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# Report On

Application for Grant of Equipment Authorization of the  
Nextivity Inc.

Cel-Fi DUO RAINIER Smart Cellular Signal Booster

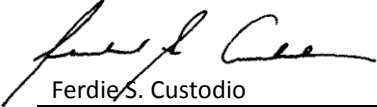
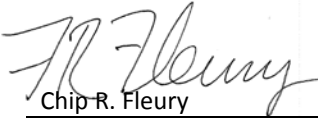
FCC Part 15 Subpart E §15.407

RSS-247 Issue 1 May 2015

**Report No. SD72116210-0416C**

**May 2016**



|                           |                                                                                                                                                                                            |
|---------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>REPORT ON</b>          | EMC Evaluation of the<br>Nextivity Inc.<br>Cel-Fi DUO RAINIER Smart Cellular Signal Booster                                                                                                |
| <b>TEST REPORT NUMBER</b> | SD72116210-0416C                                                                                                                                                                           |
| <b>TEST REPORT DATE</b>   | May 2016                                                                                                                                                                                   |
| <b>PREPARED FOR</b>       | Nextivity Inc.<br>11230 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>              | May 05, 2016                                                                                                                                                                               |



## Revision History

| SD72116210-0416C<br>Nextivity Inc.<br>M/N D32-2/12/66<br>Cel-Fi DUO RAINIER Smart Cellular Signal Booster |                 |              |        |                   |             |
|-----------------------------------------------------------------------------------------------------------|-----------------|--------------|--------|-------------------|-------------|
| DATE                                                                                                      | OLD REVISION    | NEW REVISION | REASON | PAGES<br>AFFECTED | APPROVED BY |
| 05/05/16                                                                                                  | Initial Release |              |        |                   | Chip Fleury |
|                                                                                                           |                 |              |        |                   |             |
|                                                                                                           |                 |              |        |                   |             |
|                                                                                                           |                 |              |        |                   |             |
|                                                                                                           |                 |              |        |                   |             |



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## **SECTION 1**

### **REPORT SUMMARY**

Radio Testing of the  
Nextivity Inc.  
Cel-Fi DUO RAINIER Smart Cellular Signal Booster



## 1.1 INTRODUCTION

The information contained in this report is intended to show verification of the Nextivity Inc. Smart Cellular Signal Booster to the requirements of FCC Part 15 Subpart E §15.407 and RSS-247 Issue 1 May 2015.

|                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
|-------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Objective                     | To perform Radio Testing 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 Number(s)               | D32-2/12/66                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| FCC ID Number                 | YETD32-21266NU and YETD32-21266CU                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| IC Number                     | 9298A-D3221266NU and 9298A-D3221266CU                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| Serial Number(s)              | 296546000509 (NU) and 297546000285 (CU)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| Number of Samples Tested      | 2                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| Test Specification/Issue/Date | <ul style="list-style-type: none"> <li>• FCC Part 15 Subpart E §15.407 (October 1, 2015).</li> <li>• RSS-247 - Digital Transmission Systems (DTSS) Frequency Hopping Systems (FHSs) and Licence-Exempt Local Area Network (LE-LAN) (Issue 1, May 2015).</li> <li>• RSS-Gen - General Requirements for Compliance of Radio Apparatus (Issue 4, November 2014).</li> <li>• KDB KDB789033 D02 General UNII Test Procedures New Rules v01r01 (Guidelines for Compliance Testing of Unlicensed National Information Infrastructure (UNII) Devices - Part 15, Subpart E) January 08, 2016.</li> </ul> |
| Start of Test                 | May 02, 2016                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| Finish of Test                | May 03, 2016                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| Name of Engineer(s)           | Xiaoying Zhang<br>Ferdinand Custodio                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| Related Document(s)           | <ul style="list-style-type: none"> <li>• SD72112724-0116F FCC Part 15.407 Subpart E RSS247 Test Report.docx (issued by TÜV SÜD America San Diego April 2016).</li> <li>• Supporting documents for EUT certification are separate exhibits.</li> </ul>                                                                                                                                                                                                                                                                                                                                           |



## 1.2 BRIEF SUMMARY OF RESULTS

A brief summary of the tests carried out in accordance with FCC Part 15 Subpart E §15.407 with cross-reference to the corresponding IC RSS standard is shown below.

| Operation in the UNII 1 and UNII 3 Bands (New Rules) |                                    |                  |                                      |             |          |
|------------------------------------------------------|------------------------------------|------------------|--------------------------------------|-------------|----------|
| Section                                              | Spec Clause                        | RSS              | Test Description                     | Result      | Comments |
| 2.1                                                  | §15.407(a)                         | RSS-Gen 8.8      | Conducted Emissions                  | Compliant*  |          |
| 2.2                                                  | §15.403(i)                         |                  | 26 dB Bandwidth                      | As Reported |          |
| 2.3                                                  |                                    | RSS-Gen 6.6      | 99% Emission Bandwidth               | As Reported |          |
| 2.4                                                  | §15.407(e)                         | RSS-247 6.2.4(1) | Minimum 6dB Bandwidth                | Compliant*  |          |
| 2.5                                                  | §15.407(a) (1), (a)(2) and (a)(3)  | RSS-247 6.2.4(1) | Maximum Conducted Output Power       | Compliant*  |          |
| 2.6                                                  | §15.407(a) (1), (a)(2) and (a)(3)  | RSS-247 6.2.3(1) | Maximum Power Spectral Density (PSD) | Compliant*  |          |
| 2.7                                                  | §15.407(b)(1),(4) and (7) / 15.209 | RSS-247 6.2.4(2) | Unwanted Emissions Measurement       | Compliant** |          |
| 2.8                                                  | §15.407(b)(1),(4) and (7)          | RSS-247 6.2.4(2) | Band-Edge Measurements               | Compliant*  |          |
| -                                                    | §15.407(g)                         |                  | Frequency Stability                  | N/A         |          |

**Compliant\*** A variant of the EUT was previously approved under FCC IDs YETD32-21366NU and YETD32-21366CU under Model Number D32-2/13/66. The EUT is identical with this model with the exception of LTE Band 12 support. All antenna conducted port measurement for BT LE were from this variant and covered under test report SD72112724-0116F FCC Part 15.407 Subpart E RSS247 Test Report.docx.

**Compliant\*\*** Same as above with the addition of cabinet spurious emissions verification of the EUT (variant of FCC IDs YETD32-21366NU and YETD32-21366CU with LTE Band 12 support).

**N/A** Manufacturer declaration that the emission is maintained within the band of operation. RSS-247 does not require Frequency Stability test (U-NII bands).



### 1.3 PRODUCT INFORMATION

#### 1.3.1 Technical Description

The Equipment Under Test (EUT) is a Nextivity Inc. Cel-Fi DUO RAINIER Smart Cellular Signal Booster. The EUT is a WCDMA/LTE Signal Booster to improve voice and data cellular performance for indoor residential, small business and small enterprise environments. RAINIER consists of two separate units: the Network Unit (NU), and the Coverage Unit (CU). The NU transmits and receives Cellular signals from the base station and operates similar to a cellular handset. The CU transmits and receives signals with the cellular handset and operates on frequencies similar to the cellular base station. The NU and CU are connected wirelessly over a full-duplex wireless link in the UNII band using a mixed OFDM and muxed cellular signal over a 30 or 40 MHz channel in each direction. The CU also includes Bluetooth LE connectivity. With the use of smart phone application, it allows user to register the product, update software, and capture/display details metrics of the system. NU does not support Bluetooth LE. The UNII 5GHz function of the EUT was verified in this test report.

#### 1.3.2 EUT General Description

EUT Description Smart Cellular Signal Booster

Model Name Cel-Fi DUO RAINIER

Model Number(s) D32-2/12/66

Frequency Range **NU:**

|                      |               |
|----------------------|---------------|
| 5190 MHz to 5240 MHz | UNII 1 30MHz  |
| 5190 MHz to 5230 MHz | UNII 1 40MHz  |
| 5260 MHz to 5310 MHz | UNII 2A 30MHz |
| 5270 MHz to 5310 MHz | UNII 2A 40MHz |

**CU:**

|                      |               |
|----------------------|---------------|
| 5525 MHz to 5700 MHz | UNII 2C 30MHz |
| 5525 MHz to 5700 MHz | UNII 2C 40MHz |
| 5745 MHz to 5825 MHz | UNII 3 30MHz  |
| 5755 MHz to 5825 MHz | UNII 3 40MHz  |

Channels Verified (UNII 2A)

**30MHz Bandwidth:**

|                       |            |
|-----------------------|------------|
| Low Channel 5260 MHz  | Channel 52 |
| Mid Channel 5300 MHz  | Channel 60 |
| High Channel 5310 MHz | Channel 62 |



**40MHz Bandwidth:**

|                       |            |
|-----------------------|------------|
| Low Channel 5270 MHz  | Channel 54 |
| Mid Channel 5300 MHz  | Channel 60 |
| High Channel 5310 MHz | Channel 62 |

Channels Verified (UNII 1)

**30MHz Bandwidth:**

|                       |            |
|-----------------------|------------|
| Low Channel 5190 MHz  | Channel 38 |
| Mid Channel 5220 MHz  | Channel 44 |
| High Channel 5240 MHz | Channel 48 |

**40MHz Bandwidth:**

|                       |            |
|-----------------------|------------|
| Low Channel 5190 MHz  | Channel 38 |
| Mid Channel 5220 MHz  | Channel 44 |
| High Channel 5230 MHz | Channel 46 |

Channels Verified (UNII 2C)

**30MHz and 40MHz Bandwidth:**

|                       |             |
|-----------------------|-------------|
| Low Channel 5525 MHz  | Channel 105 |
| Mid Channel 5600 MHz  | Channel 120 |
| High Channel 5700 MHz | Channel 140 |

Channels Verified (UNII 3)

**30MHz Bandwidth:**

|                       |             |
|-----------------------|-------------|
| Low Channel 5745 MHz  | Channel 149 |
| Mid Channel 5785 MHz  | Channel 157 |
| High Channel 5825 MHz | Channel 165 |

**40MHz Bandwidth:**

|                       |             |
|-----------------------|-------------|
| Low Channel 5745 MHz  | Channel 151 |
| Mid Channel 5785 MHz  | Channel 157 |
| High Channel 5825 MHz | Channel 165 |



|                    |                                                                                                                                   |
|--------------------|-----------------------------------------------------------------------------------------------------------------------------------|
| Rated Voltage      | 12V DC via external AC/DC adapter                                                                                                 |
| Mode Verified      | UNII 1, UNII 2A, UNII 2C and UNII 3                                                                                               |
| Capability         | LTE (Band 2, 12 and 4)/UNII and BT LE                                                                                             |
| Primary Unit (EUT) | <input type="checkbox"/> Production<br><input checked="" type="checkbox"/> Pre-Production<br><input type="checkbox"/> Engineering |
| Antenna Type       | PCB Monopole                                                                                                                      |
| Manufacturer       | Nextivity Inc.                                                                                                                    |
| Antenna Model      | N/A                                                                                                                               |
| Antenna Gain       | NU: 1 dBi<br>CU: 0 dBi                                                                                                            |

### 1.3.3 Maximum Conducted Output Power

| Mode    | Frequency Range (MHz) | Output Power (dBm) | Output Power (W) |
|---------|-----------------------|--------------------|------------------|
| UNII 1  | 5190 - 5250           | 22.56              | 0.18             |
| UNII 2A | 5260 - 5310           | 22.68              | 0.19             |
| UNI 2C  | 5525 - 5725           | 22.18              | 0.17             |
| UNII 3  | 5735 --5825           | 22.16              | 0.16             |

## 1.4 EUT TEST CONFIGURATION

### 1.4.1 Test Configuration Description

| Test Configuration | Description                                                                                                            |
|--------------------|------------------------------------------------------------------------------------------------------------------------|
| A                  | UNII Low Band. 90dB attenuator is connected between URX of CU and UTX of NU. Output is monitored from UTX port of NU.  |
| B                  | UNII High Band. 90dB attenuator is connected between URX of NU and UTX of CU. Output is monitored from UTX port of CU. |
| C                  | Radiated test setup.<br>Radiated test sample used for this test. Normal wireless link between NU and CU established.   |

### 1.4.2 EUT Exercise Software

Manufacturer provided a configuration software (ConformanceTest.exe) running from a support laptop where both EUT are connected via USB.

### 1.4.1 Support Equipment and I/O cables

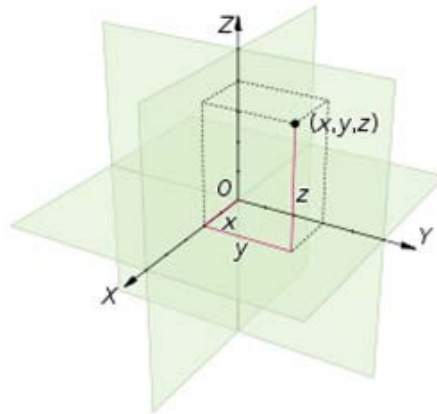
| Manufacturer  | Equipment/Cable                          | Description                                                                 |
|---------------|------------------------------------------|-----------------------------------------------------------------------------|
| Hon-Kwang     | AC/DC Adapter (EUT)                      | M/N HK-AB-120A250-US P/N 290N025-001, 12VDC 2.5A                            |
| Hon-Kwang     | I.T.E Power Supply (2X)                  | Model HK-AX-120A167-US S/N: FB0000101 and FB0000075                         |
| -             | Support USB cable                        | 1.75 meters, shielded Type A to Micro B connector                           |
| Nextivity     | Support USB cable                        | Custom 1.0 meter shielded USB Type A to DB9 for the Shielded Test Enclosure |
| Sony          | Support Laptop                           | M/N PCG-31311L S/N 27545534 3006488                                         |
| Sony          | Support Laptop AC Adapter                | M/N PCGA-AC19V9 S/N 147839091 0023259                                       |
| Mini-Circuits | Support Coaxial SMA Fixed Attenuator (x) | M/N VAT-30W2 30dB DC-6GHz                                                   |
| Agilent       | 11dB Step Attenuator                     | M/N 8494B<br>Frequency Range DC - 18GHz<br>S/N 2812A17193                   |
| Agilent       | 110dB Step Attenuator                    | M/N 8496B<br>Frequency Range DC - 18GHz<br>S/N MY42143874                   |
| Ramsey        | Support Shielded Test Enclosure          | M/N STE3300 S/N 3042 with custom USB cable and AC/DC Adapter                |

#### 1.4.2 Worst Case Configuration

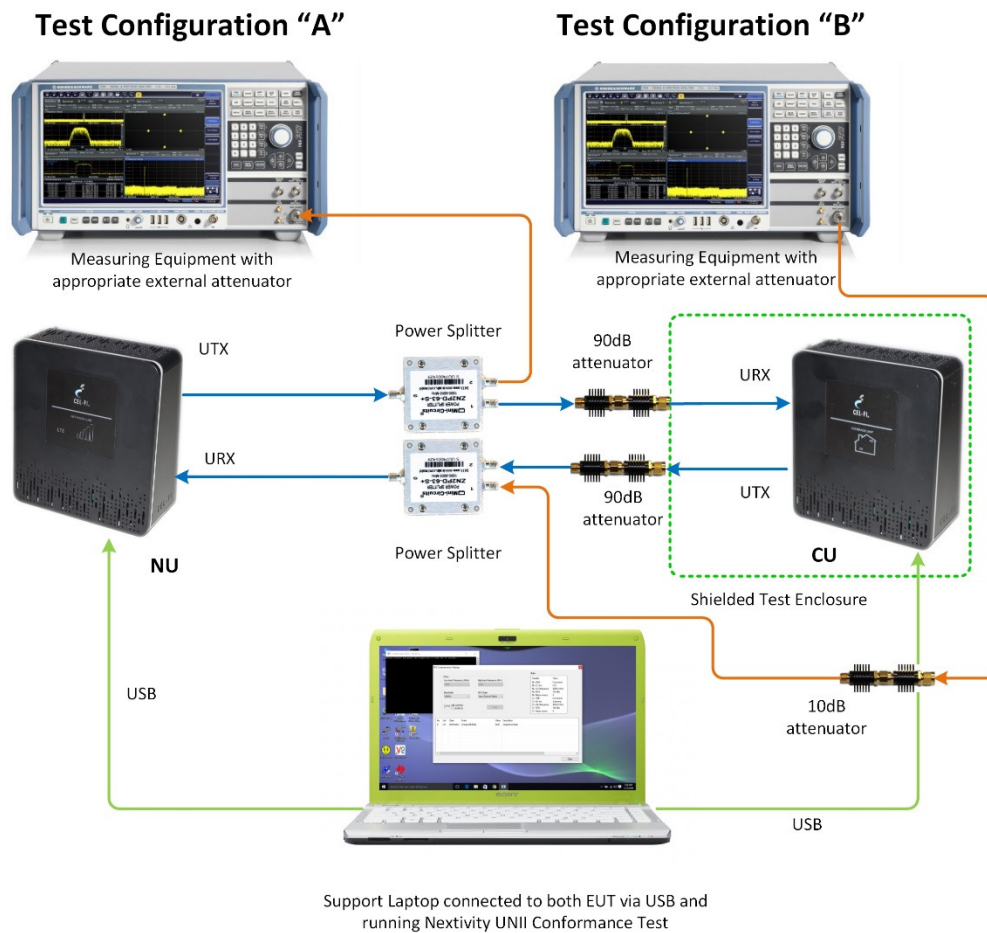
Worst-case configuration used in this test report per Transmitter Conducted Output Power (Section 2.1 of this test report). This is for single channel verification, otherwise all three channels (Low, Mid and High) are verified:

| Mode    | Channel            | Bandwidth |
|---------|--------------------|-----------|
| UNII 1  | 48 (High Channel)  | 30MHz     |
| UNII 2A | 52 (Low Channel)   | 30MHz     |
| UNII 2C | 140 (High Channel) | 40MHz     |
| UNII 3  | 165 (High Channel) | 40MHz     |

EUT is a mobile device. Final installation position is unknown at the time of verification. For radiated measurements X, Y and Z orientations were verified. No major variation in emissions observed between the three (3) orientations. Verifications performed using "Z" configuration.



### 1.4.3 Simplified Test Configuration Diagram



### Test Configuration "C"





## 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 | Description of Modification |
|-------------------------------------------------------|------------------------|-----------------------------|
| Serial Number 296546000509 (NU) and 297546000285 (CU) |                        |                             |
| N/A                                                   |                        | 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 and KDB KDB789033 D02 General UNII Test Procedures New Rules v01r01 (Guidelines for Compliance Testing of Unlicensed National Information Infrastructure (U-NII) Devices - Part 15, Subpart E) January 08, 2016.

For conducted and 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)

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.



## **SECTION 2**

### **TEST DETAILS**

Radio Testing of the  
Nextivity Inc.  
Cel-Fi DUO RAINIER Smart Cellular Signal Booster

## 2.1 CONDUCTED EMISSIONS

### 2.1.1 Specification Reference

FCC 47 CFR Part 15, 15.207(a)  
RSS-Gen, Clause 7.2.4

### 2.1.2 Standard Applicable

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).

| 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

Please refer to SD72112724-0116F FCC Part 15.407 Subpart E RSS247 Test Report.docx for serial number/s and test configuration used.

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

January 18, 2016/XYZ

### 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 Location

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

|                     |          |
|---------------------|----------|
| Ambient Temperature | 22.5°C   |
| Relative Humidity   | 52.6.%   |
| ATM Pressure        | 99.9 kPa |



### 2.1.7 Additional Observations

- Test results presented here is from SD72112724-0116F FCC Part 15.407 Subpart E RSS247 Test Report.docx (issued by TÜV SÜD America San Diego April 2016). See Section 1.2 for more details.
- 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.

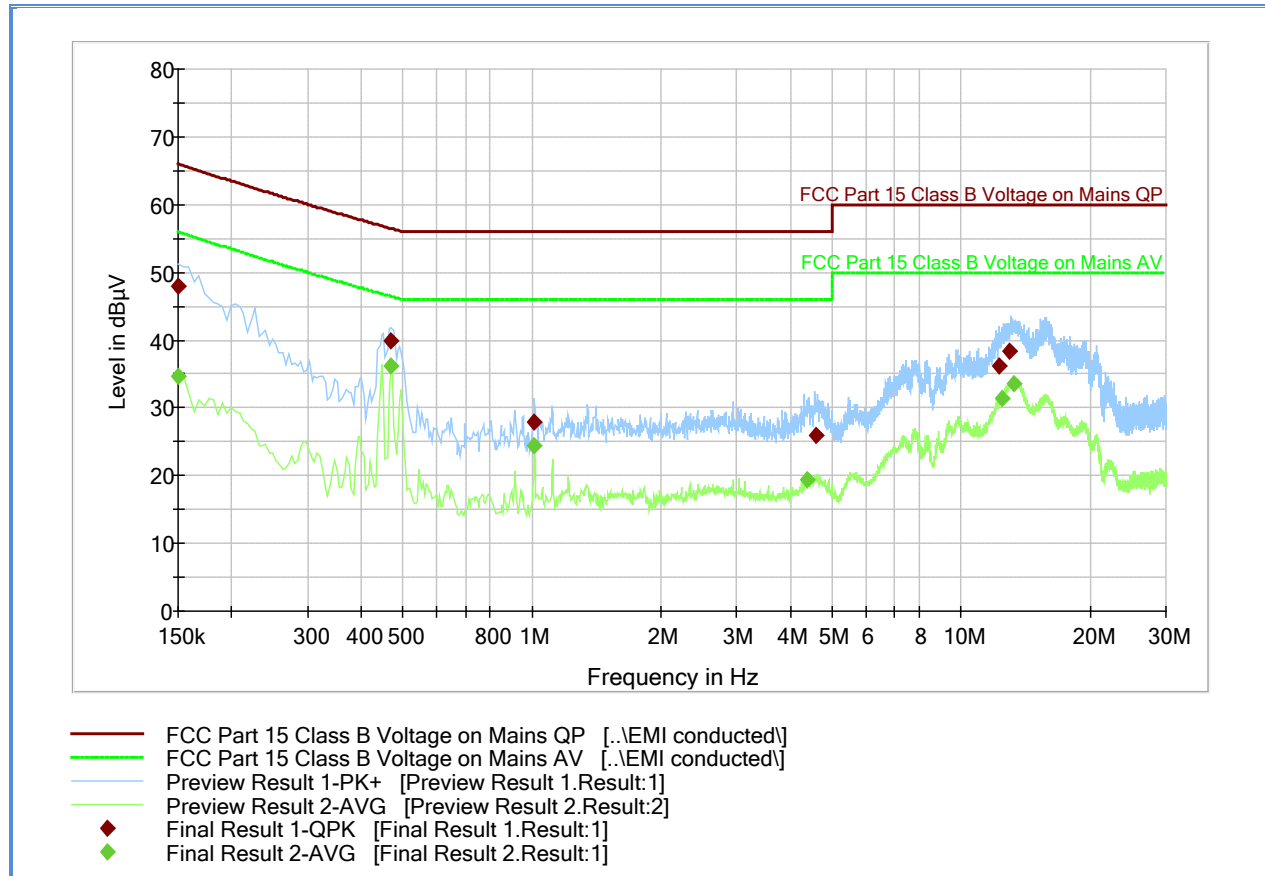
### 2.1.8 Sample Computation (Conducted Emission – Quasi Peak)

|                                                            |                                |      |      |
|------------------------------------------------------------|--------------------------------|------|------|
| Measuring equipment raw measurement (db $\mu$ V) @ 150kHz  |                                |      | 5.5  |
| Correction Factor (dB)                                     | Asset# 8607 (20 dB attenuator) | 19.9 | 20.7 |
|                                                            | Asset# 1177 (cable)            | 0.15 |      |
|                                                            | Asset# 1176 (cable)            | 0.35 |      |
|                                                            | Asset# 7568 (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 Test Results - Conducted Emissions Line 1 – Hot (NU)



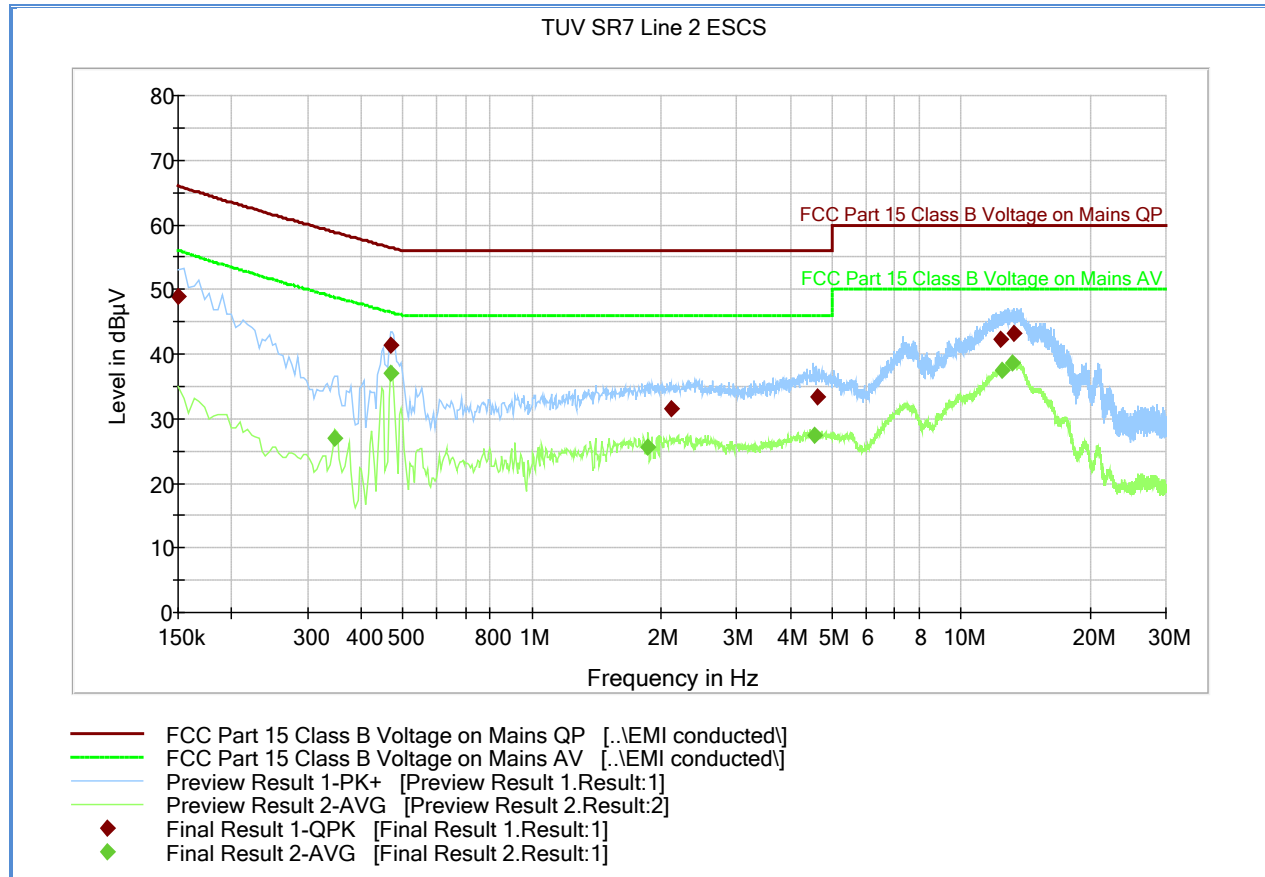
### Quasi Peak

| Frequency (MHz) | QuasiPeak (dBµV) | Meas. Time (ms) | Bandwidth (kHz) | Filter | Line | Corr. (dB) | Margin - QPK (dB) | Limit - QPK (dBµV) |
|-----------------|------------------|-----------------|-----------------|--------|------|------------|-------------------|--------------------|
| 0.150000        | 47.9             | 1000.0          | 9.000           | Off    | L1   | 20.1       | 18.1              | 66.0               |
| 0.469500        | 40.0             | 1000.0          | 9.000           | Off    | L1   | 20.1       | 16.5              | 56.5               |
| 1.014000        | 28.0             | 1000.0          | 9.000           | Off    | L1   | 20.2       | 28.0              | 56.0               |
| 4.609500        | 25.9             | 1000.0          | 9.000           | Off    | L1   | 20.5       | 30.1              | 56.0               |
| 12.246000       | 36.2             | 1000.0          | 9.000           | Off    | L1   | 20.6       | 23.8              | 60.0               |
| 12.997500       | 38.4             | 1000.0          | 9.000           | Off    | L1   | 20.6       | 21.6              | 60.0               |

### Average

| Frequency (MHz) | Average (dBµV) | Meas. Time (ms) | Bandwidth (kHz) | Filter | Line | Corr. (dB) | Margin - Ave (dB) | Limit - Ave (dBµV) |
|-----------------|----------------|-----------------|-----------------|--------|------|------------|-------------------|--------------------|
| 0.150000        | 34.6           | 1000.0          | 9.000           | Off    | L1   | 20.1       | 21.4              | 56.0               |
| 0.469500        | 36.3           | 1000.0          | 9.000           | Off    | L1   | 20.1       | 10.2              | 46.5               |
| 1.014000        | 24.4           | 1000.0          | 9.000           | Off    | L1   | 20.2       | 21.6              | 46.0               |
| 4.366500        | 19.5           | 1000.0          | 9.000           | Off    | L1   | 20.4       | 26.5              | 46.0               |
| 12.408000       | 31.4           | 1000.0          | 9.000           | Off    | L1   | 20.6       | 18.6              | 50.0               |
| 13.263000       | 33.7           | 1000.0          | 9.000           | Off    | L1   | 20.6       | 16.3              | 50.0               |

## 2.1.11 FCC Conducted Emissions Line 2 – Neutral (NU)



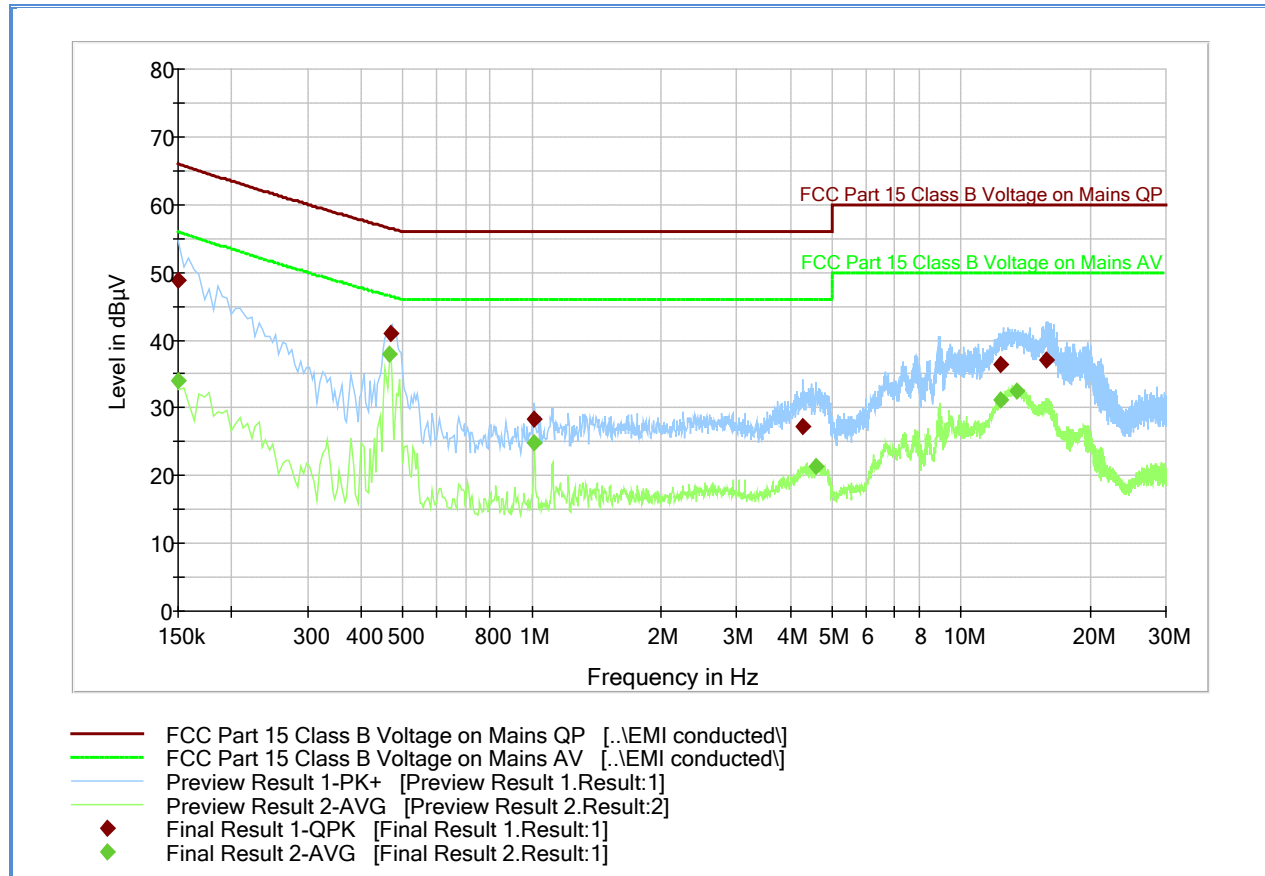
### Quasi Peak

| Frequency (MHz) | QuasiPeak (dBμV) | Meas. Time (ms) | Bandwidth (kHz) | Filter | Line | Corr. (dB) | Margin - QPK (dB) | Limit - QPK (dBμV) |
|-----------------|------------------|-----------------|-----------------|--------|------|------------|-------------------|--------------------|
| 0.150000        | 49.0             | 1000.0          | 9.000           | Off    | N    | 20.1       | 17.0              | 66.0               |
| 0.469500        | 41.5             | 1000.0          | 9.000           | Off    | N    | 20.1       | 15.0              | 56.5               |
| 2.107500        | 31.5             | 1000.0          | 9.000           | Off    | N    | 20.3       | 24.5              | 56.0               |
| 4.623000        | 33.4             | 1000.0          | 9.000           | Off    | N    | 20.4       | 22.6              | 56.0               |
| 12.358500       | 42.4             | 1000.0          | 9.000           | Off    | N    | 20.7       | 17.6              | 60.0               |
| 13.281000       | 43.2             | 1000.0          | 9.000           | Off    | N    | 20.6       | 16.8              | 60.0               |

### Average

| Frequency (MHz) | Average (dBμV) | Meas. Time (ms) | Bandwidth (kHz) | Filter | Line | Corr. (dB) | Margin - Ave (dB) | Limit - Ave (dBμV) |
|-----------------|----------------|-----------------|-----------------|--------|------|------------|-------------------|--------------------|
| 0.348000        | 26.9           | 1000.0          | 9.000           | Off    | N    | 20.2       | 21.9              | 48.8               |
| 0.469500        | 37.1           | 1000.0          | 9.000           | Off    | N    | 20.1       | 9.4               | 46.5               |
| 1.860000        | 25.7           | 1000.0          | 9.000           | Off    | N    | 20.2       | 20.3              | 46.0               |
| 4.537500        | 27.5           | 1000.0          | 9.000           | Off    | N    | 20.4       | 18.5              | 46.0               |
| 12.435000       | 37.5           | 1000.0          | 9.000           | Off    | N    | 20.7       | 12.5              | 50.0               |
| 13.177500       | 38.5           | 1000.0          | 9.000           | Off    | N    | 20.6       | 11.5              | 50.0               |

## 2.1.12 Test Results - Conducted Emissions Line 1 – Hot (CU)



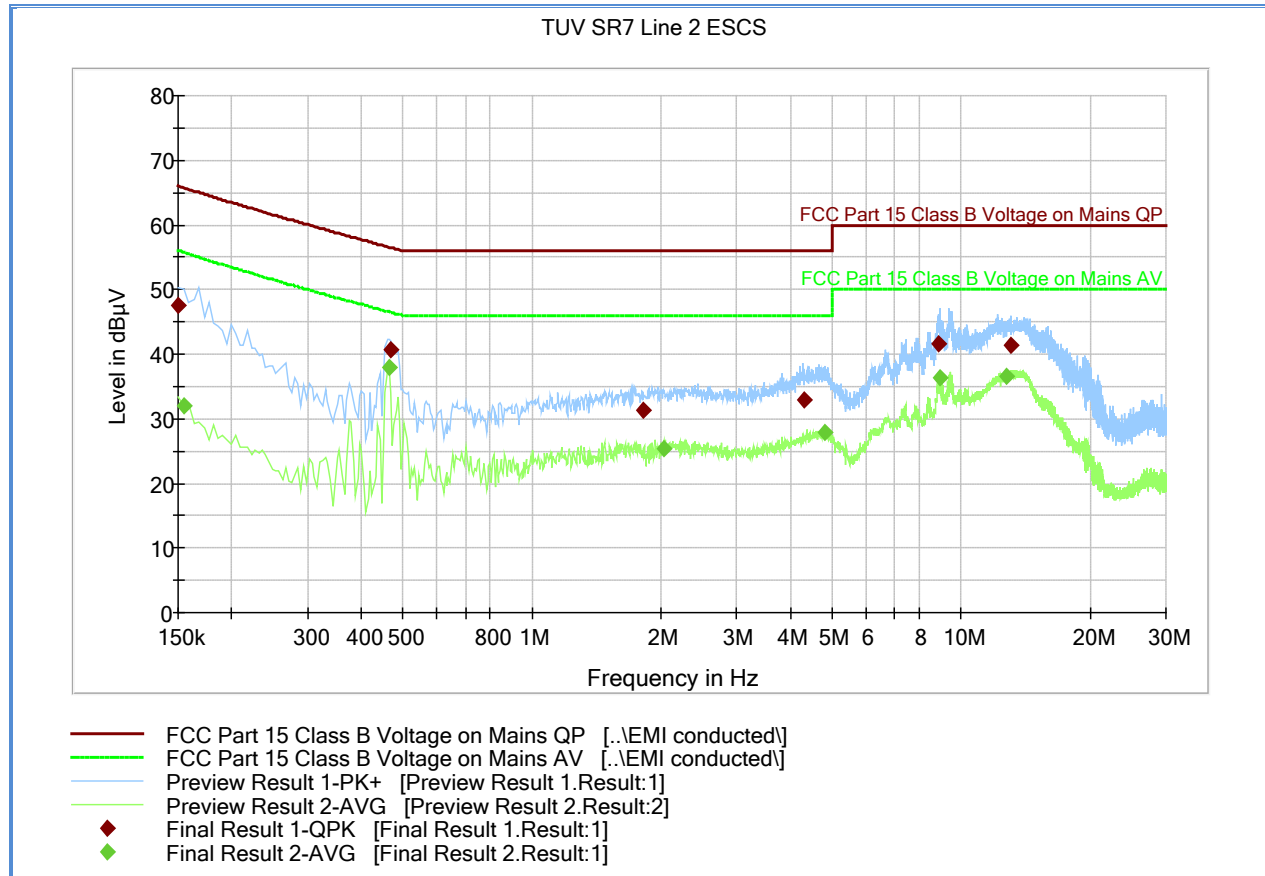
### Quasi Peak

| Frequency (MHz) | QuasiPeak (dBµV) | Meas. Time (ms) | Bandwidth (kHz) | Filter | Line | Corr. (dB) | Margin - QPK (dB) | Limit - QPK (dBµV) |
|-----------------|------------------|-----------------|-----------------|--------|------|------------|-------------------|--------------------|
| 0.150000        | 48.9             | 1000.0          | 9.000           | Off    | L1   | 20.1       | 17.1              | 66.0               |
| 0.469500        | 40.9             | 1000.0          | 9.000           | Off    | L1   | 20.1       | 15.6              | 56.5               |
| 1.014000        | 28.3             | 1000.0          | 9.000           | Off    | L1   | 20.2       | 27.7              | 56.0               |
| 4.285500        | 27.2             | 1000.0          | 9.000           | Off    | L1   | 20.4       | 28.8              | 56.0               |
| 12.363000       | 36.4             | 1000.0          | 9.000           | Off    | L1   | 20.6       | 23.6              | 60.0               |
| 15.841500       | 37.1             | 1000.0          | 9.000           | Off    | L1   | 20.6       | 22.9              | 60.0               |

### Average

| Frequency (MHz) | Average (dBµV) | Meas. Time (ms) | Bandwidth (kHz) | Filter | Line | Corr. (dB) | Margin - Ave (dB) | Limit - Ave (dBµV) |
|-----------------|----------------|-----------------|-----------------|--------|------|------------|-------------------|--------------------|
| 0.150000        | 33.9           | 1000.0          | 9.000           | Off    | L1   | 20.1       | 22.1              | 56.0               |
| 0.465000        | 37.8           | 1000.0          | 9.000           | Off    | L1   | 20.1       | 8.7               | 46.5               |
| 1.014000        | 24.9           | 1000.0          | 9.000           | Off    | L1   | 20.2       | 21.1              | 46.0               |
| 4.582500        | 21.3           | 1000.0          | 9.000           | Off    | L1   | 20.4       | 24.7              | 46.0               |
| 12.403500       | 31.3           | 1000.0          | 9.000           | Off    | L1   | 20.6       | 18.7              | 50.0               |
| 13.452000       | 32.4           | 1000.0          | 9.000           | Off    | L1   | 20.6       | 17.6              | 50.0               |

## 2.1.13 FCC Conducted Emissions Line 2 – Neutral (CU)



### Quasi Peak

| Frequency (MHz) | QuasiPeak (dBµV) | Meas. Time (ms) | Bandwidth (kHz) | Filter | Line | Corr. (dB) | Margin - QPK (dB) | Limit - QPK (dBµV) |
|-----------------|------------------|-----------------|-----------------|--------|------|------------|-------------------|--------------------|
| 0.150000        | 47.4             | 1000.0          | 9.000           | Off    | N    | 20.1       | 18.6              | 66.0               |
| 0.469500        | 40.8             | 1000.0          | 9.000           | Off    | N    | 20.1       | 15.7              | 56.5               |
| 1.819500        | 31.2             | 1000.0          | 9.000           | Off    | N    | 20.2       | 24.8              | 56.0               |
| 4.312500        | 32.9             | 1000.0          | 9.000           | Off    | N    | 20.4       | 23.1              | 56.0               |
| 8.875500        | 41.6             | 1000.0          | 9.000           | Off    | N    | 20.5       | 18.4              | 60.0               |
| 13.101000       | 41.4             | 1000.0          | 9.000           | Off    | N    | 20.6       | 18.6              | 60.0               |

### Average

| Frequency (MHz) | Average (dBµV) | Meas. Time (ms) | Bandwidth (kHz) | Filter | Line | Corr. (dB) | Margin - Ave (dB) | Limit - Ave (dBµV) |
|-----------------|----------------|-----------------|-----------------|--------|------|------------|-------------------|--------------------|
| 0.154500        | 32.0           | 1000.0          | 9.000           | Off    | N    | 20.0       | 23.7              | 55.7               |
| 0.465000        | 37.8           | 1000.0          | 9.000           | Off    | N    | 20.1       | 8.7               | 46.5               |
| 2.031000        | 25.4           | 1000.0          | 9.000           | Off    | N    | 20.1       | 20.6              | 46.0               |
| 4.803000        | 27.8           | 1000.0          | 9.000           | Off    | N    | 20.5       | 18.2              | 46.0               |
| 8.938500        | 36.2           | 1000.0          | 9.000           | Off    | N    | 20.5       | 13.8              | 50.0               |
| 12.741000       | 36.6           | 1000.0          | 9.000           | Off    | N    | 20.7       | 13.4              | 50.0               |



## **2.2 26 DB BANDWIDTH**

### **2.2.1 Specification Reference**

FCC 47 CFR Part 15, Clause 15.403

### **2.2.2 Standard Applicable**

(i) Emission bandwidth. For purposes of this subpart the emission bandwidth shall be determined by measuring the width of the signal between two points, one below the carrier center frequency and one above the carrier center frequency, that are 26 dB down relative to the maximum level of the modulated carrier. Determination of the emissions bandwidth is based on the use of measurement instrumentation employing a peak detector function with an instrument resolution bandwidth approximately equal to 1.0 percent of the emission bandwidth of the device under measurement.

### **2.2.3 Test Methodology**

Section II (C) (1) of KDB789033 D02 General UNII Test Procedures New Rules v01r01

### **2.2.4 Equipment Under Test and Modification State**

Please refer to SD72112724-0116F FCC Part 15.407 Subpart E RSS247 Test Report for serial number/s and test configuration used.

### **2.2.5 Date of Test/Initial of test personnel who performed the test**

March 18 and 21, 2016/XYZ

### **2.2.6 Test Equipment Used**

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

### **2.2.7 Environmental Conditions**

Test performed at TÜV SÜD America Inc. Rancho Bernardo facility

|                     |                |
|---------------------|----------------|
| Ambient Temperature | 25.7 - 26.0°C  |
| Relative Humidity   | 46.9 - 47.0%   |
| ATM Pressure        | 98.9 - 99.3kPa |



## 2.2.8 Additional Observations

- Test results presented here is from SD72112724-0116F FCC Part 15.407 Subpart E RSS247 Test Report.docx (issued by TÜV SÜD America San Diego April 2016). See Section 1.2 for more details.
- This is a conducted test.
- Test methodology is per Section II (C) (1) of KDB789033 D02 General UNII Test Procedures New Rules v01r01 (January 8, 2016).
- Span is wide enough to capture the channel transmission.
- RBW is 1% of EBW.
- VBW > RBW.
- Detector is peak. Trace is max hold.
- Sweep time is set to Auto.
- “n dB down” (26dB) marker function of the spectrum analyzer was used for this test.

## 2.2.9 Summary Test Results (as reported)

| UNII 1 30MHz -26dB Bandwidth (NU)  |                 |                       |
|------------------------------------|-----------------|-----------------------|
| Channel                            | Frequency (MHz) | -26dB Bandwidth (MHz) |
| 38                                 | 5190            | 30.54                 |
| 44                                 | 5220            | 30.39                 |
| 48                                 | 5240            | 30.68                 |
| UNII 1 40MHz -26dB Bandwidth (NU)  |                 |                       |
| Channel                            | Frequency (MHz) | -26dB Bandwidth (MHz) |
| 38                                 | 5190            | 38.35                 |
| 44                                 | 5220            | 38.49                 |
| 46                                 | 5230            | 38.35                 |
| UNII 2A 30MHz -26dB Bandwidth (NU) |                 |                       |
| Channel                            | Frequency (MHz) | -26dB Bandwidth (MHz) |
| 52                                 | 5260            | 30.54                 |
| 60                                 | 5300            | 31.11                 |
| 62                                 | 5310            | 30.54                 |
| UNII 2A 40MHz -26dB Bandwidth (NU) |                 |                       |
| Channel                            | Frequency (MHz) | -26dB Bandwidth (MHz) |
| 54                                 | 5270            | 38.49                 |
| 60                                 | 5300            | 38.35                 |
| 62                                 | 5310            | 38.49                 |



| UNII 2C 30MHz -26dB Bandwidth (CU) |                 |                       |
|------------------------------------|-----------------|-----------------------|
| Channel                            | Frequency (MHz) | -26dB Bandwidth (MHz) |
| 105                                | 5525            | 30.54                 |
| 120                                | 5600            | 30.54                 |
| 140                                | 5700            | 30.39                 |
| UNII 2C 40MHz -26dB Bandwidth (CU) |                 |                       |
| Channel                            | Frequency (MHz) | -26dB Bandwidth (MHz) |
| 105                                | 5525            | 39.80                 |
| 120                                | 5600            | 38.35                 |
| 140                                | 5700            | 38.35                 |
| UNII 3 30MHz -26dB Bandwidth (CU)  |                 |                       |
| Channel                            | Frequency (MHz) | -26dB Bandwidth (MHz) |
| 149                                | 5745            | 30.54                 |
| 157                                | 5785            | 30.54                 |
| 165                                | 5825            | 30.54                 |
| UNII 3 40MHz -26dB Bandwidth (CU)  |                 |                       |
| Channel                            | Frequency (MHz) | -26dB Bandwidth (MHz) |
| 151                                | 5755            | 38.35                 |
| 157                                | 5785            | 38.35                 |
| 165                                | 5825            | 38.35                 |

## 2.2.10 Test Plots



Date: 18.MAR.2016 15:05:33

### UNII 1 30MHz Bandwidth Middle Channel 5220 MHz



Date: 18.MAR.2016 15:04:31

### UNII 1 40MHz Bandwidth Mid Channel 5220 MHz



Date: 18.MAR.2016 15:18:35

#### UNII 2A 30MHz Bandwidth Middle Channel 5300 MHz



Date: 18.MAR.2016 15:20:17

#### UNII 2A 40MHz Bandwidth Middle Channel 5300 MHz



Date: 21.MAR.2016 13:56:02

#### UNII 2C 30MHz Bandwidth Middle Channel 5600 MHz



Date: 21.MAR.2016 14:00:21

#### UNII 2C 40MHz Bandwidth Middle Channel 5600 MHz



Date: 21.MAR.2016 15:22:09

### UNII 3 30MHz Bandwidth Middle Channel 5785 MHz



Date: 21.MAR.2016 15:20:00

### UNII 3 40MHz Bandwidth Middle Channel 5785 MHz



## **2.3 99% EMISSION BANDWIDTH**

### **2.3.1 Specification Reference**

RSS-Gen, Clause 6.6

### **2.3.2 Standard Applicable**

When an occupied bandwidth value is not specified in the applicable RSS, the transmitted signal bandwidth to be reported is to be its 99% emission bandwidth, as calculated or measured.

The transmitter shall be operated at its maximum carrier power measured under normal test conditions. The span of the analyzer shall be set to capture all products of the modulation process, including the emission skirts. The resolution bandwidth shall be set to as close to 1% of the selected span as is possible without being below 1%. The video bandwidth shall be set to 3 times the resolution bandwidth. Video averaging is not permitted. Where practical, a sampling detector shall be used given that a peak or peak hold may produce a wider bandwidth than actual.

The trace data points are recovered and directly summed in linear terms. The recovered amplitude data points, beginning at the lowest frequency, are placed in a running sum until 0.5% of the total is reached and that frequency recorded. The process is repeated for the highest frequency data points. This frequency is recorded. The span between the two recorded frequencies is the occupied bandwidth.

### **2.3.3 Equipment Under Test and Modification State**

Please refer to SD72112724-0116F FCC Part 15.407 Subpart E RSS247 Test Report for serial number/s and test configuration used.

### **2.3.4 Date of Test/Initial of test personnel who performed the test**

March 18 and 21, 2016/XYZ

### **2.3.5 Test Equipment Used**

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

### **2.3.6 Environmental Conditions**

Test performed at TÜV SÜD America Inc. Rancho Bernardo facility

|                     |                |
|---------------------|----------------|
| Ambient Temperature | 25.7 - 26.0°C  |
| Relative Humidity   | 46.9 - 47.0%   |
| ATM Pressure        | 98.9 - 99.3kPa |



### 2.3.7 Additional Observations

- Test results presented here is from SD72112724-0116F FCC Part 15.407 Subpart E RSS247 Test Report.docx (issued by TÜV SÜD America San Diego April 2016). See Section 1.2 for more details.
- This is a conducted test.
- The path loss was measured and entered as a level offset.
- Test methodology is per Section II (D) of KDB789033 D02 General UNII Test Procedures New Rules v01r01 (January 8, 2016).
- Span is wide enough to capture the channel transmission.
- RBW is 1% of the Emission Bandwidth.
- VBW is  $\geq 3 \times$  RBW.
- Sweep is auto.
- Detector is peak.
- The Channel Bandwidth measurement function of the spectrum analyzer was used for this test.

### 2.3.8 Summary Test Results (as reported)

| UNII 1 30MHz 99% Bandwidth (NU)  |                 |                     |
|----------------------------------|-----------------|---------------------|
| Channel                          | Frequency (MHz) | 99% Bandwidth (MHz) |
| 38                               | 5190            | 28.94               |
| 44                               | 5220            | 28.94               |
| 48                               | 5240            | 28.94               |
| UNII 1 40MHz 99% Bandwidth (NU)  |                 |                     |
| Channel                          | Frequency (MHz) | 99% Bandwidth (MHz) |
| 38                               | 5190            | 36.32               |
| 44                               | 5220            | 36.32               |
| 46                               | 5230            | 36.32               |
| UNII 2A 30MHz 99% Bandwidth (NU) |                 |                     |
| Channel                          | Frequency (MHz) | 99% Bandwidth (MHz) |
| 52                               | 5260            | 28.94               |
| 60                               | 5300            | 29.09               |
| 62                               | 5310            | 28.94               |
| UNII 2A 40MHz 99% Bandwidth (NU) |                 |                     |
| Channel                          | Frequency (MHz) | 99% Bandwidth (MHz) |
| 54                               | 5270            | 36.18               |
| 60                               | 5300            | 36.47               |
| 62                               | 5310            | 36.18               |



| UNII 2C 30MHz 99% Bandwidth (CU) |                 |                     |
|----------------------------------|-----------------|---------------------|
| Channel                          | Frequency (MHz) | 99% Bandwidth (MHz) |
| 105                              | 5525            | 28.94               |
| 120                              | 5600            | 28.94               |
| 140                              | 5700            | 28.94               |
| UNII 2C 40MHz 99% Bandwidth (CU) |                 |                     |
| Channel                          | Frequency (MHz) | 99% Bandwidth (MHz) |
| 105                              | 5525            | 36.18               |
| 120                              | 5600            | 36.18               |
| 140                              | 5700            | 36.18               |
| UNII 3 30MHz 99% Bandwidth (CU)  |                 |                     |
| Channel                          | Frequency (MHz) | 99% Bandwidth (MHz) |
| 149                              | 5745            | 28.94               |
| 157                              | 5785            | 28.94               |
| 165                              | 5825            | 28.94               |
| UNII 3 40MHz 99% Bandwidth (CU)  |                 |                     |
| Channel                          | Frequency (MHz) | 99% Bandwidth (MHz) |
| 151                              | 5755            | 36.32               |
| 157                              | 5785            | 36.18               |
| 165                              | 5825            | 36.32               |

### 2.3.9 Test Plots



Date: 18.MAR.2016 15:05:56

#### UNII 1 30MHz Bandwidth Middle Channel 5220 MHz



Date: 18.MAR.2016 15:04:04

#### UNII 1 40MHz Bandwidth Mid Channel 5220 MHz



Date: 18.MAR.2016 15:19:01

#### UNII 2A 30MHz Bandwidth Middle Channel 5300 MHz



Date: 18.MAR.2016 15:19:51

#### UNII 2A 40MHz Bandwidth Middle Channel 5300 MHz



Date: 21.MAR.2016 13:57:00

#### UNII 2C 30MHz Bandwidth Middle Channel 5600 MHz



Date: 21.MAR.2016 13:59:47

#### UNII 2C 40MHz Bandwidth Middle Channel 5600 MHz



Date: 21.MAR.2016 15:21:43

### UNII 3 30MHz Bandwidth Middle Channel 5785 MHz



Date: 21.MAR.2016 15:20:38

### UNII 3 40MHz Bandwidth Middle Channel 5785 MHz



## **2.4 MINIMUM 6DB BANDWIDTH**

### **2.4.1 Specification Reference**

FCC 47 CFR Part 152, Clause 15.407(e) and RSS-247, Clause 6.2.4(1)

### **2.4.2 Standard Applicable**

(e) Within the 5.725-5.85 GHz band, the minimum 6 dB bandwidth of UNII devices shall be at least 500 kHz.

### **2.4.3 Test Methodology**

Section II (C) (2) of KDB789033 D02 General UNII Test Procedures New Rules v01r01

### **2.4.4 Equipment Under Test and Modification State**

Please refer to SD72112724-0116F FCC Part 15.407 Subpart E RSS247 Test Report for serial number/s and test configuration used.

### **2.4.5 Date of Test/Initial of test personnel who performed the test**

February 08, 12 and 16, 2016/XYZ

### **2.4.6 Test Equipment Used**

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

### **2.4.7 Environmental Conditions**

Test performed at TÜV SÜD America Inc. Rancho Bernardo facility

|                     |                |
|---------------------|----------------|
| Ambient Temperature | 26.7 - 29.0°C  |
| Relative Humidity   | 21.4 - 26.8%   |
| ATM Pressure        | 98.9 - 99.5kPa |

### **2.4.8 Additional Observations**

- Test results presented here is from SD72112724-0116F FCC Part 15.407 Subpart E RSS247 Test Report.docx (issued by TÜV SÜD America San Diego April 2016). See Section 1.2 for more details.
- This is a conducted test.
- The path loss was measured and entered as a level offset.
- Span is wide enough to capture the channel transmission.
- RBW is 100kHz.
- VBW is  $\geq 3X$  RBW.
- Sweep is auto.
- Detector is Peak.
- Trace mode is Max Hold.



#### 2.4.9 Summary Test Results (as reported)

| UNII 1 30MHz 6dB Bandwidth (NU)  |                 |                      |
|----------------------------------|-----------------|----------------------|
| Channel                          | Frequency (MHz) | -6dB Bandwidth (MHz) |
| 38                               | 5190            | 28.90                |
| 44                               | 5220            | 28.94                |
| 48                               | 5240            | 28.97                |
| UNII 1 40MHz 6dB Bandwidth (NU)  |                 |                      |
| Channel                          | Frequency (MHz) | -6dB Bandwidth (MHz) |
| 38                               | 5190            | 38.35                |
| 44                               | 5220            | 38.35                |
| 46                               | 5230            | 38.35                |
| UNII 2A 30MHz 6dB Bandwidth (NU) |                 |                      |
| Channel                          | Frequency (MHz) | -6dB Bandwidth (MHz) |
| 52                               | 5260            | 28.94                |
| 60                               | 5300            | 29.09                |
| 62                               | 5310            | 29.09                |
| UNII 2A 40MHz 6dB Bandwidth (NU) |                 |                      |
| Channel                          | Frequency (MHz) | -6dB Bandwidth (MHz) |
| 54                               | 5270            | 38.35                |
| 60                               | 5300            | 38.35                |
| 62                               | 5310            | 38.36                |



| UNII 2C 30MHz 6dB Bandwidth (CU) |                 |                      |
|----------------------------------|-----------------|----------------------|
| Channel                          | Frequency (MHz) | -6dB Bandwidth (MHz) |
| 105                              | 5525            | 29.23                |
| 120                              | 5600            | 29.38                |
| 140                              | 5700            | 29.38                |
| UNII 2C 40MHz 6dB Bandwidth (CU) |                 |                      |
| Channel                          | Frequency (MHz) | -6dB Bandwidth (MHz) |
| 105                              | 5525            | 38.21                |
| 120                              | 5600            | 38.35                |
| 140                              | 5700            | 38.35                |
| UNII 3 30MHz 6dB Bandwidth (CU)  |                 |                      |
| Channel                          | Frequency (MHz) | -6dB Bandwidth (MHz) |
| 149                              | 5745            | 29.32                |
| 157                              | 5785            | 29.38                |
| 165                              | 5825            | 29.38                |
| UNII 3 40MHz 6dB Bandwidth (CU)  |                 |                      |
| Channel                          | Frequency (MHz) | -6dB Bandwidth (MHz) |
| 151                              | 5755            | 38.35                |
| 157                              | 5785            | 38.35                |
| 165                              | 5825            | 38.35                |

## 2.4.10 Test Plots



Date: 12.FEB.2016 13:36:26

### UNII 1 30MHz Bandwidth Middle Channel 5220 MHz



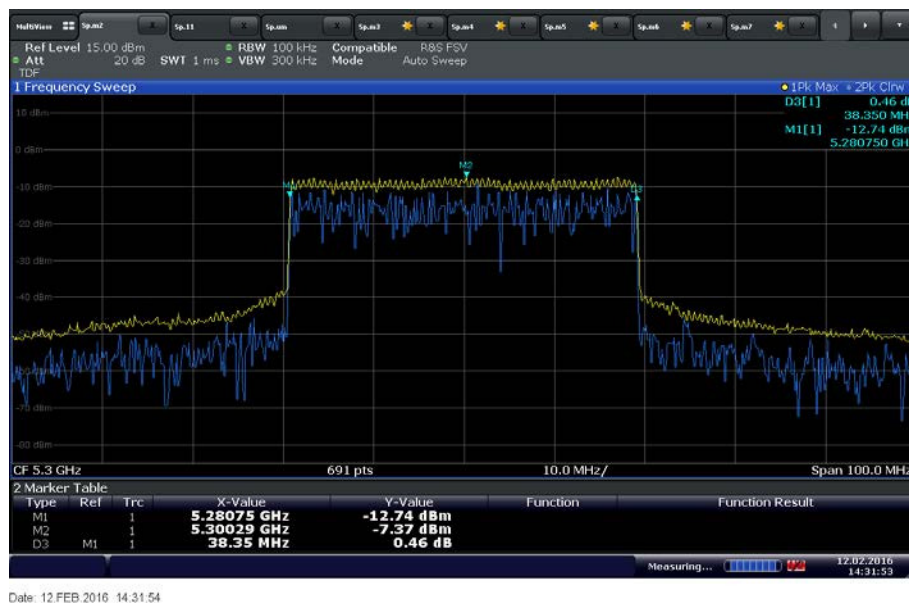
Date: 12.FEB.2016 11:54:42

### UNII 1 40MHz Bandwidth Mid Channel 5220 MHz



Date: 12.FEB.2016 14:15:29

#### UNII 2A 30MHz Bandwidth Middle Channel 5300 MHz

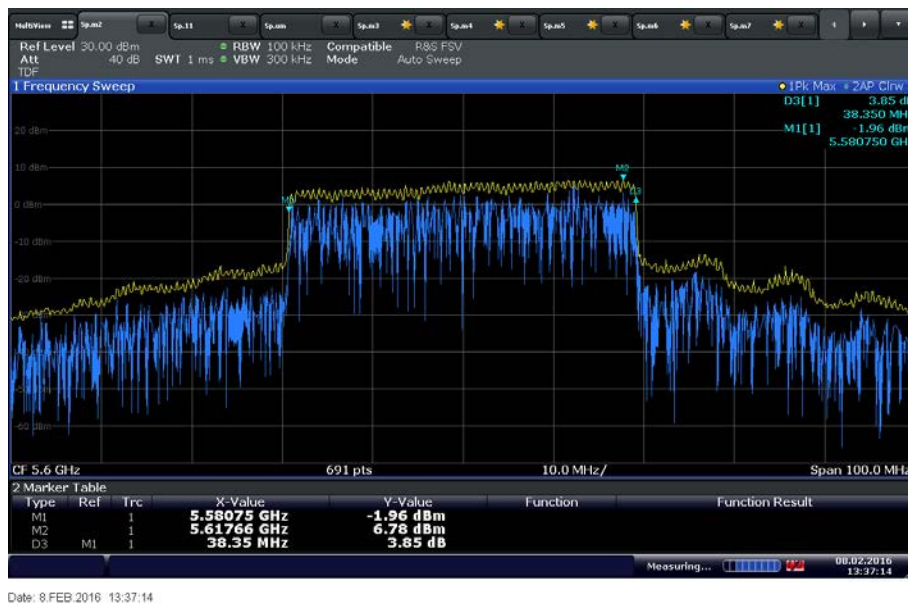


Date: 12.FEB.2016 14:31:54

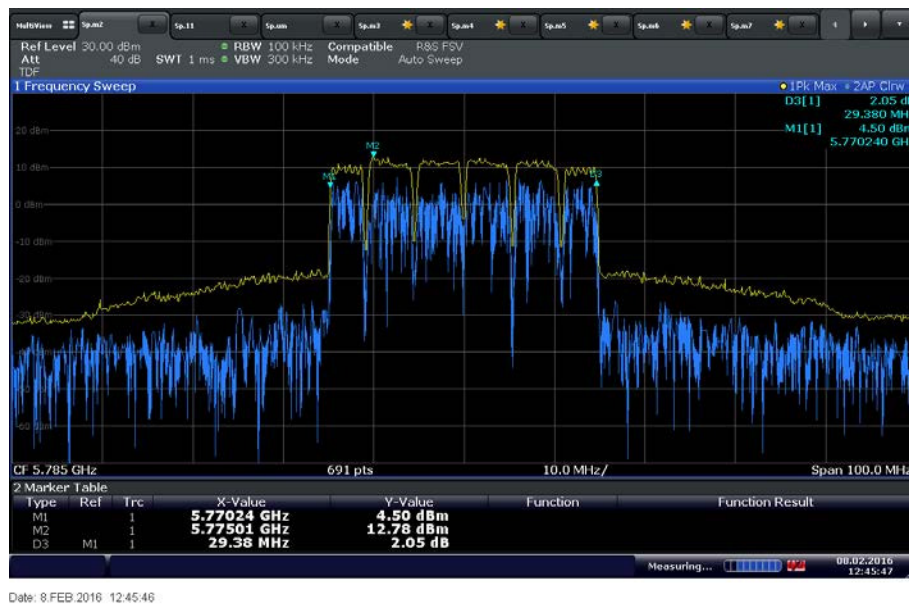
#### UNII 2A 40MHz Bandwidth Middle Channel 5300 MHz



UNII 2C 30MHz Bandwidth Middle Channel 5600 MHz



UNII 2C 40MHz Bandwidth Middle Channel 5600 MHz



Date: 8 FEB 2016 12:45:46

### UNII 3 30MHz Bandwidth Middle Channel 5785 MHz



Date: 8 FEB 2016 12:36:46

### UNII 3 40MHz Bandwidth Middle Channel 5785 MHz



## **2.5 MAXIMUM CONDUCTED OUTPUT POWER**

### **2.5.1 Specification Reference**

FCC 47 CFR Part 15, Clause 15.407(a) and RSS-247, Clause 6.2.4(1)

### **2.5.2 Standard Applicable**

(iv) For mobile and portable client devices in the 5.15-5.25 GHz band, the maximum conducted output power over the frequency band of operation shall not exceed 250 mW provided the maximum antenna gain does not exceed 6 dBi. In addition, the maximum power spectral density shall not exceed 11 dBm in any 1 megahertz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

(2) For the 5.25–5.35 GHz and 5.47–5.725 GHz bands, the maximum conducted output power over the frequency bands of operation shall not exceed the lesser of 250 mW or 11 dBm + 10 log B, where B is the 26 dB emission bandwidth in megahertz. In addition, the maximum power spectral density shall not exceed 11 dBm in any 1 megahertz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

(3) For the band 5.725-5.85 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W. In addition, the maximum power spectral density shall not exceed 30 dBm in any 500-kHz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi. However, fixed point-to-point UNII devices operating in this band may employ transmitting antennas with directional gain greater than 6 dBi without any corresponding reduction in transmitter conducted power. Fixed, point-to-point operations exclude the use of point-to-multipoint systems, omnidirectional applications, and multiple colocated transmitters transmitting the same information. The operator of the UNII device, or if the equipment is professionally installed, the installer, is responsible for ensuring that systems employing high gain directional antennas are used exclusively for fixed, point-to-point operations.

### **2.5.3 Test Methodology**

Section II (E)(2)(b) Method SA-1 of KDB789033 D02 General UNII Test Procedures New Rules v01r01

### **2.5.1 Equipment Under Test and Modification State**

Please refer to SD72112724-0116F FCC Part 15.407 Subpart E RSS247 Test Report for serial number/s and test configuration used.

### **2.5.1 Date of Test/Initial of test personnel who performed the test**

February 02, 04 and 16, 2016 / XYZ



## 2.5.2 Test Equipment Used

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

## 2.5.3 Environmental Conditions

Test performed at TÜV SÜD America Inc. Rancho Bernardo facility

|                     |                 |
|---------------------|-----------------|
| Ambient Temperature | 22.7 - 29.0°C   |
| Relative Humidity   | 21.5 - 29.1%    |
| ATM Pressure        | 98.9 - 100.1kPa |

## 2.5.4 Additional Observations

- Test results presented here is from SD72112724-0116F FCC Part 15.407 Subpart E RSS247 Test Report.docx (issued by TÜV SÜD America San Diego April 2016). See Section 1.2 for more details.
- This is a conducted test.
- Test methodology is per Section E(2)(b) Method SA-1 of KDB789033 D02 General UNII Test Procedures New Rules v01r01 (January 8, 2016). All conditions under this Section were satisfied.
- RBW is 1MHz while VBW is  $\geq 3$  MHz
- Detector is RMS
- Trace was averaged >100 times.
- The path loss was measured and entered as a level offset.
- The spectrum analyser band power function was used for this test.
- Only Middle Channel test plots presented as the representative configuration.

## 2.5.5 Test Results

| UNII 1 30MHz Bandwidth (NU) |                 |                     |                   |                              |
|-----------------------------|-----------------|---------------------|-------------------|------------------------------|
| Channel                     | Frequency (MHz) | Average Power (dBm) | Average Power (W) | Margin from 24dBm limit (dB) |
| 38                          | 5190            | 21.15               | 0.13              | 2.85                         |
| 44                          | 5220            | 21.46               | 0.14              | 2.54                         |
| <b>48</b>                   | <b>5240</b>     | <b>22.56</b>        | <b>0.18</b>       | <b>1.44</b>                  |
| UNII 1 40MHz Bandwidth (NU) |                 |                     |                   |                              |
| Channel                     | Frequency (MHz) | Average Power (dBm) | Average Power (W) | Margin from 24dBm limit (dB) |
| 38                          | 5190            | 21.45               | 0.14              | 2.55                         |
| 44                          | 5220            | 21.36               | 0.14              | 2.64                         |
| 46                          | 5230            | 21.62               | 0.15              | 2.38                         |

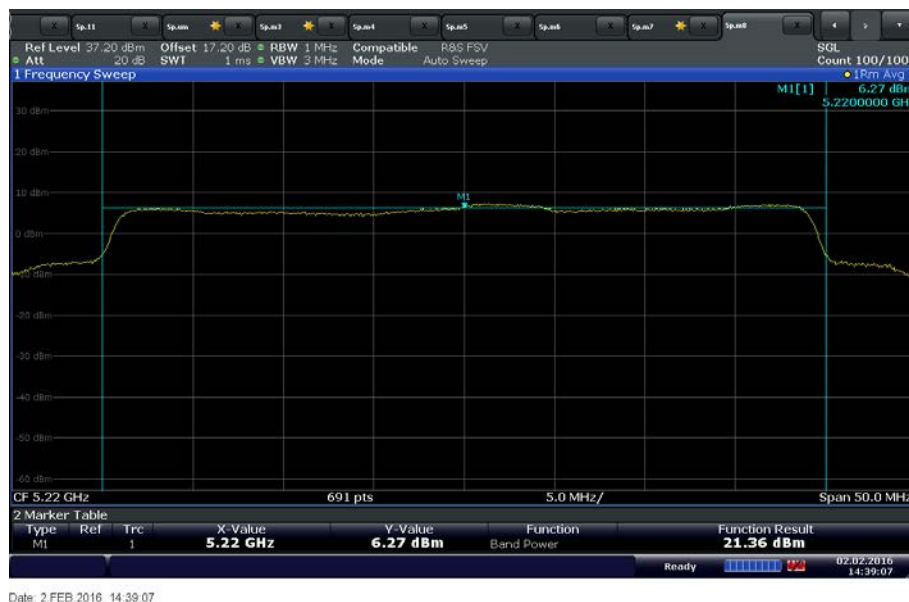
| UNII 2A 30MHz Bandwidth (NU) |                 |                     |                   |                              |
|------------------------------|-----------------|---------------------|-------------------|------------------------------|
| Channel                      | Frequency (MHz) | Average Power (dBm) | Average Power (W) | Margin from 24dBm limit (dB) |
| 52                           | 5260            | 22.68               | 0.19              | 1.32                         |
| 60                           | 5300            | 22.07               | 0.16              | 1.93                         |
| 62                           | 5310            | 20.48               | 0.11              | 3.52                         |
| UNII 2A 40MHz Bandwidth (NU) |                 |                     |                   |                              |
| Channel                      | Frequency (MHz) | Average Power (dBm) | Average Power (W) | Margin from 24dBm limit (dB) |
| 54                           | 5270            | 22.50               | 0.18              | 1.5                          |
| 60                           | 5300            | 22.48               | 0.18              | 1.52                         |
| 62                           | 5310            | 20.16               | 0.10              | 3.84                         |

| UNII 2C 30MHz Bandwidth (CU) |                 |                     |                   |                              |
|------------------------------|-----------------|---------------------|-------------------|------------------------------|
| Channel                      | Frequency (MHz) | Average Power (dBm) | Average Power (W) | Margin from 24dBm limit (dB) |
| 105                          | 5525            | 21.20               | 0.13              | 2.8                          |
| 120                          | 5600            | 21.44               | 0.14              | 2.56                         |
| 140                          | 5700            | 21.94               | 0.16              | 2.06                         |
| UNII 2C 40MHz Bandwidth (CU) |                 |                     |                   |                              |
| Channel                      | Frequency (MHz) | Average Power (dBm) | Average Power (W) | Margin from 24dBm limit (dB) |
| 105                          | 5525            | 21.21               | 0.13              | 2.79                         |
| 120                          | 5600            | 21.58               | 0.14              | 2.42                         |
| 140                          | 5700            | 22.18               | 0.17              | 1.82                         |
| UNII 3 30MHz Bandwidth (CU)  |                 |                     |                   |                              |
| Channel                      | Frequency (MHz) | Average Power (dBm) | Average Power (W) | Margin from 30dBm limit (dB) |
| 149                          | 5745            | 21.32               | 0.14              | 8.68                         |
| 157                          | 5785            | 21.87               | 0.15              | 8.13                         |
| 165                          | 5825            | 21.82               | 0.15              | 8.18                         |
| UNII 3 40MHz Bandwidth (CU)  |                 |                     |                   |                              |
| Channel                      | Frequency (MHz) | Average Power (dBm) | Average Power (W) | Margin from 30dBm limit (dB) |
| 151                          | 5755            | 20.19               | 0.10              | 9.81                         |
| 157                          | 5785            | 22.02               | 0.16              | 7.98                         |
| 165                          | 5825            | 22.16               | 0.16              | 7.84                         |

## 2.5.6 Sample Test Plots



UNII 1 30MHz Bandwidth Middle Channel 5220 MHz



UNII 1 40MHz Bandwidth Mid Channel 5220 MHz



UNII 2A 30MHz Bandwidth Middle Channel 5300 MHz



UNII 2A 40MHz Bandwidth Middle Channel 5300 MHz



UNII 2C 30MHz Bandwidth Middle Channel 5600 MHz



UNII 2C 40MHz Bandwidth Middle Channel 5600 MHz



UNII 3 30MHz Bandwidth Middle Channel 5785 MHz



UNII 3 40MHz Bandwidth Middle Channel 5785 MHz



## **2.6 MAXIMUM POWER SPECTRAL DENSITY (PSD)**

### **2.6.1 Specification Reference**

FCC 47 CFR Part 15, Clause 15.407(a)(1), (a)(2) and (a)(3)  
RSS-247, Clause 6.2.4(1)

### **2.6.2 Standard Applicable**

(iv) For mobile and portable client devices in the 5.15-5.25 GHz band, the maximum conducted output power over the frequency band of operation shall not exceed 250 mW provided the maximum antenna gain does not exceed 6 dBi. In addition, the maximum power spectral density shall not exceed 11 dBm in any 1 megahertz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

(2) For the 5.25–5.35 GHz and 5.47–5.725 GHz bands, the maximum conducted output power over the frequency bands of operation shall not exceed the lesser of 250 mW or 11 dBm + 10 log B, where B is the 26 dB emission bandwidth in megahertz. In addition, the maximum power spectral density shall not exceed 11 dBm in any 1 megahertz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

(3) For the band 5.725-5.85 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W. In addition, the maximum power spectral density shall not exceed 30 dBm in any 500-kHz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi. However, fixed point-to-point UNII devices operating in this band may employ transmitting antennas with directional gain greater than 6 dBi without any corresponding reduction in transmitter conducted power. Fixed, point-to-point operations exclude the use of point-to-multipoint systems, omnidirectional applications, and multiple collocated transmitters transmitting the same information. The operator of the UNII device, or if the equipment is professionally installed, the installer, is responsible for ensuring that systems employing high gain directional antennas are used exclusively for fixed, point-to-point operations.

### **2.6.3 Test Methodology**

Section II (F) PSD of KDB789033 D02 General UNII Test Procedures New Rules v01r01

### **2.6.4 Equipment Under Test and Modification State**

Please refer to SD72112724-0116F FCC Part 15.407 Subpart E RSS247 Test Report for serial number/s and test configuration used.

### **2.6.5 Date of Test/Initial of test personnel who performed the test**

February 05, 08, 09 and 16, 2016 / XYZ



## 2.6.6 Test Equipment Used

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

## 2.6.7 Environmental Conditions

Test performed at TÜV SÜD America Inc. Rancho Bernardo facility

Ambient Temperature 23.0 - 29.0°C  
 Relative Humidity 21.5 - 29.1%  
 ATM Pressure 98.9 - 100.1kPa

## 2.6.8 Additional Observations

- Test results presented here is from SD72112724-0116F FCC Part 15.407 Subpart E RSS247 Test Report.docx (issued by TÜV SÜD America San Diego April 2016). See Section 1.2 for more details.
- This is a conducted test as per Section II (F) PSD of KDB789033 D02 General UNII Test Procedures New Rules v01r01 (January 8, 2016). All conditions under this Section were satisfied.
- The path loss was measured and entered as a level offset.
- Only Middle Channel test plots presented as the representative configuration.
- RBW for UNII 1, UNII 2A and UNII 2C is 1MHz while 500 kHz for UNII 3.

## 2.6.9 Test Results

| UNII 1 30MHz Bandwidth (NU)  |                 |                   |            |             |
|------------------------------|-----------------|-------------------|------------|-------------|
| Channel                      | Frequency (MHz) | Maximum PSD (dBm) | Limit (dB) | Margin (dB) |
| 38                           | 5190            | 8.38              | 11         | 2.62        |
| 44                           | 5220            | 9.22              | 11         | 1.78        |
| 48                           | 5240            | 6.80              | 11         | 4.2         |
| UNII 1 40MHz Bandwidth (NU)  |                 |                   |            |             |
| Channel                      | Frequency (MHz) | Maximum PSD (dBm) | Limit (dB) | Margin (dB) |
| 38                           | 5190            | 5.14              | 11         | 5.86        |
| 44                           | 5220            | 6.34              | 11         | 4.66        |
| 46                           | 5230            | 7.04              | 11         | 3.96        |
| UNII 2A 30MHz Bandwidth (NU) |                 |                   |            |             |
| Channel                      | Frequency (MHz) | Maximum PSD (dBm) | Limit (dB) | Margin (dB) |
| 52                           | 5260            | 5.89              | 11         | 5.11        |
| 60                           | 5300            | 5.90              | 11         | 5.1         |
| 62                           | 5310            | 5.92              | 11         | 5.08        |



| UNII 2A 40MHz Bandwidth (NU) |                 |                   |            |             |
|------------------------------|-----------------|-------------------|------------|-------------|
| Channel                      | Frequency (MHz) | Maximum PSD (dBm) | Limit (dB) | Margin (dB) |
| 54                           | 5270            | 6.62              | 11         | 4.38        |
| 60                           | 5300            | 3.78              | 11         | 7.22        |
| 62                           | 5310            | 2.46              | 11         | 8.54        |

| UNII 2C 30MHz Bandwidth (CU) |                 |                       |                |             |
|------------------------------|-----------------|-----------------------|----------------|-------------|
| Channel                      | Frequency (MHz) | Maximum PSD (dBm/MHz) | Limit (dB/MHz) | Margin (dB) |
| 105                          | 5525            | 8.88                  | 11             | 2.12        |
| 120                          | 5600            | 9.10                  | 11             | 1.9         |
| 140                          | 5700            | 9.27                  | 11             | 1.73        |
| UNII 2C 40MHz Bandwidth (CU) |                 |                       |                |             |
| Channel                      | Frequency (MHz) | Maximum PSD (dBm/MHz) | Limit (dB/MHz) | Margin (dB) |
| 105                          | 5525            | 7.56                  | 11             | 3.44        |
| 120                          | 5600            | 7.85                  | 11             | 3.15        |
| 140                          | 5700            | 7.52                  | 11             | 3.48        |
| UNII 3 30MHz Bandwidth (CU)  |                 |                       |                |             |
| Channel                      | Frequency (MHz) | Maximum PSD (dBm/MHz) | Limit (dB/MHz) | Margin (dB) |
| 149                          | 5745            | 7.21                  | 30             | 22.79       |
| 157                          | 5785            | 6.84                  | 30             | 23.16       |
| 165                          | 5825            | 6.91                  | 30             | 23.09       |
| UNII 3 40MHz Bandwidth (CU)  |                 |                       |                |             |
| Channel                      | Frequency (MHz) | Maximum PSD (dBm/MHz) | Limit (dB/MHz) | Margin (dB) |
| 151                          | 5755            | 5.84                  | 30             | 24.16       |
| 157                          | 5785            | 4.93                  | 30             | 25.07       |
| 165                          | 5825            | 5.86                  | 30             | 24.14       |

## 2.6.10 Test Plots



UNII 1 30MHz Bandwidth Middle Channel 5220 MHz



UNII 1 40MHz Bandwidth Mid Channel 5220 MHz



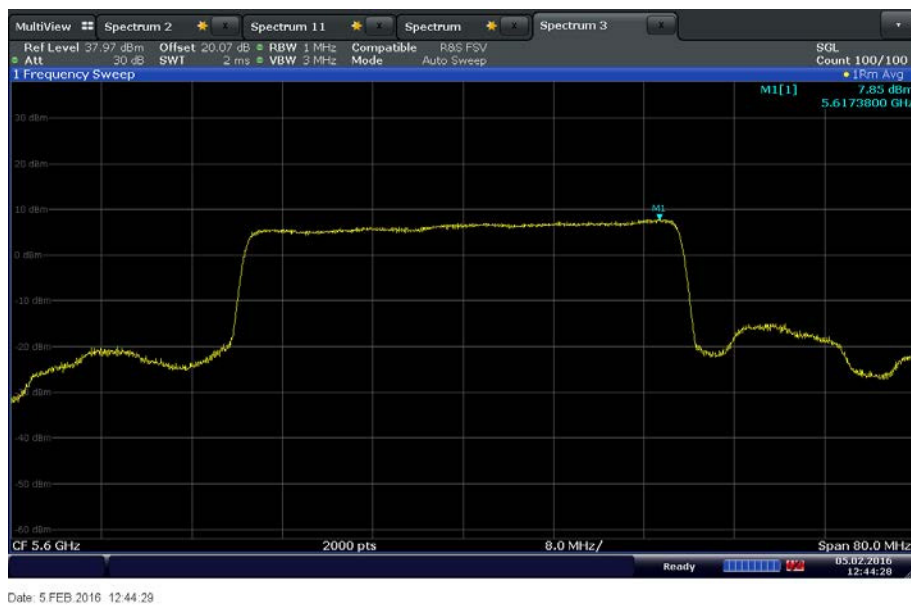
UNII 2A 30MHz Bandwidth Middle Channel 5300 MHz



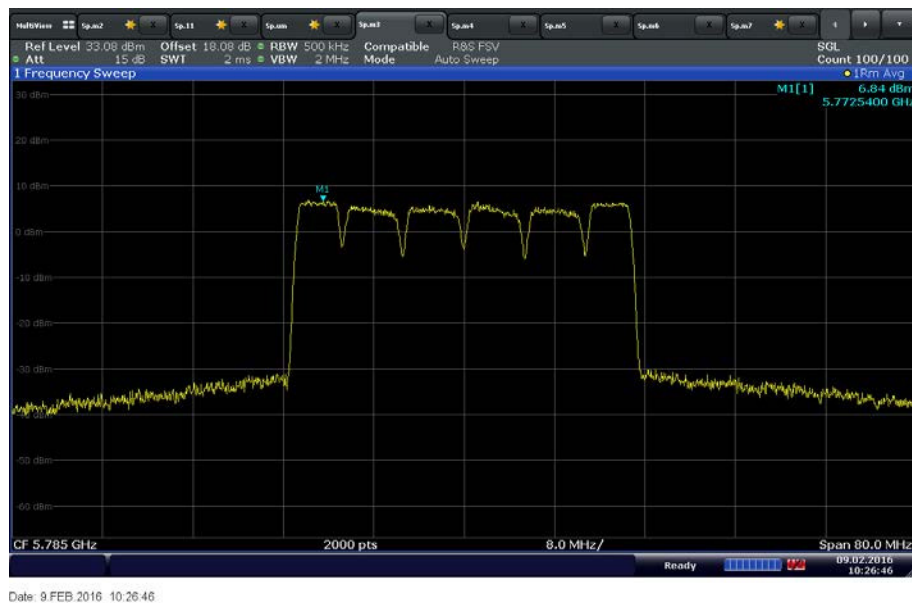
UNII 2A 40MHz Bandwidth Middle Channel 5300 MHz



UNII 2C 30MHz Bandwidth Middle Channel 5600 MHz



UNII 2C 40MHz Bandwidth Middle Channel 5600 MHz



UNII 3 30MHz Bandwidth Middle Channel 5785 MHz



UNII 3 40MHz Bandwidth Middle Channel 5785 MHz



## **2.7 UNWANTED EMISSIONS MEASUREMENT**

### **2.7.1 Specification Reference**

FCC 47 CFR Part 15, Clause 15.407(b)  
FCC 47 CFR Part 15.209  
RSS-247, Clause 6.2.4(2)

### **2.7.2 Standard Applicable**

(b) Undesirable emission limits. Except as shown in paragraph (b)(7) of this section, the maximum emissions outside of the frequency bands of operation shall be attenuated in accordance with the following limits:

(1) For transmitters operating in the 5.15-5.25 GHz band: All emissions outside of the 5.15-5.35 GHz band shall not exceed an e.i.r.p. of -27 dBm/MHz.

(2) For transmitters operating in the 5.25-5.35 GHz band: All emissions outside of the 5.15-5.35 GHz band shall not exceed an e.i.r.p. of -27 dBm/MHz.

(3) For transmitters operating in the 5.47-5.725 GHz band: All emissions outside of the 5.47-5.725 GHz band shall not exceed an e.i.r.p. of -27 dBm/MHz.

(4) For transmitters operating in the 5.725-5.85 GHz band: All emissions within the frequency range from the band edge to 10 MHz above or below the band edge shall not exceed an e.i.r.p. of -17 dBm/MHz; for frequencies 10 MHz or greater above or below the band edge, emissions shall not exceed an e.i.r.p. of -27 dBm/MHz.

(6) Unwanted emissions below 1 GHz must comply with the general field strength limits set forth in § 15.209.

(7) The provisions of §15.205 apply to intentional radiators operating under this section.

### **2.7.3 Test Methodology**

Section II (G) Unwanted Emission Measurement of KDB789033 D02 General UNII Test Procedures New Rules v01r01

### **2.7.4 Equipment Under Test and Modification State**

Serial No: 296546000509 (NU) and 297546000285 (CU) / Test Configuration C only, A and B were used for original filing. Please refer to SD72112724-0116F FCC Part 15.407 Subpart E RSS247 Test Report for serial number/s of units used in test configuration A and B.

### **2.7.5 Date of Test/Initial of test personnel who performed the test**

February 05, 06, 16 and 21, 2016 / XYZ (original filing)  
May 02, 2016 / FSC (radiated emissions verification of LTE B12 variant)



## 2.7.6 Test Equipment Used

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

## 2.7.7 Environmental Conditions

Test performed at TÜV SÜD America Inc. Rancho Bernardo facility

|                     |                 |
|---------------------|-----------------|
| Ambient Temperature | 23.0 - 25.3 °C  |
| Relative Humidity   | 21.5 – 38.8 %   |
| ATM Pressure        | 98.9 – 99.9 kPa |

## 2.7.8 Additional Observations

- This is an antenna-port conducted measurement test plus radiated cabinet emissions measurements.
- Antenna conducted port test results presented here is from SD72112724-0116F FCC Part 15.407 Subpart E RSS247 Test Report.docx (issued by TÜV SÜD America San Diego April 2016). See Section 1.2 for more details.
- Low, Middle and High channels were verified. Only Middle Channel test plots presented as the representative configuration.
- Sweep time is set to auto.
- The path loss was measured and entered as a level offset.
- The field strength limit of 15.209 is first converted to dBm (EIRP) using the formula under Section G(2)(d) of KDB789033 D02 General UNII Test Procedures New Rules v01r01. Prescans were performed against this limit. If Peak complies with the limit, no Average evaluation will be performed.
- Any emissions that is not in the restricted band will be evaluated to -27dBm/MHz (UNII 1, 2A, 2C) and -17dBm/MHz (UNII 3) limit. -27dBm limit line was set as the worst case.
- Radiated measurement was done using EMC32 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 2.7.9 for sample computation.

## 2.7.9 Sample Computation (Radiated Emission)

|                                                       |                            |       |       |
|-------------------------------------------------------|----------------------------|-------|-------|
| Measuring equipment raw measurement (dbμV) @ 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# 1002 (antenna)      | 17.2  |       |
| Reported QuasiPeak Final Measurement (dbμV/m) @ 30MHz |                            |       | 11.8  |

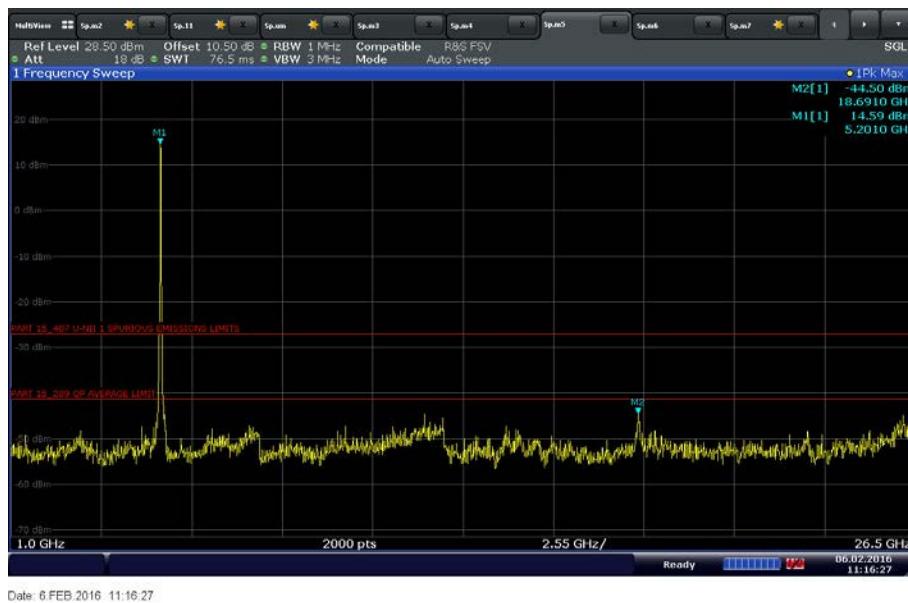
## 2.7.10 Test Results

See attached plots.

## 2.7.11 Test Plots



UNII 1 30MHz Bandwidth Middle Channel 5220 MHz Below 1GHz

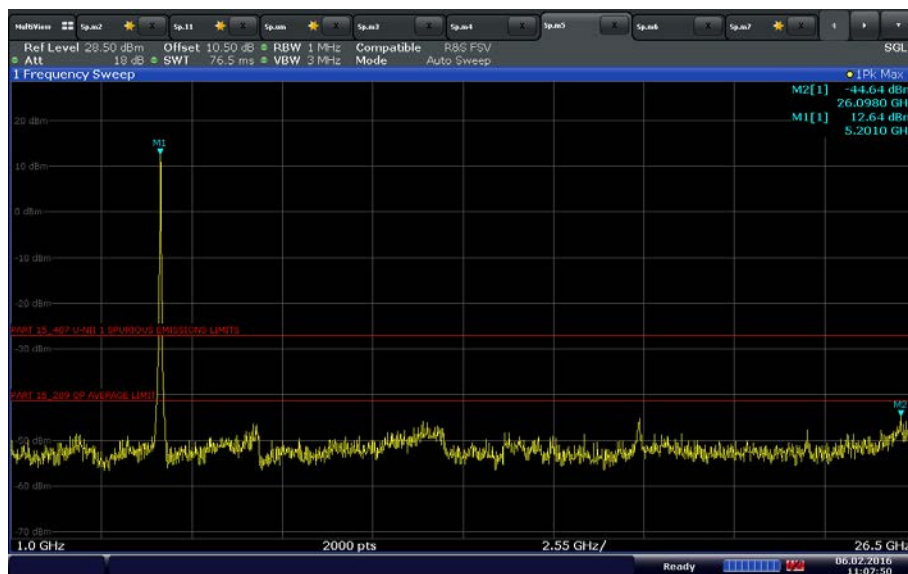


UNII 1 30MHz Bandwidth Middle Channel 5220 MHz Above 1GHz



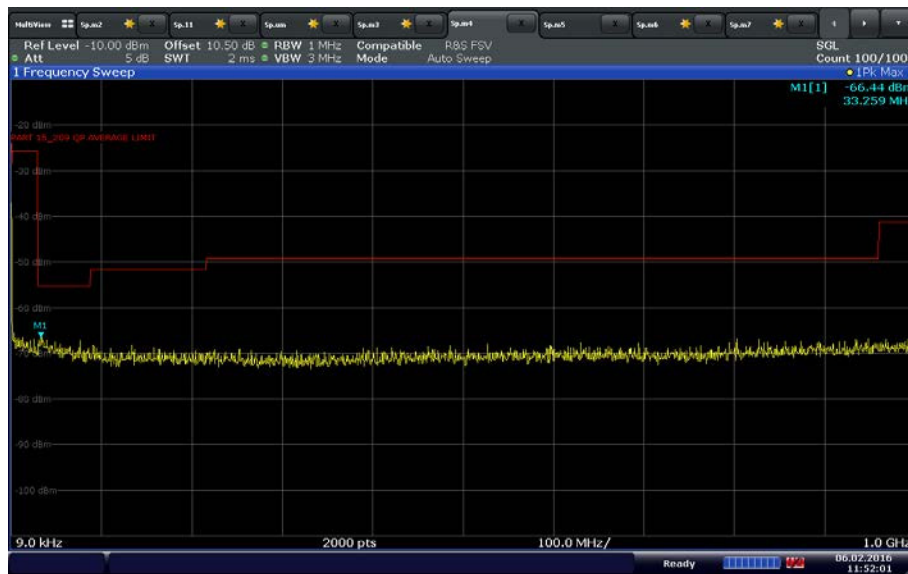
Date: 6 FEB 2016 11:06:38

#### UNII 1 40MHz Bandwidth Mid Channel 5220 MHz Below 1GHz



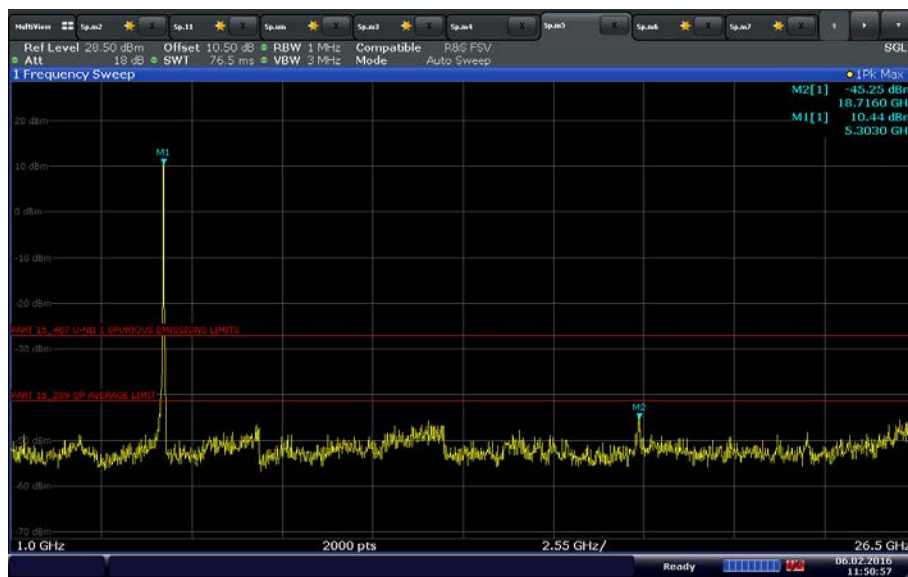
Date: 6 FEB 2016 11:07:50

#### UNII 1 40MHz Bandwidth Mid Channel 5220 MHz Above 1GHz



Date: 6 FEB 2016 11:52:02

#### UNII 2A 30MHz Bandwidth Middle Channel 5300 MHz Below 1GHz



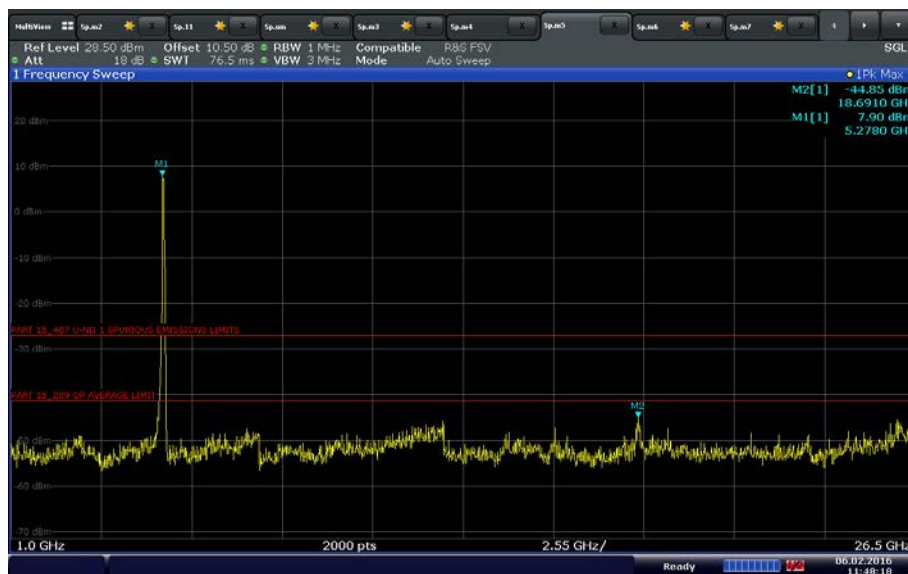
Date: 6 FEB 2016 11:50:58

#### UNII 2A 30MHz Bandwidth Middle Channel 5300 MHz Above 1GHz



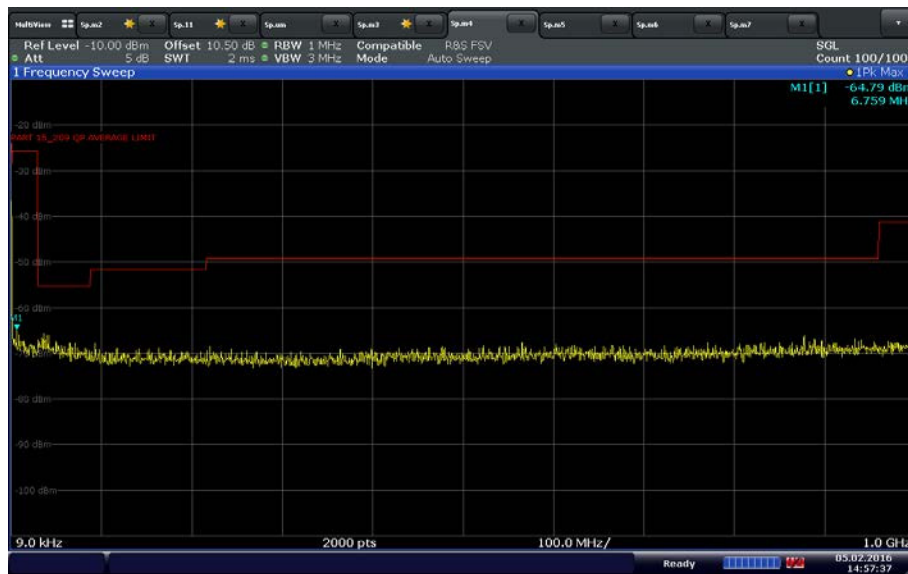
Date: 6.FEB.2016 11:49:10

#### UNII 2A 40MHz Bandwidth Middle Channel 5300 MHz Below 1GHz



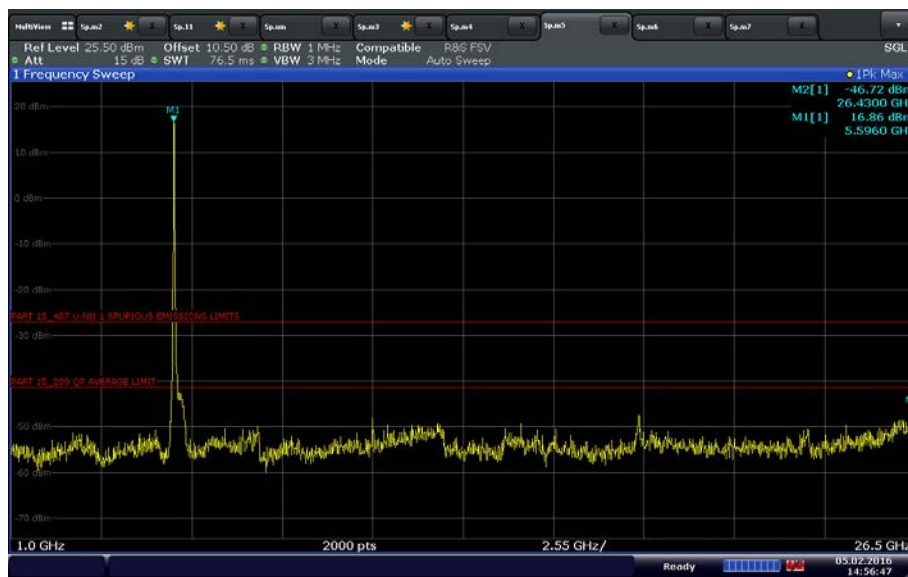
Date: 6.FEB.2016 11:48:18

#### UNII 2A 40MHz Bandwidth Middle Channel 5300 MHz Above 1GHz



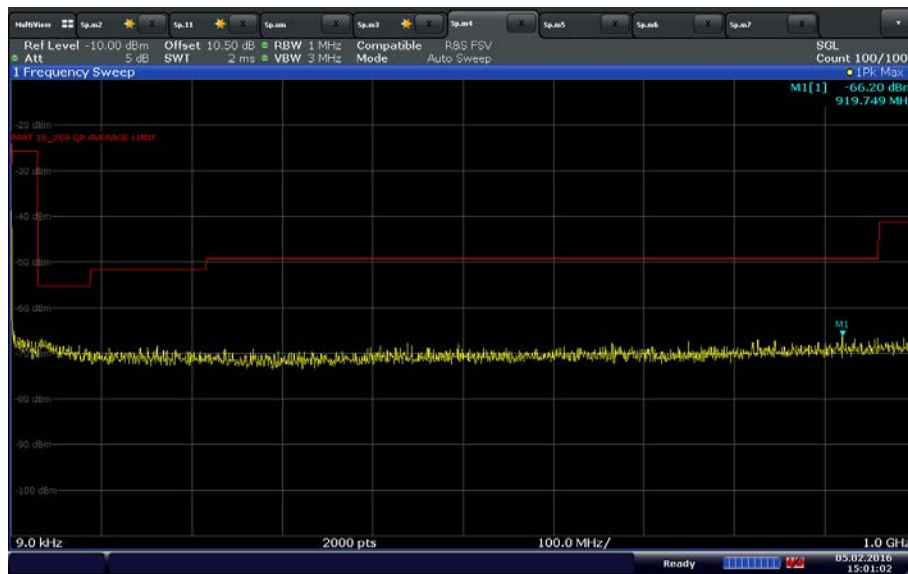
Date: 5 FEB 2016 14:57:37

#### UNII 2C 30MHz Bandwidth Middle Channel 5600 MHz Below 1GHz



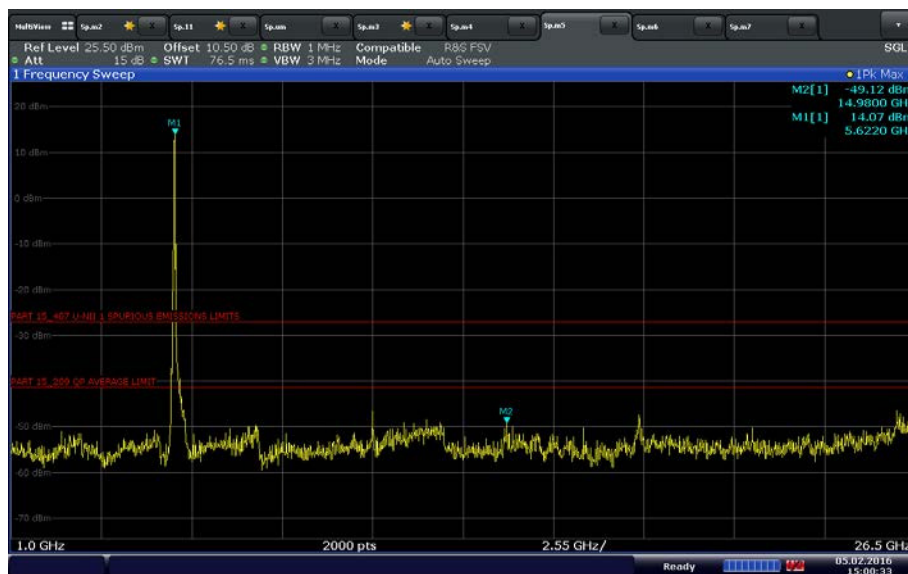
Date: 5 FEB 2016 14:56:47

#### UNII 2C 30MHz Bandwidth Middle Channel 5600 MHz Above 1GHz



Date: 5 FEB 2016 15:01:02

#### UNII 2C 40MHz Bandwidth Middle Channel 5600 MHz Below 1GHz



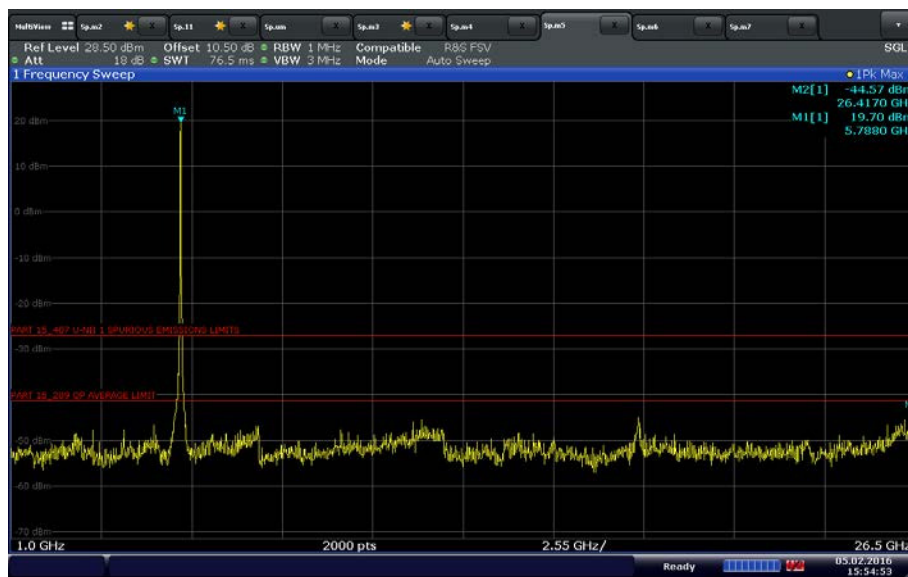
Date: 5 FEB 2016 15:00:33

#### UNII 2C 40MHz Bandwidth Middle Channel 5600 MHz Above 1GHz



Date: 5 FEB 2016 15:56:07

#### UNII 3 30MHz Bandwidth Middle Channel 5785 MHz Below 1GHz



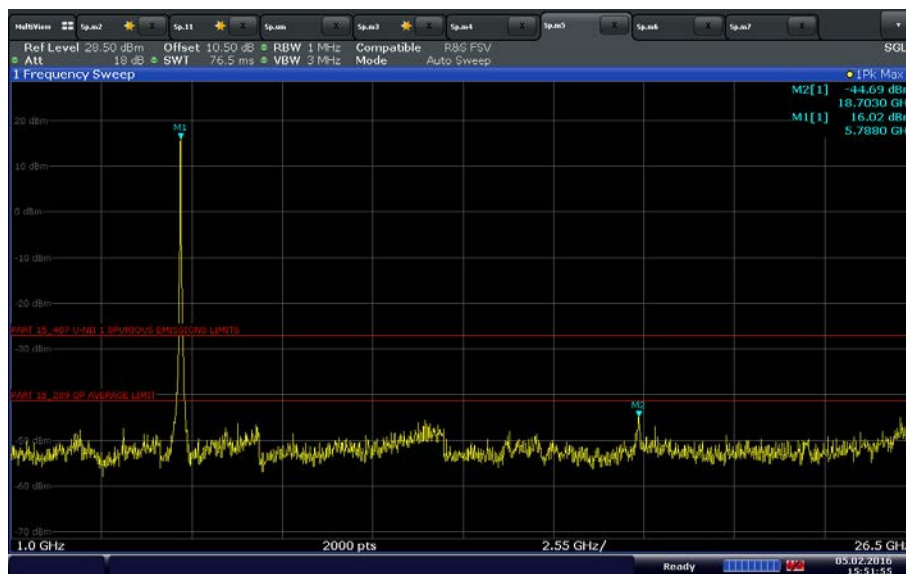
Date: 5 FEB 2016 15:54:54

#### UNII 3 30MHz Bandwidth Middle Channel 5785 MHz Above 1GHz



Date: 5 FEB 2016 15:52:48

### UNII 3 40MHz Bandwidth Middle Channel 5785 MHz Below 1GHz

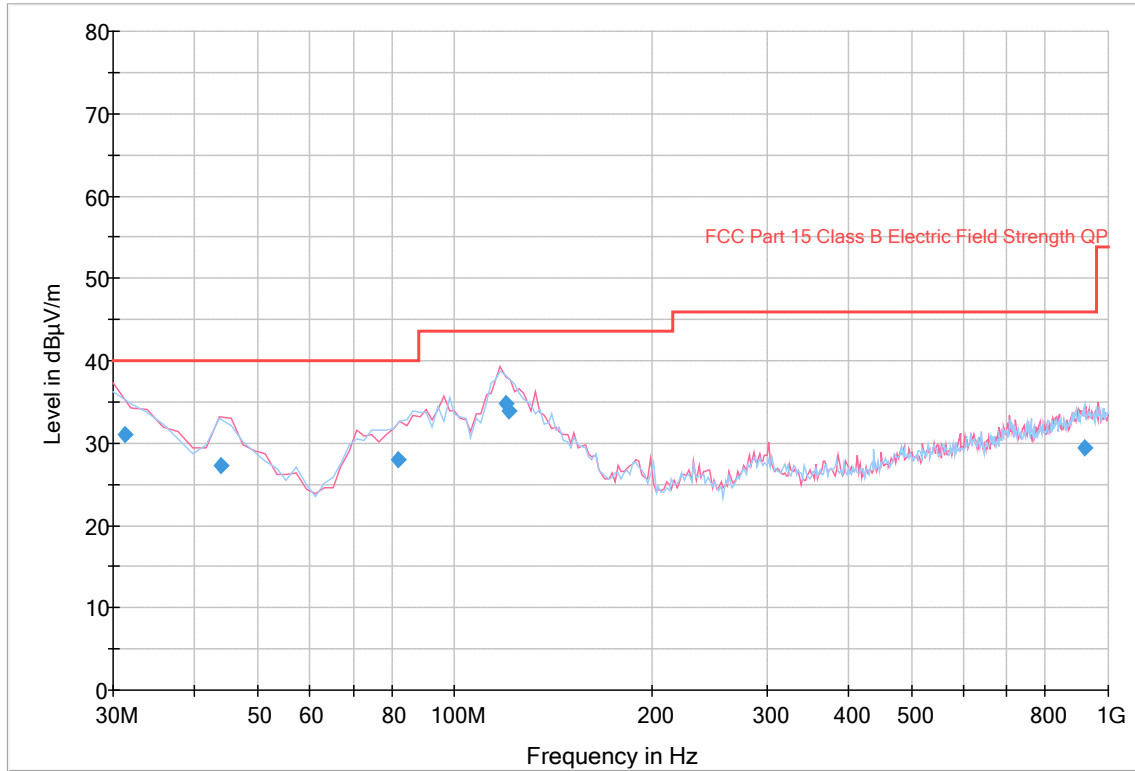


Date: 5 FEB 2016 15:51:55

### UNII 3 40MHz Bandwidth Middle Channel 5785 MHz Below 1GHz

## 2.7.12 Test Results Below 1GHz (Representative Cabinet Spurious Emissions)

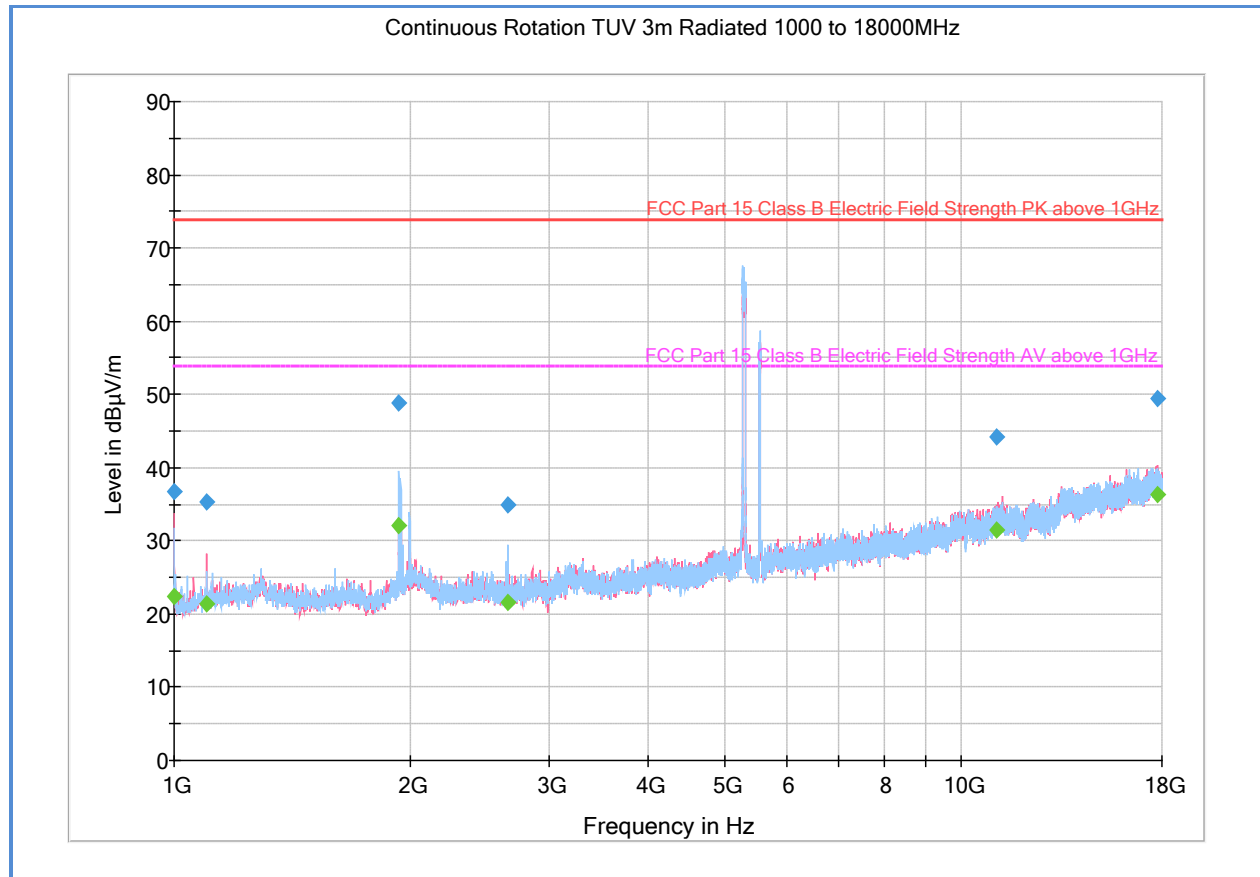
Continuous Rotation TUV 3m Radiated 30 to 1000MHz



### 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) |
|-----------------|--------------------|-----------------|-----------------|-------------|--------------|---------------|------------|-------------|----------------|
| 31.320000       | 31.0               | 1000.0          | 120.000         | 115.0       | V            | 18.0          | -6.6       | 9.0         | 40.0           |
| 43.967214       | 27.3               | 1000.0          | 120.000         | 100.0       | V            | 298.0         | -12.6      | 12.7        | 40.0           |
| 82.028858       | 27.9               | 1000.0          | 120.000         | 100.0       | H            | 138.0         | -16.3      | 12.1        | 40.0           |
| 119.594950      | 34.8               | 1000.0          | 120.000         | 100.0       | V            | 87.0          | -15.2      | 8.7         | 43.5           |
| 120.986613      | 34.0               | 1000.0          | 120.000         | 110.0       | H            | 3.0           | -15.3      | 9.5         | 43.5           |
| 920.996713      | 29.5               | 1000.0          | 120.000         | 265.0       | H            | 308.0         | 6.4        | 16.5        | 46.0           |

## 2.7.13 Test Results Above 1GHz (Representative Cabinet Spurious Emissions)



### Peak Data

| Frequency (MHz) | MaxPeak (dBμV/m) | Meas. Time (ms) | Bandwidth (kHz) | Height (cm) | Polarization | Azimuth (deg) | Corr. (dB) | Margin (dB) | Limit (dBμV/m) |
|-----------------|------------------|-----------------|-----------------|-------------|--------------|---------------|------------|-------------|----------------|
| 1000.500000     | 36.7             | 1000.0          | 1000.000        | 204.3       | V            | 236.0         | -11.2      | 37.2        | 73.9           |
| 1099.133333     | 35.4             | 1000.0          | 1000.000        | 196.5       | V            | 23.0          | -10.4      | 38.5        | 73.9           |
| 1931.966667     | 48.8             | 1000.0          | 1000.000        | 268.3       | H            | 23.0          | -6.5       | 25.1        | 73.9           |
| 2653.200000     | 35.0             | 1000.0          | 1000.000        | 397.6       | H            | 117.0         | -6.5       | 38.9        | 73.9           |
| 11087.83333     | 44.3             | 1000.0          | 1000.000        | 397.6       | V            | 289.0         | 9.4        | 29.6        | 73.9           |
| 17783.76666     | 49.4             | 1000.0          | 1000.000        | 99.7        | V            | 0.0           | 16.6       | 24.5        | 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) |
|-----------------|------------------|-----------------|-----------------|-------------|--------------|---------------|------------|-------------|----------------|
| 1000.500000     | 22.5             | 1000.0          | 1000.000        | 204.3       | V            | 236.0         | -11.2      | 31.4        | 53.9           |
| 1099.133333     | 21.4             | 1000.0          | 1000.000        | 196.5       | V            | 23.0          | -10.4      | 32.5        | 53.9           |
| 1931.966667     | 32.1             | 1000.0          | 1000.000        | 268.3       | H            | 23.0          | -6.5       | 21.8        | 53.9           |
| 2653.200000     | 21.6             | 1000.0          | 1000.000        | 397.6       | H            | 117.0         | -6.5       | 32.3        | 53.9           |
| 11087.83333     | 31.5             | 1000.0          | 1000.000        | 397.6       | V            | 289.0         | 9.4        | 22.4        | 53.9           |
| 17783.76666     | 36.4             | 1000.0          | 1000.000        | 99.7        | V            | 0.0           | 16.6       | 17.5        | 53.9           |

**Test Notes:** No significant emissions observed above 18GHz. Only the worst case configuration presented.



## **2.8 BAND-EDGE MEASUREMENTS**

### **2.8.1 Specification Reference**

FCC 47 CFR Part 15, Clause 15.407(b)  
RSS-247, Clause 6.2.4(2)

### **2.8.2 Standard Applicable**

(1) For transmitters operating in the 5.15-5.25 GHz band: All emissions outside of the 5.15-5.35 GHz band shall not exceed an e.i.r.p. of -27 dBm/MHz.

(2) For transmitters operating in the 5.25-5.35 GHz band: All emissions outside of the 5.15-5.35 GHz band shall not exceed an e.i.r.p. of -27 dBm/MHz.

(3) For transmitters operating in the 5.47-5.725 GHz band: All emissions outside of the 5.47-5.725 GHz band shall not exceed an e.i.r.p. of -27 dBm/MHz.

(4) For transmitters operating in the 5.725-5.85 GHz band: All emissions within the frequency range from the band edge to 10 MHz above or below the band edge shall not exceed an e.i.r.p. of -17 dBm/MHz; for frequencies 10 MHz or greater above or below the band edge, emissions shall not exceed an e.i.r.p. of -27 dBm/MHz.

(7) The provisions of §15.205 apply to intentional radiators operating under this section.

### **2.8.3 Test Methodology**

Section II (G)(3)(d)(ii) Band Edge Measurement of KDB789033 D02 General UNII Test Procedures New Rules v01r01

### **2.8.4 Equipment Under Test and Modification State**

Please refer to SD72112724-0116F FCC Part 15.407 Subpart E RSS247 Test Report for serial number/s and test configuration used.

### **2.8.5 Date of Test/Initial of test personnel who performed the test**

February 26 and March 18, 2016 / XYZ

### **2.8.6 Test Equipment Used**

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

### **2.8.7 Environmental Conditions**

Test performed at TÜV SÜD America Inc. Rancho Bernardo facility



Ambient Temperature 23.0 - 25.7°C  
 Relative Humidity 21.5 - 47.0%  
 ATM Pressure 98.9 - 100kPa

## 2.8.8 Additional Observations

- Test results presented here is from SD72112724-0116F FCC Part 15.407 Subpart E RSS247 Test Report.docx (issued by TÜV SÜD America San Diego April 2016). See Section 1.2 for more details.
- This is a conducted test using Integration Method as per Section II (G)(3)(d)(ii) Band Edge Measurement of KDB789033 D02 General UNII Test Procedures New Rules v01r01.
- RBW=100 kHz
- VBW=300 kHz
- Sweep time=Auto
- Trace Mode=max hold
- Detector is Peak for Peak measurements and RMS for Average measurements.
- Sweep time is set to auto.
- The path loss was measured and entered as a level offset.
- Integration performed across 1MHz bandwidth.

## 2.8.9 Test Results



### UNII 1 30MHz Lower Band Edge 5150MHz (Peak Measurement) @5190MHz

#### Lower band edge calculation:

- 5150 MHz (in the restricted band)
- Limit is -27dBm EIRP
- Use the following formula as per Section Section G(2)d)(III) of KDB789033 D02 General UNII Test

- Procedures New Rules v01r01:  
 $E(\text{dB}\mu\text{V/m}) = \text{EIRP (dBm)} + 95.2$   
 $= (-33.77 \text{ dBm} + 1 \text{ dBi antenna gain}) + 95.2$   
 $= 62.43 \text{ dB}\mu\text{V/m @ 3 meters (Complies with 74 dB}\mu\text{V/m limit)}$



#### UNII 1 30MHz Lower Band Edge 5150MHz (Average Measurement) @5190MHz

#### Lower band edge calculation:

- 5150 MHz (in the restricted band)
- Use the following formula as per Section Section G(2)d)(III) of KDB789033 D02 General UNII Test Procedures New Rules v01r01:  
 $E(\text{dB}\mu\text{V/m}) = \text{EIRP (dBm)} + 95.2$   
 $= (-44.22 \text{ dBm} + 1 \text{ dBi antenna gain}) + 95.2$   
 $= 51.98 \text{ dB}\mu\text{V/m @ 3 meters (Complies with 54 dB}\mu\text{V/m limit)}$



#### UNII 1 40MHz Lower Band Edge 5150MHz (Peak Measurement) @5190MHz

#### Lower band edge calculation:

- 5150 MHz (in the restricted band)
- Limit is -27dBm EIRP
- Use the following formula as per Section Section G(2)d)(III) of KDB789033 D02 General UNII Test Procedures New Rules v01r01:
 
$$\begin{aligned}
 E(\text{dB}\mu\text{V}/\text{m}) &= \text{EIRP (dBm)} + 95.2 \\
 &= (-33.21 \text{ dBm} + 1 \text{ dBi antenna gain}) + 95.2 \\
 &= 62.99 \text{ dB}\mu\text{V}/\text{m} @ 3 \text{ meters (Complies with } 74 \text{ dB}\mu\text{V}/\text{m limit)}
 \end{aligned}$$



#### UNII 1 40MHz Lower Band Edge 5150MHz (Average Measurement) @5190MHz

#### Lower band edge calculation:

- 5150 MHz (in the restricted band)
- Use the following formula as per Section G(2)d)(III) of KDB789033 D02 General UNII Test Procedures New Rules v01r01:
 
$$\begin{aligned}
 E(\text{dB}\mu\text{V/m}) &= \text{EIRP (dBm)} + 95.2 \\
 &= (-45.67 \text{ dBm} + 1 \text{ dBi antenna gain}) + 95.2 \\
 &= 50.53 \text{ dB}\mu\text{V/m @ 3 meters (Complies with 54 dB}\mu\text{V/m limit)}
 \end{aligned}$$



#### UNII 2A 30MHz Upper Band Edge 5350MHz (Peak Measurement) @ 5310 MHz

#### Upper band edge calculation (5350 MHz):

- 5350 MHz (in the restricted bands)
- Limit is -27dBm EIRP
- Use the following formula as per Section Section G(2)(D)(III) of KDB789033 D02 General UNII Test Procedures New Rules v01r01:
 
$$\begin{aligned}
 E(\text{dB}\mu\text{V}/\text{m}) &= \text{EIRP (dBm)} + 95.2 \\
 &= (-33.32 \text{ dBm} + 1 \text{ dBi antenna gain}) + 95.2 \\
 &= 62.88 \text{ dB}\mu\text{V}/\text{m} @ 3 \text{ meters (Complies with } 74 \text{ dB}\mu\text{V}/\text{m limit)}
 \end{aligned}$$



#### UNII 2A 30MHz Upper Band Edge 5350MHz (Average Measurement) @ 5310 MHz

#### Upper band edge calculation (5350 MHz):

- 5350 MHz (in the restricted bands)
- Limit is -27dBm EIRP
- Use the following formula as per Section Section G(2)(D)(III) of KDB789033 D02 General UNII Test Procedures New Rules v01r01:
 
$$\begin{aligned}
 E(\text{dB}\mu\text{V}/\text{m}) &= \text{EIRP (dBm)} + 95.2 \\
 &= (-43.35 \text{ dBm} + 1 \text{ dBi antenna gain}) + 95.2 \\
 &= 52.85 \text{ dB}\mu\text{V}/\text{m} @ 3 \text{ meters (Complies with } 54 \text{ dB}\mu\text{V}/\text{m limit)}
 \end{aligned}$$



#### UNII 2A 40MHz Upper Band Edge 5350MHz (Peak Measurement) @ 5310 MHz

#### Upper band edge calculation (5350 MHz):

- 5350 MHz (in the restricted bands)
- Limit is -27dBm EIRP
- Use the following formula as per Section Section G(2)(D)(III) of KDB789033 D02 General UNII Test Procedures New Rules v01r01:
 
$$\begin{aligned}
 E(\text{dB}\mu\text{V}/\text{m}) &= \text{EIRP (dBm)} + 95.2 \\
 &= (-31.16 \text{ dBm} + 1 \text{ dBi antenna gain}) + 95.2 \\
 &= 65.04 \text{ dB}\mu\text{V}/\text{m} @ 3 \text{ meters (Complies with } 74 \text{ dB}\mu\text{V}/\text{m limit)}
 \end{aligned}$$



**UNII 2A 40MHz Upper Band Edge 5350MHz (Average Measurement) @ 5310 MHz**

#### Upper band edge calculation (5350 MHz):

- 5350 MHz (in the restricted bands)
- Limit is -27dBm EIRP
- Use the following formula as per Section Section G(2)(D)(III) of KDB789033 D02 General UNII Test Procedures New Rules v01r01:
 
$$\begin{aligned}
 E(\text{dB}\mu\text{V}/\text{m}) &= \text{EIRP (dBm)} + 95.2 \\
 &= (-42.6 \text{ dBm} + 1 \text{ dBi antenna gain}) + 95.2 \\
 &= 53.6 \text{ dB}\mu\text{V}/\text{m} @ 3 \text{ meters (Complies with } 54 \text{ dB}\mu\text{V}/\text{m limit)}
 \end{aligned}$$



#### UNII 2C 30MHz Lower Band Edge 5470MHz (Peak Measurement) @ 5525 MHz

##### Lower band edge calculation:

- 5470 MHz (not in the restricted bands)
- Limit is -27dBm EIRP
- Calculation @ 5470 MHz:
 

|                                           |                                |
|-------------------------------------------|--------------------------------|
| Integrated average measurement @ 5525 MHz | = -42.74 dBm                   |
| EIRP @ 5525 MHz                           | = -42.7 + 0 dBi (antenna gain) |
|                                           | = -42.7 dBm                    |
| Margin of compliance                      | = -15.7dB (compliant)          |



#### UNII 2C 40MHz Lower Band Edge 5470MHz (Peak Measurement) @ 5525MHz

##### Lower band edge calculation:

- 5470 MHz (not in the restricted bands)
- Limit is -27dBm EIRP
- Calculation @ 5470 MHz:
 

|                                           |                                 |
|-------------------------------------------|---------------------------------|
| Integrated average measurement @ 5725 MHz | = -41.94 dBm                    |
| EIRP @ 5725 MHz                           | = -41.94 + 0 dBi (antenna gain) |
|                                           | = -41.94 dBm                    |
| Margin of compliance                      | = -14.94dB (compliant)          |



### UNII 3 30MHz Upper Band Edge 5850MHz (Peak Measurement) @ 5825 MHz

#### Lower band edge calculation:

- 5850 MHz (not in the restricted bands)
- Limit is -17dBm EIRP
- Calculation @ 5850 MHz:
 

|                                           |                                 |
|-------------------------------------------|---------------------------------|
| Integrated average measurement @ 5850 MHz | = -21.57 dBm                    |
| EIRP @ 5850 MHz                           | = -21.57 + 0 dBi (antenna gain) |
|                                           | = -21.57 dBm                    |
| Margin of compliance                      | = -4.57 dB (Compliant)          |



### UNII 3 40MHz Upper Band Edge 5850MHz (Peak Measurement) @ 5825 MHz

#### Lower band edge calculation:

- 5850 MHz (not in the restricted bands)
- Limit is -17dBm EIRP
- Calculation @ 5850 MHz:
 

|                                           |                                 |
|-------------------------------------------|---------------------------------|
| Integrated average measurement @ 5850 MHz | = -22.83 dBm                    |
| EIRP @ 5850 MHz                           | = -22.83 + 0 dBi (antenna gain) |
|                                           | = -22.83 dBm                    |
| Margin of compliance                      | = -5.83 dB (Compliant)          |



### **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 Port Setup     |                                            |                     |               |                            |                           |              |
| 7582                     | Signal/Spectrum Analyzer                   | FSW26               | 101614        | Rhode & Schwarz            | 10/05/15                  | 10/05/16     |
| 7608                     | Vector Signal Generator                    | SMBV100A            | 259021        | Rhode & Schwarz            | 07/29/15                  | 07/29/16     |
| 7569                     | Series Power Meter                         | N1911A P-           | MY45100625    | Agilent                    | 06/19/15                  | 06/19/16     |
| 7605                     | 50MHz-18GHz Wideband Power Sensor          | N1921A              | MY51100054    | Agilent                    | 04/10/15                  | 04/10/16     |
| 8772                     | 10dB Attenuator                            | 606-06-1F4/DR       | -             | MECA                       | Verified by 7608 and 7569 |              |
| -                        | Step Attenuator (110dB)                    | 8496B               | MY42143874    | Agilent                    | N/A                       |              |
| -                        | Step Attenuator (11dB)                     | 8494B               | 2812A17193    | Agilent                    | N/A                       |              |
| Radiated Test Setup      |                                            |                     |               |                            |                           |              |
| 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     |
| 1051                     | Double-ridged waveguide horn antenna       | 3115                | 9408-4329     | EMCO                       | 03/21/16                  | 03/21/17     |
| 1049                     | EMI Test Receiver                          | ESU                 | 100133        | Rhode & Schwarz            | 03/17/16                  | 03/17/17     |
| 8628                     | Pre-amplifier                              | QLJ 01182835-JO     | 8986002       | QuinStar Technologies Inc. | 01/11/16                  | 01/11/17     |
| Conducted Emissions      |                                            |                     |               |                            |                           |              |
| 1024                     | EMI Test Receiver                          | ESCS 30             | 847793/001    | Rhode & Schwarz            | 04/10/15                  | 04/10/16     |
| 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            | 02/20/15                  | 02/20/16     |
| 8824                     | 20dB Attenuator                            | 34-20-34            | N/A           | MCE / Weinschel            | 02/20/15                  | 02/20/16     |
| Miscellaneous            |                                            |                     |               |                            |                           |              |
|                          | Test Software                              | EMC32               | V8.53         | Rhode & Schwarz            | N/A                       |              |
| 1072                     | DC Power Supply                            | E3610A              | KR51311519    | Hewlett Packard            | Verified by 6752          |              |
| 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     |

### 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         |

### 3.2.4 Conducted Antenna Port Measurement

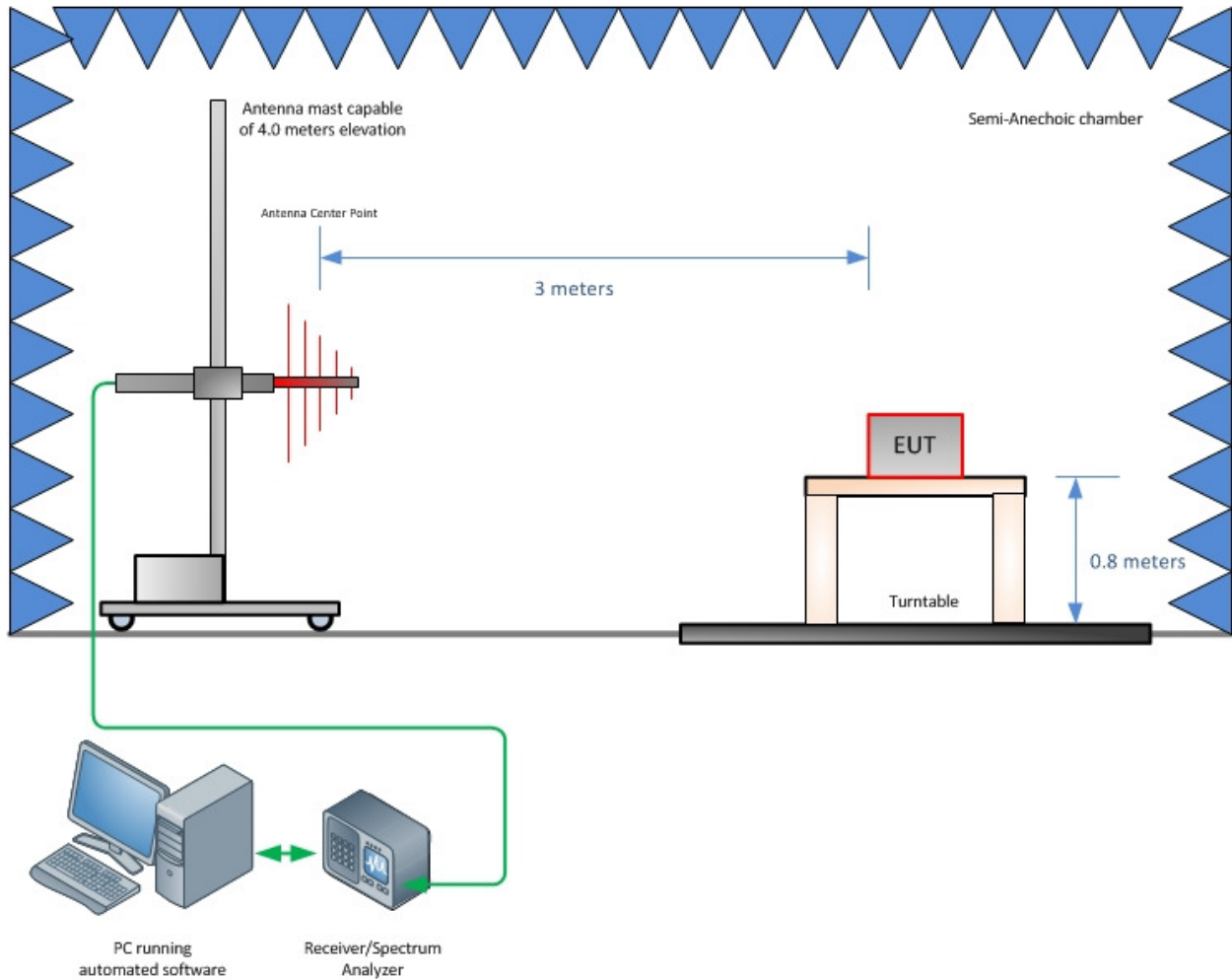
| Contribution                    |                            | Probability Distribution Type | Probability Distribution $x_i$ | Standard Uncertainty $u(x_i)$ | $[u(x_i)]^2$ |
|---------------------------------|----------------------------|-------------------------------|--------------------------------|-------------------------------|--------------|
| 1                               | Receiver/Spectrum Analyzer | Rectangular                   | 0.57                           | 0.33                          | 0.11         |
| 2                               | Cables                     | Rectangular                   | 0.50                           | 0.29                          | 0.08         |
| 3                               | EUT Setup                  | Rectangular                   | 1.00                           | 0.58                          | 0.33         |
| Combined Uncertainty ( $u_c$ ): |                            |                               |                                |                               | 0.72         |
| Coverage Factor (k):            |                            |                               |                                |                               | 2            |
| Expanded Uncertainty:           |                            |                               |                                |                               | 1.45         |



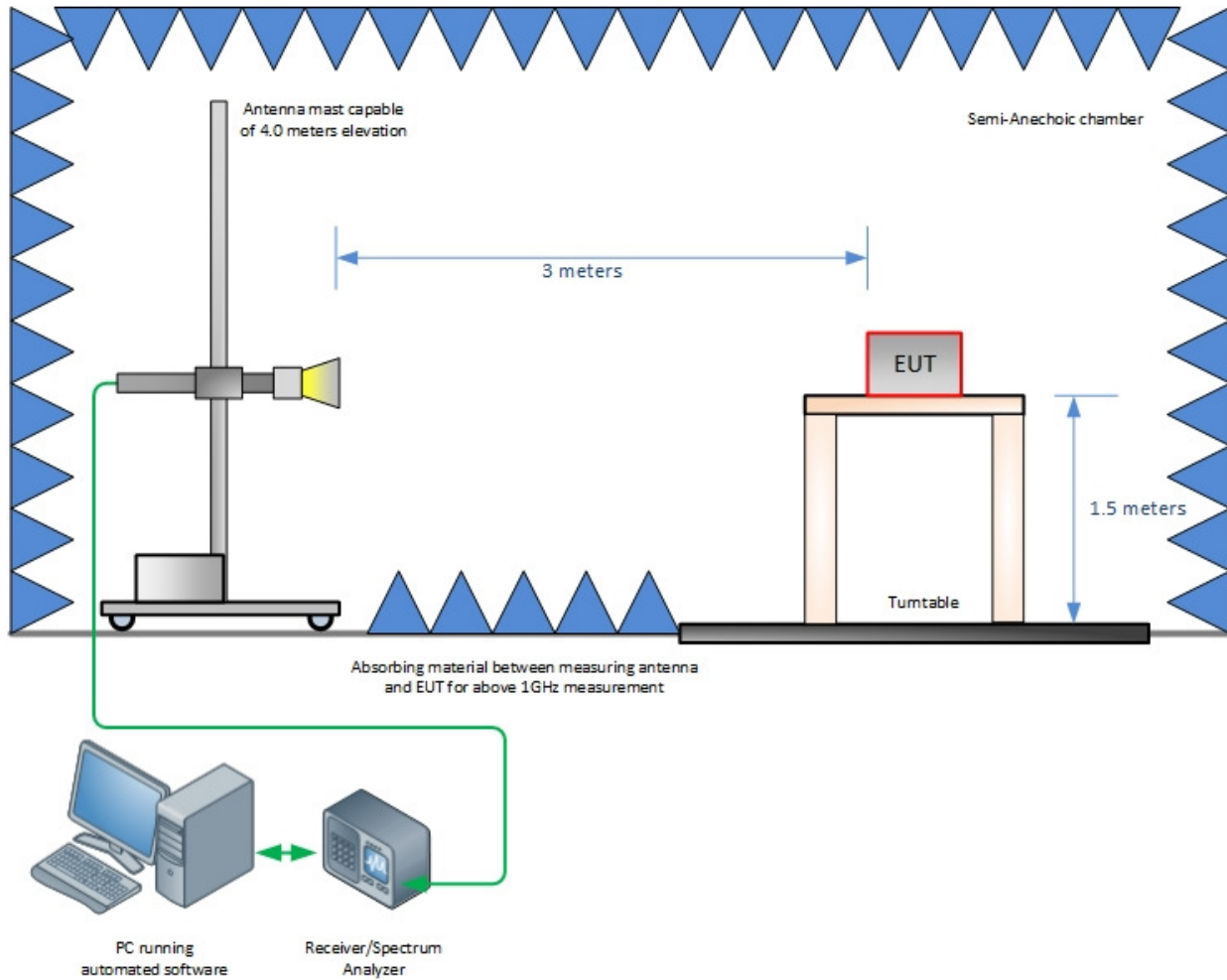
## **SECTION 4**

### **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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