166 South Carter, Genoa City, WI 53128

Company:	Ubiquiti Networks, Inc.
Model Tested:	AF5
Report Number:	20086
DLS Project:	6615

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 - 5850 MHz,
and 24.0 - 24.25 GHz.

30 MHz Bandwidth Data

THE FOLLOWING **MEETS** THE ABOVE TEST SPECIFICATION

Formal Name:	Air Fiber 5 - 5.8GHz Radio
Kind of Equipment:	Point-to-Point Digital Transmission Transceiver
Frequency Range:	**5742 to 5833 MHz**
Test Configuration:	Pole Mounted
Model Number(s):	AF5 (Please see the note on page 6 concerning the similarity to AF5U)
Model(s) Tested:	AF5
Serial Number(s):	RF Conducted Unit: MAC address: 02:27:22:DA:5F:24 Radiated Unit: MAC address: 02:27:22:DA:5F:29
Date of Tests:	May 12th to May 20th, 2014
Test Conducted For:	Ubiquiti Networks, Inc. 12F, No105, Song Ren Rd Taipei, Taiwan

SIGNATURE PAGE

Tested By:

Craig Brandt
Senior Test Engineer

Reviewed By:

William Stumpf
OATS Manager

Approved By:

Brian Mattson
General Manager

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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)

1.0 Summary of Test Report

It was determined that the Ubiquiti Networks Air Fiber 5 - 5.8GHz Radio, Model: AF5 with a 30MHz channel bandwidth, complies with the requirements of CFR 47 Part 15 Subpart C Section 15.247.

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), FCC 15.205	Maximum Unwanted Emission Levels – Radiated	FCC Publication KDB 558074 D01 DTS Meas Guidance v03r01 Sections 11.0, 12.0, 12.1	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 15.35(c)	Duty Cycle of Test Unit	FCC Publication KDB 558074 D01 DTS Meas Guidance v03r01 Section 6.0	1	NA

Note 1: RF conducted measurement.
Note 2: Radiated emission measurement.

2.0 Introduction

In May of 2014, the Air Fiber 5 - 5.8GHz Radio, Model: AF5, as provided from Ubiquiti Networks, was tested to the requirements of CFR 47 Part 15 Subpart C Section 15.247 to add a 30MHz channel bandwidth. To meet these requirements, the procedures contained within this report were performed by personnel of D.L.S Electronic Systems, Inc.

3.0 Test Facilities

D.L.S. Electronic Systems, Inc. is a full service EMC/Safety Testing Laboratory accredited to ISO 17025. NVLAP Certificate and Scope can be viewed at http://www.dlsemc.com/certificate. Our facilities are registered with the FCC, Industry Canada, and VCCI.

Wisconsin Test Facility:
D.L.S. Electronic Systems, Inc.
166 S. Carter Street
Genoa City, Wisconsin 53128

Wheeling Test Facility:
D.L.S. Electronic Systems, Inc.
1250 Peterson Drive
Wheeling, IL 60090

4.0 Description of Test Sample

Description:

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 and now a 30MHz 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. This report shows compliance of the addition of the 30MHz channel bandwidth.

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.

Type of Equipment / Frequency Range:

Stand-Alone / **5731 to 5844 MHz (10 MHz bandwidth)**
5737 to 5838 MHz (20 MHz bandwidth)
5742 to 5833 MHz (30 MHz bandwidth) (in this report)
5747 to 5828 MHz (40 MHz bandwidth)
5752 to 5823 MHz (50 MHz bandwidth)

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

Physical Dimensions of Equipment Under Test:

Length: 93.8 cm. Width: 46.8 cm. Height: 28.1 cm.

Power Source:

50 VDC (Power Over Ethernet to Radio)
120 Vac, 60 Hz using Ubiquiti Networks power supply model: GP-C500-120G or
Ubiquiti Networks power supply model: PSA60M-500(G)-R
(for AC Line Conducted testing recorded in original test reports)

Internal Frequencies:

150 kHz (Switching Power Supply Frequency)
5.844 GHz (Highest Operating Frequency for the 5.8GHz radio)

Transmit Frequencies Used For Test Purpose:

10 MHz Channel Bandwidth:	Low channel: 5731 MHz, Middle channel: 5785 MHz, High channel: 5844 MHz
20 MHz Channel Bandwidth:	Low channel: 5737 MHz, Middle channel: 5785 MHz, High channel: 5838 MHz
30 MHz Channel Bandwidth:	Low channel: 5742 MHz, Middle channel: 5785 MHz, High channel: 5833 MHz
40 MHz Channel Bandwidth:	Low channel: 5747 MHz, Middle channel: 5785 MHz, High channel: 5828 MHz
50 MHz Channel Bandwidth:	Low channel: 5752 MHz, Middle channel: 5785 MHz, High channel: 5823 MHz

Type of Modulations:

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

Description of Circuit Board(s) / Part Number:

Radio PC Board	11-02042-05 Rev 7

5.0 Test Equipment

A list of the equipment used can be found in the table below. All primary equipment was calibrated against known reference standards with a verified traceable path to NIST.

D.L.S. Wisconsin

1-18 GHz

Description	Manufacturer	Model Number	Serial Number	Frequency Range	Cal Date	Cal Due Dates
Receiver	Rohde & Schwarz	ESI 40	837808/005	20 Hz – 40 GHz	7-23-13	7-23-14
Test Software	Rohde & Schwarz	ESK-1	V1.7.1	N/A	N/A	N/A
Horn Antenna	EMCO	3115	9903-5731	1-18GHz	7-11-13	7-11-15
Preamp	Miteq	AMF-7D-01001800-22-10P	17779900	1GHz-18GHz	2-12-14	2-12-15
Filter- High-Pass	Planar Filter Co.	HP8G-7Q8-CD-SFF	PF1226/0728	7.5GHz-18GHz	8-14-13	8-14-14

additional for 18-40 GHz

Description	Manufacturer	Model Number	Serial Number	Frequency Range	Cal Date	Cal Due Dates
Preamp	Miteq	AMF-8B-180265-40-10P-H/S	438727	18GHz-26.5GHz	8-12-13	8-12-14
Preamp	Rohde & Schwarz	TS-PR40	052002/025	26GHz-40GHz	5-28-13	5-28-14
Horn Antenna	ETS Lindgren	3116	00062917	18 – 40GHz	8-15-13	8-15-15
High Pass Filter	K & l	11SH10-18000/T40000-K-K	8	18-40GHz	3-6-14	3-6-15

Other

Description	Manufacturer	Model Number	Serial Number	Frequency Range	Cal Date	Cal Due Dates
20 dB attenuator	MCE/Weinschel	5955A-20	0256	DC – 40 GHz	8-16-13	8-16-14
20 dB attenuator	Aeroflex/Weinschel	75A-20-12	1071	DC – 40 GHz	8-16-13	8-16-14
Power Meter	Anritsu	ML2487A	6K00002069	N/A	2-27-14	2-27-15
Power Sensor	Anritsu	MA24002A	1204359	10 MHz – 18 GHz	2-28-14	2-28-15
50 Ohm Load	Pasternack	PE6039	NA	DC – 18 GHz	NA	NA
50 Ohm Load	Pasternack	PE6095	NA	DC – 18 GHz	NA	NA

6.0 Test Arrangements

RF Conducted Emissions Measurement Arrangement:

All RF conducted emission measurements were performed at D.L.S. Electronic Systems, Inc. and set up according to FCC Publication KDB 558074 D01 DTS Meas Guidance v03r01 and ANSI C63.10-2009, unless otherwise noted. Description of procedures and measurements can be found in Appendix B – Measurement Data. See Appendix A for photos of the test set up.

Radiated Emissions Measurement Arrangement:

All radiated emission measurements were performed at D.L.S. Electronic Systems, Inc. and set up according to FCC KDB 558074 D01 DTS Meas Guidance v03r01 and ANSI C63.10-2009, unless otherwise noted. Description of procedures and measurements can be found in Appendix B – Measurement Data. See Appendix A for photos of the test set up.

Unless otherwise noted, the bandwidth of the measuring receiver / analyzer used during testing is shown below.

Frequency Range	Bandwidth (-6 dB)
10 to 150 kHz	200 Hz
150 kHz to 30 MHz	9 kHz
30 MHz to 1 GHz	120 kHz
Above 1 GHz	1 MHz

7.0 Test Conditions

Normal Test Conditions:

Temperature and Humidity:

73° F at 58 % RH (or noted on the test data)

Supply Voltage:

50 VDC (Power Over Ethernet to Radio)
120 Vac, 60 Hz using Ubiquiti Networks power supply model: GP-C500-120G or
Ubiquiti Networks power supply model: PSA60M-500(G)-R
(for AC Line Conducted testing recorded in original test reports)

8.0 Modifications Made To EUT for Compliance

No modifications were made to the EUT at the time of test.

9.0 Additional Descriptions

Testing was performed at low, mid, and high channels over the 30MHz modulation bandwidth. All 5 OFDM modulations types have been tested (1024QAM, 256QAM, 64QAM, 16QAM, & QPSK). The antenna ports were tested (Channel 0 & 1). AC line conducted tested (in transmit mode) for the original certification testing of this radio.

Test Software: Telnet Command Line Interface and AF02 version 21

Emission Designators:
10 MHz BW: 10M0x1D
20 MHz BW: 20M0x1D
30 MHz BW: 30M0x1D
40 MHz BW: 40M0x1D
50 MHz BW: 50M0x1D

10.0 Results

Measurements were performed in accordance with FCC Publication KDB 558074 D01 DTS Meas Guidance v03r01 and ANSI C63.10-2009. Graphical and tabular data can be found in Appendix B at the end of this report.

11.0 Conclusion

The Air Fiber 5 - 5.8GHz Radio, Model: AF5 with a 30MHz channel bandwidth, as provided from Ubiquiti Networks tested in May 2014 **meets** the requirements of CFR 47 Part 15 Subpart C Section 15.247.

Appendix A – Test Photos

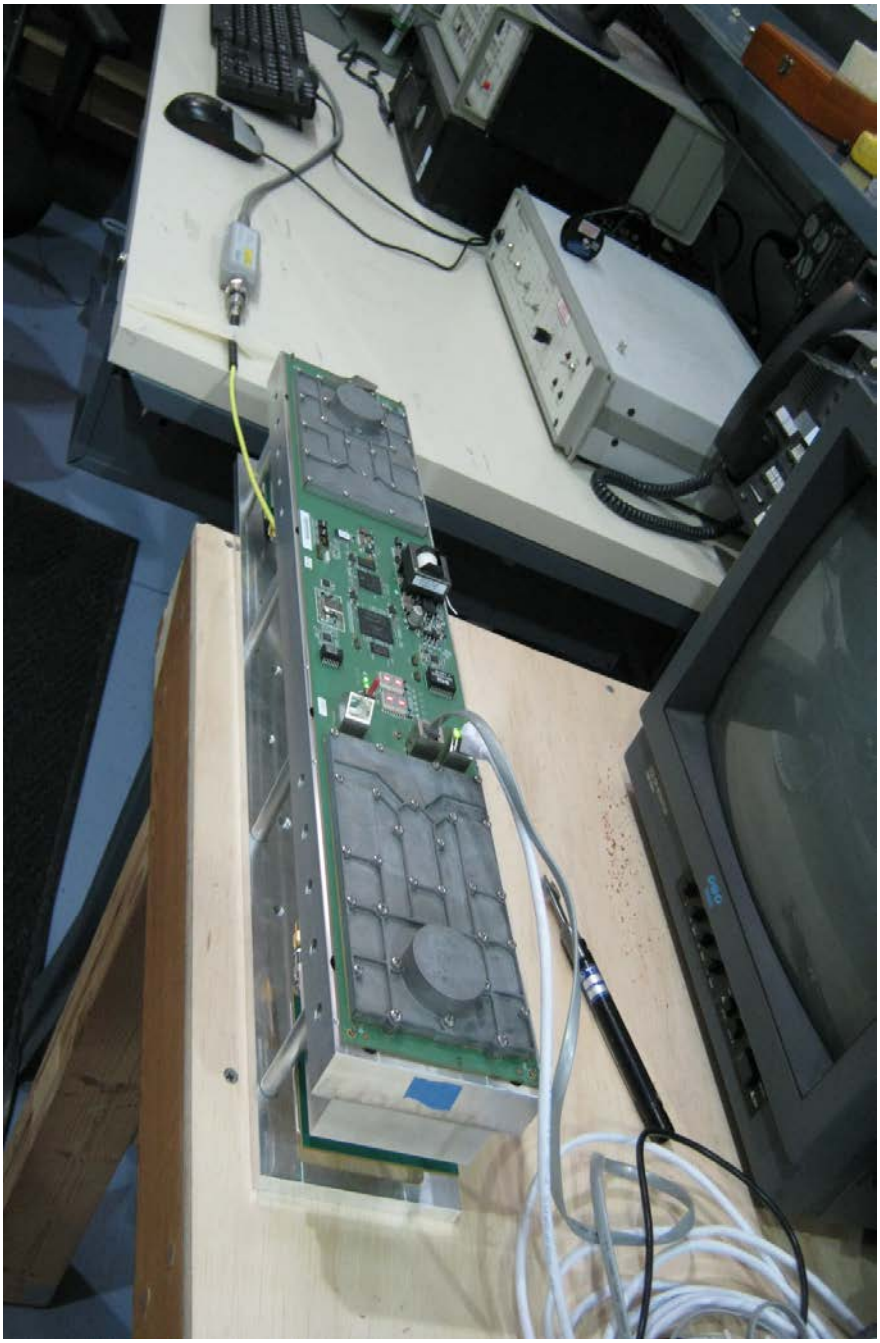
Photo Information and Test Setup:

Air Fiber 5 - 5.8GHz Radio, Model: AF5
with Shielded Power Over Ethernet Cable, 15 meters long

Radiated - above 1 GHz

Appendix A – Test Photos

RF Conducted / Output Power



Appendix A – Test Photos

RF Conducted / In Band Emissions

Appendix B – Measurement Data

B1.0 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.

Measurements were taken for QPSK, 16QAM, 64QAM, 256QAM and 1024QAM modulations over a 30MHz modulation bandwidth at the low, mid and high channels of operation. EUT was set to transmit continuously.

Limit: DTS Bandwidth shall be at least 500 kHz

Results: Passed

Test Date: 5-14-2014

Company: Ubiquiti Networks

EUT: Air Fiber 5 - 5.8GHz WiFi Radio

Test: DTS Bandwidth (6dB) - Conducted

Operator: Steve D

Test Procedure used: KDB 558074 D01 v01r03 – 8.1) Option 1

Limit: [FCC Part 15.247(a)(2) / RSS-210 A8.2]: ≥ 500 kHz

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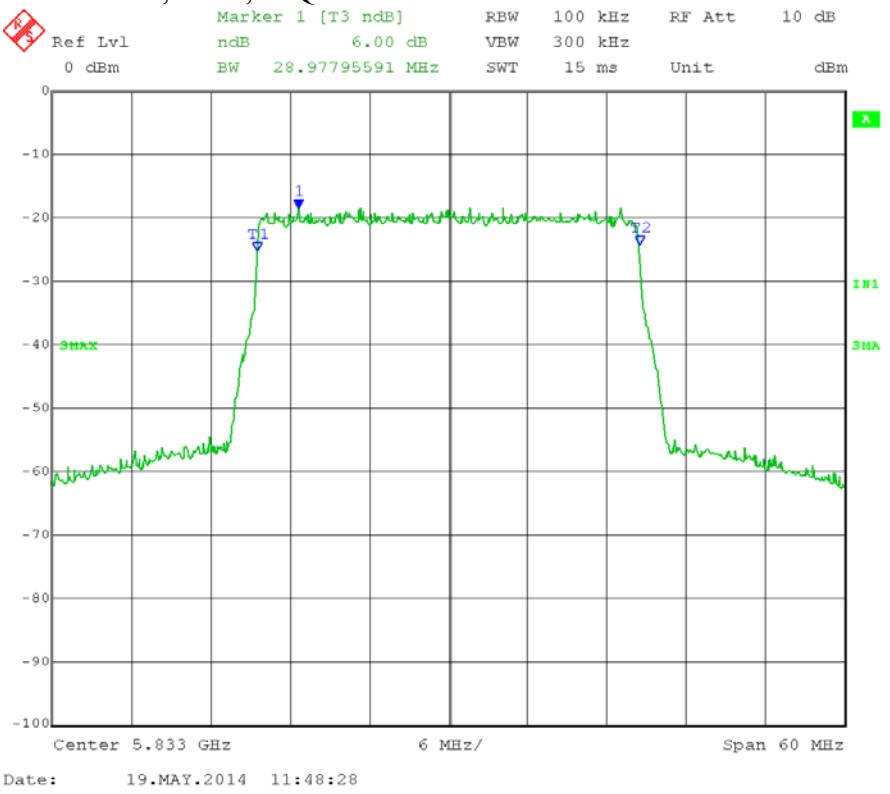

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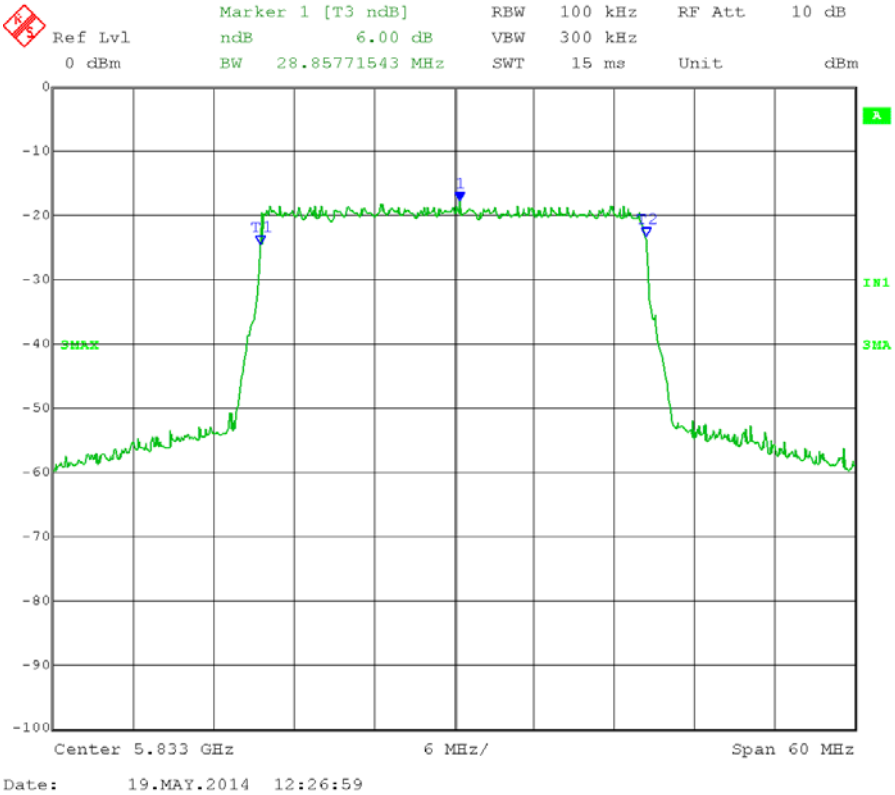

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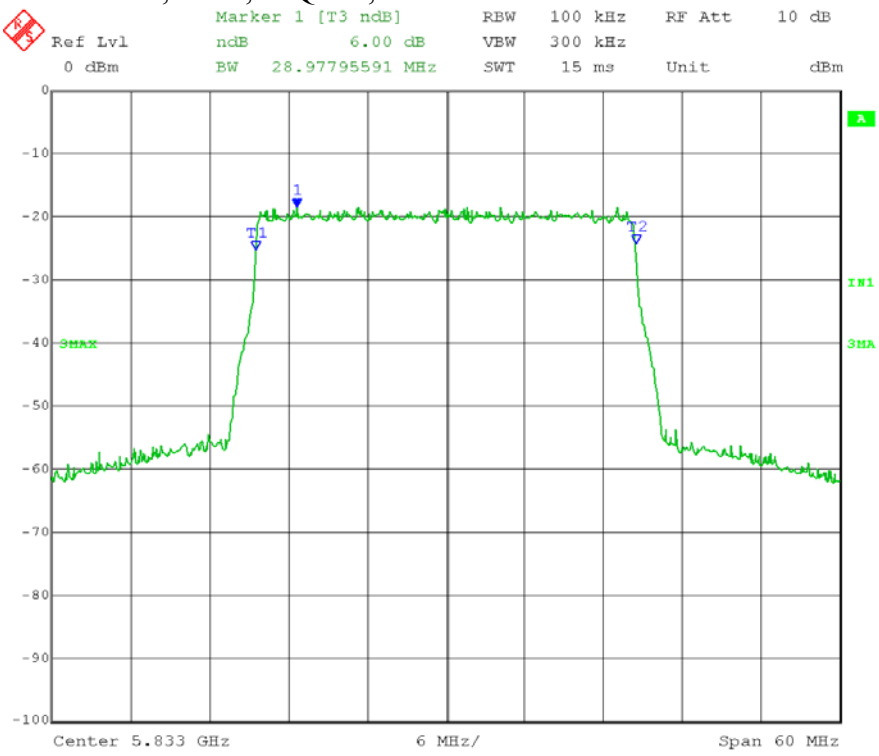

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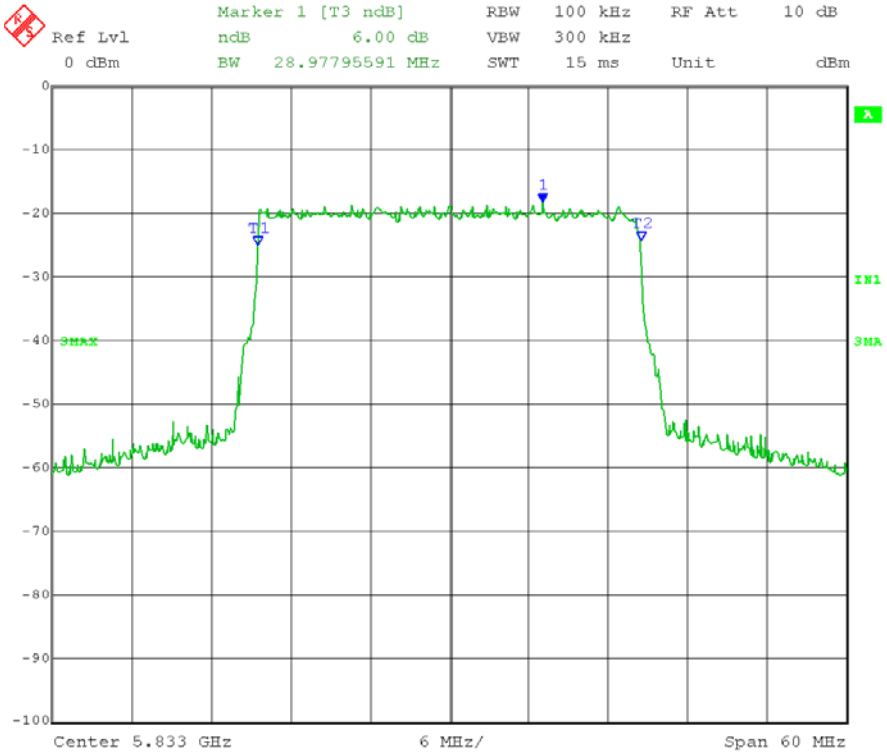

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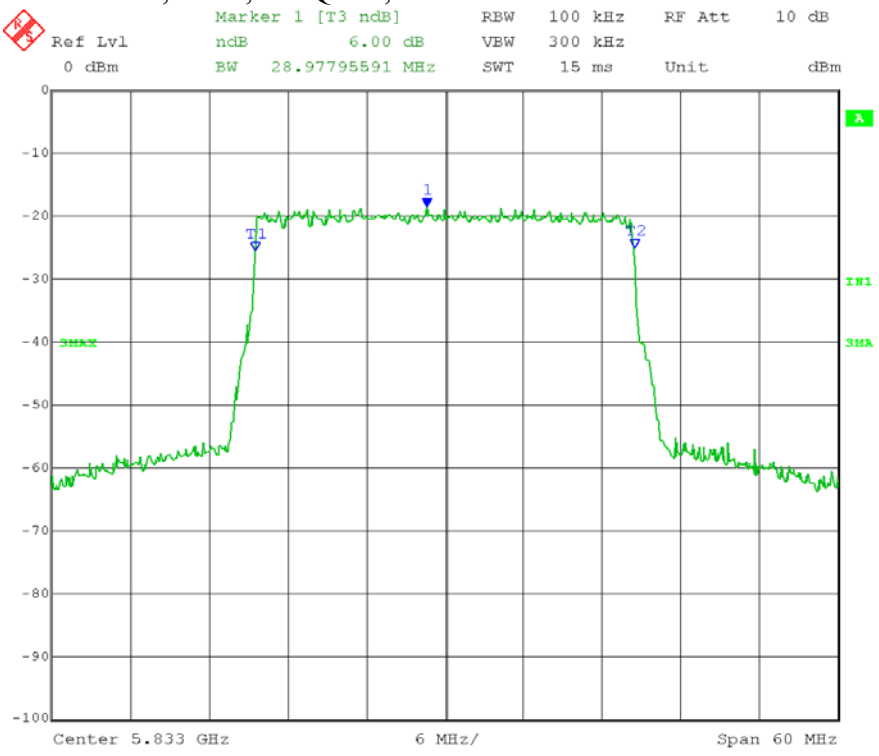

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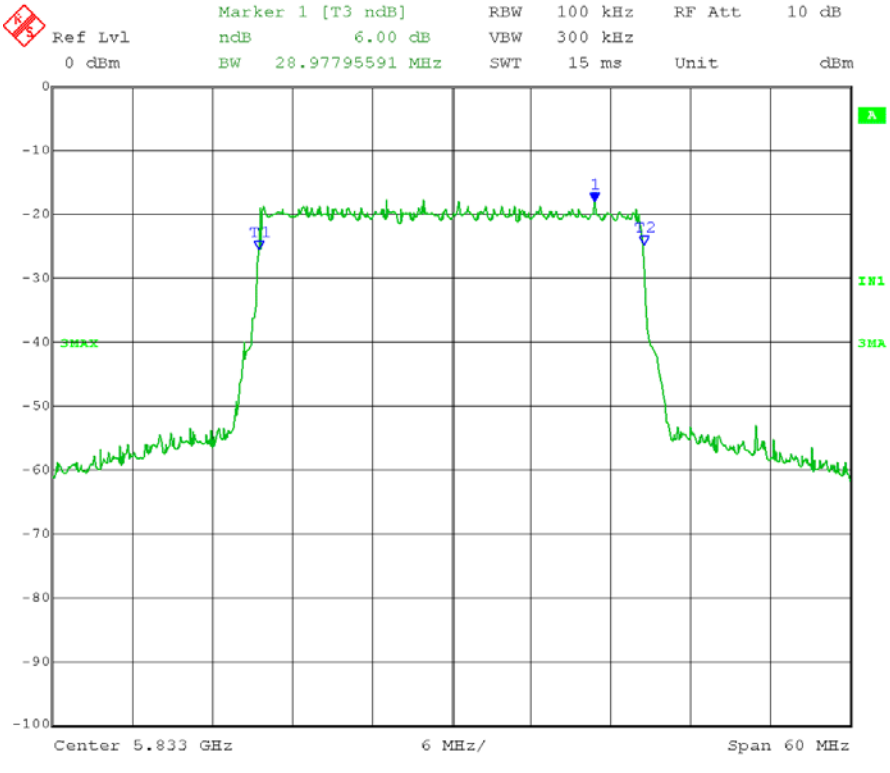

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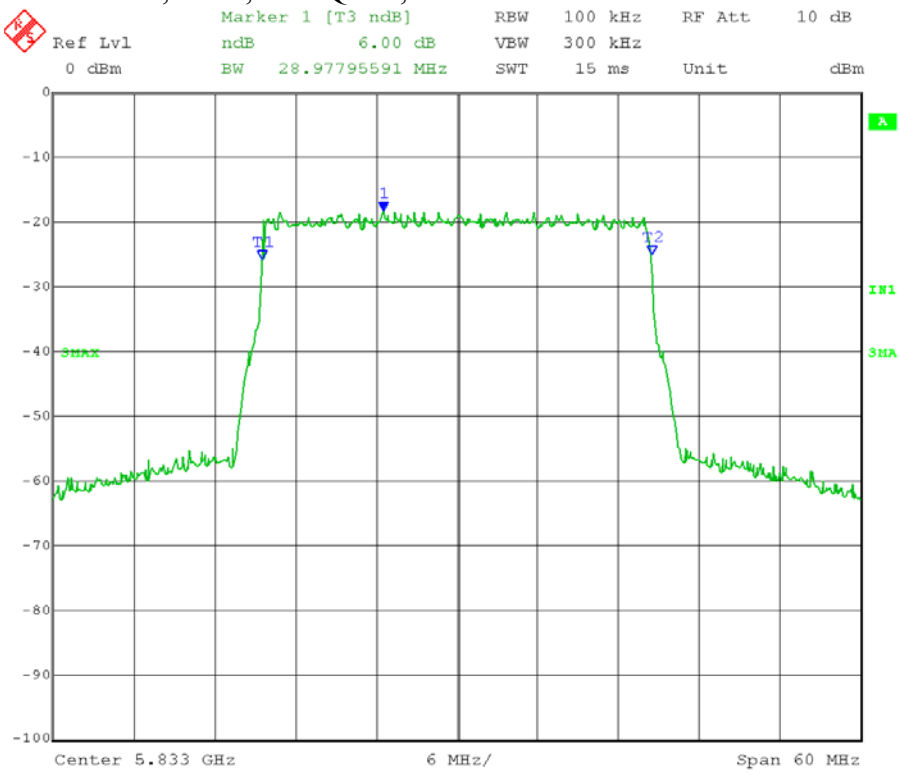

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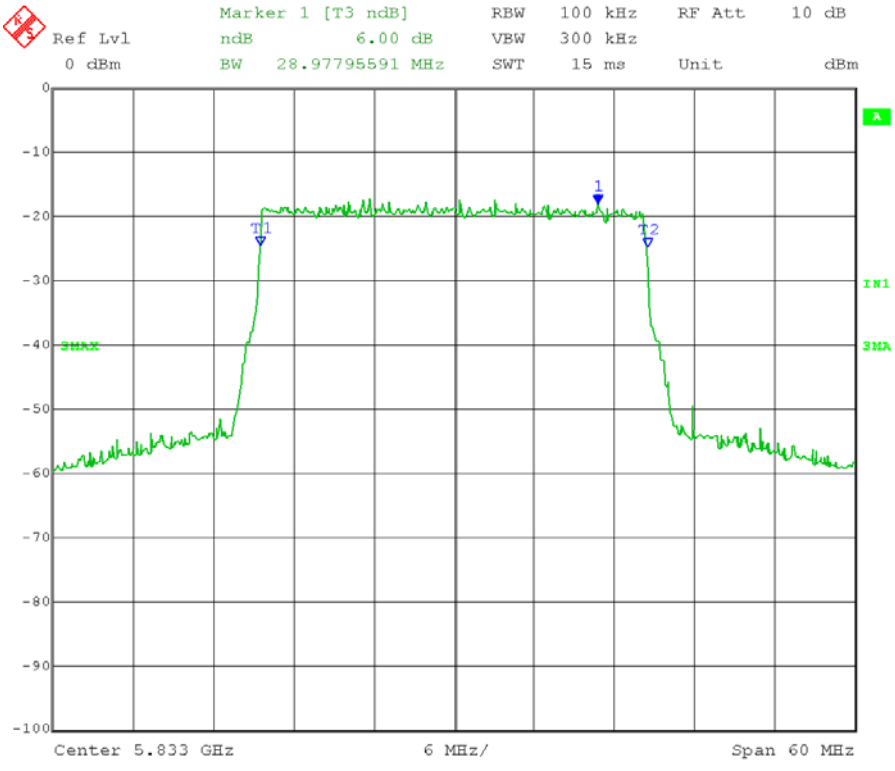

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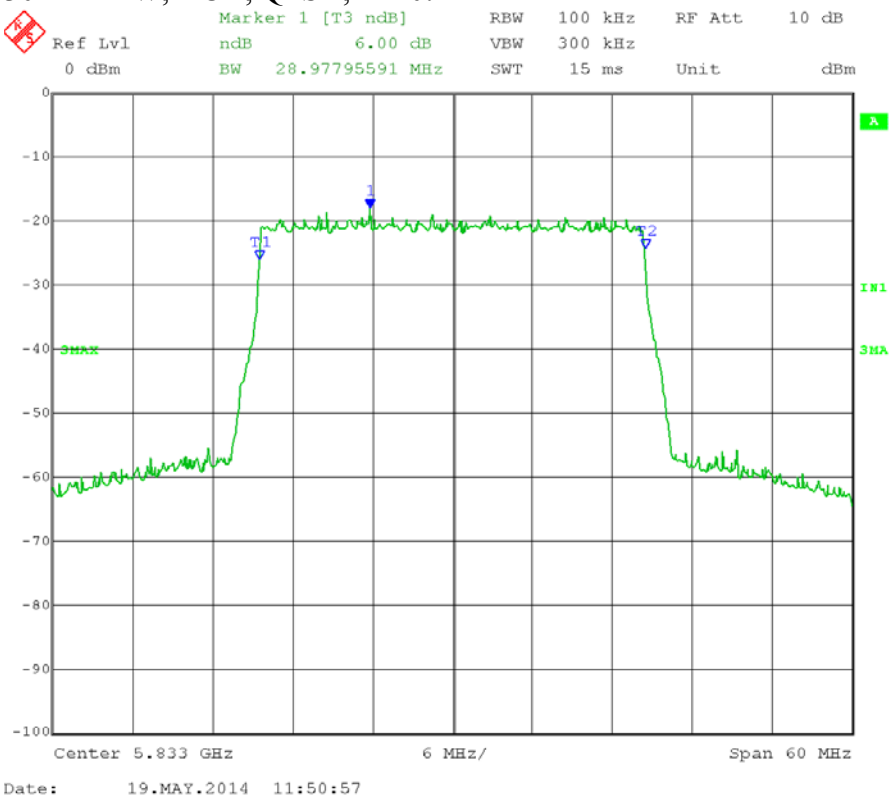

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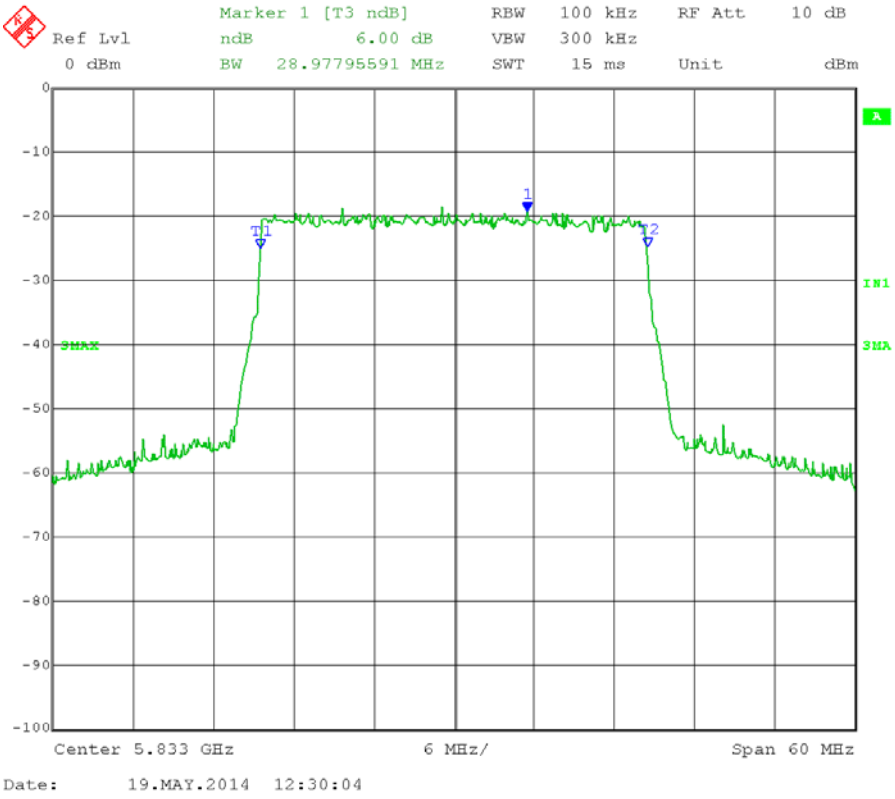

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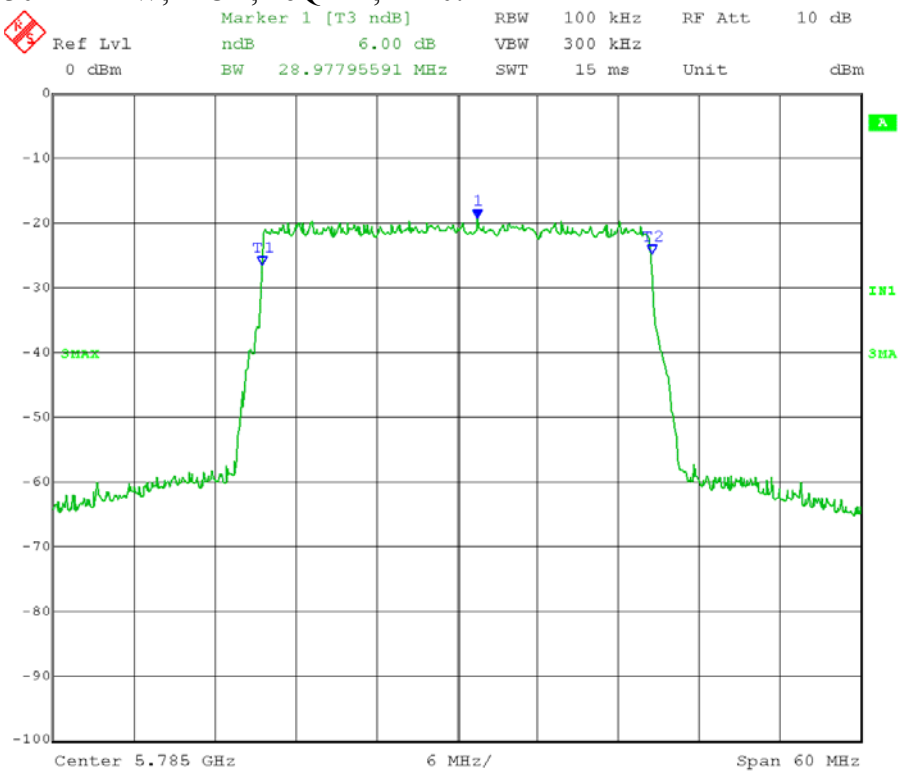

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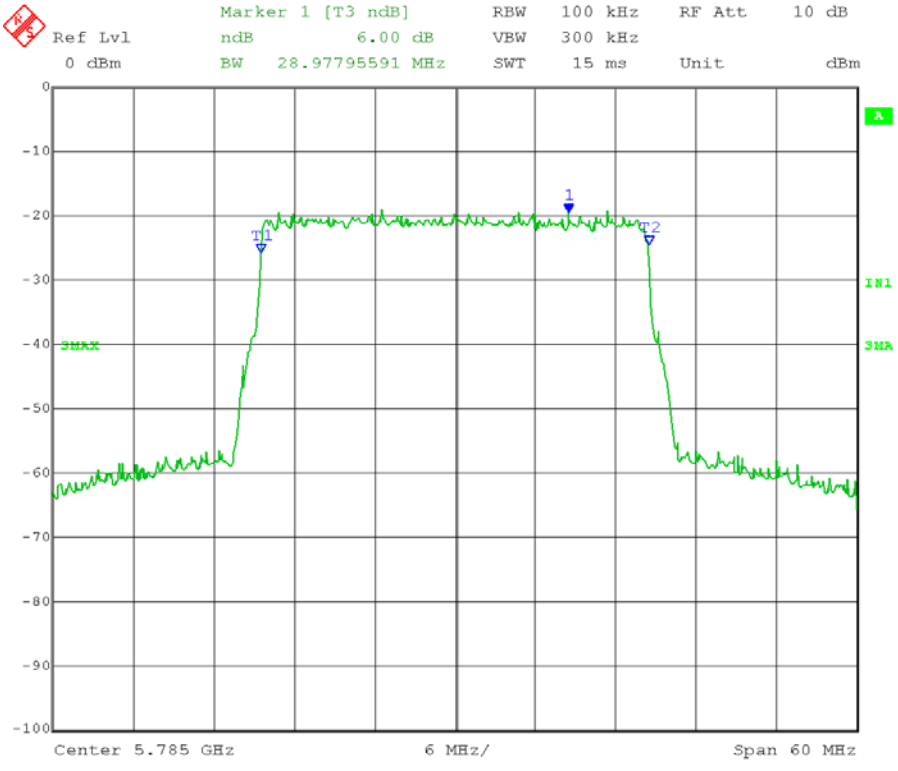

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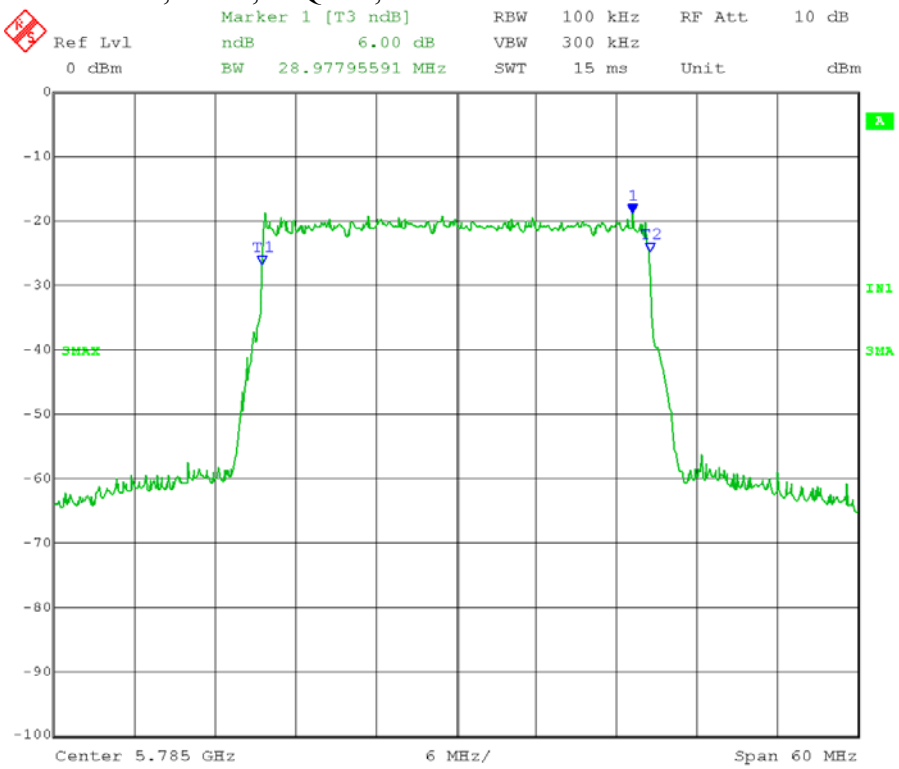

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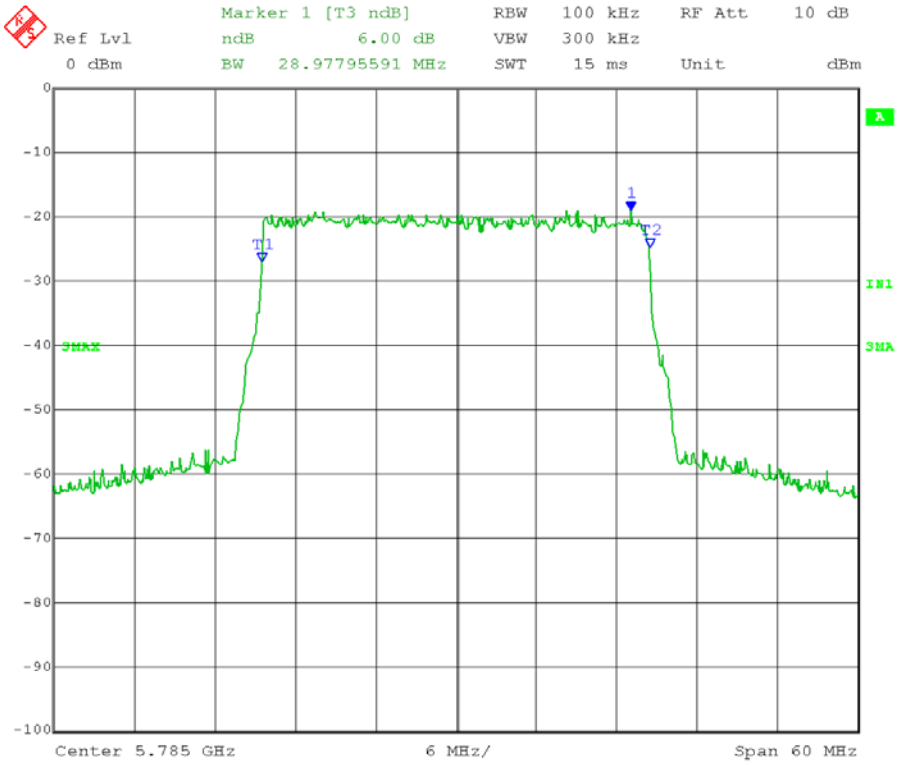

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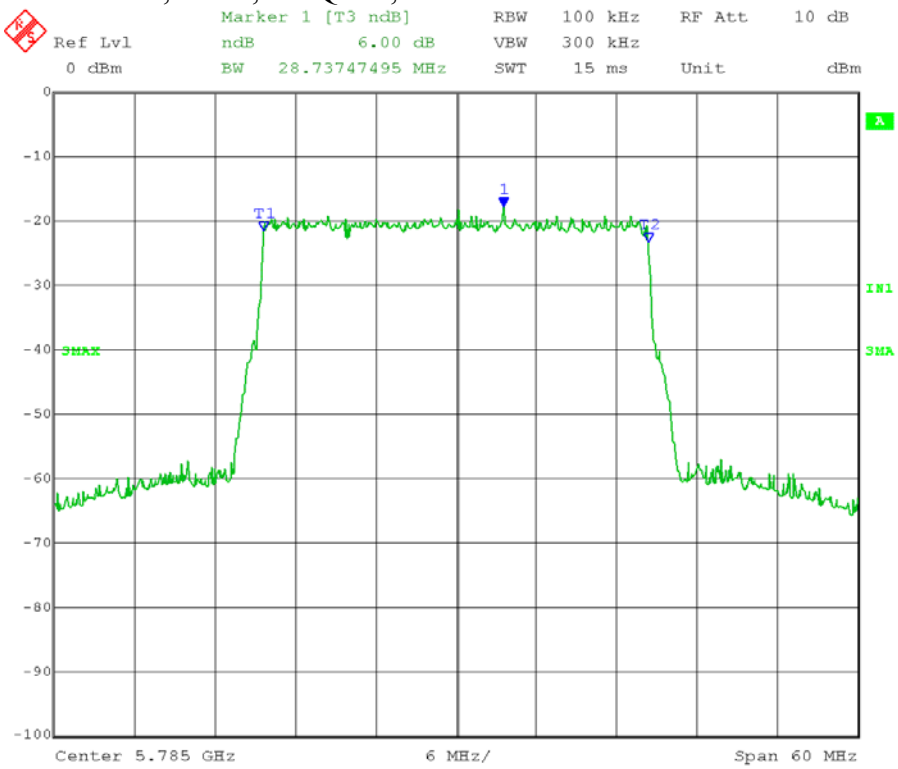

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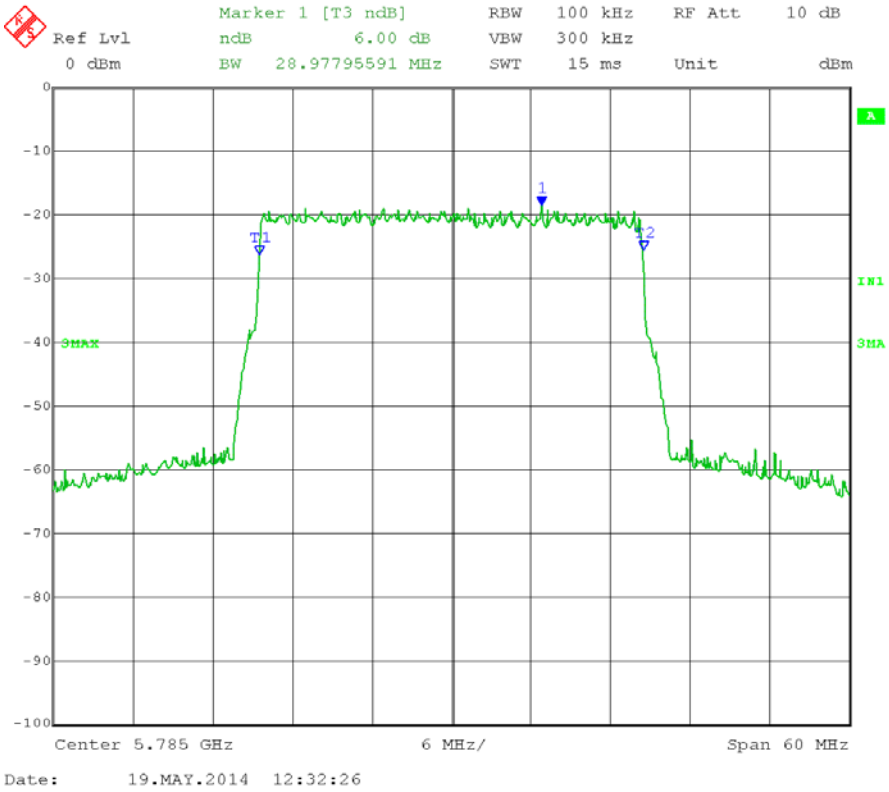

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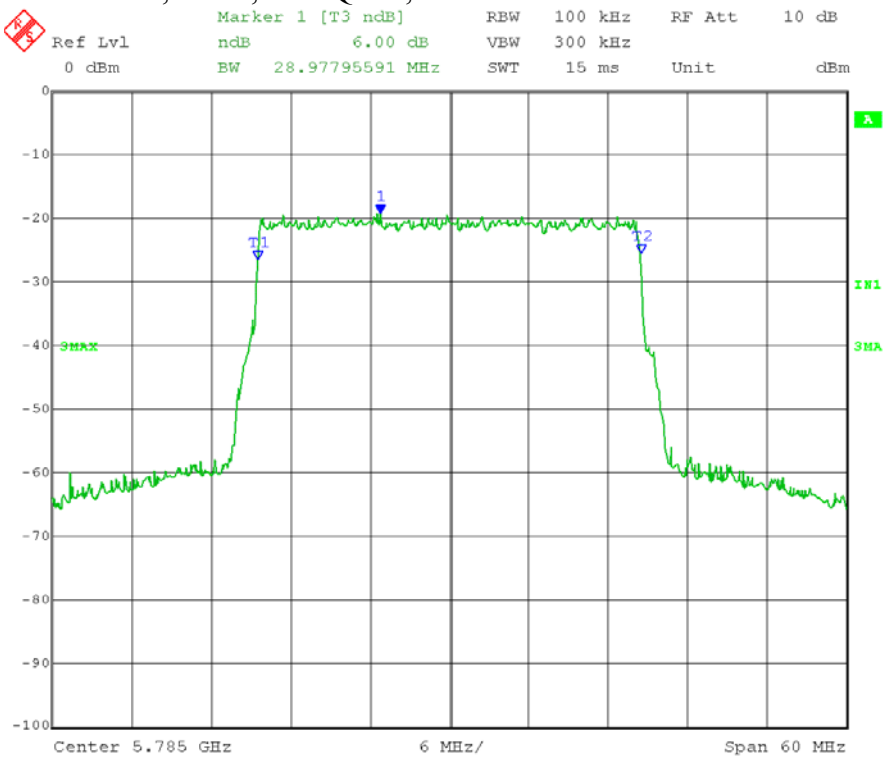

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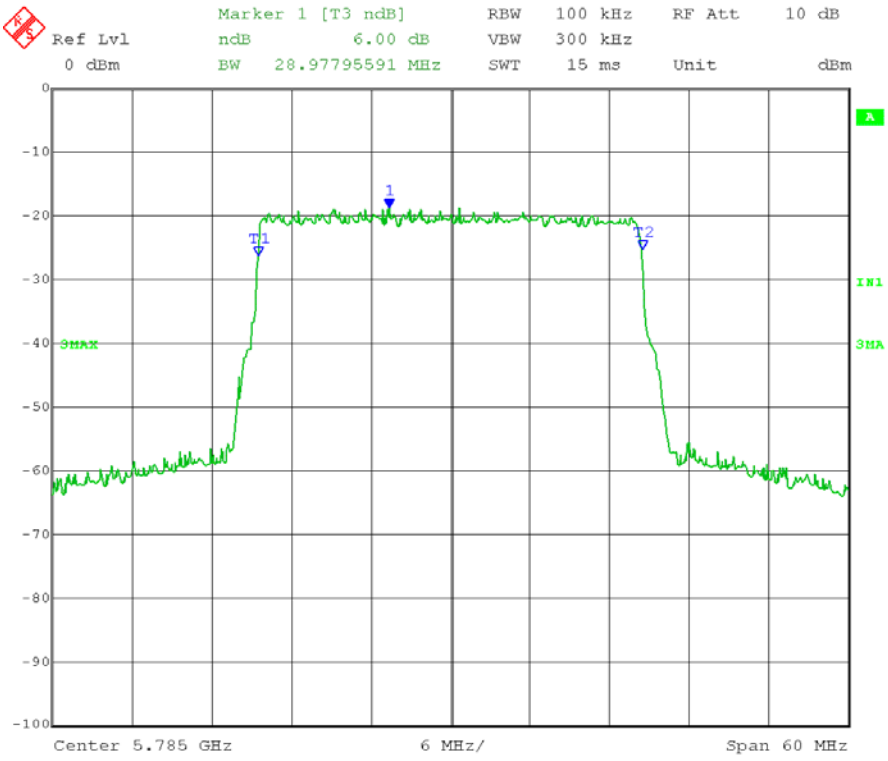

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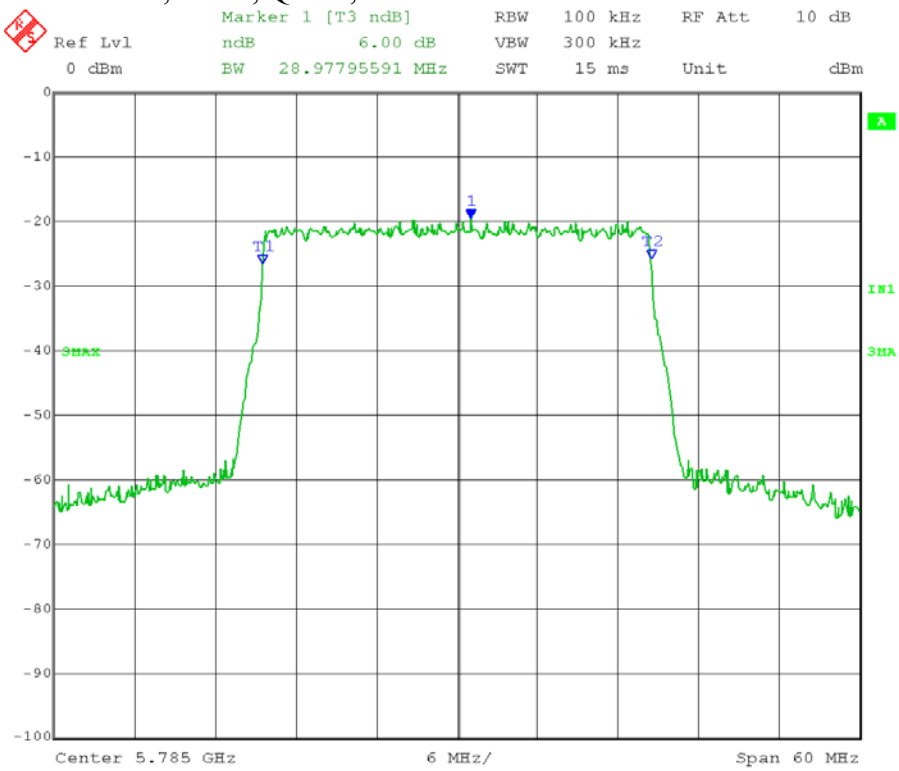

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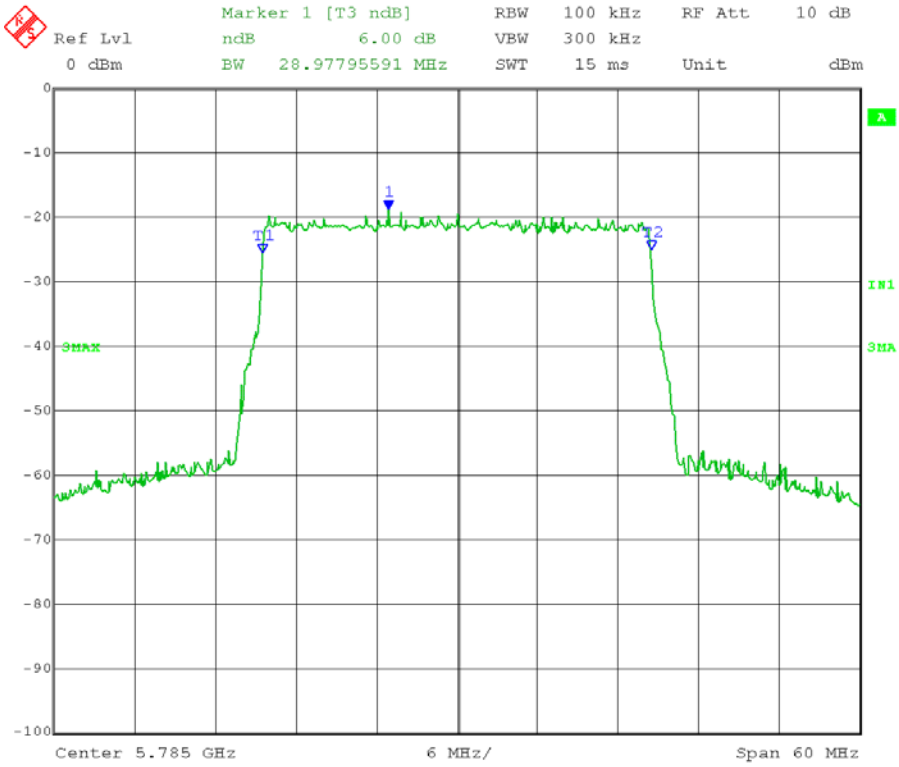

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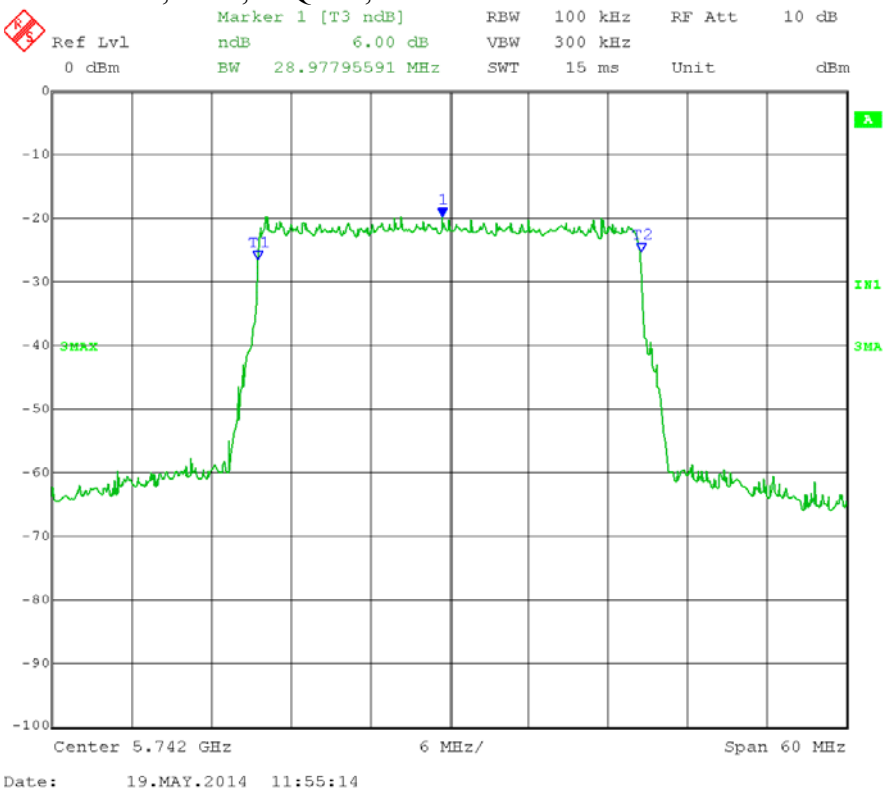

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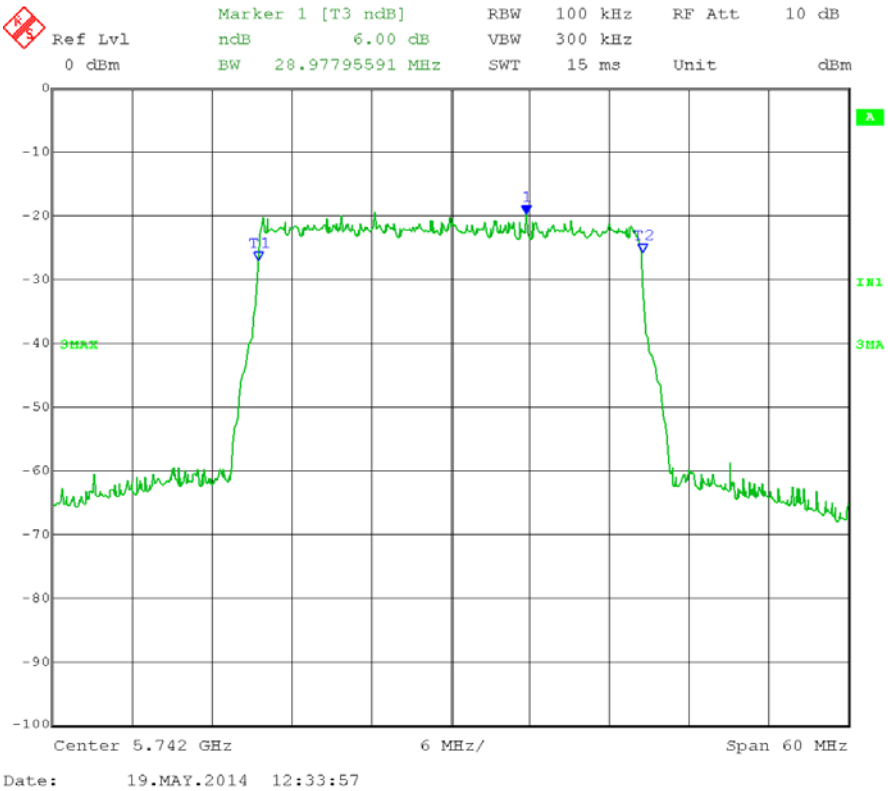

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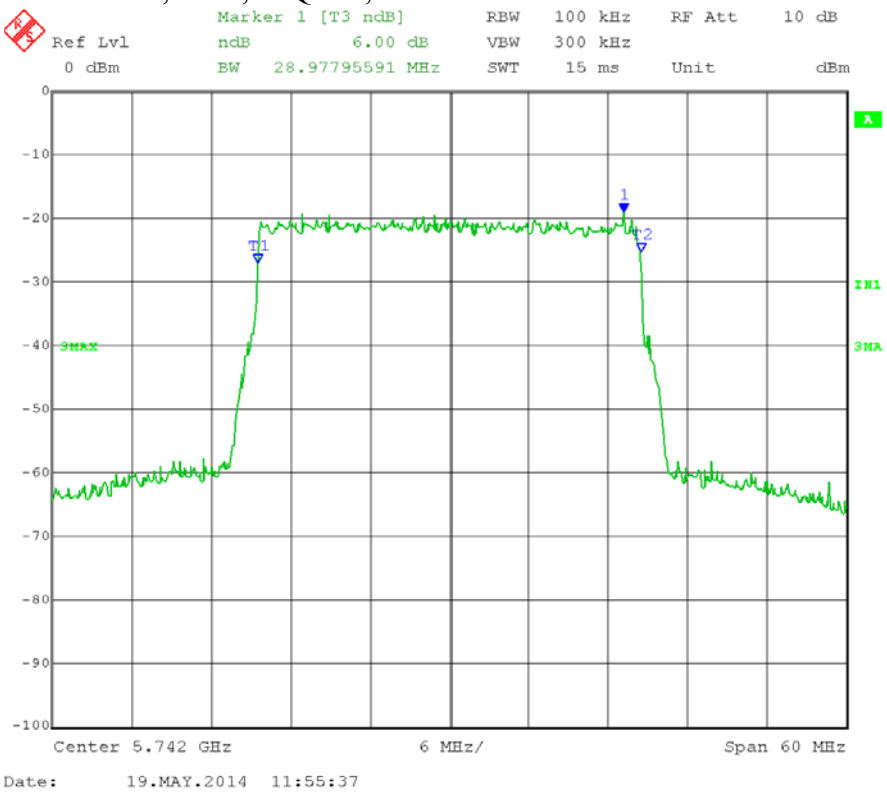

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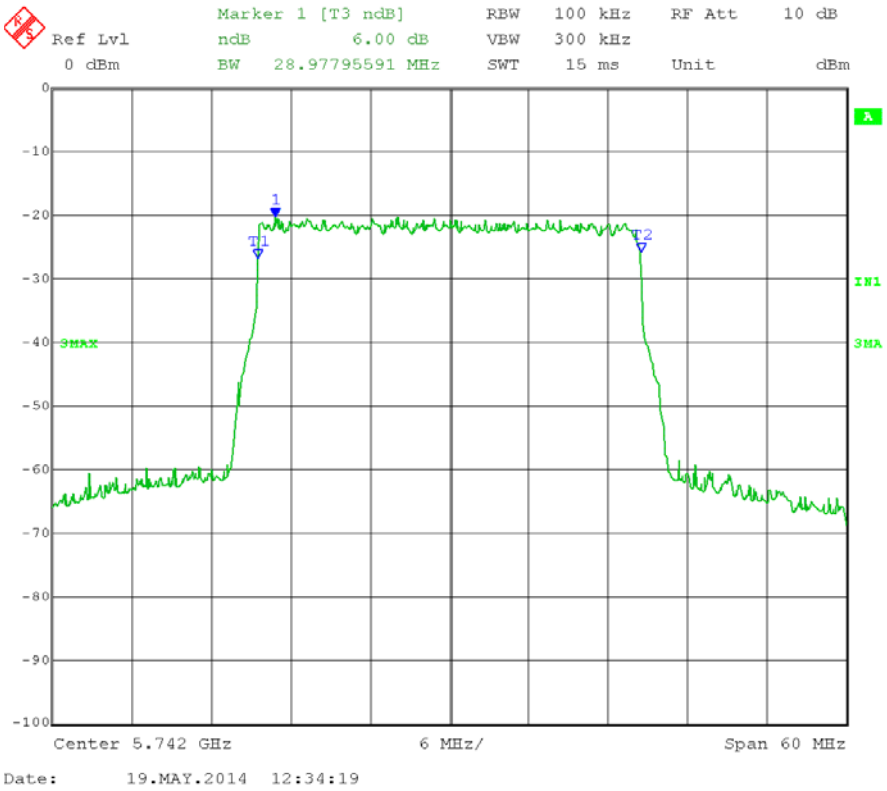

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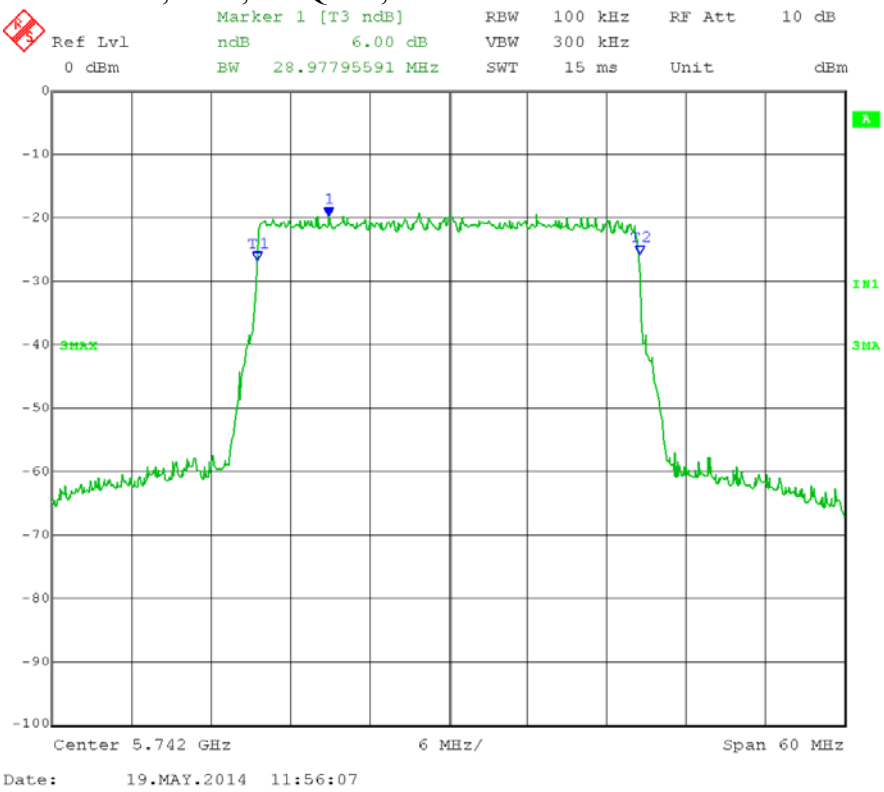

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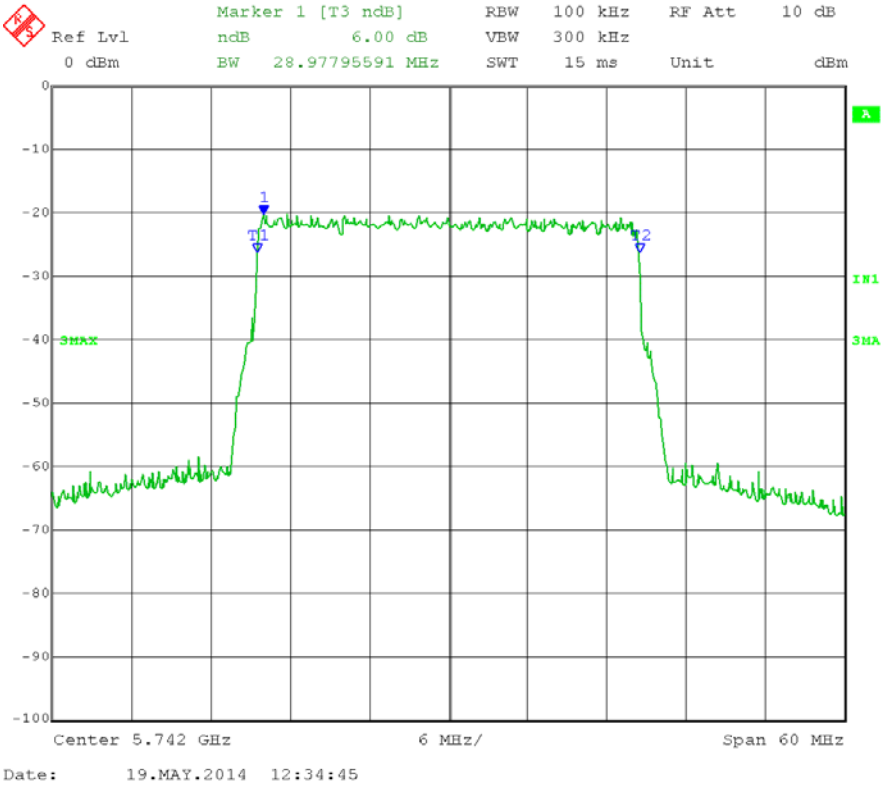

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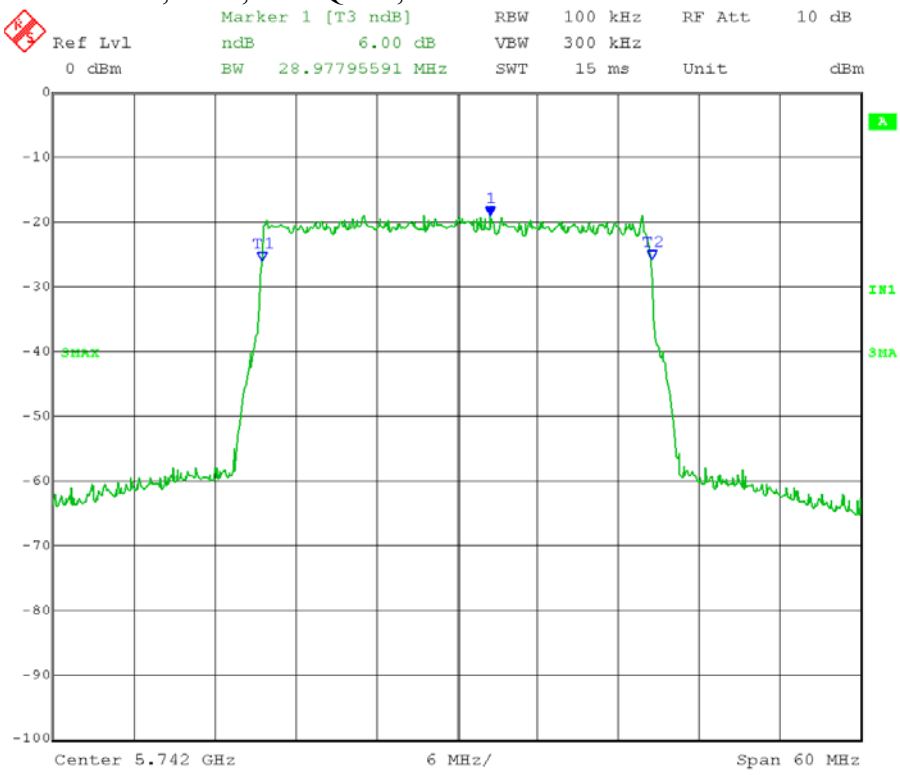

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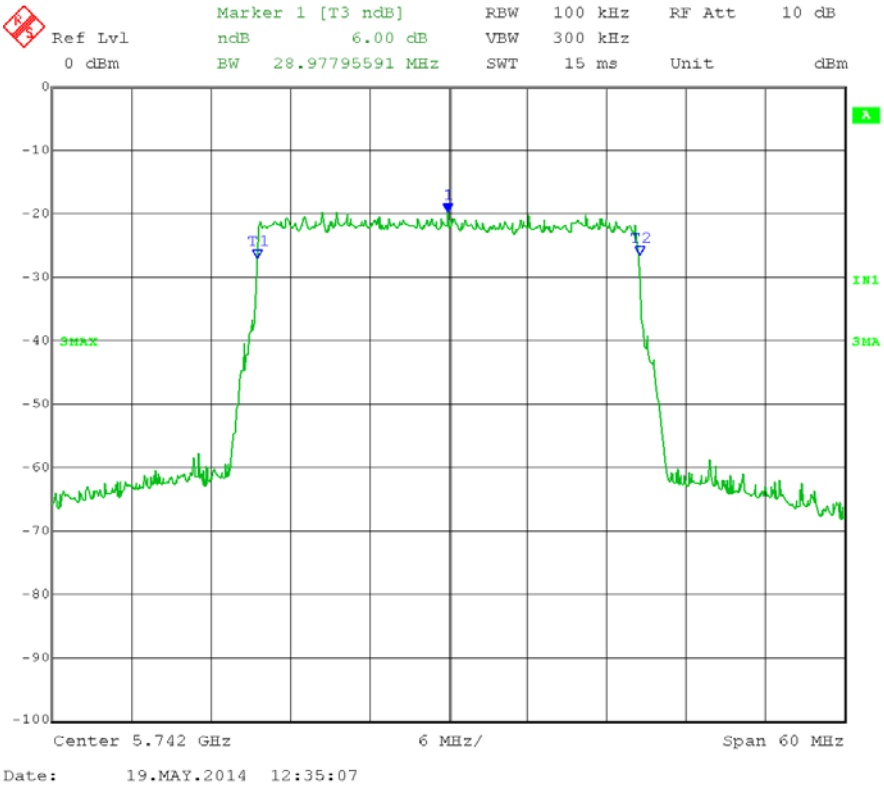
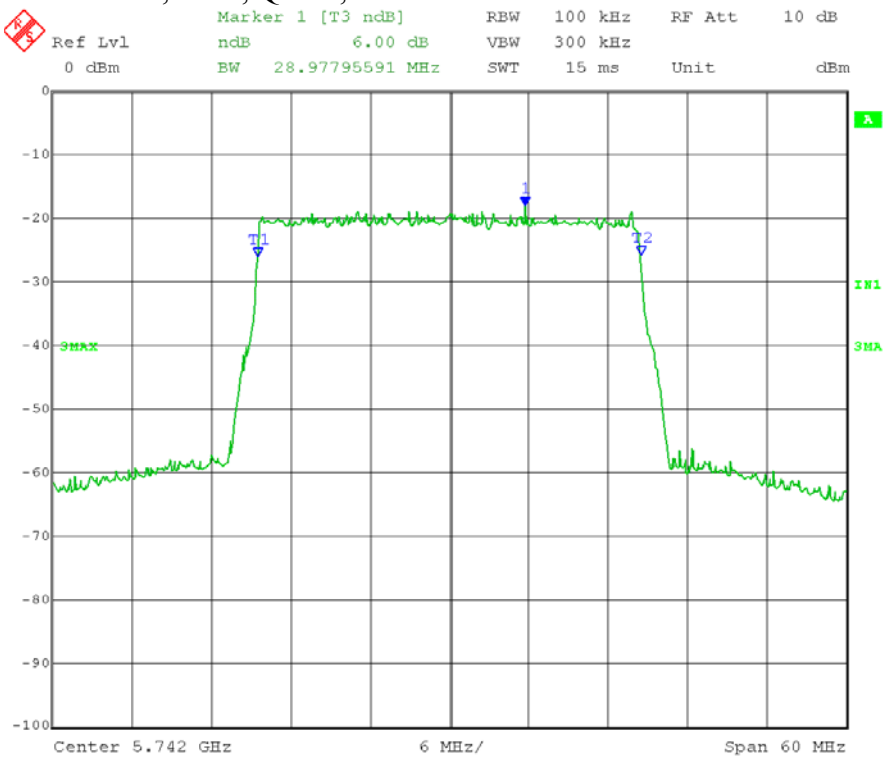


Date: 19.MAY.2014 12:35:07

30MHz BW, LCH, QPSK, TX 0:



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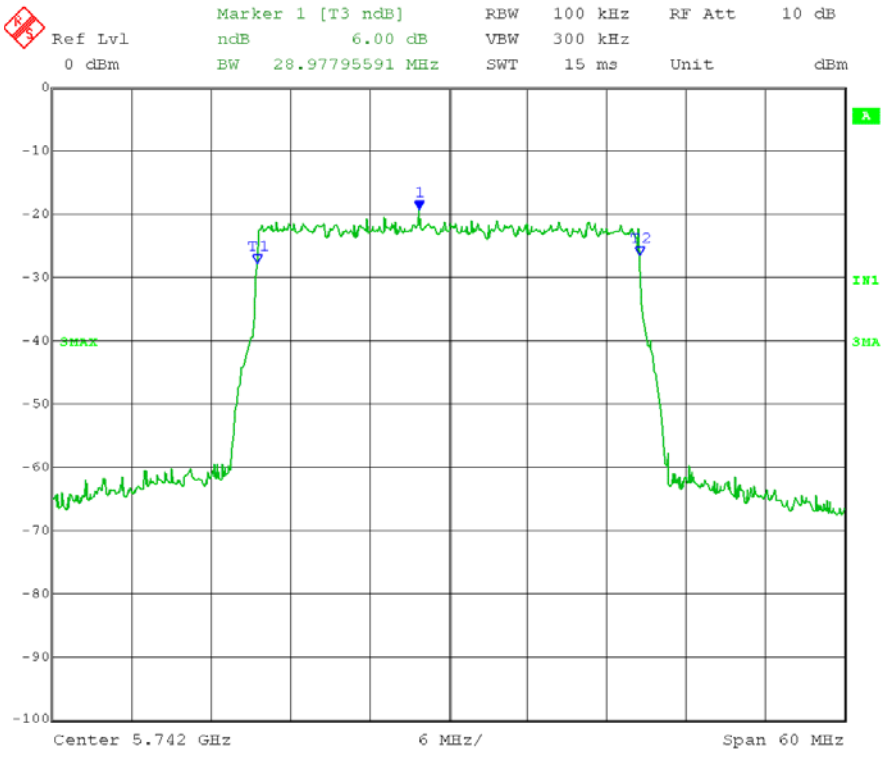


Date: 19.MAY.2014 12:35:28

Appendix B – Measurement Data

B2.0 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 1024QAM modulations over a 30MHz modulation bandwidth at the low, mid and high channels of operation. The EUT was set to transmit continuously. A duty cycle measurement of greater than 98% was confirmed. The power setting was 50 dBm e.i.r.p.

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

Results: Passed

Test Date: 05-14-2014
Company: Ubiquiti Networks
EUT: Air Fiber 5 - 5.8GHz WiFi Radio
Test: Maximum conducted output power - Conducted
Operator: Steve D

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
Power setting: 50 dBm e.i.r.p.

30 MHz Operating Bandwidth:

FCC Maximum Conducted Output Power		30M				
	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)	462.88	463.02	463.08	463.21	463.14
	TX1 (mW)	468.4	480.83	480.68	480.58	480.37
	total(mW)	**931.28**	**943.85**	**943.76**	**943.79**	**943.51**
HCH = 5833 MHz	Margin(mW)	68.72	56.15	56.24	56.21	56.49
	TX0	485.31	485.33	485.31	485.19	485.14
	TX1	482.32	481.07	480.82	481.18	481.19
	total(mW)	**967.63**	**966.40**	**966.13**	**966.37**	**966.33**
MCH = 5785 MHz	Margin(mW)	32.37	33.60	33.87	33.63	33.67
	TX0	498.13	497.66	497.66	496.95	496.76
	TX1	490.97	457.47	490.83	491.25	491.17
	total(mW)	**989.10**	**955.13**	**988.49**	**988.20**	**987.93**
LCH = 5742 MHz	Margin(mW)	10.90	44.87	11.51	11.80	12.07

Appendix B – Measurement Data

B3.0 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 1024QAM modulations over a 30MHz modulation bandwidth at the low, mid and high channels of operation. The EUT was set to transmit continuously. A duty cycle measurement of greater than 98% was confirmed. The power setting was 50 dBm e.i.r.p.

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

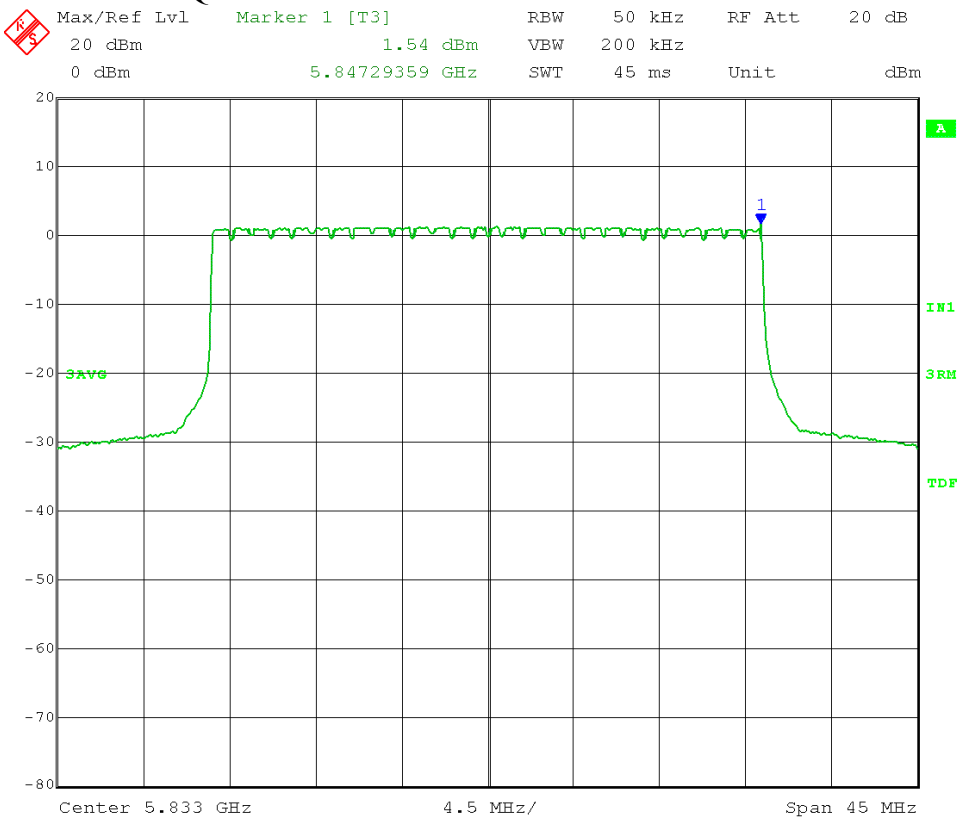
Results: Passed

Test Date: 5-15-2014
Company: Ubiquiti Networks
EUT: Air Fiber 5 - 5.8GHz WiFi Radio
Test: Maximum power spectral density- Conducted
Operator: Steve D
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
Power setting: 50

30MHz Operating Bandwidth

Power Spectral Density (PSD)		30M				
	dBm	QPSK	16QAM	64QAM	256QAM	1024Q
FCC limit=8dBm/3kHz	EUT FCC Limit	8	8	8	8	8
	TX0	1.54	1.05	0.97	1.26	1.8
	TX1	0.88	0.96	0.9	1.01	1.44
	total(mW)	2.65	2.52	2.48	2.60	2.91
	Total(dBm)	**4.23**	**4.02**	**3.95**	**4.15**	**4.63**
HCH = 5833 MHz	Margin	3.77	3.98	4.05	3.85	3.37
	TX0	0.78	0.34	0.3	0.46	-0.43
	TX1	0.07	0.15	0.2	0.37	0.91
	total(mW)	2.21	2.12	2.12	2.20	2.14
	Total(dBm)	**3.45**	**3.26**	**3.26**	**3.43**	**3.30**
MCH = 5785 MHz	Margin	4.55	4.74	4.74	4.57	4.70
	TX0	-0.01	-0.11	-0.25	-0.04	0.67
	TX1	-0.32	-0.28	-0.22	-0.29	0.24
	total(mW)	1.93	1.91	1.89	1.93	2.22
	Total(dBm)	**2.85**	**2.82**	**2.78**	**2.85**	**3.47**
LCH = 5742 MHz	Margin	5.15	5.18	5.22	5.15	4.53

30MHz HCH QPSK TX0



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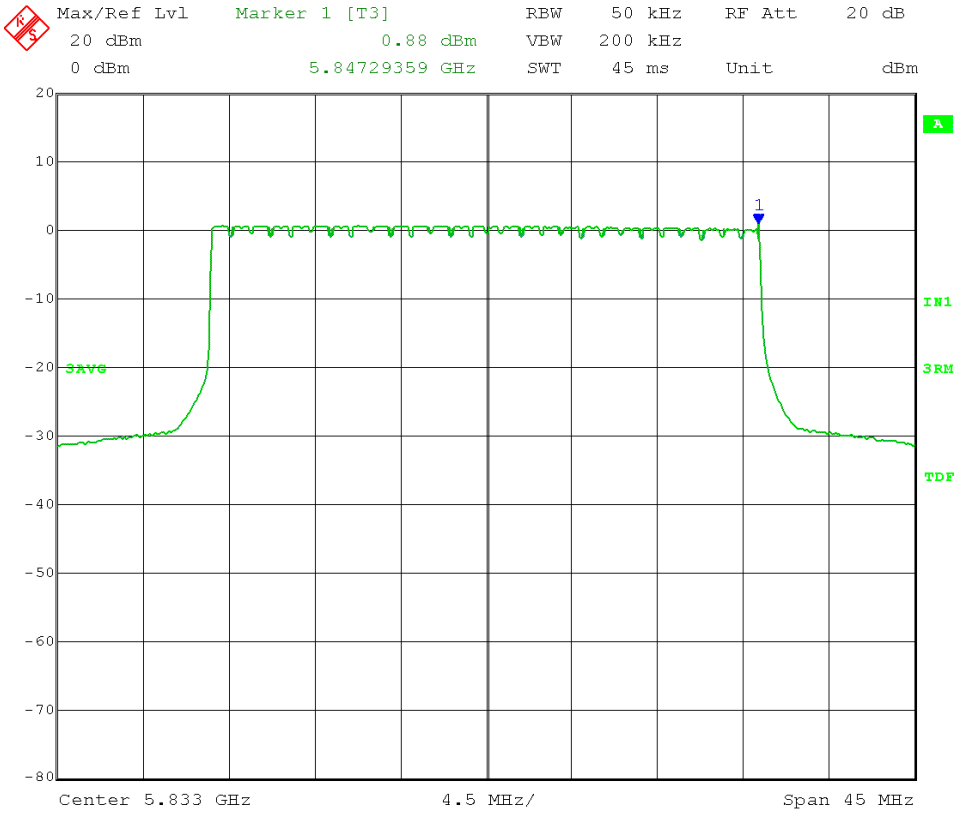
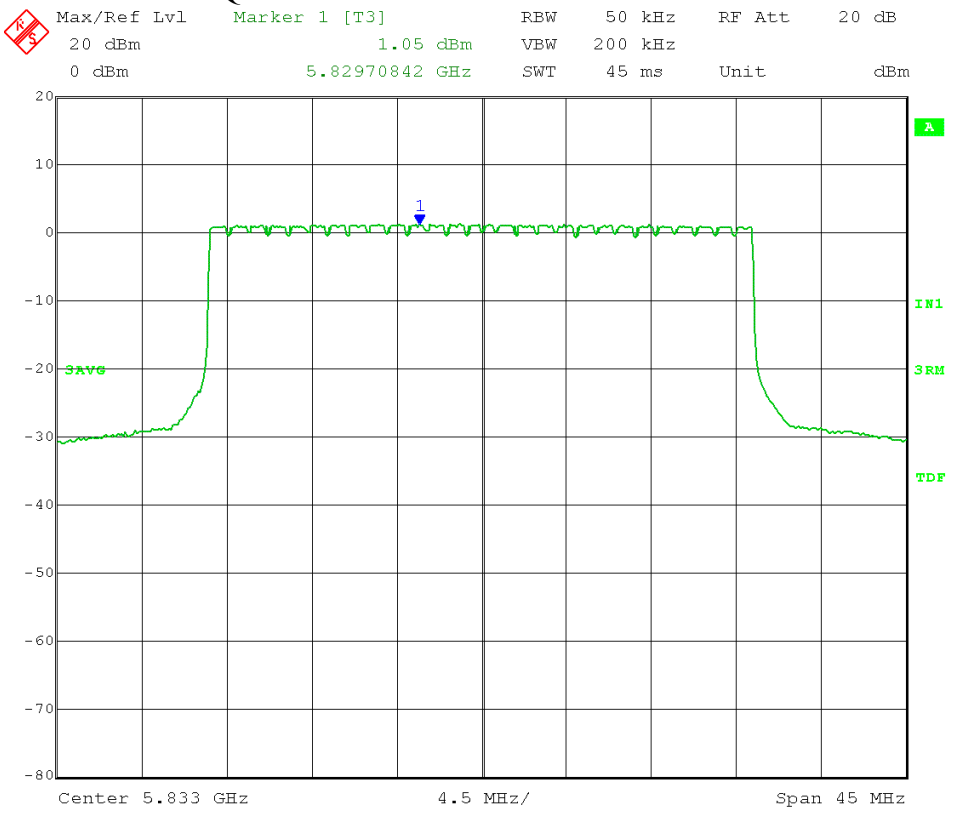


Date: 15.MAY.2014 11:20:07

30MHz HCH 16QAM TX0



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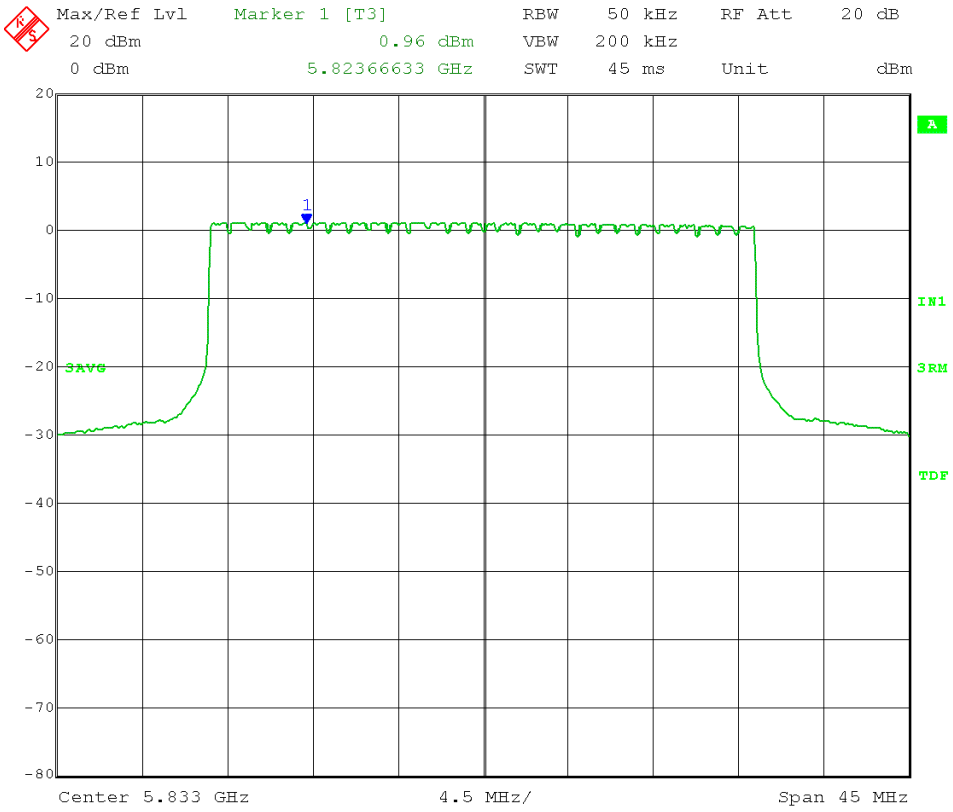

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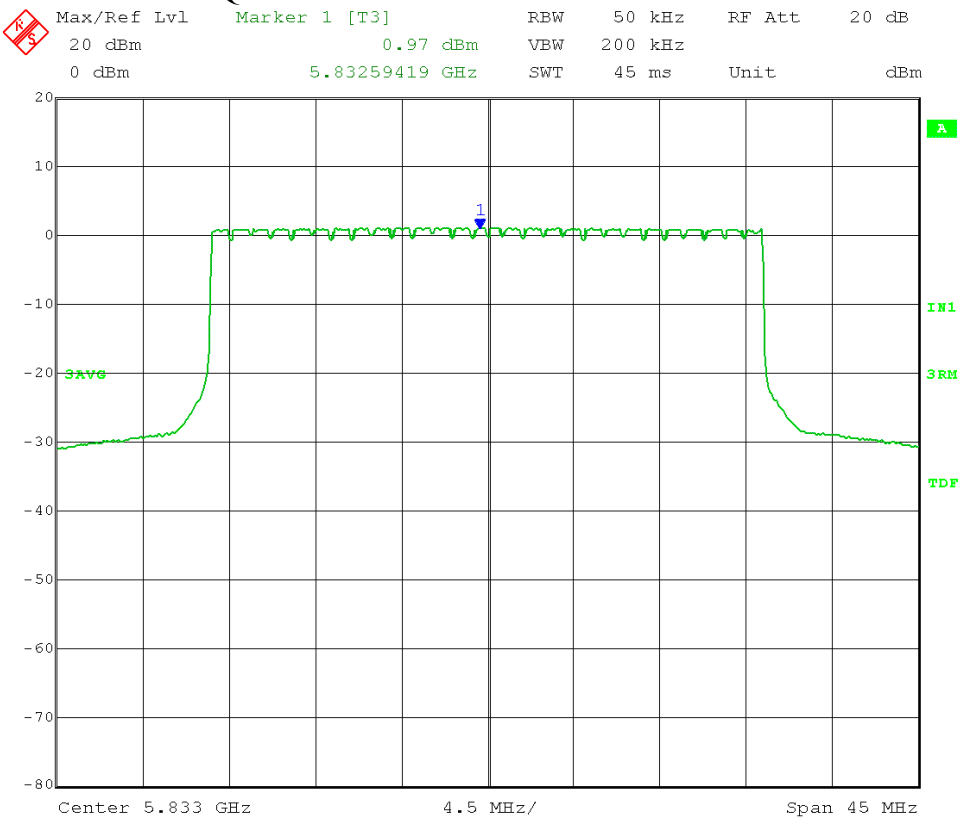
30MHz HCH 64QAM TX0



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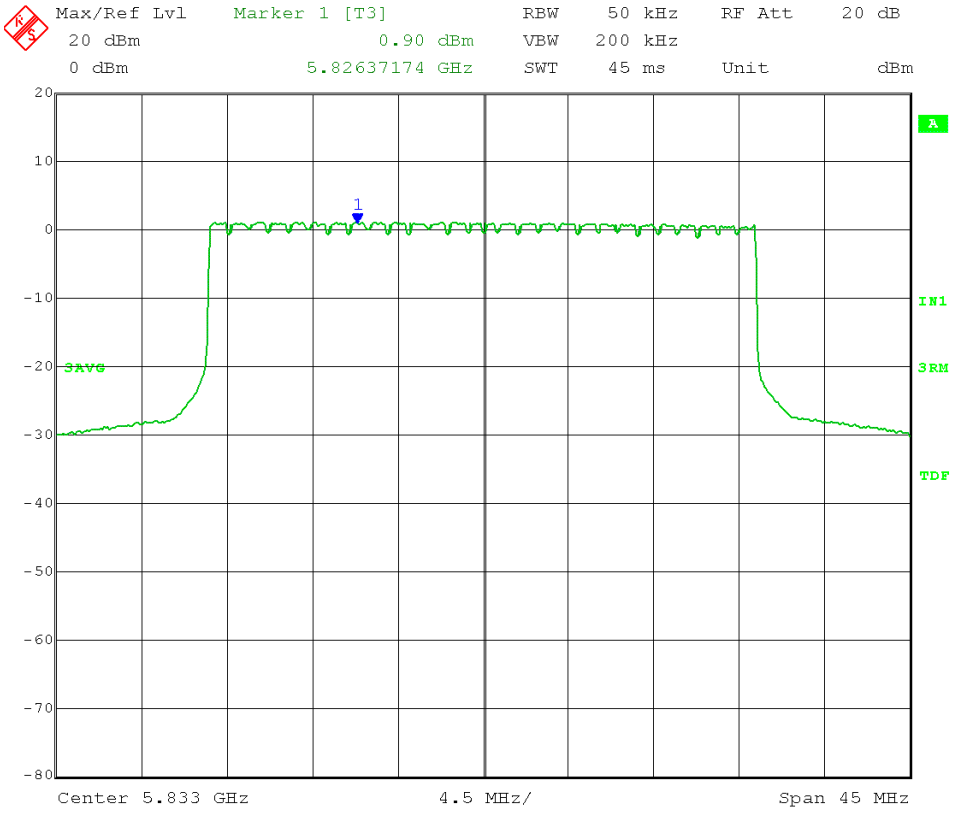

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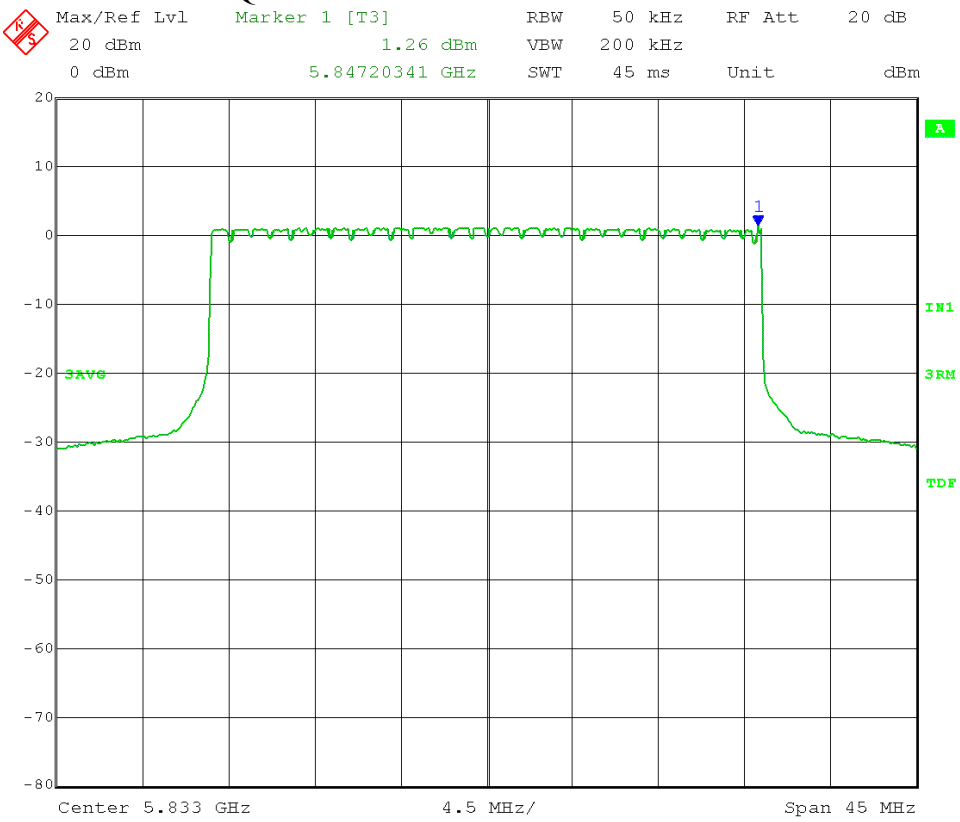
30MHz HCH 256QAM TX0



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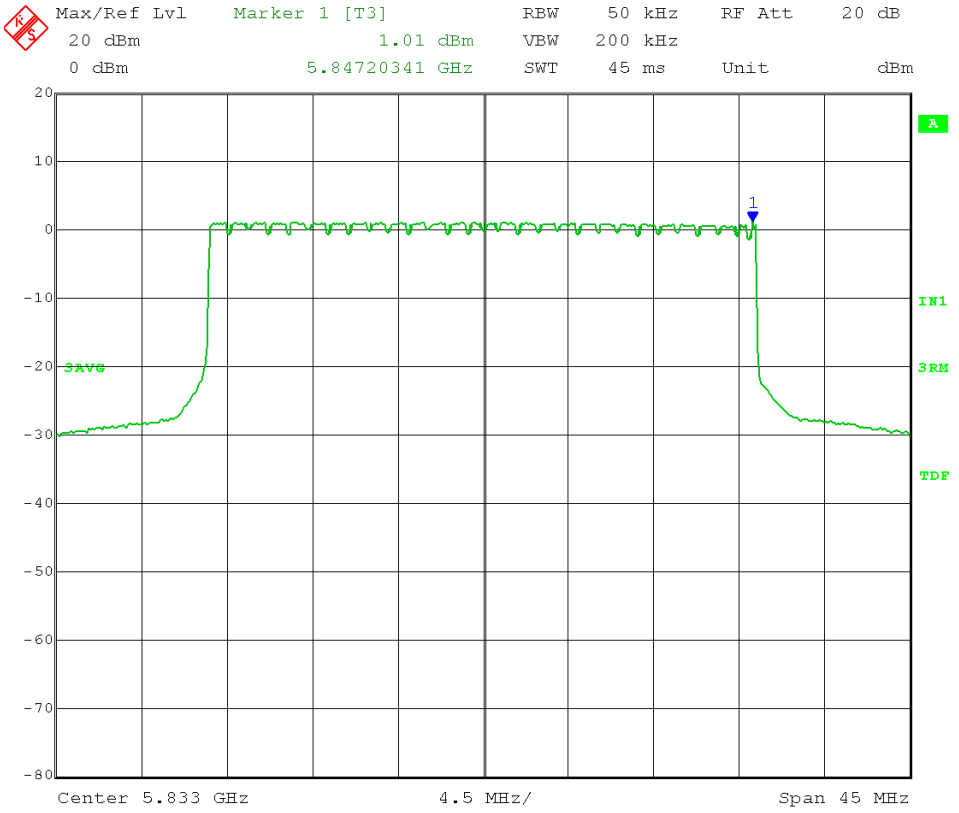

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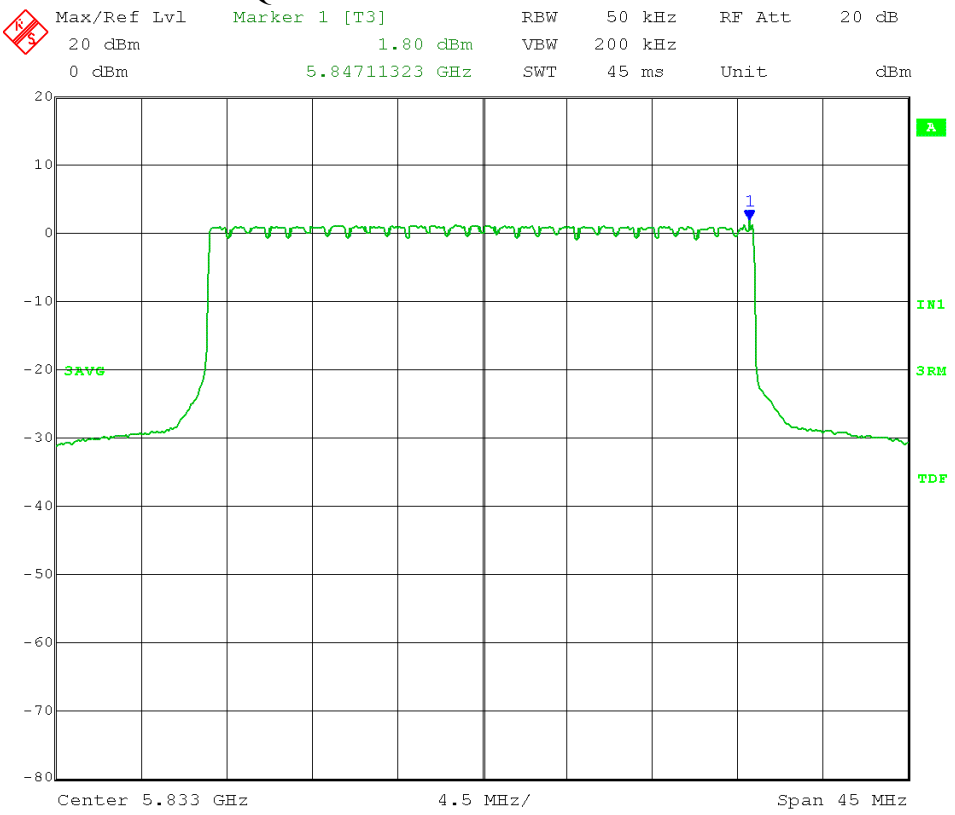

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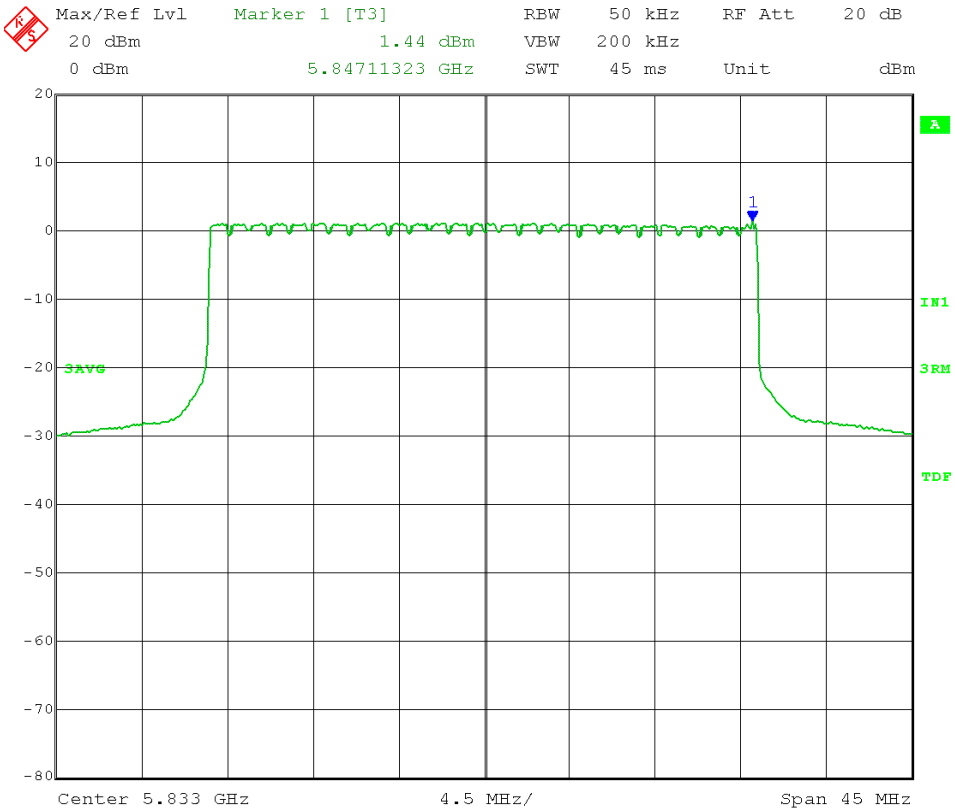

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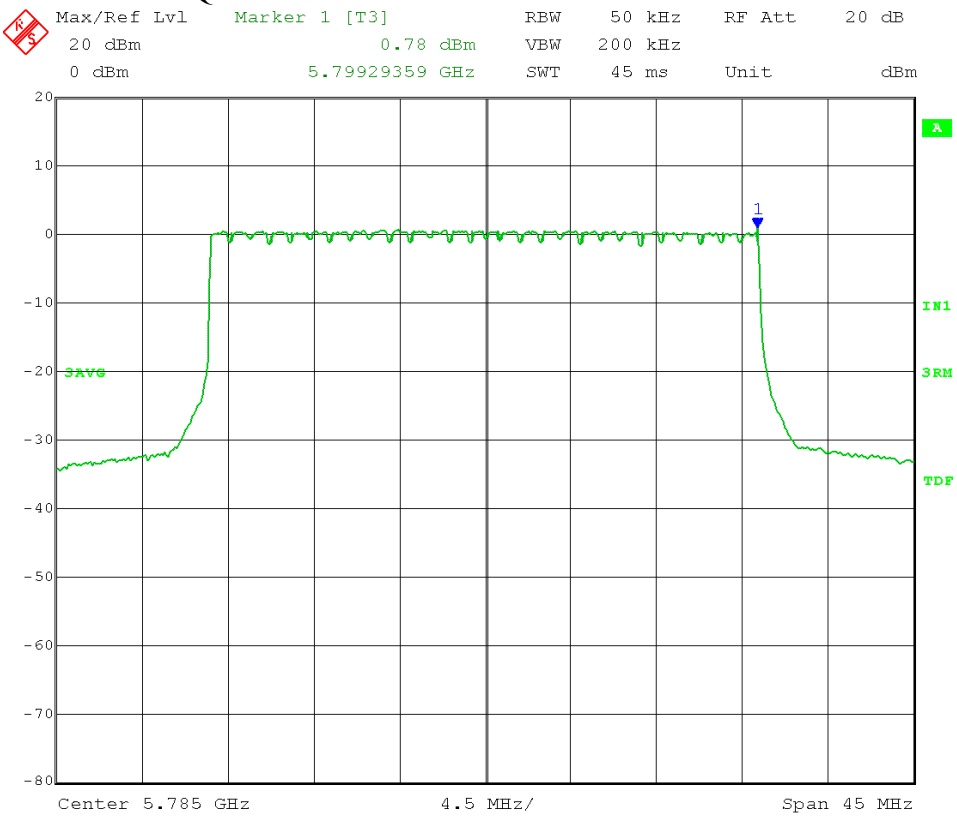
30MHz MCH QPSK TX0



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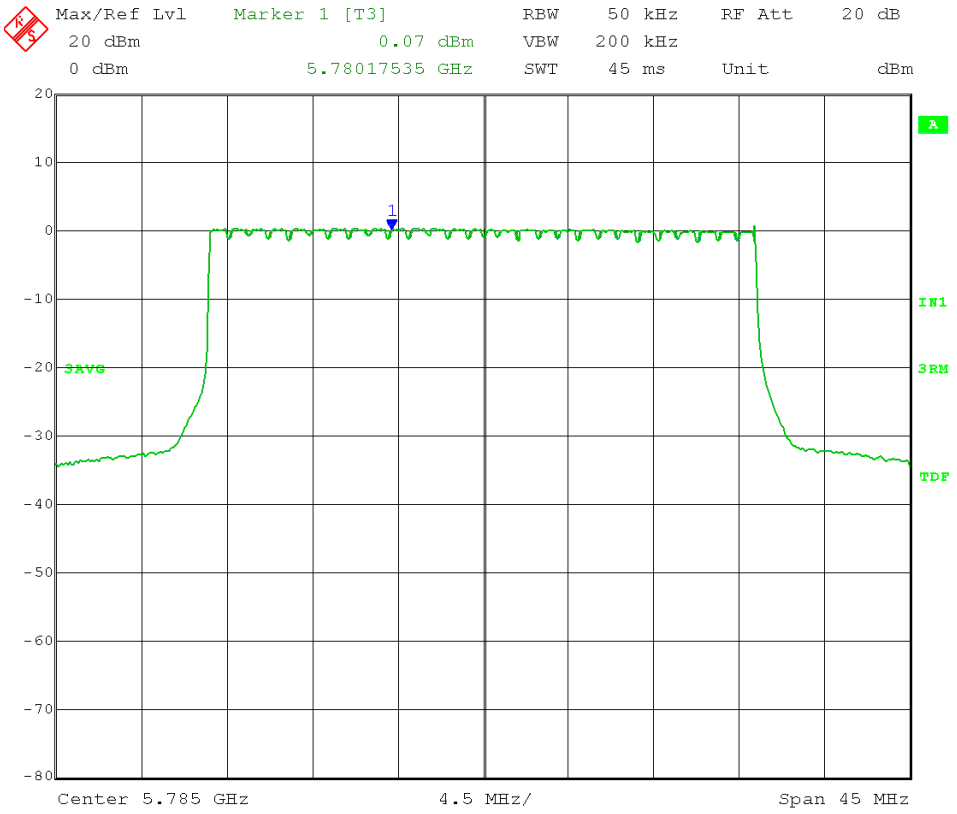

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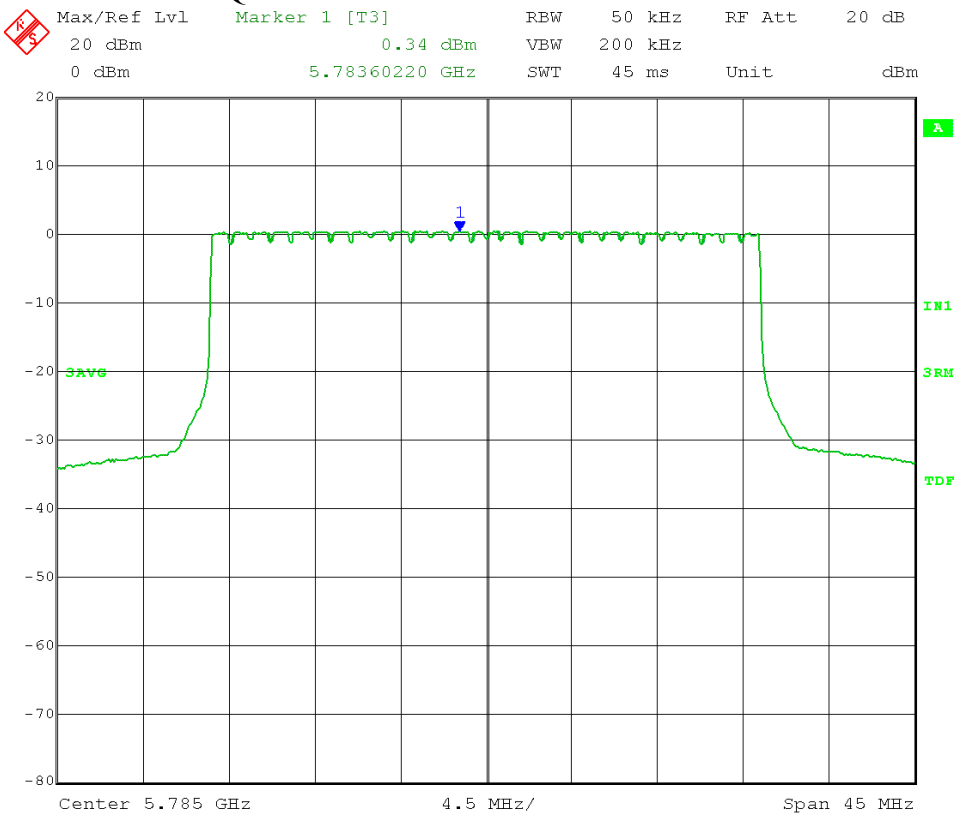
30MHz MCH 16QAM TX0



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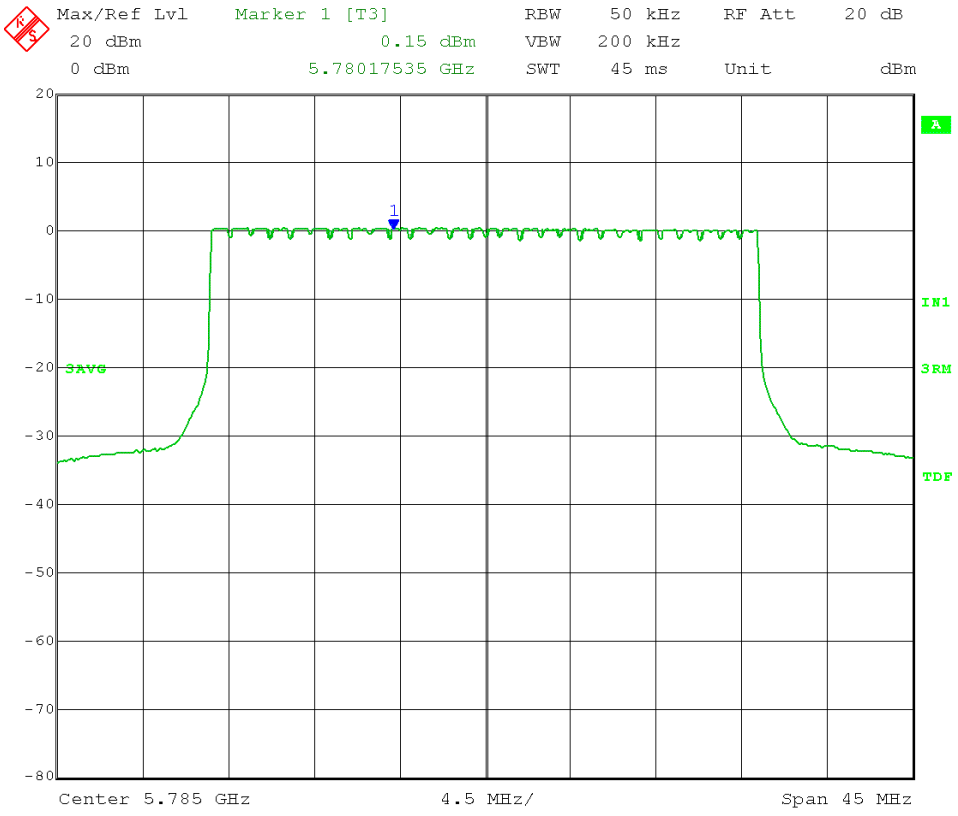

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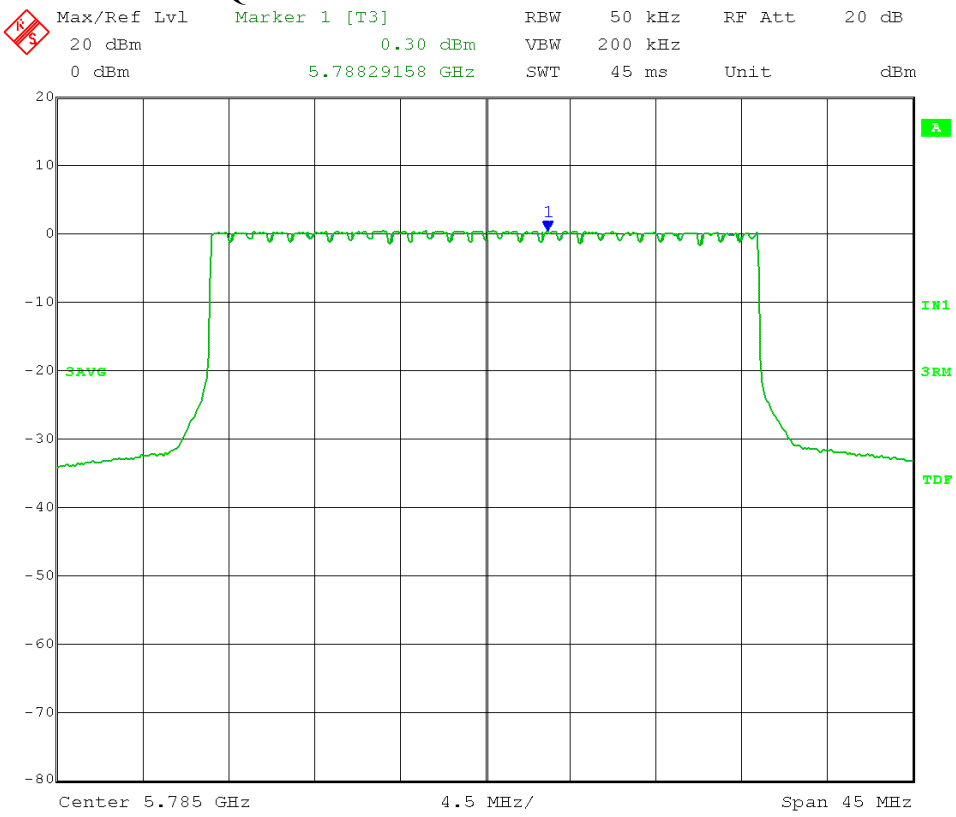

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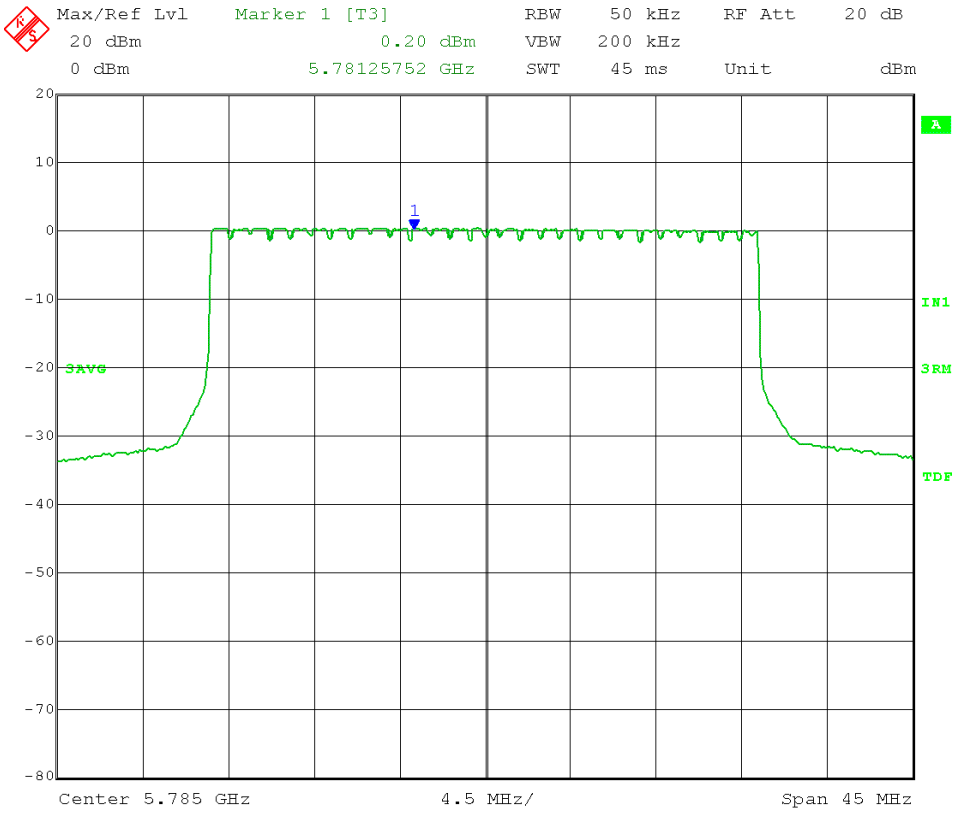

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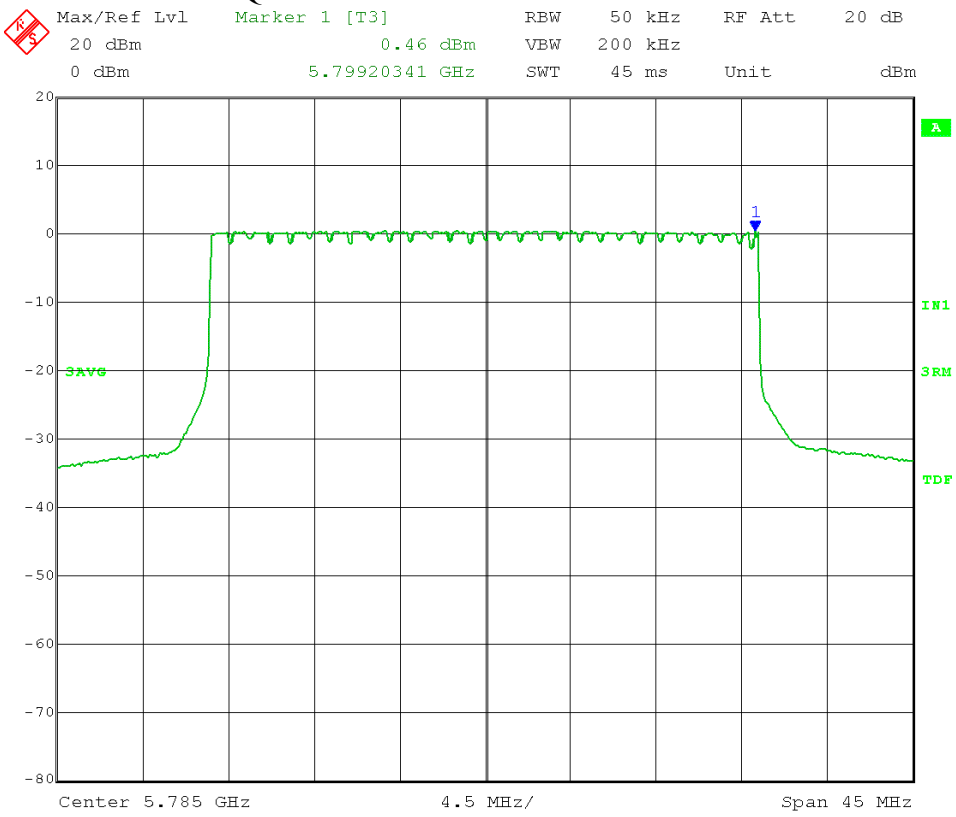
30MHz MCH 256QAM TX0



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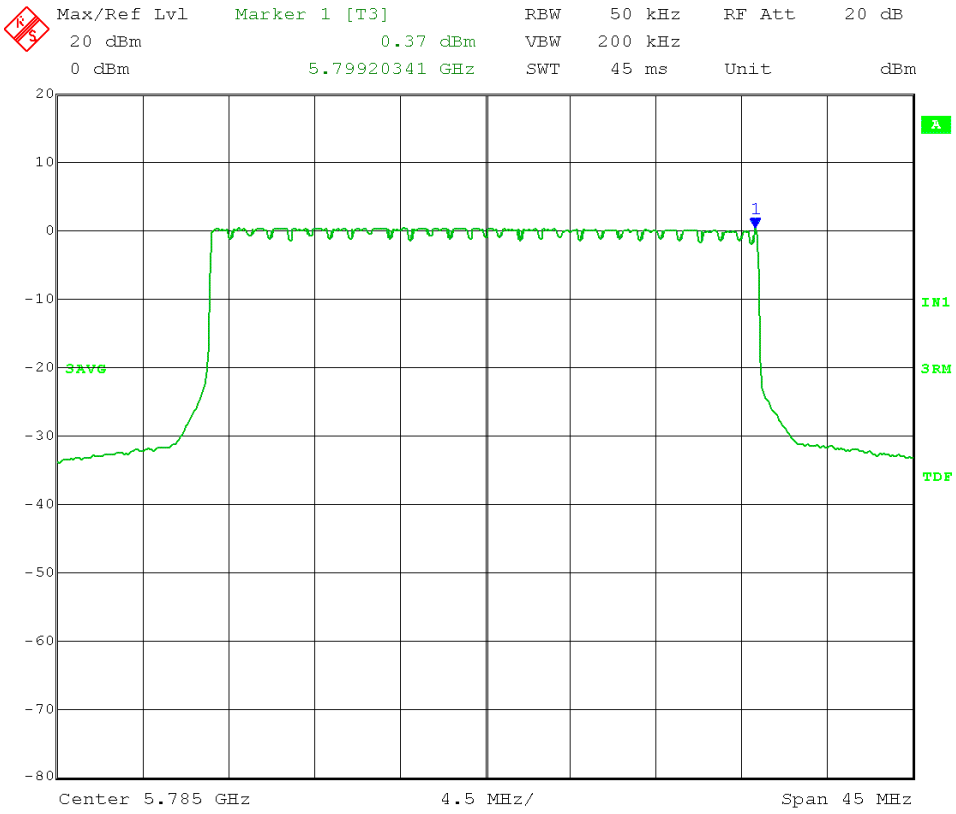

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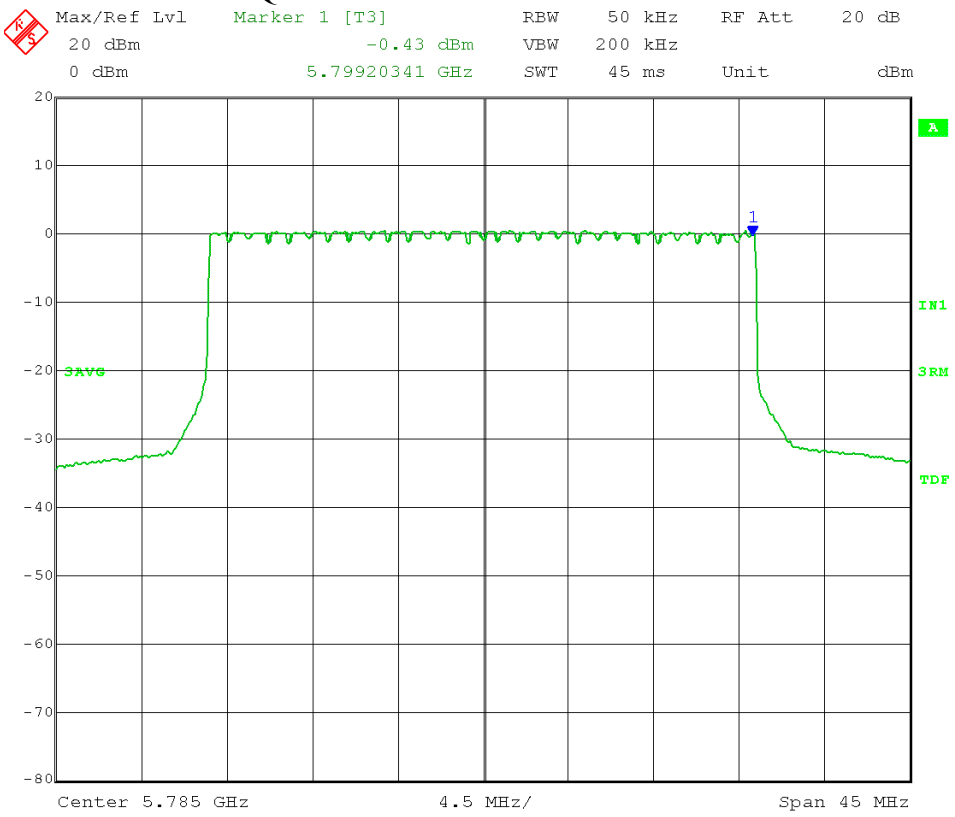
30MHz MCH 1024QAM TX0



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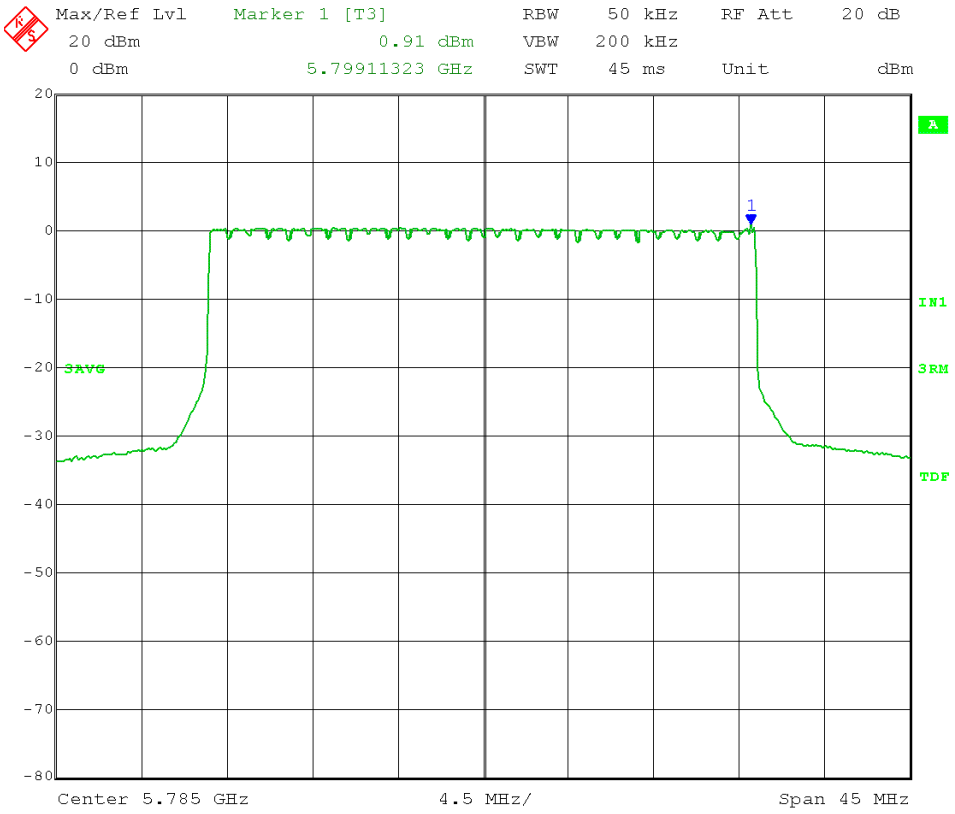

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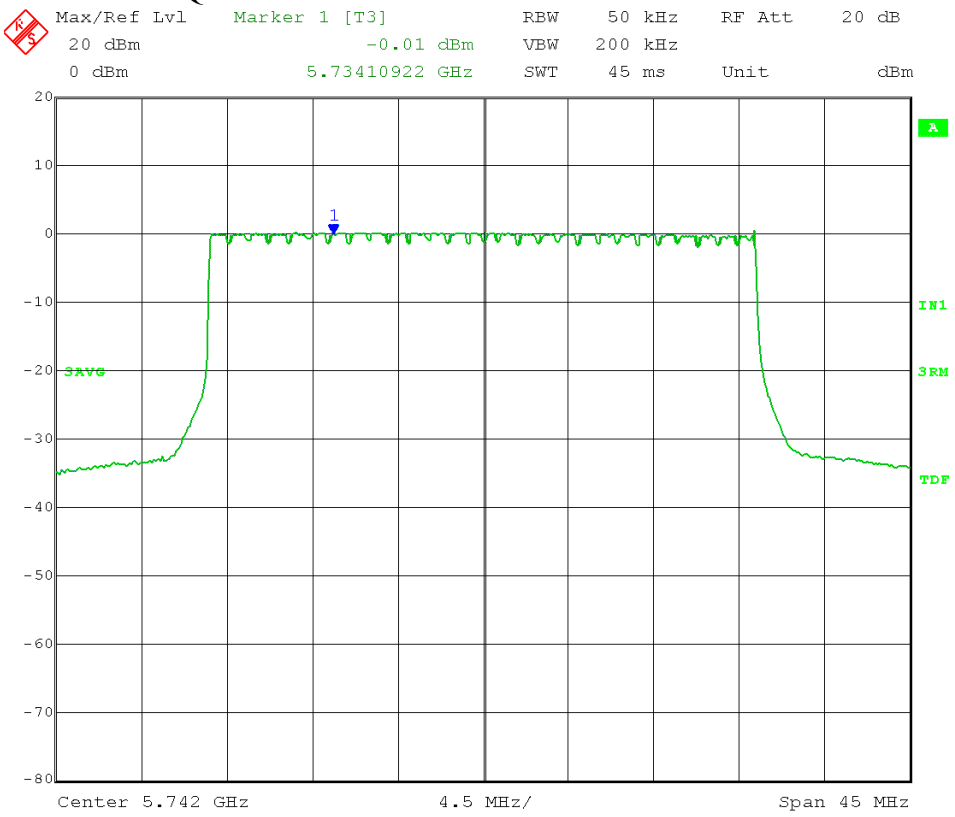
30MHz LCH QPSK TX0



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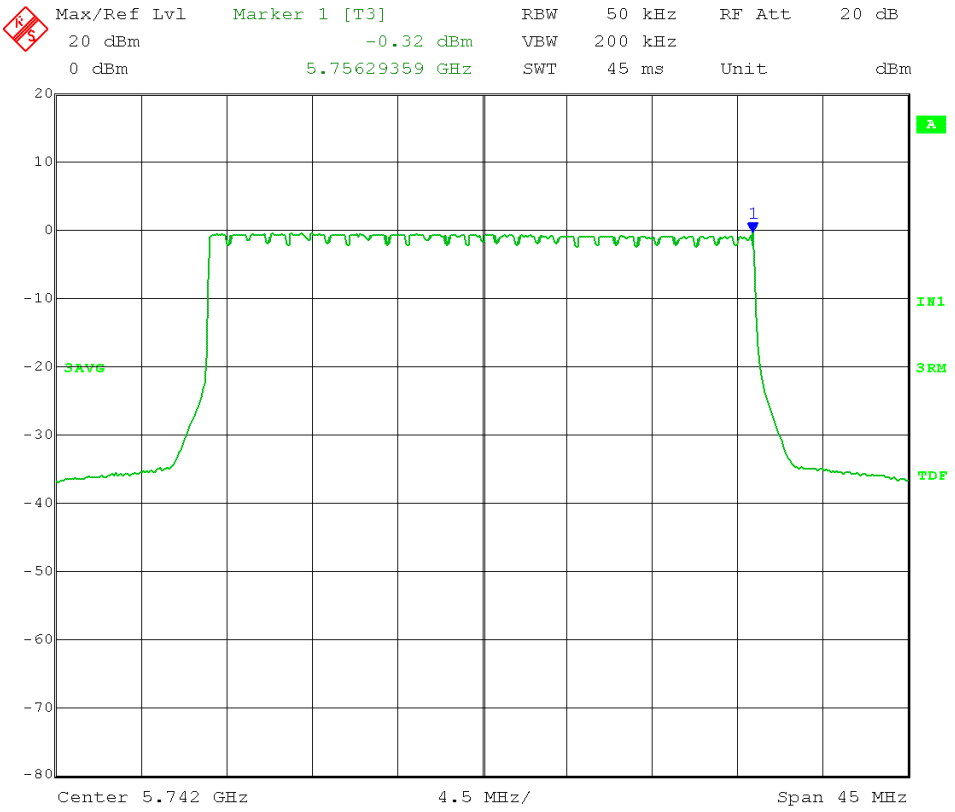

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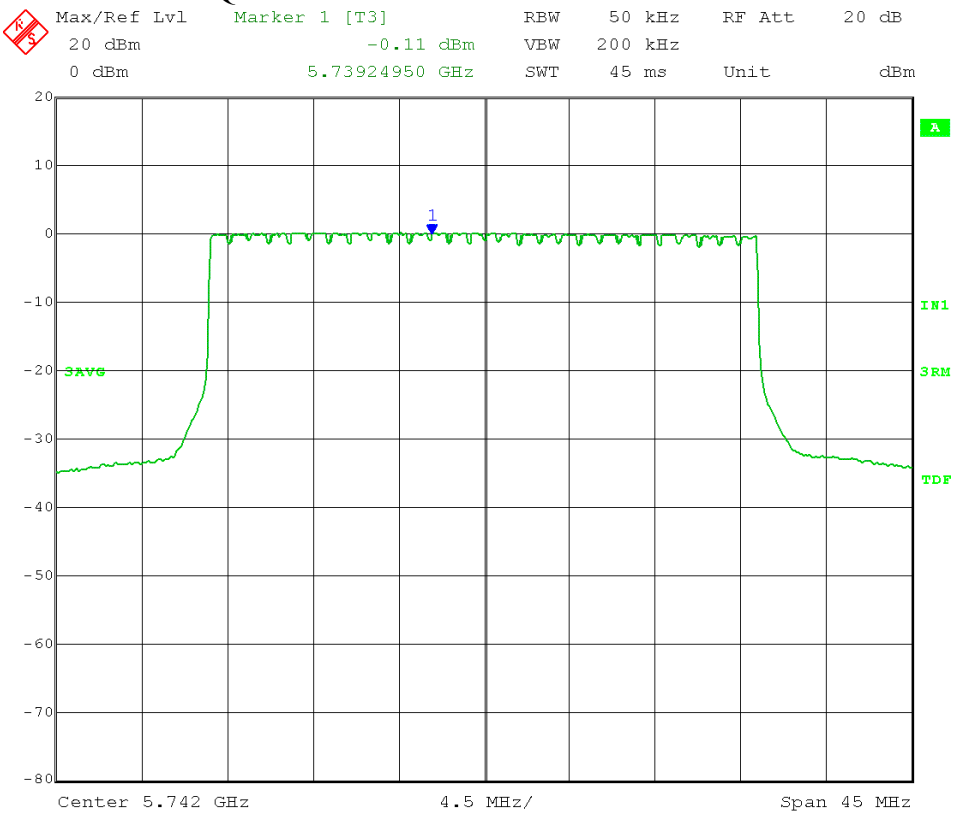

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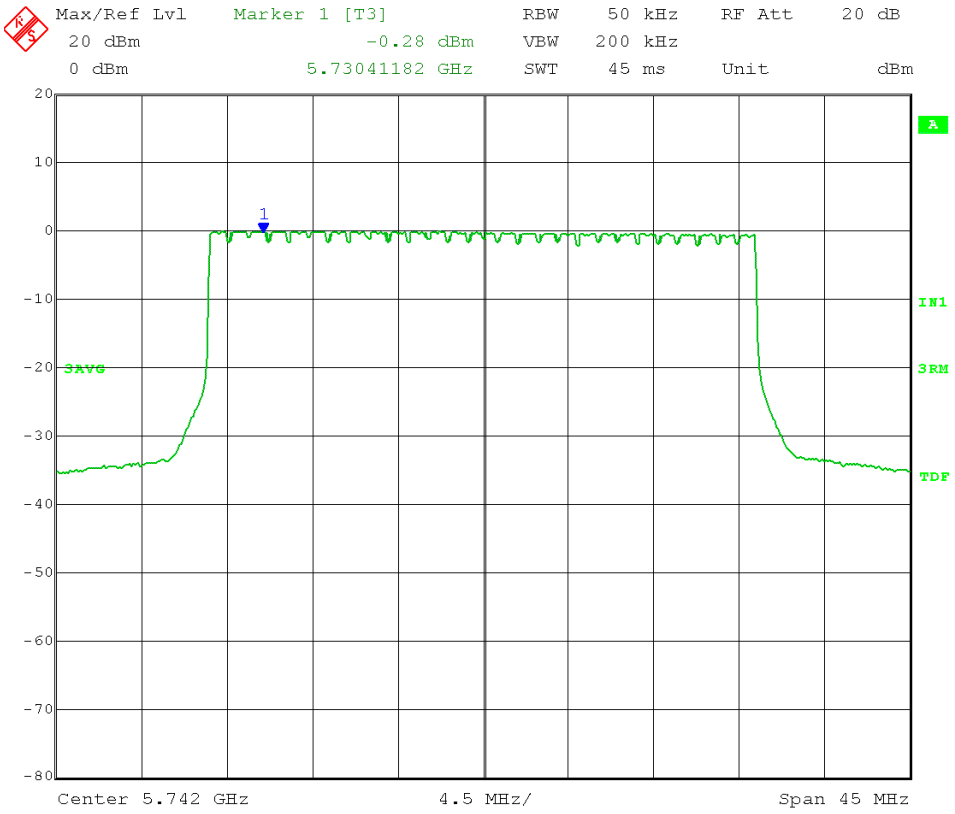

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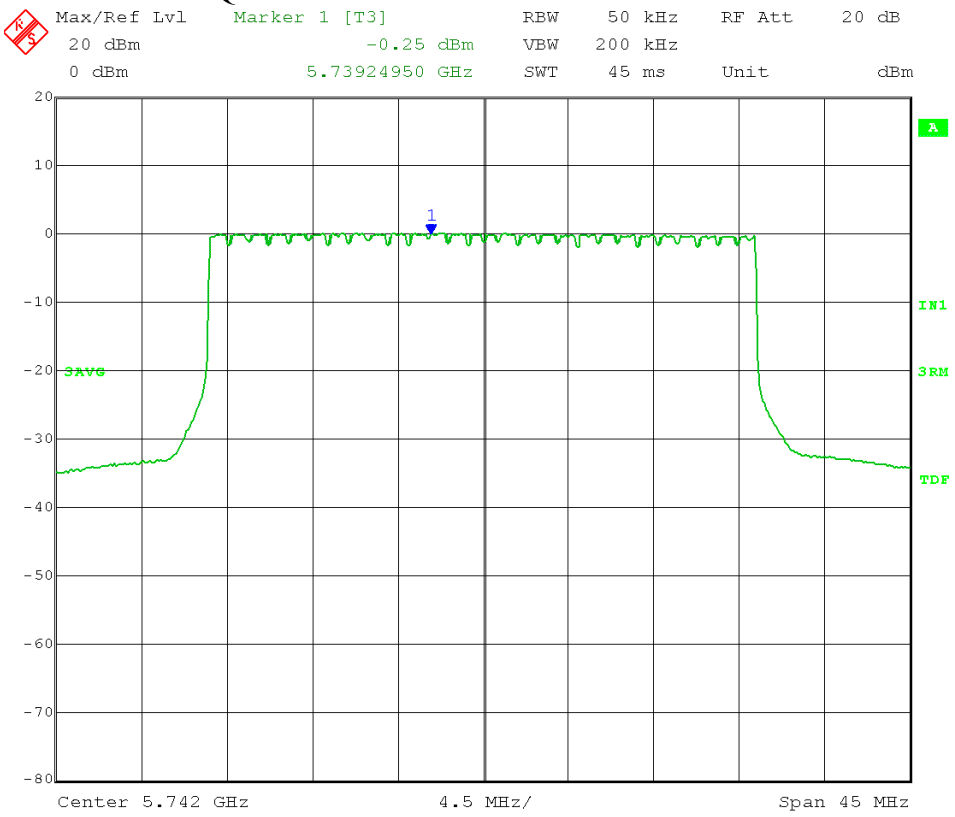
30MHz LCH 64QAM TX0



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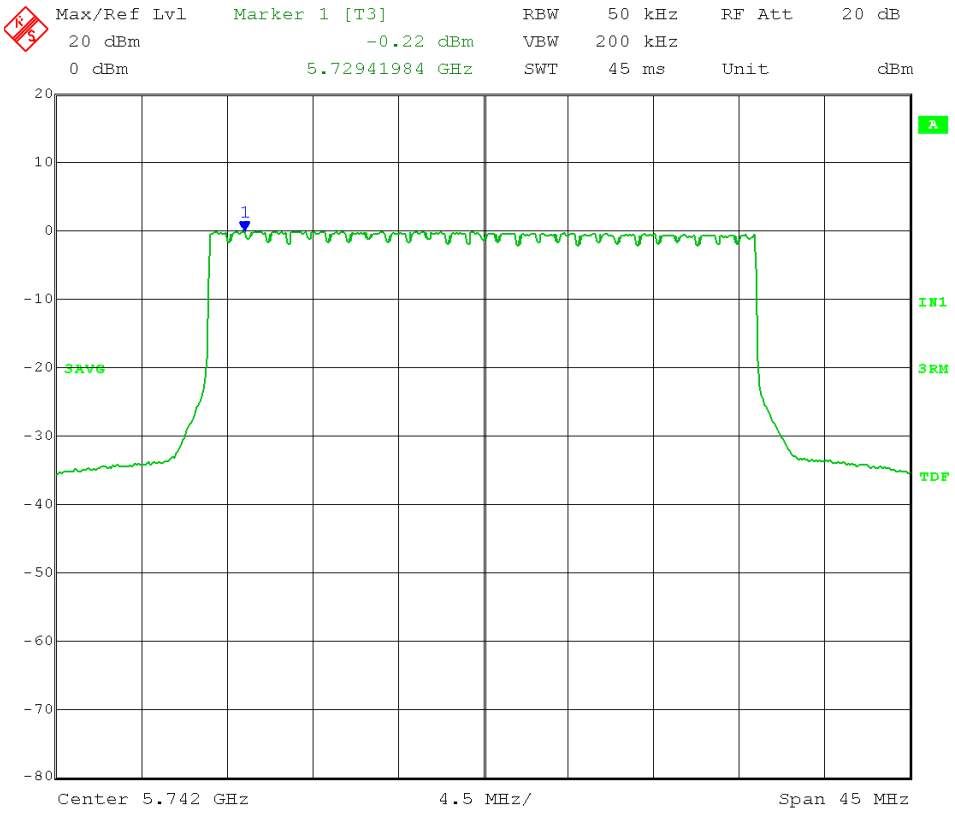

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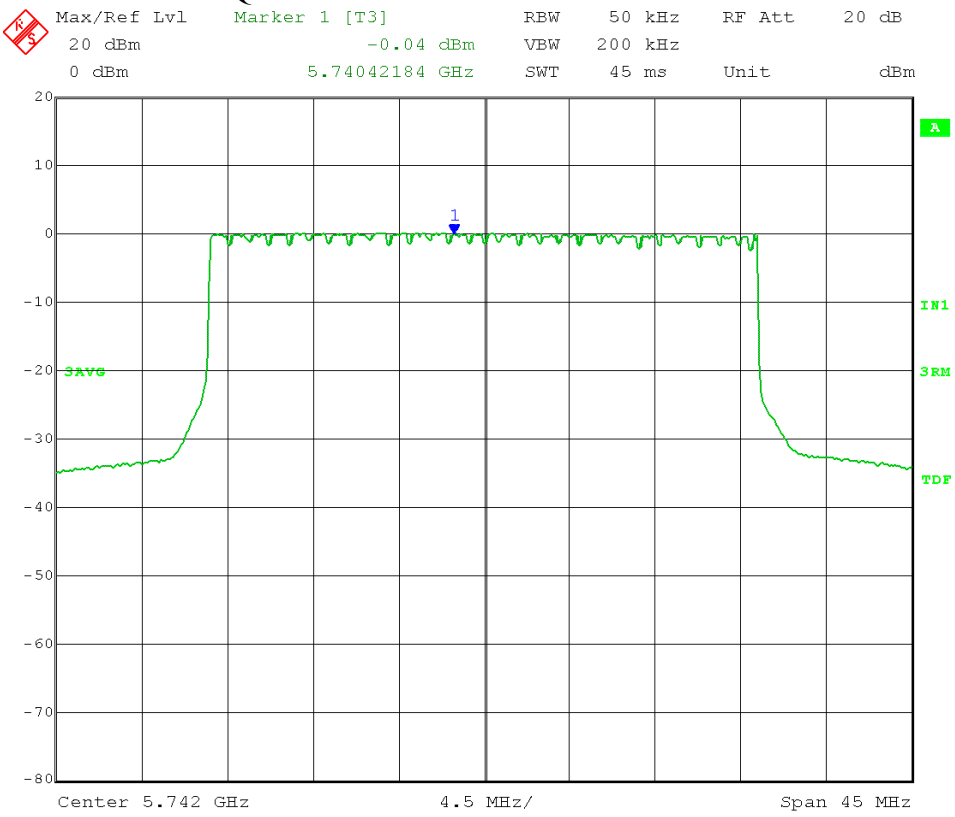
30MHz LCH 256QAM TX0



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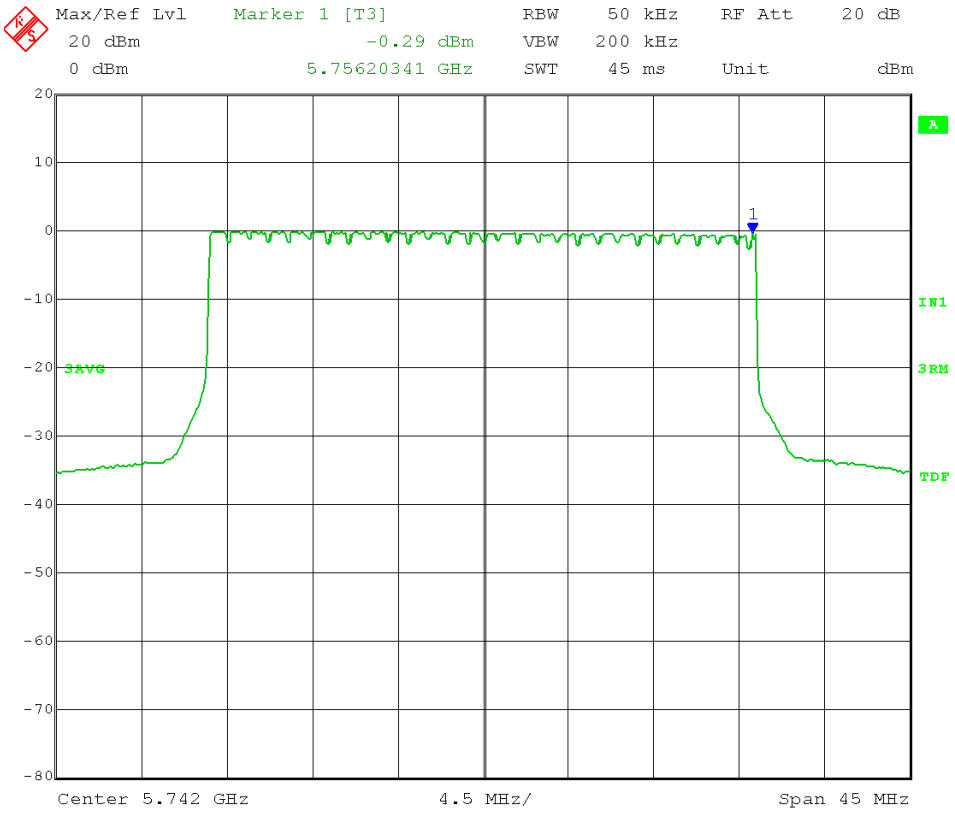

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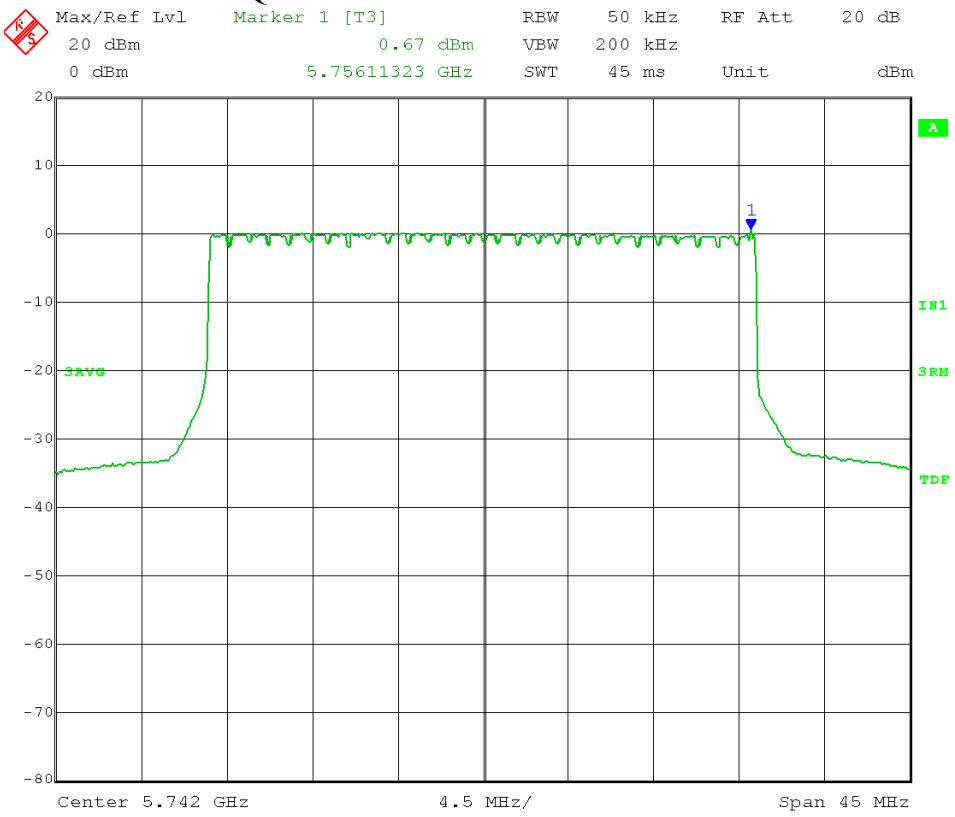
30MHz LCH 1024QAM TX0



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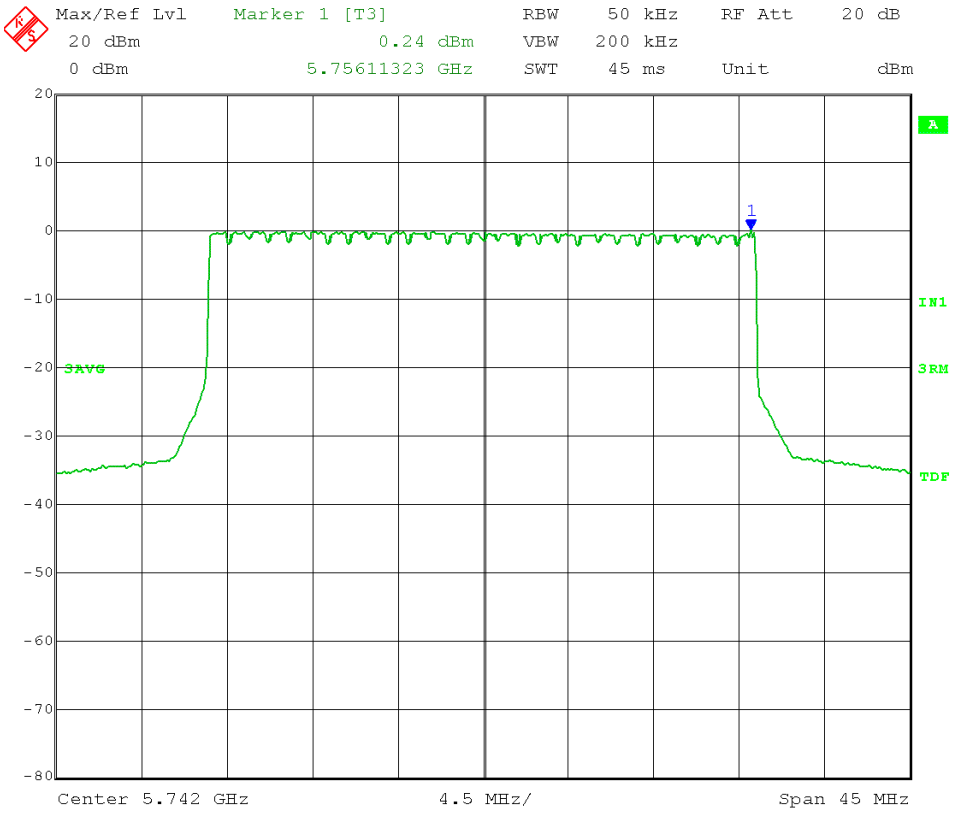


Date: 15.MAY.2014 11:32:13

166 South Carter, Genoa City, WI 53128

Appendix B – Measurement Data

B4.0 Maximum Unwanted Emission Levels – 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*

11.0 -Emissions in non-restricted frequency bands
12.0 - Emissions in restricted frequency bands
12.1 Radiated emission measurements

Description: Radiated emissions measured with tuned receiver.
Measurements were taken with Peak and Average detectors.

Measurements were taken for QPSK modulation (worst-case) at the low, mid and high channels of operation. The EUT was set to transmit continuously. A duty cycle measurement of greater than 98% was confirmed. Both chains were active with the power set to 50 dBm e.i.r.p.

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.

Part 15.209 - Restricted band limits.

Results: Passed; All unwanted emissions comply with the average and peak limits of 15.209.

NOTE: Field strength measurements were made for all unwanted emissions both in and out of restricted bands, and compared to the restricted band limits of part 15.209.

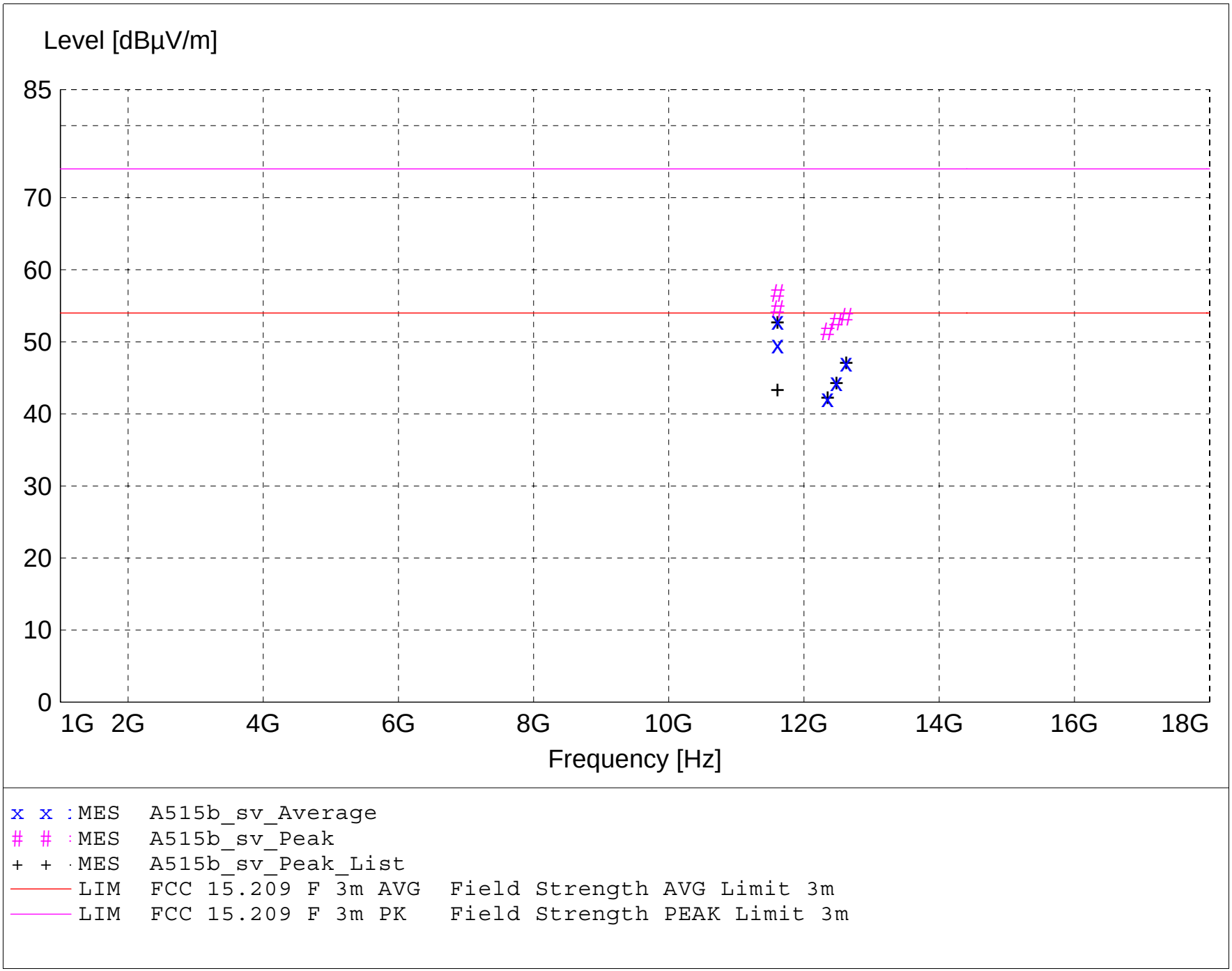
FCC Part 15.209

Electric Field Strength

```
EUT:                  AF5 - 5.8 GHz radio
Manufacturer:         Ubiquiti Networks, Inc.
Operating Condition:  73 deg. F; 58% R.H.
Test Site:            DLS O.F. Site 2
Operator:             Steve / Craig B
Test Specification:   Tx spurious emissions; QPSK modulation
Comment:              30 MHz ch BW; L,M,H channels; power set to 50 dBm eirp
                      Date:  05-16-2014
```

TEXT: "Vert 3 meters"

```
  Short Description:            Test Set-up


Test Set-up:    EUT Measured at 3 Meters with VERTICAL & HORIZONTAL Antenna Polarizations


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

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


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

                |       Final maximized level using Quasi-Peak detector

                X       Final maximized level using Average dector

                #       Final maximized level using Peak detector
```



x x : MES A515b_sv_Average
: MES A515b_sv_Peak
+ + : MES A515b_sv_Peak_List
——— LIM FCC 15.209 F 3m AVG Field Strength AVG Limit 3m
——— LIM FCC 15.209 F 3m PK Field Strength PEAK Limit 3m

MEASUREMENT RESULT: "A515b_sv_Final"

5/19/2014 2:34PM

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		
11610.000000	65.43	39.17	-51.7	52.9	54.0	1.1	1.30	0	AVERAGE	None
11610.000000	62.21	39.17	-51.7	49.6	54.0	4.4	1.70	0	AVERAGE	None
12624.000000	61.27	38.79	-53.0	47.1	54.0	6.9	1.70	0	AVERAGE	None
12480.200000	58.37	38.80	-52.8	44.3	54.0	9.7	1.50	280	AVERAGE	None
12351.000000	55.81	38.90	-52.6	42.2	54.0	11.8	1.50	10	AVERAGE	None
11610.000000	69.33	39.17	-51.7	56.8	74.0	17.2	1.30	0	MAX PEAK	None
11610.000000	67.11	39.17	-51.7	54.5	74.0	19.5	1.70	0	MAX PEAK	None
12624.000000	67.72	38.79	-53.0	53.5	74.0	20.5	1.70	0	MAX PEAK	None
12480.200000	66.86	38.80	-52.8	52.8	74.0	21.2	1.50	280	MAX PEAK	None
12351.000000	65.09	38.90	-52.6	51.4	74.0	22.6	1.50	10	MAX PEAK	None

FCC Part 15.209

Electric Field Strength

EUT: AF5 - 5.8 GHz radio
Manufacturer: Ubiquiti Networks, Inc.
Operating Condition: 73 deg. F; 58% R.H.
Test Site: DLS O.F. Site 2
Operator: Steve / Craig B
Test Specification: Tx spurious emissions; QPSK modulation
Comment: 30 MHz ch BW; L,M,H channels; power set to 50 dBm eirp
Date: 05-16-2014

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)

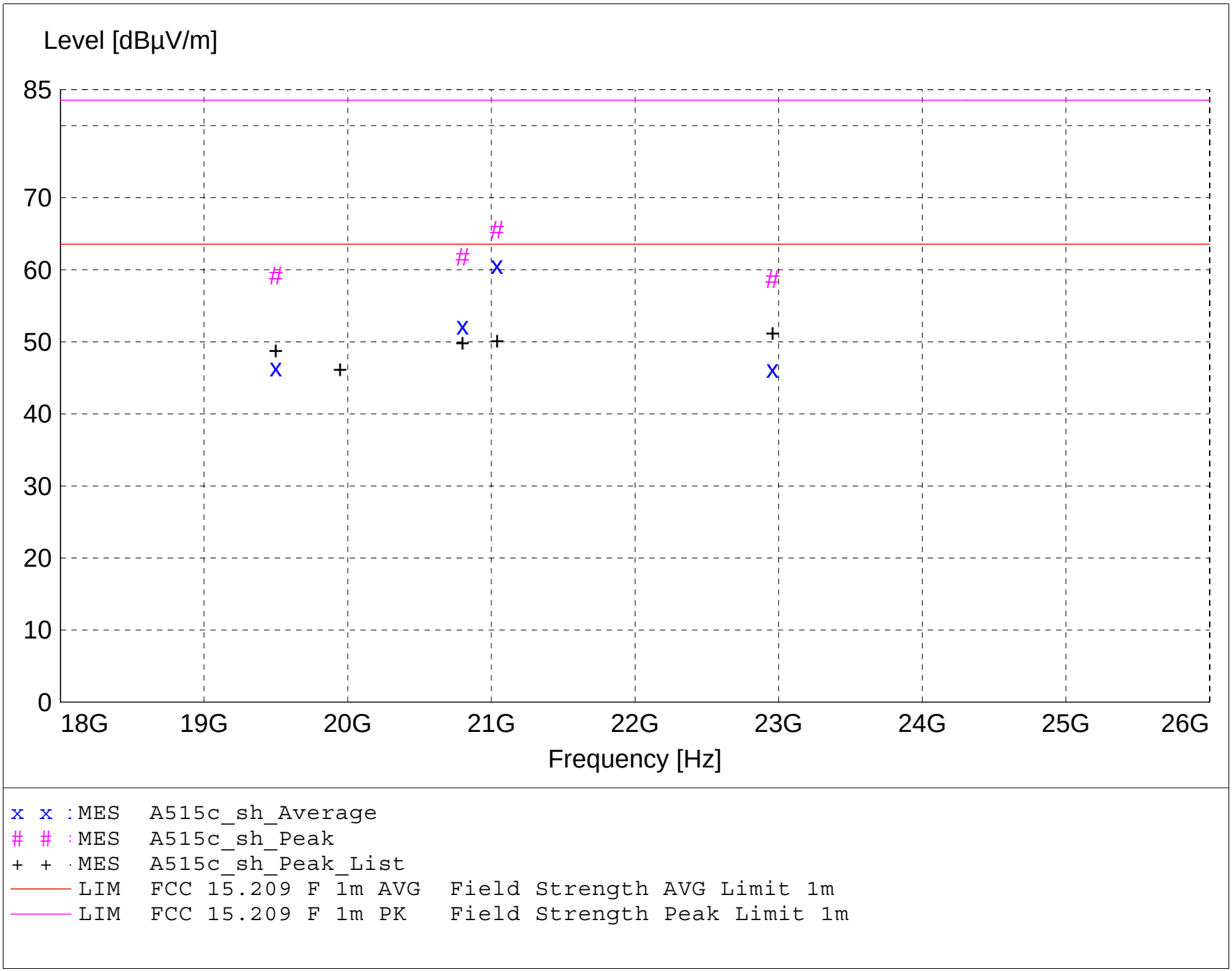
Margin(dB) = Limit(dBµV/m) - Total Level(dBµV/m)

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



x x : MES A515c_sh_Average
: MES A515c_sh_Peak
+ + : MES A515c_sh_Peak_List
——— LIM FCC 15.209 F 1m AVG Field Strength AVG Limit 1m
——— LIM FCC 15.209 F 1m PK Field Strength Peak Limit 1m

MEASUREMENT RESULT: "A515c_sh_Final"

5/16/2014 3:26PM

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		
21040.000000	50.77	47.33	-37.5	60.6	63.5	2.9	1.80	180	AVERAGE	None
20800.000000	42.22	47.39	-37.4	52.2	63.5	11.3	1.40	200	AVERAGE	None
19500.000000	38.24	47.27	-39.1	46.5	63.5	17.1	1.00	260	AVERAGE	None
22957.800000	39.73	46.79	-40.3	46.2	63.5	17.3	1.00	270	AVERAGE	None
21040.000000	55.69	47.33	-37.5	65.5	83.5	18.0	1.80	180	MAX PEAK	None
20800.000000	51.80	47.39	-37.4	61.8	83.5	21.7	1.40	200	MAX PEAK	None
19500.000000	50.99	47.27	-39.1	59.2	83.5	24.3	1.00	260	MAX PEAK	None
22957.800000	52.20	46.79	-40.3	58.7	83.5	24.8	1.00	270	MAX PEAK	None

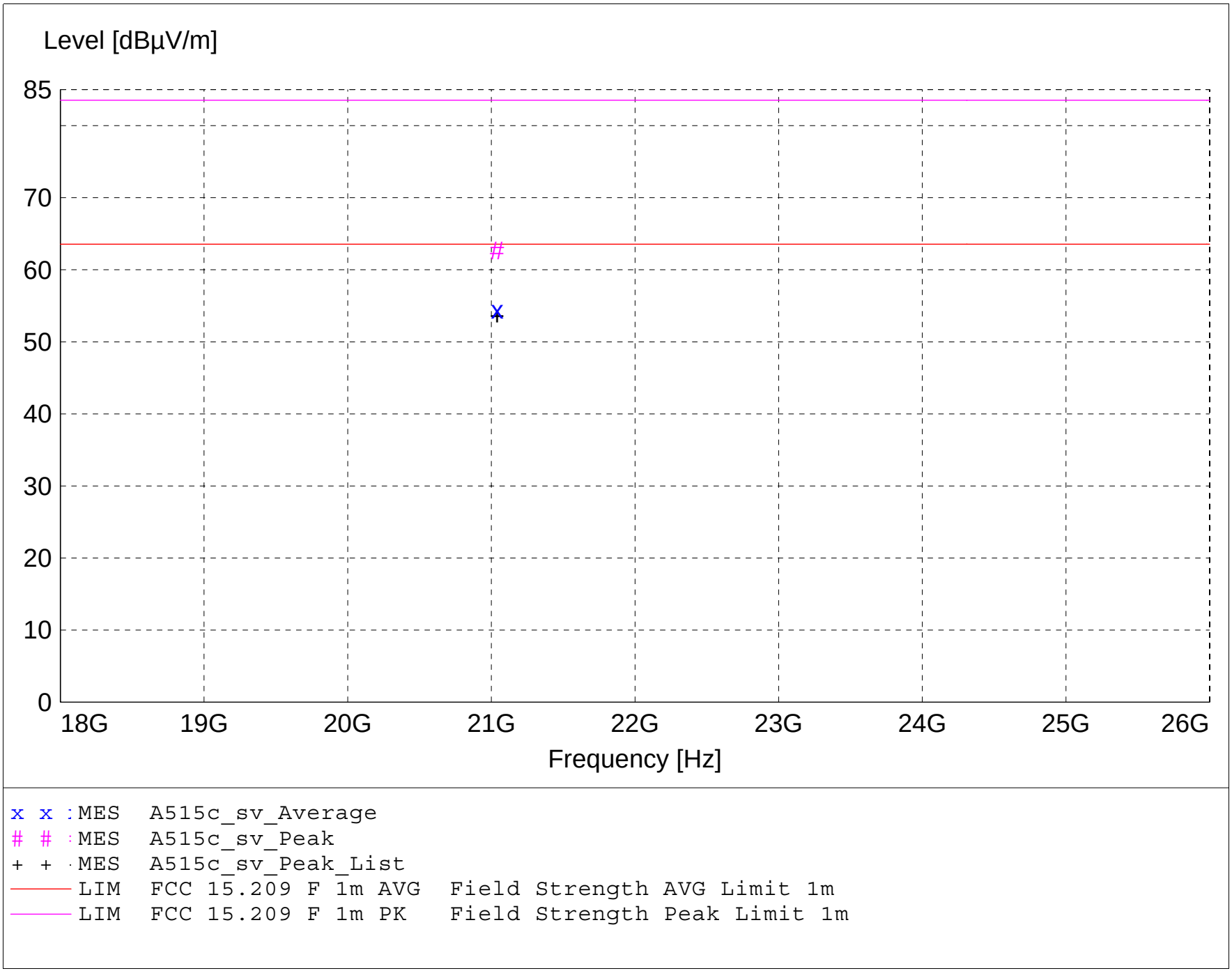
FCC Part 15.209

Electric Field Strength

```
EUT:                  AF5 - 5.8 GHz radio
Manufacturer:         Ubiquiti Networks, Inc.
Operating Condition:  73 deg. F; 58% R.H.
Test Site:            DLS O.F. Site 2
Operator:             Steve / Craig B
Test Specification:   Tx spurious emissions; QPSK modulation
Comment:              30 MHz ch BW; L,M,H channels; power set to 50 dBm eirp
                      Date:  05-16-2014
```

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 :MES A515c_sv_Average
:MES A515c_sv_Peak
+ + :MES A515c_sv_Peak_List
LIM FCC 15.209 F 1m AVG Field Strength AVG Limit 1m
LIM FCC 15.209 F 1m PK Field Strength Peak Limit 1m

MEASUREMENT RESULT: "A515c_sv_Final"

5/16/2014 4:00PM

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		
21040.000000	44.59	47.33	-37.5	54.4	63.5	9.1	1.60	180	AVERAGE	None
21040.000000	52.87	47.33	-37.5	62.7	83.5	20.8	1.60	180	MAX PEAK	None

FCC Part 15.209

Electric Field Strength

EUT: AF5 5.8 GHz radio
Manufacturer: Ubiquiti Networks
Operating Condition: 72 deg. F; 58% R.H.
Test Site: DLS Site 2
Operator: Steve D
Test Specification: Tx spurious emissions; QPSK modulation
Comment: 30 MHz ch BW; L,M,H channels; power set to 50 dBm eirp
Date: 05-20-2014

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)

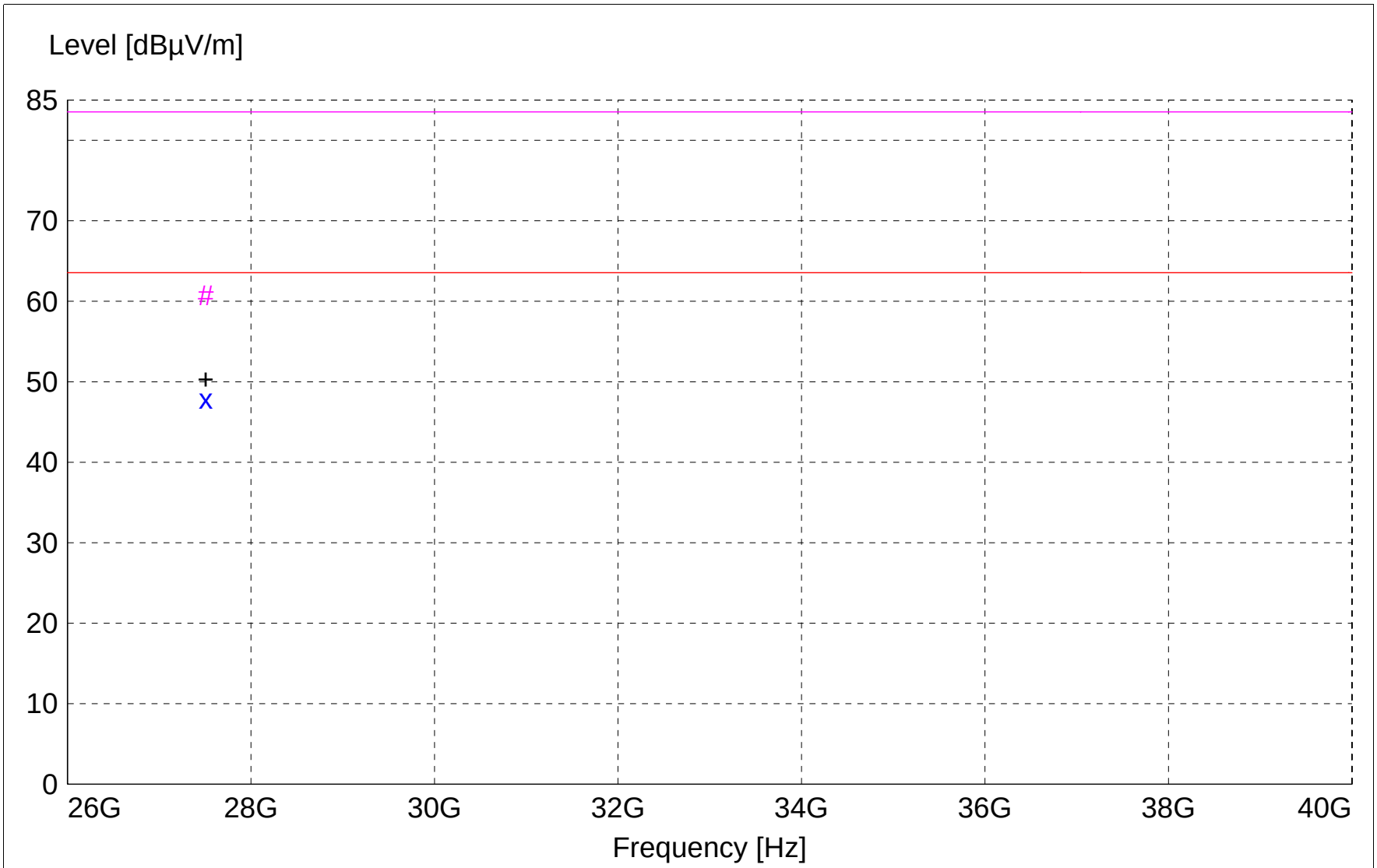
Margin(dB) = Limit(dBµV/m) - Total Level(dBµV/m)

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



x x xMES A520c_sh_Average
#MES A520c_sh_Peak
+ + +MES A520c_sh_Peak_List
——— LIM FCC 15.209 F 1m AVG Field Strength AVG Limit 1m
——— LIM FCC 15.209 F 1m PK Field Strength PEAK Limit 1m

MEASUREMENT RESULT: "A520c_sh_Final"

5/20/2014 11:29AM

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		
27506.200000	50.65	48.53	-51.3	47.9	63.5	15.7	1.20	0	AVERAGE	None
27506.200000	63.50	48.53	-51.3	60.7	83.5	22.8	1.20	0	MAX PEAK	None

FCC Part 15.209

Electric Field Strength

EUT: AF5 - 5.8 GHz radio
Manufacturer: Ubiquiti Networks, Inc.
Operating Condition: 68 deg. F; 54% R.H.
Test Site: DLS O.F. Site 2
Operator: Steve / Craig B
Test Specification: Tx spurious emissions; QPSK modulation
Comment: 30 MHz ch BW; L,M,H channels; power set to 50 dBm eirp
Date: 05-20-2014

TEXT: "Vert 1 meters"

Short Description: Test Set-up

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

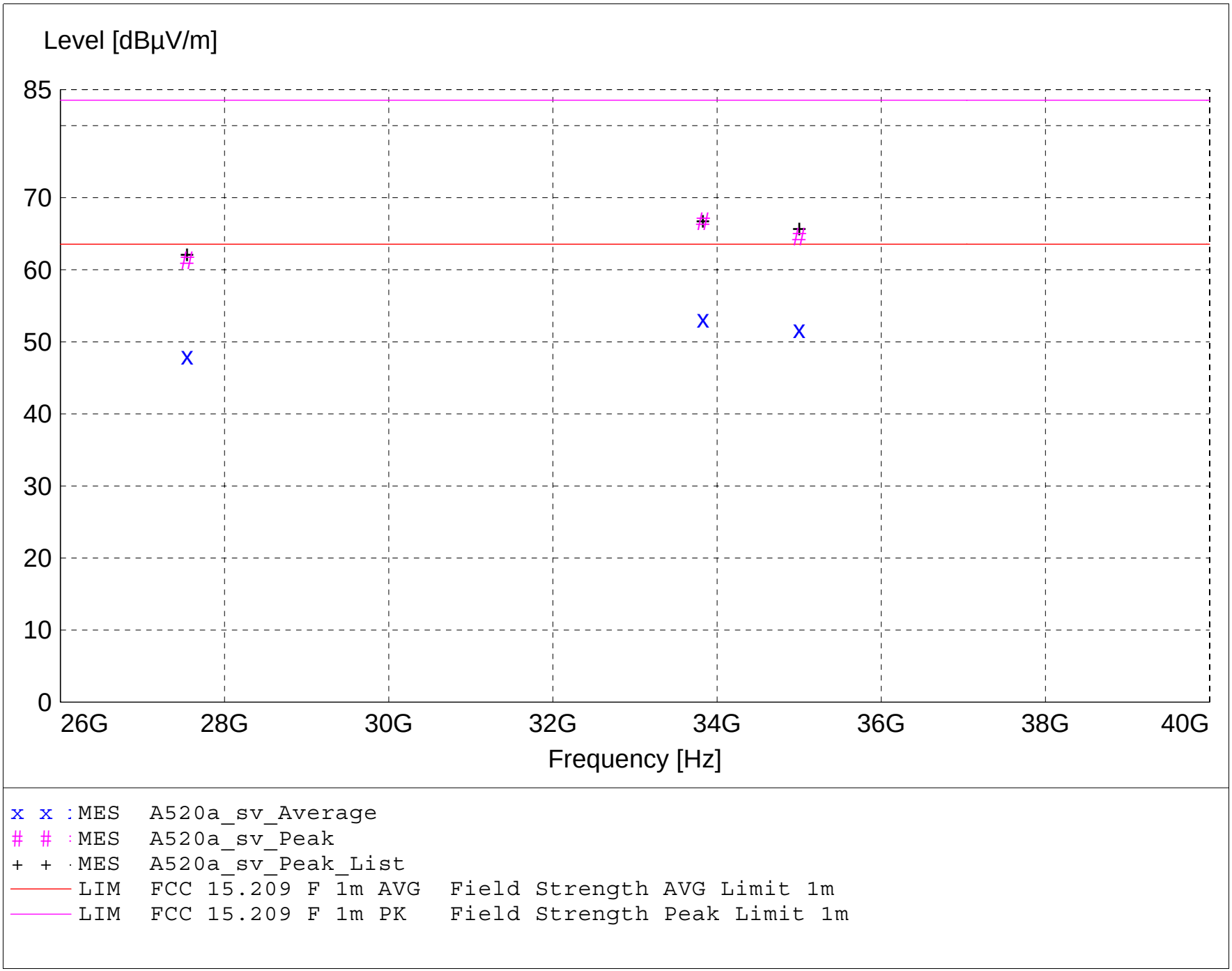
Sample Equations:

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 : MES A520a_sv_Average
: MES A520a_sv_Peak
+ + : MES A520a_sv_Peak_List
——— LIM FCC 15.209 F 1m AVG Field Strength AVG Limit 1m
——— LIM FCC 15.209 F 1m PK Field Strength Peak Limit 1m

MEASUREMENT RESULT: "A520a_sv_Final"

5/20/2014 9:45AM

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		
33829.400000	47.75	52.05	-46.6	53.2	63.5	10.3	1.40	180	AVERAGE	None
35000.800000	47.46	51.29	-47.0	51.7	63.5	11.8	1.00	350	AVERAGE	None
27544.000000	51.05	47.92	-50.9	48.0	63.5	15.5	1.00	0	AVERAGE	None
33829.400000	61.26	52.05	-46.6	66.7	83.5	16.8	1.40	180	MAX PEAK	None
35000.800000	60.35	51.29	-47.0	64.6	83.5	18.9	1.00	350	MAX PEAK	None
27544.000000	64.30	47.92	-50.9	61.3	83.5	22.2	1.00	0	MAX PEAK	None

166 South Carter, Genoa City, WI 53128

Appendix B – Measurement Data

B5.0 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 1024QAM modulations over a 30MHz modulation bandwidth at the low and high channels and on outputs of CH0 and CH1 of operation. The EUT was set to transmit continuously. A duty cycle measurement of greater than 98% was confirmed. The power setting was 50 dBm e.i.r.p.

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.

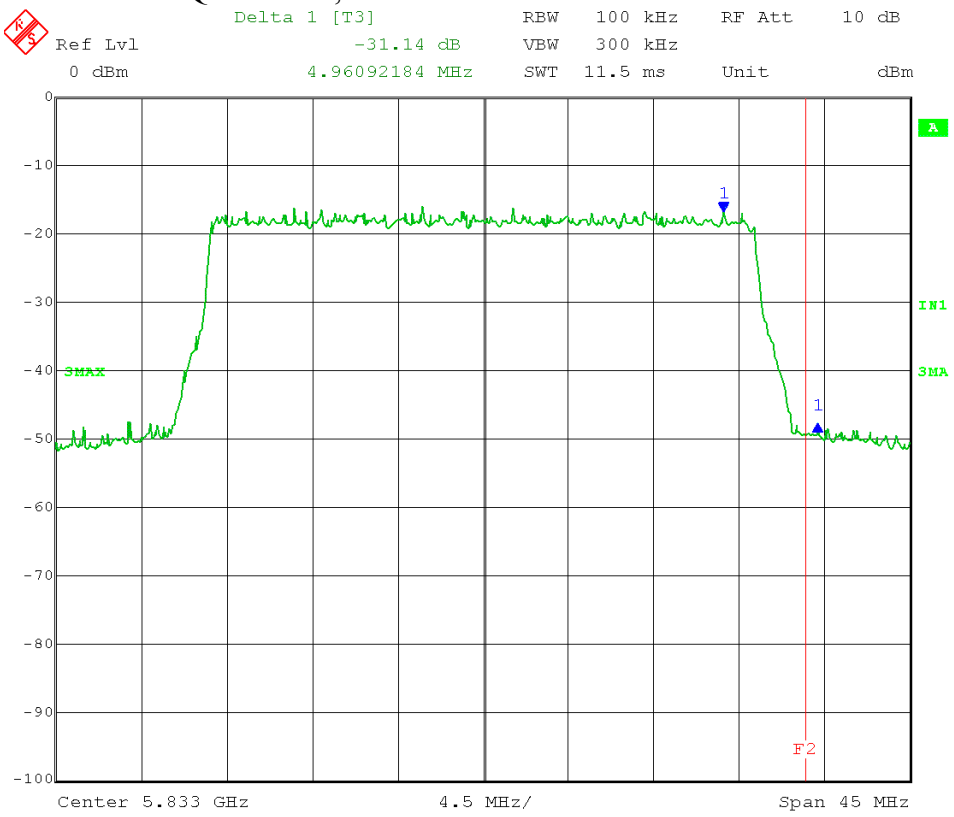
Results: Passed

Test Date: 5-16-2014
Company: Ubiquiti Networks
EUT: Air Fiber 5 - 5.8GHz WiFi Radio
Test: Band Edge/Out-of-band Emissions - Conducted
Operator: Steve D
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: 30MHz Bandwidth

30MHz HCH QPSK TX0,



Date: 16.MAY.2014 11:31:40

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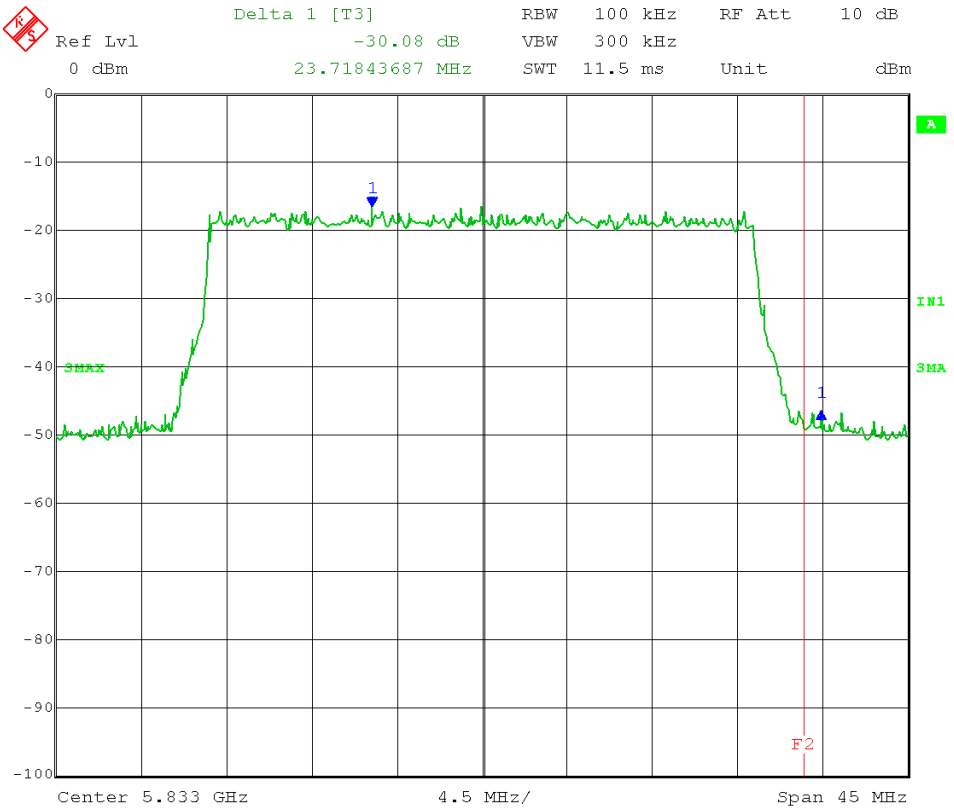
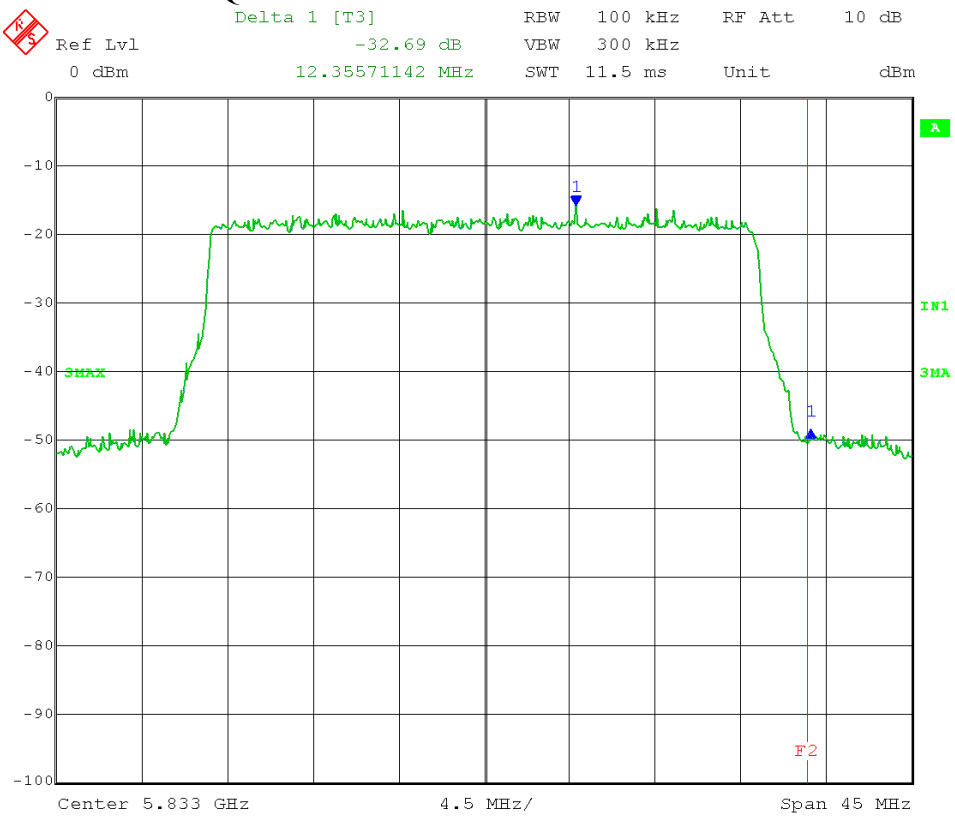


Date: 16.MAY.2014 12:50:05

30MHz HCH 16QAM TX0



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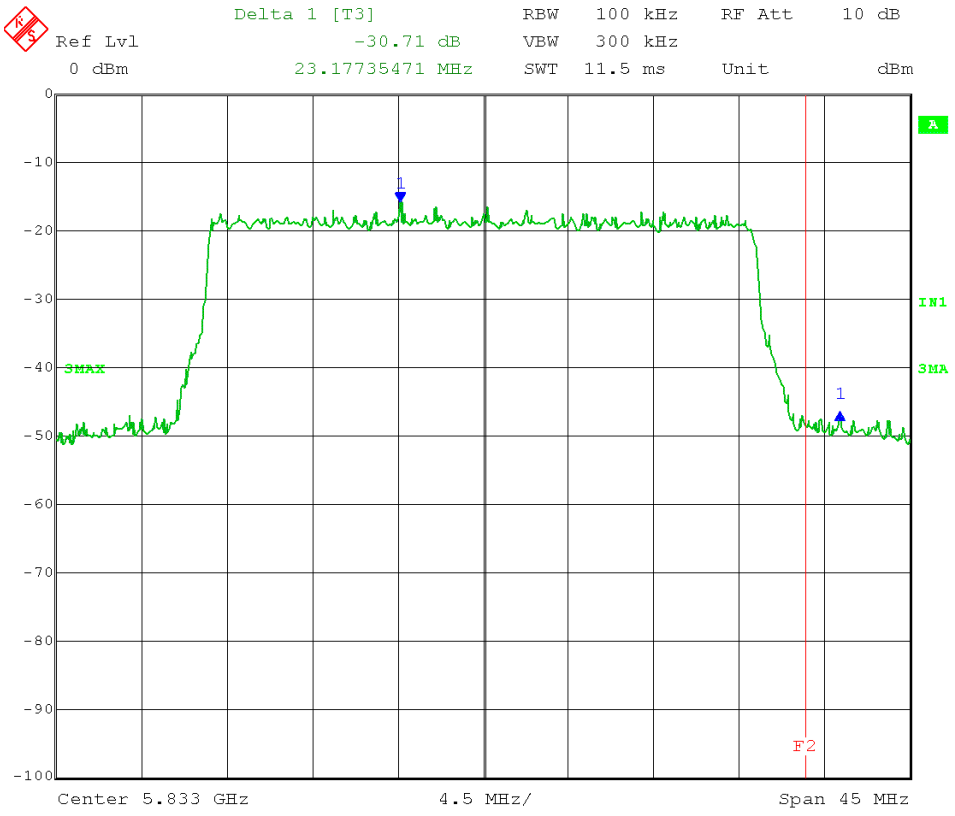
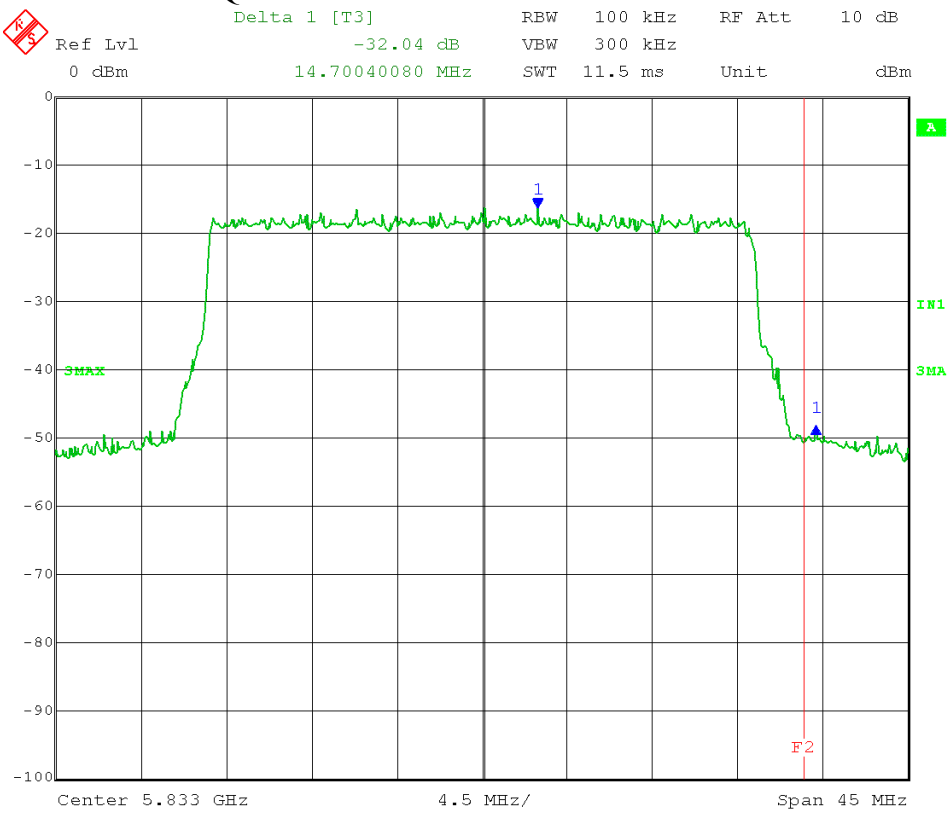


Date: 16.MAY.2014 12:50:49

30MHz HCH 64QAM TX0



Date: 16.MAY.2014 11:34:08

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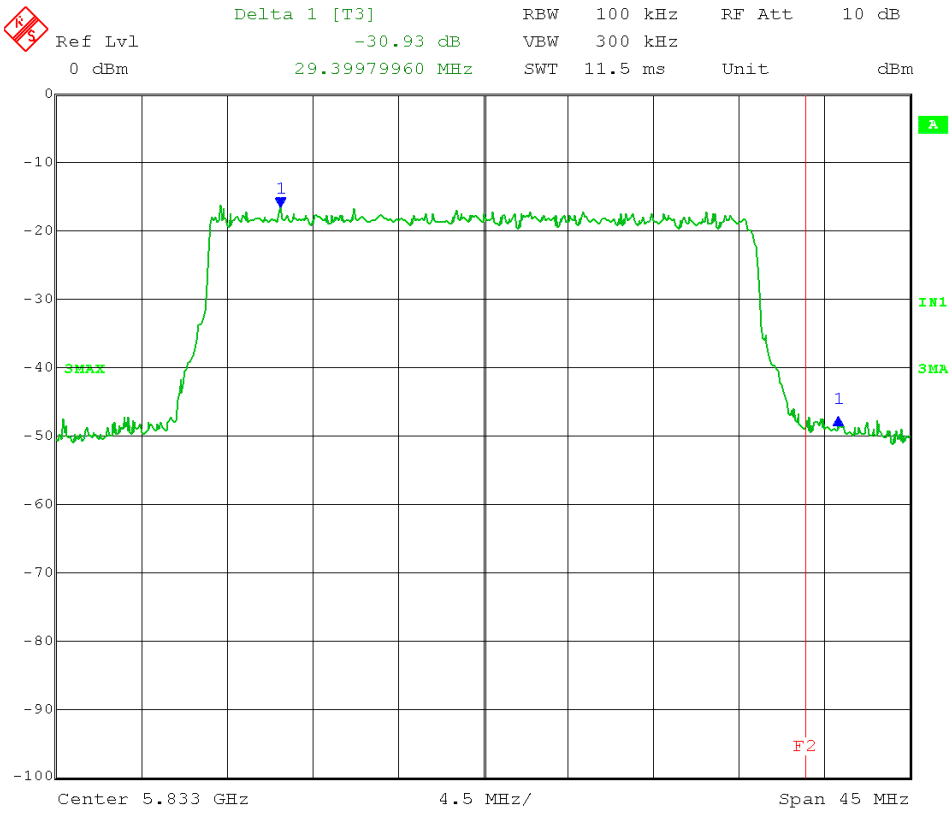
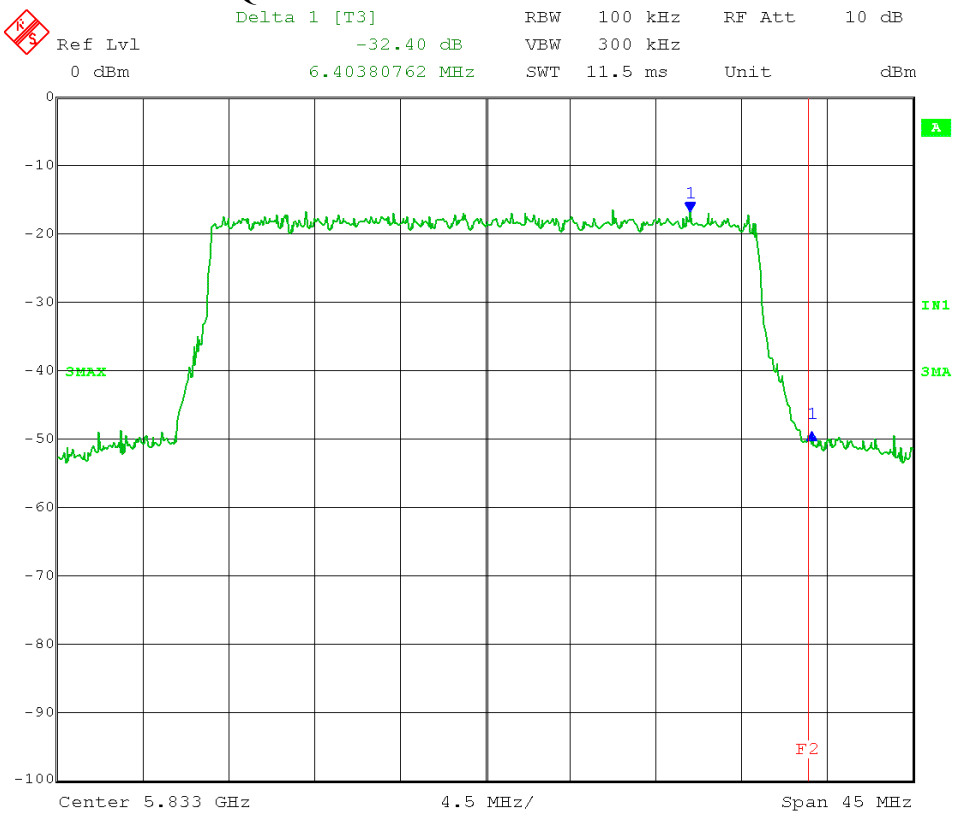


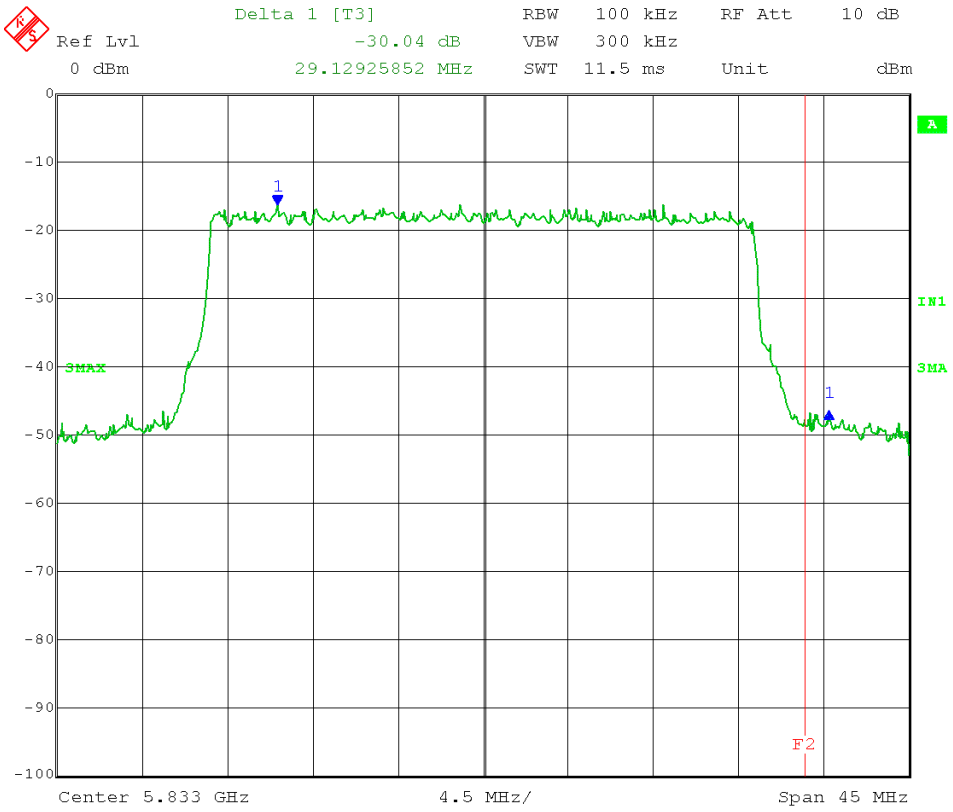
Date: 16.MAY.2014 12:51:34

30MHz HCH 256QAM TX0



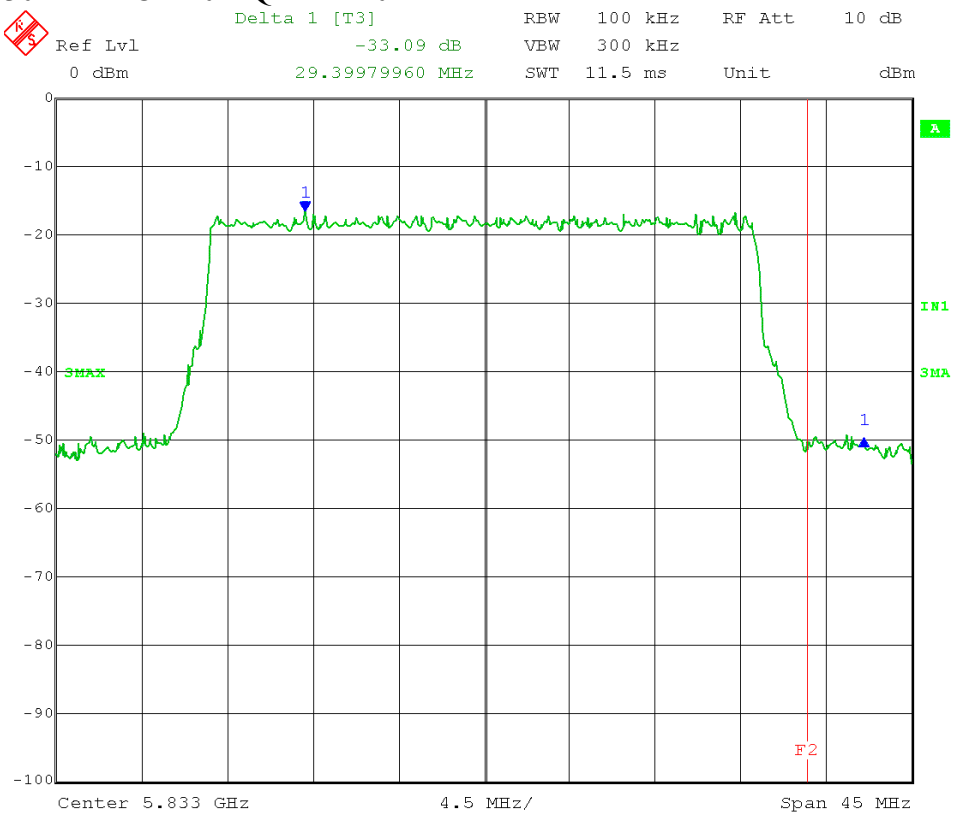
Date: 16.MAY.2014 11:34:56

TX1



Date: 16.MAY.2014 12:52:22

30MHz HCH 1024QAM TX0



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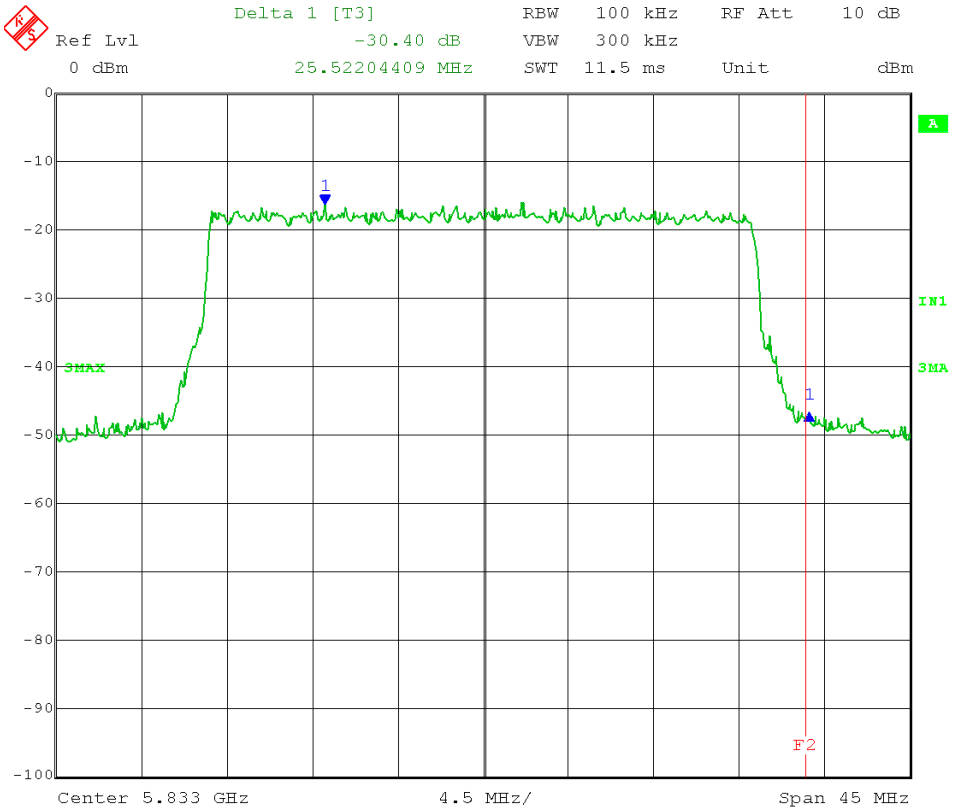

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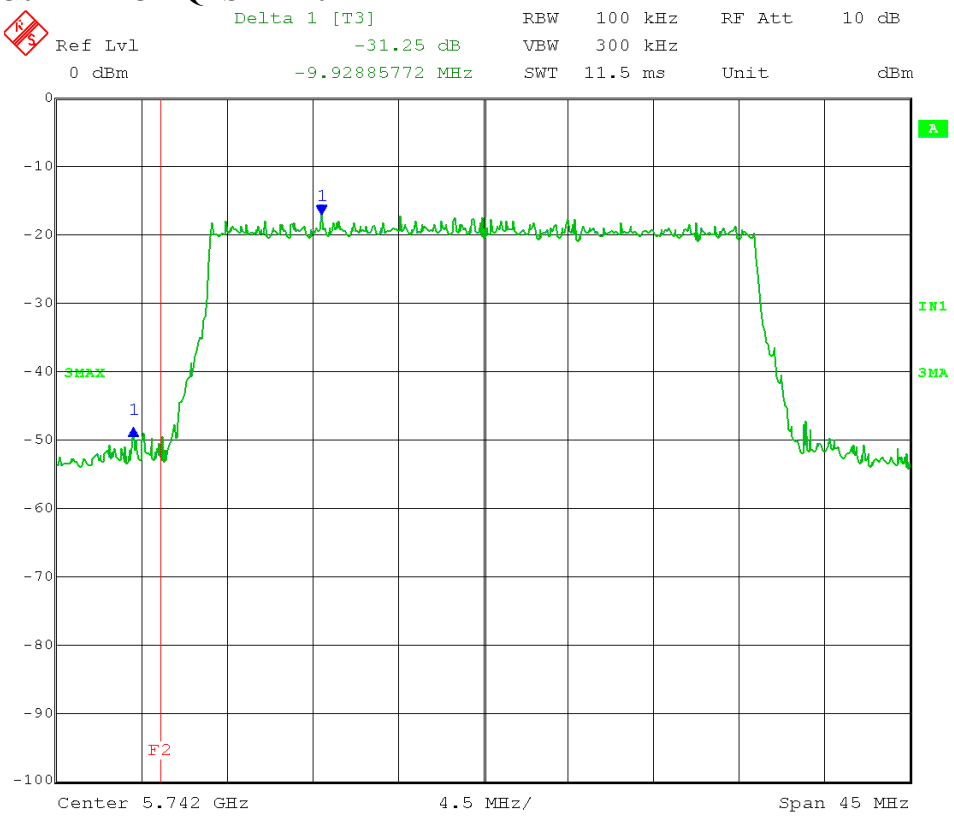
30MHz LCH QPSK TX0



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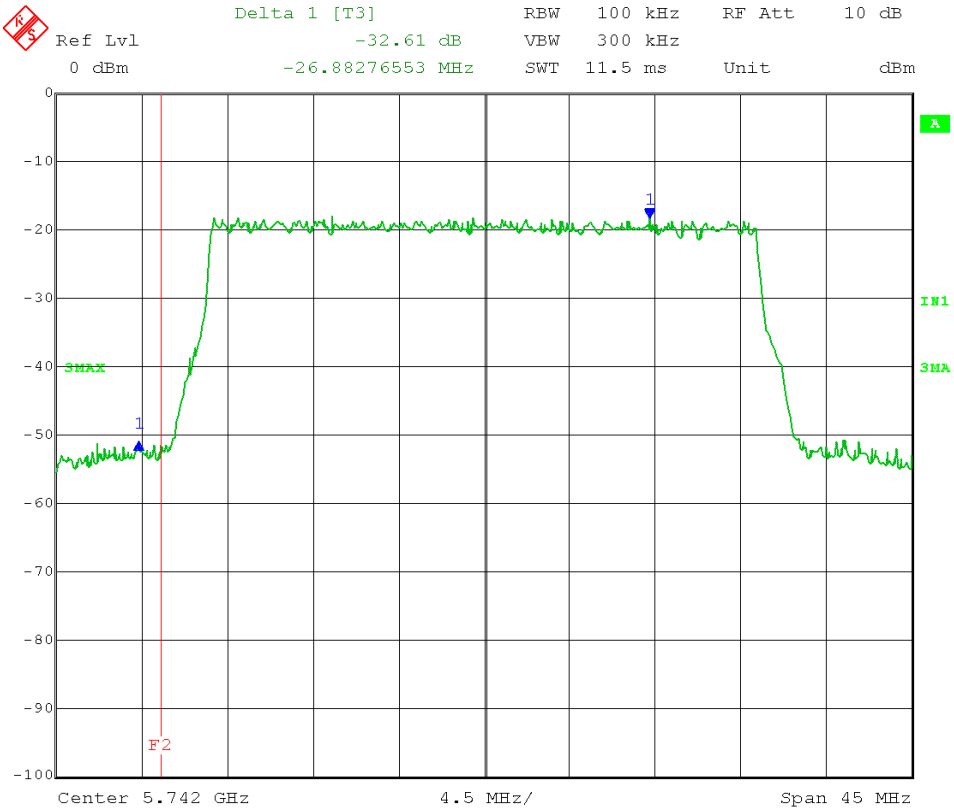
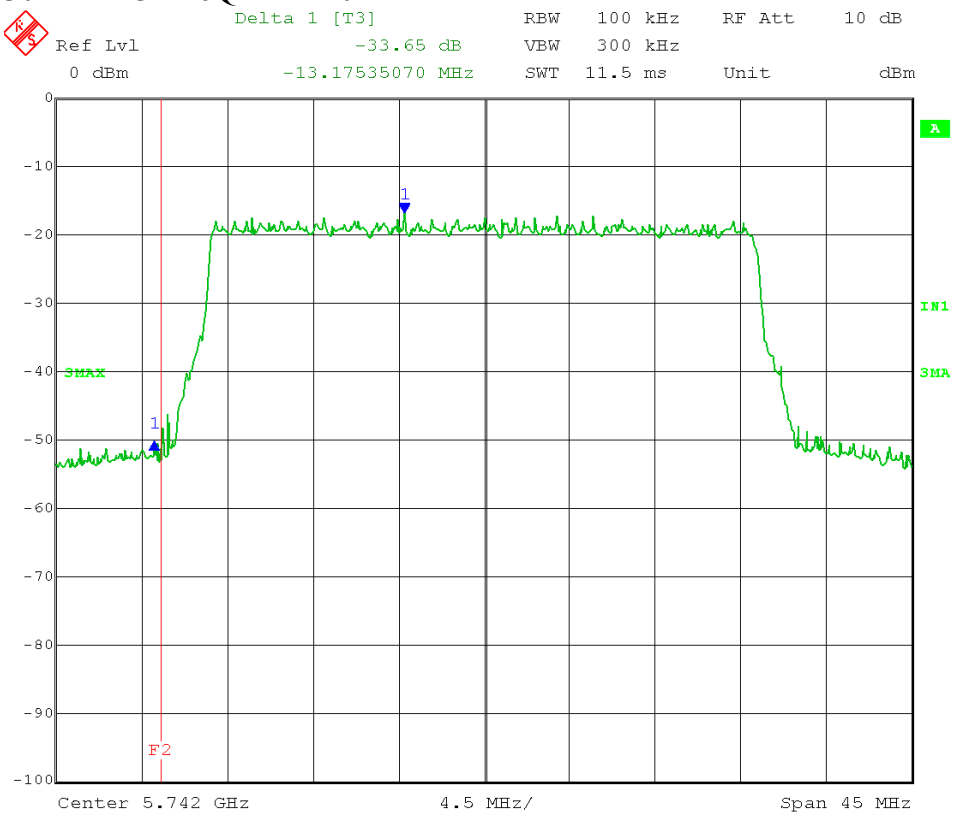


Date: 16.MAY.2014 12:39:00

30MHz LCH 16QAM TX0



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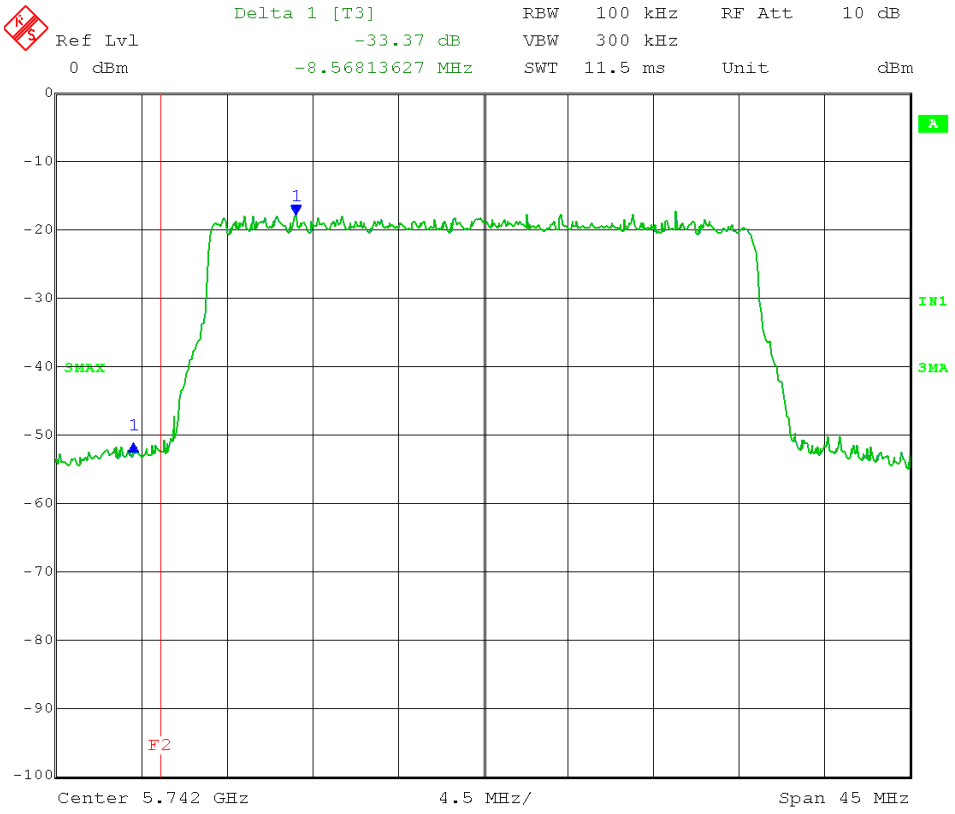
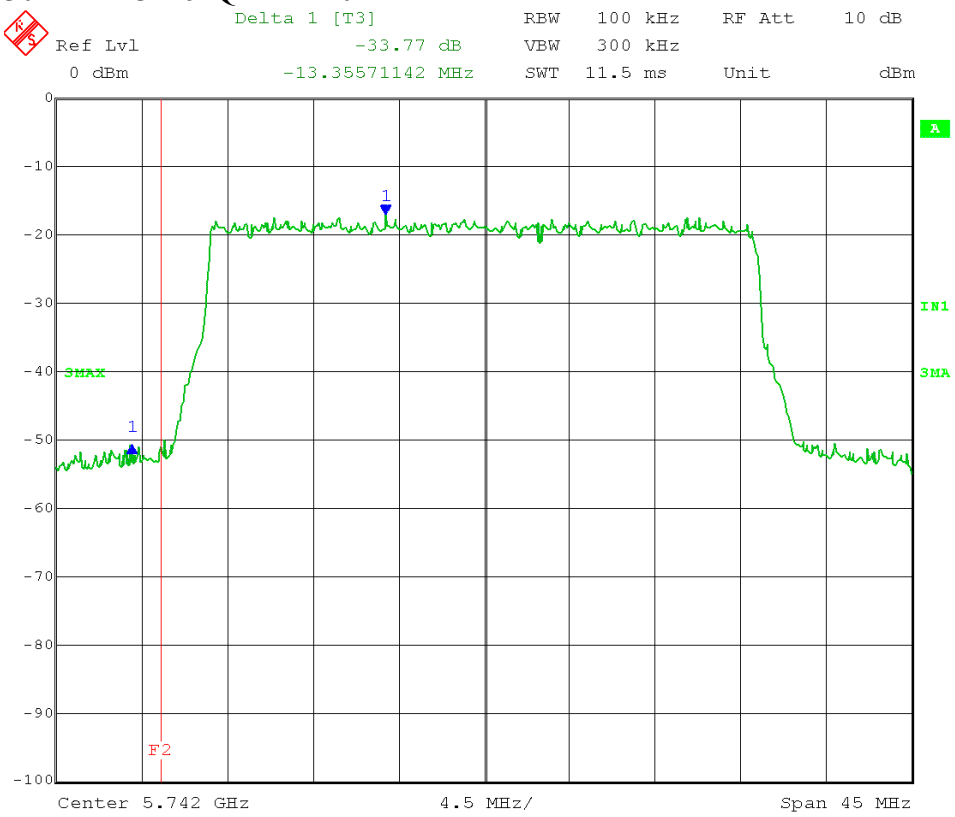
TX1



Date: 16.MAY.2014 12:40:29

30MHz LCH 64QAM TX0



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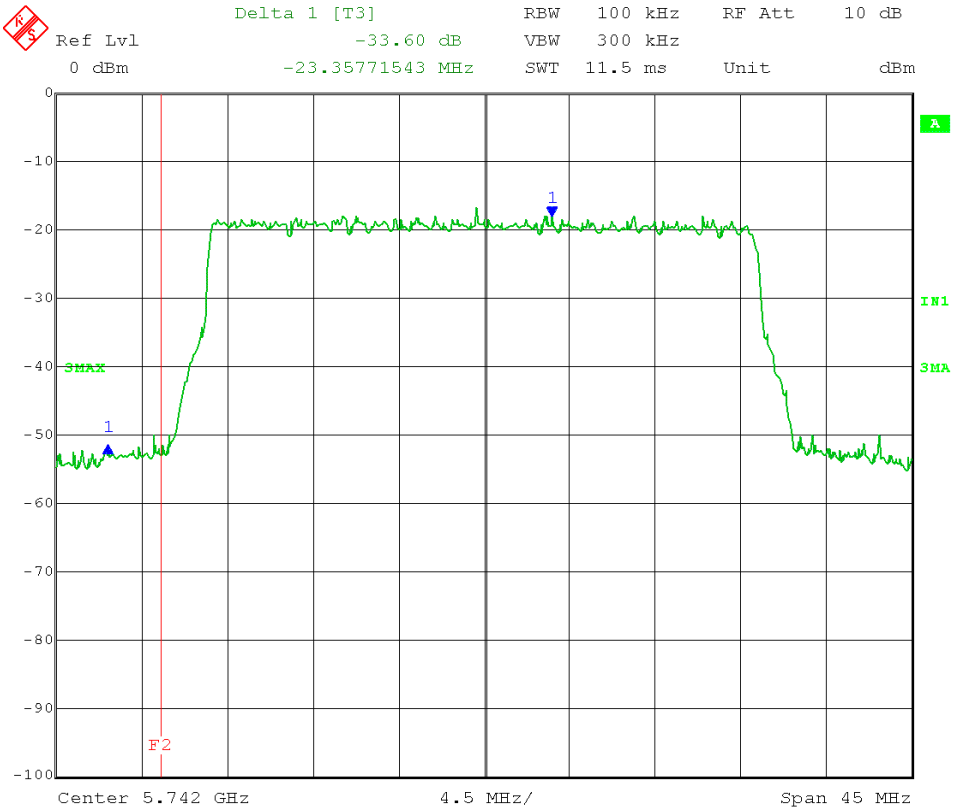

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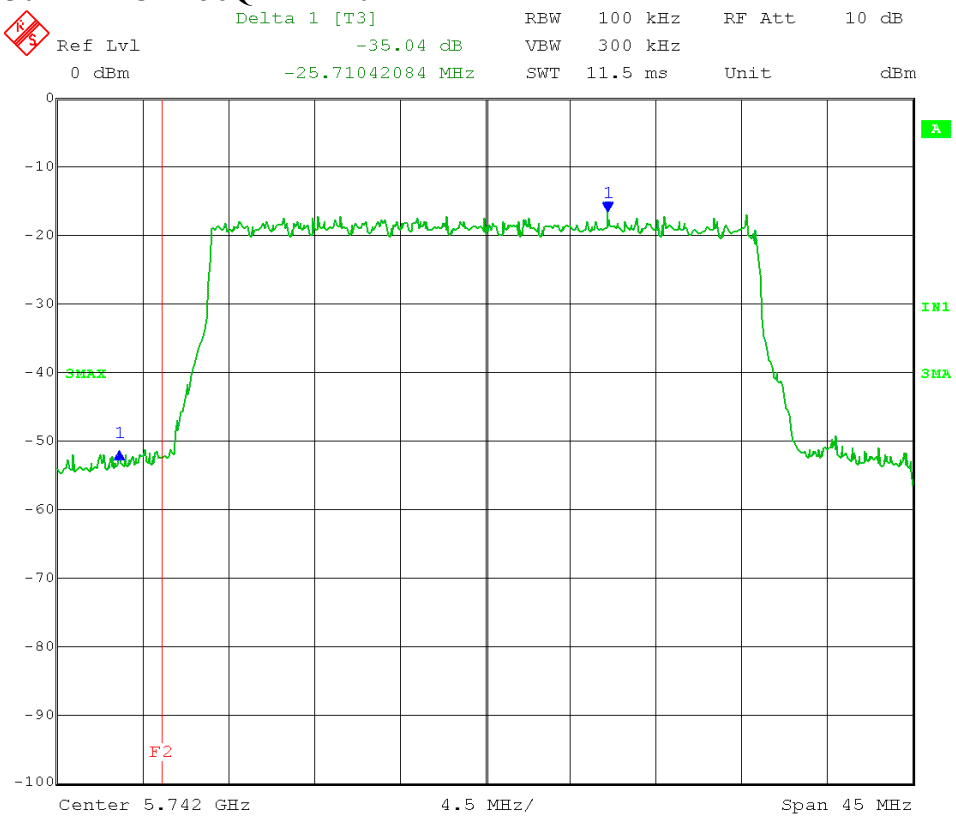
30MHz LCH 256QAM TX0



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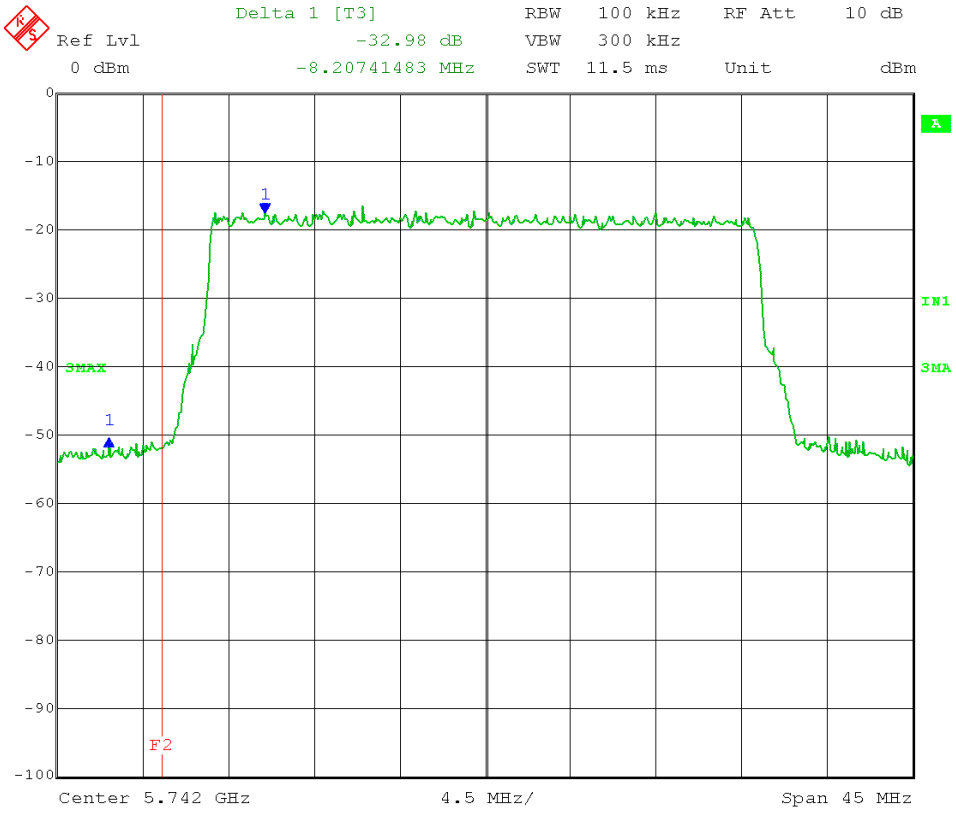
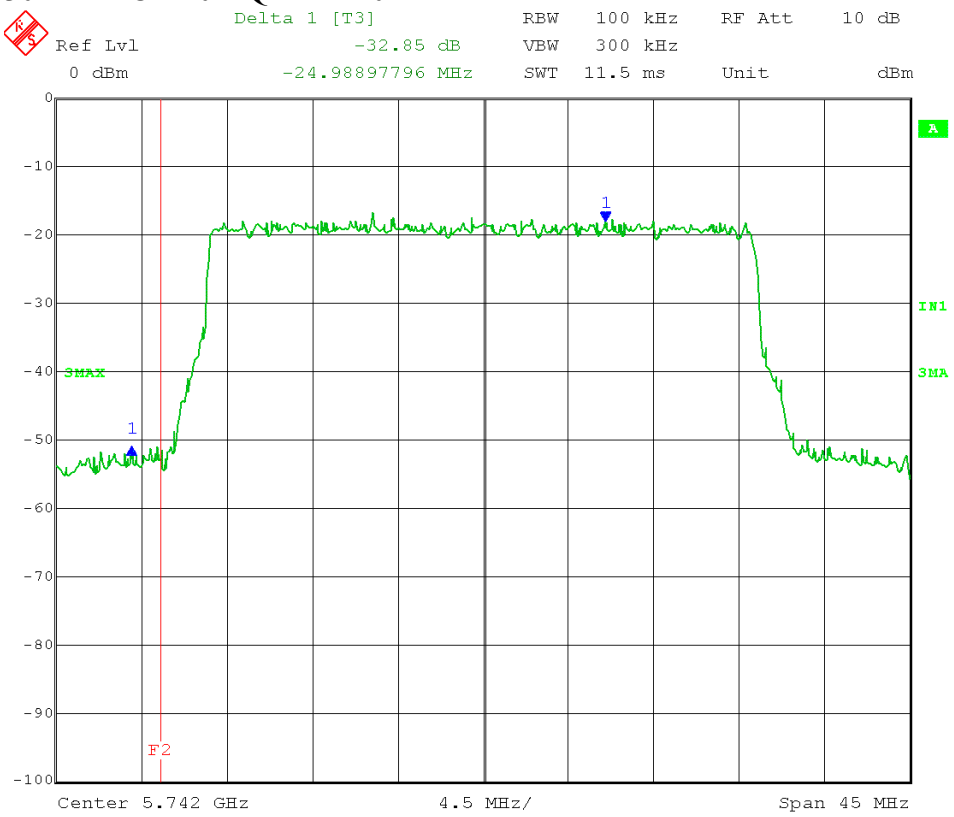
TX1



Date: 16.MAY.2014 12:46:23

30MHz LCH 1024QAM TX0



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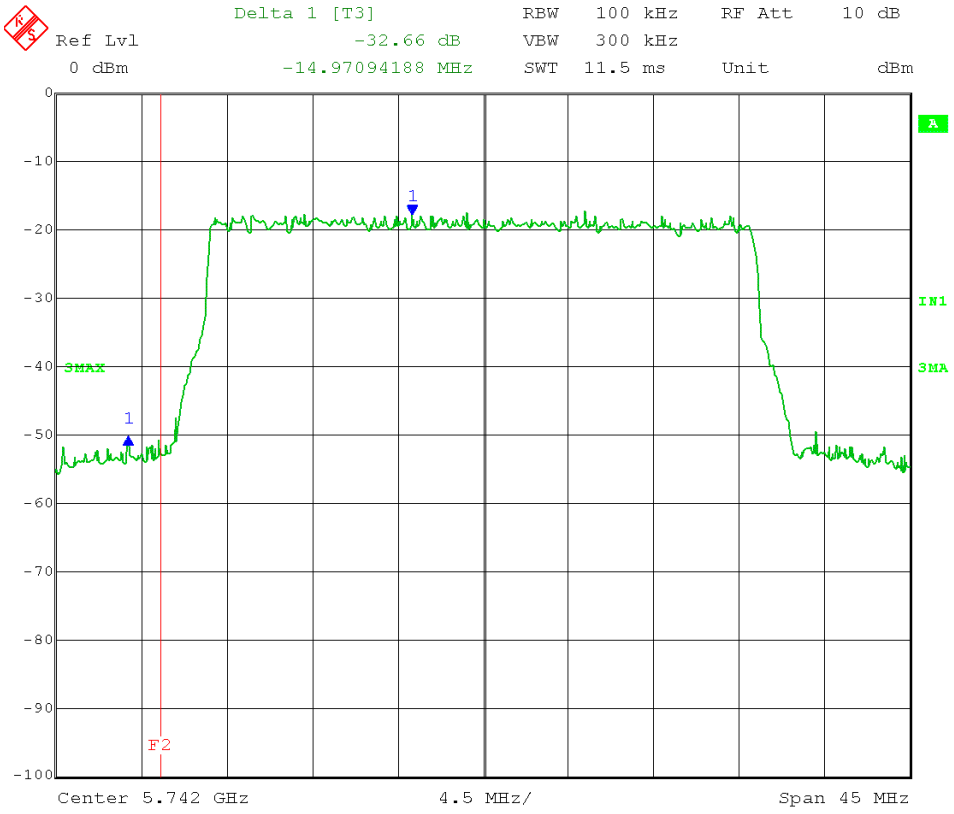
TX1



Date: 16.MAY.2014 12:47:15

Appendix B – Measurement Data

B6.0 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: Duty cycle measured 98.5%
EUT is continuously transmitting (duty cycle > 98%).

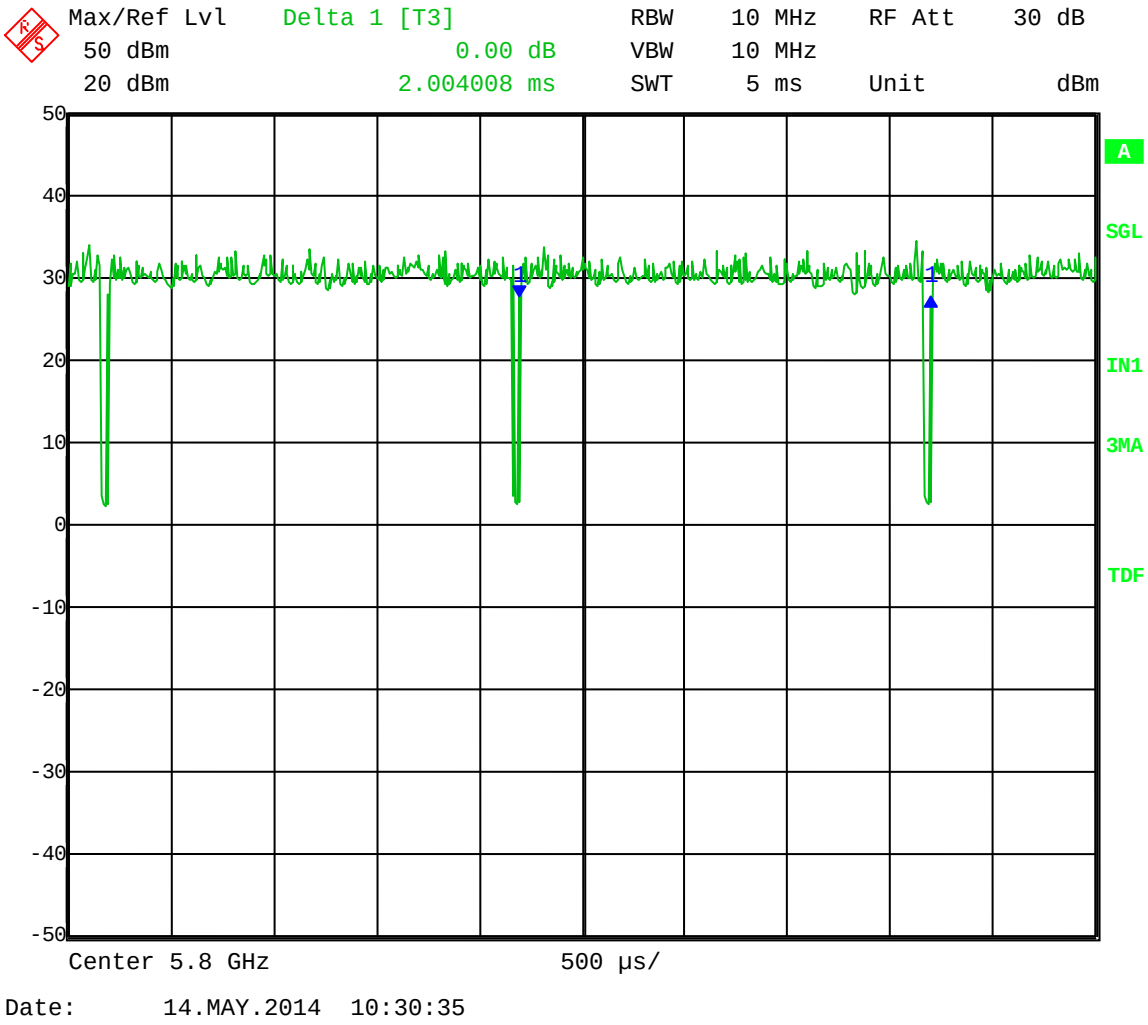
Notes: No Duty cycle correction factor was applied to measurements for this device.

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

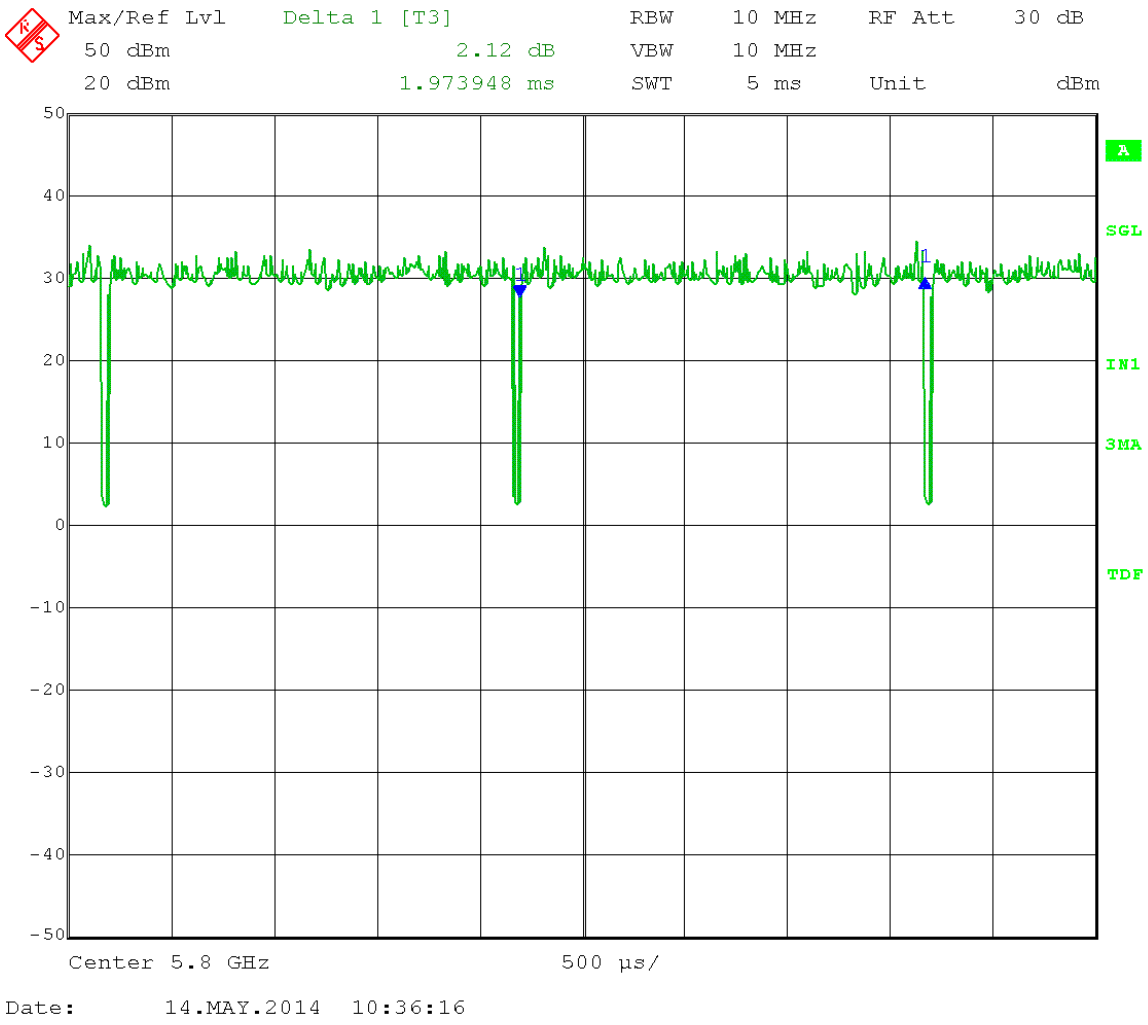
Test Date: 05-14-2014
Company: Ubiquiti Networks
EUT: Air Fiber 5 - 5.8GHz WiFi Radio
Test: Duty Cycle during testing
Operator: Steve Dahmen

Test Procedure used: KDB 558074 D01 v01r03 – 6.0)
30 MHz channel bandwidth; QPSK
Duty cycle = 1.973948 ms / 2.004008 ms = 0.985 = 98.5%

One Cycle = 2.004008 ms.



ON Time during one Cycle: 1.973948 ms.



END OF REPORT

Revision #	Date	Comments	By
1.0	05-28-2014	Preliminary Release	JS