# COMPLIANCE WORLDWIDE INC.
# TEST REPORT 491-16R5

**In Accordance with the Requirements of**

## FCC PART 27:2015 Subpart C
## FCC PART 20:2015
## 746-757 MHz & 776-787 MHz
## IC RSS-130, Issue 1
## 746-756 MHz & 777-787 MHz

**Issued to**

## Westell Technologies, Inc.
## 670 N. Commercial Street
## Manchester, NH 03101

**for**

## DSP85 Series Digital Repeater
## DSP85-U7C
## Representing Model DSP85-L7/U7C

**FCC ID: NVRDSP85-L7U7C**
**IC: 4307A-DSP85L7U7C**

**Original Report Issued on October 31, 2016**
**R5 Issued March 9, 2017**

**Tested by**

**Larry K. Stillings**

**Reviewed By**

**Brian F. Breault**

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## 1. Scope

This test report certifies that the Westell DSP85-L7/U7C, as tested, meets the FCC Part 27 Subpart C and IC RSS-130, Issue 1 requirements. The scope of this test report is limited to the test sample provided by the client, only in as much as that sample represents other production units. If any significant changes are made to the unit, the changes shall be evaluated and a retest may be required. R1 & R2 issued to update FCC and IC numbers on cover Revision R3 updates the references in section 4.3 to ANSI/TIA-603-D 2010 and ANSI C63.26 2015, and replaces the radiated data in section 6.4 with Substitution Measurement data. Revision R4 adds the DC power input information to Section 2.8 on this page and updates the FCC ID and IC Certification numbers and model numbers for the new filing.

## 2. Product Details

**2.1. Manufacturer:** Westell Technologies, Inc.

**2.2. Model Numbers:** DSP85-U7C tested also represents Model DSP85-L7/U7C

**2.3. Serial Number:** C6ZZ00002

**2.4. Description:** An in-building digital repeater is utilized to propagate over-the-air radio frequency signals from a local cell tower into buildings via a fiber or coax distributed antenna system (DAS). Once installed, a digital repeater provides the signal power necessary for wireless devices in the building to operate seamlessly.

**2.5. Power Source:** 120 VAC, 60 Hz via APX Technologies AS4528R

**2.6. Software Version:** 03.00.09 REL

**2.7. EMC Modifications:** None

**2.8. DC voltages and currents of final transmitter stage**

| | |
|---|---|
| Frequency Range | 746 – 757 MHz / 776 – 787 MHz |
| DC Input Voltage Range | +28 VDC, + 5 VDC (On-Off) |
| DC Current | 130 mA @ 1 Watt |



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# 3. Product Configuration

## 3.1. Support Equipment

| Device | Manufacturer | Model | Serial No. | Comment |
|---|---|---|---|---|
| RF Signal Generator | R & S | SMIQ06B | 10090 | Generating W-CDMA Signals |
| IQ Modulation Generator | R & S | AMIQ04 | 100540 | Generating AWS Signals |
| Power Supply | APX Technologies | AS4528R | 101710062 | |
| Notebook PC | Dell | Latitude C400 | 9760689253 | Configuring Unit |

## 3.2. Cables

| Cable Type | Length | Shield | From | To |
|---|---|---|---|---|
| RF, 50 Ω, N male – N male | 1M | Yes | DUT | Signal Generator |
| RF, 50 Ω, N male – N male | 1M | Yes | DUT | 50 Ω Load |
| Power Supply | 2M + 2M | Yes | DUT | 120 VAC, 60 Hz |
| Serial | 2M | Yes | DUT | Notebook PC |
| USB | 2M | Yes | DUT | Notebook PC |
| Ethernet | 2M | No | DUT | Notebook PC |

Notebook PC is connected only during setup

## 3.3. Operational Characteristics & Software

| Emission Designator | Modulation | Occupied Bandwidth | Channel Bandwidth |
|---|---|---|---|
| 4M18F9W | AWGN | 4.1 MHz | 5 MHz |



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# 3. Product Configuration (continued)

## 3.3. Operational Characteristics & Software

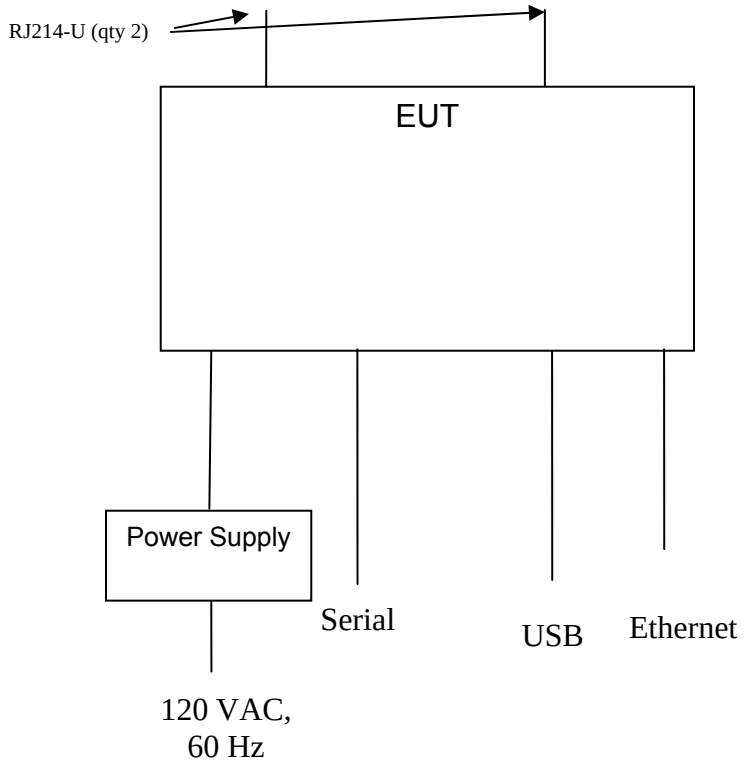
(1) The unit was allowed to power up normally and go through its configuration cycle.

(2) Using an RF Signal Generator on the Input and a Spectrum Analyzer on the output Downlink or Uplink frequencies a signal was generated over the intended bandwidth of operation.

(3) The signal generator was configured to provide AWS / LTE 4.1 MHz AWGN digital modulation to the input of the amplifier across the Cell bands to be used by the product.

(4) The units internal AGC threshold was determined by applying an input signal until a 1 dB increase in input signal did not cause a 1 dB in output signal for each of the Uplink and Downlink frequencies.

## 3.4. Block Diagram



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# 4. Measurements Parameters

## 4.1. Measurement Equipment Used to Perform Test

| Device | Manufacturer | Model No. | Serial No. | Cal Due | Interval |
|---|---|---|---|---|---|
| EMI Test Receiver, 9kHz - 7GHz [1] | Rohde & Schwarz | ESR7 | 101156 | 7/23/2017 | 2 Years |
| Spectrum Analyzer 20 Hz – 40 GHz [2] | Rohde & Schwarz | FSV40 | 100899 | 7/23/2017 | 2 Years |
| Spectrum Analyzer, 9 kHz to 40 GHz [3] | Rohde & Schwarz | FSVR40 | 100909 | 7/23/2017 | 2 Years |
| EMI Receiver, 9 kHz to 6.5 GHz | Hewlett Packard | 8546A | 3650A00360 | 6/4/2017 | 3 Years |
| Combilog Antenna, 30 MHz to 2 GHz | Com-Power | AC-220 | 25509 | 5/12/2018 | 2 Years |
| Horn Antenna 1 to 18 GHz | ETS-Lindgren | 3117 | 00143292 | 2/22/2019 | 3 Years |
| Preamplifier, 1 GHz to 26.5 GHz | Hewlett Packard | 8449B | 3008A01323 | 7/21/2017 | 2 Years |
| Digital Barometer | Control Company | 4195 | ID236 | 10/8/2017 | 2 Years |

[1] ESR7 Firmware revision: V2.28,SP1 Date installed: 9/2/2016 Previous V2.26, installed 8/15/2014.
[2] FSV40 Firmware revision: V2.30 SP4, Date installed: 5/4/2016 Previous V2.30 SP1, installed 10/22/2014.
[3] FSVR40 Firmware revision: V2.23, Date installed: 10/20/2014 Previous V1.63 SP1, installed 8/28/2013.
[4] FSW26 Firmware revision: V2.50, Date installed: 9/12/2016 Previous V2.40, installed 5/4/2016.

## 4.2. Measurement & Equipment Setup

| | |
|---|---|
| Test Dates: | 7/27/2016, 7/28/2016, 10/3/2016, 10/4/2016 |
| Test Engineer: | Larry Stillings |
| Normal Site Temperature (15 – 35°C): | 24 |
| Relative Humidity (20 -75%RH): | 33 |

## 4.3. Test Procedure

The test measurements contained in this report are based on the requirements detailed in FCC Part 27, Subpart C and RSS-130, Issue 1.

The test methods used to generate the data is this test report are in accordance with ANSI C63.26:2015, American National Standard for Compliance Testing of Transmitters Used in Licensed Radio Services, FCC OET KDB 935210 D05 Indus Booster Basic Meas v01r01 dated 2-12-2016, Measurements Guidance for Industrial and Non-Consumer Signal Booster, Repeater and Amplifier Devices and FCC OET KDB 971168 D01 Power Meas License Digital Systems v02r02 dated 10-17-2014.

Measurements were also made in accordance with ANSI/TIA-603-D 2010 Land Mobile FM or PM Communications Equipment Measurement and Performance Standard.



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## 5. Measurement Summary

| Section Description or Test Requirement | FCC Part Reference | IC RSS-130 Reference | Test Report Section | Result | Comment |
|---|---|---|---|---|---|
| Power and Antenna height limits, Output Power | 27.50 (b) (4) | 4.4 SRSP-518 | 6.1 | Compliant | |
| Occupied Bandwidth | Part 2.1049 | 4.2 RSS-GEN 6.6 | 6.2 | Compliant | |
| Spurious Emissions at Antenna Terminals | 27.53 (c) | 4.6 | 6.3 | Compliant | |
| Spurious Emissions at the Antenna Terminals Additional Requirements | 27.53 (f) | 4.6 | 6.3 | Compliant | |
| Field Strength of Spurious Emissions | 27.53 (c) | 4.6 | 6.4 | Compliant | |
| Frequency Stability / Tolerance | 27.54 | 4.3 | 6.5 | N/A | The EUT does not translate the frequency of the input signal |
| Out of Band Rejection | N/A | N/A | 6.6 | Compliant | FCC KDB 935210 |
| Public Exposure to Radio Frequency Energy Levels | Section 1.1307 (b)(1) | RSS-GEN 3.2 RSS-102 | 6.7 | Compliant | |



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# 6. Measurement Data

## 6.1. Power and Antenna Height Limits 27.50 (b) (4), RSS-130 Section 4.4

Requirements: FCC: Fixed and base stations transmitting a signal in the 746-757 MHz, 758-763 MHz, 776-787 MHz and 788-793 MHz bands with an emissions bandwidth greater than 1 MHz must not exceed an ERP of 1000 watts/MHz and an antenna height of 305 m HAAT.

IC: For fixed and base stations transmitting in the C1 and C2 channel blocks within the frequency range 716-756 MHz with a channel bandwidth greater than 1 MHz, the maximum permissible e.i.r.p. is 1640 watts/MHz.

Mobile stations and outdoor fixed subscriber equipment, which transmit in the bands 698-716 MHz and 777-787 MHz, are limited to an e.i.r.p. of 50 Watts.

Test Method: KDB 935210 Section 3.5 & KDB 971168 Section 5.2

### 6.1.1. Mean Transmitter Output Power, Transmitter Only

| Description of Measurement | Center Frequency | Output Power | |
|---|---|---|---|
| | (MHz) | (dBm) | (Watts) |
| Output Power - AWGN | 754 | 29.12 | 0.817 |
| Output Power - AWGN | 779 | 29.25 | 0.841 |
| 3 dB Above AGC - AWGN | 754 | 29.09 | 0.811 |
| 3 dB Above AGC - AWGN | 779 | 29.22 | 0.836 |
| Input Power - AWGN | 754 | -56.84 | N/A |
| Input Power - AWGN | 779 | -56.83 | N/A |

**Notes:** Input Power is AGC threshold Level, Center Frequencies are determined from Out of Band Rejection $f_0$ measurement.



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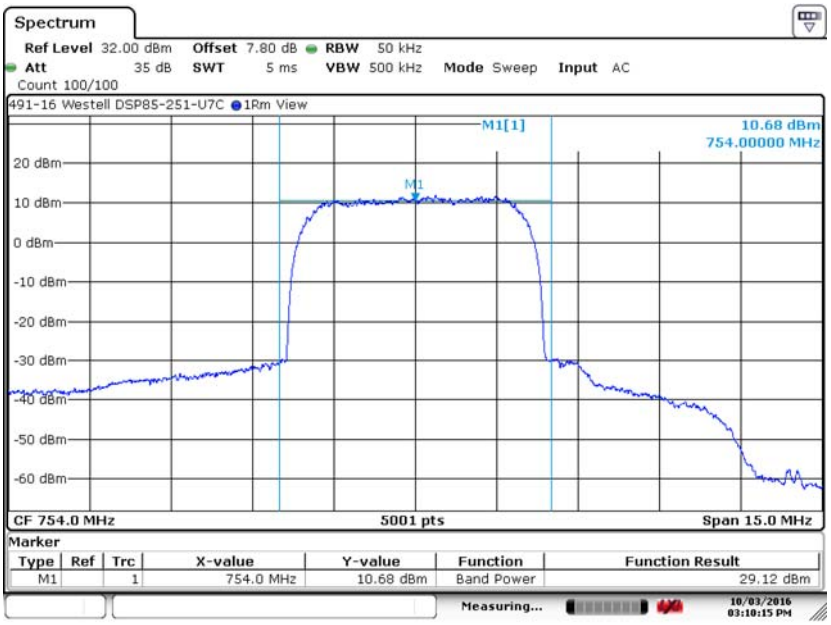
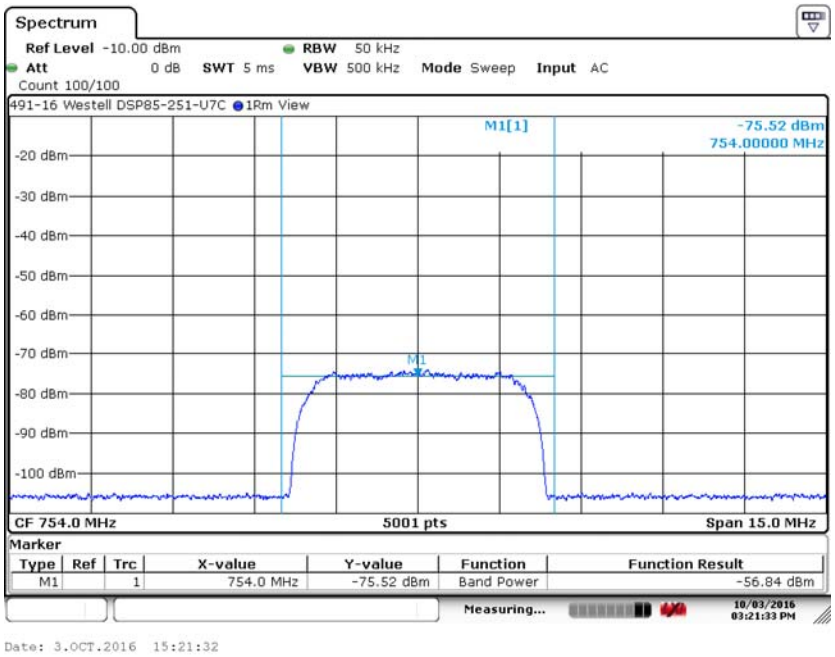
# 6. Measurement Data

## 6.1. Power and Antenna Height Limits 27.50 (b) (4), RSS-130 Section 4.4 (cont)

### 6.1.2. Mean Transmitter Output Power, 754 MHz AWGN




### 6.1.3. Mean Transmitter Output Power, 754 MHz – Input Power AWGN



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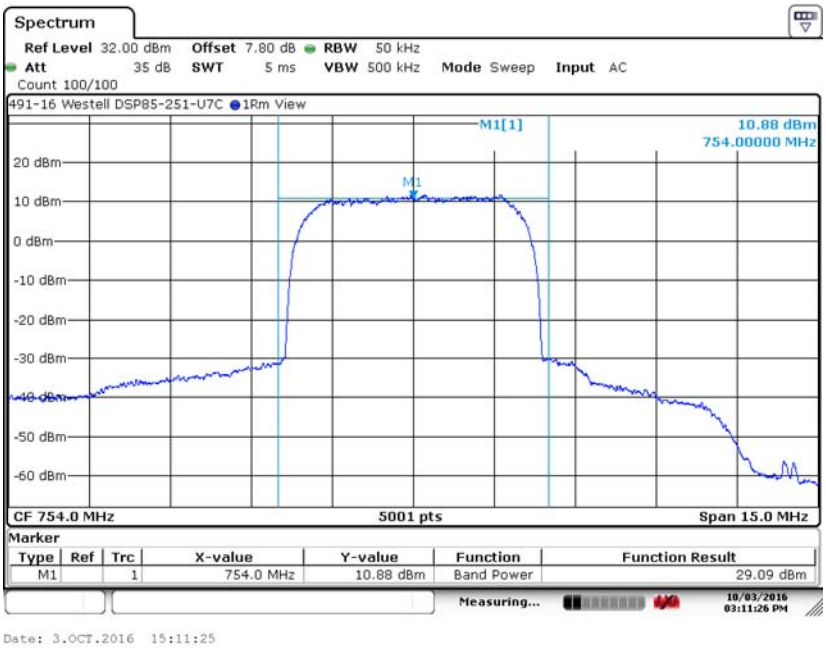
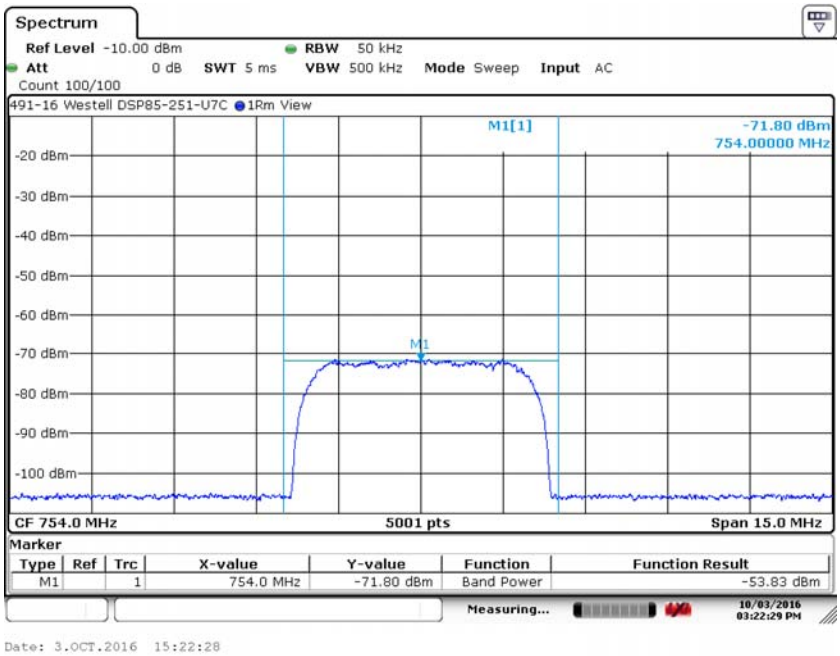
# 6. Measurement Data

## 6.1. Power and Antenna Height Limits 27.50 (b) (4), RSS-130 Section 4.4 (cont)

### 6.1.4. Mean Transmitter Output Power, 754 MHz AWGN plus 3 dB




### 6.1.5. Mean Transmitter Output Power, 754 MHz – Input Power AWGN plus 3 dB



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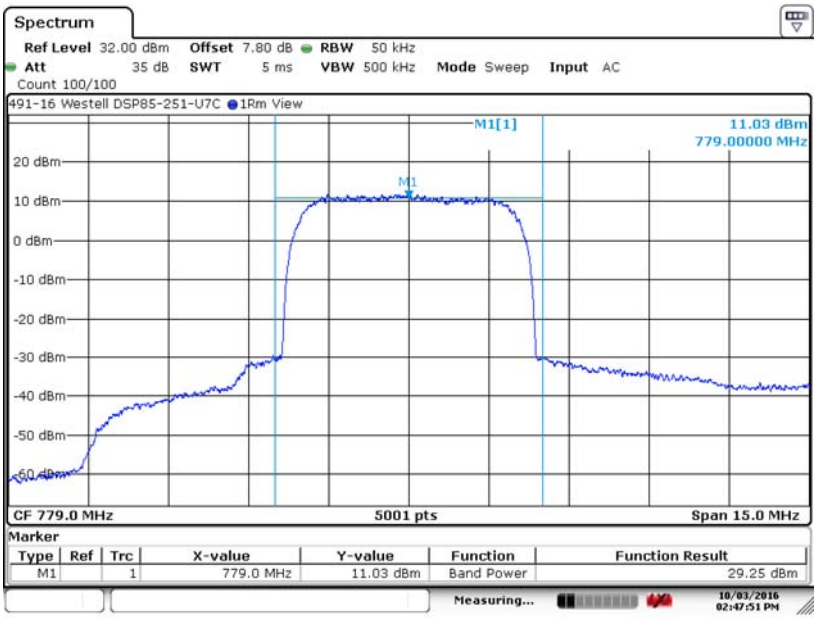
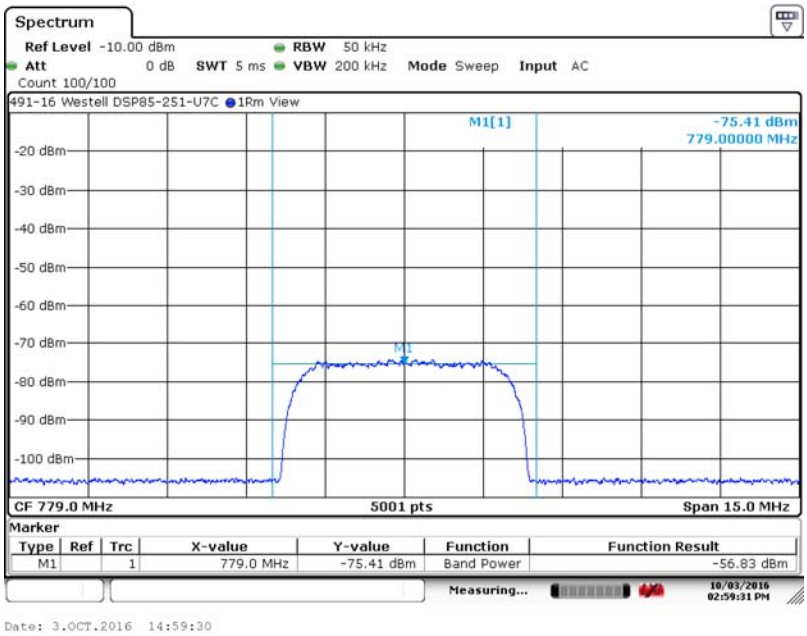
# 6. Measurement Data

## 6.1. Power and Antenna Height Limits 27.50 (b) (4), RSS-130 Section 4.4 (cont)

### 6.1.6. Mean Transmitter Output Power, 779 MHz AWGN




### 6.1.7. Mean Transmitter Output Power, 779 MHz – Input Power AWGN



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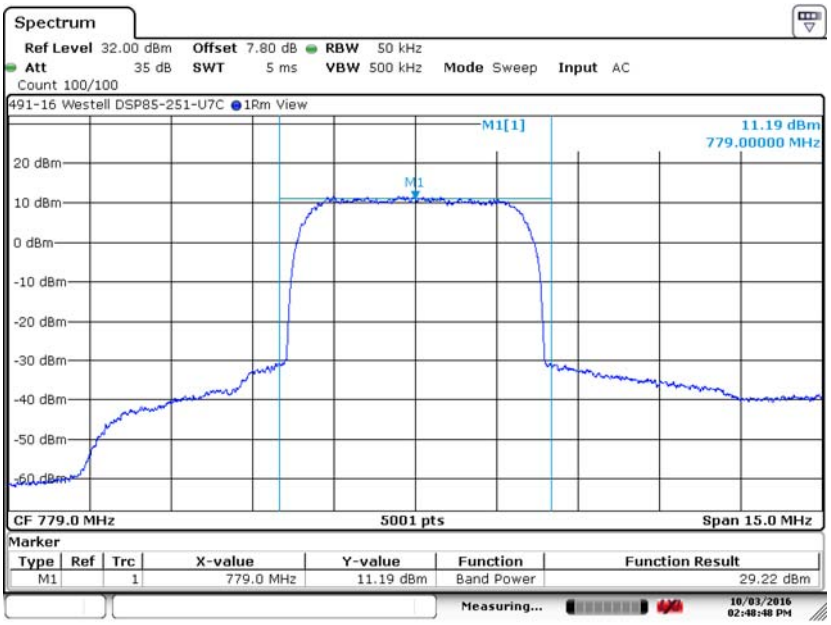
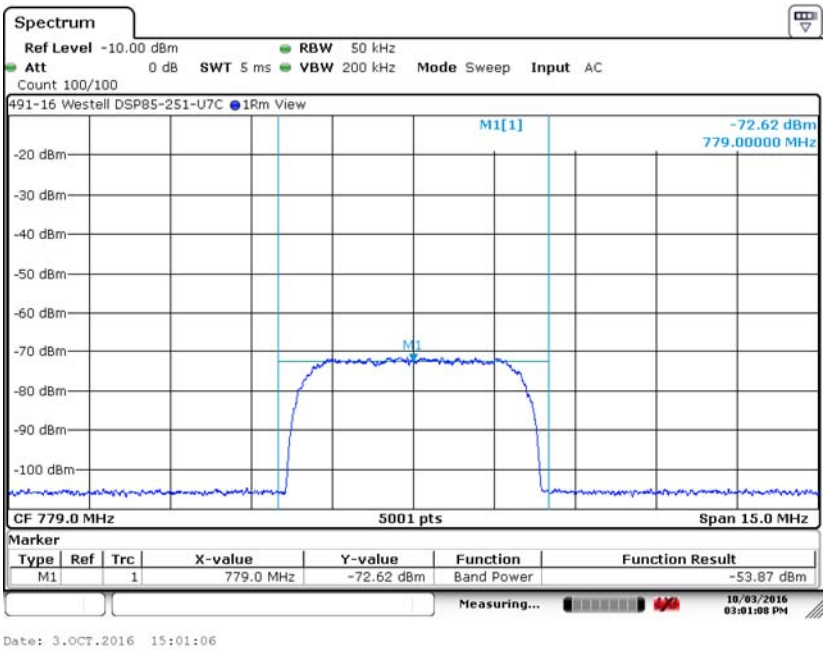
# 6. Measurement Data

## 6.1. Power and Antenna Height Limits 27.50 (b) (4), RSS-130 Section 4.4 (cont)

6.1.8. Mean Transmitter Output Power, 779 MHz AWGN plus 3 dB




6.1.9. Mean Transmitter Output Power, 779 MHz – Input Power AWGN plus 3 dB



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# 6. Measurement Data

## 6.1. Power and Antenna Height Limits 27.50 (b) (4), RSS-130 Section 4.4 (continued)

### 6.1.2. Maximum ERP

ERP is defined in FCC Title 47, Chapter I, Part 2, Subpart A, Section 2.1 as “Effective Radiated Power. The product of the power supplied to the antenna and its gain relative to a half-wave dipole in a given direction."

ERP = Transmitter Power (dBm) - Cable Loss (dB) + Antenna Gain (dBi)

The manufacturer of the device under test recommends one antenna and cable combination for use with their product. The following table provides the worst case effective radiated power based on the measured transmitter output power and the antenna gain:

| Description of Measurement | Center Frequency | Transmitter Power[1] | Cable Insertion Loss | Antenna Gain[2] | Total Output Power | |
|---|---|---|---|---|---|---|
| | (MHz) | (dBm) | (dB) | (dBi) | (dBm) | (Watts) |
| Output Power - AWGN | 754 | 29.12 | 0.00 | 3.00 | 32.12 | 1.63 |
| Output Power - AWGN | 779 | 29.25 | 0.00 | 3.00 | 32.25 | 1.68 |
| 3 dB Above AGC - AWGN | 754 | 29.09 | 0.00 | 3.00 | 32.09 | 1.62 |
| 3 dB Above AGC - AWGN | 779 | 29.22 | 0.00 | 3.00 | 32.22 | 1.67 |

[1] Measured. See section 6.1.1.
[2] Customer supplied 3 dBi for gain. Factor is a combination of both antenna gain and cable loss.

### 6.1.3. Booster gain – 85 dB Nominal

| Description of Measurement | Center Frequency | Output Power | Input Power | Gain |
|---|---|---|---|---|
| | (MHz) | (dBm) | (dBm) | dB |
| Output Power - AWGN | 754 | 29.12 | -56.84 | 85.96 |
| Output Power - AWGN | 779 | 29.25 | -56.83 | 86.08 |



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## 6. Measurement Data (continued)

### 6.2. Bandwidth Limitations FCC Part 2.1049, RSS-GEN 6.6

Requirement: Each authorization issued to a station licensed under this part will show an emission designator representing the class of emission authorized. The designator will be prefixed by a specified necessary bandwidth. This number does not necessarily indicate the bandwidth occupied by the emission at any instant.

Test Method: KDB 935210 Section 3.4

#### 6.2.1. Occupied (99% Power) Bandwidth

| Modulation Type | Center Frequency | Output Occupied Bandwidth | Input Occupied Bandwidth | Difference | Result |
|---|---|---|---|---|---|
| | MHz | kHz | kHz | kHz | |
| AWGN | 754 | 4184.16 | 4226.16 | -41.99 | Compliant |
| AWGN + 3dB | 754 | 4172.17 | 4202.16 | -29.99 | Compliant |
| AWGN | 779 | 4181.16 | 4223.16 | -41.99 | Compliant |
| AWGN + 3dB | 779 | 4178.16 | 4196.16 | -18.00 | Compliant |



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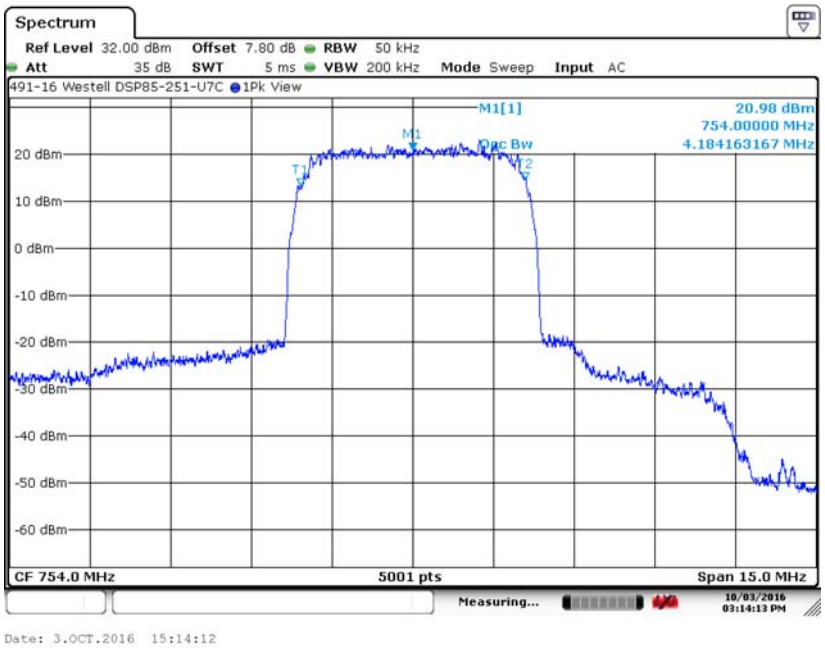
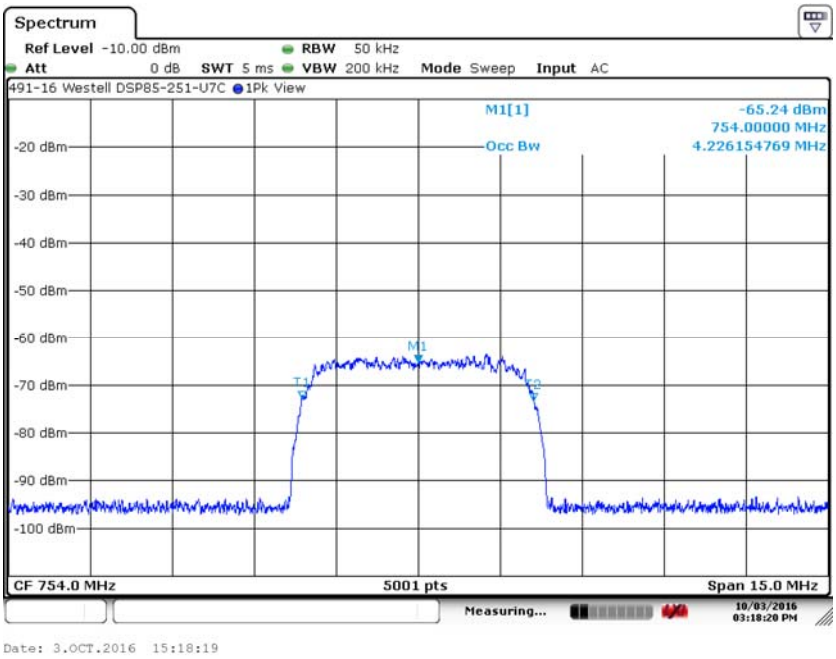
# 6. Measurement Data (continued)

## 6.2. Bandwidth Limitations FCC Part 2.1049, RSS-GEN 6.6 (continued)

6.2.1.1. Occupied (99% Power) Bandwidth Measurement, 754 MHz AWGN




6.2.1.2. Occupied (99% Power) Bandwidth Input Signal, 754 MHz AWGN



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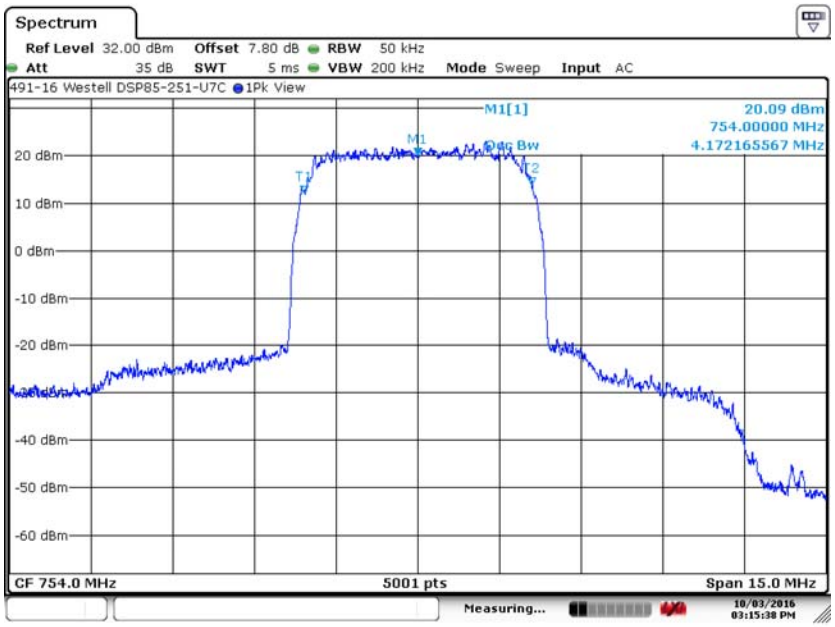
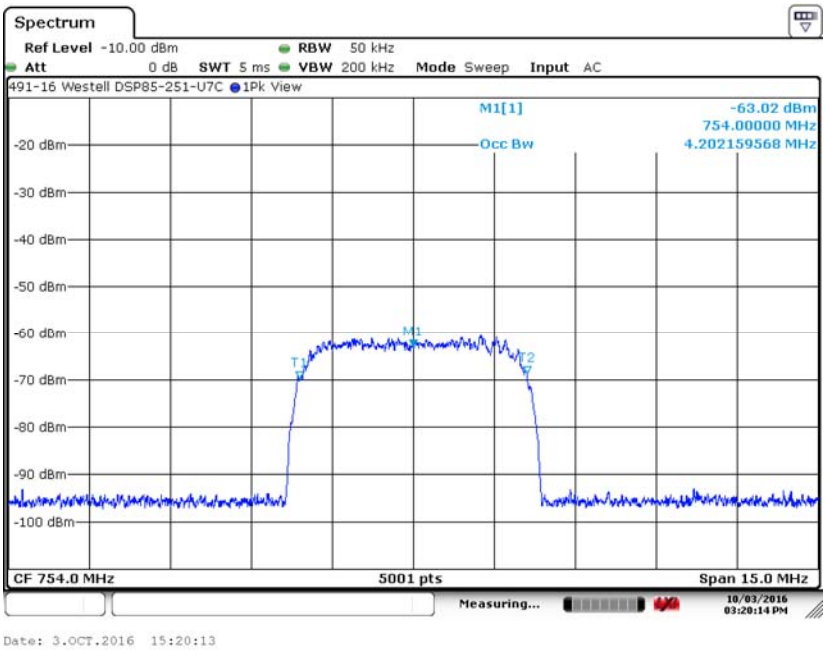
# 6. Measurement Data (continued)

## 6.2. Bandwidth Limitations FCC Part 2.1049, RSS-GEN 6.6 (continued)

6.2.1.3. Occupied (99% Power) Bandwidth Measurement, 754 MHz AWGN +3dB




6.2.1.4. Occupied (99% Power) Bandwidth Input Signal, 754 MHz AWGN + 3dB



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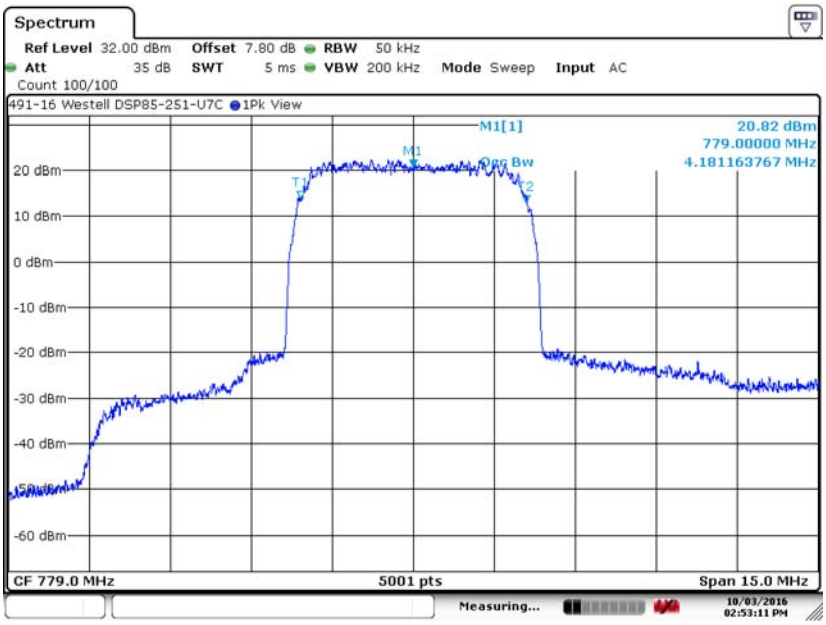
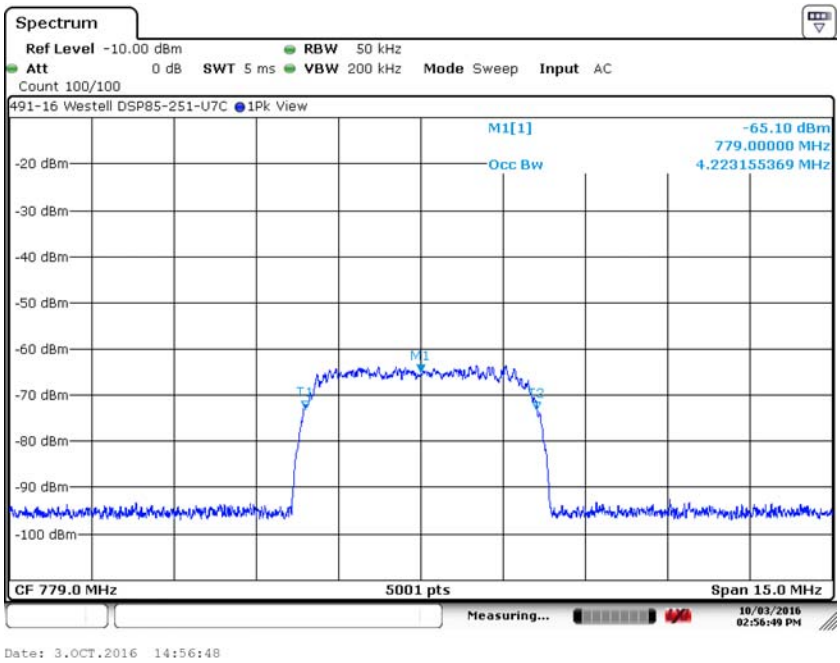
# 6. Measurement Data (continued)

## 6.2. Bandwidth Limitations FCC Part 2.1049, RSS-GEN 6.6 (continued)

6.2.1.5. Occupied (99% Power) Bandwidth Measurement, 779 MHz AWGN




6.2.1.6. Occupied (99% Power) Bandwidth Input Signal, 779 MHz AWGN



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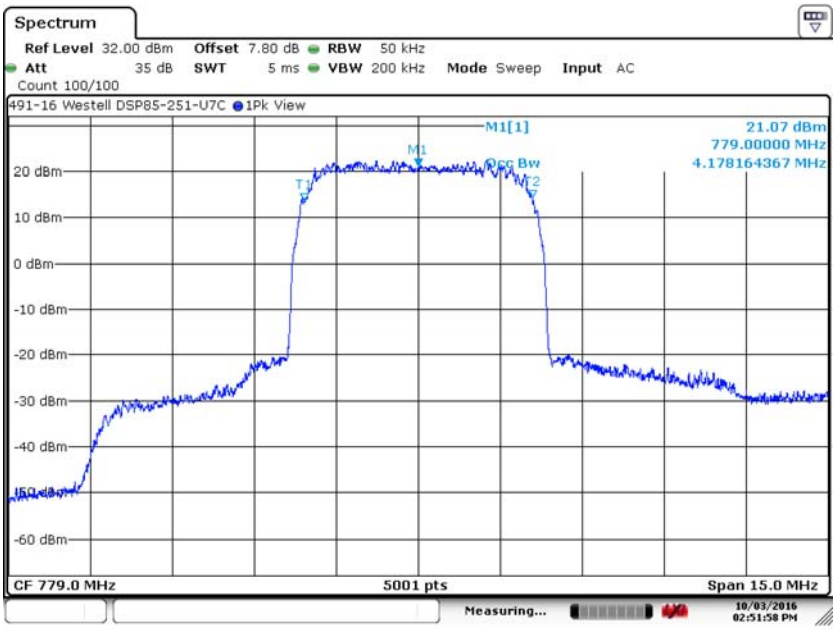
# 6. Measurement Data (continued)

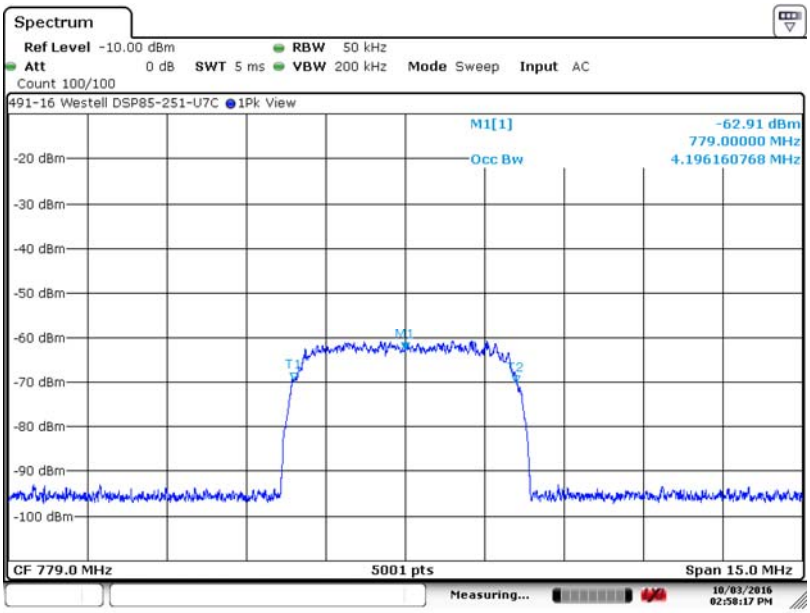
## 6.2. Bandwidth Limitations FCC Part 2.1049, RSS-GEN 6.6 (continued)

6.2.1.7. Occupied (99% Power) Bandwidth Measurement, 779 MHz AWGN + 3dB




Date: 3.OCT.2016 14:51:56

6.2.1.8. Occupied (99% Power) Bandwidth Input Signal, 779 MHz AWGN +3dB




Date: 3.OCT.2016 14:58:16



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## 6. Measurement Data (continued)

### 6.3. Spurious Emissions at the Antenna Terminals 27.53 (c), RSS-130 4.6

**Requirement:** For operations in the 746-758 MHz band and the 776-788 MHz band, the power of any emission outside of the licensee's frequency band(s) of operation shall be attenuated below the transmitter power (P) within the licensed band(s) of operation, measured in watts, in accordance with the following:

(1) On any frequency outside of the 746-758 MHz band, the power of any emission shall be attenuated outside the band below the transmitter power (P) by at least 43 + 10 log (P) dB;

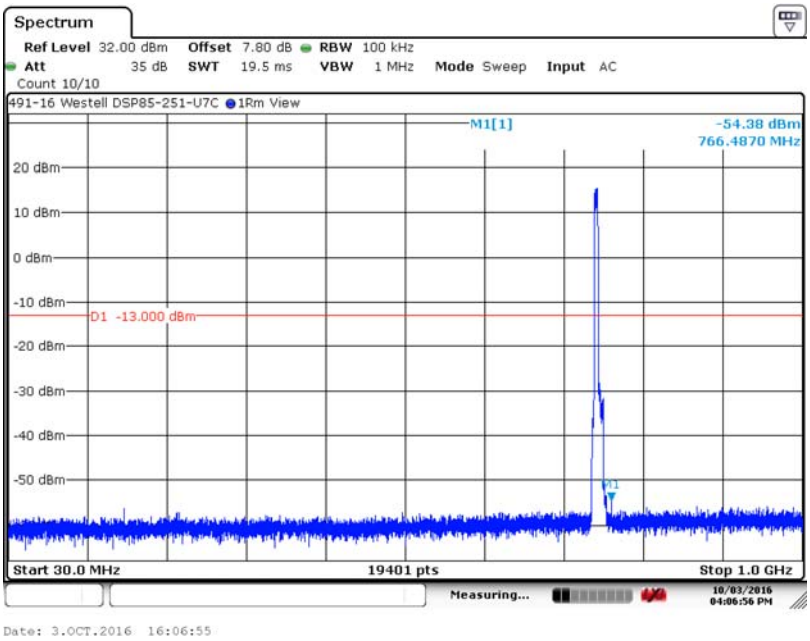
(2) On any frequency outside of the 776-787 MHz band, the power of any emission shall be attenuated outside the band below the transmitter power (P) by at least 43 + 10 log (P) dB;

(3) On all frequencies between 763-775 MHz and 793-805 MHz, by a factor not less than 76 + 10 log (P) in a 6.25 KHz band segment for base and fixed stations;

(5) Compliance with the provisions of paragraphs (c)(1) and (c)(2) of this section is based upon the use of measurement instrumentation employing a resolution bandwidth of 100 kHz or greater. However, in the 100 kHz bands immediately outside and adjacent to the frequency block a resolution bandwidth of 30 kHz may be employed.

Test Method: KDB 935210 Section 3.6.3

6.3.1. 748 MHz, 30 MHz to 1 GHz, AWGN



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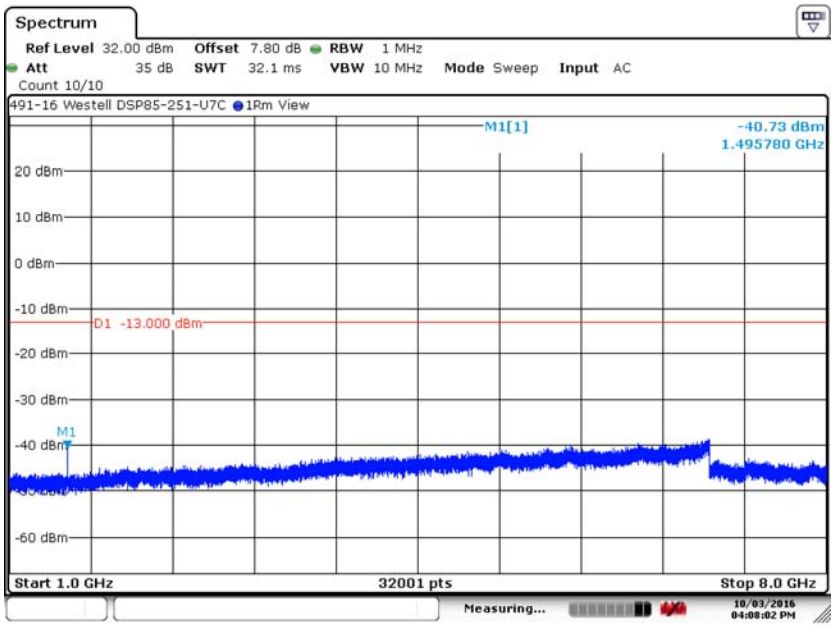
# 6. Measurement Data (continued)

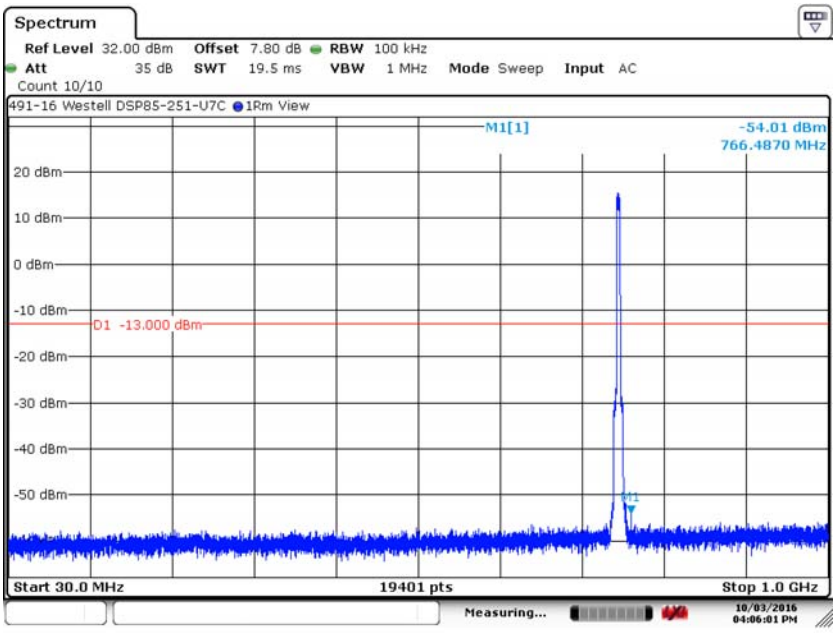
## 6.3. Spurious Emissions at the Antenna Terminals 27.53 (c), RSS-130 4.6 (continued)

### 6.3.2. 748 MHz, 1 to 8 GHz, AWGN




Date: 3.OCT.2016 16:08:00

### 6.3.3. 751.5 MHz, 30 MHz to 1 GHz, AWGN




Date: 3.OCT.2016 16:05:59



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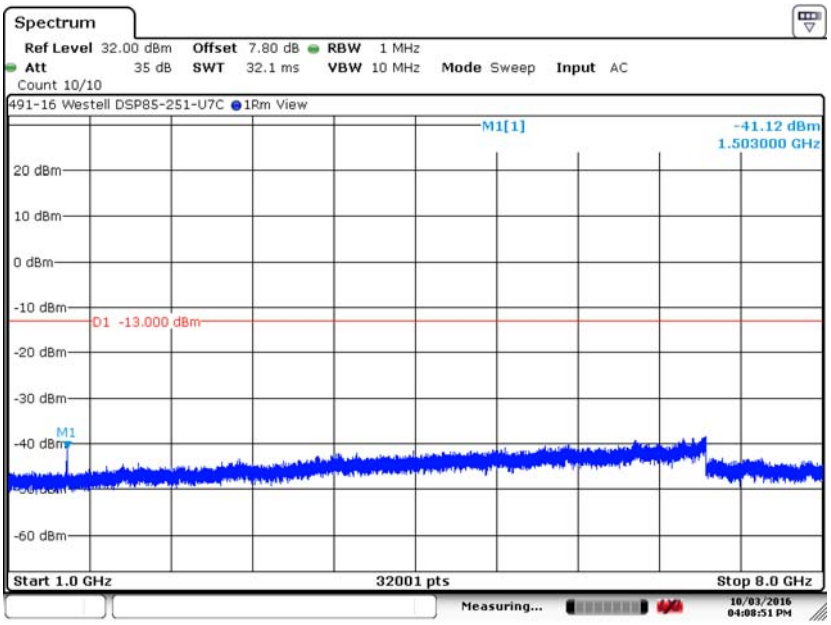
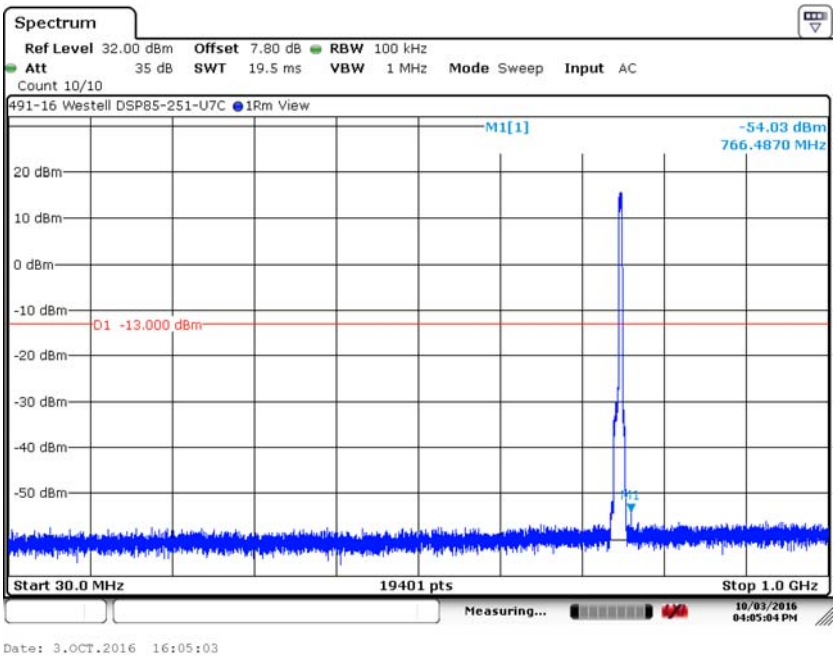
# 6. Measurement Data (continued)

## 6.3. Spurious Emissions at the Antenna Terminals 27.53 (c), RSS-130 4.6 (continued)

### 6.3.4. 751.5 MHz, 1 to 8 GHz, AWGN




### 6.3.5. 754 MHz, 30 MHz to 1 GHz, AWGN



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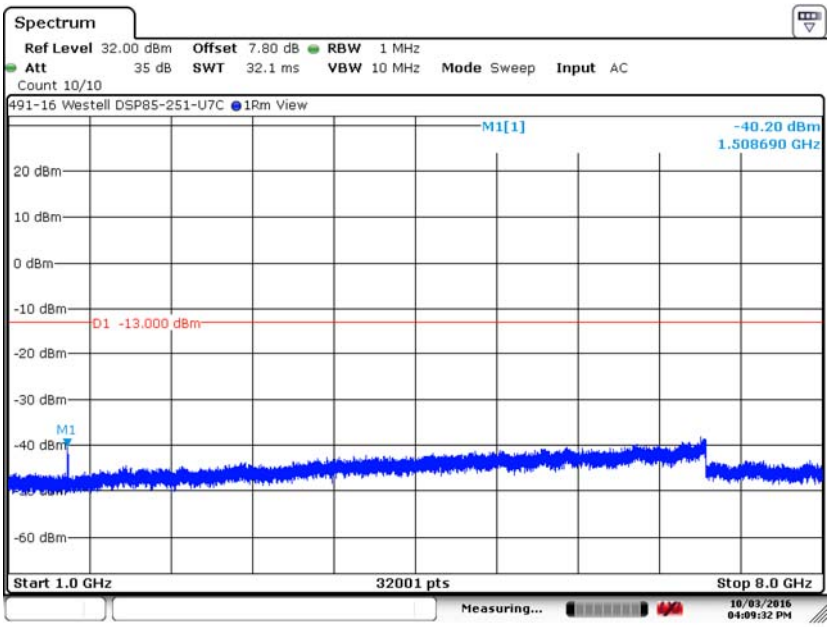
# 6. Measurement Data (continued)

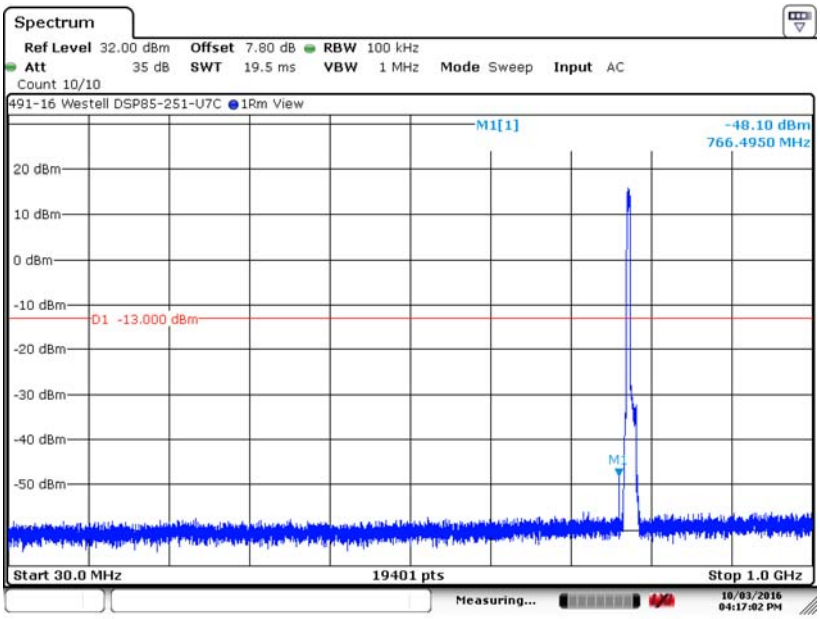
## 6.3. Spurious Emissions at the Antenna Terminals 27.53 (c), RSS-130 4.6 (continued)

### 6.3.6. 754 MHz, 1 to 8 GHz, AWGN




Date: 3.OCT.2016 16:09:31

### 6.3.7. 778 MHz, 30 MHz to 1 GHz, AWGN




Date: 3.OCT.2016 16:17:01



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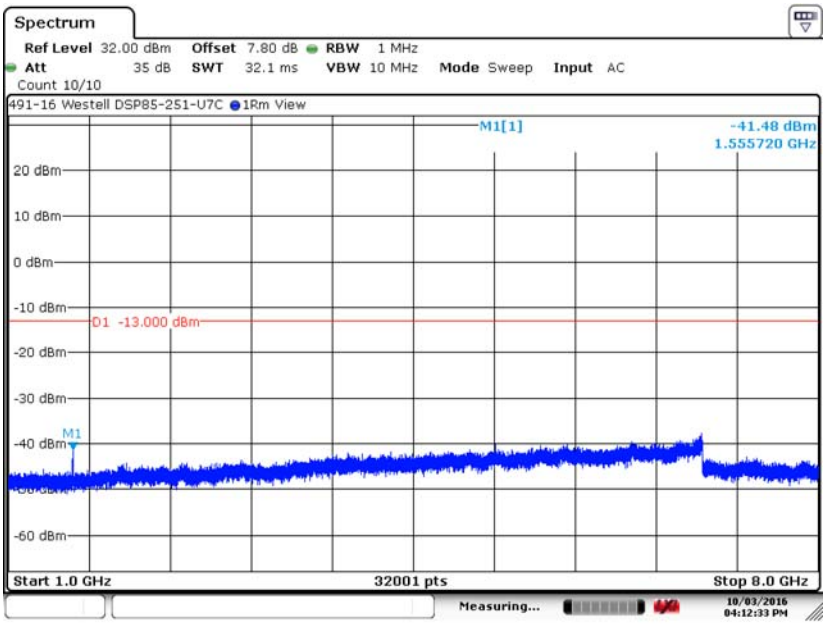
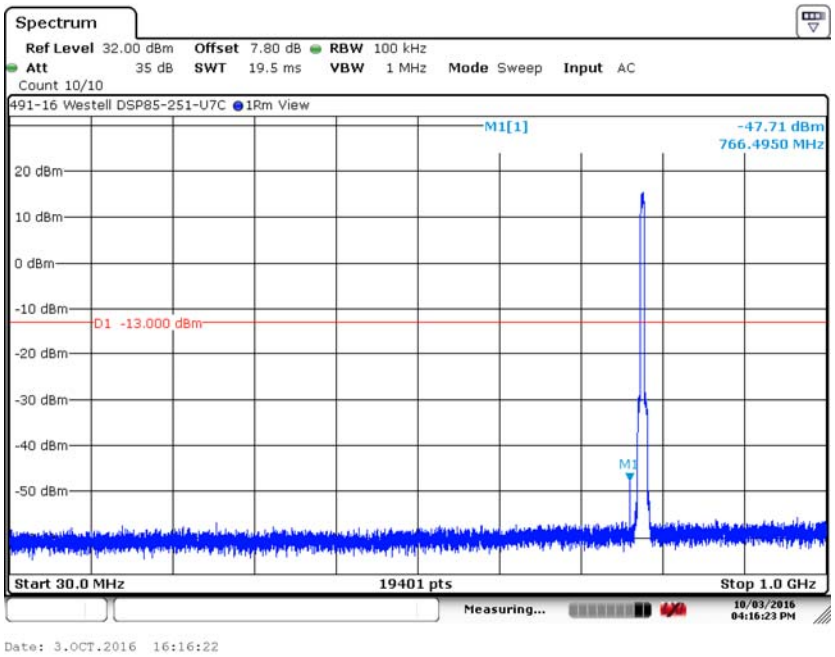
# 6. Measurement Data (continued)

## 6.3. Spurious Emissions at the Antenna Terminals 27.53 (c), RSS-130 4.6 (continued)

### 6.3.8. 778 MHz, 1 to 8 GHz, AWGN




### 6.3.9. 781.5 MHz, 30 MHz to 1 GHz, AWGN



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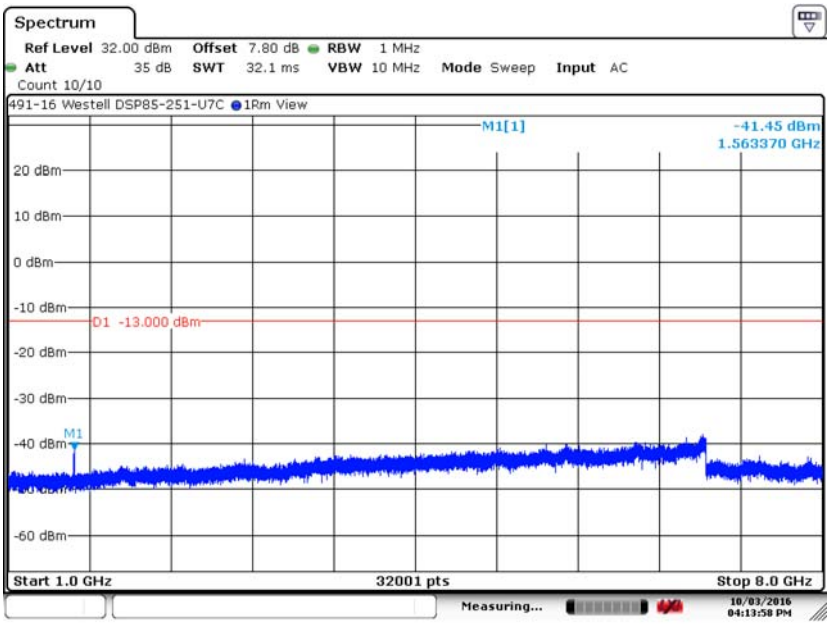
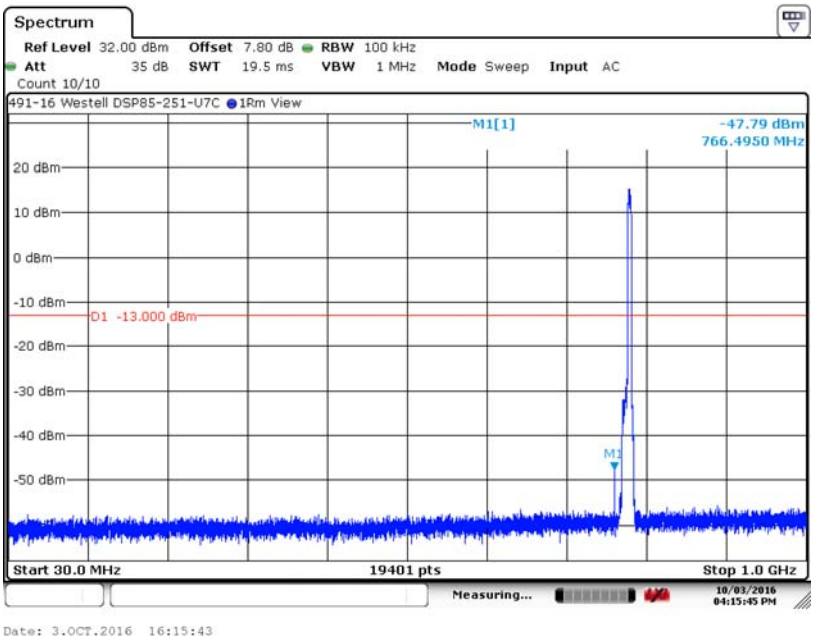
# 6. Measurement Data (continued)

## 6.3. Spurious Emissions at the Antenna Terminals 27.53 (c), RSS-130 4.6 (continued)

### 6.3.10. 781.5 MHz, 1 to 8 GHz, AWGN




### 6.3.11. 785 MHz, 30 MHz to 1 GHz, AWGN



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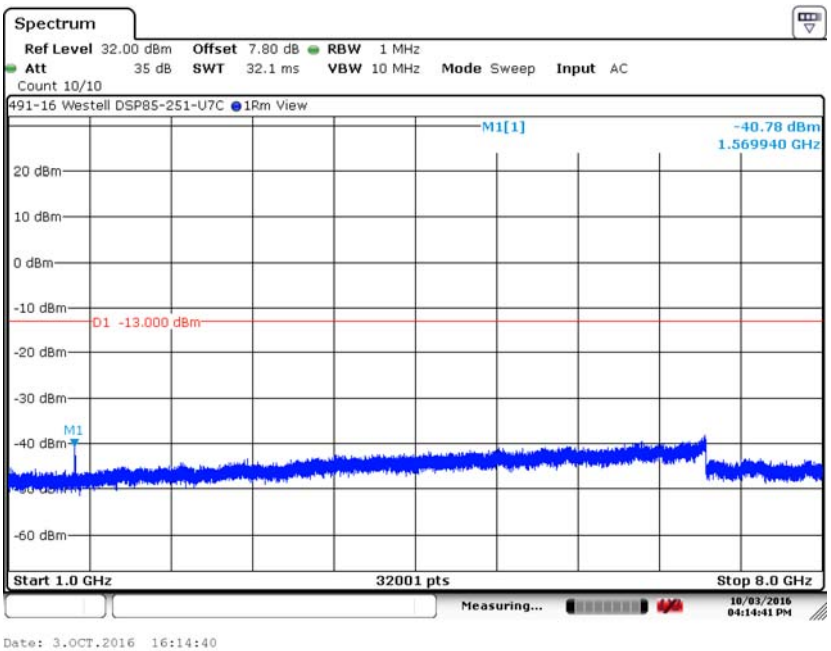
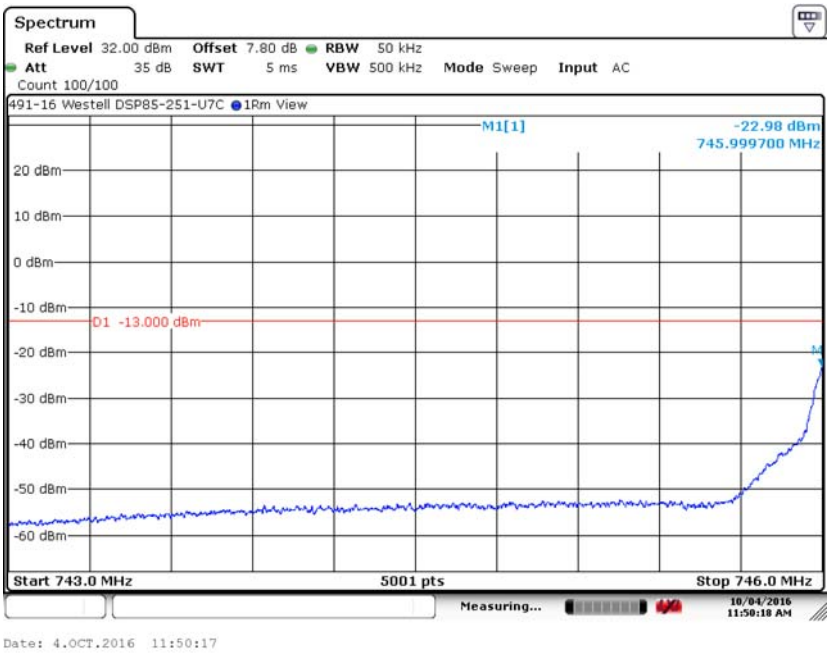
# 6. Measurement Data (continued)

## 6.3. Spurious Emissions at the Antenna Terminals 27.53 (c), RSS-130 4.6 (continued)

### 6.3.12. 785 MHz, 1 to 8 GHz, AWGN




### 6.3.13. 746 MHz Lower Bandedge, AWGN



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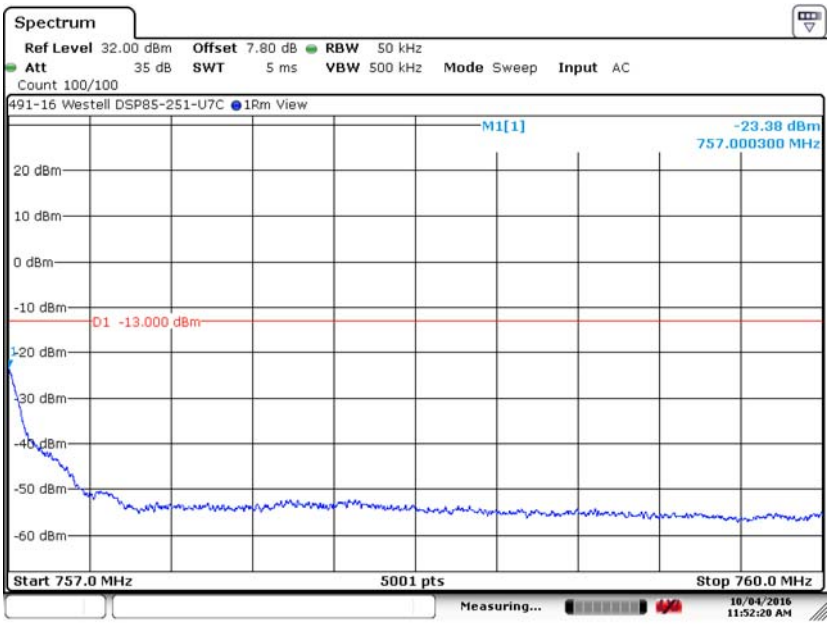
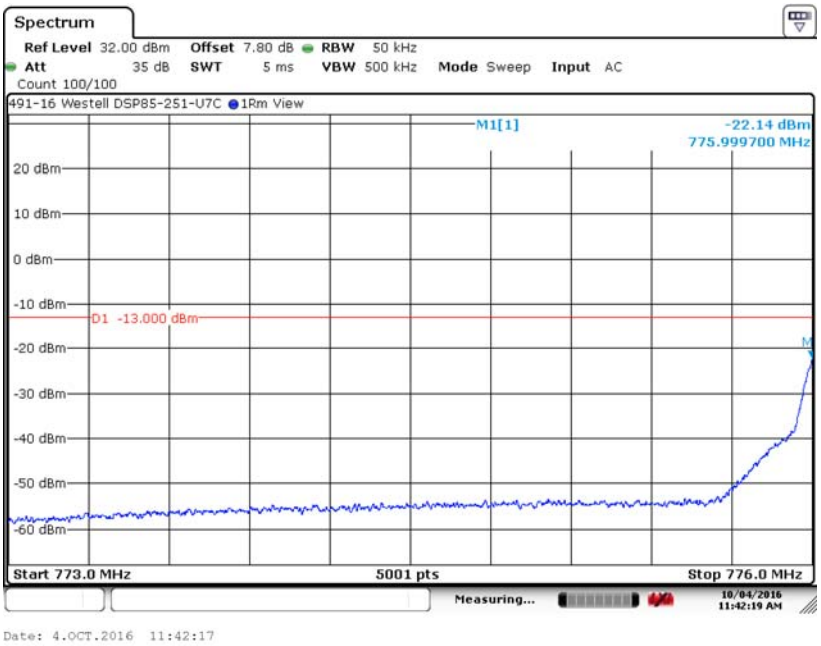
# 6. Measurement Data (continued)

## 6.3. Spurious Emissions at the Antenna Terminals 27.53 (c), RSS-130 4.6 (continued)

### 6.3.14. 757 MHz Upper Bandedge, AWGN




### 6.3.15. 776 MHz, Lower bandedge, AWGN



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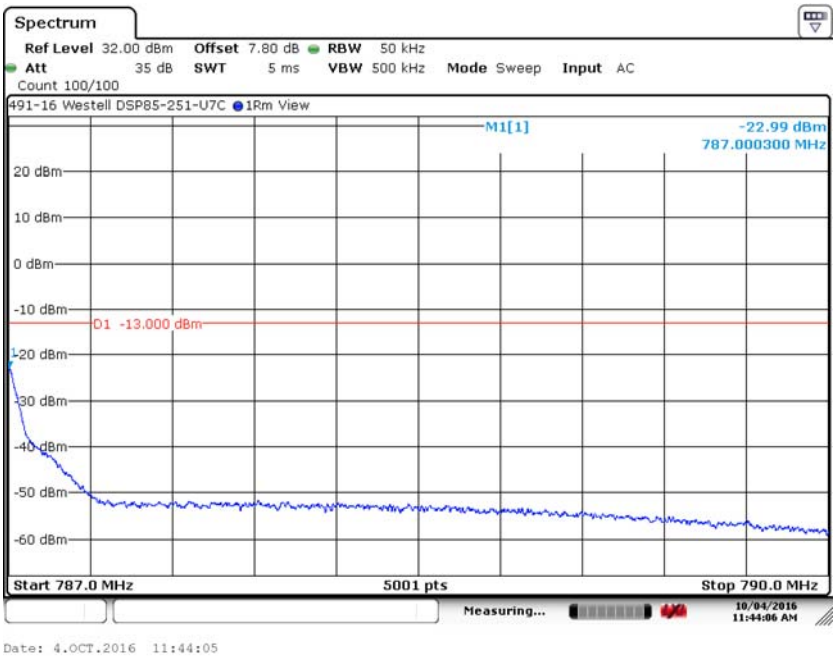
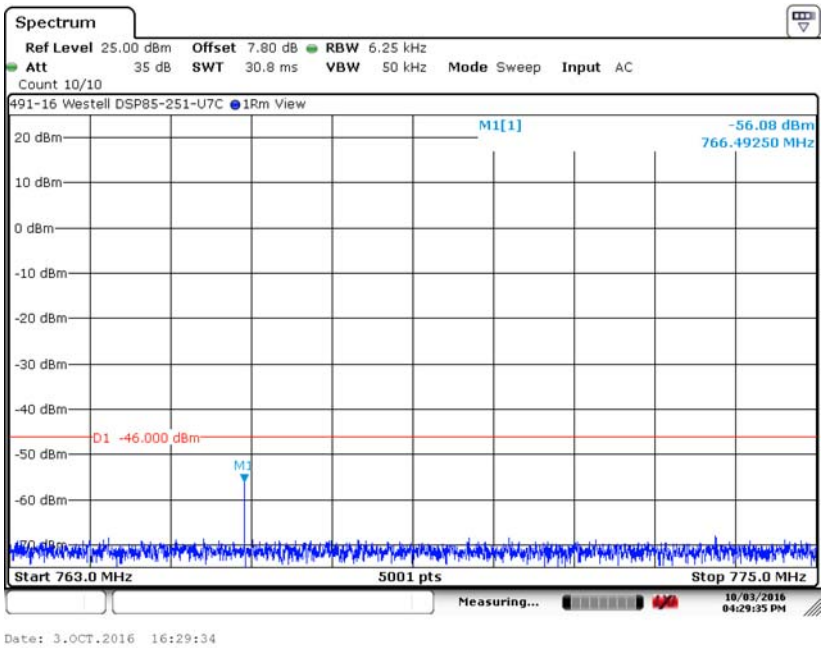
# 6. Measurement Data (continued)

## 6.3. Spurious Emissions at the Antenna Terminals 27.53 (c), RSS-130 4.6 (continued)

### 6.3.16. 787 MHz, Upper bandedge, AWGN




### 6.3.17. 751.5 MHz, 763 to 775 MHz, AWGN



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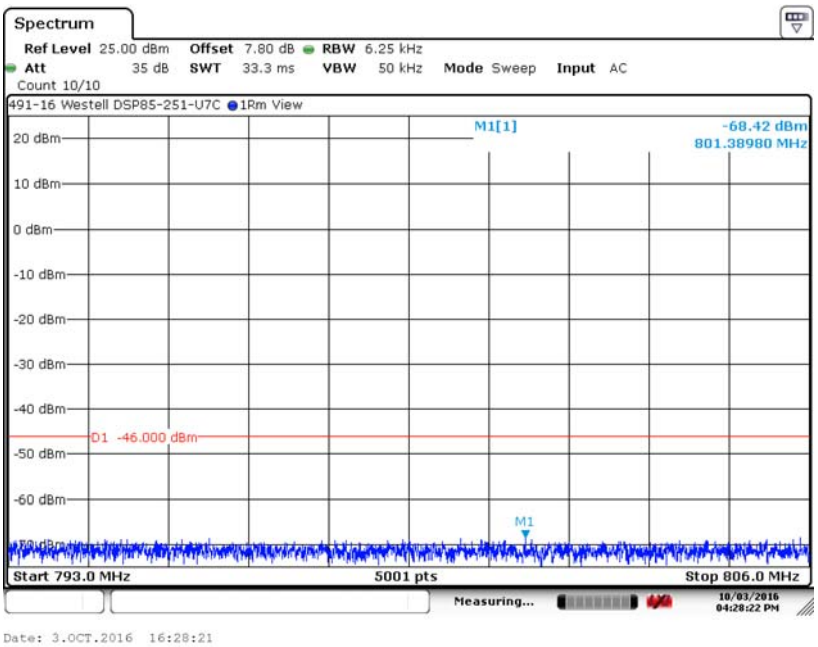
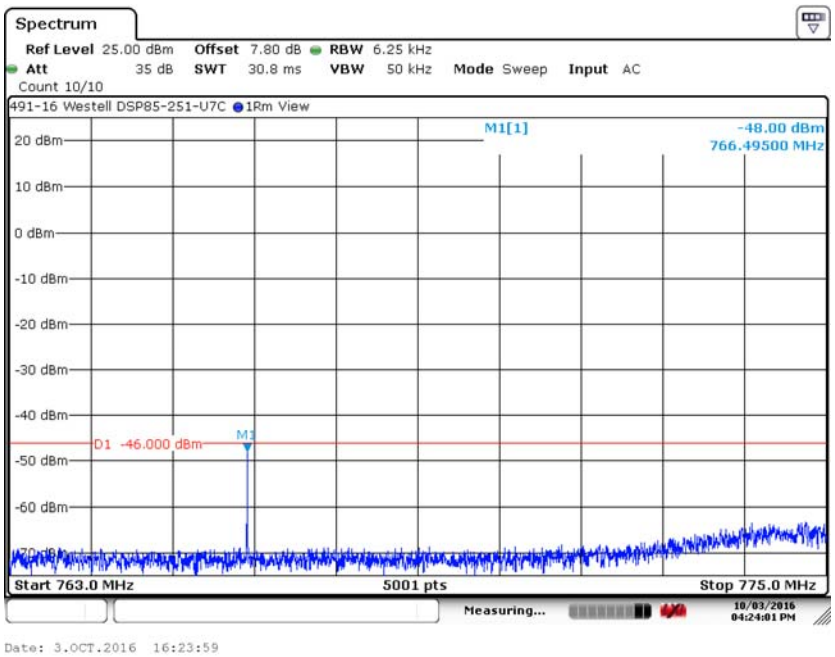
# 6. Measurement Data (continued)

## 6.3. Spurious Emissions at the Antenna Terminals 27.53 (c), RSS-130 4.6 (continued)

### 6.3.18. 751.5 MHz, 793 to 806 MHz, AWGN




### 6.3.19. 781.5 MHz, 763 to 775 MHz, AWGN



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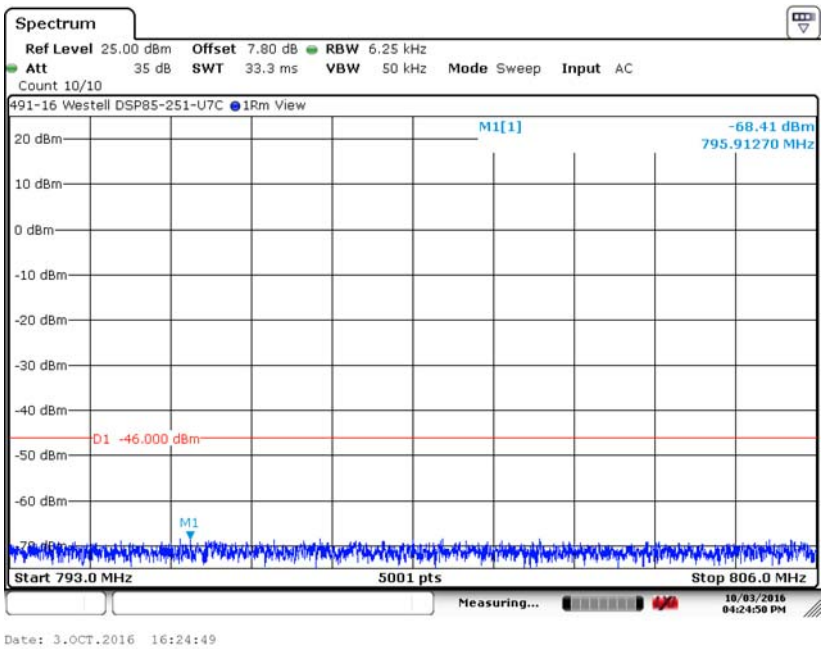
## 6. Measurement Data (continued)

### 6.3. Spurious Emissions at the Antenna Terminals 27.53 (c), RSS-130 4.6 (continued)

6.3.20. 781.5 MHz, 793 to 806 MHz, AWGN




### 6.3. Spurious Emissions at the Antenna Terminals 27.53 (f), RSS-130 4.6 Additional Requirements

Requirement: For operations in the 746-758 MHz, 775-793 MHz and the 805-806 MHz bands, emissions in the band 1559-1610 MHz shall be limited to -70 dBW/MHz equivalent isotropically radiated power (EIRP) for wideband signals and -80 dBW EIRP for discrete emissions of less than 700 Hz bandwidth.



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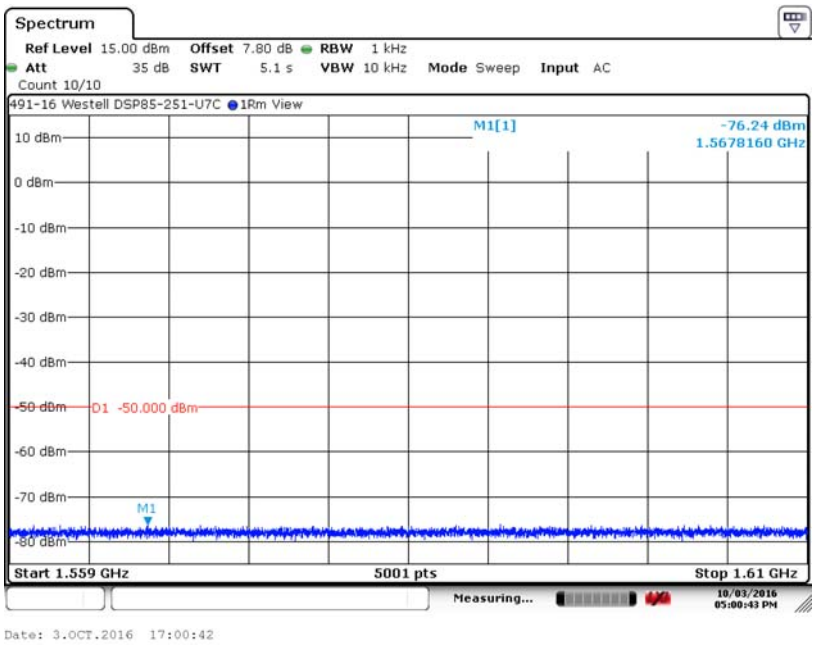
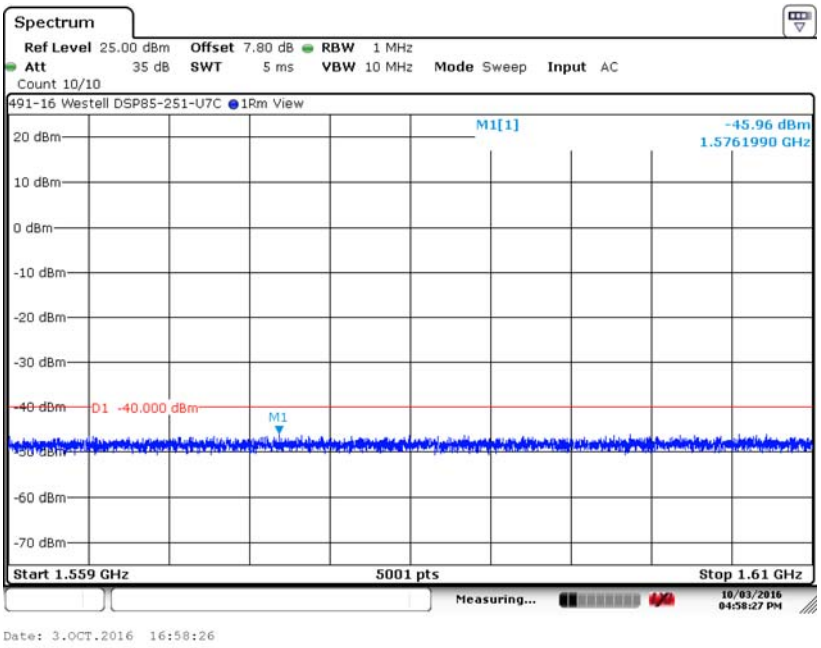
# 6. Measurement Data (continued)

## 6.3. Spurious Emissions at the Antenna Terminals 27.53 (f), RSS-130 4.6 (continued)

### 6.3.21. 751.5 MHz, 1559 to 1610 MHz, Narrowband, AWGN




### 6.3.22. 751.5 MHz, 1559 to 1610 MHz, Wideband AWGN



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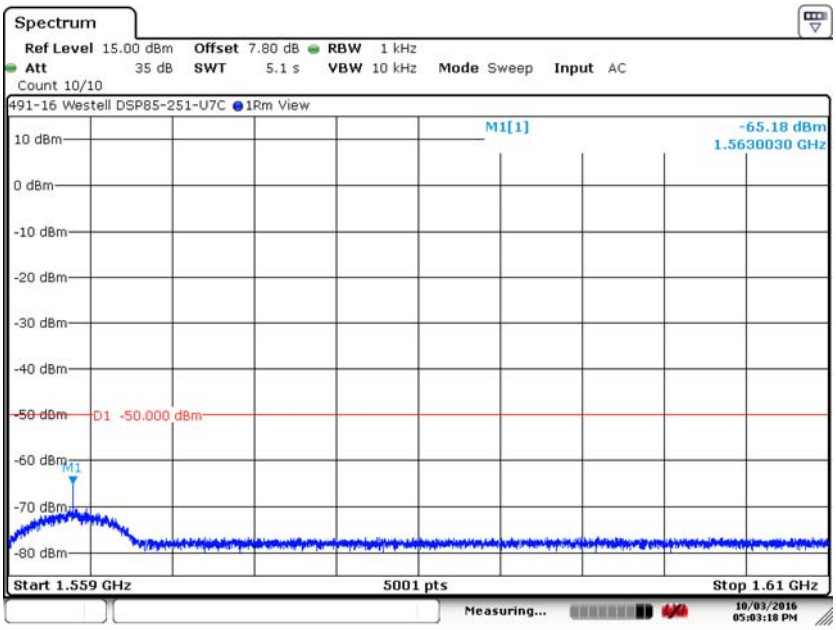
# 6. Measurement Data (continued)

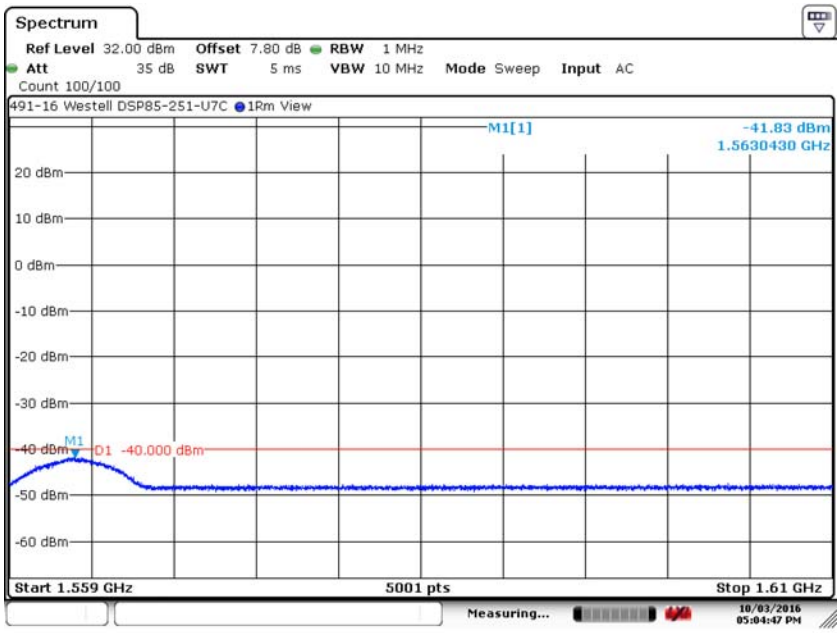
## 6.3. Spurious Emissions at the Antenna Terminals 27.53 (f), RSS-130 4.6 (continued)

### 6.3.23. 781.5 MHz, 1559 to 1610 MHz, Narrowband, AWGN




Date: 3.OCT.2016 17:03:17

### 6.3.24. 781.5 MHz, 1559 to 1610 MHz, Wideband AWGN




Date: 3.OCT.2016 17:04:46



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## 6. Measurement Data (continued)

### 6.4. Field Strength of Spurious Emissions 27.53 (c), RSS-130 4.6

**Requirement:** For operations in the 746-758 MHz band and the 776-788 MHz band, the power of any emission outside of the licensee's frequency band(s) of operation shall be attenuated below the transmitter power (P) within the licensed band(s) of operation, measured in watts, in accordance with the following:

(1) On any frequency outside of the 746-758 MHz band, the power of any emission shall be attenuated outside the band below the transmitter power (P) by at least 43 + 10 log (P) dB;

(2) On any frequency outside of the 776-787 MHz band, the power of any emission shall be attenuated outside the band below the transmitter power (P) by at least 43 + 10 log (P) dB.

Test Method: KDB 935210 Section 3.8

6.4.1. Measurement and Equipment Setup

| | |
|---|---|
| Test Date: | 7/28/2016, 1/9/2017 |
| Test Engineer: | Cody Merry, Mark McSweeney |
| Site Temperature (°C): | 22 |
| Relative Humidity (%RH): | 32 |
| Frequency Range: | 30 MHz to 1 GHz |
| Measurement Distance: | 3 Meters |
| EMI Receiver IF Bandwidth: | 120 kHz |
| EMI Receiver Avg Bandwidth: | 300 kHz |
| Detector Functions: | Peak and Quasi-Peak. |
| Antenna Height: | 1 to 4 meters |

6.4.2 Test Procedure

Test measurements were made in accordance with ANSI/TIA-603-D 2010 Land Mobile FM or PM Communications Equipment Measurement and Performance Standards and ANSI C63.26 2015 American National Standard for Compliance Testing of Transmitters Used in Licensed Radio Services, Substitution Measurement Procedures.



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## 6. Measurement Data (continued)

### 6.4. Field Strength of Spurious Emissions 27.53 (c), RSS-130 4.6 (continued)

6.4.3. Horizontal Polarity

| Frequency (MHz) | Antenna Height (cm) | Signal Gen Amp (dBm) | At Antenna Level (dBm) | Antenna Gain (dBi) | EIRP (dBm) | Limit (dBm) | Margin (dB) |
|---|---|---|---|---|---|---|---|
| 74.9936 | 302 | -50.32 | -50.94 | -8.3 | -59.24 | -13.00 | -46.24 |
| 100.0069 | 305 | -43.64 | -44.70 | -7.3 | -52.00 | -13.00 | -39.00 |
| 124.9984 | 254 | -48.65 | -49.43 | -8.0 | -57.43 | -13.00 | -44.43 |
| 174.9952 | 146 | -52.94 | -52.70 | -7.6 | -60.30 | -13.00 | -47.30 |
| 200.0258 | 150 | -47.06 | -47.92 | -8.0 | -55.92 | -13.00 | -42.92 |
| 203.3532 | 142 | -55.00 | -52.75 | -8.0 | -60.75 | -13.00 | -47.75 |
| 225.0034 | 140 | -42.52 | -43.79 | -8.1 | -51.89 | -13.00 | -38.89 |
| 275.0239 | 110 | -47.34 | -47.79 | -8.4 | -56.19 | -13.00 | -43.19 |
| 300.0586 | 100 | -40.14 | -41.79 | -8.1 | -49.89 | -13.00 | -36.89 |
| 324.9784 | 100 | -46.36 | -47.29 | -7.7 | -54.99 | -13.00 | -41.99 |
| 425.0159 | 100 | -44.42 | -46.12 | -7.2 | -53.32 | -13.00 | -40.32 |
| 475.0140 | 180 | -57.43 | -52.37 | -6.2 | -58.57 | -13.00 | -45.57 |
| 575.0151 | 136 | -46.90 | -48.68 | -7.3 | -55.98 | -13.00 | -42.98 |
| 639.9872 | 130 | -42.04 | -44.89 | -8.0 | -52.89 | -13.00 | -39.89 |
| 700.0547 | 108 | -46.38 | -49.72 | -8.2 | -57.92 | -13.00 | -44.92 |
| 775.0439 | 190 | -47.75 | -50.01 | -8.1 | -58.11 | -13.00 | -45.11 |
| 825.0280 | 100 | -41.08 | -44.04 | -8.2 | -52.24 | -13.00 | -39.24 |
| 875.0601 | 156 | -33.00 | -36.58 | -8.5 | -45.08 | -13.00 | -32.08 |
| 925.0558 | 146 | -47.60 | -50.09 | -8.6 | -58.69 | -13.00 | -45.69 |
| 959.9788 | 133 | -41.30 | -45.33 | -8.6 | -53.93 | -13.00 | -40.93 |
| 975.0616 | 137 | -51.00 | -54.23 | -8.5 | -62.73 | -13.00 | -49.73 |



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## 6. Measurement Data (continued)

### 6.4. Field Strength of Spurious Emissions 27.53 (c), RSS-130 4.6 (continued)

6.4.4. Vertical Polarity

| Frequency (MHz) | Antenna Height (cm) | Signal Gen Amp (dBm) | At Antenna Level (dBm) | Antenna Gain (dBi) | EIRP (dBm) | Limit (dBm) | Margin (dB) |
|---|---|---|---|---|---|---|---|
| 74.9987 | 100 | -48.60 | -48.52 | -7.7 | -56.22 | -13.00 | -43.22 |
| 100.0142 | 100 | -40.80 | -41.36 | -8.5 | -49.86 | -13.00 | -36.86 |
| 124.9913 | 100 | -64.58 | -59.70 | -8.0 | -67.70 | -13.00 | -54.70 |
| 175.0142 | 100 | -40.84 | -42.37 | -7.6 | -49.97 | -13.00 | -36.97 |
| 200.0434 | 100 | -33.75 | -33.38 | -8.0 | -41.38 | -13.00 | -28.38 |
| 225.0041 | 220 | -37.00 | -38.73 | -8.4 | -47.13 | -13.00 | -34.13 |
| 274.9978 | 200 | -43.50 | -45.43 | -8.1 | -53.53 | -13.00 | -40.53 |
| 300.0461 | 201 | -42.90 | -45.00 | -8.1 | -53.10 | -13.00 | -40.10 |
| 325.0123 | 160 | -44.54 | -46.67 | -7.7 | -54.37 | -13.00 | -41.37 |
| 400.0653 | 130 | -47.67 | -49.92 | -7.8 | -57.72 | -13.00 | -44.72 |
| 625.0297 | 100 | -52.11 | -54.68 | -7.9 | -62.58 | -13.00 | -49.58 |
| 639.9886 | 100 | -44.10 | -47.08 | -8.0 | -55.08 | -13.00 | -42.08 |
| 700.1280 | 160 | -44.80 | -47.33 | -8.2 | -55.53 | -13.00 | -42.53 |
| 725.0376 | 144 | -53.35 | -56.48 | -8.1 | -64.58 | -13.00 | -51.58 |
| 775.0468 | 130 | -46.64 | -50.01 | -8.1 | -58.11 | -13.00 | -45.11 |
| 825.0301 | 120 | -42.87 | -46.43 | -8.2 | -54.63 | -13.00 | -41.63 |
| 875.0461 | 105 | -32.75 | -36.44 | -8.5 | -44.94 | -13.00 | -31.94 |
| 900.1825 | 115 | -52.88 | -57.18 | -8.7 | -65.88 | -13.00 | -52.88 |
| 959.9864 | 100 | -41.51 | -45.42 | -8.6 | -54.02 | -13.00 | -41.02 |
| 975.0526 | 105 | -51.88 | -55.80 | -8.5 | -64.30 | -13.00 | -51.30 |



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# 6. Measurement Data (continued)

## 6.4. Field Strength of Spurious Emissions 27.53 (c), RSS-130 4.6 (continued)

### 6.4.5. Measurement and Equipment Setup

| | |
|---|---|
| Test Date: | 7/28/2016 |
| Test Engineer: | Cody Merry |
| Site Temperature (°C): | 24 |
| Relative Humidity (%RH): | 33 |
| Frequency Range: | Above 1 GHz |
| Measurement Distance: | 3 Meters |
| EMI Receiver IF Bandwidth: | 1 MHz |
| EMI Receiver Avg Bandwidth: | 3 MHz |
| Detector Functions: | Peak and Average |
| Antenna Height: | 1 to 4 meters |

### 6.4.6. Radiated Emissions above 1 GHz

There were no measureable emissions within 10 dB of the limit above 1 GHz



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## 6. Measurement Data (continued)

### 6.5. Frequency Stability / Tolerance 27.54, RSS-130 4.3

Requirement: The frequency stability shall be sufficient to ensure that the fundamental emissions stay within the authorized band of operation.

Test Method: KDB 935210 Section 3.7

Note: The EUT does not translate the input frequency and therefore this testing was not performed.



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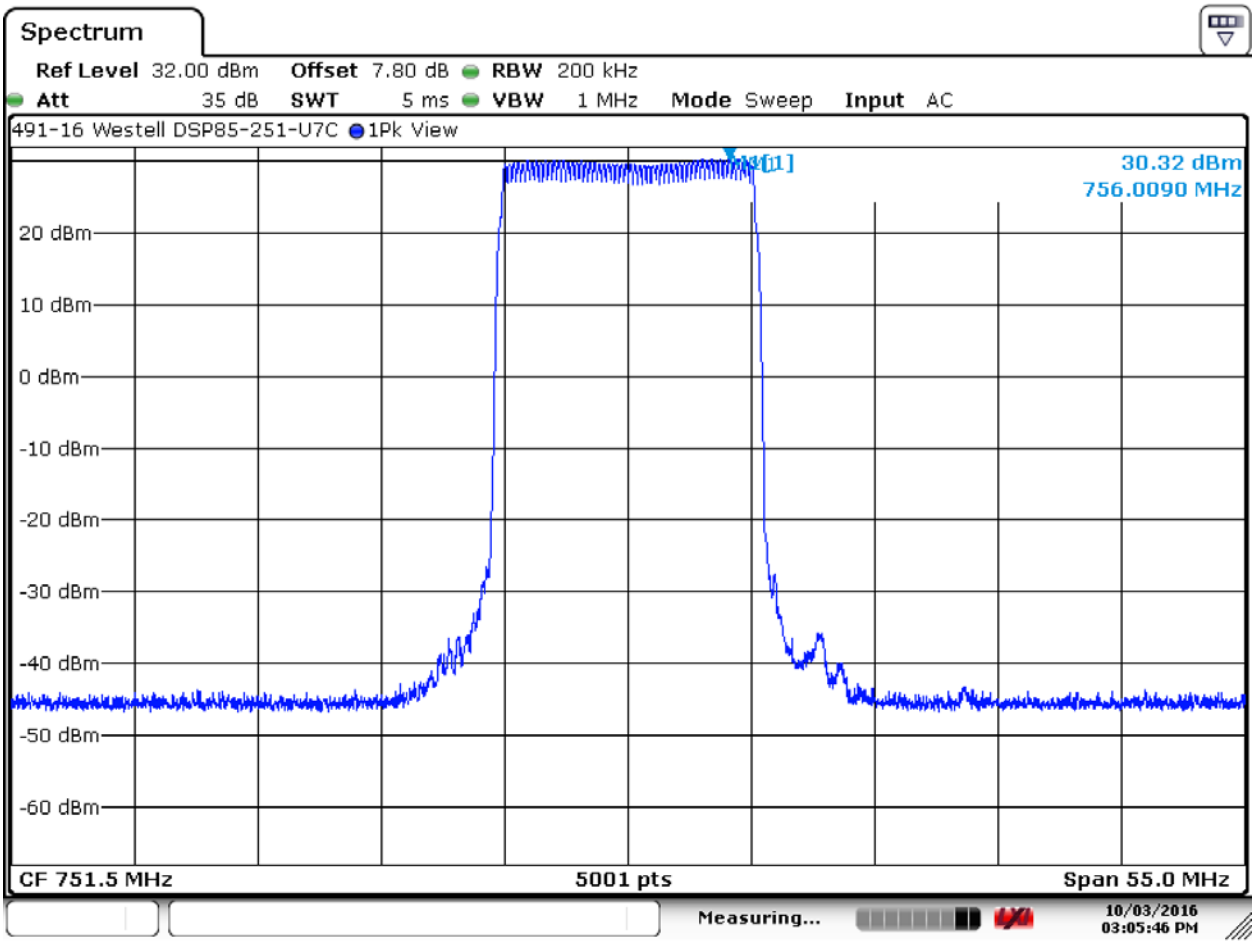
## 6. Measurement Data (continued)

### 6.6. Out of Band Rejection FCC KDB 935210

Requirement: Over a +/- 250 % span of the passband of the EUT measure the 20 dB bandwidth of the pass band of the EUT.

Test Method: KDB 935210 Section 3.3

6.6.1. 751.5 MHz Center Frequency, $f_0$ = 756.009 MHz




Date: 3.OCT.2016 15:05:45



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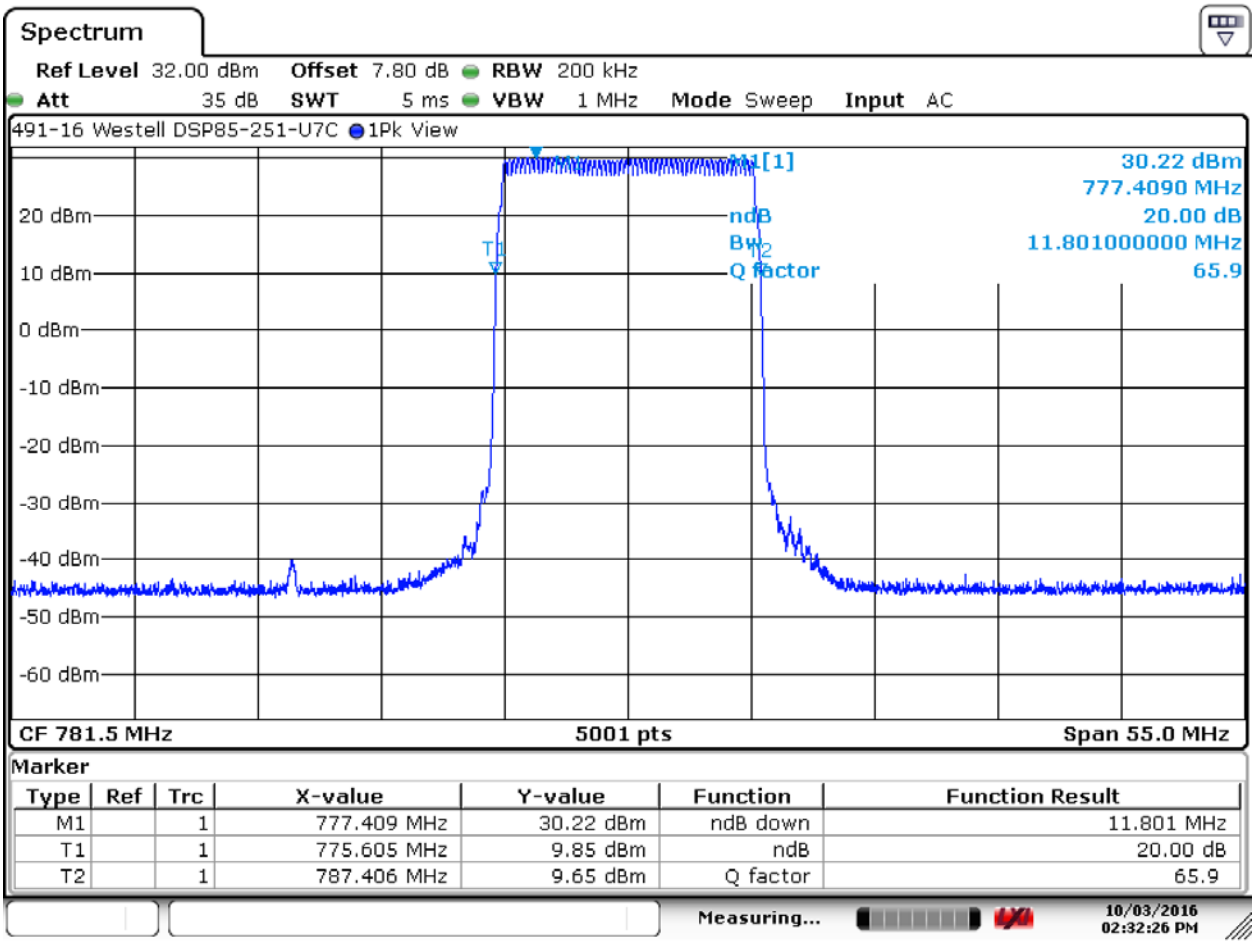
## 6. Measurement Data (continued)

### 6.6. Out of Band Rejection FCC KDB 935210 (continued)

6.6.2. 781.5 MHz, Center Frequency, $f_0$ = 777.409 MHz




Date: 3.OCT.2016 14:32:24



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## 6. Measurement Data (continued)

### 6.7. Public Exposure to Radio Frequency Energy Levels 1.1307 (b)(1), RSS-GEN, Issue 4 Section 3.2, RSS 102

| Center Frequency (MHz) | MPE Distance (cm) | DUT Output Power (dBm) | DUT Antenna Gain (dBi) | Power Density | | FCC Limit ($mW/cm^2$) | IC Limit ($W/m^2$) |
|---|---|---|---|---|---|---|---|
| | | | | ($mW/cm^2$) | ($W/m^2$) | | |
| | (1) | (2) | (3) | (4) | | (5) | (6) |
| 754.0 | 20.0 | 29.12 | 3.00 | 0.3241381 | 3.2413815 | 2.51 | 17.72 |
| 779.0 | 20.0 | 29.25 | 3.00 | 0.3339874 | 3.3398745 | 2.60 | 18.02 |

$$PD = \frac{OP + AG}{(4 \times \pi \times d^2)}$$

1. Reference CFR 2.1093(b): For purposes of this section, a portable device is defined as a transmitting device designed to be used so that the radiating structure(s) of the device is/are within 20 centimeters of the body of the user.
2. Section 6.1.2 of this test report. Note that the value has been adjusted to include the cable insertion loss.
3. Data supplied by the client for combination of cable loss and antenna gain.
4. Power density is calculated from field strength measurement and antenna gain.
5. Reference CFR 1.1310, Table 1: Limits for Maximum Permissible Exposure (MPE), Section (A): Limits for Occupational/Controlled Exposure.
6. Reference IC RSS-102 Section 4 Table 6 Controlled Use Devices (Controlled Environment) for equipment operating from 100 to 6000 MHz, the $W/m^2$ limit is determined by the formula 0.6455 * F (MHz) ^ 0.5



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## 7. Test Site Description

Compliance Worldwide is located at 357 Main Street in Sandown, New Hampshire. The test sites at Compliance Worldwide are used for conducted and radiated emissions testing in accordance with the Federal Communications Commission (FCC) and Industry Canada standards. Through our American Association for Laboratory Accreditation (A2LA) ISO Guide 17025:2005 Accreditation our test sites are designated with the FCC (designation number **US1091**), Industry Canada (file number **IC 3023A-1)** and VCCI (Member number 3168) under registration number A-0208.

Compliance Worldwide is also designated as a Phase 1 CAB under APEC-MRA (US0132) for Australia/New Zealand AS/NZS CISPR 22, Chinese-Taipei (Taiwan) BSMI CNS 13438 and Korea (RRA) KN 11, KN 13, KN 14-1, KN 22, KN 32, KN 61000-6-3, KN 61000-6-4.

The radiated emissions test site is a 3 and 10 meter enclosed open area test site (OATS). Personnel, support equipment and test equipment are located in the basement beneath the OATS ground plane.

The conducted emissions site is part of a 16' x 20' x 12' ferrite tile chamber and uses one of the walls for the vertical ground plane required by EN 55022. A second conducted emissions site is also located in the basement of the OATS site with a 2.3 x 2.5 meter ground plane and a 2.4 x 2.4 meter vertical wall.

Both sites are designed to test products or systems 1.5 meters W x 1.5 meters L x 2.0 meters H, floor standing or table top.



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# 8. Test Setup Photographs

## 8.1 Antenna Port Conducted Emissions

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## 8. Test Setup Photographs (cont)

### 8.2 Radiated Emissions (Front) 30 MHz to 1 GHz

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## 8. Test Setup Photographs (cont)

### 8.3 Radiated Emissions (Rear) 30 MHz to 1 GHz

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## 8. Test Setup Photographs (cont)

### 8.4 Radiated Emissions (Front) 1 to 18 GHz

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## 8. Test Setup Photographs (cont)

### 8.5 Radiated Emissions (Rear) 1 to 18 GHz

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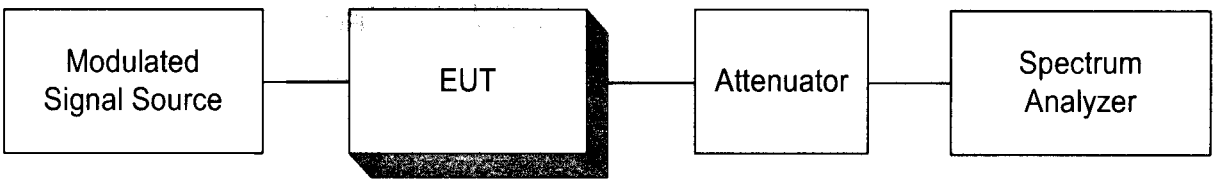
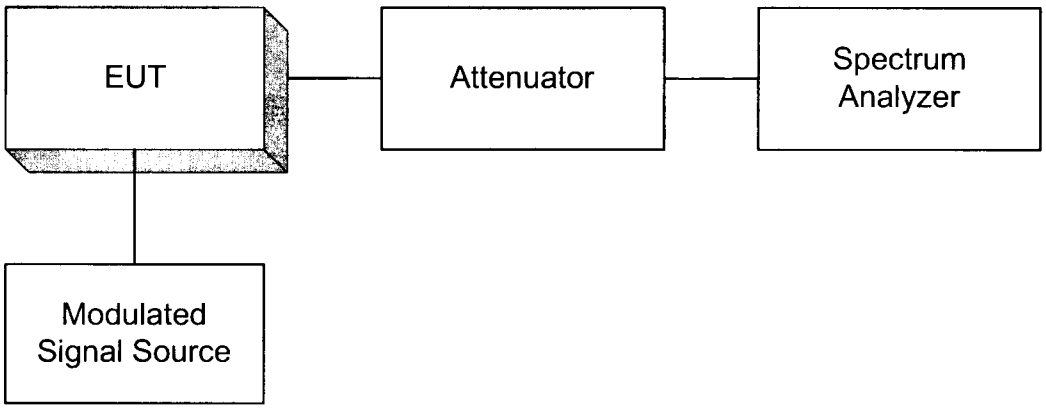
## Appendix A

### RF Output Power




### Occupied Bandwidth



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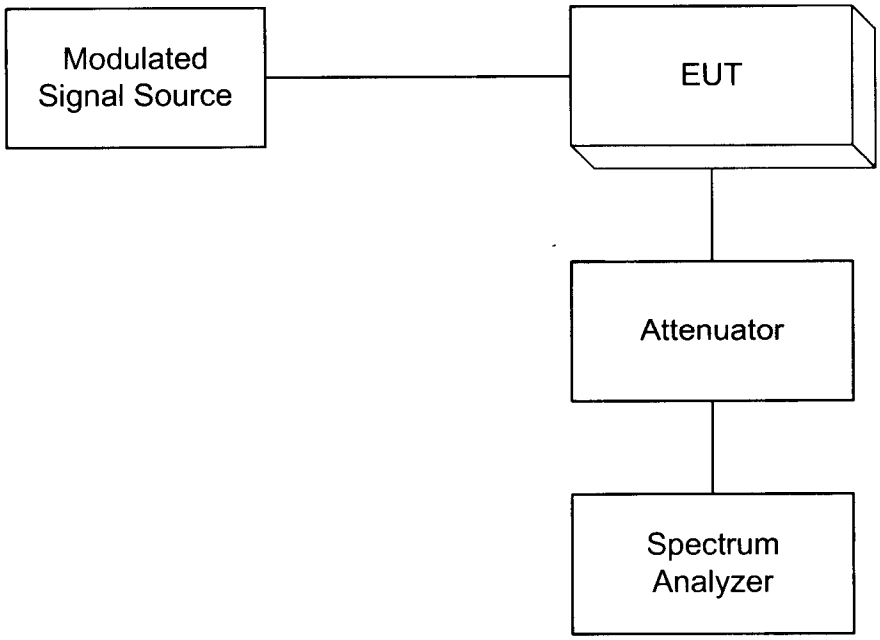
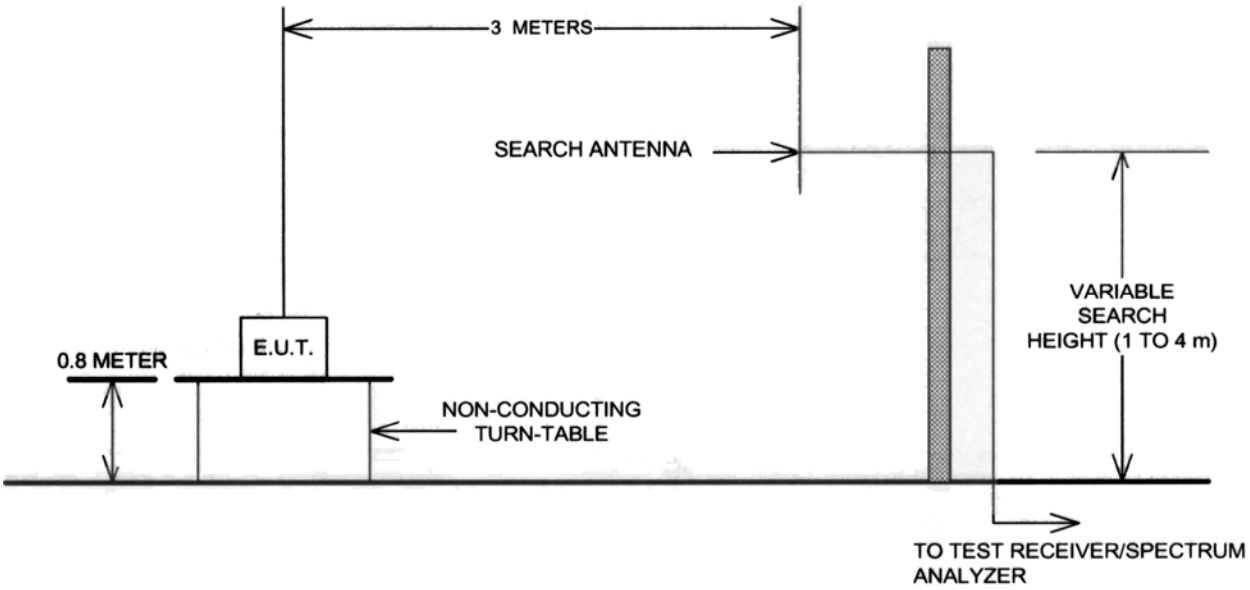
## Appendix A

### Spurious Emissions at the Antenna Terminals




### Field Strength of Spurious Radiation



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