



**FCC 47 CFR PART 15 SUBPART C  
INDUSTRY CANADA RSS-210 ISSUE 8**

**CERTIFICATION TEST REPORT**

**FOR**

**BLUETOOTH HEADSET**

**MODEL NUMBERS: WEARABLE CONCEPT 2**

**FCC ID: AL8-WC2  
IC: 457A-WC2**

**REPORT NUMBER: 15U20565-E8V2**

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**NVLAP LAB CODE 200065-0**

Revision History

| <u>Rev.</u> | <u>Issue Date</u> | <u>Revisions</u>       | <u>Revised By</u> |
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| V1          | 02/12/2016        | Initial Issue          | C. Pang           |
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# 1. ATTESTATION OF TEST RESULTS

**COMPANY NAME:** PLANTRONICS INC.  
345 ENCINAL STREET  
SANTA CRUZ, CA 95060, U.S.A.

**EUT DESCRIPTION:** BLUETOOTH HEADSET

**MODEL:** Wearable Concept 2

**SERIAL NUMBER:** BLD2\_COMP06 (CONDUCTED) & BLD2\_COMP02 (RADIATED)

**DATE TESTED:** DECEMBER 09, 2015 AND FEBRUARY 10, 2016

| APPLICABLE STANDARDS                     |              |
|--|--------------|
| STANDARD                                 | TEST RESULTS |
| FCC PART 15 SUBPART C                    | Pass         |
| INDUSTRY CANADA RSS-210 Issue 8, Annex 2 | Pass         |
| INDUSTRY CANADA RSS-GEN Issue 4          | Pass         |

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

**Note:** The results documented in this report apply only to the tested sample, under the conditions and modes of operation as described herein. This document may not be altered or revised in any way unless done so by UL Verification Services Inc. and all revisions are duly noted in the revisions section. Any alteration of this document not carried out by UL Verification Services Inc. will constitute fraud and shall nullify the document. This report must not be used by the client to claim product certification, approval, or endorsement by NVLAP, NIST, any agency of the Federal Government, or any agency of any government.

Approved & Released For  
UL Verification Services Inc. By:

Tested By:



CHIN PANG  
SENIOR ENGINEER  
UL VERIFICATION SERVICES INC.

TOM CHEN  
EMC ENGINEER  
UL VERIFICATION SERVICES INC

## 2. TEST METHODOLOGY

The tests documented in this report were performed in accordance with ANSI C63.10-2013, FCC CFR 47 Part 2, KDB 937606, FCC CFR 47 Part 15, RSS-GEN Issue 4, and RSS-210 Issue 8.

Comparisons between the semi-anechoic chamber and an open area test site for devices that operate at the EUT frequency had been conducted and data is kept on file. There were no significant differences found between the two sites so data taken in the chamber is equivalent to the data which would have been taken on the open area test site

## 3. FACILITIES AND ACCREDITATION

The test sites and measurement facilities used to collect data are located at 47173 and 47266 Benicia Street, Fremont, California, USA. Line conducted emissions are measured only at the 47173 address. The following table identifies which facilities were utilized for radiated emission measurements documented in this report. Specific facilities are also identified in the test results sections.

| 47173 Benicia Street               | 47266 Benicia Street                          |
|------------------------------------|---|
| <input type="checkbox"/> Chamber A | <input type="checkbox"/> Chamber D            |
| <input type="checkbox"/> Chamber B | <input type="checkbox"/> Chamber E            |
| <input type="checkbox"/> Chamber C | <input type="checkbox"/> Chamber F            |
|                                    | <input checked="" type="checkbox"/> Chamber G |
|                                    | <input type="checkbox"/> Chamber H            |

The above test sites and facilities are covered under FCC Test Firm Registration # 208313. Chambers A through H are covered under Industry Canada company address code 2324B with site numbers 2324B -1 through 2324B-8, respectively

UL Verification Services Inc. is accredited by NVLAP, Laboratory Code 200065-0. The full scope of accreditation can be viewed at <http://ts.nist.gov/standards/scopes/2000650.htm>.

## 4. CALIBRATION AND UNCERTAINTY

### 4.1. MEASURING INSTRUMENT CALIBRATION

The measuring equipment utilized to perform the tests documented in this report has been calibrated in accordance with the manufacturer's recommendations, and is traceable to recognized national standards.

### 4.2. SAMPLE CALCULATION

Where relevant, the following sample calculation is provided:

$$\begin{aligned} \text{Field Strength (dBuV/m)} &= \text{Measured Voltage (dBuV)} + \text{Antenna Factor (dB/m)} + \\ &\text{Cable Loss (dB)} - \text{Preamp Gain (dB)} \\ 36.5 \text{ dBuV} + 18.7 \text{ dB/m} + 0.6 \text{ dB} - 26.9 \text{ dB} &= 28.9 \text{ dBuV/m} \end{aligned}$$

### 4.3. MEASUREMENT UNCERTAINTY

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the apparatus:

| PARAMETER                             | UNCERTAINTY   |
|---------------------------------------|---------------|
| Conducted Disturbance, 0.15 to 30 MHz | $\pm 3.52$ dB |
| Radiated Disturbance, 30 to 1000 MHz  | $\pm 4.94$ dB |
| Radiated Disturbance, 1 to 6 GHz      | $\pm 3.86$ dB |
| Radiated Disturbance, 6 to 18 GHz     | $\pm 4.23$ dB |
| Radiated Disturbance, 18 to 26 GHz    | $\pm 5.30$ dB |
| Radiated Disturbance, 26 to 40 GHz    | $\pm 5.23$ dB |

Uncertainty figures are valid to a confidence level of 95%.

## 5. EQUIPMENT UNDER TEST

### 5.1. DESCRIPTION OF EUT

The EUT is a Bluetooth headset.

### 5.2. MAXIMUM OUTPUT POWER

The transmitter has a maximum peak conducted output power as follows:

| Frequency Range<br>(MHz) | E Field at 30m distance<br>(dBuV/m) |
|--------------------------|-------------------------------------|
| 13.56                    | 41.34                               |

### 5.3. DESCRIPTION OF AVAILABLE ANTENNAS

The radio utilizes a planar inductive NFC antenna.

### 5.4. SOFTWARE AND FIRMWARE

The firmware installed in the EUT during testing was 10400.

The test utility software used during testing was ConnectTest.exe.

### 5.5. WORST-CASE CONFIGURATION AND MODE

Radiated emission and power line conducted emission were performed with the EUT set to transmit at the channel with highest output power as worst-case scenario.

The fundamental of the EUT was investigated in three orthogonal orientations X, Y and Z position, it was determined that X (Flatbed) orientation was the worst-case orientation; therefore, all final radiated testing was performed with the EUT in X orientation.

## 5.6. DESCRIPTION OF TEST SETUP

### SUPPORT EQUIPMENT

| Support Equipment List |              |            |                       |        |
|------------------------|--------------|------------|-----------------------|--------|
| Description            | Manufacturer | Model      | Serial Number         | FCC ID |
| Laptop                 | Dell         | D400       | 45426167881           | N/A    |
| AC/DC Adapter          | Dell         | LA90PS0-00 | 0DF266-71615-67J-34B1 | N/A    |

### I/O CABLES

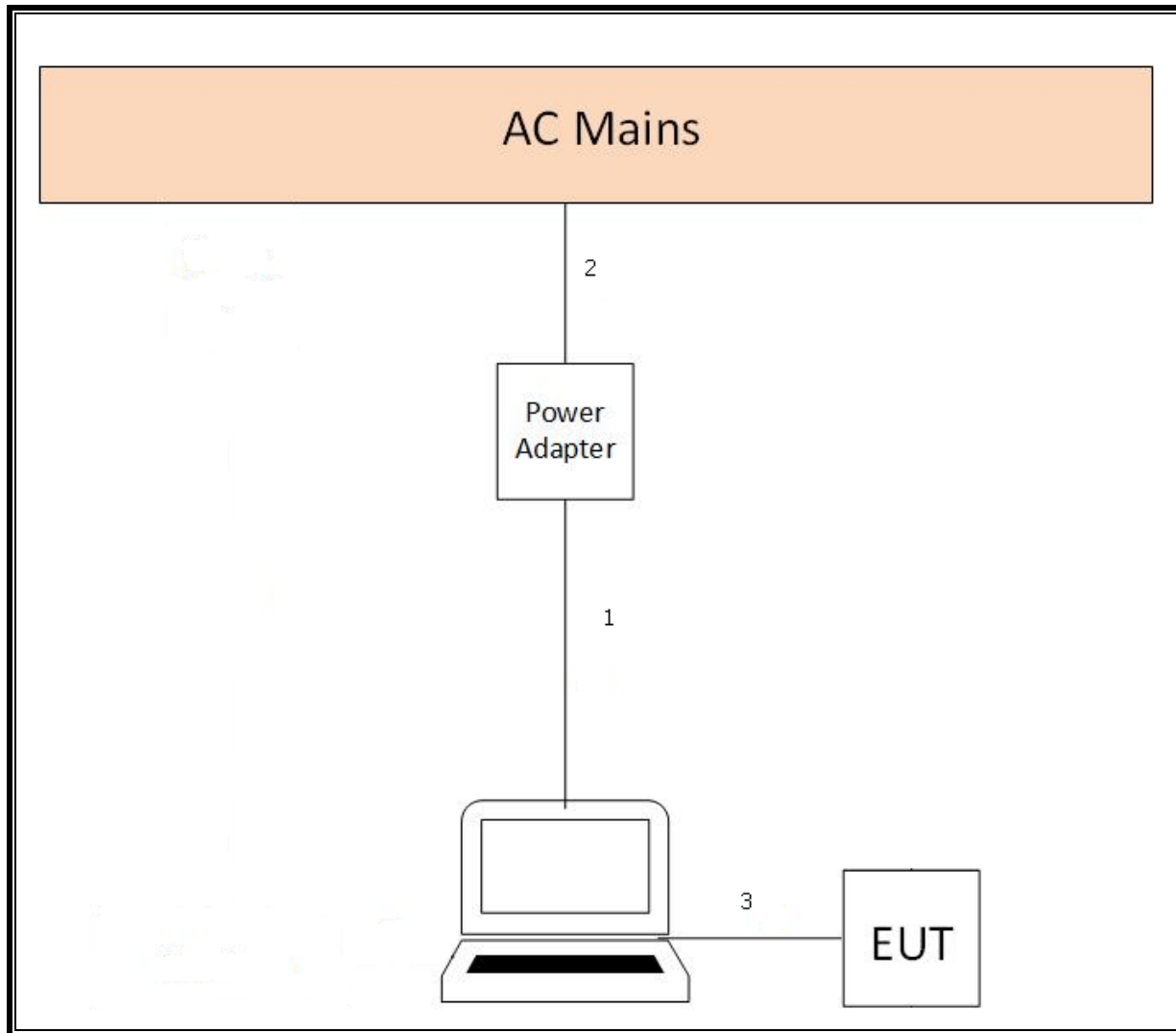
| I/O Cable List |      |                      |                |            |                  |         |
|----------------|------|----------------------|----------------|------------|------------------|---------|
| Cable No       | Port | # of identical ports | Connector Type | Cable Type | Cable Length (m) | Remarks |
| 1              | DC   | 1                    | Barrel         | Unshielded | 1                | N/A     |
| 2              | AC   | 1                    | 3-Prong        | Unshielded | 1                | N/A     |
| 3              | USB  | 1                    | USB            | Unshielded | 0.25             | N/A     |

### TEST SETUP

The EUT is connected to a host laptop via USB cable, test software exercises the radio.



**SETUP DIAGRAM RADIATED**



## 6. TEST AND MEASUREMENT EQUIPMENT

The following test and measurement equipment was utilized for the tests documented in this report:

| Test Equipment List                         |                |                  |                        |          |
|---|----------------|------------------|------------------------|----------|
| Description                                 | Manufacturer   | Model            | T No.                  | Cal Due  |
| Antenna, Broadband Hybrid                   | Sunol Sciences | JB3              | 900                    | 04/10/16 |
| Amplifier, 10KHz to 1GHz, 32dB              | Sonoma         | 310N             | 173                    | 06/09/16 |
| Antenna, Loop, 30 MHz                       | EMCO           | 6502             | 35                     | 05/15/16 |
| Chamber, Environmental                      | Thermotron     | SE 600-10-10     | 80                     | 05/15/16 |
| Spectrum Analyzer, PXA, 3Hz to 44GHz        | Agilent        | N9030A           | 1222                   | 03/27/16 |
| EMI Test Receiver, 9 kHz-7 GHz              | R & S          | ESCI 7           | 1124                   | 09/30/16 |
| LISN for Conducted Emissions CISPR-16       | FCC            | LISN-50/250-25-2 | 24                     | 01/16/16 |
| Line conducted Power cable ANSI 63.4        | UL             | PG1              | 861                    | 07/28/15 |
| Antenna, Broadband Hybrid, 30MHz to 2000MHz | Sunol Sciences | JB3              | 407                    | 03/05/16 |
| UL SOFTWARE                                 |                |                  |                        |          |
| *Radiated Software                          | UL             | UL EMC           | Ver 9.5, July 22, 2014 |          |
| *AC Line Conducted Software                 | UL             | UL EMC           | Ver 9.5, April 3, 2015 |          |

Note: \* indicates automation software version used in the compliance certification testing

## 7. OCCUPIED BANDWIDTH

### LIMITS

None; for reporting purposes only.

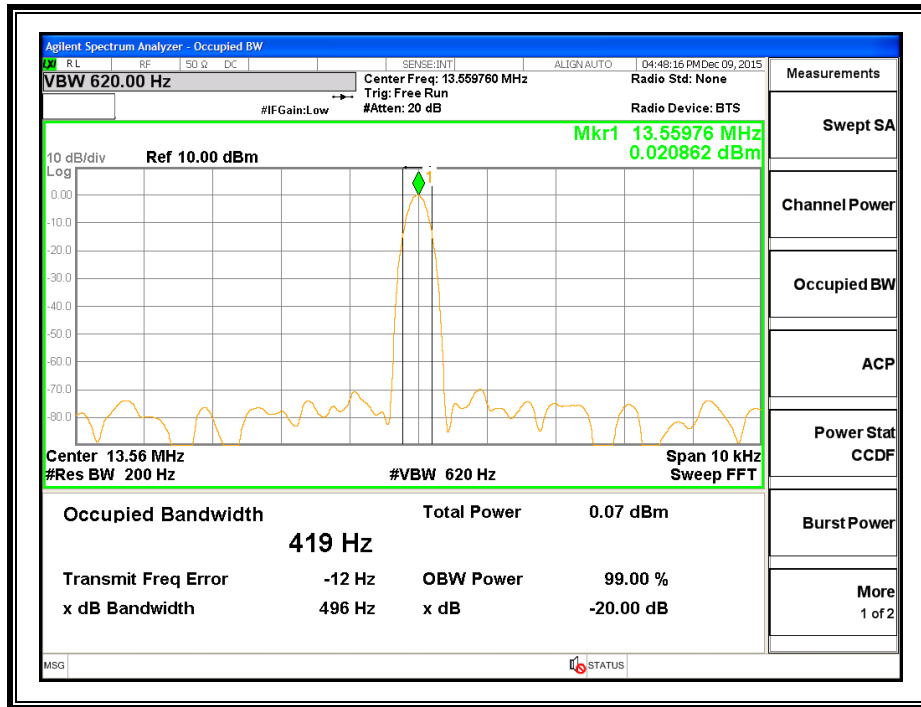
### TEST PROCEDURE

The transmitter output is connected to the spectrum analyzer. The RBW is set to 10kHz. The VBW is set to 3 times the RBW. The sweep time is coupled. The spectrum analyzer internal 99% bandwidth function is utilized.

### RESULTS

| Frequency<br>(MHz) | 99% Bandwidth<br>(KHz) | 20dB Bandwidth<br>(KHz) |
|--------------------|------------------------|-------------------------|
| 13.56              | 0.419                  | 0.496                   |

**99% BANDWIDTH**



## 8. RADIATED EMISSION TEST RESULTS

### 8.1. LIMITS AND PROCEDURE

#### LIMIT

§15.225

IC RSS-210, A2.6

IC RSS-GEN, Section 8.9 (Transmitter)

IC RSS-GEN, Section 7.1.2 (Receiver)

(a) The field strength of any emissions within the band 13.553–13.567 MHz shall not exceed 15,848 microvolts/ meter at 30 meters.

(b) Within the bands 13.410–13.553 MHz and 13.567–13.710 MHz, the field strength of any emissions shall not exceed 334 microvolts/meter at 30 meters.

(c) Within the bands 13.110–13.410 MHz and 13.710–14.010 MHz the field strength of any emissions shall not exceed 106 microvolts/meter at 30 meters.

(d) The field strength of any emissions appearing outside of the 13.110– 14.010 MHz and shall not exceed the general radiated emission limits in § 15.209 as follows:

§15.209 (a) Except as provided elsewhere in this subpart, the emissions from an intentional radiator shall not exceed the field strength levels specified in the following table:

| Limits for radiated disturbance of an intentional radiator |                 |                          |
|--|-----------------|--------------------------|
| Frequency range (MHz)                                      | Limits (µV/m)   | Measurement Distance (m) |
| 0.009 – 0.490  | 2400 / F (kHz)  | 300                      |
| 0.490 – 1.705  | 24000 / F (kHz) | 30                       |
| 1.705 – 30.0   | 30              | 30                       |
| 30 – 88  | 100**           | 3                        |
| 88 - 216   | 150**           | 3                        |
| 216 – 960  | 200**           | 3                        |
| Above 960  | 500             | 3                        |

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

§15.209 (b) In the emission table above, the tighter limit applies at the band edges.

Formula for converting the field strength from uV/m to dBuV/m is:

Limit (dBuV/m) = 20 log limit (uV/m)

In addition:

§15.209 (d) The emission limits shown the above table are based on measurements employing a CISPR quasi-peak detector except for the frequency bands 9-90 kHz, 110-490 kHz and above 1000 MHz. Radiated emissions limits in these three bands are based on measurements employing an average detector.

§15.209 (d) The provisions in §§ 15.225, measuring emissions at distances other than the distances specified in the above table, determining the frequency range over which radiated emissions are to be measured, and limiting peak emissions apply to all devices operated under this part.

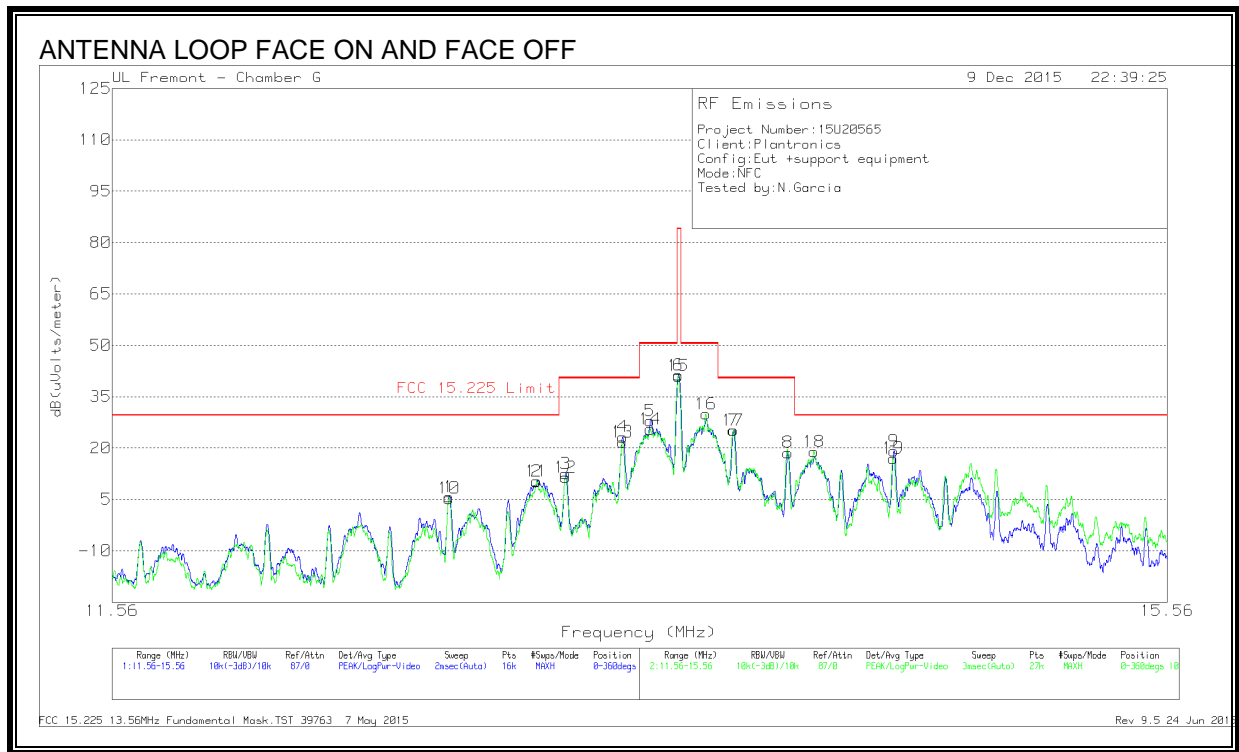
### **TEST PROCEDURE**

ANSI C63.10, 2013

The EUT is an intentional radiator that incorporates a digital device, the highest fundamental frequency generated or used in the device is 13.56 MHz; therefore, the frequency range was investigated from 0.15 MHz to the 10<sup>th</sup> harmonic of the highest fundamental frequency, or 1000 MHz, whichever is greater.

### **RESULTS**

### 8.1.1. FUNDAMENTAL AND SPURIOUS EMISSIONS (0.15 – 30 MHz)



Blue: Antenna loop face On

Green: Antenna loop face Off

Trace Markers

| Marker | Frequency (MHz) | Meter Reading (dBuV) | Det | Loop Antenna (dB/m) | Cbl (dB) | Dist Corr 30m | Corrected Reading dB(uVolts/meter) | FCC 15.225 Limit | Margin (dB) | Azimuth (Degs) |
|--------|-----------------|----------------------|-----|---------------------|----------|---------------|------------------------------------|------------------|-------------|----------------|
| 1      | 12.71           | 34.71                | Pk  | 10.4                | .6       | -40           | 5.71                               | 29.54            | -23.83      | 0-360          |
| 10     | 12.71107        | 34.32                | Pk  | 10.4                | .6       | -40           | 5.32                               | 29.54            | -24.22      | 0-360          |
| 11     | 13.02786        | 39.26                | Pk  | 10.4                | .6       | -40           | 10.26                              | 40.51            | -30.25      | 0-360          |
| 2      | 13.02825        | 39.31                | Pk  | 10.4                | .6       | -40           | 10.31                              | 40.51            | -30.2       | 0-360          |
| 3      | 13.13475        | 41.51                | Pk  | 10.4                | .6       | -40           | 12.51                              | 40.51            | -28         | 0-360          |
| 12     | 13.13479        | 40.45                | Pk  | 10.4                | .6       | -40           | 11.45                              | 40.51            | -29.06      | 0-360          |
| 13     | 13.34629        | 50.73                | Pk  | 10.4                | .6       | -40           | 21.73                              | 40.51            | -18.78      | 0-360          |
| 4      | 13.34788        | 52.26                | Pk  | 10.4                | .6       | -40           | 23.26                              | 40.51            | -17.25      | 0-360          |
| 5      | 13.45175        | 56.92                | Pk  | 10.4                | .6       | -40           | 27.92                              | 50.48            | -22.56      | 0-360          |
| 14     | 13.45196        | 54.5                 | Pk  | 10.4                | .6       | -40           | 25.5                               | 50.48            | -24.98      | 0-360          |
| 15     | 13.55793        | 70.09                | Pk  | 10.4                | .6       | -40           | 41.09                              | 84               | -42.91      | 0-360          |
| 6      | 13.55925        | 70.34                | Pk  | 10.4                | .6       | -40           | 41.34                              | 84               | -42.66      | 0-360          |
| 16     | 13.66375        | 58.91                | Pk  | 10.4                | .6       | -40           | 29.91                              | 50.48            | -20.57      | 0-360          |
| 17     | 13.76957        | 54.3                 | Pk  | 10.3                | .6       | -40           | 25.2                               | 40.51            | -15.31      | 0-360          |
| 7      | 13.77188        | 54.28                | Pk  | 10.3                | .6       | -40           | 25.18                              | 40.51            | -15.33      | 0-360          |
| 8      | 13.98388        | 47.78                | Pk  | 10.3                | .6       | -40           | 18.68                              | 40.51            | -21.83      | 0-360          |
| 18     | 14.08673        | 48.06                | Pk  | 10.3                | .6       | -40           | 18.96                              | 29.54            | -10.58      | 0-360          |
| 19     | 14.40463        | 46.1                 | Pk  | 10.3                | .6       | -40           | 17                                 | 29.54            | -12.54      | 0-360          |
| 9      | 14.40763        | 48.23                | Pk  | 10.3                | .6       | -40           | 19.13                              | 29.54            | -10.41      | 0-360          |

Pk - Peak detector

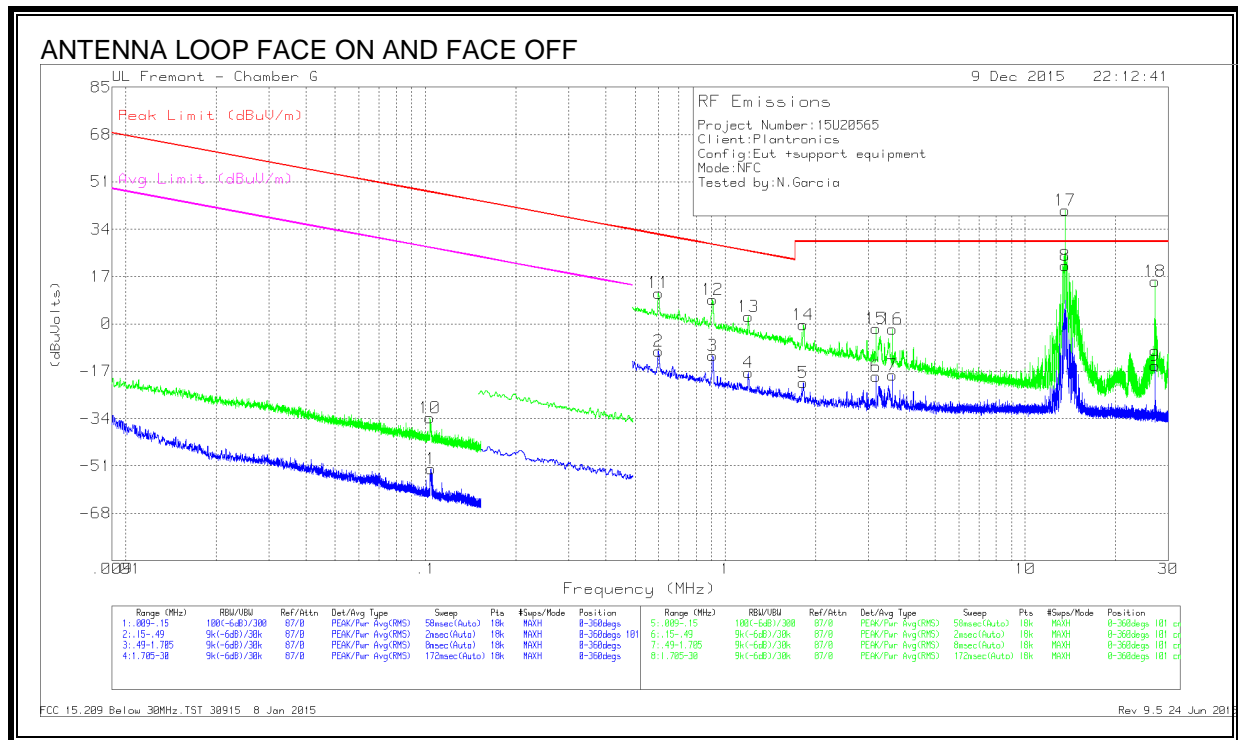
FCC 15.225 13.56MHz Fundamental Mask.TST 39763 7 May 2015

Rev 9.5 24 Jun 2015

PK - Peak detector



**SPURIOUS EMISSIONS**



Blue: Antenna Loop FACE ON

Green: Antenna Loop FACE OFF

Trace Markers

| Marker | Frequency (MHz) | Meter Reading (dBuV) | Det | Loop Antenna (dB/m) | Cbl (dB) | Dist Corr 300m | Corrected Reading (dBuVolts) | Peak Limit (dBuV/m) | Margin (dB) | Avg Limit (dBuV/m) | Margin (dB) | Azimuth (Degs) |
|--------|-----------------|----------------------|-----|---------------------|----------|----------------|------------------------------|---------------------|-------------|--------------------|-------------|----------------|
| 10     | .10346          | 35.18                | Pk  | 11                  | .1       | -80            | -33.72                       | 47.31               | -81.03      | 27.31              | -61.03      | 0-360          |
| 1      | .10422          | 16.83                | Pk  | 11                  | .1       | -80            | -52.07                       | 47.24               | -99.31      | 27.24              | -79.31      | 0-360          |

Pk - Peak detector

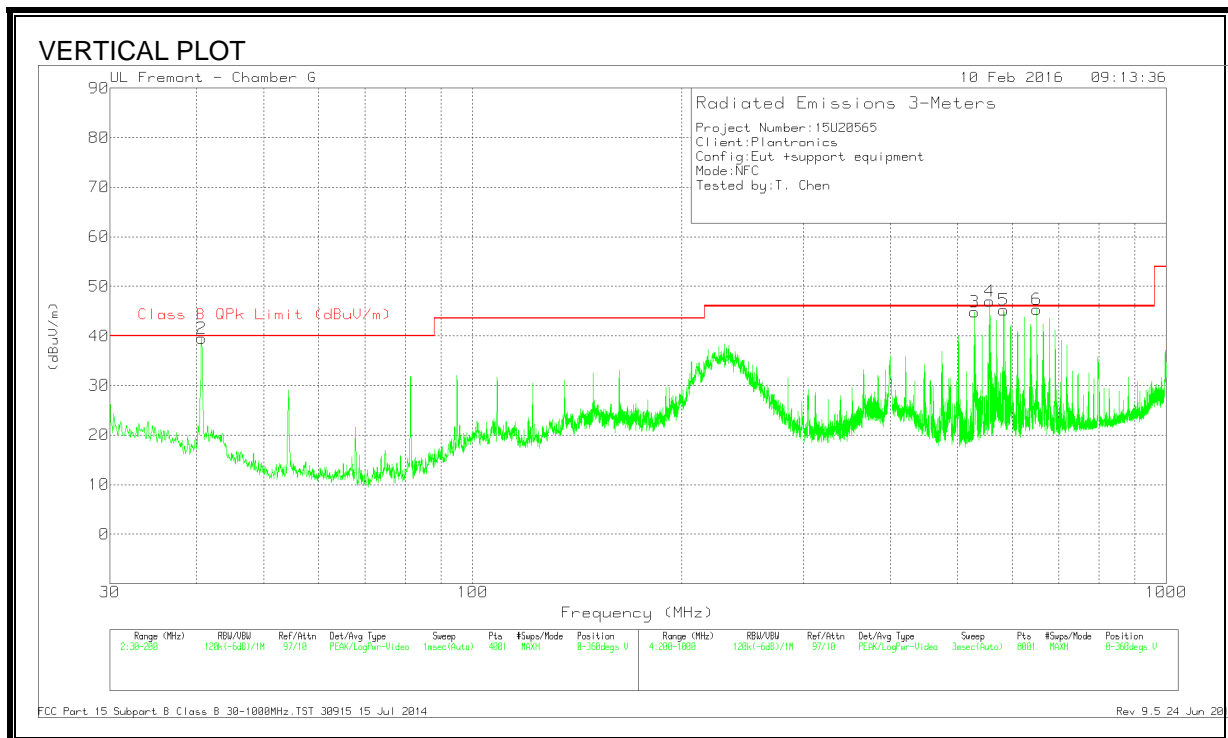
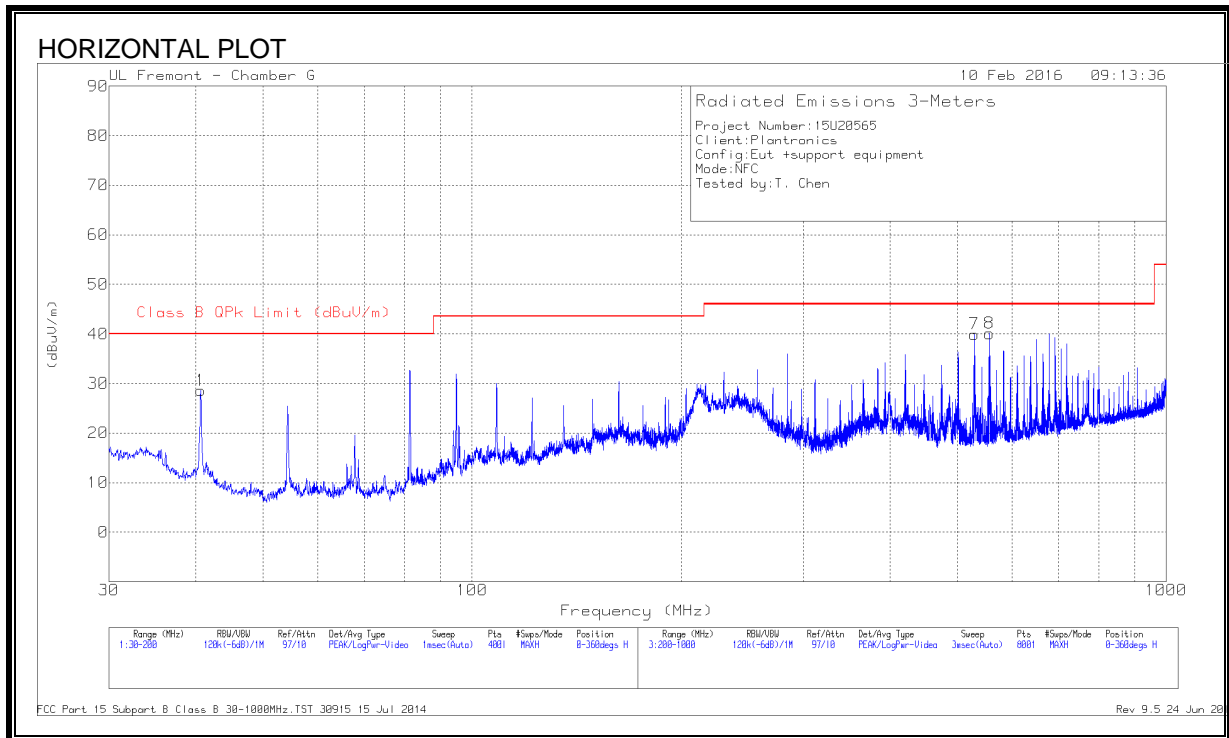
| Marker | Frequency (MHz) | Meter Reading (dBuV) | Det | Loop Antenna (dB/m) | Cbl (dB) | Dist Corr 30m | Corrected Reading (dBuVolts) | Peak Limit (dBuV/m) | Margin (dB)   | Avg Limit (dBuV/m) | Margin (dB) | Azimuth (Degs) |
|--------|-----------------|----------------------|-----|---------------------|----------|---------------|------------------------------|---------------------|---------------|--------------------|-------------|----------------|
| 2      | .59804          | 19.85                | Pk  | 10.2                | .2       | -40           | -9.75                        | 32.07               | -41.82        | -                  | -           | 0-360          |
| 11     | .59804          | 40.68                | Pk  | 10.2                | .2       | -40           | 11.08                        | 32.07               | -20.99        | -                  | -           | 0-360          |
| 12     | .9055           | 38.34                | Pk  | 10.2                | .2       | -40           | 8.74                         | 28.47               | -19.73        | -                  | -           | 0-360          |
| 3      | .90771          | 18.11                | Pk  | 10.2                | .2       | -40           | -11.49                       | 28.44               | -39.93        | -                  | -           | 0-360          |
| 13     | 1.19313         | 32.11                | Pk  | 10.4                | .2       | -40           | 2.71                         | 26.07               | -23.36        | -                  | -           | 0-360          |
| 4      | 1.19347         | 11.88                | Pk  | 10.4                | .2       | -40           | -17.52                       | 26.07               | -43.59        | -                  | -           | 0-360          |
| 14     | 1.81661         | 29.07                | Pk  | 10.4                | .2       | -40           | -.33                         | 29.54               | -29.87        | -                  | -           | 0-360          |
| 5      | 1.81976         | 8.24                 | Pk  | 10.4                | .2       | -40           | -21.16                       | 29.54               | -50.7         | -                  | -           | 0-360          |
| 6      | 3.17796         | 10.52                | Pk  | 10.4                | .3       | -40           | -18.78                       | 29.54               | -48.32        | -                  | -           | 0-360          |
| 15     | 3.17796         | 27.53                | Pk  | 10.4                | .3       | -40           | -1.77                        | 29.54               | -31.31        | -                  | -           | 0-360          |
| 7      | 3.6024          | 10.89                | Pk  | 10.5                | .3       | -40           | -18.31                       | 29.54               | -47.85        | -                  | -           | 0-360          |
| 16     | 3.6024          | 27.32                | Pk  | 10.5                | .3       | -40           | -1.88                        | 29.54               | -31.42        | -                  | -           | 0-360          |
| 17     | 13.55945        | 69.86                | Pk  | 10.4                | .6       | -40           | 40.86                        | <b>84</b>           | <b>-43.14</b> | -                  | -           | 0-360          |
| 8      | 13.56024        | 49.85                | Pk  | 10.4                | .6       | -40           | 20.85                        | 84                  | -63.15        | -                  | -           | 0-360          |
| 9      | 27.12188        | 15.73                | Pk  | 8.4                 | .9       | -40           | -14.97                       | 29.54               | -44.51        | -                  | -           | 0-360          |
| 18     | 27.12188        | 45.93                | Pk  | 8.4                 | .9       | -40           | 15.23                        | 29.54               | -14.31        | -                  | -           | 0-360          |

Pk - Peak detector

FCC 15.209 Below 30MHz.TST 30915 8 Jan 2015

Rev 9.5 24 Jun 2015

### 8.1.2. TX SPURIOUS EMISSION 30 TO 1000 MHz



Trace Markers

| Marker | Frequency (MHz) | Meter Reading (dBuV) | Det | AF T899 (dB/m) | Amp Cbl (dB) | Corrected Reading (dBuV/m) | Class B QPk Limit (dBuV/m) | Margin (dB) | Azimuth (Degs) | Height (cm) | Polarity |
|--------|-----------------|----------------------|-----|----------------|--------------|----------------------------|----------------------------|-------------|----------------|-------------|----------|
| 1      | 40.6675         | 45.65                | Pk  | 14             | -31.1        | 28.55                      | 40                         | -11.45      | 0-360          | 401         | H        |
| 2      | 40.6675         | 56.57                | Pk  | 14             | -31.1        | 39.47                      | 40                         | -.53        | 0-360          | 101         | V        |
|        | 40.6675         | 56.13                | Qp  | 14             | -31.1        | 39.03                      | 40                         | -.97        | 65             | 109         | V        |
| 3      | 528.7           | 54.48                | Pk  | 18.2           | -27.8        | 44.88                      | 46.02                      | -1.14       | 0-360          | 100         | V        |
|        | 528.7           | 52.34                | Qp  | 18.3           | -27.8        | 42.84                      | 46.02                      | -3.18       | 201            | 100         | V        |
| 7      | 528.8           | 49.46                | Pk  | 18.3           | -27.8        | 39.96                      | 46.02                      | -6.06       | 0-360          | 201         | H        |
| 8      | 555.9           | 50.09                | Pk  | 17.7           | -27.7        | 40.09                      | 46.02                      | -5.93       | 0-360          | 201         | H        |
|        | 555.9           | 55.3                 | Qp  | 17.7           | -27.7        | 45.3                       | 46.02                      | -.72        | 197            | 104         | V        |
| 5      | 583             | 54.16                | Pk  | 18.8           | -27.7        | 45.26                      | 46.02                      | -.76        | 0-360          | 100         | V        |
|        | 583             | 52.21                | QP  | 18.8           | -27.7        | 43.31                      | 46.02                      | -2.71       | 0-360          | 100         | V        |
| 6      | 650.9           | 53.09                | Pk  | 19.7           | -27.4        | 45.39                      | 46.02                      | -.63        | 0-360          | 100         | V        |
|        | 650.9           | 52.2                 | QP  | 19.7           | -27.4        | 44.5                       | 46.02                      | -1.52       | 0-360          | 100         | V        |

Pk - Peak detector

\* - indicates frequency in CFR 47, Part 15 and Industry Canada RSS-Restricted Band.

PK - Peak detector

## 9. FREQUENCY STABILITY

### LIMIT

§15.225 (e) The frequency tolerance of the carrier signal shall be maintained within  $\pm 0.01\%$  of the operating frequency, over a temperature variation of -20 degrees to +50 degrees C at normal supply voltage, and for a variation in the primary supply voltage from 85% to 115% of the rated supply voltage at a temperature of 20 degrees C. For battery operated equipment, the equipment tests shall be performed using a new battery.

### TEST PROCEDURE

ANSI C63.10 Clause 6.8

### RESULTS

| Reference Frequency: EUT Channel 13.56 MHz @ 20°C<br>Limit: $\pm 100$ ppm = 1.356 kHz |                     |   |                |                   |                |                   |                |                    |                |                             |
|---|---------------------|---|----------------|-------------------|----------------|-------------------|----------------|--------------------|----------------|-----------------------------|
| Power Supply<br>(Vdc)   | Envir. Temp<br>(°C) | Frequency Deviation Measured with Time Elapse |                |                   |                |                   |                |                    |                |                             |
|   |                     | Startup<br>(MHz)                              | Delta<br>(ppm) | @ 2 mins<br>(MHz) | Delta<br>(ppm) | @ 5 mins<br>(MHz) | Delta<br>(ppm) | @ 10 mins<br>(MHz) | Delta<br>(ppm) | Limit<br>(ppm)              |
| 3.70  | 50                  | 13.5597517                                    | 5.228          | 13.5597570        | 4.838          | 13.5597586        | 4.721          | 13.5597825         | 2.960          | $\pm 100$                   |
| 3.70  | 40                  | 13.5597497                                    | 5.372          | 13.5597497        | 5.372          | 13.5597497        | 5.378          | 13.5597495         | 5.394          | $\pm 100$                   |
| 3.70  | 30                  | 13.5597220                                    | 7.419          | 13.5597220        | 7.419          | 13.5597387        | 6.184          | 13.5597505         | 5.319          | $\pm 100$                   |
| <b>3.70</b>   | <b>20</b>           | <b>13.5598226</b>                             | <b>0.000</b>   | <b>13.5598219</b> | <b>0.051</b>   | <b>13.5598199</b> | <b>0.195</b>   | <b>13.5598209</b>  | <b>0.122</b>   | <b><math>\pm 100</math></b> |
| 3.70  | 10                  | 13.5597659                                    | 4.181          | 13.5597659        | 4.181          | 13.5597659        | 4.182          | 13.5597658         | 4.190          | $\pm 100$                   |
| 3.70  | 0                   | 13.5597657                                    | 4.196          | 13.5597166        | 7.817          | 13.5597166        | 7.820          | 13.5597166         | 7.817          | $\pm 100$                   |
| 3.30  | 20                  | 13.5597660                                    | 4.177          | 13.5597595        | 4.655          | 13.5597659        | 4.178          | 13.5597659         | 4.178          | $\pm 100$                   |
| 4.2   | 20                  | 13.5597660                                    | 4.174          | 13.5597595        | 4.655          | 13.5597659        | 4.177          | 13.5597660         | 4.177          | $\pm 100$                   |

## 10. AC MAINS LINE CONDUCTED EMISSIONS

### LIMITS

§15.207  
IC RSS-GEN, Section 7.2.2

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

| Frequency range<br>(MHz) | Limits (dB $\mu$ V) |          |
|--------------------------|---------------------|----------|
|                          | Quasi-peak          | Average  |
| 0.15 to 0.50             | 66 to 56            | 56 to 46 |
| 0.50 to 5                | 56                  | 46       |
| 5 to 30                  | 60                  | 50       |

Notes:  
1. The lower limit shall apply at the transition frequencies  
2. The limit decreases linearly with the logarithm of the frequency in the range 0.15 MHz to 0.50 MHz.

### TEST PROCEDURE

ANSI C63.10:2013

### RESULTS

No non-compliance noted:

**6 WORST EMISSIONS**

Trace Markers

Range 1: Line-L1 .15 - 30MHz

| Marker | Frequency (MHz) | Meter Reading (dBuV) | Det | T24 IL L1 | LC Cables 1&3 | Corrected Reading dBuV | CFR 47 Part 15 Class B QP | Margin (dB) | CFR 47 Part 15 Class B Avg | Margin (dB) |
|--------|-----------------|----------------------|-----|-----------|---------------|------------------------|---------------------------|-------------|----------------------------|-------------|
| 1      | .159            | 50.21                | Pk  | 1.3       | 0             | 51.51                  | 65.52                     | -14.01      |                            |             |
| 2      | .168            | 32.86                | Av  | 1.2       | 0             | 34.06                  | -                         | -           | 55.06                      | -21         |
| 3      | .4605           | 36.46                | Pk  | .4        | 0             | 36.86                  | 56.68                     | -19.82      |                            |             |
| 4      | .456            | 24.22                | Av  | .4        | 0             | 24.62                  | -                         | -           | 46.77                      | -22.15      |
| 5      | 2.427           | 44.96                | Pk  | .2        | .1            | 45.26                  | 56                        | -10.74      |                            |             |
| 6      | 2.4315          | 31.86                | Av  | .2        | .1            | 32.16                  | -                         | -           | 46                         | -13.84      |
| 7      | 9.825           | 36.94                | Pk  | .2        | .2            | 37.34                  | 60                        | -22.66      |                            |             |
| 8      | 9.825           | 25.88                | Av  | .2        | .2            | 26.28                  | -                         | -           | 50                         | -23.72      |
| 9      | 13.56           | 47.93                | Pk  | .2        | .2            | 48.33                  | 60                        | -11.67      |                            |             |
| 10     | 13.56           | 46.76                | Av  | .2        | .2            | 47.16                  | -                         | -           | 50                         | -2.84       |
| 11     | 27.1185         | 29.7                 | Pk  | .3        | .3            | 30.3                   | 60                        | -29.7       |                            |             |
| 12     | 27.1185         | 28.53                | Av  | .3        | .3            | 29.13                  | -                         | -           | 50                         | -20.87      |

Pk - Peak detector

Av - Average detection

Range 2: Line-L2 .15 - 30MHz

| Marker | Frequency (MHz) | Meter Reading (dBuV) | Det | T24 IL L2 | LC Cables 2&3 | Corrected Reading dBuV | CFR 47 Part 15 Class B QP | Margin (dB) | CFR 47 Part 15 Class B Avg | Margin (dB) |
|--------|-----------------|----------------------|-----|-----------|---------------|------------------------|---------------------------|-------------|----------------------------|-------------|
| 13     | .159            | 50.55                | Pk  | 1.4       | 0             | 51.95                  | 65.52                     | -13.57      |                            |             |
| 14     | .159            | 35.33                | Av  | 1.4       | 0             | 36.73                  | -                         | -           | 55.52                      | -18.79      |
| 15     | .4695           | 32.81                | Pk  | .4        | 0             | 33.21                  | 56.52                     | -23.31      |                            |             |
| 16     | .474            | 22.53                | Av  | .4        | 0             | 22.93                  | -                         | -           | 46.44                      | -23.51      |
| 17     | 2.283           | 40.13                | Pk  | .2        | .1            | 40.43                  | 56                        | -15.57      |                            |             |
| 18     | 2.31            | 29.24                | Av  | .2        | .1            | 29.54                  | -                         | -           | 46                         | -16.46      |
| 19     | 10.0275         | 36.28                | Pk  | .2        | .2            | 36.68                  | 60                        | -23.32      |                            |             |
| 20     | 9.9465          | 24.33                | Av  | .2        | .2            | 24.73                  | -                         | -           | 50                         | -25.27      |
| 21     | 13.56           | 48.53                | Pk  | .2        | .2            | 48.93                  | 60                        | -11.07      |                            |             |
| 22     | 13.56           | 47.78                | Av  | .2        | .2            | 48.18                  | -                         | -           | 50                         | -1.82       |
| 23     | 27.1185         | 30.15                | Pk  | .3        | .3            | 30.75                  | 60                        | -29.25      |                            |             |
| 24     | 27.1185         | 28.65                | Av  | .3        | .3            | 29.25                  | -                         | -           | 50                         | -20.75      |

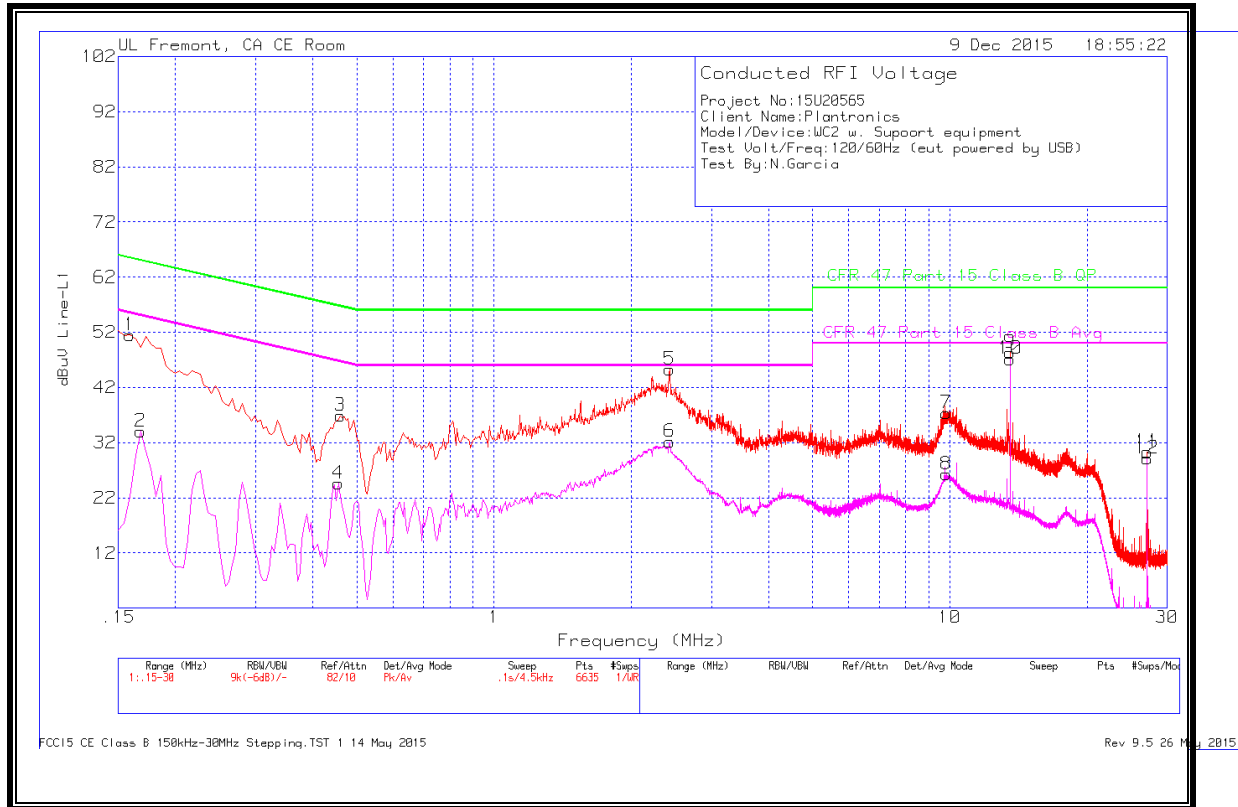
Pk - Peak detector

Av - Average detection

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**LINE 1 RESULTS**





**LINE 2 RESULTS**

