

# RADIO TEST REPORT

No. 1610783STO-005, Ed. 1

## RF Performance

### EQUIPMENT UNDER TEST

Equipment: Gateway  
Type/Model: E1526 Trådfri  
Manufacturer: IKEA of Sweden  
Tested by request of: IKEA of Sweden

### SUMMARY

Referring to the emission limits, and the operating mode during the tests specified in this report, the U-NII device complies with the requirements according to the following standards:

47 CFR Part 15 (2015): Subpart E: Unlicensed National Information Infrastructure Devices

RSS-GEN Issue 4 (2014): General requirements of compliance of radio apparatus

RSS-247 Issue 1 (2015): Digital Transmission Systems (DTSs), Frequency Hopping Systems (FHSs) and License-Exempt Local Area Network (LE-LAN) Devices

Date of issue: 2016-09-10

Tested by:

  
Matti Virkki

Approved by:

  
Stefan Andersson

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**Revision History**

Edition	Date	Description	Changes
1	2016-09-10	First release	

Version 1.00

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## 1 CLIENT INFORMATION

The EUT has been tested by request of

Company: IKEA of Sweden AB  
Box 702  
343 81 Älmhult  
Sweden

Name of contact: Daniel Lind

## 2 EQUIPMENT UNDER TEST (EUT)

### 2.1 Identification of the EUT

Equipment: Gateway

Type/Model: E1526 Trådfri

Brand name: IKEA

Serial number: No visible serial number on EUT

Manufacturer: IKEA of Sweden AB

Transmitter frequency range: 5180 – 5240 MHz, 5260 – 5320 MHz, 5500 – 5700 MHz and 5745 – 5825 MHz

Receiver frequency range: 5180 – 5240 MHz, 5260 – 5320 MHz, 5500 – 5700 MHz and 5745 – 5825 MHz

Frequency agile or hopping:  Yes  No

Antenna:  Internal antenna  External antenna

Antenna connector:  None, internal antenna  Yes,

Antenna gain: 0.7 dBi

Rating RF output power: 16 dBm e.i.r.p

Type of modulation: BPSK, QPSK, 16 QAM, 64 QAM

Transmitter standby mode supported:  Yes  No

## 2.2 Additional information about the EUT

The gateway is part of the TRÅDFRI platform from IKEA of Sweden and contain;

- 802.15.4 ZigBee radio
- 802.11 b/g/n/a Wi-Fi radio.
- Ethernet

This report covers tests of the 5 GHz Wi-Fi radio parts.

## 2.3 Test signals and operation modes

Continuous signals

802.11 a 6 MBps QPSK modulation

802.11 n MCS 7 64-QAM modulation 20 MHz bandwidth

802.11 n MCS 7 64-QAM modulation 40 MHz bandwidth

### 3 TEST SPECIFICATIONS

#### 3.1 Standards

Requirements:

47 CFR Part 15 (2015): Subpart C: Intentional radiators. Section 15.247

RSS-GEN Issue 4 (2014): General requirements of compliance of radio apparatus (2014).

RSS-247 Issue 1 (2015): Digital Transmission Systems (DTSS), Frequency Hopping Systems (FHSs) and Licence-Exempt Local Area Network (LE-LAN) Devices

Test methods:

ANSI C63.10-2013: American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices

KDB 789033 D02 General UNII Test Procedures New Rulesv01r02

#### 3.2 Additions, deviations and exclusions from standards

No additions, deviations or exclusions have been made from standards.

#### 3.3 Test site

Measurements were performed at:

Intertek Semko AB.  
Torshamnsgatan 43,  
P.O. Box 1103  
SE-164 22 Kista

Intertek Semko AB is a FCC listed test site with site registration number 90913

Intertek Semko AB is a FCC accredited conformity assessment body with designation number SE0002

Intertek Semko AB is an Industry Canada listed test facility with IC assigned code 2042G

Measurement chambers

Measurement Chamber	Type of chamber	IC Site filing #
STORA HALLEN	Semi-anechoic 10 m and 3 m	2042G-2

#### 4 TEST SUMMARY

The results in this report apply only to sample tested:

Requirement	Description	Result
<b>FCC §15.203 RSS-GEN 8.3</b>	<b>Antenna requirement</b> The EUT has integrated non detachable antenna which can't be remove without breaking the EUT.	<b>PASS</b>
<b>FCC §15.407(a)  RSS-247 6.2.1(1), 6.2.2(1), 6.2.3(1), 6.2.4(1)</b>	<b>Conducted output power and power spectral density</b> The EUT complies with the limits. The margin to the limit was at least 6.4 dB at 5200 MHz. See clause 7.4.	<b>PASS</b>
<b>FCC §15.407(b) 15.209(a) RSS-GEN 8.9 RSS-247 6.2.1(2), 6.2.2(2), 6.2.3(2), 6.2.4(2)</b>	<b>Radiated emission of electromagnetic fields in the frequency range above 1 GHz</b> The EUT complies with the limits. The margin to the limit was at least 3.7 dB at 5470 MHz. See clause 5.4.	<b>PASS</b>
<b>FCC §15.407(b) RSS-247 5.5</b>	<b>Band edge</b> The EUT complies with the limits. The margin to the limit was at least 1.0 dB at 5150 MHz. See clause 6.4.	<b>PASS</b>
<b>FCC §15.407(e) RSS-GEN 6.6 RSS-247 5.2(1)</b>	<b>Occupied bandwidth</b> The EUT complies with the limits. The margin to the limit is at least 15.8 MHz See clause 9.4.	<b>PASS</b>
<b>FCC §15.407(g)</b>	<b>Frequency stability</b> The EUT complies with the requirement.	<b>PASS</b>
<b>FCC §15.407(h)</b>	<b>Transmitter power control</b> TPC is not required the output power does not exceed the TPC requirement level	<b>NA</b>
<b>FCC §15.407(h)</b>	<b>Dynamic frequency selection</b> The EUT is a client device without radar detection capability and complies with channel shutdown and non-occupancy period requirements	<b>PASS</b>

NT Not tested

## 5 RADIATED RF EMISSION IN THE FREQUENCY-RANGE 1000 MHZ – 40 GHZ

<b>Date of test:</b>	2016-05-24 - 2016-05-26 / 2016-07-15	<b>Test location:</b>	Stora hallen / radio hallen
<b>EUT Serial:</b>	No serial on EUT	<b>Ambient temp:</b>	21 - 23 °C
<b>Tested by:</b>	Matti Virkki	<b>Relative humidity:</b>	40 - 57 %
<b>Test result:</b>	Pass	<b>Margin:</b>	3.7 dB

### 5.1 Test set-up and test procedure.

The test method is in accordance with ANSI C63.10-2013.

The EUT was placed on an insulating support 1.5 m above the turntable which is part of the reference ground plane. Pre scan was made in three orthogonal EUT orientations and worst case are presented in this report. Overview sweeps were performed with the measurement receiver in max-hold mode

### 5.2 Test conditions

<b>Test set-up:</b>	<b>1 GHz – 40 GHz</b>		
Test receiver set-up:			
Preview test:	Peak,	RBW 1 MHz	VBW 3 MHz
	Average,	RBW 1 MHz	VBW 3 MHz
Final test:	Peak,	RBW 1 MHz	VBW 3 MHz
	Average	RBW 1 MHz	VBW 3 MHz
EUT height above ground plane:	1.5 m		
Measuring distance:	3 m		
Measuring angle:	0 – 359°		
Antenna			
Height above ground plane:	1 – 4 m		
Polarisation:	Vertical and Horizontal		
Type:	Horn		
Antenna tilt:	Activated		



### 5.3 Requirements

Within restricted bands and receive mode:

Reference: CFR 47 §15.209, §15.109, RSS-Gen section 8.9

Field strength of emissions must comply with limits shown in table below

Frequency range [MHz]	Field strength at 3 m (dB $\mu$ V/m)	Field strength at 10 m (dB $\mu$ V/m)	Detector (dB $\mu$ V/m)
30 – 88	40.0	29.5	Quasi Peak
88 – 216	43.5	33.0	Quasi Peak
216 – 960	46.0	35.5	Quasi Peak
960 – 1000	54.0	43.5	Quasi Peak
Above 1000	54.0 / 74.0	43.5 / 63.5	Average / Peak

The values for 10 m measuring distance are calculated by subtracting 10.5 dB from the 3 m limit. (i.e. an extrapolation factor of 20 dB/decade according to CFR 47 §15.31(f)(1))

Outside the restricted bands:

Reference: CFR 47 §15.407 (b), KDB 789033 D02 General UNII Test Procedures New Rulesv01 RSS-247 6.2.2.2, 6.2.3.2, 6.2.4.2

For transmitters operating in the 5.15-5.25 GHz band: All emissions outside of the 5.15-5.35 GHz band shall not exceed an e.i.r.p. of -27 dBm/MHz.

For transmitters operating in the 5.25-5.35 GHz band: All emissions outside of the 5.15-5.35 GHz band shall not exceed an e.i.r.p. of -27 dBm/MHz.

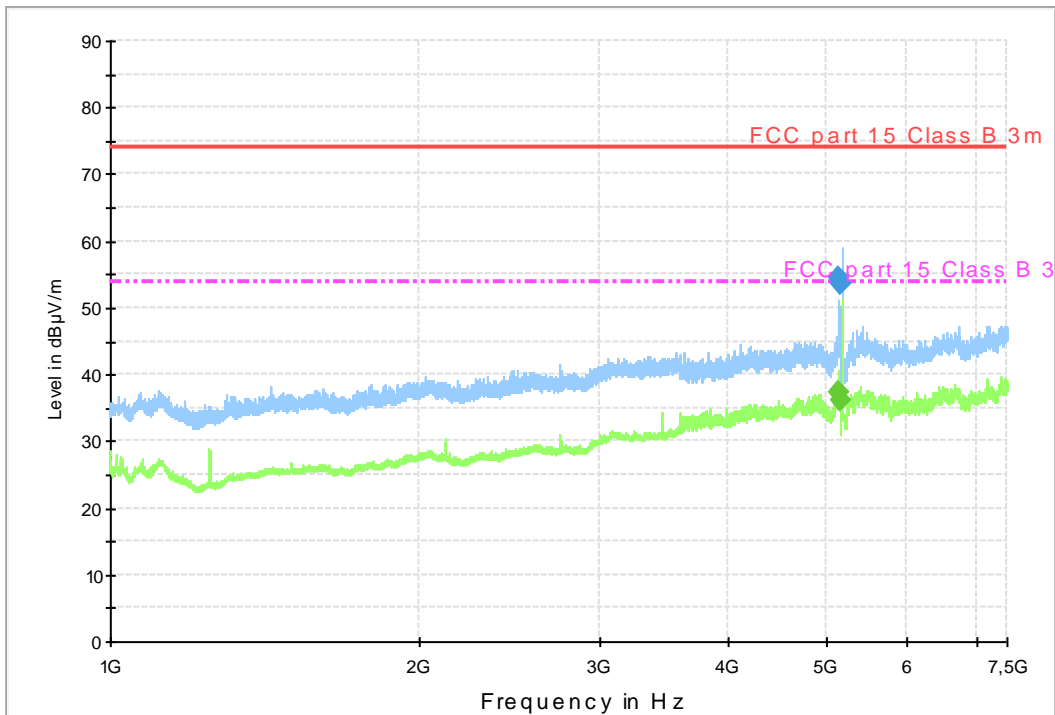
For transmitters operating in the 5.47-5.725 GHz band: All emissions outside of the 5.47-5.725 GHz band shall not exceed an e.i.r.p. of -27 dBm/MHz.

For transmitters operating in the 5.725-5.85 GHz band: All emissions within the frequency range from the band edge to 10 MHz above or below the band edge shall not exceed an e.i.r.p. of -17 dBm/MHz; for frequencies 10 MHz or greater above or below the band edge, emissions shall not exceed an e.i.r.p. of -27 dBm/MHz.

If the device complies with 15.209 peak and average limits, then peak e.i.r.p level attenuation below -27 dBm/MHz is not required.

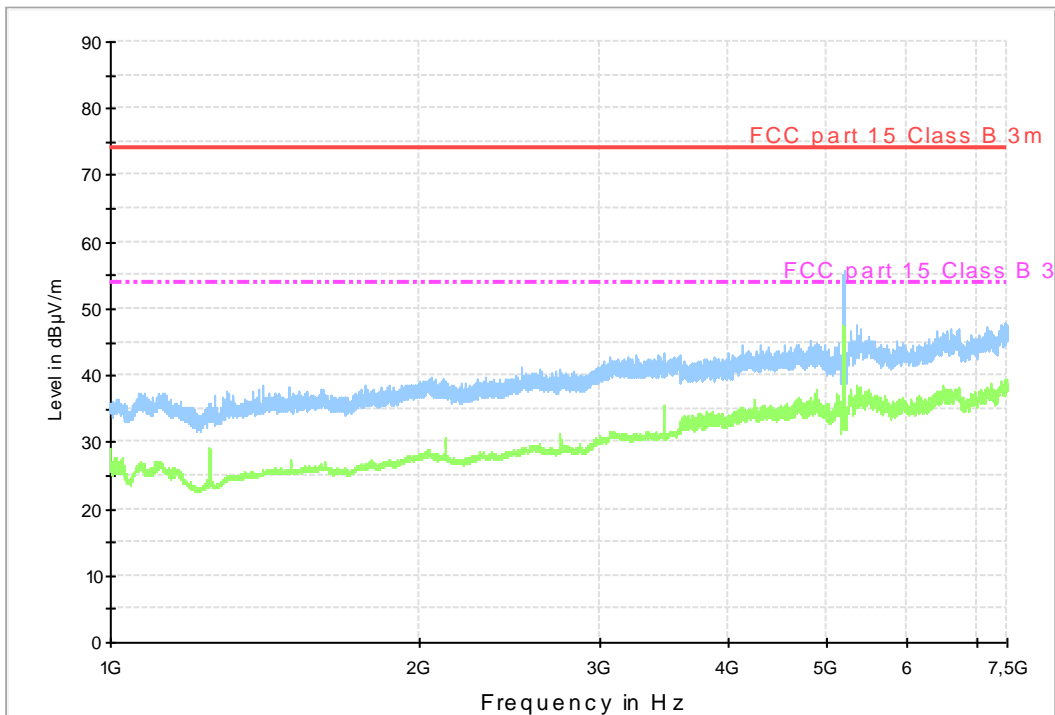
**5.4 Test results 1 GHz – 40GHz, TX**

FCC 1 G - 7,5 G class B 3m ESU40 Continuous TT rotation



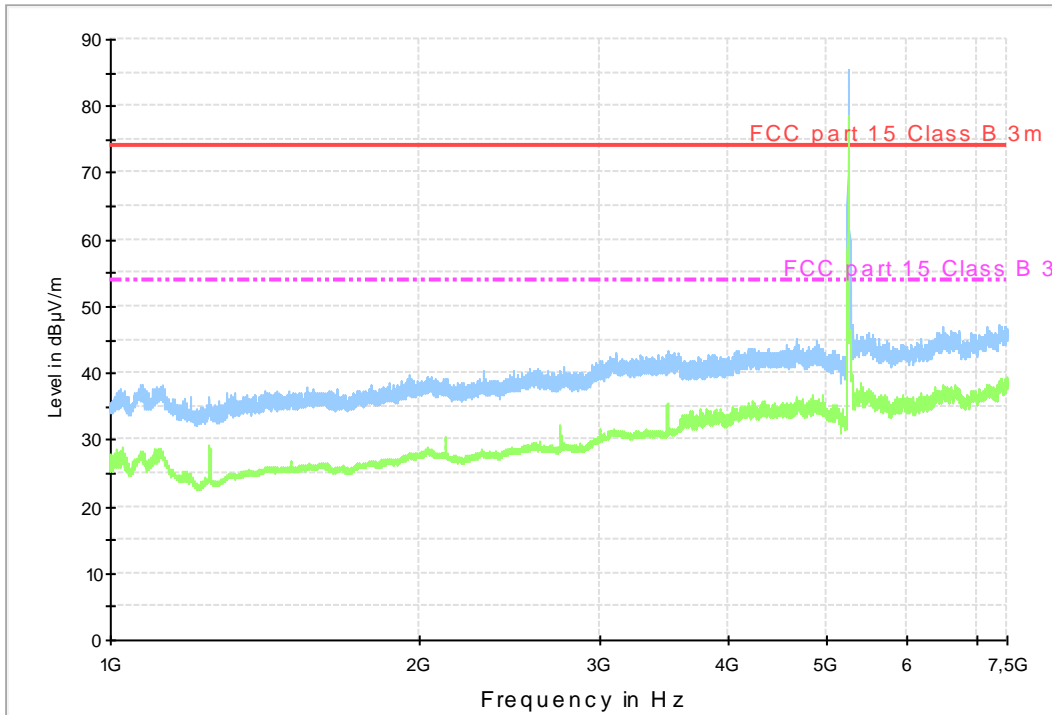
**Diagram, Peak overview sweep, 1– 7,5 GHz at 3 m distance. TX channel 36, EUT orientation 2.**

FCC 1 G - 7,5 G class B 3m ESU40 Continuous TT rotation



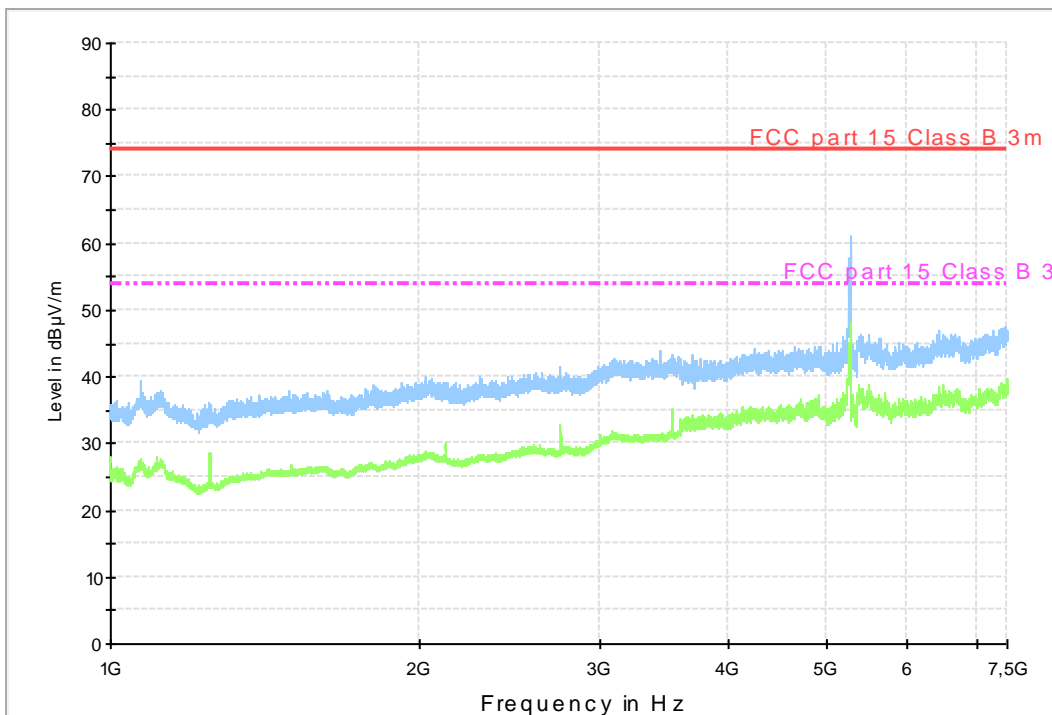
**Diagram, Peak overview sweep, 1– 7,5 GHz at 3 m distance. TX channel 40, EUT orientation 1.**

FCC 1 G - 7,5 G class B 3m ESU40 Continuous TT rotation



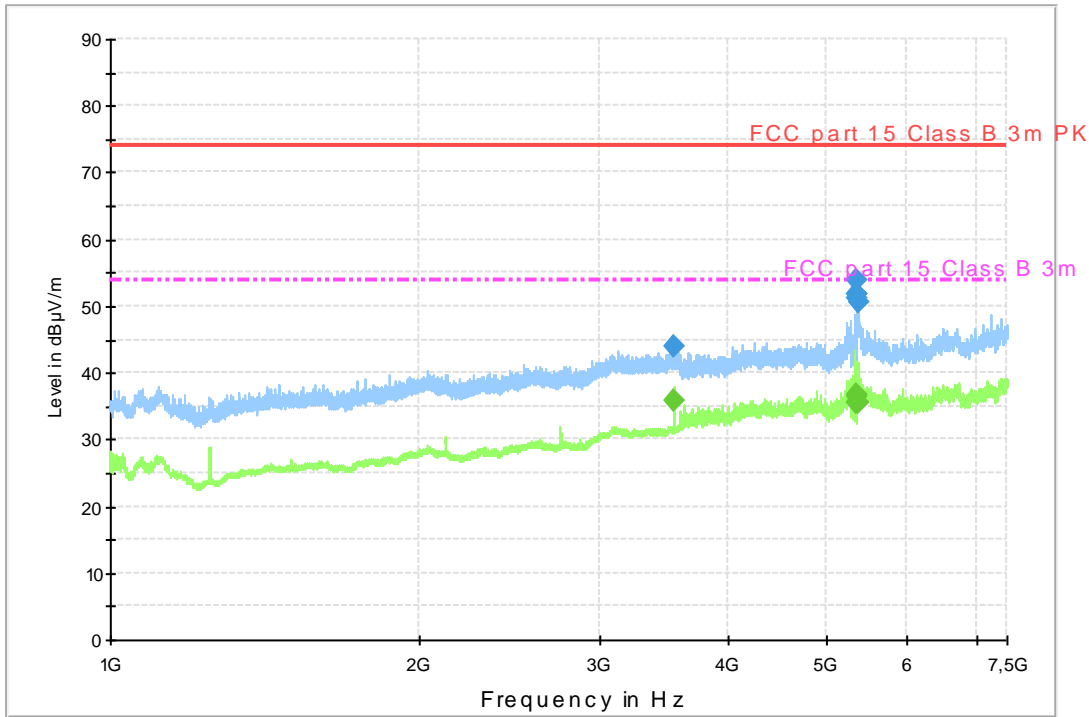
**Diagram, Peak overview sweep, 1– 7,5 GHz at 3 m distance. TX channel 48, EUT orientation 2**

FCC 1 G - 7,5 G class B 3m ESU40 Continuous TT rotation



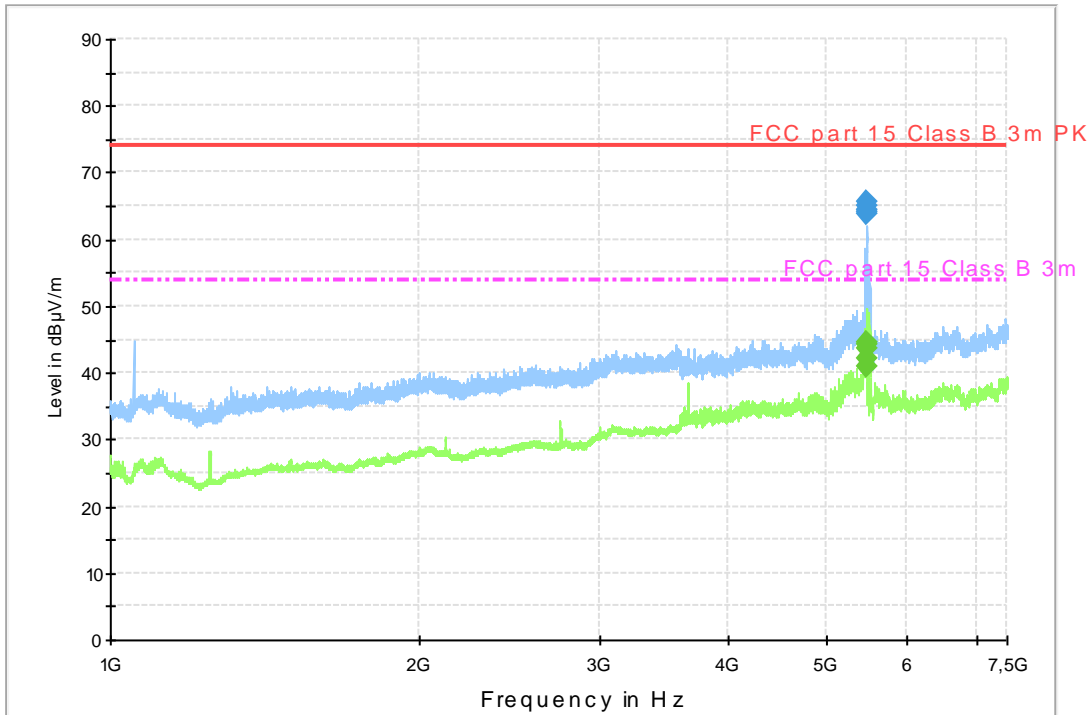
**Diagram, Peak overview sweep, 1– 7,5 GHz at 3 m distance. TX channel 60, EUT orientation 2**

FCC 1 G - 7,5 G class B 3m ESU40 Continuous TT rotation



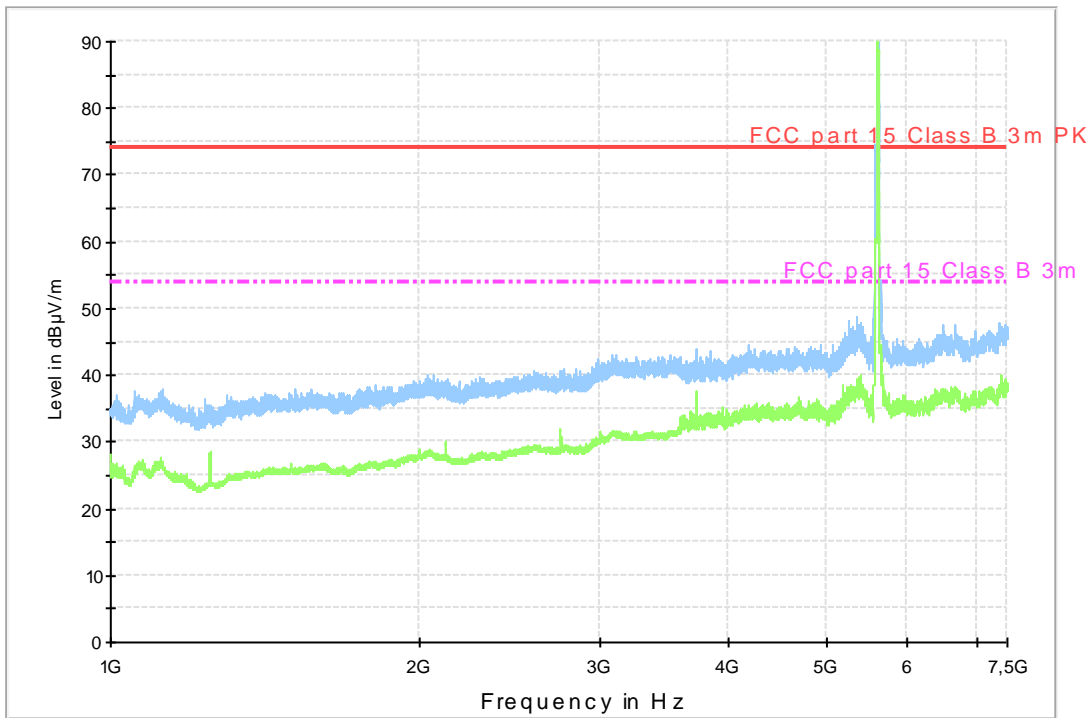
Diagram, Peak overview sweep, 1– 7,5 GHz at 3 m distance. TX channel 64 , EUT orientation 2.

FCC 1 G - 7,5 G class B 3m ESU40 Continuous TT rotation



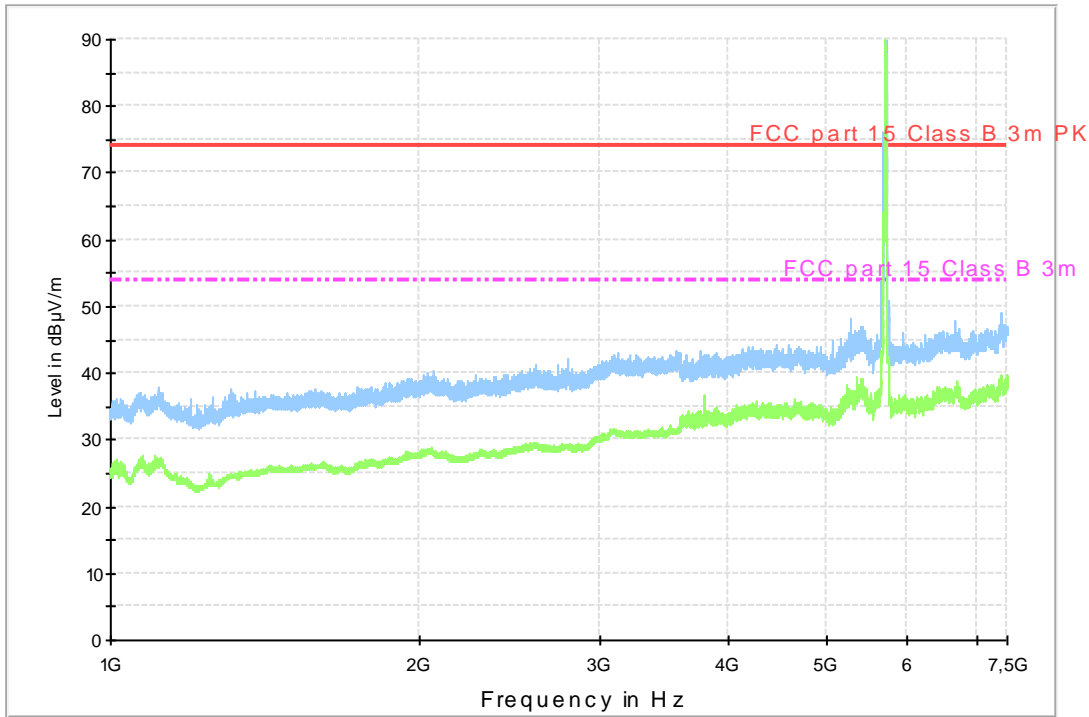
Diagram, Peak overview sweep, 1– 7 GHz at 3 m distance. TX channel 100, EUT orientation 2

FCC 1 G - 7,5 G class B 3m ESU40 Continuous TT rotation



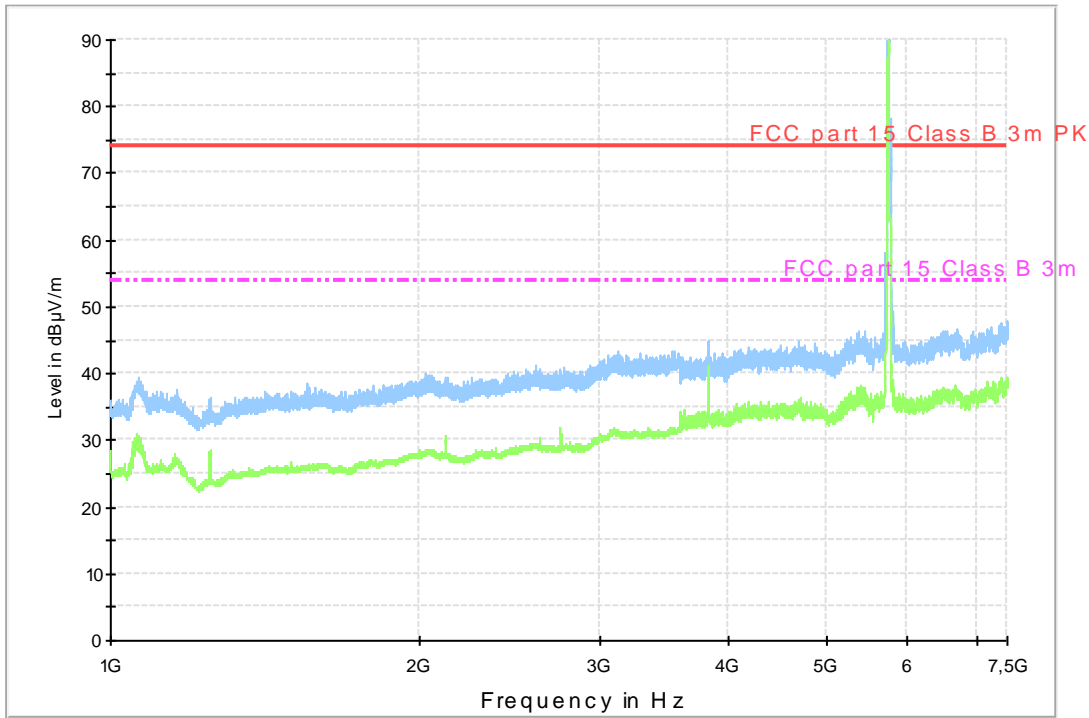
Diagram, Peak overview sweep, 1– 7,5 GHz at 3 m distance. TX channel 120, EUT orientation 2

FCC 1 G - 7,5 G class B 3m ESU40 Continuous TT rotation



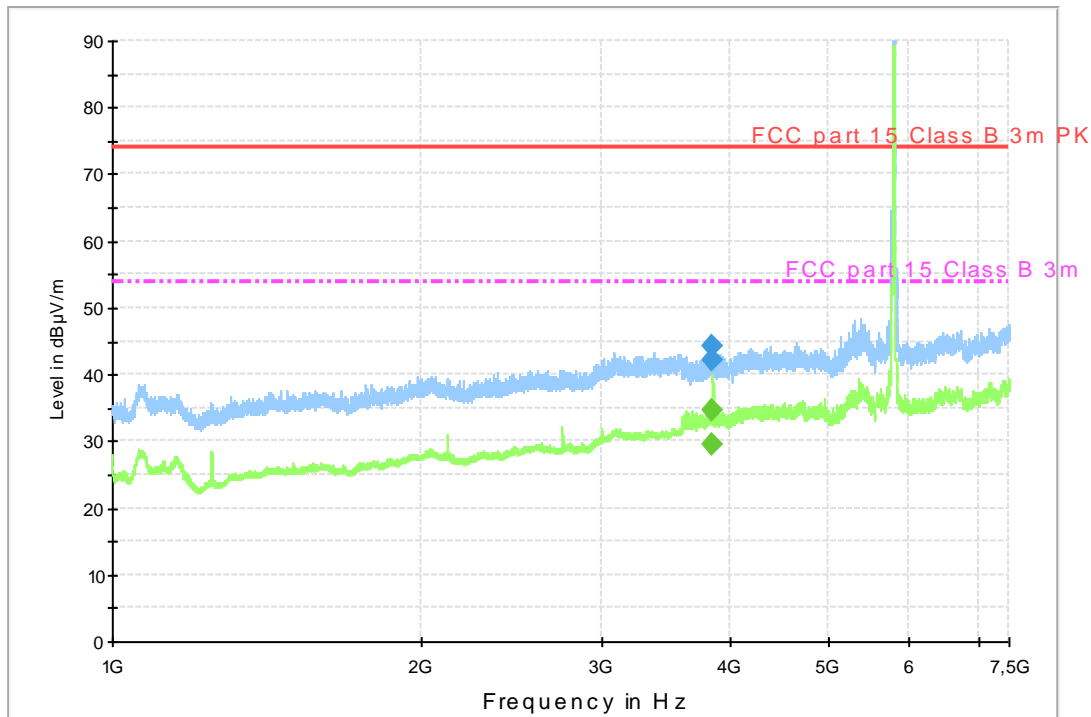
Diagram, Peak overview sweep, 1– 7 GHz at 3 m distance. TX channel 140, EUT orientation 2

FCC 1 G - 7,5 G class B 3m ESU40 Continuous TT rotation



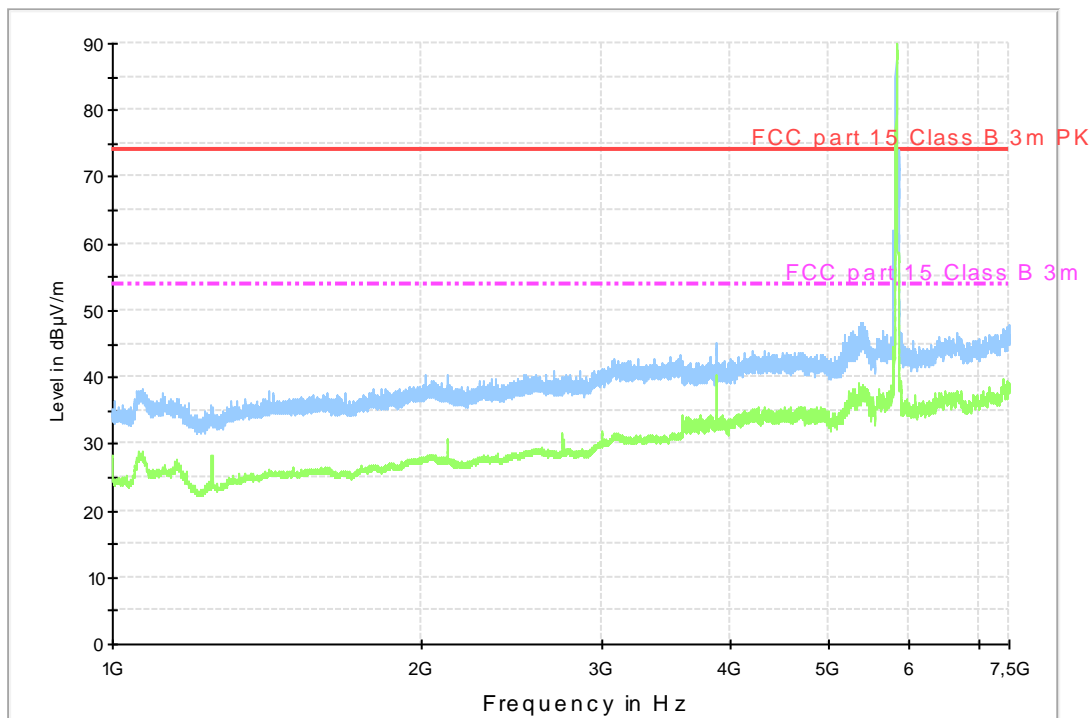
Diagram, Peak overview sweep, 1– 7,5 GHz at 3 m distance. TX channel 149, EUT orientation 1

FCC 1 G - 7,5 G class B 3m ESU40 Continuous TT rotation



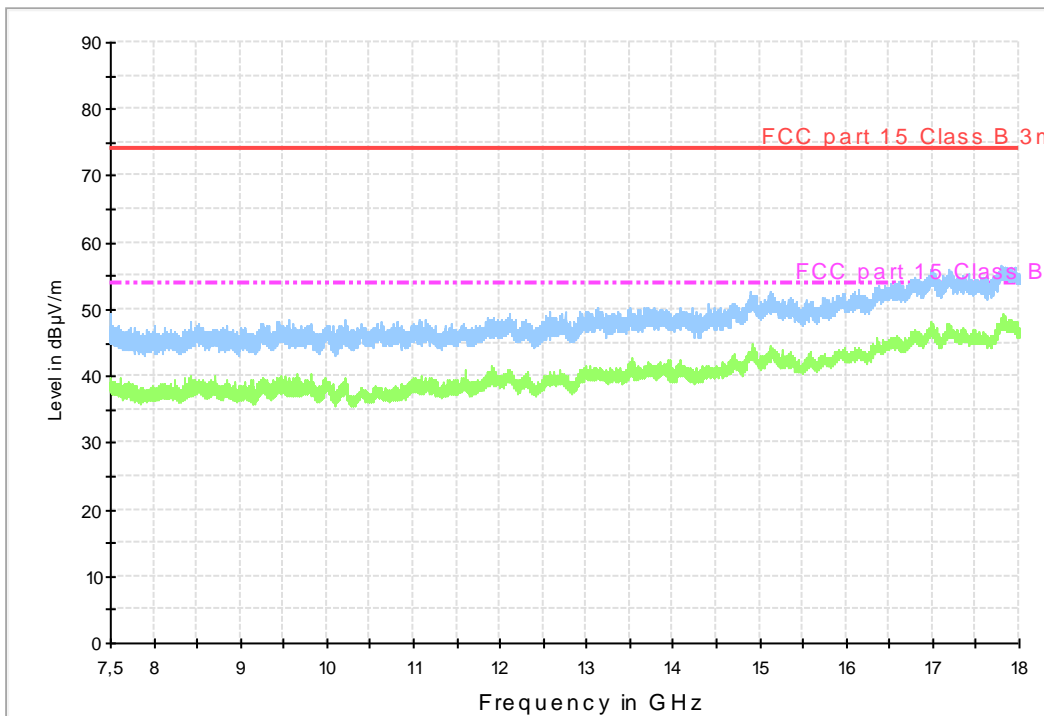
Diagram, Peak overview sweep, 1– 7,5 GHz at 3 m distance. TX channel 157, EUT orientation 1

FCC 1 G - 7,5 G class B 3m ESU40 Continuous TT rotation



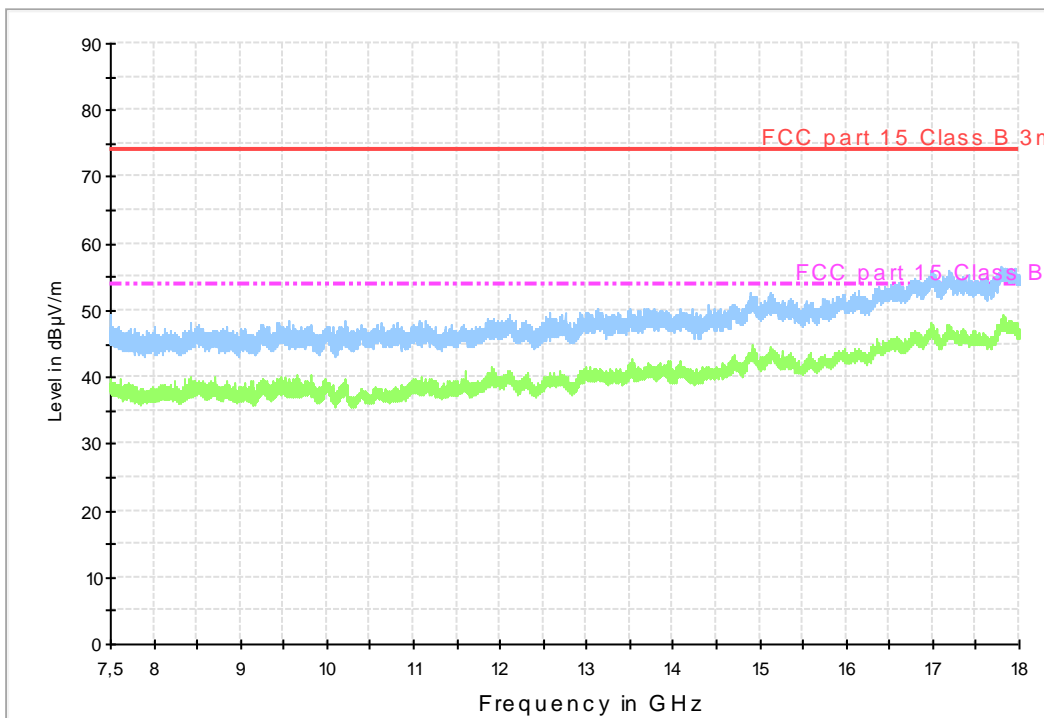
Diagram, Peak overview sweep, 1– 7,5 GHz at 3 m distance. TX channel 165, EUT orientation 1

FCC 7,5 G - 18 G class B 3m ESU40 Continuous TT rotation



**Diagram, Peak overview sweep, 7.5– 18 GHz at 3 m distance. TX channel 36, EUT orientation 2. Emissions below 7500 MHz are attenuated by high-pass filter K&L 11SH10-7500/U18000-0/0**

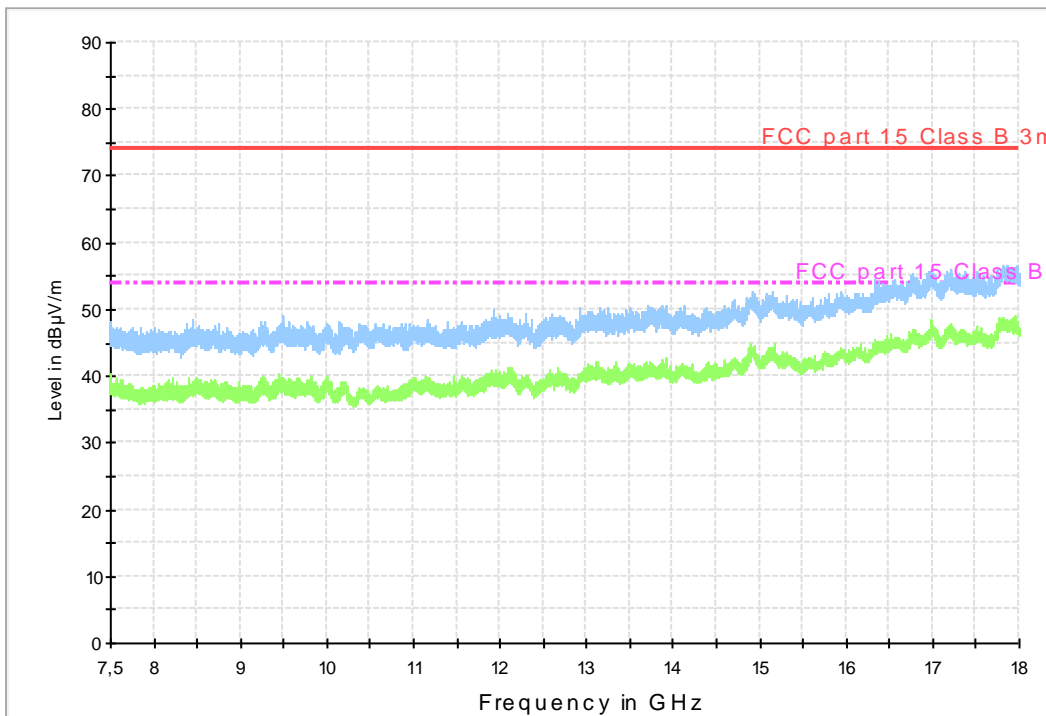
FCC 7,5 G - 18 G class B 3m ESU40 Continuous TT rotation



**Diagram, Peak overview sweep, 7.5– 18 GHz at 3 m distance. TX channel 40, EUT orientation 2. Emissions below 7500 MHz are attenuated by high-pass filter K&L 11SH10-7500/U18000-0/0**

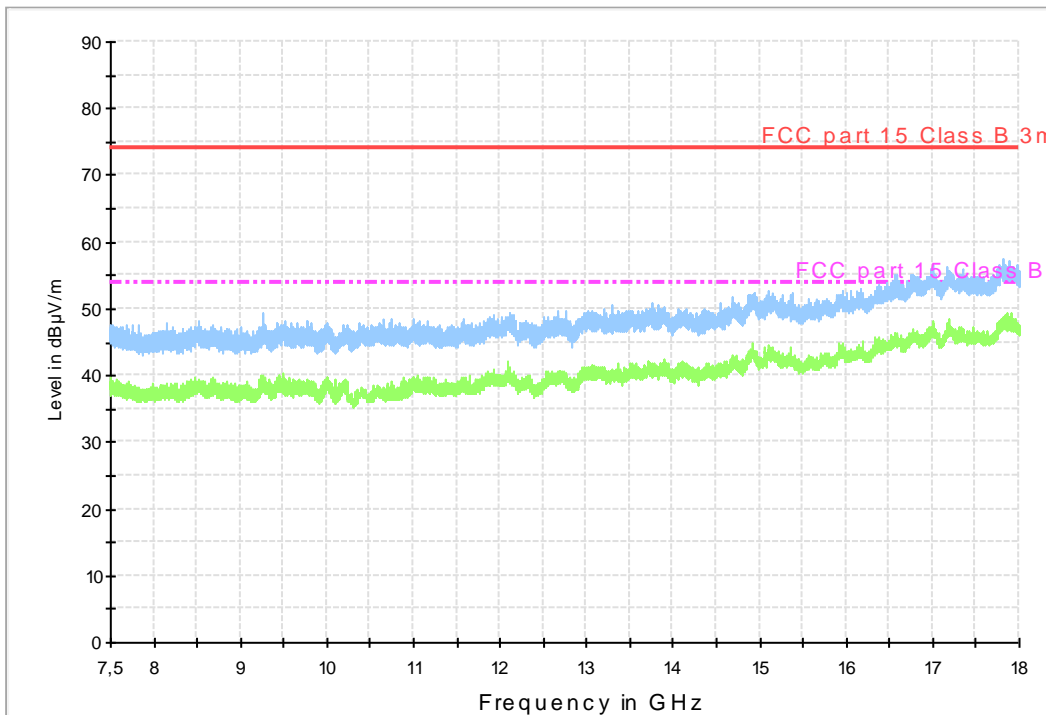


FCC 7,5 G - 18 G class B 3m ESU40 Continuous TT rotation



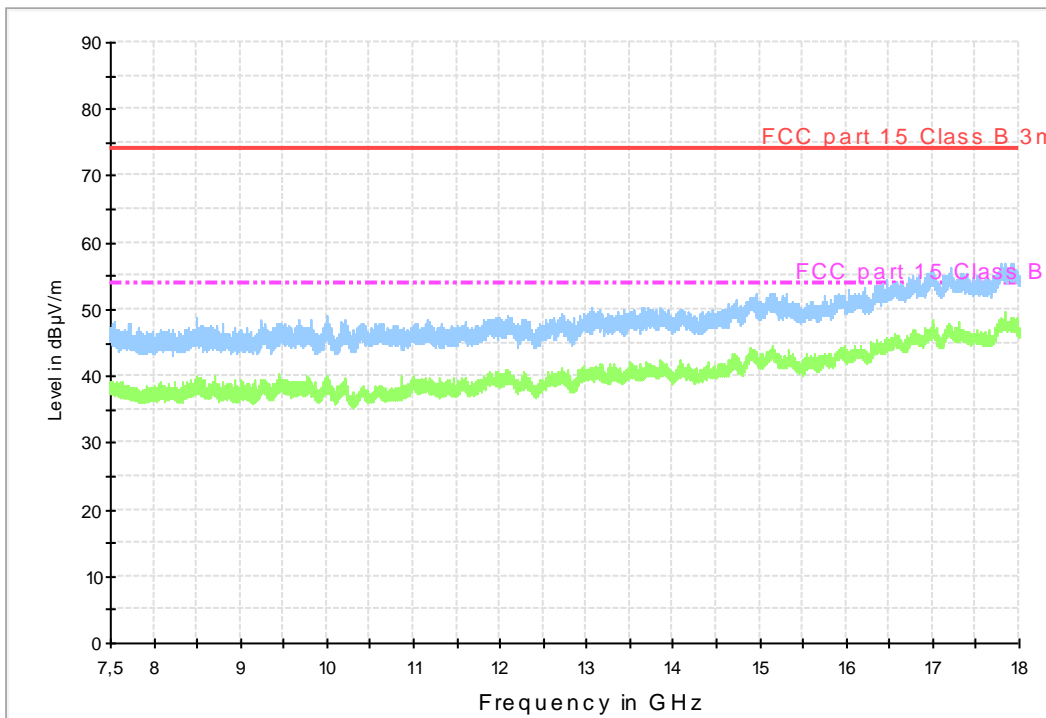
**Diagram Peak overview sweep, 7.5– 18 GHz at 3 m distance. TX channel 48, EUT orientation 2. Emissions below 7500 MHz are attenuated by high-pass filter K&L 11SH10-7500/U18000-0/0**

FCC 7,5 G - 18 G class B 3m ESU40 Continuous TT rotation



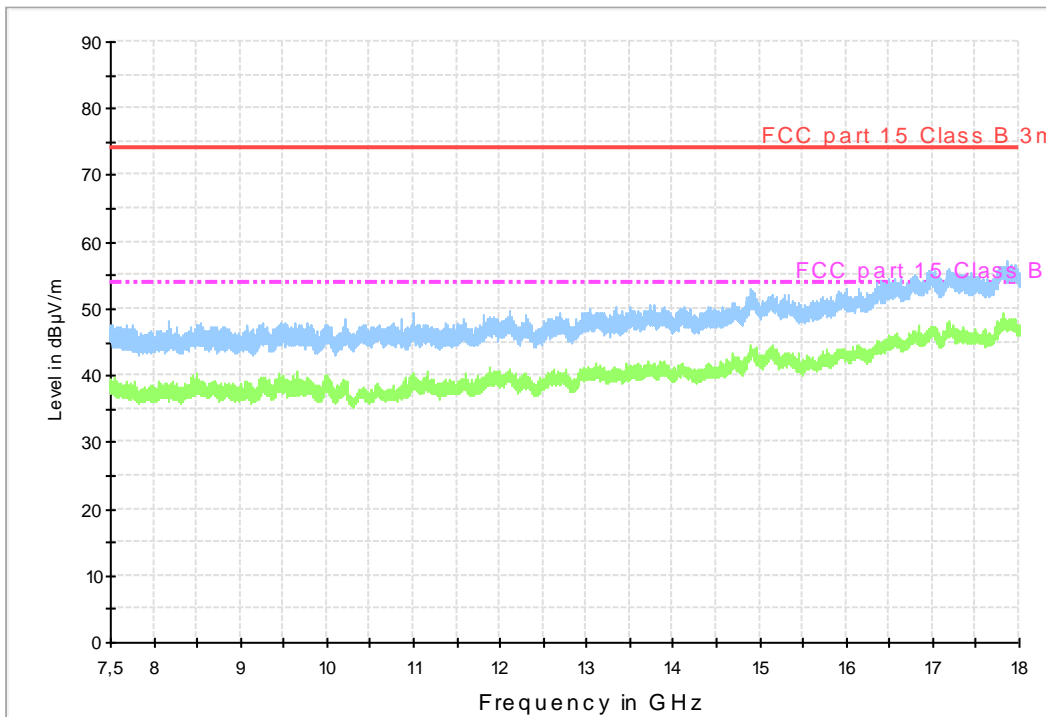
**Diagram, Peak overview sweep, 7.5– 18 GHz at 3 m distance. TX channel 52, EUT orientation 2. Emissions below 7500 MHz are attenuated by high-pass filter K&L 11SH10-7500/U18000-0/0**

FCC 7,5 G - 18 G class B 3m ESU40 Continuous TT rotation



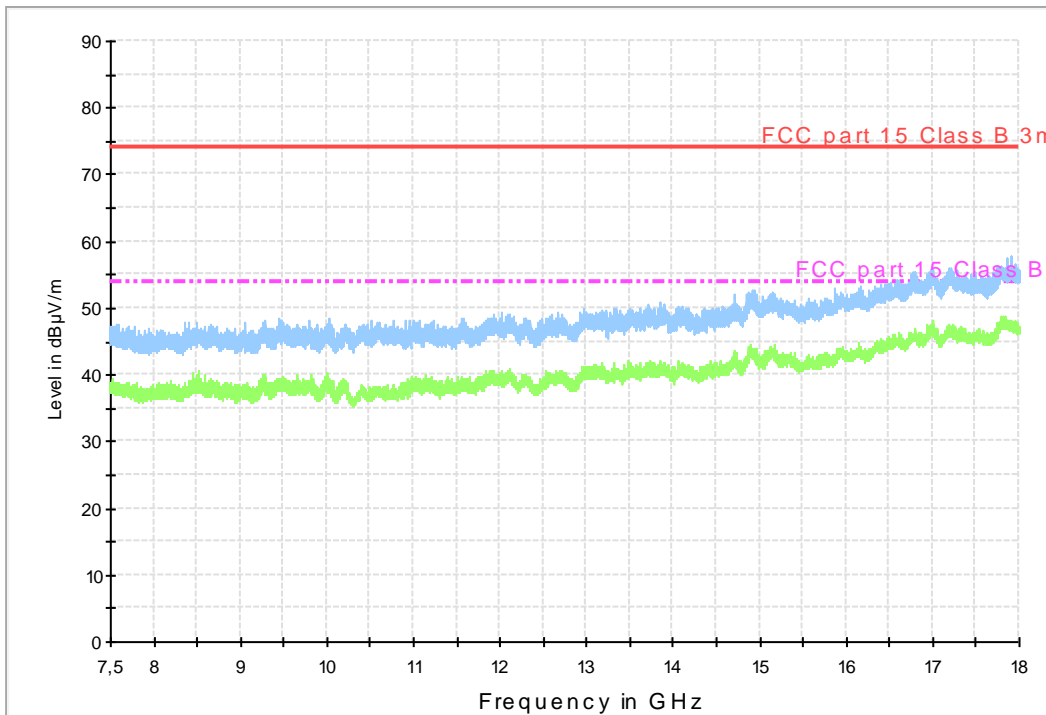
**Diagram, Peak overview sweep, 7.5– 18 GHz at 3 m distance. TX channel 64, EUT orientation 2. Emissions below 7500 MHz are attenuated by high-pass filter K&L 11SH10-7500/U18000-0/0**

FCC 7,5 G - 18 G class B 3m ESU40 Continuous TT rotation



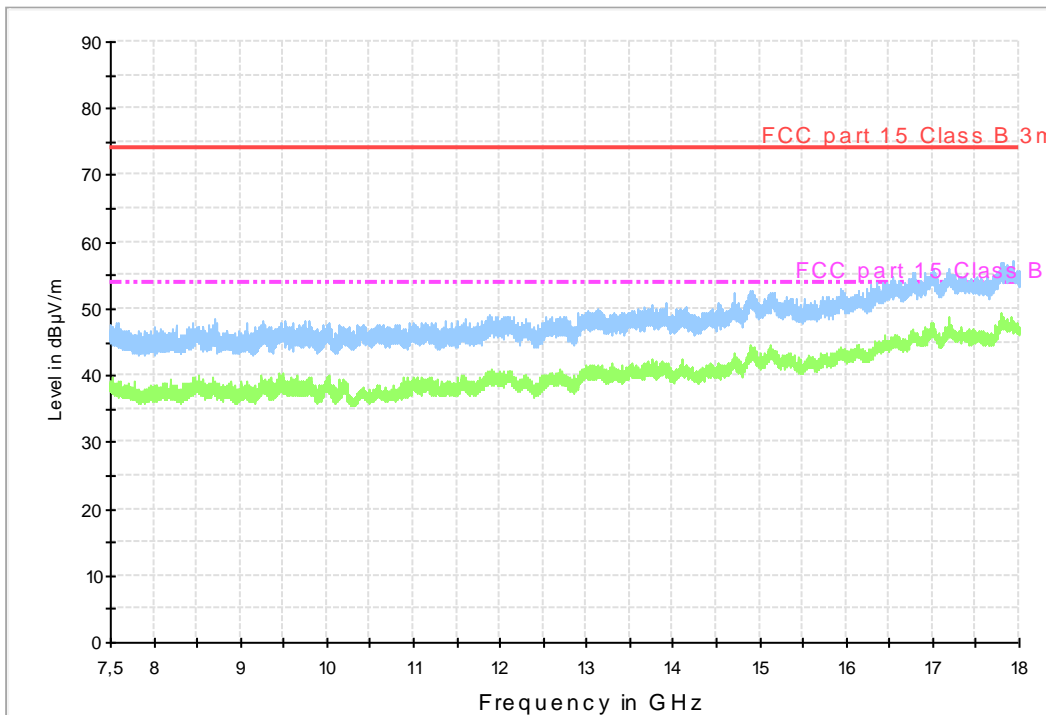
**Diagram, Peak overview sweep, 7.5– 18 GHz at 3 m distance. TX channel 100, EUT orientation 2. Emissions below 7500 MHz are attenuated by high-pass filter K&L 11SH10-7500/U18000-0/0**

FCC 7,5 G - 18 G class B 3m ESU40 Continuous TT rotation



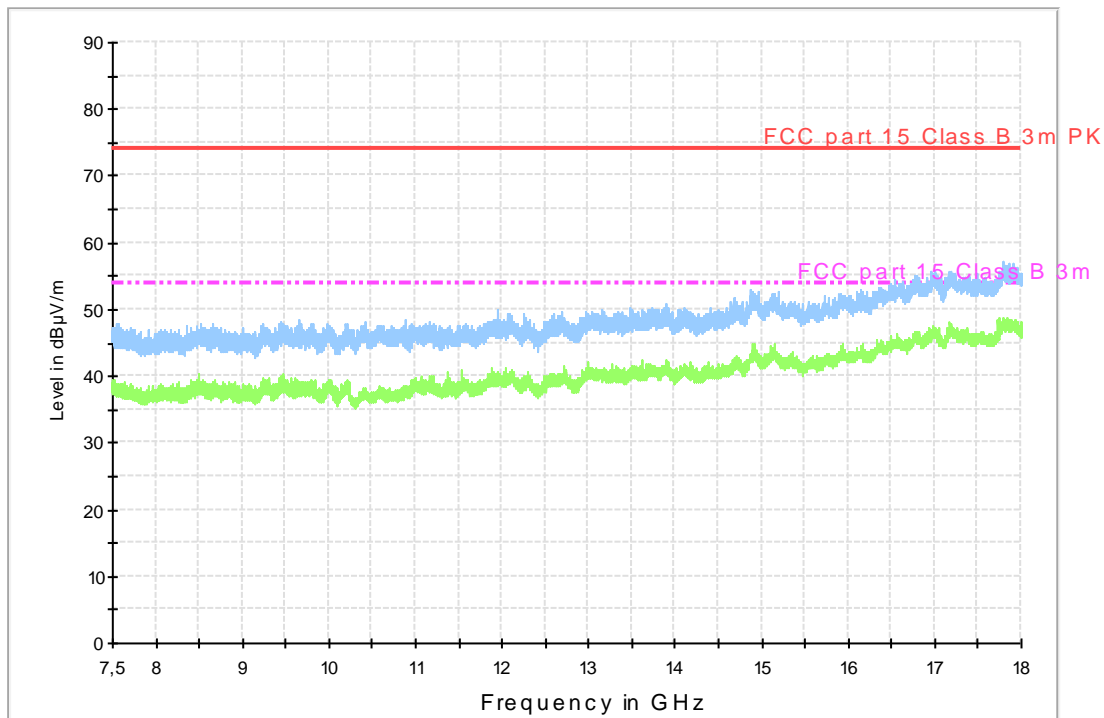
**Diagram, Peak overview sweep, 7.5– 18 GHz at 3 m distance. TX channel 120, EUT orientation 2. Emissions below 7500 MHz are attenuated by high-pass filter K&L 11SH10-7500/U18000-0/0**

FCC 7,5 G - 18 G class B 3m ESU40 Continuous TT rotation



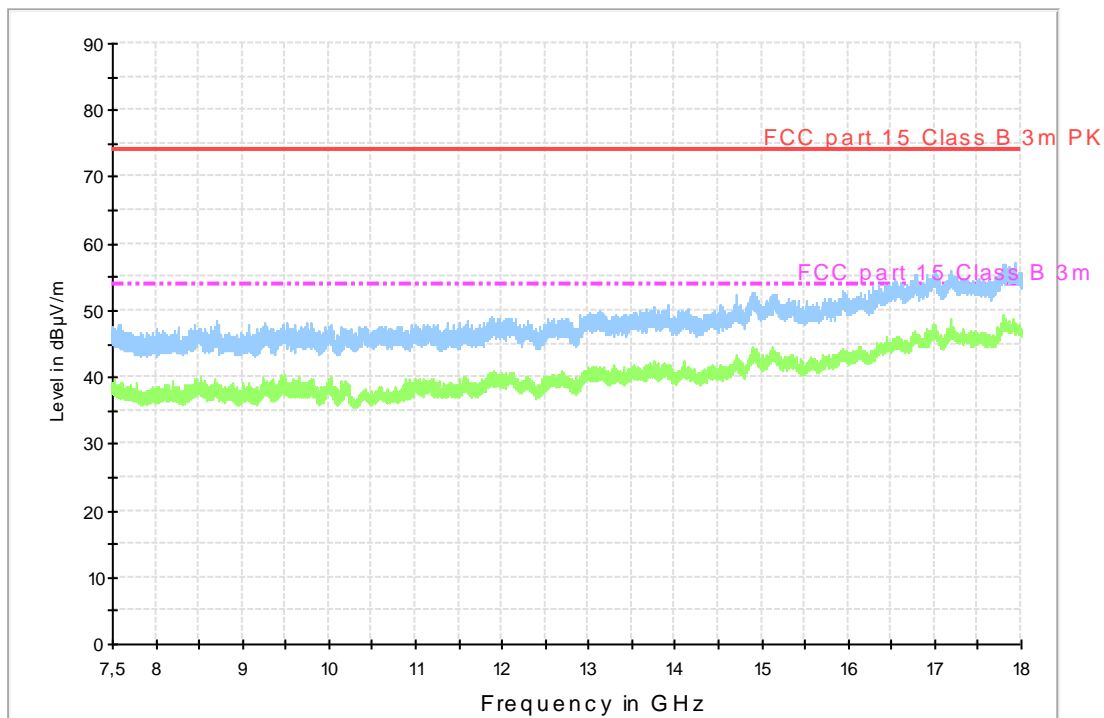
**Diagram, Peak overview sweep, 7.5– 18 GHz at 3 m distance. TX channel 140, EUT orientation 2. Emissions below 7500 MHz are attenuated by high-pass filter K&L 11SH10-7500/U18000-0/0**

FCC 7,5 G - 18 G class B 3m ESU40 Continuous TT rotation



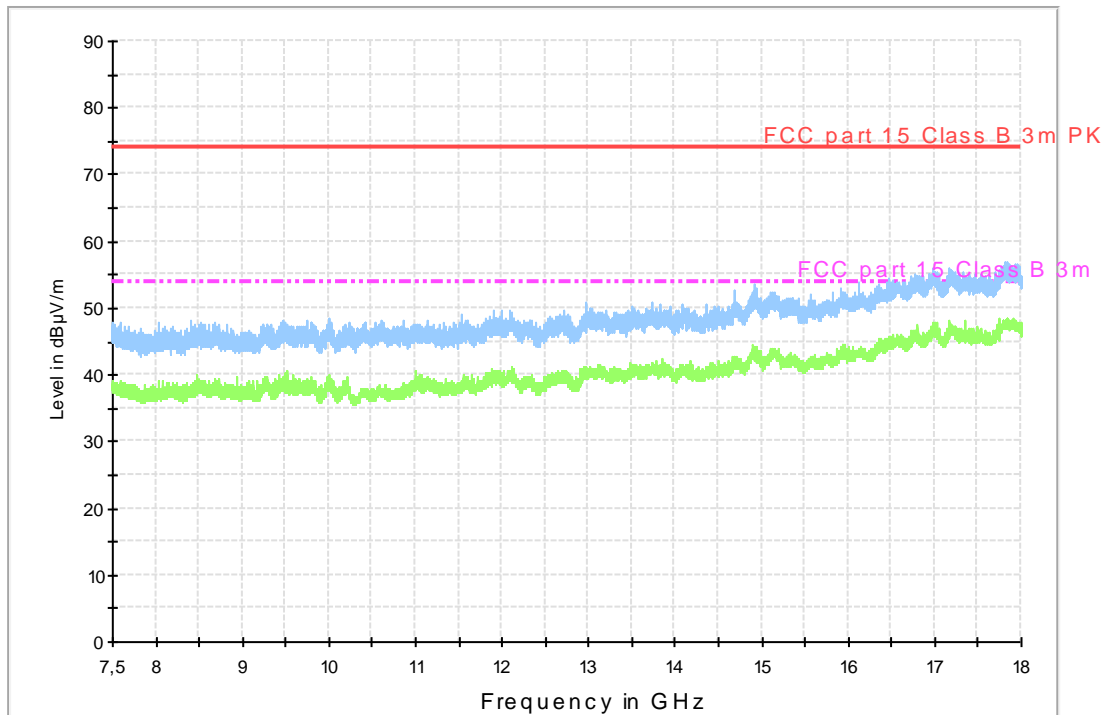
**Diagram, Peak overview sweep, 7.5– 18 GHz at 3 m distance. TX channel 149, EUT orientation 2. Emissions below 7500 MHz are attenuated by high-pass filter K&L 11SH10-7500/U18000-0/0**

FCC 7,5 G - 18 G class B 3m ESU40 Continuous TT rotation



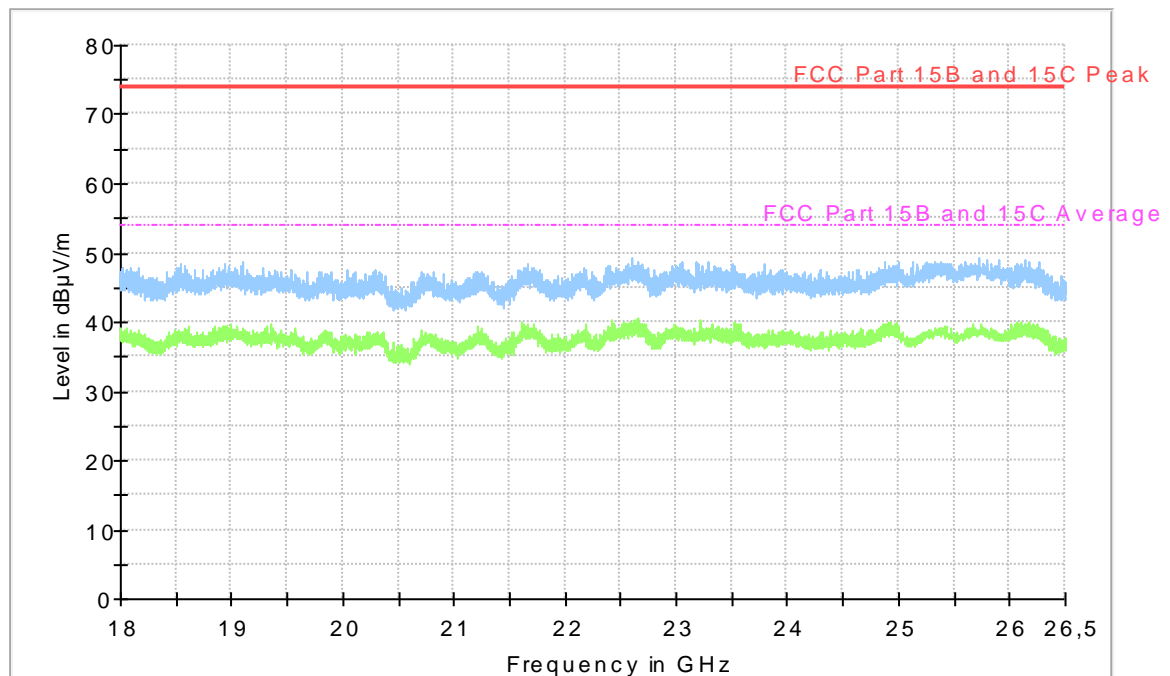
**Diagram, Peak overview sweep, 7.5– 18 GHz at 3 m distance. TX channel 157, EUT orientation 2. Emissions below 7500 MHz are attenuated by high-pass filter K&L 11SH10-7500/U18000-0/0**

FCC 7,5 G - 18 G class B 3m ESU40 Continuous TT rotation



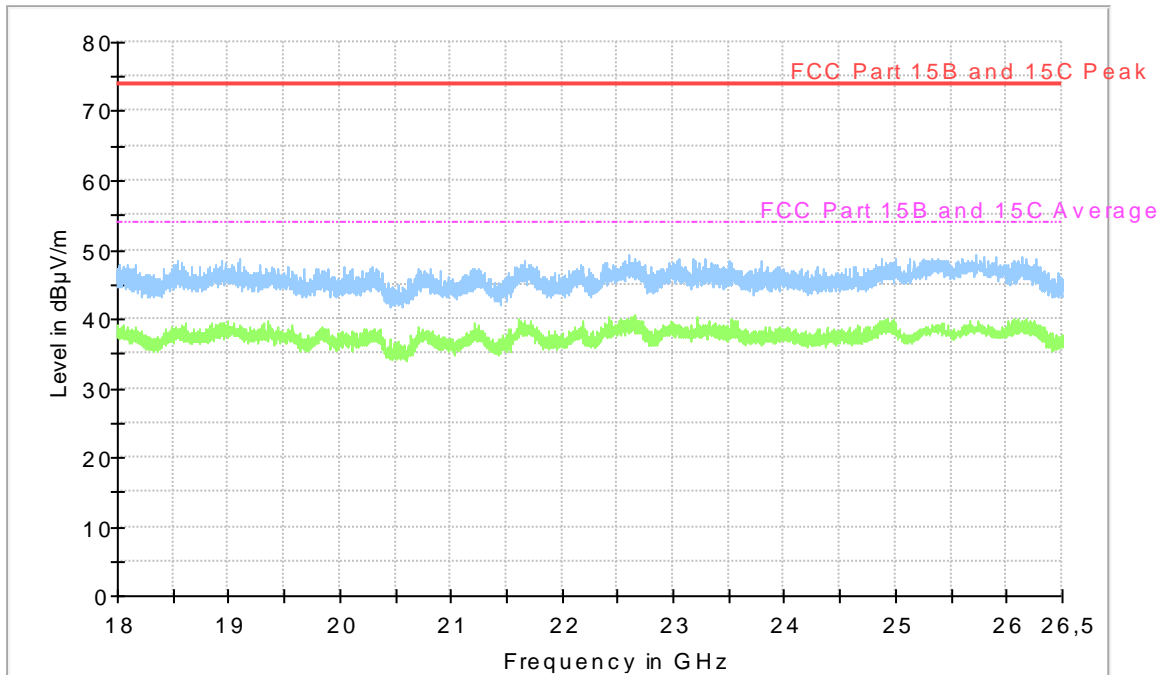
Diagram, Peak overview sweep, 7.5– 18 GHz at 3 m distance. TX channel 165, EUT orientation 2. Emissions below 7500 MHz are attenuated by high-pass filter K&L 11SH10-7500/U18000-0/0

Full Spectrum



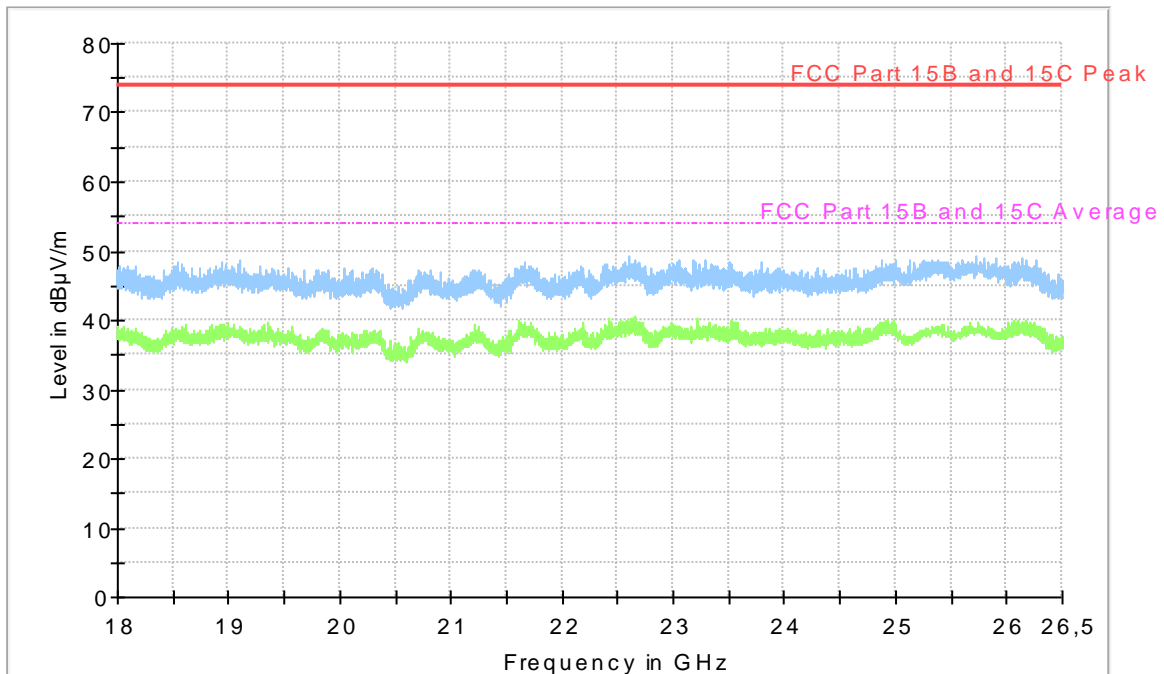
Diagram, Peak overview sweep, 18 – 26.5 GHz at 3 m distance. TX channel 36

Full Spectrum



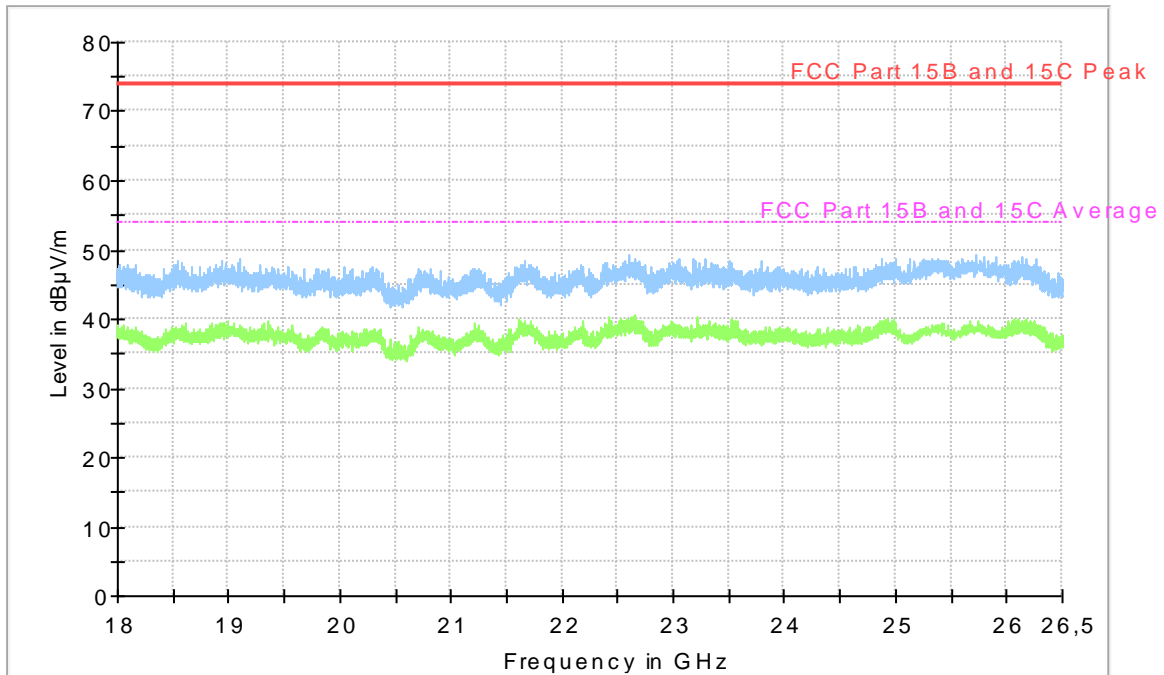
Diagram, Peak overview sweep, 18 – 26.5 GHz at 3 m distance. TX channel 40

Full Spectrum



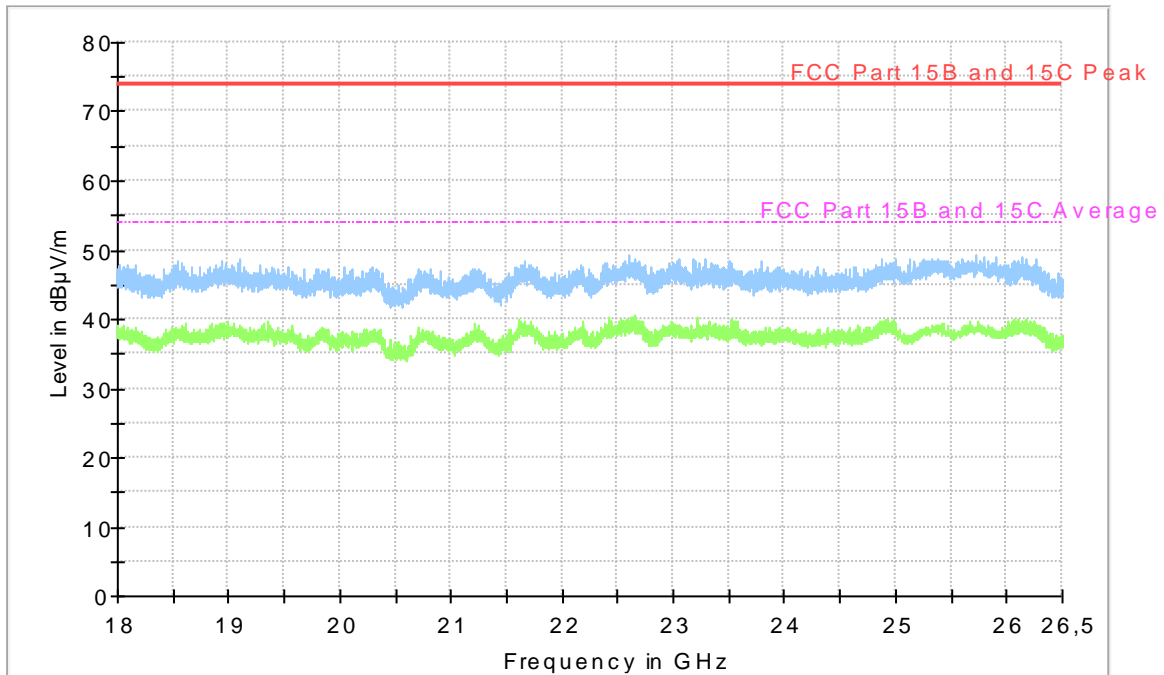
Diagram, Peak overview sweep, 18 – 26.5 GHz at 3 m distance. TX channel 48

Full Spectrum



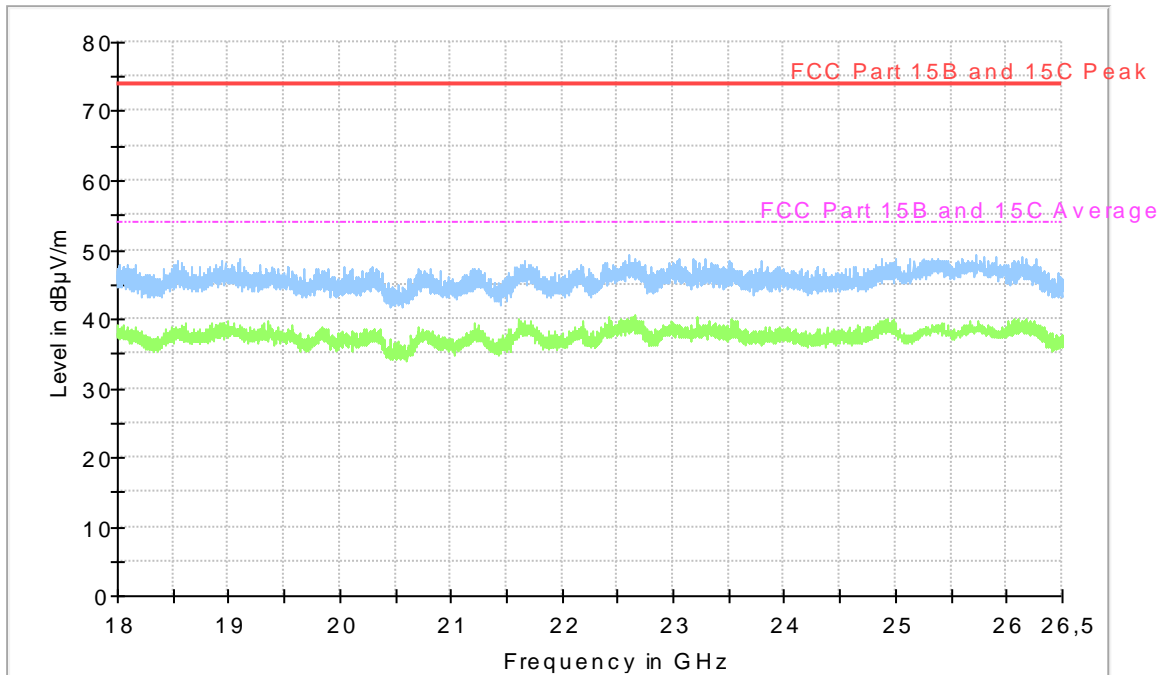
Diagram, Peak overview sweep, 18 – 26.5 GHz at 3 m distance. TX channel 52

Full Spectrum



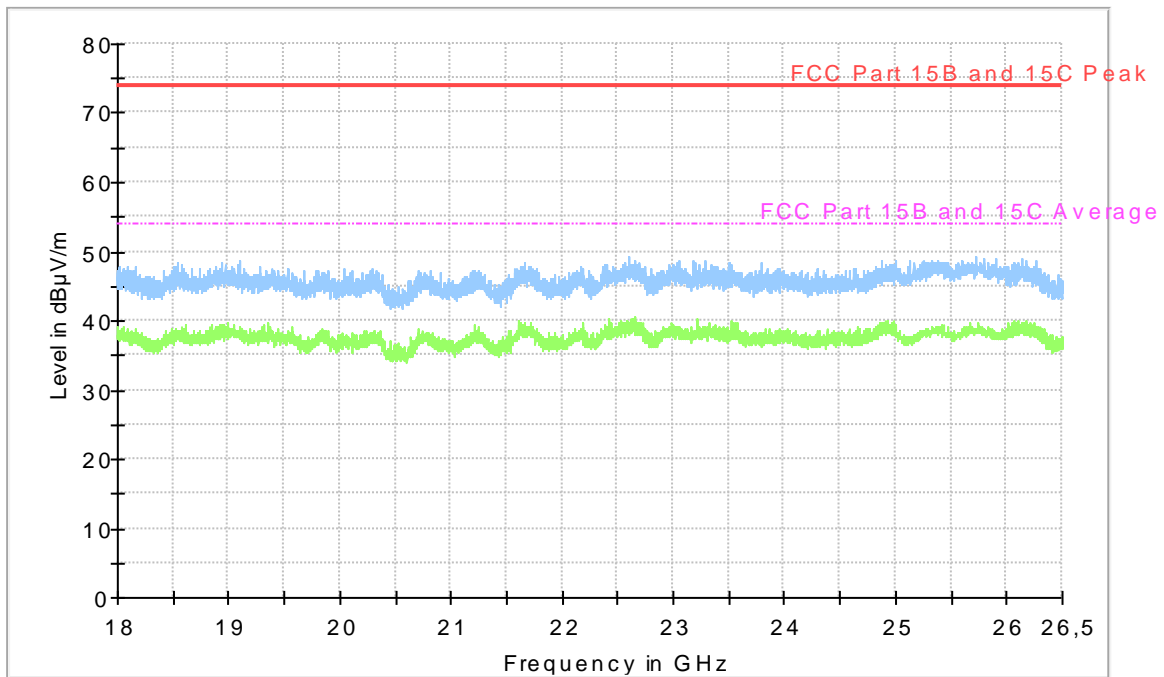
Diagram, Peak overview sweep, 18 – 26.5 GHz at 3 m distance. TX channel 60

Full Spectrum



Diagram, Peak overview sweep, 18 – 26.5 GHz at 3 m distance. TX channel 64

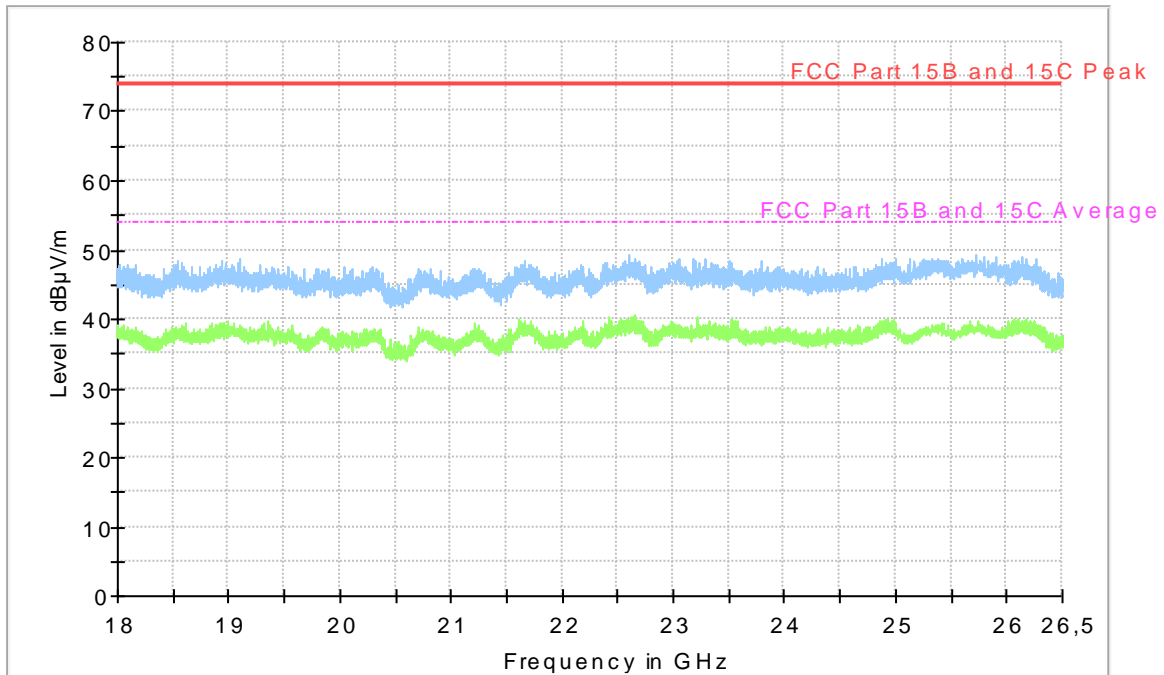
Full Spectrum



Diagram, Peak overview sweep, 18 – 26.5 GHz at 3 m distance. TX channel 100

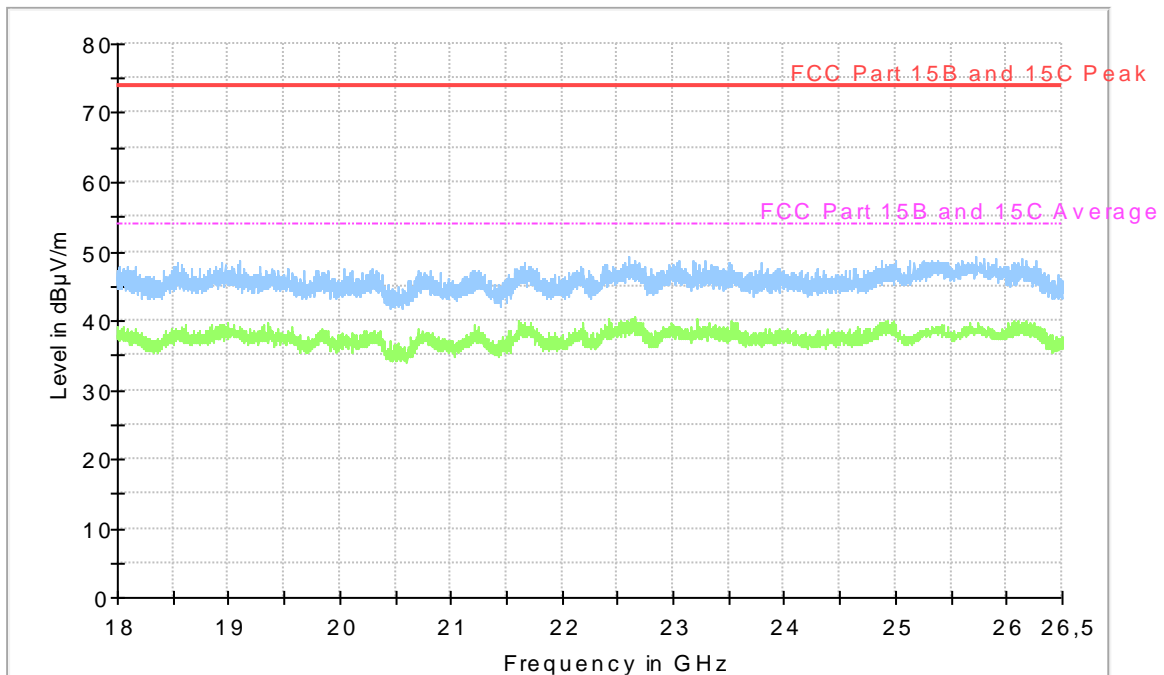


Full Spectrum



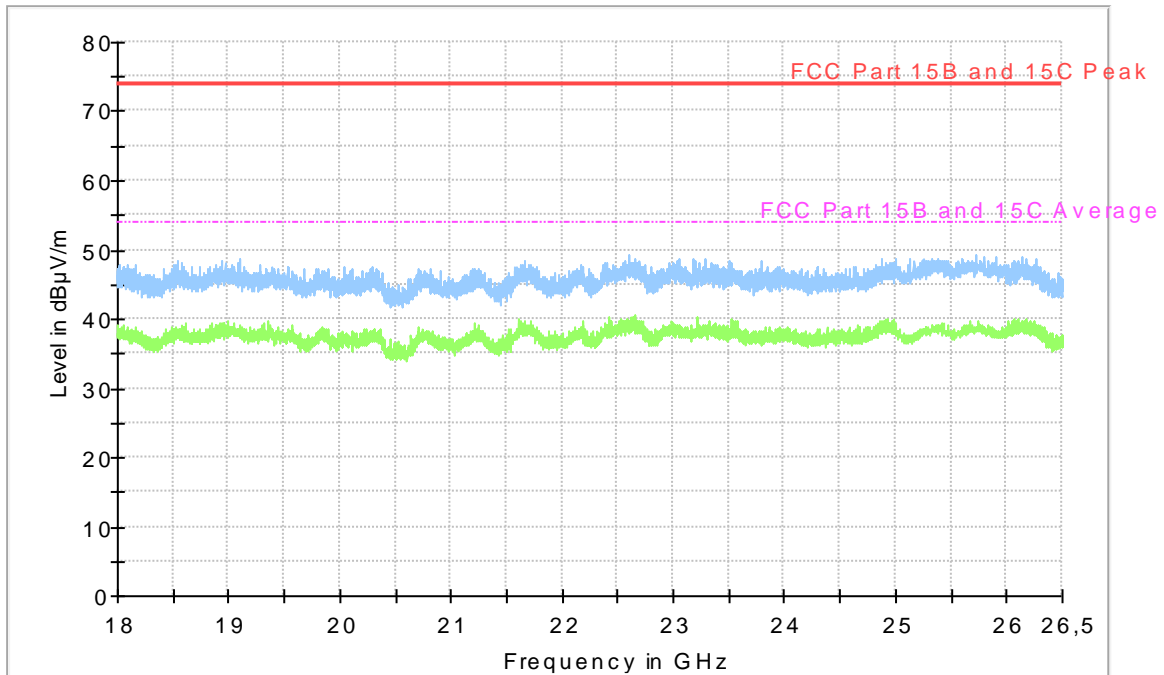
Diagram, Peak overview sweep, 18 – 26.5 GHz at 3 m distance. TX channel 120

Full Spectrum



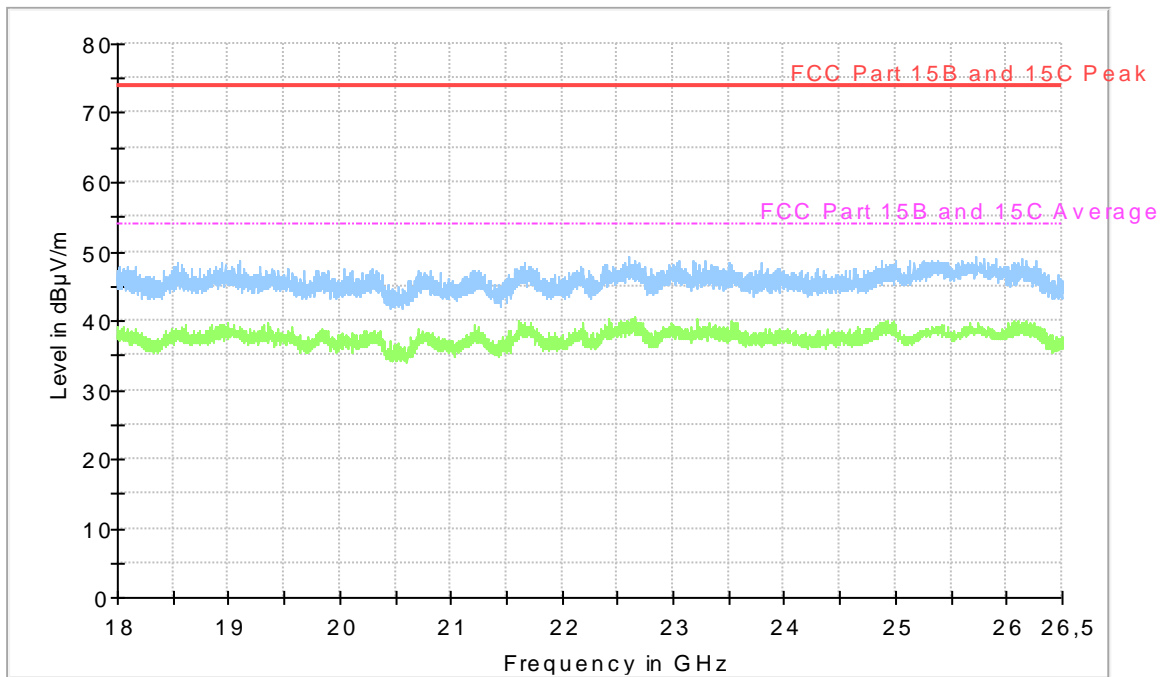
Diagram, Peak overview sweep, 18 – 26.5 GHz at 3 m distance. TX channel 140

Full Spectrum



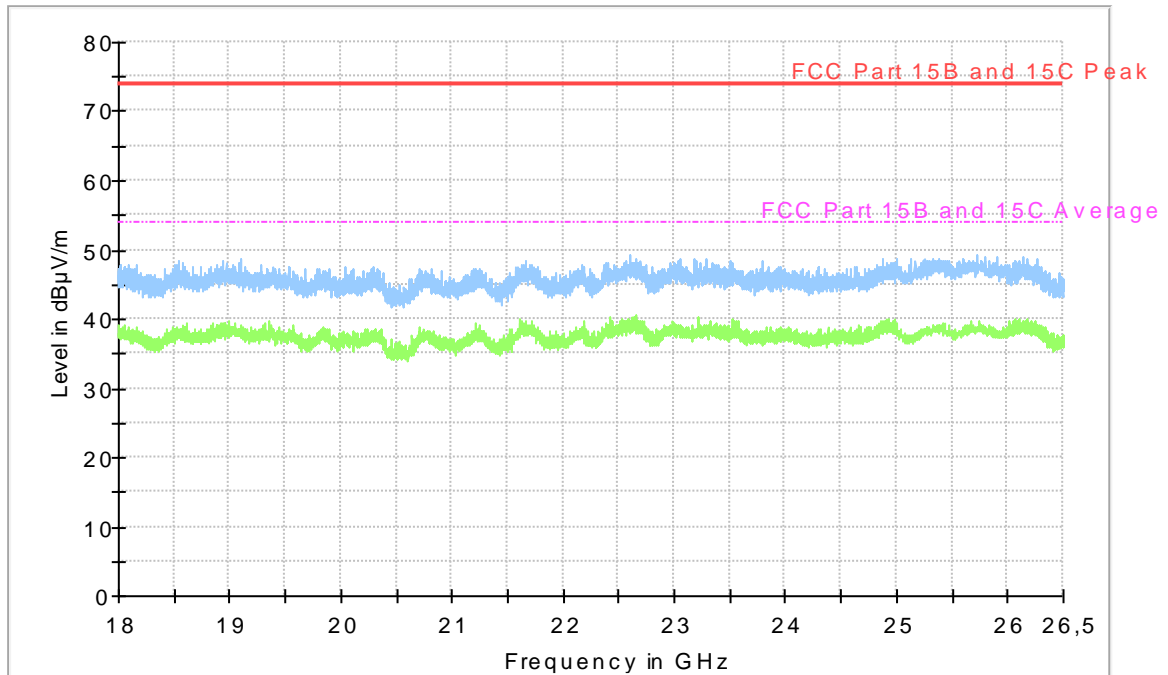
Diagram, Peak overview sweep, 18 – 26.5 GHz at 3 m distance. TX channel 149

Full Spectrum

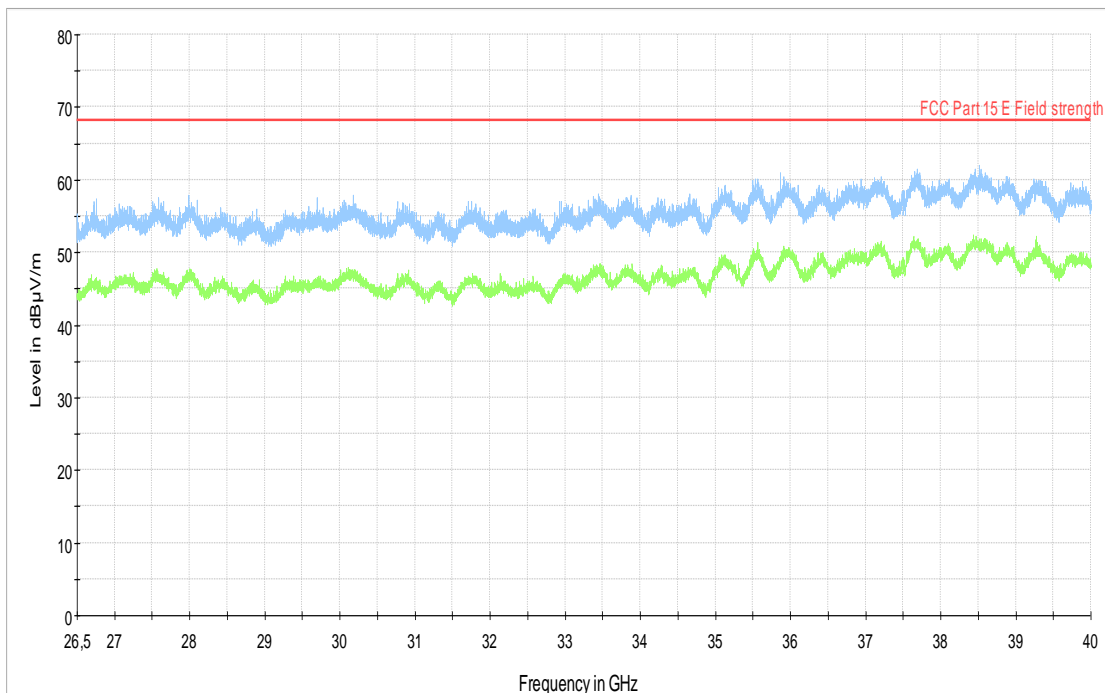


Diagram, Peak overview sweep, 18 – 26.5 GHz at 3 m distance. TX channel 157

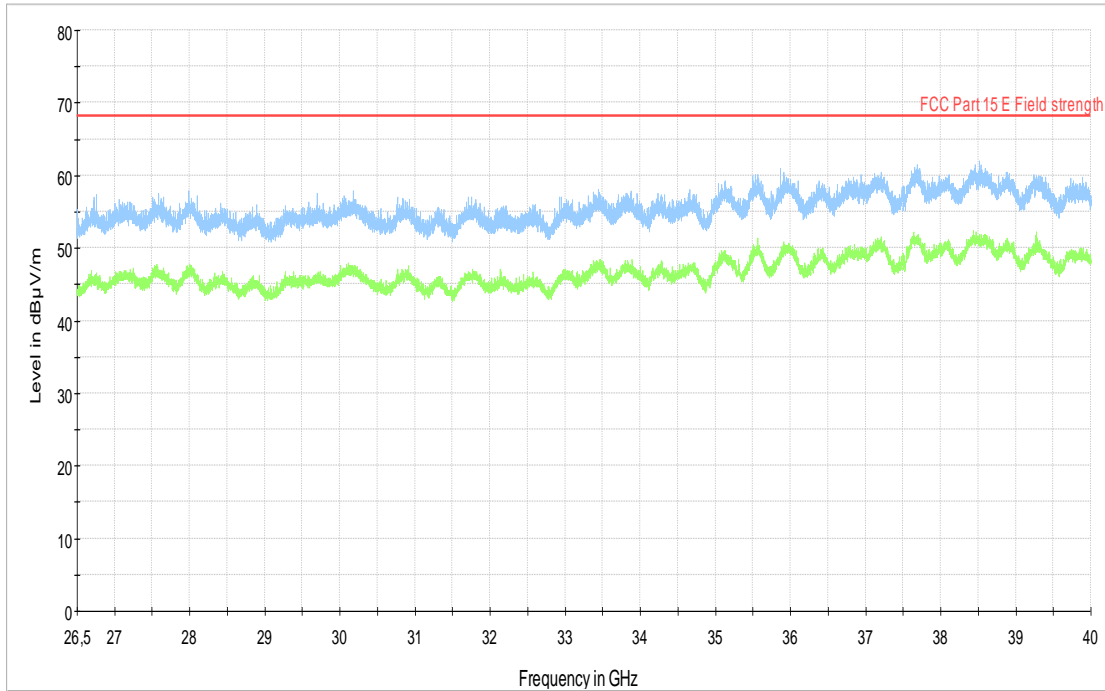
Full Spectrum



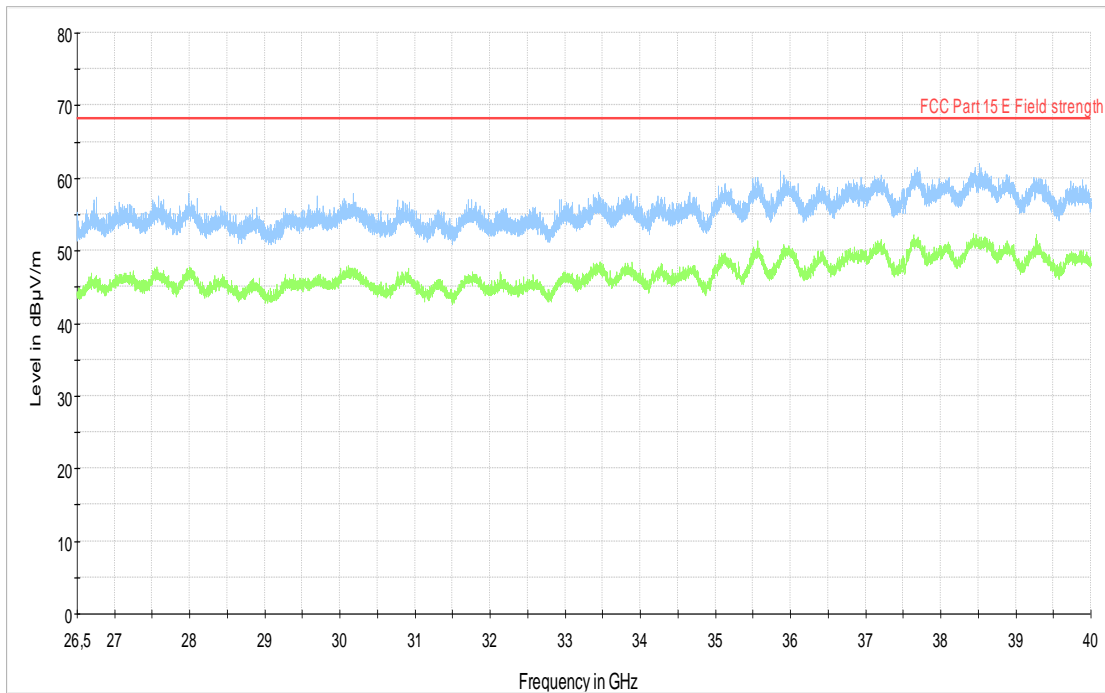
Diagram, Peak overview sweep, 18 – 26.5 GHz at 3 m distance. TX channel 165



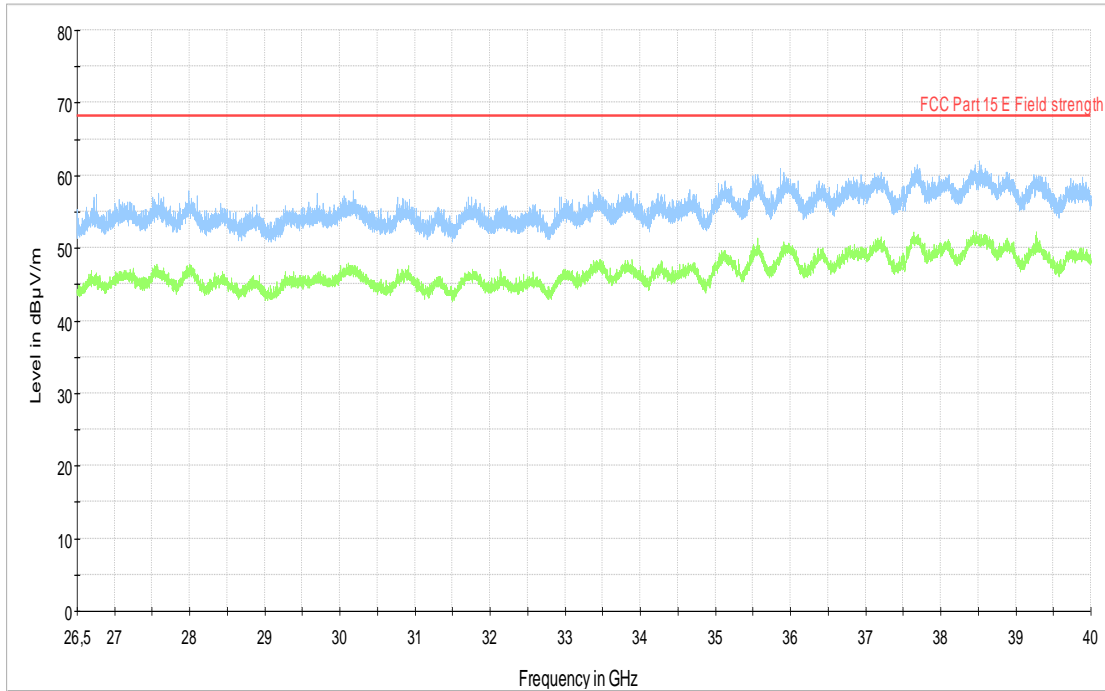
Diagram, Peak overview sweep, 26.5 – 40 GHz at 3 m distance. TX channel 36



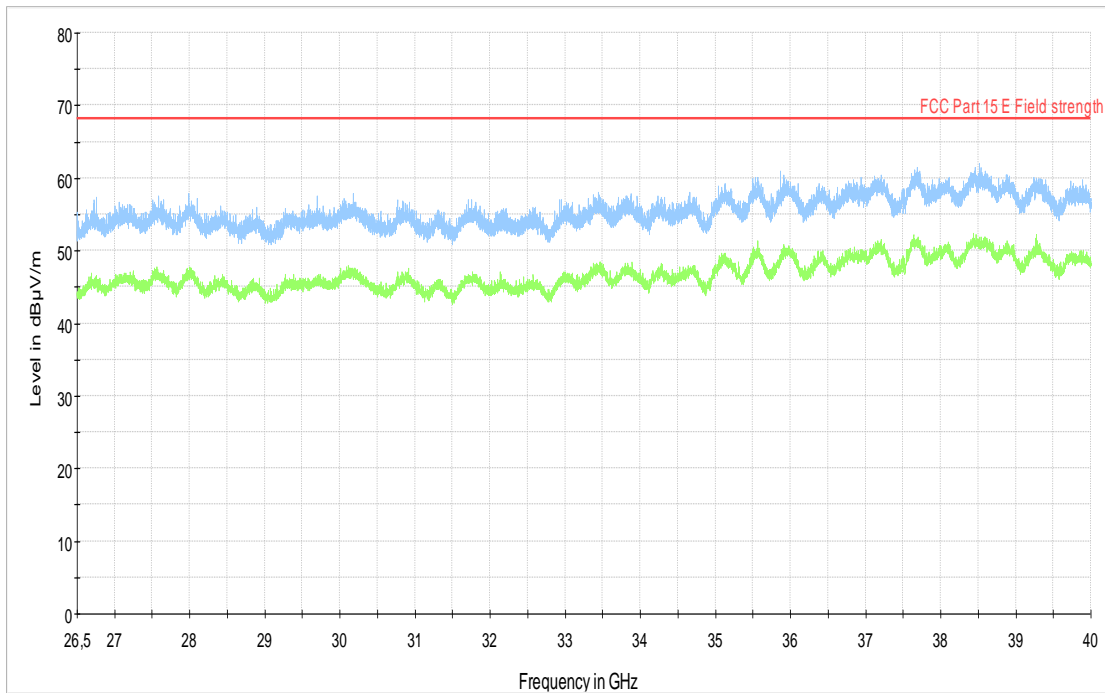
**Diagram, Peak overview sweep, 26.5 – 40 GHz at 3 m distance. TX channel 40**



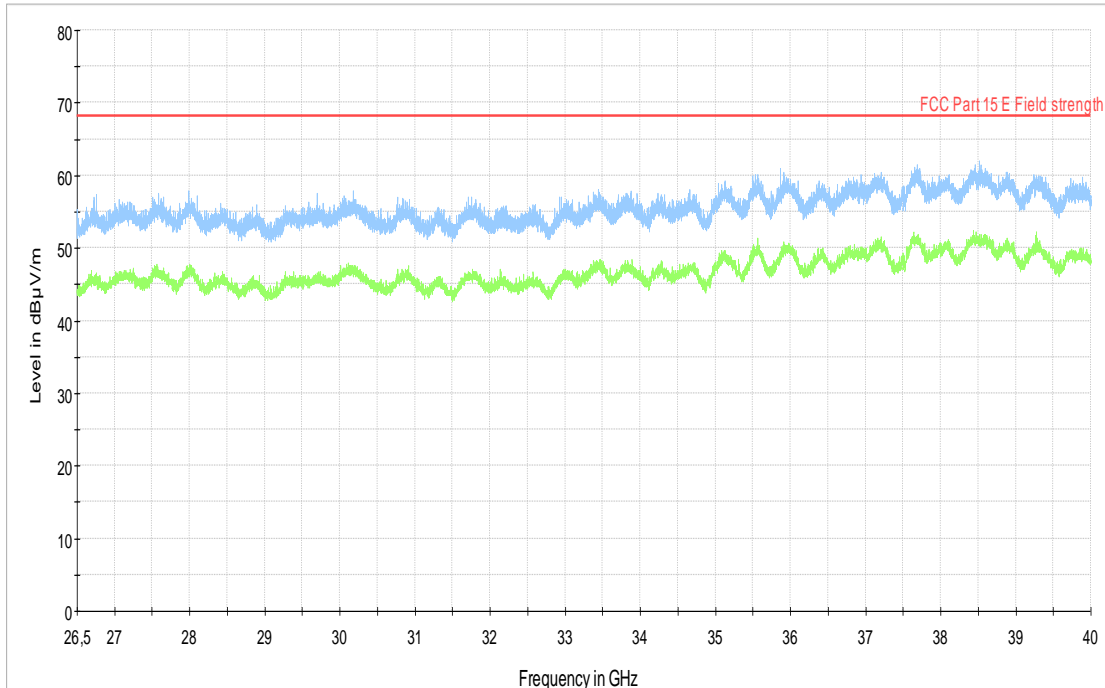
**Diagram, Peak overview sweep, 26.5 – 40 GHz at 3 m distance. TX channel 48**



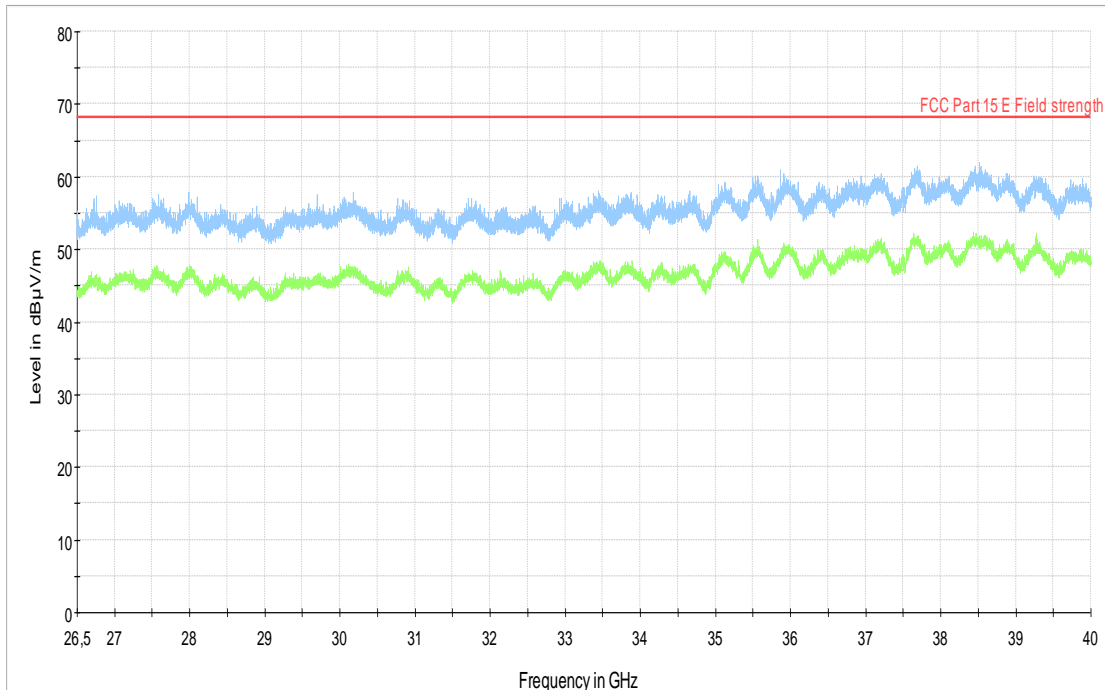
**Diagram, Peak overview sweep, 26.5 – 40 GHz at 3 m distance. TX channel 52**



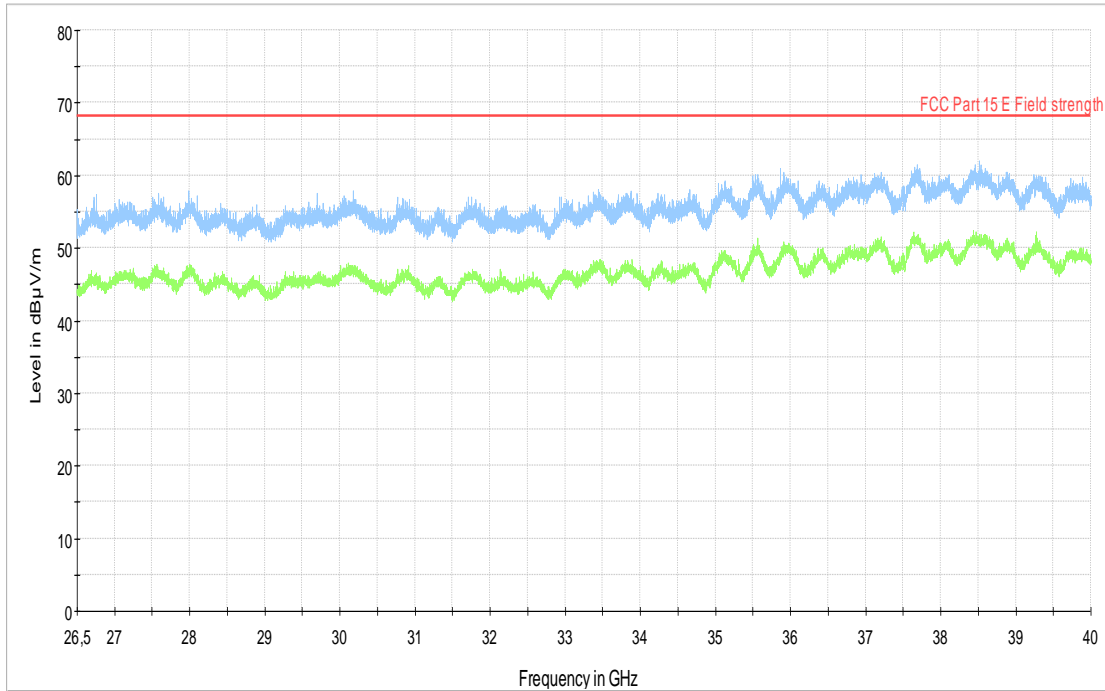
**Diagram, Peak overview sweep, 26.5 – 40 GHz at 3 m distance. TX channel 64**



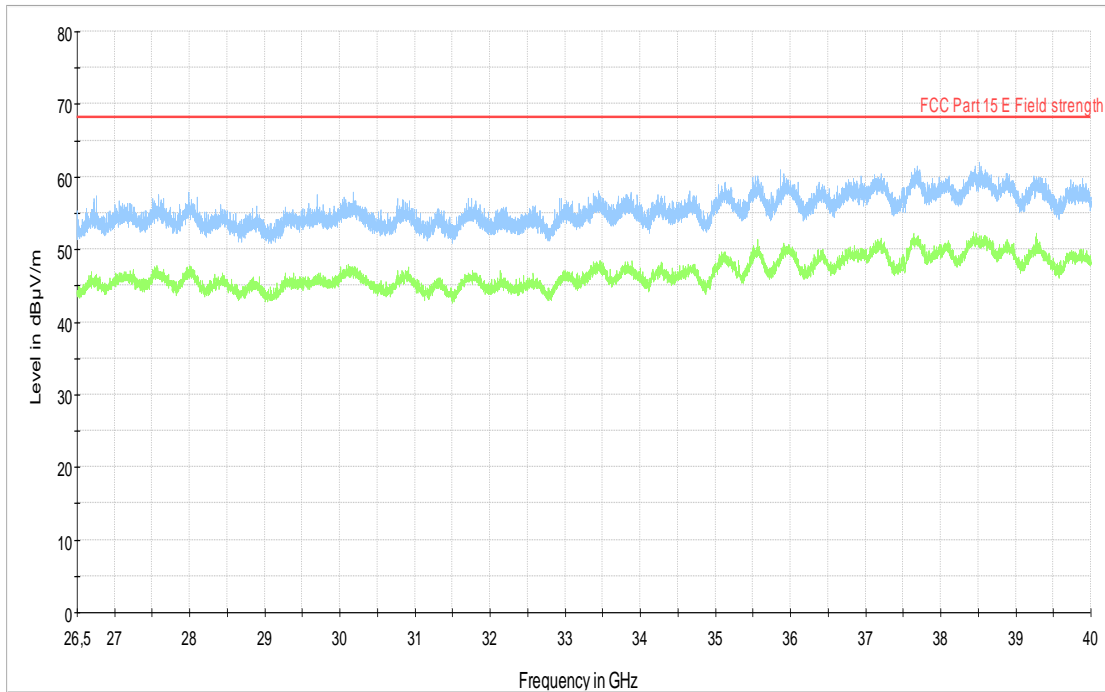
**Diagram, Peak overview sweep, 26.5 – 40 GHz at 3 m distance. TX channel 100**



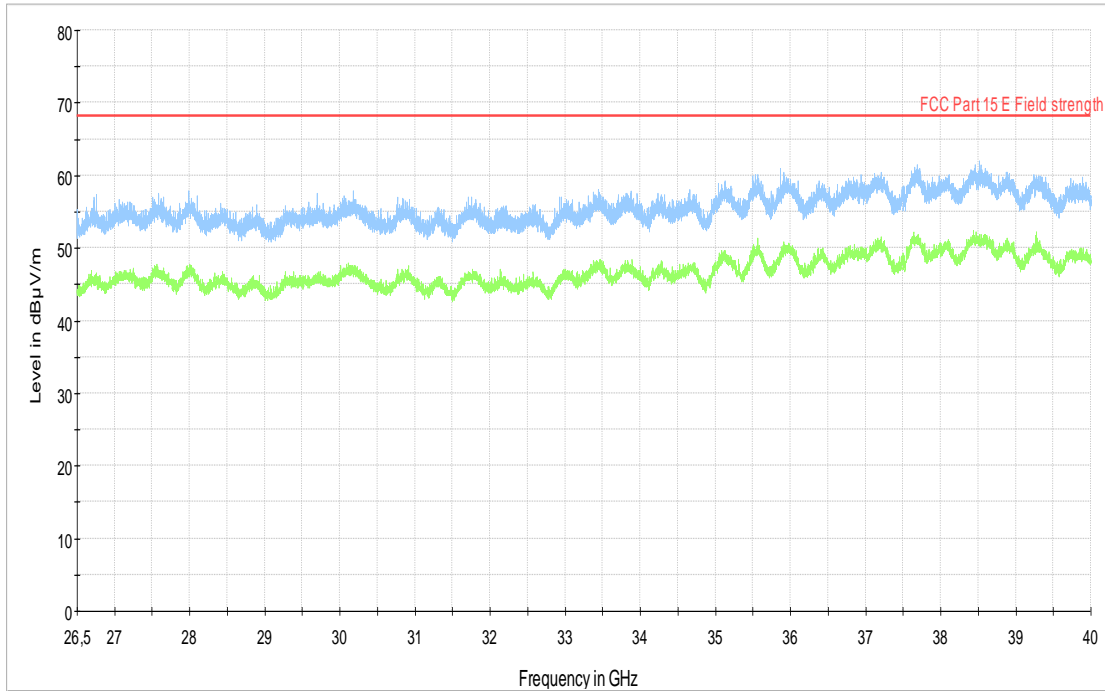
**Diagram, Peak overview sweep, 26.5 – 40 GHz at 3 m distance. TX channel 120**



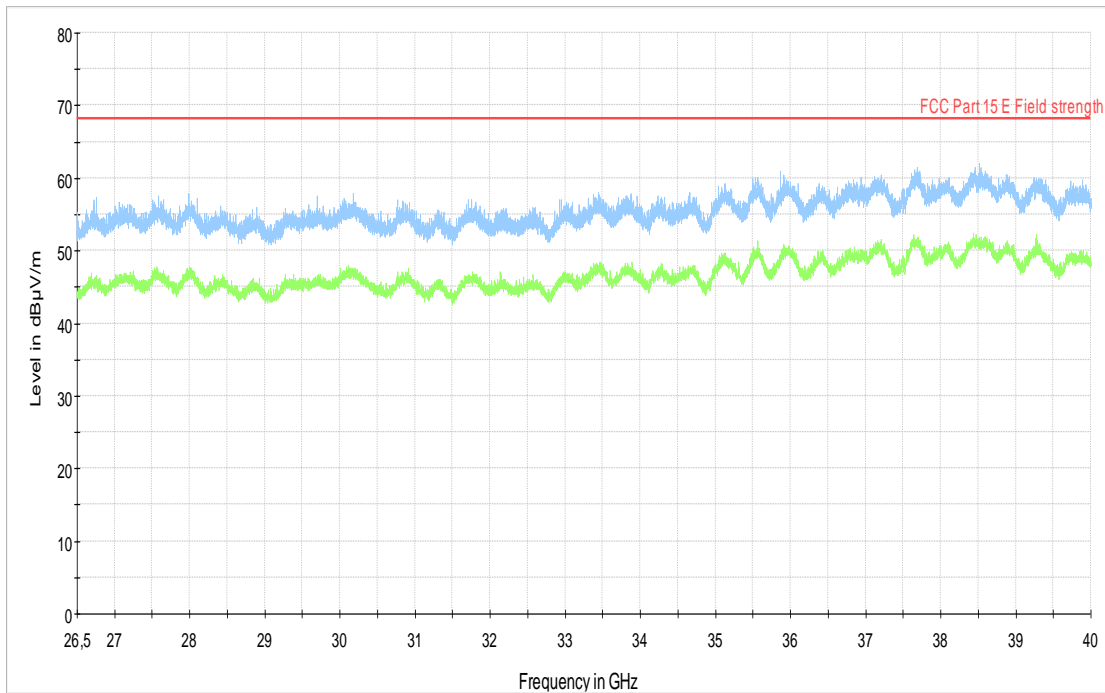
**Diagram, Peak overview sweep, 26.5 – 40 GHz at 3 m distance. TX channel 140**



**Diagram, Peak overview sweep, 26.5 – 40 GHz at 3 m distance. TX channel 149**



**Diagram, Peak overview sweep, 26.5 – 40 GHz at 3 m distance. TX channel 157**



**Diagram, Peak overview sweep, 26.5 – 40 GHz at 3 m distance. TX channel 165**



**Measurement results, Peak, TX channel 36**

Frequency [MHz]	Level [dB $\mu$ V/m]	Limit [dB $\mu$ V/m]	Polarization H/V	Margin [dB]
5141.8	59.0	74	H	15.0
5149.5	63.1	74	H	10.9

**Measurement results, Average, TX channel 36**

Frequency [MHz]	Level [dB $\mu$ V/m]	Limit [dB $\mu$ V/m]	Polarization H/V	Margin [dB]
5141.8	41.8	54	H	12.2
5149.6	47.9	54	H	6.1

**Measurement results, Peak, TX channel 40**

Frequency [MHz]	Level [dB $\mu$ V/m]	Limit [dB $\mu$ V/m]	Polarization H/V	Margin [dB]
--				

**Measurement results, Average, TX channel 40**

Frequency [MHz]	Level [dB $\mu$ V/m]	Limit [dB $\mu$ V/m]	Polarization H/V	Margin [dB]
--				

**Measurement results, Peak, TX channel 48**

Frequency [MHz]	Level [dB $\mu$ V/m]	Limit [dB $\mu$ V/m]	Polarization H/V	Margin [dB]
--				

**Measurement results, Average, TX channel 48**

Frequency [MHz]	Level [dB $\mu$ V/m]	Limit [dB $\mu$ V/m]	Polarization H/V	Margin [dB]
--				

**Measurement results, Peak, TX channel 64**

Frequency [MHz]	Level [dB $\mu$ V/m]	Limit [dB $\mu$ V/m]	Polarization H/V	Margin [dB]
3546.5	43.8	74	V	30.2
5350.5	59.6	74	H	14.4
5355.7	54.9	74	H	19.1
5357.7	55.9	74	H	22.1
5360.7	55.1	74	V	22.9
5360.7	55.8	74	H	22.2
5361.7	54.5	74	V	23.5

**Measurement results, Average, TX channel 64**

Frequency [MHz]	Level [dB $\mu$ V/m]	Limit [dB $\mu$ V/m]	Polarization H/V	Margin [dB]
3546.5	35.9	54	V	18.1
5350.5	44.0	54	H	10.0
5355.7	47.4	54	H	6.6
5357.8	46.2	54	H	7.8
5360.4	44.3	54	V	9.7
5360.6	41.5	54	H	12.5
5361.9	35.4	54	V	18.6

**Measurement results, Peak, TX channel 100**

Frequency [MHz]	Level [dB $\mu$ V/m]	Limit [dB $\mu$ V/m]	Polarization H/V	Margin [dB]
5459.8	64.5	74	H	9.5
5460.9	65.5	74	H	8.5
5464.4	64.2	74	H	9.8
5464.6	65.0	74	H	9.0
5469.5	63.7	74	H	10.3

**Measurement results, Average, TX channel 100**

Frequency [MHz]	Level [dB $\mu$ V/m]	Limit [dB $\mu$ V/m]	Polarization H/V	Margin [dB]
5459.9	44.3	54	H	9.7
5460.1	43.5	54	H	10.5
5464.4	47.8	54	H	6.2
5464.6	48.8	54	H	5.2
5469.5	50.3	54	H	3.7

**Measurement results, Peak, TX channel 120**

Frequency [MHz]	Level [dBµV/m]	Limit [dBµV/m]	Polarization H/V	Margin [dB]
--				

**Measurement results, Average, TX channel 120**

Frequency [MHz]	Level [dBµV/m]	Limit [dBµV/m]	Polarization H/V	Margin [dB]
--				

**Measurement results, Peak, TX channel 140**

Frequency [MHz]	Level [dBµV/m]	Limit [dBµV/m]	Polarization H/V	Margin [dB]
--				

**Measurement results, Average, TX channel 140**

Frequency [MHz]	Level [dBµV/m]	Limit [dBµV/m]	Polarization H/V	Margin [dB]
--				

**Measurement results, Peak, TX channel 149**

Frequency [MHz]	Level [dBµV/m]	Limit [dBµV/m]	Polarization H/V	Margin [dB]
--				

**Measurement results, Average, TX channel 149**

Frequency [MHz]	Level [dBµV/m]	Limit [dBµV/m]	Polarization H/V	Margin [dB]
--				

**Measurement results, Peak, TX channel 157**

Frequency [MHz]	Level [dBµV/m]	Limit [dBµV/m]	Polarization H/V	Margin [dB]
--				

**Measurement results, Average, TX channel 157**

Frequency [MHz]	Level [dBµV/m]	Limit [dBµV/m]	Polarization H/V	Margin [dB]
--				

**Measurement results, Peak, TX channel 165**

Frequency [MHz]	Level [dBµV/m]	Limit [dBµV/m]	Polarization H/V	Margin [dB]
--				

**Measurement results, Average, TX channel 165**

Frequency [MHz]	Level [dBµV/m]	Limit [dBµV/m]	Polarization H/V	Margin [dB]
--				

No emissions above 6 GHz were found on any channel.

Result [dBµV/m] = Analyser reading [dBµV] + Antenna factor [1/m] - Amplifier gain [dB] + Cable loss [dB] + filter loss [dB]

## 6 CONDUCTED BAND EDGE MEASUREMENT

<b>Date of test:</b>	2016-06-12 / 2016-06-15	<b>Test location:</b>	Wireless Center
<b>EUT Serial:</b>	No serial on the EUT	<b>Ambient temp:</b>	22 °C
<b>Tested by:</b>	Matti Virkki	<b>Relative humidity:</b>	40 %
<b>Test result:</b>	Pass	<b>Margin:</b>	1.0 dB

### 6.1 Test set-up and test procedure.

The test method is in accordance with 789033 D02 General UNII Test Procedures New Rules v01r02.

The EUT was connected to spectrum analyser via an rf-cable, a 10 dB attenuator and a coaxial switch.

### 6.2 Test conditions

Preliminary sweep to find worst emission frequency

Detector: Peak,  
 RBW: 1 MHz  
 VBW: 3 MHz  
 Span: 50 MHz

Final measurement settings with channel power function on worst frequency

Detector: Peak,  
 RBW: 100 kHz  
 VBW: 300 kHz  
 Span: 2 MHz

Spectrum analyser's band power function was used to measure the power over 1MHz band at band edge

### 6.3 Requirement

Reference: CFR 47 §15.407 (b), RSS-247 6.2.2.2, 6.2.3.2, 6.2.4.2

For transmitters operating in the 5.15-5.25 GHz band: All emissions outside of the 5.15-5.35 GHz band shall not exceed an e.i.r.p. of -27 dBm/MHz.

For transmitters operating in the 5.25-5.35 GHz band: All emissions outside of the 5.15-5.35 GHz band shall not exceed an e.i.r.p. of -27 dBm/MHz.

For transmitters operating in the 5.47-5.725 GHz band: All emissions outside of the 5.47-5.725 GHz band shall not exceed an e.i.r.p. of -27 dBm/MHz.

For transmitters operating in the 5.725-5.85 GHz band: All emissions within the frequency range from the band edge to 10 MHz above or below the band edge shall not exceed an e.i.r.p. of -17 dBm/MHz; for frequencies 10 MHz or greater above or below the band edge, emissions shall not exceed an e.i.r.p. of -27 dBm/MHz.

## 6.4 Test results

## Test results U-NII 1 and U-NII 2A

## Mode a

Band edge	SA level [dBm]	Pathloss [dB]	Antennna gain [dBi]	PSD [dBm/MHz]	Limit [dBm/MHz]	Margin [dB]
5150	-50.59	20	0.7	-29.9	-27	2.9
5350	-55.93	20	0.7	-35.2	-27	8.2

## Mode n HT-20

Band edge	SA level [dBm]	Pathloss [dB]	Antennna gain [dBi]	PSD [dBm/MHz]	Limit [dBm/MHz]	Margin [dB]
5150	-49.33	20	0.7	-28.6	-27	1.6
5350	-54.94	20	0.7	-34.2	-27	7.2

## Mode n HT-40

Band edge	SA level [dBm]	Pathloss [dB]	Antennna gain [dBi]	PSD [dBm/MHz]	Limit [dBm/MHz]	Margin [dB]
5150	-48.73	20	0.7	-27.7	-27	1.0
5350	-48.69	20	0.7	-28.0	-27	1.0

## Test results U-NII 2B

## Mode a

Band edge	SA level [dBm]	Pathloss [dB]	Antennna gain [dBi]	PSD [dBm/MHz]	Limit [dBm/MHz]	Margin [dB]
5470	-51.66	19,7	0.7	-31.3	-27	4.3
5725	-54.10	19,7	0.7	-33.7	-27	6.7

## Mode n HT-20

Band edge	SA level [dBm]	Pathloss [dB]	Antennna gain [dBi]	PSD [dBm/MHz]	Limit [dBm/MHz]	Margin [dB]
5470	-49.3	19,7	0.7	-29.3	-27	2.3
5725	-53.84	19,7	0.7	-33.4	-27	6.4

## Mode n HT-40

Band edge	SA level [dBm]	Pathloss [dB]	Antennna gain [dBi]	PSD [dBm/MHz]	Limit [dBm/MHz]	Margin [dB]
5470	-54.55	19,7	0.7	-34.2	-27	7.2
5725	-55.21	19,7	0.7	-34.8	-27	7.8

**Test results U-NII 3**

**Mode a**

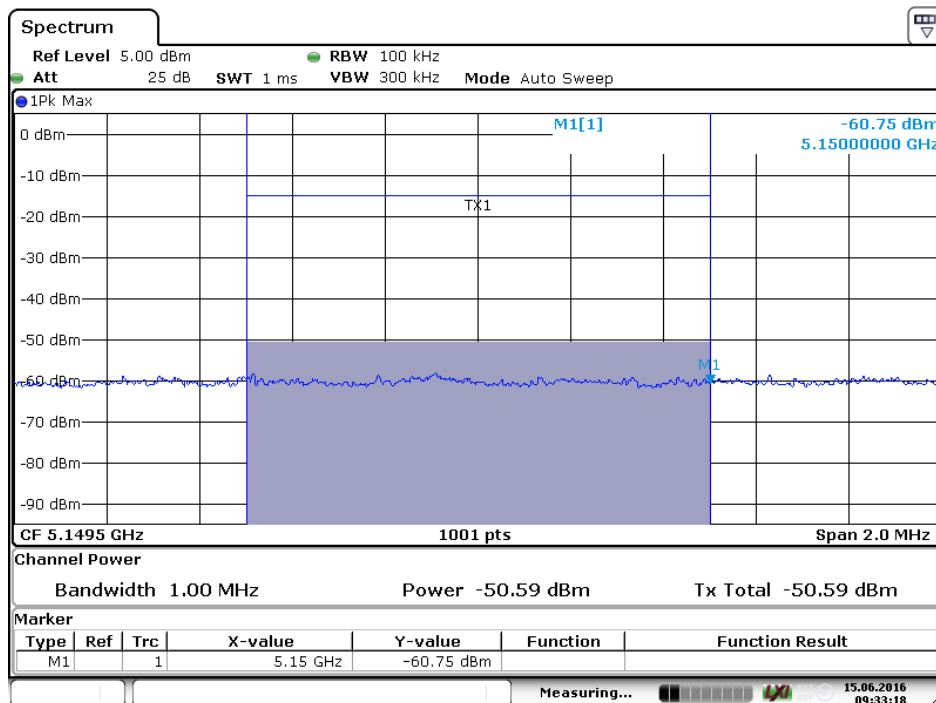
Band edge	SA level [dBm]	Pathloss [dB]	Antenna gain [dBi]	PSD [dBm/MHz]	Limit [dBm/MHz]	Margin [dB]
5725	-49.42	19,7	0.7	-29.0	-17	12.0
5715	-52.97	19,7	0.7	-32.6	-27	5.6
5850	-52.46	19,7	0.7	-32.1	-17	15.1
5860	-62.08	19,7	0.7	-41.7	-27	14.7

**Mode n HT-20**

Band edge	SA level [dBm]	Pathloss [dB]	Antenna gain [dBi]	PSD [dBm/MHz]	Limit [dBm/MHz]	Margin [dB]
5725	-43.64	19,7	0.7	-23.2	-17	3.2
5.715	-52.97	19,7	0.7	-32.6	-27	5.6
5850	-51.95	19,7	0.7	-31.6	-17	14.6
5860	-61.33	19,7	0.7	-40.9	-25	13.9

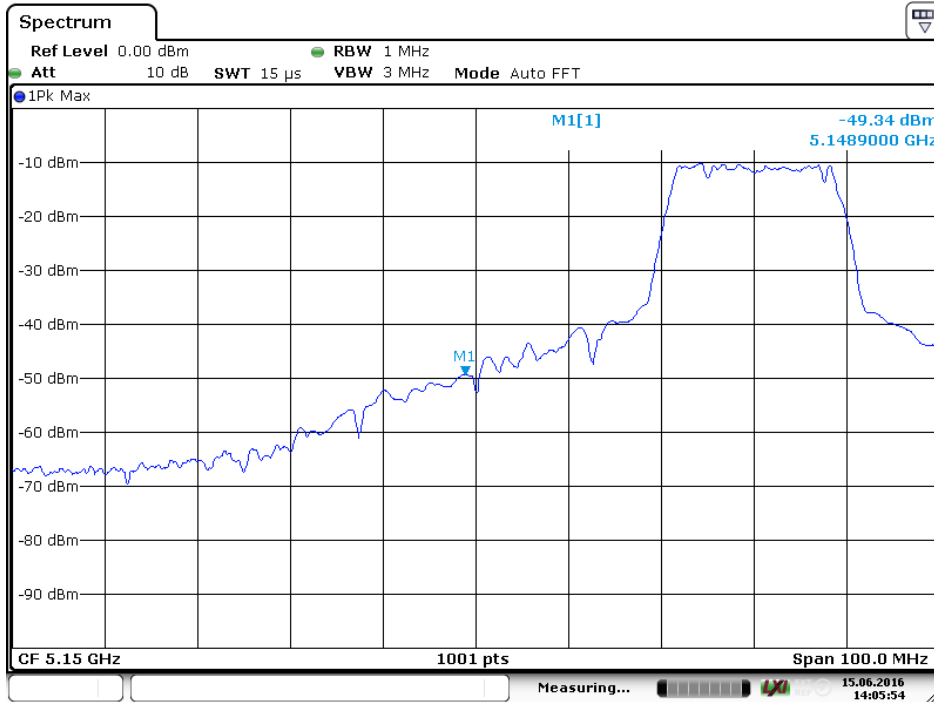
**Mode n HT-40**

Band edge	SA level [dBm]	Pathloss [dB]	Antenna gain [dBi]	PSD [dBm/MHz]	Limit [dBm/MHz]	Margin [dB]
5725	-43.64	19,7	0.7	-23.2	-17	6.2
5.715	-50.98	19,7	0.7	-30.7	-27	3.7
5850	-59.53	19,7	0.7	-39.1	-17	22.1
5860	<-59.53	19,7	0.7	<-39.1	-25	> 12.1



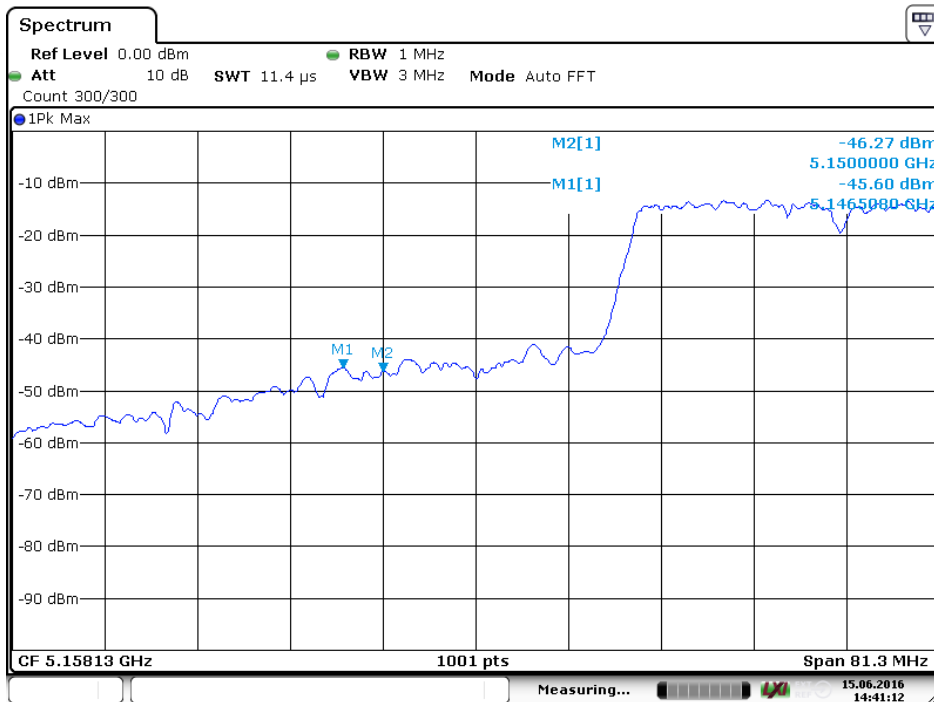
Date: 15 JUN 2016 09:33:18

**Screenshot: Lower band edge sweep, 5150 MHz mode a**



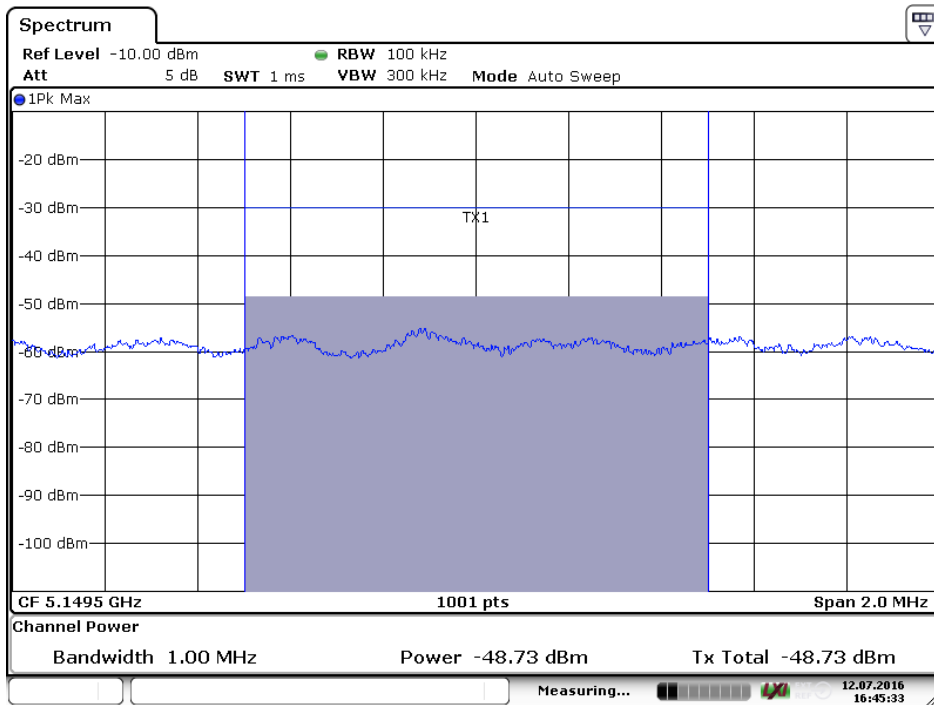
Date: 15 JUN 2016 14:05:54

**Screenshot: Lower band edge sweep, 5150 MHz mode n HT-20**



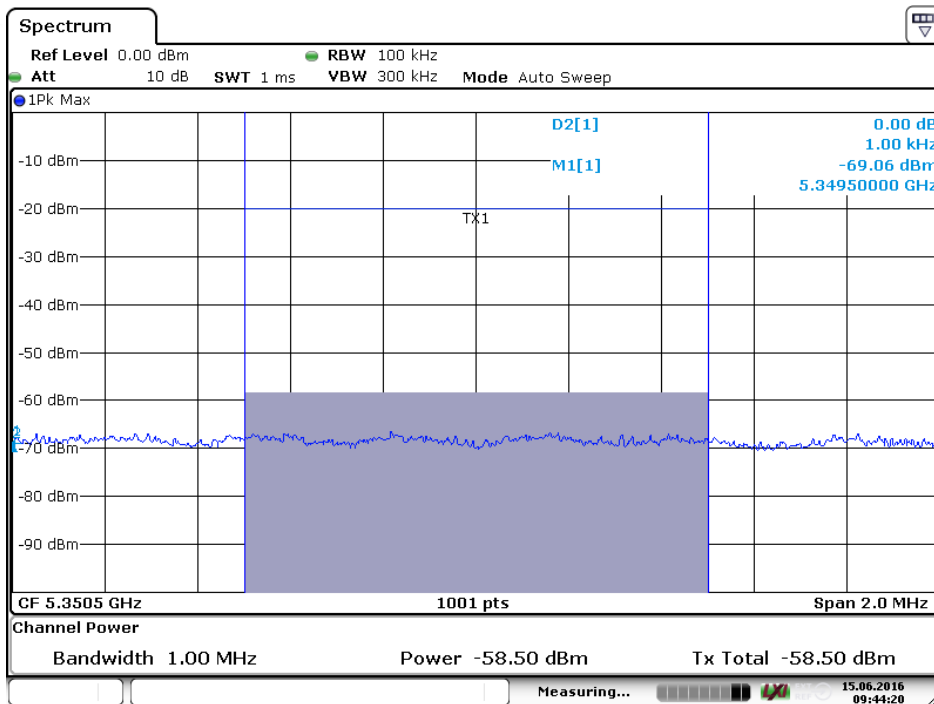
Date: 15 JUN 2016 14:41:12

**Screenshot: Lower band edge sweep, 5150 MHz mode n HT-40**



Date: 12 JUL 2016 16:45:34

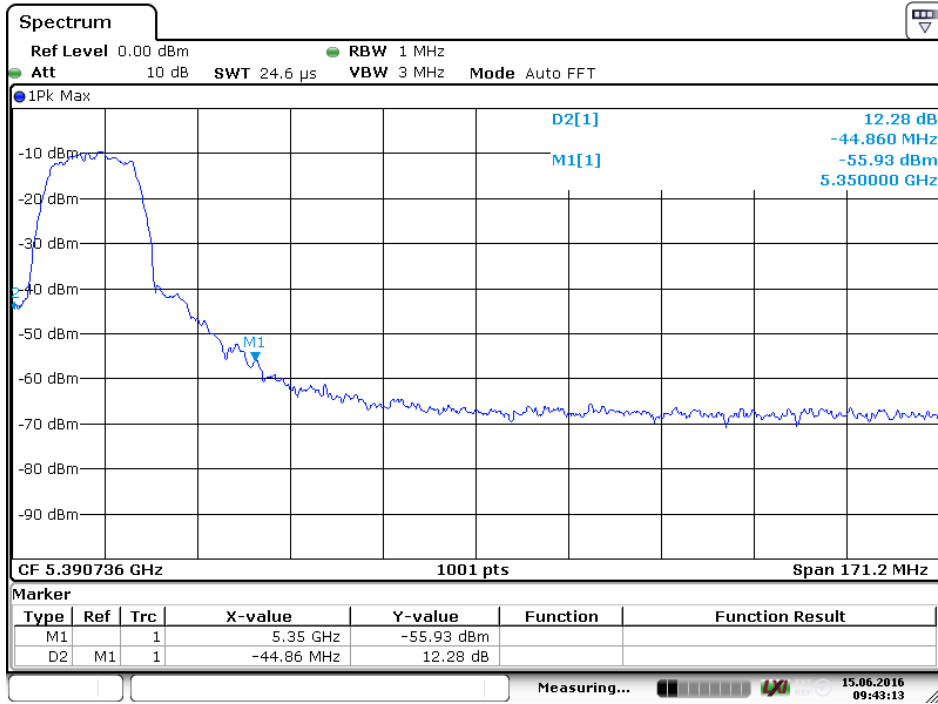
**Screenshot: Lower band edge sweep, 5150 MHz mode n HT-40**



Date: 15 JUN 2016 09:44:21

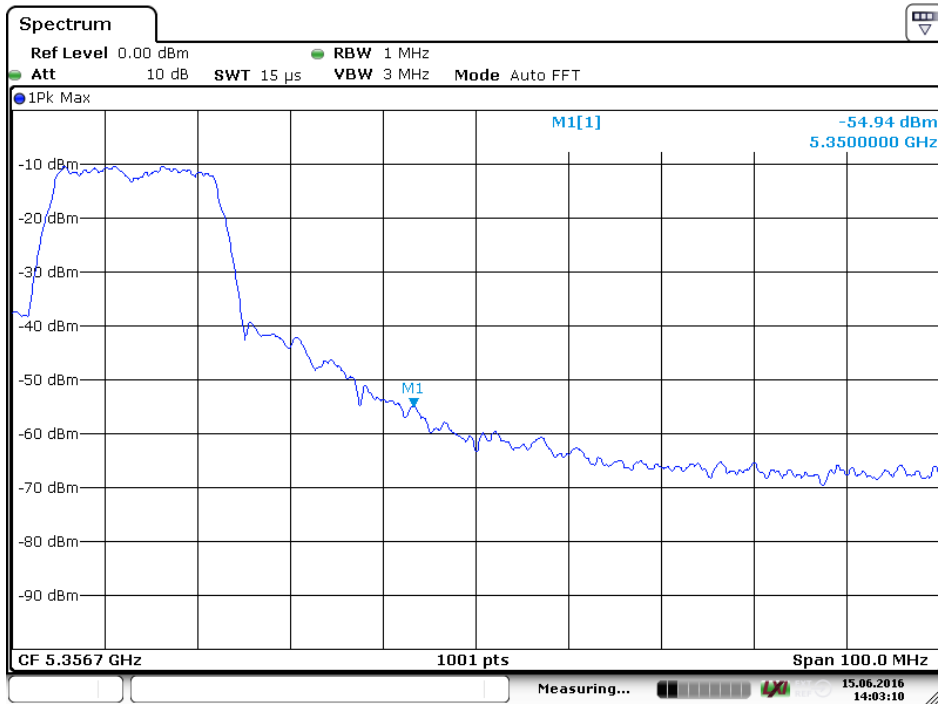
**Screenshot: upper band edge sweep, 5350 MHz mode a**





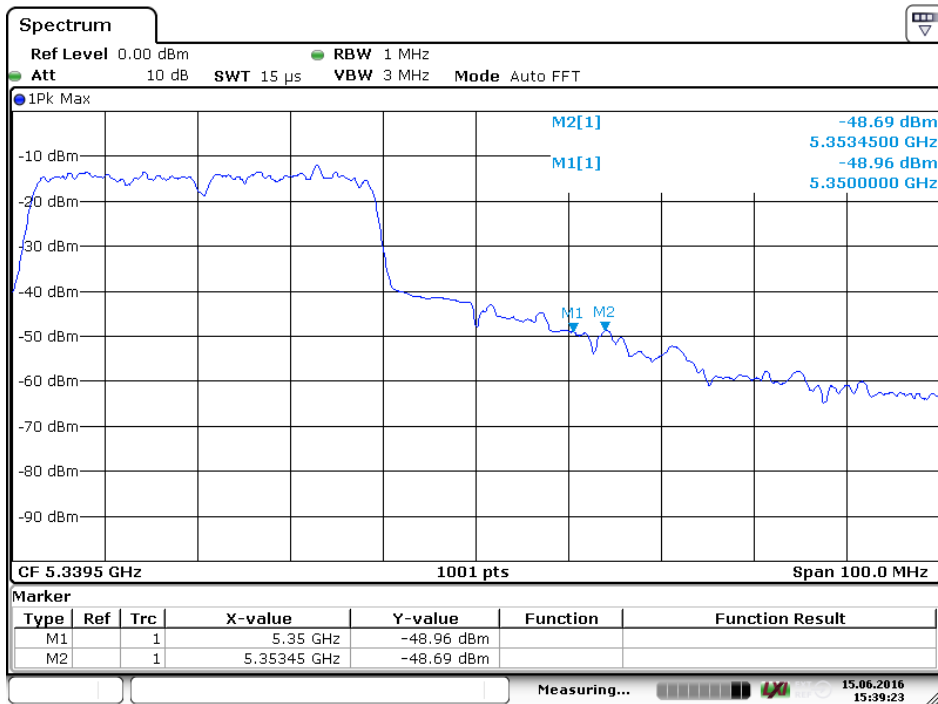
Date: 15 JUN 2016 09:43:13

**Screenshot: upper band edge sweep, 5350 MHz mode a**



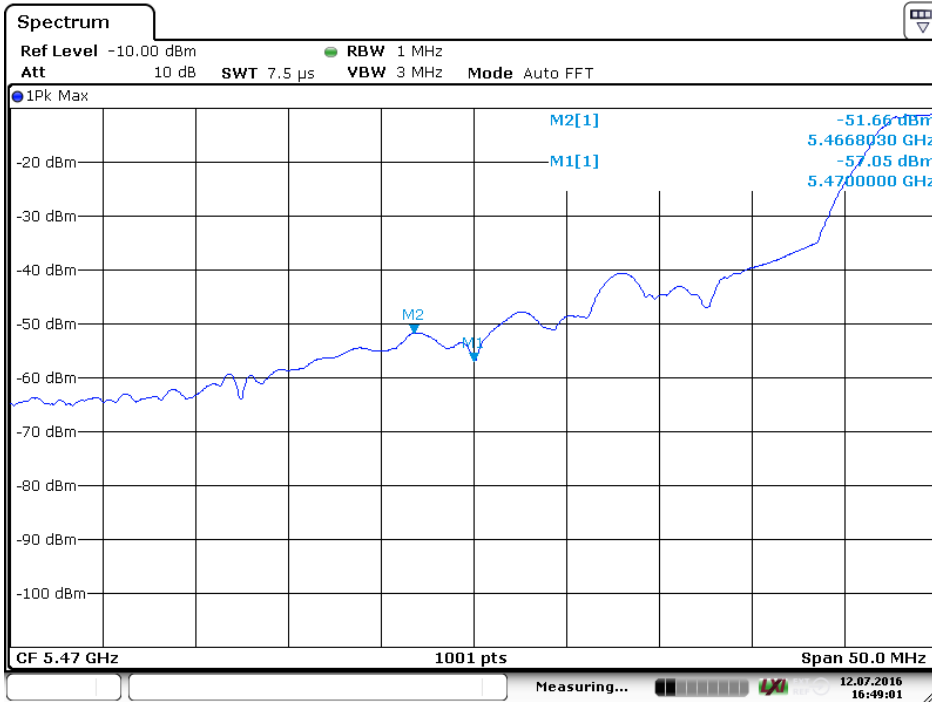
Date: 15 JUN 2016 14:03:10

**Screenshot: upper band edge sweep, 5350 MHz mode n HT-20**



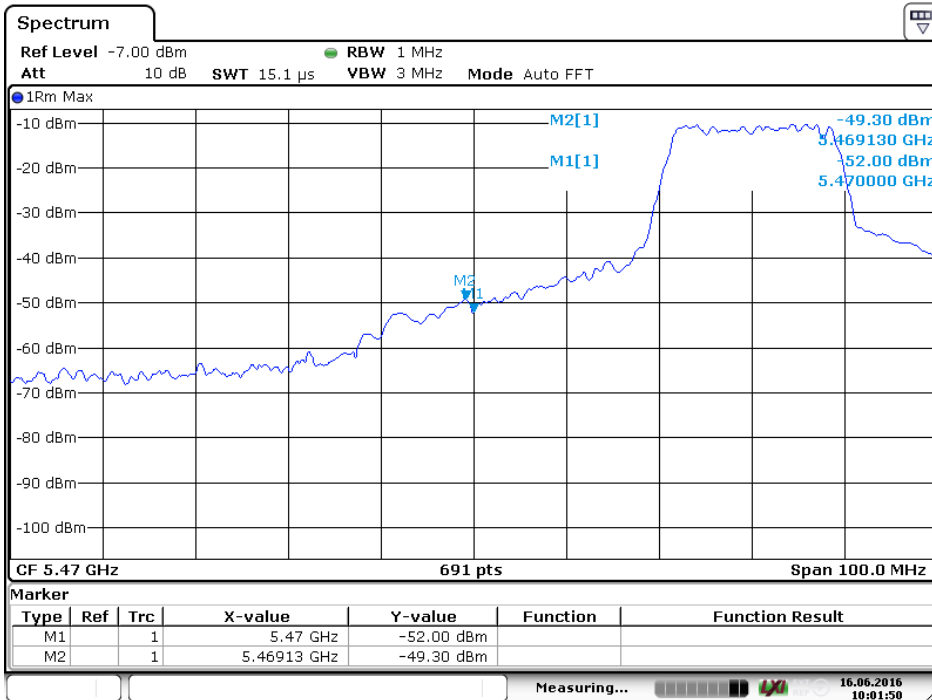
Date: 15 JUN 2016 15:39:23

**Screenshot: upper band edge sweep, 5350 MHz mode n HT-40**



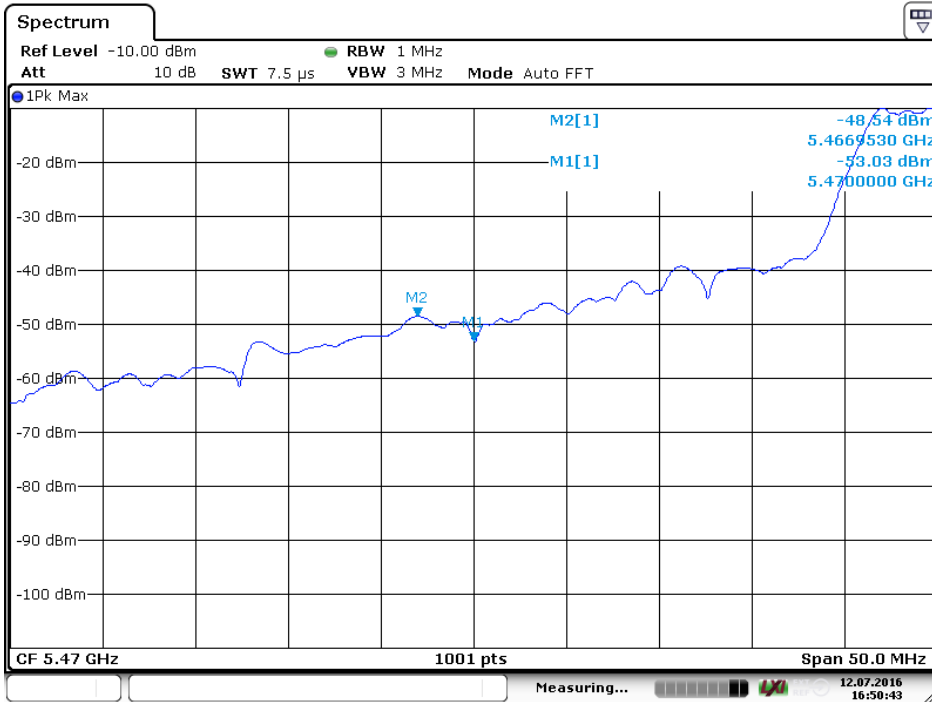
Date: 12 JUL 2016 16:49:01

**Screenshot: Lower band edge sweep, 5470 MHz mode a**



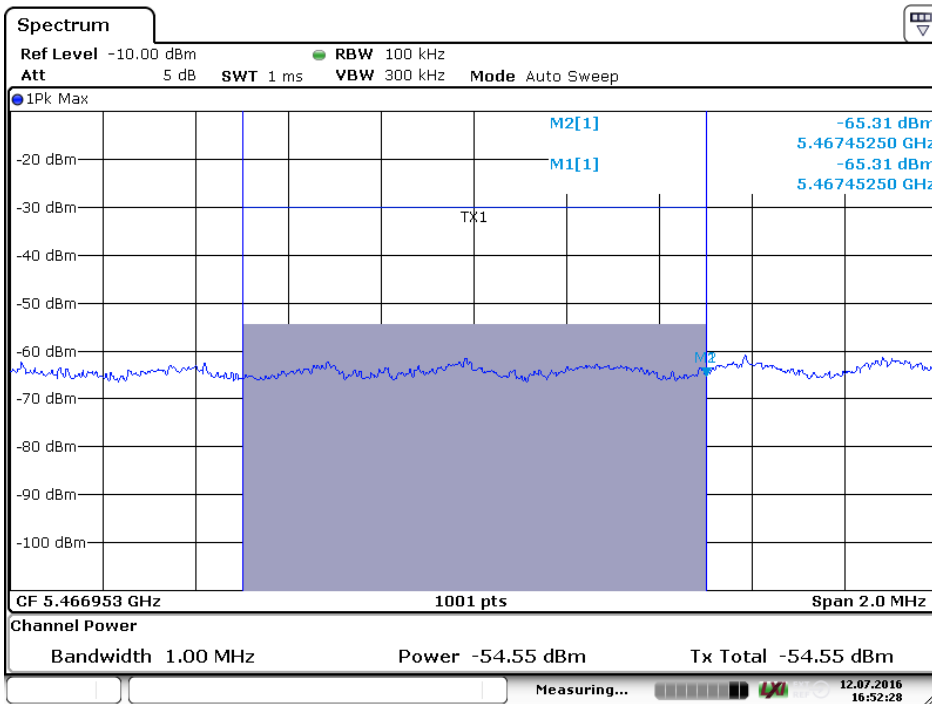
Date: 16 JUN 2016 10:01:50

**Screenshot: Lower band edge sweep, 5470 MHz mode n HT-20**



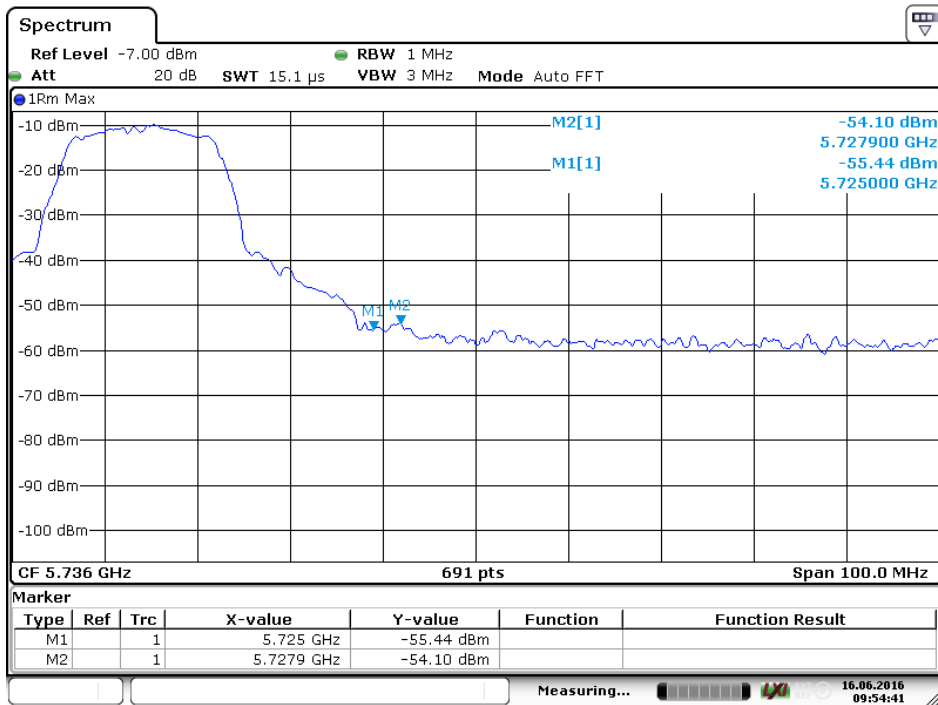
Date: 12 JUL 2016 16:50:44

**Screenshot: Lower band edge sweep, 5470 MHz mode n HT-40**



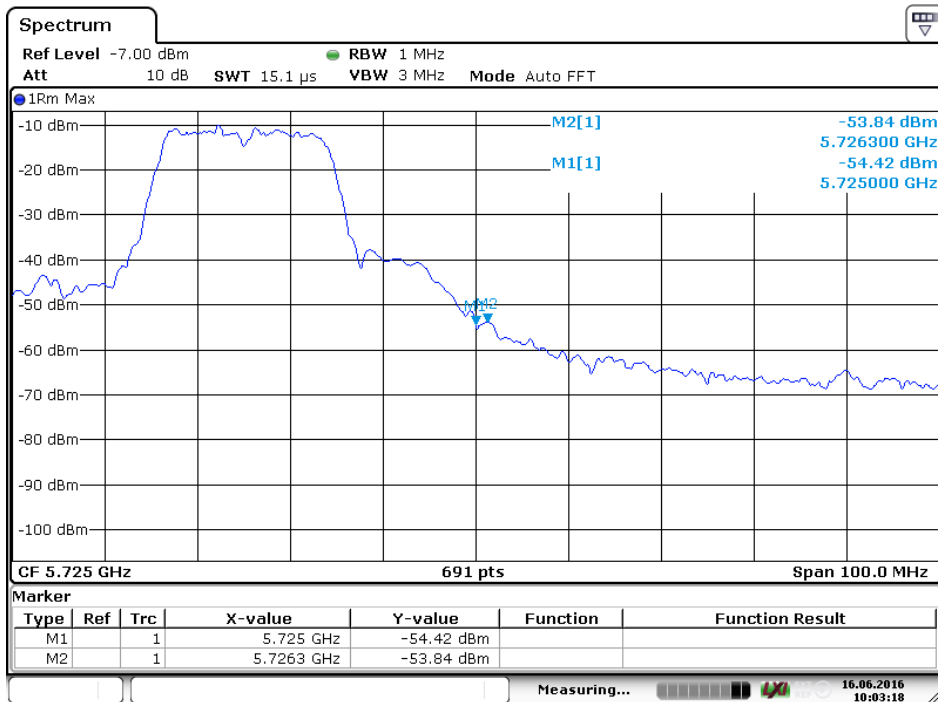
Date: 12 JUL 2016 16:52:28

**Screenshot: Lower band edge sweep, 5470 MHz mode n HT-40**



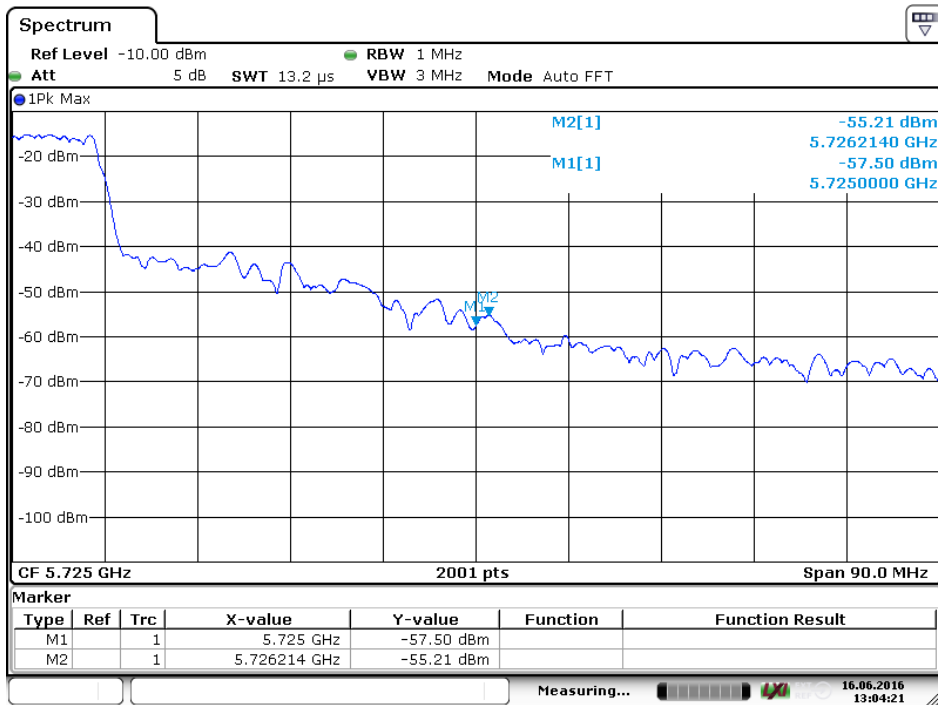
Date: 16 JUN 2016 09:54:41

**Screenshot: upper band edge sweep, 5725 MHz mode a**



Date: 16 JUN 2016 10:03:18

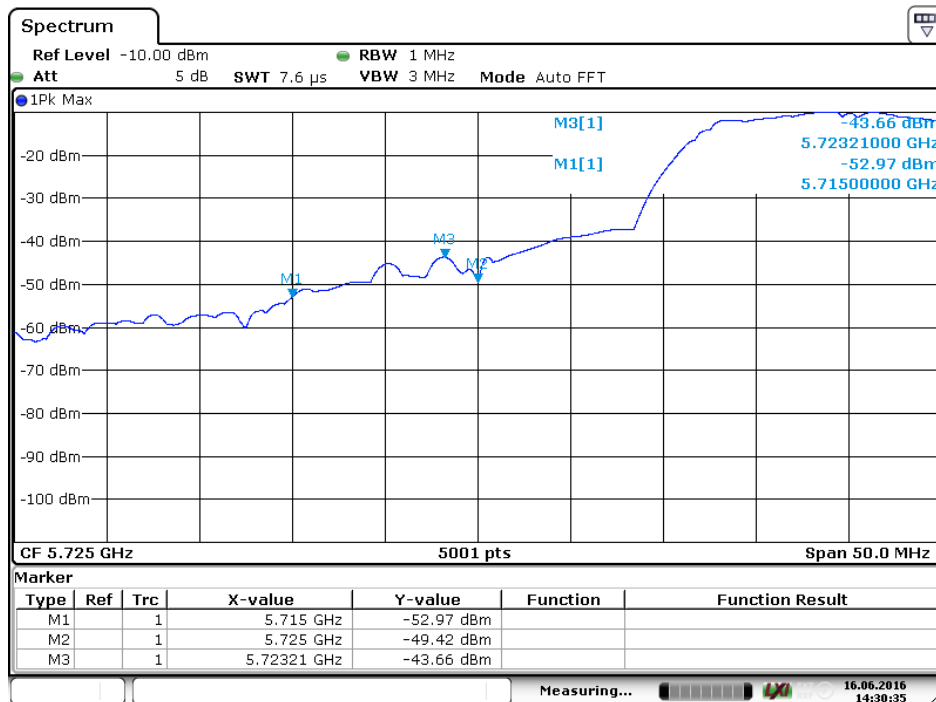
**Screenshot: upper band edge sweep, 5725 MHz mode n HT-20**



Date: 16 JUN 2016 13:04:22

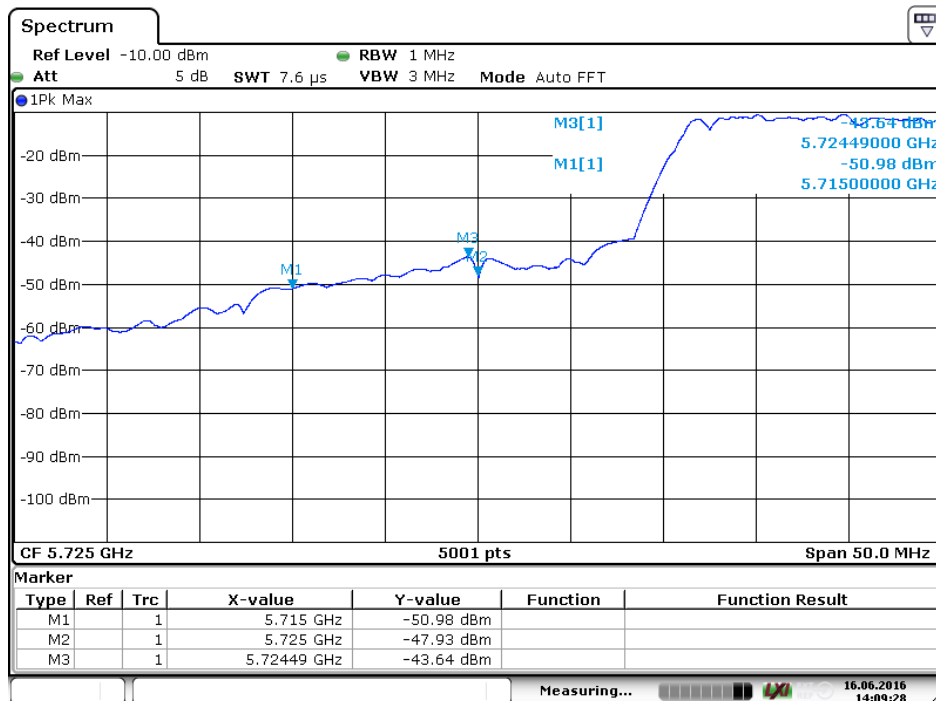
**Screenshot: upper band edge sweep, 5725 MHz mode n HT-40**

**Test results U-NII 3**



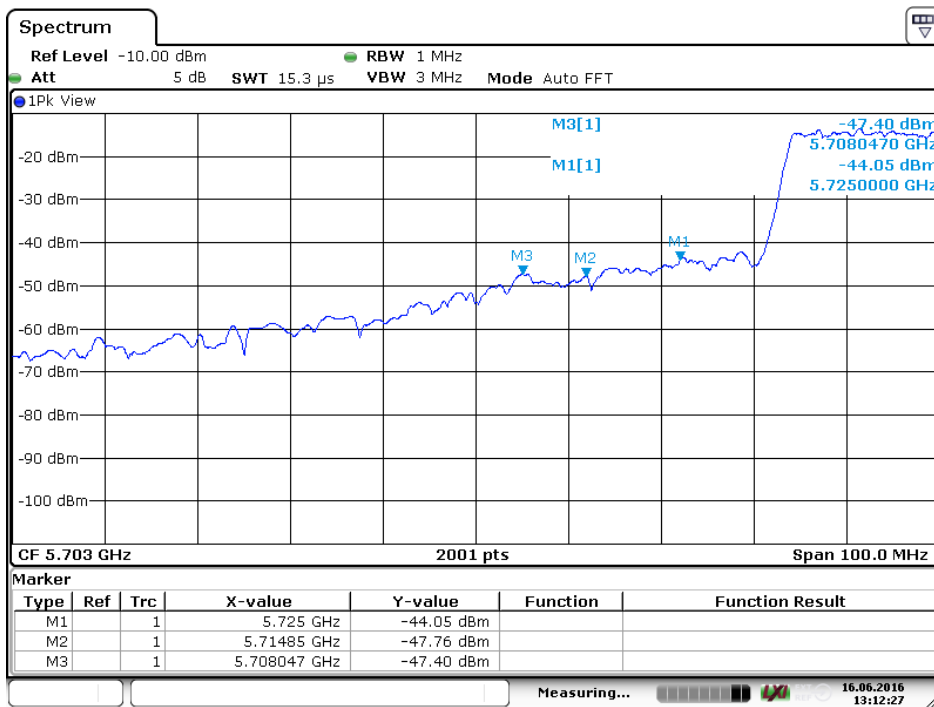
Date: 16 JUN 2016 14:30:35

**Screenshot: lower band edge sweep, 5725 MHz mode a**



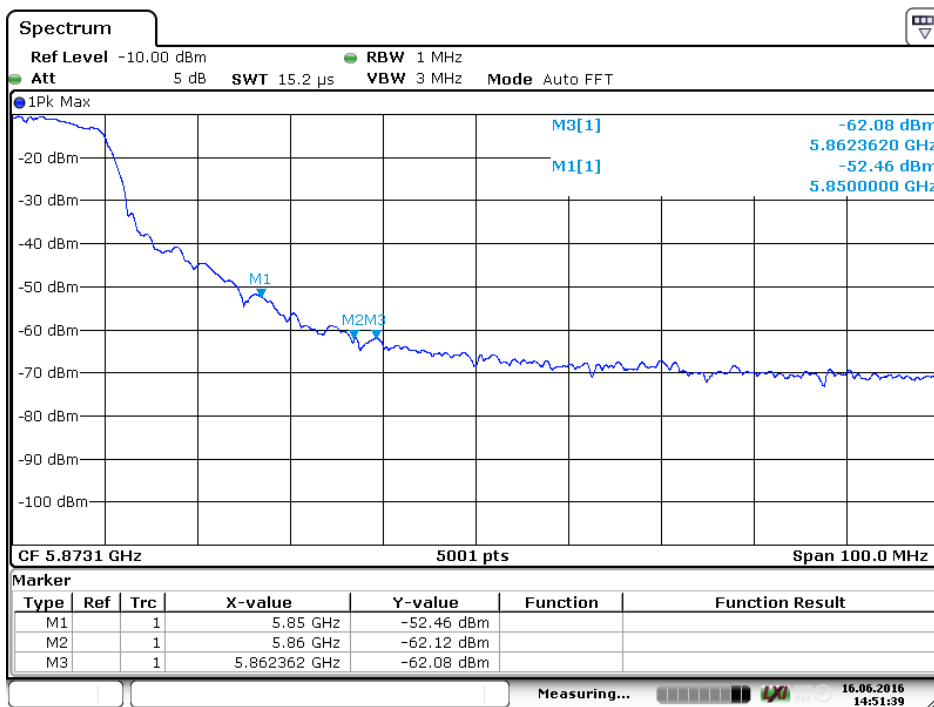
Date: 16 JUN 2016 14:09:28

**Screenshot: lower band edge sweep, 5725 MHz mode n HT-20**



Date: 16 JUN 2016 13:12:27

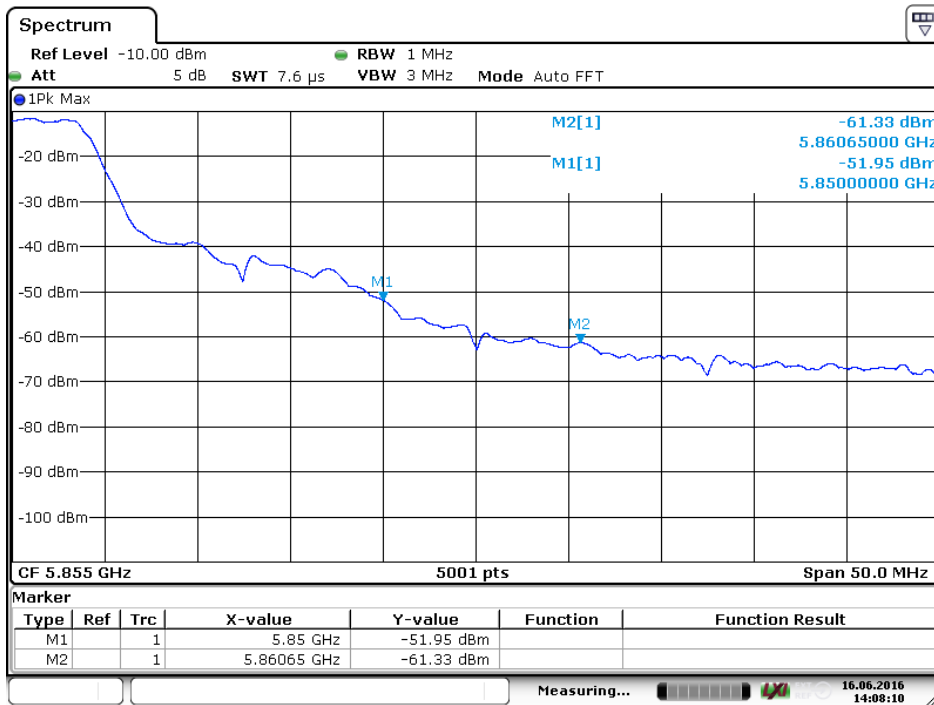
**Screenshot: lower band edge sweep, 5725 MHz mode n HT-40**



Date: 16 JUN 2016 14:51:40

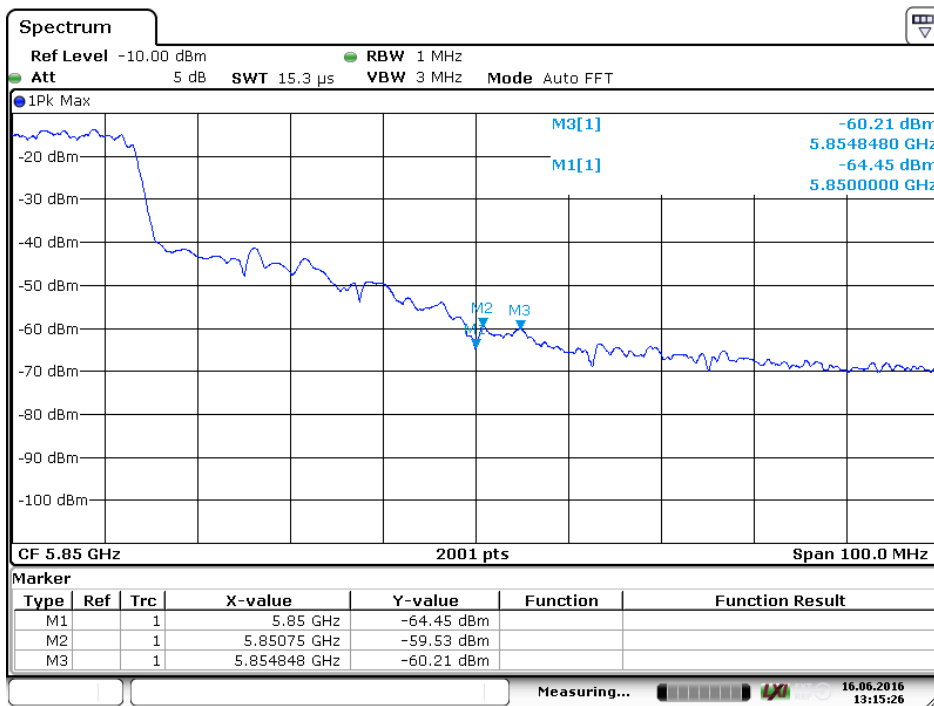
**Screenshot: upper band edge sweep, 5850 MHz mode a**





Date: 16 JUN 2016 14:08:10

**Screenshot: upper band edge sweep, 5850 MHz mode n HT-20**



Date: 16 JUN 2016 13:15:25

**Screenshot: upper band edge sweep, 5850 MHz mode n HT-40**

## 7 CONDUCTED OUTPUT POWER AND PEAK POWER SPECTRAL DENSITY

<b>Date of test:</b>	2016-06-15	<b>Test location:</b>	Wireless Center
<b>EUT Serial:</b>	No serial on the EUT	<b>Ambient temp:</b>	22 °C
<b>Tested by:</b>	Matti Virkki	<b>Relative humidity:</b>	37 %
<b>Test result:</b>	Pass	<b>Margin:</b>	6.4dB

### 7.1 Test set-up and test procedure.

The test method is in accordance with KDB 789033 D02 General UNII Test Procedures New Rulesv01r02 section E.

The EUT was connected to spectrum analyser via an rf-cable, a 10 dB attenuator and a coaxial switch.

### 7.2 Test conditions

Average power

Detector: RMS  
 RBW: 1 MHz  
 VBW: 3 x RBW  
 Span: >3 x OBW  
 Trace: avg > 100 sweeps

The spectrum analyser's band power measurement function was used to integrate the power over the whole transmitter band. The analyser marker was used to find the highest PSD value.

### 7.3 Requirements

Reference: CFR 47§15.407(a)

For mobile and portable client devices in the 5.15-5.25 GHz band, the maximum conducted output power over the frequency band of operation shall not exceed 250 mW provided the maximum antenna gain does not exceed 6 dBi. In addition, the maximum power spectral density shall not exceed 11 dBm in any 1 megahertz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

For the 5.25-5.35 GHz and 5.47-5.725 GHz bands, the maximum conducted output power over the frequency bands of operation shall not exceed the lesser of 250 mW or 11 dBm + 10 log B, where B is the 26 dB emission bandwidth in megahertz. In addition, the maximum power spectral density shall not exceed 11 dBm in any 1 megahertz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

For the band 5.725-5.85 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W. In addition, the maximum power spectral density shall not exceed 30 dBm in any 500-kHz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

Reference: RSS-247 6.2.1.1, 6.2.2.1, 6.2.3.1 and 6.2.4.1

Frequency Band 5150-5250 MHz

The maximum e.i.r.p. shall not exceed 200 mW or  $10 + 10 \log_{10}B$ , dBm, whichever power is less. B is the 99% emission bandwidth in megahertz. The e.i.r.p. spectral density shall not exceed 10 dBm in any 1.0 MHz band.

Frequency Band 5250-5350 MHz

The maximum conducted output power shall not exceed 250 mW or  $11 + 10 \log_{10}B$ , dBm, whichever is less. The power spectral density shall not exceed 11 dBm in any 1.0 MHz band..

Frequency Bands 5470-5600 MHz and 5650-5725 MHz

The maximum conducted output power shall not exceed 250 mW or  $11 + 10 \log_{10}B$ , dBm, whichever is less. The power spectral density shall not exceed 11 dBm in any 1.0 MHz band.

The maximum e.i.r.p. shall not exceed 1.0 W or  $17 + 10 \log_{10}B$ , dBm, whichever is less. B is the 99% emission bandwidth in megahertz. Note that devices with a maximum e.i.r.p. greater than 500 mW shall implement TPC in order to have the capability to operate at least 6 dB below the maximum permitted e.i.r.p. of 1 W.

Frequency Band 5725-5850 MHz

The maximum conducted output power shall not exceed 1 W. The power spectral density shall not exceed 30 dBm in any 500 kHz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

**7.4 Test results**

**Test result U-NII 1 band mode a**

Channel [MHz]	SA reading [dBm]	Signal path loss [dB]	Average Output power [dBm]	Limit [dBm]	Margin [dB]
5180	-6.95	20	13.0	23	10.0
5200	-7.38	20	12.6	23	10.4
5240	-6.86	20	13.1	23	9.9

Channel [MHz]	Marker value [dBm]	Signal path loss [dB]	PSD [dBm/MHz]	Limit [dBm/MHz]	Margin [dB]
5180	-17.06	20	2.9	10	7.1
5200	-17.52	20	2.5	10	7.5
5240	-17.05	20	2.9	10	7.1

**Test result U-NII 1 band mode n HT-20**

Channel [MHz]	SA reading [dBm]	Signal path loss [dB]	Average Output power [dBm]	Limit [dBm]	Margin [dB]
5180	-7.95	20	12.0	23	11.0
5200	-8.13	20	11.9	23	11.1
5240	-7.77	20	12.2	23	10.8

Channel [MHz]	Marker value [dBm]	Signal path loss [dB]	PSD [dBm/MHz]	Limit [dBm/MHz]	Margin [dB]
5180	-19.33	20	0.7	10	9.3
5200	-19.42	20	0.6	10	6.4
5240	-19.31	20	0.7	10	9.3

**Test result U-NII 1 band mode n HT-40**

Channel [MHz]	SA reading [dBm]	Signal path loss [dB]	Average Output power [dBm]	Limit [dBm]	Margin [dB]
5190	-8.94	20	11.1	23	11.9
5230	-8.77	20	11.2	23	11.8

Channel [MHz]	Marker value [dBm]	Signal path loss [dB]	PSD [dBm/MHz]	Limit [dBm/MHz]	Margin [dB]
5190	-23.29	20	-3.3	10	13.3
5230	-23.06	20	-3.1	10	13.1

## Test result U-NII 2A band mode a

Channel [MHz]	SA reading [dBm]	Signal path loss [dB]	Average Output power [dBm]	Limit [dBm]	Margin [dB]
5260	-6.68	20	13.3	24	6.7
5300	-7.07	20	13.0	24	7.0
5320	-6.94	20	13.1	24	6.9

Channel [MHz]	Marker value [dBm]	Signal path loss [dB]	PSD [dBm/MHz]	Limit [dBm/MHz]	Margin [dB]
5260	-16.94	20	3.1	11	7.9
5300	-17.25	20	2.7	11	8.3
5320	-17.17	20	2.8	11	8.2

## Test result U-NII 2A band mode n HT-20

Channel [MHz]	SA reading [dBm]	Signal path loss [dB]	Average Output power [dBm]	Limit [dBm]	Margin [dB]
5260	-7.63	20	12.4	24	11.6
5300	-8.03	20	12.0	24	12.0
5320	-7.87	20	12.1	24	11.9

Channel [MHz]	Marker value [dBm]	Signal path loss [dB]	PSD [dBm/MHz]	Limit [dBm/MHz]	Margin [dB]
5260	-19.04	20	1.0	11	10.0
5300	-19.62	20	0.4	11	10.6
5320	-19.17	20	0.8	11	10.2

## Test result U-NII 2A band mode n HT-40

Channel [MHz]	SA reading [dBm]	Signal path loss [dB]	Average Output power [dBm]	Limit [dBm]	Margin [dB]
5270	-8.86	20	11.1	24	12.9
5310	-9.15	20	10.8	24	13.2

Channel [MHz]	Marker value [dBm]	Signal path loss [dB]	PSD [dBm/MHz]	Limit [dBm/MHz]	Margin [dB]
5270	-23.16	20	-3.2	11	14.2
5310	-23.27	20	-3.3	11	14.3

**Test result U-NII 2b band mode a**

Channel [MHz]	SA reading [dBm]	Signal path loss [dB]	Average Output power [dBm]	Limit [dBm]	Margin [dB]
5500	-8.50	19,7	11.2	24	12.8
5600	-9.20	19,7	10.5	24	13.5
5700	-9.00	19,7	10.7	24	13.3

Channel [MHz]	Marker value [dBm]	Signal path loss [dB]	PSD [dBm/MHz]	Limit [dBm/MHz]	Margin [dB]
5500	-18.45	19,7	1.3	11	9.7
5600	-18.75	19,7	0.9	11	10.1
5700	-18.68	19,7	1.0	11	10.0

**Test result U-NII 2b band mode n HT-20**

Channel [MHz]	SA reading [dBm]	Signal path loss [dB]	Average Output power [dBm]	Limit [dBm]	Margin [dB]
5500	-7.95	19,7	11.7	24	12.3
5600	-8.21	19,7	11.5	24	12.5
5700	-8.55	19,7	11.1	24	12.9
5720	-7.99	19,7	11.7	24	12.3

Channel [MHz]	Marker value [dBm]	Signal path loss [dB]	PSD [dBm/MHz]	Limit [dBm/MHz]	Margin [dB]
5500	-19.49	19,7	0.2	11	10.8
5600	-19.86	19,7	-0.2	11	11.2
5700	-20.15	19,7	-0.5	11	11.5
5720	-19.39	19,7	0.3	11	10.7

**Test result U-NII 2b band mode n HT-40**

Channel [MHz]	SA reading [dBm]	Signal path loss [dB]	Average Output power [dBm]	Limit [dBm]	Margin [dB]
5510	-8.35	19,7	11.3	24	12.7
5590	-8.58	19,7	11.1	24	12.9
5670	-9.24	19,7	10.5	24	13.5
5710	-8.87	19,7			

Channel [MHz]	Marker value [dBm]	Signal path loss [dB]	PSD [dBm/MHz]	Limit [dBm/MHz]	Margin [dB]
5510	-22.78	19,7	-3.1	11	7.9
5590	-23.11	19,7	-3.4	11	7.6
5670	-23.54	19,7	-3.8	11	7.2
5710	-23.04	19,7	-3.5	11	7.5

**Test result U-NII 3 band mode a**

Channel [MHz]	SA reading [dBm]	Signal path loss [dB]	Average Output power [dBm]	Limit [dBm]	Margin [dB]
5745	-7.74	19.7	12.0	30	18.0
5785	-8.10	19.7	11.6	30	18.4
5825	-7.94	19.7	11.8	30	18.2

Channel [MHz]	Marker value [dBm]	Signal path loss [dB]	PSD [dBm / 500kHz]	Limit [dBm / 500kHz]	Margin [dB]
5745	-20.64	19.7	-0.9	30	30.9
5785	-20.96	19.7	-1.3	30	31.3
5825	-20.90	19.7	-1.2	30	31.2

**Test result U-NII 3 band mode n HT-20**

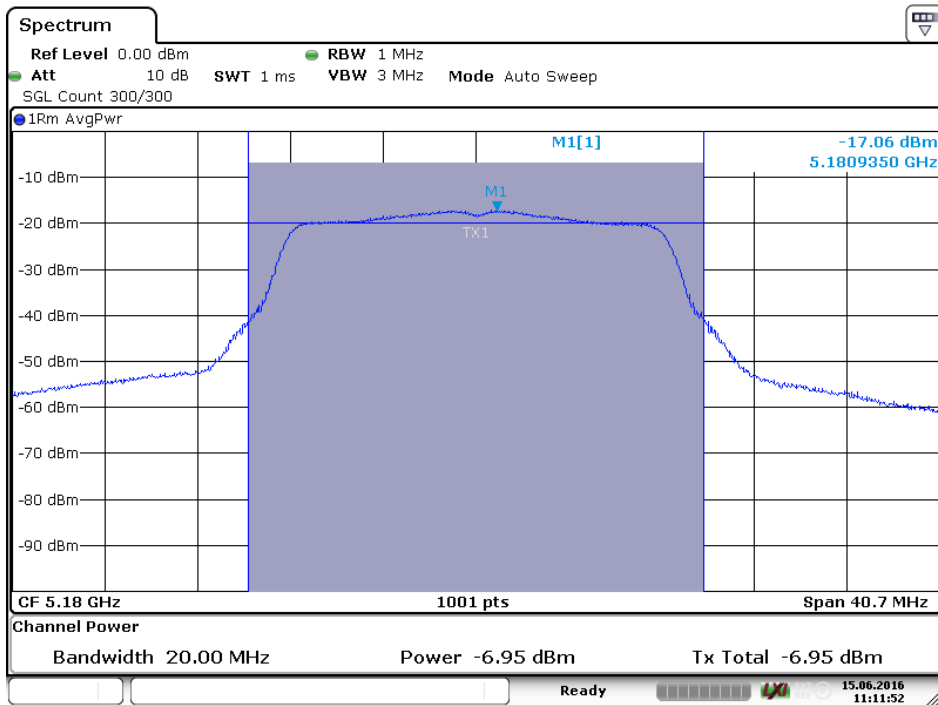
Channel [MHz]	SA reading [dBm]	Signal path loss [dB]	Average Output power [dBm]	Limit [dBm]	Margin [dB]
5745	-8.63	19.7	11.1	30	18.9
5785	-9.03	19.7	10.7	30	19.3
5825	-8.74	19.7	11.0	30	19.0

Channel [MHz]	Marker value [dBm]	Signal path loss [dB]	PSD [dBm / 500kHz]	Limit [dBm / 500kHz]	Margin [dB]
5745	-22.53	19.7	-2.8	30	32.8
5785	-23.12	19.7	-3.4	30	33.4
5825	-22.79	19.7	-3.1	30	33.1

**Test result U-NII 3 band mode n HT-40**

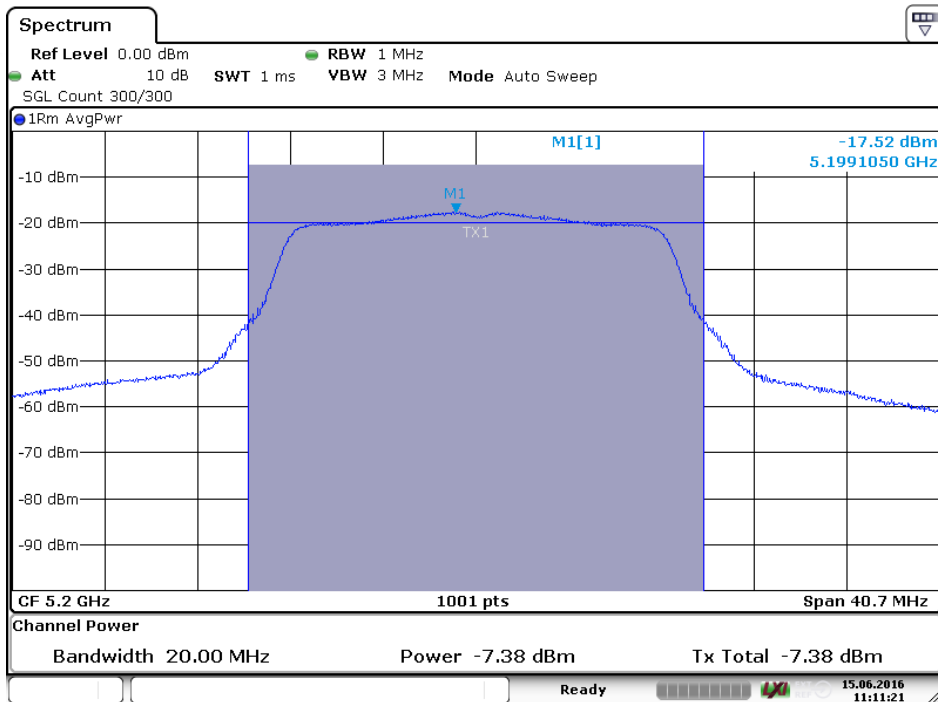
Channel [MHz]	SA reading [dBm]	Signal path loss [dB]	Average Output power [dBm]	Limit [dBm]	Margin [dB]
5710	-8.87	19.7	10.8	30	19.2
5755	-9.39	19.7	10.3	30	19.7
5795	-9.29	19.7	10.4	30	19.6

Channel [MHz]	Marker value [dBm]	Signal path loss [dB]	PSD [dBm / 500kHz]	Limit [dBm / 500kHz]	Margin [dB]
5710	-26.17	19.7	-6.5	30	36.5
5755	-25.83	19.7	-6.1	30	36.1
5795	-26.02	19.7	-6.3	30	36.3



Date: 15 JUN 2016 11:11:52

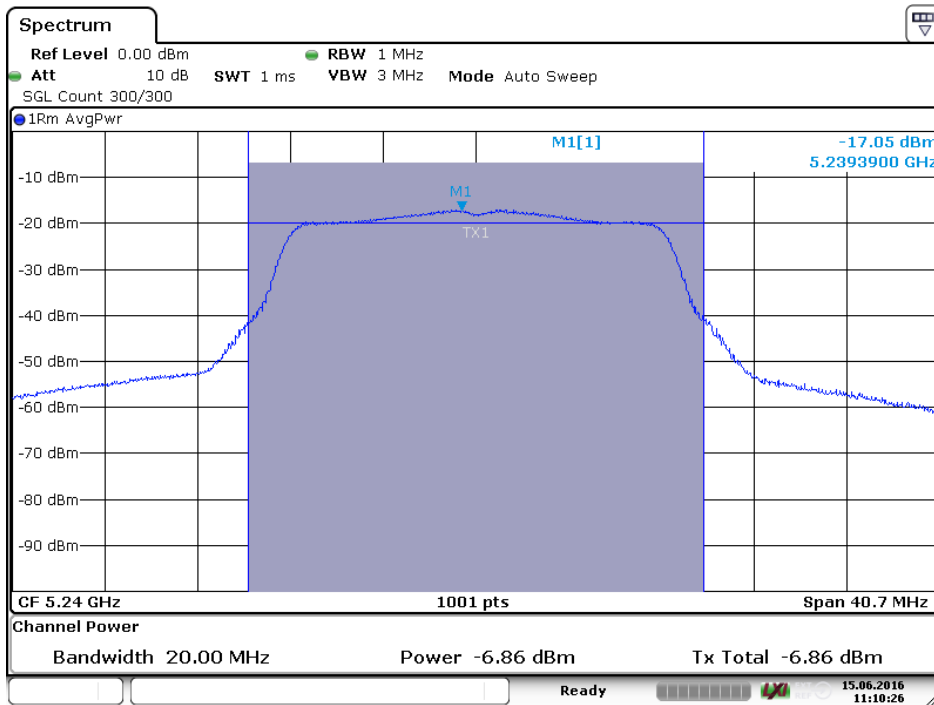
**Screenshot: Average Output power, channel 36 mode a**



Date: 15 JUN 2016 11:11:20

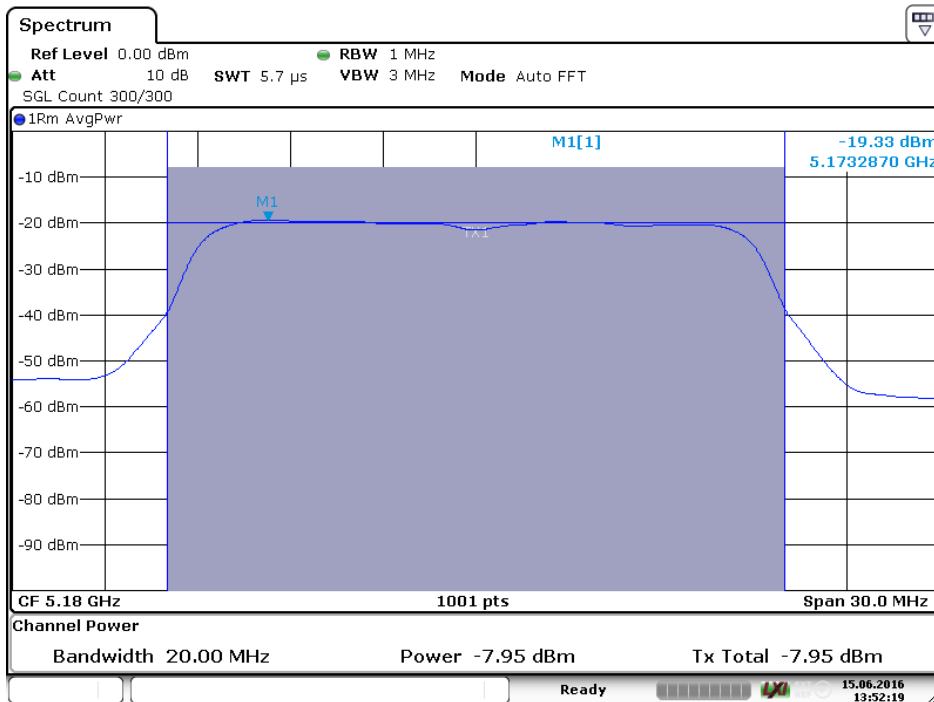
**Screenshot: Average Output power, channel 40 mode a**





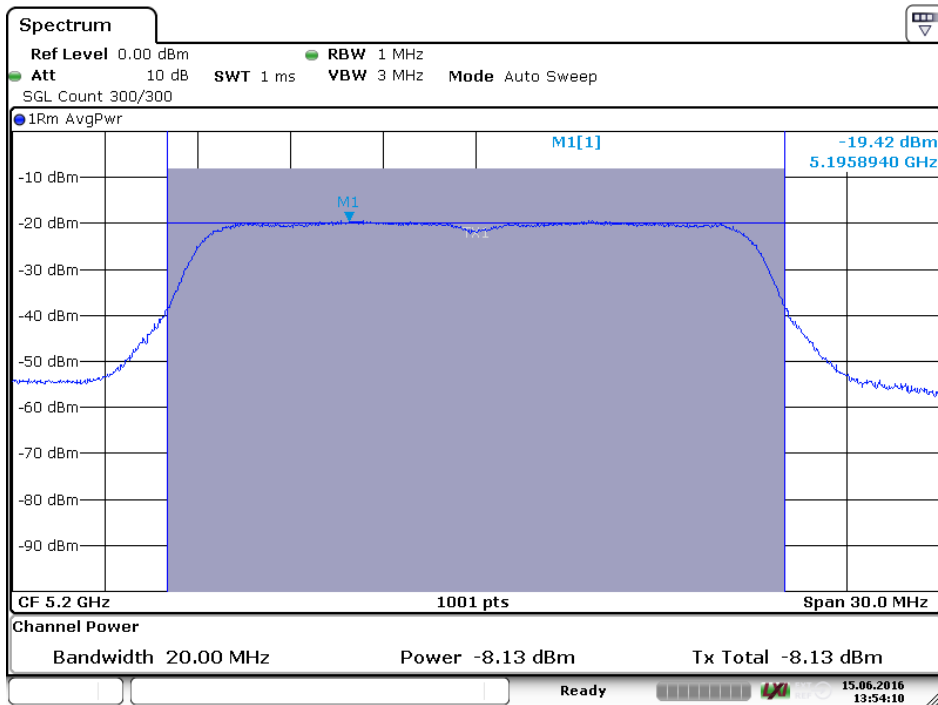
Date: 15 JUN 2016 11:10:27

**Screenshot: Average Output power, channel 48 mode a**



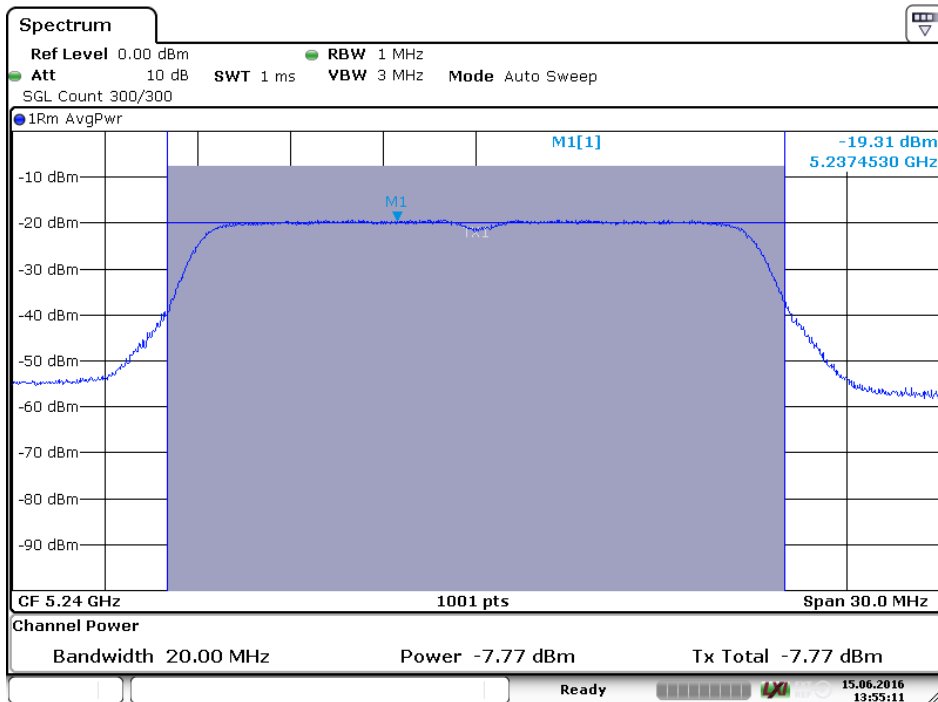
Date: 15 JUN 2016 13:52:19

**Screenshot: Average Output power, channel 36 mode n HT-20**



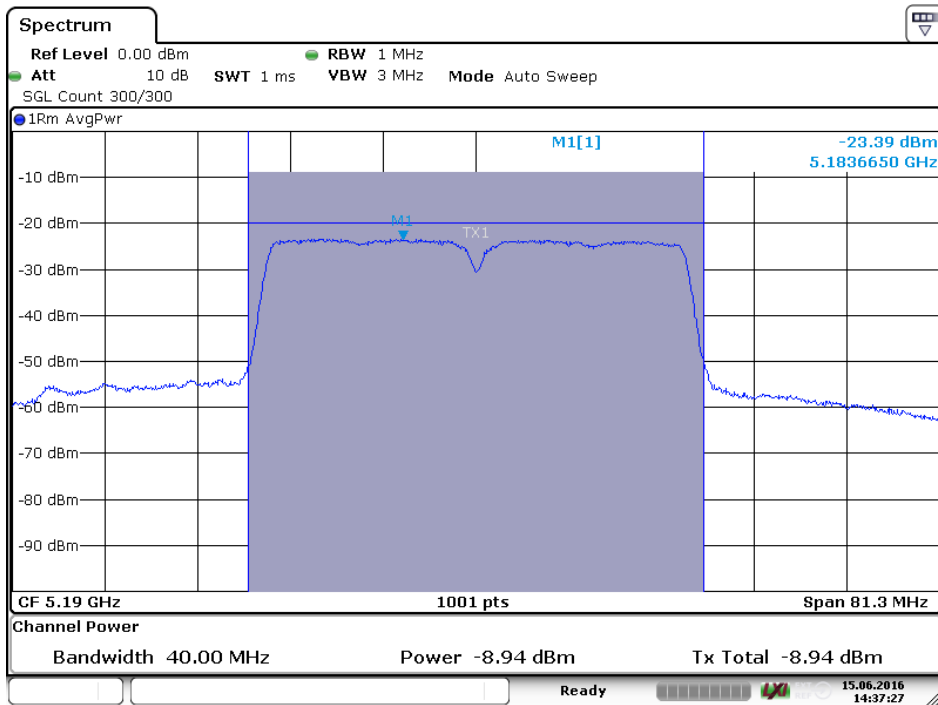
Date: 15 JUN 2016 13:54:10

**Screenshot: Average Output power, channel 40 mode n HT-20**



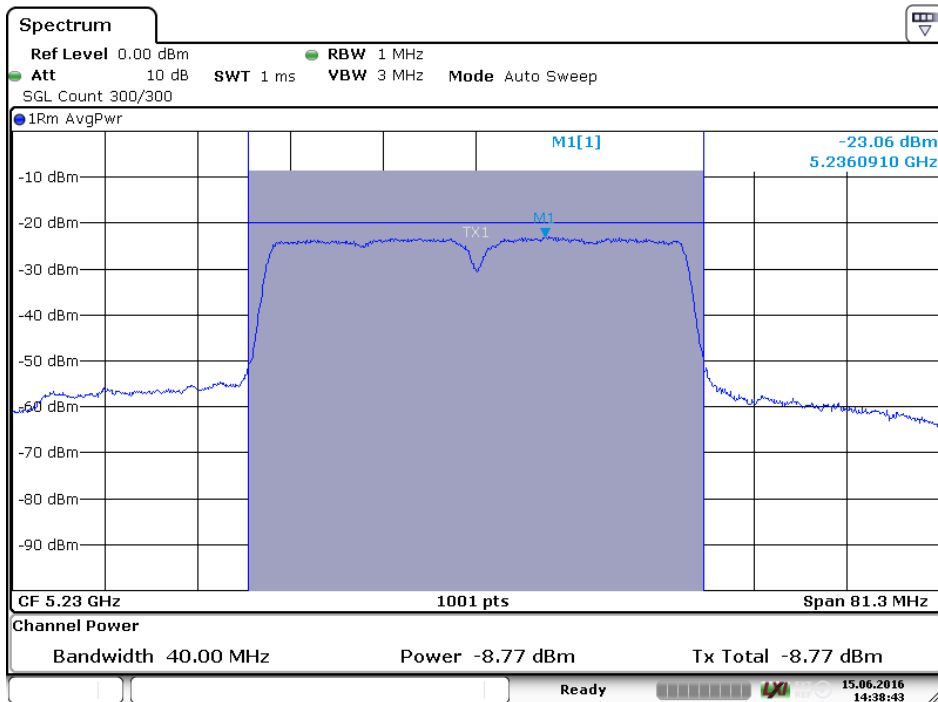
Date: 15 JUN 2016 13:55:11

**Screenshot: Average Output power, channel 48 mode n HT-20**



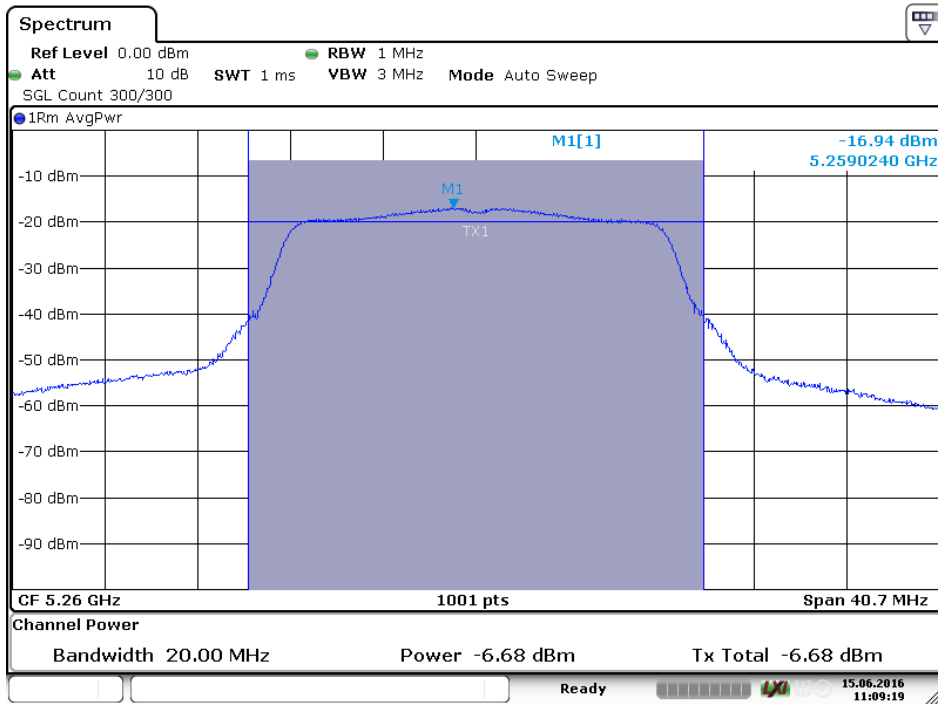
Date: 15 JUN 2016 14:37:26

**Screenshot: Average Output power, channel 38 mode n HT-40**



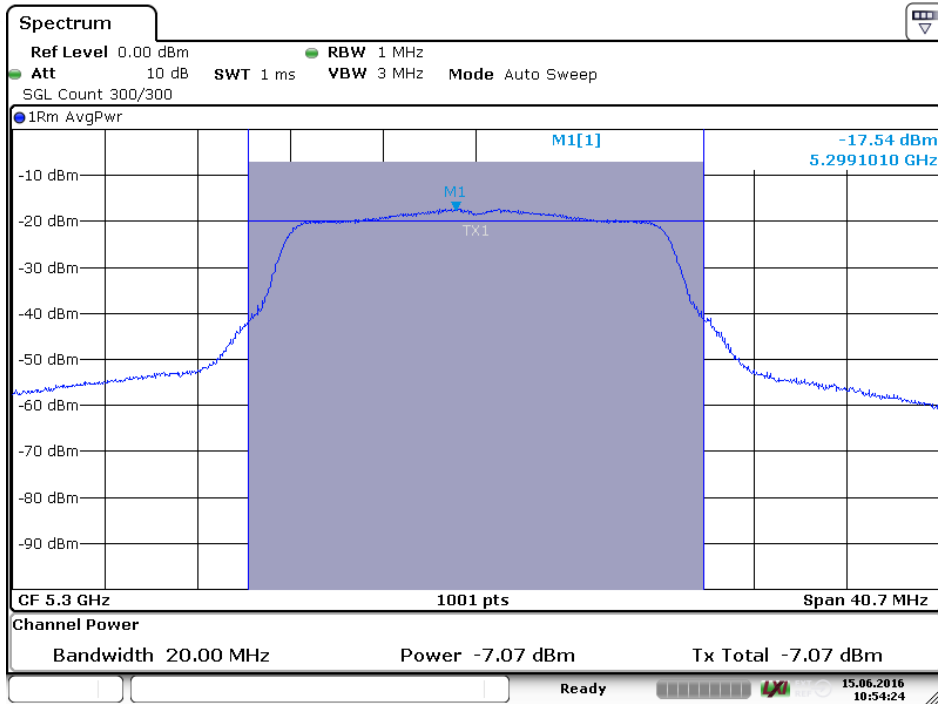
Date: 15 JUN 2016 14:38:42

**Screenshot: Average Output power, channel 46 mode n HT-40**



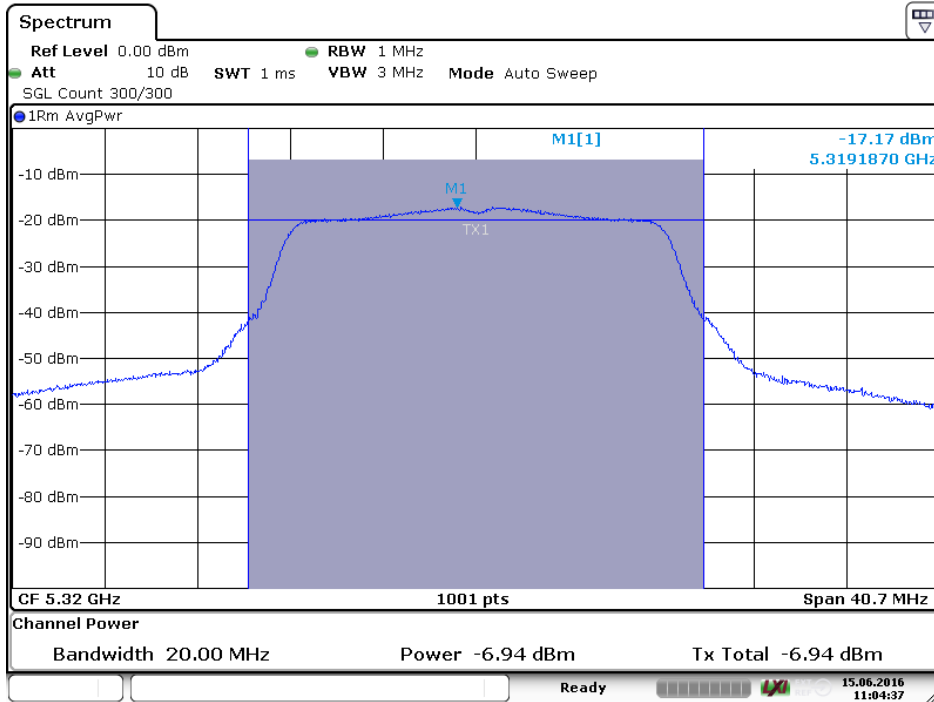
Date: 15 JUN 2016 11:09:19

**Screenshot: Average Output power, channel 52 mode a**



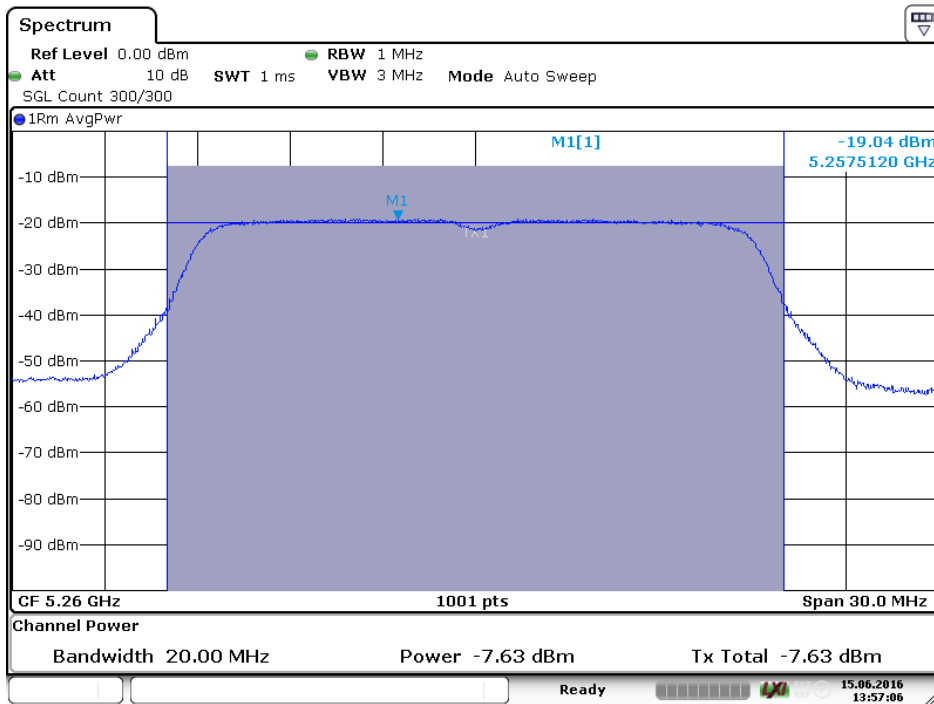
Date: 15 JUN 2016 10:54:23

**Screenshot: Average Output power, channel 60 mode a**



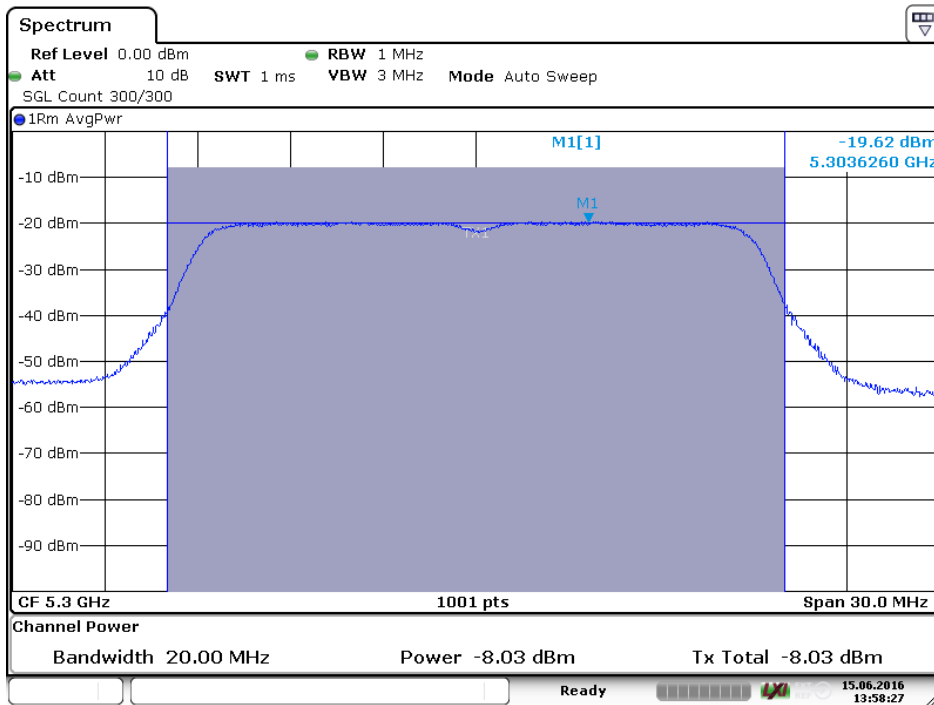
Date: 15 JUN 2016 11:04:37

**Screenshot: Average Output power, channel 64 mode a**



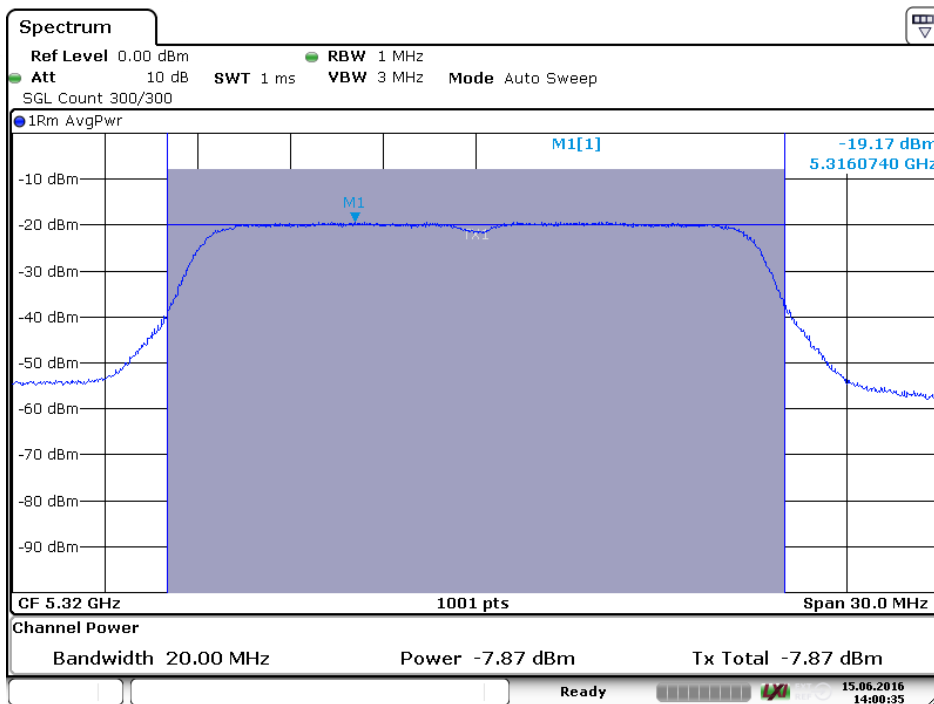
Date: 15 JUN 2016 13:57:06

**Screenshot: Average Output power, channel 52 mode n HT-20**



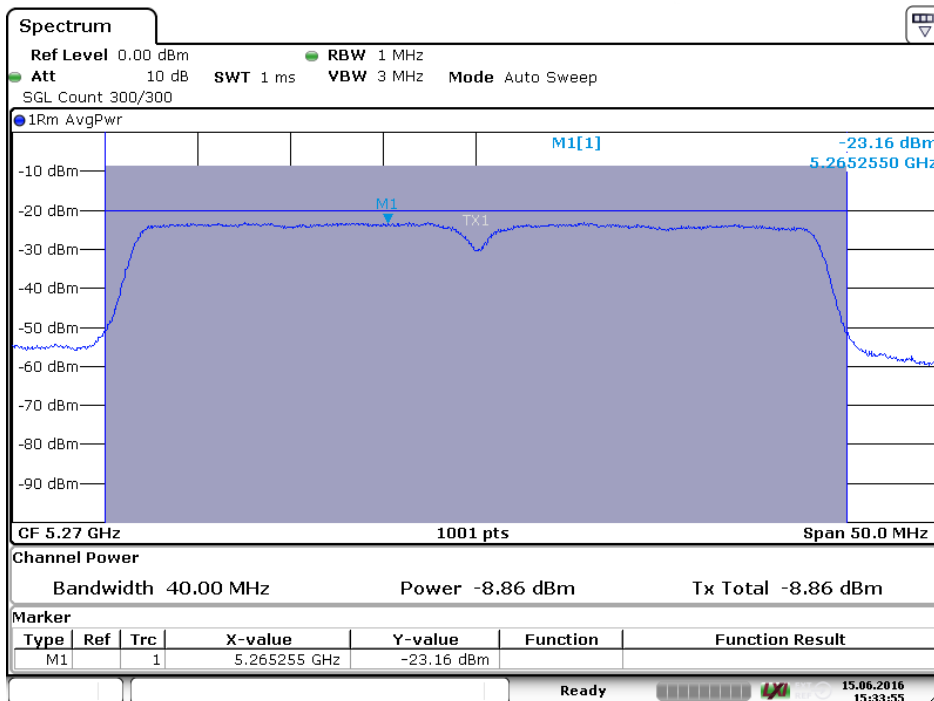
Date: 15 JUN 2016 13:58:27

**Screenshot: Average Output power, channel 60 mode n HT-20**



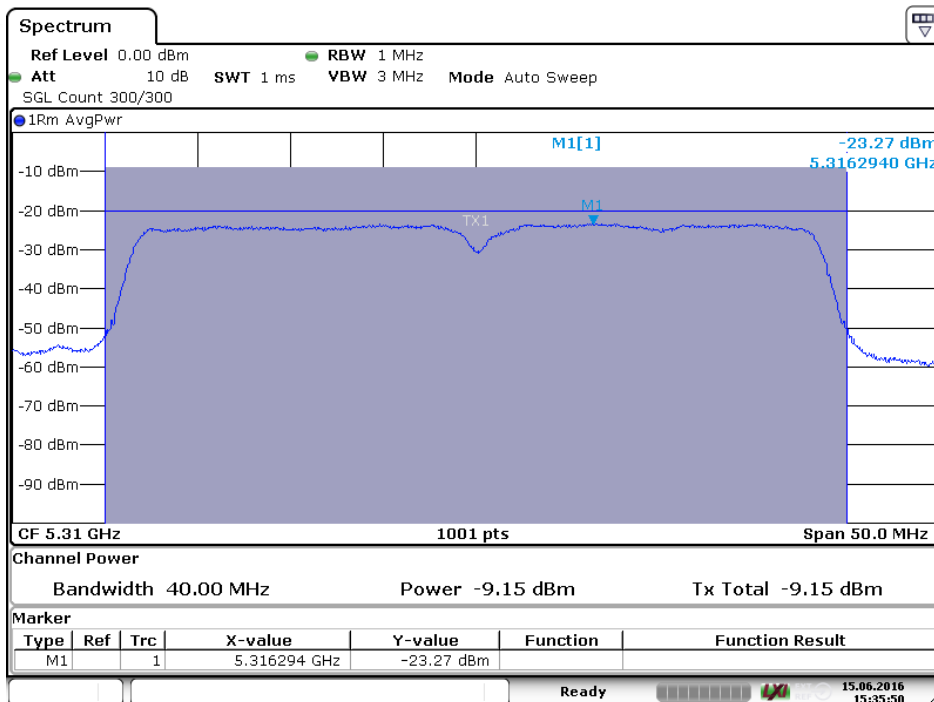
Date: 15 JUN 2016 14:00:35

**Screenshot: Average Output power, channel 64 mode n HT-20**



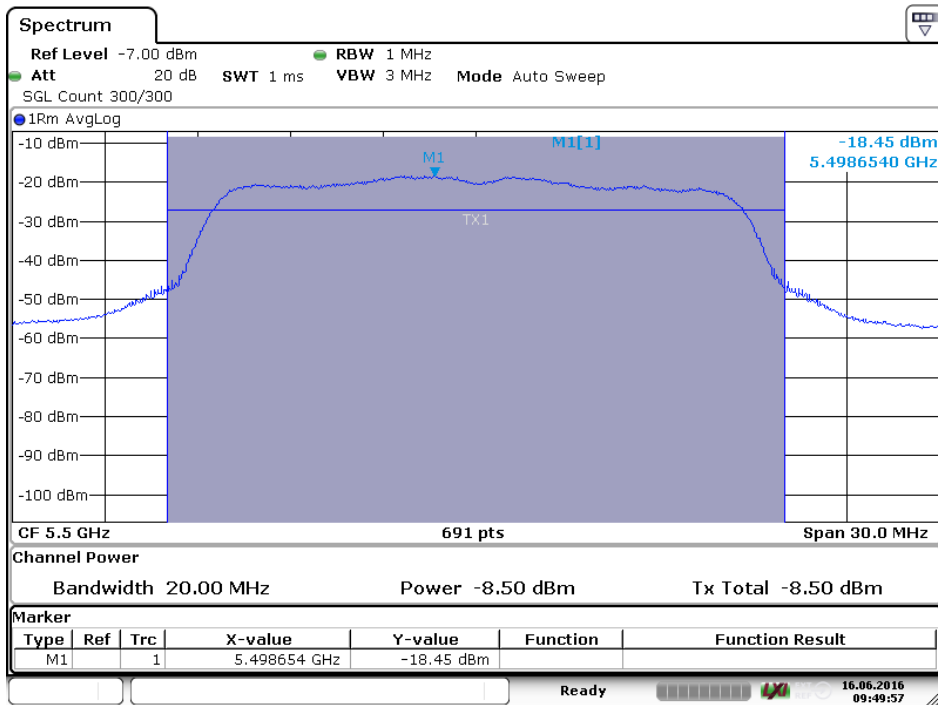
Date: 15 JUN 2016 15:33:55

**Screenshot: Average Output power, channel 54 mode n HT-40**



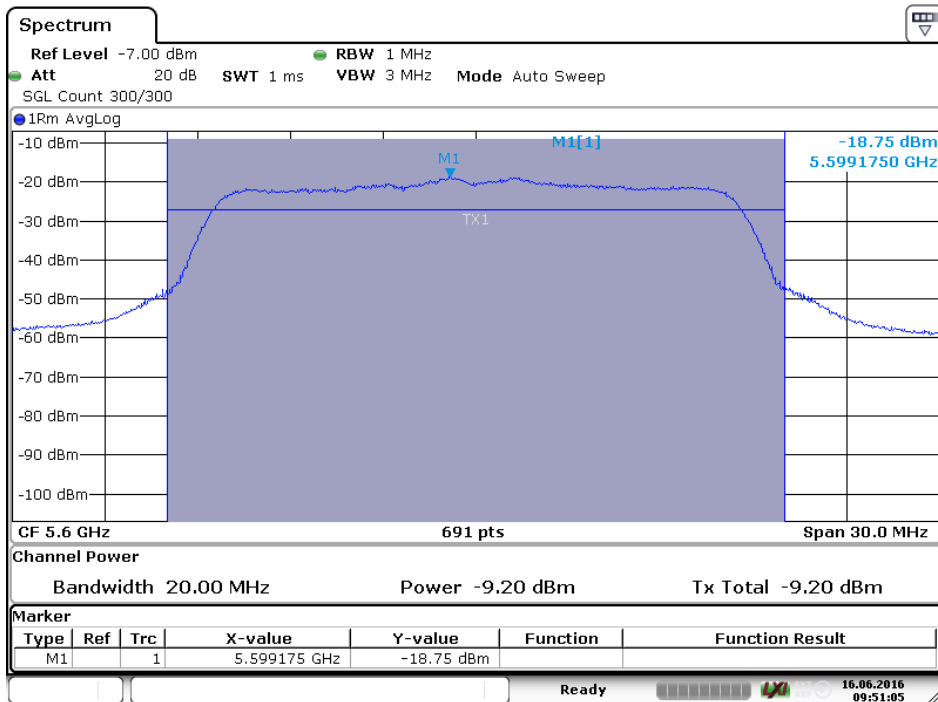
Date: 15 JUN 2016 15:35:50

**Screenshot: Average Output power, channel 62 mode n HT-40**



Date: 16 JUN 2016 09:49:58

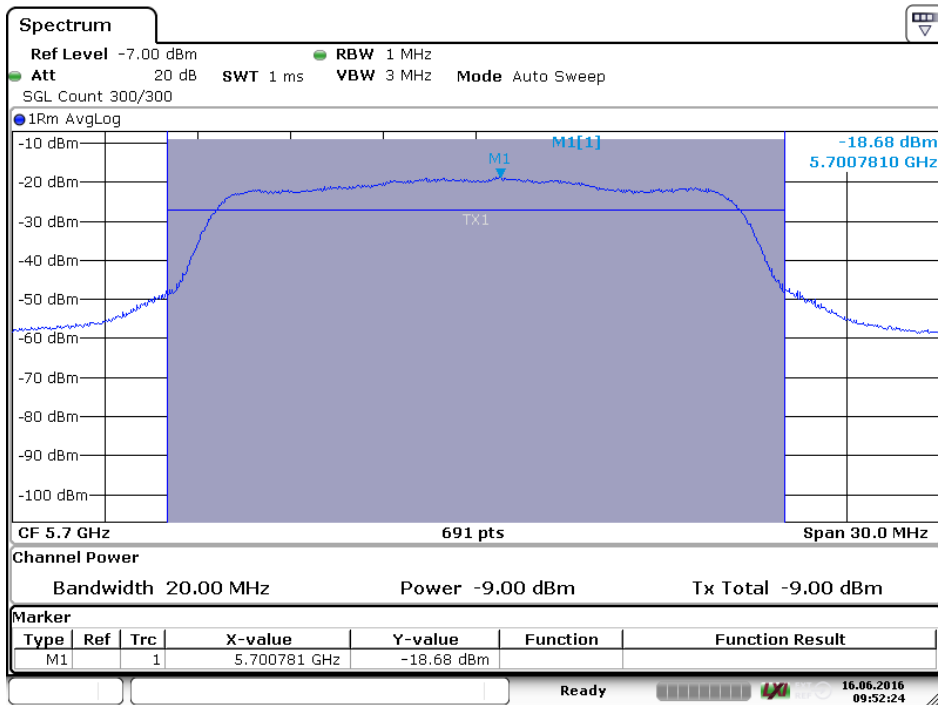
**Screenshot: Average Output power, channel 100 mode a**



Date: 16 JUN 2016 09:51:05

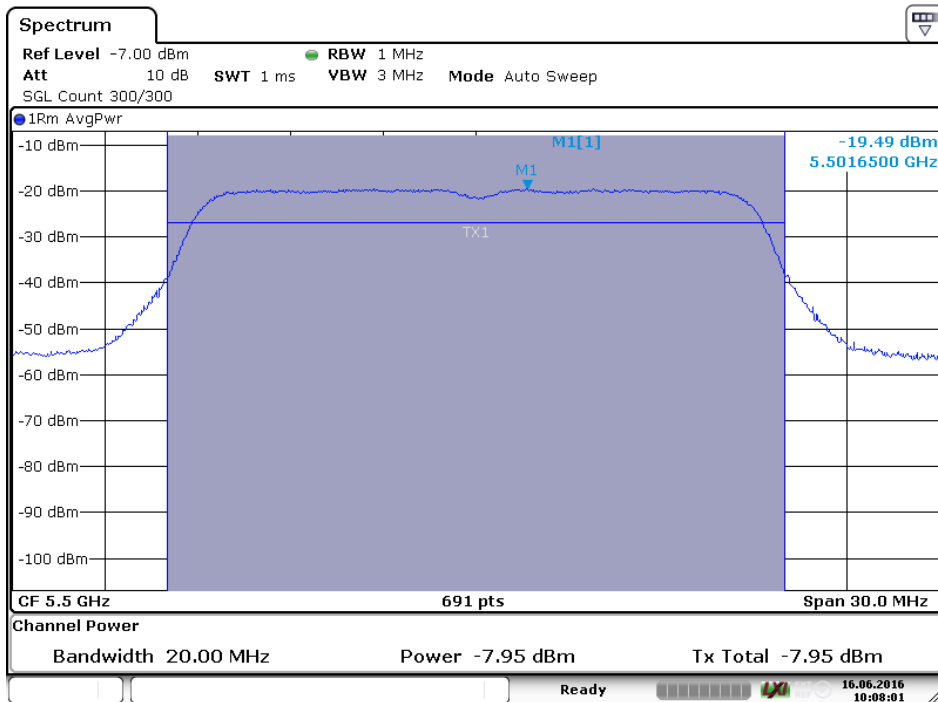
**Screenshot: Average Output power, channel 120 mode a**





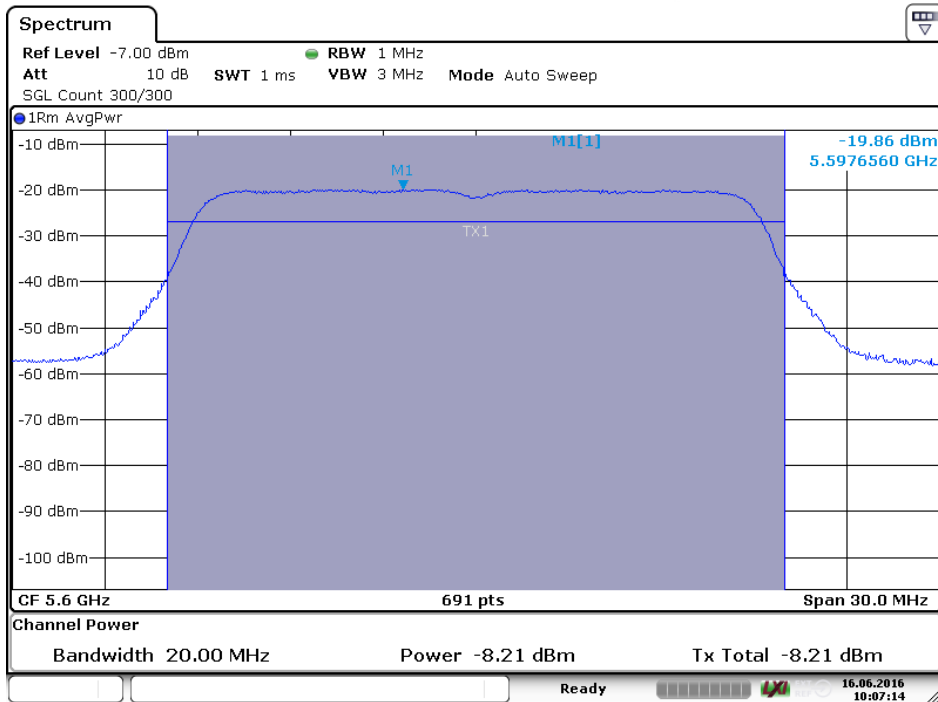
Date: 16 JUN 2016 09:52:24

**Screenshot: Average Output power, channel 140 mode a**



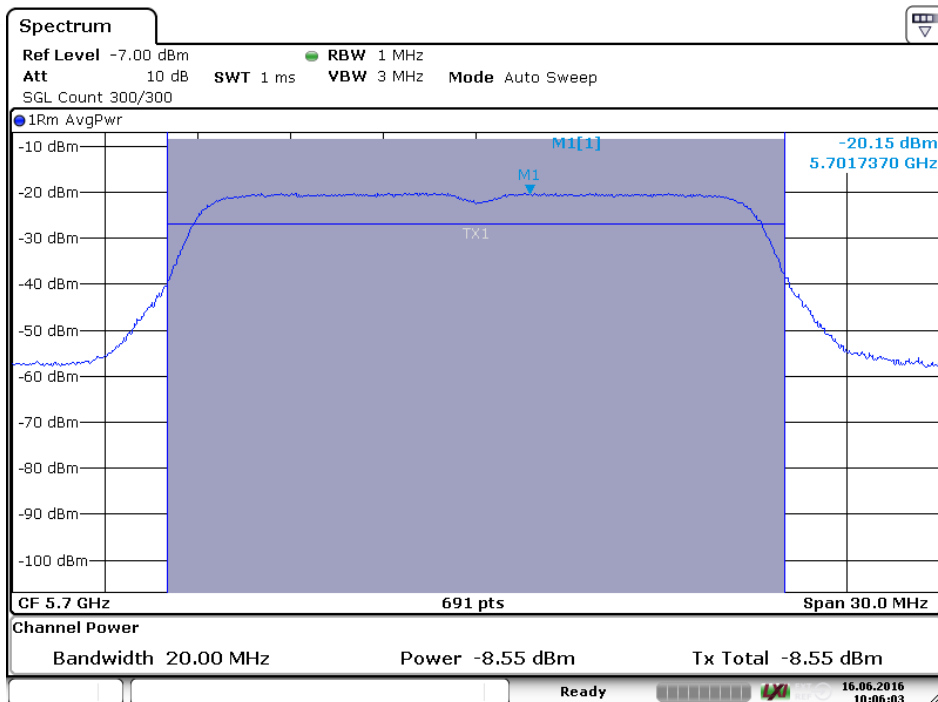
Date: 16 JUN 2016 10:08:01

**Screenshot: Average Output power, channel 100 mode n HT-20**



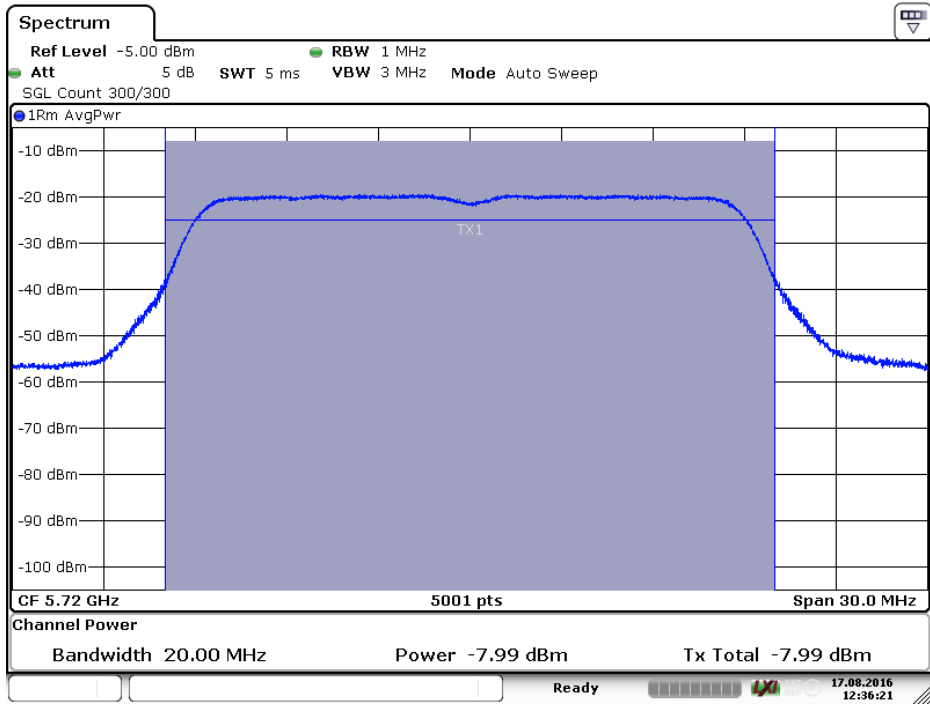
Date: 16 JUN 2016 10:07:13

**Screenshot: Average Output power, channel 120 mode n HT-20**



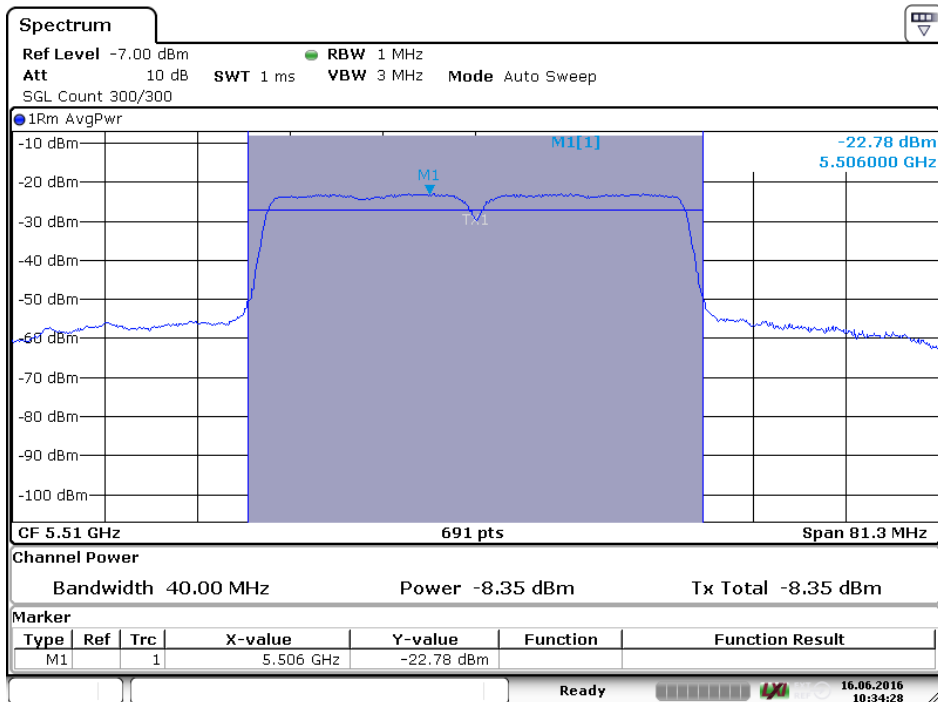
Date: 16 JUN 2016 10:06:02

**Screenshot: Average Output power, channel 140 mode n HT-20**



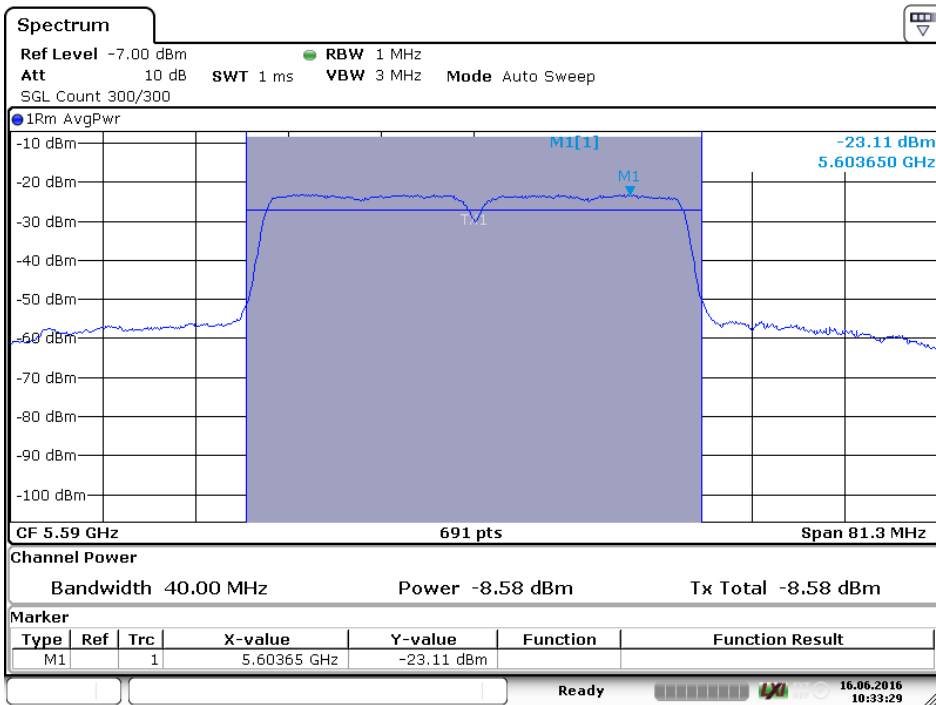
Date: 17.AUG.2016 12:36:21

**Screenshot: Average Output power, channel 144 mode n HT-20**



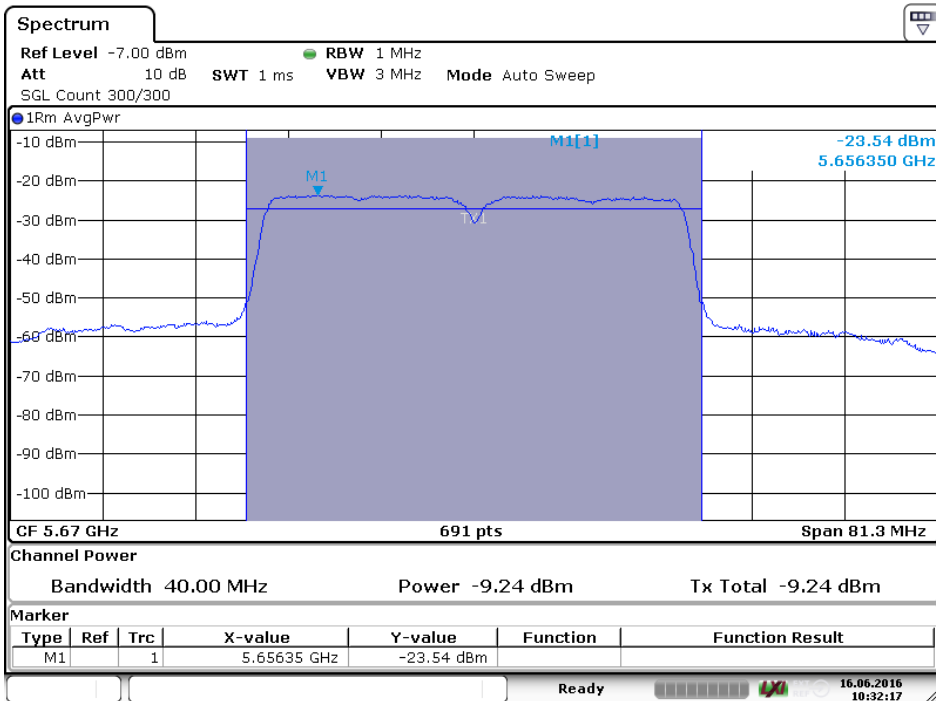
Date: 16.JUN.2016 10:34:28

**Screenshot: Average Output power, channel 102 mode n HT-40**



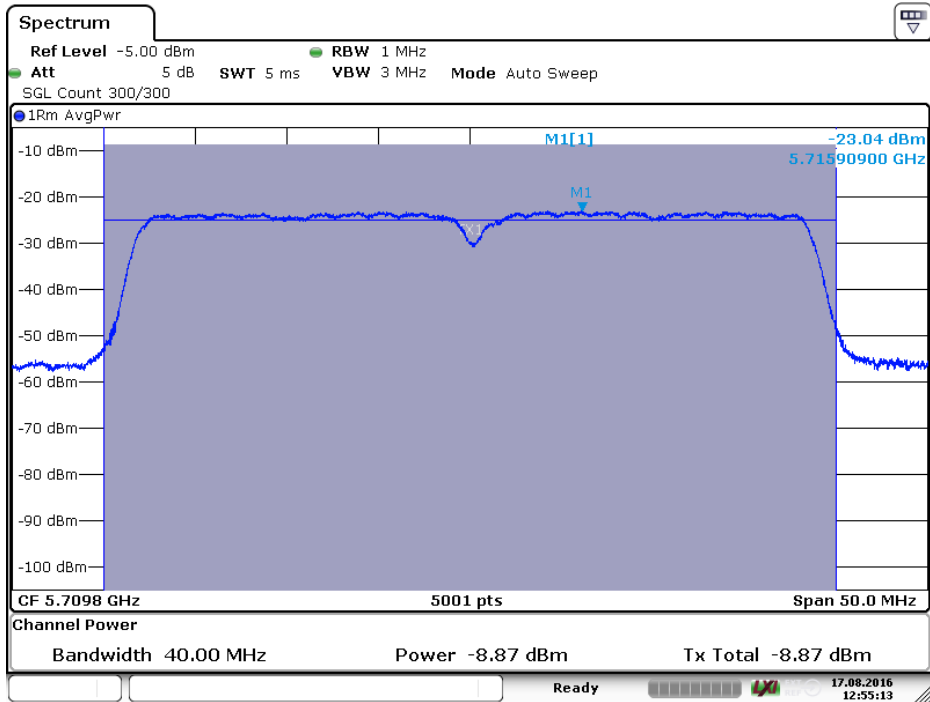
Date: 16 JUN 2016 10:33:30

**Screenshot: Average Output power, channel 118 mode n HT-40**



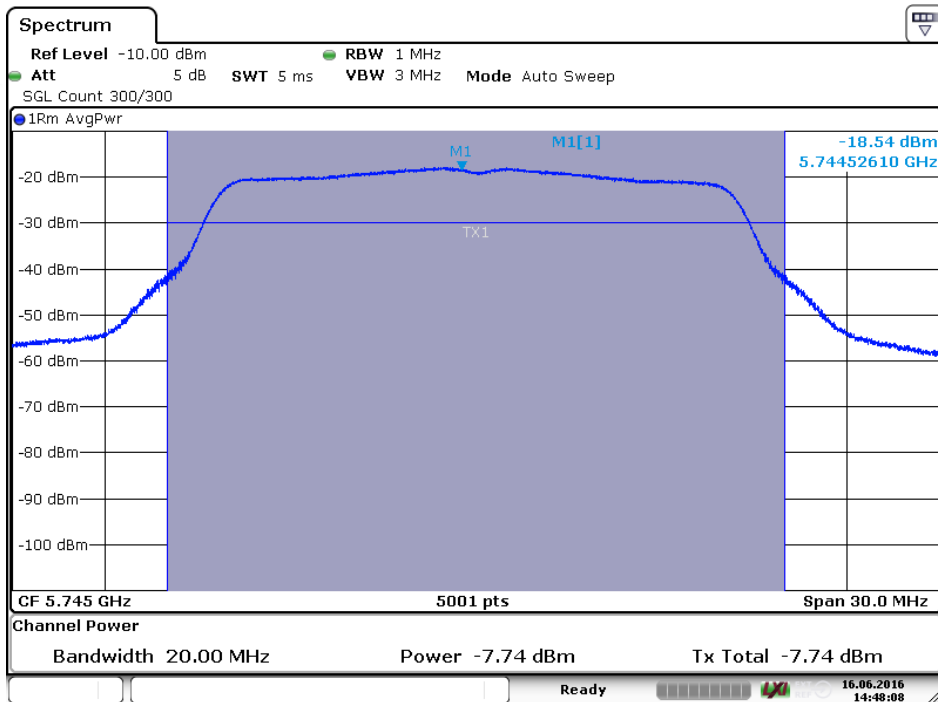
Date: 16 JUN 2016 10:32:18

**Screenshot: Average Output power, channel 132 mode n HT-40**



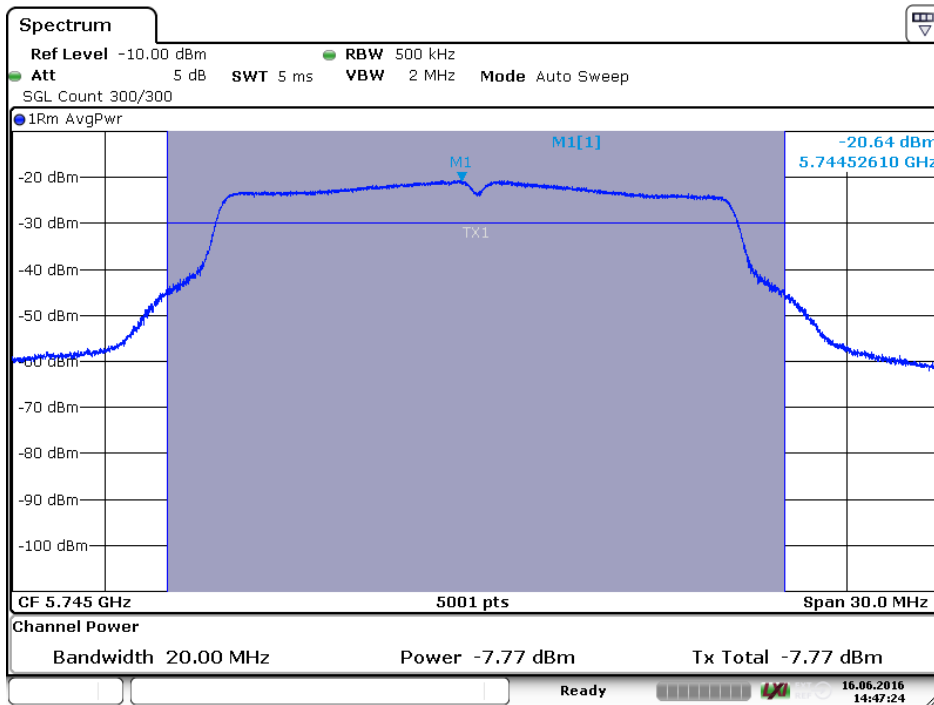
Date: 17.AUG.2016 12:55:13

**Screenshot: Average Output power, channel 142 mode n HT-40**



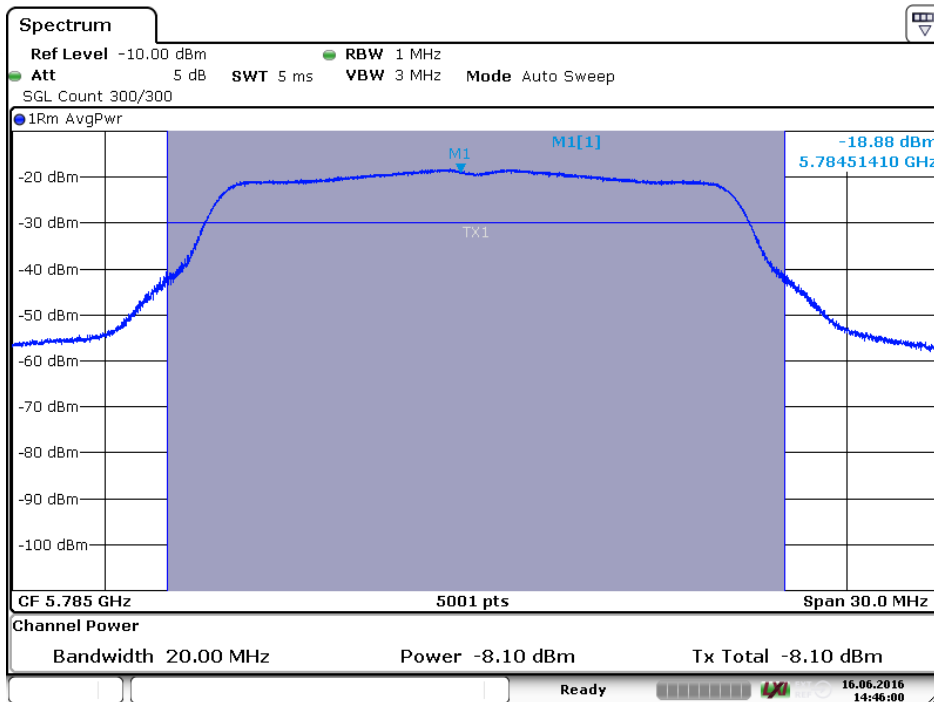
Date: 16.JUN.2016 14:48:09

**Screenshot: Average Output power, channel 149 mode a**



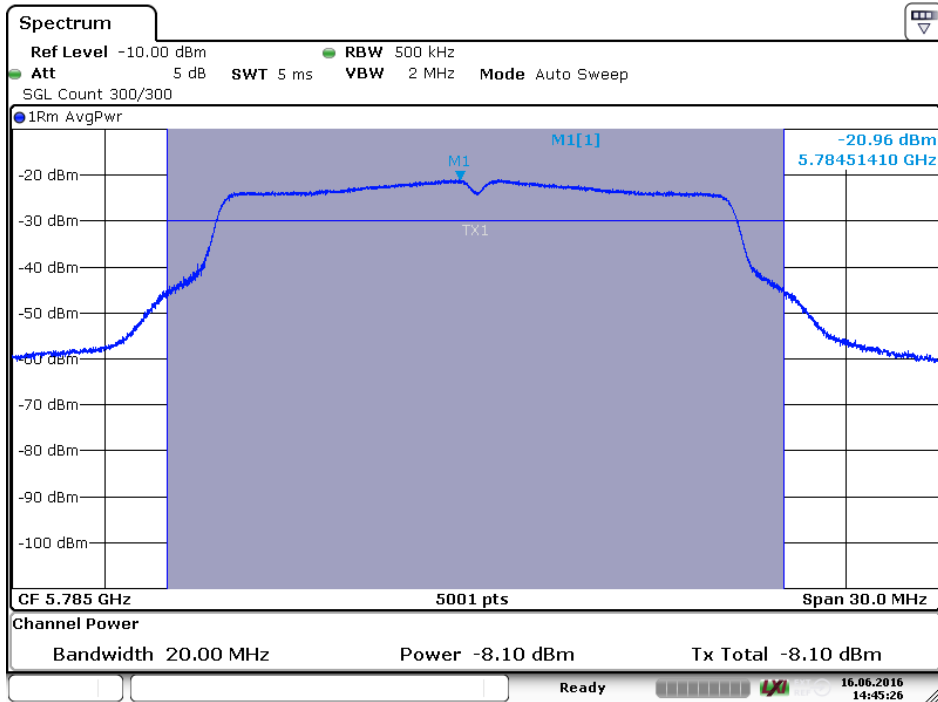
Date: 16 JUN 2016 14:47:24

**Screenshot: Power spectral density, channel 149 mode a**



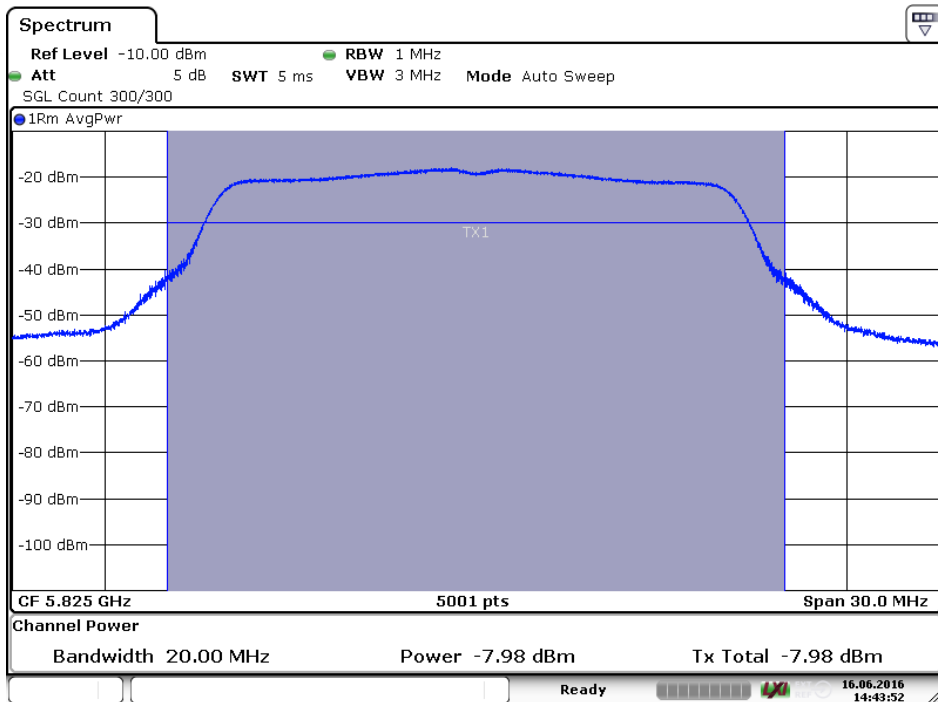
Date: 16 JUN 2016 14:46:00

**Screenshot: Average Output power, channel 157 mode a**



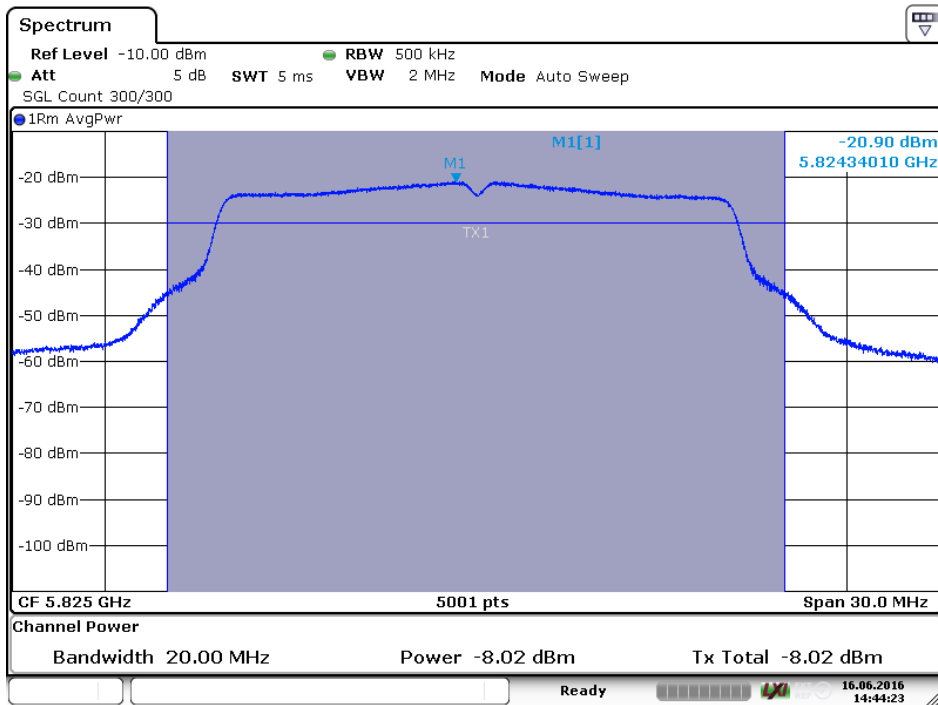
Date: 16 JUN 2016 14:45:26

**Screenshot: Power spectral density, channel 157 mode a**



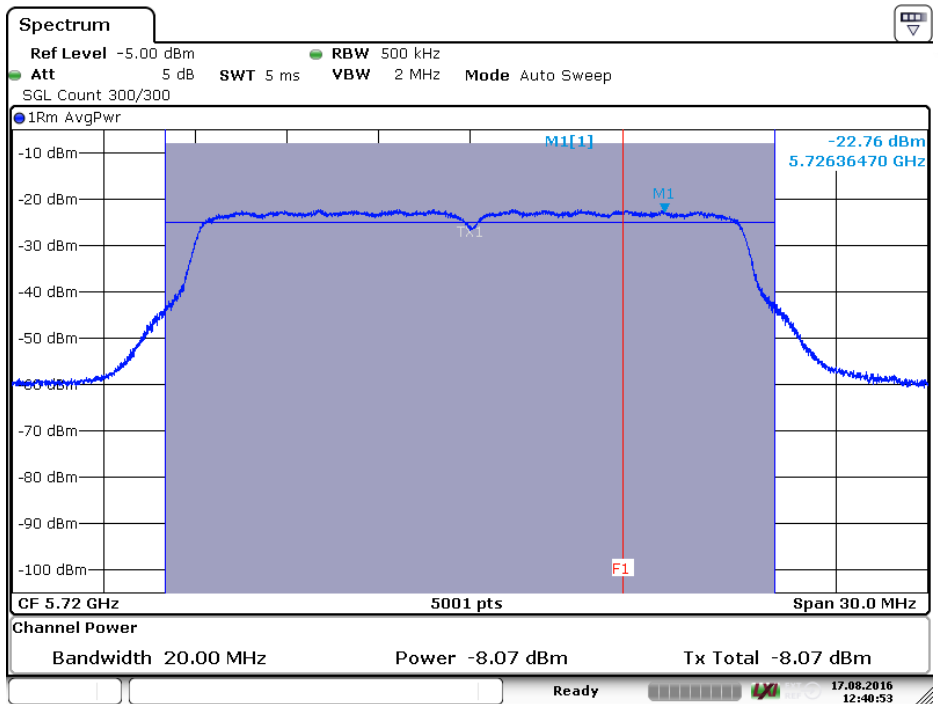
Date: 16 JUN 2016 14:43:52

**Screenshot: Average Output power, channel 165 mode a**



Date: 16 JUN 2016 14:44:24

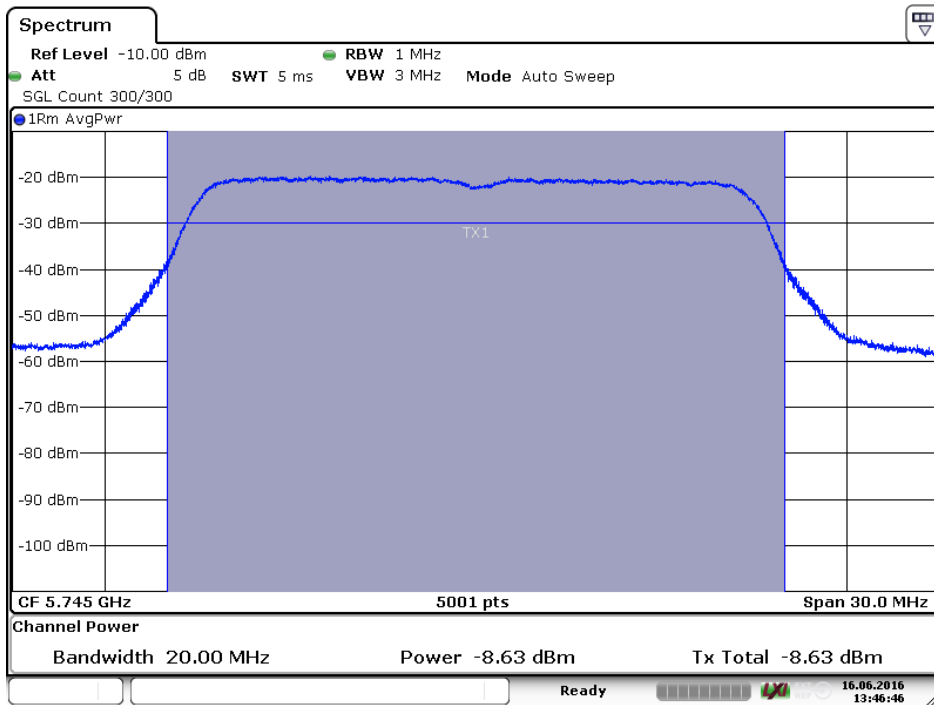
**Screenshot: Power spectral density, channel 165 mode a**



Date: 17 AUG 2016 12:40:54

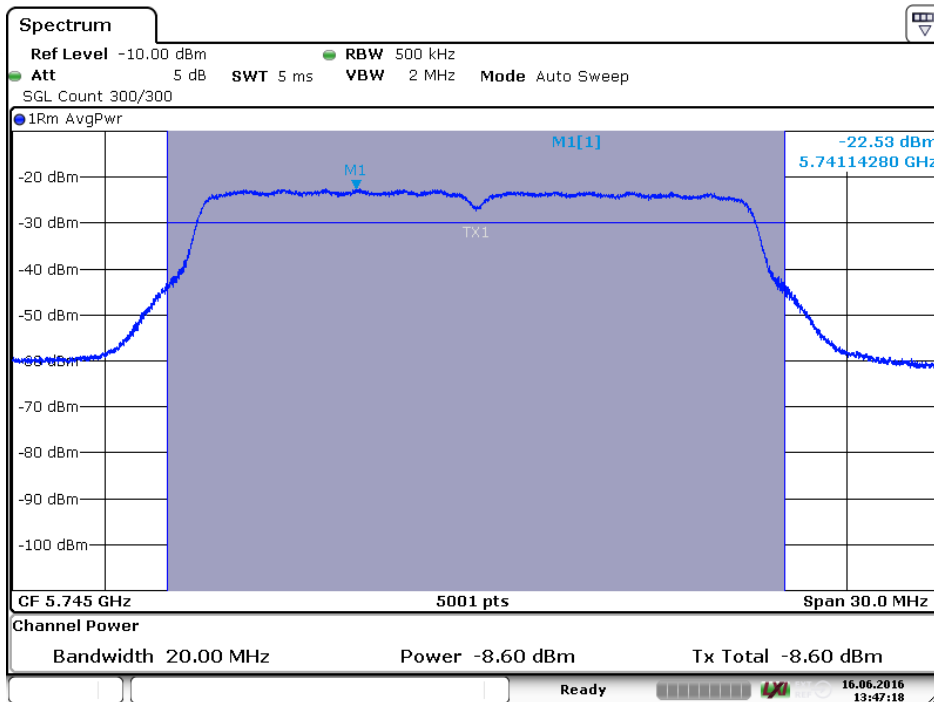
**Screenshot: Power spectral density, channel 144 mode HT 20**





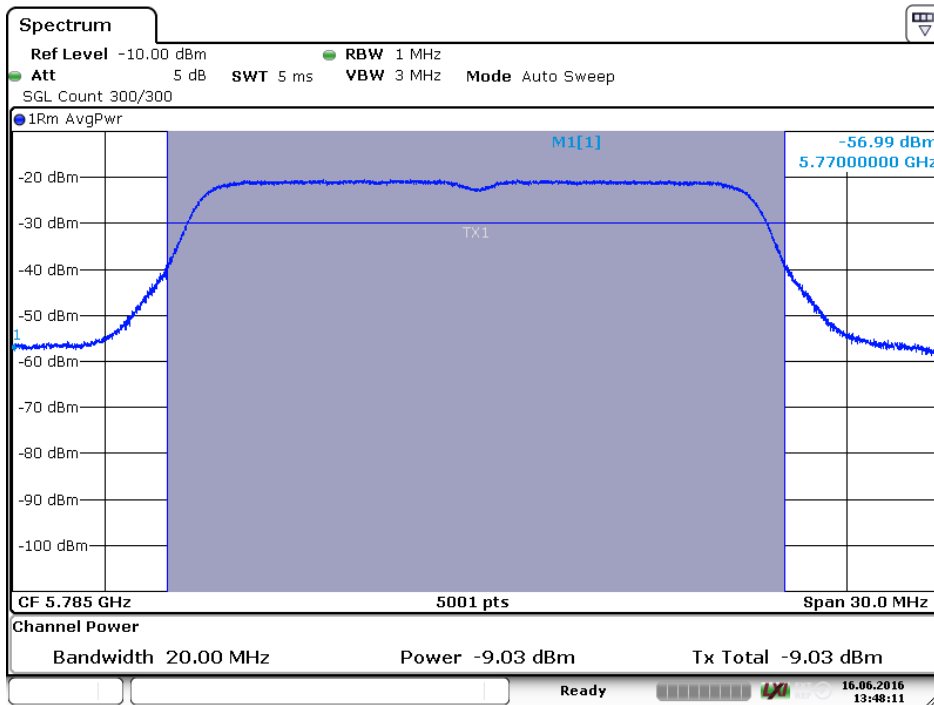
Date: 16 JUN 2016 13:46:45

**Screenshot: Average Output power, channel 149 mode n HT-20**



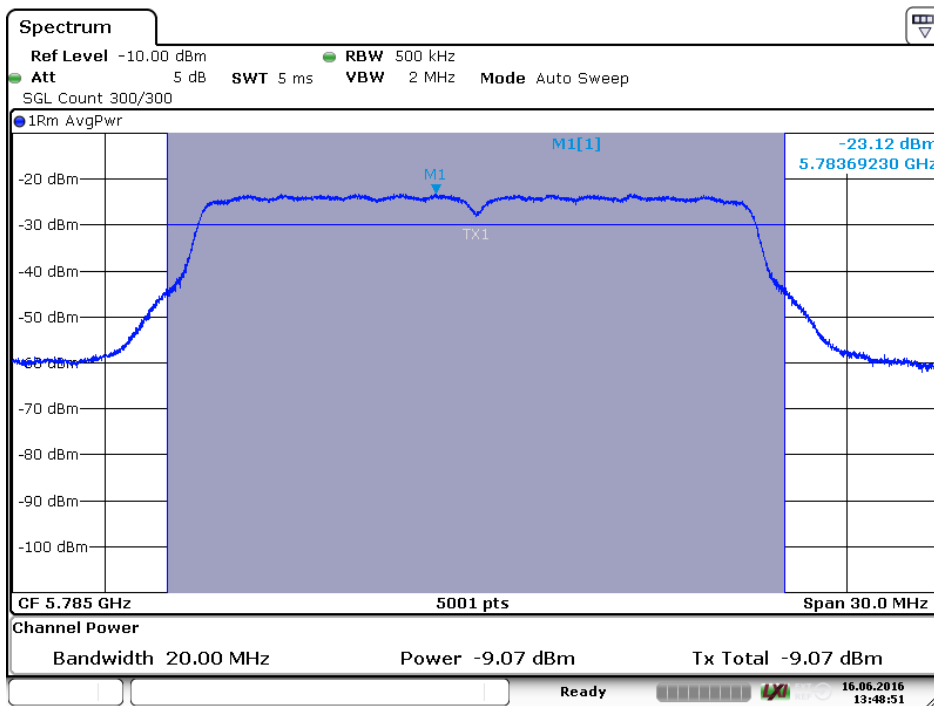
Date: 16 JUN 2016 13:47:18

**Screenshot: Power spectral density, channel 149 mode n HT-20**



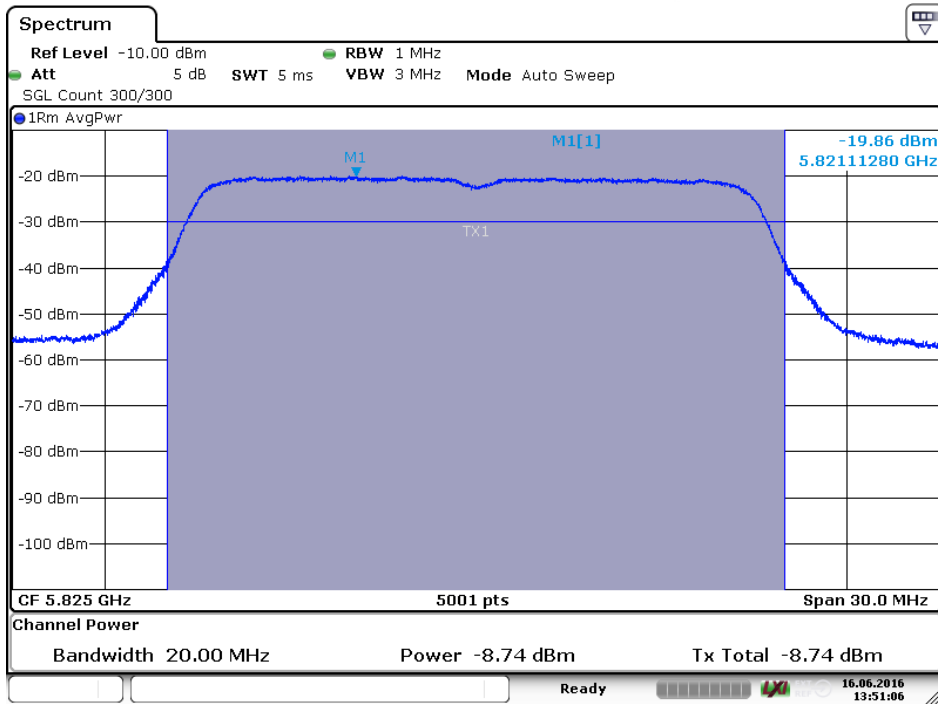
Date: 16 JUN 2016 13:48:11

**Screenshot: Average Output power, channel 157 mode n HT-20**



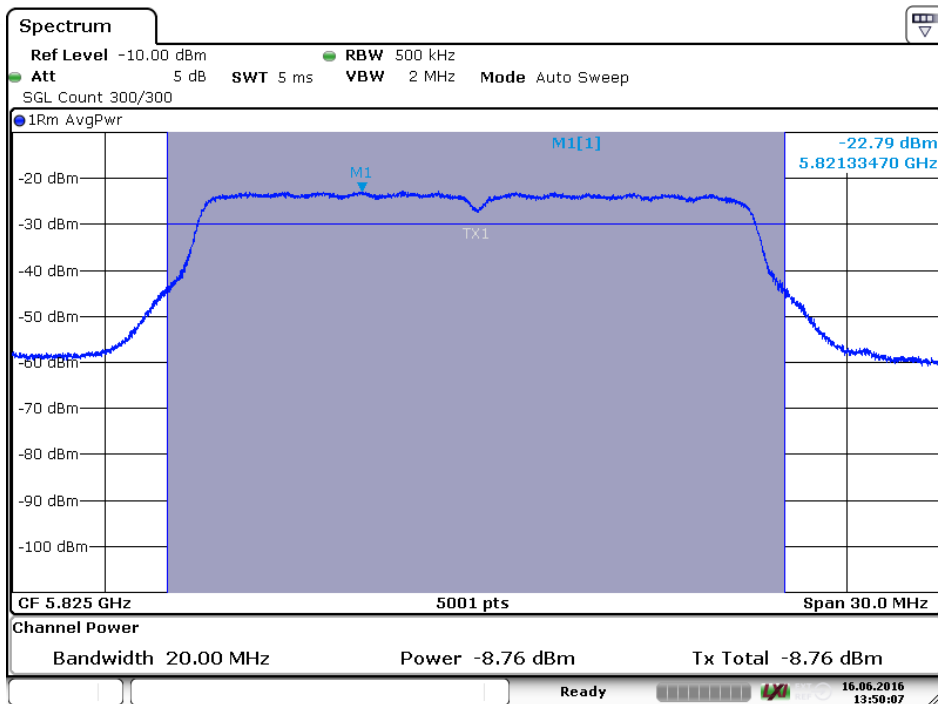
Date: 16 JUN 2016 13:48:51

**Screenshot: Power spectral density, channel 157 mode n HT-20**



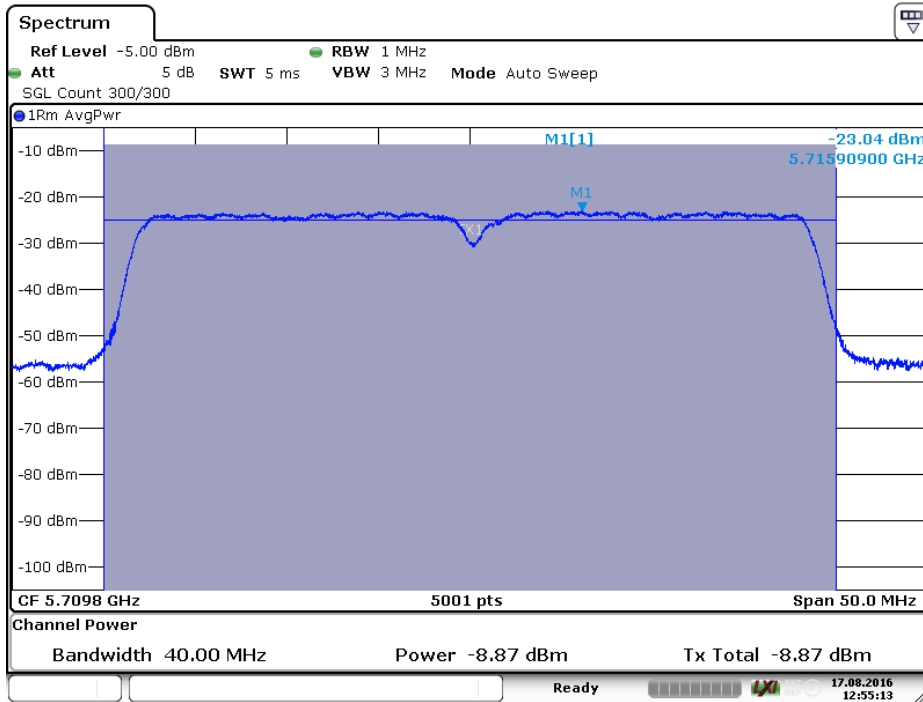
Date: 16 JUN 2016 13:51:06

**Screenshot: Average Output power, channel 165 mode n HT-20**



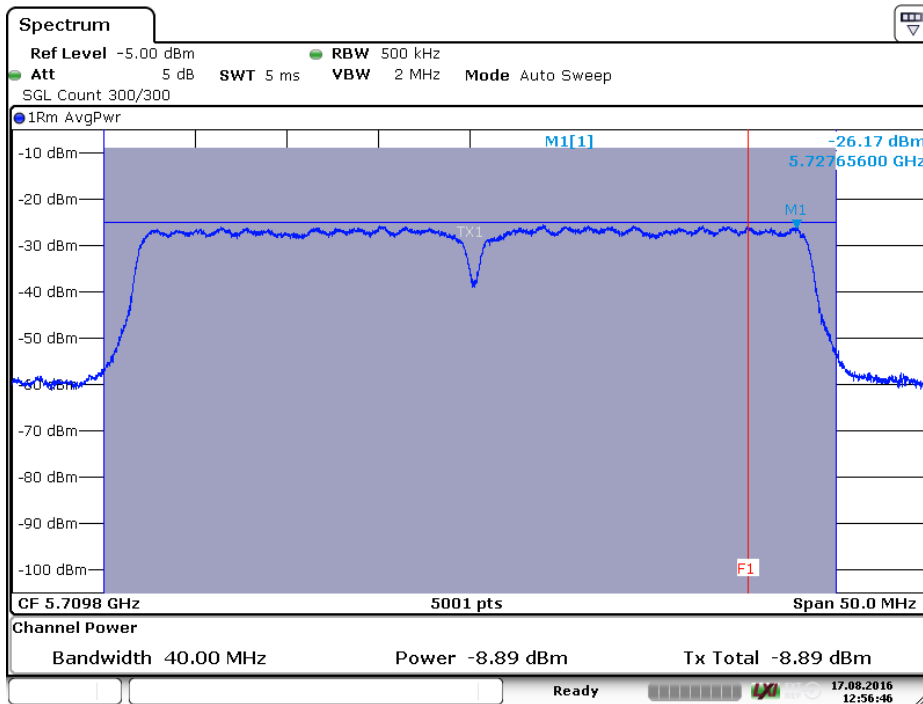
Date: 16 JUN 2016 13:50:08

**Screenshot: Power spectral density, channel 165 mode n HT-20**



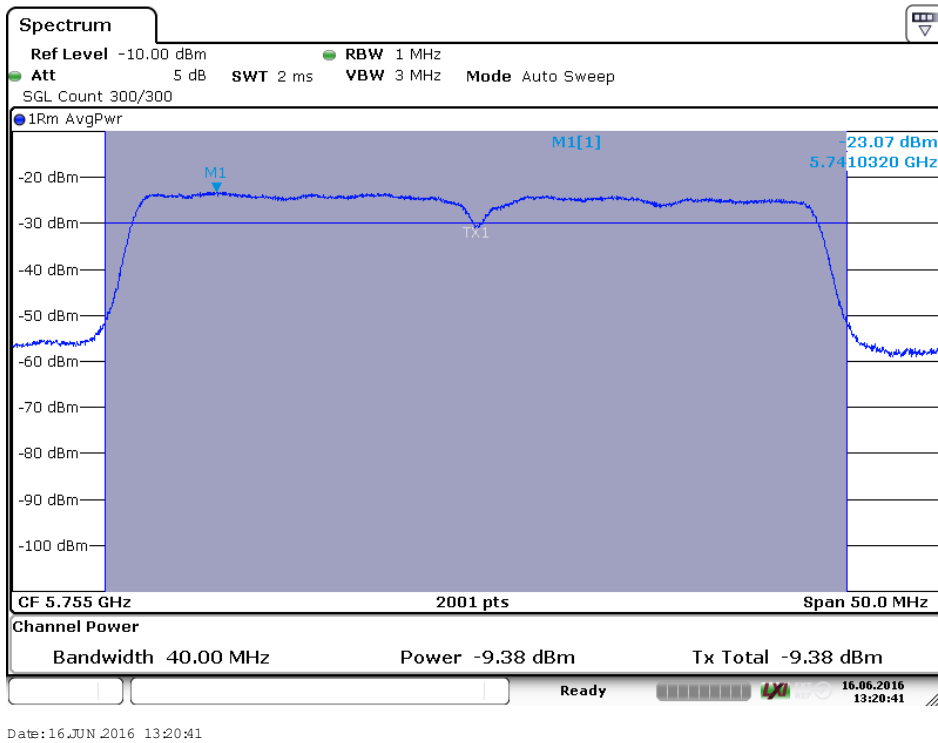
Date: 17.AUG.2016 12:55:13

**Screenshot: Average Output power, channel 142 mode n HT-40**

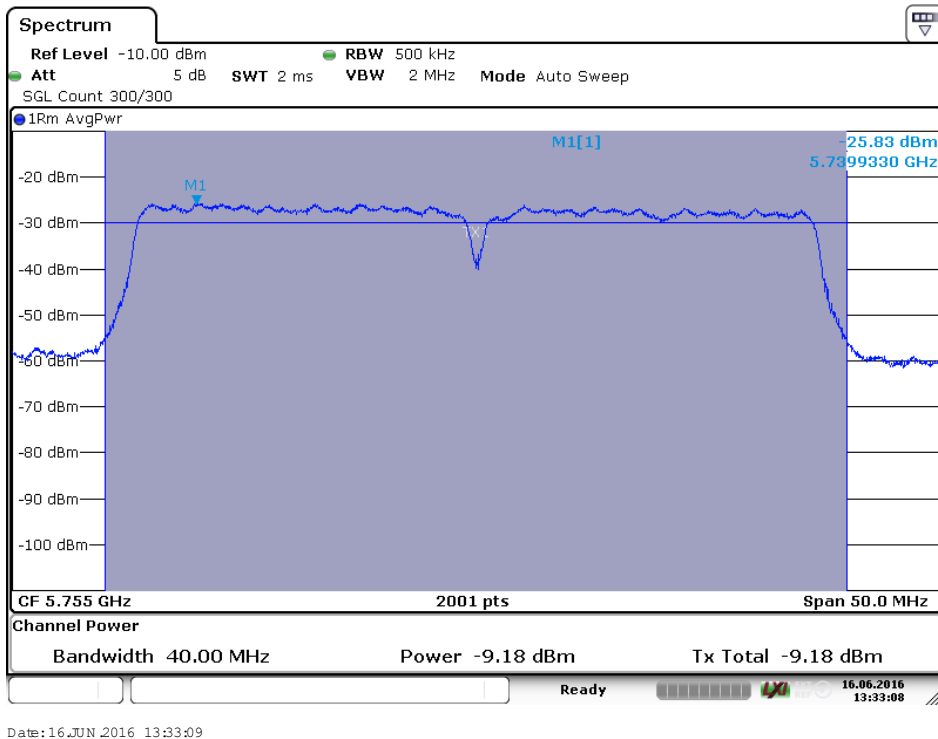


Date: 17.AUG.2016 12:56:46

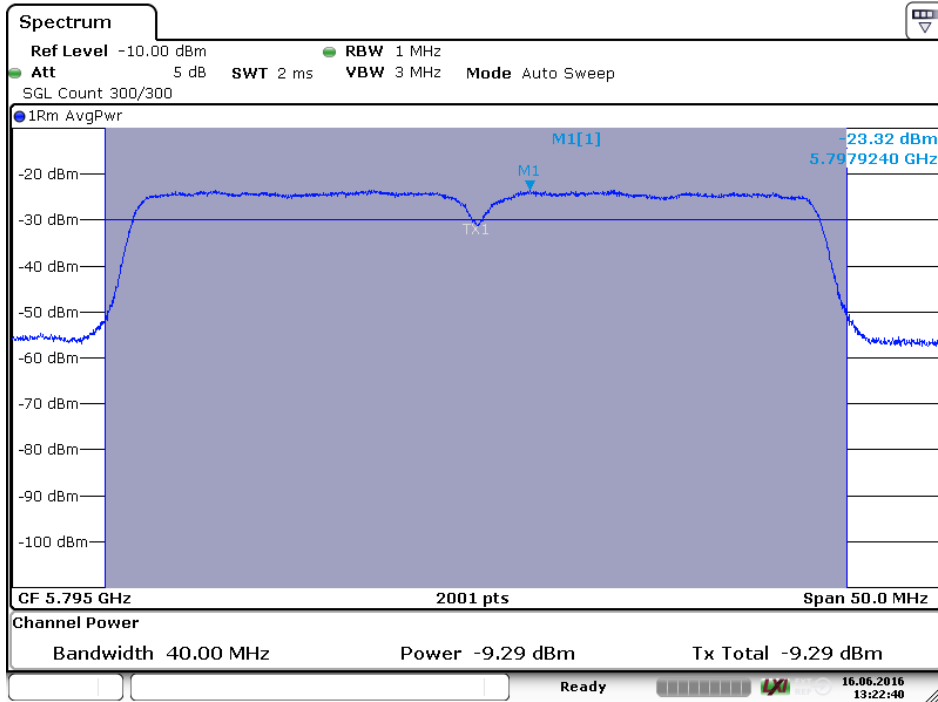
**Screenshot: Power spectral density, channel 142 mode n HT-40**



**Screenshot: Average Output power, channel 151 mode n HT-40**

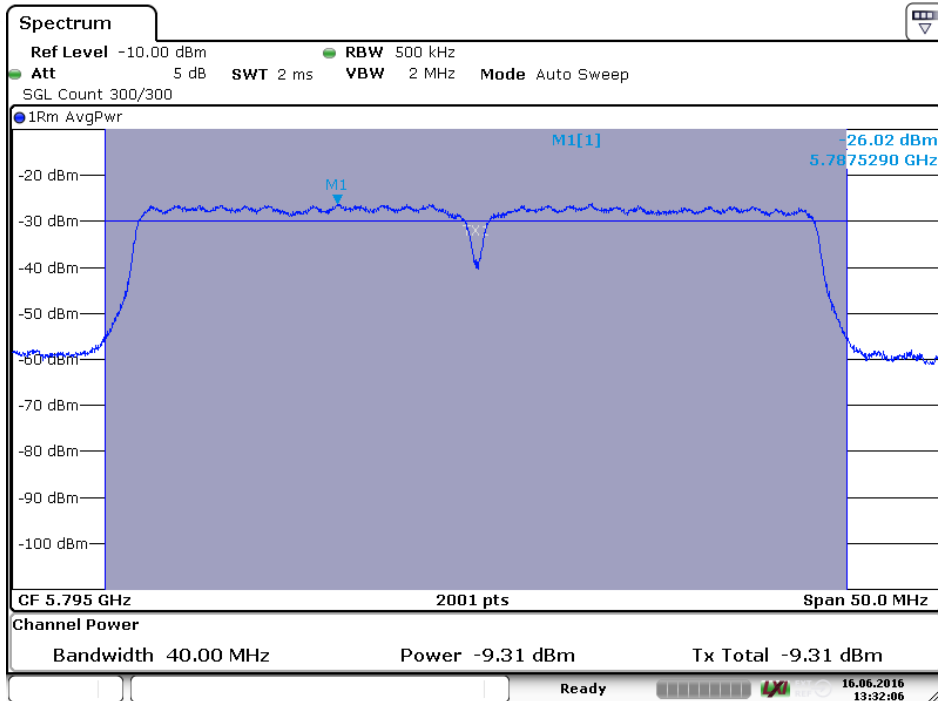


**Screenshot: Power spectral density, channel 151 mode n HT-40**



Date: 16 JUN 2016 13:22:40

**Screenshot: Average Output power, channel 159 mode n HT-40**



Date: 16 JUN 2016 13:32:07

**Screenshot: Power spectral density, channel 159 mode n HT-40**

## 8 OCCUPIED BANDWIDTH

<b>Date of test:</b>	2016-06-15	<b>Test location:</b>	Wireless Center
<b>EUT Serial:</b>	No serial on the EUT	<b>Ambient temp:</b>	22 °C
<b>Tested by:</b>	Matti Virkki	<b>Relative humidity:</b>	37 %
<b>Test result:</b>	Pass	<b>Margin:</b>	15.8 MHz

### 8.1 Test set-up and test procedure.

The test method is in accordance with KDB 789033 D02 General UNII Test Procedures New Rulesv01r02 section E.

The EUT was connected to spectrum analyser via rf-cable and attenuator.

### 8.2 Test conditions

Detector: Peak,  
RBW: 1 – 5 % of OBW  
VBW: 3 x RBW  
Span: >1.5 x OBW

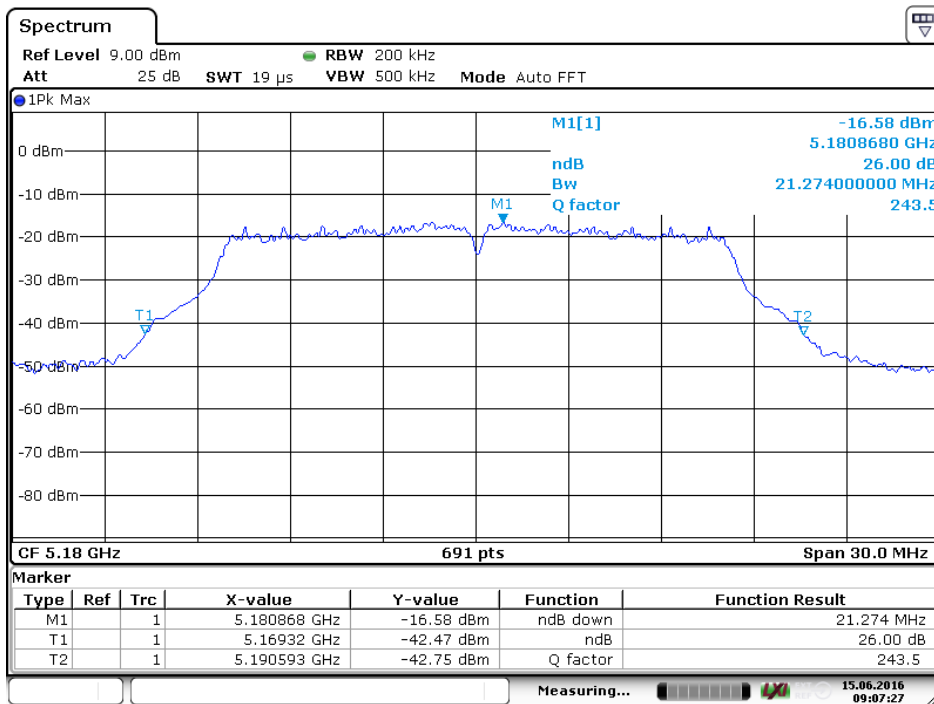
The EUT was set up in order to emit maximum disturbances.

### 8.3 Requirements

Reference: §15.407(e) RSS-247 6.2.4(1)

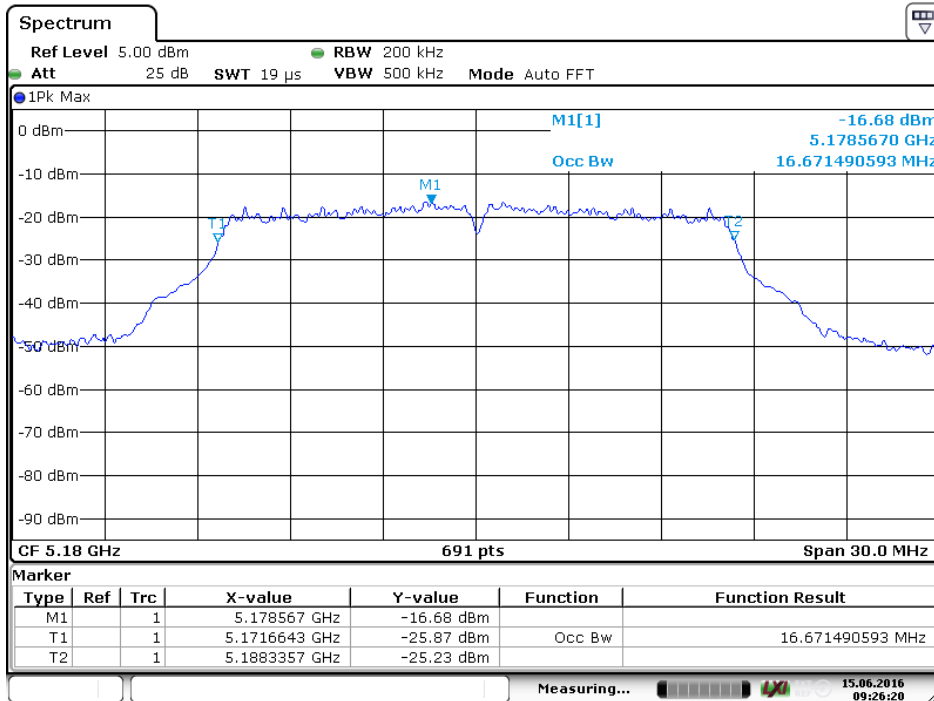
Within the 5.725-5.85 GHz band, the minimum 6 dB bandwidth of U-NII devices shall be at least 500 kHz.

**8.4 Test results**



Date: 15 JUN 2016 09:07:27

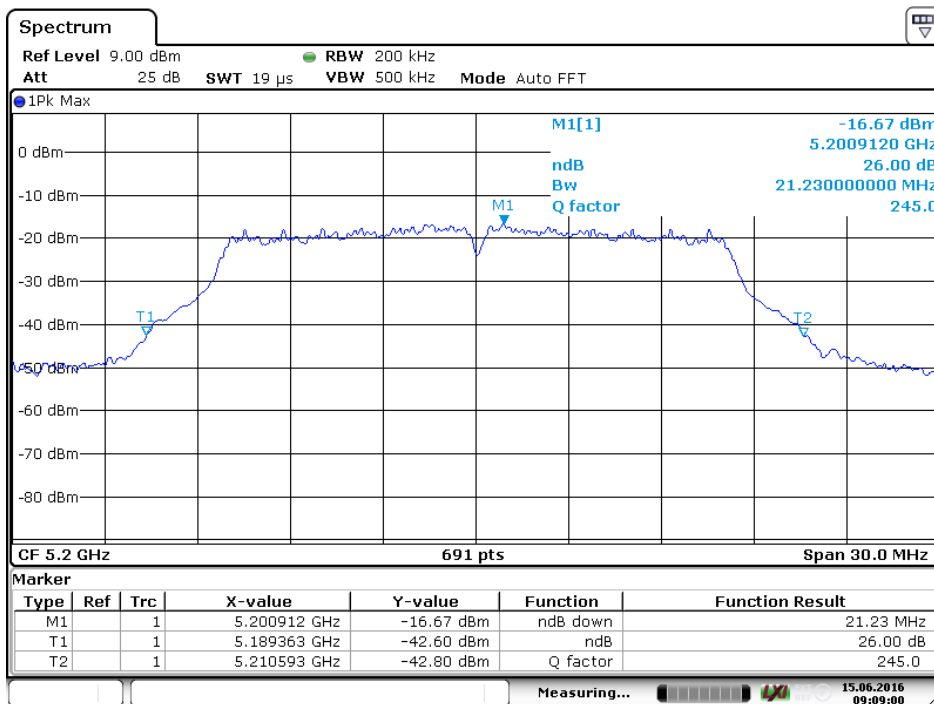
**Screenshot: Occupied 26 dB bandwidth Measurement, channel 36 mode a**



Date: 15 JUN 2016 09:26:20

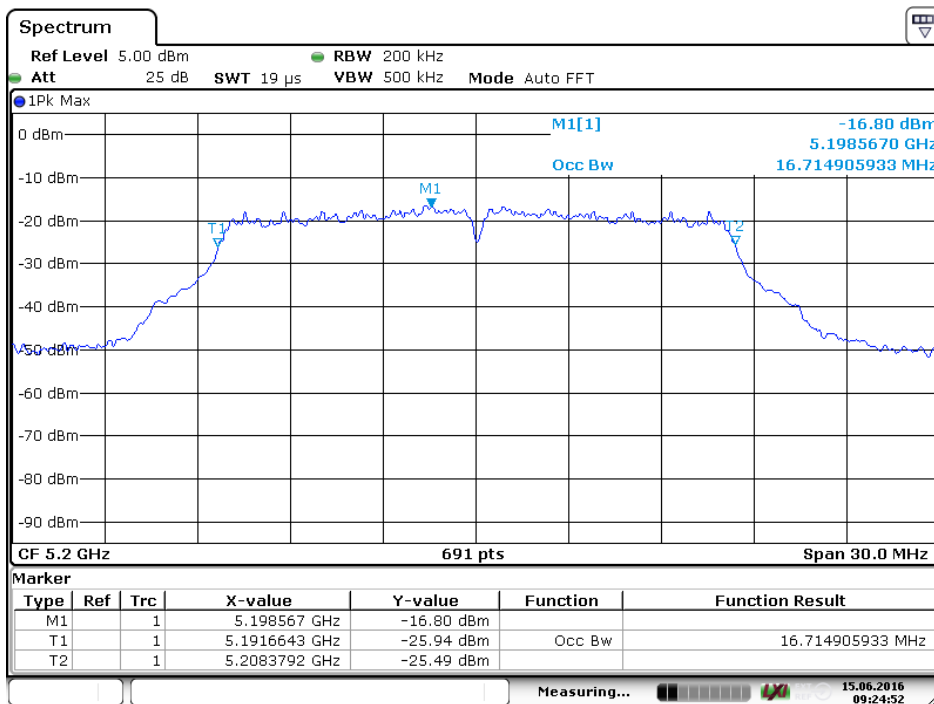
**Screenshot: Occupied 99% bandwidth Measurement, channel 36 mode a**





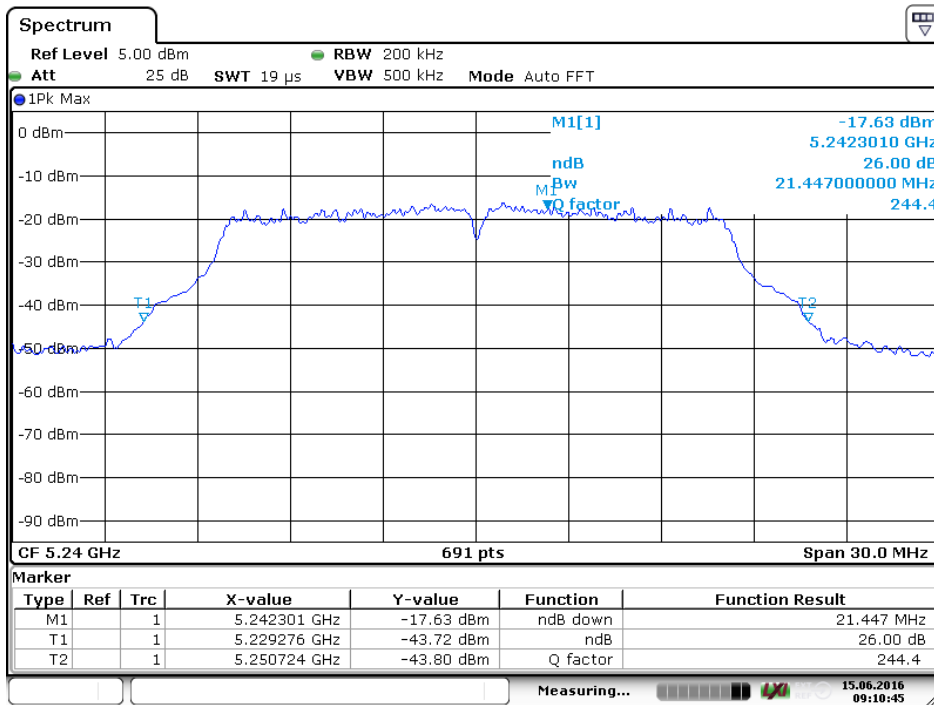
Date: 15 JUN 2016 09:09:01

**Screenshot: Occupied 26 dB bandwidth Measurement, channel 40 mode a**



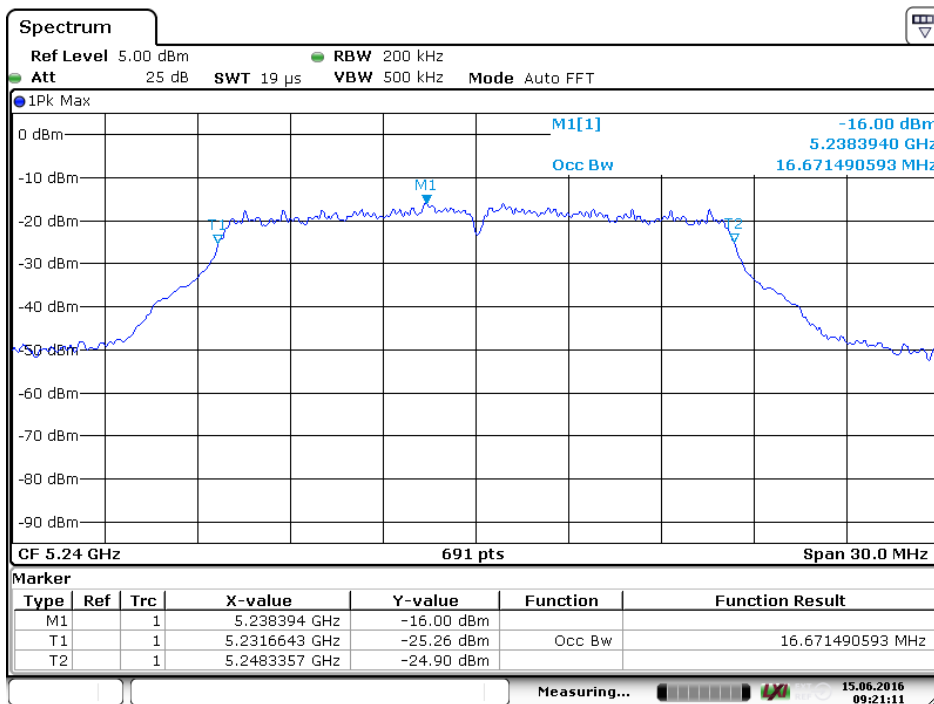
Date: 15 JUN 2016 09:24:52

**Screenshot: Occupied 99% bandwidth Measurement, channel 40 mode a**



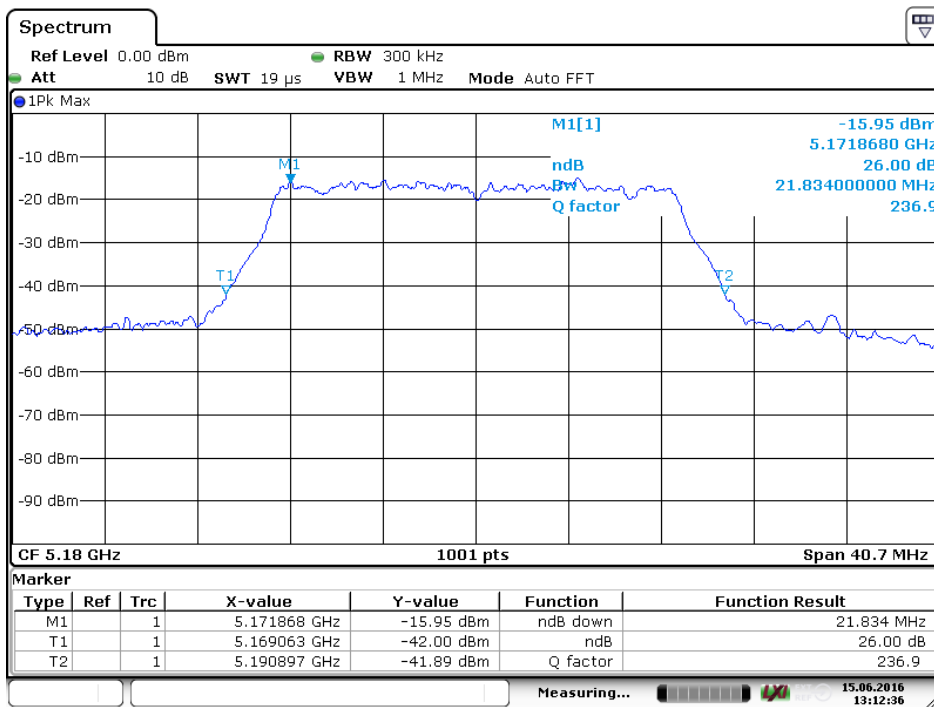
Date: 15 JUN 2016 09:10:45

**Screenshot: Occupied 26 dB bandwidth Measurement, channel 48 mode a**



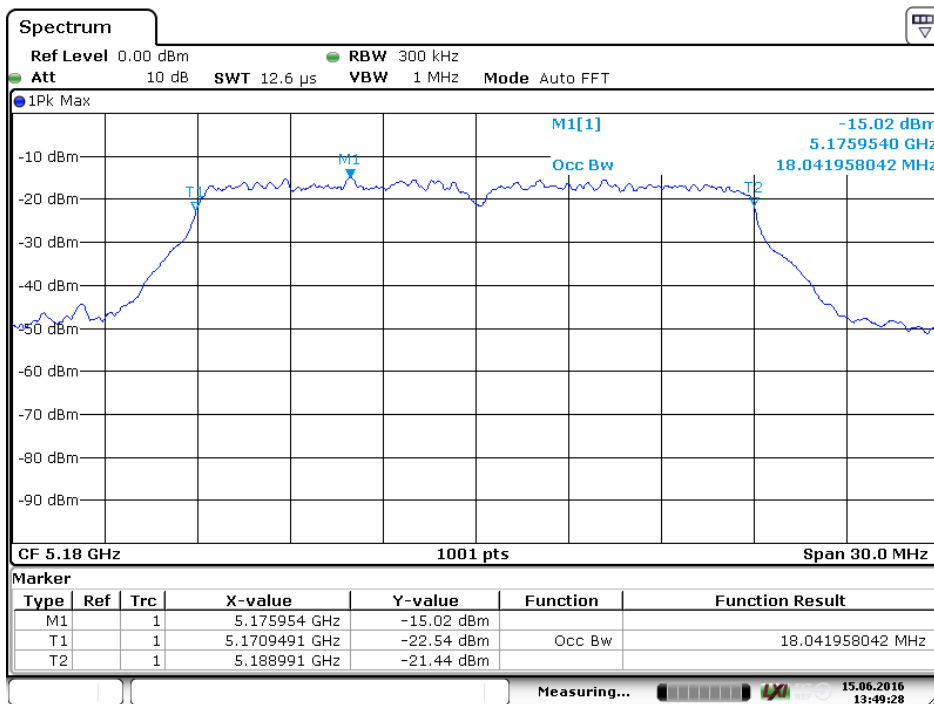
Date: 15 JUN 2016 09:21:11

**Screenshot: Occupied 99% bandwidth Measurement, channel 48 mode a**



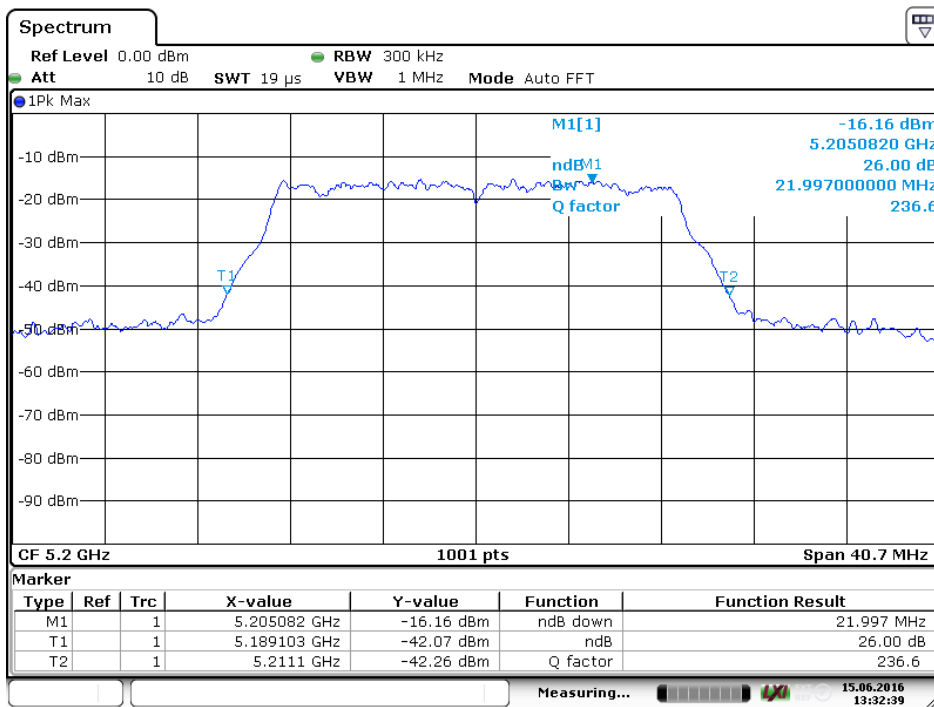
Date: 15 JUN 2016 13:12:36

**Screenshot: Occupied 26 dB bandwidth Measurement, channel 36 mode n HT-20**



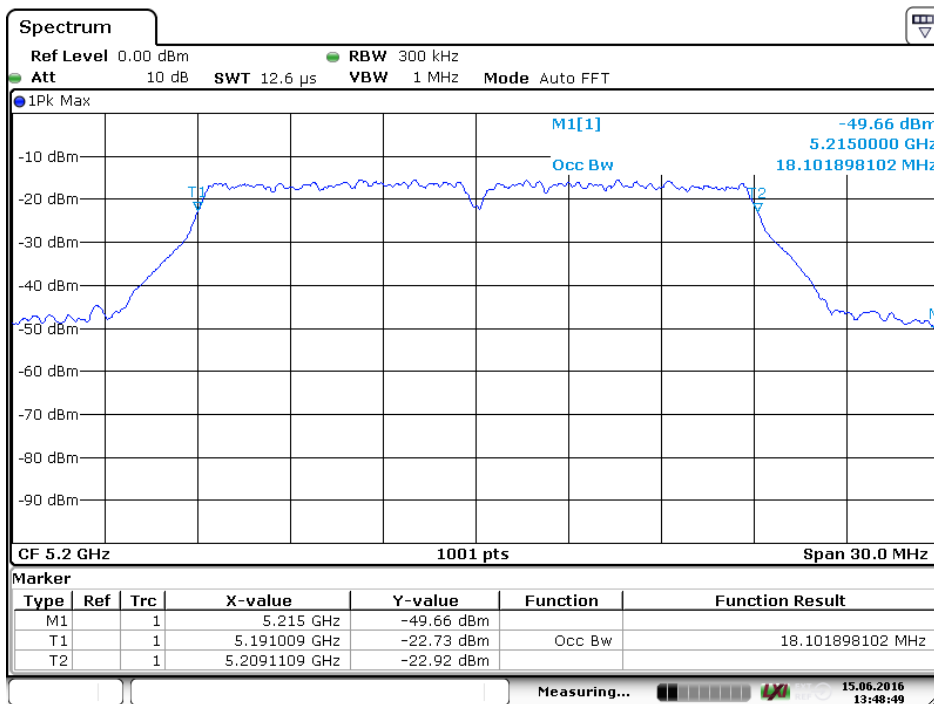
Date: 15 JUN 2016 13:49:27

**Screenshot: Occupied 99% bandwidth Measurement, channel 36 mode n HT-20**



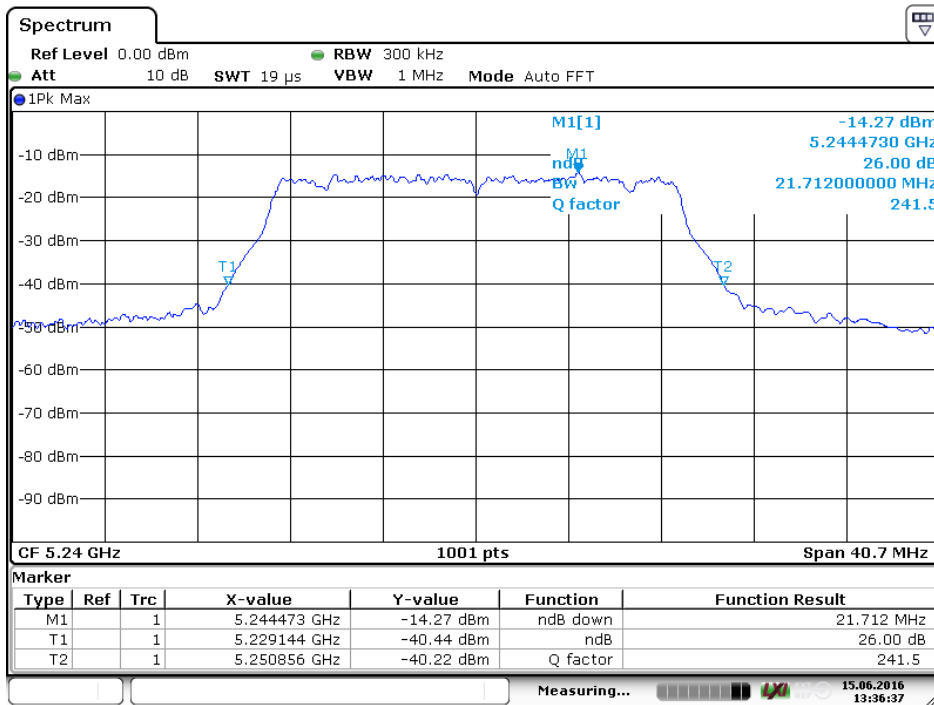
Date: 15 JUN 2016 13:32:38

**Screenshot: Occupied 26 dB bandwidth Measurement, channel 40 mode n HT-20**



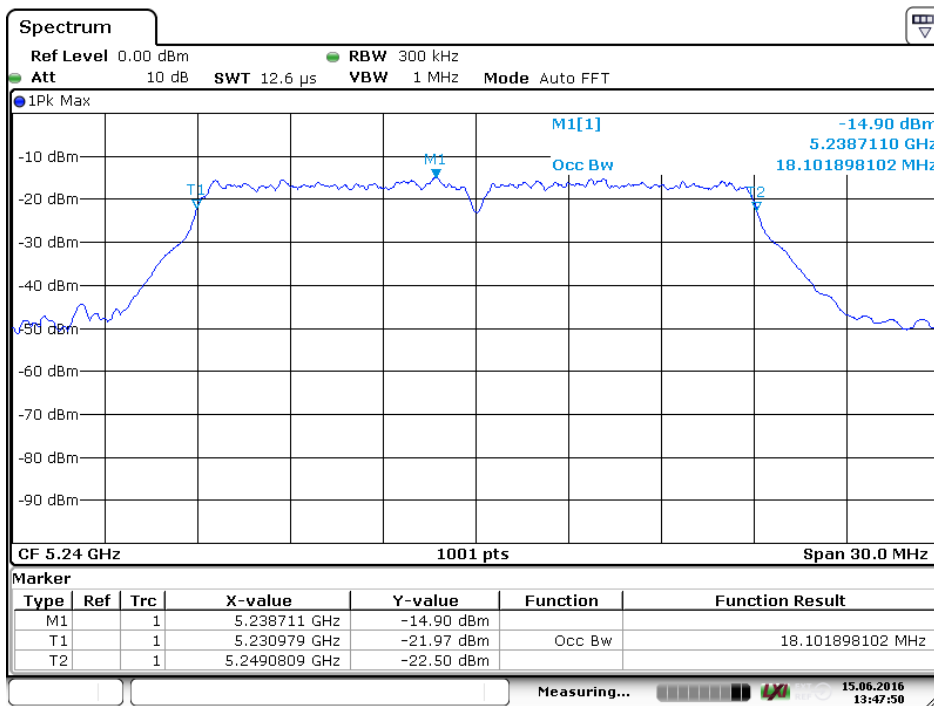
Date: 15 JUN 2016 13:48:49

**Screenshot: Occupied 99% bandwidth Measurement, channel 40 mode n HT-20**



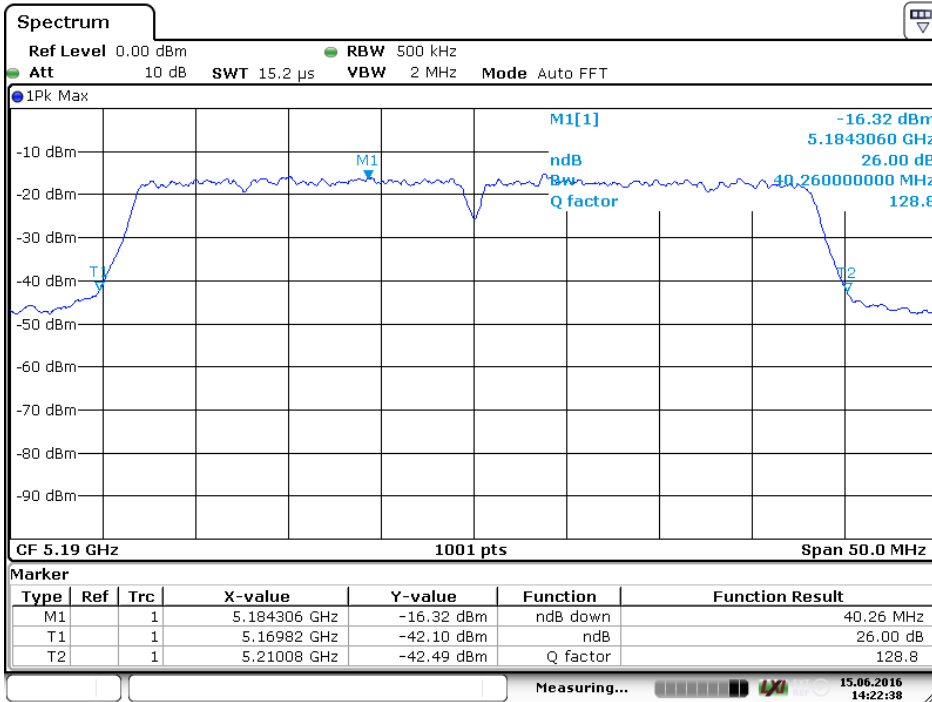
Date: 15 JUN 2016 13:36:37

**Screenshot: Occupied 26 dB bandwidth Measurement, channel 48 mode n HT-20**



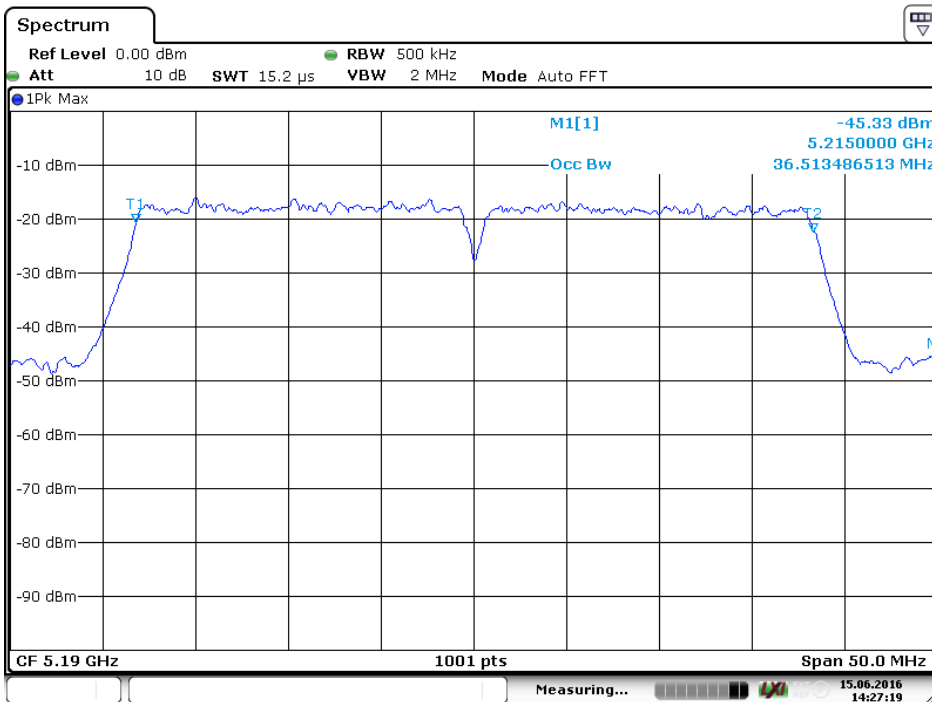
Date: 15 JUN 2016 13:47:51

**Screenshot: Occupied 99% bandwidth Measurement, channel 48 mode n HT-20**



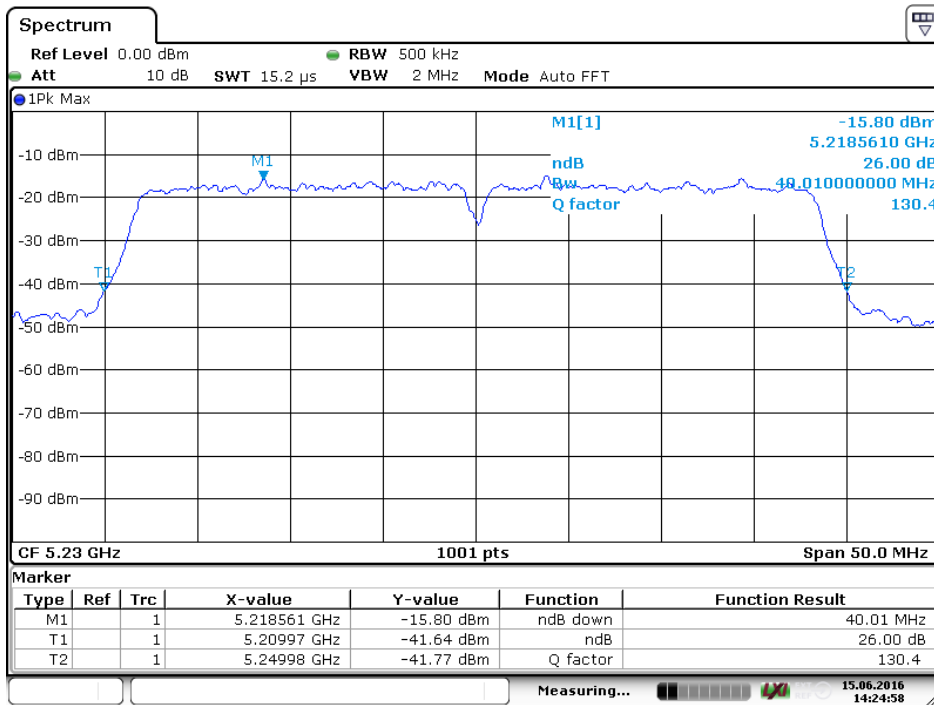
Date: 15 JUN 2016 14:22:39

**Screenshot: Occupied 26 dB bandwidth Measurement, channel 38 mode n HT-40**



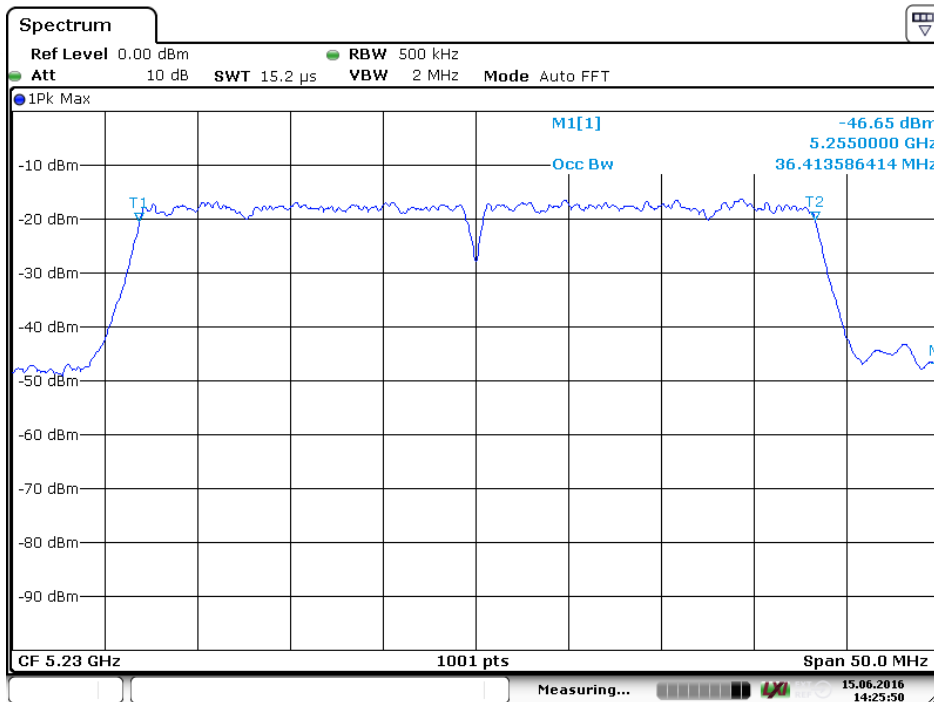
Date: 15 JUN 2016 14:27:19

**Screenshot: Occupied 99% bandwidth Measurement, channel 38 mode n HT-40**



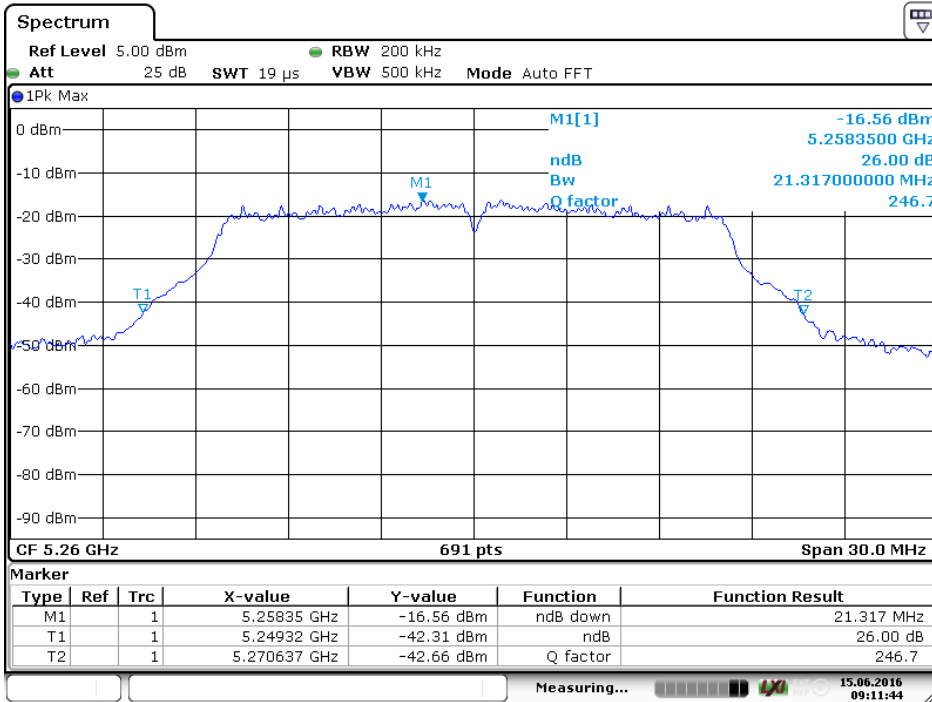
Date: 15 JUN 2016 14:24:58

**Screenshot: Occupied 26 dB bandwidth Measurement, channel 46 mode n HT-40**



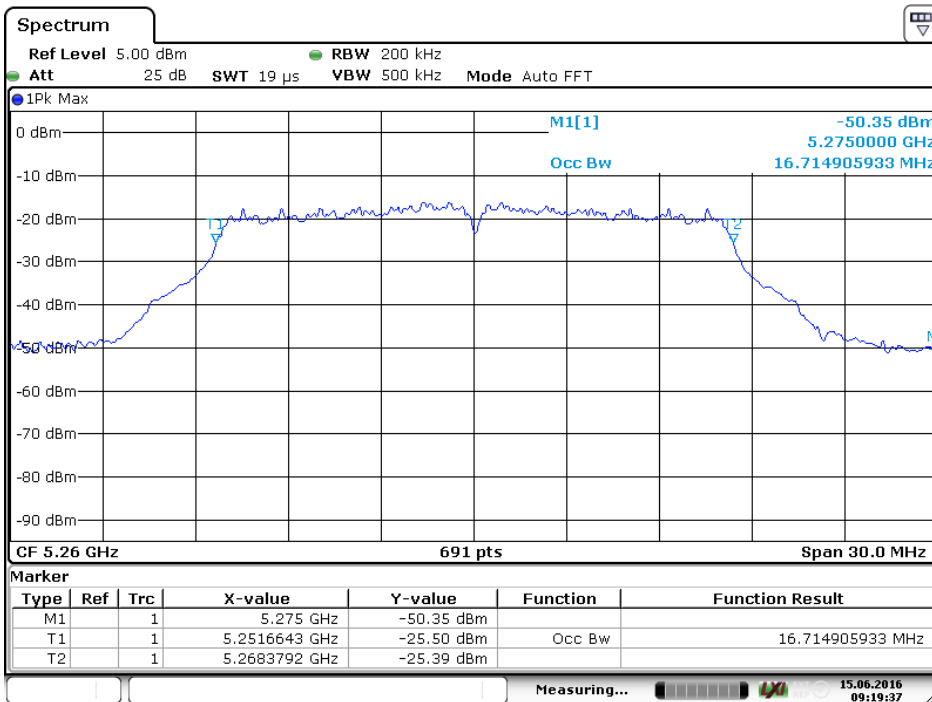
Date: 15 JUN 2016 14:25:50

**Screenshot: Occupied 99% bandwidth Measurement, channel 46 mode n HT-40**



Date: 15 JUN 2016 09:11:44

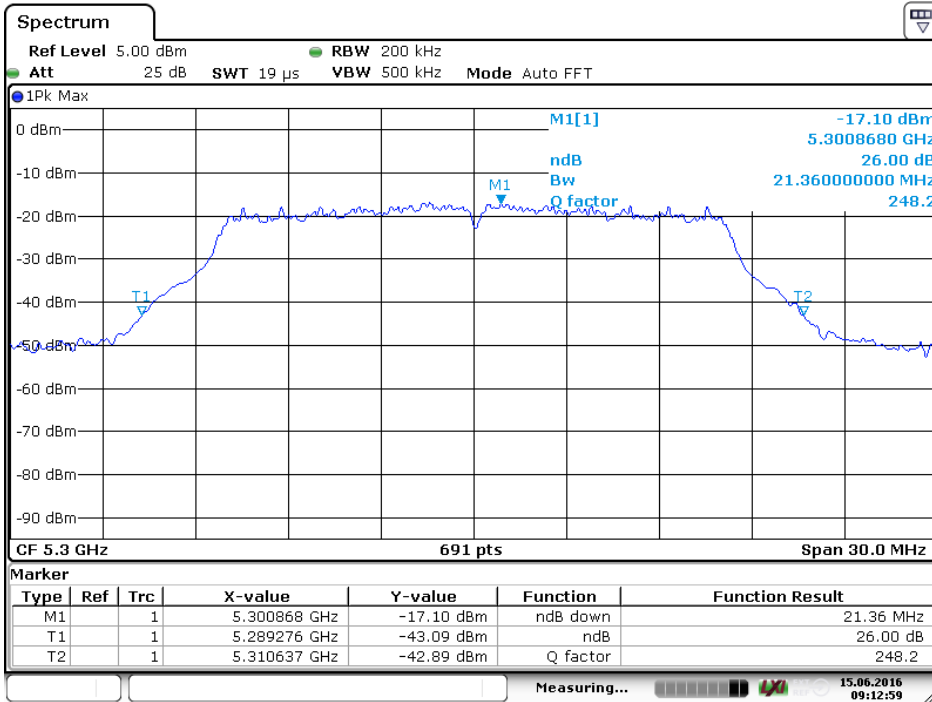
**Screenshot: Occupied 26 dB bandwidth Measurement, channel 52 mode a**



Date: 15 JUN 2016 09:19:37

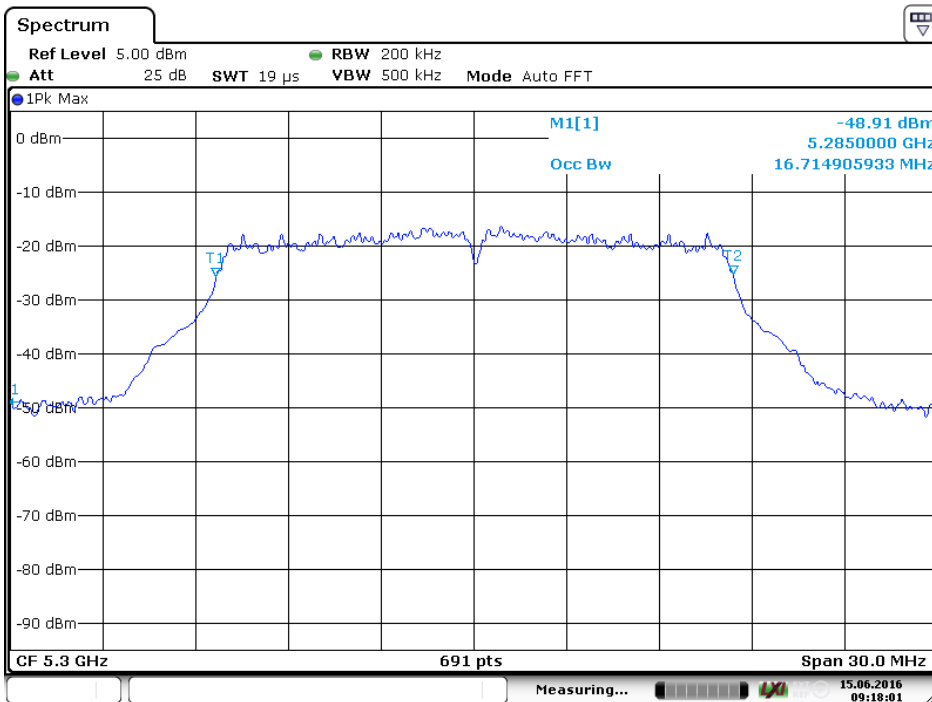
**Screenshot: Occupied 99% bandwidth Measurement, channel 52 mode a**





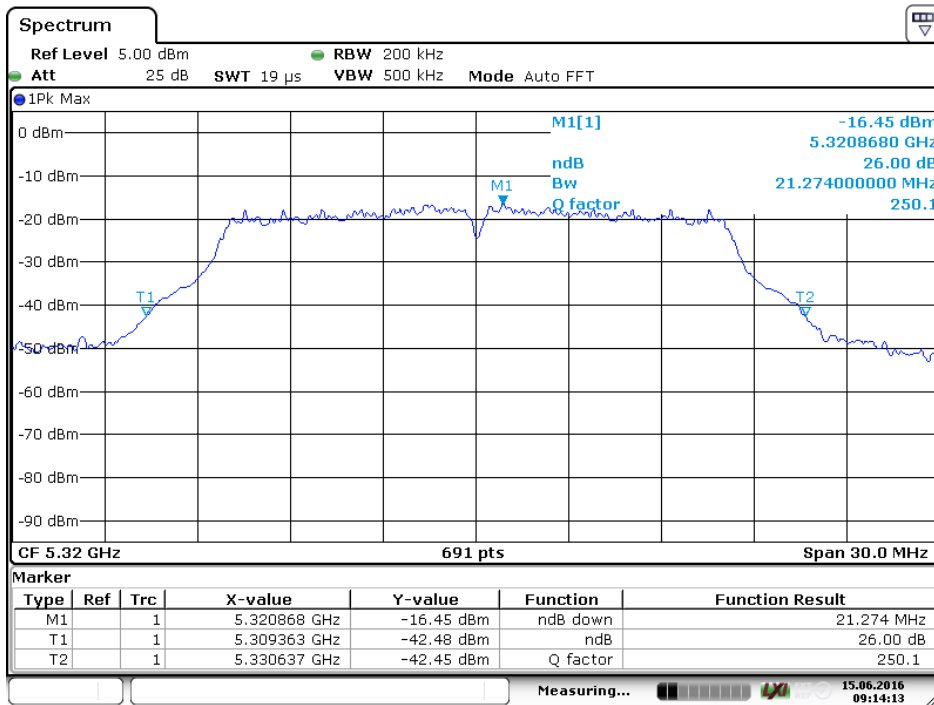
Date: 15 JUN 2016 09:13:00

**Screenshot: Occupied 26 dB bandwidth Measurement, channel 60 mode a**



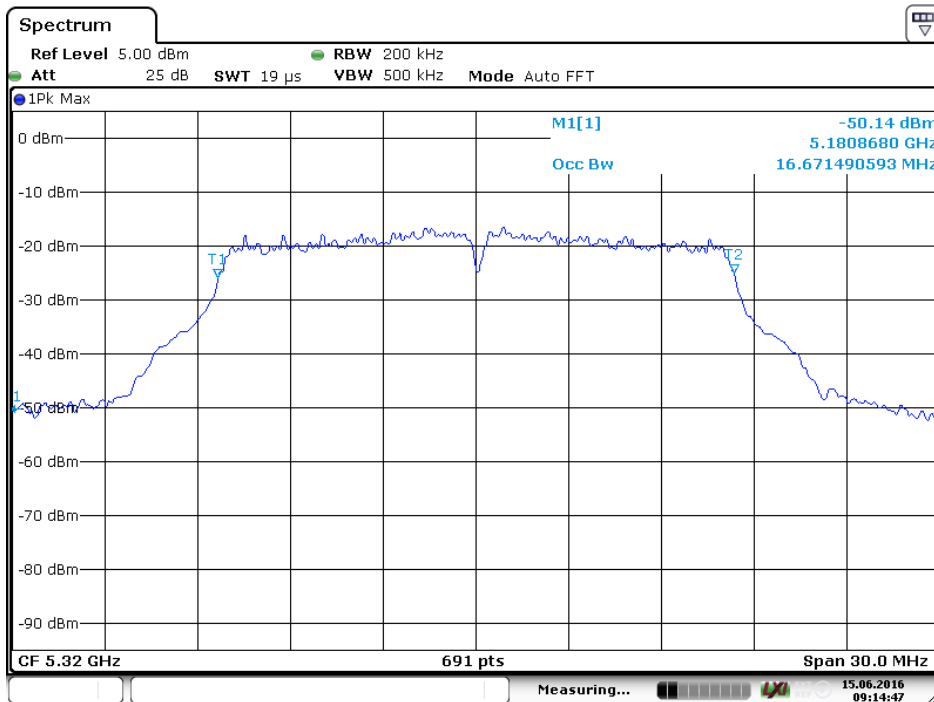
Date: 15 JUN 2016 09:18:01

**Screenshot: Occupied 99% bandwidth Measurement, channel 60 mode a**



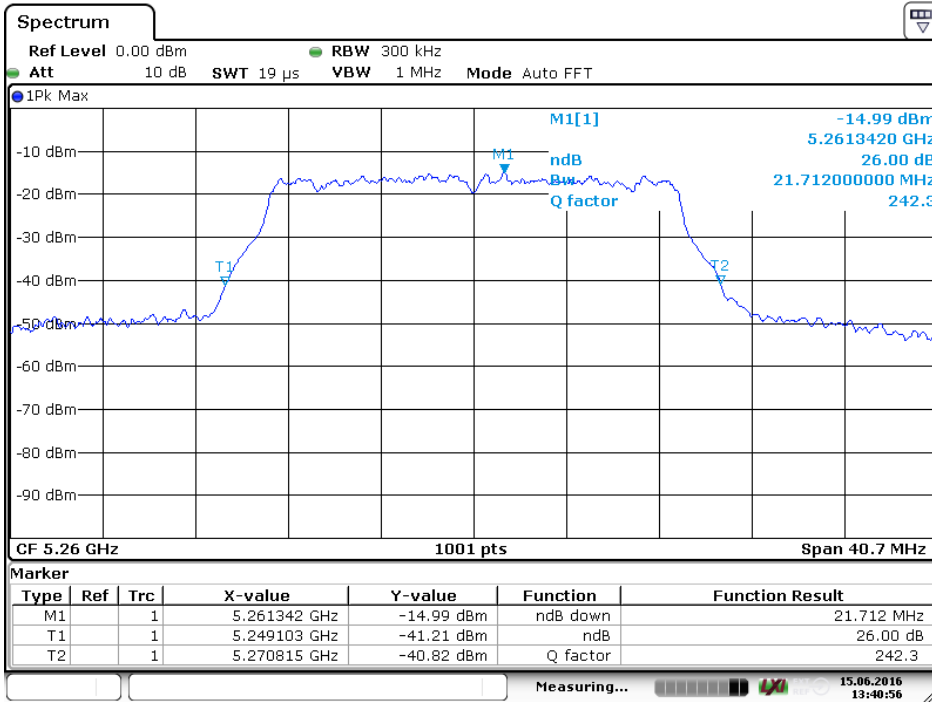
Date: 15 JUN 2016 09:14:14

**Screenshot: Occupied 26 dB bandwidth Measurement, channel 64 mode a**



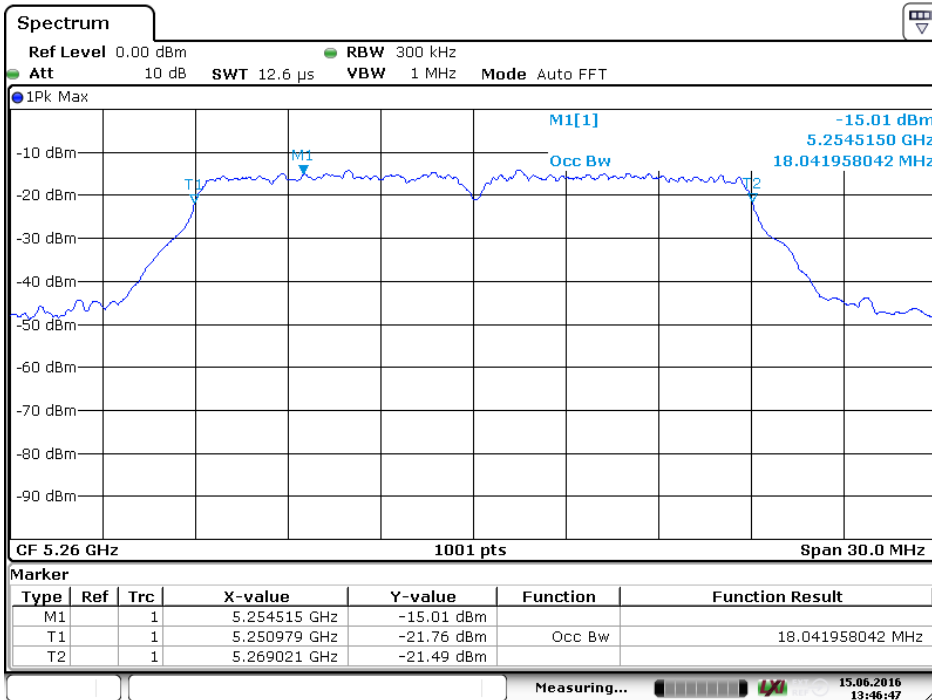
Date: 15 JUN 2016 09:14:47

**Screenshot: Occupied 99% bandwidth Measurement, channel 64 mode a**



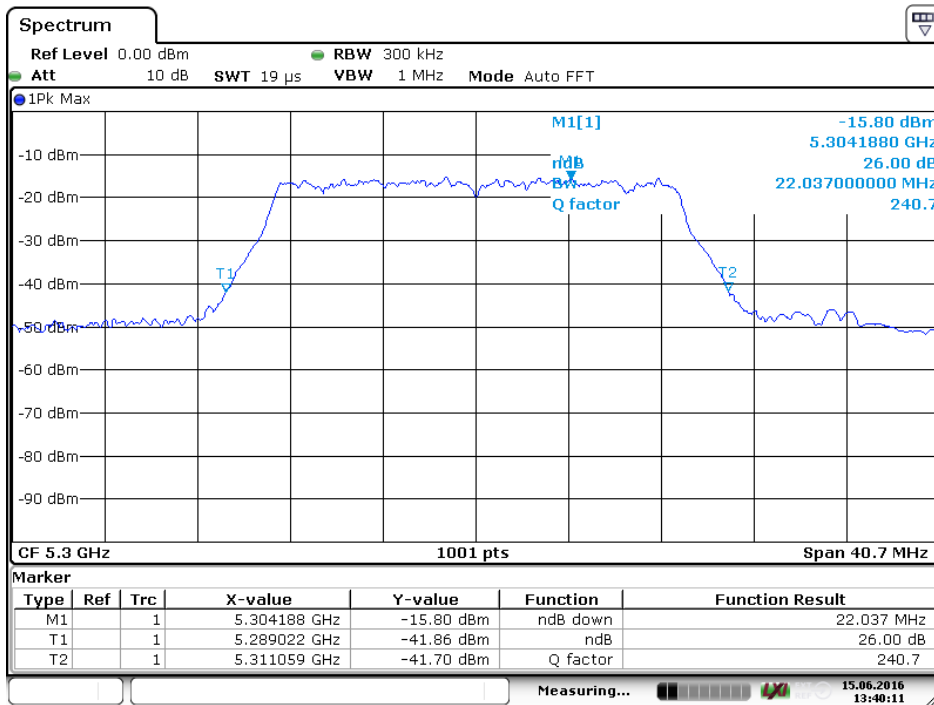
Date: 15 JUN 2016 13:40:56

**Screenshot: Occupied 26 dB bandwidth Measurement, channel 52 mode n HT-20**



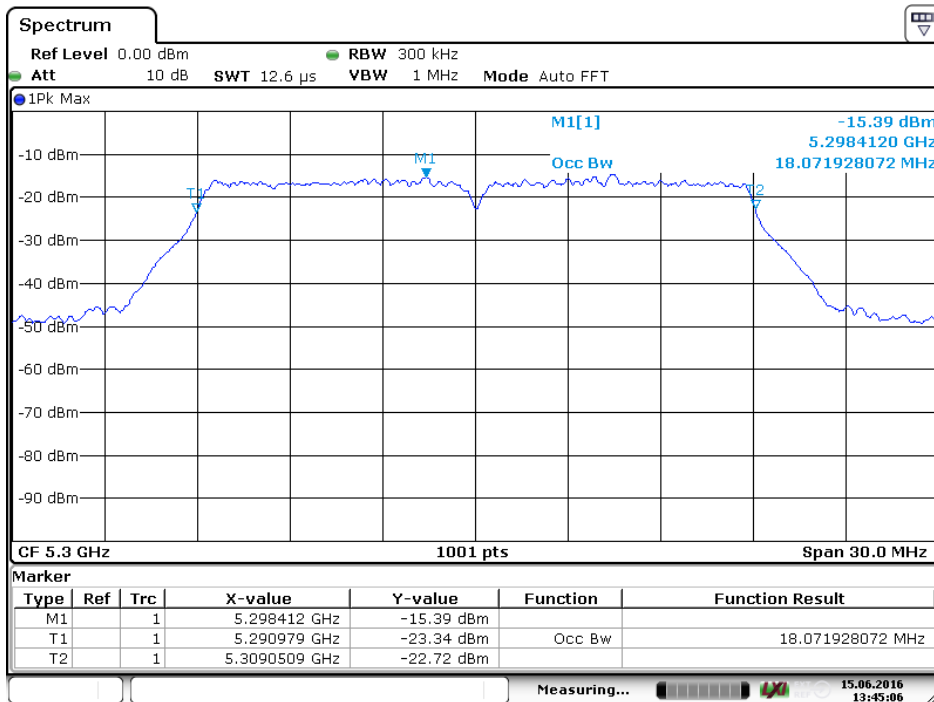
Date: 15 JUN 2016 13:46:48

**Screenshot: Occupied 99% bandwidth Measurement, channel 52 mode n HT-20**



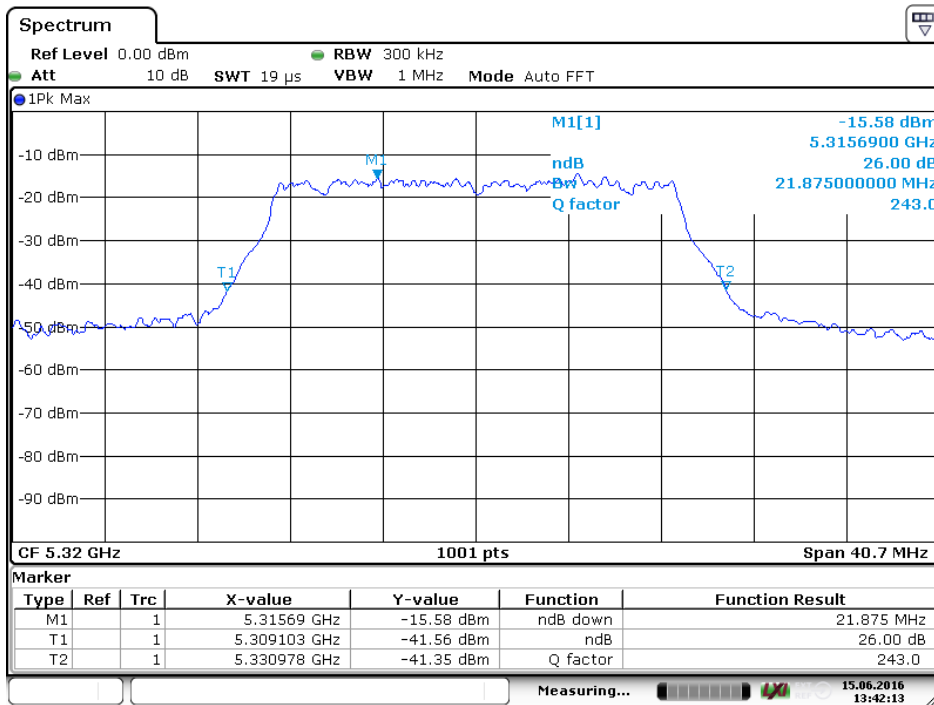
Date: 15 JUN 2016 13:40:11

**Screenshot: Occupied 26 dB bandwidth Measurement, channel 60 mode n HT-20**



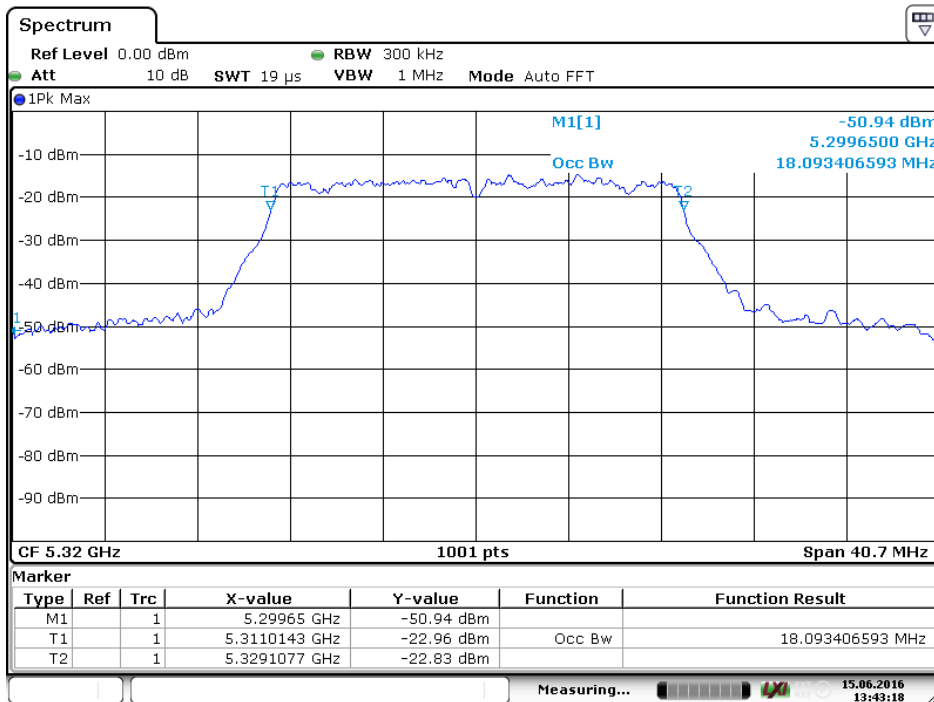
Date: 15 JUN 2016 13:45:06

**Screenshot: Occupied 99% bandwidth Measurement, channel 60 mode n HT-20**



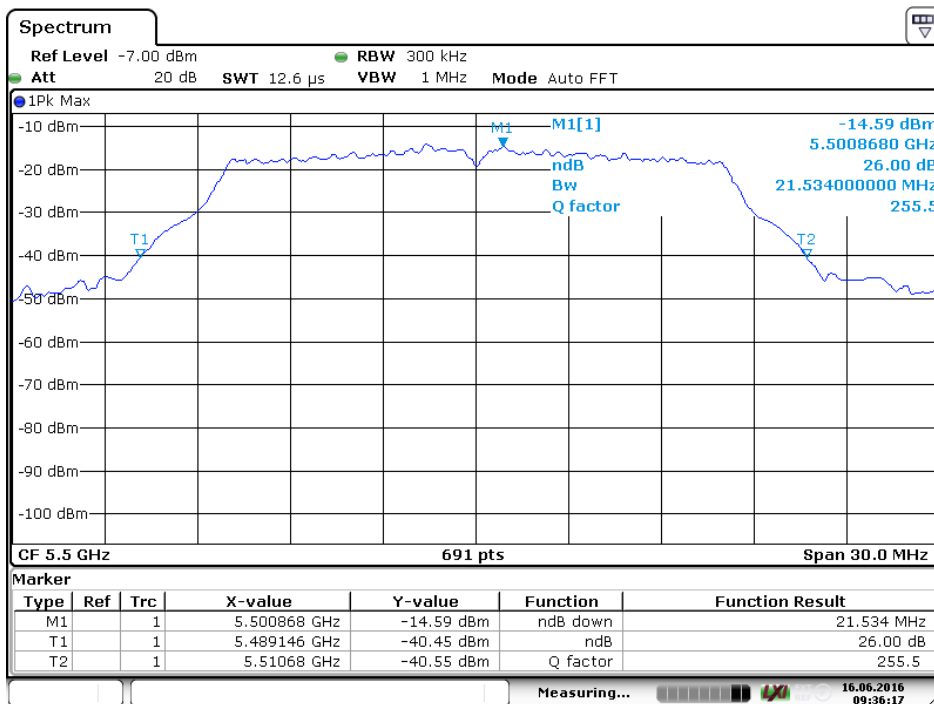
Date: 15 JUN 2016 13:42:12

**Screenshot: Occupied 26 dB bandwidth Measurement, channel 64 mode n HT-20**



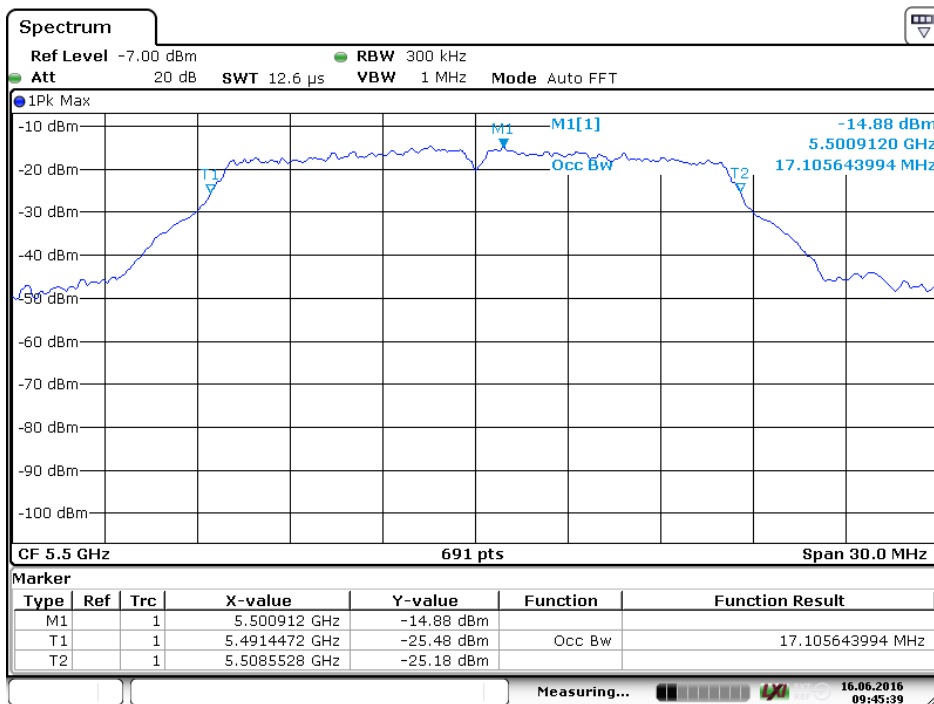
Date: 15 JUN 2016 13:43:17

**Screenshot: Occupied 99% bandwidth Measurement, channel 64 mode n HT-20**



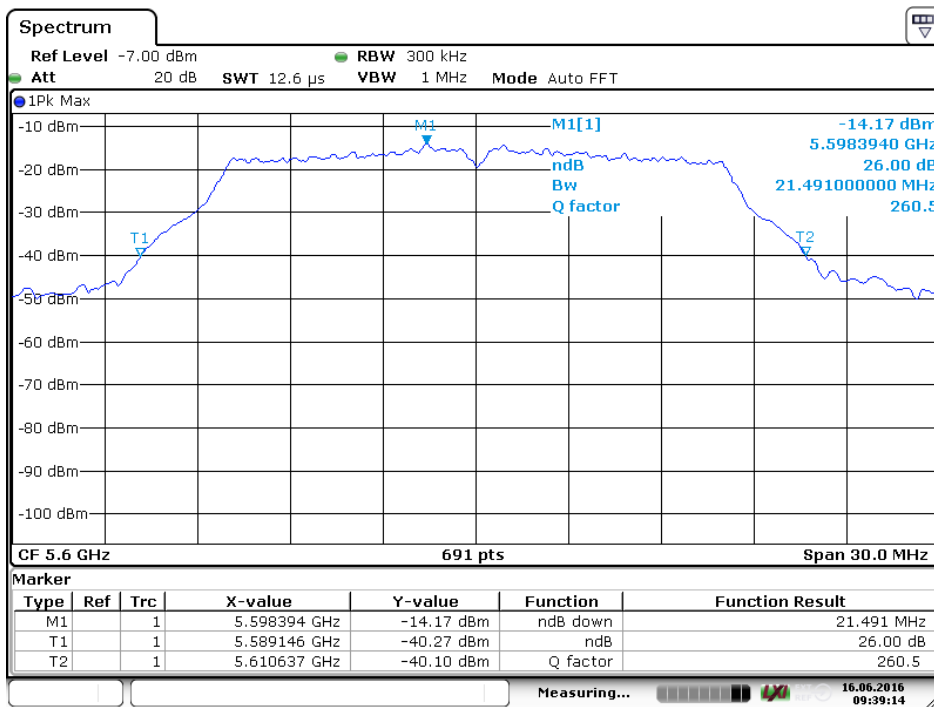
Date: 16 JUN 2016 09:36:17

**Screenshot: Occupied 26 dB bandwidth Measurement, channel 100 mode a**



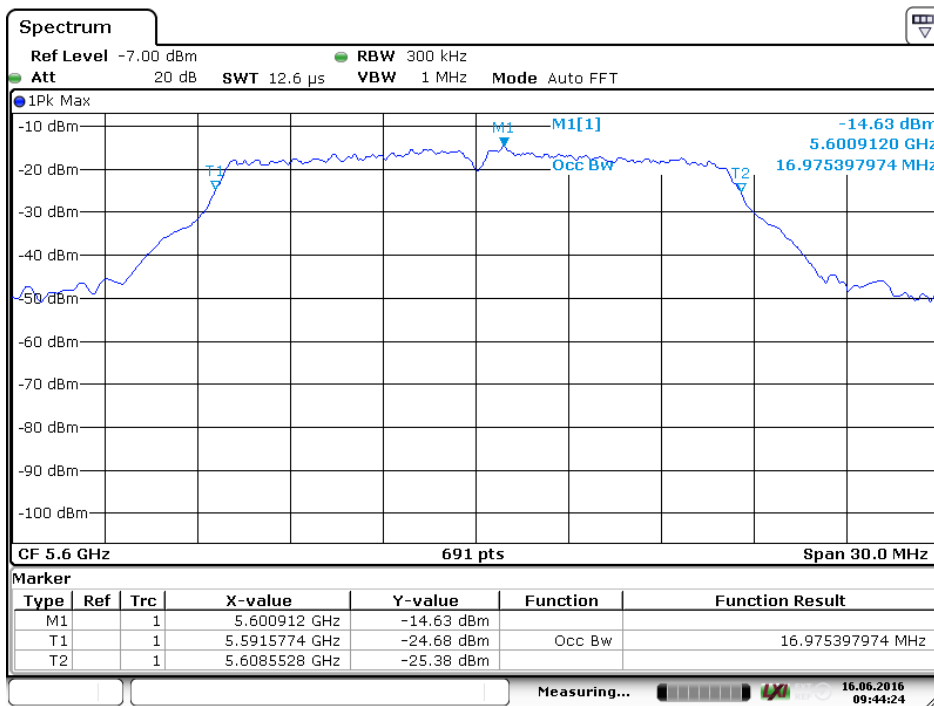
Date: 16 JUN 2016 09:45:38

**Screenshot: Occupied 99% bandwidth Measurement, channel 100 mode a**



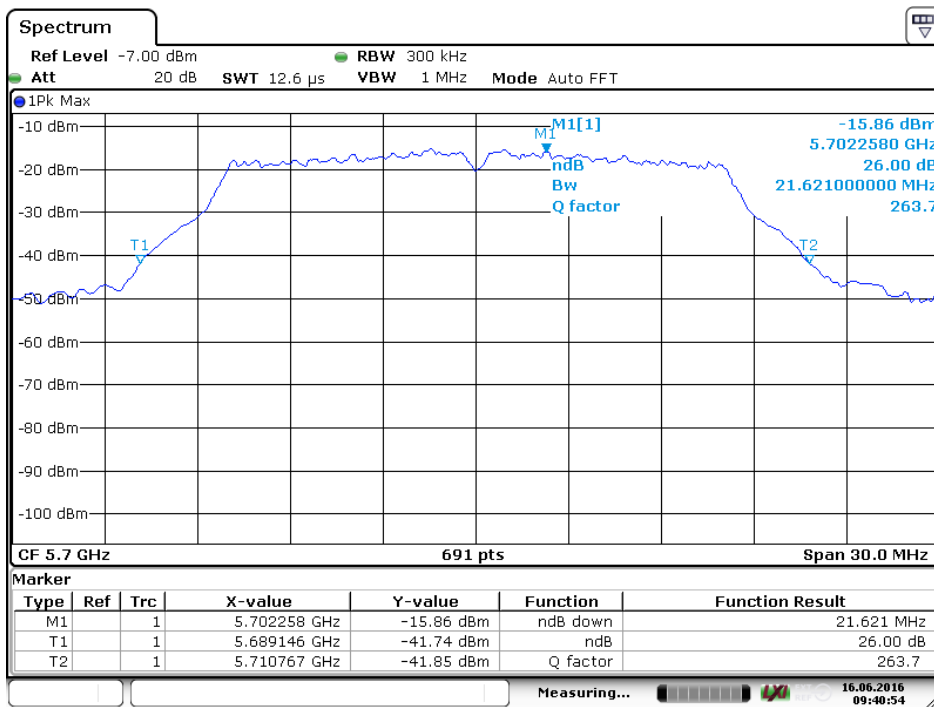
Date: 16 JUN 2016 09:39:14

**Screenshot: Occupied 26 dB bandwidth Measurement, channel 120 mode a**



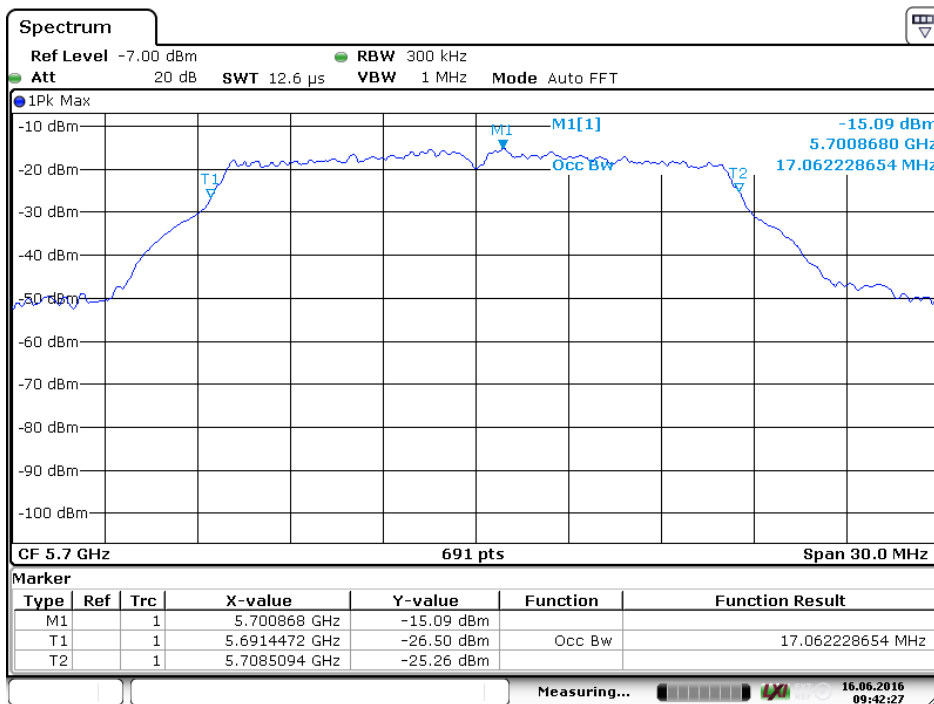
Date: 16 JUN 2016 09:44:23

**Screenshot: Occupied 99% bandwidth Measurement, channel 120 mode a**



Date: 16 JUN 2016 09:40:54

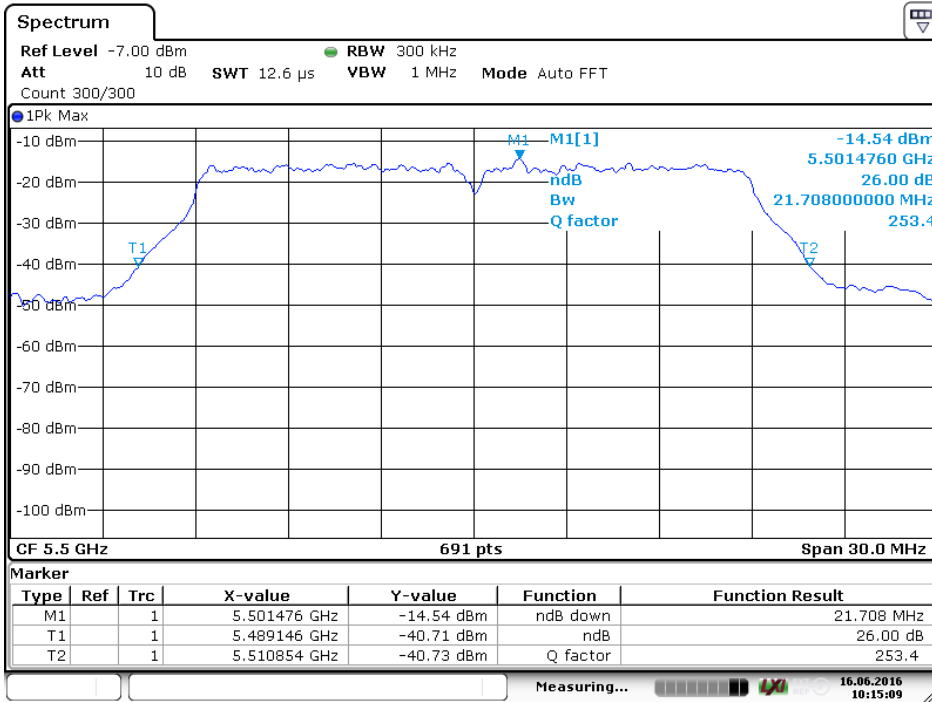
**Screenshot: Occupied 26 dB bandwidth Measurement, channel 140 mode a**



Date: 16 JUN 2016 09:42:27

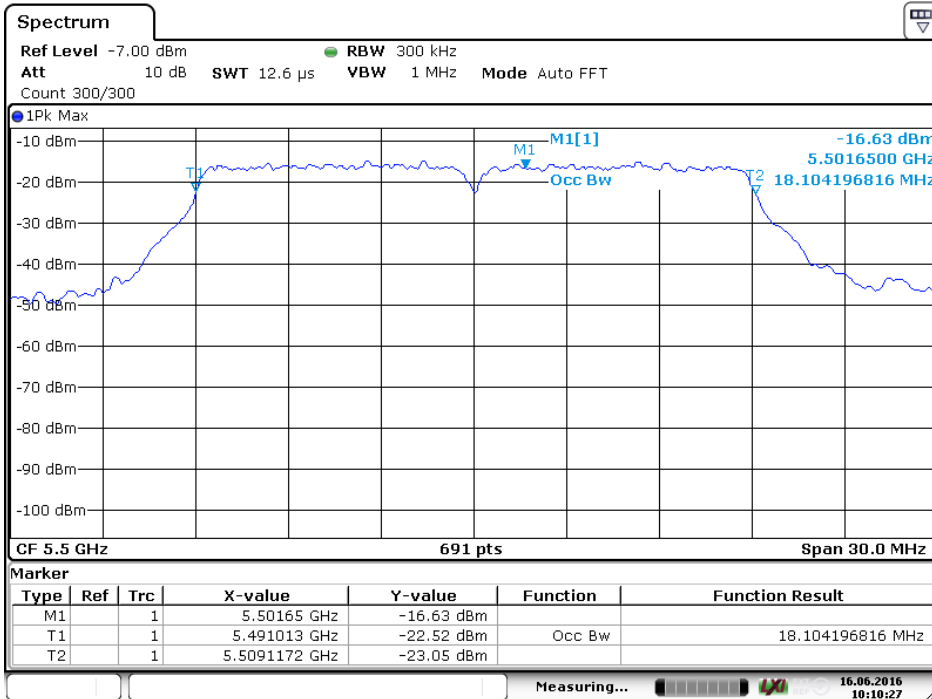
**Screenshot: Occupied 99% bandwidth Measurement, channel 140 mode a**





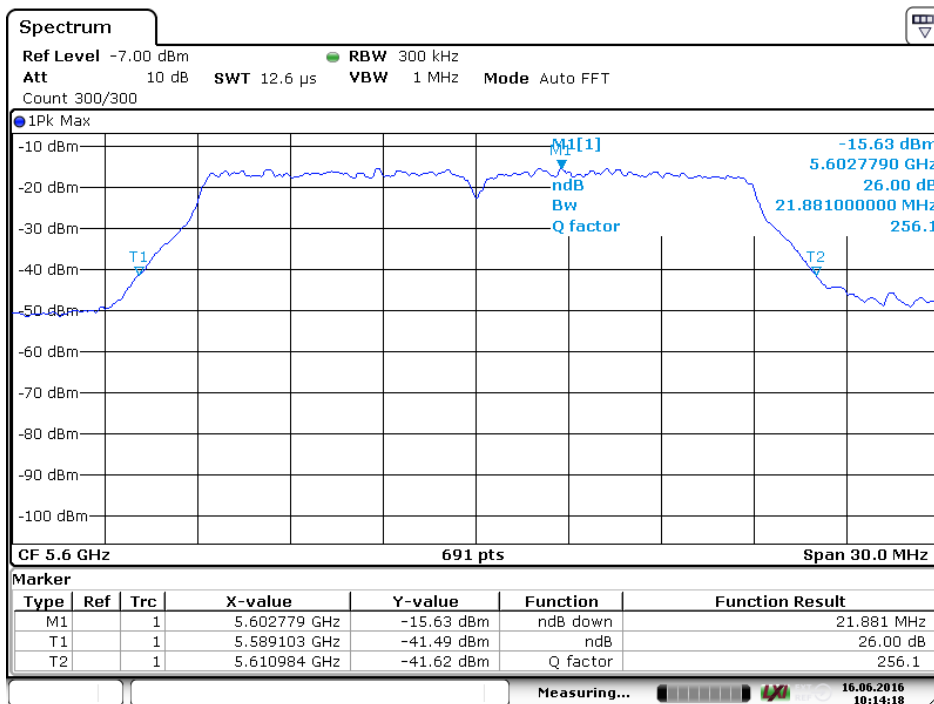
Date: 16 JUN 2016 10:15:09

**Screenshot: Occupied 26 dB bandwidth Measurement, channel 100 mode n HT-20**



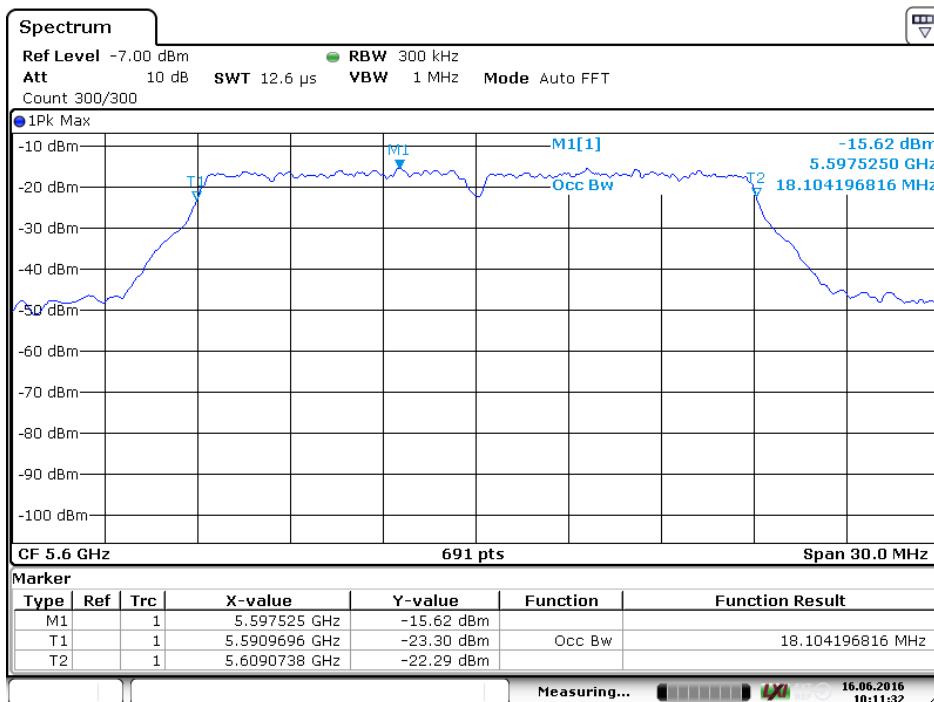
Date: 16 JUN 2016 10:10:27

**Screenshot: Occupied 99% bandwidth Measurement, channel 100 mode n HT-20**



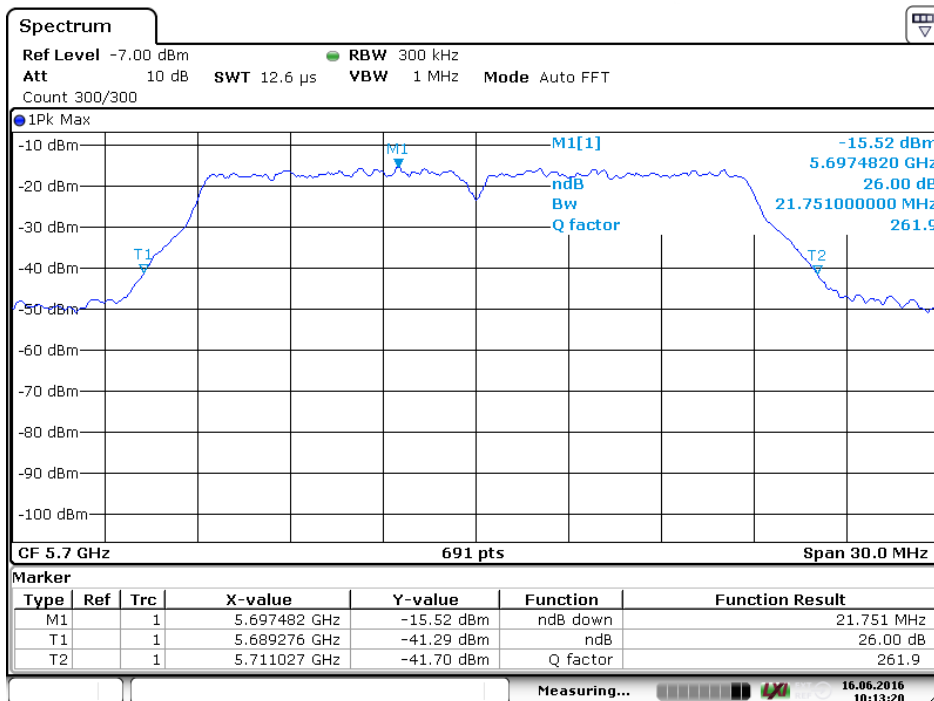
Date: 16 JUN 2016 10:14:18

**Screenshot: Occupied 26 dB bandwidth Measurement, channel 120 mode n HT-20**



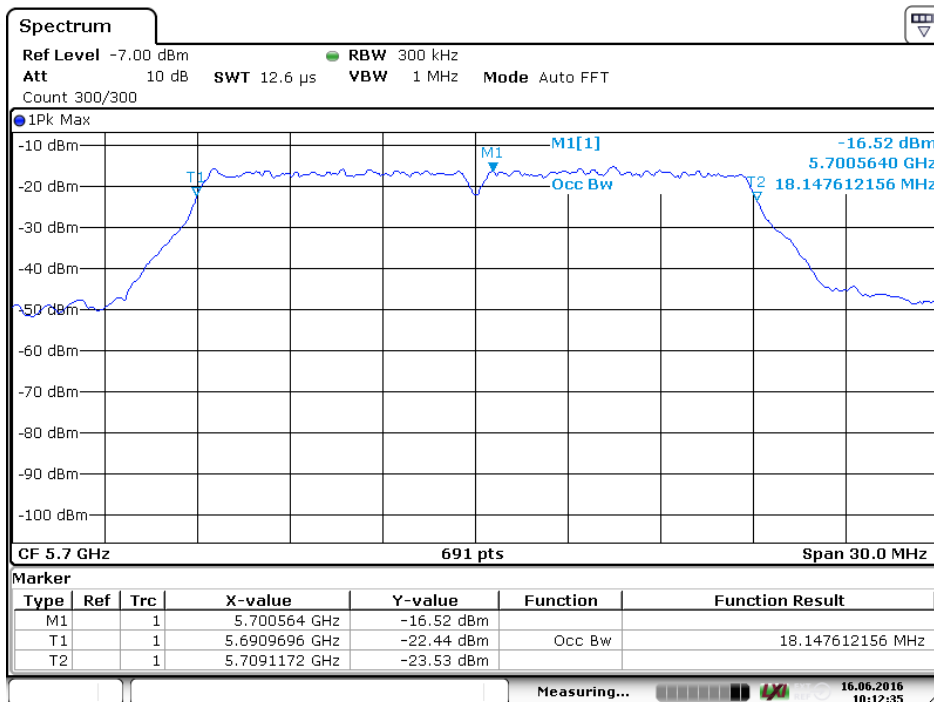
Date: 16 JUN 2016 10:11:32

**Screenshot: Occupied 99% bandwidth Measurement, channel 120 mode n HT-20**



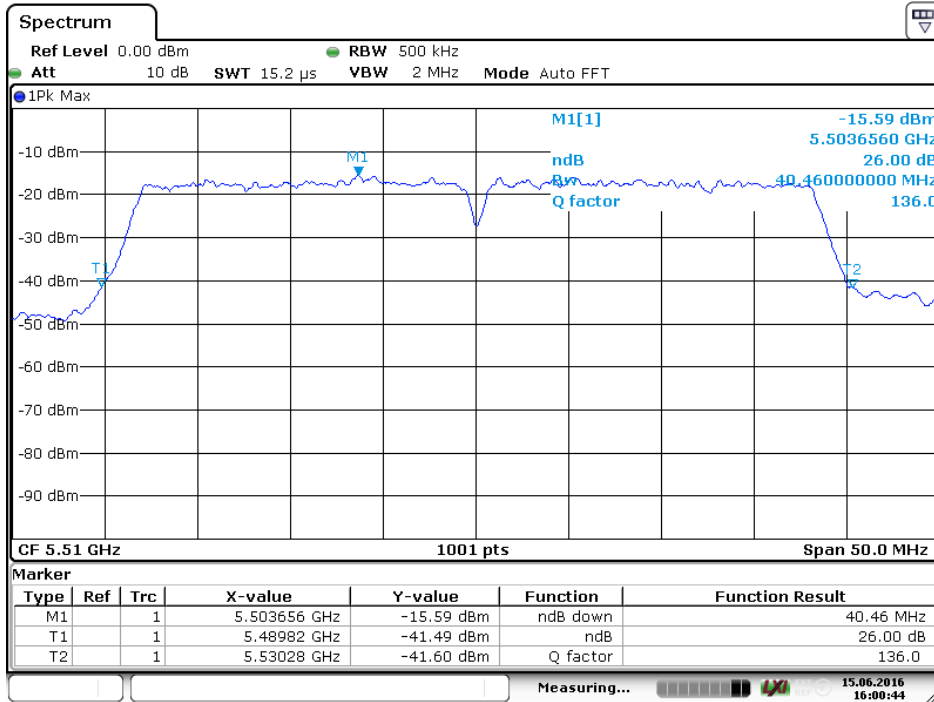
Date: 16 JUN 2016 10:13:20

**Screenshot: Occupied 26 dB bandwidth Measurement, channel 140 mode n HT-20**



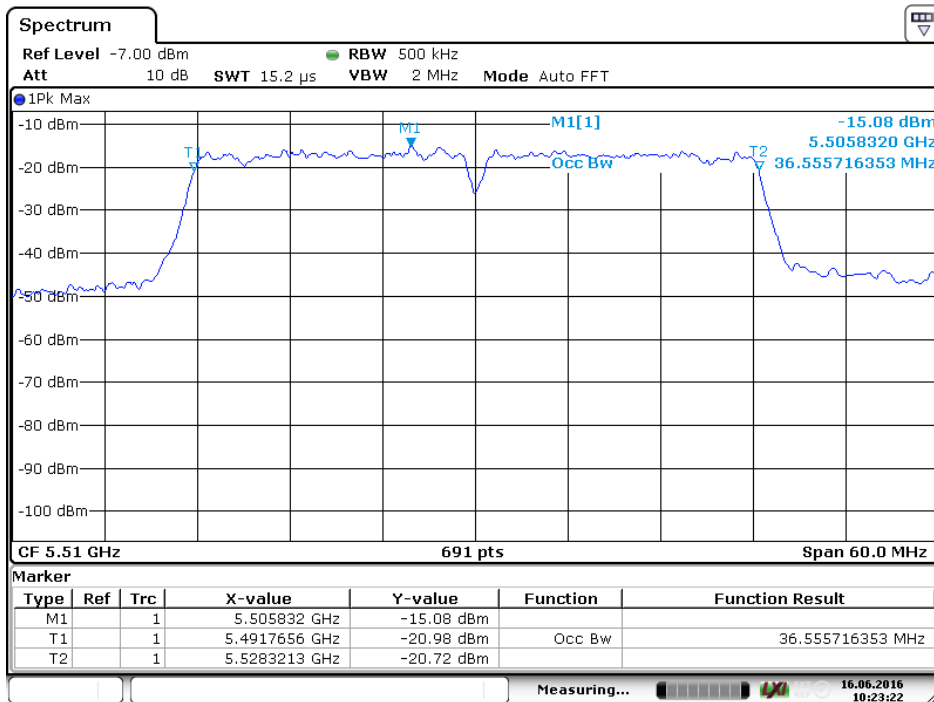
Date: 16 JUN 2016 10:12:35

**Screenshot: Occupied 99% bandwidth Measurement, channel 140 mode n HT-20**



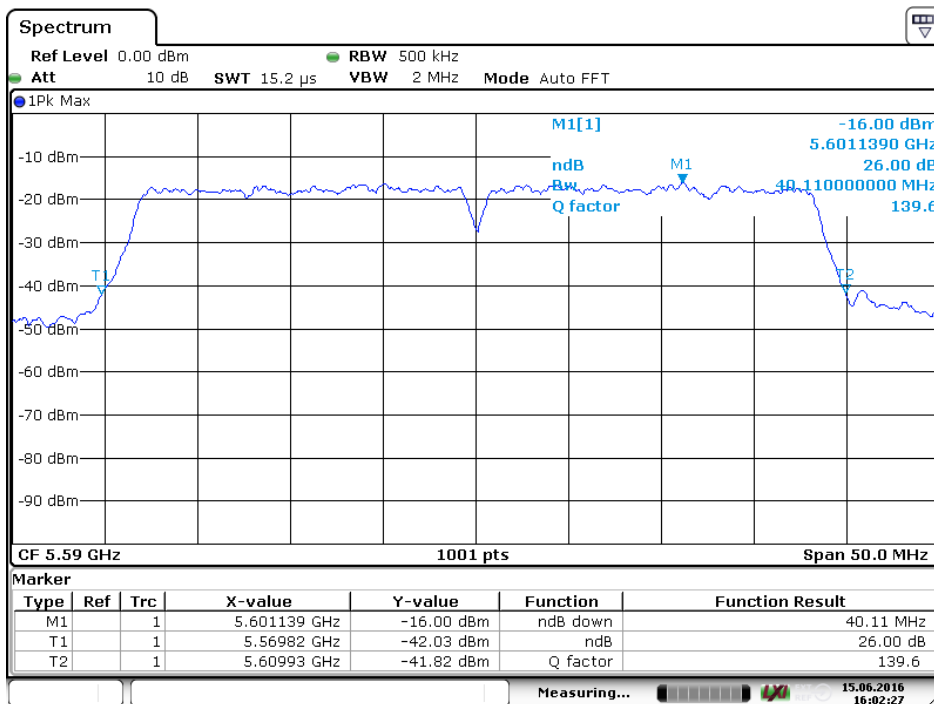
Date: 15 JUN 2016 16:00:44

**Screenshot: Occupied 26 dB bandwidth Measurement, channel 102 mode n HT-40**



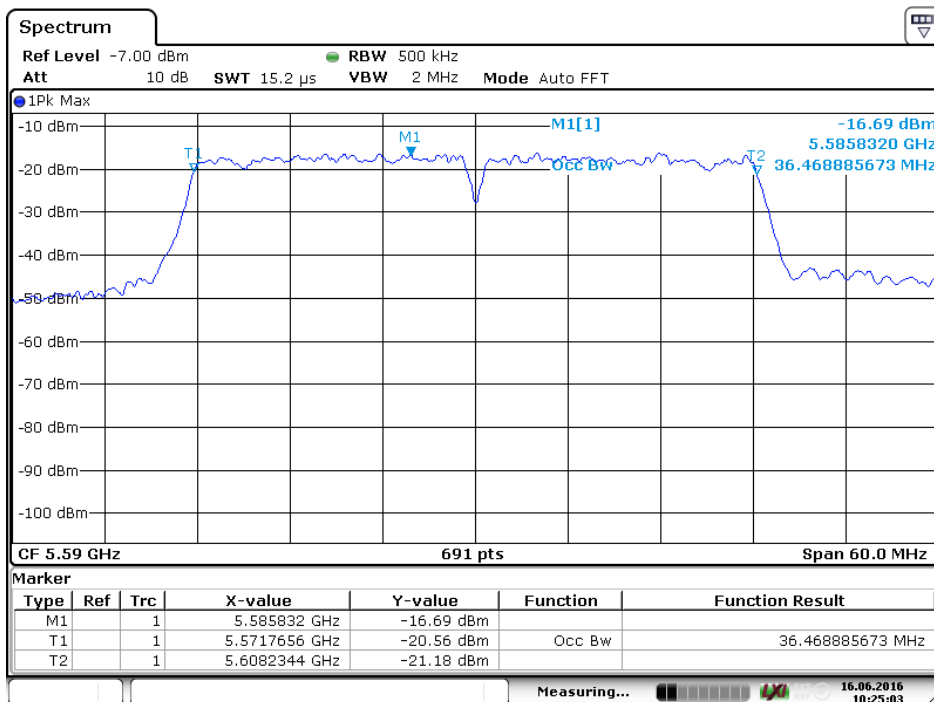
Date: 16 JUN 2016 10:23:22

**Screenshot: Occupied 99% bandwidth Measurement, channel 102 mode n HT-40**



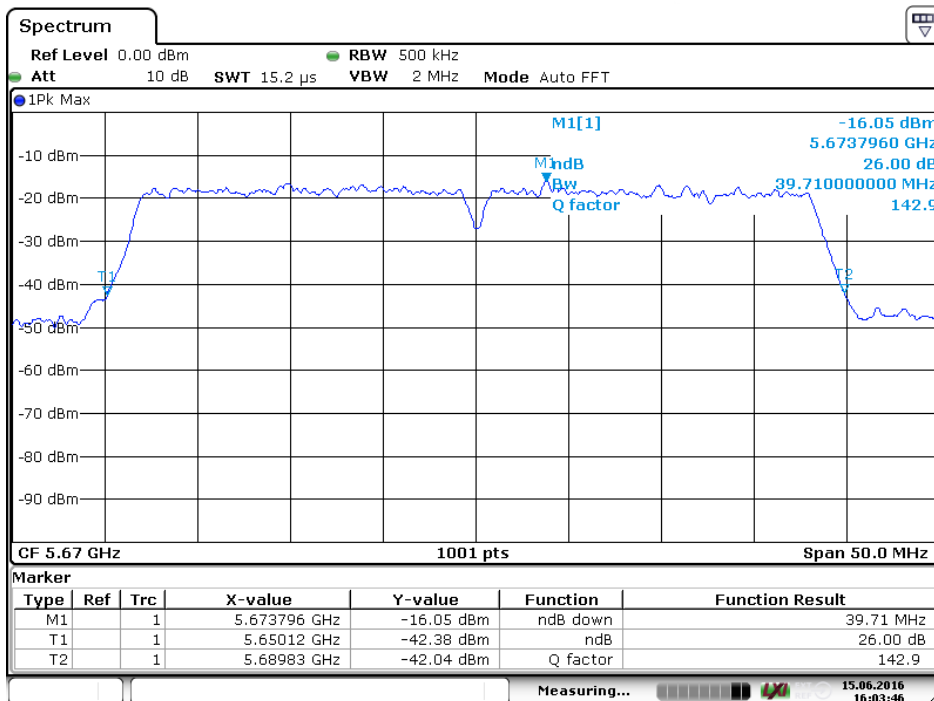
Date: 15 JUN 2016 16:02:27

**Screenshot: Occupied 26 dB bandwidth Measurement, channel 118 mode n HT-40**



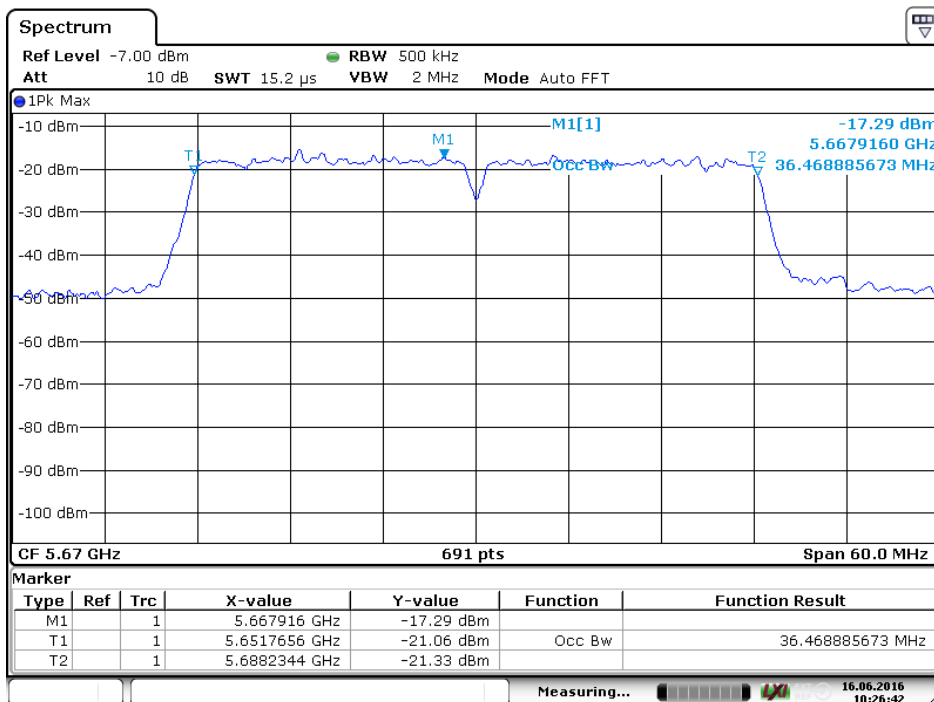
Date: 16 JUN 2016 10:25:04

**Screenshot: Occupied 99% bandwidth Measurement, channel 118 mode n HT-40**



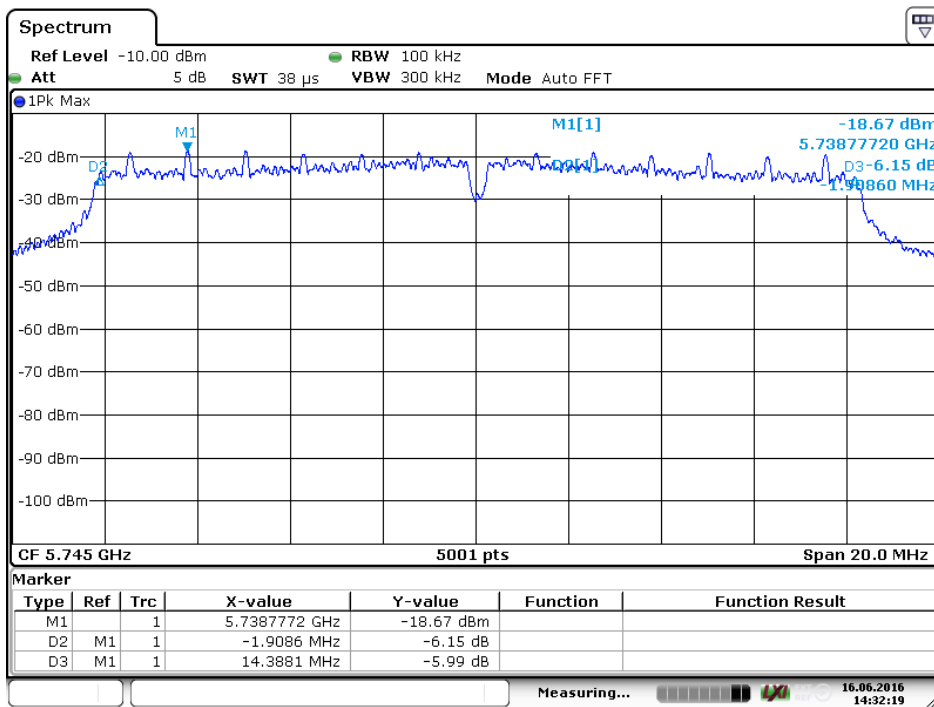
Date: 15 JUN 2016 16:03:46

**Screenshot: Occupied 26 dB bandwidth Measurement, channel 134 mode n HT-40**



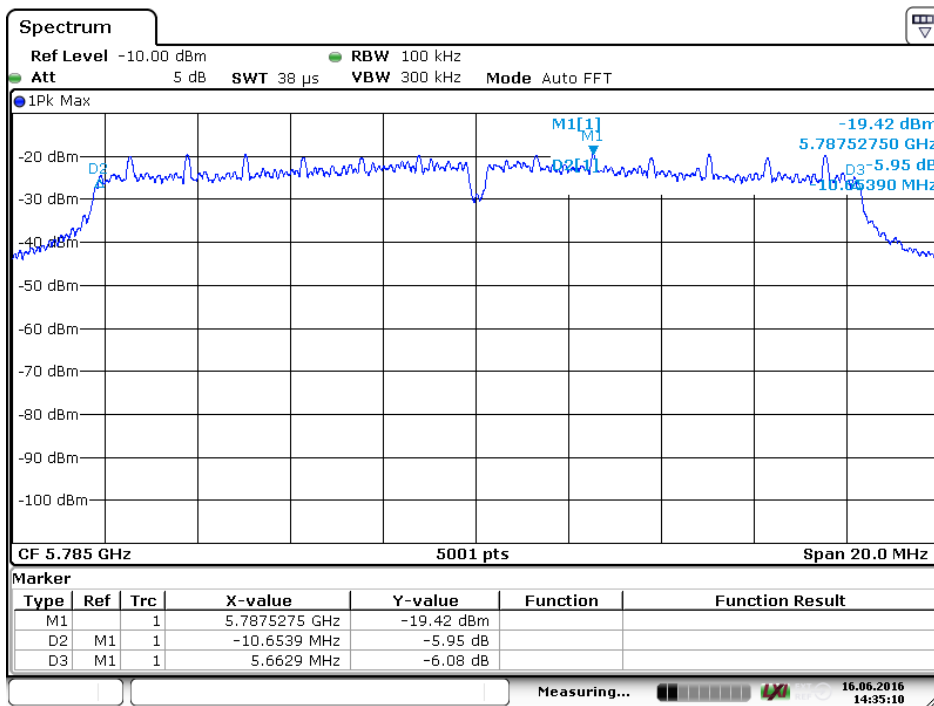
Date: 16 JUN 2016 10:26:42

**Screenshot: Occupied 99% bandwidth Measurement, channel 134 mode n HT-40**



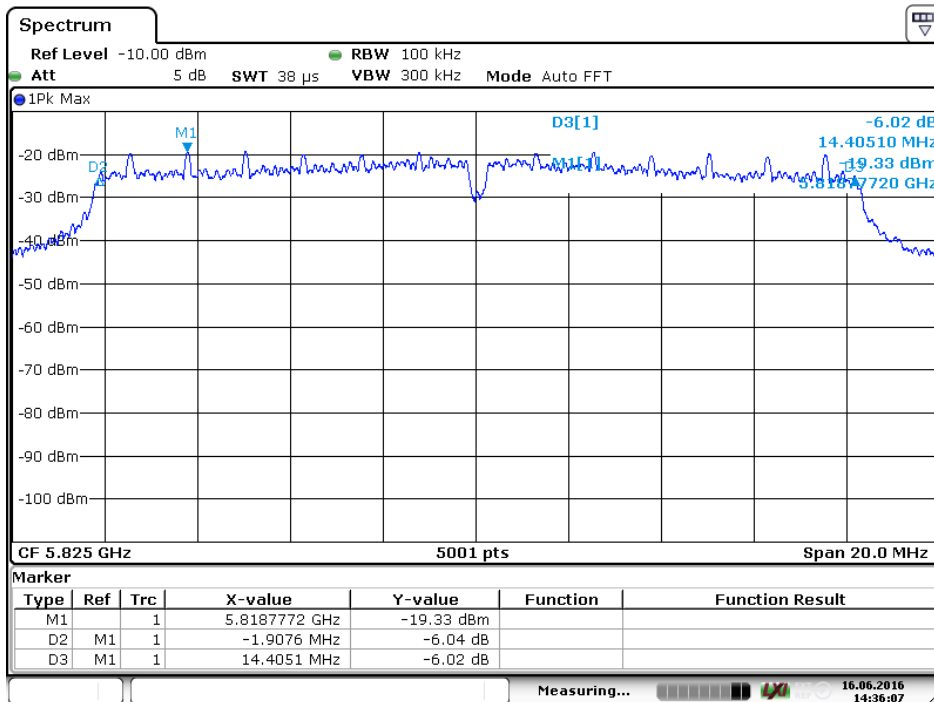
Date: 16 JUN 2016 14:32:19

**Screenshot: Occupied 6 dB bandwidth Measurement, channel 149 mode a**



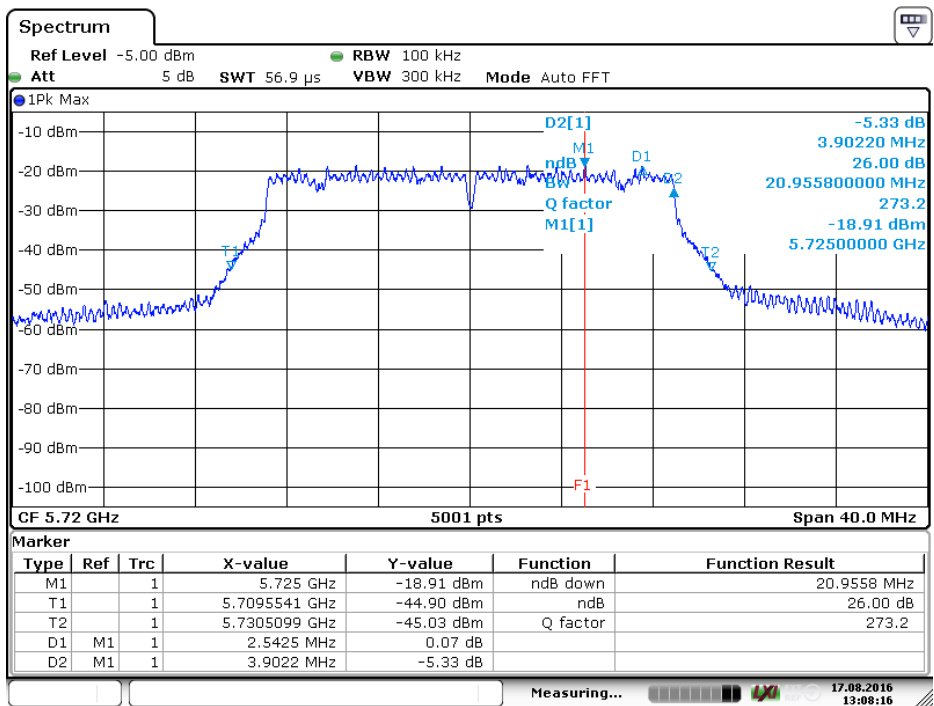
Date: 16 JUN 2016 14:35:09

**Screenshot: Occupied 6 dB bandwidth Measurement, channel 157 mode a**



Date: 16 JUN 2016 14:36:08

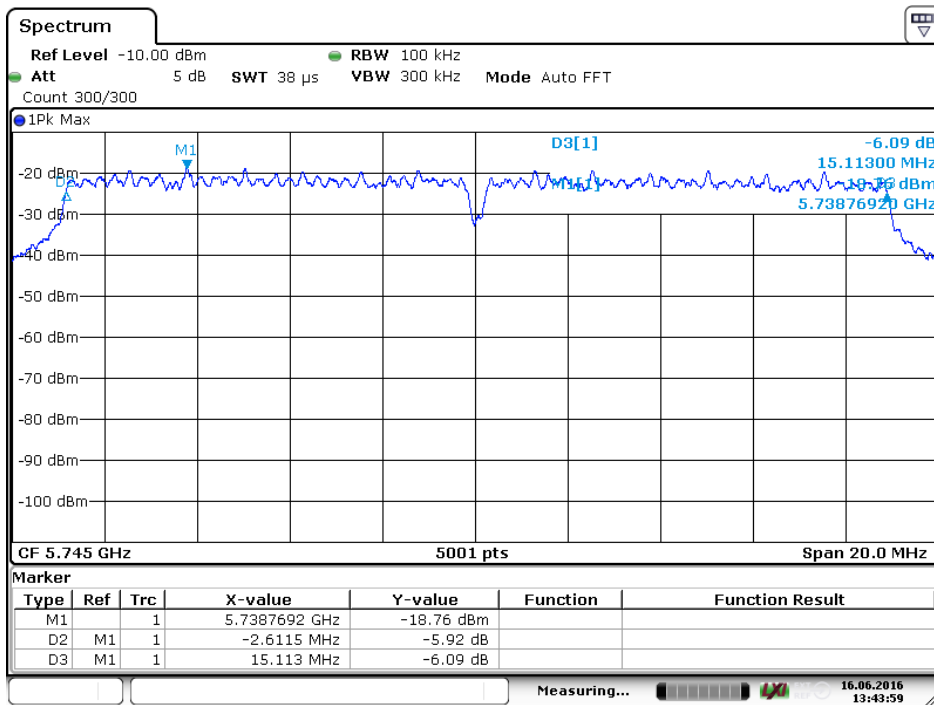
Screenshot: Occupied 6 dB bandwidth Measurement, channel 165 mode a



Date: 17 AUG 2016 13:08:16

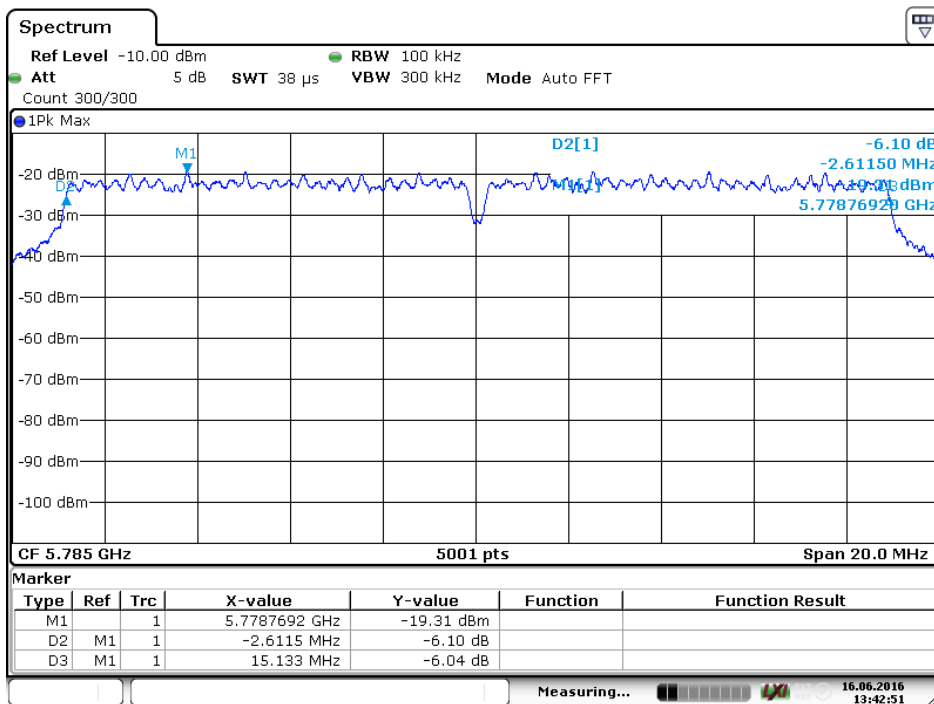
Screenshot: Occupied 6 dB and 26 dB bandwidth Measurements, channel 144 mode n HT-20





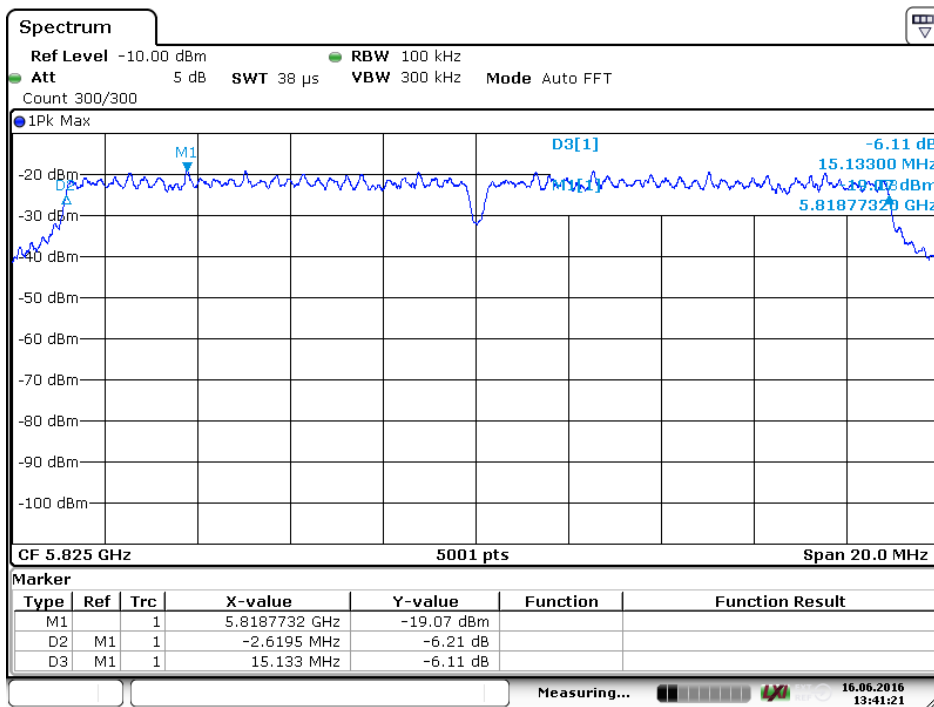
Date: 16 JUN 2016 13:44:00

**Screenshot: Occupied 6 dB bandwidth Measurement, channel 149 node n HT-20**



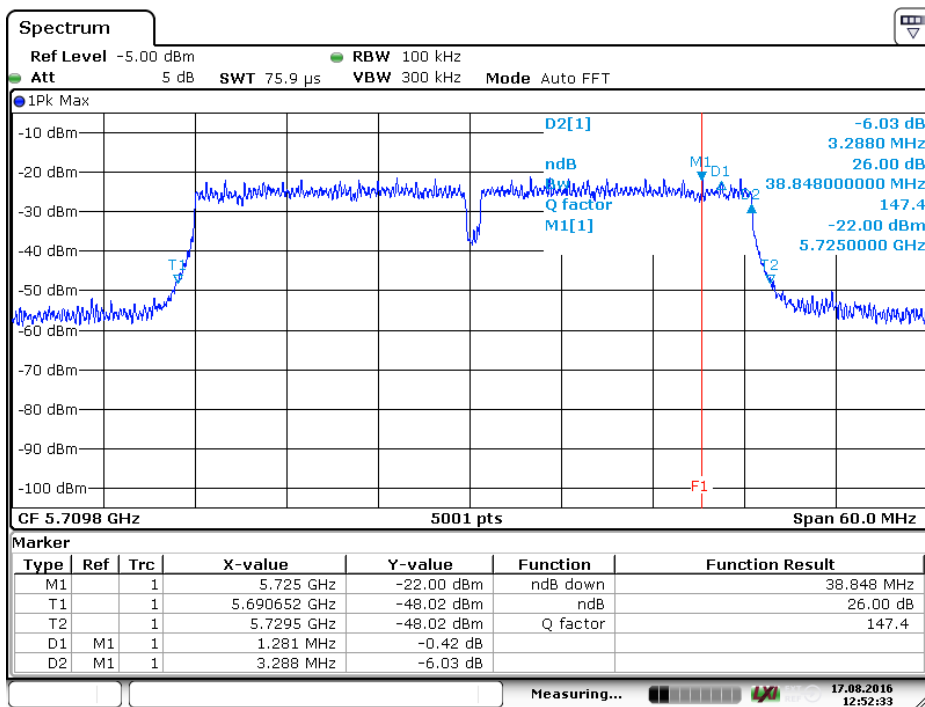
Date: 16 JUN 2016 13:42:52

**Screenshot: Occupied 6 dB bandwidth Measurement, channel 157 node n HT-20**



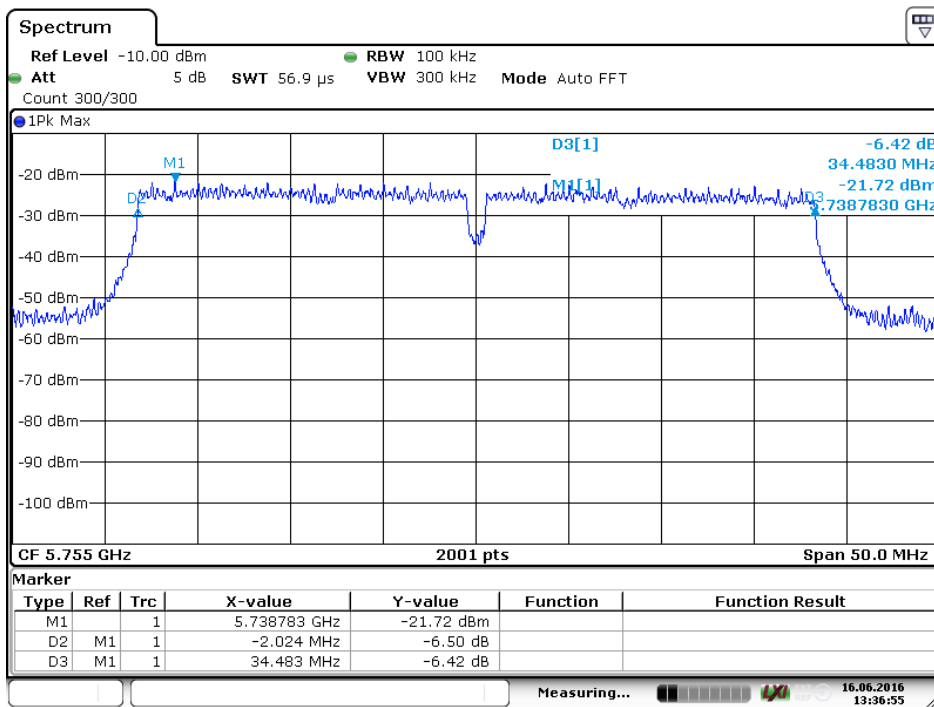
Date: 16 JUN 2016 13:41:21

**Screenshot: Occupied 6 dB bandwidth Measurement, channel 165 node n HT-20**



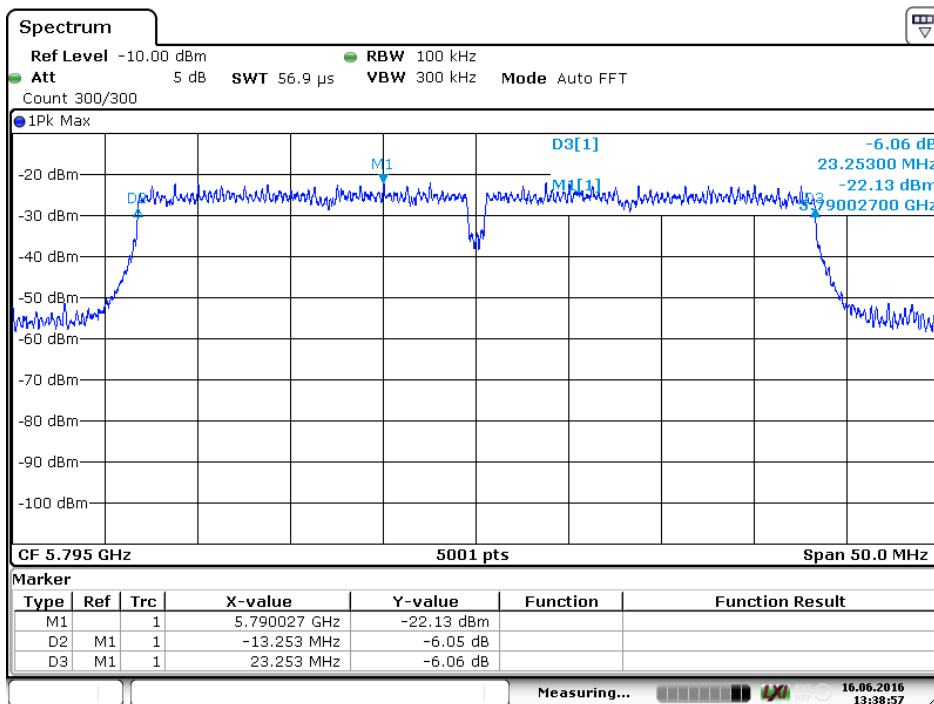
Date: 17 AUG 2016 12:52:33

**Screenshot: Occupied 6 dB bandwidth Measurement, channel 142 node n HT-40**



Date: 16 JUN 2016 13:36:56

**Screenshot: Occupied 6 dB bandwidth Measurement, channel 151 node n HT-40**



Date: 16 JUN 2016 13:38:57

**Screenshot: Occupied 6 dB bandwidth Measurement, channel 159 node n HT-40**

## Test result mode a

Channel [MHz]	26 dB BW [MHz]	Limit [kHz]	Margin [MHz]
5180	21.274	--	--
5200	21.230	--	--
5240	21.447	--	--

Channel [MHz]	26 dB BW [MHz]	Limit [kHz]	Margin [MHz]
5260	21.317	--	--
6280	21.360	--	--
5320	21.274	--	--

Channel [MHz]	26 dB BW [MHz]	Limit [kHz]	Margin [MHz]
5500	21.534	--	--
5600	21.491	--	--
5700	21.751	--	--
5720	20.956	--	--

Channel [MHz]	6 dB BW [MHz]	Limit [kHz]	Margin [MHz]
5720	3.902	>500	3.102
5745	16.297	>500	15.797
5785	16.317	>500	15.817
5825	16.313	>500	15.813

## Test result mode n HT-20

Channel [MHz]	26 dB BW [MHz]	Limit [kHz]	Margin [MHz]
5180	21.834	--	--
5200	21.997	--	--
5240	21.712	--	--

Channel [MHz]	26 dB BW [MHz]	Limit [kHz]	Margin [MHz]
5260	21.712	--	--
6280	22.037	--	--
5320	21.875	--	--

Channel [MHz]	26 dB BW [MHz]	Limit [kHz]	Margin [MHz]
5500	21.708	--	--
5600	21.881	--	--
5700	21.751	--	--

Channel [MHz]	6 dB BW [MHz]	Limit [kHz]	Margin [MHz]
5745		>500	
5785		>500	
5825		>500	

**Test result mode n HT-40**

Channel [MHz]	26 dB BW [MHz]	Limit [kHz]	Margin [MHz]
5190	40.260	--	--
5230	40.010	--	--

Channel [MHz]	26 dB BW [MHz]	Limit [kHz]	Margin [MHz]
5270	39.760	--	--
5310	40.060	--	--

Channel [MHz]	26 dB BW [MHz]	Limit [kHz]	Margin [MHz]
5510	40.460	--	--
5590	40.110	--	--
5670	39.71	--	--
5710	40.60	--	--

Channel [MHz]	6 dB BW [MHz]	Limit [kHz]	Margin [MHz]
5755	36.507	>500	36.007
5795	36.506	>500	36.006

## 9 FREQUENCY STABILITY

<b>Date of test:</b>	2016-06-17	<b>Test location:</b>	Wireless Center
<b>EUT Serial:</b>	No serial on EUT	<b>Ambient temp:</b>	-°C
<b>Tested by:</b>	Matti Virkki	<b>Relative humidity:</b>	- %
<b>Test result:</b>	Pass	<b>Margin:</b>	-

### 9.1 Requirement

Reference: FCC §15.407(g)

Manufacturers of U-NII devices are responsible for ensuring frequency stability such that an emission is maintained within the band of operation under all conditions of normal operation as specified in the user manual.

### 9.2 Test set-up

EUT antenna port was connected to spectrum analyser via rf-cable and 10 dB attenuator placed inside the temperature chamber

### 9.3 Test data

26 dBc bandwidth and the center frequency were tested in each temperature on channel 100. The EUT is for indoor use only and will not be operated in sub 0 °C temperatures.

Center frequencies in extreme temperatures

Temperature [°C]	Center freq [GHz]	Center freq [GHz]	Center freq [GHz]	Center freq [GHz]	Largest Error [kHz]
	0 min	2 min	5 min	10 min	
50	5.4999755	5.4999250	5.4998745	5.4998750	125
40	5.5000500	5.499875	5.4998750	5.4999250	75
30	5.5000495	5.4999250	5.4999250	5.4999250	75
20	5.5001000	5.4999505	5.4999505	5.4999250	100
10	5.4999250	5.5001250	5.4998845	5.4999250	125
0	5.5000000	5.4998745	5.4998845	5.4998845	126

Conclusion is that the EUT stays within operation band under all conditions.

## 10 DYNAMIC FREQUENCY SELECTION

<b>Date of test:</b>	2016-09-05	<b>Test location:</b>	Wireless Center
<b>EUT Serial:</b>	No serial on EUT	<b>Ambient temp:</b>	36°C
<b>Tested by:</b>	Matti Virkki	<b>Relative humidity:</b>	22 %
<b>Test result:</b>	Pass	<b>Margin:</b>	-

### 10.1 Requirement

Reference: FCC §15.407(h)(2) RSS 247 6.3

The EUT is a client device without radar detection capability and must comply with channel move time and non-occupancy period requirements.

**Channel Move Time.** After a radar's presence is detected, all transmissions shall cease on the operating channel within 10 seconds. Transmissions during this period shall consist of normal traffic for a maximum of 200 ms after detection of the radar signal. In addition, intermittent management and control signals can be sent during the remaining time to facilitate vacating the operating channel.

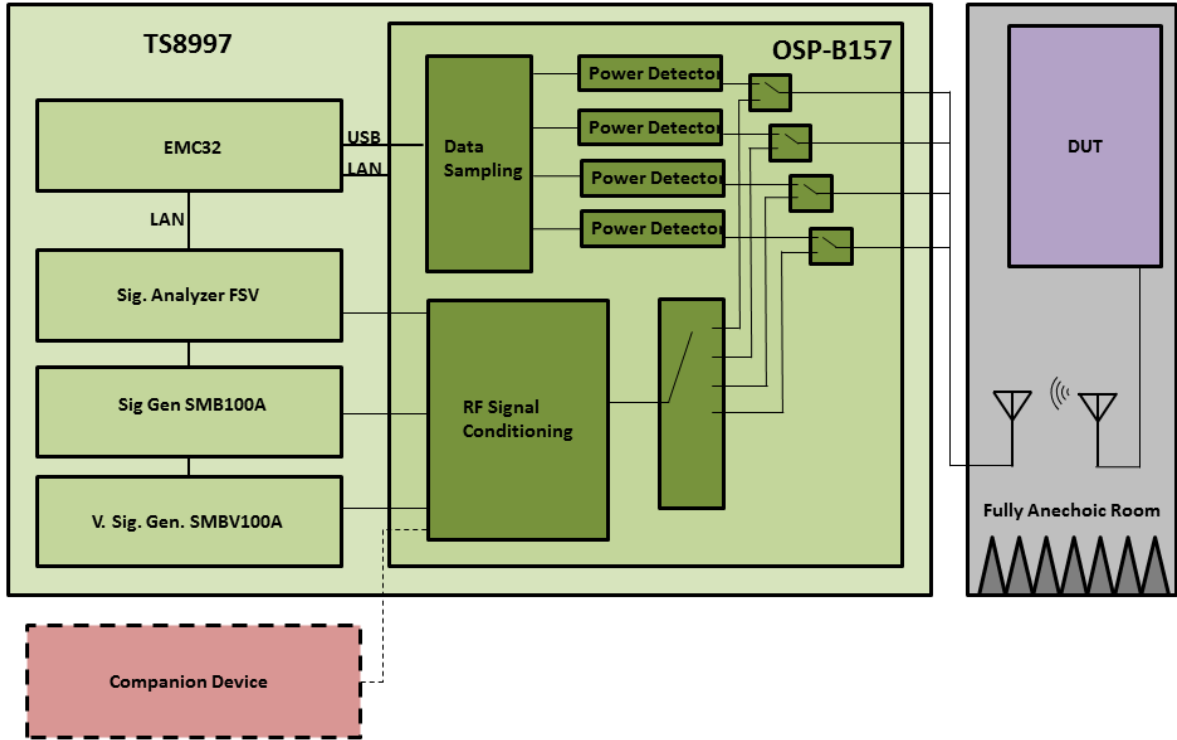
**Non-occupancy Period.** A channel that has been flagged as containing a radar system, either by a channel availability check or in-service monitoring, is subject to a non-occupancy period of at least 30 minutes. The non-occupancy period starts at the time when the radar system is detected.

**10.2 Test set-up**

40 MHz BW was used for testing

The test method is according to KDB 905462 D02 and D03.

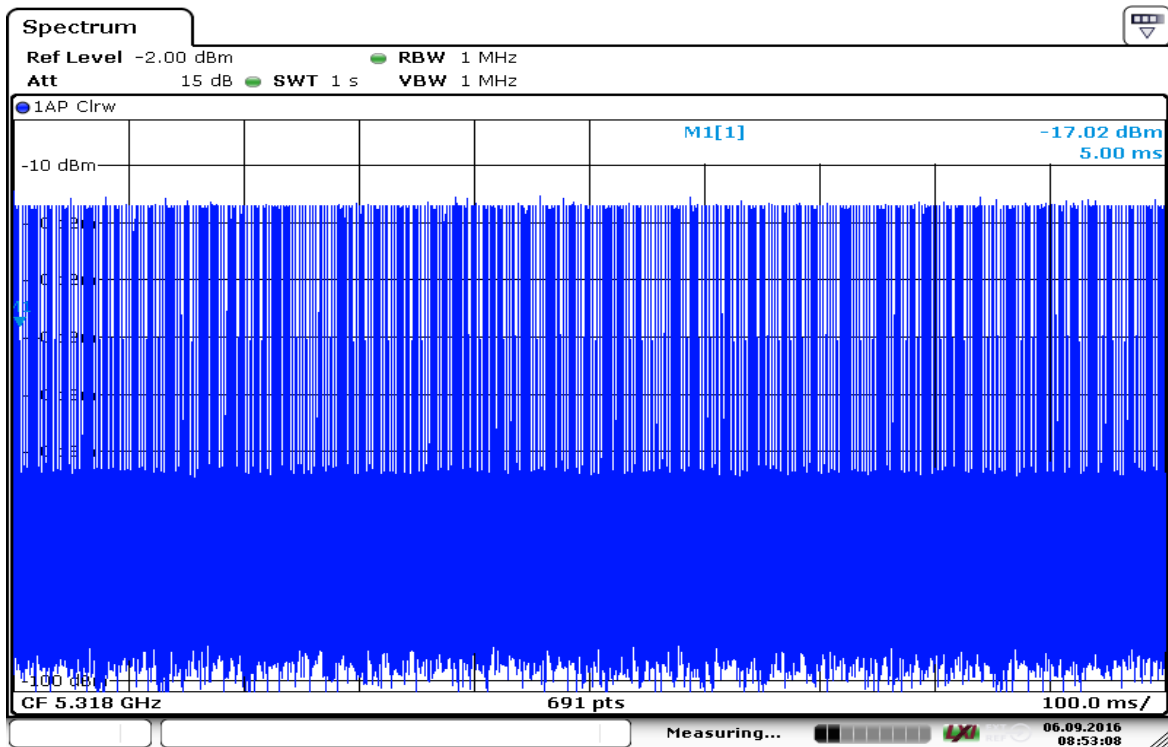
The EUT was connected to a master device and pinged continuously to simulate data transfer.



Block diagram of the test system

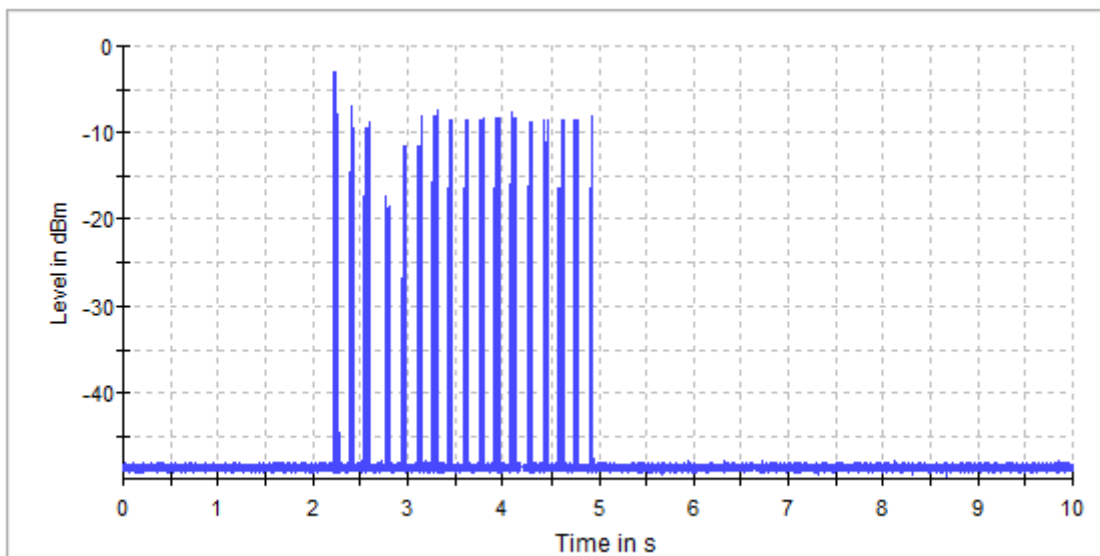


**Test data**

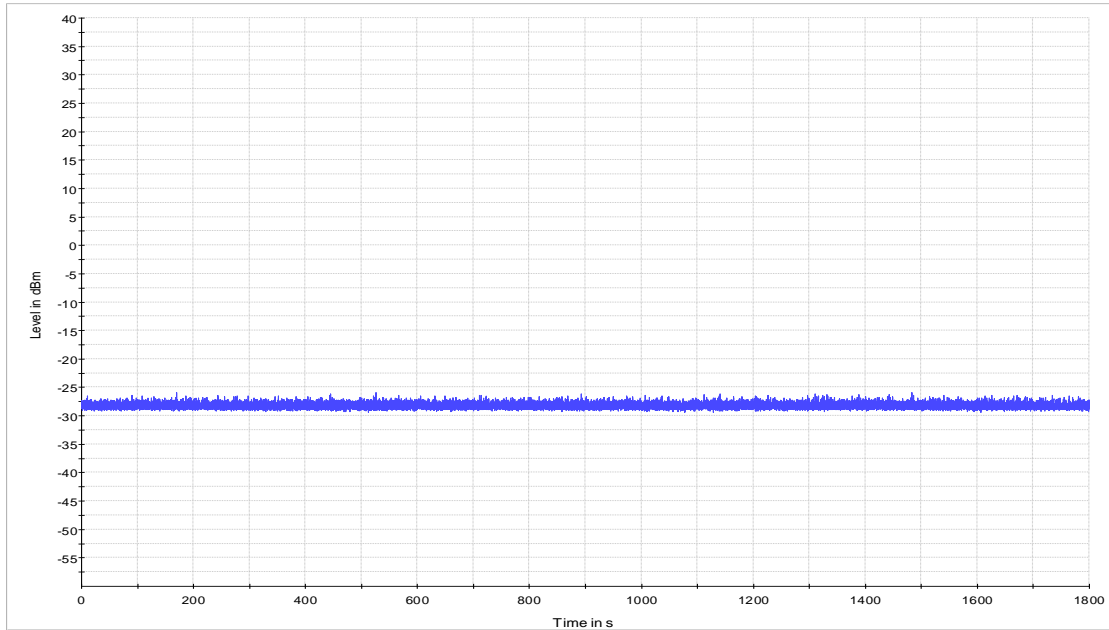


Date: 6.SEP.2016 08:53:08

**Channel loading data**



**Channel close and move period**



Channel Non Occupancy Period

DUT Frequency (MHz)	CCTT (s)	Limit CCTT (s)	Non Occupancy Time (s)	Limit Non Occupancy Time (s)	Result	Comment
5500.000000	0.060	0.200+0.06	1860.062	1800.000	PASS	

When the master device detected the radar pulse it changed channel and the EUT followed it automatically.

No emissions occurred after the channel move period or during the non-occupancy period.

## 11 TEST EQUIPMENT

## Stora Hallen

Equipment type	Manufacturer	Model	Inv. No.	Last Cal. date	Cal. interval
Measurement software	Rohde & Schwarz	EMC32 - 8.51	--	--	--
Receiver	Rohde & Schwarz	ESU 8	12866	7-2015	1 year
Receiver	Rohde & Schwarz	ESU 40	13178	7-2015	1 year
BiLog antenna	Chase	CBL6110A	971	7-2015	3-years
Preamplifier	Semko	AM1331	30366	7-2015	1 year
Preamplifier	Rohde & Schwarz	BLMA 0118-M	31246	7-2015	1 year
Horn antenna	Rohde & Schwarz	HF-907	31245	11-2013	3-years
7,5 GHz high pass filter	K&L MICROWAVE INC	11SH10-7500/U18000-O/O	32847	7-2015	1 year

## Wireless Center and 3m FAC

Equipment type	Manufacturer	Model	Inv. No.	Last Cal. date	Cal. interval
Measurement software	Rohde & Schwarz	EMC32 - 9.15	--	--	--
Signal analyzer	Rohde & Schwarz	FSIQ 40	12793	7-2015	1 year
Measurement cable	Huber + Suhner	Sucoflex 104 PE	39070	7-2015	1 year
Measurement cable	Huber + Suhner	Sucoflex 104 PE	39079	7-2015	1 year
Measurement cable	Huber + Suhner	Sucoflex 104	5191	7-2015	1 year
Horn antenna	EMCO	3115	4936	4-2014	3 years
Pre amplifier	Sangus	00101400-23-10P -6-S ; AFS44-12002400-32-10P -44	12335	7-2015	1 year
Horn antenna	EMCO	3160-08	30099	month-year	3 years
Horn antenna	EMCO	3160-09	30101	month-year	3 years
Signal analyzer:	Rohde & Schwarz	FSV	32594	month-year	1 year
Signal generator:	Rohde & Schwarz	SMB100A	32592	7-2015	1 year
Signal analyzer	Rohde & Schwarz	FSIQ 40	12793	7-2015	1 year
7,5 GHz high pass filter	K&L MICROWAVE INC	11SH10-7500/U18000-O/O	32847	7-2015	1 year
10 dB Attenuator:	Huber+Suhner	5910_N-50-010	32696	7-2015	1 year
Climatic chamber	Wötsch	VC4018	1282	9-2015	1 year
Dual band gigabit router	ASUS	RT-AC87U	-	-	-

## 12 MEASUREMENT UNCERTAINTY

Continuous conducted disturbances with AMN in the frequency range 9 kHz to 30 MHz  $\pm 3.7$  dB

Measurement uncertainty for radiated disturbance

Uncertainty for the frequency range 30 to 1000 MHz at 3 m	$\pm 5.1$ dB
Uncertainty for the frequency range 30 to 1000 MHz at 10 m	$\pm 5.0$ dB
Uncertainty for the frequency range 1.0 to 18 GHz at 3 m	$\pm 4.7$ dB
Uncertainty for the frequency range 18 to 26 GHz at 3 m	$\pm 4.8$ dB
Uncertainty for the frequency range 26 to 40 GHz at 3 m	$\pm 5.7$ dB

Measurement uncertainty is calculated in accordance with CISPR 16-4-2:2011.

The measurement uncertainty is given with a confidence of 95 %.

## 13 TEST SET UP AND EUT PHOTOS

EUT photos are in separate document 1610783STO-004 Annex 1.

Test set up photos are in separate document 1610783STO-004 Annex 2.