**SGS-CSTC Standards Technical Services Co., Ltd.**
**Shenzhen Branch**

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# FCC TEST REPORT

| | |
|---|---|
| **Application No:** | HR201880006 |
| **Applicant:** | Orion Labs, Inc |
| **Address of Applicant** | 208 Utah Street Suite 350 San Francisco California United States |
| **Manufacturer:** | Orion Labs, Inc |
| **Address of Manufacturer** | 208 Utah Street Suite 350 San Francisco California United States |
| **Factory:** | Fujian Star-net Communication Co.,Ltd |
| **Address of Factory** | 3F,Bldg 1,Star-Net Science-based Haixi Industrial Pack,No. 9 GaoxinRoad,MinhouCounty,Fuzhou, China |
| **EUT Description:** | Orion Sync |
| **Model Name:** | ROS-001-VZ |
| **Trade Mark:** | Orion Labs |
| **FCC ID:** | 2ANZ3ROS001VZ |
| **Standards:** | 47 CFR FCC Part 2, Subpart J<br>47 CFR Part 15, Subpart C<br>KDB 558074 D01 DTS Meas Guidance v05 |
| **Test Method** | ANSI C63.4(2014)<br>ANSI C63.10 (2013) |
| **Date of Receipt:** | 2018/10/15 |
| **Date of Test:** | 2018/10/16 to 2018/11/22 |
| **Date of Issue:** | 2018/11/22 |
| **Test Result:** | **PASS *** |

. * In the configuration tested, the EUT complied with the standards specified above.

Authorized Signature:

Derek Yang

Derek Yang
Wireless Laboratory Manager

The manufacturer should ensure that all products in series production are in conformity with the product sample detailed in this report. If the product in this report is used in any configuration other than that detailed in the report, the manufacturer must ensure the new system complies with all relevant standards. Any mention of SGS International Electrical Approvals or testing done by SGS International Electrical Approvals in connection with, distribution or use of the product described in this report must be approved by SGS International Electrical Approvals in writing.

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# 1 Version

| Revision Record | | | | |
|---|---|---|---|---|
| **Version** | **Chapter** | **Date** | **Modifier** | **Remark** |
| 00 | | 2018/11/22 | | Original |
| | | | | |
| | | | | |

| | | | | |
|---|---|---|---|---|
| **Authorized for issue by:** | | | | |
| **Tested By** | | Mike Hu<br>**(Mike Hu) /Project Engineer** | | 2018/11/22<br>**Date** |
| **Checked By** | | David Chen<br>**(David Chen) /Reviewer** | | 2018/11/22<br>**Date** |

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# 2 Test Summary

| Test Item | Test Requirement | Test method | Test Result | Result |
|---|---|---|---|---|
| **AC Power Line Conducted Emission** | 15.207 | ANSI C63.10 2013 | Clause 5.2 | PASS |
| **Duty Cycle** | -- | -- | Clause 5.3 | PASS |
| **Conducted Output Power** | 15.247 (b)(3) | ANSI C63.10 2013 | Clause 5.4 | PASS |
| **DTS (6 dB) Bandwidth & OBW** | 15.247 (a)(2) | ANSI C63.10 2013 | Clause 5.5 | PASS |
| **Power Spectral Density** | 15.247 (e) | ANSI C63.10 2013 | Clause 5.6 | PASS |
| **Band-edge for RF Conducted Emissions** | 15.247(d) | ANSI C63.10 2013 | Clause 5.7 | PASS |
| **RF Conducted Spurious Emissions** | 15.247(d) | ANSI C63.10 2013 | Clause 5.8 | PASS |
| **Radiated Spurious Emissions** | 15.247(d) ;15.205/15.209 | ANSI C63.10 2013 | Clause 5.9 | PASS |
| **Restricted bands around fundamental frequency (Radiated Emission)** | 15.247(d) ;15.205/15.209 | ANSI C63.10 2013 | Clause 5.10 | PASS |

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# 3 General Information

## 3.1 Client Information

| | |
|---|---|
| Applicant: | Orion Labs, Inc |
| Address of Applicant: | 208 Utah Street Suite 350 San Francisco California United States |
| Manufacturer: | Orion Labs, Inc |
| Address of Manufacturer: | 208 Utah Street Suite 350 San Francisco California United States |
| Factory: | Fujian Star-net CommunicationCo.,Ltd |
| Address of Factory: | 3F,Bldg 1,Star-Net Science-based Haixi Industrial Pack,No. 9 GaoxinRoad,MinhouCounty,Fuzhou, China |

## 3.2 General Description of EUT

| | |
|---|---|
| EUT Description: | Orion Sync |
| Model Name: | ROS-001-VZ |
| Trade Mark: | Orion Labs |
| Hardware Version: | RA15_MB P4 |
| Software Version: | 7.1.2 |
| IEEE 802.11 WLAN Mode Supported | ☒ 802.11B (20 MHz channel bandwidth),<br>☒ 802.11G (20 MHz channel bandwidth)<br>☒ 802.11N (20 MHz channel bandwidth), |
| Operation Frequency: | 2402 MHz -2483.5MHz<br>fc = 2407 MHz + N * 5 MHz, where:<br>-fc = “Operating Frequency” in MHz,<br>-N = “Channel Number” with the range from 1 to 11 for the 20 MHz channel bandwidth, or 3 to 9 for the 40 MHz channel bandwidth. |
| Type of Modulation: | IEEE for 802.11B: DSSS<br>IEEE for 802.11G : OFDM<br>IEEE for 802.11N(HT20) : OFDM |
| Sample Type: | ☒ Portable Device, ☐Module |
| Antenna Type: | ☐ External, ☒ Integrated |
| Antenna Ports | ☒ Ant 1, ☐ Ant 2, ☐ Ant 3 |
| Smart System | ☒ SISO (for 802.11B/G/N),<br>☐ MIMO (for 802.11N): 2 Tx & 2 Rx,<br>☐ Diversity (for 802.11B/G) : Tx & Rx |
| Antenna Gain: | 3.5dBi |
| Power Supply | ☒ AC/DC Adapter; ☐ Battery ☐ PoE:; ☐ Other: |

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| Operation Frequency of each channel (802.11B/G/N HT20) | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Channel** | **Frequency** | **Channel** | **Frequency** | **Channel** | **Frequency** | **Channel** | **Frequency** |
| 1 | 2412MHz | 4 | 2427MHz | 7 | 2442MHz | 10 | 2457MHz |
| 2 | 2417MHz | 5 | 2432MHz | 8 | 2447MHz | 11 | 2462MHz |
| 3 | 2422MHz | 6 | 2437MHz | 9 | 2452MHz | | |

Remark:

In section 15.31(m), regards to the operating frequency range over 10 MHz, the Lowest frequency, the middle frequency, and the highest frequency of channel were selected to perform the test, and the selected channel see below:

| Channel | Frequency for 802.11B/G/N (HT20) |
|---|---|
| The Lowest channel | 2412MHz |
| The Middle channel | 2437MHz |
| The Highest channel | 2462MHz |

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## 3.3 Test Environment and Mode

| Operating Environment: | |
|---|---|
| Temperature: | 25.0 °C |
| Humidity: | 50 % RH |
| Atmospheric Pressure: | 101.30 KPa |
| **Test mode:** | |
| Transmitting mode: | Keep the EUT in transmitting mode with all kind of modulation and all kind of data rate. |

## 3.4 Description of Support Units

The EUT has been tested independent unit.

## 3.5 Test Location

All tests were performed at:

SGS-CSTC Standards Technical Services Co., Ltd., Shenzhen Branch

No. 1 Workshop, M-10, Middle Section, Science & Technology Park, Shenzhen, Guangdong, China. 518057.

Tel: +86 755 2601 2053 Fax: +86 755 2671 0594

No tests were sub-contracted.

## 3.6 Test Facility

The test facility is recognized, certified, or accredited by the following organizations:

**• CNAS (No. CNAS L2929)**

CNAS has accredited SGS-CSTC Standards Technical Services Co., Ltd. Shenzhen Branch EMC Lab to ISO/IEC 17025:2005 General Requirements for the Competence of Testing and Calibration Laboratories (CNAS-CL01 Accreditation Criteria for the Competence of Testing and Calibration Laboratories) for the competence in the field of testing.

**• A2LA (Certificate No. 3816.01)**

SGS-CSTC Standards Technical Services Co., Ltd., Shenzhen EMC Laboratory is accredited by the American Association for Laboratory Accreditation(A2LA). Certificate No. 3816.01.

**• VCCI**

The 3m Fully-anechoic chamber for above 1GHz, 10m Semi-anechoic chamber for below 1GHz, Shielded Room for Mains Port Conducted Interference Measurement and Telecommunication Port Conducted Interference Measurement of SGS-CSTC Standards Technical Services Co., Ltd. have been registered in accordance with the Regulations for Voluntary Control Measures with Registration No.: G-20026, R-14188, C-12383 and T-11153 respectively.

**• FCC –Designation Number: CN1178**

SGS-CSTC Standards Technical Services Co., Ltd., Shenzhen EMC Laboratory has been recognized as an accredited testing laboratory.

Designation Number: CN1178. Test Firm Registration Number: 406779.

**• Industry Canada (IC)**

Two 3m Semi-anechoic chambers and the 10m Semi-anechoic chamber of SGS-CSTC Standards Technical Services Co., Ltd. Shenzhen Branch EMC Lab have been registered by Certification and Engineering Bureau of Industry Canada for radio equipment testing with Registration No.: 4620C-1, 4620C-2, 4620C-3.

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## 3.7 Deviation from Standards

None.

## 3.8 Abnormalities from Standard Conditions

None.

## 3.9 Other Information Requested by the Customer

None.

## 3.10 Measurement Uncertainty (95% confidence levels, k=2)

| No. | Item | Measurement Uncertainty |
|---|---|---|
| 1 | Total RF power, conducted | ±0.75dB |
| 2 | RF power density, conducted | ±2.84dB |
| 3 | Spurious emissions, conducted | ±0.75dB |
| 4 | Radiated Spurious emission test | ±4.5dB (30MHz-1GHz) |
| | | ±4.8dB (1GHz-25GHz) |
| 5 | Conduct emission test | ±3.12 dB (9KHz- 30MHz) |
| 6 | Temperature test | ±1°C |
| 7 | Humidity test | ±3% |
| 8 | DC and low frequency voltages | ±0.5% |

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## 3.11 Equipment List

| Conducted Emission | | | | | |
|---|---|---|---|---|---|
| Test Equipment | Manufacturer | Model No. | Inventory No. | Cal. date (yyyy-mm-dd) | Cal.Duedate (yyyy-mm-dd) |
| Shielding Room | ZhongYu Electron | GB-88 | SEM001-06 | 2017/5/10 | 2020/5/9 |
| LISN | Rohde & Schwarz | ENV216 | SEM007-01 | 2018/9/2 | 2019/9/2 |
| LISN | ETS-LINDGREN | Feb-16 | SEM007-02 | 2018/4/2 | 2019/4/1 |
| Measurement Software | AUDIX | e3 V5.4.1221d | N/A | N/A | N/A |
| Coaxial Cable | SGS | N/A | SEM024-01 | 2018/7/12 | 2019/7/11 |
| 2 Line ISN | Fischer Custom Communications Inc. | FCC-TLISN-T2-02 | EMC0122 | 2018/2/14 | 2019/2/13 |
| EMI Test Receiver | Rohde & Schwarz | ESCI | SEM004-02 | 2018/4/2 | 2019/4/1 |

| RF conducted test | | | | | |
|---|---|---|---|---|---|
| Test Equipment | Manufacturer | Model No. | Inventory No. | Cal. date (yyyy-mm-dd) | Cal.Duedate (yyyy-mm-dd) |
| DC Power Supply | Agilent Technologies Inc | 66311B | W009-09 | 2018/9/15 | 2019/9/15 |
| Signal Analyzer | Rohde & Schwarz | FSV | W025-05 | 2018/3/13 | 2019/3/12 |
| Coaxial Cable | SGS | N/A | SEM031-01 | 2018/7/13 | 2019/7/12 |
| Attenuator | Weinschel Associates | WA41 | SEM021-09 | N/A | N/A |
| Signal Generator | KEYSIGHT | N5173B | SEM006-05 | 2018/9/2 | 2019/9/2 |
| Temperature Chamber | GIANT FORCE | ICT-150-40-CP-AR | W027-03 | 2017/12/4 | 2018/12/4 |

| RE in Chamber | | | | | |
|---|---|---|---|---|---|
| Test Equipment | Manufacturer | Model No. | Inventory No. | Cal. date (yyyy-mm-dd) | Cal.Due date (yyyy-mm-dd) |
| 3m Semi-Anechoic Chamber | ETS-LINDGREN | N/A | SEM001-01 | 2017/8/5 | 2020/8/4 |
| Measurement Software | AUDIX | e3 V8.2014-6-27 | N/A | N/A | N/A |
| Coaxial Cable | SGS | N/A | SEM025-01 | 2018/7/12 | 2019/7/11 |
| MXE EMI Receiver (20Hz-8.4GHz) | Agilent Technologies | N9038A | SEM004-05 | 2018/9/2 | 2019/9/2 |
| BiConiLog Antenna (26-3000MHz) | ETS-LINDGREN | 3142C | SEM003-01 | 2017/6/27 | 2020/6/26 |
| Pre-amplifier (0.1-1.3GHz) | Agilent Technologies | 8447D | SEM005-01 | 2018/4/2 | 2019/4/1 |

| RE in Chamber | | | | | |
|---|---|---|---|---|---|
| Test Equipment | Manufacturer | Model No. | Inventory No. | Cal. Date (yyyy-mm-dd) | Cal. Due date (yyyy-mm-dd) |
| 10m Semi-Anechoic Chamber | SAEMC | FSAC1018 | SEM001-03 | 2018/3/31 | 2021/3/30 |
| EMI Test Receiver (9k-7GHz) | Rohde & Schwarz | ESR | SEM004-03 | 2018/4/2 | 2019/4/1 |
| Trilog-Broadband Antenna(25M-2GHz) | Schwarzbeck | VULB9168 | SEM003-18 | 2016/6/29 | 2019/6/28 |
| Pre-amplifier (9k-1GHz) | Sonoma | 310N | SEM005-03 | 2018/4/13 | 2019/4/12 |
| Loop Antenna (9kHz-30MHz) | ETS-Lindgren | 6502 | SEM003-08 | 2017/8/22 | 2020/8/21 |
| Measurement Software | AUDIX | e3 V8.2014-6-27 | N/A | N/A | N/A |

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# 4 Test results and Measurement Data

## 4.1 Antenna Requirement

| **Standard requirement:** | 47 CFR Part 15C Section 15.203 /247(c) |
|---|---|
| 15.203 requirement:<br>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, 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.<br>15.247(b) (4) requirement:<br>The conducted output power limit specified in paragraph (b) of this section is based on the use of antennas with directional gains that do not exceed 6 dBi. Except as shown in paragraph (c) of this section, if transmitting antennas of directional gain greater than 6 dBi are used, the conducted output power from the intentional radiator shall be reduced below the stated values in paragraphs (b)(1), (b)(2), and (b)(3) of this section, as appropriate, by the amount in dB that the directional gain of the antenna exceeds 6 dBi. | |
| The antenna is integrated on the main PCB and no consideration of replacement. The best case gain of the antenna is 3.5dBi. | |

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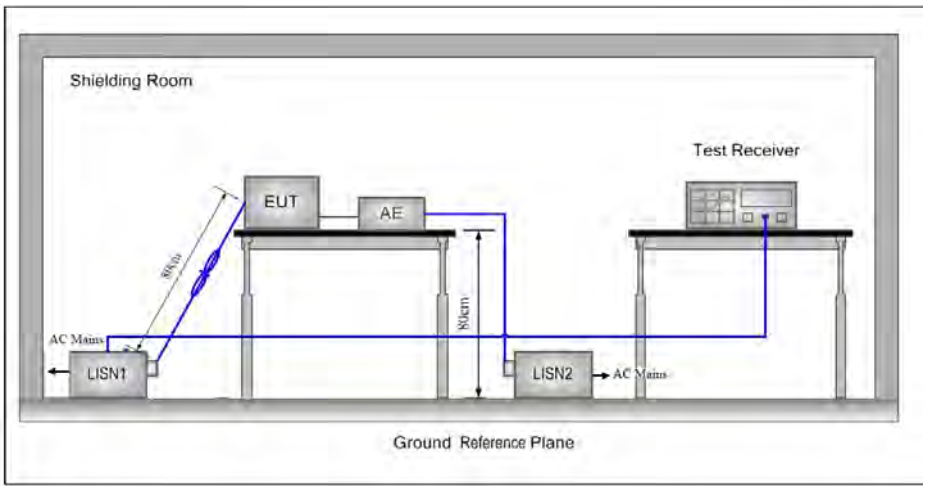
## 4.2 AC Power Line Conducted Emissions

| | | | |
|---|---|---|---|
| Test Requirement: | 47 CFR Part 15C Section 15.207 | | |
| Test Method: | ANSI C63.10: 2013 | | |
| Test Frequency Range: | 150kHz to 30MHz | | |
| Limit: | Frequency range (MHz) | 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. | | |
| Test Procedure: | 1) The mains terminal disturbance voltage test was conducted in a shielded room.<br>2) The EUT was connected to AC power source through a LISN 1 (Line Impedance Stabilization Network) which provides a 50Ω/50μH + 5Ω linear impedance. The power cables of all other units of the EUT were connected to a second LISN 2, which was bonded to the ground reference plane in the same way as the LISN 1 for the unit being measured. A multiple socket outlet strip was used to connect multiple power cables to a single LISN provided the rating of the LISN was not exceeded.<br>3) The tabletop EUT was placed upon a non-metallic table 0.8m above the ground reference plane. And for floor-standing arrangement, the EUT was placed on the horizontal ground reference plane,<br>4) The test was performed with a vertical ground reference plane. The rear of the EUT shall be 0.4 m from the vertical ground reference plane. The vertical ground reference plane was bonded to the horizontal ground reference plane. The LISN 1 was placed 0.8 m from the boundary of the unit under test and bonded to a ground reference plane for LISNs mounted on top of the ground reference plane. This distance was between the closest points of the LISN 1 and the EUT. All other units of the EUT and associated equipment was at least 0.8 m from the LISN 2.<br>5) In order to find the maximum emission, the relative positions of equipment and all of the interface cables must be changed according to ANSI C63.10: 2013 on conducted measurement. | | |
| Test Setup: |  | | |

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| | |
|---|---|
| Exploratory Test Mode: | Transmitting with all kind of modulations, data rates at lowest, middle and highest channel.<br>Charge + Transmitting mode. |
| Final Test Mode: | Through Pre-scan, find the 1Mbps of rate of 802.11B at lowest channel is the worst case.<br>Charge + Transmitting mode.<br>Only the worst case is recorded in the report. |
| Instruments Used: | Refer to section 5.10 for details |
| Test Results: | Pass |

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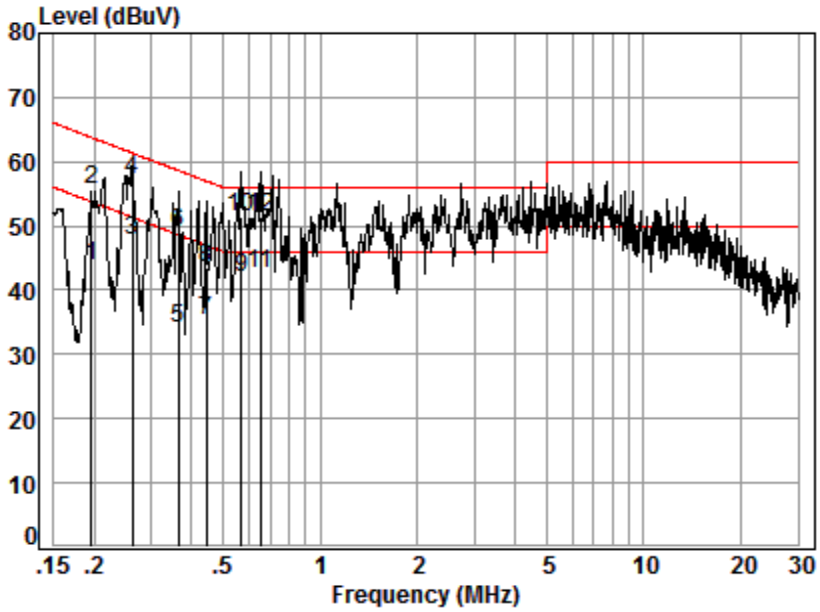
Measurement Data

An initial pre-scan was performed on the live and neutral lines with peak detector.

Quasi-Peak and Average measurement were performed at the frequencies with maximized peak emission were detected.

Live Line:




Site : Shielding Room
Condition: Line
Job No. : 80005
Test mode: d

| | Freq | Cable Loss | LISN Factor | Read Level | Level | Limit Line | Over Limit | Remark |
|---|---|---|---|---|---|---|---|---|
| | MHz | dB | dB | dBuV | dBuV | dBuV | dB | |
| 1 | 0.20 | 0.02 | 9.66 | 34.07 | 43.75 | 53.80 | -10.05 | Average |
| 2 | 0.20 | 0.02 | 9.66 | 46.05 | 55.73 | 63.80 | -8.07 | QP |
| 3 | 0.26 | 0.03 | 9.67 | 38.11 | 47.81 | 51.38 | -3.57 | Average |
| 4 | 0.26 | 0.03 | 9.67 | 47.46 | 57.16 | 61.38 | -4.22 | QP |
| 5 | 0.37 | 0.05 | 9.67 | 24.40 | 34.12 | 48.61 | -14.49 | Average |
| 6 | 0.37 | 0.05 | 9.67 | 39.36 | 49.08 | 58.61 | -9.53 | QP |
| 7 | 0.44 | 0.06 | 9.67 | 25.53 | 35.26 | 46.98 | -11.72 | Average |
| 8 | 0.44 | 0.06 | 9.67 | 33.76 | 43.49 | 56.98 | -13.49 | QP |
| 9 | 0.57 | 0.07 | 9.67 | 32.33 | 42.07 | 46.00 | -3.93 | Average |
| 10 | 0.57 | 0.07 | 9.67 | 41.73 | 51.47 | 56.00 | -4.53 | QP |
| 11 | 0.65 | 0.07 | 9.68 | 32.69 | 42.44 | 46.00 | -3.56 | Average |
| 12 | 0.65 | 0.07 | 9.68 | 41.55 | 51.30 | 56.00 | -4.70 | QP |

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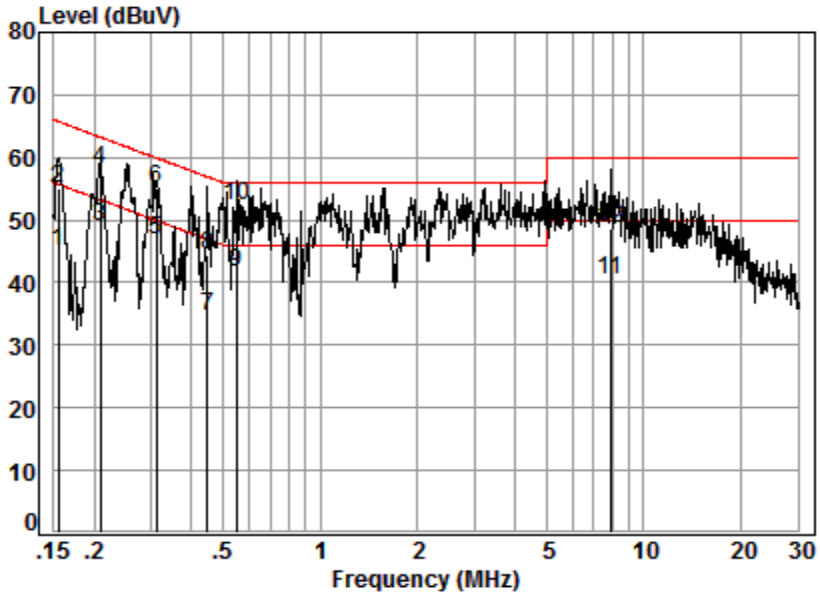
Neutral Line:




Site : Shielding Room
Condition: Neutral
Job No. : 80005
Test mode: d

| | Freq | Cable Loss | LISN Factor | Read Level | Level | Limit Line | Over Limit | Remark |
|---|---|---|---|---|---|---|---|---|
| | MHz | dB | dB | dBuV | dBuV | dBuV | dB | |
| 1 | 0.15 | 0.01 | 9.63 | 35.47 | 45.11 | 55.74 | -10.63 | Average |
| 2 | 0.15 | 0.01 | 9.63 | 45.54 | 55.18 | 65.74 | -10.56 | QP |
| 3 | 0.21 | 0.02 | 9.64 | 39.28 | 48.94 | 53.23 | -4.29 | Average |
| 4 | 0.21 | 0.02 | 9.64 | 48.40 | 58.06 | 63.23 | -5.17 | QP |
| 5 | 0.31 | 0.04 | 9.64 | 37.21 | 46.89 | 49.93 | -3.04 | Average |
| 6 | 0.31 | 0.04 | 9.64 | 45.30 | 54.98 | 59.93 | -4.95 | QP |
| 7 | 0.45 | 0.06 | 9.65 | 25.10 | 34.81 | 46.93 | -12.12 | Average |
| 8 | 0.45 | 0.06 | 9.65 | 34.71 | 44.42 | 56.93 | -12.51 | QP |
| 9 | 0.55 | 0.06 | 9.64 | 31.86 | 41.56 | 46.00 | -4.44 | Average |
| 10 | 0.55 | 0.06 | 9.64 | 42.72 | 52.42 | 56.00 | -3.58 | QP |
| 11 | 7.89 | 0.17 | 9.79 | 30.54 | 40.50 | 50.00 | -9.50 | Average |
| 12 | 7.89 | 0.17 | 9.79 | 38.56 | 48.52 | 60.00 | -11.48 | QP |

*Remarks:*

*1. The following Quasi-Peak and Average measurements were performed on the EUT:*

*2. Final Test Level =Receiver Reading + LISN Factor + Cable Loss.*

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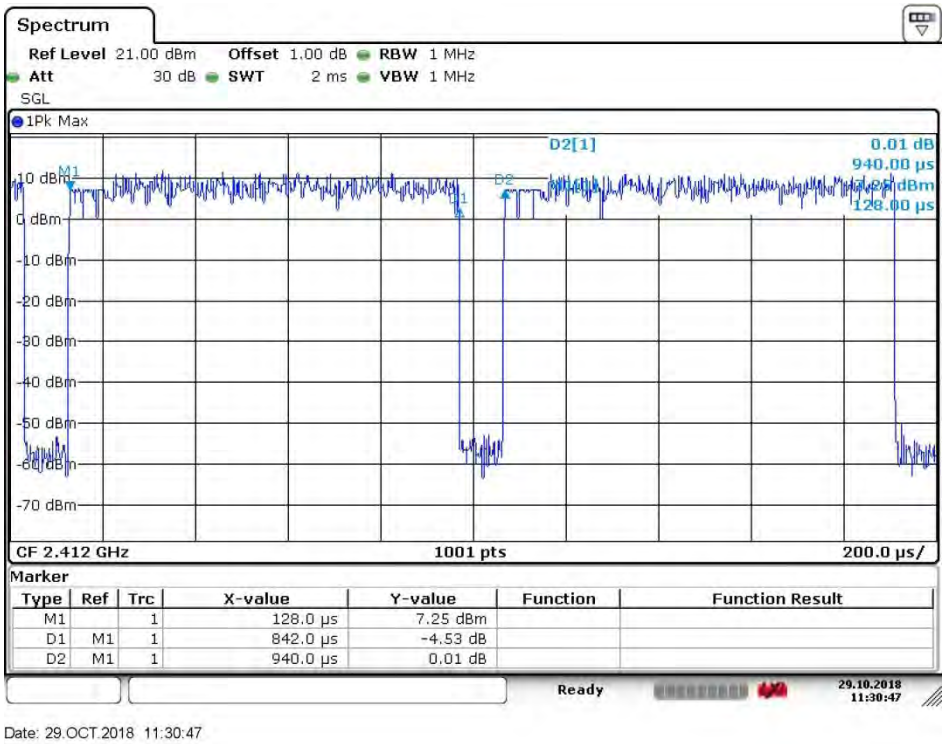
## 4.3 Duty Cycle

### 4.3.1 Part I - Test Results

| Test Mode | TX Freq. [MHz] | Duty cycle [%] |
|---|---|---|
| 11B | Ant 1: CH1 | 88 |
| 11G | Ant 1: CH1 | 63 |
| 11N_20 | Ant 1: CH1 | 61 |

### 4.3.2 Part II - Test Plots

#### 4.3.2.1 11B @Ant 1




Date: 29.OCT.2018 11:30:47

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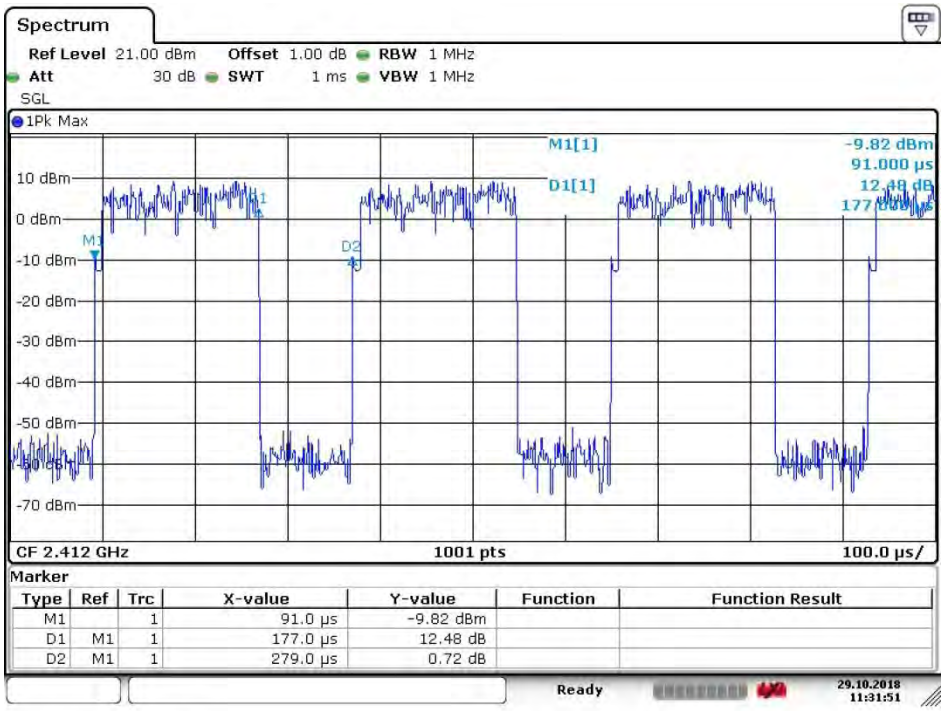
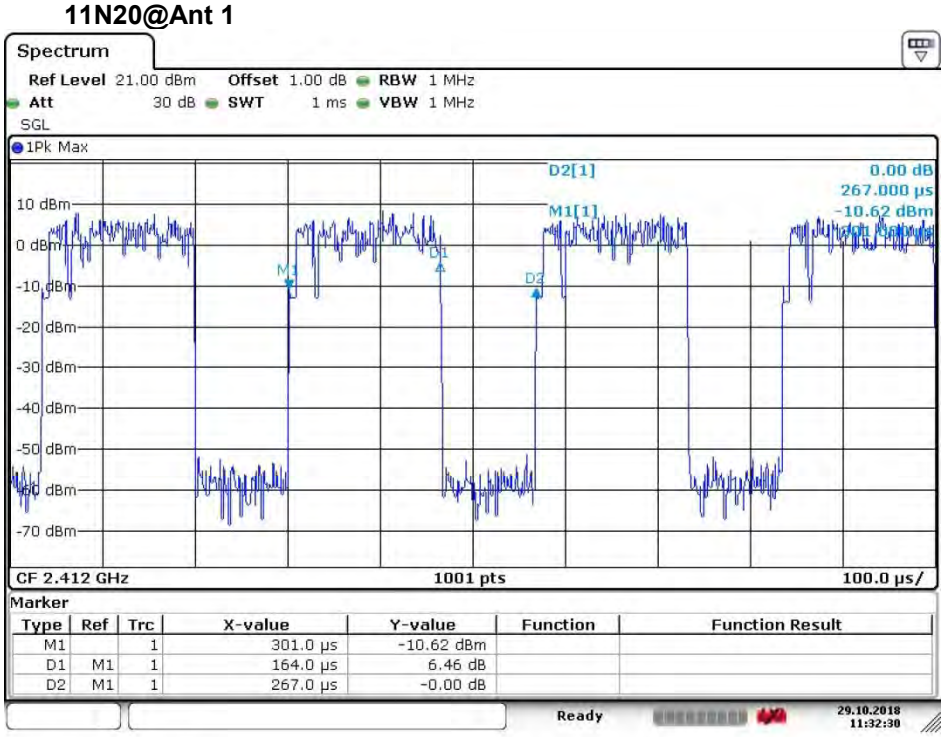
### 4.3.2.2 11G@Ant 1




Date: 29.OCT.2018 11:31:51

### 4.3.2.3 11N20@Ant 1

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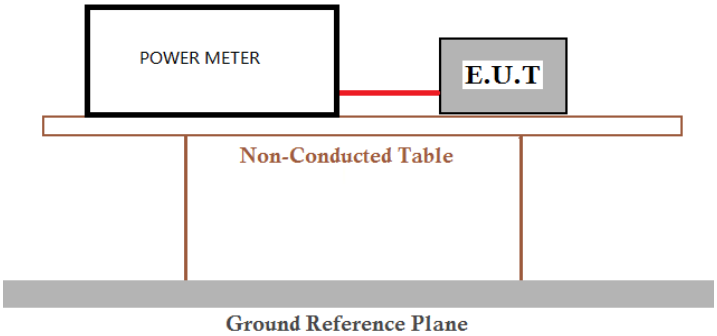
## 4.4 Conducted Output Power

| | |
|---|---|
| Test Requirement: | 47 CFR Part 15C Section 15.247 (b)(3) |
| Test Method: | ANSI C63.10 :2013 Section 11.9.1.3 |
| Test Setup: |  |
| Test Instruments: | Refer to section 5.10 for details |
| Exploratory Test Mode: | Transmitting with all kind of modulations, data rates |
| Final Test Mode: | Through Pre-scan, find the<br>1Mbps of rate is the worst case of 802.11B;<br>6Mbps of rate is the worst case of 802.11G ;<br>6.5Mbps of rate is the worst case of 802.11N(HT20); |
| Limit: | 30dBm |
| Test Results: | Pass |

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**Measurement Data of Average Power:**

| Mode | Test Channel | Average Output Power (dBm) | Result |
|---|---|---|---|
| 802.11B | Lowest | 13.65 | Report purpose only |
| | Middle | 13.97 | Report purpose only |
| | Highest | 14.22 | Report purpose only |
| 802.11G | Lowest | 11.96 | Report purpose only |
| | Middle | 12.37 | Report purpose only |
| | Highest | 12.72 | Report purpose only |
| 802.11N20 | Lowest | 10.35 | Report purpose only |
| | Middle | 10.85 | Report purpose only |
| | Highest | 11.12 | Report purpose only |

**Measurement Data of Peak Power:**

| Mode | Test Channel | Peak Output Power (dBm) | Limit (dBm) | Result |
|---|---|---|---|---|
| 802.11B | Lowest | 21.63 | 30.00 | Pass |
| | Middle | 21.93 | 30.00 | Pass |
| | Highest | 22.17 | 30.00 | Pass |
| 802.11G | Lowest | 20.18 | 30.00 | Pass |
| | Middle | 20.69 | 30.00 | Pass |
| | Highest | 20.77 | 30.00 | Pass |
| 802.11N20 | Lowest | 19.98 | 30.00 | Pass |
| | Middle | 20.78 | 30.00 | Pass |
| | Highest | 20.80 | 30.00 | Pass |

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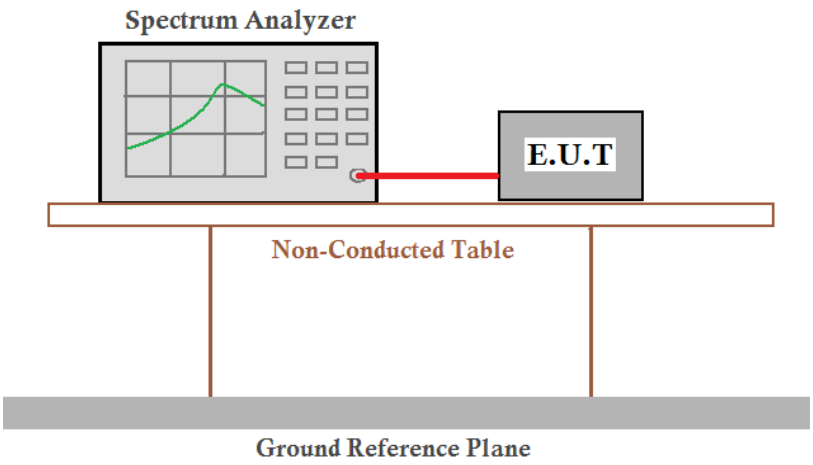
## 4.5 DTS (6 dB) Bandwidth & OBW

| | |
|---|---|
| Test Requirement: | 47 CFR Part 15C Section 15.247 (a)(2) |
| Test Method: | ANSI C63.10: 2013 Section 11.8.1 Option 1 |
| Test Setup: |  |
| Instruments Used: | Refer to section 5.10 for details |
| Exploratory Test Mode: | Transmitting with all kind of modulations, data rates |
| Final Test Mode: | Through Pre-scan, find the<br>1Mbps of rate is the worst case of 802.11B;<br>6Mbps of rate is the worst case of 802.11G;<br>6.5Mbps of rate is the worst case of 802.11N(HT20); |
| Limit: | ≥ 500 kHz |
| Test Results: | Pass |

| Mode | Test Channel | Occupied Bandwidth (MHz) | 6dB Emission Bandwidth (MHz) | Limit (kHz) | Result |
|---|---|---|---|---|---|
| 802.11B | Lowest | 11.63 | 8.57 | ≥500 | Pass |
| | Middle | 11.60 | 8.27 | ≥500 | Pass |
| | Highest | 11.63 | 8.18 | ≥500 | Pass |
| 802.11G | Lowest | 16.36 | 15.79 | ≥500 | Pass |
| | Middle | 16.36 | 15.70 | ≥500 | Pass |
| | Highest | 16.36 | 15.76 | ≥500 | Pass |
| 802.11N20 | Lowest | 17.56 | 17.59 | ≥500 | Pass |
| | Middle | 17.62 | 17.38 | ≥500 | Pass |
| | Highest | 17.59 | 17.29 | ≥500 | Pass |

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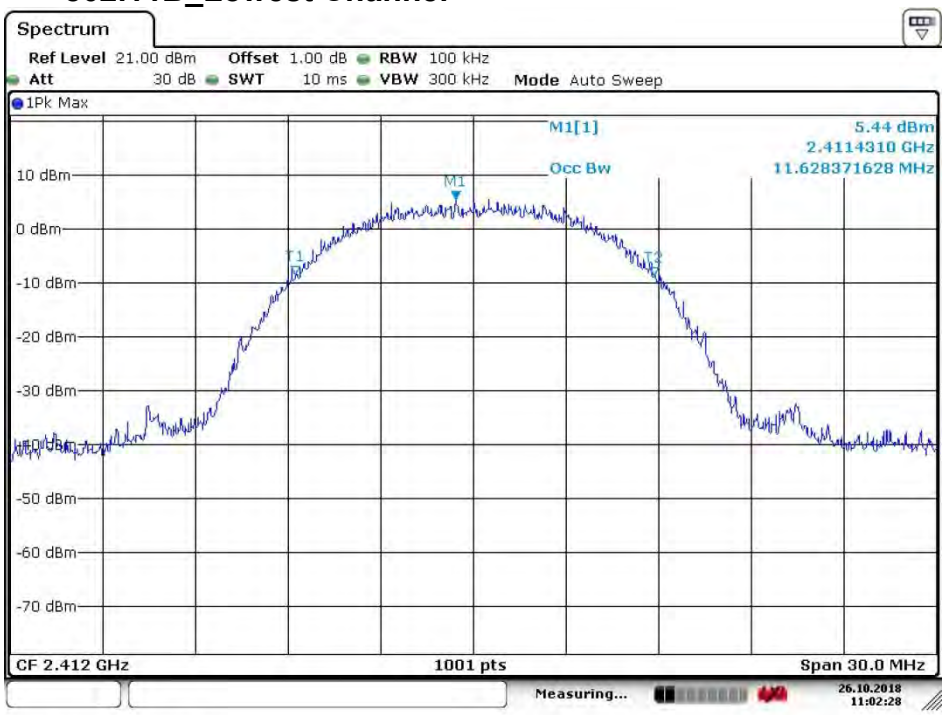
### 4.5.1 Test plots

#### 4.5.1.1 802.11B_Lowest Channel




Date: 26.OCT.2018 11:02:29

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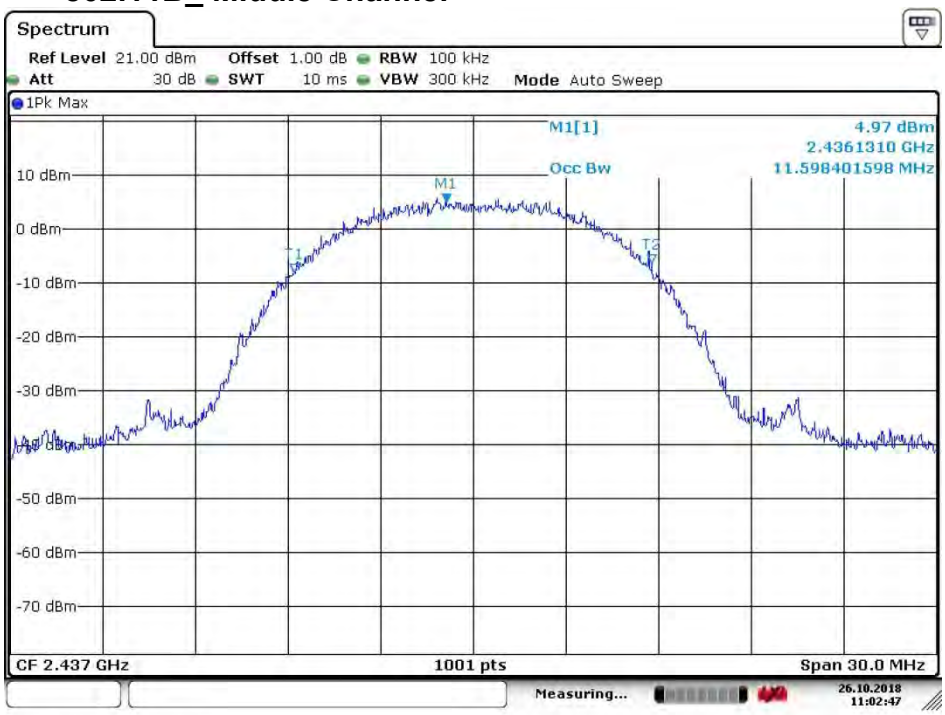
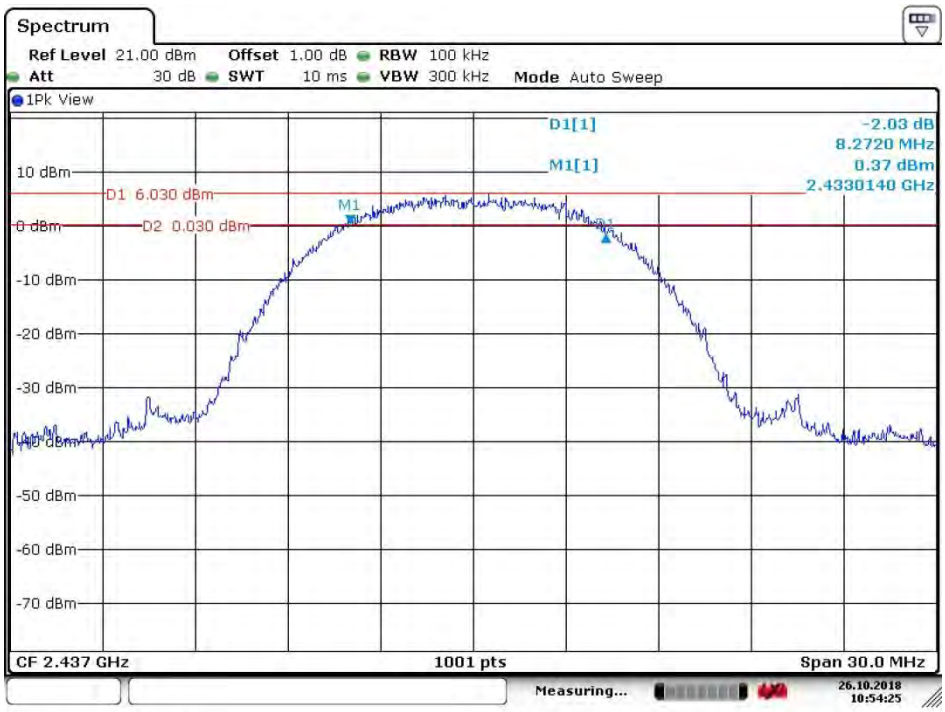
### 4.5.1.2 802.11B_ Middle Channel




Date: 26.OCT.2018 11:02:47

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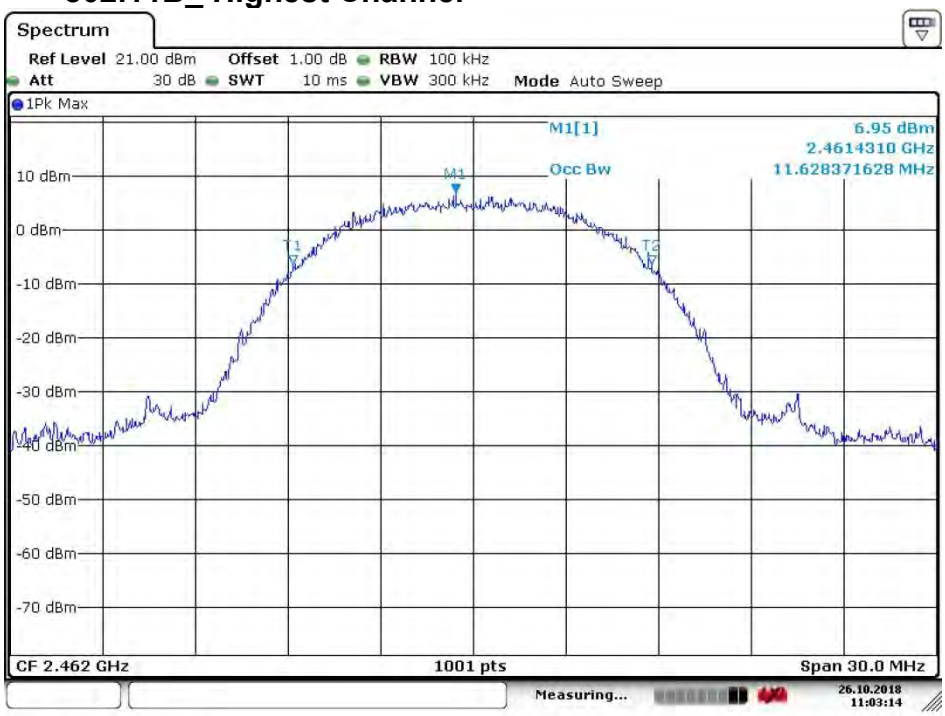
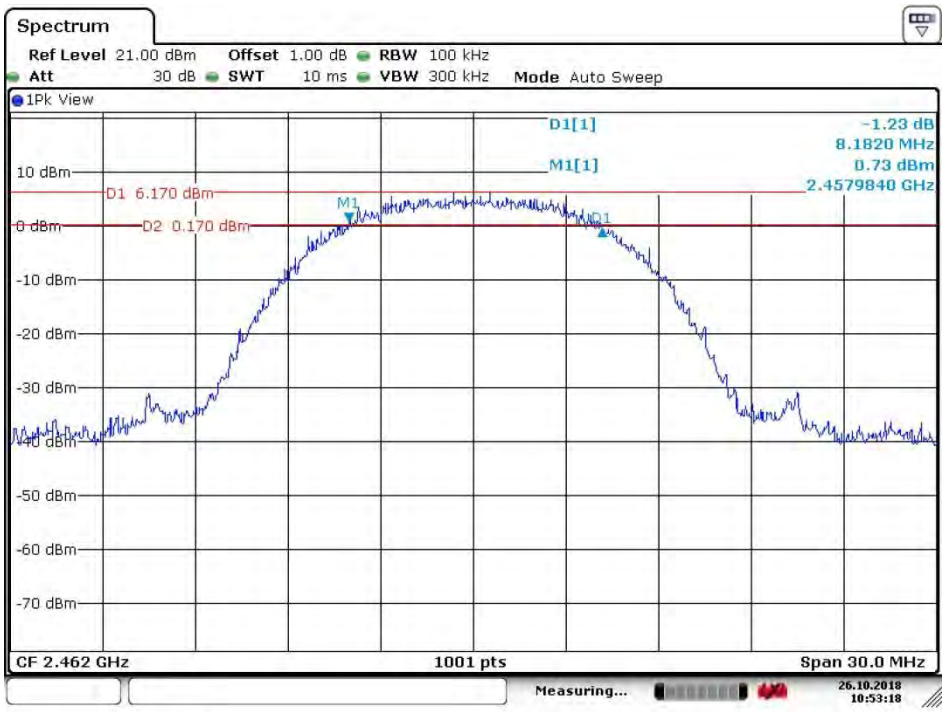
### 4.5.1.3 802.11B_ Highest Channel




Date: 26.OCT.2018 11:03:14

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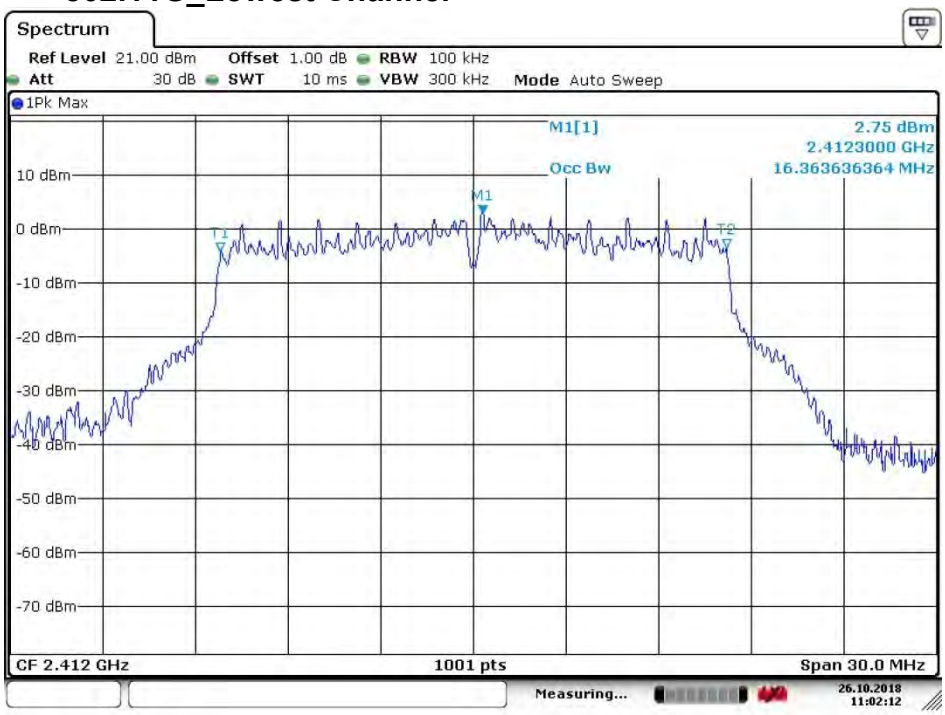
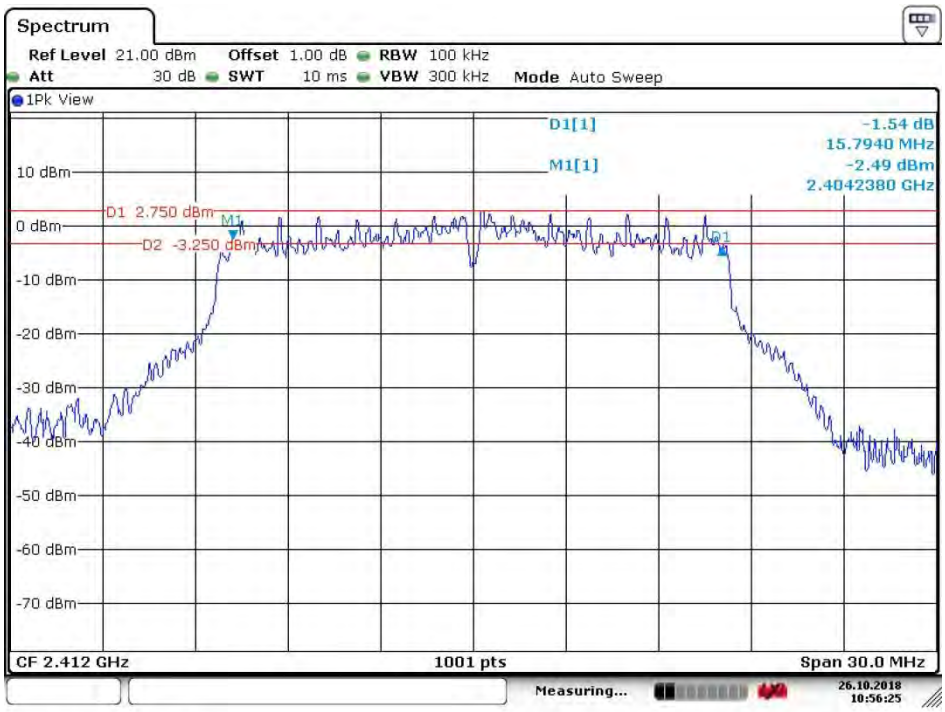
### 4.5.1.4 802.11G_Lowest Channel




Date: 26.OCT.2018 11:02:12




Date: 26.OCT.2018 10:56:25

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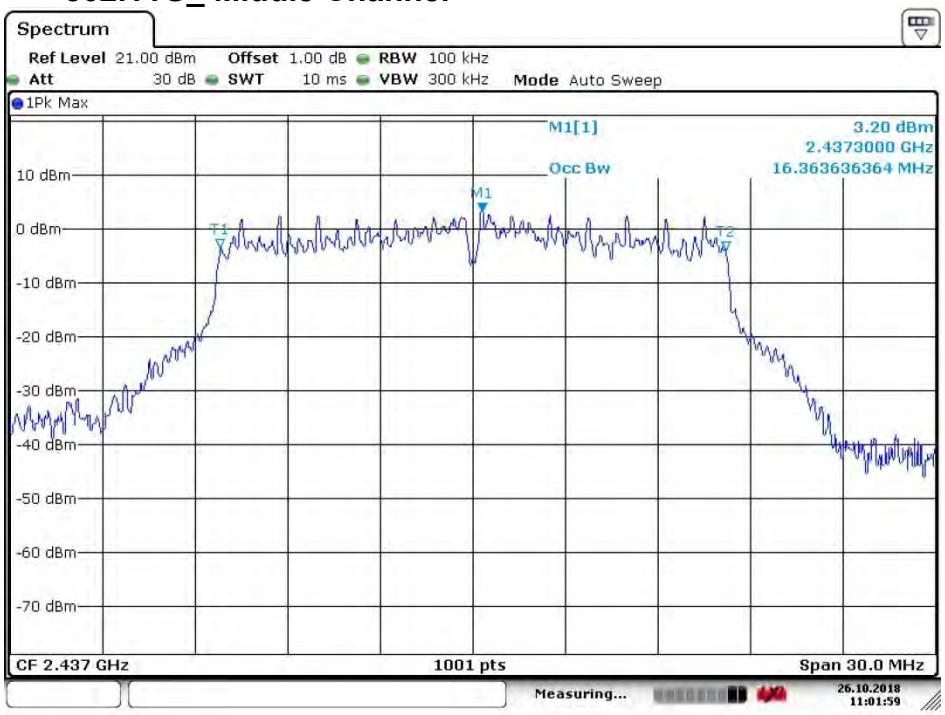
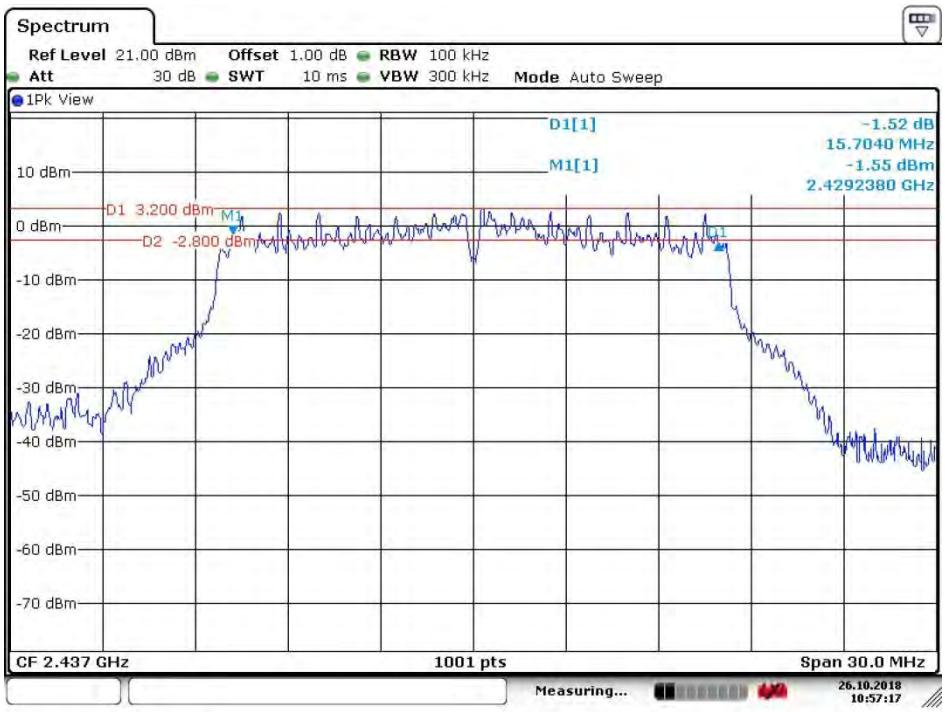
### 4.5.1.5 802.11G_ Middle Channel




Date: 26.OCT.2018 11:01:59




Date: 26.OCT.2018 10:57:18

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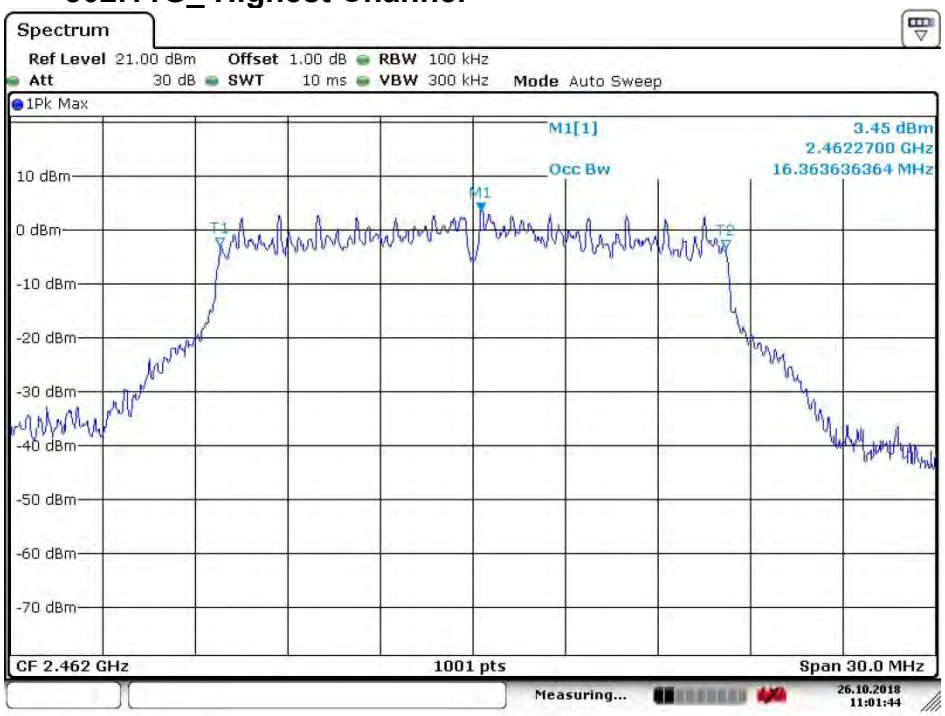
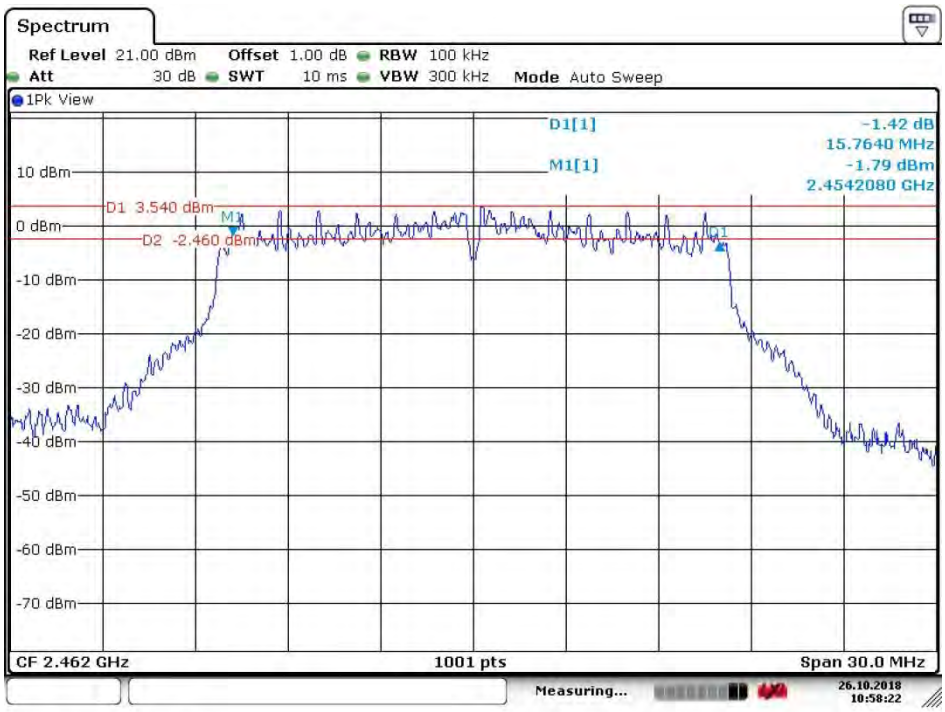
### 4.5.1.6 802.11G_ Highest Channel




Date: 26.OCT.2018 11:01:44




Date: 26.OCT.2018 10:58:22

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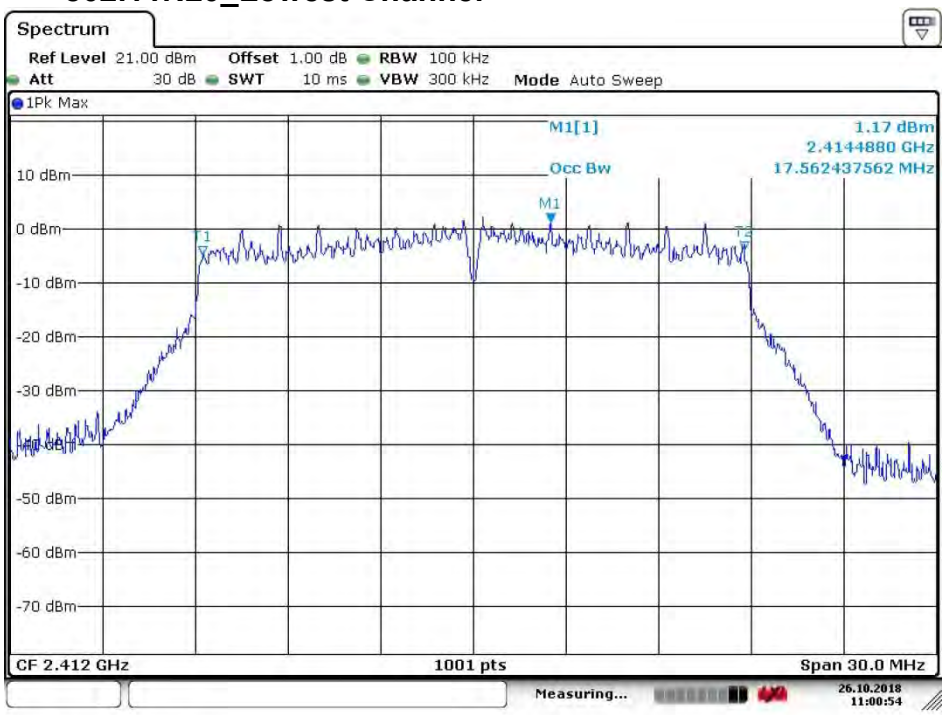
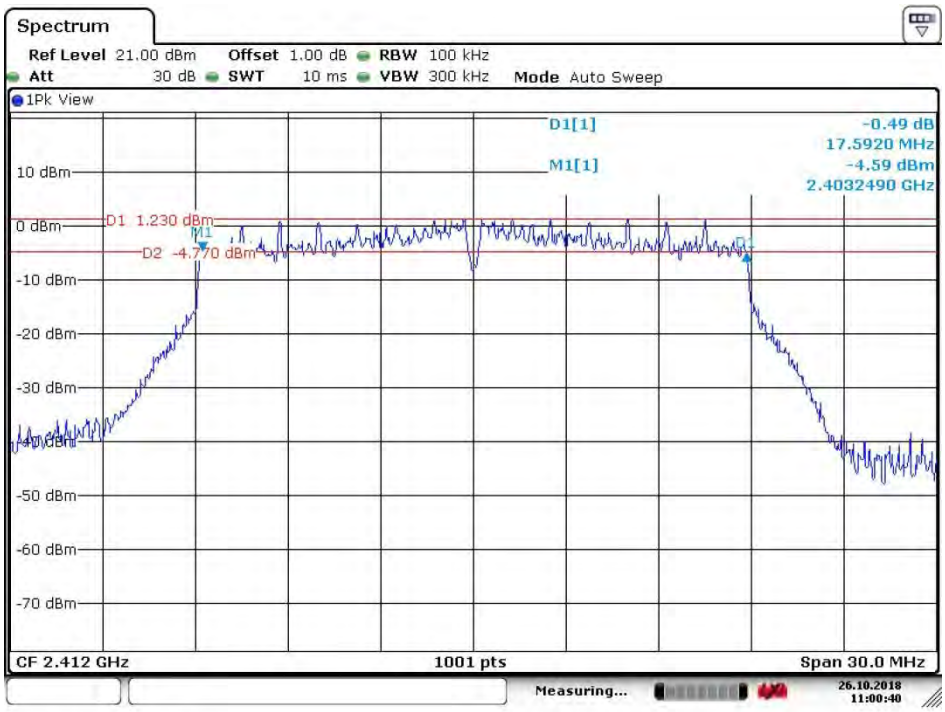
### 4.5.1.7 802.11N20_Lowest Channel




Date: 26.OCT.2018 11:00:55




Date: 26.OCT.2018 11:00:40

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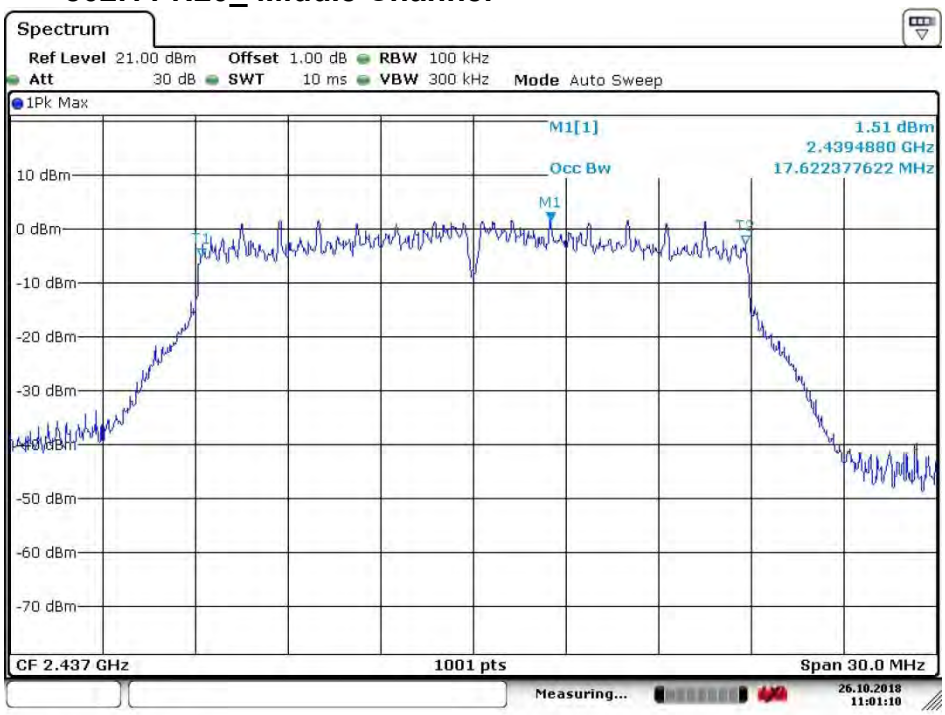
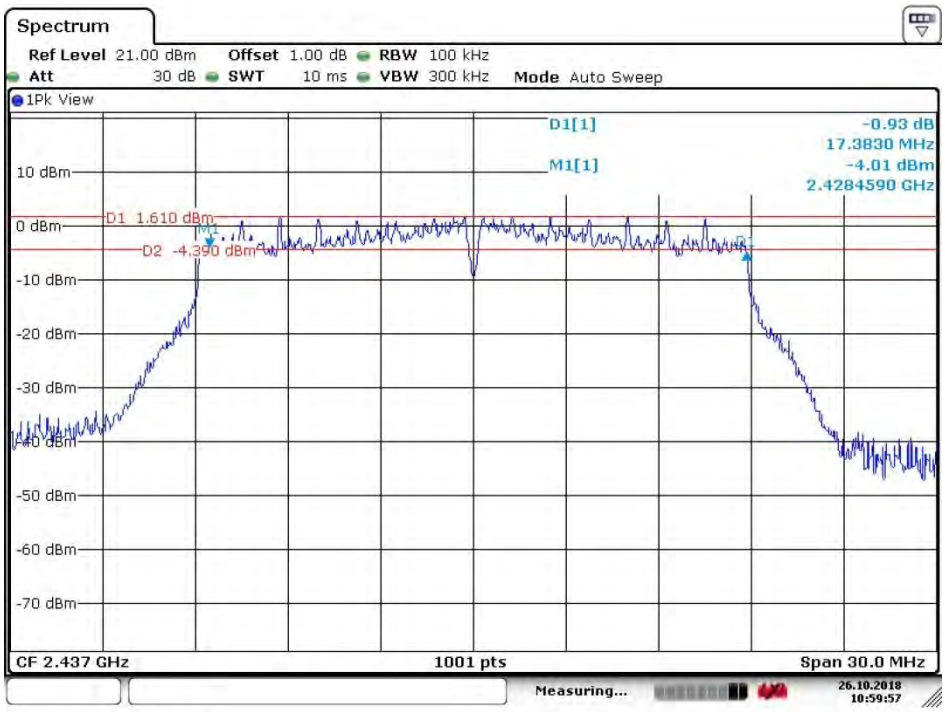
### 4.5.1.8 802.11 N20_ Middle Channel




Date: 26.OCT.2018 11:01:11




Date: 26.OCT.2018 10:59:58

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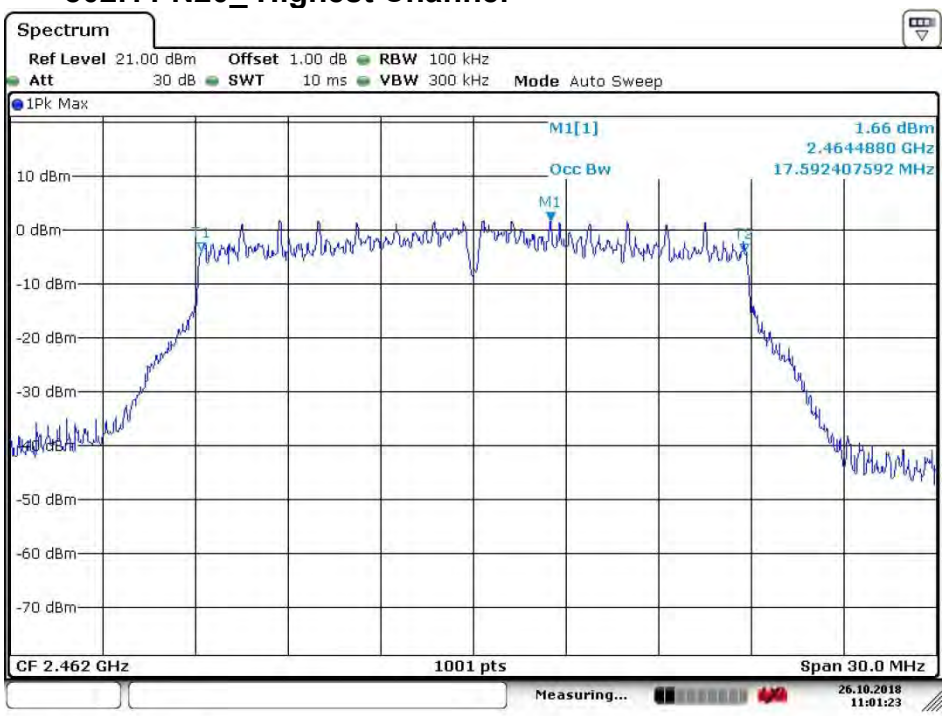
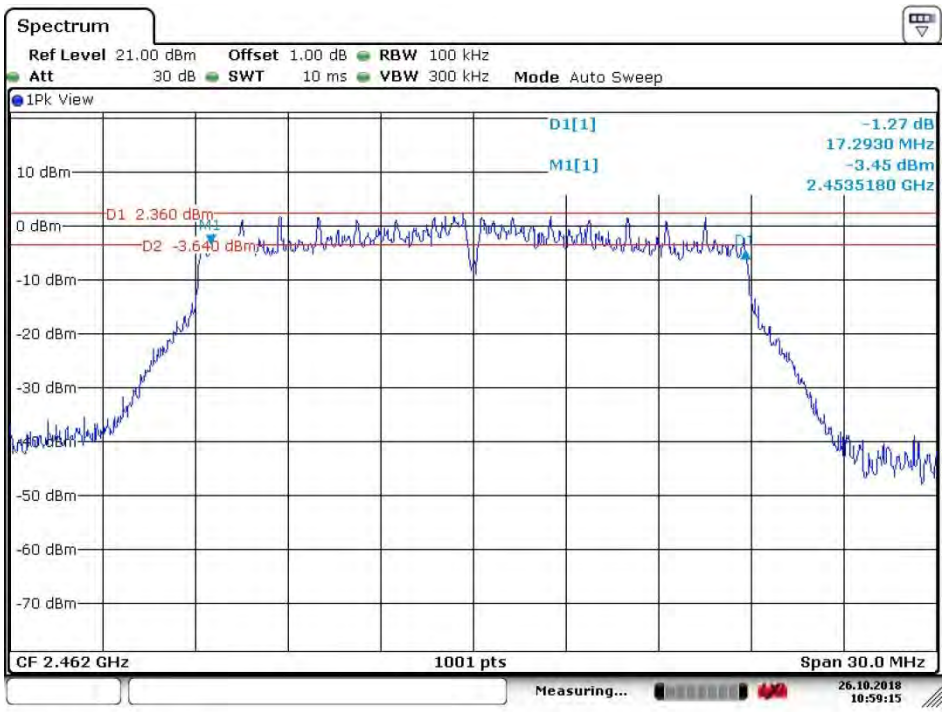
### 4.5.1.9 802.11 N20_ Highest Channel




Date: 26.OCT.2018 11:01:24




Date: 26.OCT.2018 10:59:16

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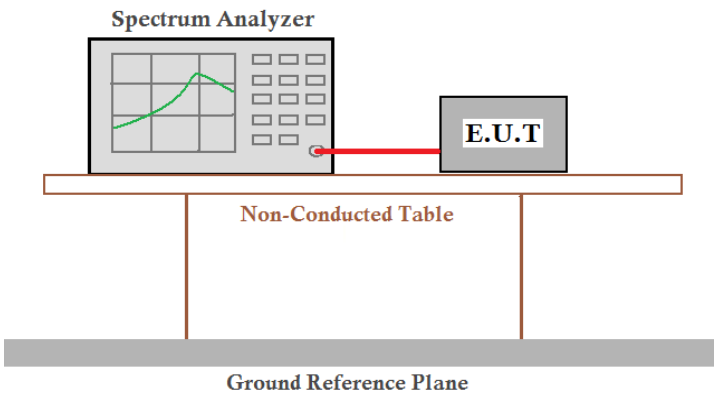
## 4.6 Power Spectral Density

| | |
|---|---|
| Test Requirement: | 47 CFR Part 15C Section 15.247 (e) |
| Test Method: | ANSI C63.10 :2013 Section 11.10.2 |
| Test Setup: |  |
| Test Instruments: | Refer to section 5.10 for details |
| Exploratory Test Mode: | Transmitting with all kind of modulations, data rates |
| Final Test Mode: | Through Pre-scan, find the<br>1Mbps of rate is the worst case of 802.11B;<br>6Mbps of rate is the worst case of 802.11G ;<br>6.5Mbps of rate is the worst case of 802.11N(HT20); |
| Limit: | ≤8.00dBm/3kHz |
| Test Results: | Pass |

| Mode | Test Channel | Power Spectral Density (dBm/3kHz) | Limit (dBm/3kHz) | Result |
|---|---|---|---|---|
| 802.11B | Lowest | -8.42 | ≤8.00 | Pass |
| | Middle | -7.95 | ≤8.00 | Pass |
| | Highest | -7.82 | ≤8.00 | Pass |
| 802.11G | Lowest | -12.51 | ≤8.00 | Pass |
| | Middle | -12.04 | ≤8.00 | Pass |
| | Highest | -11.77 | ≤8.00 | Pass |
| 802.11N20 | Lowest | -12.23 | ≤8.00 | Pass |
| | Middle | -11.72 | ≤8.00 | Pass |
| | Highest | -11.55 | ≤8.00 | Pass |

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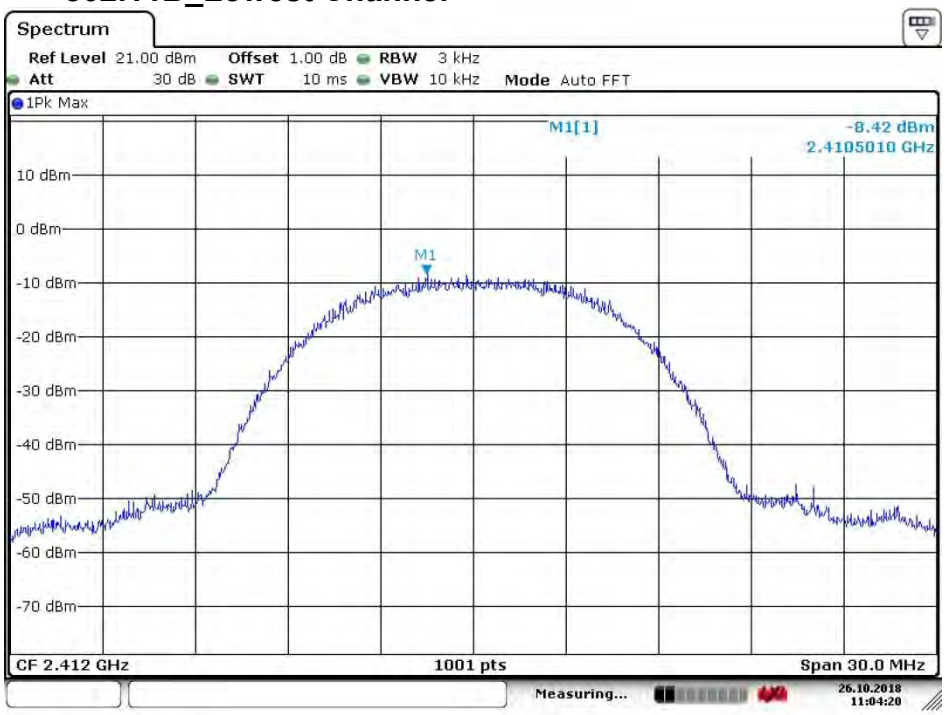
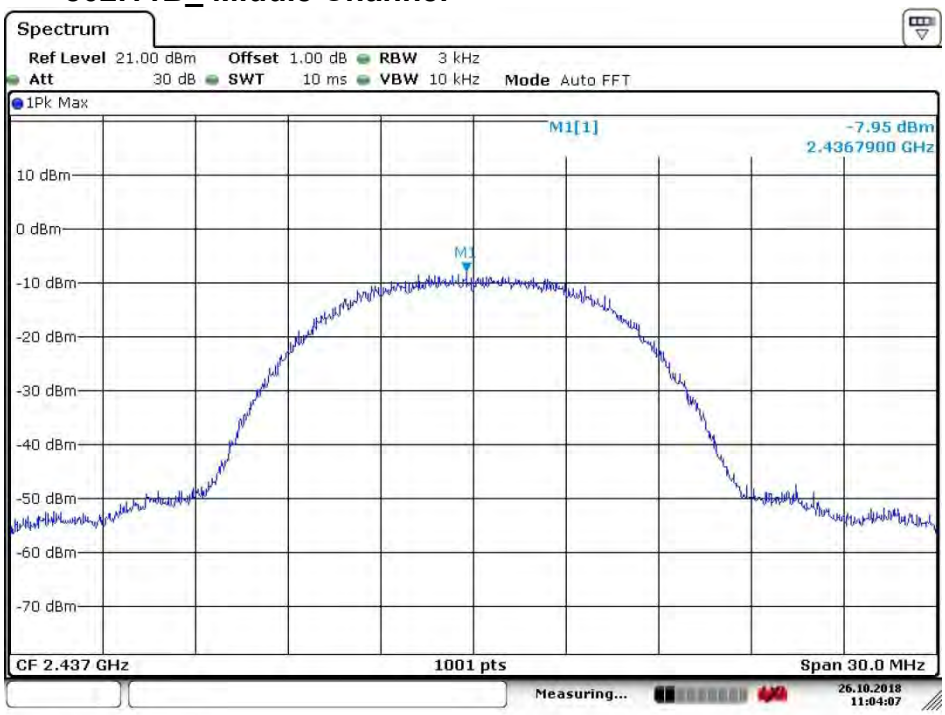
### 4.6.1 Test plots

#### 4.6.1.1 802.11B_Lowest Channel




Date: 26.OCT.2018 11:04:21

#### 4.6.1.2 802.11B_ Middle Channel




Date: 26.OCT.2018 11:04:07

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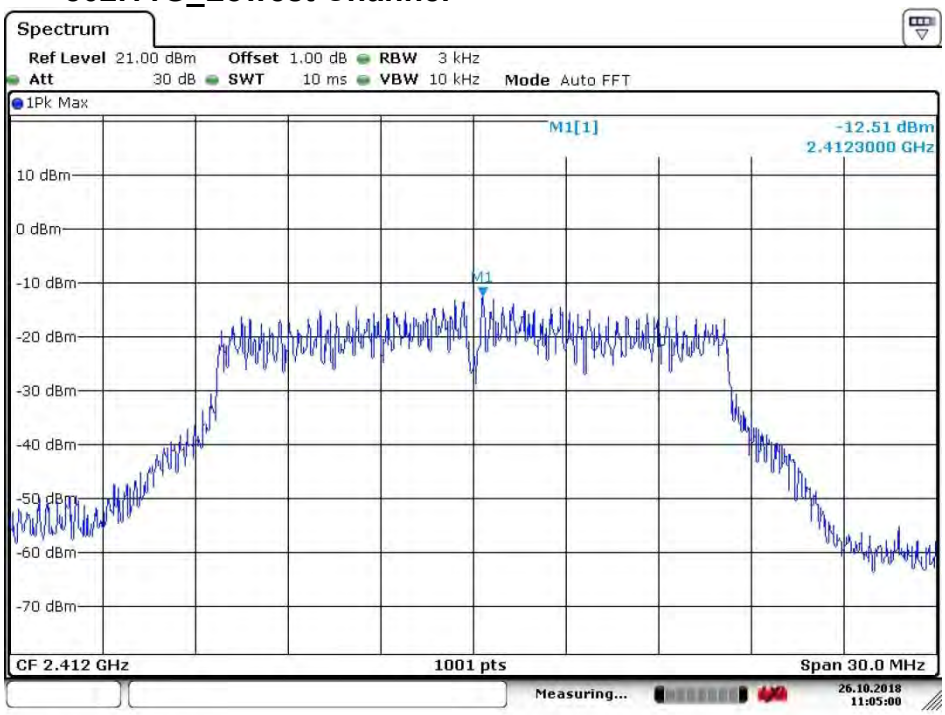
### 4.6.1.3 802.11B_ Highest Channel

Date: 26.OCT.2018 11:03:48

### 4.6.1.4 802.11G_Lowest Channel




Date: 26.OCT.2018 11:05:01

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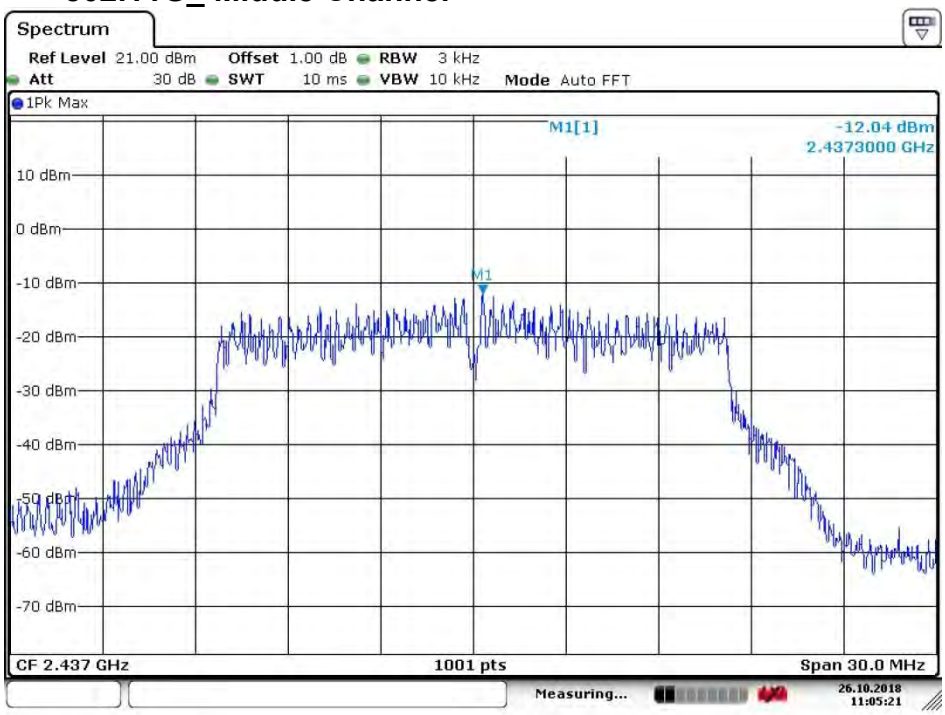
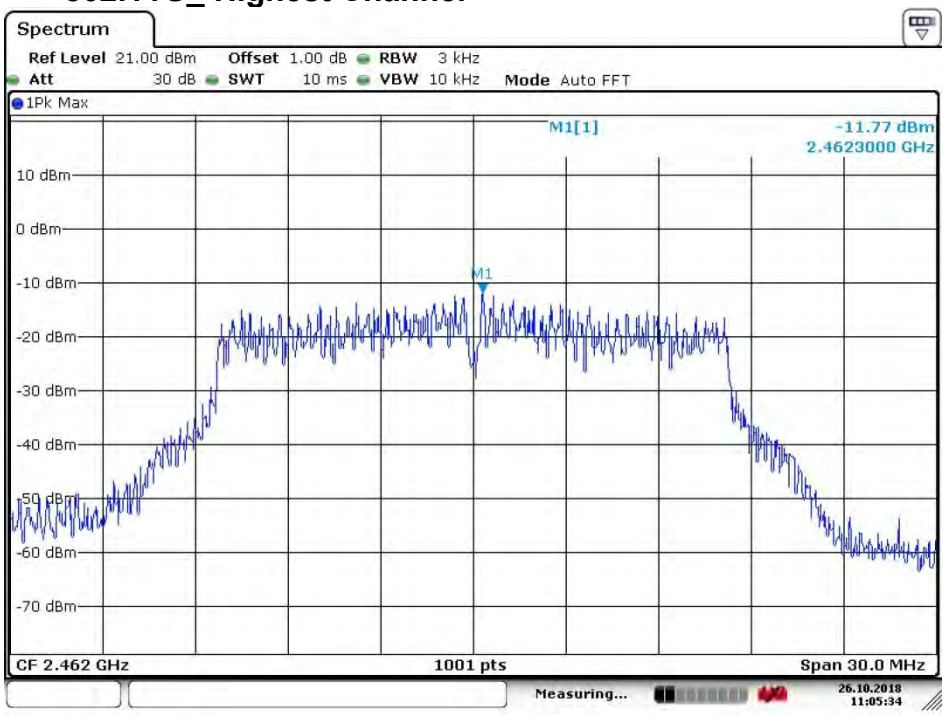
### 4.6.1.5 802.11G_ Middle Channel




Date: 26.OCT.2018 11:05:21

### 4.6.1.6 802.11G_ Highest Channel

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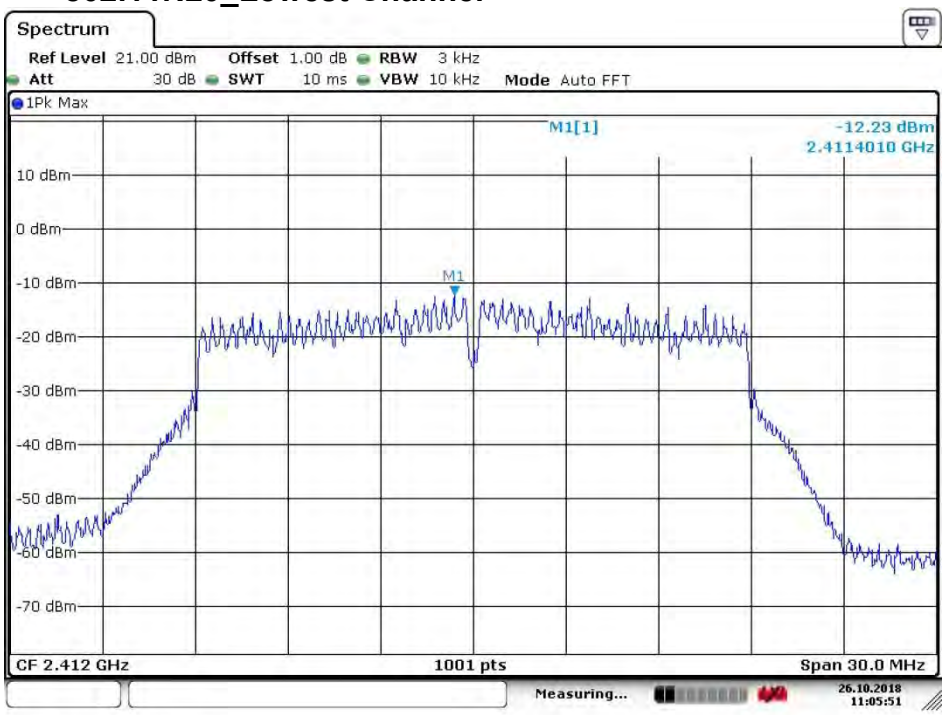
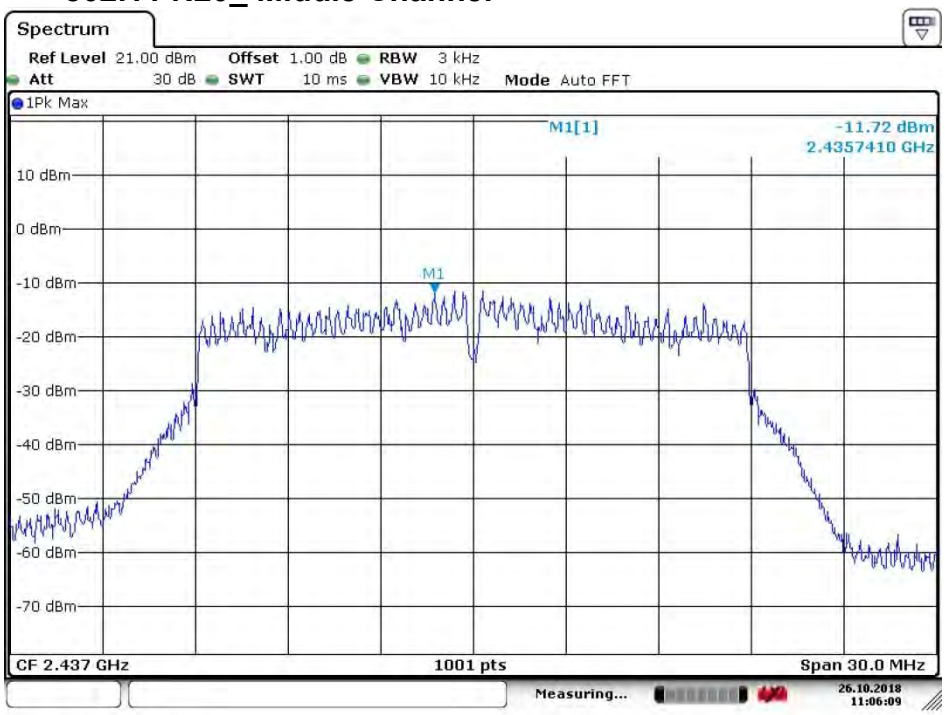
### 4.6.1.7 802.11N20_Lowest Channel




Date: 26.OCT.2018 11:05:52

### 4.6.1.8 802.11 N20_ Middle Channel




Date: 26.OCT.2018 11:06:10

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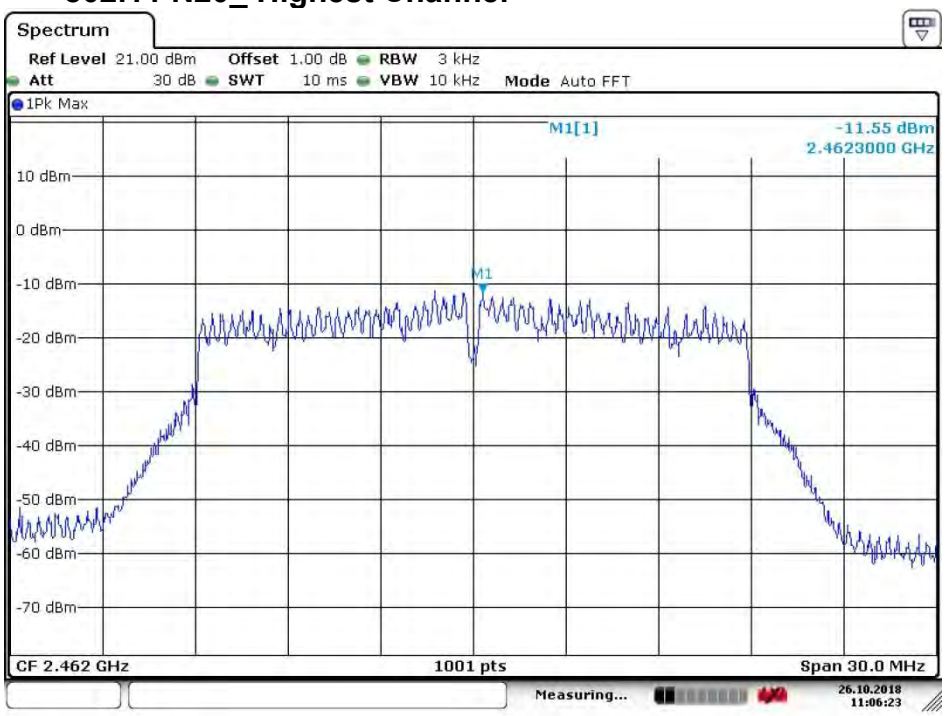
### 4.6.1.9 802.11 N20_ Highest Channel




Date: 26.OCT.2018 11:06:23

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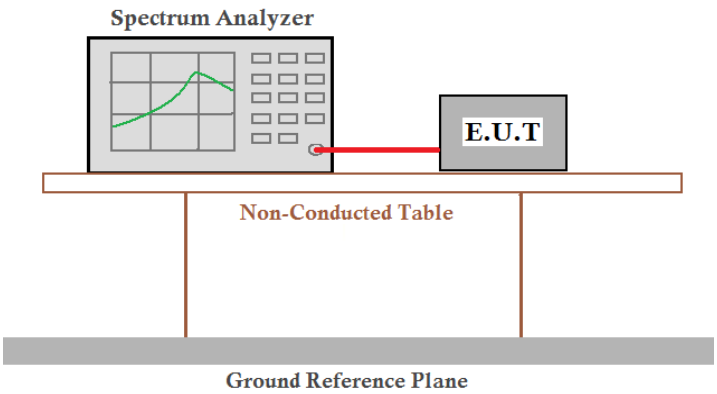
## 4.7 Band-edge for RF Conducted Emissions

| | |
|---|---|
| Test Requirement: | 47 CFR Part 15C Section 15.247 (d) |
| Test Method: | ANSI C63.10: 2013 Section 11.13 |
| Test Setup: |  |
| Exploratory Test Mode: | Transmitting with all kind of modulations, data rates |
| Final Test Mode: | Through Pre-scan, find the<br>1Mbps of rate is the worst case of 802.11B;<br>6Mbps of rate is the worst case of 802.11G ;<br>6.5Mbps of rate is the worst case of 802.11N(HT20) ; |
| Limit: | In any 100 kHz bandwidth outside the frequency band in which the spread spectrum 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. |
| Instruments Used: | Refer to section 5.10 for details |
| Test Results: | Pass |

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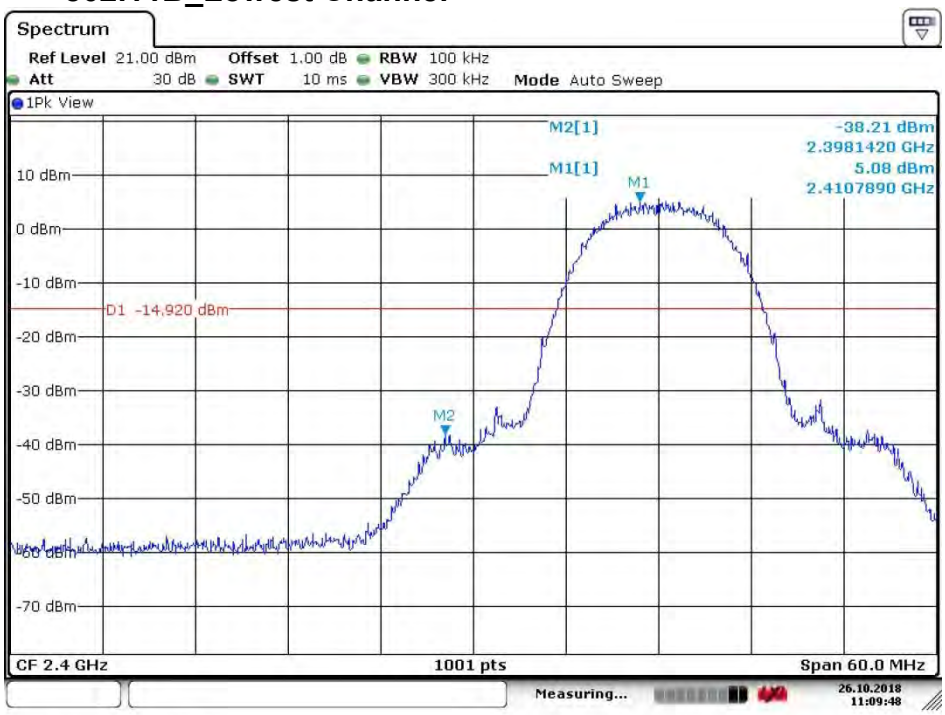
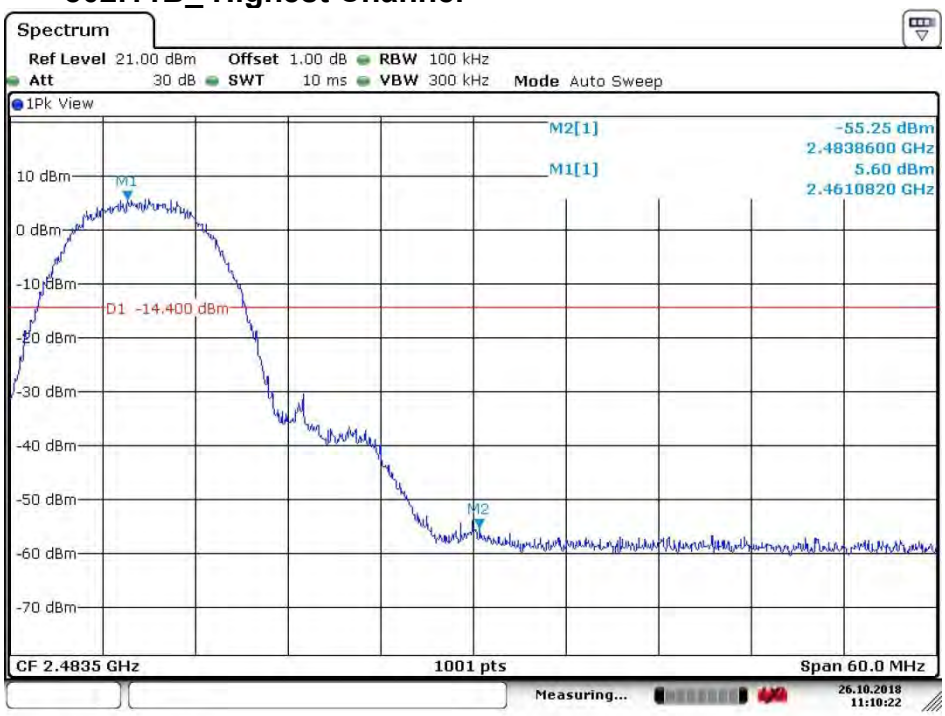
### 4.7.1 Test plots

#### 4.7.1.1 802.11B_Lowest Channel




Date: 26.OCT.2018 11:09:49

#### 4.7.1.2 802.11B_ Highest Channel




Date: 26.OCT.2018 11:10:23

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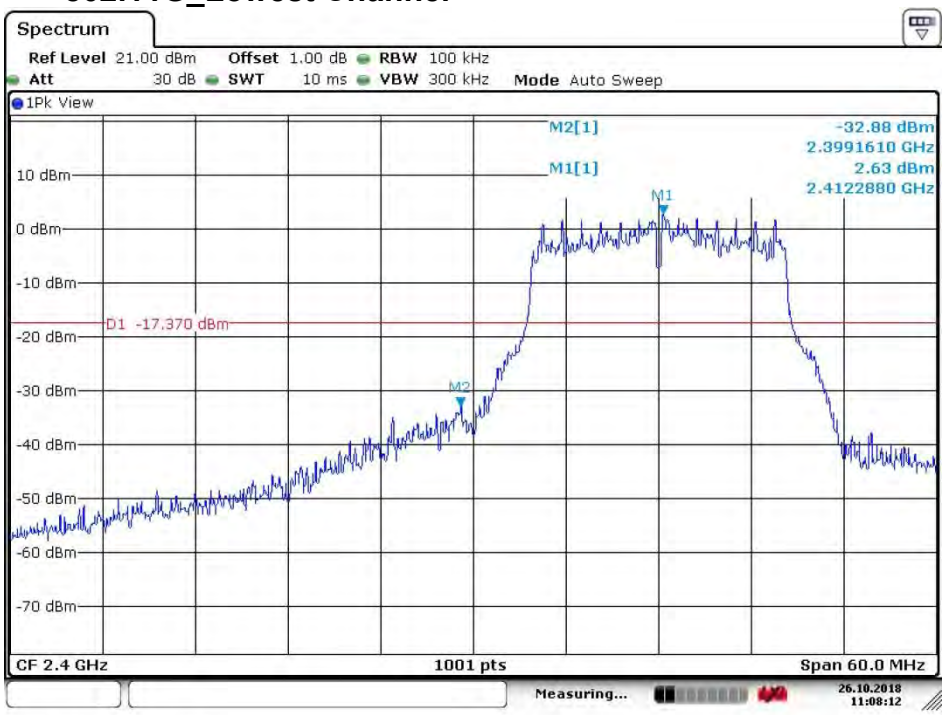
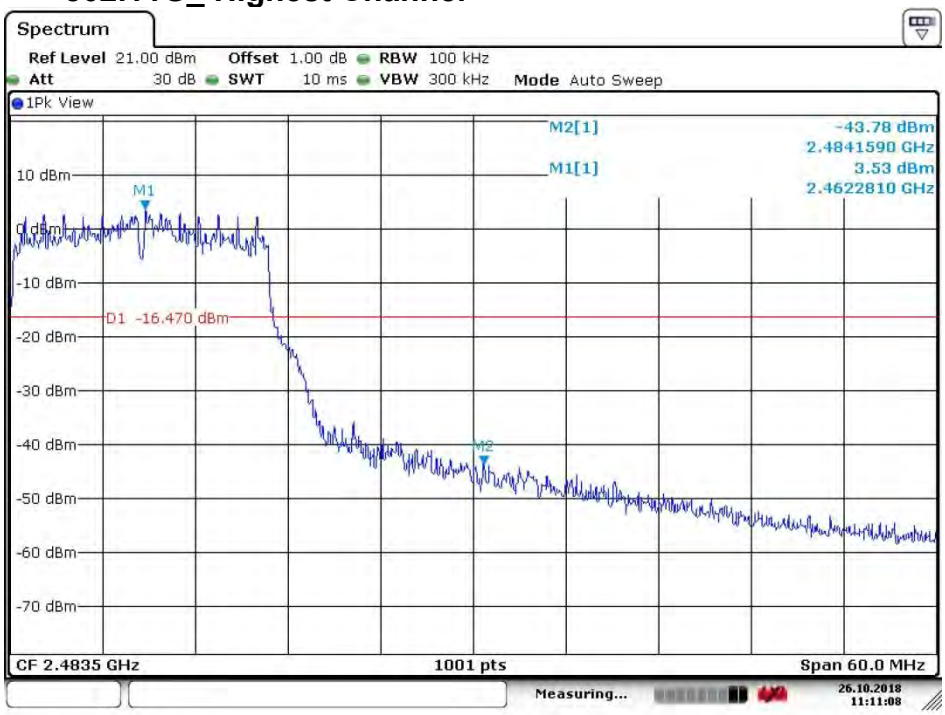
### 4.7.1.3 802.11G_Lowest Channel




Date: 26.OCT.2018 11:08:13

### 4.7.1.4 802.11G_ Highest Channel




Date: 26.OCT.2018 11:11:08

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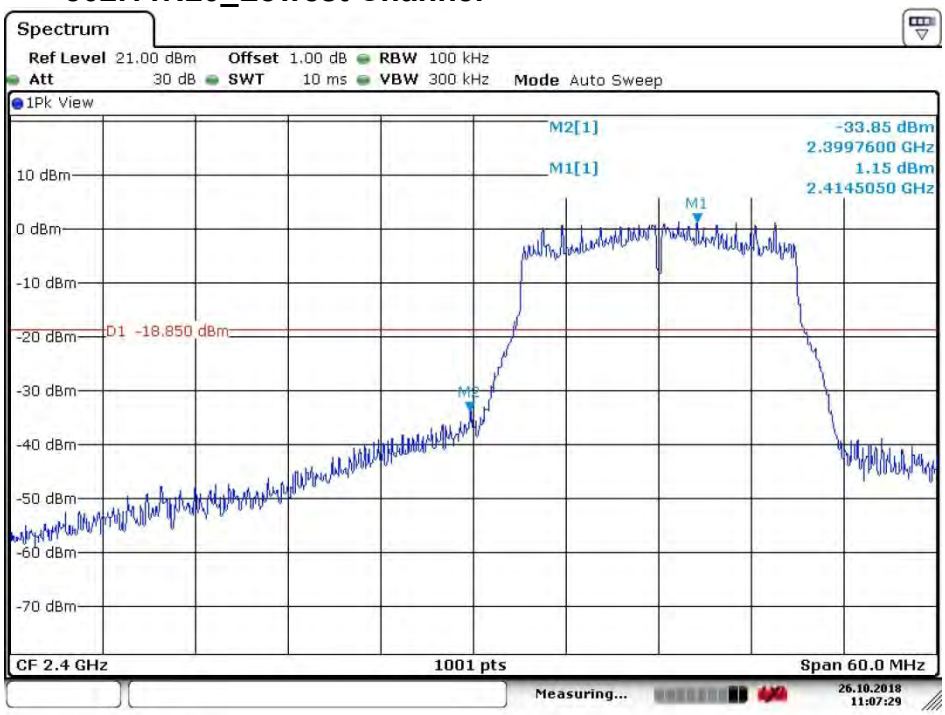
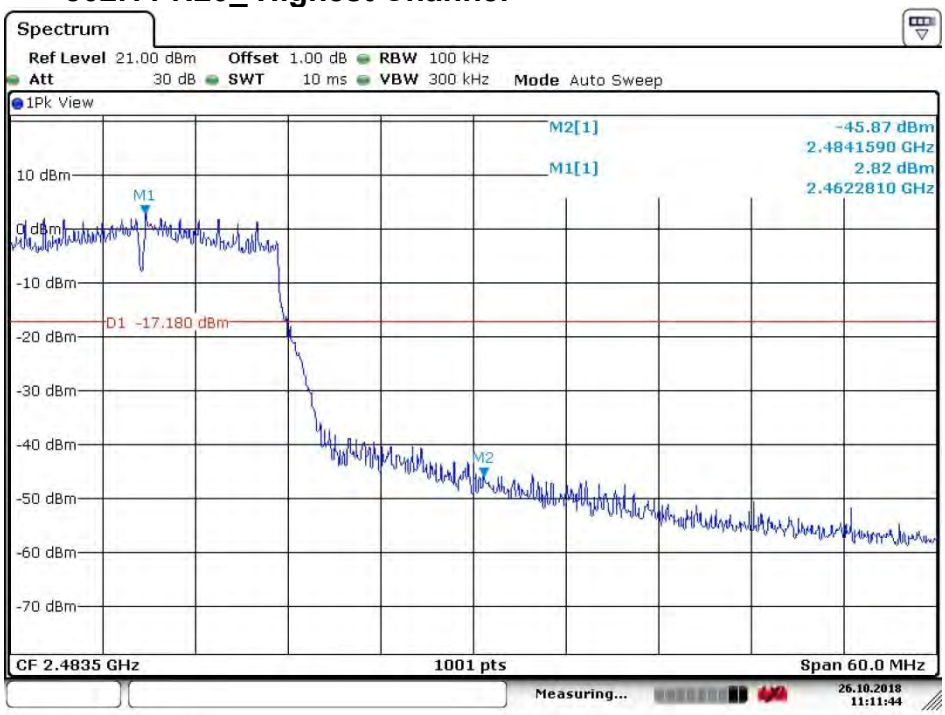
### 4.7.1.5 802.11N20_Lowest Channel




Date: 26.OCT.2018 11:07:28

### 4.7.1.6 802.11 N20_ Highest Channel




Date: 26.OCT.2018 11:11:45

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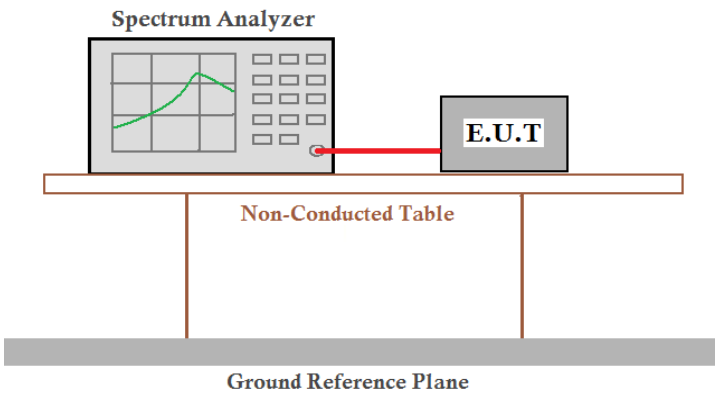
## 4.8 RF Conducted Spurious Emissions

| | |
|---|---|
| Test Requirement: | 47 CFR Part 15C Section 15.247 (d) |
| Test Method: | ANSI C63.10: 2013 Section 11.11 |
| Test Setup: |  |
| Exploratory Test Mode: | Transmitting with all kind of modulations, data rates |
| Final Test Mode: | Through Pre-scan, find the<br>1Mbps of rate is the worst case of 802.11B;<br>6Mbps of rate is the worst case of 802.11G;<br>6.5Mbps of rate is the worst case of 802.11N(HT20); |
| Limit: | In any 100 kHz bandwidth outside the frequency band in which the spread spectrum 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. |
| Instruments Used: | Refer to section 5.10 for details |
| Test Results: | Pass |

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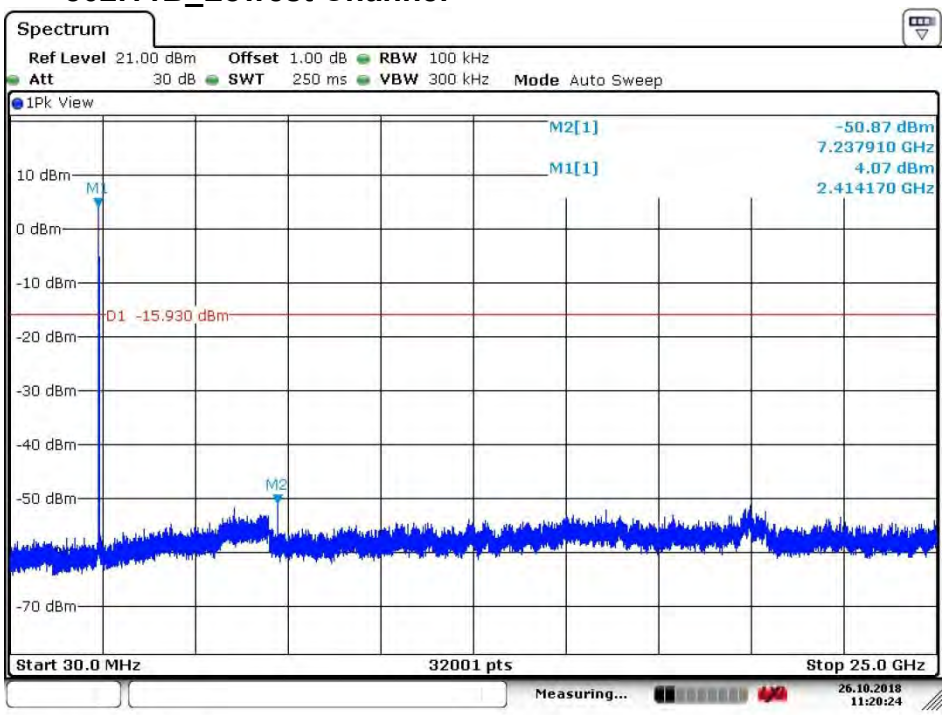
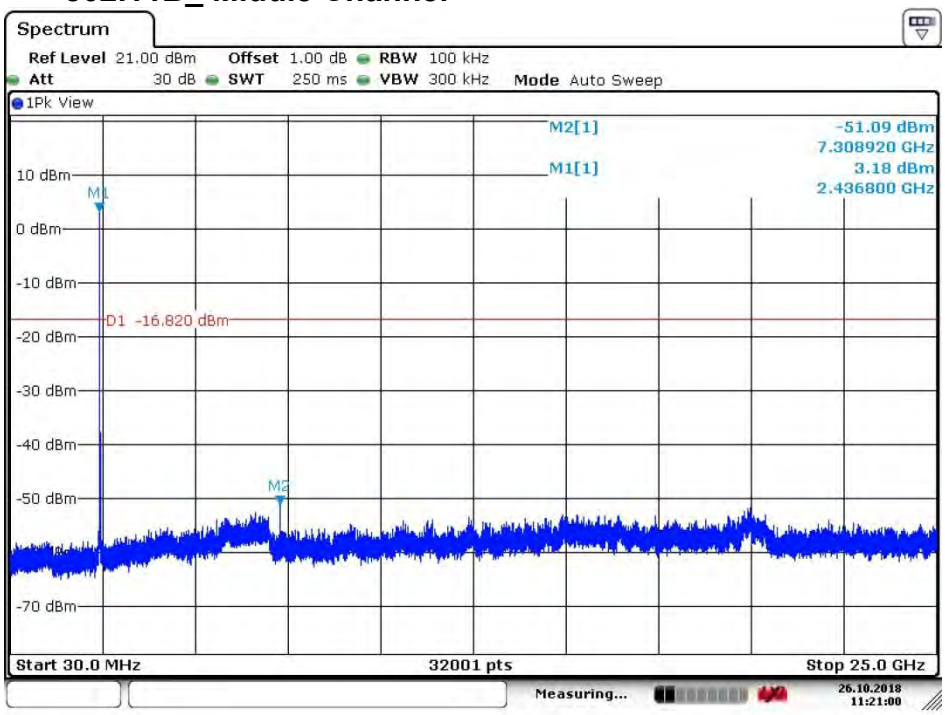
### 4.8.1 Test plots

#### 4.8.1.1 802.11B_Lowest Channel




Date: 26.OCT.2018 11:20:24

#### 4.8.1.2 802.11B_ Middle Channel

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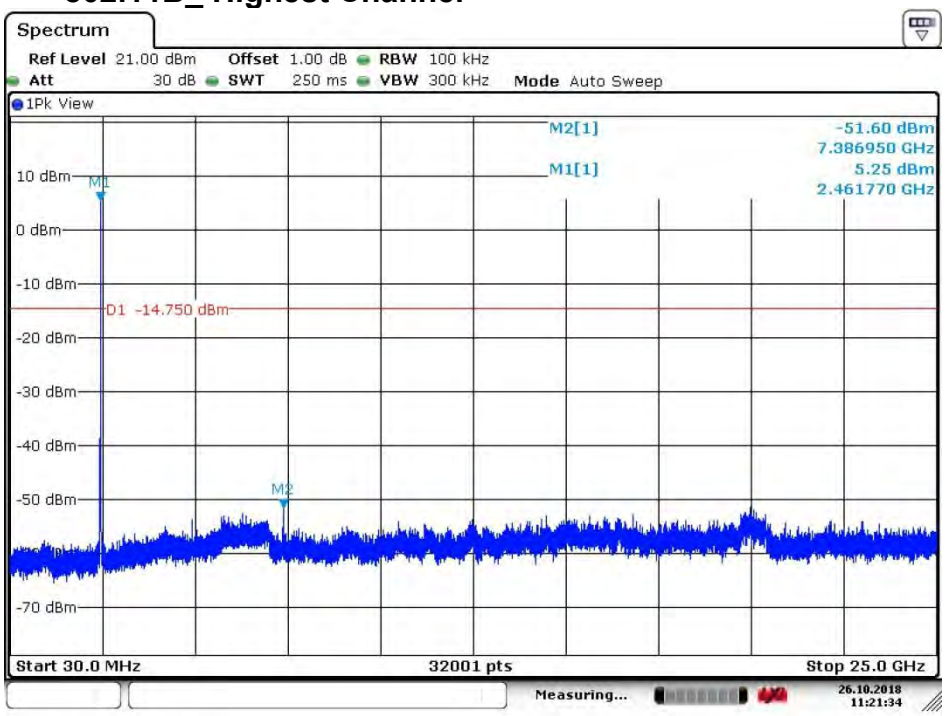
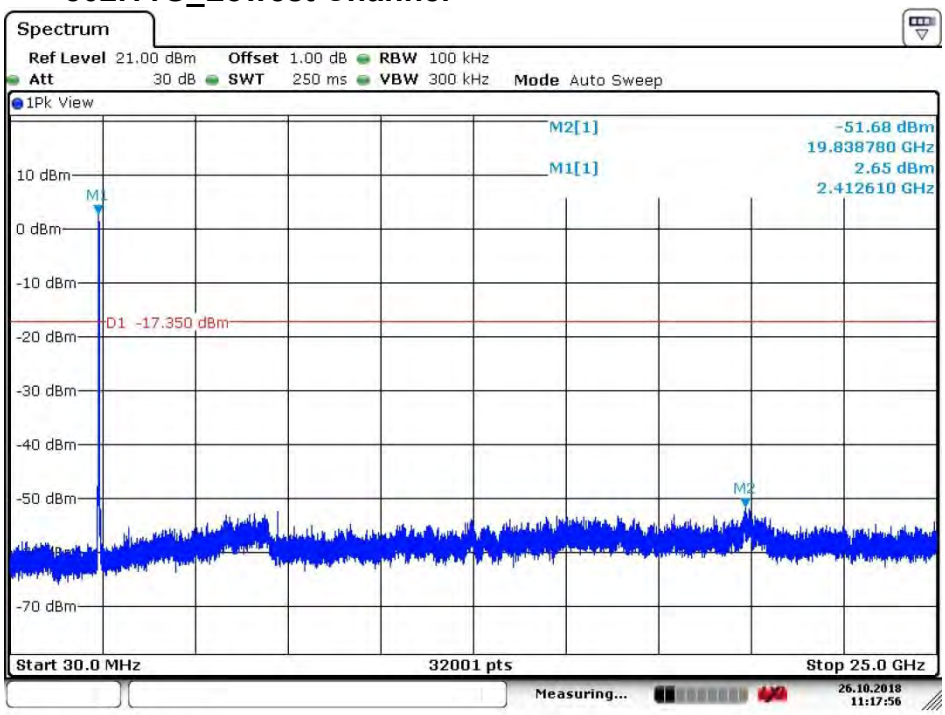
### 4.8.1.3 802.11B_ Highest Channel




Date: 26.OCT.2018 11:21:35

### 4.8.1.4 802.11G_Lowest Channel

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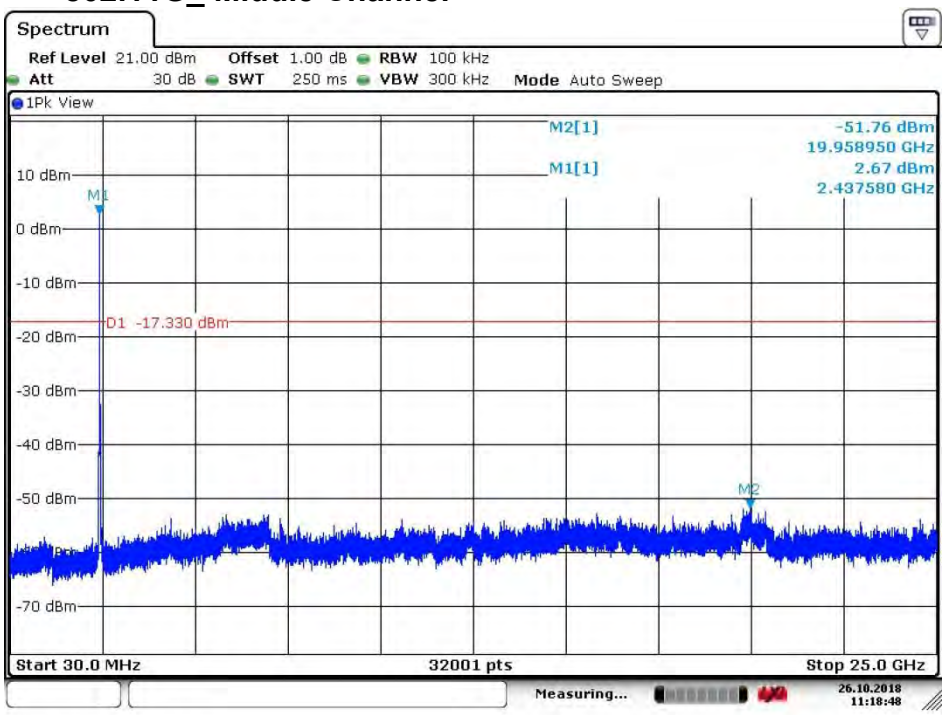
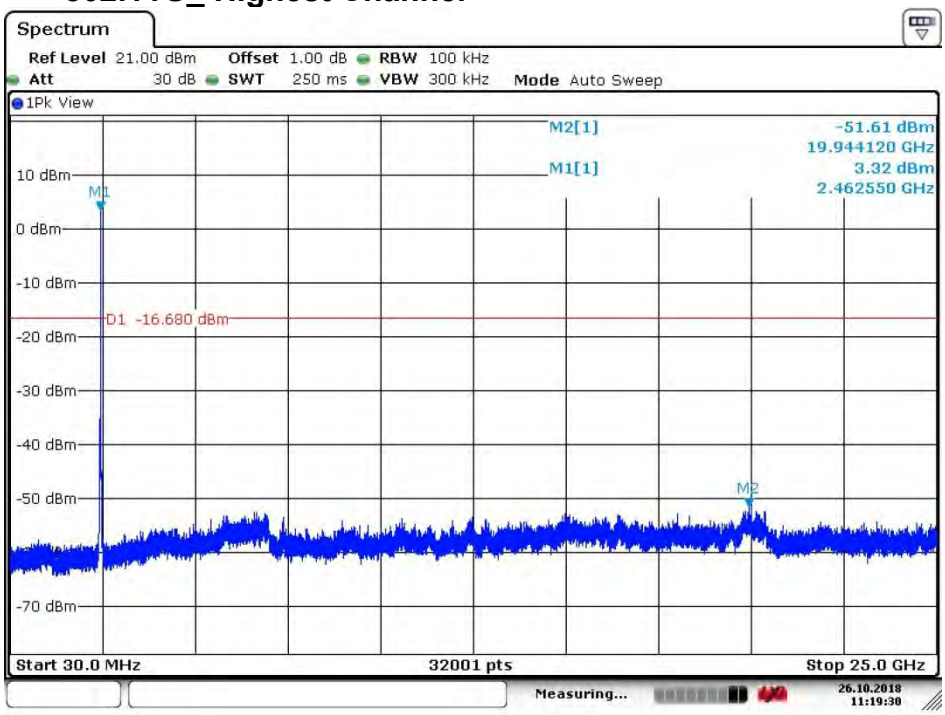
### 4.8.1.5 802.11G_ Middle Channel




Date: 26.OCT.2018 11:18:49

### 4.8.1.6 802.11G_ Highest Channel

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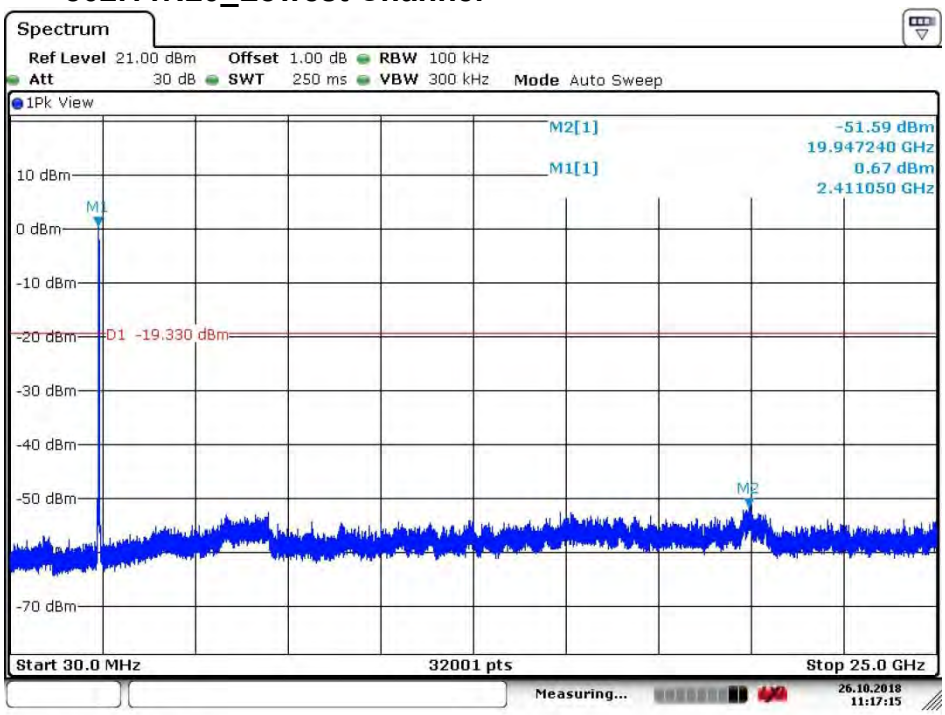
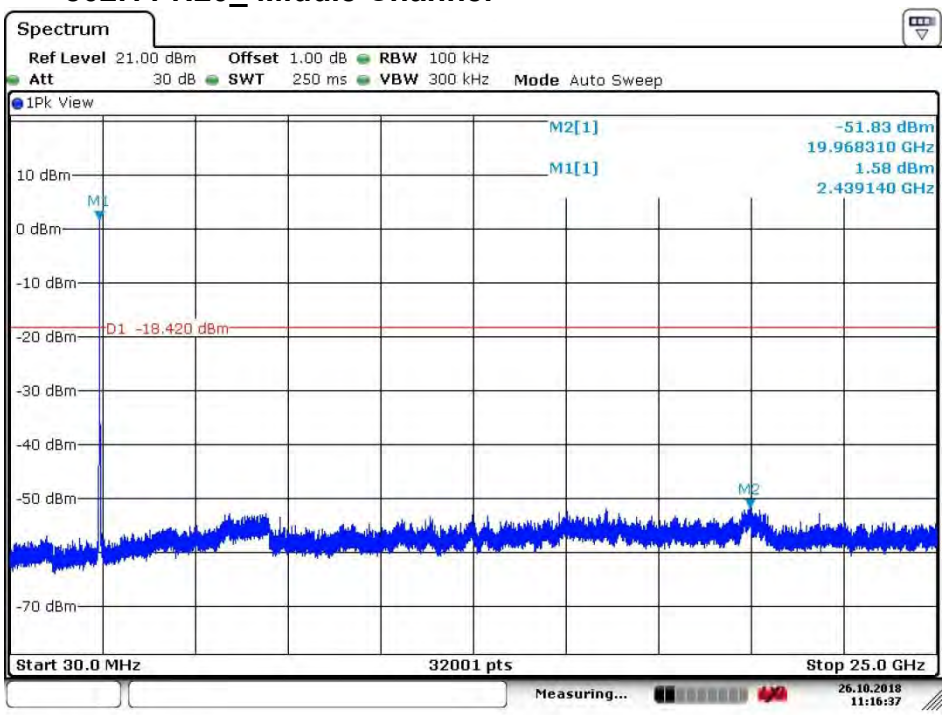
### 4.8.1.7 802.11N20_Lowest Channel




Date: 26.OCT.2018 11:17:15

### 4.8.1.8 802.11 N20_ Middle Channel

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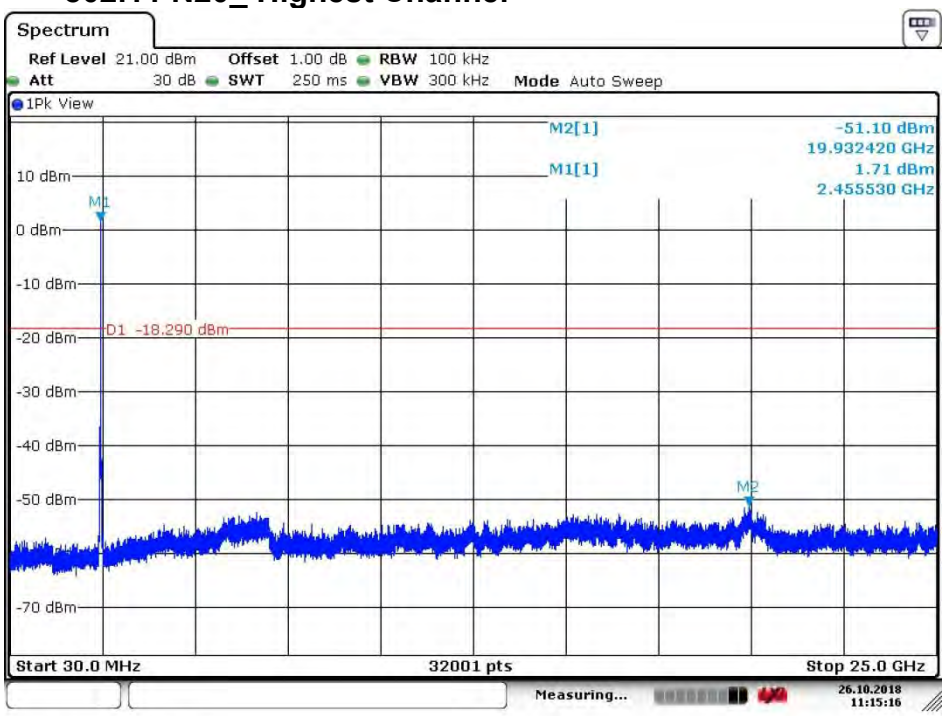
### 4.8.1.9 802.11 N20_ Highest Channel




Date: 26.OCT.2018 11:15:17

Remark:

Scan from 9kHz to 25GHz, the disturbance between 9KHz to 30MHz was very low, and the above harmonics were the highest point could be found when testing, The amplitude of spurious emissions from the radiator which are attenuated more than 20dB below the limit need not be reported.

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## 4.9 Radiated Spurious Emissions

| | | | | | |
|---|---|---|---|---|---|
| Test Requirement: | 47 CFR Part 15C Section 15.209 and 15.205 | | | | |
| Test Method: | ANSI C63.10 :2013 Section 11.12 | | | | |
| Test Site: | Measurement Distance: 3m or 10m (Semi-Anechoic Chamber) | | | | |
| Receiver Setup: | Frequency | Detector | RBW | VBW | Remark |
| | 0.009MHz-0.090MHz | Peak | 10kHz | 30kHz | Peak |
| | 0.009MHz-0.090MHz | Average | 10kHz | 30kHz | Average |
| | 0.090MHz-0.110MHz | Quasi-peak | 10kHz | 30kHz | Quasi-peak |
| | 0.110MHz-0.490MHz | Peak | 10kHz | 30kHz | Peak |
| | 0.110MHz-0.490MHz | Average | 10kHz | 30kHz | Average |
| | 0.490MHz -30MHz | Quasi-peak | 10kHz | 30kHz | Quasi-peak |
| | 30MHz-1GHz | Quasi-peak | 100 kHz | 300kHz | Quasi-peak |
| | Above 1GHz | Peak | 1MHz | 3MHz | Peak |
| | | Peak | 1MHz | 10Hz | Average |
| Limit: | Frequency | Field strength (microvolt/meter) | Limit (dBuV/m) | Remark | Measurement distance (m) |
| | 0.009MHz-0.490MHz | 2400/F(kHz) | - | - | 300 |
| | 0.490MHz-1.705MHz | 24000/F(kHz) | - | - | 30 |
| | 1.705MHz-30MHz | 30 | - | - | 30 |
| | 30MHz-88MHz | 100 | 40.0 | Quasi-peak | 3 |
| | 88MHz-216MHz | 150 | 43.5 | Quasi-peak | 3 |
| | 216MHz-960MHz | 200 | 46.0 | Quasi-peak | 3 |
| | 960MHz-1GHz | 500 | 54.0 | Quasi-peak | 3 |
| | Above 1GHz | 500 | 54.0 | Average | 3 |
| | Remark: 15.35(b), Unless otherwise specified, the limit on peak radio frequency emissions is 20dB above the maximum permitted average emission limit applicable to the equipment under test. This peak limit applies to the total peak emission level radiated by the device. | | | | |
| Test Setup: | | | | | |

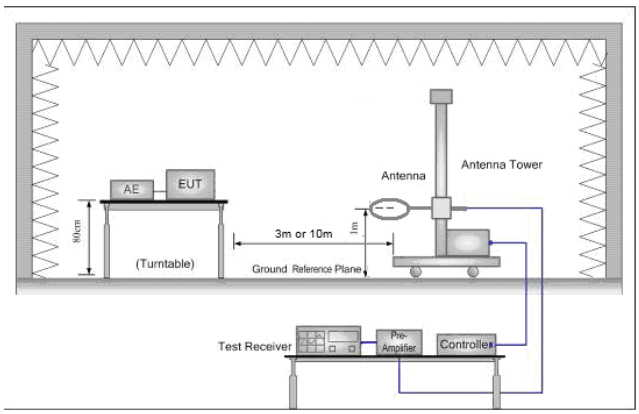


Figure 1. Below 30MHz

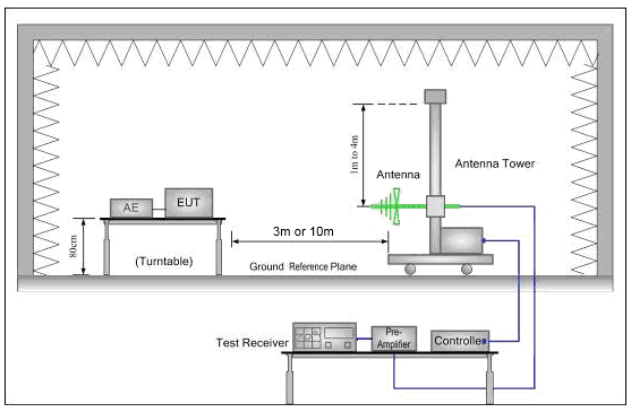


Figure 2. 30MHz to 1GHz

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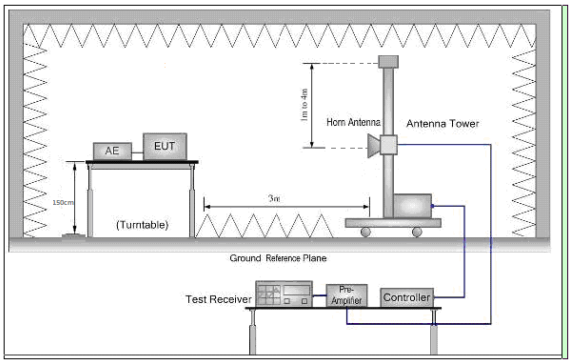


Figure 3. Above 1 GHz

| | |
|---|---|
| Test Procedure: | a. For below 1GHz, the EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 or 10 meter semi-anechoic camber. The table was rotated 360 degrees to determine the position of the highest radiation.<br>b. For above 1GHz, the EUT was placed on the top of a rotating table 1.5 meters above the ground at a 3 meter semi-anechoic camber. The table was rotated 360 degrees to determine the position of the highest radiation<br>c. The EUT was set 3 or 10 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.<br>d. The antenna height is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.<br>e. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters(for the test frequency of below 30MHz, the antenna was tuned to heights 1 meter) and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.<br>f. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.<br>g. If the emission level of the EUT in peak mode was 10dB lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emissions that did not have 10dB margin would be re-tested one by one using peak, quasi-peak or average method as specified and then reported in a data sheet.<br>h. Test the EUT in the lowest channel, the middle channel ,the Highest channel<br>i. The radiation measurements are performed in X, Y, Z axis positioning for Transmitting mode, And found the X axis positioning which it is worse case.<br>j. Repeat above procedures until all frequencies measured was complete. |
| Exploratory Test Mode: | Transmitting with all kind of modulations, data rates.<br>Charge + Transmitting mode. |
| Final Test Mode: | Pretest the EUT at Charge + Transmitting mode.<br>Through Pre-scan, find the<br>1Mbps of rate is the worst case of 802.11B;<br>6Mbps of rate is the worst case of 802.11G;<br>6.5Mbps of rate is the worst case of 802.11N(HT20);<br>For below 1GHz, through Pre-scan, find the 1Mbps of rate of 802.11B at lowest channel is the worst case. Only the worst case is recorded in the report. |
| Instruments Used: | Refer to section 5.10 for details |
| Test Results: | Pass |

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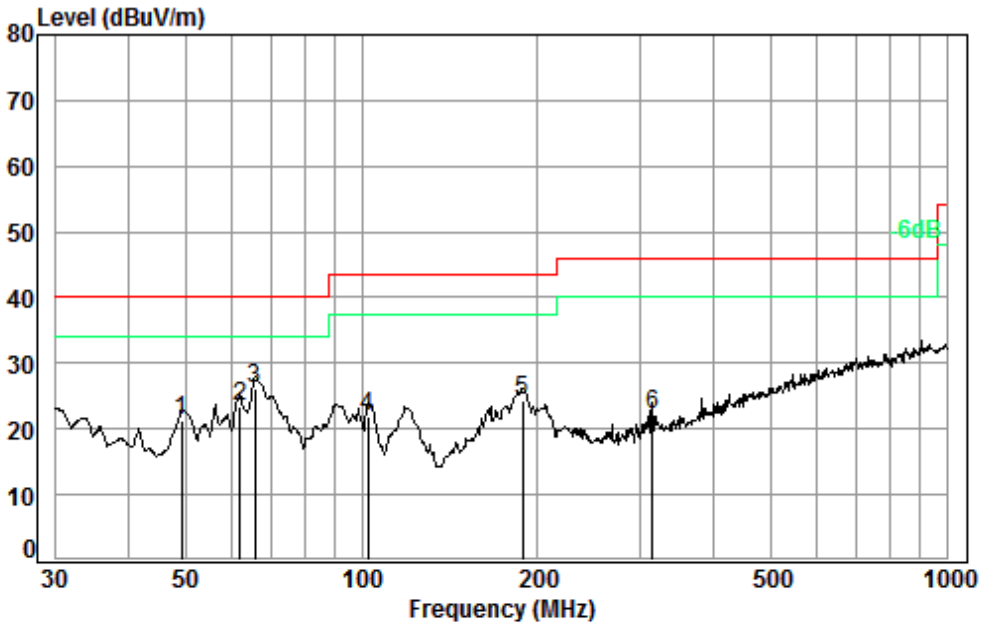
### 4.9.1 Radiated emission below 1GHz

#### 4.9.1.1 Charge + Transmitting, Vertical




Condition: 3m VERTICAL
Job No. : 80005
Test mode: d

| | Freq | Cable Loss | Ant Factor | Preamp Factor | Read Level | Level | Limit Line | Over Limit |
|---|---|---|---|---|---|---|---|---|
| | MHz | dB | dB/m | dB | dBuV | dBuV/m | dBuV/m | dB |
| 1 | 49.36 | 0.79 | 14.39 | 27.60 | 33.60 | 21.18 | 40.00 | -18.82 |
| 2 | 62.00 | 0.80 | 13.12 | 27.55 | 36.96 | 23.33 | 40.00 | -16.67 |
| 3 pp | 65.80 | 0.80 | 12.96 | 27.54 | 39.90 | 26.12 | 40.00 | -13.88 |
| 4 | 102.72 | 1.21 | 13.87 | 27.51 | 34.47 | 22.04 | 43.50 | -21.46 |
| 5 | 188.41 | 1.38 | 16.16 | 27.53 | 34.23 | 24.24 | 43.50 | -19.26 |
| 6 | 313.28 | 1.94 | 20.02 | 27.57 | 27.78 | 22.17 | 46.00 | -23.83 |

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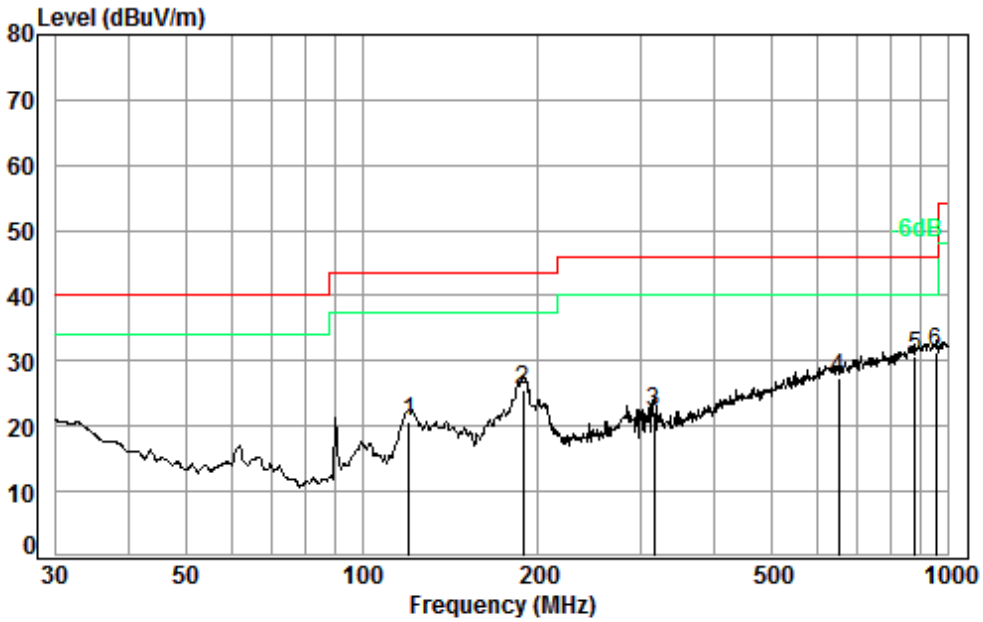
### 4.9.1.2 Charge + Transmitting, Horizontal




Condition: 3m HORIZONTAL
Job No. : 80005
Test mode: d

| | Freq | Cable Loss | Ant Factor | Preamp Factor | Read Level | Level | Limit Line | Over Limit |
|---|---|---|---|---|---|---|---|---|
| | MHz | dB | dB/m | dB | dBuV | dBuV/m | dBuV/m | dB |
| 1 | 120.28 | 1.25 | 13.11 | 27.52 | 33.77 | 20.61 | 43.50 | -22.89 |
| 2 | 188.41 | 1.38 | 16.16 | 27.53 | 35.60 | 25.61 | 43.50 | -17.89 |
| 3 | 315.48 | 1.95 | 20.09 | 27.57 | 27.80 | 22.27 | 46.00 | -23.73 |
| 4 | 649.66 | 2.80 | 27.27 | 27.62 | 24.82 | 27.27 | 46.00 | -18.73 |
| 5 | 878.32 | 3.52 | 29.53 | 27.15 | 24.75 | 30.65 | 46.00 | -15.35 |
| 6 pp | 952.09 | 3.65 | 30.07 | 26.91 | 24.44 | 31.25 | 46.00 | -14.75 |

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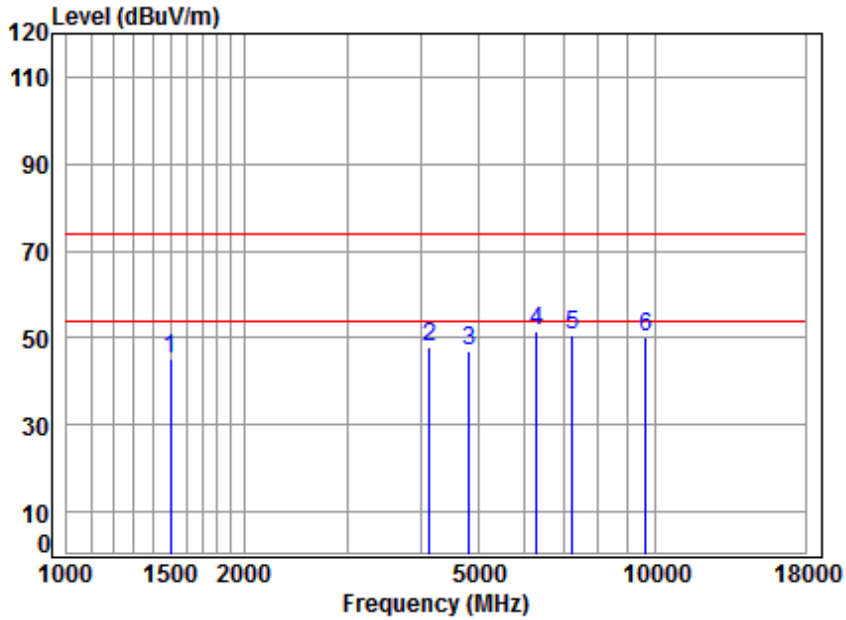
### 4.9.2 Transmitter emission above 1GHz

#### 4.9.2.1 802.11B_Lowest Channel_ Peak_ Vertical




Site : chamber
Condition: 3m VERTICAL
Job No : 80005
Mode : 2412 TX RSE
Note : 2.4G WIFI 11B

| | Freq | Cable Loss | Ant Factor | Preamp Factor | Read Level | Level | Limit Line | Over Limit | Remark |
|---|---|---|---|---|---|---|---|---|---|
| | MHz | dB | dB/m | dB | dBuV | dBuV/m | dBuV/m | dB | |
| 1 | 1498.781 | 5.48 | 25.80 | 37.32 | 51.43 | 45.39 | 74.00 | -28.61 | peak |
| 2 | 4133.699 | 7.14 | 32.95 | 38.37 | 46.19 | 47.91 | 74.00 | -26.09 | peak |
| 3 | 4824.000 | 7.91 | 34.00 | 38.48 | 43.78 | 47.21 | 74.00 | -26.79 | peak |
| 4 | 6285.695 | 11.13 | 35.39 | 37.82 | 43.05 | 51.75 | 74.00 | -22.25 | peak |
| 5 | 7236.000 | 10.07 | 36.09 | 37.75 | 42.17 | 50.58 | 74.00 | -23.42 | peak |
| 6 | 9648.000 | 10.77 | 37.69 | 38.19 | 39.77 | 50.04 | 74.00 | -23.96 | peak |

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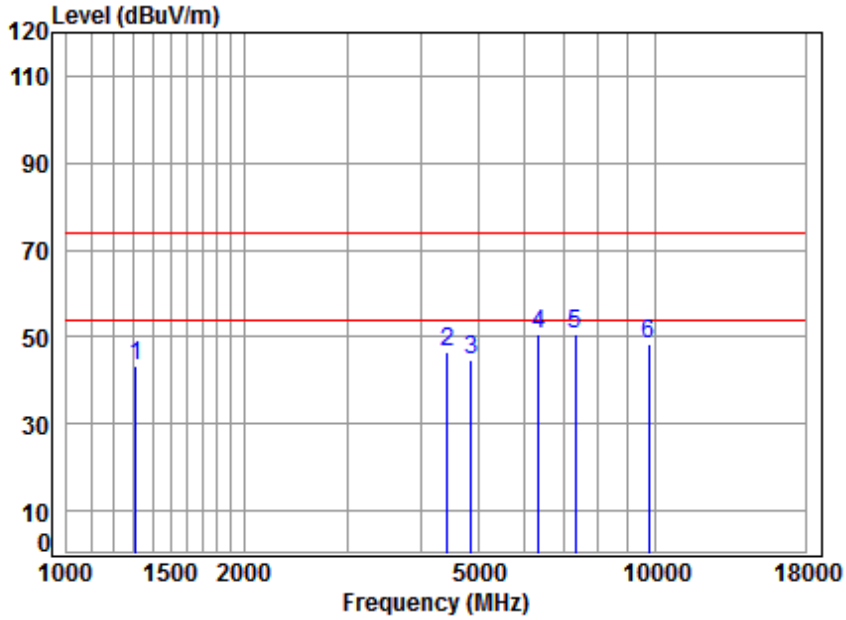
### 4.9.2.2 802.11B_ Middle Channel_ Peak_ Vertical




Site : chamber
Condition: 3m VERTICAL
Job No : 80005
Mode : 2437 TX RSE
Note : 2.4G WIFI 11B

| | Freq | Cable Loss | Ant Factor | Preamp Factor | Read Level | Level | Limit Line | Over Limit | Remark |
|---|---|---|---|---|---|---|---|---|---|
| | MHz | dB | dB/m | dB | dBuV | dBuV/m | dBuV/m | dB | |
| 1 | 1312.187 | 4.84 | 25.07 | 37.52 | 51.14 | 43.53 | 74.00 | -30.47 | peak |
| 2 | 4443.453 | 7.50 | 33.50 | 38.43 | 43.93 | 46.50 | 74.00 | -27.50 | peak |
| 3 | 4874.000 | 7.96 | 34.05 | 38.49 | 41.32 | 44.84 | 74.00 | -29.16 | peak |
| 4 | 6340.436 | 11.24 | 35.44 | 37.81 | 41.97 | 50.84 | 74.00 | -23.16 | peak |
| 5 | 7311.000 | 10.05 | 36.15 | 37.76 | 42.00 | 50.44 | 74.00 | -23.56 | peak |
| 6 | 9748.000 | 10.82 | 37.75 | 38.20 | 38.00 | 48.37 | 74.00 | -25.63 | peak |

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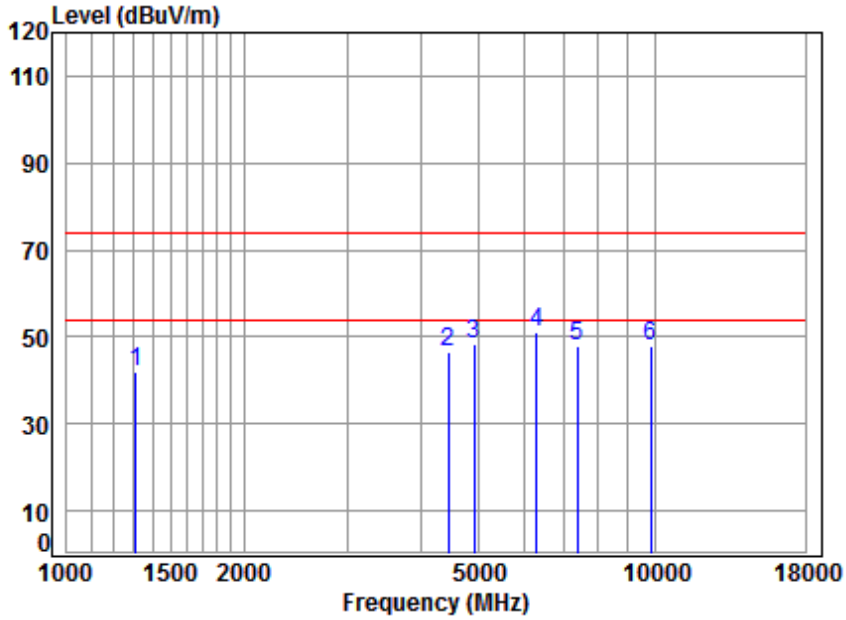
### 4.9.2.3 802.11B_ Highest Channel_ Peak_ Vertical




Site : chamber
Condition: 3m VERTICAL
Job No : 80005
Mode : 2462 TX RSE
Note : 2.4G WIFI 11B

| | Freq | Cable Loss | Ant Factor | Preamp Factor | Read Level | Level | Limit Line | Over Limit | Remark |
|---|---|---|---|---|---|---|---|---|---|
| | MHz | dB | dB/m | dB | dBuV | dBuV/m | dBuV/m | dB | |
| 1 | 1308.399 | 4.83 | 25.06 | 37.53 | 49.47 | 41.83 | 74.00 | -32.17 | peak |
| 2 | 4456.315 | 7.51 | 33.53 | 38.43 | 44.10 | 46.71 | 74.00 | -27.29 | peak |
| 3 | 4924.000 | 8.01 | 34.11 | 38.50 | 44.78 | 48.40 | 74.00 | -25.60 | peak |
| 4 | 6303.890 | 11.17 | 35.41 | 37.81 | 42.12 | 50.89 | 74.00 | -23.11 | peak |
| 5 | 7386.000 | 10.03 | 36.21 | 37.76 | 39.42 | 47.90 | 74.00 | -26.10 | peak |
| 6 | 9848.000 | 10.87 | 37.81 | 38.21 | 37.27 | 47.74 | 74.00 | -26.26 | peak |

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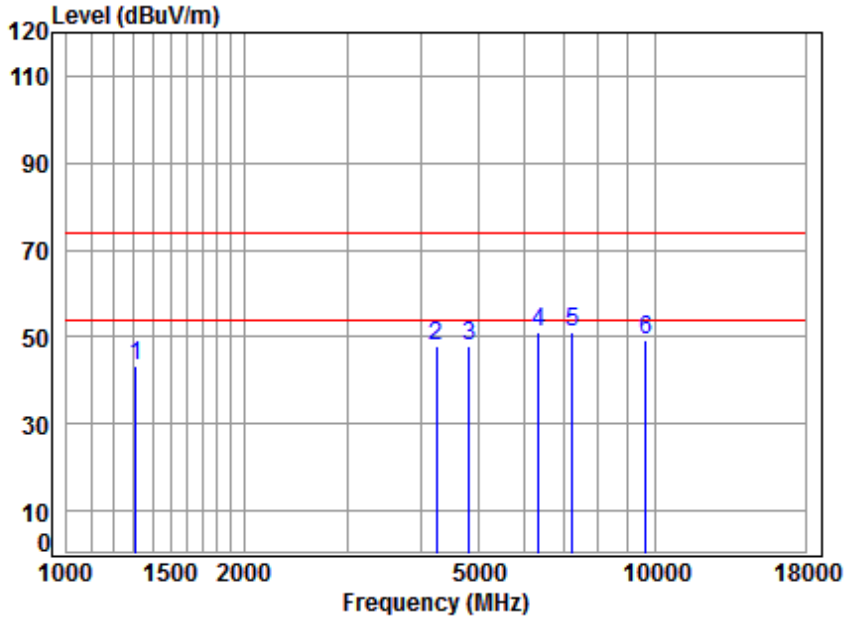
### 4.9.2.4 802.11B_Lowest Channel_ Peak_ Horizontal




Site : chamber
Condition: 3m HORIZONTAL
Job No : 80005
Mode : 2412 TX RSE
Note : 2.4G WIFI 11B

| | Freq | Cable Loss | Ant Factor | Preamp Factor | Read Level | Level | Limit Line | Over Limit | Remark |
|---|---|---|---|---|---|---|---|---|---|
| | MHz | dB | dB/m | dB | dBuV | dBuV/m | dBuV/m | dB | |
| 1 | 1312.187 | 4.84 | 25.07 | 37.52 | 50.76 | 43.15 | 74.00 | -30.85 | peak |
| 2 | 4254.921 | 7.28 | 33.17 | 38.39 | 45.63 | 47.69 | 74.00 | -26.31 | peak |
| 3 | 4824.000 | 7.91 | 34.00 | 38.48 | 44.65 | 48.08 | 74.00 | -25.92 | peak |
| 4 | 6340.436 | 11.24 | 35.44 | 37.81 | 42.22 | 51.09 | 74.00 | -22.91 | peak |
| 5 | 7236.000 | 10.07 | 36.09 | 37.75 | 42.73 | 51.14 | 74.00 | -22.86 | peak |
| 6 | 9648.000 | 10.77 | 37.69 | 38.19 | 39.08 | 49.35 | 74.00 | -24.65 | peak |

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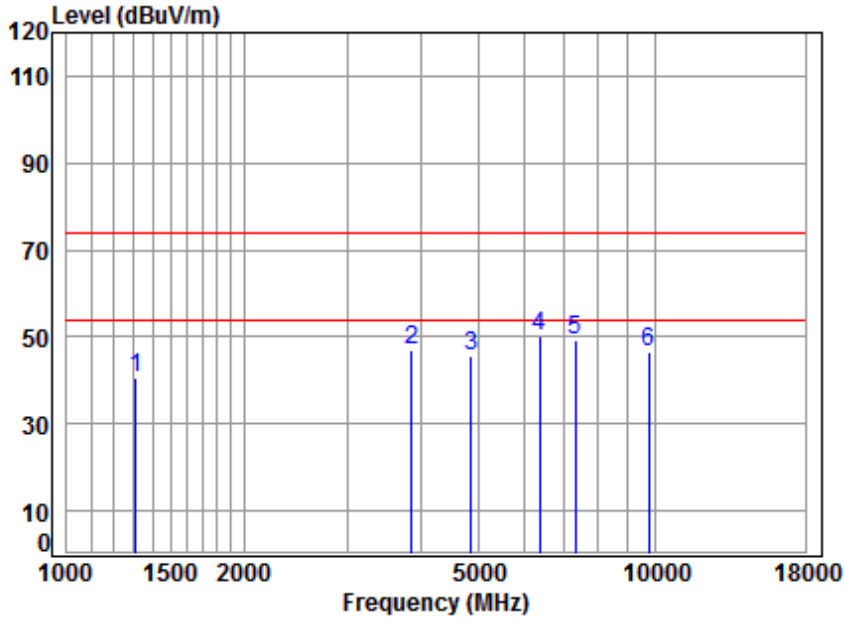
### 4.9.2.5 802.11B_ Middle Channel_ Peak_ Horizontal




Site : chamber
Condition: 3m HORIZONTAL
Job No : 80005
Mode : 2437 TX RSE
Note : 2.4G WIFI 11B

| | Freq | Cable Loss | Ant Factor | Preamp Factor | Read Level | Level | Limit Line | Over Limit | Remark |
|---|---|---|---|---|---|---|---|---|---|
| | MHz | dB | dB/m | dB | dBuV | dBuV/m | dBuV/m | dB | |
| 1 | 1308.399 | 4.83 | 25.06 | 37.53 | 48.27 | 40.63 | 74.00 | -33.37 | peak |
| 2 | 3856.668 | 6.84 | 32.43 | 38.33 | 46.20 | 47.14 | 74.00 | -26.86 | peak |
| 3 | 4874.000 | 7.96 | 34.05 | 38.49 | 42.22 | 45.74 | 74.00 | -28.26 | peak |
| 4 | 6358.789 | 11.27 | 35.46 | 37.81 | 41.34 | 50.26 | 74.00 | -23.74 | peak |
| 5 | 7311.000 | 10.05 | 36.15 | 37.76 | 41.00 | 49.44 | 74.00 | -24.56 | peak |
| 6 | 9748.000 | 10.82 | 37.75 | 38.20 | 36.35 | 46.72 | 74.00 | -27.28 | peak |

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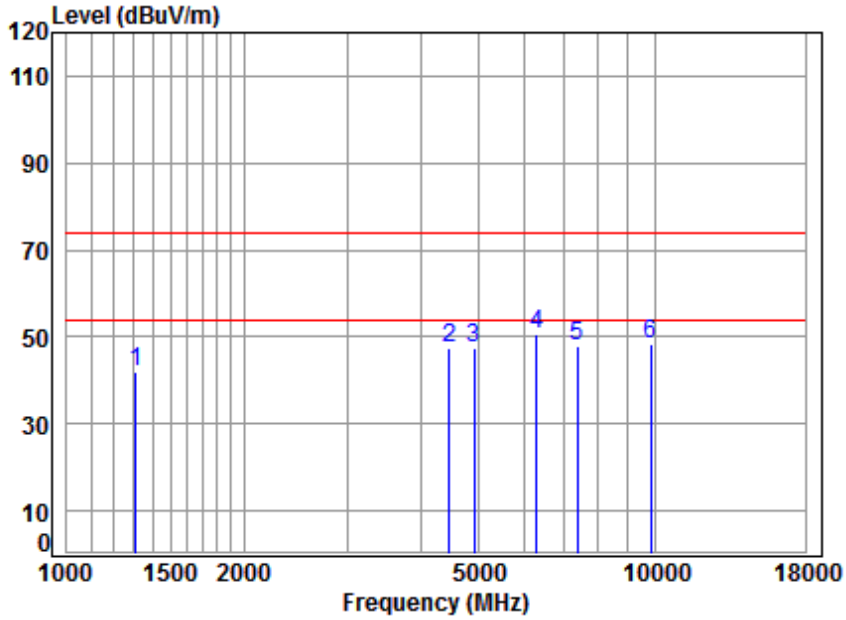
### 4.9.2.6 802.11B_ Highest Channel_ Peak_ Horizontal




Site : chamber
Condition: 3m HORIZONTAL
Job No : 80005
Mode : 2462 TX RSE
Note : 2.4G WIFI 11B

| | Freq | Cable Loss | Ant Factor | Preamp Factor | Read Level | Level | Limit Line | Over Limit | Remark |
|---|---|---|---|---|---|---|---|---|---|
| | MHz | dB | dB/m | dB | dBuV | dBuV/m | dBuV/m | dB | |
| 1 | 1312.187 | 4.84 | 25.07 | 37.52 | 49.40 | 41.79 | 74.00 | -32.21 | peak |
| 2 | 4469.214 | 7.53 | 33.55 | 38.43 | 44.76 | 47.41 | 74.00 | -26.59 | peak |
| 3 | 4924.000 | 8.01 | 34.11 | 38.50 | 43.83 | 47.45 | 74.00 | -26.55 | peak |
| 4 | 6285.695 | 11.13 | 35.39 | 37.82 | 41.87 | 50.57 | 74.00 | -23.43 | peak |
| 5 | 7386.000 | 10.03 | 36.21 | 37.76 | 39.33 | 47.81 | 74.00 | -26.19 | peak |
| 6 | 9848.000 | 10.87 | 37.81 | 38.21 | 38.12 | 48.59 | 74.00 | -25.41 | peak |

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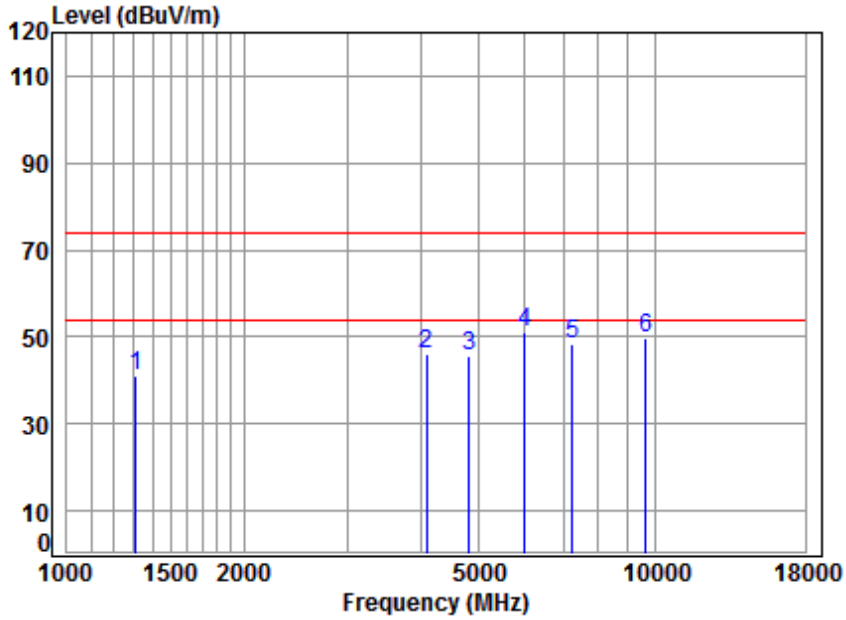
### 4.9.2.7 802.11G_Lowest Channel_ Peak_ Vertical




Site : chamber
Condition: 3m VERTICAL
Job No : 80005
Mode : 2412 TX RSE
Note : 2.4G WIFI 11G

| | Freq | Cable Loss | Ant Factor | Preamp Factor | Read Level | Level | Limit Line | Over Limit | Remark |
|---|---|---|---|---|---|---|---|---|---|
| | MHz | dB | dB/m | dB | dBuV | dBuV/m | dBuV/m | dB | |
| 1 | 1312.187 | 4.84 | 25.07 | 37.52 | 48.87 | 41.26 | 74.00 | -32.74 | peak |
| 2 | 4086.182 | 7.08 | 32.86 | 38.37 | 44.74 | 46.31 | 74.00 | -27.69 | peak |
| 3 | 4824.000 | 7.91 | 34.00 | 38.48 | 42.20 | 45.63 | 74.00 | -28.37 | peak |
| 4 | 6001.626 | 10.57 | 35.10 | 37.85 | 43.22 | 51.04 | 74.00 | -22.96 | peak |
| 5 | 7236.000 | 10.07 | 36.09 | 37.75 | 40.12 | 48.53 | 74.00 | -25.47 | peak |
| 6 | 9648.000 | 10.77 | 37.69 | 38.19 | 39.49 | 49.76 | 74.00 | -24.24 | peak |

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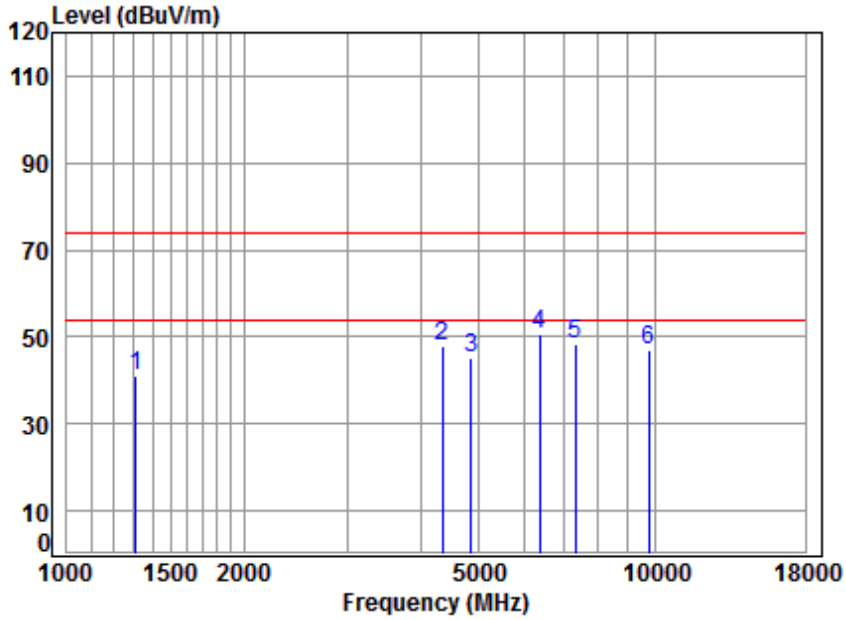
### 4.9.2.8 802.11G_ Middle Channel_ Peak_ Vertical




Site : chamber
Condition: 3m VERTICAL
Job No : 80005
Mode : 2437 TX RSE
Note : 2.4G WIFI 11G

| | Freq | Cable Loss | Ant Factor | Preamp Factor | Read Level | Level | Limit Line | Over Limit | Remark |
|---|---|---|---|---|---|---|---|---|---|
| | MHz | dB | dB/m | dB | dBuV | dBuV/m | dBuV/m | dB | |
| 1 | 1308.399 | 4.83 | 25.06 | 37.53 | 48.60 | 40.96 | 74.00 | -33.04 | peak |
| 2 | 4354.454 | 7.40 | 33.35 | 38.41 | 45.37 | 47.71 | 74.00 | -26.29 | peak |
| 3 | 4874.000 | 7.96 | 34.05 | 38.49 | 41.87 | 45.39 | 74.00 | -28.61 | peak |
| 4 | 6377.195 | 11.31 | 35.48 | 37.81 | 41.64 | 50.62 | 74.00 | -23.38 | peak |
| 5 | 7311.000 | 10.05 | 36.15 | 37.76 | 40.06 | 48.50 | 74.00 | -25.50 | peak |
| 6 | 9748.000 | 10.82 | 37.75 | 38.20 | 36.63 | 47.00 | 74.00 | -27.00 | peak |

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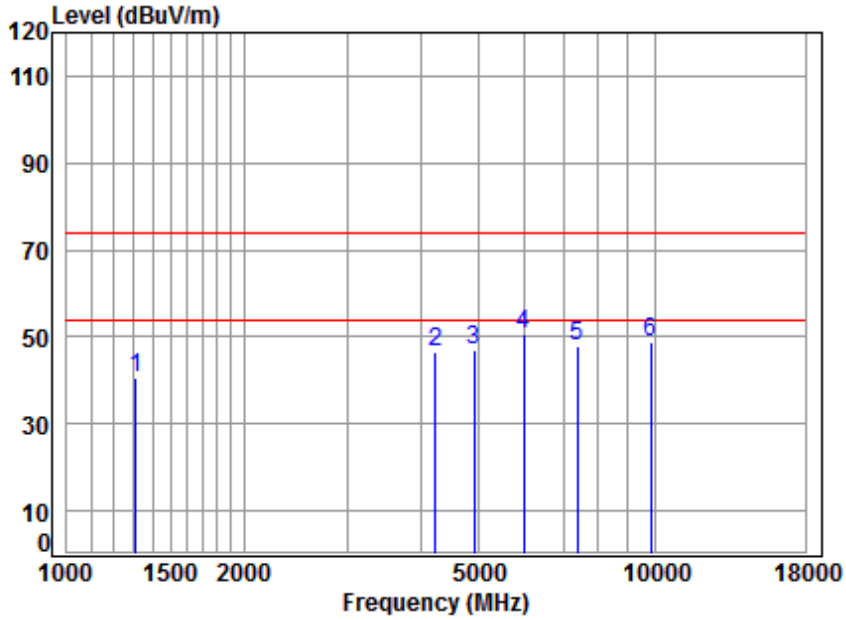
### 4.9.2.9 802.11G_ Highest Channel_ Peak_ Vertical




Site : chamber
Condition: 3m VERTICAL
Job No : 80005
Mode : 2462 TX RSE
Note : 2.4G WIFI 11G

| | Freq | Cable Loss | Ant Factor | Preamp Factor | Read Level | Level | Limit Line | Over Limit | Remark |
|---|---|---|---|---|---|---|---|---|---|
| | MHz | dB | dB/m | dB | dBuV | dBuV/m | dBuV/m | dB | |
| 1 | 1308.399 | 4.83 | 25.06 | 37.53 | 48.14 | 40.50 | 74.00 | -33.50 | peak |
| 2 | 4230.396 | 7.26 | 33.13 | 38.39 | 44.71 | 46.71 | 74.00 | -27.29 | peak |
| 3 | 4924.000 | 8.01 | 34.11 | 38.50 | 43.24 | 46.86 | 74.00 | -27.14 | peak |
| 4 | 5984.305 | 10.52 | 35.08 | 37.86 | 42.71 | 50.45 | 74.00 | -23.55 | peak |
| 5 | 7386.000 | 10.03 | 36.21 | 37.76 | 39.26 | 47.74 | 74.00 | -26.26 | peak |
| 6 | 9848.000 | 10.87 | 37.81 | 38.21 | 38.40 | 48.87 | 74.00 | -25.13 | peak |

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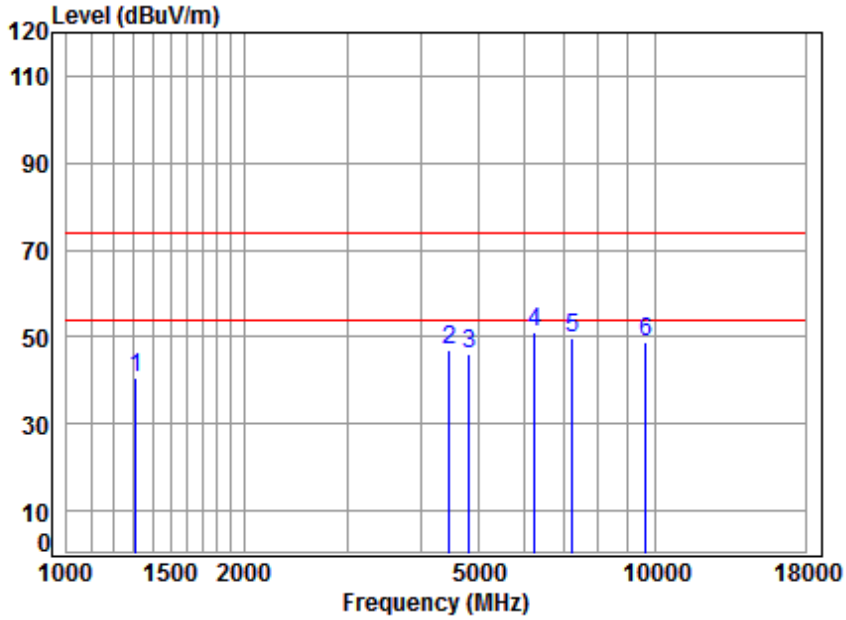
### 4.9.2.10 802.11G_Lowest Channel_ Peak_ Horizontal




Site : chamber
Condition: 3m HORIZONTAL
Job No : 80005
Mode : 2412 TX RSE
Note : 2.4G WIFI 11G

| | Freq | Cable Loss | Ant Factor | Preamp Factor | Read Level | Level | Limit Line | Over Limit | Remark |
|---|---|---|---|---|---|---|---|---|---|
| | MHz | dB | dB/m | dB | dBuV | dBuV/m | dBuV/m | dB | |
| 1 | 1312.187 | 4.84 | 25.07 | 37.52 | 48.44 | 40.83 | 74.00 | -33.17 | peak |
| 2 | 4469.214 | 7.53 | 33.55 | 38.43 | 44.55 | 47.20 | 74.00 | -26.80 | peak |
| 3 | 4824.000 | 7.91 | 34.00 | 38.48 | 42.75 | 46.18 | 74.00 | -27.82 | peak |
| 4 | 6249.464 | 11.06 | 35.35 | 37.82 | 42.70 | 51.29 | 74.00 | -22.71 | peak |
| 5 | 7236.000 | 10.07 | 36.09 | 37.75 | 41.12 | 49.53 | 74.00 | -24.47 | peak |
| 6 | 9648.000 | 10.77 | 37.69 | 38.19 | 38.35 | 48.62 | 74.00 | -25.38 | peak |

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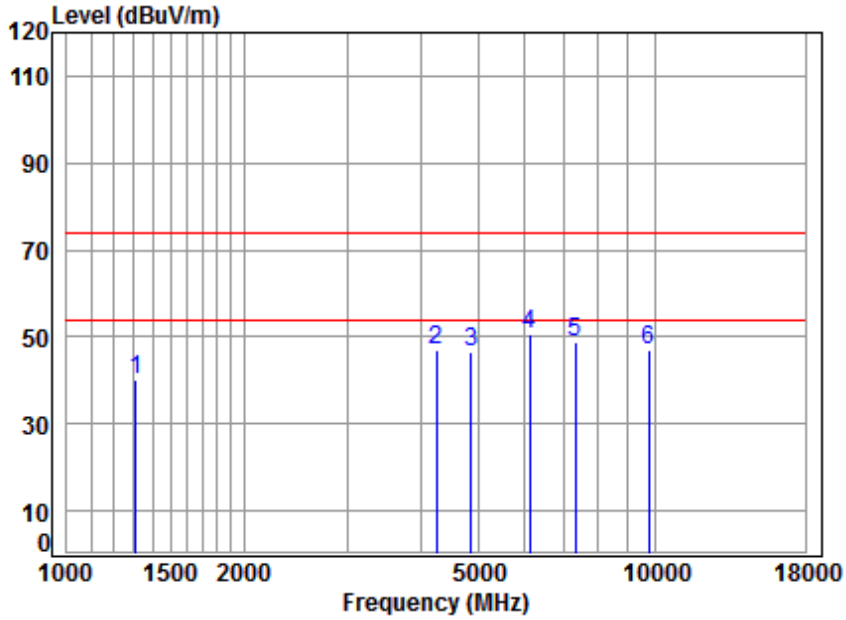
### 4.9.2.11 802.11G_ Middle Channel_ Peak_ Horizontal




Site : chamber
Condition: 3m HORIZONTAL
Job No : 80005
Mode : 2437 TX RSE
Note : 2.4G WIFI 11G

| | Freq | Cable Loss | Ant Factor | Preamp Factor | Read Level | Level | Limit Line | Over Limit | Remark |
|---|---|---|---|---|---|---|---|---|---|
| | MHz | dB | dB/m | dB | dBuV | dBuV/m | dBuV/m | dB | |
| 1 | 1312.187 | 4.84 | 25.07 | 37.52 | 47.93 | 40.32 | 74.00 | -33.68 | peak |
| 2 | 4242.641 | 7.27 | 33.15 | 38.39 | 44.95 | 46.98 | 74.00 | -27.02 | peak |
| 3 | 4874.000 | 7.96 | 34.05 | 38.49 | 42.96 | 46.48 | 74.00 | -27.52 | peak |
| 4 | 6124.292 | 10.82 | 35.23 | 37.84 | 42.26 | 50.47 | 74.00 | -23.53 | peak |
| 5 | 7311.000 | 10.05 | 36.15 | 37.76 | 40.36 | 48.80 | 74.00 | -25.20 | peak |
| 6 | 9748.000 | 10.82 | 37.75 | 38.20 | 36.61 | 46.98 | 74.00 | -27.02 | peak |

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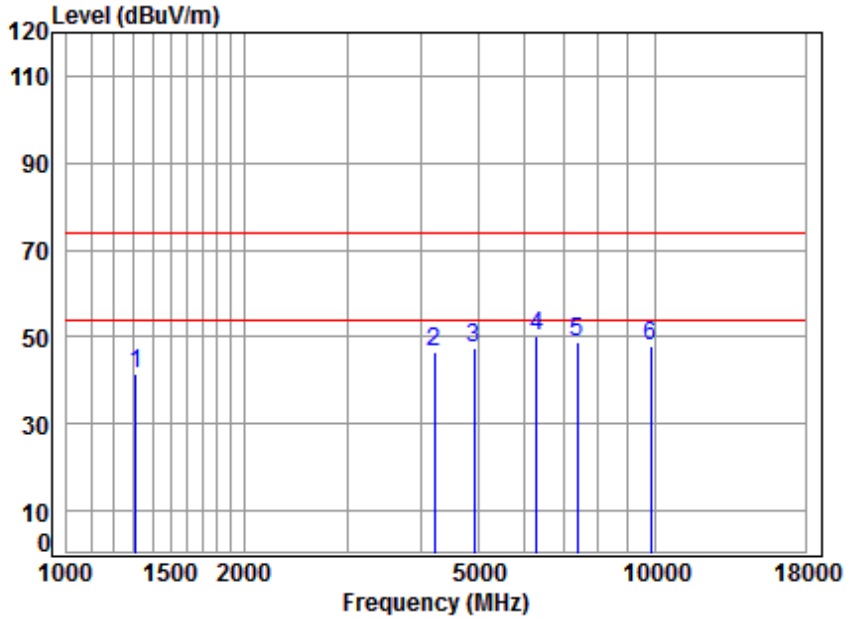
### 4.9.2.12 802.11G_ Highest Channel_ Peak_ Horizontal




Site : chamber
Condition: 3m HORIZONTAL
Job No : 80005
Mode : 2462 TX RSE
Note : 2.4G WIFI 11G

| | Freq | Cable Loss | Ant Factor | Preamp Factor | Read Level | Level | Limit Line | Over Limit | Remark |
|---|---|---|---|---|---|---|---|---|---|
| | MHz | dB | dB/m | dB | dBuV | dBuV/m | dBuV/m | dB | |
| 1 | 1308.399 | 4.83 | 25.06 | 37.53 | 49.17 | 41.53 | 74.00 | -32.47 | peak |
| 2 | 4218.186 | 7.24 | 33.11 | 38.39 | 44.57 | 46.53 | 74.00 | -27.47 | peak |
| 3 | 4924.000 | 8.01 | 34.11 | 38.50 | 44.00 | 47.62 | 74.00 | -26.38 | peak |
| 4 | 6303.890 | 11.17 | 35.41 | 37.81 | 41.40 | 50.17 | 74.00 | -23.83 | peak |
| 5 | 7386.000 | 10.03 | 36.21 | 37.76 | 40.23 | 48.71 | 74.00 | -25.29 | peak |
| 6 | 9848.000 | 10.87 | 37.81 | 38.21 | 37.67 | 48.14 | 74.00 | -25.86 | peak |

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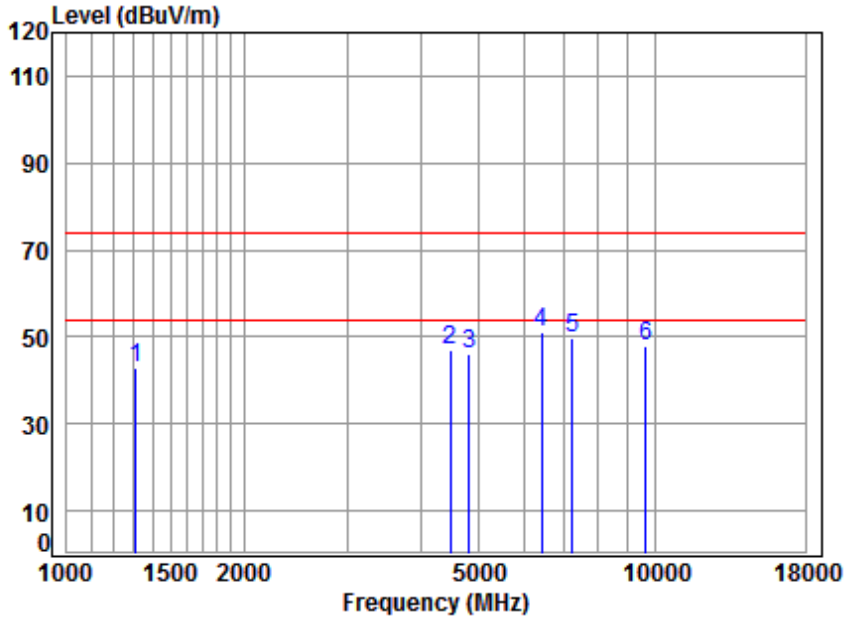
### 4.9.2.13 802.11N20_Lowest Channel_ Peak_ Vertical




Site : chamber
Condition: 3m VERTICAL
Job No : 80005
Mode : 2412 TX RSE
Note : 2.4G WIFI 11N 20

| | Freq | Cable Loss | Ant Factor | Preamp Factor | Read Level | Level | Limit Line | Over Limit | Remark |
|---|---|---|---|---|---|---|---|---|---|
| | MHz | dB | dB/m | dB | dBuV | dBuV/m | dBuV/m | dB | |
| 1 | 1308.399 | 4.83 | 25.06 | 37.53 | 50.74 | 43.10 | 74.00 | -30.90 | peak |
| 2 | 4495.125 | 7.55 | 33.59 | 38.43 | 44.34 | 47.05 | 74.00 | -26.95 | peak |
| 3 | 4824.000 | 7.91 | 34.00 | 38.48 | 42.54 | 45.97 | 74.00 | -28.03 | peak |
| 4 | 6414.167 | 11.38 | 35.52 | 37.80 | 41.82 | 50.92 | 74.00 | -23.08 | peak |
| 5 | 7236.000 | 10.07 | 36.09 | 37.75 | 41.13 | 49.54 | 74.00 | -24.46 | peak |
| 6 | 9648.000 | 10.77 | 37.69 | 38.19 | 37.59 | 47.86 | 74.00 | -26.14 | peak |

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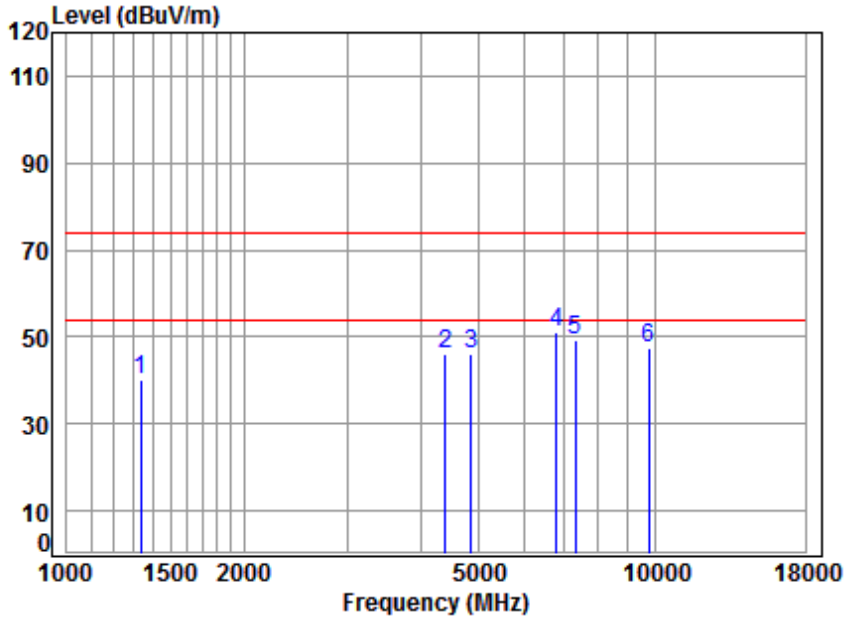
### 4.9.2.14 802.11N20_ Middle Channel_ Peak_ Vertical




Site : chamber
Condition: 3m VERTICAL
Job No : 80005
Mode : 2437 TX RSE
Note : 2.4G WIFI 11N 20

| | Freq | Cable Loss | Ant Factor | Preamp Factor | Read Level | Level | Limit Line | Over Limit | Remark |
|---|---|---|---|---|---|---|---|---|---|
| | MHz | dB | dB/m | dB | dBuV | dBuV/m | dBuV/m | dB | |
| 1 | 1335.141 | 4.93 | 25.17 | 37.50 | 47.40 | 40.00 | 74.00 | -34.00 | peak |
| 2 | 4405.090 | 7.46 | 33.44 | 38.42 | 43.76 | 46.24 | 74.00 | -27.76 | peak |
| 3 | 4874.000 | 7.96 | 34.05 | 38.49 | 42.34 | 45.86 | 74.00 | -28.14 | peak |
| 4 | 6795.879 | 10.69 | 35.78 | 37.76 | 42.49 | 51.20 | 74.00 | -22.80 | peak |
| 5 | 7311.000 | 10.05 | 36.15 | 37.76 | 40.85 | 49.29 | 74.00 | -24.71 | peak |
| 6 | 9748.000 | 10.82 | 37.75 | 38.20 | 36.88 | 47.25 | 74.00 | -26.75 | peak |

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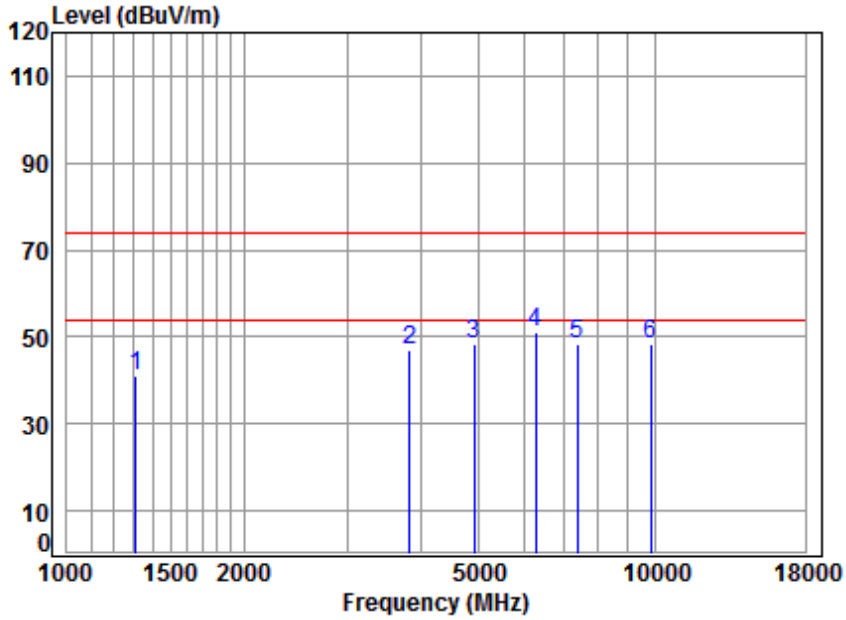
### 4.9.2.15 802.11N20_ Highest Channel_ Peak_ Vertical




Site : chamber
Condition: 3m VERTICAL
Job No : 80005
Mode : 2462 TX RSE
Note : 2.4G WIFI 11N 20

| | Freq | Cable Loss | Ant Factor | Preamp Factor | Read Level | Level | Limit Line | Over Limit | Remark |
|---|---|---|---|---|---|---|---|---|---|
| | MHz | dB | dB/m | dB | dBuV | dBuV/m | dBuV/m | dB | |
| 1 | 1312.187 | 4.84 | 25.07 | 37.52 | 48.89 | 41.28 | 74.00 | -32.72 | peak |
| 2 | 3834.438 | 6.82 | 32.38 | 38.33 | 46.12 | 46.99 | 74.00 | -27.01 | peak |
| 3 | 4924.000 | 8.01 | 34.11 | 38.50 | 44.92 | 48.54 | 74.00 | -25.46 | peak |
| 4 | 6267.553 | 11.10 | 35.37 | 37.82 | 42.62 | 51.27 | 74.00 | -22.73 | peak |
| 5 | 7386.000 | 10.03 | 36.21 | 37.76 | 39.82 | 48.30 | 74.00 | -25.70 | peak |
| 6 | 9848.000 | 10.87 | 37.81 | 38.21 | 37.77 | 48.24 | 74.00 | -25.76 | peak |

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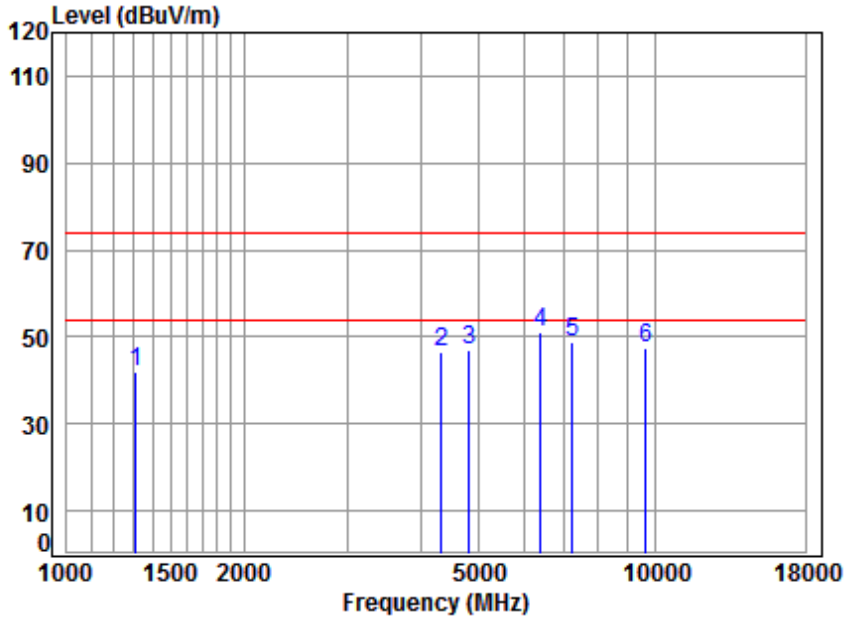
### 4.9.2.16 802.11N20_Lowest Channel_ Peak_ Horizontal




Site : chamber
Condition: 3m HORIZONTAL
Job No : 80005
Mode : 2412 TX RSE
Note : 2.4G WIFI 11N 20

| | Freq | Cable Loss | Ant Factor | Preamp Factor | Read Level | Level | Limit Line | Over Limit | Remark |
|---|---|---|---|---|---|---|---|---|---|
| | MHz | dB | dB/m | dB | dBuV | dBuV/m | dBuV/m | dB | |
| 1 | 1312.187 | 4.84 | 25.07 | 37.52 | 49.52 | 41.91 | 74.00 | -32.09 | peak |
| 2 | 4329.354 | 7.37 | 33.30 | 38.41 | 44.17 | 46.43 | 74.00 | -27.57 | peak |
| 3 | 4824.000 | 7.91 | 34.00 | 38.48 | 43.77 | 47.20 | 74.00 | -26.80 | peak |
| 4 | 6395.654 | 11.34 | 35.50 | 37.80 | 42.25 | 51.29 | 74.00 | -22.71 | peak |
| 5 | 7236.000 | 10.07 | 36.09 | 37.75 | 40.32 | 48.73 | 74.00 | -25.27 | peak |
| 6 | 9648.000 | 10.77 | 37.69 | 38.19 | 37.17 | 47.44 | 74.00 | -26.56 | peak |

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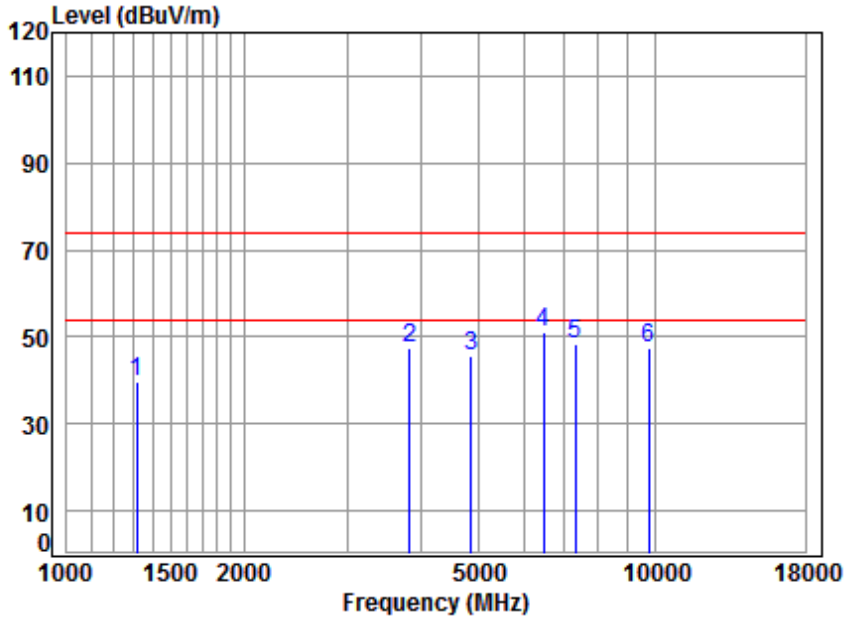
### 4.9.2.17 802.11N20_ Middle Channel_ Peak_ Horizontal




Site : chamber
Condition: 3m HORIZONTAL
Job No : 80005
Mode : 2437 TX RSE
Note : 2.4G WIFI 11N 20

| | Freq | Cable Loss | Ant Factor | Preamp Factor | Read Level | Level | Limit Line | Over Limit | Remark |
|---|---|---|---|---|---|---|---|---|---|
| | MHz | dB | dB/m | dB | dBuV | dBuV/m | dBuV/m | dB | |
| 1 | 1315.985 | 4.86 | 25.09 | 37.52 | 47.34 | 39.77 | 74.00 | -34.23 | peak |
| 2 | 3834.438 | 6.82 | 32.38 | 38.33 | 46.36 | 47.23 | 74.00 | -26.77 | peak |
| 3 | 4874.000 | 7.96 | 34.05 | 38.49 | 41.89 | 45.41 | 74.00 | -28.59 | peak |
| 4 | 6470.026 | 11.48 | 35.57 | 37.80 | 41.67 | 50.92 | 74.00 | -23.08 | peak |
| 5 | 7311.000 | 10.05 | 36.15 | 37.76 | 39.72 | 48.16 | 74.00 | -25.84 | peak |
| 6 | 9748.000 | 10.82 | 37.75 | 38.20 | 36.98 | 47.35 | 74.00 | -26.65 | peak |

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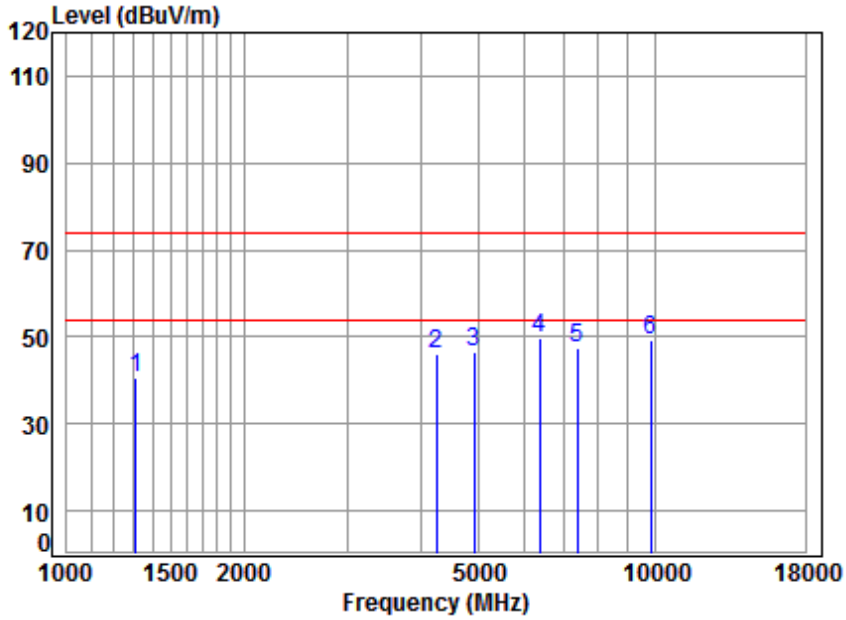
### 4.9.2.18 802.11N20_ Highest Channel_ Peak_ Horizontal




Site : chamber
Condition: 3m HORIZONTAL
Job No : 80005
Mode : 2462 TX RSE
Note : 2.4G WIFI 11N 20

| | Freq | Cable Loss | Ant Factor | Preamp Factor | Read Level | Level | Limit Line | Over Limit | Remark |
|---|---|---|---|---|---|---|---|---|---|
| | MHz | dB | dB/m | dB | dBuV | dBuV/m | dBuV/m | dB | |
| 1 | 1312.187 | 4.84 | 25.07 | 37.52 | 48.08 | 40.47 | 74.00 | -33.53 | peak |
| 2 | 4242.641 | 7.27 | 33.15 | 38.39 | 43.94 | 45.97 | 74.00 | -28.03 | peak |
| 3 | 4924.000 | 8.01 | 34.11 | 38.50 | 43.10 | 46.72 | 74.00 | -27.28 | peak |
| 4 | 6377.195 | 11.31 | 35.48 | 37.81 | 40.88 | 49.86 | 74.00 | -24.14 | peak |
| 5 | 7386.000 | 10.03 | 36.21 | 37.76 | 39.16 | 47.64 | 74.00 | -26.36 | peak |
| 6 | 9848.000 | 10.87 | 37.81 | 38.21 | 38.66 | 49.13 | 74.00 | -24.87 | peak |

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Remark:

1) The field strength is calculated by adding the Antenna Factor, Cable Factor & Preamplifier. The basic equation with a sample calculation is as follows:

   Final Test Level =Receiver Reading + Antenna Factor + Cable Factor – Preamplifier Factor

2) Scan from 9kHz to 25GHz, the disturbance between 9KHz to 30MHz and 18GHz to 25GHz was very low, and the above harmonics were the highest point could be found when testing, The amplitude of spurious emissions from the radiator which are attenuated more than 20dB below the limit need not be reported.

3）As shown in this section, for frequencies above 1GHz, the field strength limits are based on average limits. However, the peak field strength of any emission shall not exceed the maximum permitted average limits specified above by more than 20 dB under any condition of modulation. So, only the peak measurements were shown in the report.

4）All Modes have been tested, but only the worst case data displayed in this report.

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## 4.10 Restricted bands around fundamental frequency

| | | | |
|---|---|---|---|
| Test Requirement: | 47 CFR Part 15C Section 15.209 and 15.205 | | |
| Test Method: | ANSI C63.10: 2013 Section 11.12 | | |
| Test Site: | Measurement Distance: 3m or 10m (Semi-Anechoic Chamber) | | |
| Limit: | Frequency | Limit (dBuV/m @3m) | Remark |
| | 30MHz-88MHz | 40.0 | Quasi-peak Value |
| | 88MHz-216MHz | 43.5 | Quasi-peak Value |
| | 216MHz-960MHz | 46.0 | Quasi-peak Value |
| | 960MHz-1GHz | 54.0 | Quasi-peak Value |
| | Above 1GHz | 54.0 | Average Value |
| | | 74.0 | Peak Value |
| Test Setup: | | | |

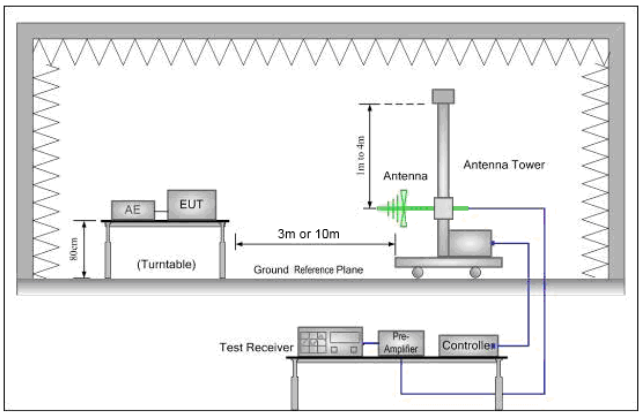


Figure 1. 30MHz to 1GHz

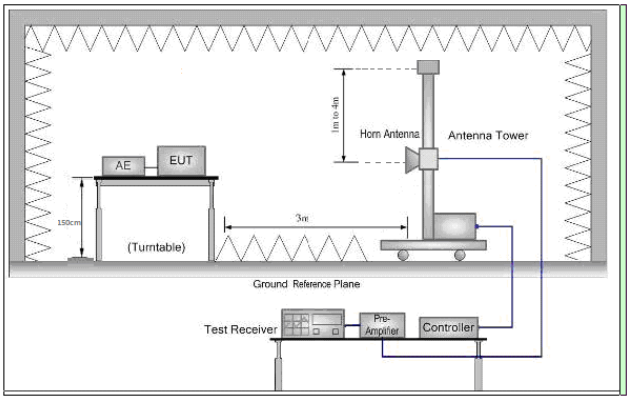


Figure 2. Above 1 GHz

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| | |
|---|---|
| Test Procedure: | a. For below 1GHz, the EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 or 10 meter semi-anechoic camber. The table was rotated 360 degrees to determine the position of the highest radiation.<br>b. For above 1GHz, the EUT was placed on the top of a rotating table 1.5 meters above the ground at a 3 meter semi-anechoic camber. The table was rotated 360 degrees to determine the position of the highest radiation.<br>c. The EUT was set 3 or 10 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.<br>d. The antenna height is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.<br>e. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.<br>f. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.<br>g. Place a marker at the end of the restricted band closest to the transmit frequency to show compliance. Also measure any emissions in the restricted bands. Save the spectrum analyzer plot. Repeat for each power and modulation for lowest and highest channel<br>h. Test the EUT in the lowest channel , the Highest channel<br>i. The radiation measurements are performed in X, Y, Z axis positioning for Transmitting mode,And found the X axis positioning which it is worse case.<br>j. Repeat above procedures until all frequencies measured was complete. |
| Exploratory Test Mode: | Transmitting with all kind of modulations, data rates.<br>Charge + Transmitting mode. |
| Final Test Mode: | Pretest the EUT at Charge +Transmitting mode.<br>Through Pre-scan, find the<br>1Mbps of rate is the worst case of 802.11B;<br>6Mbps of rate is the worst case of 802.11G ;<br>6.5Mbps of rate is the worst case of 802.11N(HT20);<br>Only the worst case is recorded in the report. |
| Instruments Used: | Refer to section 5.10 for details |
| Test Results: | Pass |

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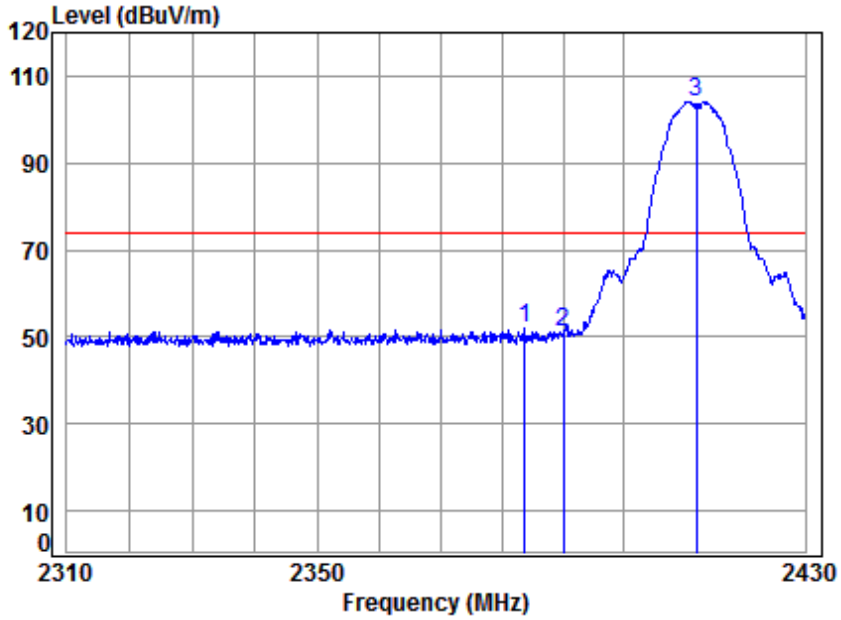
**Test plot as follows:**

### 4.10.1.1 802.11B_Lowest Channel_ Peak_ Vertical




Site : chamber
Condition: 3m VERTICAL
Job No : 80005
Mode : 2412 Band edge
Note : 2.4G WiFi 11B

| | Freq | Cable Loss | Ant Factor | Preamp Factor | Read Level | Level | Limit Line | Over Limit | Remark |
|---|---|---|---|---|---|---|---|---|---|
| | MHz | dB | dB/m | dB | dBuV | dBuV/m | dBuV/m | dB | |
| 1 | 2383.683 | 5.47 | 28.51 | 37.46 | 55.32 | 51.84 | 74.00 | -22.16 | peak |
| 2 | 2390.000 | 5.47 | 28.52 | 37.47 | 54.73 | 51.25 | 74.00 | -22.75 | peak |
| 3 * | 2412.000 | 5.50 | 28.56 | 37.50 | 107.69 | 104.25 | 74.00 | 30.25 | peak |

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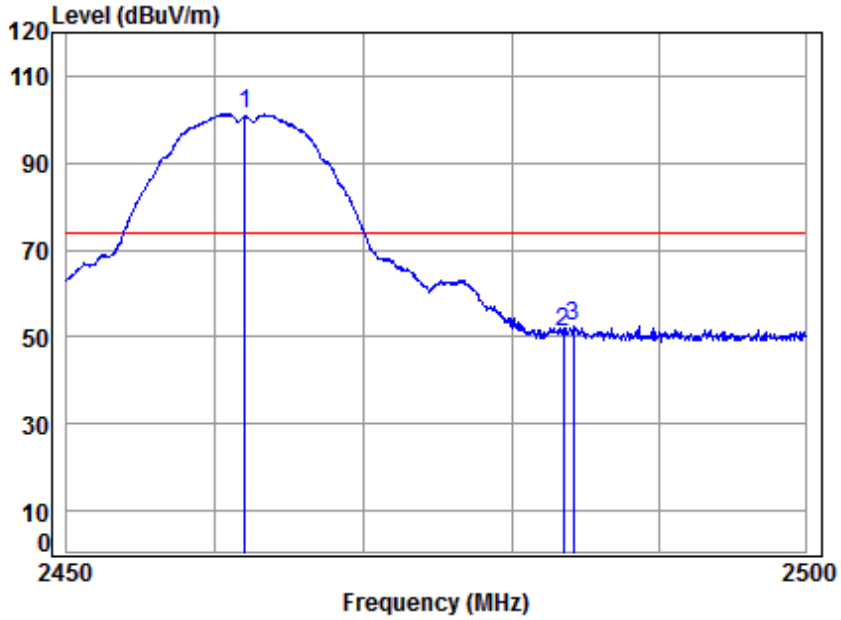
### 4.10.1.2 802.11B_ Highest Channel_ Peak_ Vertical




Site : chamber
Condition: 3m VERTICAL
Job No : 80005
Mode : 2462 Band edge
Note : 2.4G WiFi 11B

| | Freq | Cable Loss | Ant Factor | Preamp Factor | Read Level | Level | Limit Line | Over Limit | Remark |
|---|---|---|---|---|---|---|---|---|---|
| | MHz | dB | dB/m | dB | dBuV | dBuV/m | dBuV/m | dB | |
| 1 * | 2462.000 | 5.57 | 28.64 | 37.56 | 104.60 | 101.25 | 74.00 | 27.25 | peak |
| 2 | 2483.500 | 5.60 | 28.67 | 37.59 | 54.43 | 51.11 | 74.00 | -22.89 | peak |
| 3 | 2484.191 | 5.60 | 28.67 | 37.59 | 55.84 | 52.52 | 74.00 | -21.48 | peak |

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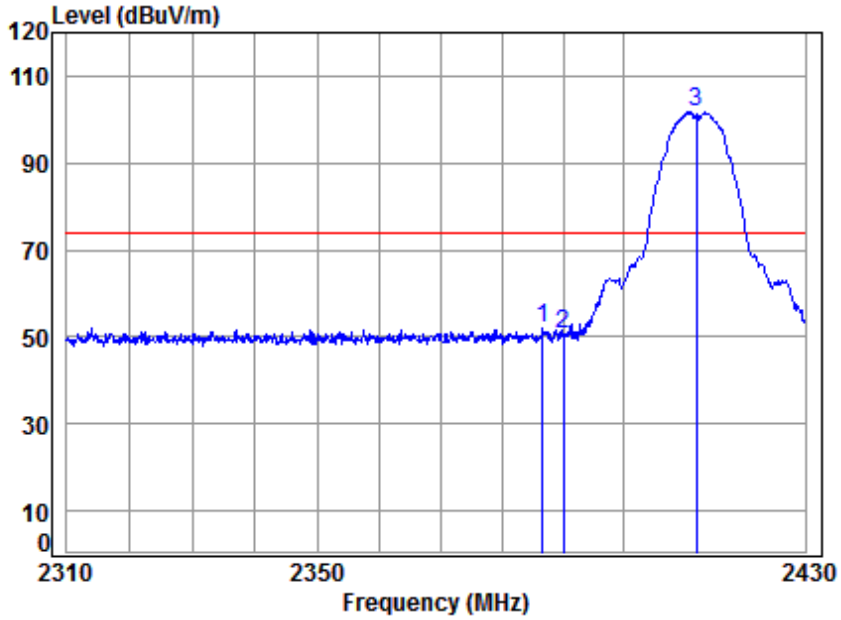
### 4.10.1.3 802.11B_Lowest Channel_ Peak_ Horizontal




Site : chamber
Condition: 3m HORIZONTAL
Job No : 80005
Mode : 2412 Band edge
Note : 2.4G WiFi 11B

| | Freq | Cable Loss | Ant Factor | Preamp Factor | Read Level | Level | Limit Line | Over Limit | Remark |
|---|---|---|---|---|---|---|---|---|---|
| | MHz | dB | dB/m | dB | dBuV | dBuV/m | dBuV/m | dB | |
| 1 | 2386.703 | 5.47 | 28.51 | 37.46 | 55.61 | 52.13 | 74.00 | -21.87 | peak |
| 2 | 2390.000 | 5.47 | 28.52 | 37.47 | 54.25 | 50.77 | 74.00 | -23.23 | peak |
| 3 * | 2412.000 | 5.50 | 28.56 | 37.50 | 105.10 | 101.66 | 74.00 | 27.66 | peak |

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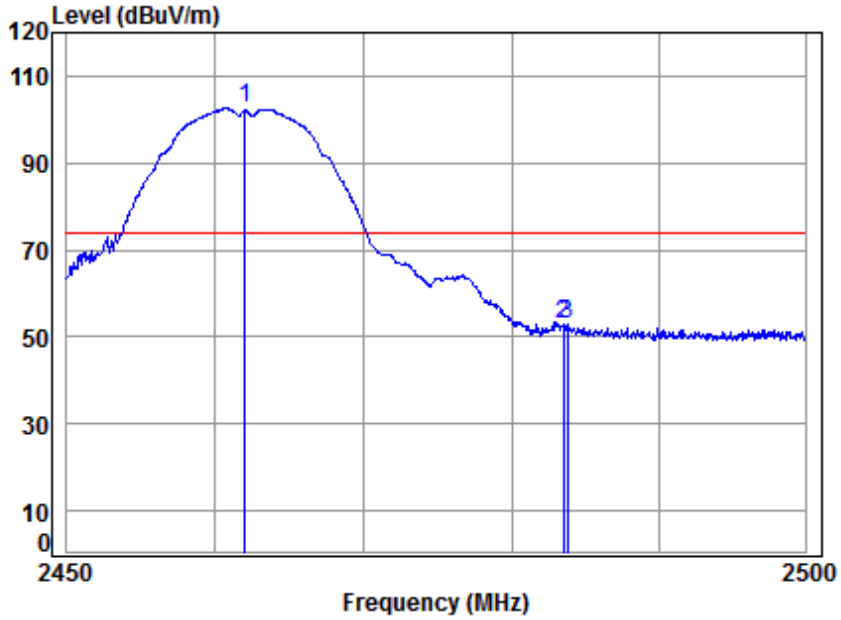
### 4.10.1.4 802.11B_ Highest Channel_ Peak_ Horizontal




Site : chamber
Condition: 3m HORIZONTAL
Job No : 80005
Mode : 2462 Band edge
Note : 2.4G WiFi 11B

| | Freq | Cable Loss | Ant Factor | Preamp Factor | Read Level | Level | Limit Line | Over Limit | Remark |
|---|---|---|---|---|---|---|---|---|---|
| | MHz | dB | dB/m | dB | dBuV | dBuV/m | dBuV/m | dB | |
| 1 * | 2462.000 | 5.57 | 28.64 | 37.56 | 105.86 | 102.51 | 74.00 | 28.51 | peak |
| 2 | 2483.500 | 5.60 | 28.67 | 37.59 | 56.39 | 53.07 | 74.00 | -20.93 | peak |
| 3 | 2483.790 | 5.60 | 28.67 | 37.59 | 56.12 | 52.80 | 74.00 | -21.20 | peak |

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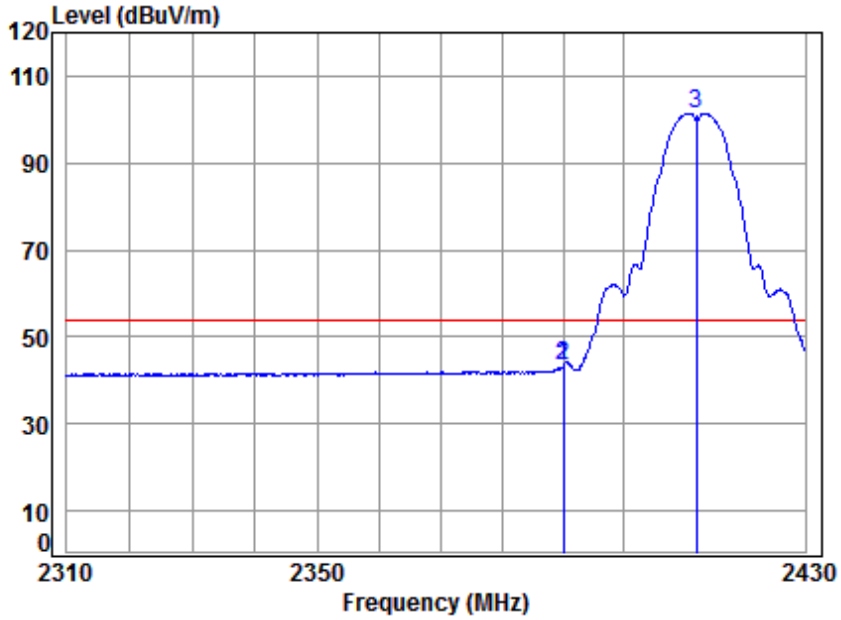
### 4.10.1.5 802.11B_Lowest Channel_ Average_ Vertical




Site : chamber
Condition: 3m VERTICAL
Job No : 80005
Mode : 2412 Band edge
Note : 2.4G WiFi 11B

| | Freq | Cable Loss | Ant Factor | Preamp Factor | Read Level | Level | Limit Line | Over Limit | Remark |
|---|---|---|---|---|---|---|---|---|---|
| | MHz | dB | dB/m | dB | dBuV | dBuV/m | dBuV/m | dB | |
| 1 | 2389.968 | 5.47 | 28.52 | 37.47 | 46.73 | 43.25 | 54.00 | -10.75 | Average |
| 2 | 2390.000 | 5.47 | 28.52 | 37.47 | 46.73 | 43.25 | 54.00 | -10.75 | Average |
| 3 * | 2412.000 | 5.50 | 28.56 | 37.50 | 104.94 | 101.50 | 54.00 | 47.50 | Average |

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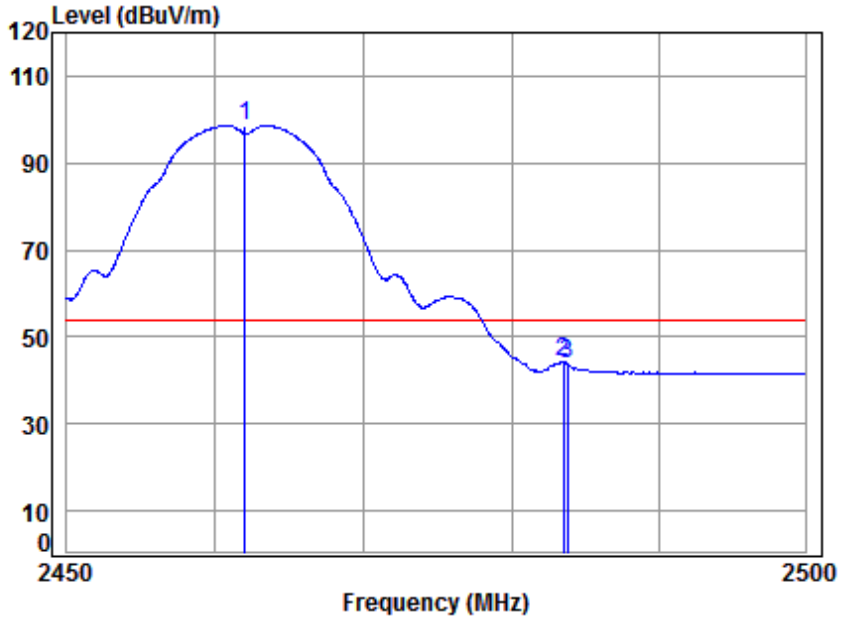
### 4.10.1.6 802.11B_ Highest Channel_ Average _ Vertical




Site : chamber
Condition: 3m VERTICAL
Job No : 80005
Mode : 2462 Band edge
Note : 2.4G WiFi 11B

| | Freq | Cable Loss | Ant Factor | Preamp Factor | Read Level | Level | Limit Line | Over Limit | Remark |
|---|---|---|---|---|---|---|---|---|---|
| | MHz | dB | dB/m | dB | dBuV | dBuV/m | dBuV/m | dB | |
| 1 * | 2462.000 | 5.57 | 28.64 | 37.56 | 102.01 | 98.66 | 54.00 | 44.66 | Average |
| 2 | 2483.500 | 5.60 | 28.67 | 37.59 | 47.58 | 44.26 | 54.00 | -9.74 | Average |
| 3 | 2483.790 | 5.60 | 28.67 | 37.59 | 47.18 | 43.86 | 54.00 | -10.14 | Average |

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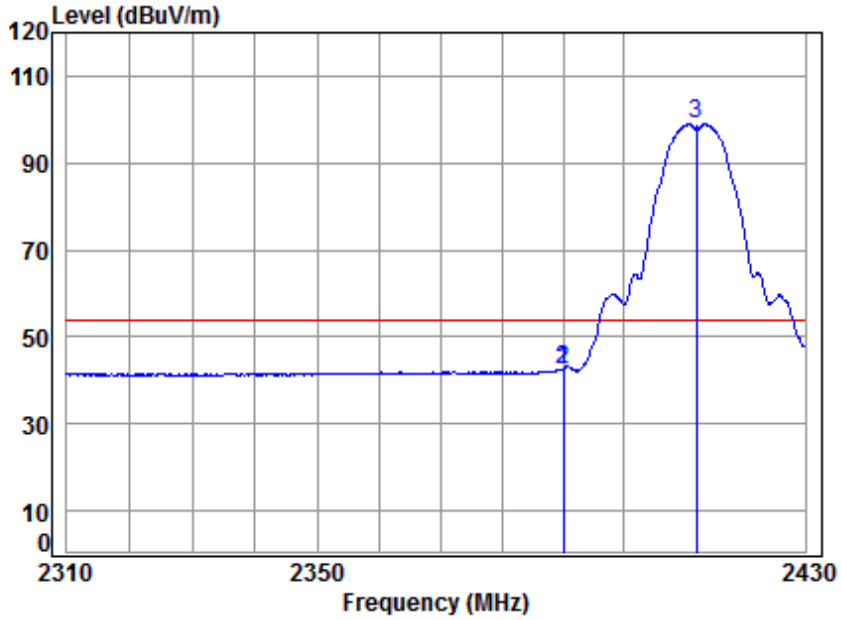
### 4.10.1.7 802.11B_Lowest Channel_ Average _ Horizontal




Site : chamber
Condition: 3m HORIZONTAL
Job No : 80005
Mode : 2412 Band edge
Note : 2.4G WiFi 11B

| | Freq | Cable Loss | Ant Factor | Preamp Factor | Read Level | Level | Limit Line | Over Limit | Remark |
|---|---|---|---|---|---|---|---|---|---|
| | MHz | dB | dB/m | dB | dBuV | dBuV/m | dBuV/m | dB | |
| 1 | 2389.968 | 5.47 | 28.52 | 37.47 | 46.09 | 42.61 | 54.00 | -11.39 | Average |
| 2 | 2390.000 | 5.47 | 28.52 | 37.47 | 46.09 | 42.61 | 54.00 | -11.39 | Average |
| 3 * | 2412.000 | 5.50 | 28.56 | 37.50 | 102.32 | 98.88 | 54.00 | 44.88 | Average |

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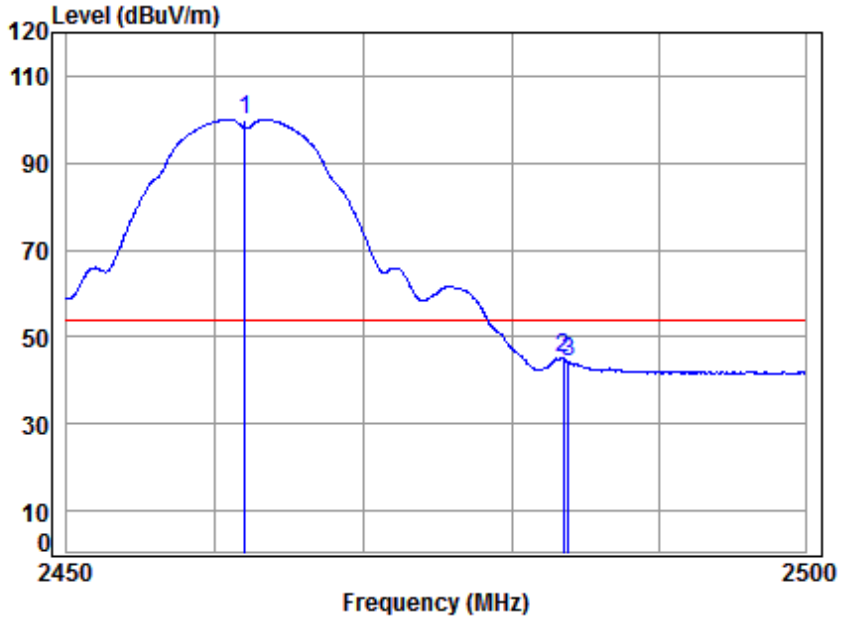
### 4.10.1.8 802.11B_ Highest Channel_ Average_ Horizontal




Site : chamber
Condition: 3m HORIZONTAL
Job No : 80005
Mode : 2462 Band edge
Note : 2.4G WiFi 11B

| | Freq | Cable Loss | Ant Factor | Preamp Factor | Read Level | Level | Limit Line | Over Limit | Remark |
|---|---|---|---|---|---|---|---|---|---|
| | MHz | dB | dB/m | dB | dBuV | dBuV/m | dBuV/m | dB | |
| 1 * | 2462.000 | 5.57 | 28.64 | 37.56 | 103.28 | 99.93 | 54.00 | 45.93 | Average |
| 2 | 2483.500 | 5.60 | 28.67 | 37.59 | 48.68 | 45.36 | 54.00 | -8.64 | Average |
| 3 | 2483.890 | 5.60 | 28.67 | 37.59 | 47.70 | 44.38 | 54.00 | -9.62 | Average |

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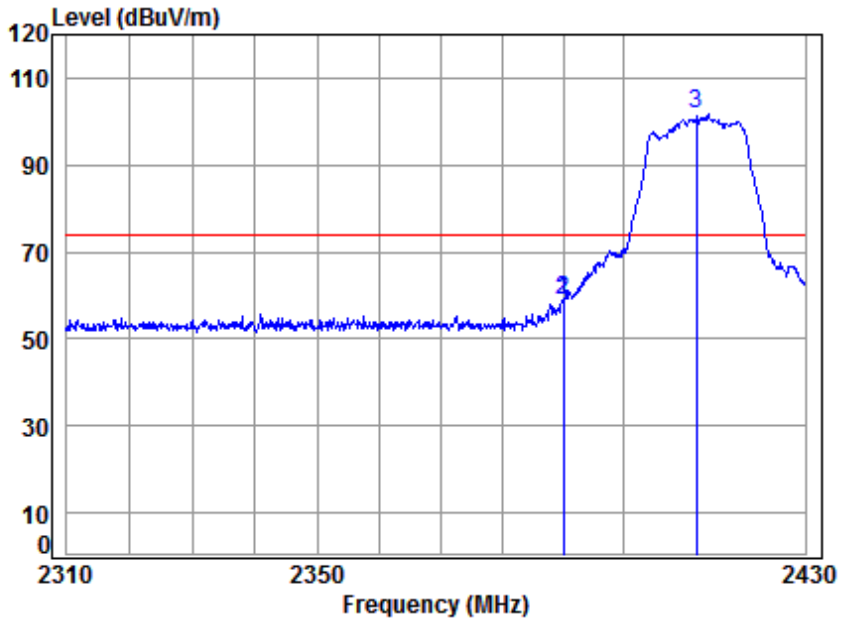
### 4.10.1.9 802.11G_Lowest Channel_ Peak_ Vertical




Site : chamber
Condition: 3m VERTICAL
Job No : 80005
Mode : 2412 Band edge
Note : 2.4G WiFi 11G

| | Freq | Cable Loss | Ant Factor | Preamp Factor | Read Level | Level | Limit Line | Over Limit | Remark |
|---|---|---|---|---|---|---|---|---|---|
| | MHz | dB | dB/m | dB | dBuV | dBuV/m | dBuV/m | dB | |
| 1 | 2389.968 | 5.47 | 28.52 | 37.47 | 62.42 | 58.94 | 74.00 | -15.06 | peak |
| 2 | 2390.000 | 5.47 | 28.52 | 37.47 | 62.42 | 58.94 | 74.00 | -15.06 | peak |
| 3 * | 2412.000 | 5.50 | 28.56 | 37.50 | 105.32 | 101.88 | 74.00 | 27.88 | peak |

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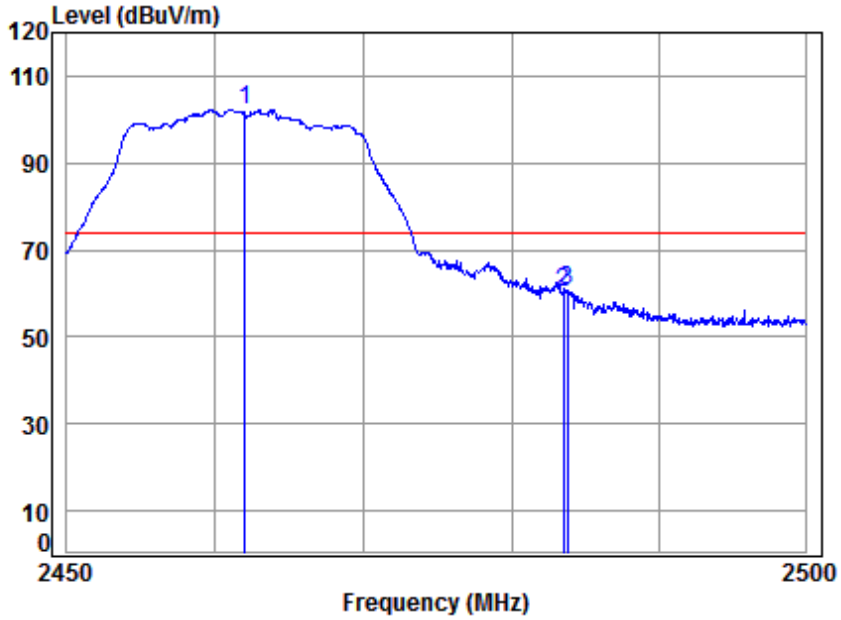
### 4.10.1.10 802.11G_ Highest Channel_ Peak_ Vertical




Site : chamber
Condition: 3m VERTICAL
Job No : 80005
Mode : 2462 Band edge
Note : 2.4G WiFi 11G

| | Freq | Cable Loss | Ant Factor | Preamp Factor | Read Level | Level | Limit Line | Over Limit | Remark |
|---|---|---|---|---|---|---|---|---|---|
| | MHz | dB | dB/m | dB | dBuV | dBuV/m | dBuV/m | dB | |
| 1 * | 2462.000 | 5.57 | 28.64 | 37.56 | 105.59 | 102.24 | 74.00 | 28.24 | peak |
| 2 | 2483.500 | 5.60 | 28.67 | 37.59 | 63.57 | 60.25 | 74.00 | -13.75 | peak |
| 3 | 2483.790 | 5.60 | 28.67 | 37.59 | 64.01 | 60.69 | 74.00 | -13.31 | peak |

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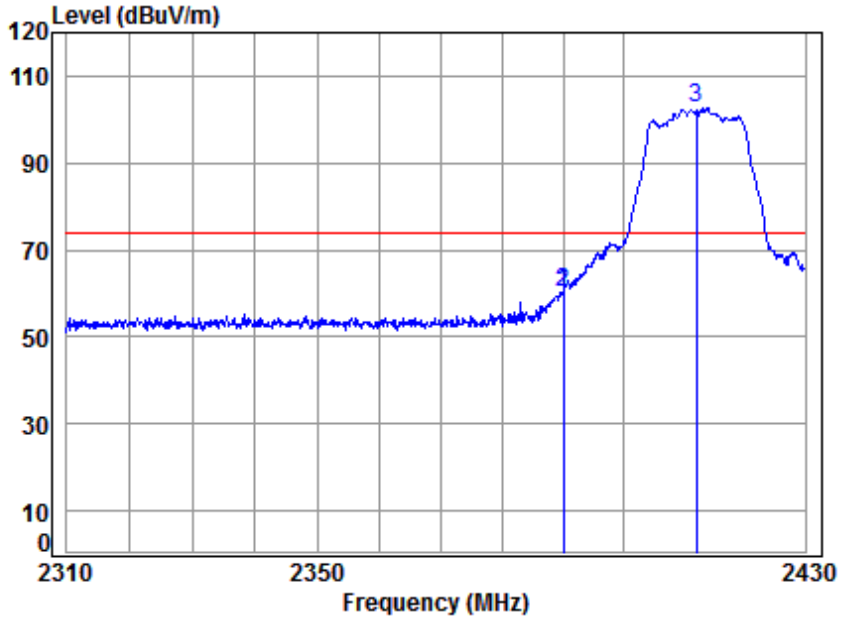
### 4.10.1.11 802.11G_Lowest Channel_ Peak_ Horizontal




Site : chamber
Condition: 3m HORIZONTAL
Job No : 80005
Mode : 2412 Band edge
Note : 2.4G WiFi 11G

| | Freq | Cable Loss | Ant Factor | Preamp Factor | Read Level | Level | Limit Line | Over Limit | Remark |
|---|---|---|---|---|---|---|---|---|---|
| | MHz | dB | dB/m | dB | dBuV | dBuV/m | dBuV/m | dB | |
| 1 | 2389.968 | 5.47 | 28.52 | 37.47 | 63.78 | 60.30 | 74.00 | -13.70 | peak |
| 2 | 2390.000 | 5.47 | 28.52 | 37.47 | 63.78 | 60.30 | 74.00 | -13.70 | peak |
| 3 * | 2412.000 | 5.50 | 28.56 | 37.50 | 106.22 | 102.78 | 74.00 | 28.78 | peak |

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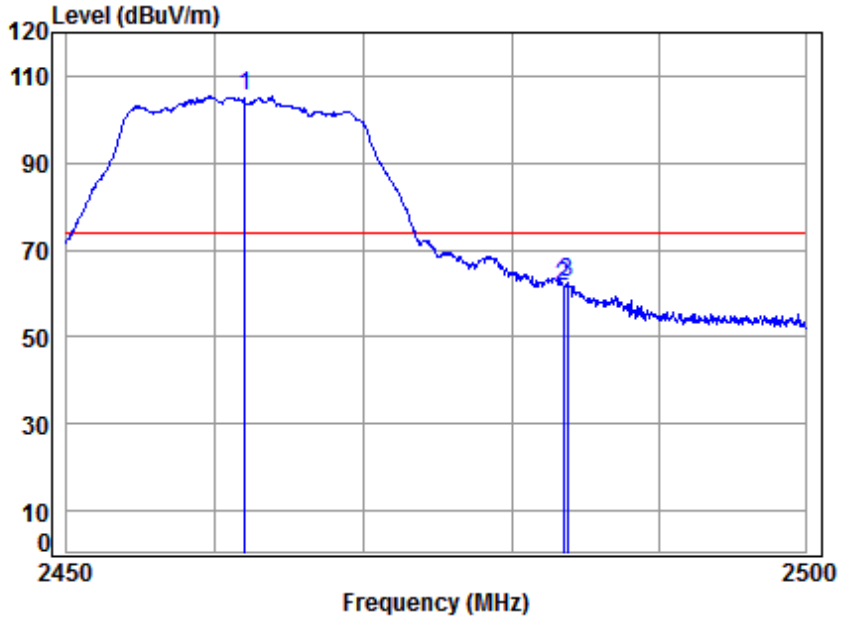
### 4.10.1.12 802.11G_ Highest Channel_ Peak_ Horizontal




Site : chamber
Condition: 3m HORIZONTAL
Job No : 80005
Mode : 2462 Band edge
Note : 2.4G WiFi 11G

| | Freq | Cable Loss | Ant Factor | Preamp Factor | Read Level | Level | Limit Line | Over Limit | Remark |
|---|---|---|---|---|---|---|---|---|---|
| | MHz | dB | dB/m | dB | dBuV | dBuV/m | dBuV/m | dB | |
| 1 * | 2462.000 | 5.57 | 28.64 | 37.56 | 108.66 | 105.31 | 74.00 | 31.31 | peak |
| 2 | 2483.500 | 5.60 | 28.67 | 37.59 | 64.87 | 61.55 | 74.00 | -12.45 | peak |
| 3 | 2483.790 | 5.60 | 28.67 | 37.59 | 65.60 | 62.28 | 74.00 | -11.72 | peak |

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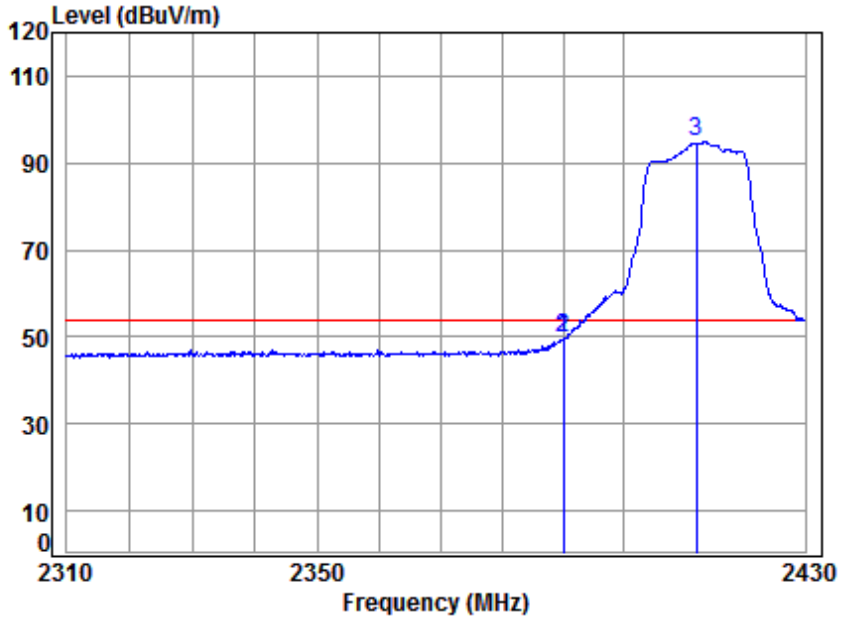
### 4.10.1.13 802.11G_Lowest Channel_ Average_ Vertical




Site : chamber
Condition: 3m VERTICAL
Job No : 80005
Mode : 2412 Band edge
Note : 2.4G WiFi 11G

| | Freq | Cable Loss | Ant Factor | Preamp Factor | Read Level | Level | Limit Line | Over Limit | Remark |
|---|---|---|---|---|---|---|---|---|---|
| | MHz | dB | dB/m | dB | dBuV | dBuV/m | dBuV/m | dB | |
| 1 | 2389.968 | 5.47 | 28.52 | 37.47 | 53.03 | 49.55 | 54.00 | -4.45 | Average |
| 2 | 2390.000 | 5.47 | 28.52 | 37.47 | 53.03 | 49.55 | 54.00 | -4.45 | Average |
| 3 * | 2412.000 | 5.50 | 28.56 | 37.50 | 98.33 | 94.89 | 54.00 | 40.89 | Average |

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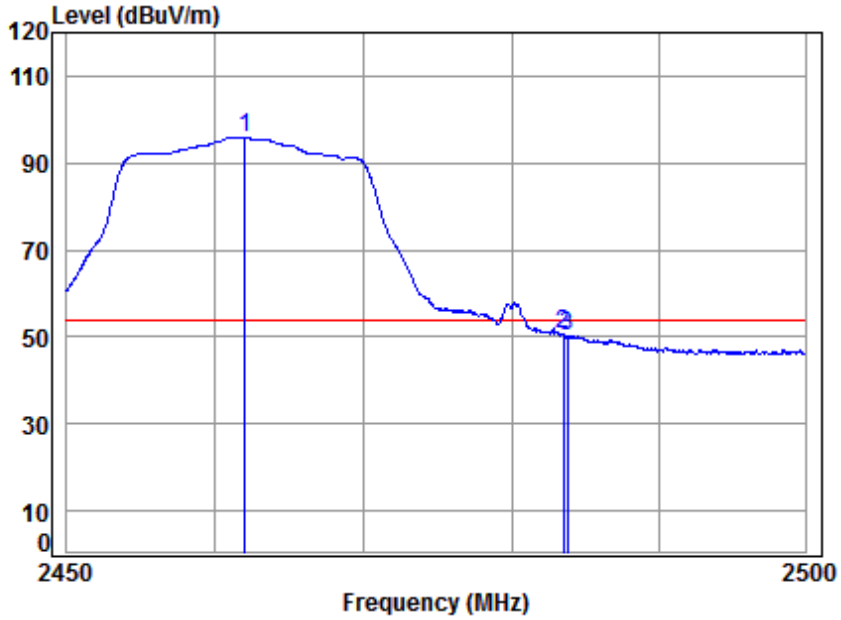
### 4.10.1.14 802.11G_ Highest Channel_ Average _ Vertical




Site : chamber
Condition: 3m VERTICAL
Job No : 80005
Mode : 2462 Band edge
Note : 2.4G WiFi 11G

| | Freq | Cable Loss | Ant Factor | Preamp Factor | Read Level | Level | Limit Line | Over Limit | Remark |
|---|---|---|---|---|---|---|---|---|---|
| | MHz | dB | dB/m | dB | dBuV | dBuV/m | dBuV/m | dB | |
| 1 * | 2462.000 | 5.57 | 28.64 | 37.56 | 99.24 | 95.89 | 54.00 | 41.89 | Average |
| 2 | 2483.500 | 5.60 | 28.67 | 37.59 | 53.84 | 50.52 | 54.00 | -3.48 | Average |
| 3 | 2483.790 | 5.60 | 28.67 | 37.59 | 53.42 | 50.10 | 54.00 | -3.90 | Average |

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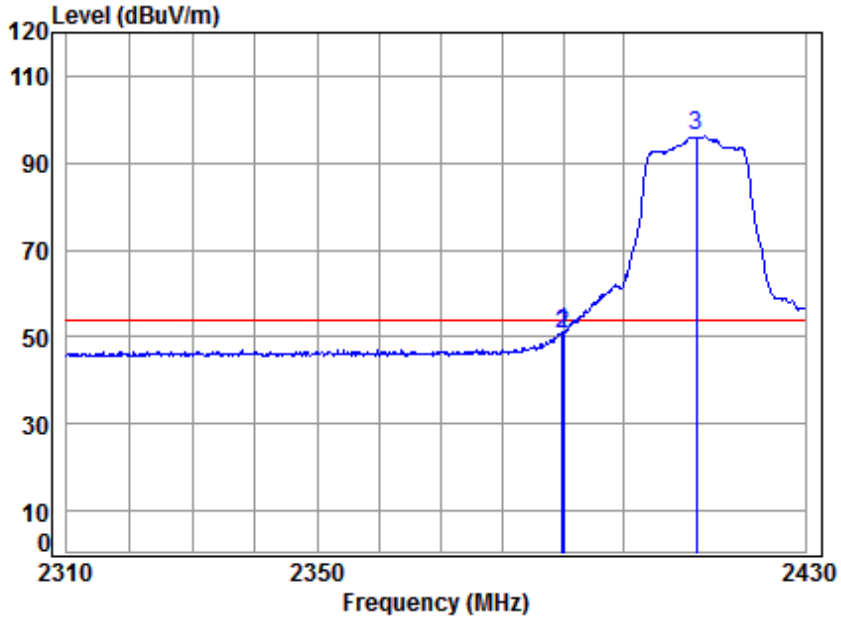
### 4.10.1.15 802.11G_Lowest Channel_ Average _ Horizontal




Site : chamber
Condition: 3m HORIZONTAL
Job No : 80005
Mode : 2412 Band edge
Note : 2.4G WiFi 11G

| | Freq | Cable Loss | Ant Factor | Preamp Factor | Read Level | Level | Limit Line | Over Limit | Remark |
|---|---|---|---|---|---|---|---|---|---|
| | MHz | dB | dB/m | dB | dBuV | dBuV/m | dBuV/m | dB | |
| 1 | 2389.847 | 5.47 | 28.52 | 37.47 | 54.46 | 50.98 | 54.00 | -3.02 | Average |
| 2 | 2390.000 | 5.47 | 28.52 | 37.47 | 54.02 | 50.54 | 54.00 | -3.46 | Average |
| 3 * | 2412.000 | 5.50 | 28.56 | 37.50 | 99.54 | 96.10 | 54.00 | 42.10 | Average |

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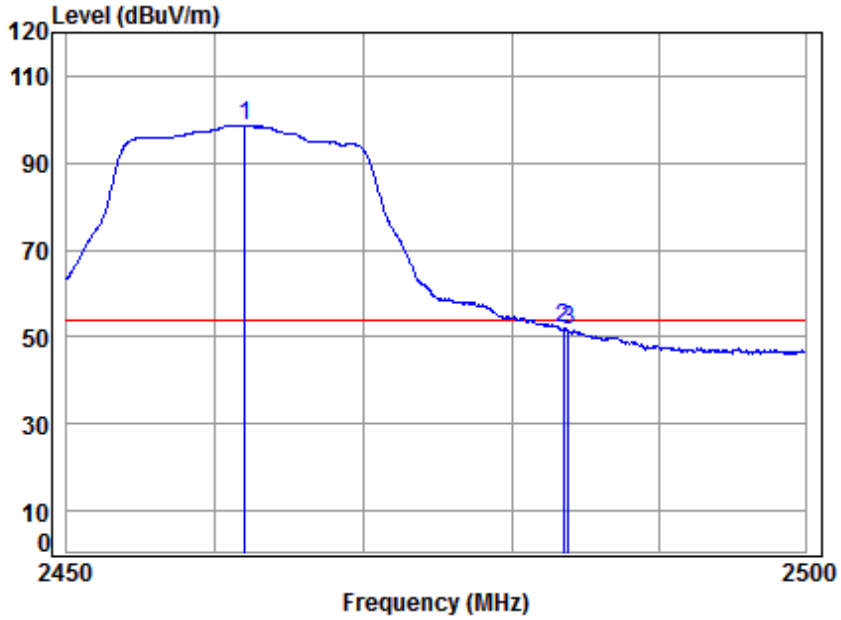
### 4.10.1.16 802.11G_ Highest Channel_ Average_ Horizontal




Site : chamber
Condition: 3m HORIZONTAL
Job No : 80005
Mode : 2462 Band edge
Note : 2.4G WiFi 11G

| | Freq | Cable Loss | Ant Factor | Preamp Factor | Read Level | Level | Limit Line | Over Limit | Remark |
|---|---|---|---|---|---|---|---|---|---|
| | MHz | dB | dB/m | dB | dBuV | dBuV/m | dBuV/m | dB | |
| 1 * | 2462.000 | 5.57 | 28.64 | 37.56 | 102.11 | 98.76 | 54.00 | 44.76 | Average |
| 2 | 2483.500 | 5.60 | 28.67 | 37.59 | 55.31 | 51.99 | 54.00 | -2.01 | Average |
| 3 | 2483.890 | 5.60 | 28.67 | 37.59 | 55.11 | 51.79 | 54.00 | -2.21 | Average |

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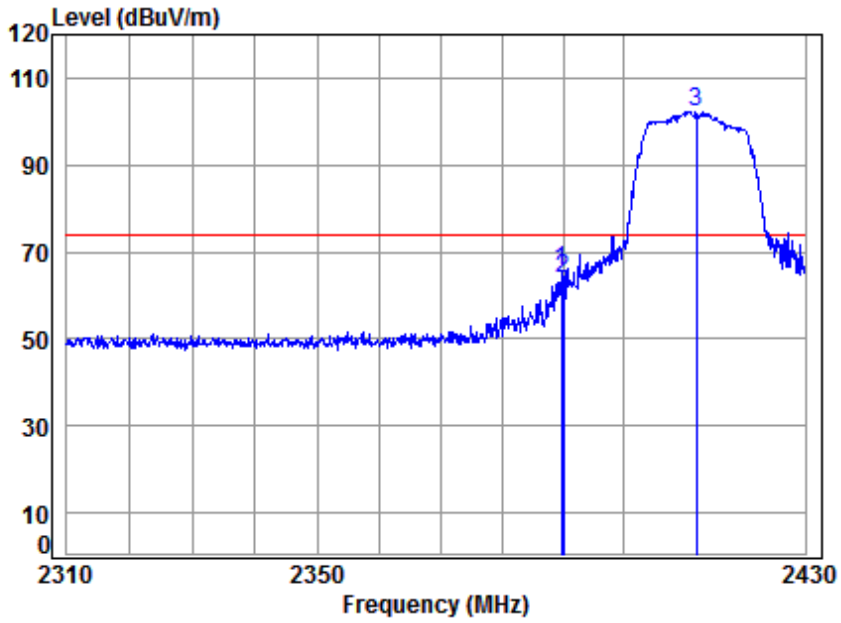
### 4.10.1.17 802.11N20_Lowest Channel_ Peak_ Vertical




Site : chamber
Condition: 3m VERTICAL
Job No : 80005
Mode : 2412 Band edge
Note : 2.4G WiFi 11N 20

| | Freq | Cable Loss | Ant Factor | Preamp Factor | Read Level | Level | Limit Line | Over Limit | Remark |
|---|---|---|---|---|---|---|---|---|---|
| | MHz | dB | dB/m | dB | dBuV | dBuV/m | dBuV/m | dB | |
| 1 | 2389.726 | 5.47 | 28.52 | 37.47 | 69.27 | 65.79 | 74.00 | -8.21 | peak |
| 2 | 2390.000 | 5.47 | 28.52 | 37.47 | 67.20 | 63.72 | 74.00 | -10.28 | peak |
| 3 * | 2412.000 | 5.50 | 28.56 | 37.50 | 105.79 | 102.35 | 74.00 | 28.35 | peak |

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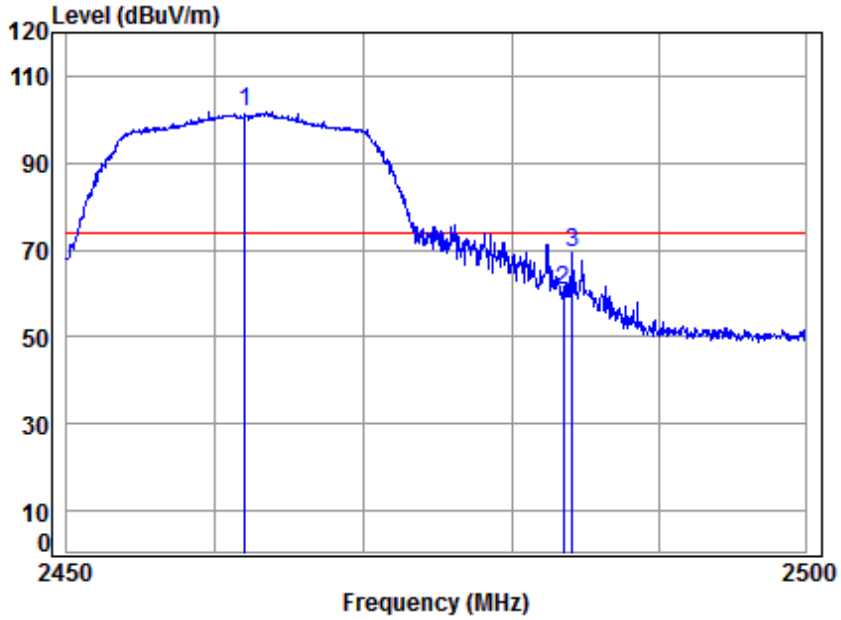
### 4.10.1.18 802.11N20_ Highest Channel_ Peak_ Vertical




Site : chamber
Condition: 3m VERTICAL
Job No : 80005
Mode : 2462 Band edge
Note : 2.4G WiFi 11N 20

| | Freq | Cable Loss | Ant Factor | Preamp Factor | Read Level | Level | Limit Line | Over Limit | Remark |
|---|---|---|---|---|---|---|---|---|---|
| | MHz | dB | dB/m | dB | dBuV | dBuV/m | dBuV/m | dB | |
| 1 * | 2462.000 | 5.57 | 28.64 | 37.56 | 105.20 | 101.85 | 74.00 | 27.85 | peak |
| 2 | 2483.500 | 5.60 | 28.67 | 37.59 | 64.18 | 60.86 | 74.00 | -13.14 | peak |
| 3 | 2484.141 | 5.60 | 28.67 | 37.59 | 72.71 | 69.39 | 74.00 | -4.61 | peak |

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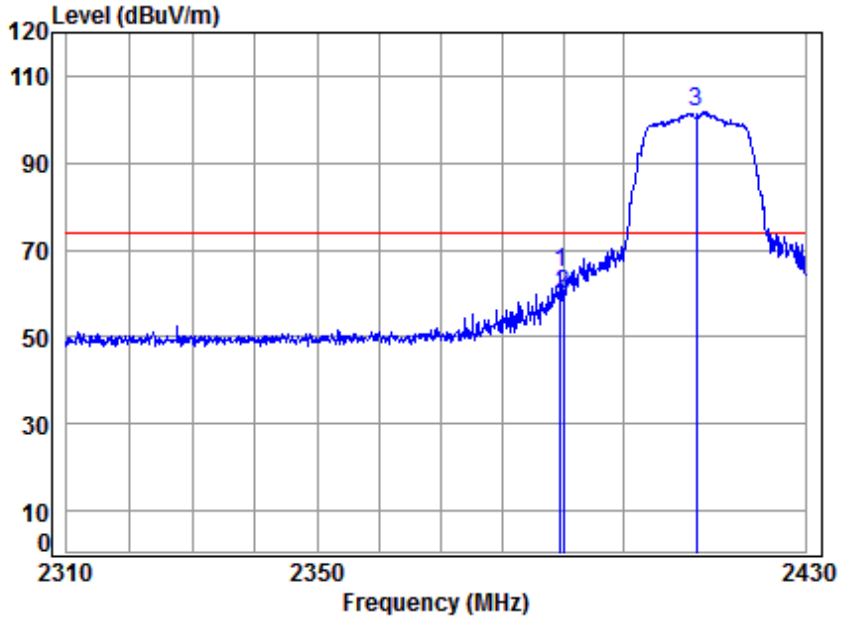
### 4.10.1.19 802.11N20_Lowest Channel_ Peak_ Horizontal




Site : chamber
Condition: 3m HORIZONTAL
Job No : 80005
Mode : 2412 Band edge
Note : 2.4G WiFi 11N 20

| | Freq | Cable Loss | Ant Factor | Preamp Factor | Read Level | Level | Limit Line | Over Limit | Remark |
|---|---|---|---|---|---|---|---|---|---|
| | MHz | dB | dB/m | dB | dBuV | dBuV/m | dBuV/m | dB | |
| 1 | 2389.484 | 5.47 | 28.52 | 37.46 | 68.17 | 64.70 | 74.00 | -9.30 | peak |
| 2 | 2390.000 | 5.47 | 28.52 | 37.47 | 63.16 | 59.68 | 74.00 | -14.32 | peak |
| 3 * | 2412.000 | 5.50 | 28.56 | 37.50 | 105.18 | 101.74 | 74.00 | 27.74 | peak |

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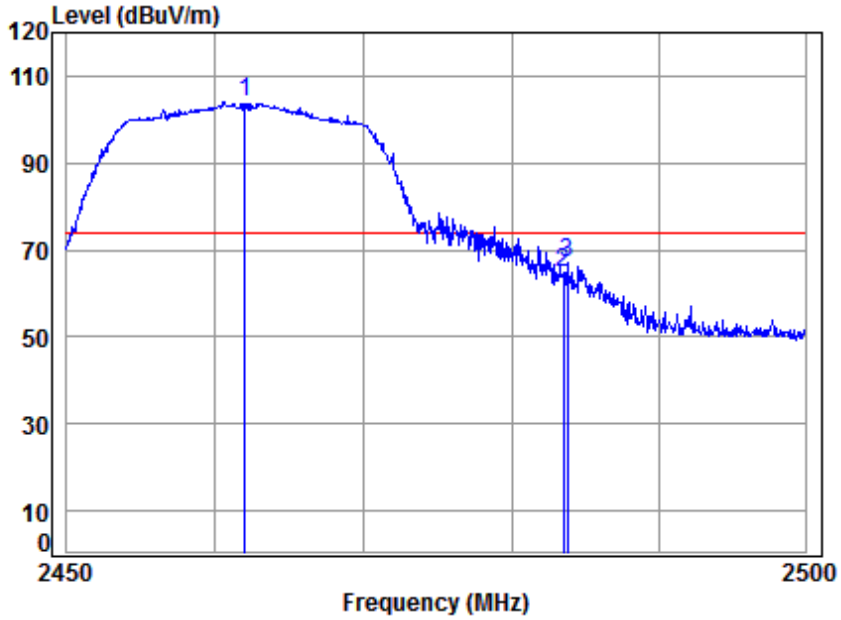
### 4.10.1.20 802.11N20_ Highest Channel_ Peak_ Horizontal




Site : chamber
Condition: 3m HORIZONTAL
Job No : 80005
Mode : 2462 Band edge
Note : 2.4G WiFi 11N 20

| | Freq | Cable Loss | Ant Factor | Preamp Factor | Read Level | Level | Limit Line | Over Limit | Remark |
|---|---|---|---|---|---|---|---|---|---|
| | MHz | dB | dB/m | dB | dBuV | dBuV/m | dBuV/m | dB | |
| 1 * | 2462.000 | 5.57 | 28.64 | 37.56 | 107.26 | 103.91 | 74.00 | 29.91 | peak |
| 2 | 2483.500 | 5.60 | 28.67 | 37.59 | 68.15 | 64.83 | 74.00 | -9.17 | peak |
| 3 | 2483.790 | 5.60 | 28.67 | 37.59 | 70.28 | 66.96 | 74.00 | -7.04 | peak |

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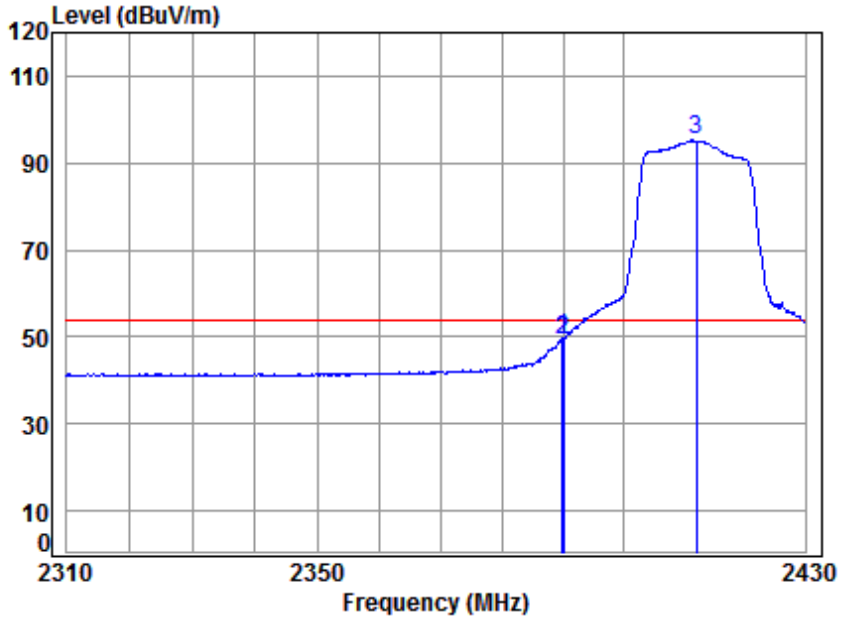
### 4.10.1.21 802.11N20_Lowest Channel_ Average_ Vertical




Site : chamber
Condition: 3m VERTICAL
Job No : 80005
Mode : 2412 Band edge
Note : 2.4G WiFi 11N 20

| | Freq | Cable Loss | Ant Factor | Preamp Factor | Read Level | Level | Limit Line | Over Limit | Remark |
|---|---|---|---|---|---|---|---|---|---|
| | MHz | dB | dB/m | dB | dBuV | dBuV/m | dBuV/m | dB | |
| 1 | 2389.847 | 5.47 | 28.52 | 37.47 | 53.09 | 49.61 | 54.00 | -4.39 | Average |
| 2 | 2390.000 | 5.47 | 28.52 | 37.47 | 52.78 | 49.30 | 54.00 | -4.70 | Average |
| 3 * | 2412.000 | 5.50 | 28.56 | 37.50 | 98.63 | 95.19 | 54.00 | 41.19 | Average |

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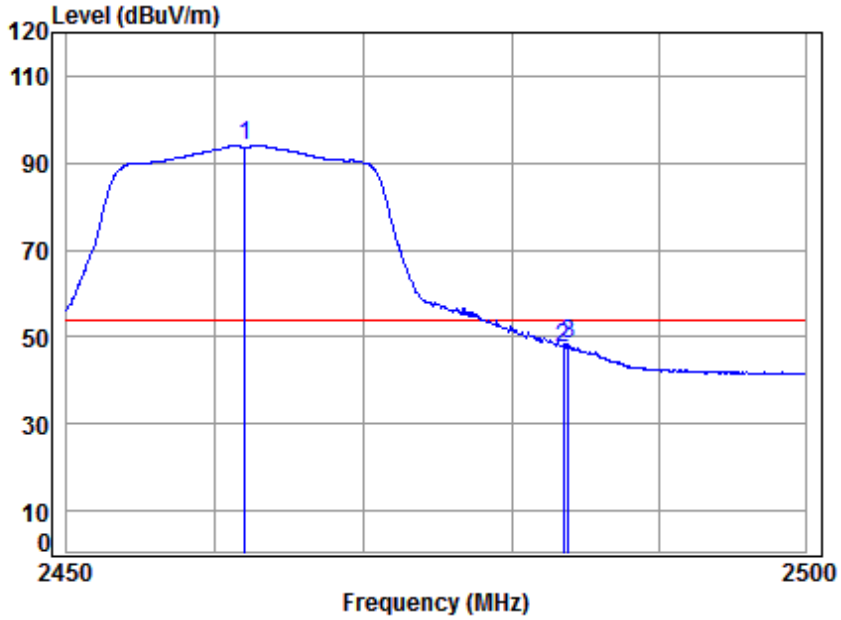
### 4.10.1.22 802.11N20_ Highest Channel_ Average _ Vertical




Site : chamber
Condition: 3m VERTICAL
Job No : 80005
Mode : 2462 Band edge
Note : 2.4G WiFi 11N 20

| | Freq | Cable Loss | Ant Factor | Preamp Factor | Read Level | Level | Limit Line | Over Limit | Remark |
|---|---|---|---|---|---|---|---|---|---|
| | MHz | dB | dB/m | dB | dBuV | dBuV/m | dBuV/m | dB | |
| 1 * | 2462.000 | 5.57 | 28.64 | 37.56 | 97.37 | 94.02 | 54.00 | 40.02 | Average |
| 2 | 2483.500 | 5.60 | 28.67 | 37.59 | 50.96 | 47.64 | 54.00 | -6.36 | Average |
| 3 | 2483.840 | 5.60 | 28.67 | 37.59 | 51.64 | 48.32 | 54.00 | -5.68 | Average |

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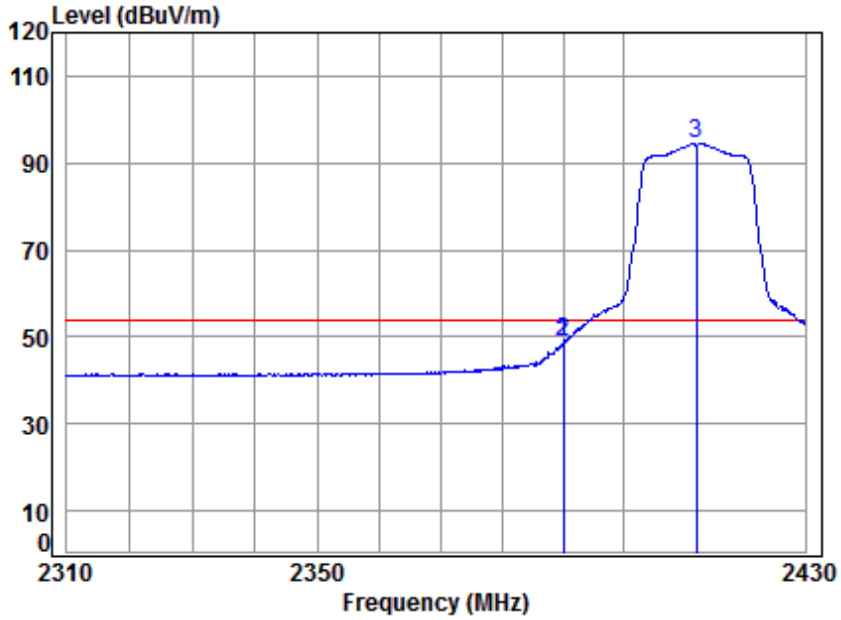
### 4.10.1.23 802.11N20_Lowest Channel_ Average _ Horizontal




Site : chamber
Condition: 3m HORIZONTAL
Job No : 80005
Mode : 2412 Band edge
Note : 2.4G WiFi 11N 20

| | Freq | Cable Loss | Ant Factor | Preamp Factor | Read Level | Level | Limit Line | Over Limit | Remark |
|---|---|---|---|---|---|---|---|---|---|
| | MHz | dB | dB/m | dB | dBuV | dBuV/m | dBuV/m | dB | |
| 1 | 2389.968 | 5.47 | 28.52 | 37.47 | 52.11 | 48.63 | 54.00 | -5.37 | Average |
| 2 | 2390.000 | 5.47 | 28.52 | 37.47 | 52.11 | 48.63 | 54.00 | -5.37 | Average |
| 3 * | 2412.000 | 5.50 | 28.56 | 37.50 | 97.95 | 94.51 | 54.00 | 40.51 | Average |

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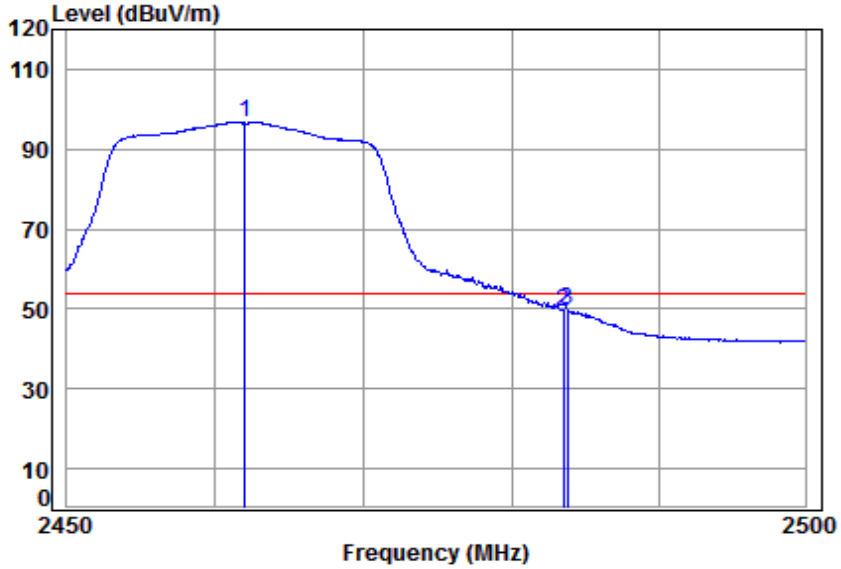
### 4.10.1.24 802.11N20_ Highest Channel_ Average_ Horizontal




Site : chamber
Condition: 3m HORIZONTAL
Job No : 80005
Mode : 2462 Band edge
Note : 2.4G WiFi 11N 20

| | Freq | Cable Loss | Ant Factor | Preamp Factor | Read Level | Level | Limit Line | Over Limit | Remark |
|---|---|---|---|---|---|---|---|---|---|
| | MHz | dB | dB/m | dB | dBuV | dBuV/m | dBuV/m | dB | |
| 1 * | 2462.000 | 5.57 | 28.64 | 37.56 | 100.23 | 96.88 | 54.00 | 42.88 | Average |
| 2 | 2483.500 | 5.60 | 28.67 | 37.59 | 52.77 | 49.45 | 54.00 | -4.55 | Average |
| 3 | 2483.790 | 5.60 | 28.67 | 37.59 | 53.10 | 49.78 | 54.00 | -4.22 | Average |

*Remark:*
*The field strength is calculated by adding the Antenna Factor, Cable Factor & Preamplifier. The basic equation with a sample calculation is as follows:*
*Final Test Level =Receiver Reading + Antenna Factor + Cable Factor – Preamplifier Factor*

All Modes have been tested, but only the worst case data displayed in this report.

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# 5 Photographs - EUT Constructional Details

Refer to Appendix A - Photographs of EUT Constructional Details for HR201880006.

The End

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