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# Report On

EMC Evaluation of  
Nextivity Inc.  
Cel-Fi Quatra Cellphone Signal Repeater

FCC Part 15 Subpart B  
ICES-003 Issue 5

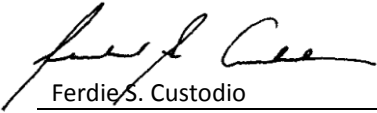
**Report No. SD72113545-0216A**

**March 2016**



America

TÜV SÜD America Inc., 10040 Mesa Rim Road, San Diego, CA 92121  
Tel: (858) 678-1400. Website: [www.TUVamerica.com](http://www.TUVamerica.com)

|                           |                                                                                                                                                                                              |
|---------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>REPORT ON</b>          | EMC Evaluation of the<br>Nextivity Inc.<br>Cel-Fi Quatra Cellphone Signal Repeater                                                                                                           |
| <b>TEST REPORT NUMBER</b> | SD72113545-0216A                                                                                                                                                                             |
| <b>TEST REPORT DATE</b>   | March 2016                                                                                                                                                                                   |
| <b>PREPARED FOR</b>       | Nextivity Inc.<br>12230 World trade Drive, Suite 250<br>San Diego, CA 92128                                                                                                                  |
| <b>CONTACT PERSON</b>     | CK Li<br>Sr. Principal Engineer, Regulatory<br>CLi@NextivityInc.com<br>(858) 829-1692                                                                                                        |
| <b>PREPARED BY</b>        | <br>Ferdie S. Custodio<br><b>Name</b><br>Authorized Signatory<br>Title: EMC/Senior Wireless Test Engineer |
| <b>APPROVED BY</b>        | <br>Chip R. Fleury<br><b>Name</b><br>Authorized Signatory<br>Title: West Coast EMC Manager                |
| <b>DATED</b>              | <u>March 03, 2016</u>                                                                                                                                                                        |



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## Revision History

| SD72113545-0216A<br>Nextivity Inc.<br>Cel-Fi Quatra Cellphone Signal Repeater |                 |              |        |                   |                    |
|-------------------------------------------------------------------------------|-----------------|--------------|--------|-------------------|--------------------|
| DATE                                                                          | OLD REVISION    | NEW REVISION | REASON | PAGES<br>AFFECTED | APPROVED BY        |
| 03/03/2016                                                                    | Initial Release |              |        |                   | Ferdinand Custodio |
|                                                                               |                 |              |        |                   |                    |
|                                                                               |                 |              |        |                   |                    |
|                                                                               |                 |              |        |                   |                    |
|                                                                               |                 |              |        |                   |                    |

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## **SECTION 1**

### **REPORT SUMMARY**

EMC Evaluation of the  
Nextivity Inc.  
Cellphone Signal Repeater



## 1.1 INTRODUCTION

The information contained in this report is intended to show verification of the Nextivity Inc. Cel-Fi Quatra Cellphone Signal Repeater to the requirements of FCC Part 15 Subpart B and Innovation, Science and Economic Development Canada ICES-003.

|                                     |                                                                                                                                                                                                                                                                                                   |
|-------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Objective                           | To perform EMC Evaluation to determine the Equipment Under Test's (EUT's) compliance with the Test Specification, for the series of tests carried out.                                                                                                                                            |
| Manufacturer                        | Nextivity Inc.                                                                                                                                                                                                                                                                                    |
| Model Name                          | Cel-Fi Quatra                                                                                                                                                                                                                                                                                     |
| Model Number(s)                     | Q34-2/5/12/66NU and Q34-2/66/5/12CU                                                                                                                                                                                                                                                               |
| Serial Number(s)                    | 258602000045 (NU), 259551000476 (CU #1), 259551000285 (CU #2), 259551000049 (CU #3), 259551000131 (CU #4)                                                                                                                                                                                         |
| Number of Samples Tested            | 5                                                                                                                                                                                                                                                                                                 |
| Highest Frequency Generated or Used | 2480 MHz (BT LE)                                                                                                                                                                                                                                                                                  |
| Test Specification/Issue/Date       | <ul style="list-style-type: none"> <li>FCC Part 15 Subpart B (October 1, 2015)</li> <li>Spectrum Management and Telecommunications Interference-Causing Equipment Standard ICES-003 Information Technology Equipment (ITE) — Limits and methods of measurement (Issue 6 January 2016).</li> </ul> |
| Start of Test                       | March 01, 2016                                                                                                                                                                                                                                                                                    |
| Finish of Test                      | March 02, 2016                                                                                                                                                                                                                                                                                    |
| Name of Engineer(s)                 | Ferdie Custodio                                                                                                                                                                                                                                                                                   |
| Related Document(s)                 | None                                                                                                                                                                                                                                                                                              |



## 1.2 BRIEF SUMMARY OF RESULTS

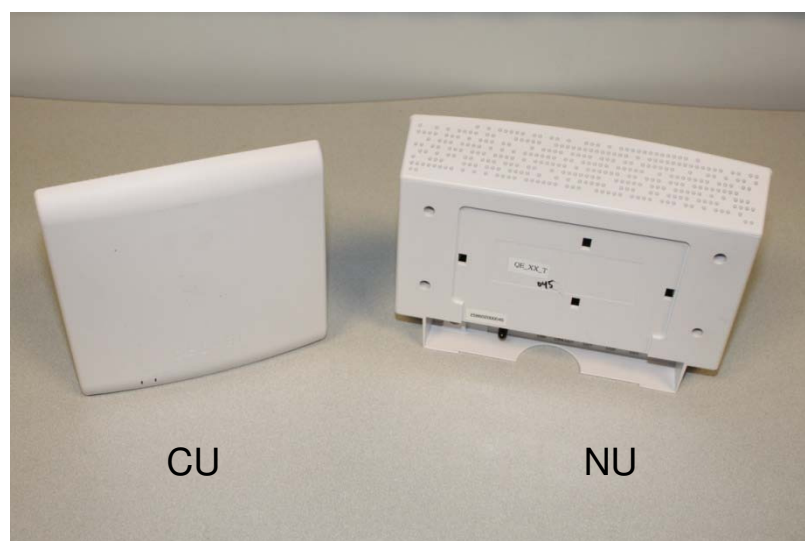
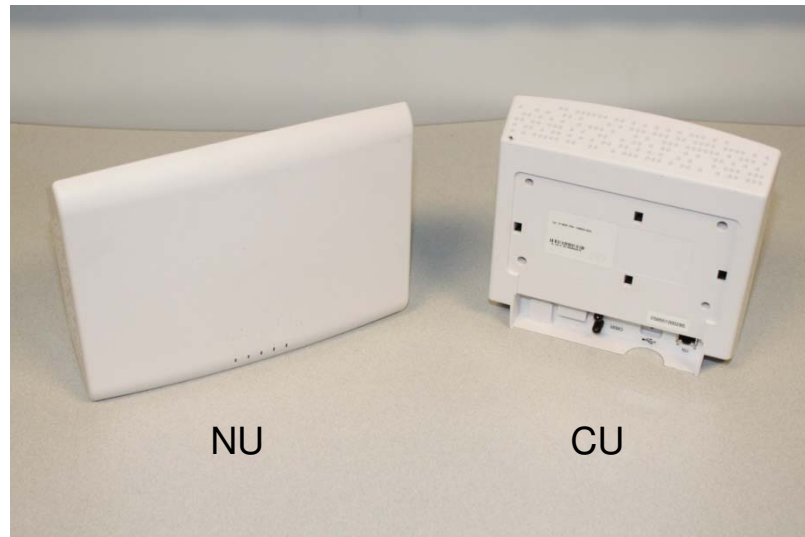
A brief summary of the tests carried out in accordance with FCC Part 15 Subpart B with cross-reference to Innovation, Science and Economic Development Canada Interference-Causing Equipment Standard ICES-003 is shown below.

| Part 15 | ICES-003   | Test Description         | Result    | Comments/Base Standard |
|---------|------------|--------------------------|-----------|------------------------|
| §15.107 | Clause 6.1 | Conducted Limits         | Compliant | Class B requirement    |
| §15.109 | Clause 6.2 | Radiated Emission Limits | Compliant | Class B requirement    |

### 1.3 PRODUCT INFORMATION

#### 1.3.1 Technical Description

The Equipment Under Test (EUT) was a Nextivity Inc. Cel-Fi Quatra Cellphone Signal Repeater as shown in the photograph below. The EUT is a WCDMA/LTE Signal Booster to improve voice and data cellular performance in large enterprise environments. The EUT consists of two separate units: the Network Unit (NU) and the Coverage Unit (CU). The NU comprises a transmitter and receiver which communicate with the cell tower and the CU. Users place the NU in an area with the strongest signal from the carrier network. The CU is then placed in the center of the home or office, or in the area where the best signal quality is best needed. The NU and CU are placed at varying distances apart and are communicated via Ethernet cables. This report covers “unintentional radiator” aspect of the EUT, all radios were placed on standby mode during testing (except for BT LE running in very low duty cycle).



**Equipment Under Test**



### 1.3.2 Labelling Requirement for Innovation, Science and Economic Development Canada

The manufacturer, importer or supplier shall meet the labelling requirements set out in this section and in Notice 2014-DRS1003 for electronic labelling for every unit:

- (i) Prior to marketing in Canada, for ITE manufactured in Canada, and;
- (ii) Prior to importation into Canada, for imported ITE.

Each unit of an ITE model shall bear a label (see below) that represents the manufacturer's or the importer's SDoC with Innovation, Science and Economic Development Canada's ICES-003. This label shall be permanently affixed to the ITE or displayed electronically and its text must be clearly legible. If the dimensions of the device are too small or if it is not practical to place the label on the ITE and electronic labelling has not been implemented, the label shall be, upon agreement with Innovation, Science and Economic Development Canada, placed in a prominent location in the user manual supplied with the ITE. The user manual may be in an electronic format and must be readily available.

Innovation, Science and Economic Development Canada ICES-003 Compliance Label:

***CAN ICES-3 (B)/NMB-3(B)***

### 1.3.3 Labelling Requirement for Part 15 (Verification) Device

See FCC Publication Number: 784748 for details:

<https://apps.fcc.gov/oetcf/kdb/forms/FTSSearchResultPage.cfm?id=27980&switch=P>

#### 1.4 EUT TEST CONFIGURATION

##### 1.4.1 Test Configuration Description

| Test Configuration | Description                                                                                                                                                                                                                                                                                                                 |
|--------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Default            | NU powered supplying power via PoE to CU. Both NU and the CUs were fully booted up before each test. For Radiated Emissions, the NU and CU were verified independently while maintaining connections with each other. For AC Conducted Emissions, the EUT were tested as a set where four (4) CUs were connected to the NU. |

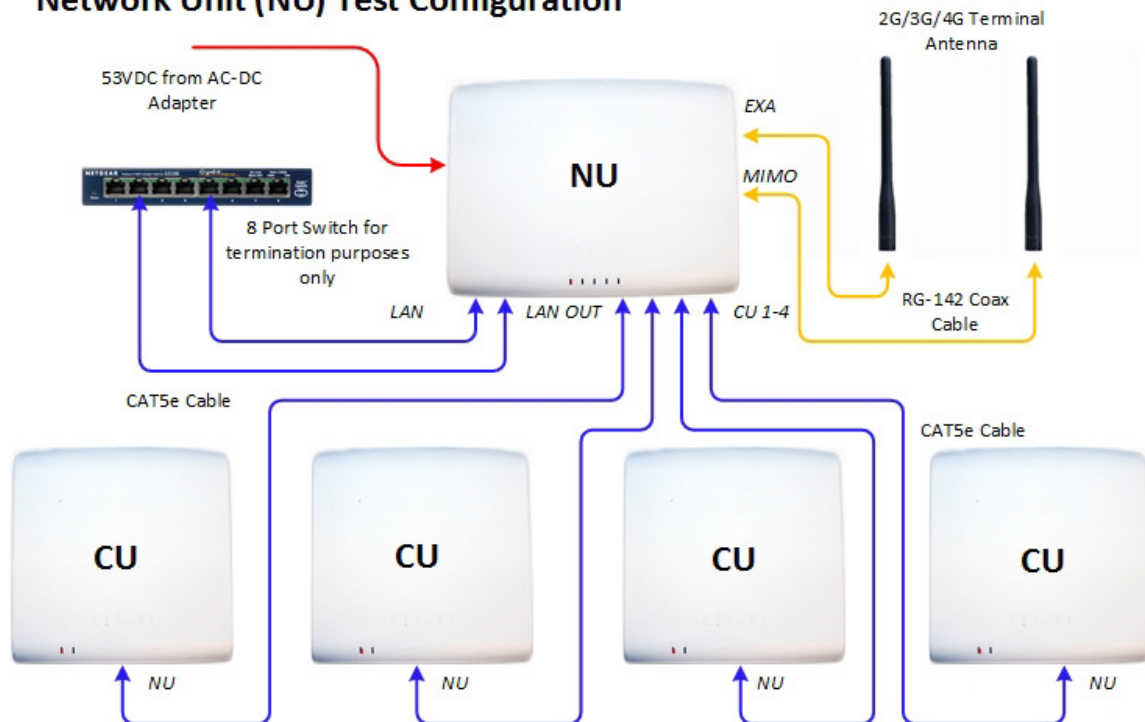
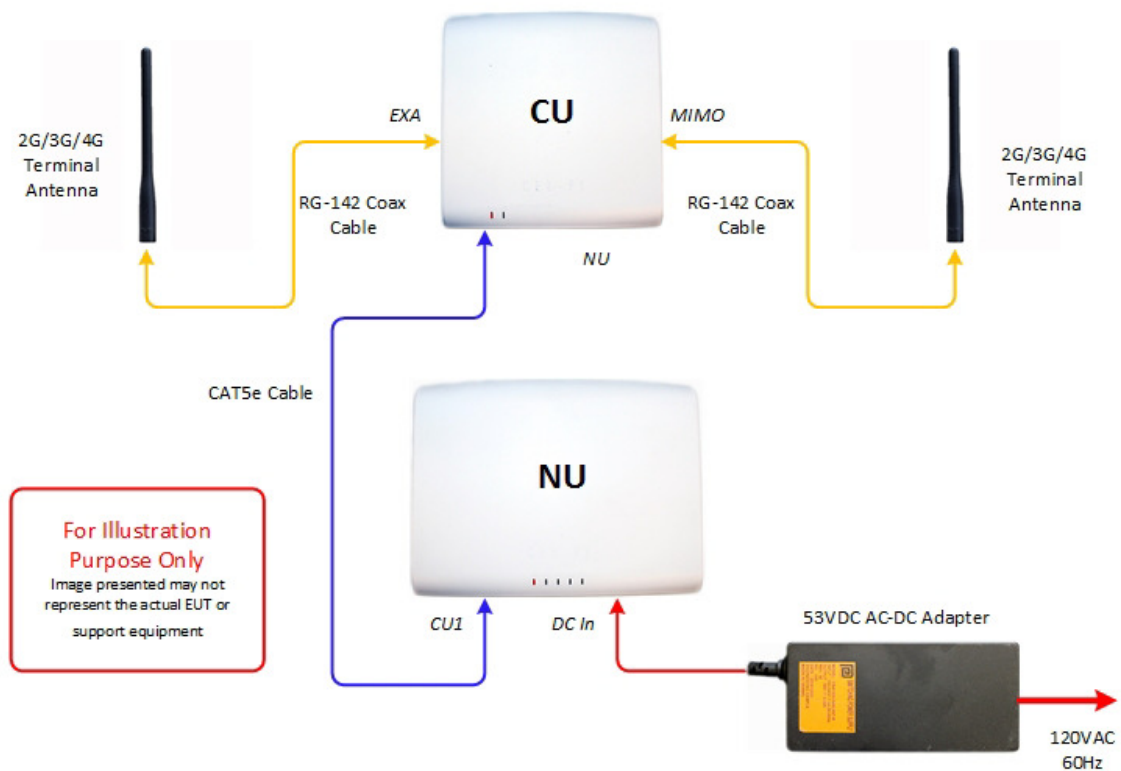
##### 1.4.2 EUT Exercise Software

None. No special test software was used to exercise the EUT during verification.

##### 1.4.3 Support Equipment and I/O cables

| Manufacturer | Equipment/Cable                               | Description                                                 |
|--------------|-----------------------------------------------|-------------------------------------------------------------|
| Phihong      | Switching Power Supply                        | Model PSA120U-540L6NT-R Rev 02 No. 026 (Engineering Sample) |
| Netgear      | ProSAFE® 8-Port Gigabit Switch                | M/N GS108v4 S/N 3TX25B7W86385                               |
| Netgear      | AC-DC Adapter for support switch              | Model AD2015F23 P/N 332-10744-01                            |
| -            | Network patch Cable (2x NU to support Switch) | 4.0m, unshielded, Cat5e 24AWG UTP                           |
| -            | Network patch Cable (4x NU to CU)             | 4.0m, unshielded, Cat5e 24AWG UTP                           |
| -            | Coaxial Cable (2x NU/CU to support antenna)   | 7.0m, RG-142 B/U                                            |
| Taoglass     | 2G/3G/4G Terminal Antenna (2x)                | Model TG.10.0113                                            |

## 1.4.4 Simplified Test Configuration Diagram

**Network Unit (NU) Test Configuration****Coverage Unit (CU) Radiated Emissions Test Configuration**



## 1.5 DEVIATIONS FROM THE STANDARD

No deviations from the applicable test standards or test plan were made during testing.

## 1.6 MODIFICATION RECORD

| Description of Modification                                                                                              | Modification Fitted By | Date Modification Fitted |
|--------------------------------------------------------------------------------------------------------------------------|------------------------|--------------------------|
| Serial Number: 258602000045 (NU), 259551000476 (CU #1), 259551000285 (CU #2), 259551000049 (CU #3), 259551000131 (CU #4) |                        |                          |
| N/A                                                                                                                      |                        |                          |

The table above details modifications made to the EUT during the test programme. The modifications incorporated during each test (if relevant) are recorded on the appropriate test pages.

## 1.7 TEST METHODOLOGY

All measurements contained in this report were conducted with ANSI C63.4-2014, American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the range of 9 kHz to 40 GHz.

For radiated emissions the equipment under test (EUT) was configured to measure its highest possible emission level. This level was based on the maximized cable configuration from exploratory testing per ANSI C63.4-2014. The test modes were adapted according to the Operating Instructions provided by the manufacturer/client.

## 1.8 TEST FACILITY LOCATION

### 1.8.1 TÜV SÜD America Inc. (Mira Mesa)

10040 Mesa Rim Road, San Diego, CA 92121-2912 (32.901268,-117.177681). Phone: 858 678 1400 Fax: 858 546 0364.

### 1.8.2 TÜV SÜD America Inc. (Rancho Bernardo)

Building #8, 16530 Via Esprillo, San Diego, CA 92127-1708 (33.018644,-117.092409). Phone: 858 942 5542 Fax: 858 546 0364.

## 1.9 TEST FACILITY REGISTRATION

### 1.9.1 FCC – Registration No.: US1146

TUV SUD America Inc. (San Diego), is an accredited test facility with the site description report on file and has met all the requirements specified in §2.948 of the FCC rules. The acceptance letter from the FCC is maintained in our files and the Registration is US1146.



**1.9.2 Innovation, Science and Economic Development Canada (IC) Registration No.: 3067A**

The 10m Semi-anechoic chamber of TÜV SÜD America Inc. (San Diego) has been registered by Certification and Engineering Bureau of Innovation, Science and Economic Development Canada for radio equipment testing with Registration No. 3067A.

**1.9.3 BSMI – Laboratory Code: SL2-IN-E-028R (US0102)**

TÜV Product Service Inc. (San Diego) is a recognized EMC testing laboratory by the BSMI under the MRA (Mutual Recognition Arrangement) with the United States. Accreditation includes CNS 13438 up to 6GHz.

**1.9.4 VCCI – Registration No. A-0230**

TÜV SÜD America Inc. (San Diego) is a VCCI registered measurement facility which includes radiated field strength measurement, radiated field strength measurement above 1GHz, mains port interference measurement and telecommunication port interference measurement.



## **SECTION 2**

### **TEST DETAILS**

EMC Evaluation of the  
Nextivity Inc.  
Cellphone Signal Repeater

## 2.1 CONDUCTED LIMITS

### 2.1.1 Specification Reference

Part 15 Subpart B §15.107(a)

### 2.1.2 Standard Applicable

Except for Class A digital devices, for equipment 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 of emission (MHz) | Conducted limit (dB $\mu$ V) |           |
|-----------------------------|------------------------------|-----------|
|                             | 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.

### 2.1.3 Equipment Under Test and Modification State

Serial No: 258602000045 (NU), 259551000476 (CU #1), 259551000285 (CU #2), 259551000049 (CU #3), 259551000131 (CU #4) /Default Test Configuration

### 2.1.4 Date of Test/Initial of test personnel who performed the test

March 01, 2016/FSC

### 2.1.5 Test Equipment Used

The major items of test equipment used for the above tests are identified in Section 3.1.

### 2.1.6 Environmental Conditions

Test performed at TÜV SÜD America Inc. Rancho Bernardo facility.

|                     |          |
|---------------------|----------|
| Ambient Temperature | 24.9 °C  |
| Relative Humidity   | 42.3 %   |
| ATM Pressure        | 99.3 kPa |

### 2.1.7 Additional Observations

- EUT verified as a system through the NU with four (4) CU connected.



- Measurement was done using EMC32 V8.53 automated software. Reported level is the actual level with all the correction factors factored in. Correction Factor column is for informational purposes only. See Section 2.1.8 for sample computation.

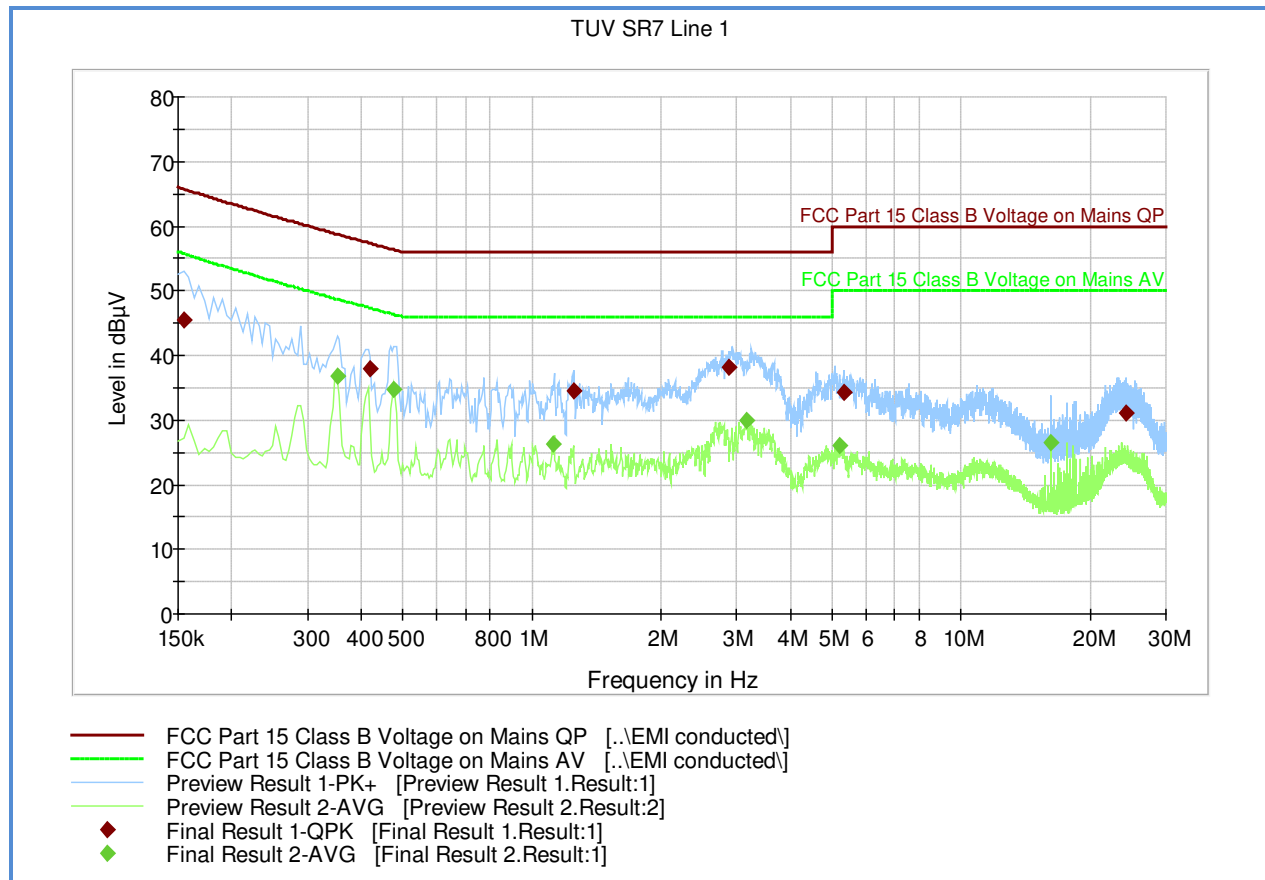
#### 2.1.8 Sample Computation (Conducted Emission – Quasi Peak)

|                                                            |                               |      |      |
|------------------------------------------------------------|-------------------------------|------|------|
| Measuring equipment raw measurement (db $\mu$ V) @ 150kHz  |                               |      | 5.5  |
| Correction Factor (dB)                                     | Asset# 8822(20 dB attenuator) | 19.9 | 20.7 |
|                                                            | Asset# 1177 (cable)           | 0.15 |      |
|                                                            | Asset# 1176 (cable)           | 0.35 |      |
|                                                            | Asset# 7567(LISN)             | 0.30 |      |
| Reported QuasiPeak Final Measurement (db $\mu$ V) @ 150kHz |                               |      | 26.2 |

#### 2.1.9 Test Results

Compliant. See attached plots and tables.

## 2.1.10 FCC Class B 120V 60Hz (Line 1 – Hot)



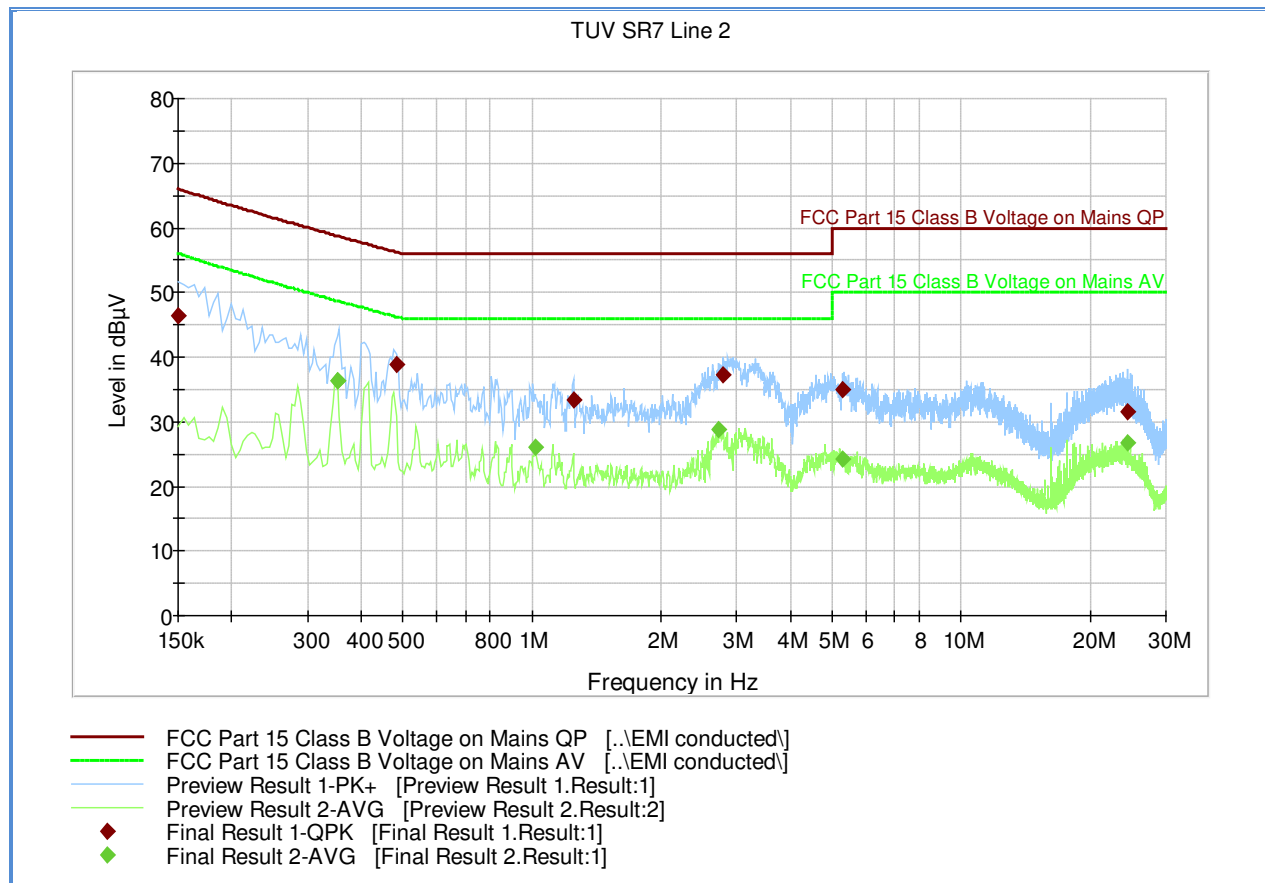
## Quasi Peak

| Frequency (MHz) | QuasiPeak (dBµV) | Meas. Time (ms) | Bandwidth (kHz) | Filter | Line | Corr. (dB) | Margin - QPK (dB) | Limit - QPK (dBµV) |
|-----------------|------------------|-----------------|-----------------|--------|------|------------|-------------------|--------------------|
| 0.154500        | 45.4             | 1000.0          | 9.000           | Off    | L1   | 20.2       | 20.3              | 65.7               |
| 0.420000        | 38.0             | 1000.0          | 9.000           | Off    | L1   | 20.0       | 19.4              | 57.3               |
| 1.248000        | 34.4             | 1000.0          | 9.000           | Off    | L1   | 20.0       | 21.6              | 56.0               |
| 2.868000        | 38.2             | 1000.0          | 9.000           | Off    | L1   | 20.1       | 17.8              | 56.0               |
| 5.338500        | 34.2             | 1000.0          | 9.000           | Off    | L1   | 20.1       | 25.8              | 60.0               |
| 24.216000       | 31.1             | 1000.0          | 9.000           | Off    | L1   | 20.5       | 28.9              | 60.0               |

## Average

| Frequency (MHz) | Average (dBµV) | Meas. Time (ms) | Bandwidth (kHz) | Filter | Line | Corr. (dB) | Margin - Ave (dB) | Limit - Ave (dBµV) |
|-----------------|----------------|-----------------|-----------------|--------|------|------------|-------------------|--------------------|
| 0.352500        | 36.7           | 1000.0          | 9.000           | Off    | L1   | 20.0       | 12.0              | 48.7               |
| 0.478500        | 34.7           | 1000.0          | 9.000           | Off    | L1   | 20.0       | 11.6              | 46.3               |
| 1.122000        | 26.2           | 1000.0          | 9.000           | Off    | L1   | 20.0       | 19.8              | 46.0               |
| 3.156000        | 29.9           | 1000.0          | 9.000           | Off    | L1   | 20.1       | 16.1              | 46.0               |
| 5.208000        | 25.9           | 1000.0          | 9.000           | Off    | L1   | 20.1       | 24.1              | 50.0               |
| 16.228500       | 26.6           | 1000.0          | 9.000           | Off    | L1   | 20.3       | 23.4              | 50.0               |

## 2.1.1.1 FCC Class B 120V 60Hz (Line 2 – Neutral)



## Quasi Peak

| Frequency (MHz) | QuasiPeak (dBµV) | Meas. Time (ms) | Bandwidth (kHz) | Filter | Line | Corr. (dB) | Margin - QPK (dB) | Limit - QPK (dBµV) |
|-----------------|------------------|-----------------|-----------------|--------|------|------------|-------------------|--------------------|
| 0.150000        | 46.5             | 1000.0          | 9.000           | Off    | N    | 20.2       | 19.5              | 66.0               |
| 0.483000        | 38.9             | 1000.0          | 9.000           | Off    | N    | 20.0       | 17.4              | 56.3               |
| 1.252500        | 33.3             | 1000.0          | 9.000           | Off    | N    | 20.0       | 22.7              | 56.0               |
| 2.791500        | 37.3             | 1000.0          | 9.000           | Off    | N    | 20.1       | 18.7              | 56.0               |
| 5.307000        | 34.9             | 1000.0          | 9.000           | Off    | N    | 20.1       | 25.1              | 60.0               |
| 24.450000       | 31.5             | 1000.0          | 9.000           | Off    | N    | 20.4       | 28.5              | 60.0               |

## Average

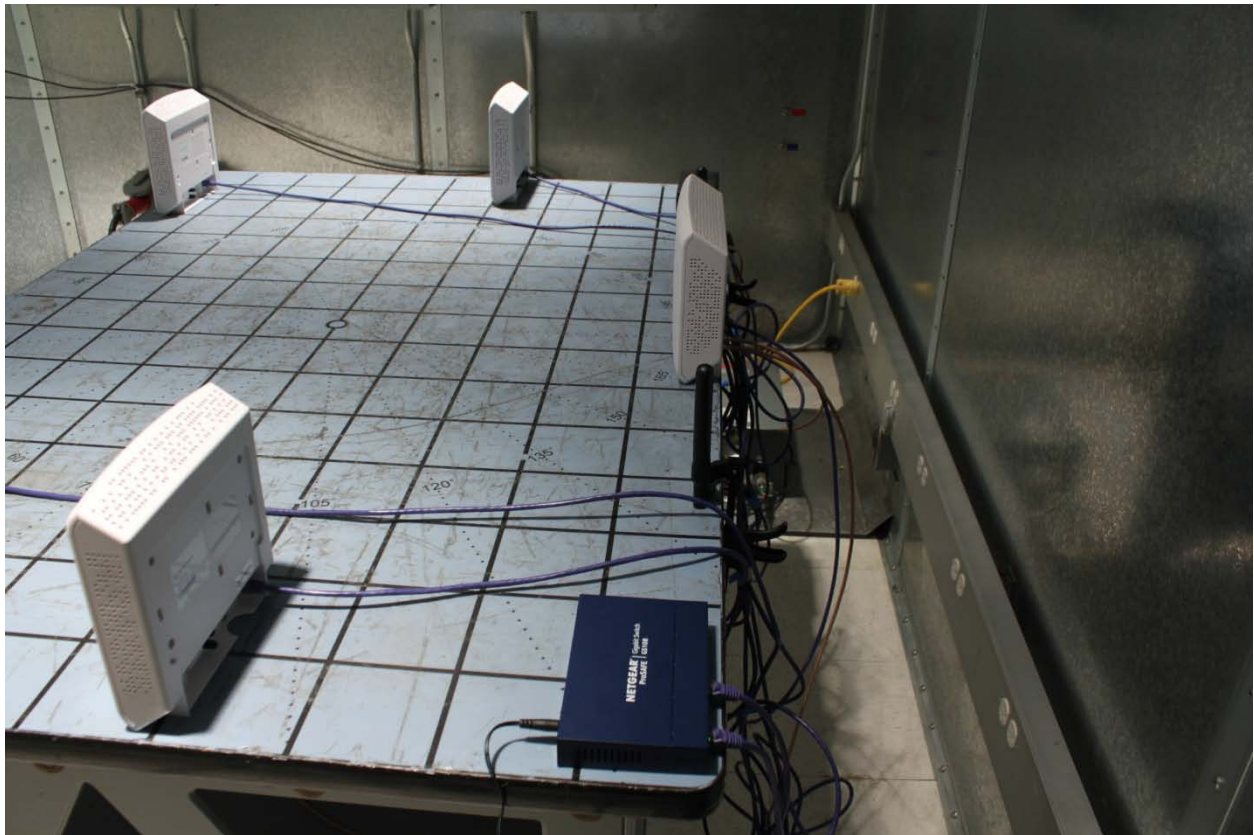
| Frequency (MHz) | Average (dBµV) | Meas. Time (ms) | Bandwidth (kHz) | Filter | Line | Corr. (dB) | Margin - Ave (dB) | Limit - Ave (dBµV) |
|-----------------|----------------|-----------------|-----------------|--------|------|------------|-------------------|--------------------|
| 0.352500        | 36.3           | 1000.0          | 9.000           | Off    | N    | 20.0       | 12.4              | 48.7               |
| 0.352500        | 36.4           | 1000.0          | 9.000           | Off    | N    | 20.0       | 12.3              | 48.7               |
| 1.018500        | 26.0           | 1000.0          | 9.000           | Off    | N    | 20.0       | 20.0              | 46.0               |
| 2.733000        | 28.8           | 1000.0          | 9.000           | Off    | N    | 20.1       | 17.2              | 46.0               |
| 5.316000        | 24.3           | 1000.0          | 9.000           | Off    | N    | 20.1       | 25.7              | 50.0               |
| 24.445500       | 26.9           | 1000.0          | 9.000           | Off    | N    | 20.4       | 23.1              | 50.0               |

#### 2.1.12 Test Setup Photo (Front)



*Arrangement of EUT is for maximum separation possible as recommended by the manufacturer*

2.1.13 Test Setup Photo (Back)



*Arrangement of EUT is for maximum separation possible as recommended by the manufacturer*

## 2.2 RADIATED EMISSION LIMITS

### 2.2.1 Specification Reference

Part 15 Subpart B §15.109(a)

### 2.2.2 Standard Applicable

(a) Except for Class A digital devices, the field strength of radiated emissions from unintentional radiators at a distance of 3 meters shall not exceed the following values:

| Frequency of emission (MHz) | Field Strength (microvolts/meter) |
|-----------------------------|-----------------------------------|
| 30-88                       | 100                               |
| 88-216                      | 150                               |
| 216-960                     | 200                               |
| Above 960                   | 500                               |

### 2.2.3 Equipment Under Test and Modification State

Serial No: 258602000045 (NU), 259551000476 (CU #1), 259551000285 (CU #2), 259551000049 (CU #3), 259551000131 (CU #4) /Default Test Configuration

### 2.2.4 Date of Test/Initial of test personnel who performed the test

March 02, 2016/FSC

### 2.2.5 Test Equipment Used

The major items of test equipment used for the above tests are identified in Section 3.1.

### 2.2.6 Environmental Conditions

Test performed at TÜV SÜD America Inc. Rancho Bernardo facility.

|                     |          |
|---------------------|----------|
| Ambient Temperature | 25.7 °C  |
| Relative Humidity   | 41.3 %   |
| ATM Pressure        | 99.5 kPa |

### 2.2.7 Additional Observations

- The spectrum was searched from 30MHz to 18GHz.
- Verification was performed at 3 meters.
- Measurement was done using EMC32 V8.53 automated software. Reported level is the actual level with all the correction factors factored in. Correction Factor column is for informational purposes only. See Section 2.2.8 for sample computation.

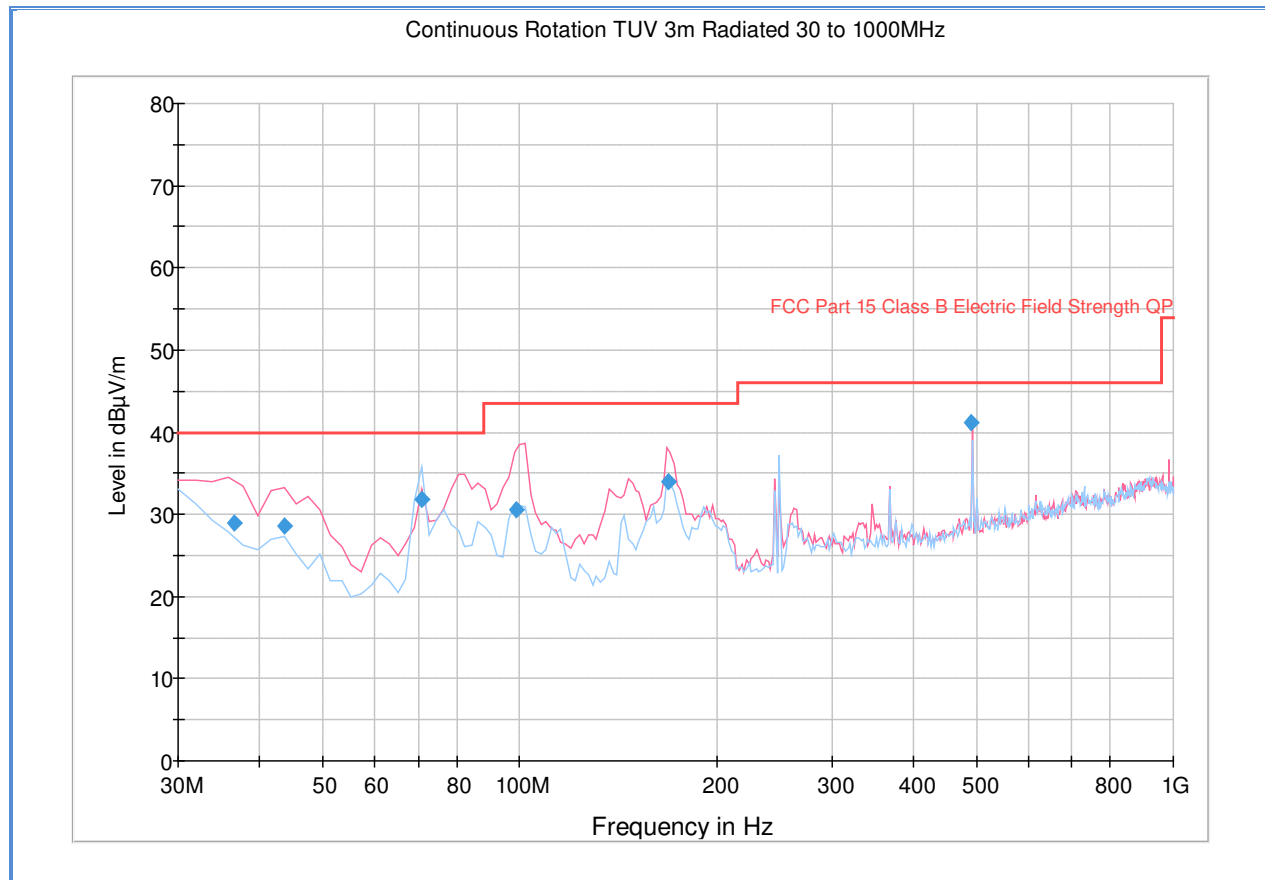
### 2.2.8 Sample Computation (Radiated Emission)

|                                                             |                            |       |       |
|-------------------------------------------------------------|----------------------------|-------|-------|
| Measuring equipment raw measurement (db $\mu$ V) @ 30 MHz   |                            |       | 24.4  |
| Correction Factor (dB)                                      | Asset# 1066 (cable)        | 0.3   | -12.6 |
|                                                             | Asset# 1172 (cable)        | 0.3   |       |
|                                                             | Asset# 1016 (preamplifier) | -30.7 |       |
|                                                             | Asset# 1175(cable)         | 0.3   |       |
|                                                             | Asset# 1033 (antenna)      | 17.2  |       |
| Reported QuasiPeak Final Measurement (db $\mu$ V/m) @ 30MHz |                            |       | 11.8  |

### 2.2.9 Test Results

See attached plots.

## 2.2.9.1 Below 1GHz Radiated Emission Test (NU)

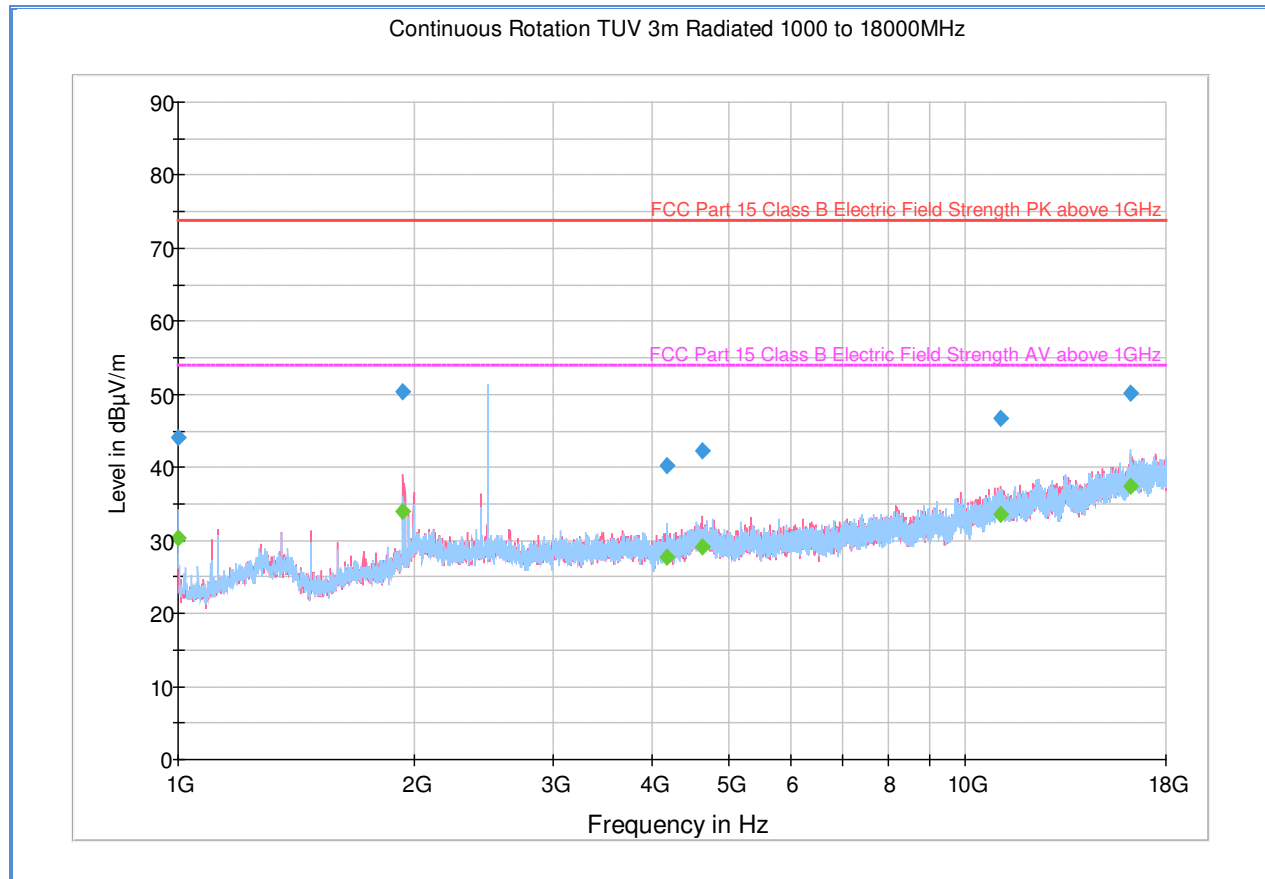


## Quasi-Peak Data

| Frequency (MHz) | QuasiPeak (dBµV/m) | Meas. Time (ms) | Bandwidth (kHz) | Height (cm) | Polarization | Azimuth (deg) | Corr. (dB) | Margin (dB) | Limit (dBµV/m) |
|-----------------|--------------------|-----------------|-----------------|-------------|--------------|---------------|------------|-------------|----------------|
| 36.471663       | 28.9               | 1000.0          | 120.000         | 100.0       | V            | 279.0         | -9.2       | 11.1        | 40.0           |
| 43.687214       | 28.6               | 1000.0          | 120.000         | 100.0       | V            | 285.0         | -12.3      | 11.4        | 40.0           |
| 70.621643       | 31.8               | 1000.0          | 120.000         | 377.0       | H            | 311.0         | -16.8      | 8.2         | 40.0           |
| 99.003848       | 30.6               | 1000.0          | 120.000         | 127.0       | V            | 41.0          | -14.1      | 12.9        | 43.5           |
| 169.016032      | 34.0               | 1000.0          | 120.000         | 100.0       | V            | 184.0         | -12.8      | 9.5         | 43.5           |
| 491.525291      | 41.2               | 1000.0          | 120.000         | 100.0       | V            | 223.0         | -1.6       | 4.8         | 46.0           |

**Test Notes:** All four (4) CU were placed inside a Faraday cage.

## 2.2.9.2 Above 1GHz Radiated Emission Test (NU)



## Peak Data

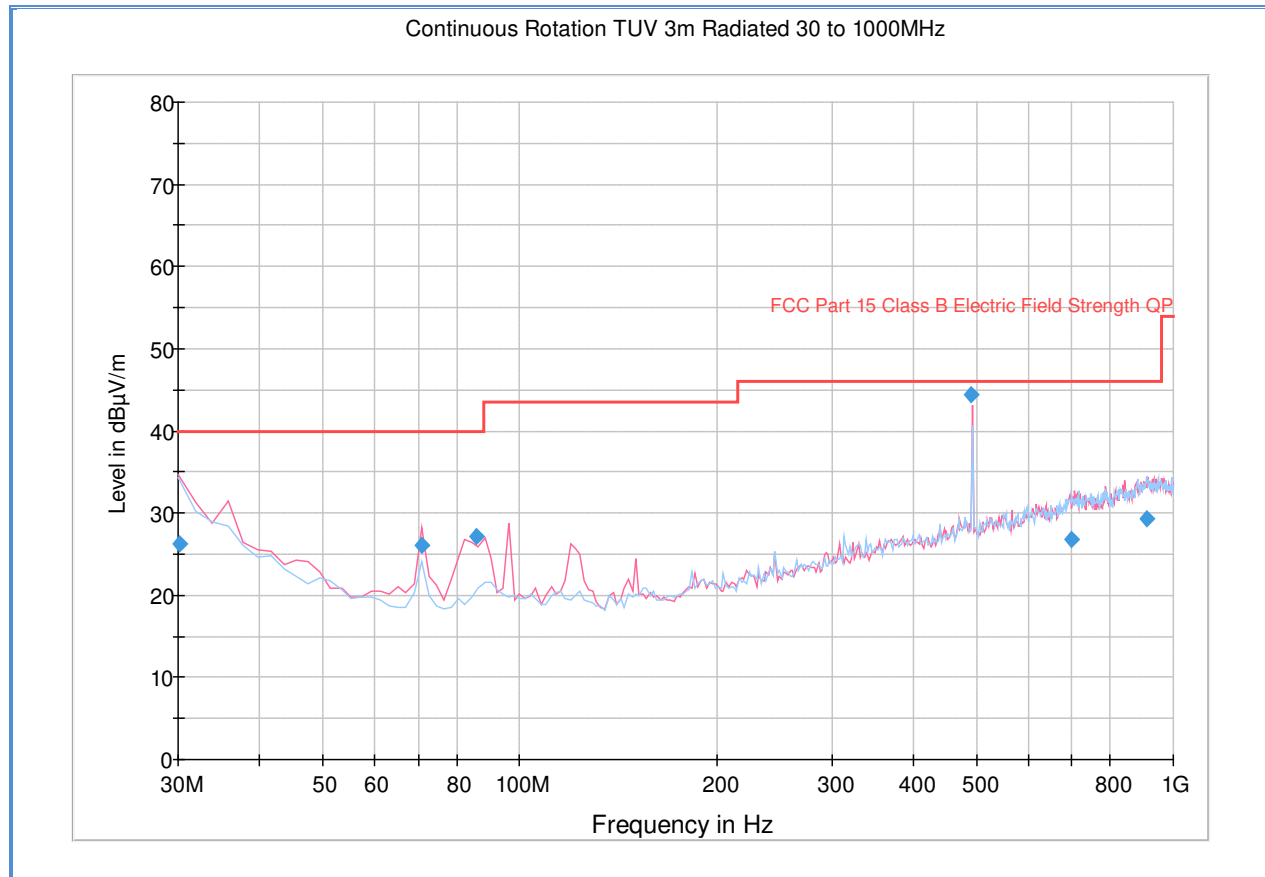
| Frequency (MHz) | MaxPeak (dBμV/m) | Meas. Time (ms) | Bandwidth (kHz) | Height (cm) | Polarization | Azimuth (deg) | Corr. (dB) | Margin (dB) | Limit (dBμV/m) |
|-----------------|------------------|-----------------|-----------------|-------------|--------------|---------------|------------|-------------|----------------|
| 1000.400000     | 44.0             | 1000.0          | 1000.000        | 239.4       | H            | 11.0          | -7.9       | 29.9        | 73.9           |
| 1932.366667     | 50.4             | 1000.0          | 1000.000        | 270.3       | V            | 245.0         | -1.6       | 23.5        | 73.9           |
| 4181.066667     | 40.1             | 1000.0          | 1000.000        | 404.5       | H            | 175.0         | 1.9        | 33.8        | 73.9           |
| 4634.966667     | 42.2             | 1000.0          | 1000.000        | 372.1       | V            | -20.0         | 2.8        | 31.7        | 73.9           |
| 11088.733333    | 46.7             | 1000.0          | 1000.000        | 404.5       | V            | 87.0          | 11.6       | 27.2        | 73.9           |
| 16249.600000    | 50.2             | 1000.0          | 1000.000        | 238.4       | H            | 20.0          | 17.1       | 23.7        | 73.9           |

## Average Data

| Frequency (MHz) | Average (dBμV/m) | Meas. Time (ms) | Bandwidth (kHz) | Height (cm) | Polarization | Azimuth (deg) | Corr. (dB) | Margin (dB) | Limit (dBμV/m) |
|-----------------|------------------|-----------------|-----------------|-------------|--------------|---------------|------------|-------------|----------------|
| 1000.400000     | 30.3             | 1000.0          | 1000.000        | 239.4       | H            | 11.0          | -7.9       | 23.6        | 53.9           |
| 1932.366667     | 34.0             | 1000.0          | 1000.000        | 270.3       | V            | 245.0         | -1.6       | 19.9        | 53.9           |
| 4181.066667     | 27.8             | 1000.0          | 1000.000        | 404.5       | H            | 175.0         | 1.9        | 26.1        | 53.9           |
| 4634.966667     | 29.1             | 1000.0          | 1000.000        | 372.1       | V            | -20.0         | 2.8        | 24.8        | 53.9           |
| 11088.733333    | 33.5             | 1000.0          | 1000.000        | 404.5       | V            | 87.0          | 11.6       | 20.4        | 53.9           |
| 16249.600000    | 37.4             | 1000.0          | 1000.000        | 238.4       | H            | 20.0          | 17.1       | 16.5        | 53.9           |

**Test Notes:** BT LE ignored during final measurement phase.

## 2.2.9.3 Below 1GHz Radiated Emission Test (CU)

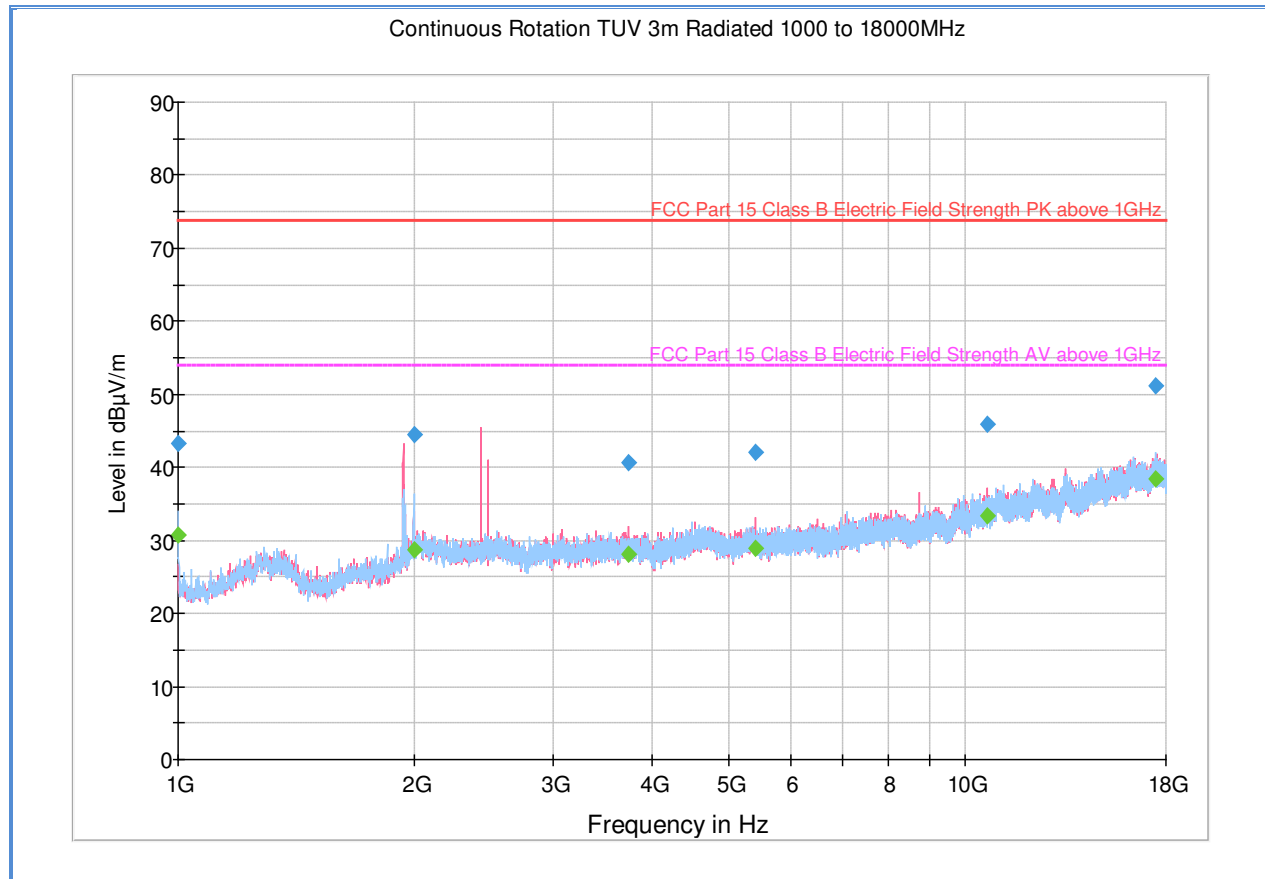


## Quasi-Peak Data

| Frequency (MHz) | QuasiPeak (dBµV/m) | Meas. Time (ms) | Bandwidth (kHz) | Height (cm) | Polarization | Azimuth (deg) | Corr. (dB) | Margin (dB) | Limit (dBµV/m) |
|-----------------|--------------------|-----------------|-----------------|-------------|--------------|---------------|------------|-------------|----------------|
| 30.120000       | 26.3               | 1000.0          | 120.000         | 150.0       | V            | 18.0          | -5.6       | 13.7        | 40.0           |
| 70.781643       | 26.0               | 1000.0          | 120.000         | 100.0       | V            | -5.0          | -16.8      | 14.0        | 40.0           |
| 85.692745       | 27.2               | 1000.0          | 120.000         | 100.0       | V            | 326.0         | -15.9      | 12.8        | 40.0           |
| 491.525291      | 44.5               | 1000.0          | 120.000         | 100.0       | V            | 250.0         | -1.6       | 1.5         | 46.0           |
| 698.977395      | 26.8               | 1000.0          | 120.000         | 211.0       | H            | 208.0         | 3.1        | 19.2        | 46.0           |
| 908.877275      | 29.3               | 1000.0          | 120.000         | 150.0       | H            | 154.0         | 6.4        | 16.7        | 46.0           |

**Test Notes:** NU was placed inside a Faraday cage for this test.

## 2.2.9.4 Above 1GHz Radiated Emission Test (CU)



## Peak Data

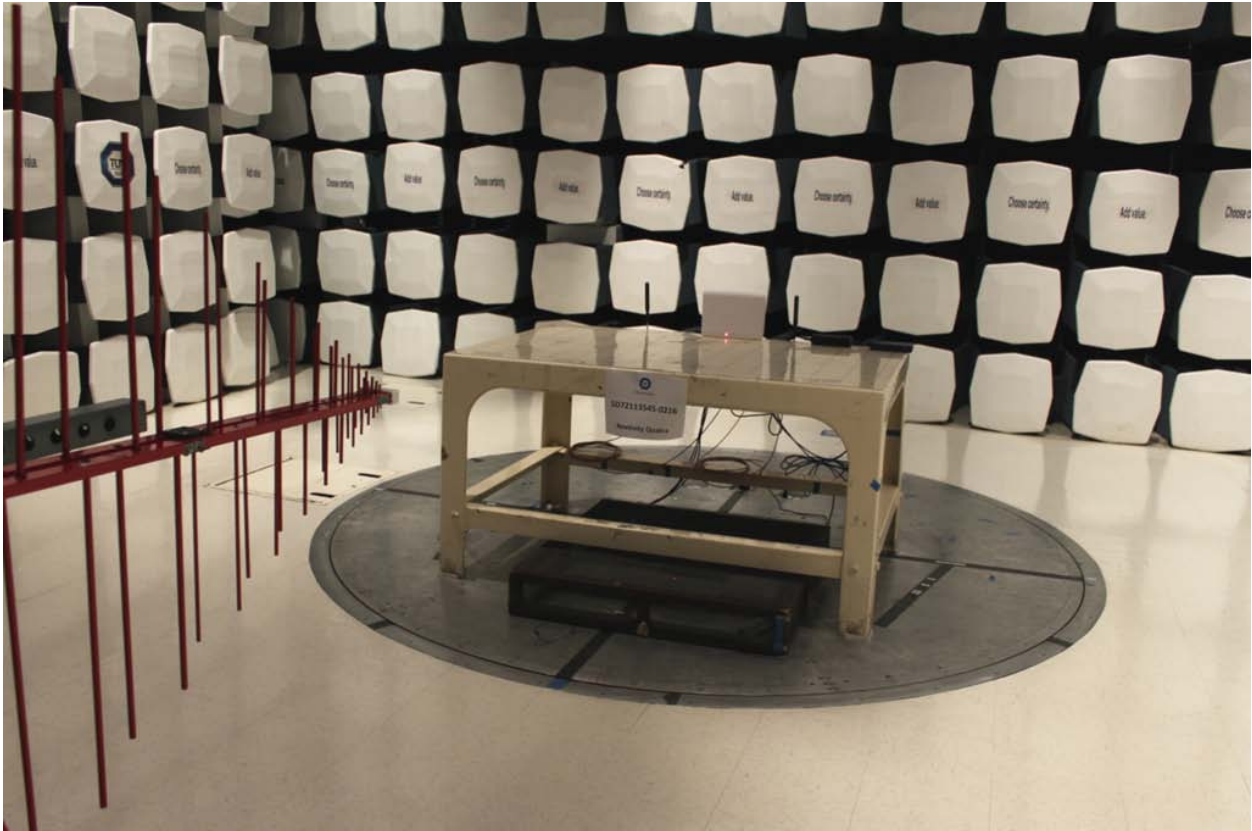
| Frequency (MHz) | MaxPeak (dB $\mu$ V/m) | Meas. Time (ms) | Bandwidth (kHz) | Height (cm) | Polarization | Azimuth (deg) | Corr. (dB) | Margin (dB) | Limit (dB $\mu$ V/m) |
|-----------------|------------------------|-----------------|-----------------|-------------|--------------|---------------|------------|-------------|----------------------|
| 1000.000000     | 43.2                   | 1000.0          | 1000.000        | 202.3       | H            | 287.0         | -7.9       | 30.7        | 73.9                 |
| 1993.200000     | 44.4                   | 1000.0          | 1000.000        | 314.2       | H            | 320.0         | -0.7       | 29.5        | 73.9                 |
| 3729.633333     | 40.7                   | 1000.0          | 1000.000        | 167.6       | V            | 13.0          | 1.2        | 33.2        | 73.9                 |
| 5407.533333     | 42.0                   | 1000.0          | 1000.000        | 164.6       | V            | 245.0         | 3.9        | 31.9        | 73.9                 |
| 10654.666667    | 45.9                   | 1000.0          | 1000.000        | 300.6       | V            | 20.0          | 11.1       | 28.0        | 73.9                 |
| 17475.866667    | 51.2                   | 1000.0          | 1000.000        | 302.2       | H            | 20.0          | 18.0       | 22.7        | 73.9                 |

## Average Data

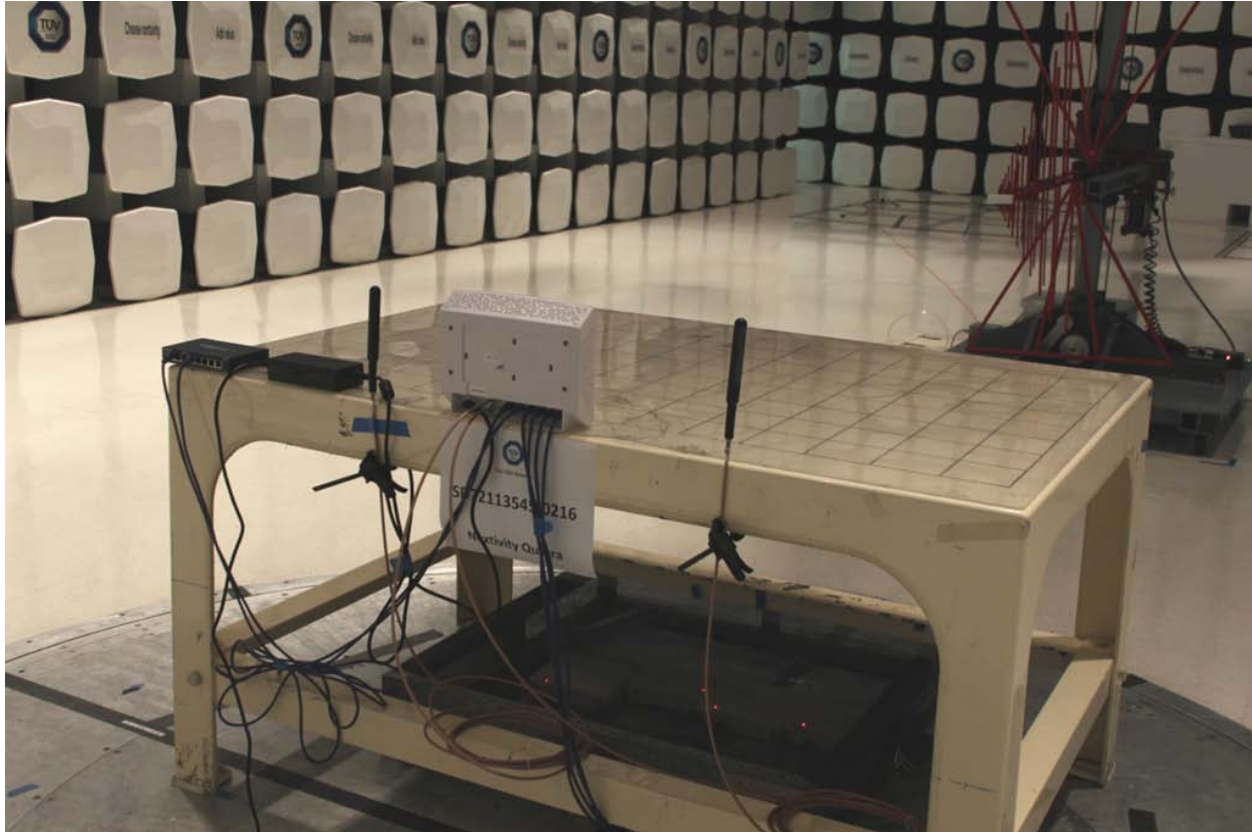
| Frequency (MHz) | Average (dB $\mu$ V/m) | Meas. Time (ms) | Bandwidth (kHz) | Height (cm) | Polarization | Azimuth (deg) | Corr. (dB) | Margin (dB) | Limit (dB $\mu$ V/m) |
|-----------------|------------------------|-----------------|-----------------|-------------|--------------|---------------|------------|-------------|----------------------|
| 1000.000000     | 30.7                   | 1000.0          | 1000.000        | 202.3       | H            | 287.0         | -7.9       | 23.2        | 53.9                 |
| 1993.200000     | 28.8                   | 1000.0          | 1000.000        | 314.2       | H            | 320.0         | -0.7       | 25.1        | 53.9                 |
| 3729.633333     | 28.1                   | 1000.0          | 1000.000        | 167.6       | V            | 13.0          | 1.2        | 25.8        | 53.9                 |
| 5407.533333     | 29.0                   | 1000.0          | 1000.000        | 164.6       | V            | 245.0         | 3.9        | 24.9        | 53.9                 |
| 10654.666667    | 33.3                   | 1000.0          | 1000.000        | 300.6       | V            | 20.0          | 11.1       | 20.6        | 53.9                 |
| 17475.866667    | 38.5                   | 1000.0          | 1000.000        | 302.2       | H            | 20.0          | 18.0       | 15.4        | 53.9                 |

**Test Notes:** BT LE and known ambient noise were ignored during final measurement phase.

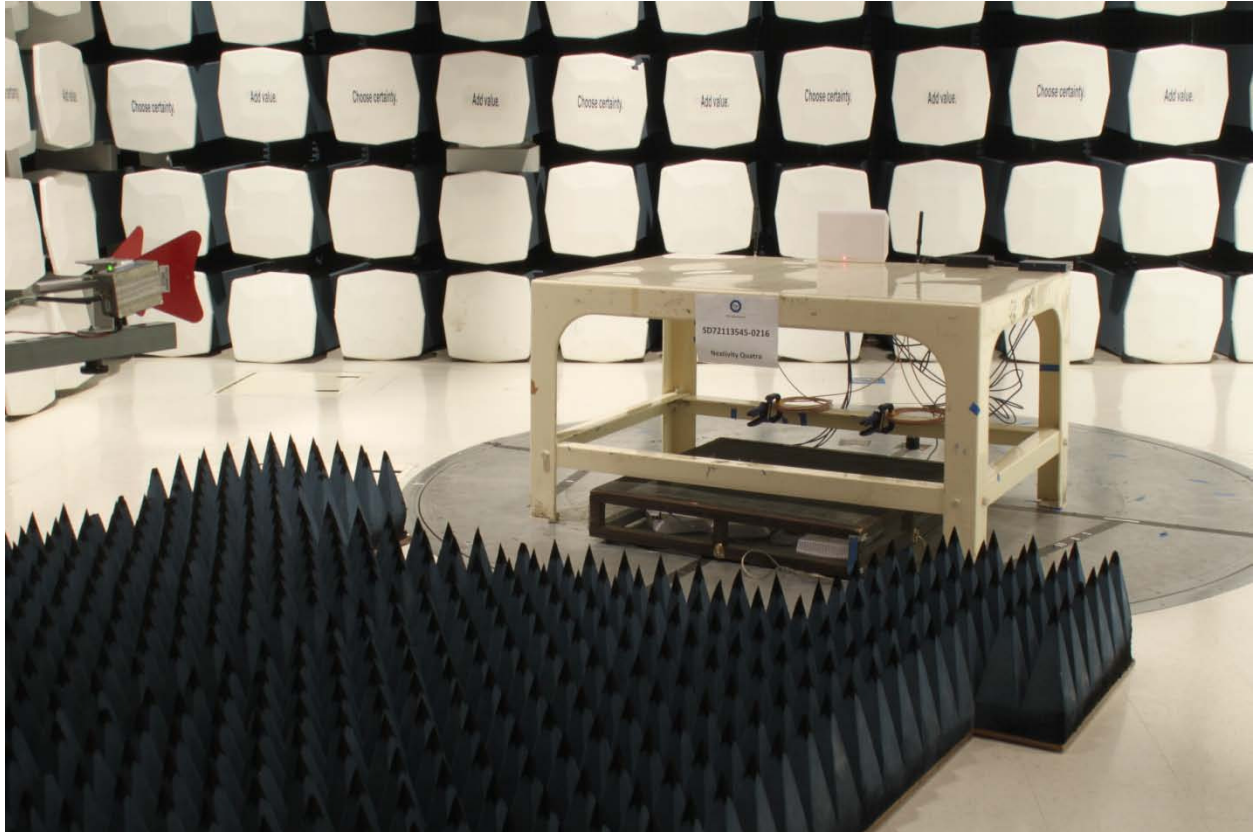
2.2.10 Test Setup Photo (Below 1GHz Front -NU)



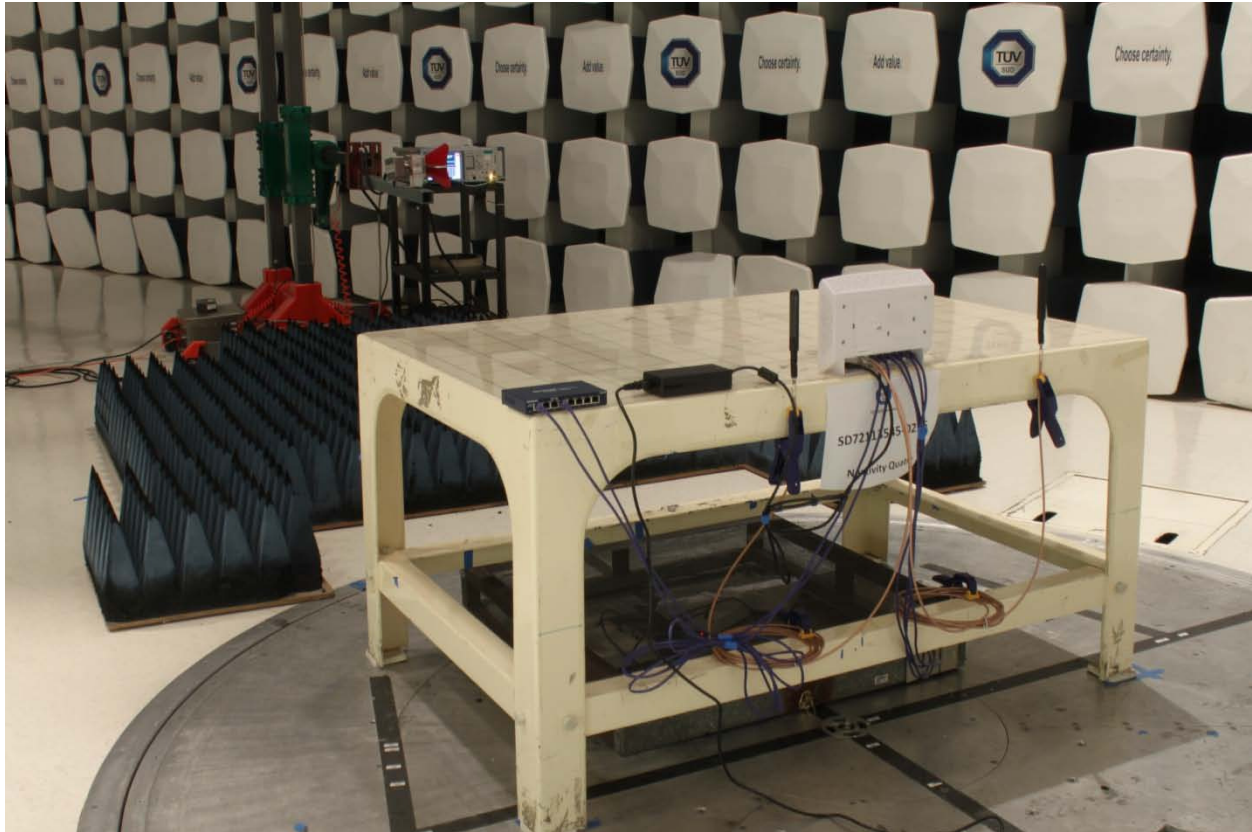
2.2.11 Test Setup Photo (Below 1GHz Back -NU)



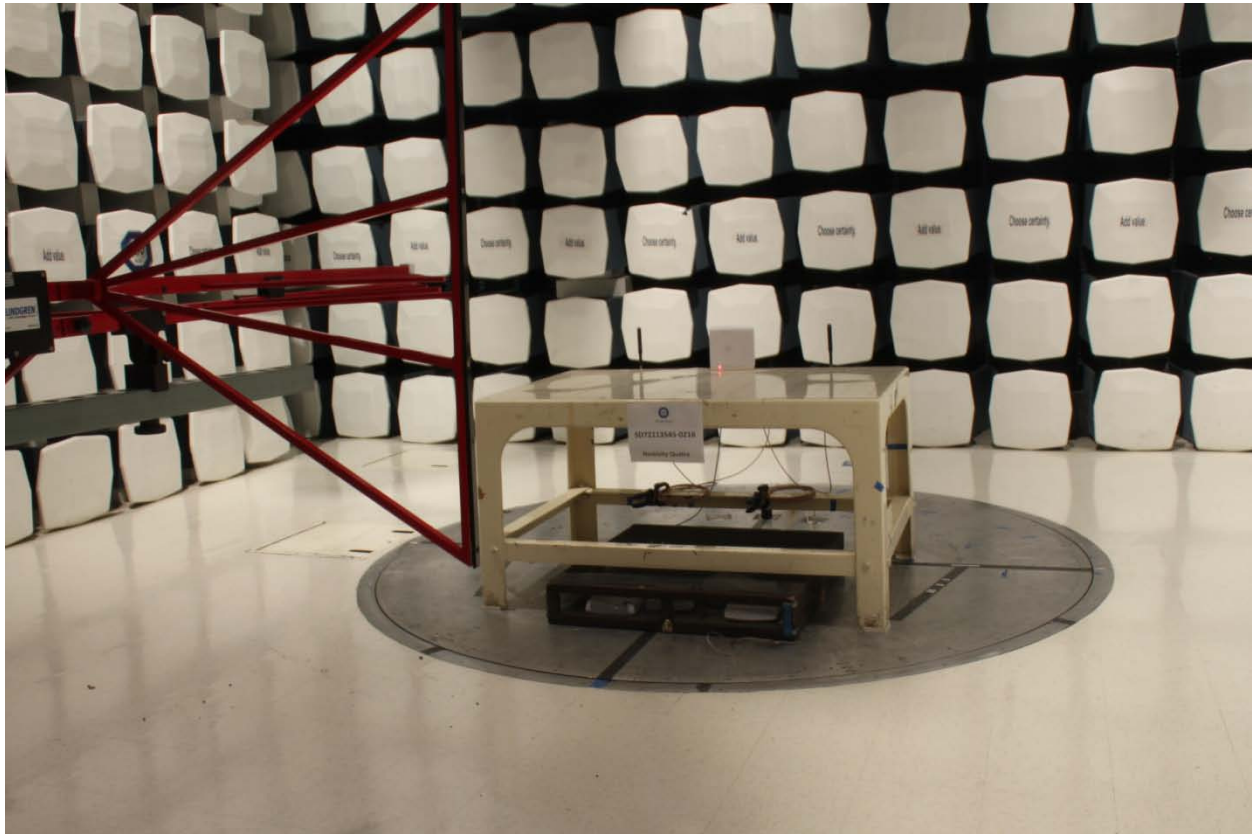
### 2.2.12 Test Setup Photo (Above 1GHz Front - NU)



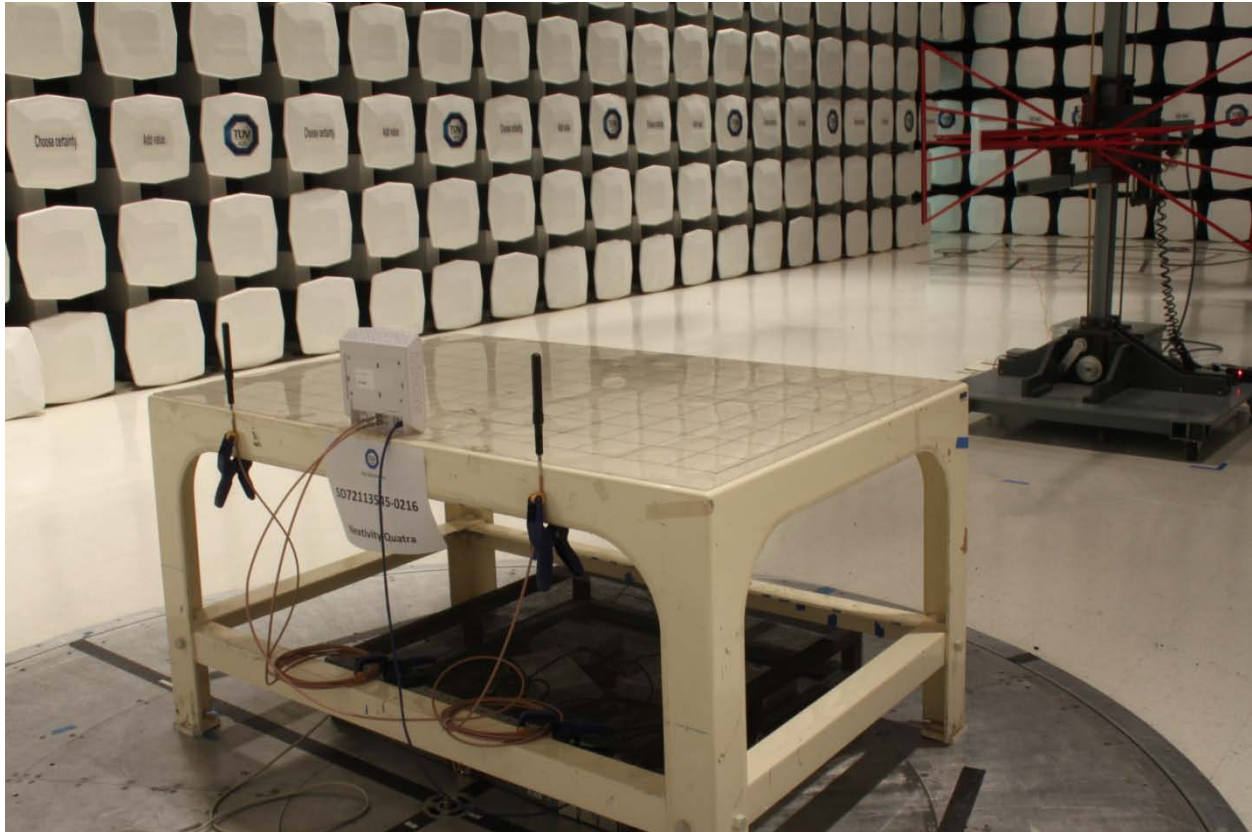
### 2.2.13 Test Setup Photo (Above 1GHz Back - NU)



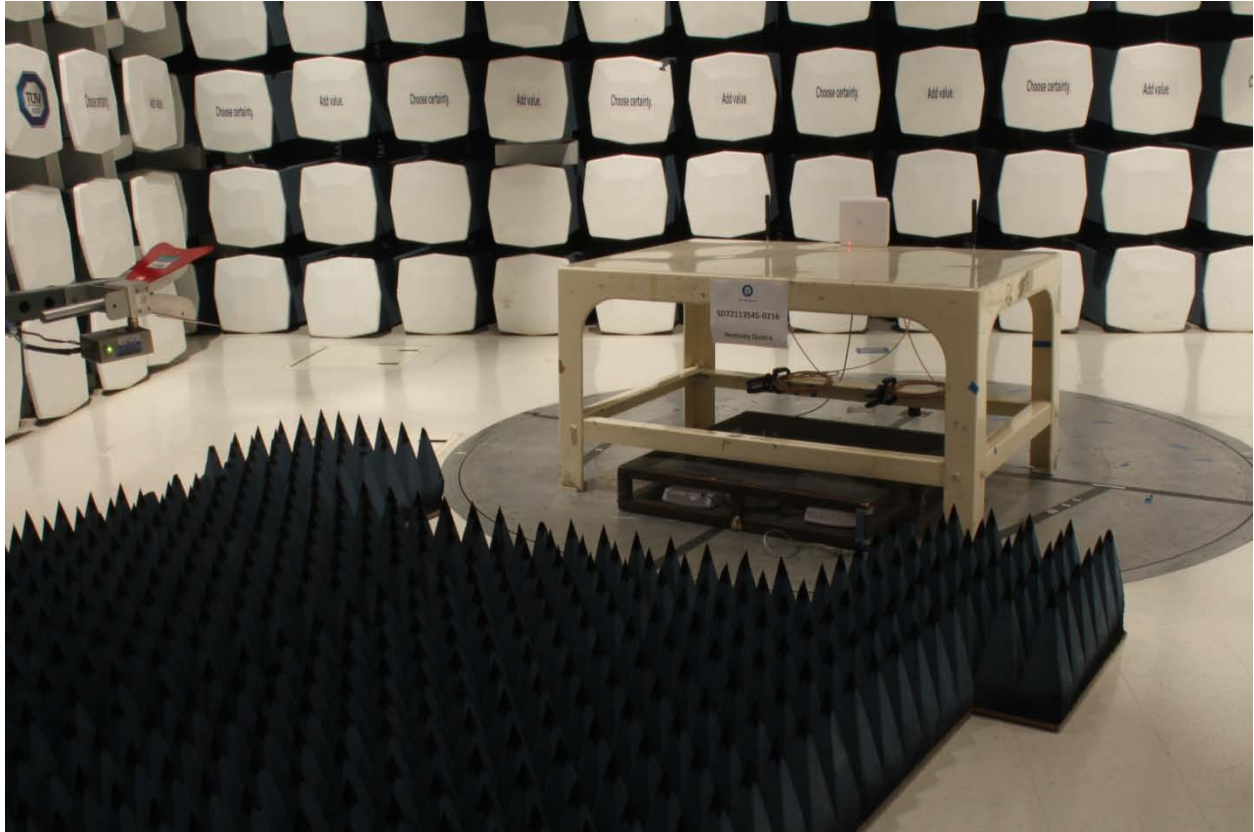
### 2.2.1 Test Setup Photo (Below 1GHz Front -CU)



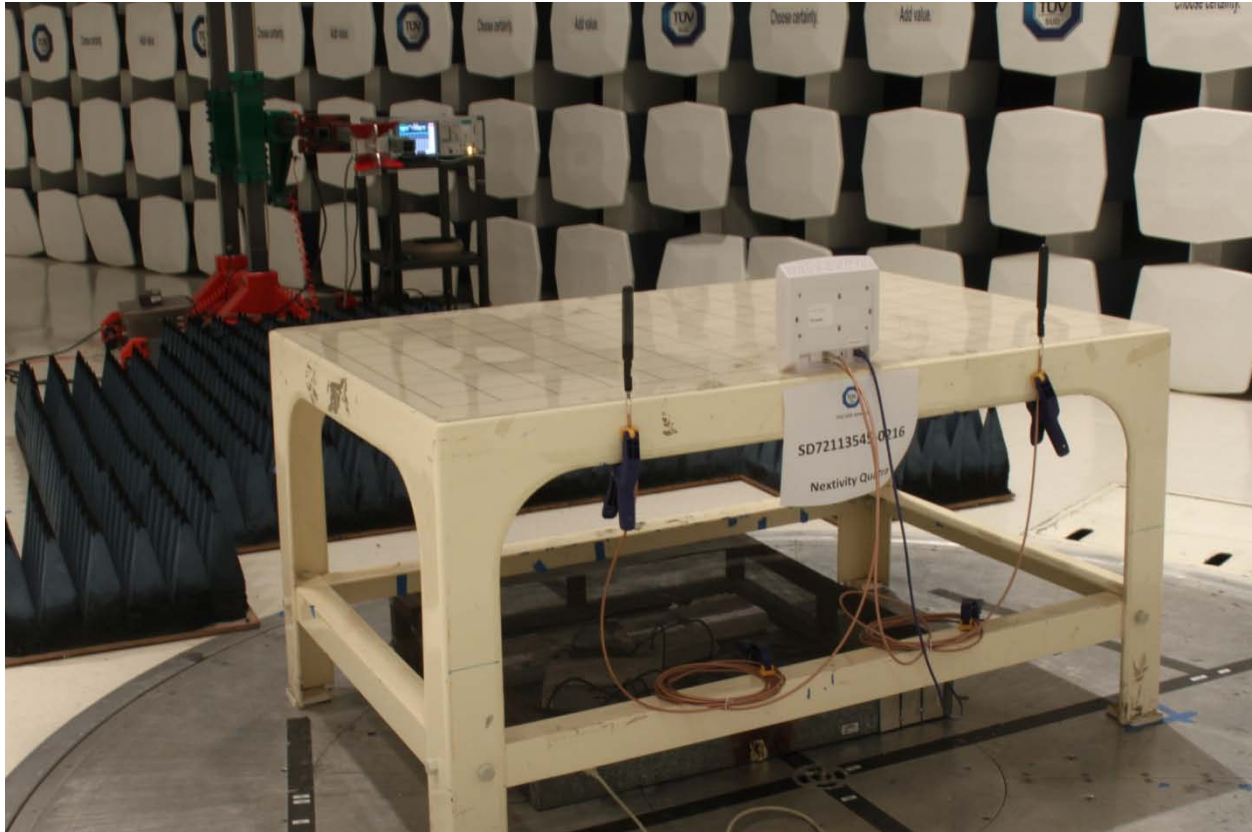
### 2.2.2 Test Setup Photo (Below 1GHz Back -CU)



### 2.2.3 Test Setup Photo (Above 1GHz Front - CU)



#### 2.2.4 Test Setup Photo (Above 1GHz Back - CU)





### **SECTION 3**

#### **TEST EQUIPMENT USED**



### 3.1 TEST EQUIPMENT USED

List of absolute measuring and other principal items of test equipment.

| ID Number<br>(SDGE/SDRB) | Test Equipment                              | Type                | Serial Number | Manufacturer               | Cal Date | Cal Due Date |
|--------------------------|---------------------------------------------|---------------------|---------------|----------------------------|----------|--------------|
| Conducted Emissions      |                                             |                     |               |                            |          |              |
| 7620                     | EMI Test Receiver                           | ESU40               | 100399        | Rhode & Schwarz            | 09/03/15 | 09/03/16     |
| 7567                     | LISN                                        | FCC-LISN-50-25-2-10 | 120304        | Fischer Custom Comm.       | 07/14/15 | 07/14/16     |
| 7568                     | LISN                                        | FCC-LISN-50-25-2-10 | 120305        | Fischer Custom Comm.       | 10/28/15 | 10/28/16     |
| 8822                     | 20dB Attenuator                             | 34-20-34            | N/A           | MCE / Weinschel            | 02/29/16 | 02/28/17     |
| 8824                     | 20dB Attenuator                             | 34-20-34            | N/A           | MCE / Weinschel            | 02/29/16 | 02/28/17     |
| Radiated Emissions       |                                             |                     |               |                            |          |              |
| 1002                     | Bilog Antenna                               | 3142C               | 00058717      | ETS-Lindgren               | 11/06/15 | 11/06/17     |
| 1040                     | EMI Test Receiver                           | ESIB40              | 100292        | Rhode & Schwarz            | 09/29/15 | 09/29/16     |
| 1016                     | Pre-amplifier                               | PAM-0202            | 187           | PAM                        | 12/15/15 | 12/15/16     |
| 7575                     | Double-ridged waveguide horn antenna        | 3117                | 00155511      | EMCO                       | 04/27/15 | 04/27/16     |
| 1049                     | EMI Test Receiver                           | ESU                 | 100133        | Rhode & Schwarz            | 03/11/15 | 03/11/16     |
| 8628                     | Pre-amplifier                               | QLJ 01182835-JO     | 8986002       | QuinStar Technologies Inc. | 03/20/15 | 03/20/16     |
| Miscellaneous            |                                             |                     |               |                            |          |              |
| 6792                     | Multimeter                                  | 3478A               | 2911A70964    | Hewlett Packard            | 08/14/15 | 08/14/16     |
| 7560                     | Barometer/Temperature /Humidity Transmitter | iBTHX-W             | 1240476       | Omega                      | 10/19/15 | 10/19/16     |
|                          | Test Software                               | EMC32               | V8.53         | Rhode & Schwarz            | N/A      |              |

### 3.2 MEASUREMENT UNCERTAINTY

For a 95% confidence level, the measurement uncertainties for defined systems are:

#### 3.2.1 Conducted Measurements

| Contribution                    |                            | Probability Distribution Type | Probability Distribution $x_i$ | Standard Uncertainty $u(x_i)$ | $[u(x_i)]^2$ |
|---------------------------------|----------------------------|-------------------------------|--------------------------------|-------------------------------|--------------|
| 1                               | Receiver/Spectrum Analyzer | Rectangular                   | 0.36                           | 0.21                          | 0.04         |
| 2                               | Cables                     | Rectangular                   | 0.50                           | 0.29                          | 0.08         |
| 3                               | LISN                       | Rectangular                   | 0.66                           | 0.38                          | 0.15         |
| 4                               | Attenuator                 | Rectangular                   | 0.30                           | 0.17                          | 0.03         |
| 5                               | EUT Setup                  | Rectangular                   | 1.00                           | 0.58                          | 0.33         |
| Combined Uncertainty ( $u_c$ ): |                            |                               |                                |                               | 0.80         |
| Coverage Factor (k):            |                            |                               |                                |                               | 2            |
| Expanded Uncertainty:           |                            |                               |                                |                               | 1.59         |

#### 3.2.2 Radiated Measurements (Below 1GHz)

| Contribution                    |                            | Probability Distribution Type | Probability Distribution $x_i$ | Standard Uncertainty $u(x_i)$ | $[u(x_i)]^2$ |
|---------------------------------|----------------------------|-------------------------------|--------------------------------|-------------------------------|--------------|
| 1                               | Receiver/Spectrum Analyzer | Rectangular                   | 0.45                           | 0.26                          | 0.07         |
| 2                               | Cables                     | Rectangular                   | 0.50                           | 0.29                          | 0.08         |
| 3                               | Preamp                     | Rectangular                   | 0.50                           | 0.29                          | 0.08         |
| 4                               | Antenna                    | Rectangular                   | 0.75                           | 0.43                          | 0.19         |
| 5                               | Site                       | Rectangular                   | 2.70                           | 1.56                          | 2.43         |
| 6                               | EUT Setup                  | Rectangular                   | 1.00                           | 0.58                          | 0.33         |
| Combined Uncertainty ( $u_c$ ): |                            |                               |                                |                               | 1.78         |
| Coverage Factor (k):            |                            |                               |                                |                               | 2            |
| Expanded Uncertainty:           |                            |                               |                                |                               | 3.57         |

#### 3.2.3 Radiated Emission Measurements (Above 1GHz)

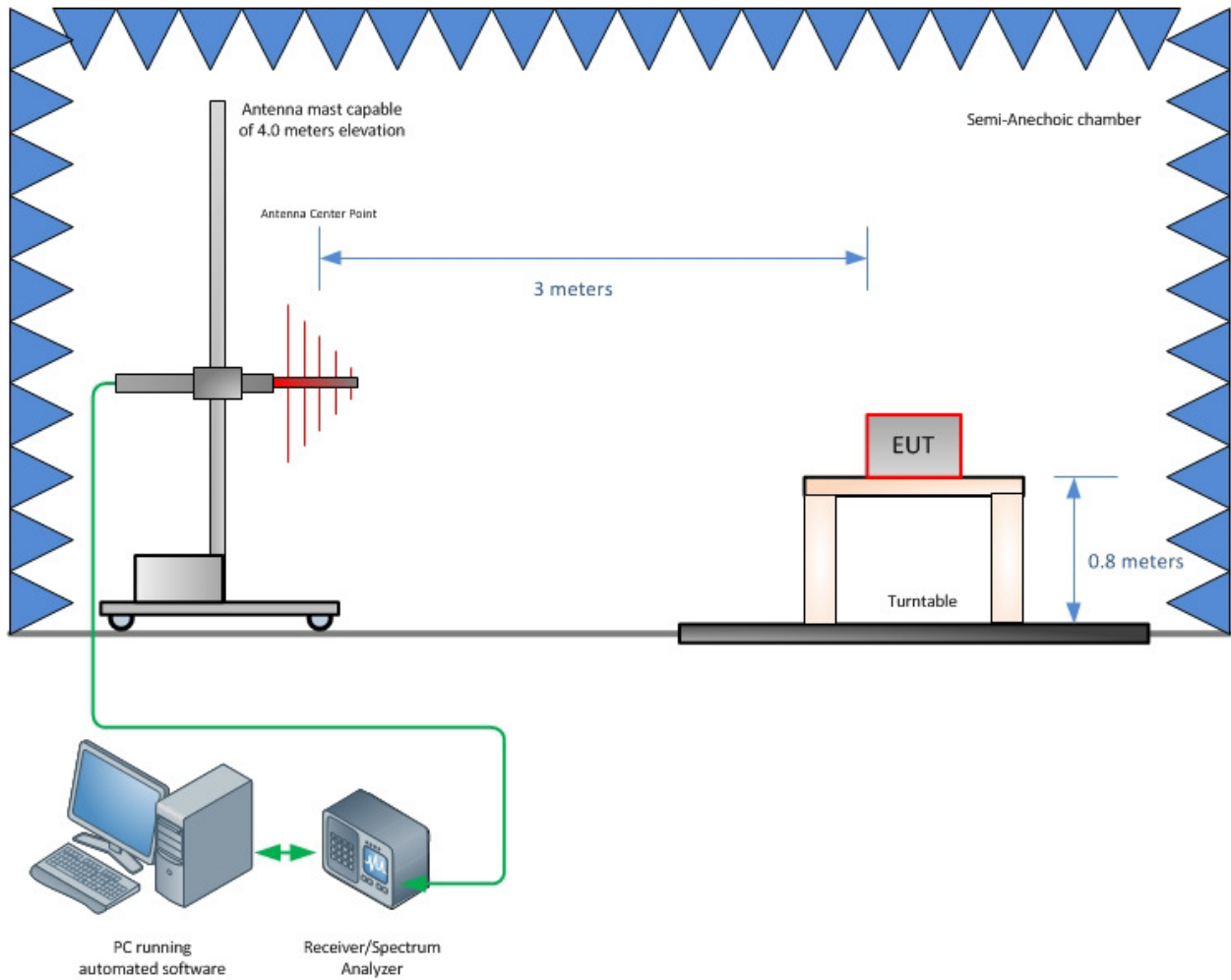
| Contribution                    |                            | Probability Distribution Type | Probability Distribution $x_i$ | Standard Uncertainty $u(x_i)$ | $[u(x_i)]^2$ |
|---------------------------------|----------------------------|-------------------------------|--------------------------------|-------------------------------|--------------|
| 1                               | Receiver/Spectrum Analyzer | Rectangular                   | 0.57                           | 0.33                          | 0.11         |
| 2                               | Cables                     | Rectangular                   | 0.70                           | 0.40                          | 0.16         |
| 3                               | Preamp                     | Rectangular                   | 0.50                           | 0.29                          | 0.08         |
| 4                               | Antenna                    | Rectangular                   | 0.37                           | 0.21                          | 0.05         |
| 5                               | Site                       | Rectangular                   | 2.70                           | 1.56                          | 2.43         |
| 6                               | EUT Setup                  | Rectangular                   | 1.00                           | 0.58                          | 0.33         |
| Combined Uncertainty ( $u_c$ ): |                            |                               |                                |                               | 1.78         |
| Coverage Factor (k):            |                            |                               |                                |                               | 2            |
| Expanded Uncertainty:           |                            |                               |                                |                               | 3.56         |



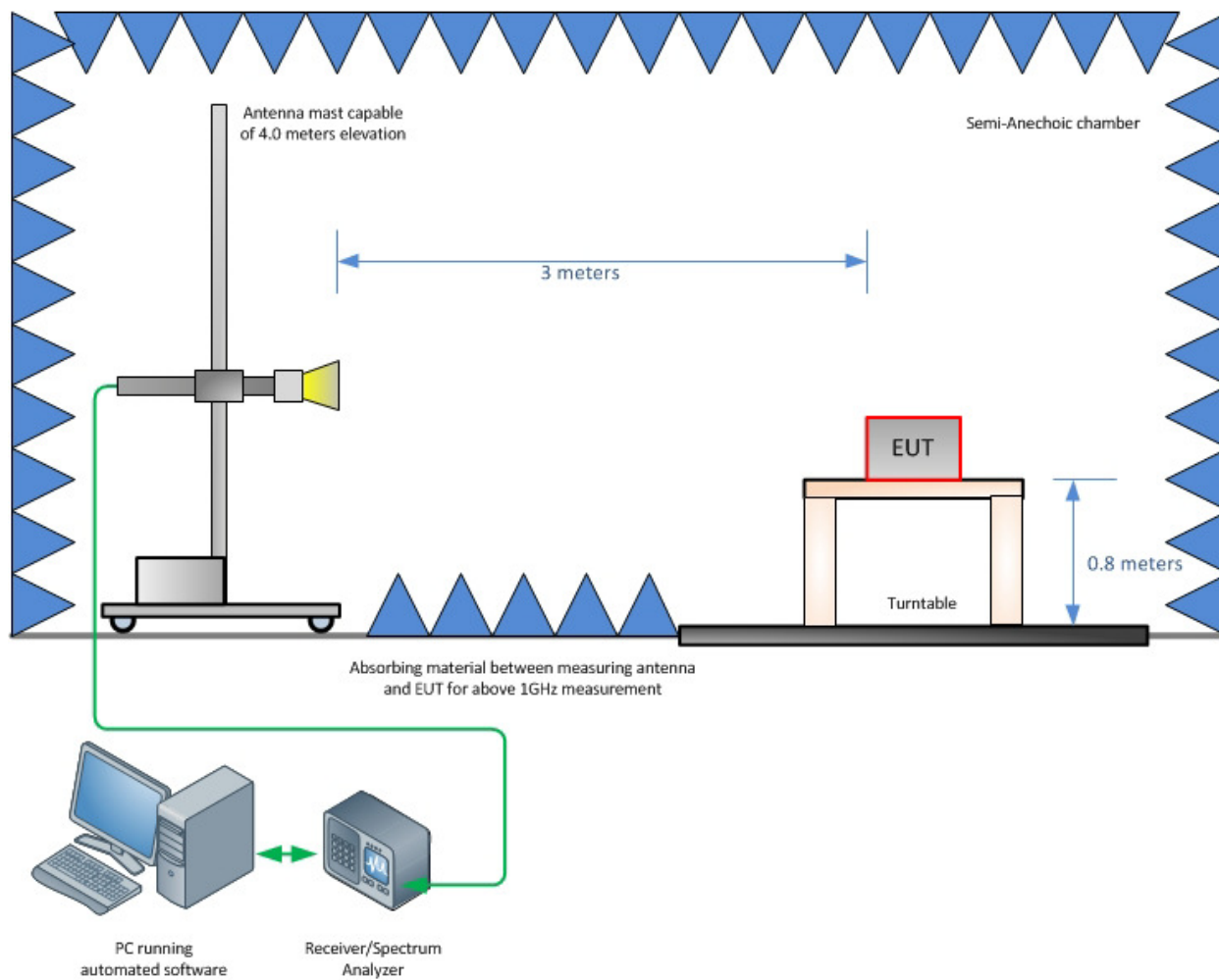
## **SECTION 4**

### **DIAGRAM OF TEST SETUP**

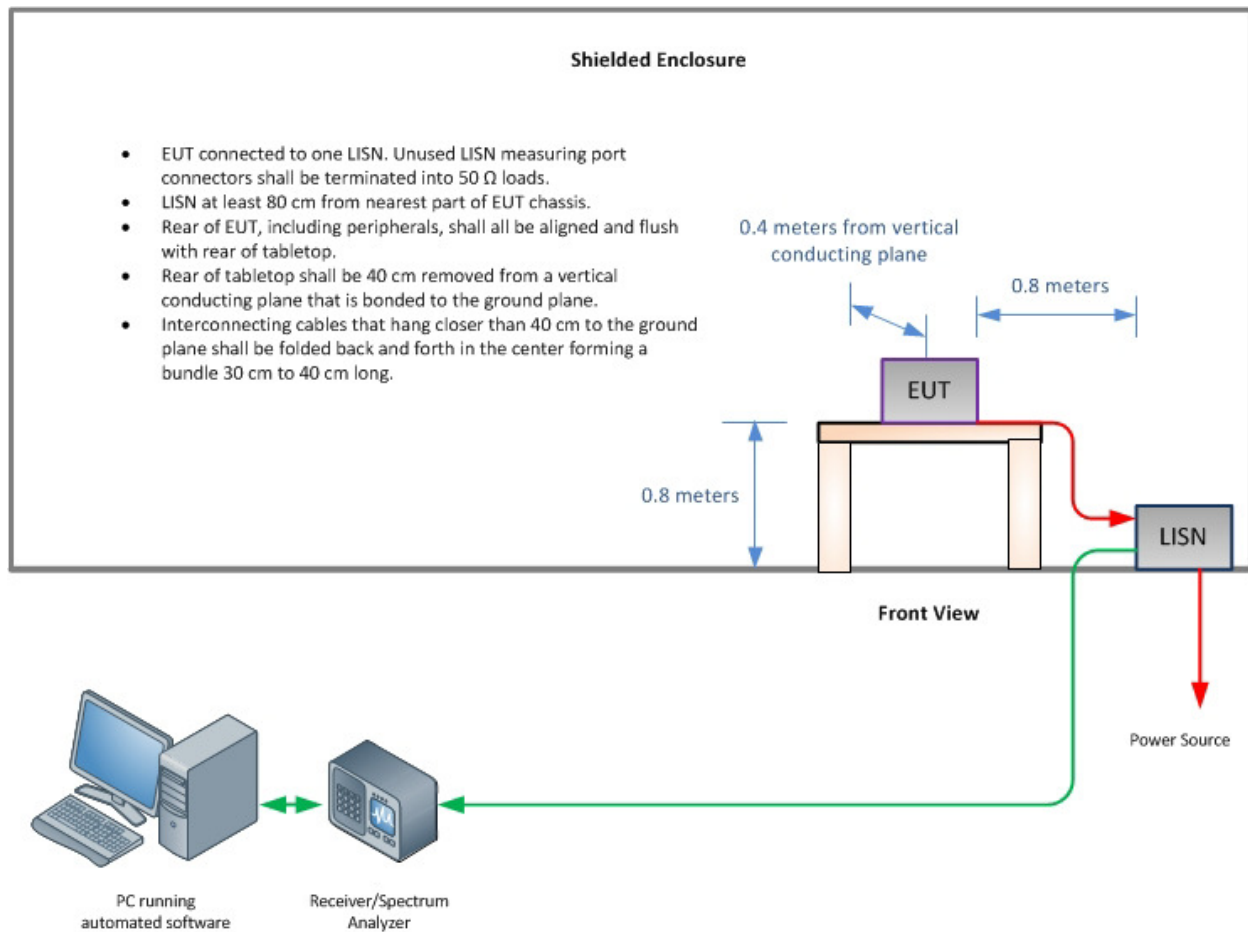
#### 4.1 TEST SETUP DIAGRAM



**Radiated Emission Test Setup (Below 1GHz)**



**Radiated Emission Test Setup (Above 1GHz)**





## **SECTION 5**

### **ACCREDITATION, DISCLAIMERS AND COPYRIGHT**



## 5.1 ACCREDITATION, DISCLAIMERS AND COPYRIGHT

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