit shall be determined in the following manner:

If $U_{lab}$ is less than or equal to $U_{cispr}$ of Table 1, then:
- compliance is deemed to occur if no measured disturbance level exceeds the disturbance limit;
- non - compliance is deemed to occur if any measured disturbance level exceeds the disturbance limit.

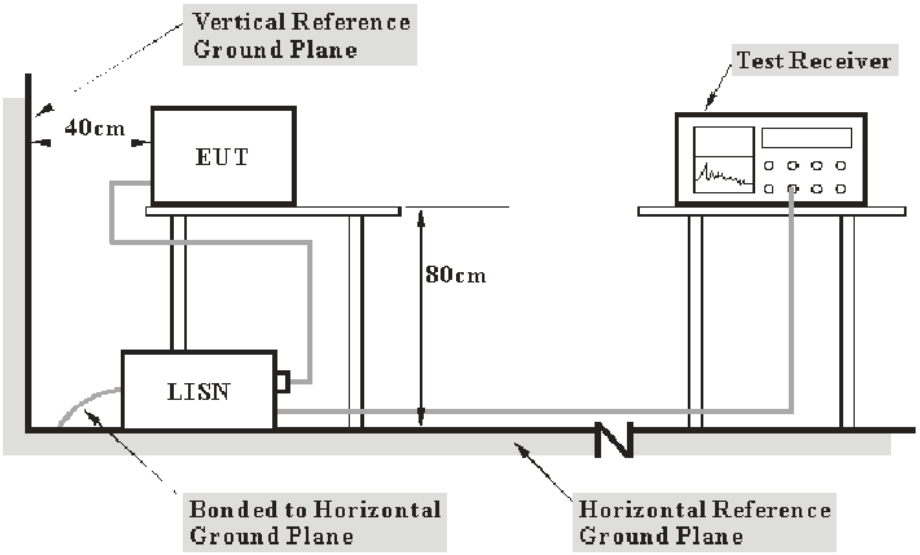
If $U_{lab}$ is greater than $U_{cispr}$ of Table 1, then:
- compliance is deemed to occur if no measured disturbance level, increased by ($U_{lab} - U_{cispr}$), exceeds the disturbance limit;
- non - compliance is deemed to occur if any measured disturbance level, increased by ($U_{lab} - U_{cispr}$), exceeds the disturbance limit.

Based on CISPR 16-4-2-2011, measurement uncertainty of conducted disturbance at mains port using AMN at Bay Area Compliance Laboratories Corp. (Dongguan) is 3.46 dB (150 kHz to 30 MHz).

Table 1 – Values of $U_{cispr}$

| Measurement | $U_{cispr}$ |
|---|---|
| Conducted disturbance at mains port using AMN (150 kHz to 30 MHz) | 3.4 dB |

## EUT Setup




Note: 1. Support units were connected to second LISN.
2. Both of LISNs (AMN) 80 cm from EUT and at the least 80 cm from other units and other metal planes support units.

The setup of EUT is according with per ANSI C63.4-2003 measurement procedure. The specification used was with the FCC Part 15.207 limits.

The spacing between the peripherals was 10 cm.

The adapter was connected to a 120 VAC/60 Hz power source

## EMI Test Receiver Setup

The EMI test receiver was set to investigate the spectrum from 150 kHz to 30 MHz.

During the conducted emission test, the EMI test receiver was set with the following configurations:

| Frequency Range | IF B/W |
|---|---|
| 150 kHz – 30 MHz | 9 kHz |

## Test Procedure

During the conducted emission test, the adapter was connected to the outlet of the first LISN and the other support equipments were connected to the outlet of the second LISN.

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

All data was recorded in the Quasi-peak and average detection mode.

## Corrected Amplitude & Margin Calculation

The basic equation is as follows:

$V_C = V_R + A_C + VDF$
$C_f = A_C + VDF$

Herein,
$V_C$ (cord. Reading): corrected voltage amplitude
$V_R$: reading voltage amplitude
$A_c$: attenuation caused by cable loss
VDF: voltage division factor of AMN
$C_f$: Correction Factor

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

Margin = Limit – Corrected Amplitude

## Test Equipment List and Details

| Manufacturer | Description | Model | Serial Number | Calibration Date | Calibration Due Date |
|---|---|---|---|---|---|
| R&S | EMI Test Receiver | ESCS 30 | 830245/006 | 2013-11-20 | 2014-11-19 |
| R&S | Two-line V-network | ENV216 | 3560.6550.12 | 2014-01-22 | 2015-01-21 |
| R&S | L.I.S.N | ESH3-Z5 | 100113 | N/A | N/A |

*** Statement of Traceability:** Bay Area Compliance Laboratories Corp. (Dongguan) attests that all calibrations have been performed in accordance to NVLAP requirements, traceable to National Primary Standards and International System of Units (SI).

## Test Results Summary

According to the recorded data in following table, the EUT complied with the FCC Part 15.207, with the worst margin reading of:

**2.40 dB** at **0.274848 MHz** in the **Neutral** conducted mode

## Test Data

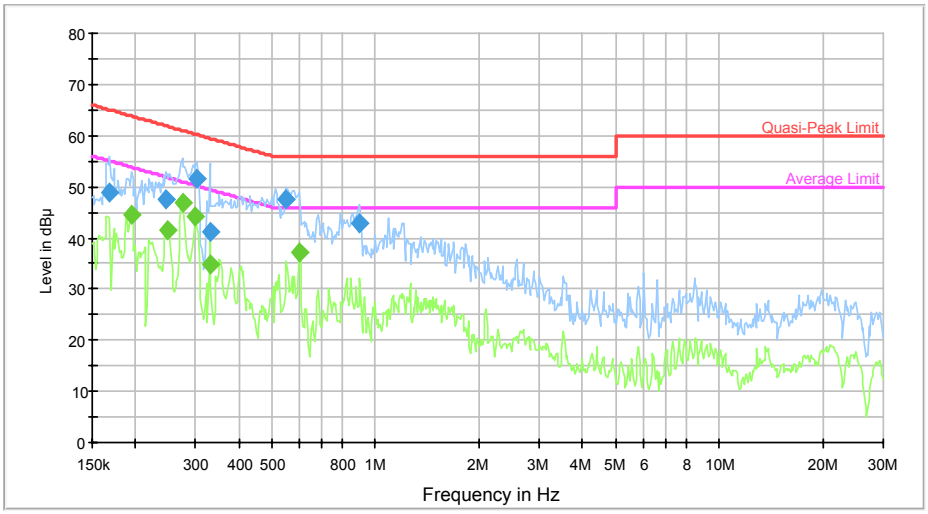
### Environmental Conditions

| | |
|---|---|
| **Temperature:** | 22.6 °C |
| **Relative Humidity:** | 69 % |
| **ATM Pressure:** | 100.9 kPa |

*The testing was performed by Allen Qiao on 2014-04-08.*

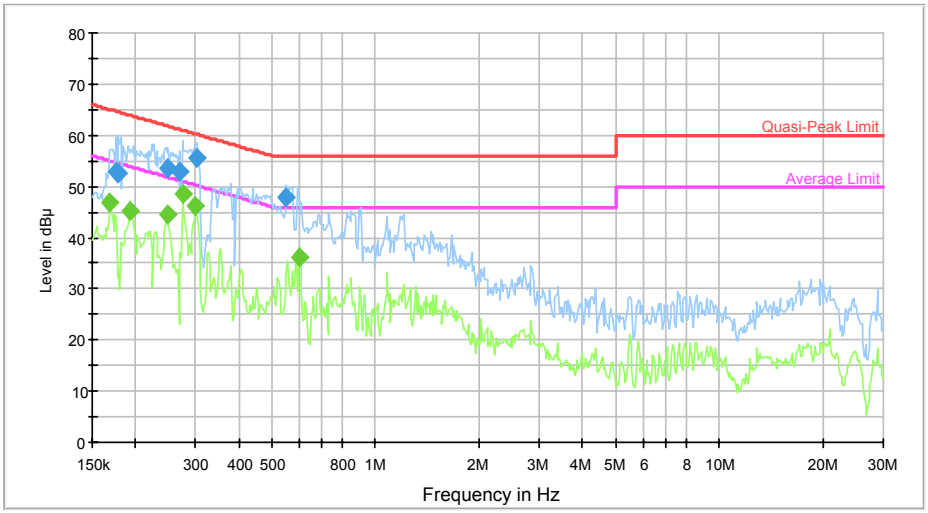
*Test Mode: Transmitting*

**120 V, 60 Hz, Line:**




| Frequency (MHz) | Cord. Reading (dBµV) | Correction Factor (dB) | Margin (dB) | Limit (dBµV) | Detector (PK/AV/QP) |
|---|---|---|---|---|---|
| 0.169044 | 48.7 | 9.8 | 16.3 | 65.0 | QP |
| 0.245835 | 47.6 | 10.2 | 14.3 | 61.9 | QP |
| 0.302425 | 51.7 | 10.1 | 8.5 | 60.2 | QP |
| 0.330129 | 41.2 | 10.1 | 18.2 | 59.4 | QP |
| 0.549741 | 47.4 | 9.9 | 8.6 | 56.0 | QP |
| 0.900972 | 42.7 | 9.8 | 13.3 | 56.0 | QP |
| 0.195114 | 44.5 | 10.1 | 9.3 | 53.8 | AV |
| 0.249785 | 41.5 | 10.2 | 10.2 | 51.8 | AV |
| 0.274848 | 46.9 | 10.1 | 4.1 | 51.0 | AV |
| 0.300025 | 44.0 | 10.1 | 6.2 | 50.2 | AV |
| 0.330129 | 34.7 | 10.1 | 14.8 | 49.4 | AV |
| 0.600101 | 37.1 | 9.9 | 8.9 | 46.0 | AV |

**120 V, 60 Hz, Neutral:**




| Frequency (MHz) | Cord. Reading (dBµV) | Correction Factor (dB) | Margin (dB) | Limit (dBµV) | Detector (PK/AV/QP) |
|---|---|---|---|---|---|
| 0.175915 | 53.0 | 10.3 | 11.7 | 64.7 | QP |
| 0.178741 | 52.7 | 10.3 | 11.8 | 64.5 | QP |
| 0.249785 | 53.5 | 10.7 | 8.3 | 61.8 | QP |
| 0.270502 | 52.9 | 10.6 | 8.2 | 61.1 | QP |
| 0.302425 | 55.5 | 10.5 | 4.6 | 60.2 | QP |
| 0.549741 | 47.8 | 9.9 | 8.2 | 56.0 | QP |
| 0.169044 | 46.9 | 10.1 | 8.1 | 55.0 | AV |
| 0.193566 | 45.2 | 10.7 | 8.7 | 53.9 | AV |
| 0.247802 | 44.4 | 10.7 | 7.5 | 51.8 | AV |
| 0.274848 | 48.6 | 10.6 | **2.4** | 51.0 | AV |
| 0.300025 | 46.1 | 10.5 | 4.1 | 50.2 | AV |
| 0.600101 | 36.2 | 9.9 | 9.8 | 46.0 | AV |

# FCC §15.209, §15.205 & §15.247(d) - SPURIOUS EMISSIONS

## Applicable Standard

FCC §15.247 (d); §15.209; §15.205;

## Measurement Uncertainty

Compliance or non- compliance with a disturbance limit shall be determined in the following manner：

If $U_{lab}$ is less than or equal to $U_{cispr}$ of Table 2, then:
- compliance is deemed to occur if no measured disturbance level exceeds the disturbance limit;
- non - compliance is deemed to occur if any measured disturbance level exceeds the disturbance limit.

If $U_{lab}$ is greater than $U_{cispr}$ of Table 2, then:
- compliance is deemed to occur if no measured disturbance level, increased by ($U_{lab} - U_{cispr}$), exceeds the disturbance limit;
- non - compliance is deemed to occur if any measured disturbance level, increased by ($U_{lab} - U_{cispr}$), exceeds the disturbance limit.

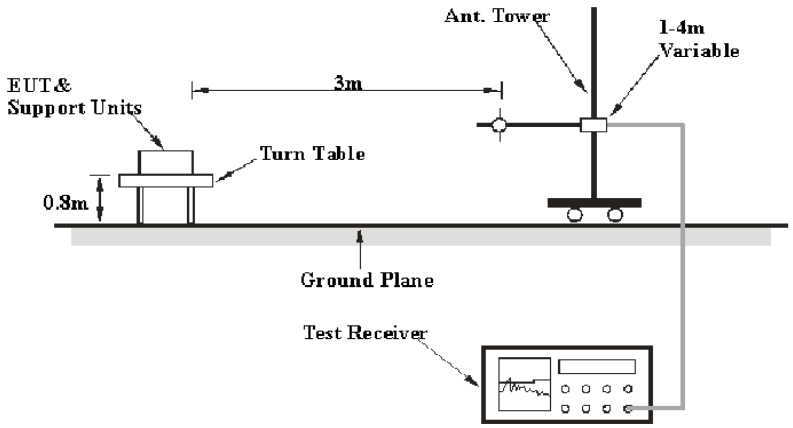
Based on CISPR 16-4-2-2011, measurement uncertainty of radiated emission at a distance of 3m at Bay Area Compliance Laboratories Corp. (Dongguan) is:
30M~200MHz: 5.0 dB
200M~1GHz: 6.2 dB
1G~6GHz: 4.45 dB
6G~18GHz: 5.23 dB

Table 2 – Values of $U_{cispr}$

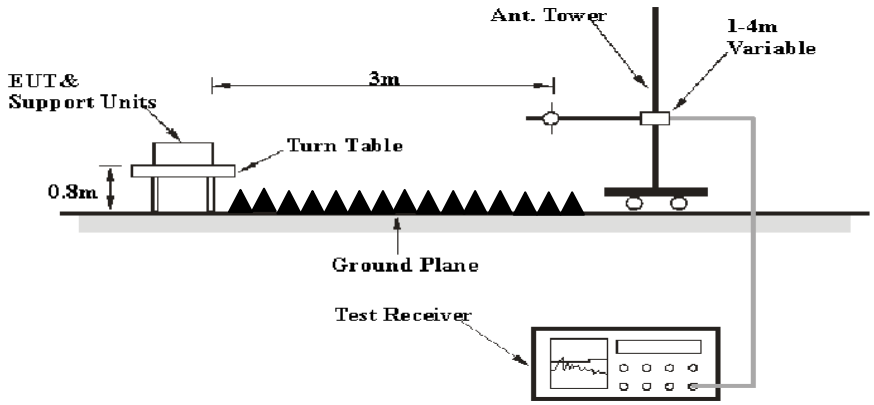
| Measurement | $U_{cispr}$ |
|---|---|
| Radiated disturbance (electric field strength at an OATS or in a SAC) (30 MHz to 1000 MHz) | 6.3 dB |
| Radiated disturbance (electric field strength in a FAR) (1 GHz to 6 GHz) | 5.2 dB |
| Radiated disturbance (electric field strength in a FAR) (6 GHz to 18 GHz) | 5.5 dB |

## EUT Setup

**Below 1GHz:**



**Above 1GHz:**




The radiated emission tests were performed in the 3 meters chamber test site, using the setup accordance with the ANSI C63.4-2003. The specification used was the FCC 15.209, and FCC 15.247 limits.

The external I/O cables were draped along the test table and formed a bundle 30 to 40 cm long in the middle.

The spacing between the peripherals was 10 cm.

The adapter was connected to a 120 VAC/60 Hz power source

## EMI Test Receiver & Spectrum Analyzer Setup

The system was investigated from 30 MHz to 25 GHz.

During the radiated emission test, the EMI test receiver & Spectrum Analyzer Setup were set with the following configurations:

| Frequency Range | RBW | Video B/W | IF B/W | Detector |
|---|---|---|---|---|
| 30MHz – 1000 MHz | 120 kHz | 300 kHz | 120kHz | QP |
| Above 1 GHz | 1MHz | 3 MHz | / | PK |
| | 1MHz | 10 Hz | / | Ave. |

## Test Procedure

During the radiated emission test, the adapter was connected to the first AC floor outlet and the other support equipments were connected to the second AC floor outlet.

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

Data was recorded in Quasi-peak detection mode for frequency range of 30 MHz-1 GHz, peak and Average detection modes for frequencies above 1 GHz.

## Corrected Amplitude & Margin Calculation

The Corrected Amplitude is calculated by adding the Antenna Loss and Cable Loss, and subtracting the Amplifier Gain from the Meter Reading. The basic equation is as follows:

Corrected Amplitude = Meter Reading + Antenna Loss + Cable Loss - Amplifier Gain

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

Margin = Limit – Corrected Amplitude

## Test Equipment List and Details

| Manufacturer | Description | Model | Serial Number | Calibration Date | Calibration Due Date |
|---|---|---|---|---|---|
| R&S | EMI Test Receiver | ESCI | 100224 | 2013-05-06 | 2014-05-05 |
| Sunol Sciences | Antenna | JB3 | A060611-1 | 2011-09-06 | 2014-09-05 |
| HP | Amplifier | 8447E | 2434A02181 | 2013-09-06 | 2014-09-05 |
| R&S | Spectrum Analyzer | FSEM | DE31388 | 2013-05-07 | 2014-05-06 |
| ETS LINDGREN | Horn Antenna | 3115 | 000 527 35 | 2012-09-06 | 2015-09-05 |
| Mini-Circuit | Amplifier | ZVA-213-S+ | 054201245 | 2014-02-19 | 2015-02-18 |
| R&S | Spectrum Analyzer | FSP 38 | 100478 | 2013-06-16 | 2014-06-15 |
| Ducommun Technolagies | Horn Antenna | ARH-4223-02 | 1007726-01 1304 | 2013-06-16 | 2014-06-15 |
| Quinstar | Amplifier | QLW-18405536-JO | 15964001001 | 2013-09-06 | 2014-09-05 |

*** Statement of Traceability:** Bay Area Compliance Laboratories Corp. (Dongguan) attests that all calibrations have been performed in accordance to NVLAP requirements, traceable to National Primary Standards and International System of Units (SI).

## Test Results Summary

According to the recorded data in following table, the EUT complied with the FCC Title 47, Part 15, Section 15.205, 15.209 and 15.247, with the worst margin reading of:

**10.04 dB** at **2390 MHz** in the **Horizontal** polarization for 802.11n40 Mode

## Test Data

### Environmental Conditions

| | |
|---|---|
| **Temperature:** | 22.6 °C |
| **Relative Humidity:** | 60 % |
| **ATM Pressure:** | 100.9 kPa |

*The testing was performed by Allen Qiao on 2014-04-08.*

*Mode: Transmitting*
802.11b Mode

| Frequency (MHz) | Receiver | | Rx Antenna | | Cable loss (dB) | Amplifier Gain (dB) | Corrected Amplitude (dBμV/m) | FCC 15.247 | |
|---|---|---|---|---|---|---|---|---|---|
| | Reading (dBμV) | Detector (PK/QP/AV) | Polar (H/V) | Factor (dB) | | | | Limit (dBμV/m) | Margin (dB) |
| Low Channel: 2412 MHz | | | | | | | | | |
| 2412 | 75.31 | PK | H | 25.67 | 4.42 | 0.00 | 105.40 | N/A | N/A |
| 2412 | 71.96 | AV | H | 25.67 | 4.42 | 0.00 | 102.05 | N/A | N/A |
| 2412 | 66.97 | PK | V | 25.67 | 4.42 | 0.00 | 97.06 | N/A | N/A |
| 2412 | 62.08 | AV | V | 25.67 | 4.42 | 0.00 | 92.17 | N/A | N/A |
| 2390 | 26.72 | PK | H | 25.61 | 4.39 | 0.00 | 56.72 | 74.00 | 17.28 |
| 2390 | 13.55 | AV | H | 25.61 | 4.39 | 0.00 | 43.55 | 54.00 | 10.45 |
| 4824 | 33.94 | PK | H | 30.64 | 6.03 | 27.41 | 43.20 | 74.00 | 30.80 |
| 4824 | 25.72 | AV | H | 30.64 | 6.03 | 27.41 | 34.98 | 54.00 | 19.02 |
| 7236 | 30.07 | PK | H | 34.17 | 7.47 | 25.90 | 45.81 | 74.00 | 28.19 |
| 7236 | 18.63 | AV | H | 34.17 | 7.47 | 25.90 | 34.37 | 54.00 | 19.63 |
| 9648 | 29.37 | PK | H | 36.06 | 8.81 | 27.46 | 46.78 | 74.00 | 27.22 |
| 9648 | 17.96 | AV | H | 36.06 | 8.81 | 27.46 | 35.37 | 54.00 | 18.63 |
| 1900 | 36.36 | PK | H | 24.40 | 3.60 | 27.51 | 36.85 | 74.00 | 37.15 |
| 1900 | 22.13 | AV | H | 24.40 | 3.60 | 27.51 | 22.62 | 54.00 | 31.38 |
| 400.92 | 38.1 | QP | V | 16.21 | 2.43 | 21.77 | 34.97 | 46.00 | 11.03 |
| Middle Channel: 2437 MHz | | | | | | | | | |
| 2437 | 75.03 | PK | H | 25.74 | 4.41 | 0.00 | 105.18 | N/A | N/A |
| 2437 | 71.28 | AV | H | 25.74 | 4.41 | 0.00 | 101.43 | N/A | N/A |
| 2437 | 67.01 | PK | V | 25.74 | 4.41 | 0.00 | 97.16 | N/A | N/A |
| 2437 | 62.3 | AV | V | 25.74 | 4.41 | 0.00 | 92.45 | N/A | N/A |
| 4874 | 33.27 | PK | H | 30.77 | 6.09 | 27.42 | 42.71 | 74.00 | 31.29 |
| 4874 | 25.65 | AV | H | 30.77 | 6.09 | 27.42 | 35.09 | 54.00 | 18.91 |
| 7311 | 30.18 | PK | H | 34.35 | 7.51 | 25.88 | 46.16 | 74.00 | 27.84 |
| 7311 | 18.65 | AV | H | 34.35 | 7.51 | 25.88 | 34.63 | 54.00 | 19.37 |
| 9748 | 28.09 | PK | H | 36.30 | 8.83 | 27.24 | 45.98 | 74.00 | 28.02 |
| 9748 | 15.6 | AV | H | 36.30 | 8.83 | 27.24 | 33.49 | 54.00 | 20.51 |
| 1795 | 36.11 | PK | H | 24.19 | 3.51 | 27.54 | 36.27 | 74.00 | 37.73 |
| 1795 | 22.33 | AV | H | 24.19 | 3.51 | 27.54 | 22.49 | 54.00 | 31.51 |
| 7735 | 30.2 | PK | H | 34.99 | 7.56 | 26.85 | 45.90 | 74.00 | 28.10 |
| 7735 | 17.63 | AV | H | 34.99 | 7.56 | 26.85 | 33.33 | 54.00 | 20.67 |
| 400.17 | 37.8 | QP | V | 16.19 | 2.43 | 21.77 | 34.65 | 46.00 | 11.35 |
| High Channel: 2462 MHz | | | | | | | | | |
| 2462 | 76.67 | PK | H | 25.80 | 4.43 | 0.00 | 106.90 | N/A | N/A |
| 2462 | 71.89 | AV | H | 25.80 | 4.43 | 0.00 | 102.12 | N/A | N/A |
| 2462 | 67.59 | PK | V | 25.80 | 4.43 | 0.00 | 97.82 | N/A | N/A |
| 2462 | 62.91 | AV | V | 25.80 | 4.43 | 0.00 | 93.14 | N/A | N/A |
| 2483.5 | 25.43 | PK | H | 25.86 | 4.49 | 0.00 | 55.78 | 74.00 | 18.22 |
| 2483.5 | 13.37 | AV | H | 25.86 | 4.49 | 0.00 | 43.72 | 54.00 | 10.28 |
| 4924 | 34.93 | PK | H | 30.90 | 5.97 | 27.43 | 44.37 | 74.00 | 29.63 |
| 4924 | 26.88 | AV | H | 30.90 | 5.97 | 27.43 | 36.32 | 54.00 | 17.68 |
| 7386 | 30.25 | PK | H | 34.53 | 7.55 | 25.86 | 46.47 | 74.00 | 27.53 |
| 7386 | 18.36 | AV | H | 34.53 | 7.55 | 25.86 | 34.58 | 54.00 | 19.42 |
| 9848 | 27.69 | PK | H | 36.54 | 8.85 | 26.94 | 46.14 | 74.00 | 27.86 |
| 9848 | 15.37 | AV | H | 36.54 | 8.85 | 26.94 | 33.82 | 54.00 | 20.18 |
| 1780 | 35.69 | PK | H | 24.16 | 3.57 | 27.56 | 35.86 | 74.00 | 38.14 |
| 1780 | 21.81 | AV | H | 24.16 | 3.57 | 27.56 | 21.98 | 54.00 | 32.02 |
| 400.54 | 38.6 | QP | V | 16.20 | 2.43 | 21.77 | 35.46 | 46.00 | 10.54 |

802.11g Mode

| Frequency (MHz) | Receiver | | Rx Antenna | | Cable loss (dB) | Amplifier Gain (dB) | Corrected Amplitude (dBμV/m) | FCC 15.247 | |
|---|---|---|---|---|---|---|---|---|---|
| | Reading (dBμV) | Detector (PK/QP/AV) | Polar (H/V) | Factor (dB) | | | | Limit (dBμV/m) | Margin (dB) |
| Low Channel: 2412 MHz | | | | | | | | | |
| 2412 | 72.04 | PK | H | 25.67 | 4.42 | 0.00 | 102.13 | N/A | N/A |
| 2412 | 61.19 | AV | H | 25.67 | 4.42 | 0.00 | 91.28 | N/A | N/A |
| 2412 | 60.32 | PK | V | 25.67 | 4.42 | 0.00 | 90.41 | N/A | N/A |
| 2412 | 49.1 | AV | V | 25.67 | 4.42 | 0.00 | 79.19 | N/A | N/A |
| 2390 | 25.98 | PK | H | 25.61 | 4.39 | 0.00 | 55.98 | 74.00 | 18.02 |
| 2390 | 11.78 | AV | H | 25.61 | 4.39 | 0.00 | 41.78 | 54.00 | 12.22 |
| 4824 | 30.54 | PK | H | 30.64 | 6.03 | 27.41 | 39.80 | 74.00 | 34.20 |
| 4824 | 17.96 | AV | H | 30.64 | 6.03 | 27.41 | 27.22 | 54.00 | 26.78 |
| 7236 | 31.64 | PK | H | 34.17 | 7.47 | 25.90 | 47.38 | 74.00 | 26.62 |
| 7236 | 18.37 | AV | H | 34.17 | 7.47 | 25.90 | 34.11 | 54.00 | 19.89 |
| 9648 | 27.7 | PK | H | 36.06 | 8.81 | 27.46 | 45.11 | 74.00 | 28.89 |
| 9648 | 15.36 | AV | H | 36.06 | 8.81 | 27.46 | 32.77 | 54.00 | 21.23 |
| 1900 | 36.27 | PK | H | 24.40 | 3.60 | 27.51 | 36.76 | 74.00 | 37.24 |
| 1900 | 22.09 | AV | H | 24.40 | 3.60 | 27.51 | 22.58 | 54.00 | 31.42 |
| 400.92 | 38.2 | QP | V | 16.21 | 2.43 | 21.77 | 35.07 | 46.00 | 10.93 |
| Middle Channel: 2437 MHz | | | | | | | | | |
| 2437 | 71.8 | PK | H | 25.74 | 4.41 | 0.00 | 101.95 | N/A | N/A |
| 2437 | 61.04 | AV | H | 25.74 | 4.41 | 0.00 | 91.19 | N/A | N/A |
| 2437 | 64.36 | PK | V | 25.74 | 4.41 | 0.00 | 94.51 | N/A | N/A |
| 2437 | 53.86 | AV | V | 25.74 | 4.41 | 0.00 | 84.01 | N/A | N/A |
| 4874 | 31.34 | PK | H | 30.77 | 6.09 | 27.42 | 40.78 | 74.00 | 33.22 |
| 4874 | 18.41 | AV | H | 30.77 | 6.09 | 27.42 | 27.85 | 54.00 | 26.15 |
| 7311 | 30.86 | PK | H | 34.35 | 7.51 | 25.88 | 46.84 | 74.00 | 27.16 |
| 7311 | 18.36 | AV | H | 34.35 | 7.51 | 25.88 | 34.34 | 54.00 | 19.66 |
| 9748 | 28.36 | PK | H | 36.30 | 8.83 | 27.24 | 46.25 | 74.00 | 27.75 |
| 9748 | 15.29 | AV | H | 36.30 | 8.83 | 27.24 | 33.18 | 54.00 | 20.82 |
| 1795 | 36.35 | PK | H | 24.19 | 3.51 | 27.54 | 36.51 | 74.00 | 37.49 |
| 1795 | 22.29 | AV | H | 24.19 | 3.51 | 27.54 | 22.45 | 54.00 | 31.55 |
| 7735 | 30.27 | PK | H | 34.99 | 7.56 | 26.85 | 45.97 | 74.00 | 28.03 |
| 7735 | 17.72 | AV | H | 34.99 | 7.56 | 26.85 | 33.42 | 54.00 | 20.58 |
| 400.17 | 37.9 | QP | V | 16.19 | 2.43 | 21.77 | 34.75 | 46.00 | 11.25 |
| High Channel: 2462 MHz | | | | | | | | | |
| 2462 | 72.32 | PK | H | 25.80 | 4.43 | 0.00 | 102.55 | N/A | N/A |
| 2462 | 61.53 | AV | H | 25.80 | 4.43 | 0.00 | 91.76 | N/A | N/A |
| 2462 | 62.76 | PK | V | 25.80 | 4.43 | 0.00 | 92.99 | N/A | N/A |
| 2462 | 51.86 | AV | V | 25.80 | 4.43 | 0.00 | 82.09 | N/A | N/A |
| 2483.5 | 25.17 | PK | H | 25.86 | 4.49 | 0.00 | 55.52 | 74.00 | 18.48 |
| 2483.5 | 11.18 | AV | H | 25.86 | 4.49 | 0.00 | 41.53 | 54.00 | 12.47 |
| 4924 | 31.69 | PK | H | 30.90 | 5.97 | 27.43 | 41.13 | 74.00 | 32.87 |
| 4924 | 18.37 | AV | H | 30.90 | 5.97 | 27.43 | 27.81 | 54.00 | 26.19 |
| 7386 | 32.9 | PK | H | 34.53 | 7.55 | 25.86 | 49.12 | 74.00 | 24.88 |
| 7386 | 18.39 | AV | H | 34.53 | 7.55 | 25.86 | 34.61 | 54.00 | 19.39 |
| 9848 | 28.36 | PK | H | 36.54 | 8.85 | 26.94 | 46.81 | 74.00 | 27.19 |
| 9848 | 16.05 | AV | H | 36.54 | 8.85 | 26.94 | 34.50 | 54.00 | 19.50 |
| 1780 | 35.89 | PK | H | 24.16 | 3.57 | 27.56 | 36.06 | 74.00 | 37.94 |
| 1780 | 21.93 | AV | H | 24.16 | 3.57 | 27.56 | 22.10 | 54.00 | 31.90 |
| 400.54 | 38.4 | QP | V | 16.20 | 2.43 | 21.77 | 35.26 | 46.00 | 10.74 |

802.11 n20 Mode

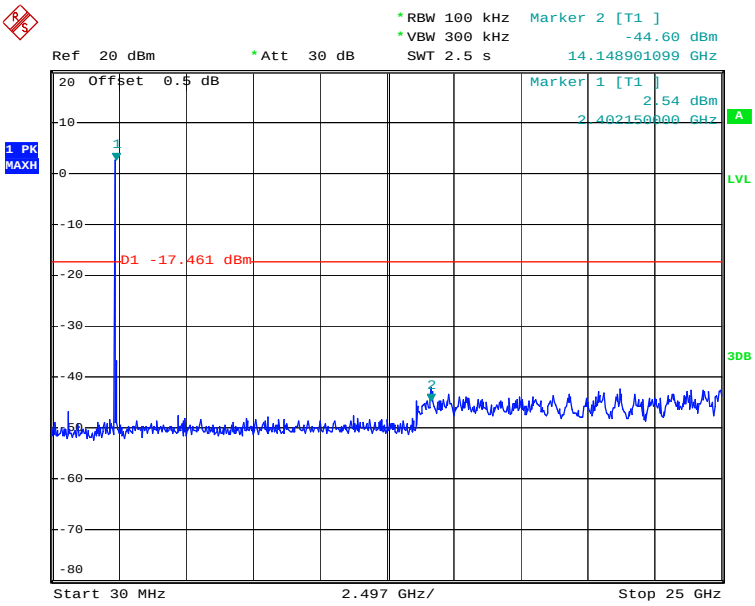
| Frequency (MHz) | Receiver | | Rx Antenna | | Cable loss (dB) | Amplifier Gain (dB) | Corrected Amplitude (dBµV/m) | Limit (dBµV/m) | Margin (dB) |
|---|---|---|---|---|---|---|---|---|---|
| | Reading (dBµV) | Detector (PK/QP/AV) | Polar (H/V) | Factor (dB) | | | | | |
| Low Channel: 2412 MHz | | | | | | | | | |
| 2412 | 72.54 | PK | H | 25.67 | 4.42 | 0.00 | 102.63 | N/A | N/A |
| 2412 | 61.26 | AV | H | 25.67 | 4.42 | 0.00 | 91.35 | N/A | N/A |
| 2412 | 61.48 | PK | V | 25.67 | 4.42 | 0.00 | 91.57 | N/A | N/A |
| 2412 | 50.09 | AV | V | 25.67 | 4.42 | 0.00 | 80.18 | N/A | N/A |
| 2390 | 25.24 | PK | H | 25.61 | 4.39 | 0.00 | 55.24 | 74.00 | 18.76 |
| 2390 | 12.69 | AV | H | 25.61 | 4.39 | 0.00 | 42.69 | 54.00 | 11.31 |
| 4824 | 28.67 | PK | H | 30.64 | 6.03 | 27.41 | 37.93 | 74.00 | 36.07 |
| 4824 | 18.09 | AV | H | 30.64 | 6.03 | 27.41 | 27.35 | 54.00 | 26.65 |
| 7236 | 31.67 | PK | H | 34.17 | 7.47 | 25.90 | 47.41 | 74.00 | 26.59 |
| 7236 | 18.69 | AV | H | 34.17 | 7.47 | 25.90 | 34.43 | 54.00 | 19.57 |
| 9648 | 28.68 | PK | H | 36.06 | 8.81 | 27.46 | 46.09 | 74.00 | 27.91 |
| 9648 | 16.31 | AV | H | 36.06 | 8.81 | 27.46 | 33.72 | 54.00 | 20.28 |
| 1900 | 36.31 | PK | H | 24.40 | 3.60 | 27.51 | 36.80 | 74.00 | 37.20 |
| 1900 | 22.18 | AV | H | 24.40 | 3.60 | 27.51 | 22.67 | 54.00 | 31.33 |
| 400.92 | 38.5 | QP | V | 16.21 | 2.43 | 21.77 | 35.37 | 46.00 | 10.63 |
| Middle Channel: 2437 MHz | | | | | | | | | |
| 2437 | 72.66 | PK | H | 25.74 | 4.41 | 0.00 | 102.81 | N/A | N/A |
| 2437 | 62.99 | AV | H | 25.74 | 4.41 | 0.00 | 93.14 | N/A | N/A |
| 2437 | 60.94 | PK | V | 25.74 | 4.41 | 0.00 | 91.09 | N/A | N/A |
| 2437 | 49.38 | AV | V | 25.74 | 4.41 | 0.00 | 79.53 | N/A | N/A |
| 4874 | 30.69 | PK | H | 30.77 | 6.09 | 27.42 | 40.13 | 74.00 | 33.87 |
| 4874 | 19.31 | AV | H | 30.77 | 6.09 | 27.42 | 28.75 | 54.00 | 25.25 |
| 7311 | 32.66 | PK | H | 34.35 | 7.51 | 25.88 | 48.64 | 74.00 | 25.36 |
| 7311 | 19.95 | AV | H | 34.35 | 7.51 | 25.88 | 35.93 | 54.00 | 18.07 |
| 9748 | 30.67 | PK | H | 36.30 | 8.83 | 27.24 | 48.56 | 74.00 | 25.44 |
| 9748 | 18.67 | AV | H | 36.30 | 8.83 | 27.24 | 36.56 | 54.00 | 17.44 |
| 1795 | 36.39 | PK | H | 24.19 | 3.51 | 27.54 | 36.55 | 74.00 | 37.45 |
| 1795 | 22.48 | AV | H | 24.19 | 3.51 | 27.54 | 22.64 | 54.00 | 31.36 |
| 7735 | 31.22 | PK | H | 34.99 | 7.56 | 26.85 | 46.92 | 74.00 | 27.08 |
| 7735 | 17.98 | AV | H | 34.99 | 7.56 | 26.85 | 33.68 | 54.00 | 20.32 |
| 400.17 | 38.9 | QP | V | 16.19 | 2.43 | 21.77 | 35.75 | 46.00 | 10.25 |
| High Channel: 2462 MHz | | | | | | | | | |
| 2462 | 71.82 | PK | H | 25.80 | 4.43 | 0.00 | 102.05 | N/A | N/A |
| 2462 | 60.68 | AV | H | 25.80 | 4.43 | 0.00 | 90.91 | N/A | N/A |
| 2462 | 62.08 | PK | V | 25.80 | 4.43 | 0.00 | 92.31 | N/A | N/A |
| 2462 | 50.36 | AV | V | 25.80 | 4.43 | 0.00 | 80.59 | N/A | N/A |
| 2483.5 | 26.6 | PK | H | 25.86 | 4.49 | 0.00 | 56.95 | 74.00 | 17.05 |
| 2483.5 | 13.08 | AV | H | 25.86 | 4.49 | 0.00 | 43.43 | 54.00 | 10.57 |
| 4924 | 29.67 | PK | H | 30.90 | 5.97 | 27.43 | 39.11 | 74.00 | 34.89 |
| 4924 | 19.34 | AV | H | 30.90 | 5.97 | 27.43 | 28.78 | 54.00 | 25.22 |
| 7386 | 32.06 | PK | H | 34.53 | 7.55 | 25.86 | 48.28 | 74.00 | 25.72 |
| 7386 | 19.22 | AV | H | 34.53 | 7.55 | 25.86 | 35.44 | 54.00 | 18.56 |
| 9848 | 29.41 | PK | H | 36.54 | 8.85 | 26.94 | 47.86 | 74.00 | 26.14 |
| 9848 | 17.54 | AV | H | 36.54 | 8.85 | 26.94 | 35.99 | 54.00 | 18.01 |
| 1780 | 36.07 | PK | H | 24.16 | 3.57 | 27.56 | 36.24 | 74.00 | 37.76 |
| 1780 | 21.95 | AV | H | 24.16 | 3.57 | 27.56 | 22.12 | 54.00 | 31.88 |
| 400.54 | 38.3 | QP | V | 16.20 | 2.43 | 21.77 | 35.16 | 46.00 | 10.84 |

802.11 n40 Mode

| Frequency (MHz) | Receiver | | Rx Antenna | | Cable loss (dB) | Amplifier Gain (dB) | Corrected Amplitude (dBµV/m) | Limit (dBµV/m) | Margin (dB) |
|---|---|---|---|---|---|---|---|---|---|
| | Reading (dBµV) | Detector (PK/QP/AV) | Polar (H/V) | Factor (dB) | | | | | |
| Low Channel: 2422 MHz | | | | | | | | | |
| 2422 | 69.18 | PK | H | 25.70 | 4.41 | 0.00 | 99.29 | N/A | N/A |
| 2422 | 58.06 | AV | H | 25.70 | 4.41 | 0.00 | 88.17 | N/A | N/A |
| 2422 | 59.36 | PK | V | 25.70 | 4.41 | 0.00 | 89.47 | N/A | N/A |
| 2422 | 48.96 | AV | V | 25.70 | 4.41 | 0.00 | 79.07 | N/A | N/A |
| 2390 | 27.96 | PK | H | 25.61 | 4.39 | 0.00 | 57.96 | 74.00 | 16.04 |
| 2390 | 13.96 | AV | H | 25.61 | 4.39 | 0.00 | 43.96 | 54.00 | 10.04 |
| 4844 | 29.09 | PK | H | 30.69 | 6.08 | 27.42 | 38.44 | 74.00 | 35.56 |
| 4844 | 18.33 | AV | H | 30.69 | 6.08 | 27.42 | 27.68 | 54.00 | 26.32 |
| 7266 | 31.85 | PK | H | 34.24 | 7.48 | 25.89 | 47.68 | 74.00 | 26.32 |
| 7266 | 19.66 | AV | H | 34.24 | 7.48 | 25.89 | 35.49 | 54.00 | 18.51 |
| 9688 | 28.96 | PK | H | 36.15 | 8.82 | 27.37 | 46.56 | 74.00 | 27.44 |
| 9688 | 17.08 | AV | H | 36.15 | 8.82 | 27.37 | 34.68 | 54.00 | 19.32 |
| 1900 | 36.51 | PK | H | 24.40 | 3.60 | 27.51 | 37.00 | 74.00 | 37.00 |
| 1900 | 22.63 | AV | H | 24.40 | 3.60 | 27.51 | 23.12 | 54.00 | 30.88 |
| 400.92 | 37.5 | QP | V | 16.21 | 2.43 | 21.77 | 34.37 | 46.00 | 11.63 |
| Middle Channel: 2437 MHz | | | | | | | | | |
| 2437 | 70.03 | PK | H | 25.74 | 4.41 | 0.00 | 100.18 | N/A | N/A |
| 2437 | 58.11 | AV | H | 25.74 | 4.41 | 0.00 | 88.26 | N/A | N/A |
| 2437 | 59.37 | PK | V | 25.74 | 4.41 | 0.00 | 89.52 | N/A | N/A |
| 2437 | 49.08 | AV | V | 25.74 | 4.41 | 0.00 | 79.23 | N/A | N/A |
| 4874 | 29.06 | PK | H | 30.77 | 6.09 | 27.42 | 38.50 | 74.00 | 35.50 |
| 4874 | 17.83 | AV | H | 30.77 | 6.09 | 27.42 | 27.27 | 54.00 | 26.73 |
| 7311 | 31.52 | PK | H | 34.35 | 7.51 | 25.88 | 47.50 | 74.00 | 26.50 |
| 7311 | 18.63 | AV | H | 34.35 | 7.51 | 25.88 | 34.61 | 54.00 | 19.39 |
| 9748 | 30.21 | PK | H | 36.30 | 8.83 | 27.24 | 48.10 | 74.00 | 25.90 |
| 9748 | 18.11 | AV | H | 36.30 | 8.83 | 27.24 | 36.00 | 54.00 | 18.00 |
| 1795 | 36.22 | PK | H | 24.19 | 3.51 | 27.54 | 36.38 | 74.00 | 37.62 |
| 1795 | 22.19 | AV | H | 24.19 | 3.51 | 27.54 | 22.35 | 54.00 | 31.65 |
| 7735 | 30.17 | PK | H | 34.99 | 7.56 | 26.85 | 45.87 | 74.00 | 28.13 |
| 7735 | 17.62 | AV | H | 34.99 | 7.56 | 26.85 | 33.32 | 54.00 | 20.68 |
| 400.17 | 38.3 | QP | V | 16.19 | 2.43 | 21.77 | 35.15 | 46.00 | 10.85 |
| High Channel: 2452 MHz | | | | | | | | | |
| 2452 | 69.98 | PK | H | 25.78 | 4.41 | 0.00 | 100.17 | N/A | N/A |
| 2452 | 58.81 | AV | H | 25.78 | 4.41 | 0.00 | 89.00 | N/A | N/A |
| 2452 | 58.15 | PK | V | 25.78 | 4.41 | 0.00 | 88.34 | N/A | N/A |
| 2452 | 47.91 | AV | V | 25.78 | 4.41 | 0.00 | 78.10 | N/A | N/A |
| 2483.5 | 26.53 | PK | H | 25.86 | 4.49 | 0.00 | 56.88 | 74.00 | 17.12 |
| 2483.5 | 12.98 | AV | H | 25.86 | 4.49 | 0.00 | 43.33 | 54.00 | 10.67 |
| 4904 | 30.36 | PK | H | 30.85 | 6.06 | 27.43 | 39.84 | 74.00 | 34.16 |
| 4904 | 18.08 | AV | H | 30.85 | 6.06 | 27.43 | 27.56 | 54.00 | 26.44 |
| 7356 | 31.08 | PK | H | 34.45 | 7.53 | 25.87 | 47.19 | 74.00 | 26.81 |
| 7356 | 19.32 | AV | H | 34.45 | 7.53 | 25.87 | 35.43 | 54.00 | 18.57 |
| 9808 | 28.96 | PK | H | 36.44 | 8.84 | 27.09 | 47.15 | 74.00 | 26.85 |
| 9808 | 16.38 | AV | H | 36.44 | 8.84 | 27.09 | 34.57 | 54.00 | 19.43 |
| 1780 | 36.37 | PK | H | 24.16 | 3.57 | 27.56 | 36.54 | 74.00 | 37.46 |
| 1780 | 21.73 | AV | H | 24.16 | 3.57 | 27.56 | 21.90 | 54.00 | 32.10 |
| 400.54 | 38.9 | QP | V | 16.20 | 2.43 | 21.77 | 35.76 | 46.00 | 10.24 |

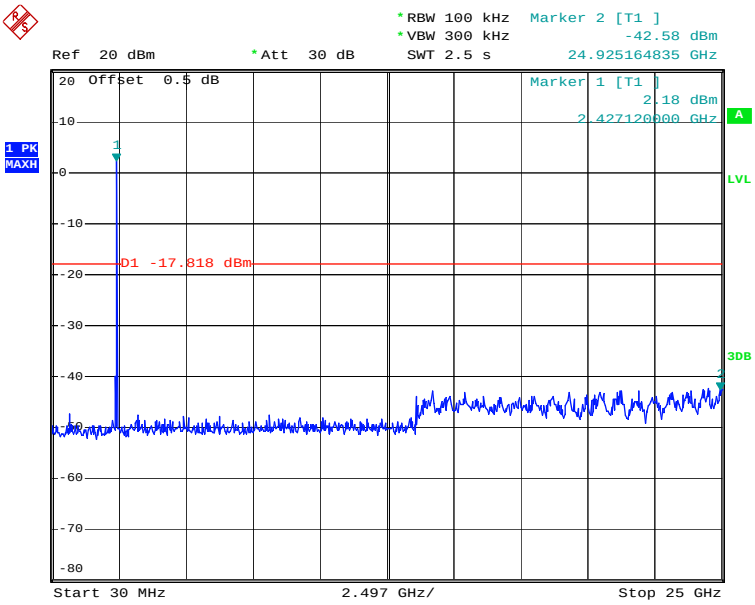
## Conducted Spurious Emissions at Antenna Port

### 802.11b Low Channel



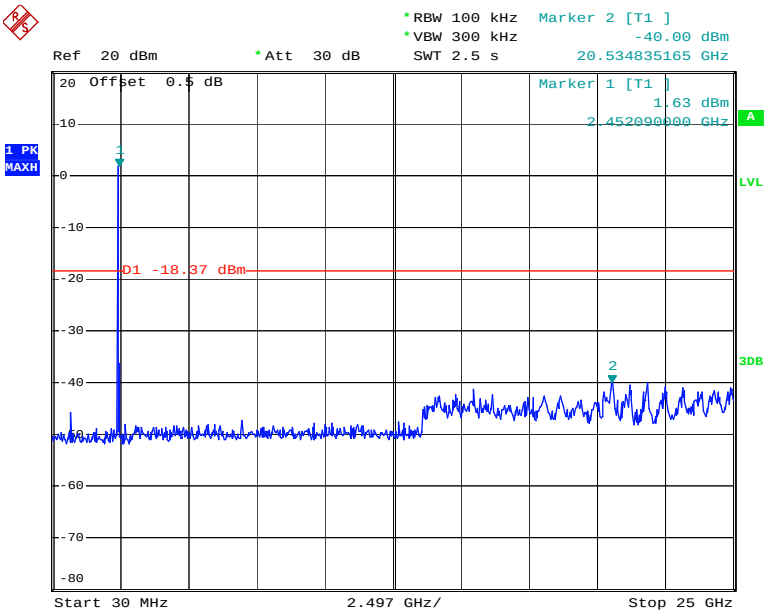

Date: 8.APR.2014 15:20:47

### 802.11b Middle Channel



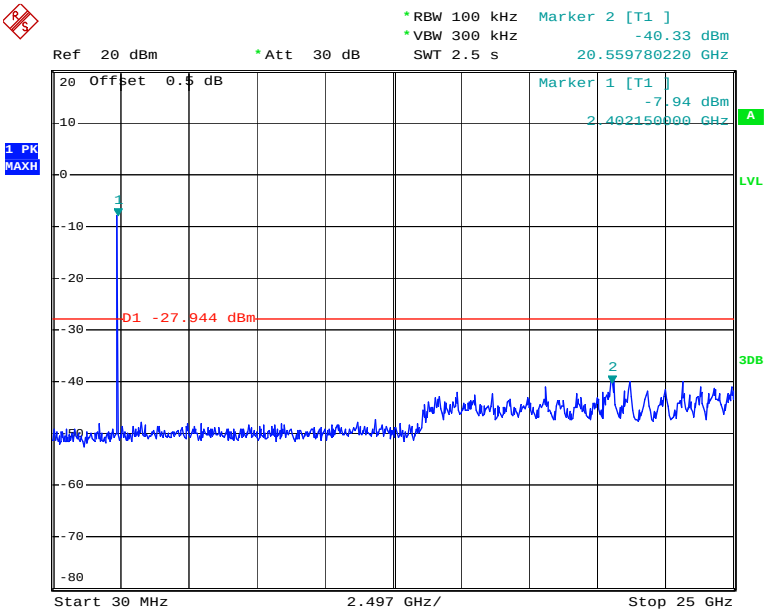

Date: 8.APR.2014 15:22:42

## 802.11b High Channel



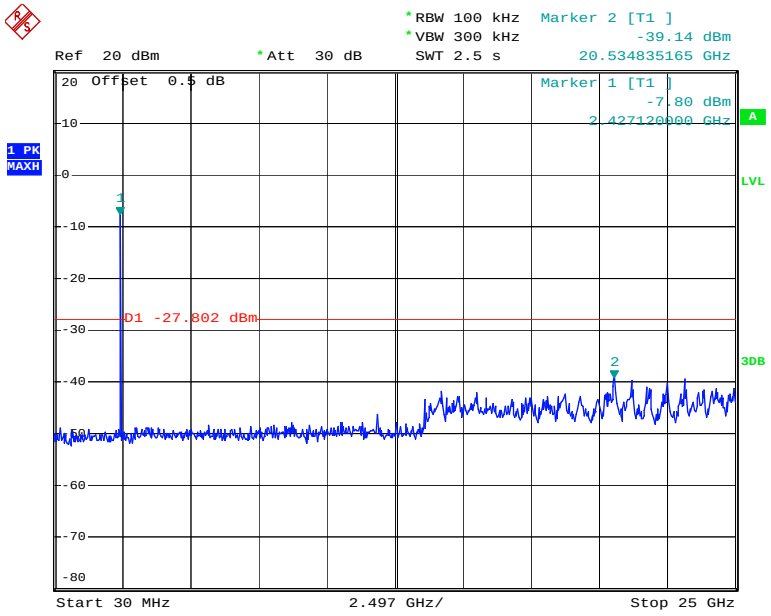

Date: 8.APR.2014 15:25:48

## 802.11g Low Channel



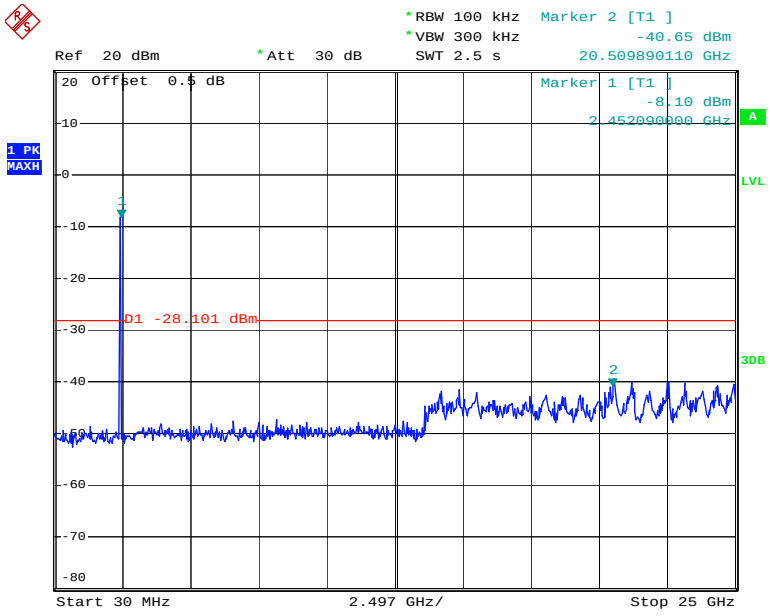

Date: 8.APR.2014 15:38:23

## 802.11g Middle Channel



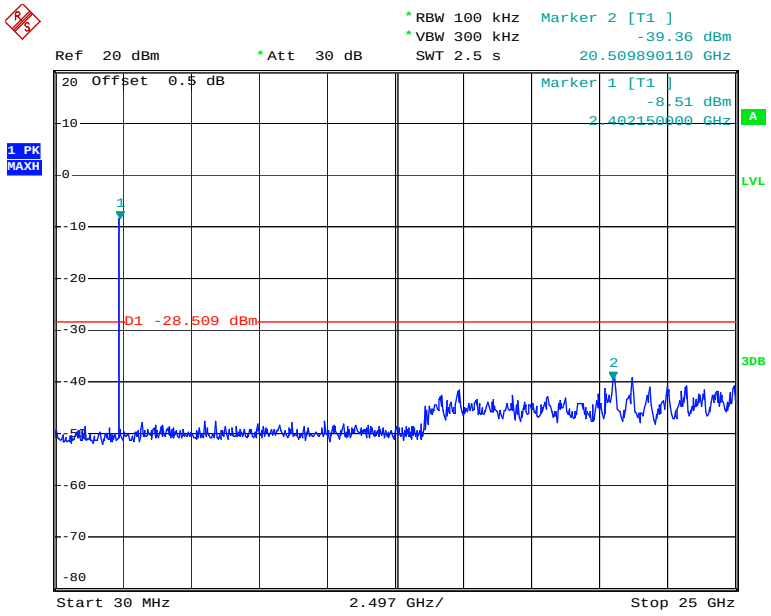

Date: 8.APR.2014 15:36:37

## 802.11g High Channel



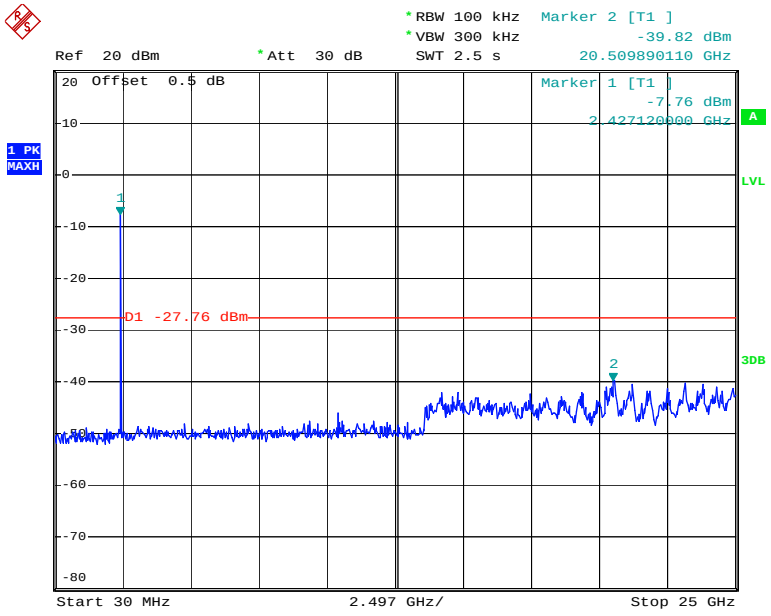

Date: 8.APR.2014 15:28:07

## 802.11n20 Low Channel



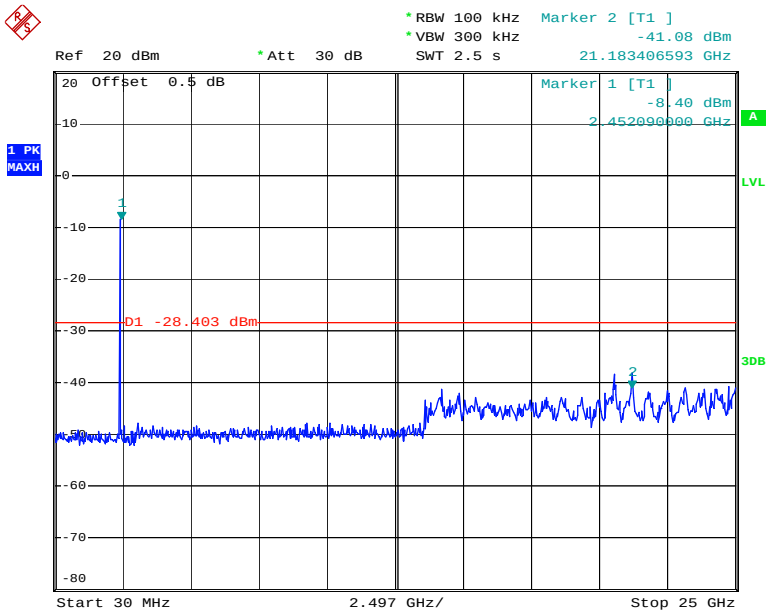

Date: 8.APR.2014 15:40:17

## 802.11n20 Middle Channel



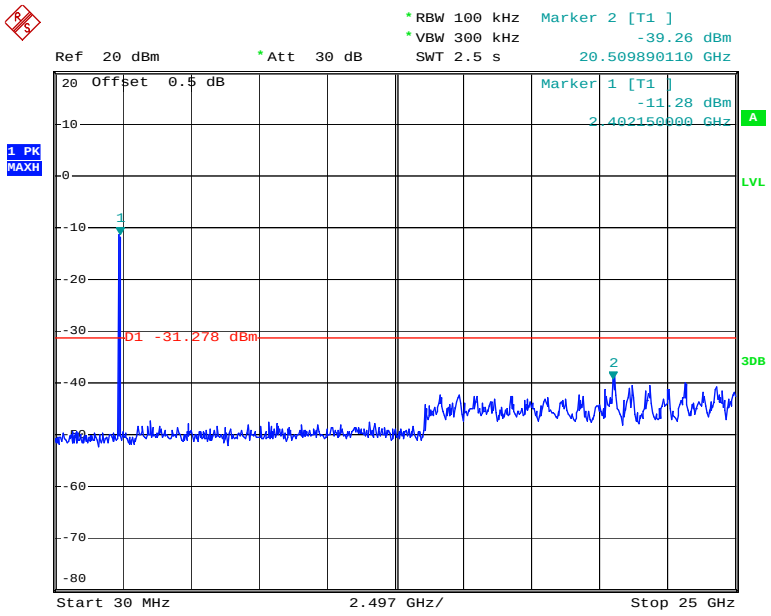

Date: 8.APR.2014 15:41:47

## 802.11n20 High Channel



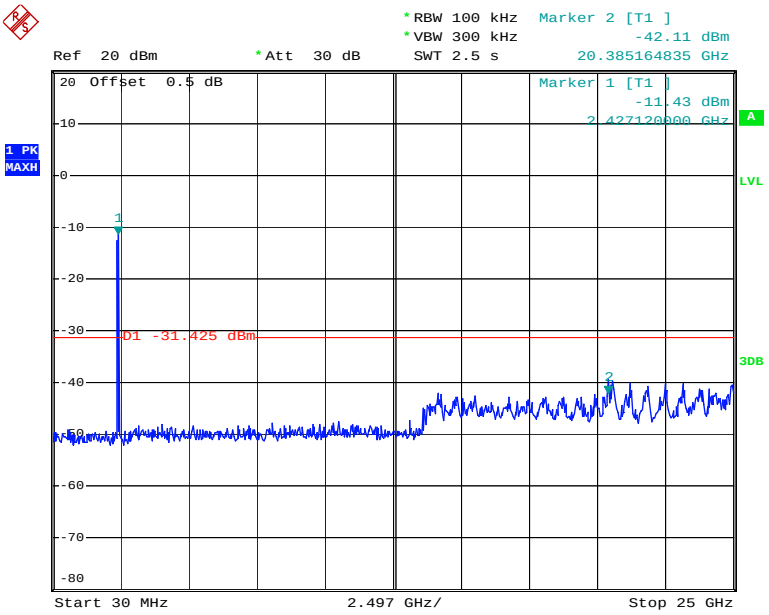

Date: 8.APR.2014 15:43:19

## 802.11n40 Low Channel



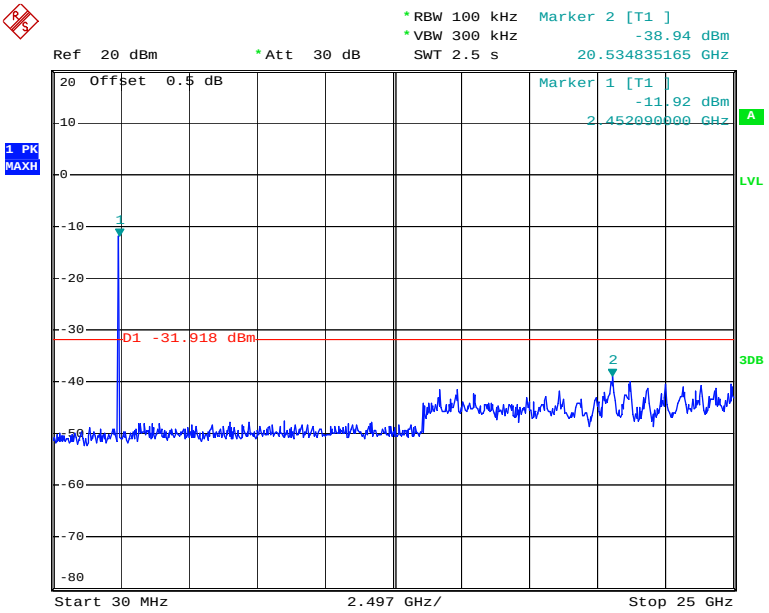

Date: 8.APR.2014 15:49:04

## 802.11n40 Middle Channel




Date: 8.APR.2014 15:47:28

## 802.11n40 High Channel




Date: 8.APR.2014 15:45:39

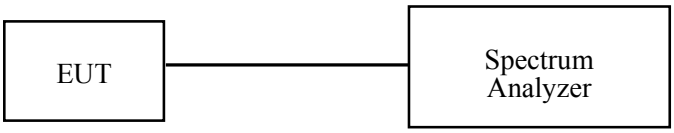
# FCC §15.247(a) (2) – 6 dB EMISSION BANDWIDTH

## Applicable Standard

Systems using digital modulation techniques may operate in the 902–928 MHz, 2400–2483.5 MHz, and 5725–5850 MHz bands. The minimum 6 dB bandwidth shall be at least 500 kHz.

## Test Procedure

1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
2. Position the EUT without connection to measurement instrument. Turn on the EUT and connect it to measurement instrument. Then set it to any one convenient frequency within its operating range. Set a reference level on the measuring instrument equal to the highest peak value.
3. Measure the frequency difference of two frequencies that were attenuated 6 dB from the reference level. Record the frequency difference as the emission bandwidth.
4. Repeat above procedures until all frequencies measured were complete.




## Test Equipment List and Details

| Manufacturer | Description | Model | Serial Number | Calibration Date | Calibration Due Date |
|---|---|---|---|---|---|
| R&S | Spectrum Analyzer | FSP 38 | 100478 | 2013-06-16 | 2014-06-15 |

*** Statement of Traceability:** Bay Area Compliance Laboratories Corp. (Dongguan) attests that all calibrations have been performed in accordance to NVLAP requirements, traceable to National Primary Standards and International System of Units (SI).

## Test Data

### Environmental Conditions

| | |
|---|---|
| **Temperature:** | 24.1 °C |
| **Relative Humidity:** | 64 % |
| **ATM Pressure:** | 100.9 kPa |

*The testing was performed by Allen Qiao on 2014-04-08.*

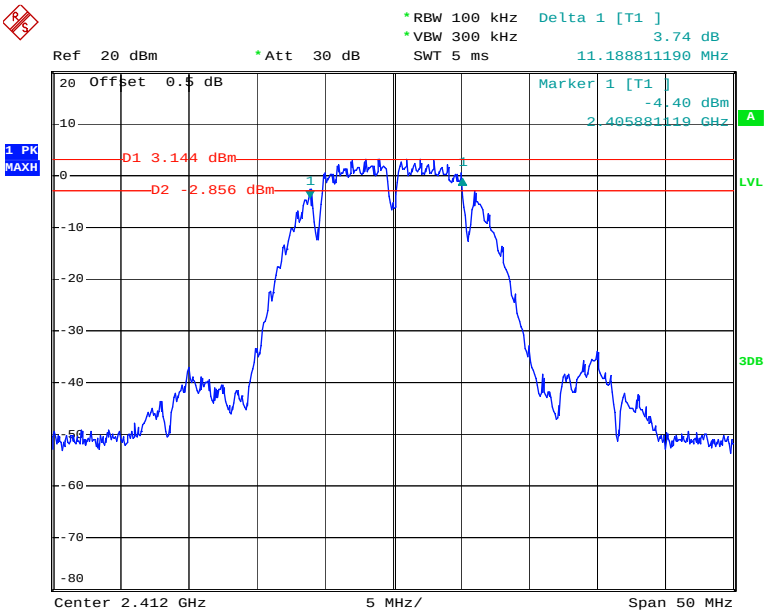
**Test Result:** Pass.

Please refer to the following tables and plots.

*Test Mode: Transmitting*

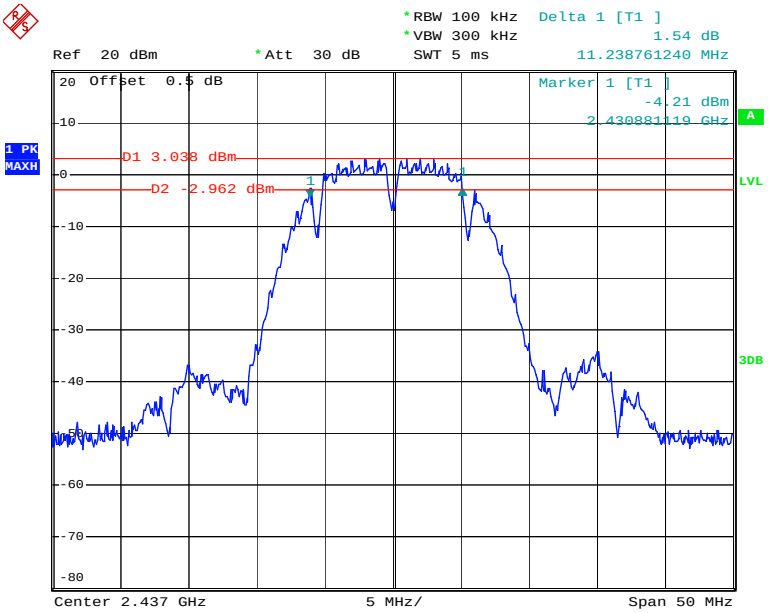
| Test Mode | Channel | Frequency | 6 dB Bandwidth | Limit |
|---|---|---|---|---|
| | | (MHz) | (MHz) | (kHz) |
| 802.11b | Low | 2412 | 11.19 | >500 |
| | Middle | 2437 | 11.24 | >500 |
| | High | 2462 | 11.24 | >500 |
| 802.11g | Low | 2412 | 16.48 | >500 |
| | Middle | 2437 | 16.48 | >500 |
| | High | 2462 | 16.48 | >500 |
| 802.11n20 | Low | 2412 | 17.13 | >500 |
| | Middle | 2437 | 17.43 | >500 |
| | High | 2462 | 17.38 | >500 |
| 802.11n40 | Low | 2422 | 35.46 | >500 |
| | Middle | 2437 | 35.56 | >500 |
| | High | 2452 | 35.46 | >500 |

## 802.11b Low Channel



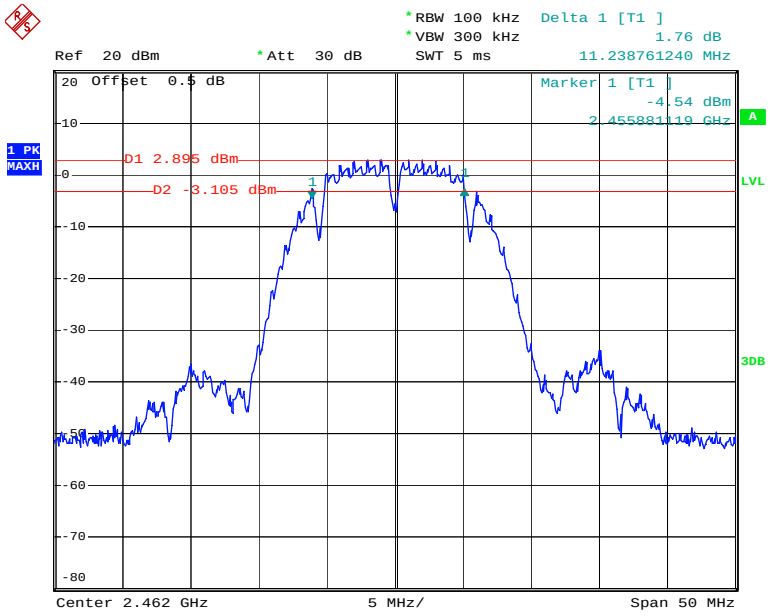

Date: 8.APR.2014 15:20:10

## 802.11b Middle Channel



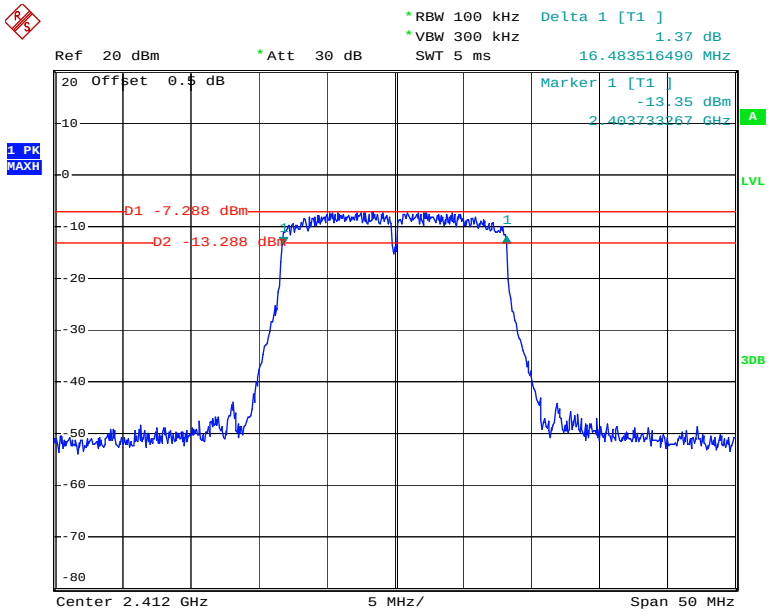

Date: 8.APR.2014 15:23:34

## 802.11b High Channel



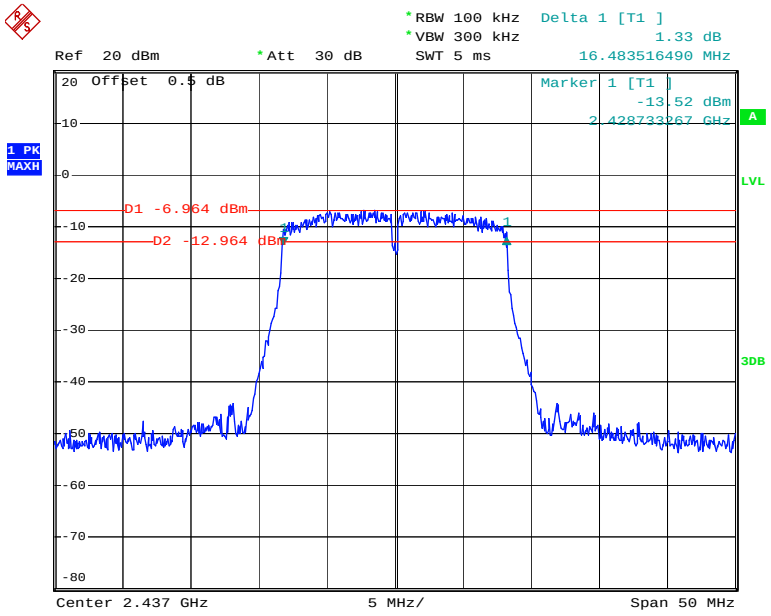

Date: 8.APR.2014 15:25:11

## 802.11g Low Channel



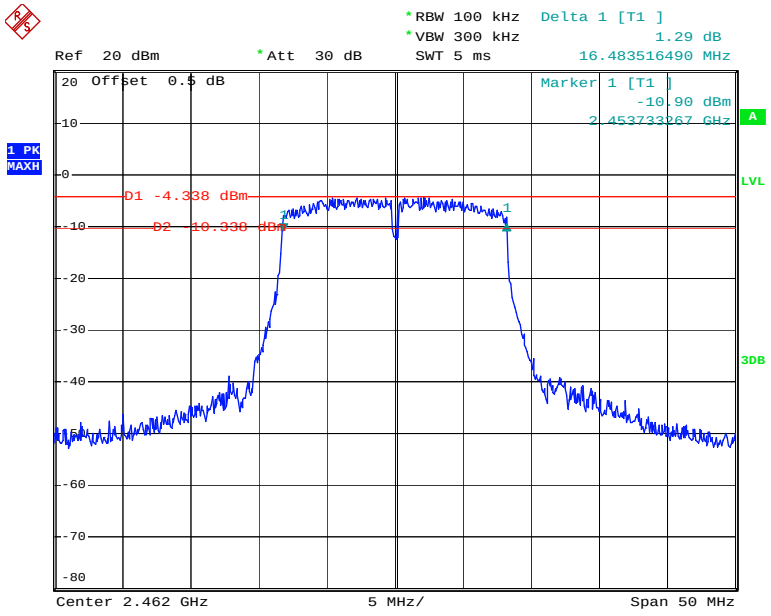

Date: 8.APR.2014 15:37:39

## 802.11g Middle Channel



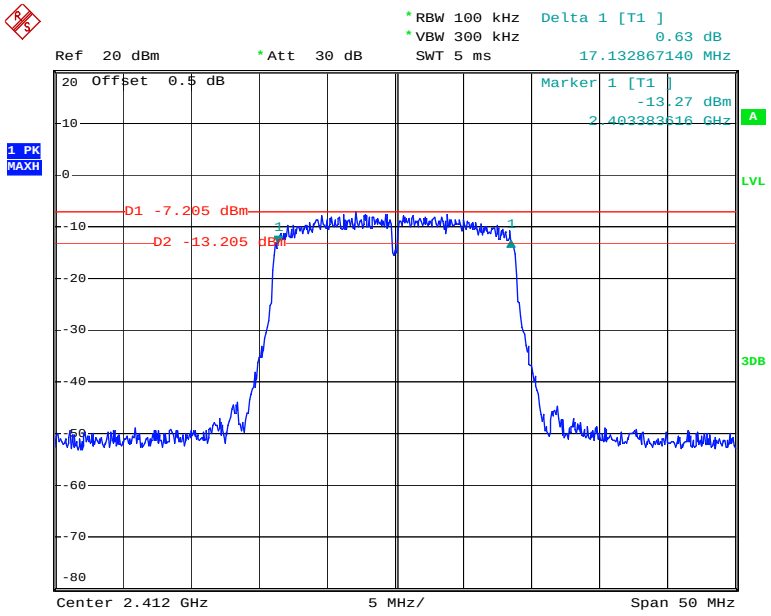

Date: 8.APR.2014 15:35:55

## 802.11g High Channel



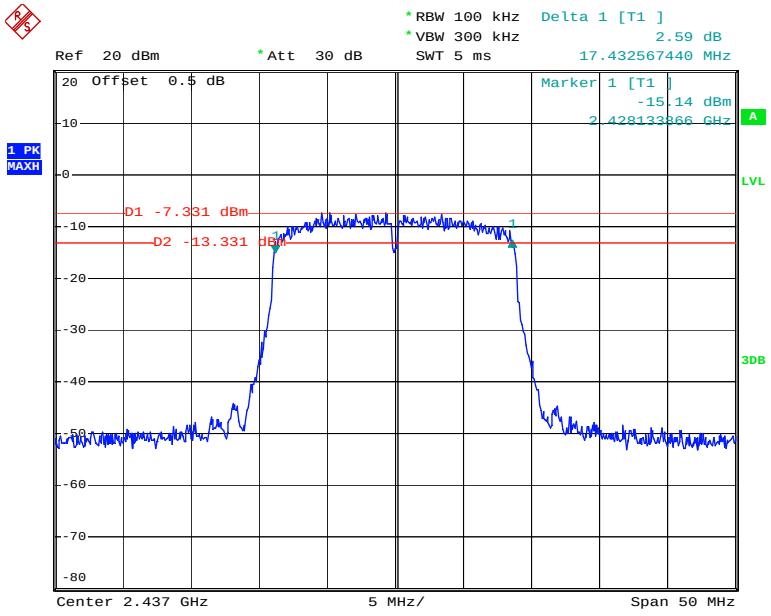

Date: 8.APR.2014 15:26:57

## 802.11n20 Low Channel



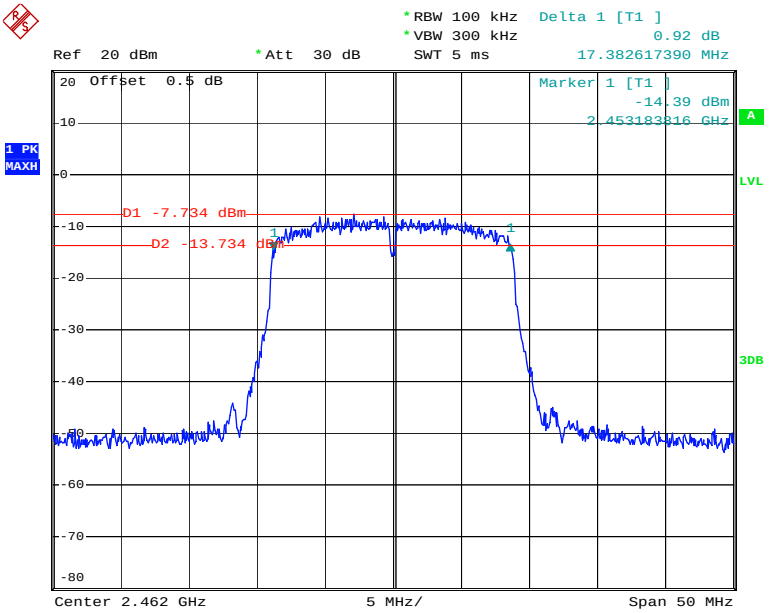

Date: 8.APR.2014 15:39:36

## 802.11n20 Middle Channel



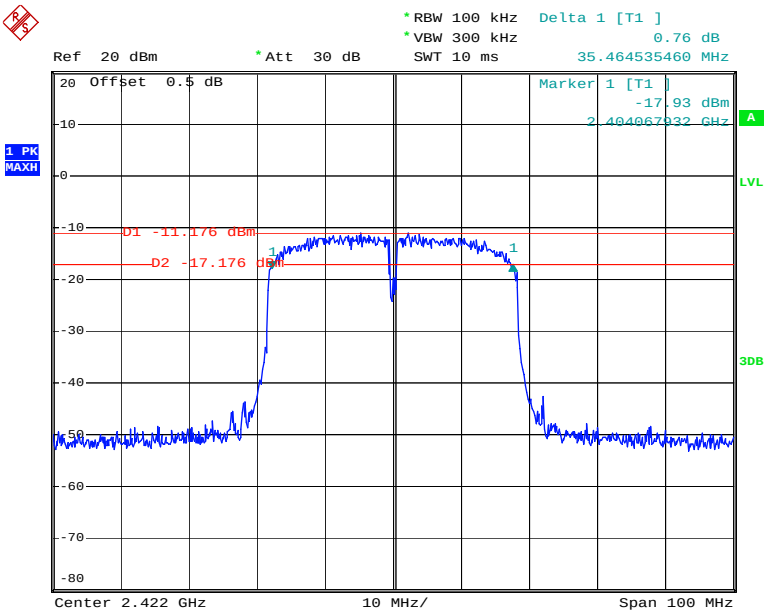

Date: 8.APR.2014 15:41:02

## 802.11n20 High Channel



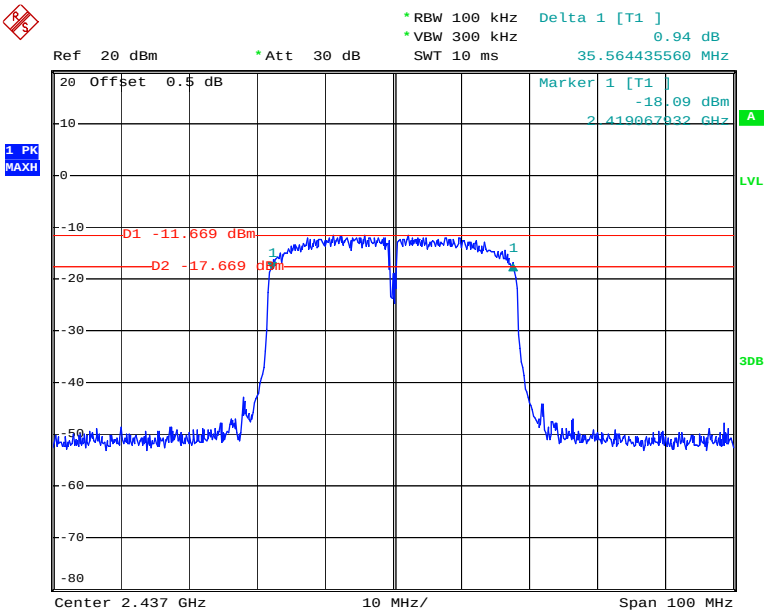

Date: 8.APR.2014 15:42:16

## 802.11n40 Low Channel



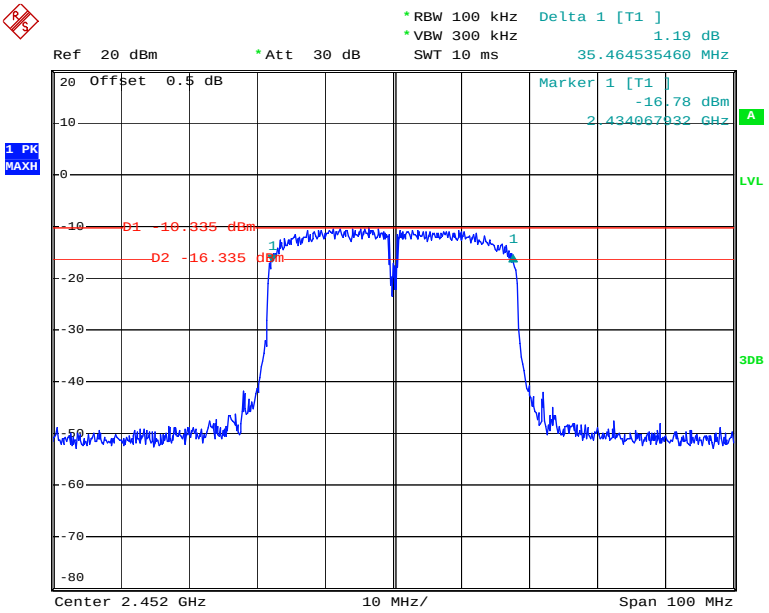

Date: 8.APR.2014 15:47:59

## 802.11n40 Middle Channel




Date: 8.APR.2014 15:46:23

## 802.11n40 High Channel




Date: 8.APR.2014 15:44:41

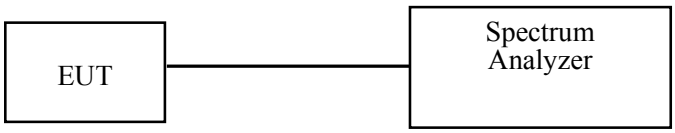
# FCC §15.247(b) (3) - MAXIMUM CONDUCTED OUTPUT POWER

## Applicable Standard

According to FCC §15.247(b) (3), for systems using digital modulation in the 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz bands: 1 Watt. As an alternative to a peak power measurement, compliance with the one Watt limit can be based on a measurement of the maximum conducted output power. Maximum Conducted Output Power is defined as the total transmit power delivered to all antennas and antenna elements averaged across all symbols in the signaling alphabet when the transmitter is operating at its maximum power control level. Power must be summed across all antennas and antenna elements. The average must not include any time intervals during which the transmitter is off or is transmitting at a reduced power level. If multiple modes of operation are possible (e.g., alternative modulation methods), the maximum conducted output power is the highest total transmit power occurring in any mode.

## Test Procedure

1. According to KDB 558074 D01 DTS Meas Guidance v03r01, place the EUT on a bench and set it in transmitting mode.
2. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to a spectrum Analyzer.
3. Add a correction factor to the display.




## Test Equipment List and Details

| Manufacturer | Description | Model | Serial Number | Calibration Date | Calibration Due Date |
|---|---|---|---|---|---|
| R&S | Spectrum Analyzer | FSP 38 | 100478 | 2013-06-16 | 2014-06-15 |

*** Statement of Traceability:** Bay Area Compliance Laboratories Corp. (Dongguan) attests that all calibrations have been performed in accordance to NVLAP requirements, traceable to National Primary Standards and International System of Units (SI).

# Test Data

## Environmental Conditions

| | |
|---|---|
| **Temperature:** | 24.1 °C |
| **Relative Humidity:** | 64 % |
| **ATM Pressure:** | 100.9 kPa |

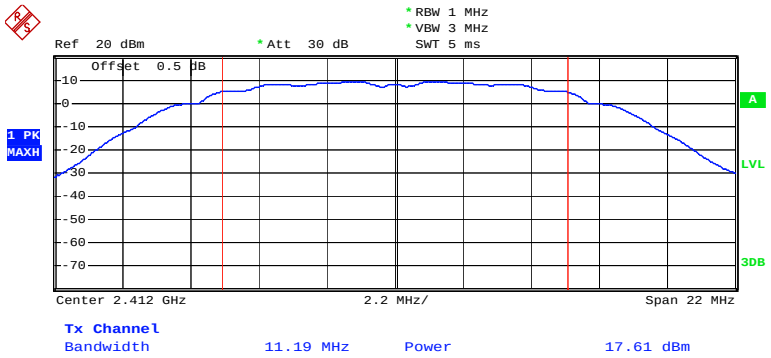
*The testing was performed by Allen Qiao on 2014-04-08.*

*Test Mode: Transmitting*

| Test Mode | Channel | Frequency (MHz) | Conducted Output Power (dBm) | Limit (dBm) | Result |
|---|---|---|---|---|---|
| 802.11b | Low | 2412 | 17.61 | 30 | PASS |
| | Middle | 2437 | 17.59 | 30 | PASS |
| | High | 2462 | 17.37 | 30 | PASS |
| 802.11g | Low | 2412 | 14.81 | 30 | PASS |
| | Middle | 2437 | 15.06 | 30 | PASS |
| | High | 2462 | 14.65 | 30 | PASS |
| 802.11n20 | Low | 2412 | 14.26 | 30 | PASS |
| | Middle | 2437 | 14.57 | 30 | PASS |
| | High | 2462 | 14.56 | 30 | PASS |
| 802.11n40 | Low | 2422 | 14.65 | 30 | PASS |
| | Middle | 2437 | 14.69 | 30 | PASS |
| | High | 2452 | 14.46 | 30 | PASS |

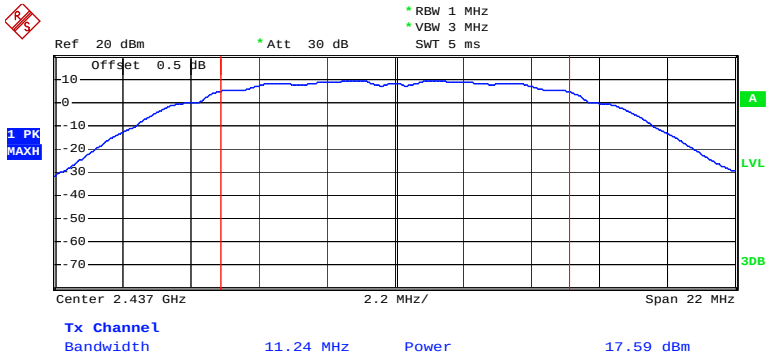
Please refer to the following plots

## 802.11b RF Output Power, Low Channel



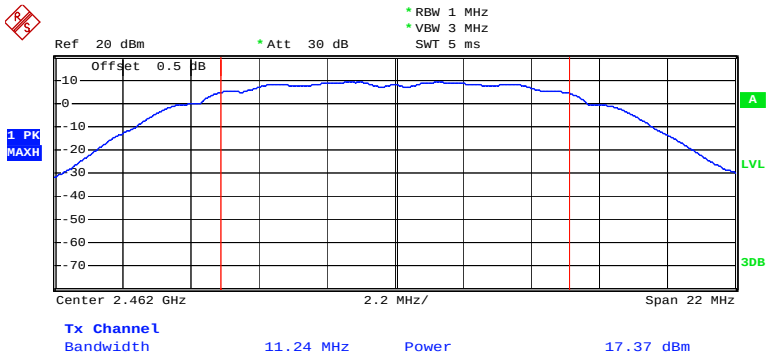

Date: 8.APR.2014 15:20:25

## 802.11b RF Output Power, Middle Channel



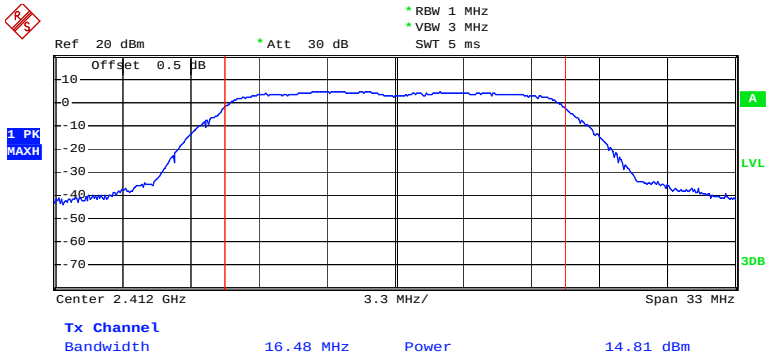

Date: 8.APR.2014 15:23:48

## 802.11b RF Output Power, High Channel



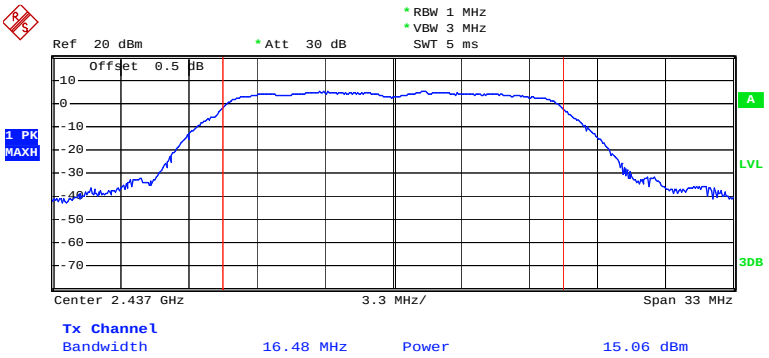

Date: 8.APR.2014 15:25:25

## 802.11g RF Output Power, Low Channel



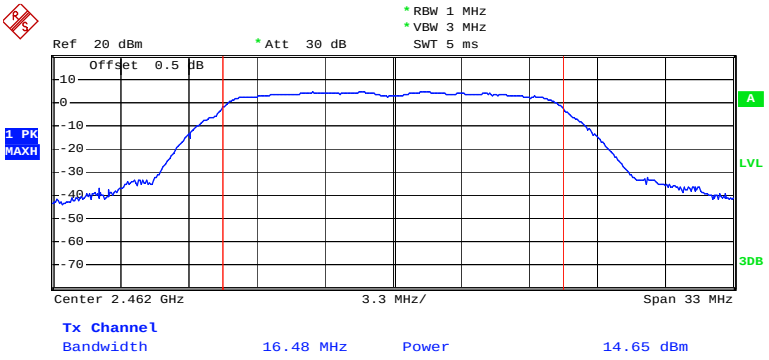

Date: 8.APR.2014 15:37:57

## 802.11g RF Output Power, Middle Channel



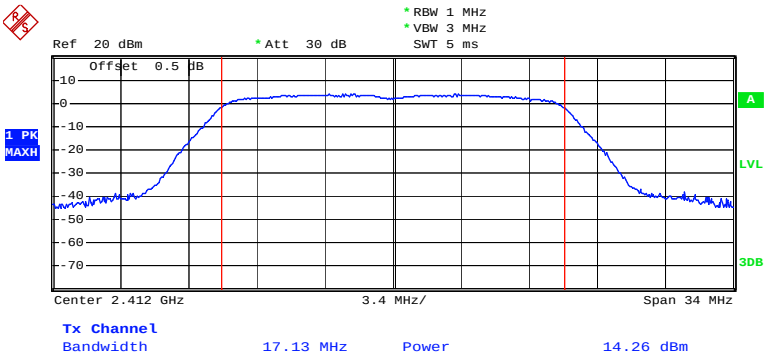

Date: 8.APR.2014 15:36:10

## 802.11g RF Output Power, High Channel



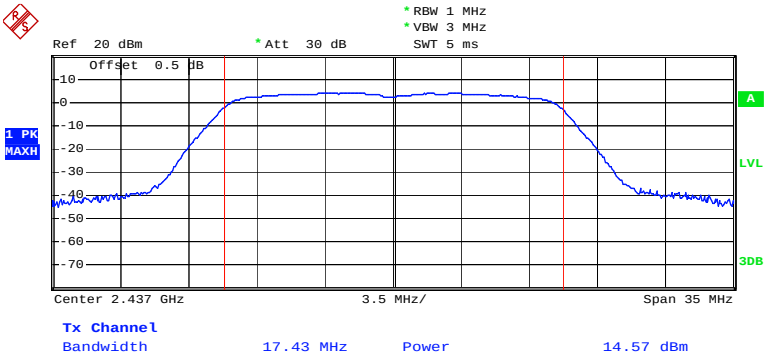

Date: 8.APR.2014 15:27:41

## 802.11n20 RF Output Power, Low Channel



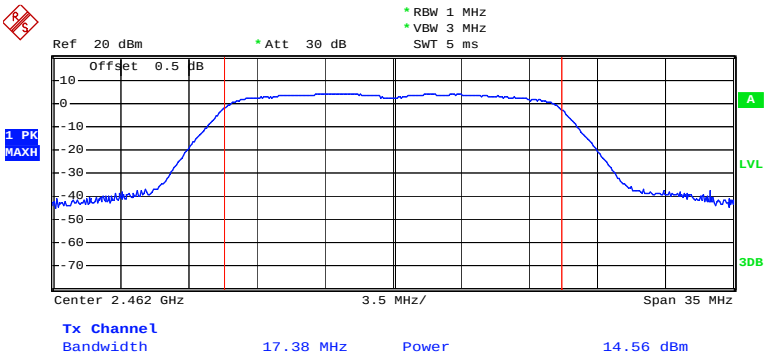

Date: 8.APR.2014 15:39:51

## 802.11n20 RF Output Power, Middle Channel



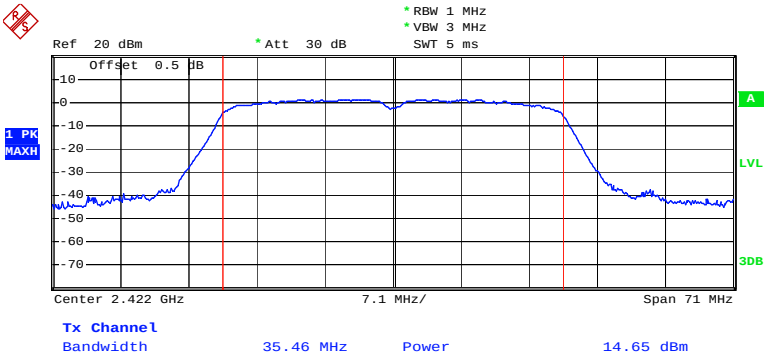

Date: 8.APR.2014 15:41:20

## 802.11n20 RF Output Power, High Channel



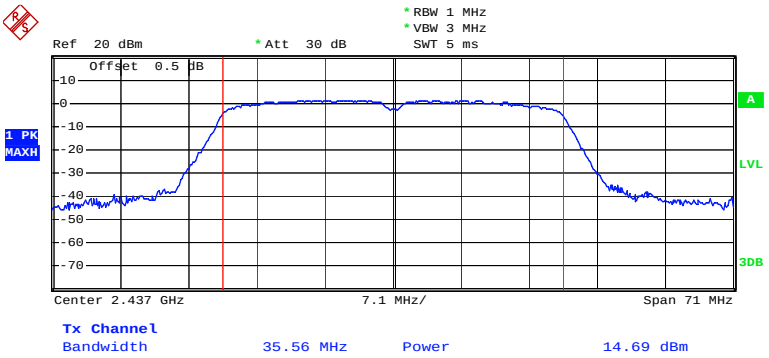

Date: 8.APR.2014 15:42:45

## 802.11n40 RF Output Power, Low Channel



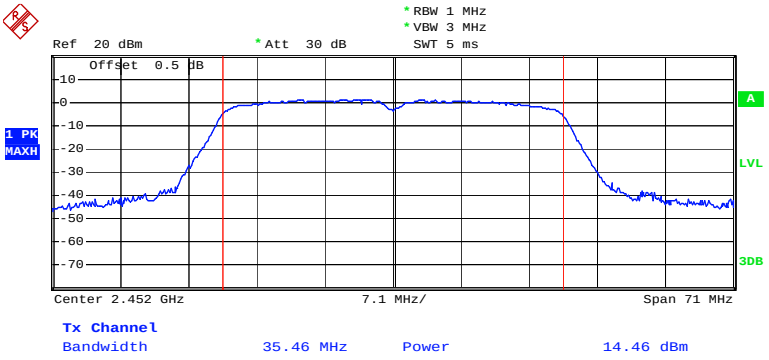

Date: 8.APR.2014 15:48:25

## 802.11n40 RF Output Power, Middle Channel




Date: 8.APR.2014 15:46:49

## 802.11n40 RF Output Power, High Channel




Date: 8.APR.2014 15:45:00

# FCC §15.247(d) – 100 kHz BANDWIDTH OF FREQUENCY BAND EDGE

## Applicable Standard

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in §15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a) (see §15.205(c)).

## Test Procedure

1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
2. Position the EUT without connection to measurement instrument. Turn on the EUT and connect its antenna terminal to measurement instrument via a low loss cable. Then set it to any one measured frequency within its operating range, and make sure the instrument is operated in its linear range.
3. Set RBW to 100 kHz and VBW of spectrum analyzer to 300 kHz with a convenient frequency span including 100 kHz bandwidth from band edge.
4. Measure the highest amplitude appearing on spectral display and set it as a reference level. Plot the graph with marking the highest point and edge frequency.
5. Repeat above procedures until all measured frequencies were complete.

## Test Equipment List and Details

| Manufacturer | Description | Model | Serial Number | Calibration Date | Calibration Due Date |
|---|---|---|---|---|---|
| R&S | Spectrum Analyzer | FSP 38 | 100478 | 2013-06-16 | 2014-06-15 |

*** Statement of Traceability:** Bay Area Compliance Laboratories Corp. (Dongguan) attests that all calibrations have been performed in accordance to NVLAP requirements, traceable to National Primary Standards and International System of Units (SI).

## Test Data

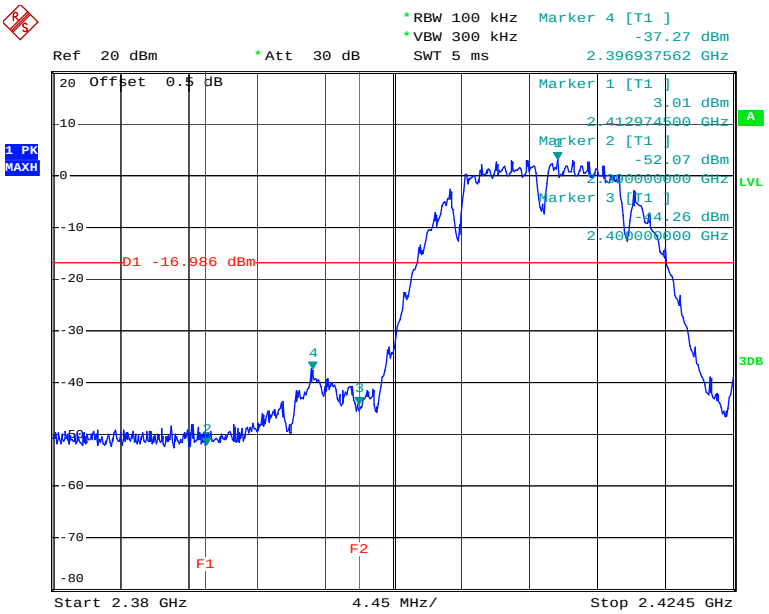
### Environmental Conditions

| | |
|---|---|
| **Temperature:** | 24.1 °C |
| **Relative Humidity:** | 64 % |
| **ATM Pressure:** | 100.9 kPa |

*The testing was performed by Allen Qiao on 2014-04-08.*

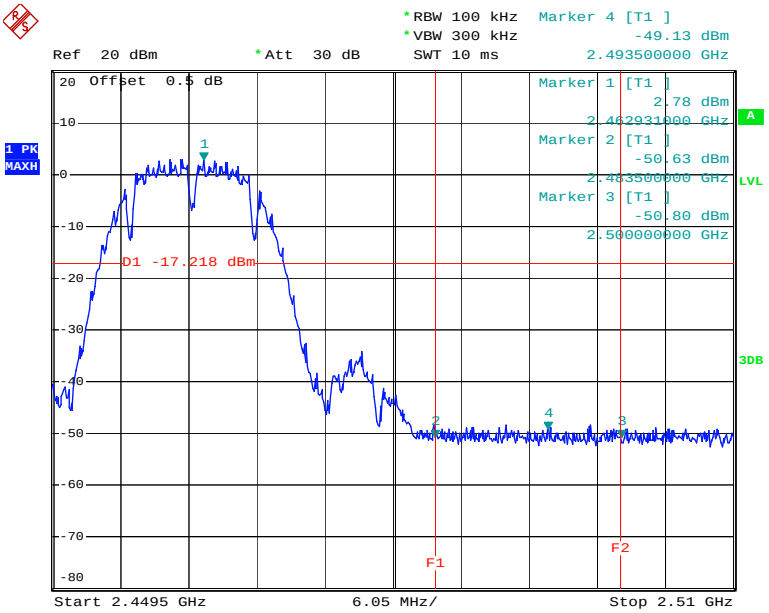
**Test Result:** *Compliance*
Please refer to following table and plots.

## 802.11b: Band Edge, Left Side



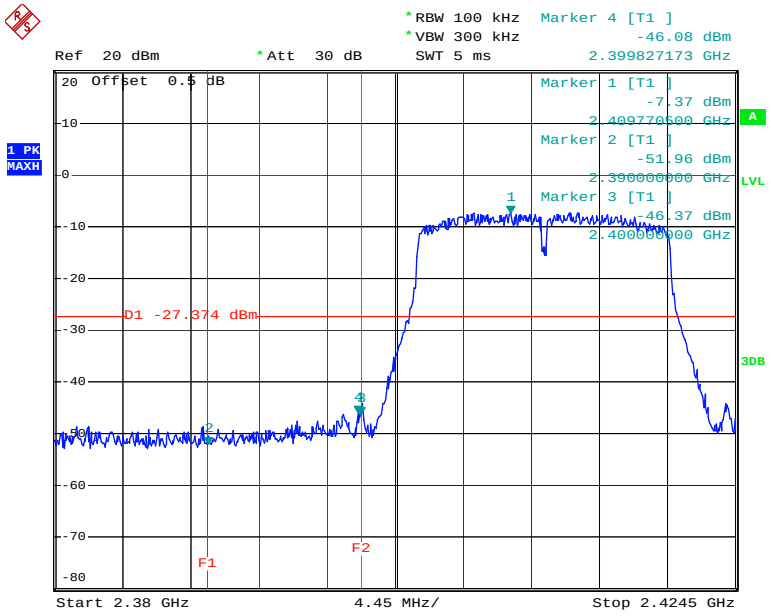

Date: 8.APR.2014 15:20:59

## 802.11b: Band Edge, Right Side



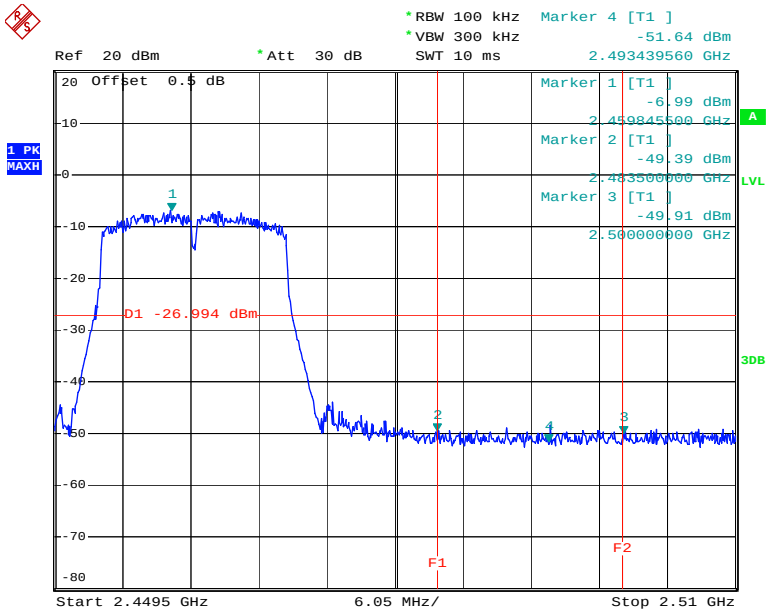

Date: 8.APR.2014 15:25:59

## 802.11g: Band Edge, Left Side



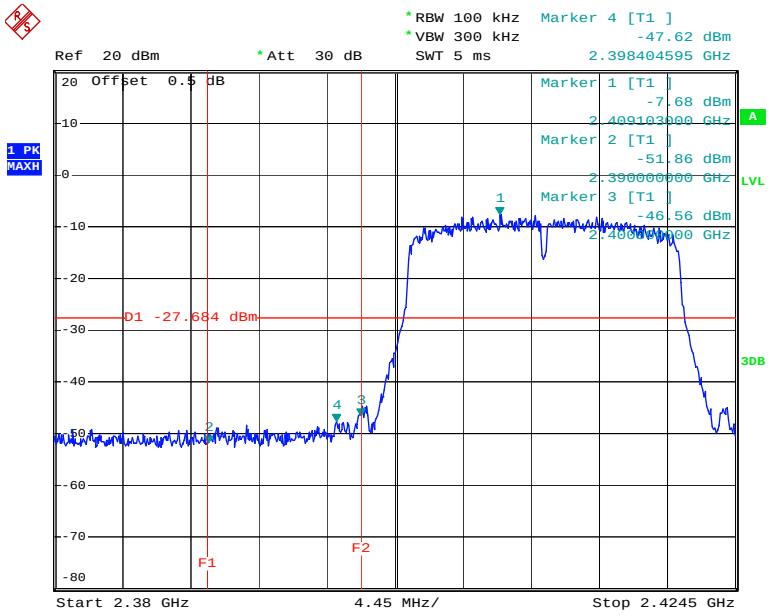

Date: 8.APR.2014 15:38:45

## 802.11g: Band Edge, Right Side



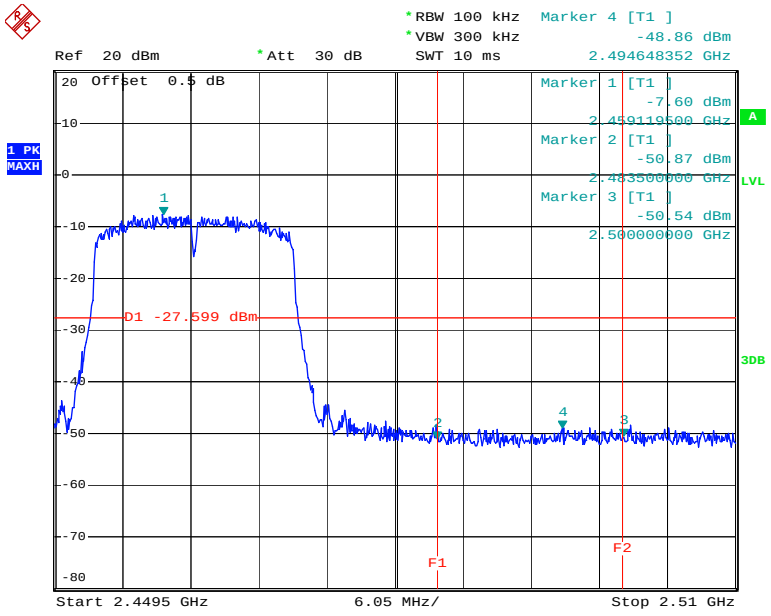

Date: 8.APR.2014 15:28:19

## 802.11n20 Band Edge, Left Side



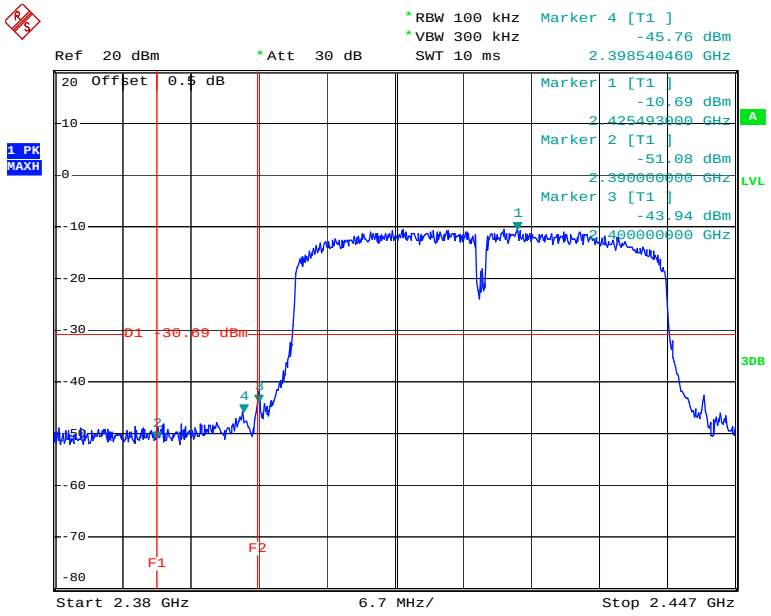

Date: 8.APR.2014 15:40:29

## 802.11n20 Band Edge, Right Side



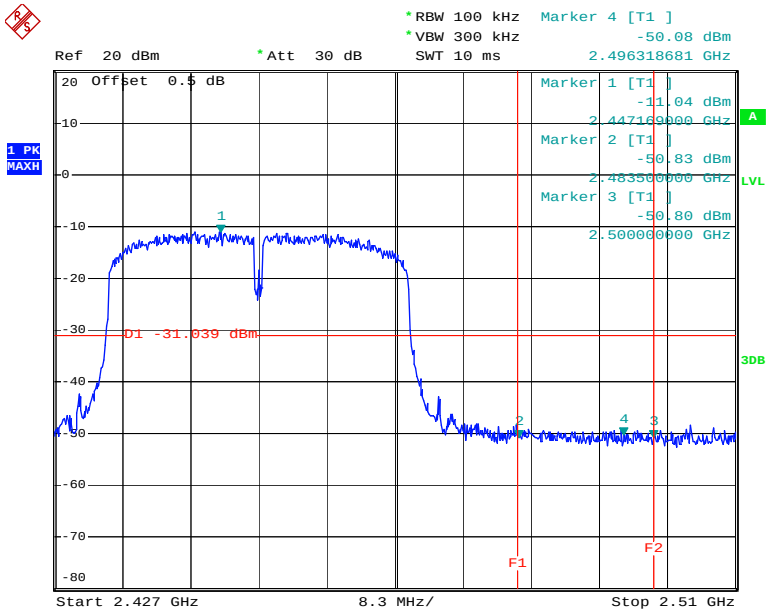

Date: 8.APR.2014 15:43:31

## 802.11n40 Band Edge, Left Side




Date: 8.APR.2014 15:49:16

## 802.11n40 Band Edge, Right Side




Date: 8.APR.2014 15:45:50

# FCC §15.247(e) - POWER SPECTRAL DENSITY

## Applicable Standard

For digitally modulated systems, the power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission. This power spectral density shall be determined in accordance with the provisions of paragraph (b) of this section. The same method of determining the conducted output power shall be used to determine the power spectral density.

## Test Procedure

1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
2. Position the EUT was set without connection to measurement instrument. Turn on the EUT and connect its antenna terminal to measurement instrument via a low loss cable. Then set it to any one measured frequency within its operating range, and make sure the instrument is operated in its linear range.
3. Set the RBW = 3 kHz, VBW = 10 kHz, Set the span to 1.5 times the DTS bandwidth.
4. Use the peak marker function to determine the maximum amplitude level.

## Test Equipment List and Details

| Manufacturer | Description | Model | Serial Number | Calibration Date | Calibration Due Date |
|---|---|---|---|---|---|
| R&S | Spectrum Analyzer | FSP 38 | 100478 | 2013-06-16 | 2014-06-15 |

*** Statement of Traceability:** Bay Area Compliance Laboratories Corp. (Dongguan) attests that all calibrations have been performed in accordance to NVLAP requirements, traceable to National Primary Standards and International System of Units (SI).

## Test Data

### Environmental Conditions

| | |
|---|---|
| **Temperature:** | 24.1 °C |
| **Relative Humidity:** | 64 % |
| **ATM Pressure:** | 100.9 kPa |

*The testing was performed by Allen Qiao on 2014-04-08.*

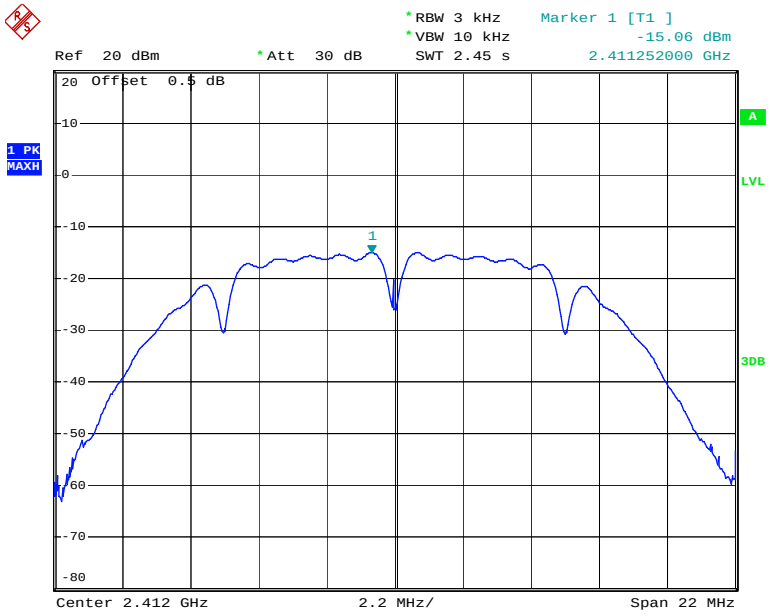
*Test Mode: Transmitting*

**Test Result:** Pass

| Test Mode | Channel | PSD (dBm/3kHz) | Limit (dBm/3kHz) | Result |
|---|---|---|---|---|
| 802.11b | Low | -15.06 | 8 | PASS |
| | Middle | -15.10 | 8 | PASS |
| | High | -15.33 | 8 | PASS |
| 802.11g | Low | -21.13 | 8 | PASS |
| | Middle | -20.77 | 8 | PASS |
| | High | -20.78 | 8 | PASS |
| 802.11n20 | Low | -21.82 | 8 | PASS |
| | Middle | -20.85 | 8 | PASS |
| | High | -21.20 | 8 | PASS |
| 802.11n40 | Low | -21.43 | 8 | PASS |
| | Middle | -21.48 | 8 | PASS |
| | High | -21.54 | 8 | PASS |

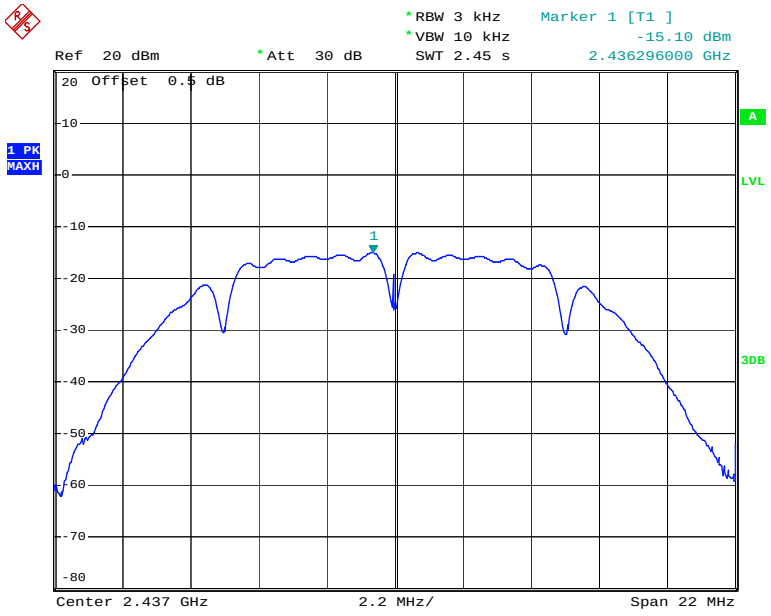
Please refer to the following plots

## Power Spectral Density, 802.11b Low Channel




Date: 8.APR.2014 15:20:35

## Power Spectral Density, 802.11b Middle Channel

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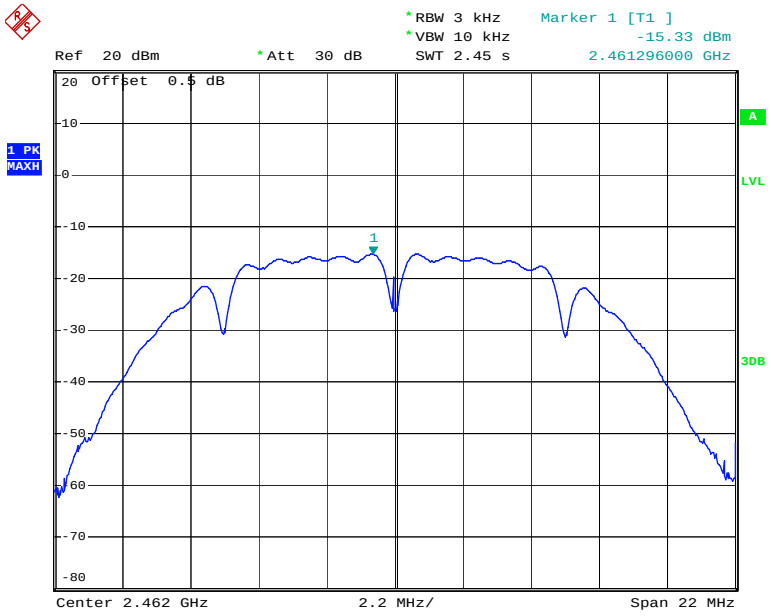
## Power Spectral Density, 802.11b High Channel

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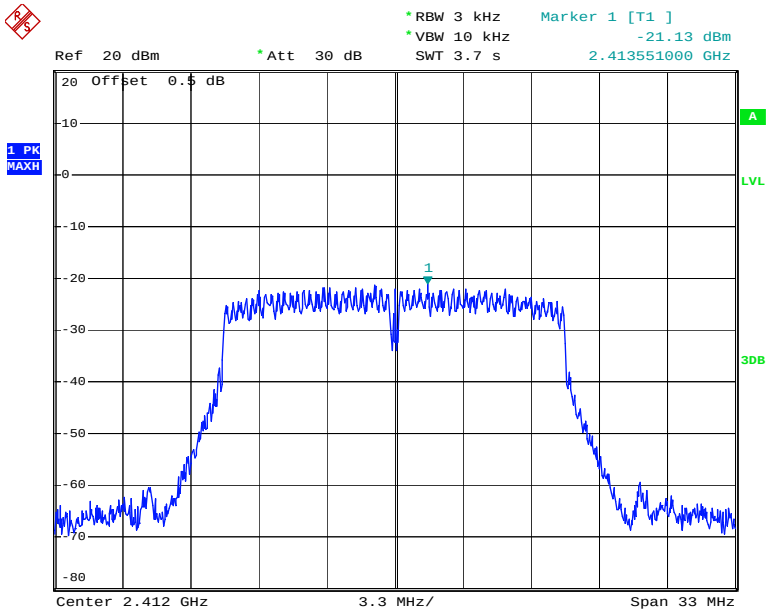
## Power Spectral Density, 802.11g Low Channel

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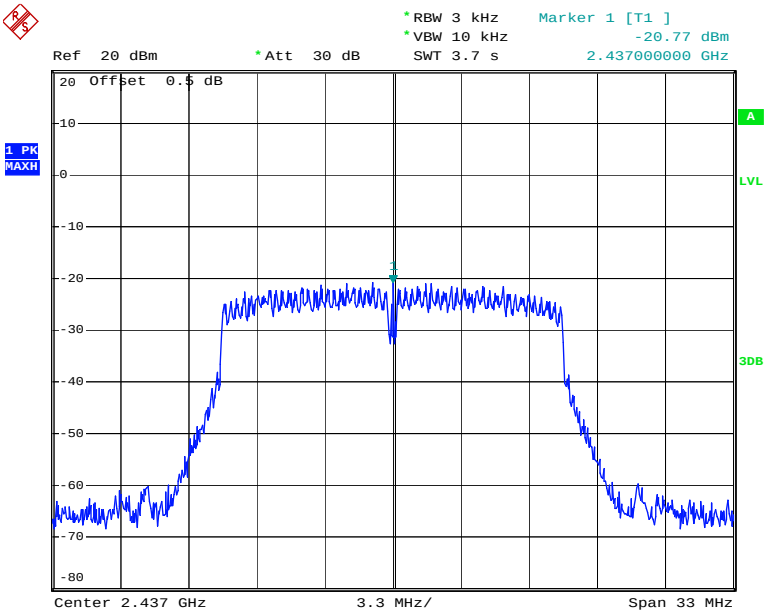
## Power Spectral Density, 802.11g Middle Channel

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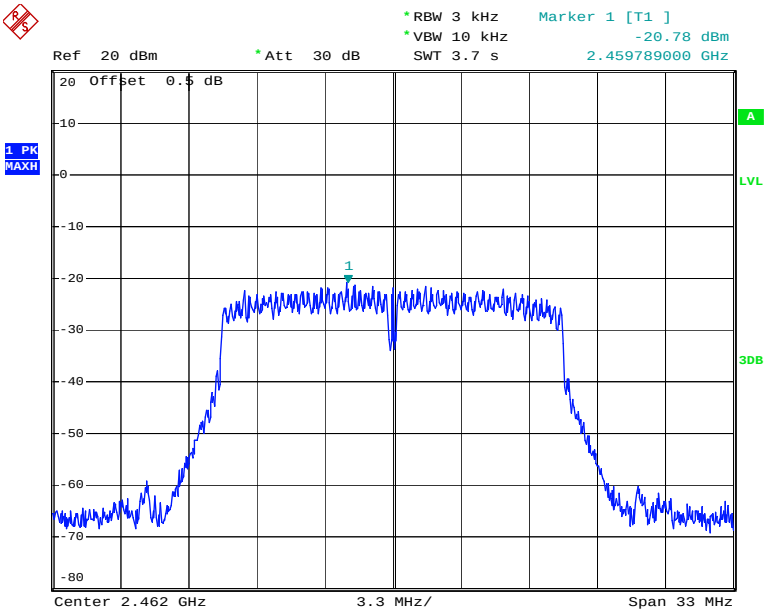
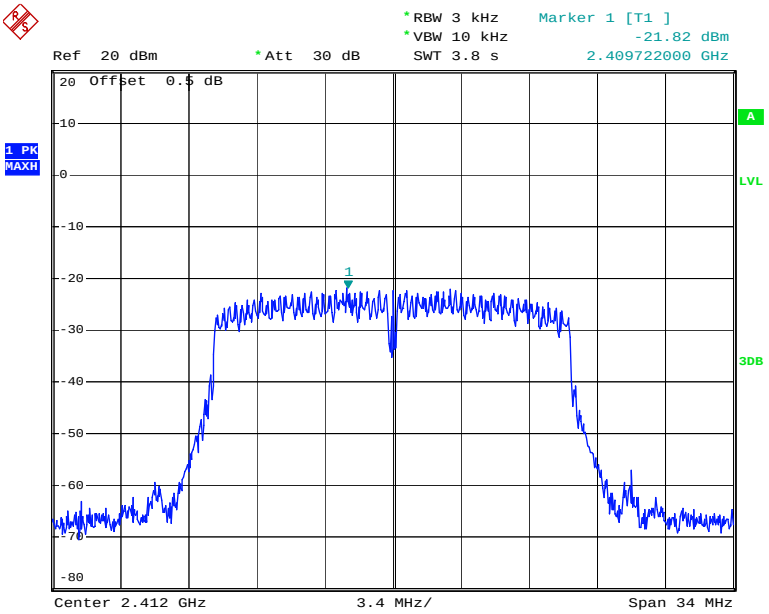
## Power Spectral Density, 802.11g High Channel



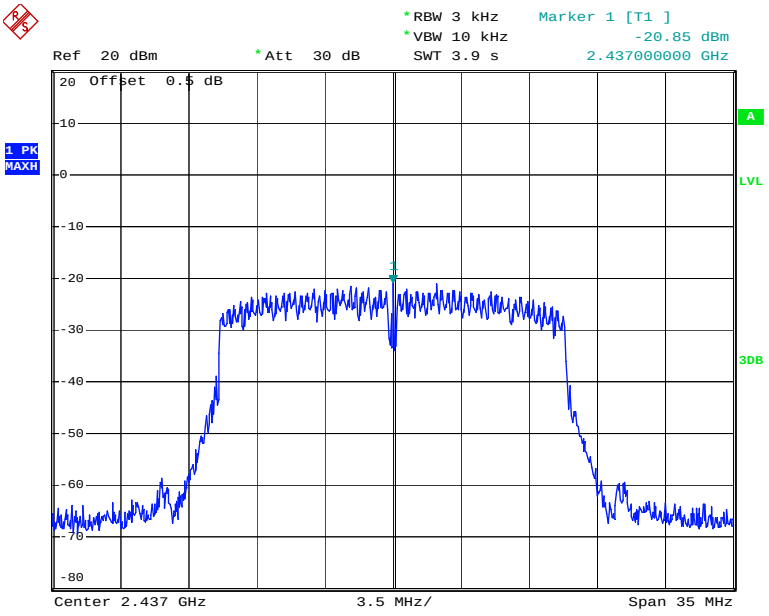

Date: 8.APR.2014 15:27:54

## Power Spectral Density, 802.11n20 Low Channel




Date: 8.APR.2014 15:40:04

## Power Spectral Density, 802.11n20 Middle Channel

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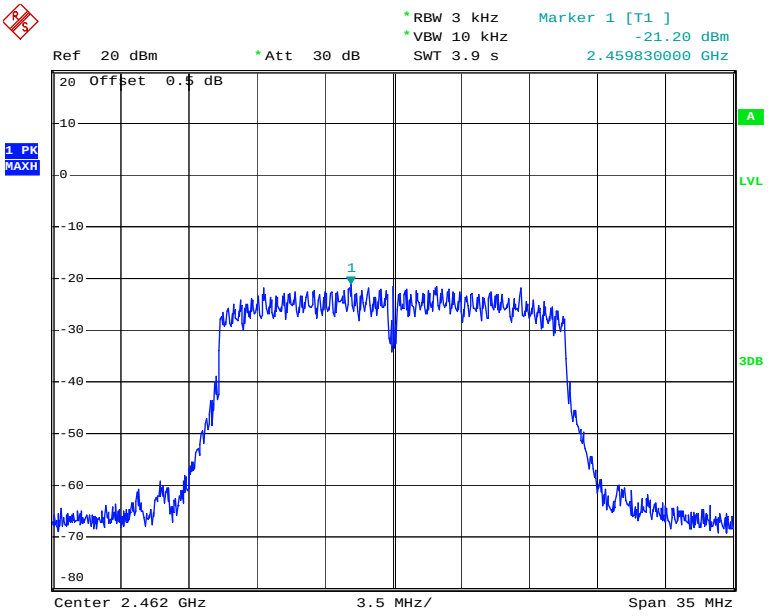
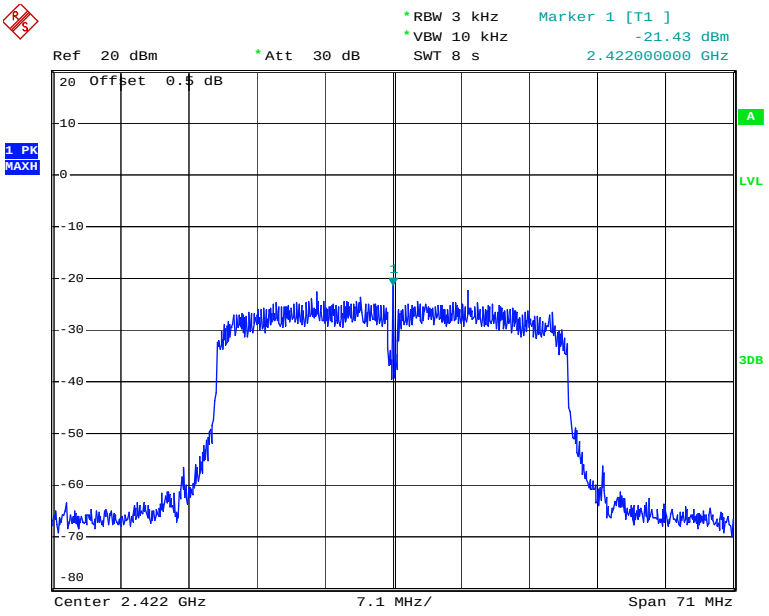
## Power Spectral Density, 802.11n20 High Channel




Date: 8.APR.2014 15:43:06

## Power Spectral Density, 802.11n40 Low Channel

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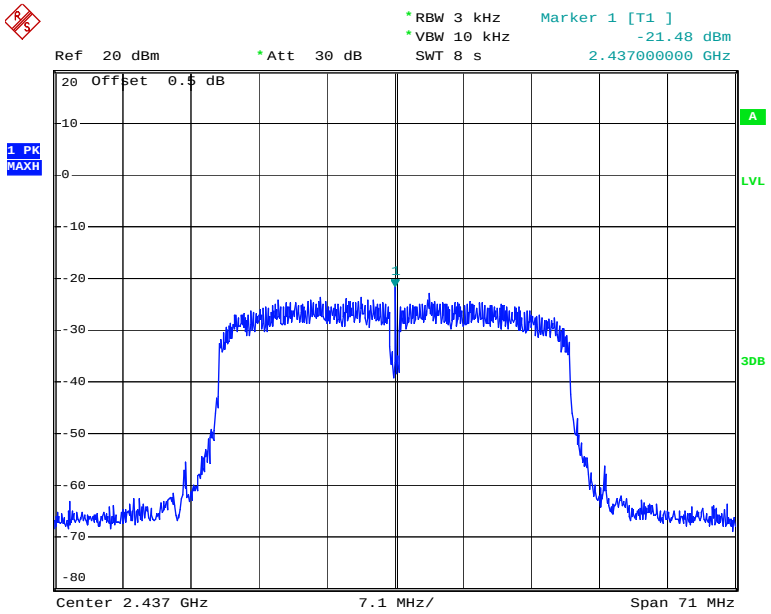
**Power Spectral Density, 802.11n40 Middle Channel**

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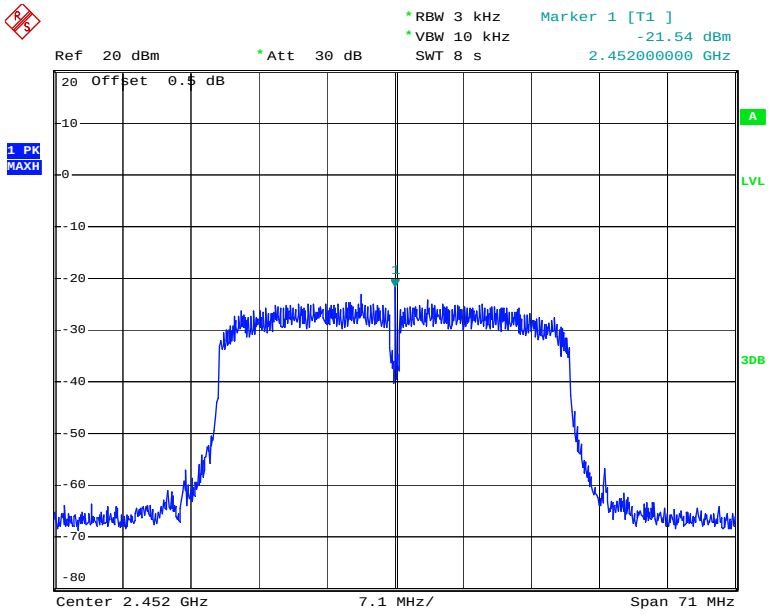
**Power Spectral Density, 802.11n40 High Channel**

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******* END OF REPORT *******