

COMPLIANCE WORLDWIDE INC. TEST REPORT 208-15

**In Accordance with the Requirements of
FCC PART 27:2014 Subparts C & L
FCC PART 20:2014**

Issued to

**Westell, Inc.
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Manchester, NH 03101
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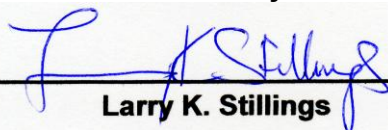
for

**Acela Digital Repeater AWS
Model: CSI-DRACELA-PR-AW**

FCC ID: NVRCSIDRACELAAWS

Original Report Issued on July 15, 2015

Tested by

A blue ink signature of Larry K. Stillings, written over a horizontal line.

Larry K. Stillings

Reviewed By

A blue ink signature of Brian F. Breault, written over a horizontal line.

Brian F. Breault

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1. Scope

This test report certifies that the Westell Digital Repeater Acela AWS, as tested, meets the FCC Part 27 Subparts C & L 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.

2. Product Details

- 2.1. Manufacturer:** Westell, Inc.
- 2.2. Model Number:** CSI-DRACELA-PR-AW (CSI-DRACELA-B-AW)
- 2.3. Serial Number:** C1L20004, Item# CS12-558-419 (CS12-560-419)
- 2.4. Description:** This repeater consists of a single Module configured in a 2U high sealed enclosure for use on a train in the AWS frequency band. Through the use of two multiband cavity filters and front panel connectors which are terminated if not used, this repeater optionally provides connection to the Donor and Server antennas for type certified PCS, CELL and U7C repeaters. As the train moves between cell sites, the desired filter can then be switched to maintain coverage in the band licensed for that area.
- 2.5. Power Source:** 72 VDC via Train power source.
- 2.6. Software Version:** N/A
- 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 Signals
IQ Modulation Generator	R & S	AMIQ04	100540	Generating AWS Signals
Power Supplies (2)	Lambda	SWS600-36	n/a	Two In Series for 72 VDC
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 1	2M	Yes	DUT	Notebook PC
USB 1	2M	Yes	DUT	Notebook PC
Ethernet	2M	No	DUT	Notebook PC

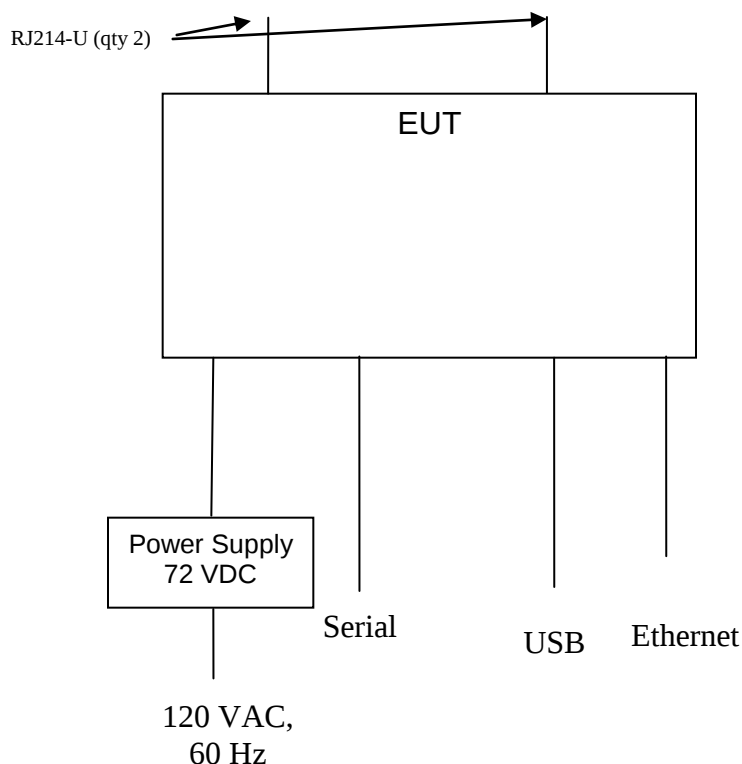
Notebook PC is connected only during setup

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 an AWS / LTE 4.1 MHz AWGN digital modulation to the input of the amplifier across the AWS 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
Spectrum Analyzer 20 Hz – 40 GHz ²	Rohde & Schwarz	FSV40 ¹	100899	6/5/2015	2 Years
EMI Receiver	Hewlett Packard	8546A	3650A00360	6/4/2016	2 Years
Microwave Preamp	Hewlett Packard	8449B	3008A01323	6/5/2015	2 Years
Biconilog Antenna, 30 MHz to 2 GHz	Com-Power	AC-220	25509	8/30/2015	1 Year
Horn Antenna, 960 MHz to 18 GHz	Electro-Metrics	EM-6961	6337	10/11/2015	2 Years
Horn Antenna 18 to 26 GHz	Com-Power	AH-826	080151	9/23/2016	2 Years
RF Signal Generator	Rohde & Schwarz	SMIQ06B	100090	7/31/2015	2 Years
Power Attenuator	Aeroflex / Weinschel	41-10-12	75411	CBU	n/a
Power Attenuator	Pasternack	PE7017-6	Cal ID# 233	CBU	n/a
Digital Barometer	Extech Instruments	SD700	Q590483	9/18/2015	2 Years

¹ FSV40 Firmware revision: V2.30 SP1 Date installed: 10/22/2014 Previous V2.30, installed 7/23/2014.

4.2. Measurement & Equipment Setup

Test Dates: 3/18/2015, 3/19/2015,
3/25/2015

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, Subparts C & L.

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 6-5-2015, 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 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 27 Reference	Test Report Section	Result	Comment
Power and Antenna height limits, Output Power	27.50 (d)	6.1	Compliant	
Occupied Bandwidth	Part 2.1049	6.2	Compliant	
Spurious Emissions at Antenna Terminals	27.53 (h)	6.3	Compliant	
Field Strength of Spurious Emissions	27.53 (h)	6.4	Compliant	
Frequency Stability	27.54	6.5	N/A	The EUT does not translate the frequency of the input signal
Out of Band Rejection	N/A	6.6	Compliant	
Public Exposure to Radio Frequency Energy Levels	Section 1.1307 (b)(1)	6.7	Compliant	

6. Measurement Data

6.1. Power and Antenna Height Limits 27.50 (d)(4)

Requirement: Fixed and base stations transmitting a signal in the 2110-2180 MHz, band must not exceed an ERP of 1640 watts/MHz and an antenna height of 305 m HAAT.

Fixed, mobile, and portable (handheld) stations operating in the 1710–1780 MHz band are limited to 1 watt EIRP. Fixed stations operating in this band are limited to a maximum antenna height of 10 meters above ground.

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	1715	32.00	1.585
Output Power	1745	31.77	1.503
Output Power	1775	31.76	1.500
Output Power	2115	27.77	0.598
Output Power	2145	27.68	0.586
Output Power	2175	27.34	0.542
3 dB Above AGC	1715	31.98	1.578
3 dB Above AGC	1745	31.77	1.503
3 dB Above AGC	1775	31.83	1.524
3 dB Above AGC	2115	27.73	0.593
3 dB Above AGC	2145	27.98	0.628
3 dB Above AGC	2175	27.89	0.615
Input Power	1715	-61.04	N/A
Input Power	1745	-60.33	N/A
Input Power	1775	-60.61	N/A
Input Power	2115	-61.81	N/A
Input Power	2145	-61.95	N/A
Input Power	2175	-62.14	N/A

Note: Input Power is AGC threshold Level

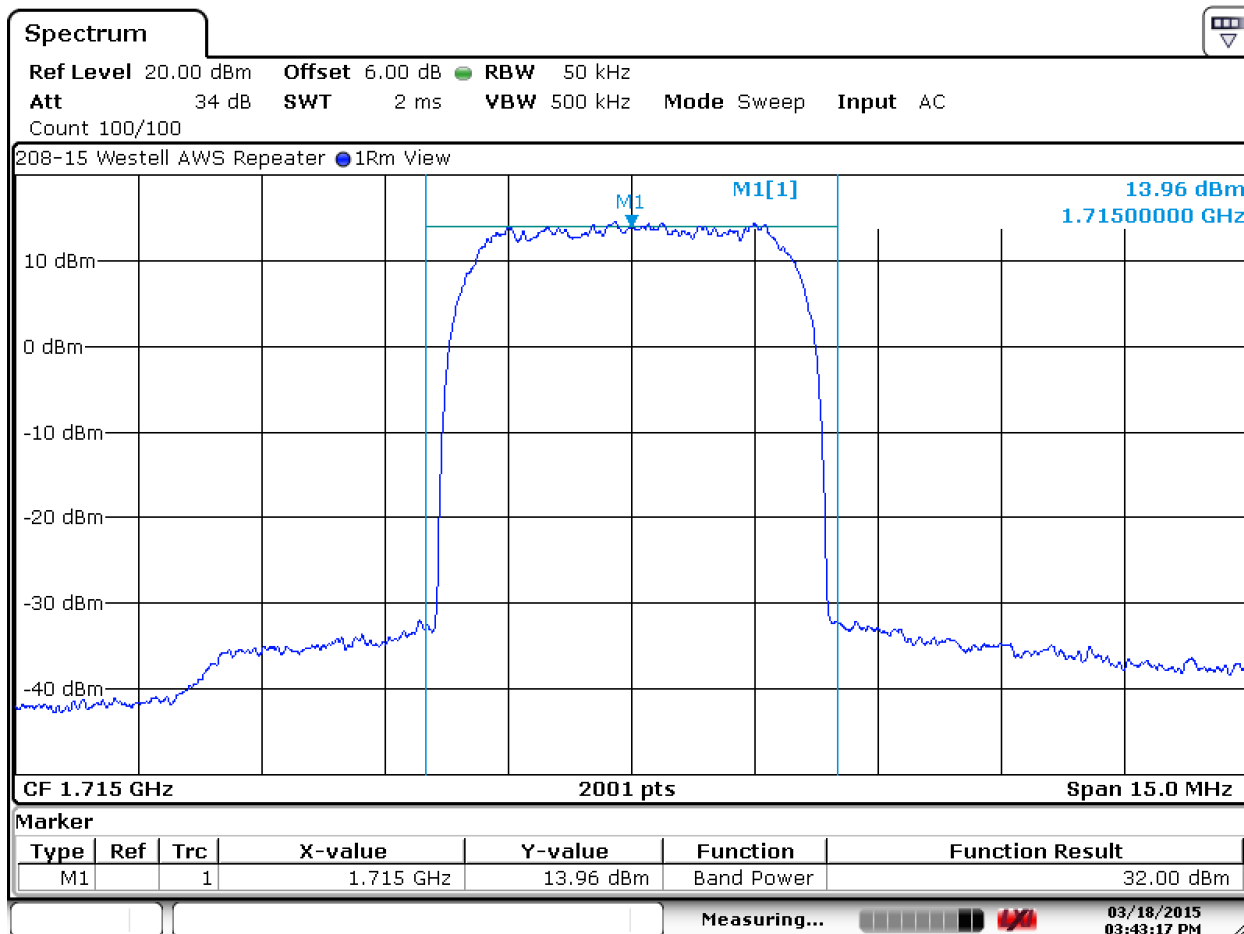
Test Number: 208-15

Issue Date: 7/15/2015

6. Measurement Data

6.1. Power and Antenna Height Limits 27.50 (b)(4) (cont)

6.1.2. Mean Transmitter Output Power, 1715 MHz



Date: 18.MAR.2015 15:43:17

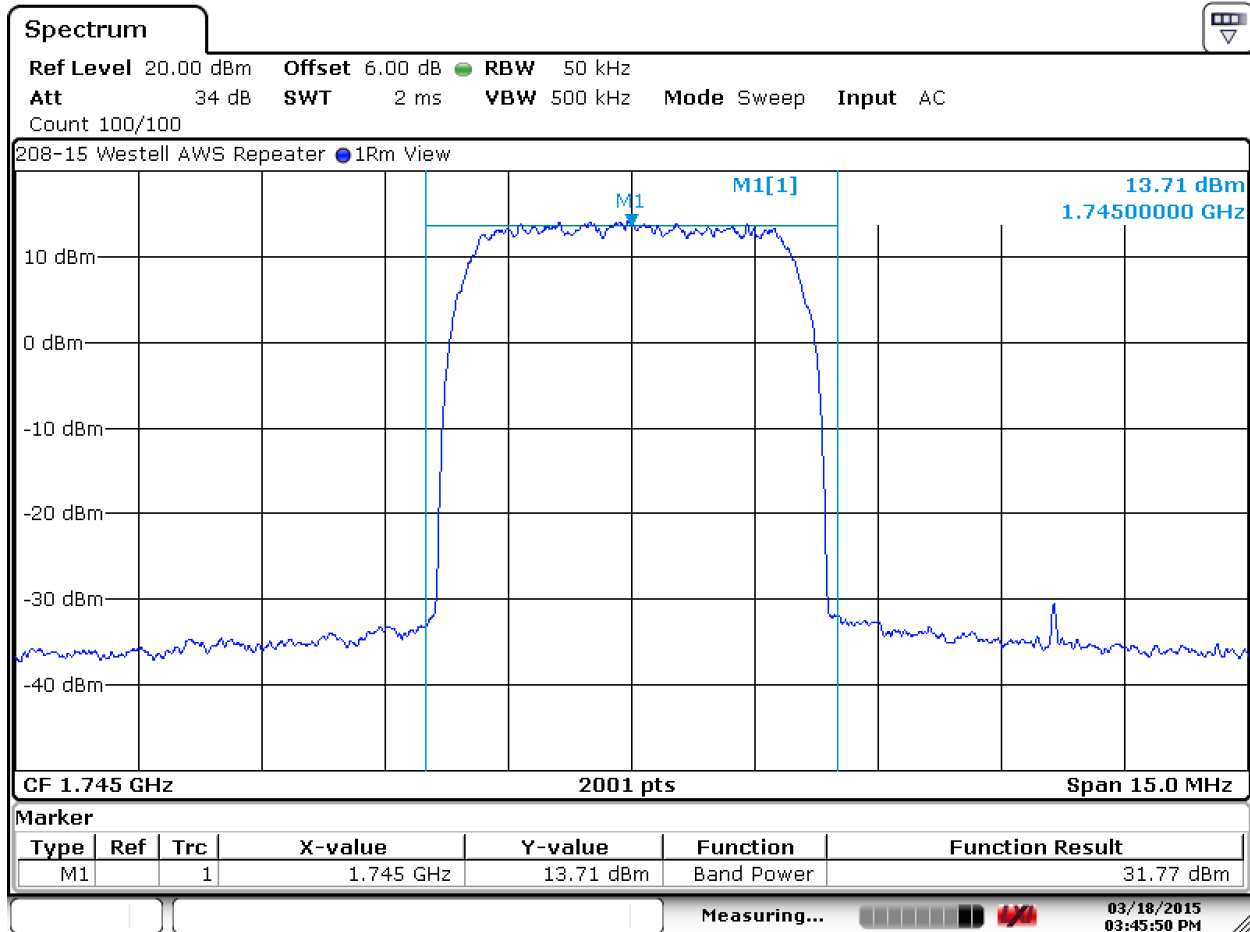
Test Number: 208-15

Issue Date: 7/15/2015

6. Measurement Data

6.1. Power and Antenna Height Limits 27.50 (b)(4) (cont)

6.1.3. Mean Transmitter Output Power, 1745 MHz



Date: 18.MAR.2015 15:45:49

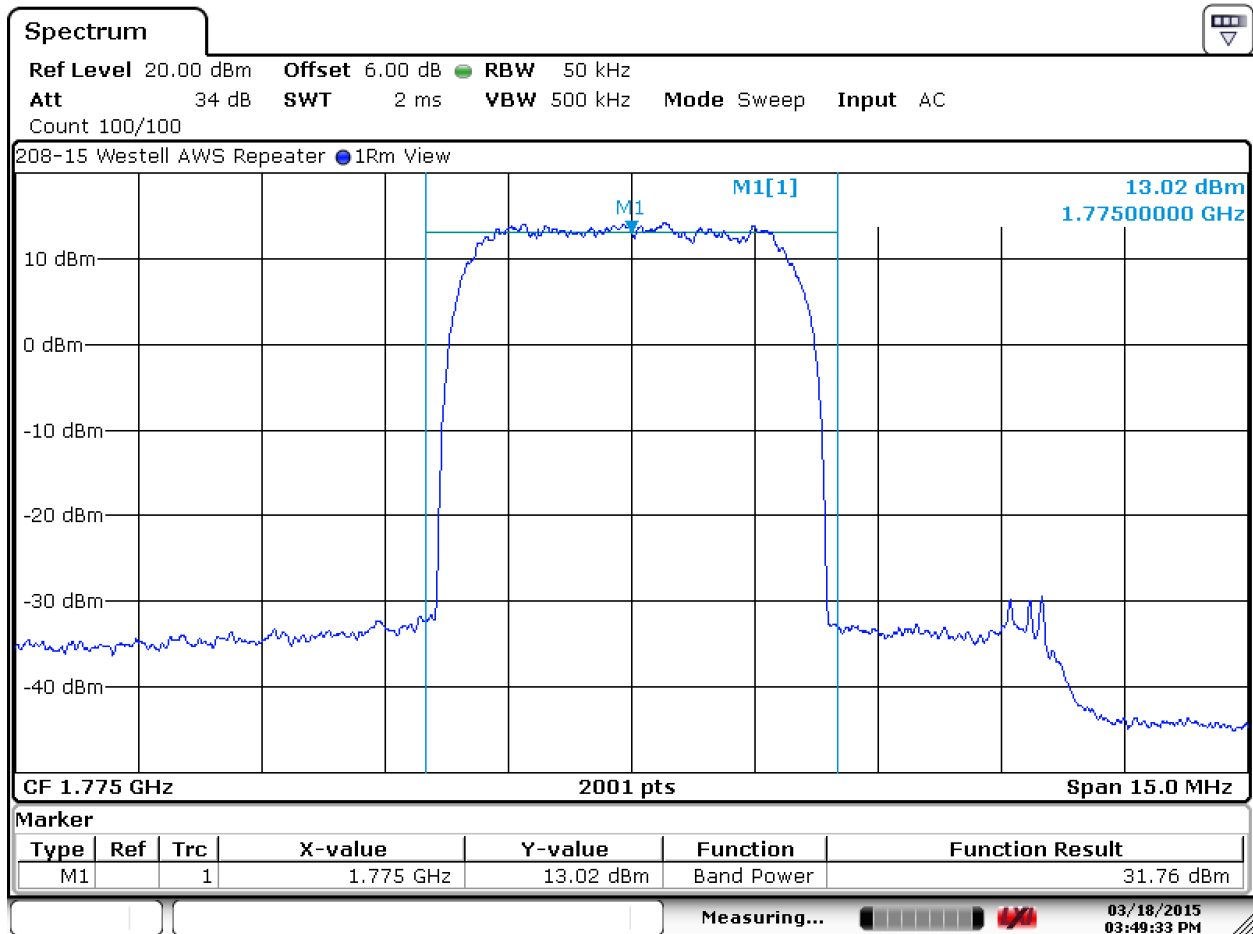
Test Number: 208-15

Issue Date: 7/15/2015

6. Measurement Data

6.1. Power and Antenna Height Limits 27.50 (b)(4) (cont)

6.1.4. Mean Transmitter Output Power, 1775 MHz



Date: 18.MAR.2015 15:49:32

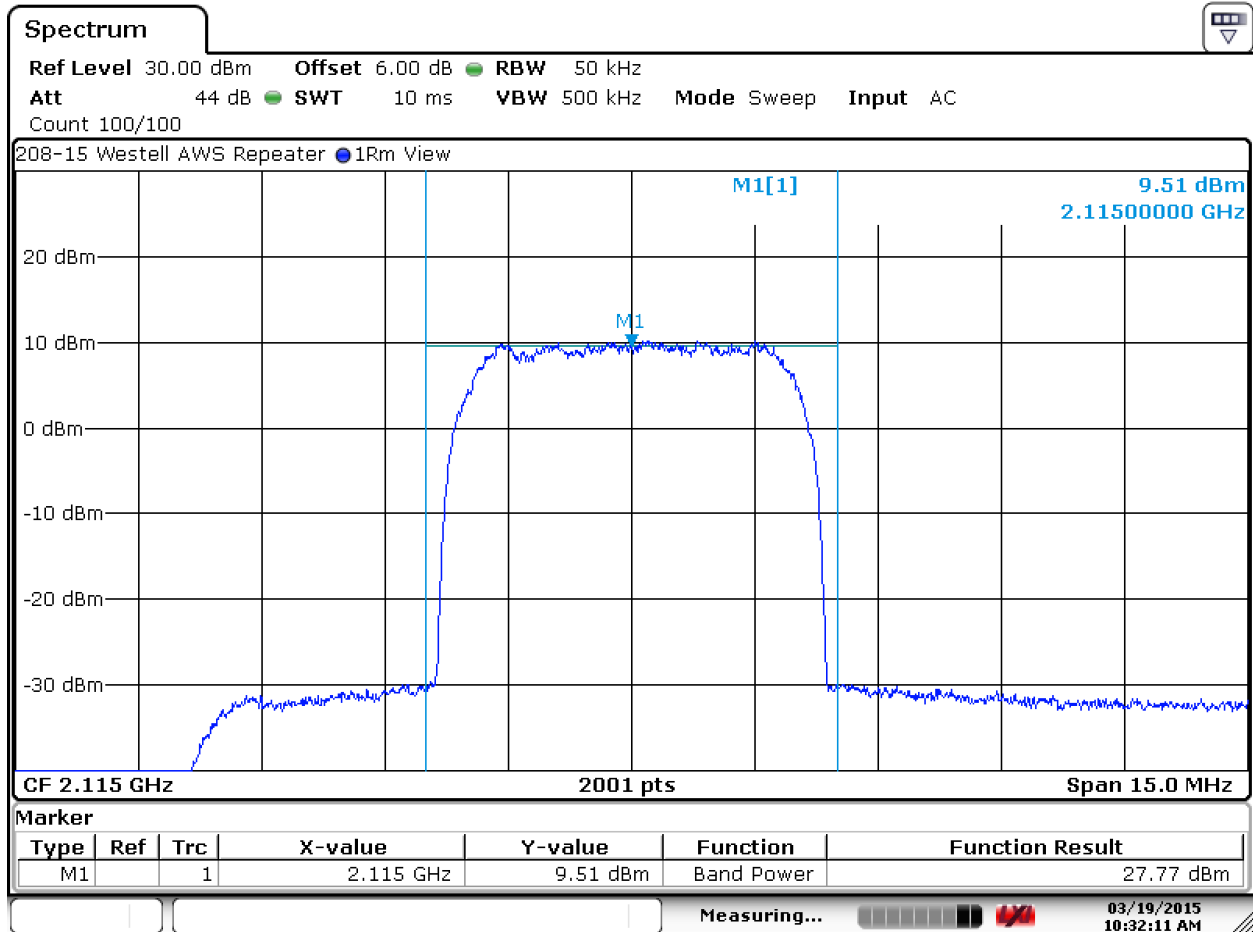
Test Number: 208-15

Issue Date: 7/15/2015

6. Measurement Data

6.1. Power and Antenna Height Limits 27.50 (b)(4) (cont)

6.1.5. Mean Transmitter Output Power, 2115 MHz



Date: 19.MAR.2015 10:32:12

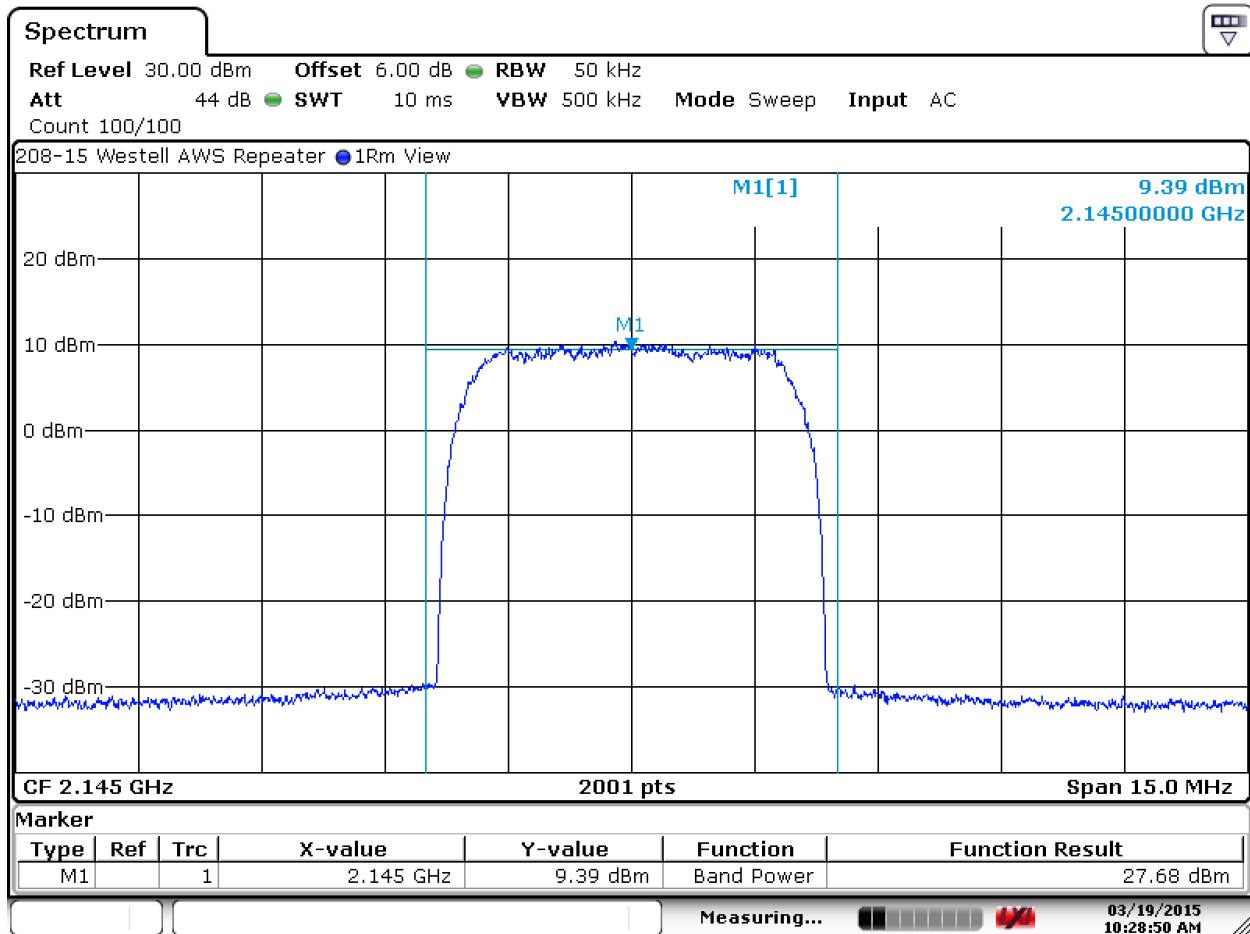
Test Number: 208-15

Issue Date: 7/15/2015

6. Measurement Data

6.1. Power and Antenna Height Limits 27.50 (b)(4) (cont)

6.1.6. Mean Transmitter Output Power, 2145 MHz



Date: 19.MAR.2015 10:28:49

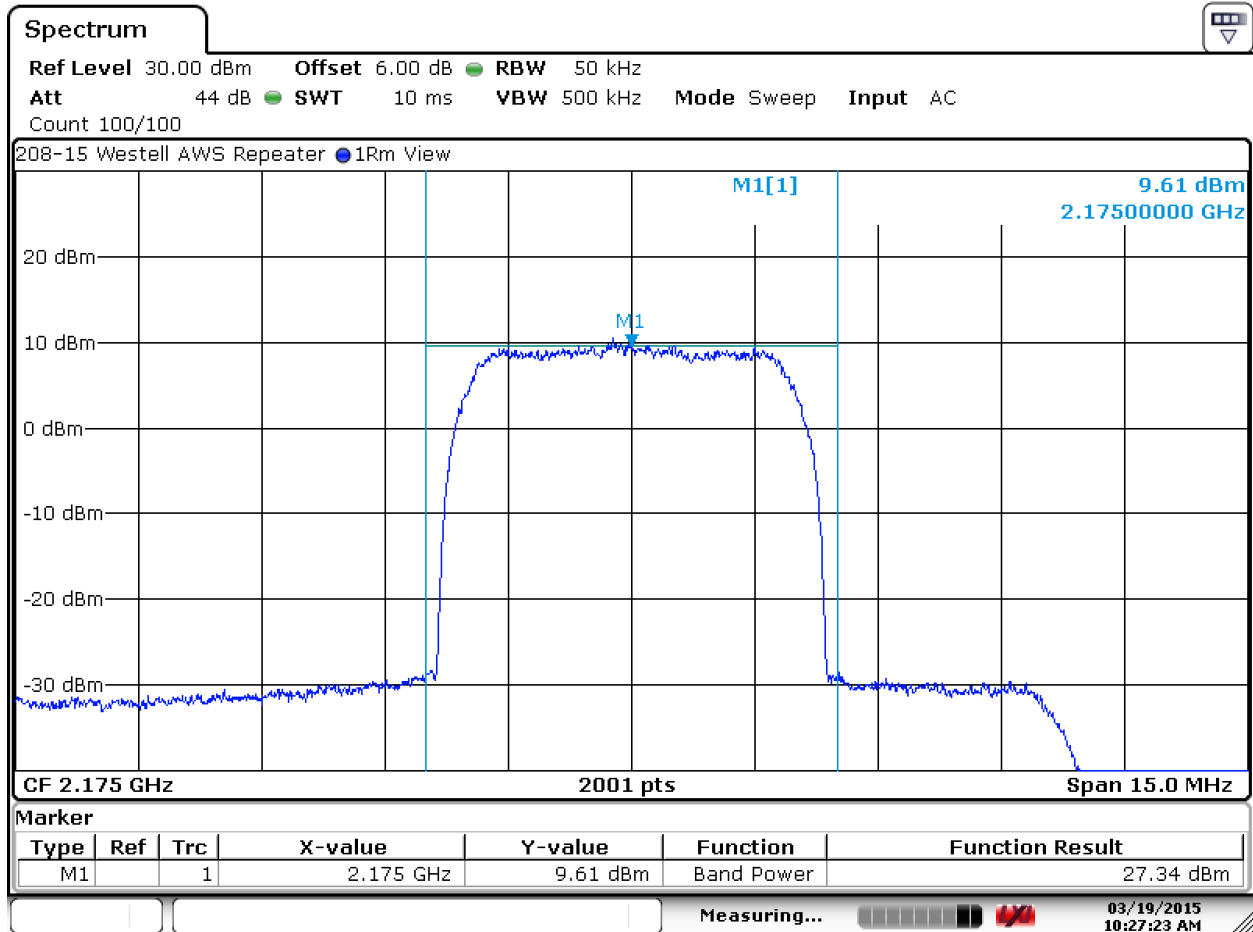
Test Number: 208-15

Issue Date: 7/15/2015

6. Measurement Data

6.1. Power and Antenna Height Limits 27.50 (b)(4) (cont)

6.1.7. Mean Transmitter Output Power, 2175 MHz



Date: 19.MAR.2015 10:27:24

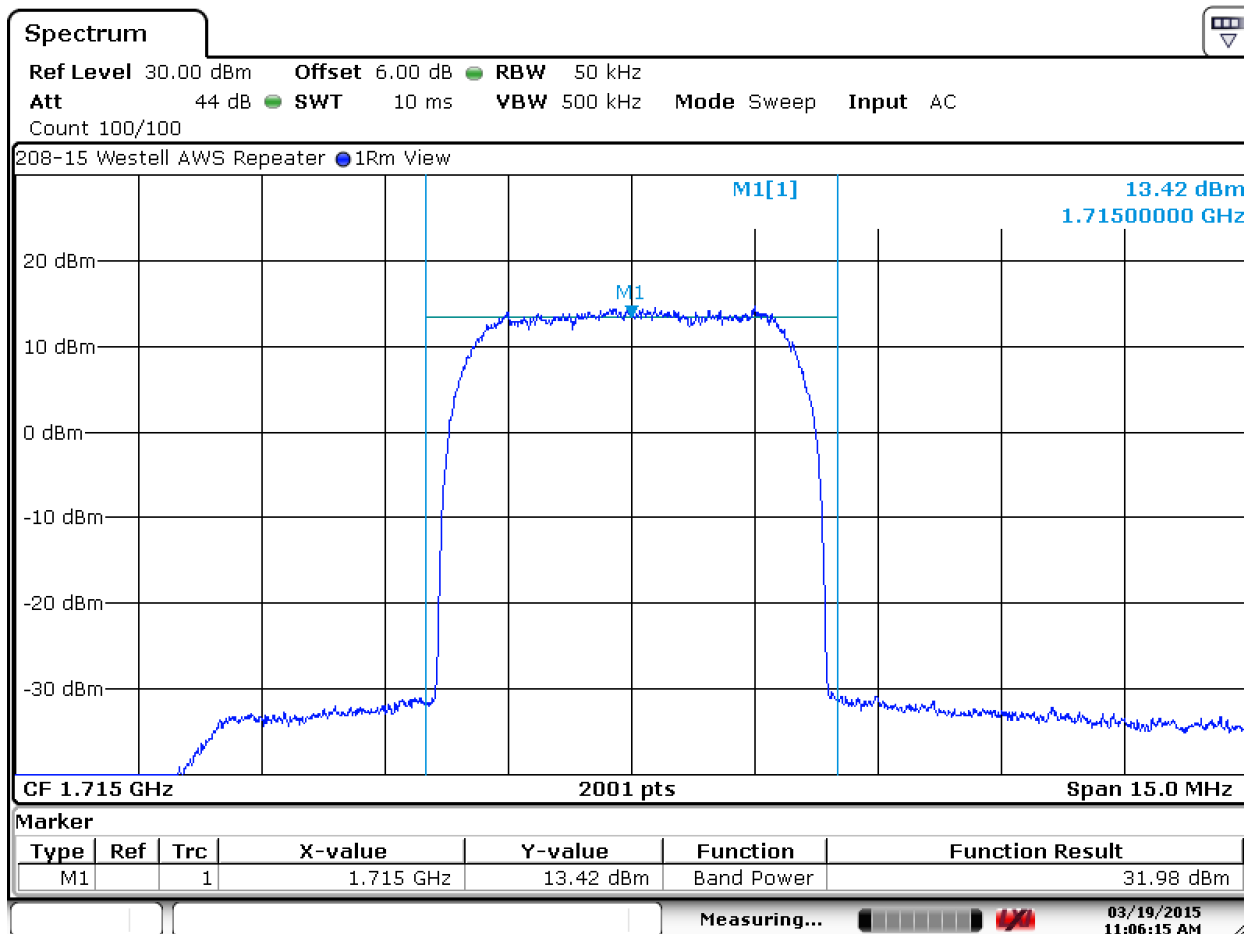
Test Number: 208-15

Issue Date: 7/15/2015

6. Measurement Data

6.1. Power and Antenna Height Limits 27.50 (b)(4) (cont)

6.1.8. Mean Transmitter Output Power, 1715 MHz – 3 dB Increase to Input



Date: 19.MAR.2015 11:06:16

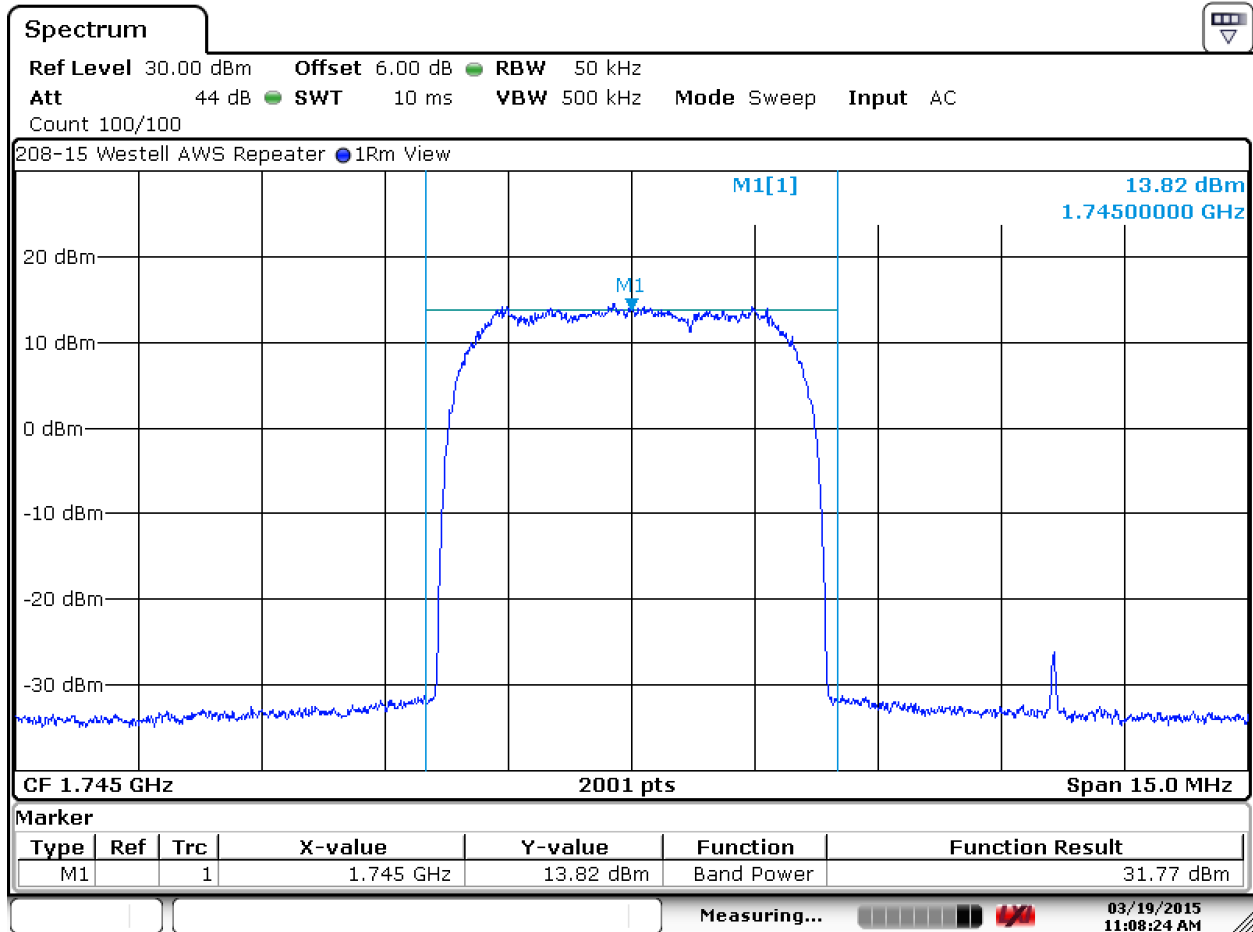
Test Number: 208-15

Issue Date: 7/15/2015

6. Measurement Data

6.1. Power and Antenna Height Limits 27.50 (b)(4) (cont)

6.1.9. Mean Transmitter Output Power, 1745 MHz – 3 dB Increase to Input



Date: 19.MAR.2015 11:08:25

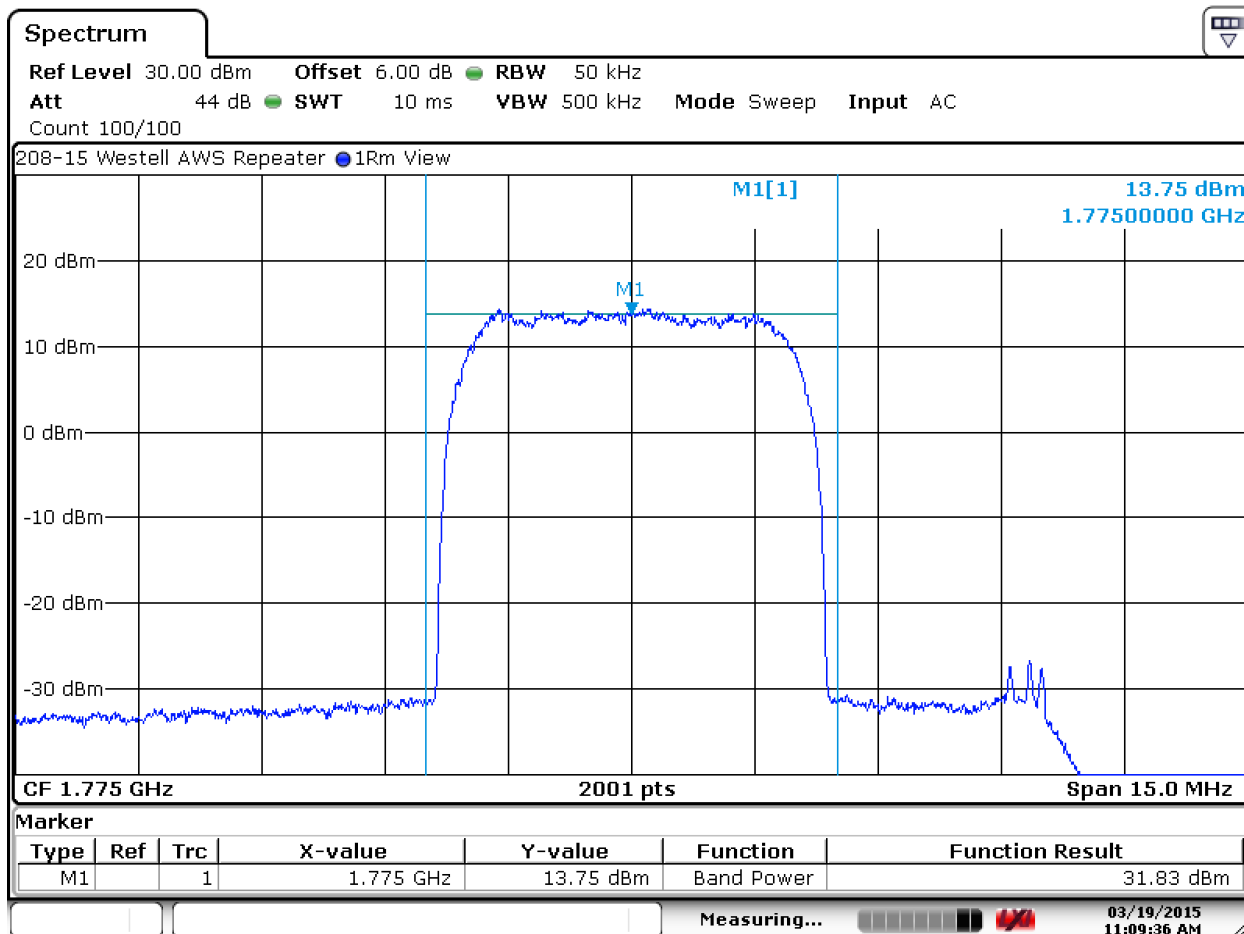
Test Number: 208-15

Issue Date: 7/15/2015

6. Measurement Data

6.1. Power and Antenna Height Limits 27.50 (d)(4) cont.

6.1.10. Mean Transmitter Output Power, 1775 MHz – 3 dB Increase to Input



Date: 19.MAR.2015 11:09:35

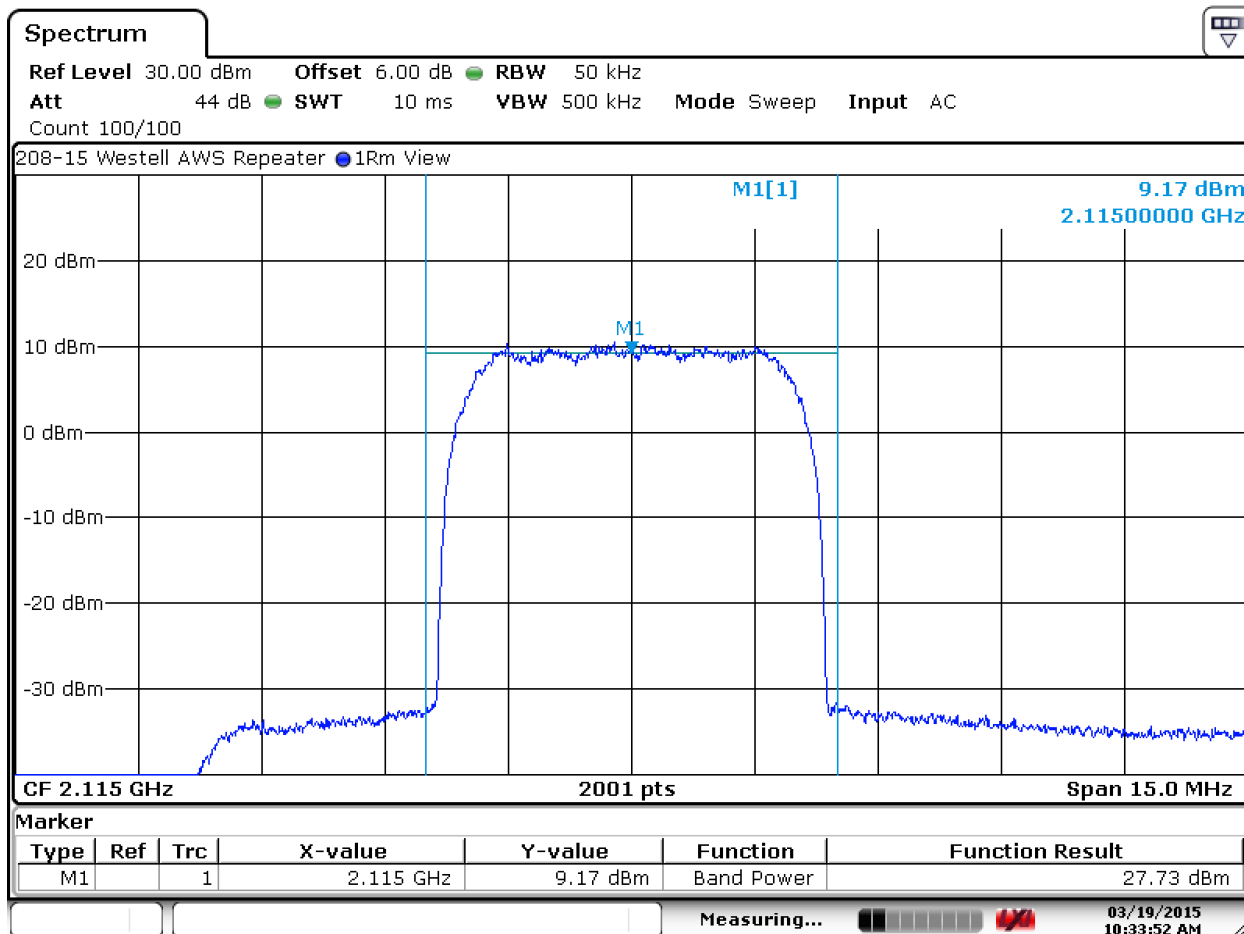
Test Number: 208-15

Issue Date: 7/15/2015

6. Measurement Data

6.1. Power and Antenna Height Limits 27.50 (d)(4) cont.

6.1.11. Mean Transmitter Output Power, 2115 MHz – 3 dB Increase to Input



Date: 19.MAR.2015 10:33:53

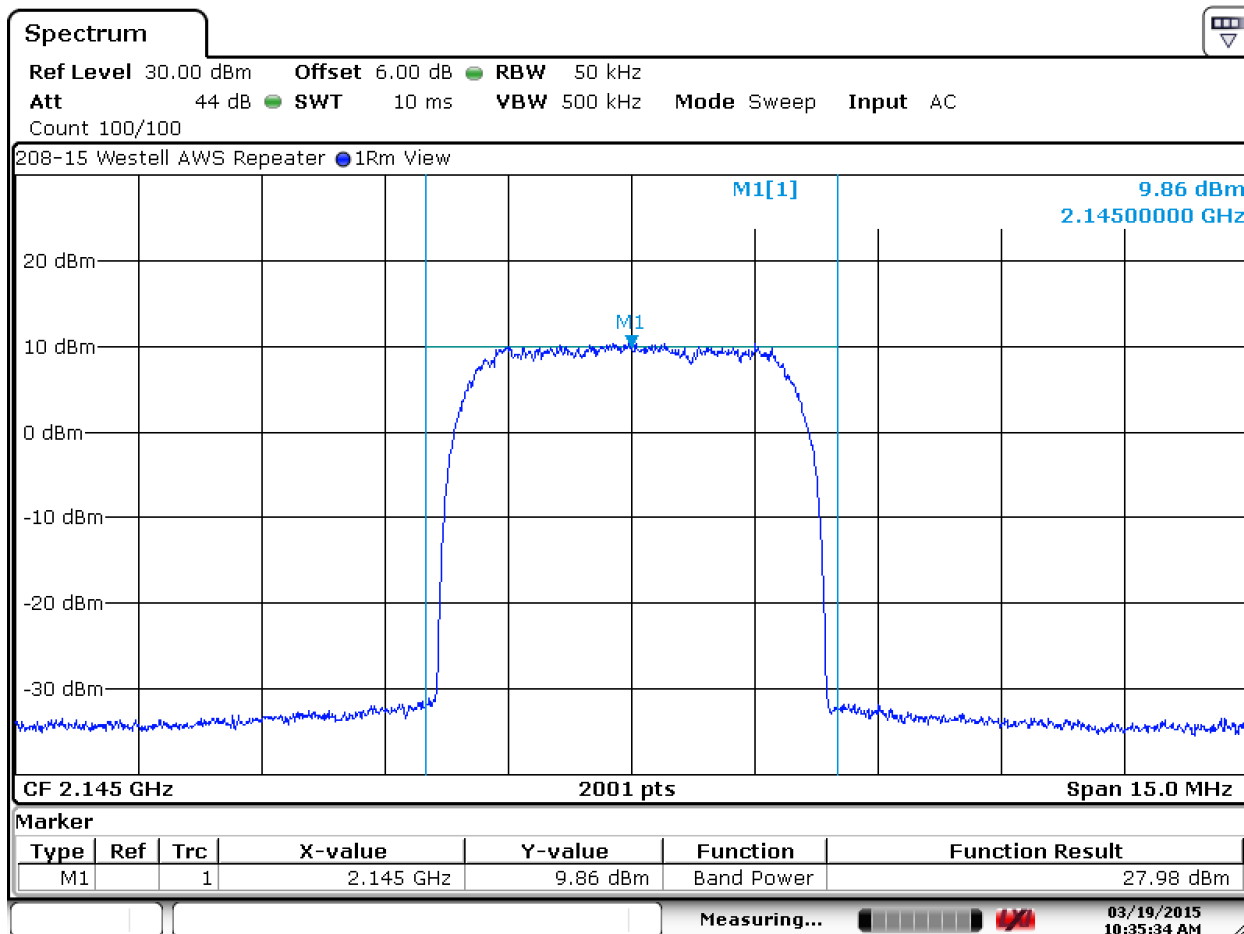
Test Number: 208-15

Issue Date: 7/15/2015

6. Measurement Data

6.1. Power and Antenna Height Limits 27.50 (b)(4) (cont)

6.1.12. Mean Transmitter Output Power, 2145 MHz – 3 dB Increase to Input



Date: 19.MAR.2015 10:35:35

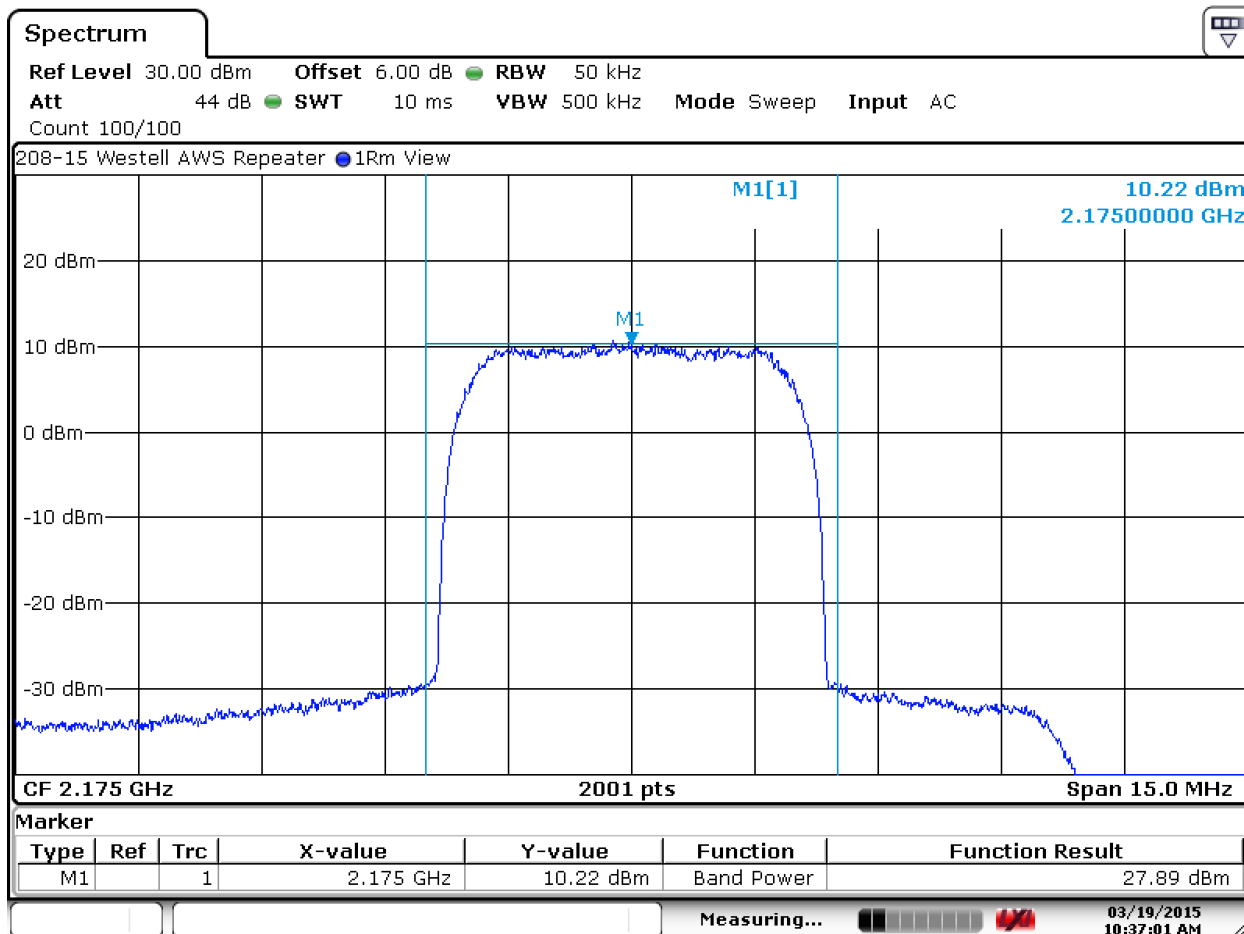
Test Number: 208-15

Issue Date: 7/15/2015

6. Measurement Data

6.1. Power and Antenna Height Limits 27.50 (b)(4) (cont)

6.1.13. Mean Transmitter Output Power, 2175 MHz – 3 dB Increase to Input



Date: 19.MAR.2015 10:37:02

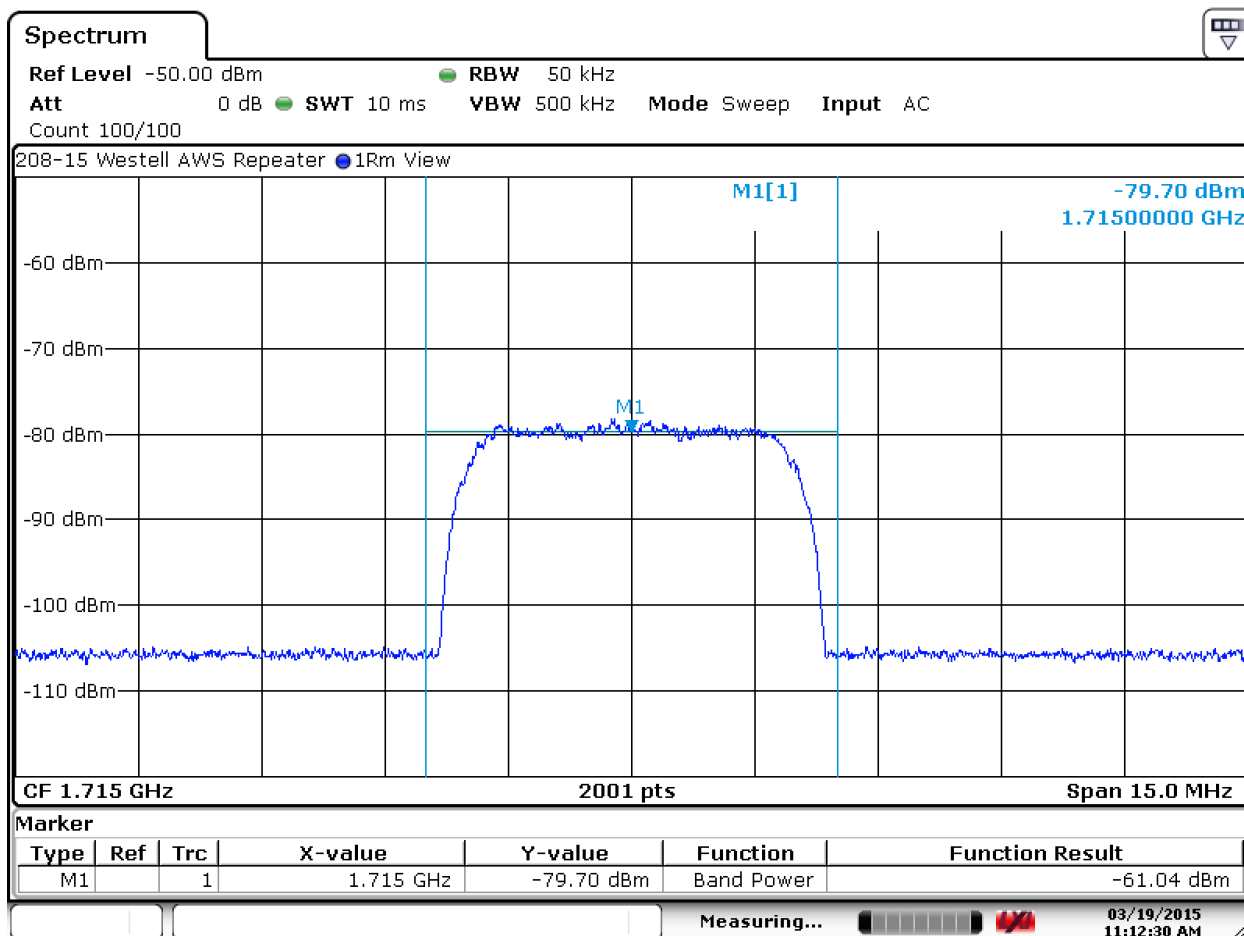
Test Number: 208-15

Issue Date: 7/15/2015

6. Measurement Data

6.1. Power and Antenna Height Limits 27.50 (b)(4) (cont)

6.1.14. Mean Transmitter Output Power, 1715 MHz – Input Power



Date: 19.MAR.2015 11:12:31

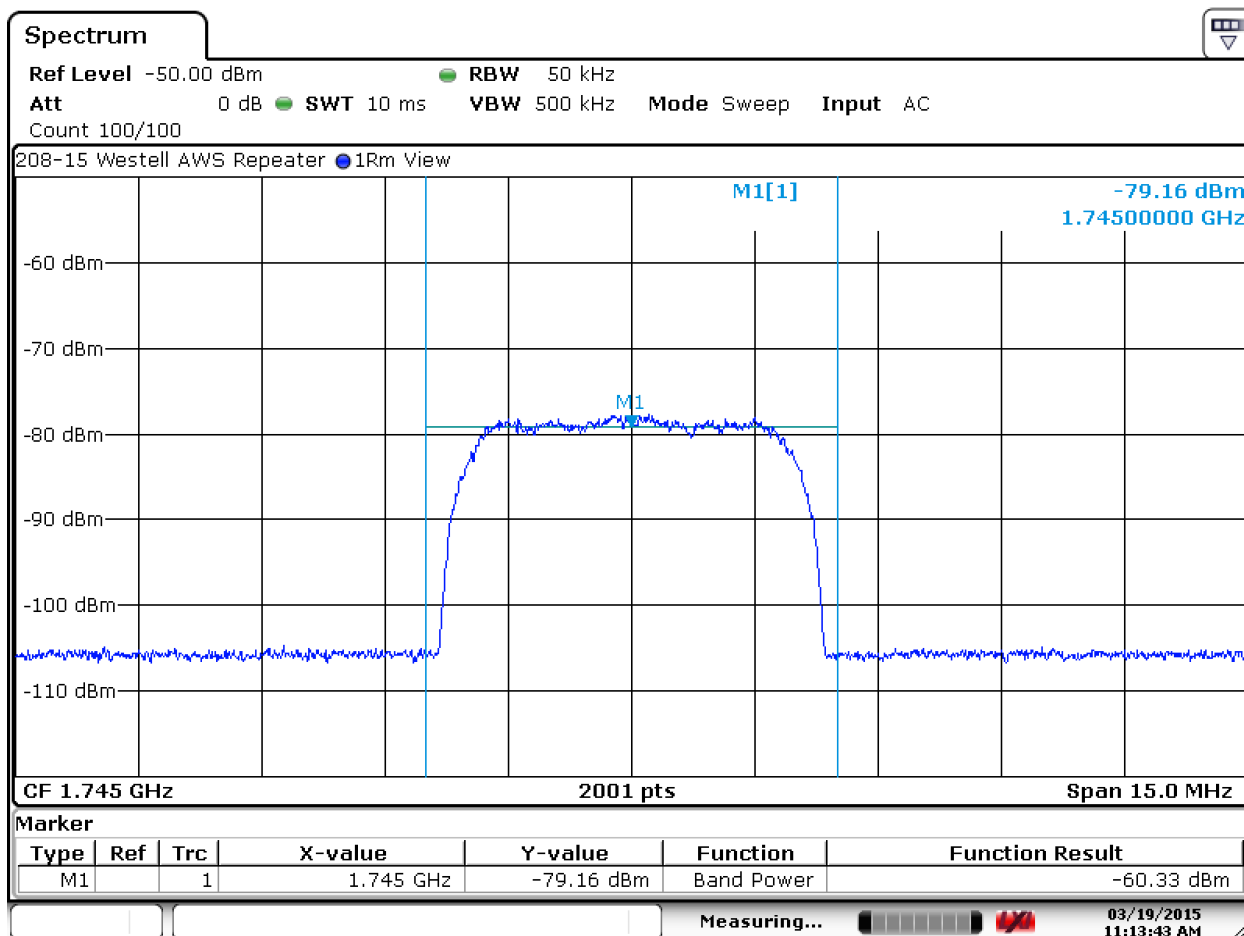
Test Number: 208-15

Issue Date: 7/15/2015

6. Measurement Data

6.1. Power and Antenna Height Limits 27.50 (b)(4) (cont)

6.1.15. Mean Transmitter Output Power, 1745 MHz – Input Power



Date: 19.MAR.2015 11:13:44

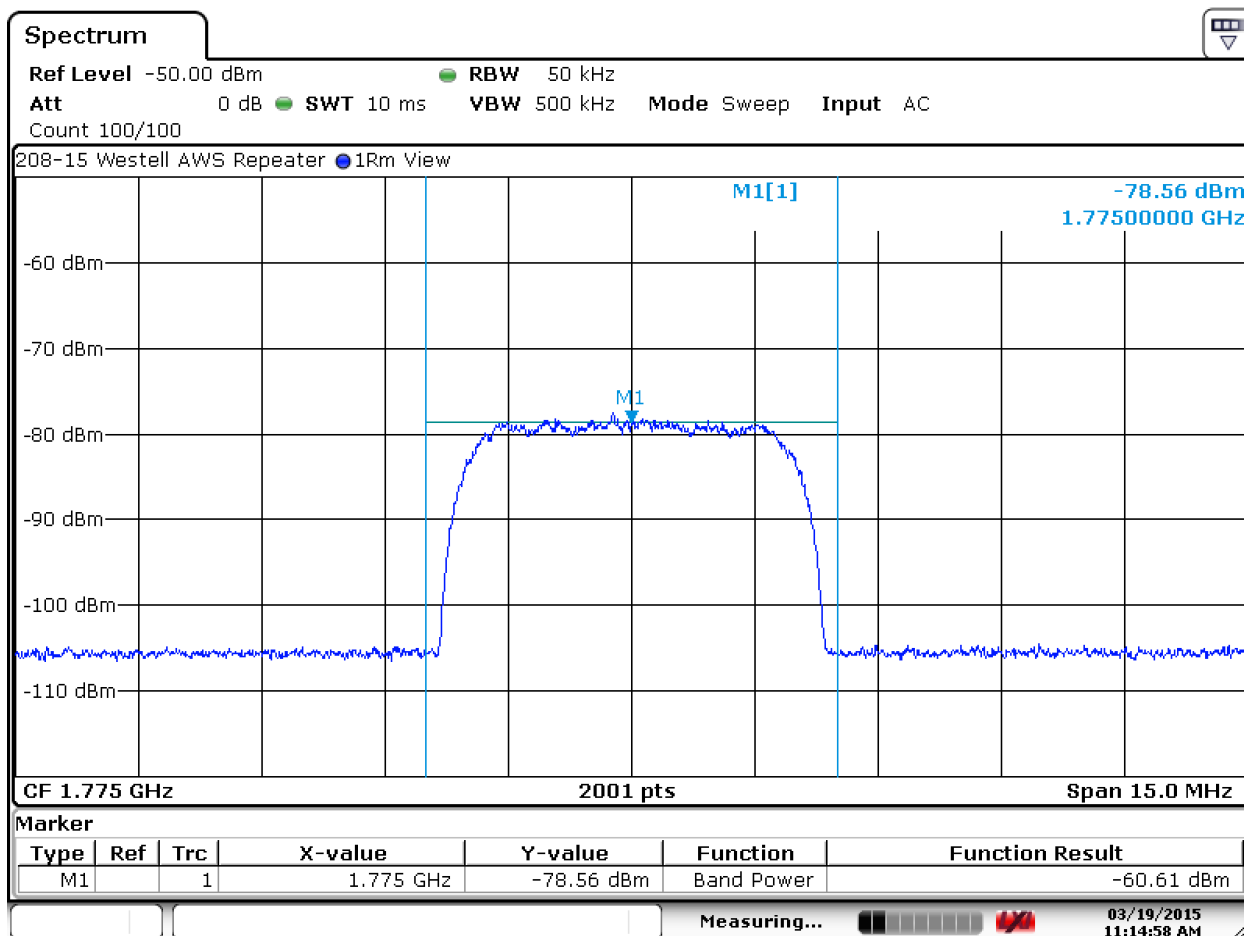
Test Number: 208-15

Issue Date: 7/15/2015

6. Measurement Data

6.1. Power and Antenna Height Limits 27.50 (b)(4) (cont)

6.1.16. Mean Transmitter Output Power, 1775 MHz – Input Power



Date: 19.MAR.2015 11:14:59

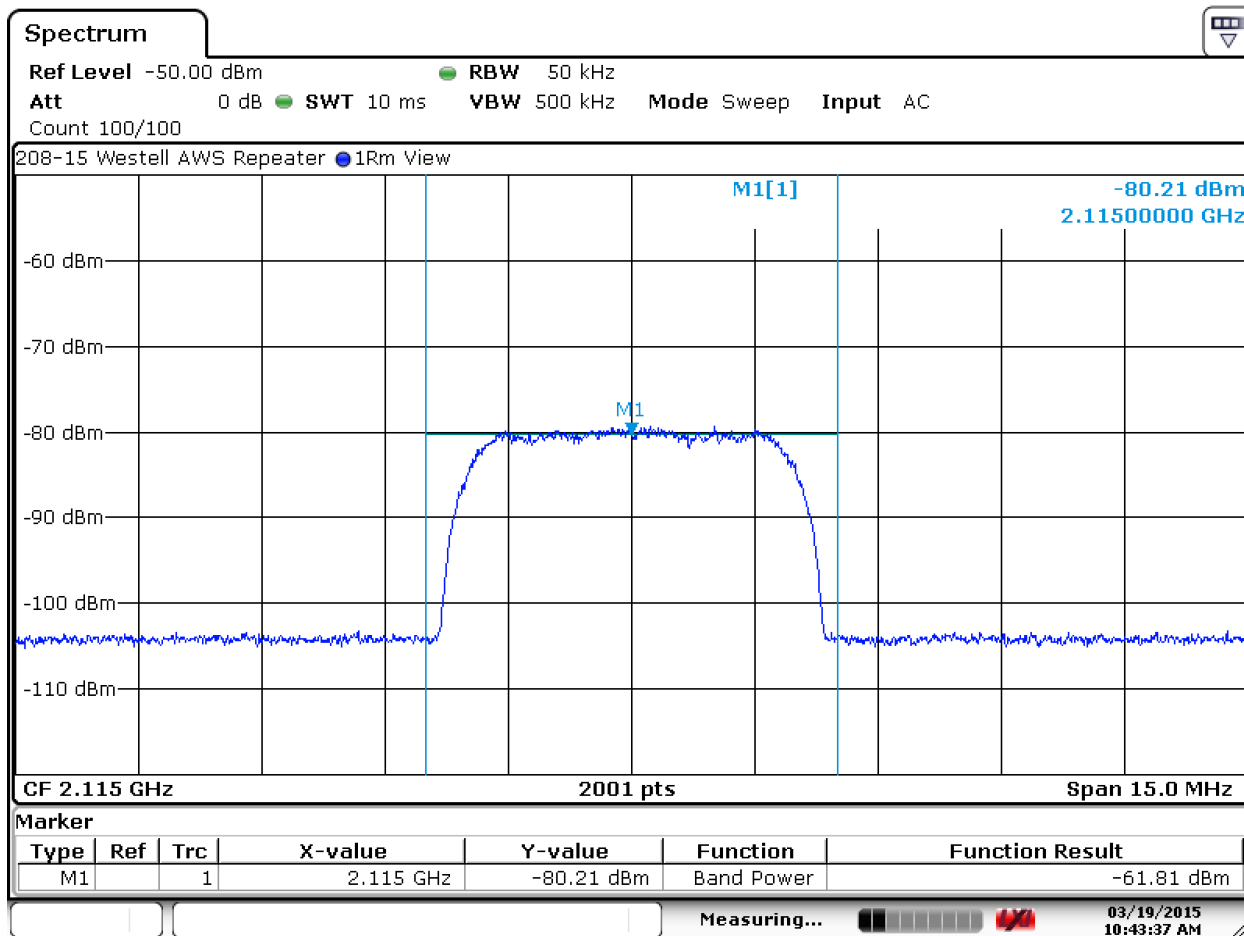
Test Number: 208-15

Issue Date: 7/15/2015

6. Measurement Data

6.1. Power and Antenna Height Limits 27.50 (b)(4) (cont)

6.1.17. Mean Transmitter Output Power, 2115 MHz – Input Power



Date: 19.MAR.2015 10:43:38

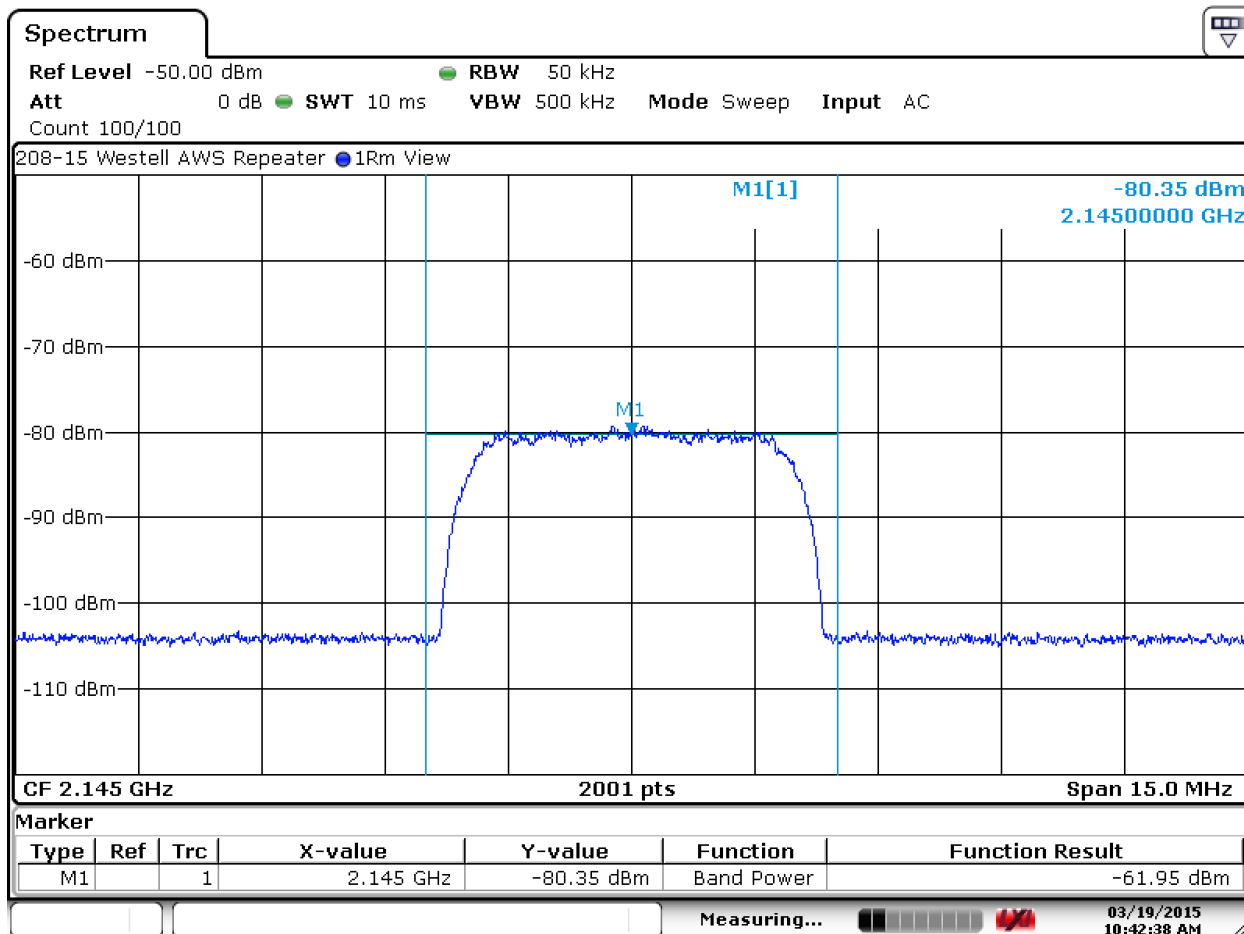
Test Number: 208-15

Issue Date: 7/15/2015

6. Measurement Data

6.1. Power and Antenna Height Limits 27.50 (b)(4) (cont)

6.1.18. Mean Transmitter Output Power, 2145 MHz – Input Power



Date: 19.MAR.2015 10:42:38

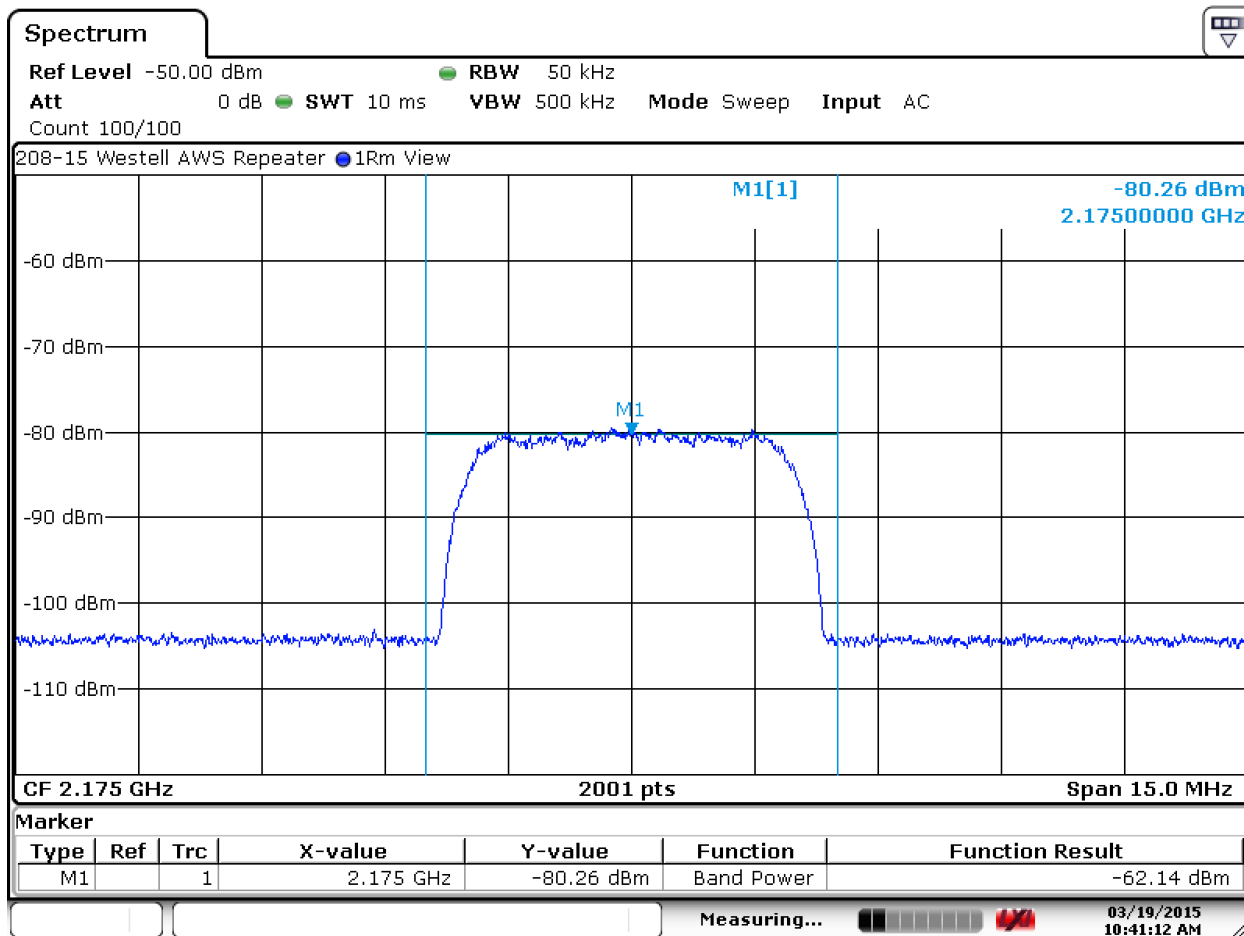
Test Number: 208-15

Issue Date: 7/15/2015

6. Measurement Data

6.1. Power and Antenna Height Limits 27.50 (b)(4) (cont)

6.1.19. Mean Transmitter Output Power, 2175 MHz – Input Power



Date: 19.MAR.2015 10:41:12

6. Measurement Data

6.1. Power and Antenna Height Limits (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	1715	32.00	0.00	-2.00	30.00	1.00
Output Power	1745	31.77	0.00	-2.00	29.77	0.95
Output Power	1775	31.76	0.00	-2.00	29.76	0.95
Output Power	2115	27.77	0.00	3.00	30.77	1.19
Output Power	2145	27.68	0.00	3.00	30.68	1.17
Output Power	2175	27.34	0.00	3.00	30.34	1.08
3 dB Above AGC	1715	31.98	0.00	-2.00	29.98	1.00
3 dB Above AGC	1745	31.77	0.00	-2.00	29.77	0.95
3 dB Above AGC	1775	31.83	0.00	-2.00	29.83	0.96
3 dB Above AGC	2115	27.73	0.00	3.00	30.73	1.18
3 dB Above AGC	2145	27.98	0.00	3.00	30.98	1.25
3 dB Above AGC	2175	27.89	0.00	3.00	30.89	1.23

¹ Measured. See section 6.1.1.

² Customer supplied 3 dBi for Downlink, -2 dBi for Uplink. Factor is a combination of both antenna gain and cable loss.

Note: EUT was tested without AGC turned on. The AGC will be set to 32 dBm for the Uplink band, and therefore the output power will never exceed 30 dBm / 1 Watt EIRP in the UpLink band based upon associated cable loss and antenna gain.

6. Measurement Data (continued)

6.2. Bandwidth Limitations (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.

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	1715	4.172	Compliant
Output	1745	4.192	Compliant
Output	1775	4.192	Compliant
Output	2115	4.178	Compliant
Output	2145	4.178	Compliant
Output	2175	4.168	Compliant
Input	1715	4.318	Compliant
Input	1745	4.303	Compliant
Input	1775	4.308	Compliant
Input	2115	4.372	Compliant
Input	2145	4.397	Compliant
Input	2175	4.387	Compliant

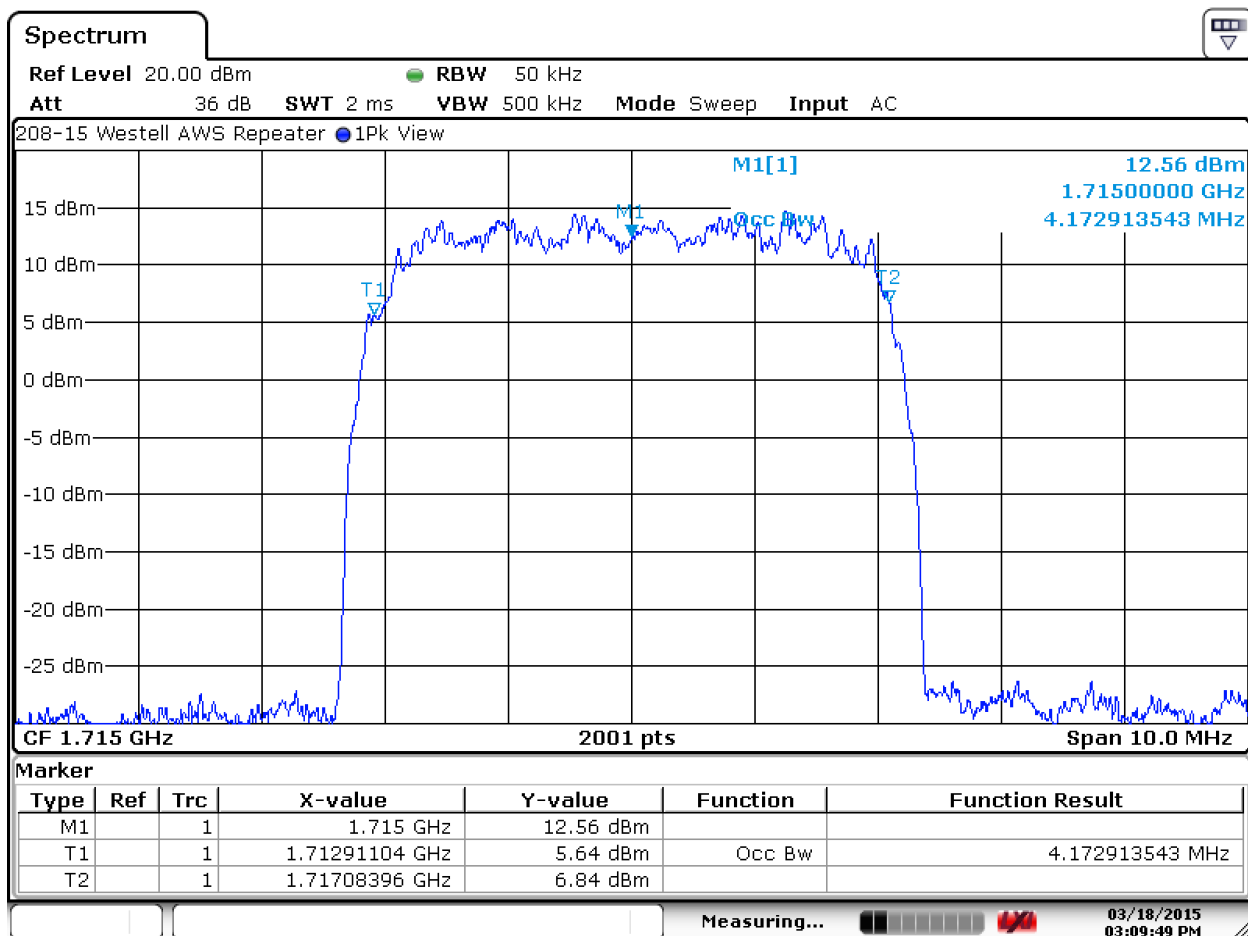
Test Number: 208-15

Issue Date: 7/15/2015

6. Measurement Data (continued)

6.2. Bandwidth Limitations (FCC Part 2.1049)

6.2.1.1. Occupied (99% Power) Bandwidth Measurement, 1715 MHz



Date: 18.MAR.2015 15:09:49

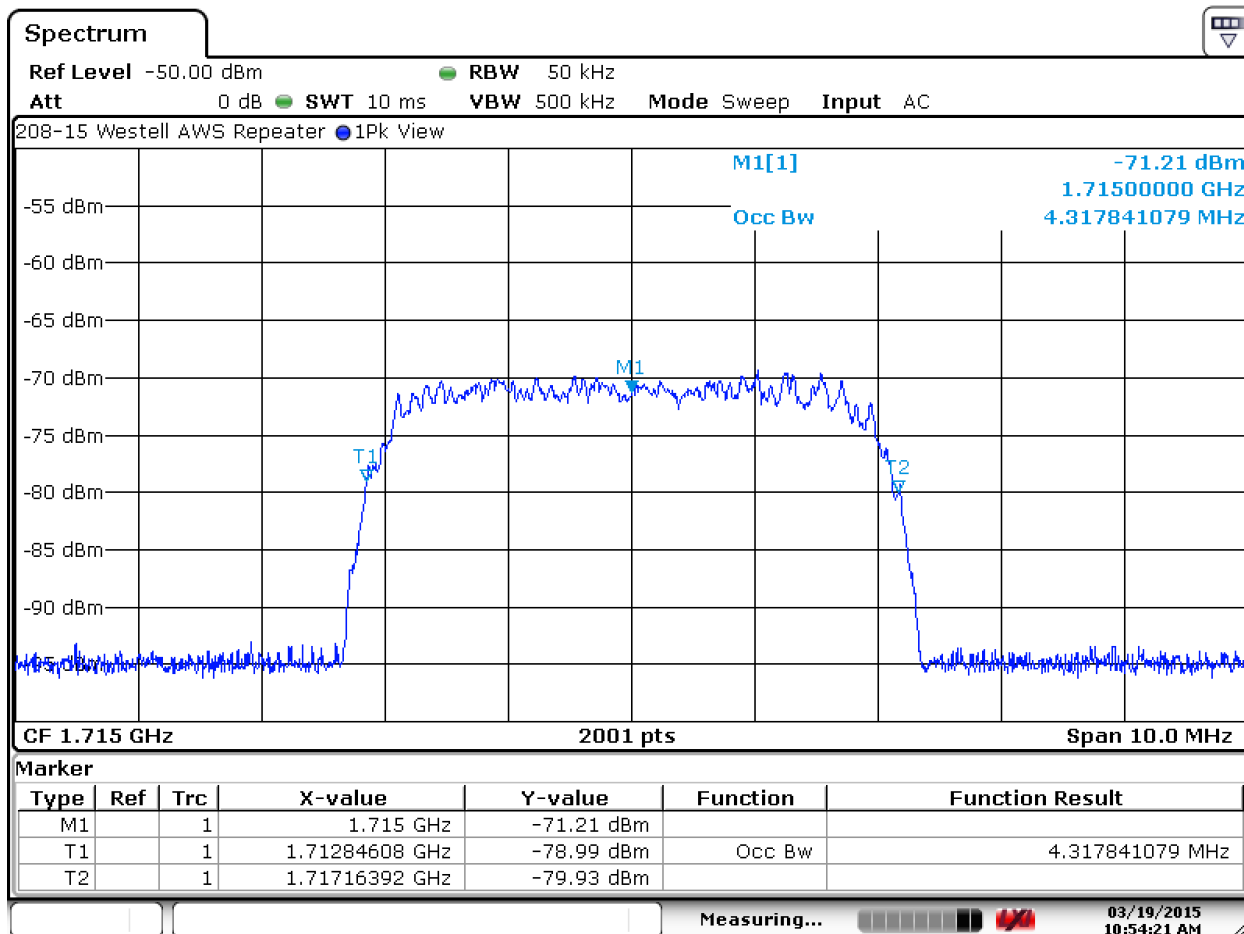
Test Number: 208-15

Issue Date: 7/15/2015

6. Measurement Data (continued)

6.2. Bandwidth Limitations (FCC Part 2.1049)

6.2.1.2. Occupied (99% Power) Bandwidth Input Signal, 1715 MHz



Date: 19.MAR.2015 10:54:22

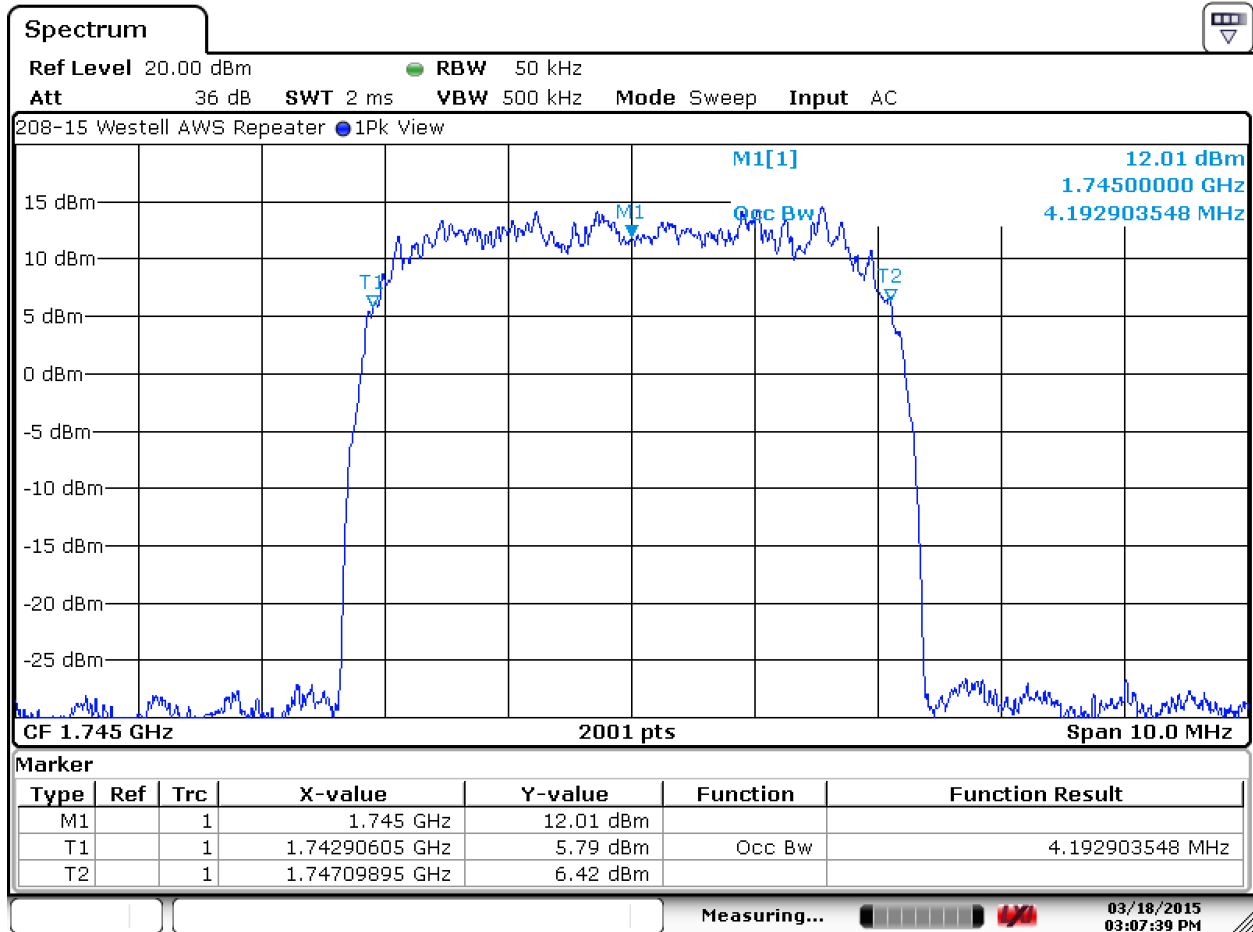
Test Number: 208-15

Issue Date: 7/15/2015

6. Measurement Data (continued)

6.2. Bandwidth Limitations (FCC Part 2.1049) (continued)

6.2.1.3. Occupied (99% Power) Bandwidth Measurement, 1745 MHz



Date: 18.MAR.2015 15:07:39

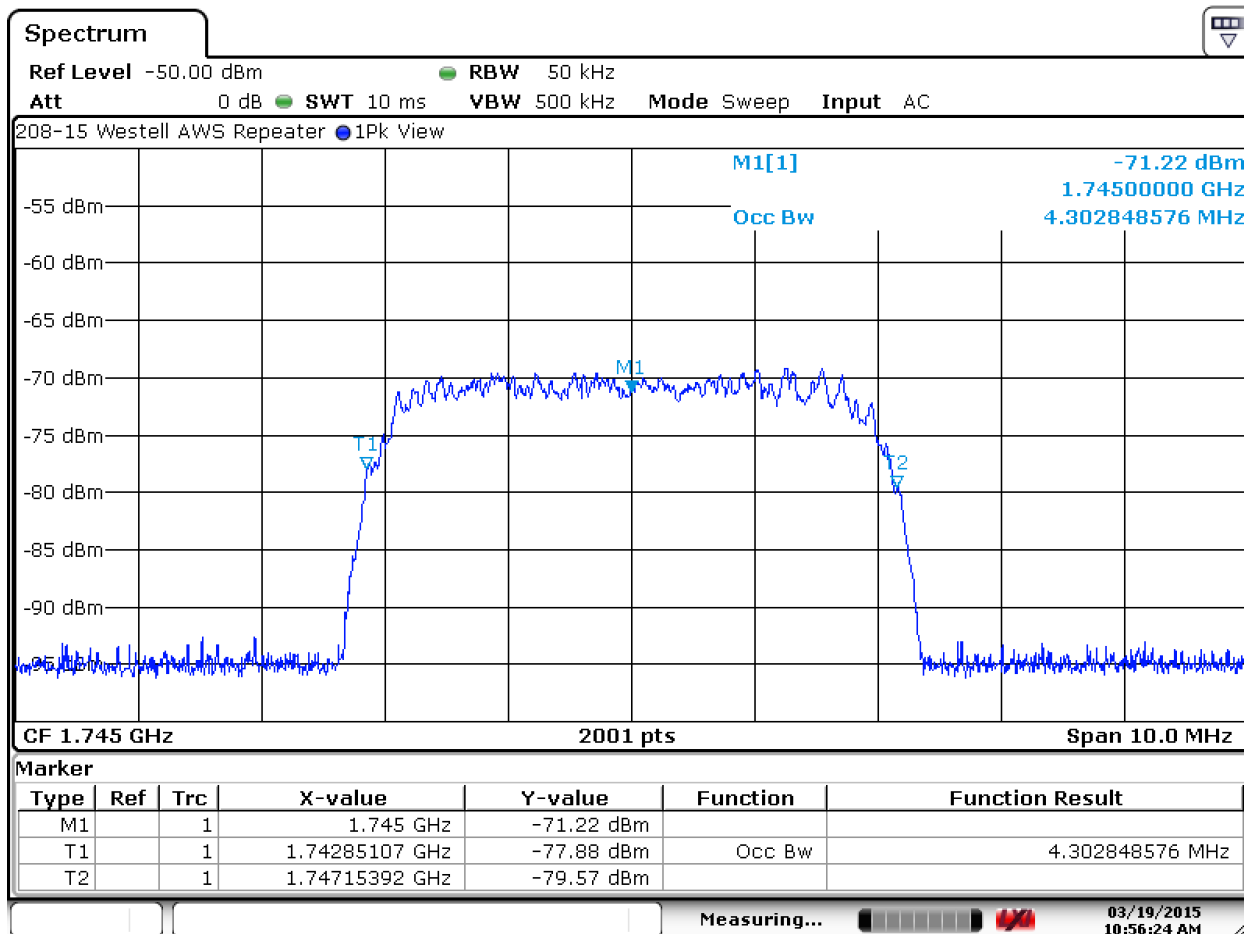
Test Number: 208-15

Issue Date: 7/15/2015

6. Measurement Data (continued)

6.2. Bandwidth Limitations (FCC Part 2.1049) (continued)

6.2.1.4. Occupied (99% Power) Bandwidth Input Signal, 1745 MHz



Date: 19.MAR.2015 10:56:25

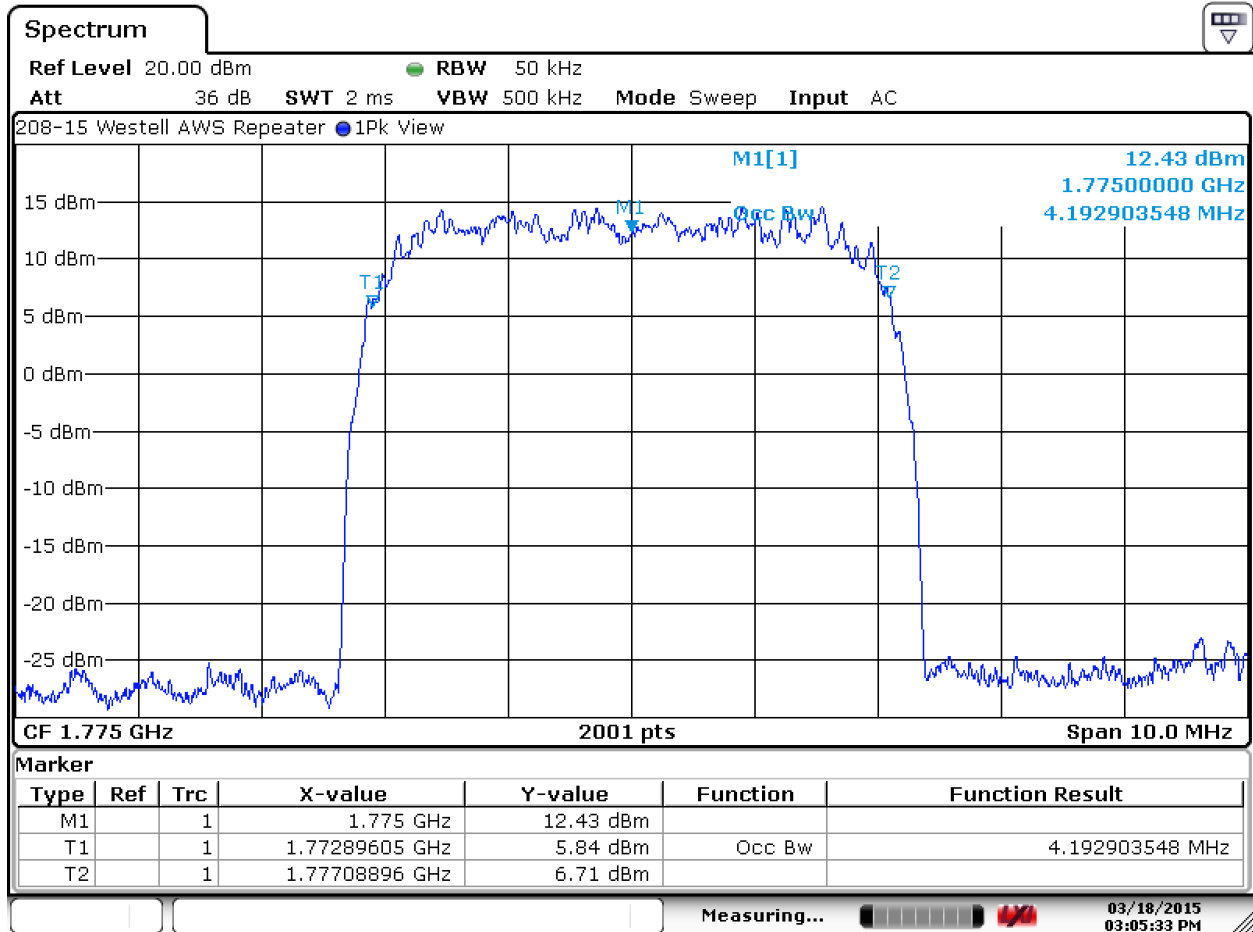
Test Number: 208-15

Issue Date: 7/15/2015

6. Measurement Data (continued)

6.2. Bandwidth Limitations (FCC Part 2.1049) (continued)

6.2.1.5. Occupied (99% Power) Bandwidth Measurement, 1775 MHz



Date: 18.MAR.2015 15:05:33

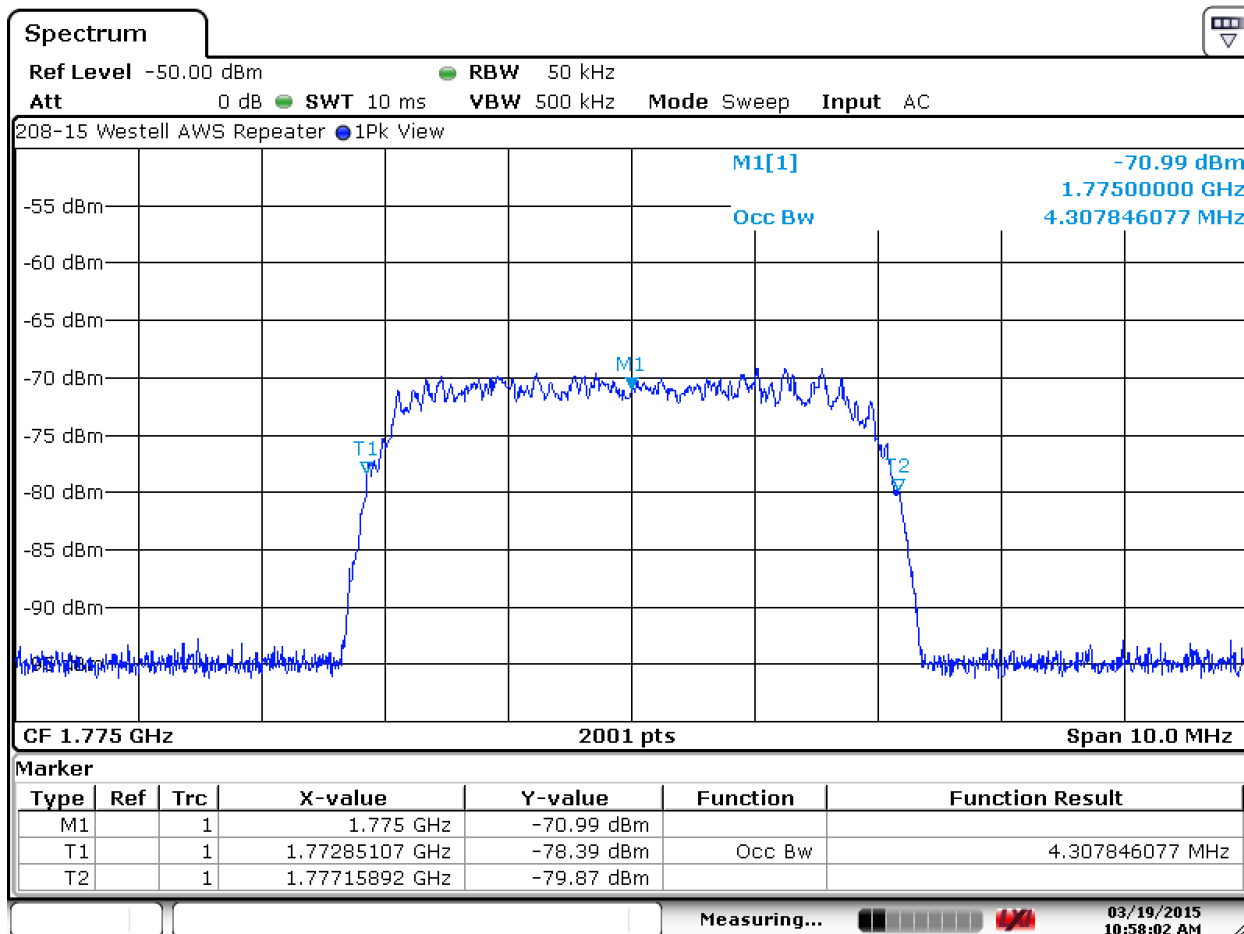
Test Number: 208-15

Issue Date: 7/15/2015

6. Measurement Data (continued)

6.2. Bandwidth Limitations (FCC Part 2.1049) (continued)

6.2.1.6. Occupied (99% Power) Bandwidth Input Signal, 1775 MHz



Date: 19.MAR.2015 10:58:03

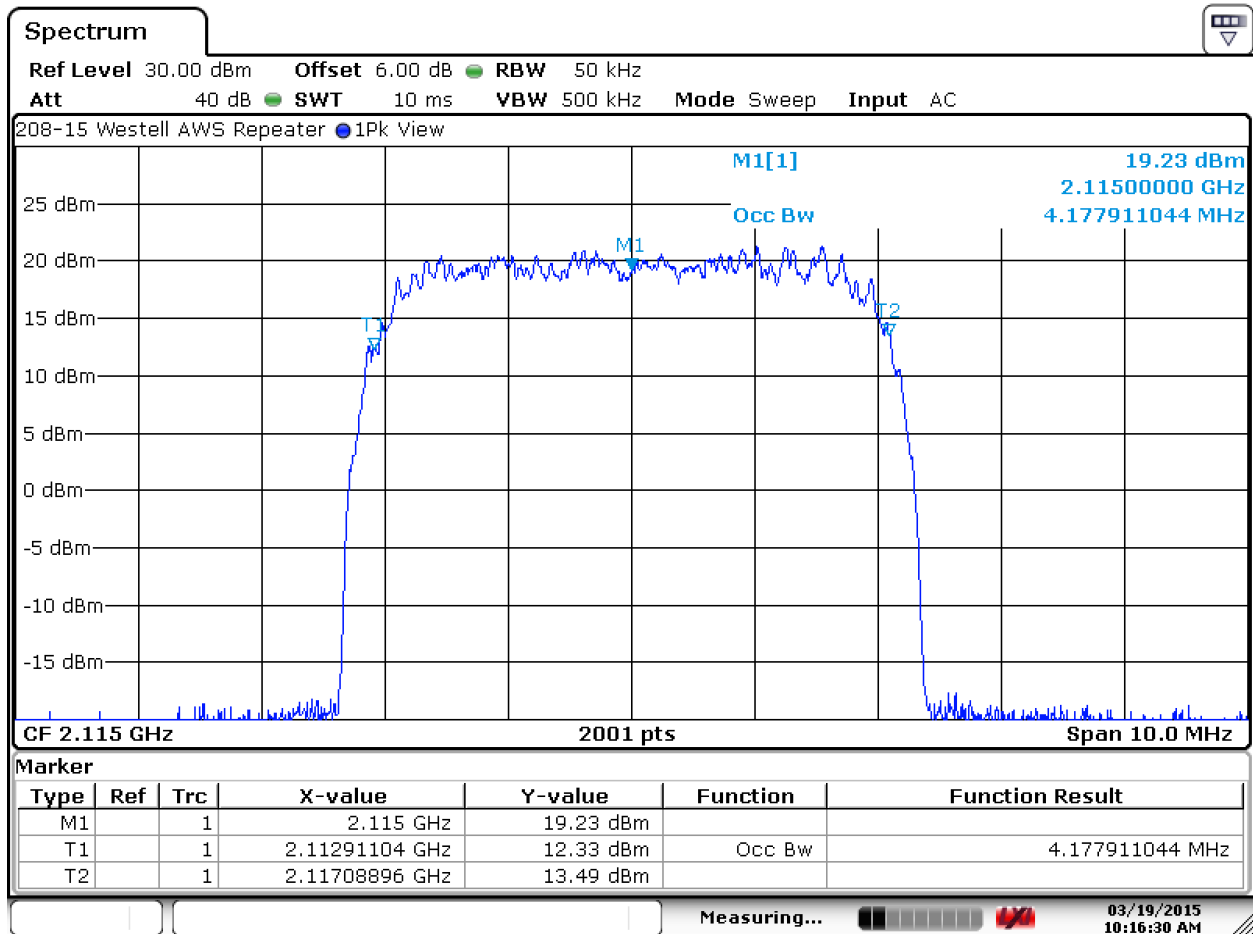
Test Number: 208-15

Issue Date: 7/15/2015

6. Measurement Data (continued)

6.2. Bandwidth Limitations (FCC Part 2.1049) (continued)

6.2.1.7. Occupied (99% Power) Bandwidth Measurement, 2115 MHz



Date: 19.MAR.2015 10:16:30

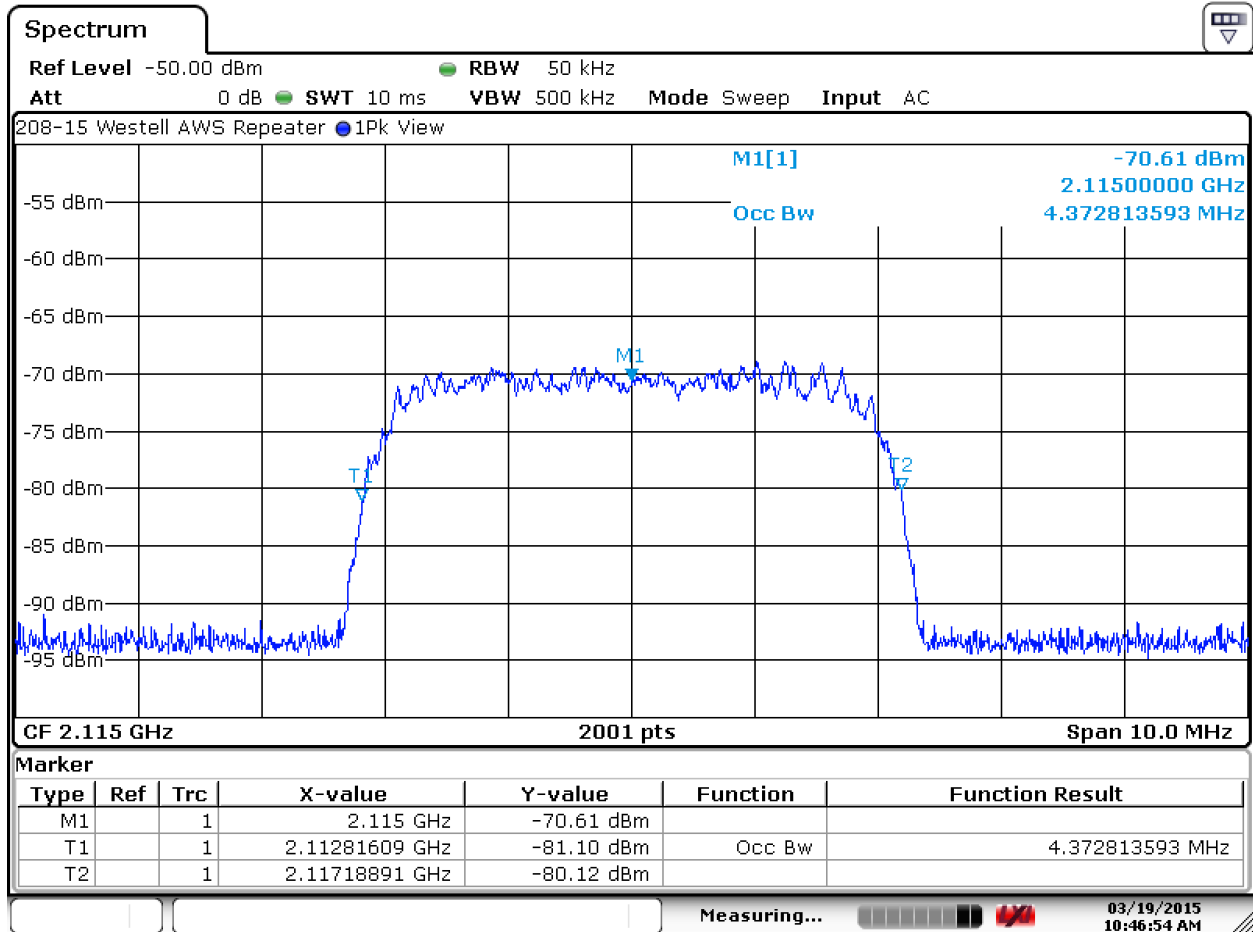
Test Number: 208-15

Issue Date: 7/15/2015

6. Measurement Data (continued)

6.2. Bandwidth Limitations (FCC Part 2.1049) (continued)

6.2.1.8. Occupied (99% Power) Bandwidth Input Signal, 2115 MHz



Date: 19.MAR.2015 10:46:54

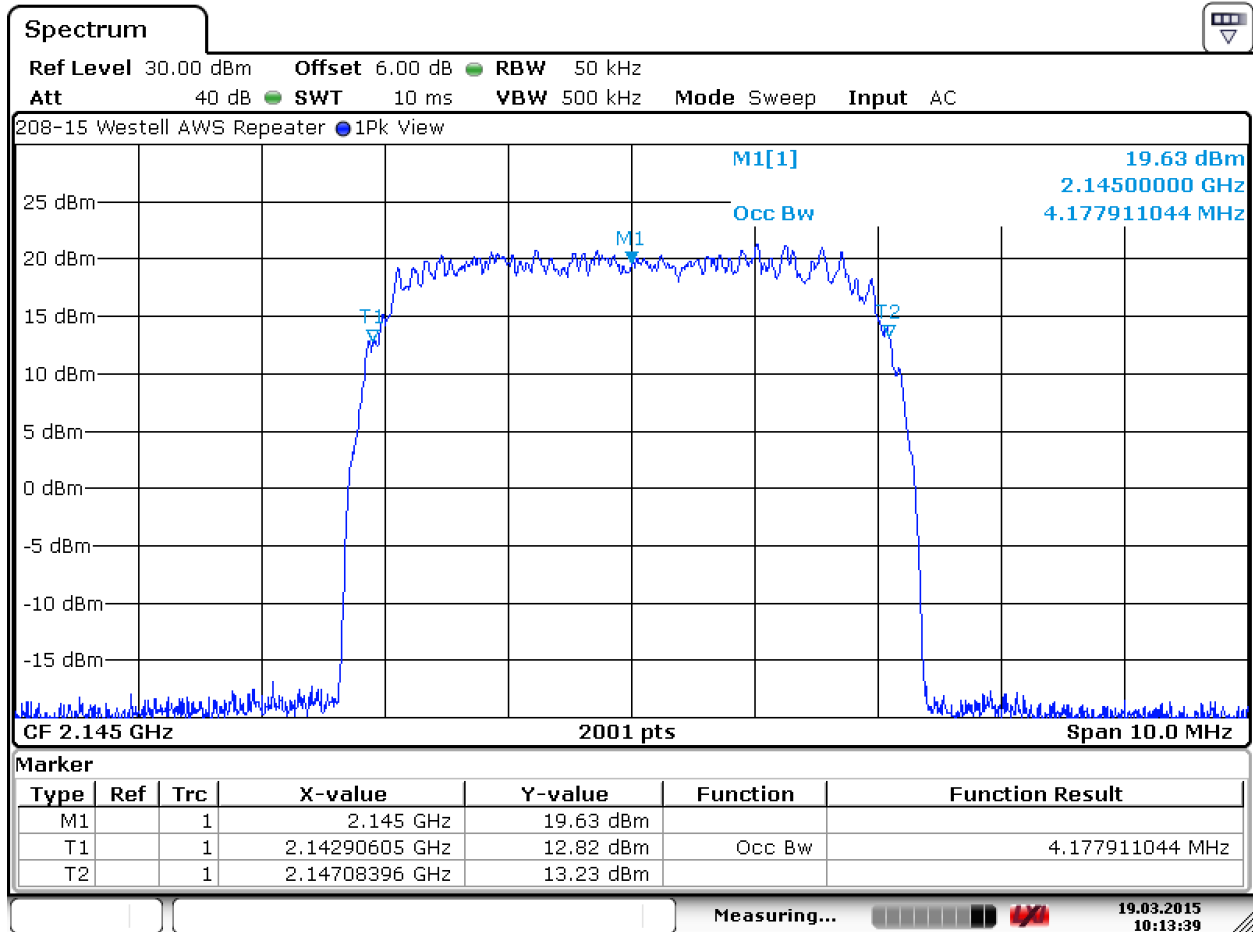
Test Number: 208-15

Issue Date: 7/15/2015

6. Measurement Data (continued)

6.2. Bandwidth Limitations (FCC Part 2.1049) (continued)

6.2.1.9. Occupied (99% Power) Bandwidth Measurement, 2145 MHz



Date: 19.MAR.2015 10:13:38

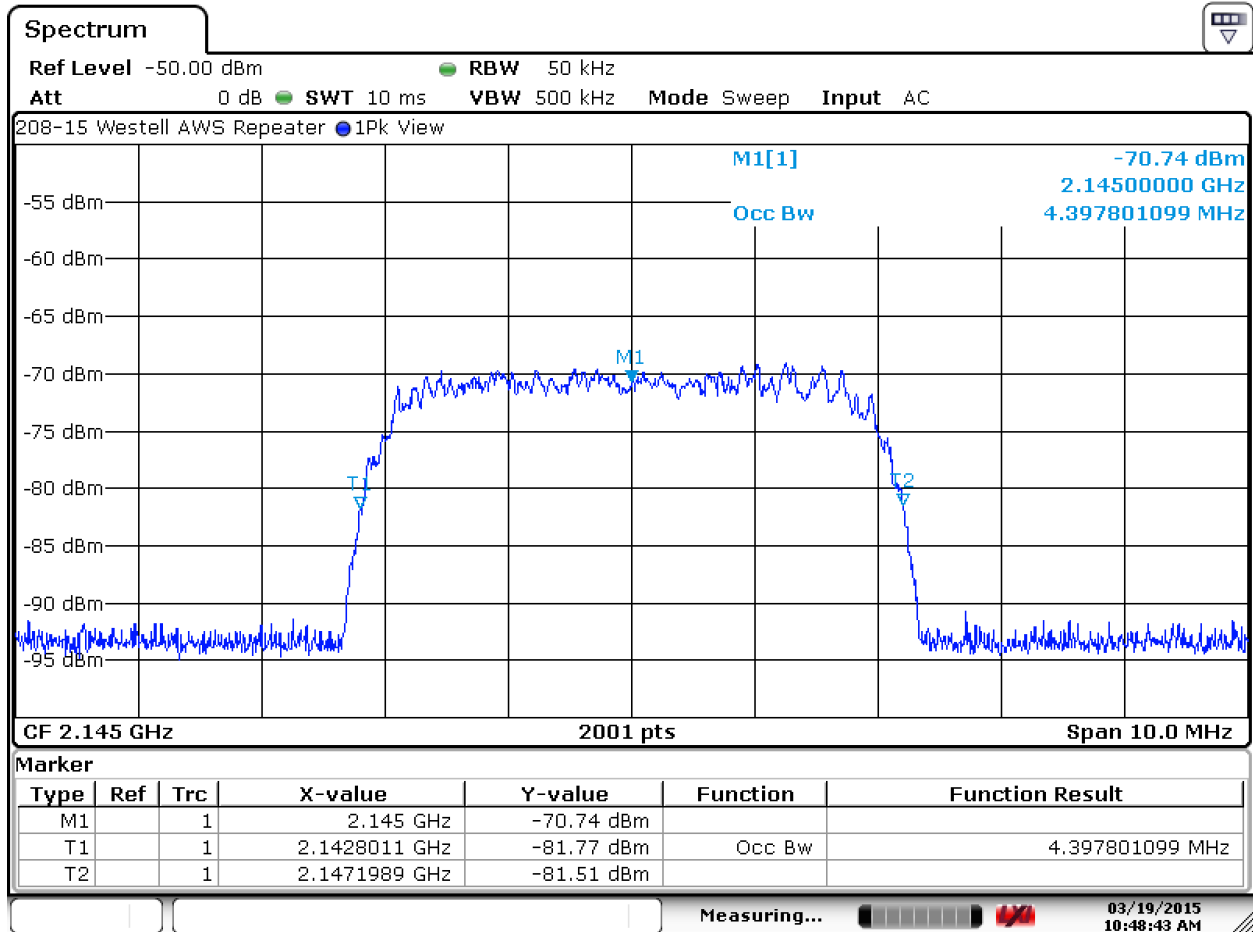
Test Number: 208-15

Issue Date: 7/15/2015

6. Measurement Data (continued)

6.2. Bandwidth Limitations (FCC Part 2.1049) (continued)

6.2.1.10. Occupied (99% Power) Bandwidth Input Signal, 2145 MHz



Date: 19.MAR.2015 10:48:43

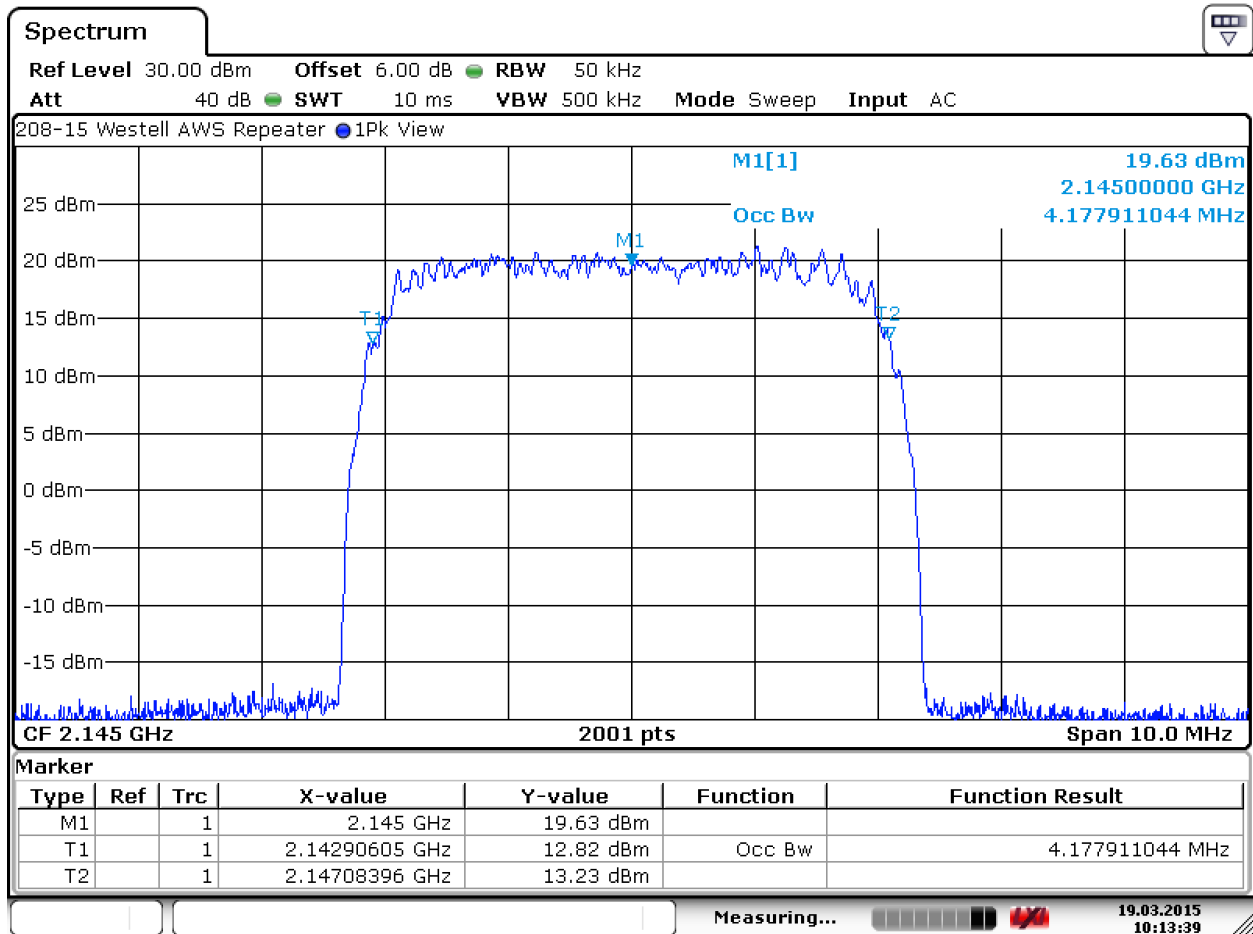
Test Number: 208-15

Issue Date: 7/15/2015

6. Measurement Data (continued)

6.2. Bandwidth Limitations (FCC Part 2.1049) (continued)

6.2.1.11. Occupied (99% Power) Bandwidth Measurement, 2175 MHz



Date: 19.MAR.2015 10:13:38

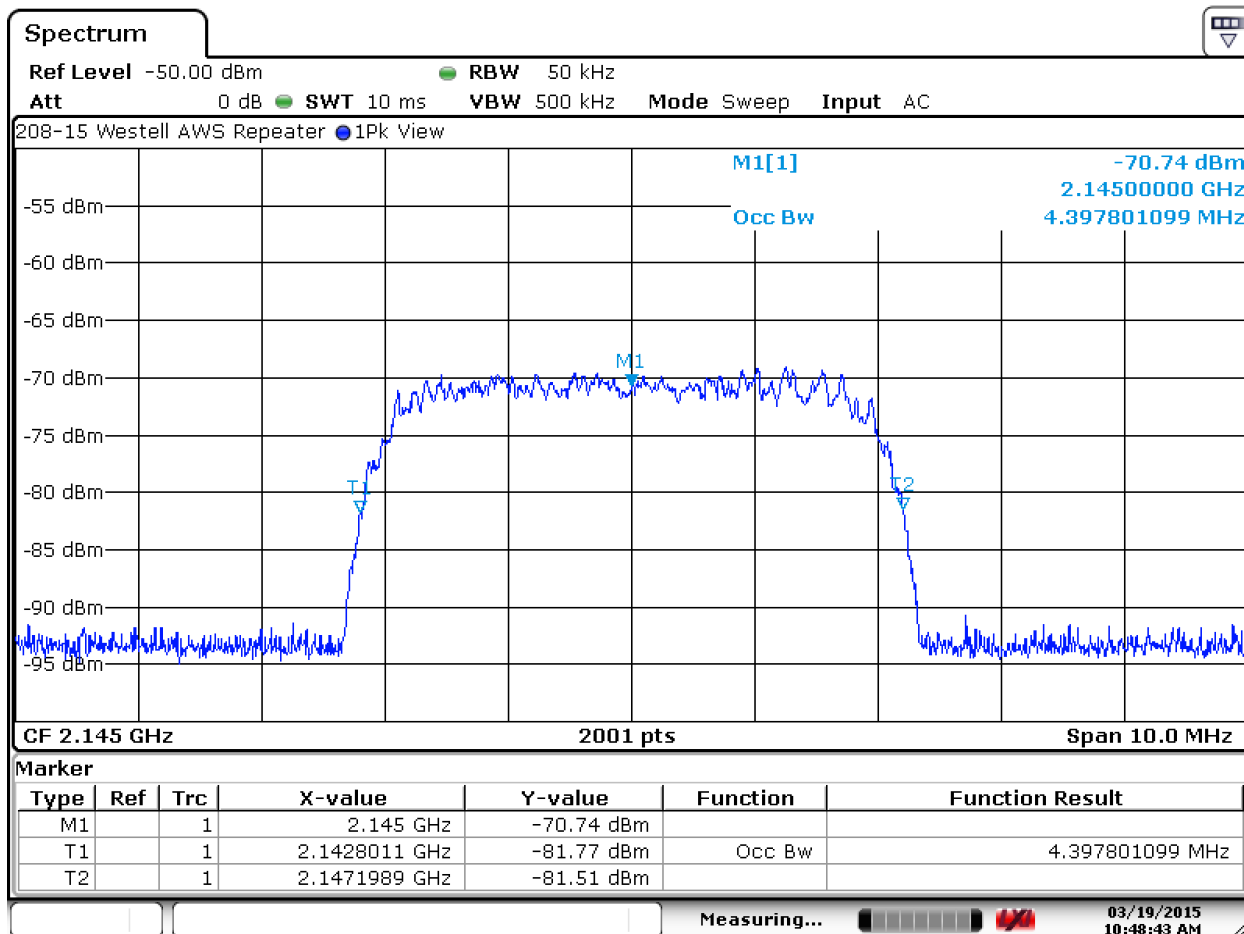
Test Number: 208-15

Issue Date: 7/15/2015

6. Measurement Data (continued)

6.2. Bandwidth Limitations (FCC Part 2.1049) (continued)

6.2.1.12. Occupied (99% Power) Bandwidth Input Signal, 2175 MHz



Date: 19.MAR.2015 10:48:43

6. Measurement Data (continued)

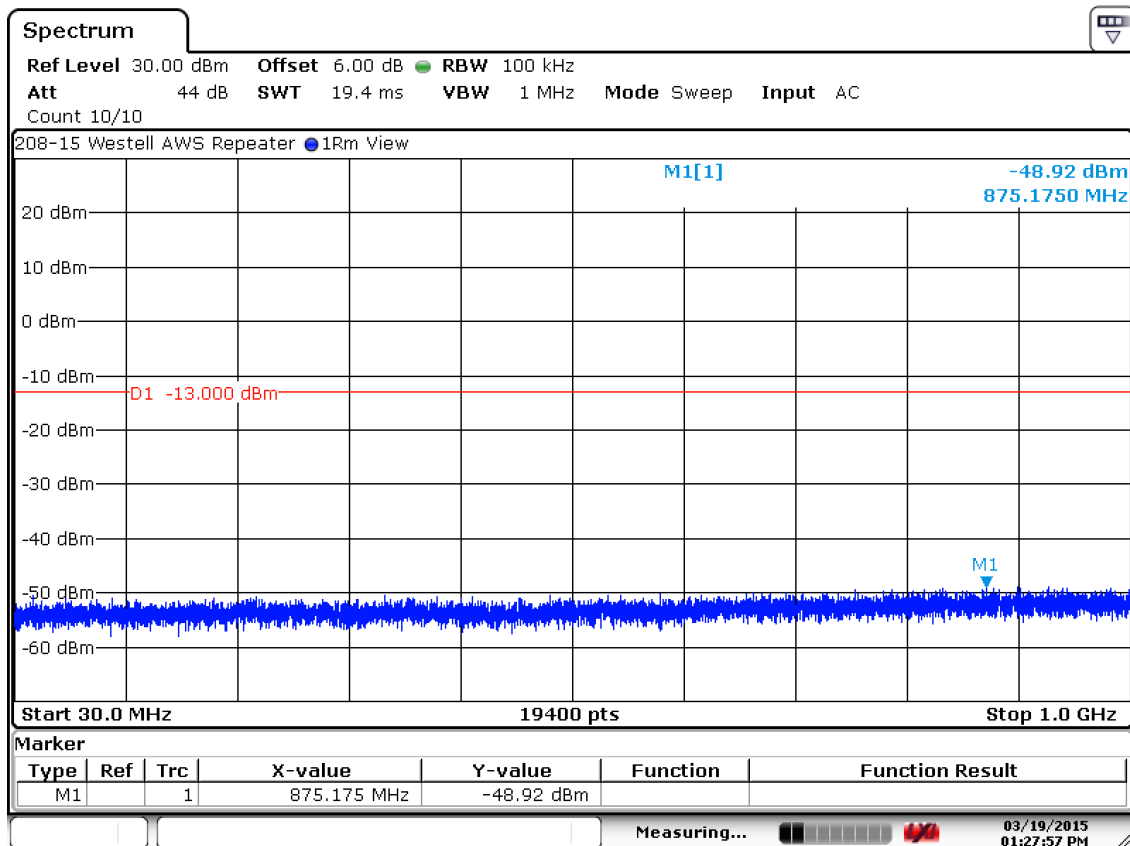
6.3. Spurious Emissions at the Antenna Terminals 27.53 (h)

Requirement: For operations in the 1710-1755 MHz and 2110-2155 MHz bands, the power of any emission outside of the licensee's frequency block 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 1 MHz or greater. However, in the 1 MHz bands immediately outside and adjacent to the licensee's frequency block a resolution bandwidth of at least one percent of the emissions bandwidth of the fundamental emission of the transmitter may be employed. The emission bandwidth is defined as the width of the signal between two points, one below the carrier center frequency and one above the carrier center frequency, outside of which all emission are attenuated at least 26 dB below the transmitter power.

Test Method: KDB 935210 Section 3.6.3

6.3.1. 1715 MHz, 30 MHz to 1 GHz



Date: 19.MAR.2015 13:27:57

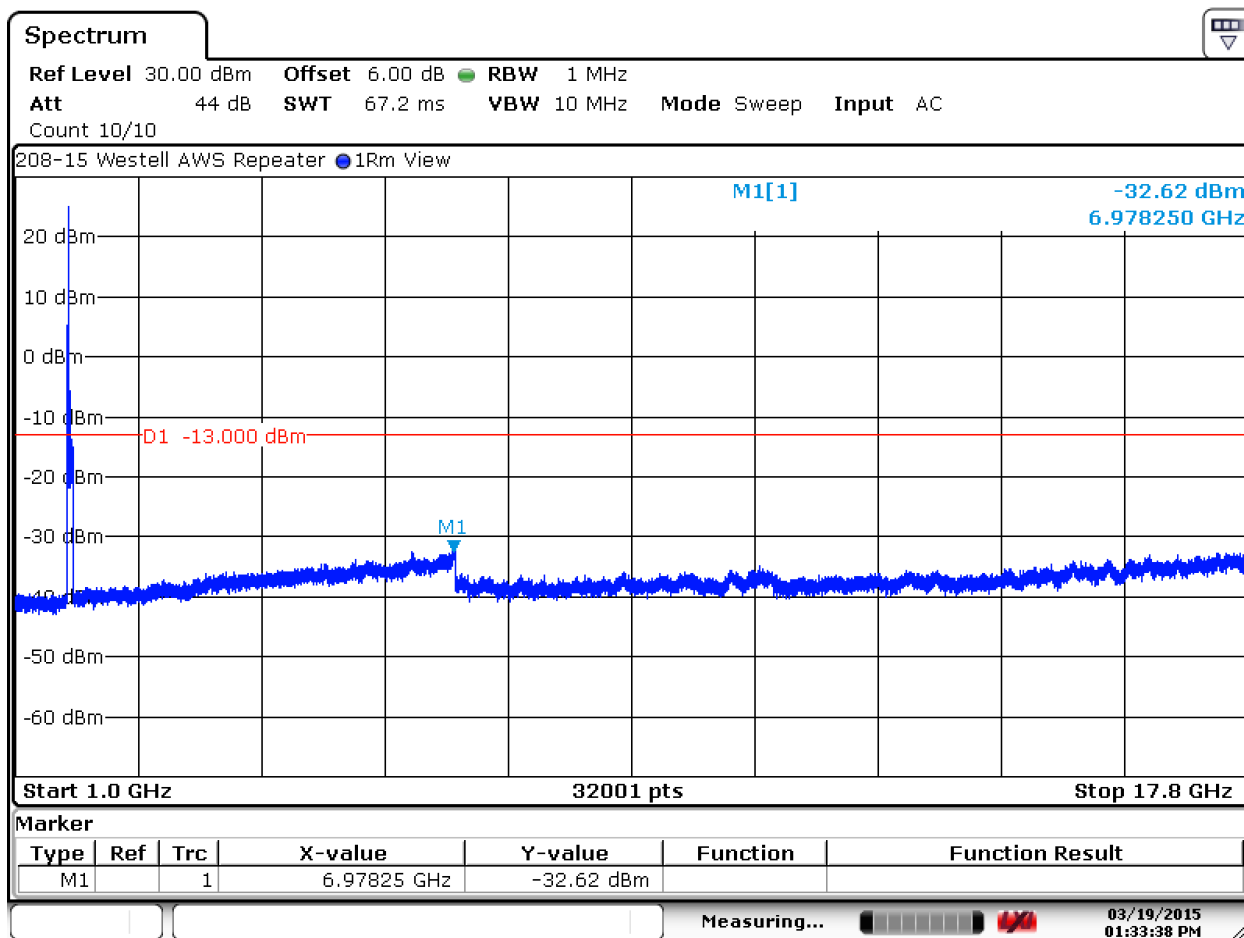
Test Number: 208-15

Issue Date: 7/15/2015

6. Measurement Data (continued)

6.3. Spurious Emissions at the Antenna Terminals 27.53 (h) (continued)

6.3.2. 1715 MHz, 1 to 17.8 GHz



Date: 19.MAR.2015 13:33:37

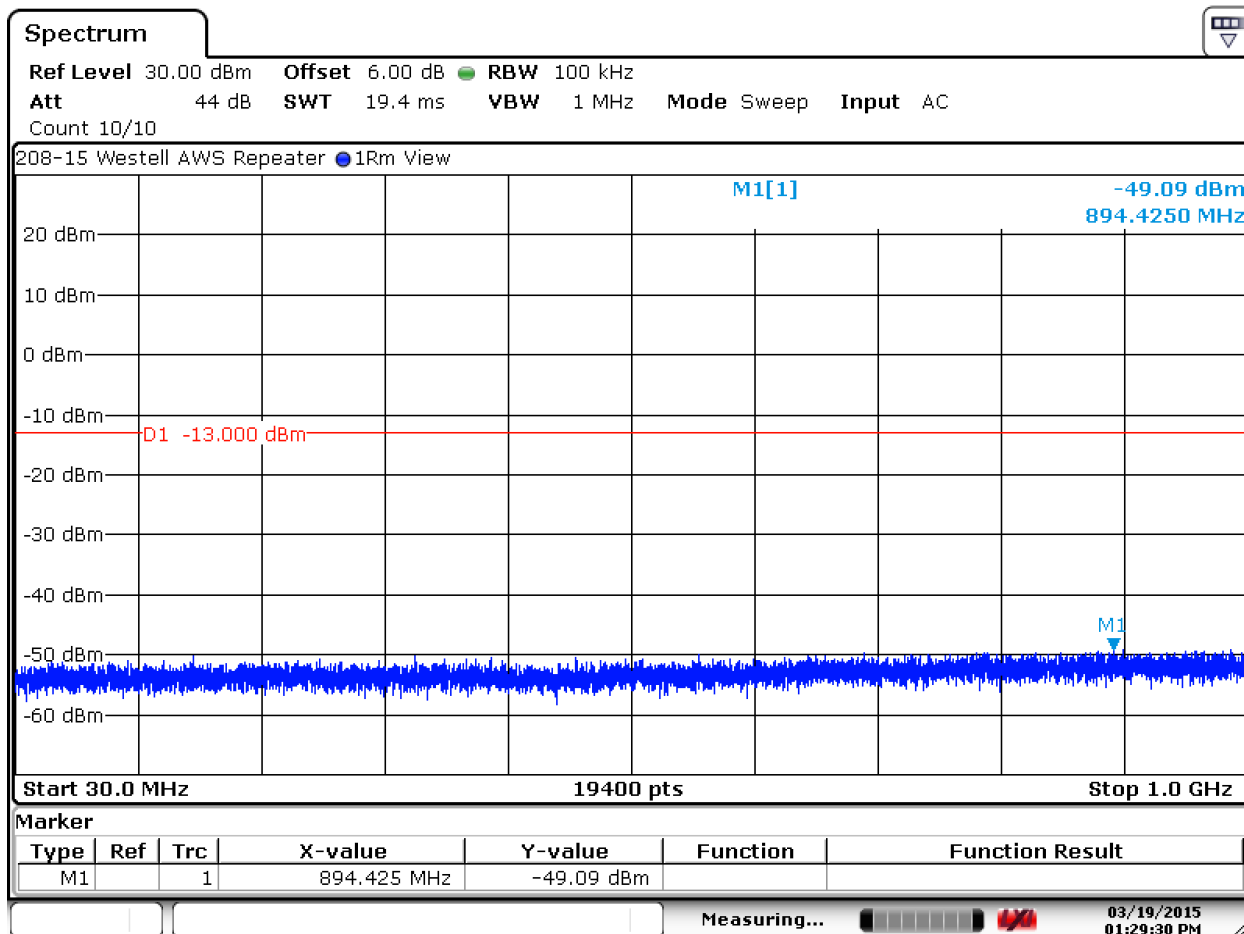
Test Number: 208-15

Issue Date: 7/15/2015

6. Measurement Data (continued)

6.3. Spurious Emissions at the Antenna Terminals 27.53 (h) (continued)

6.3.3. 1745 MHz, 30 MHz to 1 GHz



Date: 19.MAR.2015 13:29:31

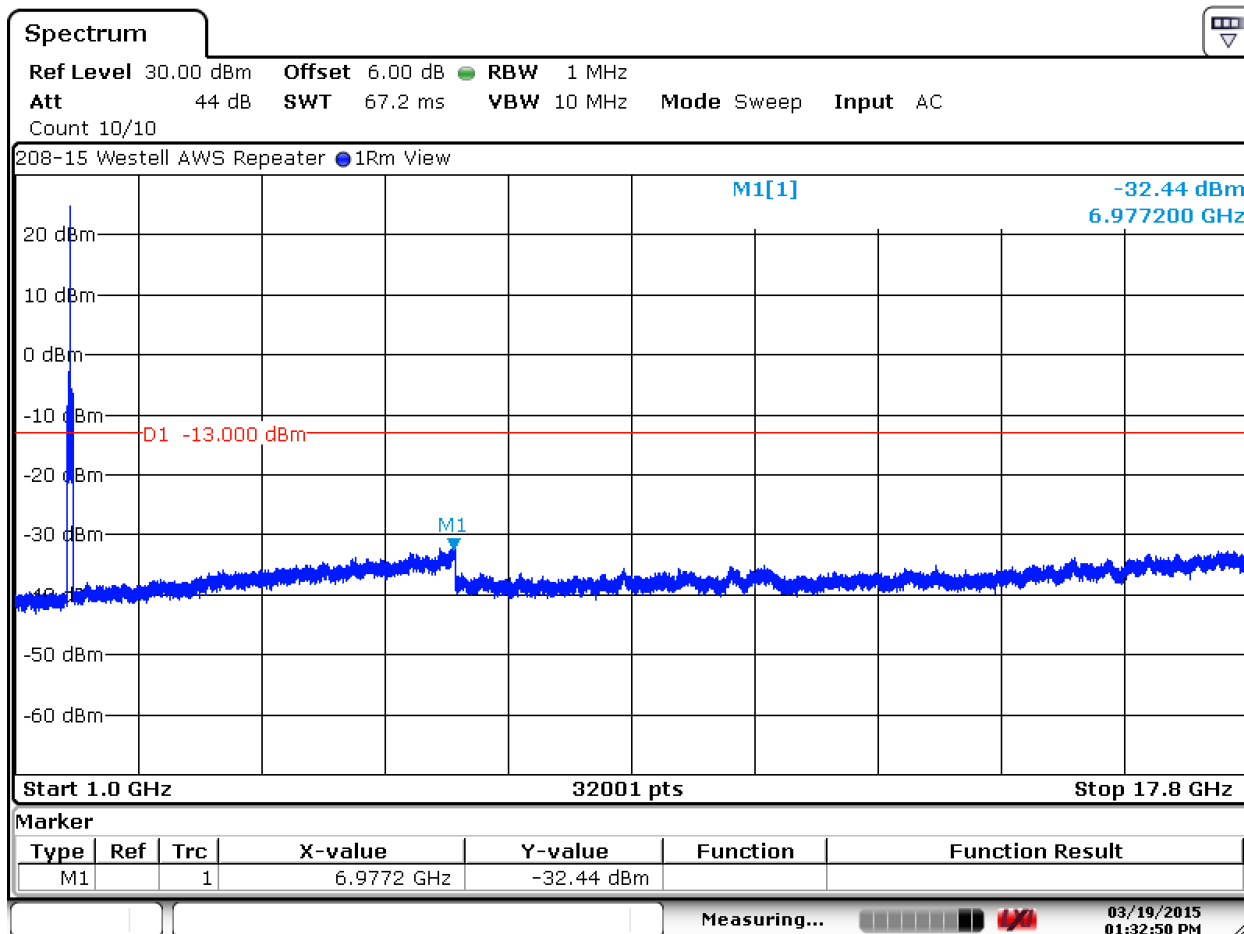
Test Number: 208-15

Issue Date: 7/15/2015

6. Measurement Data (continued)

6.3. Spurious Emissions at the Antenna Terminals 27.53 (h) (continued)

6.3.4. 1745 MHz, 1 to 17.8 GHz



Date: 19.MAR.2015 13:32:51

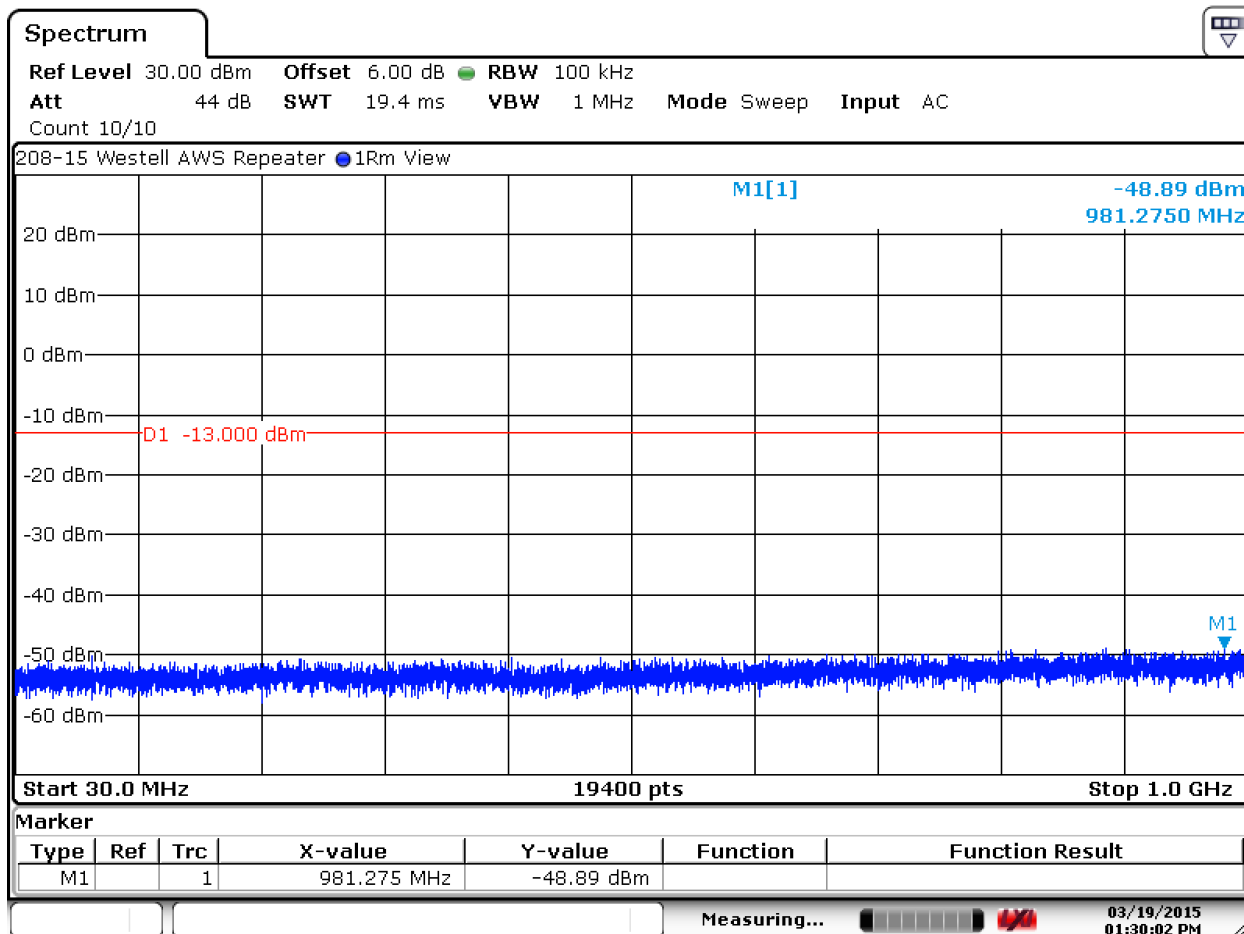
Test Number: 208-15

Issue Date: 7/15/2015

6. Measurement Data (continued)

6.3. Spurious Emissions at the Antenna Terminals 27.53 (h) (continued)

6.3.5. 1775 MHz, 30 MHz to 1 GHz



Date: 19.MAR.2015 13:30:03

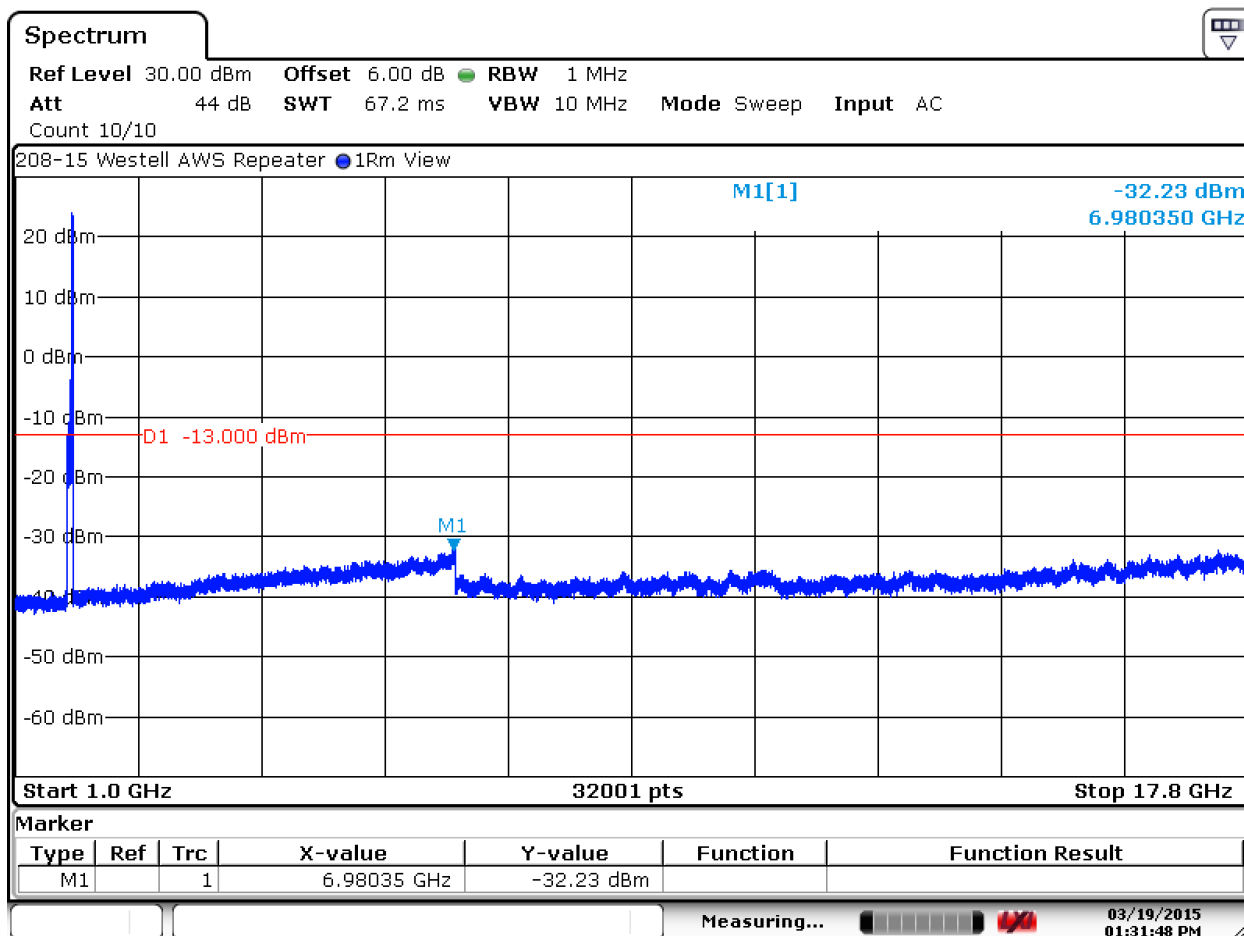
Test Number: 208-15

Issue Date: 7/15/2015

6. Measurement Data (continued)

6.3. Spurious Emissions at the Antenna Terminals 27.53 (h) (continued)

6.3.6. 1775 MHz, 1 to 17.8 GHz



Date: 19.MAR.2015 13:31:48

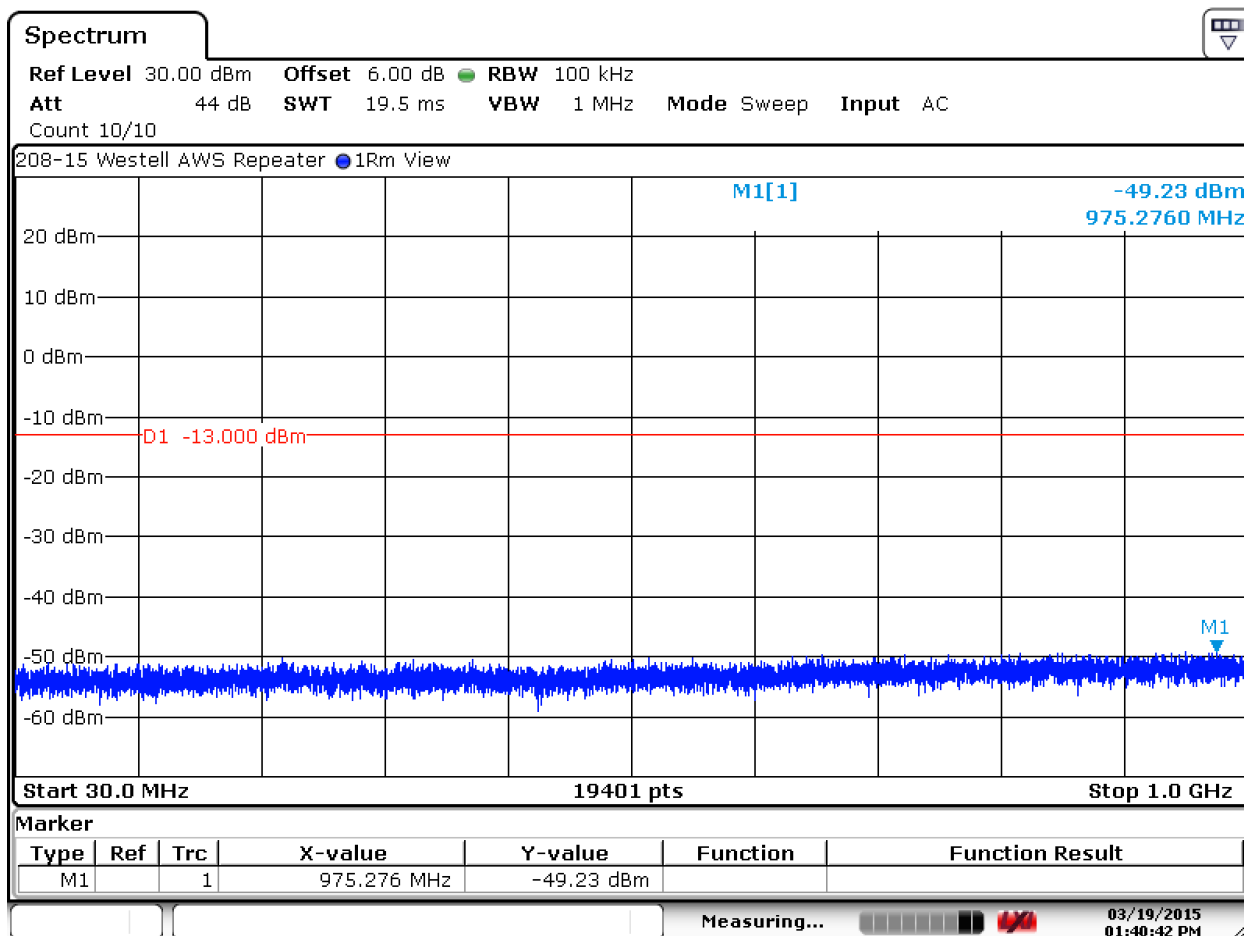
Test Number: 208-15

Issue Date: 7/15/2015

6. Measurement Data (continued)

6.3. Spurious Emissions at the Antenna Terminals 27.53 (h) (continued)

6.3.7. 2115 MHz, 30 MHz to 1 GHz



Date: 19.MAR.2015 13:40:43

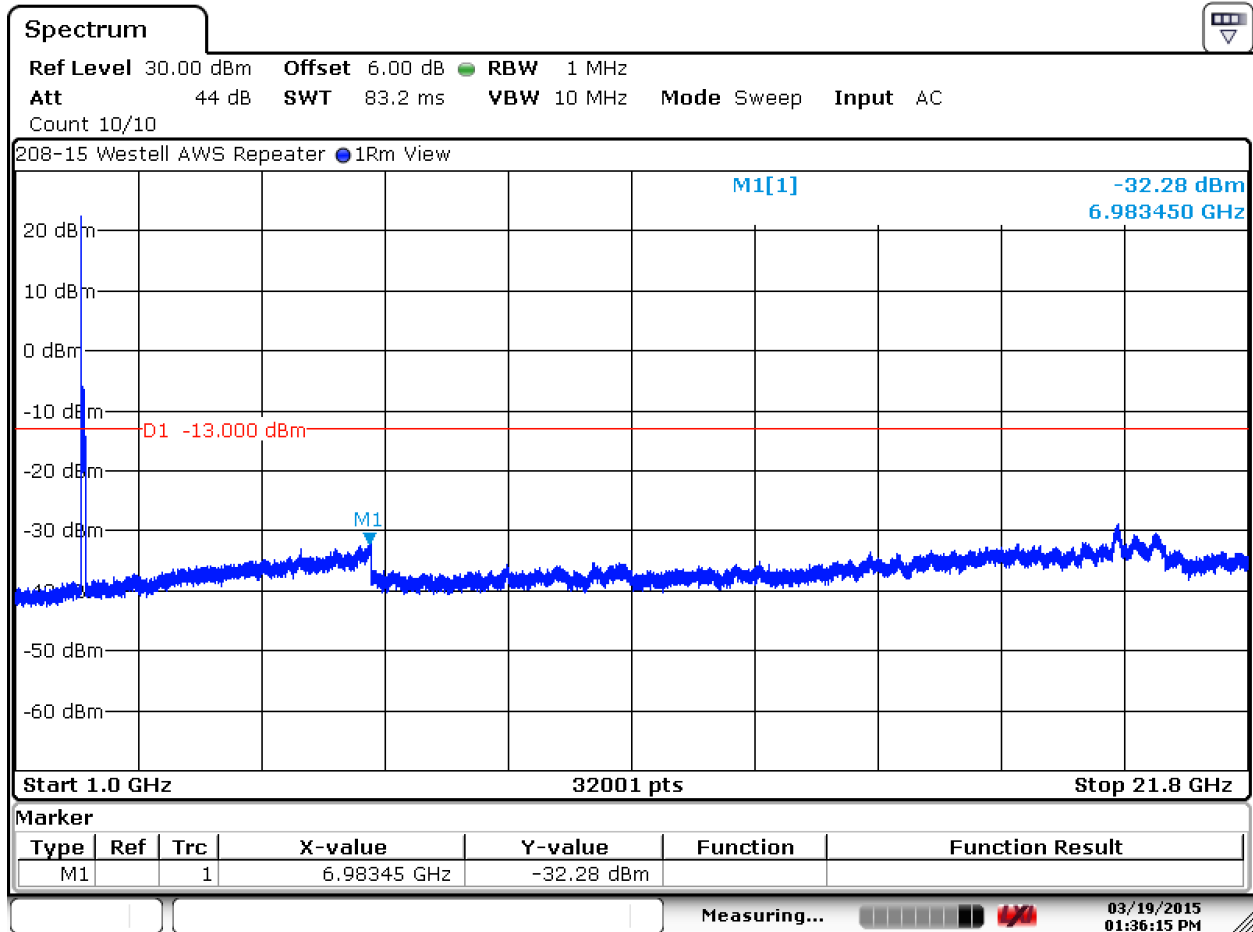
Test Number: 208-15

Issue Date: 7/15/2015

6. Measurement Data (continued)

6.3. Spurious Emissions at the Antenna Terminals 27.53 (h) (continued)

6.3.8. 2115 MHz, 1 to 21.8 GHz



Date: 19.MAR.2015 13:36:15

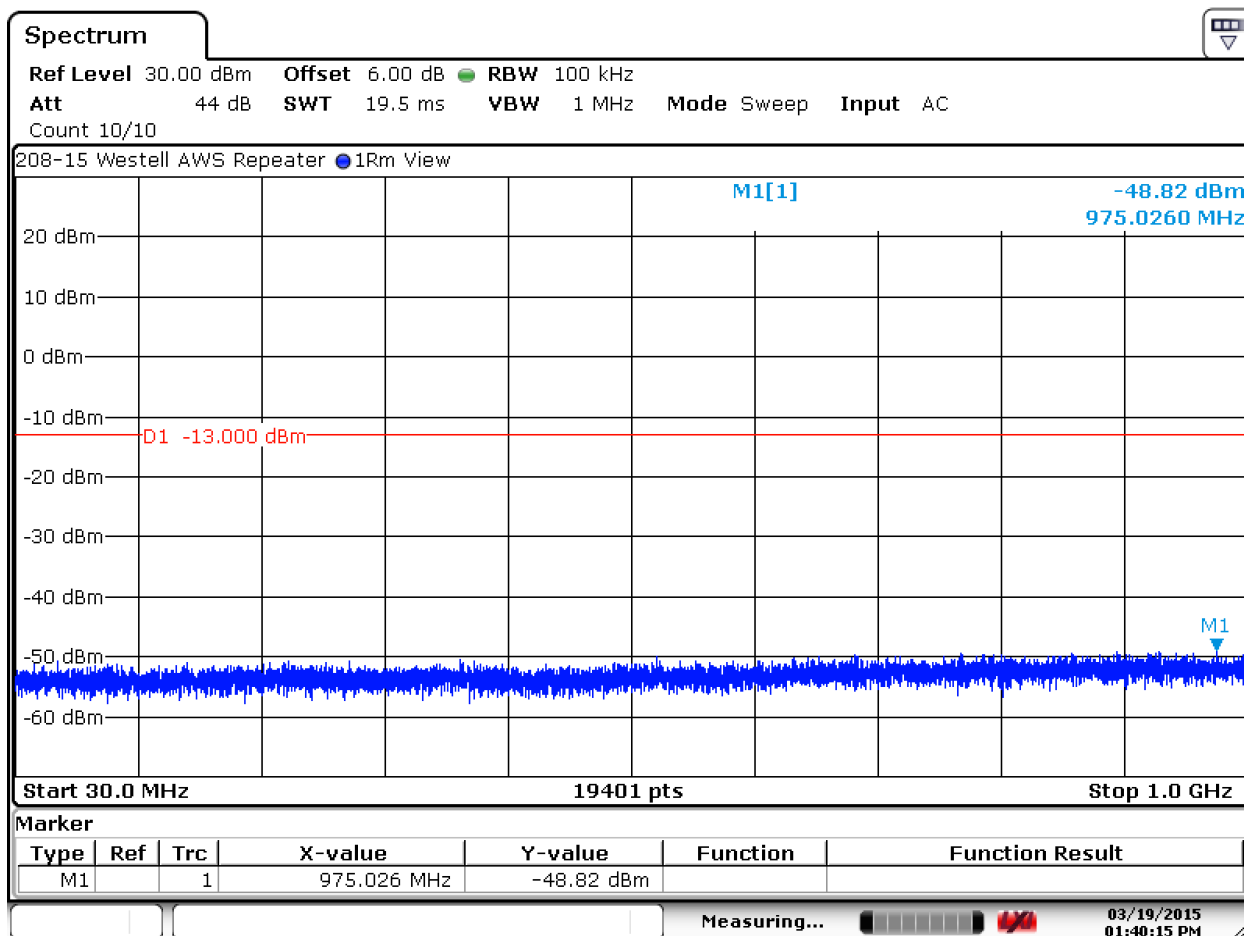
Test Number: 208-15

Issue Date: 7/15/2015

6. Measurement Data (continued)

6.3. Spurious Emissions at the Antenna Terminals 27.53 (h) (continued)

6.3.9. 2145 MHz, 30 MHz to 1 GHz



Date: 19.MAR.2015 13:40:15

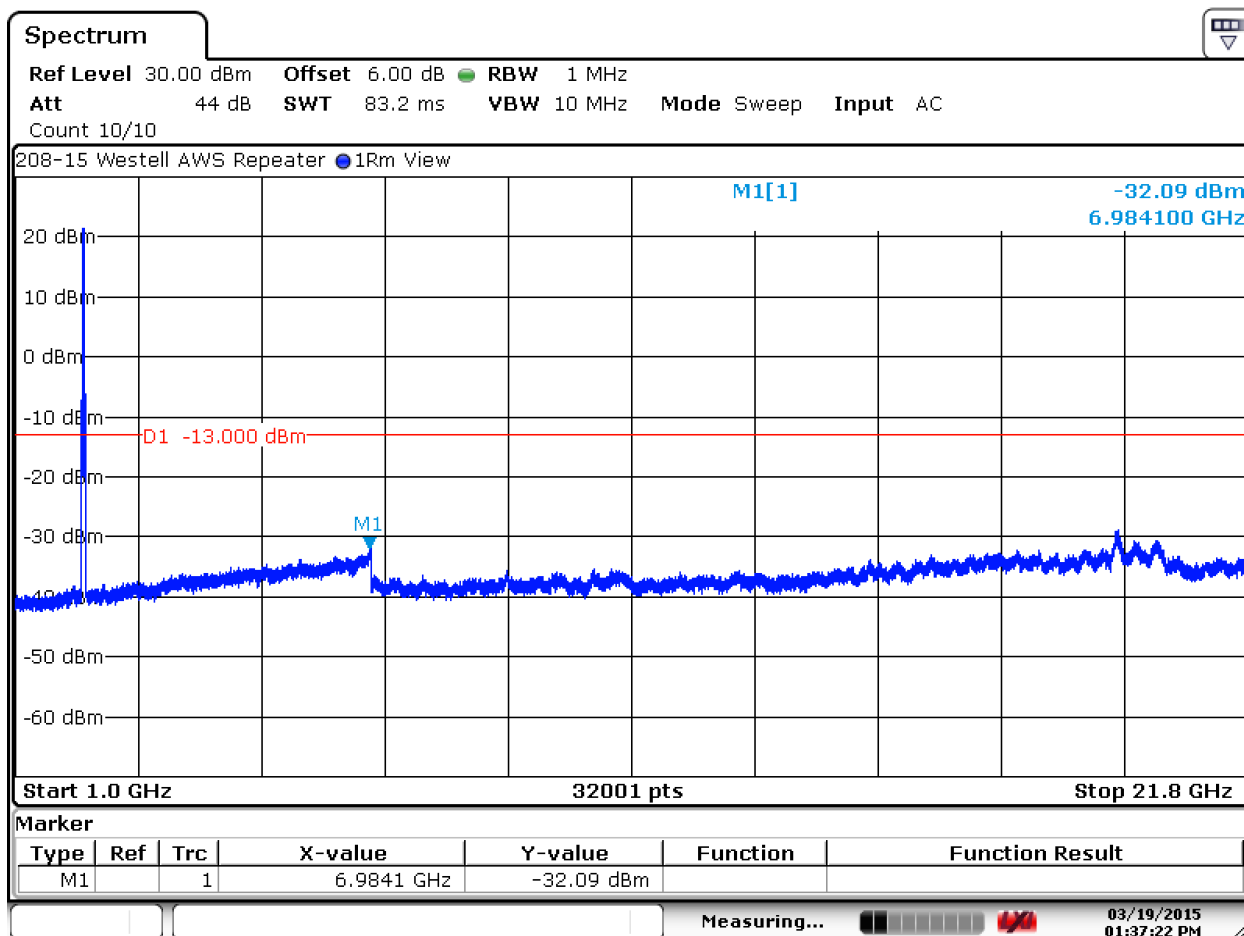
Test Number: 208-15

Issue Date: 7/15/2015

6. Measurement Data (continued)

6.3. Spurious Emissions at the Antenna Terminals 27.53 (h) (continued)

6.3.10. 2145 MHz, 1 to 21.8 GHz



Date: 19.MAR.2015 13:37:23

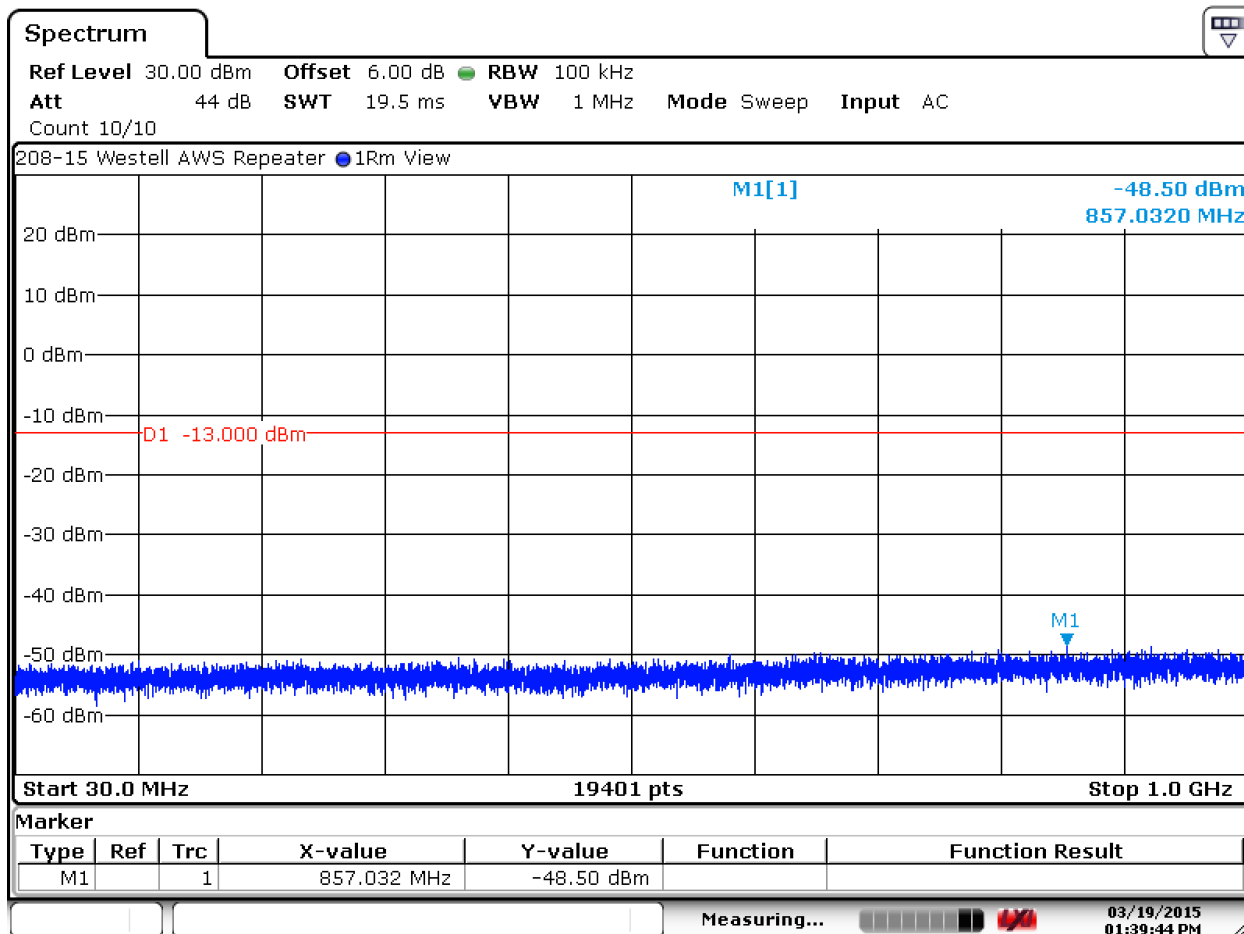
Test Number: 208-15

Issue Date: 7/15/2015

6. Measurement Data (continued)

6.3. Spurious Emissions at the Antenna Terminals 27.53 (h) (continued)

6.3.11. 2175 MHz, 30 MHz to 1 GHz



Date: 19.MAR.2015 13:39:43

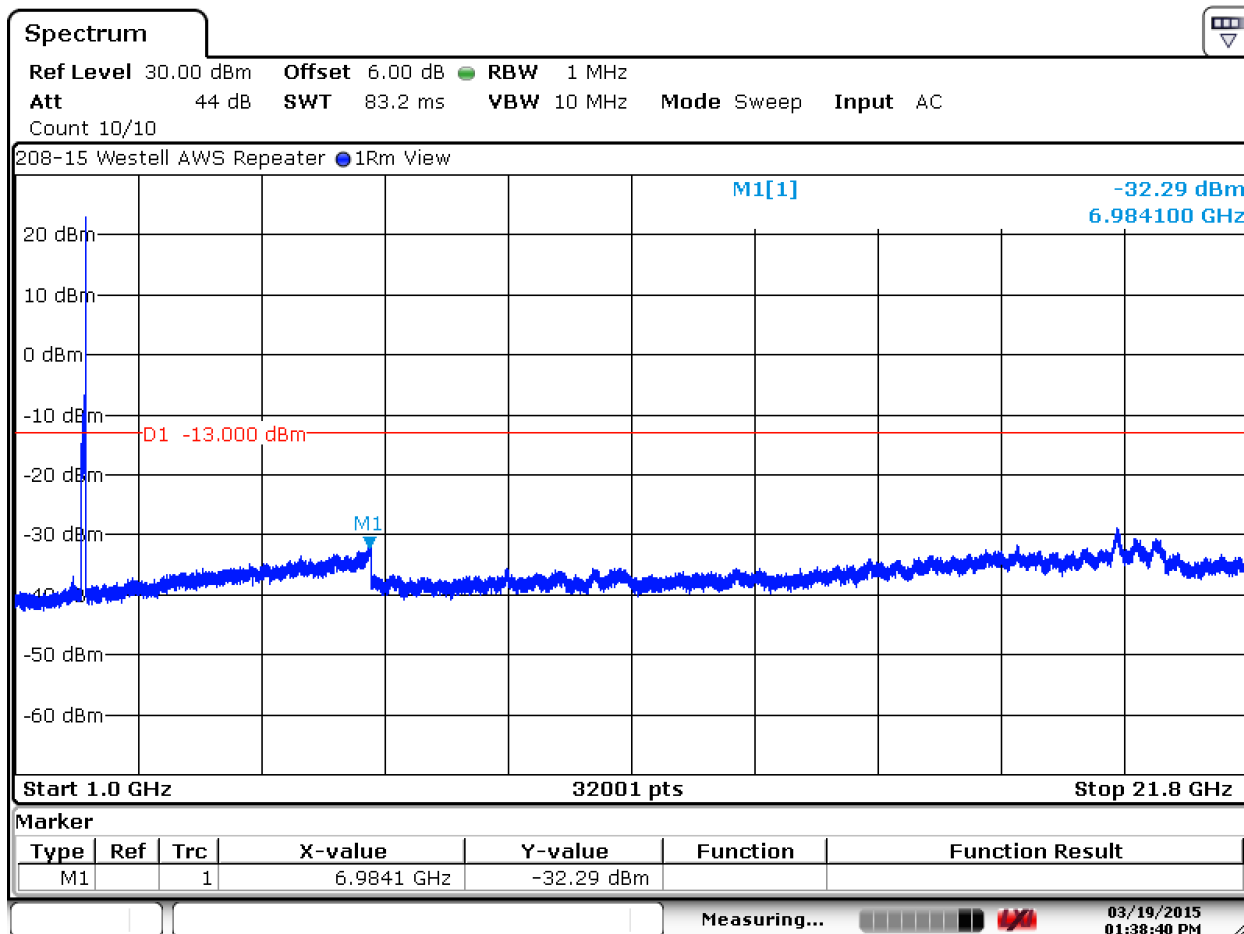
Test Number: 208-15

Issue Date: 7/15/2015

6. Measurement Data (continued)

6.3. Spurious Emissions at the Antenna Terminals 27.53 (h) (continued)

6.3.12. 2175 MHz, 1 to 21.8 GHz



Date: 19.MAR.2015 13:38:40

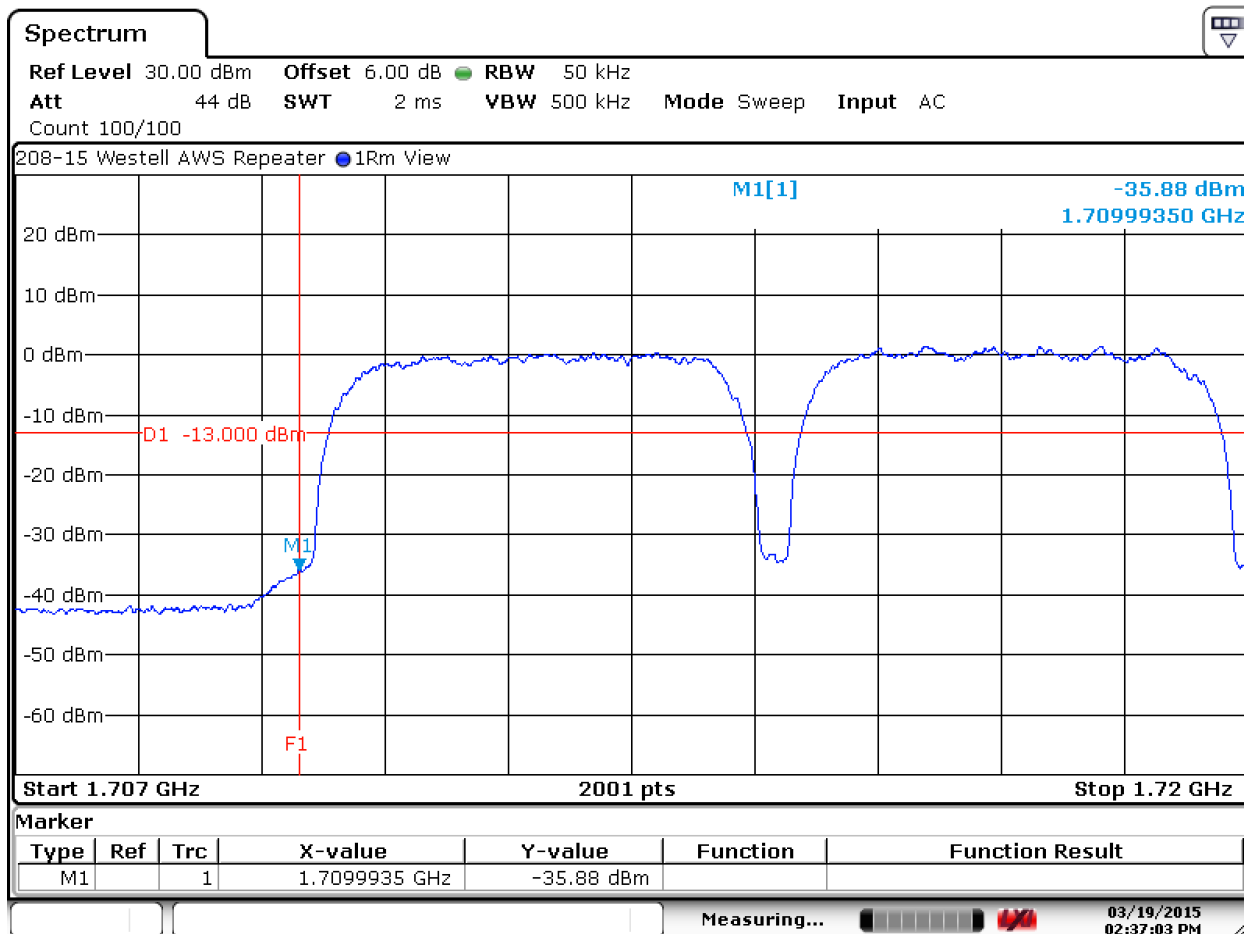
Test Number: 208-15

Issue Date: 7/15/2015

6. Measurement Data (continued)

6.3. Spurious Emissions at the Antenna Terminals 27.53 (h) (continued)

6.3.13. 1710 MHz Lower Bandedge



Date: 19.MAR.2015 14:37:04

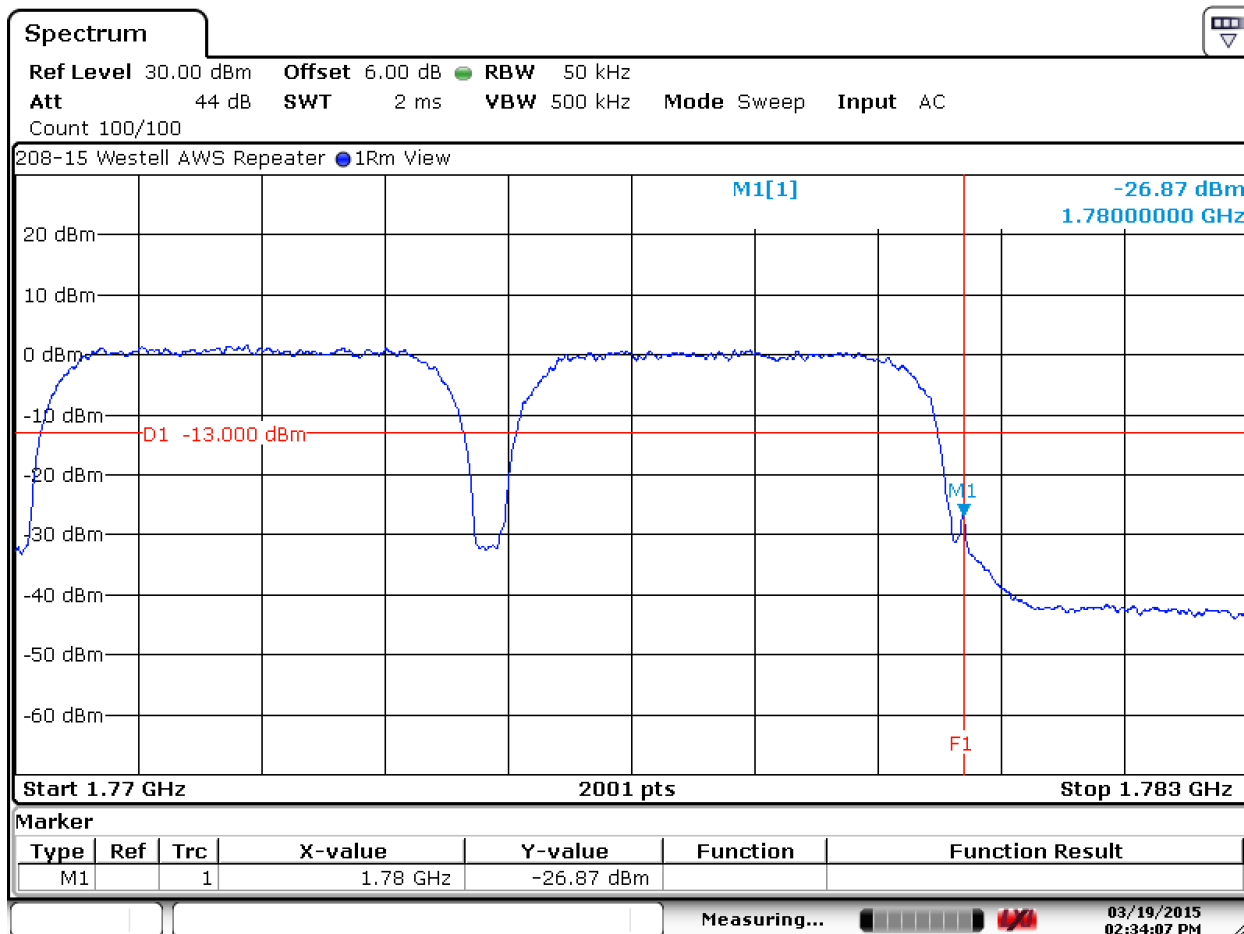
Test Number: 208-15

Issue Date: 7/15/2015

6. Measurement Data (continued)

6.3. Spurious Emissions at the Antenna Terminals 27.53 (h) (continued)

6.3.14. 1780 MHz Upper Bandedge



Date: 19.MAR.2015 14:34:08

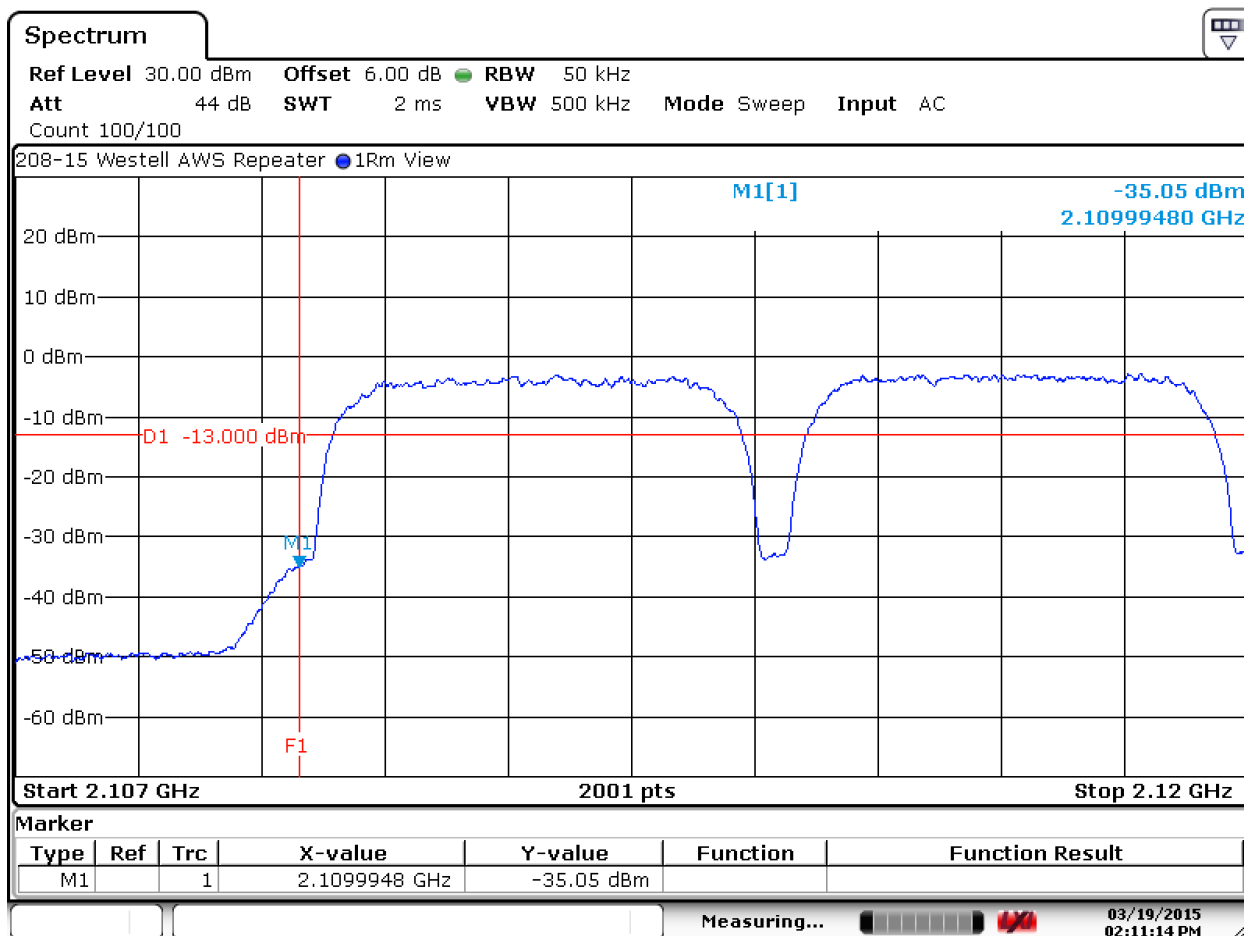
Test Number: 208-15

Issue Date: 7/15/2015

6. Measurement Data (continued)

6.3. Spurious Emissions at the Antenna Terminals 27.53 (h) (continued)

6.3.15. 2110 MHz, Lower bandedge



Date: 19.MAR.2015 14:11:14

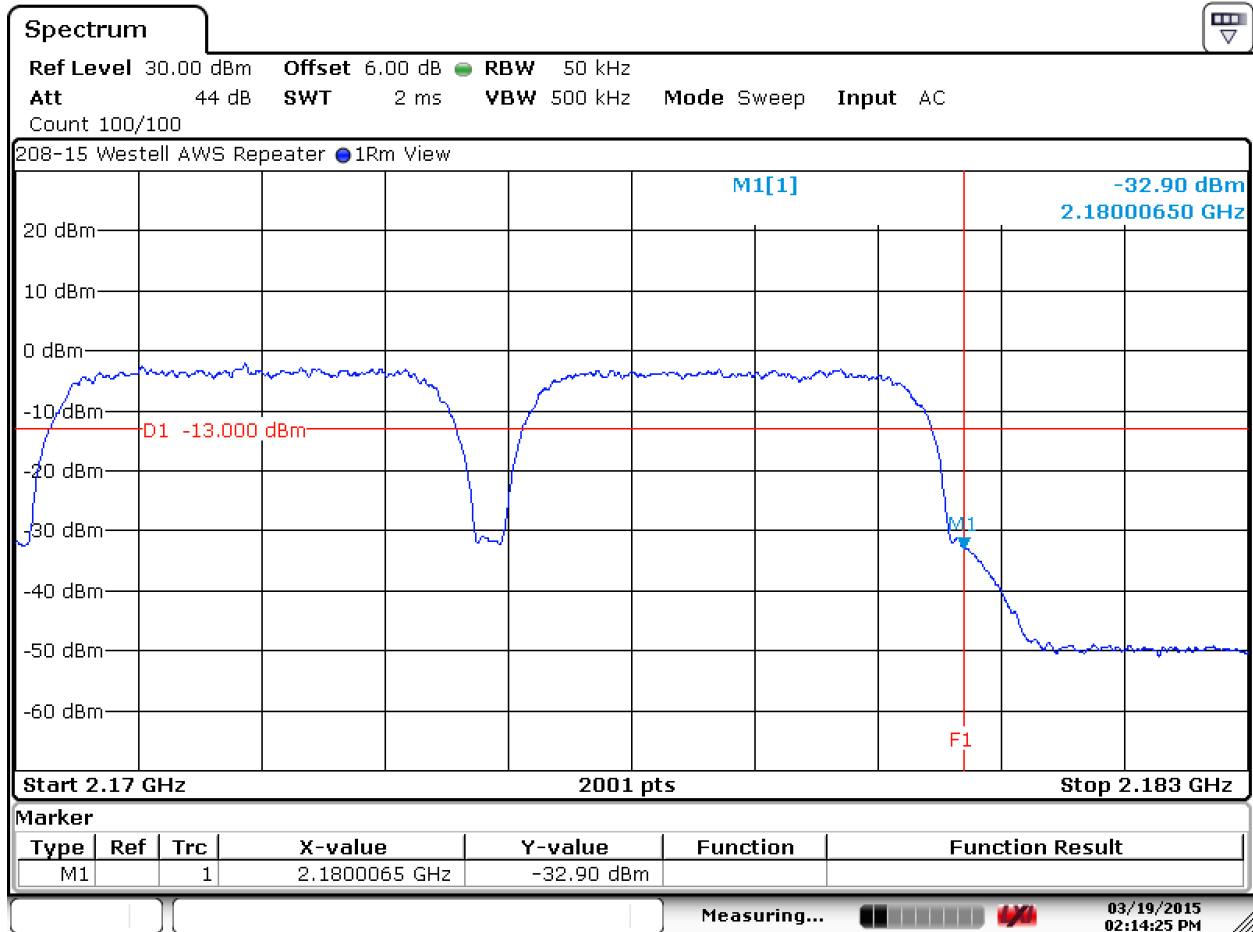
Test Number: 208-15

Issue Date: 7/15/2015

6. Measurement Data (continued)

6.3. Spurious Emissions at the Antenna Terminals 27.53 (h) (continued)

6.3.16. 2180 MHz, Upper bandedge



Date: 19.MAR.2015 14:14:24

6. Measurement Data (continued)

6.4. Field Strength of Spurious Emissions 27.53 (h)

Requirement: For operations in the 1710-1780 MHz and 2110-2180 MHz bands, the power of any emission outside of the licensee's frequency block 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 1 MHz or greater. However, in the 1 MHz bands immediately outside and adjacent to the licensee's frequency block a resolution bandwidth of at least one percent of the emissions bandwidth of the fundamental emission of the transmitter may be employed. The emission bandwidth is defined as the width of the signal between two points, one below the carrier center frequency and one above the carrier center frequency, outside of which all emission are attenuated at least 26 dB below the transmitter power.

Test Method: KDB 935210 Section 3.8

6.4.1. Measurement and Equipment Setup

Test Date:	3/25/2015
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

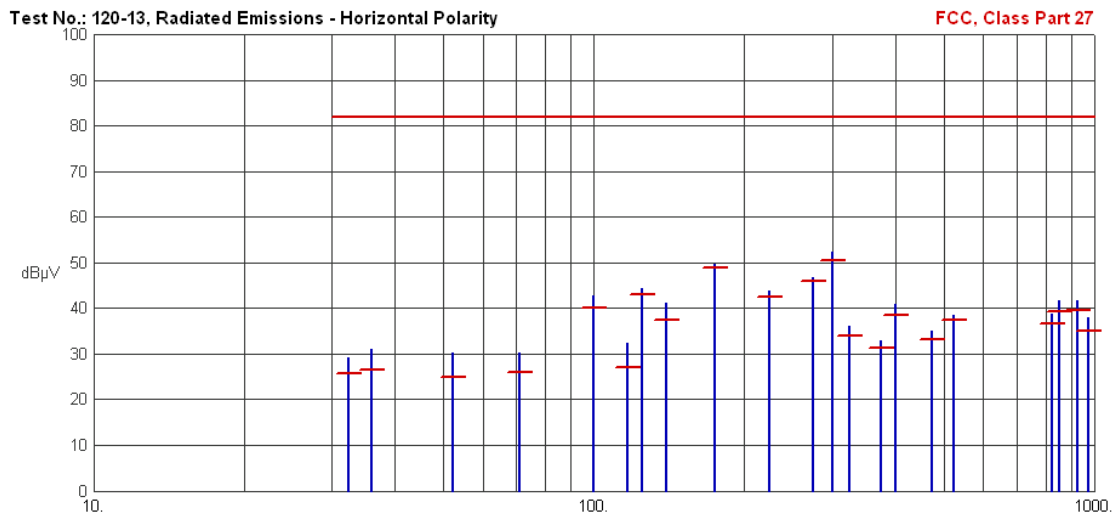
6.4.2 Test Procedure

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 27.53 (h) (continued)

6.4.3. Horizontal Polarity

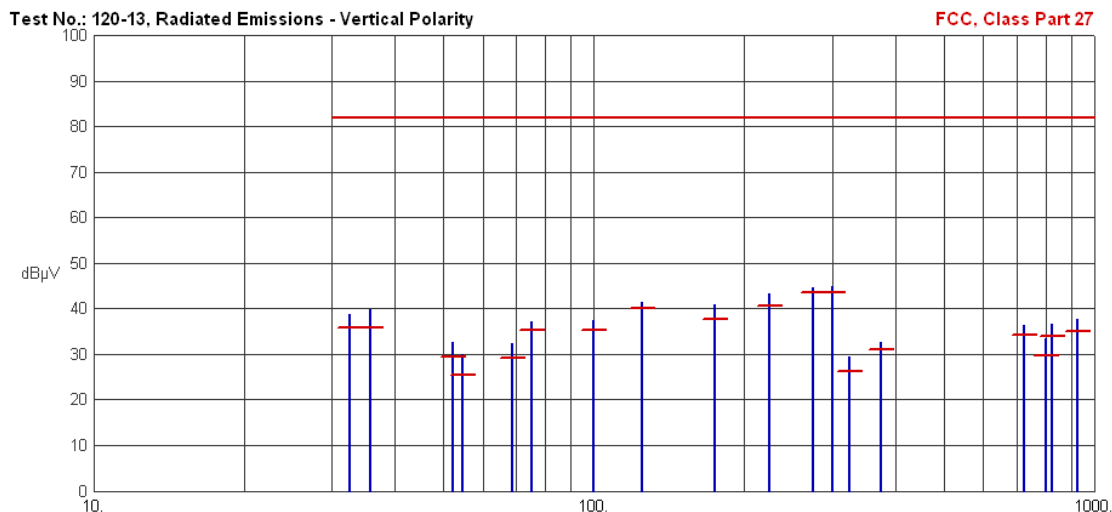


Frequency (MHz)	Pk Amp (dBμV/m)	QP Amp (dBμV/m)	QP Limit (dBμV/m)	Margin (dB)	Ant Ht (cm)	Table (Deg)	Comments
32.3174	29.19	25.79	82.00	-56.21	N/A	N/A	
35.9729	31.14	26.55	82.00	-55.45	N/A	N/A	
52.1760	30.35	24.92	82.00	-57.08	N/A	N/A	
71.0806	30.14	26.09	82.00	-55.91	N/A	N/A	
100.0095	42.67	40.15	82.00	-41.85	N/A	N/A	
116.6634	32.52	27.17	82.00	-54.83	N/A	N/A	
124.9950	44.29	43.09	82.00	-38.91	N/A	N/A	
140.0051	41.21	37.56	82.00	-44.44	N/A	N/A	
175.0042	49.65	49.01	82.00	-32.99	N/A	N/A	
225.0109	43.95	42.40	82.00	-39.60	N/A	N/A	
275.0057	46.72	45.96	82.00	-36.04	N/A	N/A	
300.0604	52.29	50.41	82.00	-31.59	N/A	N/A	
325.0117	36.20	33.95	82.00	-48.05	N/A	N/A	
375.0308	32.90	31.39	82.00	-50.61	N/A	N/A	
400.0433	40.85	38.65	82.00	-43.35	N/A	N/A	
475.0465	35.07	33.06	82.00	-48.94	N/A	N/A	
525.0395	38.49	37.34	82.00	-44.66	N/A	N/A	
825.0488	38.70	36.58	82.00	-45.42	N/A	N/A	
850.0566	41.71	39.27	82.00	-42.73	N/A	N/A	
925.0576	41.59	39.64	82.00	-42.36	N/A	N/A	
975.0483	38.11	35.14	82.00	-46.86	N/A	N/A	

6. Measurement Data (continued)

6.4. Field Strength of Spurious Emissions 27.53 (h) (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
32.5224	38.80	35.94	82.00	-46.06	N/A	N/A	
35.7227	39.78	35.93	82.00	-46.07	N/A	N/A	
52.3070	32.71	29.52	82.00	-52.48	N/A	N/A	
54.6344	29.91	25.57	82.00	-56.43	N/A	N/A	
68.8659	32.39	29.19	82.00	-52.81	N/A	N/A	
74.9821	37.18	35.43	82.00	-46.57	N/A	N/A	
100.0206	37.43	35.21	82.00	-46.79	N/A	N/A	
124.9898	41.46	40.12	82.00	-41.88	N/A	N/A	
174.9936	40.84	37.84	82.00	-44.16	N/A	N/A	
224.9992	43.23	40.67	82.00	-41.33	N/A	N/A	
274.9926	44.70	43.60	82.00	-38.40	N/A	N/A	
300.0625	44.94	43.47	82.00	-38.53	N/A	N/A	
325.0062	29.47	26.32	82.00	-55.68	N/A	N/A	
375.0104	32.78	30.94	82.00	-51.06	N/A	N/A	
725.0537	36.26	34.20	82.00	-47.80	N/A	N/A	
800.0538	33.41	29.72	82.00	-52.28	N/A	N/A	
825.0361	36.52	33.87	82.00	-48.13	N/A	N/A	
925.0655	37.68	35.04	82.00	-46.96	N/A	N/A	

6. Measurement Data (continued)**6.4. Field Strength of Spurious Emissions 27.53 (h) (continued)****6.4.5. Measurement and Equipment Setup**

Test Date:	03/25/2015
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 27.54

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.

Test Number: 208-15

Issue Date: 7/15/2015

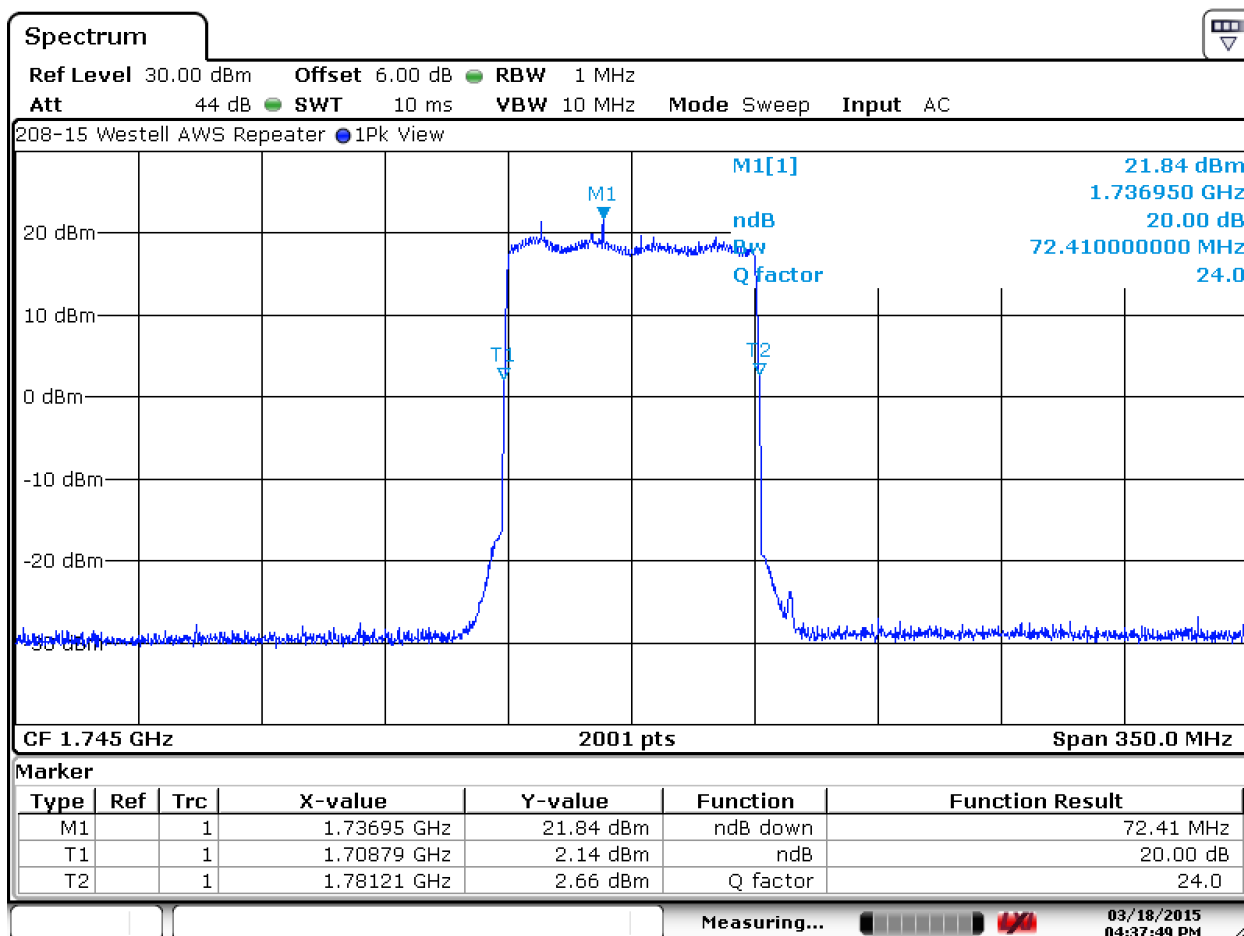
6. Measurement Data (continued)

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. 1745 MHz Center Frequency



Date: 18.MAR.2015 16:37:49

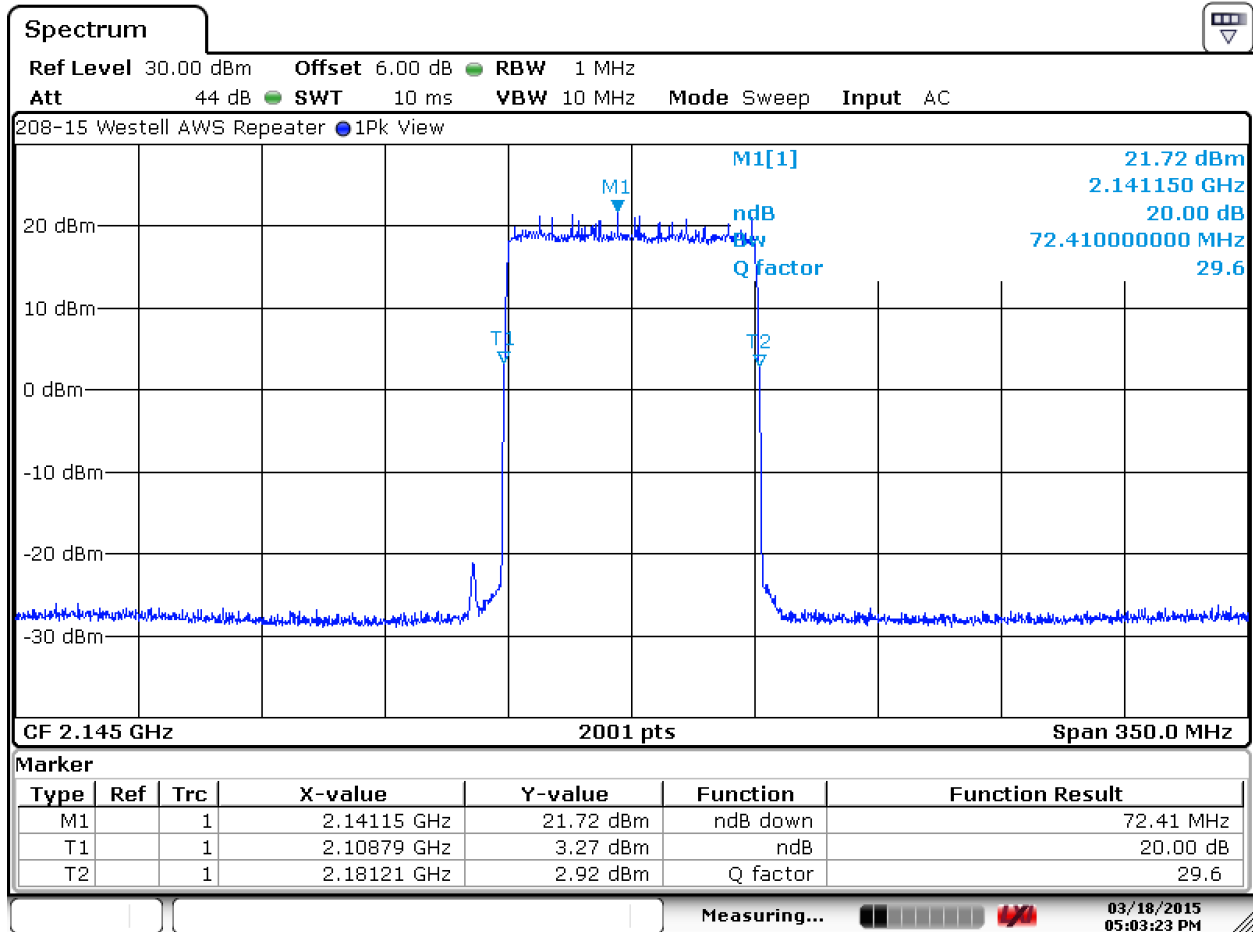
Test Number: 208-15

Issue Date: 7/15/2015

6. Measurement Data (continued)

6.6. Out of Band Rejection (continued)

6.6.2. 2145 MHz, Center Frequency



Date: 18.MAR.2015 17:03:23

6. Measurement Data (continued)

6.7. 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 ²)	Result
				(mW/cm ²)	(W/m ²)		
	(1)	(2)	(3)	(4)		(5)	
1715	20.0	32.00	-2.00	0.1989437	1.9894368	1	Compliant
1745	20.0	31.77	-2.00	0.1886819	1.8868186	1	Compliant
1775	20.0	31.76	-2.00	0.1882479	1.8824790	1	Compliant
2115	20.0	27.77	3.00	0.2375364	2.3753639	1	Compliant
2145	20.0	27.68	3.00	0.2326645	2.3266451	1	Compliant
2175	20.0	27.34	3.00	0.2151444	2.1514445	1	Compliant
1715	20.0	31.98	-2.00	0.1980296	1.9802962	1	Compliant
1745	20.0	31.77	-2.00	0.1886819	1.8868186	1	Compliant
1775	20.0	31.83	-2.00	0.1913067	1.9130668	1	Compliant
2115	20.0	27.73	3.00	0.2353586	2.3535864	1	Compliant
2145	20.0	27.98	3.00	0.2493045	2.4930452	1	Compliant
2175	20.0	27.89	3.00	0.2441913	2.4419128	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. Actual separation distance was calculated for outdoor applications.
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



Test Number: 208-15

Issue Date: 7/15/2015

8. Test Setup Photographs (cont)

Radiated Emissions (Front)



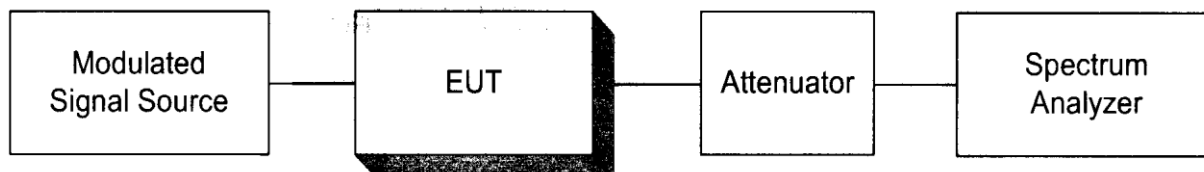
8. Test Setup Photographs (cont)

Radiated Emissions (Rear) 30 MHz to 1 GHz

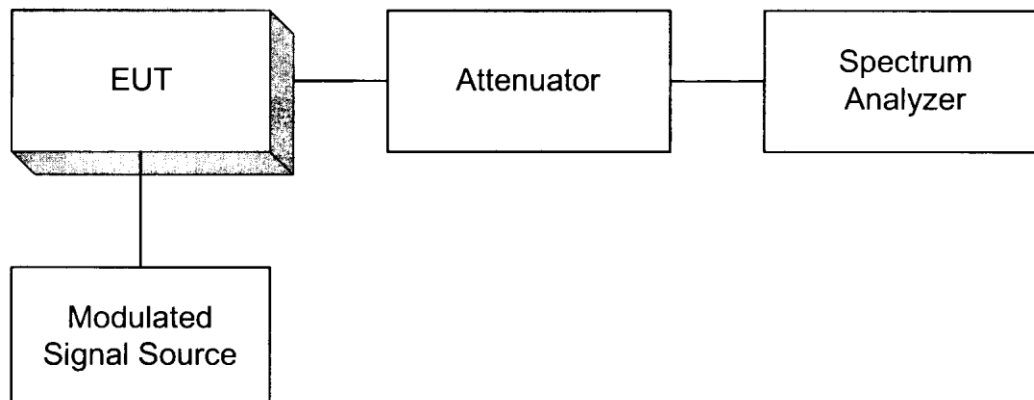


Appendix A

RF Output Power

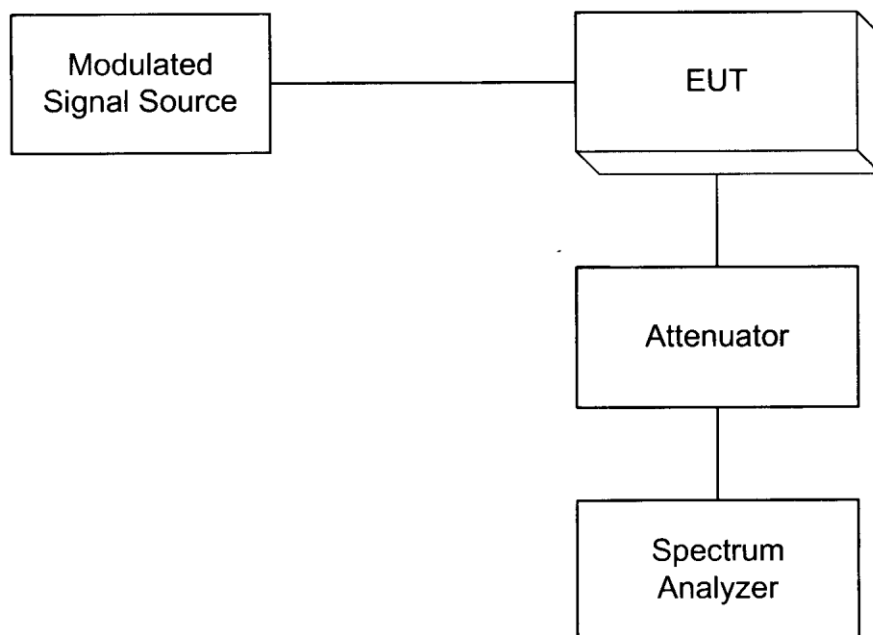


Occupied Bandwidth



Appendix A

Spurious Emissions at the Antenna Terminals



Field Strength of Spurious Radiation

