166 South Carter, Genoa City, WI 53128

| | |
|---|---|
| Company: | Ubiquiti Networks, Inc. |
| Model Tested: | AF5 |
| Report Number: | 19544 Part 2 |
| DLS Project: | 6172 |

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

Subpart C – Intentional Radiators
Section 15.247
Operation within the bands 902 - 928 MHz,
2400 - 2483.5 MHz, 5725 - 5875 MHz,
and 24.0 - 24.25 GHz.

## Part 2 - 40 & 50 MHz Bandwidth Data

THE FOLLOWING **MEETS** THE ABOVE TEST SPECIFICATION

| | |
|---|---|
| Formal Name: | Air Fiber 5 - 5.8GHz Radio |
| Model Number(s): | AF5<br>(Please see the note on page 6 concerning the similarity to AF5U) |
| 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 40 MHz & 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 # 19544.

166 South Carter, Genoa City, WI 53128

| | |
|---|---|
| Company: | Ubiquiti Networks, Inc. |
| Model Tested: | AF5 |
| Report Number: | 19544 Part 2 |
| DLS Project: | 6172 |

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)

**Applicable Technical Requirements Tested**

| Section | Description | Procedure | Note | Compliant? |
|---|---|---|---|---|
| FCC 15.247(a)(2) | 6 dB Emission Bandwidth - Conducted | FCC Publication KDB 558074 D01 DTS Meas Guidance v03r01 Section 8.1 Option 1 | 1 | Yes |
| FCC 15.247(b)(3) | Fundamental Emission Output Power – Conducted | FCC Publication KDB 558074 D01 DTS Meas Guidance v03r01 Section 9.2.3.1-AVGPM | 1 | Yes |
| FCC 15.247(e) | Maximum Power Spectral Density - Conducted | FCC Publication KDB 558074 D01 DTS Meas Guidance v03r01 Section 10.3-AVGPSD-1 | 1 | Yes |
| FCC 15.247(d) | Maximum Unwanted Emission Levels – Radiated | FCC Publication KDB 558074 D01 DTS Meas Guidance v03r01 Sections 11.0, 11.2, 11.3 | 2 | Yes |
| FCC 15.247(d) | Band Edge Measurements - Conducted | FCC Publication KDB 558074 D01 DTS Meas Guidance v03r01 Section 11.1(b) | 1 | Yes |
| FCC 15.247(d), FCC 15.205 | Restricted Band Measurements - Radiated | FCC Publication KDB 558074 D01 DTS Meas Guidance v03r01 Section 12.0 & 12.1 | 2 | Yes |
| FCC 15.35(c) | Duty Cycle of Test Unit | FCC Publication KDB 558074 D01 DTS Meas Guidance v03r01 Section 6.0(b) | 1 | NA |
| FCC 15.207(a) | AC Line Conducted Emissions | ANSI C63.10-2009 Section 6.2 | 3 | Yes |

Note 1: RF conducted measurement.
Note 2: Radiated emission measurement.
Note 3: AC Line Conducted measurements - reported in Part 1 of Report #19544.

**Description of 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.

The AF5 radio product is based on the AF5U radio with FCC ID: SWX-AF5U. The radios have identical RF filtering. The passband performance is slightly shifted from the AF5U to the AF5, but still provides identical coverage of the 5.8GHz allowable band usage.

**Frequency Ranges of the 5.8GHz radio**

**5731 to 5844 MHz (10 MHz bandwidth)**
**5737 to 5838 MHz (20 MHz bandwidth)**
**5747 to 5828 MHz (40 MHz bandwidth) (in this report)**
**5752 to 5823 MHz (50 MHz bandwidth) (in this report)**

(The 5.4 radio data is in a separate report.)

**Type of Modulations Tested**

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

**Emission Designators**

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

**Conclusion**

The Air Fiber 5 - 5.8GHz Radio with 40MHz & 50MHz Channel Bandwidths, Model: AF5, as provided from Ubiquiti Networks tested in October 2013 meets the requirements of CFR 47 Part 15 Subpart C Section 15.247.

**Appendix – Measurement Data**

## 1.0 DTS Bandwidth – 6 dB bandwidth - Conducted

**Rule Section**: FCC 15.247(a)(2)

**Test Procedure**: FCC KDB 558074 D01 DTS Meas Guidance v03r01 – *Guidance for Performing Compliance Measurements on Digital Transmission Systems (DTS) Operating Under §15.247*

Section 8.0 DTS Bandwidth
8.1 Option 1

**Description**:

RBW = 100kHz
Detector = Peak
Sweep = Auto Couple

VBW ≥ 3 x RBW
Trace mode = Max Hold

Allow the trace to stabilize. Measure the maximum width of the emission that is constrained by the frequencies associated with the two outermost amplitude points (upper and lower frequencies) that are attenuated by 6 dB relative to the maximum level measured in the fundamental emission. Measure the maximum width of the emission between the lower and upper frequencies that measure 6 dB below the maximum level of the in-band emission.

Measurements were taken for QPSK, 16QAM, 64QAM, 256QAM and 1024 QAM modulations over a 10MHz, 20MHz, 40MHz and 50MHz modulation bandwidth at the low, mid and high channels of operation. EUT was set to transmit continuously over various frequencies and power settings.

**Limit:** DTS Bandwidth shall be at least 500 kHz

**Results:** Passed

Test Date: 11-5&7-2013
Company: Ubiquiti Networks
EUT: Air Fiber 5 - 5.8GHz WiFi Radio
Test: DTS Bandwidth (6dB) - Conducted
Operator: Lillian Li
Test Procedure used: KDB 558074 D01 v01r03 – 8.1) Option 1
Limit: [15.247(a)(2); RSS-210 A8.2]: ≥ 500 kHz

40MHz DTS Bandwidth:

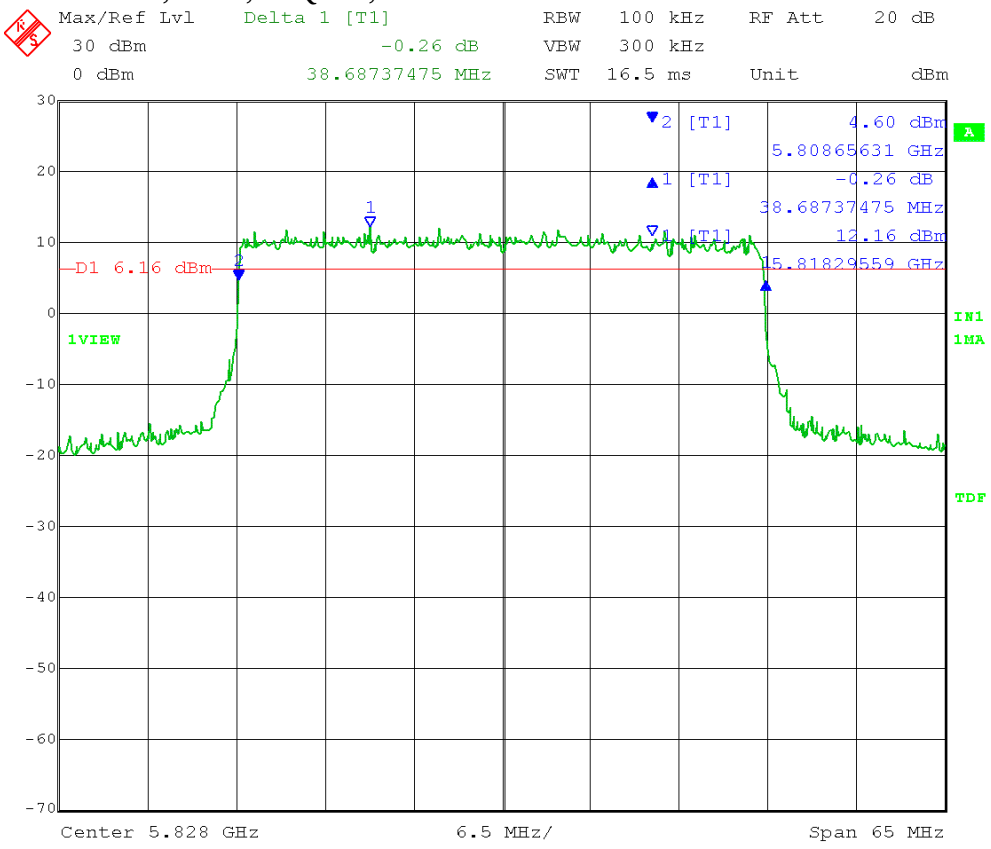
| **FCC DTS Bandwidth** | | 40M | | | | |
|---|---|---|---|---|---|---|
| FCC limit ≥ 500 kHz | MHz | QPSK | 16QAM | 64QAM | 256QAM | 1024Q |
| | *EUT FCC limit:[15.247(a)(2); RSS-210 A8.2]* | *Note that units are in MHz, not kHz* | | | | |
| HCH = 5838 MHz | TX0 | 38.43 | 38.69 | 38.69 | 38.43 | 38.3 |
| | TX1 | 38.56 | 38.43 | 38.43 | 38.56 | 38.56 |
| MCH = 5785 MHz | TX0 | 38.69 | 38.43 | 38.69 | 38.56 | 38.43 |
| | TX1 | 38.43 | 38.56 | 38.43 | 38.43 | 38.56 |
| LCH = 5747 MHz | TX0 | 38.56 | 38.56 | 38.56 | 38.56 | 38.43 |
| | TX1 | 38.56 | 38.43 | 38.56 | 38.56 | 38.56 |

50MHz DTS Bandwidth:

| **FCC DTS Bandwidth** | | 50MHz | | | | |
|---|---|---|---|---|---|---|
| FCC limit ≥ 500 kHz | MHz | QPSK | 16QAM | 64QAM | 256QAM | 1024Q |
| | *EUT FCC limit:[15.247(a)(2); RSS-210 A8.2]* | *Note that units are in MHz, not kHz* | | | | |
| HCH = 5823 MHz | TX0 | 48.26 | 48.26 | 48.1 | 48.94 | 47.94 |
| | TX1 | 48.26 | 48.26 | 48.26 | 48.1 | 48.42 |
| MCH = 5785 MHz | TX0 | 48.26 | 48.26 | 48.26 | 48.26 | 48.26 |
| | TX1 | 48.26 | 48.1 | 48.26 | 48.42 | 48.26 |
| LCH = 5752 MHz | TX0 | 48.26 | 48.26 | 48.1 | 48.26 | 48.26 |
| | TX1 | 48.1 | 48.26 | 48.26 | 48.26 | 48.1 |

PLOTS: 40MHz Bandwidth & 50MHz Bandwidth

40MHz BW, HCH, 16QAM, TX 0:

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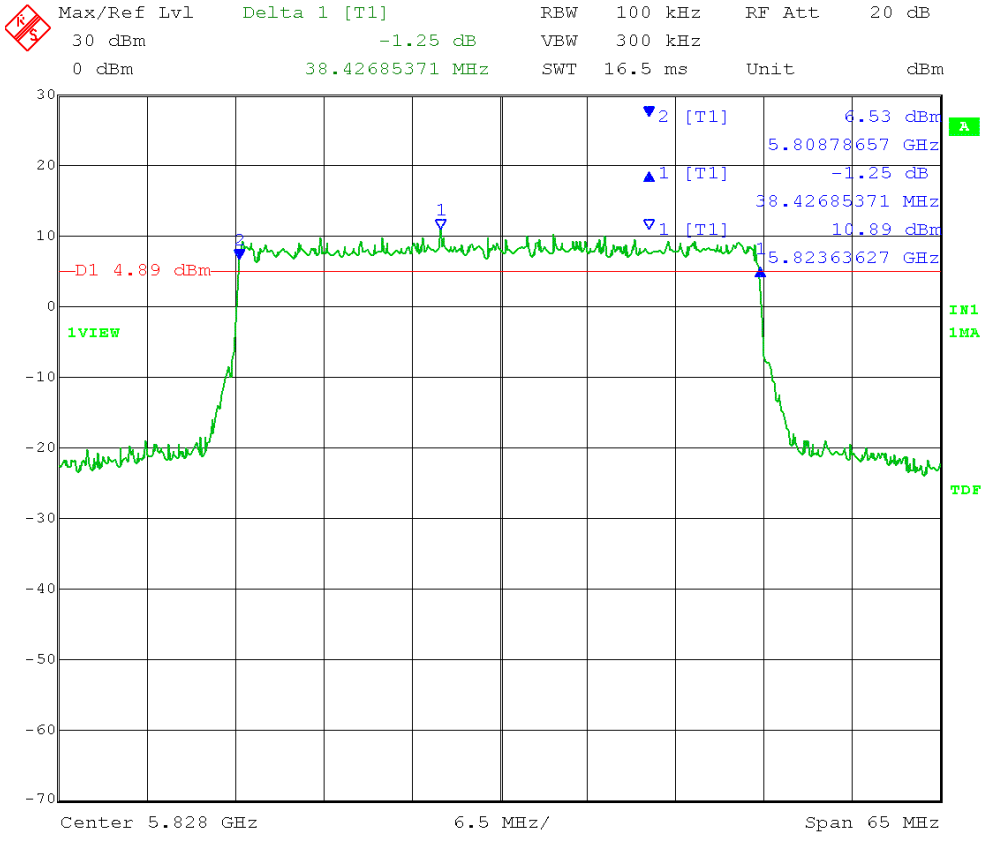


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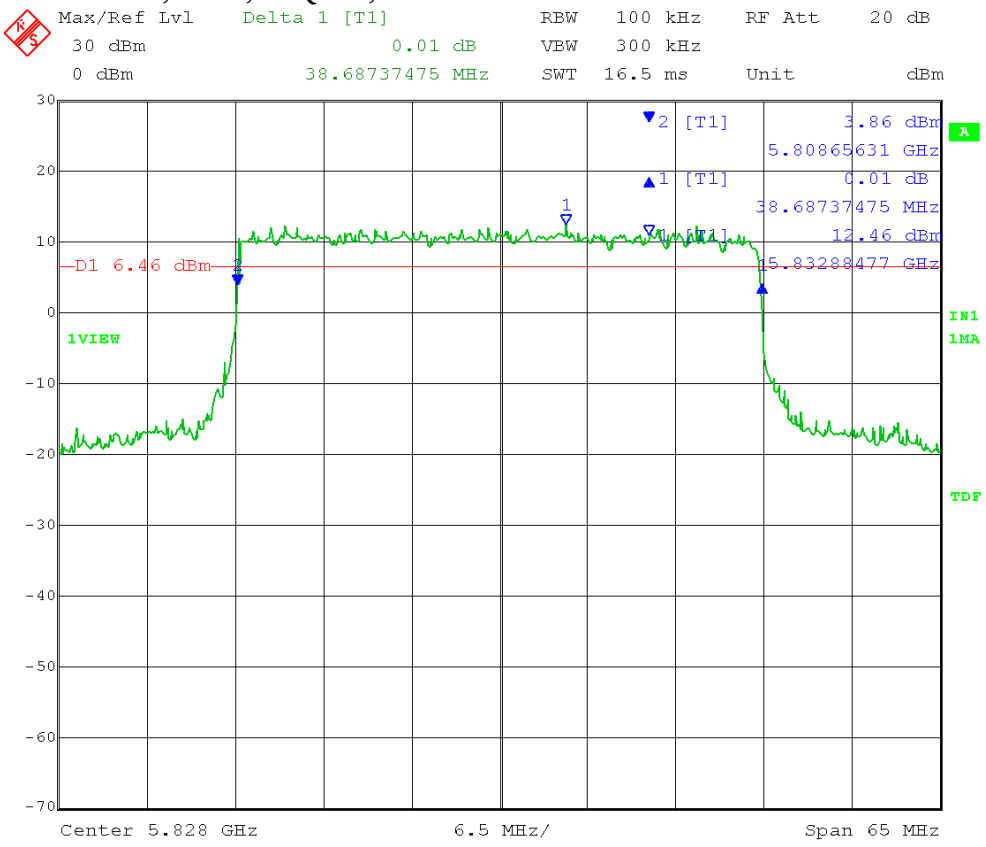


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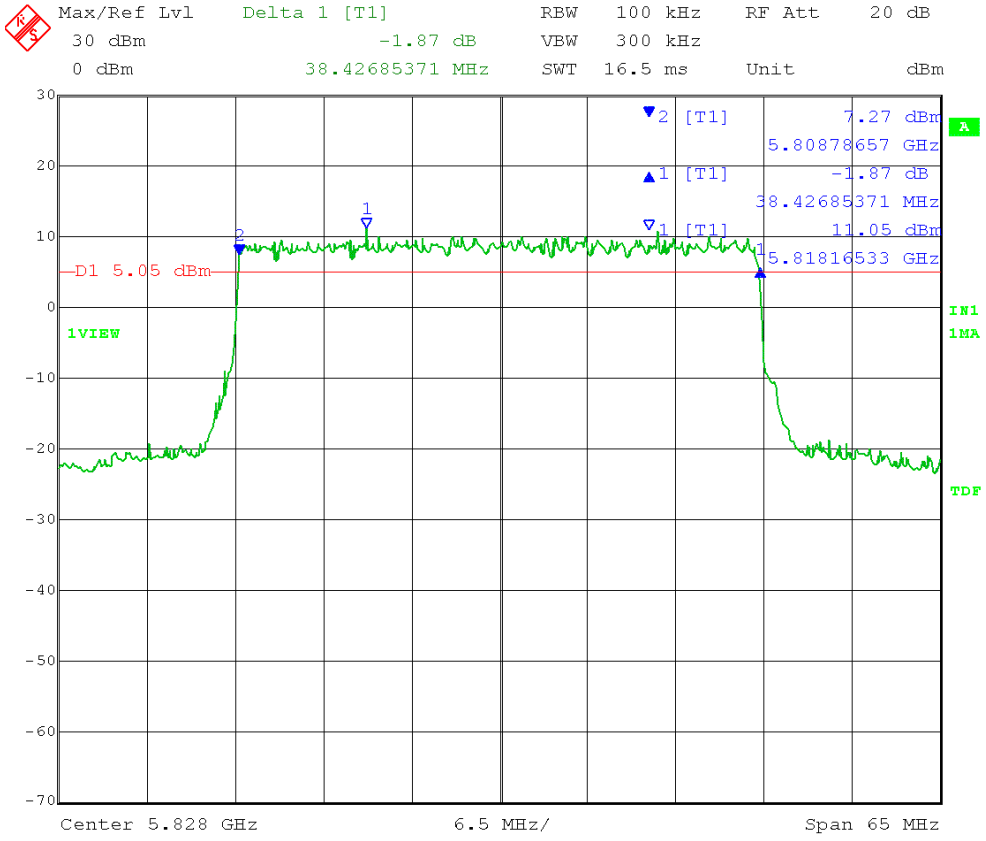


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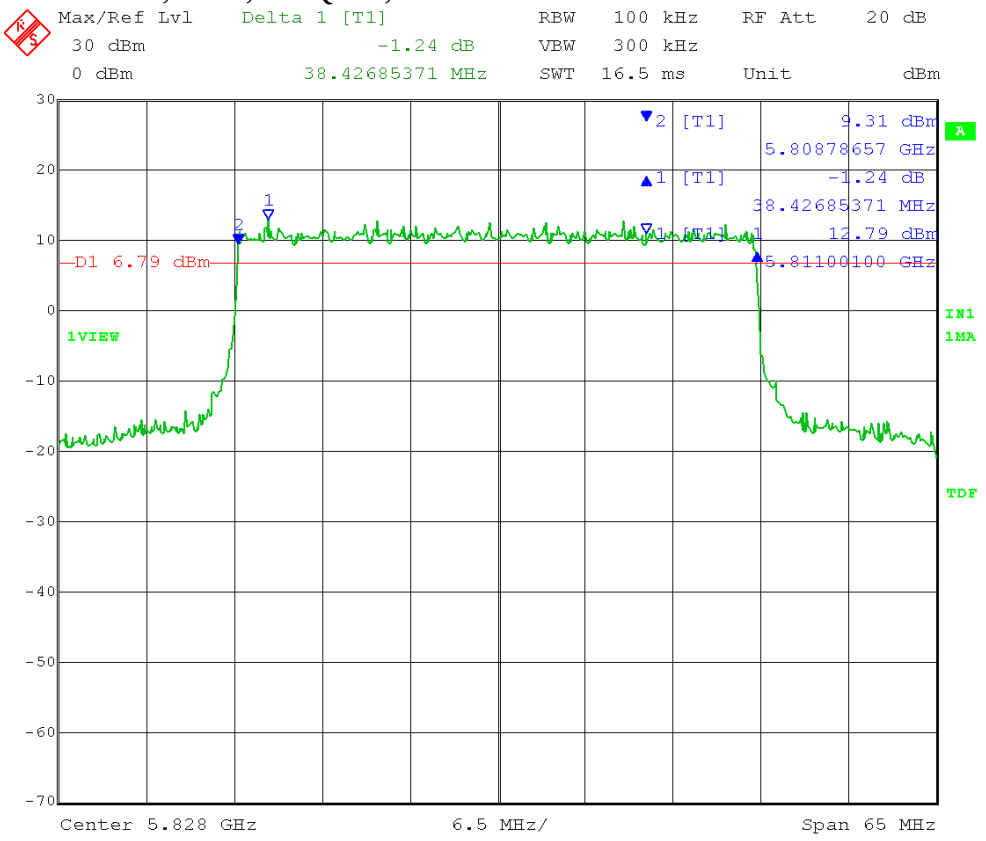


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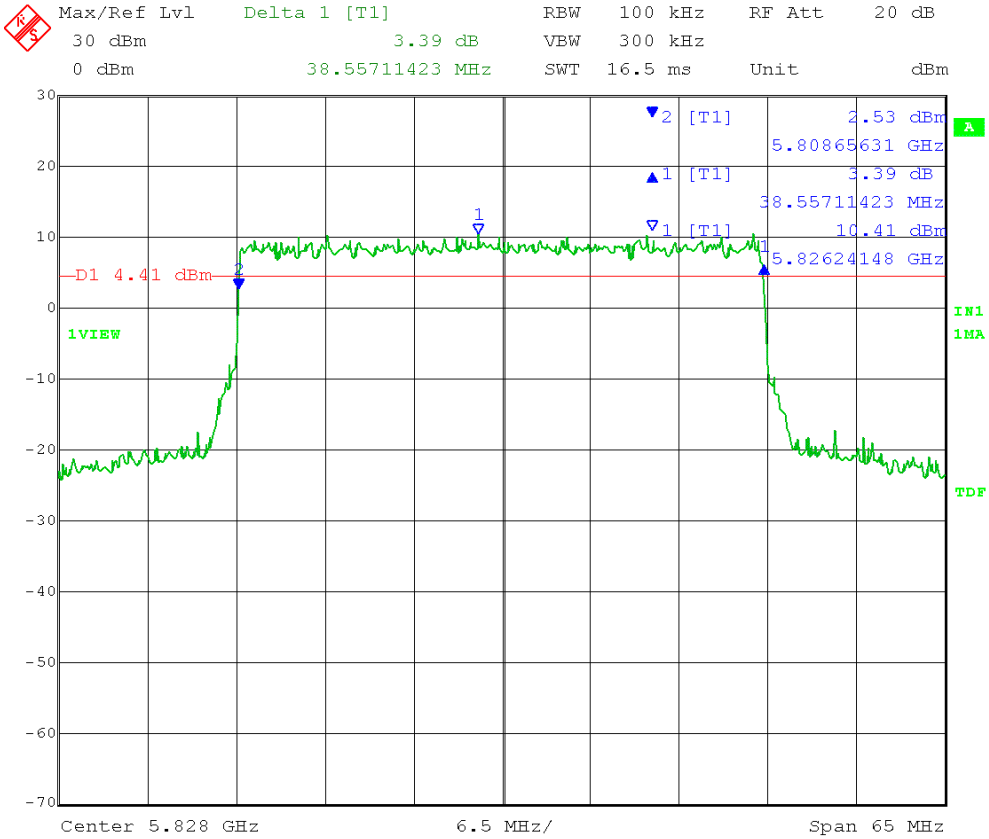


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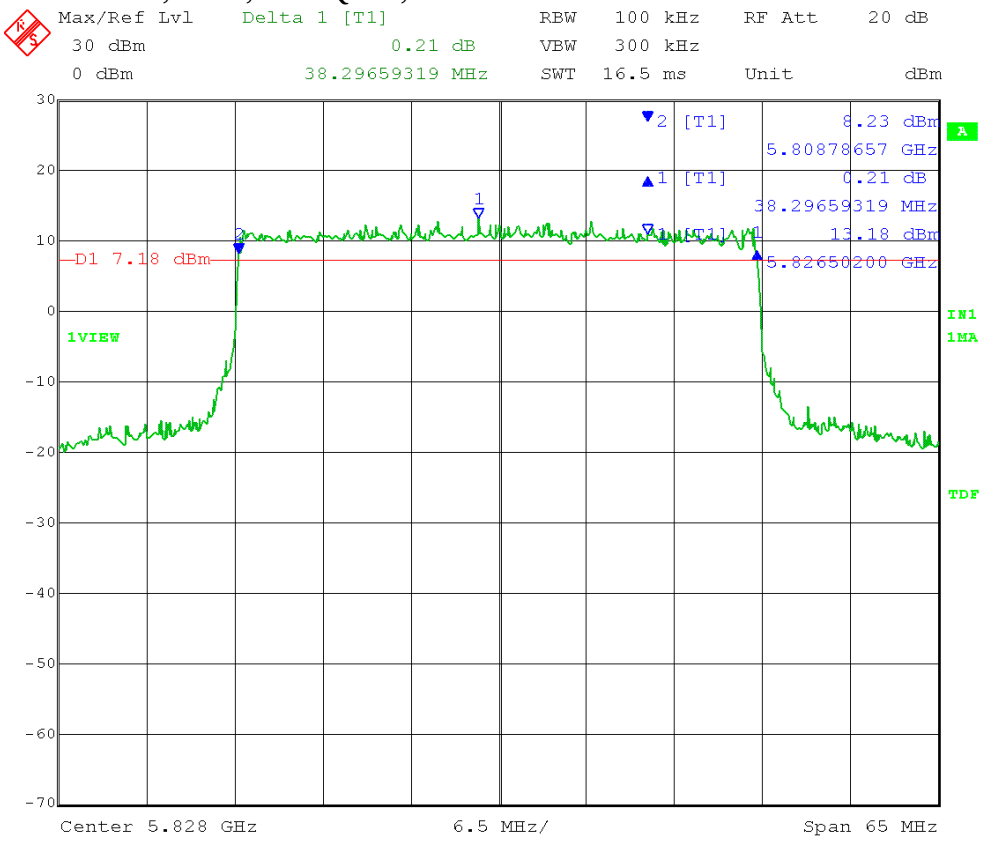


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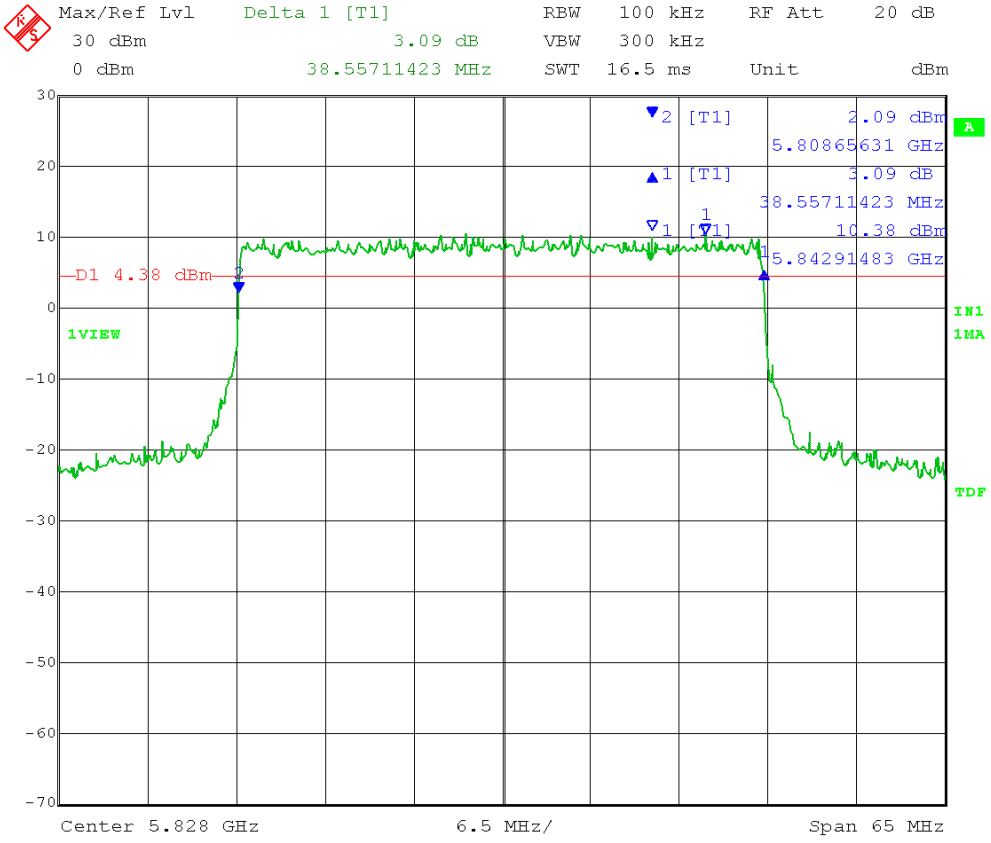


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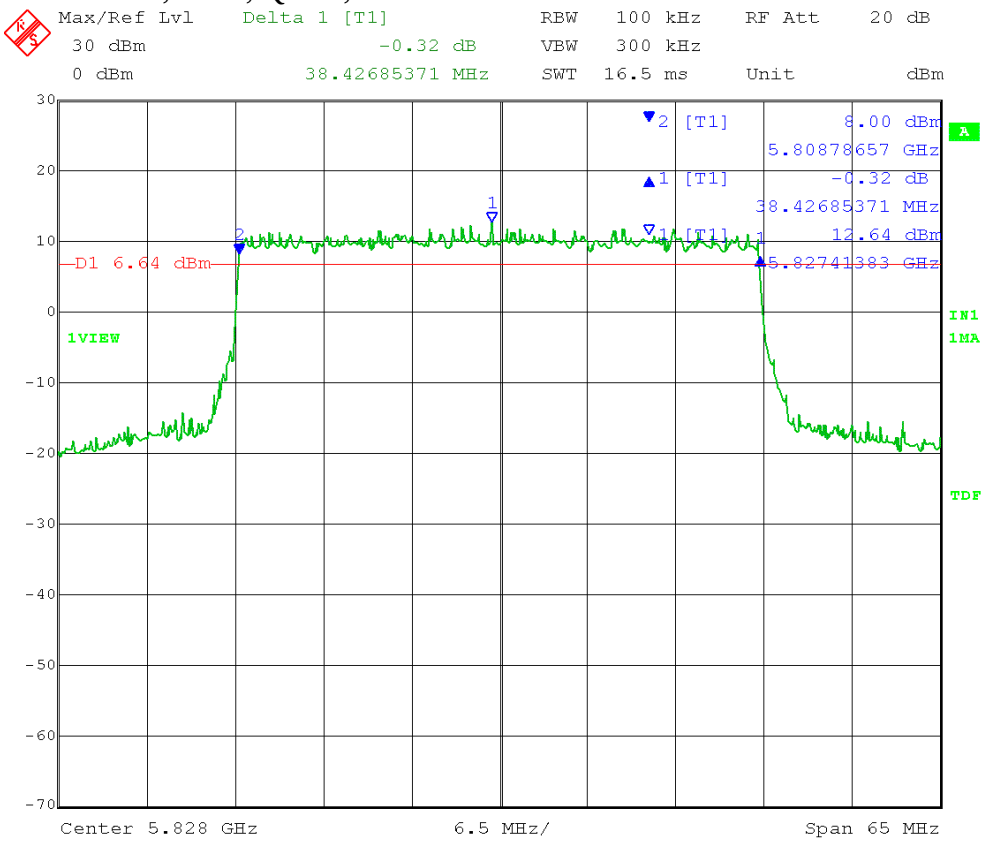


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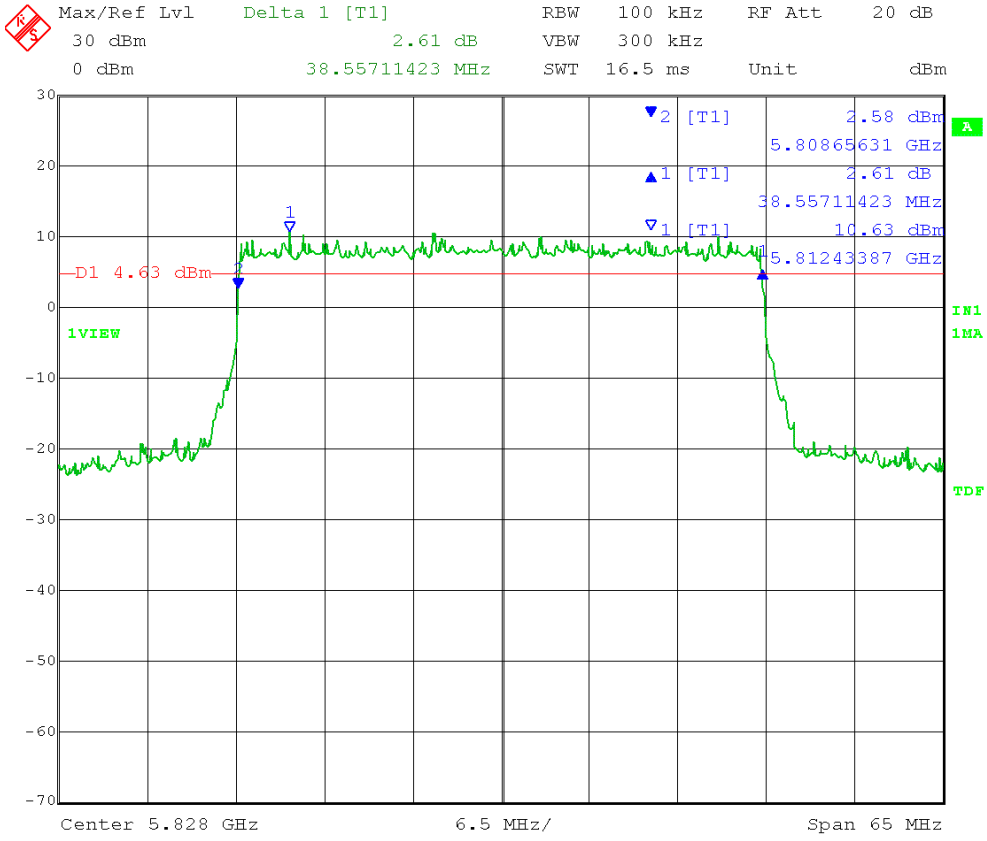


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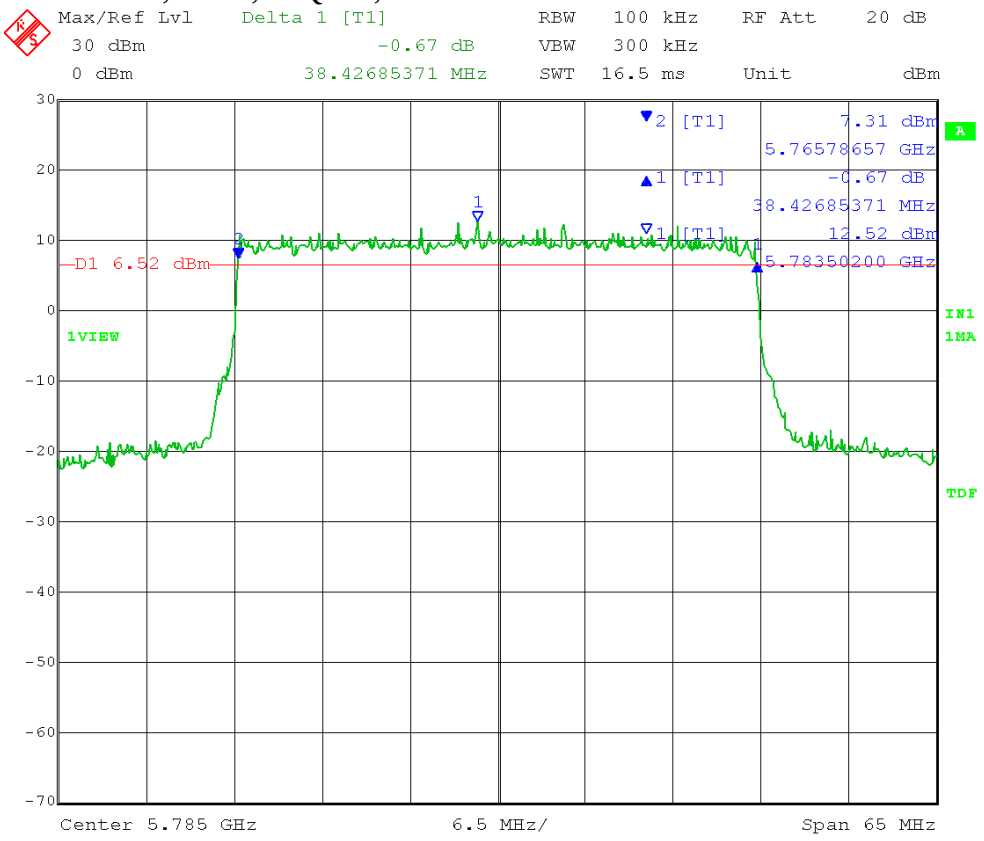
40MHz BW, MCH, 16QAM, TX 0:

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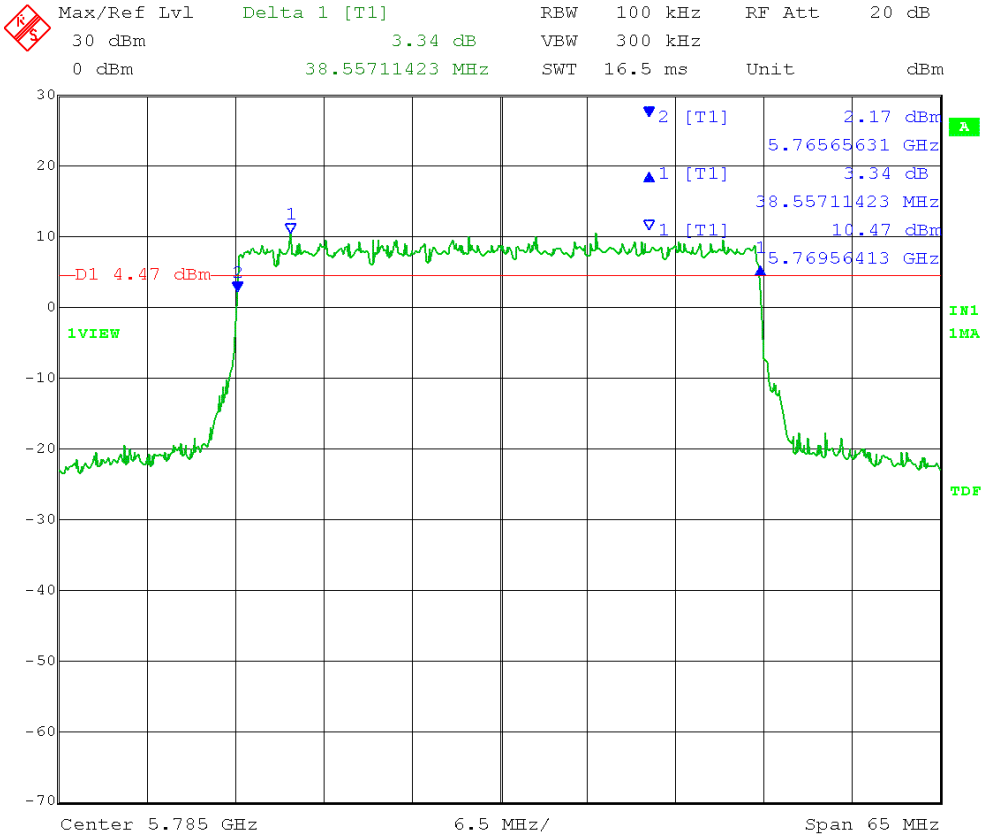


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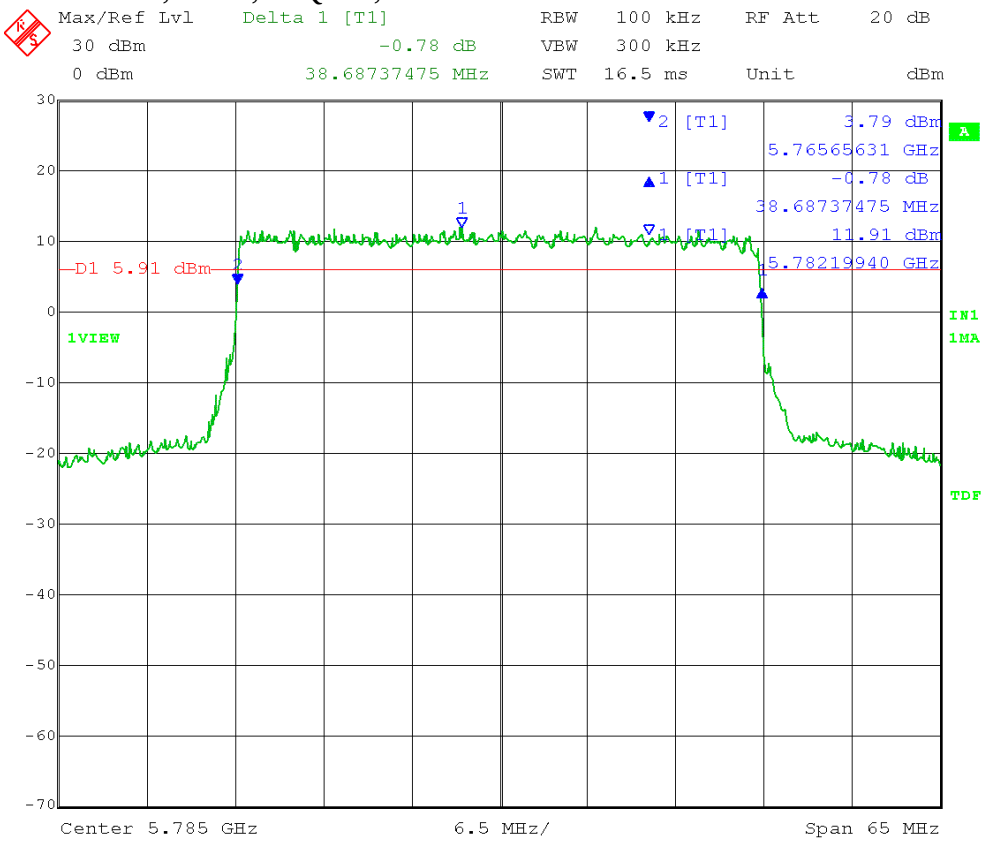


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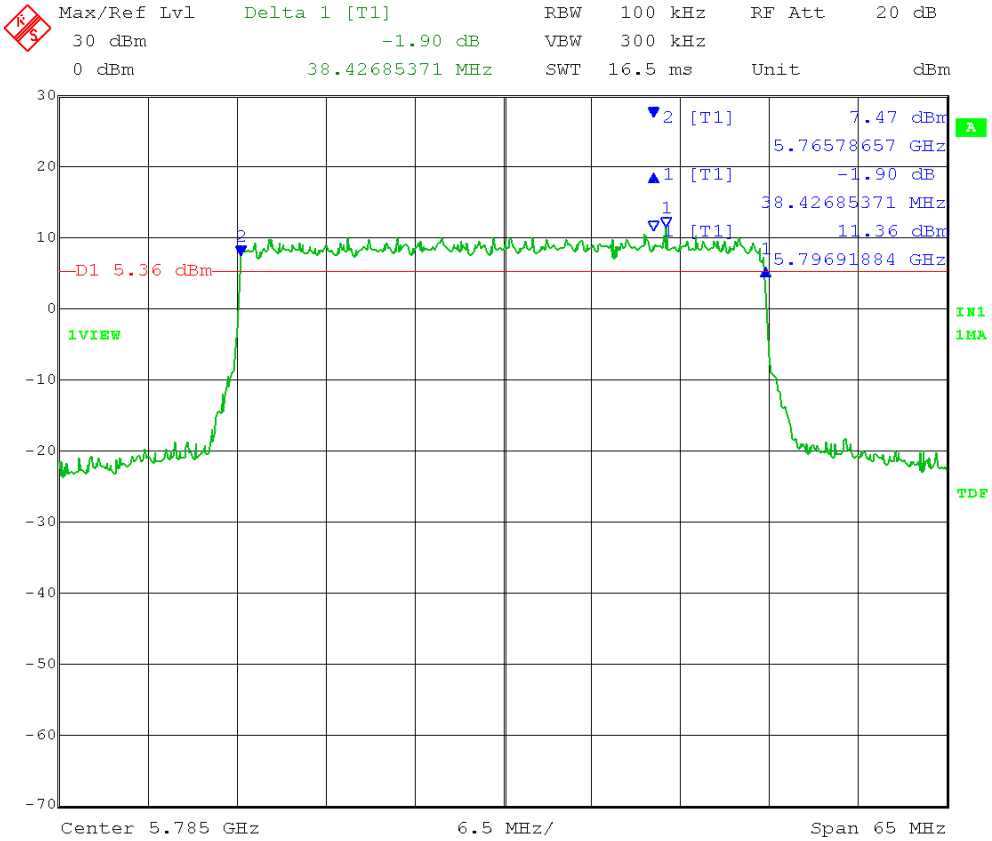


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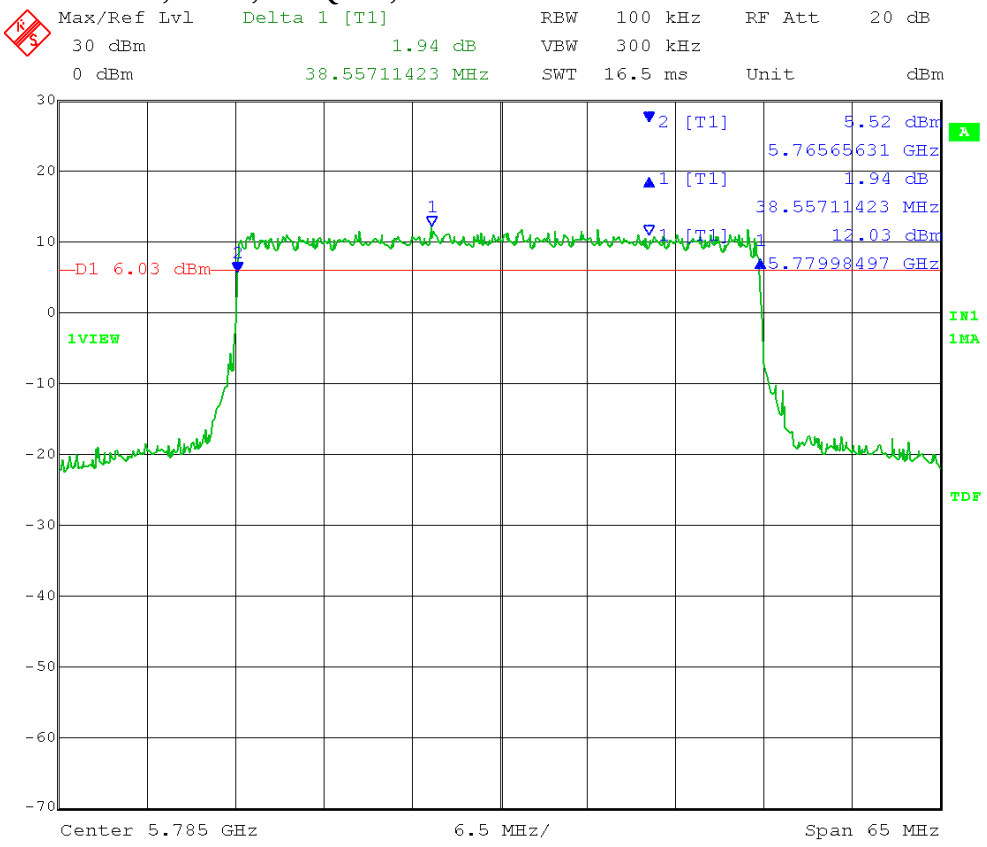


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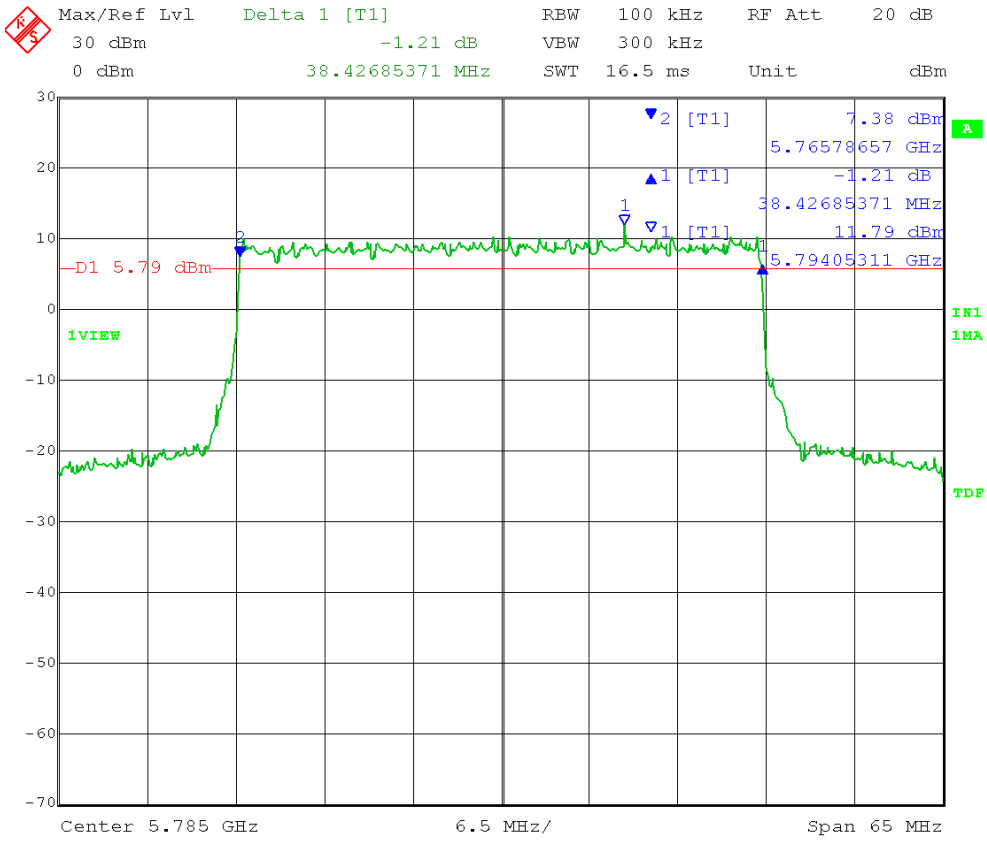


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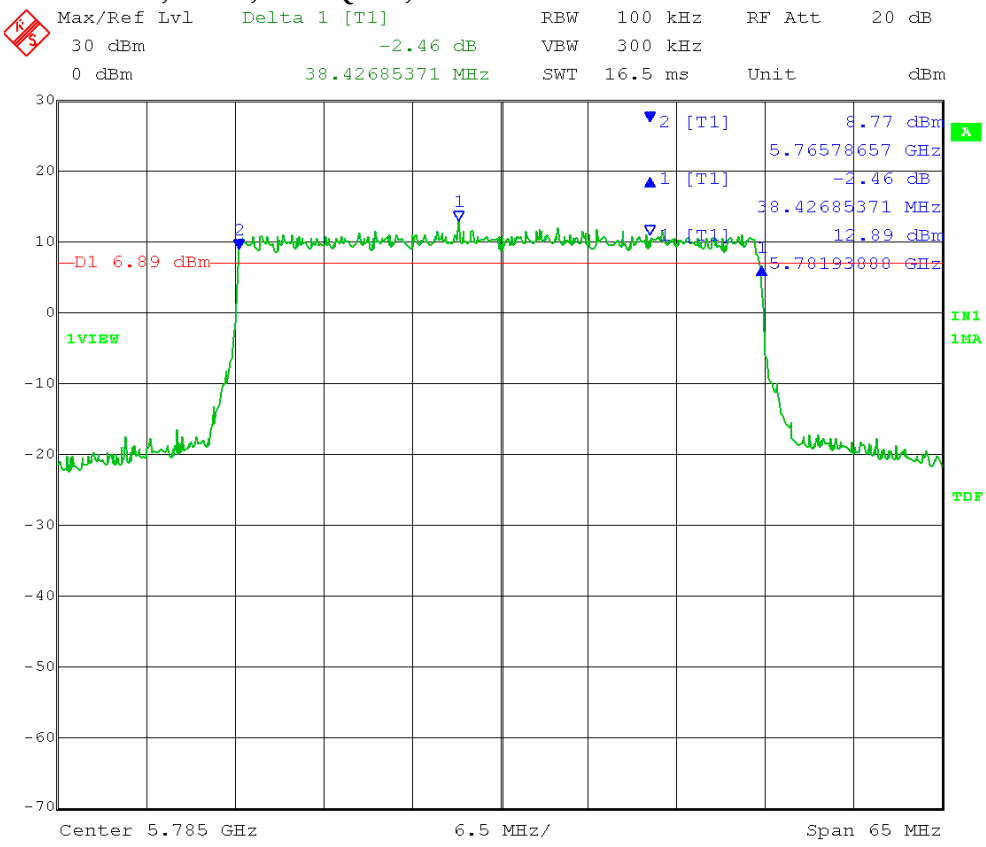


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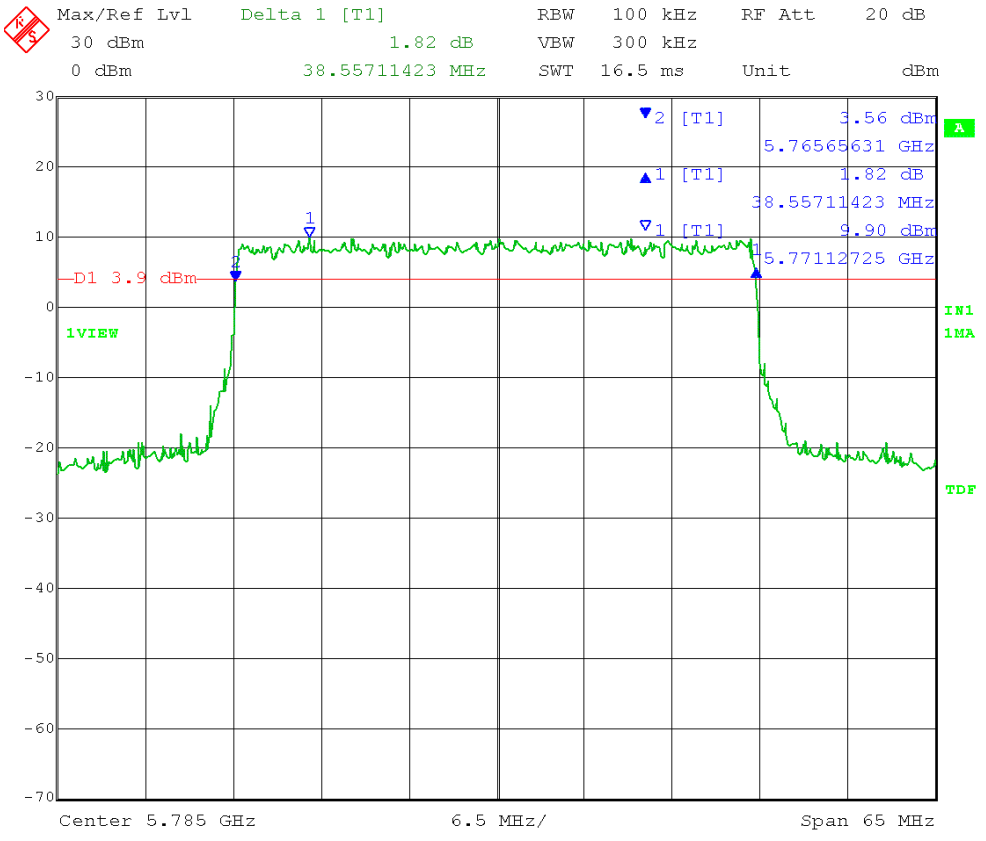


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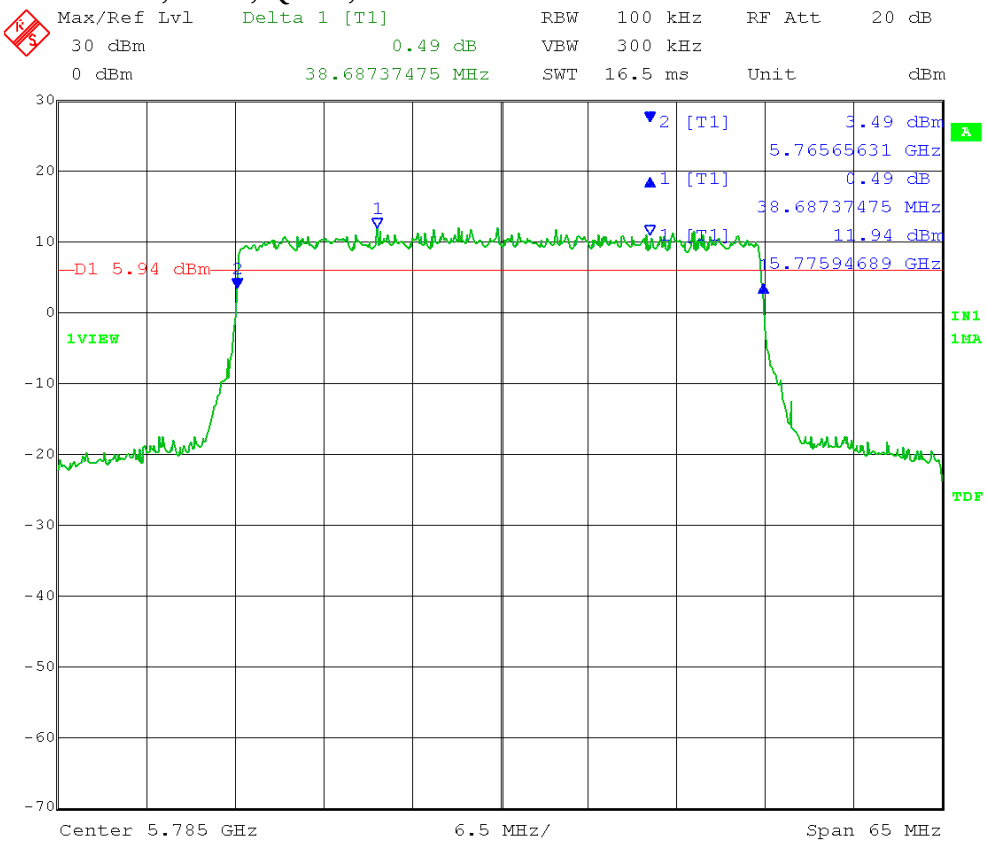


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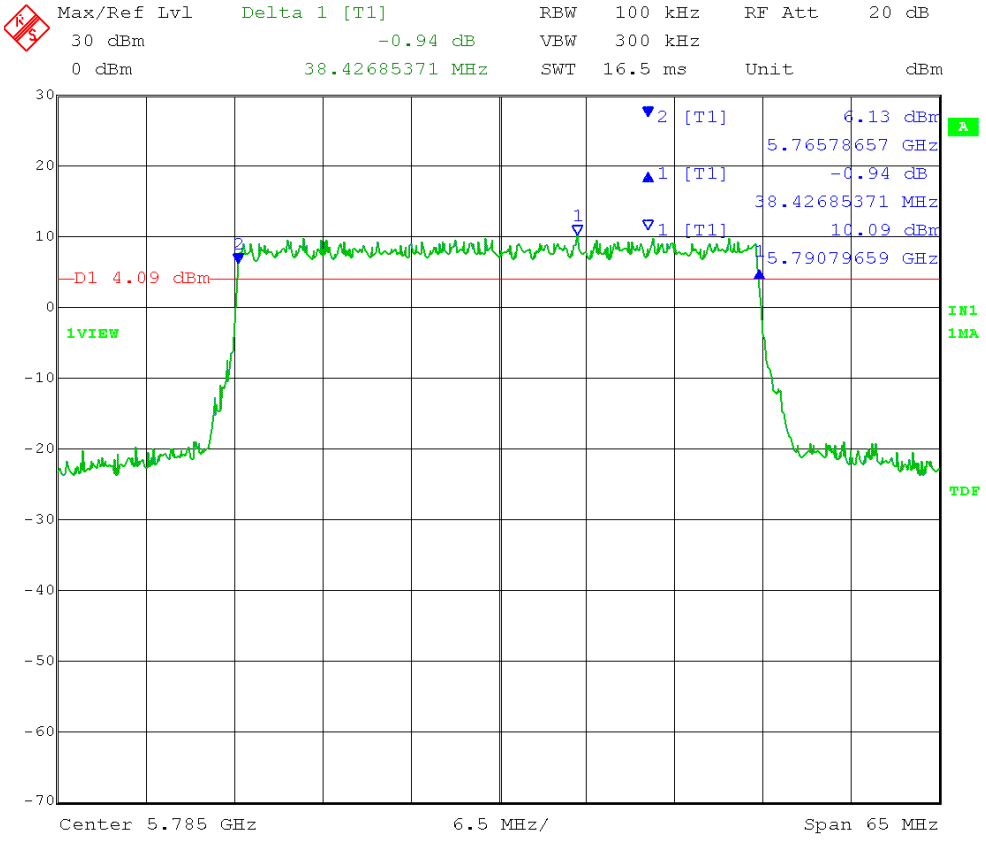


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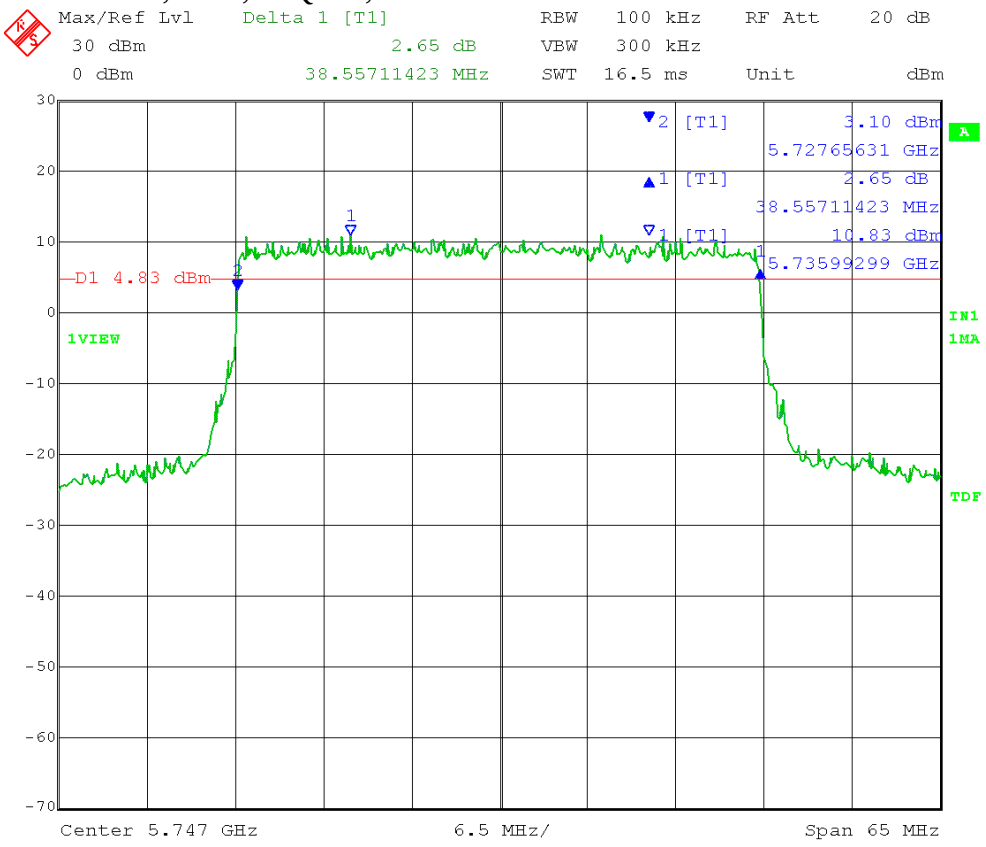


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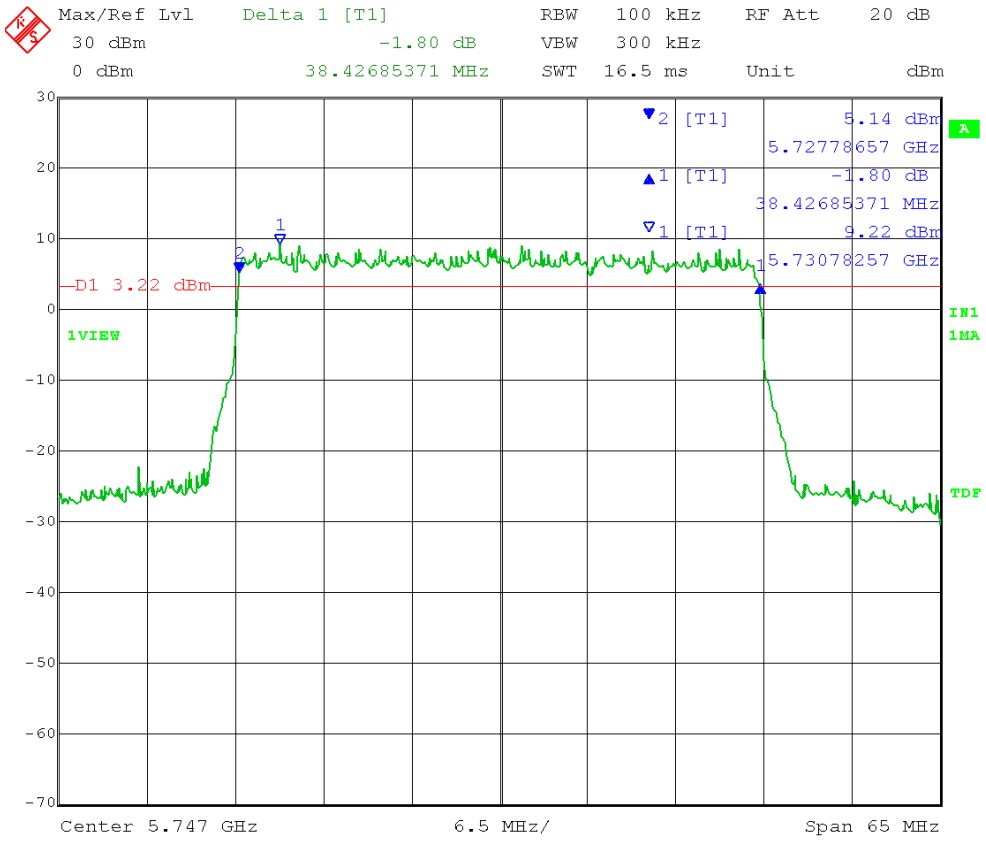


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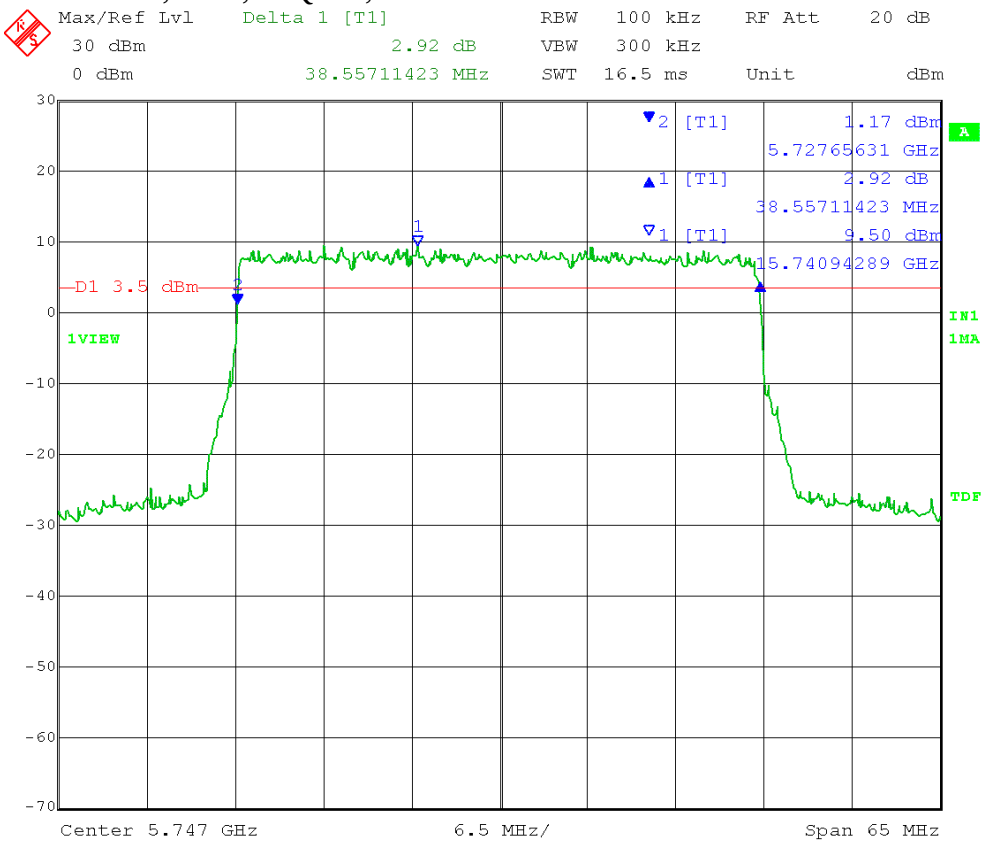


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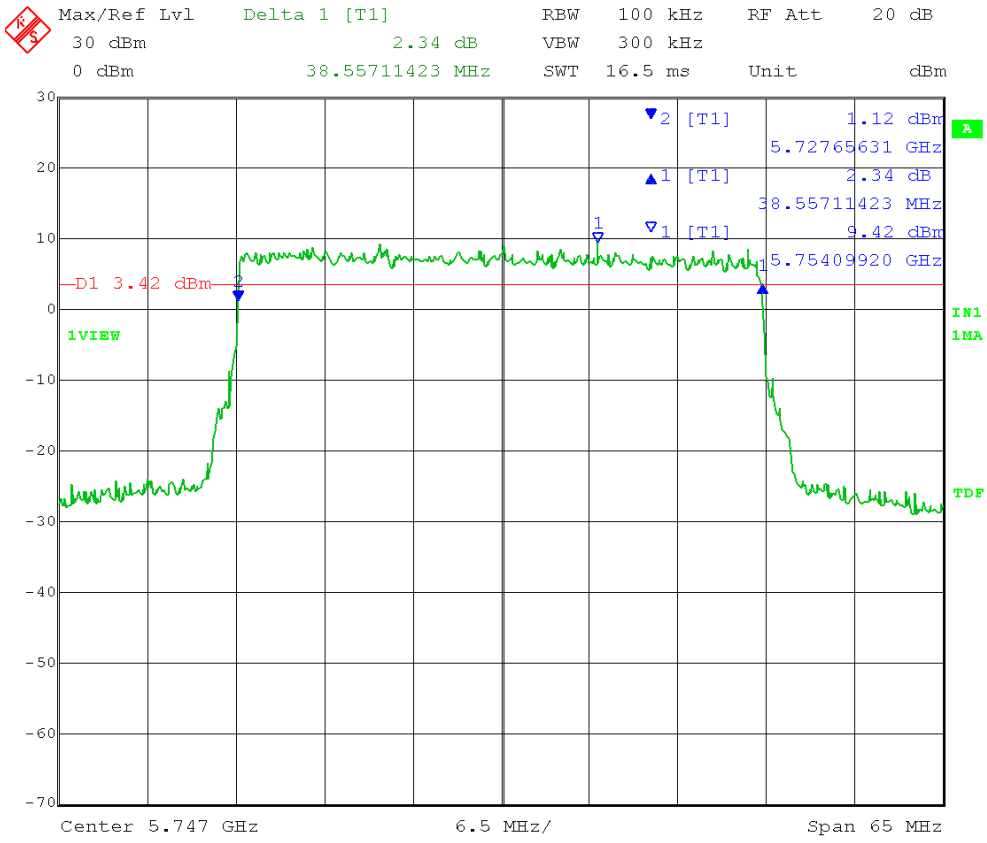


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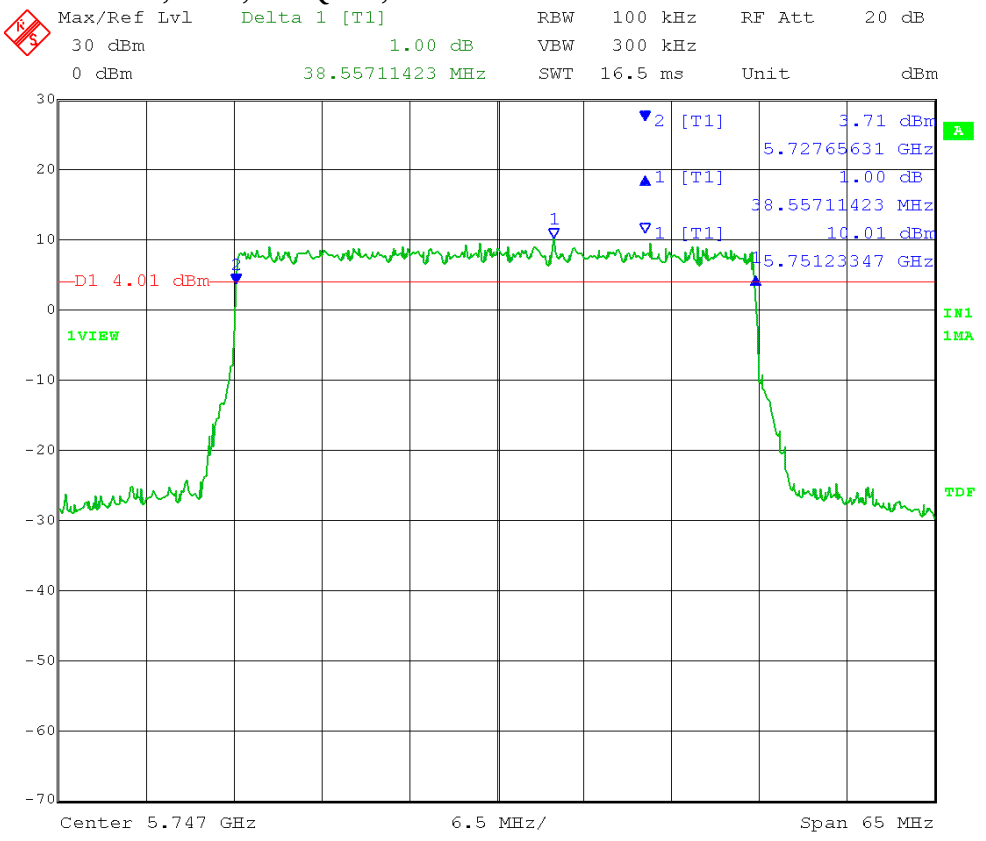


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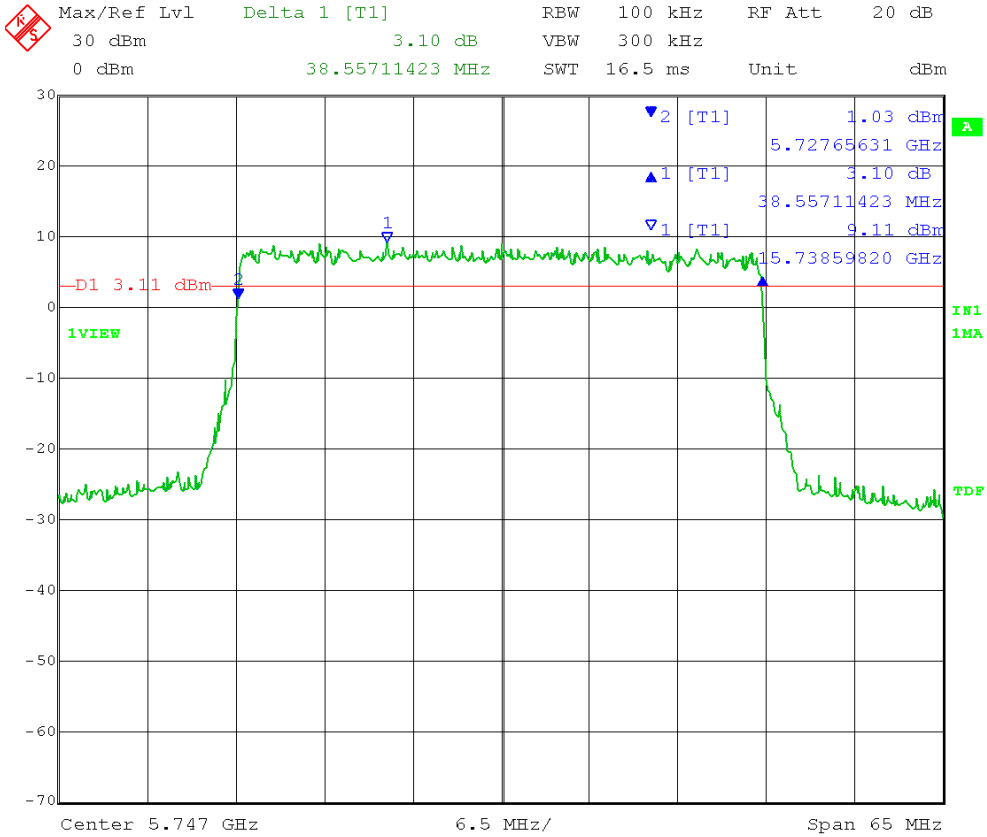


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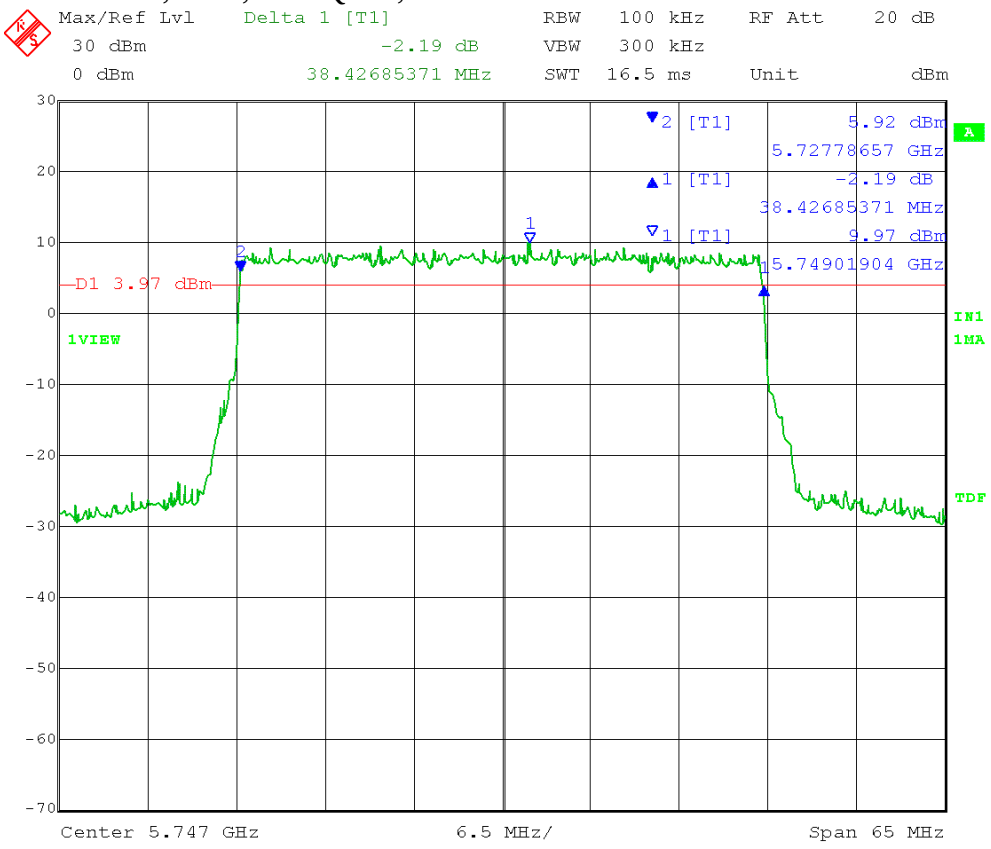


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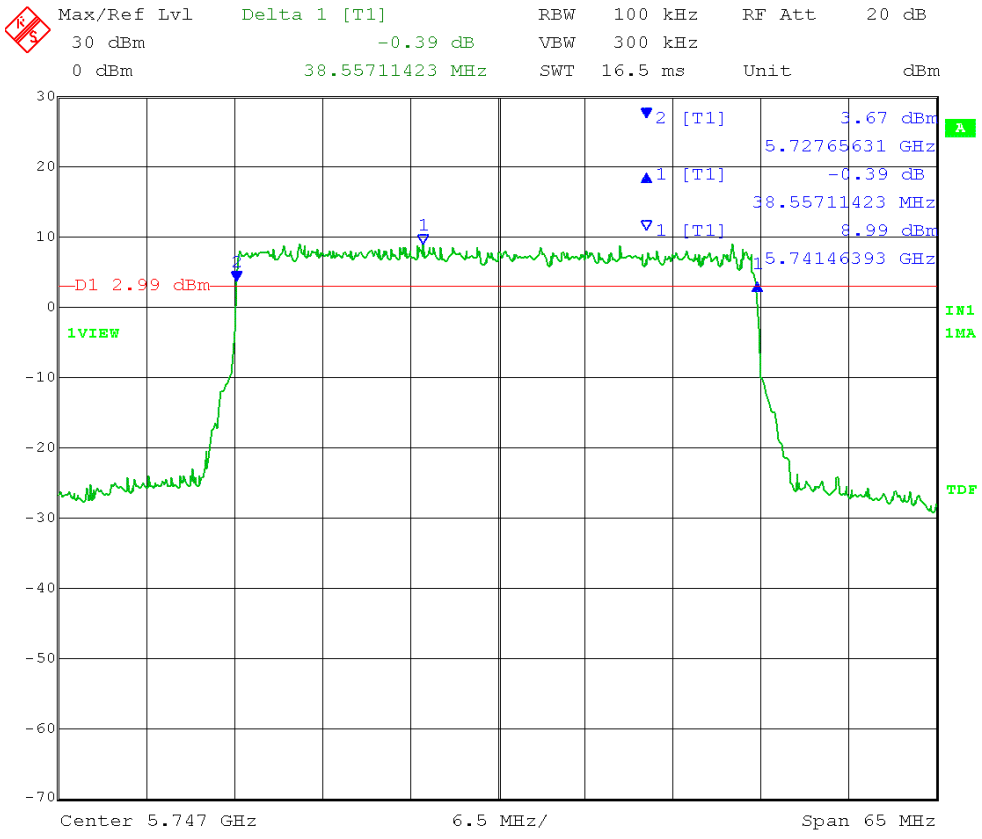


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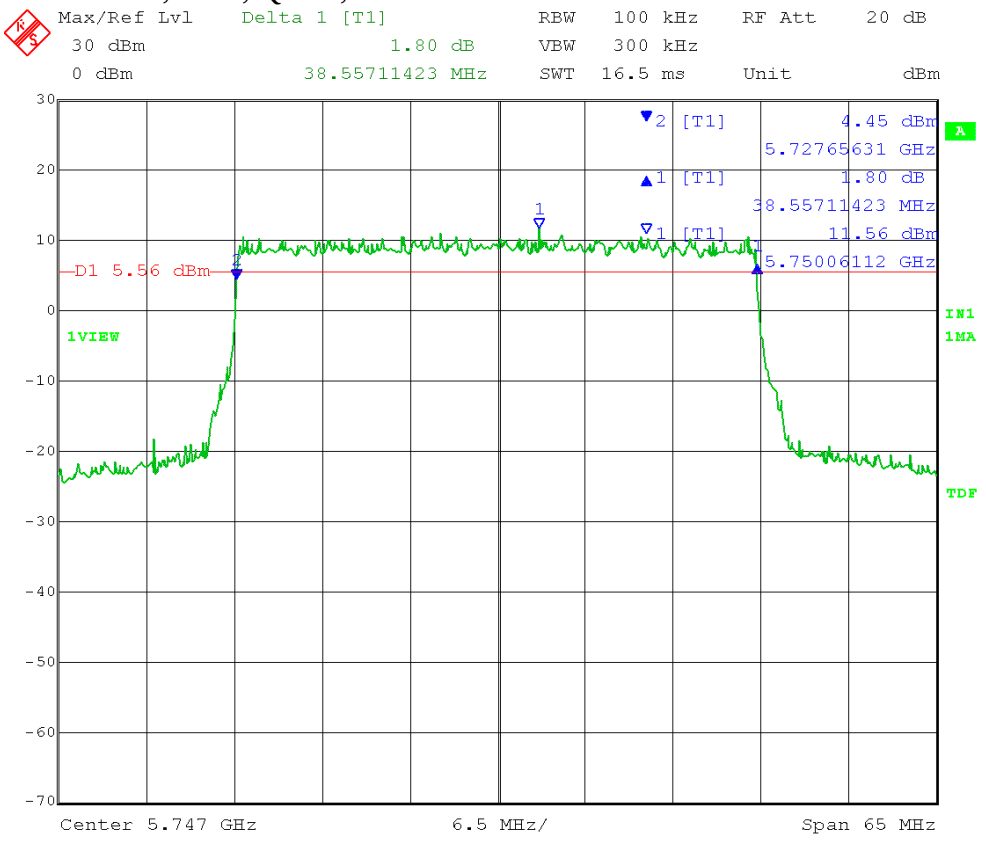


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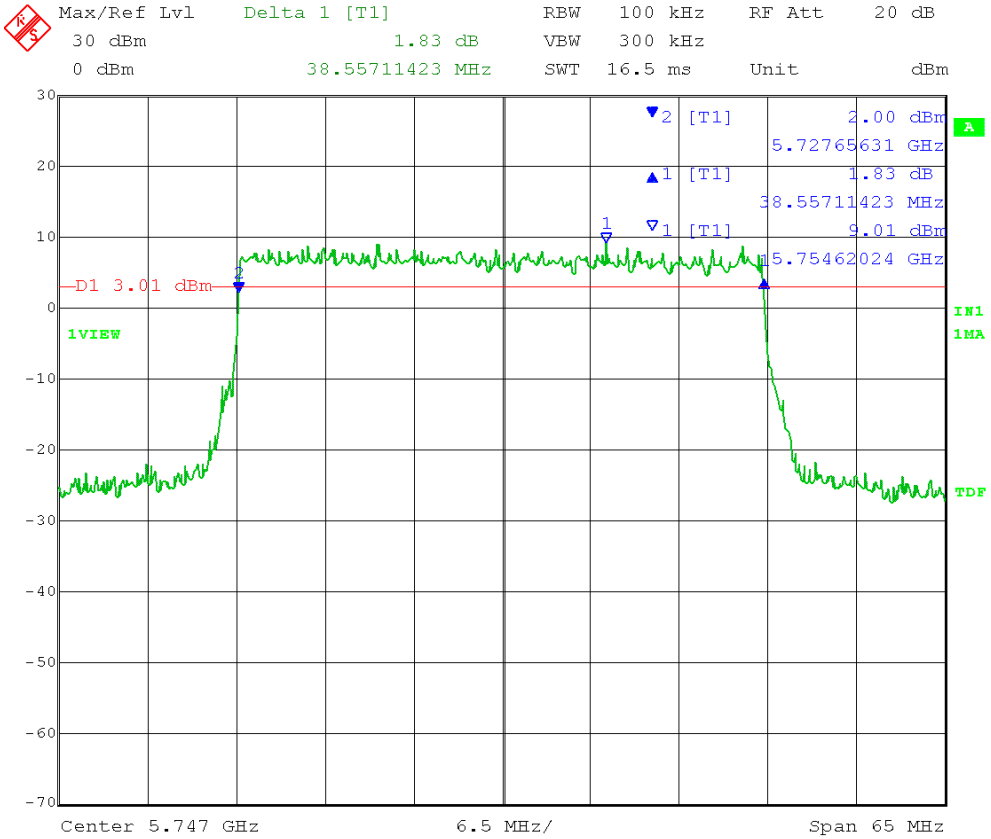


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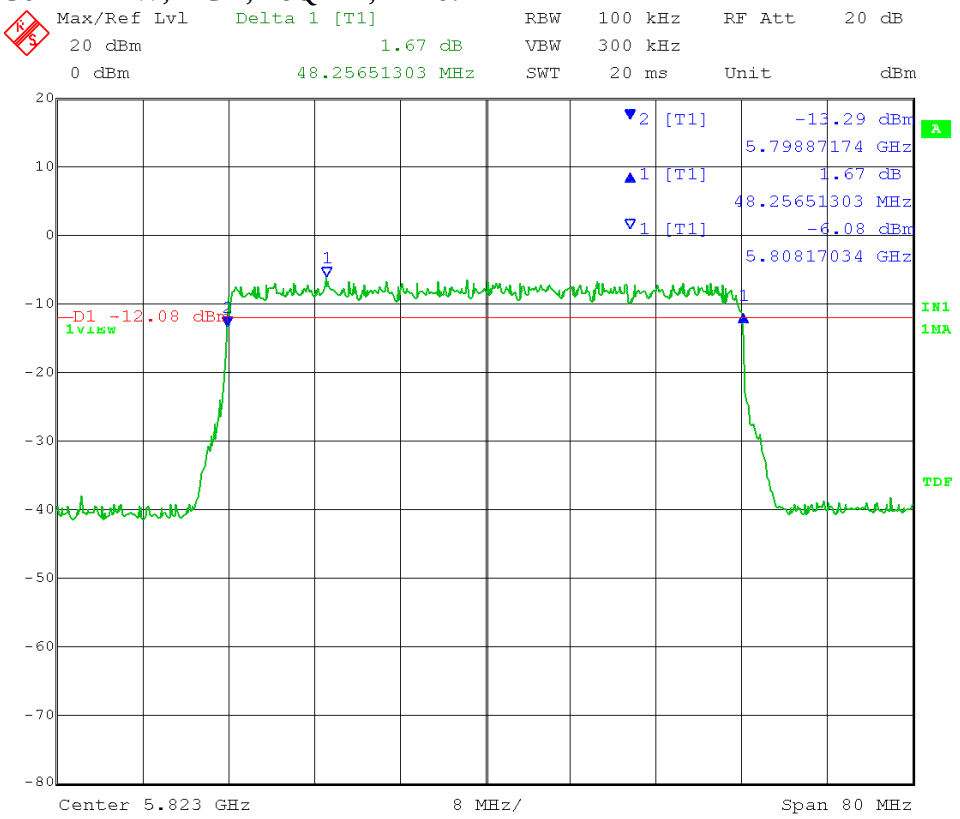


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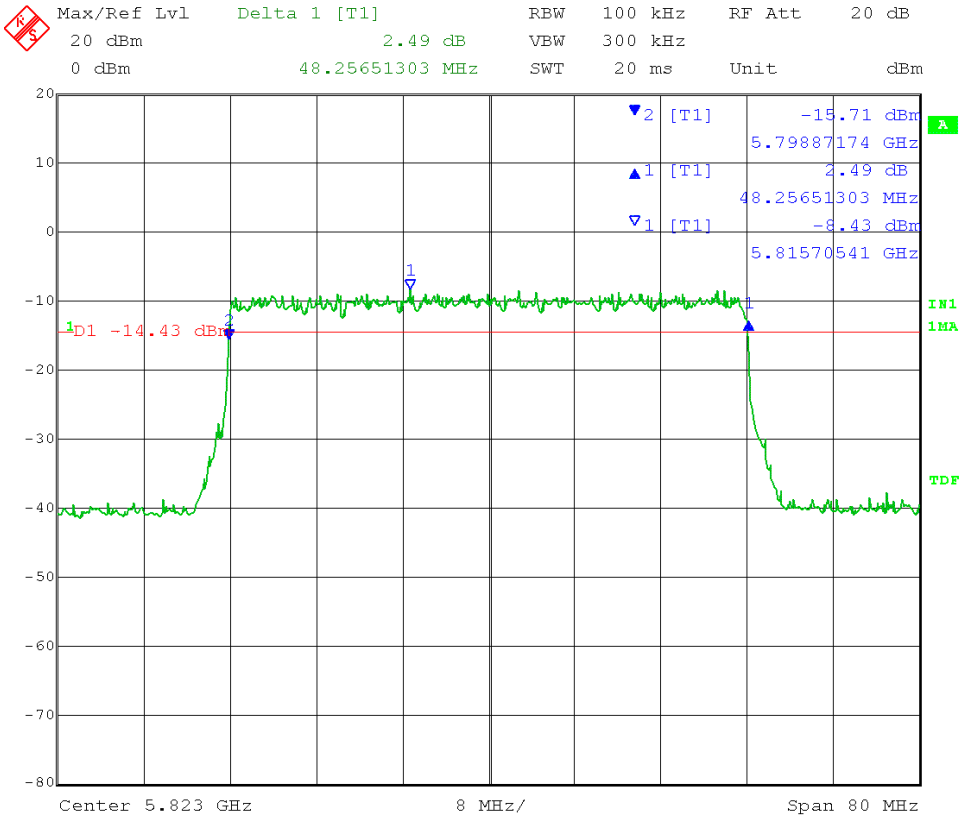


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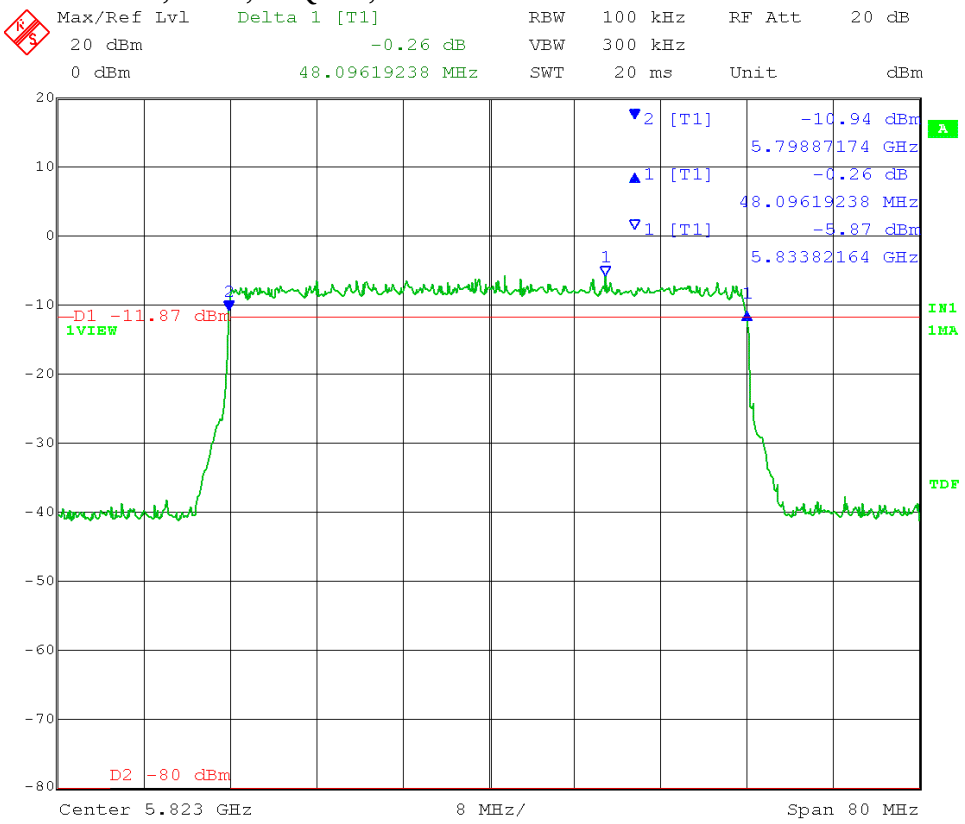


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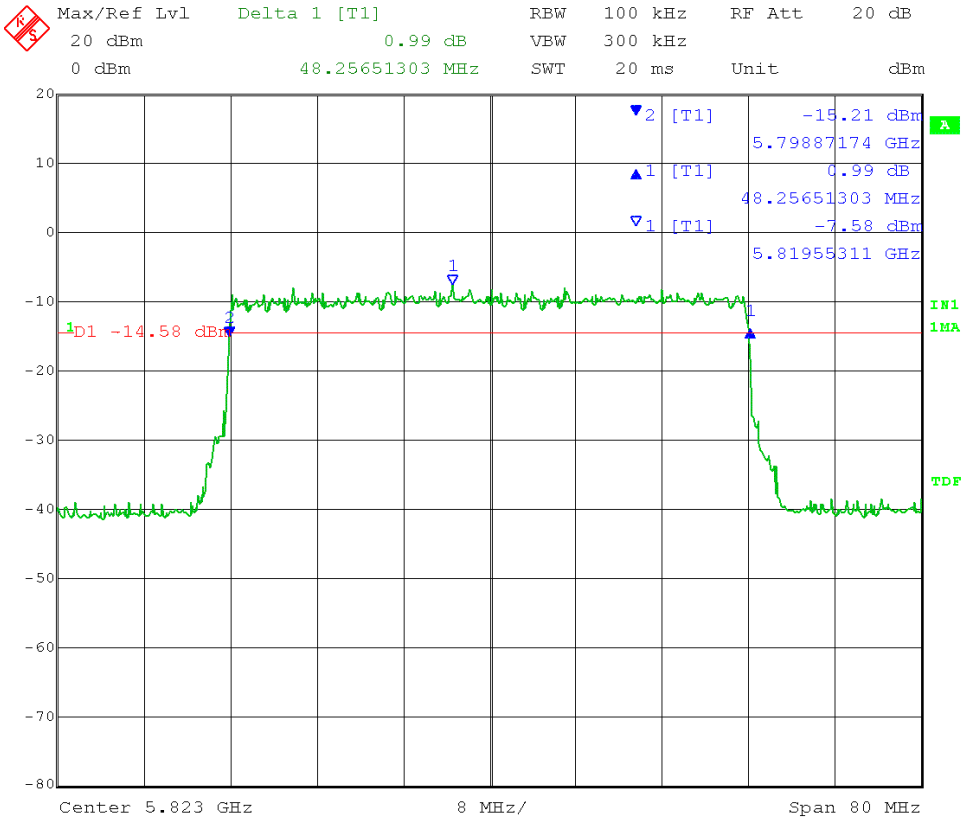


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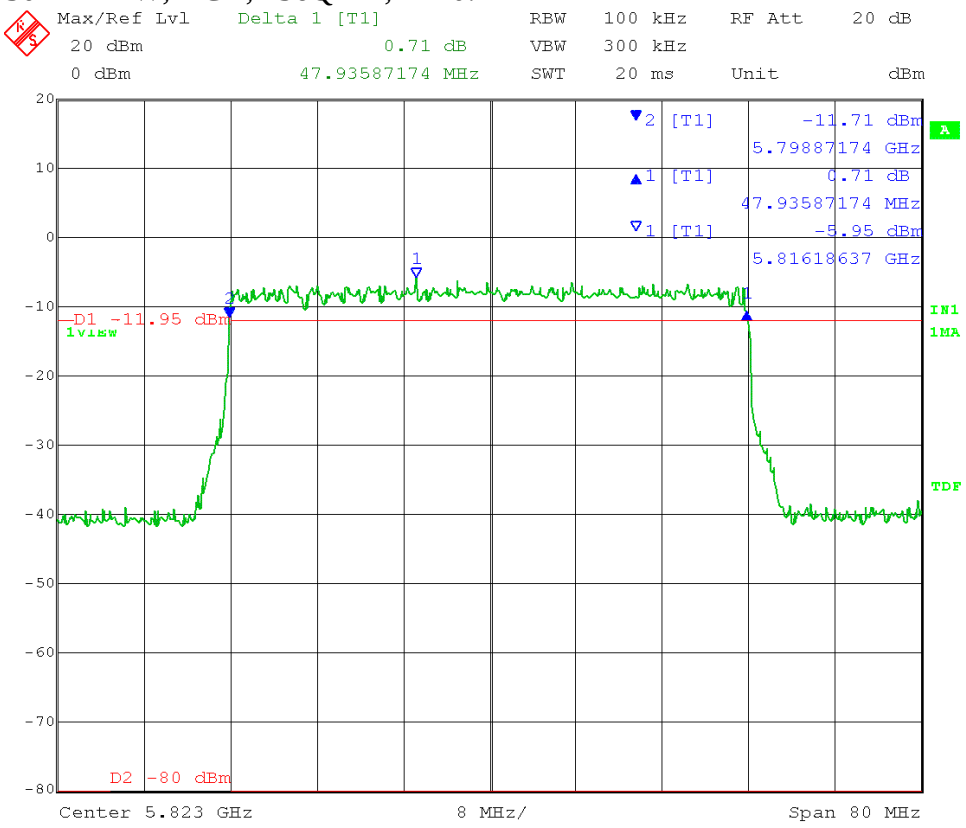


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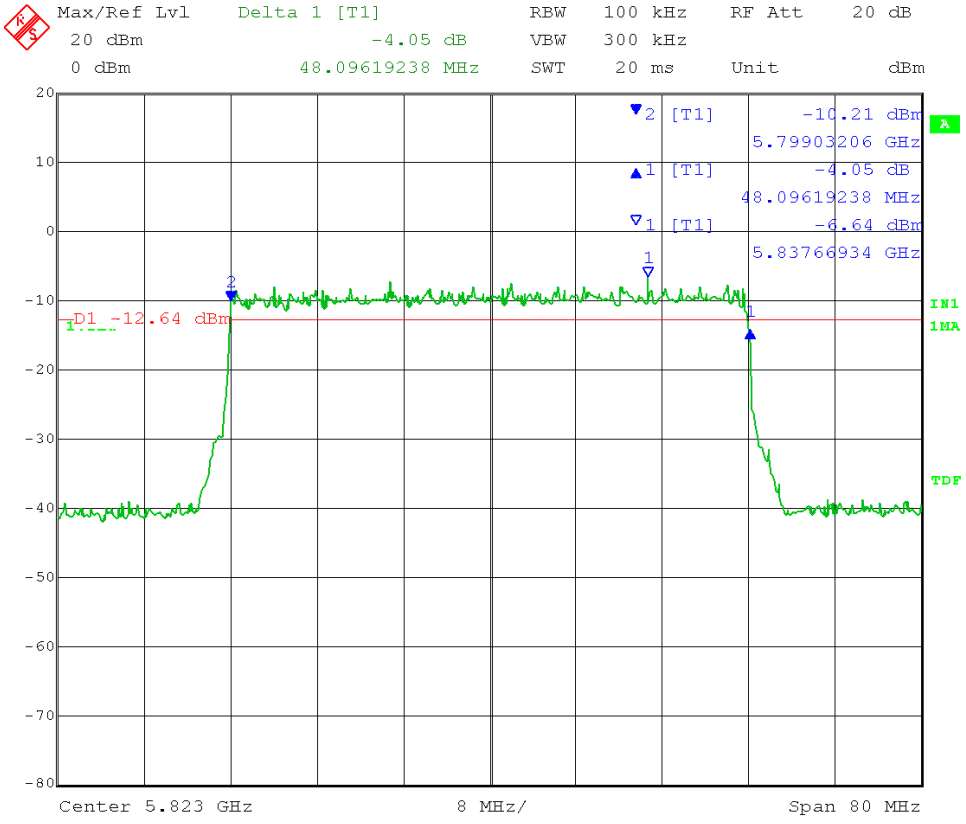
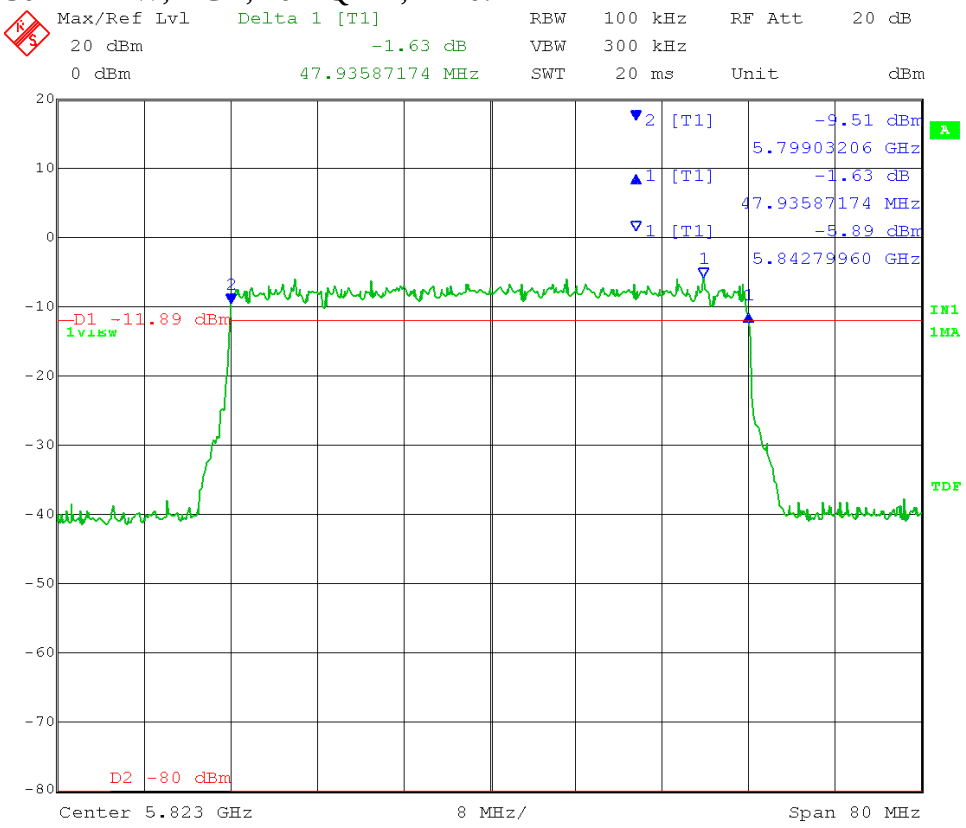


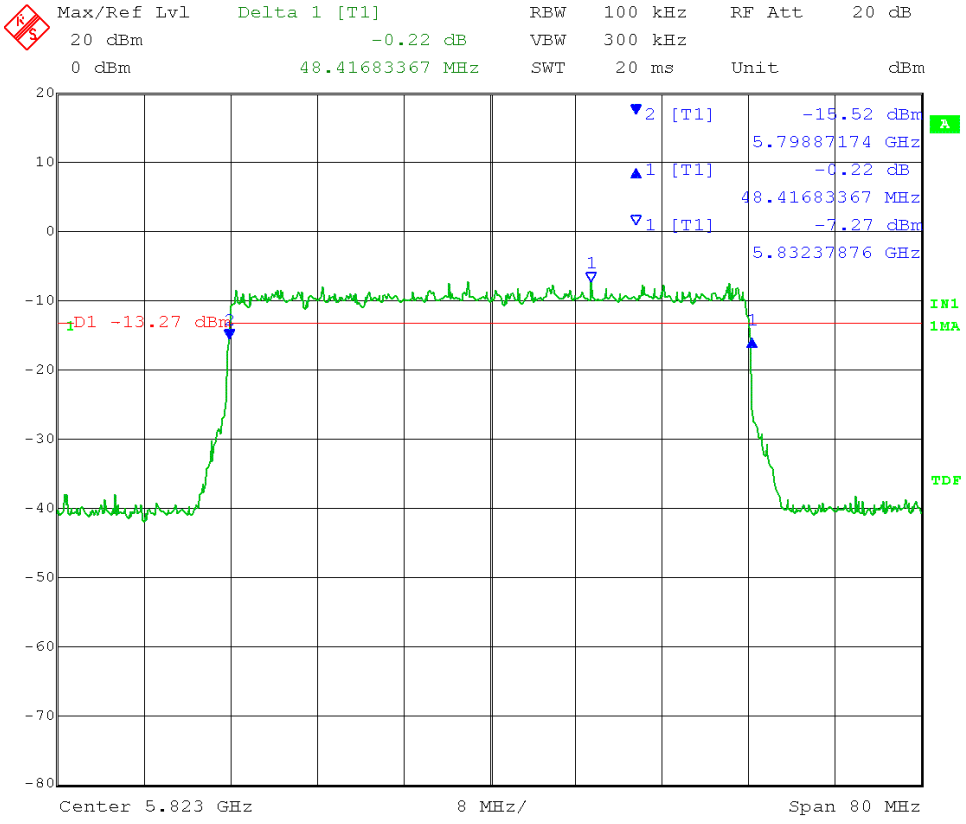

Date: 5.NOV.2013 14:48:53

50MHz BW, HCH, 1024QAM, TX 0:



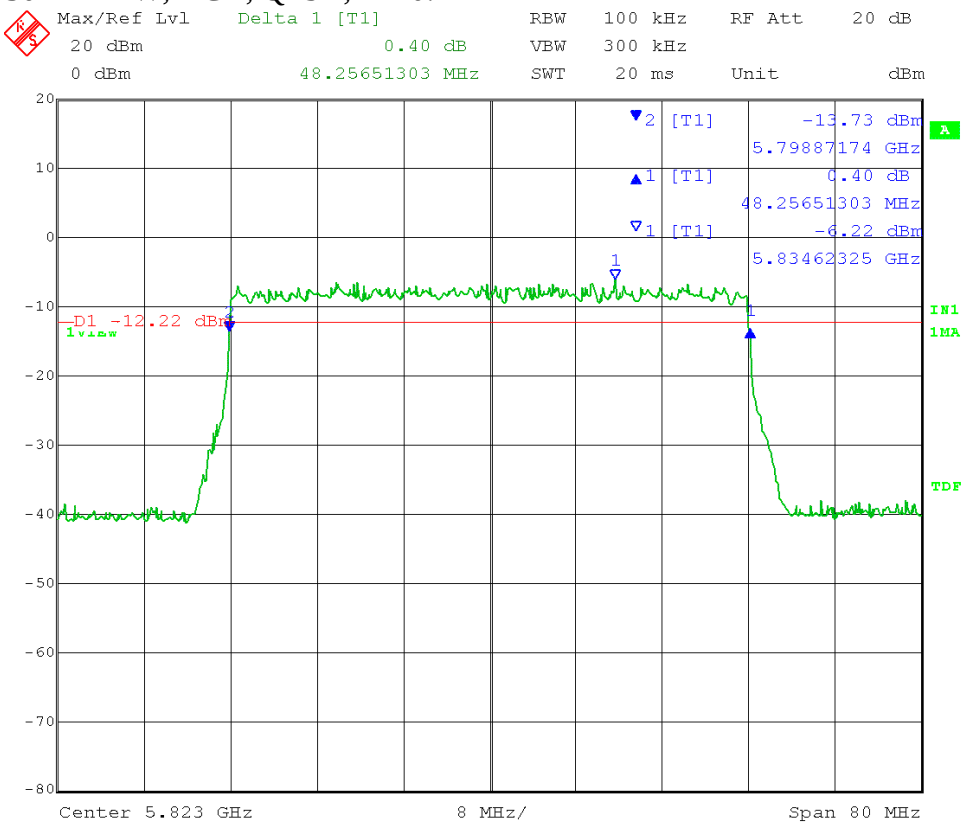

Date: 5.NOV.2013 13:47:48

TX1:




Date: 5.NOV.2013 14:50:26

50MHz BW, HCH, QPSK, TX 0:




Date: 5.NOV.2013 13:41:39

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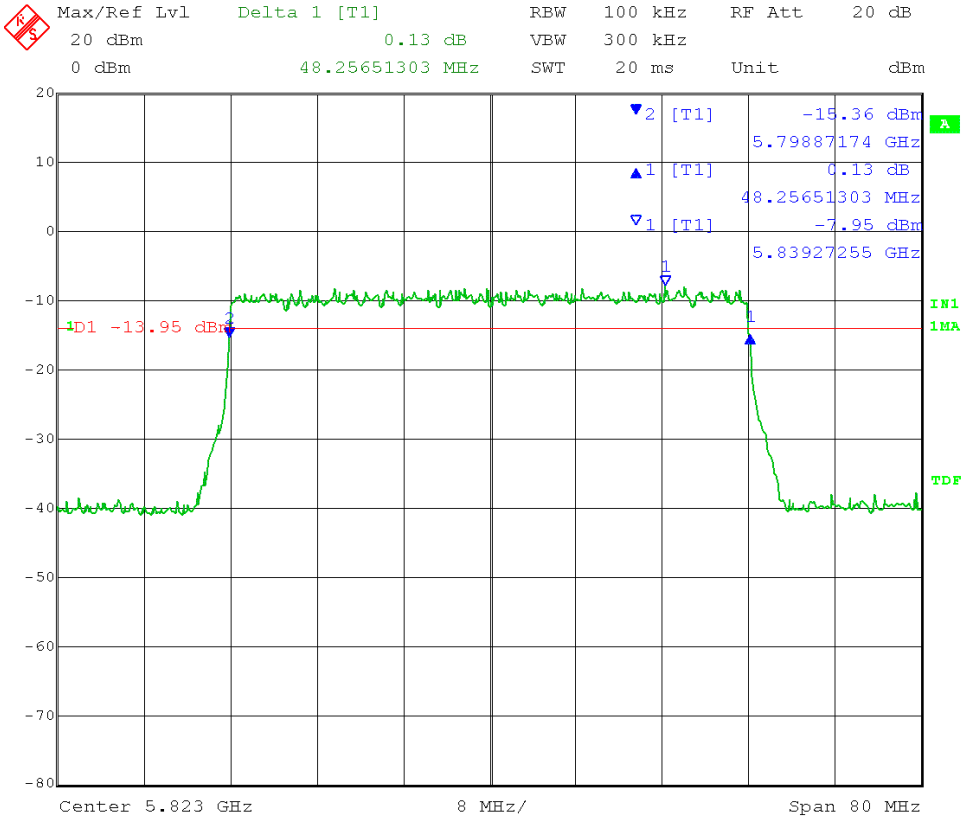
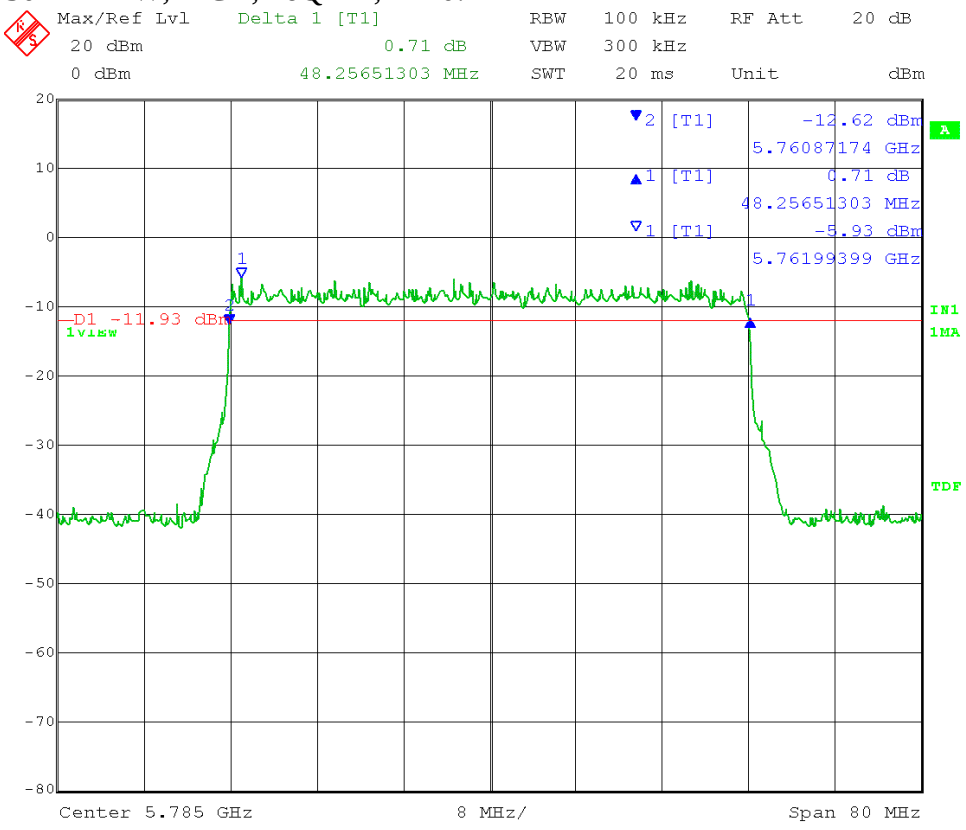


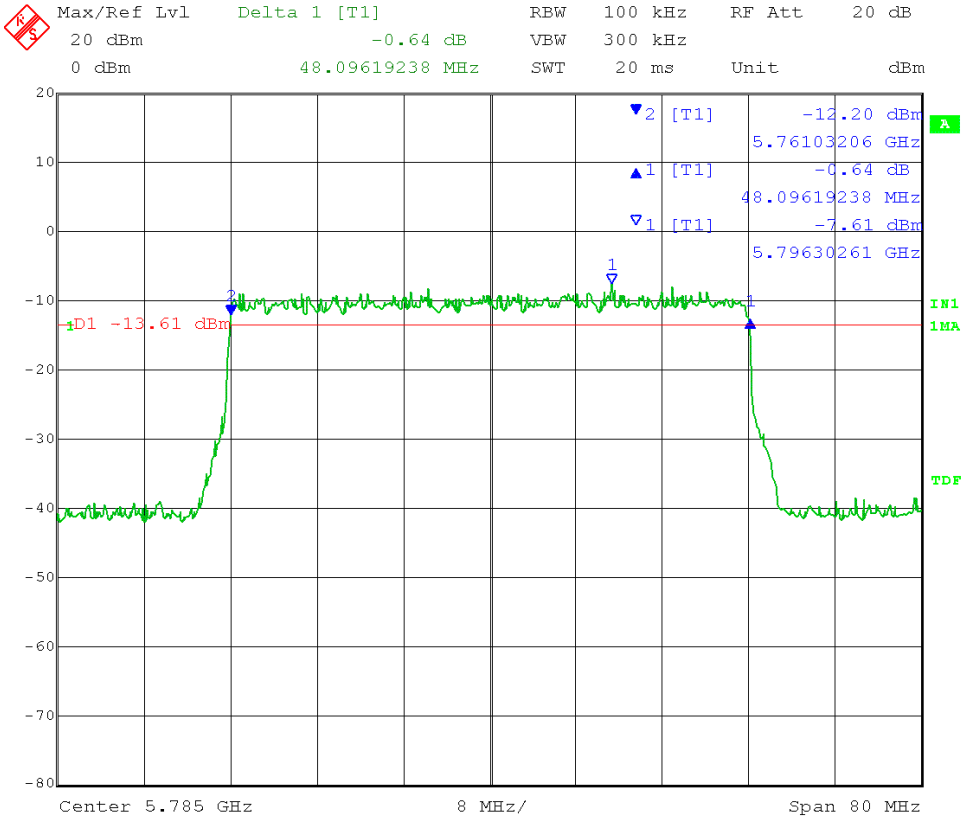

Date: 5.NOV.2013 14:40:14

50MHz BW, MCH, 16QAM, TX 0:



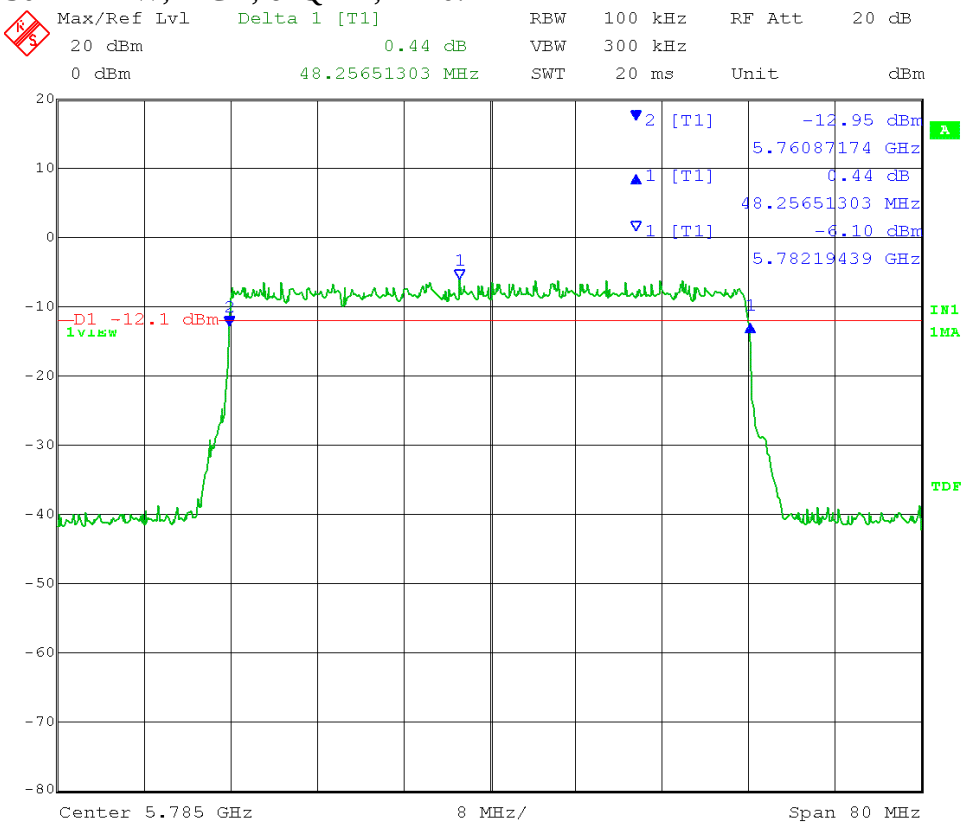

Date: 5.NOV.2013 13:54:10

TX1:



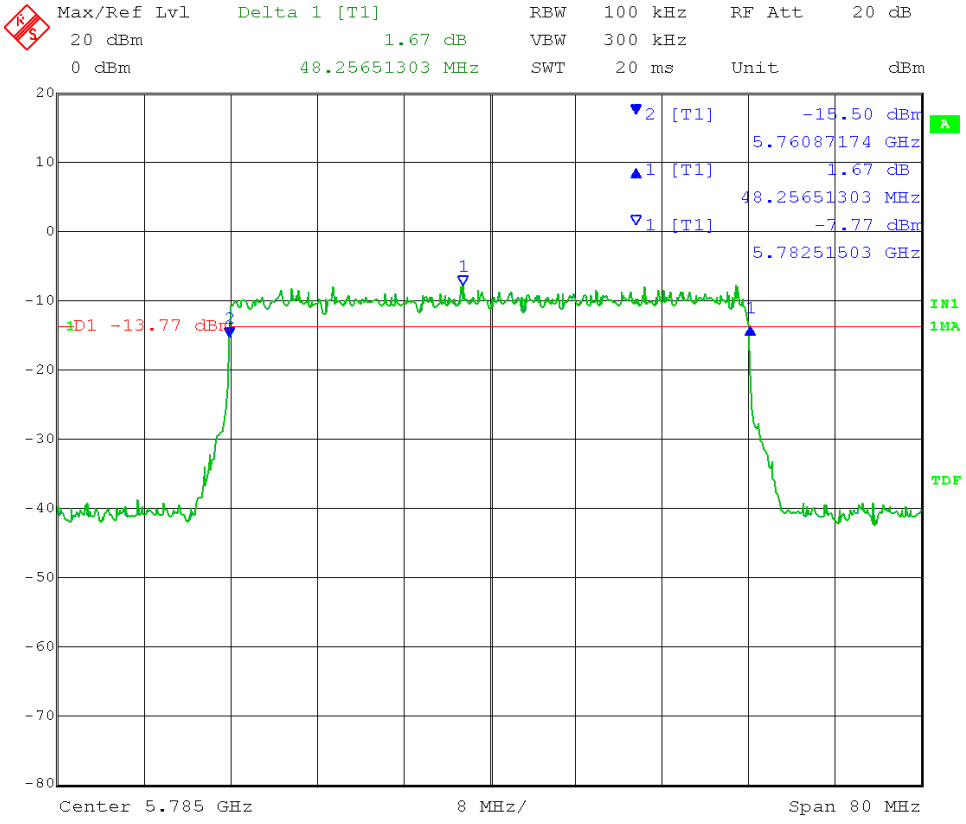

Date: 5.NOV.2013 14:34:45

50MHz BW, MCH, 64QAM, TX 0:



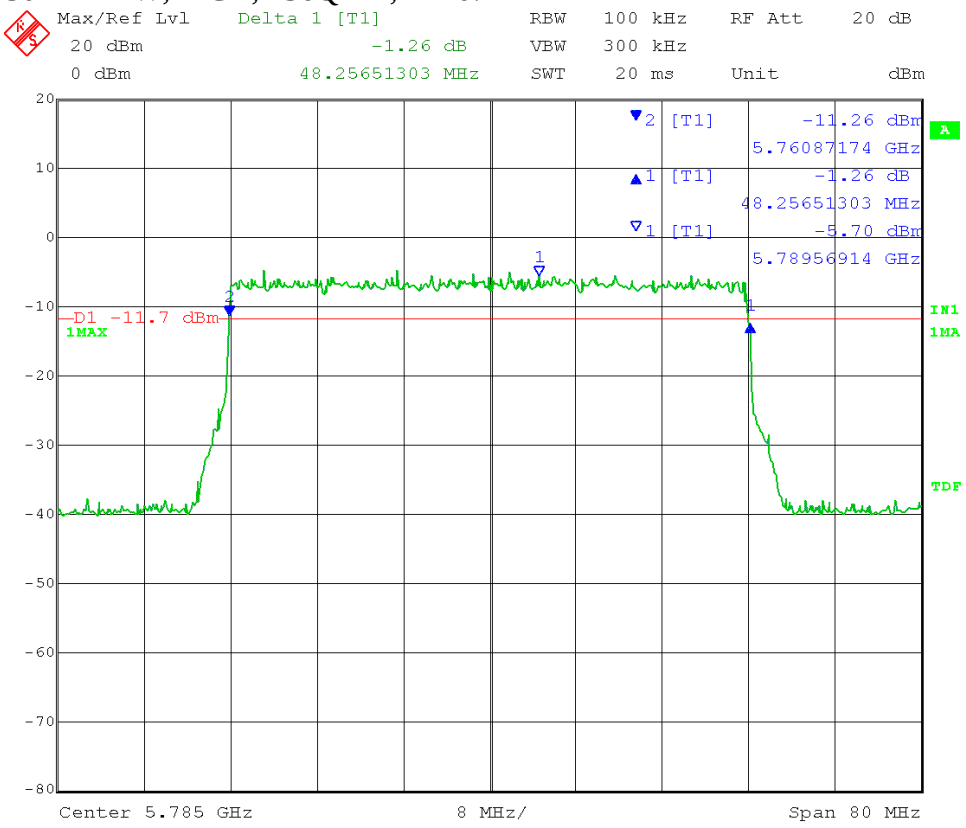

Date: 5.NOV.2013 13:55:43

TX1:



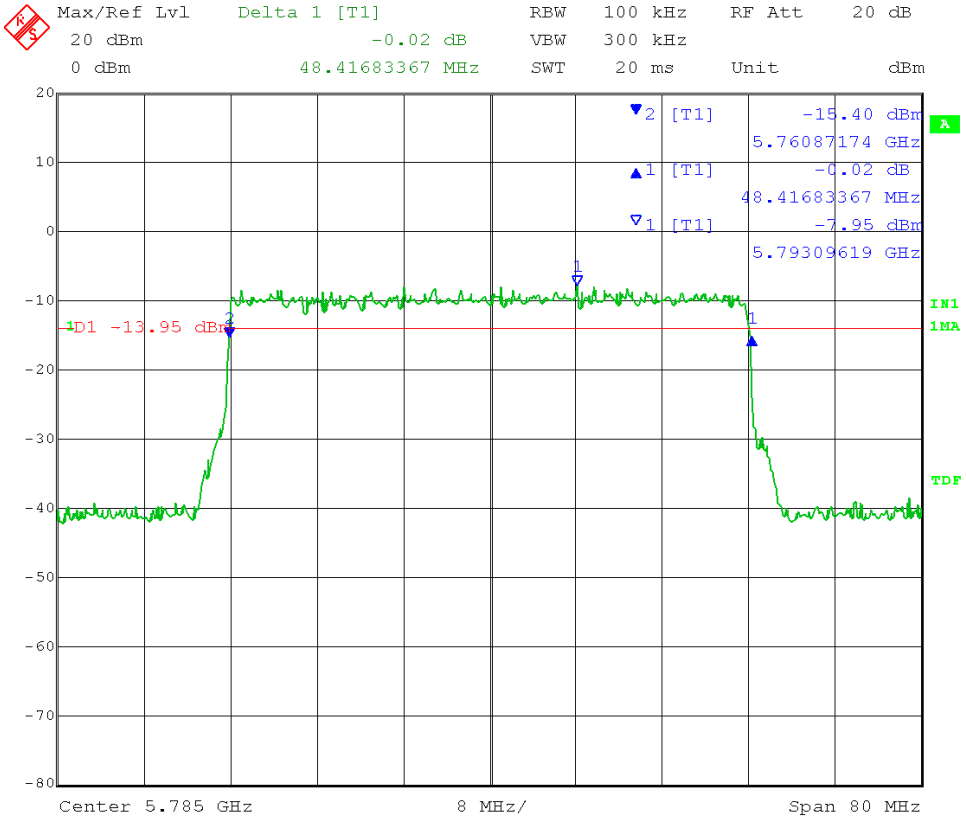

Date: 5.NOV.2013 14:35:34

50MHz BW, MCH, 256QAM, TX 0:



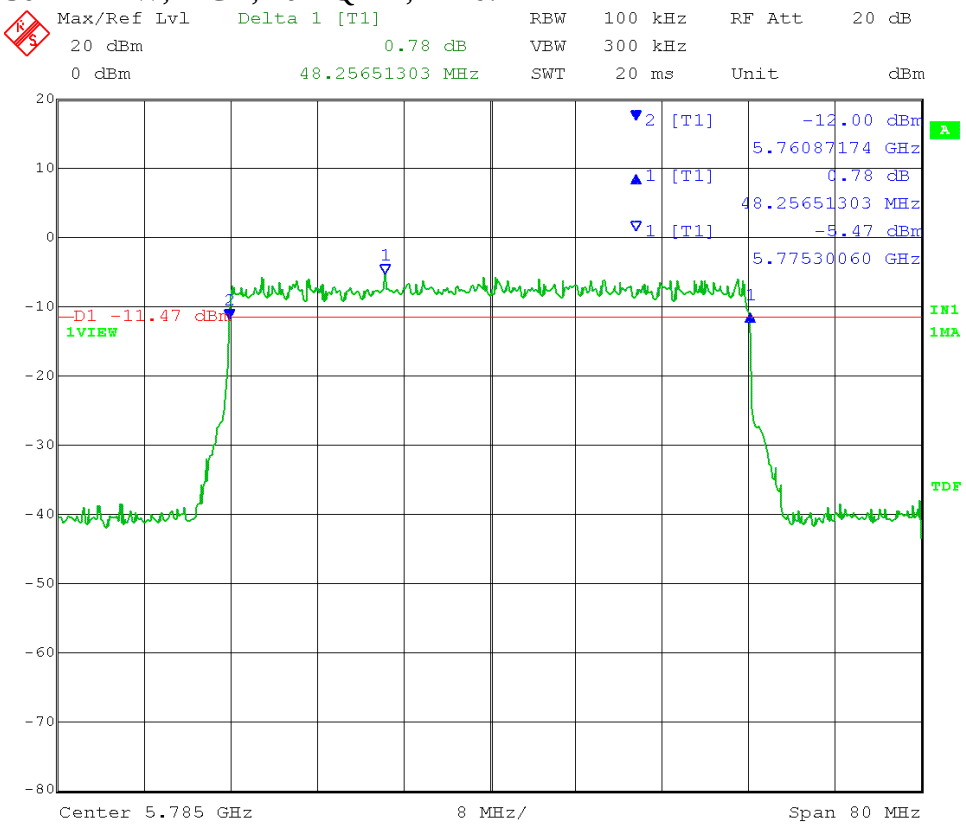

Date: 5.NOV.2013 13:57:12

TX1:



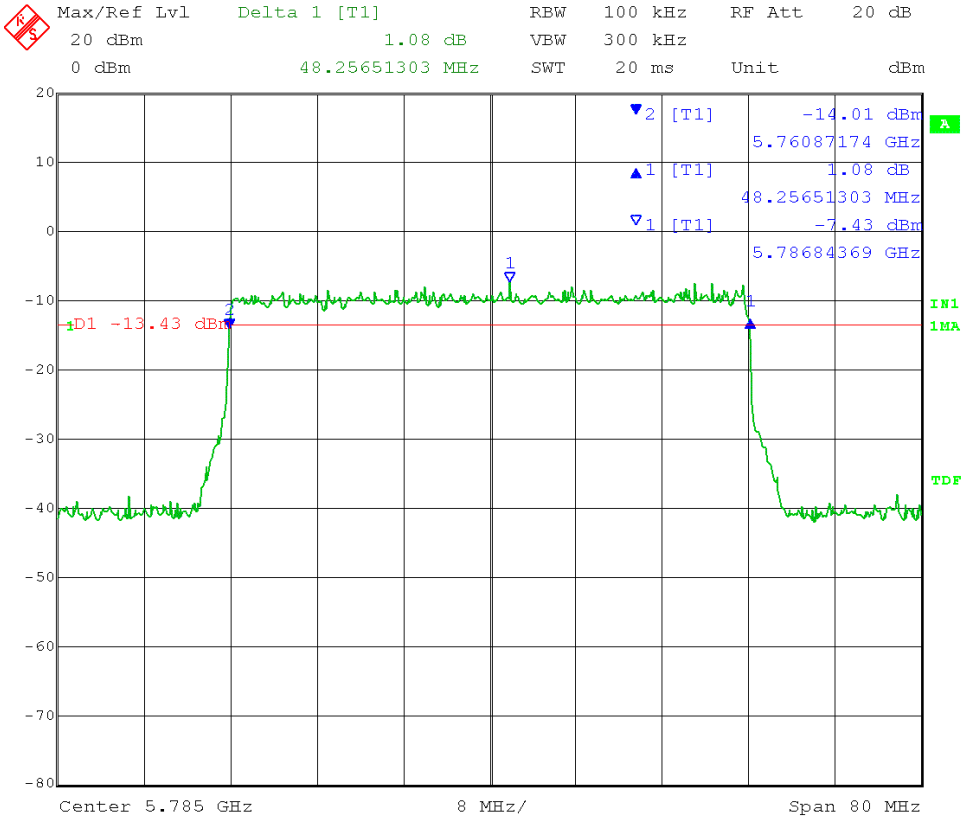

Date: 5.NOV.2013 14:36:34

50MHz BW, MCH, 1024QAM, TX 0:



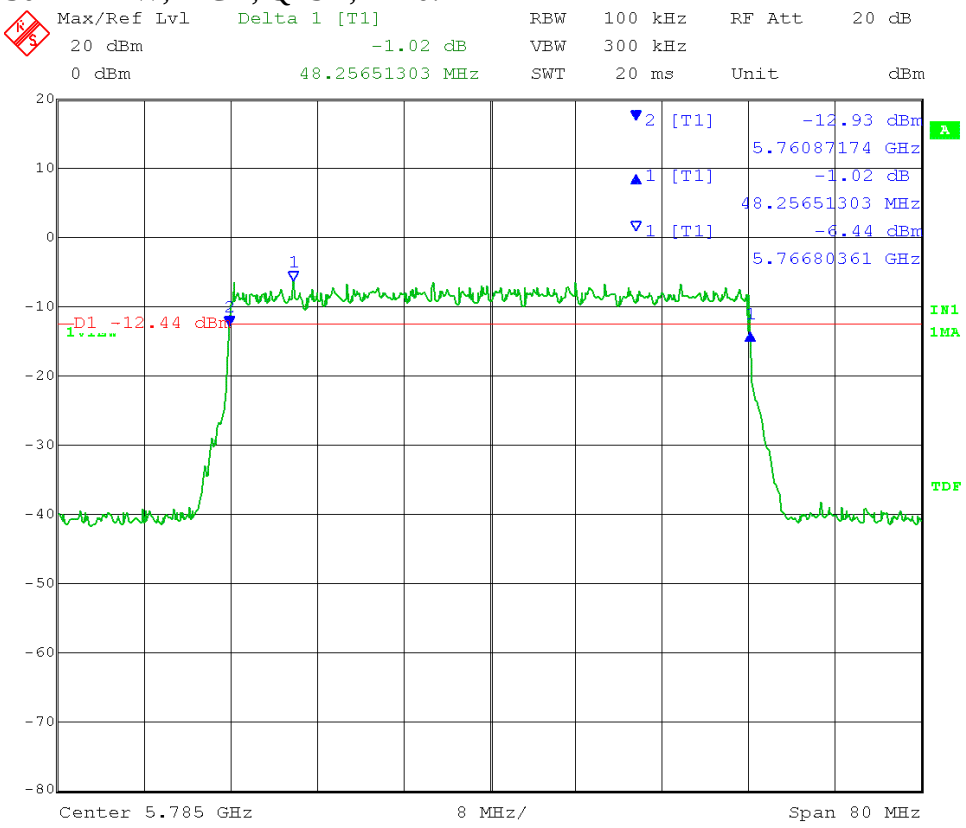

Date: 5.NOV.2013 13:58:04

TX1:



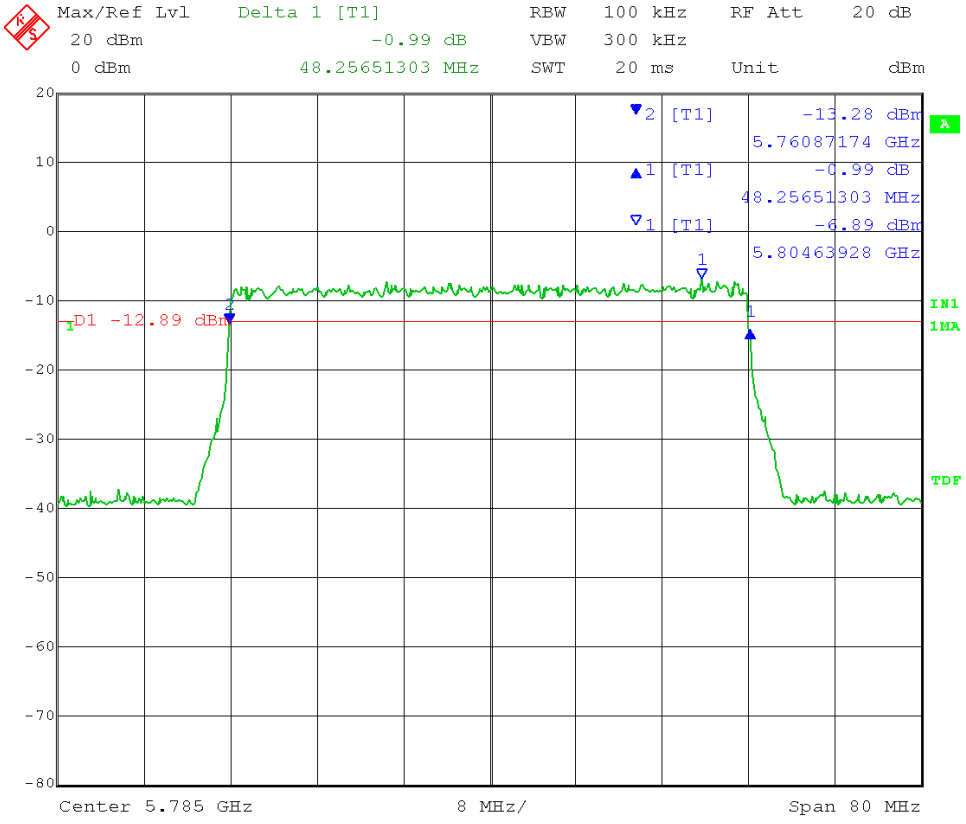

Date: 5.NOV.2013 14:37:38

50MHz BW, MCH, QPSK, TX 0:



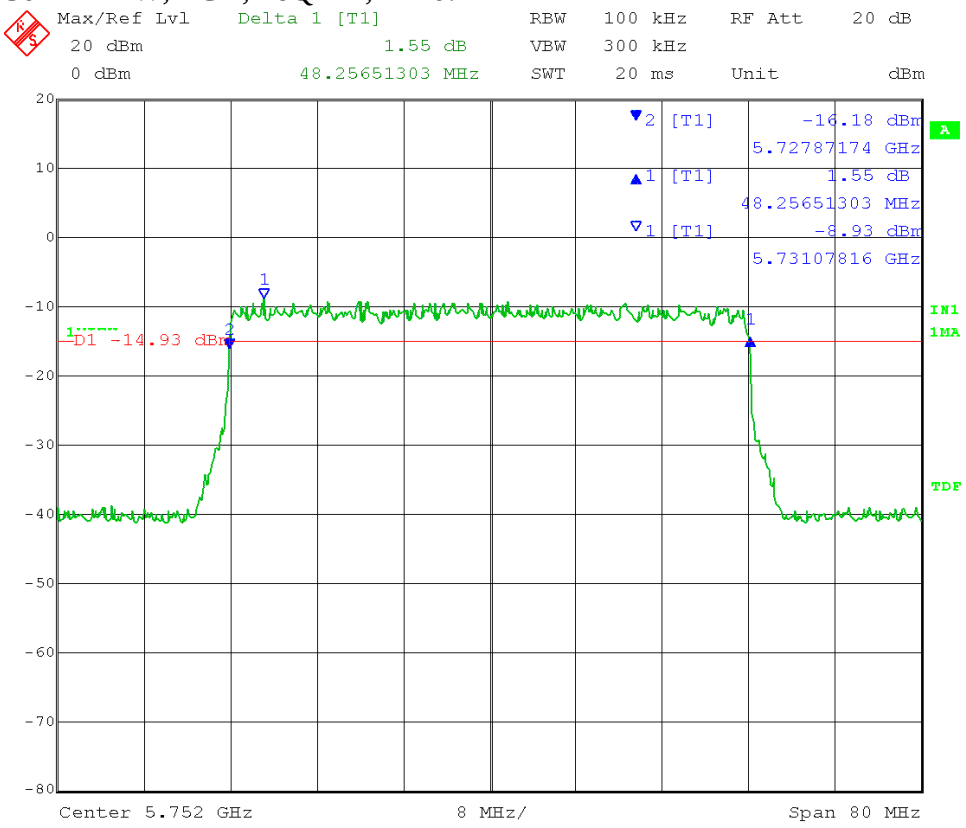

Date: 5.NOV.2013 13:52:51

TX1:



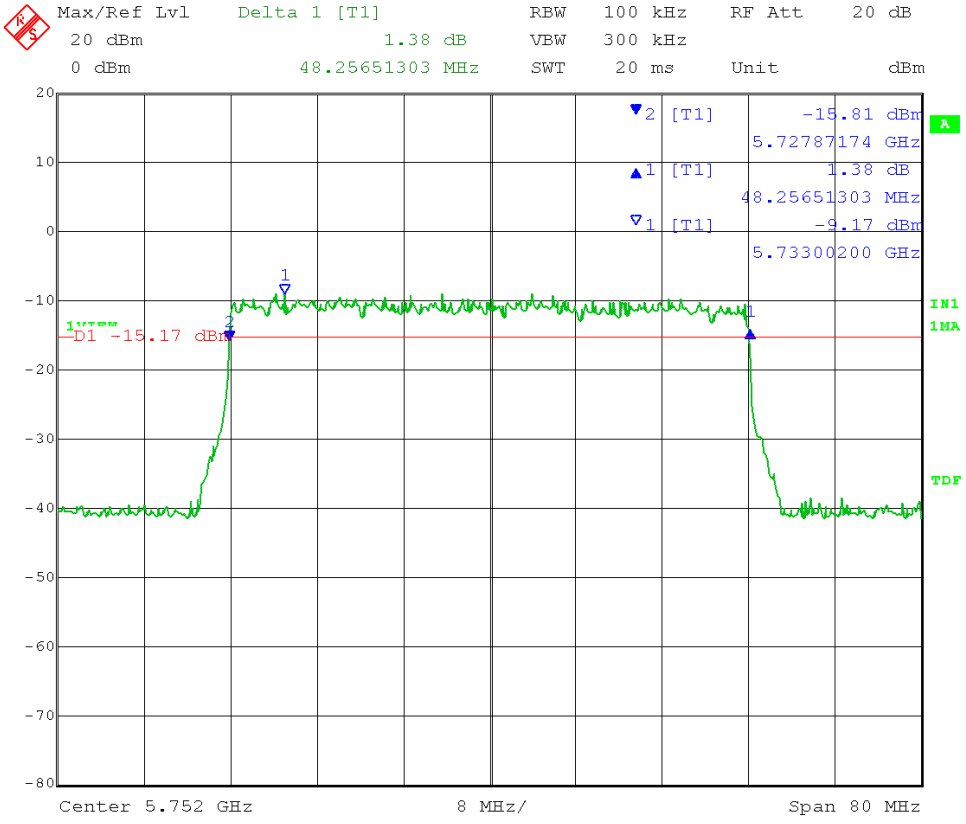

Date: 5.NOV.2013 14:33:37

50MHz BW, LCH, 16QAM, TX 0:



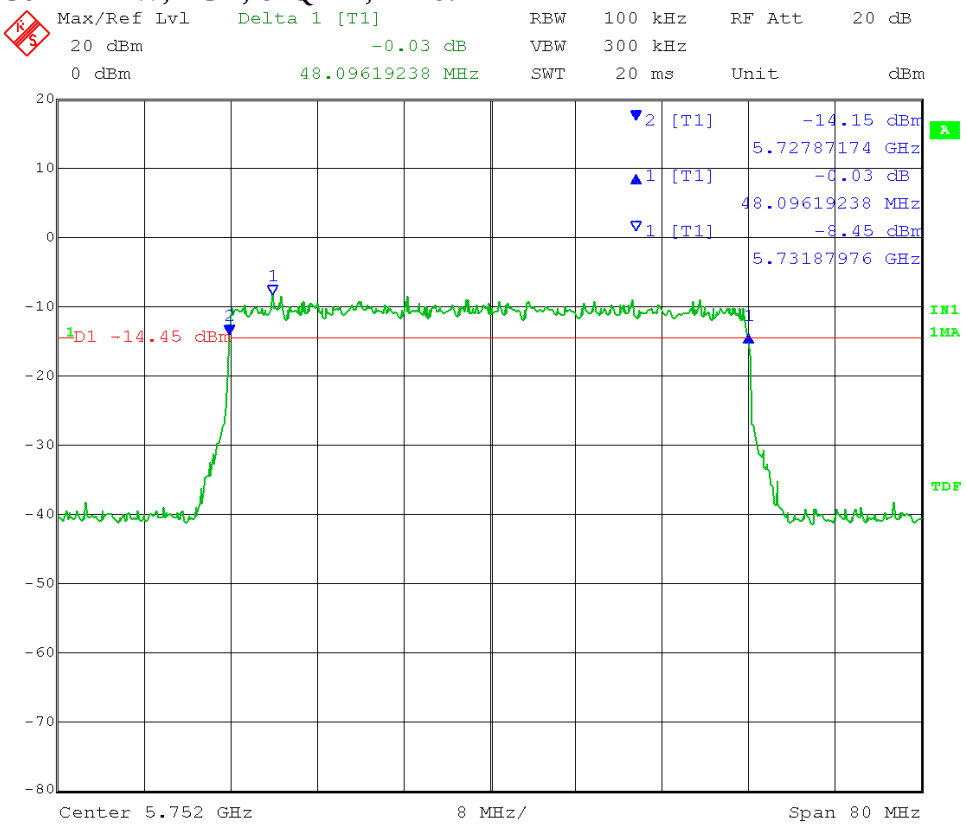

Date: 5.NOV.2013 14:04:56

TX1:



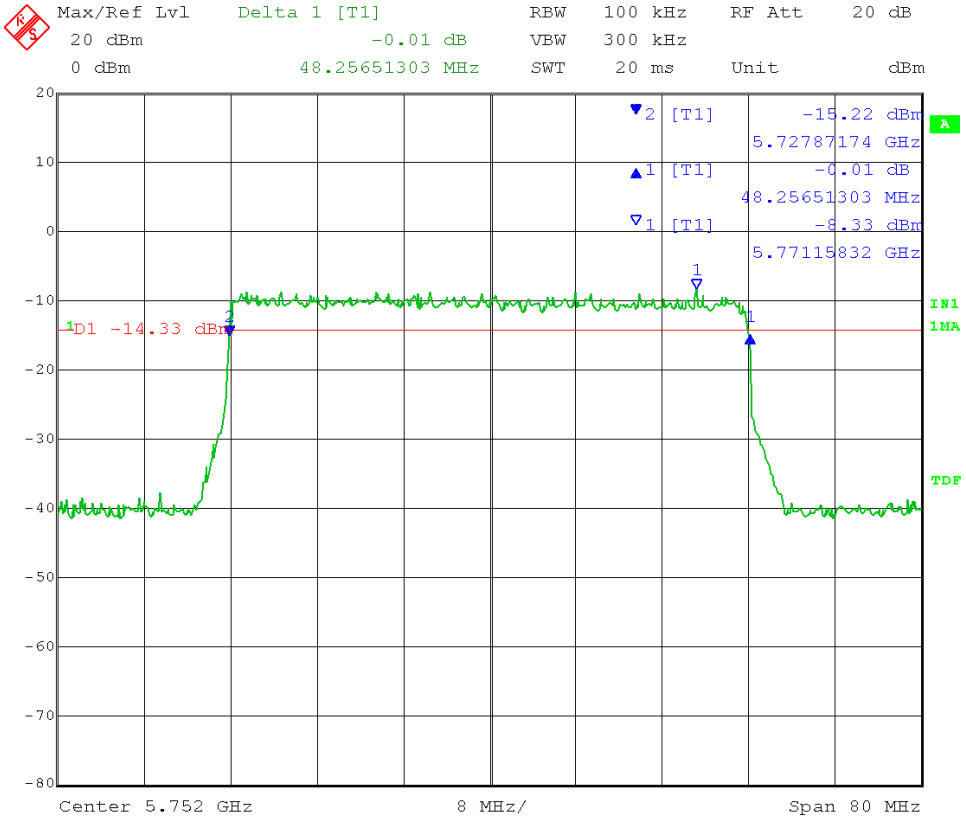

Date: 5.NOV.2013 14:24:39

50MHz BW, LCH, 64QAM, TX 0:



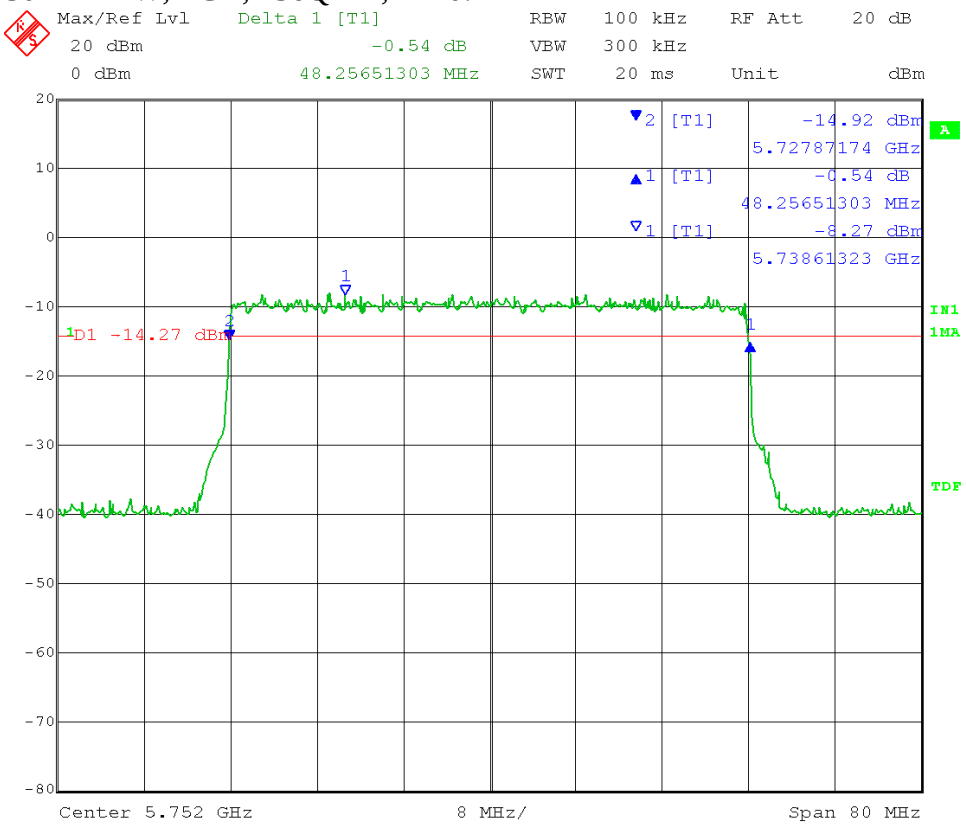

Date: 5.NOV.2013 14:06:27

TX1:



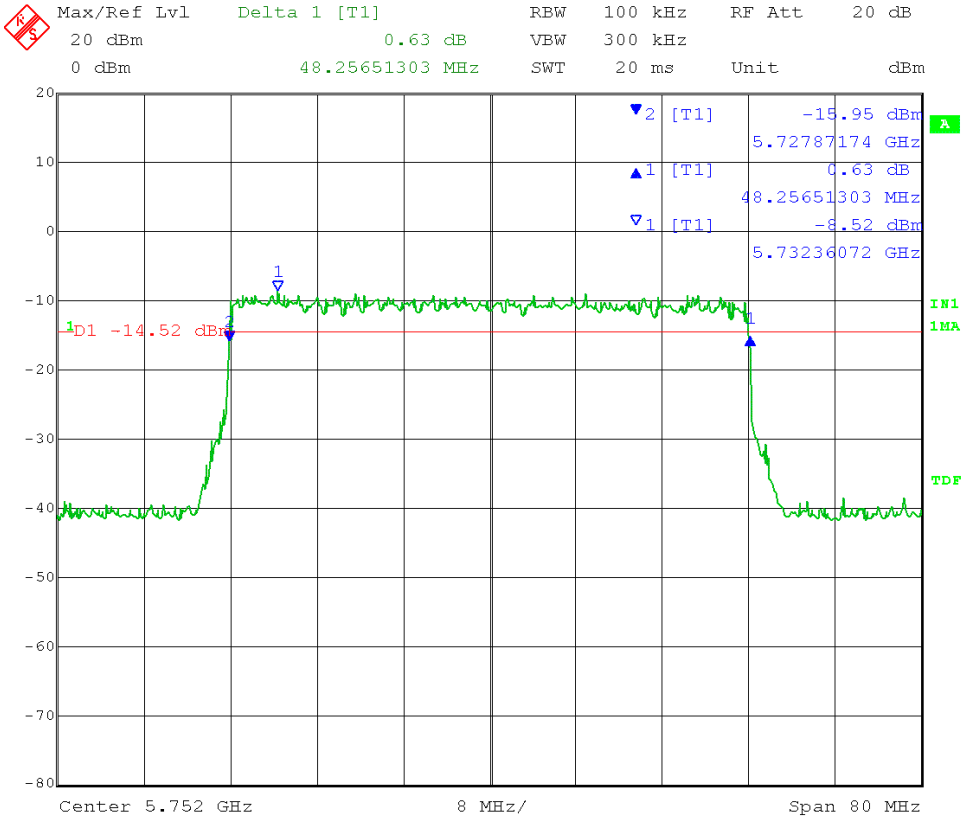

Date: 5.NOV.2013 14:25:45

50MHz BW, LCH, 256QAM, TX 0:



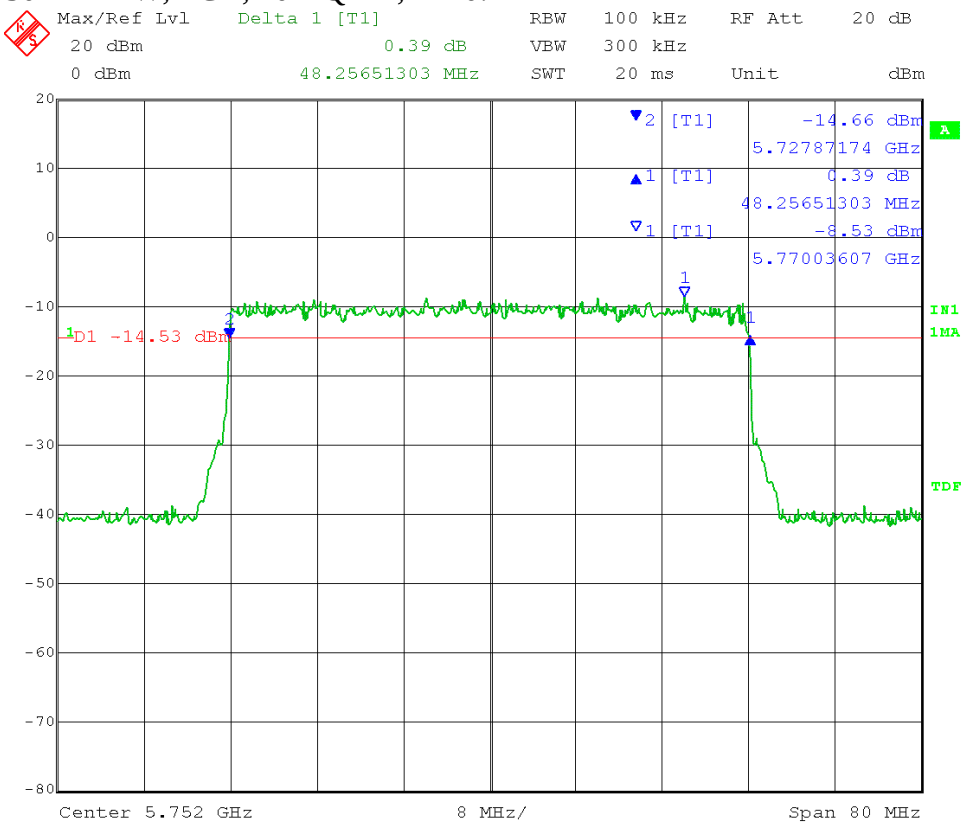

Date: 5.NOV.2013 14:08:10

TX1:



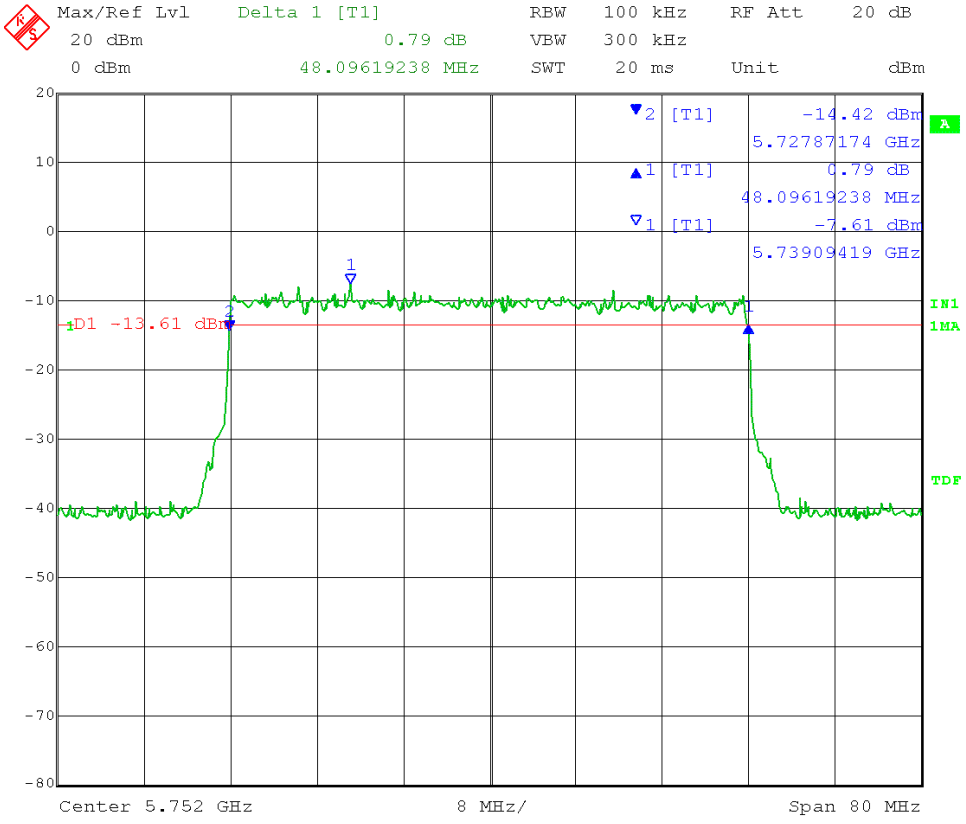

Date: 5.NOV.2013 14:26:40

50MHz BW, LCH, 1024QAM, TX 0:



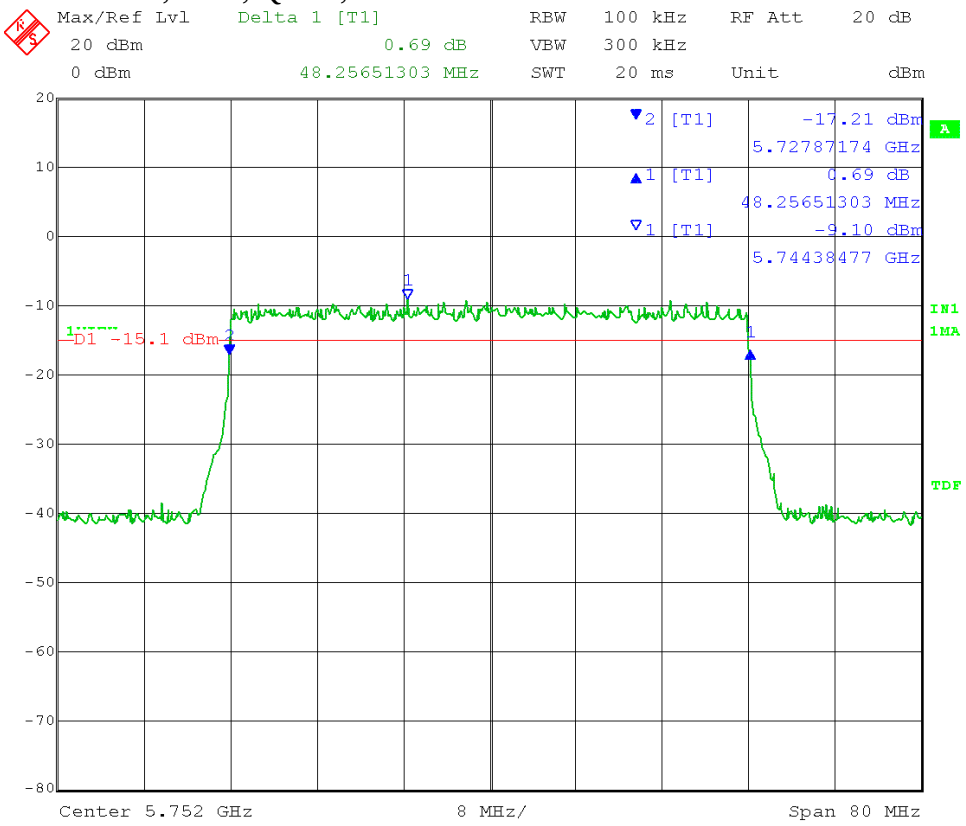

Date: 5.NOV.2013 14:09:55

TX1:



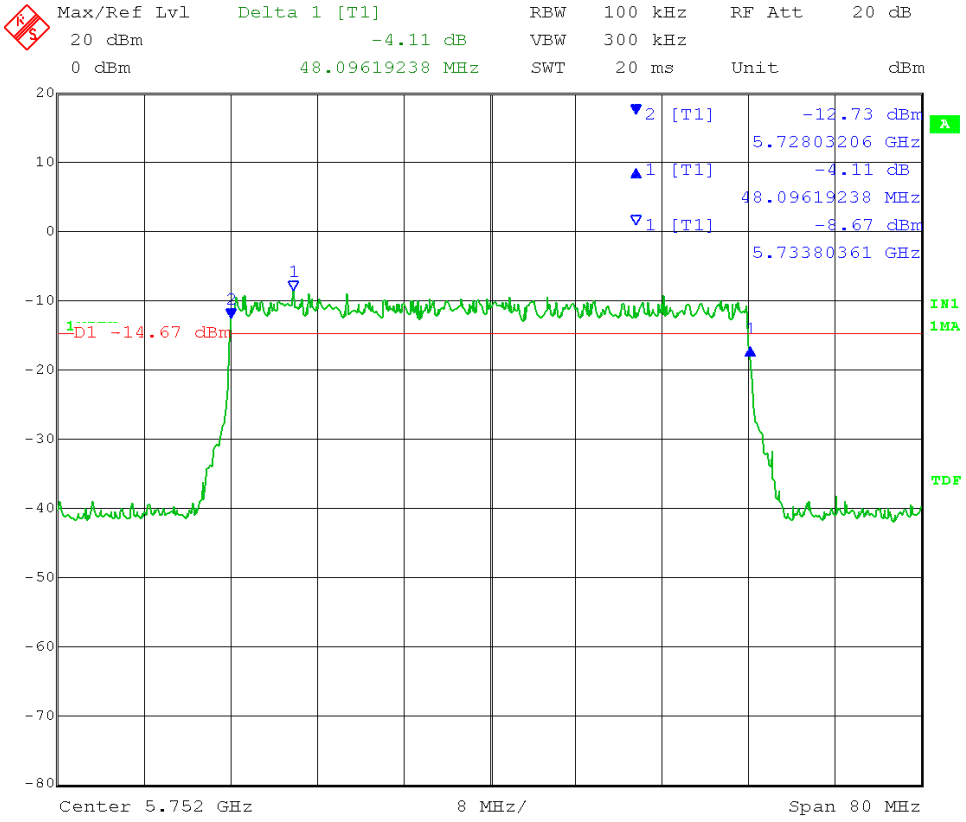

Date: 5.NOV.2013 14:27:44

50MHz BW, LCH, QPSK, TX 0:




Date: 5.NOV.2013 14:01:30

TX1:




Date: 5.NOV.2013 14:22:50

**Appendix – Measurement Data**

## 2.0 Fundamental Emission Output Power - Conducted

**Rule Section**: Section 15.247(b)(3)

**Test Procedure**: FCC KDB 558074 D01 DTS Meas Guidance v03r01 – *Guidance for Performing Compliance Measurements on Digital Transmission Systems (DTS) Operating Under §15.247*

Section 9.2.3.1 – AVGPM (Measurement using an RF average power meter with a thermocouple detector)

**Description**: As an alternative to spectrum analyzer or EMI receiver measurements, measurements may be performed using a wideband RF power meter with a thermocouple detector or equivalent.

Measurements were taken for QPSK, 16QAM, 64QAM, 256QAM and 1024 QAM modulations over a 10MHz, 20MHz, 40MHz and 50MHz modulation bandwidth at the low, mid and high channels of operation. EUT was set to transmit continuously over various frequencies and power settings. A duty cycle measurement of greater than 98% was confirmed.

**Limit:** 1 Watt (30dBm) for Point-to-Point mode

**Results:** Passed

Test Date: 11-05-2013
Company: Ubiquiti Networks
EUT: Air Fiber 5 - 5.8GHz WiFi Radio
Test: Maximum peak conducted output power - Conducted
Operator: Lillian Li
Test Procedure used: KDB 558074 D01 v01r03 – 9.2.3.1) – Method AVGPM
Limit: [15.247(b)(3); RSS-210 A8.4(4)]: < 1 Watt (30 dBm)
Operating Mode: Point-to-Point; Antenna Gain = 23 dBi
EUT Limit[15.247(c)(1)(ii) PTP]: ≤ 30dBm

40MHz Operating Bandwidth:

| **FCC Maximum Conducted Output Power** | | 40M | | | | |
|---|---|---|---|---|---|---|
| | mW | QPSK | 16QAM | 64QAM | 256QAM | 1024Q |
| FCC limit =1W(30dBm) | *EUT FCC limit:[15.247(b)(4)]* | *1,000.00* | *1,000.00* | *1,000.00* | *1,000.00* | *1,000.00* |
| | TX0 (mW) | 476.54 | 478.68 | 476.68 | 475.51 | 476.39 |
| | TX1 (mW) | 494.16 | 489.78 | 487.92 | 487.95 | 487.36 |
| | total(mW) | **970.70** | **968.46** | **964.60** | **963.46** | **963.75** |
| HCH = 5828 MHz | Margin(mW) | 29.30 | 31.54 | 35.40 | 36.54 | 36.25 |
| | TX0 | 471.56 | 470.78 | 469.82 | 472.56 | 470.18 |
| | TX1 | 487.66 | 488.56 | 488.42 | 488.78 | 488.92 |
| | total(mW) | **959.22** | **959.34** | **958.24** | **961.34** | **959.10** |
| MCH = 5785 MHz | Margin(mW) | 40.78 | 40.66 | 41.76 | 38.66 | 40.90 |
| | TX0 | 485.78 | 483.12 | 483.21 | 482.98 | 495.23 |
| | TX1 | 493.13 | 491.56 | 491.85 | 492.39 | 491.78 |
| | total(mW) | **978.91** | **974.68** | **975.06** | **975.37** | **987.01** |
| LCH = 5727 MHz | Margin(mW) | 21.09 | 25.32 | 24.94 | 24.63 | 12.99 |

50MHz Operating Bandwidth:

| **FCC Maximum Conducted Output Power** | | 50MHz | | | | |
|---|---|---|---|---|---|---|
| | mW | QPSK | 16QAM | 64QAM | 256QAM | 1024Q |
| FCC limit =1W(30dBm) | *EUT FCC limit:[15.247(b)(4)]* | *1,000.00* | *1,000.00* | *1,000.00* | *1,000.00* | *1,000.00* |
| | TX0 (mW) | 500.12 | 499.85 | 499.87 | 499.89 | 499.72 |
| | TX1 (mW) | 495.23 | 498.22 | 497.23 | 498.55 | 498.75 |
| | total(mW) | **995.35** | **998.07** | **997.10** | **998.44** | **998.47** |
| HCH = 5823 MHz | Margin(mW) | 4.65 | 1.93 | 2.90 | 1.56 | 1.53 |
| | TX0 | 474.48 | 475.25 | 474.98 | 475.34 | 487.52 |
| | TX1 | 495.23 | 491.75 | 490.25 | 490.23 | 490.34 |
| | total(mW) | **969.71** | **967.00** | **965.23** | **965.57** | **977.86** |
| MCH = 5785 MHz | Margin(mW) | 30.29 | 33.00 | 34.77 | 34.43 | 22.14 |
| | TX0 | 485.24 | 484.03 | 484.13 | 483.53 | 483.24 |
| | TX1 | 489.78 | 488.79 | 487.92 | 488.92 | 491.34 |
| | total(mW) | **975.02** | **972.82** | **972.05** | **972.45** | **974.58** |
| LCH = 5752 MHz | Margin(mW) | 24.98 | 27.18 | 27.95 | 27.55 | 25.42 |

**Appendix – Measurement Data**

## 3.0 Maximum Power Spectral Density – Conducted

**Rule Section**: FCC 15.247(e)

**Test Procedure**: FCC KDB 558074 D01 DTS Meas Guidance v03r01 – *Guidance for Performing Compliance Measurements on Digital Transmission Systems (DTS) Operating Under §15.247*

**10.3 Method AVGPSD-1 (trace averaging with EUT transmitting at full power throughout each sweep)**

**Description**: Set instrument center frequency to DTS channel center frequency.
Set span to at least 1.5 times the OBW.
Set RBW to: 3 kHz ≤ RBW ≤ 100 kHz. .
Set VBW ≥3 x RBW.
Detector = power averaging (RMS) or sample detector (when RMS not available).
Ensure that the number of measurement points in the sweep ≥ 2 x span/RBW.
Sweep time = auto couple.
Employ trace averaging (RMS) mode over a minimum of 100 traces.
Use the peak marker function to determine the maximum amplitude level.

Measurements were taken for an QPSK, 16QAM, 64QAM, 256QAM and 1024 QAM modulations over a 10MHz, 20MHz, 40MHz and 50MHz modulation bandwidth at the low, mid and high channels of operation. EUT was set to transmit continuously over various frequencies and power settings. A duty cycle measurement of greater than 98% was confirmed.

**Limit:** 8 dBm in any 3 kHz band segment within the fundamental EBW during any time interval of continuous transmission.

**Results:** Passed

Test Date: 11-06-2013
Company: Ubiquiti Networks
EUT: Air Fiber 5 - 5.8GHz WiFi Radio
Test: Maximum power spectral density- Conducted
Operator: Lillian Li
Test Procedure used: KDB 558074 D01 v01r03 – 10.3) – Method AVGPSD-1
Limit: [15.247(e); RSS-210 A8.2(b)]: < 8dBm/3kHz Band
Operating Mode: Point-to-Point; Antenna Gain = 23 dBi

40MHz Operating Bandwidth:

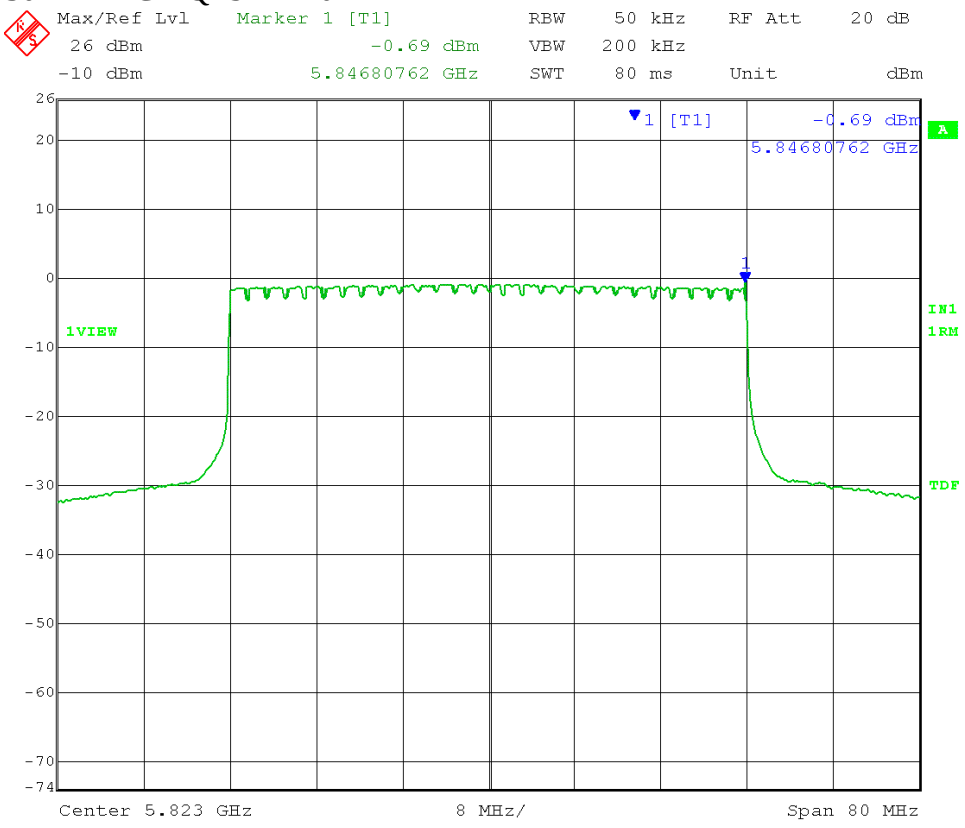
| **Power Spectral Density (PSD)** | | 40M | | | | |
|---|---|---|---|---|---|---|
| FCC limit=8dBm/3kHz | dBm | QPSK | 16QAM | 64QAM | 256QAM | 1024Q |
| | EUT FCC Limit | 8 | 8 | 8 | 8 | 8 |
| | TX0 | 0.51 | 0.28 | 0.19 | 0.27 | 0.69 |
| | TX1 | -0.65 | -1.2 | -1.28 | -0.88 | -0.12 |
| | total(mW) | 1.99 | 1.83 | 1.79 | 1.88 | 2.14 |
| | Total(dBm) | **2.98** | **2.61** | **2.53** | **2.74** | **3.31** |
| HCH = 5828 MHz | Margin(dB) | 5.02 | 5.39 | 5.47 | 5.26 | 4.69 |
| | TX0 | 0.88 | 0.41 | 0.4 | 0.49 | 1.12 |
| | TX1 | -0.63 | -1.34 | -1.37 | -0.94 | -0.42 |
| | total(mW) | 2.09 | 1.83 | 1.83 | 1.92 | 2.20 |
| | Total(dBm) | **3.20** | **2.63** | **2.61** | **2.84** | **3.43** |
| MCH = 5785 MHz | Margin(dB) | 4.80 | 5.37 | 5.39 | 5.16 | 4.57 |
| | TX0 | -1.9 | -2.17 | -2.16 | -2.14 | -1.52 |
| | TX1 | -1.72 | -1.85 | -1.91 | -1.88 | -1.28 |
| | total(mW) | 1.32 | 1.26 | 1.25 | 1.26 | 1.45 |
| | Total(dBm) | **1.20** | **1.00** | **0.98** | **1.00** | **1.61** |
| LCH = 5727 MHz | Margin(dB) | 6.80 | 7.00 | 7.02 | 7.00 | 6.39 |

50MHz Operating Bandwidth:

| **Power Spectral Density (PSD)** | | 50MHz | | | | |
|---|---|---|---|---|---|---|
| FCC | dBm | QPSK | 16QAM | 64QAM | 256QAM | 1024Q |
| limit=8dBm/3kHz | EUT FCC Limit | 8 | 8 | 8 | 8 | 8 |
| | TX0 | -0.69 | -0.44 | -0.58 | -0.52 | 0.33 |
| | TX1 | -1.3 | -1.98 | -1.93 | -1.61 | -0.74 |
| | total(mW) | 1.59 | 1.54 | 1.52 | 1.58 | 1.92 |
| | Total(dBm) | **2.03** | **1.87** | **1.81** | **1.98** | **2.84** |
| HCH = 5823 MHz | Margin(dB) | 5.97 | 6.13 | 6.19 | 6.02 | 5.16 |
| | TX0 | -0.01 | -0.36 | -0.38 | -0.31 | 0.83 |
| | TX1 | -1.25 | -2.01 | -1.92 | -1.51 | -0.63 |
| | total(mW) | 1.75 | 1.55 | 1.56 | 1.64 | 2.08 |
| | Total(dBm) | **2.42** | **1.90** | **1.93** | **2.14** | **3.17** |
| MCH = 5785 MHz | Margin(dB) | 5.58 | 6.10 | 6.07 | 5.86 | 4.83 |
| | TX0 | -2.9 | -2.89 | -2.89 | -2.81 | -2.03 |
| | TX1 | -2.28 | -2.65 | -2.64 | -2.59 | -1.44 |
| | total(mW) | 1.10 | 1.06 | 1.06 | 1.07 | 1.34 |
| | Total(dBm) | **0.43** | **0.24** | **0.25** | **0.31** | **1.29** |
| LCH = 5752 MHz | Margin(dB) | 7.57 | 7.76 | 7.75 | 7.69 | 6.71 |

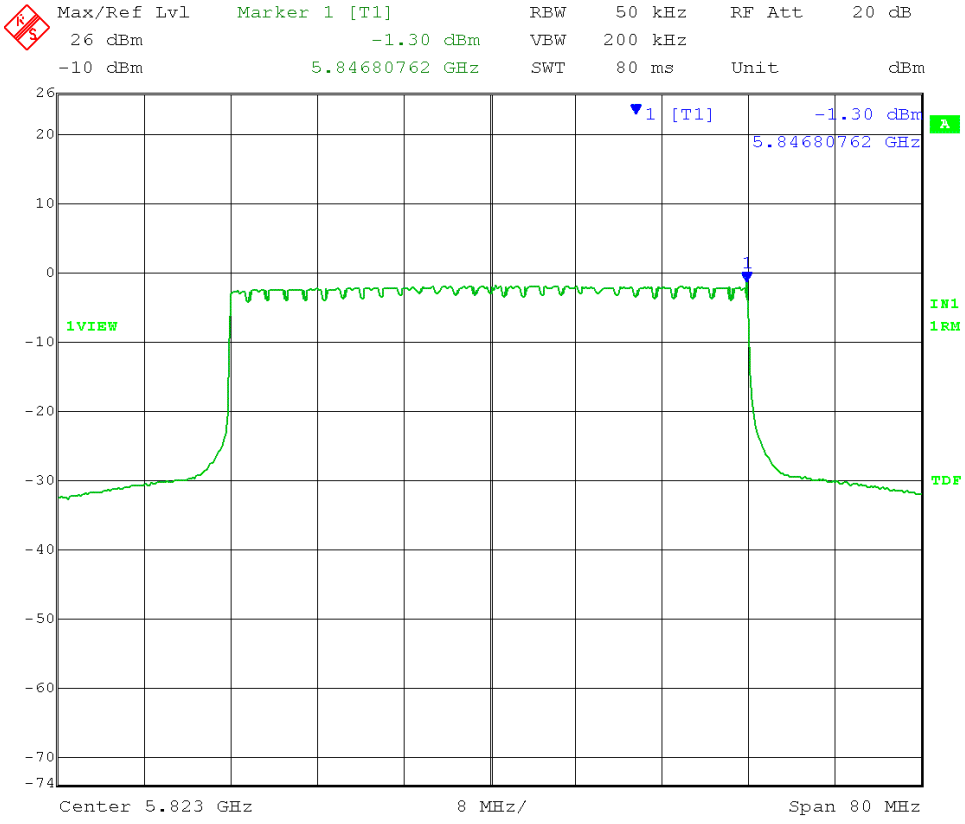
PLOTS: For 50MHz Bandwidth & 40MHz Bandwidth

50MHz HCH QPSK TX0



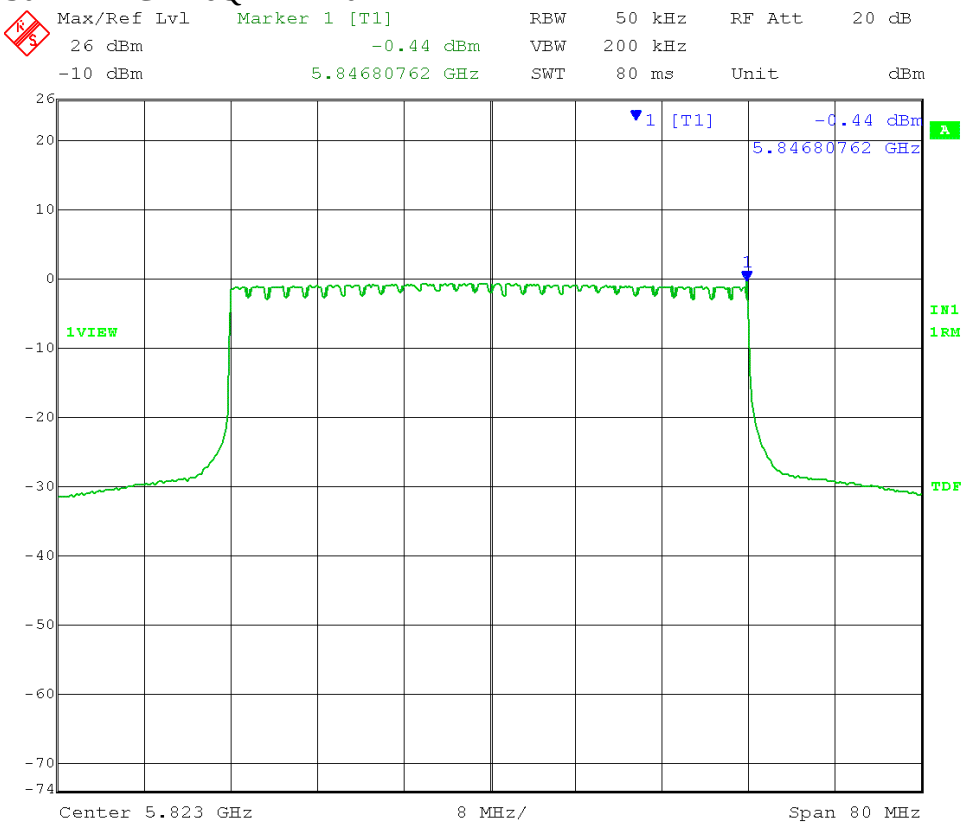

Date: 6.NOV.2013 14:22:54

TX1



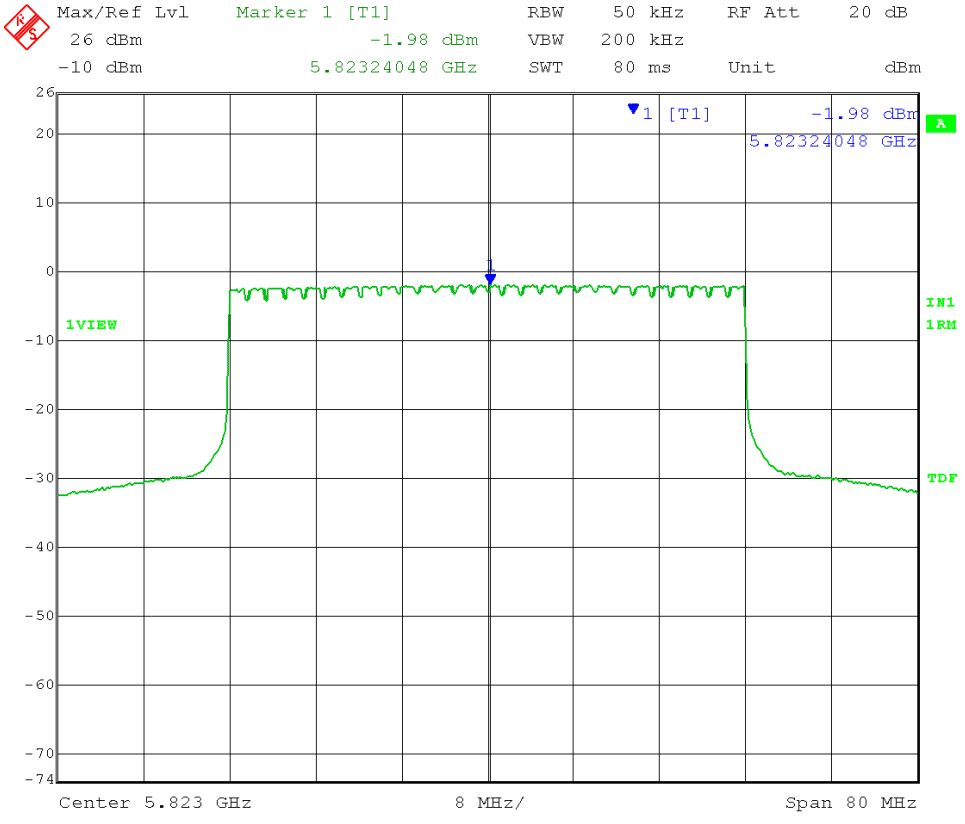

Date: 6.NOV.2013 14:16:15

50MHz HCH 16QAM TX0



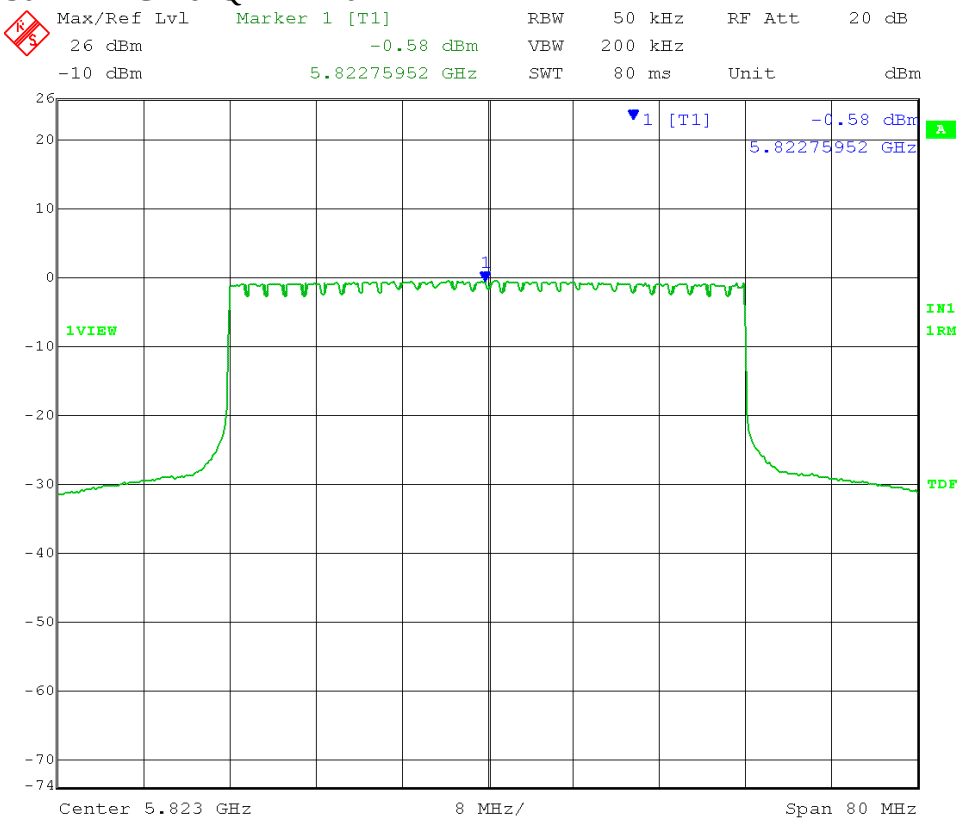

Date: 6.NOV.2013 14:23:34

TX1



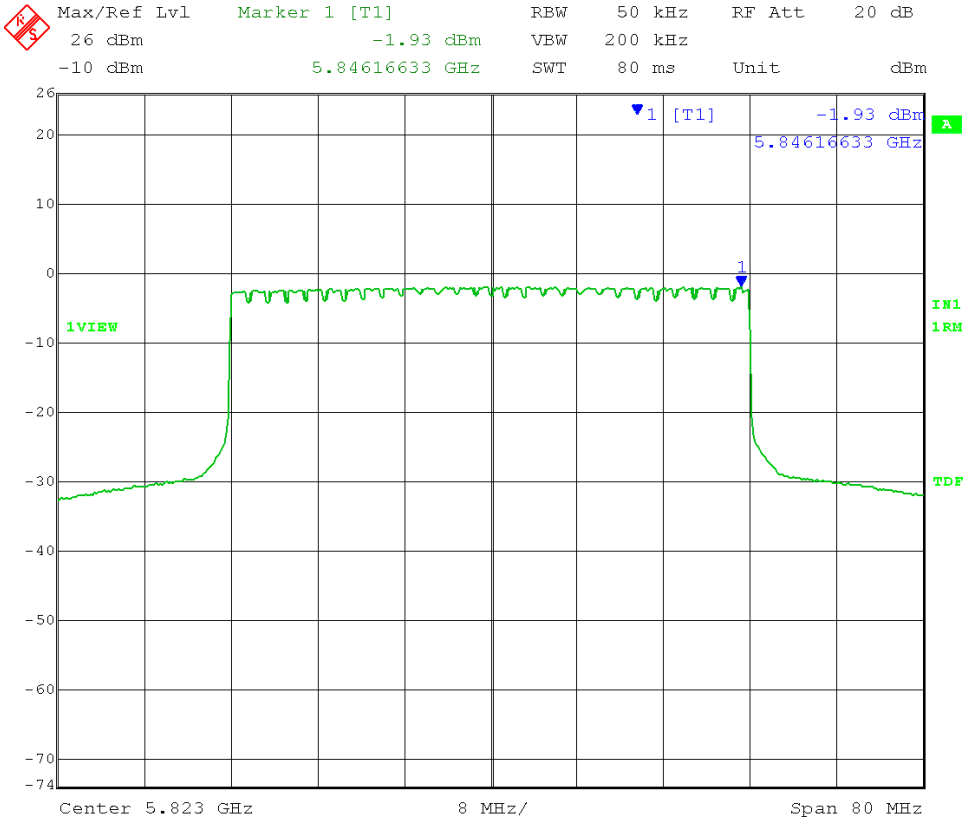

Date: 6.NOV.2013 14:16:45

50MHz HCH 64QAM TX0



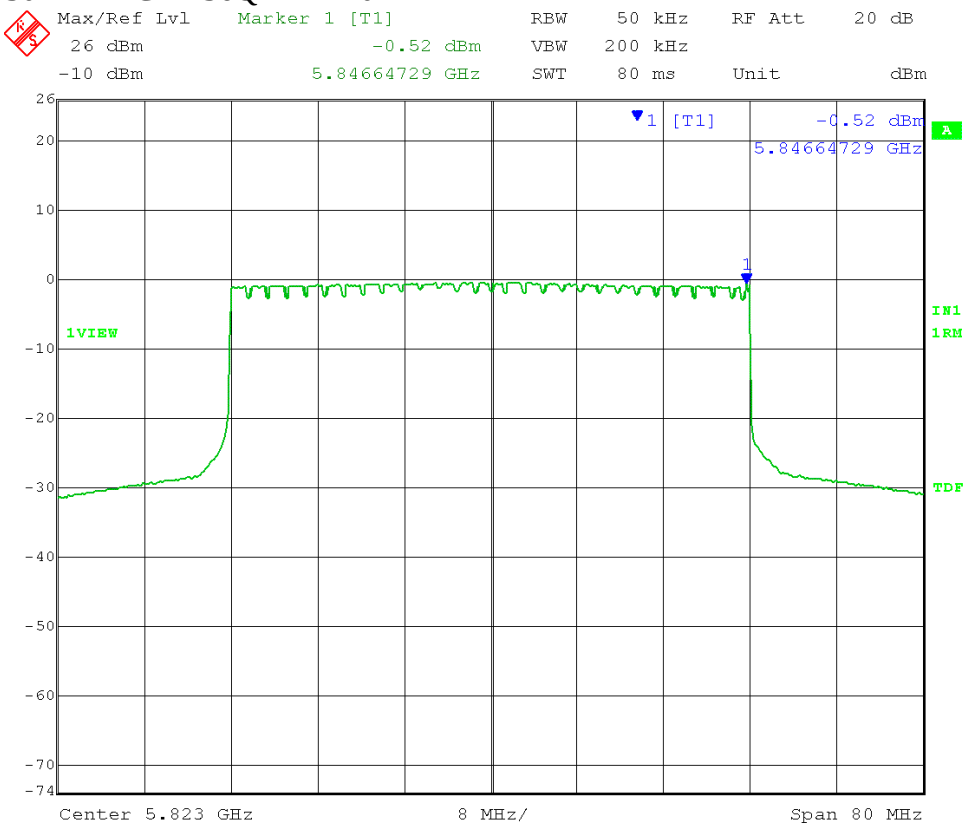

Date: 6.NOV.2013 14:24:31

TX1



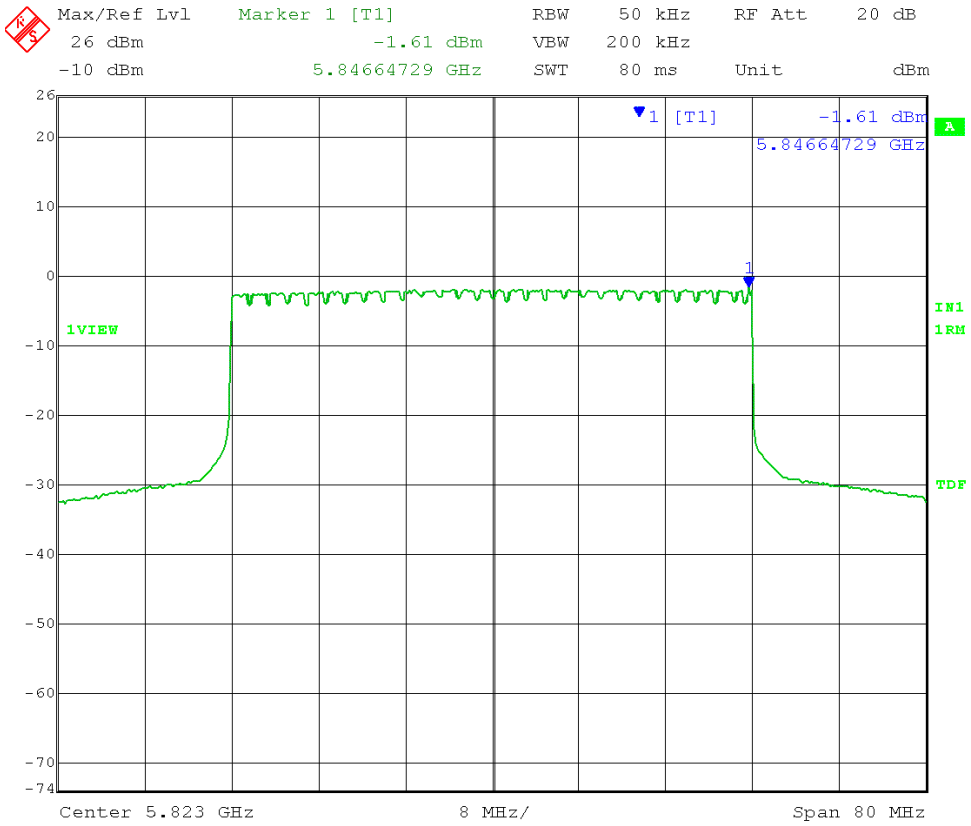

Date: 6.NOV.2013 14:17:18

50MHz HCH 256QAM TX0



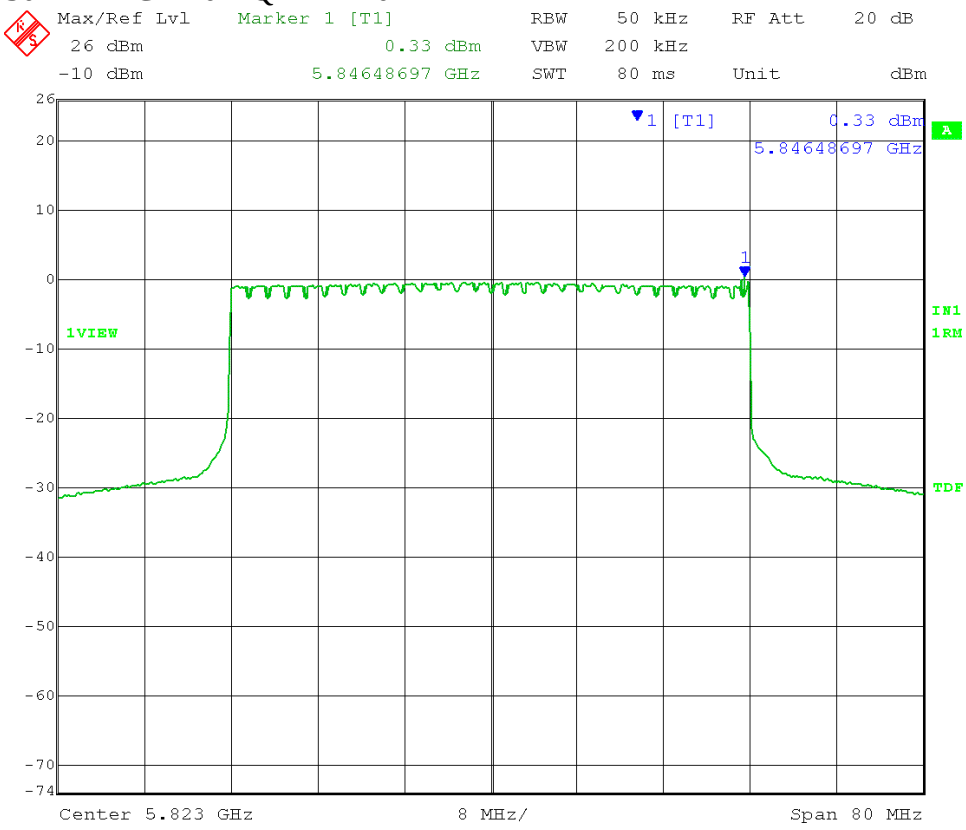

Date: 6.NOV.2013 14:25:02

TX1



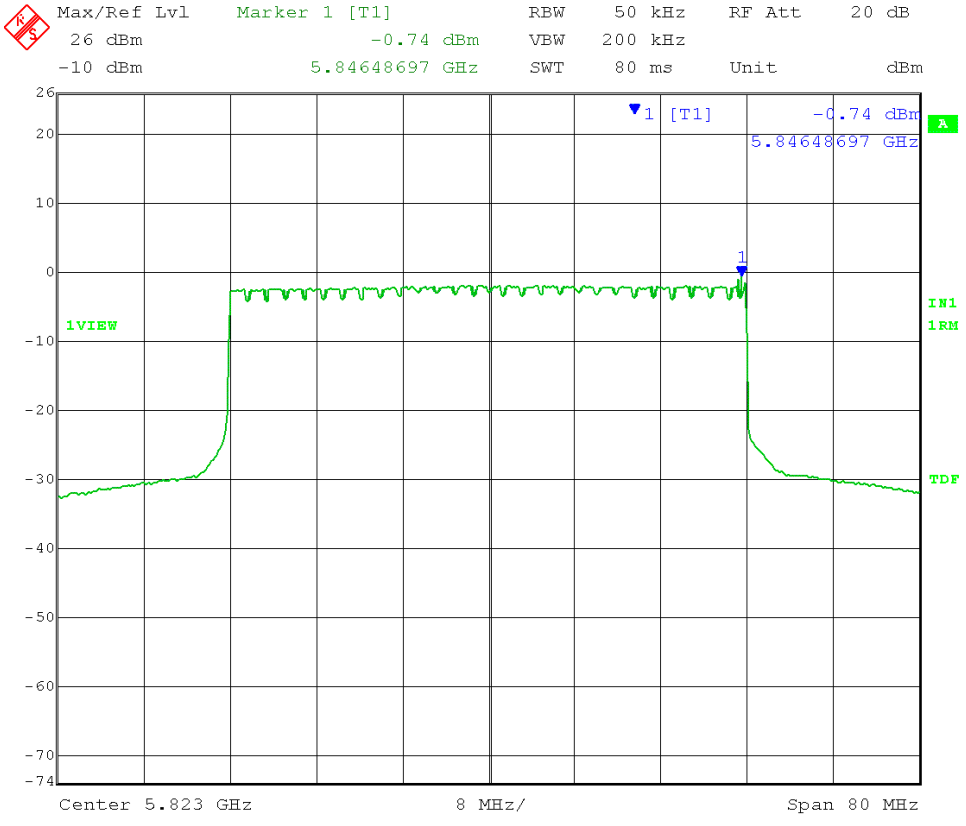

Date: 6.NOV.2013 14:17:47

50MHz HCH 1024QAM TX0



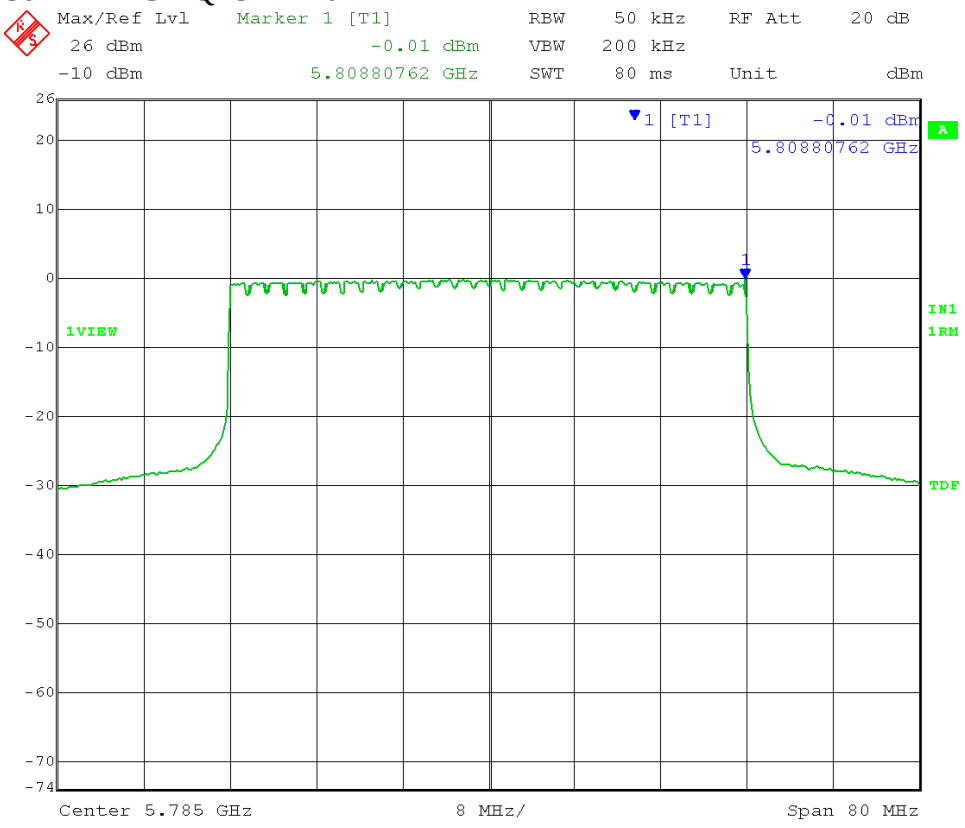

Date: 6.NOV.2013 14:25:35

TX1



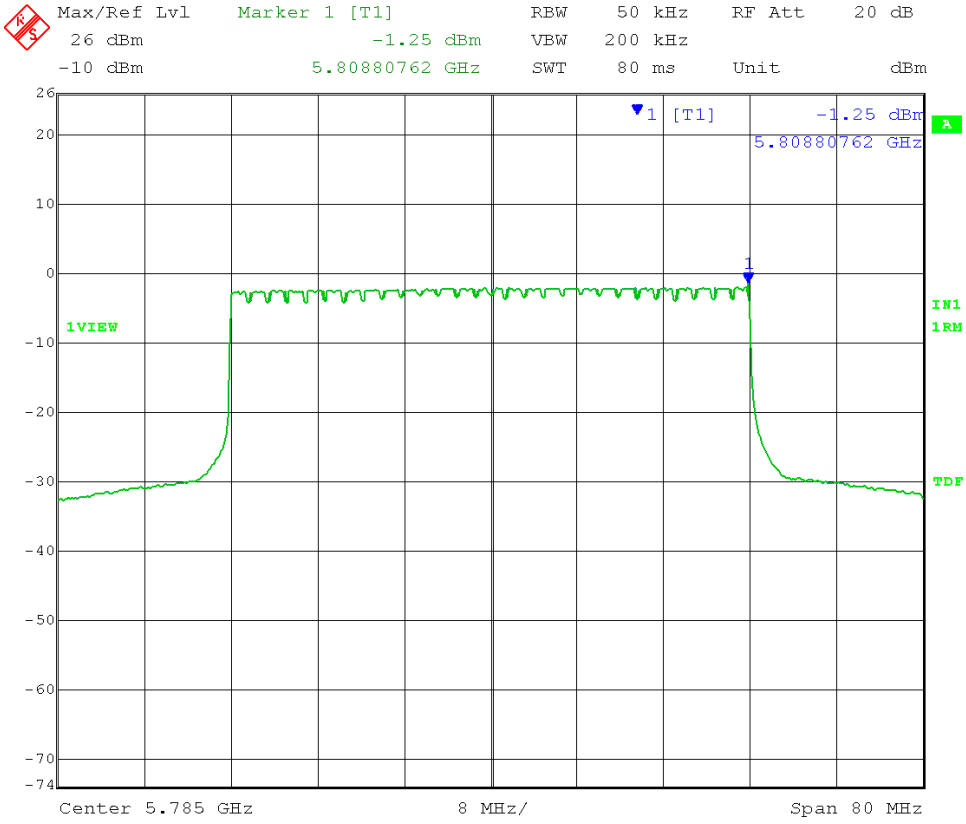

Date: 6.NOV.2013 14:18:24

50MHz MCH QPSK TX0



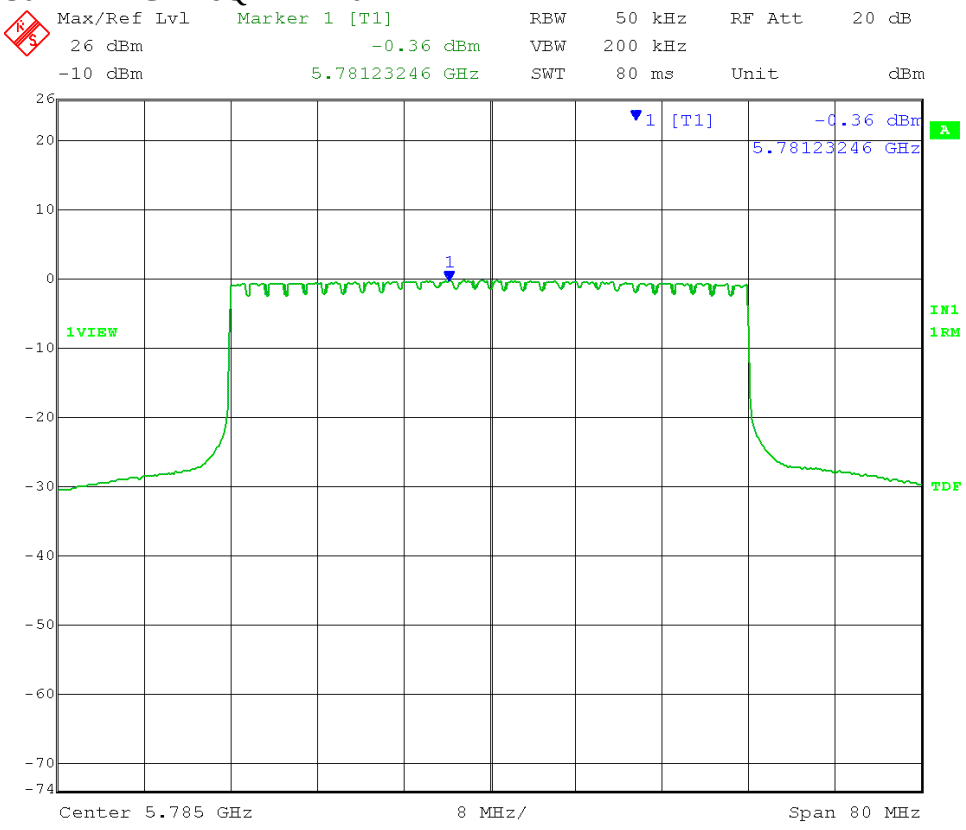

Date: 6.NOV.2013 14:26:23

TX1




Date: 6.NOV.2013 14:13:15

50MHz MCH 16QAM TX0




Date: 6.NOV.2013 14:27:03

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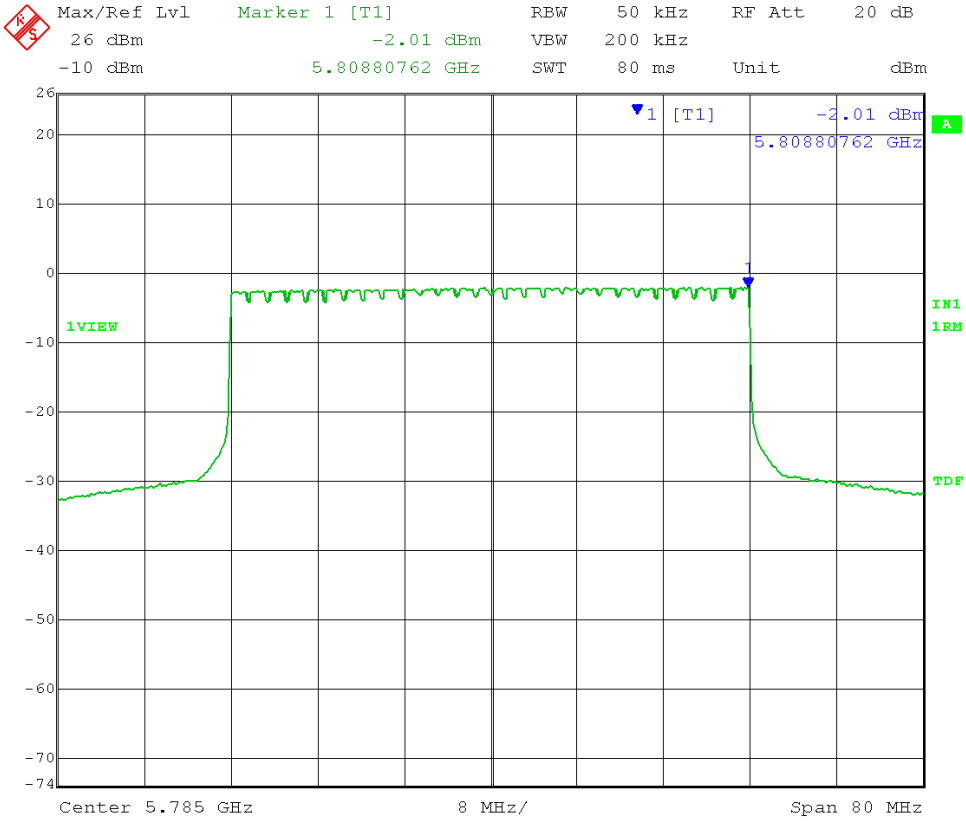
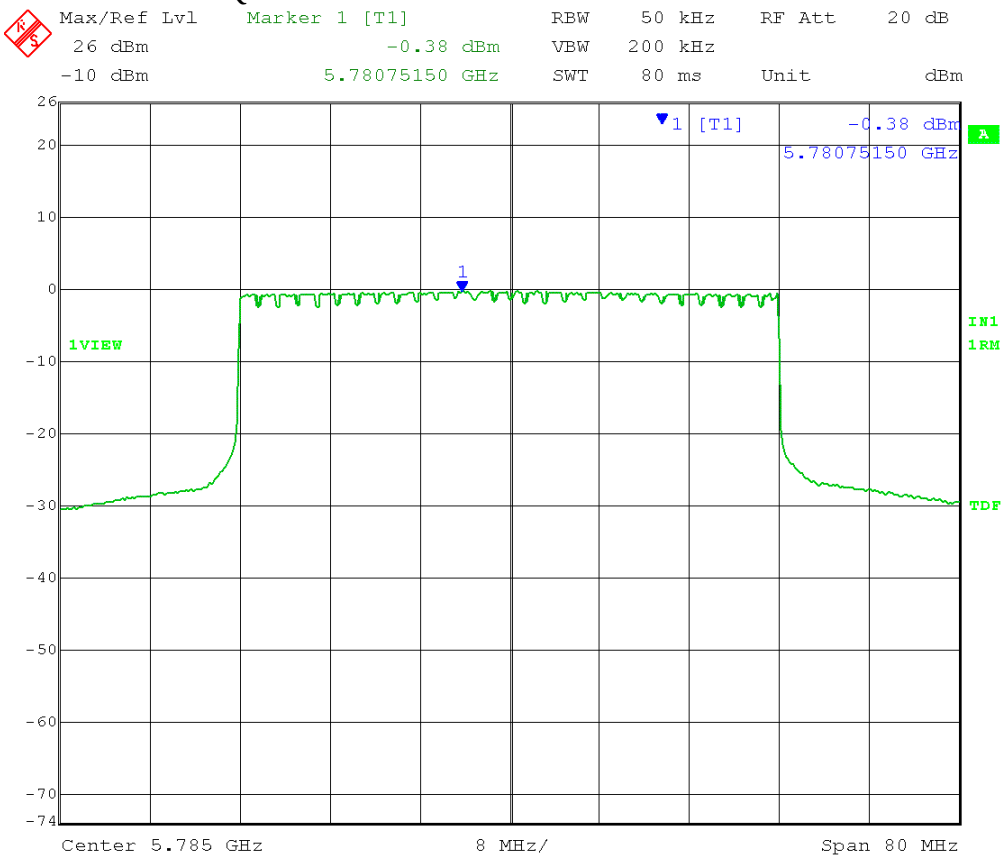


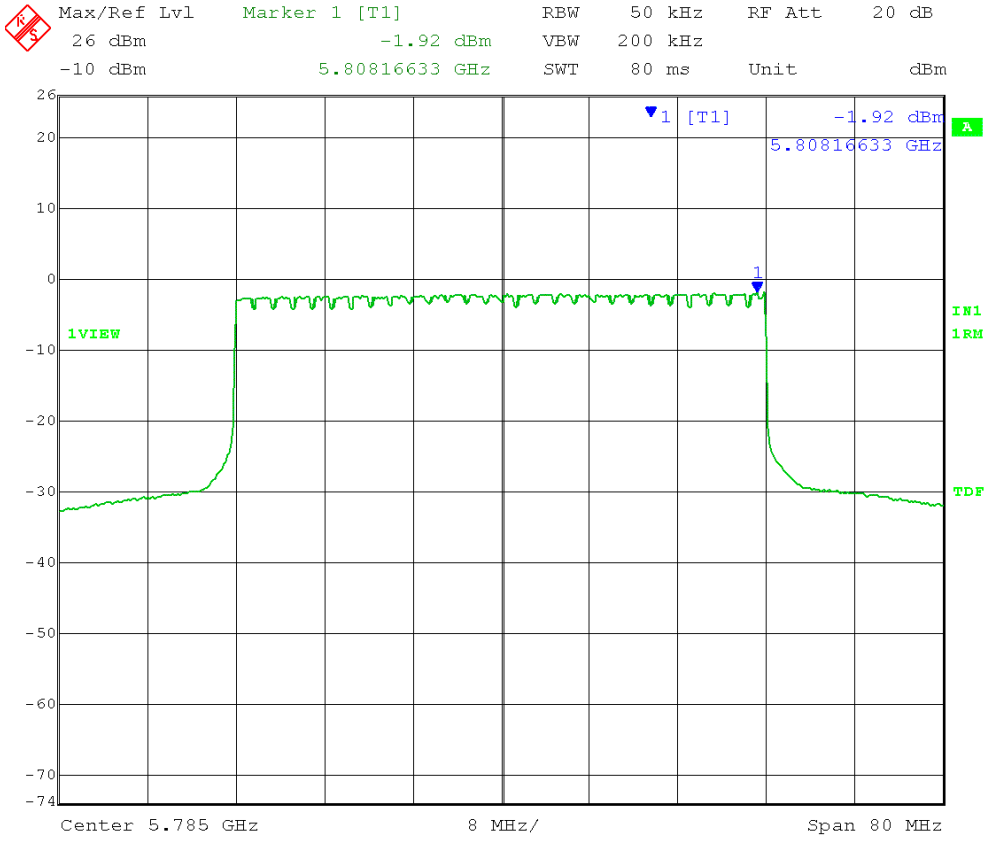

Date: 6.NOV.2013 14:13:49

50MHz MCH 64QAM TX0



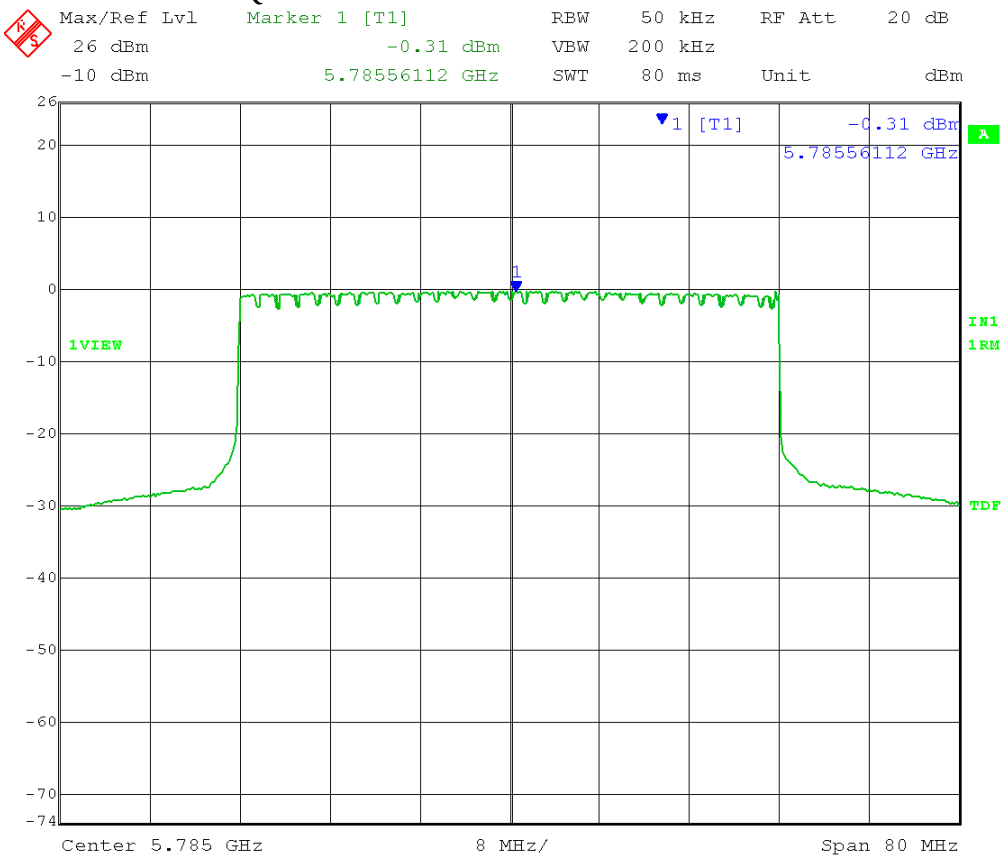

Date: 6.NOV.2013 14:27:40

TX1




Date: 6.NOV.2013 14:14:19

50MHz MCH 256QAM TX0




Date: 6.NOV.2013 14:28:16

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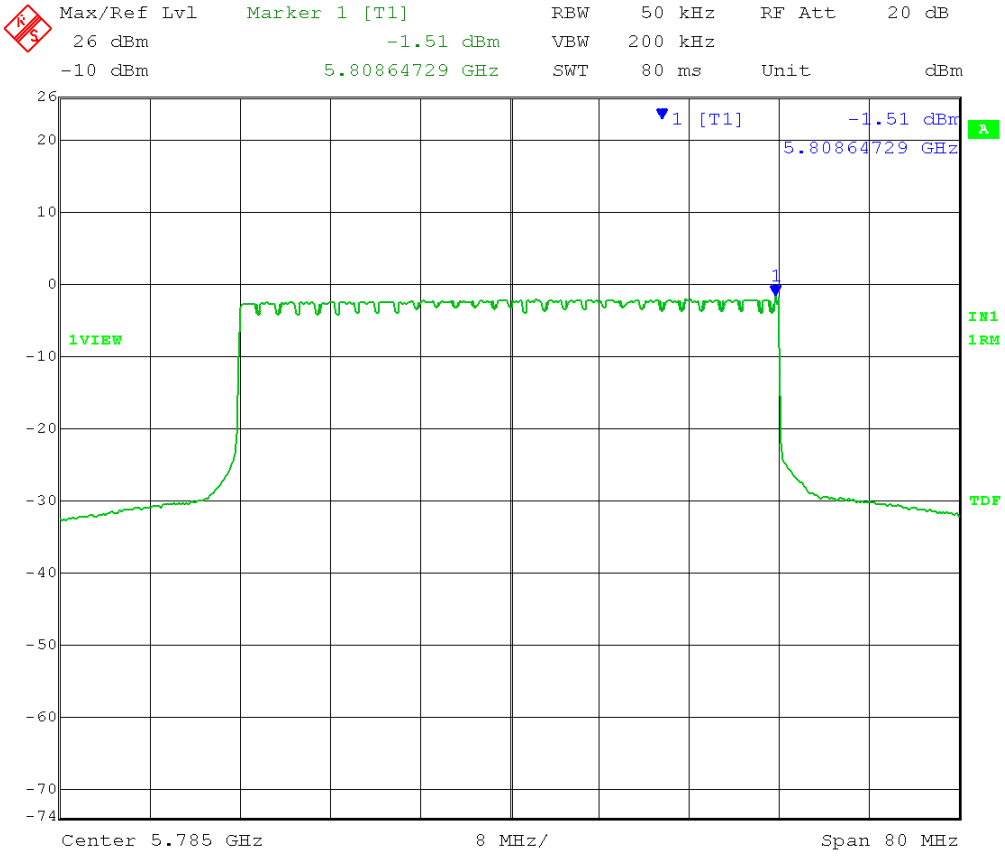
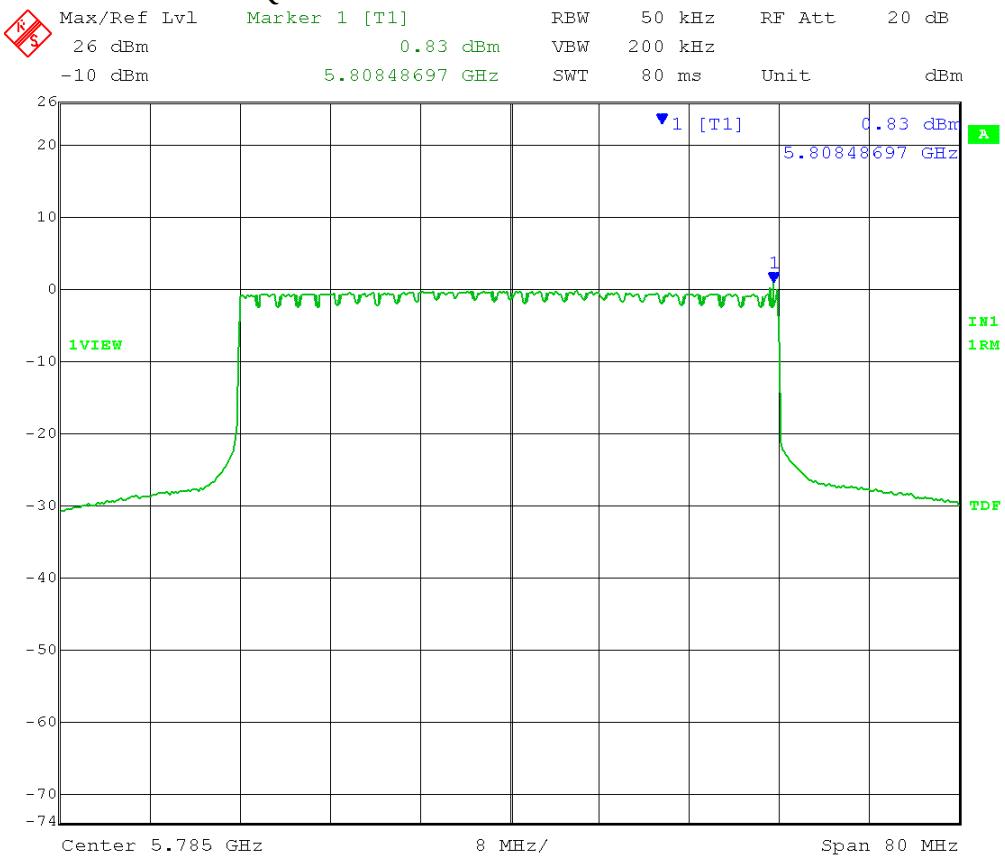



Date: 6.NOV.2013 14:14:51

50MHz MCH 1024QAM TX0




Date: 6.NOV.2013 14:28:48

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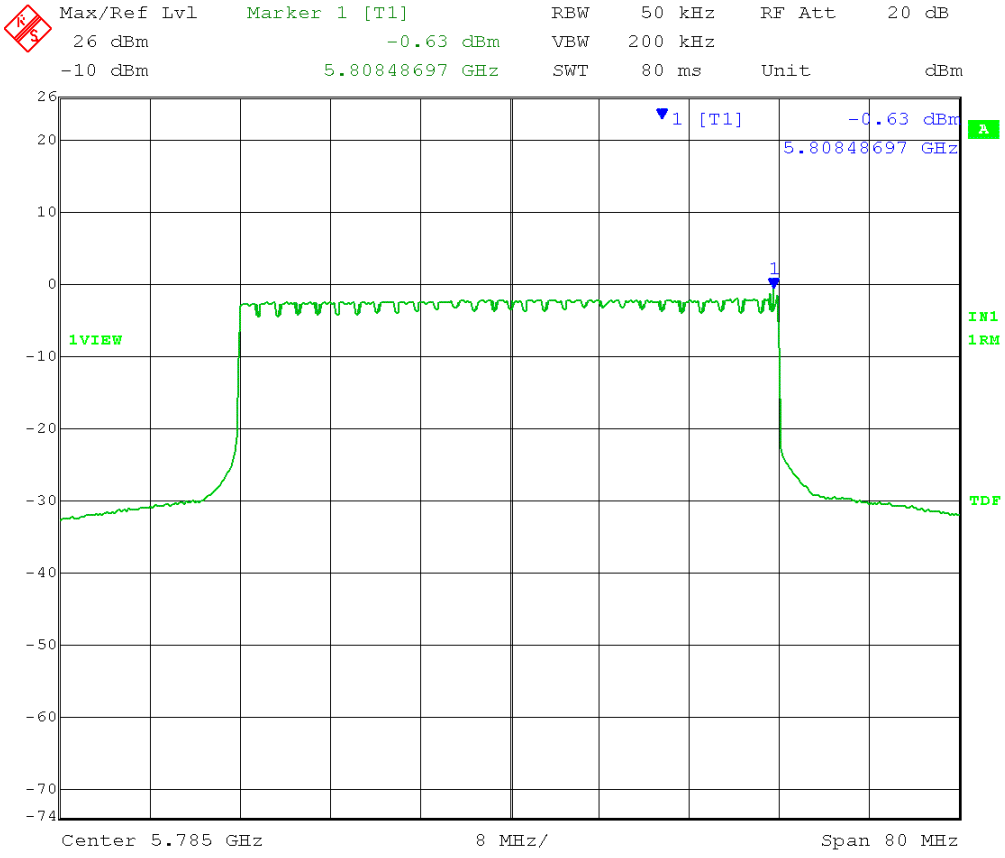
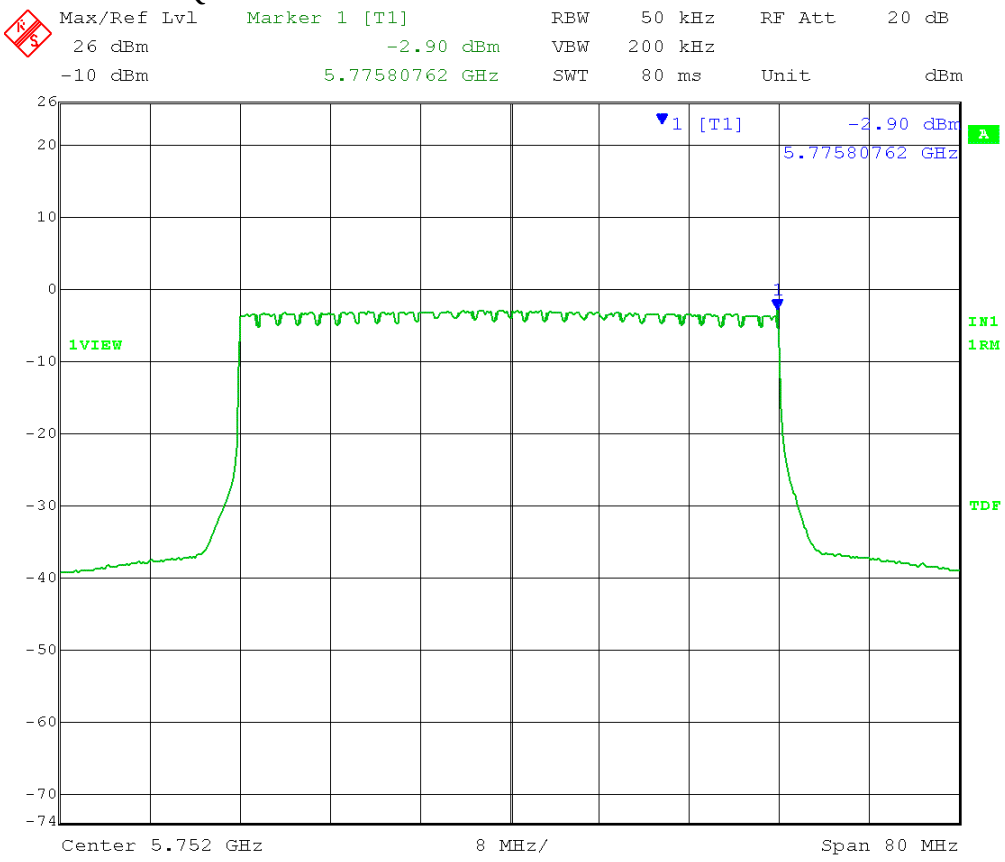


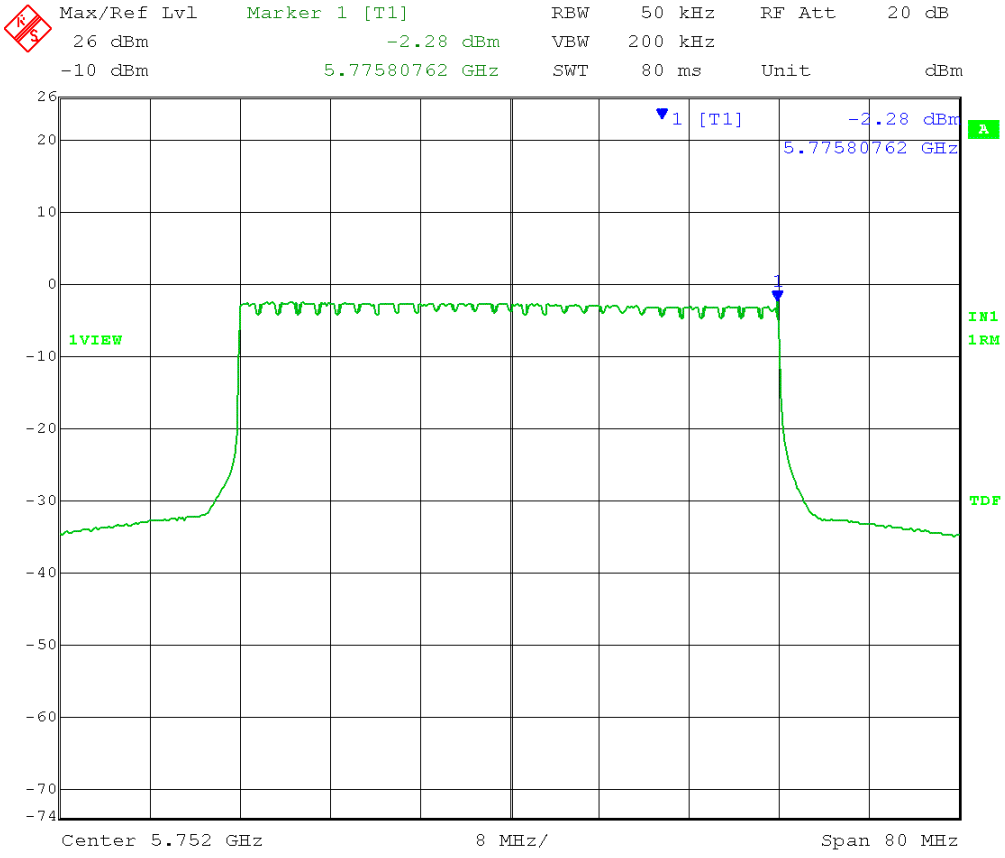

Date: 6.NOV.2013 14:15:23

50MHz LCH QPSK TX0



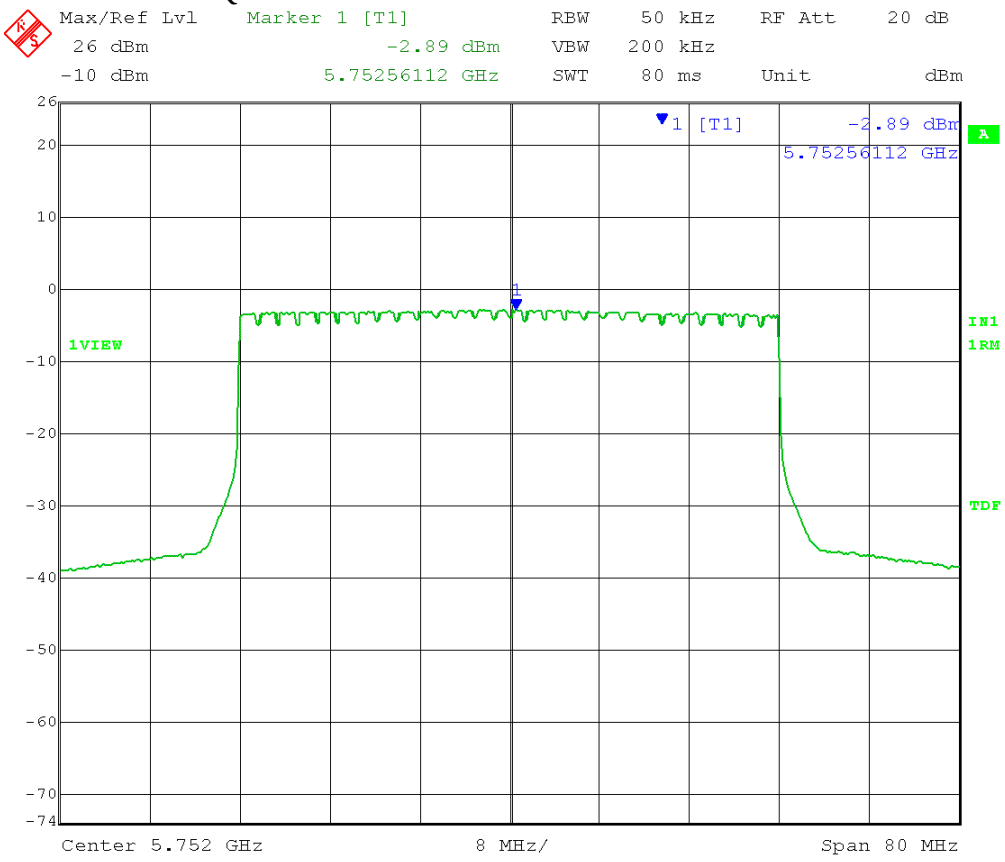

Date: 6.NOV.2013 14:29:30

TX1



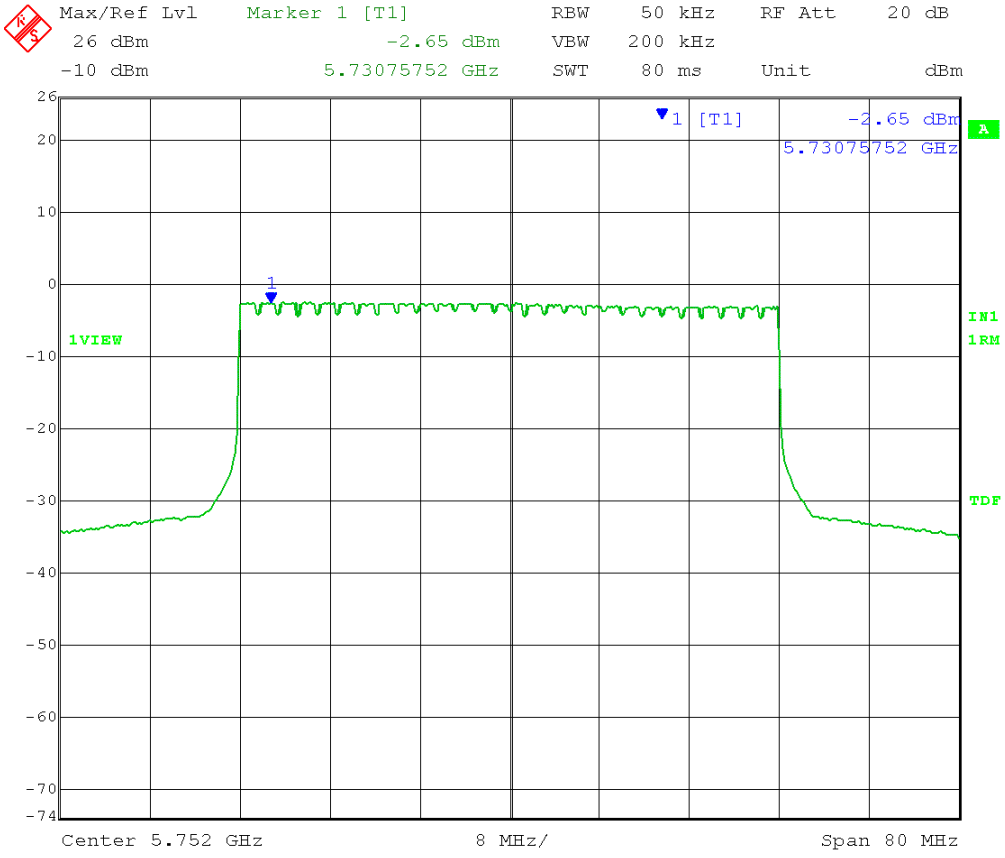

Date: 6.NOV.2013 14:10:24

50MHz LCH 16QAM TX0



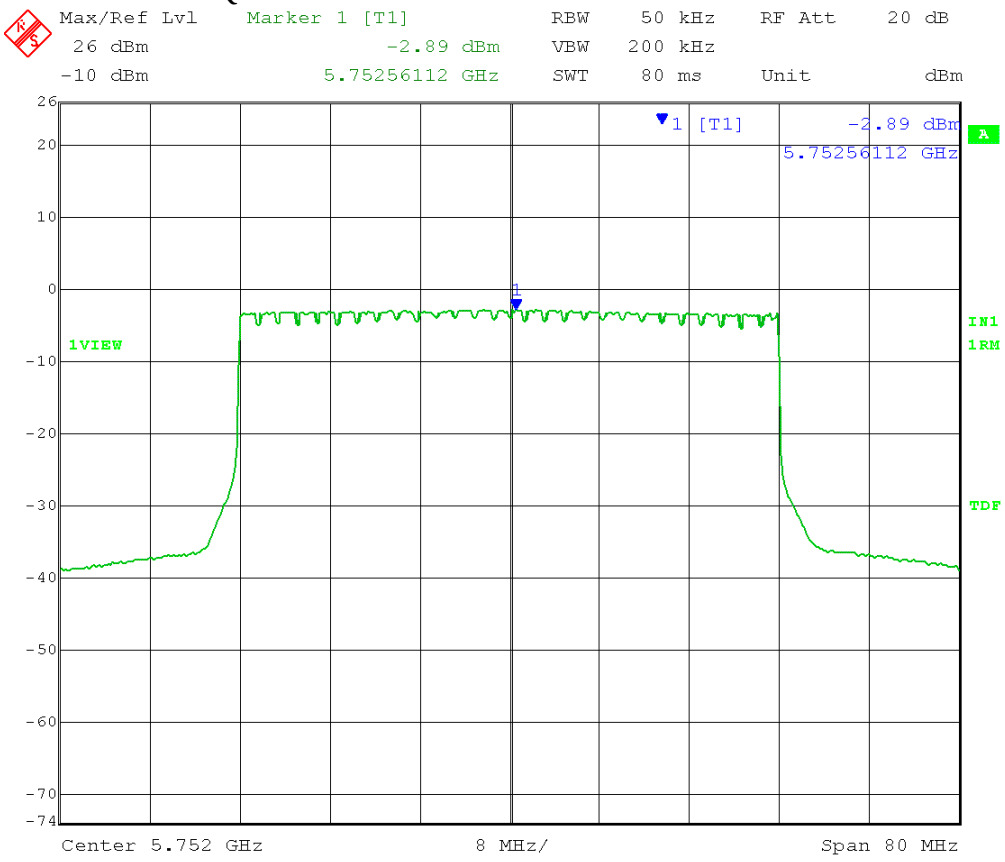

Date: 6.NOV.2013 14:30:11

TX1



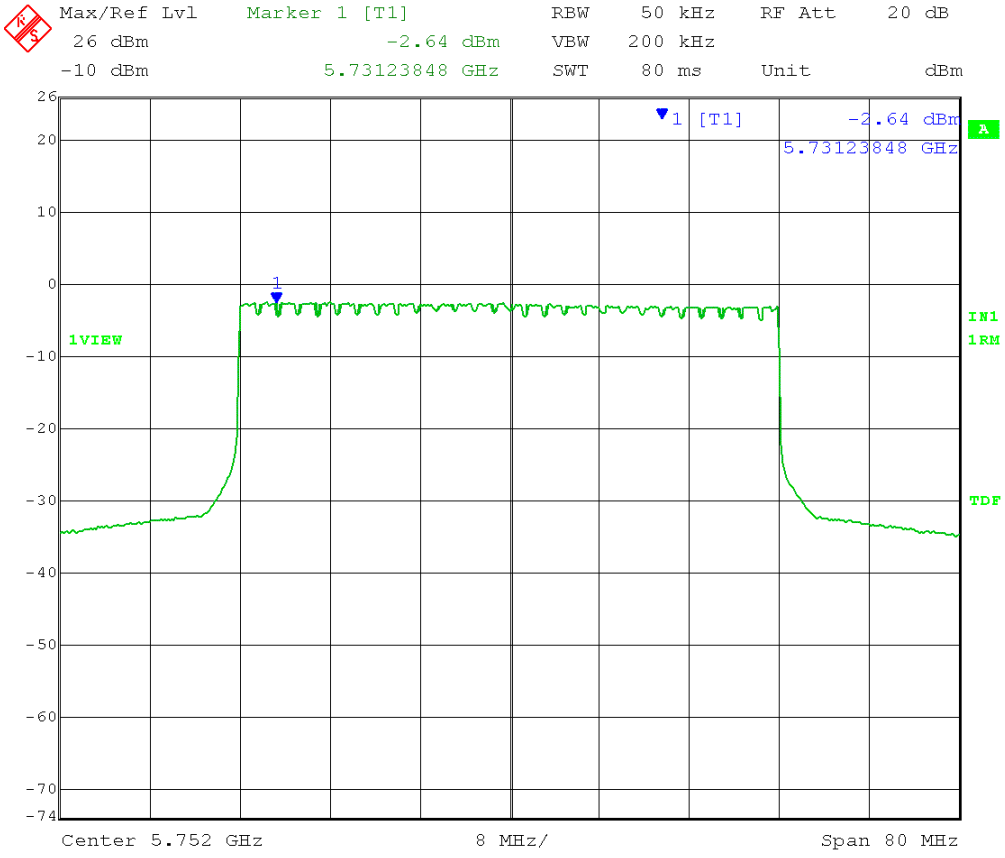

Date: 6.NOV.2013 14:10:53

50MHz LCH 64QAM TX0



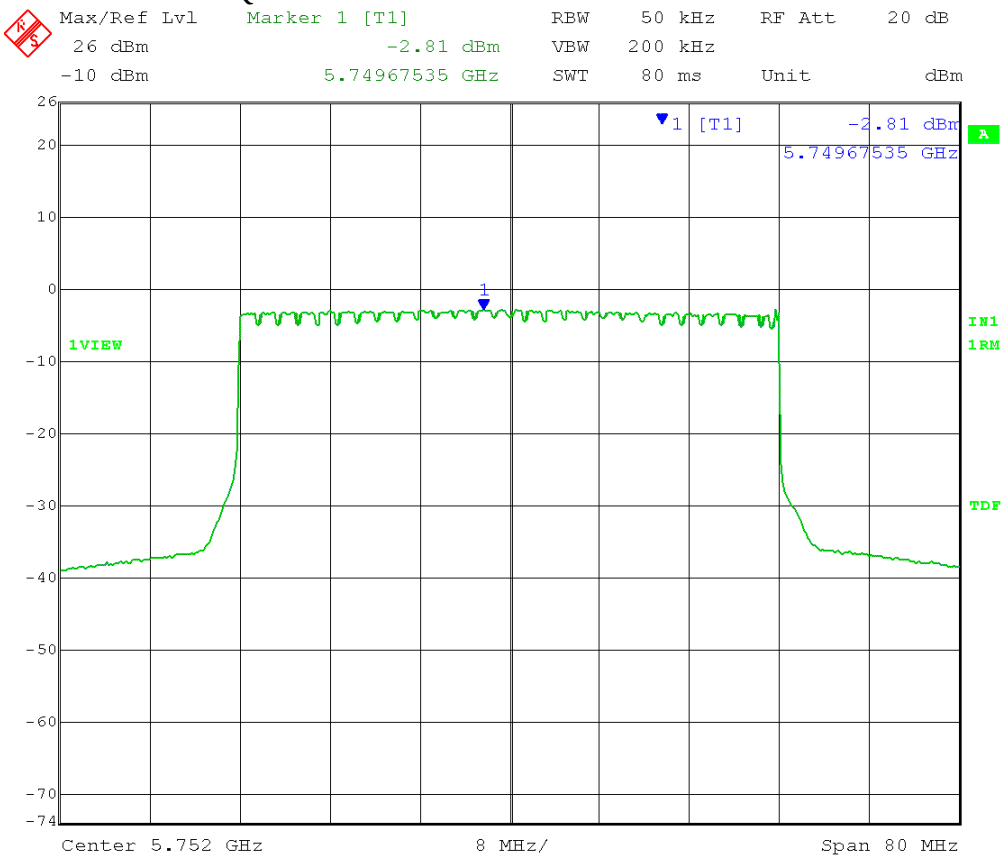

Date: 6.NOV.2013 14:30:42

TX1



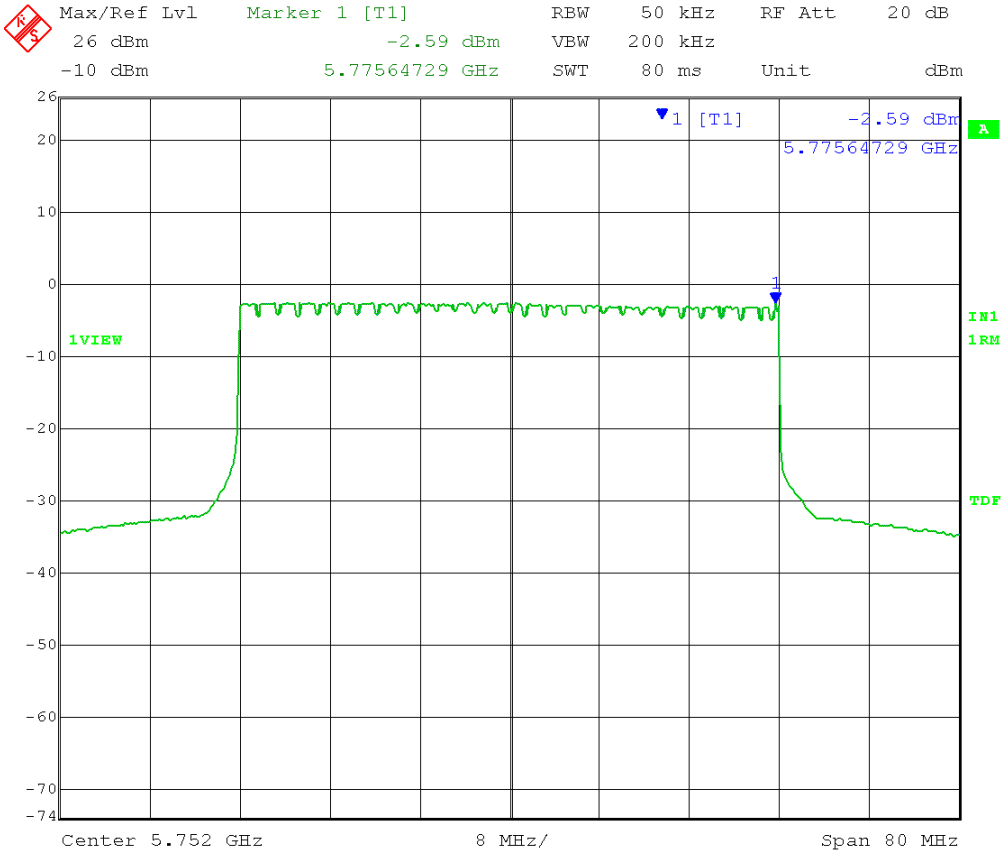

Date: 6.NOV.2013 14:11:23

50MHz LCH 256QAM TX0



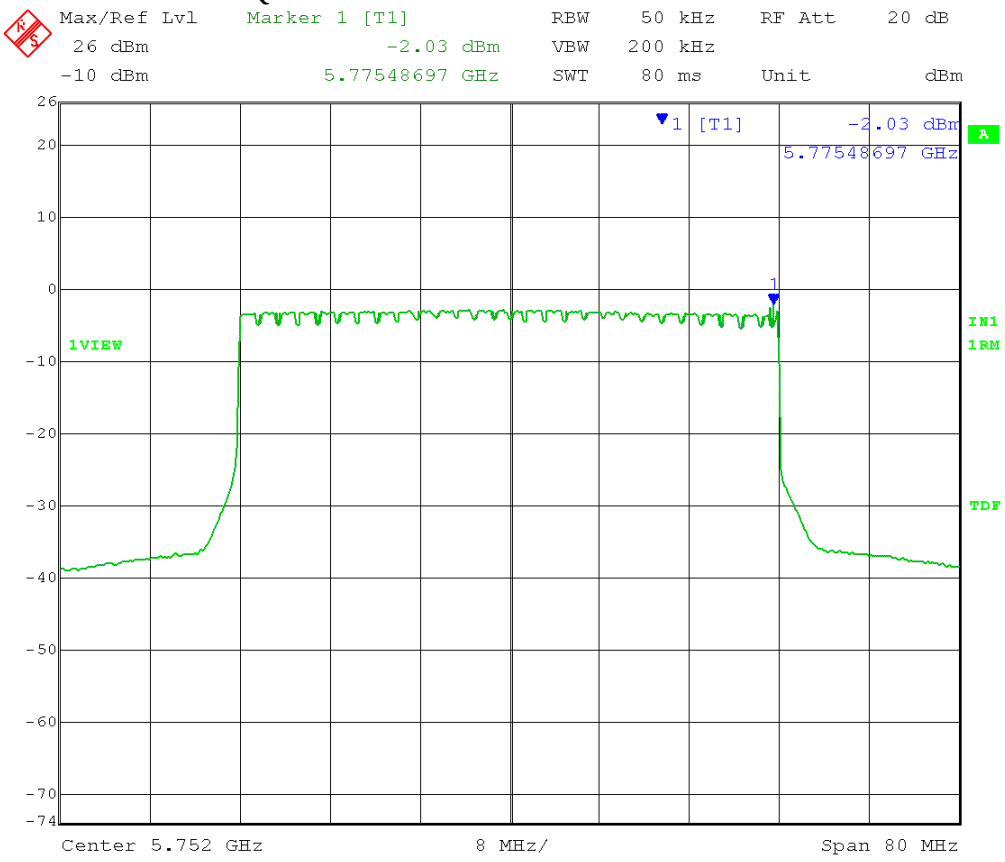

Date: 6.NOV.2013 14:31:14

TX1



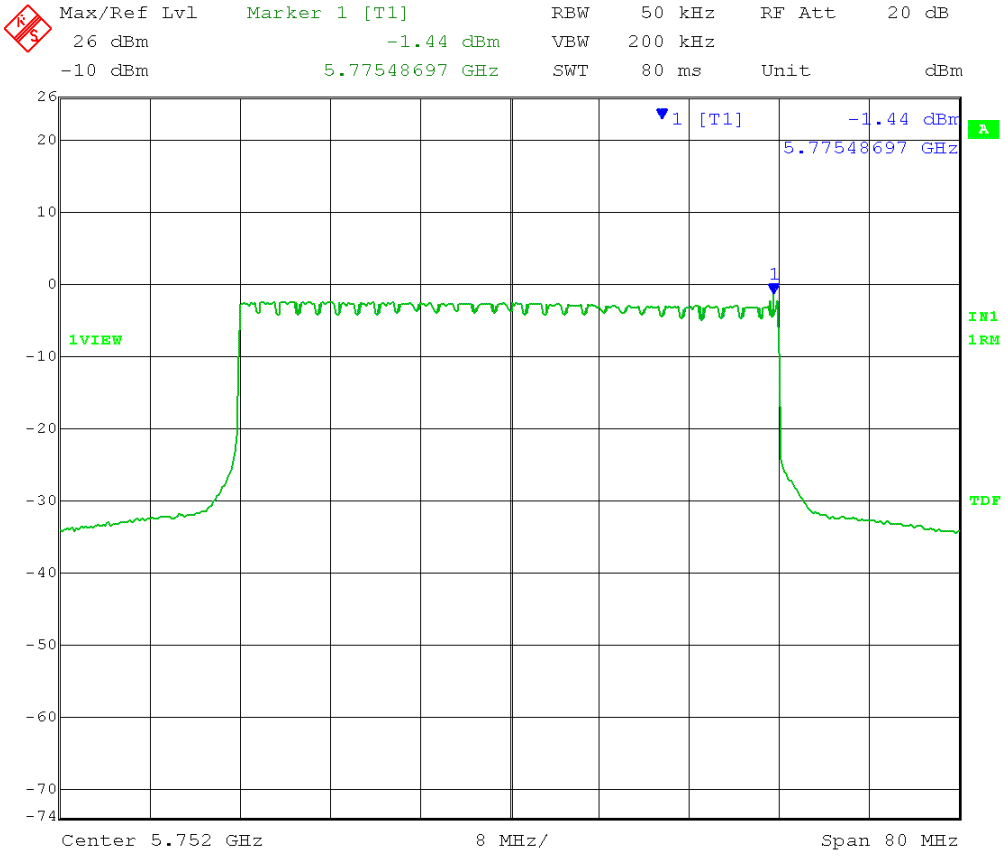

Date: 6.NOV.2013 14:11:57

50MHz LCH 1024QAM TX0



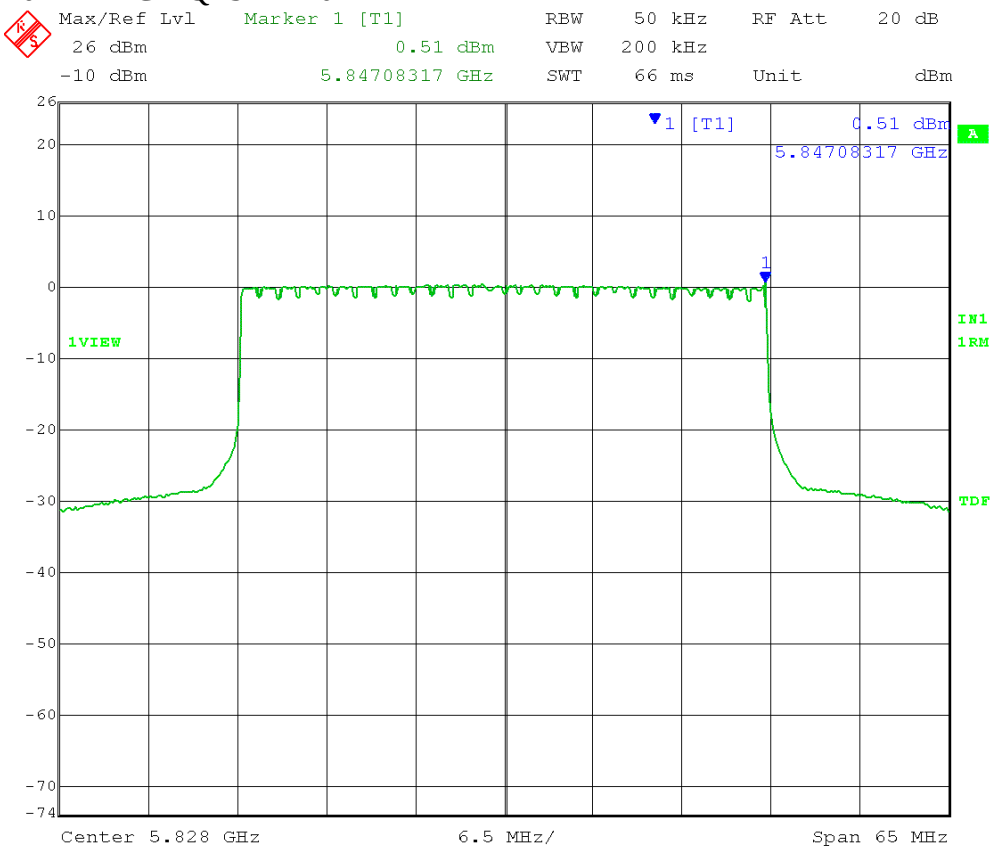

Date: 6.NOV.2013 14:31:49

TX1



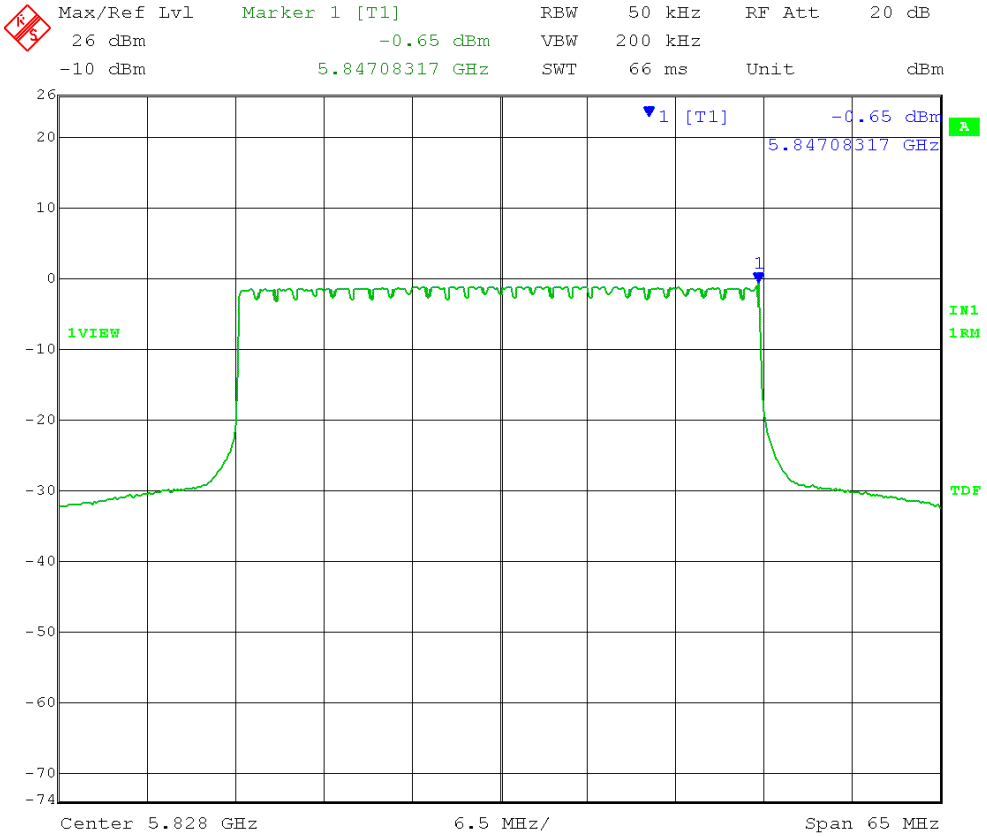

Date: 6.NOV.2013 14:12:26

40MHz HCH QPSK TX0



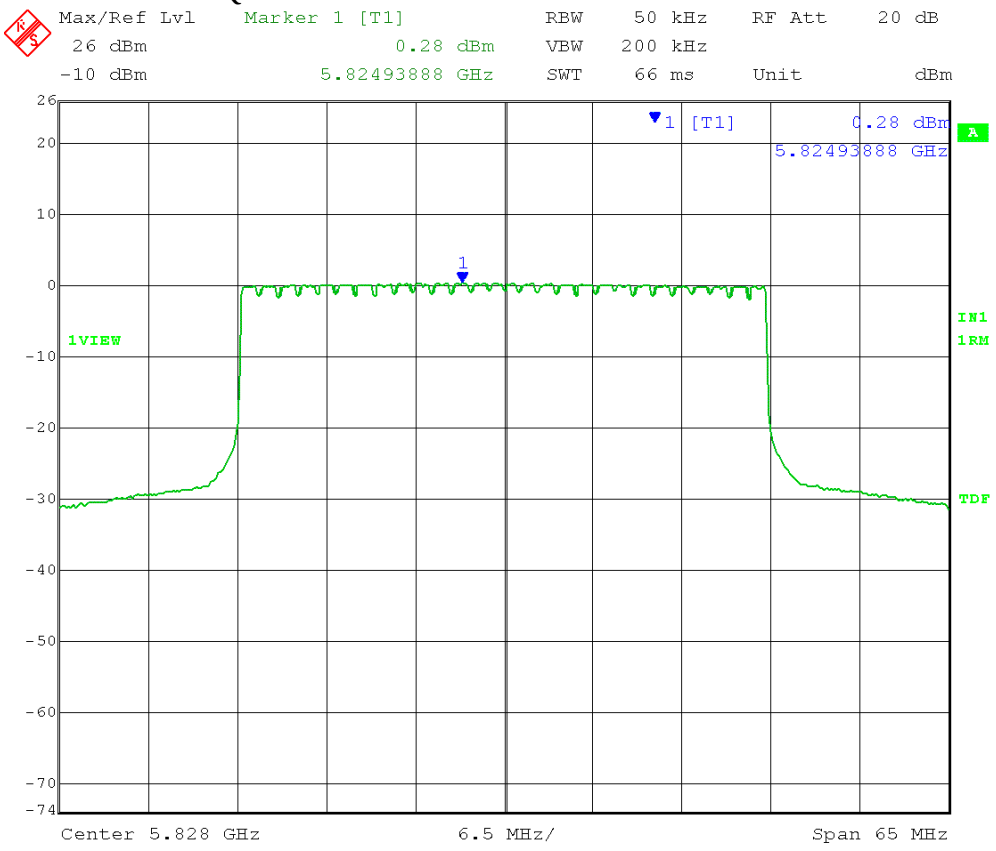

Date: 6.NOV.2013 14:33:07

TX1



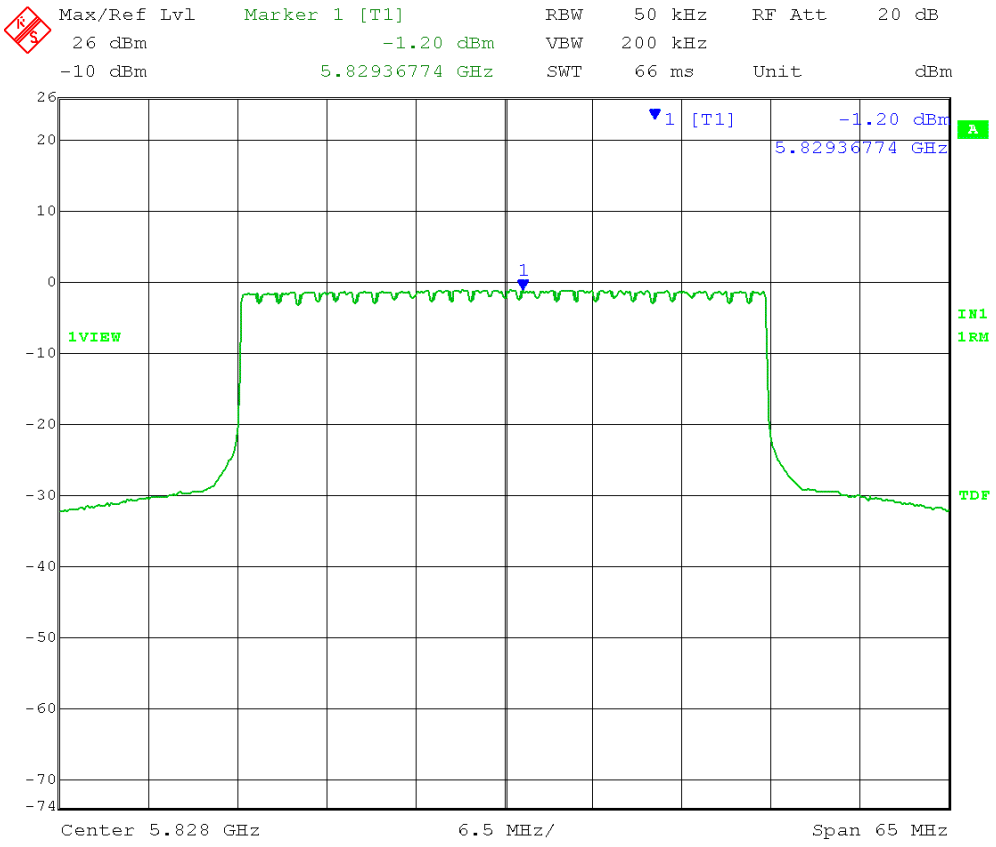

Date: 6.NOV.2013 13:56:57

40MHz HCH 16QAM TX0



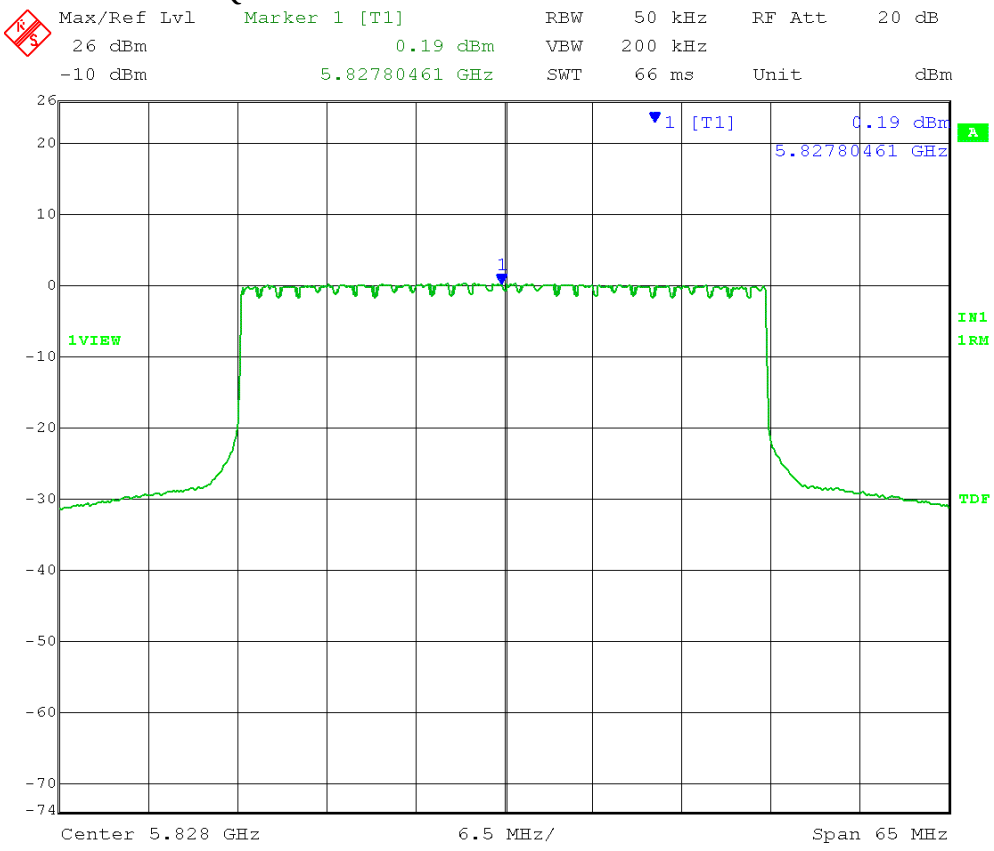

Date: 6.NOV.2013 14:33:38

TX1




Date: 6.NOV.2013 13:57:26

40MHz HCH 64QAM TX0




Date: 6.NOV.2013 14:34:08

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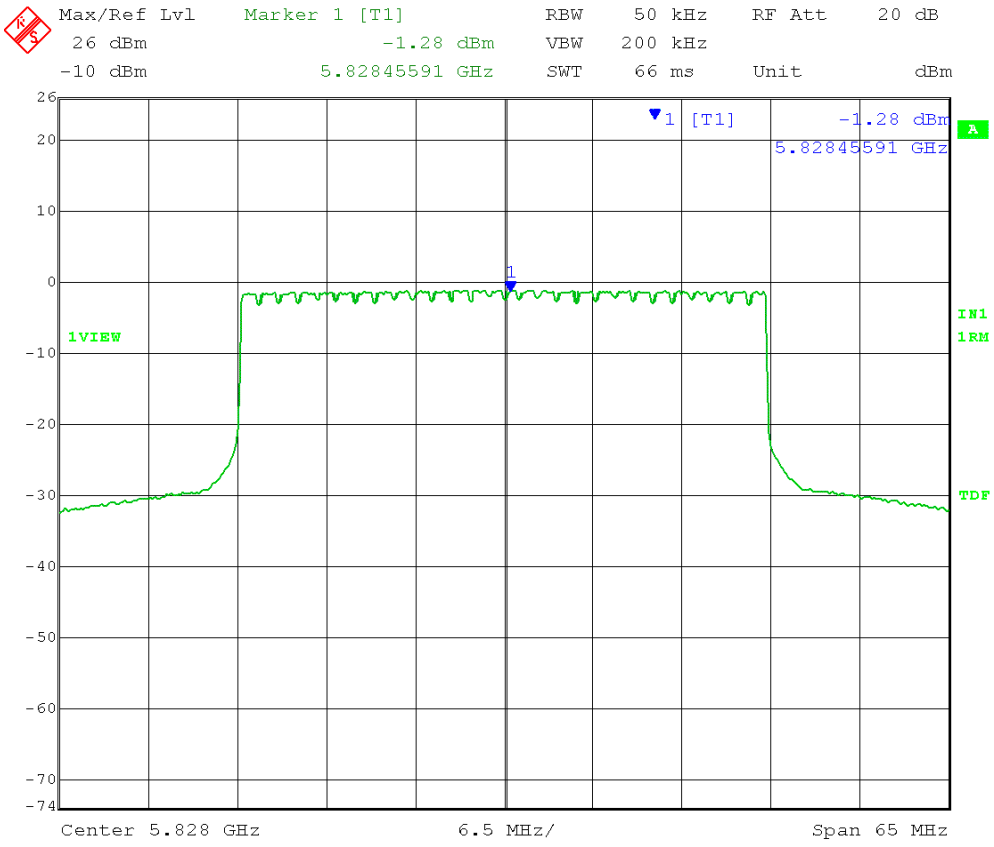
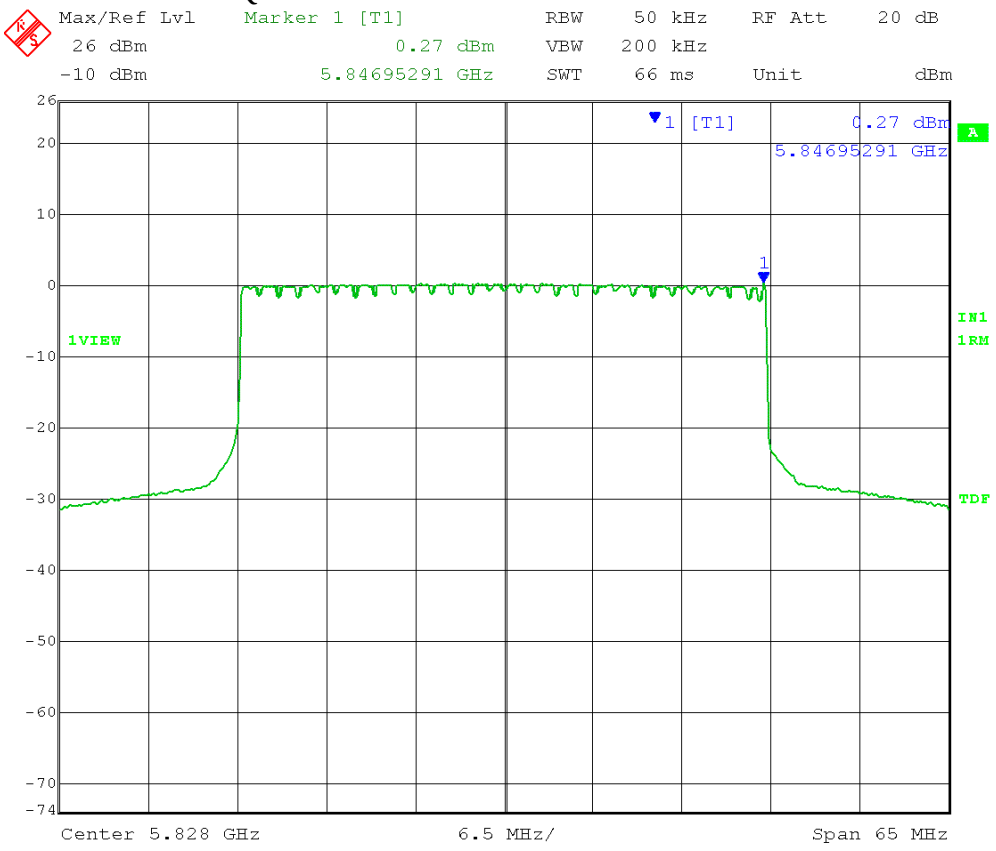


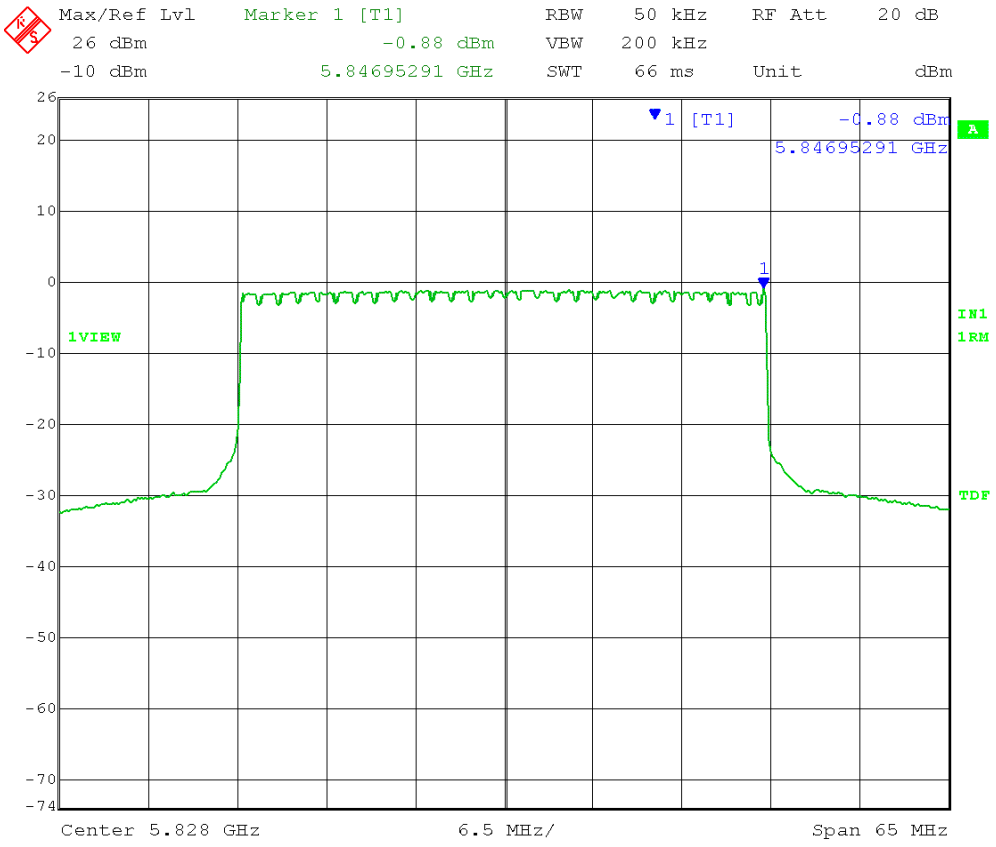

Date: 6.NOV.2013 13:57:55

## 40MHz HCH 256QAM TX0



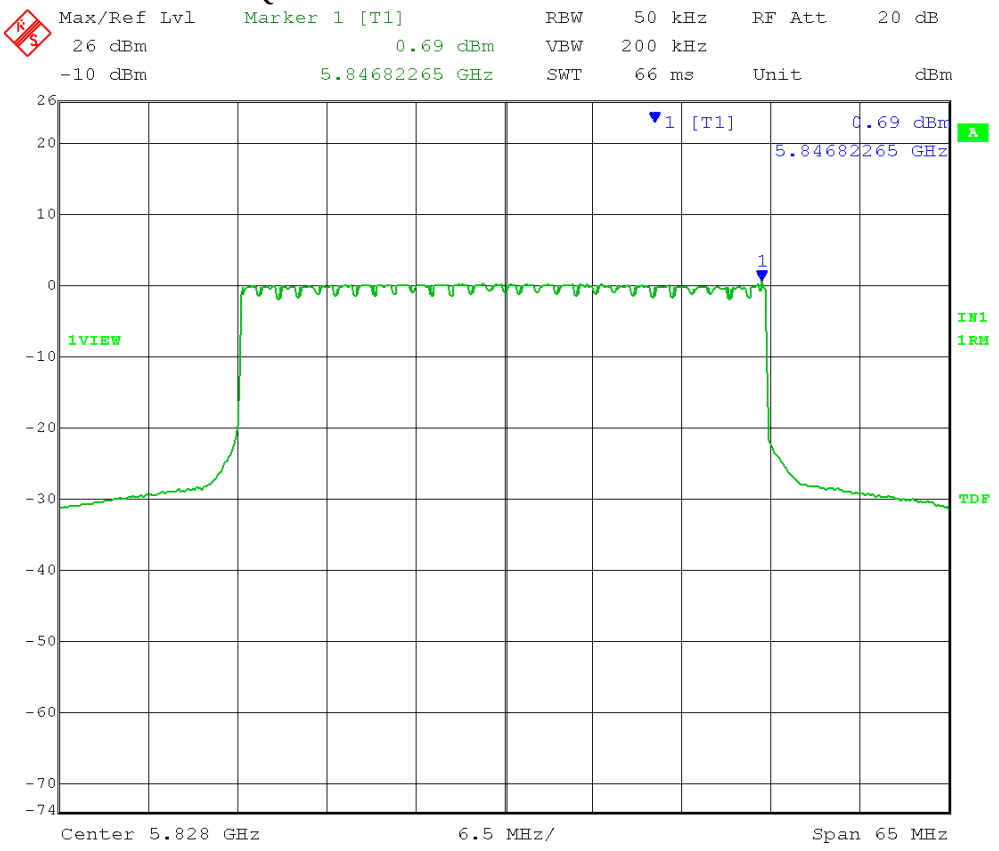

Date: 6.NOV.2013 14:34:40

## TX1



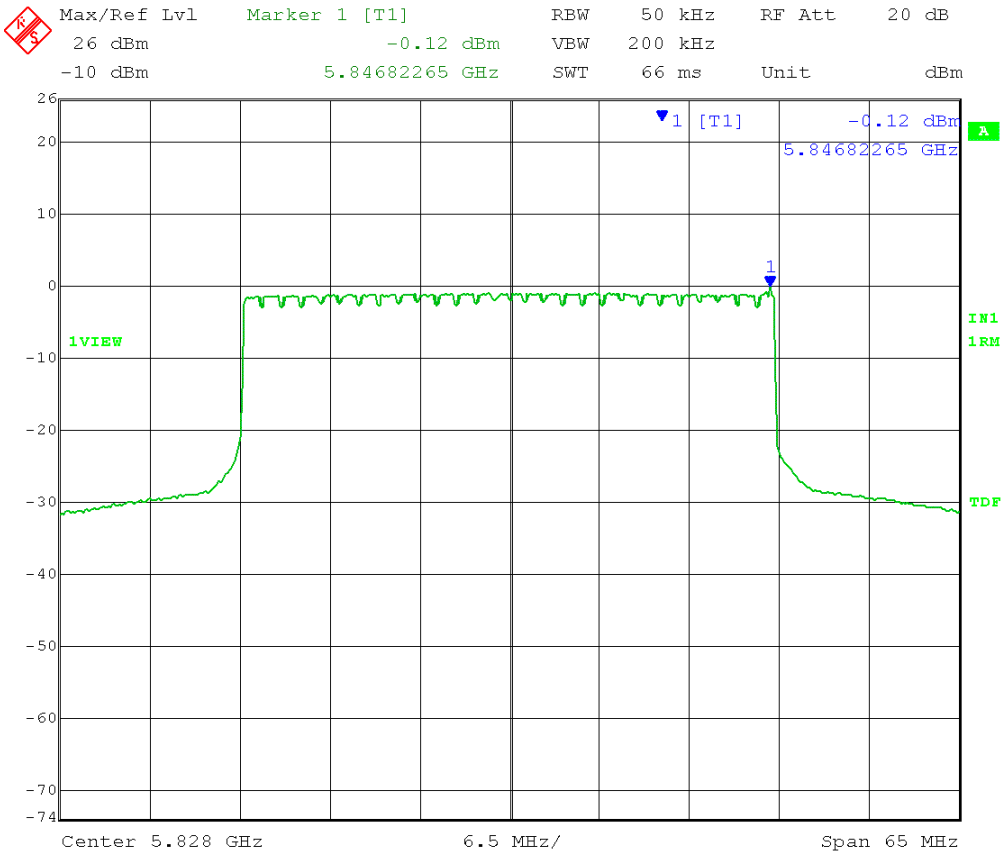

Date: 6.NOV.2013 13:58:24

40MHz HCH 1024QAM TX0



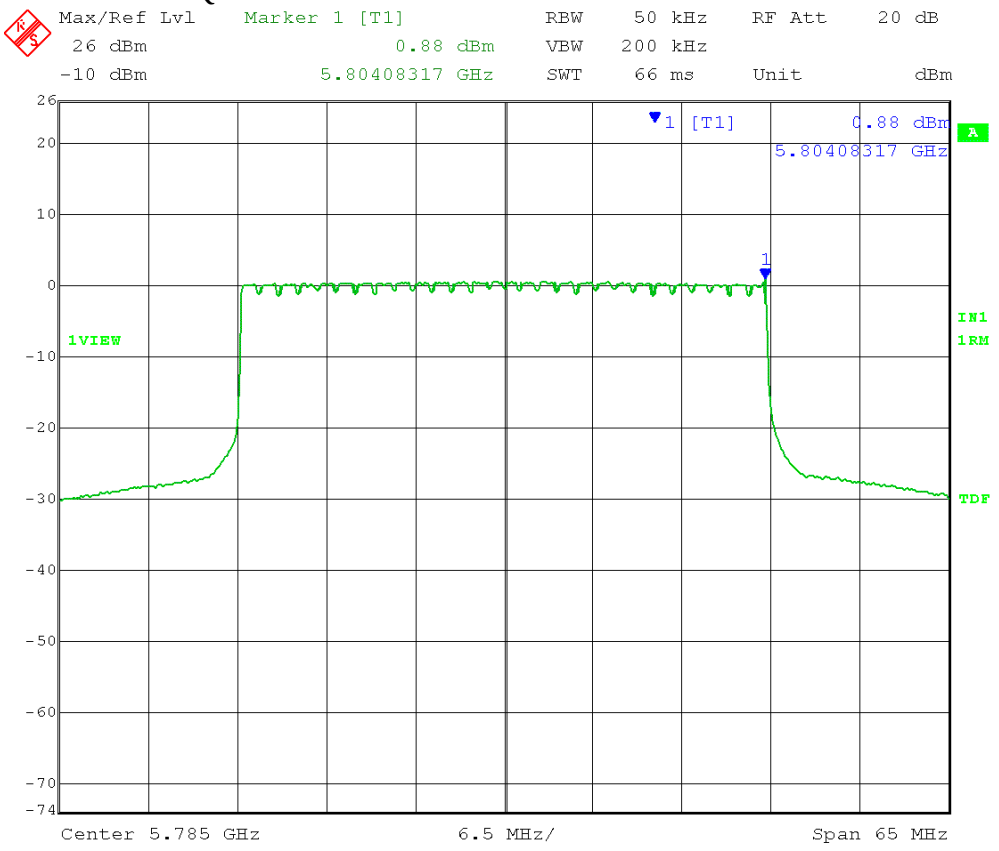

Date: 6.NOV.2013 14:35:09

TX1




Date: 6.NOV.2013 14:00:24

## 40MHz MCH QPSK TX0




Date: 6.NOV.2013 14:35:49

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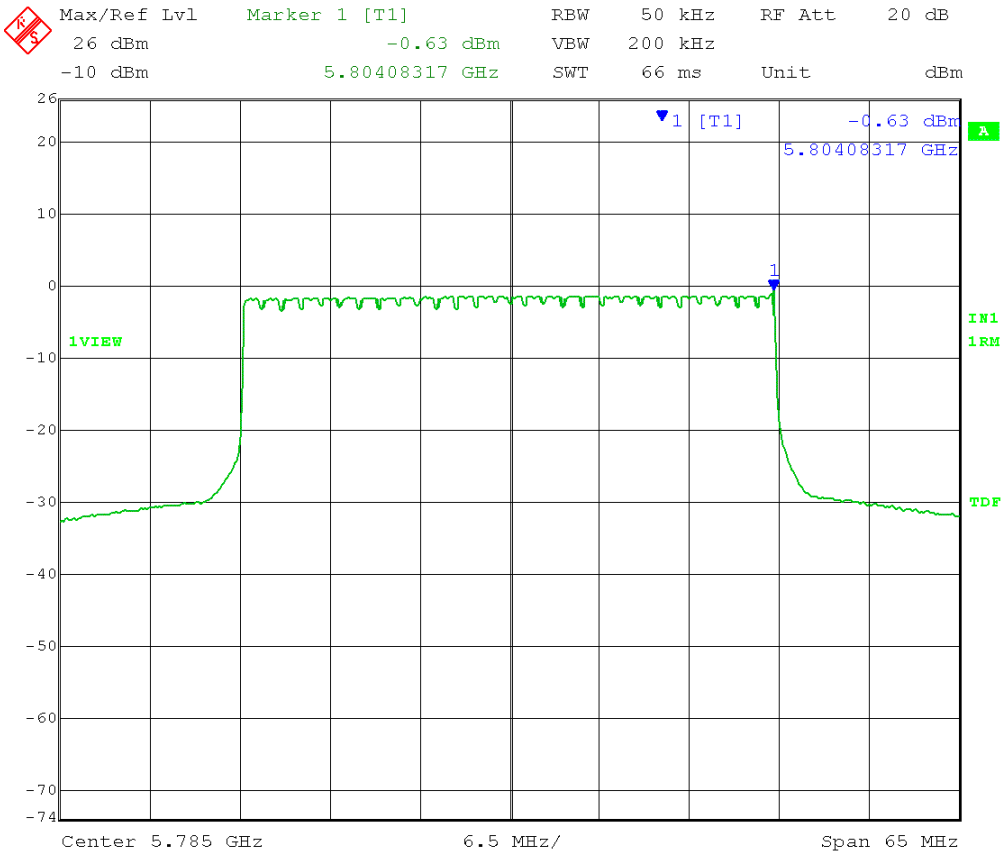
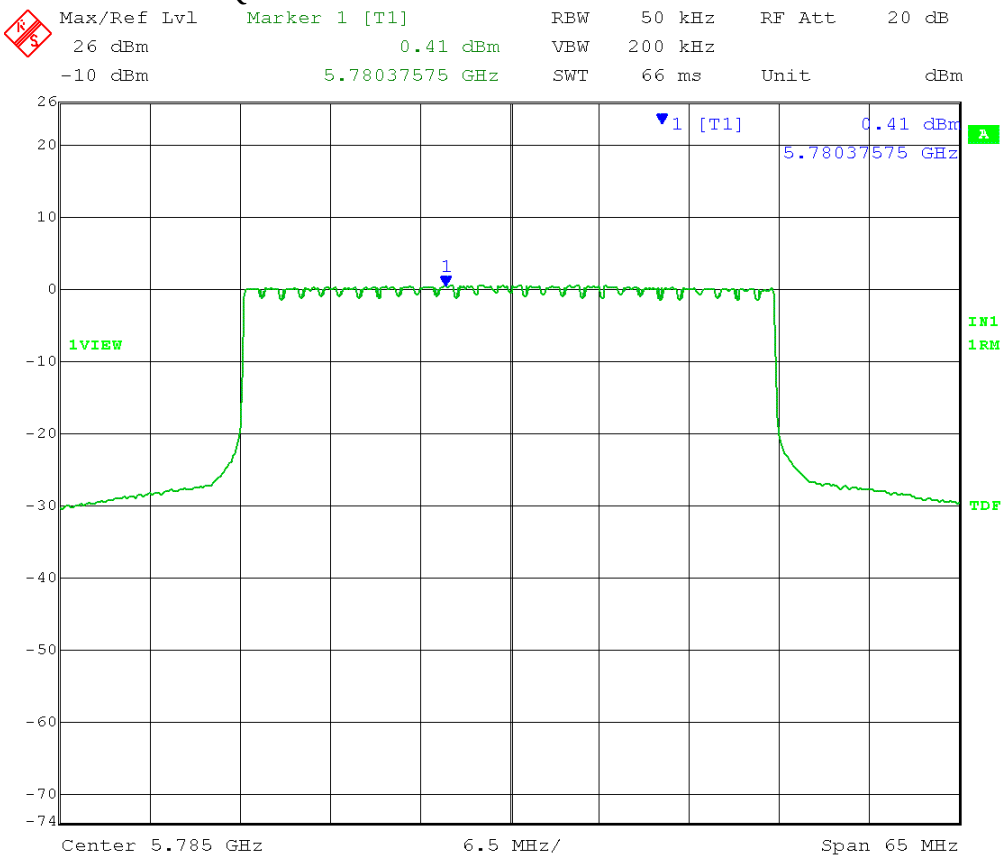


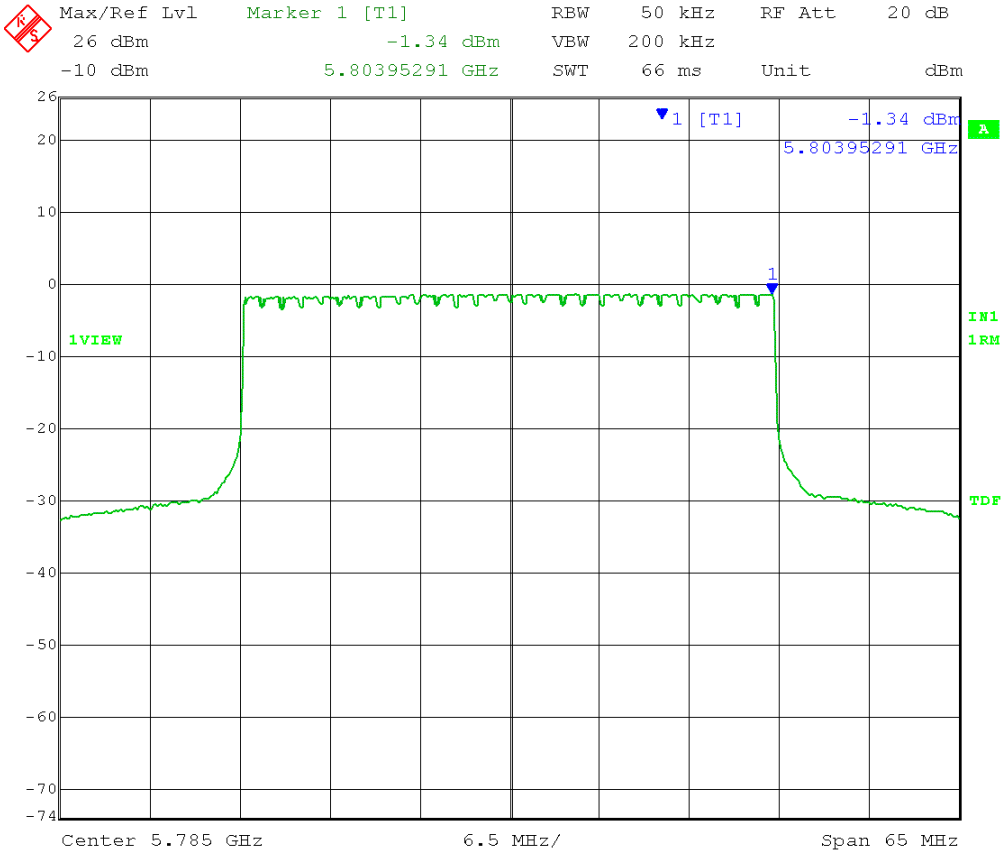

Date: 6.NOV.2013 14:01:41

40MHz MCH 16QAM TX0



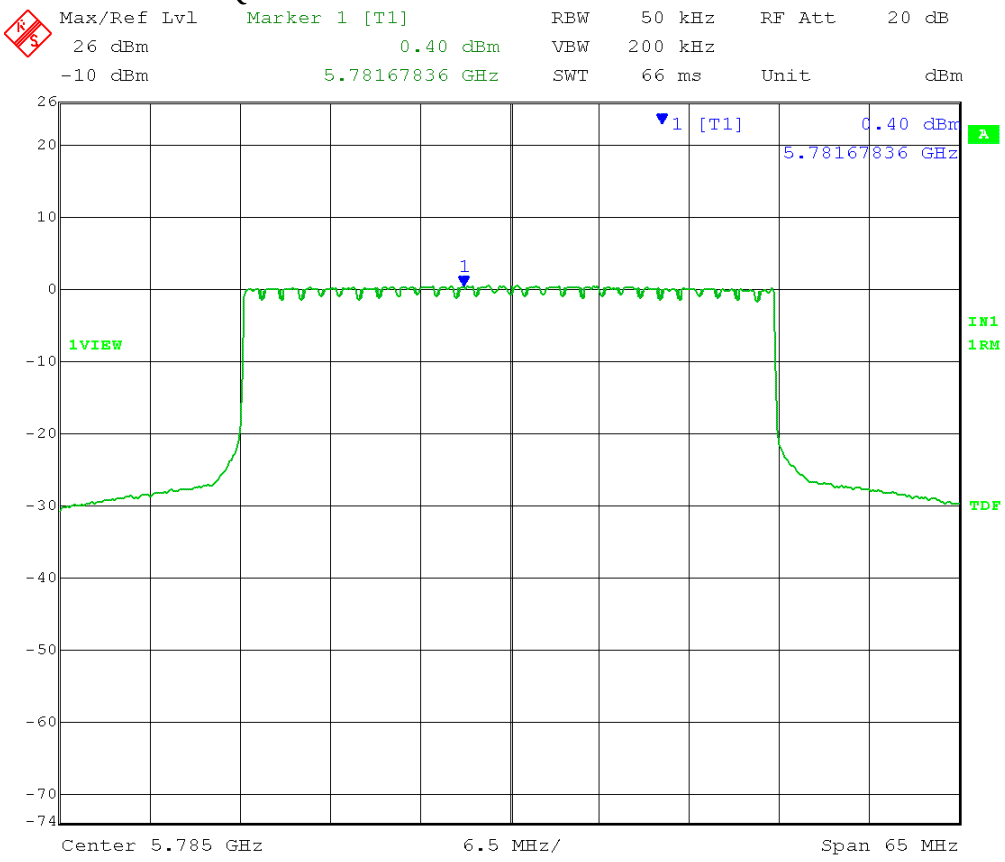

Date: 6.NOV.2013 14:36:20

TX1



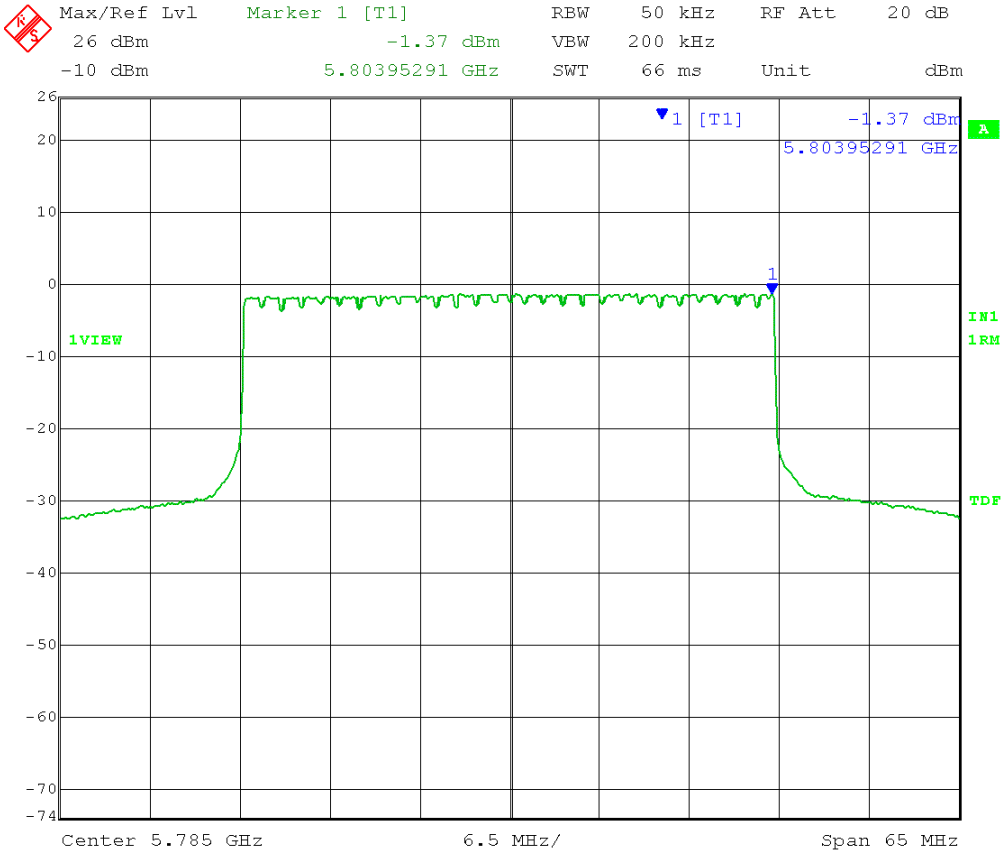

Date: 6.NOV.2013 14:02:09

40MHz MCH 64QAM TX0



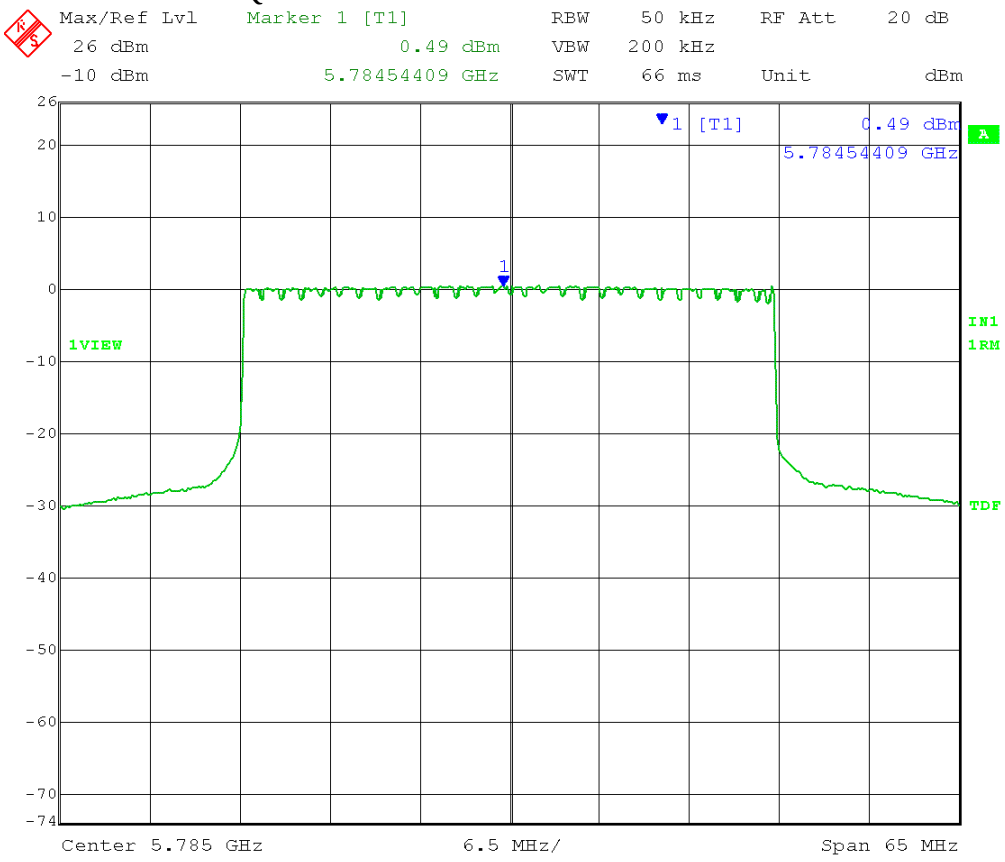

Date: 6.NOV.2013 14:36:50

TX1



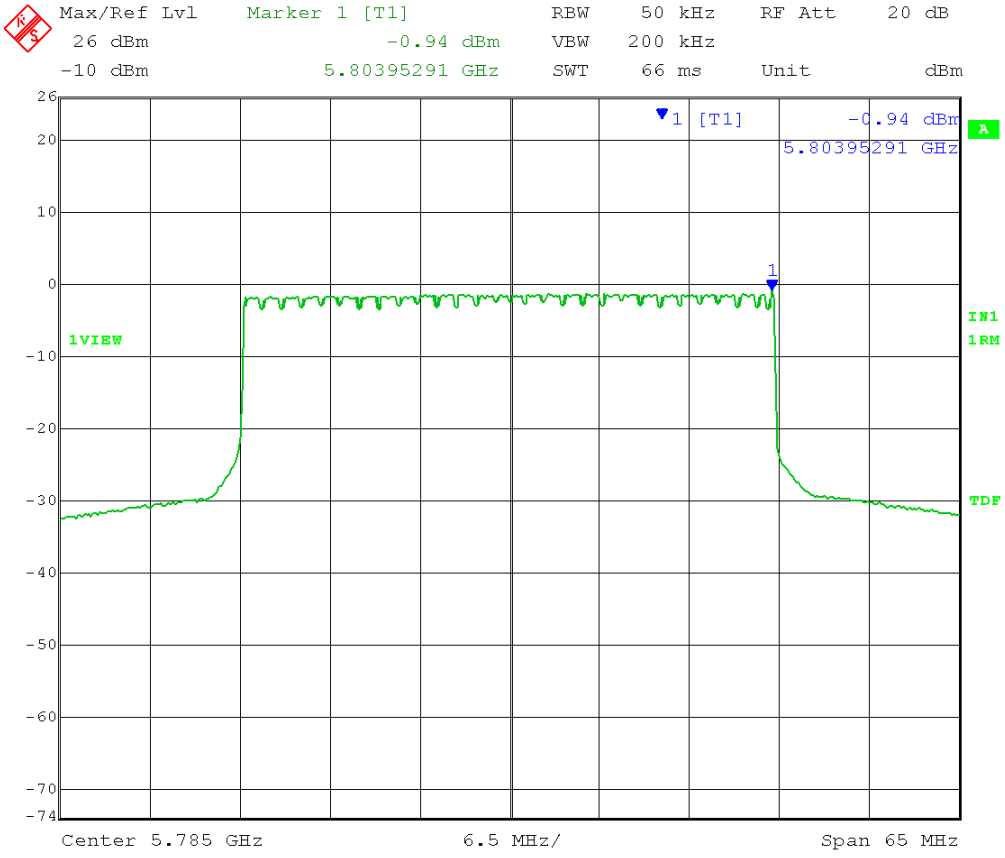

Date: 6.NOV.2013 14:02:46

## 40MHz MCH 256QAM TX0



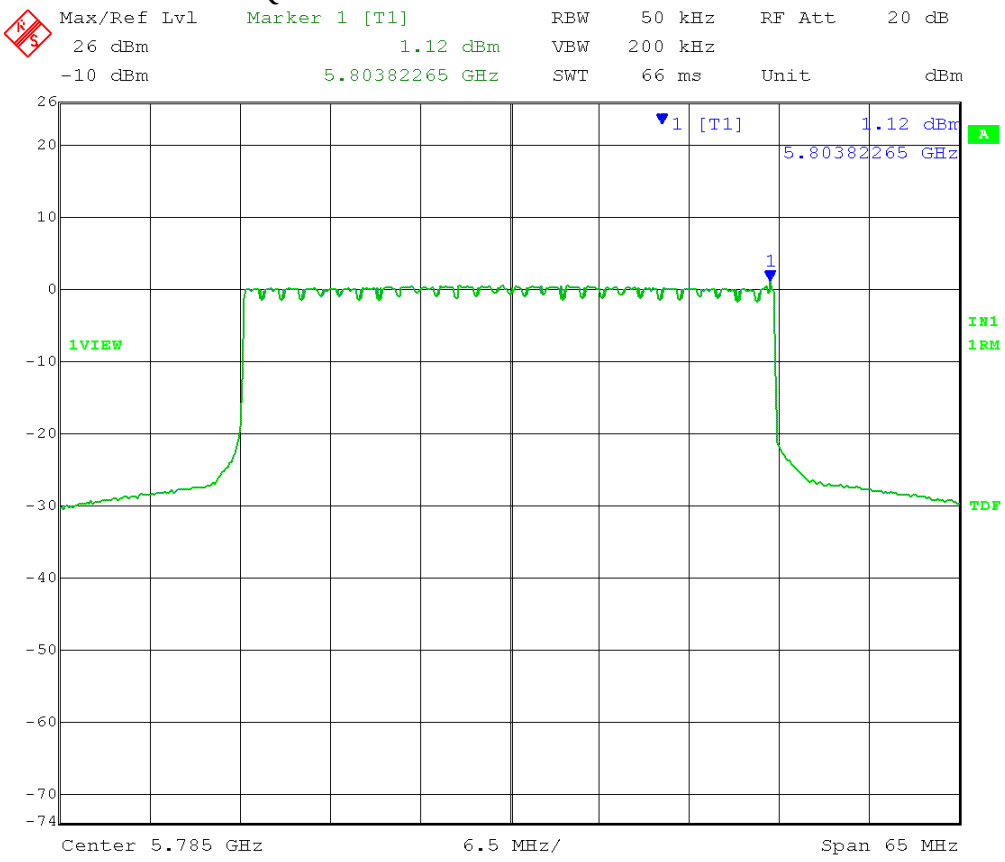

Date: 6.NOV.2013 14:37:20

## TX1



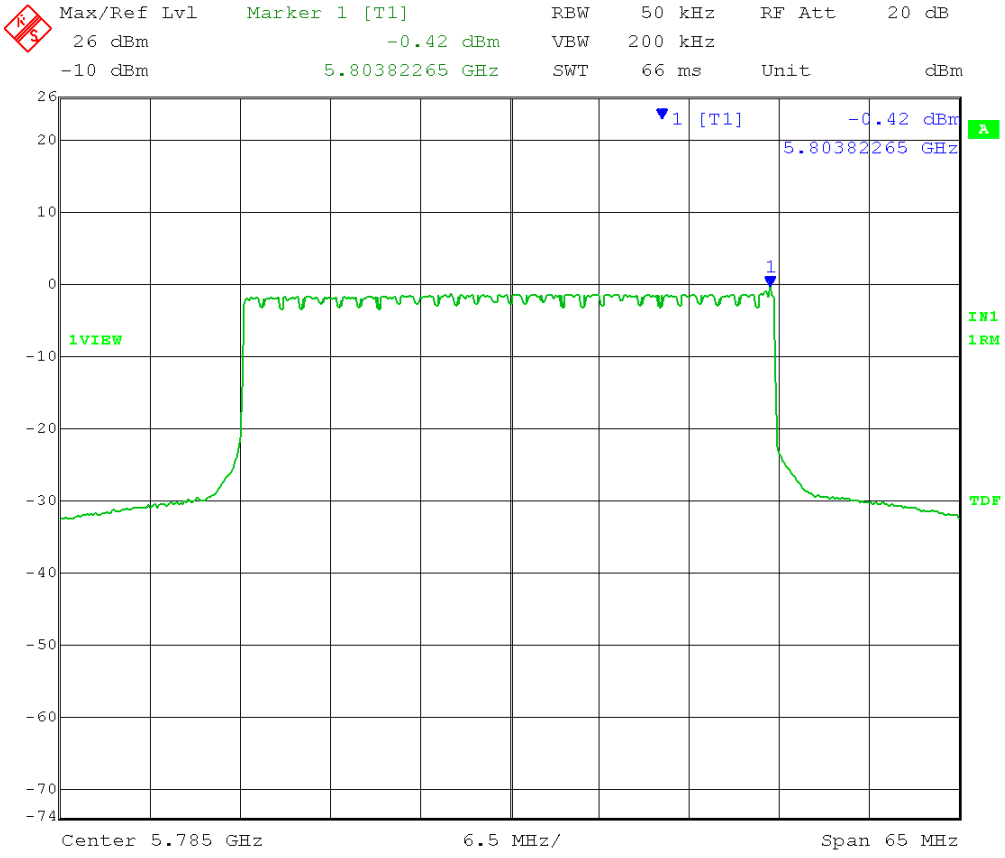

Date: 6.NOV.2013 14:03:18

40MHz MCH 1024QAM TX0



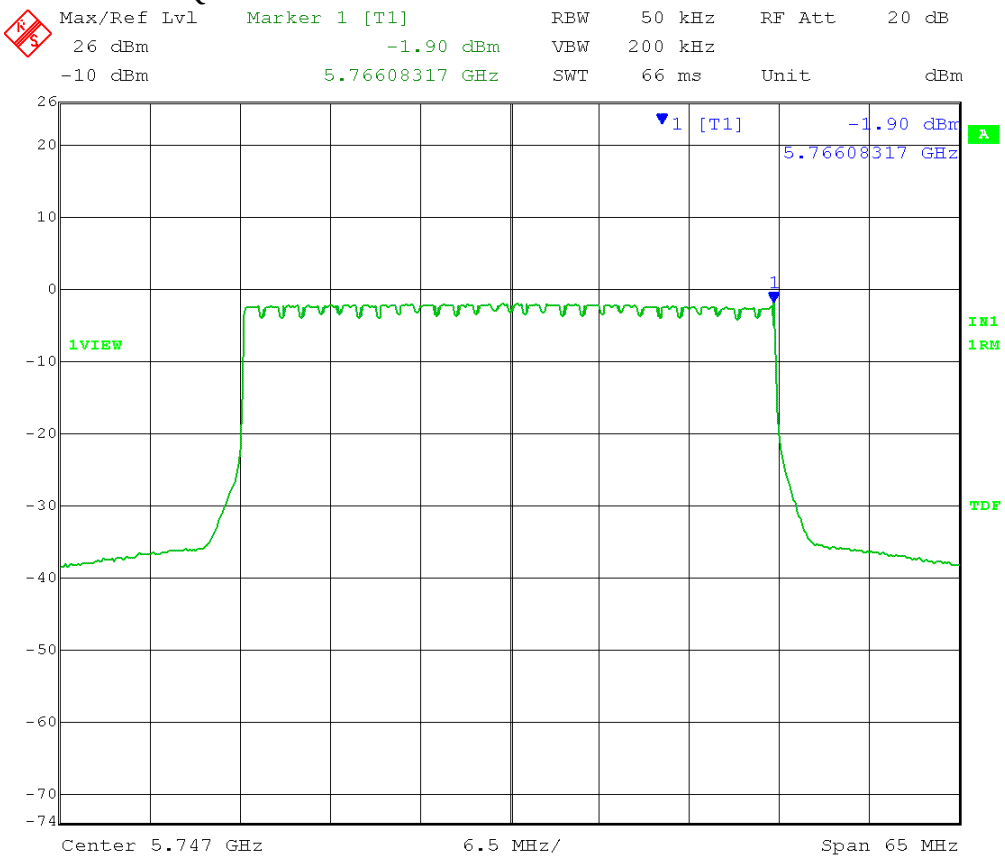

Date: 6.NOV.2013 14:37:54

TX1



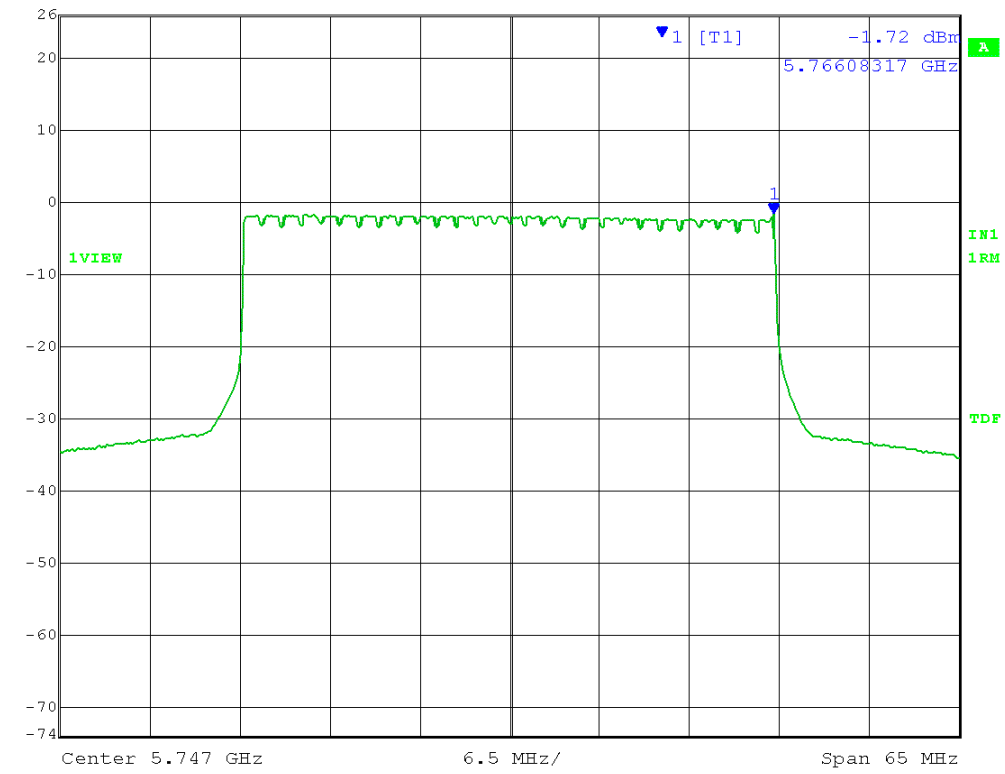

Date: 6.NOV.2013 14:03:46

40MHz LCH QPSK TX0



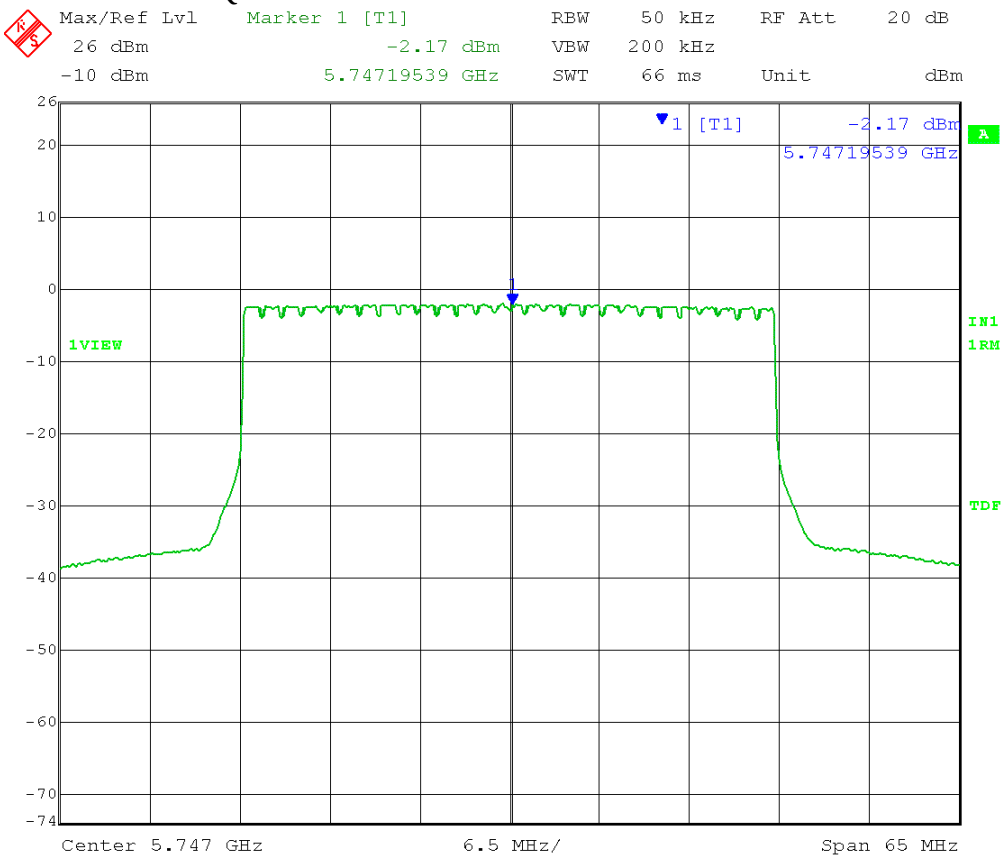

Date: 6.NOV.2013 14:38:41

TX1



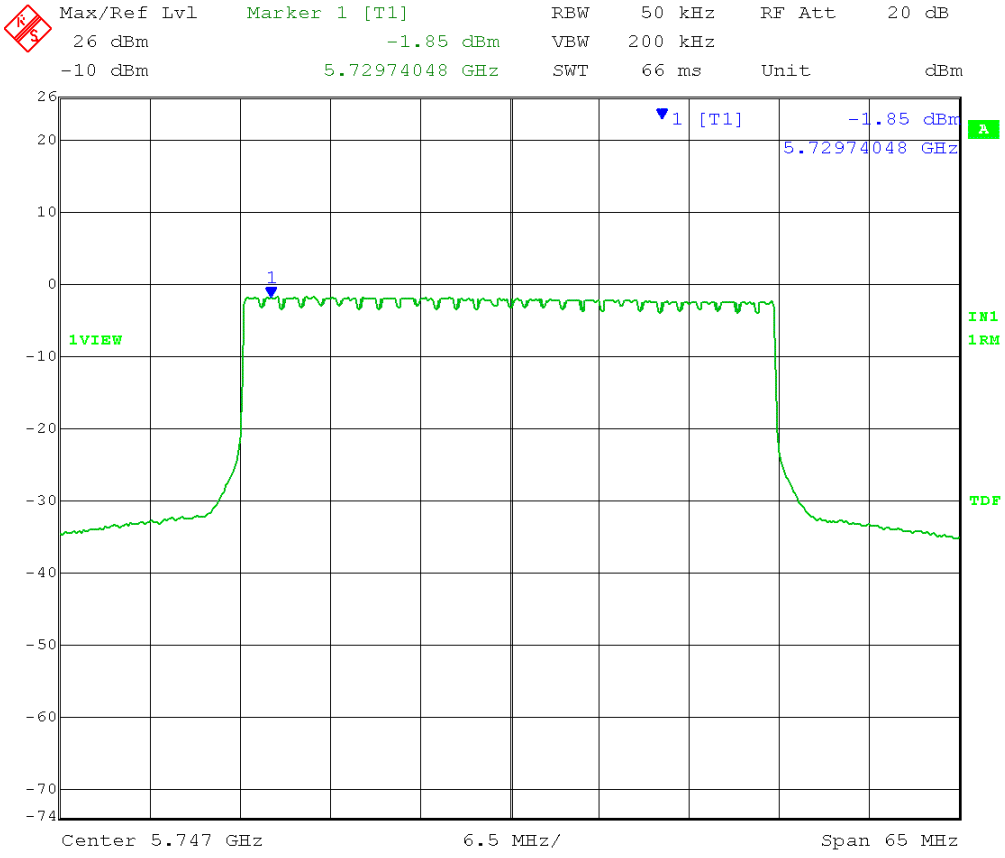

Date: 6.NOV.2013 14:05:06

40MHz LCH 16QAM TX0



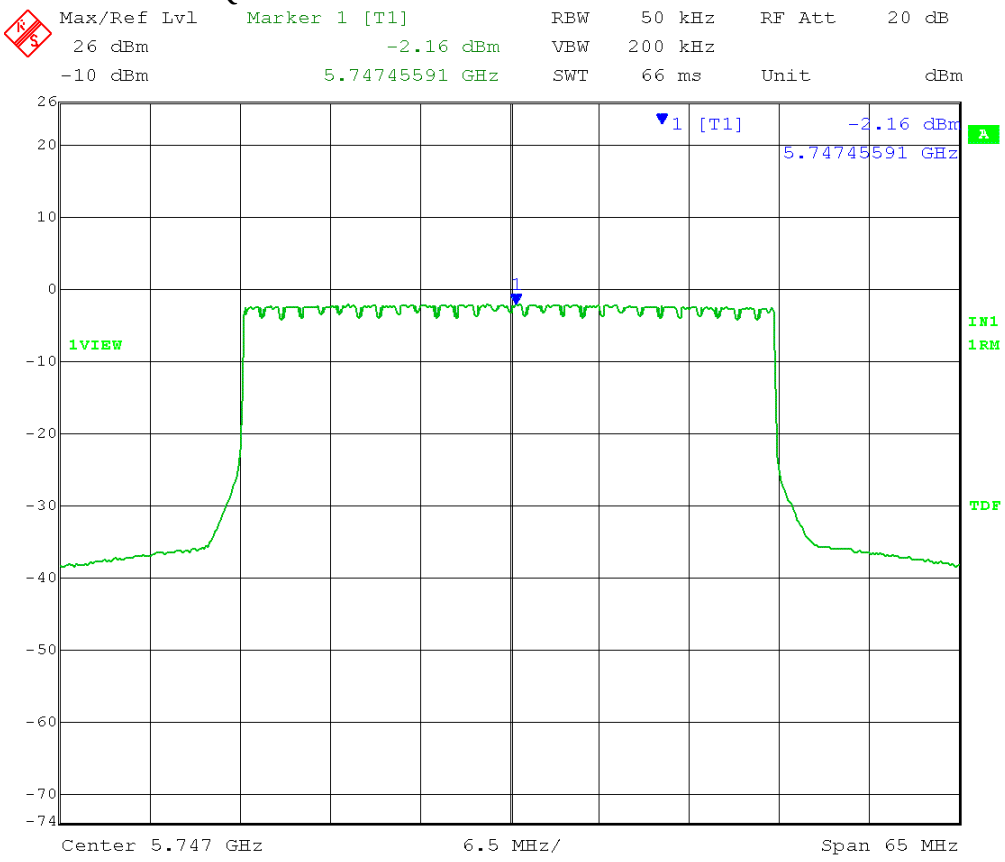

Date: 6.NOV.2013 14:39:17

TX1



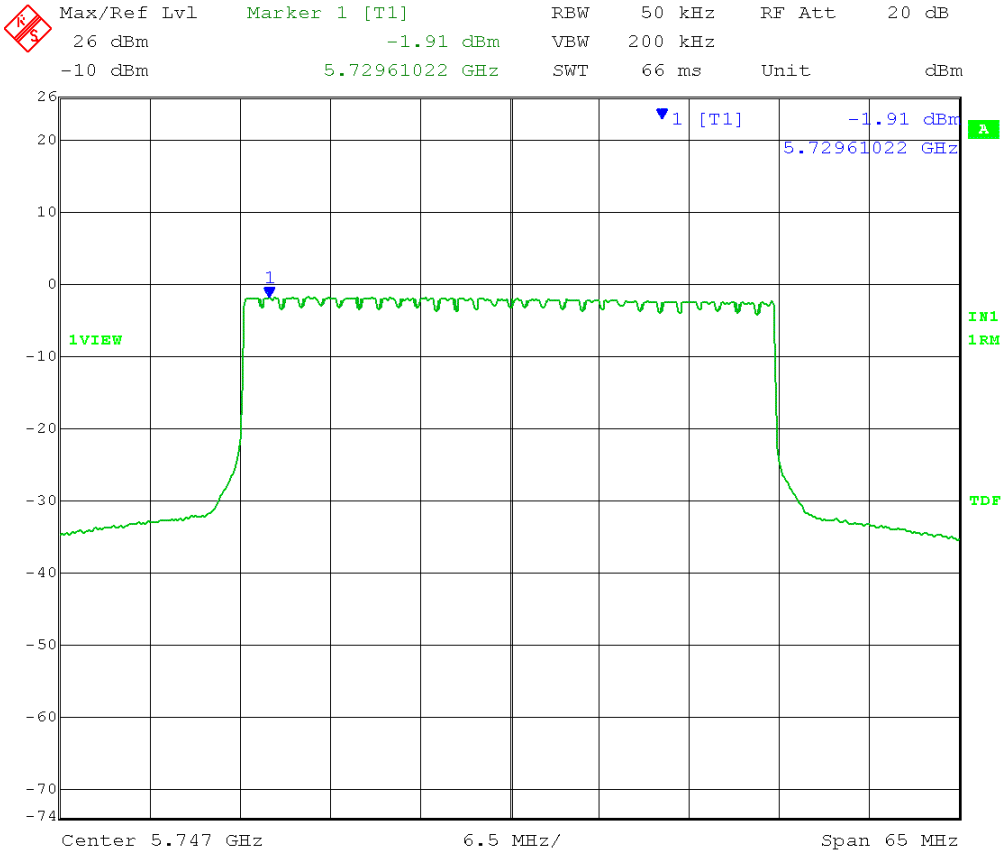

Date: 6.NOV.2013 14:05:35

40MHz LCH 64QAM TX0



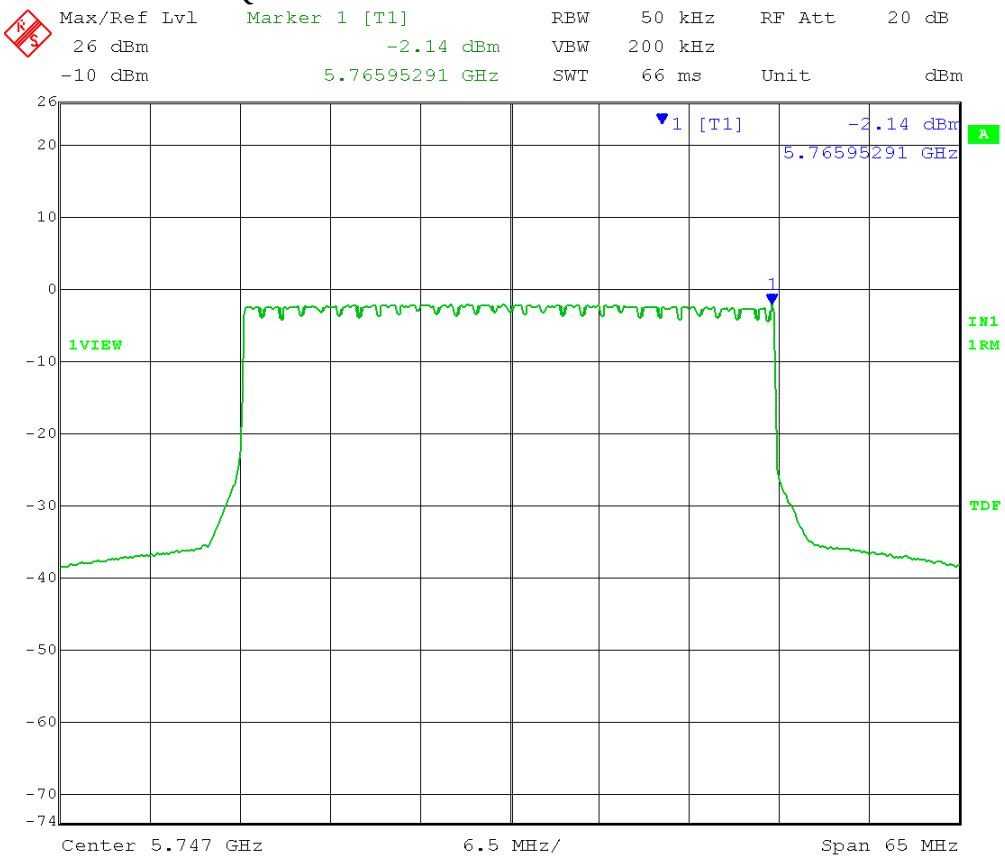

Date: 6.NOV.2013 14:39:51

TX1



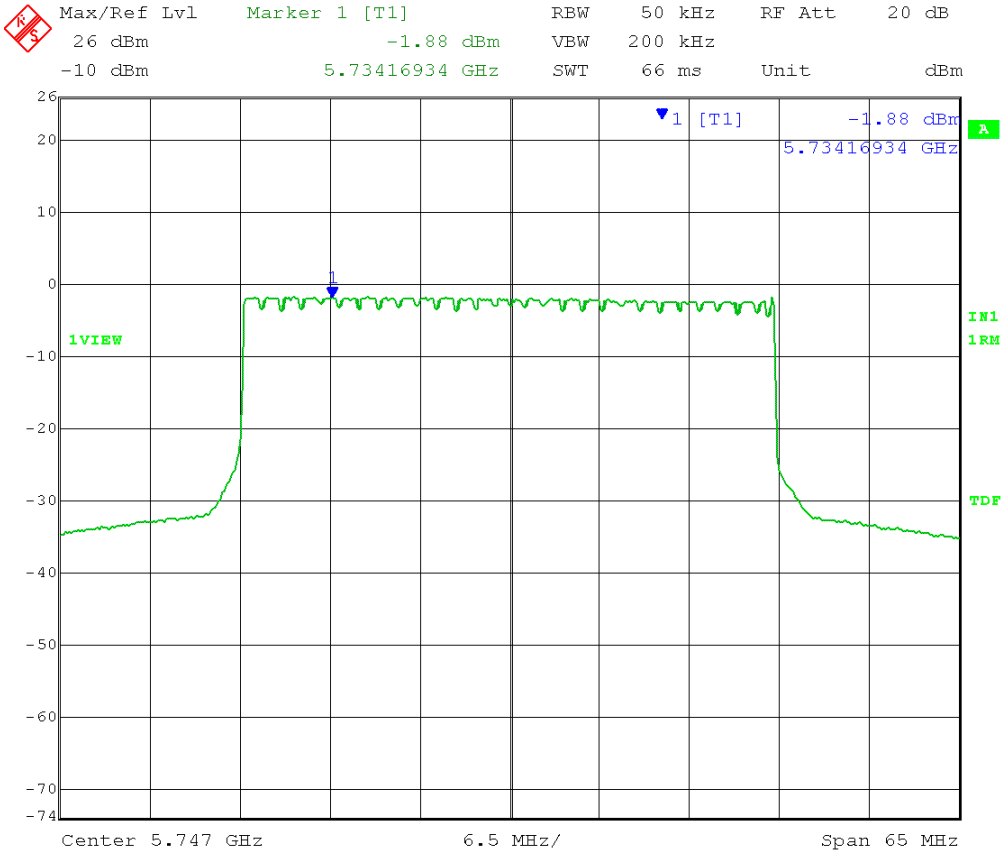

Date: 6.NOV.2013 14:06:04

40MHz LCH 256QAM TX0



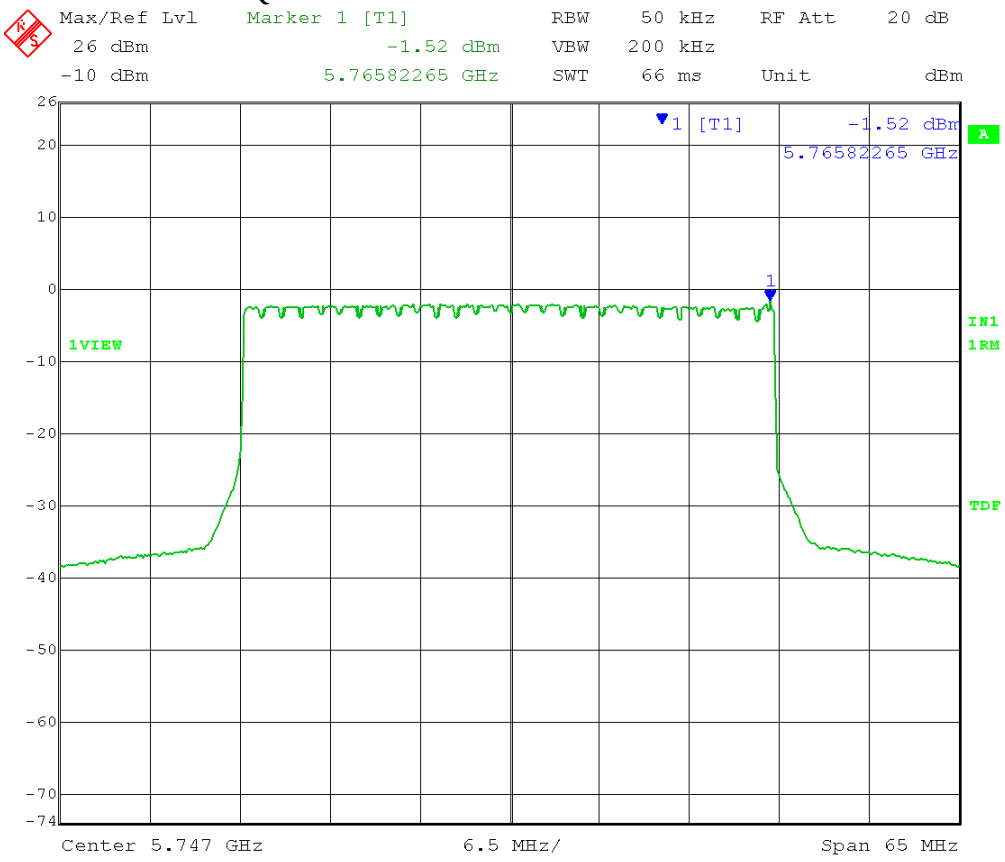

Date: 6.NOV.2013 14:40:22

TX1



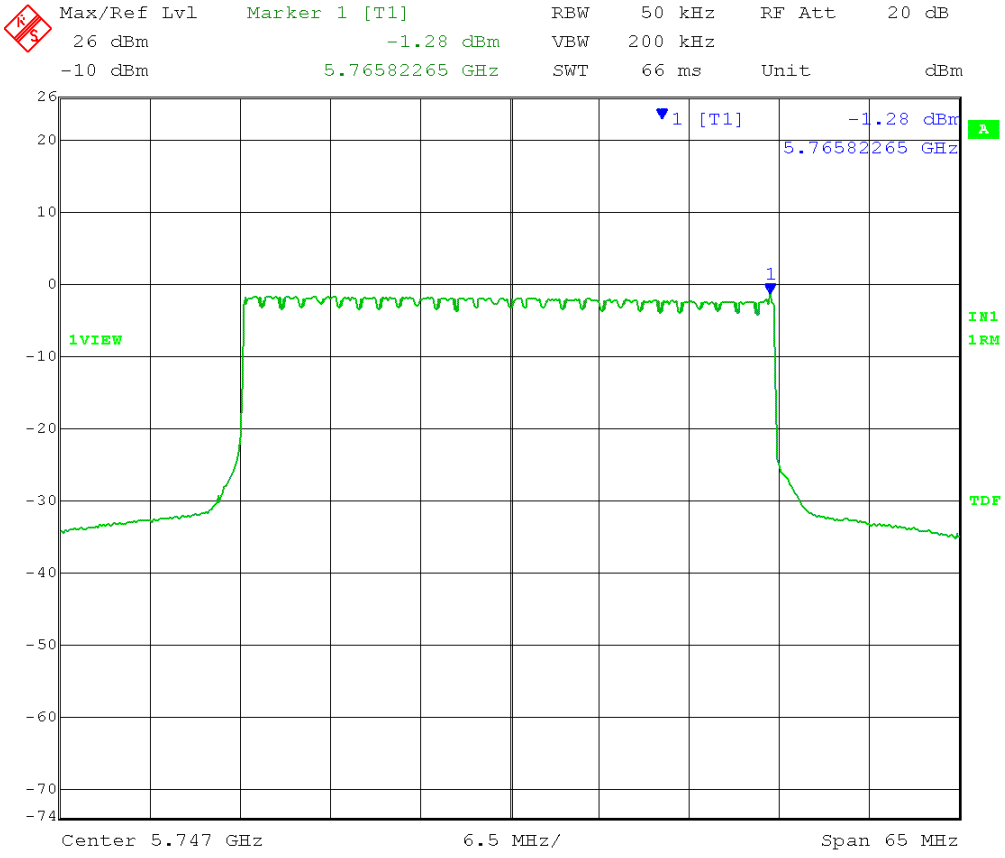

Date: 6.NOV.2013 14:06:33

40MHz LCH 1024QAM TX0




Date: 6.NOV.2013 14:40:56

TX1




Date: 6.NOV.2013 14:07:01

**Appendix – Measurement Data**

## 4.0 Maximum Unwanted Emission Levels – Radiated

**Rule Section**: FCC 15.247(d)

**Test Procedure**: FCC KDB 558074 D01 DTS Meas Guidance v03r01 – *Guidance for Performing Compliance Measurements on Digital Transmission Systems (DTS) Operating Under §15.247*

**11.0 -Emissions in non-restricted frequency bands**
**11.2 - Reference level measurement**
**11.3 - Emission level measurement**

**Description**:
RBW = 100 kHz
VBW ≥ 300 kHz
Span to ≥ 1.5 times the *DTS bandwidth* (Reference Level)
Set the center frequency and span to encompass frequency range to be measured. (Emission Level)
Detector = peak
Sweep = auto couple
Trace mode = max hold

Measurements were taken for QPSK, 16QAM, 64QAM, 256QAM and 1024 QAM modulations over a 10MHz, 20MHz, 40MHz and 50MHz modulation bandwidth at the low, mid and high channels of operation. EUT was set to transmit continuously over various frequencies and power settings.

**Limit:** 30 dB below maximum in-band average PSD level (maximum level in any 100 kHz band). Average output power procedure was used to measure the fundamental emission power

**Results:** Passed

**All non-restricted band emissions**

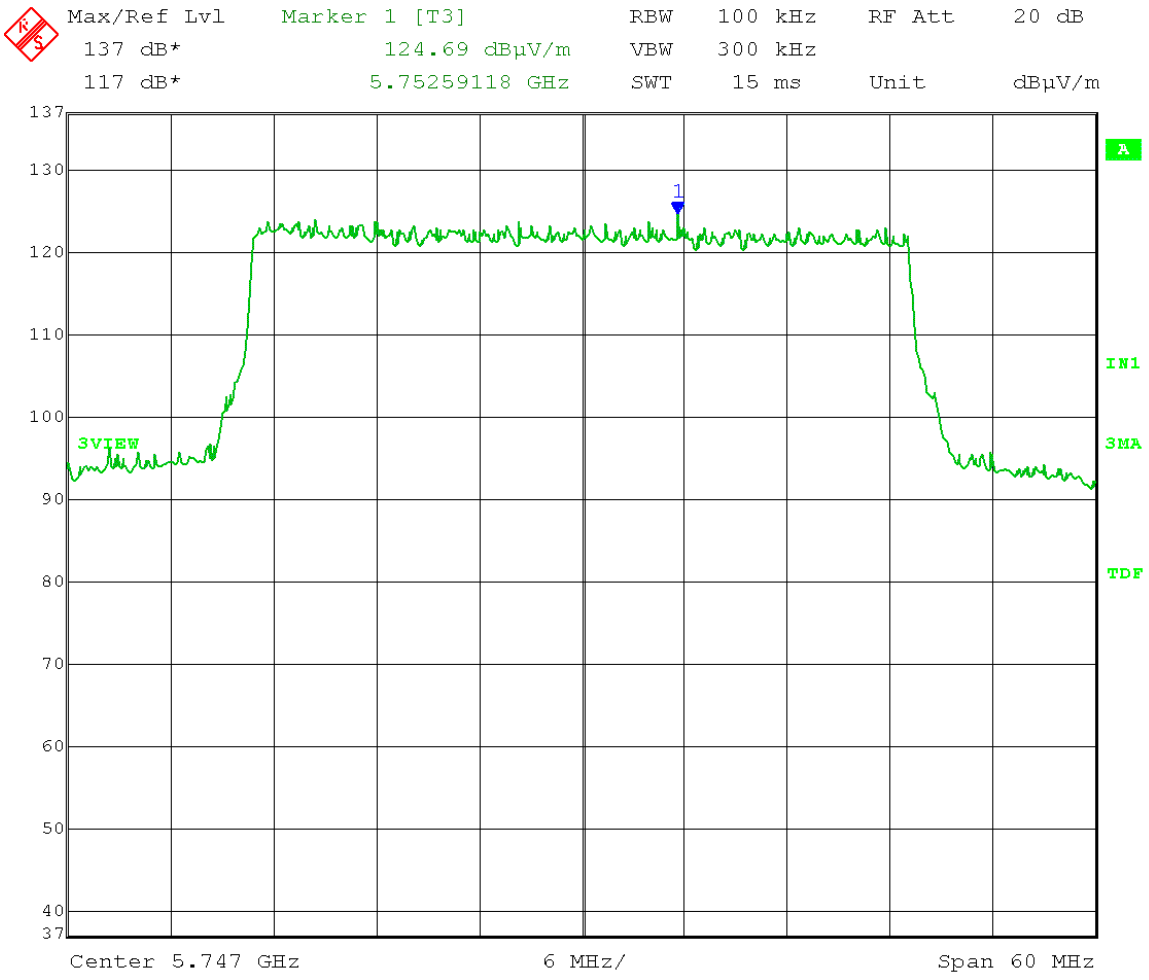
**30-1000 MHz**

**are more than 40 dB under the limit**

Test Date: 11-07-2013
Company: Ubiquiti Networks
EUT: Model AF5 - 40MHz BW
Test: Maximum Unwanted Emission Levels - Radiated
Operator: Craig B

Comment: RBW = 100 kHz
VBW ≥ 300 kHz
Span ≥ 1.5 the DTS bandwidth
Detector = Peak
Sweep = auto couple
Trace = max hold

Low Channel Transmit = 5.747 GHz
HORIZONTAL; 3 meter
Output power setting: 50 dBm eirp (Point-to-Point system)
**Reference Level** measurement
Limit = 124.69 dBµV/m – 30 dB = 94.69 dBµV/m

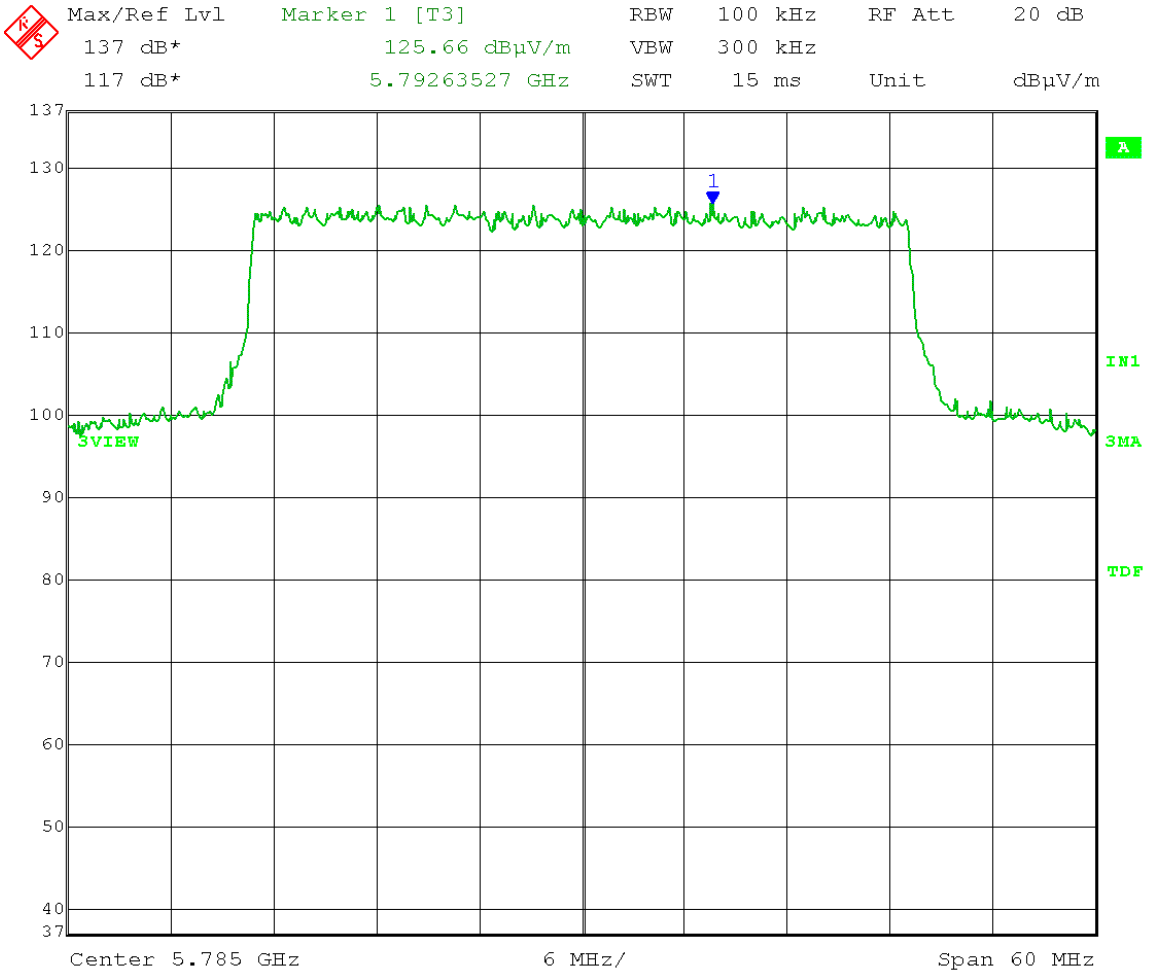



Date: 7.NOV.2013 10:41:35

Test Date: 11-07-2013
Company: Ubiquiti Networks
EUT: Model AF5 - 40MHz BW
Test: Maximum Unwanted Emission Levels - Radiated
Operator: Craig B

Comment: RBW = 100 kHz
VBW ≥ 300 kHz
Span ≥ 1.5 the DTS bandwidth
Detector = Peak
Sweep = auto couple
Trace = max hold

Mid Channel Transmit = 5.785 GHz
HORIZONTAL; 3 meter
Output power setting: 50 dBm eirp (Point-to-Point system)
**Reference Level** measurement
Limit = 125.66 dBµV/m – 30 dB = 95.66 dBµV/m

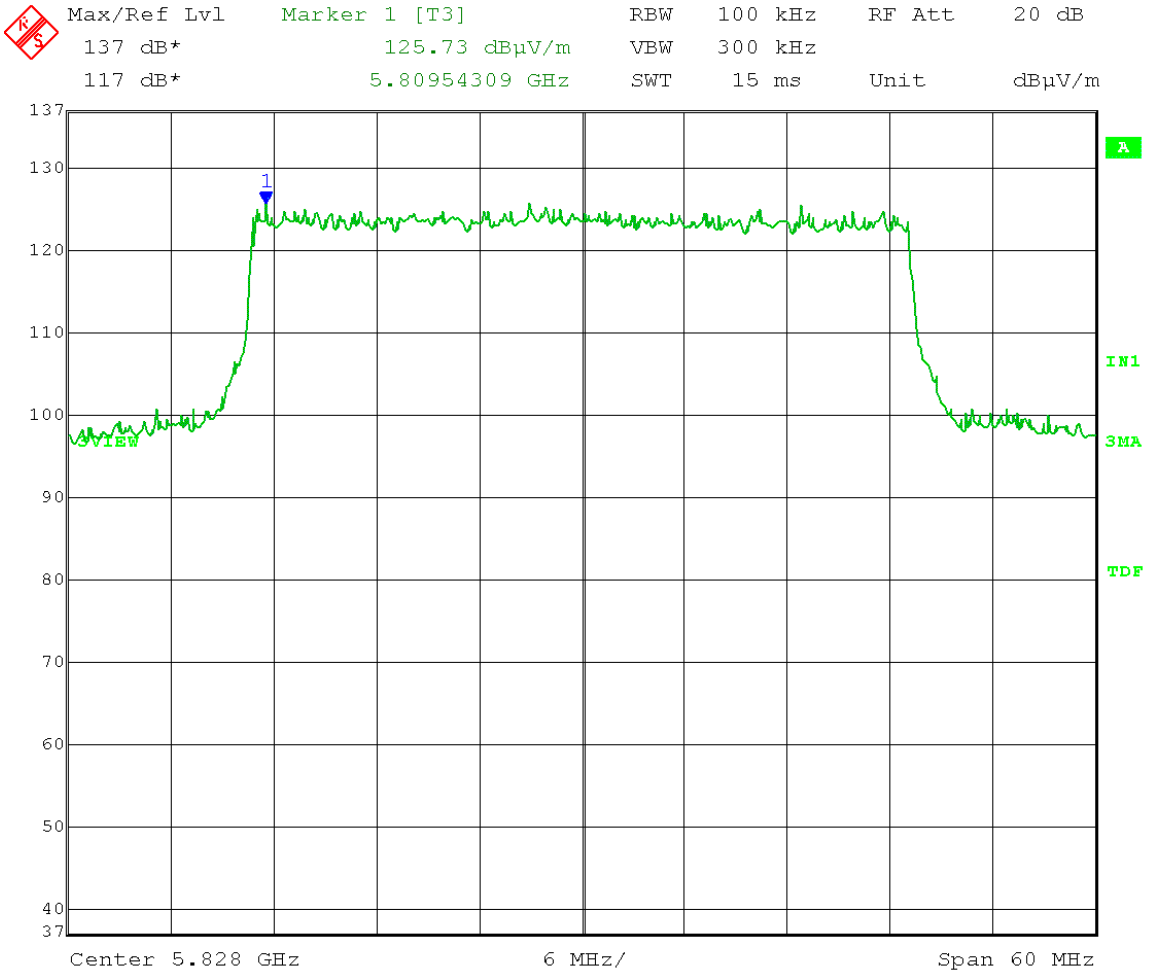



Date: 7.NOV.2013 10:38:40

Test Date: 11-07-2013
Company: Ubiquiti Networks
EUT: Model AF5 - 40MHz BW
Test: Maximum Unwanted Emission Levels - Radiated
Operator: Craig B

Comment: RBW = 100 kHz
VBW ≥ 300 kHz
Span ≥ 1.5 the DTS bandwidth
Detector = Peak
Sweep = auto couple
Trace = max hold

High Channel Transmit = 5.828 GHz
HORIZONTAL; 3 meter
Output power setting: 50 dBm eirp (Point-to-Point system)
**Reference Level** measurement
Limit = 125.73 dBµV/m – 30 dB = 95.73 dBµV/m



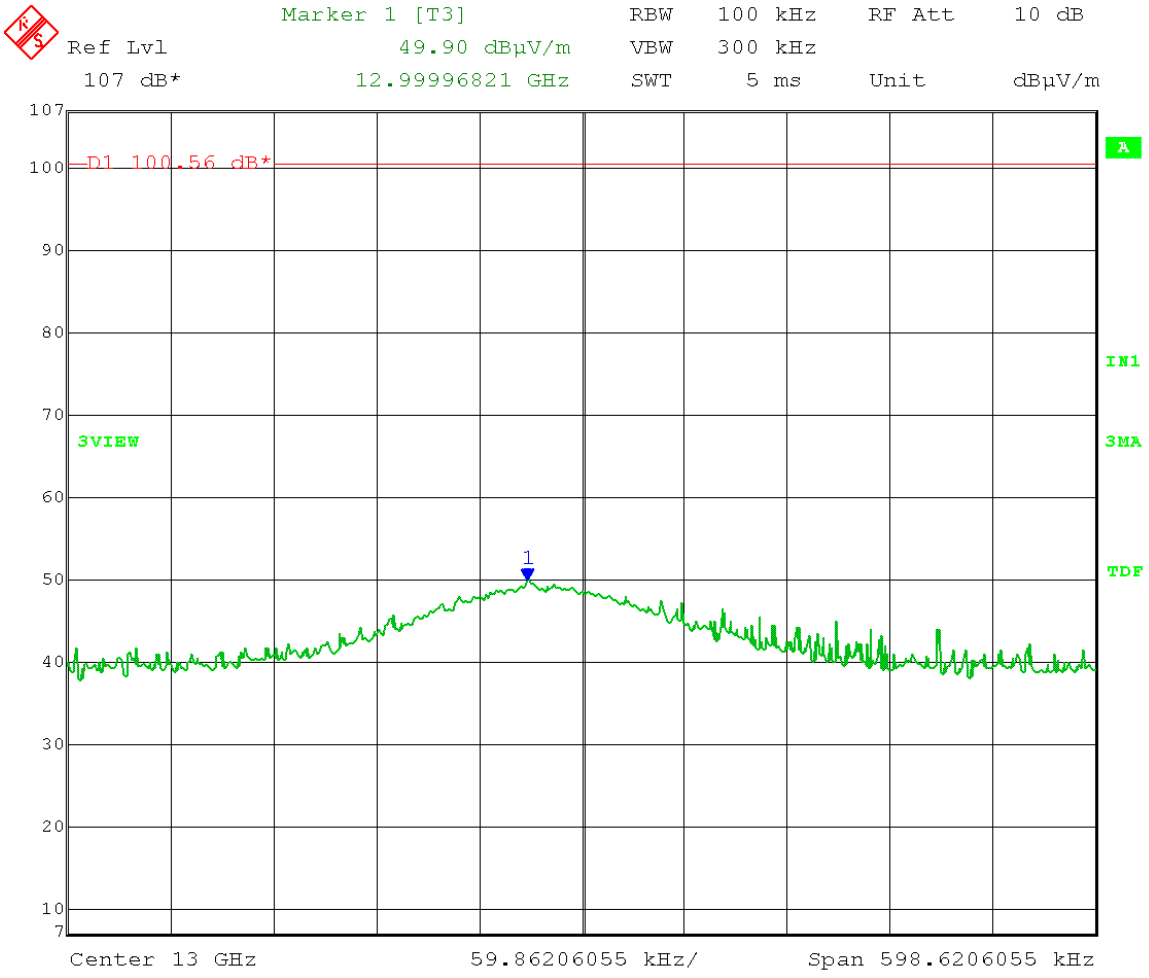

Date: 7.NOV.2013 10:34:33

Test Date: 11-07-2013 / 11-08-2013
Company: Ubiquiti Networks
EUT: Model AF5 - 40MHz BW
Test: Maximum Unwanted Emission Levels - Radiated
Operator: Craig B

Comment: RBW = 100 kHz
VBW ≥ 300 kHz
Detector = Peak
Sweep = auto couple
Trace = max hold

HORIZONTAL; 3 meter
Output power setting: 50 dBm eirp (Point-to-Point system)
**Emission Level** measurement
Limit = 124.69 dBµV/m – 30 dB = 94.69 dBµV/m

Same frequency and level on all channels (Low, Mid, and High)

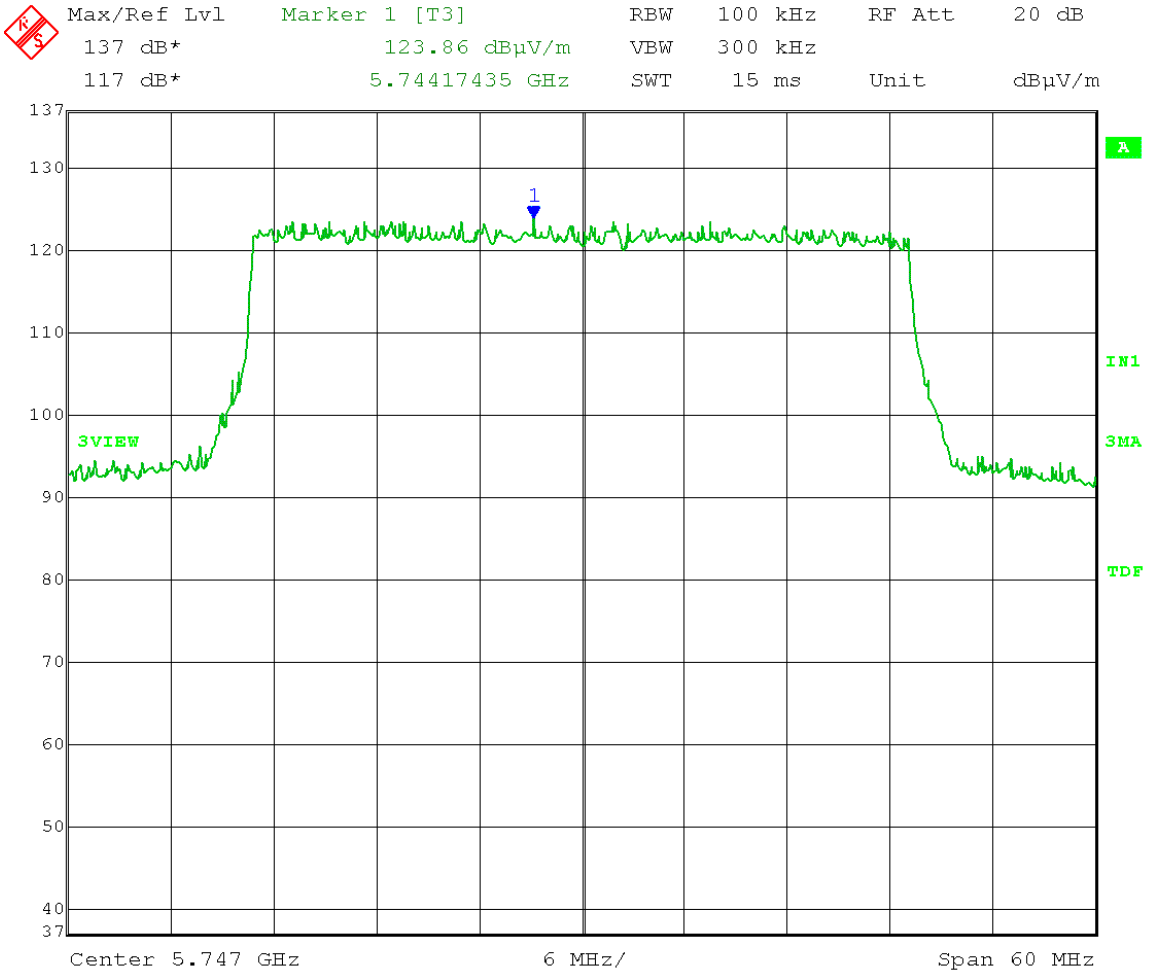



Date: 7.NOV.2013 12:22:59

Test Date: 11-07-2013
Company: Ubiquiti Networks
EUT: Model AF5 - 40MHz BW
Test: Maximum Unwanted Emission Levels - Radiated
Operator: Craig B

Comment: RBW = 100 kHz
VBW ≥ 300 kHz
Span ≥ 1.5 the DTS bandwidth
Detector = Peak
Sweep = auto couple
Trace = max hold

Low Channel Transmit = 5.747 GHz
VERTICAL; 3 meter
Output power setting: 50 dBm eirp (Point-to-Point system)
**Reference Level** measurement
Limit = 123.86 dBµV/m – 30 dB = 93.86 dBµV/m

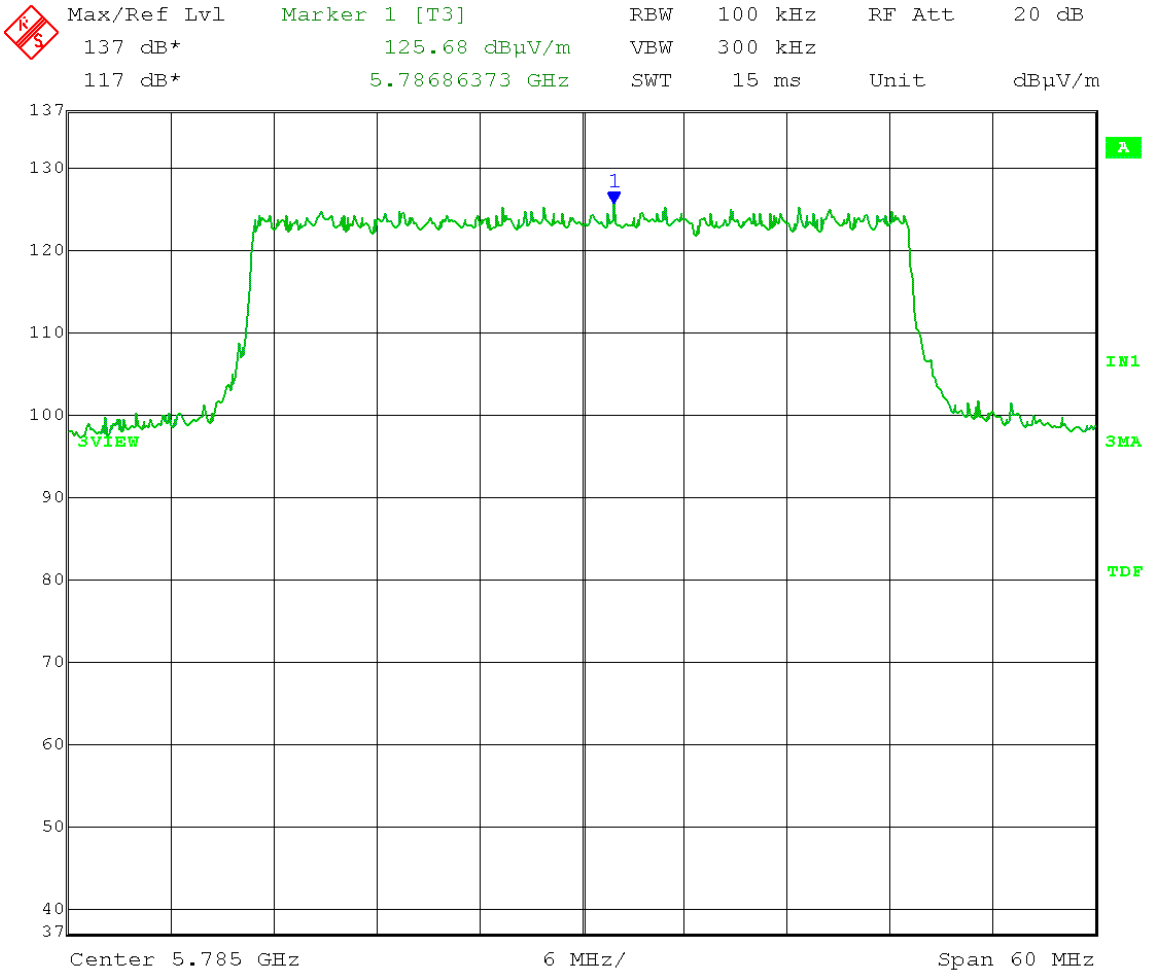



Date: 7.NOV.2013 10:14:16

Test Date: 11-07-2013
Company: Ubiquiti Networks
EUT: Model AF5 - 40MHz BW
Test: Maximum Unwanted Emission Levels - Radiated
Operator: Craig B

Comment: RBW = 100 kHz
VBW ≥ 300 kHz
Span ≥ 1.5 the DTS bandwidth
Detector = Peak
Sweep = auto couple
Trace = max hold

Mid Channel Transmit = 5.785 GHz
VERTICAL; 3 meter
Output power setting: 50 dBm eirp (Point-to-Point system)
**Reference Level** measurement
Limit = 125.68 dBµV/m – 30 dB = 95.68 dBµV/m

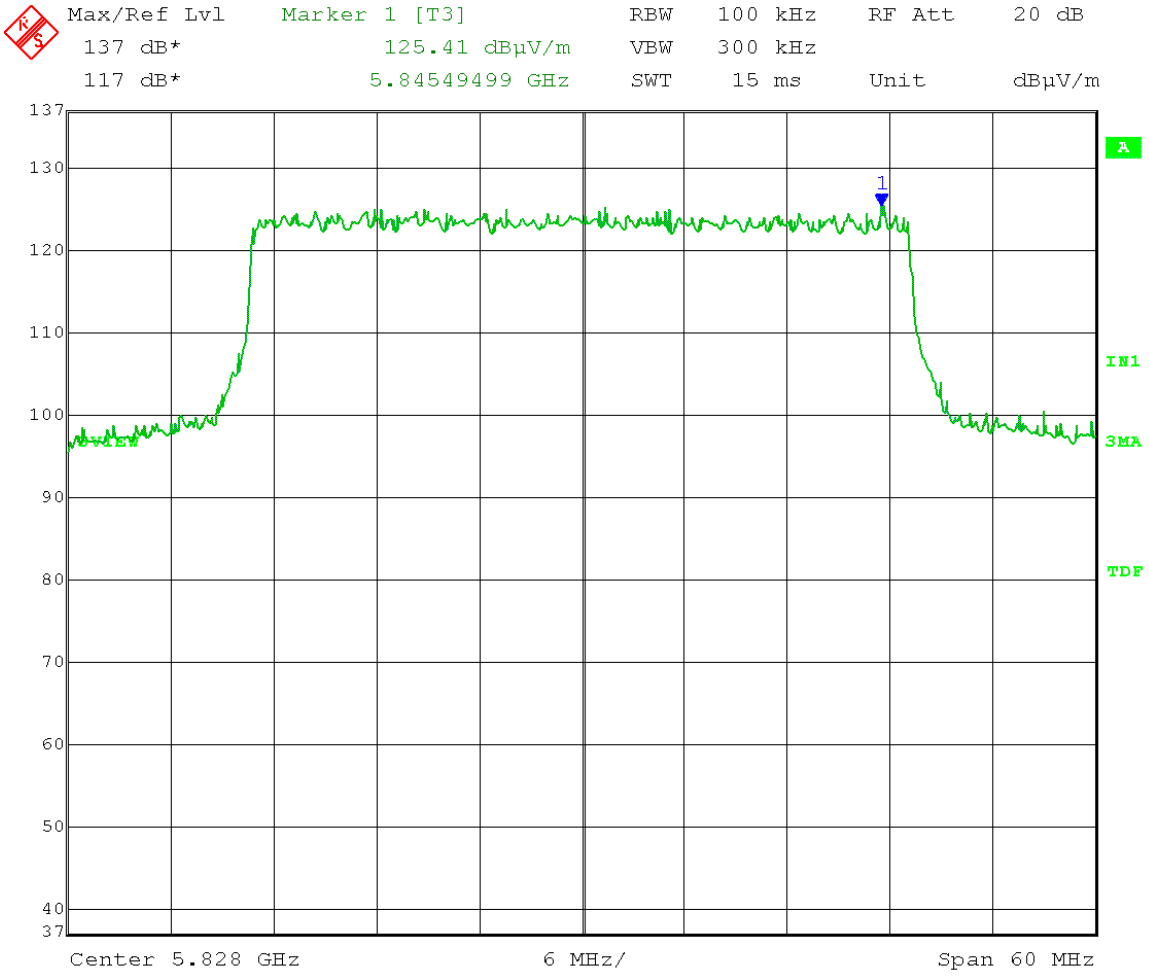



Date: 7.NOV.2013 10:17:40

Test Date: 11-07-2013
Company: Ubiquiti Networks
EUT: Model AF5 - 40MHz BW
Test: Maximum Unwanted Emission Levels - Radiated
Operator: Craig B

Comment: RBW = 100 kHz
VBW ≥ 300 kHz
Span ≥ 1.5 the DTS bandwidth
Detector = Peak
Sweep = auto couple
Trace = max hold

High Channel Transmit = 5.828 GHz
VERTICAL; 3 meter
Output power setting: 50 dBm eirp (Point-to-Point system)
**Reference Level** measurement
Limit = 125.41 dBµV/m – 30 dB = 95.41 dBµV/m



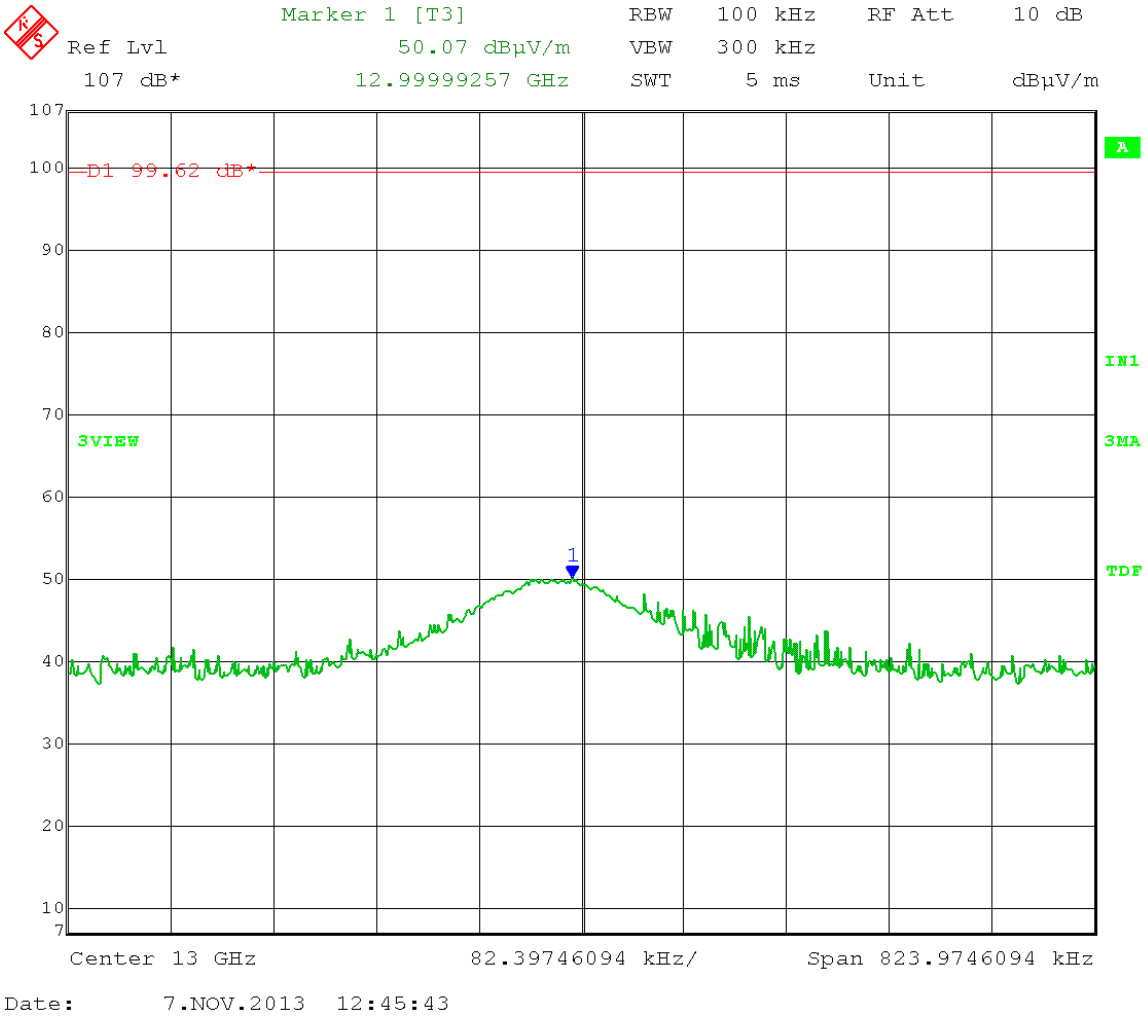

Date: 7.NOV.2013 10:28:51

Test Date: 11-07-2013 / 11-08-2013
Company: Ubiquiti Networks
EUT: Model AF5 - 40MHz BW
Test: Maximum Unwanted Emission Levels - Radiated
Operator: Craig B

Comment: RBW = 100 kHz
VBW ≥ 300 kHz
Detector = Peak
Sweep = auto couple
Trace = max hold

VERTICAL; 3 meter
Output power setting: 50 dBm eirp (Point-to-Point system)
**Emission Level** measurement
Limit = 123.86 dBµV/m – 30 dB = 93.86 dBµV/m

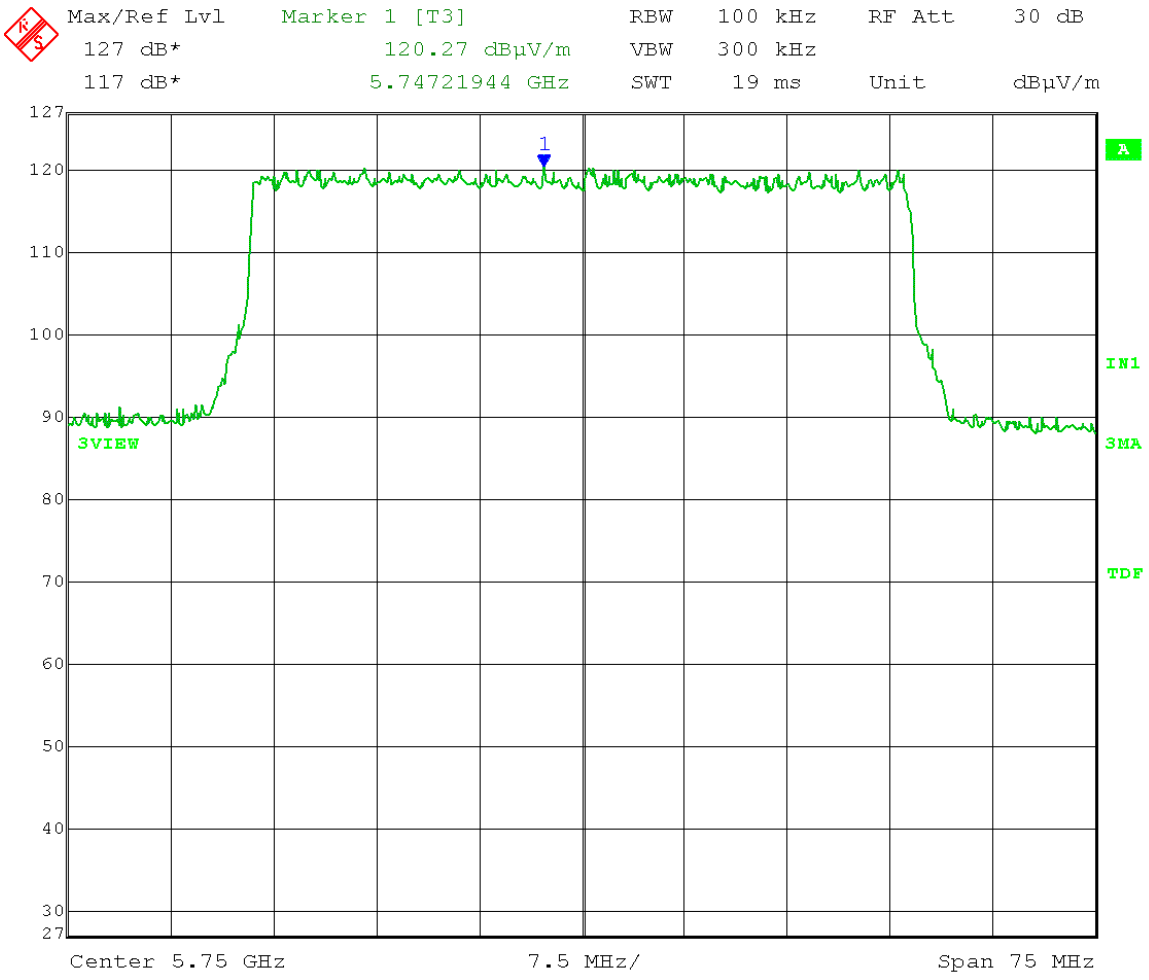
Note: emission is at same level and same frequency for Low, Mid, and High channels.



Test Date: 10-17-2013
Company: Ubiquiti Networks
EUT: Model AF5 - 50MHz BW
Test: Maximum Unwanted Emission Levels - Radiated
Operator: Craig B

Comment: RBW = 100 kHz
VBW ≥ 300 kHz
Span ≥ 1.5 the DTS bandwidth
Detector = Peak
Sweep = auto couple
Trace = max hold

Low Channel Transmit = 5.750 GHz
HORIZONTAL; 3 meter
Output power setting: 50 dBm eirp (Point-to-Point system)
**Reference Level** measurement
Limit = 120.27 dBµV/m – 30 dB = 90.27 dBµV/m

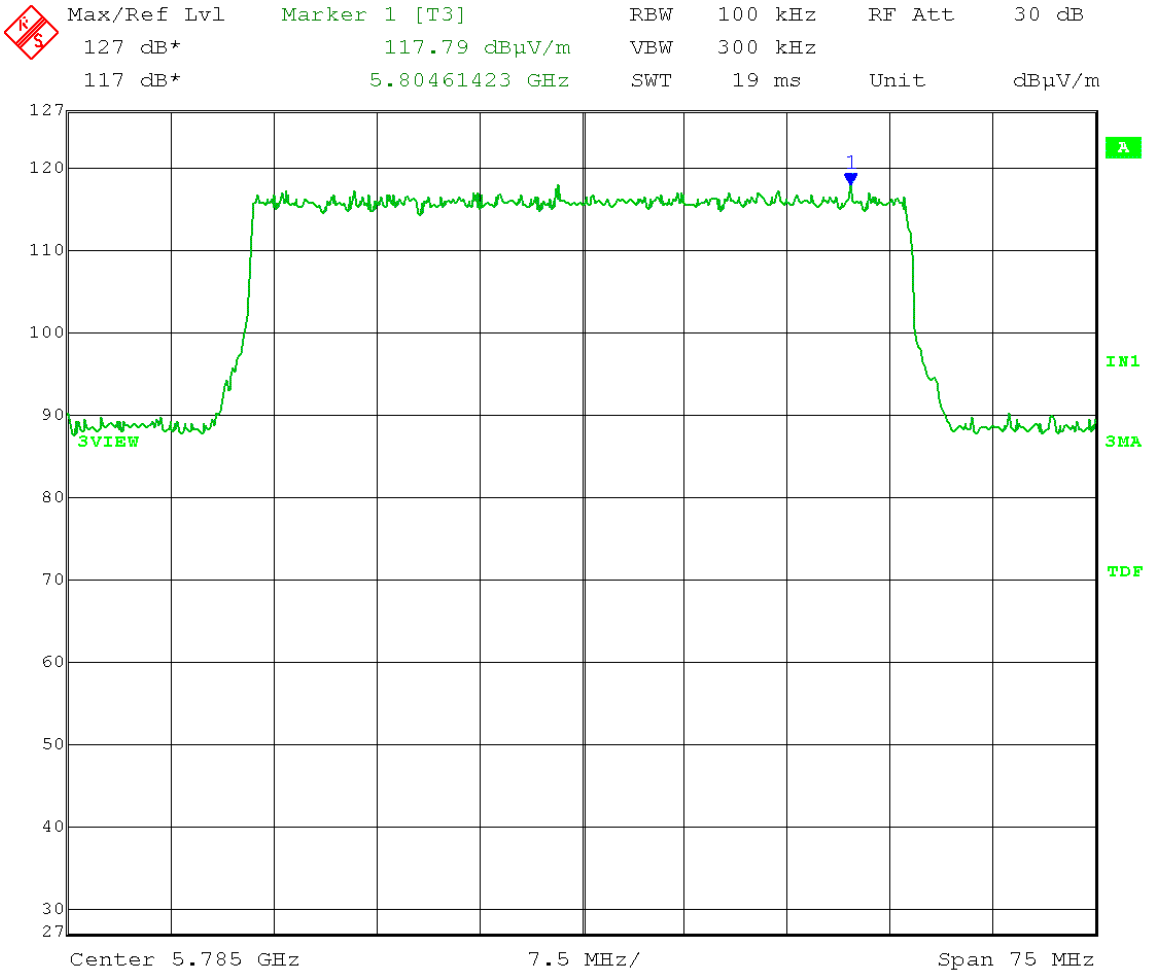



Date: 17.OCT.2013 13:32:40

Test Date: 10-17-2013
Company: Ubiquiti Networks
EUT: Model AF5 - 50MHz BW
Test: Maximum Unwanted Emission Levels - Radiated
Operator: Craig B

Comment: RBW = 100 kHz
VBW ≥ 300 kHz
Span ≥ 1.5 the DTS bandwidth
Detector = Peak
Sweep = auto couple
Trace = max hold

Mid Channel Transmit = 5.785 GHz
HORIZONTAL; 3 meter
Output power setting: 50 dBm eirp (Point-to-Point system)
**Reference Level** measurement
Limit = 117.79 dBµV/m – 30 dB = 87.79 dBµV/m

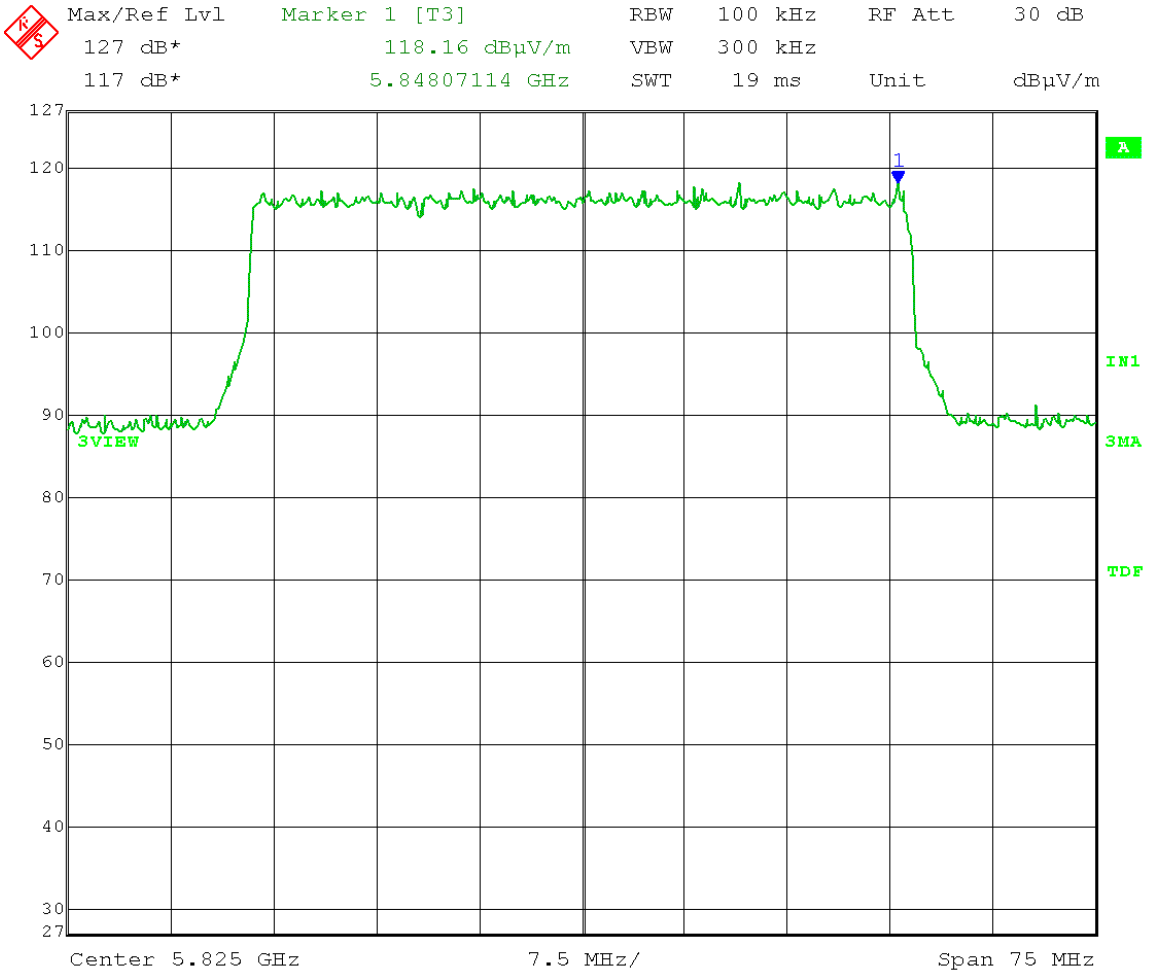



Date: 17.OCT.2013 13:43:04

Test Date: 10-17-2013
Company: Ubiquiti Networks
EUT: Model AF5 - 50MHz BW
Test: Maximum Unwanted Emission Levels - Radiated
Operator: Craig B

Comment: RBW = 100 kHz
VBW ≥ 300 kHz
Span ≥ 1.5 the DTS bandwidth
Detector = Peak
Sweep = auto couple
Trace = max hold

High Channel Transmit = 5.825 GHz
HORIZONTAL; 3 meter
Output power setting: 50 dBm eirp (Point-to-Point system)
**Reference Level** measurement
Limit = 118.16 dBµV/m – 30 dB = 88.16 dBµV/m



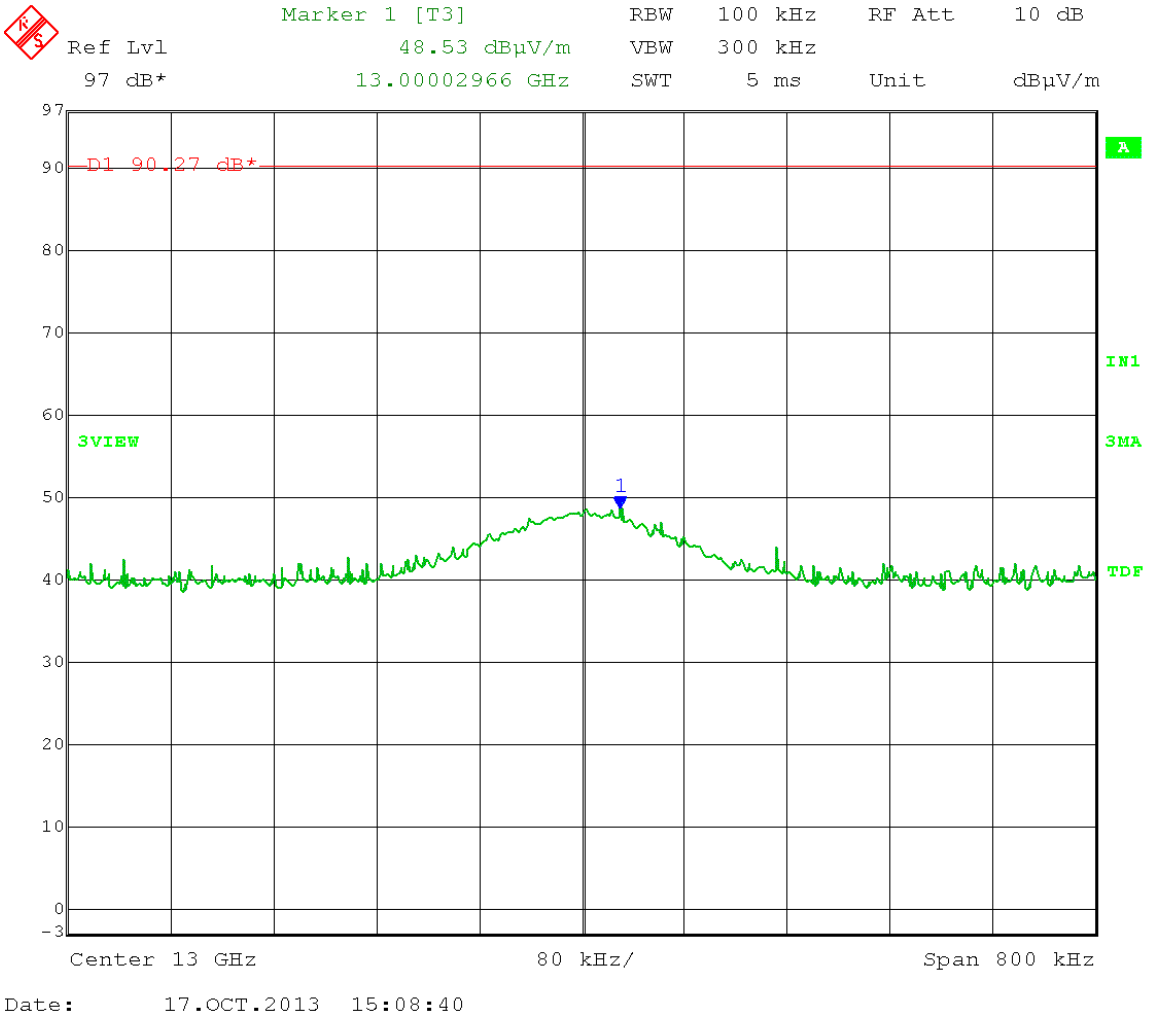

Date: 17.OCT.2013 13:48:02

Test Date: 10-17-2013
Company: Ubiquiti Networks
EUT: Model AF5 - 50MHz BW
Test: Maximum Unwanted Emission Levels - Radiated
Operator: Craig B

Comment: RBW = 100 kHz
VBW ≥ 300 kHz
Detector = Peak
Sweep = auto couple
Trace = max hold

HORIZONTAL; 3 meter
Output power setting: 50 dBm eirp (Point-to-Point system)
**Emission Level** measurement
Limit = 120.27 dBµV/m – 30 dB = 90.27 dBµV/m

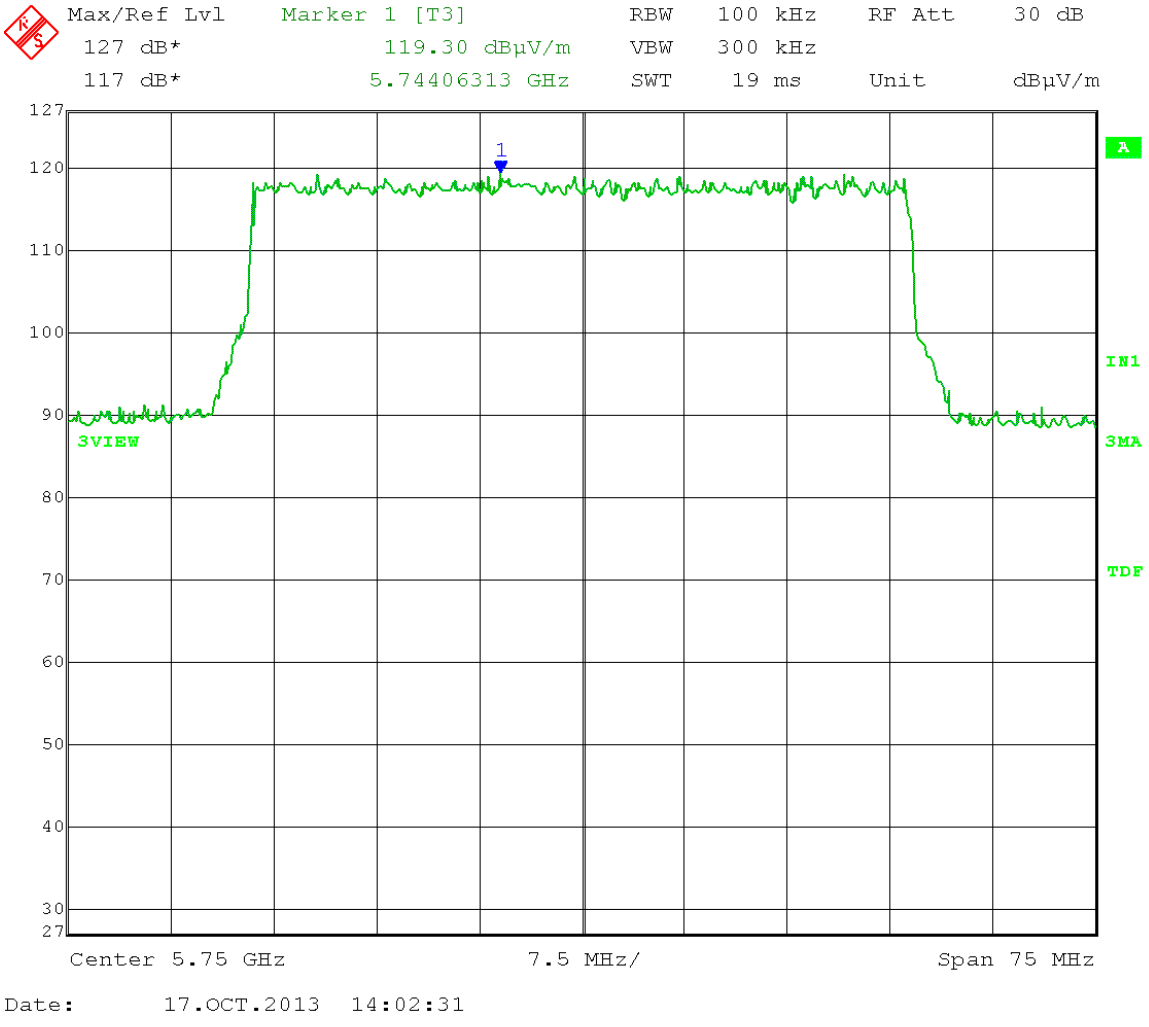
Note: emission is at same level and same frequency for Low, Mid, and High channels.



Test Date: 10-17-2013
Company: Ubiquiti Networks
EUT: Model AF5 - 50MHz BW
Test: Maximum Unwanted Emission Levels - Radiated
Operator: Craig B

Comment: RBW = 100 kHz
VBW ≥ 300 kHz
Span ≥ 1.5 the DTS bandwidth
Detector = Peak
Sweep = auto couple
Trace = max hold

Low Channel Transmit = 5.750 GHz
VERTICAL; 3 meter
Output power setting: 50 dBm eirp (Point-to-Point system)
**Reference Level** measurement
Limit = 119.30 dBµV/m – 30 dB = 89.30 dBµV/m

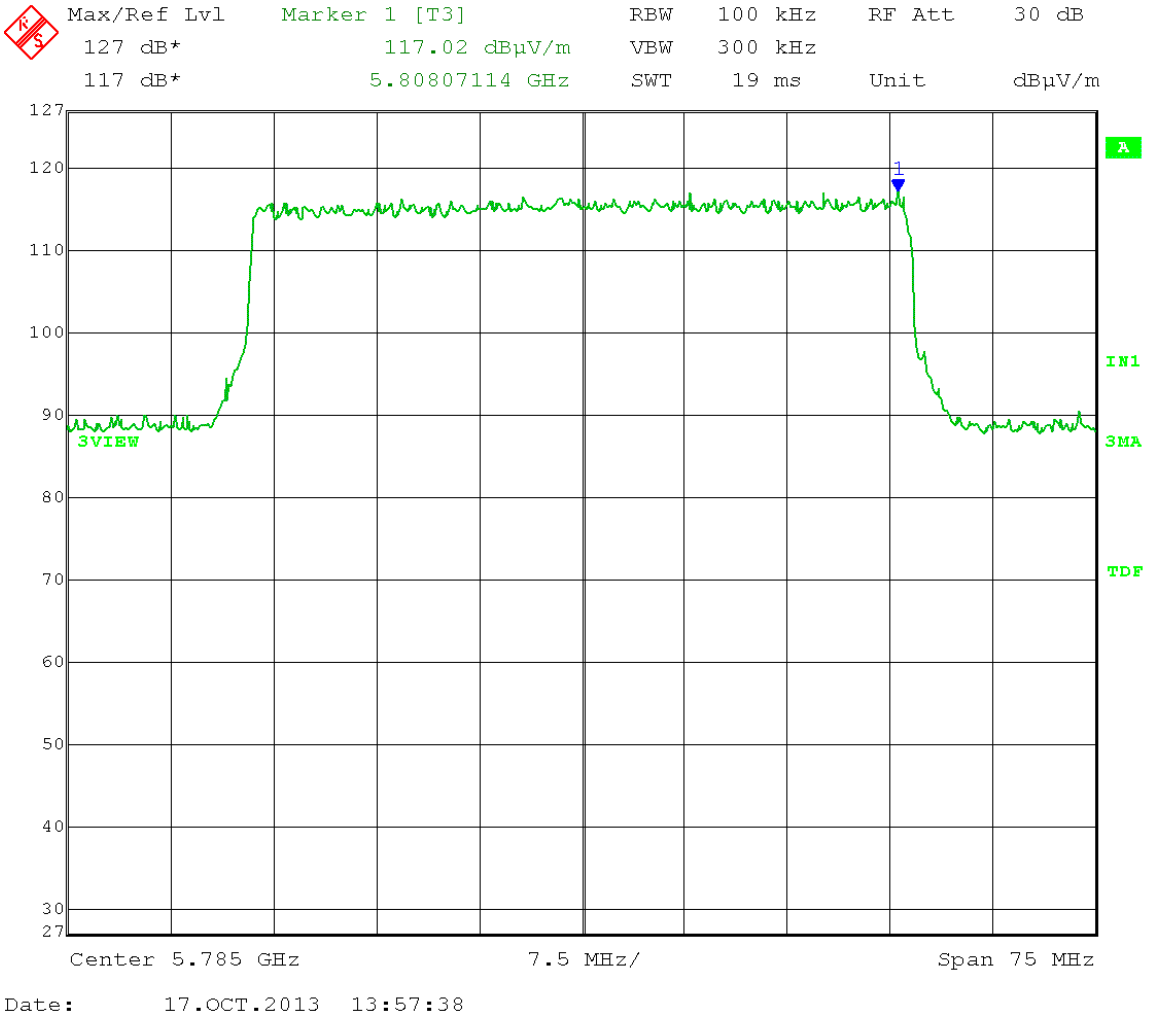



Date: 17.OCT.2013 14:02:31

Test Date: 10-17-2013
Company: Ubiquiti Networks
EUT: Model AF5 - 50MHz BW
Test: Maximum Unwanted Emission Levels - Radiated
Operator: Craig B

Comment: RBW = 100 kHz
VBW ≥ 300 kHz
Span ≥ 1.5 the DTS bandwidth
Detector = Peak
Sweep = auto couple
Trace = max hold

Mid Channel Transmit = 5.785 GHz
VERTICAL; 3 meter
Output power setting: 50 dBm eirp (Point-to-Point system)
**Reference Level** measurement
Limit = 117.02 dBµV/m – 30 dB = 87.02 dBµV/m

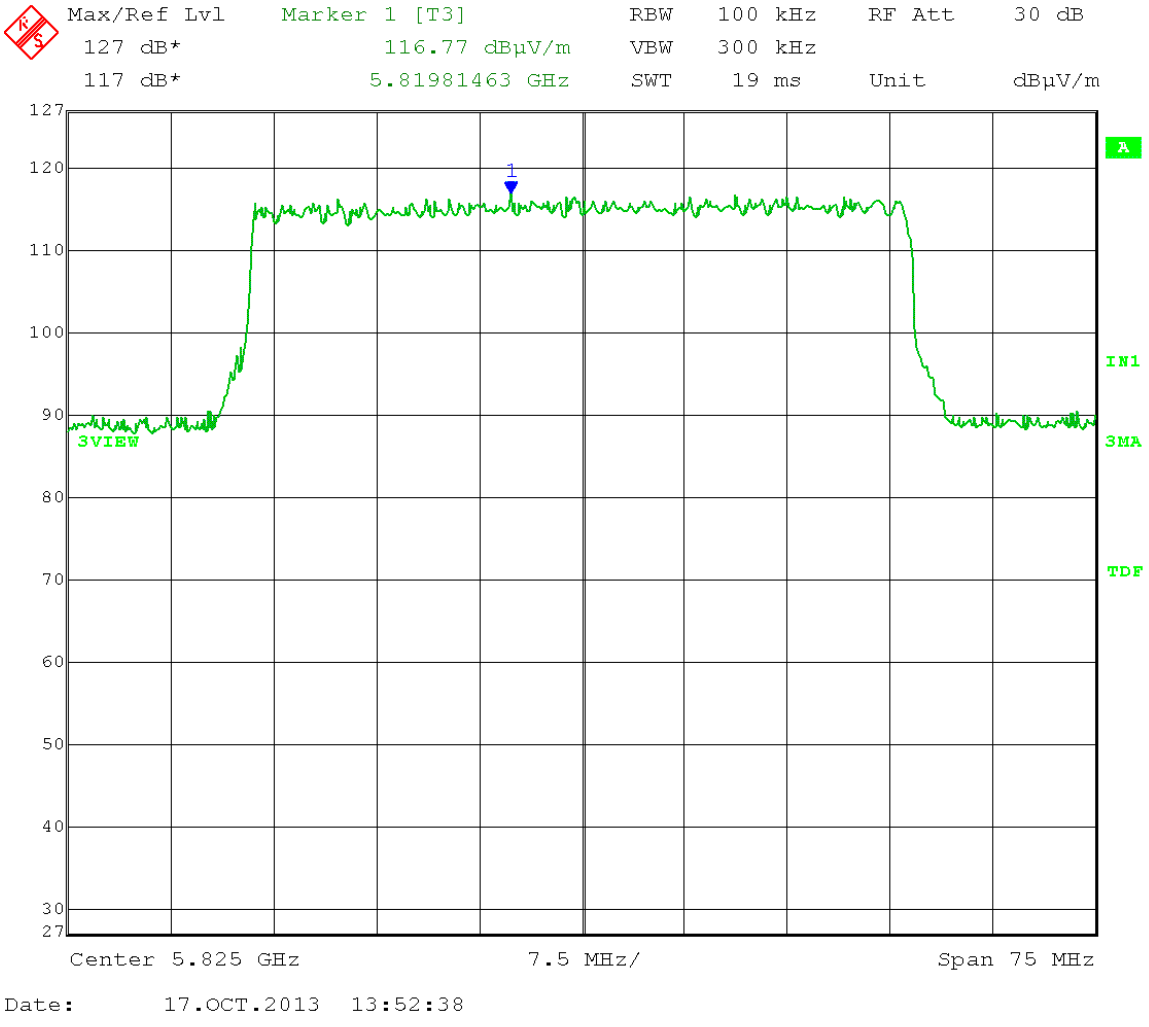



Date: 17.OCT.2013 13:57:38

Test Date: 10-17-2013
Company: Ubiquiti Networks
EUT: Model AF5 - 50MHz BW
Test: Maximum Unwanted Emission Levels - Radiated
Operator: Craig B

Comment: RBW = 100 kHz
VBW ≥ 300 kHz
Span ≥ 1.5 the DTS bandwidth
Detector = Peak
Sweep = auto couple
Trace = max hold

High Channel Transmit = 5.825 GHz
VERTICAL; 3 meter
Output power setting: 50 dBm eirp (Point-to-Point system)
**Reference Level** measurement
Limit = 116.77 dBµV/m – 30 dB = 86.77 dBµV/m



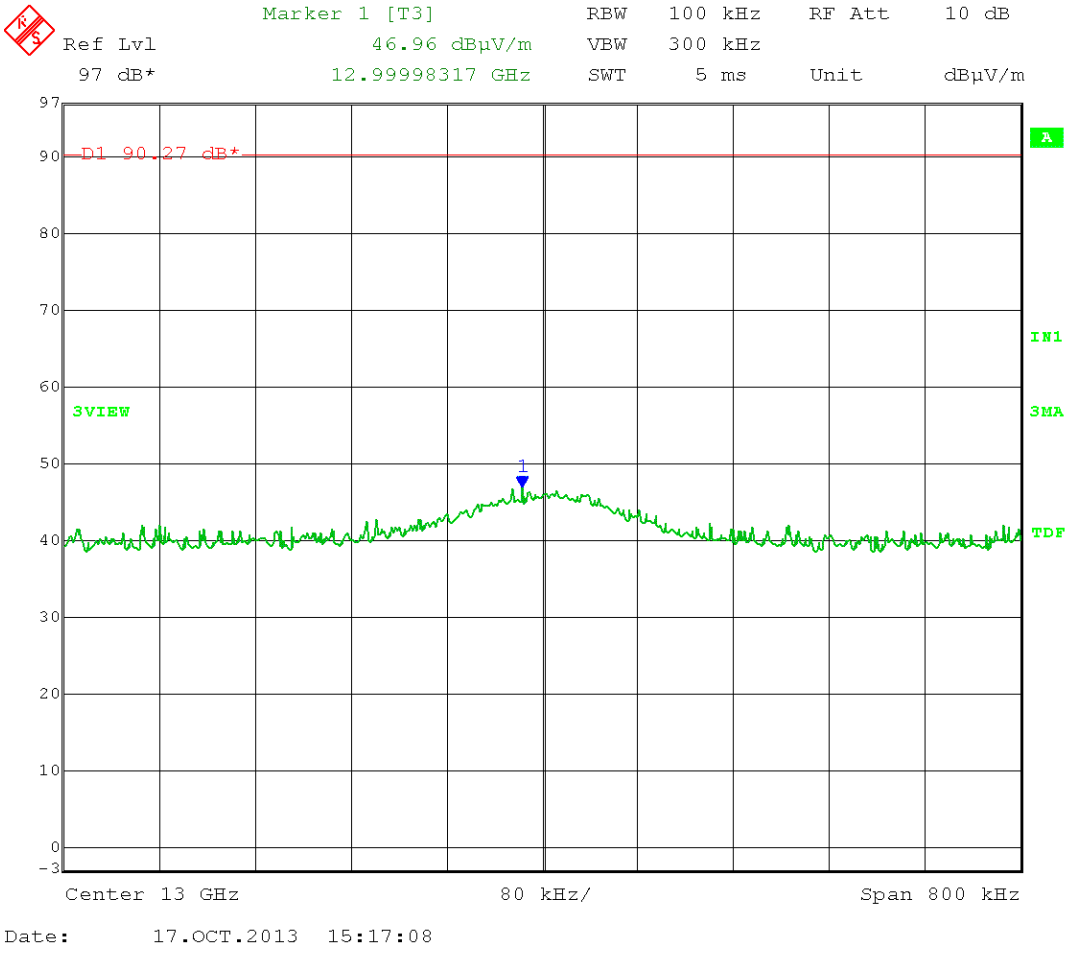

Date: 17.OCT.2013 13:52:38

Test Date: 10-17-2013
Company: Ubiquiti Networks
EUT: Model AF5 - 50MHz BW
Test: Maximum Unwanted Emission Levels - Radiated
Operator: Craig B

Comment: RBW = 100 kHz
VBW ≥ 300 kHz
Detector = Peak
Sweep = auto couple
Trace = max hold

VERTICAL; 3 meter
Output power setting: 50 dBm eirp (Point-to-Point system)
**Emission Level** measurement
Limit = 119.30 dBµV/m – 30 dB = 89.30 dBµV/m

Note: emission is at same level and same frequency for Low, Mid, and High channels.



**Appendix – Measurement Data**

## 5.0 Band-Edge Measurements - Conducted

**Rule Section**: FCC 15.247(d)

FCC KDB 558074 D01 DTS Meas Guidance v03r01 – *Guidance for Performing Compliance Measurements on Digital Transmission Systems (DTS) Operating Under §15.247*

**11.1(b) Emissions in non-restricted frequency bands**

**Test Procedure**:
RBW = 100 kHz
VBW ≥ 300 kHz
Span = spectrum to be examined
Detector = peak
Sweep = auto couple
Trace mode = max hold

Measurements were taken for QPSK, 16QAM, 64QAM, 256QAM and 1024 QAM modulations over a 10MHz, 20MHz, 40MHz and 50MHz modulation bandwidth at the low and high channels and on outputs of CH0 and CH1 of operation. EUT was set to transmit continuously over various low and high channel frequencies and maximum power settings.

**Limit:** 30 dB below maximum in-band average PSD level (maximum level in any 100 kHz band). Average output power procedure was used to measure the fundamental emission power.

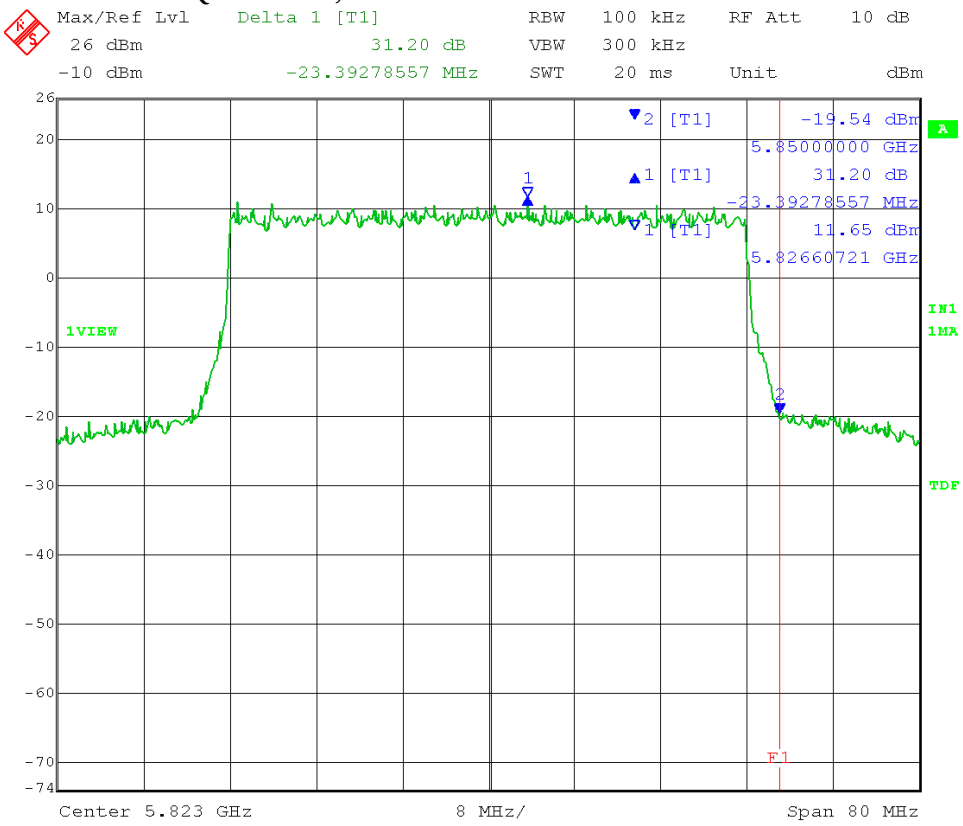
**Results:** Passed

Test Date: 11-06-2013
Company: Ubiquiti Networks
EUT: Air Fiber 5 - 5.8GHz WiFi Radio
Test: Band Edge/Out-of-band Emissions - Conducted
Operator: Lillian Li
Test Procedure used: KDB 558074 D01 v01r03 – 11.1(b)
Limit: [15.247(d); RSS-210 A8.5]: ≥ 30dBc

Upper Band-edge (**F1**) = 5.850GHz
Lower Band-edge (**F2**) = 5.725GHz

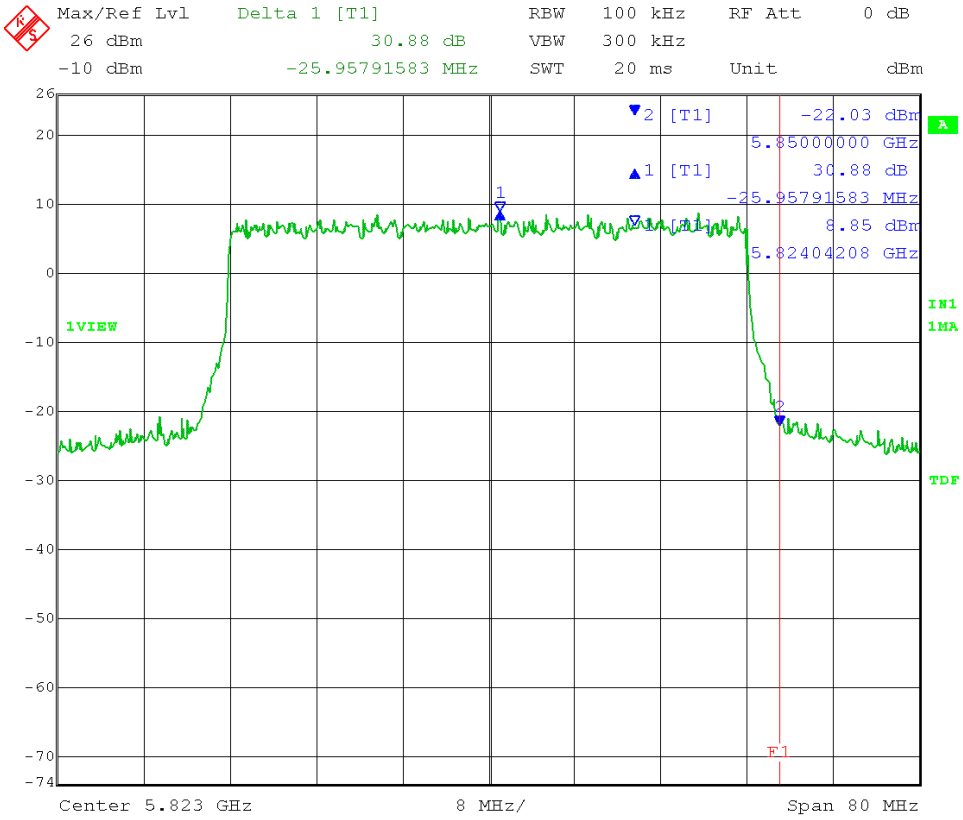
# PLOTS: 50MHz Bandwidth & 40MHz Bandwidth

50MHz HCH QPSK TX0,



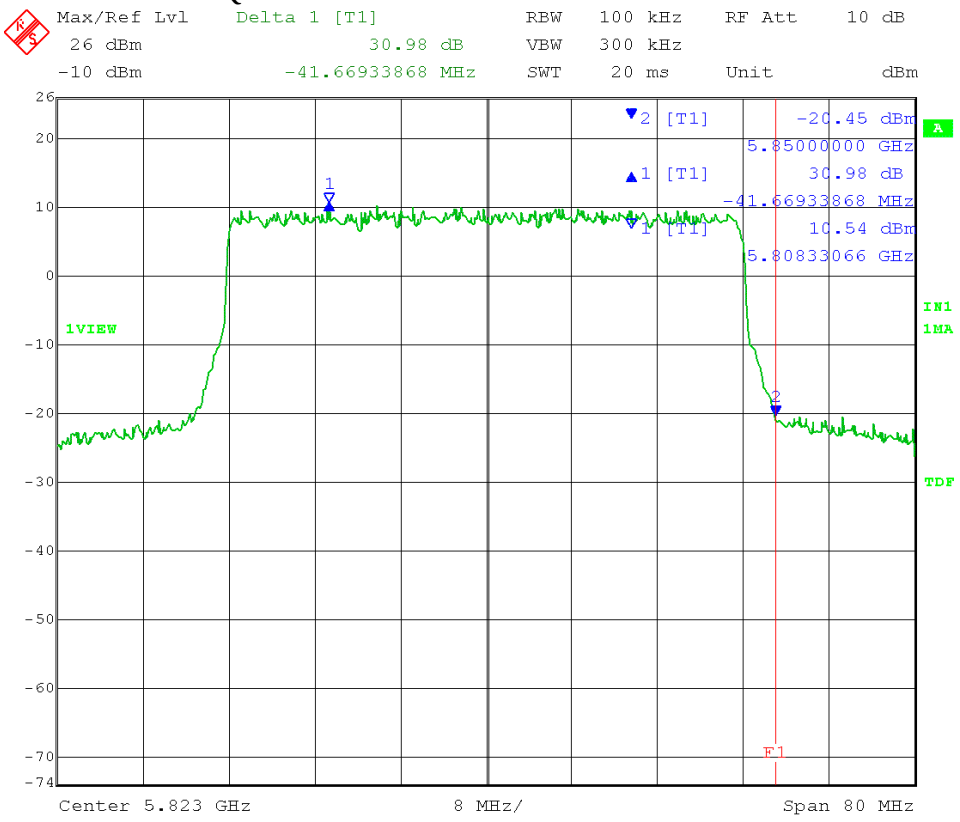

Date: 6.NOV.2013 09:11:34

TX1



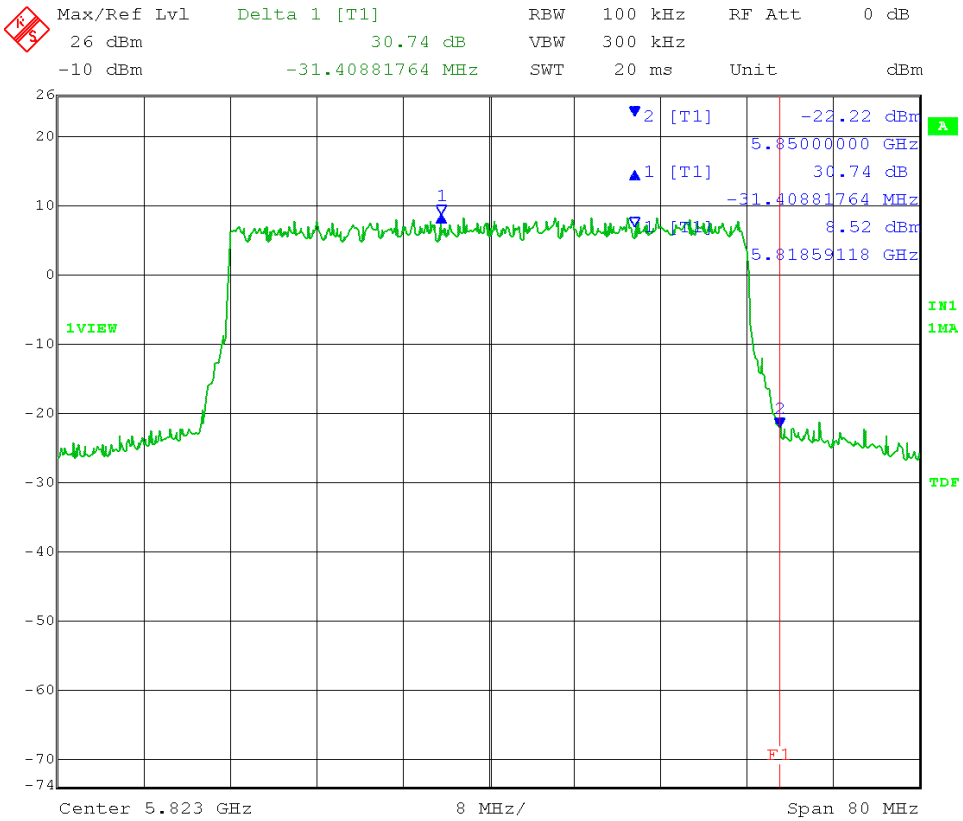

Date: 6.NOV.2013 11:10:42

50MHz HCH 16QAM TX0



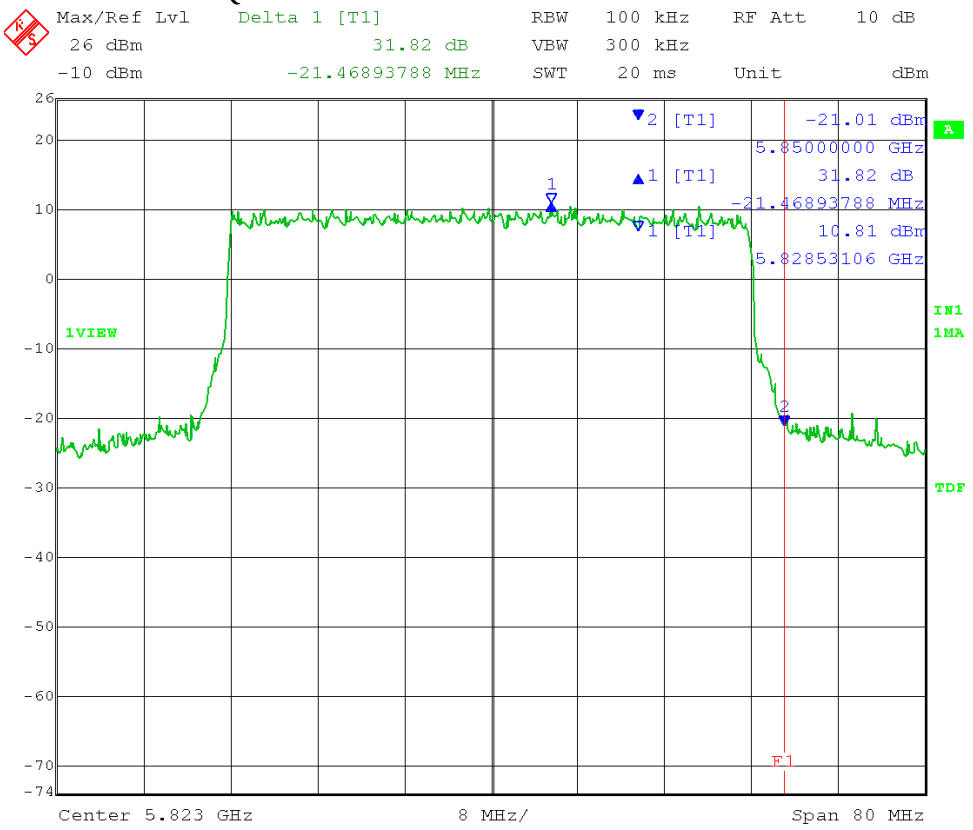

Date: 6.NOV.2013 09:13:18

TX1



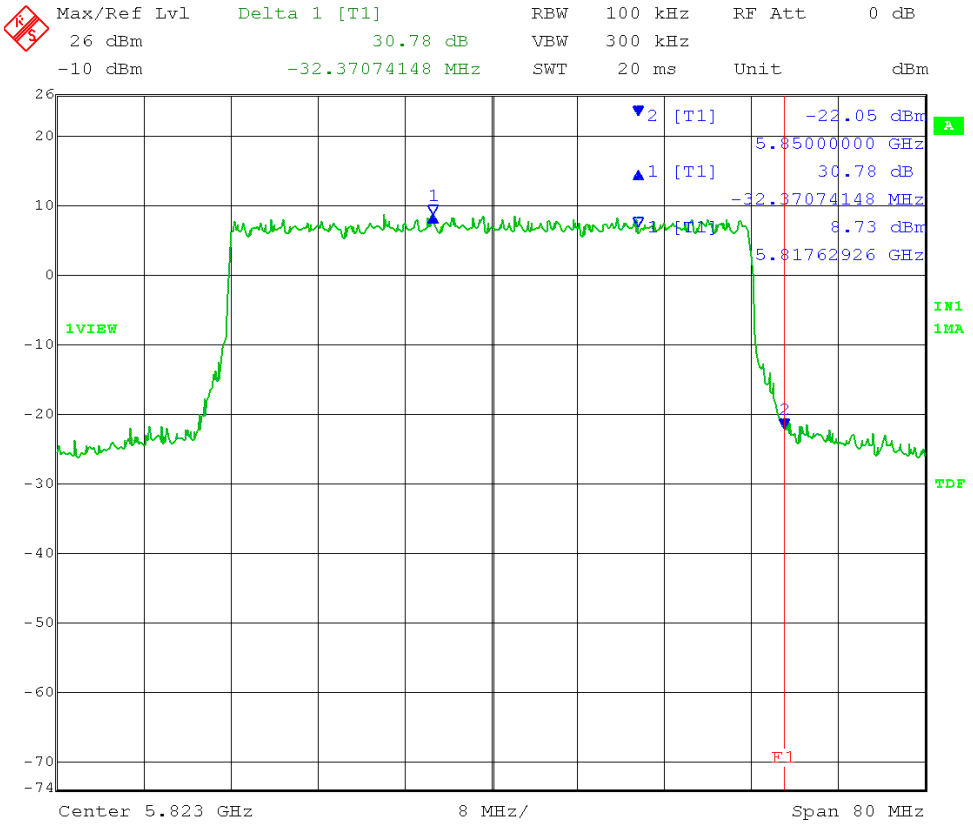

Date: 6.NOV.2013 11:11:54

50MHz HCH 64QAM TX0



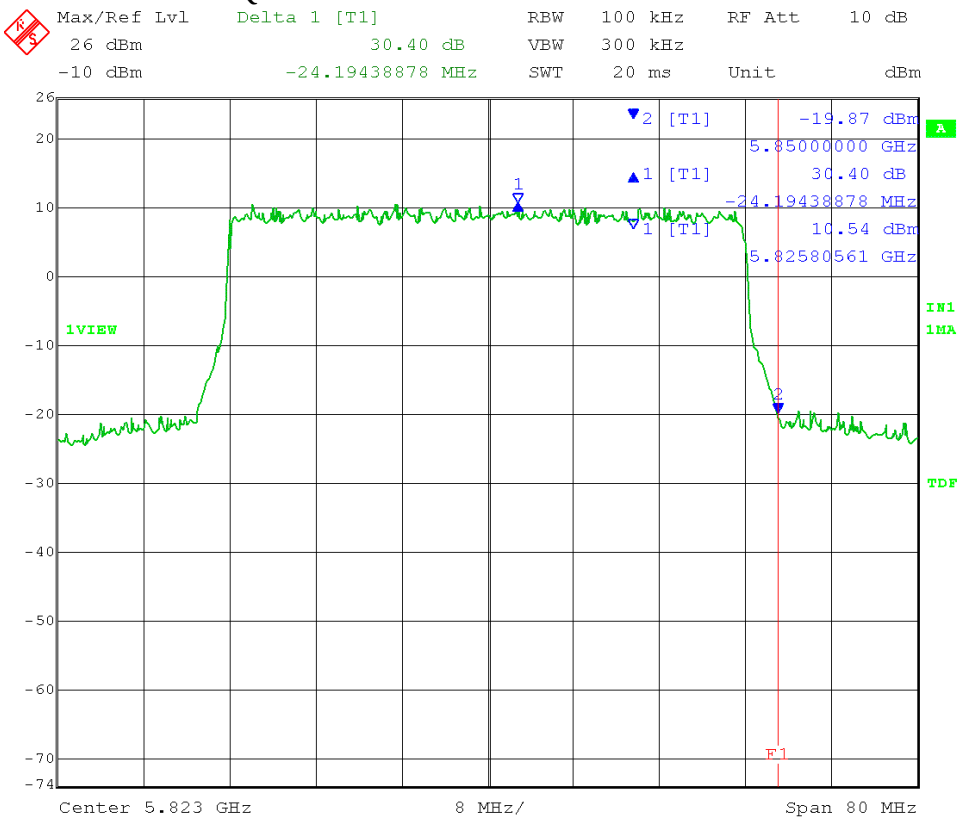

Date: 6.NOV.2013 09:15:23

TX1



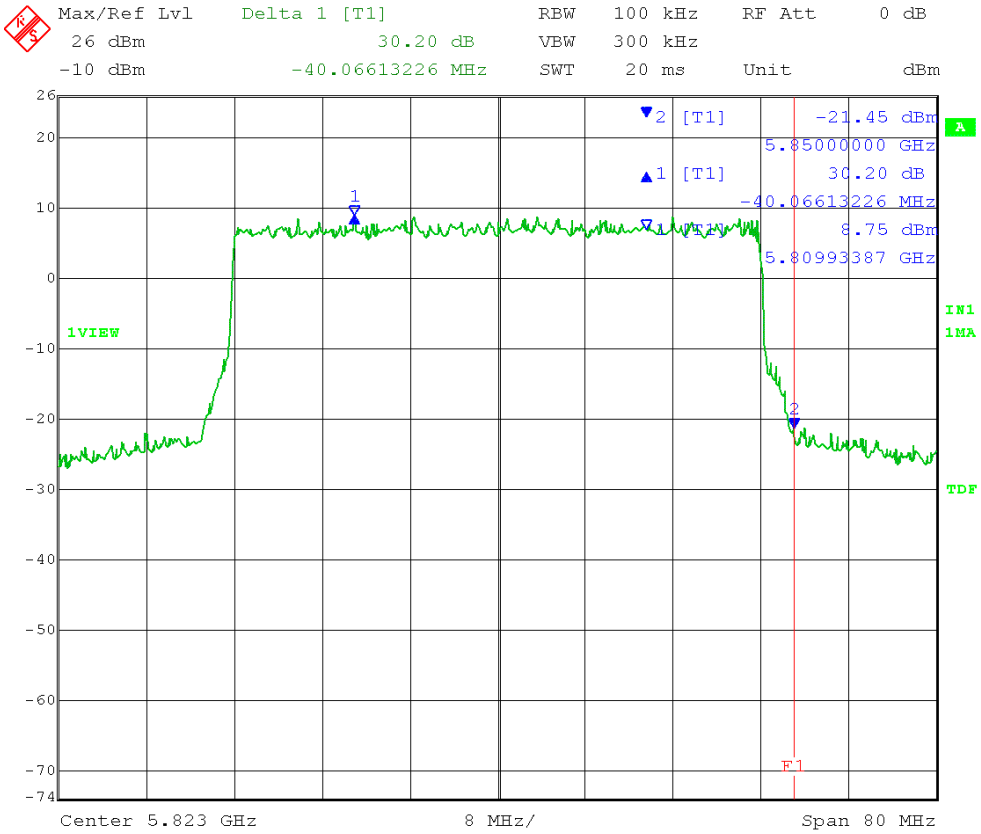

Date: 6.NOV.2013 11:12:34

50MHz HCH 256QAM TX0



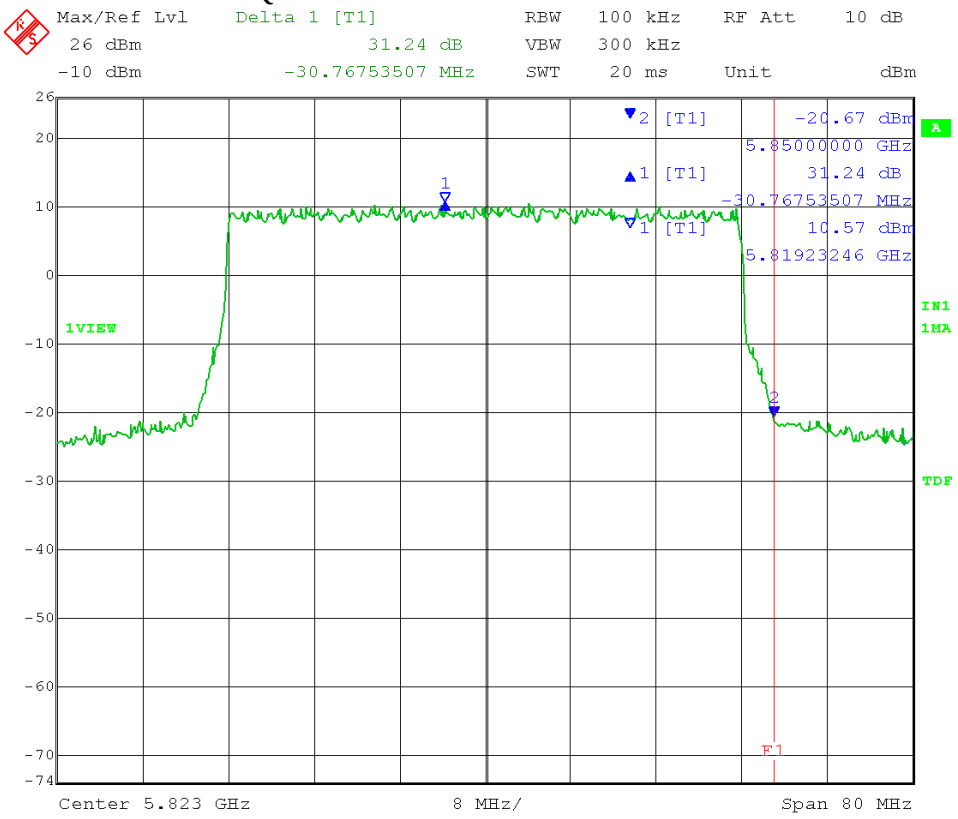

Date: 6.NOV.2013 09:16:28

TX1



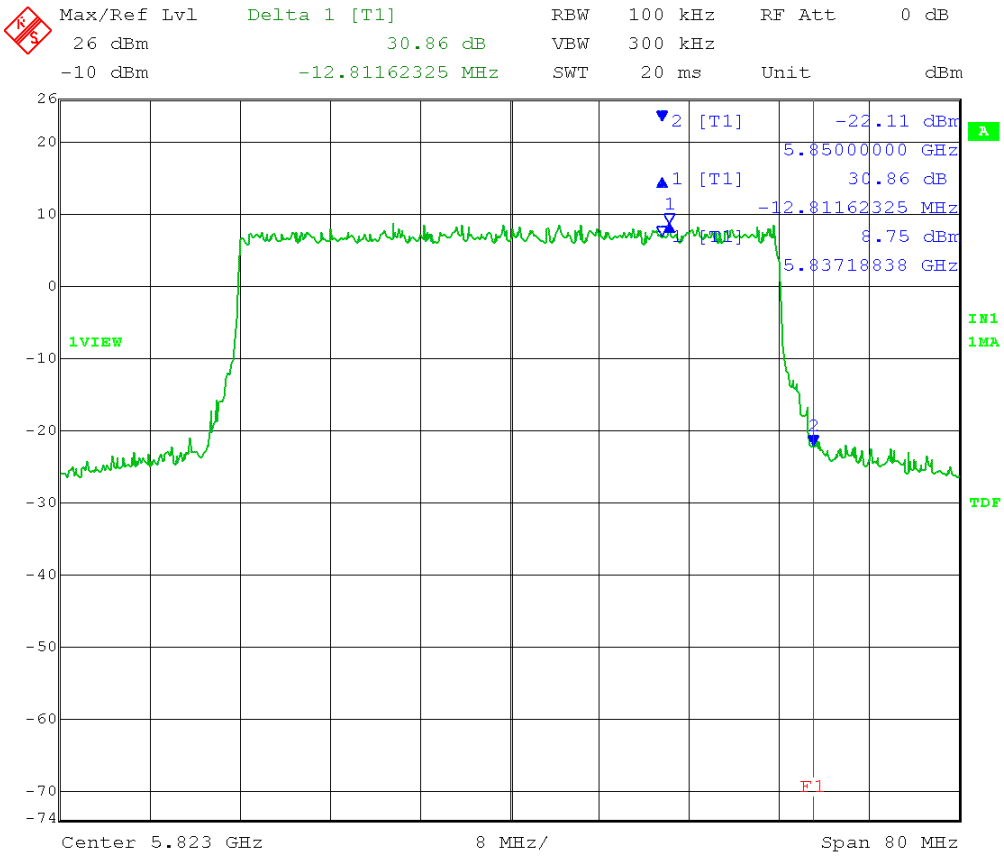

Date: 6.NOV.2013 11:13:49

50MHz HCH 1024QAM TX0



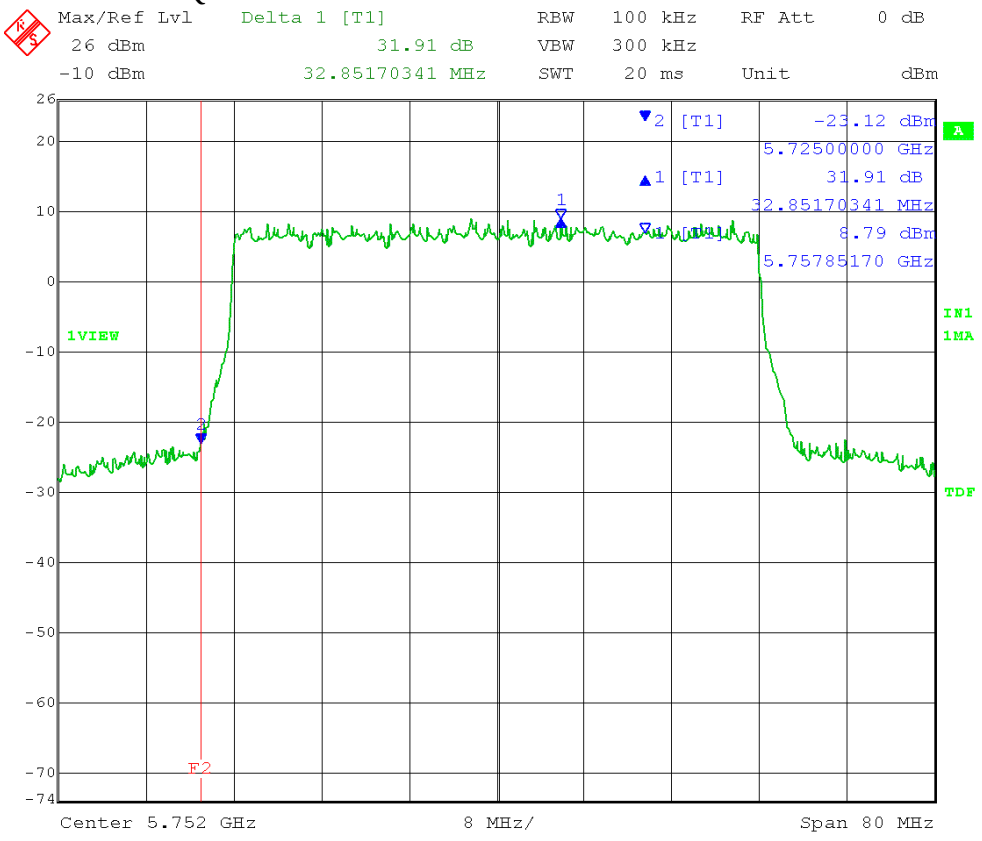

Date: 6.NOV.2013 09:17:18

TX1



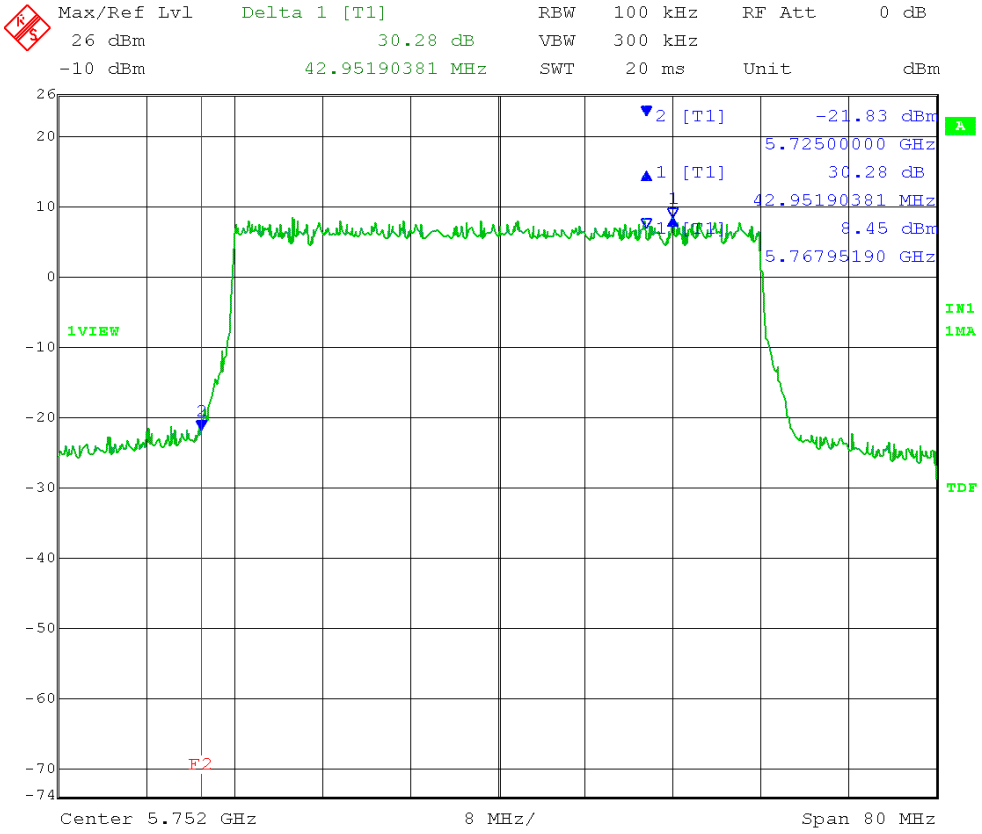

Date: 6.NOV.2013 11:14:52

50MHz LCH QPSK TX0



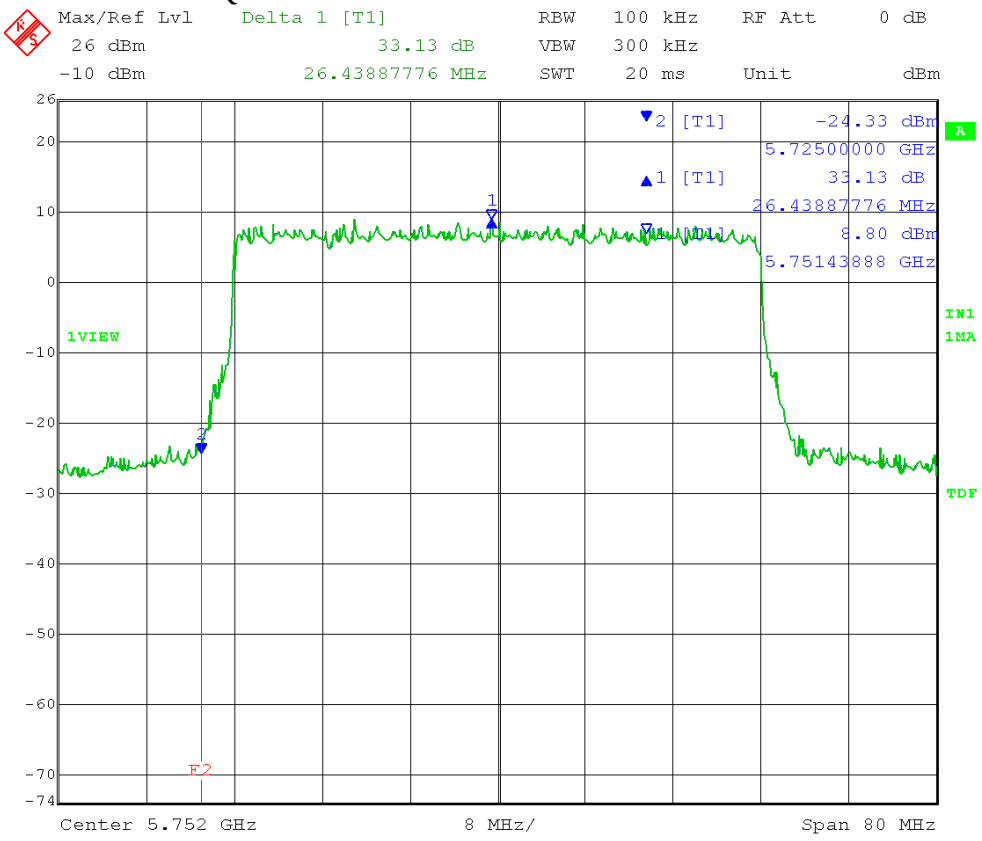

Date: 6.NOV.2013 12:23:15

TX1



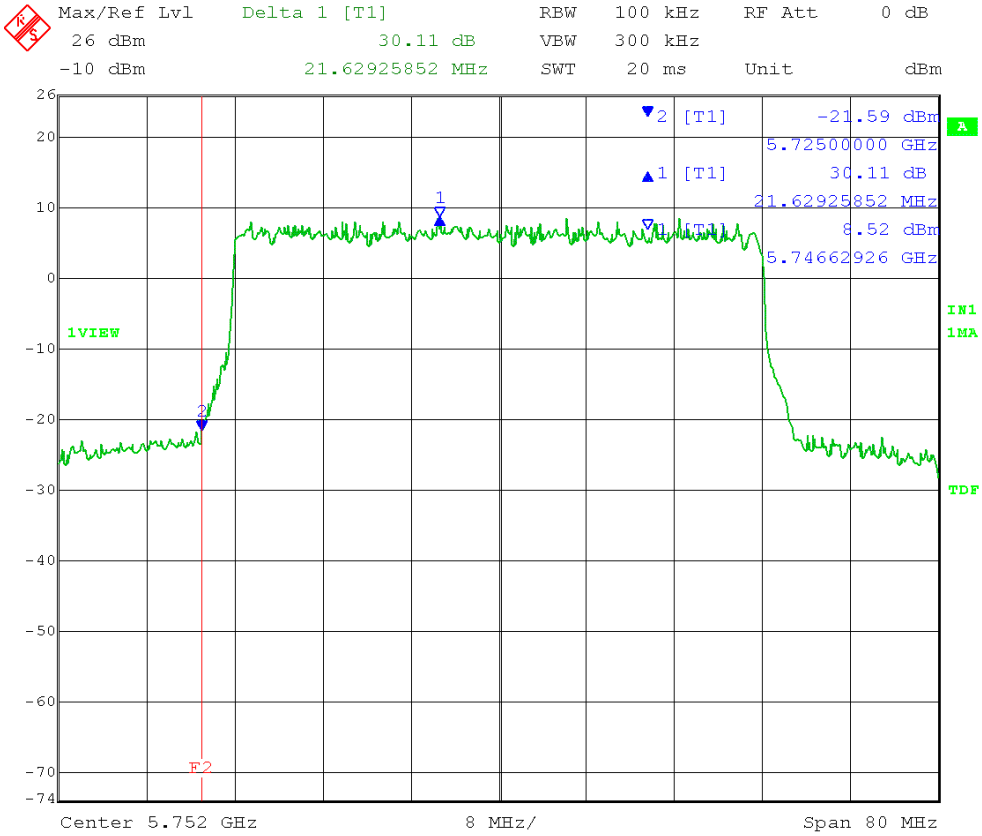

Date: 6.NOV.2013 12:28:53

## 50MHz LCH 16QAM TX0



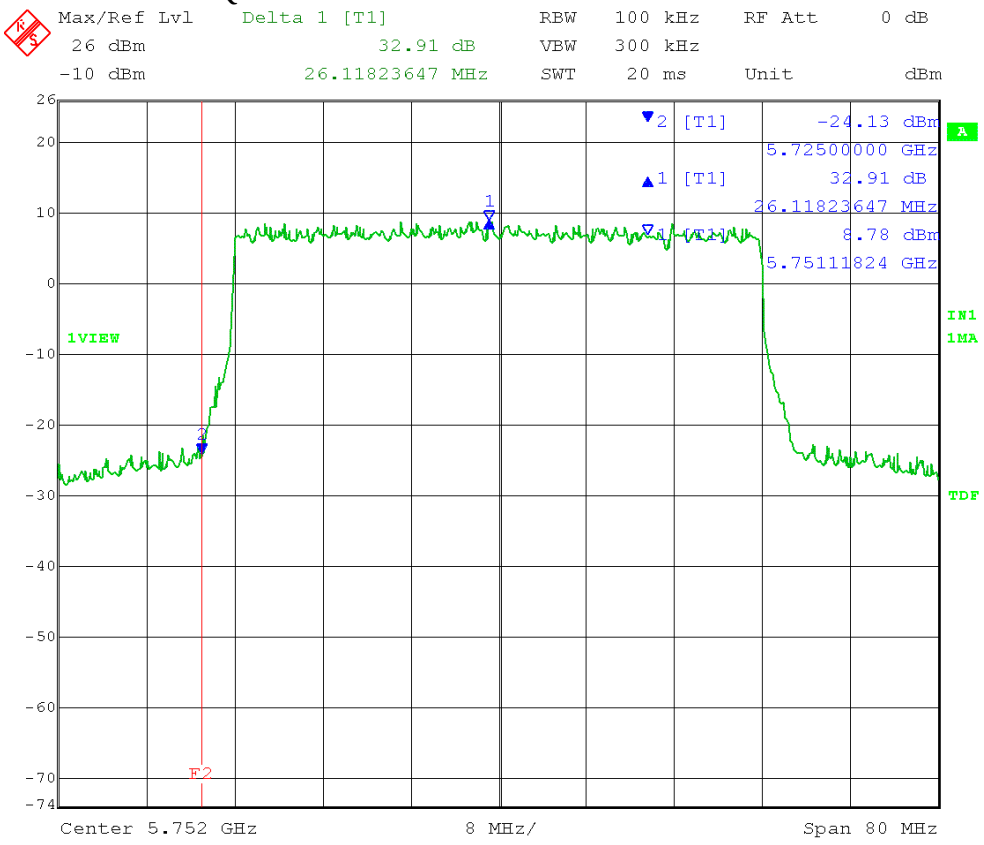

Date: 6.NOV.2013 12:23:41

## TX1



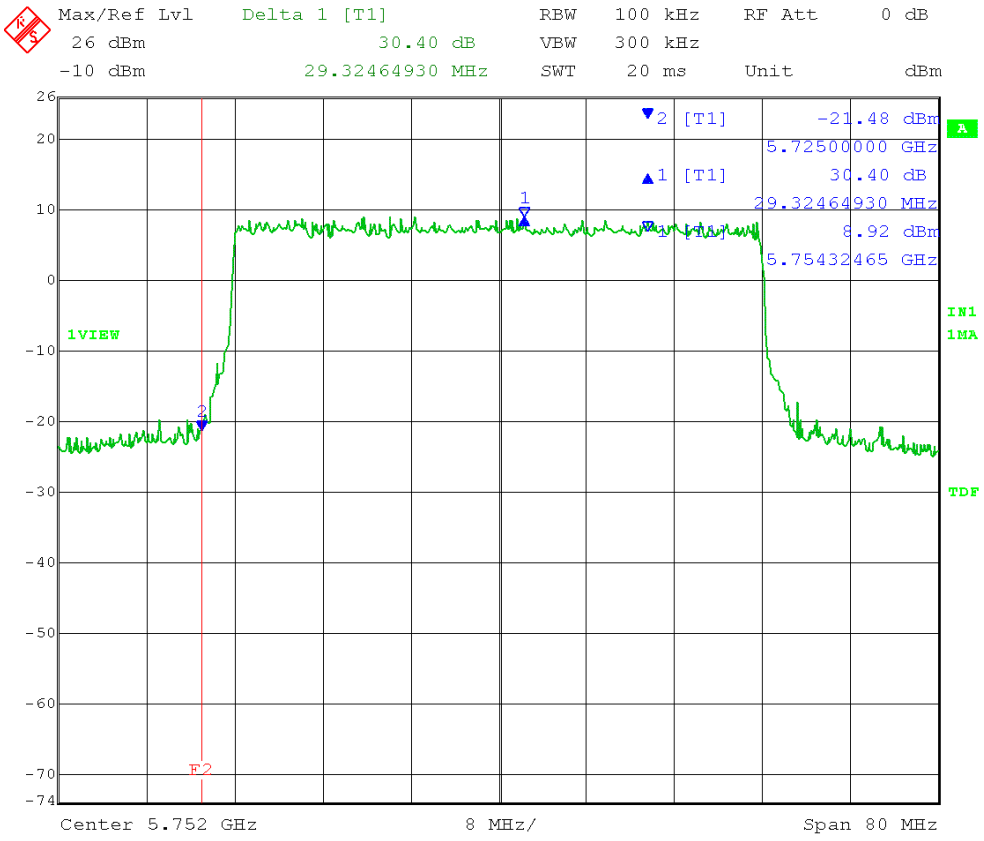

Date: 6.NOV.2013 12:29:25

50MHz LCH 64QAM TX0



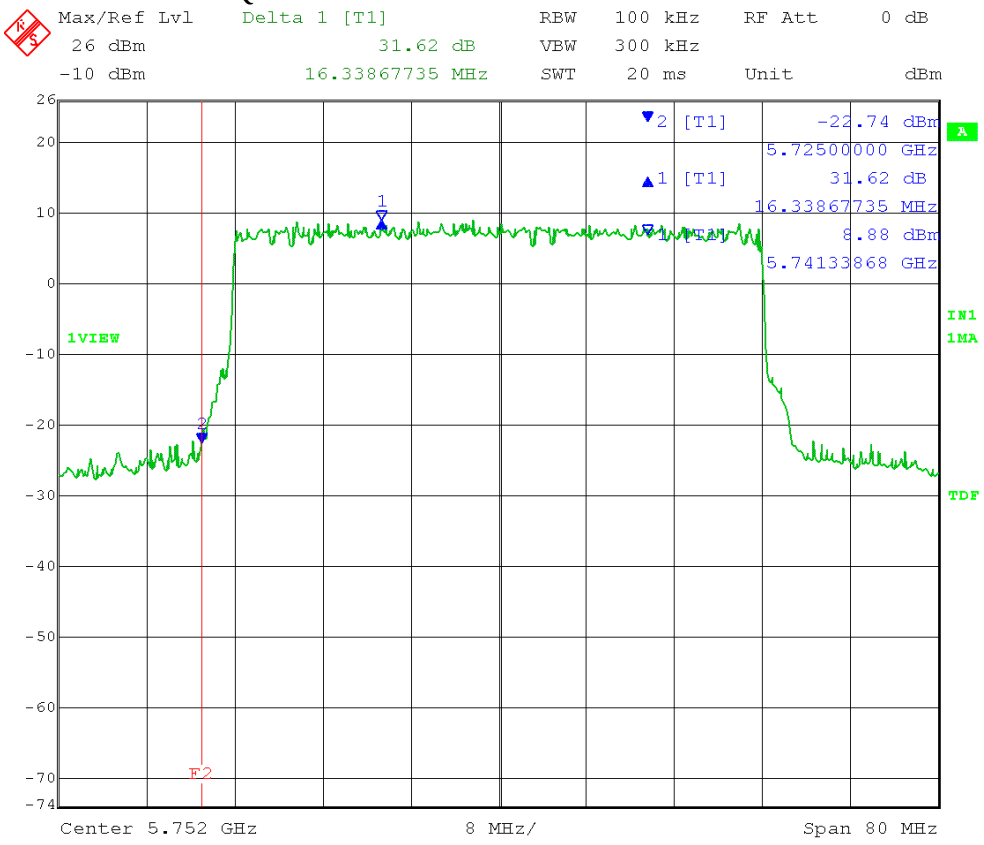

Date: 6.NOV.2013 12:24:07

TX1



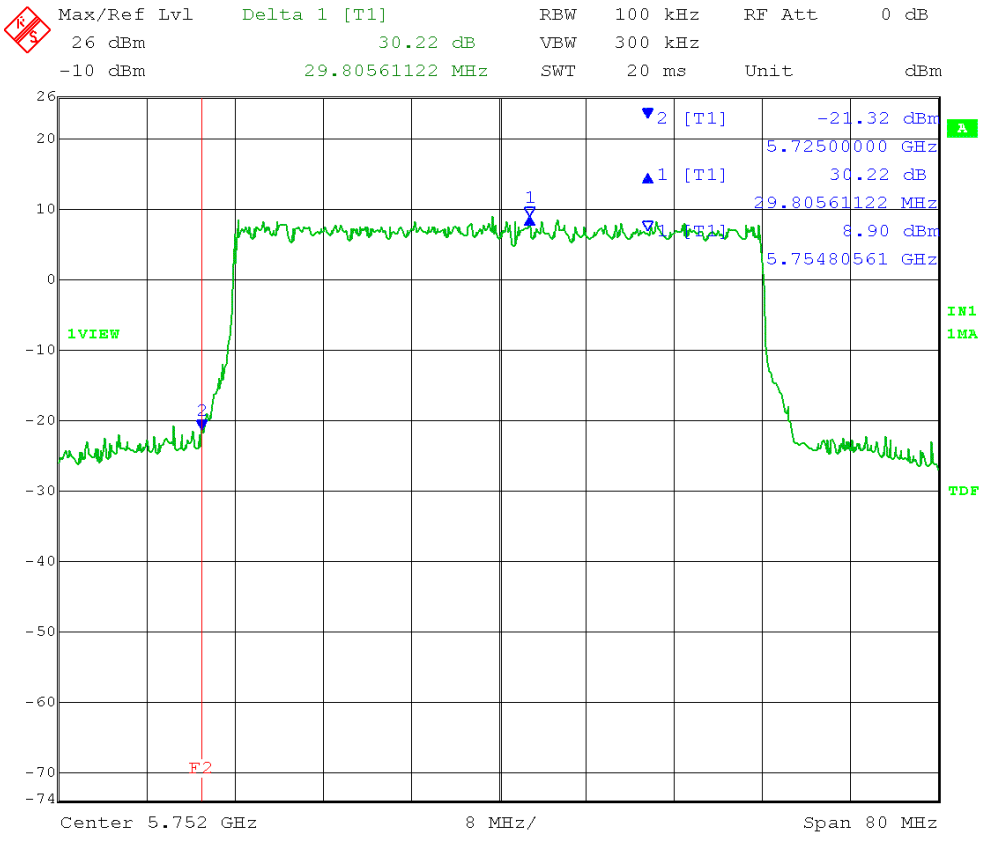

Date: 6.NOV.2013 12:30:04

50MHz LCH 256QAM TX0



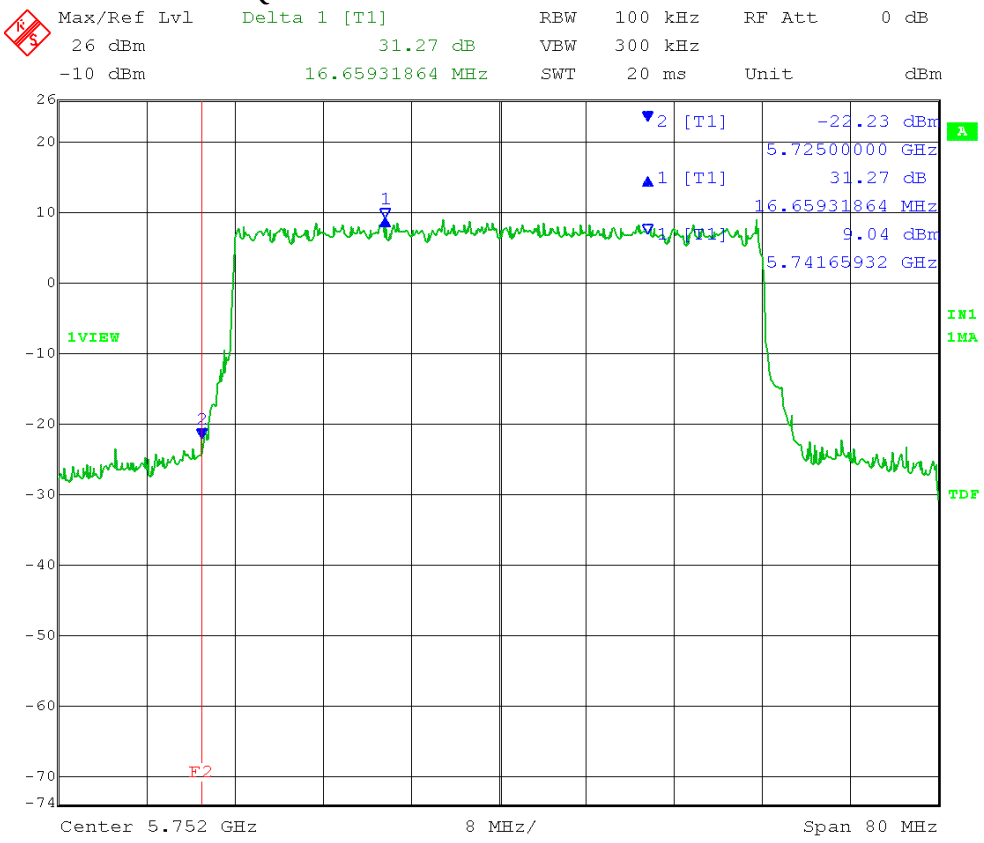

Date: 6.NOV.2013 12:24:29

TX1



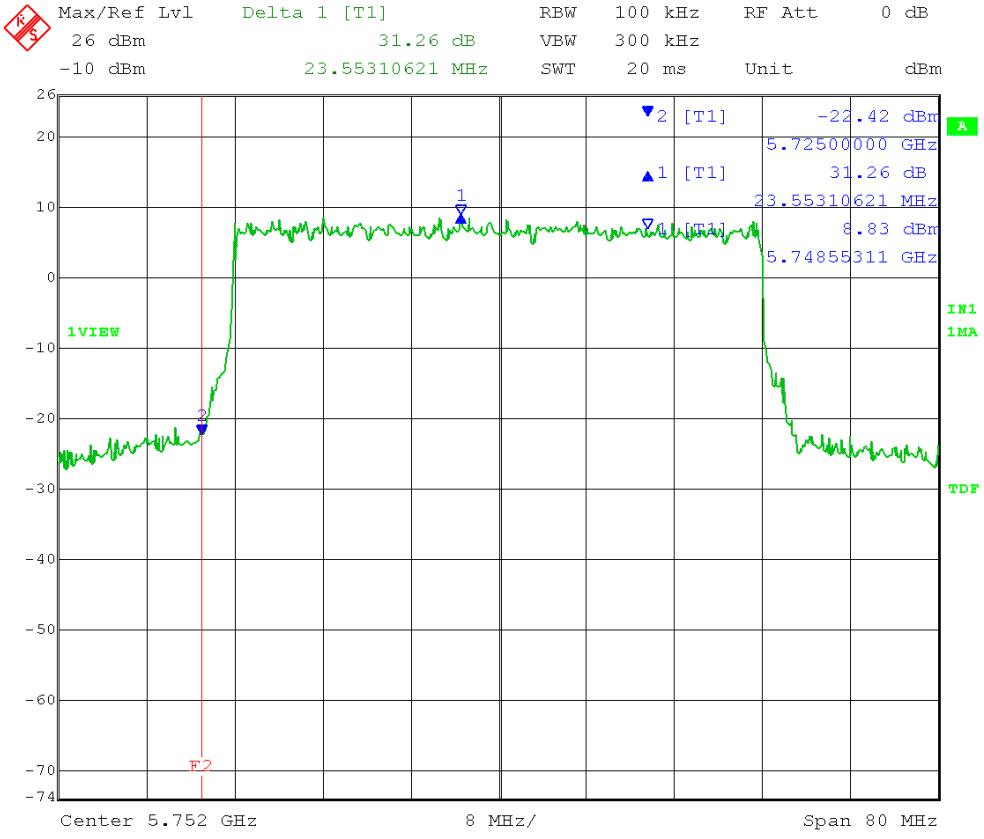

Date: 6.NOV.2013 12:31:26

50MHz LCH 1024QAM TX0



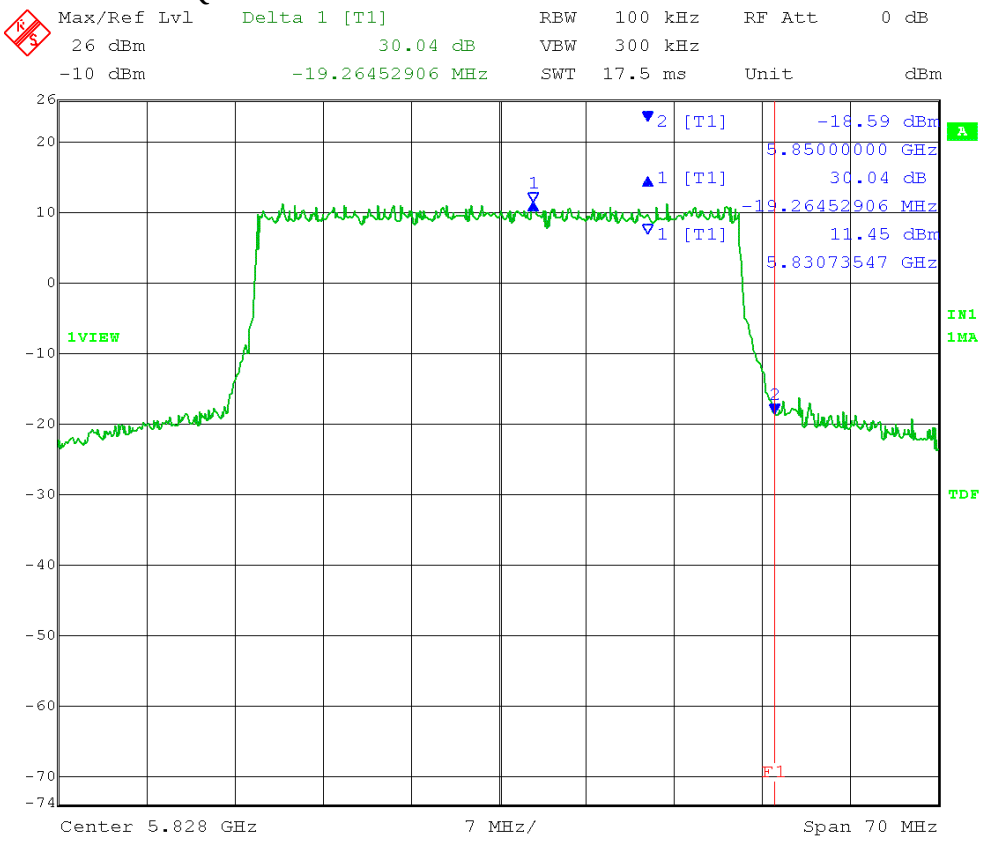

Date: 6.NOV.2013 12:25:01

TX1



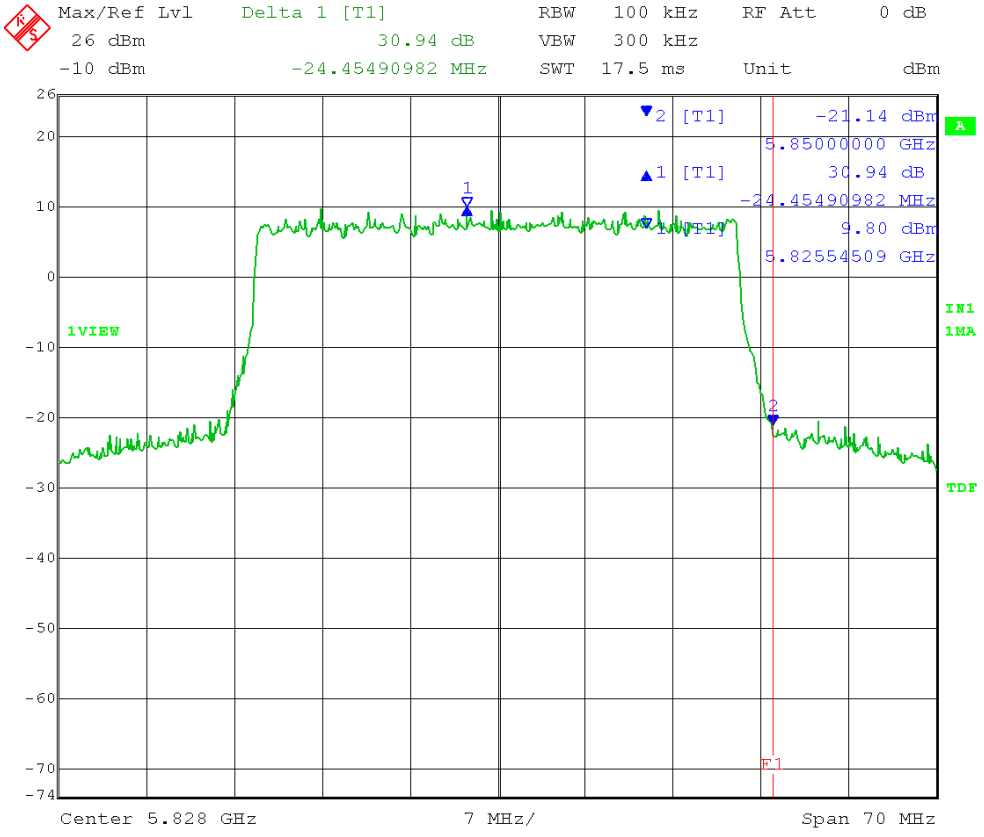

Date: 6.NOV.2013 12:32:26

40MHz HCH QPSK TX0



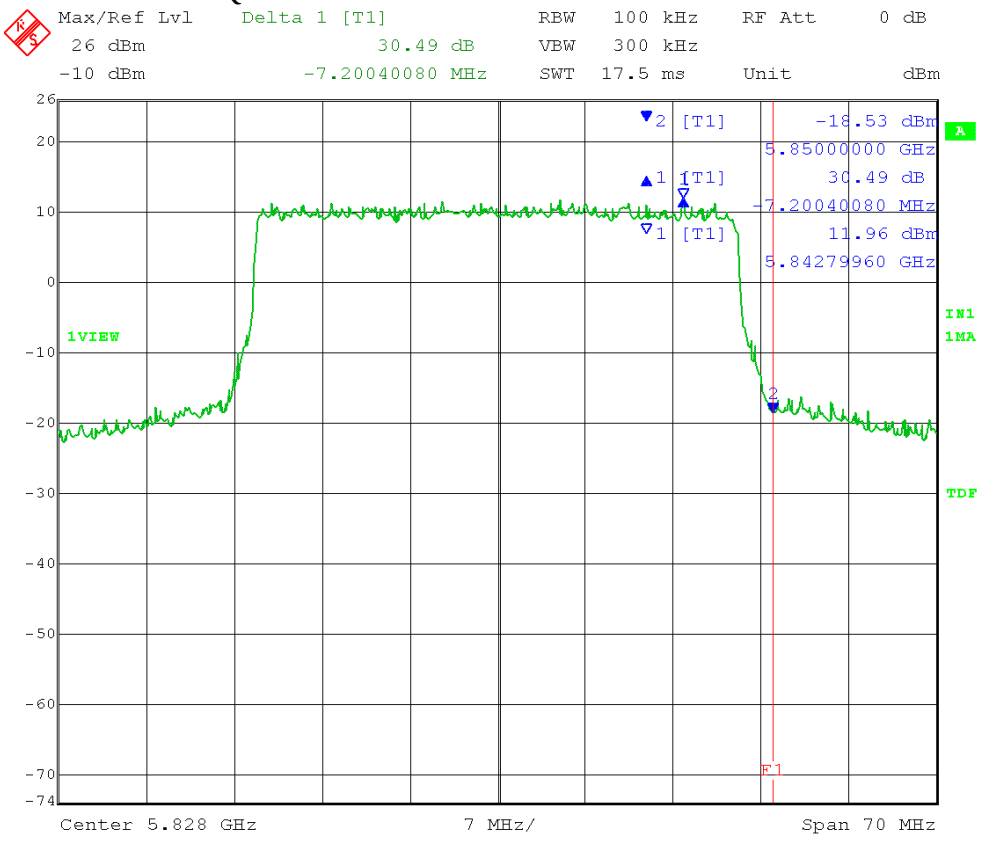

Date: 6.NOV.2013 10:16:49

TX1



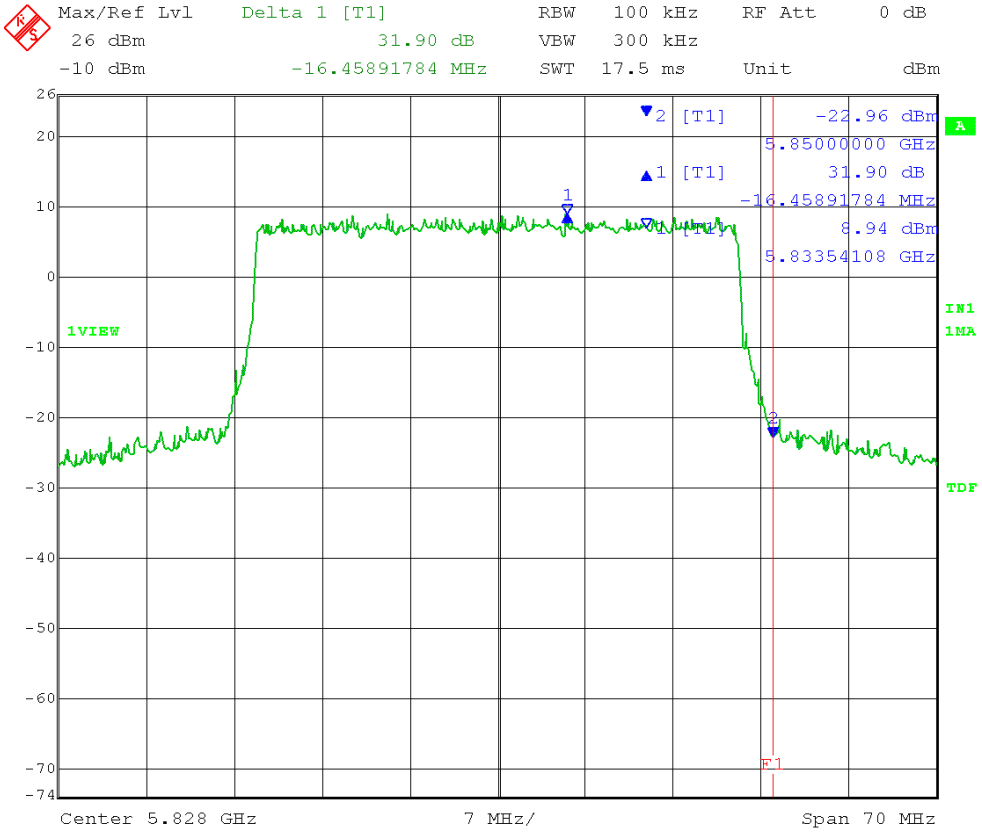

Date: 6.NOV.2013 11:04:59

## 40MHz HCH 16QAM TX0



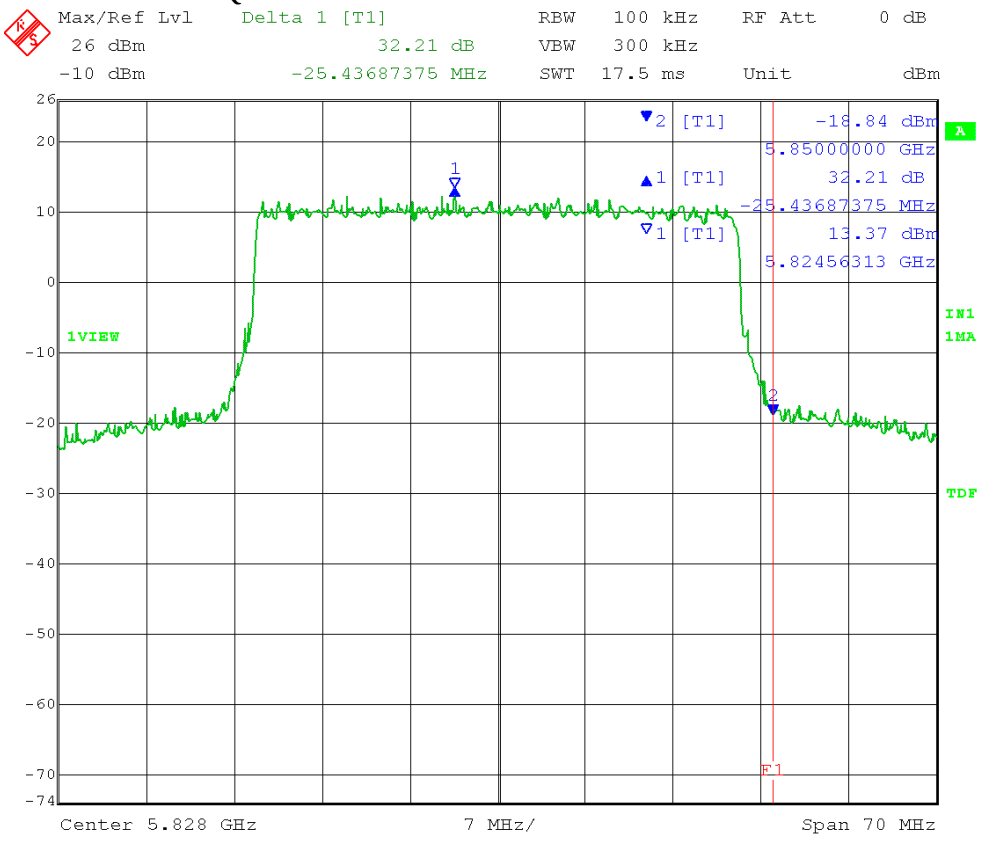

Date: 6.NOV.2013 10:17:25

## TX1



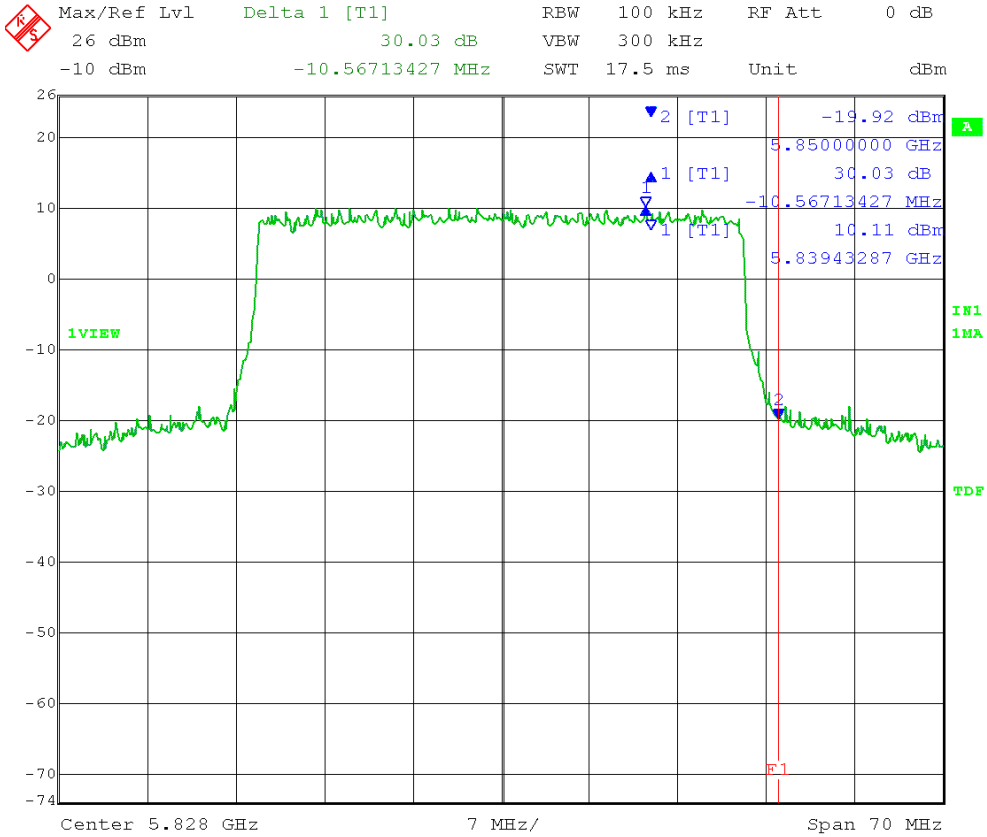

Date: 6.NOV.2013 11:05:33

## 40MHz HCH 64QAM TX0



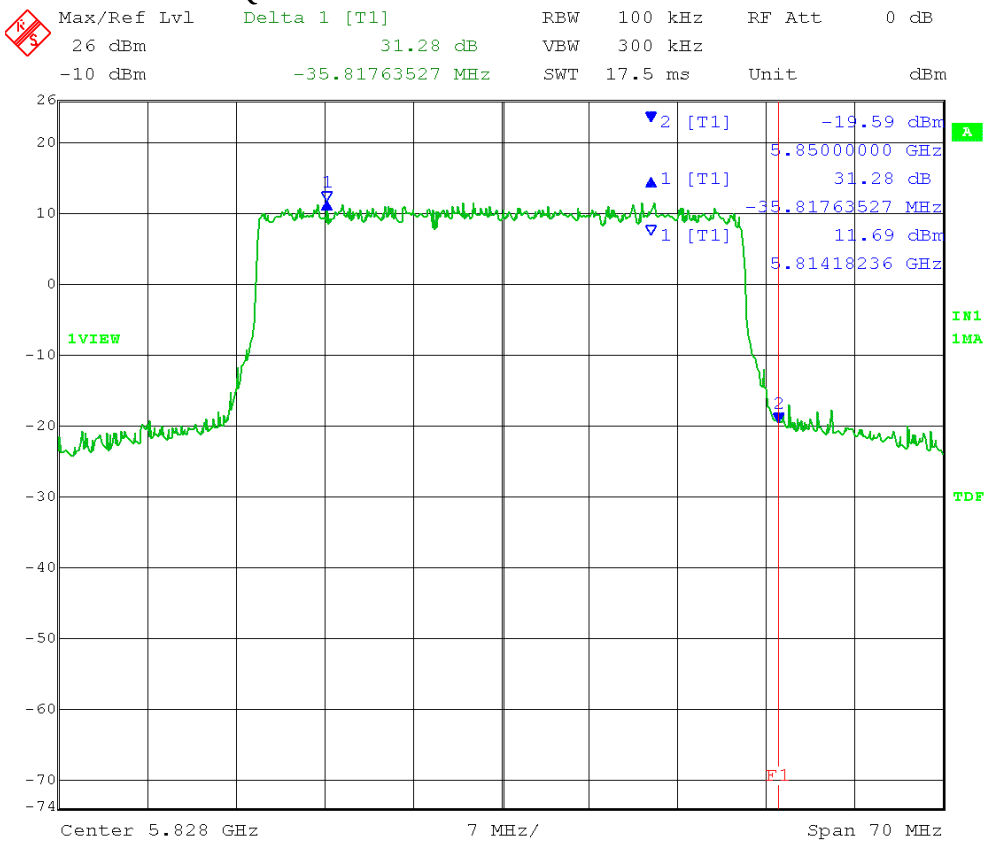

Date: 6.NOV.2013 10:19:25

## TX1



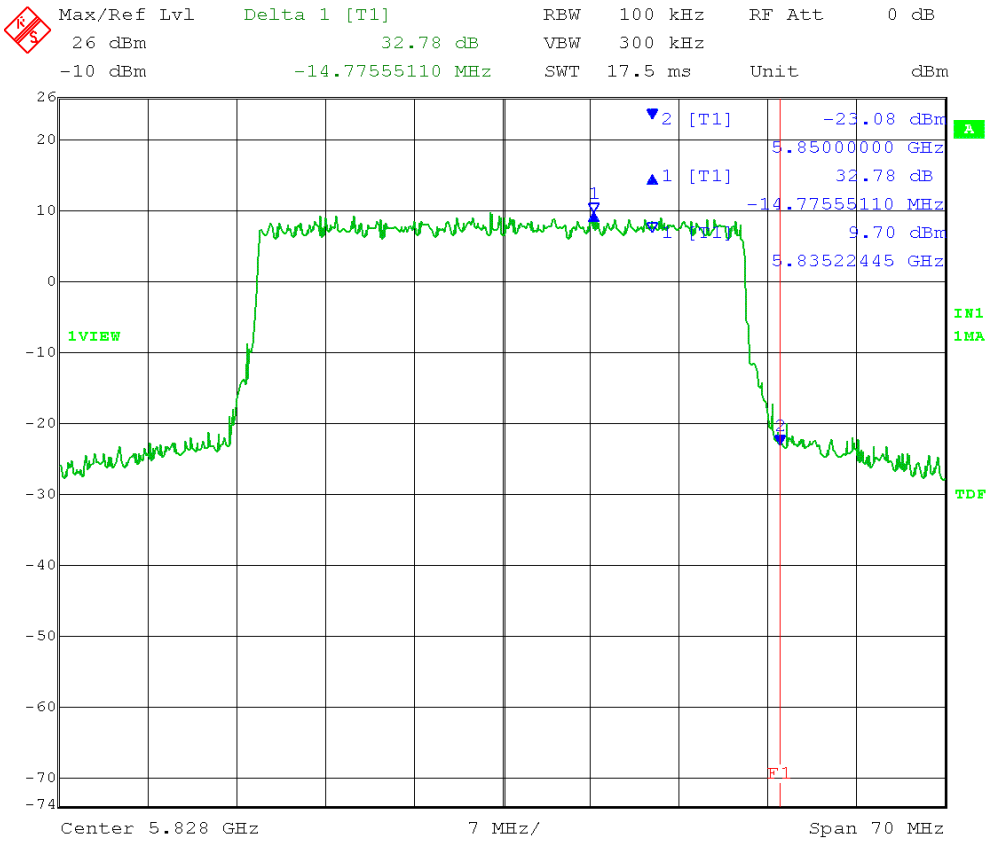

Date: 6.NOV.2013 11:06:07

## 40MHz HCH 256QAM TX0



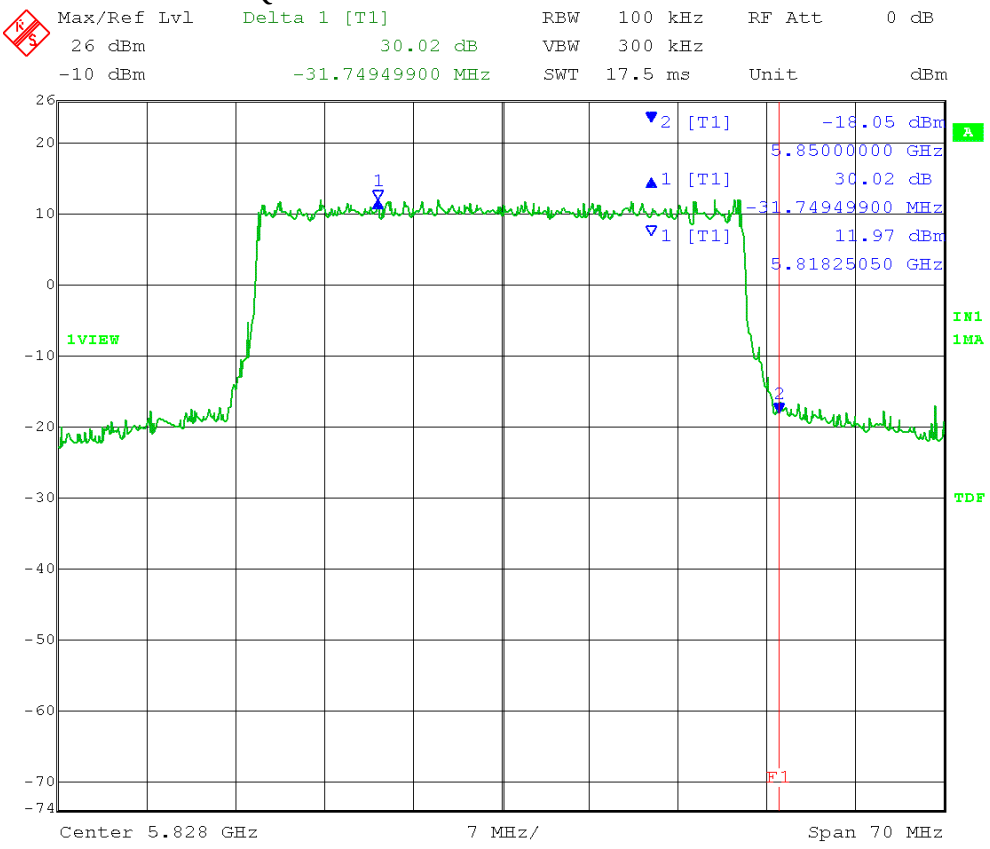

Date: 6.NOV.2013 10:20:01

## TX1



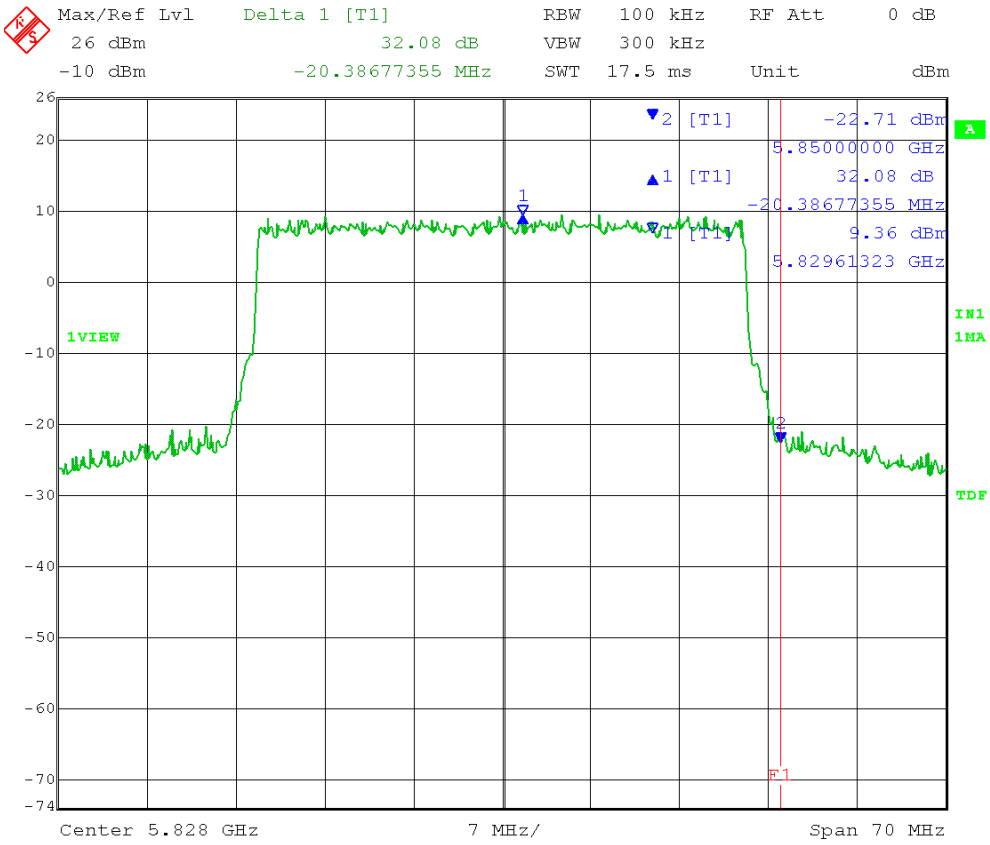

Date: 6.NOV.2013 11:06:42

40MHz HCH 1024QAM TX0



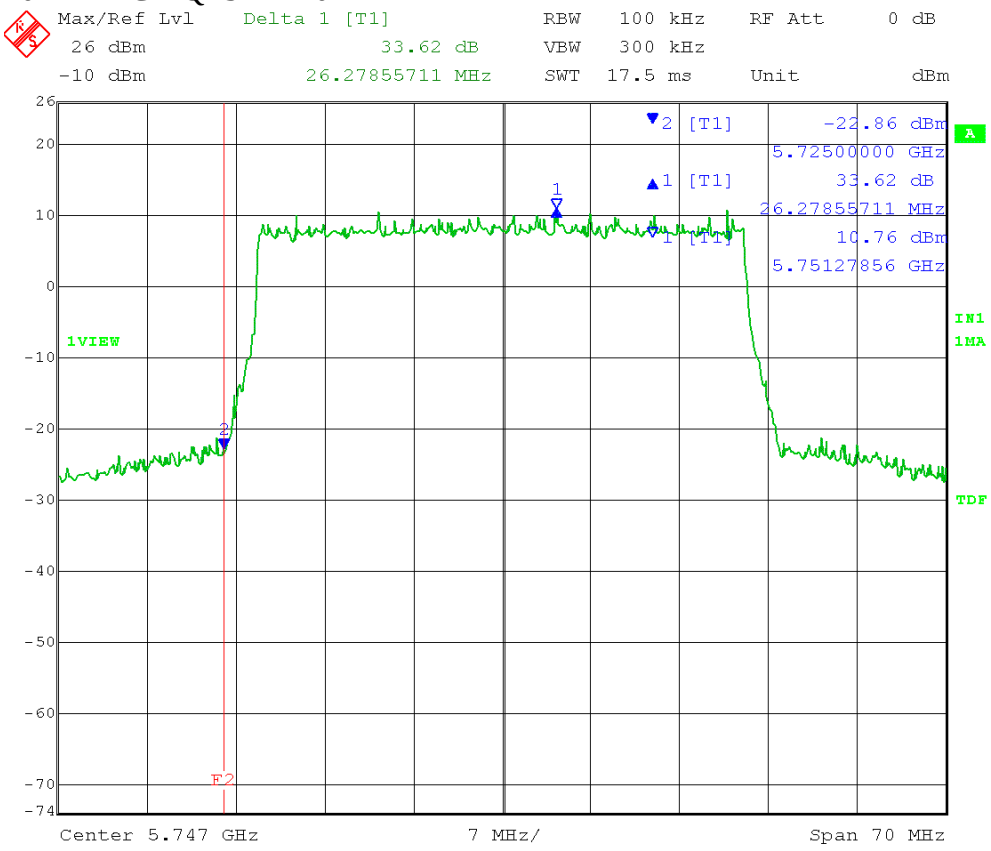

Date: 6.NOV.2013 10:20:47

TX1



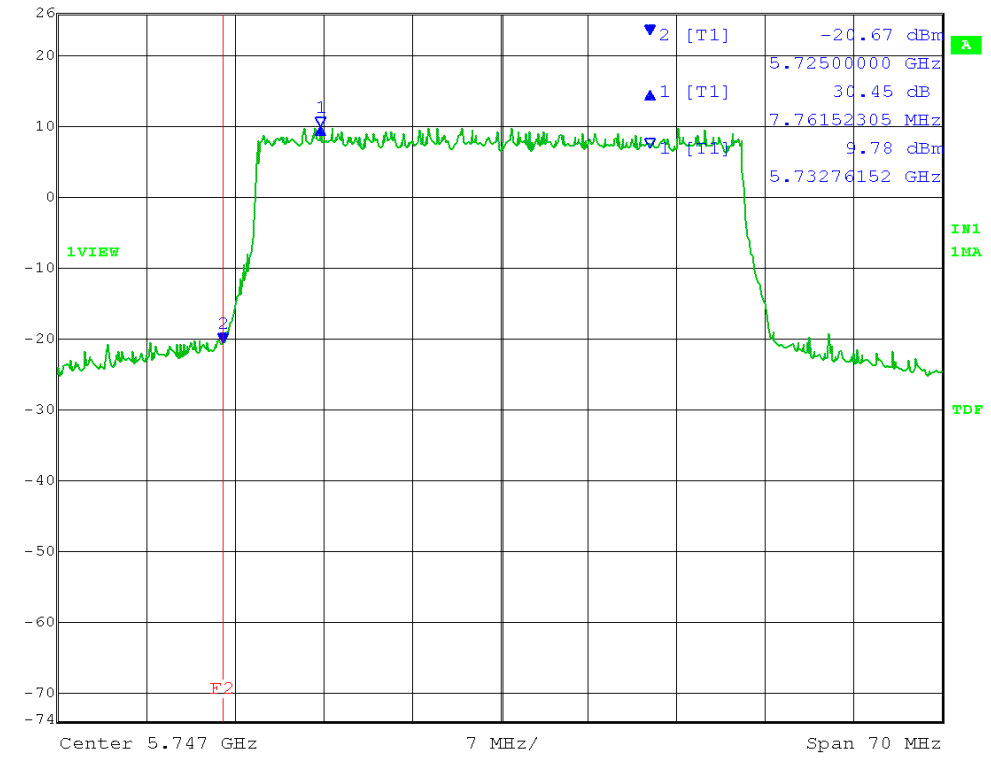

Date: 6.NOV.2013 11:07:18

40MHz LCH QPSK TX0



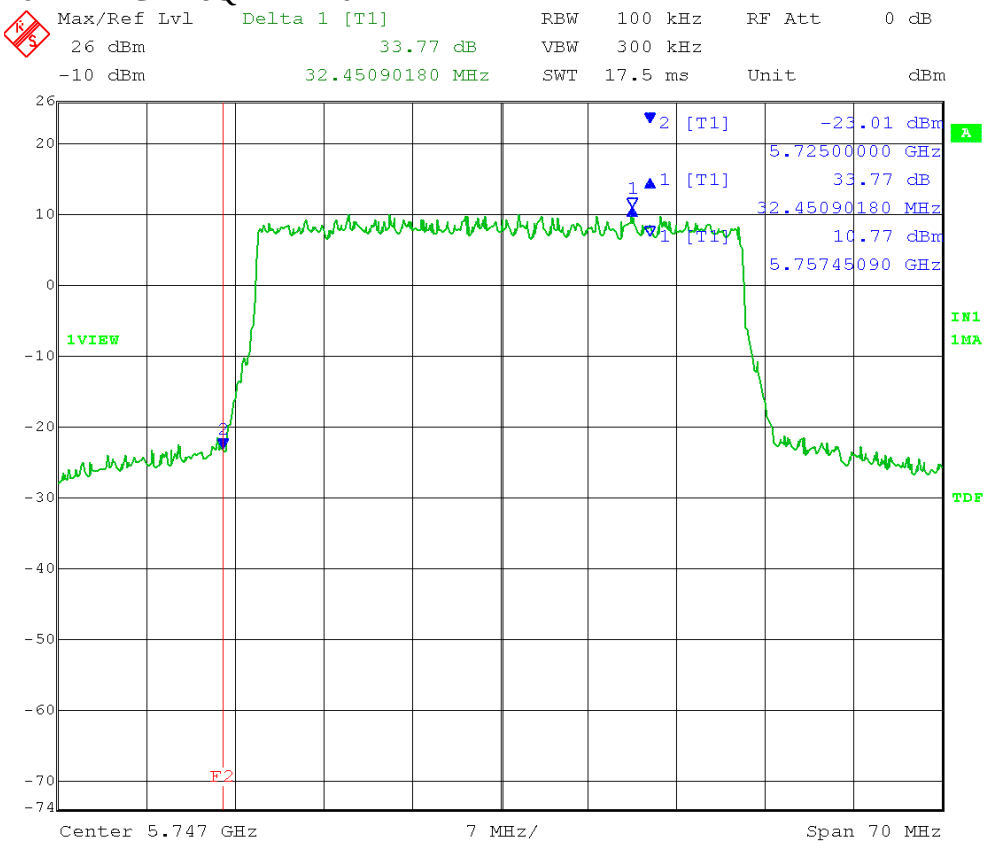

Date: 6.NOV.2013 11:41:24

TX1



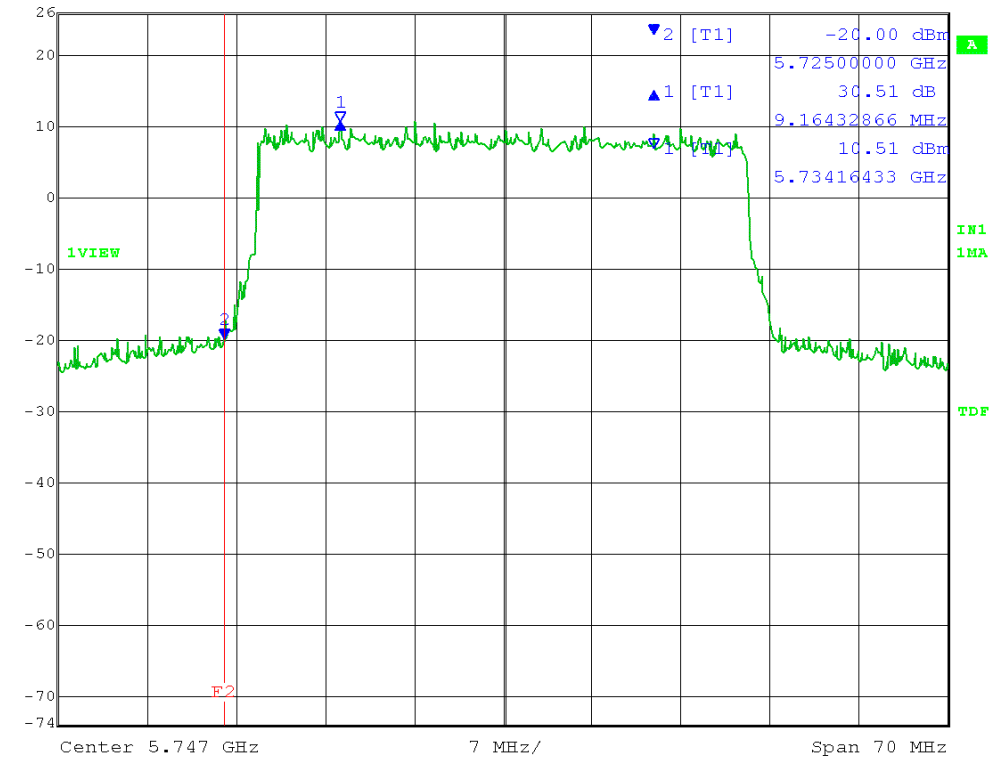

Date: 6.NOV.2013 12:34:56

40MHz LCH 16QAM TX0



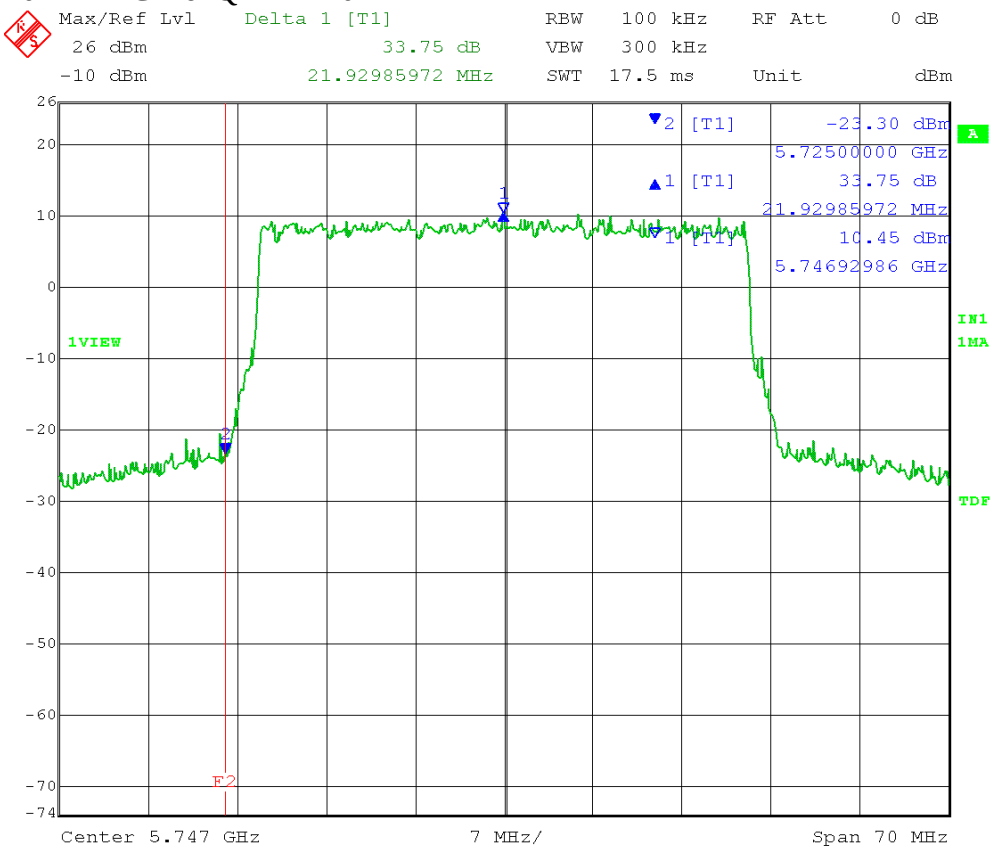

Date: 6.NOV.2013 11:42:12

TX1



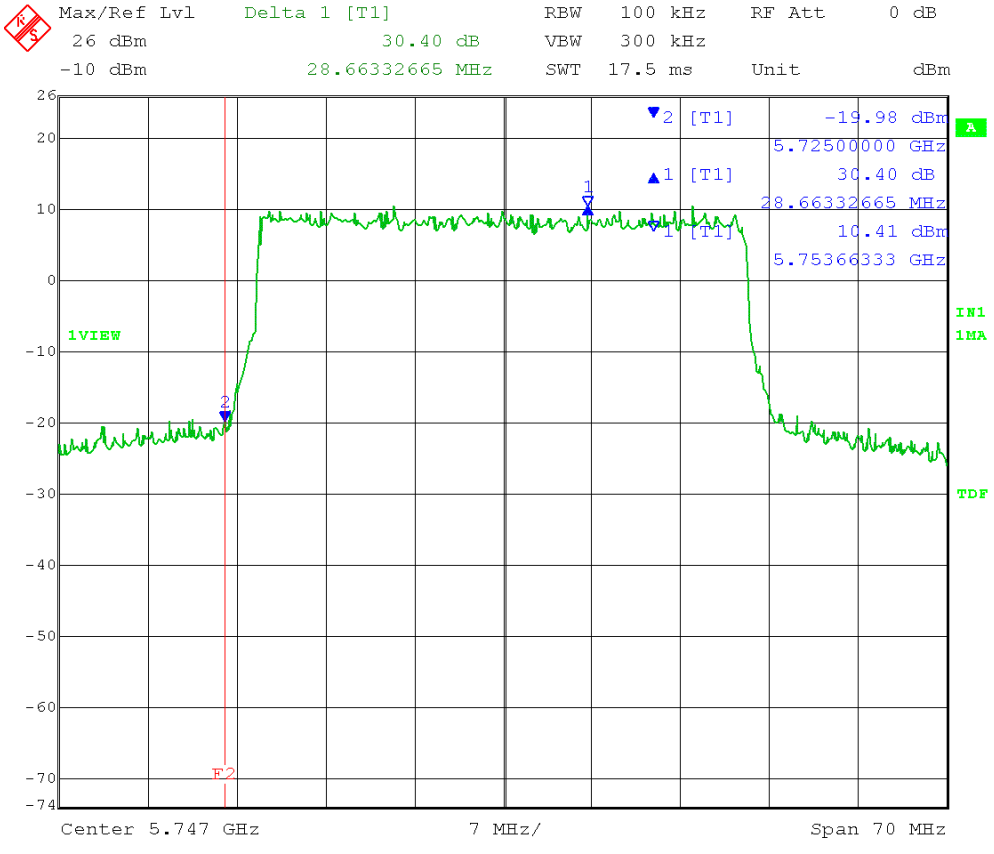

Date: 6.NOV.2013 12:35:27

## 40MHz LCH 64QAM TX0



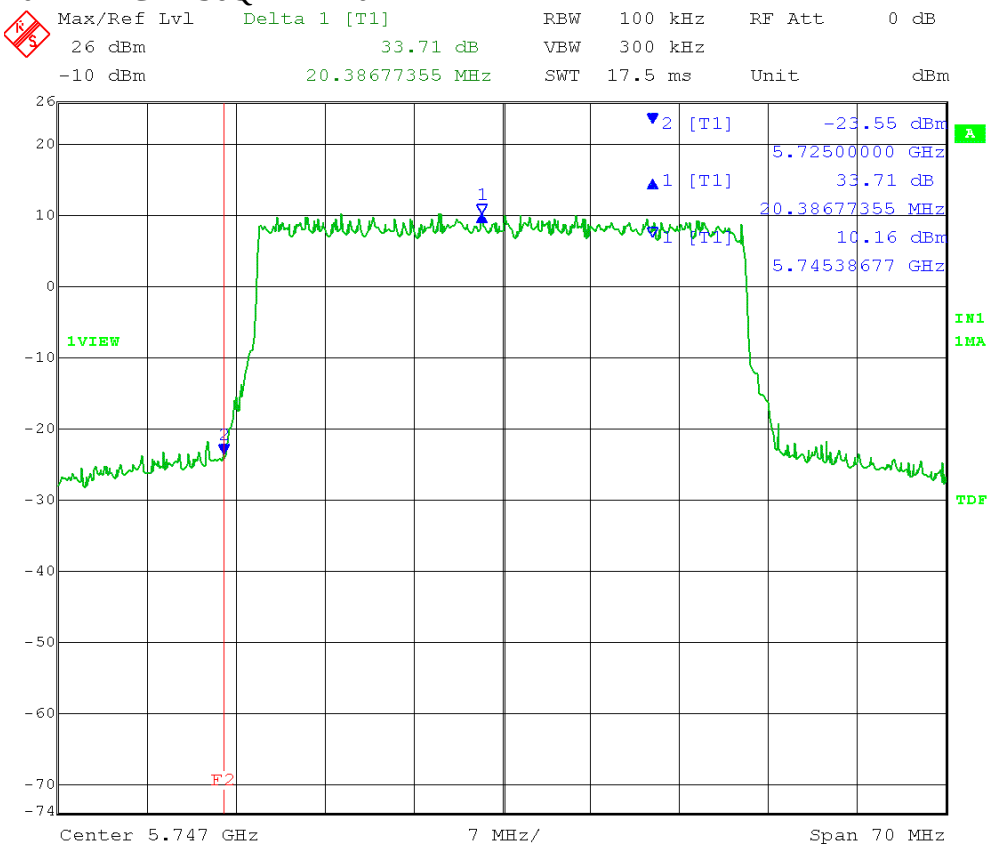

Date: 6.NOV.2013 12:20:23

## TX1



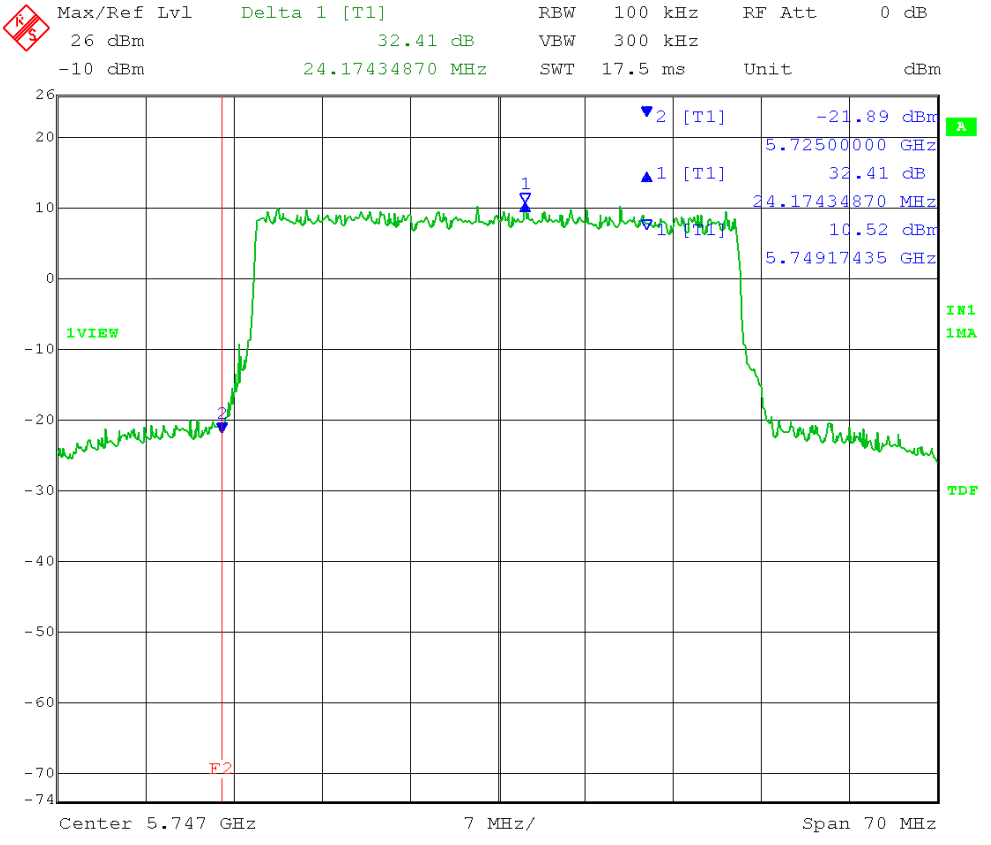

Date: 6.NOV.2013 12:35:58

## 40MHz LCH 256QAM TX0



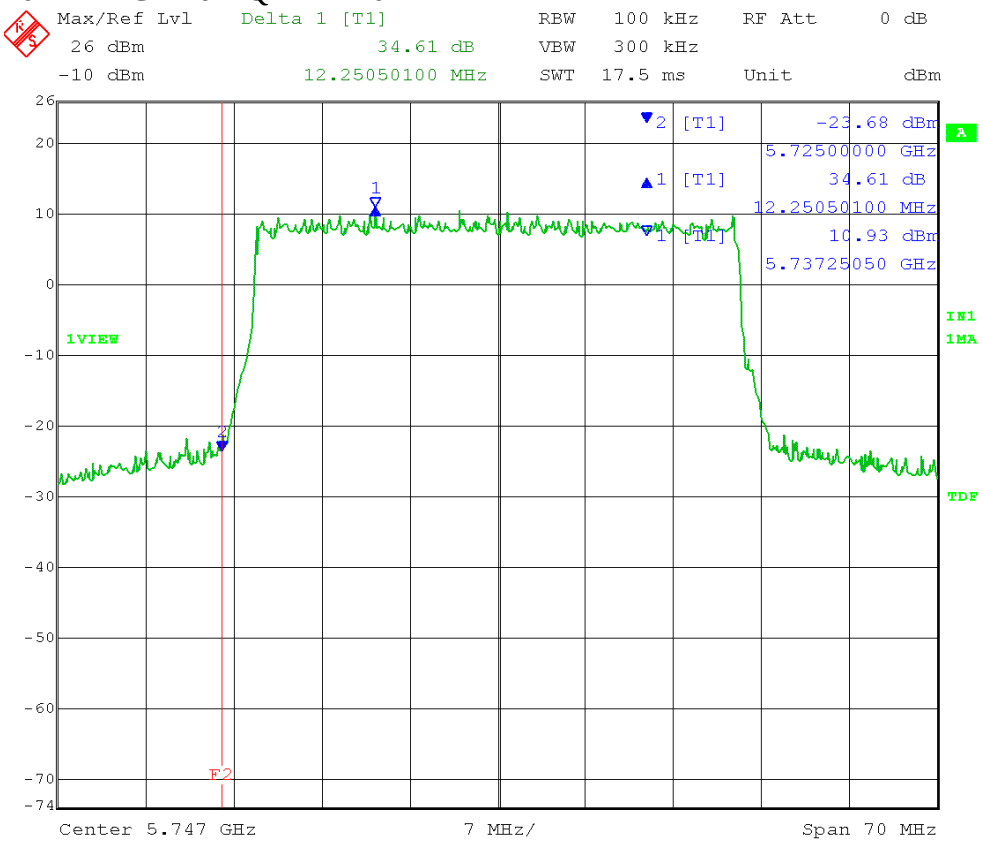

Date: 6.NOV.2013 12:20:52

## TX1



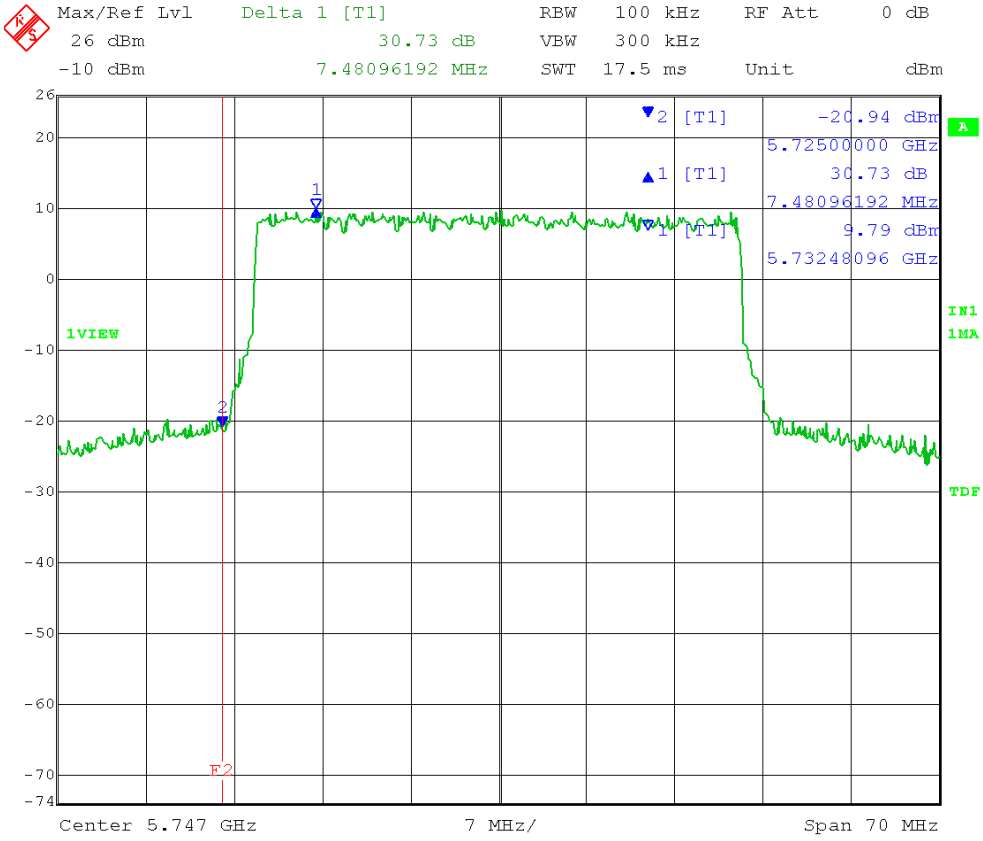

Date: 6.NOV.2013 12:36:30

## 40MHz LCH 1024QAM TX0




Date: 6.NOV.2013 12:21:19

## TX1




Date: 6.NOV.2013 12:36:56

166 South Carter, Genoa City, WI 53128

**Appendix – Measurement Data**

## 6.0 Max Unwanted Emission Levels into Restricted Frequency Bands - Radiated

**Rule Section**: FCC 15.247(d) & FCC 15.205

**Test Procedure**: FCC KDB 558074 D01 DTS Meas Guidance v03r01 – *Guidance for Performing Compliance Measurements on Digital Transmission Systems (DTS) Operating Under §15.247*

**12.0 Emissions in restricted frequency bands**
**12.1 Radiated emission measurements**

**Description**: This test applies to harmonics/spurs that fall in the restricted bands listed in FCC 15.205. These are radiated emission measurements.

Both transmit chains active. Output power was set to 50 dBm eirp using special test software. Measurements were taken for QPSK modulation (worst case) at the lowest, middle, and highest channels of operation. Test data taken between 30 & 1000MHz at a 50MHz channel bandwidth is representative of the 10MHz, 20MHz, and 40MHz bandwidths as well. Testing above 1GHz is documented for all bandwidths. EUT was set to transmit continuously. Radiated measurements were taken both vertically and horizontally. All other restricted band emissions were at least 20 dB under the limit.

**Limit:** FCC Part 15.209

**Results:** Passed

***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: 50 MHz channel BW; L, M, and H channels
Comment: Power set to 50 dBm eirp; QPSK
Date: 10-02-2013; 10-17-2013; 10-18-13

***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)

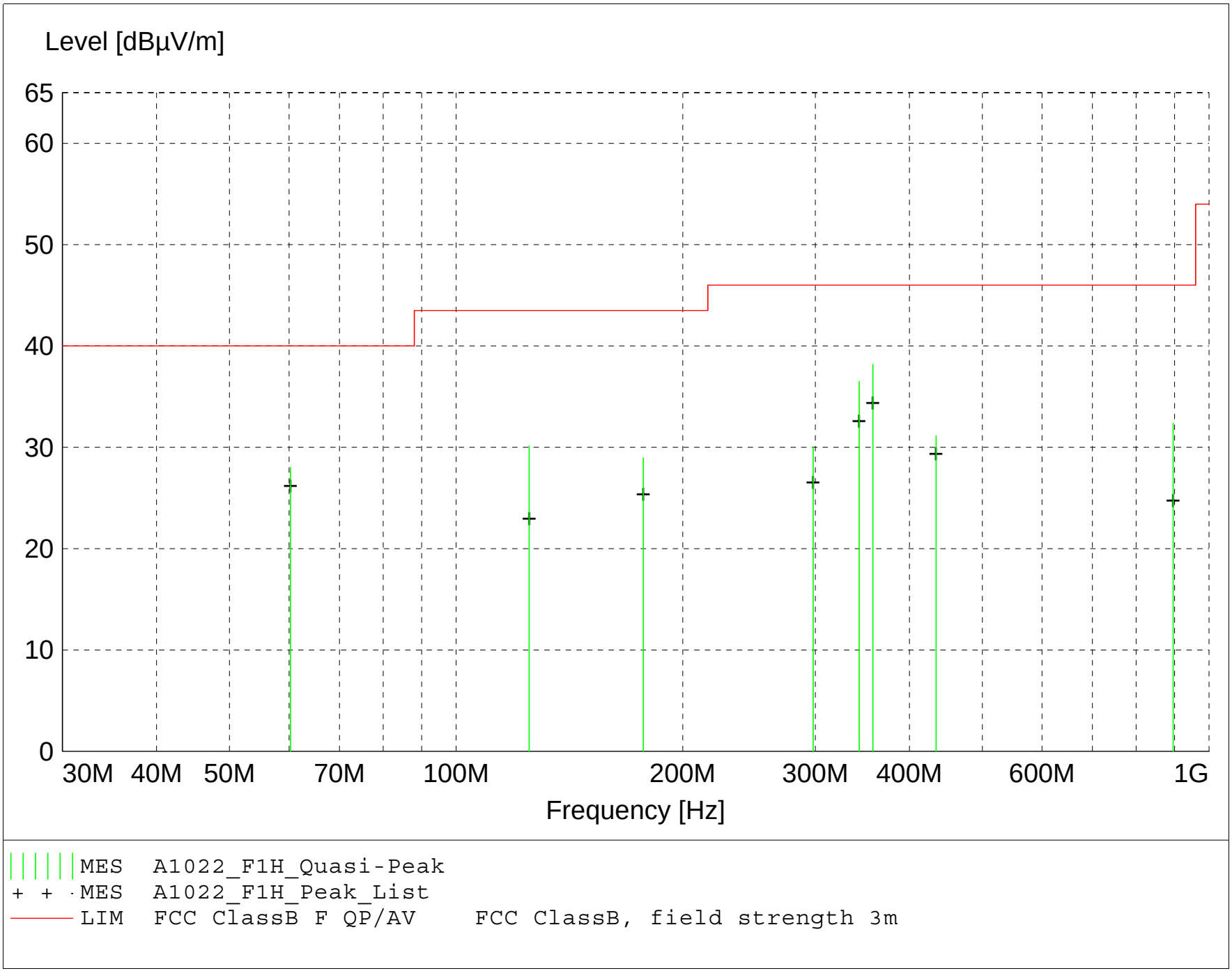
Margin(dB) = Limit(dBµV/m) - Total Level(dBµV/m)

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 |

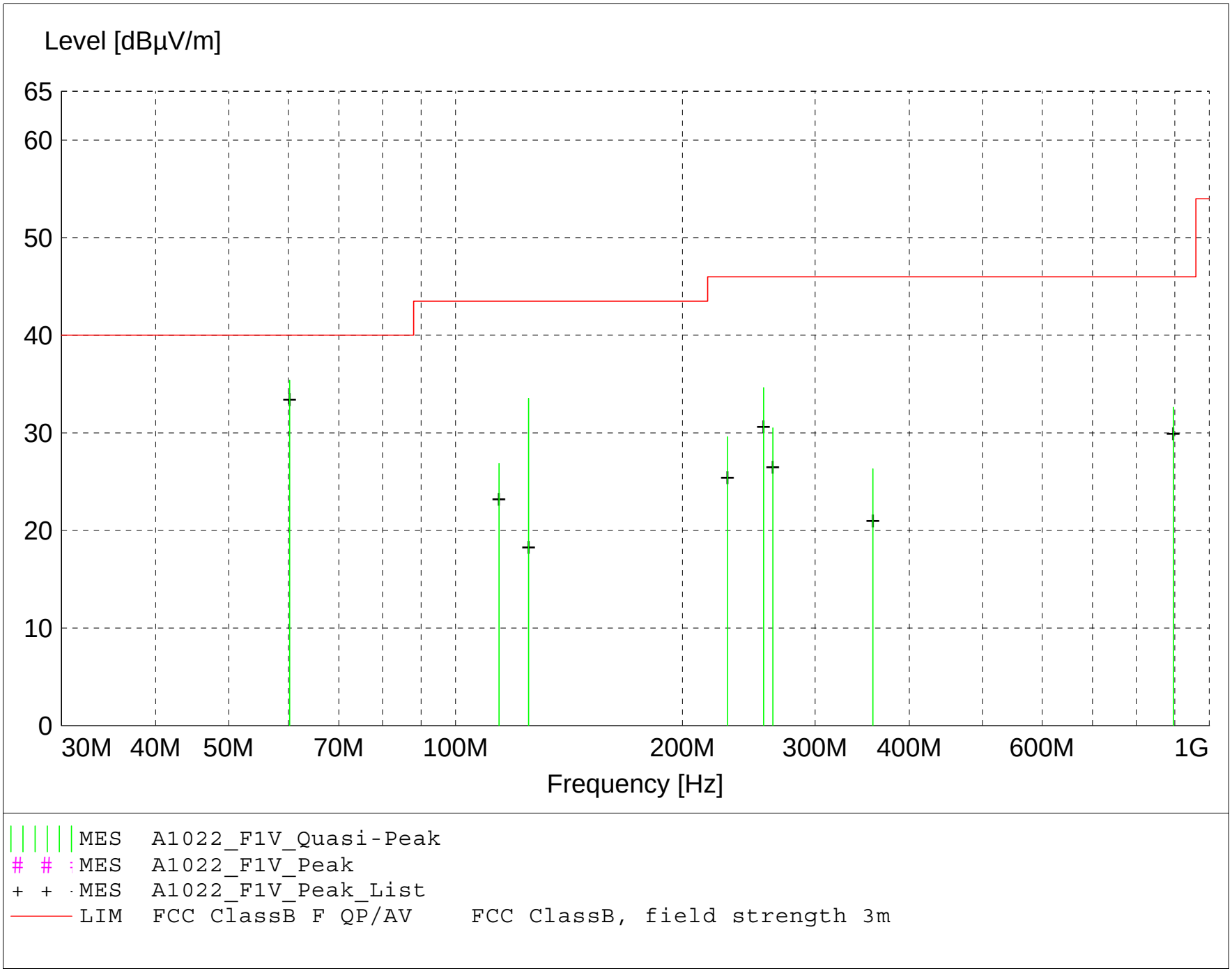
***FCC Part 15.209***

***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:   50 MHz channel BW; L, M, and H channels
Comment:              Power set to 50 dBm eirp; QPSK
                      Date: 10-02-2013; 10-17-2013; 10-18-13
```

***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 15.209  Class B*

## *Electric Field Strength*

EUT: AF5
Manufacturer: Ubiquiti Networks
Operating Condition: 72 deg. F; 31% R.H.
Test Site: DLS O.F. Site 3
Operator: Craig B
Test Specification: Radiated emissions with integral antenna
Comment: 40 MHz ch BW; 50 dBm eirp; QPSK; L, M, H channels
Date: 11-08-2013

## *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)

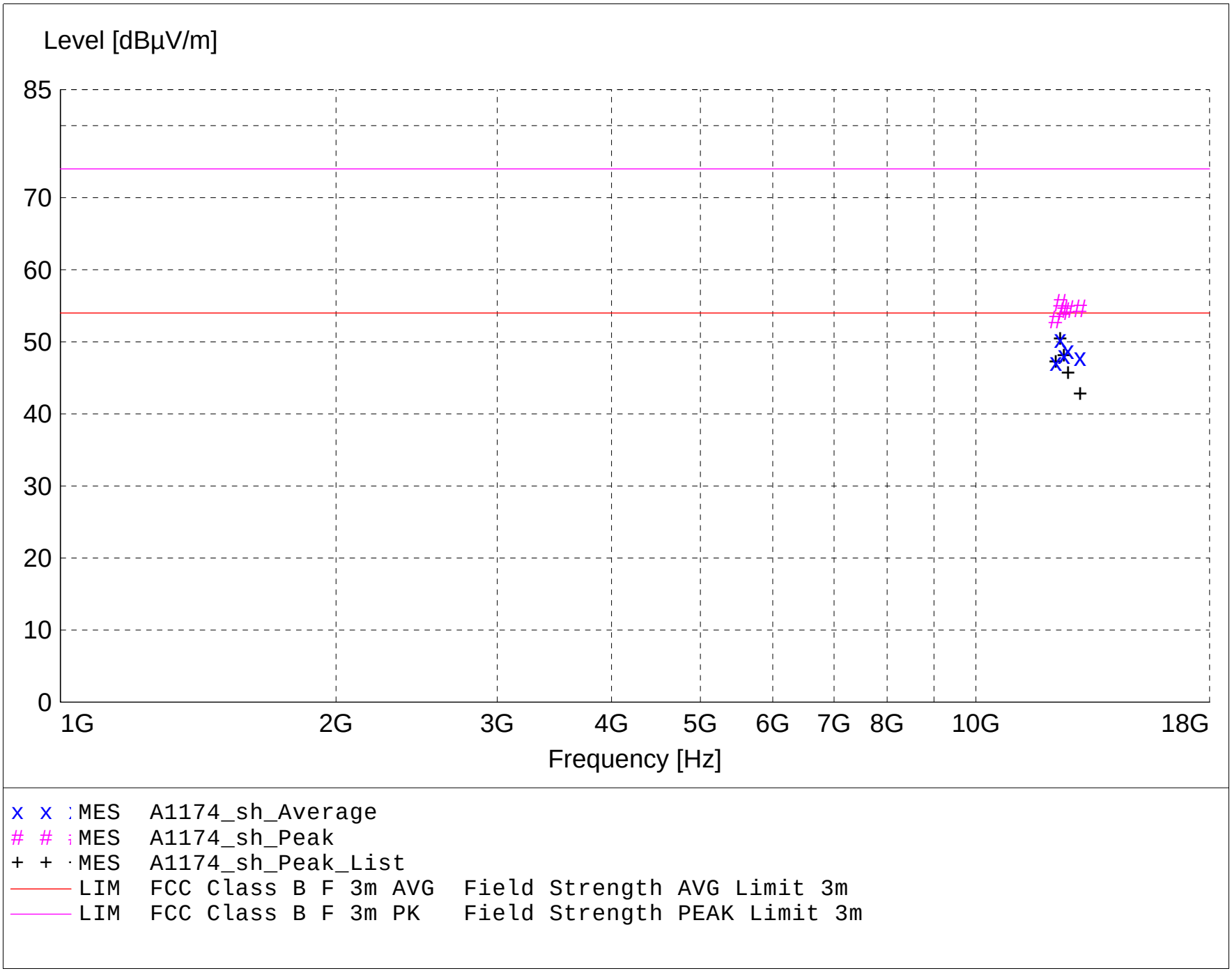
Margin(dB) = Limit(dBµV/m) - Total Level(dBµV/m)

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 x MES A1174_sh_Average
# # # MES A1174_sh_Peak
+ + + MES A1174_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: "A1174_sh_Final"***

11/8/2013 11:25AM

| 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 | | |
| 12366.000000 | 62.92 | 38.85 | -51.4 | 50.4 | 54.0 | 3.6 | 1.00 | 0 | AVERAGE | Low ch |
| 12609.000000 | 61.19 | 38.69 | -51.1 | 48.8 | 54.0 | 5.2 | 1.60 | 135 | AVERAGE | High ch |
| 12480.000000 | 60.69 | 38.75 | -51.2 | 48.2 | 54.0 | 5.8 | 1.60 | 200 | AVERAGE | Mid ch |
| 13000.000000 | 59.46 | 39.50 | -51.1 | 47.8 | 54.0 | 6.2 | 1.10 | 15 | AVERAGE | all channels |
| 12225.000000 | 59.73 | 38.95 | -51.5 | 47.2 | 54.0 | 6.8 | 1.50 | 0 | AVERAGE | all channels |
| 12366.000000 | 67.92 | 38.85 | -51.4 | 55.4 | 74.0 | 18.6 | 1.00 | 0 | MAX PEAK | Low ch |
| 13000.000000 | 66.25 | 39.50 | -51.1 | 54.6 | 74.0 | 19.4 | 1.10 | 15 | MAX PEAK | all channels |
| 12609.000000 | 66.93 | 38.69 | -51.1 | 54.6 | 74.0 | 19.4 | 1.60 | 135 | MAX PEAK | High ch |
| 12480.000000 | 66.79 | 38.75 | -51.2 | 54.3 | 74.0 | 19.7 | 1.60 | 200 | MAX PEAK | Mid ch |
| 12225.000000 | 65.58 | 38.95 | -51.5 | 53.1 | 74.0 | 20.9 | 1.50 | 0 | MAX PEAK | all channels |

## *FCC 15.209  Class B*

## *Electric Field Strength*

EUT: AF5
Manufacturer: Ubiquiti Networks
Operating Condition: 72 deg. F; 31% R.H.
Test Site: DLS O.F. Site 3
Operator: Craig B
Test Specification: Radiated emissions with integral antenna
Comment: 40 MHz ch BW; 50 dBm eirp; QPSK; L, M, H channels
Date: 11-08-2013

## *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

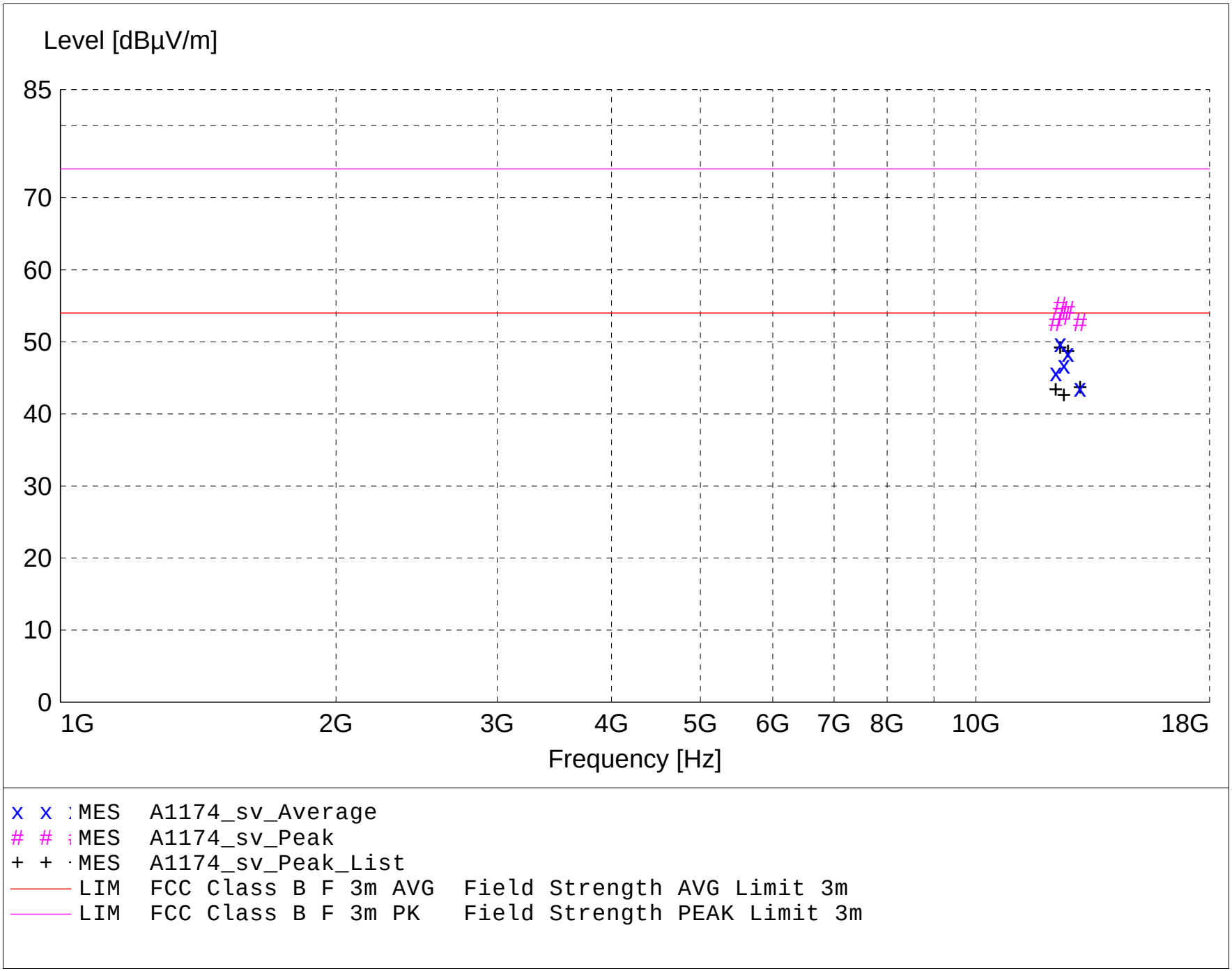
Margin(dB) = Limit(dBµV/m) - Total Level(dBµV/m)
15.4 = 40 - 24.6

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]
85
70
60
50
40
30
20
10
0
1G
2G
3G
4G
5G
6G
7G
8G
10G
18G
Frequency [Hz]
x x x MES A1174_sv_Average
# # # MES A1174_sv_Peak
+ + + MES A1174_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: "A1174_sv_Final"***

11/8/2013 10:47AM

| 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 | | |
| 12366.000000 | 62.29 | 38.85 | -51.4 | 49.8 | 54.0 | 4.2 | 1.10 | 0 | AVERAGE | Low ch |
| 12608.980000 | 60.79 | 38.69 | -51.1 | 48.4 | 54.0 | 5.6 | 1.10 | 0 | AVERAGE | High ch |
| 12480.000000 | 59.34 | 38.75 | -51.2 | 46.8 | 54.0 | 7.2 | 1.40 | 0 | AVERAGE | Mid ch |
| 12225.000000 | 58.25 | 38.95 | -51.5 | 45.8 | 54.0 | 8.2 | 1.20 | 0 | AVERAGE | all channels |
| 13000.000000 | 55.22 | 39.50 | -51.1 | 43.6 | 54.0 | 10.4 | 1.20 | 0 | AVERAGE | all channels |
| 12366.000000 | 67.55 | 38.85 | -51.4 | 55.0 | 74.0 | 19.0 | 1.10 | 0 | MAX PEAK | Low ch |
| 12608.980000 | 66.79 | 38.69 | -51.1 | 54.4 | 74.0 | 19.6 | 1.10 | 0 | MAX PEAK | High ch |
| 12480.000000 | 66.11 | 38.75 | -51.2 | 53.6 | 74.0 | 20.4 | 1.40 | 0 | MAX PEAK | Mid ch |
| 12225.000000 | 65.18 | 38.95 | -51.5 | 52.7 | 74.0 | 21.3 | 1.20 | 0 | MAX PEAK | all channels |
| 13000.000000 | 64.27 | 39.50 | -51.1 | 52.7 | 74.0 | 21.3 | 1.20 | 0 | MAX PEAK | all channels |

## *FCC 15.209  Class B*

## *Electric Field Strength*

EUT: AF5
Manufacturer: Ubiquiti Networks
Operating Condition: 72 deg. F; 31% R.H.
Test Site: DLS O.F. Site 3
Operator: Craig B
Test Specification: Radiated emissions with integral antenna
Comment: 40 MHz ch BW; 50 dBm eirp; QPSK; L, M, H channels
Date: 11-08-2013

## *TEXT: "Horz 1 meters"*

Short Description: Test Set-up

Test Set-up: EUT Measured at 1 Meters with HORIZONTAL Antenna Polarization

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

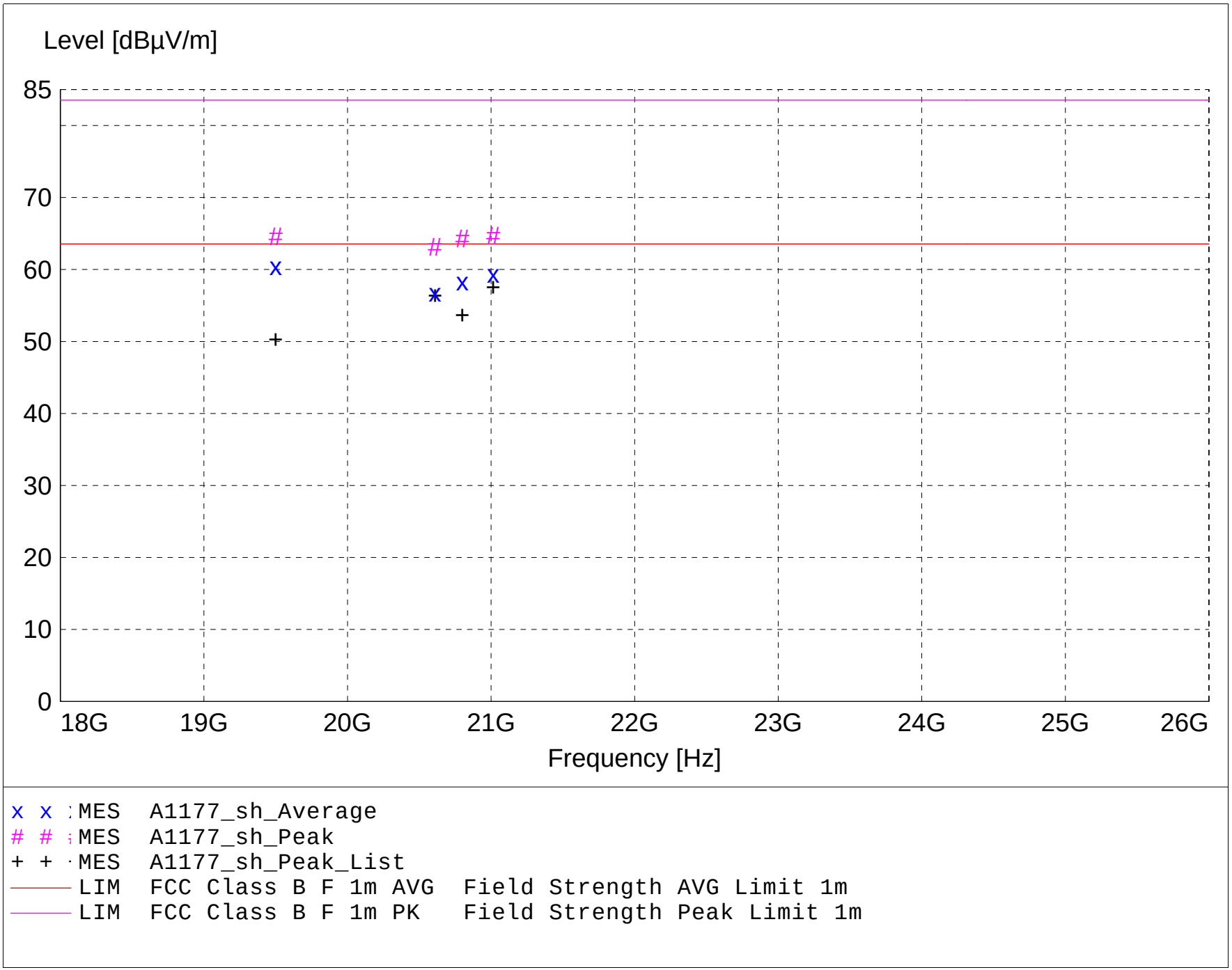
Margin(dB) = Limit(dBµV/m) - Total Level(dBµV/m)

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]
85
70
60
50
40
30
20
10
0
18G
19G
20G
21G
22G
23G
24G
25G
26G
Frequency [Hz]
x x x MES A1177_sh_Average
# # # MES A1177_sh_Peak
+ + + MES A1177_sh_Peak_List
LIM FCC Class B F 1m AVG Field Strength AVG Limit 1m
LIM FCC Class B F 1m PK Field Strength Peak Limit 1m

***MEASUREMENT RESULT: "A1177_sh_Final"***

11/8/2013 3:57PM

| 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 | | |
| 19500.000000 | 52.86 | 45.94 | -38.3 | 60.5 | 63.5 | 3.0 | 1.50 | 225 | AVERAGE | all channels |
| 21015.000000 | 48.90 | 46.85 | -36.4 | 59.3 | 63.5 | 4.2 | 1.40 | 245 | AVERAGE | High ch |
| 20800.020000 | 47.90 | 46.66 | -36.3 | 58.3 | 63.5 | 5.2 | 1.50 | 250 | AVERAGE | Mid ch |
| 20610.020000 | 46.86 | 46.45 | -36.5 | 56.8 | 63.5 | 6.8 | 1.70 | 240 | AVERAGE | Low ch |
| 21015.000000 | 54.24 | 46.85 | -36.4 | 64.7 | 83.5 | 18.9 | 1.40 | 245 | MAX PEAK | High ch |
| 19500.000000 | 56.98 | 45.94 | -38.3 | 64.6 | 83.5 | 18.9 | 1.50 | 225 | MAX PEAK | all channels |
| 20800.020000 | 53.97 | 46.66 | -36.3 | 64.4 | 83.5 | 19.2 | 1.50 | 250 | MAX PEAK | Mid ch |
| 20610.020000 | 53.29 | 46.45 | -36.5 | 63.2 | 83.5 | 20.3 | 1.70 | 240 | MAX PEAK | Low ch |

## *FCC 15.209  Class B*

## *Electric Field Strength*

EUT: AF5
Manufacturer: Ubiquiti Networks
Operating Condition: 72 deg. F; 31% R.H.
Test Site: DLS O.F. Site 3
Operator: Craig B
Test Specification: Radiated emissions with integral antenna
Comment: 40 MHz ch BW; 50 dBm eirp; QPSK; L, M, H channels
Date: 11-08-2013

## *TEXT: "Vert 1 meters"*

Short Description: Test Set-up

Test Set-up: EUT Measured at 1 Meters with VERTICAL Antenna Polarization

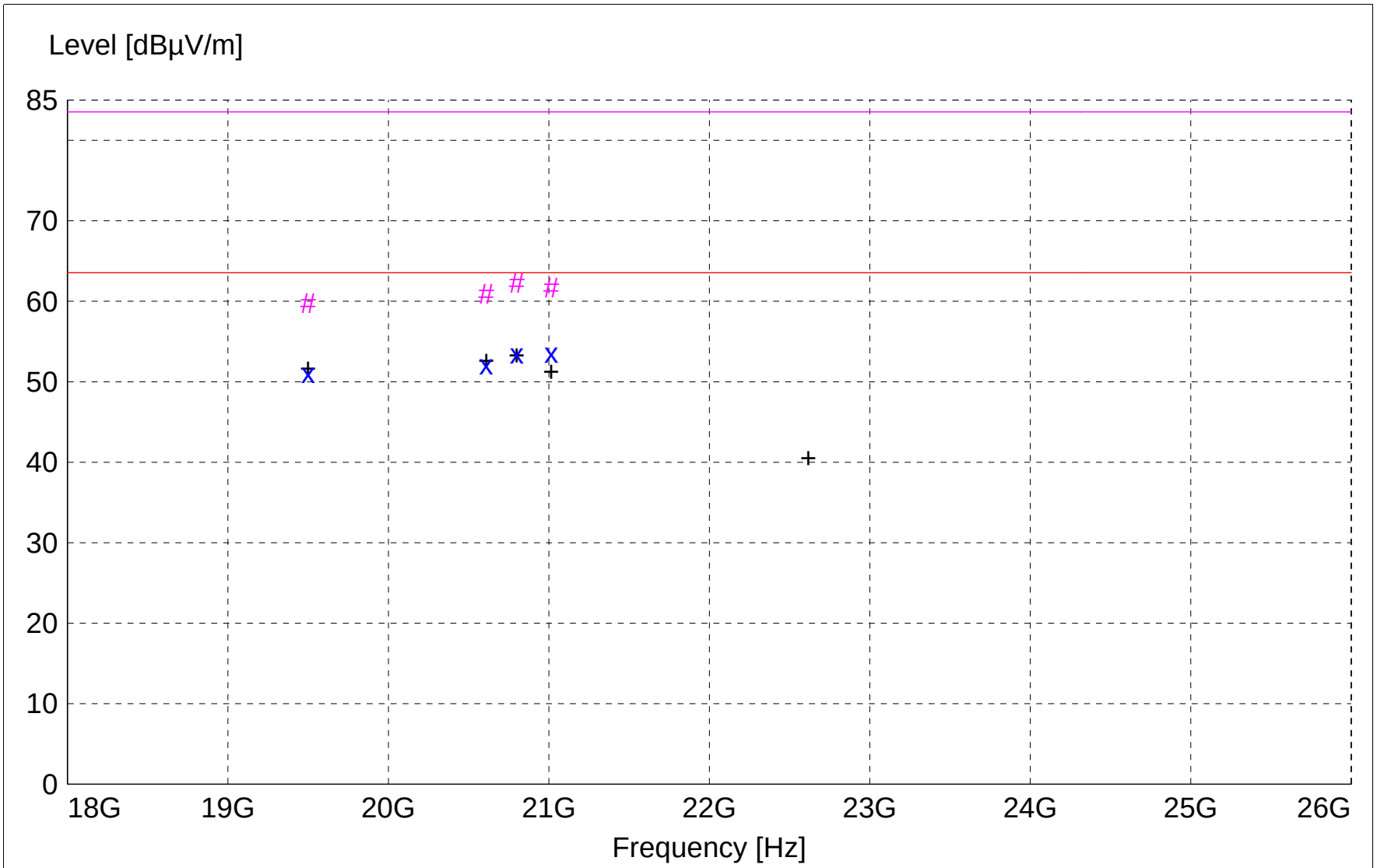
Sample Equations:

| 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 x MES A1177_sv_Average
# # # MES A1177_sv_Peak
+ + + MES A1177_sv_Peak_List
——— LIM FCC Class B F 1m AVG Field Strength AVG Limit 1m
——— LIM FCC Class B F 1m PK Field Strength Peak Limit 1m

***MEASUREMENT RESULT: "A1177_sv_Final"***

11/8/2013 4:18PM

| 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 | | |
| 21015.020000 | 43.16 | 46.85 | -36.4 | 53.6 | 63.5 | 9.9 | 1.50 | 200 | AVERAGE | High ch |
| 20800.020000 | 43.09 | 46.66 | -36.3 | 53.5 | 63.5 | 10.0 | 1.80 | 225 | AVERAGE | Mid ch |
| 20610.020000 | 42.22 | 46.45 | -36.5 | 52.1 | 63.5 | 11.4 | 1.60 | 220 | AVERAGE | Low ch |
| 19500.000000 | 43.41 | 45.94 | -38.3 | 51.0 | 63.5 | 12.5 | 1.70 | 170 | AVERAGE | all channels |
| 20800.020000 | 51.90 | 46.66 | -36.3 | 62.3 | 83.5 | 21.2 | 1.80 | 225 | MAX PEAK | Mid ch |
| 21015.020000 | 51.25 | 46.85 | -36.4 | 61.7 | 83.5 | 21.8 | 1.50 | 200 | MAX PEAK | High ch |
| 20610.020000 | 50.99 | 46.45 | -36.5 | 60.9 | 83.5 | 22.6 | 1.60 | 220 | MAX PEAK | Low ch |
| 19500.000000 | 52.18 | 45.94 | -38.3 | 59.8 | 83.5 | 23.7 | 1.70 | 170 | MAX PEAK | all channels |

## *FCC 15.209  Class B*

## *Electric Field Strength*

EUT: AF5
Manufacturer: Ubiquiti Networks
Operating Condition: 72 deg. F; 31% R.H.
Test Site: DLS O.F. Site 3
Operator: Craig B
Test Specification: Radiated emissions with integral antenna
Comment: 50 MHz ch BW; 50 dBm eirp; QPSK; L, M, H channels
Date: 10-17-2013 / 11-08-2013

## *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)

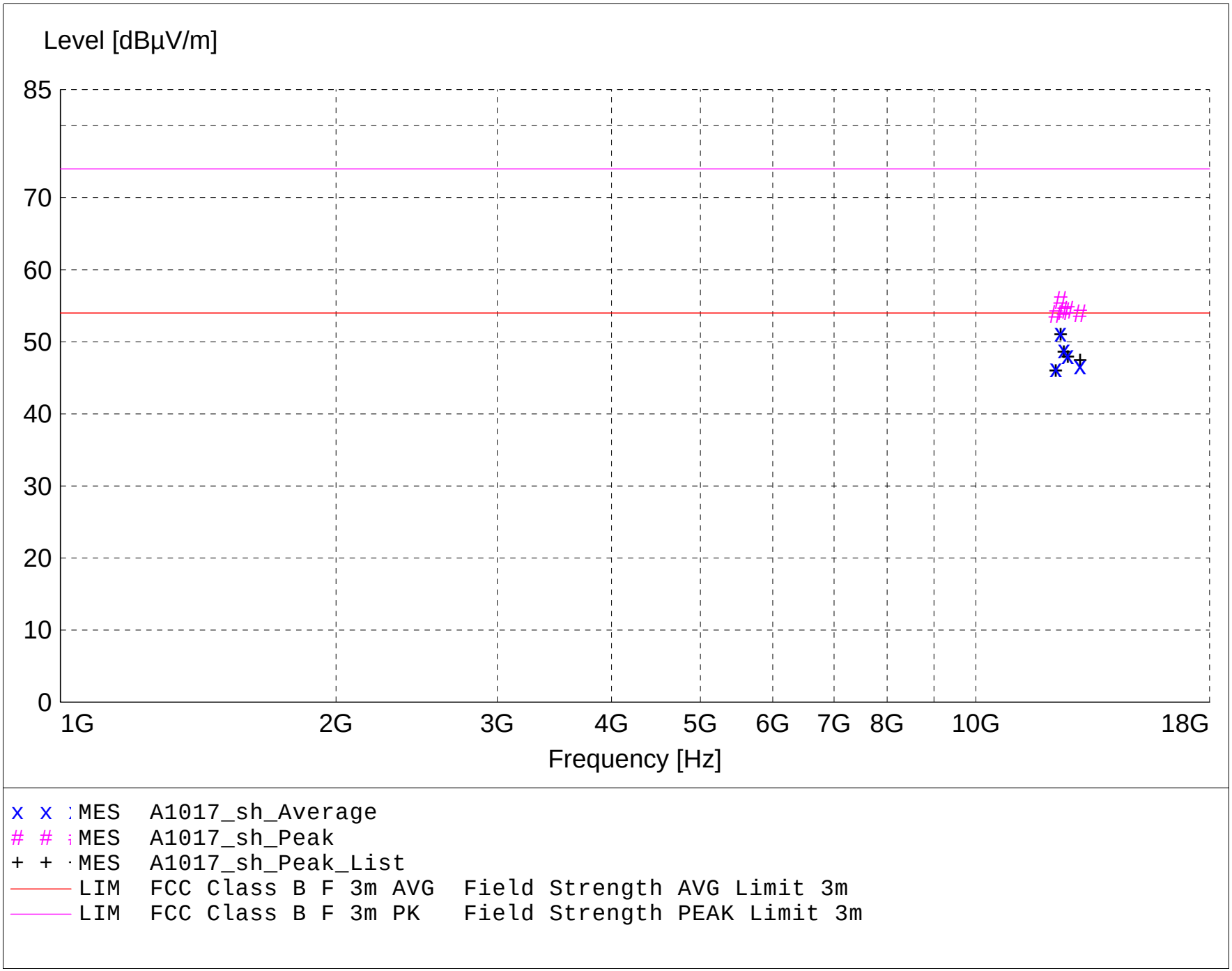
Margin(dB) = Limit(dBµV/m) - Total Level(dBµV/m)

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 x MES A1017_sh_Average
# # # MES A1017_sh_Peak
+ + + MES A1017_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: "A1017_sh_Final"***

11/8/2013 11:48AM

| 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 | | |
| 12375.000000 | 63.79 | 38.85 | -51.4 | 51.3 | 54.0 | 2.7 | 1.00 | 0 | AVERAGE | Low ch |
| 12480.000000 | 61.44 | 38.75 | -51.2 | 48.9 | 54.0 | 5.1 | 1.00 | 195 | AVERAGE | Mid ch |
| 12600.000000 | 60.52 | 38.69 | -51.1 | 48.1 | 54.0 | 5.9 | 1.00 | 180 | AVERAGE | High ch |
| 13000.000000 | 58.30 | 39.50 | -51.1 | 46.7 | 54.0 | 7.3 | 1.00 | 10 | AVERAGE | all channels |
| 12225.000000 | 58.77 | 38.95 | -51.5 | 46.3 | 54.0 | 7.7 | 1.80 | 215 | AVERAGE | L,M,H ch; QPSK |
| 12375.000000 | 68.29 | 38.85 | -51.4 | 55.8 | 74.0 | 18.2 | 1.00 | 0 | MAX PEAK | Low ch |
| 12600.000000 | 66.79 | 38.69 | -51.1 | 54.4 | 74.0 | 19.6 | 1.00 | 180 | MAX PEAK | High ch |
| 12480.000000 | 66.79 | 38.75 | -51.2 | 54.3 | 74.0 | 19.7 | 1.00 | 195 | MAX PEAK | Mid ch |
| 13000.000000 | 65.58 | 39.50 | -51.1 | 54.0 | 74.0 | 20.0 | 1.00 | 10 | MAX PEAK | all channels |
| 12225.000000 | 66.34 | 38.95 | -51.5 | 53.8 | 74.0 | 20.2 | 1.80 | 215 | MAX PEAK | L,M,H ch; QPSK |

## *FCC 15.209  Class B*

## *Electric Field Strength*

EUT: AF5
Manufacturer: Ubiquiti Networks
Operating Condition: 72 deg. F; 31% R.H.
Test Site: DLS O.F. Site 3
Operator: Craig B
Test Specification: Radiated emissions with integral antenna
Comment: 50 MHz ch BW; 50 dBm eirp; QPSK; L, M, H channels
Date: 10-17-2013 / 11-08-2013

## *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

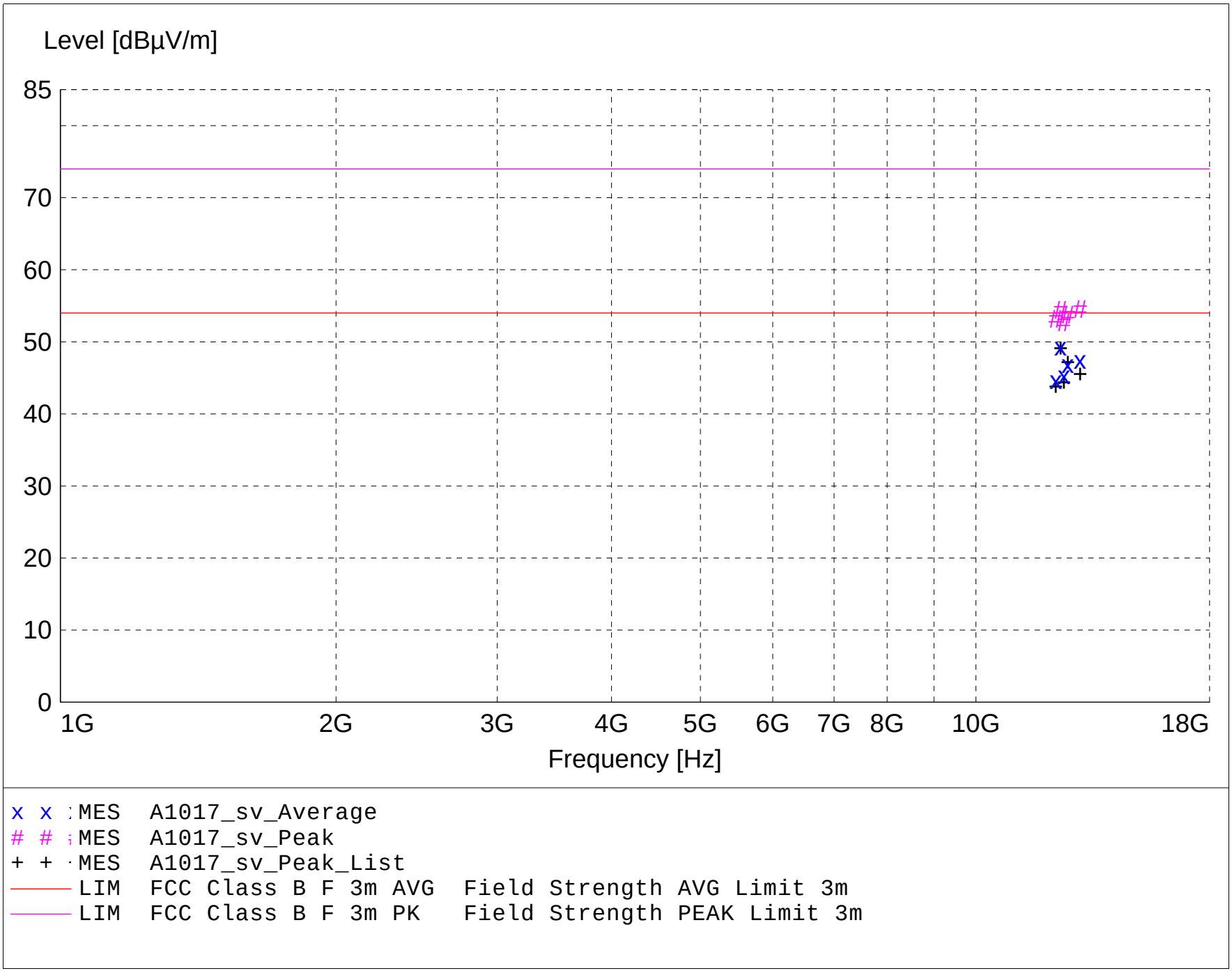
Margin(dB) = Limit(dBµV/m) - Total Level(dBµV/m)
15.4 = 40 - 24.6

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]
85
70
60
50
40
30
20
10
0
1G
2G
3G
4G
5G
6G
7G
8G
10G
18G
Frequency [Hz]
x x x MES A1017_sv_Average
# # # MES A1017_sv_Peak
+ + + MES A1017_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: "A1017_sv_Final"***

11/8/2013 12:08PM

| 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 | | |
| 12374.960000 | 61.79 | 38.85 | -51.4 | 49.3 | 54.0 | 4.7 | 1.10 | 0 | AVERAGE | Low ch |
| 13000.000000 | 59.05 | 39.50 | -51.1 | 47.4 | 54.0 | 6.6 | 1.00 | 0 | AVERAGE | all channels |
| 12599.980000 | 59.29 | 38.69 | -51.1 | 46.9 | 54.0 | 7.1 | 1.10 | 0 | AVERAGE | High ch |
| 12480.000000 | 57.80 | 38.75 | -51.2 | 45.3 | 54.0 | 8.7 | 1.00 | 0 | AVERAGE | Mid ch |
| 12225.000000 | 57.18 | 38.95 | -51.5 | 44.7 | 54.0 | 9.3 | 1.80 | 0 | AVERAGE | L,M,H ch; QPSK |
| 13000.000000 | 66.11 | 39.50 | -51.1 | 54.5 | 74.0 | 19.5 | 1.00 | 0 | MAX PEAK | all channels |
| 12374.960000 | 66.93 | 38.85 | -51.4 | 54.4 | 74.0 | 19.6 | 1.10 | 0 | MAX PEAK | Low ch |
| 12599.980000 | 66.11 | 38.69 | -51.1 | 53.7 | 74.0 | 20.3 | 1.10 | 0 | MAX PEAK | High ch |
| 12225.000000 | 65.71 | 38.95 | -51.5 | 53.2 | 74.0 | 20.8 | 1.80 | 0 | MAX PEAK | L,M,H ch; QPSK |
| 12480.000000 | 65.18 | 38.75 | -51.2 | 52.7 | 74.0 | 21.3 | 1.00 | 0 | MAX PEAK | Mid ch |

## *FCC 15.209  Class B*

## *Electric Field Strength*

EUT: AF5
Manufacturer: Ubiquiti Networks
Operating Condition: 72 deg. F; 31% R.H.
Test Site: DLS O.F. Site 3
Operator: Craig B
Test Specification: Radiated emissions with integral antenna
Comment: 50 MHz ch BW; 50 dBm eirp; QPSK; L, M, H channels
Date: 10-18-2013 / 11-08-2013

## *TEXT: "Horz 1 meters"*

Short Description: Test Set-up

Test Set-up: EUT Measured at 1 Meters with HORIZONTAL Antenna Polarization

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

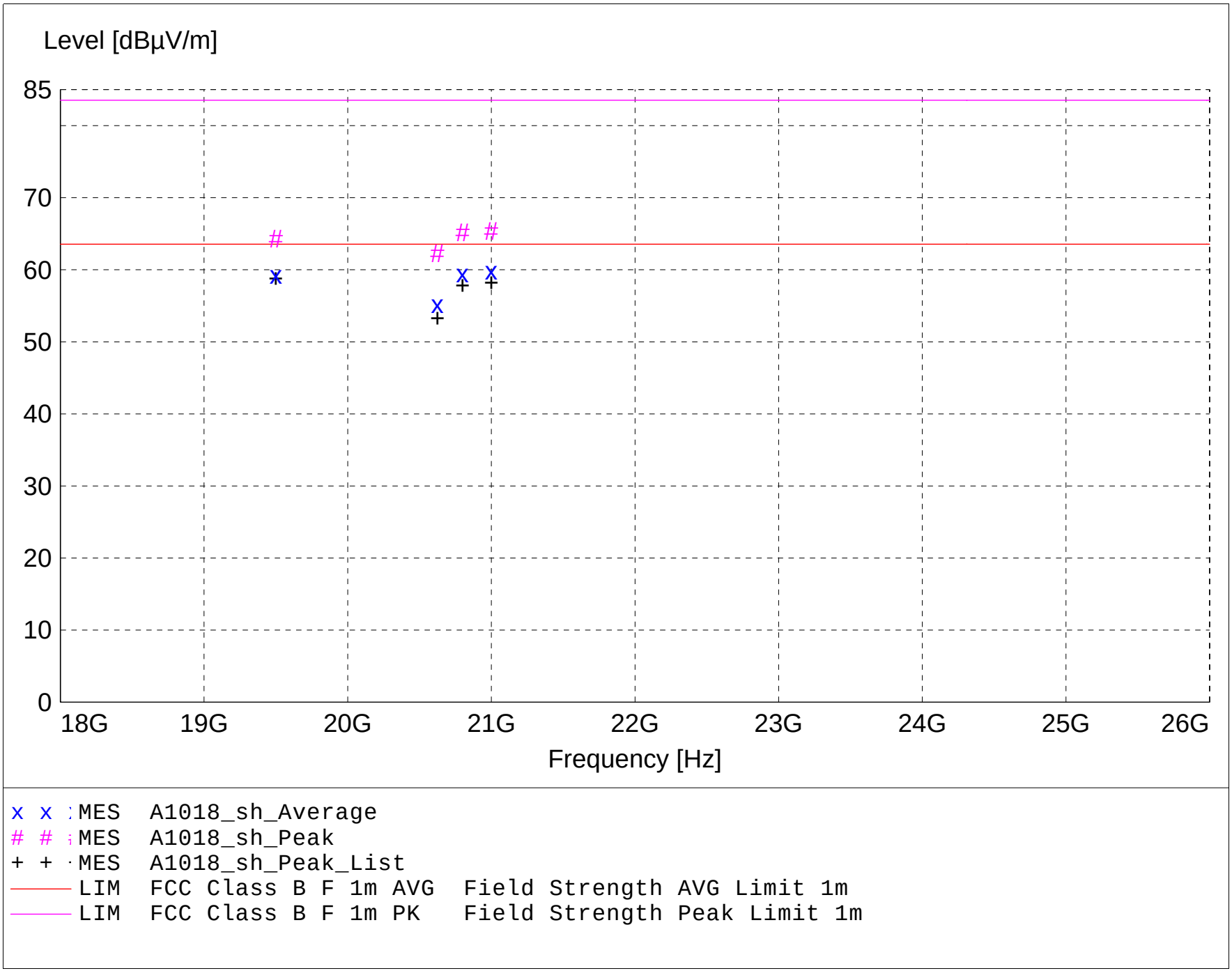
Margin(dB) = Limit(dBµV/m) - Total Level(dBµV/m)

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]
85
70
60
50
40
30
20
10
0
18G
19G
20G
21G
22G
23G
24G
25G
26G
Frequency [Hz]
x x x MES A1018_sh_Average
# # # MES A1018_sh_Peak
+ + + MES A1018_sh_Peak_List
LIM FCC Class B F 1m AVG Field Strength AVG Limit 1m
LIM FCC Class B F 1m PK Field Strength Peak Limit 1m

***MEASUREMENT RESULT: "A1018_sh_Final"***

11/8/2013 4:50PM

| 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 | | |
| 21000.020000 | 49.34 | 46.85 | -36.3 | 59.8 | 63.5 | 3.7 | 1.40 | 230 | AVERAGE | High ch |
| 20800.020000 | 49.03 | 46.66 | -36.3 | 59.4 | 63.5 | 4.1 | 1.50 | 250 | AVERAGE | Mid ch |
| 19500.000000 | 51.63 | 45.94 | -38.3 | 59.3 | 63.5 | 4.3 | 1.70 | 190 | AVERAGE | L,M,H ch; QPSK |
| 20625.000000 | 45.24 | 46.46 | -36.5 | 55.2 | 63.5 | 8.4 | 1.50 | 230 | AVERAGE | Low ch |
| 21000.020000 | 54.90 | 46.85 | -36.3 | 65.4 | 83.5 | 18.1 | 1.40 | 230 | MAX PEAK | High ch |
| 20800.020000 | 54.77 | 46.66 | -36.3 | 65.2 | 83.5 | 18.4 | 1.50 | 250 | MAX PEAK | Mid ch |
| 19500.000000 | 56.66 | 45.94 | -38.3 | 64.3 | 83.5 | 19.2 | 1.70 | 190 | MAX PEAK | L,M,H ch; QPSK |
| 20625.000000 | 52.32 | 46.46 | -36.5 | 62.2 | 83.5 | 21.3 | 1.50 | 230 | MAX PEAK | Low ch |

## *FCC 15.209  Class B*

## *Electric Field Strength*

EUT: AF5
Manufacturer: Ubiquiti Networks
Operating Condition: 72 deg. F; 31% R.H.
Test Site: DLS O.F. Site 3
Operator: Craig B
Test Specification: Radiated emissions with integral antenna
Comment: 50 MHz ch BW; 50 dBm eirp; QPSK; L, M, H channels
Date: 10-18-2013 / 11-08-2013

## *TEXT: "Vert 1 meters"*

Short Description: Test Set-up

Test Set-up: EUT Measured at 1 Meters with VERTICAL Antenna Polarization

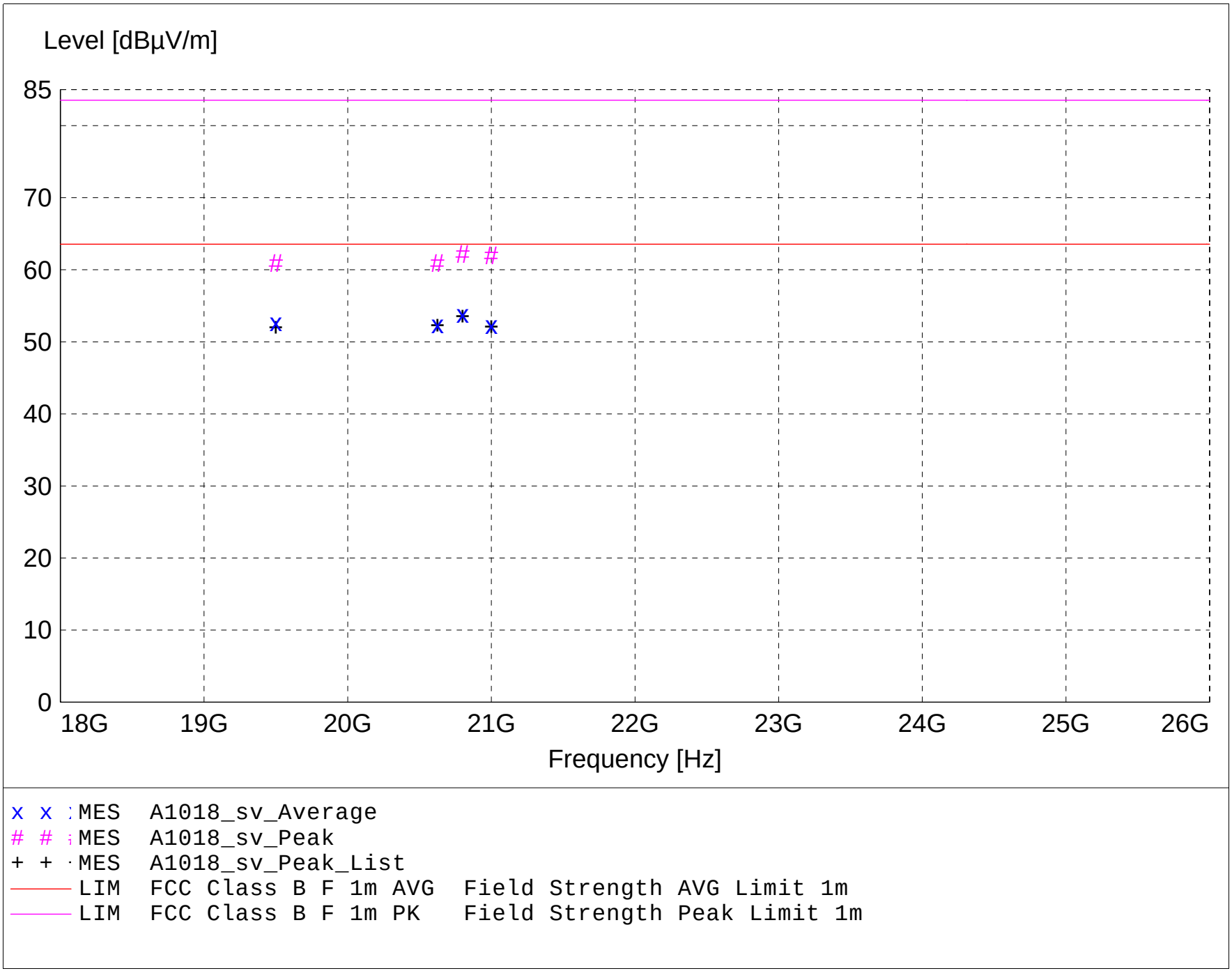
Sample Equations:

| 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]
85
70
60
50
40
30
20
10
0
18G
19G
20G
21G
22G
23G
24G
25G
26G
Frequency [Hz]
x x x MES A1018_sv_Average
# # # MES A1018_sv_Peak
+ + + MES A1018_sv_Peak_List
LIM FCC Class B F 1m AVG Field Strength AVG Limit 1m
LIM FCC Class B F 1m PK Field Strength Peak Limit 1m

***MEASUREMENT RESULT: "A1018_sv_Final"***

11/8/2013 4:35PM

| 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 | | |
| 20800.020000 | 43.50 | 46.66 | -36.3 | 53.9 | 63.5 | 9.6 | 1.50 | 230 | AVERAGE | Mid ch |
| 19500.000000 | 45.06 | 45.94 | -38.3 | 52.7 | 63.5 | 10.8 | 1.70 | 125 | AVERAGE | L,M,H ch; QPSK |
| 20625.020000 | 42.53 | 46.46 | -36.5 | 52.4 | 63.5 | 11.1 | 1.50 | 225 | AVERAGE | Low ch |
| 21000.020000 | 41.82 | 46.85 | -36.3 | 52.3 | 63.5 | 11.2 | 1.50 | 180 | AVERAGE | High ch |
| 20800.020000 | 51.77 | 46.66 | -36.3 | 62.2 | 83.5 | 21.4 | 1.50 | 230 | MAX PEAK | Mid ch |
| 21000.020000 | 51.51 | 46.85 | -36.3 | 62.0 | 83.5 | 21.5 | 1.50 | 180 | MAX PEAK | High ch |
| 19500.000000 | 53.33 | 45.94 | -38.3 | 61.0 | 83.5 | 22.6 | 1.70 | 125 | MAX PEAK | L,M,H ch; QPSK |
| 20625.020000 | 50.99 | 46.46 | -36.5 | 60.9 | 83.5 | 22.6 | 1.50 | 225 | MAX PEAK | Low ch |

**No measurable emissions were detected from the EUT from 26 to 40 GHz.**

**Appendix – Measurement Data**

## 7.0 Duty Cycle of Test Unit

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

FCC KDB 558074 D01 DTS Meas Guidance v03r01 – *Guidance for Performing Compliance Measurements on Digital Transmission Systems (DTS) Operating Under §15.247*

**6.0 Duty cycle, transmission duration**

**Test Procedure:** The zero-span mode on a spectrum analyzer.
Set the center frequency of the instrument to the center frequency of the transmission.
RBW ≥ OBW if possible; otherwise, **set RBW to the largest available value**
VBW ≥ RBW
Detector = peak

**Limits:** Informative

**Results:** EUT is continuously transmitting (duty cycle > 98%).

**Sample Equations:** None

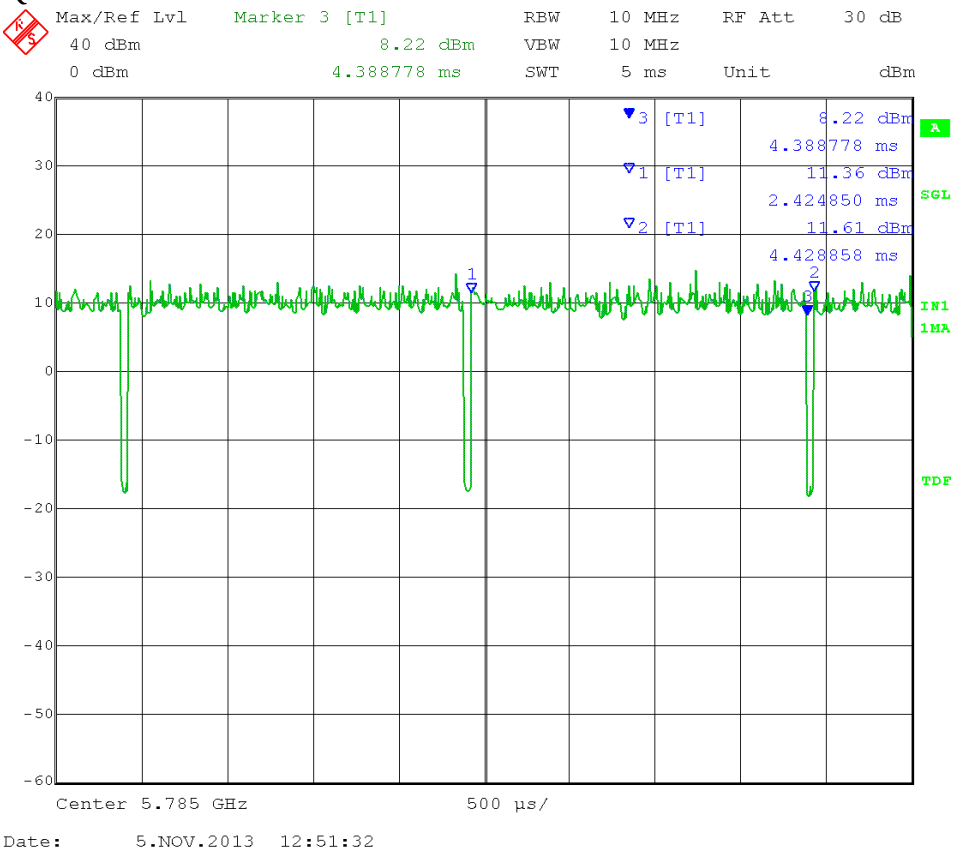
**Notes:** No Duty cycle correction factor was applied to measurements for this device.

The EUT was transmitting above the minimum duty cycle of 98%.

40MHz BW

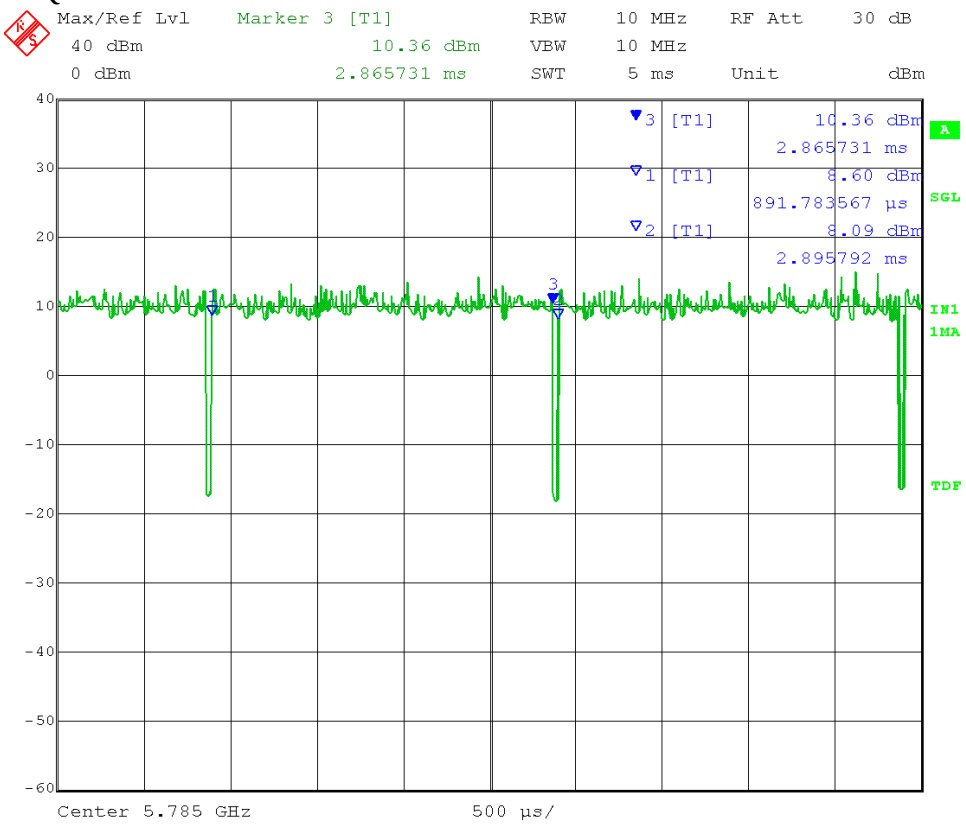
Total Cycle time = 4.428858-2.424850=2.004008 ms
Total on Time = 4.388778-2.424850=1.963929 ms
**Duty cycle factor x =** 1.963928/2.004008=0.98
Adjustment for duty cycle =10log1/x = 0

QPSK



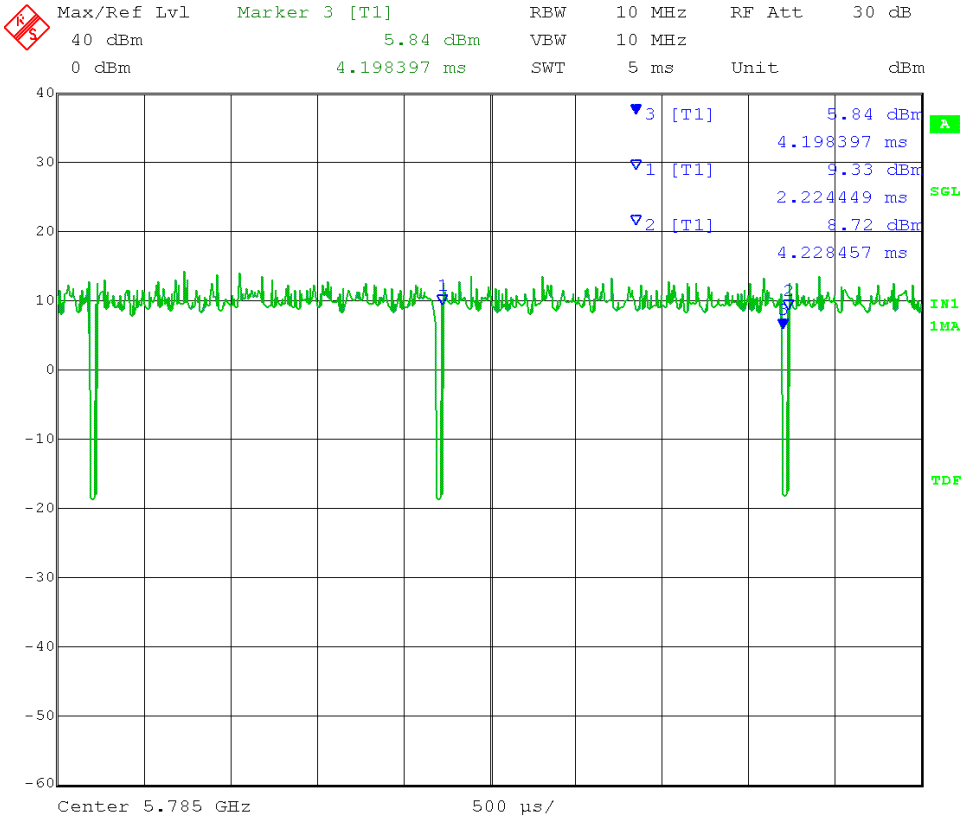

Date: 5.NOV.2013 12:51:32

16QAM



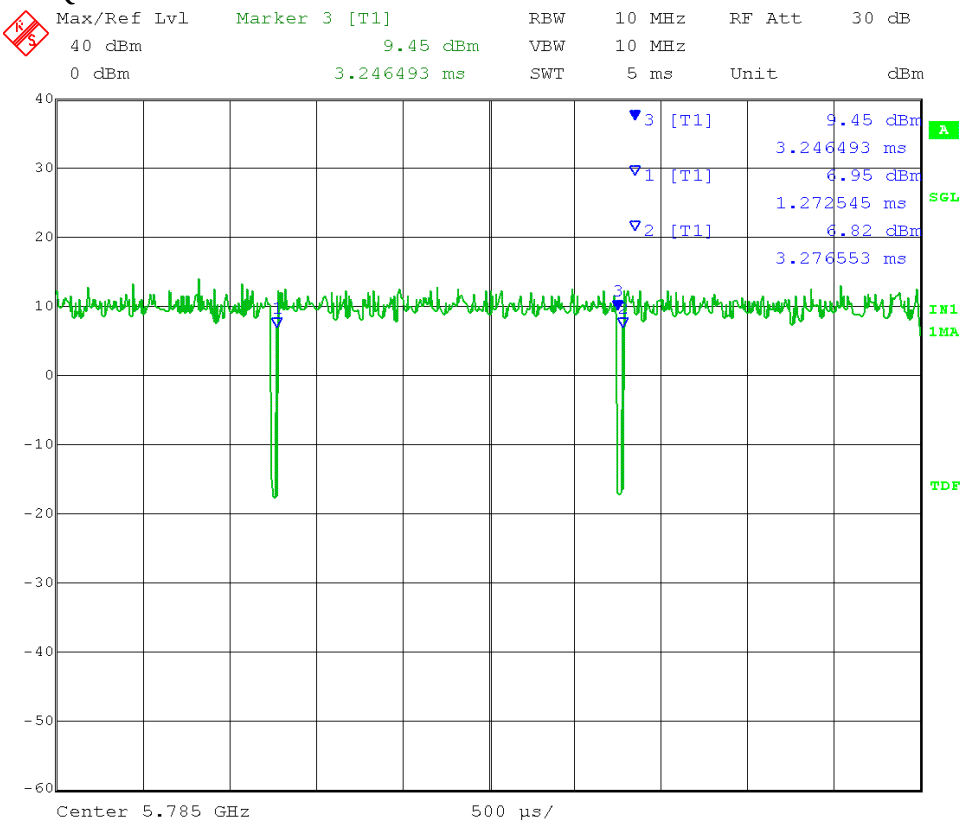

Date: 5.NOV.2013 12:57:53

64QAM



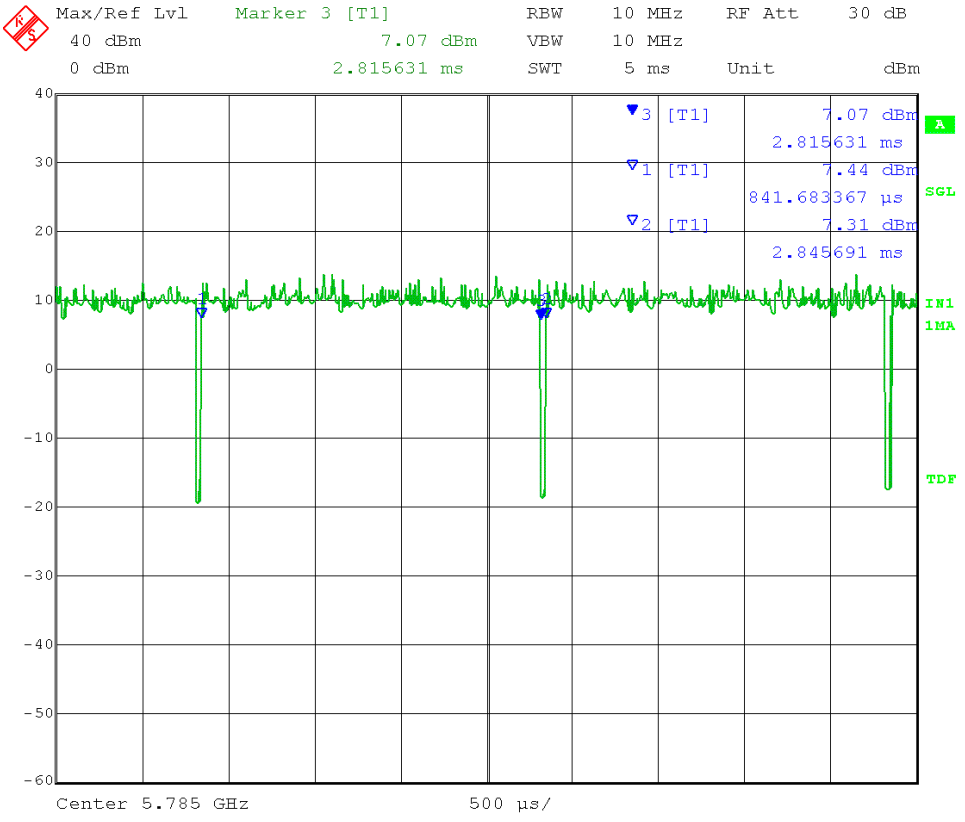

Date: 5.NOV.2013 12:59:05

256QAM




Date: 5.NOV.2013 13:00:00

1024QAM

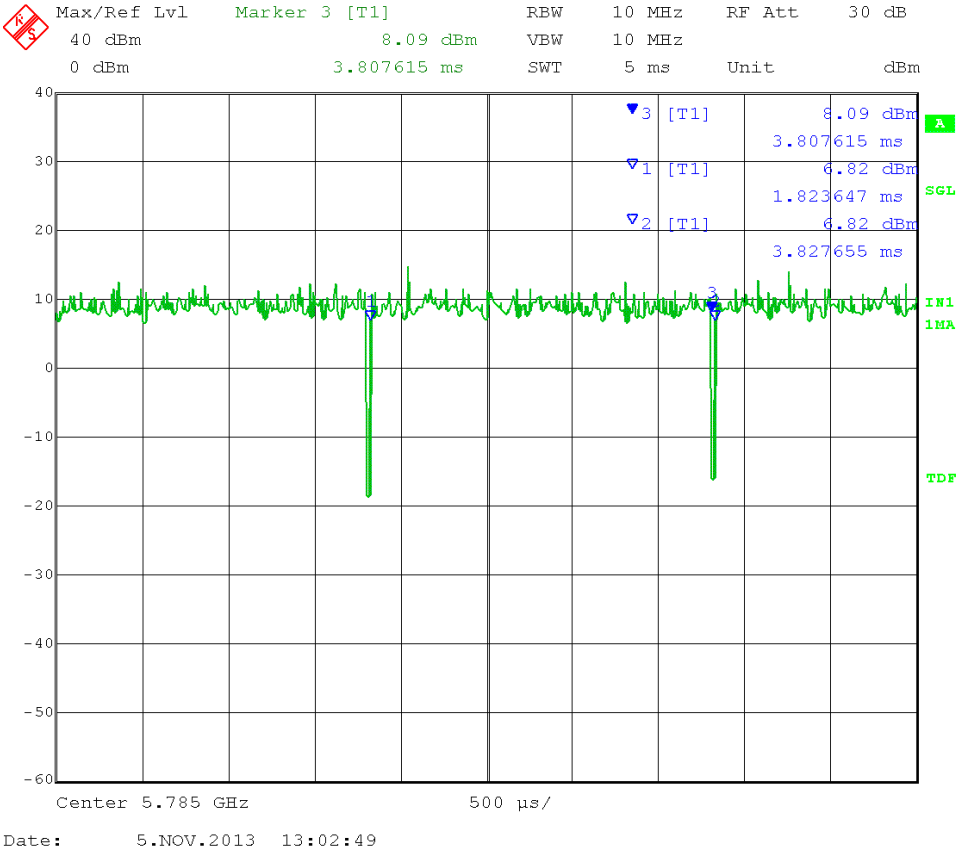



Date: 5.NOV.2013 13:01:01

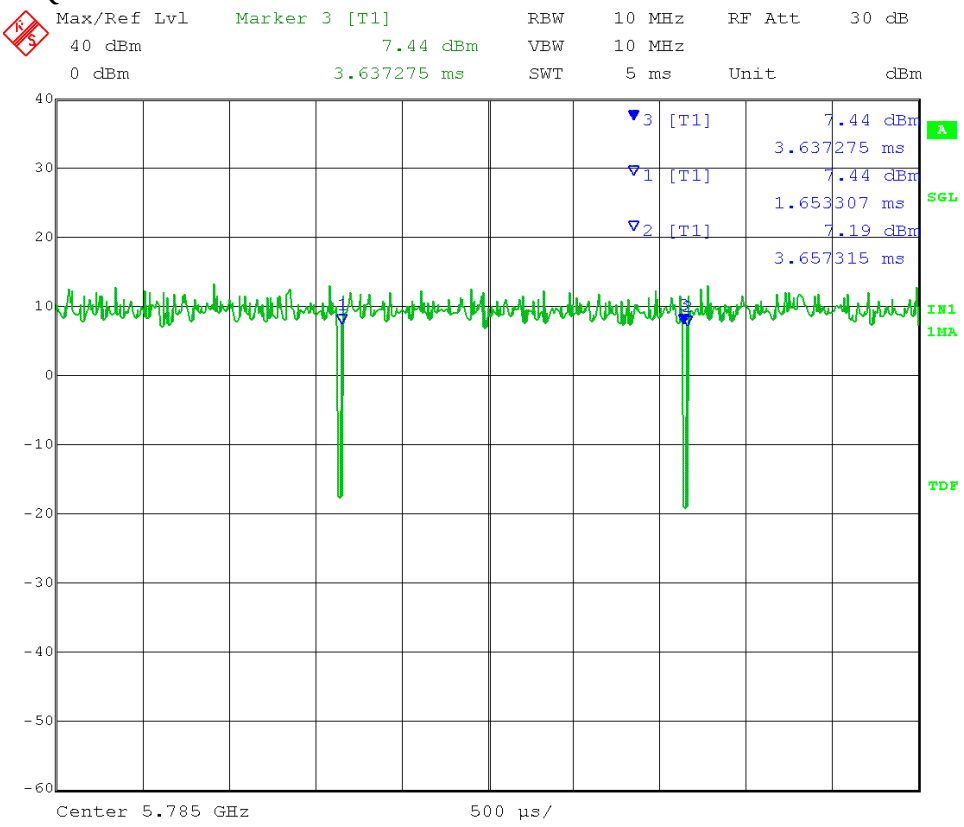
50MHZ

Total Cycle time = 3.827655-1.823648=2.004007 ms
Total on Time = 3.807615-1.823648=1.983967 ms
**Duty cycle factor x =** 1.963928/2.004008=0.99
Adjustment for duty cycle =10log1/x = 0

QPSK

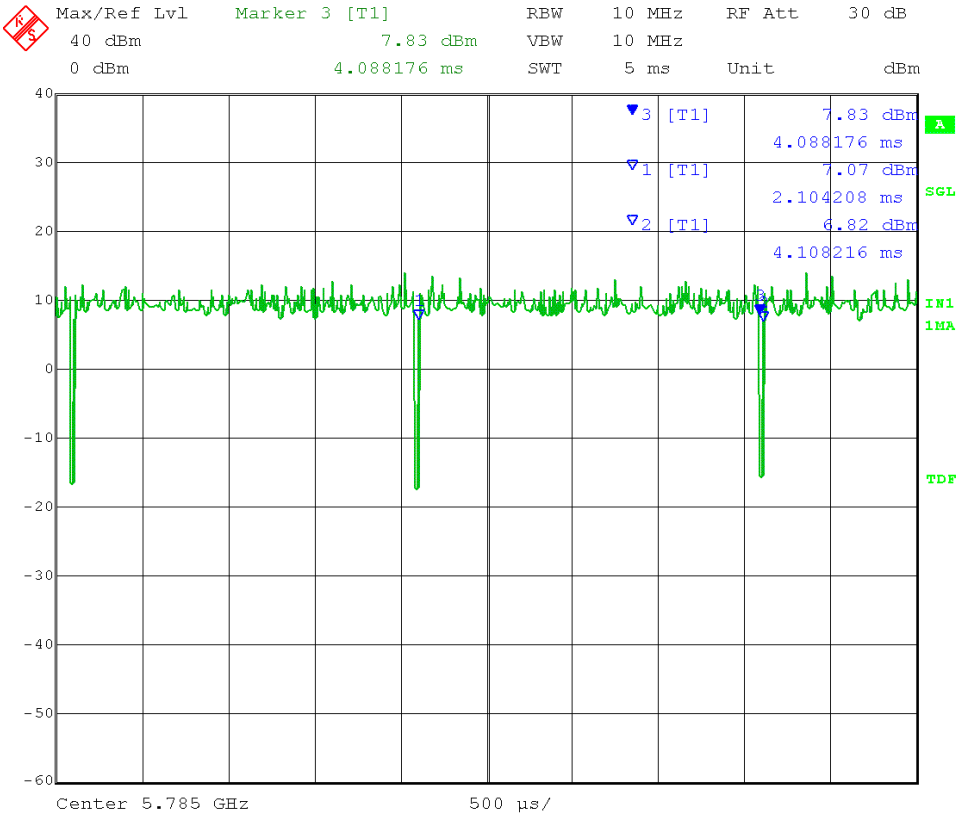


16QAM



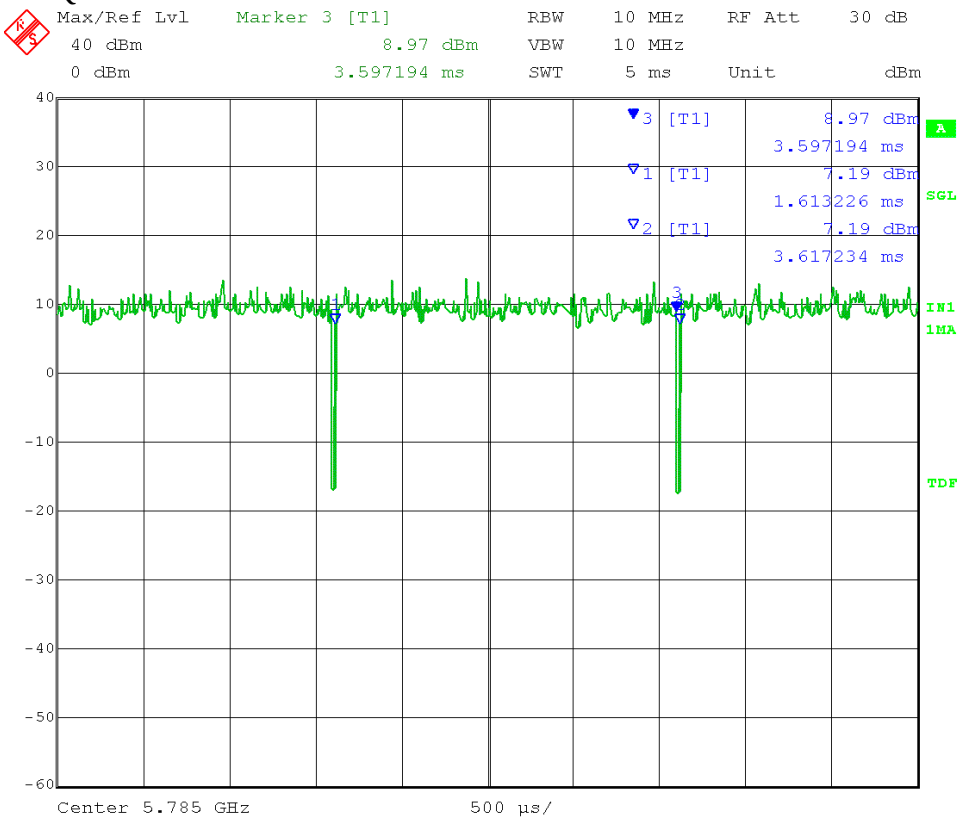

Date: 5.NOV.2013 13:03:35

64QAM




Date: 5.NOV.2013 13:04:32

256QAM

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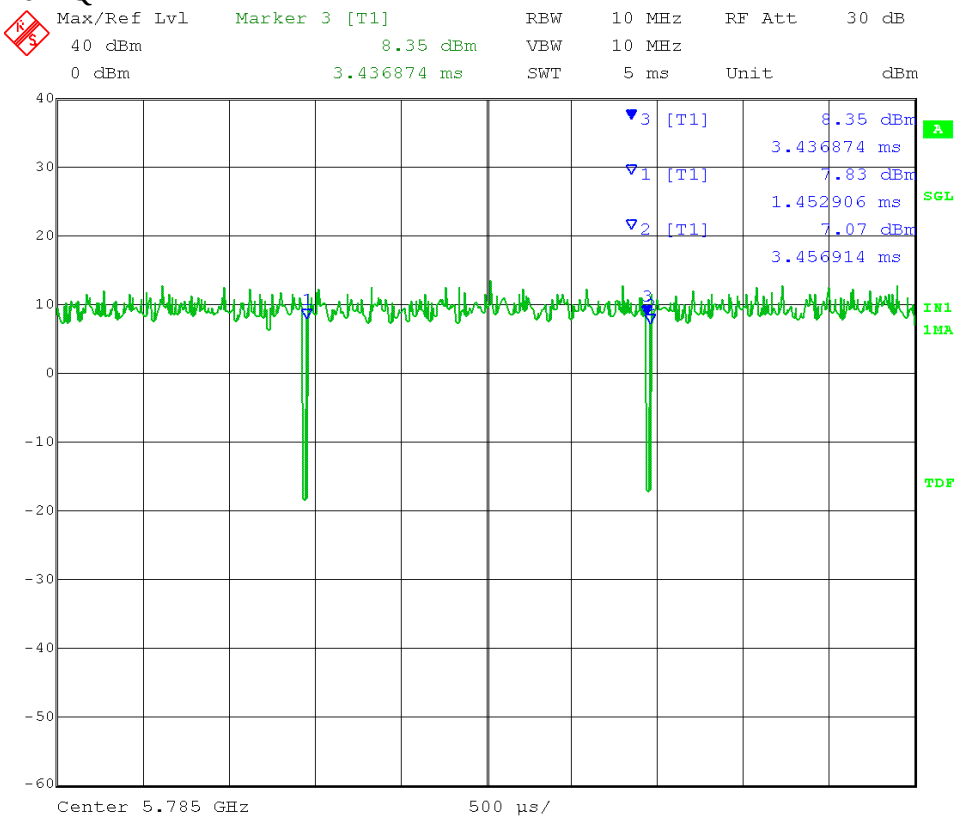
1024QAM




Date: 5.NOV.2013 13:06:00

# END OF REPORT

| Revision # | Date | Comments | By |
|---|---|---|---|
| 1.0 | 11-12-2013 | Preliminary Release | JS |
| 1.1 | 11-19-2013 | Final Edits | JS |
| 1.2 | 12-2-2013 | Added page 6 notes | JS |
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