166 South Carter, Genoa City, WI 53128

| | |
|---|---|
| Company: | Ubiquiti Networks, Inc. |
| Model Tested: | AF5 |
| Report Number: | 19519 Part 4 |
| DLS Project: | 6154 |

# Code of Federal Regulations 47 Part 15 – Radio Frequency Devices

Subpart E – Unlicensed National Information Infrastructure Devices
Section 15.407
General Technical Requirements.

## Part 4 - 50 MHz Bandwidth Data

THE FOLLOWING **MEETS** THE ABOVE TEST SPECIFICATION
(DFS not tested by DLS Electronic Systems Inc.)

| | |
|---|---|
| Formal Name: | Air Fiber 5 - 5.4GHz Radio |
| Model Number(s): | AF5 |
| Kind of Equipment: | Point-to-Point Digital Transmission Transceiver |
| Test Conducted For: | Ubiquiti Networks, Inc.<br>12F, No105, Song Ren Rd<br>Taipei, Taiwan |

## This part of the report includes the 50 MHz Bandwidth Data Only

Further descriptions of the equipment under test
and the test setup photos will be found in Part 1 of test report # 19519.

166 South Carter, Genoa City, WI 53128

| | |
|---|---|
| Company: | Ubiquiti Networks, Inc. |
| Model Tested: | AF5 |
| Report Number: | 19519 Part 4 |
| DLS Project: | 6154 |

SIGNATURE PAGE

Tested By:

Craig Brandt
Senior Test Engineer

Reviewed By:

William Stumpf
OATS Manager

Approved By:

Brian Mattson
General Manager

## Table of Contents

United States Department of Commerce
National Institute of Standards and Technology

NVLAP®

# Certificate of Accreditation to ISO/IEC 17025:2005

NVLAP LAB CODE: 100276-0

**D.L.S. Electronic Systems, Inc.**
Wheeling, IL

*is accredited by the National Voluntary Laboratory Accreditation Program for specific services, listed on the Scope of Accreditation, for:*

## ELECTROMAGNETIC COMPATIBILITY AND TELECOMMUNICATIONS

*This laboratory is accredited in accordance with the recognized International Standard ISO/IEC 17025:2005. This accreditation demonstrates technical competence for a defined scope and the operation of a laboratory quality management system (refer to joint ISO-ILAC-IAF Communique dated January 2009).*

2013-10-01 through 2014-09-30
*Effective dates*

*For the National Institute of Standards and Technology*

NVLAP-01C (REV. 2009-01-28)

**Subpart E Section 15.407 Applicable Technical Requirements Tested:**

| Section | Description | Procedure | Note | Compliant? |
|---|---|---|---|---|
| Informative | Duty Cycle | FCC KDB 789033 D01 General UNII Test Procedures v01r03 Section B(2)(b) | 1 | NA |
| Informative | Emission Bandwidth – 26 dB bandwidth | FCC KDB 789033 D01 General UNII Test Procedures v01r03 Section C | 1 | NA |
| Informative | 99 Percent Occupied Bandwidth | FCC KDB 789033 D01 General UNII Test Procedures v01r03 Section D | 1 | NA |
| 15.407(a)(2) | Maximum Conducted Output Power | FCC KDB 789033 D01 General UNII Test Procedures v01r03 Section E(3)(a) | 1 | Yes |
| 15.407(b)(7) & 15.205 | Unwanted Emission Levels – Radiated Restricted Band-Edge (with antenna connected) | FCC KDB 789033 D01 General UNII Test Procedures v01r03 Sections H(1), H(2), H(3), H(5), H(6) & H(6)(c) | 2 | Yes |
| 15.407(a)(2) | Peak Power Spectral Density - Conducted | FCC KDB 789033 D01 General UNII Test Procedures v01r03 Section E(2)(b) or (d) | 1 | Yes |
| 15.407(a)(6) | Peak Excursion - Conducted | FCC KDB 789033 D01 General UNII Test Procedures v01r03 Section G | 1 | Yes |
| 15.407(b)(3) & 15.407(b)(5) | Unwanted Emission Levels – Radiated Operating Band-Edge (with antenna connected) | FCC KDB 789033 D01 General UNII Test Procedures v01r03 Sections H, H(2), H(3), H(3)(d)(ii) & H(5) | 2 | Yes |
| 15.407(b)(3) & 15.407(b)(6) | Unwanted Emission Levels – Radiated with integral antenna | FCC KDB 789033 D01 General UNII Test Procedures v01r03 Sections H(1), H(2), H(3), H(4), H(5), H(6) & H(6)(c) | 2 | Yes |
| 15.407(b)(6) & 15.207(a) | AC Line Conducted Emissions | ANSI C63.10:2009 | 3 | Yes |
| 15.407(h)(2) | Dynamic Frequency Selection (DFS) | Not tested by DLS | | NA |

Note 1: RF Conducted emission measurement.
Note 2: Radiated emission measurement.
Note 3: AC Line Conducted measurements - reported in Part 1 of Report #19519.

**Description of the Test Sample:**

The Ubiquiti Networks model AirFiber 5 is a 5.4Ghz and 5.8GHz Point-to-Point radio that uses OFDM with a 50MHz/40MHz/20MHz/10MHz bandwidth configuration. The EUT would be used outdoors and pole mounted. It is powered from a POE adapter. The integral antenna has a 23 dBi gain. This is an uncorrelated MIMO software defined radio.

**Frequency Ranges of the Radio:**

**5476 to 5719 MHz (10 MHz bandwidth)**
**5481 to 5714 MHz (20 MHz bandwidth)**
**5492 to 5703 MHz (40 MHz bandwidth)**
**5497 to 5698 MHz (50 MHz bandwidth) (in this part of the report)**

(The 5.8 radio data is in a separate report.)

**Type of Modulations Tested:**

**OFDM: 1024QAM, 256QAM, 64QAM, 16QAM, QPSK**

**Conclusion**

Dynamic Frequency Selection (DFS) testing was not performed by DLS Electronic Systems,Inc. Otherwise, the Air Fiber 5 - 5.4GHz Radio with the 50MHz Channel Bandwidth, Model: AF5, as provided from Ubiquiti Networks tested in October 2013 **meets** the requirements of CFR 47 Part 15 Subpart E Section 15.407.

**Appendix – Measurement Data**

## 1.0 Duty Cycle of Test Unit

**Rule Part:** FCC Section 15.35(c)

**Test Procedure:** FCC KDB 789033 D01 General UNII Test Procedures v01r03 – *Guidance for Compliance Testing of Unlicensed National Information Infrastructure (U-NII) Devices – Part 15, Subpart E*
Section B(2)(b) – Duty cycle (x)

Center frequency = center of emission
RBW ≥ OBW (otherwise, RBW = largest possible)
VBW ≥ RBW
Detector = Peak or Average
Span = Zero Span
Verify both RBW and VBW are > 50/minimum transmission duration (T)
Verify the number of sweep points across T exceeds 100

**Limits:** Informative. Use correction factor if duty cycle is less than 100% (x < 1).

**Results:** 10 MHz BW mode: Requires a correction factor of 0.13 dB
20 MHz BW mode: Requires a correction factor of 0.13 dB
40 MHz BW mode: Requires a correction factor of 0.07 dB
50 MHz BW mode: Requires a correction factor of 0.07 dB

**Sample Equations:** Total Cycle time = 2.004008 ms
Total on Time = 1.943887 ms
**Duty cycle factor x =** 1.943887 / 2.004008 = 0.970
Correction for duty cycle =10 log (1/x) = 0.13 dB

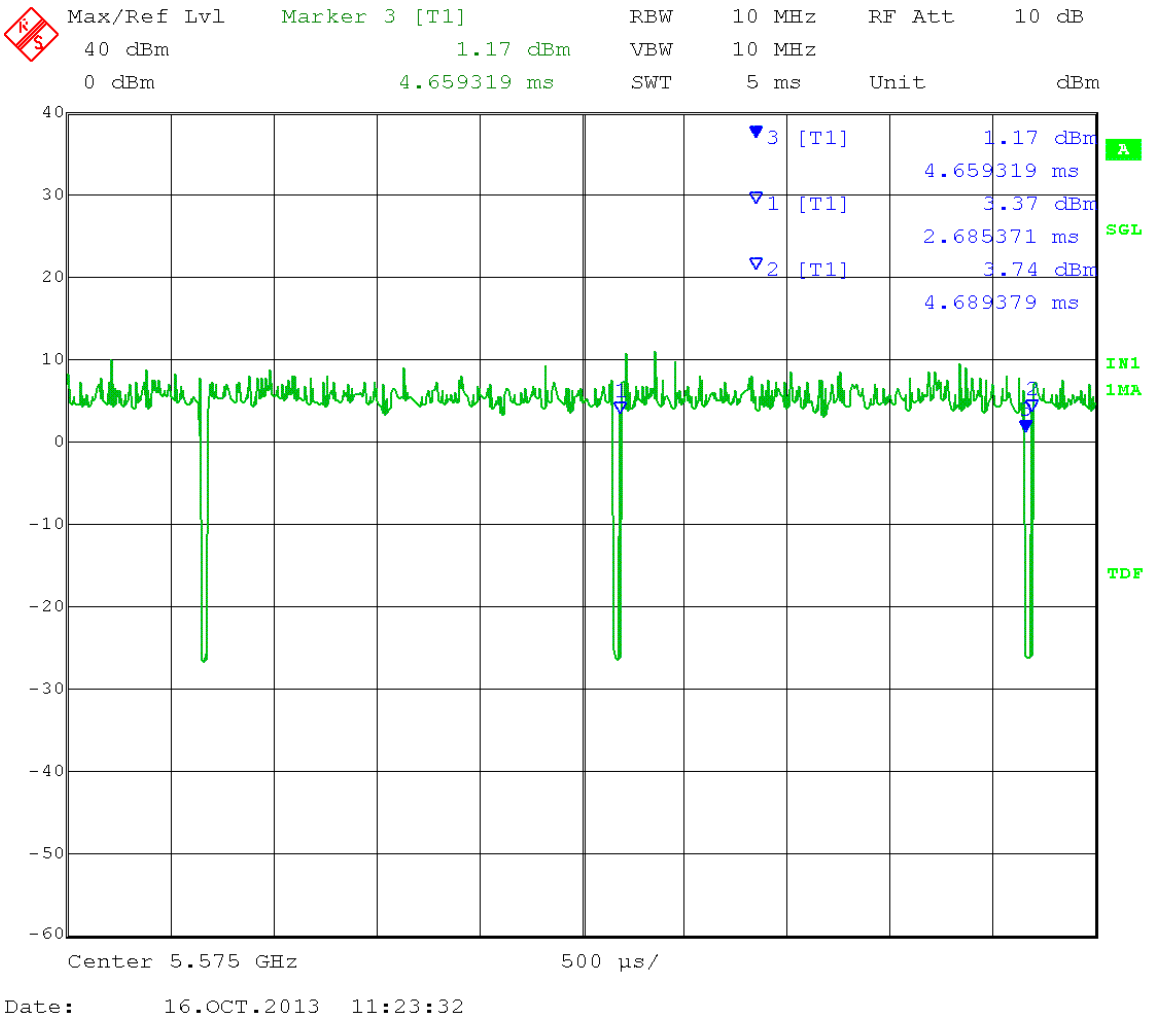
**Notes:** Measurements were taken for QPSK, 16QAM, 64QAM, 256QAM and 1024 QAM modulations at the lowest, middle, and highest channels of operation. EUT was set to transmit continuously.

Output power was set to 30 dBm eirp using special test software.

Test Date: 10-16-2013
Company: Ubiquiti Networks
EUT: Air Fiber 5 - 5.4GHz WiFi Radio
Test: Duty Cycle during testing
Operator: Lillian L
Test Procedure used: KDB 789033 D01 v01r03 – B)2)b) zero-span method

RBW = 10 MHz VBW = 10 MHz
Span = 0 Hz SWT = 5 ms
Mid Channel: Transmit = 5.575GHz 50MHz BW 16QAM
Total Cycle time = 4.689379-2.685371 = 2.004008
Total on Time = 4.659319- 2.685371 = 1.973948 ms

**Duty cycle factor x =** 1.973948 / 2.004008= 0.985
Adjustment for duty cycle =10log1/x = 0.07

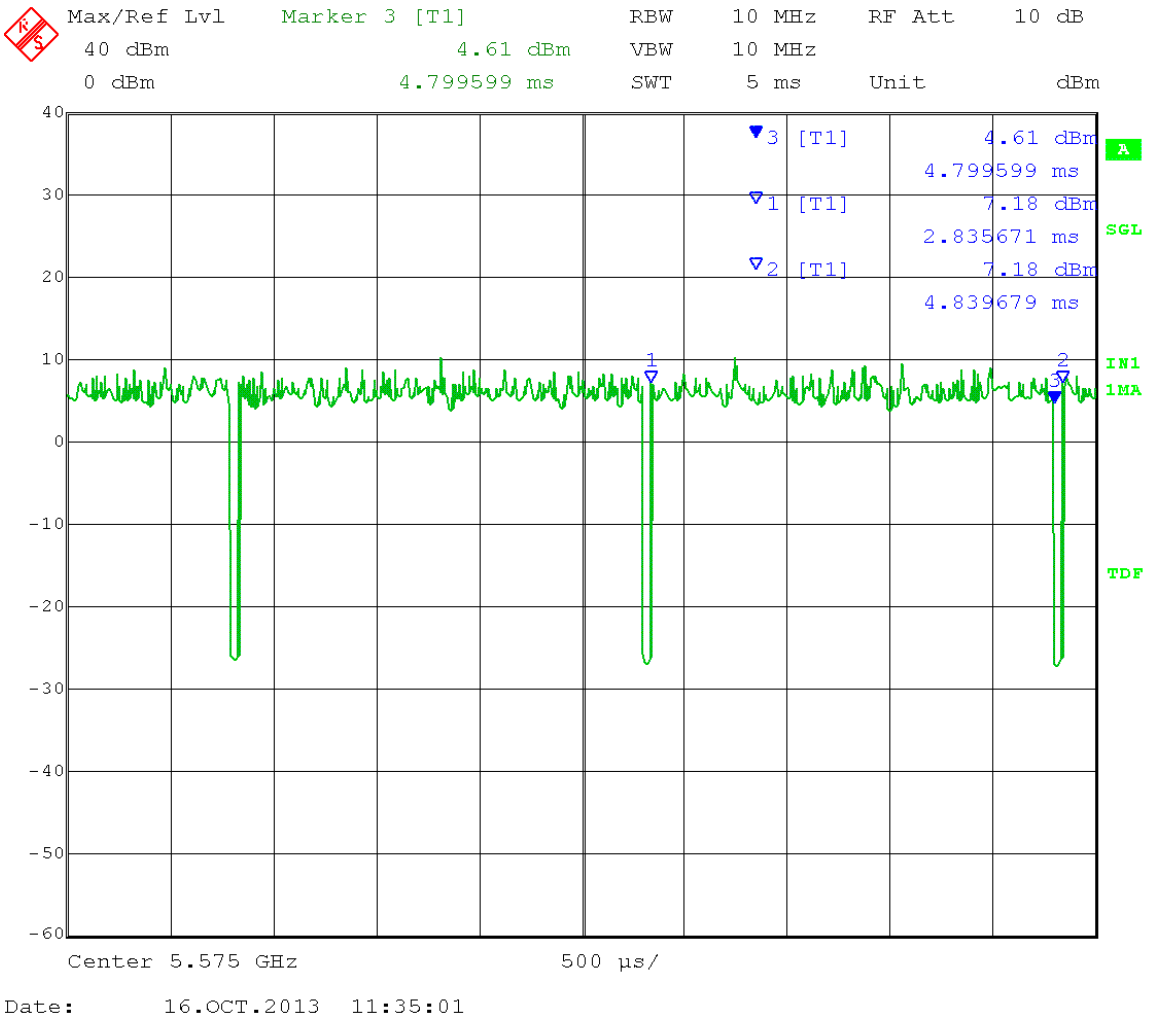



Date: 16.OCT.2013 11:23:32

Test Date: 10-16-2013
Company: Ubiquiti Networks
EUT: Air Fiber 5 - 5.4GHz WiFi Radio
Test: Duty Cycle during testing
Operator: Lillian L
Test Procedure used: KDB 789033 D01 v01r03 – B)2)b) zero-span method

RBW = 10 MHz VBW = 10 MHz
Span = 0 Hz SWT = 5 ms
Mid Channel: Transmit = 5.575GHz 50MHz BW 64QAM
Total Cycle time = 4.839679-2.835671 = 2.004008
Total on Time = 4.799599- 2.835671 = 1.963928 ms

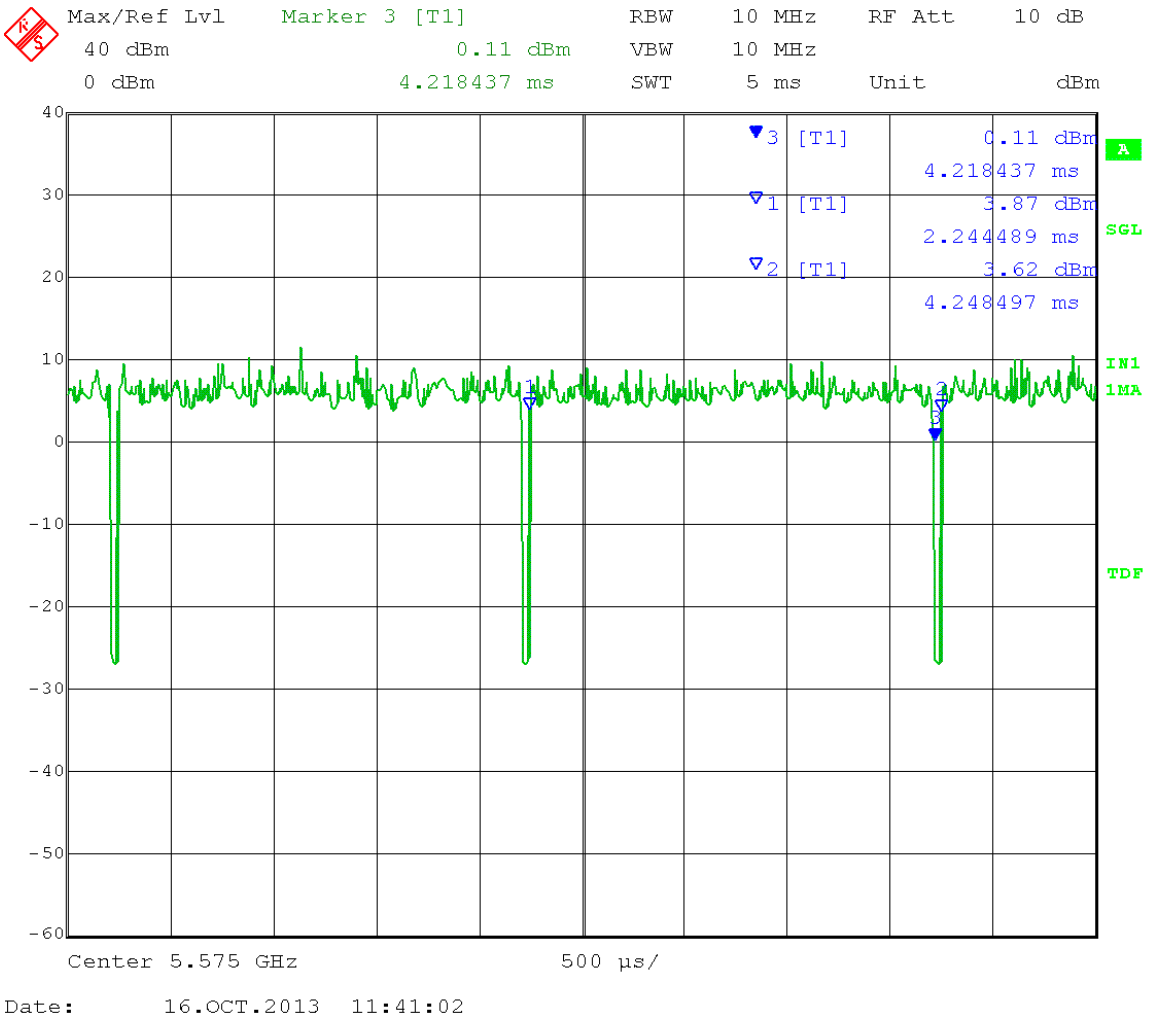
**Duty cycle factor x =** 1.963928 / 2.004008= 0.980
Adjustment for duty cycle =10log1/x = 0.07



Test Date: 10-16-2013
Company: Ubiquiti Networks
EUT: Air Fiber 5 - 5.4GHz WiFi Radio
Test: Duty Cycle during testing
Operator: Lillian L
Test Procedure used: KDB 789033 D01 v01r03 – B)2)b) zero-span method

RBW = 10 MHz VBW = 10 MHz
Span = 0 Hz SWT = 5 ms
Mid Channel: Transmit = 5.575GHz 50MHz BW 256QAM
Total Cycle time = 4.248497-2.244489 = 2.004008
Total on Time = 4.218437- 2.244489 = 1.993948 ms

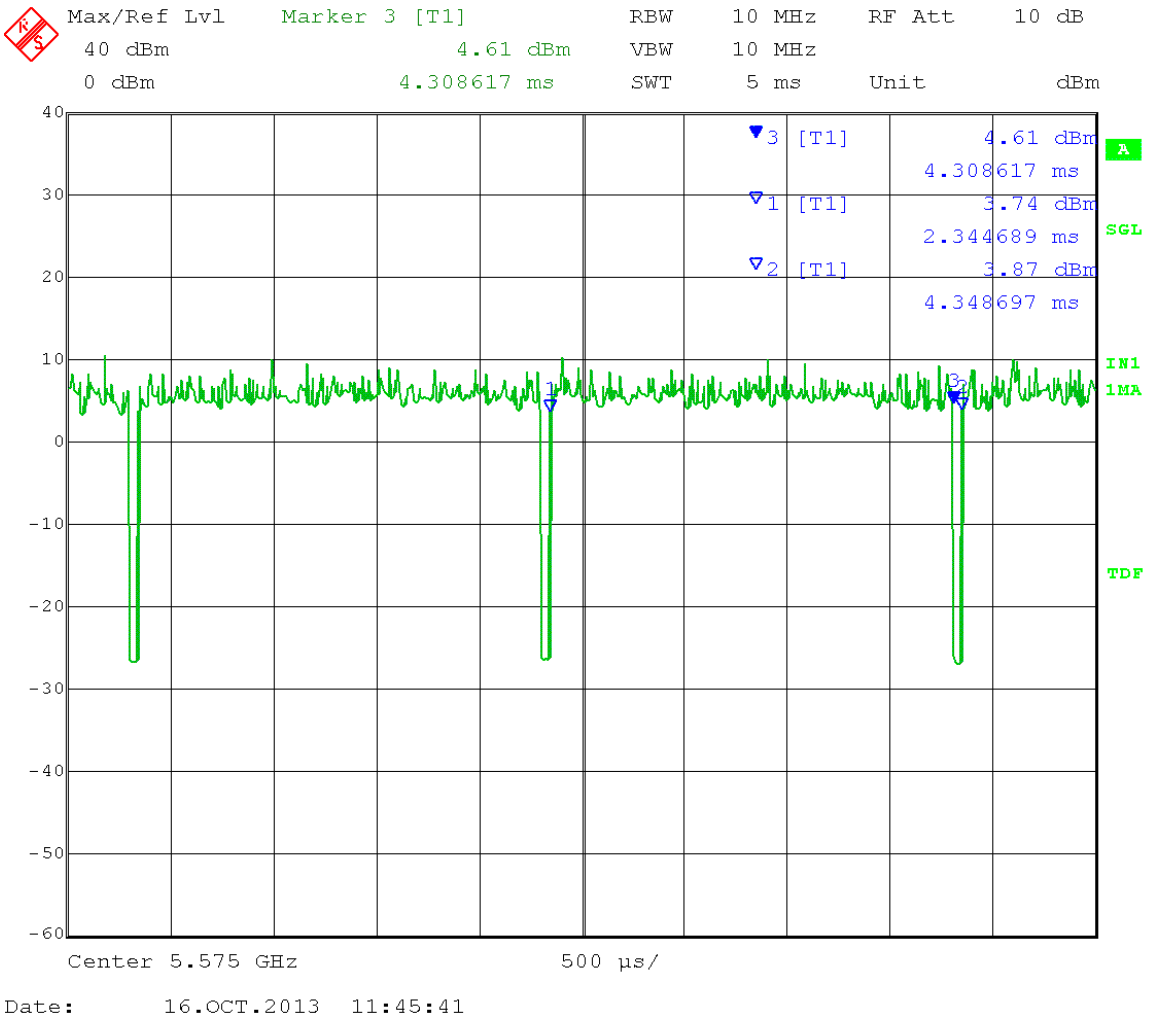
**Duty cycle factor x =** 1.963928 / 2.004008= 0.985
Adjustment for duty cycle =10log1/x = 0.07



Test Date: 10-16-2013
Company: Ubiquiti Networks
EUT: Air Fiber 5 - 5.4GHz WiFi Radio
Test: Duty Cycle during testing
Operator: Lillian L
Test Procedure used: KDB 789033 D01 v01r03 – B)2)b) zero-span method

RBW = 10 MHz VBW = 10 MHz
Span = 0 Hz SWT = 5 ms
Mid Channel: Transmit = 5.575GHz 50MHz BW 1024QAM
Total Cycle time = 4.348697-2.344689 = 2.004008
Total on Time = 4.308617- 2.344689 = 1.963928 ms

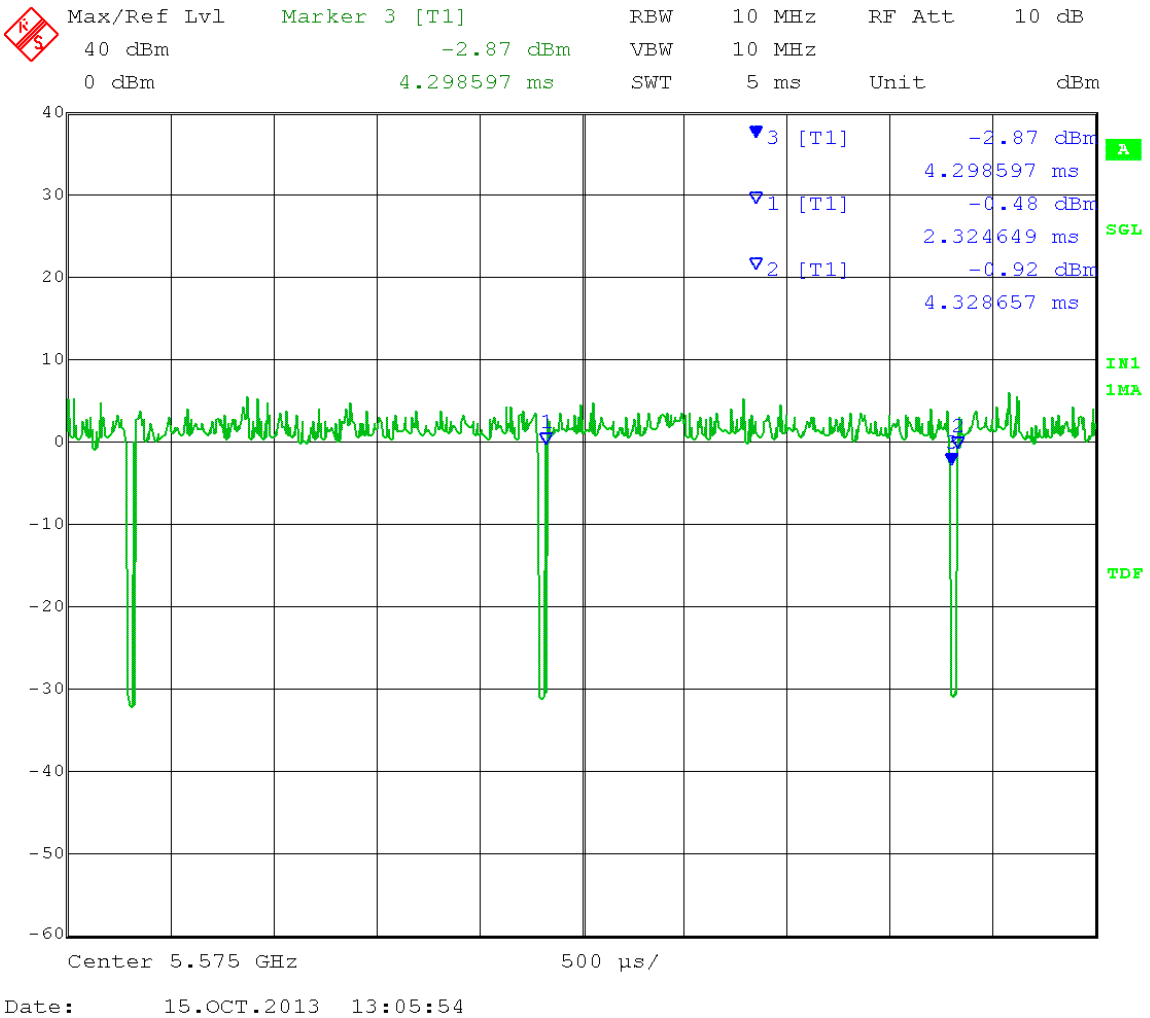
**Duty cycle factor x =** 1.963928 / 2.004008= 0.980
Adjustment for duty cycle =10log1/x = 0.07



Test Date: 10-15-2013
Company: Ubiquiti Networks
EUT: Air Fiber 5 - 5.4GHz WiFi Radio
Test: Duty Cycle during testing
Operator: Lillian L
Test Procedure used: KDB 789033 D01 v01r03 – B)2)b) zero-span method

RBW = 10 MHz VBW = 10 MHz
Span = 0 Hz SWT = 5 ms
Mid Channel: Transmit = 5.575GHz 50MHz BW QPSK
Total Cycle time = 4.328657-2.324649 = 2.004008
Total on Time = 4.298597- 2.324649 = 1.973948 ms

**Duty cycle factor x =** 1.973948 / 2.004008= 0.985
Adjustment for duty cycle =10log1/x = 0.07




Date: 15.OCT.2013 13:05:54

## Appendix – Measurement Data

### 2.0 Emission Bandwidth – 26 dB bandwidth – conducted

**Rule Section**: Informative

**Test Procedure**: FCC KDB 789033 D01 General UNII Test Procedures v01r03 – *Guidance for Compliance Testing of Unlicensed National Information Infrastructure (U-NII) Devices – Part 15, Subpart E*

Section C – Emission bandwidth

**Description**: RBW = approximately 1% of EBW
VBW > RBW
Detector = Peak
Trace mode = max hold

Measure the maximum width of the emission between the lower and upper frequencies that measure 26 dB below the maximum level of the in-band emission.

**Limit:** Informative

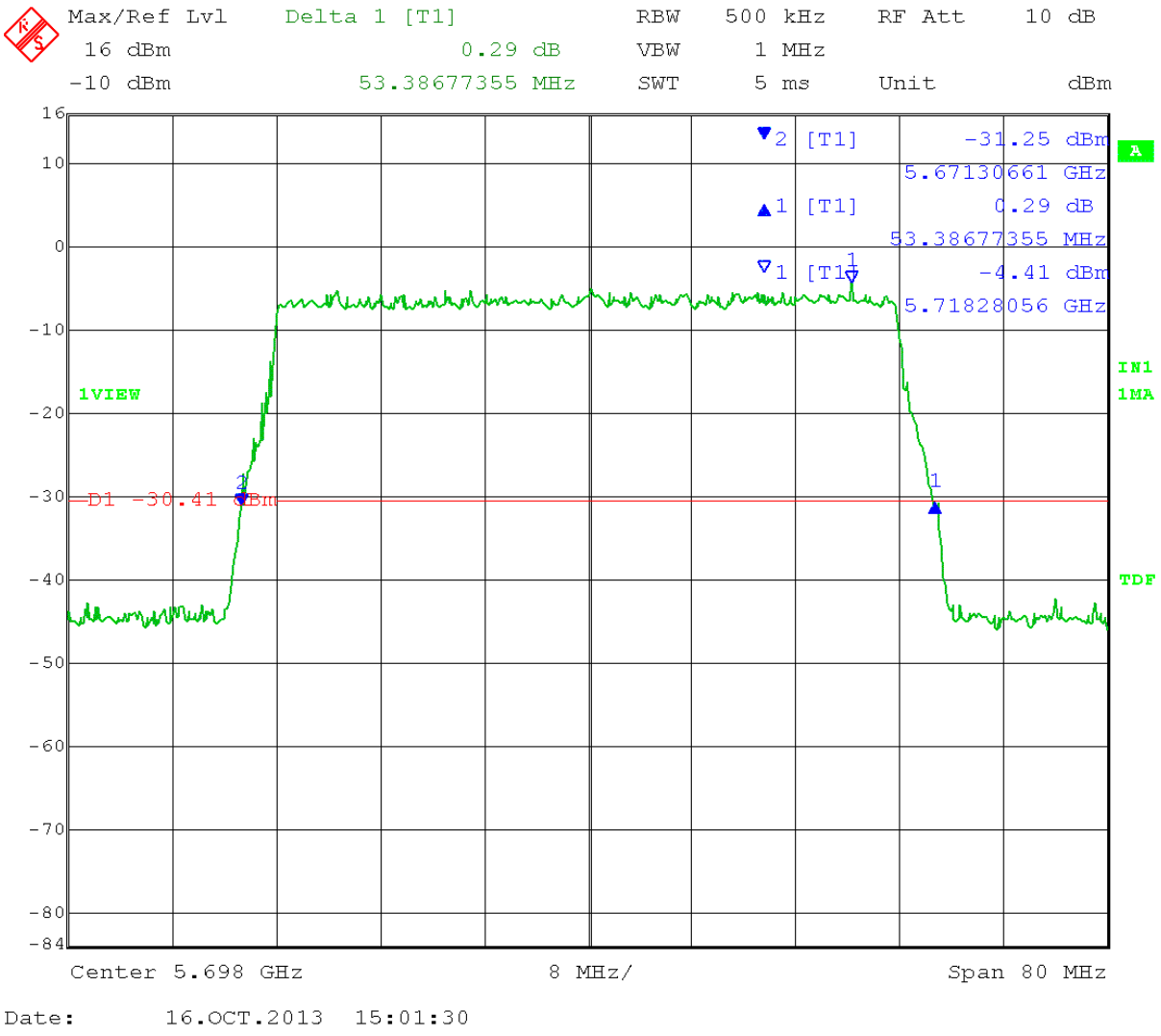
**Notes:** Measurements were taken for QPSK, 16QAM, 64QAM, 256QAM and 1024 QAM modulations at the lowest, middle, and highest channels of operation. EUT was set to transmit continuously.

Output power was set to 30 dBm eirp using special test software.

Test Date: 10-16-2013
Company: Ubiquiti Networks
EUT: Air Fiber 5 - 5.4GHz WiFi Radio
Test: Emission Bandwidth (26 dB) - Conducted
Operator: Lillian Li
Test Procedure used: KDB 789033 D01 v01r03 – C)
High Channel: Transmit = 5.698 GHz 50MHz BW 16QAM
Output power setting: 30 dBm eirp

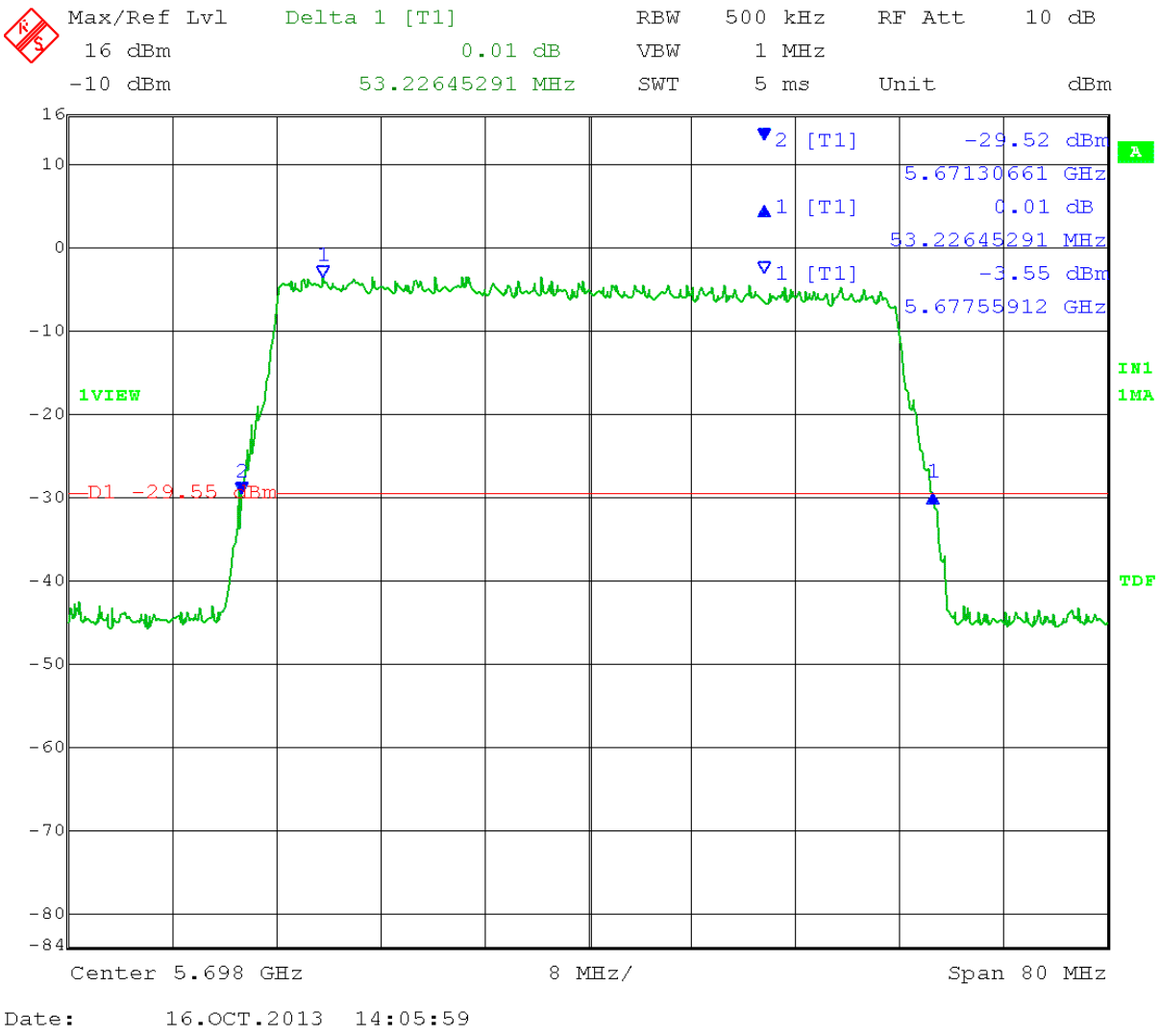
TX 0:

**26 dB Emission Bandwidth = 53.39MHz**



TX 1:

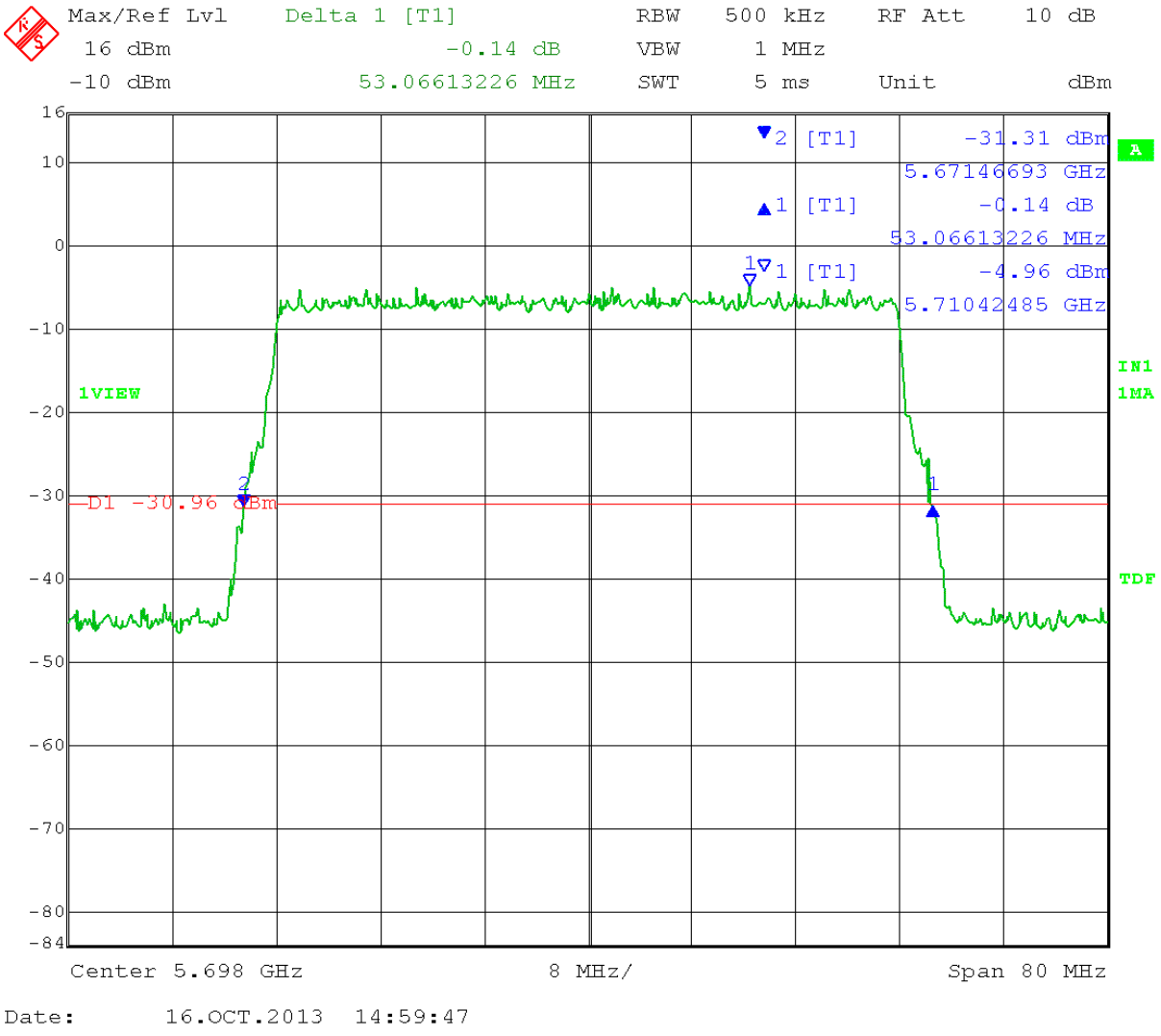
**26 dB Emission Bandwidth = 53.23MHz**



Test Date: 10-16-2013
Company: Ubiquiti Networks
EUT: Air Fiber 5 - 5.4GHz WiFi Radio
Test: Emission Bandwidth (26 dB) - Conducted
Operator: Lillian Li
Test Procedure used: KDB 789033 D01 v01r03 – C)
High Channel: Transmit = 5.698 GHz 50MHz BW 64QAM
Output power setting: 30 dBm eirp

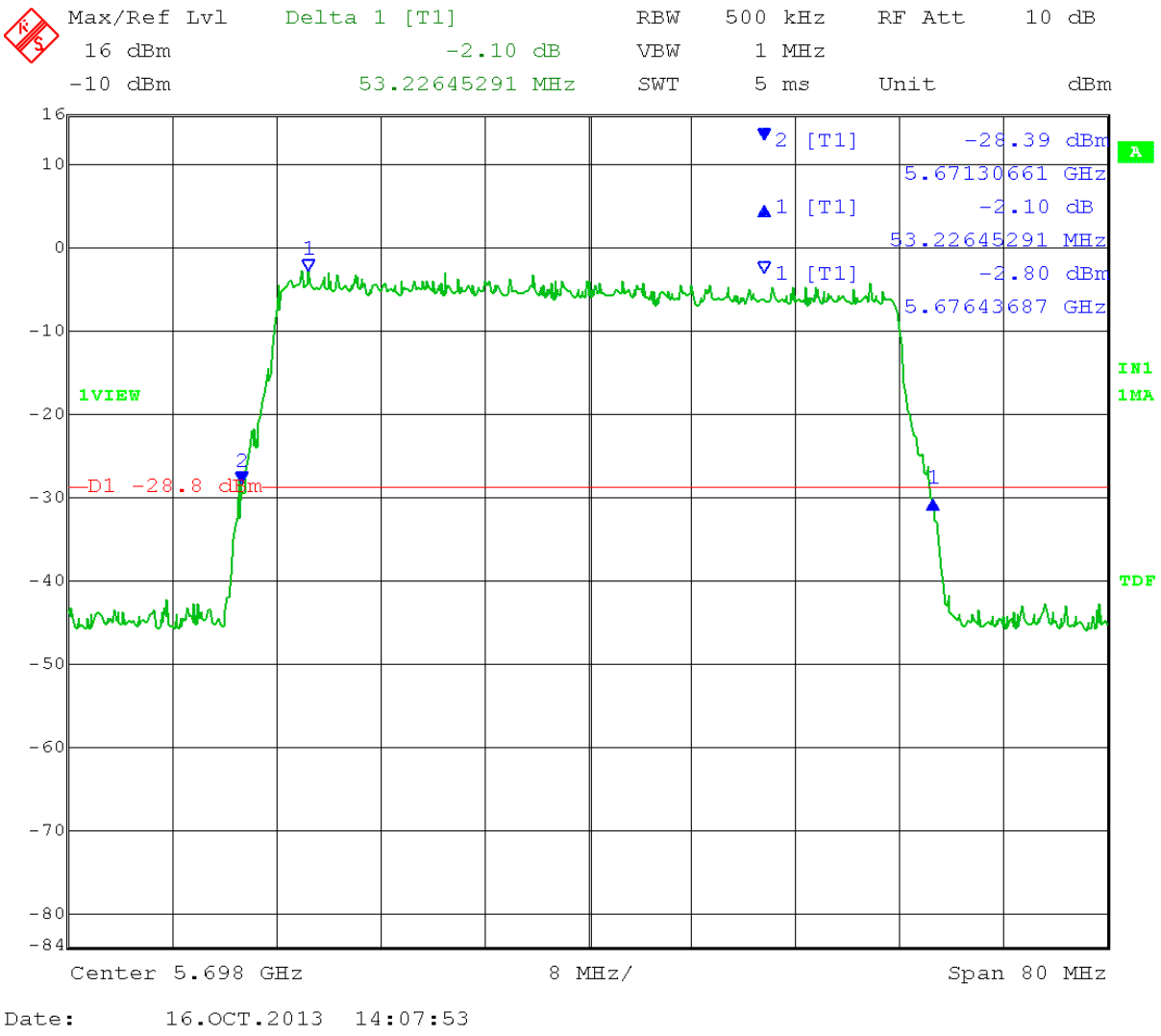
TX 0:

**26 dB Emission Bandwidth = 53.07MHz**



TX 1:

**26 dB Emission Bandwidth = 53.23MHz**

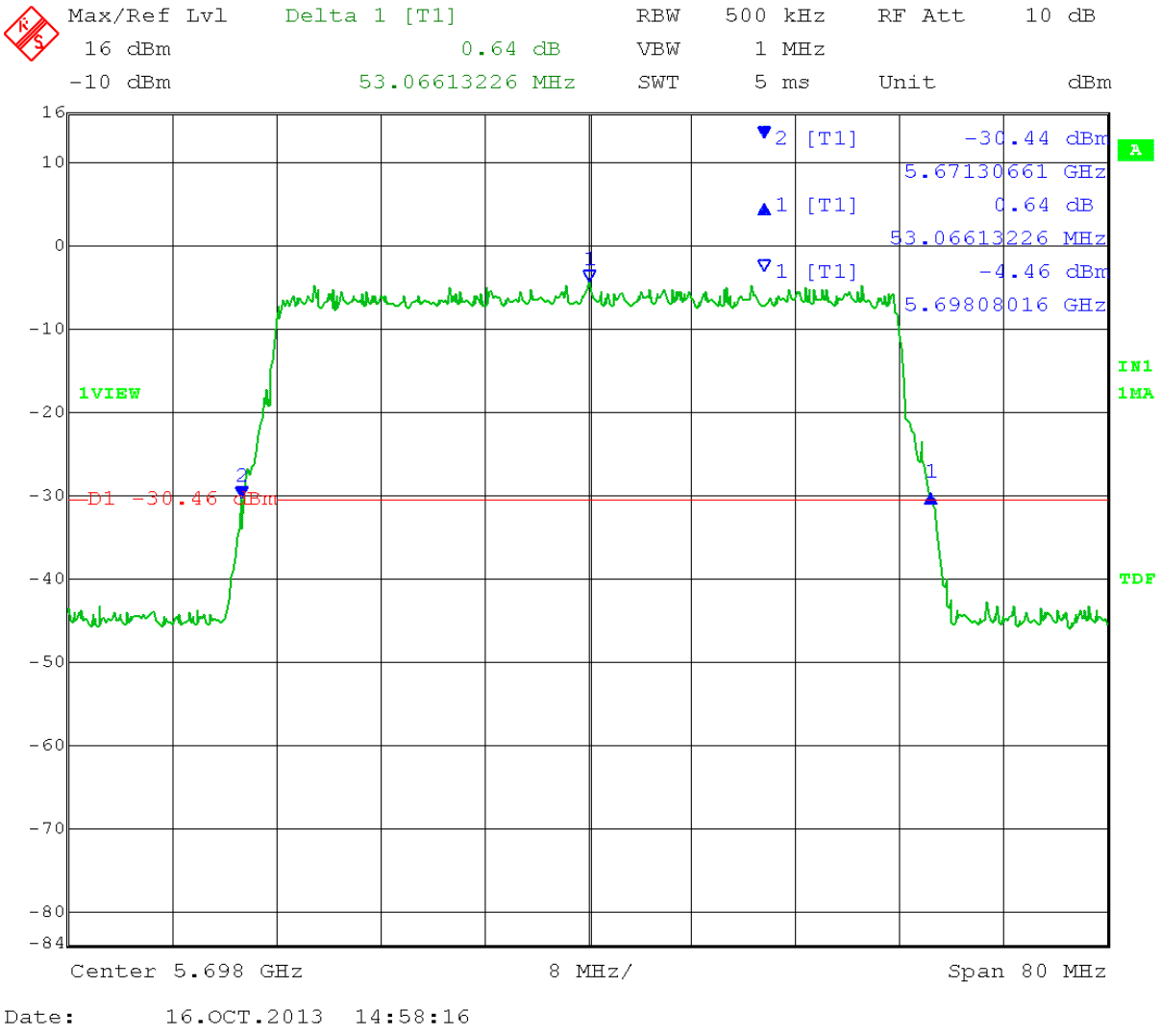



Date: 16.OCT.2013 14:07:53

Test Date: 10-16-2013
Company: Ubiquiti Networks
EUT: Air Fiber 5 - 5.4GHz WiFi Radio
Test: Emission Bandwidth (26 dB) - Conducted
Operator: Lillian Li
Test Procedure used: KDB 789033 D01 v01r03 – C)
High Channel: Transmit = 5.698 GHz 50MHz BW 256QAM
Output power setting: 30 dBm eirp

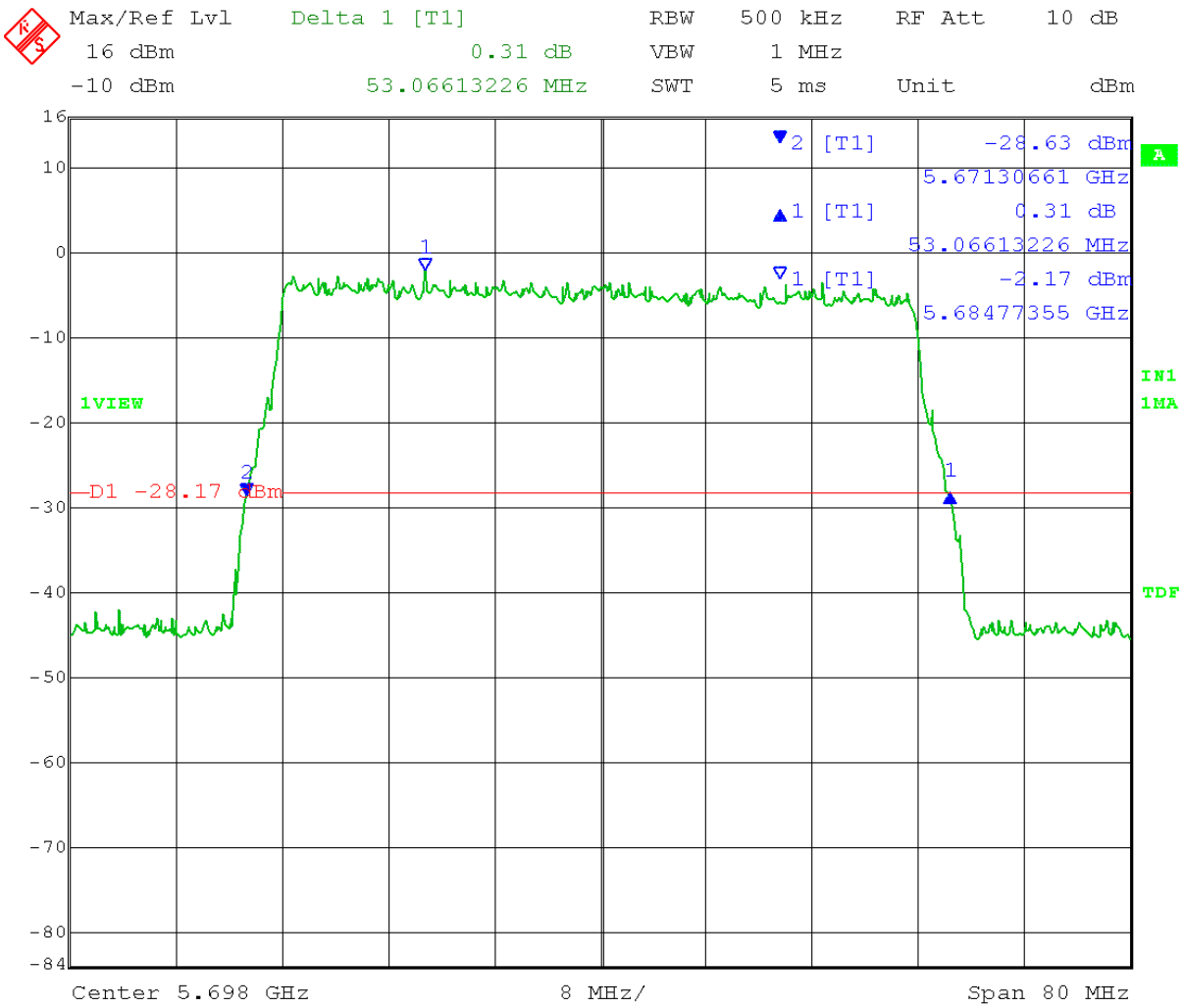
TX 0:

**26 dB Emission Bandwidth = 53.07MHz**



TX 1:

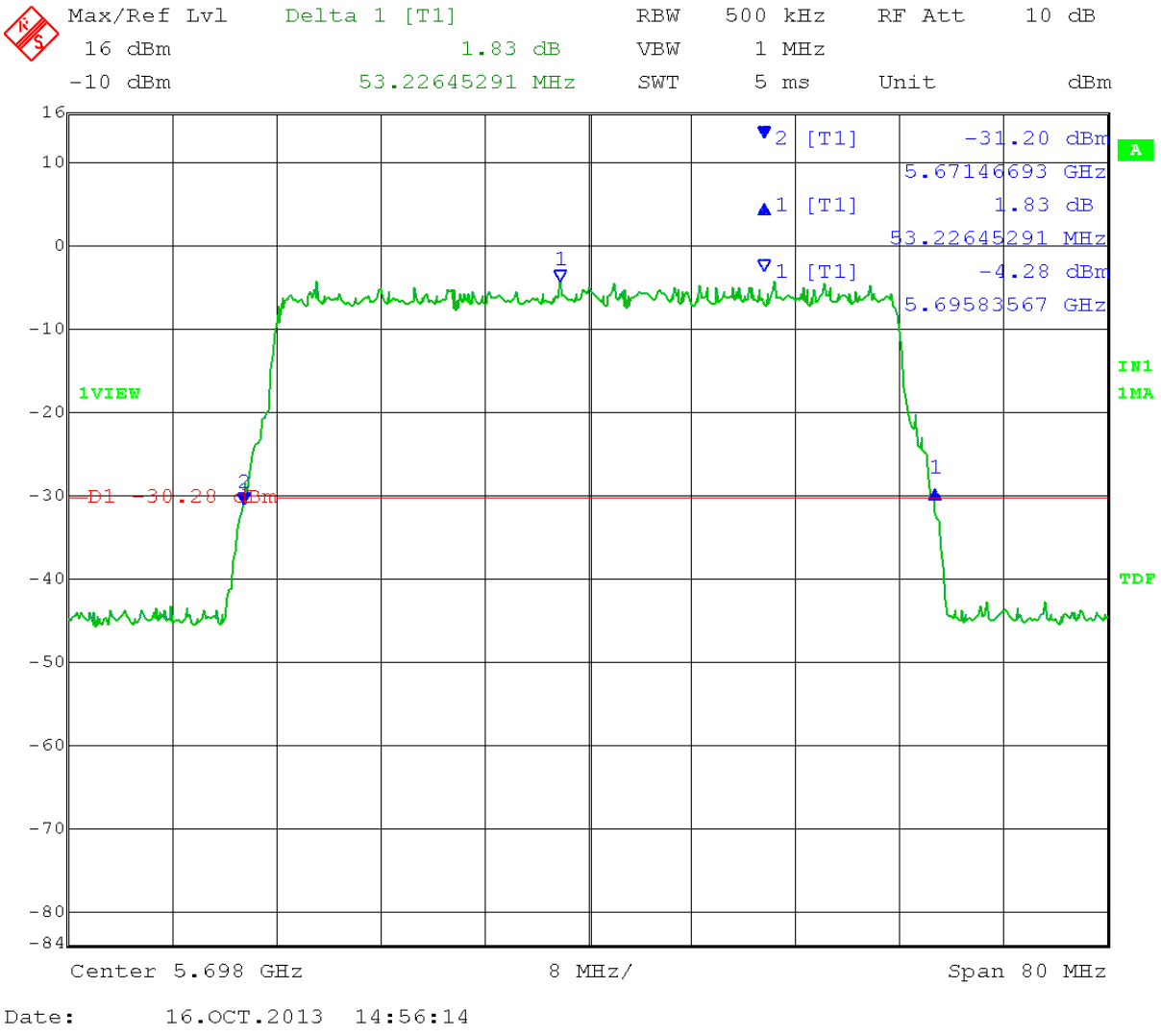
**26 dB Emission Bandwidth = 53.07MHz**



Test Date: 10-16-2013
Company: Ubiquiti Networks
EUT: Air Fiber 5 - 5.4GHz WiFi Radio
Test: Emission Bandwidth (26 dB) - Conducted
Operator: Lillian Li
Test Procedure used: KDB 789033 D01 v01r03 – C)
High Channel: Transmit = 5.698 GHz 50MHz BW 1024QAM
Output power setting: 30 dBm eirp

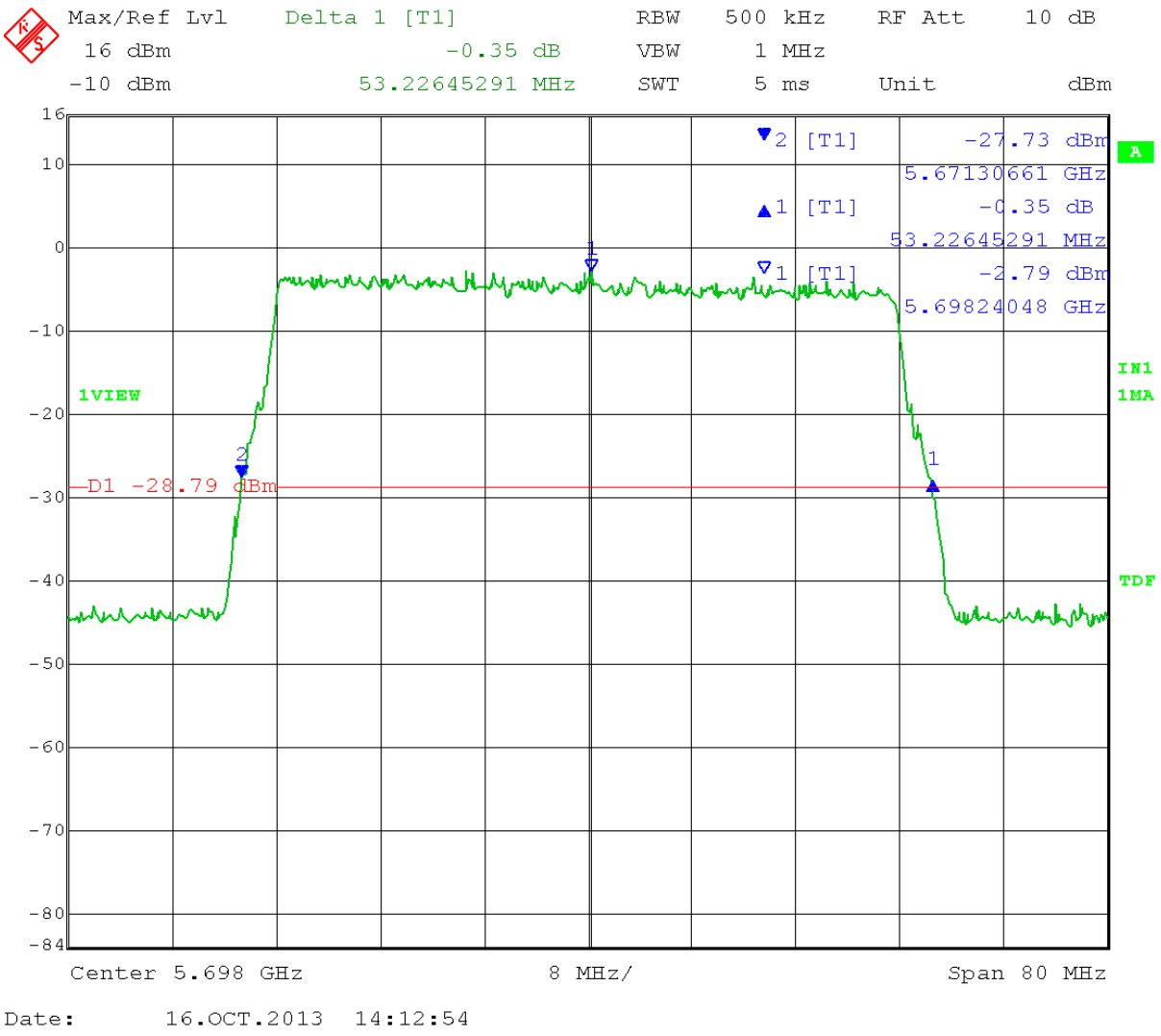
TX 0:

**26 dB Emission Bandwidth = 53.23MHz**



TX 1:

**26 dB Emission Bandwidth = 53.23MHz**

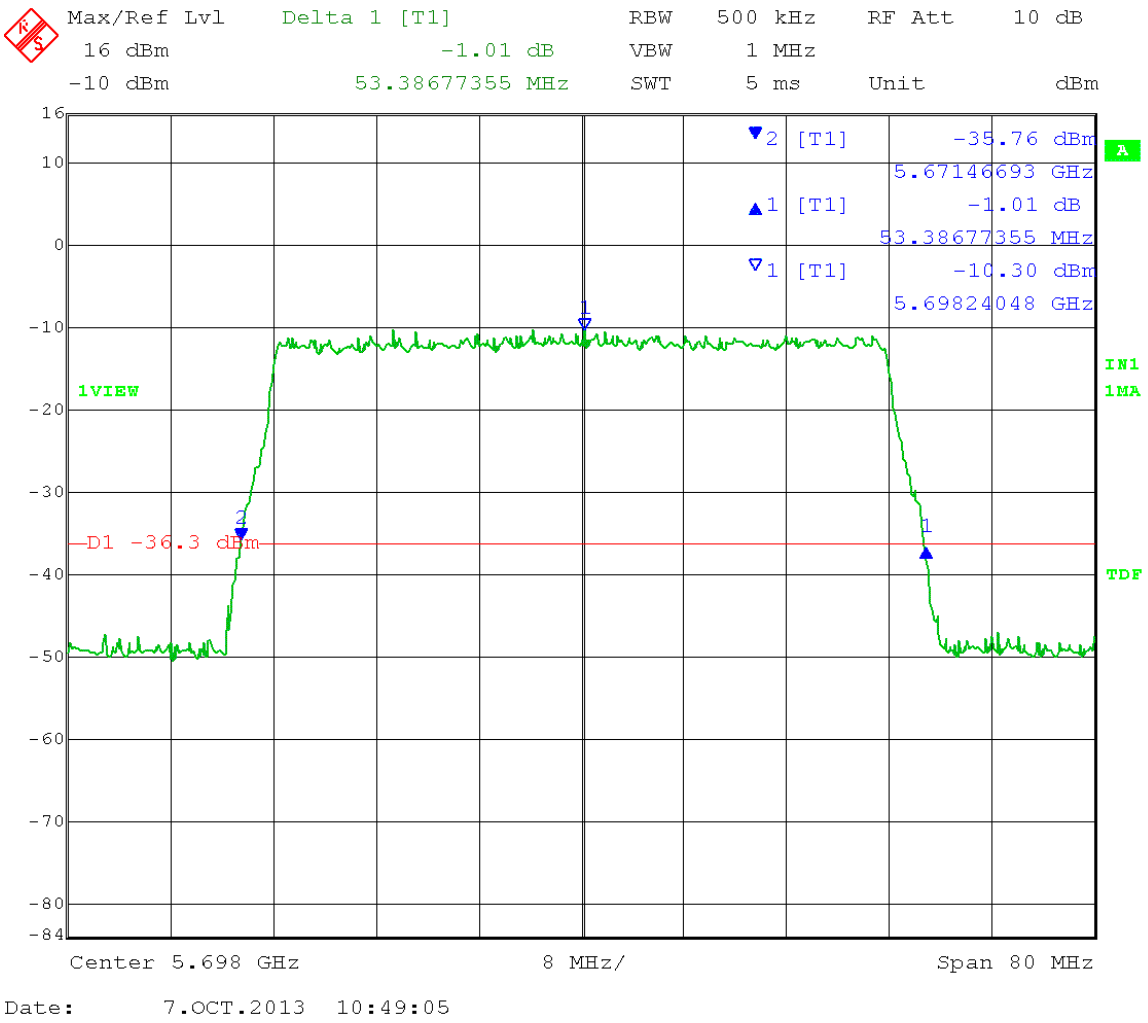



Date: 16.OCT.2013 14:12:54

Test Date: 10-4&7-2013
Company: Ubiquiti Networks
EUT: Air Fiber 5 - 5.4GHz WiFi Radio
Test: Emission Bandwidth (26 dB) - Conducted
Operator: Lillian Li
Test Procedure used: KDB 789033 D01 v01r03 – C)
High Channel: Transmit = 5.698 GHz 50MHz BW QPSK
Output power setting: 30 dBm eirp

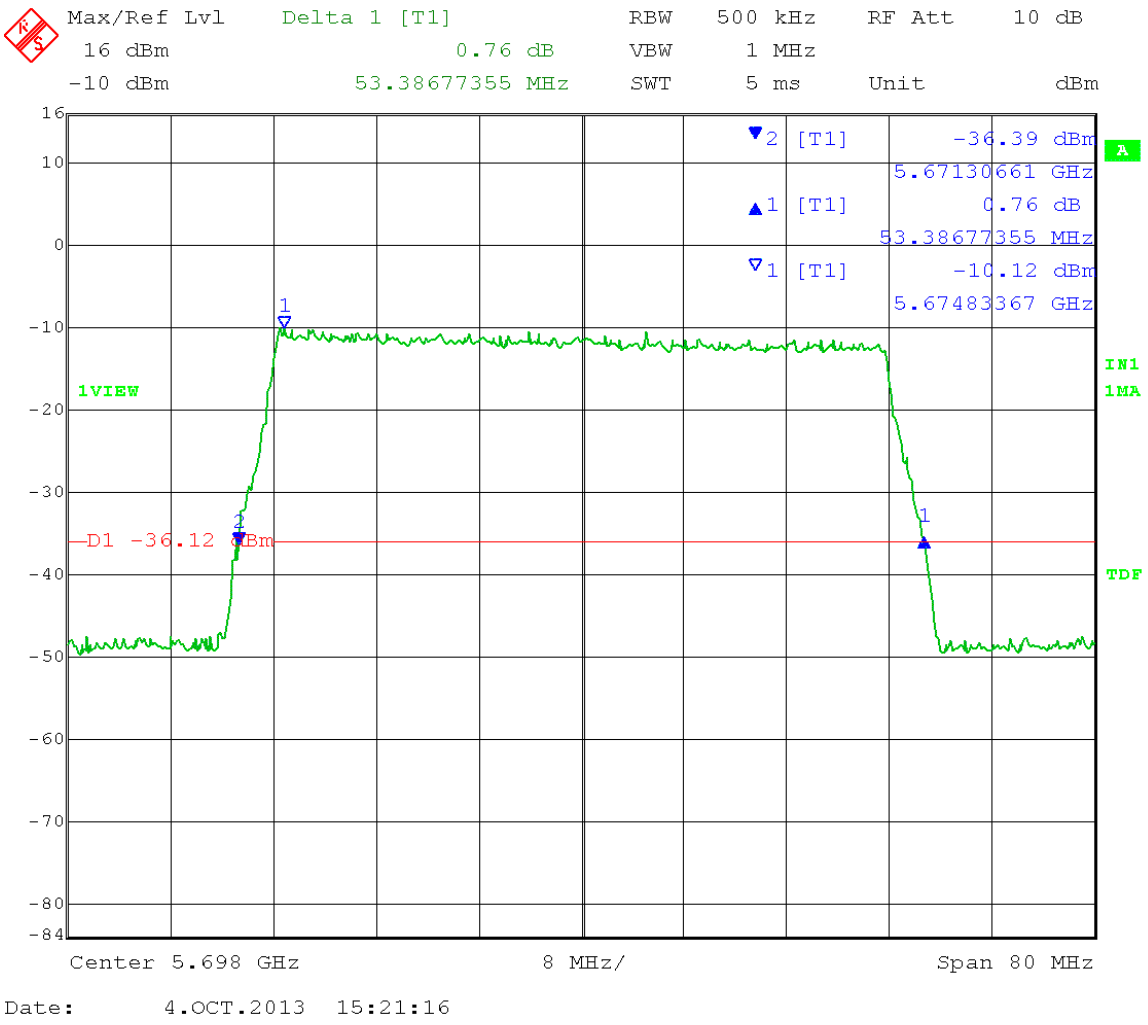
TX 0:

**26 dB Emission Bandwidth = 53.39MHz**



TX 1:

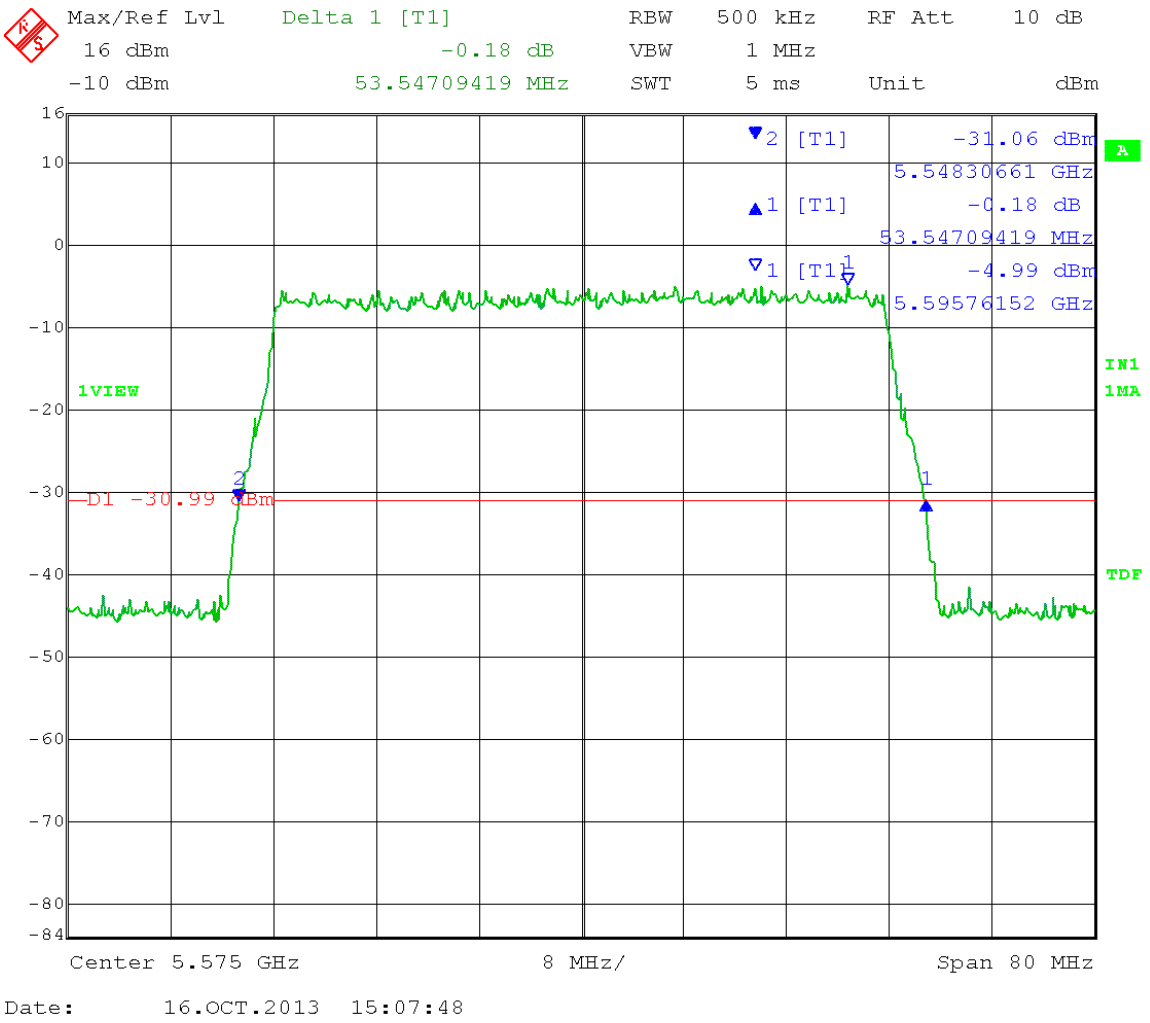
**26 dB Emission Bandwidth = 53.39MHz**



Test Date: 10-16-2013
Company: Ubiquiti Networks
EUT: Air Fiber 5 - 5.4GHz WiFi Radio
Test: Emission Bandwidth (26 dB) - Conducted
Operator: Lillian Li
Test Procedure used: KDB 789033 D01 v01r03 – C)
Mid Channel: Transmit = 5.575 GHz 50MHz BW 16QAM
Output power setting: 30 dBm eirp

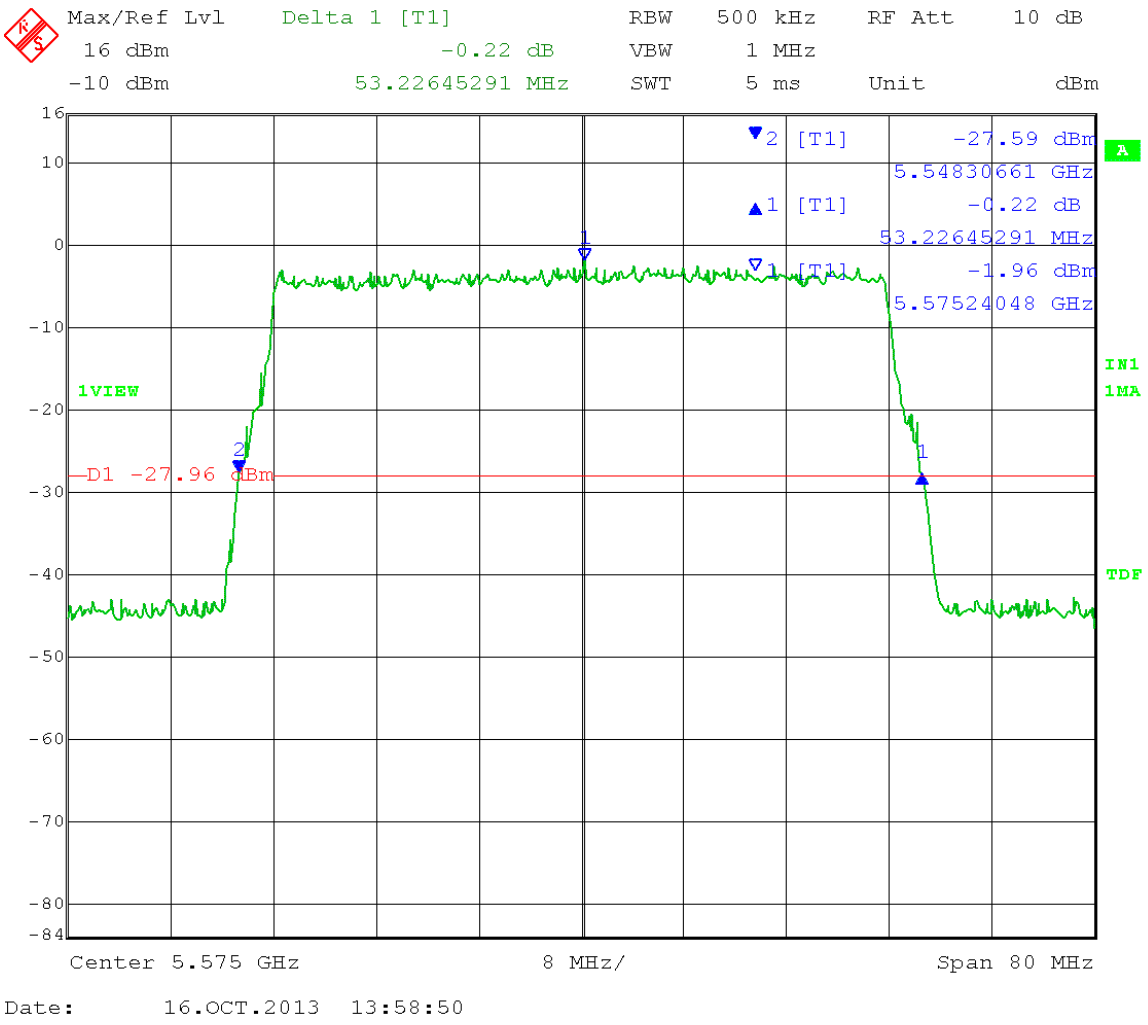
TX 0:

**26 dB Emission Bandwidth = 53.55MHz**



TX 1:

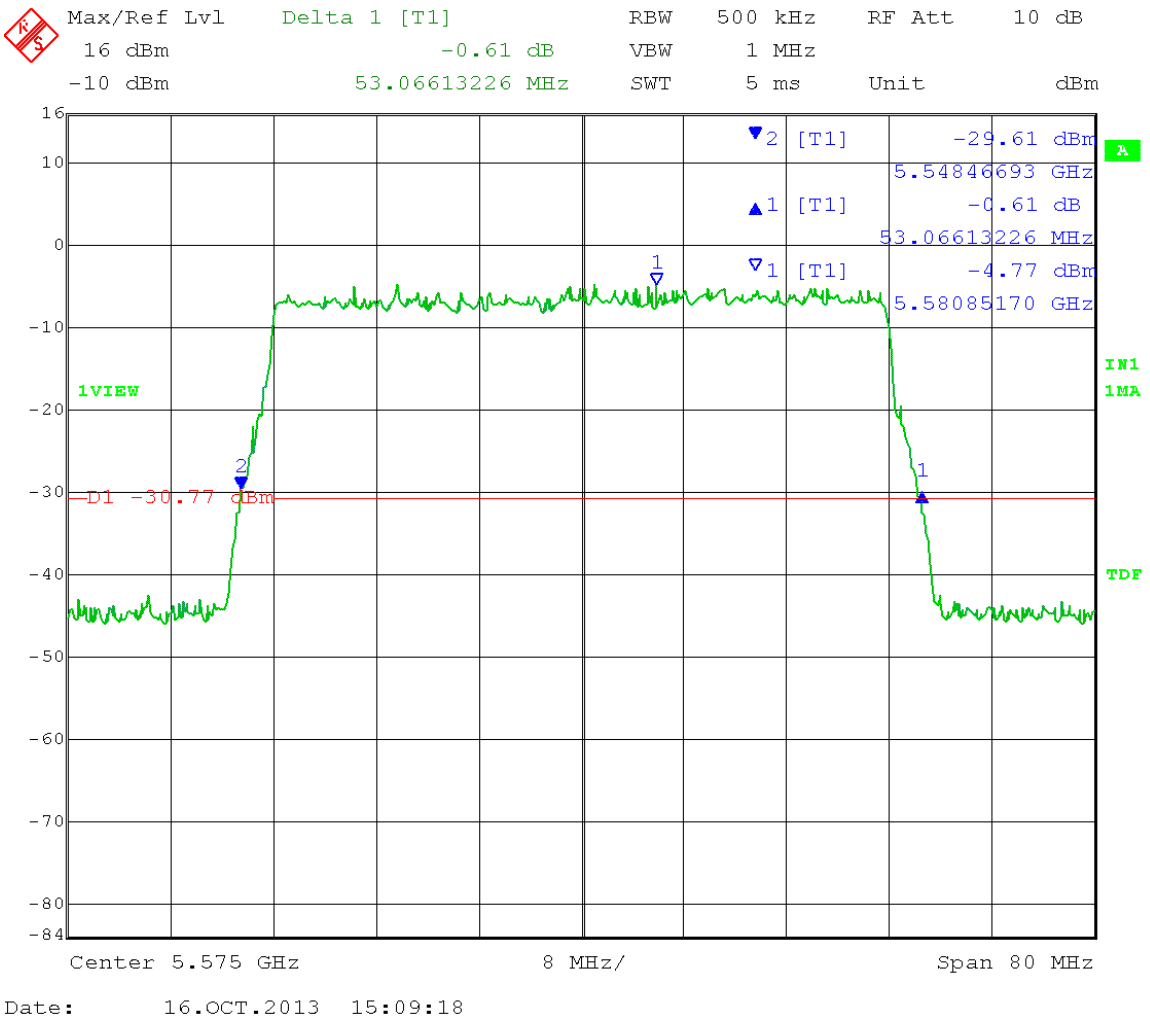
**26 dB Emission Bandwidth = 53.23MHz**



Test Date: 10-16-2013
Company: Ubiquiti Networks
EUT: Air Fiber 5 - 5.4GHz WiFi Radio
Test: Emission Bandwidth (26 dB) - Conducted
Operator: Lillian Li
Test Procedure used: KDB 789033 D01 v01r03 – C)
Mid Channel: Transmit = 5.575 GHz 50MHz BW 64QAM
Output power setting: 30 dBm eirp

TX 0:

**26 dB Emission Bandwidth = 53.07MHz**



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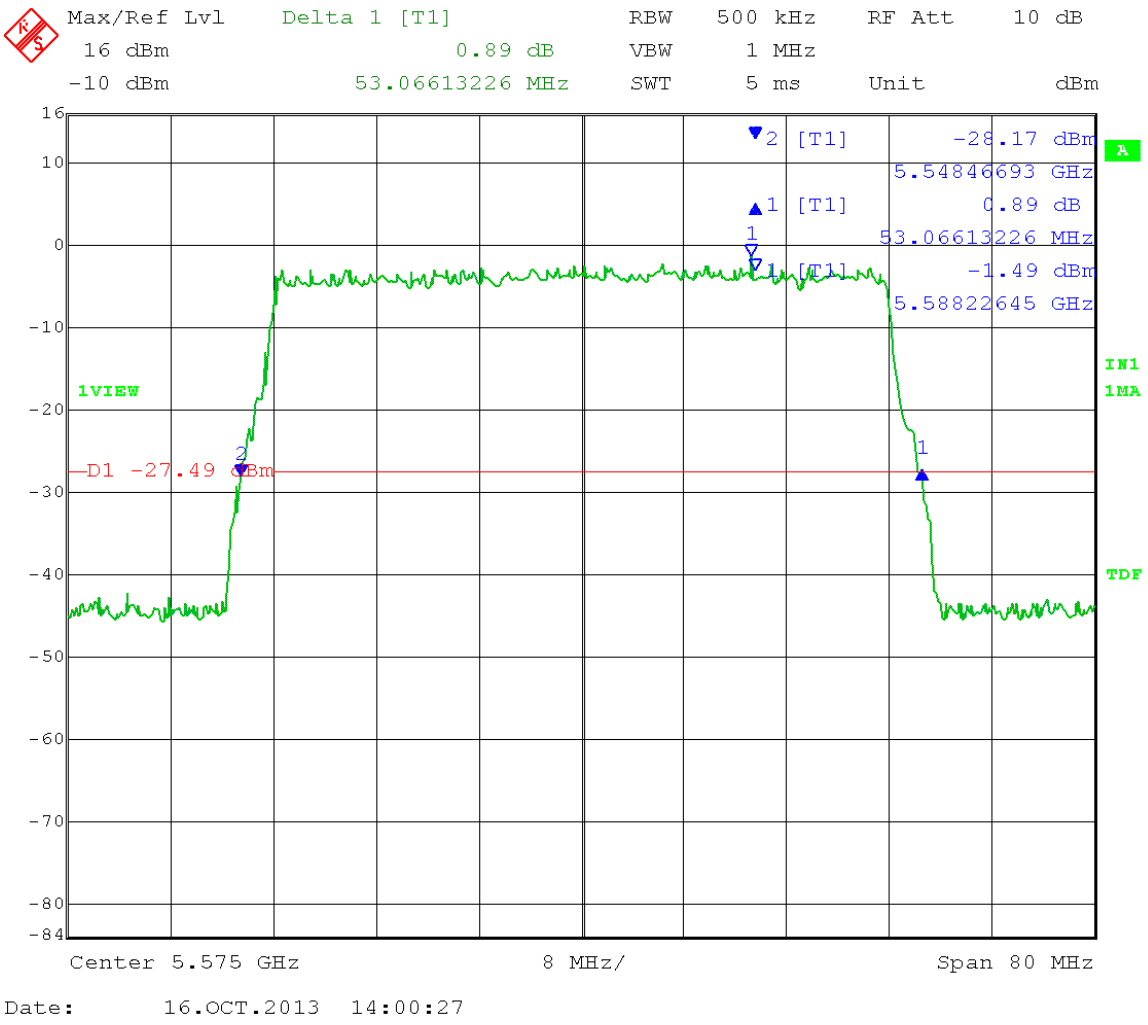
**26 dB Emission Bandwidth = 53.07MHz**

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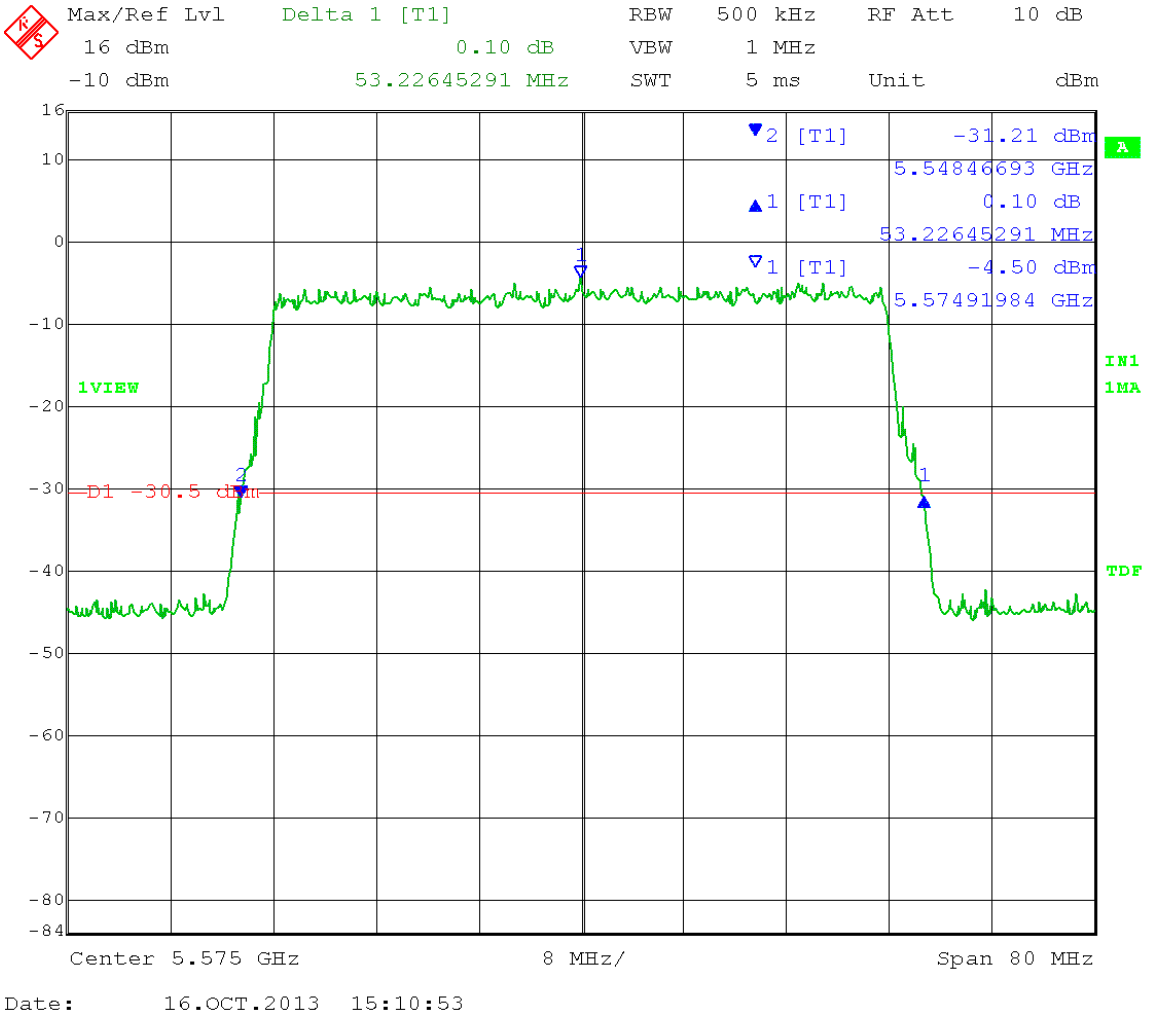
Test Date: 10-16-2013
Company: Ubiquiti Networks
EUT: Air Fiber 5 - 5.4GHz WiFi Radio
Test: Emission Bandwidth (26 dB) - Conducted
Operator: Lillian Li
Test Procedure used: KDB 789033 D01 v01r03 – C)
Mid Channel: Transmit = 5.575 GHz 50MHz BW 256QAM
Output power setting: 30 dBm eirp

TX 0:

**26 dB Emission Bandwidth = 53.23MHz**



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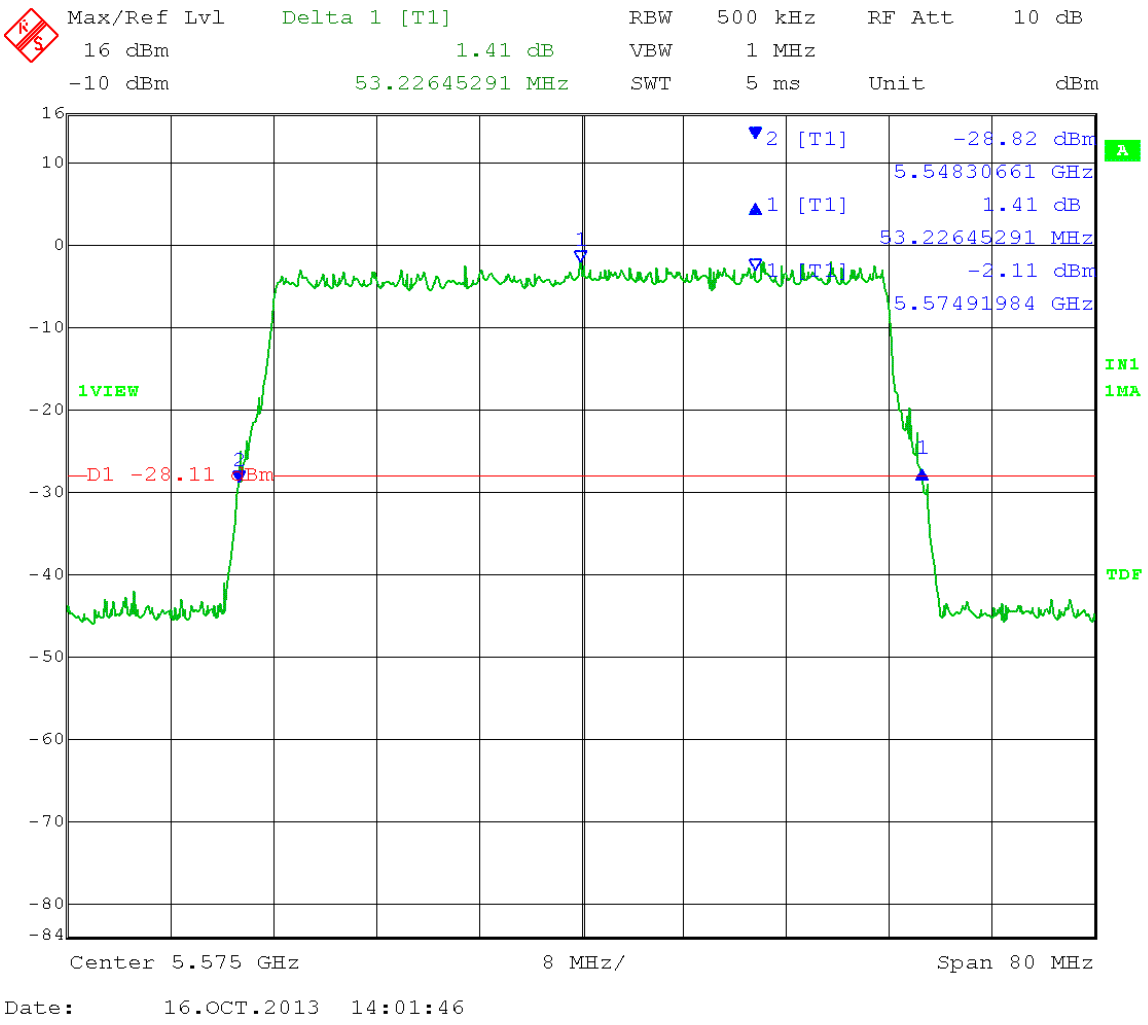
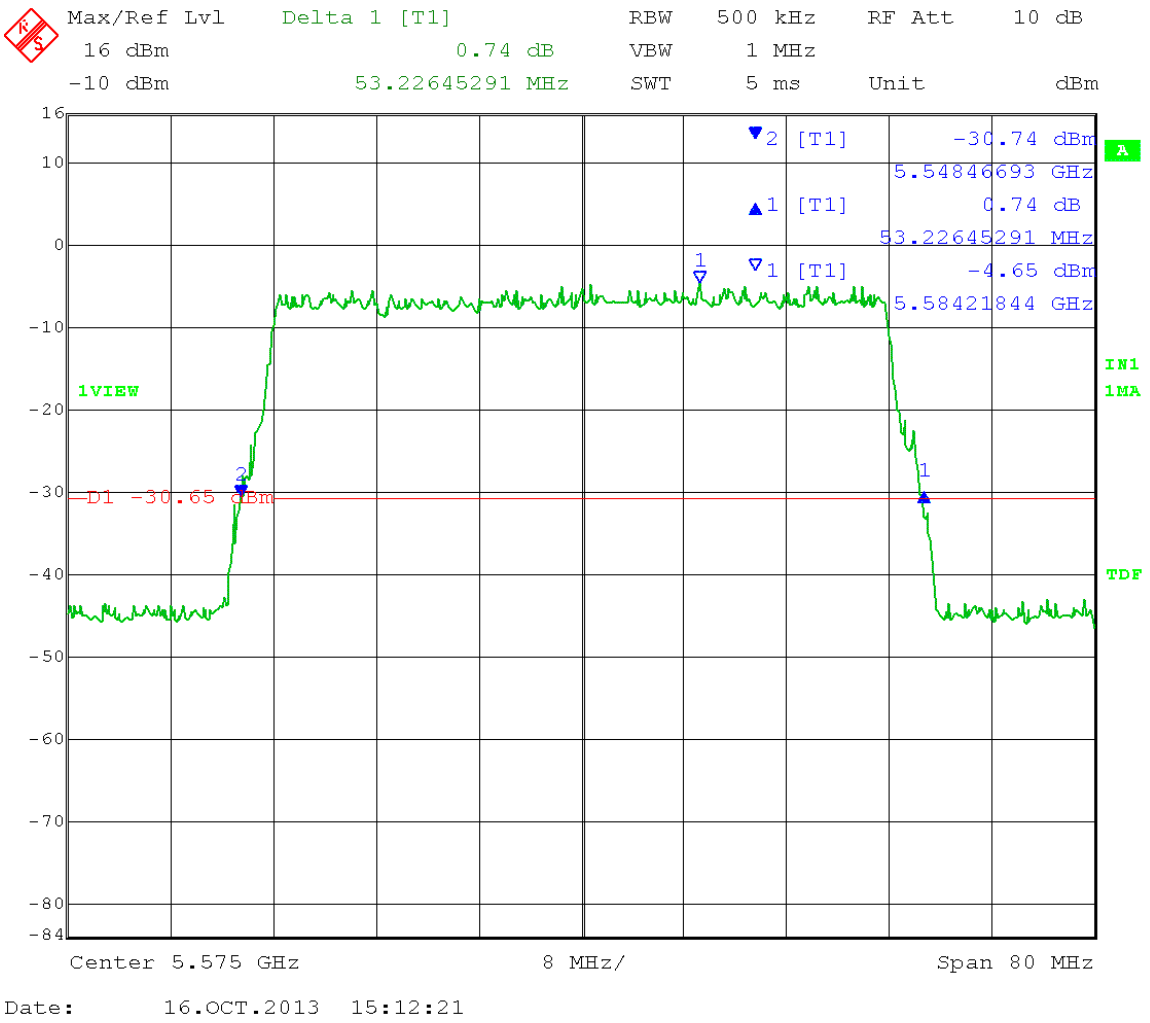
**26 dB Emission Bandwidth = 53.23MHz**



Test Date: 10-16-2013
Company: Ubiquiti Networks
EUT: Air Fiber 5 - 5.4GHz WiFi Radio
Test: Emission Bandwidth (26 dB) - Conducted
Operator: Lillian Li
Test Procedure used: KDB 789033 D01 v01r03 – C)
Mid Channel: Transmit = 5.575 GHz 50MHz BW 1024QAM
Output power setting: 30 dBm eirp

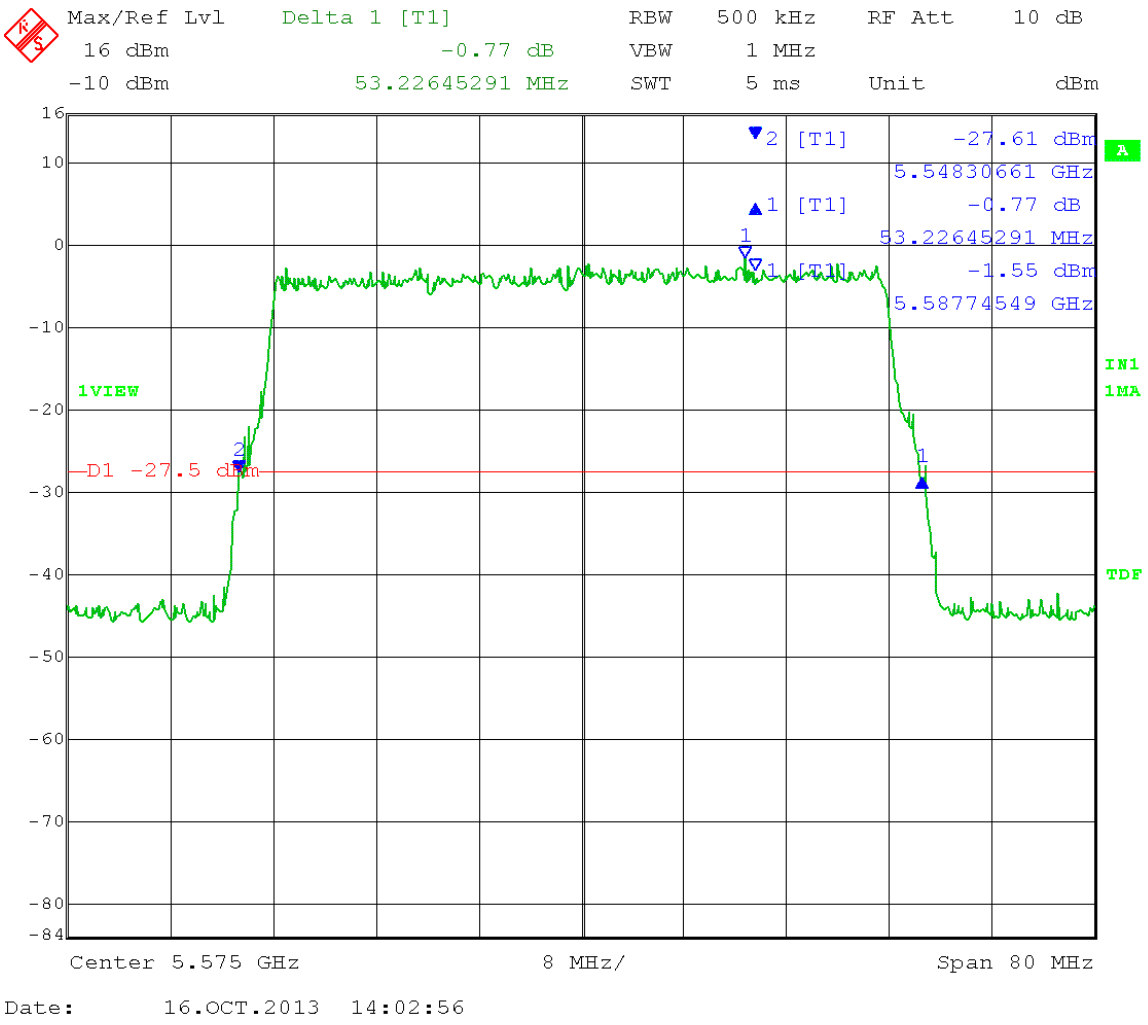
TX 0:

**26 dB Emission Bandwidth = 53.23MHz**



TX 1:

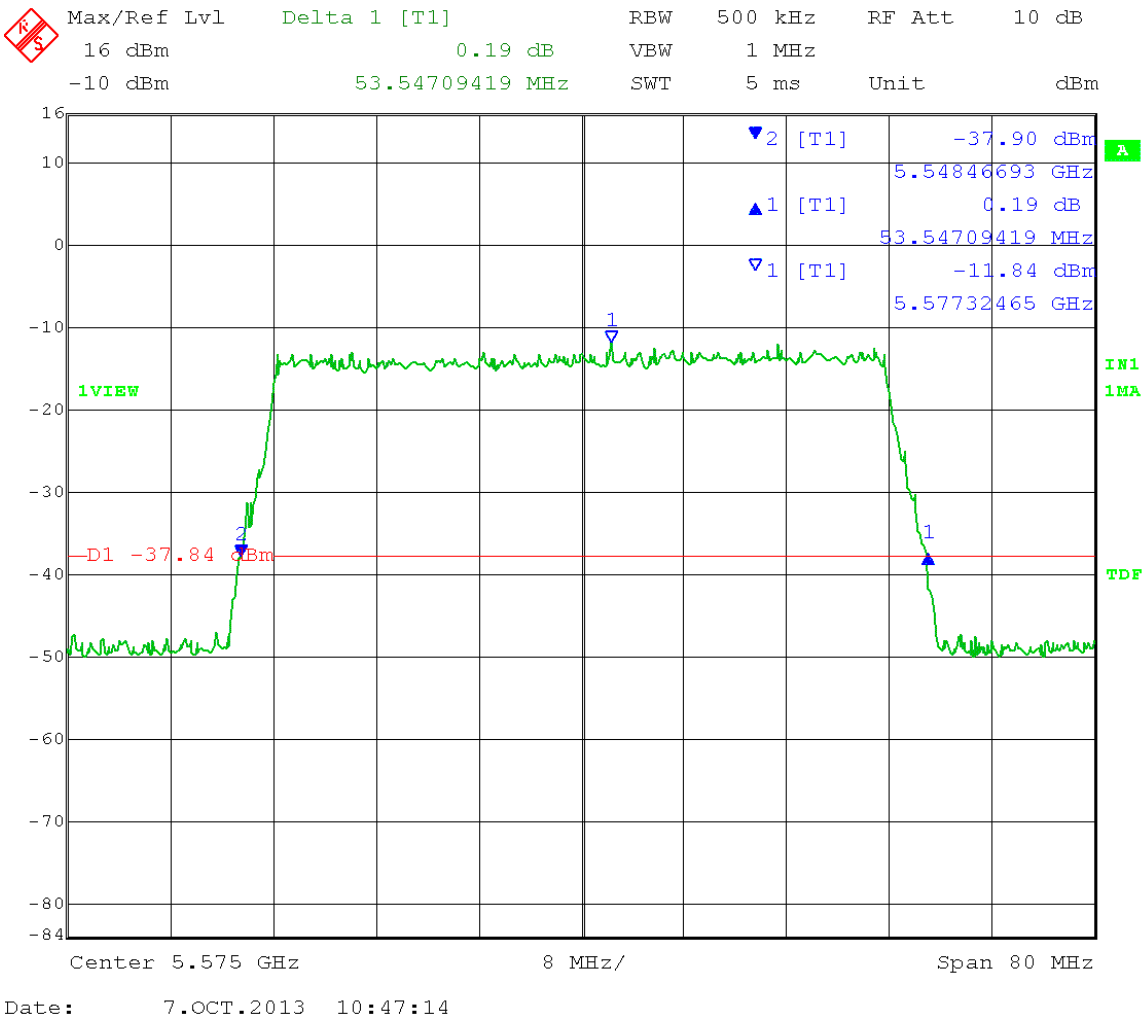
**26 dB Emission Bandwidth = 53.23MHz**



Test Date: 10-4&7-2013
Company: Ubiquiti Networks
EUT: Air Fiber 5 - 5.4GHz WiFi Radio
Test: Emission Bandwidth (26 dB) - Conducted
Operator: Lillian Li
Test Procedure used: KDB 789033 D01 v01r03 – C)
Mid Channel: Transmit = 5.575 GHz 50MHz BW QPSK
Output power setting: 30 dBm eirp

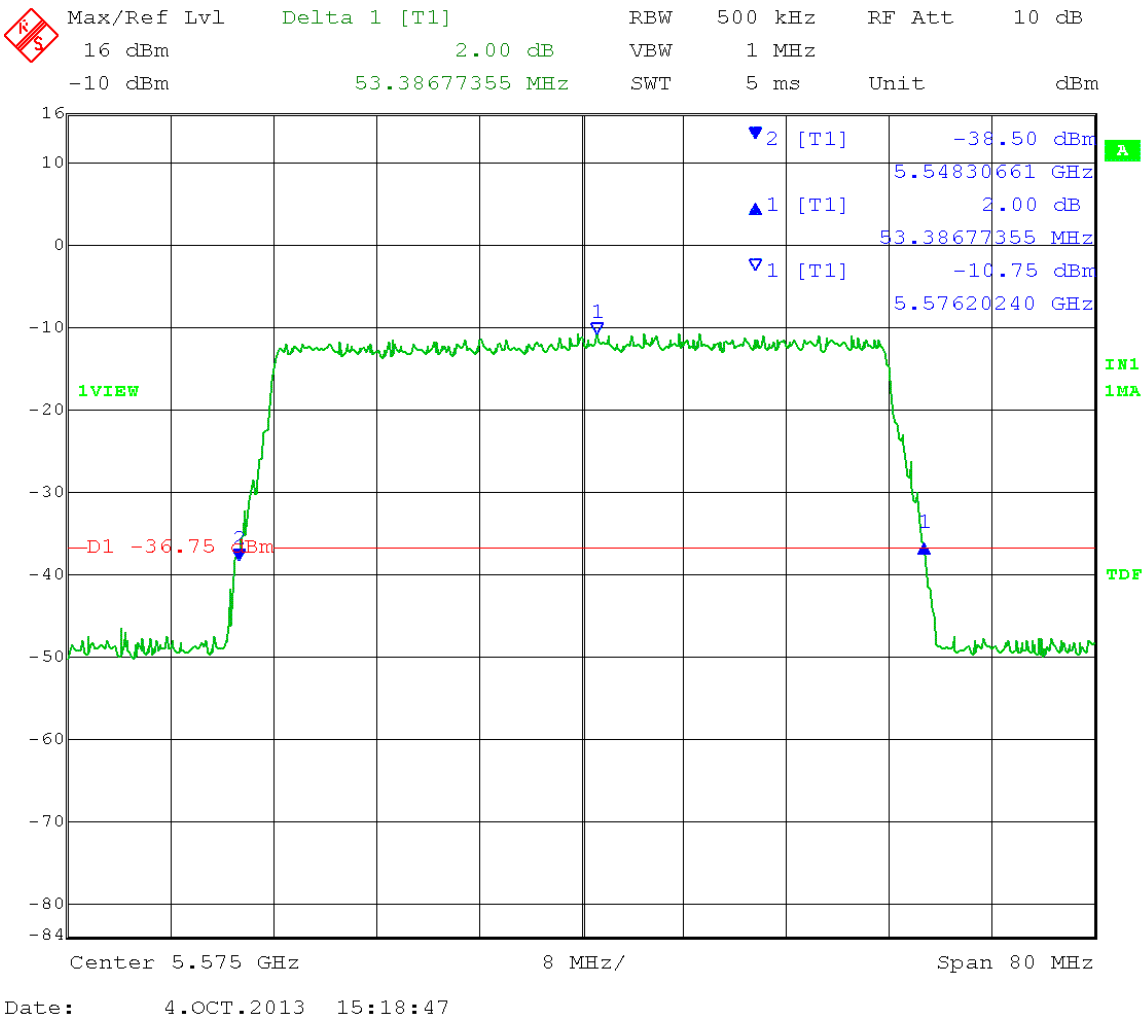
TX 0:

**26 dB Emission Bandwidth = 53.55MHz**



TX 1:

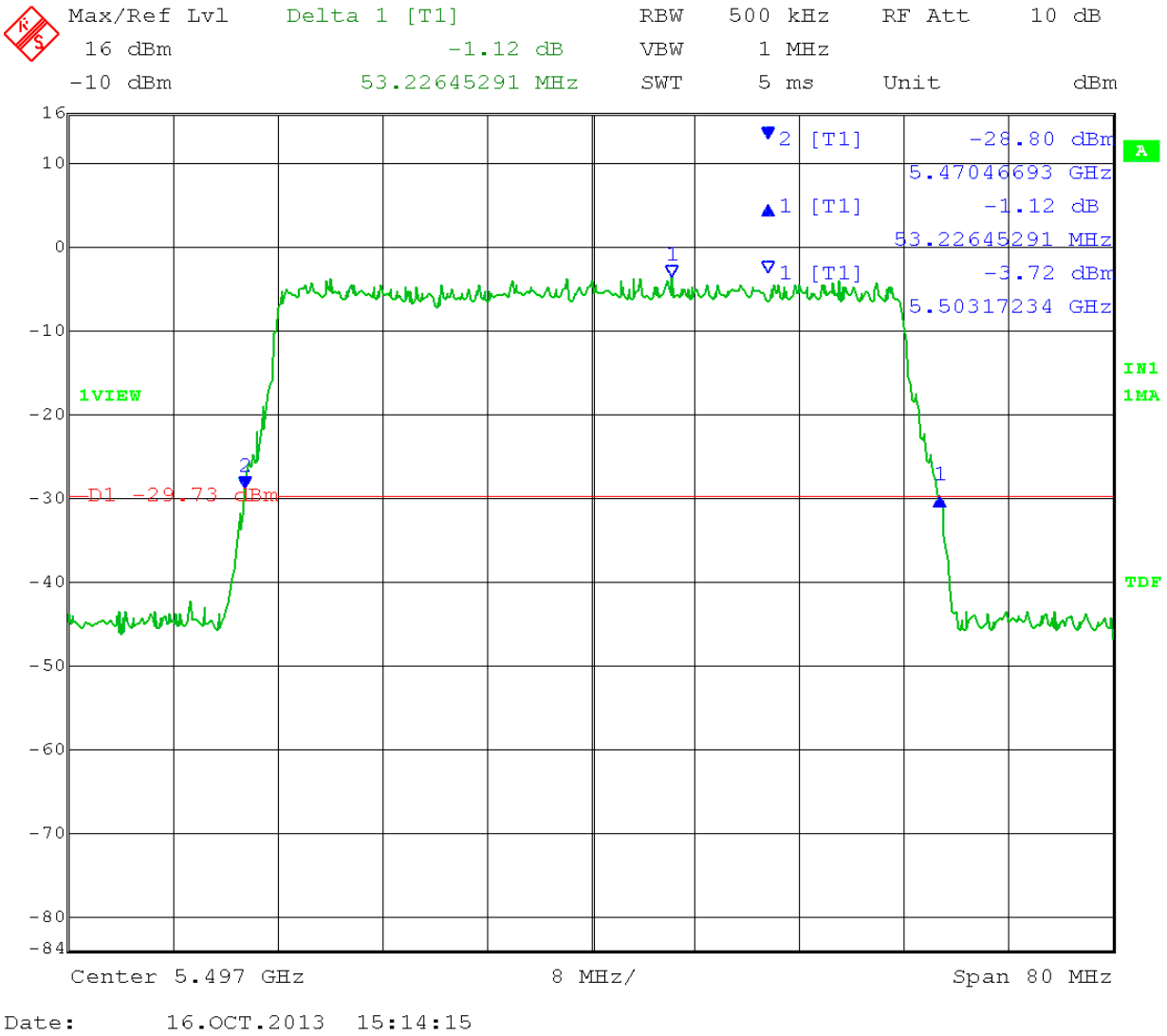
**26 dB Emission Bandwidth = 53.39MHz**



Test Date: 10-16-2013
Company: Ubiquiti Networks
EUT: Air Fiber 5 - 5.4GHz WiFi Radio
Test: Emission Bandwidth (26 dB) - Conducted
Operator: Lillian Li
Test Procedure used: KDB 789033 D01 v01r03 – C)
Low Channel: Transmit = 5.497 GHz 50MHz BW 16QAM
Output power setting: 30 dBm eirp

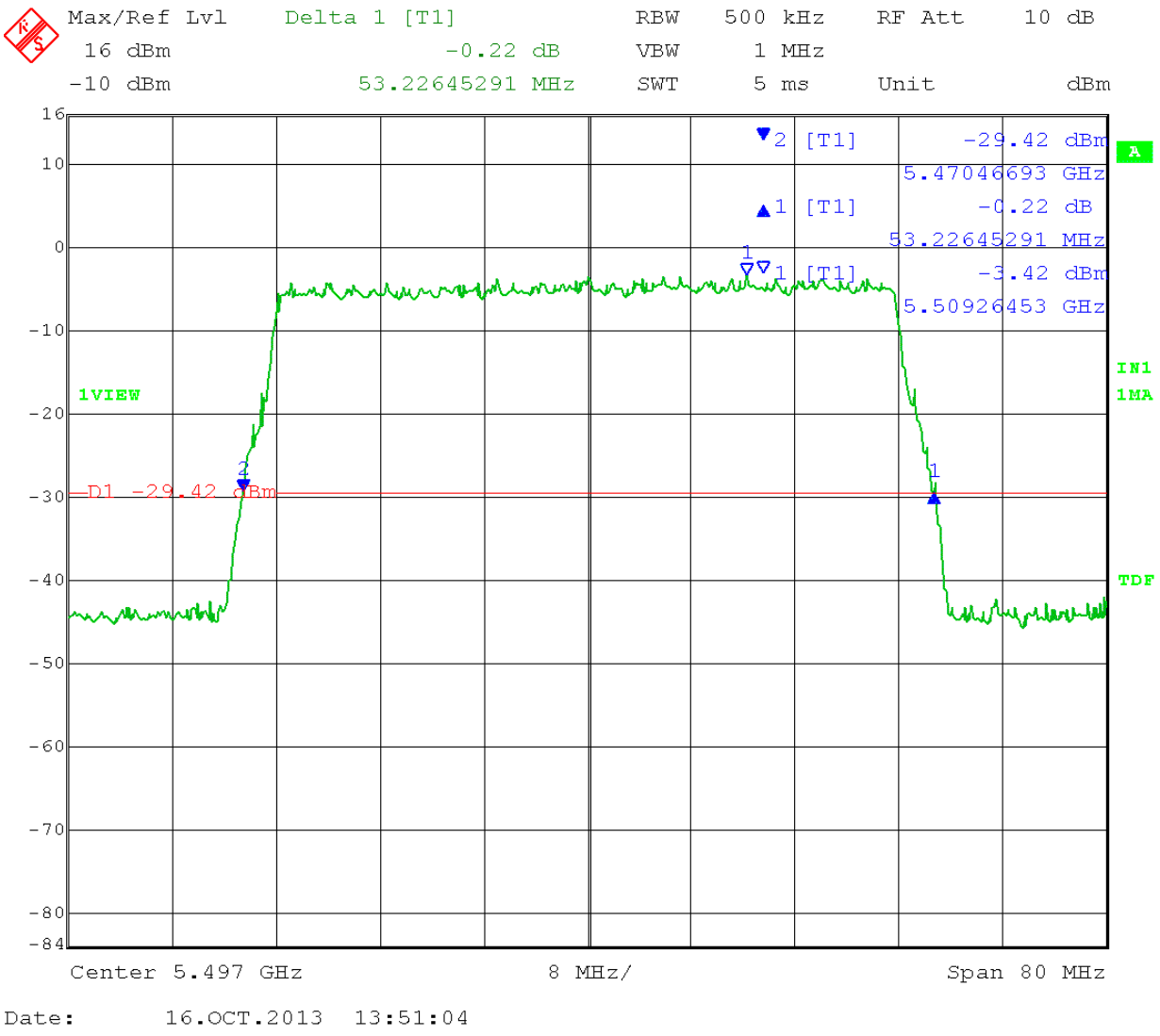
TX 0:

**26 dB Emission Bandwidth = 53.23MHz**



TX 1:

**26 dB Emission Bandwidth = 53.23MHz**

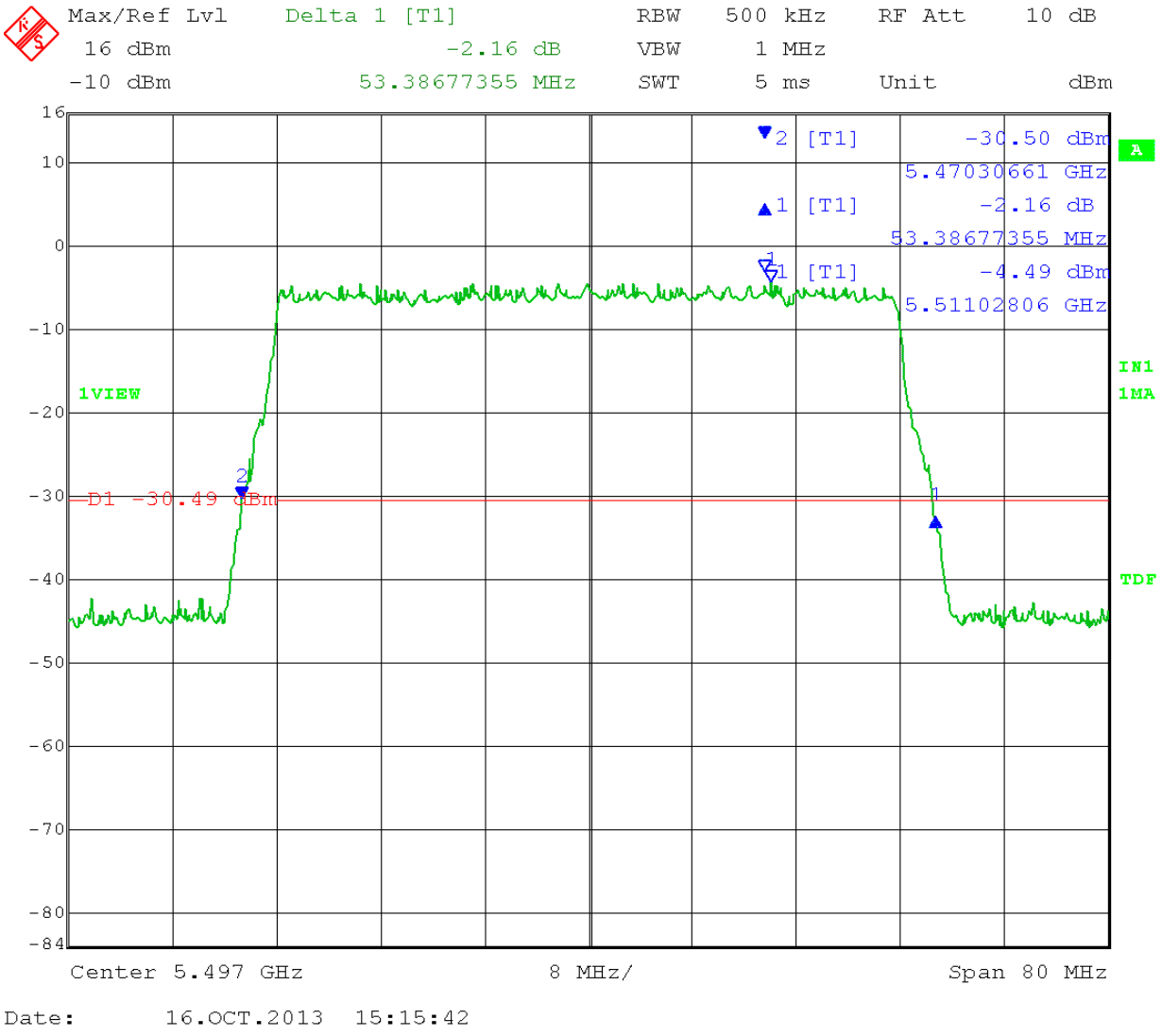



Date: 16.OCT.2013 13:51:04

Test Date: 10-16-2013
Company: Ubiquiti Networks
EUT: Air Fiber 5 - 5.4GHz WiFi Radio
Test: Emission Bandwidth (26 dB) - Conducted
Operator: Lillian Li
Test Procedure used: KDB 789033 D01 v01r03 – C)
Low Channel: Transmit = 5.497 GHz 50MHz BW 64QAM
Output power setting: 30 dBm eirp

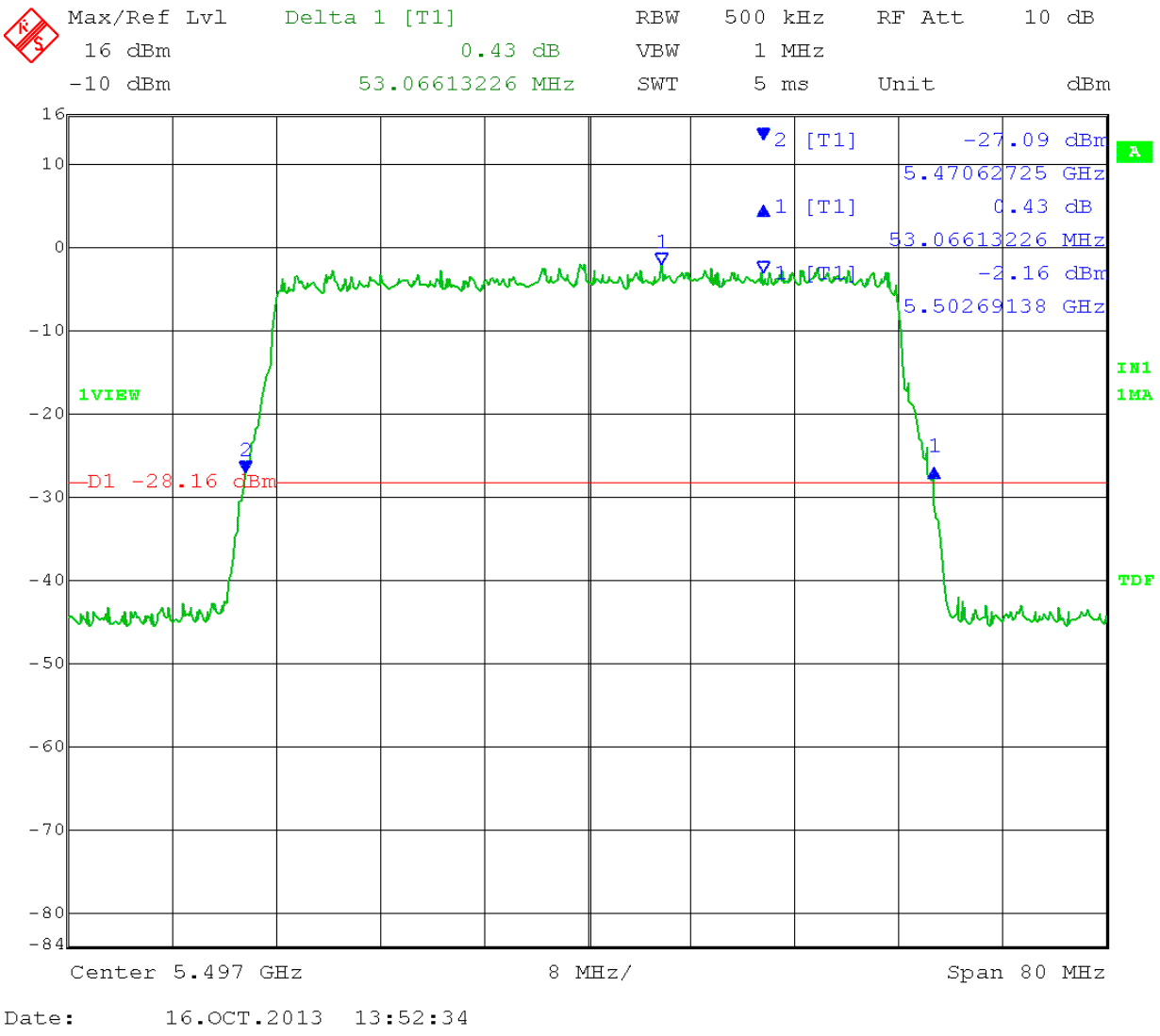
TX 0:

**26 dB Emission Bandwidth = 53.39MHz**



TX 1:

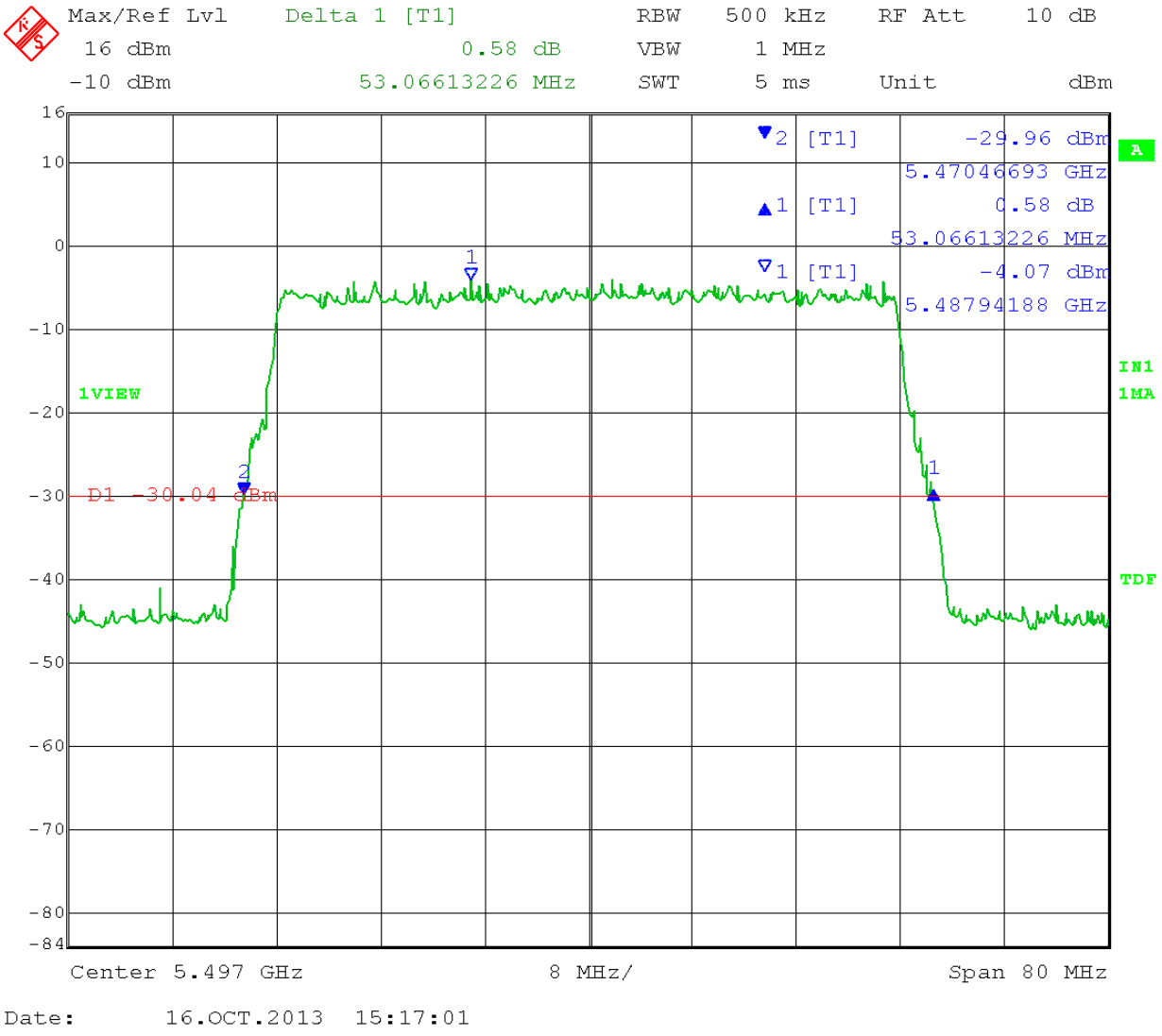
**26 dB Emission Bandwidth = 53.07MHz**



Test Date: 10-16-2013
Company: Ubiquiti Networks
EUT: Air Fiber 5 - 5.4GHz WiFi Radio
Test: Emission Bandwidth (26 dB) - Conducted
Operator: Lillian Li
Test Procedure used: KDB 789033 D01 v01r03 – C)
Low Channel: Transmit = 5.497 GHz 50MHz BW 256QAM
Output power setting: 30 dBm eirp

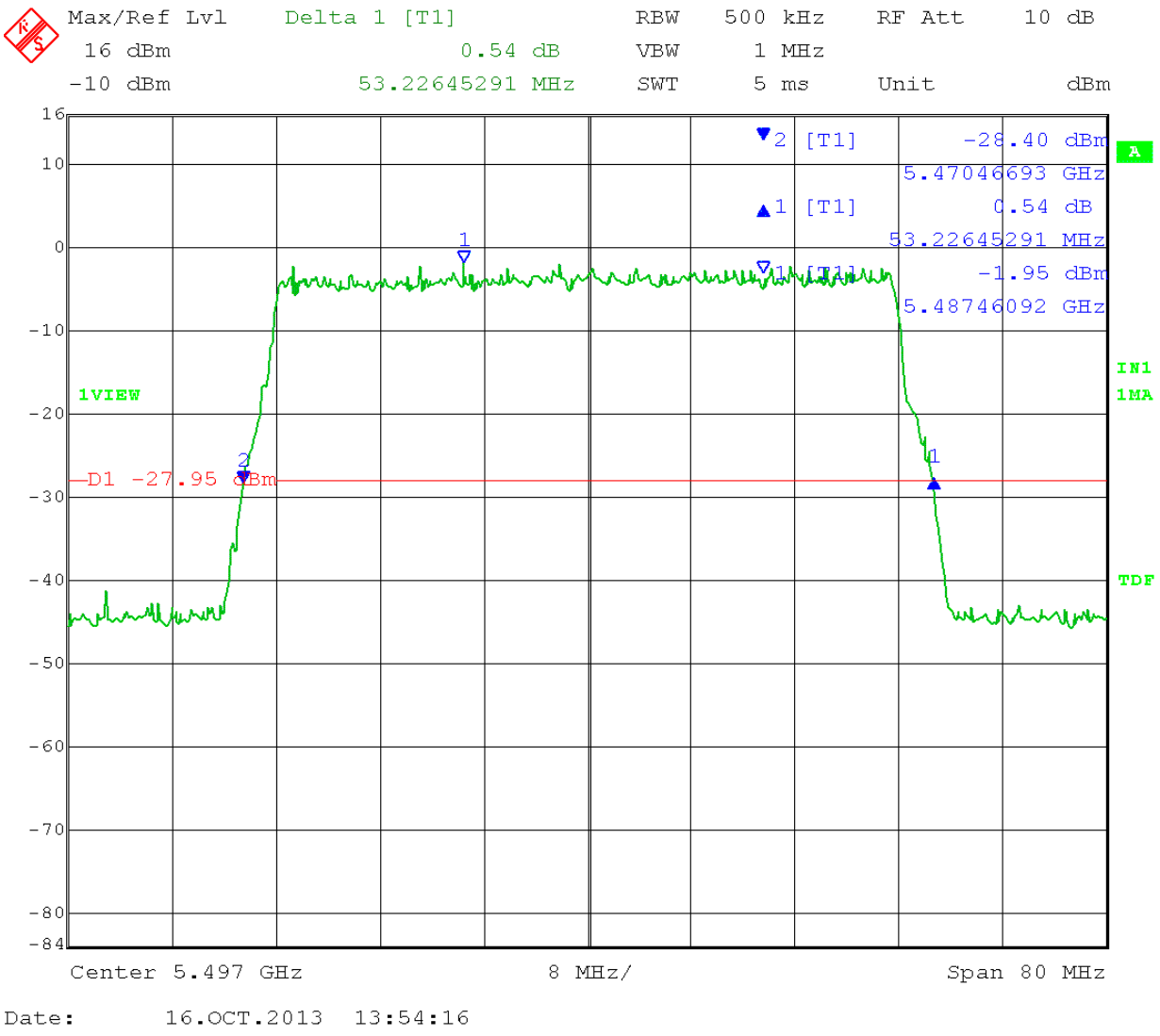
TX 0:

**26 dB Emission Bandwidth = 53.07MHz**



TX 1:

**26 dB Emission Bandwidth = 53.23MHz**

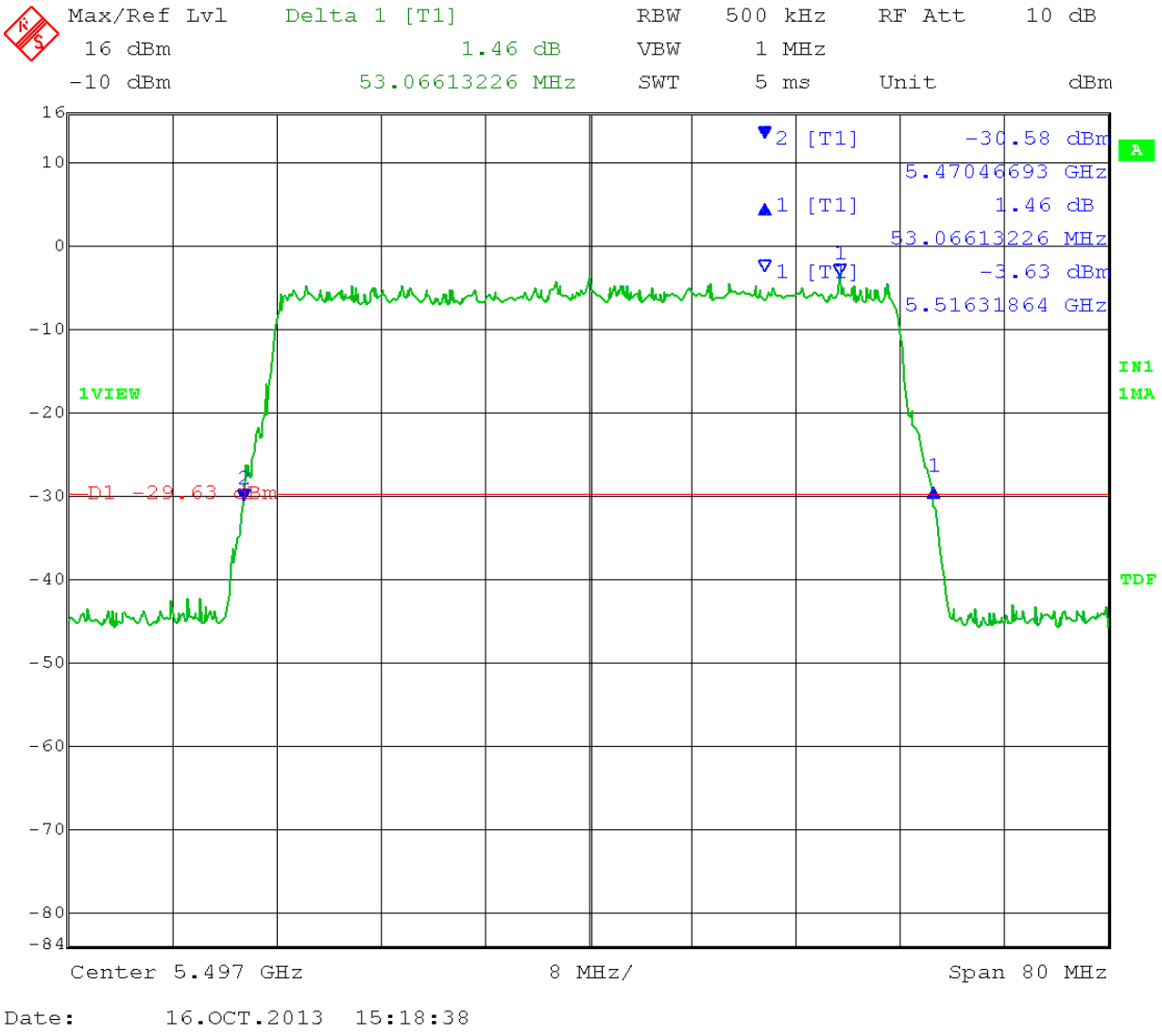



Date: 16.OCT.2013 13:54:16

Test Date: 10-16-2013
Company: Ubiquiti Networks
EUT: Air Fiber 5 - 5.4GHz WiFi Radio
Test: Emission Bandwidth (26 dB) - Conducted
Operator: Lillian Li
Test Procedure used: KDB 789033 D01 v01r03 – C)
Low Channel: Transmit = 5.497 GHz 50MHz BW 1024QAM
Output power setting: 30 dBm eirp

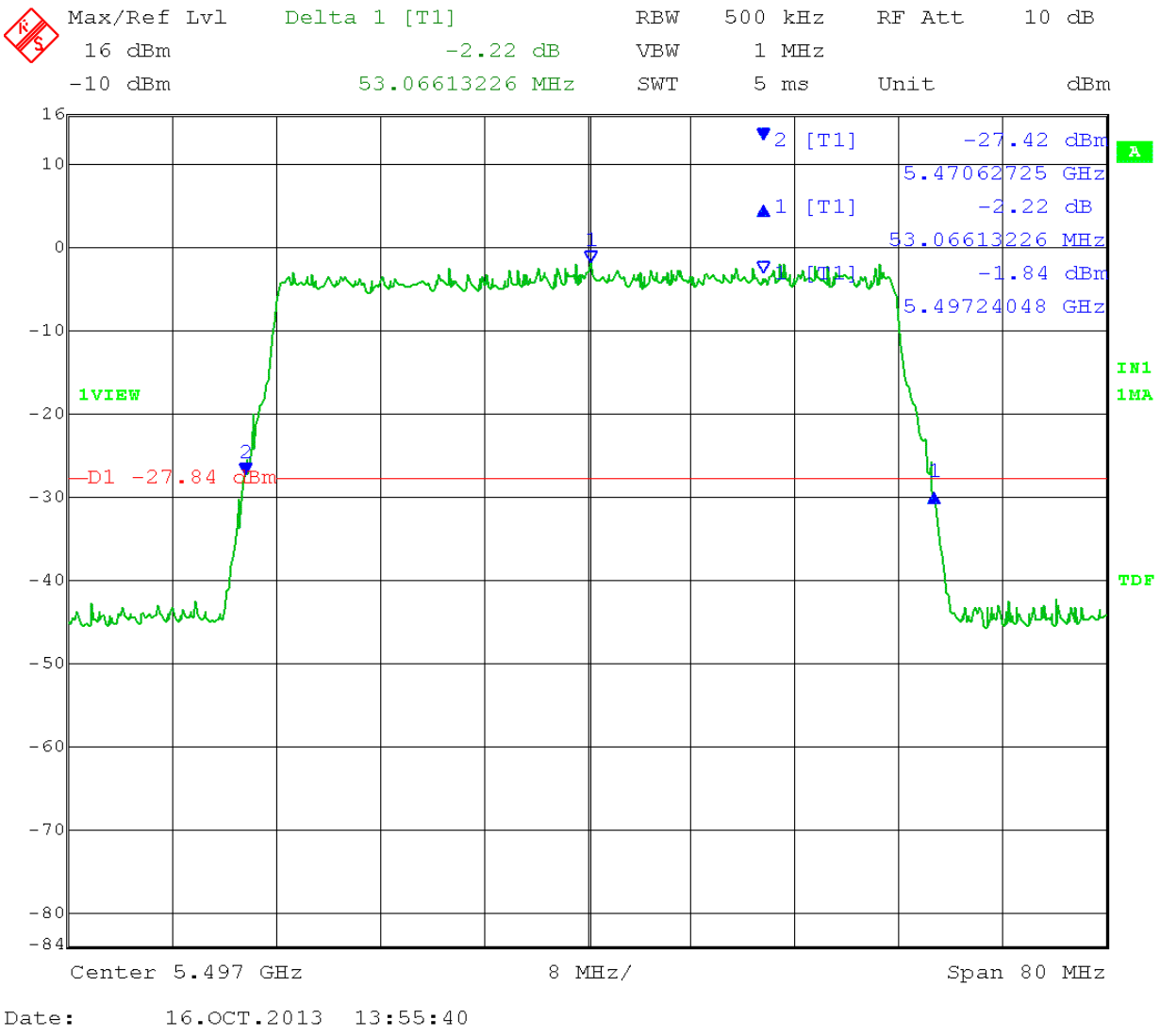
TX 0:

**26 dB Emission Bandwidth = 53.07MHz**



TX 1:

**26 dB Emission Bandwidth = 53.07MHz**

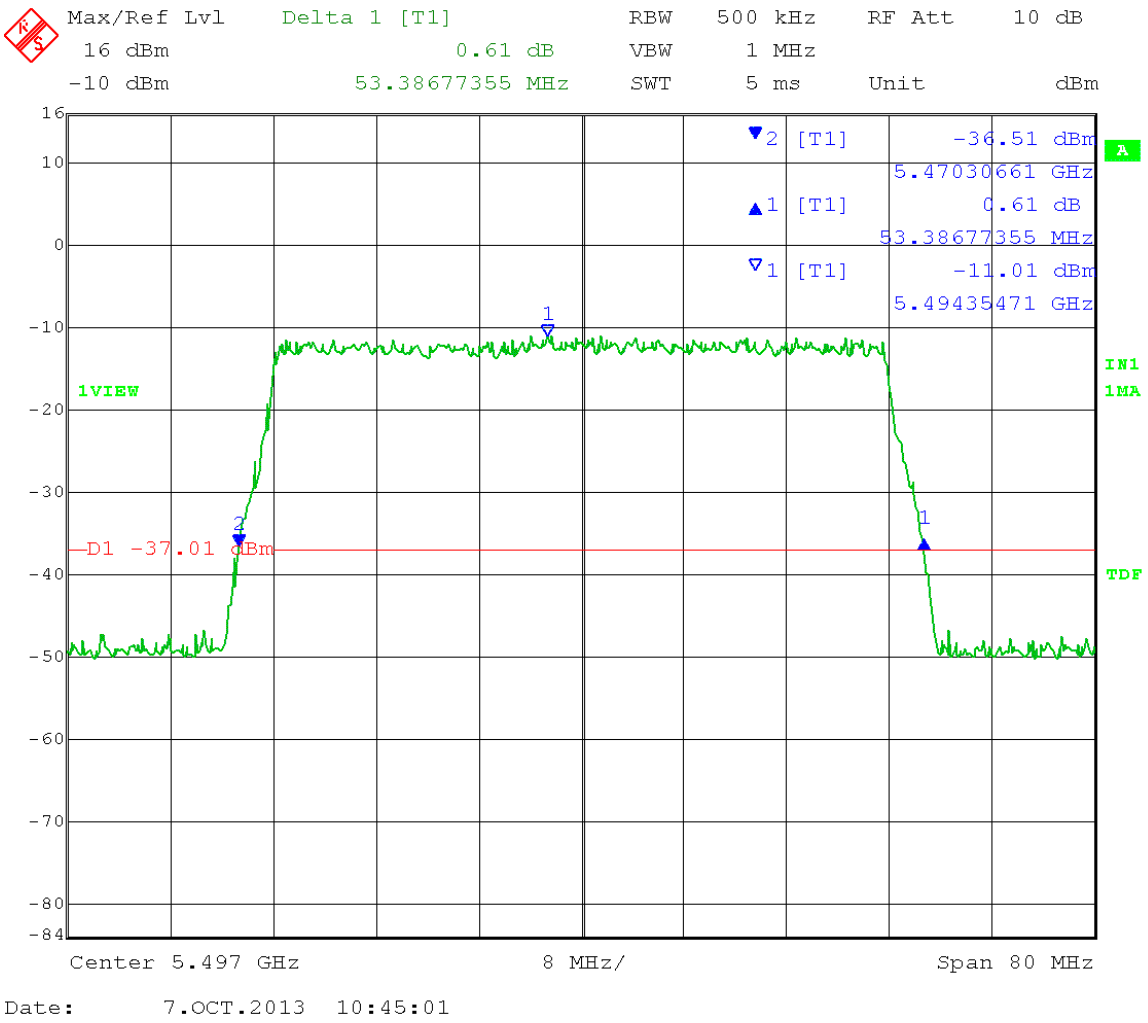



Date: 16.OCT.2013 13:55:40

Test Date: 10-4&7-2013
Company: Ubiquiti Networks
EUT: Air Fiber 5 - 5.4GHz WiFi Radio
Test: Emission Bandwidth (26 dB) - Conducted
Operator: Lillian Li
Test Procedure used: KDB 789033 D01 v01r03 – C)
Low Channel: Transmit = 5.497 GHz 50MHz BW QPSK
Output power setting: 30 dBm eirp

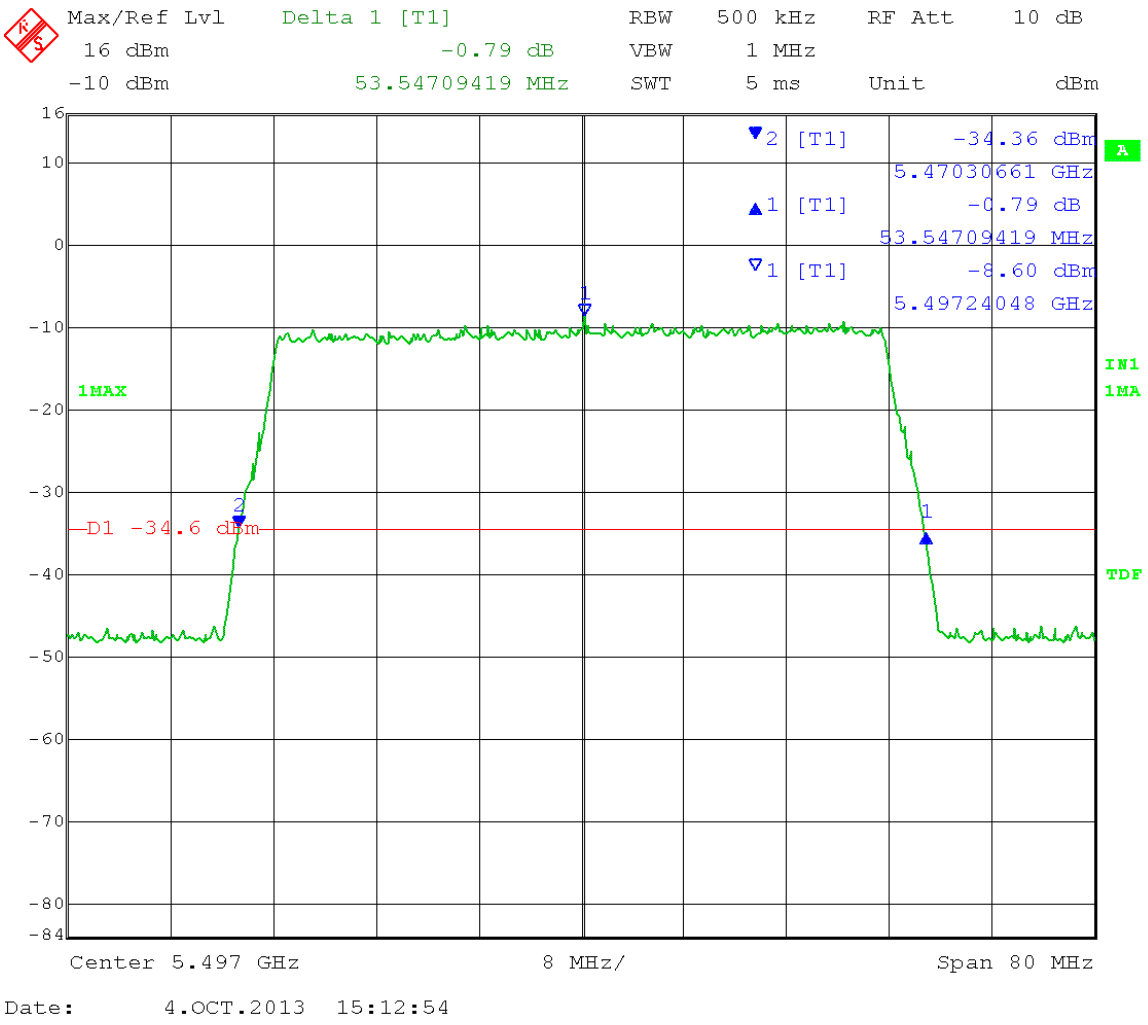
TX 0:

**26 dB Emission Bandwidth = 53.39MHz**



TX 1:

**26 dB Emission Bandwidth = 53.55MHz**



## Appendix – Measurement Data

### 3.0 99 Percent Occupied Bandwidth

**Rule Section**: Informative

**Test Procedure**: FCC KDB 789033 D01 General UNII Test Procedures v01r03 – *Guidance for Compliance Testing of Unlicensed National Information Infrastructure (U-NII) Devices – Part 15, Subpart E*

Section D – 99 Percent Occupied Bandwidth

**Description**: SPAN = 1.5 to 5 times the OBW
RBW = 1% to 5% of OBW
VBW ≥ RBW
Detector = Peak
Trace mode = max hold

Measure the width of the emission using the 99% power bandwidth function of the spectrum analyzer

**Limit:** Informative.
The emission designators are:

10 MHz BW: 10M0x1D
20 MHz BW: 20M0x1D
40 MHz BW: 40M0x1D
50 MHz BW: 50M0x1D

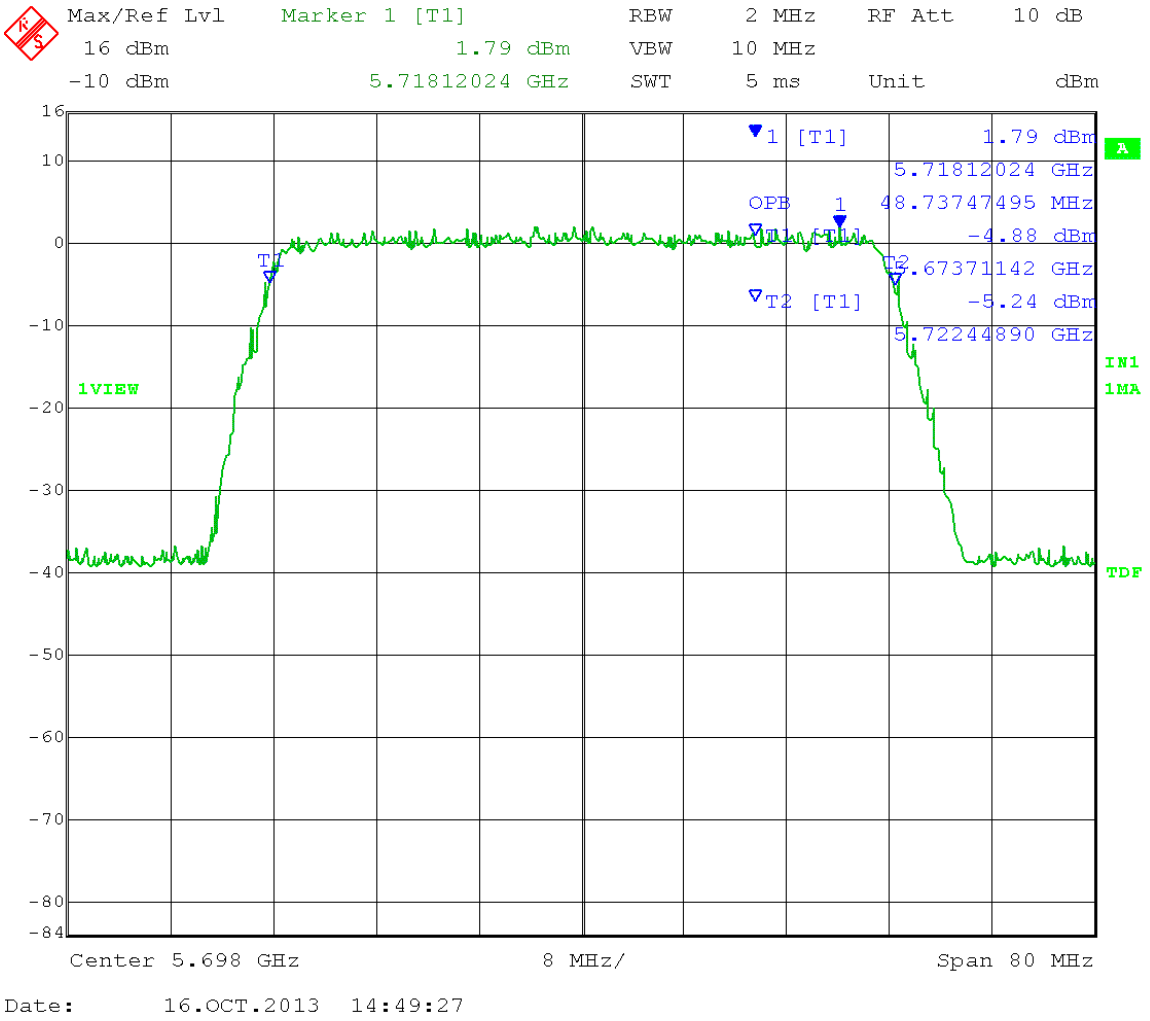
**Notes:** Measurements were taken for QPSK, 16QAM, 64QAM, 256QAM and 1024 QAM modulations at the lowest, middle, and highest channels of operation. EUT was set to transmit continuously.

Output power was set to 30 dBm eirp using special test software.

Test Date: 10-16-2013
Company: Ubiquiti Networks
EUT: Air Fiber 5 - 5.4GHz WiFi Radio
Test: 99% Occupied Bandwidth - Conducted
Operator: Lillian Li
Test Procedure used: KDB 789033 D01 v01r03 – D)
High Channel: Transmit = 5.698 GHz 50MHz BW 16QPSK
Output power setting: 30 dBm eirp

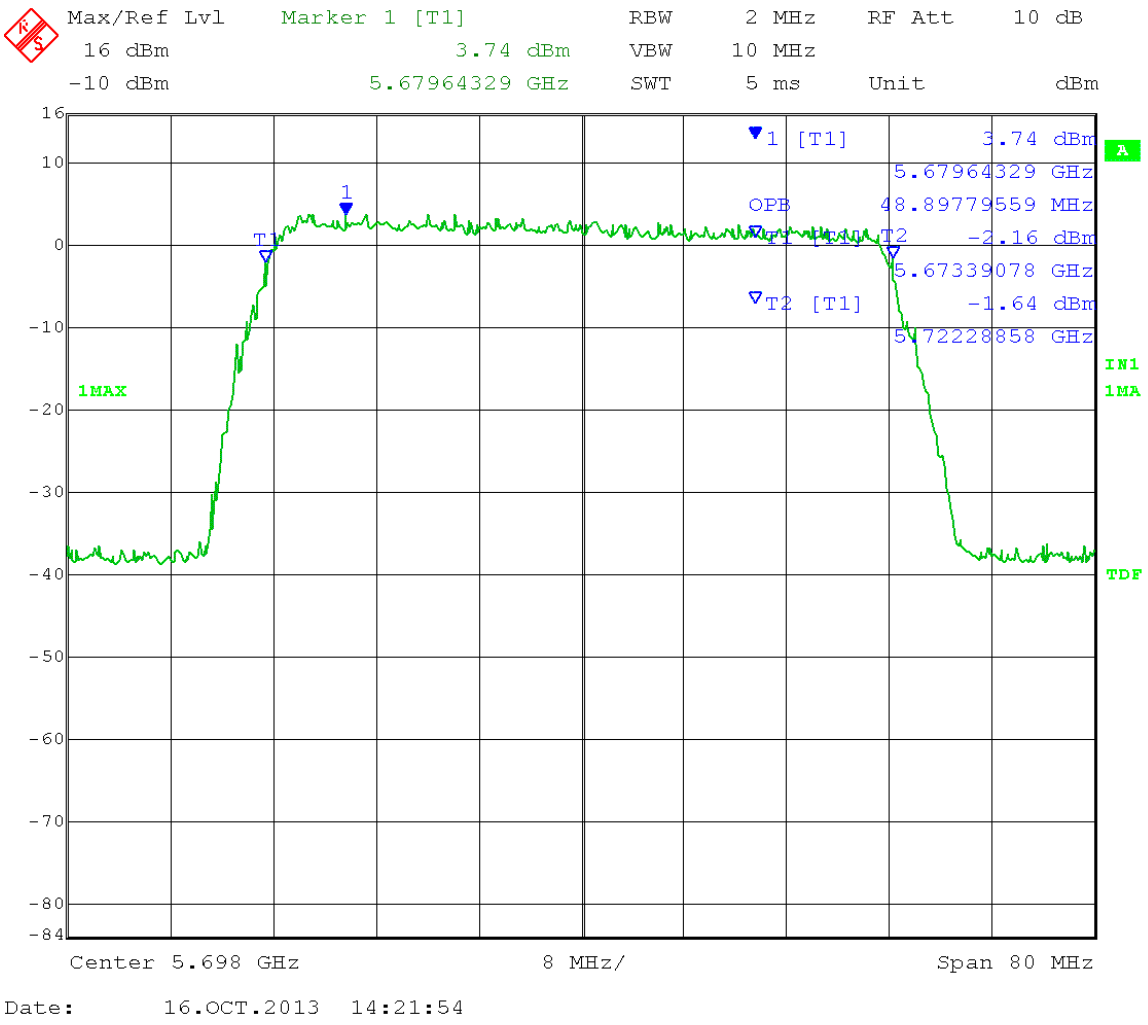
TX 0:

**99% OBW = 48.74MHz**



TX 1:

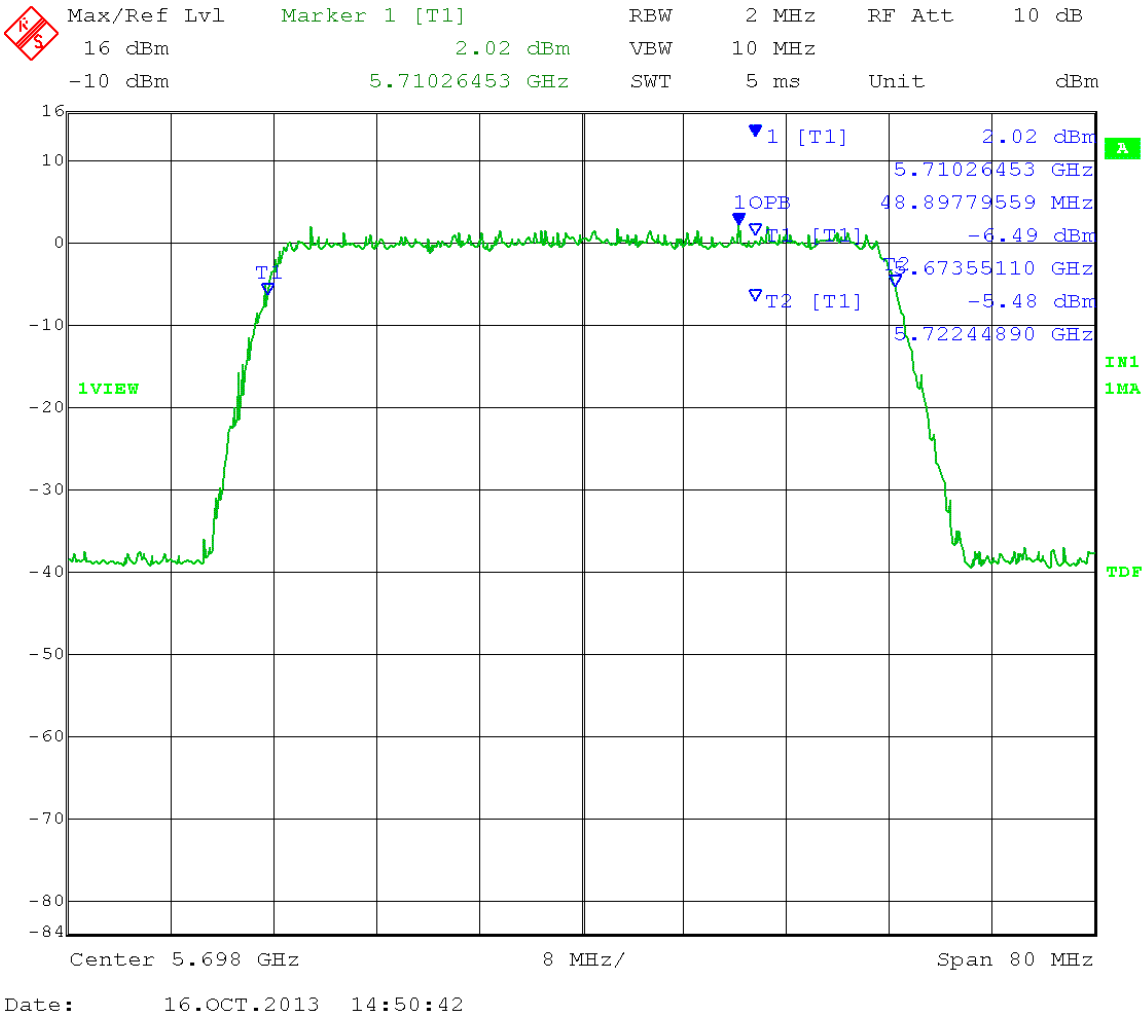
**99% OBW = 48.90MHz**



Test Date: 10-16-2013
Company: Ubiquiti Networks
EUT: Air Fiber 5 - 5.4GHz WiFi Radio
Test: 99% Occupied Bandwidth - Conducted
Operator: Lillian Li
Comment: FCC Test Guidelines for UNII Devices under 15.407 – OET 4/8/2013
- D) 99% Occupied Bandwidth ( Page 4)
RBW = 2MHz VBW = 10MHz
High Channel: Transmit = 5.698 GHz 50MHz BW 64QPSK
Output power setting: 30 dBm eirp

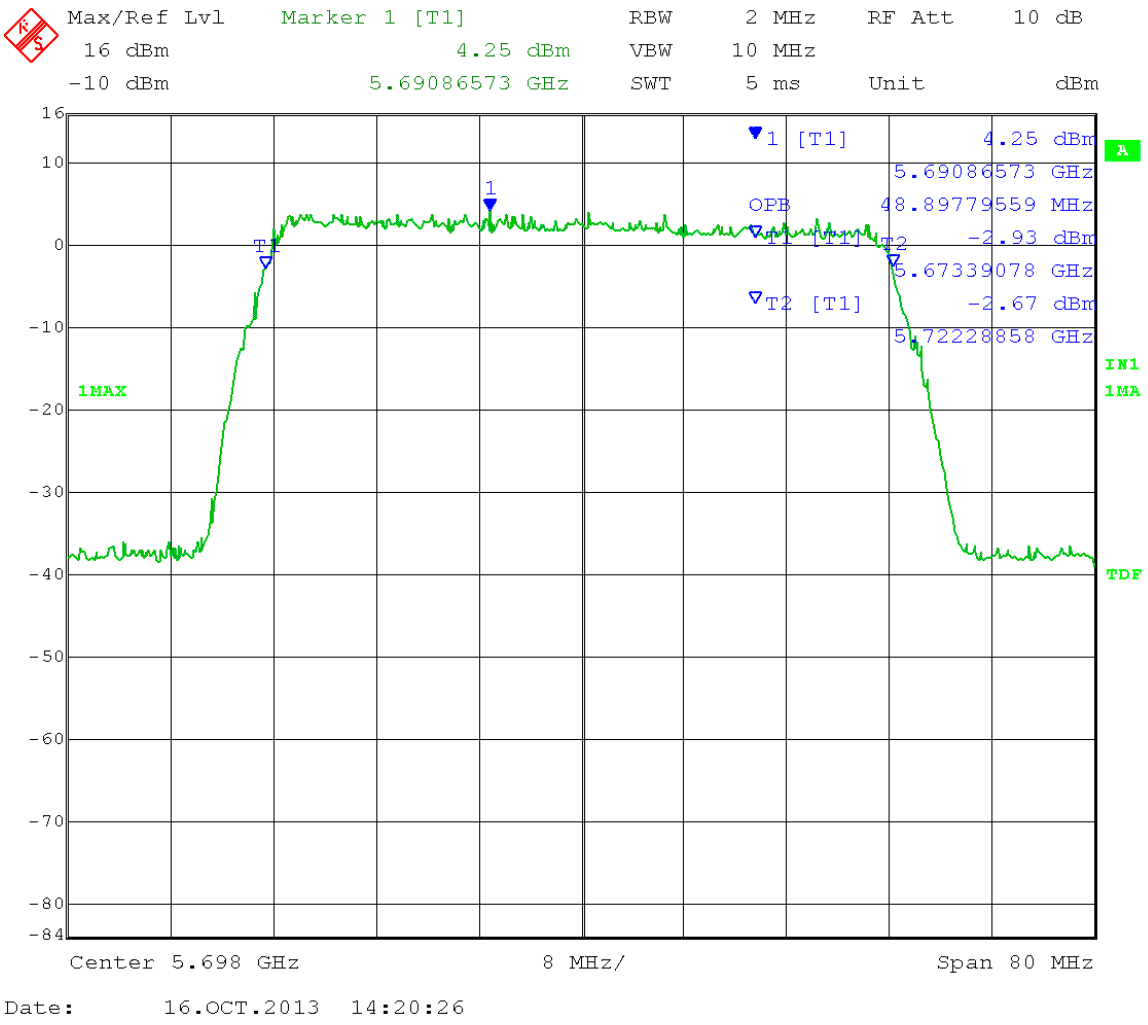
Channel 0:

**99% OBW = 48.90MHz**



Channel 1:

**99% OBW = 48.90MHz**

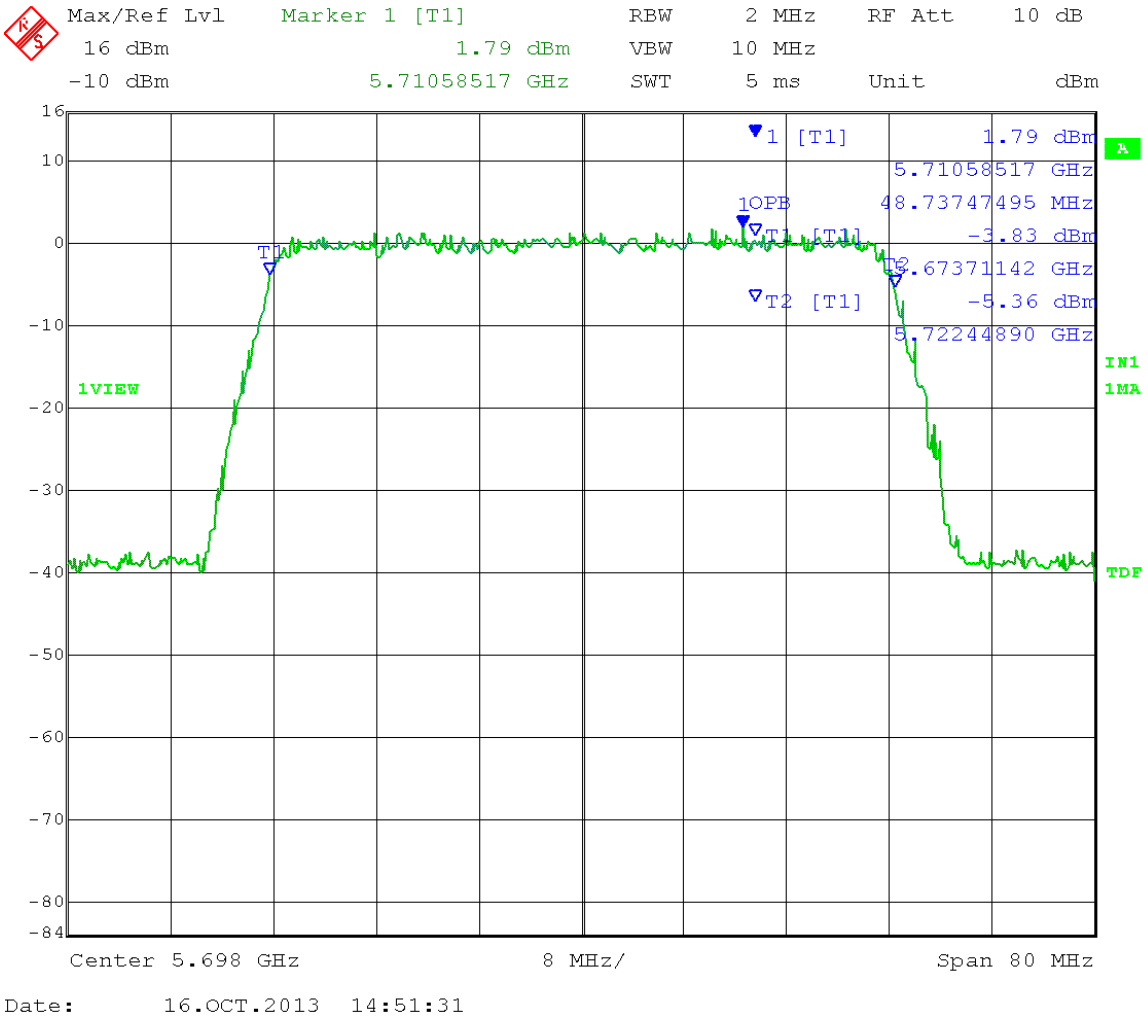



Date: 16.OCT.2013 14:20:26

Test Date: 10-16-2013
Company: Ubiquiti Networks
EUT: Air Fiber 5 - 5.4GHz WiFi Radio
Test: 99% Occupied Bandwidth - Conducted
Operator: Lillian Li
Test Procedure used: KDB 789033 D01 v01r03 – D)
High Channel: Transmit = 5.698 GHz 50MHz BW 256QPSK
Output power setting: 30 dBm eirp

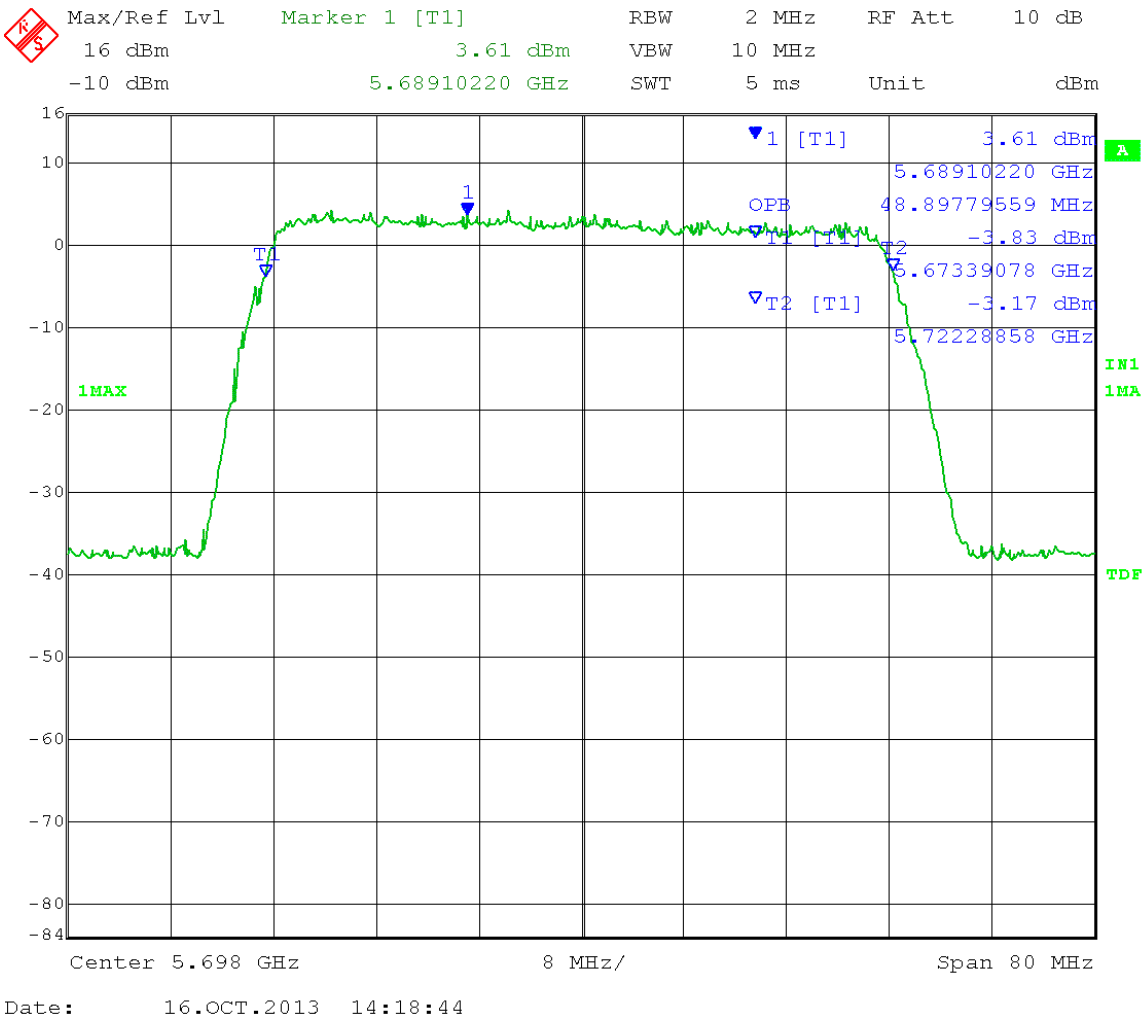
TX 0:

**99% OBW = 48.74MHz**



TX 1:

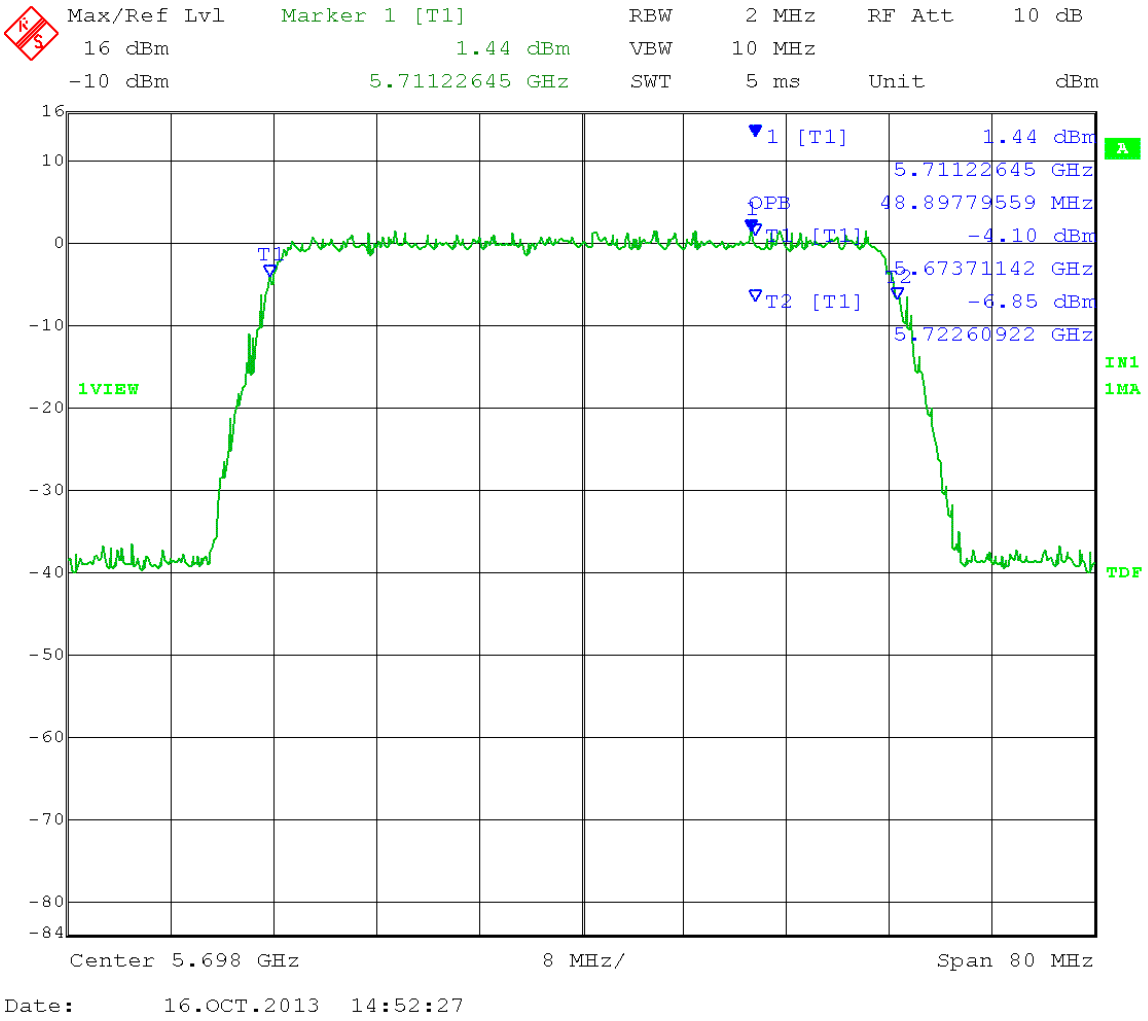
**99% OBW = 48.90MHz**



Test Date: 10-16-2013
Company: Ubiquiti Networks
EUT: Air Fiber 5 - 5.4GHz WiFi Radio
Test: 99% Occupied Bandwidth - Conducted
Operator: Lillian Li
Test Procedure used: KDB 789033 D01 v01r03 – D)
High Channel: Transmit = 5.698 GHz 50MHz BW 1024QPSK
Output power setting: 30 dBm eirp

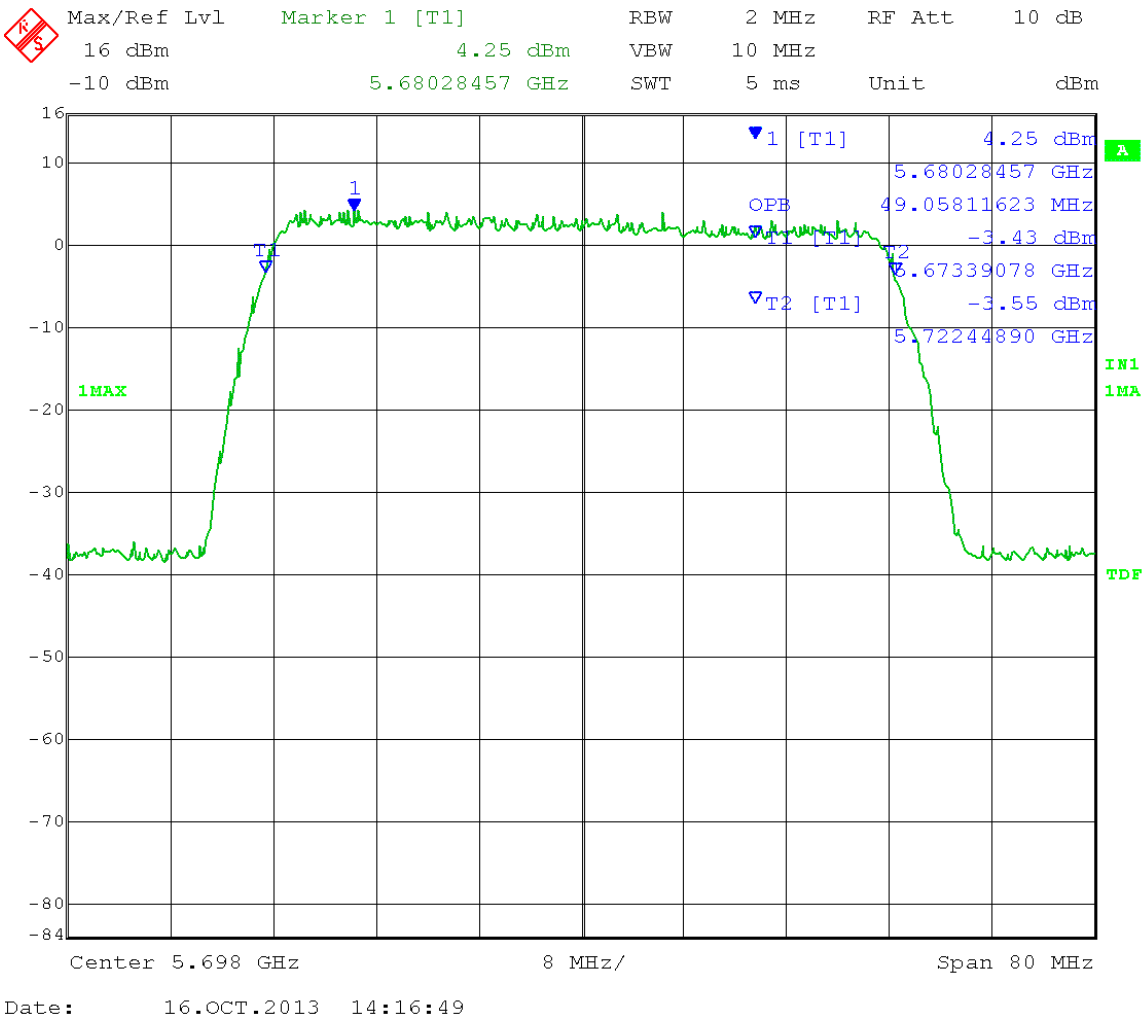
TX 0:

**99% OBW = 48.90MHz**



TX 1:

**99% OBW = 49.06MHz**

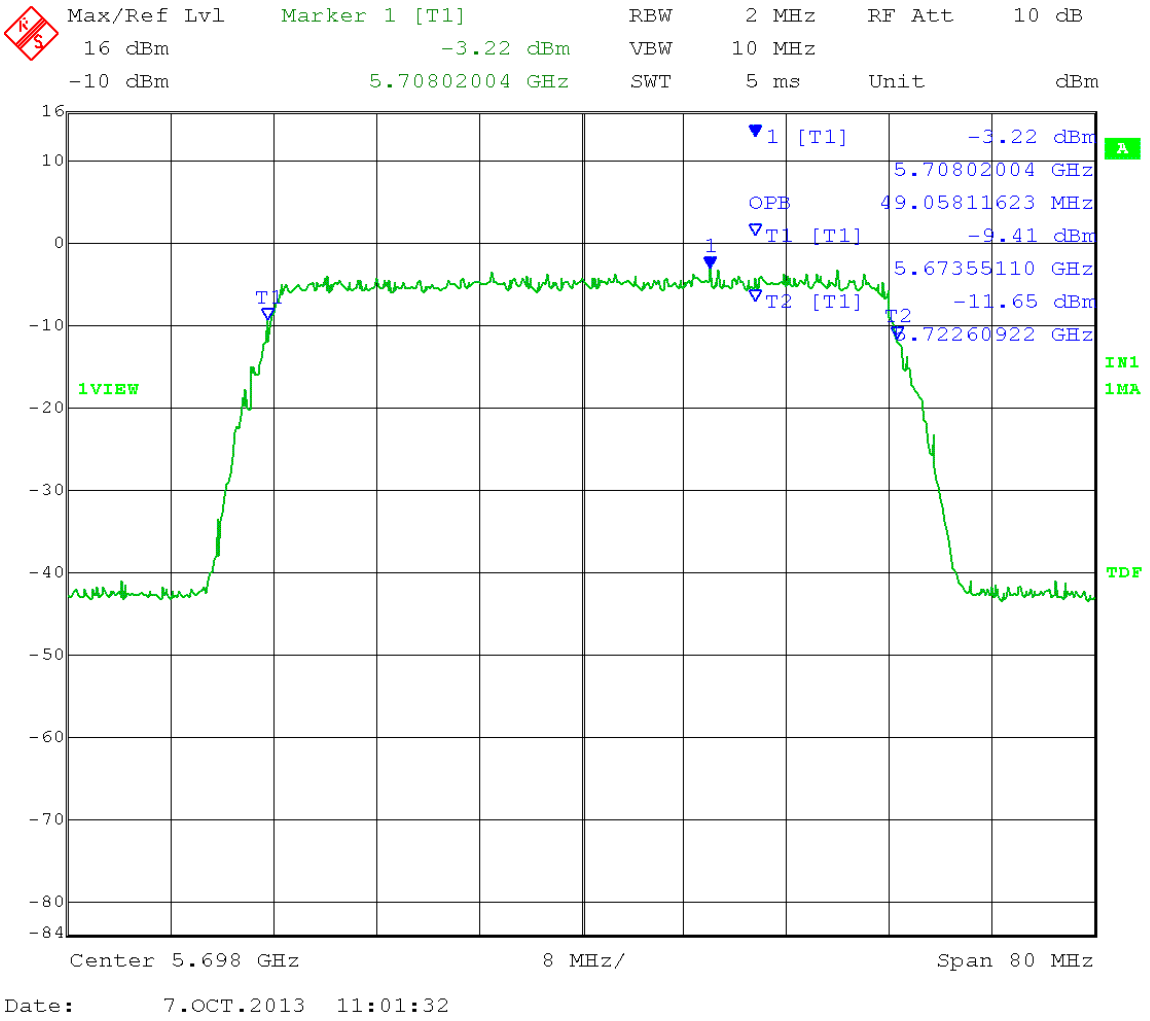



Date: 16.OCT.2013 14:16:49

Test Date: 10-07-2013
Company: Ubiquiti Networks
EUT: Air Fiber 5 - 5.4GHz WiFi Radio
Test: 99% Occupied Bandwidth - Conducted
Operator: Lillian Li
Test Procedure used: KDB 789033 D01 v01r03 – D)
High Channel: Transmit = 5.698 GHz 50MHz BW QPSK
Output power setting: 30 dBm eirp

TX 0:

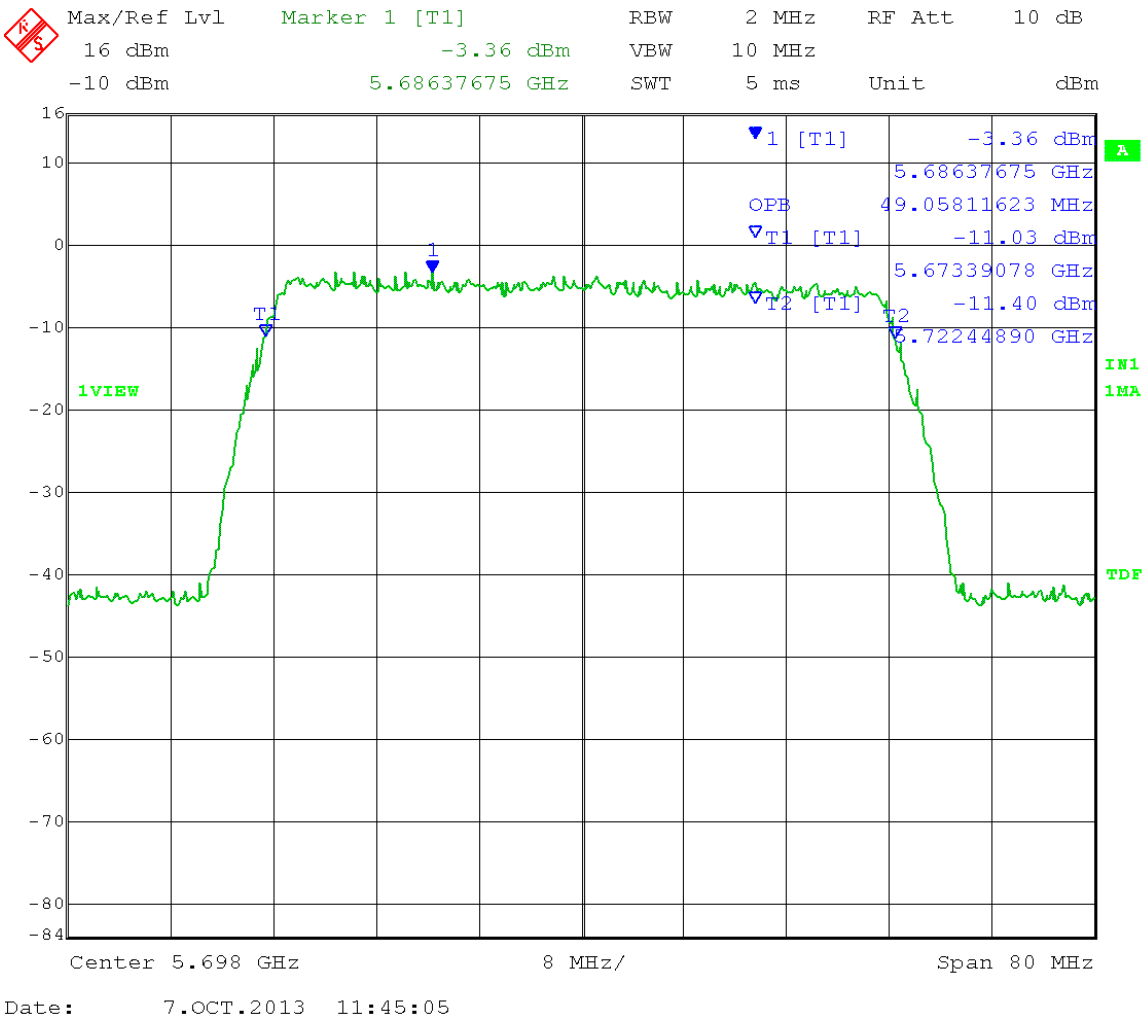
**99% OBW = 49.06MHz**




Date: 7.OCT.2013 11:01:32

TX 1:

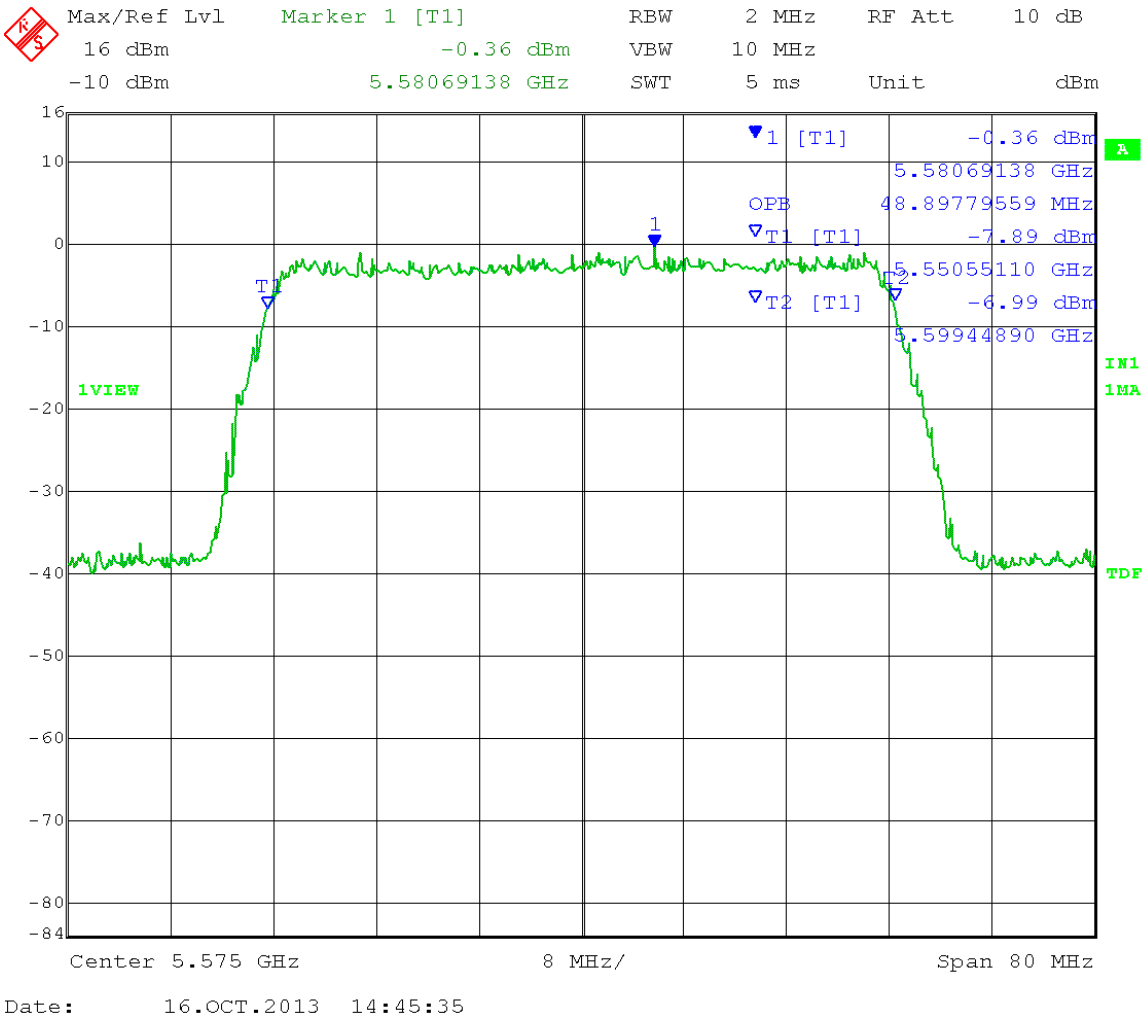
**99% OBW = 49.06MHz**



Test Date: 10-16-2013
Company: Ubiquiti Networks
EUT: Air Fiber 5 - 5.4GHz WiFi Radio
Test: 99% Occupied Bandwidth - Conducted
Operator: Lillian Li
Test Procedure used: KDB 789033 D01 v01r03 – D)
Mid Channel: Transmit = 5.575 GHz 50MHz BW 16QAM
Output power setting: 30 dBm eirp

TX 0:

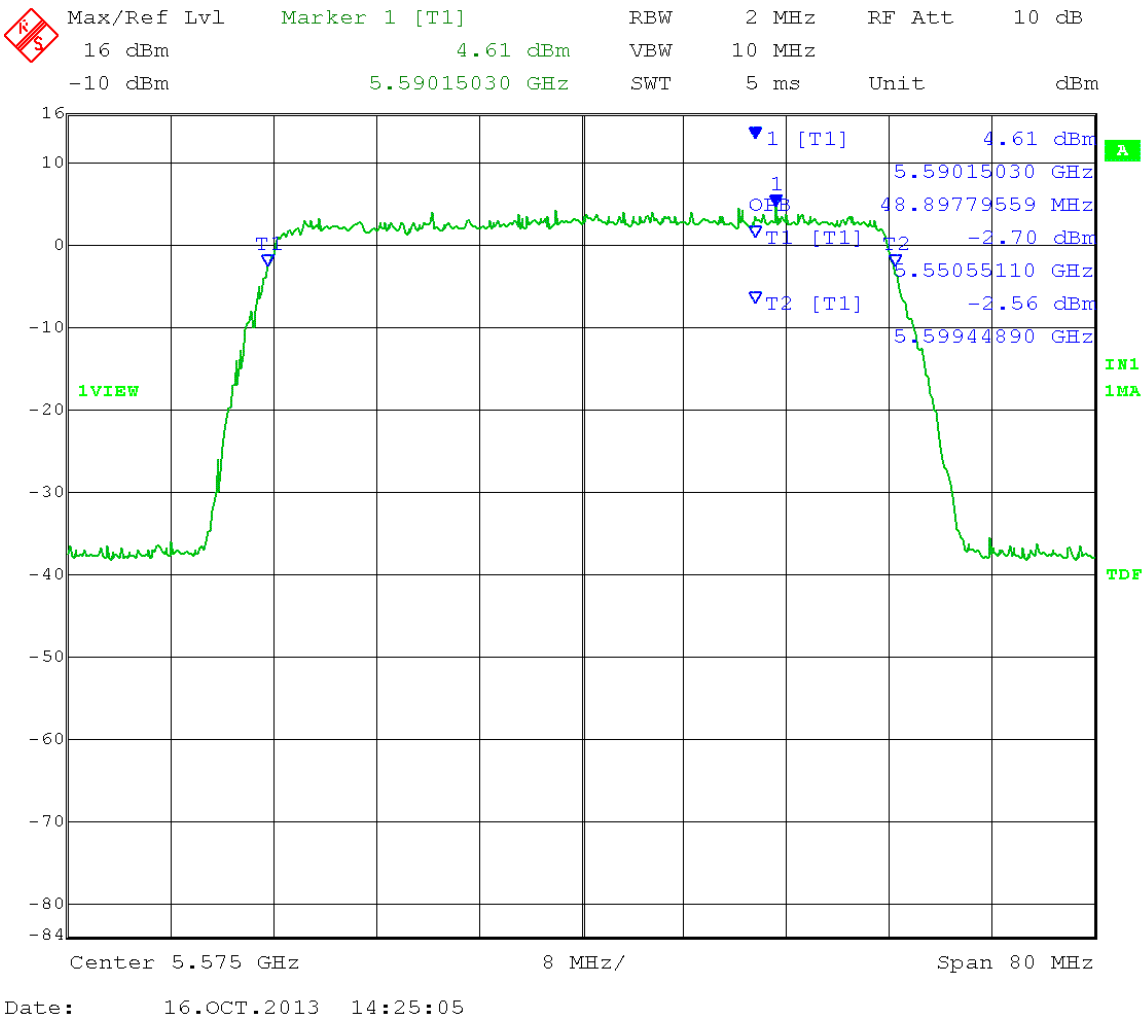
**99% OBW = 48.90MHz**




Date: 16.OCT.2013 14:45:35

TX 1:

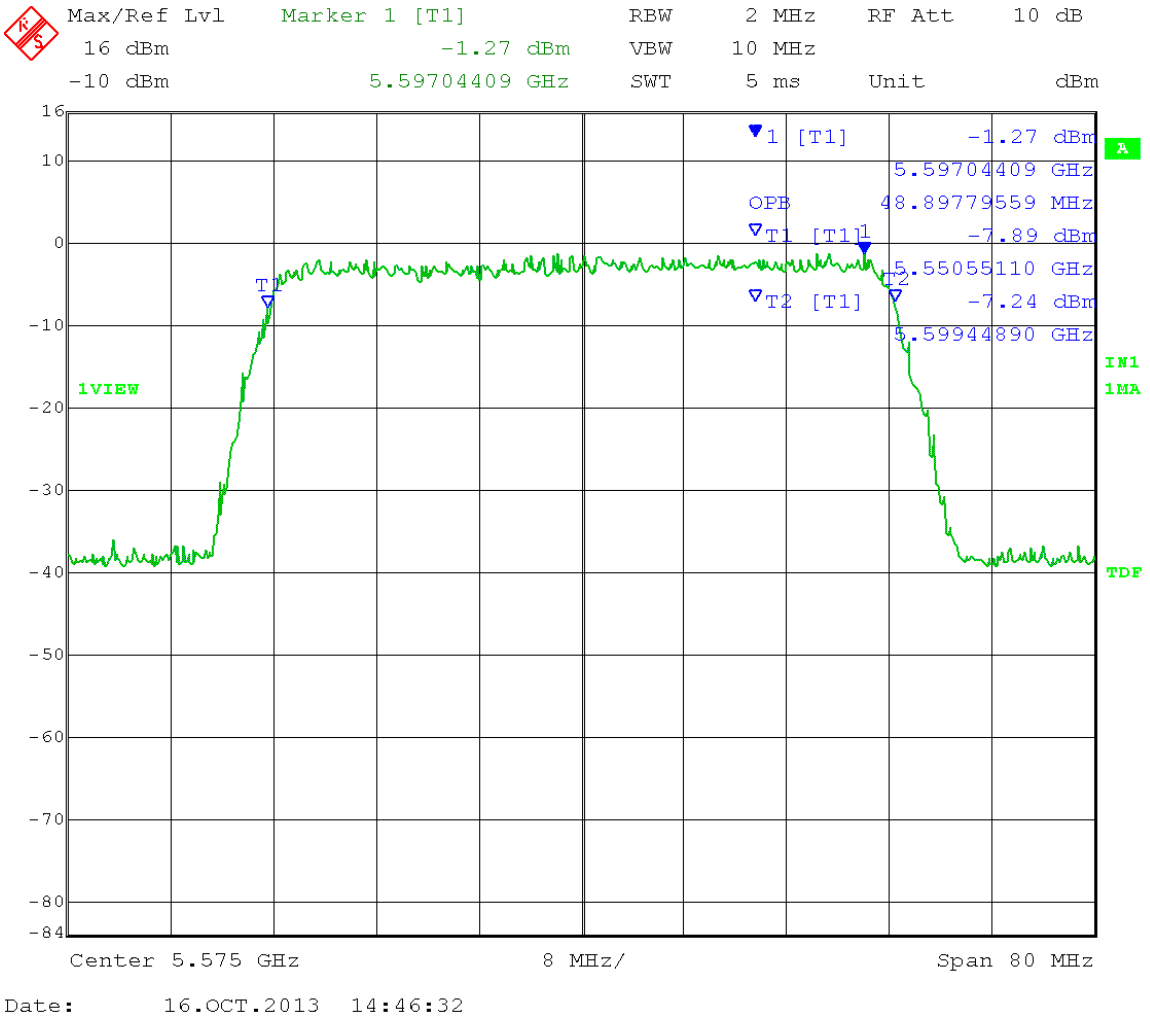
**99% OBW = 48.90MHz**



Test Date: 10-16-2013
Company: Ubiquiti Networks
EUT: Air Fiber 5 - 5.4GHz WiFi Radio
Test: 99% Occupied Bandwidth - Conducted
Operator: Lillian Li
Test Procedure used: KDB 789033 D01 v01r03 – D)
Mid Channel: Transmit = 5.575 GHz 50MHz BW 64QAM
Output power setting: 30 dBm eirp

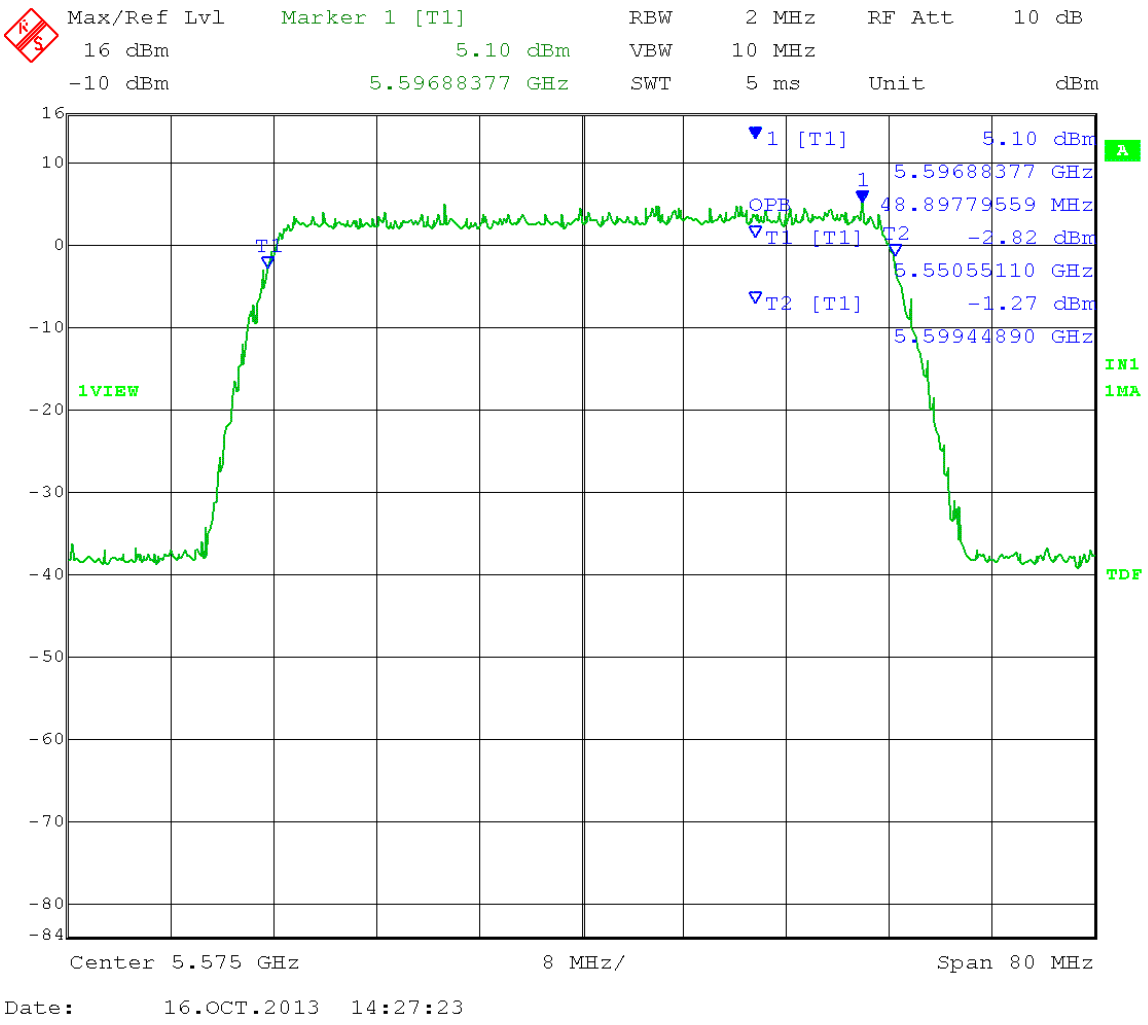
TX 0:

**99% OBW = 48.90MHz**



TX 1:

**99% OBW = 48.90MHz**

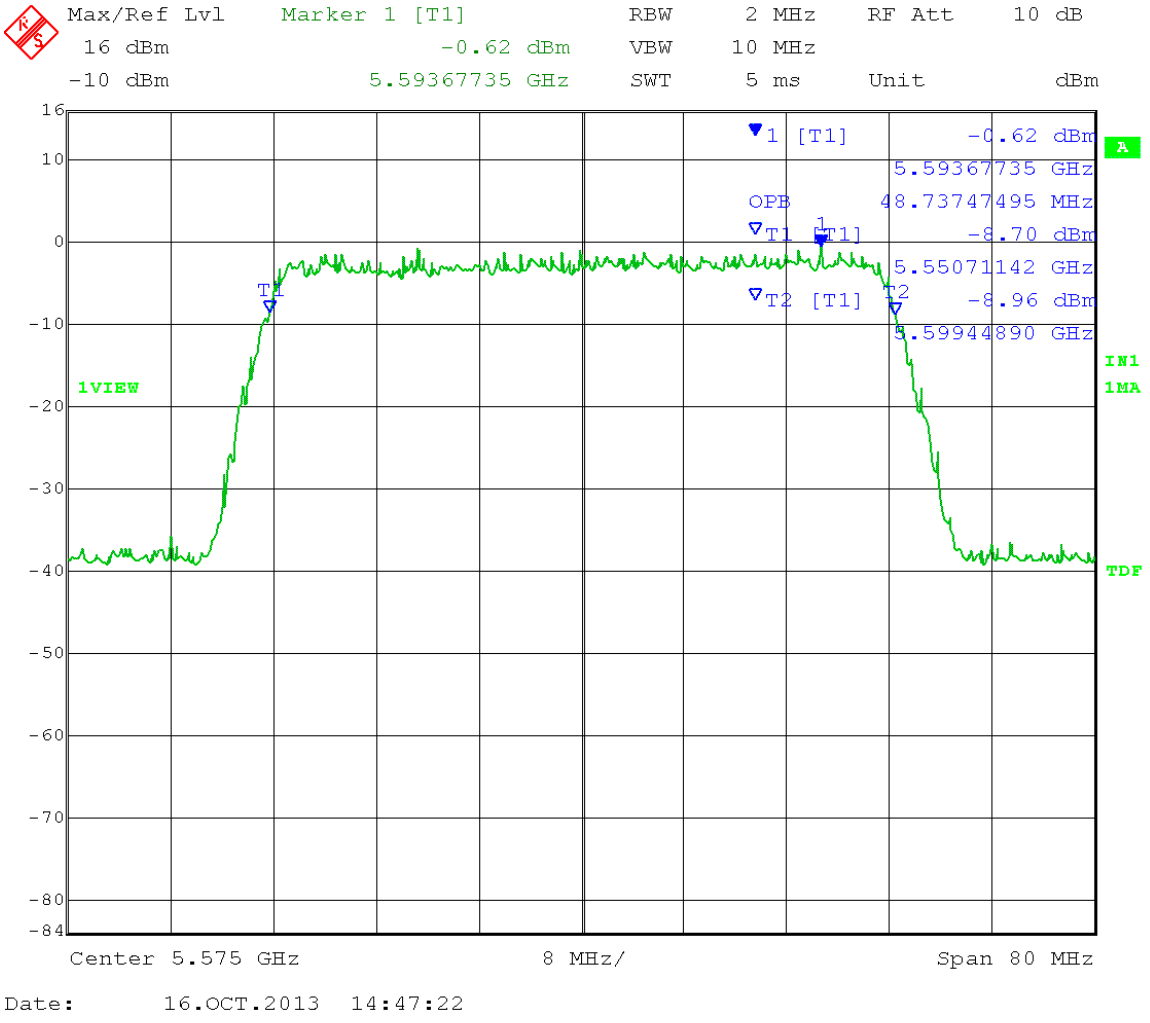



Date: 16.OCT.2013 14:27:23

Test Date: 10-16-2013
Company: Ubiquiti Networks
EUT: Air Fiber 5 - 5.4GHz WiFi Radio
Test: 99% Occupied Bandwidth - Conducted
Operator: Lillian Li
Test Procedure used: KDB 789033 D01 v01r03 – D)
Mid Channel: Transmit = 5.575 GHz 50MHz BW 256QAM
Output power setting: 30 dBm eirp

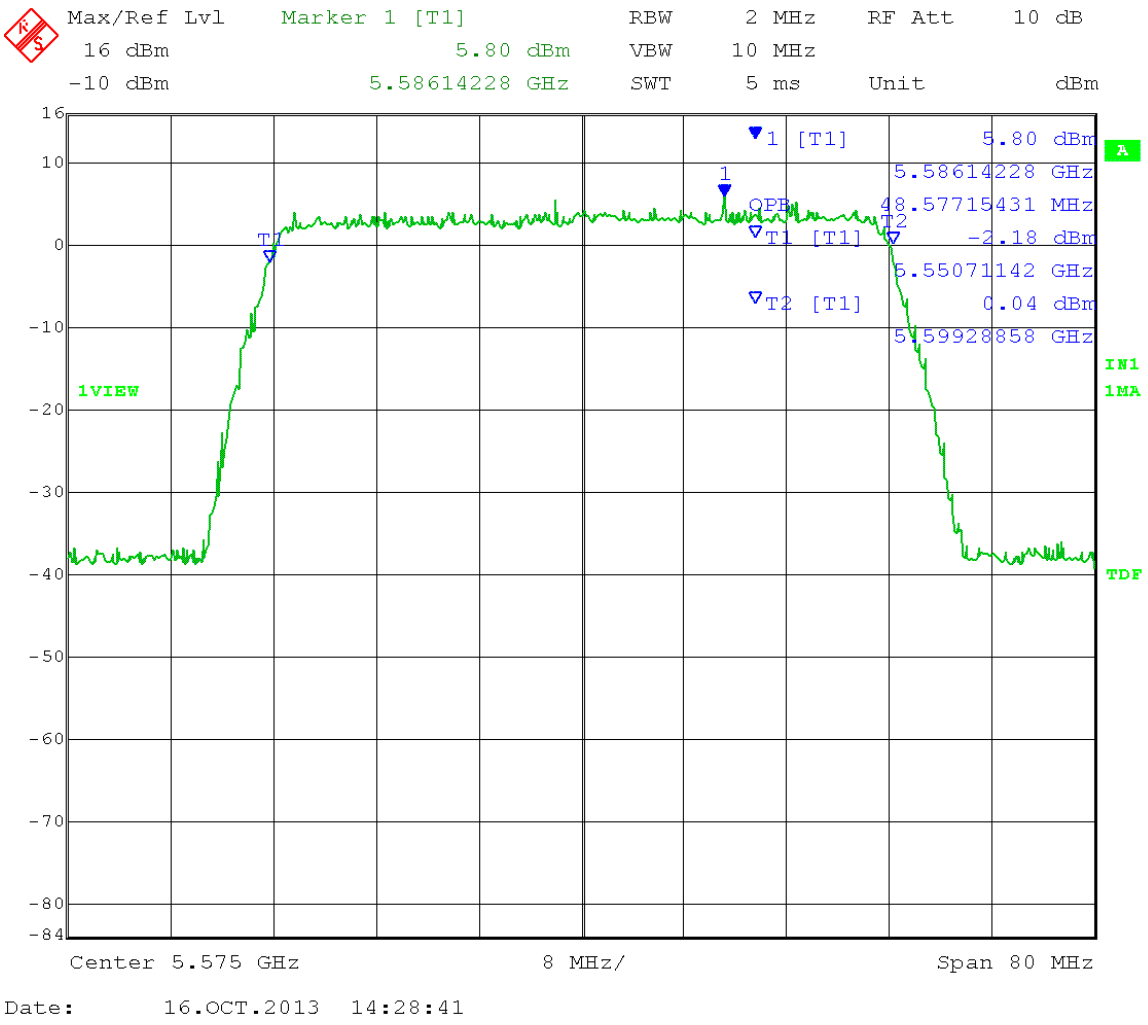
TX 0:

**99% OBW = 48.74MHz**



TX 1:

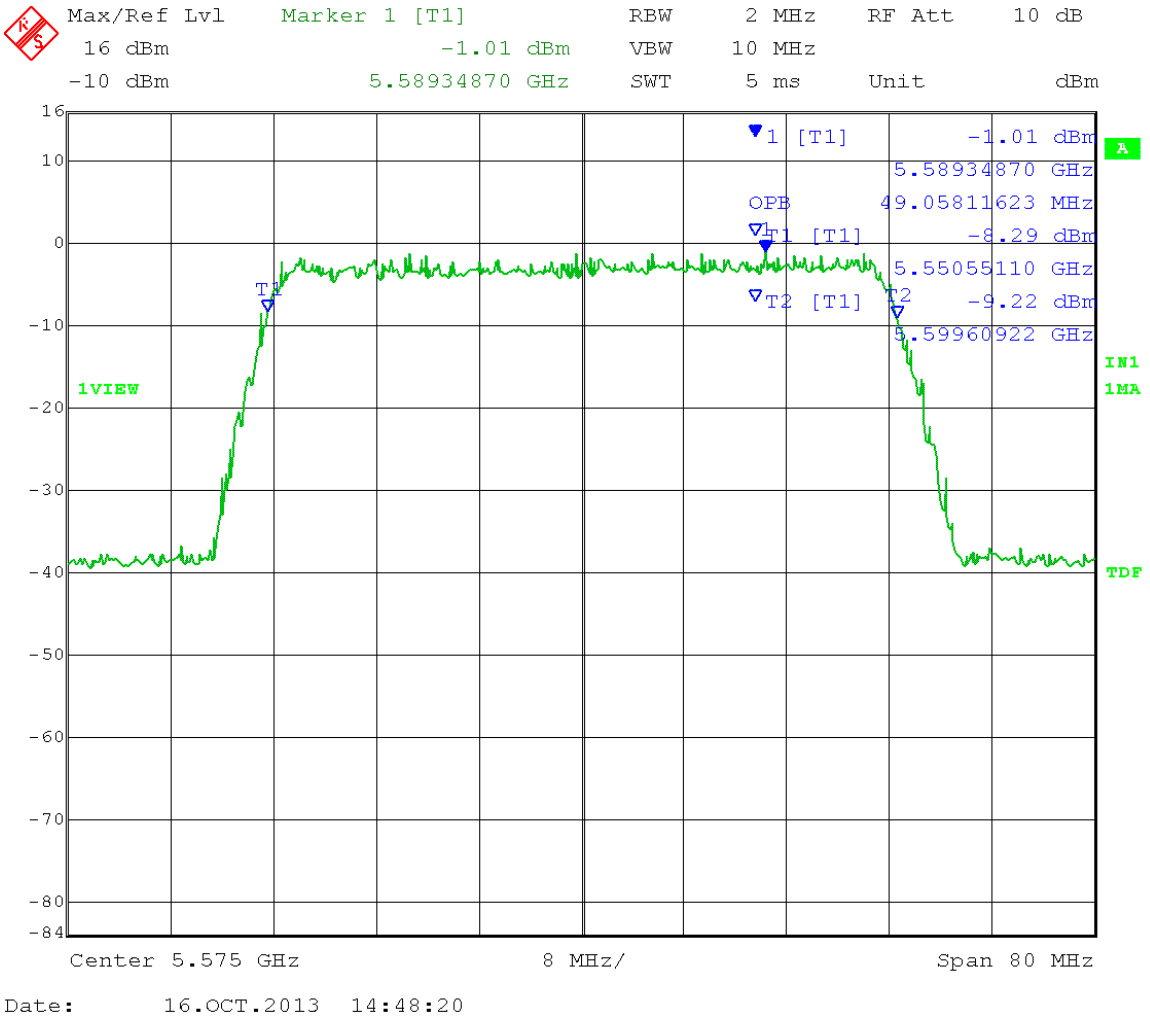
**99% OBW = 48.58MHz**



Test Date: 10-16-2013
Company: Ubiquiti Networks
EUT: Air Fiber 5 - 5.4GHz WiFi Radio
Test: 99% Occupied Bandwidth - Conducted
Operator: Lillian Li
Test Procedure used: KDB 789033 D01 v01r03 – D)
Mid Channel: Transmit = 5.575 GHz 50MHz BW 1024QAM
Output power setting: 30 dBm eirp

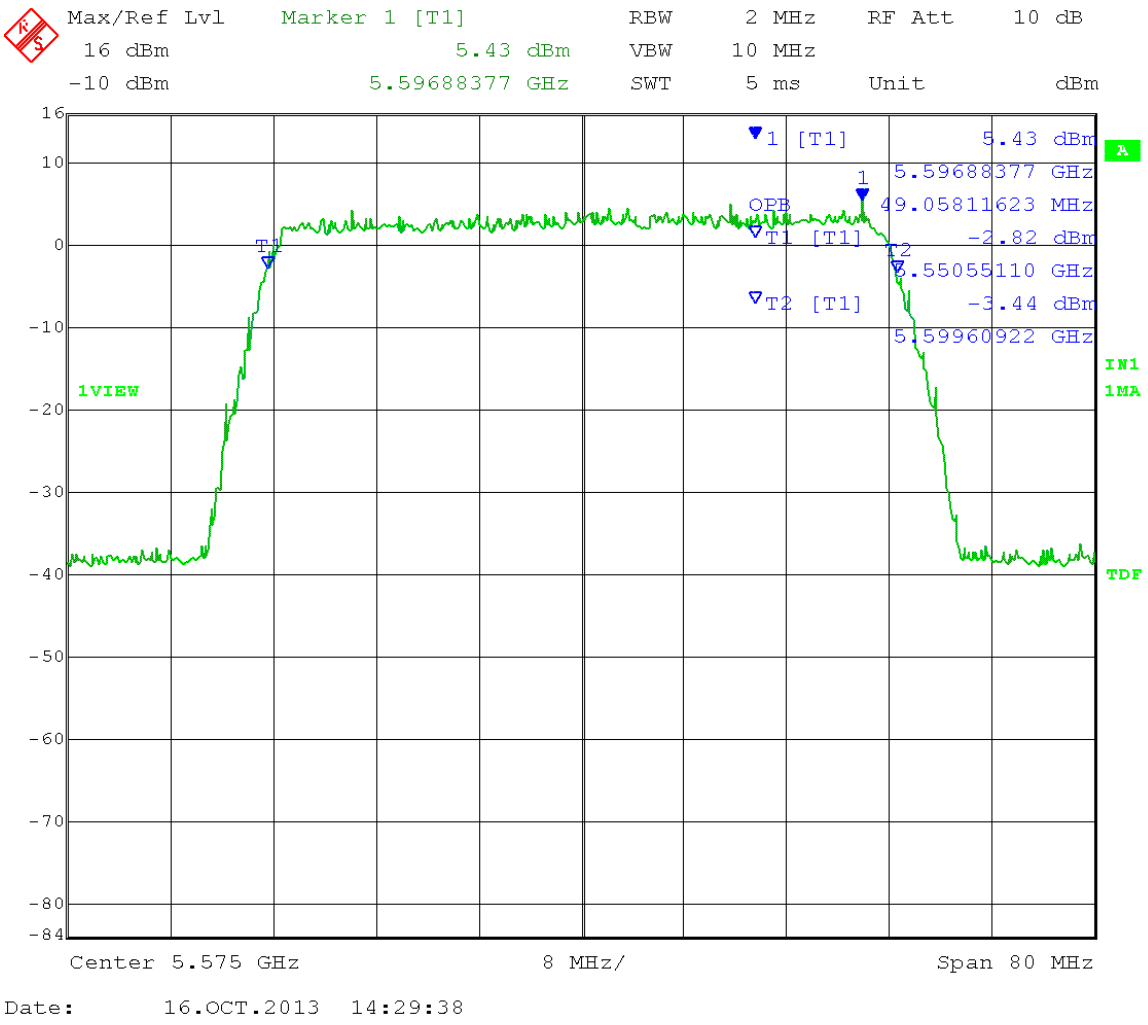
TX 0:

**99% OBW = 49.06MHz**



TX 1:

**99% OBW = 49.06MHz**

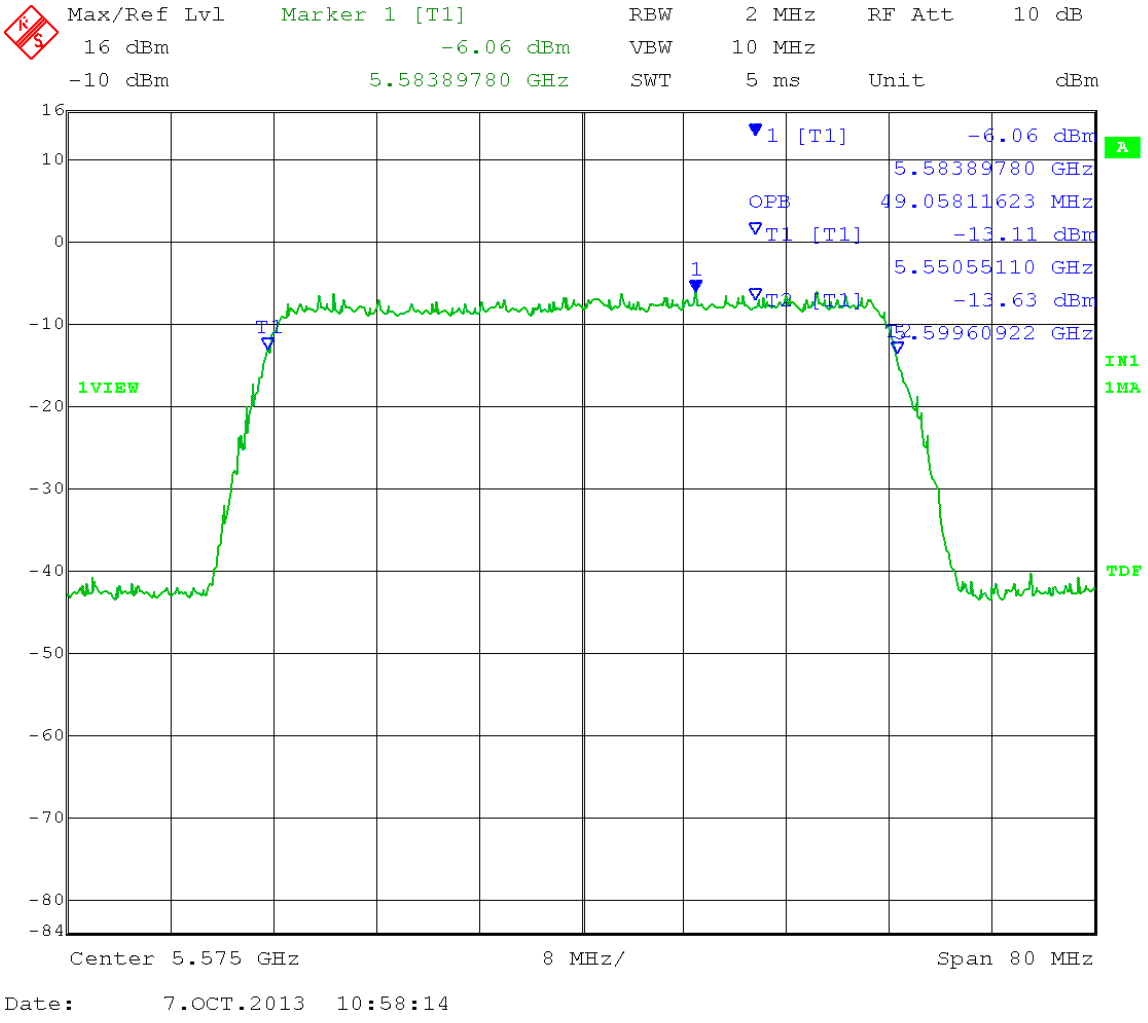



Date: 16.OCT.2013 14:29:38

Test Date: 10-07-2013
Company: Ubiquiti Networks
EUT: Air Fiber 5 - 5.4GHz WiFi Radio
Test: 99% Occupied Bandwidth - Conducted
Operator: Lillian Li
Comment: FCC Test Guidelines for UNII Devices under 15.407 – OET 4/8/2013
- D) 99% Occupied Bandwidth ( Page 4)
RBW = 2MHz VBW = 10MHz
Mid Channel: Transmit = 5.575 GHz 50MHz BW QPSK
Output power setting: 30 dBm eirp

Channel 0:

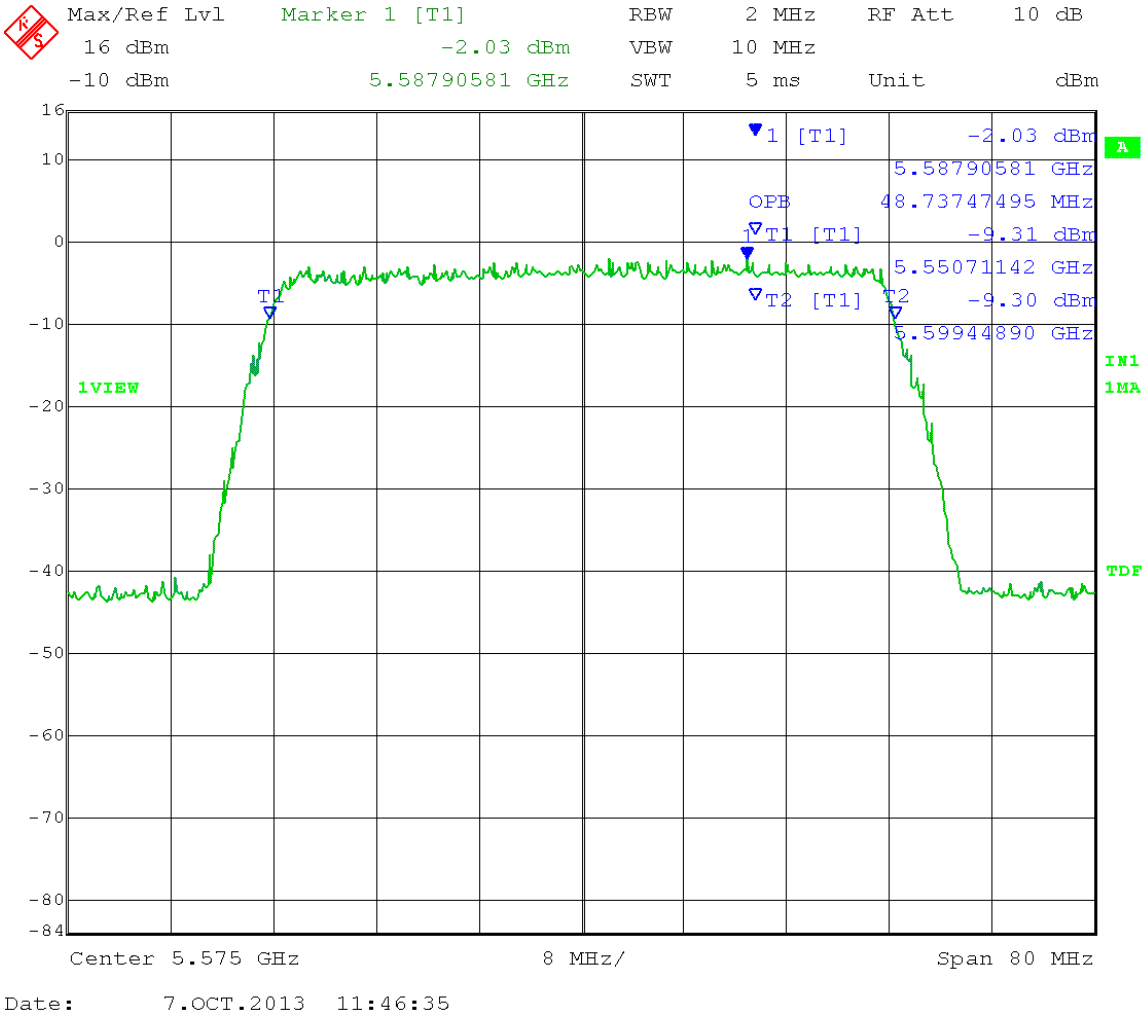
**99% OBW = 49.06MHz**



Test Date: 10-07-2013
Company: Ubiquiti Networks
EUT: Air Fiber 5 - 5.4GHz WiFi Radio
Test: 99% Occupied Bandwidth - Conducted
Operator: Lillian Li
Comment: FCC Test Guidelines for UNII Devices under 15.407 – OET 4/8/2013
- D) 99% Occupied Bandwidth ( Page 4)
RBW = 2MHz VBW = 10MHz
Mid Channel: Transmit = 5.575 GHz 50MHz BW QPSK
Output power setting: 30 dBm eirp

Channel 1:

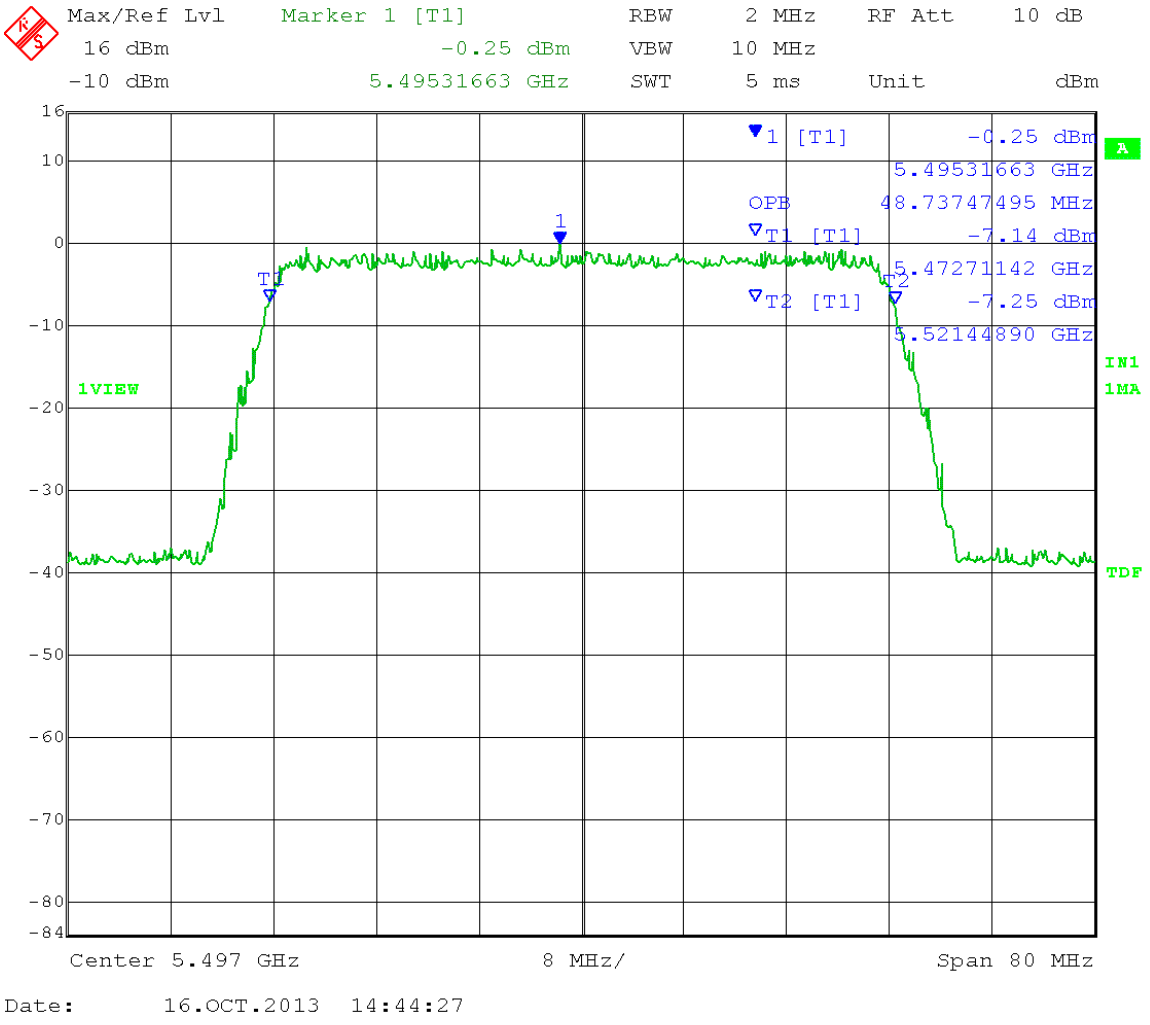
**99% OBW = 48.74MHz**



Test Date: 10-07-2013
Company: Ubiquiti Networks
EUT: Air Fiber 5 - 5.4GHz WiFi Radio
Test: 99% Occupied Bandwidth - Conducted
Operator: Lillian Li
Test Procedure used: KDB 789033 D01 v01r03 – D)
Low Channel: Transmit = 5.497 GHz 50MHz BW 16QAM
Output power setting: 30 dBm eirp

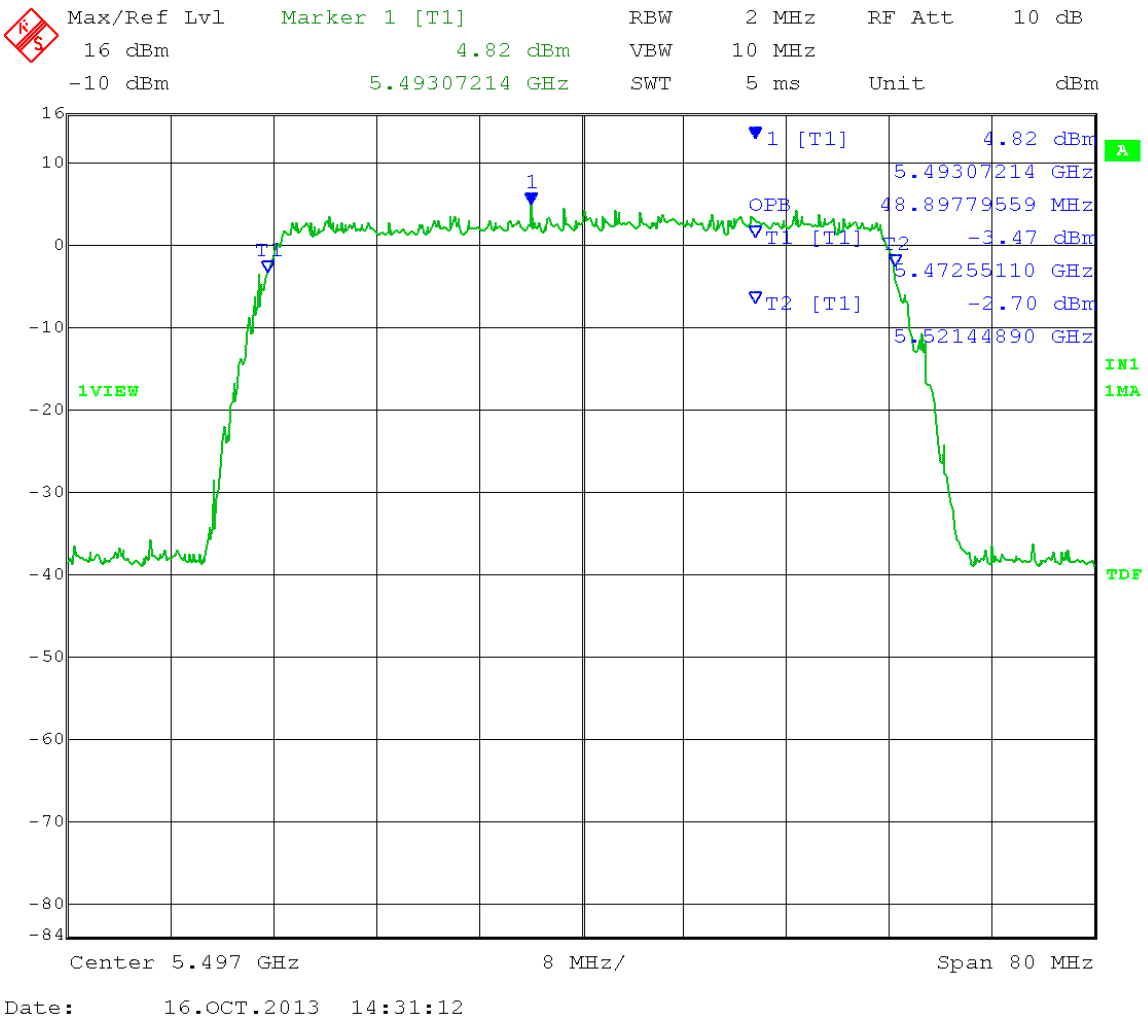
TX 0:

**99% OBW = 48.74MHz**



TX 1:

**99% OBW = 48.90MHz**

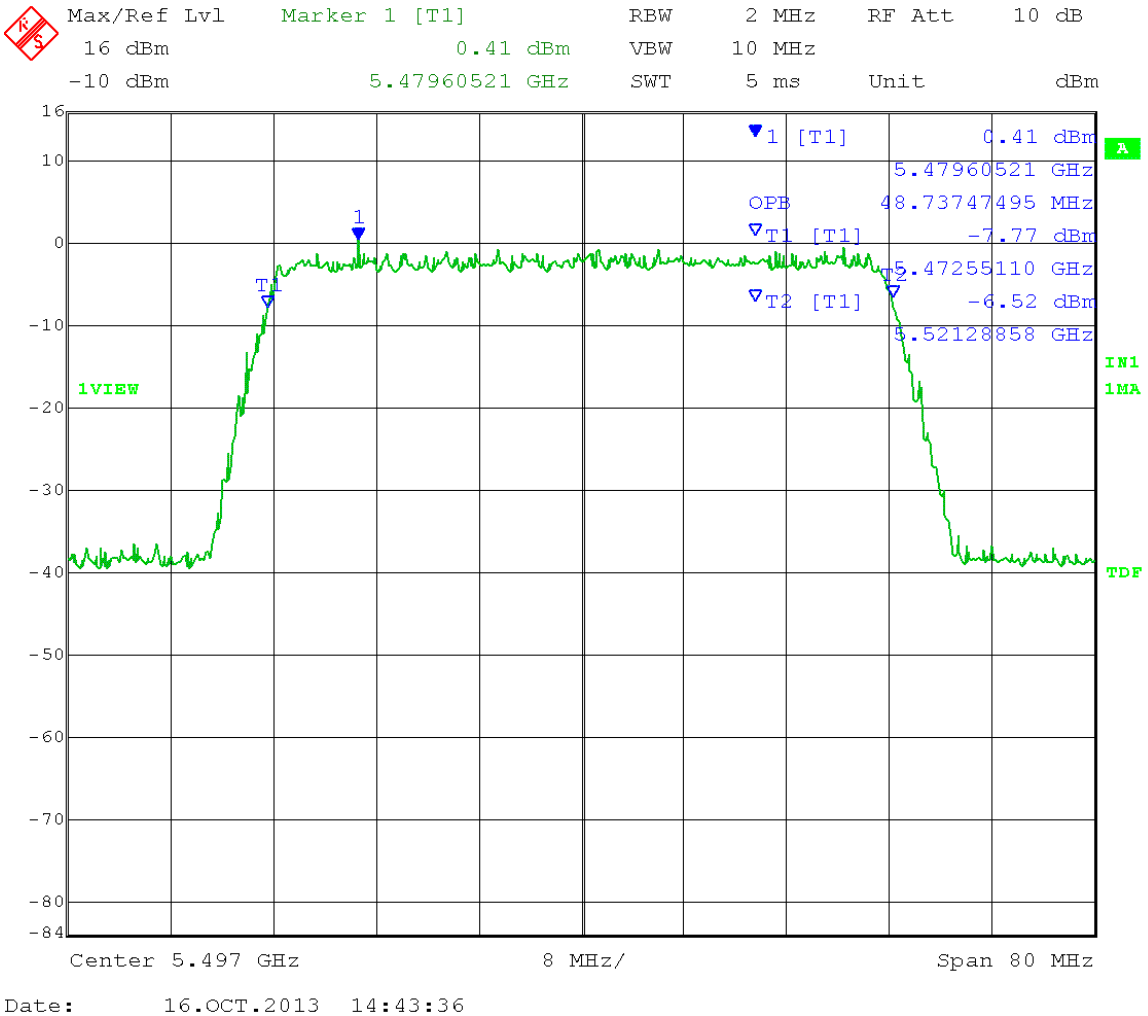



Date: 16.OCT.2013 14:31:12

Test Date: 10-16-2013
Company: Ubiquiti Networks
EUT: Air Fiber 5 - 5.4GHz WiFi Radio
Test: 99% Occupied Bandwidth - Conducted
Operator: Lillian Li
Test Procedure used: KDB 789033 D01 v01r03 – D)
Low Channel: Transmit = 5.497 GHz 50MHz BW 64QAM
Output power setting: 30 dBm eirp

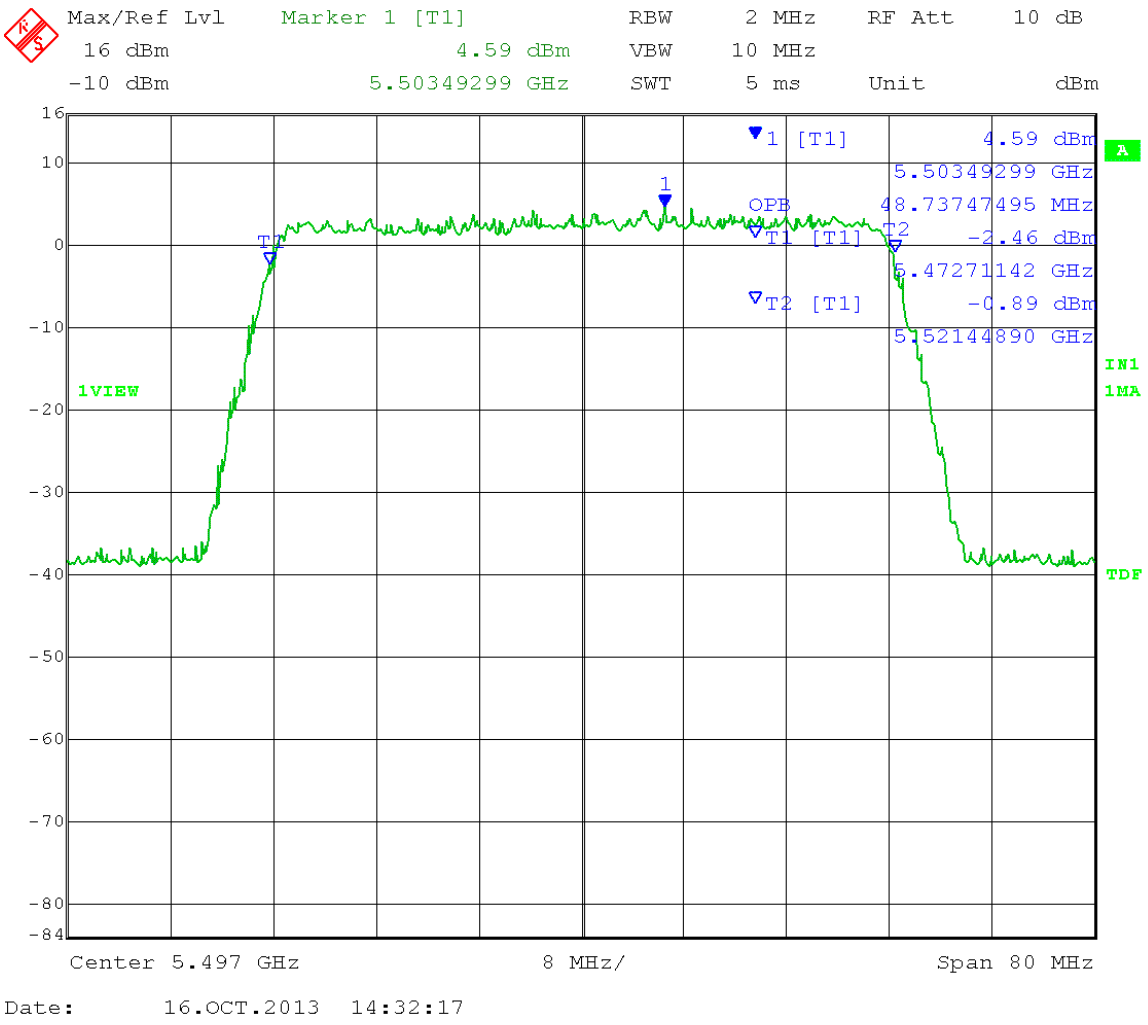
TX 0:

**99% OBW = 48.74MHz**



TX 1:

**99% OBW = 48.74MHz**

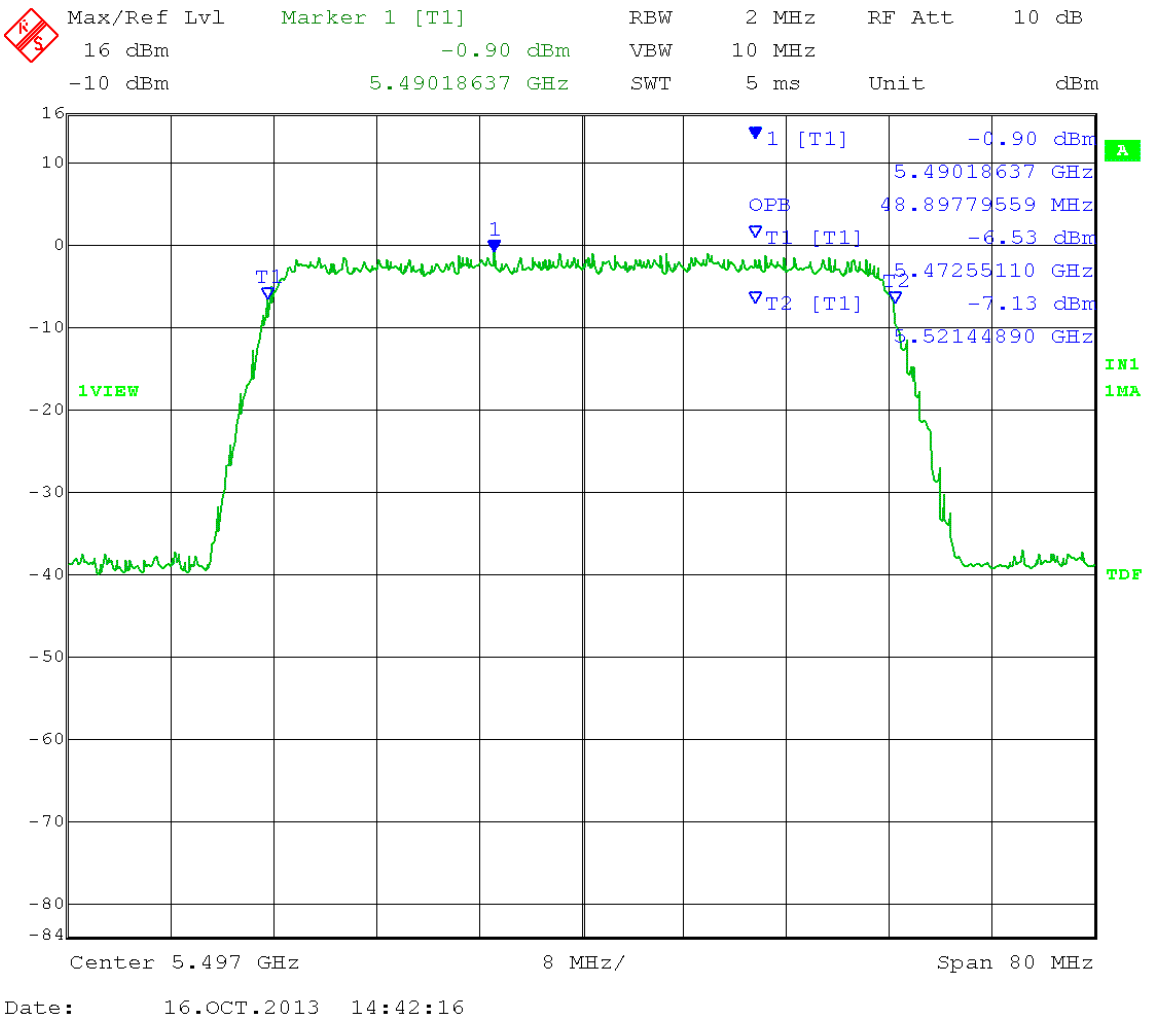



Date: 16.OCT.2013 14:32:17

Test Date: 10-16-2013
Company: Ubiquiti Networks
EUT: Air Fiber 5 - 5.4GHz WiFi Radio
Test: 99% Occupied Bandwidth - Conducted
Operator: Lillian Li
Test Procedure used: KDB 789033 D01 v01r03 – D)
Low Channel: Transmit = 5.497 GHz 50MHz BW 256QAM
Output power setting: 30 dBm eirp

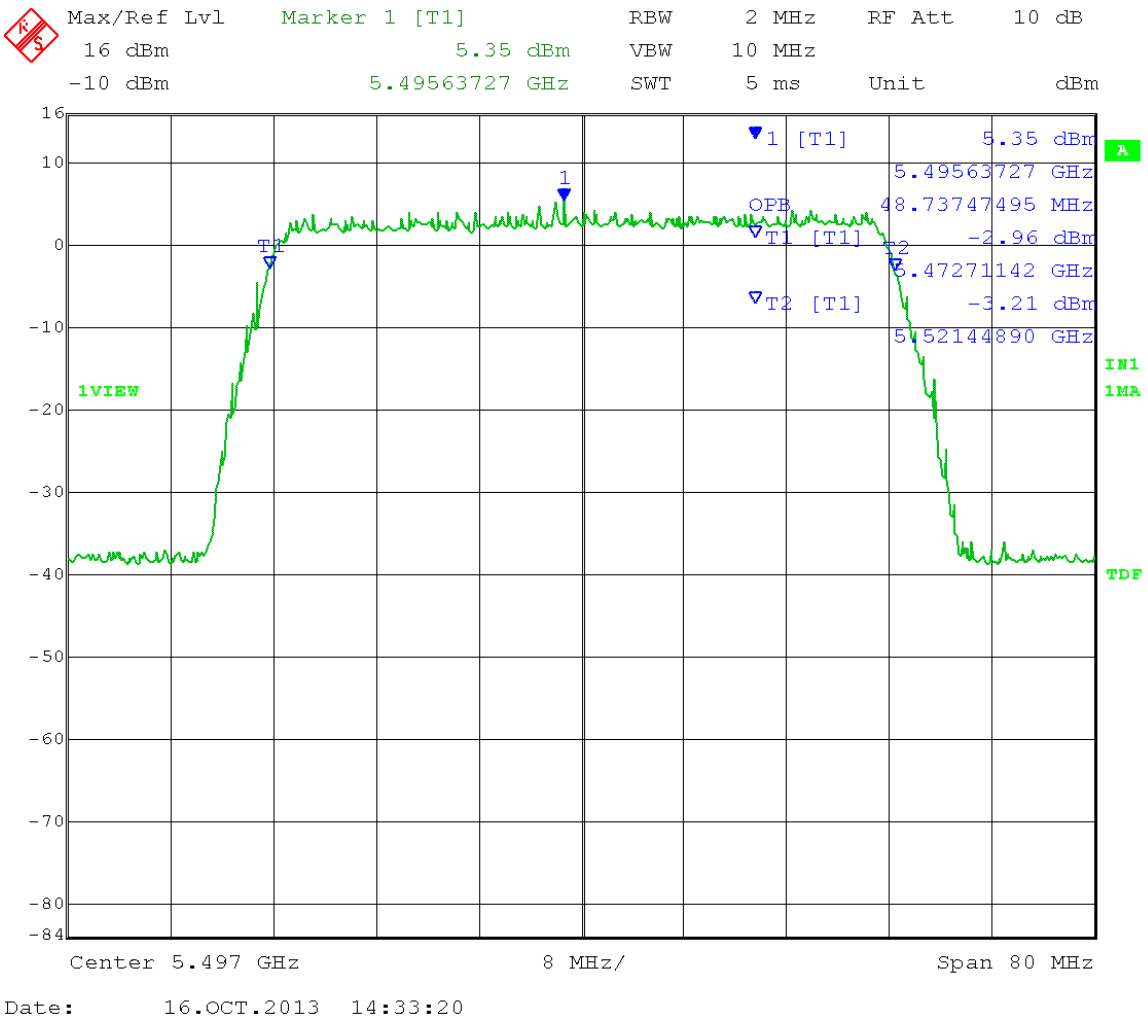
TX 0:

**99% OBW = 48.90MHz**



TX 1:

**99% OBW = 48.74MHz**

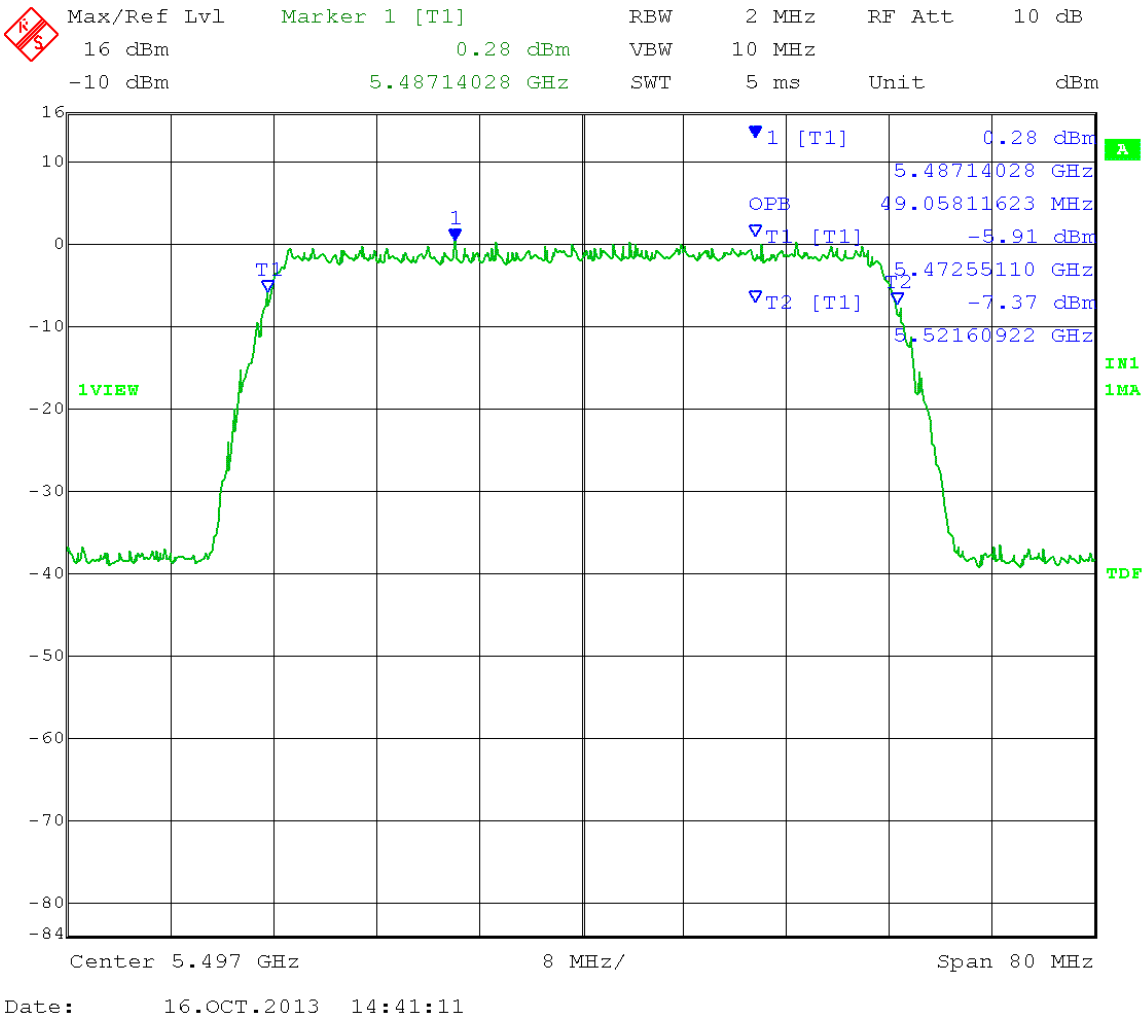



Date: 16.OCT.2013 14:33:20

Test Date: 10-16-2013
Company: Ubiquiti Networks
EUT: Air Fiber 5 - 5.4GHz WiFi Radio
Test: 99% Occupied Bandwidth - Conducted
Operator: Lillian Li
Test Procedure used: KDB 789033 D01 v01r03 – D)
Low Channel: Transmit = 5.497 GHz 50MHz BW 1024QAM
Output power setting: 30 dBm eirp

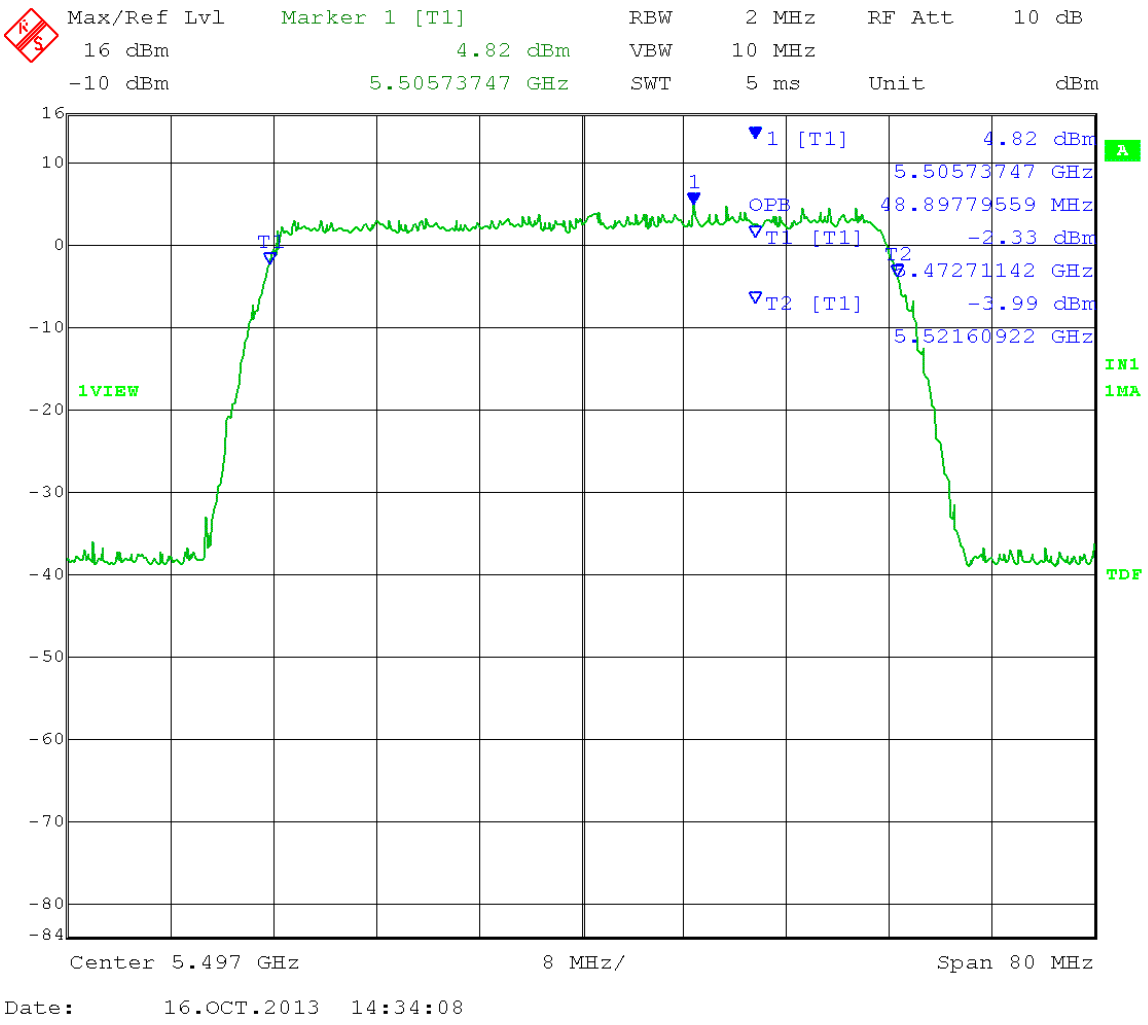
TX 0:

**99% OBW = 49.06MHz**



TX 1:

**99% OBW = 48.90MHz**

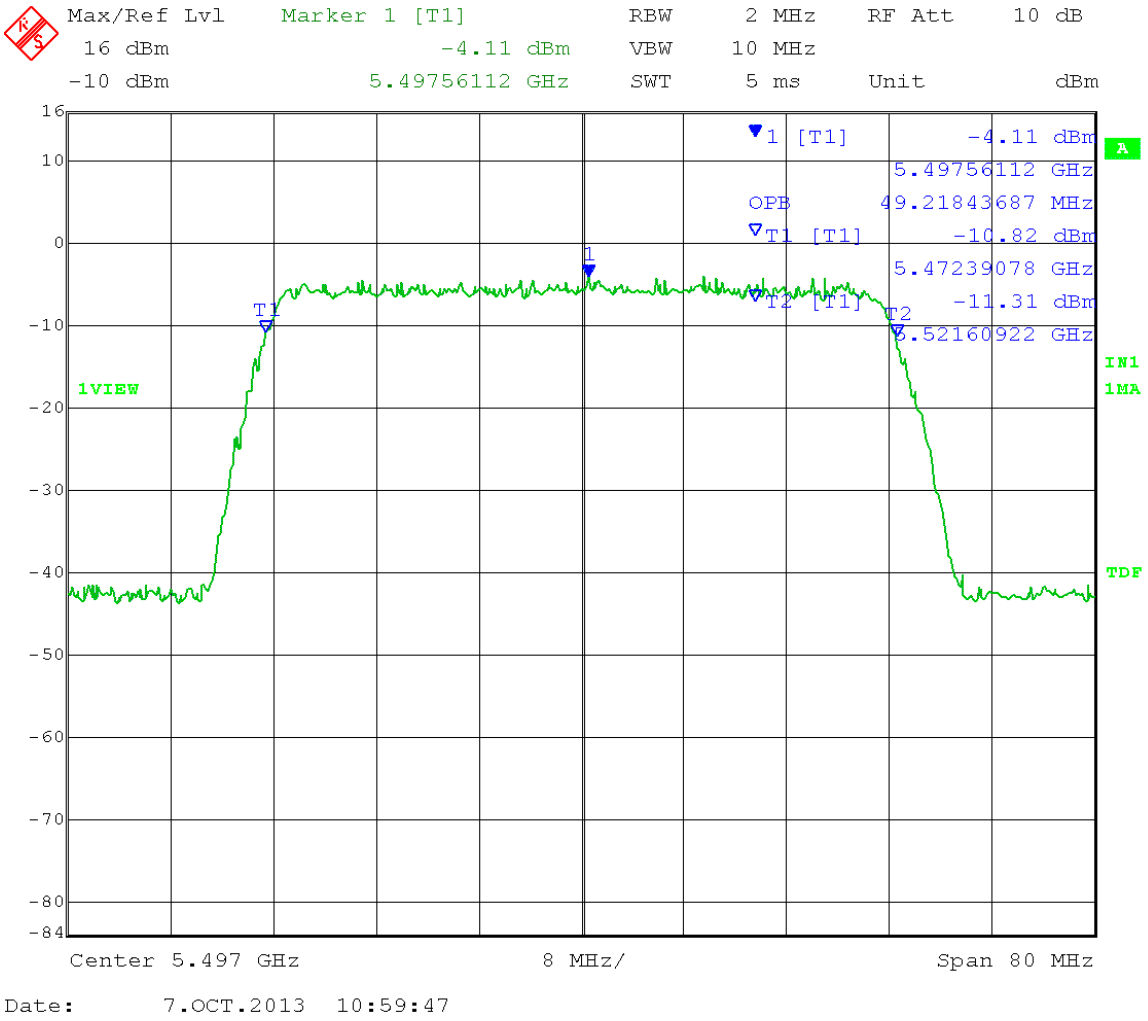



Date: 16.OCT.2013 14:34:08

Test Date: 10-07-2013
Company: Ubiquiti Networks
EUT: Air Fiber 5 - 5.4GHz WiFi Radio
Test: 99% Occupied Bandwidth - Conducted
Operator: Lillian Li
Test Procedure used: KDB 789033 D01 v01r03 – D)
Low Channel: Transmit = 5.497 GHz 50MHz BW QPSK
Output power setting: 30 dBm eirp

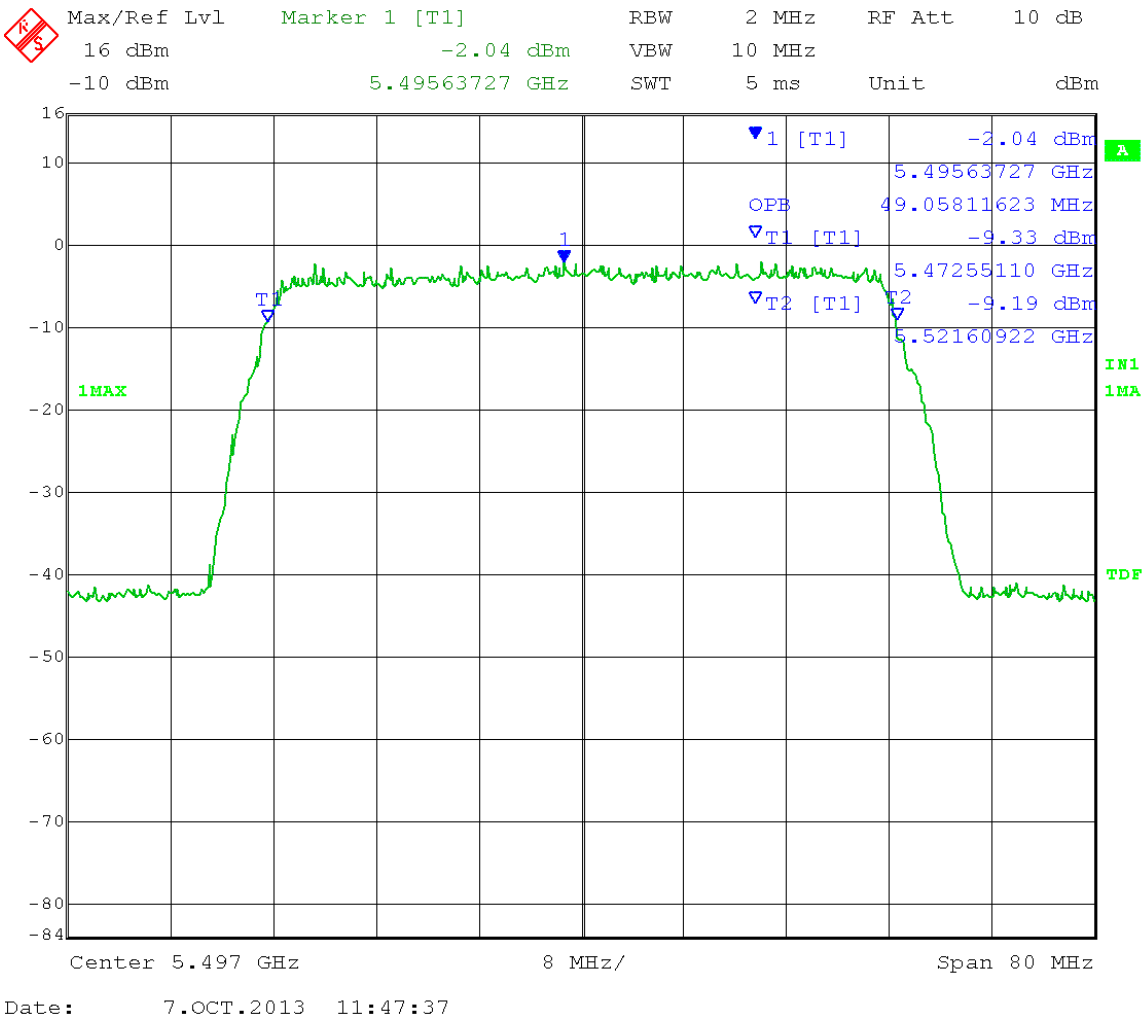
TX 0:

**99% OBW = 49.22MHz**



TX 1:

**99% OBW = 49.06MHz**



## Appendix – Measurement Data

### 4.0 Maximum Conducted Output Power

**Rule Section**: Section 15.407(a)(2)

**Test Procedure:** FCC KDB 789033 D01 General UNII Test Procedures v01r03 – *Guidance for Compliance Testing of Unlicensed National Information Infrastructure (U-NII) Devices – Part 15, Subpart E*

Section E(3)(a) Method PM (Measurement using an RF average power meter): Measurements performed using a wideband RF power meter with a thermocouple detector

**Description:** Measure the average power of each RF output port of the transmitter
Sum the powers of each port in linear power units
Convert linear power units to dBm
Add 10 log (1/x), where x is the duty cycle, to the measured power

**Limit:** Lesser of: 250 mW (24 dBm) or 11 dBm + 10 log B, where B is the 26 dB emission bandwidth in MHz.
Limit shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi

**Results:** Passed

**Notes:** Measurements were taken for QPSK, 16QAM, 64QAM, 256QAM and 1024 QAM modulations at the lowest, middle, and highest channels of operation. EUT was set to transmit continuously.

Output power was set to 30 dBm eirp using special test software.

Test Date: 10-22-2013
Company: Ubiquiti Networks
EUT: Air Fiber 5 - 5.4GHz WiFi Radio
Test: Maximum conducted output power – Conducted
Operator: Lillian L
Test Procedure used: KDB 789033 D01 v01r03 – E)3)a) Method PM
Limit: [15.407(a)(2)]: lesser of 250mW or 11dBm+10log B (B=26dB EBW)
Operating Mode: Point-to-Point; Antenna Gain = 23 dBi
EUT Conducted Limit: = Limit - (23 dBi - 6 dB)

50MHz Operating Bandwidth:

| **FCC Maximum Conducted Output Power** | | 50MHz | | | | |
|---|---|---|---|---|---|---|
| | dBm | QPSK | 16QAM | 64QAM | 256QAM | 1024Q |
| FCC limit ≤ 250mW | *EUT FCC limit:* | *7* | *7* | *7* | *7* | *7* |
| | TX0 (mW) | 2.25 | 2.24 | 2.23 | 2.22 | 2.22 |
| | TX1 (mW) | 2.72 | 2.68 | 2.56 | 2.58 | 2.76 |
| | total(mW) | 4.97 | 4.92 | 4.79 | 4.80 | 4.98 |
| | Total(dBm) | **6.96** | **6.92** | **6.80** | **6.81** | **6.97** |
| HCH = 5698 MHz | Margin | 0.04 | 0.08 | 0.20 | 0.19 | 0.03 |
| | TX0 | 2.33 | 2.32 | 2.33 | 2.36 | 2.45 |
| | TX1 | 2.58 | 2.51 | 2.49 | 2.63 | 2.5 |
| | total(mW) | 4.91 | 4.83 | 4.82 | 4.99 | 4.95 |
| | Total(dBm) | **6.91** | **6.84** | **6.83** | **6.98** | **6.95** |
| MCH = 5575 MHz | Margin | 0.09 | 0.16 | 0.17 | 0.02 | 0.05 |
| | TX0 | 2.36 | 2.36 | 2.37 | 2.36 | 2.36 |
| | TX1 | 2.53 | 2.58 | 2.56 | 2.52 | 2.5 |
| | total(mW) | 4.89 | 4.94 | 4.93 | 4.88 | 4.86 |
| | Total(dBm) | **6.89** | **6.94** | **6.93** | **6.88** | **6.87** |
| LCH = 5497 MHz | Margin | 0.11 | 0.06 | 0.07 | 0.12 | 0.13 |

## Appendix – Measurement Data

**5.0 Unwanted Emission Levels –** Radiated Restricted Band-Edge
Radiated with antenna connected

**Rule Part:** FCC Part 15.407(b)(7) and FCC Part 15.205

**Test Procedure:** FCC KDB 789033 D01 General UNII Test Procedures v01r03 – *Guidance for Compliance Testing of Unlicensed National Information Infrastructure (U-NII) Devices – Part 15, Subpart E*

Section H(1) – Unwanted emissions in the restricted bands
Section H(3) – General Requirements for Unwanted Emissions Measurements
Section H(5) – Procedure for Peak Unwanted Emissions Measurements Above 1 GHz
Section H(6) – Procedure for Average Unwanted Emissions Measurements Above 1 GHz
Section H(6)(c) – Average Detection method

**Limit:** FCC Part 15.209

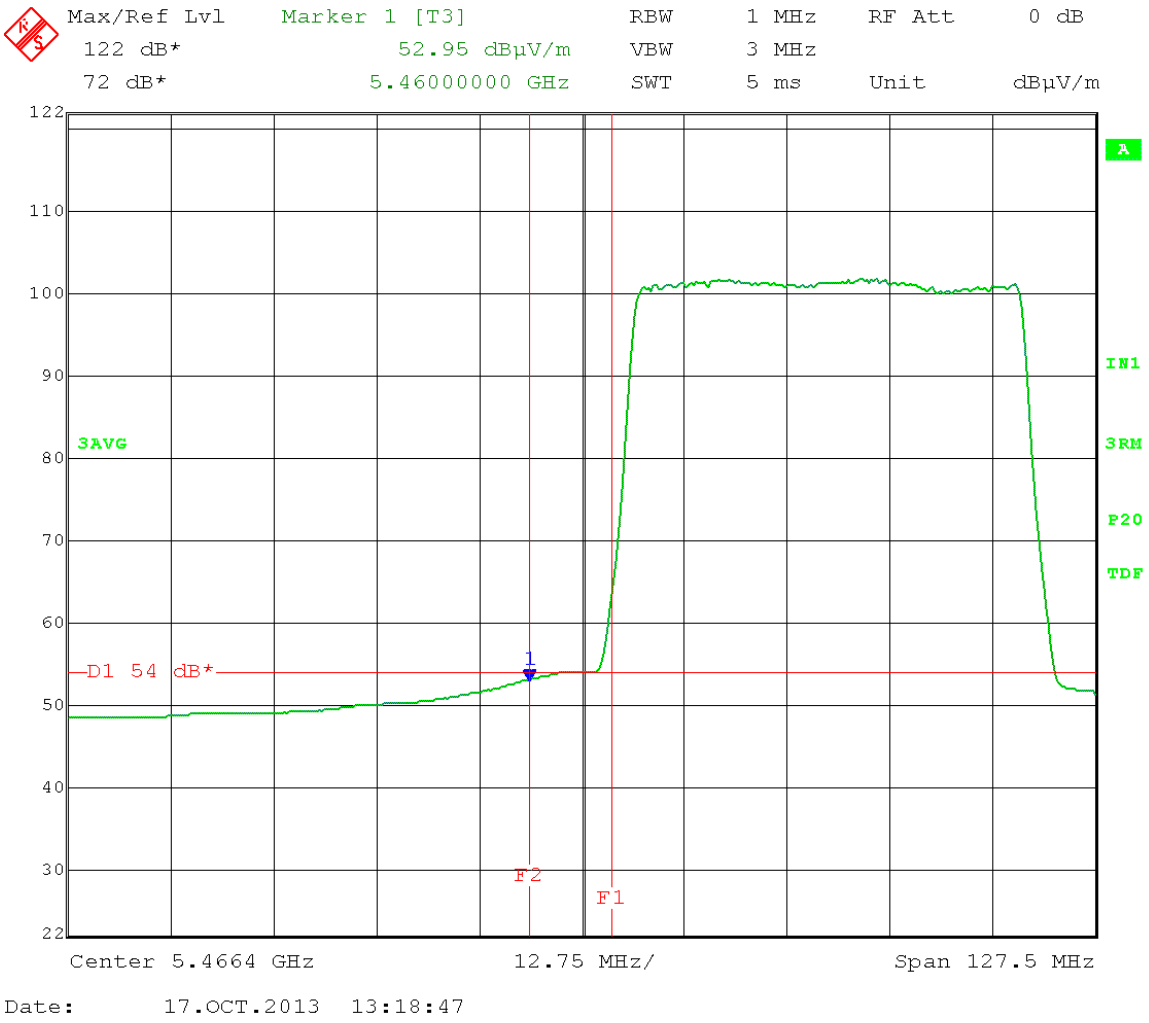
**Results:** Compliant

**Notes:** Because the lower operating band-edge is near a restricted band, compliance with this restricted band was determined by measuring the field strength of the lower channel emission at the restricted band edge.

Measurements were taken for QPSK, 16QAM, 64QAM, 256QAM and 1024QAM modulations at the lowest channel of operation. The EUT was set to transmit continuously.

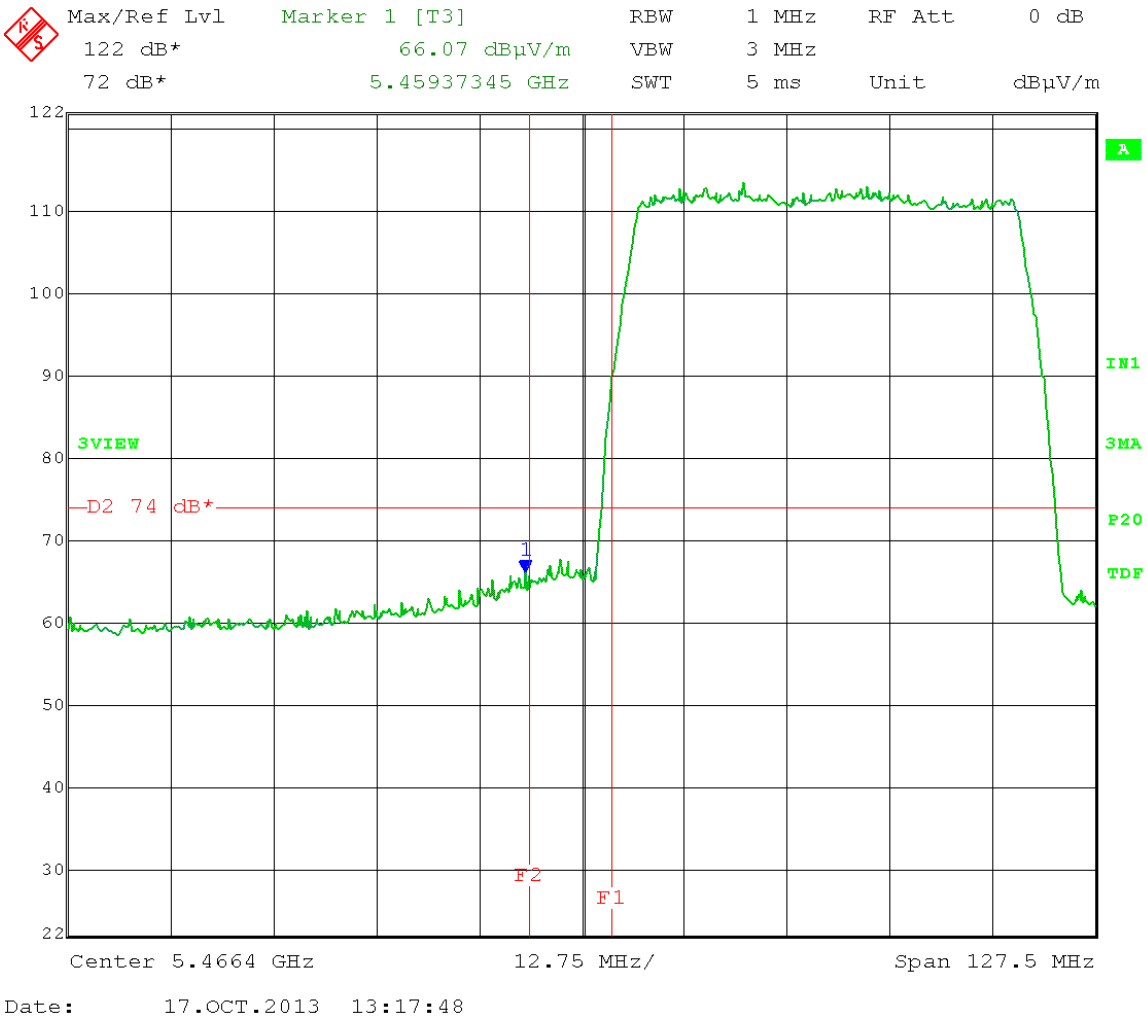
Both transmit chains active. Output power was set to 30 dBm eirp using special test software.

Test Date: 10-17-2013
Company: Ubiquiti Networks
EUT: AF5
Test: Lower Restricted Band-Edge Compliance - Radiated – AVG (FCC 15.407(b)(7))
Operator: Craig B
Comment: 50 MHz channel Bandwidth
Low Channel: Frequency – 5497 MHz
Modulation: 1024QAM
Horizontal
Restricted Band-Edge Frequency: 5460 MHz (F2)
Band-Edge Limit: 54 dBµV/m AVERAGE at a test distance of 3 meters.



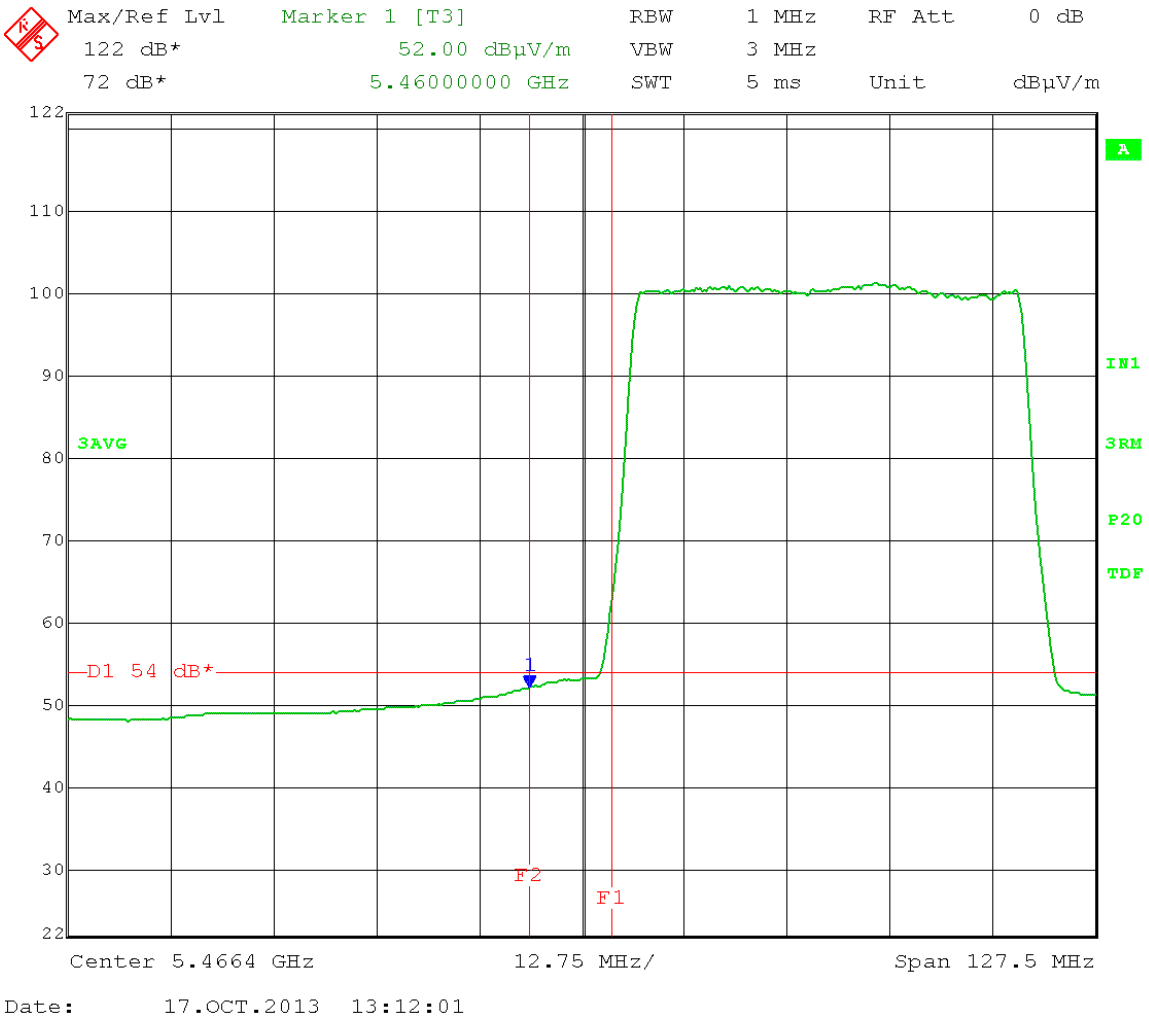

Date: 17.OCT.2013 13:18:47

Test Date: 10-17-2013
Company: Ubiquiti Networks
EUT: AF5
Test: Lower Restricted Band-Edge Compliance - Radiated – Peak (FCC 15.407(b)(7))
Operator: Craig B
Comment: 50 MHz channel Bandwidth
Low Channel: Frequency – 5497 MHz
Modulation: 1024QAM
Horizontal
Restricted Band-Edge Frequency: 5460 MHz (F2)
Band-Edge Limit: 74 dBµV/m PEAK at a test distance of 3 meters.



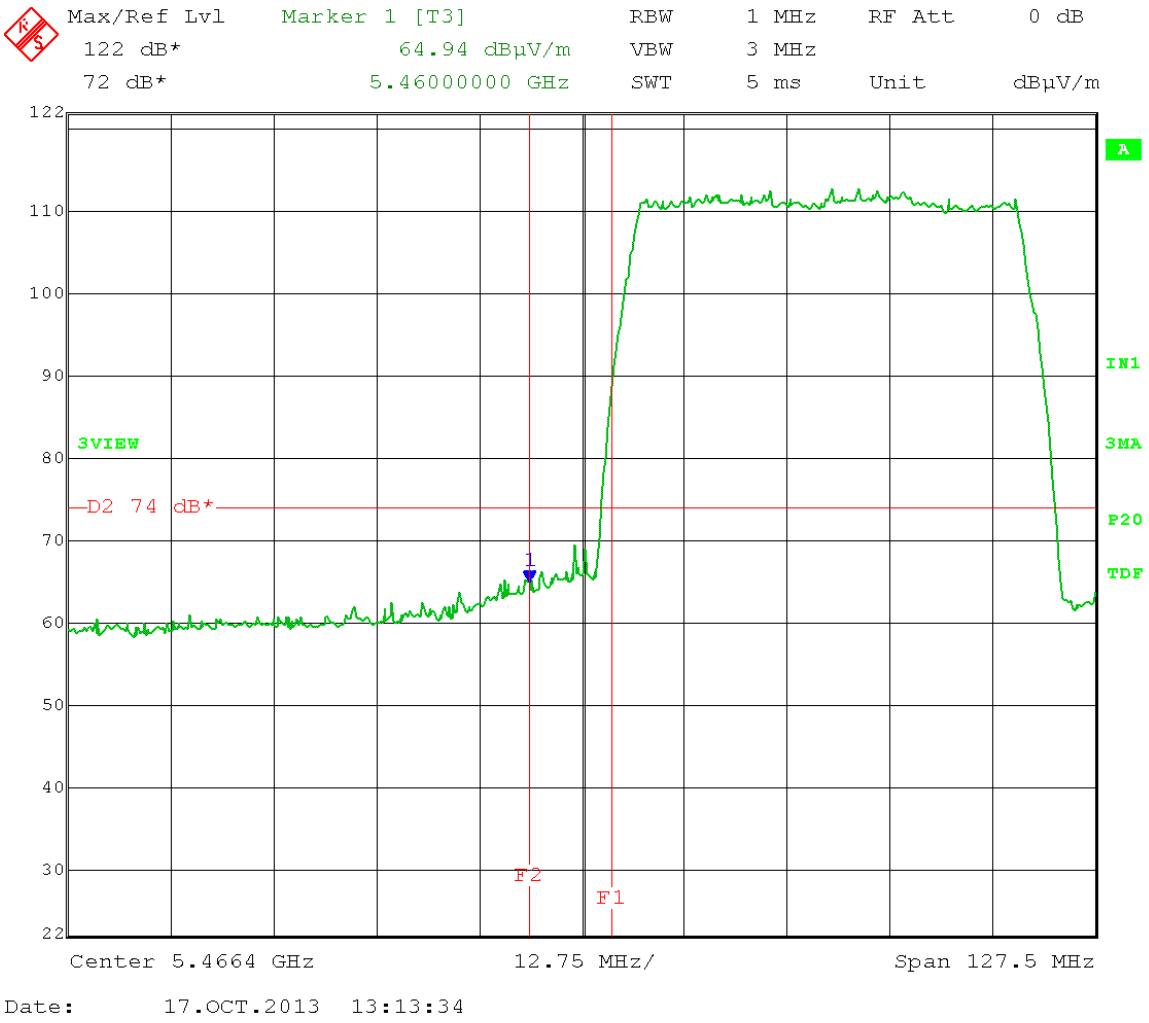

Date: 17.OCT.2013 13:17:48

Test Date: 10-17-2013
Company: Ubiquiti Networks
EUT: AF5
Test: Lower Restricted Band-Edge Compliance - Radiated – AVG (FCC 15.407(b)(7))
Operator: Craig B
Comment: 50 MHz channel Bandwidth
Low Channel: Frequency – 5497 MHz
Modulation: 1024QAM
Vertical
Restricted Band-Edge Frequency: 5460 MHz (F2)
Band-Edge Limit: 54 dBµV/m AVERAGE at a test distance of 3 meters.



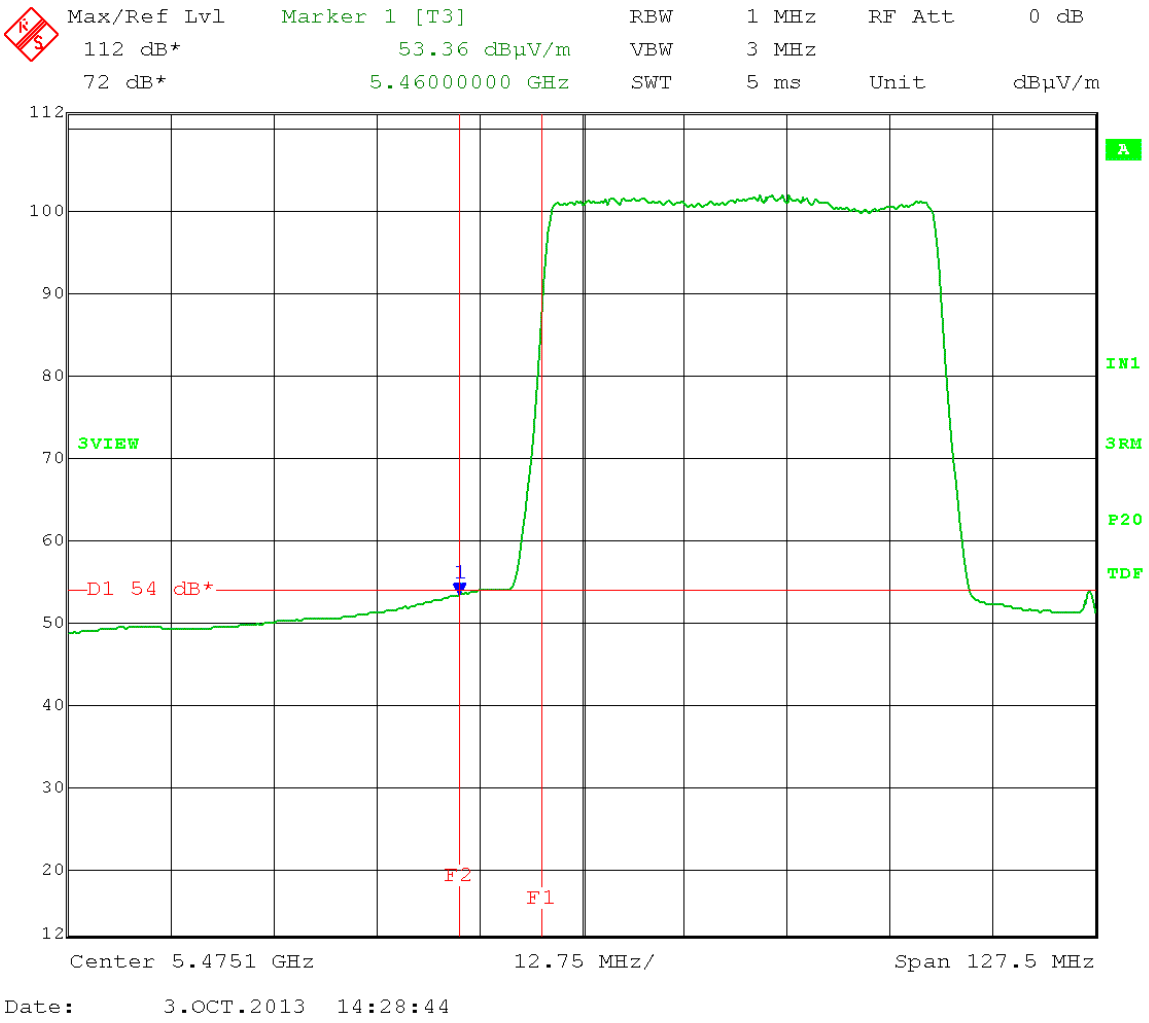

Date: 17.OCT.2013 13:12:01

Test Date: 10-17-2013
Company: Ubiquiti Networks
EUT: AF5
Test: Lower Restricted Band-Edge Compliance - Radiated – Peak (FCC 15.407(b)(7))
Operator: Craig B
Comment: 50 MHz channel Bandwidth
Low Channel: Frequency – 5497 MHz
Modulation: 1024QAM
Vertical
Restricted Band-Edge Frequency: 5460 MHz (F2)
Band-Edge Limit: 74 dBµV/m PEAK at a test distance of 3 meters.



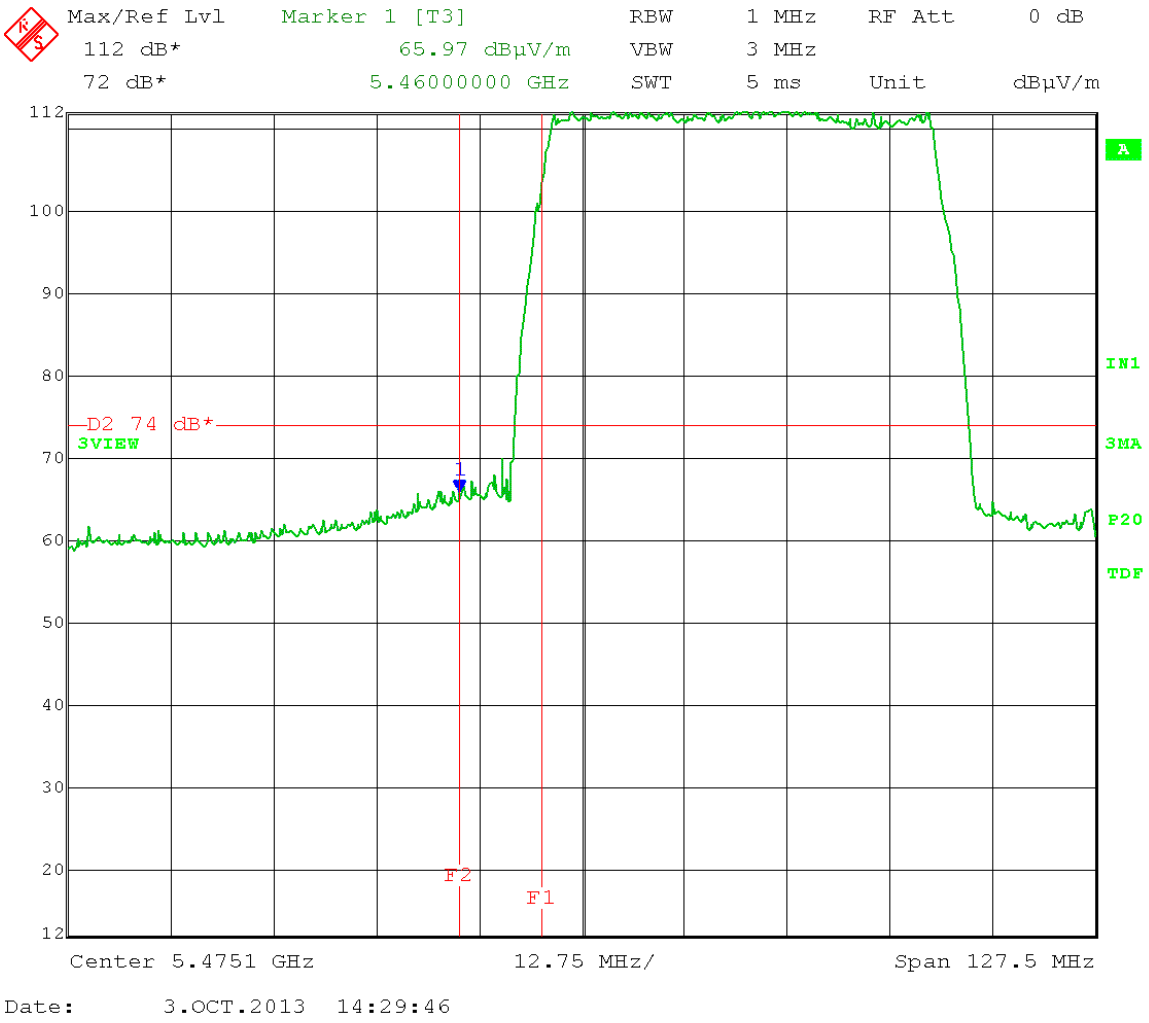

Date: 17.OCT.2013 13:13:34

Test Date: 10-03-2013
Company: Ubiquiti Networks
EUT: AF5
Test: Lower Restricted Band-Edge Compliance - Radiated – AVG (FCC 15.407(b)(7))
Operator: Craig B
Comment: 50 MHz channel Bandwidth
Low Channel: Frequency – 5495 MHz
Modulation: 16QAM
Horizontal
Restricted Band-Edge Frequency: 5460 MHz (F2)
Band-Edge Limit: 54 dBµV/m AVERAGE at a test distance of 3 meters.

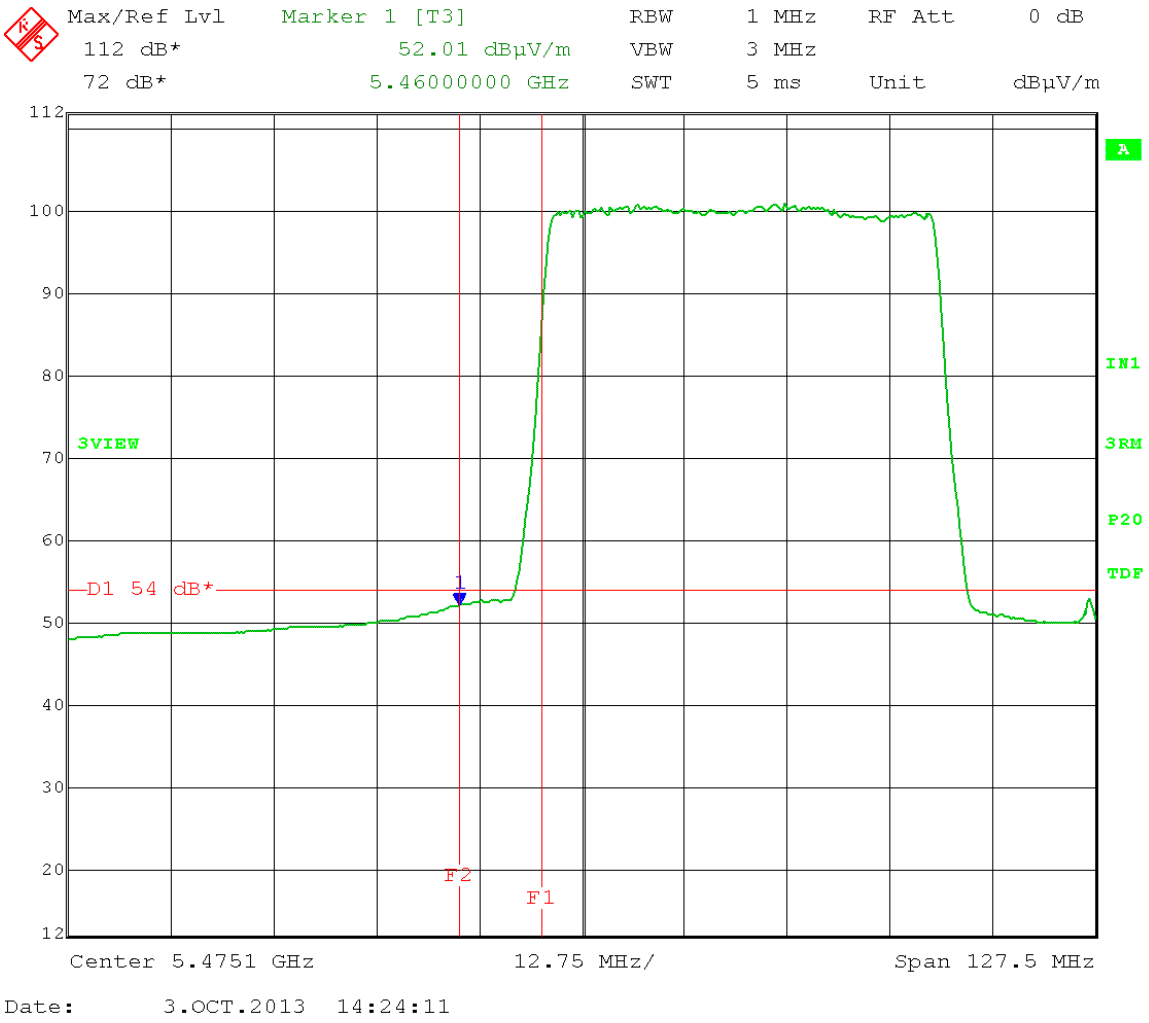



Date: 3.OCT.2013 14:28:44

Test Date: 10-03-2013
Company: Ubiquiti Networks
EUT: AF5
Test: Lower Restricted Band-Edge Compliance - Radiated – Peak (FCC 15.407(b)(7))
Operator: Craig B
Comment: 50 MHz channel Bandwidth
Low Channel: Frequency – 5495 MHz
Modulation: 16QAM
Horizontal
Restricted Band-Edge Frequency: 5460 MHz (F2)
Band-Edge Limit: 74 dBµV/m PEAK at a test distance of 3 meters.

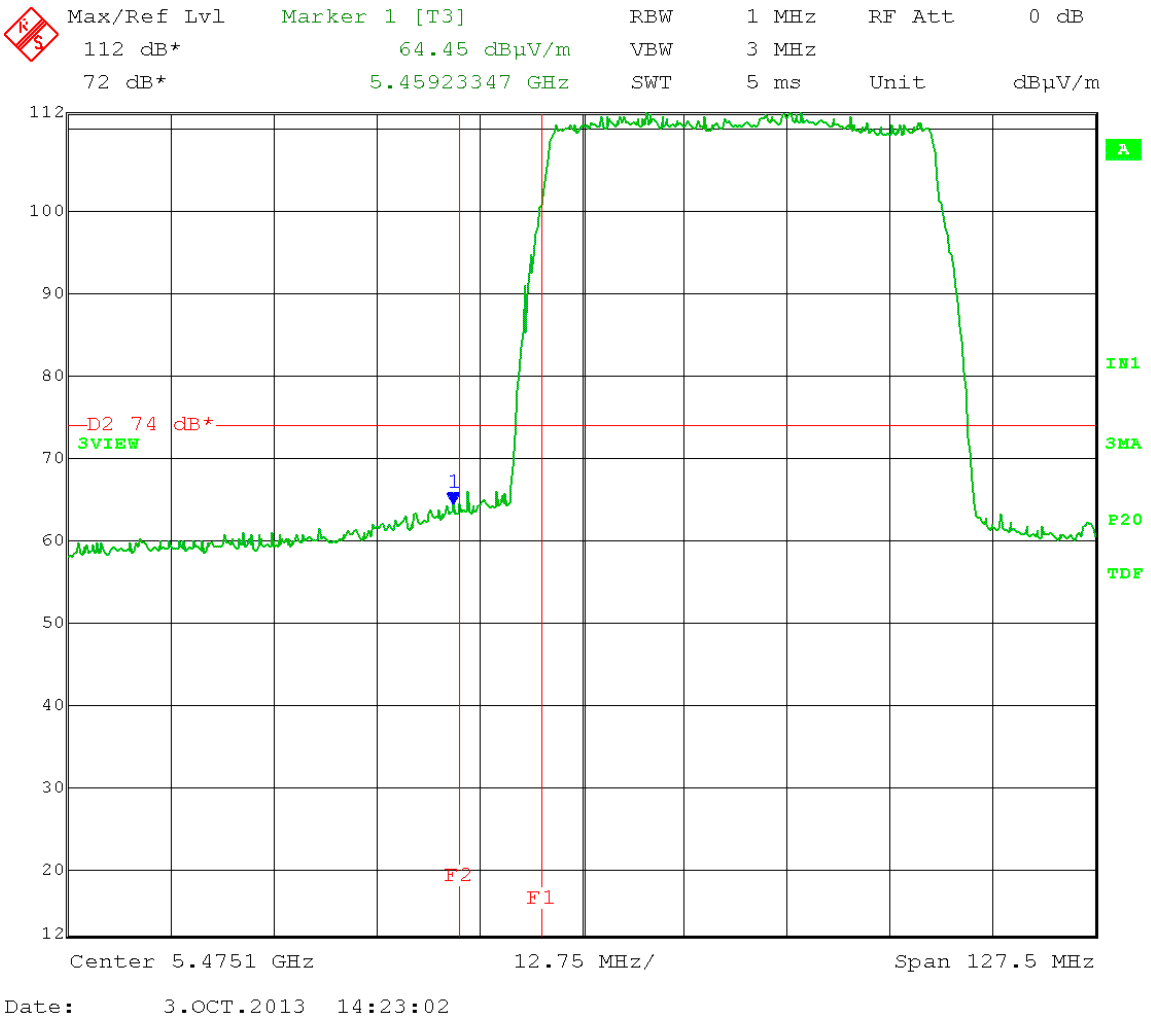


Test Date: 10-03-2013
Company: Ubiquiti Networks
EUT: AF5
Test: Lower Restricted Band-Edge Compliance - Radiated – AVG (FCC 15.407(b)(7))
Operator: Craig B
Comment: 50 MHz channel Bandwidth
Low Channel: Frequency – 5495 MHz
Modulation: 16QAM
Vertical
Restricted Band-Edge Frequency: 5460 MHz (F2)
Band-Edge Limit: 54 dBµV/m AVERAGE at a test distance of 3 meters.



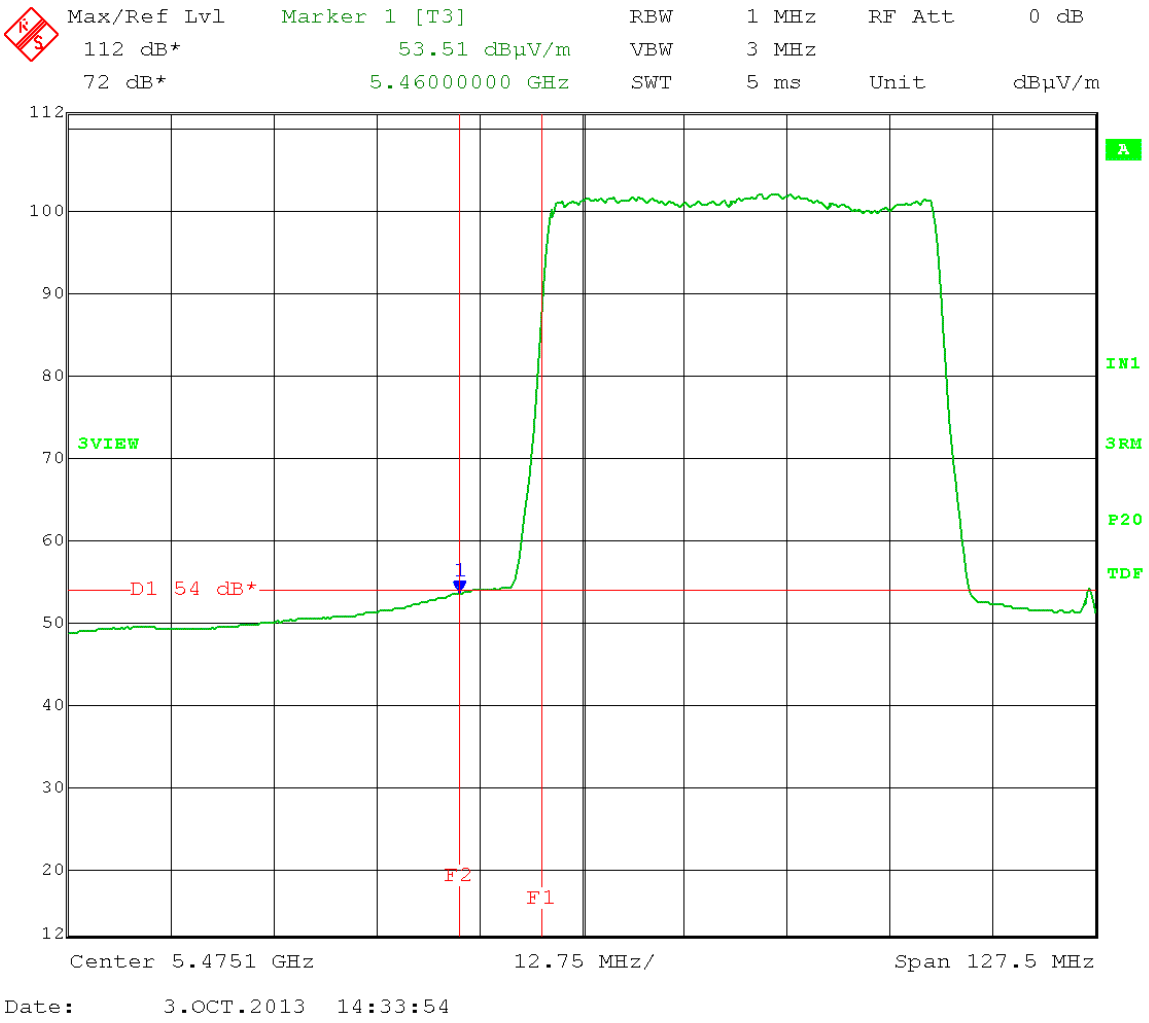

Date: 3.OCT.2013 14:24:11

Test Date: 10-03-2013
Company: Ubiquiti Networks
EUT: AF5
Test: Lower Restricted Band-Edge Compliance - Radiated – Peak (FCC 15.407(b)(7))
Operator: Craig B
Comment: 50 MHz channel Bandwidth
Low Channel: Frequency – 5495 MHz
Modulation: 16QAM
Vertical
Restricted Band-Edge Frequency: 5460 MHz (F2)
Band-Edge Limit: 74 dBµV/m PEAK at a test distance of 3 meters.



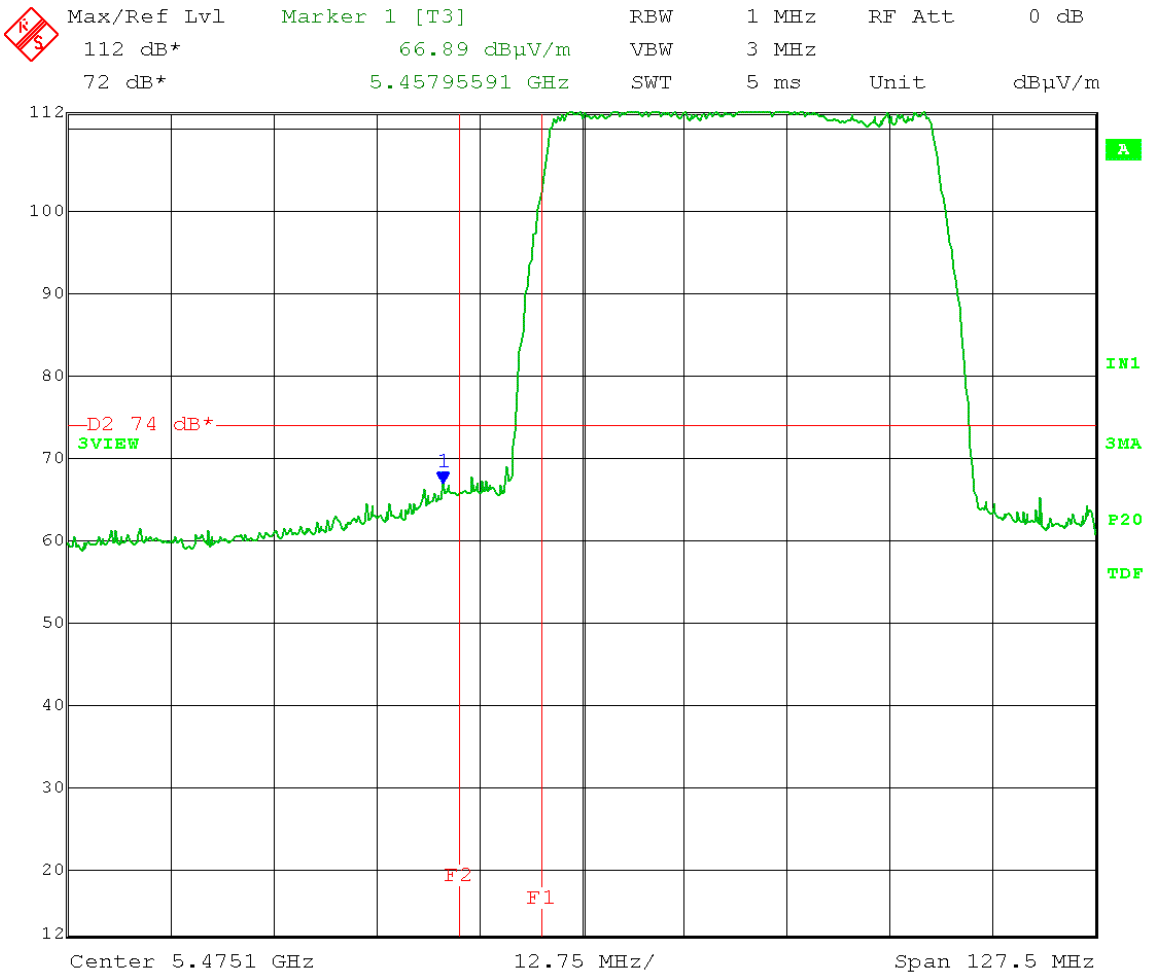

Date: 3.OCT.2013 14:23:02

Test Date: 10-03-2013
Company: Ubiquiti Networks
EUT: AF5
Test: Lower Restricted Band-Edge Compliance - Radiated – AVG (FCC 15.407(b)(7))
Operator: Craig B
Comment: 50 MHz channel Bandwidth
Low Channel: Frequency – 5495 MHz
Modulation: 256QAM
Horizontal
Restricted Band-Edge Frequency: 5460 MHz (F2)
Band-Edge Limit: 54 dBµV/m AVERAGE at a test distance of 3 meters.



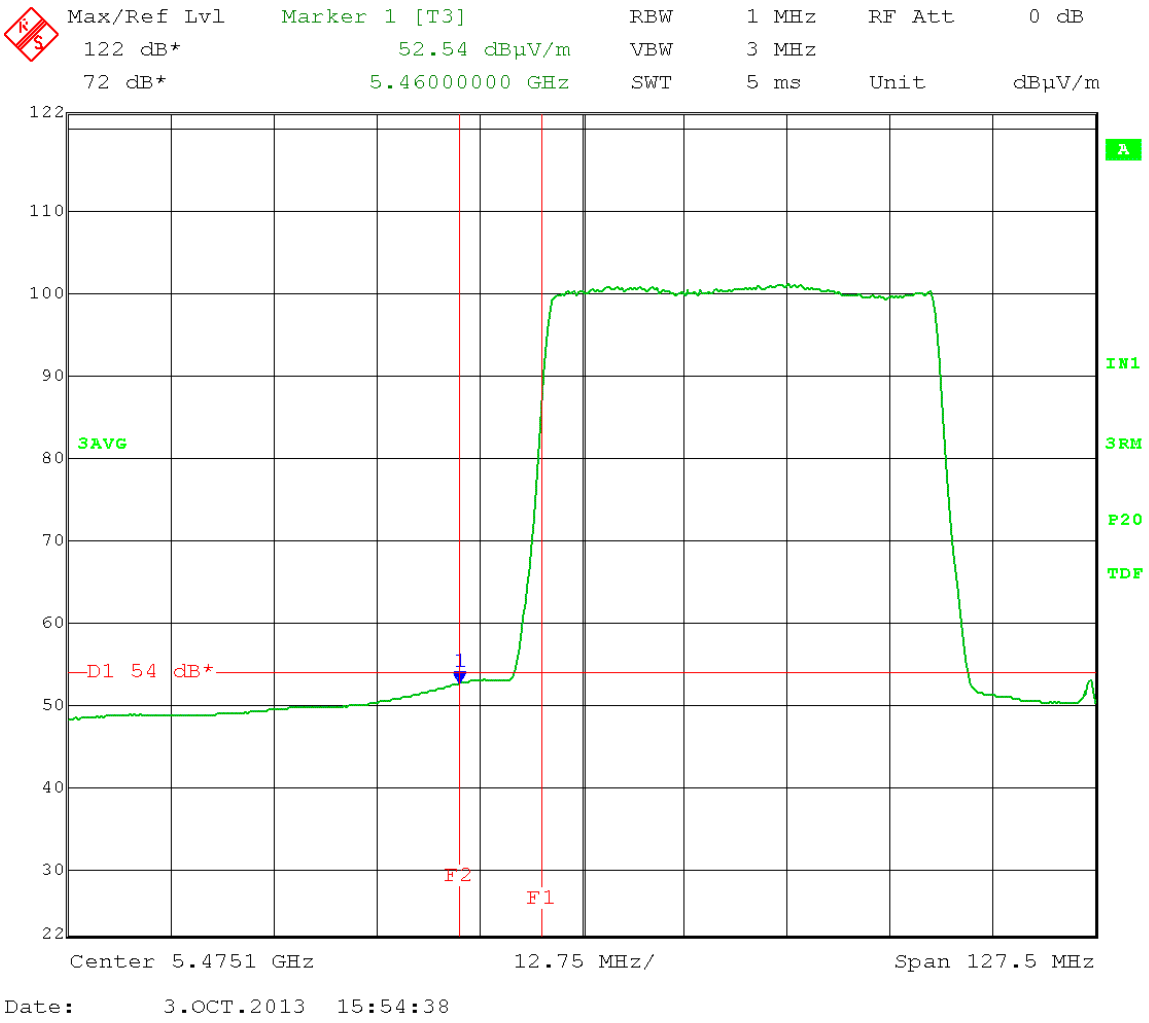

Date: 3.OCT.2013 14:33:54

Test Date: 10-03-2013
Company: Ubiquiti Networks
EUT: AF5
Test: Lower Restricted Band-Edge Compliance - Radiated – Peak (FCC 15.407(b)(7))
Operator: Craig B
Comment: 50 MHz channel Bandwidth
Low Channel: Frequency – 5495 MHz
Modulation: 256QAM
Horizontal
Restricted Band-Edge Frequency: 5460 MHz (F2)
Band-Edge Limit: 74 dBµV/m PEAK at a test distance of 3 meters.



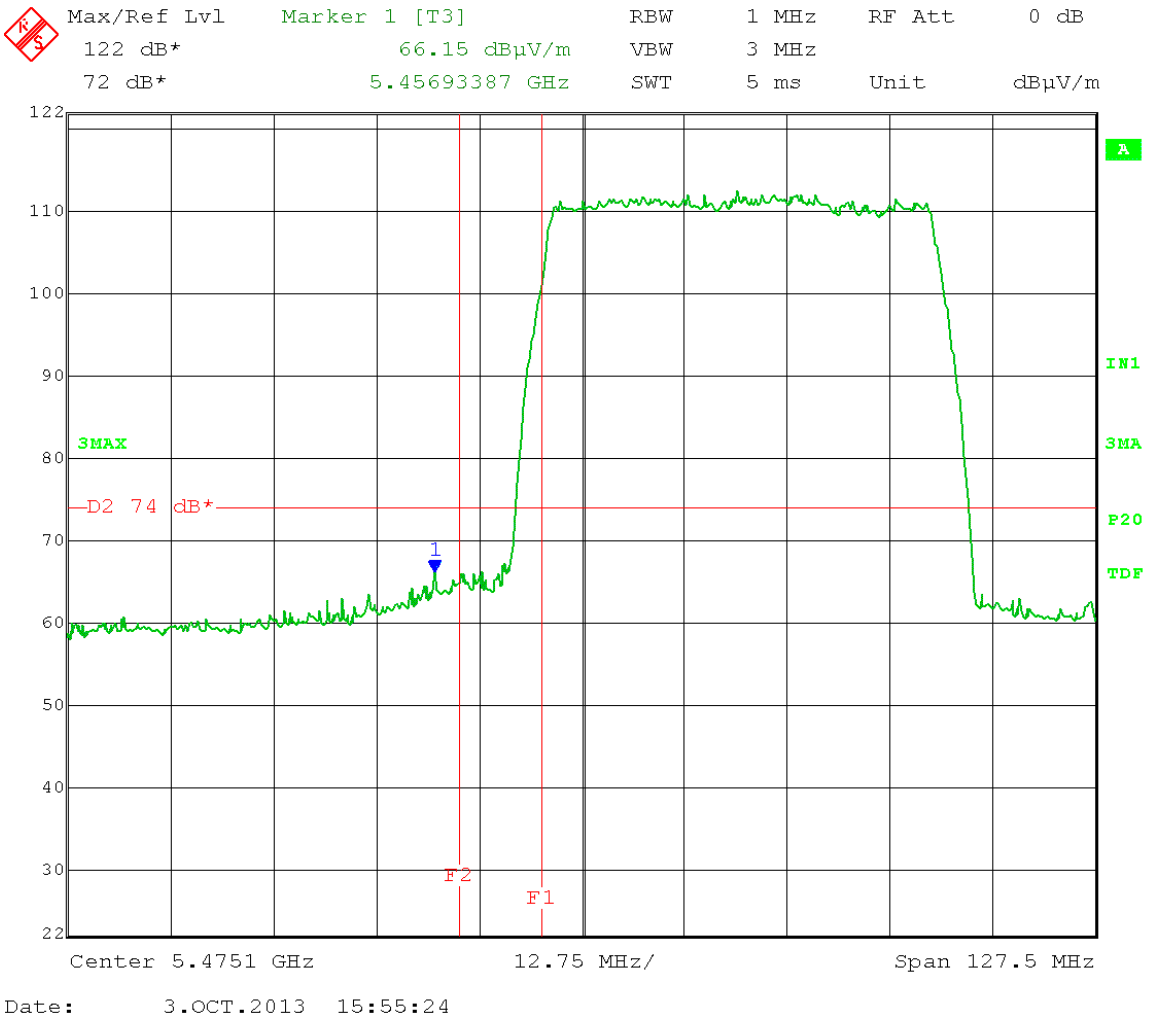

Date: 3.OCT.2013 14:34:55

Test Date: 10-03-2013
Company: Ubiquiti Networks
EUT: AF5
Test: Lower Restricted Band-Edge Compliance - Radiated – AVG (FCC 15.407(b)(7))
Operator: Craig B
Comment: 50 MHz channel Bandwidth
Low Channel: Frequency – 5495 MHz
Modulation: 256QAM
Vertical
Restricted Band-Edge Frequency: 5460 MHz (F2)
Band-Edge Limit: 54 dBµV/m AVERAGE at a test distance of 3 meters.



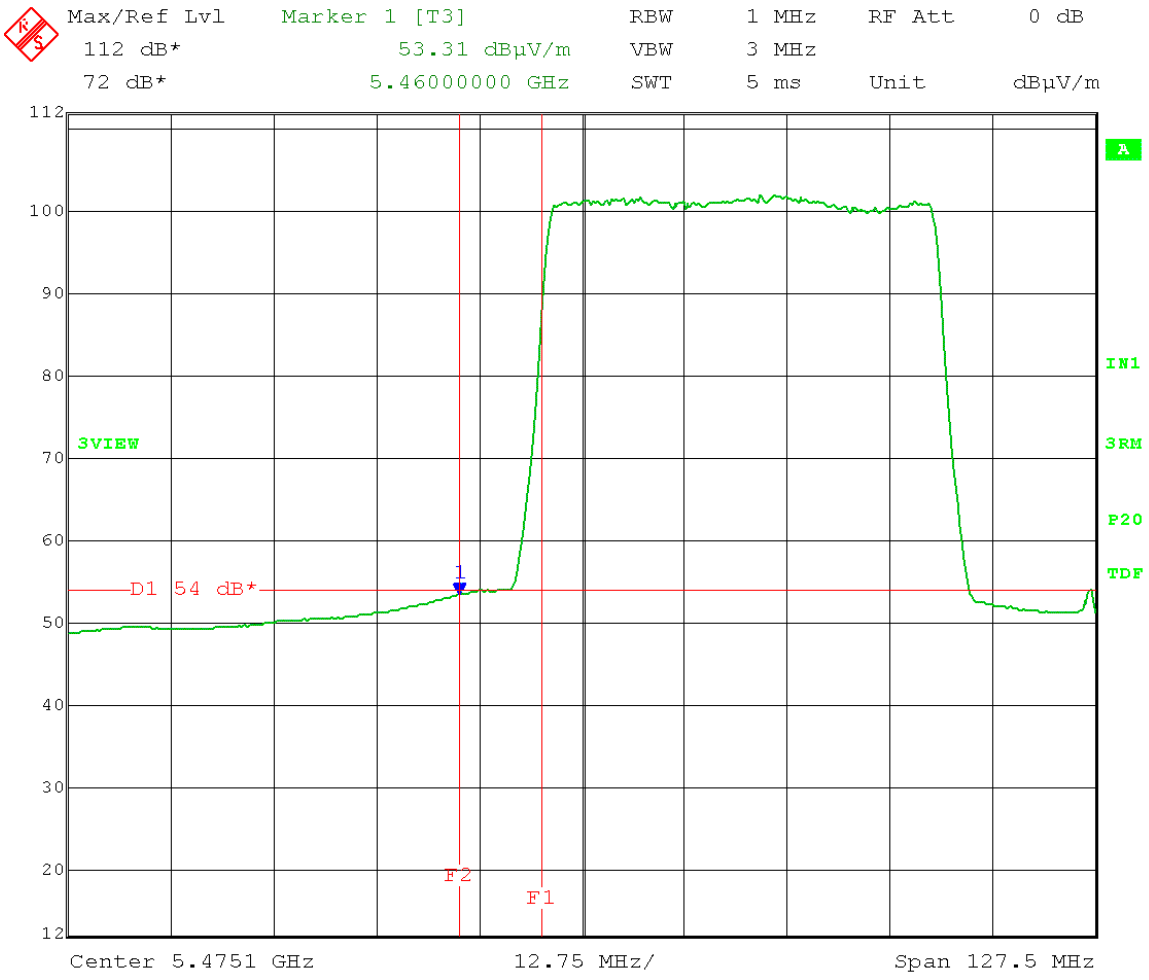

Date: 3.OCT.2013 15:54:38

Test Date: 10-03-2013
Company: Ubiquiti Networks
EUT: AF5
Test: Lower Restricted Band-Edge Compliance - Radiated – Peak (FCC 15.407(b)(7))
Operator: Craig B
Comment: 50 MHz channel Bandwidth
Low Channel: Frequency – 5495 MHz
Modulation: 256QAM
Vertical
Restricted Band-Edge Frequency: 5460 MHz (F2)
Band-Edge Limit: 74 dBµV/m PEAK at a test distance of 3 meters.



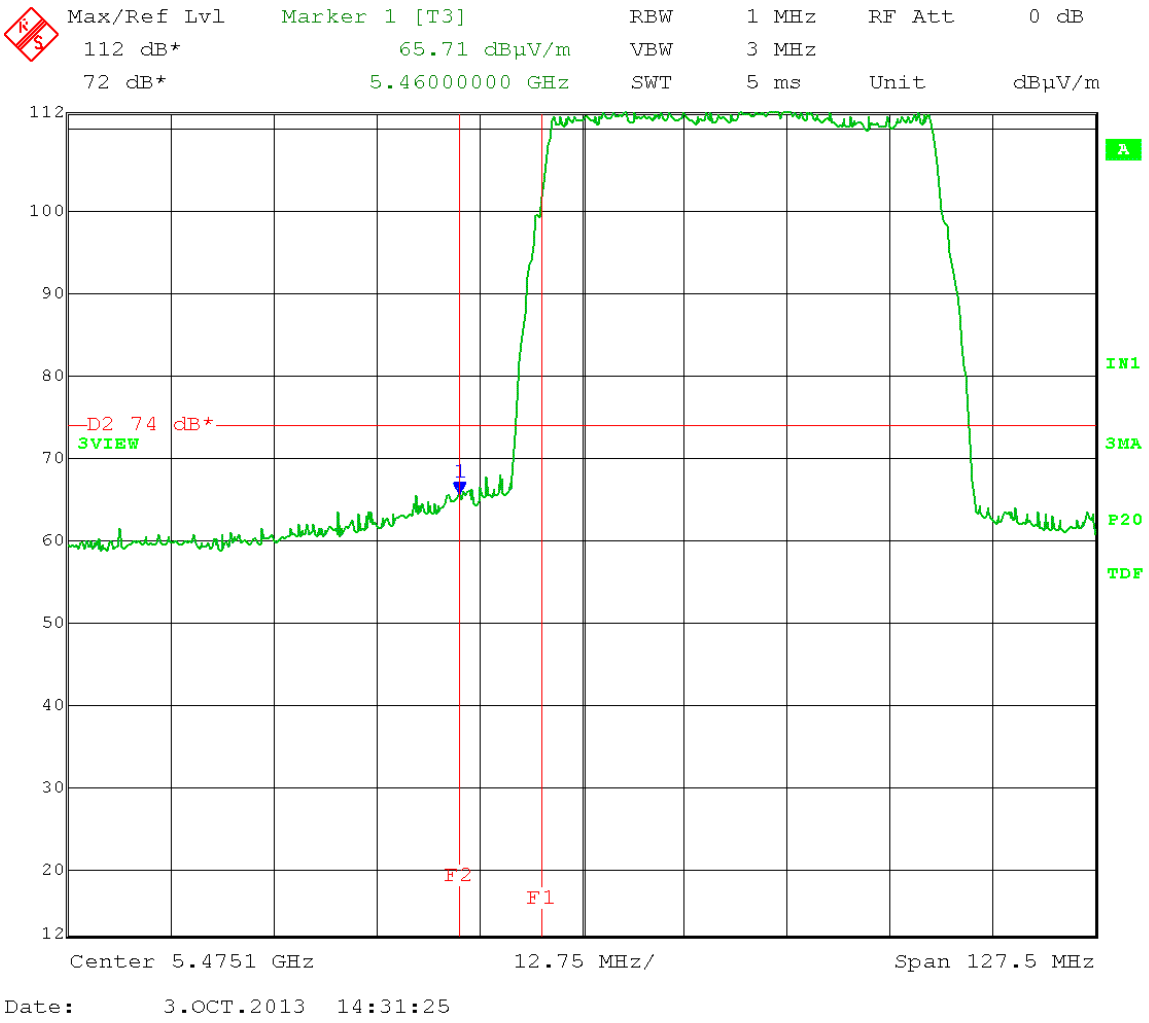

Date: 3.OCT.2013 15:55:24

Test Date: 10-03-2013
Company: Ubiquiti Networks
EUT: AF5
Test: Lower Restricted Band-Edge Compliance - Radiated – AVG (FCC 15.407(b)(7))
Operator: Craig B
Comment: 50 MHz channel Bandwidth
Low Channel: Frequency – 5495 MHz
Modulation: 64QAM
Horizontal
Restricted Band-Edge Frequency: 5460 MHz (F2)
Band-Edge Limit: 54 dBµV/m AVERAGE at a test distance of 3 meters.



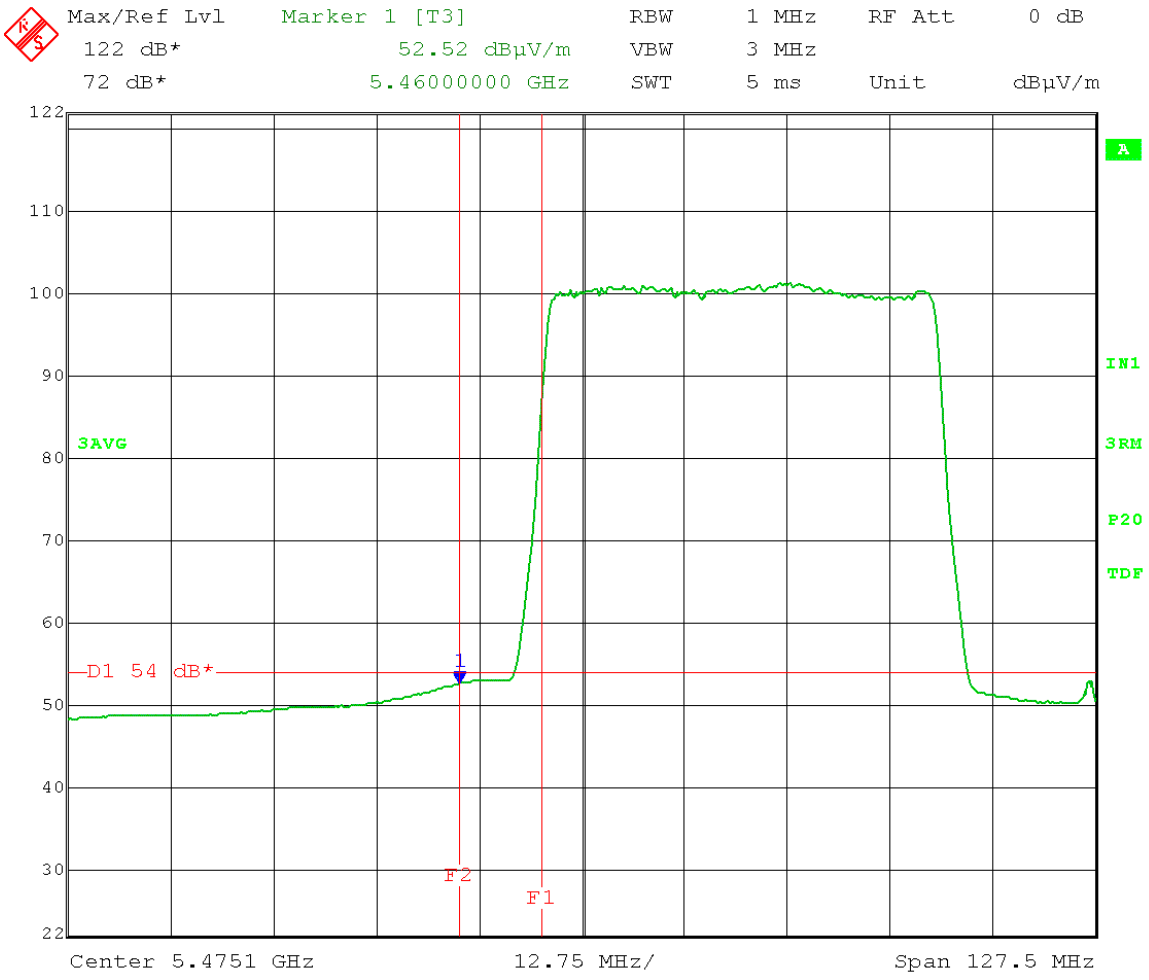

Date: 3.OCT.2013 14:32:24

Test Date: 10-03-2013
Company: Ubiquiti Networks
EUT: AF5
Test: Lower Restricted Band-Edge Compliance - Radiated – Peak (FCC 15.407(b)(7))
Operator: Craig B
Comment: 50 MHz channel Bandwidth
Low Channel: Frequency – 5495 MHz
Modulation: 64QAM
Horizontal
Restricted Band-Edge Frequency: 5460 MHz (F2)
Band-Edge Limit: 74 dBµV/m PEAK at a test distance of 3 meters.



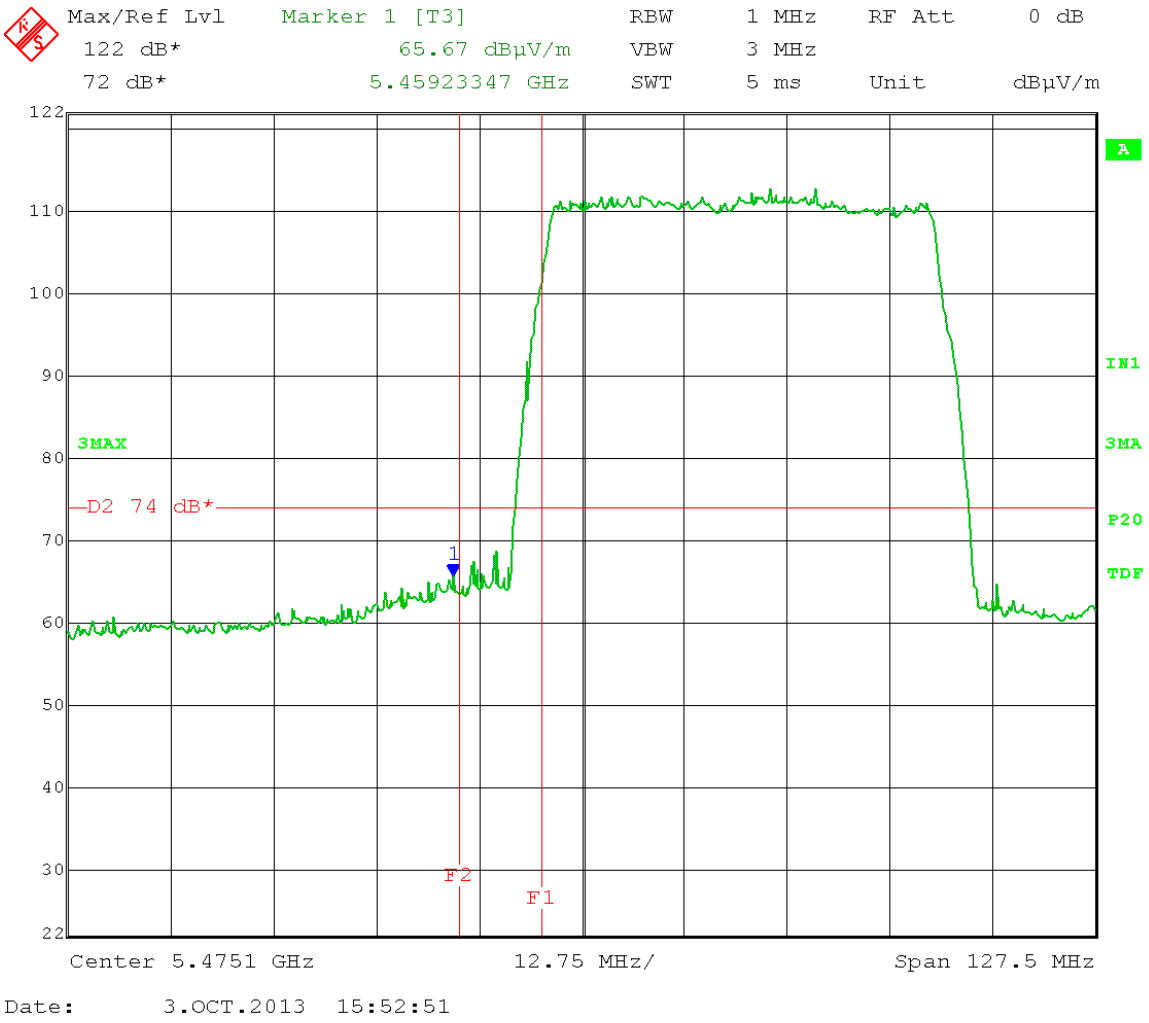

Date: 3.OCT.2013 14:31:25

Test Date: 10-03-2013
Company: Ubiquiti Networks
EUT: AF5
Test: Lower Restricted Band-Edge Compliance - Radiated – AVG (FCC 15.407(b)(7))
Operator: Craig B
Comment: 50 MHz channel Bandwidth
Low Channel: Frequency – 5495 MHz
Modulation: 64QAM
Vertical
Restricted Band-Edge Frequency: 5460 MHz (F2)
Band-Edge Limit: 54 dBµV/m AVERAGE at a test distance of 3 meters.



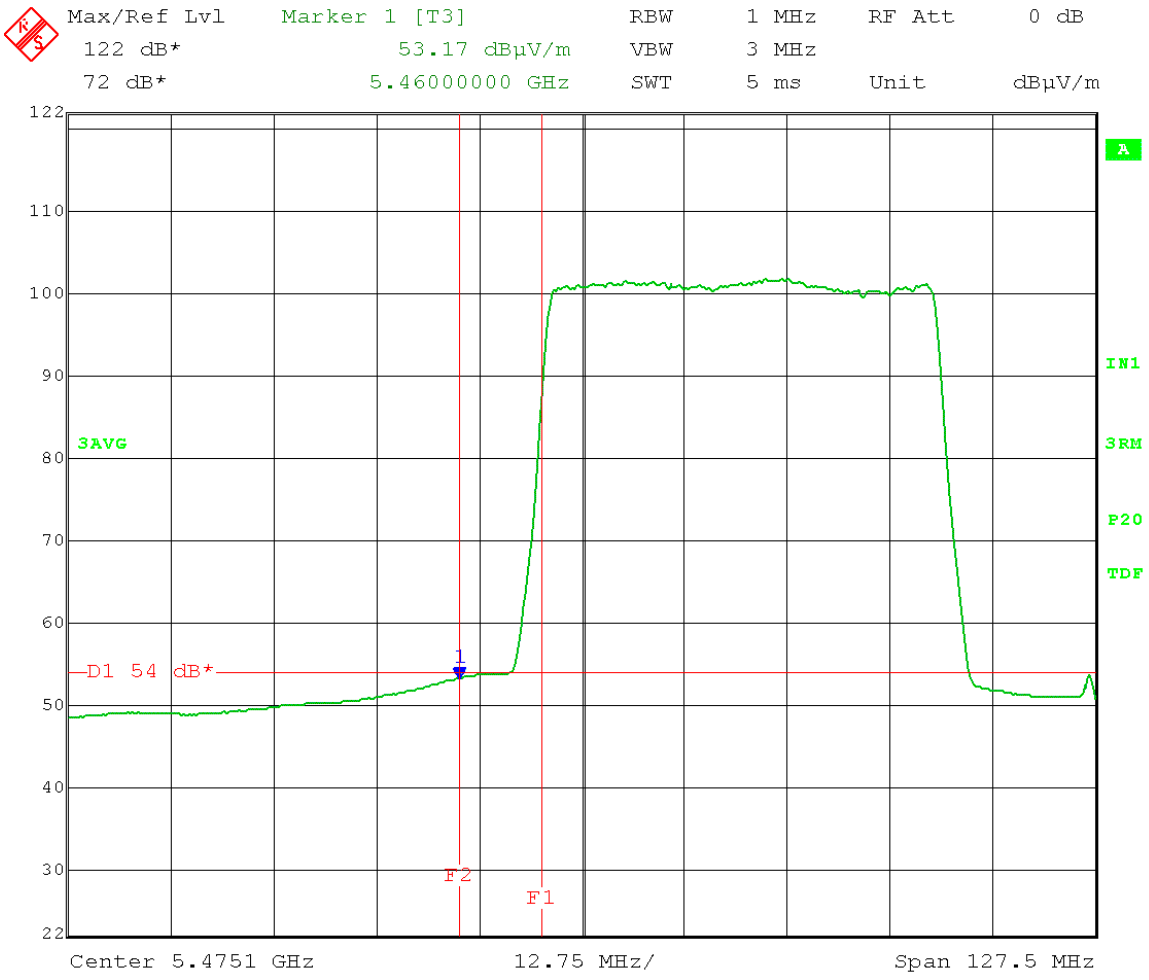

Date: 3.OCT.2013 15:53:25

Test Date: 10-03-2013
Company: Ubiquiti Networks
EUT: AF5
Test: Lower Restricted Band-Edge Compliance - Radiated – Peak (FCC 15.407(b)(7))
Operator: Craig B
Comment: 50 MHz channel Bandwidth
Low Channel: Frequency – 5495 MHz
Modulation: 64QAM
Vertical
Restricted Band-Edge Frequency: 5460 MHz (F2)
Band-Edge Limit: 74 dBµV/m PEAK at a test distance of 3 meters.



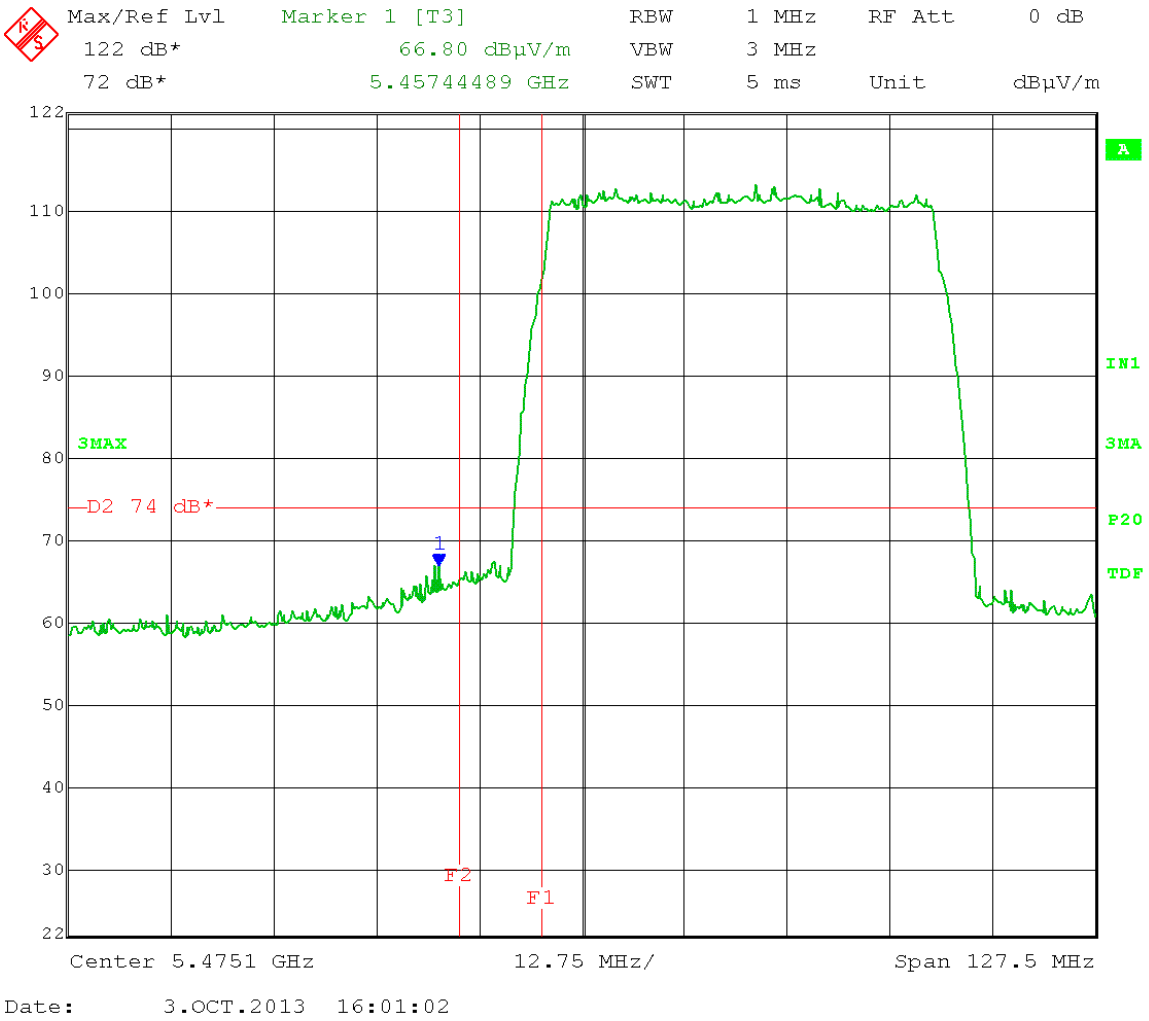

Date: 3.OCT.2013 15:52:51

Test Date: 10-03-2013
Company: Ubiquiti Networks
EUT: AF5
Test: Lower Restricted Band-Edge Compliance - Radiated – AVG (FCC 15.407(b)(7))
Operator: Craig B
Comment: 50 MHz channel Bandwidth
Low Channel: Frequency – 5495 MHz
Modulation: QPSK
Horizontal
Restricted Band-Edge Frequency: 5460 MHz (F2)
Band-Edge Limit: 54 dBµV/m AVERAGE at a test distance of 3 meters.



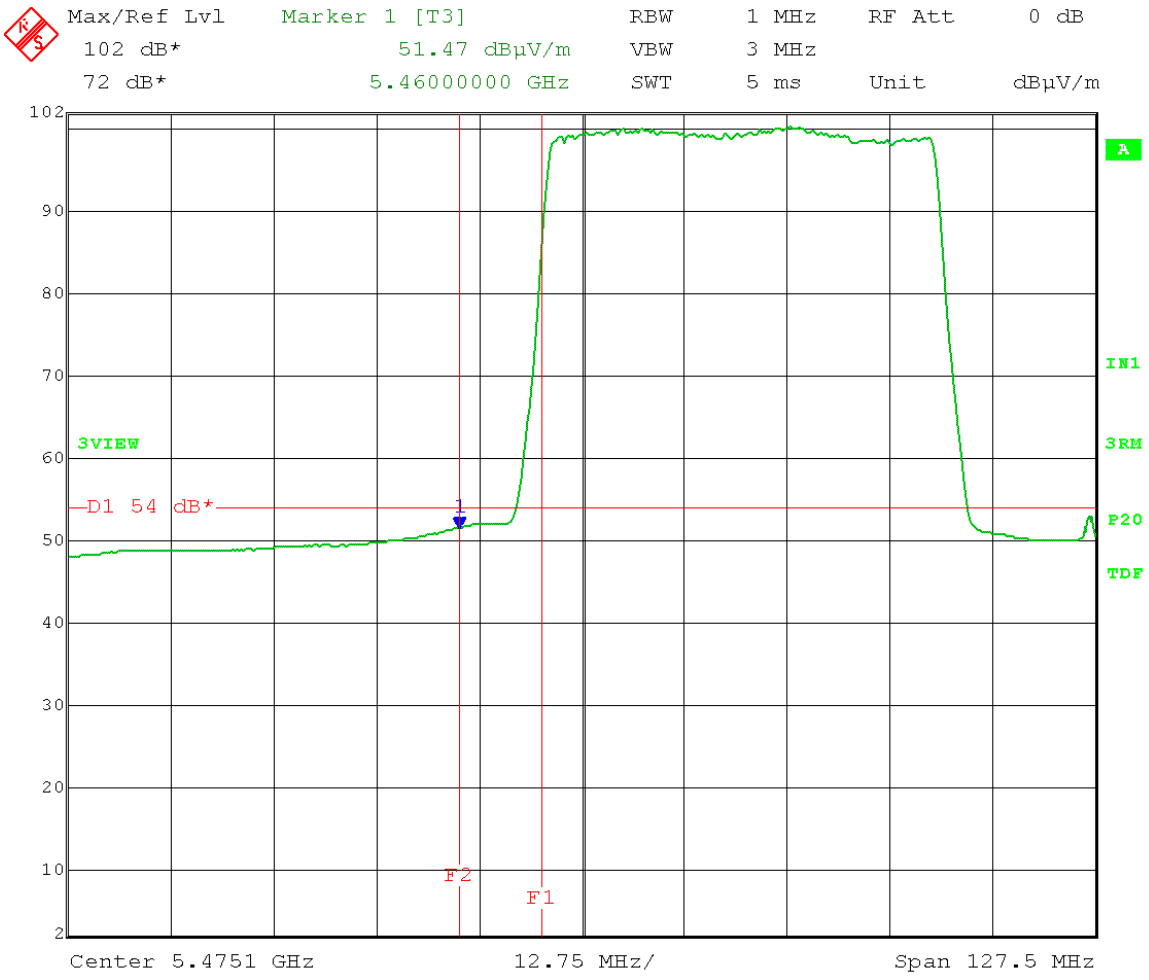

Date: 3.OCT.2013 16:00:28

Test Date: 10-03-2013
Company: Ubiquiti Networks
EUT: AF5
Test: Lower Restricted Band-Edge Compliance - Radiated – Peak (FCC 15.407(b)(7))
Operator: Craig B
Comment: 50 MHz channel Bandwidth
Low Channel: Frequency – 5495 MHz
Modulation: QPSK
Horizontal
Restricted Band-Edge Frequency: 5460 MHz (F2)
Band-Edge Limit: 74 dBµV/m PEAK at a test distance of 3 meters.



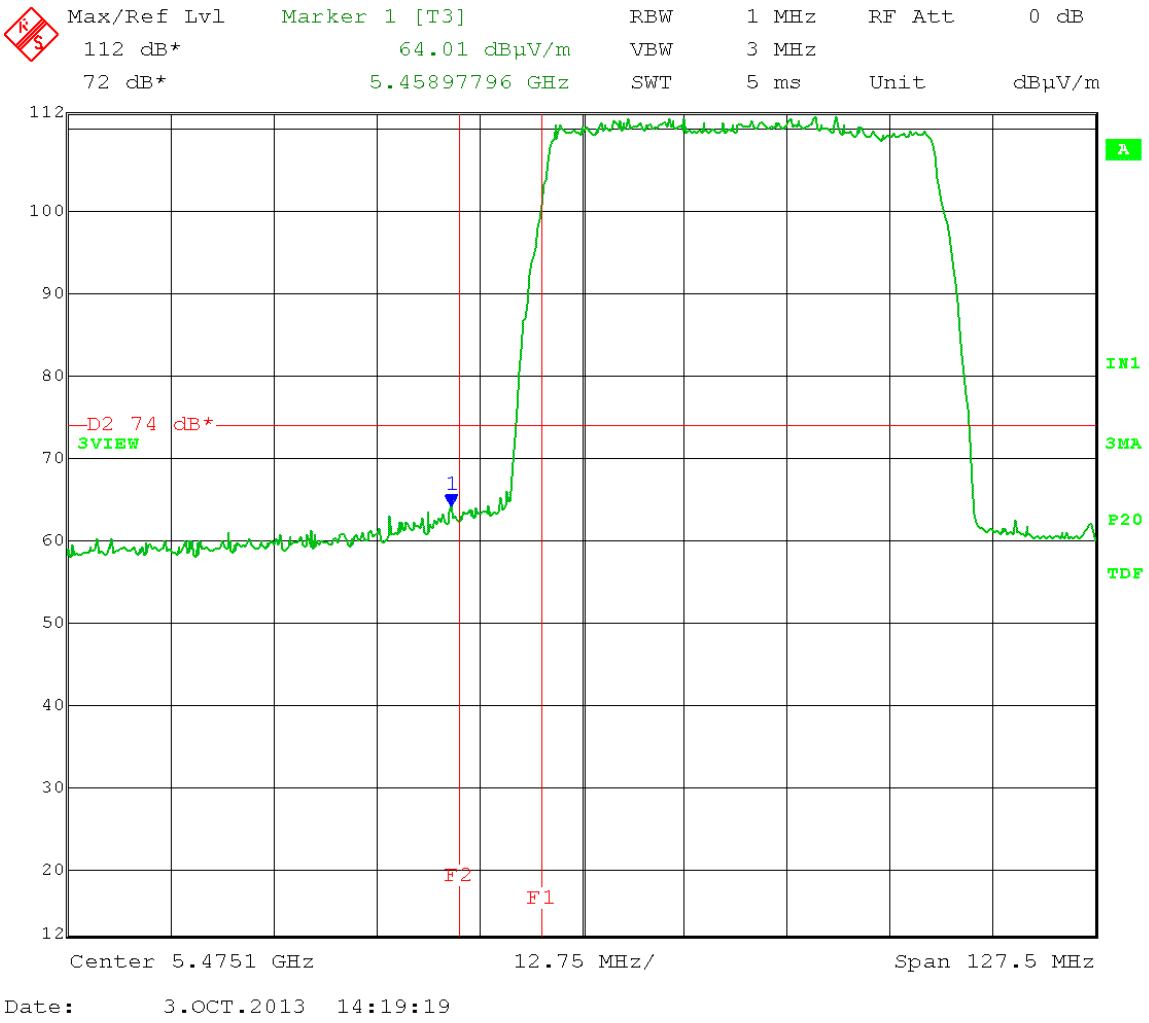

Date: 3.OCT.2013 16:01:02

Test Date: 10-03-2013
Company: Ubiquiti Networks
EUT: AF5
Test: Lower Restricted Band-Edge Compliance - Radiated – AVG (FCC 15.407(b)(7))
Operator: Craig B
Comment: 50 MHz channel Bandwidth
Low Channel: Frequency – 5495 MHz
Modulation: QPSK
Vertical
Restricted Band-Edge Frequency: 5460 MHz (F2)
Band-Edge Limit: 54 dBµV/m AVERAGE at a test distance of 3 meters.




Date: 3.OCT.2013 14:17:36

Test Date: 10-03-2013
Company: Ubiquiti Networks
EUT: AF5
Test: Lower Restricted Band-Edge Compliance - Radiated – Peak (FCC 15.407(b)(7))
Operator: Craig B
Comment: 50 MHz channel Bandwidth
Low Channel: Frequency – 5495 MHz
Modulation: QPSK
Vertical
Restricted Band-Edge Frequency: 5460 MHz (F2)
Band-Edge Limit: 74 dBµV/m PEAK at a test distance of 3 meters.




Date: 3.OCT.2013 14:19:19

## Appendix – Measurement Data

### 6.0 Peak Power Spectral Density – Conducted

**Rule Section**: Section 15.407(a)(2)

**Test Procedure**: FCC KDB 789033 D01 General UNII Test Procedures v01r03 – *Guidance for Compliance Testing of Unlicensed National Information Infrastructure (U-NII) Devices – Part 15, Subpart E*

Section F – Peak power spectral density (PPSD)
Using method E(2)(d) SA-2 for power spectrum (10 and 20 MHz BW's)
Using method E(2)(b) SA-1 for power spectrum (40 and 50 MHz BW's)

**Description**: SPAN: set to encompass entire emission bandwidth
RBW = 1 MHz
VBW ≥ 3 MHz
Number of points ≥ 2 x Span/RBW
Sweep time: auto
Detector = RMS
Sweep: trace average 200 sweeps in RMS mode
Use peak search to find the peak of the spectrum
Add 10 log (1/x) where x is the duty cycle when duty cycle is < 98%

**Limit:** 11 dBm in any 1 MHz band
Limit shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi

**Results:** Passed

**Notes:** Measurements were taken for QPSK, 16QAM, 64QAM, 256QAM and 1024 QAM modulations at the lowest, middle, and highest channels of operation. EUT was set to transmit continuously.

Output power was set to 30 dBm eirp using special test software.

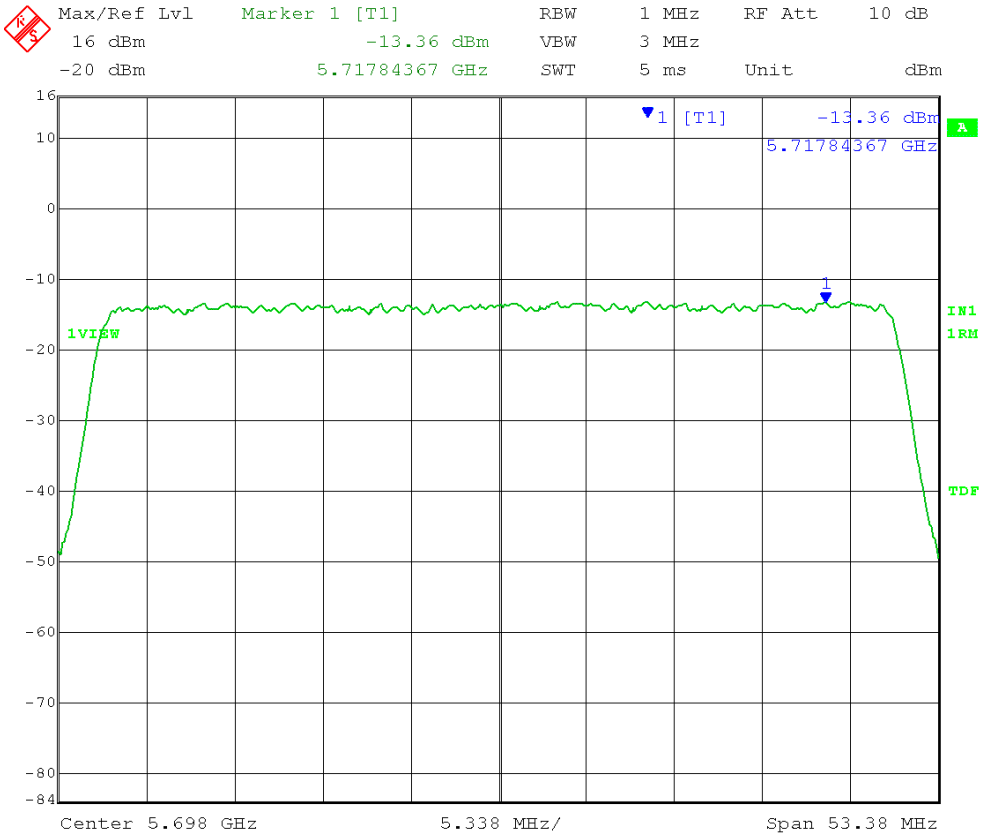
Test Date: 10-22-2013
Company: Ubiquiti Networks
EUT: Air Fiber 5 - 5.4GHz WiFi Radio
Test: Peak Power Spectral Density - Conducted
Operator: Lillian Li
Test Procedure used: KDB 789033 D01 v01r03 – F)
Limit: [15.407(a)(2)&(a)(5); RSS-210 A9.2(3)]: < 11dBm/MHz
Operating Mode: Point-to-Point; Antenna Gain = 23 dBi
EUT Limit: < 11-(23-6) = -6dBm/MHz

50MHz Operating Bandwidth( Method SA-1):

| **Pesk Power Spectral Density (PPSD)** | | 50MHz | | | | |
|---|---|---|---|---|---|---|
| | dBm | QPSK | 16QAM | 64QAM | 256QAM | 1024Q |
| FCC limit=11dBm/MHz | EUT FCC Limit | -6 | -6 | -6 | -6 | -6 |
| | TX0 | -13.5 | -13.36 | -13.38 | -13.4 | -13.33 |
| | TX1 | -12.6 | -14.14 | -14.45 | -14.32 | -13.97 |
| | total(mW) | 0.0996 | 0.0847 | 0.0818 | 0.0827 | 0.0865 |
| | Total(dBm) | **-10.02** | **-10.72** | **-10.87** | **-10.83** | **-10.63** |
| HCH = 5698 MHz | Margin | 4.02 | 4.72 | 4.87 | 4.83 | 4.63 |
| | TX0 | -15.52 | -15.93 | -15.9 | -15.52 | -15.54 |
| | TX1 | -11.61 | -13.27 | -13.33 | -13.28 | -13.01 |
| | total(mW) | 0.0971 | 0.0726 | 0.0722 | 0.0750 | 0.0779 |
| | Total(dBm) | **-10.13** | **-11.39** | **-11.42** | **-11.25** | **-11.08** |
| MCH = 5575 MHz | Margin | 4.13 | 5.39 | 5.42 | 5.25 | 5.08 |
| | TX0 | -14.06 | -15.12 | -13.99 | -13.97 | -13.96 |
| | TX1 | -12.51 | -13.79 | -13.56 | -13.7 | -13.52 |
| | total(mW) | 0.0954 | 0.0725 | 0.0840 | 0.0827 | 0.0846 |
| | Total(dBm) | **-10.21** | **-11.39** | **-10.76** | **-10.82** | **-10.72** |
| LCH = 5497 MHz | Margin | 4.21 | 5.39 | 4.76 | 4.82 | 4.72 |

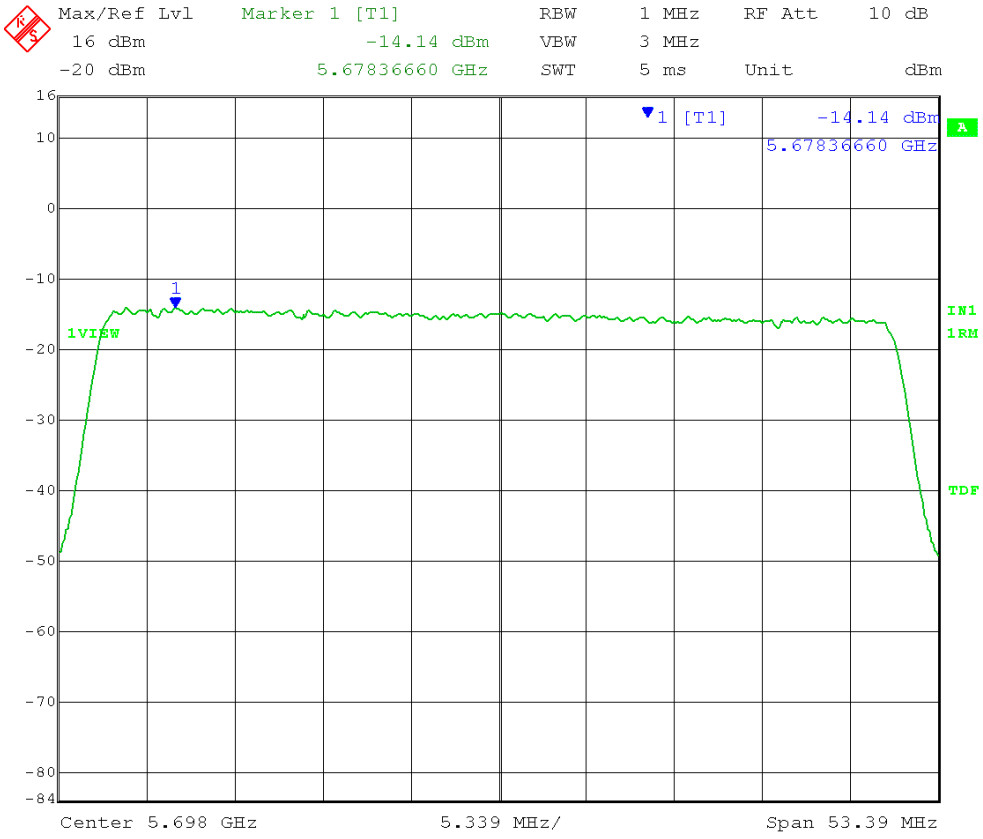
50MHz BW, HCH, 16QAM

TX 0: 26 dB EBW = 53.38MHz




Date: 7.OCT.2013 15:43:02

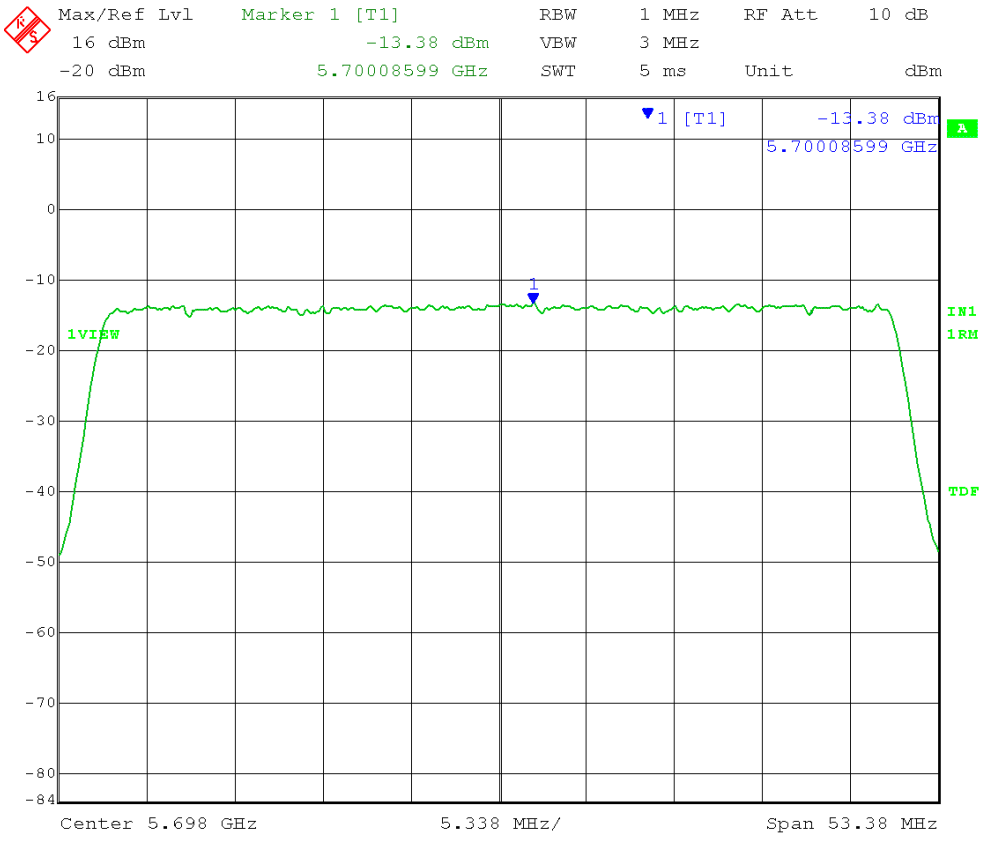
TX1: 26 dB EBW = 53.39MHz




Date: 16.OCT.2013 15:52:46

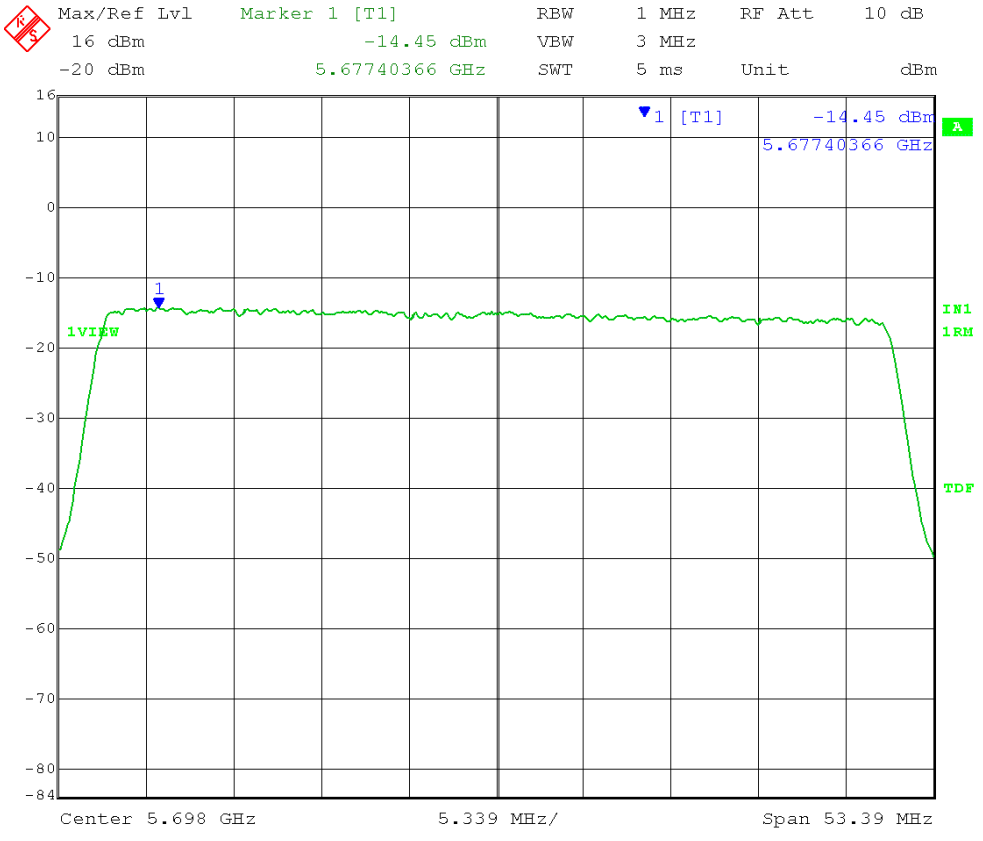
50MHz BW, HCH, 64QAM

TX 0: 26 dB EBW = 53.38MHz




Date: 7.OCT.2013 15:44:26

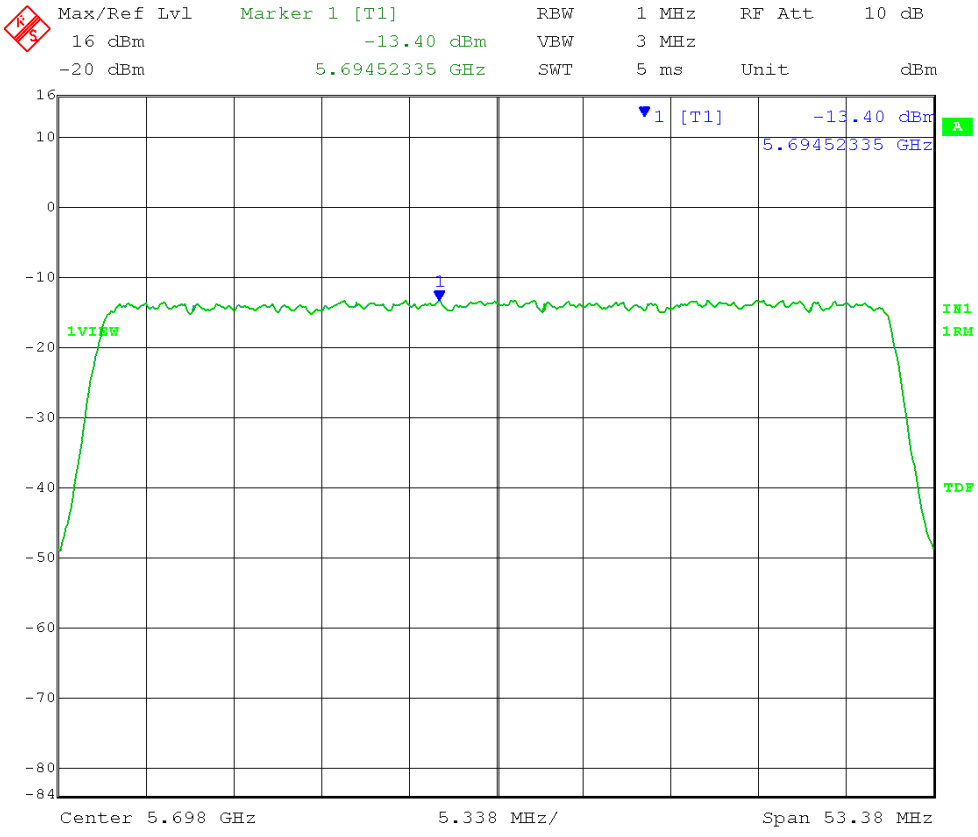
TX1: 26 dB EBW = 53.39MHz




Date: 16.OCT.2013 15:47:46

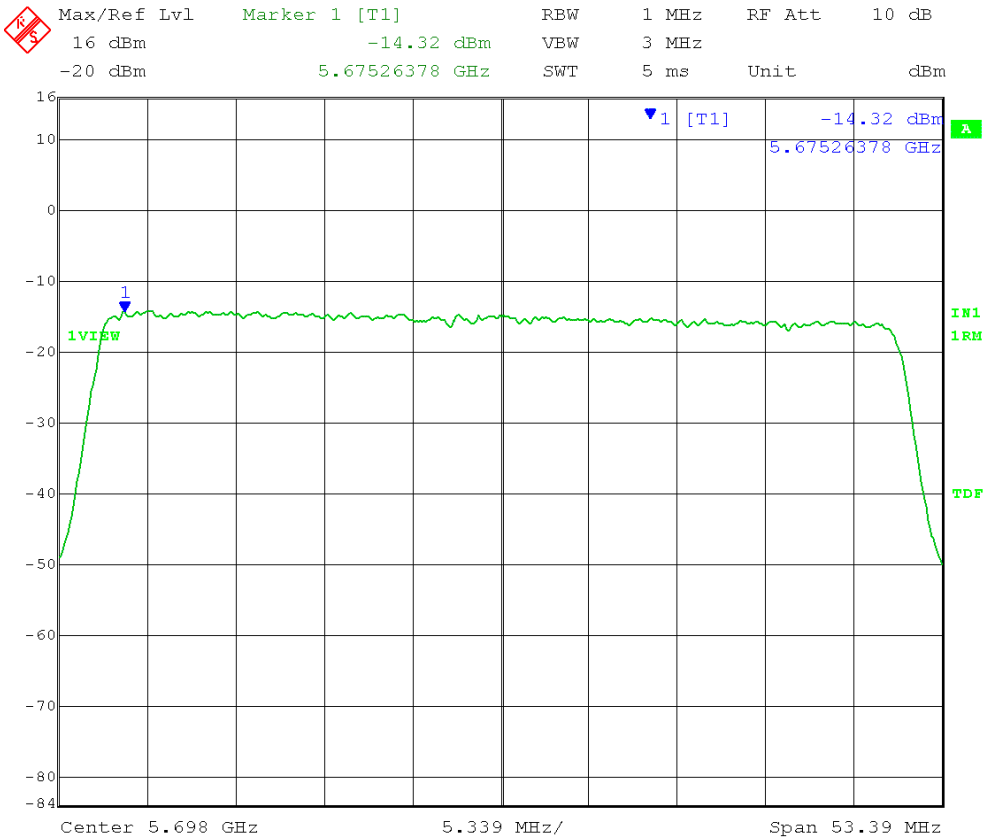
50MHz BW, HCH, 256QAM

TX 0: 26 dB EBW = 53.38MHz




Date: 7.OCT.2013 15:45:35

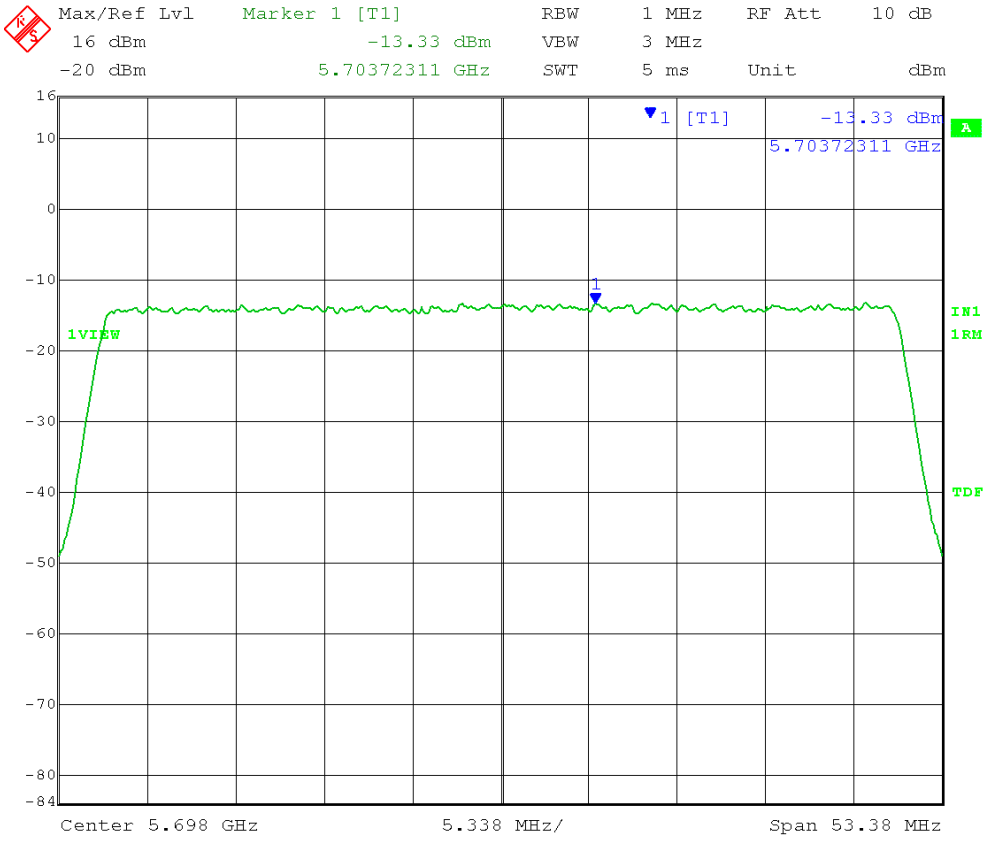
TX1: 26 dB EBW = 53.39MHz




Date: 16.OCT.2013 15:51:00

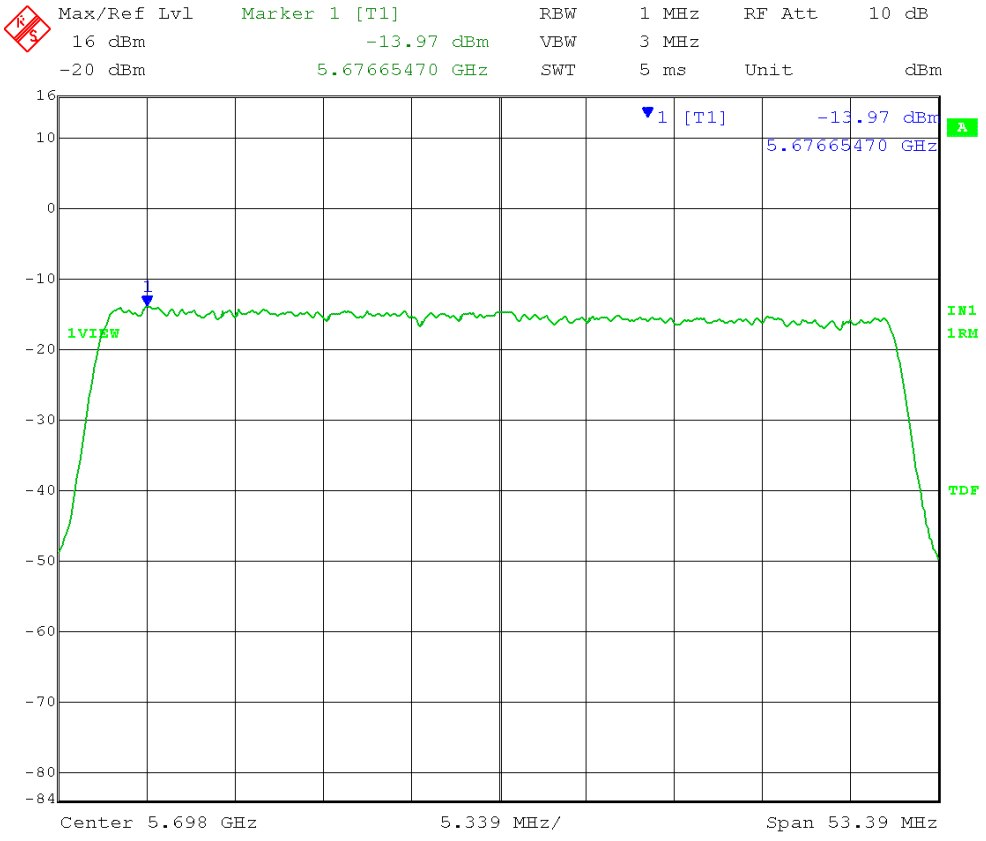
50MHz BW, HCH, 1024QAM

TX 0:  26 dB EBW = 53.38MHz




Date:  7.OCT.2013  15:46:41

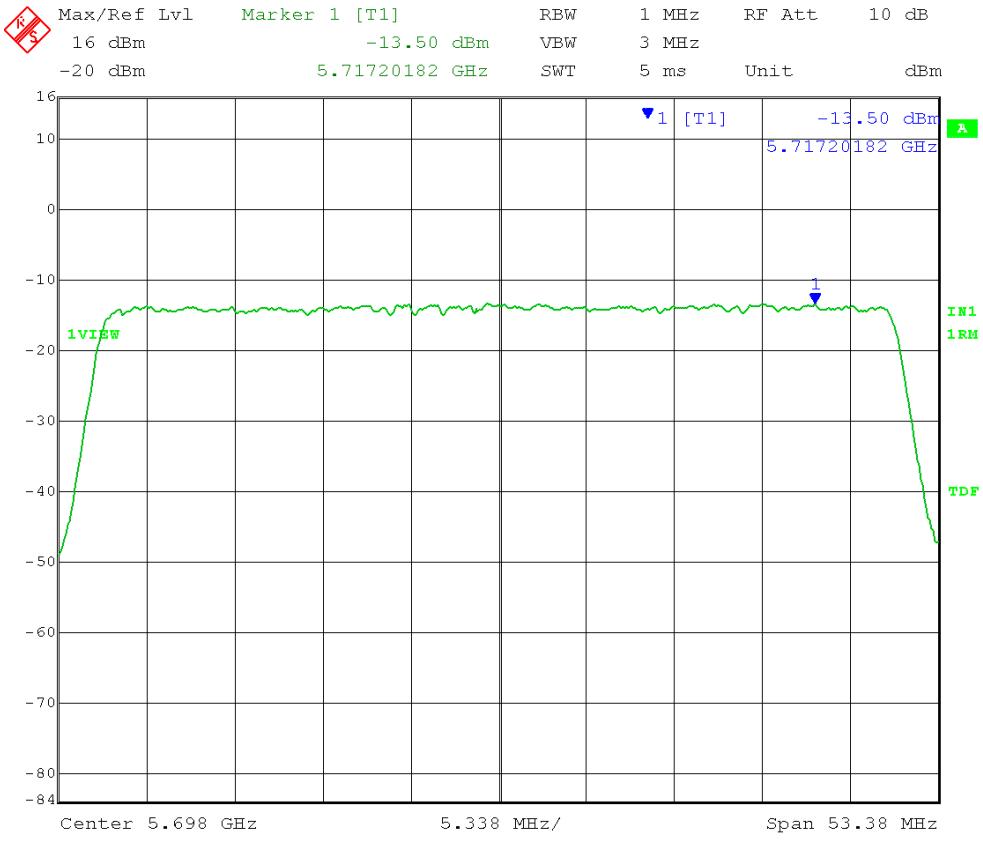
TX1: 26 dB EBW = 53.39MHz




Date:  16.OCT.2013  15:51:50

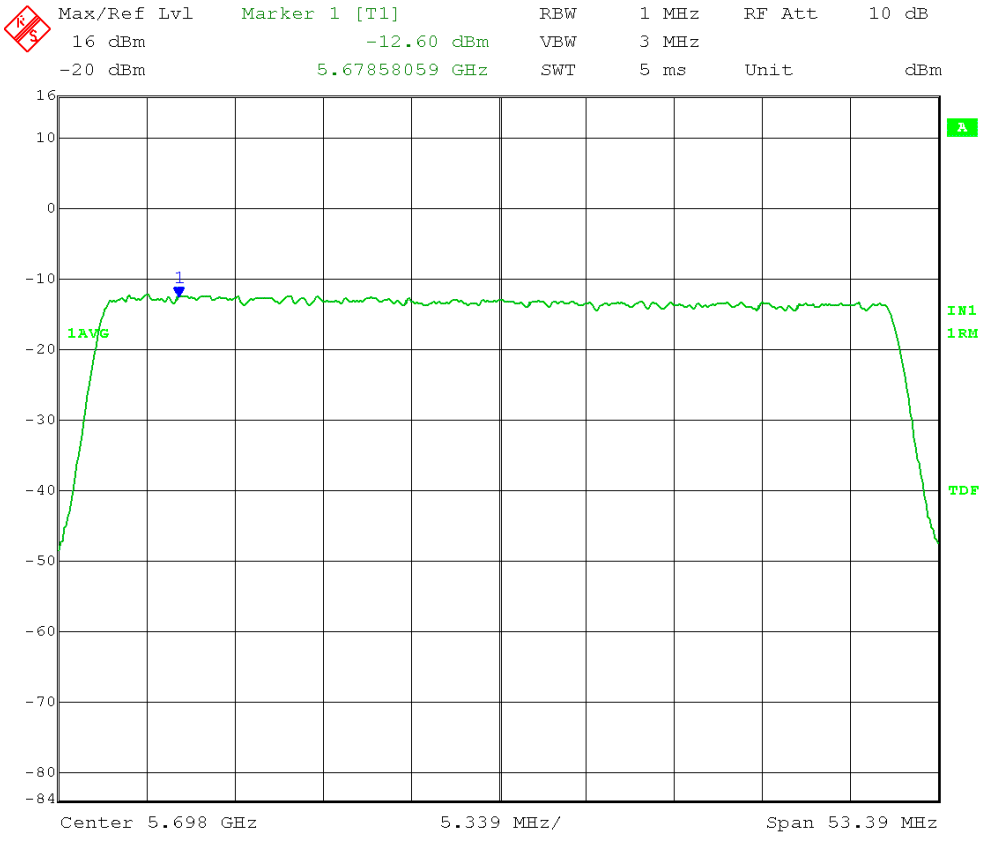
50MHz BW, HCH, QPSK

TX 0:  26 dB EBW = 53.38MHz




Date:  7.OCT.2013  15:41:35

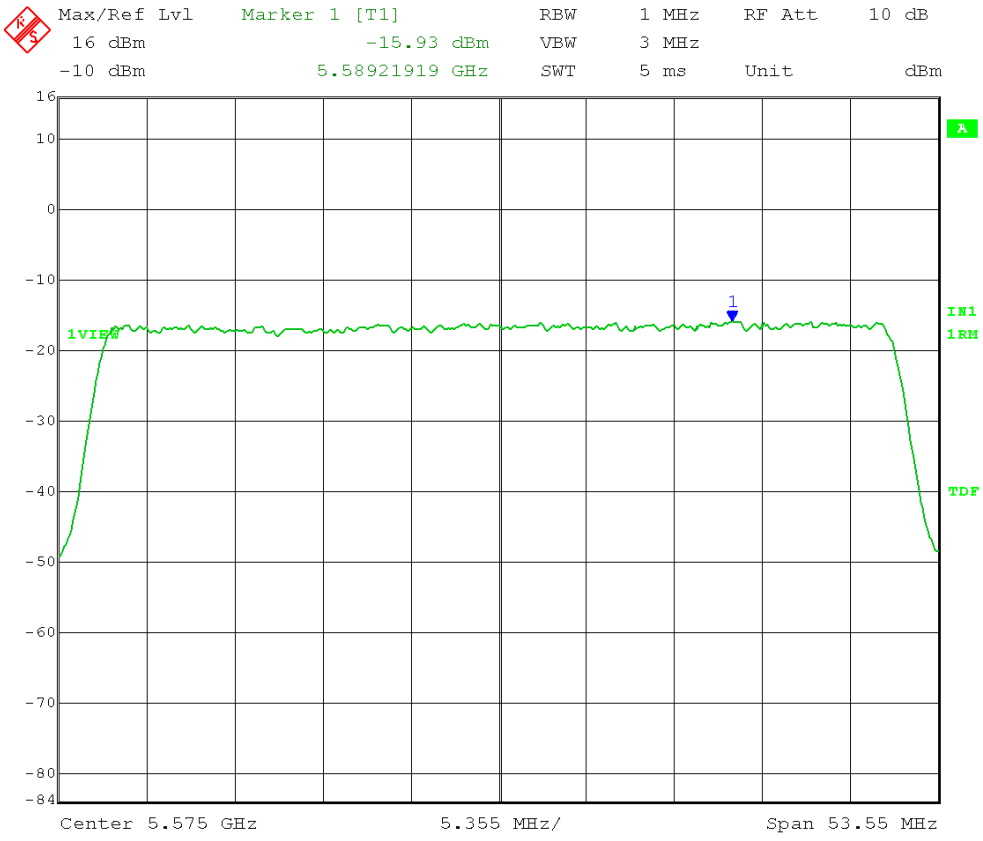
TX1: 26 dB EBW = 53.39MHz




Date:  7.OCT.2013  13:24:36

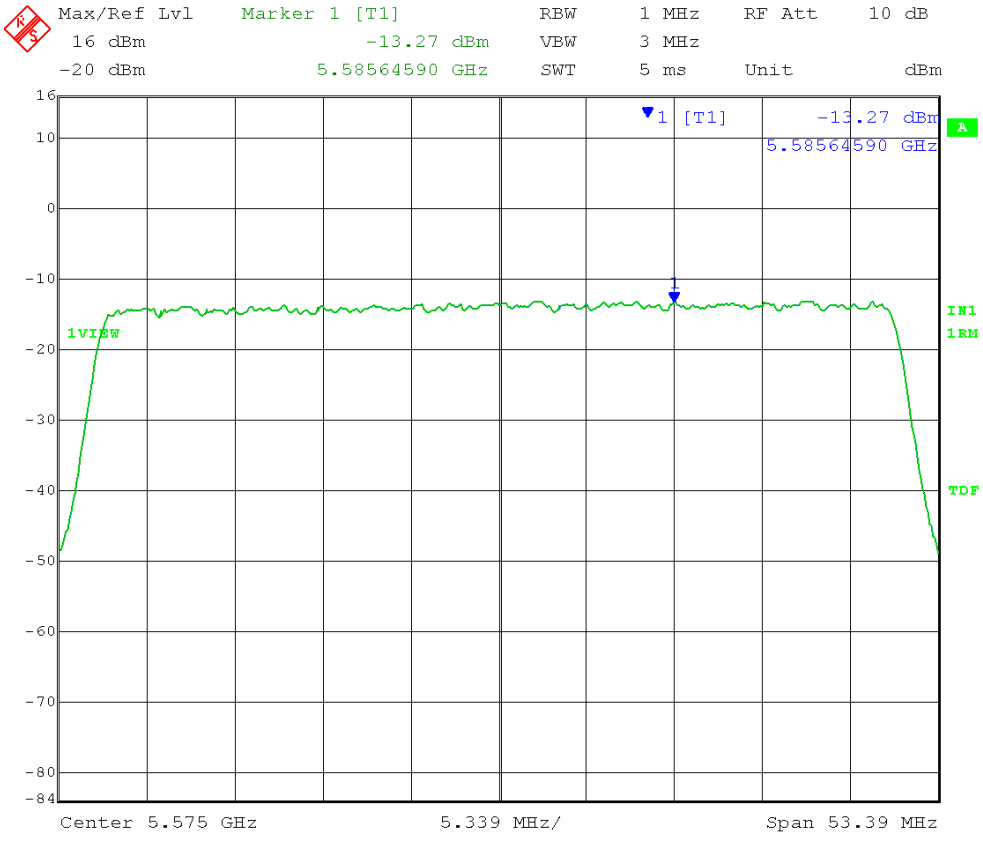
50MHz BW, MCH, 16QAM

TX 0:  26 dB EBW = 53.55MHz




Date:  15.OCT.2013  11:38:32

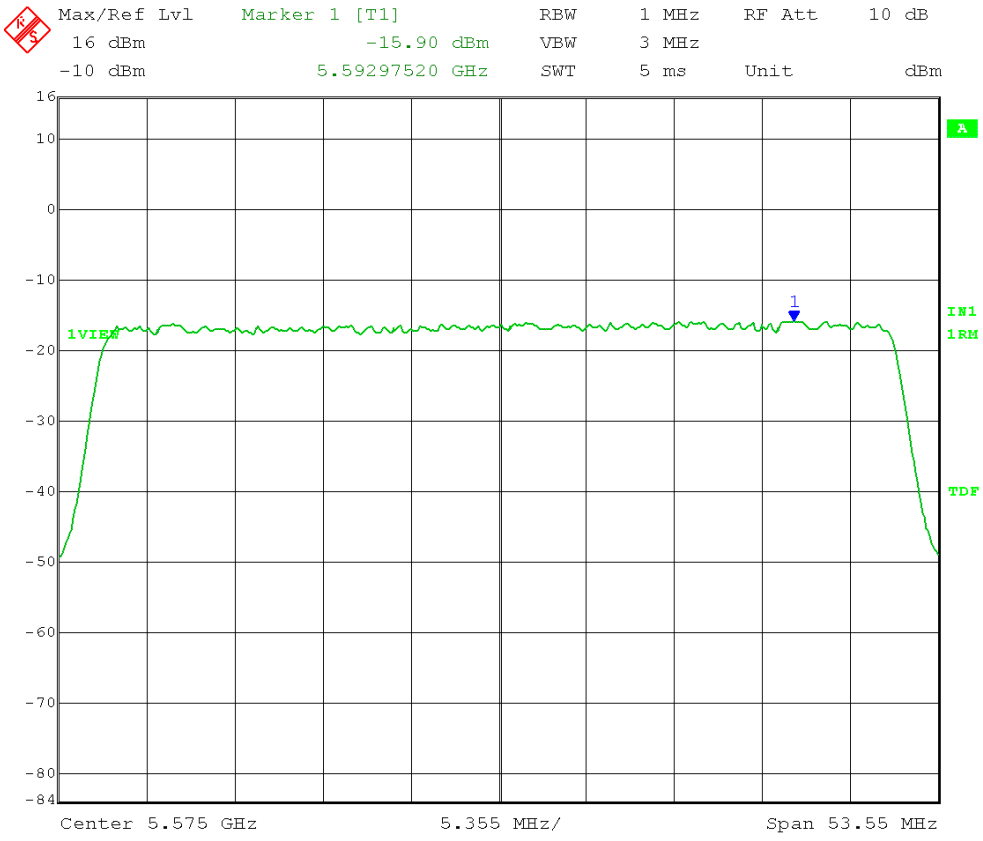
TX1: 26 dB EBW = 53.39MHz




Date:  16.OCT.2013  15:45:53

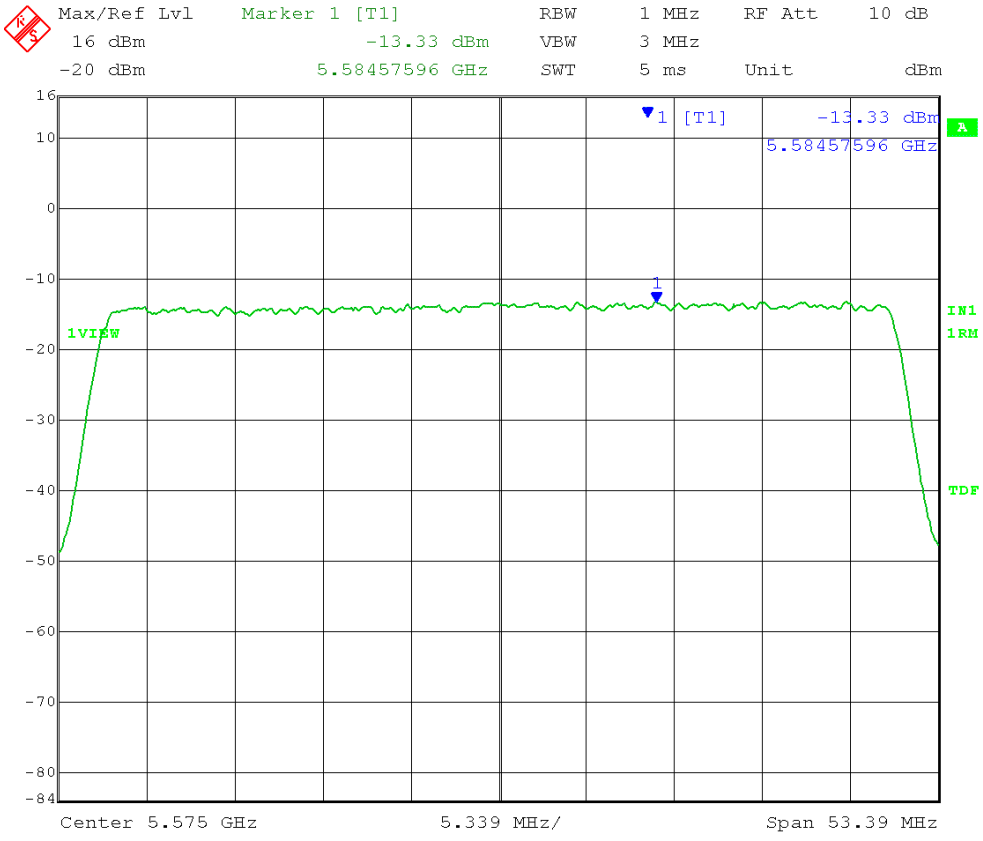
50MHz BW, MCH, 64QAM

TX 0:  26 dB EBW = 53.55MHz




Date:  15.OCT.2013  11:36:19

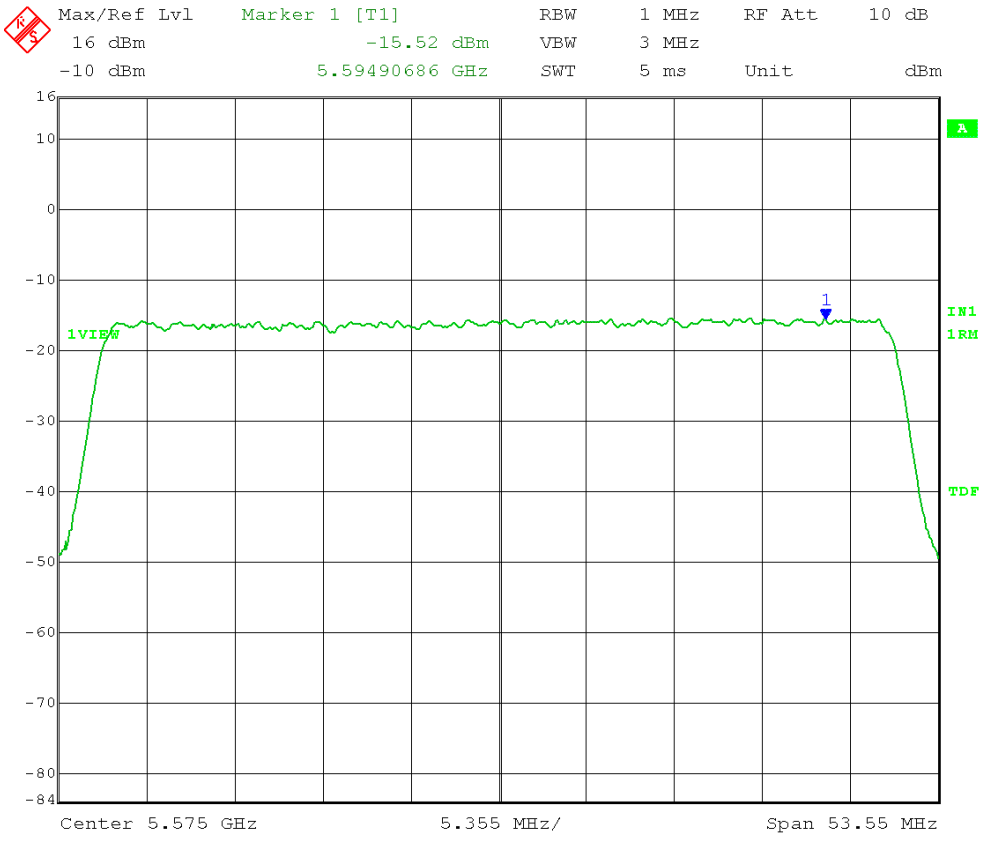
TX1: 26 dB EBW = 53.39MHz




Date:  16.OCT.2013  15:42:49

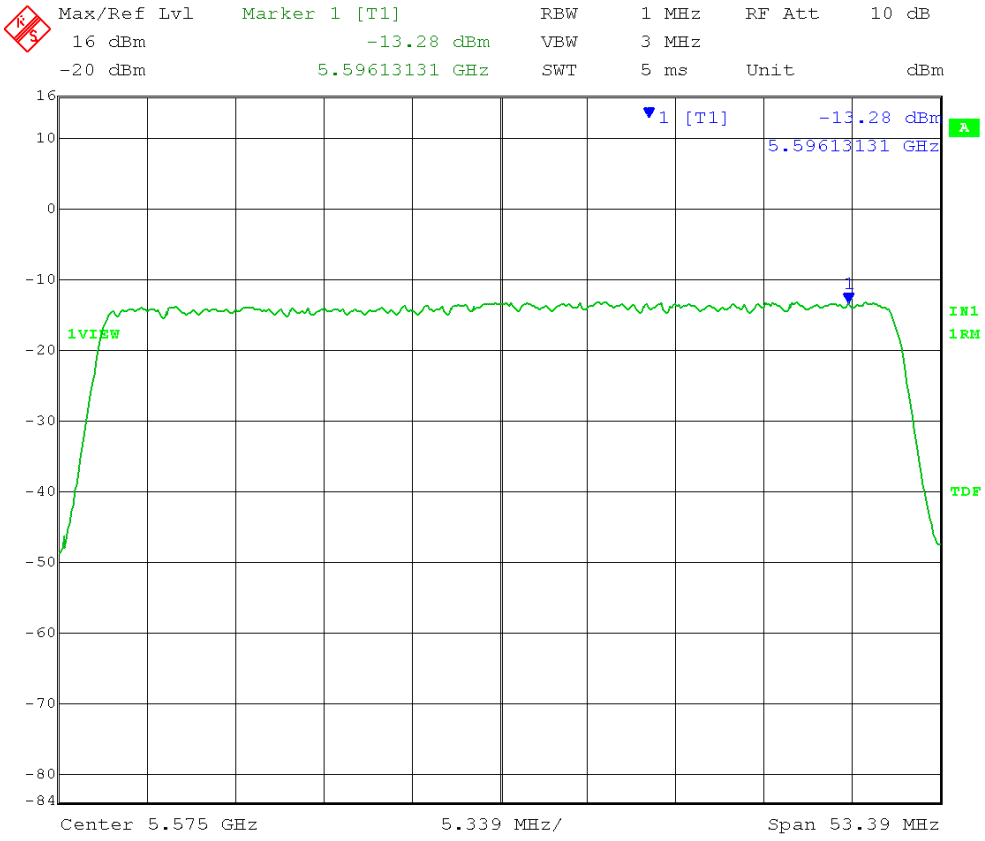
50MHz BW, MCH, 256QAM

TX 0:  26 dB EBW = 53.55MHz




Date:  15.OCT.2013  11:35:17

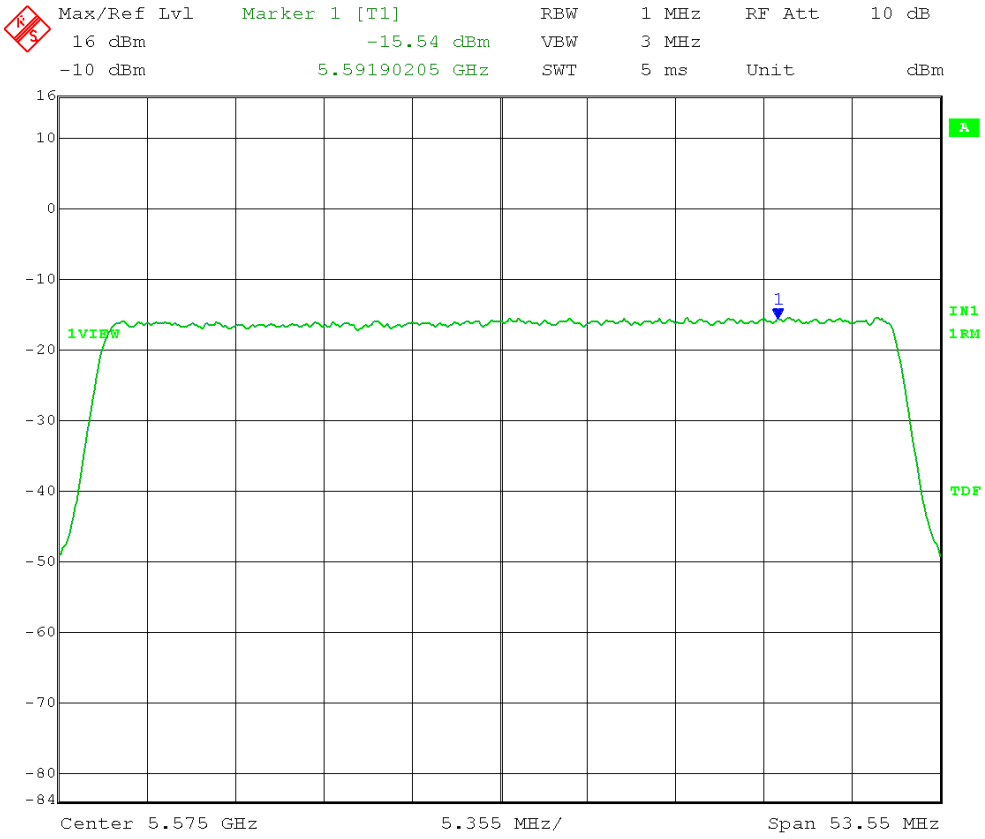
TX1: 26 dB EBW = 53.39MHz




Date:  16.OCT.2013  15:43:51

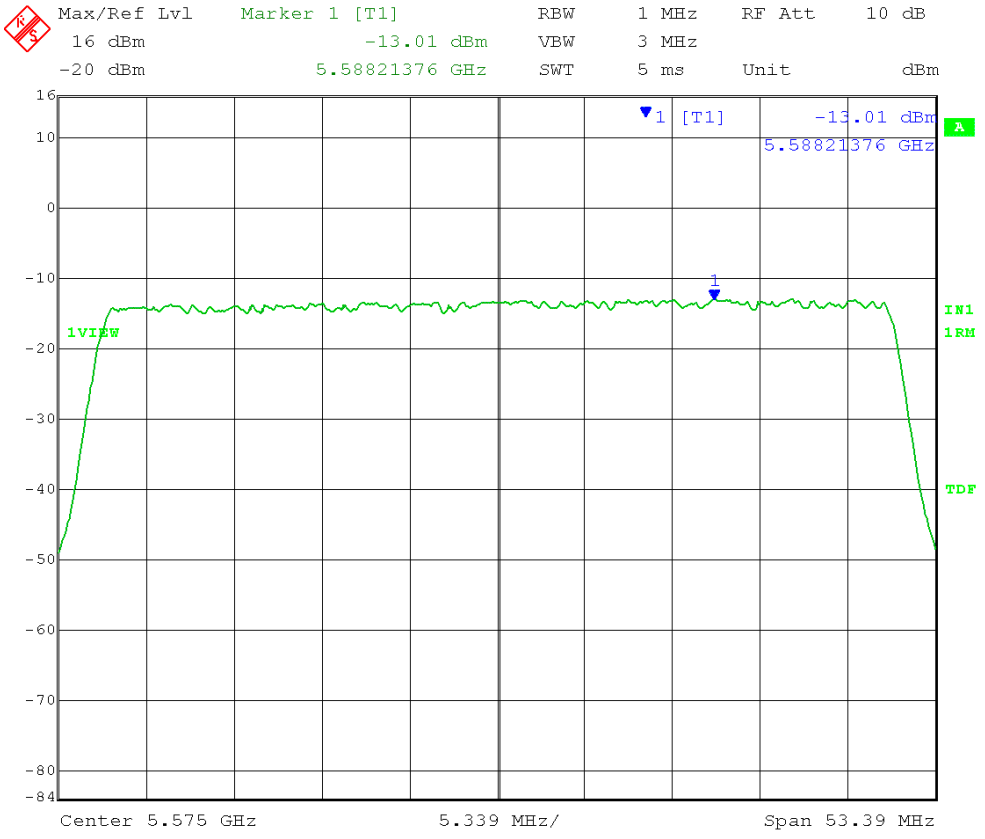
50MHz BW, MCH, 1024QAM

TX 0:  26 dB EBW = 53.55MHz




Date:  15.OCT.2013  11:32:34

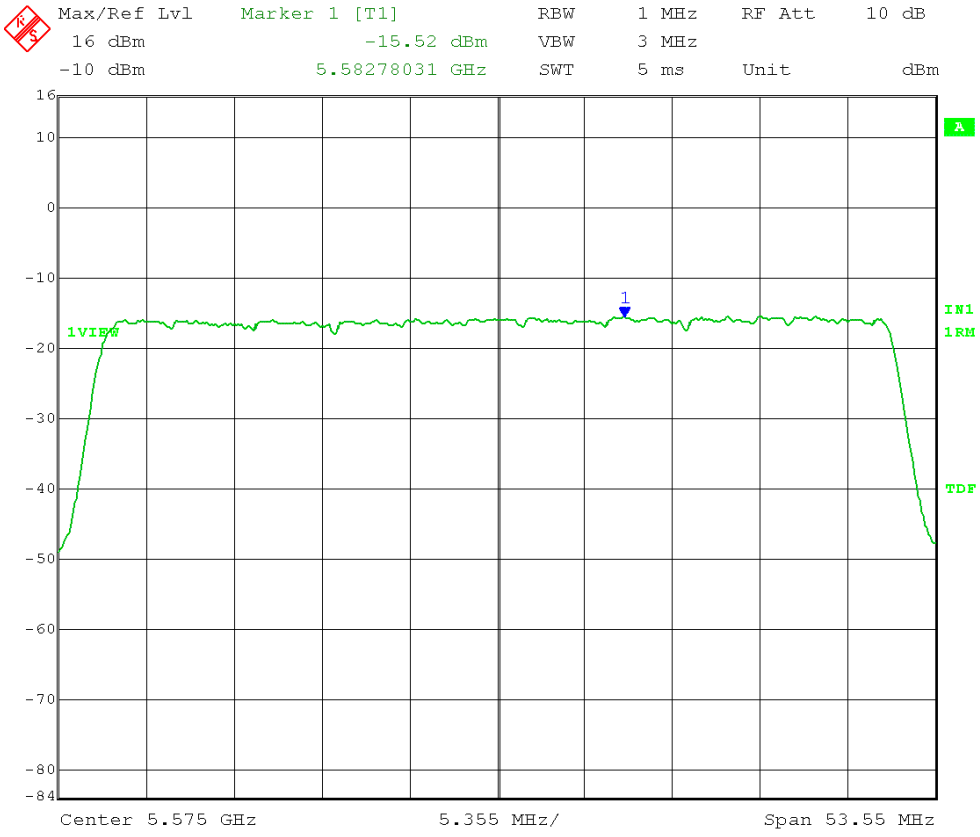
TX1: 26 dB EBW = 53.39MHz




Date:  16.OCT.2013  15:44:53

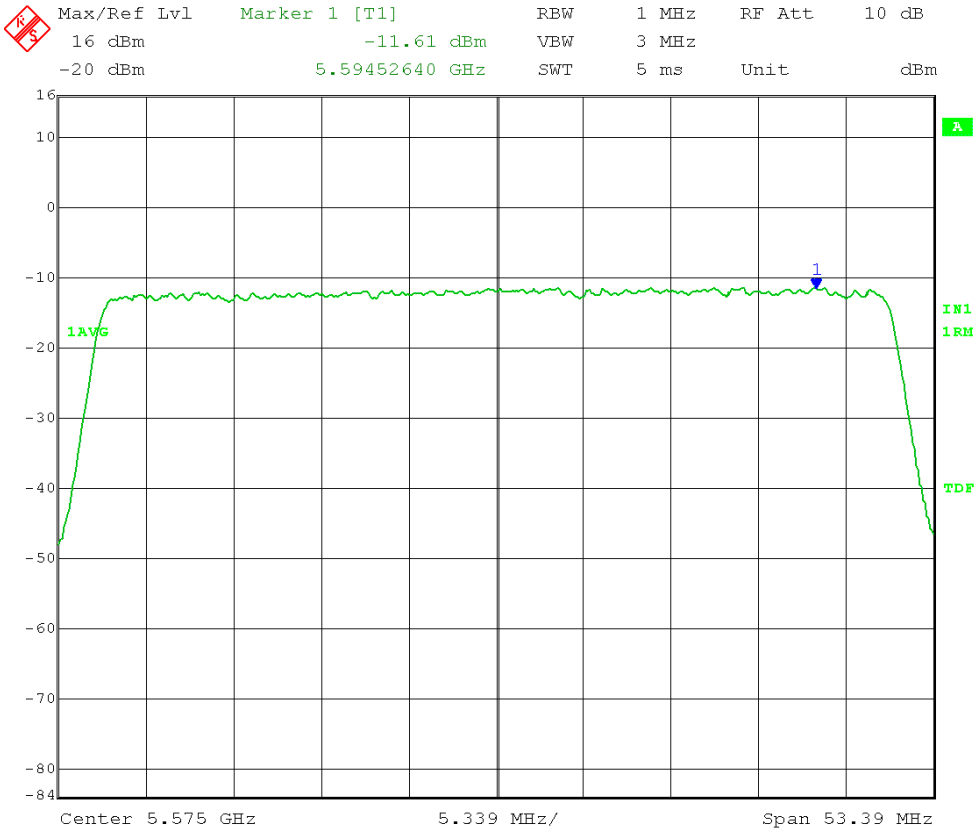
50MHz BW, MCH, QPSK

TX 0:  26 dB EBW = 53.55MHz




Date:  15.OCT.2013  11:39:36

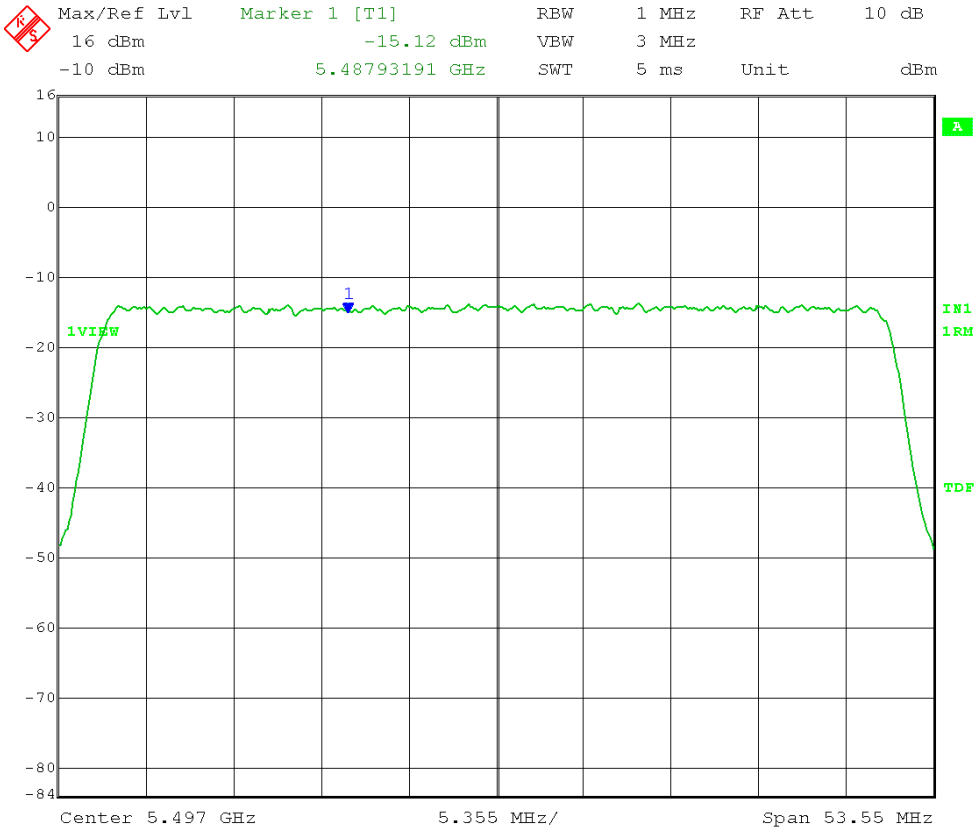
TX1: 26 dB EBW = 53.39MHz




Date:  7.OCT.2013  13:22:15

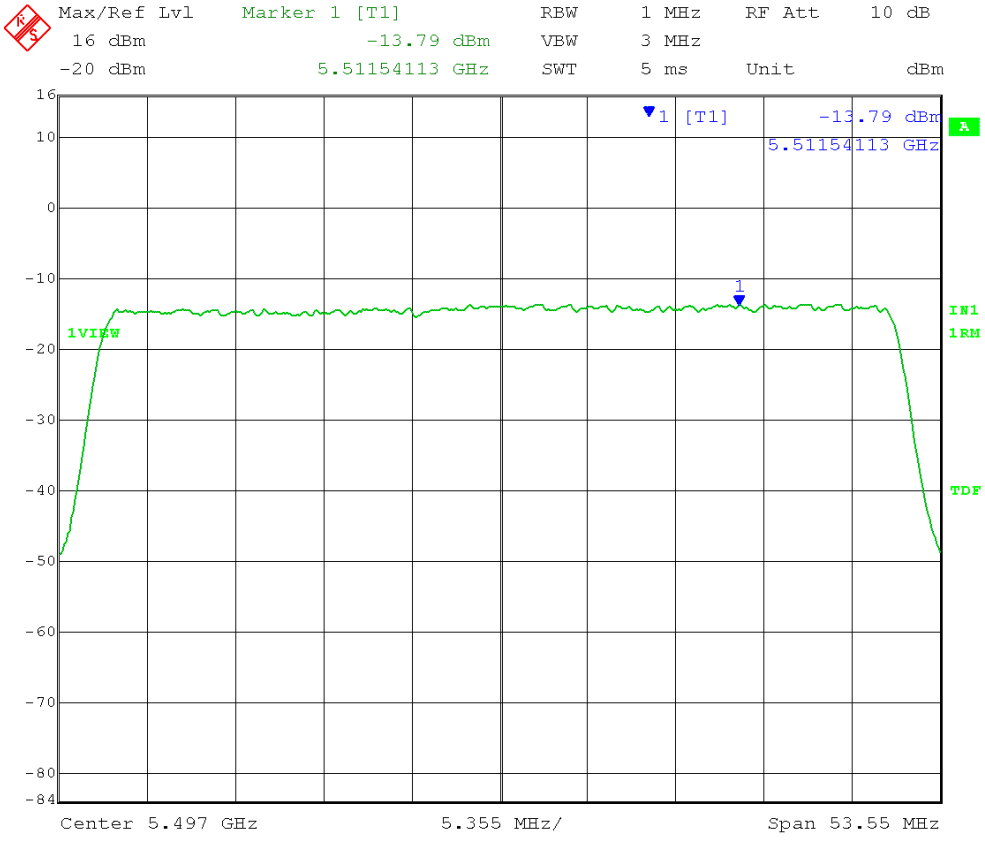
50MHz BW, LCH, 16QAM

TX 0:  26 dB EBW = 53.39MHz




Date:  15.OCT.2013  11:21:12

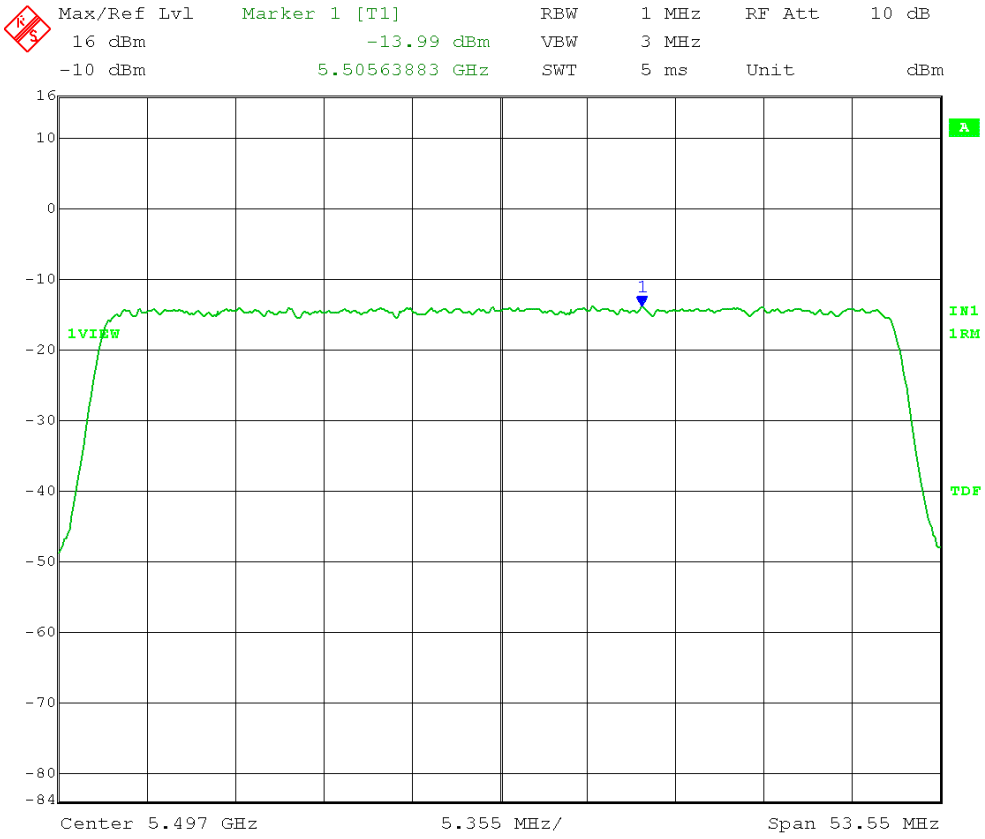
TX1: 26 dB EBW = 53.33MHz




Date:  16.OCT.2013  15:33:11

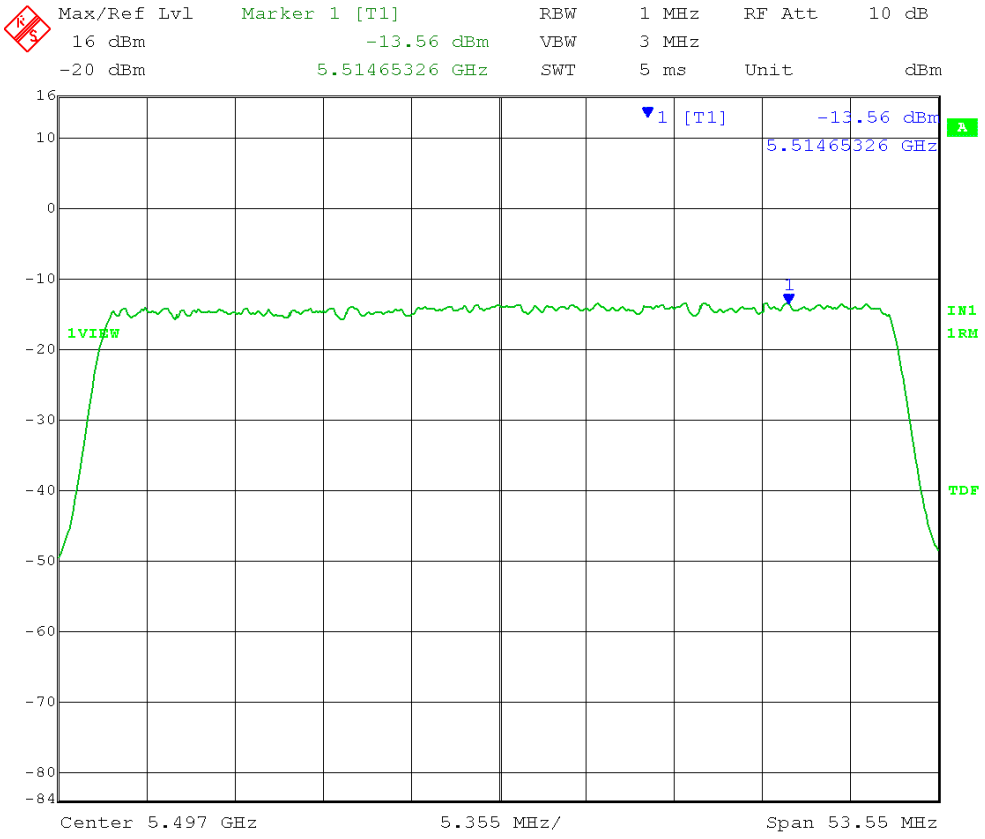
50MHz BW, LCH, 64QAM

TX 0:  26 dB EBW = 53.39MHz




Date:  15.OCT.2013  11:24:09

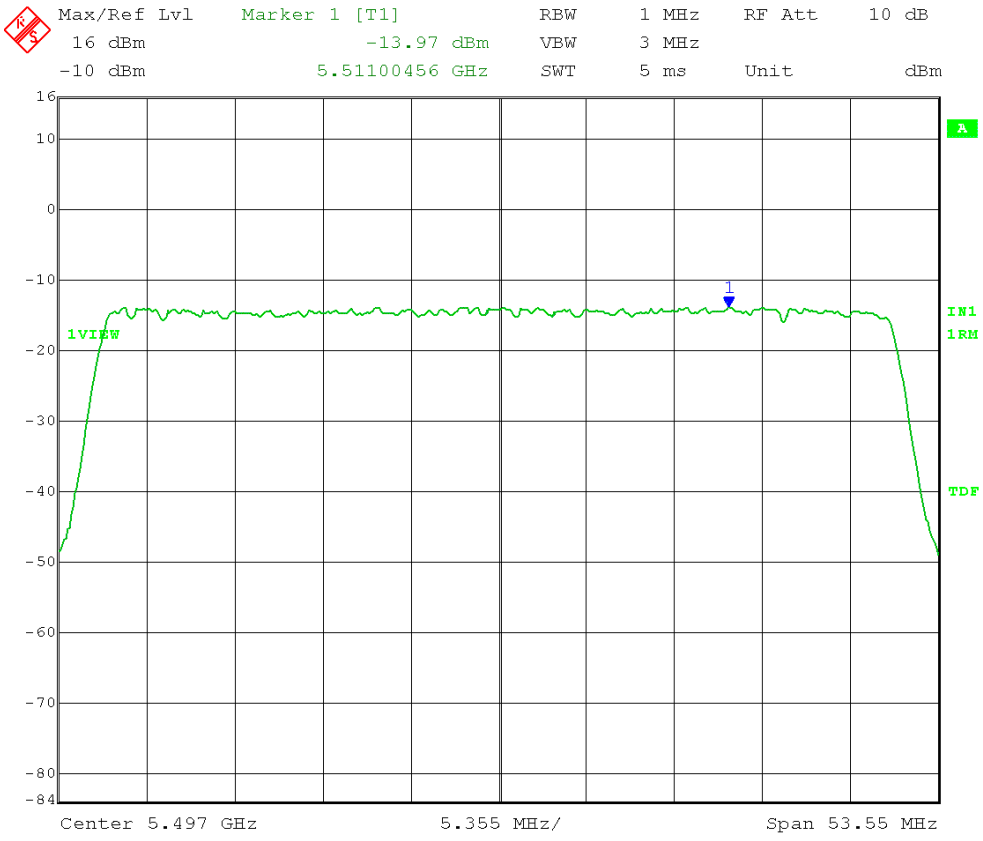
TX1: 26 dB EBW = 53.55MHz




Date:  16.OCT.2013  15:36:09

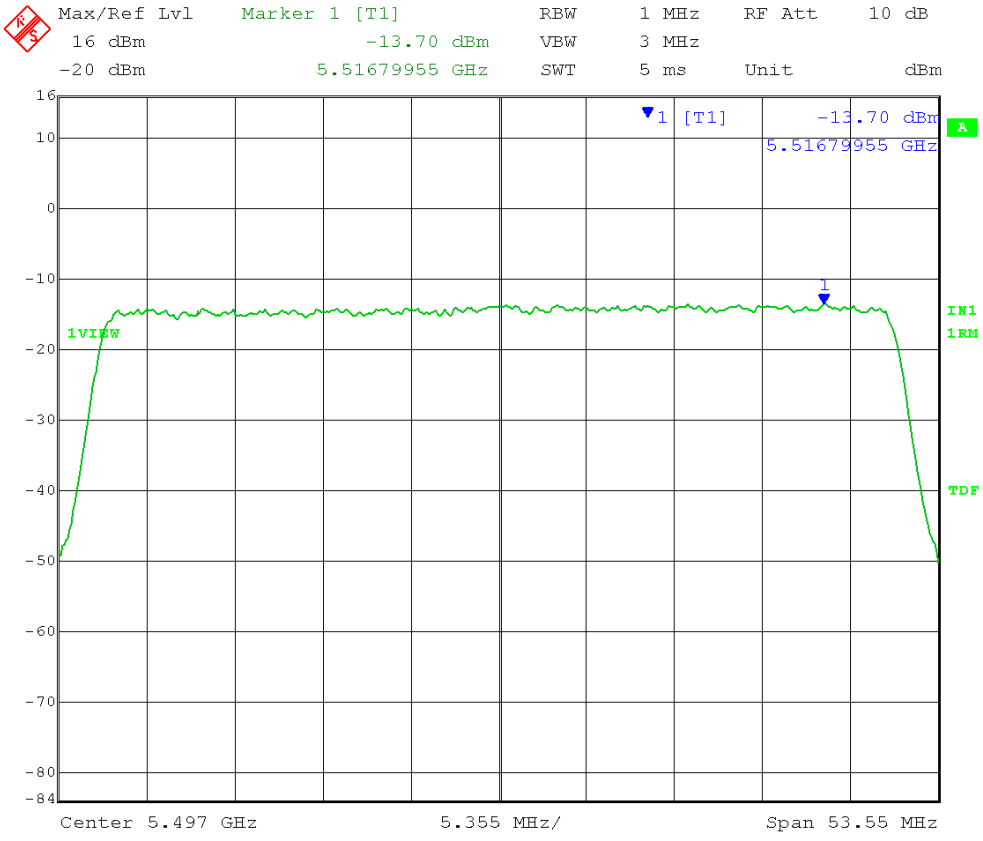
50MHz BW, LCH, 256QAM

TX 0:  26 dB EBW = 53.39MHz




Date:  15.OCT.2013  11:25:26

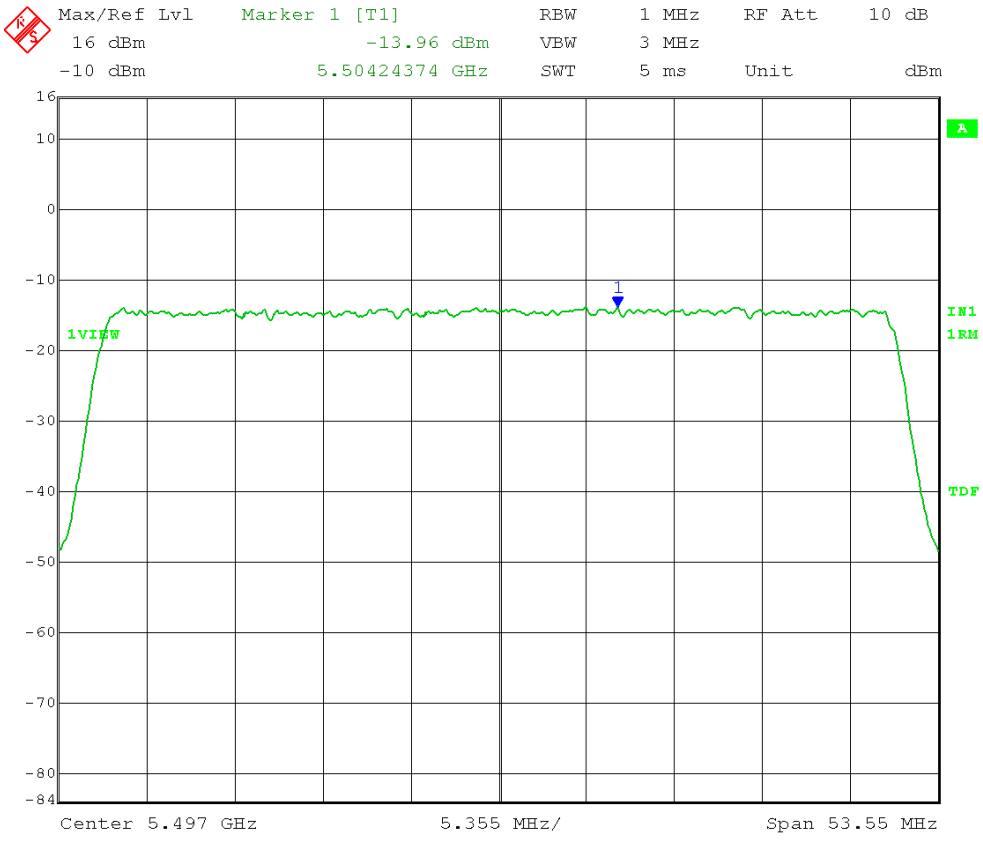
TX1: 26 dB EBW = 53.55MHz




Date:  16.OCT.2013  15:37:45

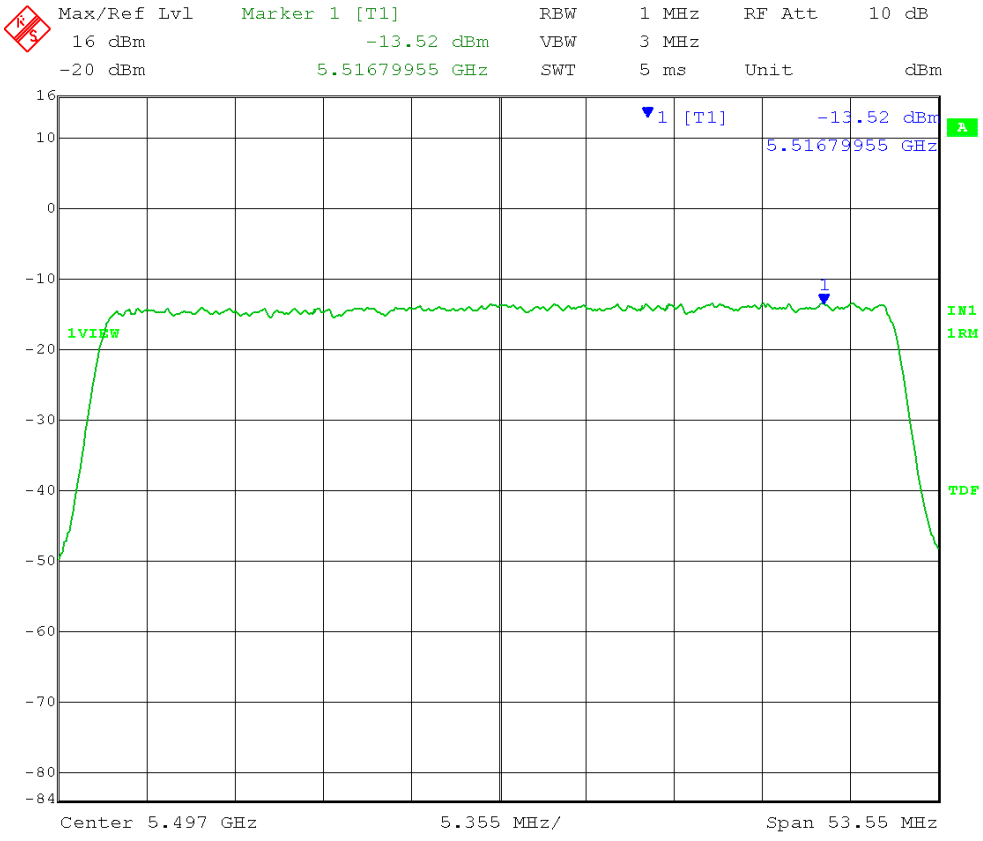
50MHz BW, LCH, 1024QAM

TX 0:  26 dB EBW = 53.39MHz




Date:  15.OCT.2013  11:28:58

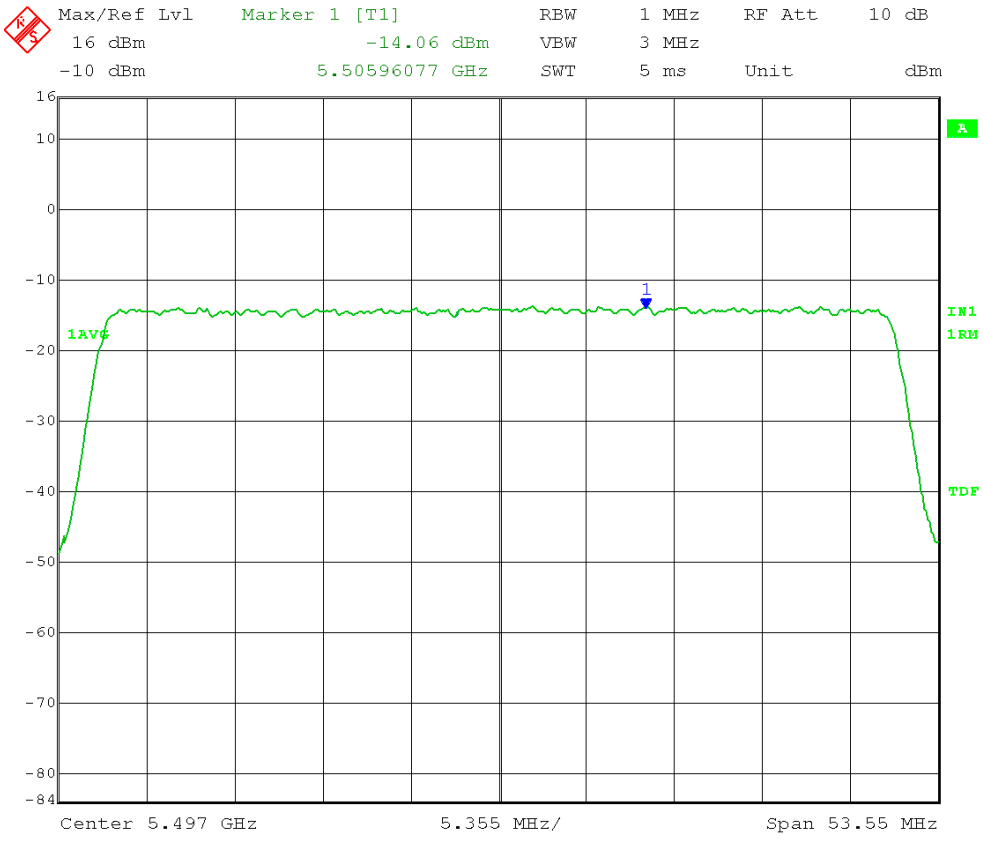
TX1: 26 dB EBW = 53.55MHz




Date:  16.OCT.2013  15:39:55

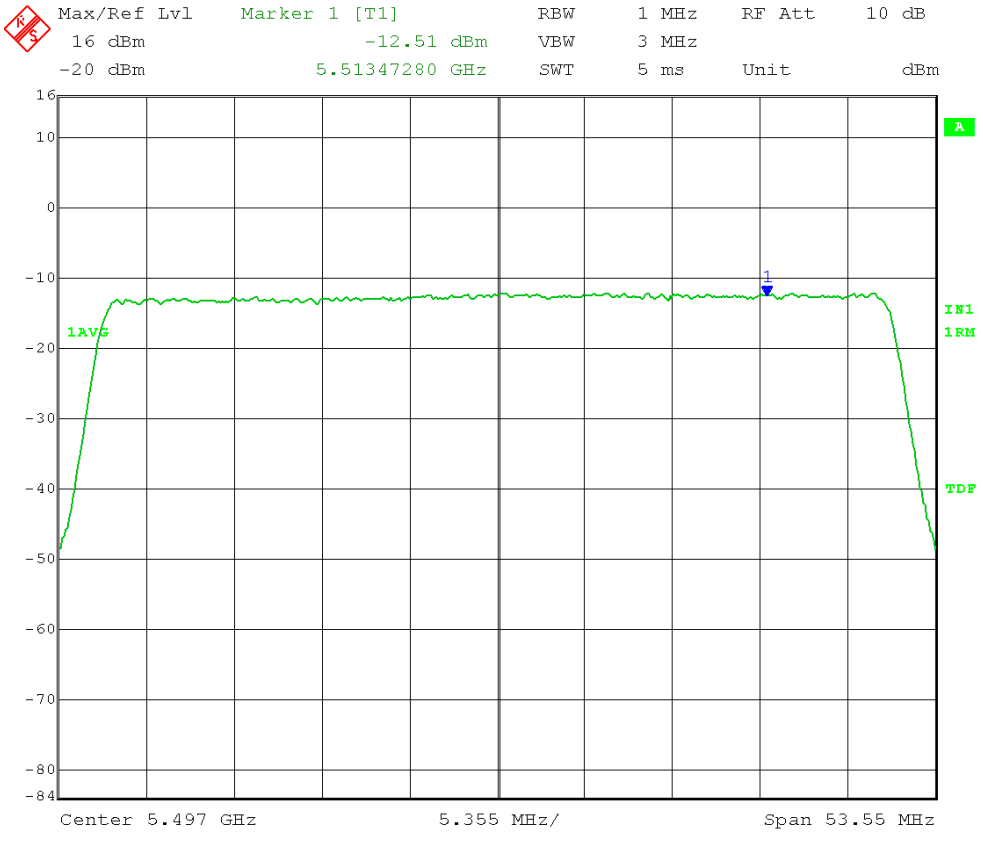
50MHz BW, LCH, QPSK

TX 0:  26 dB EBW = 53.39MHz




Date:  15.OCT.2013  11:15:19

TX1: 26 dB EBW = 53.55MHz




Date:  7.OCT.2013  13:17:54

## Appendix – Measurement Data

### 7.0 Peak Excursion – Conducted

**Rule Section**: Section 15.407(a)(6)

**Test Procedure**: FCC KDB 789033 D01 General UNII Test Procedures v01r03 – *Guidance for Compliance Testing of Unlicensed National Information Infrastructure (U-NII) Devices – Part 15, Subpart E*

Section G – Peak excursion measurement

**Description**: SPAN: set to encompass entire emission bandwidth
RBW = 1 MHz
VBW ≥ 3 MHz
Detector = Peak
Trace mod = max hold
Use peak search to find the peak of the spectrum
Compute the ratio of the maximum of the peak-max-hold spectrum to the PPSD

**Limit:** 13 dB peak-to-average ratio across any 1 MHz bandwidth

**Results:** Passed

**Notes:** Measurements were taken for QPSK, 16QAM, 64QAM, 256QAM and 1024 QAM modulations at the lowest, middle, and highest channels of operation. EUT was set to transmit continuously.

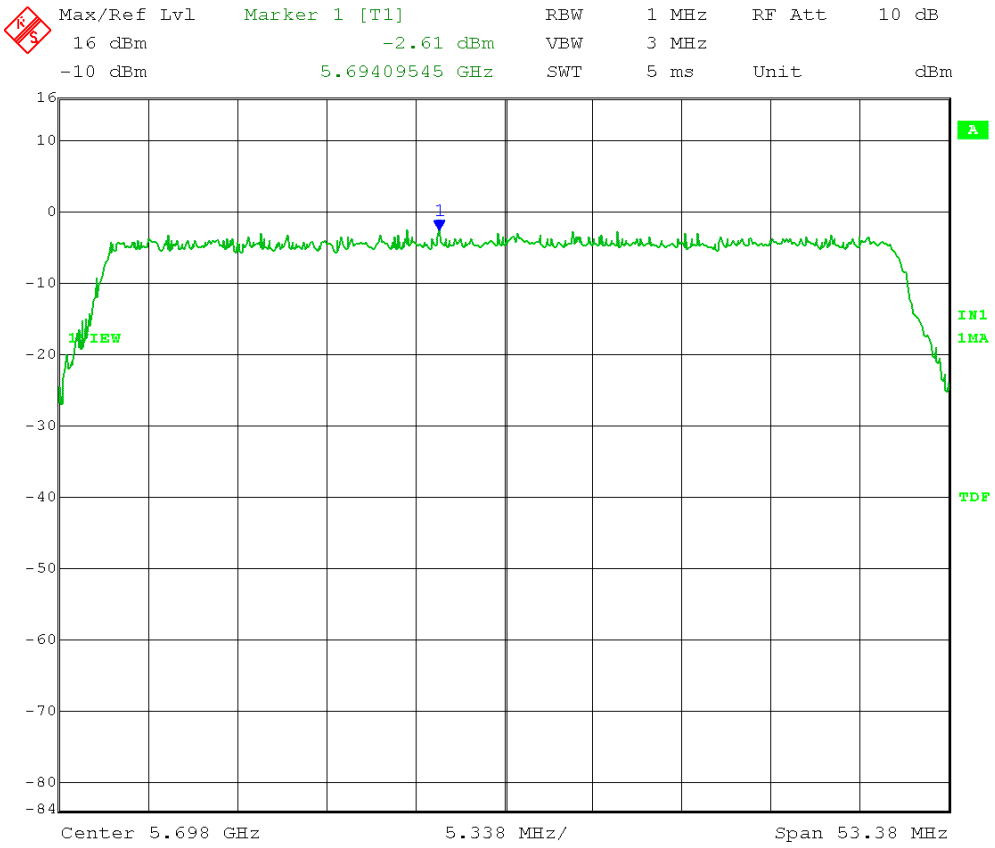
Output power was set to 30 dBm eirp using special test software.

Test Date: 10-22-2013
Company: Ubiquiti Networks
EUT: Air Fiber 5 - 5.4GHz WiFi Radio
Test: Peak Excursion Measurement - Conducted
Operator: Lillian Li
Test Procedure used: KDB 789033 D01 v01r03 – G)
Limit: [15.407(a)(6)]: < 13dB/MHz

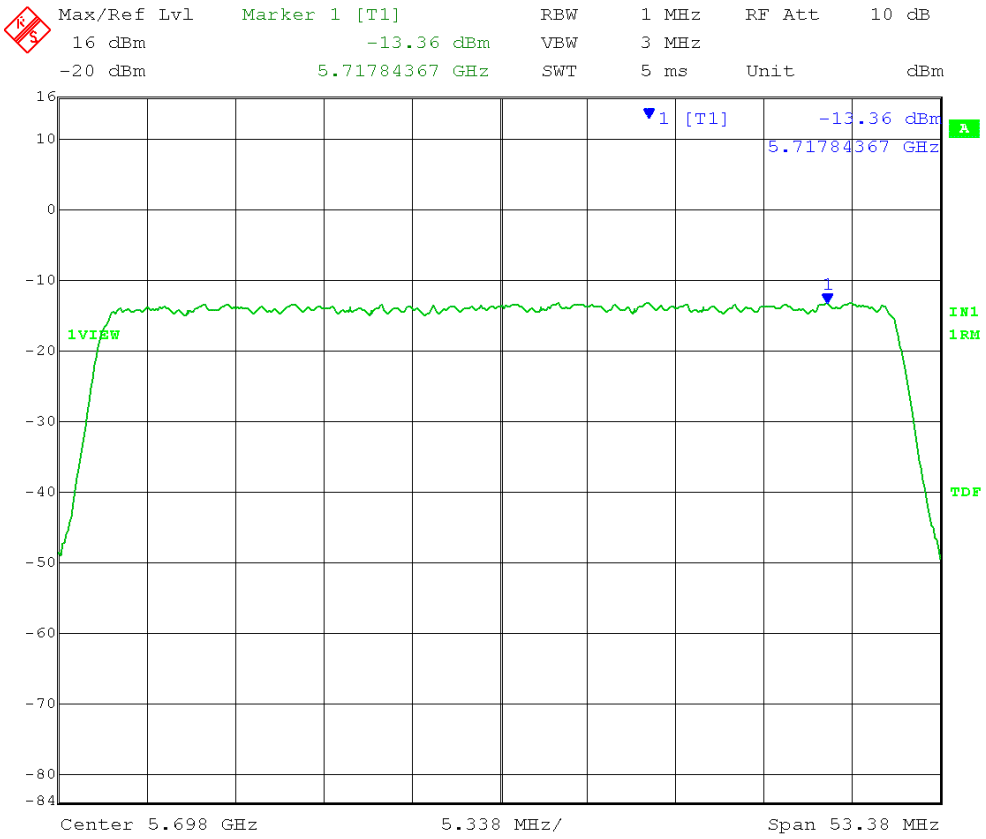
50MHz Operating Bandwidth:

| **Peak Excursion** | | 50MHz | | | | |
|---|---|---|---|---|---|---|
| | dB | QPSK | 16QAM | 64QAM | 256QAM | 1024Q |
| FCC limit = 13dB | *FCC limit:* | 13 | 13 | 13 | 13 | 13 |
| | PK | -2.22 | -2.61 | -2.42 | -2.08 | -2.2 |
| | AVG | -13.5 | -13.36 | -13.38 | -13.4 | -13.33 |
| | Excursion | **11.28** | **10.75** | **10.96** | **11.32** | **11.13** |
| HCH = 5698 MHz | Margin | 1.72 | 2.25 | 2.04 | 1.68 | 1.87 |
| | PK | -4.93 | -5.12 | -4.29 | -4.5 | -4.76 |
| | AVG | -15.52 | -15.93 | -15.9 | -15.52 | -15.54 |
| | Excursion | **10.59** | **10.81** | **11.61** | **11.02** | **10.78** |
| MCH = 5575 MHz | Margin | 2.41 | 2.19 | 1.39 | 1.98 | 2.22 |
| | PK | -2.75 | -2.33 | -2.36 | -2.22 | -2.65 |
| | AVG | -14.06 | -15.12 | -13.99 | -13.97 | -13.96 |
| | Excursion | **11.31** | **12.79** | **11.63** | **11.75** | **11.31** |
| LCH = 5497 MHz | Margin | 1.69 | 0.21 | 1.37 | 1.25 | 1.69 |

50MHz BW, HCH, 16QAM, 26 dB EBW = 53.38MHz

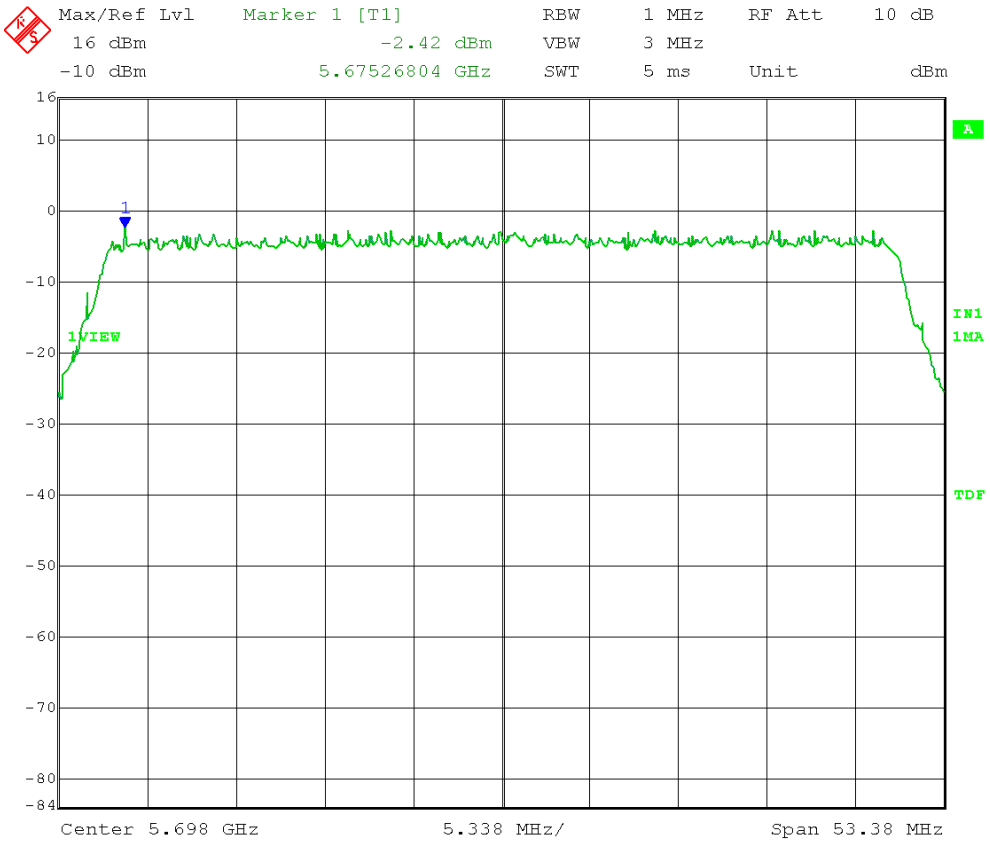



Date: 15.OCT.2013 11:42:53




Date: 7.OCT.2013 15:43:02

50MHz BW, HCH, 64QAM, 26 dB EBW = 53.38MHz

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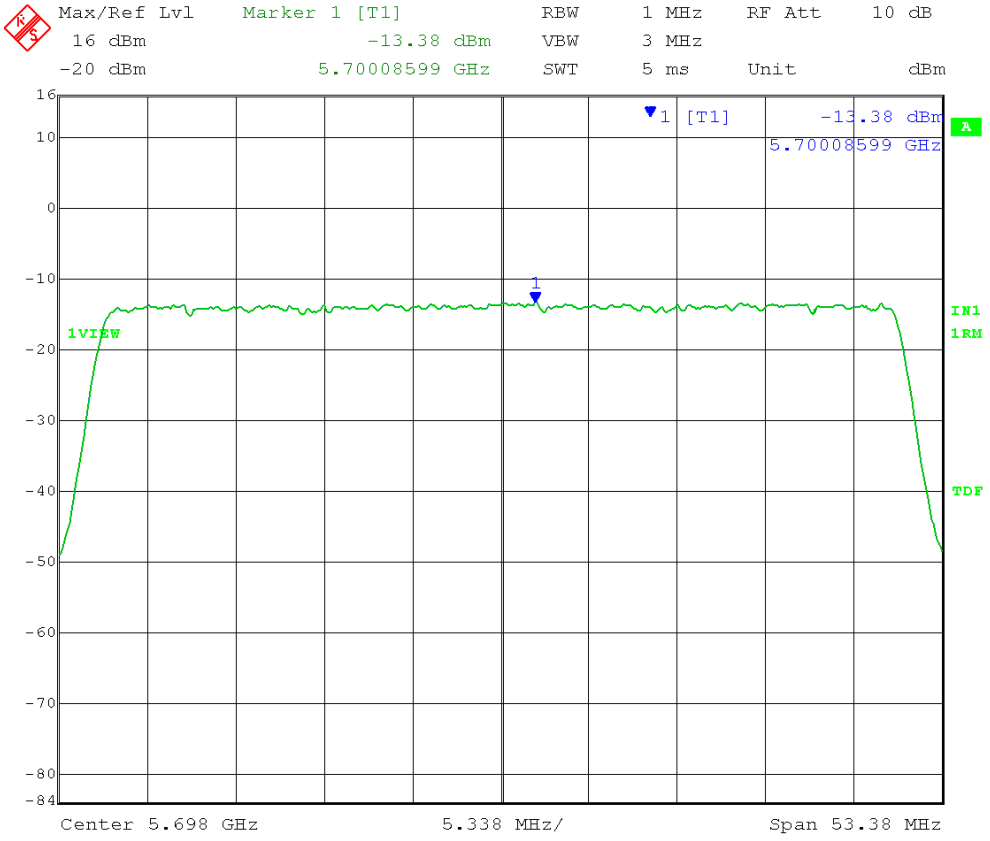
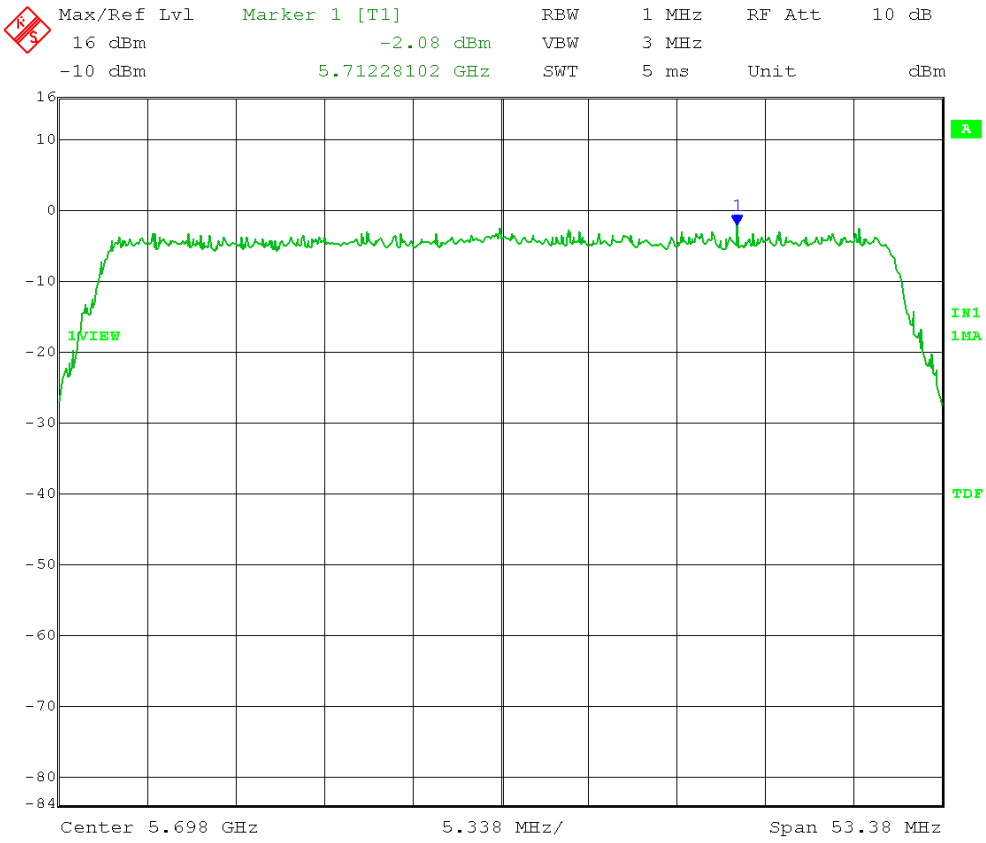



Date: 7.OCT.2013 15:44:26

50MHz BW, HCH, 256QAM, 26 dB EBW = 53.38MHz

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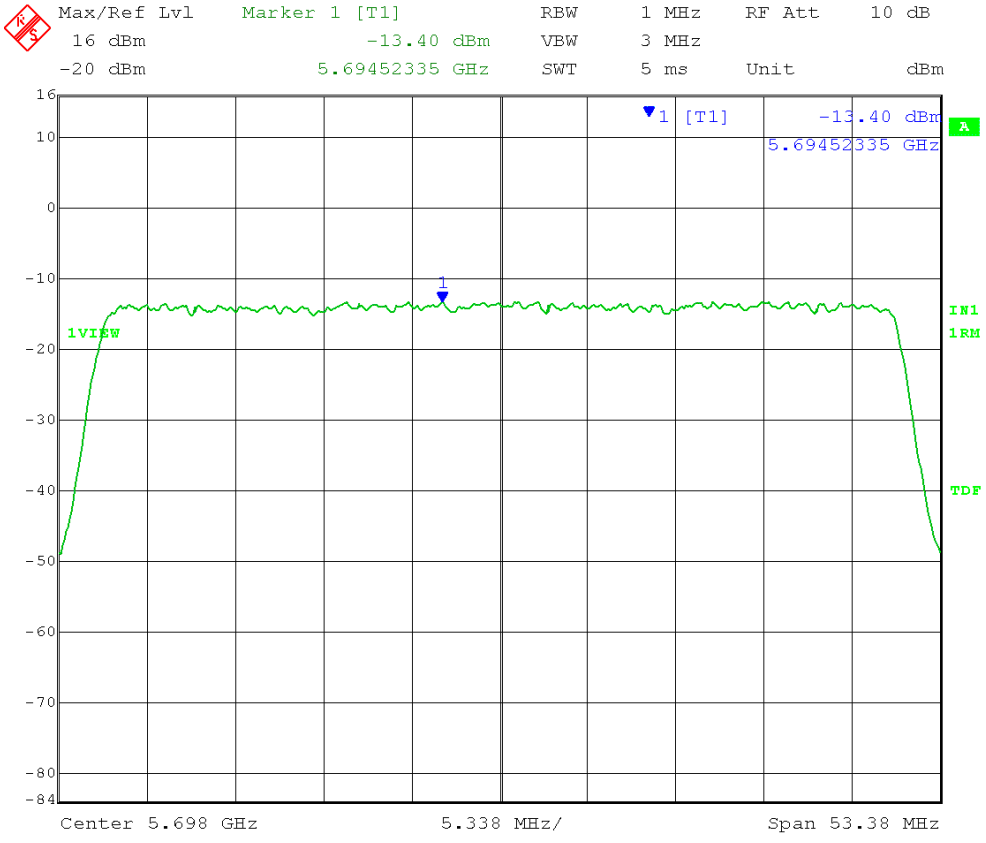
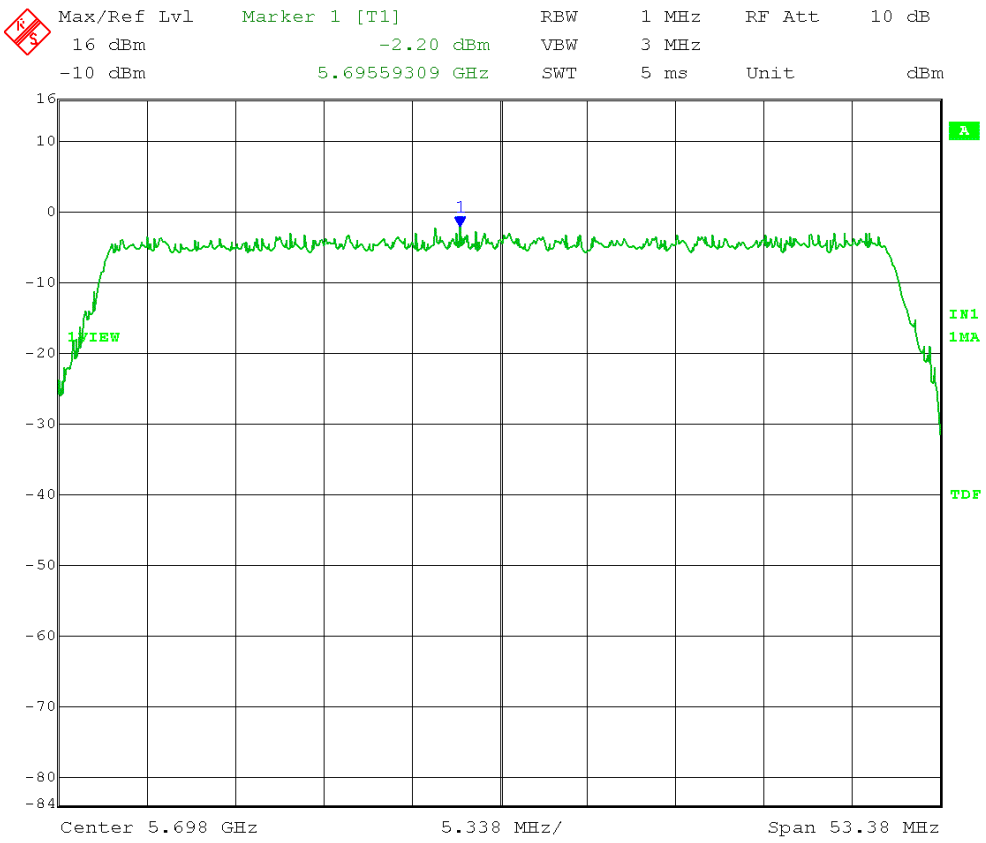



Date: 7.OCT.2013 15:45:35

50MHz BW, HCH, 1024QAM, 26 dB EBW = 53.38MHz

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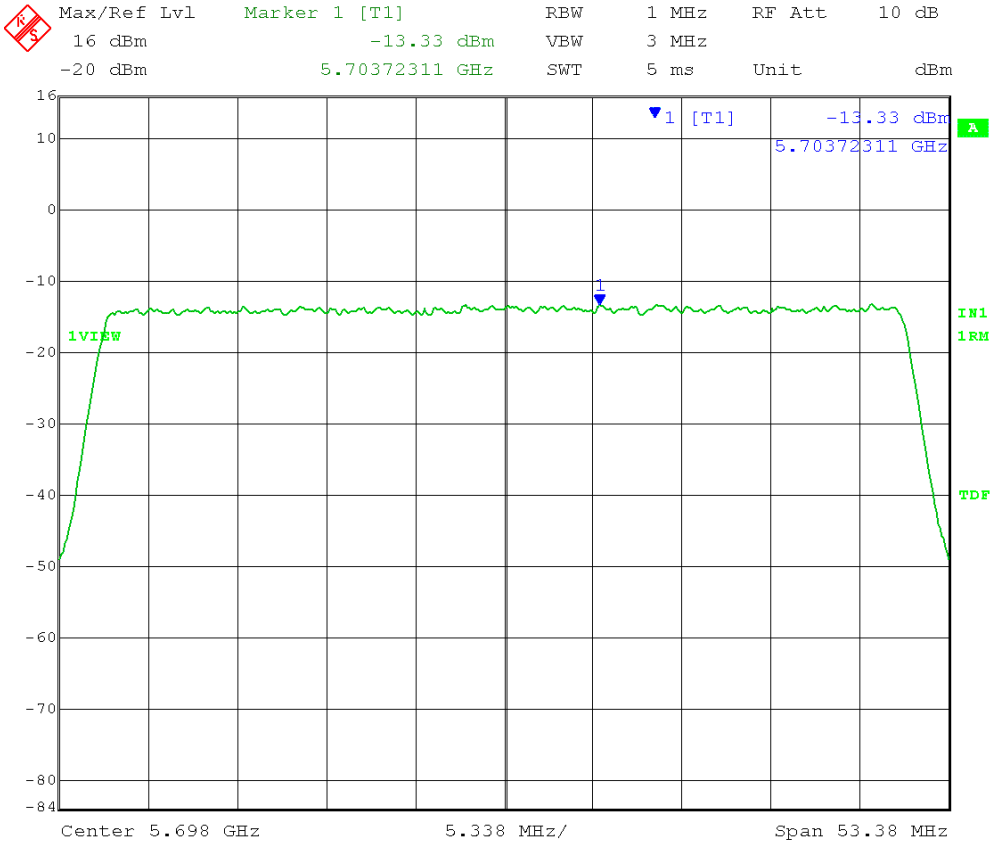
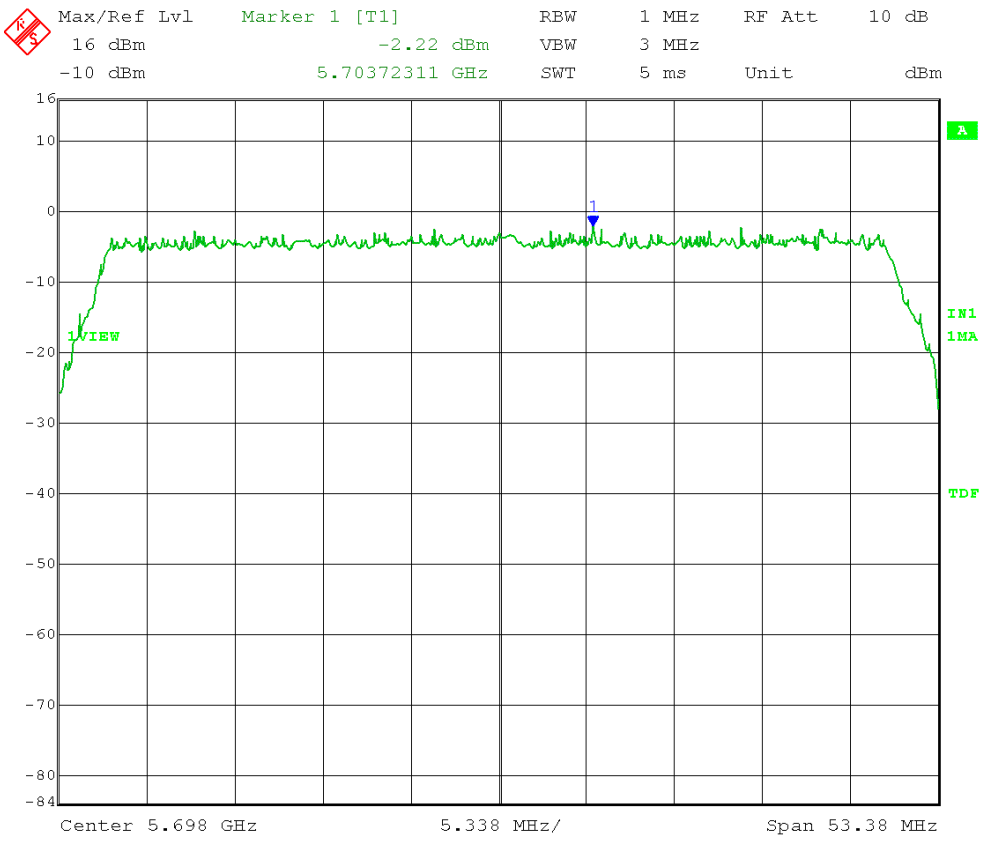



Date: 7.OCT.2013 15:46:41

50MHz BW, HCH, QPSK, 26 dB EBW = 53.38MHz

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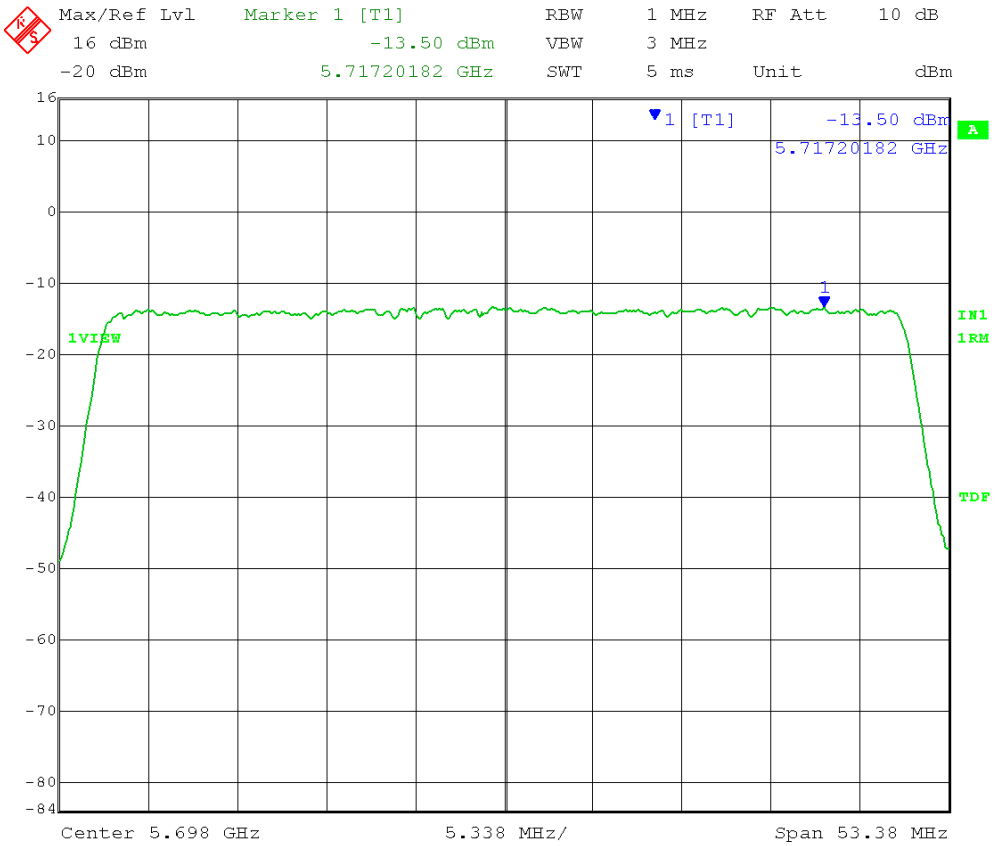
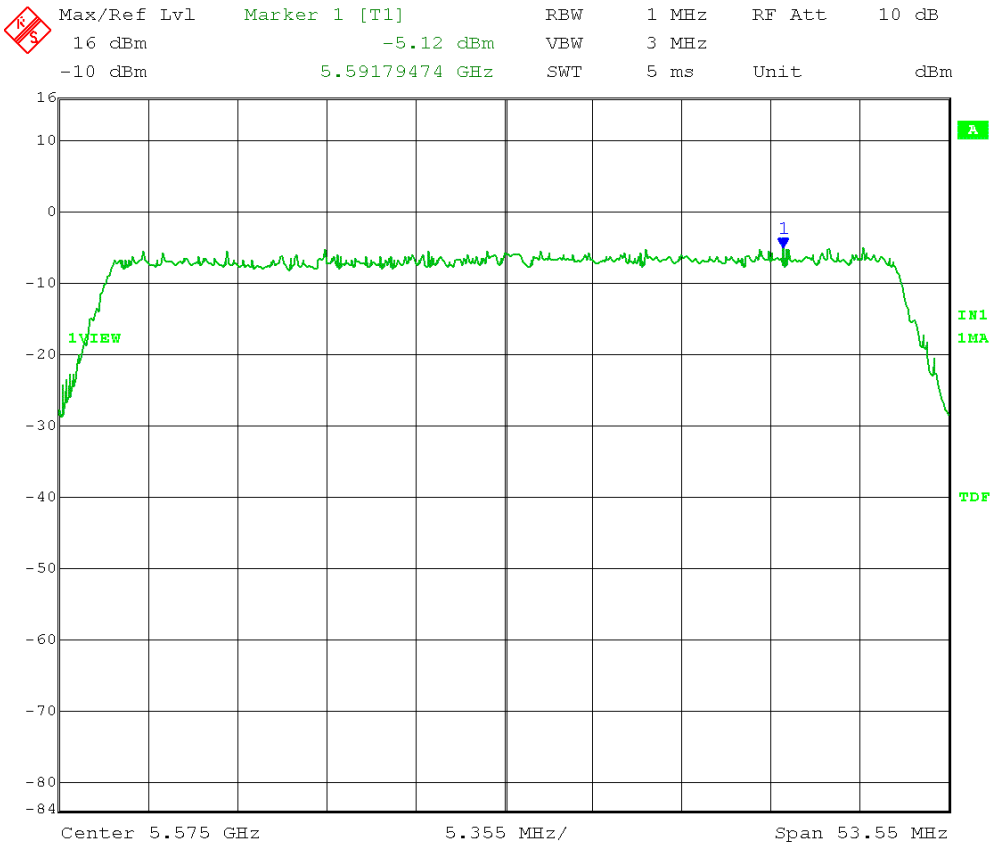



Date: 7.OCT.2013 15:41:35

50MHz BW, MCH, 16QAM, 26 dB EBW = 53.55MHz

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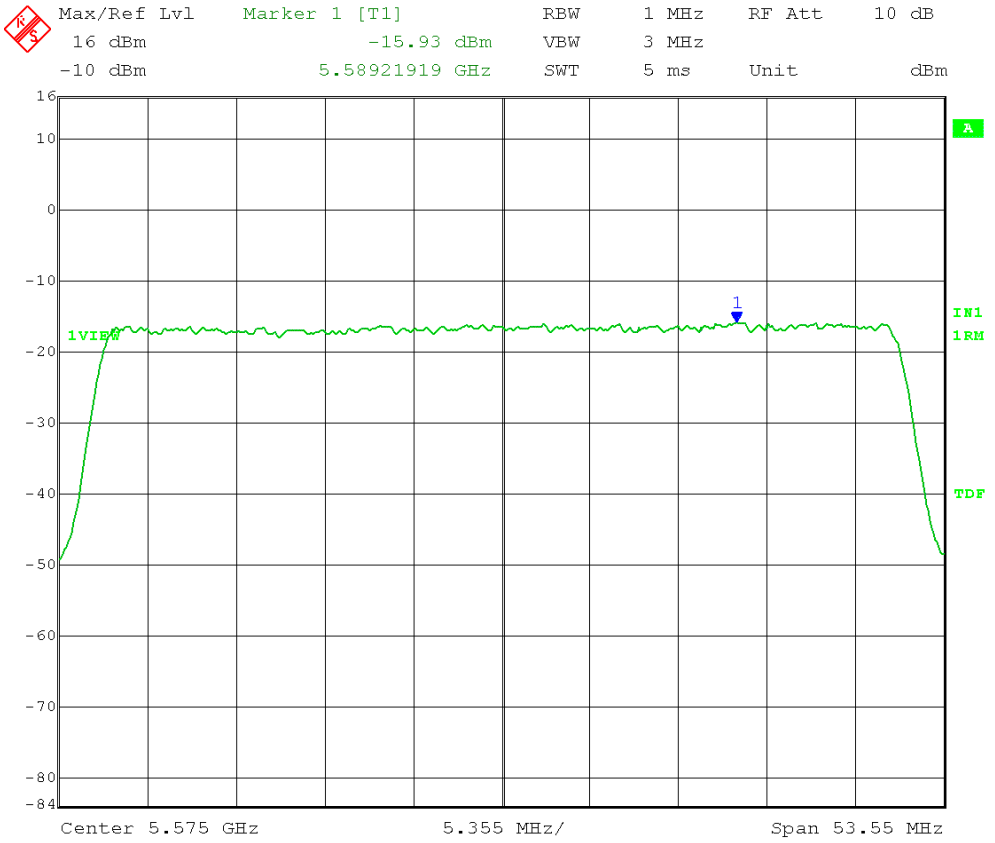
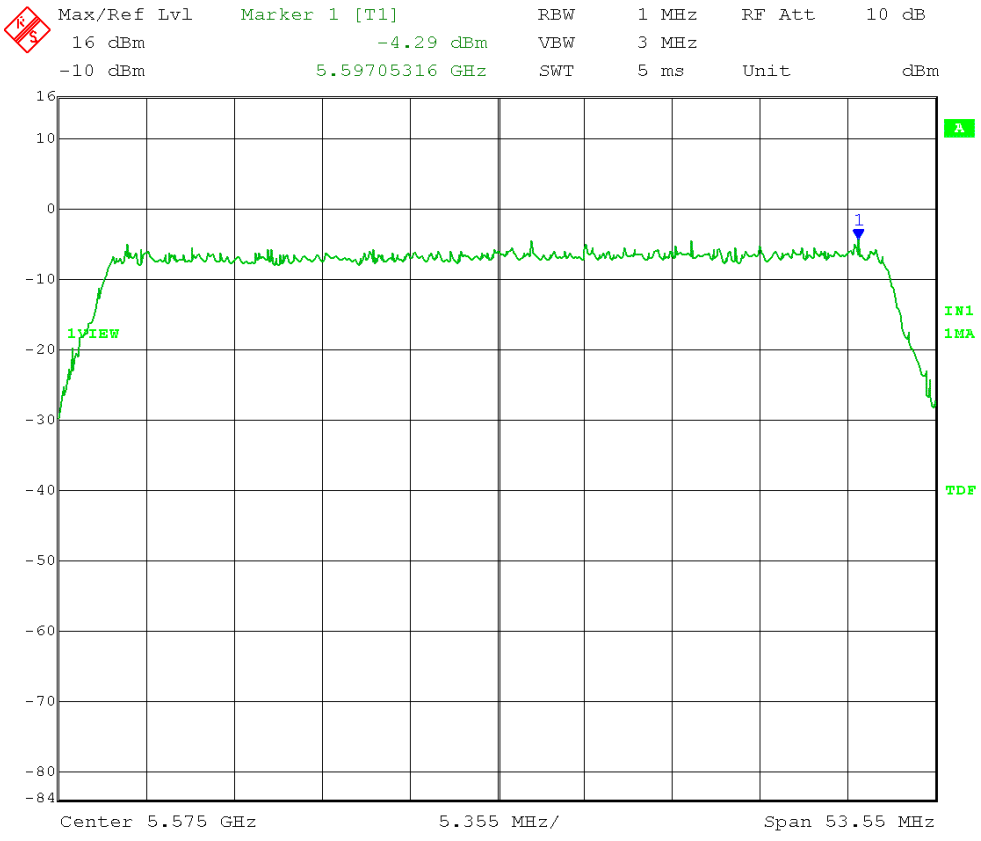
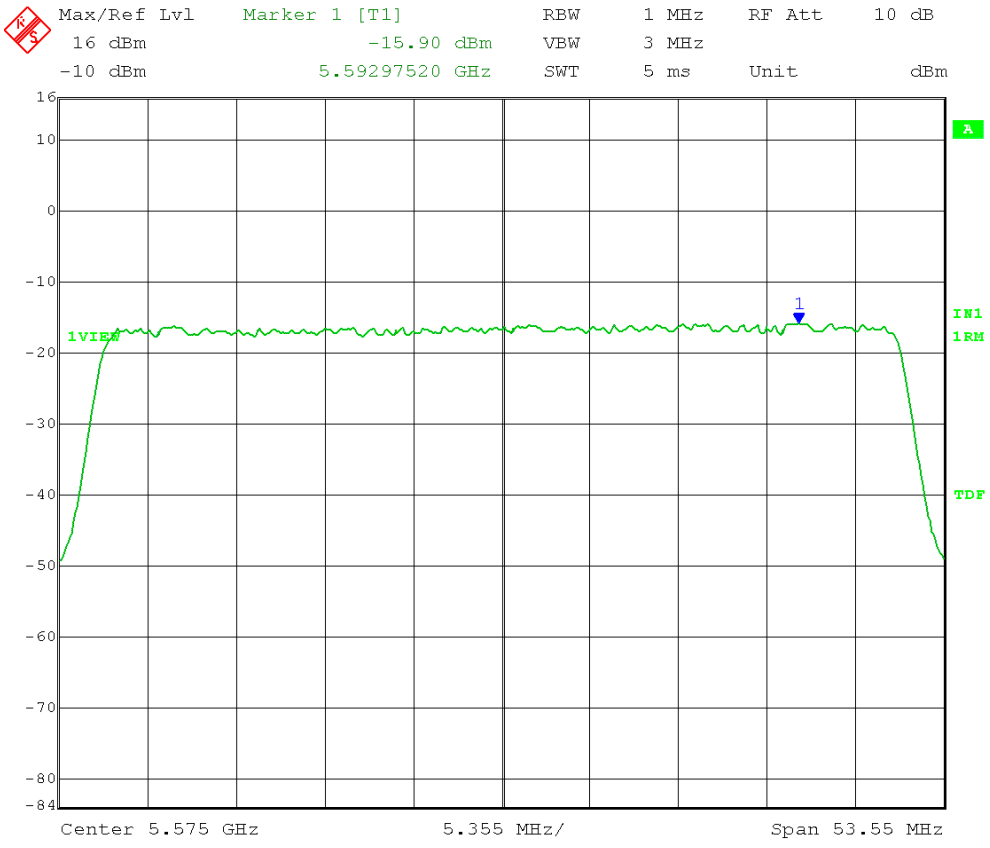


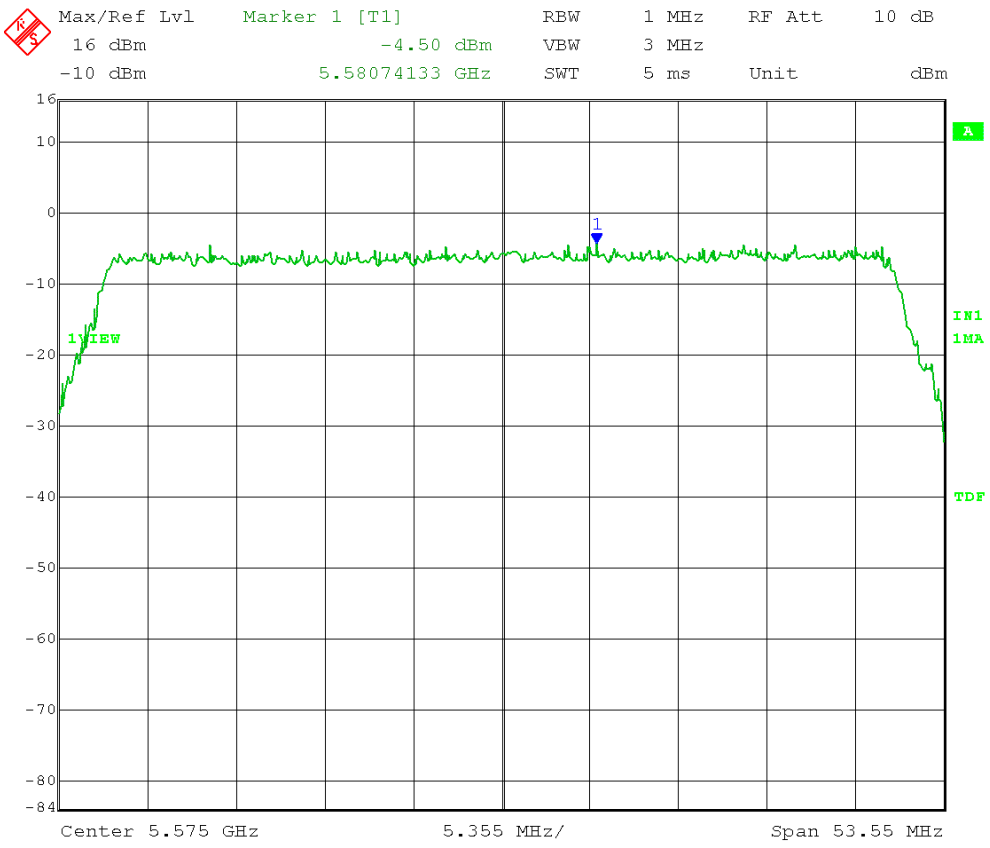

Date: 15.OCT.2013 11:38:32

50MHz BW, MCH, 64QAM, 26 dB EBW = 53.55MHz

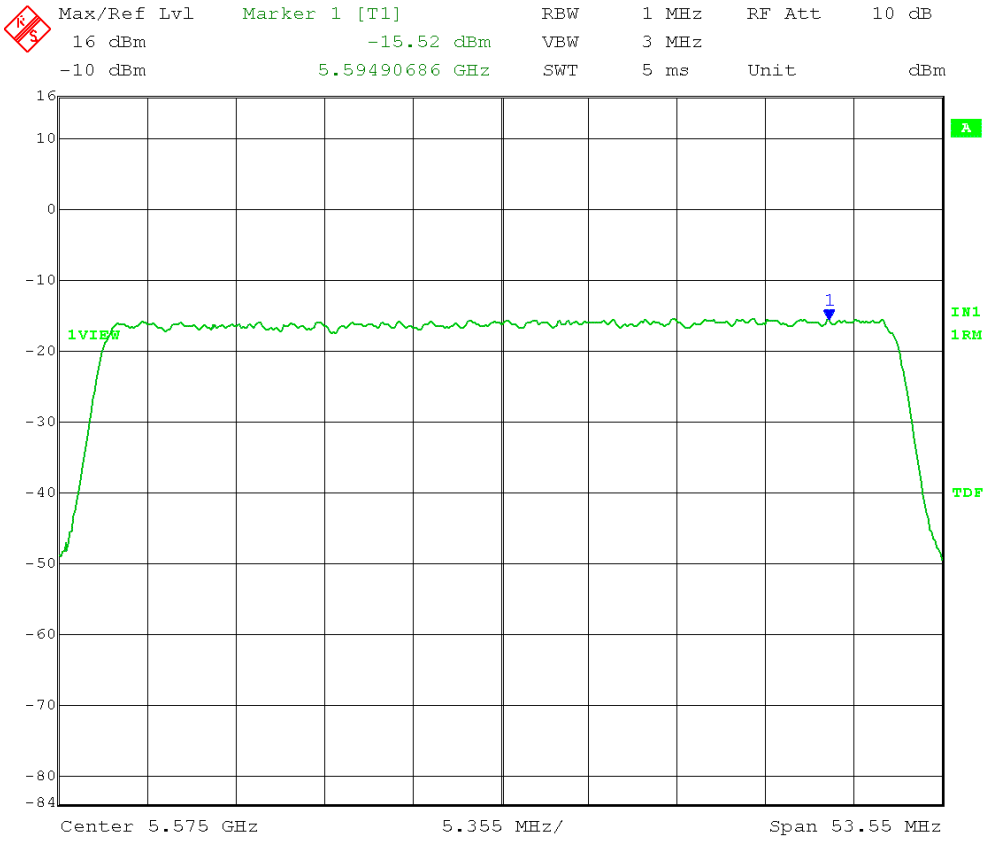


50MHz BW, MCH, 256QAM, 26 dB EBW = 53.55MHz

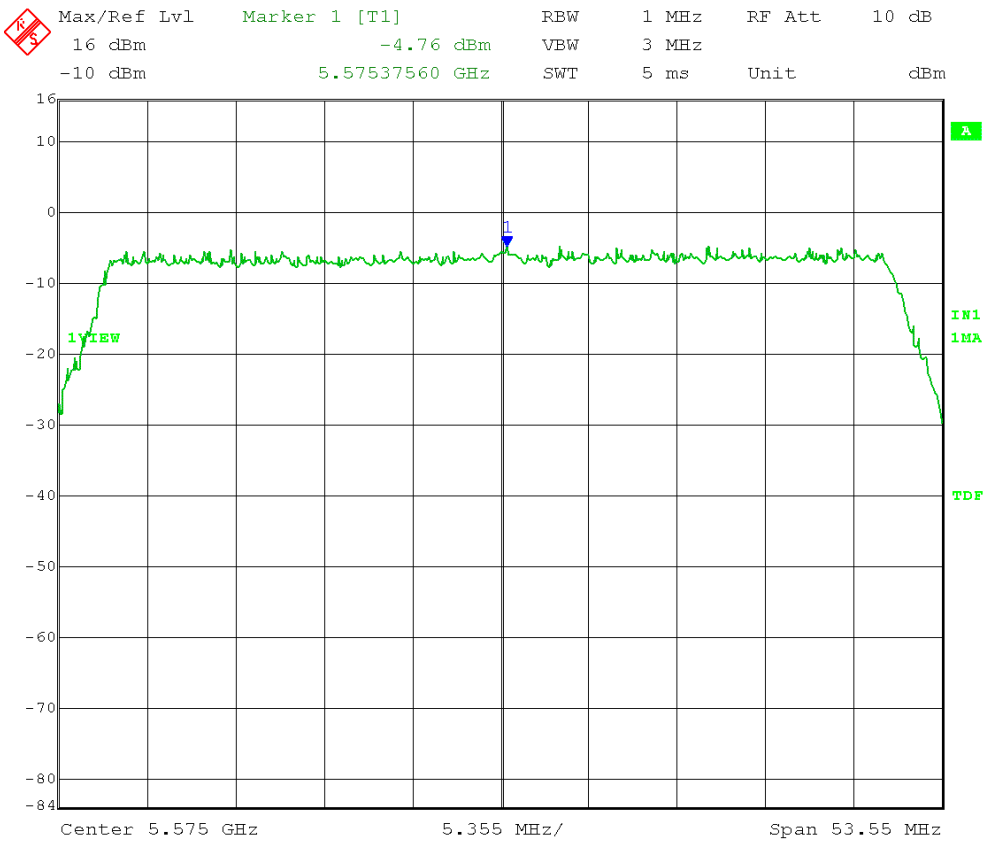



Date: 15.OCT.2013 11:34:27

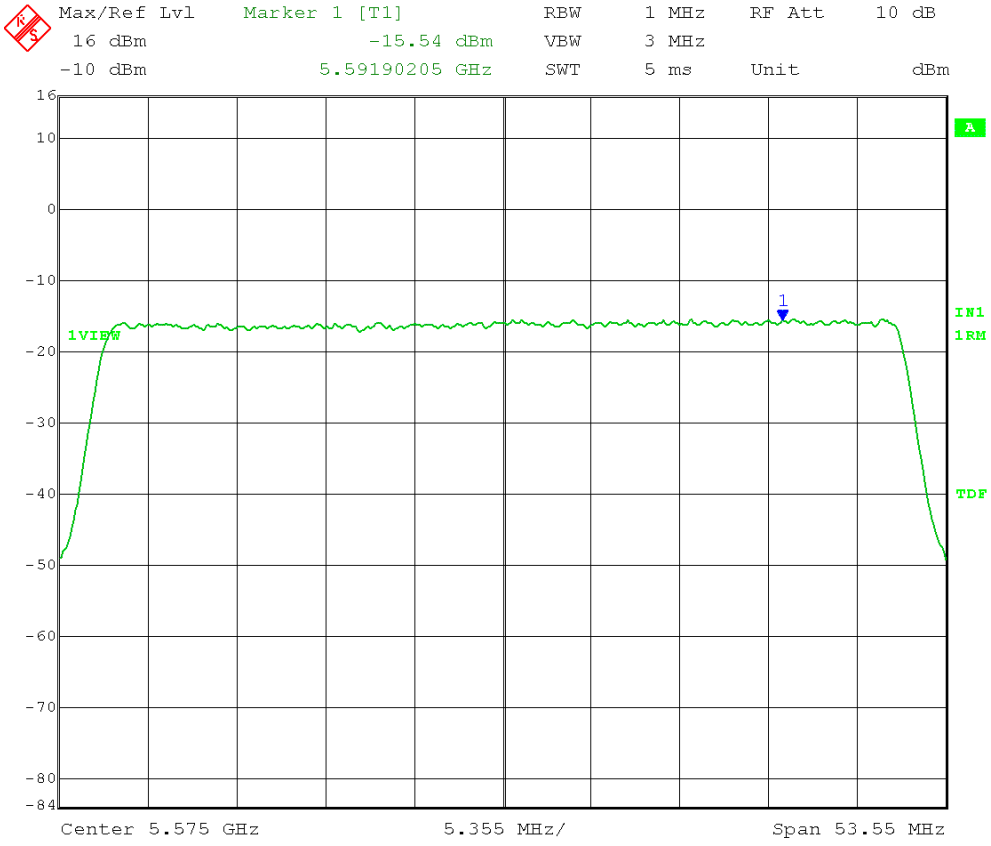



Date: 15.OCT.2013 11:35:17

50MHz BW, MCH, 1024QAM, 26 dB EBW = 53.55MHz

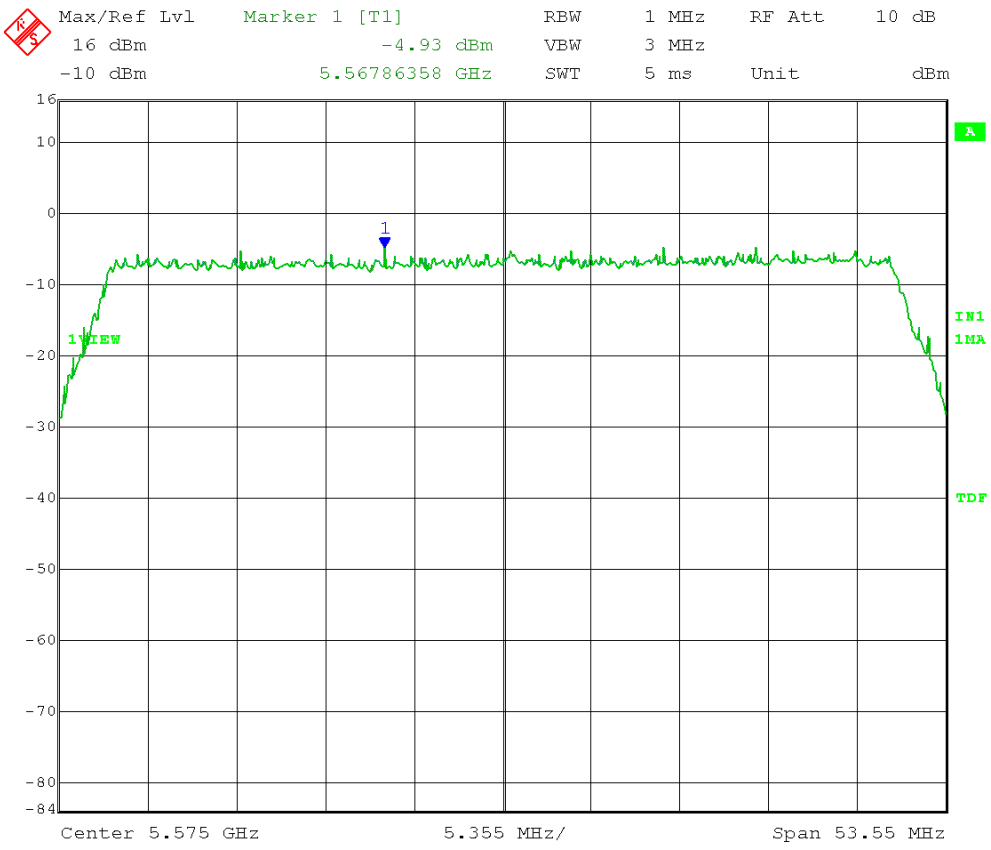


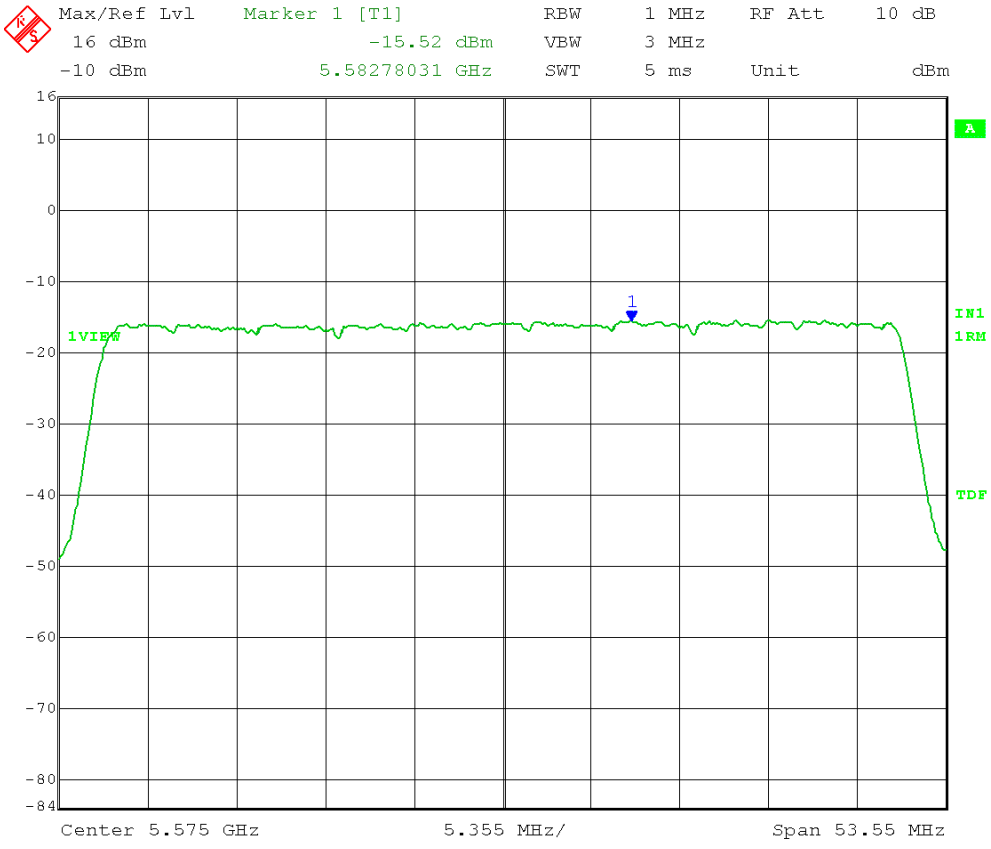

Date: 15.OCT.2013 11:33:20



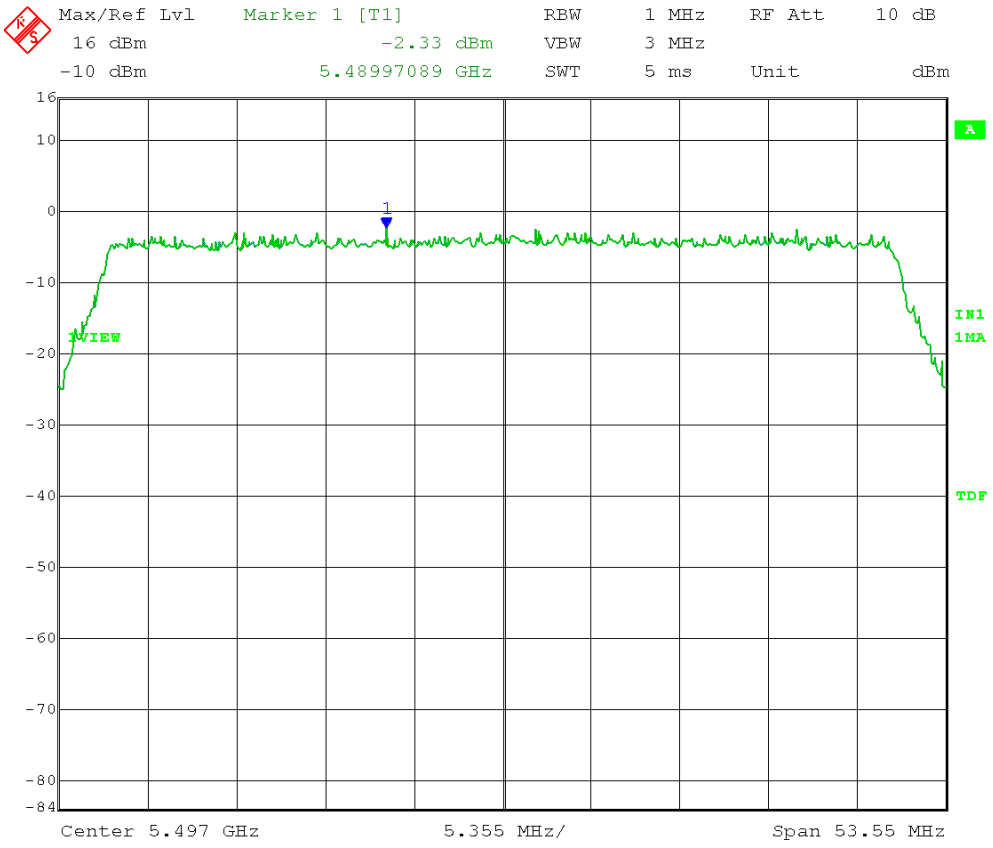

Date: 15.OCT.2013 11:32:34

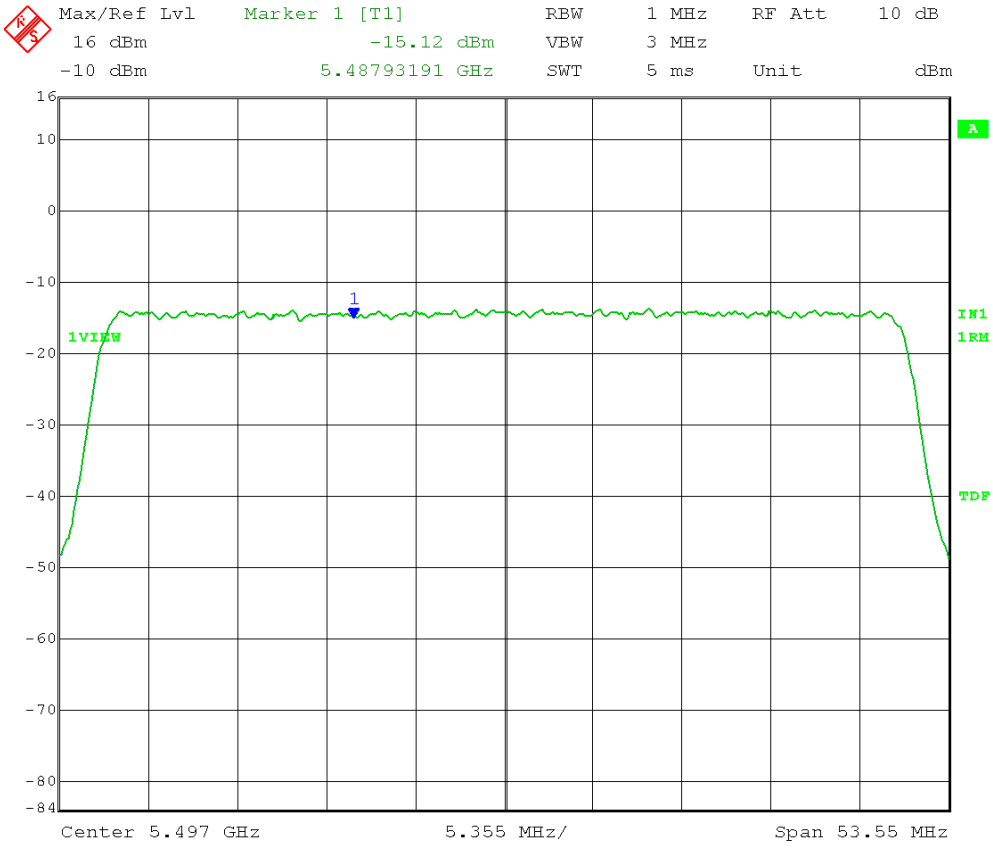
50MHz BW, MCH, QPSK, 26 dB EBW = 53.55MHz



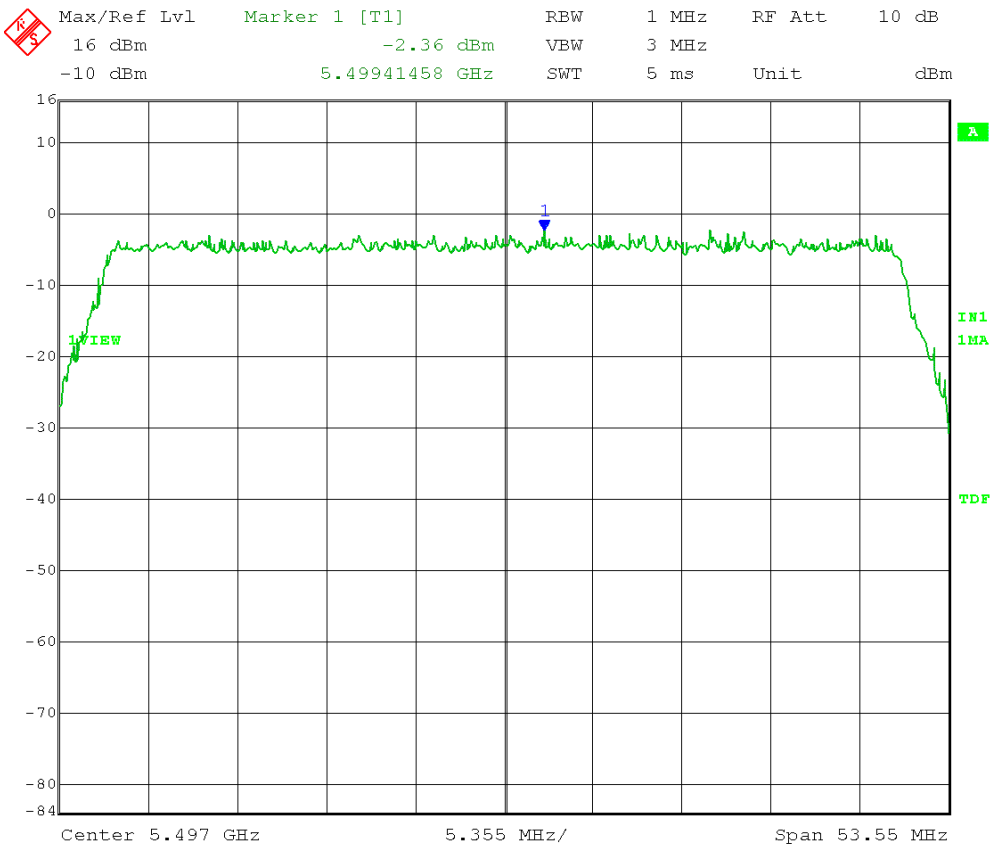



50MHz BW, LCH, 16QAM, 26 dB EBW = 53.39MHz

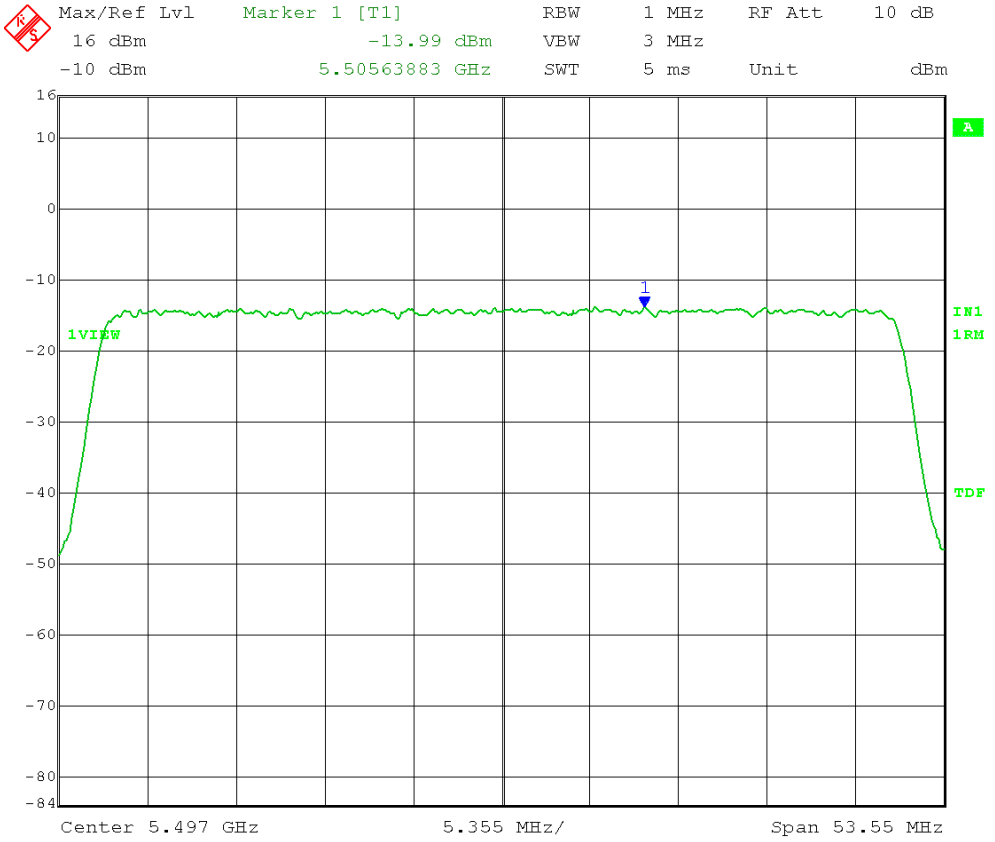


50MHz BW, LCH, 64QAM, 26 dB EBW = 53.39MHz

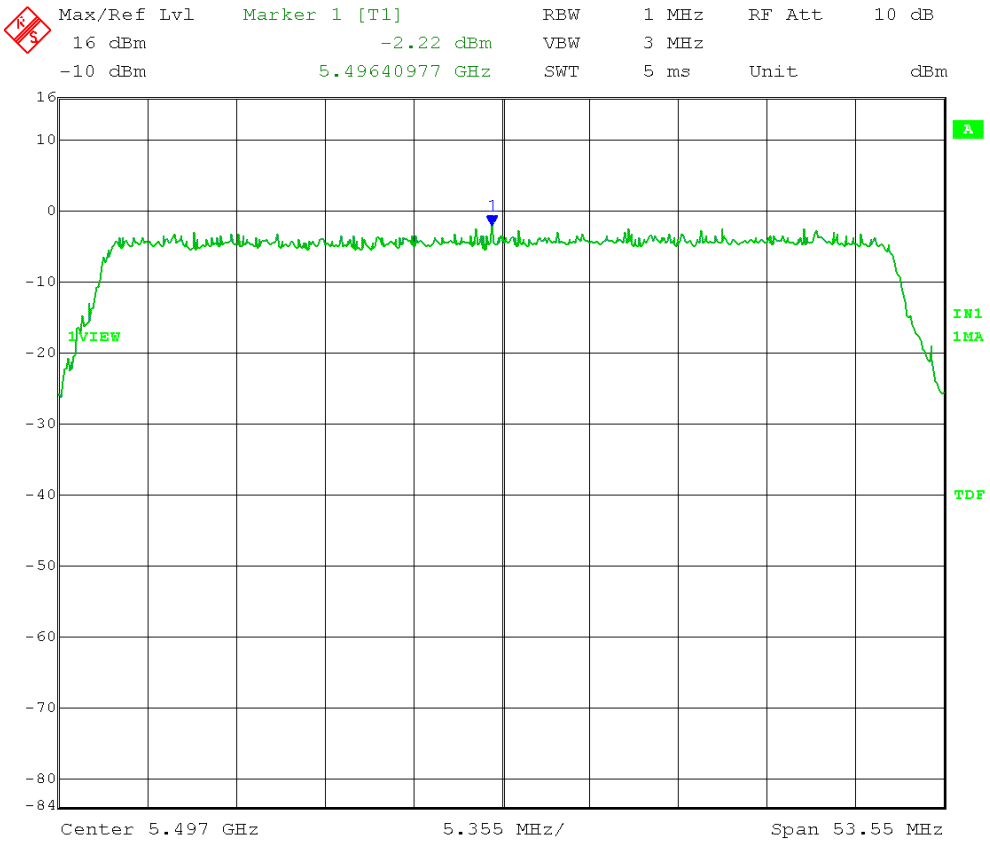



Date: 15.OCT.2013 11:23:08

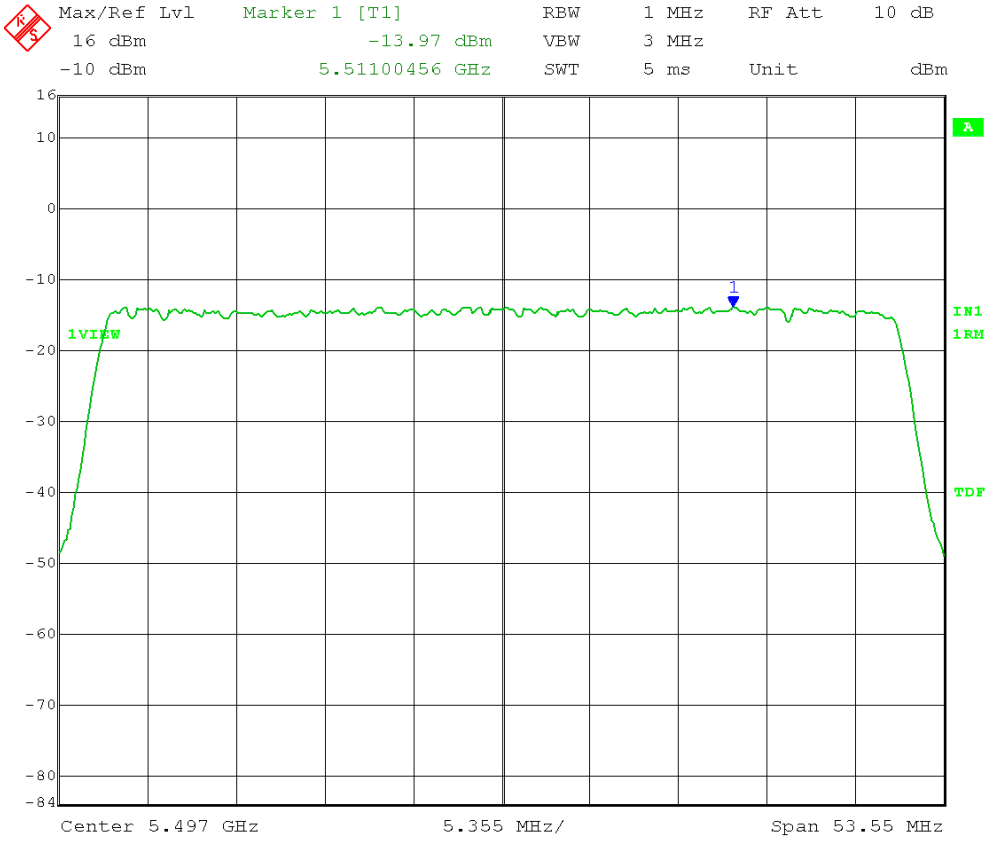



Date: 15.OCT.2013 11:24:09

50MHz BW, LCH, 256QAM, 26 dB EBW = 53.39MHz

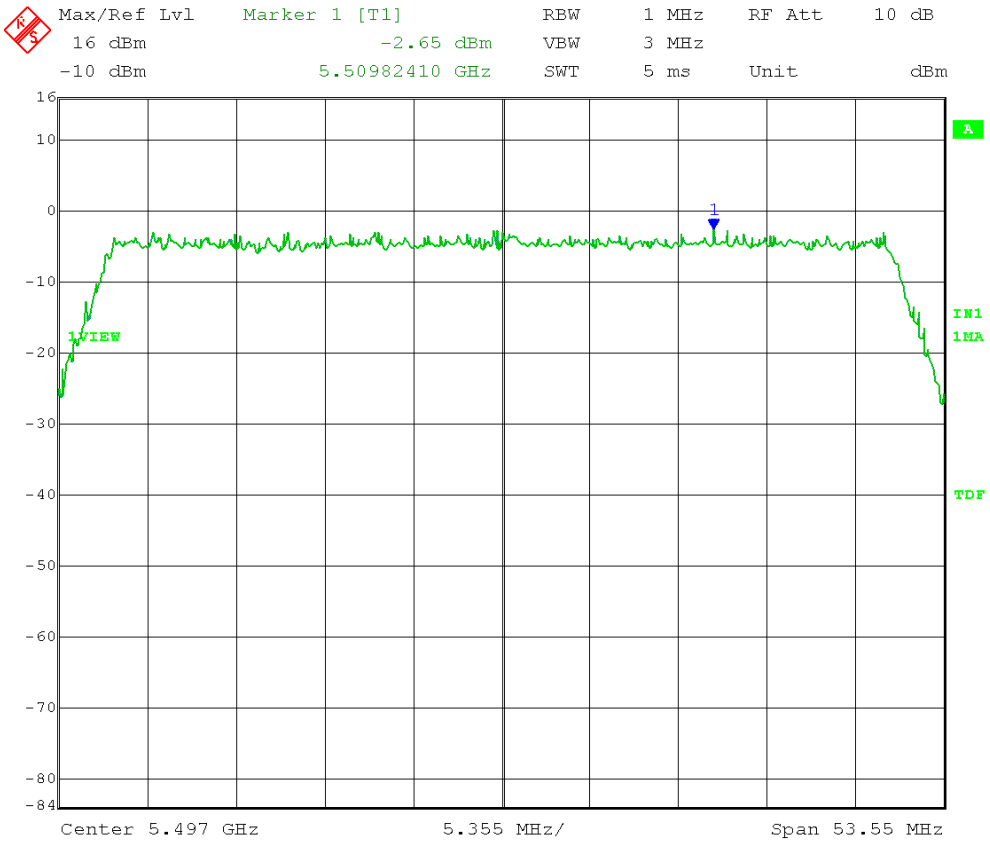



Date: 15.OCT.2013 11:27:17

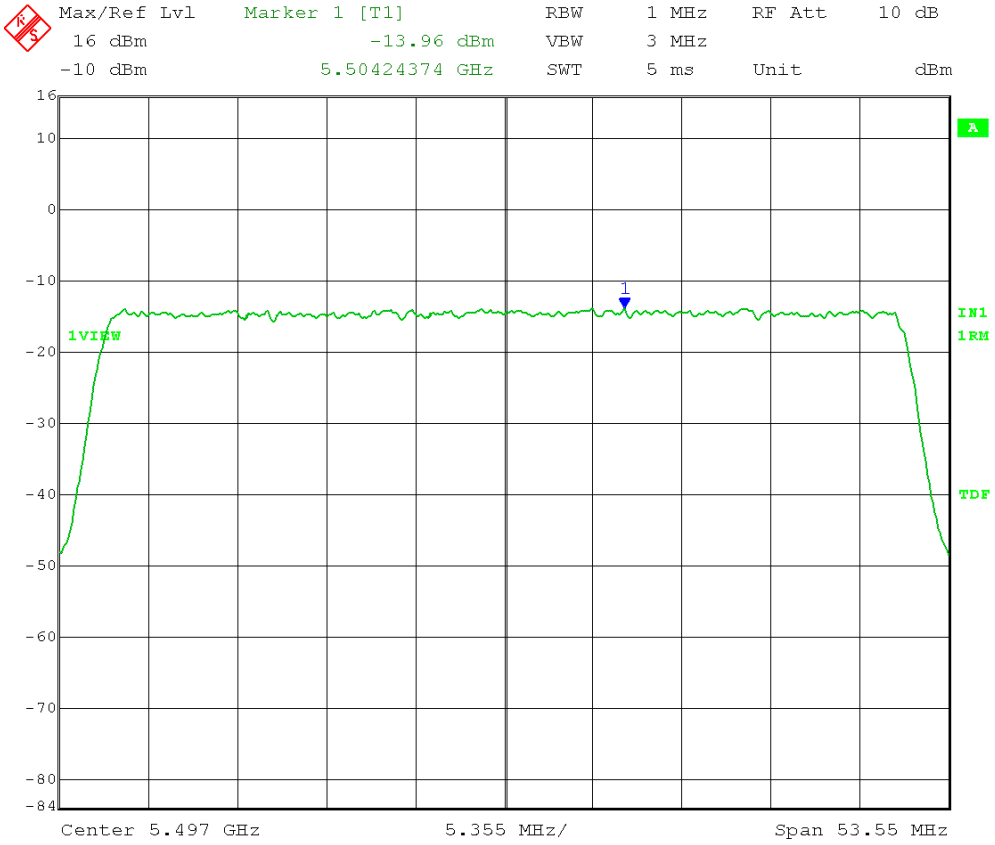



Date: 15.OCT.2013 11:25:26

50MHz BW, LCH, 1024QAM, 26 dB EBW = 53.39MHz

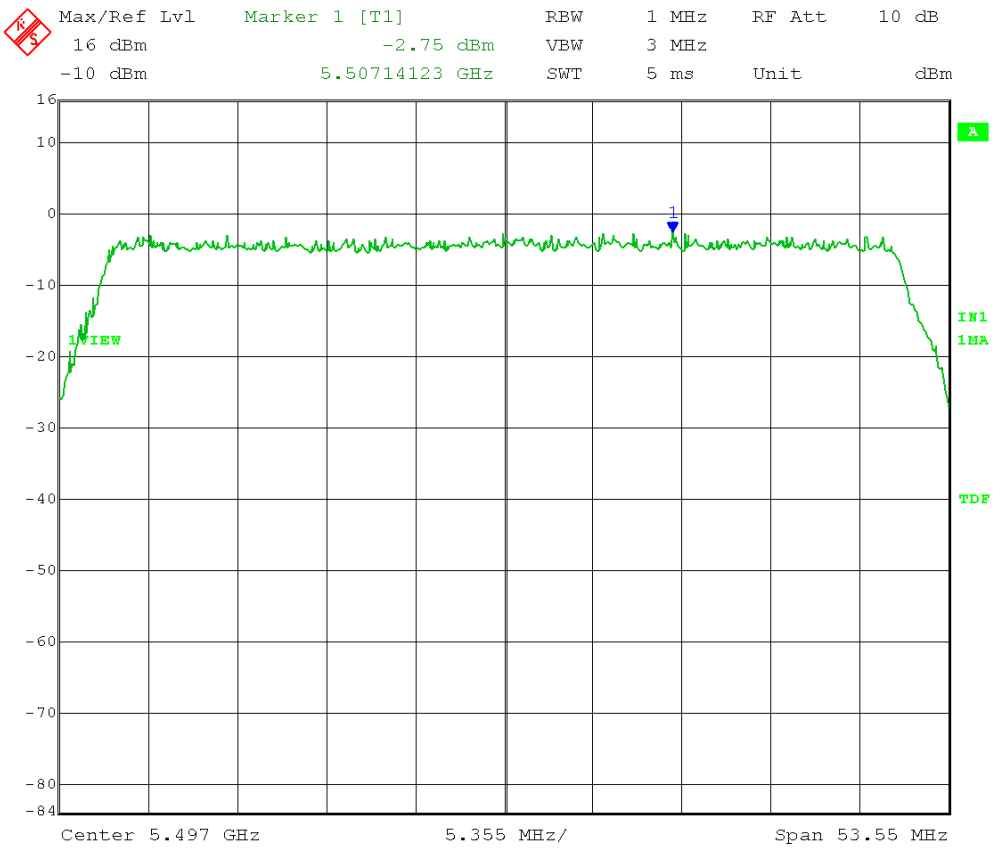



Date: 15.OCT.2013 11:28:16




Date: 15.OCT.2013 11:28:58

50MHz BW, LCH, QPSK, 26 dB EBW = 53.39MHz

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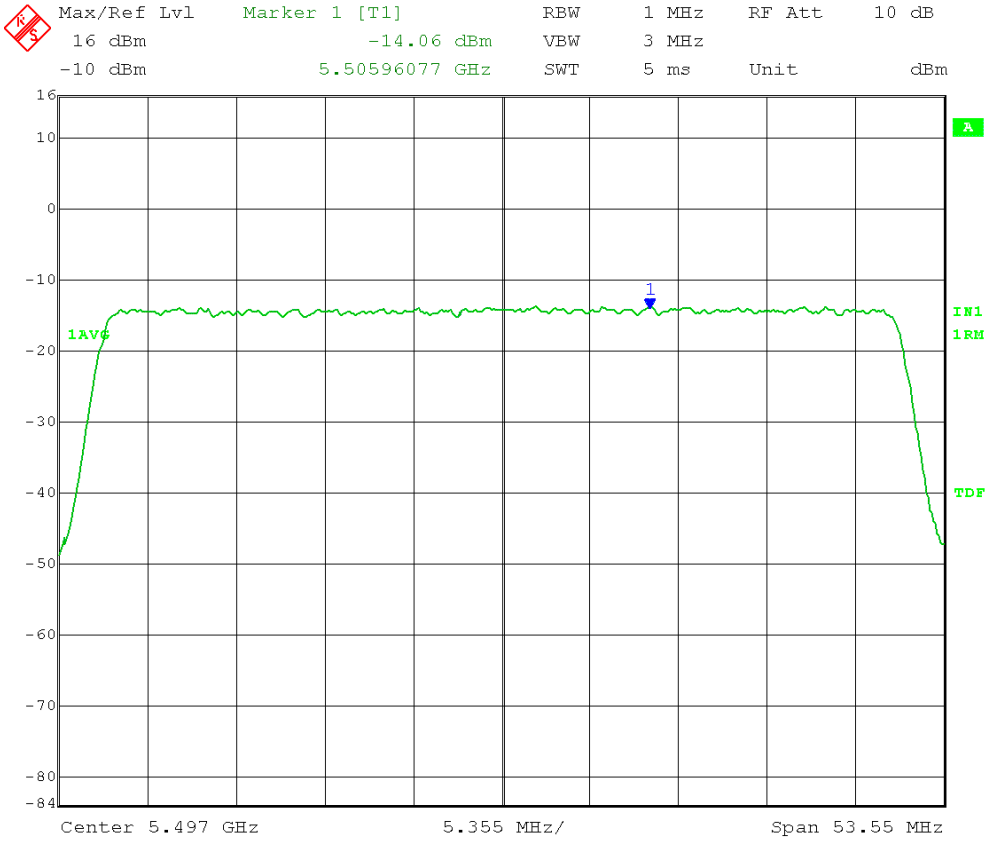



Date: 15.OCT.2013 11:15:19

## Appendix – Measurement Data

**8.0 Unwanted Emission Levels –** Radiated Operating Band-Edge
Radiated with antenna connected

**Rule Section**: Sections 15.407(b)(3) and 15.407(b)(5)

**Test Procedure**: FCC KDB 789033 D01 General UNII Test Procedures v01r03 – *Guidance for Compliance Testing of Unlicensed National Information Infrastructure (U-NII) Devices – Part 15, Subpart E*

Section H – Unwanted emission levels
Section H(2) – Unwanted emissions that fall outside of the restricted bands
Section H(3) – General Requirements for Unwanted Emissions Measurements
Section H(3)(d)(ii) – Band edge measurements, Integration method
Section H(5) – Procedure for Peak Unwanted Emissions Measurements Above 1 GHz

**Description**: Measure the band-edge emission level using the following settings

Standard method: (needed for the 20MHz BW)
RBW = 1 MHz
VBW ≥ 3 MHz
Detector = peak
Sweep time = auto
Trace mode = max hold

Integration method (if band edge is within 2 MHz of the 99% occupied bandwidth edge:
RBW = 100 kHz
VBW ≥ 3 x RBW
Use the band power integration function of the spectrum analyzer to integrate the power across the 1 MHz bandwidth at the operating band edge

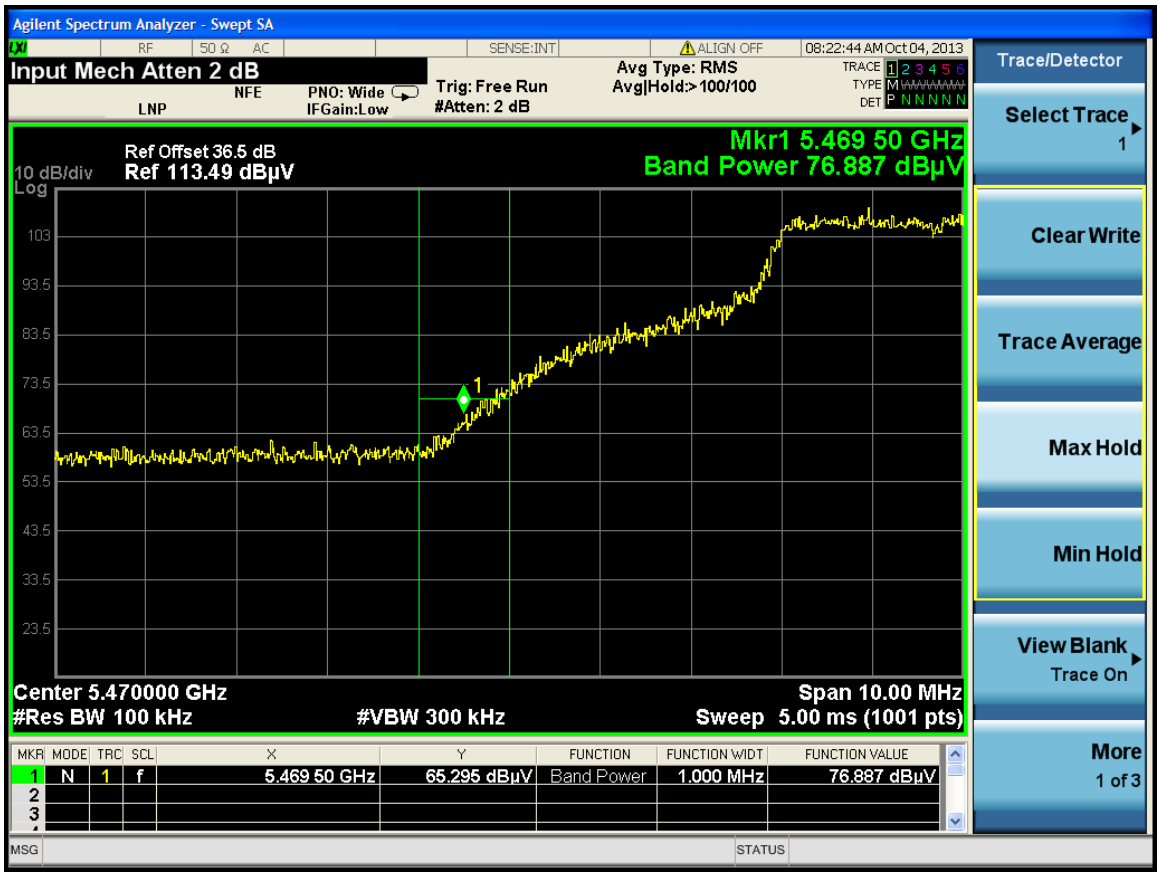
**Limit:** -27 dBm/MHz

**Results:** Passed

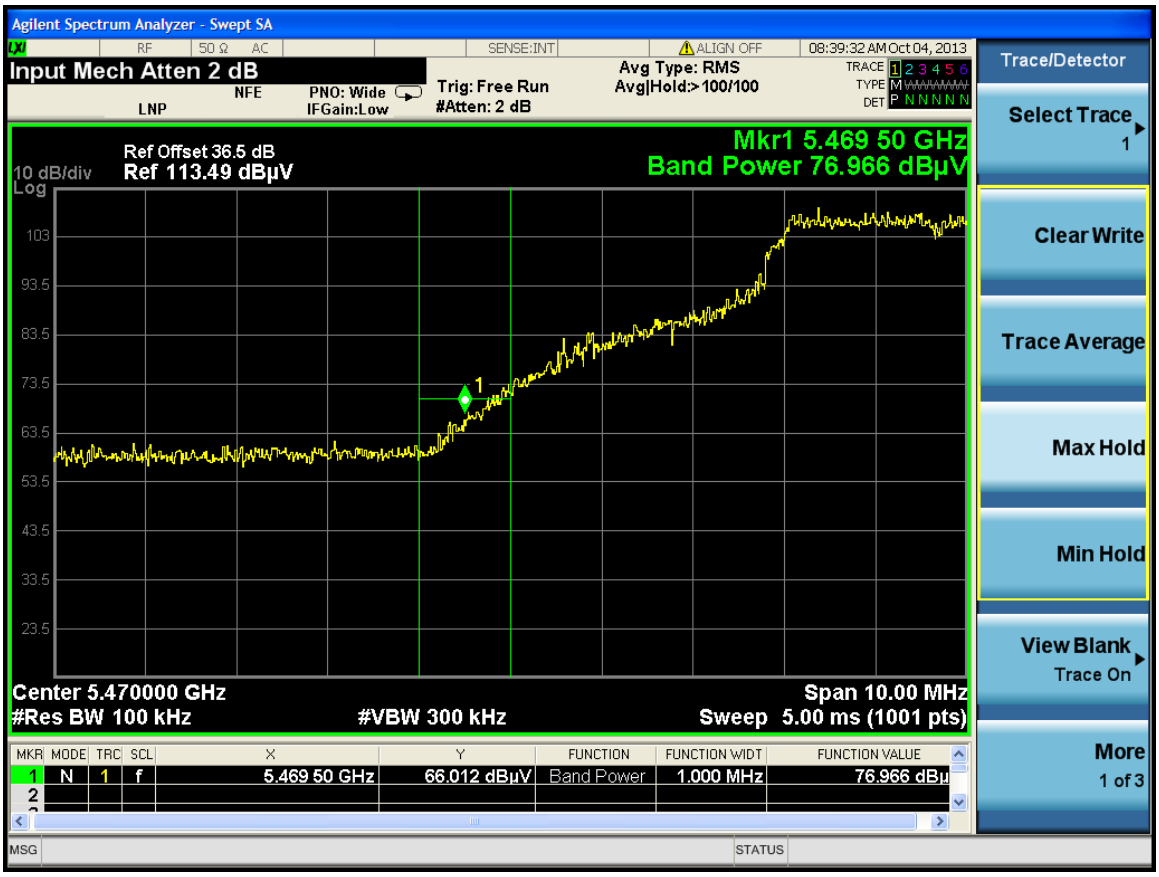
**Notes:** Measurements were taken for QPSK, 16QAM, 64QAM, 256QAM and 1024 QAM modulations at the lowest, middle, and highest channels of operation. EUT was set to transmit continuously.

Both transmit chains active. Output power was set to 30 dBm eirp using special test software.
Test distance was 1 meter.

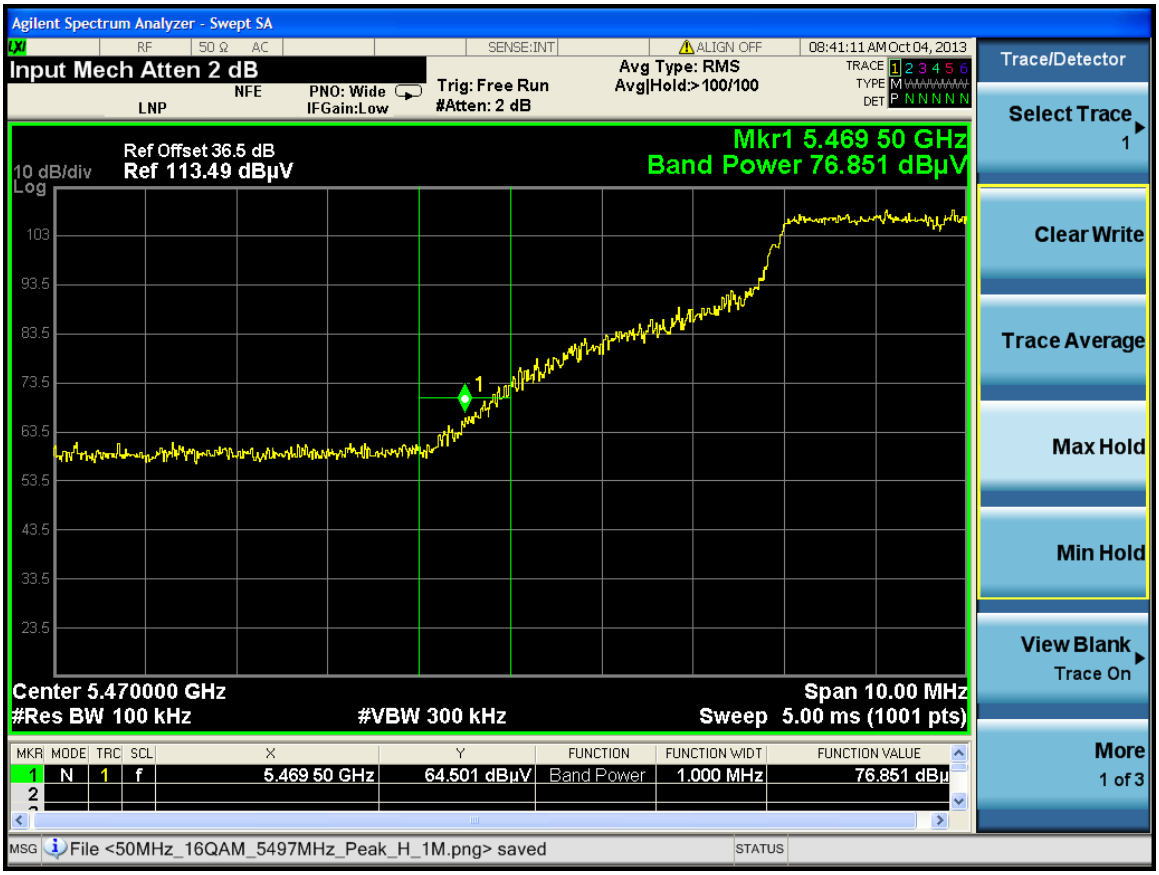
Test Date: 10-04-2013
Company: Ubiquiti Networks
EUT: AF5
Test: Lower Operating Band-Edge Compliance - Radiated
(FCC 15.407(b)(3))
Operator: Craig B
Comment: 50 MHz channel Bandwidth
Low Channel: Frequency – 5497 MHz
Modulation: QPSK
Horizontal
Operating Band-Edge Frequency: 5470 MHz
Band-Edge Limit: -27 dBm/MHz
Test method: Integration
Offset on analyzer includes horn antenna and cable loss correction factors
Limit: -27 dBm/MHz
Measurement: EIRP[dBm] = E[dBµV/m] + 20 log(d[meters]) - 104.77
= 76.887 dBµV/m + 20 log(1 meter) - 104.77
= **-27.88 dBm/MHz**



Test Date: 10-04-2013
Company: Ubiquiti Networks
EUT: AF5
Test: Lower Operating Band-Edge Compliance - Radiated
(FCC 15.407(b)(3))
Operator: Craig B
Comment: 50 MHz channel Bandwidth
Low Channel: Frequency – 5497 MHz
Modulation: 16QAM
Horizontal
Operating Band-Edge Frequency: 5470 MHz
Band-Edge Limit: -27 dBm/MHz
Test method: Integration
Offset on analyzer includes horn antenna and cable loss correction factors
Limit: -27 dBm/MHz
Measurement: EIRP[dBm] = E[dBµV/m] + 20 log(d[meters]) - 104.77
= 76.966 dBµV/m + 20 log(1 meter) - 104.77
= **-27.80 dBm/MHz**

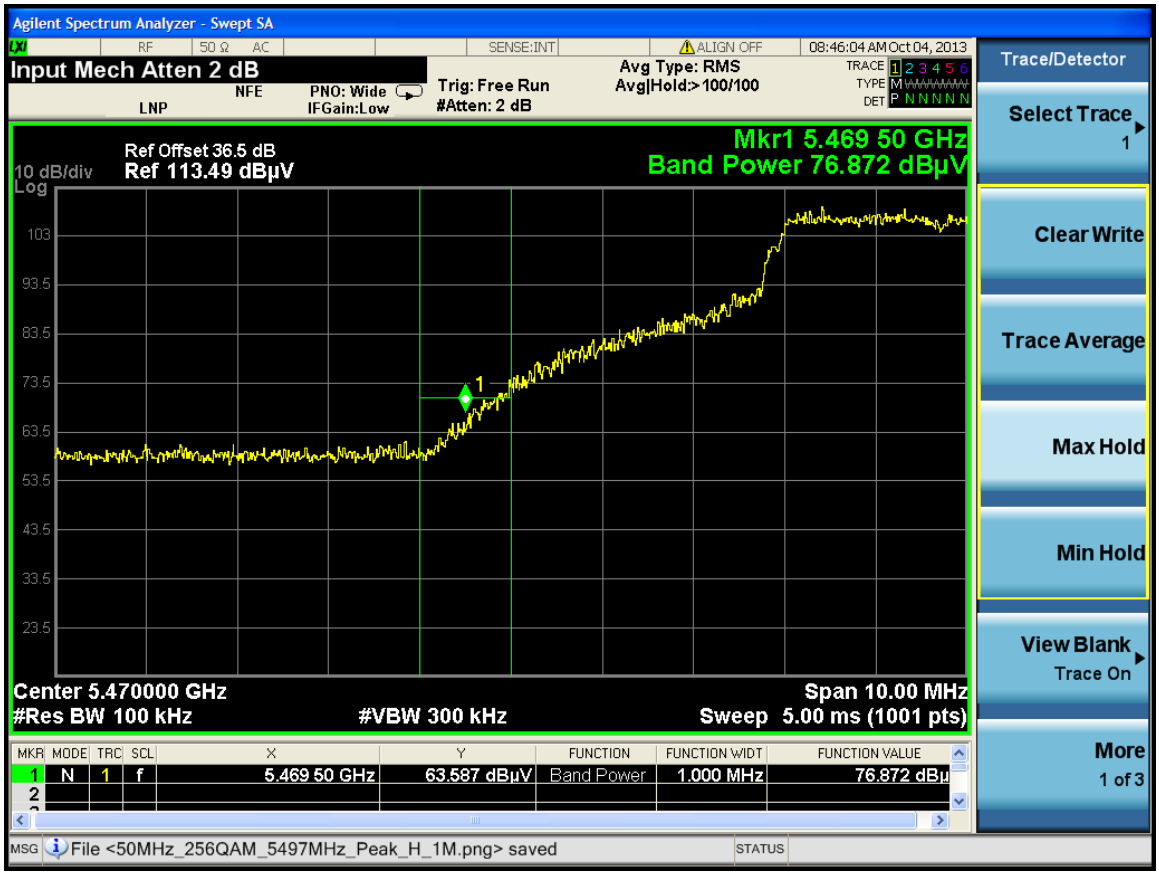


Test Date: 10-04-2013
Company: Ubiquiti Networks
EUT: AF5
Test: Lower Operating Band-Edge Compliance - Radiated
(FCC 15.407(b)(3))
Operator: Craig B
Comment: 50 MHz channel Bandwidth
Low Channel: Frequency – 5497 MHz
Modulation: 64QAM
Horizontal
Operating Band-Edge Frequency: 5470 MHz
Band-Edge Limit: -27 dBm/MHz
Test method: Integration
Offset on analyzer includes horn antenna and cable loss correction factors
Limit: -27 dBm/MHz
Measurement: EIRP[dBm] = E[dBµV/m] + 20 log(d[meters]) - 104.77
= 76.851 dBµV/m + 20 log(1 meter) - 104.77
= **-27.92 dBm/MHz**

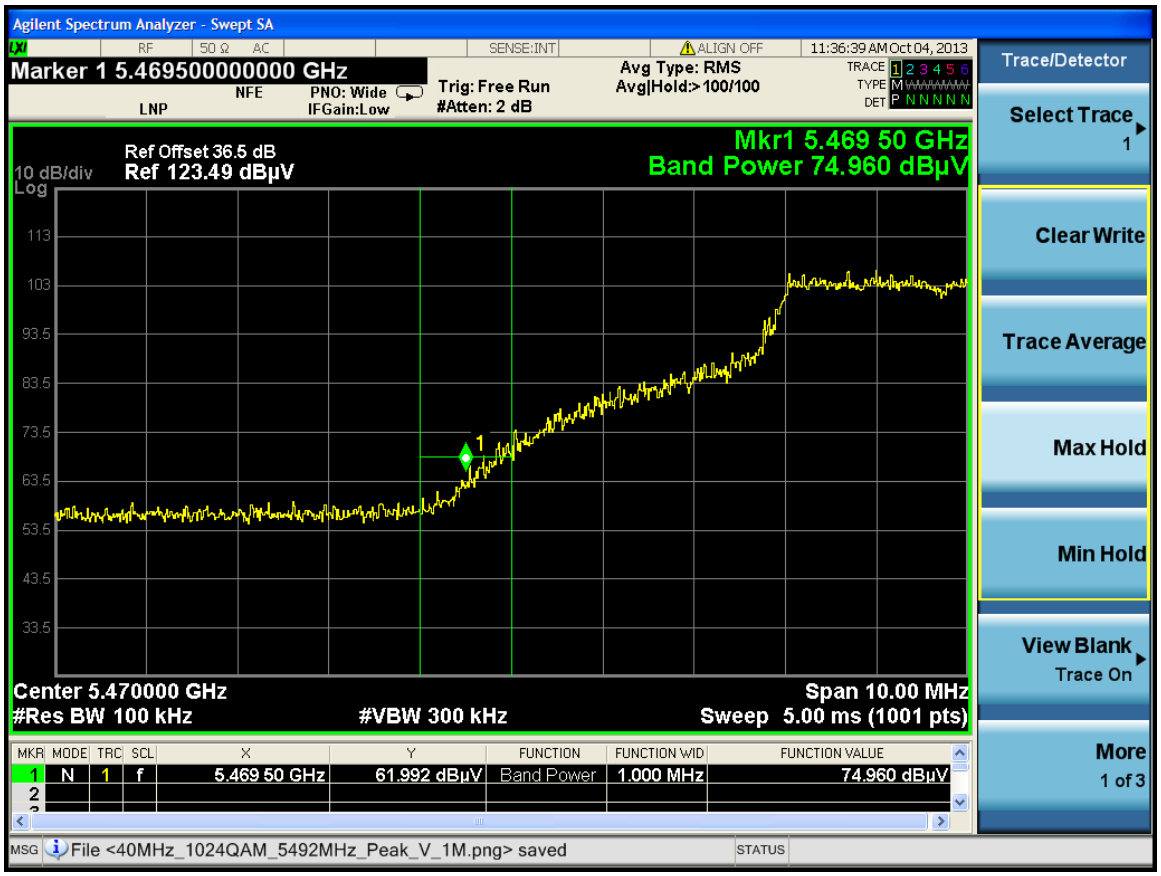


Test Date: 10-04-2013
Company: Ubiquiti Networks
EUT: AF5
Test: Lower Operating Band-Edge Compliance - Radiated
(FCC 15.407(b)(3))
Operator: Craig B
Comment: 50 MHz channel Bandwidth
Low Channel: Frequency – 5497 MHz
Modulation: 256QAM
Horizontal
Operating Band-Edge Frequency: 5470 MHz
Band-Edge Limit: -27 dBm/MHz
Test method: Integration
Offset on analyzer includes horn antenna and cable loss correction factors
Limit: -27 dBm/MHz
Measurement: EIRP[dBm] = E[dBµV/m] + 20 log(d[meters]) - 104.77
= 76.727 dBµV/m + 20 log(1 meter) - 104.77
= **-28.04 dBm/MHz**

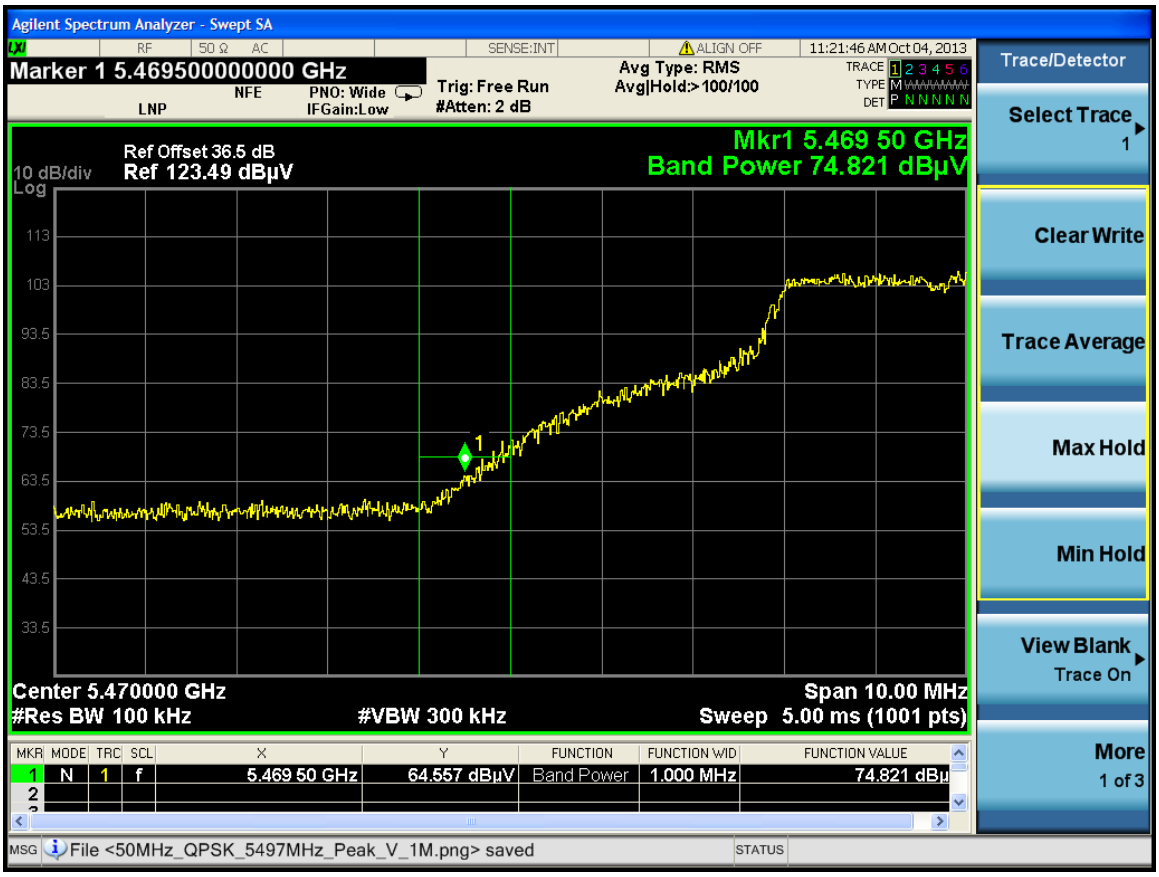
Test Date: 10-04-2013
Company: Ubiquiti Networks
EUT: AF5
Test: Lower Operating Band-Edge Compliance - Radiated
(FCC 15.407(b)(3))
Operator: Craig B
Comment: 50 MHz channel Bandwidth
Low Channel: Frequency – 5497 MHz
Modulation: 1024QAM
Horizontal
Operating Band-Edge Frequency: 5470 MHz
Band-Edge Limit: -27 dBm/MHz
Test method: Integration
Offset on analyzer includes horn antenna and cable loss correction factors
Limit: -27 dBm/MHz
Measurement: EIRP[dBm] = E[dBµV/m] + 20 log(d[meters]) - 104.77
= 76.872 dBµV/m + 20 log(1 meter) - 104.77
= **-27.90 dBm/MHz**



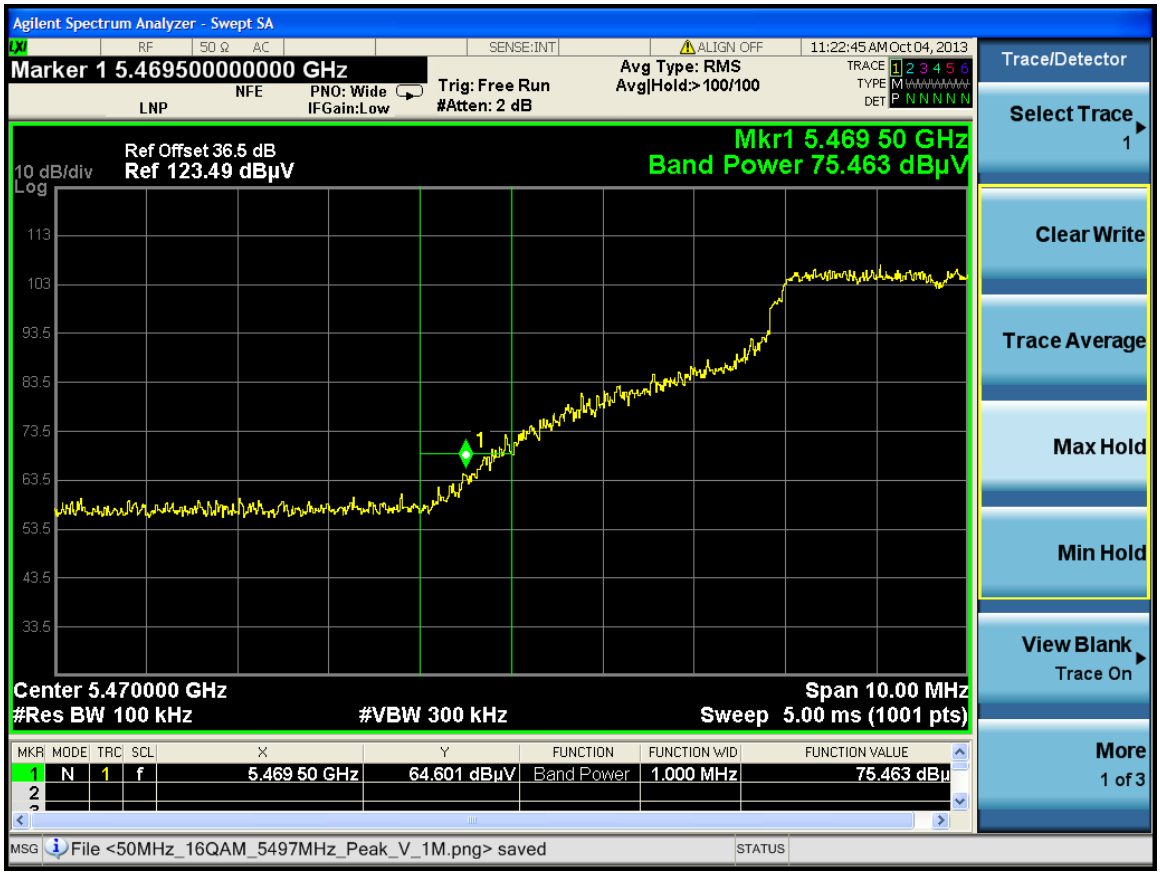
Test Date: 10-04-2013
Company: Ubiquiti Networks
EUT: AF5
Test: Lower Operating Band-Edge Compliance - Radiated
(FCC 15.407(b)(3))
Operator: Craig B
Comment: 50 MHz channel Bandwidth
Low Channel: Frequency – 5497 MHz
Modulation: QPSK
Vertical
Operating Band-Edge Frequency: 5470 MHz
Band-Edge Limit: -27 dBm/MHz
Test method: Integration
Offset on analyzer includes horn antenna and cable loss correction factors
Limit: -27 dBm/MHz
Measurement: EIRP[dBm] = E[dBµV/m] + 20 log(d[meters]) - 104.77
= 74.960 dBµV/m + 20 log(1 meter) - 104.77
= **-29.81 dBm/MHz**



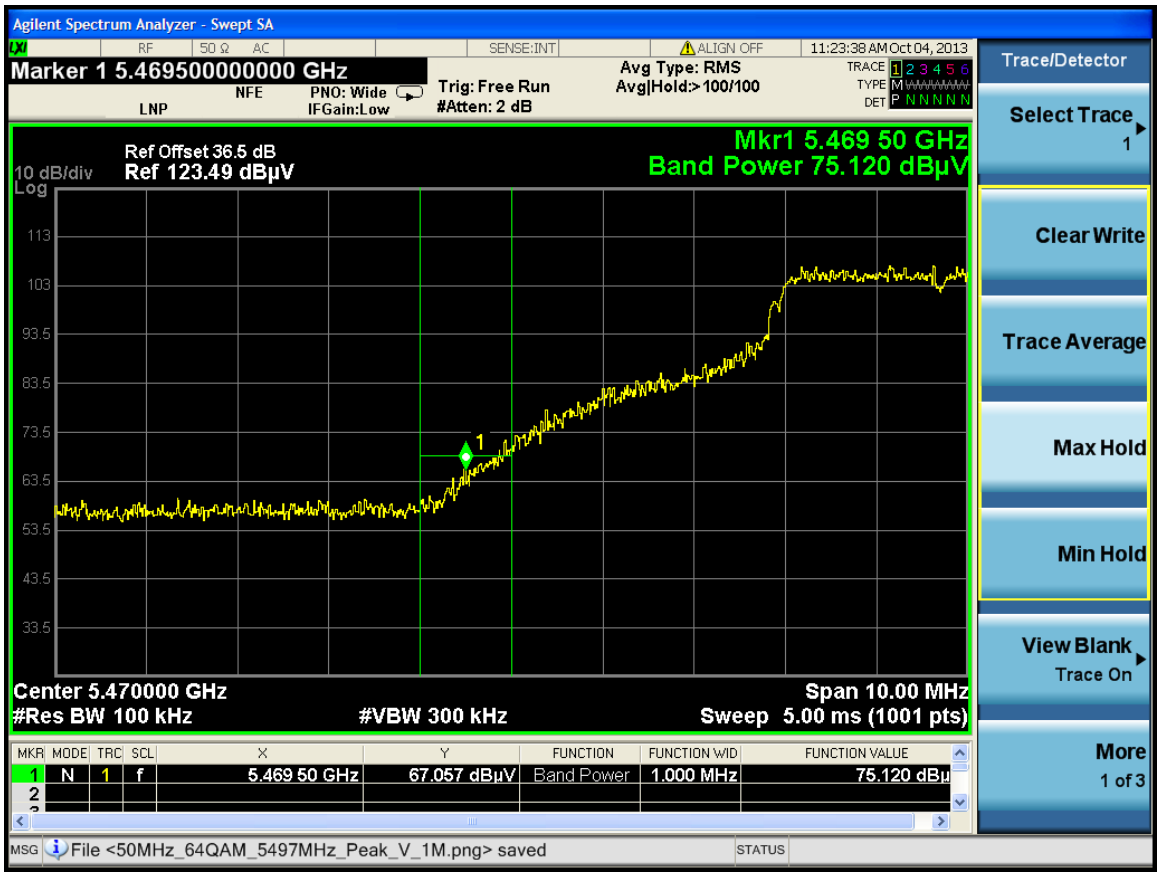
Test Date: 10-04-2013
Company: Ubiquiti Networks
EUT: AF5
Test: Lower Operating Band-Edge Compliance - Radiated
(FCC 15.407(b)(3))
Operator: Craig B
Comment: 50 MHz channel Bandwidth
Low Channel: Frequency – 5497 MHz
Modulation: 16QAM
Vertical
Operating Band-Edge Frequency: 5470 MHz
Band-Edge Limit: -27 dBm/MHz
Test method: Integration
Offset on analyzer includes horn antenna and cable loss correction factors
Limit: -27 dBm/MHz
Measurement: EIRP[dBm] = E[dBµV/m] + 20 log(d[meters]) - 104.77
= 74.821 dBµV/m + 20 log(1 meter) - 104.77
= **-29.95 dBm/MHz**



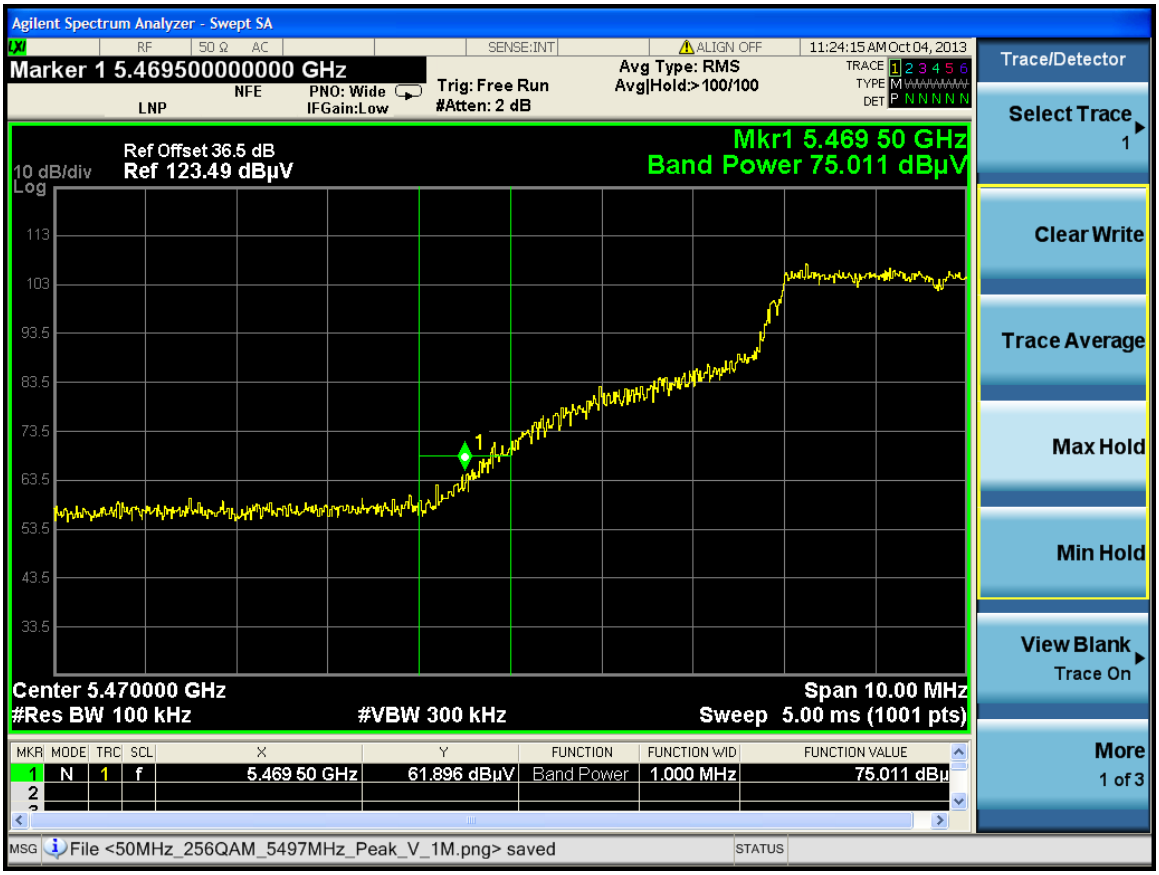
Test Date: 10-04-2013
Company: Ubiquiti Networks
EUT: AF5
Test: Lower Operating Band-Edge Compliance - Radiated
(FCC 15.407(b)(3))
Operator: Craig B
Comment: 50 MHz channel Bandwidth
Low Channel: Frequency – 5497 MHz
Modulation: 64QAM
Vertical
Operating Band-Edge Frequency: 5470 MHz
Band-Edge Limit: -27 dBm/MHz
Test method: Integration
Offset on analyzer includes horn antenna and cable loss correction factors
Limit: -27 dBm/MHz
Measurement: EIRP[dBm] = E[dBµV/m] + 20 log(d[meters]) - 104.77
= 75.463 dBµV/m + 20 log(1 meter) - 104.77
= **-29.31 dBm/MHz**



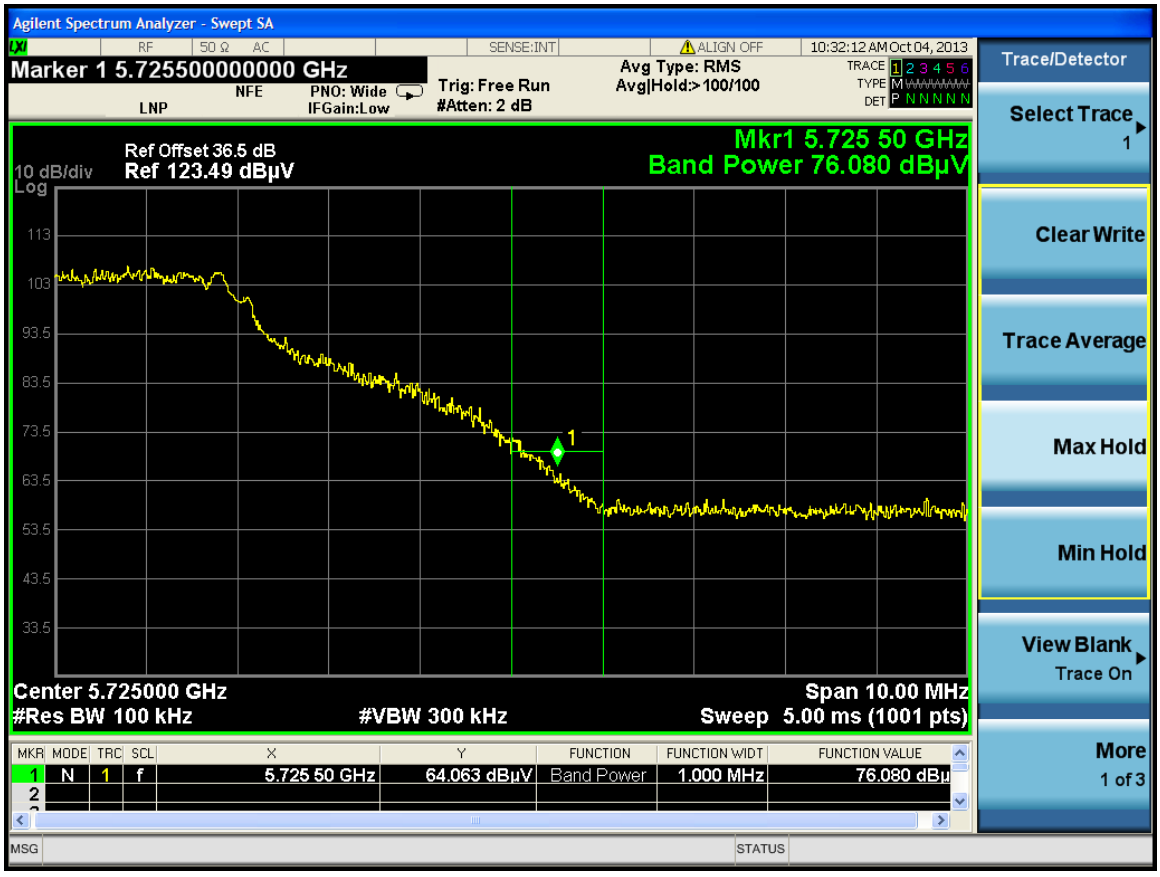
Test Date: 10-04-2013
Company: Ubiquiti Networks
EUT: AF5
Test: Lower Operating Band-Edge Compliance - Radiated
(FCC 15.407(b)(3))
Operator: Craig B
Comment: 50 MHz channel Bandwidth
Low Channel: Frequency – 5497 MHz
Modulation: 256QAM
Vertical
Operating Band-Edge Frequency: 5470 MHz
Band-Edge Limit: -27 dBm/MHz
Test method: Integration
Offset on analyzer includes horn antenna and cable loss correction factors
Limit: -27 dBm/MHz
Measurement: EIRP[dBm] = E[dBµV/m] + 20 log(d[meters]) - 104.77
= 75.120 dBµV/m + 20 log(1 meter) - 104.77
= **-29.65 dBm/MHz**



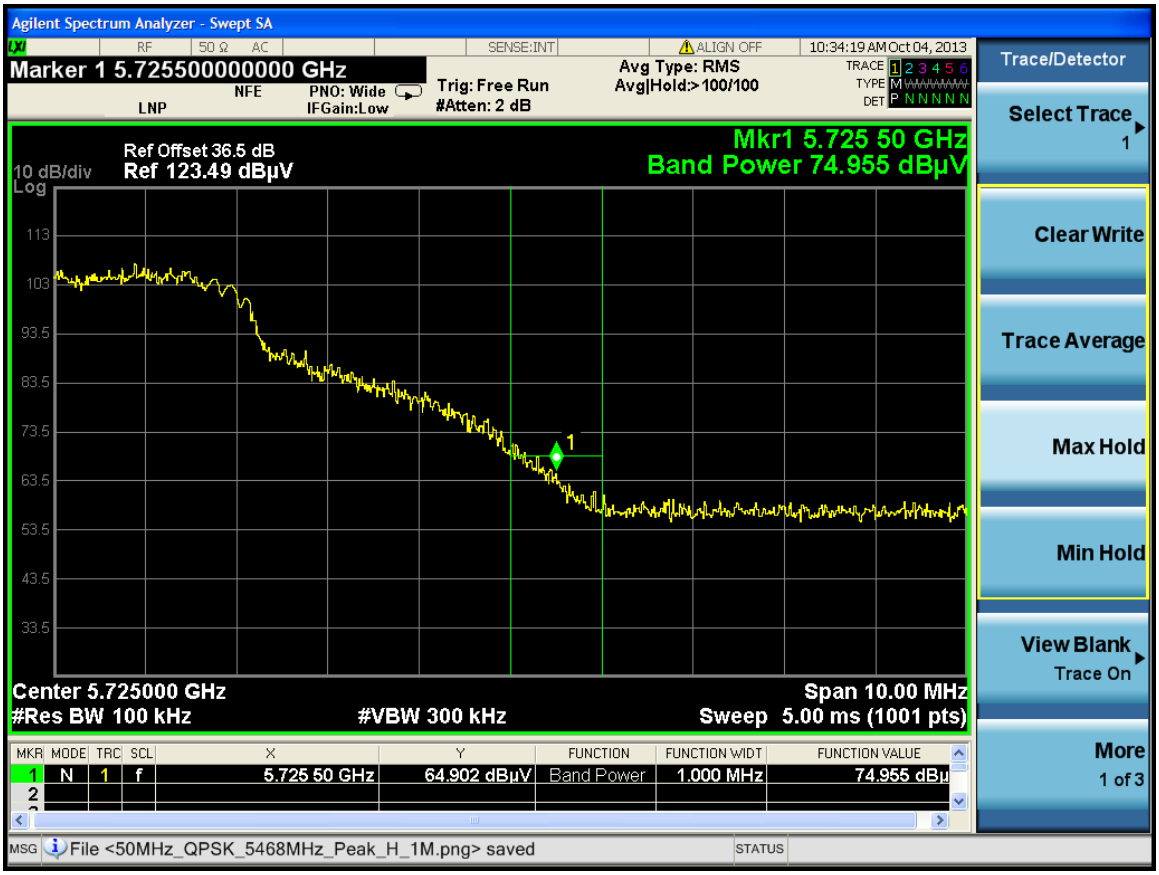
Test Date: 10-04-2013
Company: Ubiquiti Networks
EUT: AF5
Test: Lower Operating Band-Edge Compliance - Radiated
(FCC 15.407(b)(3))
Operator: Craig B
Comment: 50 MHz channel Bandwidth
Low Channel: Frequency – 5497 MHz
Modulation: 1024QAM
Vertical
Operating Band-Edge Frequency: 5470 MHz
Band-Edge Limit: -27 dBm/MHz
Test method: Integration
Offset on analyzer includes horn antenna and cable loss correction factors
Limit: -27 dBm/MHz
Measurement: EIRP[dBm] = E[dBµV/m] + 20 log(d[meters]) - 104.77
= 75.011 dBµV/m + 20 log(1 meter) - 104.77
= **-29.76 dBm/MHz**



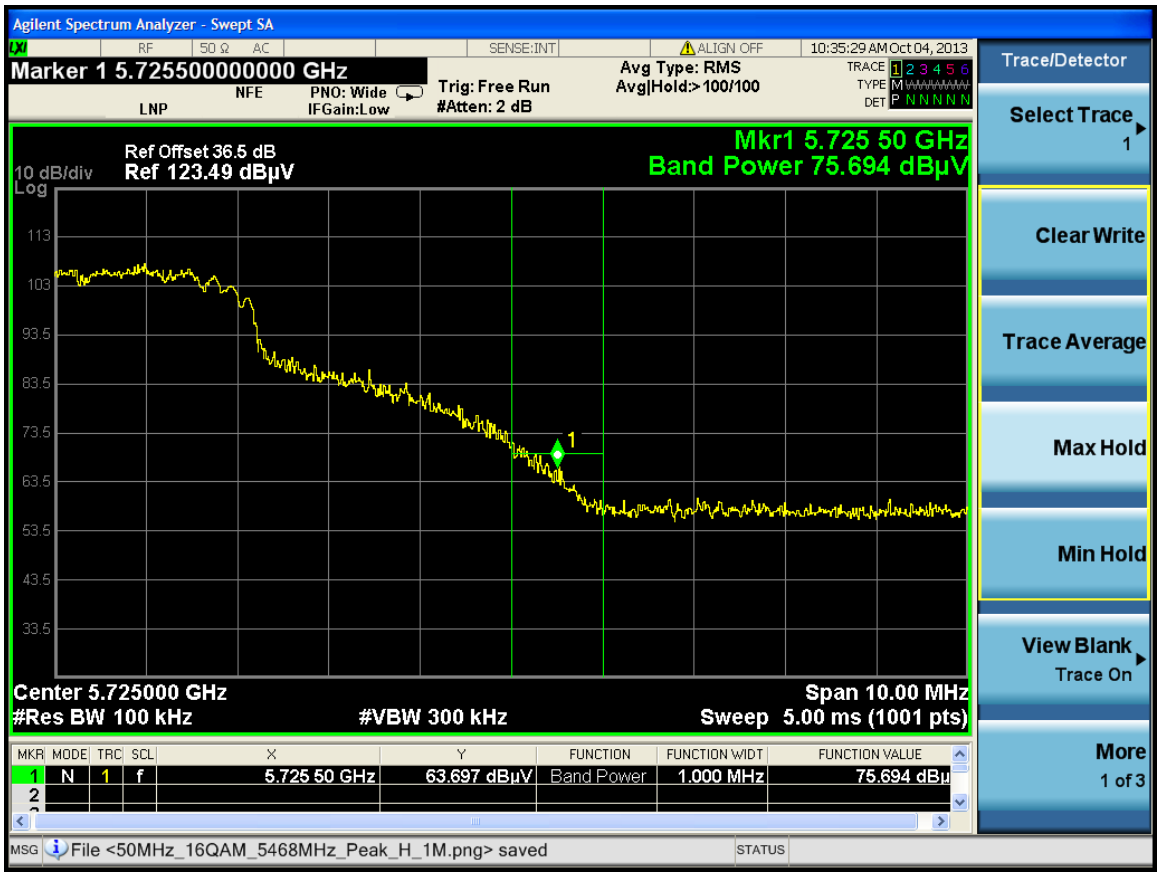
Test Date: 10-04-2013
Company: Ubiquiti Networks
EUT: AF5
Test: Upper Operating Band-Edge Compliance - Radiated
(FCC 15.407(b)(3))
Operator: Craig B
Comment: 50 MHz channel Bandwidth
High Channel: Frequency – 5698 MHz
Modulation: QPSK
Horizontal
Operating Band-Edge Frequency: 5725 MHz
Band-Edge Limit: -27 dBm/MHz
Test method: Integration
Offset on analyzer includes horn antenna and cable loss correction factors
Limit: -27 dBm/MHz
Measurement: EIRP[dBm] = E[dBµV/m] + 20 log(d[meters]) - 104.77
= 76.080 dBµV/m + 20 log(1 meter) - 104.77
= **-28.69 dBm/MHz**



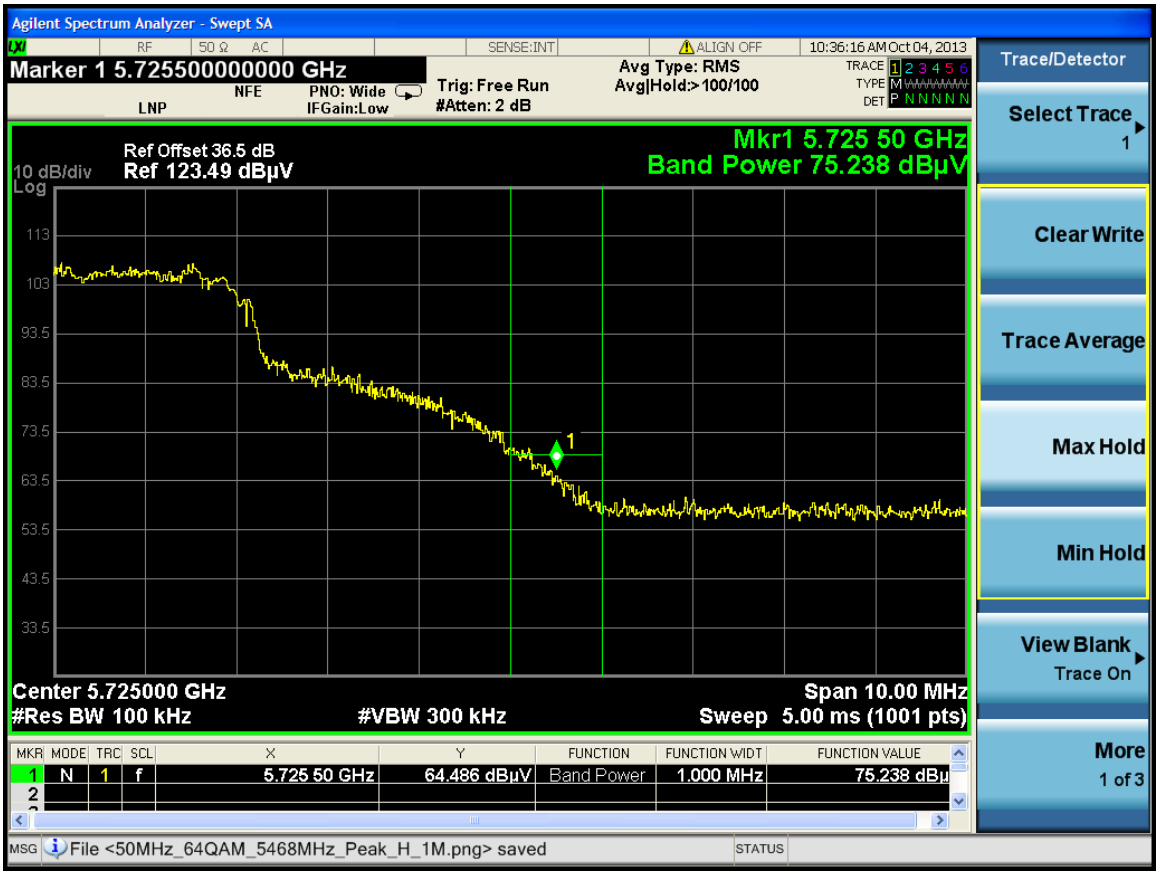
Test Date: 10-04-2013
Company: Ubiquiti Networks
EUT: AF5
Test: Upper Operating Band-Edge Compliance - Radiated
(FCC 15.407(b)(3))
Operator: Craig B
Comment: 50 MHz channel Bandwidth
High Channel: Frequency – 5698 MHz
Modulation: 16QAM
Horizontal
Operating Band-Edge Frequency: 5725 MHz
Band-Edge Limit: -27 dBm/MHz
Test method: Integration
Offset on analyzer includes horn antenna and cable loss correction factors
Limit: -27 dBm/MHz
Measurement: EIRP[dBm] = E[dBµV/m] + 20 log(d[meters]) - 104.77
= 74.955 dBµV/m + 20 log(1 meter) - 104.77
= **-29.81 dBm/MHz**



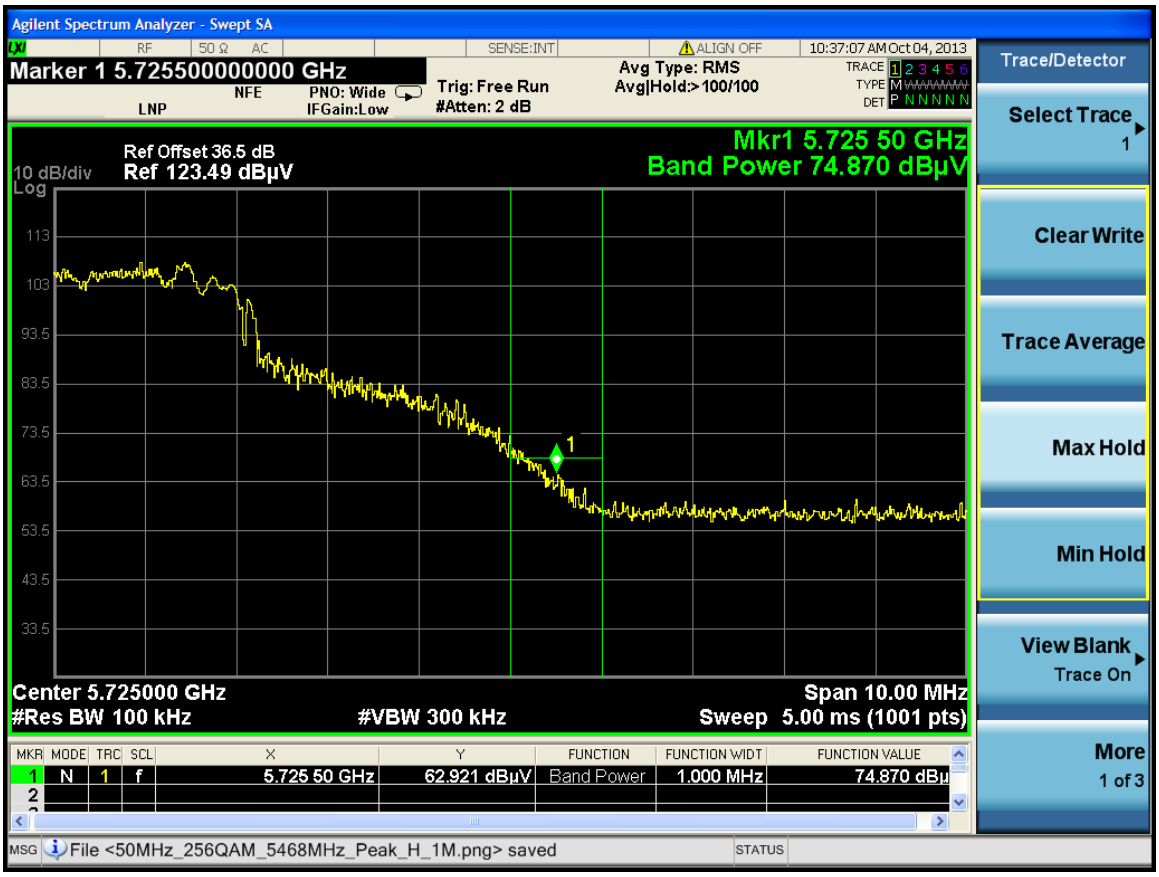
Test Date: 10-04-2013
Company: Ubiquiti Networks
EUT: AF5
Test: Upper Operating Band-Edge Compliance - Radiated
(FCC 15.407(b)(3))
Operator: Craig B
Comment: 50 MHz channel Bandwidth
High Channel: Frequency – 5698 MHz
Modulation: 64QAM
Horizontal
Operating Band-Edge Frequency: 5725 MHz
Band-Edge Limit: -27 dBm/MHz
Test method: Integration
Offset on analyzer includes horn antenna and cable loss correction factors
Limit: -27 dBm/MHz
Measurement: EIRP[dBm] = E[dBµV/m] + 20 log(d[meters]) - 104.77
= 75.694 dBµV/m + 20 log(1 meter) - 104.77
= **-29.07 dBm/MHz**



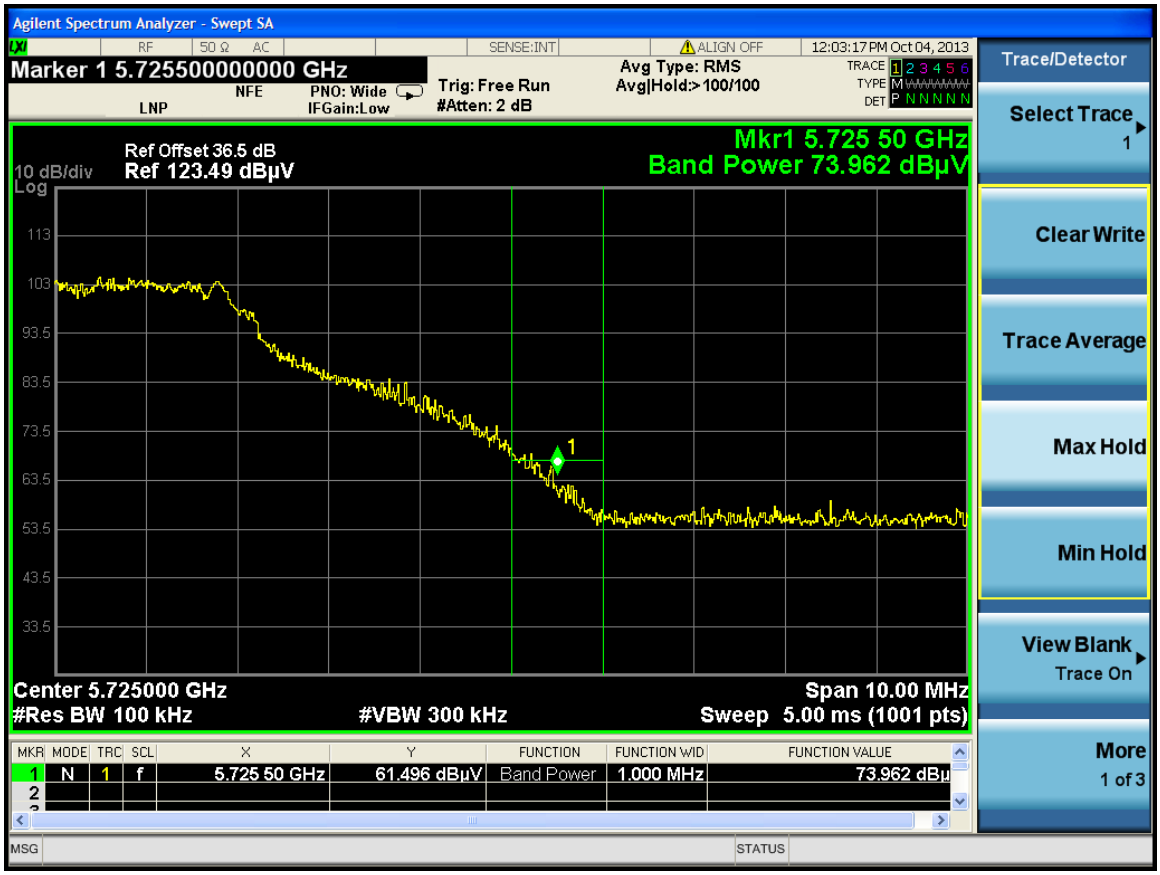
Test Date: 10-04-2013
Company: Ubiquiti Networks
EUT: AF5
Test: Upper Operating Band-Edge Compliance - Radiated
(FCC 15.407(b)(3))
Operator: Craig B
Comment: 50 MHz channel Bandwidth
High Channel: Frequency – 5698 MHz
Modulation: 256QAM
Horizontal
Operating Band-Edge Frequency: 5725 MHz
Band-Edge Limit: -27 dBm/MHz
Test method: Integration
Offset on analyzer includes horn antenna and cable loss correction factors
Limit: -27 dBm/MHz
Measurement: EIRP[dBm] = E[dBµV/m] + 20 log(d[meters]) - 104.77
= 75.238 dBµV/m + 20 log(1 meter) - 104.77
= **-29.35 dBm/MHz**



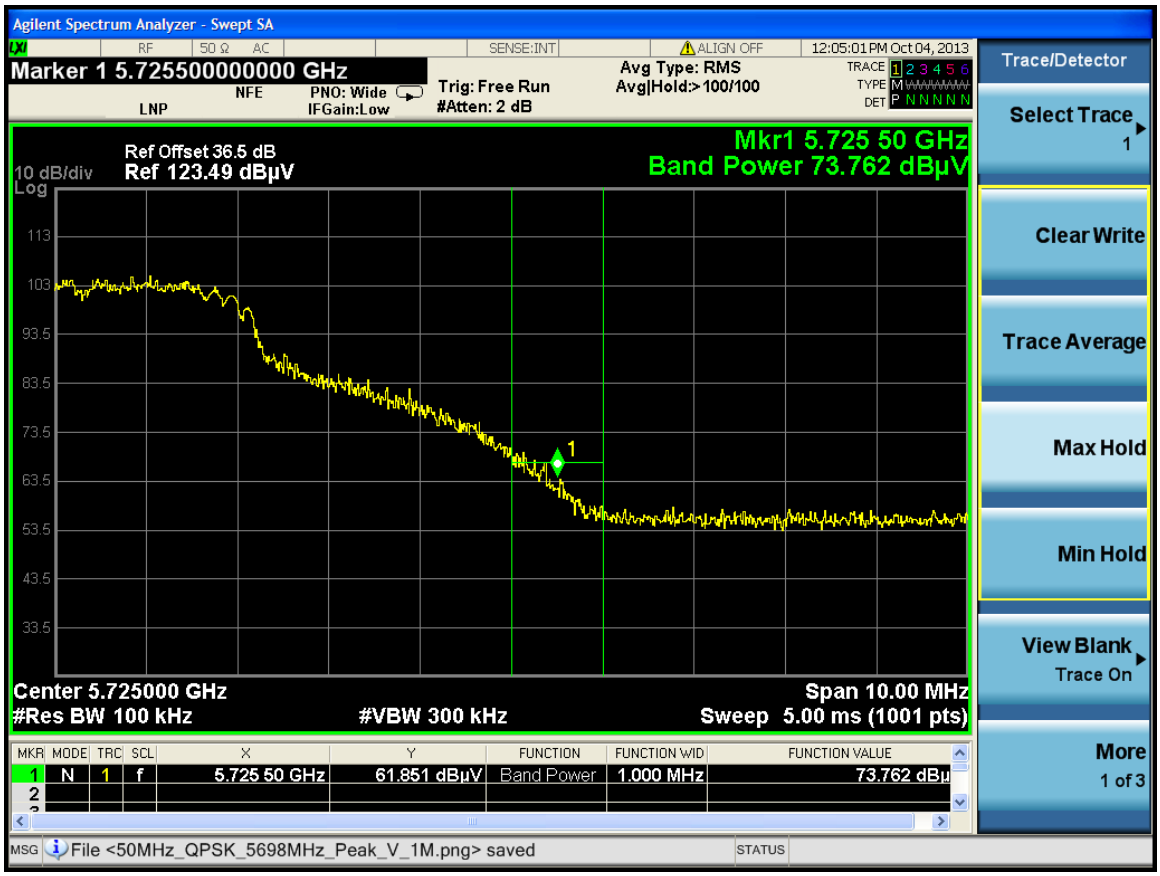
Test Date: 10-04-2013
Company: Ubiquiti Networks
EUT: AF5
Test: Upper Operating Band-Edge Compliance - Radiated
(FCC 15.407(b)(3))
Operator: Craig B
Comment: 50 MHz channel Bandwidth
High Channel: Frequency – 5698 MHz
Modulation: 1024QAM
Horizontal
Operating Band-Edge Frequency: 5725 MHz
Band-Edge Limit: -27 dBm/MHz
Test method: Integration
Offset on analyzer includes horn antenna and cable loss correction factors
Limit: -27 dBm/MHz
Measurement: EIRP[dBm] = E[dBµV/m] + 20 log(d[meters]) - 104.77
= 74.870 dBµV/m + 20 log(1 meter) - 104.77
= **-29.90 dBm/MHz**



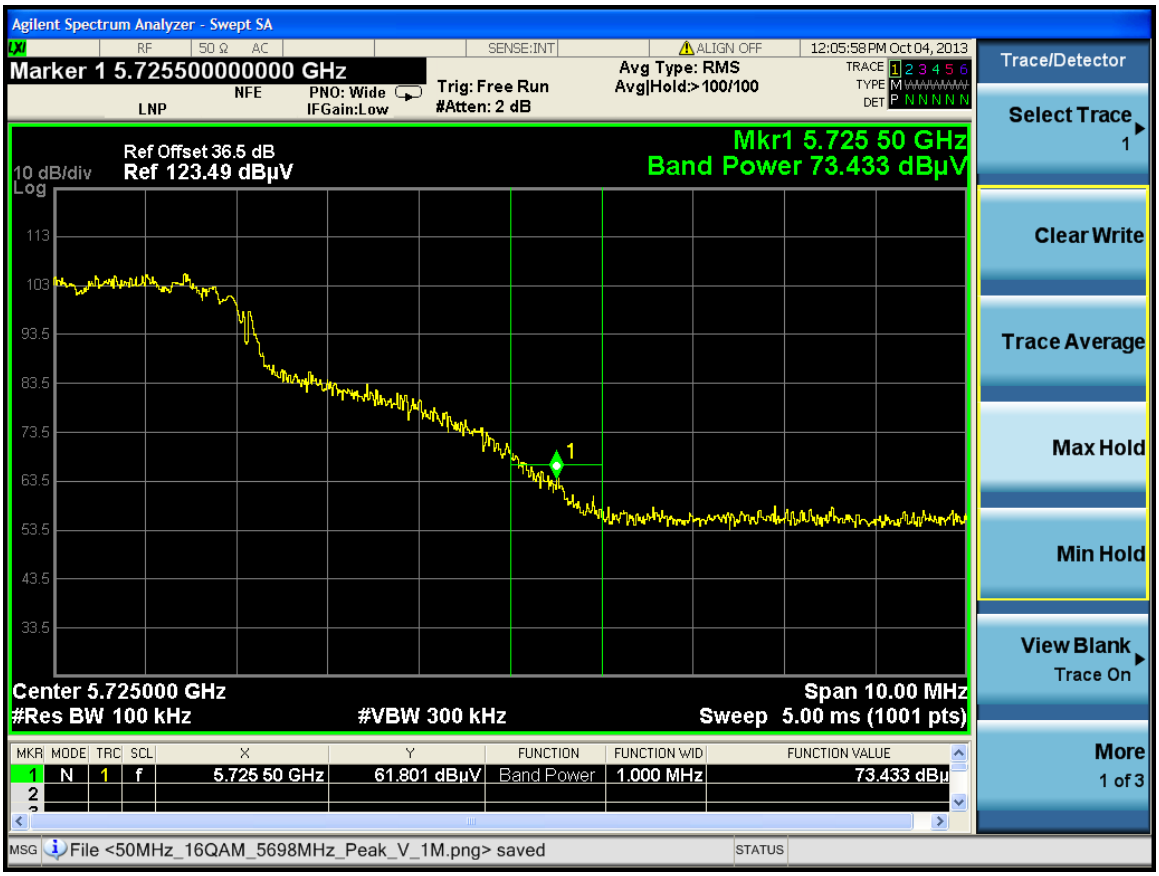
Test Date: 10-04-2013
Company: Ubiquiti Networks
EUT: AF5
Test: Upper Operating Band-Edge Compliance - Radiated
(FCC 15.407(b)(3))
Operator: Craig B
Comment: 50 MHz channel Bandwidth
High Channel: Frequency – 5698 MHz
Modulation: QPSK
Vertical
Operating Band-Edge Frequency: 5725 MHz
Band-Edge Limit: -27 dBm/MHz
Test method: Integration
Offset on analyzer includes horn antenna and cable loss correction factors
Limit: -27 dBm/MHz
Measurement: EIRP[dBm] = E[dBµV/m] + 20 log(d[meters]) - 104.77
= 73.962 dBµV/m + 20 log(1 meter) - 104.77
= **-30.81 dBm/MHz**



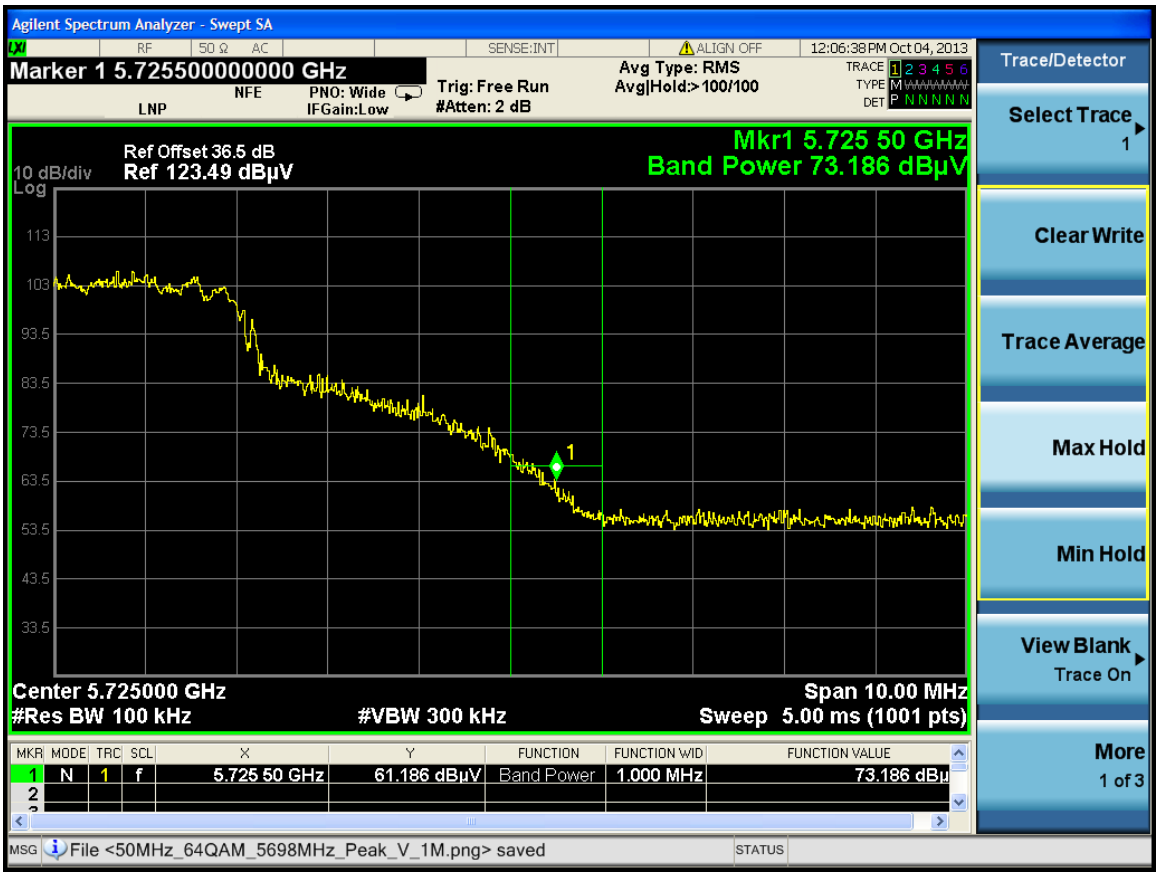
Test Date: 10-04-2013
Company: Ubiquiti Networks
EUT: AF5
Test: Upper Operating Band-Edge Compliance - Radiated
(FCC 15.407(b)(3))
Operator: Craig B
Comment: 50 MHz channel Bandwidth
High Channel: Frequency – 5698 MHz
Modulation: 16QAM
Vertical
Operating Band-Edge Frequency: 5725 MHz
Band-Edge Limit: -27 dBm/MHz
Test method: Integration
Offset on analyzer includes horn antenna and cable loss correction factors
Limit: -27 dBm/MHz
Measurement: EIRP[dBm] = E[dBµV/m] + 20 log(d[meters]) - 104.77
= 73.762 dBµV/m + 20 log(1 meter) - 104.77
= **-31.01 dBm/MHz**



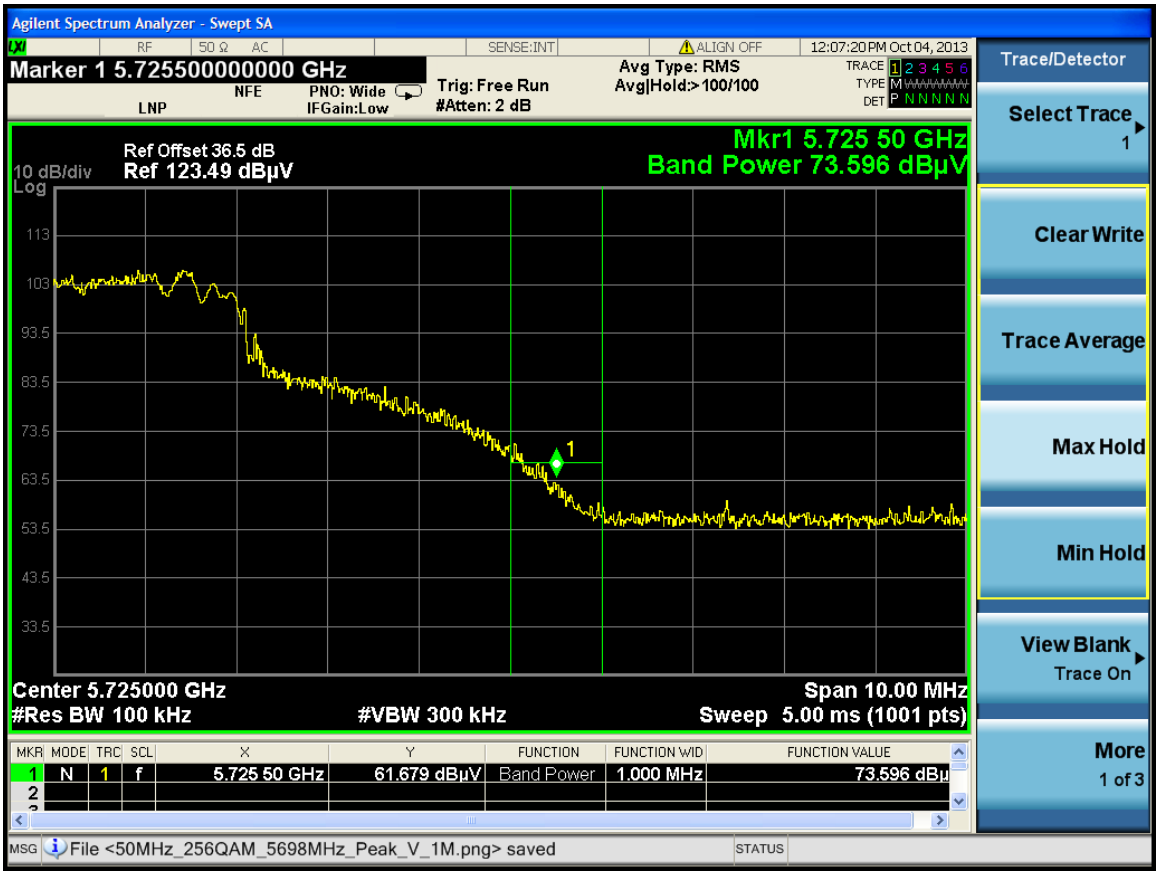
Test Date: 10-04-2013
Company: Ubiquiti Networks
EUT: AF5
Test: Upper Operating Band-Edge Compliance - Radiated
(FCC 15.407(b)(3))
Operator: Craig B
Comment: 50 MHz channel Bandwidth
High Channel: Frequency – 5698 MHz
Modulation: 64QAM
Vertical
Operating Band-Edge Frequency: 5725 MHz
Band-Edge Limit: -27 dBm/MHz
Test method: Integration
Offset on analyzer includes horn antenna and cable loss correction factors
Limit: -27 dBm/MHz
Measurement: EIRP[dBm] = E[dBµV/m] + 20 log(d[meters]) - 104.77
= 73.433 dBµV/m + 20 log(1 meter) - 104.77
= **-31.34 dBm/MHz**



Test Date: 10-04-2013
Company: Ubiquiti Networks
EUT: AF5
Test: Upper Operating Band-Edge Compliance - Radiated
(FCC 15.407(b)(3))
Operator: Craig B
Comment: 50 MHz channel Bandwidth
High Channel: Frequency – 5698 MHz
Modulation: 256QAM
Vertical
Operating Band-Edge Frequency: 5725 MHz
Band-Edge Limit: -27 dBm/MHz
Test method: Integration
Offset on analyzer includes horn antenna and cable loss correction factors
Limit: -27 dBm/MHz
Measurement: EIRP[dBm] = E[dBµV/m] + 20 log(d[meters]) - 104.77
= 73.186 dBµV/m + 20 log(1 meter) - 104.77
= **-31.58 dBm/MHz**



Test Date: 10-04-2013
Company: Ubiquiti Networks
EUT: AF5
Test: Upper Operating Band-Edge Compliance - Radiated
(FCC 15.407(b)(3))
Operator: Craig B
Comment: 50 MHz channel Bandwidth
High Channel: Frequency – 5698 MHz
Modulation: 1024QAM
Vertical
Operating Band-Edge Frequency: 5725 MHz
Band-Edge Limit: -27 dBm/MHz
Test method: Integration
Offset on analyzer includes horn antenna and cable loss correction factors
Limit: -27 dBm/MHz
Measurement: EIRP[dBm] = E[dBµV/m] + 20 log(d[meters]) - 104.77
= 73.596 dBµV/m + 20 log(1 meter) - 104.77
= **-31.17 dBm/MHz**



## Appendix – Measurement Data

### 9.0 Unwanted Emission Levels – Radiated with integral antenna

**Rule Section**: Sections 15.407(b)(3) and 15.407(b)(6)

**Test Procedure**: FCC KDB 789033 D01 General UNII Test Procedures v01r03 – *Guidance for Compliance Testing of Unlicensed National Information Infrastructure (U-NII) Devices – Part 15, Subpart E*

Section H(1) – Unwanted emissions in the restricted bands
Section H(2) – Unwanted emissions that fall outside of the restricted bands
Section H(3) – General Requirements for Unwanted Emissions Measurements
Section H(4) – Procedure for Unwanted Emissions Measurements Below 1 GHz
Section H(5) – Procedure for Peak Unwanted Emissions Measurements Above 1 GHz
Section H(6) – Procedure for Average Unwanted Emissions Measurements Above 1 GHz
Section H(6)(c) – Average Detection method

Below 1000 MHz
Detector = quasi-peak
Alternately, peak detector is permitted

Peak measurements above 1000 MHz
RBW = 1 MHz
VBW ≥ 3 MHz
Detector = peak
Sweep time = auto; increased by a factor of (1 / duty cycle)
Trace mode = max hold

Average measurements above 1000 MHz (required for peak emissions that are above the average limits) – Method AD (Average Detection)
RBW = 1 MHz
VBW ≥ 3 MHz
Detector = RMS (span/(# of points in sweep) ≤ RBW/2)
Averaging type = power
Sweep time = auto; increased by a factor of (1 / duty cycle)
Trace mode = trace average 100 sweeps; increased by a factor of (1 / duty cycle)
For a duty cycle less than 98%, add 10 log (1/duty cycle)

**Limits:** Outside restricted bands: Peak EIRP shall not exceed -27 dBm/MHz
Inside restricted bands: Peak and Average limits of FCC Part 15.209
Per Section H(2)(c)(i): "an out-of-band emission that complies with both the average and peak limits of 15.209 is not required to satisfy the -27 dBm/MHz or -17 dBm/MHz peak emission limit."

**Results:** Passed

**Notes:** Both transmit chains active. Output power was set to 30 dBm eirp using special test software. Measurements were taken for QPSK modulation (worst case) at the lowest, middle, and highest channels of operation. EUT was set to transmit continuously.

***FCC Part 15.209***

***Electric Field Strength***

EUT: Model: AF5
Manufacturer: Ubiquiti Networks
Operating Condition: 70 deg. F; 46% R.H.
Test Site: DLS O.F. Site 3
Operator: Craig B
Test Specification: All channel BW; L, M, and H channels
Comment: Power set to 30 dBm eirp; QPSK
Date: 10-02-2013; 10-17-2013

***TEXT: "Horz 3 meters"***

Short Description: Test Set-up

Test Set-up: EUT Measured at 3 Meters with HORIZONTAL Antenna Polarization

Equations: Total Level(dBµV/m) = Level(dBµV) + System Loss(dB) + Antenna Factor(dBµV/m)

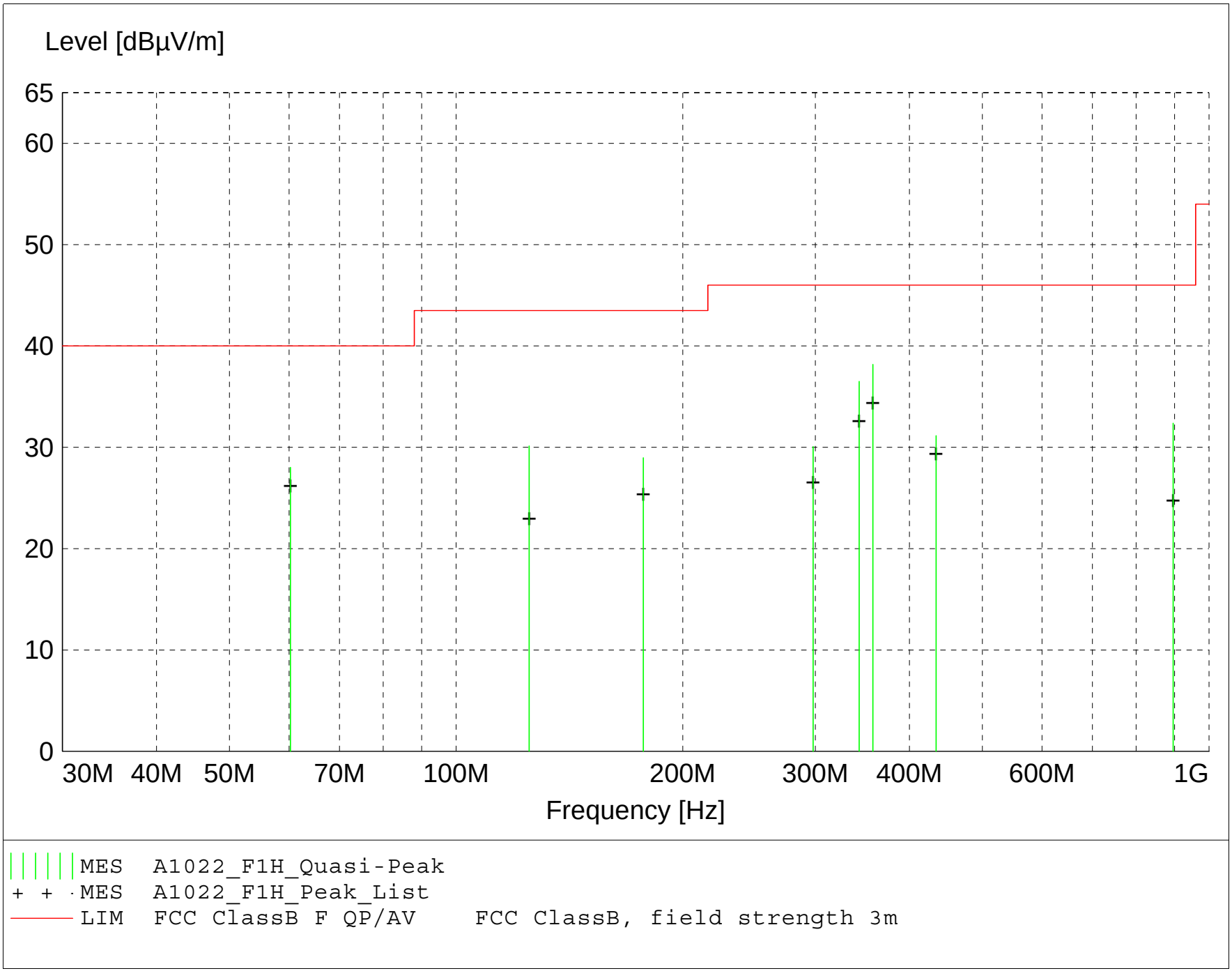
Margin(dB) = Limit(dBµV/m) - Total Level(dBµV/m)

Graph Markers: + Frequency marker (Level of marker not related to final level)

| Final maximized level using Quasi-Peak detector

X Final maximized level using Average dector

# Final maximized level using Peak detector


Level [dBµV/m]
65
60
50
40
30
20
10
0
30M
40M
50M
70M
100M
200M
300M
400M
600M
1G
Frequency [Hz]
MES A1022_F1H_Quasi-Peak
MES A1022_F1H_Peak_List
LIM FCC ClassB F QP/AV FCC ClassB, field strength 3m

***MEASUREMENT RESULT: "A1022_F1H_Final"***

10/17/2013 11:53AM

| Frequency | Level | Antenna Factor | System Loss | Total Level | Limit | Margin | Height Ant. | EuT Angle | Final Detector | Comment |
|---|---|---|---|---|---|---|---|---|---|---|
| MHz | dBµV | dBµV/m | dB | dBµV/m | dBµV/m | dB | m | deg | | |
| 357.640000 | 44.19 | 14.90 | -20.9 | 38.2 | 46.0 | 7.8 | 2.00 | 290 | QUASI-PEAK | broadband |
| 342.990000 | 42.57 | 14.90 | -21.0 | 36.5 | 46.0 | 9.5 | 2.00 | 270 | QUASI-PEAK | broadband |
| 60.245000 | 41.69 | 10.15 | -23.8 | 28.0 | 40.0 | 12.0 | 1.90 | 270 | QUASI-PEAK | broadband |
| 125.000000 | 39.72 | 13.10 | -22.7 | 30.1 | 43.5 | 13.4 | 1.60 | 260 | QUASI-PEAK | None |
| 896.000000 | 26.63 | 23.44 | -17.7 | 32.4 | 46.0 | 13.6 | 1.20 | 135 | QUASI-PEAK | None |
| 177.260000 | 35.09 | 15.95 | -22.1 | 29.0 | 43.5 | 14.5 | 1.00 | 340 | QUASI-PEAK | broadband |
| 433.960000 | 34.96 | 16.70 | -20.5 | 31.2 | 46.0 | 14.9 | 2.00 | 290 | QUASI-PEAK | None |
| 297.900000 | 36.98 | 14.27 | -21.2 | 30.1 | 46.0 | 15.9 | 2.20 | 260 | QUASI-PEAK | broadband |

***FCC Part 15.209***

***Electric Field Strength***

EUT: Model: AF5
Manufacturer: Ubiquiti Networks
Operating Condition: 70 deg. F; 46% R.H.
Test Site: DLS O.F. Site 3
Operator: Craig B
Test Specification: All channel BW; L, M, and H channels
Comment: Power set to 30 dBm eirp; QPSK
Date: 10-02-2013; 10-17-2013

***TEXT: "Vert 3 meters"***

Short Description: Test Set-up

Test Set-up: EUT Measured at 3 Meters with VERTICAL Antenna Polarization

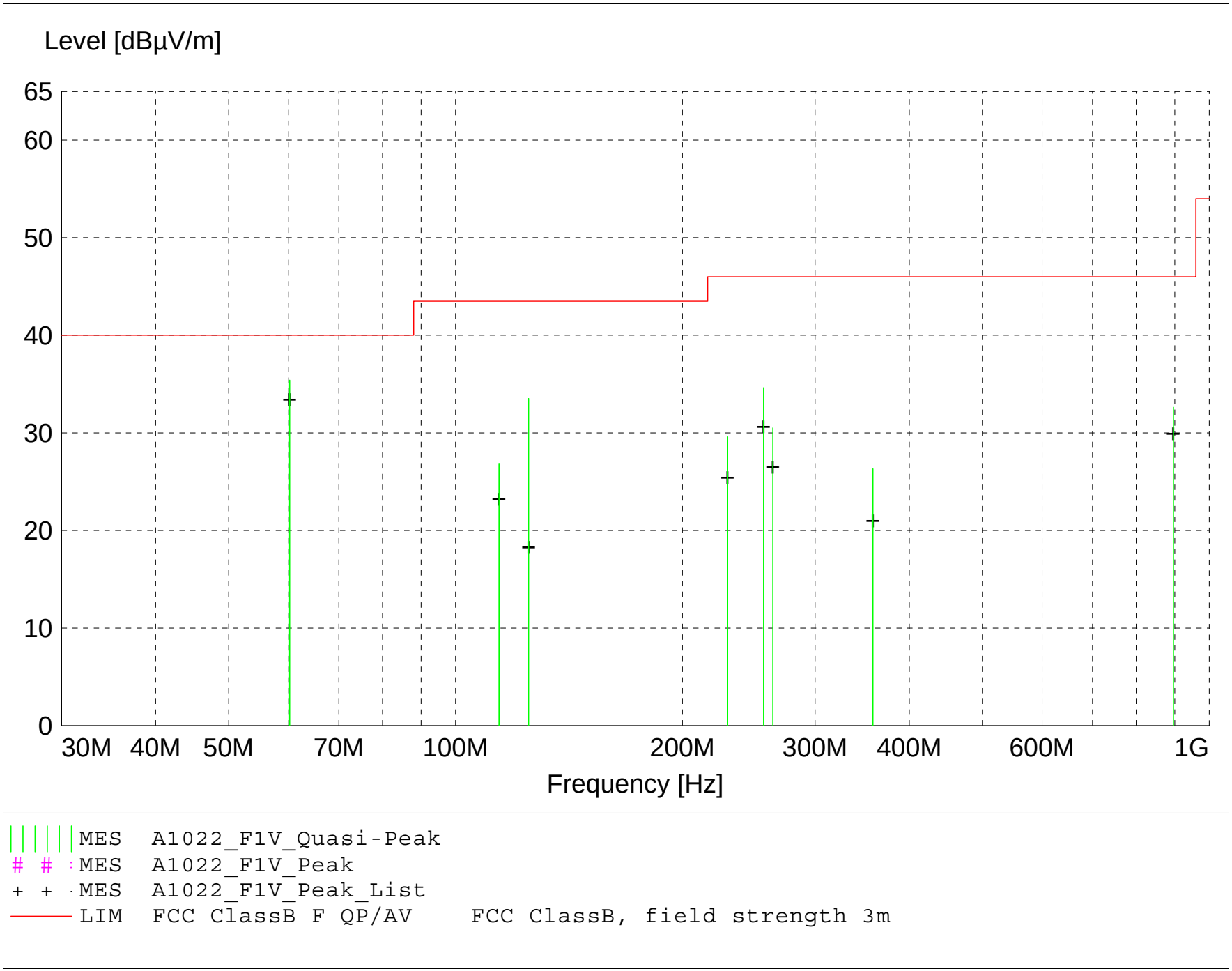
Sample Equations:

| Total Level(dBµV/m) | = Level(dBµV) | + System Loss(dB) | + Antenna Factor(dBµV/m) |
|---|---|---|---|
| 24.6 | = 35.51 | + (-22.1) | + 11.20 |

| Margin(dB) | = Limit(dBµV/m) | - Total Level(dBµV/m) |
|---|---|---|
| 15.4 | = 40 | - 24.6 |

Graph Markers:

| | |
|---|---|
| + | Frequency marker (Level of marker not related to final level) |
| \| | Final maximized level using Quasi-Peak detector |
| X | Final maximized level using Average dector |
| # | Final maximized level using Peak detector |


Level [dBµV/m]
65
60
50
40
30
20
10
0
30M
40M
50M
70M
100M
200M
300M
400M
600M
1G
Frequency [Hz]
MES A1022_F1V_Quasi-Peak
MES A1022_F1V_Peak
MES A1022_F1V_Peak_List
LIM FCC ClassB F QP/AV FCC ClassB, field strength 3m

***MEASUREMENT RESULT: "A1022_F1V_Final"***

10/17/2013 11:50AM

| Frequency | Level | Antenna Factor | System Loss | Total Level | Limit | Margin | Height Ant. | EuT Angle | Final Detector | Comment |
|---|---|---|---|---|---|---|---|---|---|---|
| MHz | dBµV | dBµV/m | dB | dBµV/m | dBµV/m | dB | m | deg | | |
| 60.260000 | 49.07 | 10.15 | -23.8 | 35.4 | 40.0 | 4.6 | 1.00 | 200 | QUASI-PEAK | broadband |
| 125.000000 | 43.12 | 13.10 | -22.7 | 33.5 | 43.5 | 10.0 | 1.00 | 180 | QUASI-PEAK | None |
| 256.300000 | 43.39 | 12.78 | -21.5 | 34.6 | 46.0 | 11.4 | 1.80 | 180 | QUASI-PEAK | broadband |
| 896.000000 | 26.87 | 23.44 | -17.7 | 32.6 | 46.0 | 13.4 | 1.10 | 110 | QUASI-PEAK | None |
| 263.630000 | 38.83 | 13.15 | -21.5 | 30.5 | 46.0 | 15.5 | 2.00 | 180 | QUASI-PEAK | broadband |
| 229.630000 | 39.75 | 11.49 | -21.6 | 29.6 | 46.0 | 16.4 | 1.70 | 130 | QUASI-PEAK | broadband |
| 114.215000 | 36.99 | 12.68 | -22.8 | 26.9 | 43.5 | 16.6 | 1.00 | 180 | QUASI-PEAK | broadband |
| 357.860000 | 32.32 | 14.90 | -20.9 | 26.3 | 46.0 | 19.7 | 2.00 | 260 | QUASI-PEAK | broadband |

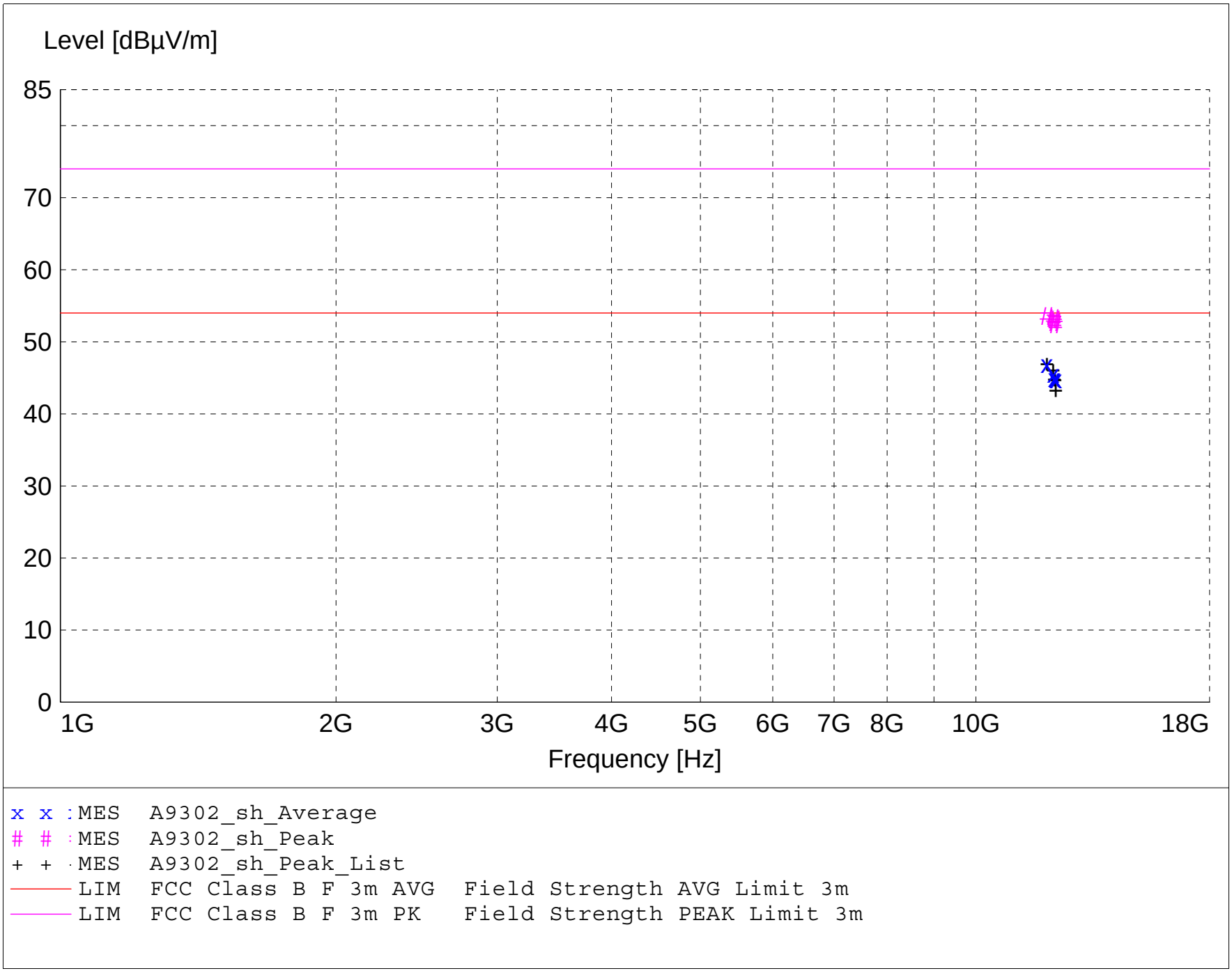
***FCC Part 15.209***

***Electric Field Strength***

```
EUT:                  Model:  AF5
Manufacturer:         Ubiquiti Networks
Operating Condition:  70 deg. F; 44% R.H.
Test Site:            DLS O.F. Site 3
Operator:             Craig B
Test Specification:   50 MHz channel BW; 5510, ,5575, 5685 MHz channels
Comment:              Power set to 30 dBm eirp; QPSK
                      Date:  09-30-2013
```

***TEXT: "Horz 3 meters"***

```
  Short Description:            Test Set-up

Test Set-up:     EUT Measured at 3 Meters with HORIZONTAL Antenna Polarization

Equations:       Total Level(dBµV/m) = Level(dBµV) + System Loss(dB) + Antenna Factor(dBµV/m)

                 Margin(dB)  = Limit(dBµV/m) - Total Level(dBµV/m)

Graph Markers:   +       Frequency marker (Level of marker not related to final level)

                 |       Final maximized level using Quasi-Peak detector

                 X       Final maximized level using Average dector

                 #       Final maximized level using Peak detector
```




x x : MES A9302_sh_Average
# # : MES A9302_sh_Peak
+ + : MES A9302_sh_Peak_List
——— LIM FCC Class B F 3m AVG Field Strength AVG Limit 3m
——— LIM FCC Class B F 3m PK Field Strength PEAK Limit 3m

***MEASUREMENT RESULT: "A9302_sh_Final"***

9/30/2013 2:24PM

| Frequency | Level | Antenna Factor | System Loss | Total Level | Limit | Margin | Height Ant. | EuT Angle | Final Detector | Comment |
|---|---|---|---|---|---|---|---|---|---|---|
| MHz | dBµV | dBµV/m | dB | dBµV/m | dBµV/m | dB | m | deg | | |
| 11955.020000 | 60.19 | 39.09 | -52.4 | 46.9 | 54.0 | 7.1 | 1.20 | 225 | AVERAGE | Low ch; QPSK |
| 12150.000000 | 58.71 | 38.99 | -52.1 | 45.6 | 54.0 | 8.4 | 1.00 | 100 | AVERAGE | Mid ch; QPSK |
| 12180.000000 | 58.05 | 38.97 | -52.1 | 45.0 | 54.0 | 9.0 | 1.00 | 110 | AVERAGE | High ch; QPSK |
| 12200.000000 | 57.96 | 38.96 | -52.0 | 44.9 | 54.0 | 9.1 | 1.10 | 0 | AVERAGE | Low ch; QPSK |
| 12225.000000 | 57.89 | 38.95 | -52.0 | 44.8 | 54.0 | 9.2 | 1.00 | 170 | AVERAGE | Low ch; QPSK |
| 11955.020000 | 66.82 | 39.09 | -52.4 | 53.5 | 74.0 | 20.5 | 1.20 | 225 | MAX PEAK | Low ch; QPSK |
| 12150.000000 | 66.43 | 38.99 | -52.1 | 53.3 | 74.0 | 20.7 | 1.00 | 100 | MAX PEAK | Mid ch; QPSK |
| 12180.000000 | 66.18 | 38.97 | -52.1 | 53.1 | 74.0 | 20.9 | 1.00 | 110 | MAX PEAK | High ch; QPSK |
| 12200.000000 | 65.80 | 38.96 | -52.0 | 52.7 | 74.0 | 21.3 | 1.10 | 0 | MAX PEAK | Low ch; QPSK |
| 12225.000000 | 65.55 | 38.95 | -52.0 | 52.5 | 74.0 | 21.5 | 1.00 | 170 | MAX PEAK | Low ch; QPSK |

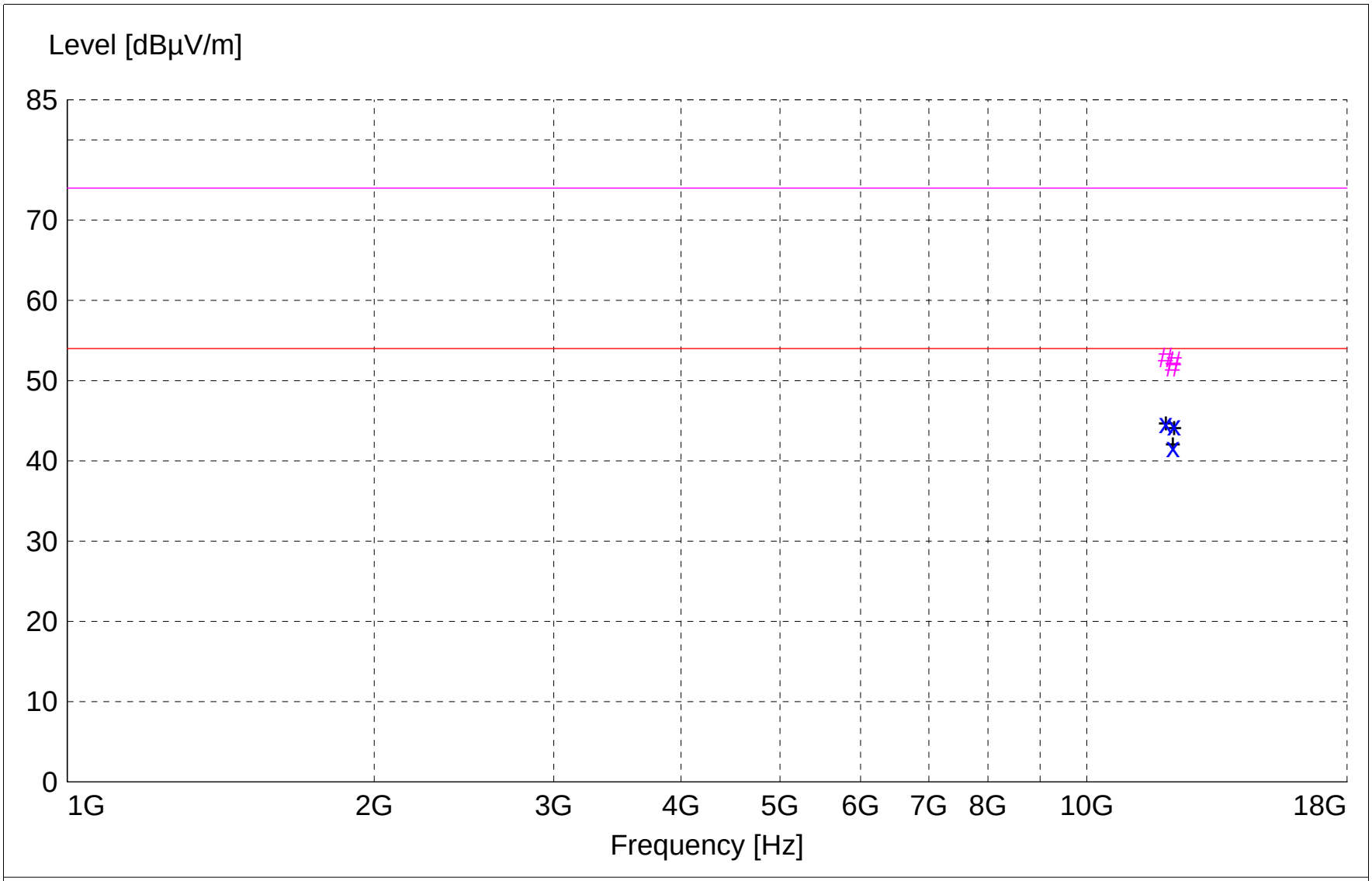
***FCC Part 15.209***

***Electric Field Strength***

```
EUT:                  Model:  AF5
Manufacturer:         Ubiquiti Networks
Operating Condition:  70 deg. F; 44% R.H.
Test Site:            DLS O.F. Site 3
Operator:             Craig B
Test Specification:   50 MHz channel BW; 5510, ,5575, 5685 MHz channels
Comment:              Power set to 30 dBm eirp; QPSK
                      Date:  09-30-2013
```

***TEXT: "Vert 3 meters"***

```
  Short Description:            Test Set-up


Test Set-up:    EUT Measured at 3 Meters with VERTICAL Antenna Polarization


Sample Equations:   Total Level(dBµV/m) = Level(dBµV) + System Loss(dB) + Antenna Factor(dBµV/m)
                    24.6                = 35.51       + (-22.1)         + 11.20

                    Margin(dB)  = Limit(dBµV/m) - Total Level(dBµV/m)
                    15.4        = 40            - 24.6


Graph Markers:  +       Frequency marker (Level of marker not related to final level)

                |       Final maximized level using Quasi-Peak detector

                X       Final maximized level using Average dector

                #       Final maximized level using Peak detector
```




x x : MES A9302_sv_Average
# # : MES A9302_sv_Peak
+ + : MES A9302_sv_Peak_List
——— LIM FCC Class B F 3m AVG Field Strength AVG Limit 3m
——— LIM FCC Class B F 3m PK Field Strength PEAK Limit 3m

***MEASUREMENT RESULT: "A9302_sv_Final"***

9/30/2013 2:12PM

| Frequency | Level | Antenna Factor | System Loss | Total Level | Limit | Margin | Height Ant. | EuT Angle | Final Detector | Comment |
|---|---|---|---|---|---|---|---|---|---|---|
| MHz | dBµV | dBµV/m | dB | dBµV/m | dBµV/m | dB | m | deg | | |
| 11955.020000 | 57.92 | 39.09 | -52.4 | 44.6 | 54.0 | 9.4 | 1.30 | 0 | AVERAGE | L ch; QPSK |
| 12180.000000 | 57.52 | 38.97 | -52.1 | 44.4 | 54.0 | 9.6 | 1.30 | 0 | AVERAGE | High ch; QPSK |
| 12150.005000 | 54.79 | 38.99 | -52.1 | 41.6 | 54.0 | 12.4 | 1.40 | 190 | AVERAGE | Mid ch; QPSK |
| 11955.020000 | 66.18 | 39.09 | -52.4 | 52.9 | 74.0 | 21.1 | 1.30 | 0 | MAX PEAK | L ch; QPSK |
| 12180.000000 | 65.55 | 38.97 | -52.1 | 52.5 | 74.0 | 21.5 | 1.30 | 0 | MAX PEAK | High ch; QPSK |
| 12150.005000 | 64.91 | 38.99 | -52.1 | 51.8 | 74.0 | 22.2 | 1.40 | 190 | MAX PEAK | Mid ch; QPSK |

**No measurable emissions were detected from the EUT from 18 to 40 GHz.**

# END OF REPORT

| Revision # | Date | Comments | By |
|---|---|---|---|
| 1.0 | 11-5-2013 | Preliminary Release | JS |
| 1.1 | 11-7-2013 | Removed data for other bandwidths | JS |
| 1.2 | 11-11-2013 | Additional Description | JS |
| | | | |
| | | | |