

Date: **ESPOO 01.04.2014**

Page: **1 (40)**

Appendices **–**

Number:  
No. 1 / 1

**249312A**

Date of handing in: 31.10.2013

Tested by:



Timo Hietala, Test Specialist

Reviewed by:



Timo Leismala, Test Manager

SORT OF EQUIPMENT:

**Vital Signs Monitor**

MARKETING NAME:

**VC150 Vital Signs Monitor**

TYPE:

**VC150**

MANUFACTURER:

**Innokas Medical Oy**

CLIENT:

**Innokas Medical Oy**

ADDRESS:

**Tarjusojantie 12, FI-90440 Kempele, FINLAND**

TELEPHONE:

**+358 8 562 3100**

TEST LABORATORY:

**SGS Fimko EMC Oy**

FCC REG. NO.

**359859 October 25, 2013**

IC FILE NO.

**2040F-1 November 22, 2012**

## SUMMARY:

In regard to the performed tests the equipment under test fulfils the requirements defined in the test specifications, see page 2 for details

The test results are valid for the tested unit only. Without a written permission of SGS Fimko EMC Oy it is allowed to copy this report as a whole, but not partially.

## Summary of performed tests and test results

Section in CFR 47		Result
15.207	AC power line conducted emissions	<b>PASS</b> , margin 3.5 dB
15.209 / 15.247 (d)	Radiated Emissions, 30MHz ~ 40000MHz	<b>PASS</b> , margin 3.3 dB
15.247 (d)	Conducted Emissions at antenna port, 30MHz ~ 40000MHz	<b>PASS</b>
15.247 (b)	Maximum peak output power	<b>PASS</b>
15.247 (d)	Band Edge compliance	<b>PASS</b>
15.247	6dB Bandwidth	<b>PASS</b>
15.247	Peak Power Spectral Density	<b>PASS</b>

### Explanations:

**PASS** The EUT passed that particular test.

**FAIL** The EUT failed that particular test.

### Disclaimer

This test report is issued under SGS Fimko EMC general terms of delivery (available on request and accessible at [www.fi.sgs.com](http://www.fi.sgs.com)). Attention is drawn to the limitations of liability, indemnification and jurisdictional issues defined therein. Unless otherwise stated: (a) the results shown in this document refer only to the sample(s) tested and (b) such sample(s) are retained for three months. This document cannot be reproduced except in full, without prior approval of SGS Fimko EMC.

Any unauthorized alteration, forgery or falsification of the content or appearance of this report is unlawful and offenders may be prosecuted to the fullest extent of the law.

## Contents

Summary of performed tests and test results .....	2
1. EUT and Accessory Information .....	4
1.1 EUT description .....	4
1.2 EUT and accessories.....	4
2. Standards and measurement methods.....	5
3. Test results.....	5
3.1 AC power line conducted emissions.....	5
3.1.1 Test method and limit .....	5
3.1.2 Test results .....	6
3.2 Radiated emissions .....	8
3.2.1 Test method and limit .....	8
3.2.2 Test results non- restricted bands .....	10
3.2.3 Test results, Radiated emissions in restricted bands 30 MHz – 40 GHz .....	11
3.3 Band-edge compliance .....	13
3.3.1 Test results .....	13
3.4 Conducted emissions at antenna port .....	16
3.4.1 Test method and limit .....	16
3.4.2 Test results .....	16
3.5 Maximum peak output power.....	23
3.5.1 Test method and limit .....	23
3.5.2 Test data .....	24
3.1 6dB Bandwidth.....	28
3.1.1 Test method.....	28
3.1.2 EUT operation mode.....	28
3.1.2 Test data .....	28
3.2 Peak power spectral density.....	32
3.2.1 Test method and limit .....	32
3.2.2 EUT operation mode.....	32
3.2.2 Test data .....	32
4. List of test equipment.....	39
5. Photographs.....	40

## 1. EUT and Accessory Information

### 1.1 EUT description

The EUT is a Vital Signs Monitor with WLAN unit.

Operating frequencies and channels:

	Channel	Frequency [MHz]
802.11a, 6Mbit/s, 9 Mbit/s, 12 Mbit/s 18Mbit/s, 24 Mbit/s 36Mbit/s, 48Mbit/s 54 Mbit/s	149	5745
	157	5785
	165	5825
802.11n, 20MHz BW MCS0, MCS1, MCS2, MCS3, MCS4, MCS5, MCS6, MCS7	149	5745
	157	5785
	165	5825

Preliminary tests were performed in different data rates and modulation methods to find the worst case emissions. The following test modes were selected for the final tests:

Mode 802.11a: 6Mbps

Mode 802.11n: 20 MHz BW, MCS0

Power supply: 11.1V DC, (power supply rated 100-240 VAC, 1.1A, 50-60 Hz, output 24VDC 2.0A).

Antenna: PCB, gain <2dBi.

### 1.2 EUT and accessories

<i>unit</i>	<i>type</i>	<i>S/N</i>
<b>Monitor (EUT1, radiated tests)</b>	<b>VC150, application version v13.6, MSP sw 0.34</b>	<b>SK513340005YP</b>
<b>Monitor (EUT2, conducted tests)</b>	<b>VC150, application version v13.6, MSP sw 0.34</b>	<b>SK513340001YP</b>
<b>AC power unit</b>	<b>XP Power, AFM45US24</b>	<b>1315-00971</b>
<b>Infrared Thermometer (USB)</b>	<b>Exergen TAT-50005-USB-GE</b>	<b>-</b>
<b>SpO<sub>2</sub></b>	<b>TS-F4-GE</b>	<b>-</b>
<b>Bar code reader (USB)</b>	<b>JDK-2083</b>	<b>130301-003</b>
<b>Temperature probe</b>	<b>Welch Allyn, PN 02692-100</b>	<b>-</b>

Cables:

From	To	Type	Length [m]
<b>AC mains</b>	<b>AC power unit</b>	unshielded	2.0
<b>AC power unit</b>	<b>EUT</b>	unshielded	2.0
<b>SpO<sub>2</sub></b>	<b>EUT</b>	shielded	4.2
<b>Infrared Thermometer</b>	<b>EUT</b>	shielded, (USB)	2.7
<b>Bar code reader</b>	<b>EUT</b>	shielded, (USB)	1.3
<b>Temperature probe</b>	<b>EUT</b>	shielded	3.0

Operating voltage during the tests: 11.1 VDC (115VAC, 60 Hz).

## 2. Standards and measurement methods

The test were performed in guidance of the CFR 47 Part 15, Subpart B, Class B, ANSI C63.4 (2009), ANSI C63.10 (2009) and CISPR 22 Ed. 6.

## 3. Test results

### 3.1 AC power line conducted emissions

The test was performed as a compliance test. The test parameters concerned were as follows:

<i>Site name</i>	SGS Fimko EMC Oy/ Perkkaa
<i>Date of testing</i>	6.11.2013
<i>Test equipment</i>	694, 745, 348
<i>Test conditions</i>	23 °C, 35 % RH
<i>Test result</i>	<b>PASS</b>

#### 3.1.1 Test method and limit

The test was performed inside a shielded room where the floor and one of the walls of the test site comprised the reference ground plane (RGP). For the duration of the test the EUT was placed on a non-conductive table 0.8 m high standing on the reference ground plane. The power input cable of the EUT was connected to an artificial mains network. The test was performed separately on the phase and also on the neutral wire.

The disturbances were first examined by performing a spectrum scan by using a peak detector. The general procedure in the conducted disturbance emission test is that no further measurements are necessary if the disturbance levels measured by using the peak detector are below the limit value defined for the measurement performed by using an average detector.

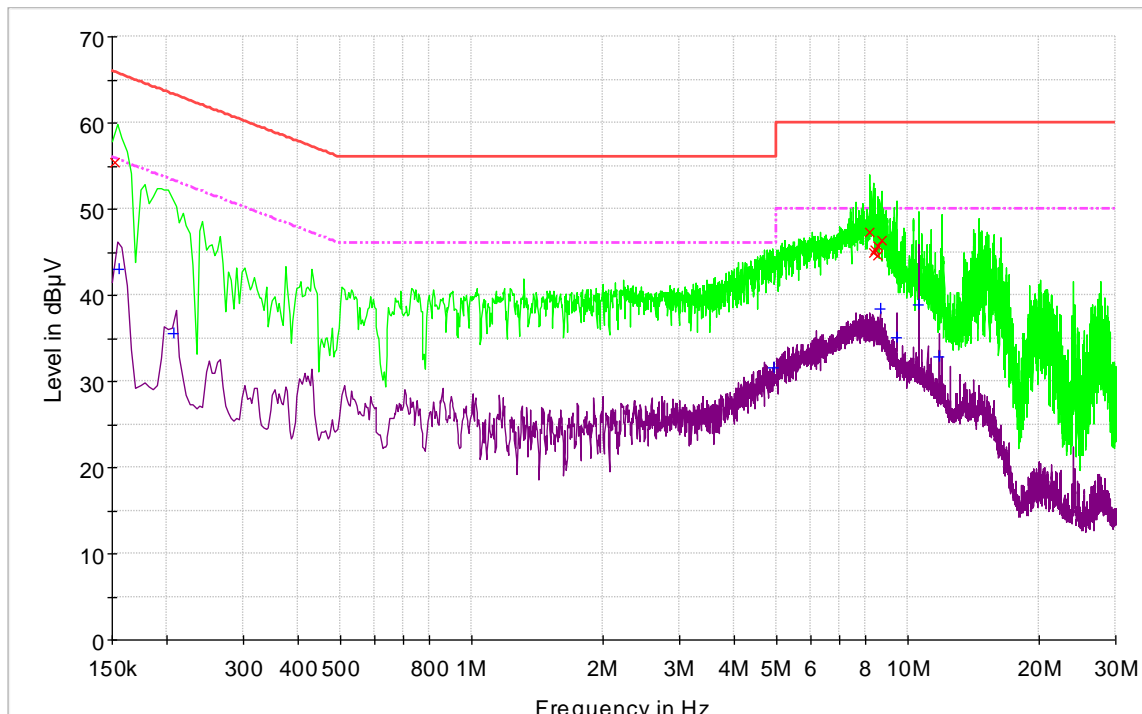
If not, then at the test frequencies concerned the measurement is performed also by using a quasi-peak detector. If the disturbance levels measured by using the quasi-peak detector are below the limit value defined for the measurement performed by using an average detector, then measurements by using the average detector are not necessary.

<i>Frequency band MHz</i>	<i>Quasi-peak limit dB(μV)</i>	<i>Average limit dB(μV)</i>
<b>0.15 – 0.5</b>	<b>66 – 56</b>	<b>56 – 46</b>
<b>0.5 – 5</b>	<b>56</b>	<b>46</b>
<b>5 - 30</b>	<b>60</b>	<b>50</b>

### 3.1.2 Test results

802.11a, 6Mbit/s, channel 157, TXf=5785MHz

line N, Uin = 115V/60Hz



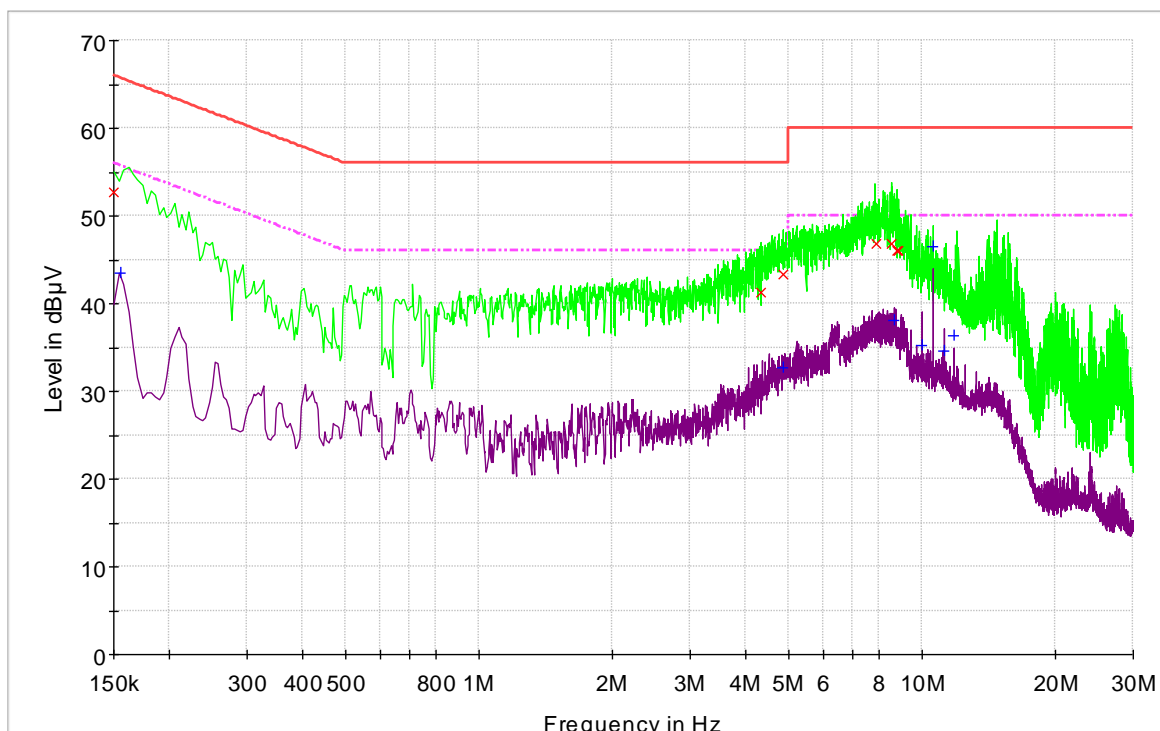
Measurement results (QP):

Frequency MHz	Level dBμV	Limit dBμV	Margin dB	Line	Conclusion Pass/Fail
0.152	55.4	65.9	10.5	N	Pass
8.189	47.3	60.0	12.7	N	Pass
8.347	45.0	60.0	15.0	N	Pass
8.408	45.2	60.0	14.8	N	Pass
8.522	45.7	60.0	14.3	N	Pass
8.550	44.6	60.0	15.4	N	Pass
8.749	46.4	60.0	13.6	N	Pass

Measurement results (Average):

Frequency MHz	Level dBμV	Limit dBμV	Margin dB	Line	Conclusion Pass/Fail
0.156	43.0	55.7	12.7	N	Pass
0.208	35.5	53.3	17.8	N	Pass
4.920	31.6	46.0	14.4	N	Pass
8.643	38.4	50.0	11.6	N	Pass
9.439	35.1	50.0	14.9	N	Pass
10.618	38.9	50.0	11.1	N	Pass
11.795	32.9	50.0	17.1	N	Pass

line L,  $U_{in} = 115V/60Hz$



Measurement results (QP):

Frequency MHz	Level dBμV	Limit dBμV	Margin dB	Line	Conclusion Pass/Fail
0.150	52.7	66.0	13.3	L	Pass
4.345	41.3	56.0	14.7	L	Pass
4.879	43.4	56.0	12.6	L	Pass
7.873	46.8	60.0	13.2	L	Pass
8.524	46.8	60.0	13.2	L	Pass
8.776	46.1	60.0	13.9	L	Pass
8.855	46.0	60.0	14.0	L	Pass

Measurement results (Average):

Frequency MHz	Level dBμV	Limit dBμV	Margin dB	Line	Conclusion Pass/Fail
0.156	43.5	55.7	12.1	L	Pass
4.876	32.7	46.0	13.3	L	Pass
8.649	38.1	50.0	11.9	L	Pass
10.029	35.3	50.0	14.7	L	Pass
10.617	46.5	50.0	3.5	L	Pass
11.212	34.6	50.0	15.4	L	Pass
11.796	36.3	50.0	13.7	L	Pass

### 3.2 Radiated emissions

<i>Site name</i>	SGS Fimko EMC Oy / Perkkaa
<i>Date of testing</i>	11.-30.11.2013
<i>Test equipment</i>	350, 709, 544, 319, 566, 564, 525, 88, 521, 710
<i>Test conditions</i>	23 °C, 35 % RH
<i>Test result</i>	<b>PASS</b>

#### 3.2.1 Test method and limit

The test 30-1000 MHz was performed in a semi-anechoic shielded room. The EUT was placed on a non-conductive table 0.8 m high standing on the turntable. During the test in the frequency range 30-1000 MHz the distance from the EUT to the measuring antenna was 3 m (with conducting ground plane). The excess length of the cables of the EUT was made into bundles 30-40 cm in length. In order to find the maximum levels of the disturbance radiation the angle of the turntable, the height of the measuring antenna and the lay-out of the EUT cables were varied during the tests. The test was performed with the measuring antenna being both in horizontal and vertical polarizations. In the frequency range 1000-40000 MHz the test was performed in the absorber lined fully-anechoic room. During the test in the frequency range 1000-18000 MHz the distance from the EUT to the measuring antenna was 3 m and in the frequency range 18000-40000 MHz the distance from the EUT to the measuring antenna was 1 m. The test was performed with the measuring antenna being both in horizontal and vertical polarizations.



**Minimum Standard:** In any 100kHz bandwidth outside the frequency band in which the transmitter is operating, emissions shall be at least 20 dB below the fundamental emission or shall not exceed the following field strength limits:

Emissions falling in the restricted bands of 15.205 shall not exceed the limits shown in §15.209. At frequencies equal to or less than 1000 MHz, compliance with the limits in §15.209 shall be demonstrated using measurement instrumentation employing a CISPR quasi-peak detector. Above 1000 MHz, compliance with the emission limits in §15.209 shall be demonstrated based on the average value of the measured emissions. (below 1GHz: RBW 120kHz; above 1GHz: RBW 1MHz, VBW 3MHz)

The CFR 47 Part 15, Section 15.209(a) limit of 500 µV/m has been calculated to correspond 54 dB(µV/m) as follows:  $[dB(\mu V/m)] = 20 \log[\mu V/m]$ .

<i>Frequency band MHz</i>	<i>Quasi-peak limit dB(µV/m)</i>
<b>30 - 88</b>	<b>40</b>
<b>88 - 216</b>	<b>43.5</b>
<b>216 - 960</b>	<b>46</b>
<b>960 - 1000</b>	<b>54</b>

The CFR 47 Part 15, Section 15.209(a) limit values for radiated emissions which fall in the restricted bands (3m measuring distance)

<i>Frequency band MHz</i>	<i>Average limit dB(µV/m)</i>	<i>Peak limit dB(µV/m)</i>
<b>1000 - 40000</b>	<b>54</b>	<b>74</b>

The device was tested from 30 MHz to the tenth harmonic of the highest fundamental frequency per 15.33.

The device was tested on three channels per 15.31(l).

The measurement results were obtained as described below.

$$E [dB\mu V/m] = U_{RX} + A_{CABLE} + AF - G_{PREAMP}$$

Where

$U_{RX}$	receiver reading
$A_{CABLE}$	attenuation of the cable
$AF$	antenna factor
$G_{PREAMP}$	gain of the preamplifier

<b>15.205 Restricted Bands</b>			
<b>MHz</b>	<b>MHz</b>	<b>MHz</b>	<b>GHz</b>
0.09-0.110	16.42-16.423	399.9-410	4.5-5.15
0.495-0.505	16.69475-16.69525	608-614	5.35-5.46
2.1735-2.1905	16.80425-16.80475	960-1240	7.25-7.75
4.125-4.128	25.5-25.67	1300-1427	8.025-8.5
4.17725-4.17775	37.5-38.25	1435-1626.5	9.0-9.2
4.20725-4.20775	73-74.6	1645.5-1646.5	9.3-9.5
6.125-6.218	74.8-75.2	1660-1710	10.6-12.7
6.26775-6.26825	108-121.94	1718.8-1722.2	13.25-13.4
6.31175-6.31225	123-138	2200-2300	14.47-14.5
8.291-8.294	149.9-150.05	2310-2390	15.35-16.2
8.362-8.366	156.52475-156.52525	2483.5-2500	17.7-21.4
8.37625-8.38675	156.7-156.9	2690-2900	22.01-23.12
8.41425-8.41475	162.0125-167.17	3260-3267	23.6-24.0
12.29-12.293	167.72-173.2	3332-3339	31.2-31.8
12.51975-12.52025	240-285	3345.8-3358	36.43-36.5
12.57675-12.57725	322-335.4	3600-4400	Above 38.6
13.36-13.41			

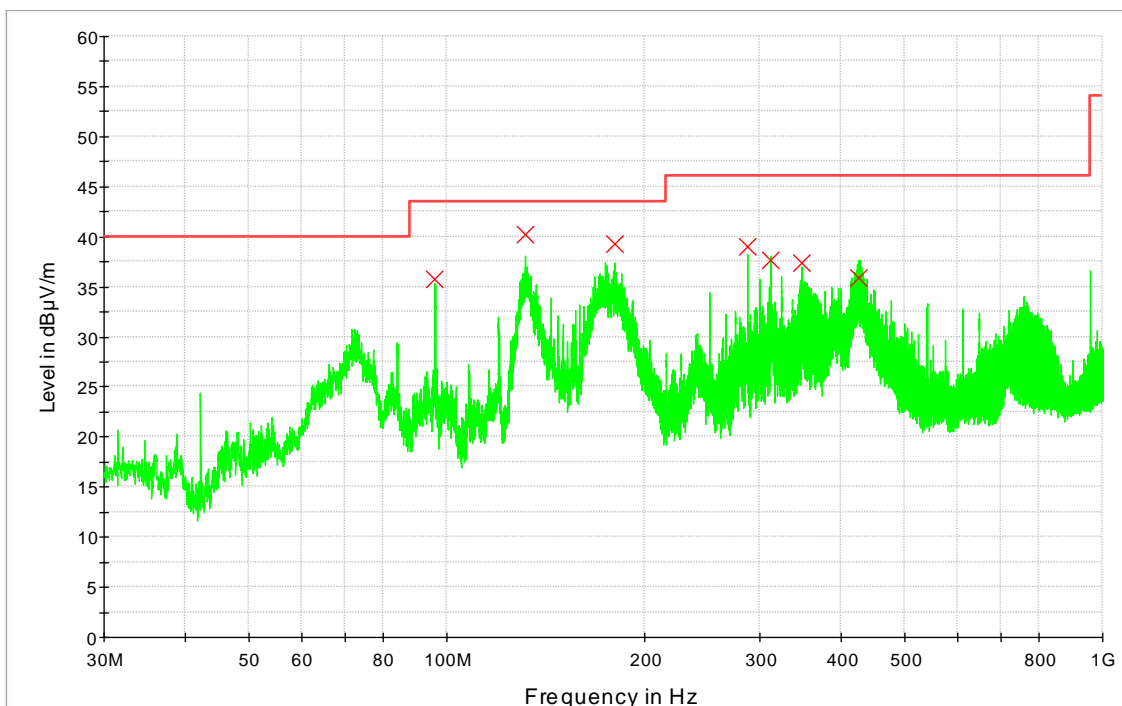
### 3.2.2 Test results non- restricted bands

No emissions were detected within 20 dB of the specification limit therefore none are reported per 15.31(o).

### 3.2.3 Test results, Radiated emissions in restricted bands 30 MHz – 40 GHz

30-1000MHz

Ch 149, 802.11a, 6Mbit/s



Vertical and horizontal polarizations in the frequency range 30 – 1000 MHz measured by using the peak detector. During the peak detector scan, the turntable was rotated from 0° to 360° with 30° step with the antenna heights 1.0 m and 3.0 m. The highest levels of the radiated interference field strength measured by using the quasi-peak detector were recorded.

Measurement results (Quasi-Peak):

Frequency MHz	Level dBμV/m	Limit dBμV/m	Margin dB	Height cm	Polarization Hor/Ver	Azimuth degrees
95.970	35.7	43.5	7.8	141	V	325
131.970	40.2	43.5	3.3	100	V	249
179.990	39.3	43.5	4.2	100	V	258
288.020	39.0	46.0	7.0	137	H	357
311.880	37.7	46.0	8.3	133	H	4
347.750	37.3	46.0	8.7	100	H	110
424.050	35.9	46.0	10.1	134	H	46

**802.11a, 6Mbit/s**

<i>Channel</i>	<i>Frequency MHz</i>	<i>Result Peak dBμV/m</i>	<i>Limit Peak dBμV/m</i>	<i>Margin dB</i>	<i>Result Average dBμV/m</i>	<i>Limit Average dBμV/m</i>	<i>Margin dB</i>
149	11490	49.5	74	24.5	36.1	54	17.9
149	22980	53.8	74	20.2	49.8	54	4.2
157	11570	48.9	74	25.1	37.2	54	16.8
165	11650	51.1	74	22.9	37.5	54	16.5

**802.11n, 20MHz BW, MCS0**

<i>Channel</i>	<i>Frequency MHz</i>	<i>Result Peak dBμV/m</i>	<i>Limit Peak dBμV/m</i>	<i>Margin dB</i>	<i>Result Average dBμV/m</i>	<i>Limit Average dBμV/m</i>	<i>Margin dB</i>
149	11490	50.1	74	23.9	37.0	54	17.0
149	22980	53.8	74	20.2	49.8	54	4.2
157	11570	49.0	74	25.0	37.2	54	16.8
165	11650	51.0	74	23.0	37.4	54	16.6

### 3.3 Band-edge compliance

The test was performed as a compliance test. The test parameters concerned were as follows:

<i>Site name</i>	SGS Fimko EMC Oy / Perkaa
<i>FCC rule part</i>	§ 15.247
<i>Date of testing</i>	7.11.2013
<i>Test equipment</i>	566, 542, 564
<i>Test conditions</i>	23 °C, 50 % RH
<i>Test result</i>	<b>PASS</b> limit: -20dBc out of restricted bands

The measurements -20dBc out of restricted bands were performed with peak-detector (RBW: 100 kHz, VBW: 3000 kHz).

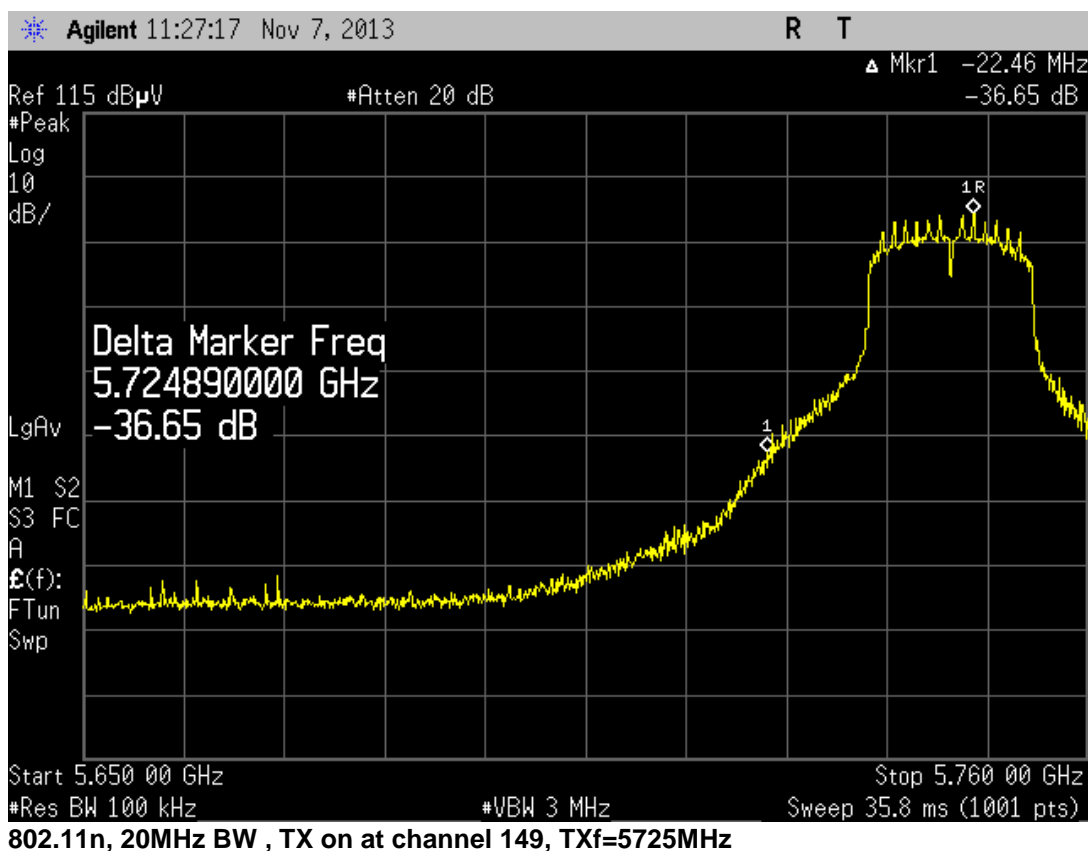
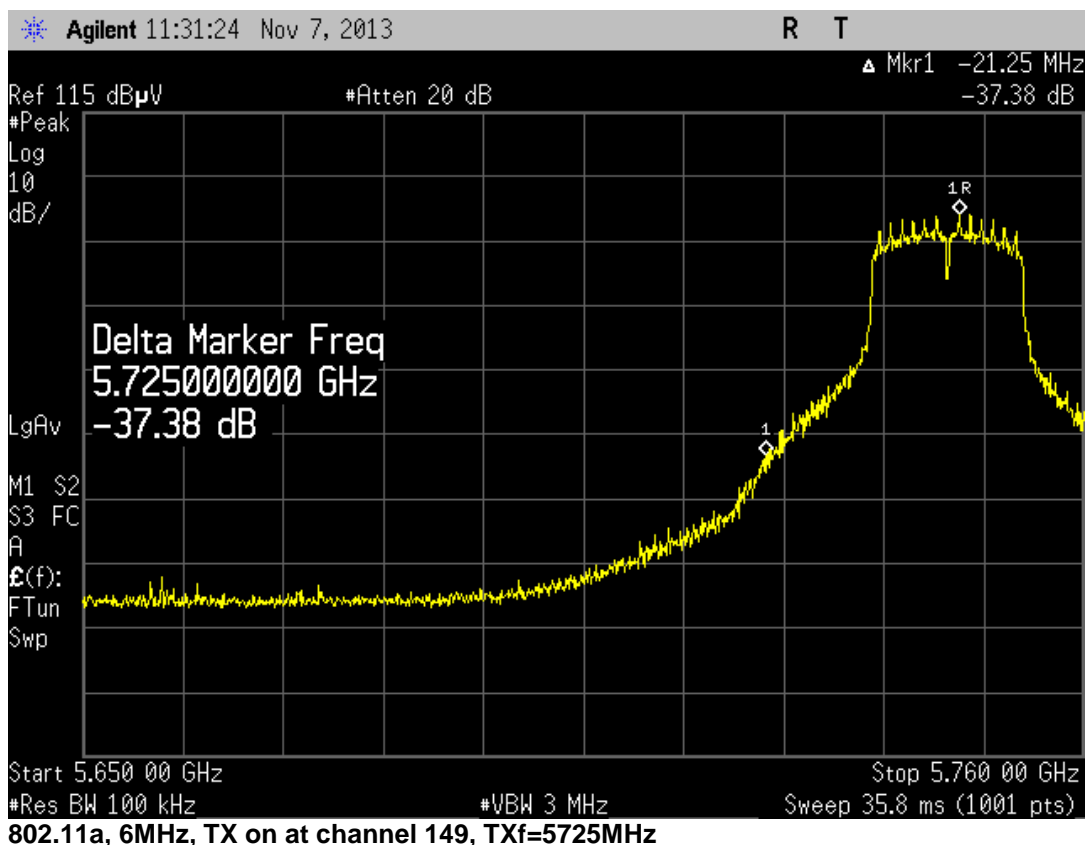
#### 3.3.1 Test results

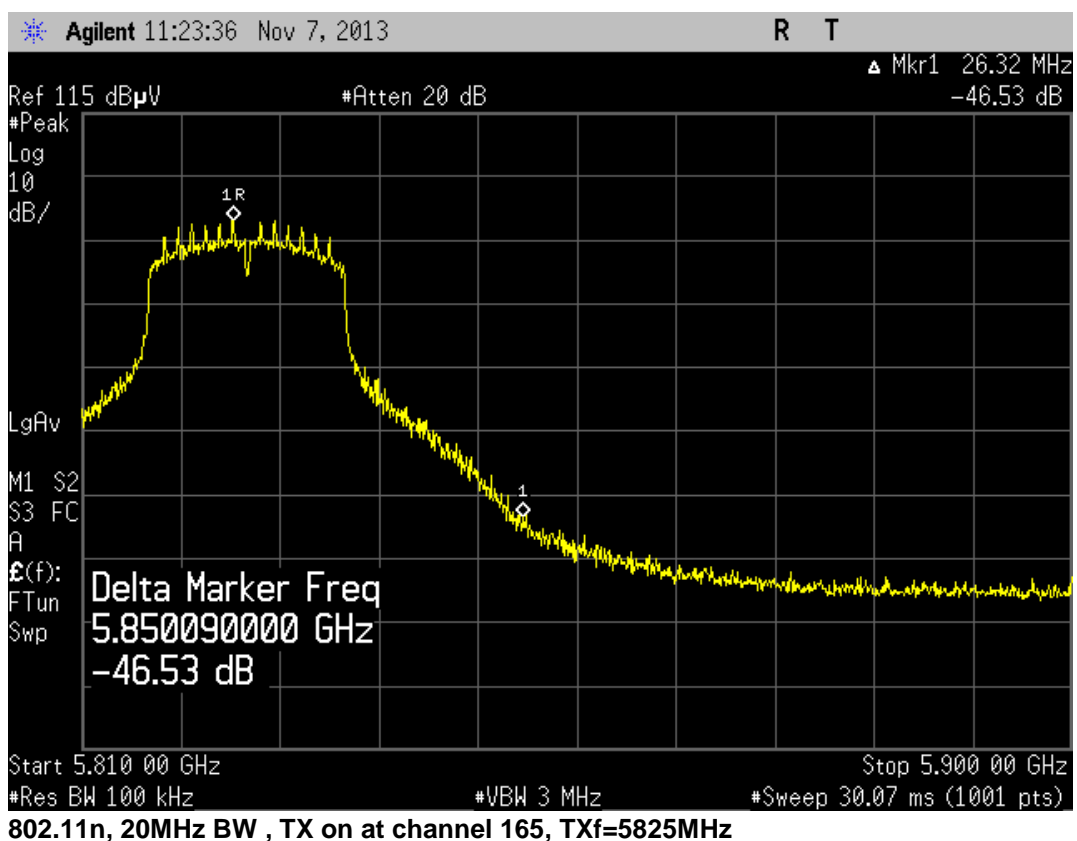
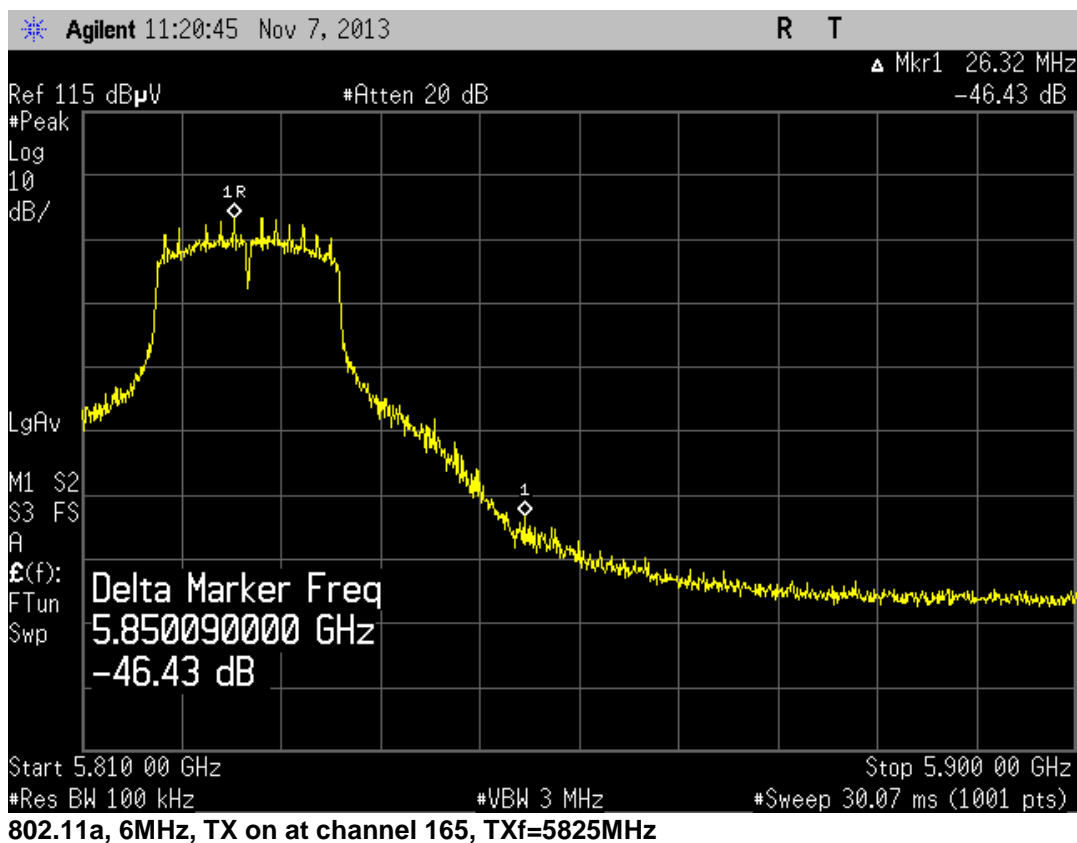
##### 802.11a, 6Mbit/s

<i>Channel</i>	<i>Band Frequency MHz</i>	<i>Result dBc</i>	<i>Limit dBc</i>	<i>Margin dB</i>
149	5725	-37.4	-20	17.4
165	5850	-46.4	-20	26.4

##### 802.11n, 20MHz BW

<i>Channel</i>	<i>Band Frequency MHz</i>	<i>Result dBc</i>	<i>Limit dBc</i>	<i>Margin dB</i>
149	5725	-36.7	-20	16.7
165	5850	-46.5	-20	26.5





### 3.4 Conducted emissions at antenna port

<i>Site name</i>	SGS Fimko EMC Oy / Perkkaa
<i>Date of testing</i>	05.11.2013
<i>Test equipment</i>	566
<i>Test conditions</i>	23 °C, 35 % RH
<i>Test result</i>	<b>PASS</b>

#### 3.4.1 Test method and limit

The measurements were performed with peak-detector (RBW: 100 kHz, VBW 300kHz).

<i>Operating Frequency MHz</i>	<i>Frequency band MHz</i>	<i>Limit dBc</i>
<b>5725-5850</b>	<b>30 - 40000</b>	<b>-20</b>

#### 3.4.2 Test results

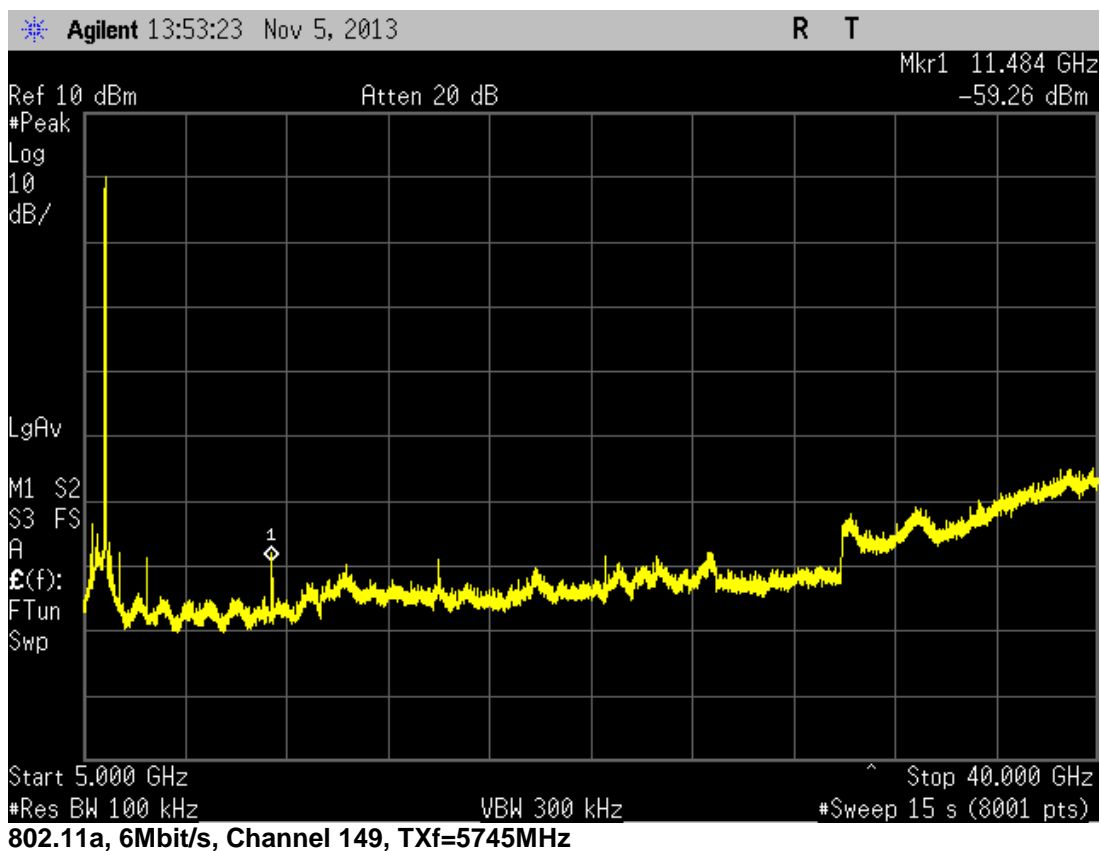
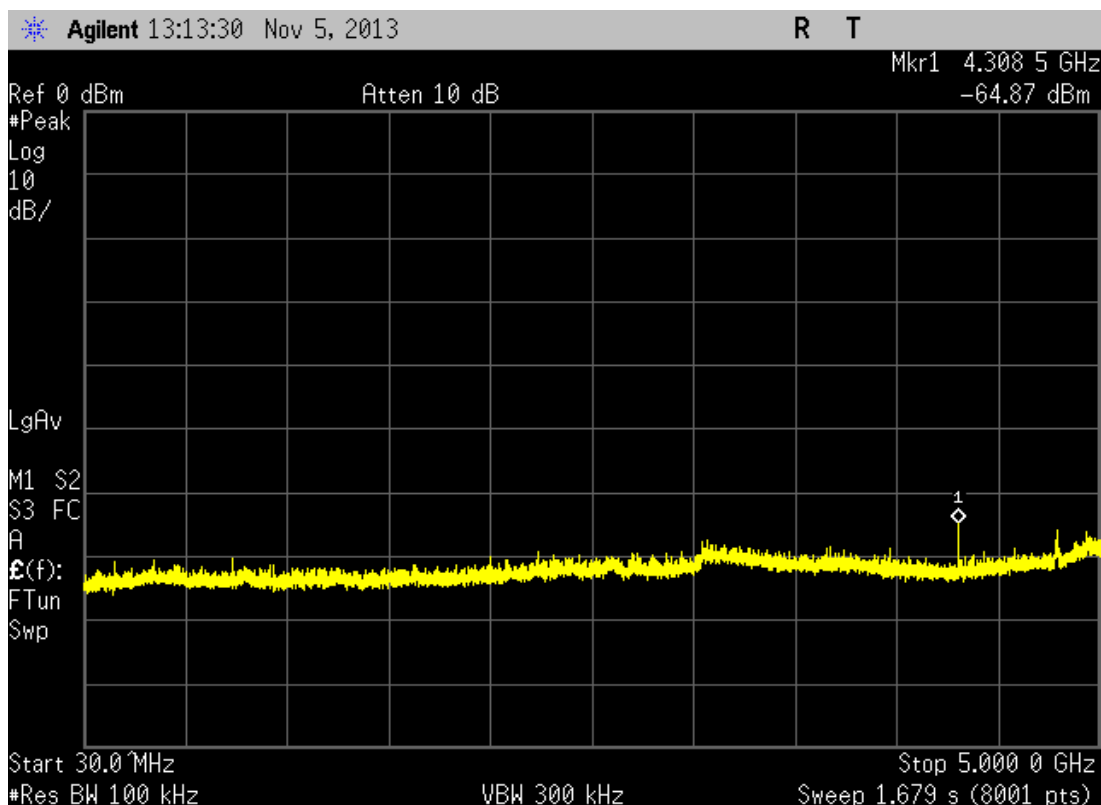
##### 802.11a, 6Mbit/s

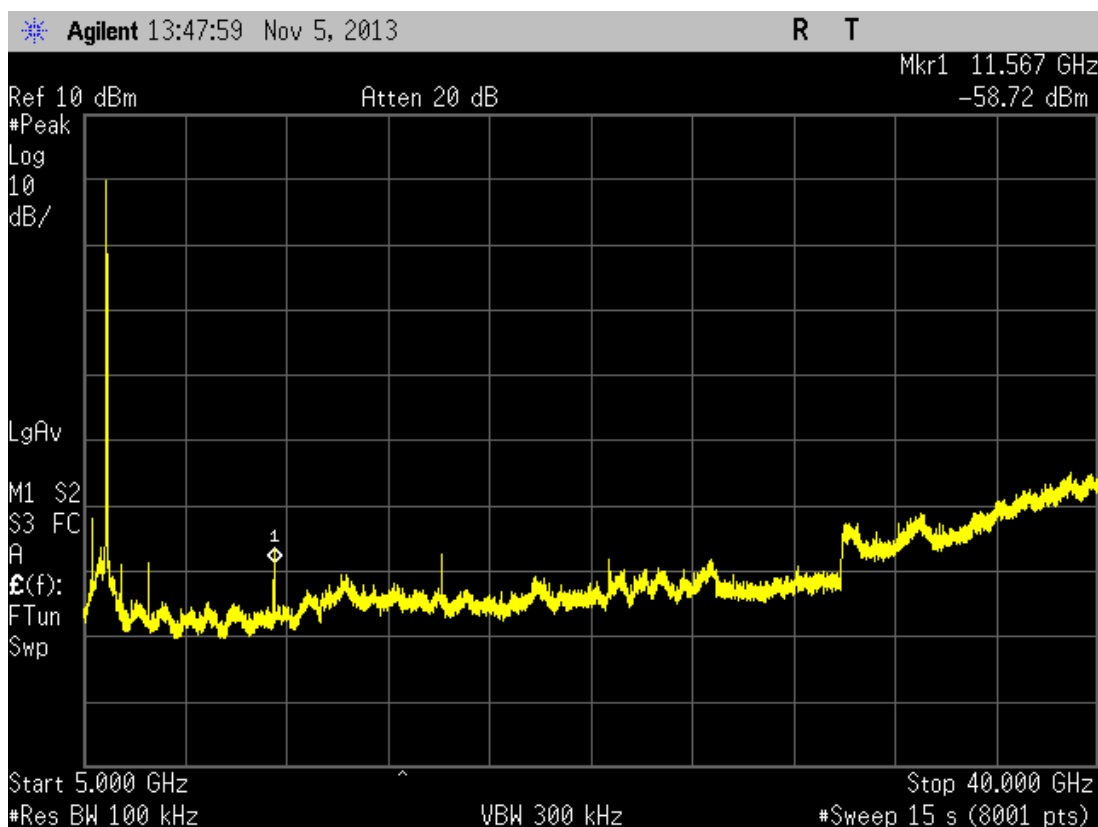
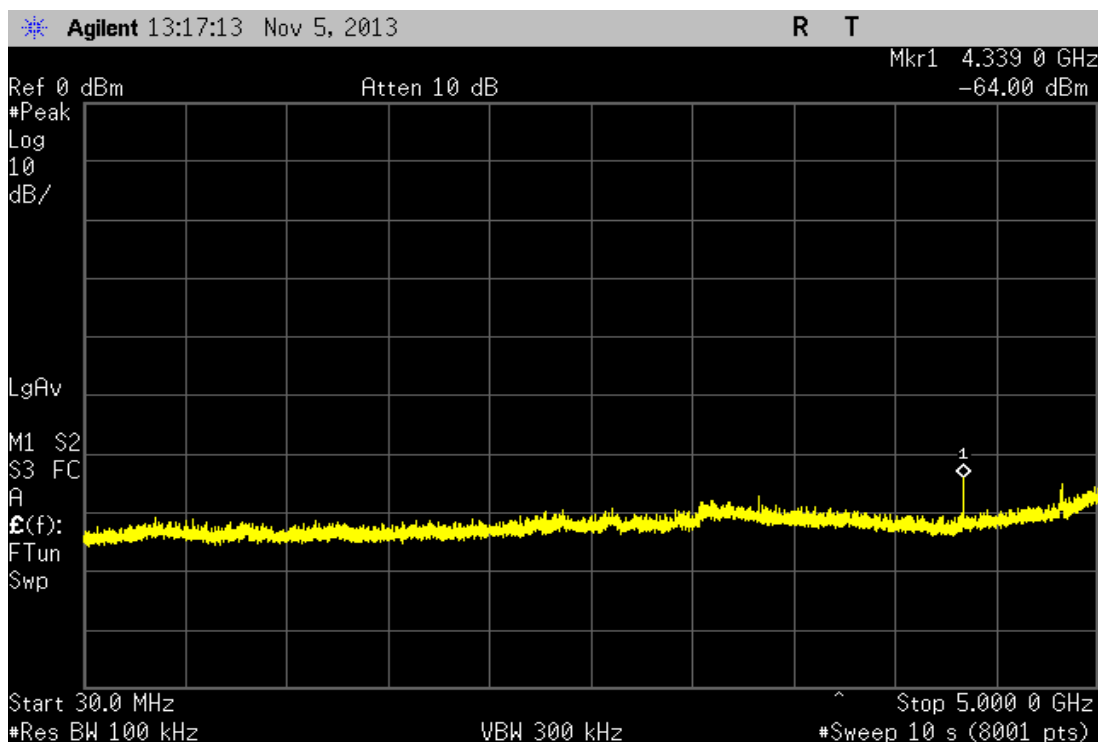
<i>Channel</i>	<i>Frequency MHz</i>	<i>Result dBc</i>	<i>Limit dBc</i>	<i>Margin dB</i>
149	30-5000	<-40	-20	>20
	5000-40000	<-40	-20	>10
157	30-5000	<-40	-20	>20
	5000-40000	<-40	-20	>10
165	30-5000	<-40	-20	>20
	5000-40000	<-40	-20	>10

##### 802.11n, 20MHz BW

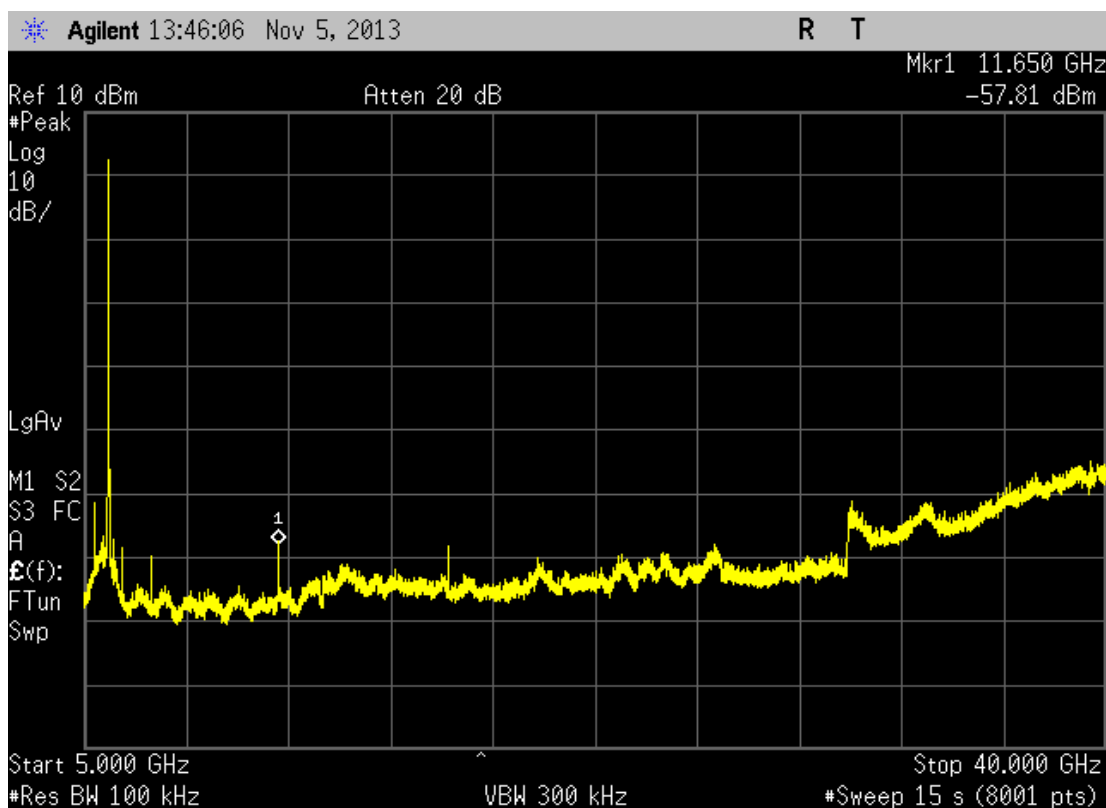
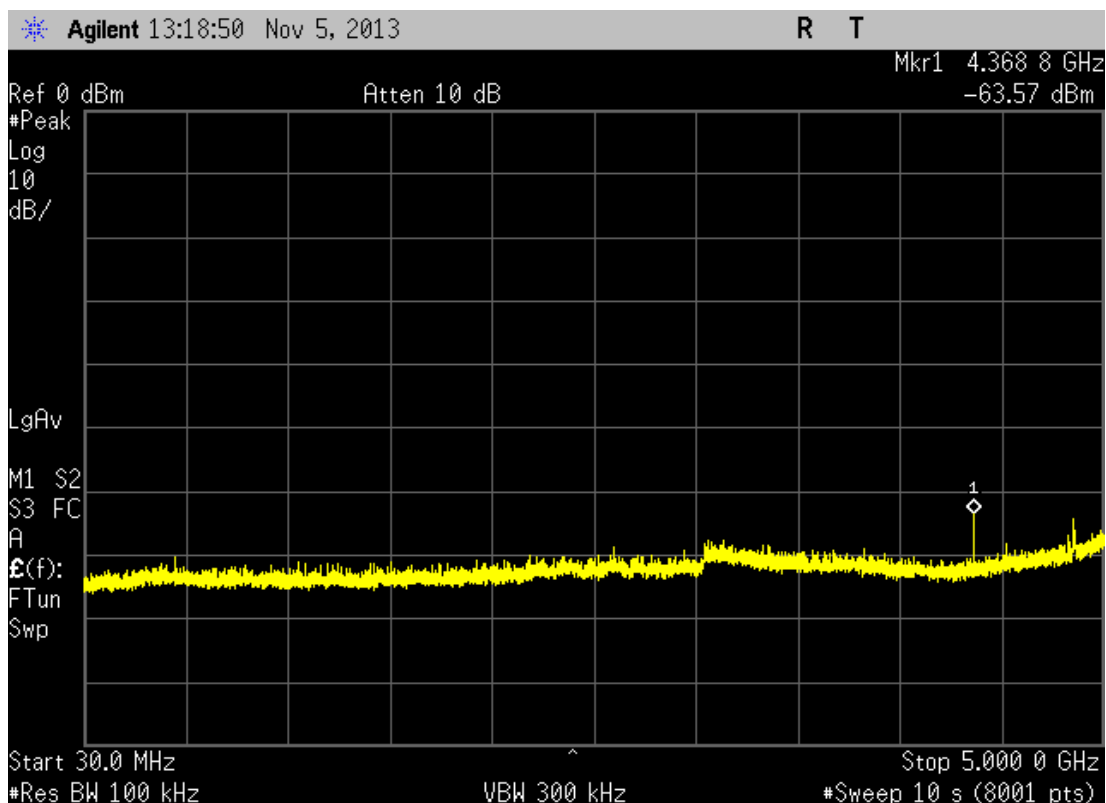
<i>Channel</i>	<i>Frequency MHz</i>	<i>Result dBc</i>	<i>Limit dBc</i>	<i>Margin dB</i>
149	30-5000	<-40	-20	>20
	5000-40000	<-40	-20	>10
157	30-5000	<-40	-20	>20
	5000-40000	<-40	-20	>10
165	30-5000	<-40	-20	>20
	5000-40000	<-40	-20	>10



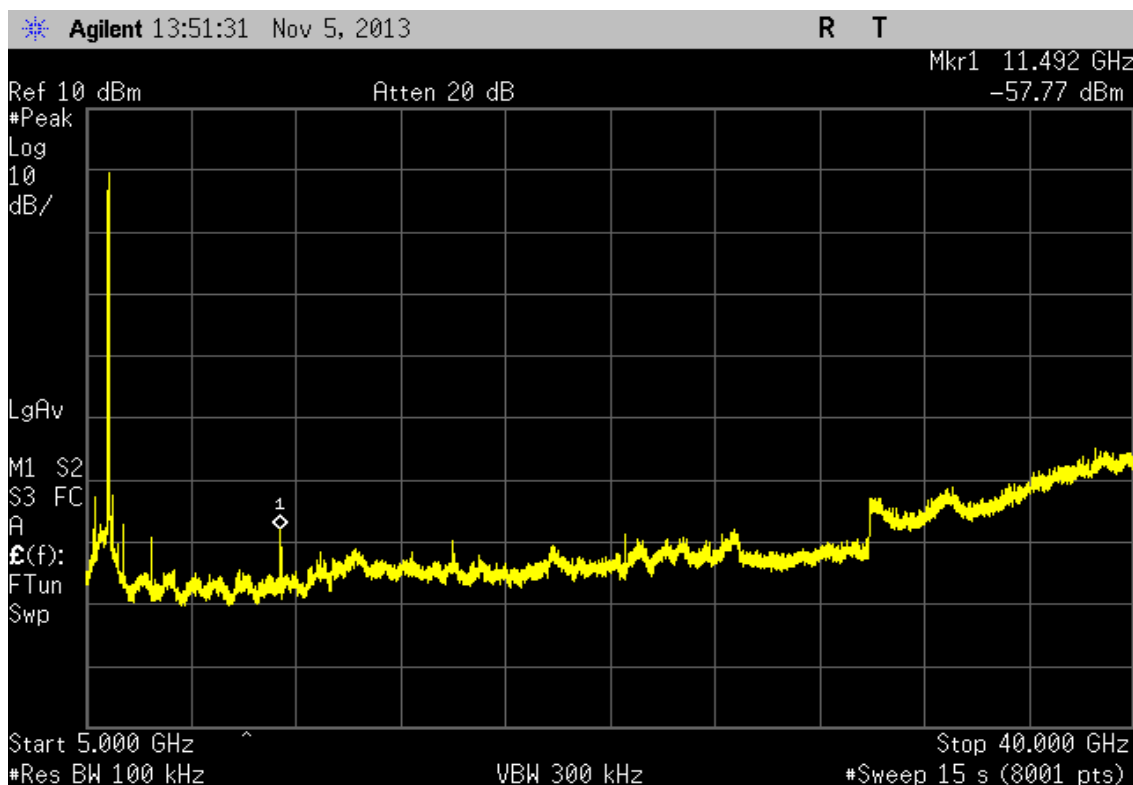
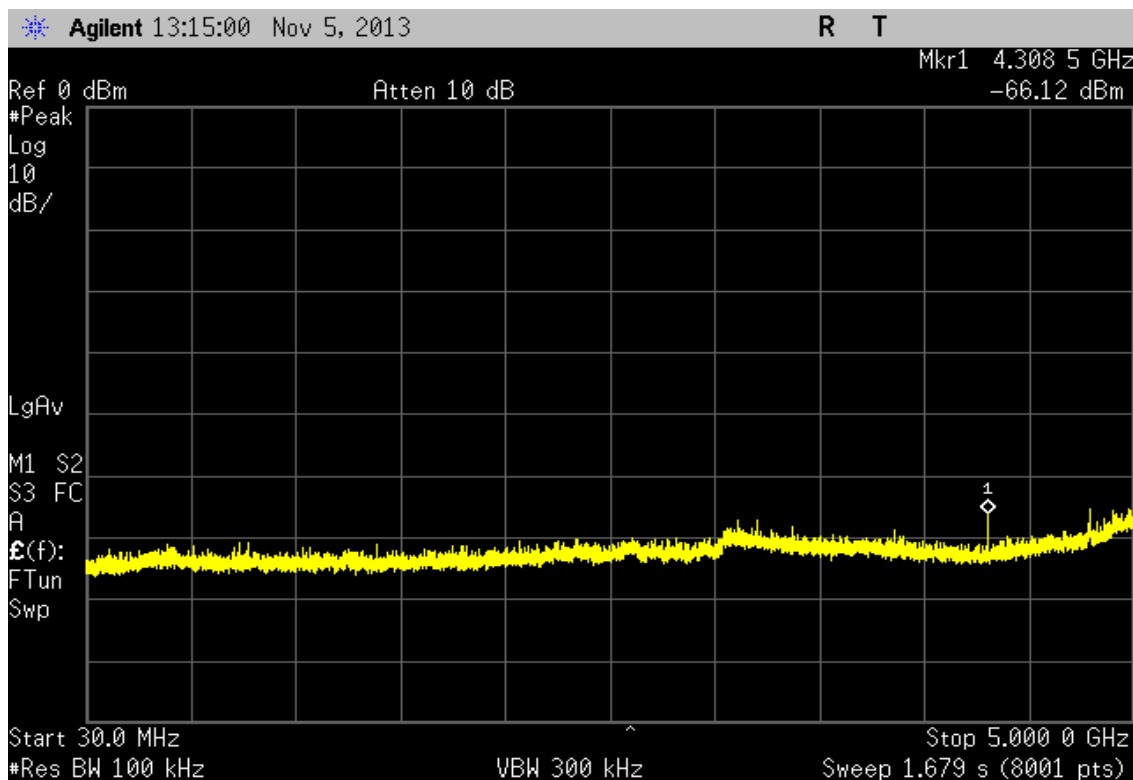




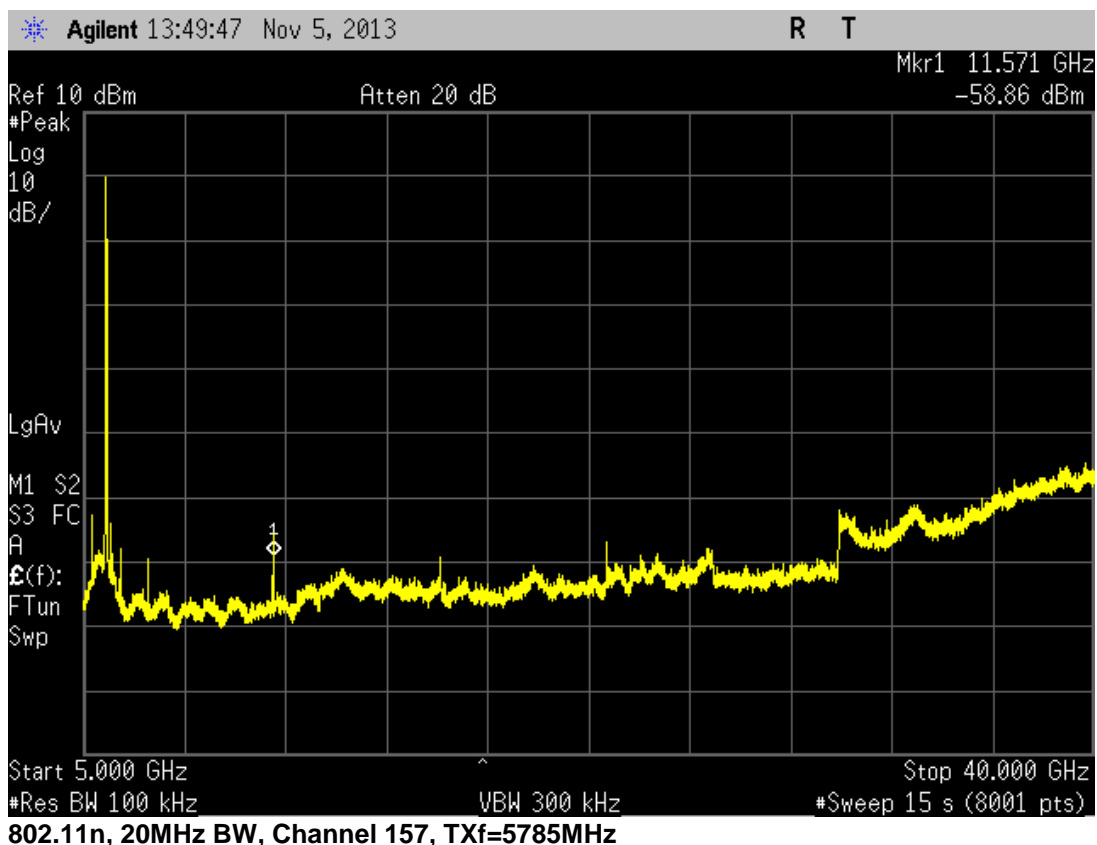
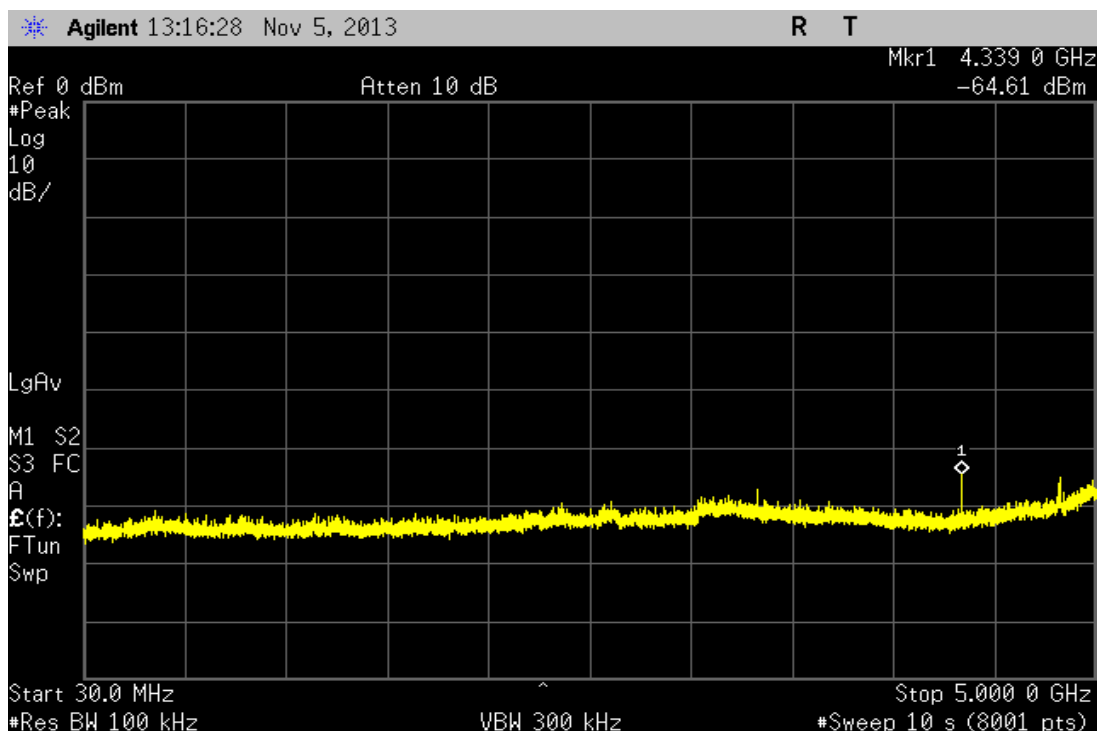
802.11a, 6Mbit/s, Channel 157, TXf=5785MHz

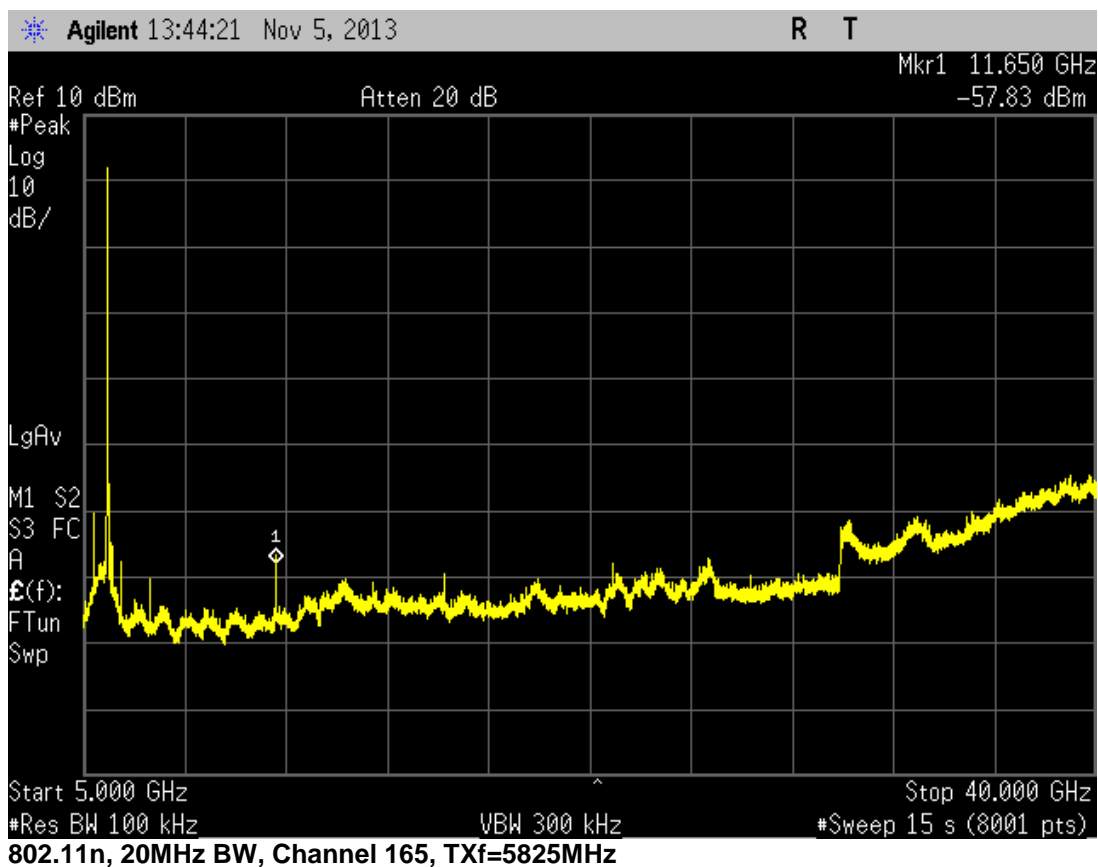
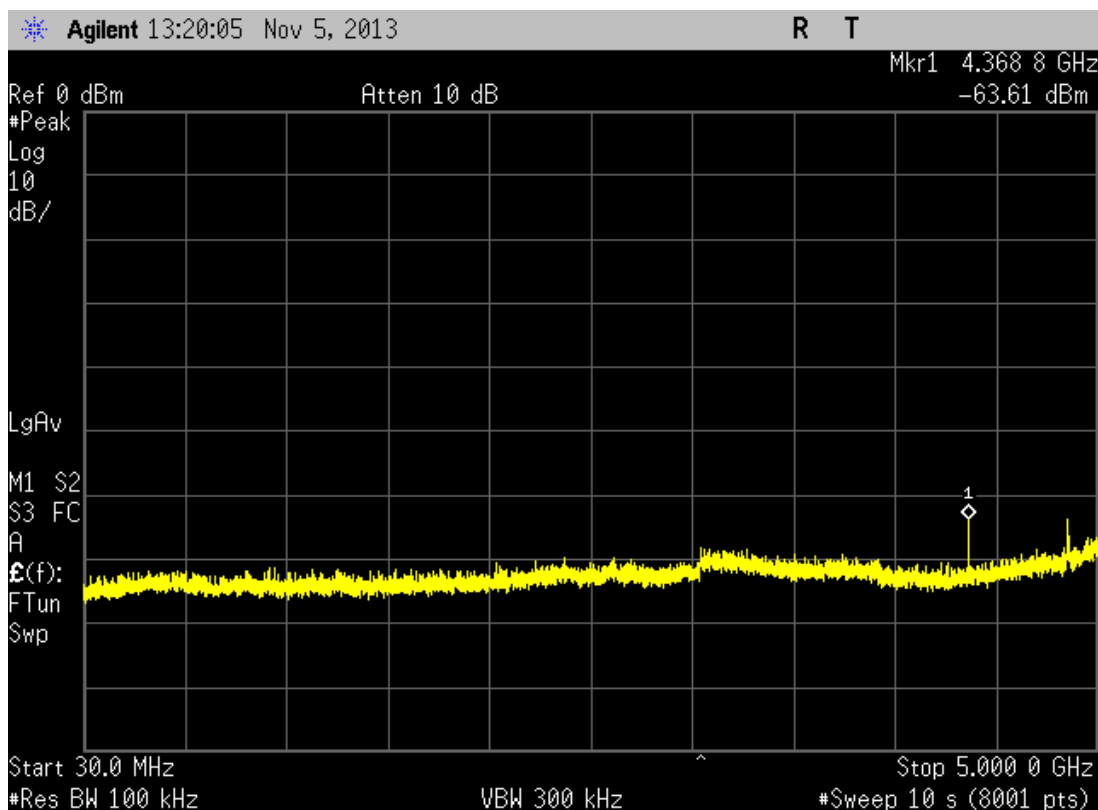


802.11a, 6Mbit/s, Channel 165, TXf=5825MHz



802.11n, 20MHz BW, Channel 149, TXf=5745MHz





### 3.5 Maximum peak output power

The test was performed as a compliance test. The test parameters concerned were as follows:

<i>Site name</i>	SGS Fimko EMC Oy / Perkkaa
<i>FCC rule part</i>	§ 15.247
<i>Date of testing</i>	1.11.2013
<i>Test equipment</i>	566
<i>Test conditions</i>	25 °C, 55 % RH
<i>Test result</i>	<b>PASS</b>

#### 3.5.1 Test method and limit

Test method b was used. RBW=8MHz and VBW=50MHz. Peak detector was used. Gated sweep was used in order not to have periods OFF included in the result. Compute power by integrating the spectrum across the 6 dB OBW of the signal. The integration was performed using the spectrum analyzer's band power measurement function.

The external antenna port of the EUT was connected to the spectrum analyzer.

Antenna gain <2 dBi => limit = 30 dBm

### 3.5.2 Test data

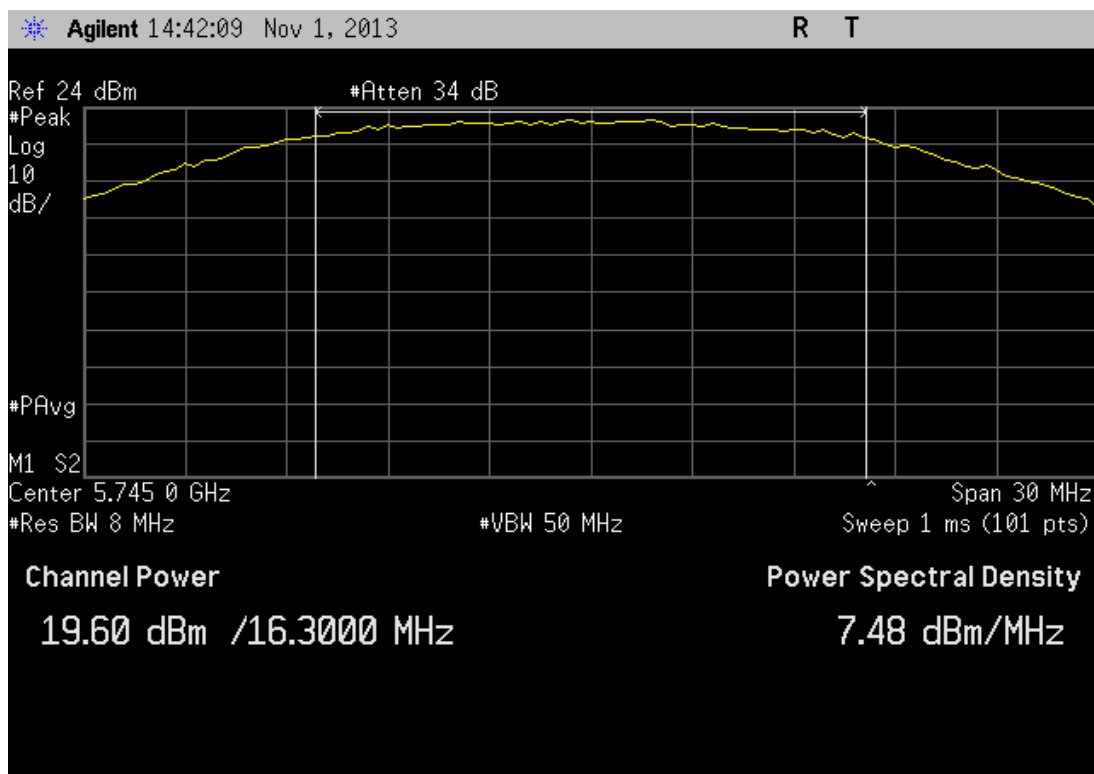
#### 802.11a, 6Mbit/s

<i>Channel</i>	<i>Frequency MHz</i>	<i>Result dBm</i>	<i>Limit dBm</i>	<i>Margin dBm</i>
149	5745	19.60	30.0	10.40
157	5785	19.68	30.0	10.32
165	5825	19.57	30.0	10.43

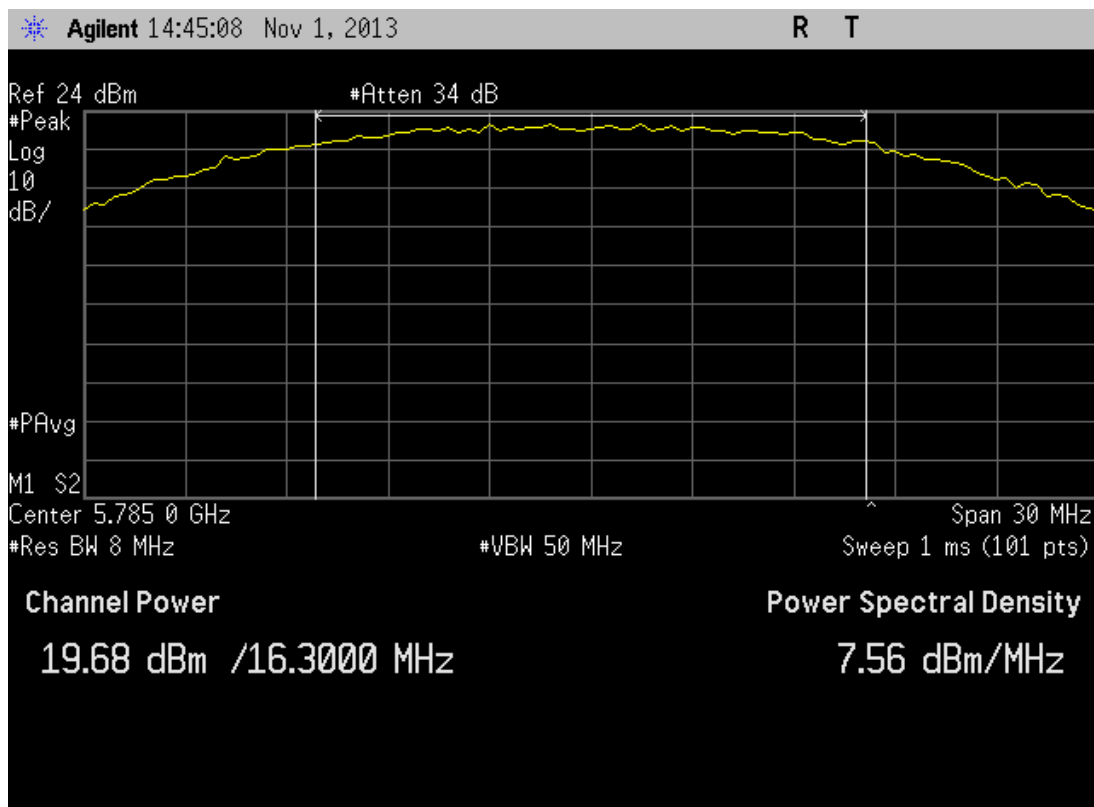
#### 802.11n, 20MHz BW, MCS0

<i>Channel</i>	<i>Frequency MHz</i>	<i>Result dBm</i>	<i>Limit dBm</i>	<i>Margin dBm</i>
149	5745	19.66	30.0	10.34
157	5785	19.81	30.0	10.19
165	5825	19.67	30.0	10.33

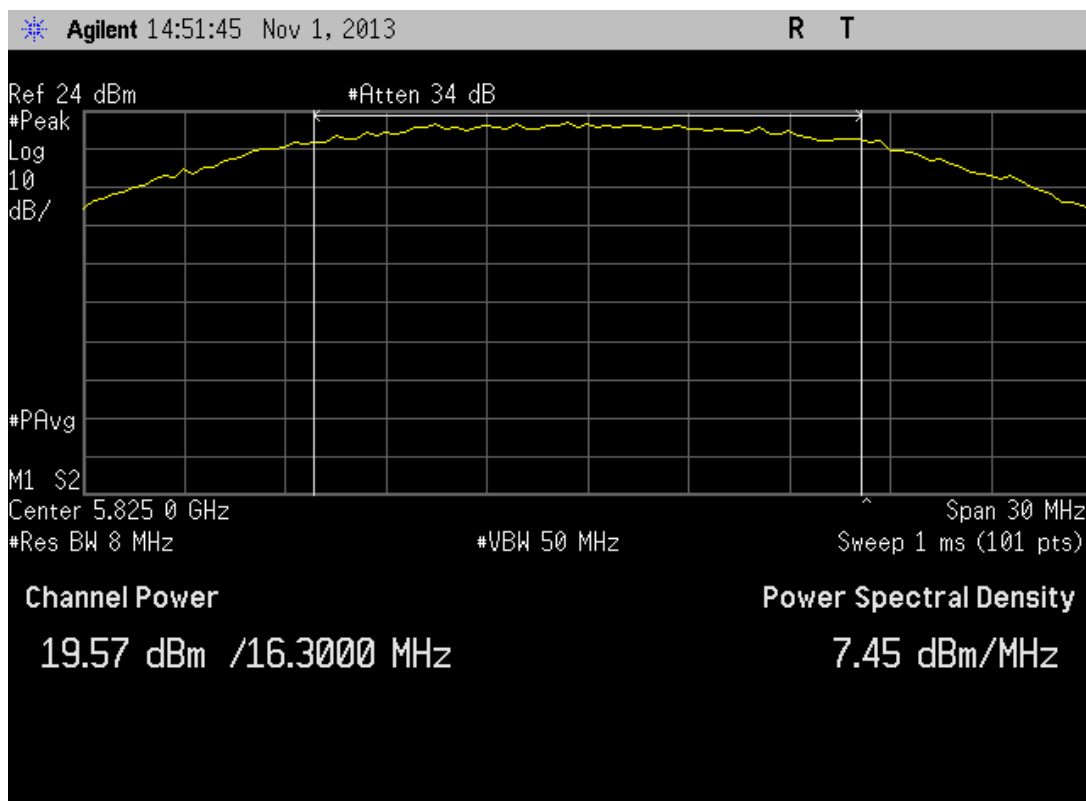




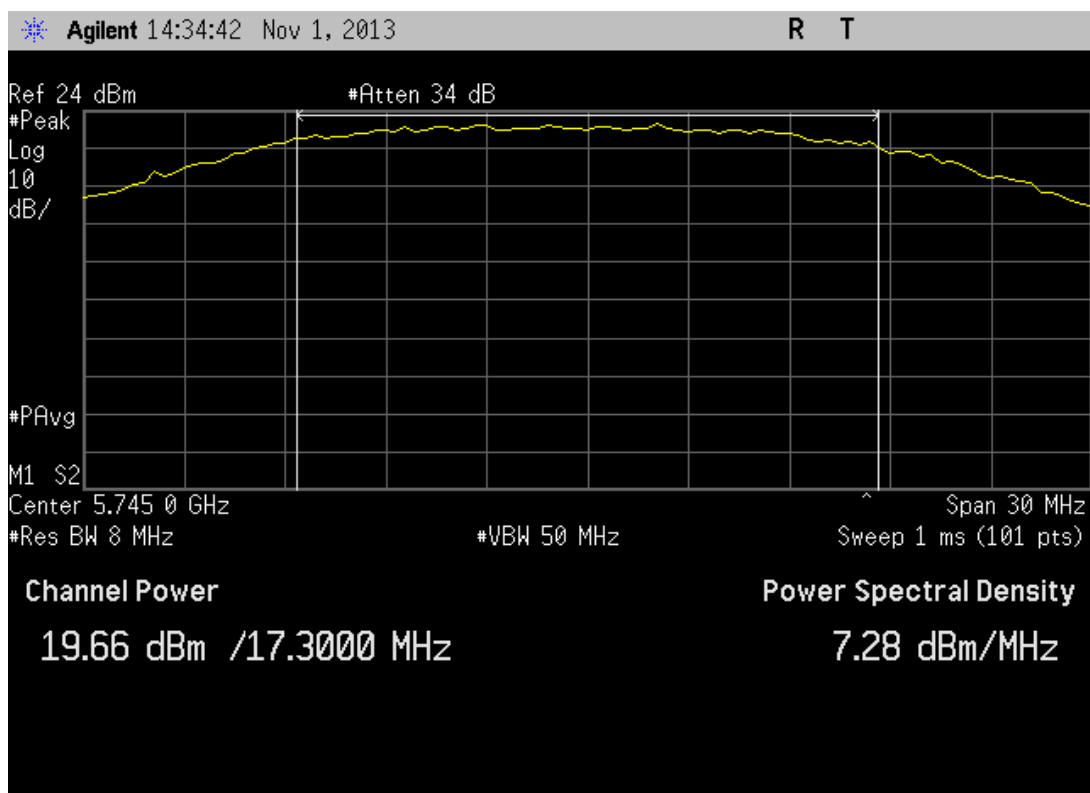
802.11a 6 Mbit/s, Channel 149, TXf=5745MHz



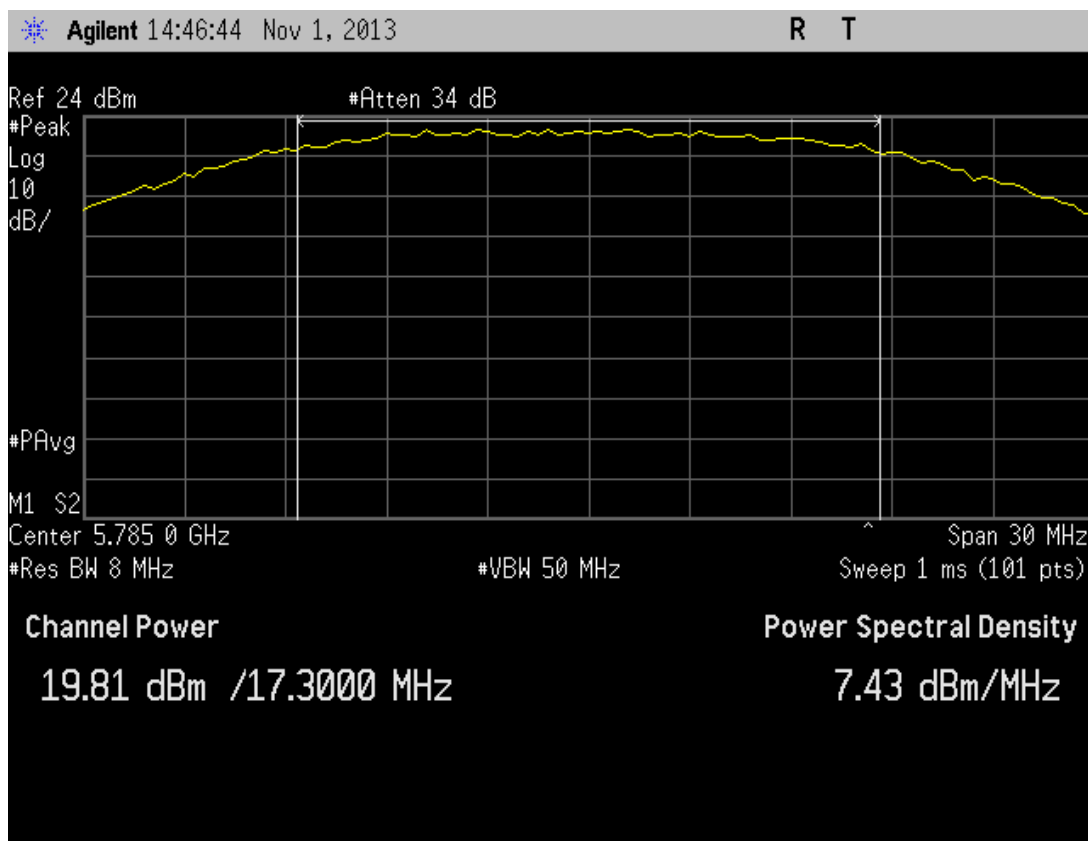
802.11a 6 Mbit/s, Channel 157, TXf=5785MHz



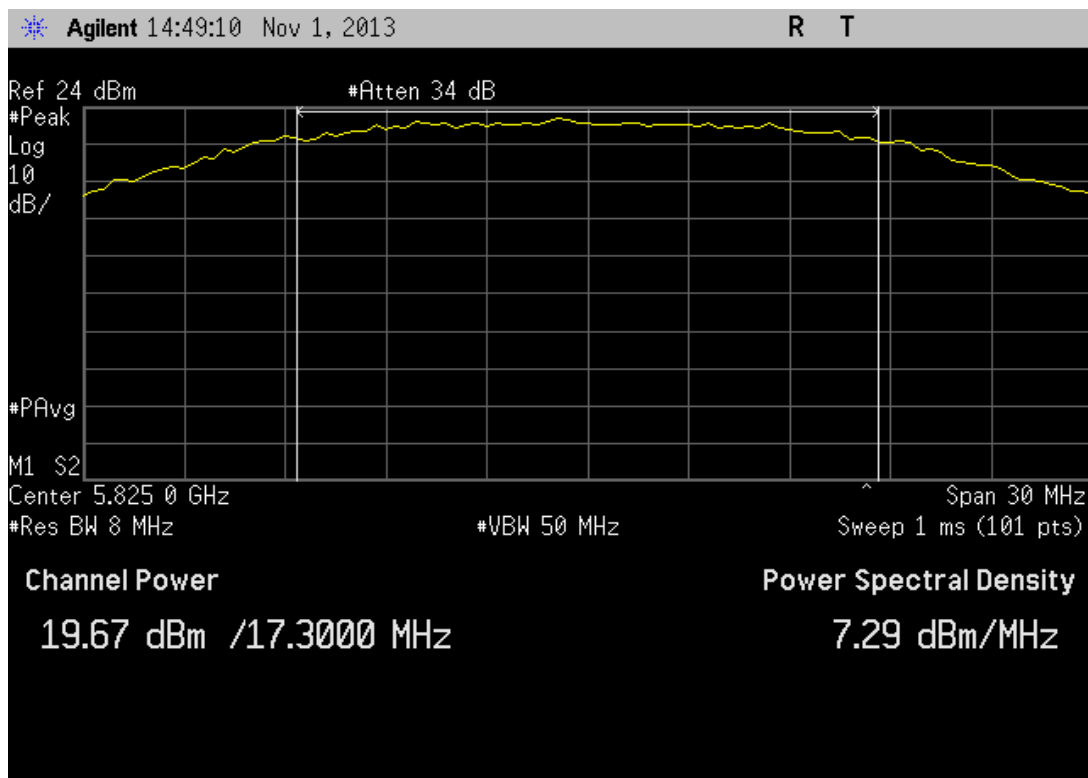
802.11a 6 Mbit/s, Channel 165, TXf=5825MHz



802.11n, 20MHz BW, MCS0, Channel 149, TXf=5745MHz



802.11n, 20MHz BW, MCS0, Channel 157, TXf=5785MHz



802.11n, 20MHz BW, MCS0, Channel 165, TXf=5825MHz

### 3.1 6dB Bandwidth

The test was performed as a compliance test. The test parameters concerned were as follows:

<i>Site name</i>	SGS Fimko EMC Oy / Perkkaa
<i>FCC rule part</i>	§ 15.247
<i>Date of testing</i>	31.10.2013
<i>Test equipment</i>	566
<i>Test conditions</i>	25 °C, 35 % RH
<i>Test result</i>	<b>PASS (Limit: min 500 kHz)</b>

#### 3.1.1 Test method

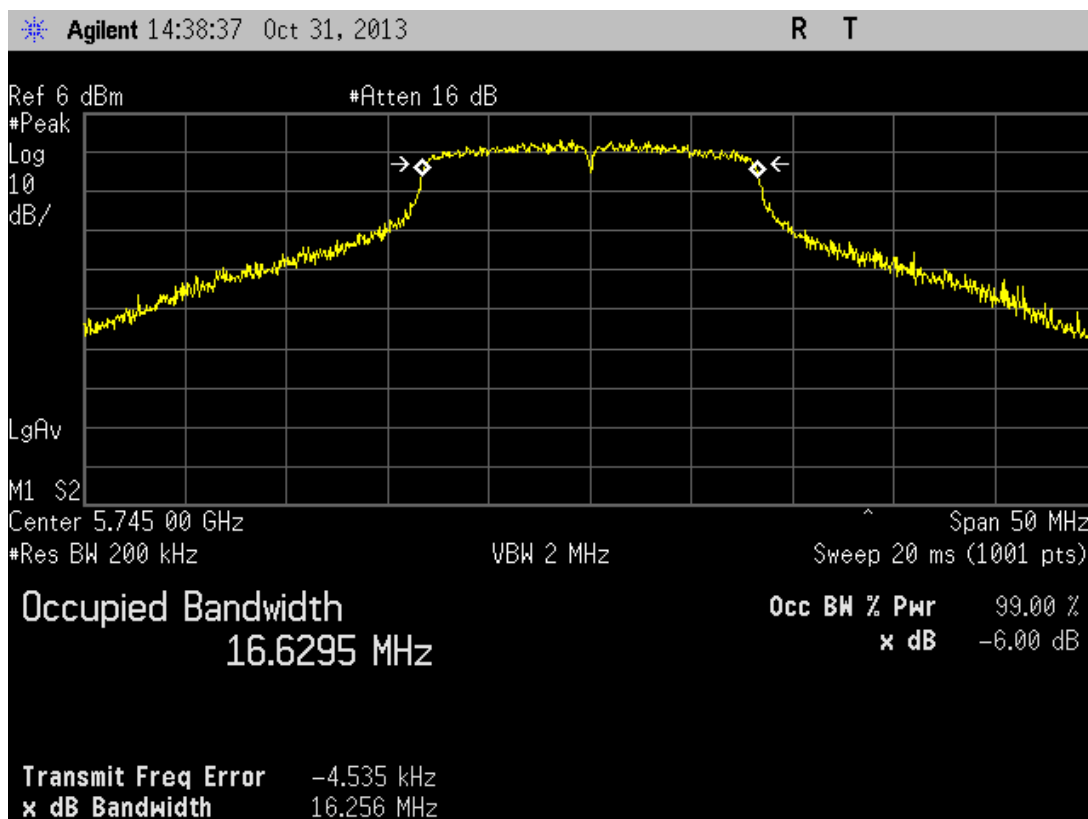
The external antenna port of the EUT was connected to the spectrum analyzer.

#### 3.1.2 EUT operation mode

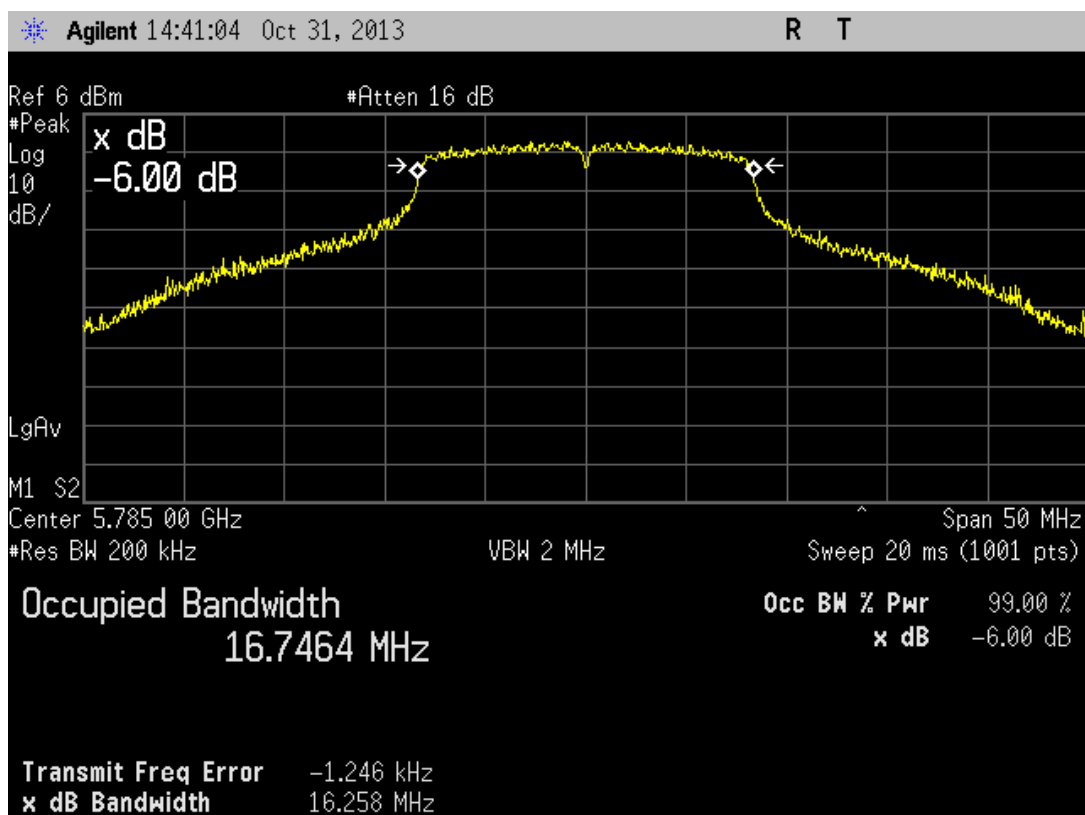
<i>EUT operation mode</i>	<b>802.11a, 6Mbit/s, TX on at channels 149, 157, 165</b>
	<b>802.11n, 20MHz BW MSC0 , TX on at channels 149, 157, 165</b>

#### 3.1.2 Test data

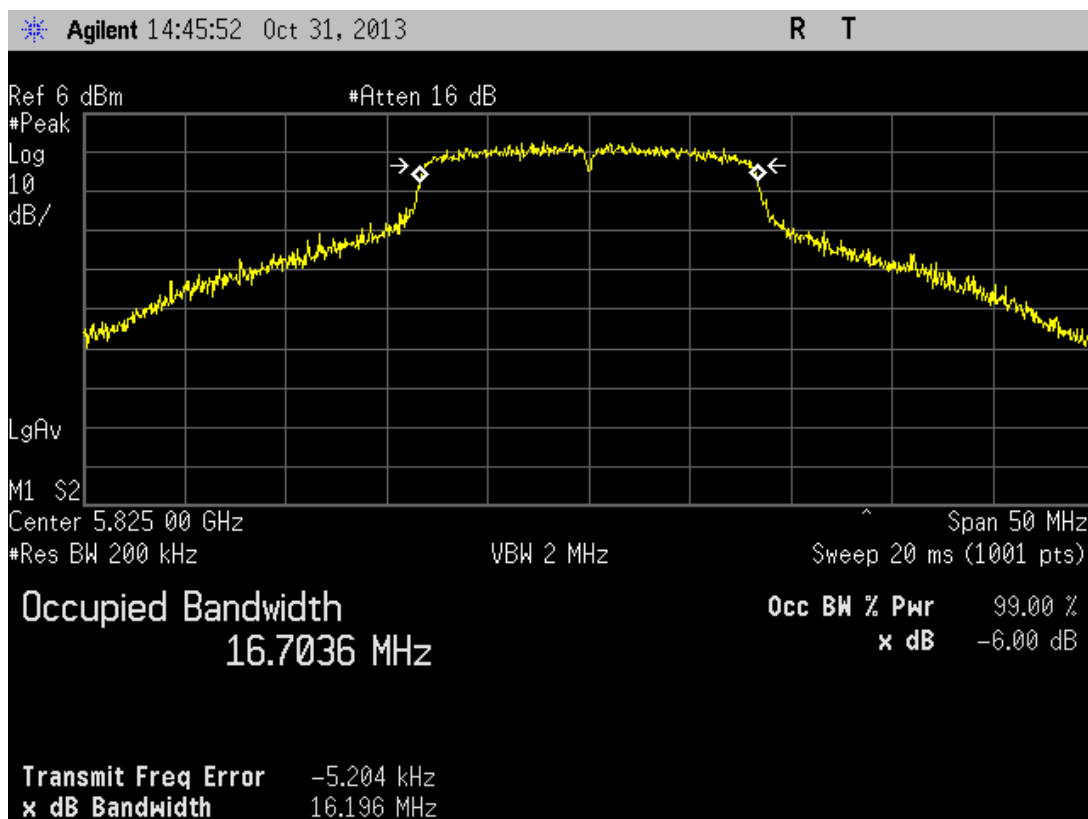
EUT operation mode	<i>Result</i> MHz
<b>802.11a, 6Mbit/s, TX on at channels 149, TXf=5745MHz</b>	<b>16.3</b>
<b>802.11a, 6Mbit/s, TX on at channels 157, TXf=5785MHz</b>	<b>16.3</b>
<b>802.11a, 6Mbit/s, TX on at channels 165, TXf=5825MHz</b>	<b>16.2</b>
<b>802.11n, 20MHz BW MSC0, TX on at channels 149, TXf=5745MHz</b>	<b>17.2</b>
<b>802.11n, 20MHz BW MSC0, TX on at channels 157, TXf=5785MHz</b>	<b>17.2</b>
<b>802.11n, 20MHz BW MSC0, TX on at channels 165, TXf=5825MHz</b>	<b>17.3</b>



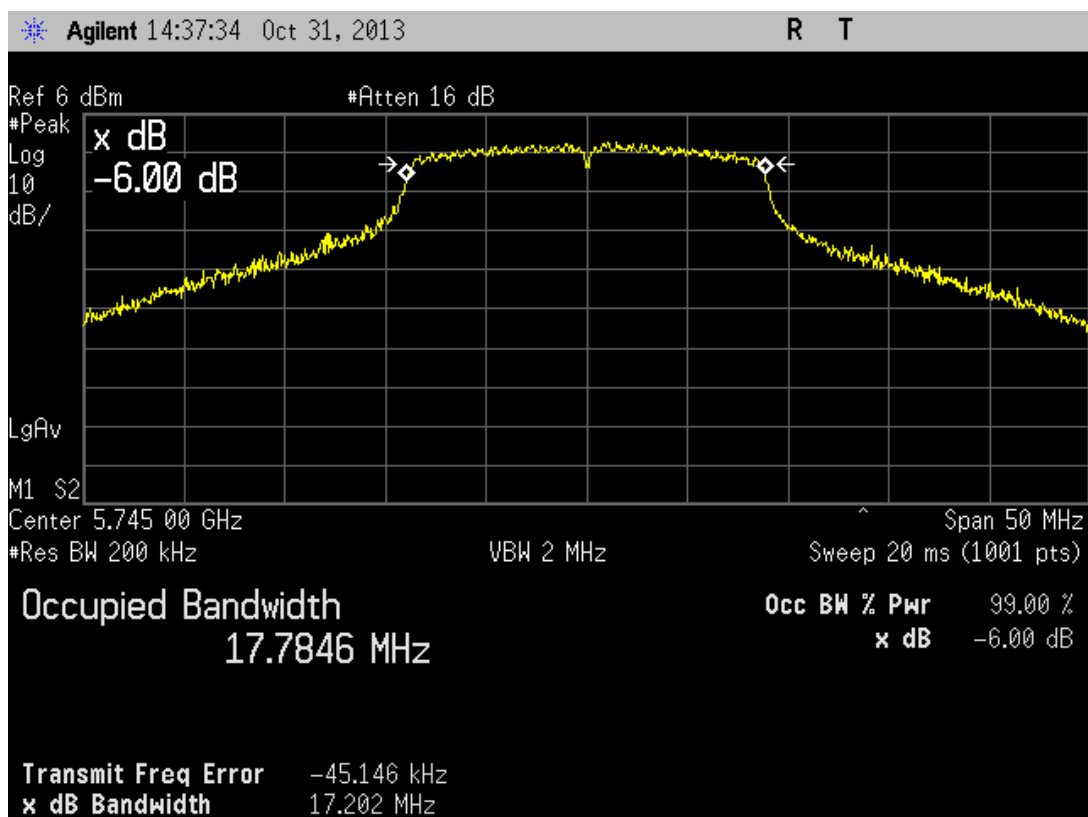
802.11a, 6Mbit/s, TX on at channels 149, TXf=5745MHz



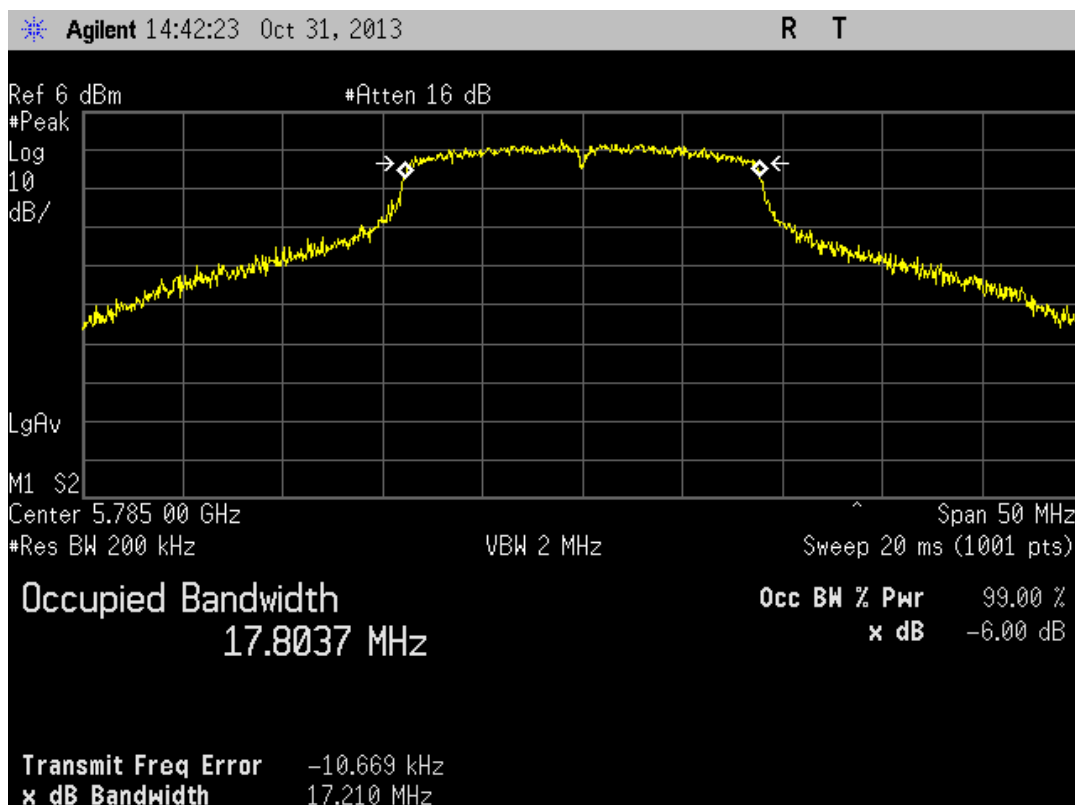
802.11a, 6Mbit/s, TX on at channels 157, TXf=5785MHz



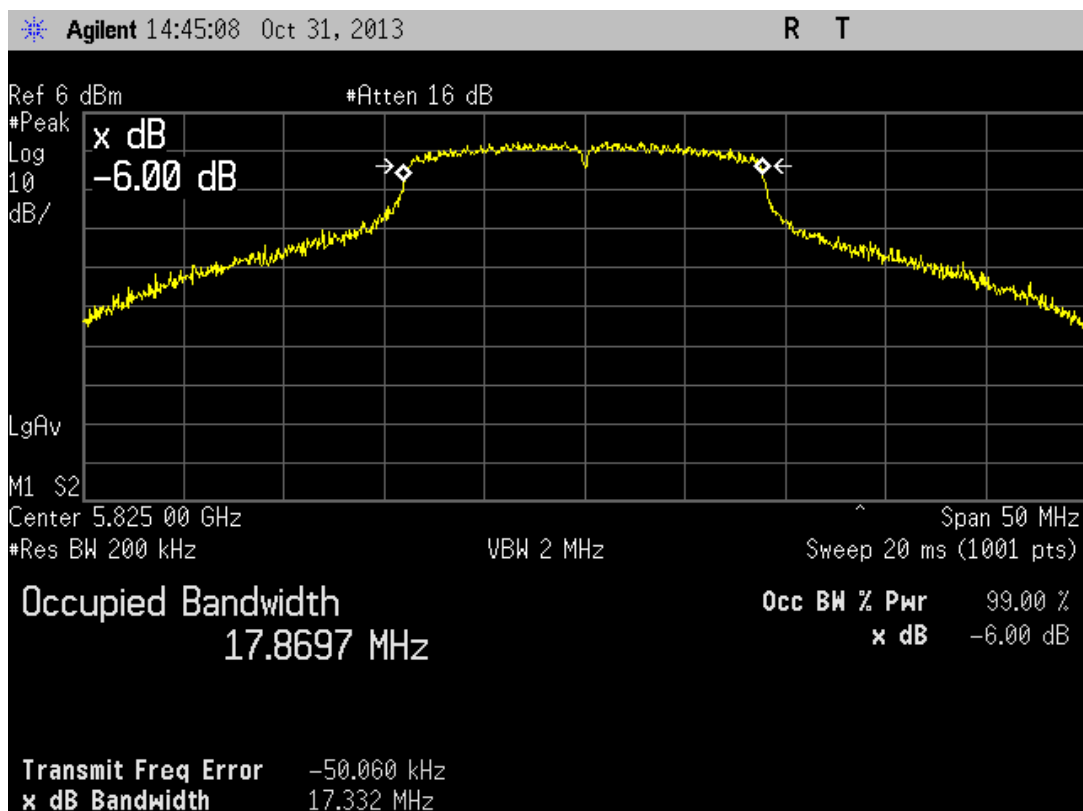
802.11a, 6Mbit/s, TX on at channels 165, TXf=5825MHz



802.11n, 20MHz BW MCS0, TX on at channels 149, TXf=5745MHz



802.11n, 20MHz BW MCS0, TX on at channels 157, TXf=5785MHz



802.11n, 20MHz BW MCS0, TX on at channels 165, TXf=5825MHz

### 3.2 Peak power spectral density

The test was performed as a compliance test. The test parameters concerned were as follows:

Site name	SGS Fimko EMC Oy / Perkkää
FCC rule part	§ 15.247
Date of testing	4.11.2013
Test equipment	566
Test conditions	25 °C, 35 % RH
Test result	<b>PASS</b>

#### 3.2.1 Test method and limit

The external antenna port of the EUT was connected to the spectrum analyzer.  
ANSI C63.10-2009 test method PSD option 1 (6.11.2.3)

Antenna gain <2 dBi => limit = 8 dBm

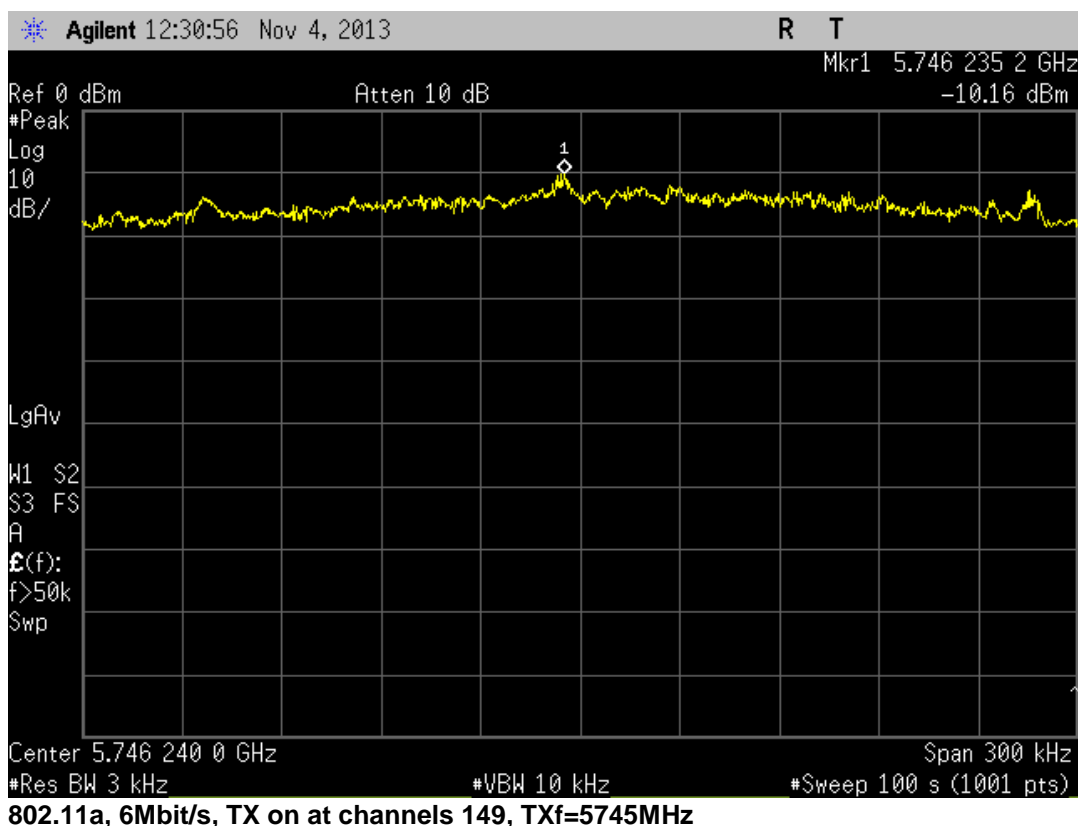
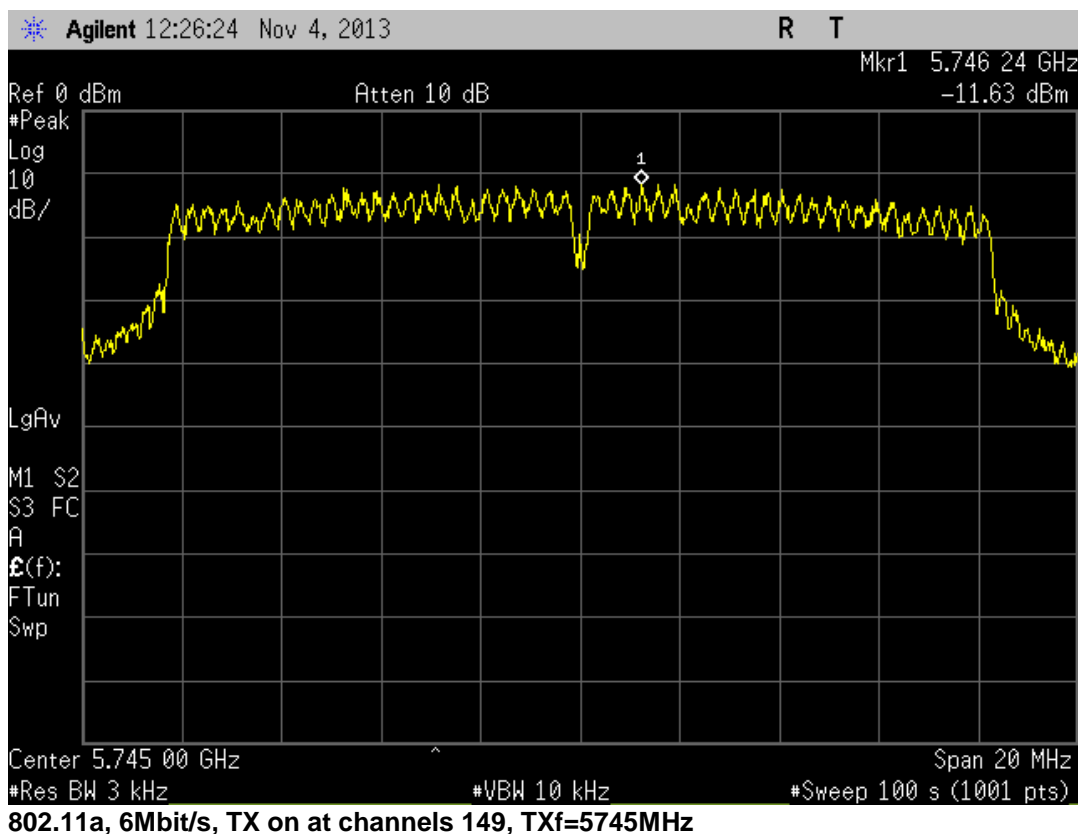
#### 3.2.2 EUT operation mode

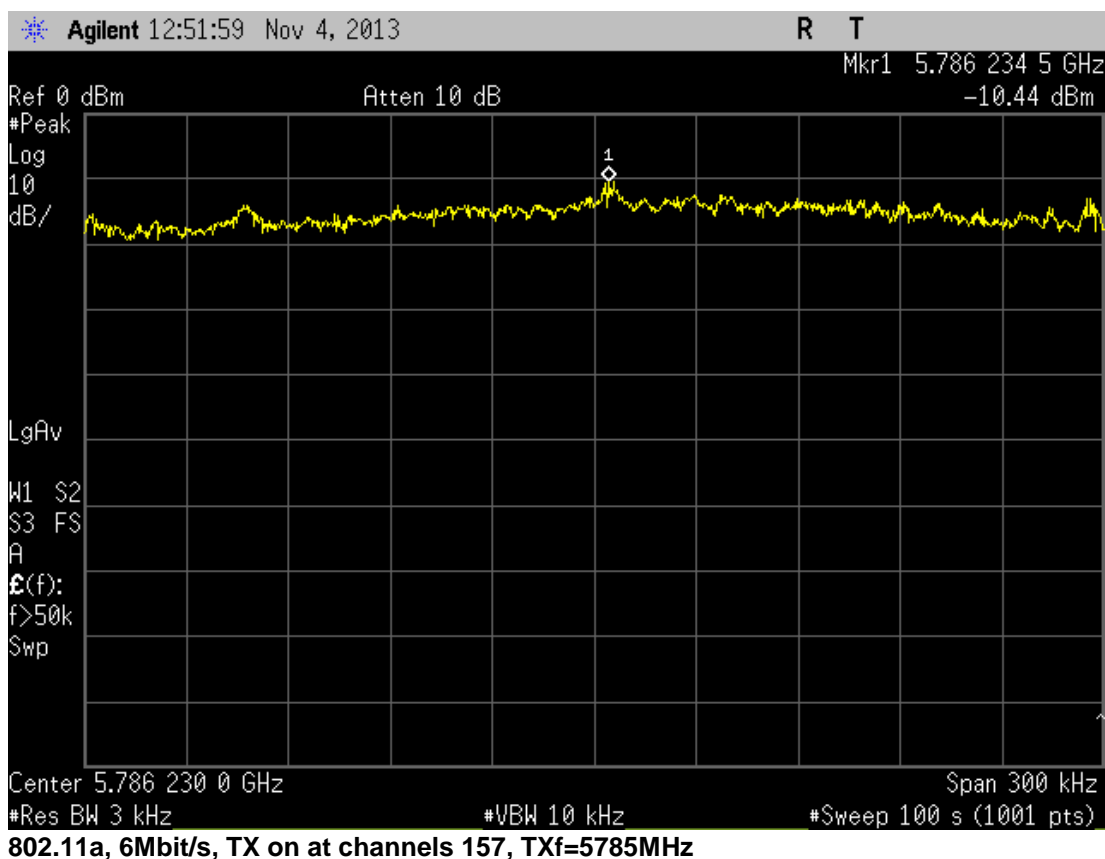
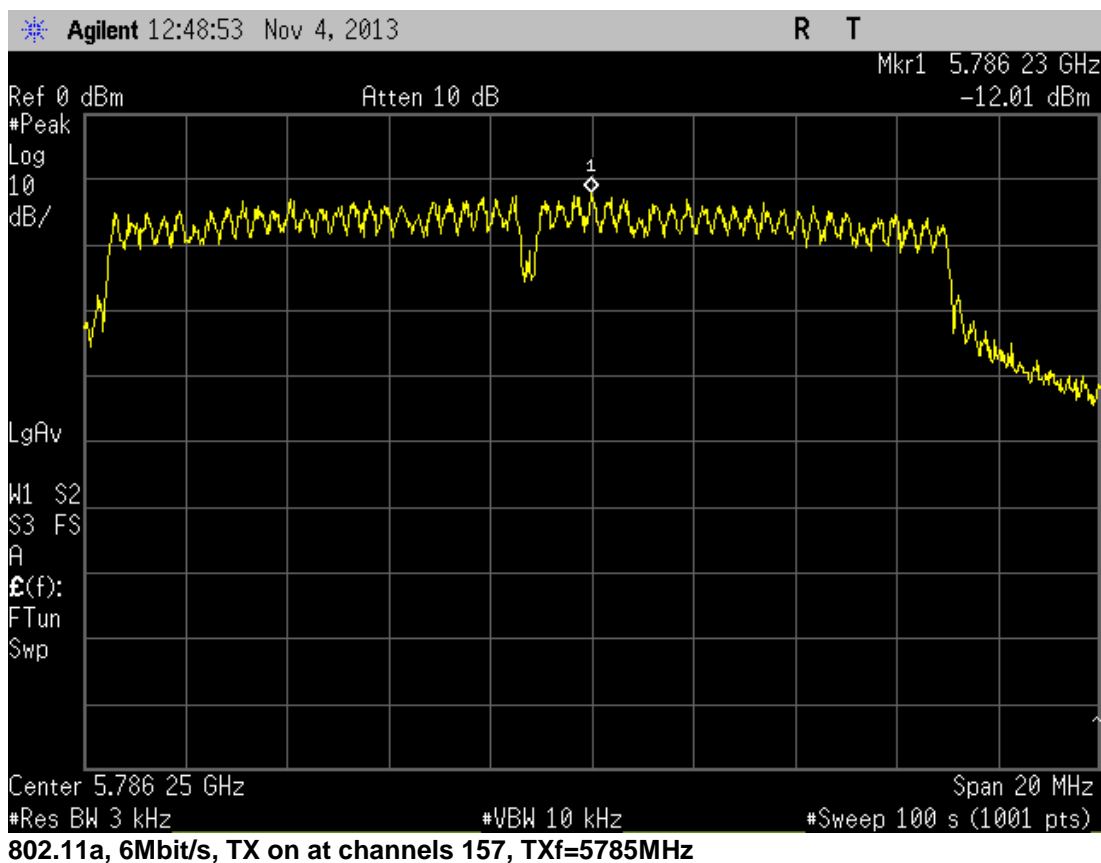
EUT operation mode	<b>802.11a, 6Mbit/s, TX on at channels 149, 157, 165</b>
	<b>802.11n, 20MHz BW MCS0 , TX on at channels 149, 157, 165</b>

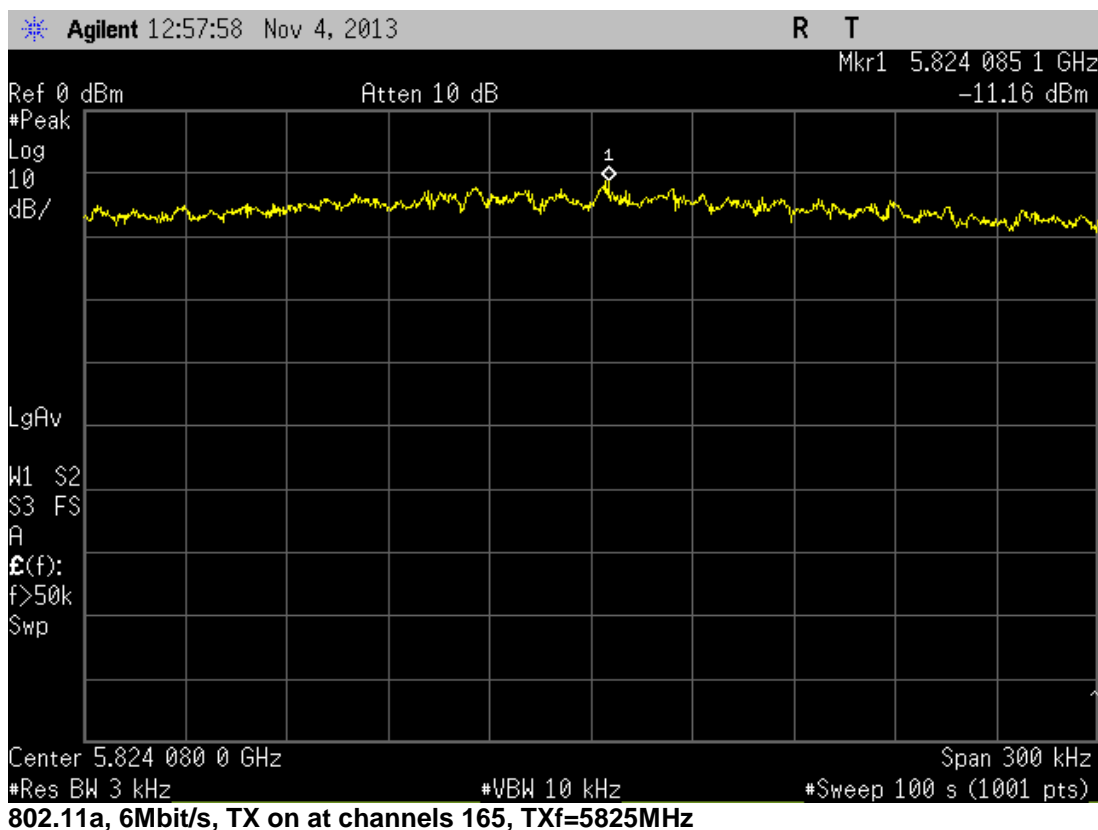
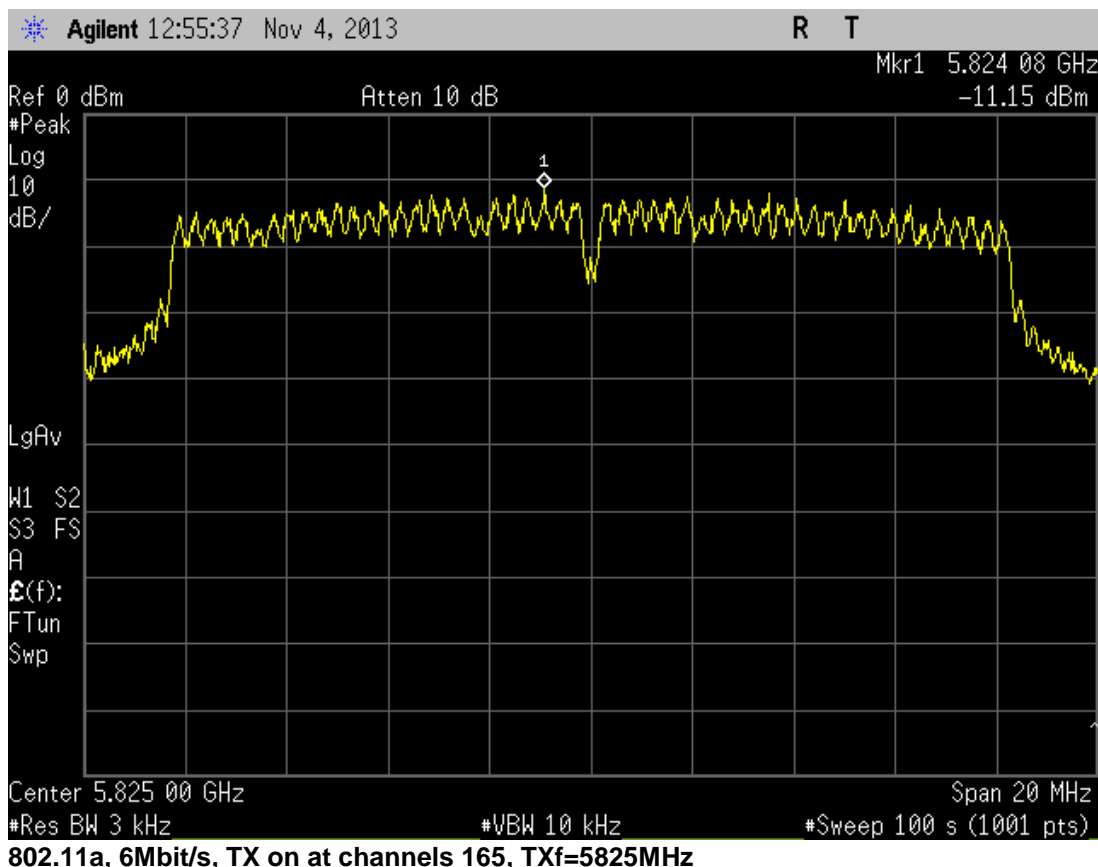
#### 3.2.2 Test data

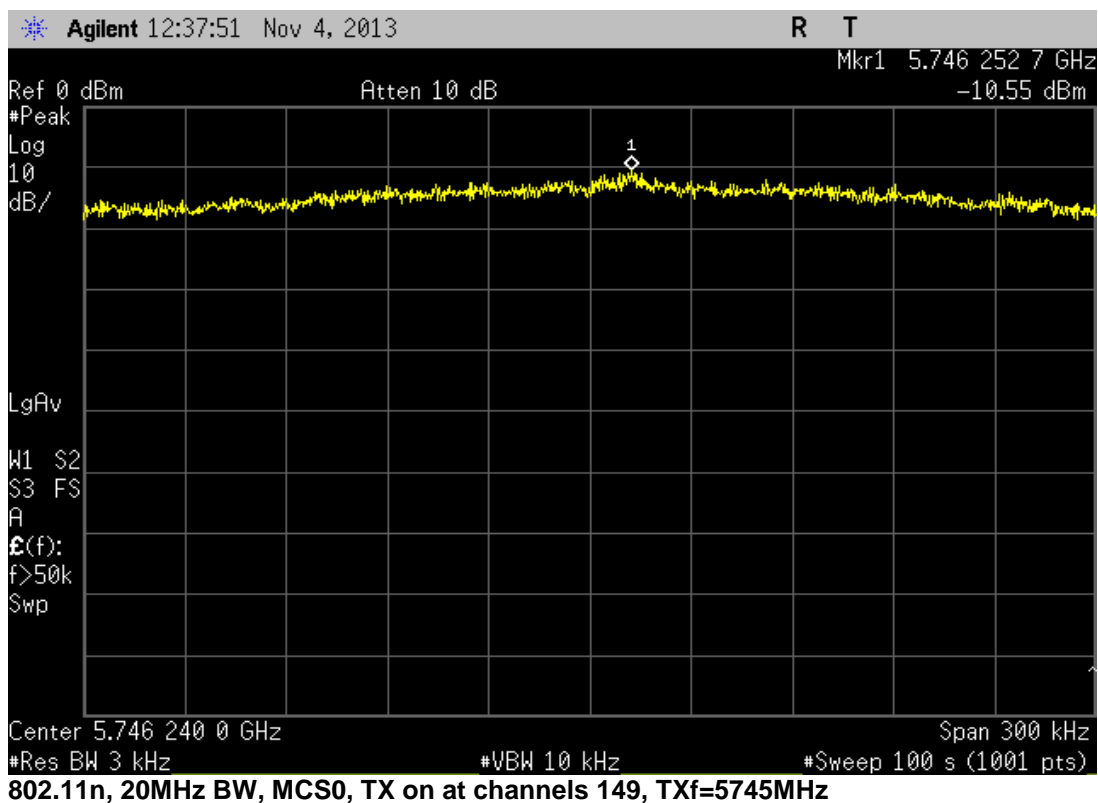
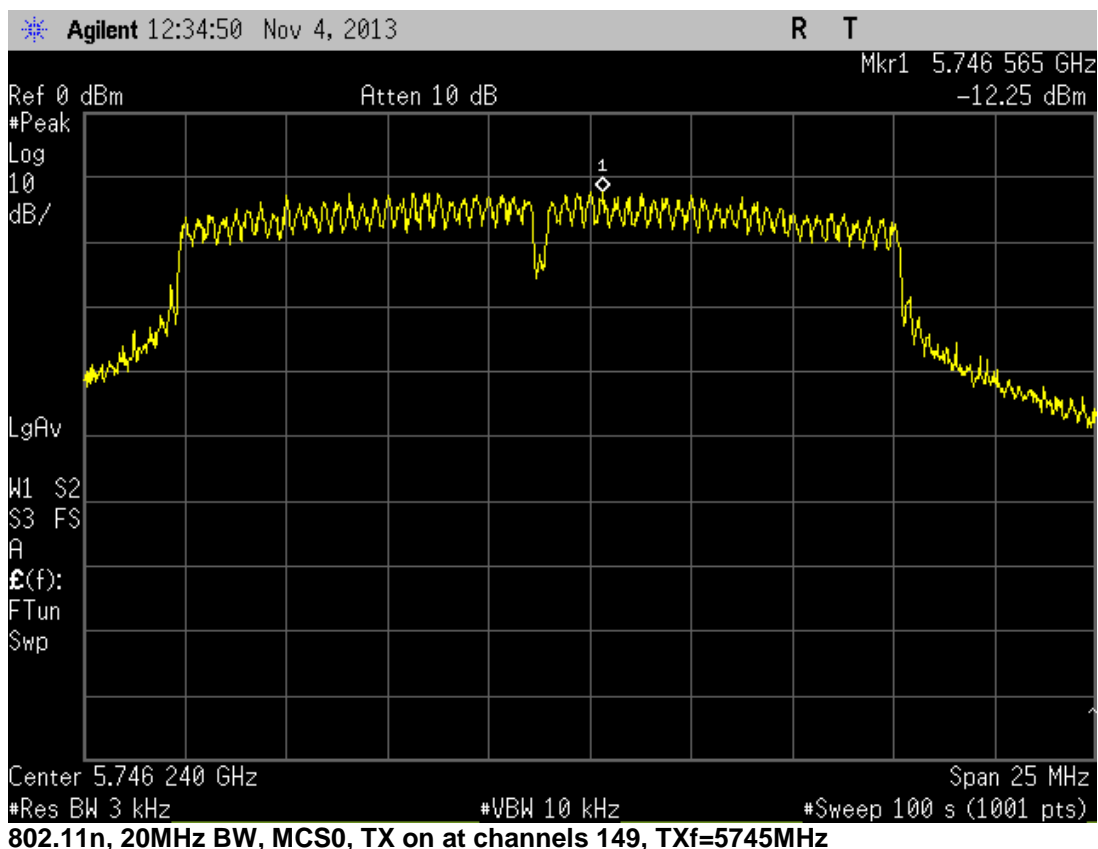
EUT operation mode	Result dBm	Limit dBm	Margin dB
<b>802.11a, 6Mbit/s, TX on at channels 149, TXf=5745MHz</b>	<b>-10.16</b>	<b>8.0</b>	<b>18.16</b>
<b>802.11a, 6Mbit/s, TX on at channels 157, TXf=5785MHz</b>	<b>-10.44</b>	<b>8.0</b>	<b>18.44</b>
<b>802.11a, 6Mbit/s, TX on at channels 165, TXf=5825MHz</b>	<b>-11.16</b>	<b>8.0</b>	<b>19.16</b>
<b>802.11n, 20MHz MCS0, TX on at channels 149, TXf=5745MHz</b>	<b>-10.15</b>	<b>8.0</b>	<b>18.15</b>
<b>802.11n, 20MHz MCS0 , TX on at channels 157, TXf=5785MHz</b>	<b>-10.53</b>	<b>8.0</b>	<b>18.53</b>
<b>802.11n, 20MHz MCS0 , TX on at channels 165, TXf=5825MHz</b>	<b>-10.92</b>	<b>8.0</b>	<b>18.92</b>

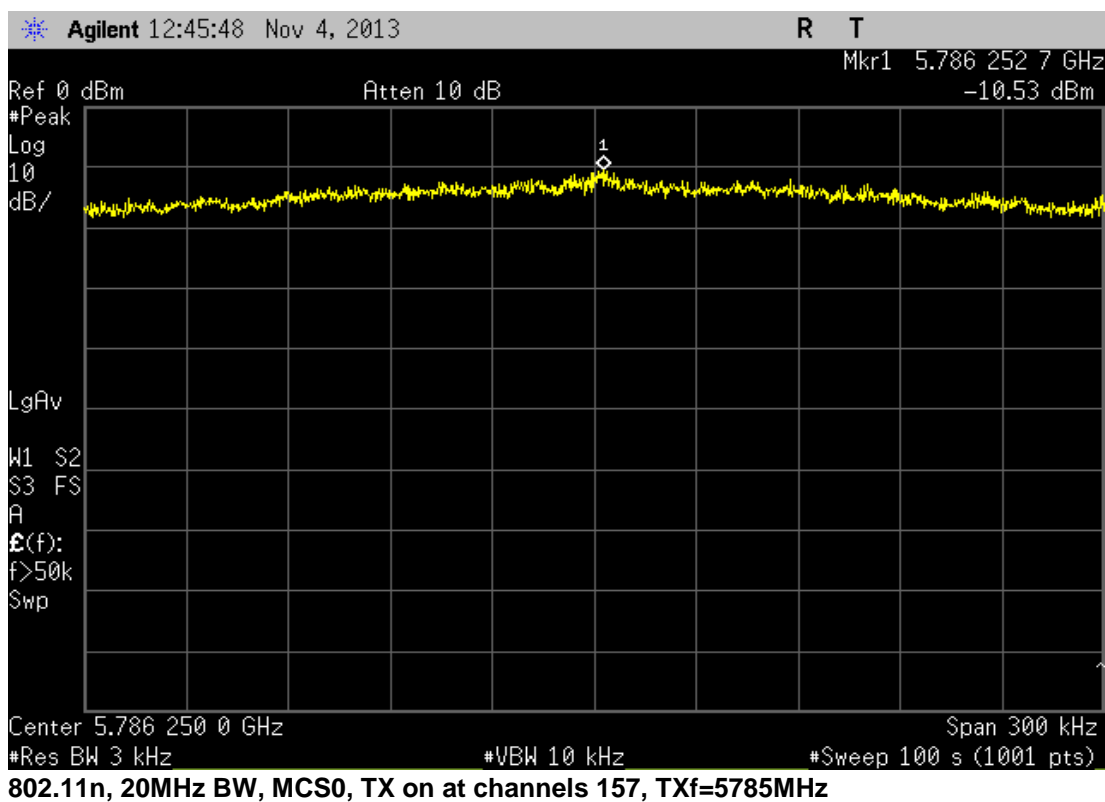
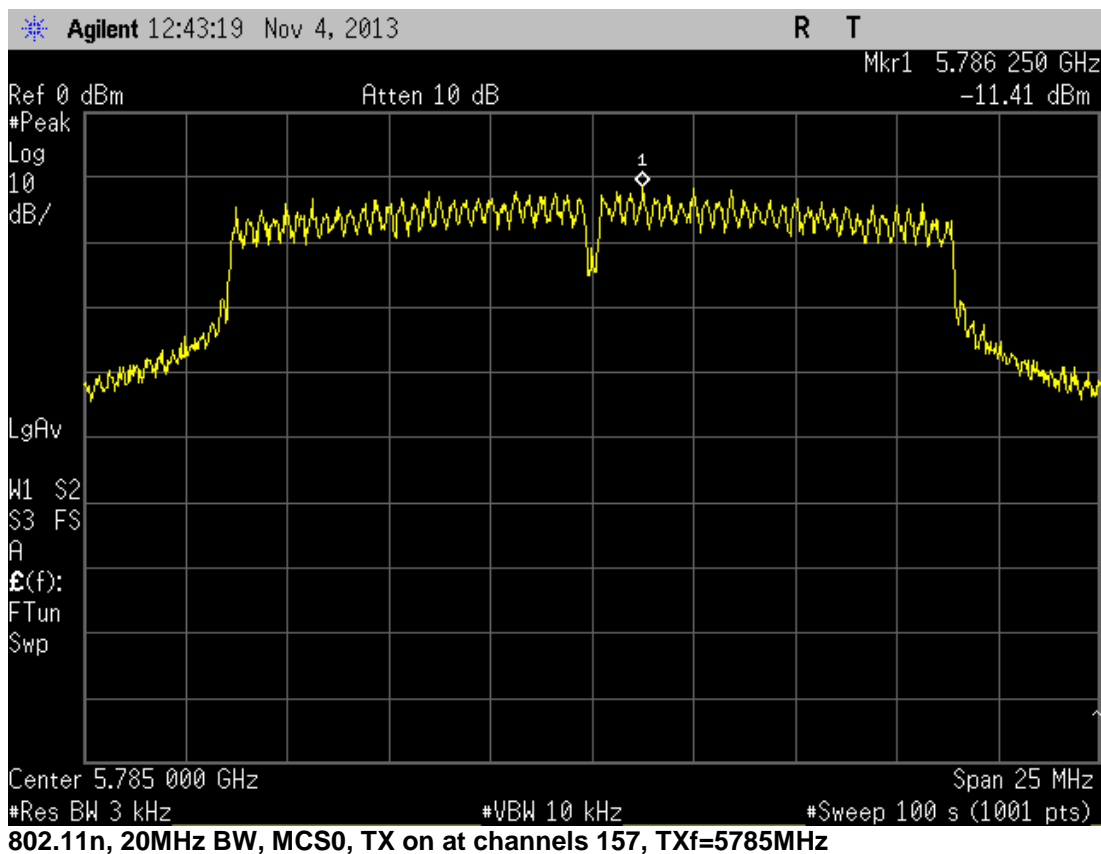


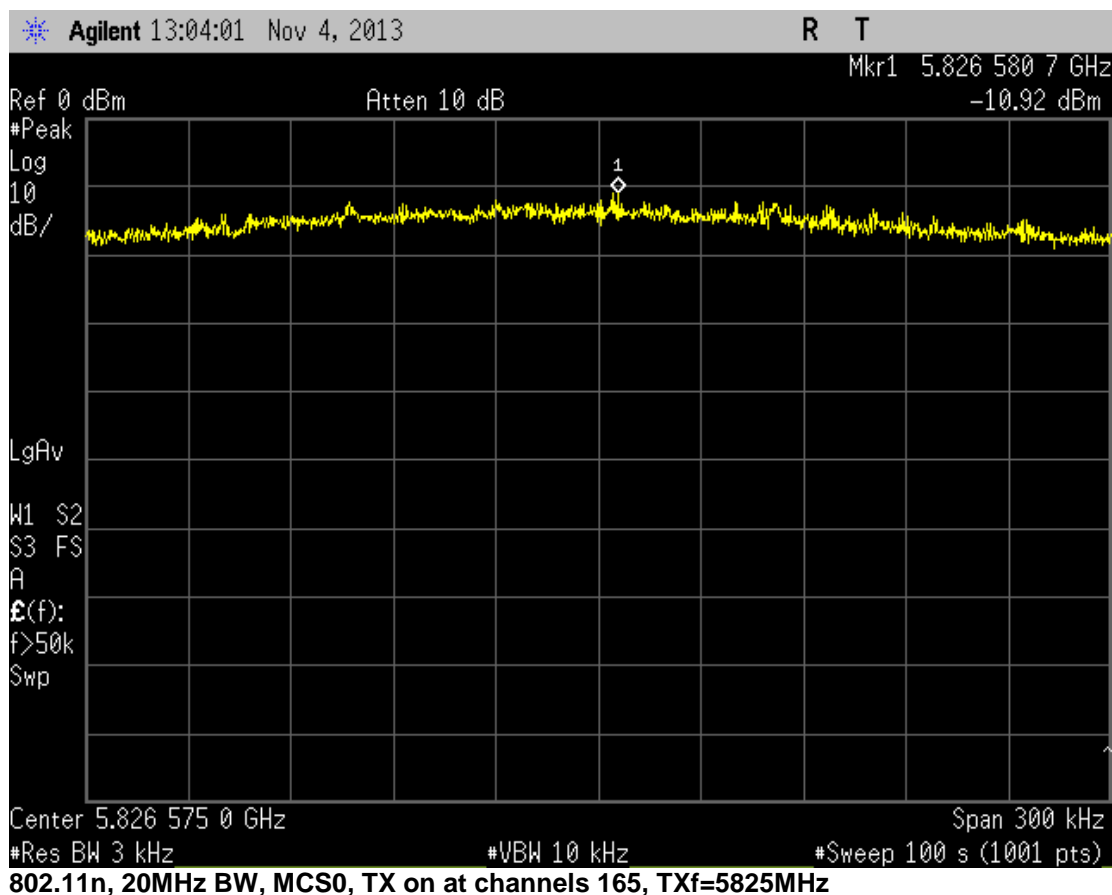
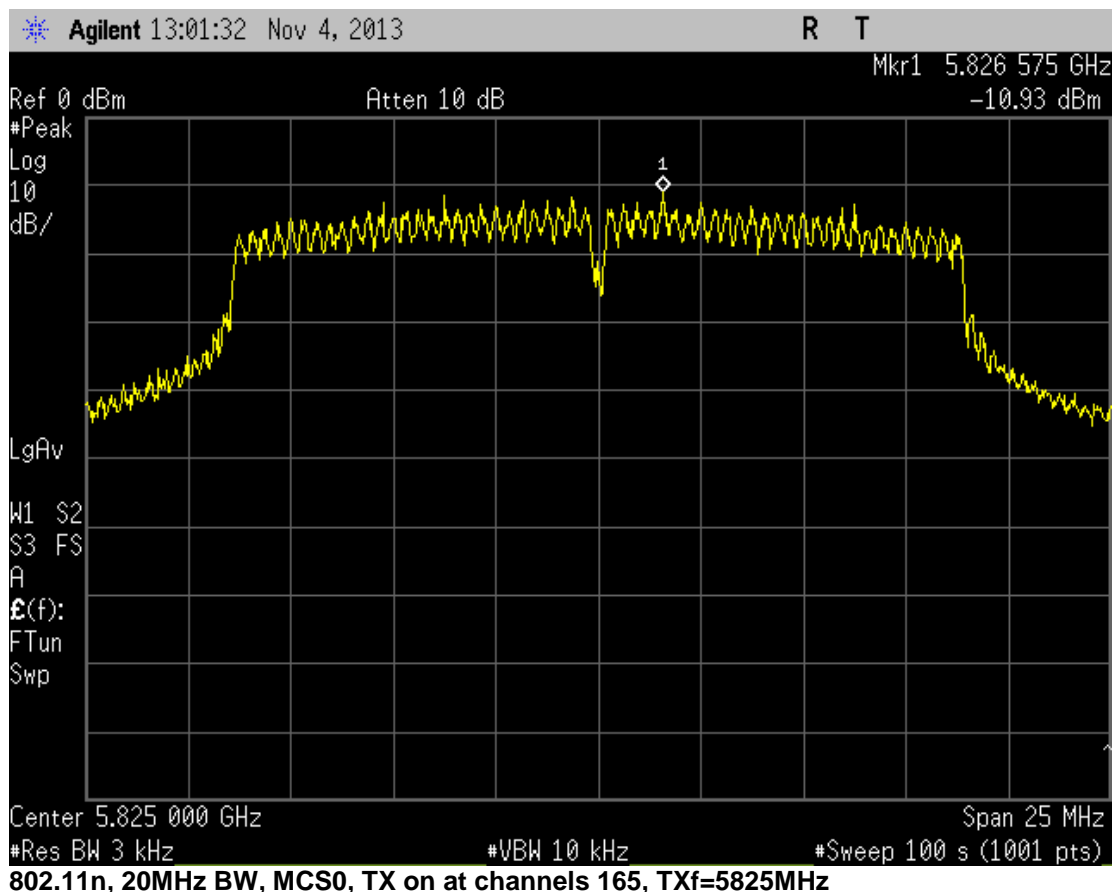










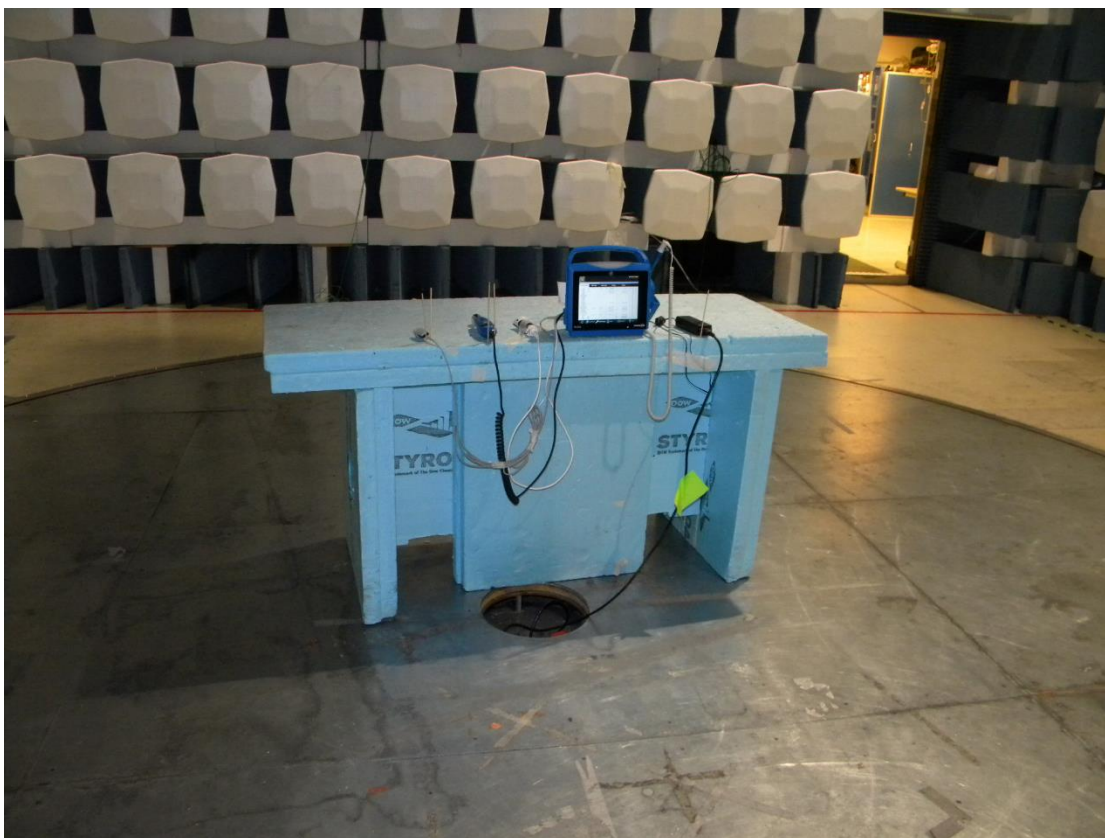


#### 4. List of test equipment

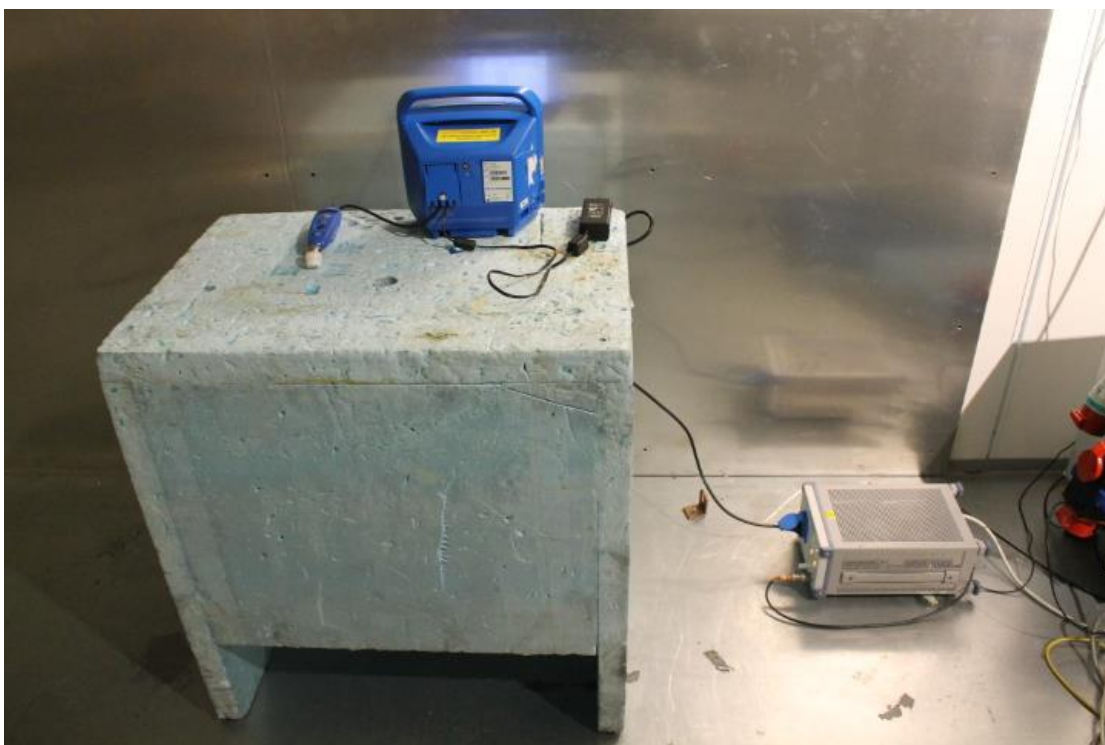
Each active test equipment is calibrated once a year, antennas every 18 months and other passive equipment every 24 months.

Nr.	Equipment	Type	Manufacturer	Serial number	Cal date	Cal due
694	EMI Test Receiver	ESPC	Rohde & Schwarz	842888/023	11.12.2012	12.2013
566	Spectrum analyzer	E4448A	Agilent	US42510236	17.4.2013	4.2014
709	EMI test receiver	ESU8	Rohde & Schwarz	100297	24.07.2013	7.2014
567	RF generator	E8257C	Agilent	MY43320736	25.2.2013	2.2014
544	RF-amplifier	ZFL-2000VH2	Mini-Circuits	QA0749010	9.1.2013	1.2014
564	RF amplifier	CA018-4010	CIAO Wireless	132	9.1.2013	1.2014
710	RF-amplifier	ALS 1826-41-12	ALC Microwave Inc.	0011	04.04.2014	4.2015
745	2-Line V-Network	ENV216	Rohde & Schwarz	101466	11.6.2013	06.2014
319	Antenna	CBL6112	Chase	2018	12.7.2012	1.2014
525	Double-Ridged Horn	3115	Emco	6691	10.10.2012	4.2014
542	Double-Ridged Horn	3115	Emco	00023905	10.10.2012	4.2014
86	Waveguide horn	640	Narda	09	10.10.2012	4.2014
87	Waveguide horn	639	Narda	7909	10.10.2012	4.2014
88	Waveguide horn	638	Narda	8003	10.10.2012	4.2014
521	Waveguide horn	V637	Narda	9307	10.10.2012	4.2014
350	Semianechoic shielded room	RFD-F-100	Euroshield Oy	1327	26.10.2012	10.2014
X1	Attenuator pad	8493B	Hewlett-PackardP	04228	2.12.2011	12.2013

## 5. Photographs



Photograph 1. Radiated disturbance emission test.



Photograph 2. Conducted emissions at mains ports emission test.