

**COMPLIANCE WORLDWIDE INC.  
TEST REPORT 136-16R2**

In Accordance with the Requirements of  
**FCC PART 90:2015 Subpart R**  
**Operation in the 758 to 775 MHz and 788 to 805 MHz bands**  
**FCC PART 20:2015**

Issued to

**Westell, Inc.**  
**670 North Commercial Street**  
**Manchester, NH 03101**  
**(603) 626-6677**

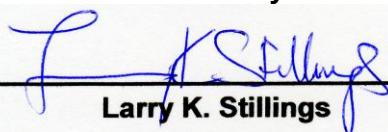
for

**Public Safety Repeater**  
**PS51080**


**FCC ID: NVRCSIPS51080PS78**

**Original Report Issued on April 12, 2016**  
**Revision R2 Issued on June 24, 2016**

Tested by

  
\_\_\_\_\_  
**Larry K. Stillings**

Reviewed By

  
\_\_\_\_\_  
**Brian F. Breault**

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## Table of Contents

1. Scope .....	3
2. Product Details .....	3
2.1. Manufacturer .....	3
2.2. Model Number .....	3
2.3. Serial Number .....	3
2.4. Description .....	3
2.5. Power Source .....	3
2.6. Software Version .....	3
2.7. EMC Modifications .....	3
3. Product Configuration .....	4
3.1. Support Equipment .....	4
3.2. Cables .....	4
3.3. Operational Characteristics & Software .....	5
3.4. Block Diagram .....	5
4. Measurement Parameters .....	6
4.1. Measurement Equipment Used to Perform Test .....	6
4.2. Measurement & Equipment Setup .....	6
4.3. Test Procedure .....	6
5. Measurement Summary .....	7
6. Measurement Data .....	8
6.1. Broadband Transmitting Power Limits 90.541, 90.542 .....	8
6.2. Bandwidth Limitations (FCC Part 2.1049) .....	28
6.3. Spurious Emissions at the Antenna Terminals 90.543 (c) .....	41
6.4. Field Strength of Spurious Emissions 90.543 (c) .....	57
6.5. Frequency Stability 90.539 .....	61
6.6. Out of Band Rejection .....	62
6.7. Noise Figure .....	64
6.8. Public Exposure to Radio Frequency Energy Levels 1.1307 (b)(1) .....	66
7. Test Site Description .....	67
8. Test Setup Photographs .....	68
Appendix A .....	70

## 1. Scope

This test report certifies that the Westell Public Safety Repeater Model PS51080, as tested, meets the FCC Part 90 Subpart R 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. Revision R1 adds noise figure measurements of the uplink and downlink bands in new section 6.7 of the test report. Revision R2 updates the test report for narrowband operation in the bands of 769 to 775 MHz and 799 to 805 MHz.

## 2. Product Details

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

**2.2. Model Numbers:** PS51080

**2.3. Serial Number:** 15100001

**2.4. Description:** The PS51080 repeater was developed for use in enclosed structures where signals from local public safety towers to operate mobile units is poor or unavailable. Adequate signal strength must be available outside the structure as a prerequisite to achieving in-building coverage. The device is connected to an external antenna, normally located on a roof, and to one or more internal antennas placed strategically throughout the area where wireless service is desired.

**2.5. Power Source:** 120 VAC, 60 Hz

**2.6. Software Version:** 1.0

**2.7. EMC Modifications:** None

### 3. Product Configuration

#### 3.1. Support Equipment

Device	Manufacturer	Model	Serial No.	Comment
RF Signal Generator	R & S	SMIQ06B	10090	Generating W-CDMA
IQ Modulation Generator	R & S	AMIQ04	100540	Generating AWS Signals
Power Supply	APX Technologies	SP130P966ER	n/a	
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
Ethernet	2M	No	DUT	Notebook PC

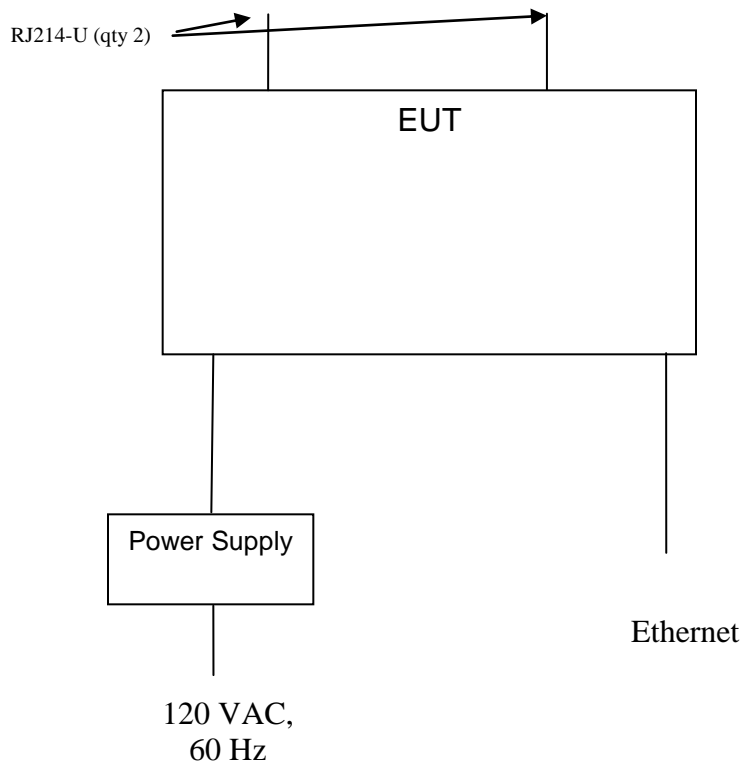
Notebook PC is connected only during setup and configuration

### 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 a wideband 1.25 MHz CDMA digital modulation to the input of the amplifier across the public safety 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



#### 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 <sup>1</sup>	Rohde & Schwarz	ESR7	101156	7/23/2017	2 Years
Spectrum Analyzer 20 Hz – 40 GHz <sup>2</sup>	Rohde & Schwarz	FSV40	100899	7/23/2017	2 Years
Spectrum Analyzer, 9 kHz to 40 GHz <sup>3</sup>	Rohde & Schwarz	FSVR40	100909	7/23/2017	2 Years
EMI Receiver, 9 kHz to 6.5 GHz	Hewlett Packard	8546A	3650A00360	6/4/2016	2 Years
Biconilog Antenna, 30 MHz to 2 GHz	Sunol Sciences Corp	JB1	25509	5/15/2016	3 Years
Horn Antenna, 960 MHz – 18 GHz	Electro-Metrics	RGA-50 / 60	2813	7/15/2016	2 Years
Preamplifier, 1 GHz to 26.5 GHz	Hewlett Packard	8449B	3008A01323	7/21/2017	2 Years
Noise Source 10 MHz to 6 GHz	Micronetics	NS346B	17883	10/15/2016	1 Year
Digital Barometer	Control Company	4195	ID236	10/8/2017	2 Years

<sup>1</sup> ESR7 Firmware revision: V2.26, Date installed: 8/15/2014 Previous V2.17, installed 6/11/2014.  
<sup>2</sup> FSV40 Firmware revision: V2.30 SP1 Date installed: 10/22/2014 Previous V2.30, installed 7/23/2014.  
<sup>3</sup> FSVR40 Firmware revision: V2.23, Date installed: 10/20/2014 Previous V1.63 SP1, installed 8/28/2013.

##### 4.2. Measurement & Equipment Setup

Test Dates: 1/18/2016, 1/20/2016,  
 1/25/2016, 2/1/2016,  
 5/12/2016, 6/24/2016

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 90.219 & Subpart R.

The test methods used to generate the data in this test report are in accordance 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, FCC OET KDB 935210 D05 Indus Booster Basic Meas v01 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 TIA-603-C:2004 Land Mobile FM or PM Communications Equipment Measurement and Performance Standard.

**5. Measurement Summary**

Section Description or Test Requirement	FCC Part 90 Reference	Test Report Section	Result	Comment
Broadband Transmitting Power Limits	90.219(e)(1) 90.541 90.542	6.1	Compliant	
Occupied Bandwidth	90.219(e)(4)(ii) Part 2.1049	6.2	Compliant	
Spurious Emissions at Antenna Terminals	90.219(e)(3) 90.543	6.3	Compliant	
Field Strength of Spurious Emissions	90.219(e)(3) 90.543	6.4	Compliant	
Frequency Stability	90.539	6.5	N/A	The EUT does not translate the frequency of the input signal
Out of Band Rejection	N/A	6.6	Compliant	
Noise Figure	90.219(e)(2)	6.7	Compliant	
Public Exposure to Radio Frequency Energy Levels	Section 1.1307 (b)(1)	6.8	Compliant	

**6. Measurement Data**

**6.1. Broadband Transmitting Power Limits 90.219(e)(1), 90.541, 90.542**

Requirement: The transmitter output power of mobile and control transmitters operating in the 758 to 768 MHz, 769 to 775 MHz, 788 to 798 MHz and 799 to 805 MHz bands must not exceed 30 Watts.

The output power capability of a signal booster must be designed for deployments providing a radiated power not exceeding 5 Watts ERP for each retransmitted channel.

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	759	27.67	0.585
Output Power	766.5	28.89	0.774
Output Power	774	27.66	0.583
Output Power	789	25.66	0.368
Output Power	796.5	27.20	0.525
Output Power	804	27.81	0.604
3 dB Above AGC	759	30.45	1.109
3 dB Above AGC	766.5	31.75	1.496
3 dB Above AGC	774	30.38	1.091
3 dB Above AGC	789	28.23	0.665
3 dB Above AGC	796.5	29.69	0.931
3 dB Above AGC	804	30.30	1.072
Input Power	759	-51.74	N/A
Input Power	766.5	-51.67	N/A
Input Power	774	-51.81	N/A
Input Power	789	-53.59	N/A
Input Power	796.5	-53.61	N/A
Input Power	804	-53.74	N/A

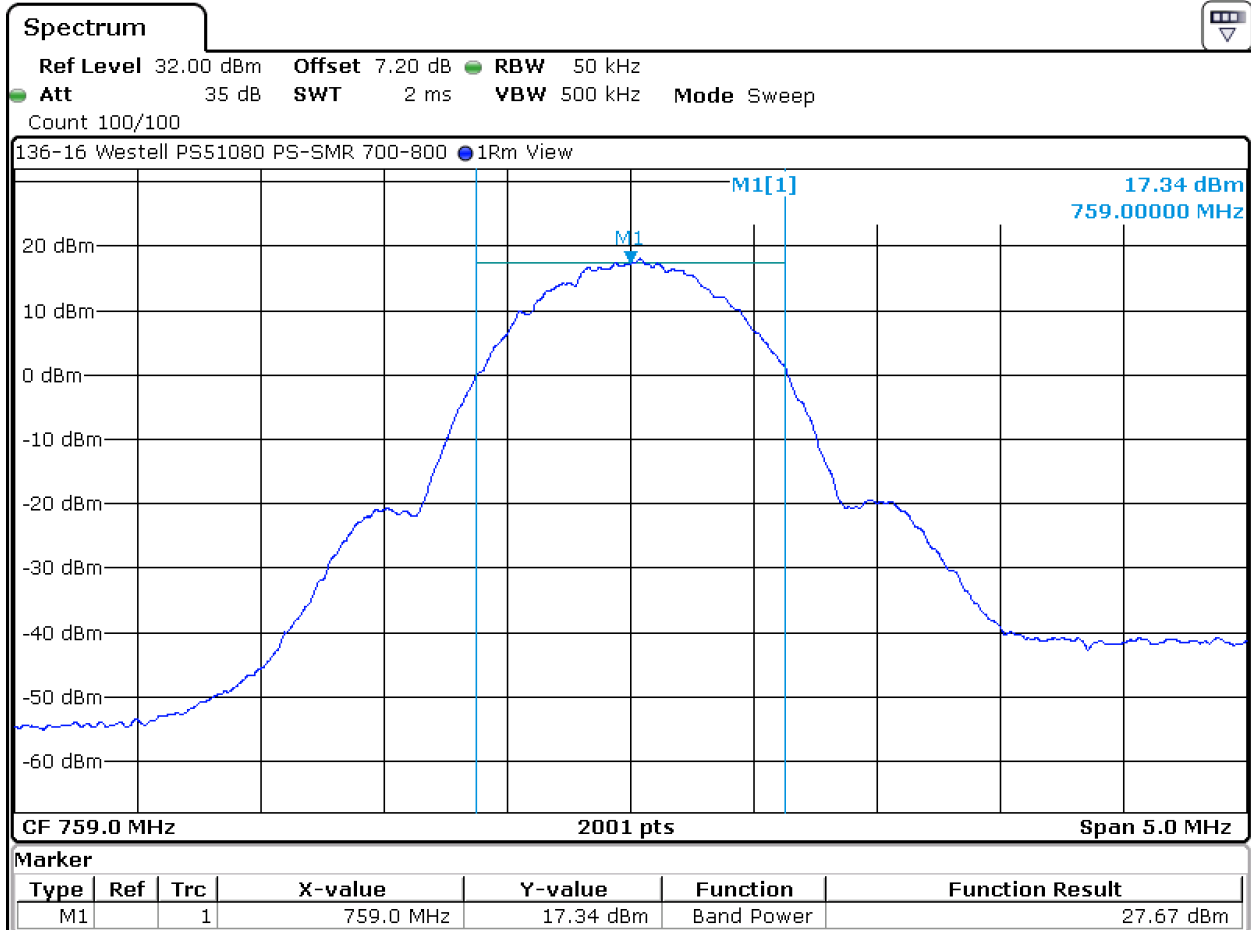
**Note: Input Power is at the 1 dB AGC threshold Level**



6. Measurement Data

6.1. Broadband Transmitting Power Limits 90.219(e)(1), 90.541, 90.542 (cont)

6.1.2. Mean Transmitter Output Power, 759 MHz

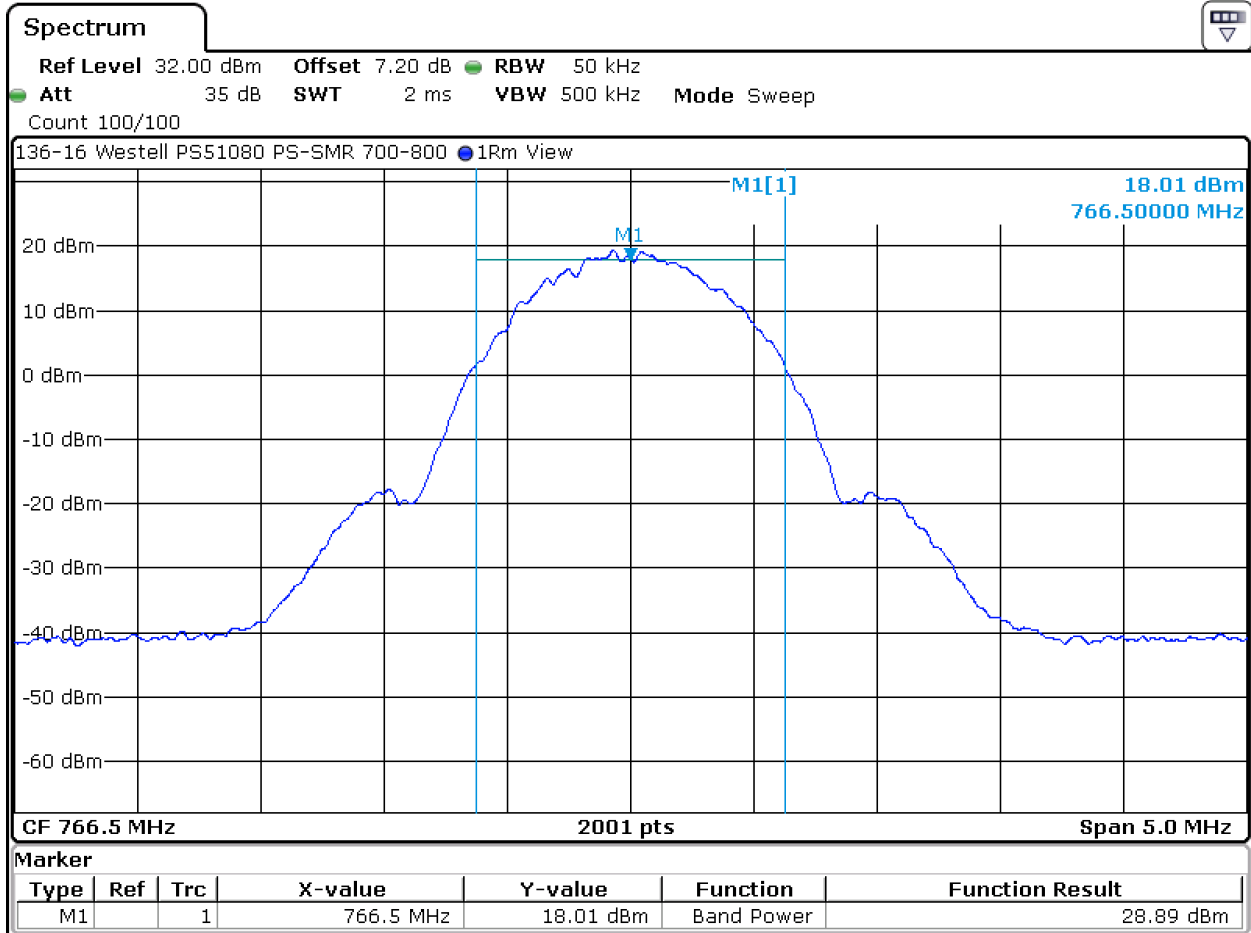


Date: 20.JAN.2016 14:46:36

6. Measurement Data

6.1. Broadband Transmitting Power Limits 90.219(e)(1), 90.541, 90.542 (cont)

6.1.3. Mean Transmitter Output Power, 766.5 MHz

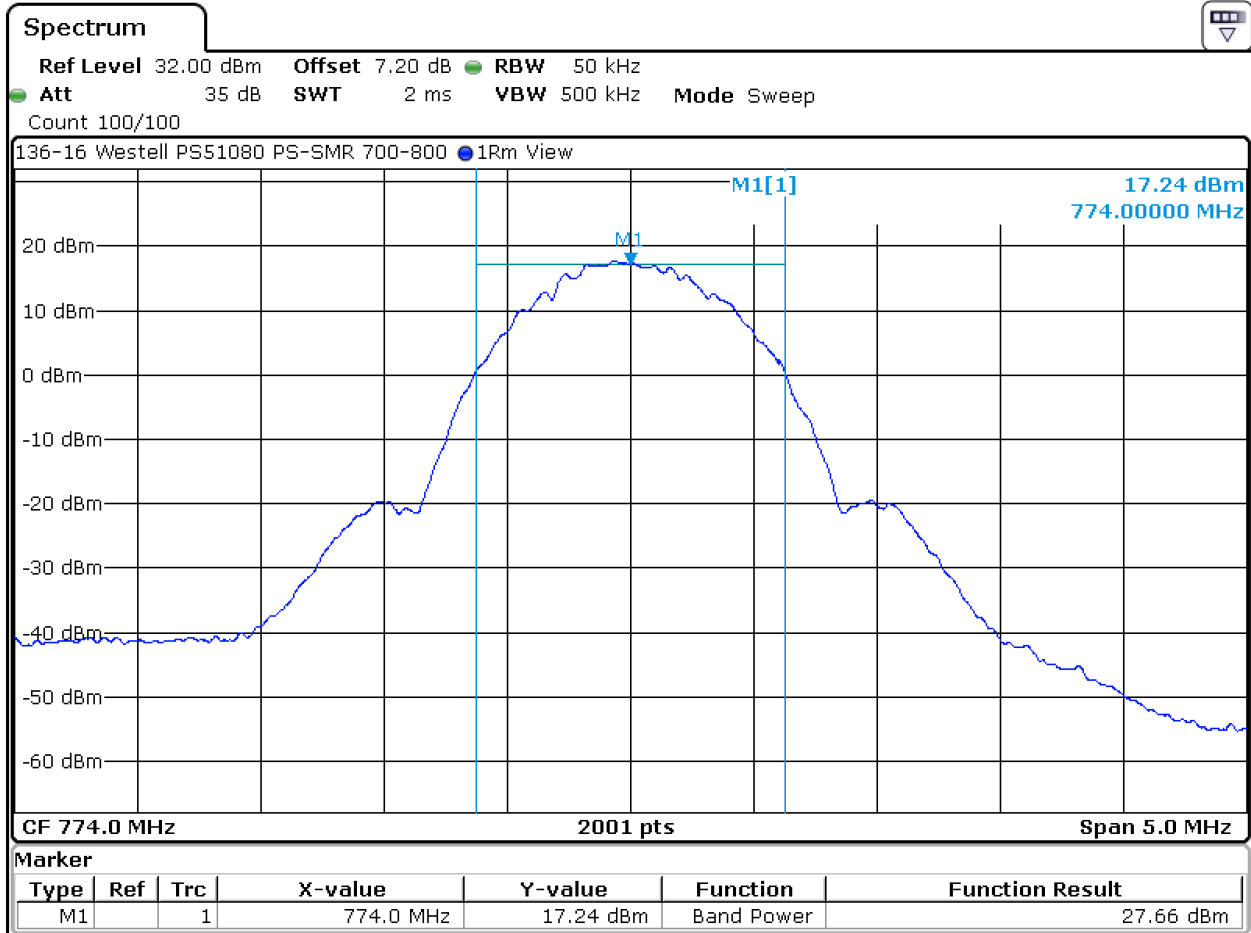


Date: 20.JAN.2016 14:45:36

6. Measurement Data

6.1. Broadband Transmitting Power Limits 90.219(e)(1), 90.541, 90.542 (cont)

6.1.4. Mean Transmitter Output Power, 774 MHz

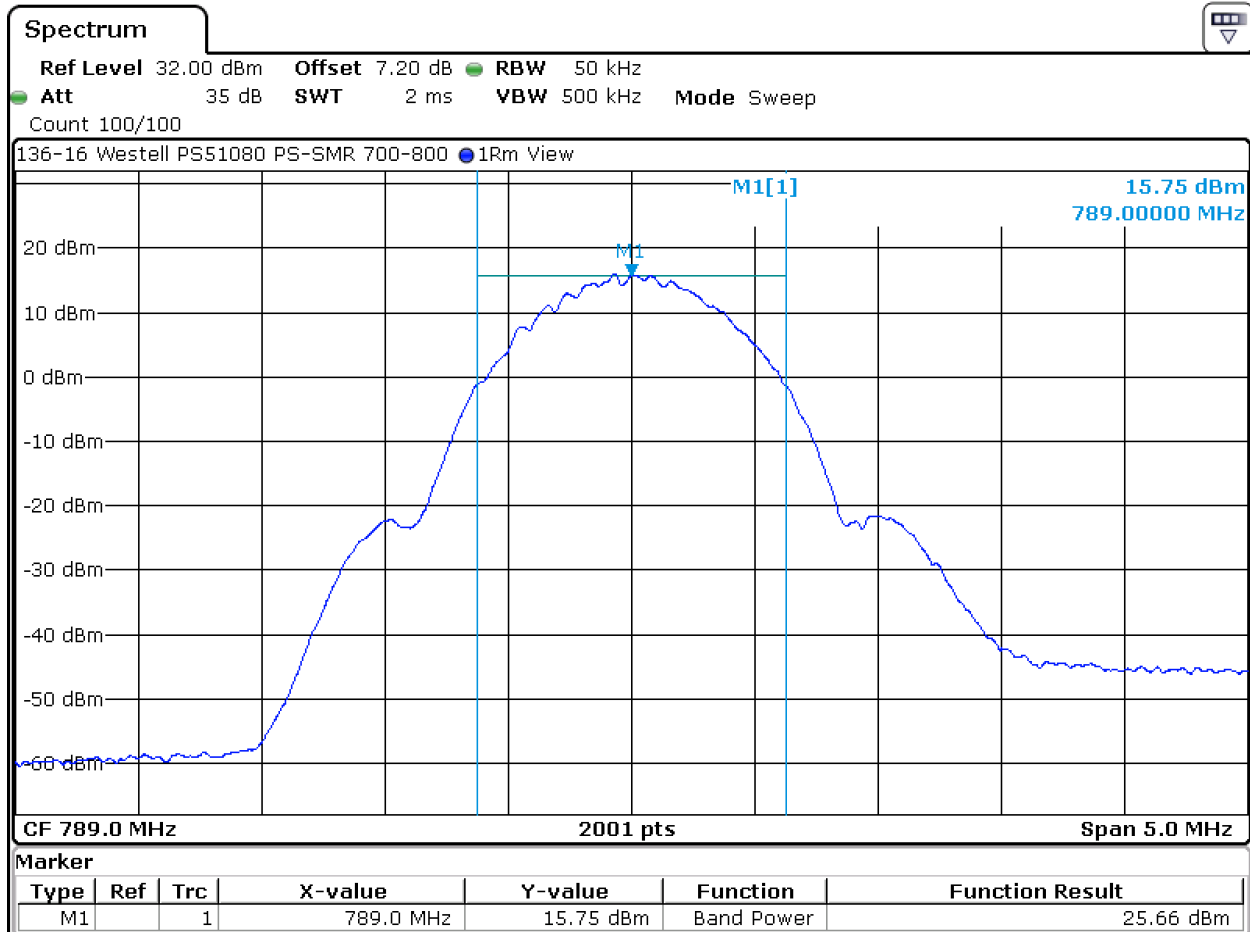


Date: 20.JAN.2016 14:47:44

6. Measurement Data

6.1. Broadband Transmitting Power Limits 90.219(e)(1), 90.541, 90.542 (cont)

6.1.5. Mean Transmitter Output Power, 789 MHz

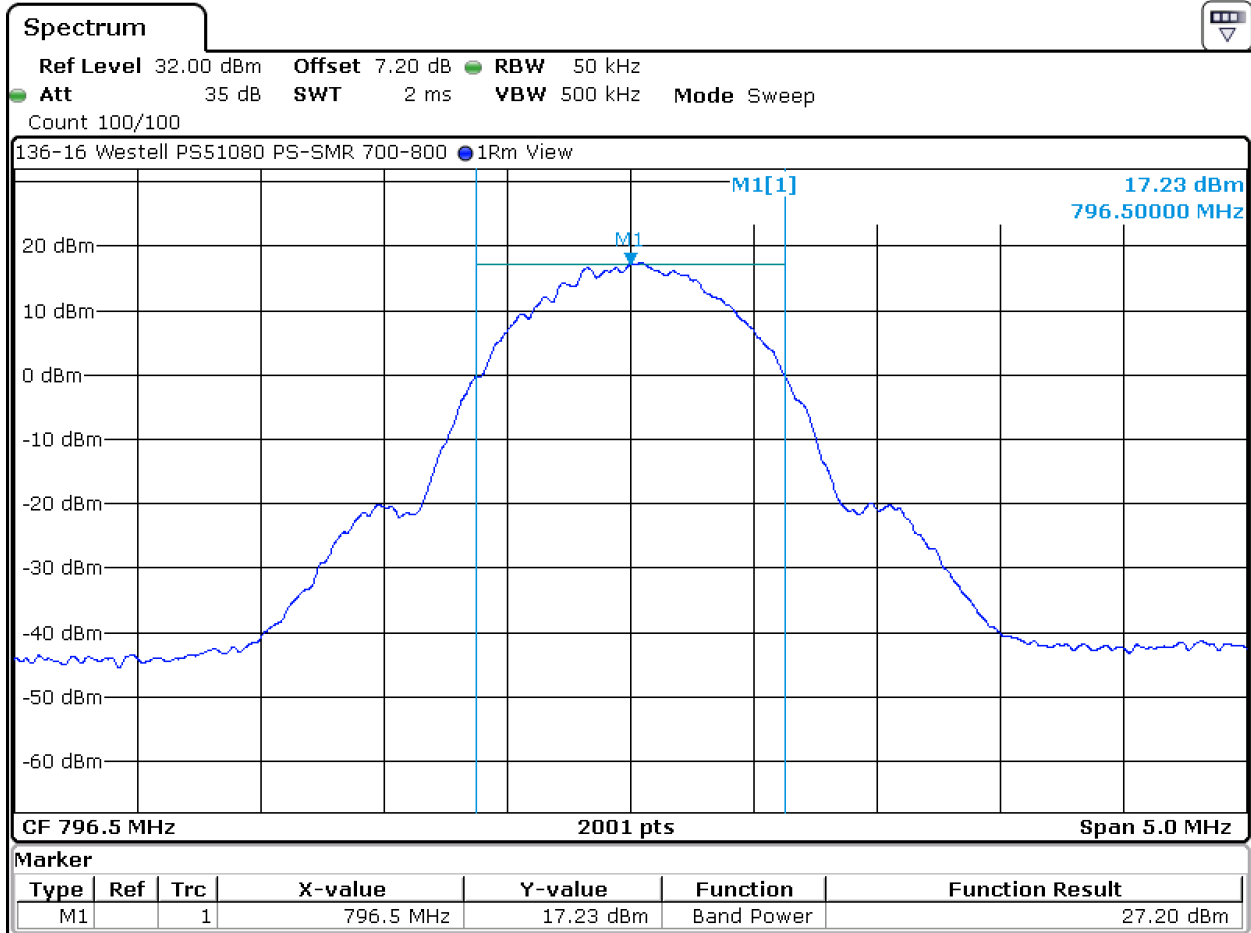


Date: 25.JAN.2016 14:23:38

6. Measurement Data

6.1. Broadband Transmitting Power Limits 90.219(e)(1), 90.541, 90.542 (cont)

6.1.6. Mean Transmitter Output Power, 796.5 MHz

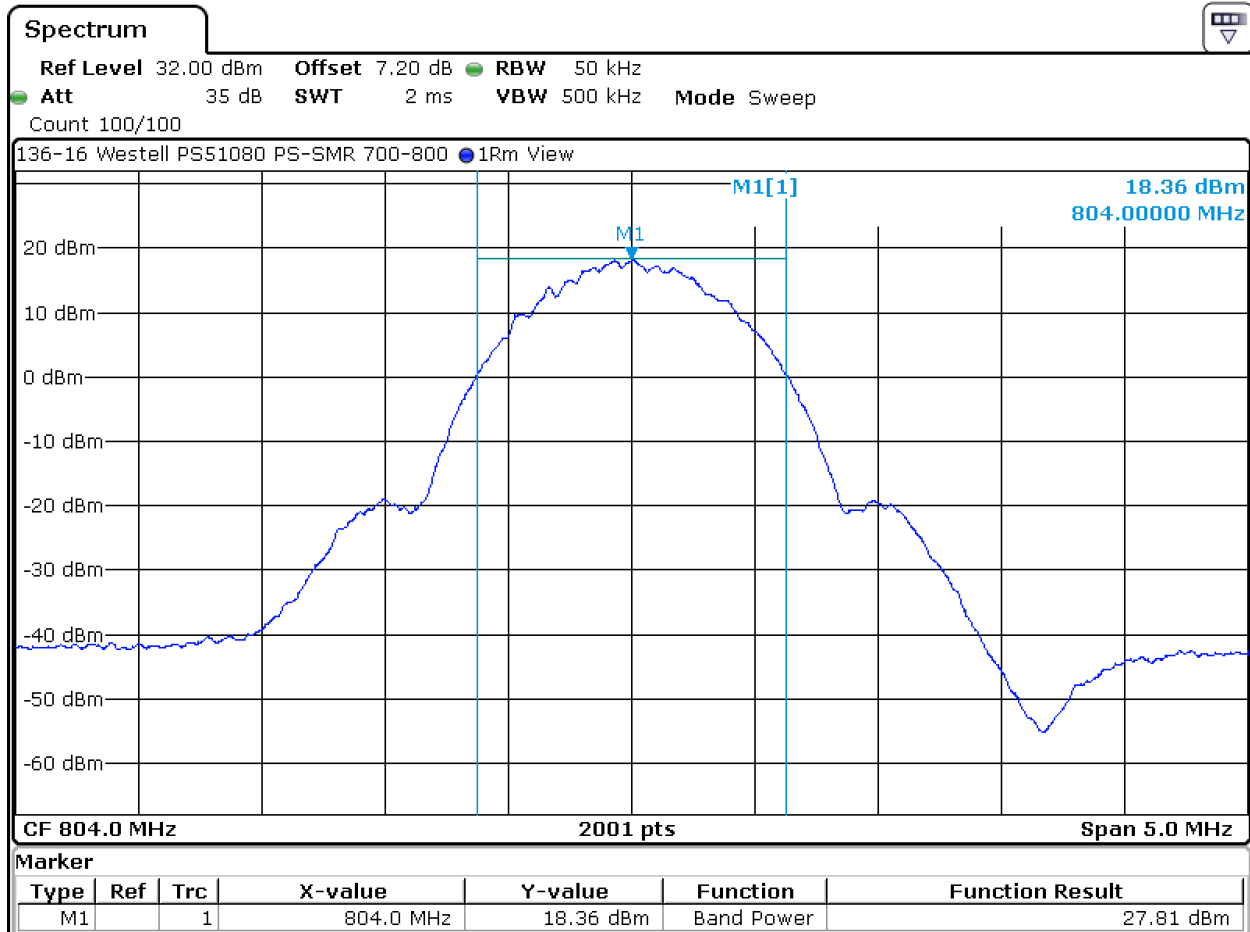


Date: 25.JAN.2016 14:22:09

6. Measurement Data

6.1. Broadband Transmitting Power Limits 90.219(e)(1), 90.541, 90.542 (cont)

6.1.7. Mean Transmitter Output Power, 804 MHz

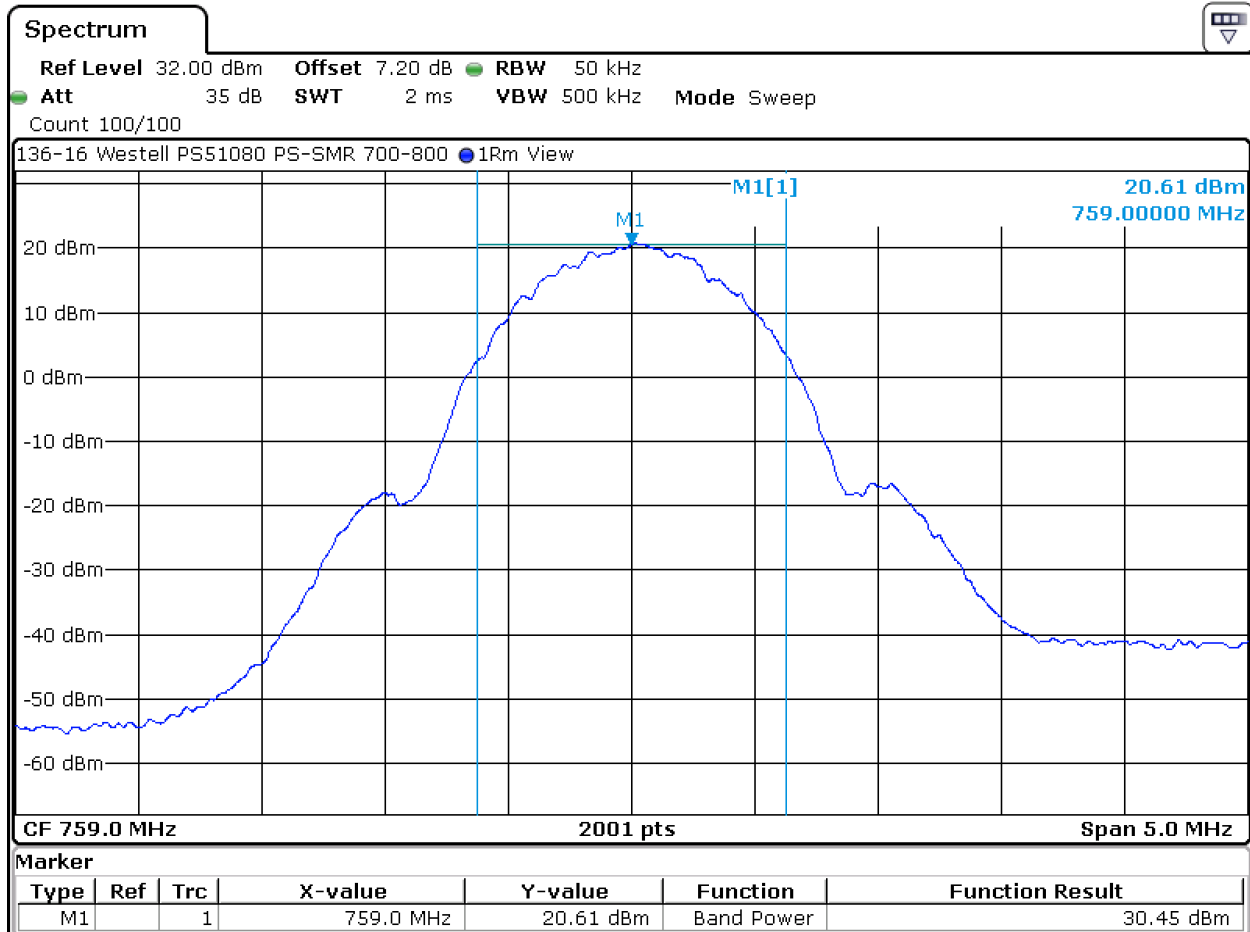


Date: 25.JAN.2016 14:24:46

6. Measurement Data

6.1. Broadband Transmitting Power Limits 90.219(e)(1), 90.541, 90.542 (cont)

6.1.8. Mean Transmitter Output Power, 759 MHz – 3 dB Increase to Input

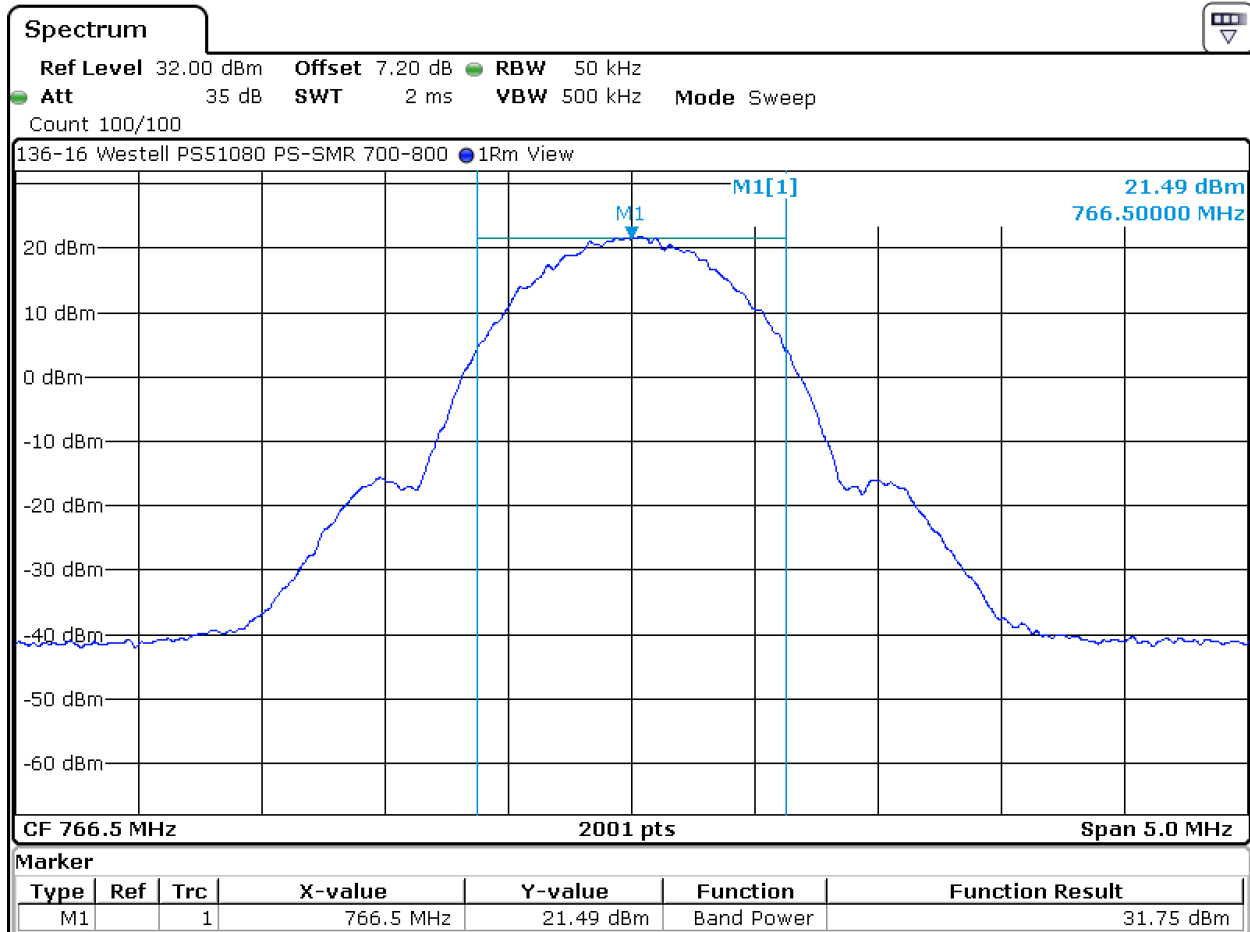


Date: 20.JAN.2016 14:51:15

6. Measurement Data

6.1. Broadband Transmitting Power Limits 90.219(e)(1), 90.541, 90.542 (cont)

6.1.9. Mean Transmitter Output Power, 766.5 MHz – 3 dB Increase to Input



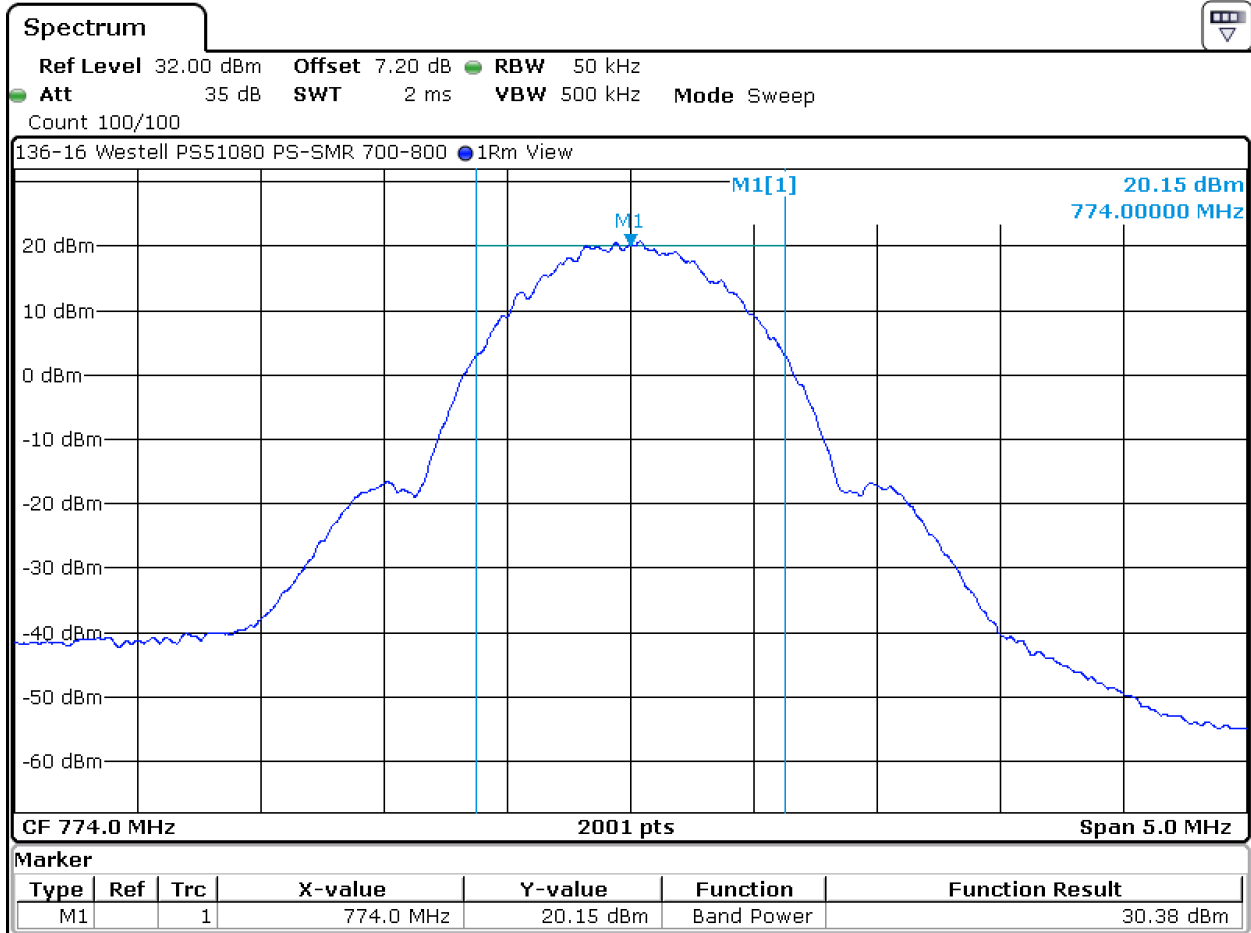
Date: 20.JAN.2016 14:50:13



6. Measurement Data

6.1. Broadband Transmitting Power Limits 90.219(e)(1), 90.541, 90.542 cont.

6.1.10. Mean Transmitter Output Power, 774 MHz – 3 dB Increase to Input

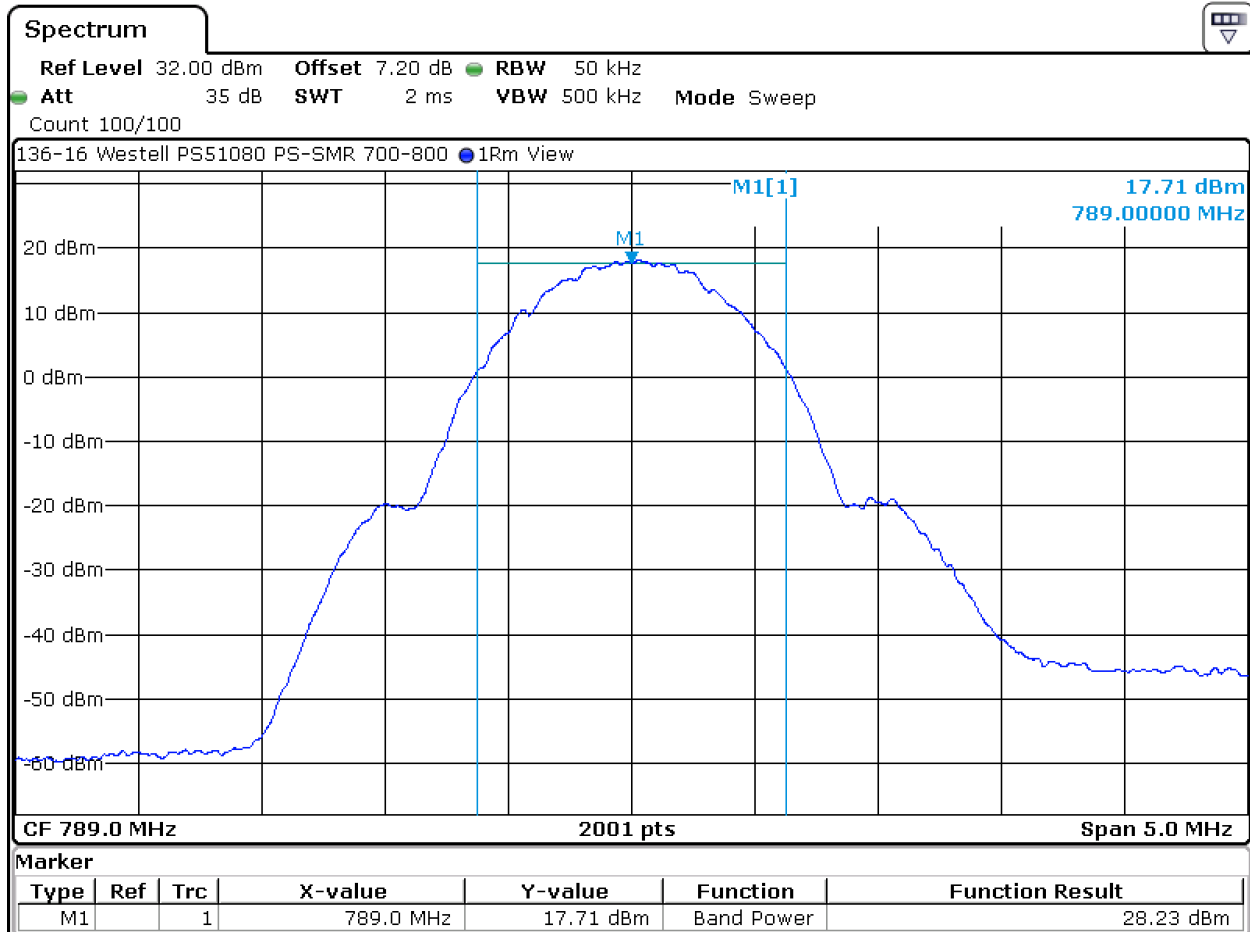


Date: 20.JAN.2016 14:49:01

6. Measurement Data

6.1. Broadband Transmitting Power Limits 90.219(e)(1), 90.541, 90.542 cont.

6.1.11. Mean Transmitter Output Power, 789 MHz – 3 dB Increase to Input

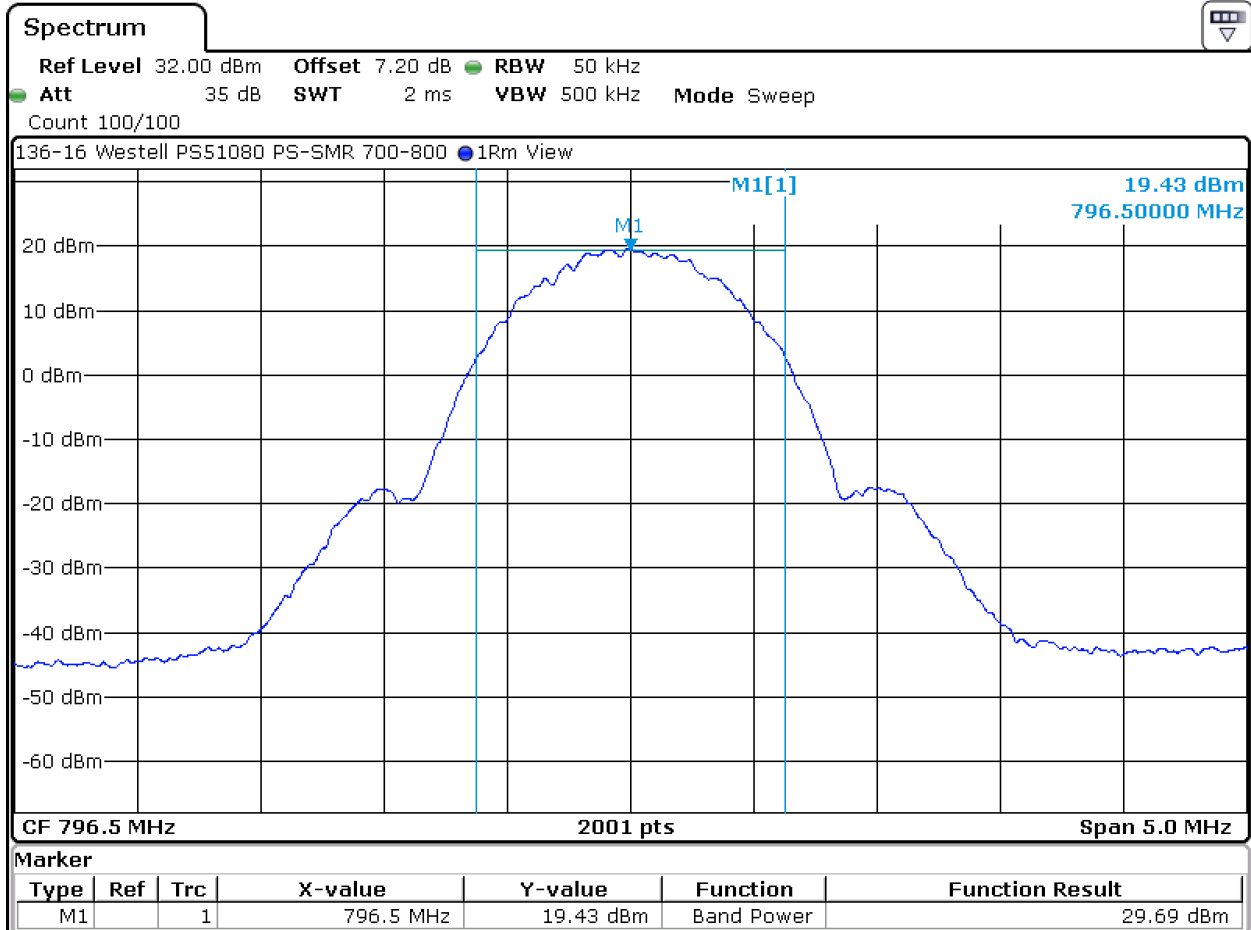


Date: 25.JAN.2016 14:27:57

6. Measurement Data

6.1. Broadband Transmitting Power Limits 90.219(e)(1), 90.541, 90.542 (cont)

6.1.12. Mean Transmitter Output Power, 796.5 MHz – 3 dB Increase to Input

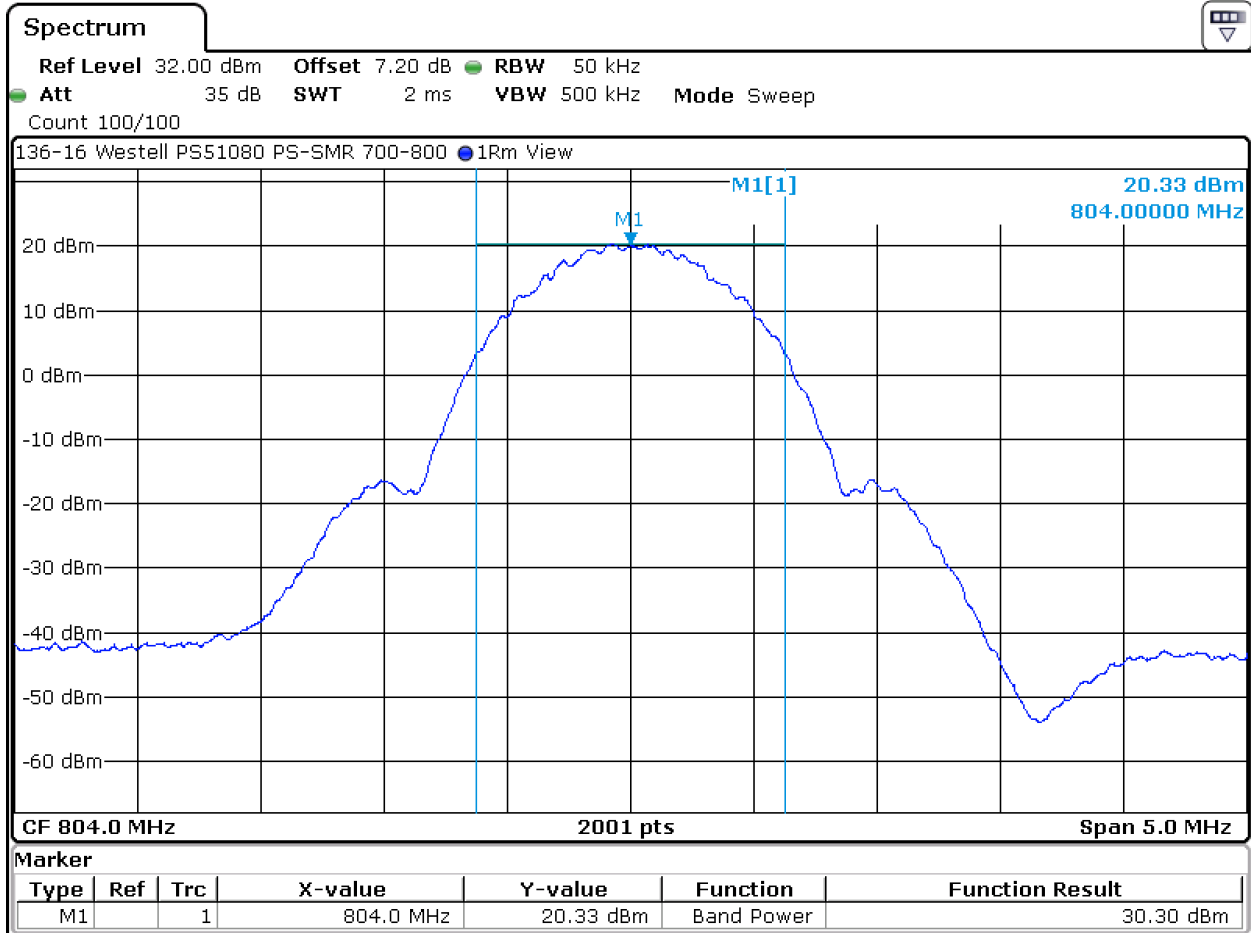


Date: 25.JAN.2016 14:27:07

6. Measurement Data

6.1. Broadband Transmitting Power Limits 90.219(e)(1), 90.541, 90.542 (cont)

6.1.13. Mean Transmitter Output Power, 804 MHz – 3 dB Increase to Input

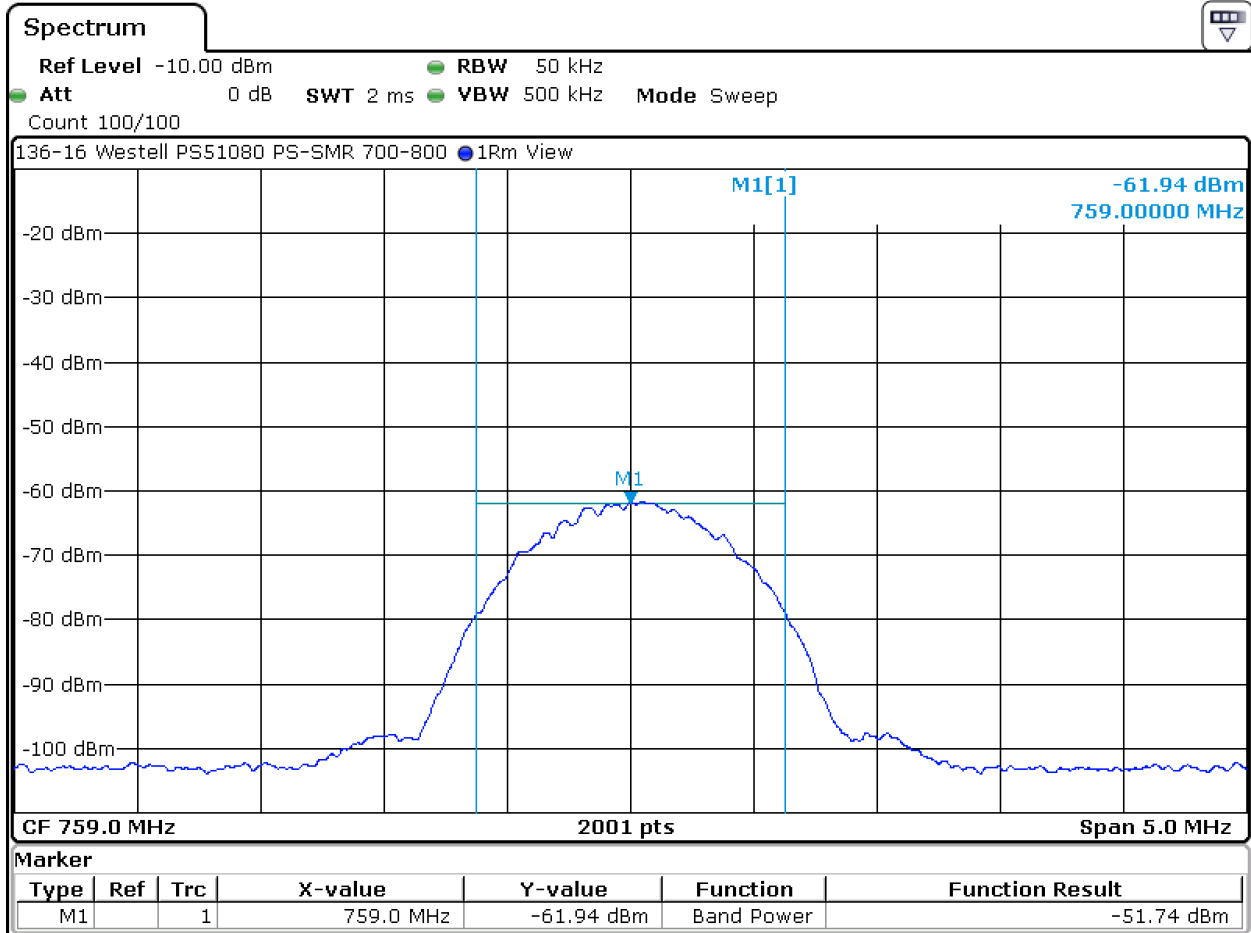


Date: 25.JAN.2016 14:26:13

6. Measurement Data

6.1. Broadband Transmitting Power Limits 90.219(e)(1), 90.541, 90.542 (cont)

6.1.14. Mean Transmitter Output Power, 759 MHz – Input Power

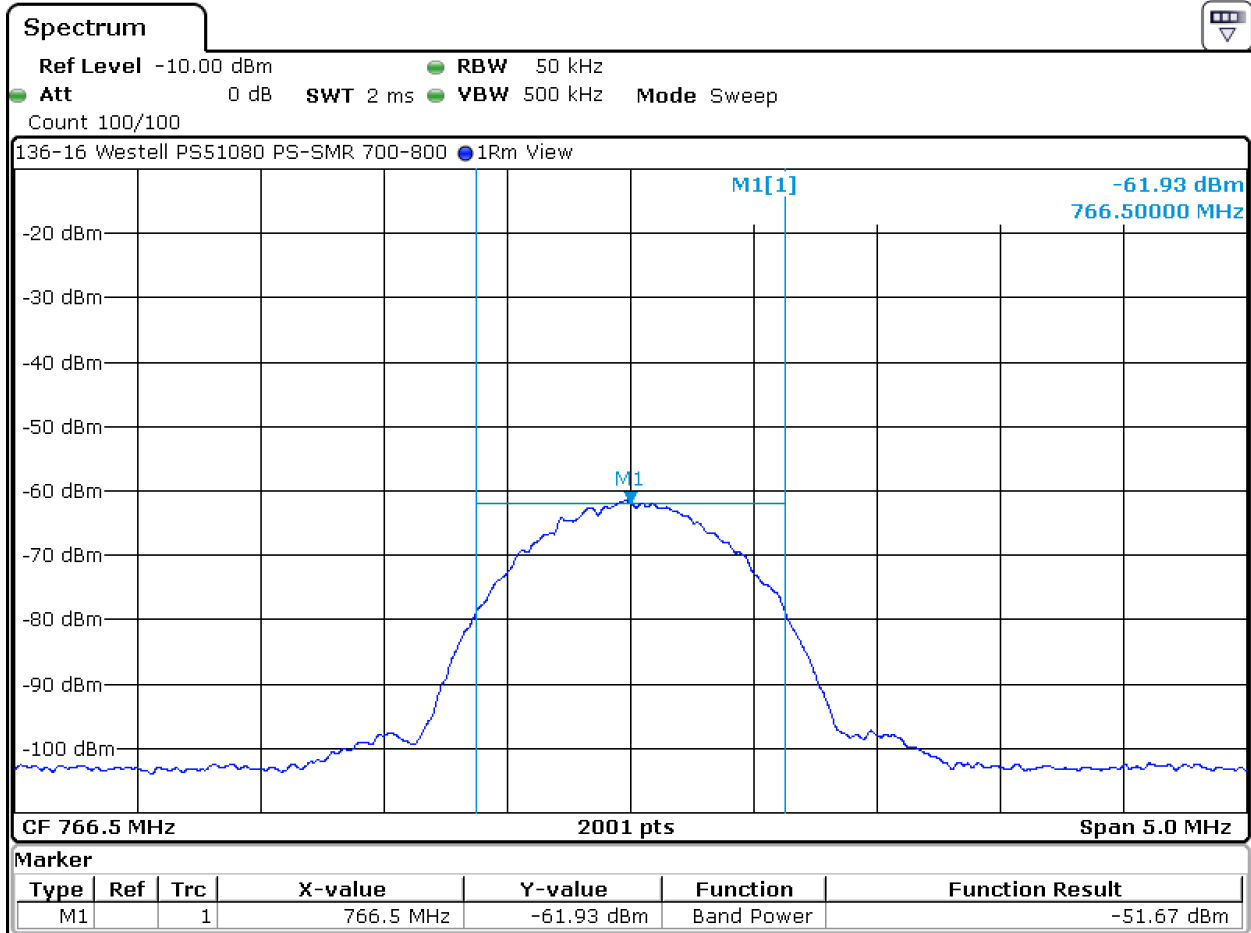


Date: 20.JAN.2016 15:18:48

6. Measurement Data

6.1. Broadband Transmitting Power Limits 90.219(e)(1), 90.541, 90.542 (cont)

6.1.15. Mean Transmitter Output Power, 766.5 MHz – Input Power

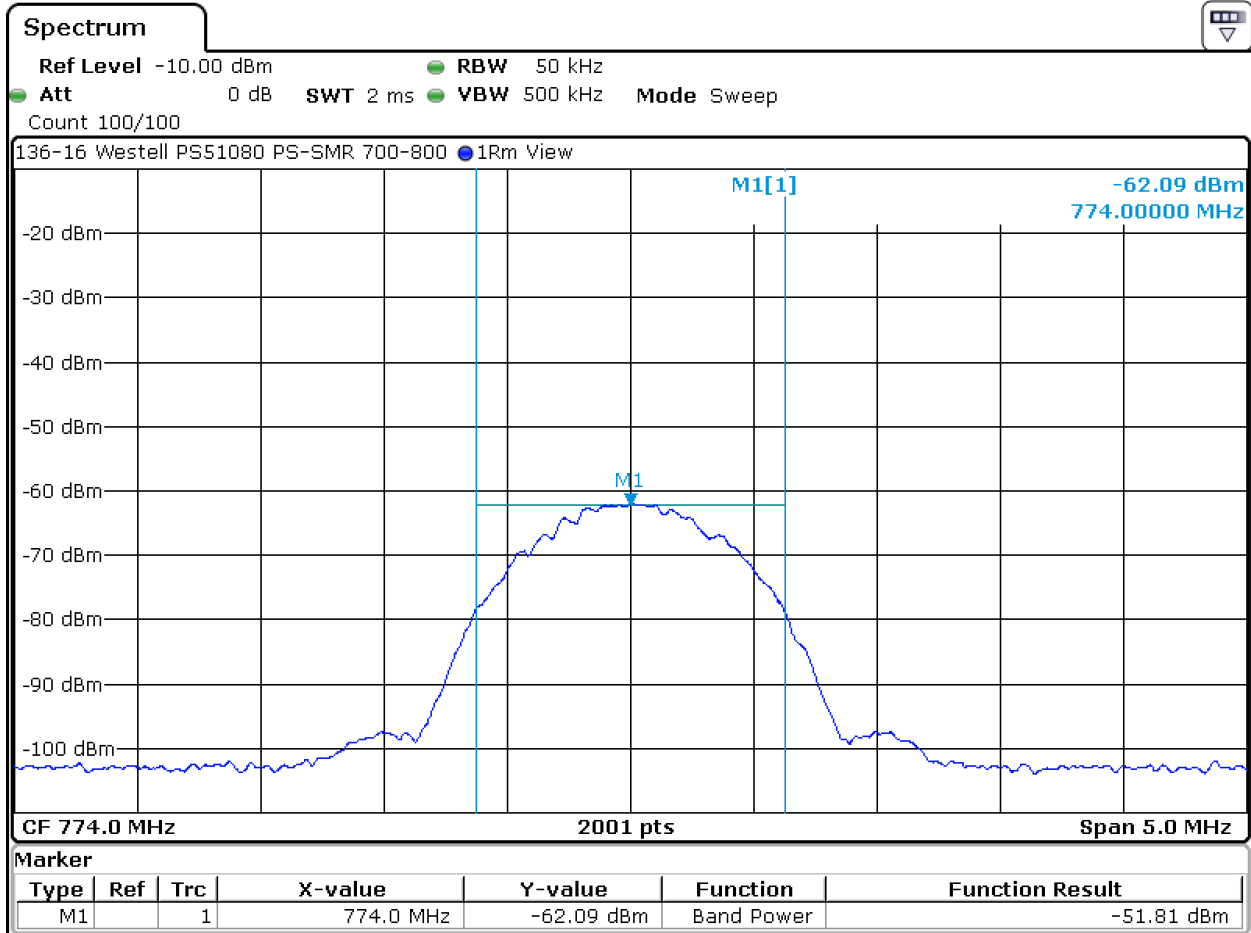


Date: 20.JAN.2016 15:19:57

6. Measurement Data

6.1. Broadband Transmitting Power Limits 90.219(e)(1), 90.541, 90.542 (cont)

6.1.16. Mean Transmitter Output Power, 774 MHz – Input Power

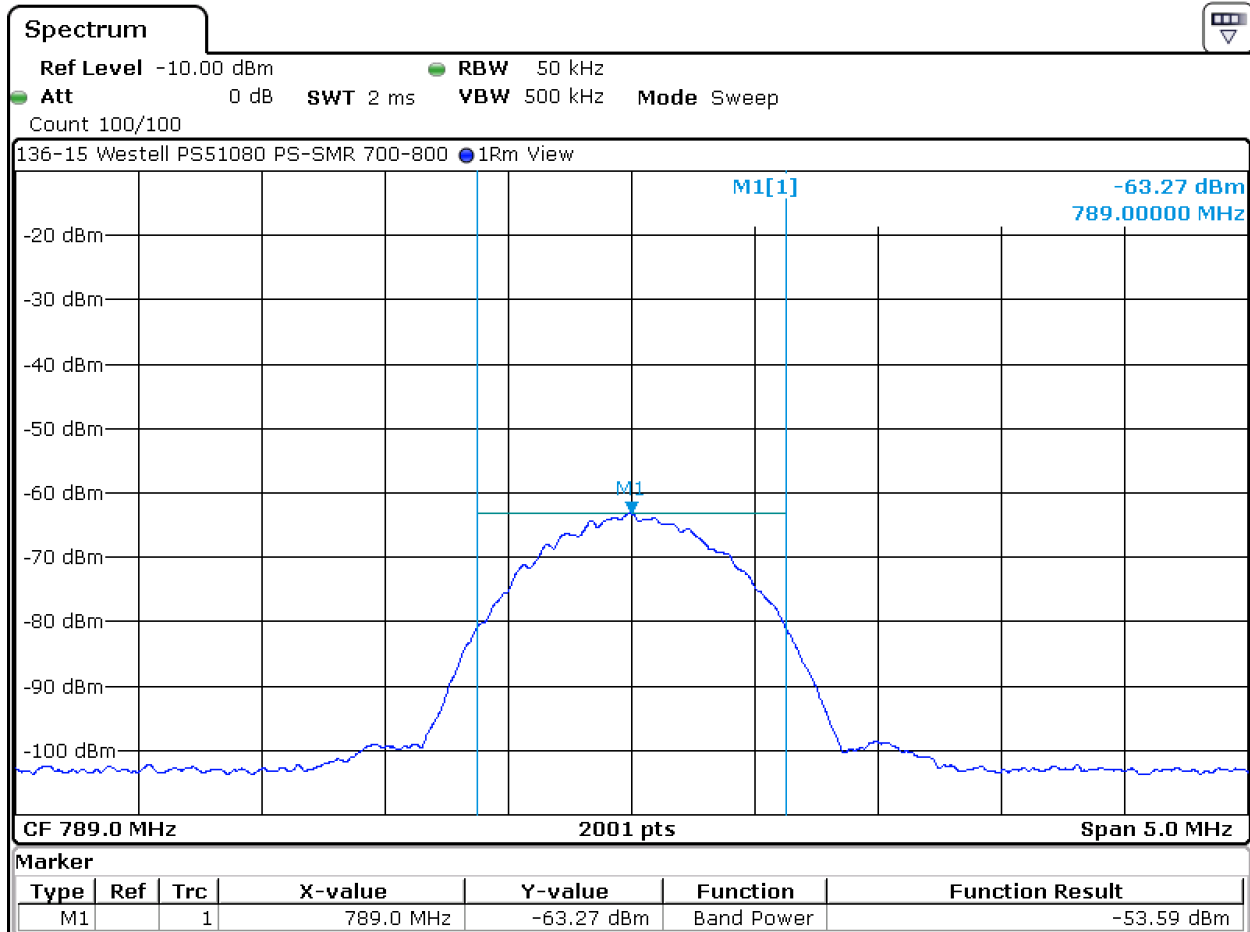


Date: 20.JAN.2016 15:21:09

6. Measurement Data

6.1. Broadband Transmitting Power Limits 90.219(e)(1), 90.541, 90.542 (cont)

6.1.17. Mean Transmitter Output Power, 789 MHz – Input Power



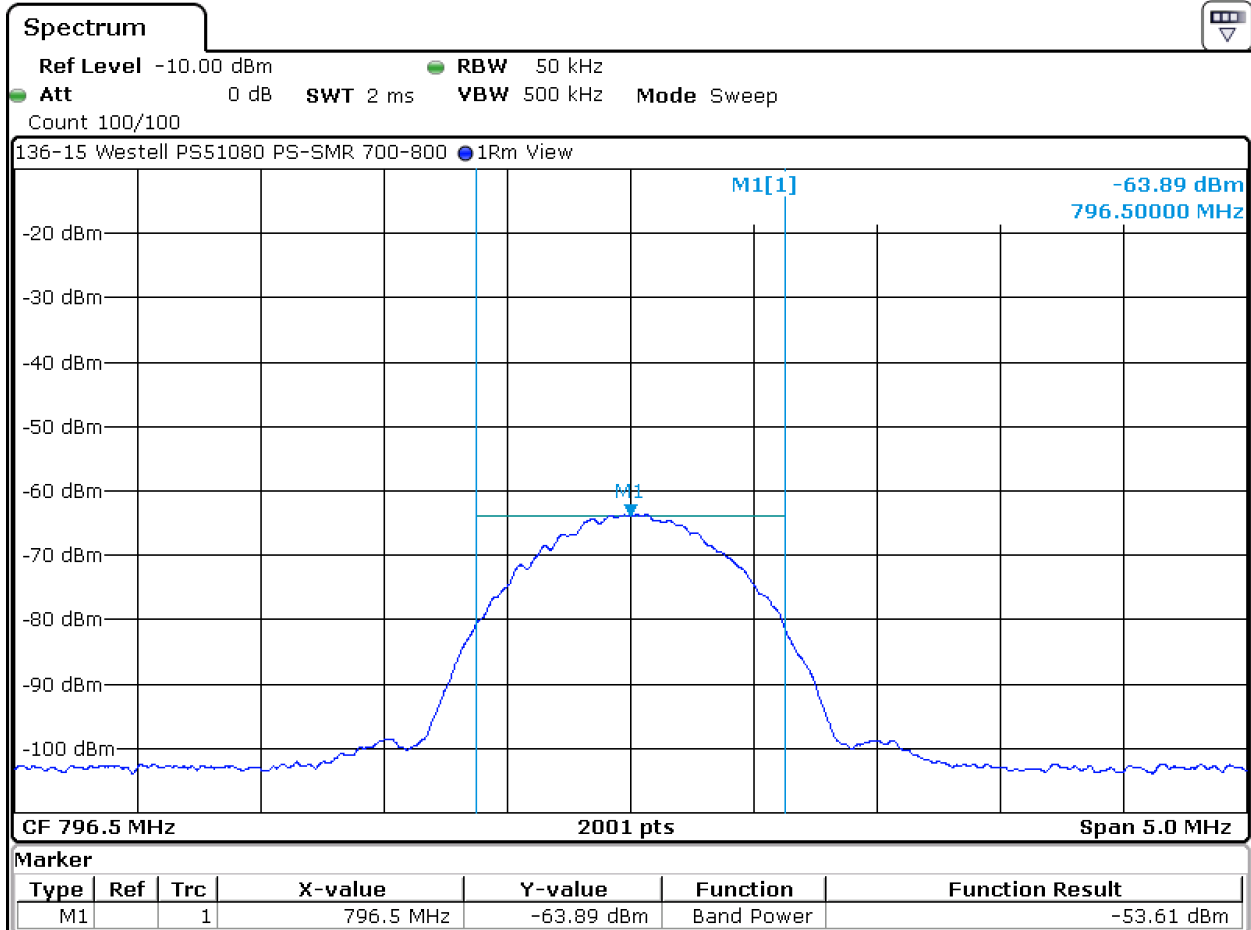
Date: 18.JAN.2016 16:11:39



6. Measurement Data

6.1. Broadband Transmitting Power Limits 90.219(e)(1), 90.541, 90.542 (cont)

6.1.18. Mean Transmitter Output Power, 796.5 MHz – Input Power

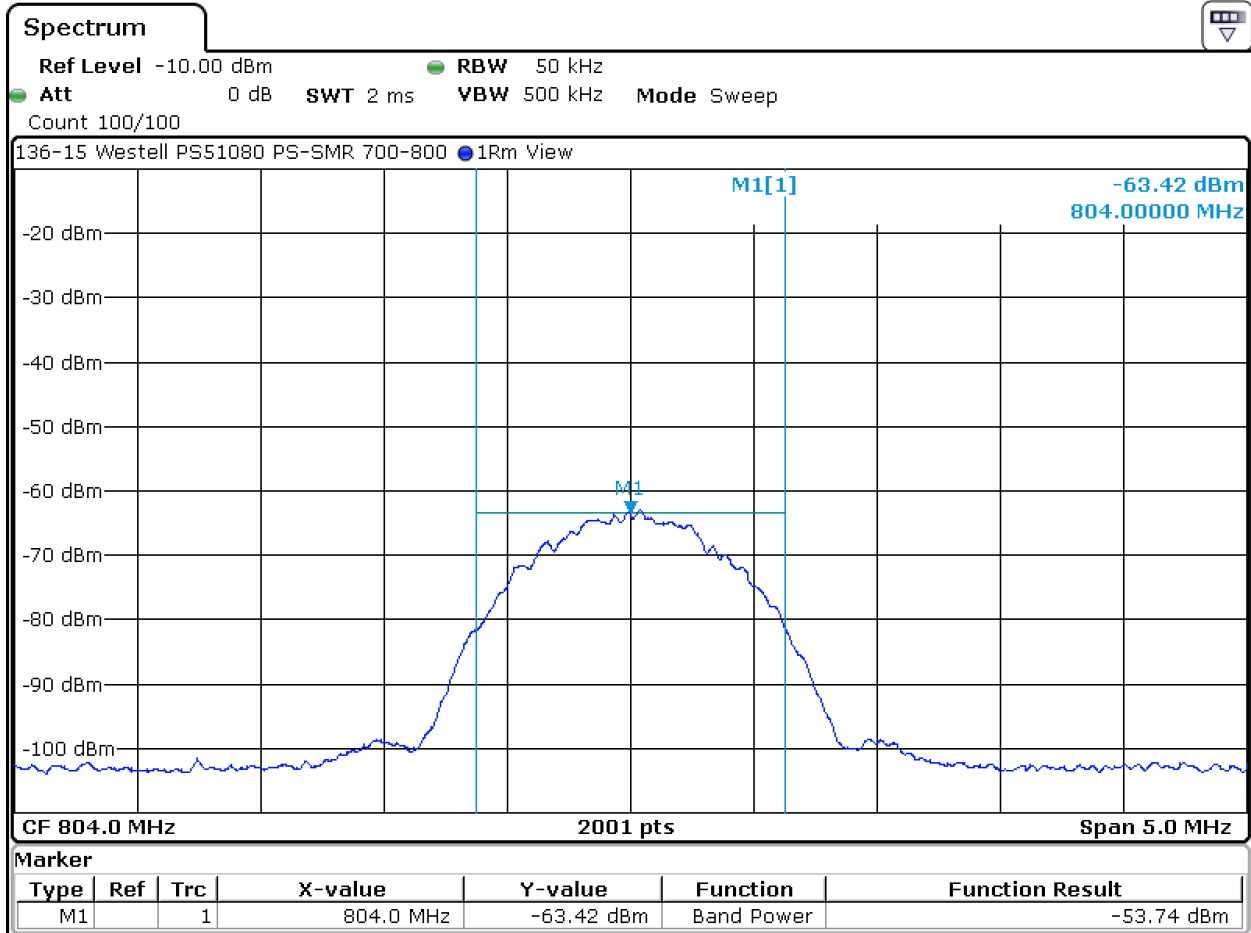


Date: 18.JAN.2016 16:12:41

6. Measurement Data

6.1. Broadband Transmitting Power Limits 90.219(e)(1), 90.541, 90.542 (cont)

6.1.19. Mean Transmitter Output Power, 804 MHz – Input Power



Date: 18.JAN.2016 16:13:53

**6. Measurement Data**

**6.1. Broadband Transmitting Power Limits 90.219(e)(1), 90.541, 90.542 (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."

$$\text{ERP} = \text{Transmitter Power (dBm)} - \text{Cable Loss (dB)} + \text{Antenna Gain (dBi)}$$

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 <sup>1</sup>	Cable Insertion Loss	Antenna Gain <sup>2</sup>	Total Output Power	
	(MHz)	(dBm)	(dB)	(dBi)	(dBm)	(Watts)
Output Power	759	27.67	0.00	3.00	30.67	1.17
Output Power	766.5	28.89	0.00	3.00	31.89	1.55
Output Power	774	27.66	0.00	3.00	30.66	1.16
Output Power	789	25.66	0.00	3.00	28.66	0.73
Output Power	796.5	27.20	0.00	3.00	30.20	1.05
Output Power	804	27.81	0.00	3.00	30.81	1.21
3 dB Above AGC	759	30.45	0.00	3.00	33.45	2.21
3 dB Above AGC	766.5	31.75	0.00	3.00	34.75	2.99
3 dB Above AGC	774	30.38	0.00	3.00	33.38	2.18
3 dB Above AGC	789	28.23	0.00	3.00	31.23	1.33
3 dB Above AGC	796.5	29.69	0.00	3.00	32.69	1.86
3 dB Above AGC	804	30.30	0.00	3.00	33.30	2.14

<sup>1</sup> Measured. See section 6.1.1.

<sup>2</sup> Customer supplied 3 dBi. Factor is a combination of both antenna gain and cable loss.

**6. Measurement Data (continued)**

**6.2. Bandwidth Limitations 90.219(e)(4)(ii), FCC Part 2.1049**

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.

There is no change in the occupied bandwidth of the retransmitted signal.

Test Method: KDB 935210 Section 3.4

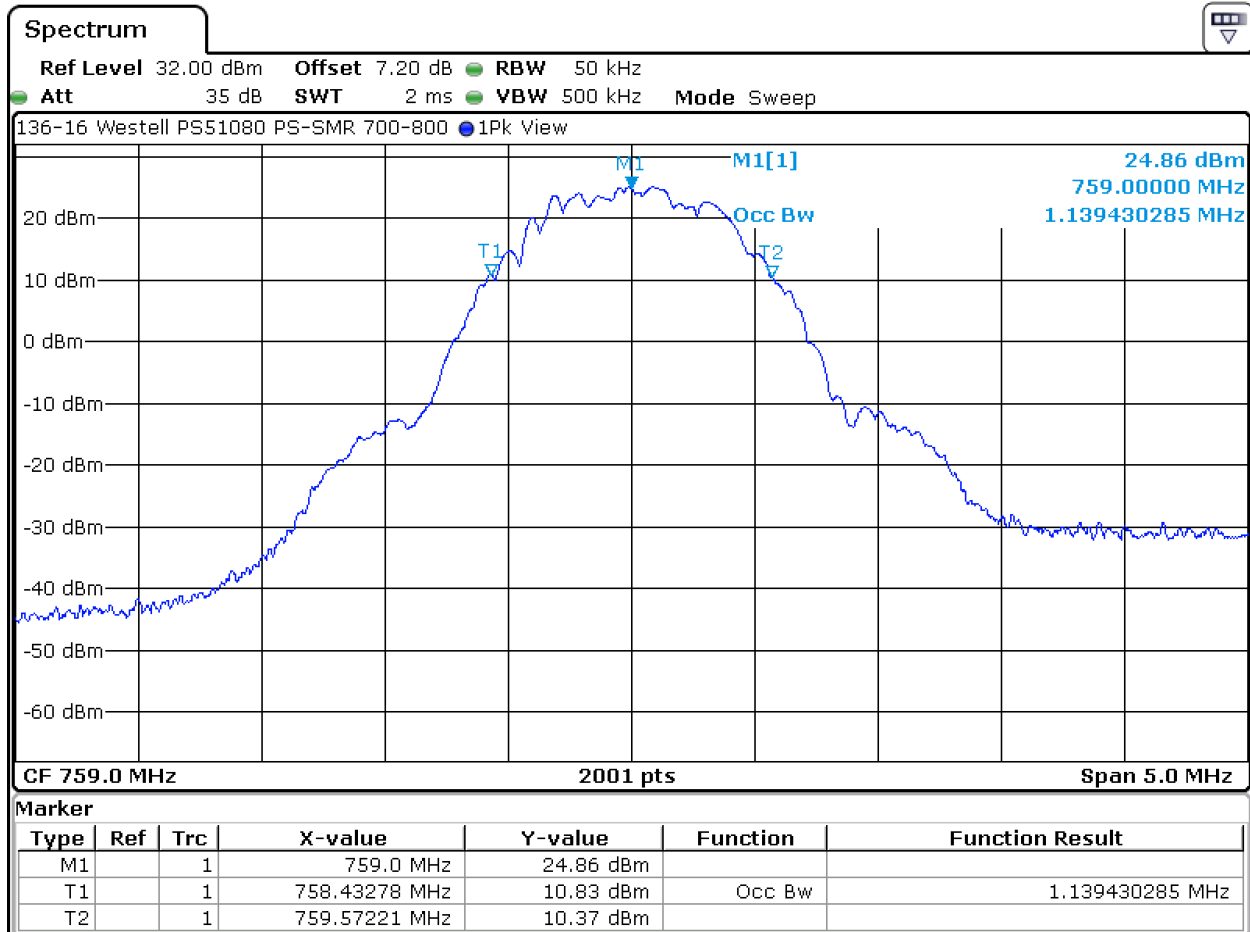
**6.2.1. Occupied (99% Power) Bandwidth**

Description of Measurement	Center Frequency	Occupied Bandwidth	Result
	MHz	MHz	
Output	759	1.1394	Compliant
Output	766.5	1.1344	Compliant
Output	774	0.0178	Compliant
Output	789	1.1419	Compliant
Output	796.5	1.1419	Compliant
Output	804	0.0178	Compliant
Input	759	1.1669	Compliant
Input	766.5	1.1669	Compliant
Input	774	0.0178	Compliant
Input	789	1.1794	Compliant
Input	796.5	1.1744	Compliant
Input	804	0.0178	Compliant

6. Measurement Data (continued)

6.2. Bandwidth Limitations 90.219(e)(4)(ii), FCC Part 2.1049 (continued)

6.2.1.1. Occupied (99% Power) Bandwidth Measurement, 759 MHz

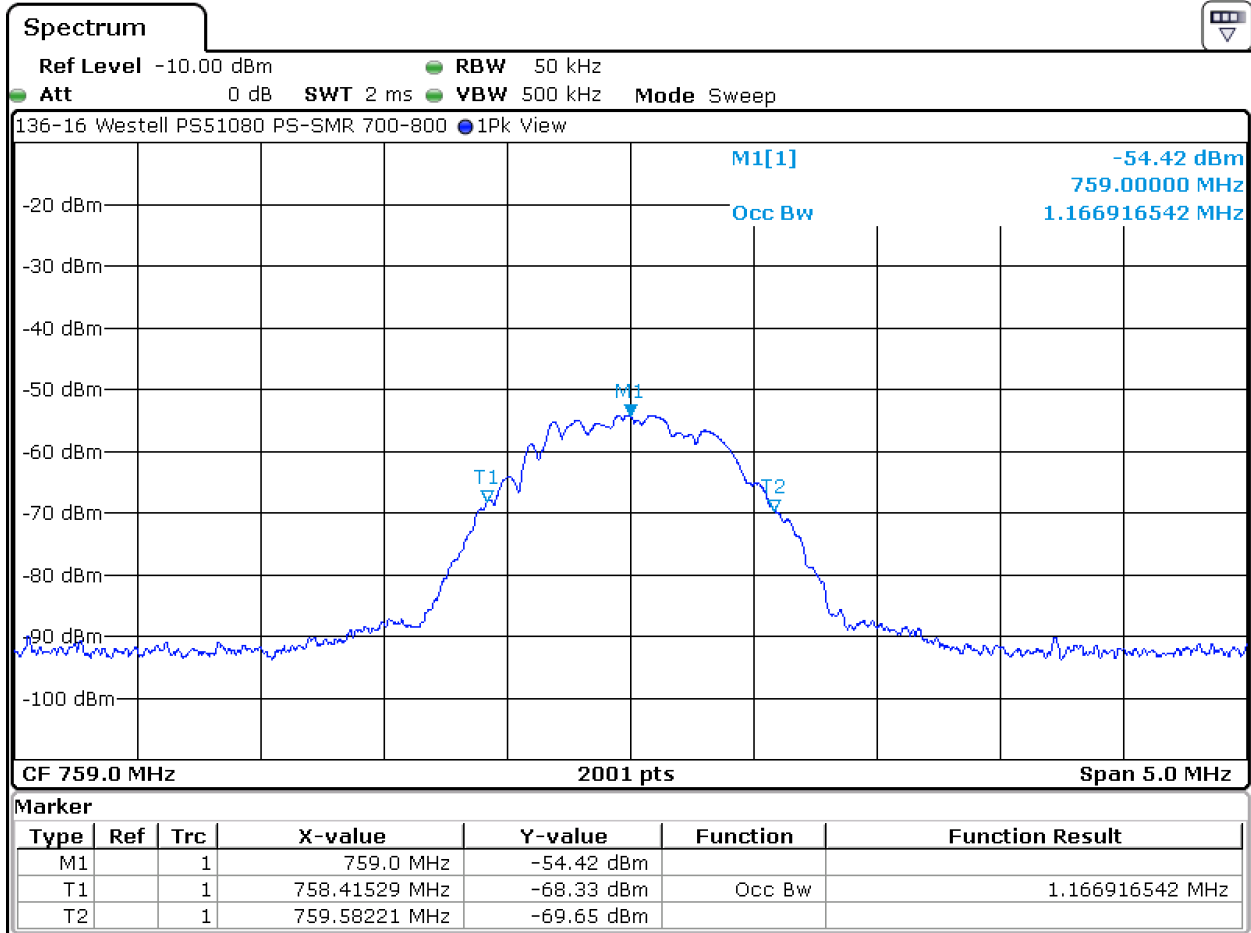


Date: 20.JAN.2016 15:08:26

6. Measurement Data (continued)

6.2. Bandwidth Limitations 90.219(e)(4)(ii), FCC Part 2.1049 (continued)

6.2.1.2. Occupied (99% Power) Bandwidth Input Signal, 759 MHz

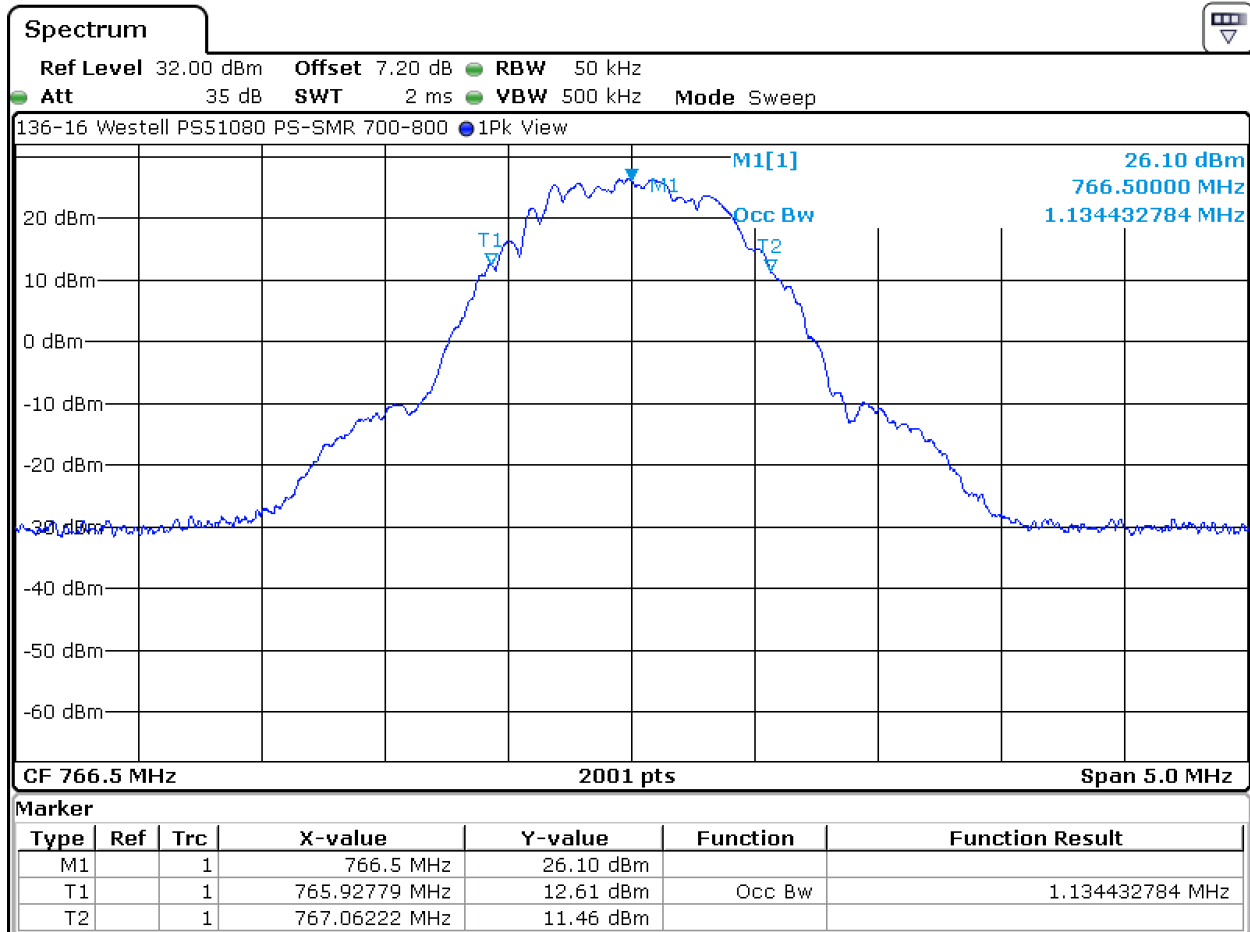


Date: 20.JAN.2016 15:17:06

6. Measurement Data (continued)

6.2. Bandwidth Limitations 90.219(e)(4)(ii), FCC Part 2.1049 (continued)

6.2.1.3. Occupied (99% Power) Bandwidth Measurement, 766.5 MHz

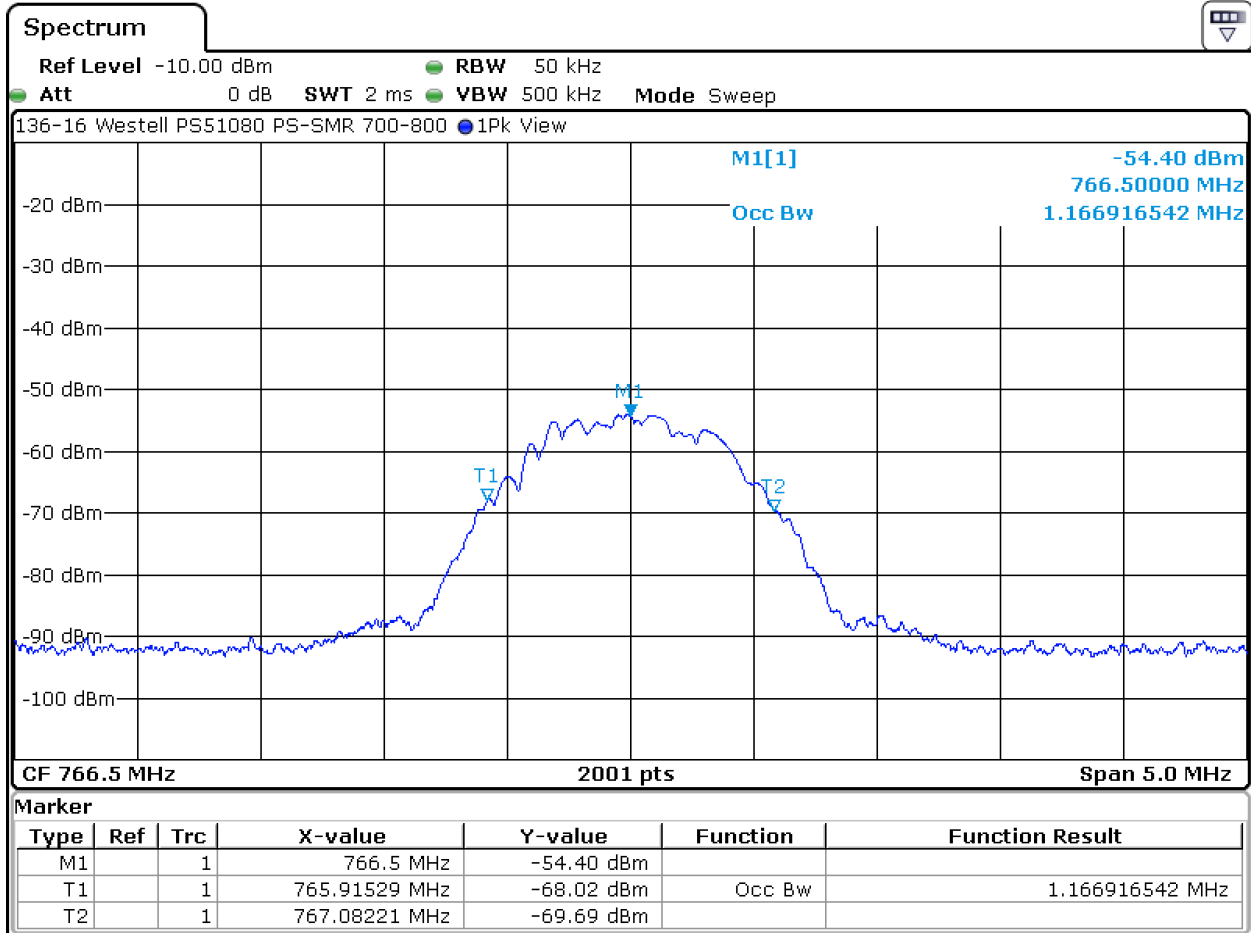


Date: 20.JAN.2016 15:09:51

6. Measurement Data (continued)

6.2. Bandwidth Limitations 90.219(e)(4)(ii), FCC Part 2.1049 (continued)

6.2.1.4. Occupied (99% Power) Bandwidth Input Signal, 766.5 MHz



Date: 20.JAN.2016 15:15:34



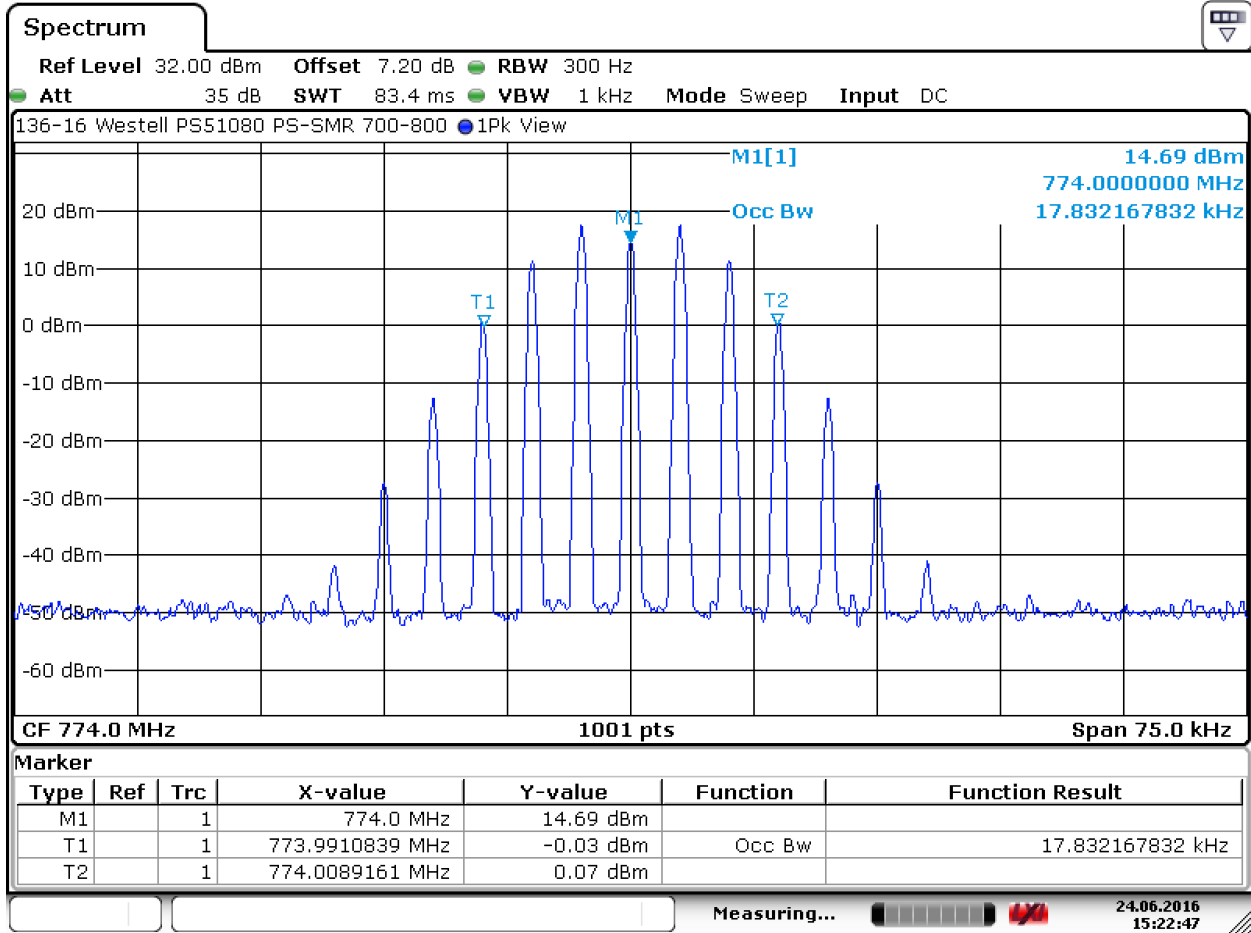
Test Number: 136-16R2

Issue Date: 6/24/2016

6. Measurement Data (continued)

6.2. Bandwidth Limitations 90.219(e)(4)(ii), FCC Part 2.1049 (continued)

6.2.1.5. Occupied (99% Power) Bandwidth Measurement, 774 MHz



Date: 24.JUN.2016 15:22:46

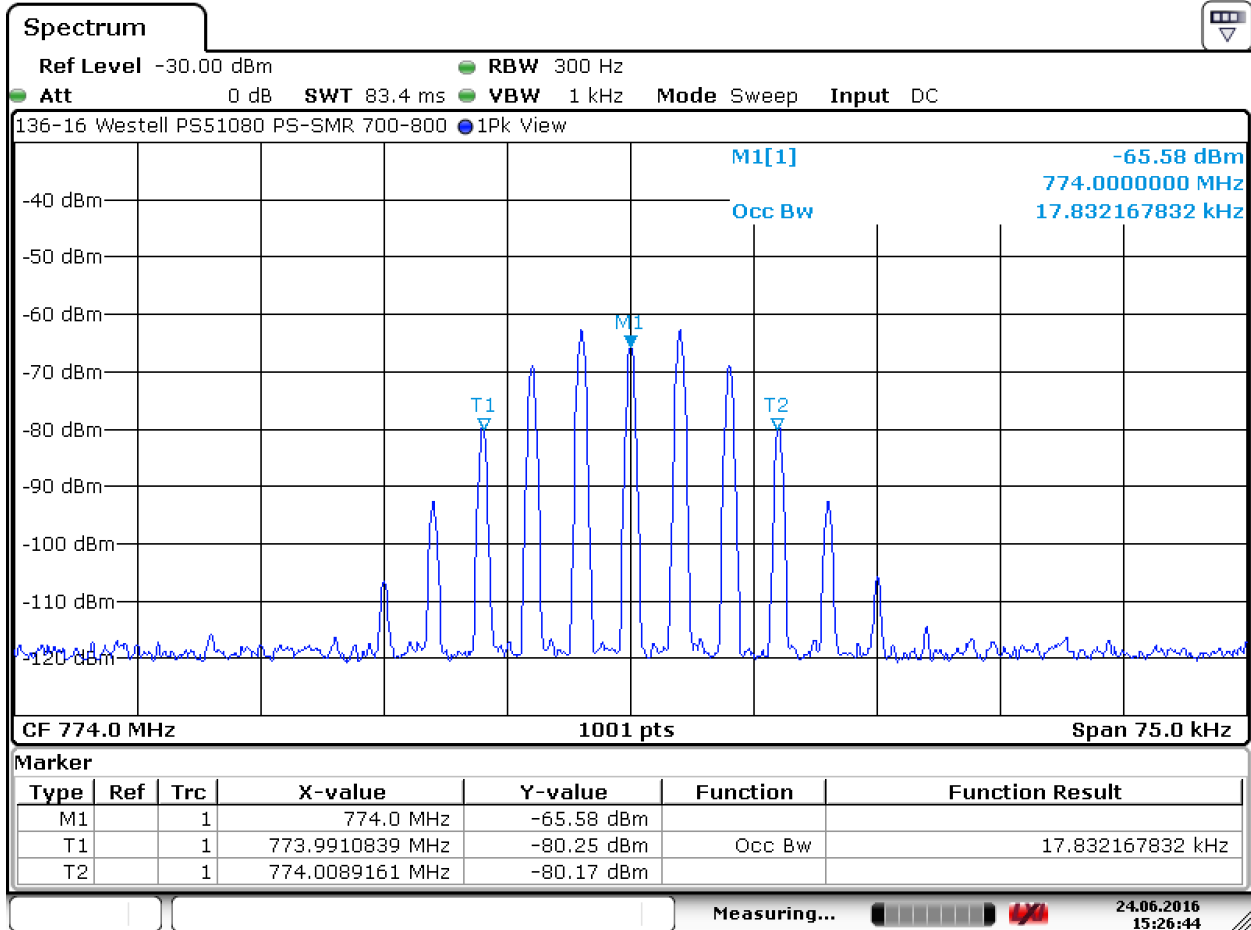
Test Number: 136-16R2

Issue Date: 6/24/2016

6. Measurement Data (continued)

6.2. Bandwidth Limitations 90.219(e)(4)(ii), FCC Part 2.1049 (continued)

6.2.1.6. Occupied (99% Power) Bandwidth Input Signal, 774 MHz

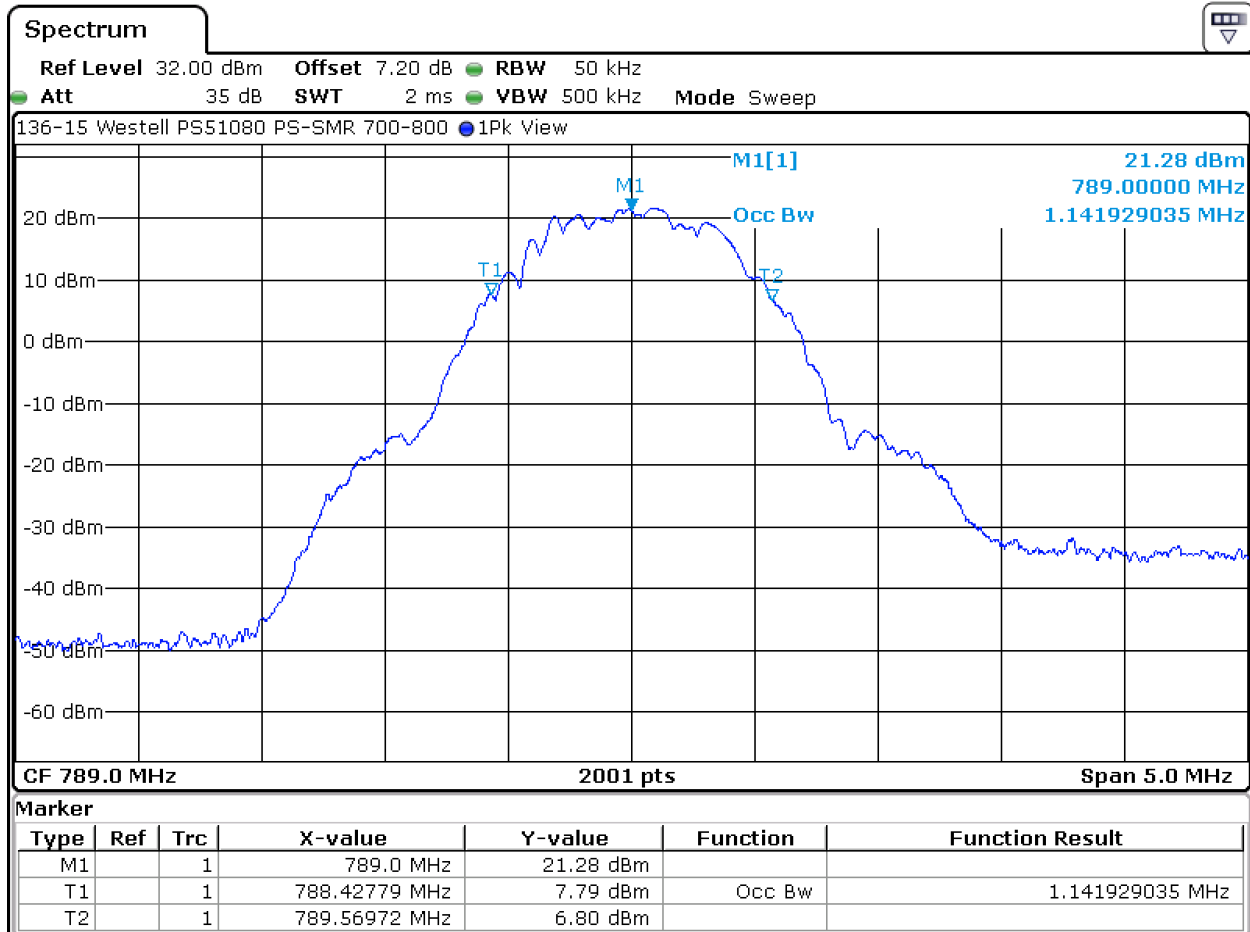


Date: 24.JUN.2016 15:26:43

6. Measurement Data (continued)

6.2. Bandwidth Limitations 90.219(e)(4)(ii), FCC Part 2.1049 (continued)

6.2.1.7. Occupied (99% Power) Bandwidth Measurement, 789 MHz

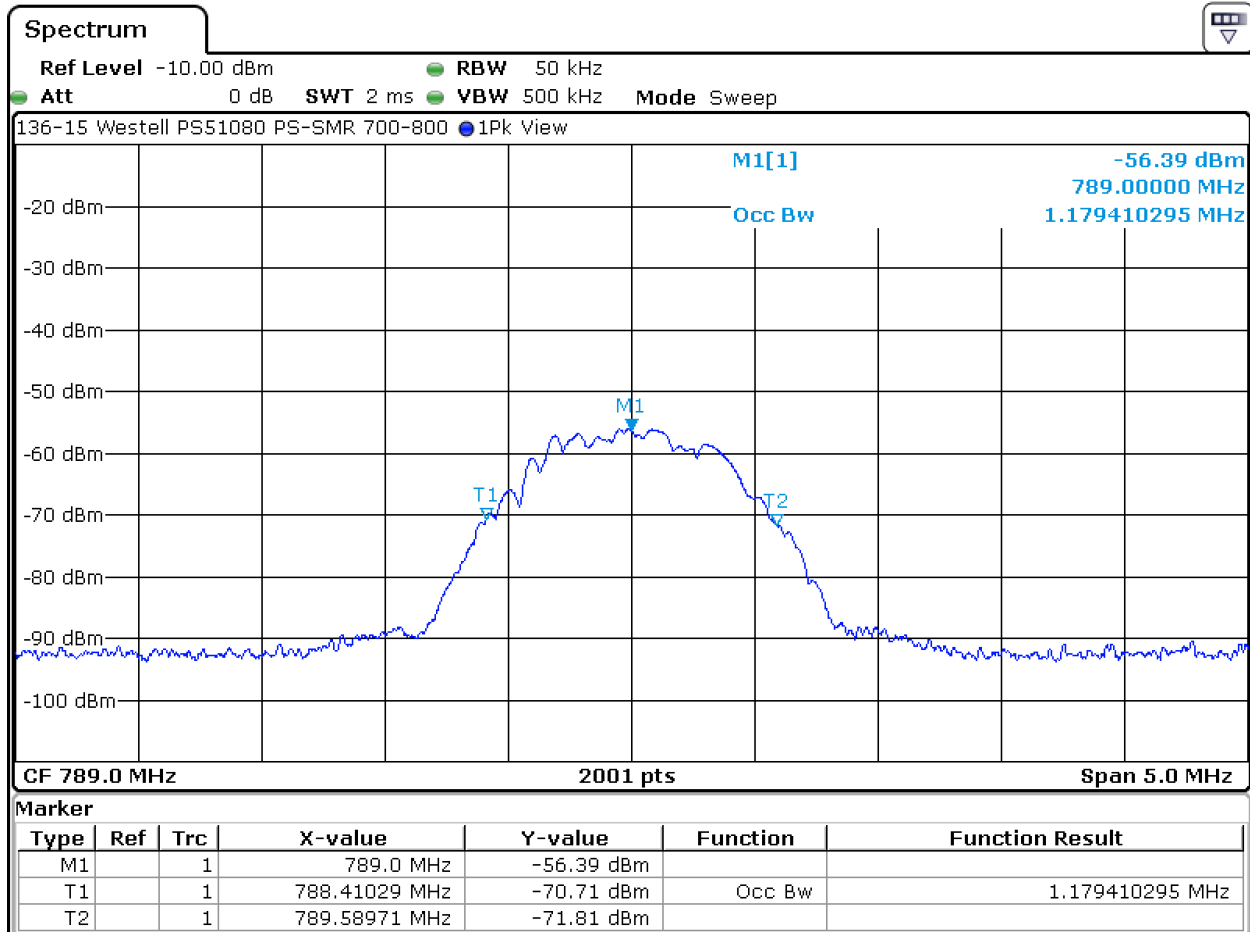


Date: 18.JAN.2016 16:02:10

6. Measurement Data (continued)

6.2. Bandwidth Limitations 90.219(e)(4)(ii), FCC Part 2.1049 (continued)

6.2.1.8. Occupied (99% Power) Bandwidth Input Signal, 789 MHz



Date: 18.JAN.2016 16:10:14

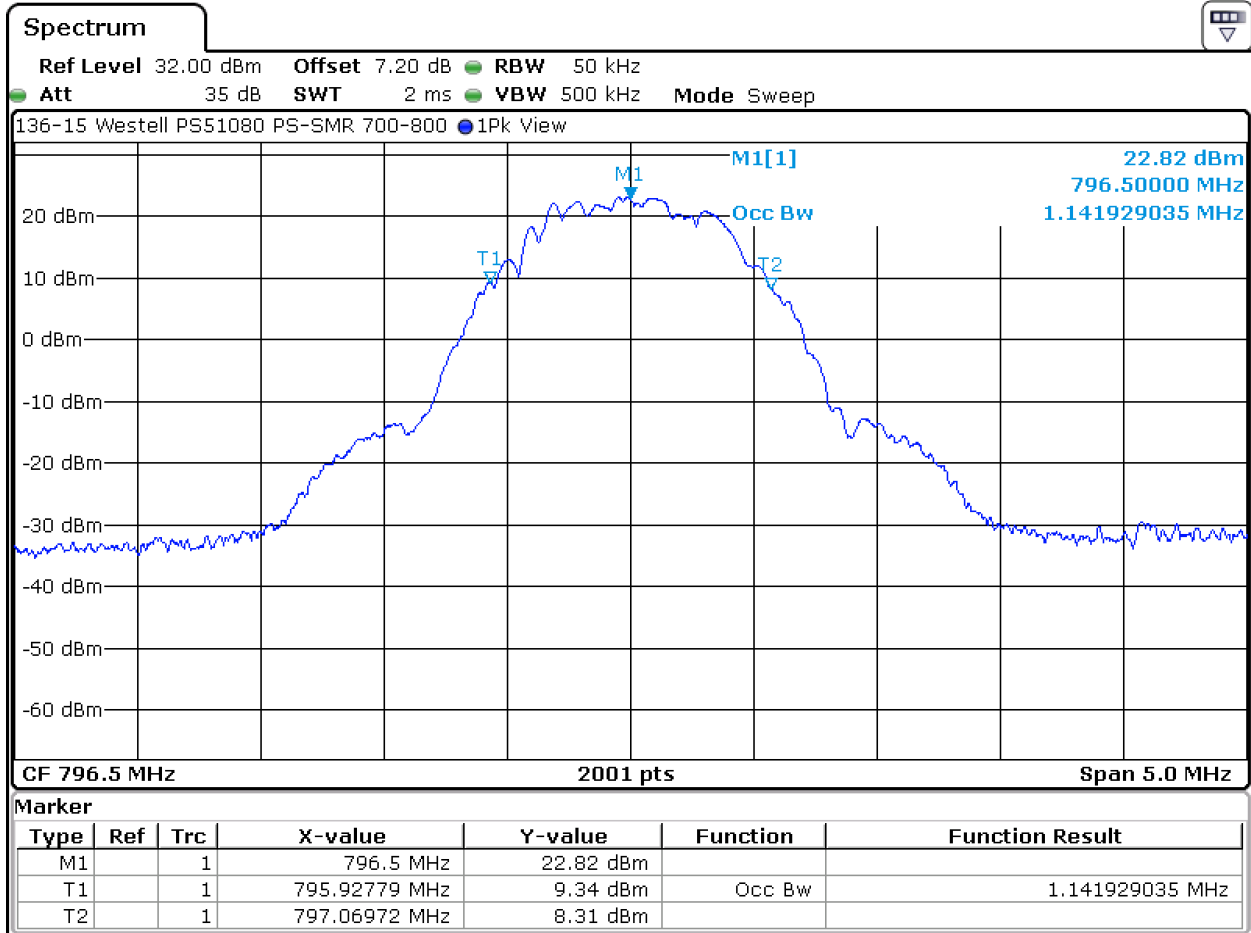
Test Number: 136-16R2

Issue Date: 6/24/2016

6. Measurement Data (continued)

6.2. Bandwidth Limitations 90.219(e)(4)(ii), FCC Part 2.1049 (continued)

6.2.1.9. Occupied (99% Power) Bandwidth Measurement, 796.5 MHz

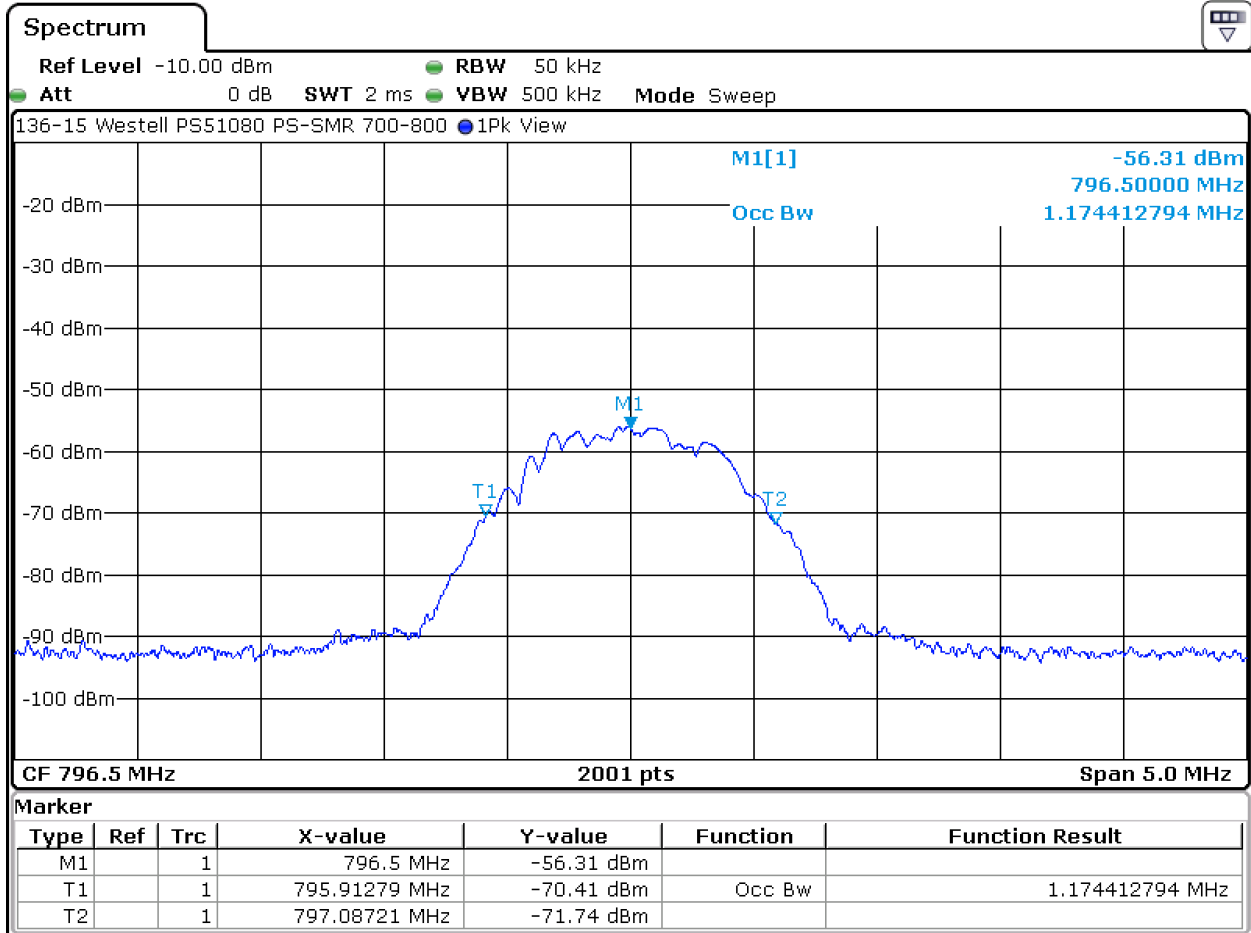


Date: 18.JAN.2016 16:03:11

6. Measurement Data (continued)

6.2. Bandwidth Limitations 90.219(e)(4)(ii), FCC Part 2.1049 (continued)

6.2.1.10. Occupied (99% Power) Bandwidth Input Signal, 796.5 MHz



Date: 18.JAN.2016 16:09:09

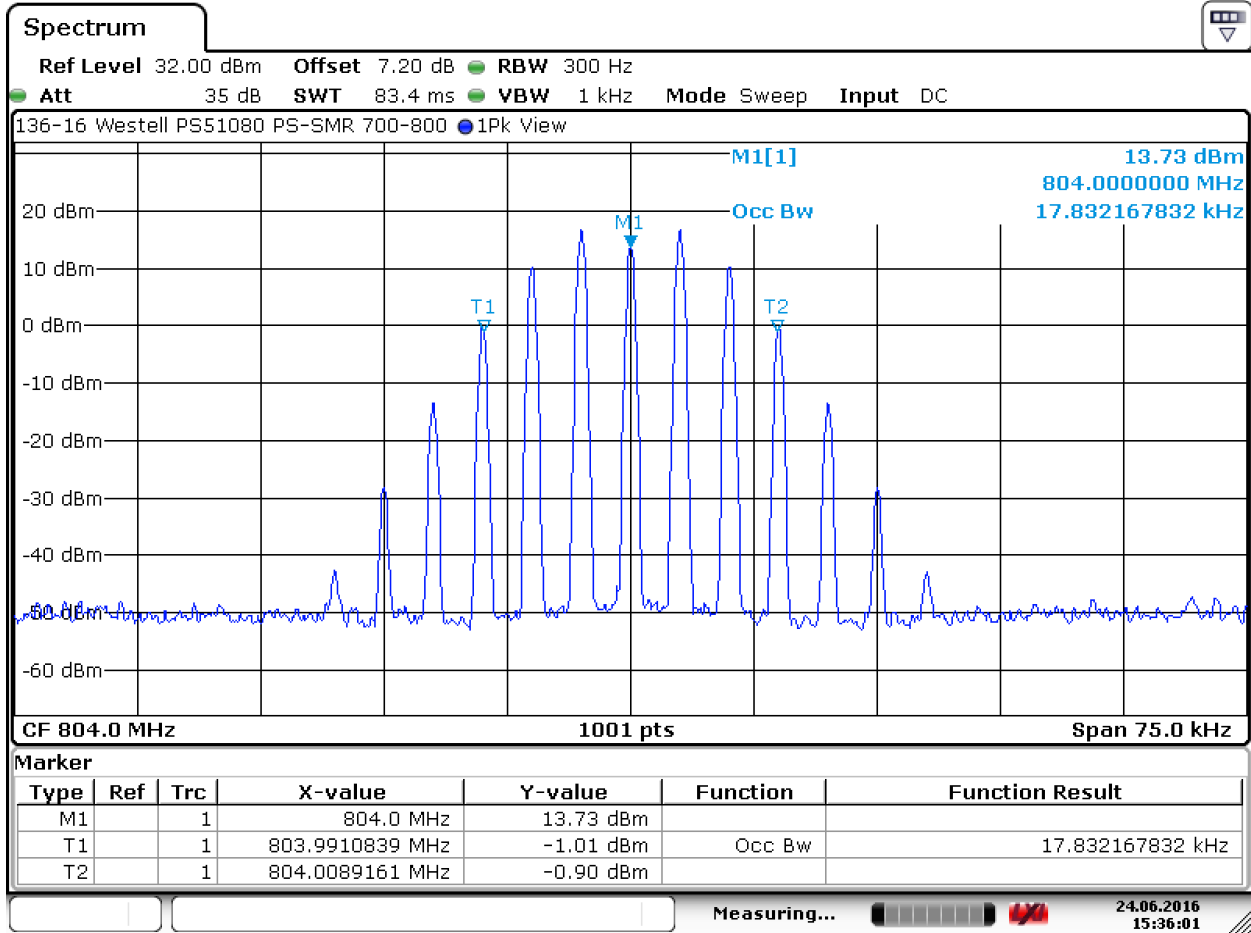
Test Number: 136-16R2

Issue Date: 6/24/2016

6. Measurement Data (continued)

6.2. Bandwidth Limitations 90.219(e)(4)(ii), FCC Part 2.1049 (continued)

6.2.1.11. Occupied (99% Power) Bandwidth Measurement, 804 MHz



Date: 24.JUN.2016 15:36:01

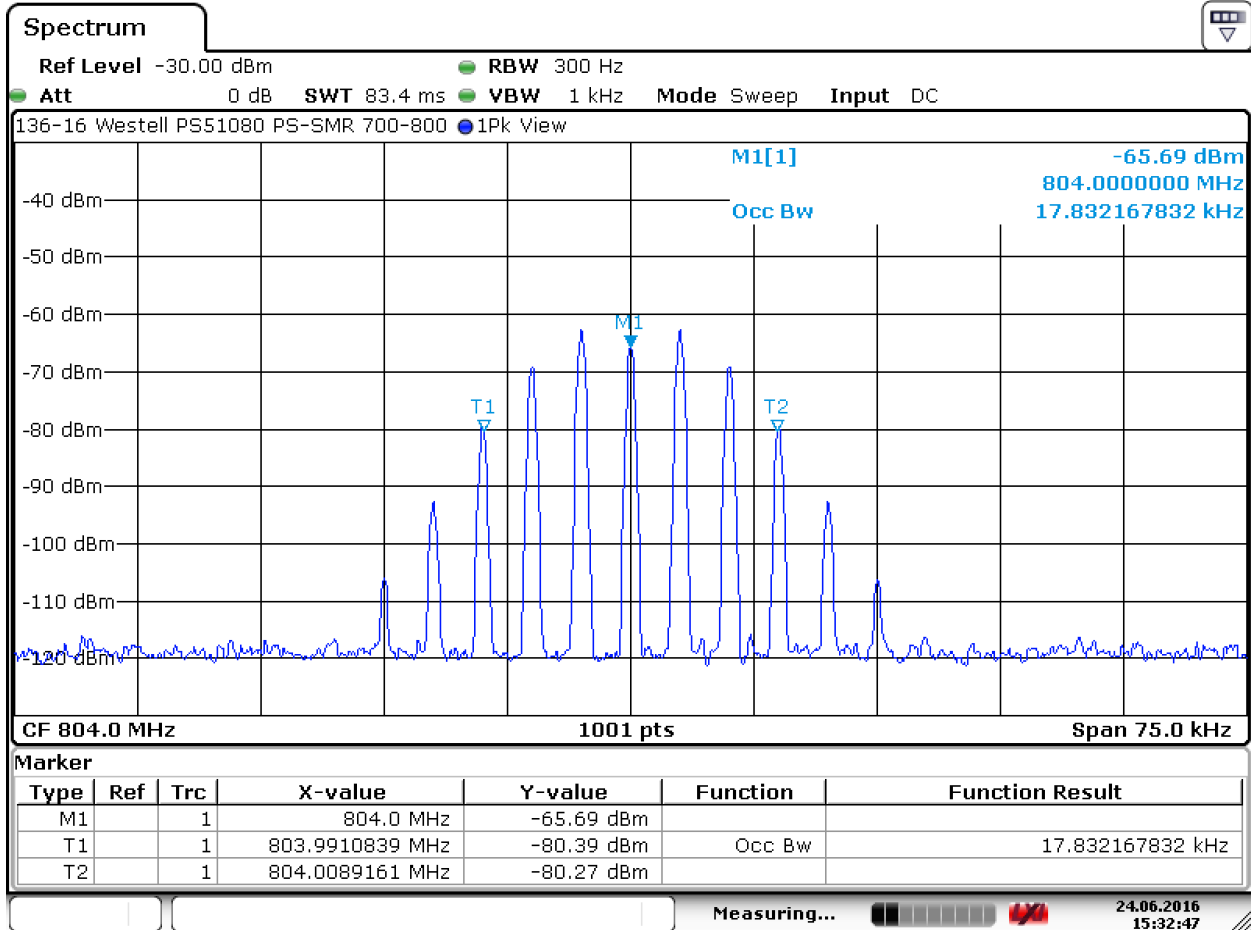
Test Number: 136-16R2

Issue Date: 6/24/2016

6. Measurement Data (continued)

6.2. Bandwidth Limitations 90.219(e)(4)(ii), FCC Part 2.1049 (continued)

6.2.1.12. Occupied (99% Power) Bandwidth Input Signal, 804 MHz



Date: 24.JUN.2016 15:32:47



6. Measurement Data (continued)

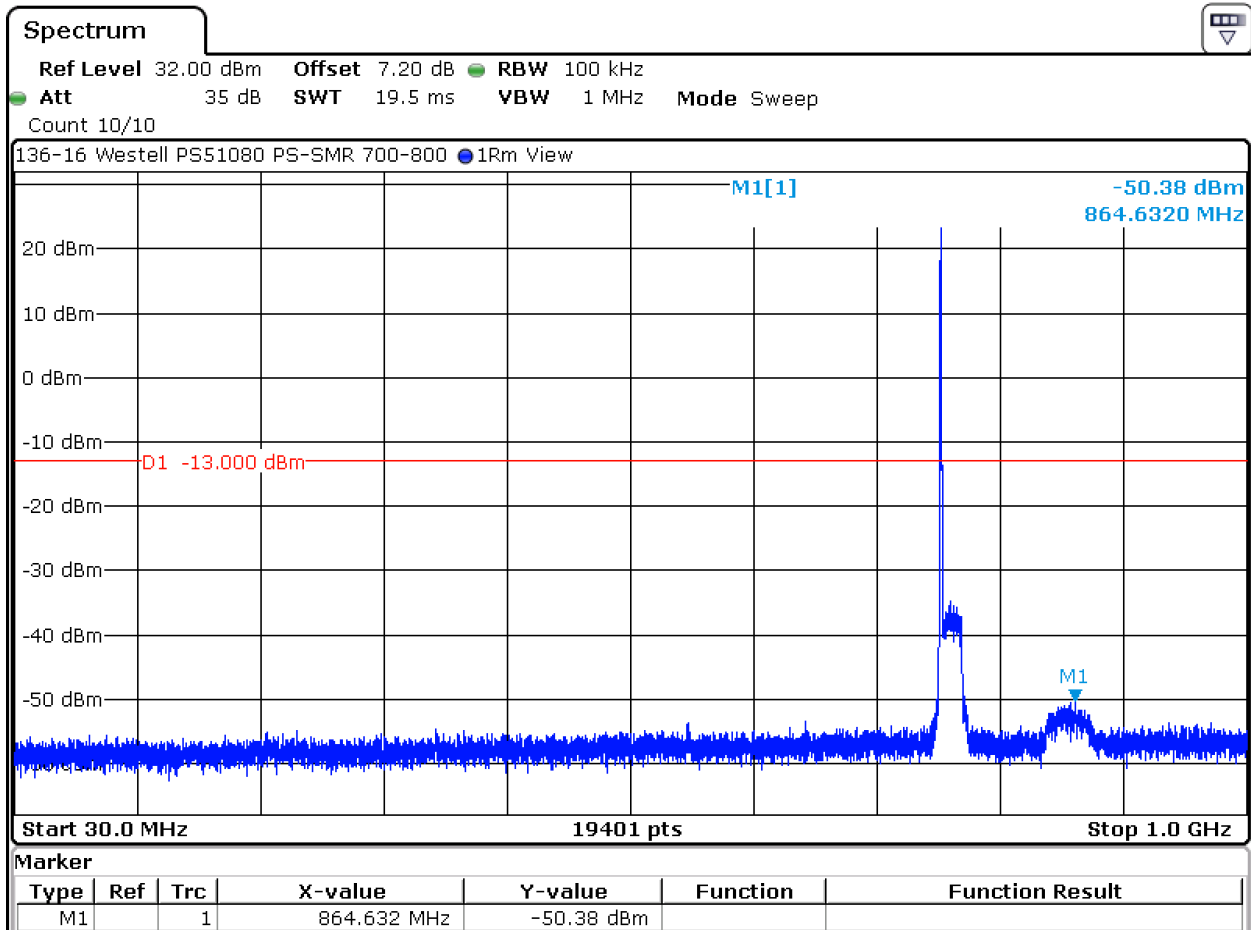
6.3. Spurious Emissions at the Antenna Terminals 90.219(e)(3), 90.543 (c)

**Requirement:** Transmitters designed to operate in the 758 to 768 MHz, 769 to 775 MHz, 788 to 798 MHz and 799 to 805 MHz bands, any emission outside of the ACP tables in this section shall be attenuated below the transmitter power (P) by at least  $43 + 10 \log (P)$  dB.

Compliance with this provision is based upon the use of measurement instrumentation employing a resolution bandwidth of 100 kHz bandwidth for frequencies less than 1 GHz, and in a 1 MHz bandwidth for frequencies greater than 1 GHz.

Test Method: KDB 935210 Section 3.6.3

6.3.1. 759 MHz, 30 MHz to 1 GHz

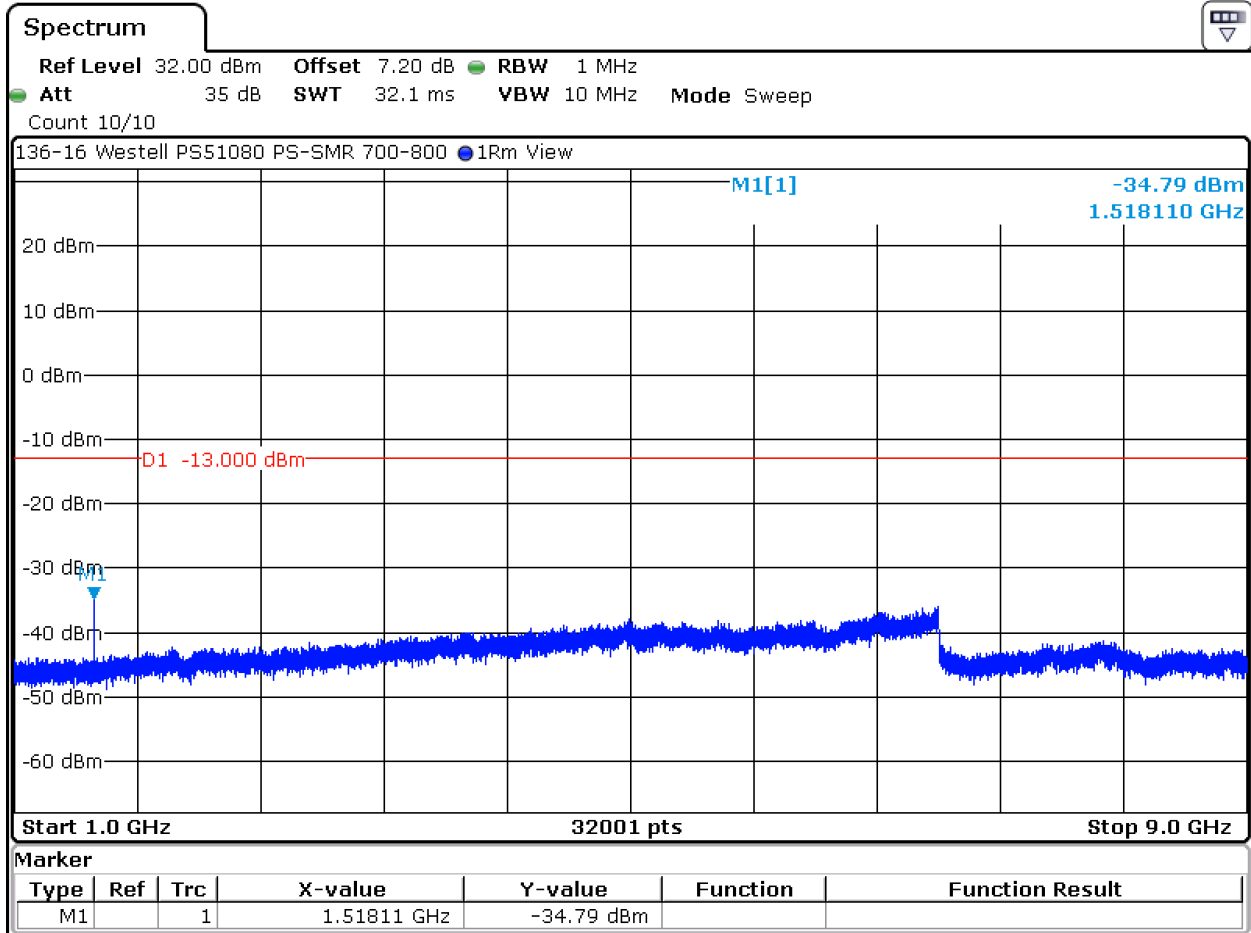


Date: 20.JAN.2016 14:53:50

6. Measurement Data (continued)

6.3. Spurious Emissions at the Antenna Terminals 90.219(e)(3), 90.543 (c) (continued)

6.3.2. 759 MHz, 1 to 9 GHz



Date: 20.JAN.2016 14:54:46

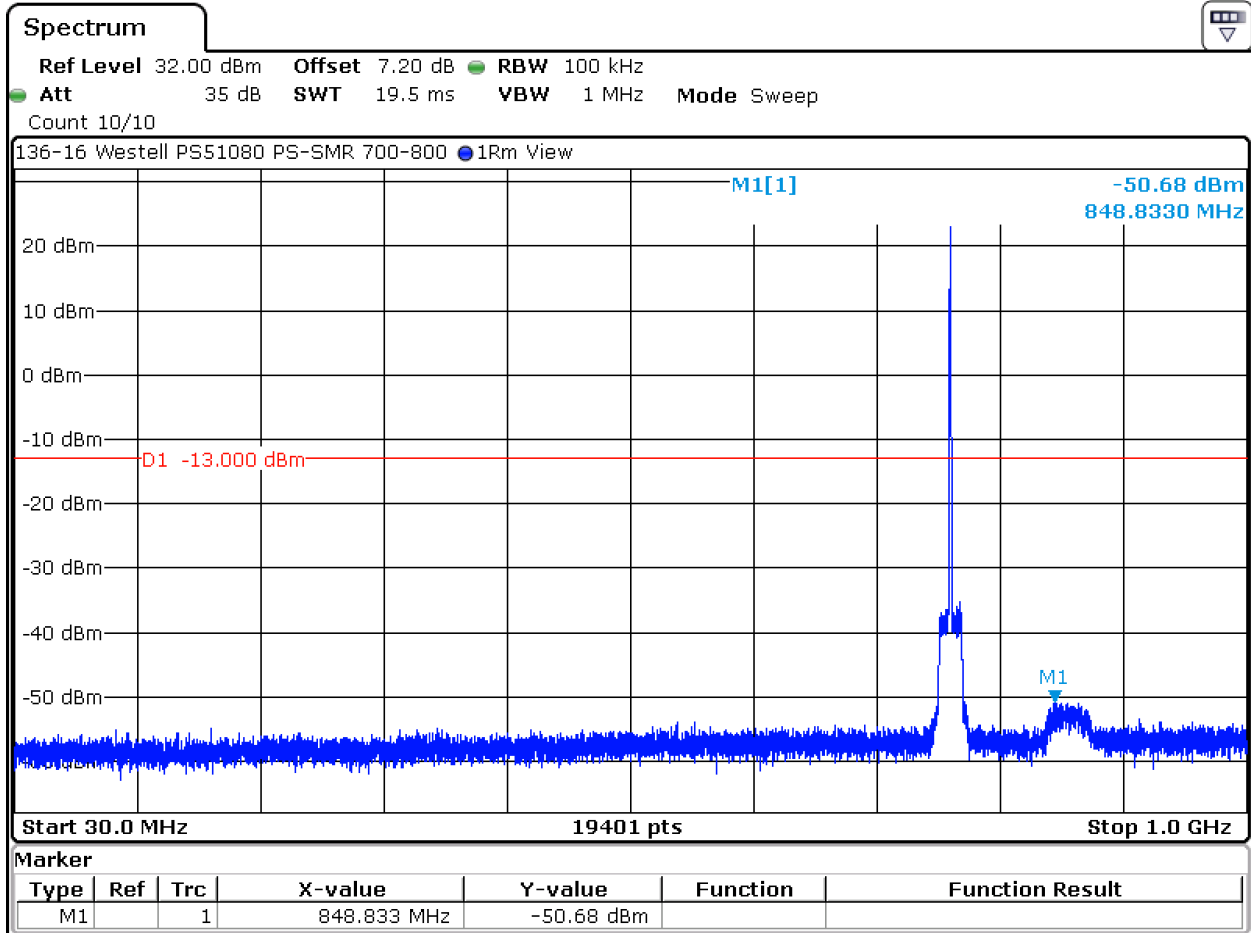
Test Number: 136-16R2

Issue Date: 6/24/2016

6. Measurement Data (continued)

6.3. Spurious Emissions at the Antenna Terminals 90.219(e)(3), 90.543 (c) (continued)

6.3.3. 766.5 MHz, 30 MHz to 1 GHz

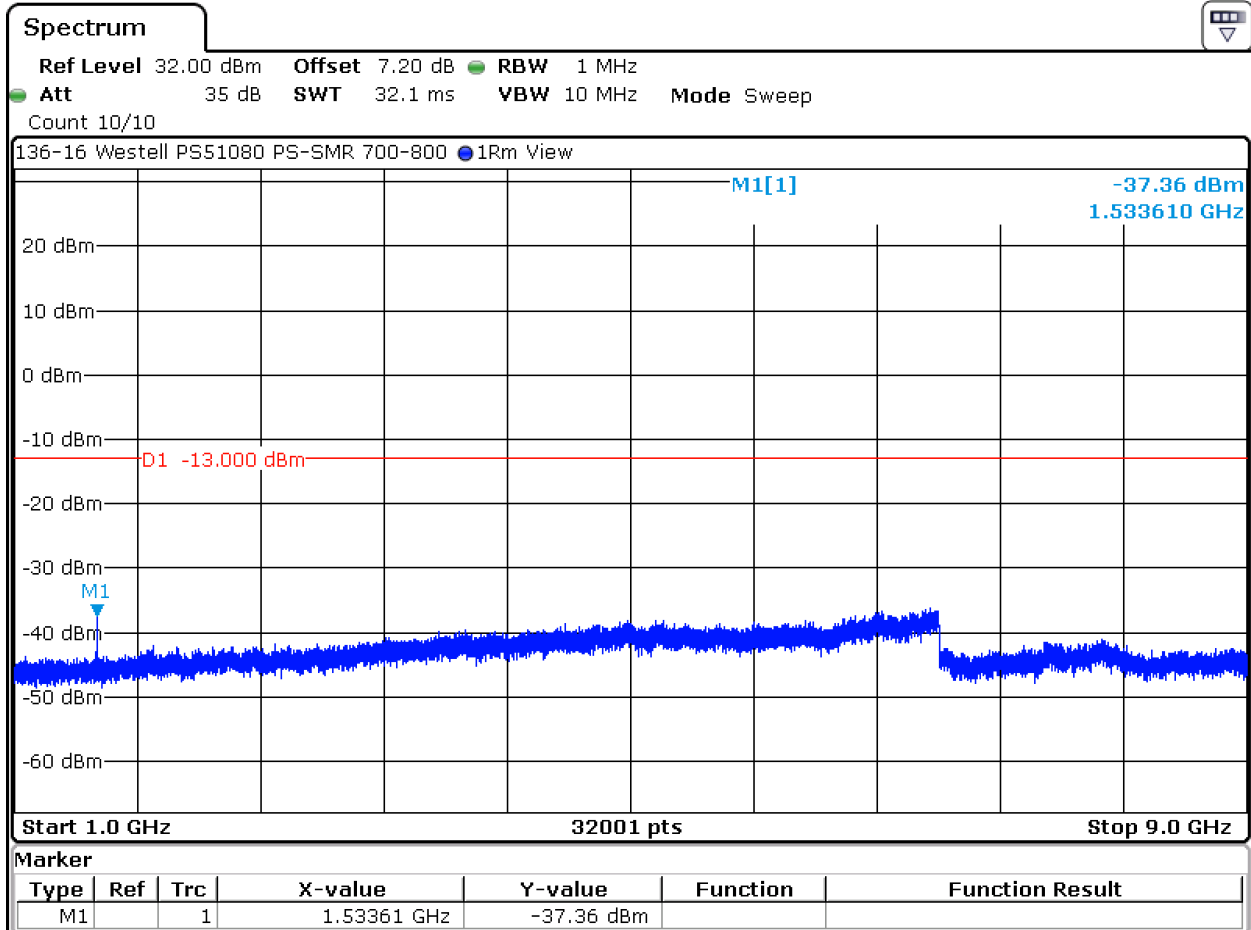


Date: 20.JAN.2016 14:57:39

6. Measurement Data (continued)

6.3. Spurious Emissions at the Antenna Terminals 90.219(e)(3), 90.543 (c) (continued)

6.3.4. 766.5 MHz, 1 to 9 GHz

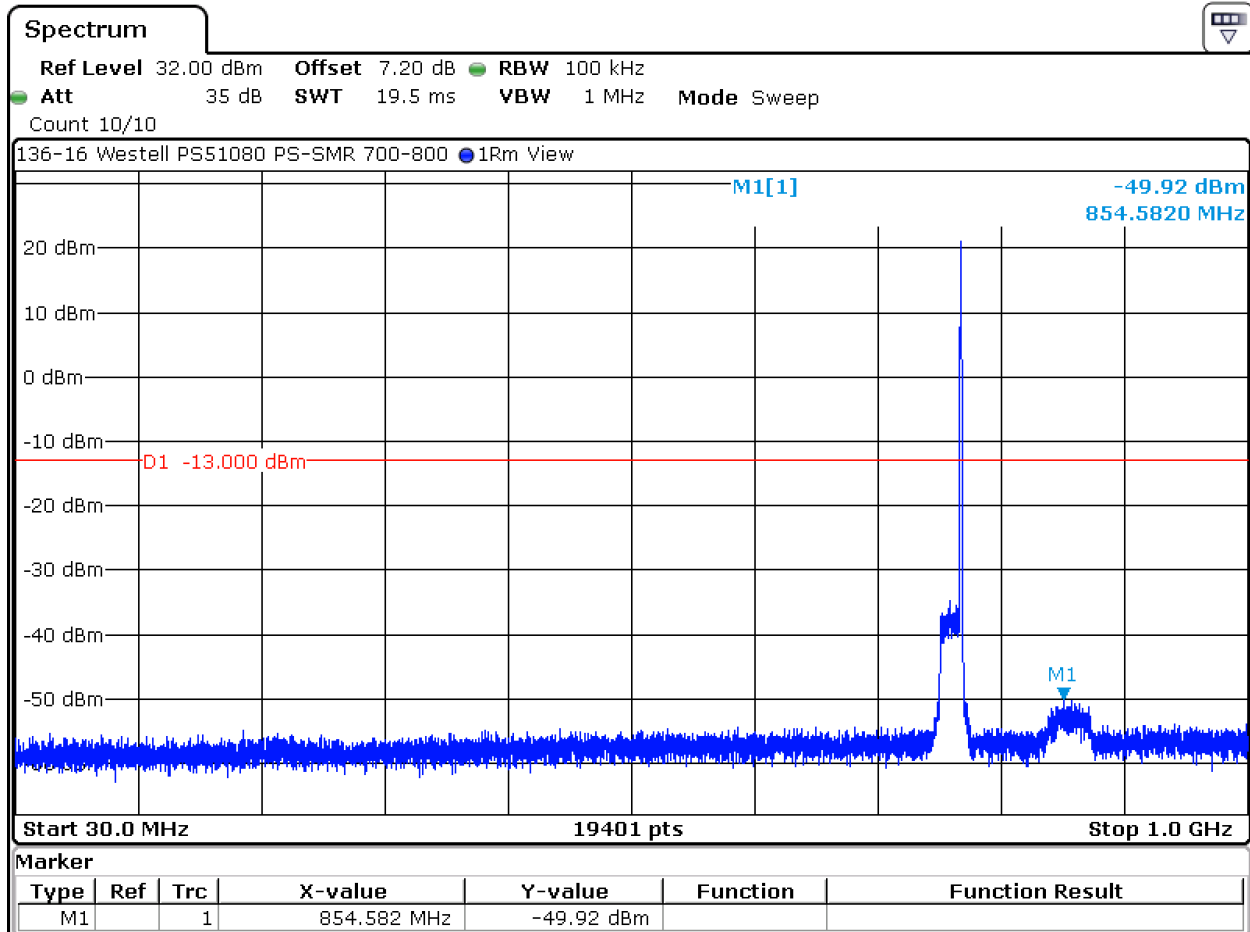


Date: 20.JAN.2016 14:55:46

6. Measurement Data (continued)

6.3. Spurious Emissions at the Antenna Terminals 90.219(e)(3), 90.543 (c) (continued)

6.3.5. 774 MHz, 30 MHz to 1 GHz



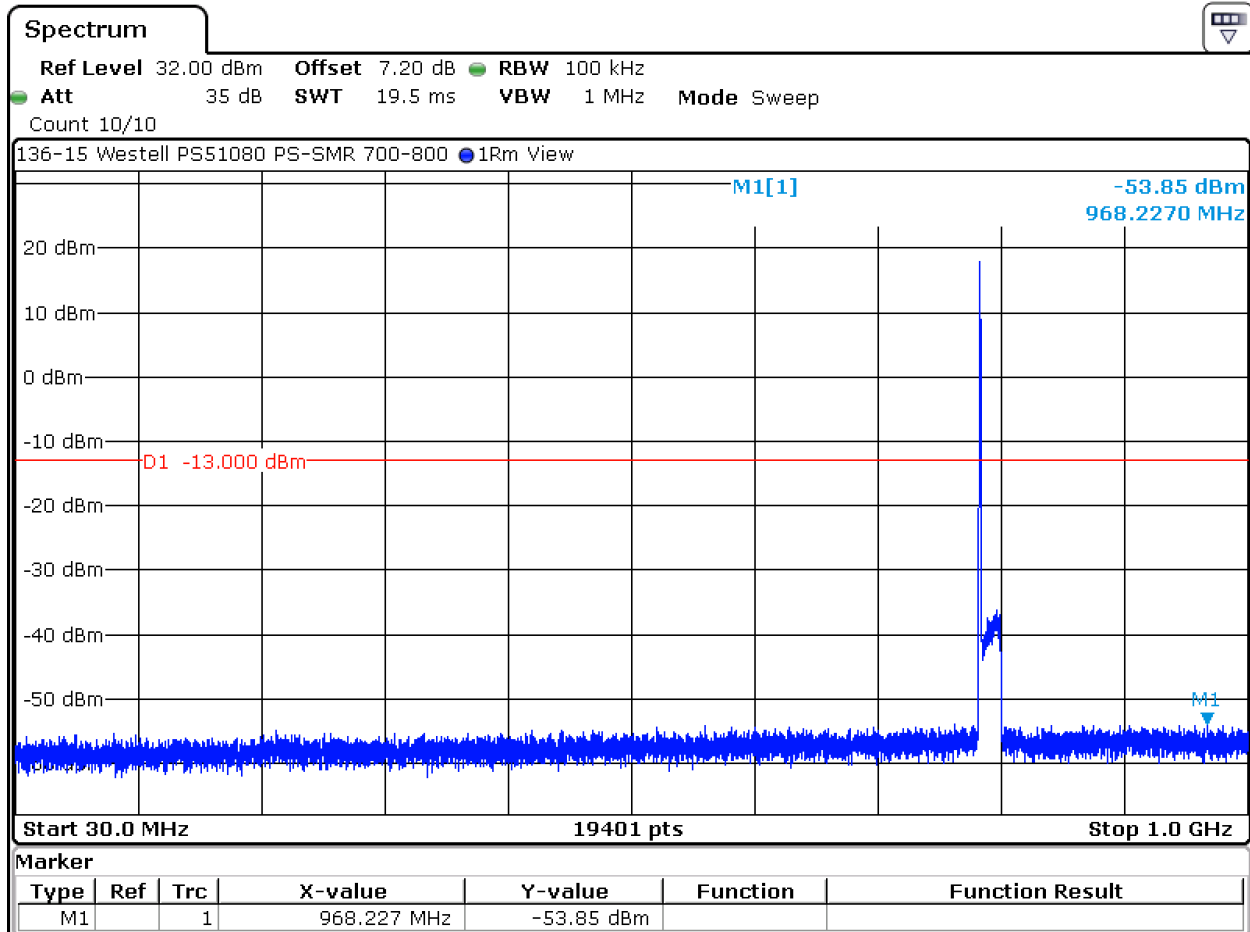
Date: 20.JAN.2016 14:58:42



6. Measurement Data (continued)

6.3. Spurious Emissions at the Antenna Terminals 90.219(e)(3), 90.543 (c) (continued)

6.3.7. 789 MHz, 30 MHz to 1 GHz

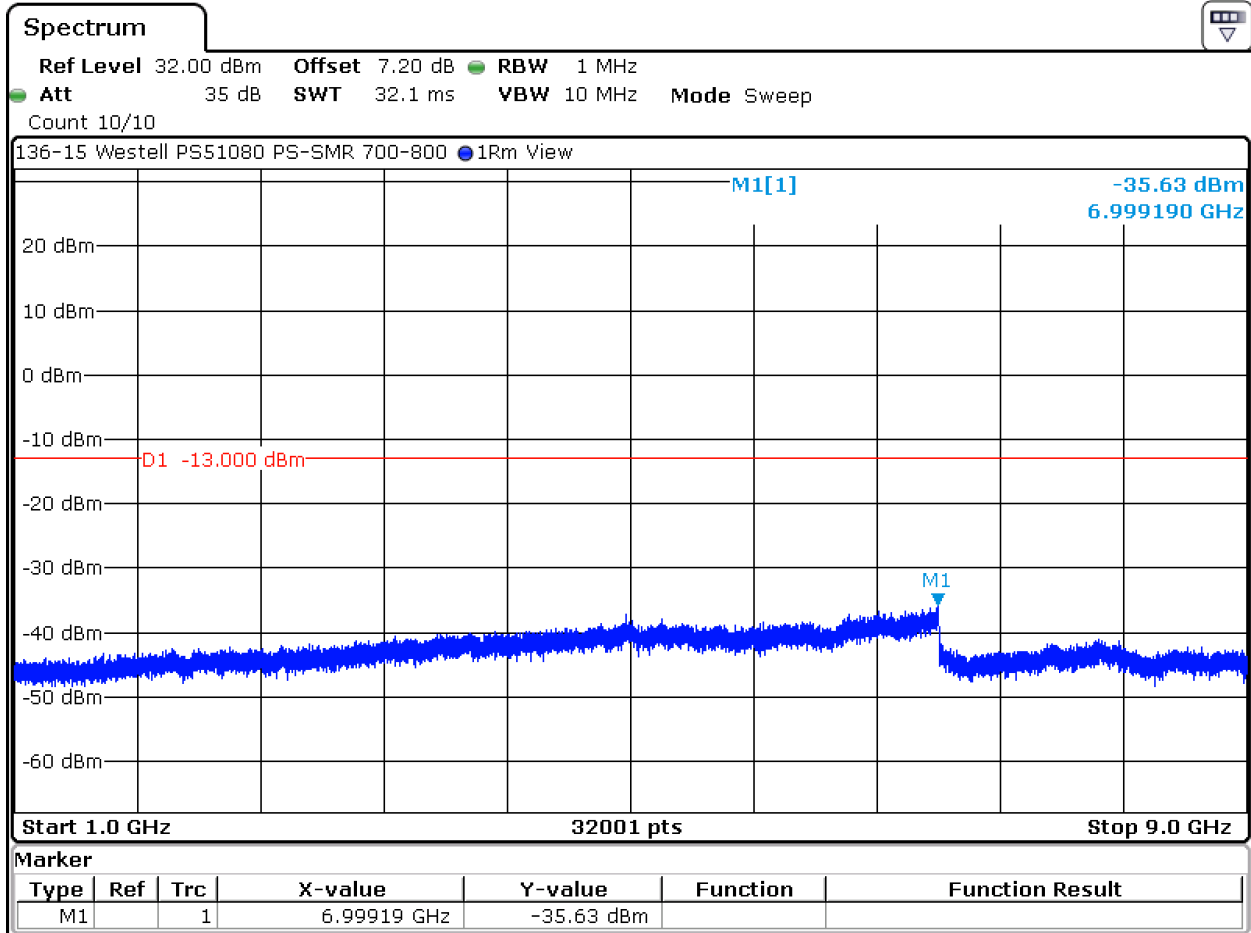


Date: 18.JAN.2016 15:46:40

6. Measurement Data (continued)

6.3. Spurious Emissions at the Antenna Terminals 90.219(e)(3), 90.543 (c) (continued)

6.3.8. 789 MHz, 1 to 9 GHz



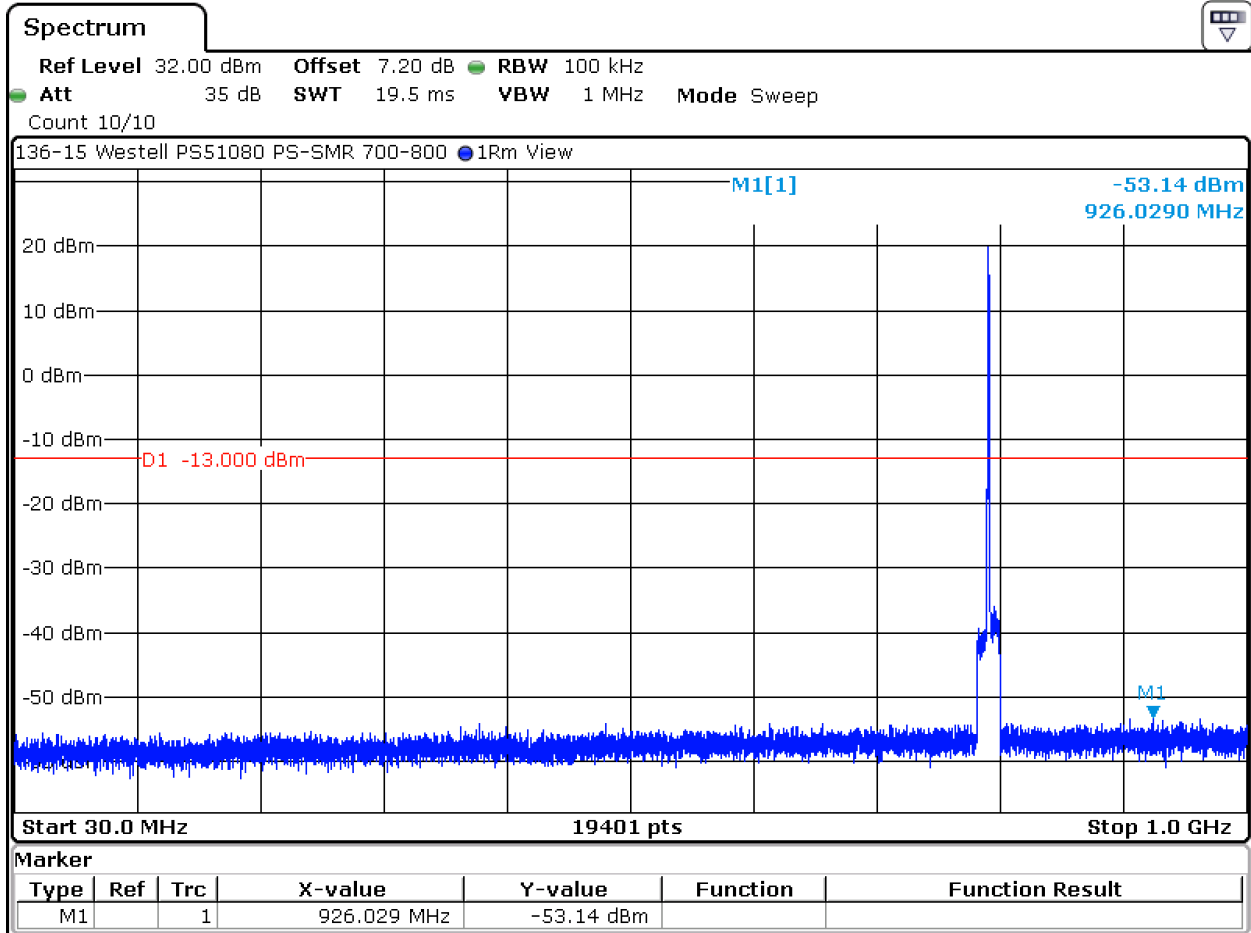
Date: 18.JAN.2016 15:47:30



6. Measurement Data (continued)

6.3. Spurious Emissions at the Antenna Terminals 90.219(e)(3), 90.543 (c) (continued)

6.3.9. 796.5 MHz, 30 MHz to 1 GHz

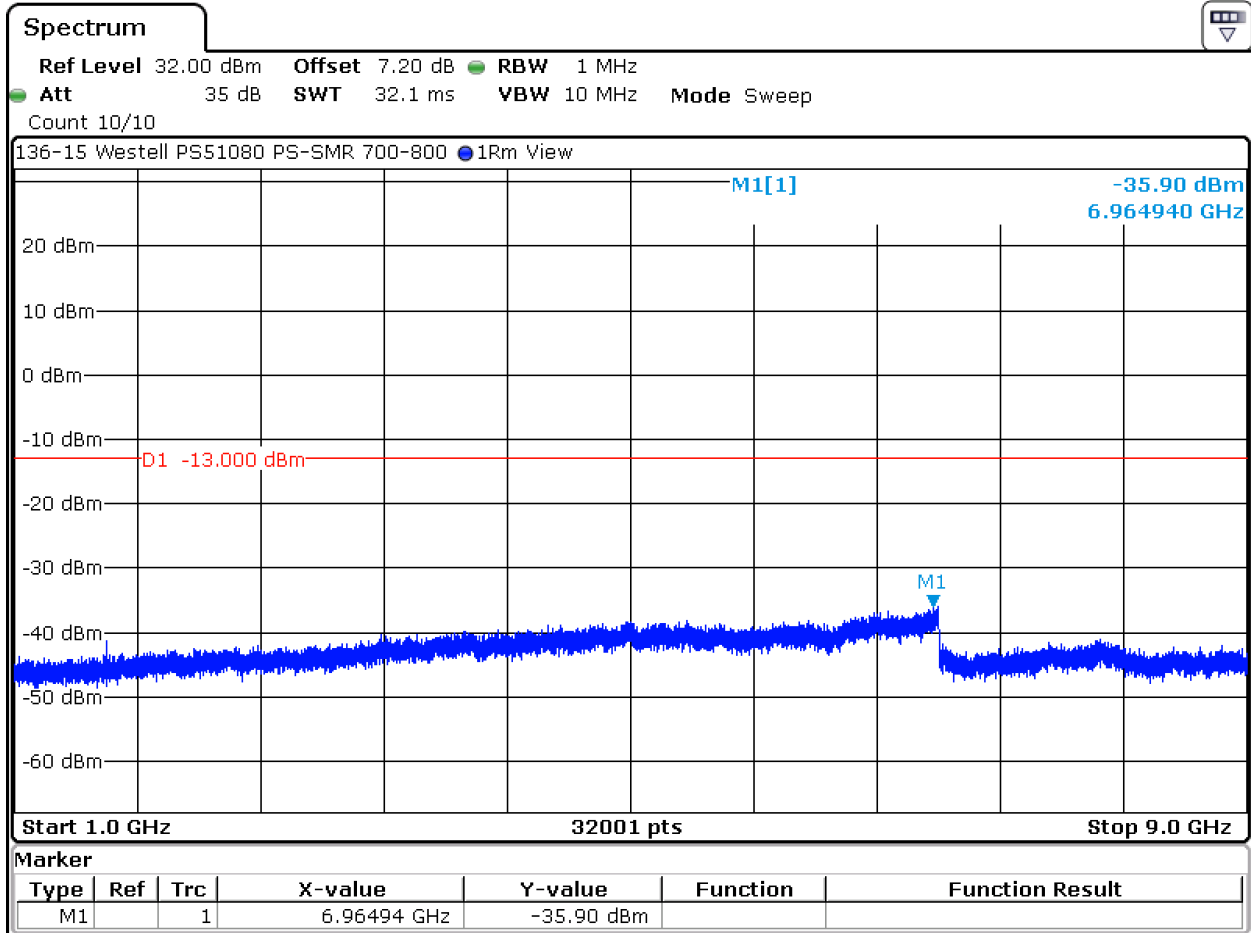


Date: 18.JAN.2016 15:49:24

6. Measurement Data (continued)

6.3. Spurious Emissions at the Antenna Terminals 90.219(e)(3), 90.543 (c) (continued)

6.3.10. 796.5 MHz, 1 to 9 GHz



Date: 18.JAN.2016 15:48:26

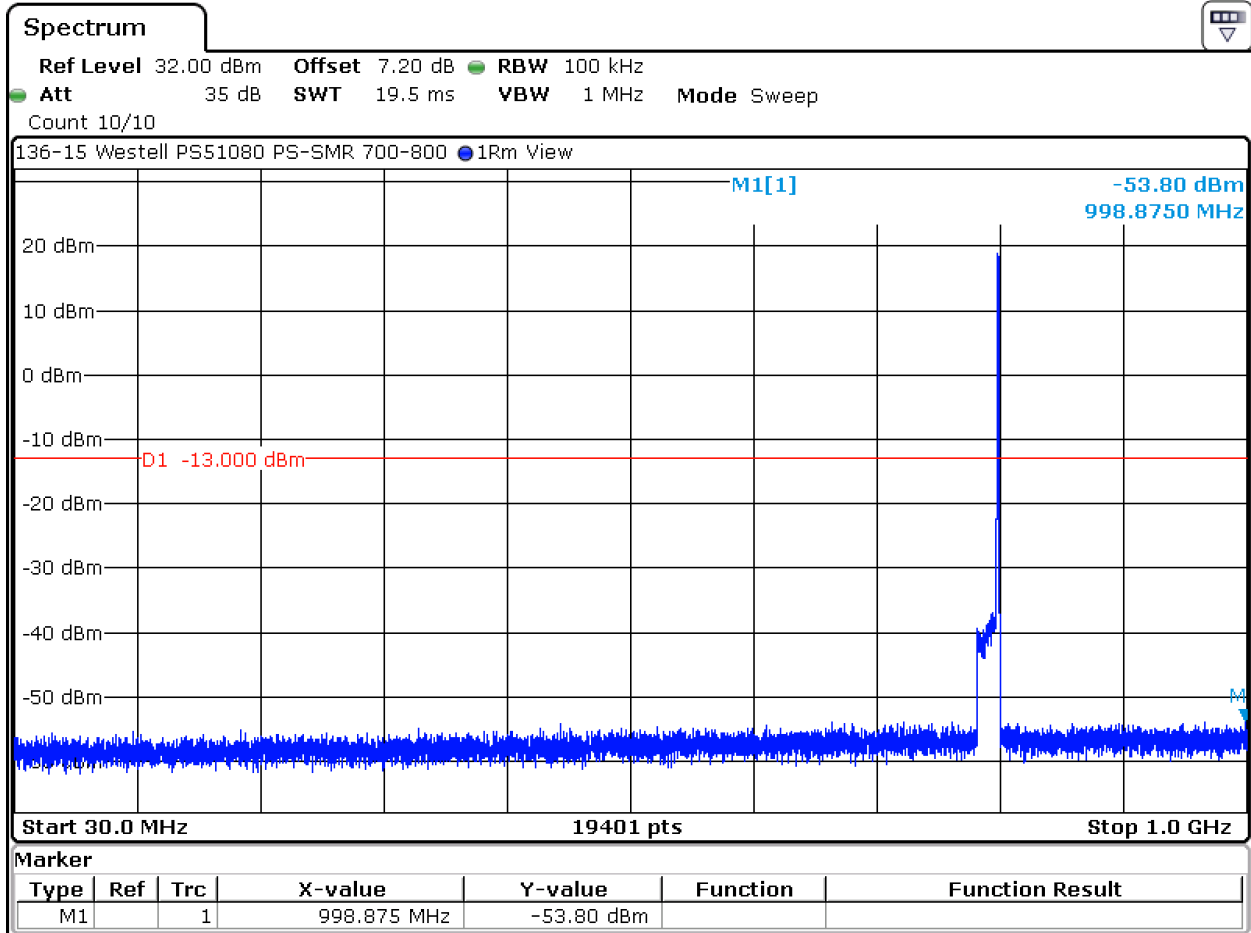
Test Number: 136-16R2

Issue Date: 6/24/2016

6. Measurement Data (continued)

6.3. Spurious Emissions at the Antenna Terminals 90.219(e)(3), 90.543 (c) (continued)

6.3.11. 804 MHz, 30 MHz to 1 GHz



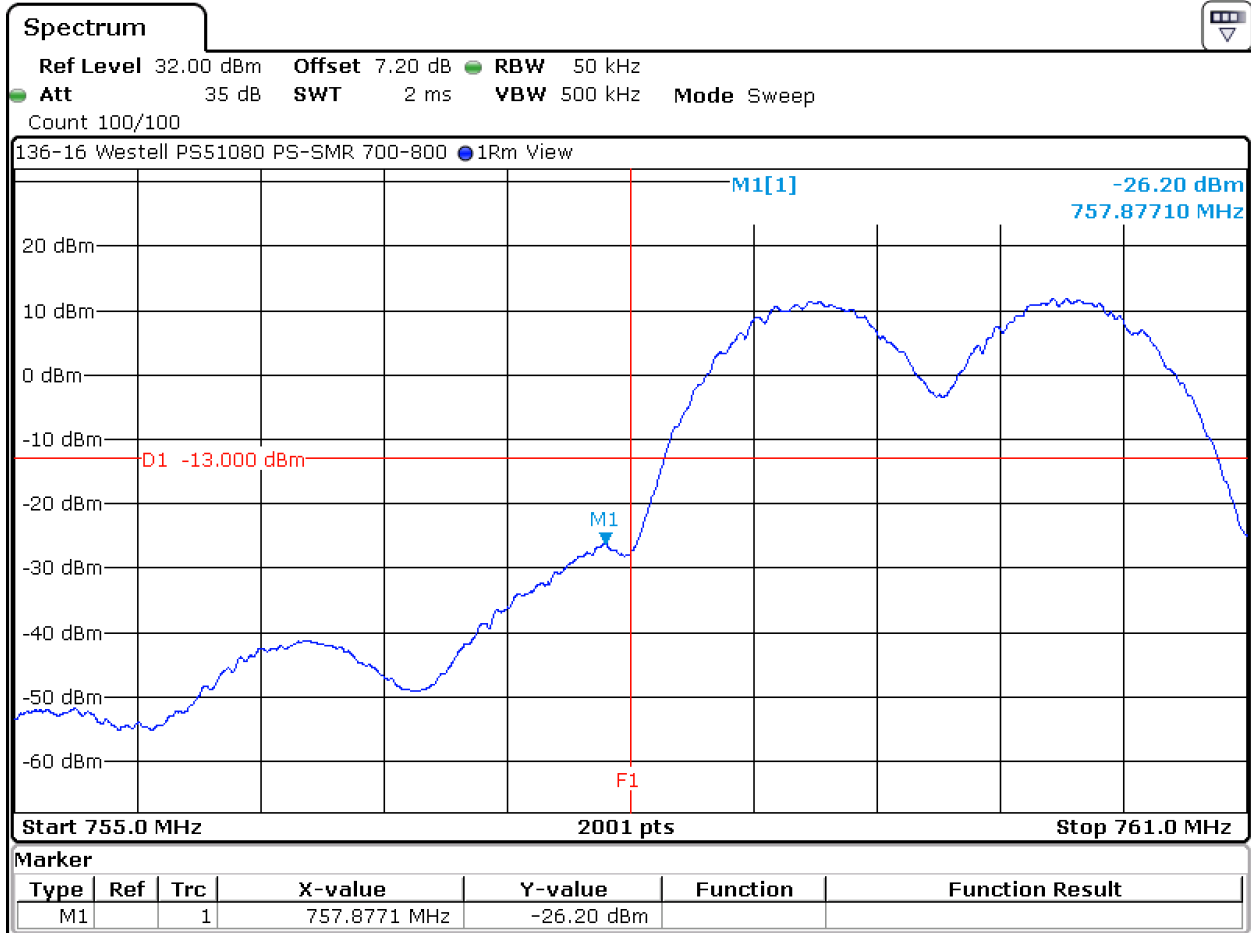
Date: 18.JAN.2016 15:50:23



6. Measurement Data (continued)

6.3. Spurious Emissions at the Antenna Terminals 90.219(e)(3), 90.543 (c) (continued)

6.3.13. 758 MHz Lower Bandedge

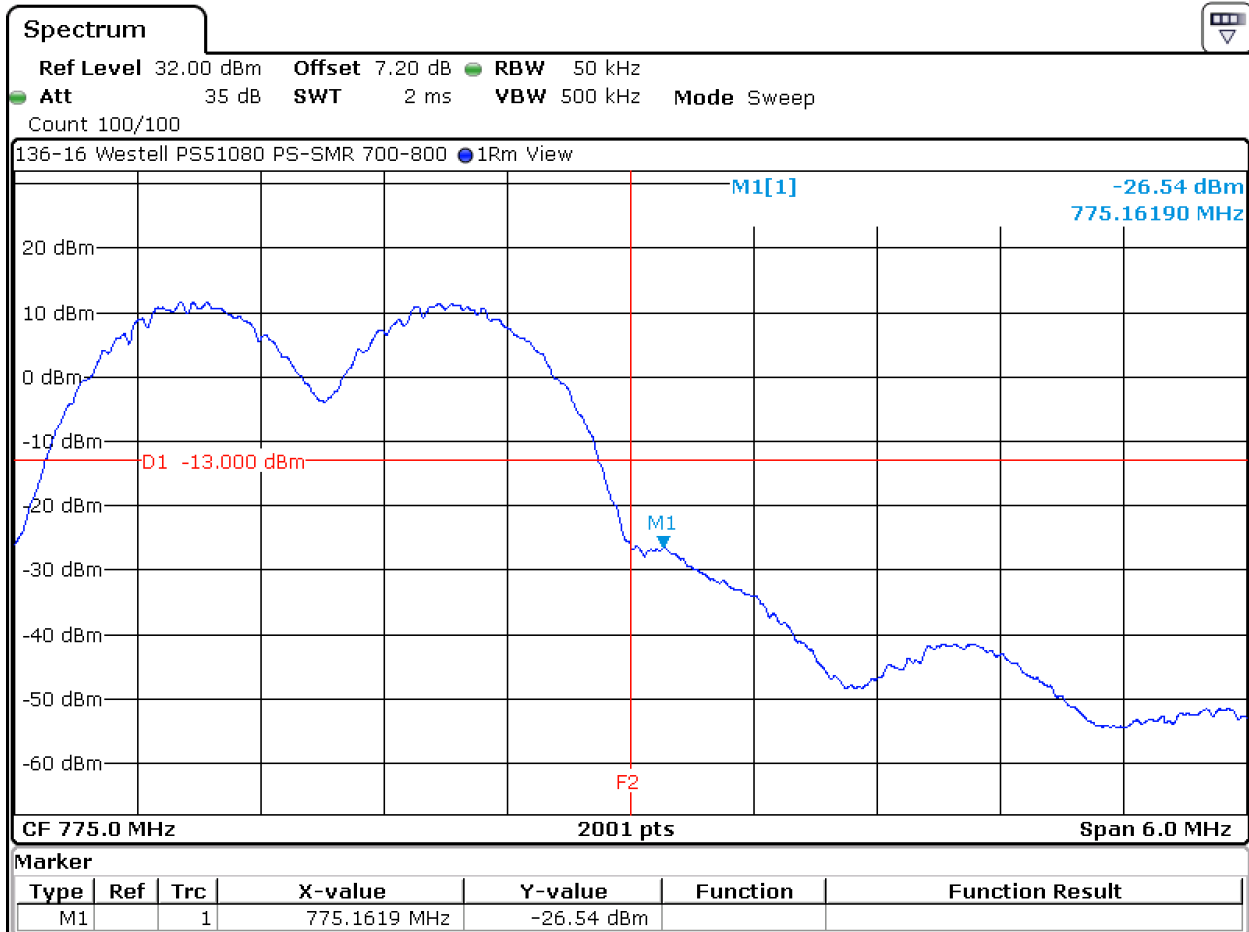


Date: 20.JAN.2016 15:04:01

6. Measurement Data (continued)

6.3. Spurious Emissions at the Antenna Terminals 90.219(e)(3), 90.543 (c) (continued)

6.3.14. 775 MHz Upper Bandedge

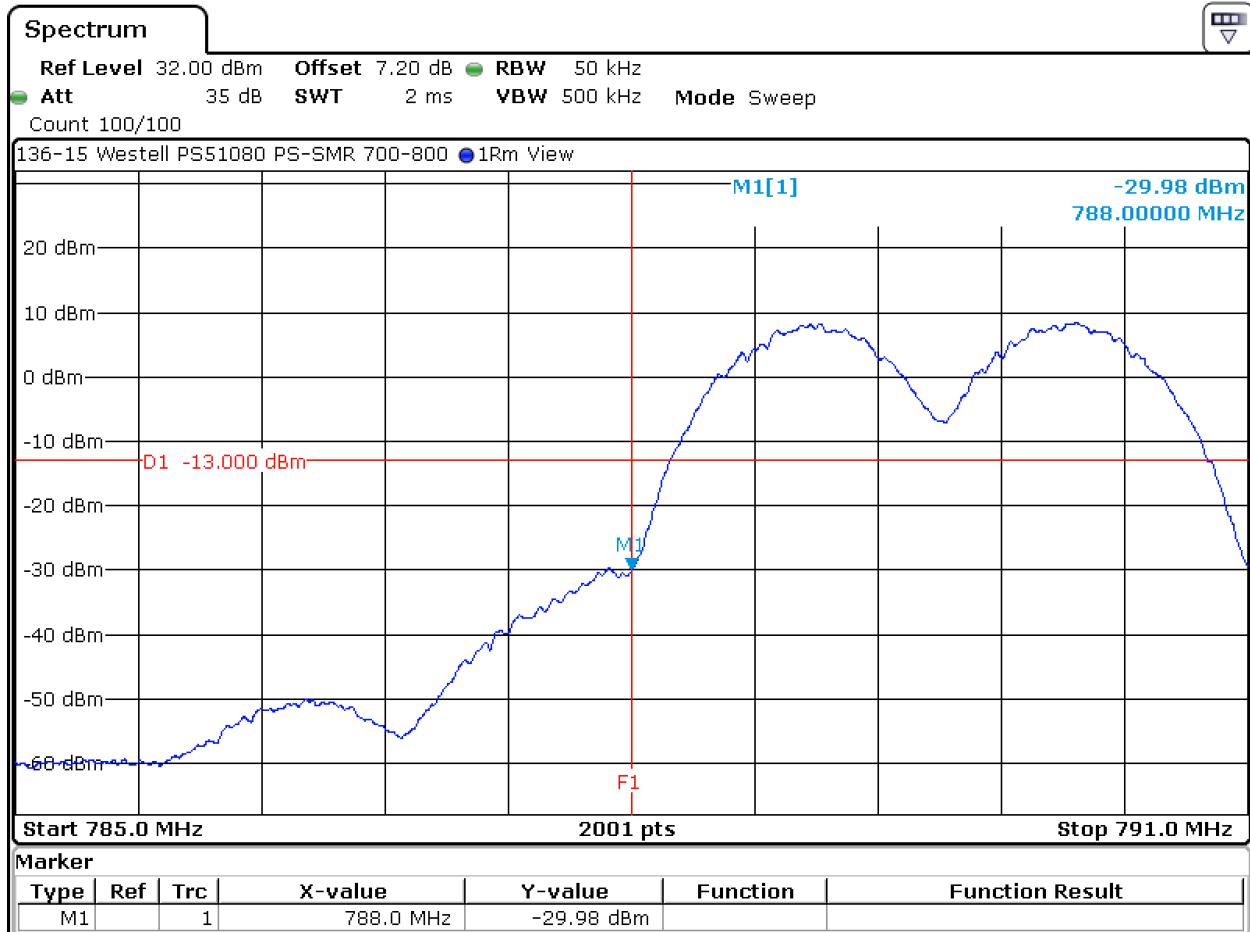


Date: 20.JAN.2016 15:05:32

**6. Measurement Data (continued)**

**6.3. Spurious Emissions at the Antenna Terminals 90.219(e)(3), 90.543 (c) (continued)**

**6.3.15. 788 MHz, Lower Bandedge**

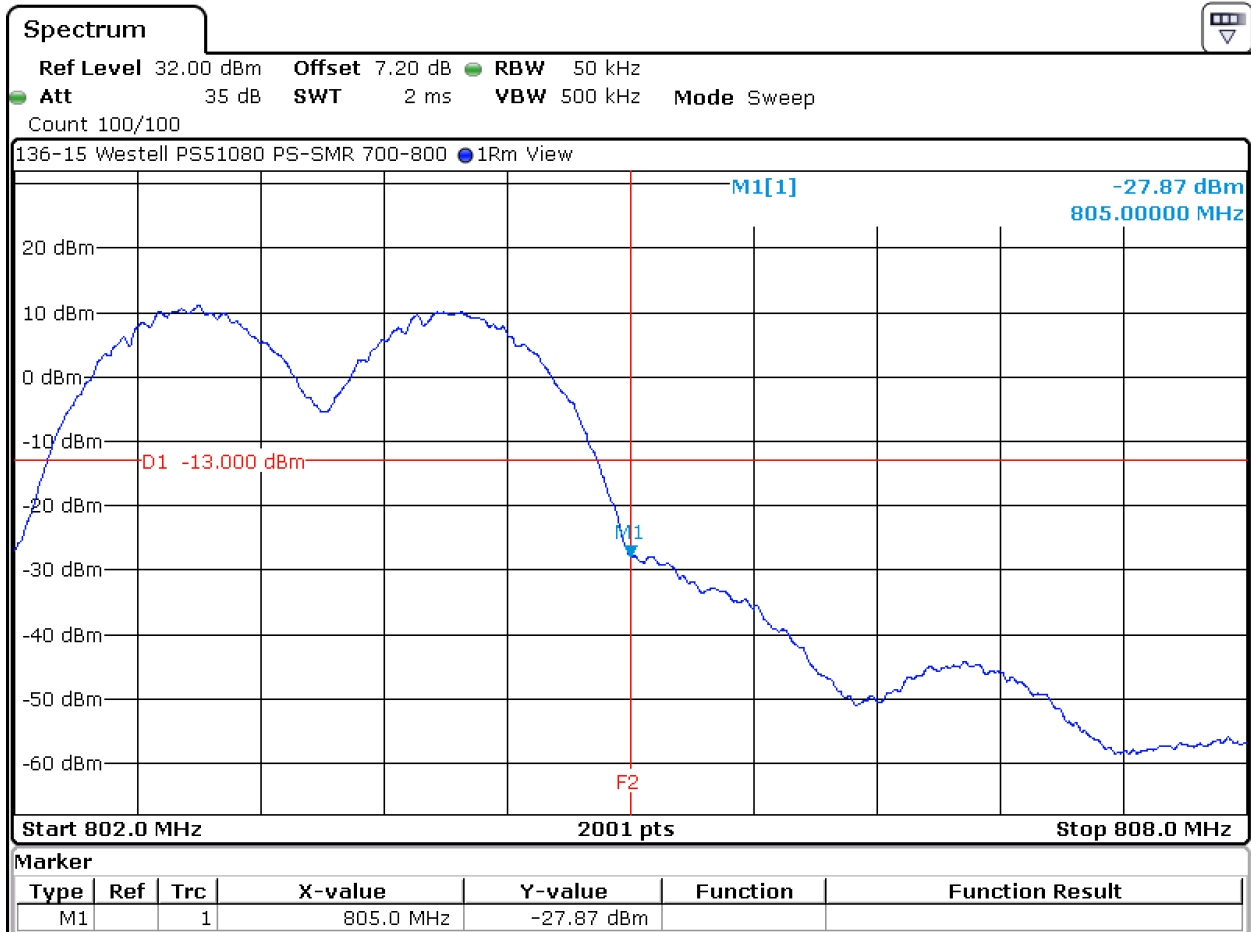


Date: 18.JAN.2016 15:55:37

6. Measurement Data (continued)

6.3. Spurious Emissions at the Antenna Terminals 90.219(e)(3), 90.543 (c) (continued)

6.3.16. 805 MHz, Upper Bandedge



Date: 18.JAN.2016 15:54:09



## 6. Measurement Data (continued)

### 6.4. Field Strength of Spurious Emissions 90.219(e)(3), 90.543 (c)

**Requirement:** Transmitters designed to operate in the 758 to 768 MHz, 769 to 775 MHz, 788 to 798 MHz and 799 to 805 MHz bands, any emission outside of the ACP tables in this section shall be attenuated below the transmitter power (P) by at least  $43 + 10 \log (P)$  dB.

Compliance with this provision is based upon the use of measurement instrumentation employing a resolution bandwidth of 100 kHz bandwidth for frequencies less than 1 GHz, and in a 1 MHz bandwidth for frequencies greater than 1 GHz.

Test Method: KDB 935210 Section 3.8

#### 6.4.1. Measurement and Equipment Setup

Test Date:	2/1/2016
Test Engineer:	Cody Merry
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

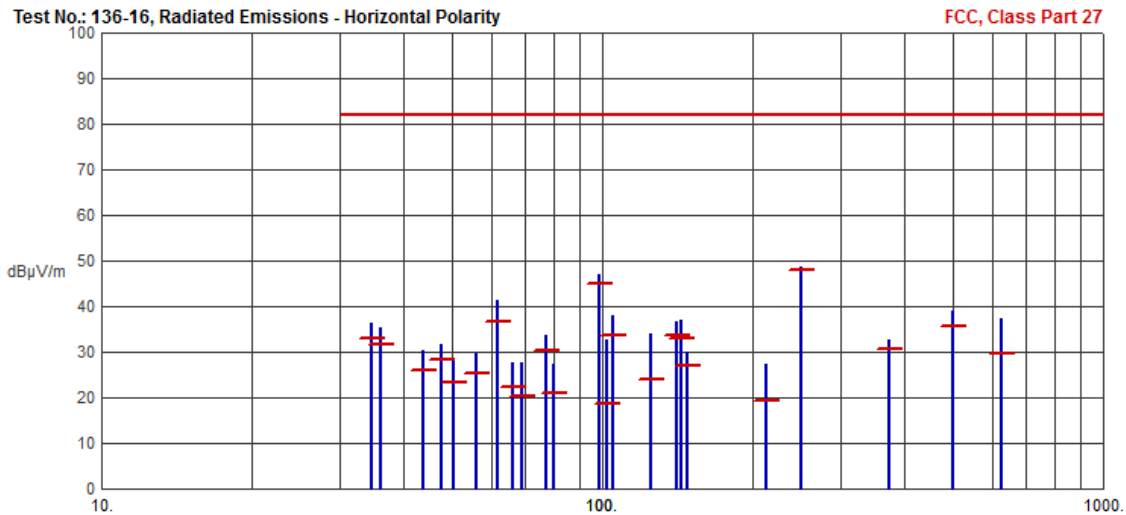
#### 6.4.2 Test Procedure

Test measurements were made in accordance with ANSI C63.4-2014, Standard Methods of Measurement of Radio Noise Emissions from Low-Voltage Electrical and Electronics Equipment in the Range of 9 kHz to 40 GHz.

6. Measurement Data (continued)

6.4. Field Strength of Spurious Emissions 90.219(e)(3), 90.543 (c) (continued)

6.4.3. Horizontal Polarity

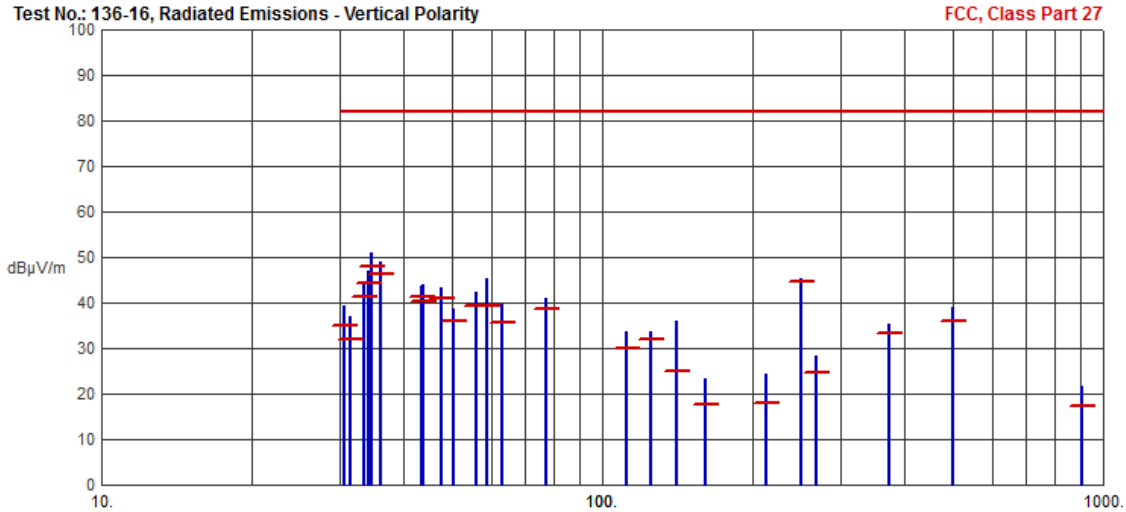


Frequency (MHz)	Pk Amp (dBµV/m)	QP Amp (dBµV/m)	QP Limit (dBµV/m)	Margin (dB)	Ant Ht (cm)	Table (Deg)	Comments
34.6273	36.17	32.87	82.00	-49.13	N/A	N/A	
36.1486	35.24	31.68	82.00	-50.32	N/A	N/A	
43.7770	30.21	26.11	82.00	-55.89	N/A	N/A	
47.7902	31.57	28.20	82.00	-53.80	N/A	N/A	
50.4102	27.88	23.31	82.00	-58.69	N/A	N/A	
55.8835	29.81	25.35	82.00	-56.65	N/A	N/A	
61.9982	41.29	36.51	82.00	-45.49	N/A	N/A	
66.2841	27.70	22.46	82.00	-59.54	N/A	N/A	
68.9830	27.82	20.31	82.00	-61.69	N/A	N/A	
77.1777	33.80	30.46	82.00	-51.54	N/A	N/A	
79.8064	27.38	20.99	82.00	-61.01	N/A	N/A	
98.4490	47.08	44.89	82.00	-37.11	N/A	N/A	
101.8657	32.55	18.82	82.00	-63.18	N/A	N/A	
104.8044	38.15	33.71	82.00	-48.29	N/A	N/A	
124.9922	34.16	24.15	82.00	-57.85	N/A	N/A	
141.1696	36.62	33.67	82.00	-48.33	N/A	N/A	
143.2824	36.87	33.09	82.00	-48.91	N/A	N/A	
148.1194	30.02	27.11	82.00	-54.89	N/A	N/A	
212.8925	27.38	19.22	82.00	-62.78	N/A	N/A	
249.9882	48.53	47.91	82.00	-34.09	N/A	N/A	
374.9902	32.50	30.63	82.00	-51.37	N/A	N/A	
499.9859	39.00	35.78	82.00	-46.22	N/A	N/A	
625.0010	37.47	29.59	82.00	-52.41	N/A	N/A	

6. Measurement Data (continued)

6.4. Field Strength of Spurious Emissions 90.219(e)(3), 90.543 (c) (continued)

6.4.4. Vertical Polarity



Frequency (MHz)	Pk Amp (dBµV/m)	QP Amp (dBµV/m)	QP Limit (dBµV/m)	Margin (dB)	Ant Ht (cm)	Table (Deg)	Comments
30.6174	39.24	34.97	82.00	-47.03	N/A	N/A	
31.4082	36.98	32.01	82.00	-49.99	N/A	N/A	
33.4300	43.96	41.43	82.00	-40.57	N/A	N/A	
34.0650	47.05	44.25	82.00	-37.75	N/A	N/A	
34.6388	50.99	47.95	82.00	-34.05	N/A	N/A	
36.1518	49.06	46.36	82.00	-35.64	N/A	N/A	
43.5020	43.75	41.28	82.00	-40.72	N/A	N/A	
43.8006	43.84	40.17	82.00	-41.83	N/A	N/A	
47.7690	43.30	40.91	82.00	-41.09	N/A	N/A	
50.4247	38.81	35.92	82.00	-46.08	N/A	N/A	
55.9910	42.29	39.35	82.00	-42.65	N/A	N/A	
58.7035	45.21	39.42	82.00	-42.58	N/A	N/A	
62.9352	39.69	35.62	82.00	-46.38	N/A	N/A	
77.1893	40.98	38.65	82.00	-43.35	N/A	N/A	
111.5913	33.76	29.88	82.00	-52.12	N/A	N/A	
124.9831	33.82	31.97	82.00	-50.03	N/A	N/A	
141.2108	36.05	24.96	82.00	-57.04	N/A	N/A	
161.1294	23.43	17.63	82.00	-64.37	N/A	N/A	
212.3355	24.20	17.84	82.00	-64.16	N/A	N/A	
249.9882	45.45	44.80	82.00	-37.20	N/A	N/A	
268.2679	28.31	24.51	82.00	-57.49	N/A	N/A	
374.9832	35.27	33.49	82.00	-48.51	N/A	N/A	
499.9842	38.99	35.86	82.00	-46.14	N/A	N/A	
905.0078	21.52	17.26	82.00	-64.74	N/A	N/A	

**6. Measurement Data (continued)****6.4. Field Strength of Spurious Emissions 90.219(e)(3), 90.543 (c) (continued)**

## 6.4.5. Measurement and Equipment Setup

Test Date:	02/01/2016
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 above 1 GHz

**6. Measurement Data (continued)**

**6.5. Frequency Stability 90.539**

Requirement: Transmitters designed to operate in the 769 to 775 MHz and 799 to 805 MHz frequency bands must meet the frequency stability requirements of this section. The frequency stability of base transmitters operating in the wideband segment must be 1 part per million or better.

Test Method: KDB 935210 Section 3.7

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

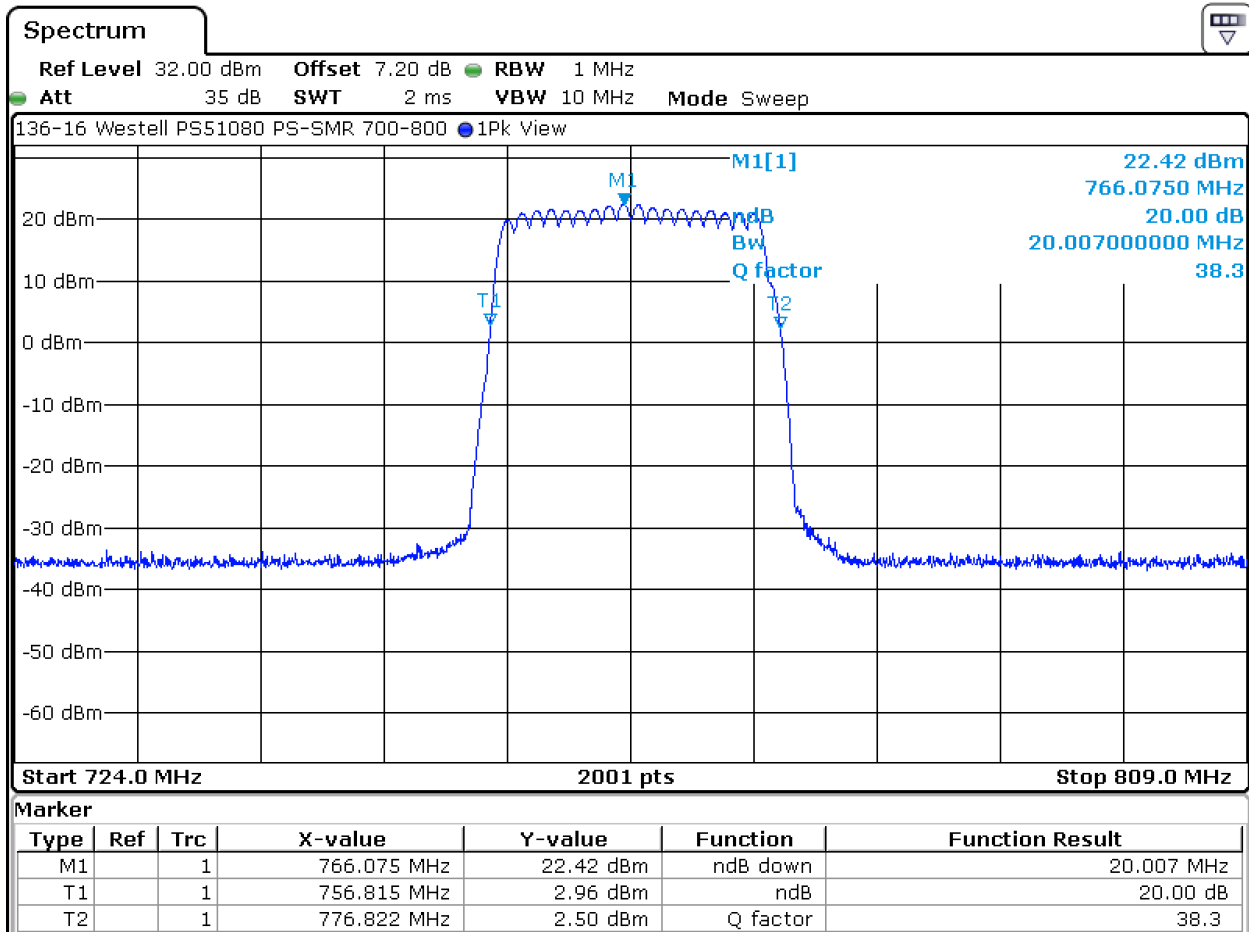
6. Measurement Data (continued)

6.6. Out of Band Rejection

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. 766.5 MHz Center Frequency

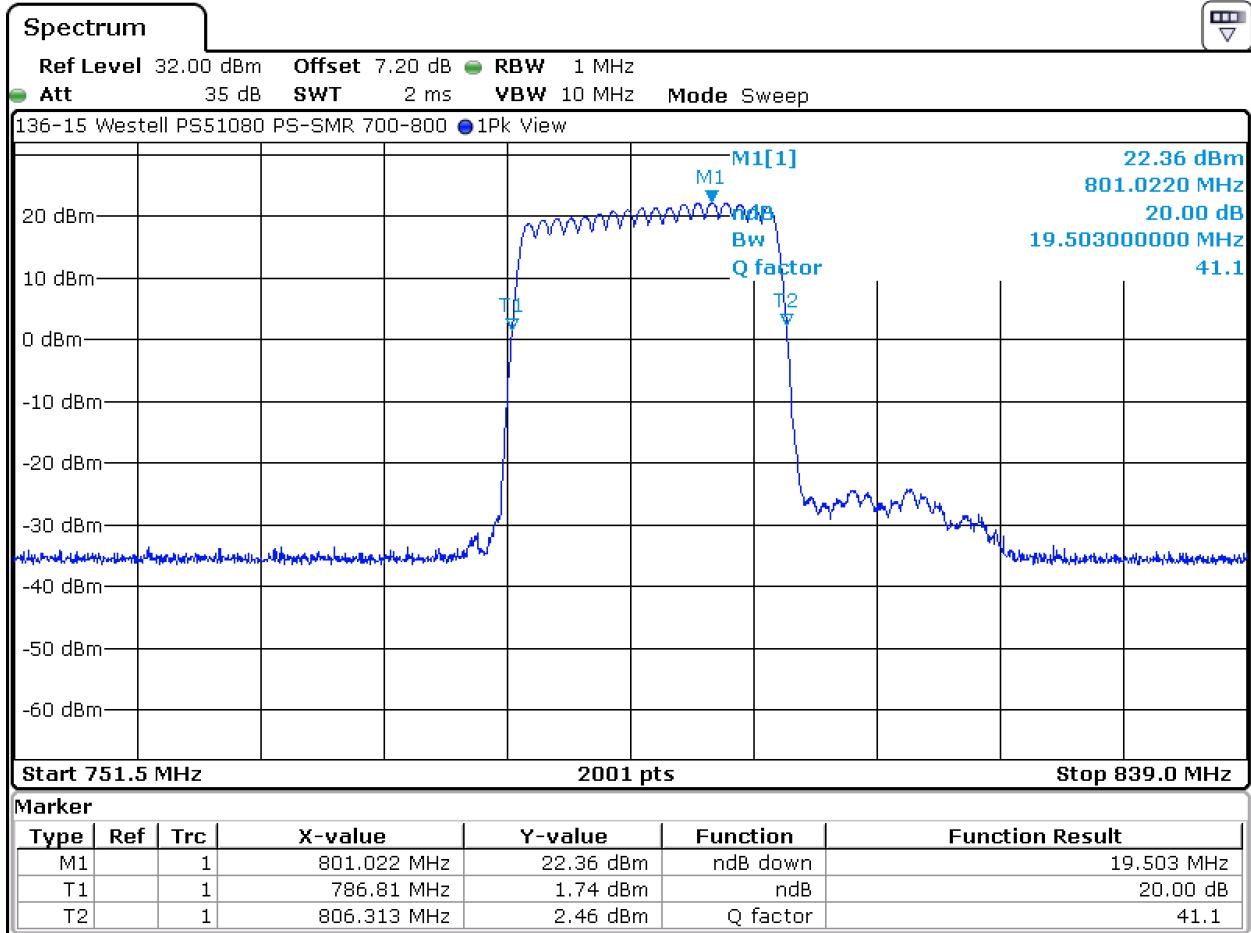


Date: 20.JAN.2016 14:40:17

6. Measurement Data (continued)

6.6. Out of Band Rejection (continued)

6.6.2. 796.5 MHz, Center Frequency



Date: 18.JAN.2016 16:21:59

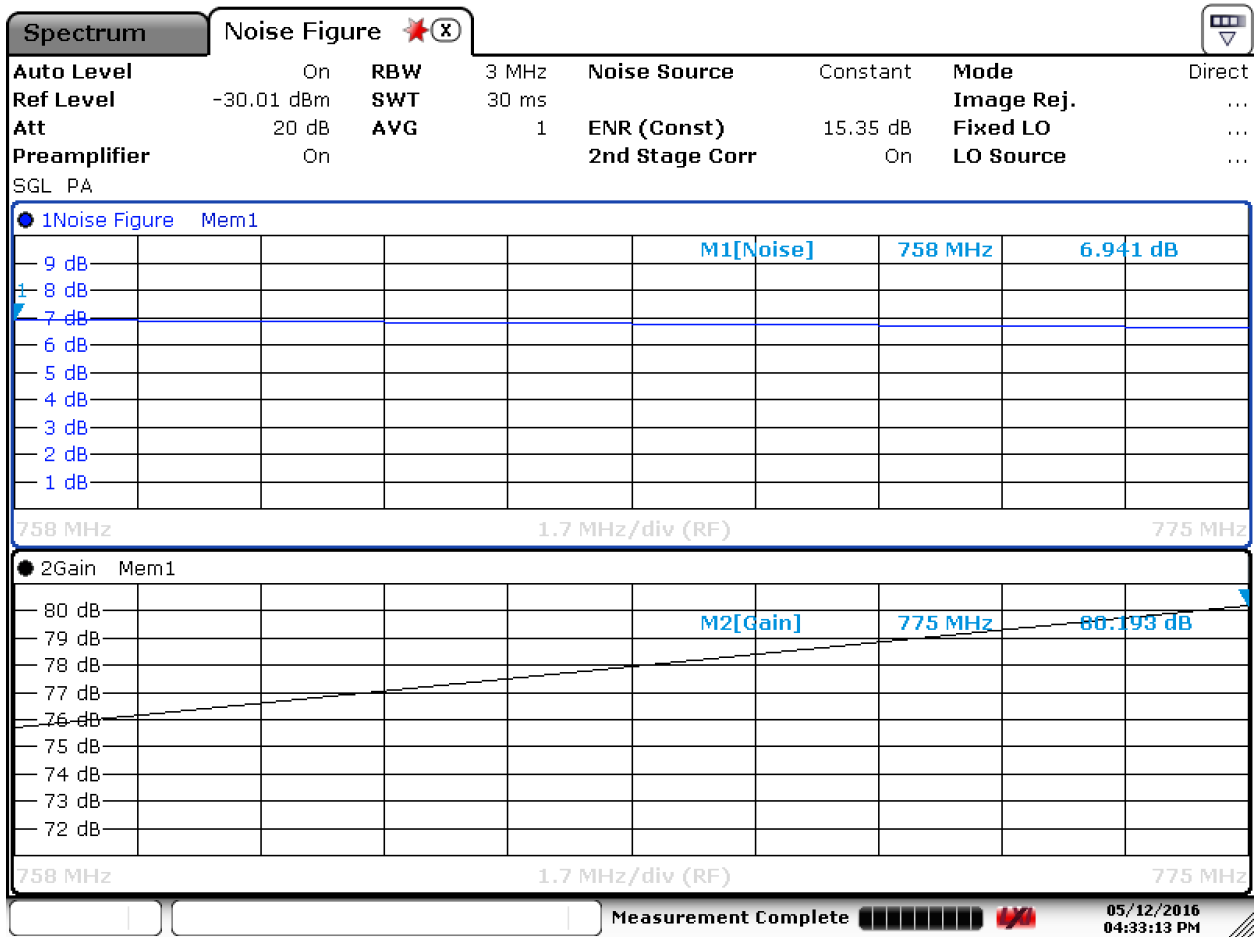
6. Measurement Data (continued)

6.7. Noise Figure

Requirement: The noise figure of a signal booster must not exceed 9 dB in either direction.

Result: Compliant, 6.941 dB

6.7.1. 758 to 775 MHz band



Date: 12.MAY.2016 16:33:12



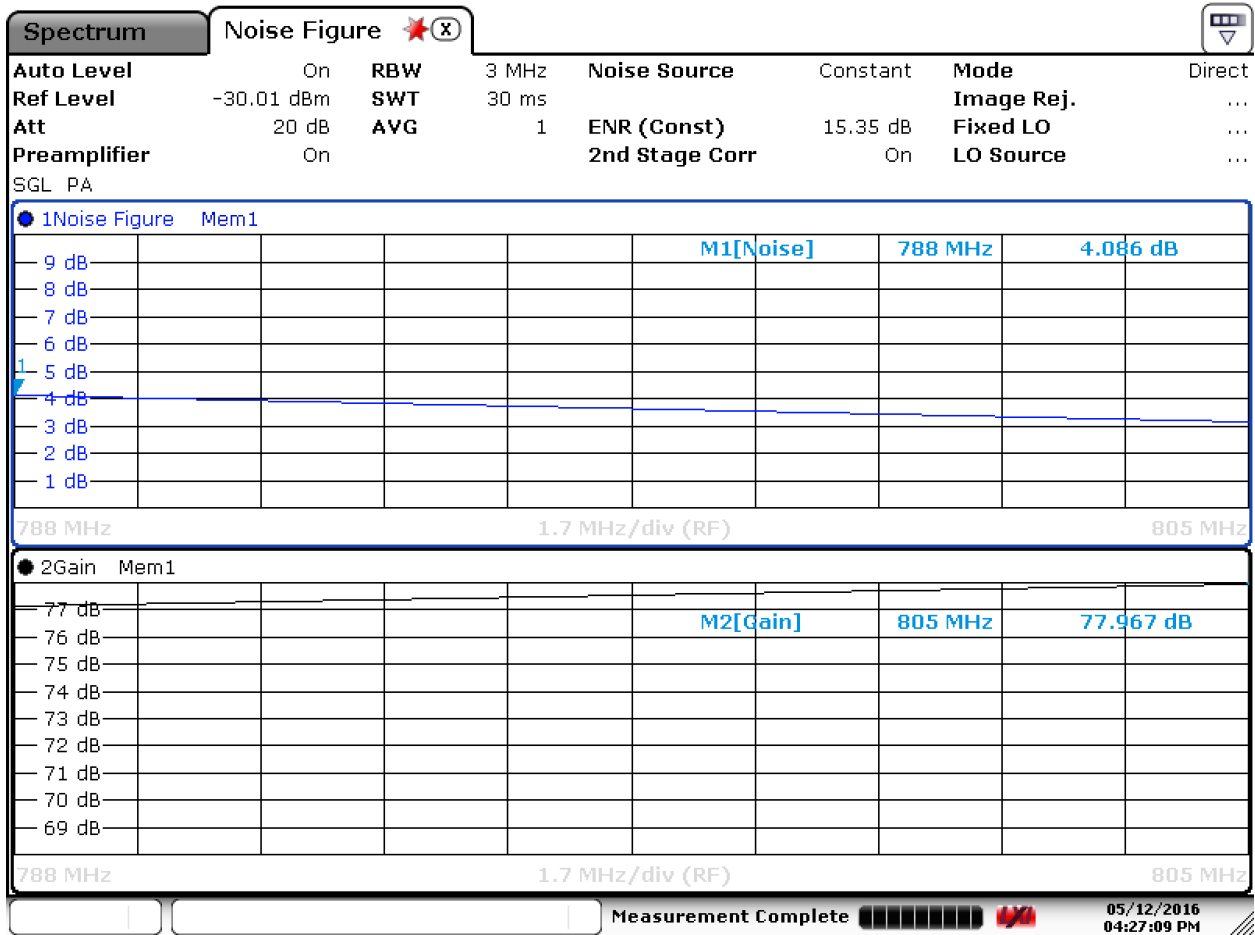
6. Measurement Data (continued)

6.7. Noise Figure (continued)

Requirement: The noise figure of a signal booster must not exceed 9 dB in either direction.

Result: Compliant, 4.086 dB

6.7.2. 788 to 805 MHz band



Date: 12.MAY.2016 16:27:08

**6. Measurement Data (continued)**

**6.8. Public Exposure to Radio Frequency Energy Levels 1.1307 (b)(1)**

Center Frequency (MHz)	MPE Distance (cm)	DUT Output Power (dBm)	DUT Antenna Gain (dBi)	Power Density		Limit (mW/cm <sup>2</sup> )	Result
				(mW/cm <sup>2</sup> )	(W/m <sup>2</sup> )		
	(1)	(2)	(3)	(4)		(5)	
759	20.0	27.67	3.00	0.2321294	2.3212940	1	Compliant
767	20.0	28.89	3.00	0.3074186	3.0741860	1	Compliant
774	20.0	27.66	3.00	0.2315955	2.3159551	1	Compliant
789	20.0	25.66	3.00	0.1461269	1.4612689	1	Compliant
797	20.0	27.20	3.00	0.2083196	2.0831961	1	Compliant
804	20.0	27.81	3.00	0.2397343	2.3973428	1	Compliant

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

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 (B): Limits for General Population/Uncontrolled Exposure.

## **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 Federal Communications Commission (FCC) and Industry Canada standards. A description of the test sites is on file with the FCC (registration number **96392**) and Industry Canada (file number **IC 3023A-1**).

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.

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

## 8. Test Setup Photographs

### Antenna Port Conducted Emissions



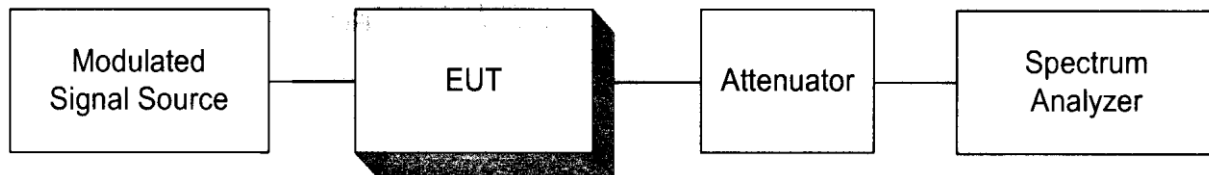
**8. Test Setup Photographs (cont)**

**Radiated Emissions**

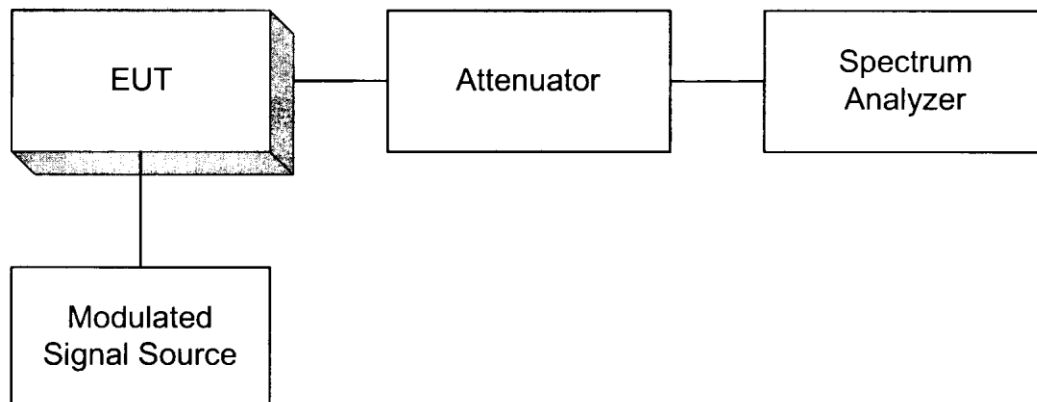


Appendix A

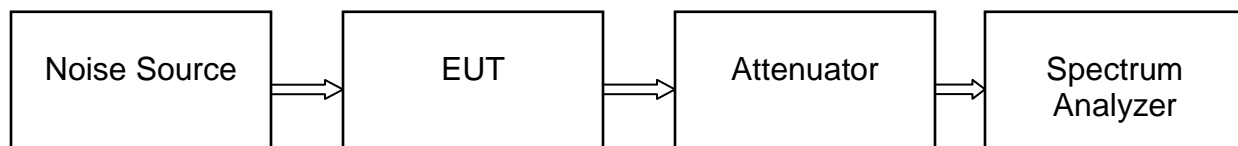
RF Output Power



Occupied Bandwidth

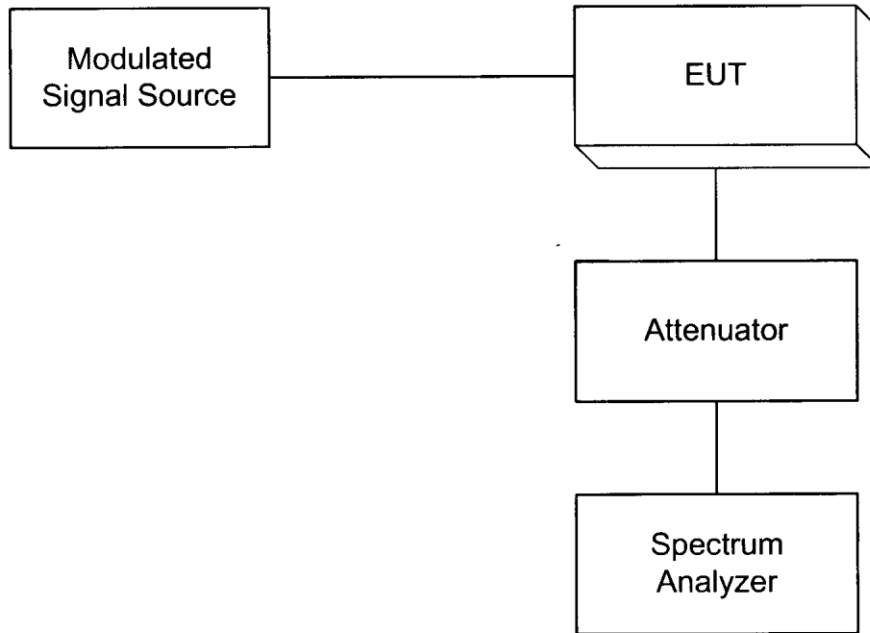


Noise Figure



### Appendix A

#### Spurious Emissions at the Antenna Terminals



#### Field Strength of Spurious Radiation

