# Certification Test Report

**FCC ID: 2ADDKFLY4KW11**
**IC: 12404A-FLY4KW01**

**FCC Rule Part: 15.407**
**ISED Canada's Radio Standards Specification: RSS-247**

**Report Number: BO72136175.402**

Applicant: 360fly, Inc.

Model(s): FLY4KW01 and FLY4KW11

Test Begin Date: **September 28, 2017**
Test End Date: **October 25, 2017**

Report Issue Date: April 2, 2018

FOR THE SCOPE OF ACCREDITATION UNDER CERTIFICATE NUMBER 2955.15

This report must not be used by the client to claim product certification, approval, or endorsement by A2LA, ANSI, or any agency of the Federal Government.

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**This report contains 47 pages**

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# 1 GENERAL

## 1.1 Purpose

The purpose of this report is to demonstrate compliance with Part 15 Subpart C of the FCC's Code of Federal Regulations Section 15.407 and Innovation Science and Economic Development Canada's Radio Standards Specification RSS-247 for the tests documented herein.

## 1.2 Applicant Information

360fly, Inc.
1975 East Sunrise Blvd., Suite 400
Fort Lauderdale, FL 33304

## 1.3 Product Description

The 360fly, Inc. models FLY4KW01 and FLY4KW11 360-degree cameras which can be body-worn or installed in vehicles. The two models are identical and differ only by the top housing design. The cameras provide Bluetooth and 2.4/5 GHz Wi-Fi connectivity. This test report documents the compliance of the 5 GHz Wi-Fi Transmitter.

Technical Details
Mode of Operation: 5 GHz WLAN IEEE 802.11a/n/ac
Modulations: OFDM
Antenna Type/Gain: Loop with parasitic antenna, -0.36 dBi
Input Power: 5 VDC USB, 4 VDC Dock.

**Table 1.3-1: 5 GHz WLAN Specifications**

| Band of Operation (MHz) | Mode of Operation | Frequency Range (MHz) | Number of Available Channels | Channel Spacing (MHz) | Data Rates (Mbps) |
|---|---|---|---|---|---|
| 5150 – 5250 (U-NII-1) | 802.11a | 5180 – 5240 | 4 | 20 | 6, 9, 12, 18, 24, 36, 48, 54 |
| | 802.11n (HT20) | 5180 – 5240 | 4 | 20 | 6.5, 13, 19.5, 26, 52, 58.5, 65, 72.2 |
| | 802.11 ac (VHT20) | 5180 – 5240 | 4 | 20 | 6.5, 13, 19.5, 26, 39, 52, 58.5, 65, 78, 86.5 |
| | 802.11n (HT40) | 5190 – 5230 | 2 | 40 | 13, 27, 40.5, 54, 81, 108, 121.5, 135 |
| | 802.11ac (VHT40) | 5190 – 5230 | 2 | 40 | 13.5, 27, 40.5, 54, 81, 108, 121.5, 135, 162, 180 |
| | 802.11ac (VHT80) | 5210 | 1 | N/A | 29.3, 58.5, 87.8, 117, 175.5, 234, 263.3, 292.5, 351, 390 |

Model Number: FLY4KW01 and FLY4KW11

Test Sample Serial Number(s): 1708174355 (RF Conducted Measurements), 1709174742 (Radiated and Power Line Conducted Emissions).

Test Sample Condition: The samples were in good operating condition with no physical damages.

### 1.4 Test Methodology and Considerations

The EUT was evaluated for RF Conducted, Radiated and Power Line Conducted emissions. All the available data rates were inverstigated. Where applicable, the data rate leading to the highest emissions with respect to the limits are reported. All the measurements were performed on the FLY4KW01 model and the results are deemed representative of both model variants.

Preliminary radiated emission measurements were performed for the EUT standalone, the EUT powered via USB and the EUT set within the dock. Additionally, the EUT worst position with respect to the ground plane was investigated as well. The configuration with the dock led to the highest emissions. The EUT set sideways on the table top was determined as the worst case orientation. The results reported accordingly.

The RF conducted measurements were performed on a sample modified with a temporary RF connnector to allow direct coupling to the spectrum analyzer.

The power line conducted emission measurements were performed on the EUT powered via USB using an off-the-shelf power supply.

The EUT was also investigated for compliance to the unintentional emission requirements. The results are documented in a verification test report.

**Table 1.4-1: IEEE 802.11a/n/ac Radio Test Configuration**

| Mode of Operation | Frequency (MHz) | Channel | Test Software Power Setting | Data Rate (Mbps) |
|---|---|---|---|---|
| 802.11a | 5180 | 36 | 14 | 6 |
| | 5200 | 40 | | |
| | 5240 | 48 | | |
| 802.11n 20 MHz (HT20) | 5180 | 36 | 14 | 6.5 |
| | 5200 | 40 | | |
| | 5240 | 48 | | |
| 802.11n 40 MHz (HT40) | 5190 | 38 | 13 | 13 |
| | 5230 | 46 | | |
| 802.11ac 80 MHz (VHT80) | 5210 | 42 | 13 | 29.3 |

**Note: 802.11n(HT20) and 802.11n(HT40) test results are deemed representative of the 802.11ac(VHT20) and 802.11ac(VHT40), respectively.**

# 2 TEST FACILITIES

## 2.1 Location

The radiated and conducted emissions test sites are located at the following address:

TÜV SÜD America, Inc.
3998 FAU Blvd, Suite 310
Boca Raton, Florida 33431
Phone: (561) 961-5585
Fax: (561) 961-5587
http://www.tuv-sud-america.com

## 2.2 Laboratory Accreditations/Recognitions/Certifications

TÜV SÜD America, Inc. is accredited to ISO/IEC 17025 by American Association for Laboratory Accreditation (A2LA) and has been issued certificate number 2955.15 in recognition of this accreditation. Unless otherwise specified, all test methods described within this report are covered under the ISO/IEC 17025 scope of accreditation.

FCC Test Firm Registration #: 475089
Innovation, Science and Economic Development Canada Lab Code: 4175C

## 2.3 Radiated & Conducted Emissions Test Site Description

### 2.3.1 Semi-Anechoic Chamber Test Site

The EMC radiated test facility consists of an RF-shielded enclosure. The interior dimensions of the indoor semi-anechoic chamber are approximately 48 feet (14.6 m) long by 36 feet (10.8 m) wide by 24 feet (7.3 m) high and consist of rigid, 1/8 inch (0.32 cm) steel-clad, wood core modular panels with steel framing. In the shielded enclosure, the faces of the panels are galvanized and the chamber is self-supporting. 8-foot RF absorbing cones are installed on 4 walls and the ceiling. The steel-clad ground plane is covered with vinyl flooring.

The turntable is driven by pneumatic motor, which can support a 2000 lb. load. The turntable is flush with the chamber floor which it is connected to, around its circumference, with a continuous metallic loaded spring. An EMCO Model 1060 Multi-device controller controls the turntable position.

A pneumatic motor is used to control antenna polarizations and height relative to the ground. The height information is displayed on the control unit EMCO Model 1050.

The control room is an RF shielded enclosure attached to the semi-anechoic chamber with two bulkhead panels for connecting RF, and control cables. The dimension of the room is 7.3 m x 4.9 m x 3 m high and the entrance doors of both control and conducted rooms are 3 feet (0.91 m) by 7 feet (2.13 m).

A diagram of the Semi-Anechoic Chamber Test Site is shown in Figure 2.3.1-1 below:

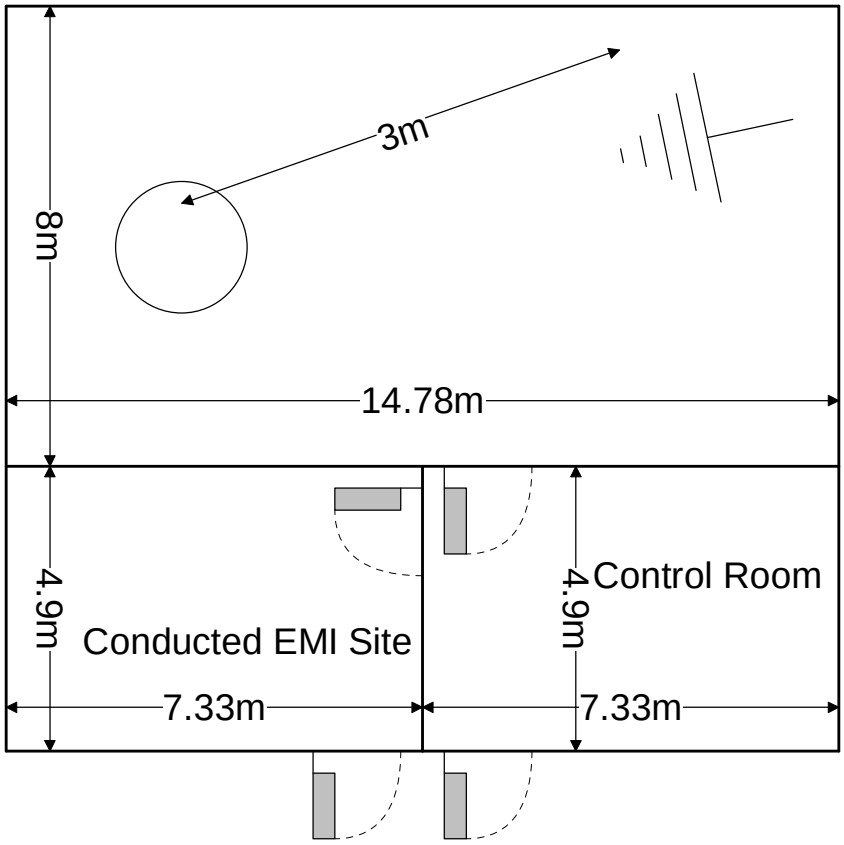



**Figure 2.3.1-1: Semi-Anechoic Chamber Test Site**

### 2.3.2 Conducted Emissions Test Site Description

The dimensions of the shielded conducted room are 7.3 x 4.9 x 3 $m^3$. The power line conducted emission site includes two LISNs: a Solar Model 8028-50 50 Ω/50 µH and an EMCO Model 3825/2R, which are installed as shown in the figure below. For evaluations requiring 230 V, 50 Hz AC input, a Polarad LISN (S/N 879341/048) is used in conjunction with a California Instruments signal generator Model 2001RP-OP1.

A diagram of the room is shown below in figure 2.3.2-1:

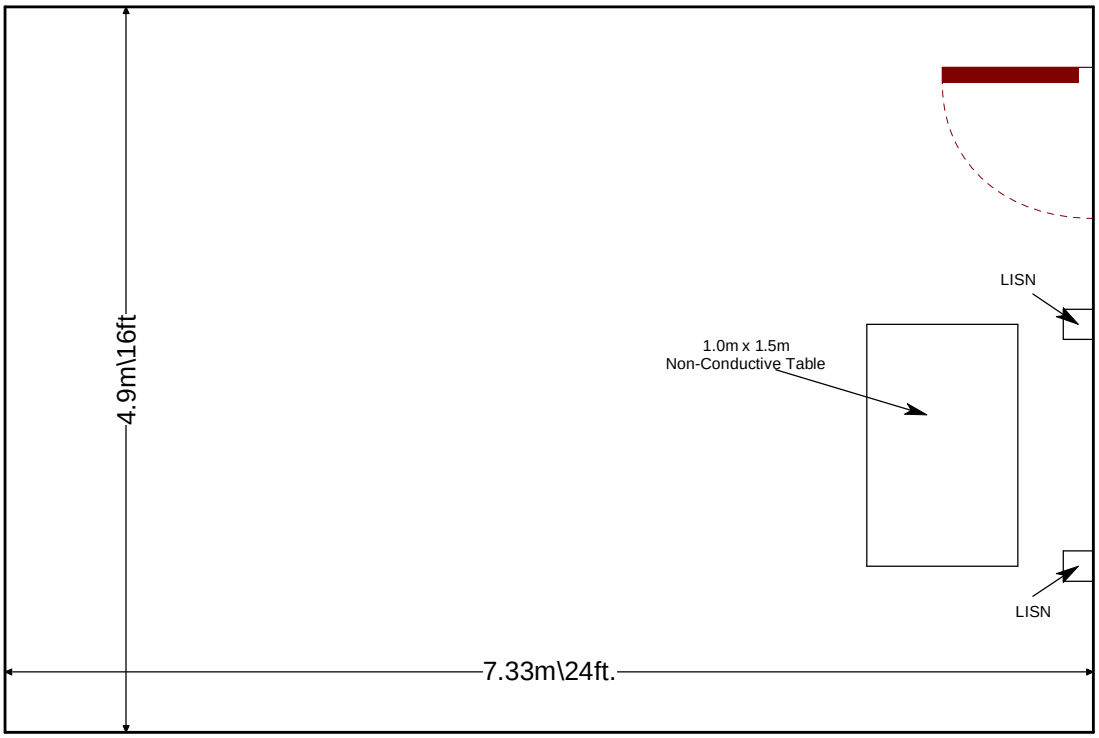



**Figure 2.3.2-1: AC Mains Conducted EMI Site**

## 3 APPLICABLE STANDARD REFERENCES

The following standards were used:

- ANSI C63.10-2013: American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices
- US Code of Federal Regulations (CFR): Title 47, Part 2, Subpart J: Equipment Authorization Procedures, 2018.
- US Code of Federal Regulations (CFR): Title 47, Part 15, Subpart C: Radio Frequency Devices, Intentional Radiators, 2018
- FCC OET KDB Publication No. 789033 D02 General U-NII Test Procedures New Rules v02r01: Guidelines for Compliance Testing of Unlicensed National Information Infrastructure (U-NII) Devices Part 15, Subpart E, December 14, 2017.
- FCC OET KDB Publication No. 905462 D06 802.11 Channel Plans New Rules v02: Operation in U-NII Bands – 802.11 Channel Plan, 15.407.
- Innovation, Science and Economic Development Canada Radio Standards Specification: RSS-247 — Digital Transmission Systems (DTSs), Frequency Hopping Systems (FHSs) and Licence-Exempt Local Area Network (LE-LAN) Devices, Issue 2, February 2017.
- Innovation, Science and Economic Development Canada Radio Standards Specification: RSS-GEN – General Requirements for Compliance of Radio Apparatus, Issue 4, Amendment 1, March 2018.

## 4 LIST OF TEST EQUIPMENT

The calibration interval of test equipment is annually or the manufacturer's recommendations. Where the calibration interval deviates from the annual cycle based on the instrument manufacturer's recommendations, it shall be stated below.

**Table 4-1: Test Equipment List**

| AssetID | Manufacturer | Model # | Equipment Type | Serial # | Last Calibration Date | Calibration Due Date |
|---|---|---|---|---|---|---|
| 282 | Microwave Circuits | H2G020G4 | Filters | 74541 | 5/23/2017 | 5/23/2018 |
| 283 | Rohde & Schwarz | FSP40 | Spectrum Analyzers | 1000033 | 7/21/2016 | 7/21/2018 |
| 332 | Rohde & Schwarz | TS-PR40 | Amplifiers | 100021 | 3/14/2016 | 3/14/2018 |
| 333 | Rohde&Schwarz | 3160-10 | Antennas | 45576 | 11/4/2010 | NCR |
| 479 | Electro-Metrics | ALP-70 | Antennas | 158 | 12/3/2015 | 12/3/2017 |
| 523 | Agilent | E7405 | Spectrum Analyzers | MY45103293 | 12/9/2016 | 12/9/2018 |
| 653 | Suhner | SF-102A | Cables | 0944/2A | 9/5/2017 | 9/5/2018 |
| 2002 | EMCO | 3108 | Antennas | 2147 | 11/19/2015 | 11/19/2017 |
| 2004 | EMCO | 3146 | Antennas | 1385 | 11/19/2015 | 11/19/2017 |
| 2006 | EMCO | 3115 | Antennas | 2573 | 4/7/2017 | 4/7/2019 |
| 2008 | COM-Power | AH-826 | Antennas | 81009 | NCR | NCR |
| 2045 | ACS Boca | Conducted Cable Set | Cable Set | 2045 | 10/31/2016 | 10/31/2017 |
| 2082 | Teledyne Storm Products | 90-010-048 | Cables | 2082 | 4/7/2017 | 4/7/2018 |
| 2086 | Merrimac | FAN-6-10K | Attenuators | 23148-83-1 | 11/2/2016 | 11/2/2017 |
| 2089 | Agilent Technologies, Inc. | 83017A | Amplifiers | 3123A00214 | 12/2/2016 | 12/2/2017 |
| 2095 | ETS Lindgren | TILE4! - Version 4.2.A | Software | 85242 | NCR | NCR |
| 2102 | Test Equity | 115 | Environmental Chamber | 150892 | NCR | NCR |
| 2108 | Fluke | 115 | Digital MultiMeter | 99211160 | 4/25/2017 | 4/25/2018 |
| 2111 | Aeroflex Inmet | 40AH2W-20 | Attenuator | 2111 | 7/20/2017 | 7/20/2018 |
| 2112 | Teledyne Storm Products | 921-0101-036 | Cables | 12-06-698 | 11/2/2016 | 11/2/2017 |
| 2121 | ACS Boca | Radiated Cable Set | Cable Set | 2121 | 7/31/2017 | 7/31/2018 |
| 2124 | Fluke | 51II | Digital Thermometer | 97060019 | 6/1/2017 | 6/1/2018 |
| 3004 | Teseq | CFL 9206A | Attenuators | 34720 | 8/29/2017 | 8/29/2018 |
| TEMC00153 | Rohde and Schwarz | ESH3-Z5 | LISN | 894785/012 | 9/27/2017 | 9/27/2018 |

**Notes:**

- **NCR=No Calibration Required**
- **The assets were only used during the active period of the calibration cycle.**

## 5 SUPPORT EQUIPMENT

**Table 5-1: EUT and Support Equipment Description – Radiated Emissions**

| Item # | Type Device | Manufacturer | Model/Part # | Serial # |
|---|---|---|---|---|
| 1 | EUT | 360fly, Inc. | FLY4KW01 | 1709174742 |
| 2 | Car Cradle | 360fly, Inc. | FLYCRD01 | N/A |
| 3 | Cigarette Lighter Adapter (CLA) | N/A | N/A | N/A |
| 4 | Power Supply | MPJA | HY5003 | 3700278 |

**Table 5-2: Cable Description – Radiated Emissions**

| Cable # | Cable Type | Length | Shield | Termination |
|---|---|---|---|---|
| A | DC Cable | 2.05 m | No | CLA to EUT |
| B | DC Leads | 2.9 m | No | CLA to Power Supply |
| C | Power Cord | 2.3 m | No | Power Supply to AC Mains |

**Table 5-3: EUT and Support Equipment Description – Power Line Conducted Emissions**

| Item # | Type Device | Manufacturer | Model/Part # | Serial # |
|---|---|---|---|---|
| 1 | EUT | 360fly, Inc. | FLY4KW01 | 1709174742 |
| 2 | 5 VDC Power Supply | VSN Mobil | C-P06 | 141119001574 |

**Table 5-4: Cable Description – Power Line Conducted Emissions**

| Cable # | Cable Type | Length | Shield | Termination |
|---|---|---|---|---|
| A | USB Cable | 0.98 m | No | EUT to Power Supply |
| B | Extension Cord | 1.85 m | No | Power Supply to AC Mains |

## 6 EQUIPMENT UNDER TEST SETUP BLOCK DIAGRAM

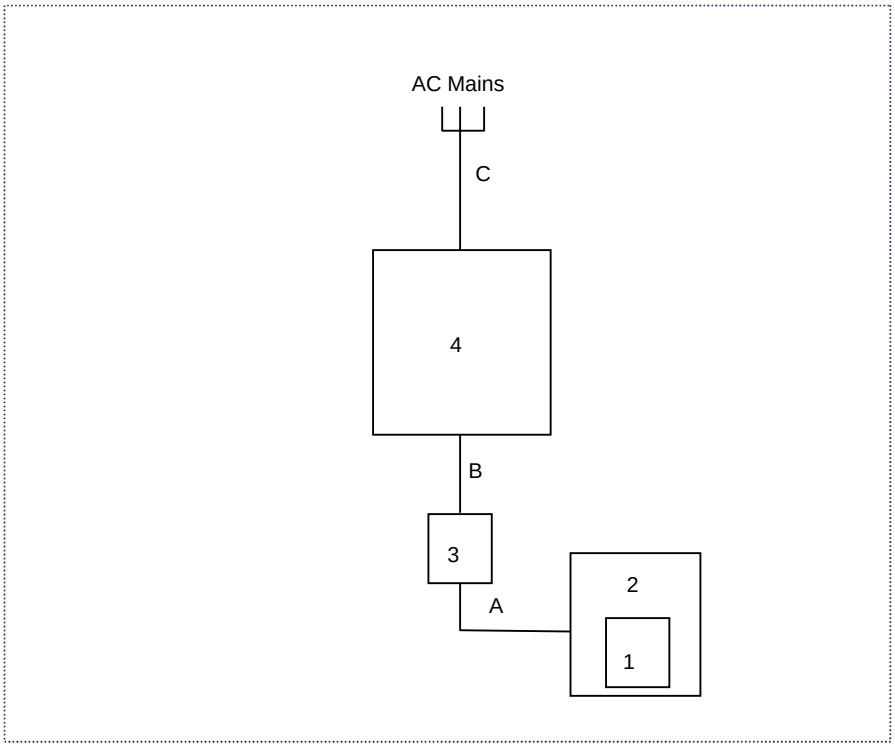



**Figure 6-1: EUT and Support Equipment Block Diagram – Radiated Emissions**

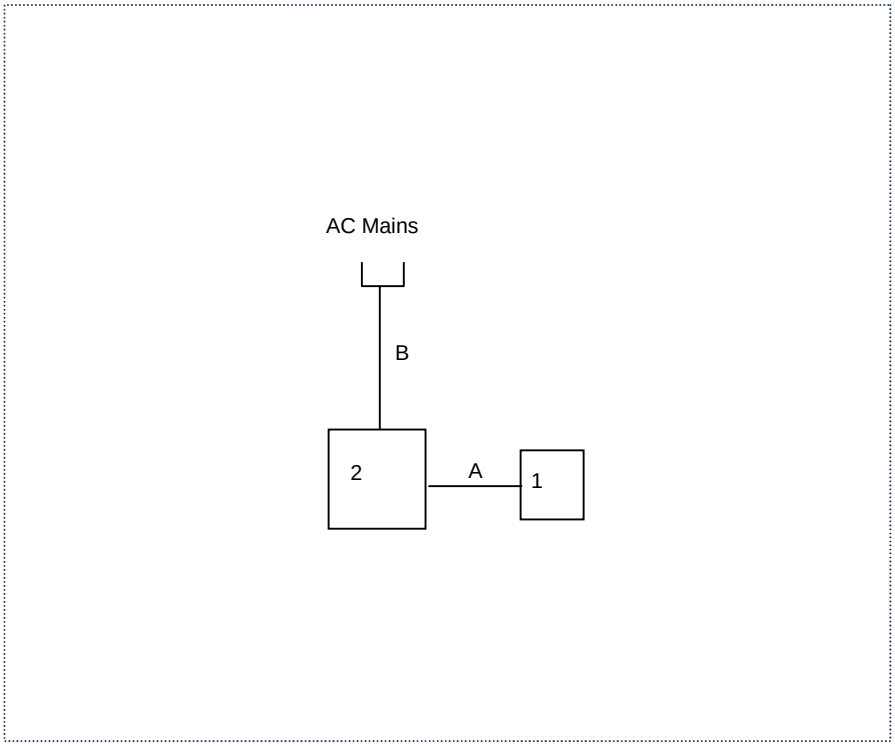



**Figure 6-2: EUT and Support Equipment Block Diagram – Power Line Conducted Emissions**

# 7 SUMMARY OF TESTS

Along with the tabular data shown below, plots were taken of all signals deemed important enough to document.

## 7.1 Antenna Requirement – FCC: Section 15.203

The EUT uses an internal -0.36 dBi loop with parasitic antenna that is connected to the main PCB via contact springs. The antenna is not replacable without damaging the equipment and therefore meets the reguirements of FCC Section 15.203.

## 7.2 26 dB Emission Bandwidth / Occupied Bandwidth - FCC: Section 15.407(e); ISED Canada: RSS-247 6.2, RSS-GEN 6.6

### 7.2.1 Measurement Procedure

The 26 dB Emission Bandwidth (EBW) was measured in accordance with the FCC KDB Publication No. 789033 D02 General UNII Test Procedures New Rules v01r04 “Guidelines for Compliance Testing of Unlicensed National Information Infrastructure (U-NII) Devices Part 15, Subpart E” Emission Bandwidth (EBW). The RBW was set to approximately 1% of the emission bandwidth. The bandwidth was measured as the maximum width of the emission that is 26 dB down form the maximum of the emission.

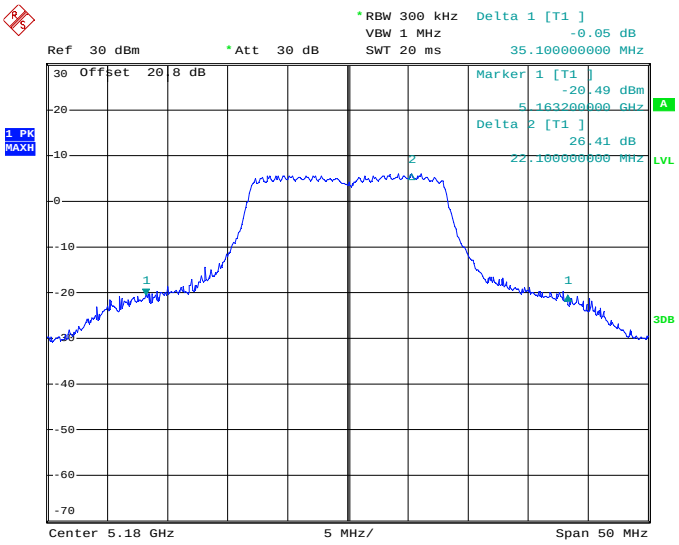
The 99% occupied bandwidth was measured with the spectrum analyzer span set to fully display the emission, including the emissions skirts. The RBW was to 1% to 5% of the occupied bandwidth. The occupied 99% bandwidth was measured using the occupied bandwidth function of the analyzer.

### 7.2.2 Measurement Results

Performed by: Thierry Jean-Charles

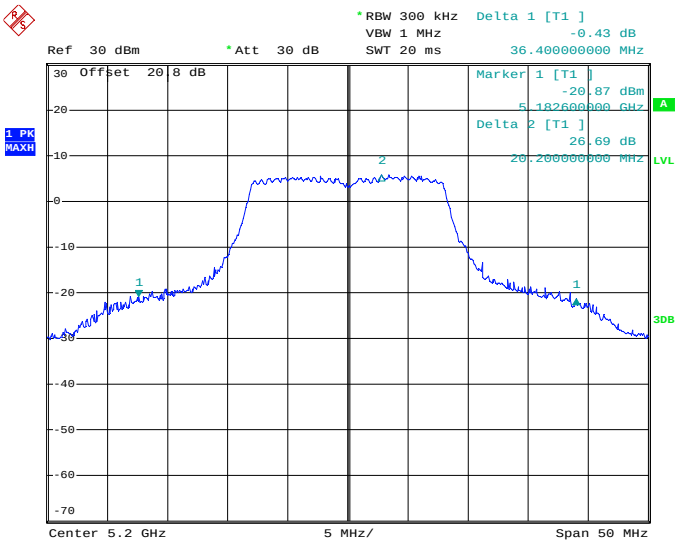
**Table 7.2.2-1: EBW / 99% Bandwidth – 802.11a**

| Frequency (MHz) | 26 dB Bandwidth (MHz) | 99% Bandwidth (MHz) |
|---|---|---|
| 5180 | 35.1 | 18.4 |
| 5200 | 36.4 | 18.3 |
| 5240 | 33.7 | 18.3 |



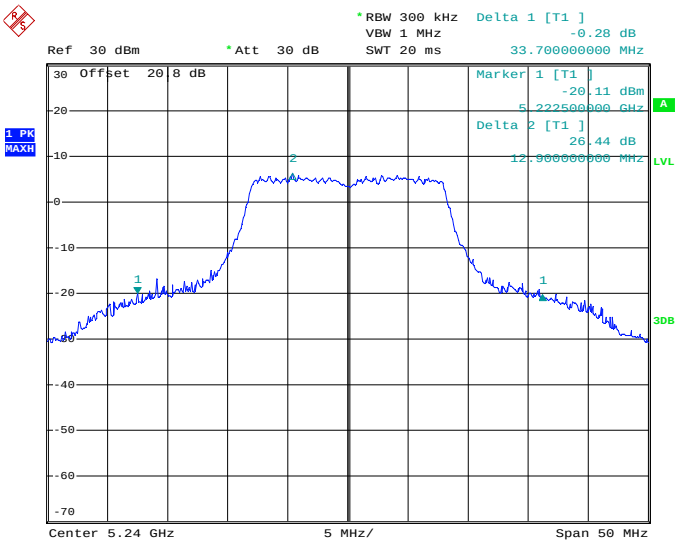

Date: 19.OCT.2017 14:02:09

**Figure 7.2.2-1: 26 dB EBW - Low Channel – 802.11a**



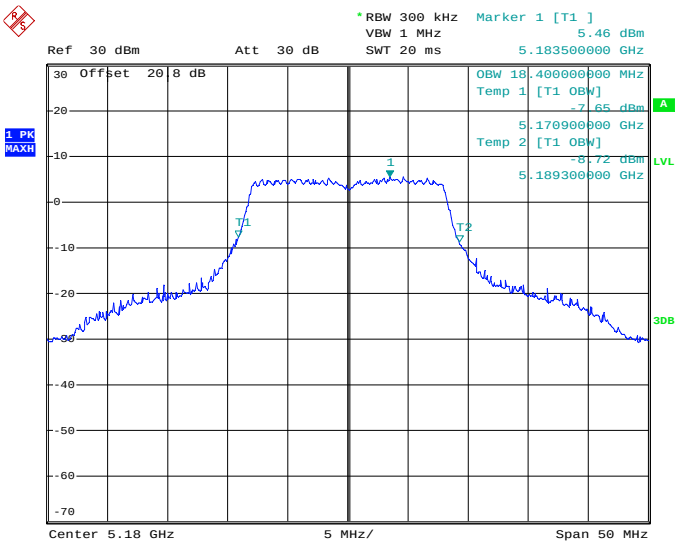

Date: 19.OCT.2017 13:58:25

**Figure 7.2.2-2: 26 dB EBW - Middle Channel – 802.11a**




Date: 19.OCT.2017 14:05:20

**Figure 7.2.2-3: 26 dB EBW - High Channel – 802.11a**




Date: 19.OCT.2017 11:15:57

**Figure 7.2.2-4: 99% OBW - Low Channel – 802.11a**

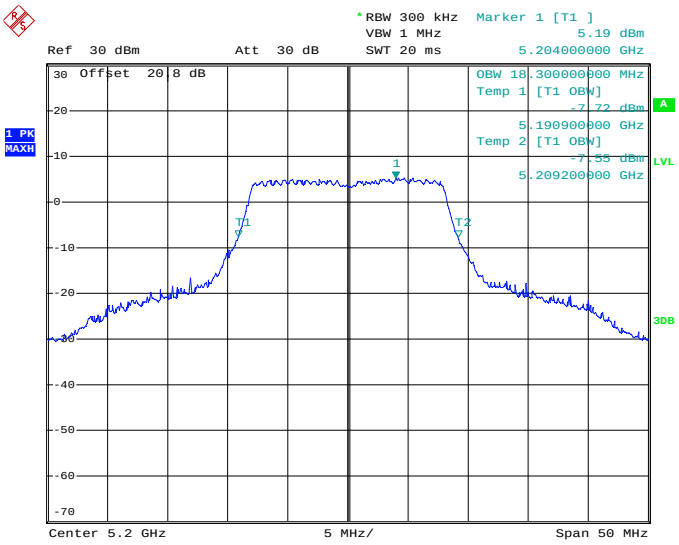



**Figure 7.2.2-5: 99% OBW - Middle Channel – 802.11a**

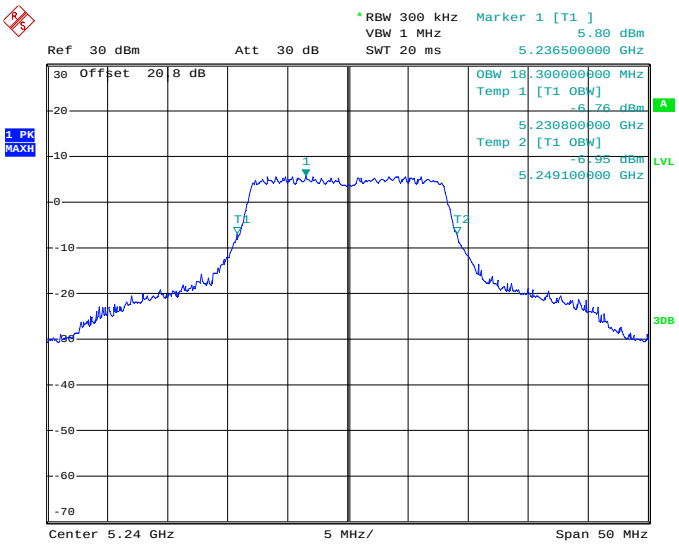



**Figure 7.2.2-6: 99% OBW - High Channel – 802.11a**

**Table 7.2.2-2: EBW / 99% Bandwidth – 802.11n 20 MHz**

| Frequency (MHz) | 26 dB Bandwidth (MHz) | 99% Bandwidth (MHz) |
|---|---|---|
| 5180 | 37.3 | 19.1 |
| 5200 | 37.5 | 19.1 |
| 5240 | 37.7 | 19.0 |

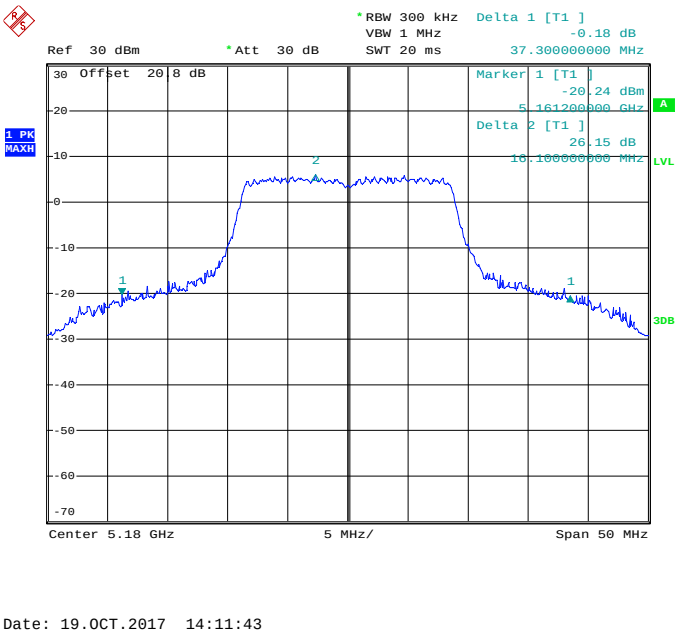



**Figure 7.2.2-7: 26 dB EBW - Low Channel – 802.11n 20 MHz**

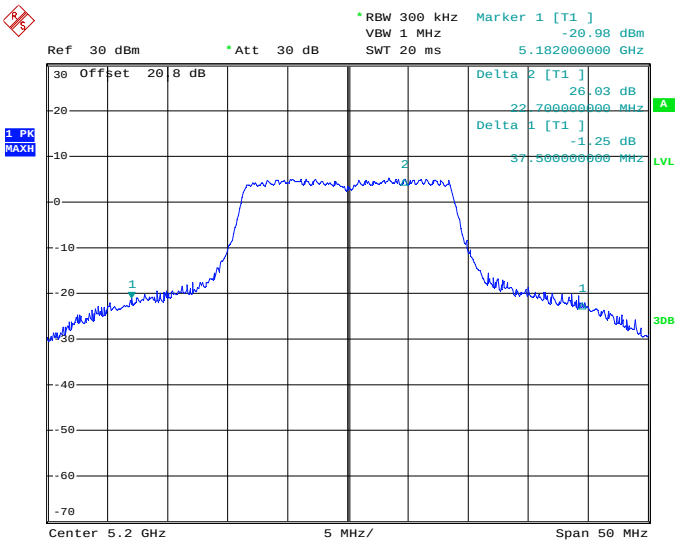



**Figure 7.2.2-8: 26 dB EBW - Middle Channel – 802.11n 20 MHz**

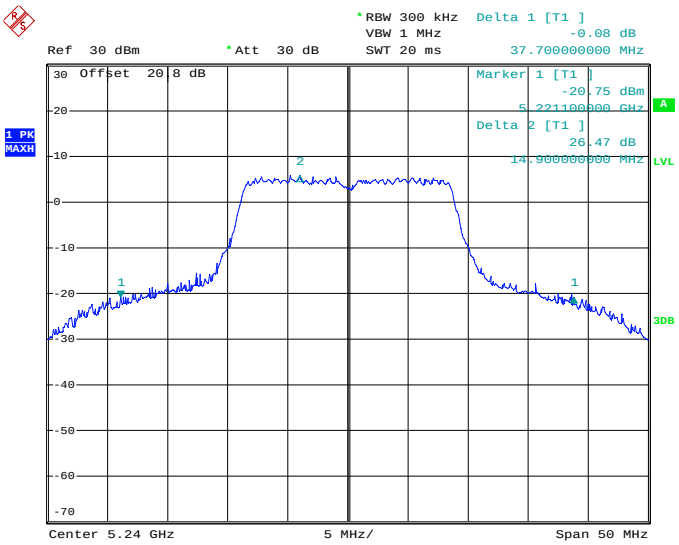



**Figure 7.2.2-9: 26 dB EBW - High Channel – 802.11n 20 MHz**

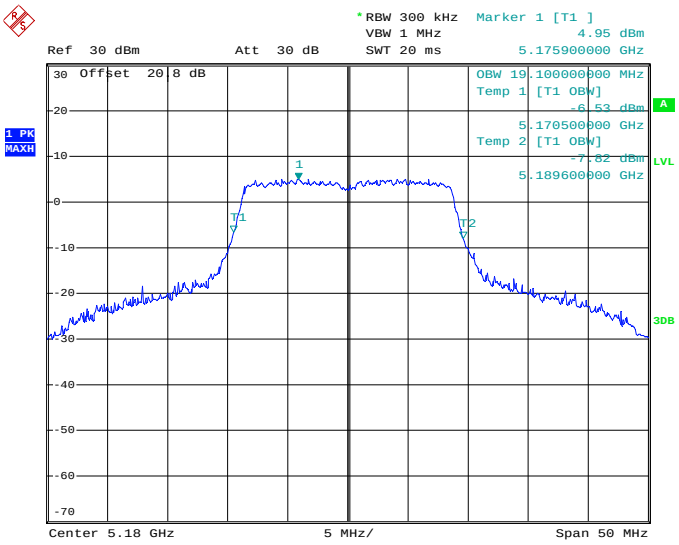



**Figure 7.2.2-10: 99% OBW - Low Channel – 802.11n 20 MHz**

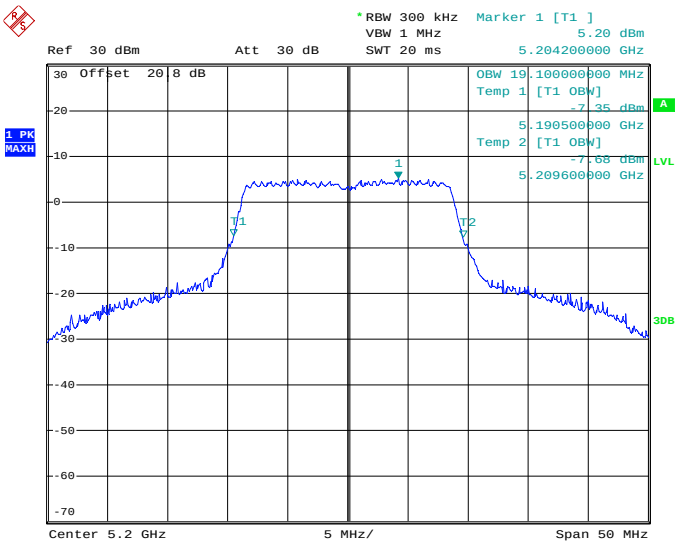



**Figure 7.2.2-11: 99% OBW - Middle Channel – 802.11n 20 MHz**

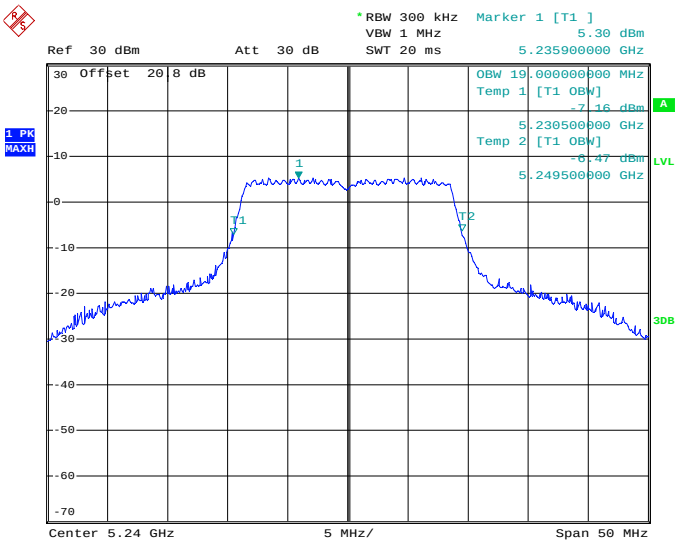



**Figure 7.2.2-12: 99% OBW - High Channel – 802.11n 20 MHz**

**Table 7.2.2-3: EBW / 99% Bandwidth – 802.11n 40 MHz**

| Frequency (MHz) | 26 dB Bandwidth (MHz) | 99% Bandwidth (MHz) |
|---|---|---|
| 5190 | 66.6 | 38.4 |
| 5230 | 61.8 | 38.4 |

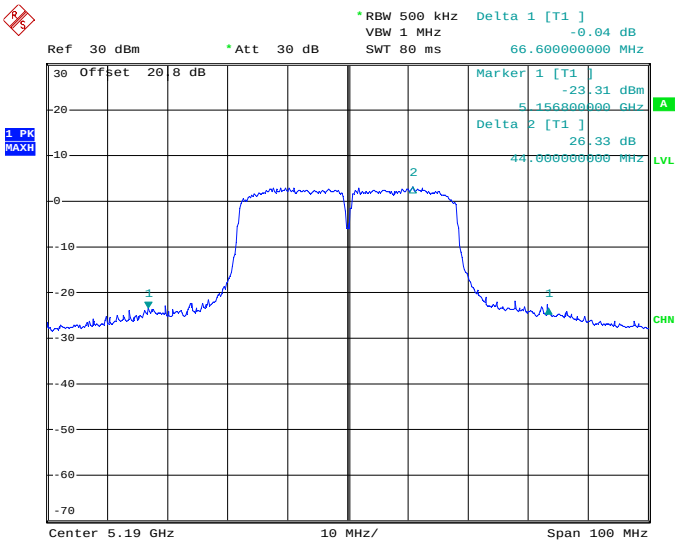



**Figure 7.2.2-13: 26 dB EBW - Low Channel – 802.11n 40 MHz**

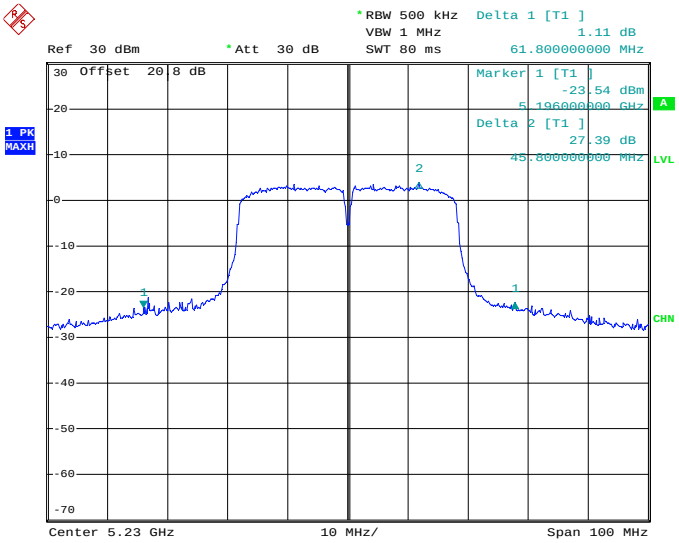



**Figure 7.2.2-14: 26 dB EBW - High Channel – 802.11n 40 MHz**

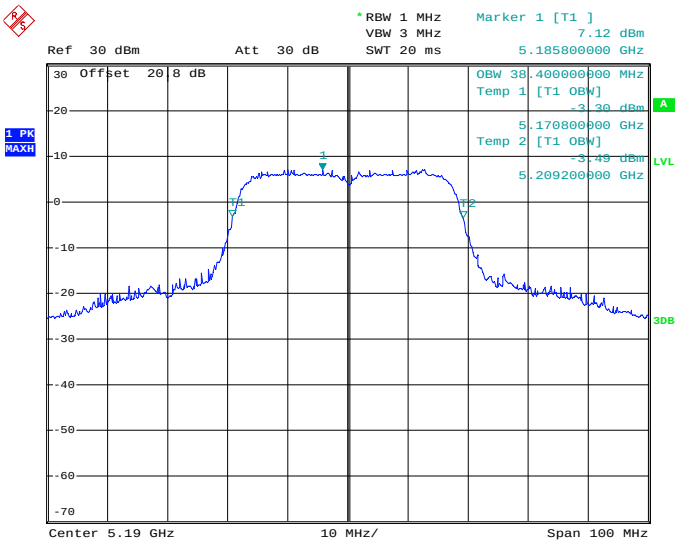



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**Figure 7.2.2-15: 99% OBW - Low Channel – 802.11n 40 MHz**

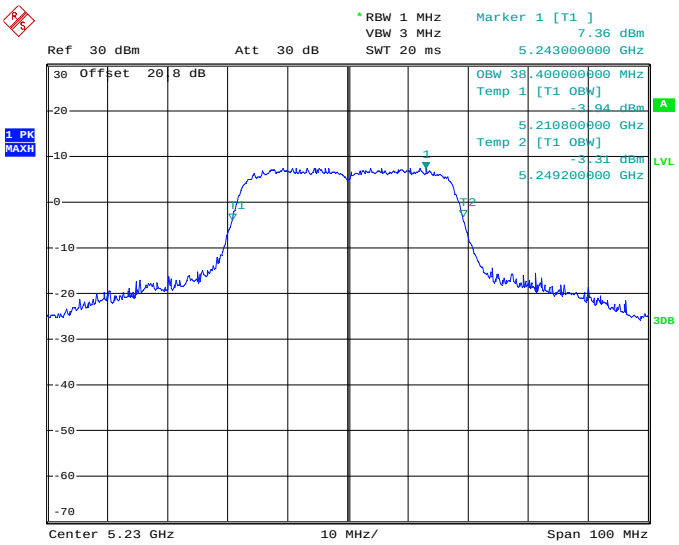


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**Figure 7.2.2-16: 99% OBW - High Channel – 802.11n 40 MHz**

**Table 7.2.2-4: EBW / 99% Bandwidth – 802.11ac 80 MHz**

| Frequency (MHz) | 26 dB Bandwidth (MHz) | 99% Bandwidth (MHz) |
|---|---|---|
| 5210 | 96.4 | 76.4 |

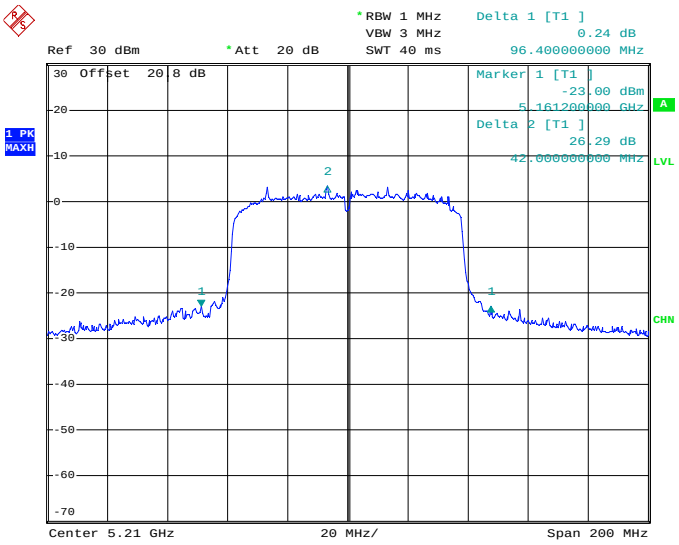


**Figure 7.2.2-17: 26 dB EBW - Middle Channel – 802.11ac 80 MHz**

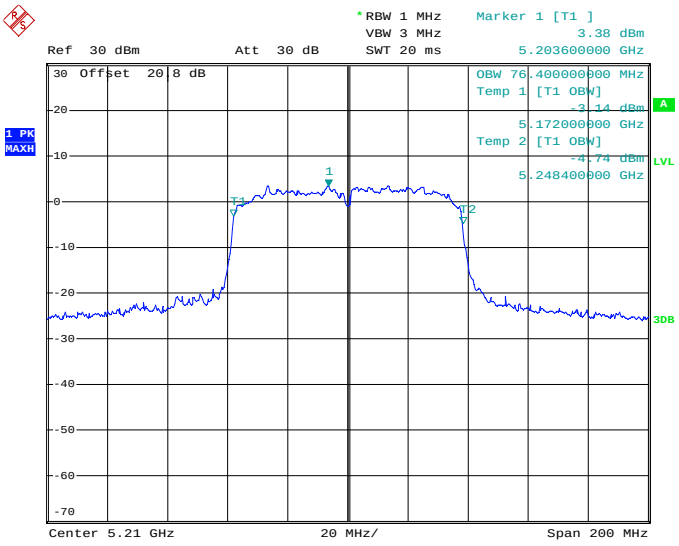


**Figure 7.2.2-118: 99% OBW - High Channel – 802.11ac 80 MHz**

## 7.3 Maximum Conducted Output Power

### 7.3.1 Measurement Procedure (Conducted Method) – FCC: Section 15.407(a)(1); ISED Canada: RSS-247 6.2.1 Band 5.15 GHz-5.25GHz

The Peak Output Power was measured in accordance with the KDB Publication No. 789033 D02 General UNII Test Procedures New Rules v02r01 “Guidelines for Compliance Testing of Unlicensed National Information Infrastructure (U-NII) Devices Part 15, Subpart E” Method SA-1. The RF output of the equipment under test was directly connected to the input of the spectrum analyzer through suitable attenuation. The power was integrated over the 99% alternative bandwidth instead of the 26-dB bandwidth.

### 7.3.2 Measurement Results

Performed by: Thierry Jean-Charles

**Table 7.3.2-1: RF Output Power – 802.11a**

| Frequency (MHz) | Level (dBm) |
|---|---|
| 5180 | 12.61 |
| 5200 | 12.53 |
| 5240 | 13.05 |

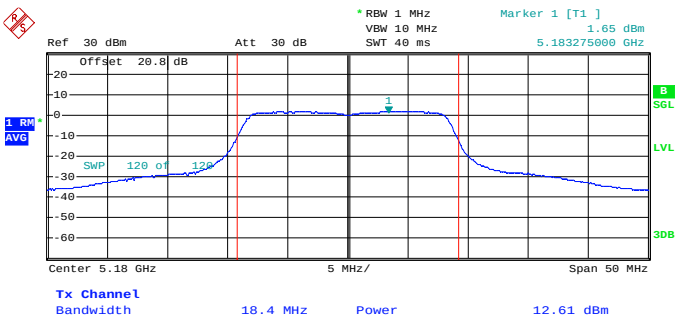


**Figure 7.3.2-1: RF Output Power - Low Channel – 802.11a**

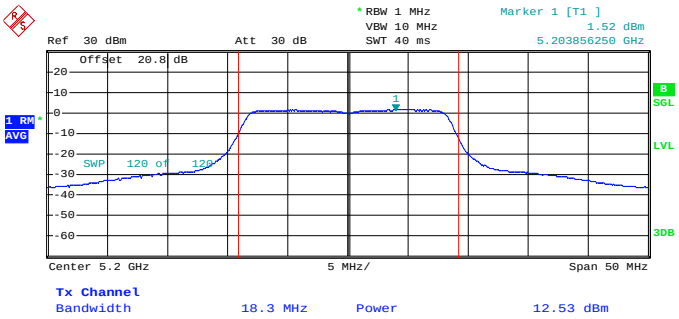


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**Figure 7.3.2-2: RF Output Power - Middle Channel – 802.11a**

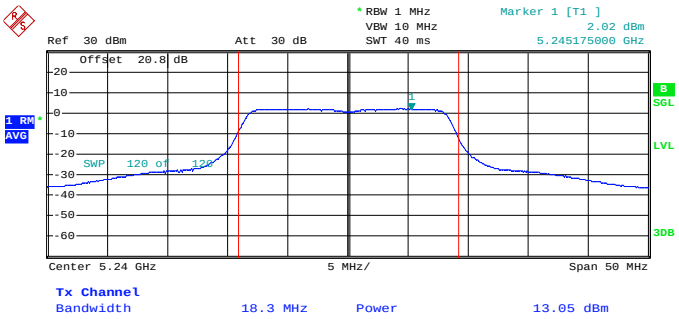


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**Figure 7.3.2-3: RF Output Power - High Channel – 802.11a**

**Table 7.3.2-2: RF Output Power – 802.11n 20 MHz**

| Frequency (MHz) | Level (dBm) |
|---|---|
| 5180 | 12.65 |
| 5200 | 12.34 |
| 5240 | 12.95 |

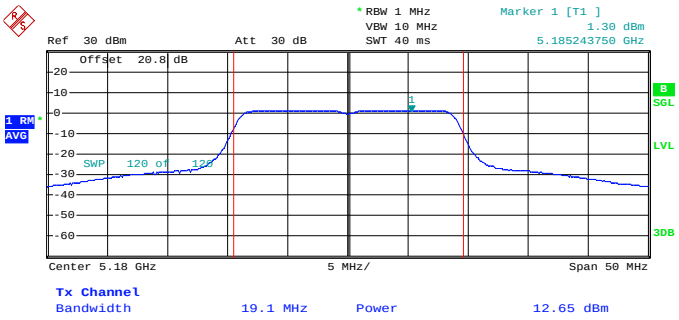


**Figure 7.3.2-4: RF Output Power - Low Channel – 802.11n 20 MHz**

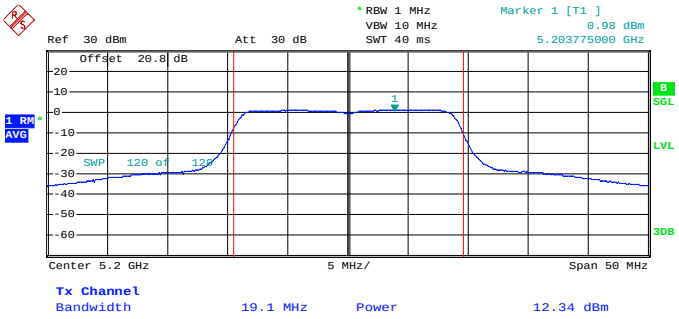


**Figure 7.3.2-5: RF Output Power - Middle Channel – 802.11n 20 MHz**

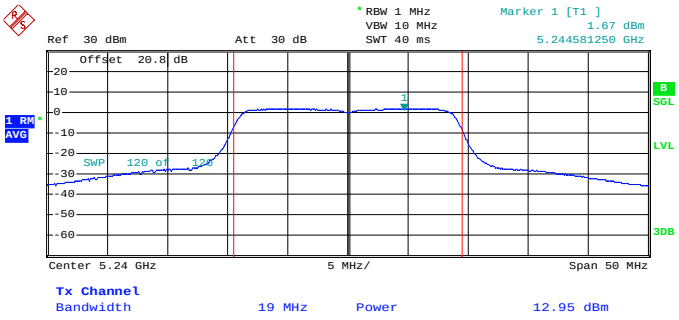


**Figure 7.3.2-6: RF Output Power - High Channel – 802.11n 20 MHz**

**Table 7.3.2-3: RF Output Power – 802.11n 40 MHz**

| Frequency (MHz) | Level (dBm) |
|---|---|
| 5180 | 11.32 |
| 5230 | 11.78 |

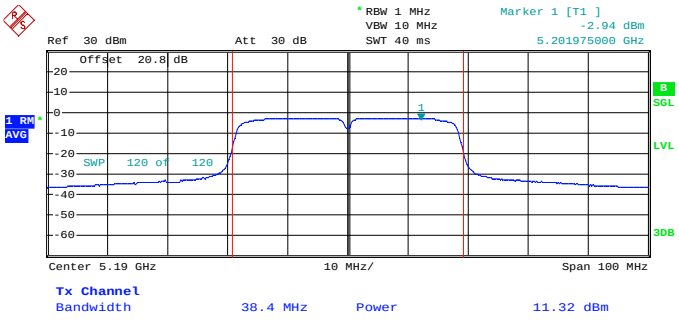


**Figure 7.3.2-7: RF Output Power - Low Channel – 802.11n 40 MHz**

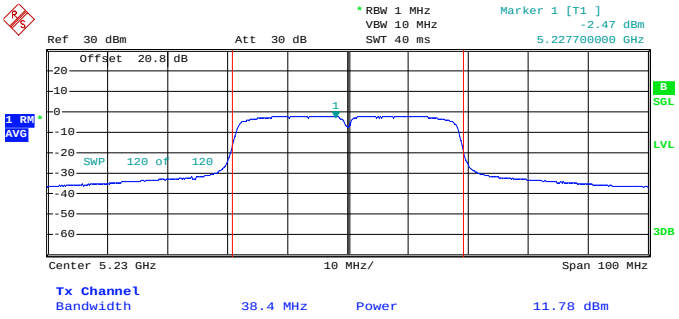


**Figure 7.3.2-8: RF Output Power - High Channel – 802.11n 40 MHz**

**Table 7.3.2-4: RF Output Power – 802.11ac 80 MHz**

| Frequency (MHz) | Level (dBm) |
|---|---|
| 5210 | 11.61 |

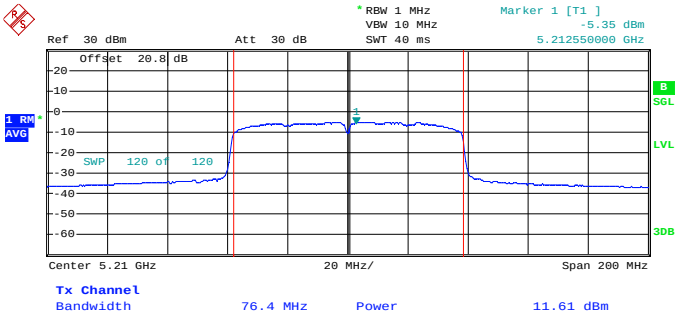


**Figure 7.3.2-9: RF Output Power - Middle Channel – 802.11ac 80 MHz**

## 7.4 Maximum Power Spectral Density – FCC: Section 15.407(a)(1); ISED Canada: RSS-247 6.2.1 Band 5.15 – 5.25 GHz

### 7.4.1 PSD Measurement Procedure (Conducted Method)

The power spectral density was measured in accordance with the FCC KDB Publication No. 789033 D02 General UNII Test Procedures New Rules v02r01 "Guidelines for Compliance Testing of Unlicensed National Information Infrastructure (U-NII) Devices Part 15, Subpart E" Maximum Power Spectral Density (PSD). The RF output port of the EUT was directly connected to the input of the spectrum analyzer. Offset values were input for cable, external attenuation. The spectrum analyzer RBW was set to 1 MHz and VBW >>3*RBW. The power spectral density was measured from the Maximum Conducted Output Power Measurement.

### 7.4.2 Measurement Results

Performed by: Thierry Jean-Charles

**Table 7.4.2-1: Power Spectral Density – 802.11a**

| Frequency (MHz) | PSD (dBm) | Limit (dBm) | Margin (dB) |
|---|---|---|---|
| 5180 | 1.65 | 11 | 9.35 |
| 5200 | 1.52 | 11 | 9.48 |
| 5240 | 2.02 | 11 | 8.98 |

**Note: Graphical data for the measurement is provided in Section 7.3**

**Table 7.4.2-2: Power Spectral Density – 802.11n 20 MHz**

| Frequency (MHz) | PSD (dBm) | Limit (dBm) | Margin (dB) |
|---|---|---|---|
| 5180 | 1.30 | 11 | 9.7 |
| 5200 | 0.98 | 11 | 10.02 |
| 5240 | 1.67 | 11 | 9.33 |

**Note: Graphical data for the measurement is provided in Section 7.3**

**Table 7.4.2-3: Power Spectral Density – 802.11n 40 MHz**

| Frequency (MHz) | PSD (dBm) | Limit (dBm) | Margin (dB) |
|---|---|---|---|
| 5190 | -2.94 | 11 | 13.94 |
| 5230 | -2.47 | 11 | 13.47 |

**Note: Graphical data for the measurement is provided in Section 7.3**

**Table 7.4.2-4: Power Spectral Density – 802.11ac 80 MHz**

| Frequency (MHz) | PSD (dBm) | Limit (dBm) | Margin (dB) |
|---|---|---|---|
| 5210 | -5.35 | 11 | 16.36 |

**Note: Graphical data for the measurement is provided in Section 7.3**

## 7.5 Band-Edge Compliance and Spurious Emissions – FCC: 15.407(b); ISED Canada: RSS-247 6.2

### 7.5.1 Radiated Emissions below 1 GHz

#### 7.5.1.1 Measurement Procedure

Radiated emissions tests were made over the frequency range of 9 kHz to 1 GHz.

For measurements below 30 MHz, the receive antenna height was set to 1m and the EUT was rotated through 360 degrees. The resolution bandwidth was set to 200 Hz below 150 kHz and to 9 kHz above 150 kHz.

For frequencies from 30 MHz to 1000 MHz, quasi-peak measurements were made using a resolution bandwidth RBW of 120 kHz and a video bandwidth VBW of 300 kHz. The EUT was rotated through 360° and the receive antenna height was varied from 1m to 4m so that the maximum radiated emissions level would be detected.

#### 7.5.1.2 Measurement Results

The highest radiated emissions with respect to the limits found in from 9 kHz to 1 GHz are reported in the tables below.

**Table 7.5.1.2-1: Radiated Emissions Below 1 GHz**

| Frequency (MHz) | Level (dBuV) | | Antenna Polarity | Correction Factors | Corrected Level (dBuV/m) | | Limit (dBuV/m) | | Margin (dB) | |
|---|---|---|---|---|---|---|---|---|---|---|
| | pk | Qpk/Avg | (H/V) | (dB) | pk | Qpk/Avg | pk | Qpk/Avg | pk | Qpk/Avg |
| **146.79** | --------- | 43.43 | H | -13.92 | --------- | 29.51 | -------- | 43.5 | --------- | 14.0 |
| **195.964** | --------- | 37.35 | H | -12.45 | --------- | 24.90 | -------- | 43.5 | --------- | 18.6 |
| **311.998** | --------- | 53.21 | H | -11.26 | --------- | 41.94 | -------- | 46.0 | --------- | 4.1 |
| **408.022** | --------- | 42.93 | H | -10.57 | --------- | 32.35 | -------- | 46.0 | --------- | 13.6 |
| **431.989** | --------- | 45.67 | H | -9.69 | --------- | 35.98 | -------- | 46.0 | --------- | 10.0 |
| **575.996** | --------- | 40.82 | H | -6.44 | --------- | 34.38 | -------- | 46.0 | --------- | 11.6 |
| **600.003** | --------- | 39.95 | H | -6.50 | --------- | 33.44 | -------- | 46.0 | --------- | 12.6 |
| **623.997** | --------- | 42.96 | H | -5.98 | --------- | 36.98 | -------- | 46.0 | --------- | 9.0 |
| **648.003** | --------- | 39.01 | H | -4.62 | --------- | 34.39 | -------- | 46.0 | --------- | 11.6 |
| **146.764** | --------- | 37.34 | V | -13.92 | --------- | 23.42 | -------- | 43.5 | --------- | 20.1 |
| **246.389** | --------- | 42.36 | V | -14.46 | --------- | 27.90 | -------- | 46.0 | --------- | 18.1 |
| **311.996** | --------- | 43.13 | V | -11.26 | --------- | 31.87 | -------- | 46.0 | --------- | 14.1 |
| **576.005** | --------- | 40.22 | V | -6.44 | --------- | 33.78 | -------- | 46.0 | --------- | 12.2 |
| **600.005** | --------- | 38.12 | V | -6.50 | --------- | 31.62 | -------- | 46.0 | --------- | 14.4 |
| **623.987** | --------- | 38.37 | V | -5.98 | --------- | 32.39 | -------- | 46.0 | --------- | 13.6 |
| **648.003** | --------- | 36.29 | V | -4.62 | --------- | 31.67 | -------- | 46.0 | --------- | 14.3 |

**Notes:**

- **The levels reported correspond to Quasi-Peak measurements.**
- **The data reported is representative of all the modes of operation of the WLAN transceiver.**

### 7.5.2 Radiated Spurious Emissions above 1 GHz

#### 7.5.2.1 Measurement Procedure

Radiated emissions tests were made over the frequency range of 1 GHz to 40 GHz. Each emission found to be in a restricted band as defined by section 15.205, including any emission at the operational band-edge, was compared to the radiated emission limits as defined in section 15.209. The other emissions were evaluated either per the general radiated emission limits of FCC Section 15.209 or the limits of FCC Section 15.407(b) / IC RSS-247 6.2. The EIRP limits of FCC Section 15.407(b) / IC RSS-247 6.2 were converted to field strength limits using a correction factor of 95.2 dB.

The EUT was rotated through 360° and the receive antenna height was varied from 1 m to 4 m so that the maximum radiated emissions level would be detected. Peak measurements are made with RBW of 1 MHz and VBW of 3 MHz. Average measurements are performed in the linear scale using VBW of 30 Hz.

#### 7.5.2.2 Measurement Results

Radiated band-edge and spurious emissions found within or outside of the restricted frequency bands from 1 GHz to 40 GHz are reported in the tables below.

**Table 7.5.2.2-1: Radiated Spurious Emissions Tabulated Data – 802.11a**

| Frequency (MHz) | Level (dBuV) | | Antenna Polarity | Correction Factors | Corrected Level (dBuV/m) | | Limit (dBuV/m) | | Margin (dB) | |
|---|---|---|---|---|---|---|---|---|---|---|
| | pk | Qpk/Avg | (H/V) | (dB) | pk | Qpk/Avg | pk | Qpk/Avg | pk | Qpk/Avg |
| **Low Channel (5180 MHz)** | | | | | | | | | | |
| **5150** | 58.73 | 42.5 | H | 4.65 | 63.38 | 47.15 | 74.0 | 54.0 | 10.6 | 6.8 |
| **5150** | 57.57 | 41.55 | V | 4.65 | 62.22 | 46.20 | 74.0 | 54.0 | 11.8 | 7.8 |
| **10360** | 44.21 | 34.26 | H | 14.71 | 58.92 | 48.97 | 77.7 | --------- | 18.8 | --------- |
| **10360** | 44.37 | 35.59 | V | 14.71 | 59.08 | 50.30 | 77.7 | --------- | 18.7 | --------- |
| **20720** | 43.97 | 30.51 | H | 13.27 | 57.24 | 43.78 | 83.5 | 63.5 | 26.3 | 19.7 |
| **20720** | 44.43 | 31.85 | V | 13.27 | 57.70 | 45.12 | 83.5 | 63.5 | 25.8 | 18.4 |
| **Middle Channel (5200 MHz)** | | | | | | | | | | |
| **10400** | 44.24 | 33.96 | H | 14.80 | 59.04 | 48.76 | 77.7 | --------- | 18.7 | --------- |
| **10400** | 44.63 | 35.36 | V | 14.80 | 59.43 | 50.16 | 77.7 | --------- | 18.3 | --------- |
| **20800** | 43.73 | 30.35 | H | 13.12 | 56.85 | 43.47 | 83.5 | 63.5 | 26.7 | 20.0 |
| **20800** | 44.11 | 31.13 | V | 13.12 | 57.23 | 44.25 | 83.5 | 63.5 | 26.3 | 19.3 |
| **High Channel (5240 MHz)** | | | | | | | | | | |
| **10480** | 44.66 | 35.40 | H | 14.98 | 59.64 | 50.38 | 77.7 | --------- | 18.1 | --------- |
| **10480** | 44.68 | 35.56 | V | 14.98 | 59.66 | 50.54 | 77.7 | --------- | 18.1 | --------- |
| **20960** | 43.28 | 30.22 | H | 12.83 | 56.11 | 43.05 | 83.5 | 63.5 | 27.4 | 20.5 |
| **20960** | 43.82 | 30.53 | V | 12.83 | 56.65 | 43.36 | 83.5 | 63.5 | 26.9 | 20.1 |

**Notes:**

- **All emissions above 20.96 GHz were attenuated below the limits and the noise floor of the measurement equipment.**
- **The emissions above 10 GHz were measured at a test distance of 1m. The limits are corrected accordingly using a distance factor of 20*log(3/1) = 9.5 dB.**

**Table 7.5.2.2-2: Radiated Spurious Emissions Tabulated Data – 802.11n 20 MHz**

| Frequency (MHz) | Level (dBuV) | | Antenna Polarity | Correction Factors | Corrected Level (dBuV/m) | | Limit (dBuV/m) | | Margin (dB) | |
|---|---|---|---|---|---|---|---|---|---|---|
| | pk | Qpk/Avg | (H/V) | (dB) | pk | Qpk/Avg | pk | Qpk/Avg | pk | Qpk/Avg |
| **Low Channel (5180 MHz)** | | | | | | | | | | |
| **5150** | 58.53 | 42.72 | H | 4.65 | 63.18 | 47.37 | 74.0 | 54.0 | 10.8 | 6.6 |
| **5150** | 58.15 | 42.63 | V | 4.65 | 62.80 | 47.28 | 74.0 | 54.0 | 11.2 | 6.7 |
| **10360** | 44.74 | 34.61 | H | 14.71 | 59.45 | 49.32 | 77.7 | --------- | 18.3 | --------- |
| **10360** | 45.11 | 36.04 | V | 14.71 | 59.82 | 50.75 | 77.7 | --------- | 17.9 | --------- |
| **20720** | 43.58 | 30.42 | H | 13.27 | 56.85 | 43.69 | 83.5 | 63.5 | 26.7 | 19.8 |
| **20720** | 44.37 | 31.69 | V | 13.27 | 57.64 | 44.96 | 83.5 | 63.5 | 25.9 | 18.5 |
| **Middle Channel (5200 MHz)** | | | | | | | | | | |
| **10400** | 44.80 | 34.25 | H | 14.80 | 59.60 | 49.05 | 77.7 | --------- | 18.1 | --------- |
| **10400** | 44.87 | 35.46 | V | 14.80 | 59.67 | 50.26 | 77.7 | --------- | 18.1 | --------- |
| **15600** | 43.83 | 30.40 | H | 18.89 | 62.72 | 49.29 | 83.5 | 63.5 | 20.8 | 14.2 |
| **15600** | 44.27 | 31.43 | V | 18.89 | 63.16 | 50.32 | 83.5 | 63.5 | 20.3 | 13.2 |
| **High Channel (5240 MHz)** | | | | | | | | | | |
| **10480** | 44.28 | 34.42 | H | 14.98 | 59.26 | 49.40 | 77.7 | --------- | 18.5 | --------- |
| **10480** | 45.32 | 36.38 | V | 14.98 | 60.30 | 51.36 | 77.7 | --------- | 17.4 | --------- |
| **20960** | 43.66 | 30.00 | H | 12.83 | 56.49 | 42.83 | 83.5 | 63.5 | 27.0 | 20.7 |
| **20960** | 43.81 | 30.49 | V | 12.83 | 56.64 | 43.32 | 83.5 | 63.5 | 26.9 | 20.2 |

**Notes:**

- **All emissions above 20.96 GHz were attenuated below the limits and the noise floor of the measurement equipment.**
- **The emissions above 10 GHz were measured at a test distance of 1m. The limits are corrected accordingly using a distance factor of 20*log(3/1) = 9.5 dB.**

**Table 7.5.2.2-3: Radiated Spurious Emissions Tabulated Data – 802.11n 40 MHz**

| Frequency (MHz) | Level (dBuV) | | Antenna Polarity | Correction Factors | Corrected Level (dBuV/m) | | Limit (dBuV/m) | | Margin (dB) | |
|---|---|---|---|---|---|---|---|---|---|---|
| | pk | Qpk/Avg | (H/V) | (dB) | pk | Qpk/Avg | pk | Qpk/Avg | pk | Qpk/Avg |
| **Low Channel (5190 MHz)** | | | | | | | | | | |
| **5150** | 68.03 | 47.18 | H | 4.65 | 72.68 | 51.83 | 74.0 | 54.0 | 1.3 | 2.2 |
| **5150** | 64.48 | 46.02 | V | 4.65 | 69.13 | 50.67 | 74.0 | 54.0 | 4.9 | 3.3 |
| **10380** | 43.76 | 33.58 | H | 14.75 | 58.51 | 48.33 | 77.7 | --------- | 19.2 | --------- |
| **10380** | 44.13 | 35.15 | V | 14.75 | 58.88 | 49.90 | 77.7 | --------- | 18.9 | --------- |
| **20760** | 43.48 | 30.41 | H | 13.19 | 56.67 | 43.60 | 83.5 | 63.5 | 26.8 | 19.9 |
| **20760** | 44.46 | 30.93 | V | 13.19 | 57.65 | 44.12 | 83.5 | 63.5 | 25.8 | 19.4 |
| **High Channel (5230 MHz)** | | | | | | | | | | |
| **10460** | 44.11 | 44.42 | H | 14.93 | 59.04 | 59.35 | 77.7 | --------- | 18.7 | --------- |
| **10460** | 44.55 | 35.84 | V | 14.93 | 59.48 | 50.77 | 77.7 | --------- | 18.3 | --------- |
| **20920** | 44.18 | 30.64 | H | 12.90 | 57.08 | 43.54 | 83.5 | 63.5 | 26.4 | 20.0 |
| **20920** | 43.90 | 30.90 | V | 12.90 | 56.80 | 43.80 | 83.5 | 63.5 | 26.7 | 19.7 |

**Notes:**

- **All emissions above 20.92 GHz were attenuated below the limits and the noise floor of the measurement equipment.**
- **The emissions above 10 GHz were measured at a test distance of 1m. The limits are corrected accordingly using a distance factor of 20*log(3/1) = 9.5 dB.**

**Table 7.5.2.2-4: Radiated Spurious Emissions Tabulated Data – 802.11ac 80 MHz**

| Frequency (MHz) | Level (dBuV) | | Antenna Polarity | Correction Factors | Corrected Level (dBuV/m) | | Limit (dBuV/m) | | Margin (dB) | |
|---|---|---|---|---|---|---|---|---|---|---|
| | pk | Qpk/Avg | (H/V) | (dB) | pk | Qpk/Avg | pk | Qpk/Avg | pk | Qpk/Avg |
| **Middle Channel (5210 MHz)** | | | | | | | | | | |
| **5150** | 62.31 | 47.70 | H | 4.65 | 66.96 | 52.35 | 74.0 | 54.0 | 7.0 | 1.6 |
| **5150** | 60.65 | 46.22 | V | 4.65 | 65.30 | 50.87 | 74.0 | 54.0 | 8.7 | 3.1 |
| **10420** | 43.69 | 33.46 | H | 14.84 | 58.53 | 48.30 | 77.7 | --------- | 19.2 | --------- |
| **10420** | 45.22 | 35.65 | V | 14.84 | 60.06 | 50.49 | 77.7 | --------- | 17.7 | --------- |
| **20840** | 43.75 | 30.56 | H | 13.05 | 56.80 | 43.61 | 83.5 | 63.5 | 26.7 | 19.9 |
| **20840** | 43.89 | 30.86 | V | 13.05 | 56.94 | 43.91 | 83.5 | 63.5 | 26.6 | 19.6 |

**Notes:**

- **All emissions above 20.84 GHz were attenuated below the limits and the noise floor of the measurement equipment.**
- **The emissions above 10 GHz were measured at a test distance of 1m. The limits are corrected accordingly using a distance factor of 20*log(3/1) = 9.5 dB.**

### 7.5.3 Sample Calculation

$R_C = R_U + CF_T$

Where:

| | | |
|---|---|---|
| $CF_T$ | = | Total Correction Factor (AF+CA+AG)-DC (Average Measurements Only) |
| $R_U$ | = | Uncorrected Reading |
| $R_C$ | = | Corrected Level |
| AF | = | Antenna Factor |
| CA | = | Cable Attenuation |
| AG | = | Amplifier Gain |
| DC | = | Duty Cycle Correction Factor |

**Example Calculation: Peak**
Corrected Level: 58.73+ 4.65 = 63.38 dBµV/m
Margin: 74 dBµV/m – 63.38 dBµV/m = 10.6 dB

**Example Calculation: Average**
Corrected Level: 42.5 + 4.65 = 47.15 dBµV/m
Margin: 54 dBµV/m – 47.15 dBµV/m = 6.8 dB

## 7.6 Power Line Conducted Emissions – FCC: Section 15.207; ISED Canada: RSS-Gen 8.8

### 7.6.1 Measurement Procedure

ANSI C63.10 section 6.2 was the guiding document for this evaluation. Conducted emissions were performed from 150 kHz to 30 MHz with the spectrum analyzer's resolution bandwidth set to 9 kHz and the video bandwidth set to 30 kHz. The calculation for the conducted emissions is as follows:

**Corrected Reading = Analyzer Reading + LISN Loss + Cable Loss**
**Margin = Applicable Limit - Corrected Reading**

### 7.6.2 Measurement Results

Performed by: Thierry Jean-Charles

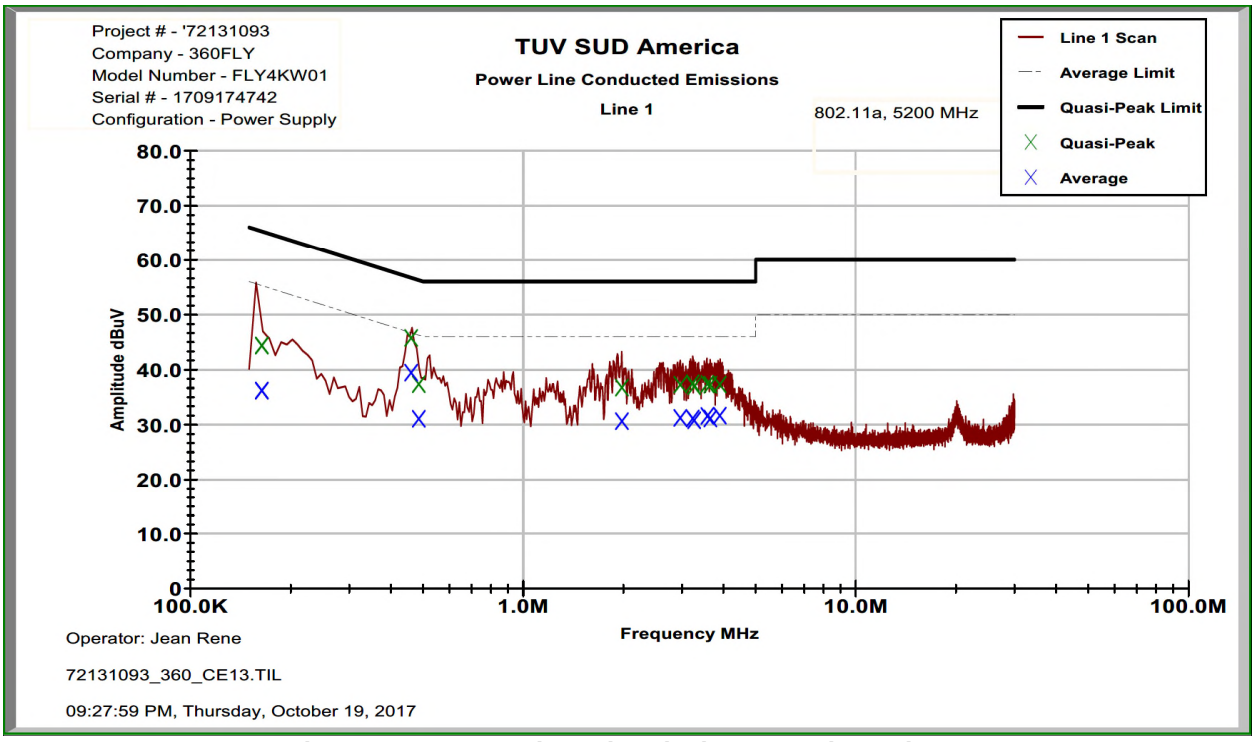


**Figure 7.6.2-1: Conducted Emissions Results – Line 1**

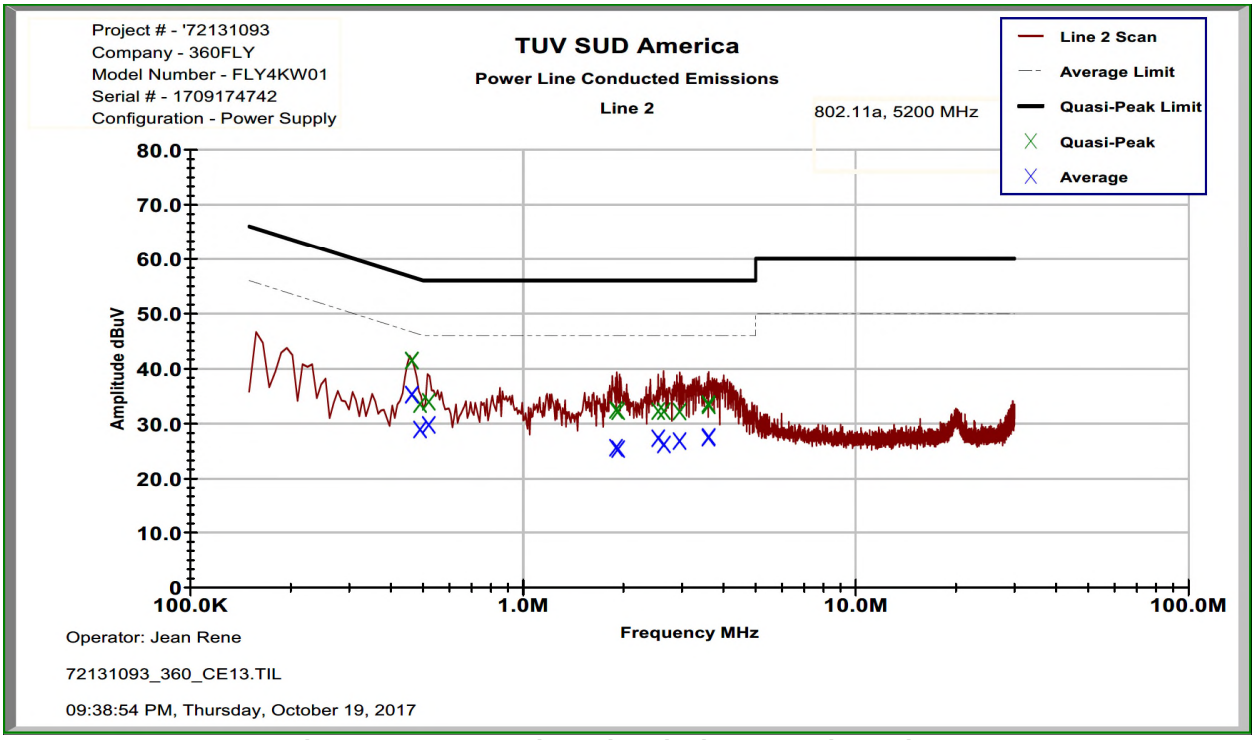


**Figure 7.6.2-2: Conducted Emissions Results – Line 2**

**Table 7.6.2-1: Conducted EMI Results**

☒ Line 1 ☒ Line 2 ☐ Line 3
☐ Line 4
☐ To Ground ☒ Floating
☐ Telecom Port _____
☒ dBµV ☐ dBµA

**Plot Number:**
**72131093_360_CE13**
**Power Supply Description: 5 VDC Power Supply**

| Frequency (MHz) | Uncorrected Reading | | Total Correction Factor (dB) | Corrected Level | | Limit | | Margin (dB) | |
|---|---|---|---|---|---|---|---|---|---|
| | Quasi-Peak | Average | | Quasi-Peak | Average | Quasi-Peak | Average | Quasi-Peak | Average |
| **Line 1** | | | | | | | | | |
| 0.163651 | 34.059 | 25.875 | 10.17 | 44.23 | 36.05 | 65.28 | 55.28 | 21.0 | 19.2 |
| 0.460425 | 35.381 | 29.091 | 10.23 | 45.61 | 39.32 | 56.68 | 46.68 | 11.1 | 7.4 |
| 0.485299 | 27.029 | 20.697 | 10.23 | 37.26 | 30.93 | 56.25 | 46.25 | 19.0 | 15.3 |
| 1.97946 | 26.228 | 20.12 | 10.26 | 36.48 | 30.38 | 56.00 | 46.00 | 19.5 | 15.6 |
| 2.96471 | 26.634 | 20.624 | 10.38 | 37.02 | 31.01 | 56.00 | 46.00 | 19.0 | 15.0 |
| 3.23206 | 26.889 | 20.492 | 10.48 | 37.37 | 30.97 | 56.00 | 46.00 | 18.6 | 15.0 |
| 3.26505 | 26.314 | 20.169 | 10.48 | 36.79 | 30.65 | 56.00 | 46.00 | 19.2 | 15.4 |
| 3.57647 | 26.721 | 20.909 | 10.48 | 37.20 | 31.39 | 56.00 | 46.00 | 18.8 | 14.6 |
| 3.65101 | 26.584 | 20.463 | 10.48 | 37.06 | 30.94 | 56.00 | 46.00 | 18.9 | 15.1 |
| 3.9003 | 26.607 | 20.928 | 10.48 | 37.09 | 31.41 | 56.00 | 46.00 | 18.9 | 14.6 |
| **Line 2** | | | | | | | | | |
| 0.462463 | 31.125 | 24.93 | 10.27 | 41.40 | 35.20 | 56.65 | 46.65 | 15.3 | 11.4 |
| 0.489349 | 23.218 | 18.592 | 10.27 | 33.49 | 28.86 | 56.18 | 46.18 | 22.7 | 17.3 |
| 0.519713 | 23.627 | 19.443 | 10.26 | 33.89 | 29.70 | 56.00 | 46.00 | 22.1 | 16.3 |
| 1.9018 | 21.978 | 15.108 | 10.30 | 32.27 | 25.40 | 56.00 | 46.00 | 23.7 | 20.6 |
| 1.92846 | 21.722 | 14.893 | 10.30 | 32.02 | 25.19 | 56.00 | 46.00 | 24.0 | 20.8 |
| 2.54476 | 21.727 | 16.765 | 10.42 | 32.15 | 27.19 | 56.00 | 46.00 | 23.9 | 18.8 |
| 2.64662 | 21.696 | 15.614 | 10.42 | 32.12 | 26.04 | 56.00 | 46.00 | 23.9 | 20.0 |
| 2.95215 | 21.593 | 16.243 | 10.42 | 32.02 | 26.67 | 56.00 | 46.00 | 24.0 | 19.3 |
| 3.60421 | 22.928 | 16.794 | 10.50 | 33.43 | 27.29 | 56.00 | 46.00 | 22.6 | 18.7 |
| 3.6123 | 22.687 | 16.932 | 10.50 | 33.19 | 27.43 | 56.00 | 46.00 | 22.8 | 18.6 |

## 7.7 Frequency Stability – FCC: Section 15.407(g); ISED Canada: RSS-Gen 8.11

### 7.7.1 Measurement Procedure

The equipment under test is placed inside an environmental chamber. The RF output is directly coupled to the input of the measurement equipment and a power supply is attached to the primary supply voltage.

Frequency measurements were made at the extremes of the of temperature range -30º C to +50º C and at intervals of 10º C at normal supply voltage. A period of time sufficient to stabilize all components of the equipment was allowed at each frequency measurement. At a temperature 20º C the supply voltage was also varied at 115 % and 85 % of the nominal voltage. The maximum variation of frequency was recorded.

Results of the test are shown below

### 7.7.2 Measurement Results

Performed by: Thierry Jean-Charles

# Frequency Stability

**Frequency (MHz):** 5180
**Deviation Limit (PPM):** 20

| Temperature | Frequency | Frequency Error | Voltage | Voltage |
|---|---|---|---|---|
| C | MHz | (PPM) | (%) | (VDC) |
| | | | | |
| -30 C | **5179.988660** | **-2.189** | 100% | 4.00 |
| -20 C | **5180.020370** | **3.932** | 100% | 4.00 |
| -10 C | **5180.029050** | **5.608** | 100% | 4.00 |
| 0 C | **5180.028050** | **5.415** | 100% | 4.00 |
| 10 C | **5180.026550** | **5.125** | 100% | 4.00 |
| 20 C | **5180.011600** | **2.239** | 100% | 4.00 |
| 30 C | **5180.004288** | **0.828** | 100% | 4.00 |
| 40 C | **5179.998883** | **-0.216** | 100% | 4.00 |
| 50 C | **5179.999086** | **-0.176** | 100% | 4.00 |
| | | | | |
| 20 C | **5180.013520** | **2.610** | 85% | 3.40 |
| 20 C | **5180.012930** | **2.496** | 115% | 4.60 |

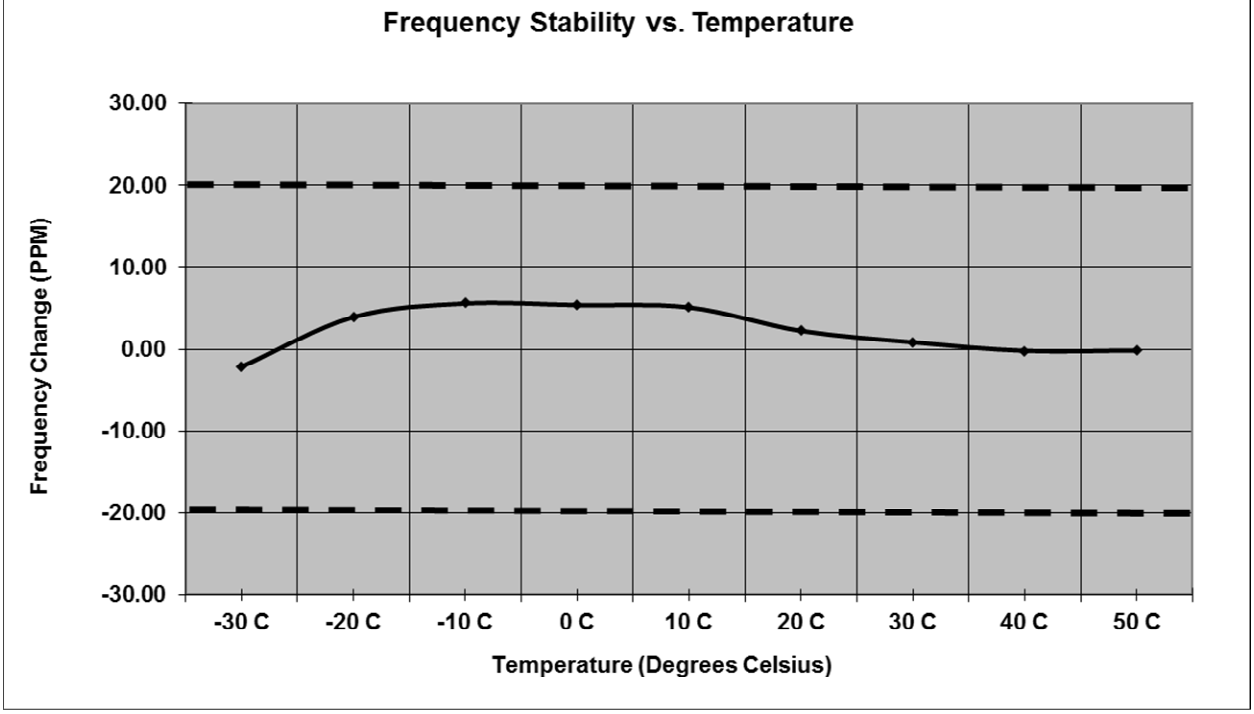


**Figure 7.7.2-1: Frequency Stability – Low Channel**

# Frequency Stability

**Frequency (MHz):** 5200
**Deviation Limit (PPM):** 20

| Temperature | Frequency | Frequency Error | Voltage | Voltage |
|---|---|---|---|---|
| C | MHz | (PPM) | (%) | (VDC) |
| | | | | |
| -30 C | **5199.979970** | **-3.852** | 100% | 4.00 |
| -20 C | **5200.019010** | **3.656** | 100% | 4.00 |
| -10 C | **5200.029010** | **5.579** | 100% | 4.00 |
| 0 C | **5200.028680** | **5.515** | 100% | 4.00 |
| 10 C | **5200.025010** | **4.810** | 100% | 4.00 |
| 20 C | **5200.013860** | **2.665** | 100% | 4.00 |
| 30 C | **5200.004128** | **0.794** | 100% | 4.00 |
| 40 C | **5199.998890** | **-0.213** | 100% | 4.00 |
| 50 C | **5199.999517** | **-0.093** | 100% | 4.00 |
| | | | | |
| 20 C | **5200.014340** | **2.758** | 85% | 3.40 |
| 20 C | **5200.015350** | **2.952** | 115% | 4.60 |

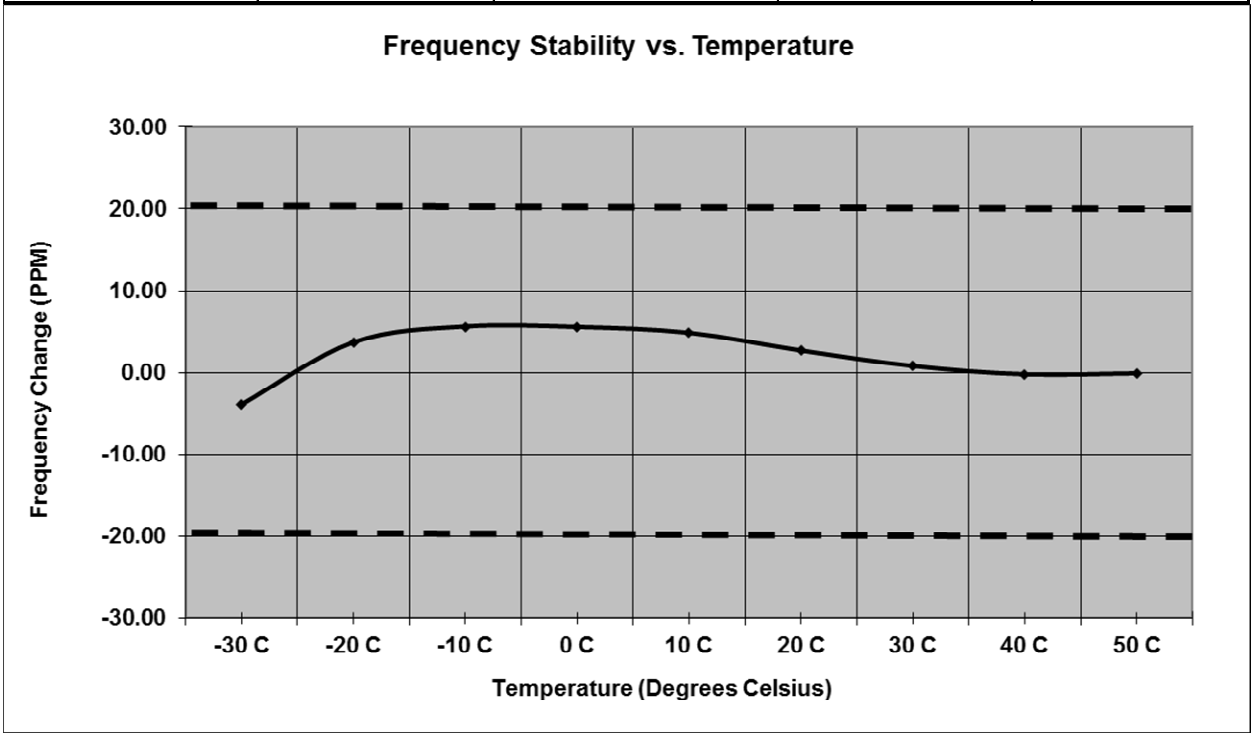


**Figure 7.7.2-2: Frequency Stability – Middle Channel**

# Frequency Stability

**Frequency (MHz):** 5240

**Deviation Limit (PPM):** 20

| Temperature | Frequency | Frequency Error | Voltage | Voltage |
|---|---|---|---|---|
| C | MHz | (PPM) | (%) | (VDC) |
| | | | | |
| -30 C | **5239.981970** | **-3.441** | 100% | 4.00 |
| -20 C | **5240.019350** | **3.693** | 100% | 4.00 |
| -10 C | **5240.029350** | **5.601** | 100% | 4.00 |
| 0 C | **5240.029010** | **5.536** | 100% | 4.00 |
| 10 C | **5240.025350** | **4.838** | 100% | 4.00 |
| 20 C | **5240.013736** | **2.621** | 100% | 4.00 |
| 30 C | **5240.004225** | **0.806** | 100% | 4.00 |
| 40 C | **5239.998874** | **-0.215** | 100% | 4.00 |
| 50 C | **5240.002063** | **0.394** | 100% | 4.00 |
| | | | | |
| 20 C | **5240.014750** | **2.815** | 85% | 3.40 |
| 20 C | **5240.013000** | **2.481** | 115% | 4.60 |

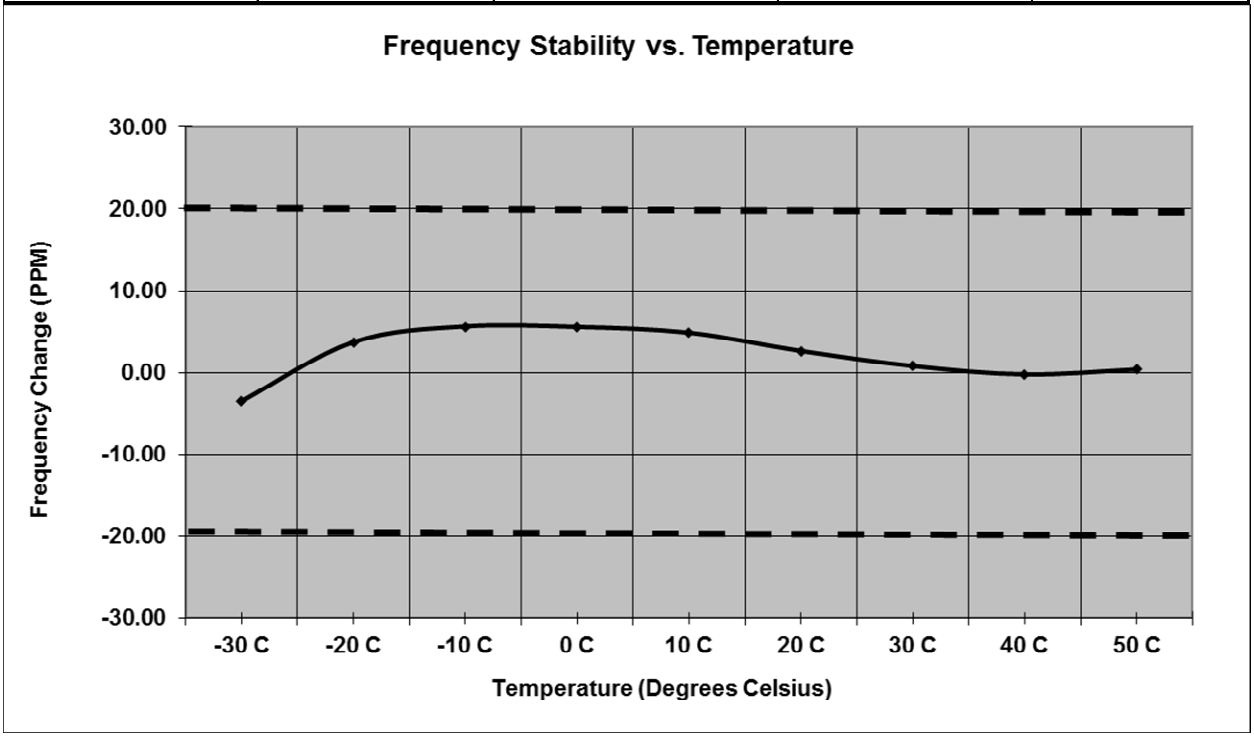


**Figure 7.7.2-3: Frequency Stability – High Channel**

## 7.8 Duty Cycle

### 7.8.1 Measurement Procedure

The duty cycle was measured in accordance with ANSI C63.10 Section 11.6 Duty cycle (D), transmission duration (T), and maximum power control level. The unit was connected directly to the input of the spectrum analyzer via suitable attenuation. The RBW and VBW were set to 10 MHz and the number of sweep points across duration T was set to exceed 100.

### 7.8.2 Measurement Results

Performed by: Thierry Jean-Charles

**Table 7.8.2-1 Duty Cycle Correction Factor**

| Mode | Data Rate (Mbps) | Time On (ms) | Period (ms) | Duty Cycle (%) | Correction Factor (dB) |
|---|---|---|---|---|---|
| 802.11a | 6 | 2.0202 | 2.0282 | 99.61% | N/A |
| 802.11n 20 MHz | 6.5 | 1.888 | 1.893 | 99.74% | N/A |
| 802.11n 40 MHz | 13 | 0.932 | 0.936 | 99.57% | N/A |
| 802.11ac 80 MHz | 29.3 | 0.248 | 0.253 | 98.02% | N/A |

**Notes:**
**Per FCC KDB 789033 D02 General UNII Test Procedures New Rules v01r04 duty cycle correction factor is not needed for duty cycle > 98%**

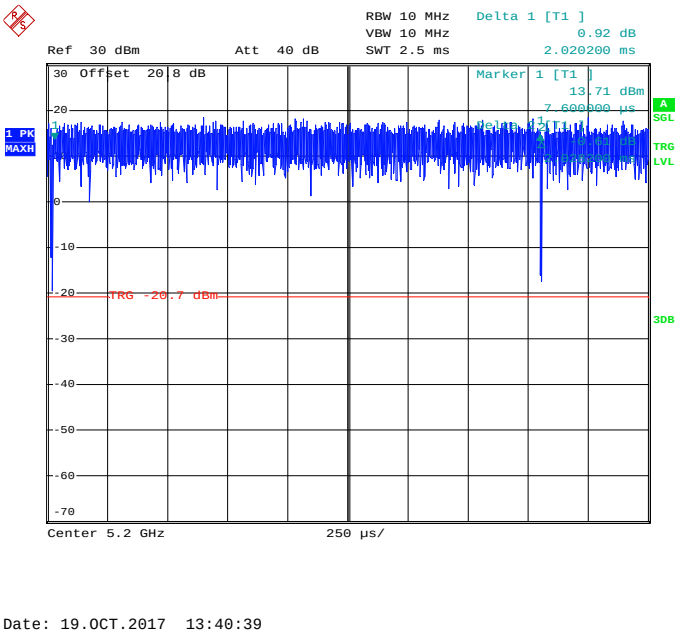


**Figure 7.8.2-1: Duty Cycle 802.11a**

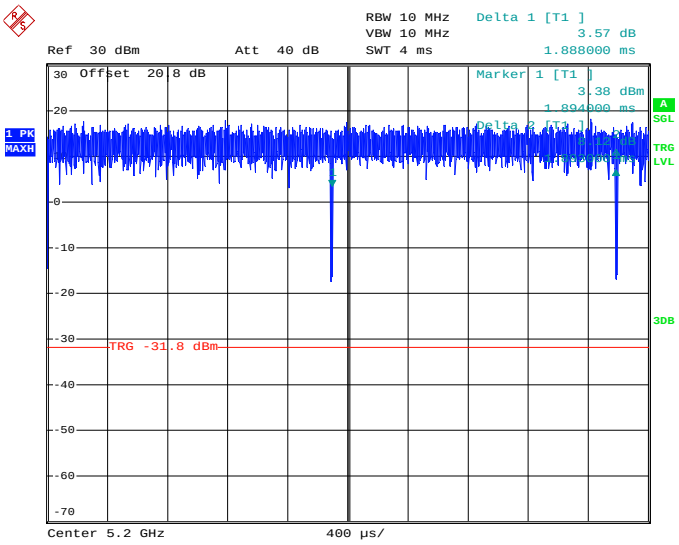


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**Figure 7.8.2-2: Duty Cycle 802.11n 20 MHz**

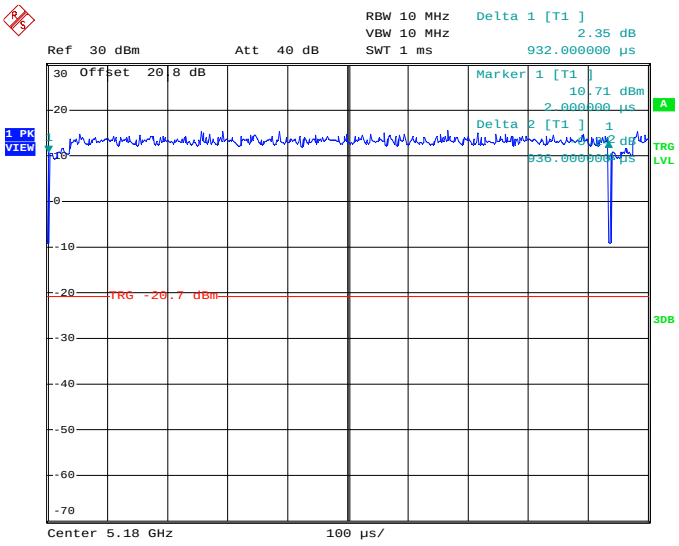


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**Figure 7.8.2-3: Duty Cycle 802.11n 40 MHz**

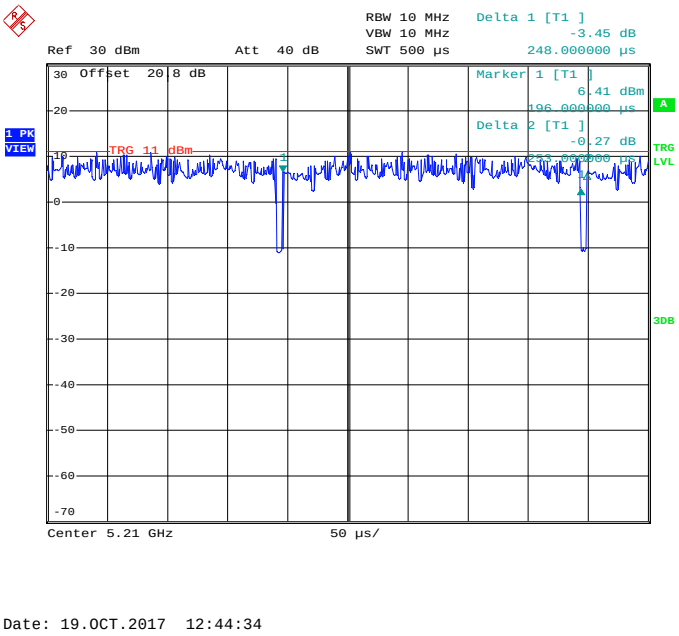


**Figure 7.7.2-4: Duty Cycle 802.11ac 80 MHz**

## 8 MEASUREMENT UNCERTAINTIES

The expanded laboratory measurement uncertainty figures ($U_{Lab}$) provided below correspond to an expansion factor (coverage factor) k = 1.96 which provide confidence levels of 95%.

**Table 8-1: Measurement Uncertainties**

| Parameter | $U_{lab}$ |
|---|---|
| Occupied Channel Bandwidth | ± 0.009 % |
| RF Conducted Output Power | ± 1.15 dB |
| Power Spectral Density | ± 1.15 dB |
| Antenna Port Conducted Emissions | ± 1.15 dB |
| Radiated Emissions ≤ 1GHz | ± 5.86 dB |
| Radiated Emissions > 1GHz | ± 4.65 dB |
| Temperature | ± 0.860 °C |
| Radio Frequency | $\pm 2.832 \times 10^{-8}$ |
| AC Power Line Conducted Emissions | ±3.72 dB |

## 9 CONCLUSION

In the opinion of TÜV SÜD America, Inc. the models FLY4KW01 and FLY4KW11, manufactured by 360fly, Inc., meet the requirements of FCC Part 15.407 and Industry Canada's Radio Standards Specification RSS-247 for the tests documented herein.

# END REPORT