

## Test Report for FCC 47 CFR Part §15, subpart C, §15.247 and §15.207

|                                                         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                        |                                                                                                                                                            |
|---------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Test Report no.:</b>                                 | 20153885303-Ver 2.00                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | <b>Date of Report:</b> | Sept 30 <sup>h</sup> . 2015                                                                                                                                |
| <b>Number of pages:</b>                                 | Page 1 of 61                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | <b>Contact person:</b> | Amir Amininejad                                                                                                                                            |
| <b>Testing laboratory:</b>                              | Telefication<br><br>Edisonstraat 12a<br>6902 PK Zevenaar<br>The Netherlands<br><br>Tel. +31 316583180<br>Fax. +31 316583189                                                                                                                                                                                                                                                                                                                                                                                                                                  | <b>Client:</b>         | TechNed Benelux<br><br>Veersteeg 15<br>4212 LR Spijk<br>The Netherlands<br><br>Tel. +31 183631295<br>Fax.+31 1836 31778<br><br>Contact Person:<br>M. Geluk |
| <b>Tested device(s):</b>                                | IP-68 mobile phone TechNed EX-SM14<br>Build number: EX0150_20141106_M312_SP<br>BB ver.: MOLY.WR8.W1248.MD.WG.MP.V28.P1<br>(Detailed information for each device is listed in section 1).                                                                                                                                                                                                                                                                                                                                                                     |                        |                                                                                                                                                            |
| <b>Testing has been carried out in accordance with:</b> | CFR 47, FCC rules Parts 15, KDB pub. 558074 meas. Guidance v03r02. Deviations, modifications or clarifications (if any) to above mentioned documents are written in each section under "Test method and limit"                                                                                                                                                                                                                                                                                                                                               |                        |                                                                                                                                                            |
| <b>Documentation:</b>                                   | The test report must always be reproduced in full; reproduction of an excerpt only is subject to written approval of the testing laboratory. The documentation of the testing performed on the tested devices is archived for 10 years at Telefication Nederland.                                                                                                                                                                                                                                                                                            |                        |                                                                                                                                                            |
| <b>Test Results:</b>                                    | The results of the inspection are described on the following pages, where "conformity" in the Summary List means that test specification test purposes were verified and the tested device conforms to the applied standards. All performed tests are validated and the dates of testing are always available within internal documentation at Telefication. In cases where "declaration" is printed the required documents are available in the customer's documentation. This test result relates only to those tested devices mentioned in this document. |                        |                                                                                                                                                            |
| <b>Accreditation:</b>                                   | Telefication is designated by the FCC as an Accredited Test Firm for compliance testing of equipment subject to Certification under Parts 15 & 18. The Designation number is: NL0001                                                                                                                                                                                                                                                                                                                                                                         |                        |                                                                                                                                                            |
| <b>Date of Signature:</b>                               | 30-09-2015                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                        |                                                                                                                                                            |



**RF Test Laboratory Manager**  
Amir Amininejad

## 1 Revision record sheet

| VERSION | DATE       | REMARKS                                                                                                                                                                                     | BY              |
|---------|------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------|
| 2.00    | 25-09-2015 | On page 7: nominal powers of BT and WLAN added;<br>actual operating frequency ranges of BT and WLAN added;<br>Coverage of the frequency band above 18 GHz added in sections 5.5.5 and 5.5.6 | P.A. Suringa    |
| 1.50    | 2015 09 21 | Full revision                                                                                                                                                                               | R.van.Barneveld |
| 1.00    | 2015 08 26 | Version for first release                                                                                                                                                                   | A.Amininejad    |
| 0.50    | 2015 08 20 | Version for peer review.                                                                                                                                                                    | A.Amininejad    |
|         |            |                                                                                                                                                                                             |                 |
|         |            |                                                                                                                                                                                             |                 |
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## Summary of test results

| FCC              | IC                        | Description                                  | Section in this report | Verdict |
|------------------|---------------------------|----------------------------------------------|------------------------|---------|
| 15.207           | RSS-GEN 7.2.2             | AC Power Conducted Emission                  | 5.6                    | Pass    |
| 15.247(d)        | RSS-210 Annex 8 (A8.5)    | Radiated Spurious Emission                   | 5.5                    | Pass    |
| §2.1049(h)       | 4.6.1 RSS-GEN             | 99% bandwidth                                | 5.4                    | Pass    |
| 15.247(a) (2)    | RSS-210 Annex 8 (A8.2(a)) | 6 dB bandwidth                               | 5.1                    | Pass    |
| 15.247(b)        | RSS-210 Annex 8 (A8.4(4)) | RF Output Power                              | 5.2                    | Pass    |
| 15.247(e)        | RSS-210 Annex 8 (A8.2(b)) | Peak Power Spectral Density                  | 5.3                    | Pass    |
| 15.203           | ----                      | Antenna Requirement                          | 5.7                    | Pass    |
| 15.209;<br>15205 | RSS-210 Annex 8 (A8.5)    | Transmitter Radiated Emission (Restr. Bands) | 5.5                    | Pass    |

## 2 General Description

### 2.1 Applicant

TechNed Benelux, Veersteeg 15, 4212 LR Spijk, The Netherlands

### 2.2 Manufacturer

TechNed Benelux, Veersteeg 15, 4212 LR Spijk, The Netherlands

### 2.3 Tested Equipment under Test (EUT)

|                                 |                                                                                                             |
|---------------------------------|-------------------------------------------------------------------------------------------------------------|
| Device type:                    | Mobile Phone                                                                                                |
| Brand Name                      | Rough Pro                                                                                                   |
| Model Name                      | EX0150_20141106_M312_SP EX-SM14                                                                             |
| FCC ID                          | 2AD2CEX-SM14                                                                                                |
| EUT support Radio applications  | GSM850, PCS1900,GPRS,WCDMA BII and B V, WLAN 2.4GHz IEEE802.11b,g,N HT20, Bluetooth3.0, Bluetooth LE v. 4.0 |
| DUT no.:                        | DUT#0005                                                                                                    |
| Device type:                    | Mobile Phone IP-68 EX-SM14<br>BC_EX_SM14_USB_Cable-1<br>USB Travel Charger                                  |
| SN/ IMEI number:                | 860636000507855 and<br>860636000607853                                                                      |
| Hardware version/ Build number: | EX0150_20141106_M312_SP<br>EX0150_20141106_M312_SP                                                          |
| Software version:               | Android 4.2.2                                                                                               |
| Test software / firmware        | EX0150_20141106_M312_SP                                                                                     |
| Date of receipt:                | June 3rd. 2015                                                                                              |
| Date of tests started:          | May 22 <sup>nd</sup> . 2015                                                                                 |
| Date of tests ended:            | Aug 18th. 2015                                                                                              |

## 2.4 Product Specification subjective to this standard

|                                        |                                                                                                                                                                                                                                                          |
|----------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Tx Frequencies</b>                  | GSM850: 824.2 MHz ~ 848.8 MHz<br>GSM1900: 1850.2 MHz ~ 1909.8 MHz<br>WCDMA Band II: 1712.4 MHz ~ 1752.6 MHz<br>WCDMA Band V: 826.4 MHz ~ 1907.6 MHz<br>Bluetooth : 2402 MHz ~ 2480 MHz<br>Bluetooth LE: 2402 MHz ~ 2480 MHz<br>WLAN: 2412 MHz ~ 2462 MHz |
| <b>Rx Frequency</b>                    | GSM850: 869.2 MHz ~ 893.8 MHz<br>GSM1900: 1930.2 MHz ~ 1989.8 MHz<br>WCDMA Band II: 1932.4 MHz ~ 1987.6 MHz<br>WCDMA Band V: 871.4 MHz ~ 891.6 MHz<br>Bluetooth : 2402 MHz ~ 2480 MHz<br>Bluetooth LE: 2402 MHz ~ 2480 MHz<br>WLAN: 2412 MHz ~ 2462 MHz  |
| <b>Maximum Output power to Antenna</b> | GSM/GPRS: 31 dBm<br>GSM1900: 28 dBm<br>WCDMA Band II: 23.5 dBm<br>WCDMA Band V: 23.5 dBm<br>Bluetooth: 8 dBm<br>IEEE 802.11b: < 18.5 dBm<br>IEEE 802.11g: 15.5 dBm<br>IEEE 802.11n (HT20): 15.5 dBm                                                      |
| <b>Antenna Type</b>                    | Integrated antenna: Monopole FPC;<br>Antenna Gain: GSM -2,4 dBi; WCDMA -2.5 dBi<br>Bluetooth: 2.5 dBi<br>WLAN: 2.5 dBi                                                                                                                                   |
| <b>Type of Modulation</b>              | GSM/GPRS: GMSK<br>EDGE: GMSK/8PSK<br>WCDMA: QPSK (UL)<br>HSUPA: QPSK (UL)<br>Bluetooth: Basic Rate (1Mbps) GFSK<br>WLAN: DSSS/OFDM                                                                                                                       |

## 2.5 Modification of the EUT

In order to be able to do the conducted tests, EUT is being modified by:

- a) Soldering a 50 Ohm impedance matched coaxial cable to the antenna pads of the device, disconnecting the integrated antenna terminals. A SMA female connector is added to the other end of the RF coaxial cable (pigtail).
- b) Battery terminal taken out from the EUT for variations of Supply voltage.

The modification is done following Device manufacturing instructions. The task of modification is performed using external company Techniveau:

Techniveau  
Bijsterhuizen 2414  
6604 LL Wijchen  
Tel. +31 (0)6 21 551 223  
[www.techniveau.nl](http://www.techniveau.nl)  
[info@techniveau.nl](mailto:info@techniveau.nl)

## 2.6 Testing Location

|                               |                                                                                                         |
|-------------------------------|---------------------------------------------------------------------------------------------------------|
| Test Site                     | Telefication BV                                                                                         |
| Test Site location            | Edisonstraat 12a<br>6902 PK Zevenaar<br>The Netherlands<br><br>Tel. +31 316583180<br>Fax. +31 316583189 |
| Test Site FCC Designation No. | NL0001                                                                                                  |

## 2.7 Applicable Standards

According to the specifications of the manufacturer, the EUT must comply with the requirements of the following standards:

- FCC Part 15 Subpart C §15.247 and Part15 Subpart C §15.207
- FCC KDB Publication No. 558074 D01DTS Meas. Guidance V03r02

### Observations and remarks:

All tested items were verified and recorded according to the standards and no deviations were identified during the test.

## 2.8 Conclusions

The sample of the product showed **NO NON-COMPLIANCES** to the specifications stated in paragraph 2.7 of this report.

The results of the tests as stated in this report, are exclusively applicable to the product item as identified in this report. Telefication accepts no responsibility for any stated properties of product items in this test report, which are not supported by the tests as specified in paragraph 2.7 *"Applicable standards"*.

All conducted tests are performed by:

Name : A. Amininejad

Review of test methods and report by:

Name : ing. P.A. Suringa

The above conclusions have been verified by the following signatory:

Date : 30 September 2015

Name : A. Amininejad

Function : Operational Manager Radio Laboratory

Signature :



### **3 Test Configuration of the EUT (Equipment under Test)**

#### **3.1 Test mode**

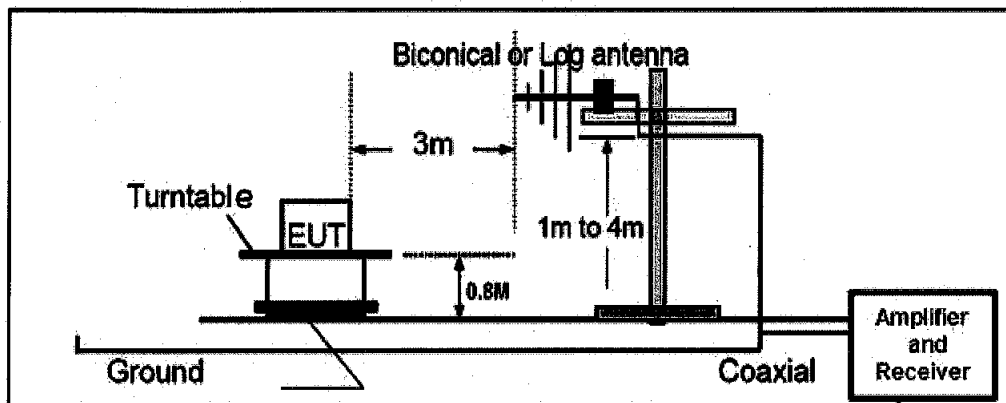
Antenna port conducted and radiated test cases were performed with the EUT configured to transmit at its maximum power. Frequency range from 30 MHz up to 10<sup>th</sup> Harmonic of the Fundamental Frequencies at low, mid and high channel were examined.

#### **3.2 Conducted Test setup diagram**

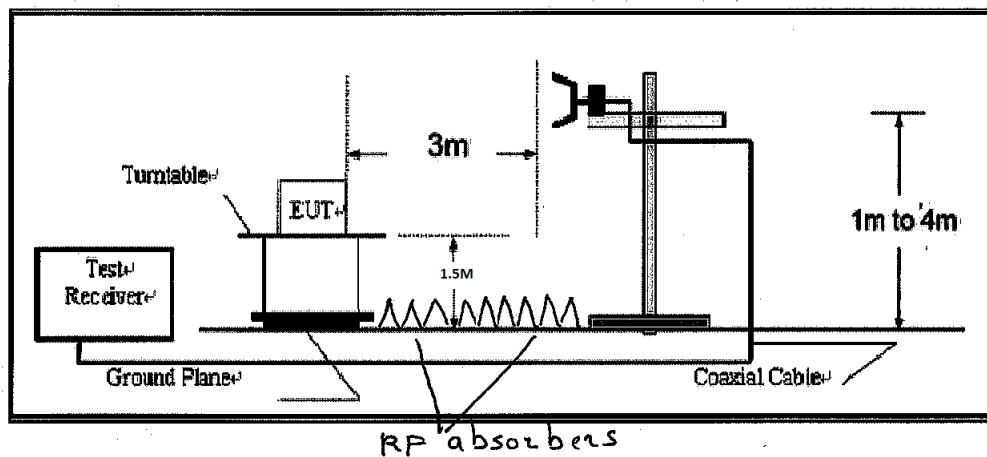


### 3.3 Radiated Test setup within a SAC Chamber

RADIATED EMISSION TEST SETUP 30MHz-1000MHz



RADIATED EMISSION TEST SETUP ABOVE 1000MHz



### 3.4 Equipment used in test configuration

|                      |                                                         |
|----------------------|---------------------------------------------------------|
| <b>No 1:</b>         | HMP2020 Programmable Power Supply                       |
| <b>Manufacturer:</b> | Rohde & Schwarz                                         |
| <b>TE number</b>     | TE01270                                                 |
| <b>No 2:</b>         | Hewlett Packard 83650B Signal Generator 10 MHz – 50 GHz |
| <b>Manufacturer:</b> | Hewlett Packard                                         |
| <b>TE number</b>     | TE00487                                                 |
| <b>No 3:</b>         | FSV Signal Analyzer 10Hz- 40 GHz                        |
| <b>Manufacturer:</b> | Rohde & Schwarz                                         |
| <b>TE number</b>     | TE01269                                                 |
| <b>No 4:</b>         | VT4002 EMC Climate Chmber                               |
| <b>Manufacturer</b>  | Vötsch Industrietechnik GmbH                            |
| <b>Serial number</b> | 56600930                                                |
| <b>TE number</b>     | TE01288                                                 |
| <b>No 5:</b>         | Low insertion loss and VSWR DC – 40 GHz                 |
| <b>Manufacturer:</b> | Directional Coupler                                     |
| <b>Serial number</b> | Marki CA-40 1443                                        |
| <b>TE number</b>     | TE01278                                                 |
| <b>No 6:</b>         | FS735/1 10 MHz distribution Amplifier                   |
| <b>Manufacturer:</b> | Stanford Research Systems                               |
| <b>TE number</b>     | TE01281                                                 |
| <b>No 7:</b>         | USB to RS232 converter                                  |
| <b>Manufacturer:</b> | Targus                                                  |
| <b>Serial number</b> | PA088                                                   |
| <b>No 8:</b>         | USB to GPIB interface adopter                           |
| <b>Manufacturer:</b> | National Instruments                                    |
| <b>TE number</b>     | TE01283                                                 |
| <b>No 9:</b>         | FSP- Signal Analyzer 9KHz- 40 GHz                       |
| <b>Manufacturer:</b> | Rohde & Schwarz                                         |
| <b>TE number</b>     | TE11125                                                 |
| <b>No 10:</b>        | Biconilog Antenna 30MHz-2GHz                            |
| <b>Manufacturer:</b> | Case                                                    |
| <b>TE number</b>     | TE00967                                                 |
| <b>No 11:</b>        | Horn Antenna 1GHz -18 GHz Model no. 3115                |
| <b>Manufacturer:</b> | EMCO The Electro –Mechanics Co.                         |
| <b>TE number</b>     | TE 00531                                                |

|                      |                        |
|----------------------|------------------------|
| <b>No 12:</b>        | SAC Chamber            |
| <b>Manufacturer:</b> | Comtest Engineering BV |
| <b>TE number</b>     | TE00861                |

|                      |                                     |
|----------------------|-------------------------------------|
| <b>No. 13:</b>       | ESCI EMI Test Receiver 9KHz - 3 GHz |
| <b>Manufacturer:</b> | Rohde & Schwarz                     |
| <b>TE number</b>     | TE11128                             |

|                      |                   |
|----------------------|-------------------|
| <b>No. 14:</b>       | ESH3 Z2 Mains CDN |
| <b>Manufacturer:</b> | Rohde & Schwarz   |
| <b>TE number</b>     | TE 000208         |

|                      |                       |
|----------------------|-----------------------|
| <b>No. 15:</b>       | ESH3 Z2 Pulse limiter |
| <b>Manufacturer:</b> | Rohde & Schwarz       |
| <b>TE number</b>     | TE 00756              |

### 3.5 Explanation of the Measurement results for all conducted test Items

The Path loss between the DUT and the Spectrum Analyser at the frequency range of 30 MHz up to 40 GHz is measured and is stored in a transducer table. This transducer table is used for a level offset of the spectrum analyser. With this level offset, the spectrum analyser's reading will exactly be the RF output.

## 4 Tested Channels

### 4.1 Wi-Fi Channels

| Technology                   | $F_l, F_m$ and $F_h$ | Channel | Frequency [MHz] |
|------------------------------|----------------------|---------|-----------------|
| IEEE802.11b,g and n<br>(20M) | Low Channel          | 1       | 2412            |
|                              | Mid Channel          | 6       | 2437            |
|                              | High Channel         | 11      | 2462            |

## 5 Wi-Fi 2.4 Test results

### 5.1 6 dB Bandwidth Measurement

#### 5.1.1 Limit

The Minimum 6 dB Bandwidth shall be at least 500 kHz.

#### 5.1.2 Measuring instruments

The measuring instruments are listed in chapter 3.4 of this report.

#### 5.1.3 Test setup

As shown in chapter 3.2 of this report.

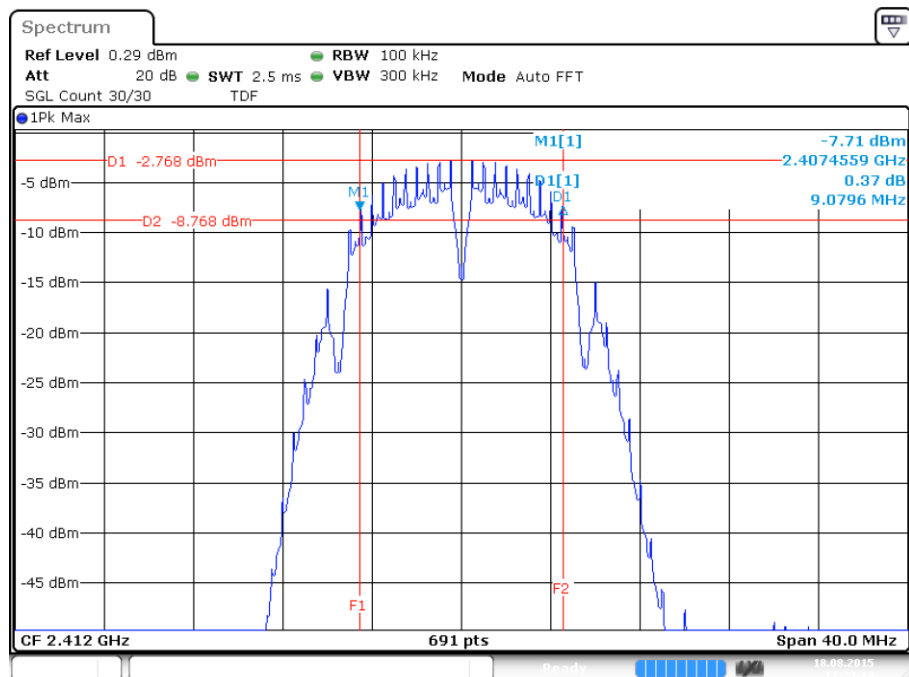
#### 5.1.4 Test procedure

1. The testing follows FCC KDB Publication No. 558074 D01 DTS Meas. Guidance v03r02.
2. The RF output of EUT was connected to the spectrum analyser by RF cable and attenuator.
3. The path loss was compensated to the results for each measurement. This path loss is stored within the transducer table of the Spectrum analyzer.
4. Measurement is made with Spectrum analyser RBW =100 kHz. VBW = 3xRBW = 300 kHz.
5. Criteria is that 6 dB Bandwidth must be greater than 500 kHz.
6. Measurement results are recorded in the test report.

#### 5.1.5 Test results of the 6 dB Bandwidth

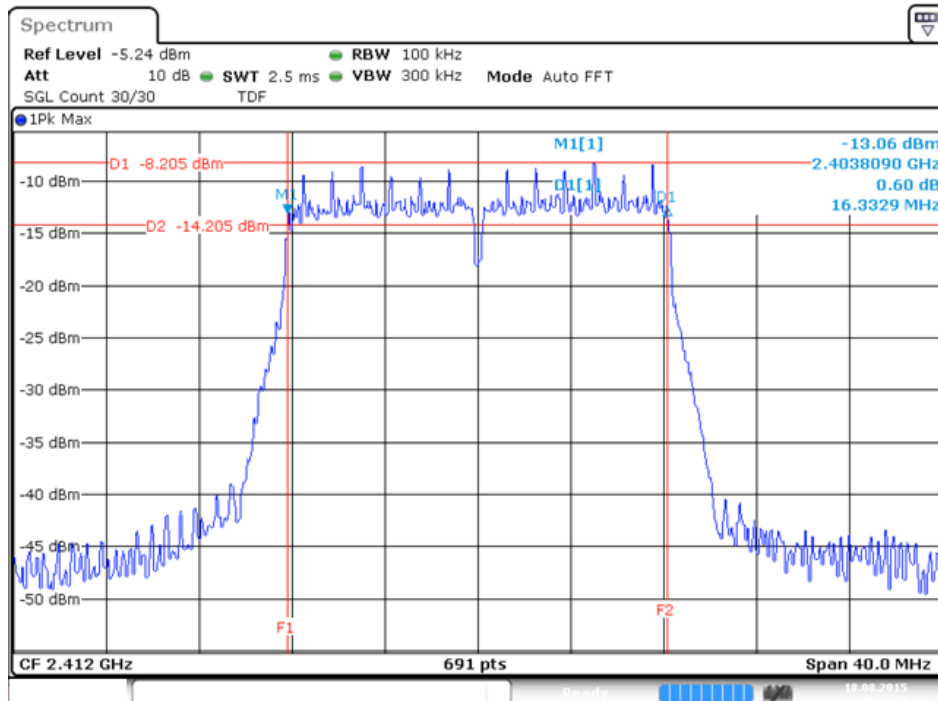
| Technology Std. | Channel   | Data Rate [mbps] | 6dB Bandwidth [MHz] |
|-----------------|-----------|------------------|---------------------|
| IEEE802_11b     | 1         | 1                | 9.07959             |
| IEEE802_11g     | 1         | 6                | 16.33285            |
| IEEE802_11n(20) | 1         | 12               | 16.45441            |
| IEEE802_11b     | 6         | 1                | 9.07959             |
| IEEE802_11g     | 6         | 6                | 16.33285            |
| IEEE802_11n(20) | 6         | 12               | 16.39074            |
| IEEE802_11n(20) | 6         | 36               | 16.45441            |
| IEEE802_11n(20) | 6         | 54               | 16.45441            |
| IEEE802_11b     | 11        | 1                | 9.07959             |
| IEEE802_11g     | 11        | 6                | 16.33285            |
| IEEE802_11n(20) | 11        | 12               | 16.45441            |
| Uncertainty     | ±88.2 kHz |                  |                     |

### IEEE 802.11b (1 Mbps, channel1) 6 dB bandwidth.



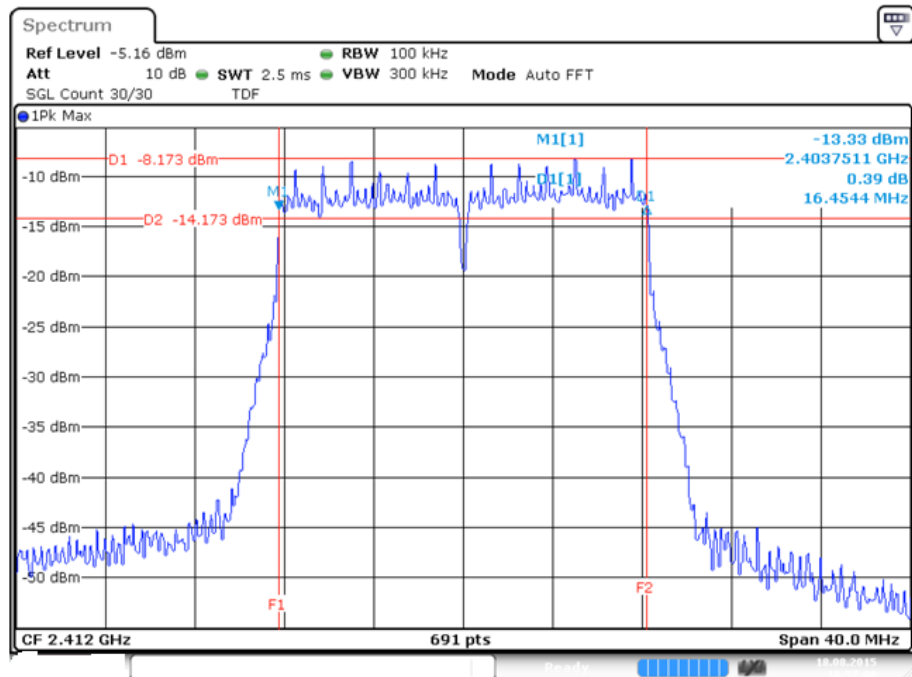
IEEE802\_11b\_DBPSK\_1M, channel: 1 : 6dB BW measurement  
Date: 18.AUG.2015 11:23:14

### IEEE 802.11g (6 Mbps, channel1) 6 dB bandwidth.

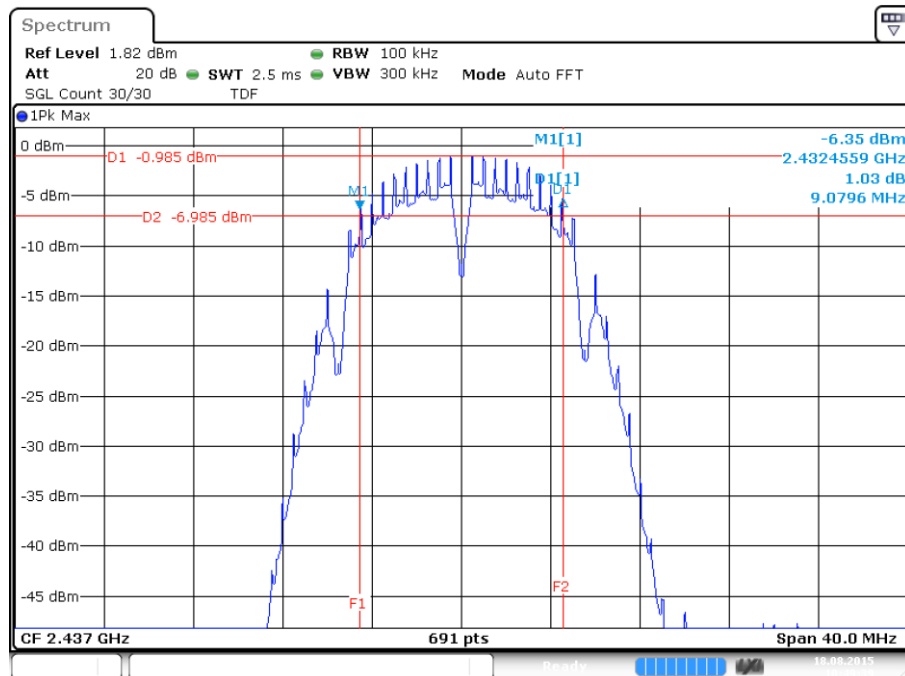


IEEE802\_11g\_OFDM\_6M, channel: 1 : 6dB BW measurement  
Date: 18.AUG.2015 11:23:14

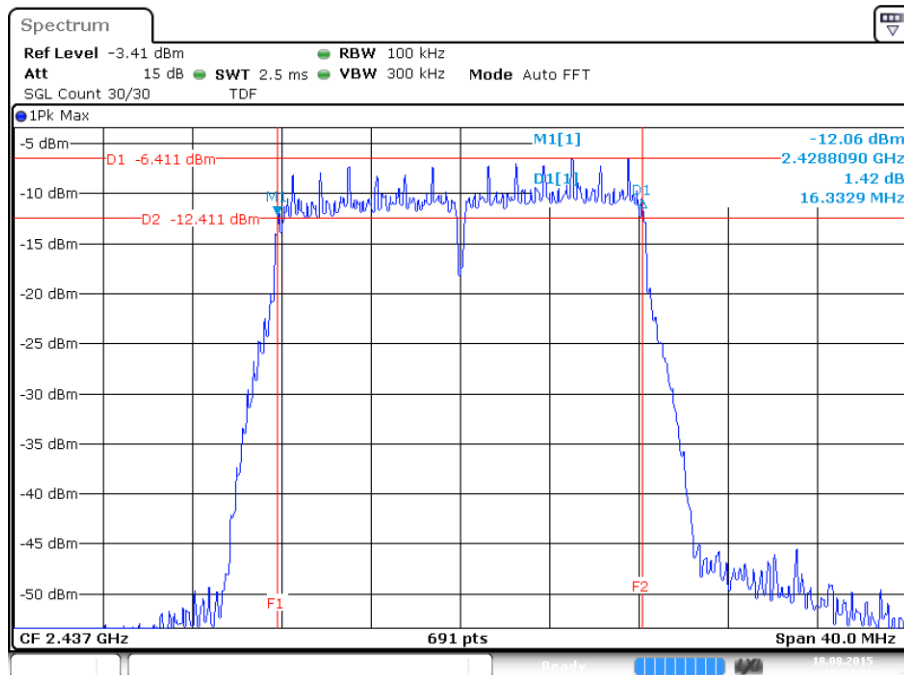
### IEEE 802.11n (12 Mbps, channel1) 6 dB bandwidth.



### IEEE 802.11b (1 Mbps, channel 6) 6 dB bandwidth.

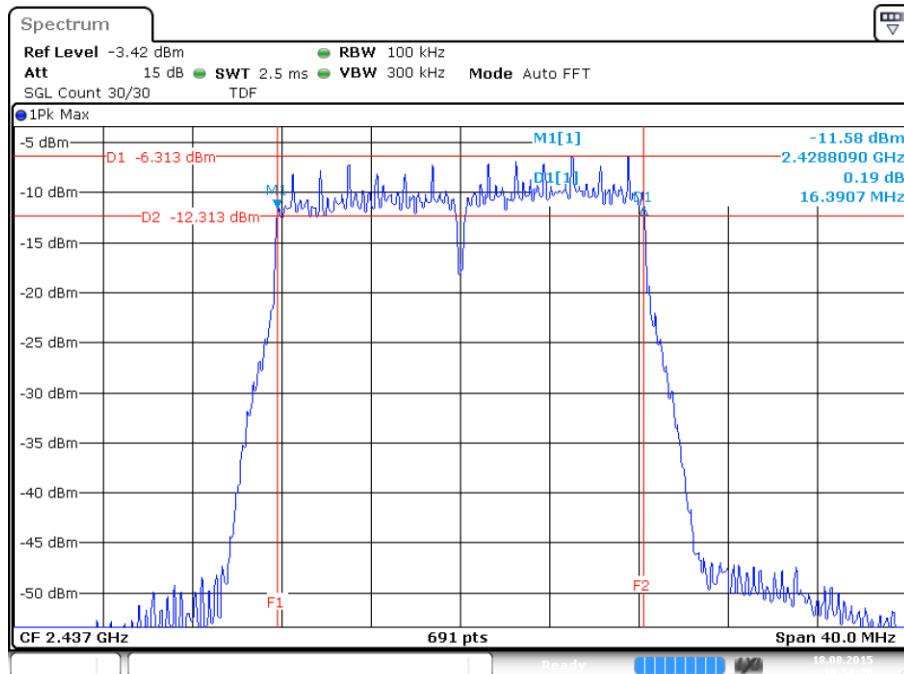


### IEEE 802.11g (6 Mbps, channel 6) 6 dB bandwidth.



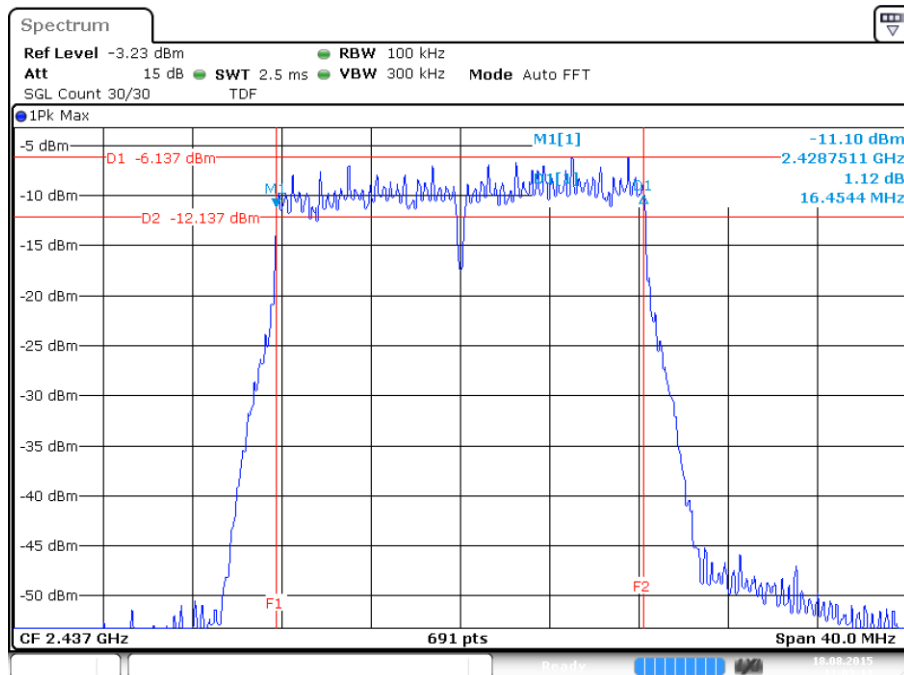
IEEE802\_11g\_OFDM\_6M, channel: 6 : 6dB BW measurement  
Date: 18.AUG.2015 10:54:20

### IEEE 802.11n (12 Mbps, channel 6) 6 dB bandwidth.



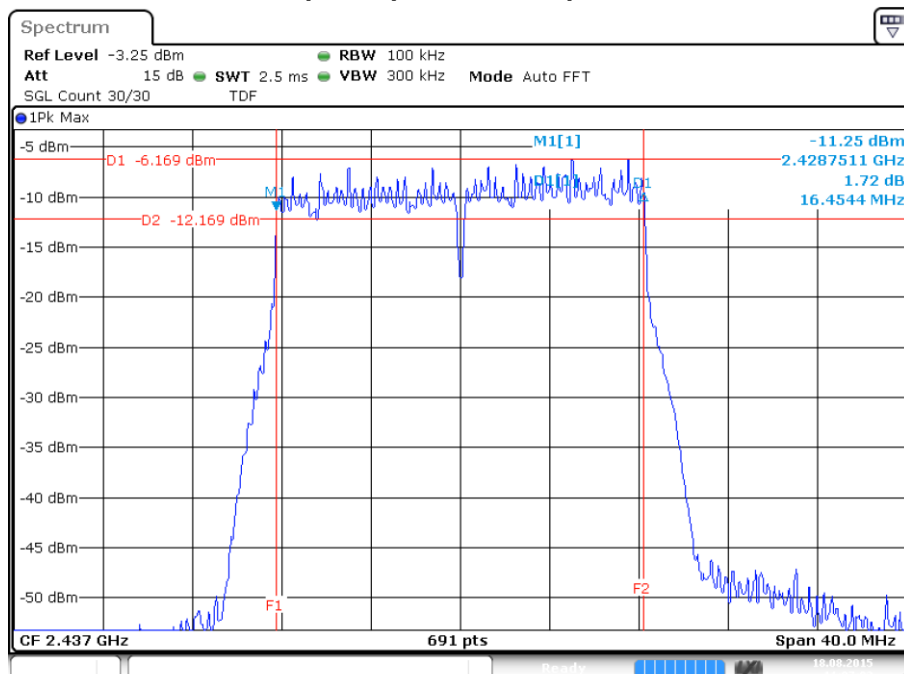
IEEE802\_11n\_12M, channel: 6 : 6dB BW measurement  
Date: 18.AUG.2015 10:58:38

### IEEE 802.11n (36 Mbps, channel 6) 6 dB bandwidth.



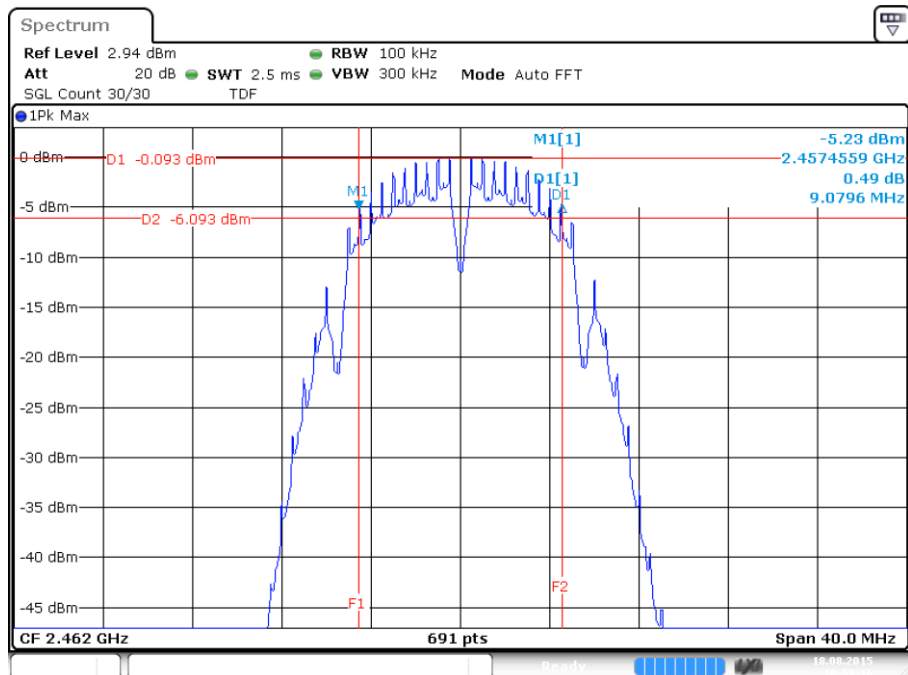
IEEE802\_11n\_36M, channel: 6 : 6dB BW measurement  
Date: 18.AUG.2015 11:03:12

### IEEE 802.11n (54 Mbps, channel 6) 6 dB bandwidth.



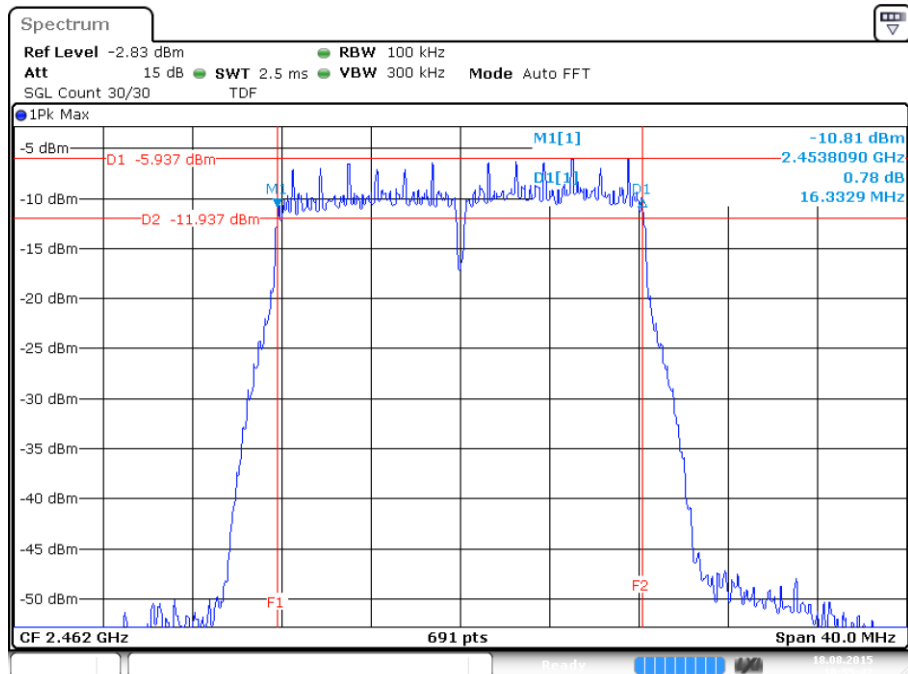
IEEE802\_11n\_54M, channel: 6 : 6dB BW measurement  
Date: 18.AUG.2015 11:07:03

### IEEE 802.11b (1 Mbps, channel 11) 6 dB bandwidth.



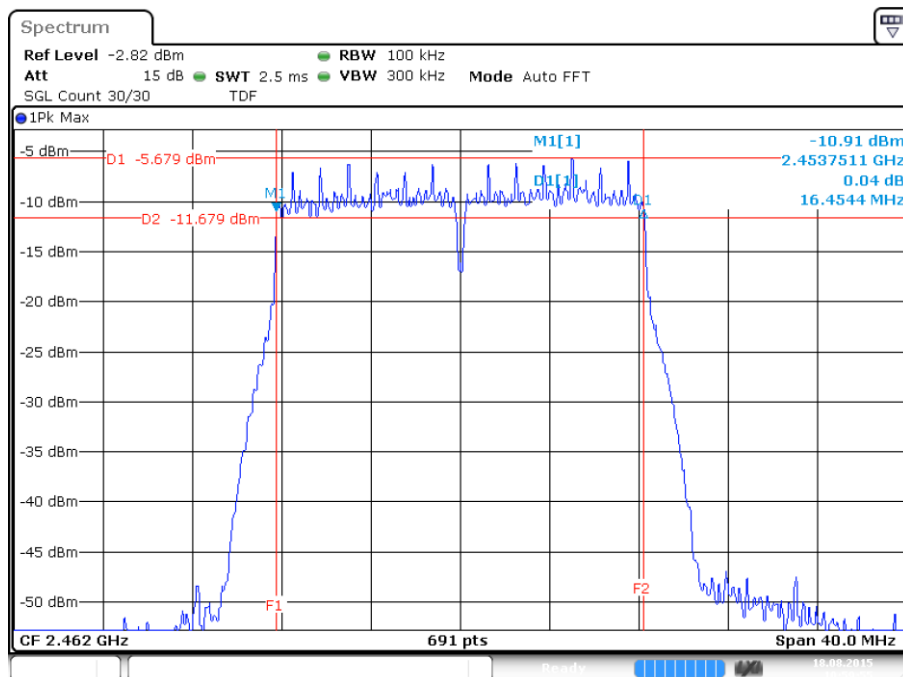
IEEE802\_11b\_DBPSK\_1M, channel: 11 : 6dB BW measurement  
 Date: 18.AUG.2015 10:51:17

### IEEE 802.11g (6 Mbps, channel 11) 6 dB bandwidth.



IEEE802\_11g\_OFDM\_6M, channel: 11 : 6dB BW measurement  
 Date: 18.AUG.2015 10:55:42

### IEEE 802.11n (12 Mbps, channel 11) 6 dB bandwidth.



IEEE802\_11n\_12M, channel: 11 : 6dB BW measurement  
Date: 18.AUG.2015 10:59:56

## 5.2 Peak Output Power Measurement

### 5.2.1 Limit

For systems using digital modulation in the 2400-2483.5 MHz, the limit for the peak output power is 30 dBm. If transmitting antenna of directional gain greater than 6 dBi is used, the peak output power from the intentional radiator shall be reduced below the above stated value by the amount in dB that the directional gain of the antenna exceeds 6 dBi. In case of point to point operation, the limit has to be reduced by 1 dB for every 3 dB that the directional gain of the antenna exceeds 6 dBi.

### 5.2.2 Measuring instruments

The measuring instruments are listed in chapter 3.4 of this report.

### 5.2.3 Test setup

As shown in chapter 3.2 of this report.

### 5.2.4 Test procedure

1. The testing follows the measurement Procedure of FCC KDB No. 558074 DTS D01 Meas. Guidance V03r02.
2. The RF output of EUT was connected to the Spectrum analyser by RF Cable trough the directional coupler. The pathloss was compensated to the results for each measurement.
3. Set the EUT to maximum power settings and enable continuous transmission.
4. Measure the conducted output power and record the results in the test report.

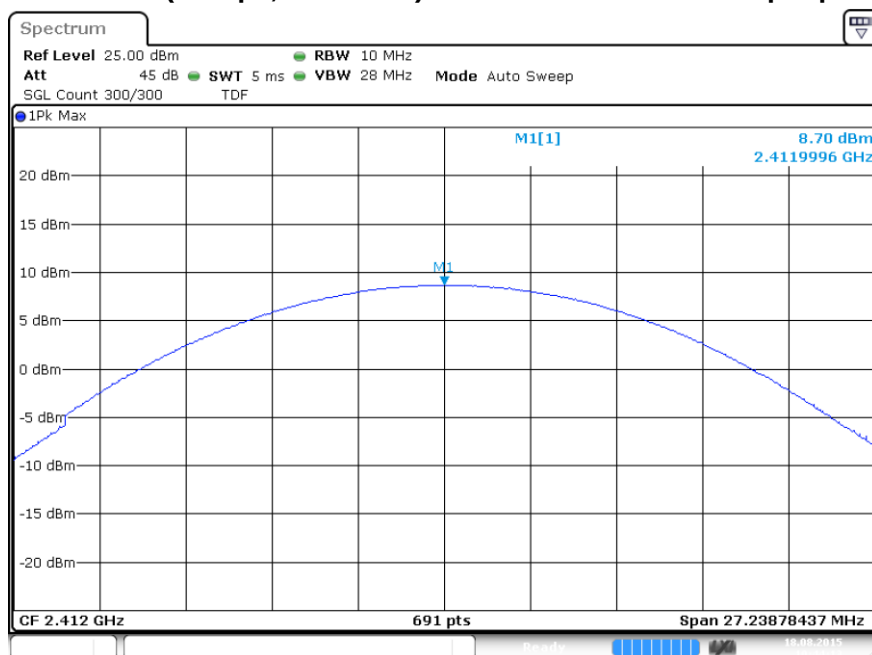
## 5.2.5 Test results of conducted Output power IEEE 802.11b

Used standard: IEEE802.11b Data rate= 1 Mbps.

| Channel     | Frequency [MHz] | RF Power [dBm] | EIRP [dBm] | Limit [dBm] |
|-------------|-----------------|----------------|------------|-------------|
| 1           | 2412            | 8,7            | 11.2       | 30          |
| 6           | 2437            | 10,2           | 12.7       | 30          |
| 11          | 2462            | 11,32          | 13.82      | 30          |
| Uncertainty | $\pm 1.78$ dB   |                |            |             |

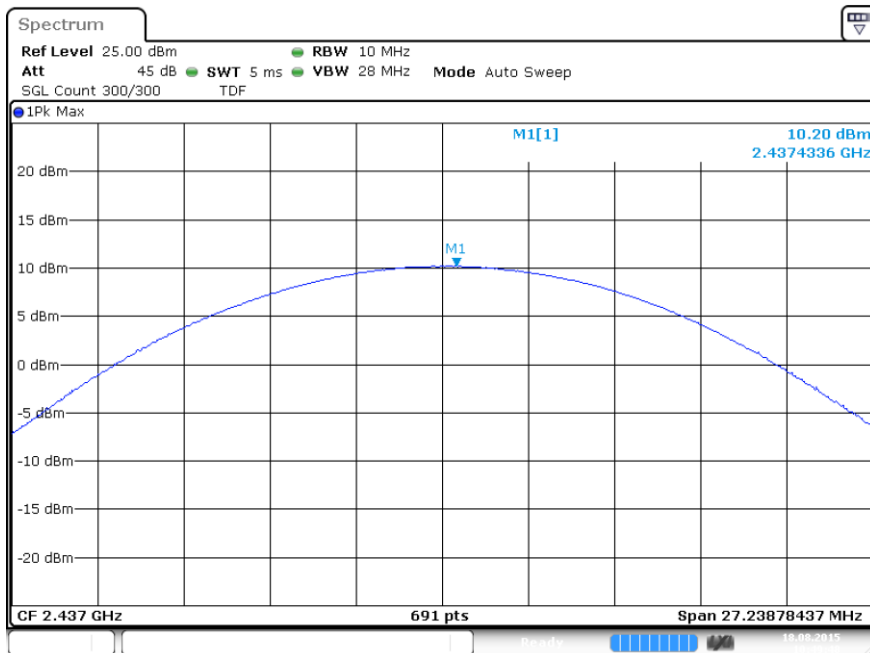
Note: The EIRP values are calculated values where 2.5 dBi Integrated Antenna gain is encountered. The information related to the antenna gain is provided by the device manufacturer.

### IEEE 802.11B (1 Mbps, channel 1) Maximum conducted Output power.



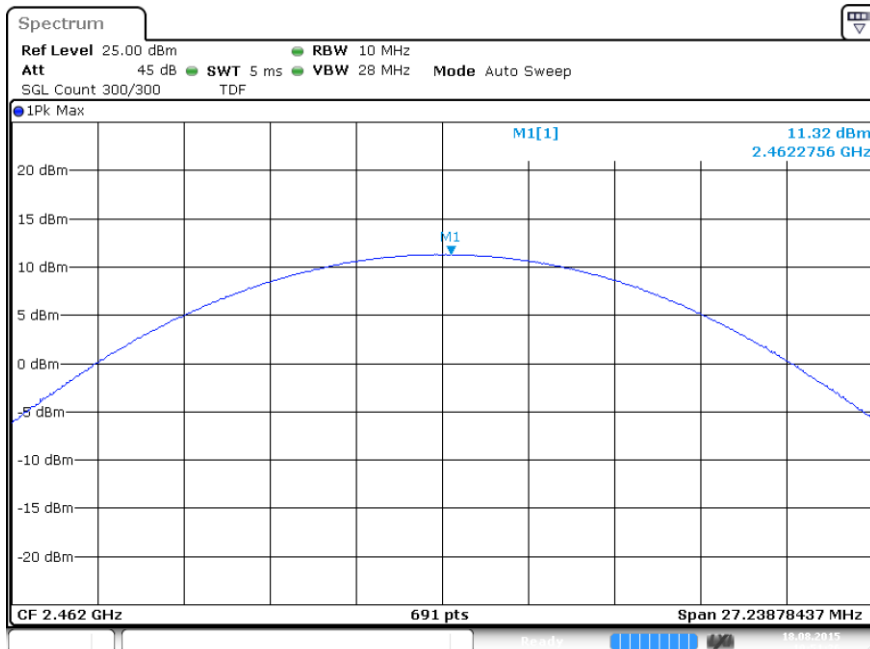
IEEE802\_11b\_DBPSK\_1M, channel: 1 : Maximum Peak conducted output power  
Date: 18.AUG.2015 10:44:13

### IEEE 802.11B (1 Mbps, channel 6) Maximum conducted Output power.



IEEE802\_11b\_DBPSK\_1M, channel: 6 : Maximum Peak conducted output power  
Date: 18.AUG.2015 10:49:48

### IEEE 802.11B (1 Mbps, channel 11) Maximum conducted Output power.



IEEE802\_11b\_DBPSK\_1M, channel: 11 : Maximum Peak conducted output power  
Date: 18.AUG.2015 10:51:27

Duty Cycle of the transmitter at various configurations:

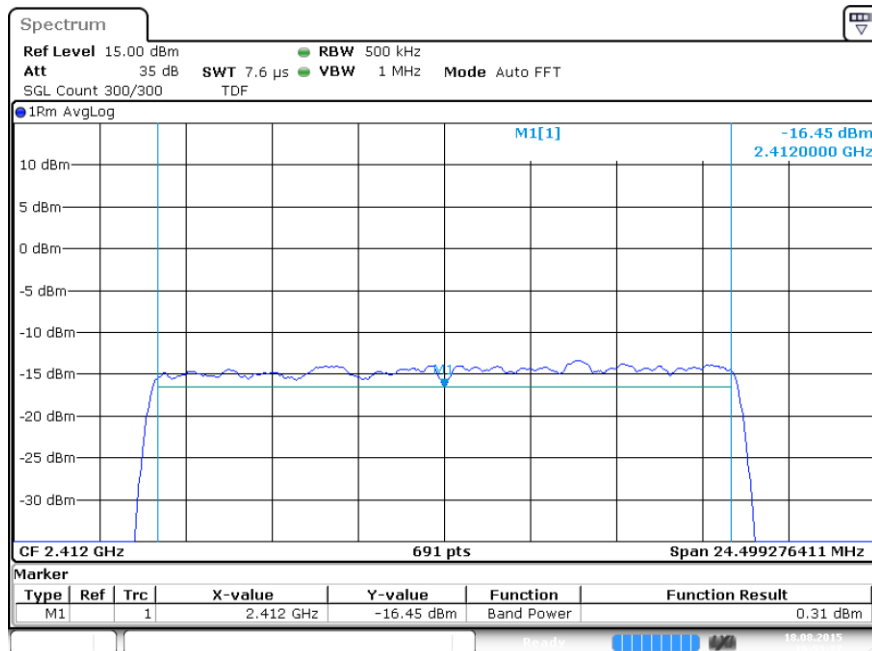
| Technology standard | Data rate [Mbps] | Channel No. | DC%    |
|---------------------|------------------|-------------|--------|
| IEEE802.11b         | 1                | 1           | 98.94% |
| IEEE802.11b         | 1                | 6           | 99.29% |
| IEEE802.11b         | 1                | 11          | 99.29% |
| IEEE802.11g         | 6                | 1           | 93.43% |
| IEEE802.11g         | 6                | 6           | 93.43% |
| IEEE802.11g         | 6                | 11          | 93.43% |
| IEEE802.11n (20)    | 12               | 1           | 87.85% |
| IEEE802.11n (20)    | 12               | 6           | 87.85% |
| IEEE802.11n (20)    | 36               | 6           | 71.74% |
| IEEE802.11n (20)    | 54               | 6           | 63.89% |

Note: (20) is the modulation Bandwidth of the device utilizing IEEE802.11n Standard and is an Indication of the fact that the device is measured at 20 MHz Bandwidth.

| Technology standard | Data rate [Mbps] | Channel No. | Avarage Power [dBm] |
|---------------------|------------------|-------------|---------------------|
| IEEE802.11g         | 6                | 1           | 0.31                |
| IEEE802.11g         | 6                | 6           | 1.92                |
| IEEE802.11g         | 6                | 11          | 2.69                |
| IEEE802.11n (20)    | 12               | 1           | 0.59                |
| IEEE802.11n (20)    | 12               | 11          | 3.17                |
| IEEE802.11n (20)    | 36               | 3           | 0.82                |
| IEEE802.11n (20)    | 36               | 6           | 2.07                |
| IEEE802.11n (20)    | 36               | 9           | 2.65                |
| IEEE802.11n (20)    | 54               | 3           | 0.72                |
| IEEE802.11n (20)    | 54               | 6           | 1.55                |
| IEEE802.11n (20)    | 54               | 9           | 2.46                |
| Uncertainty         | $\pm 1.78$ dB    |             |                     |

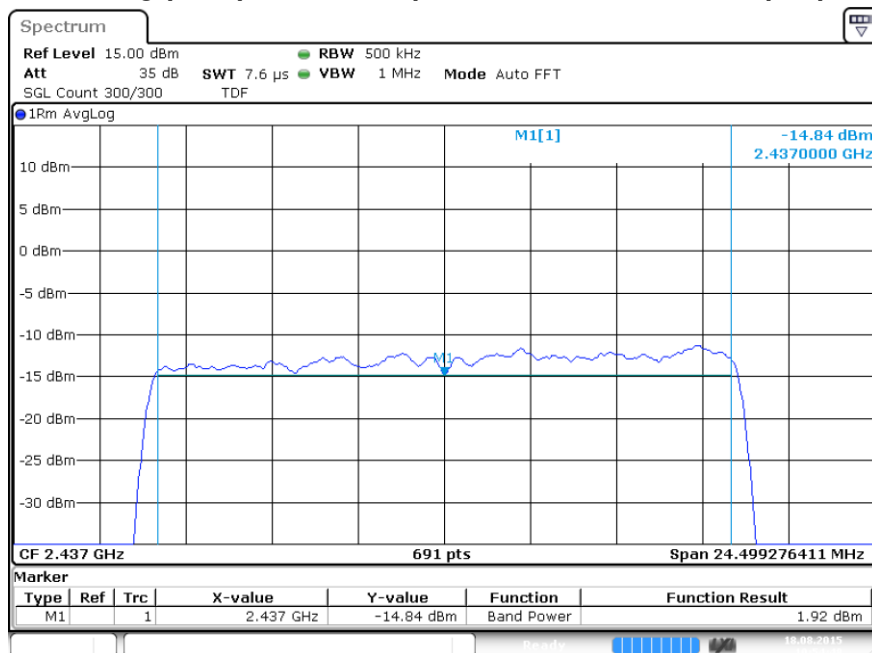
## 5.2.6 Test results output power IEEE 802.11g

### IEEE 802.11g (6 Mbps, channel 1) Maximum conducted Output power.



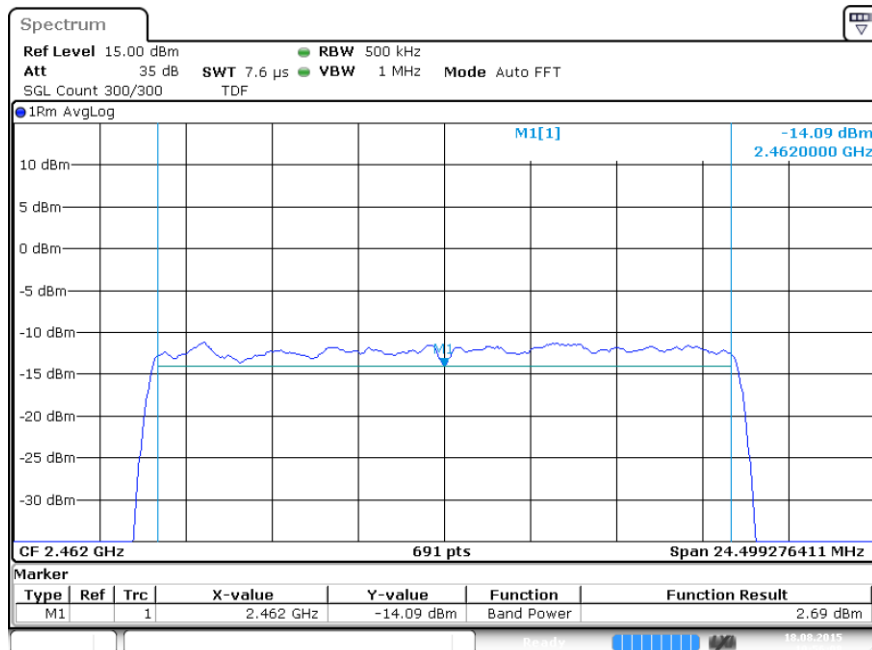
IEEE802\_11g\_OFDM\_6M, channel: 1 : Maximum Peak conducted output power  
Date: 18.AUG.2015 10:53:28

### IEEE 802.11g (6 Mbps, channel 6) Maximum conducted Output power.



IEEE802\_11g\_OFDM\_6M, channel: 6 : Maximum Peak conducted output power  
Date: 18.AUG.2015 10:54:48

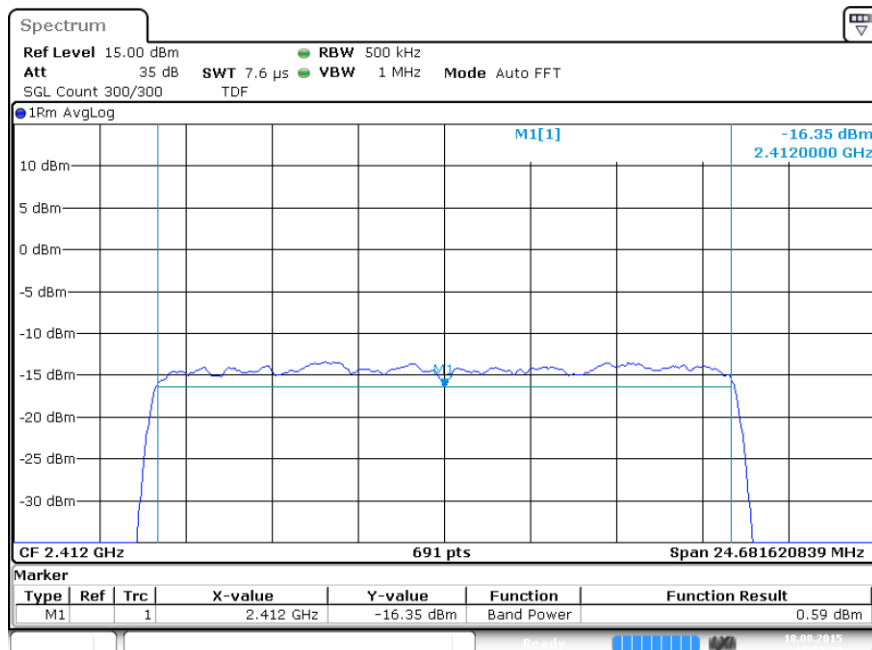
### IEEE 802.11g (6 Mbps, channel 11) Maximum conducted Output power.



IEEE802\_11g\_OFDM\_6M, channel: 11 : Maximum Peak conducted ou  
tput power  
Date: 18.AUG.2015 10:56:08

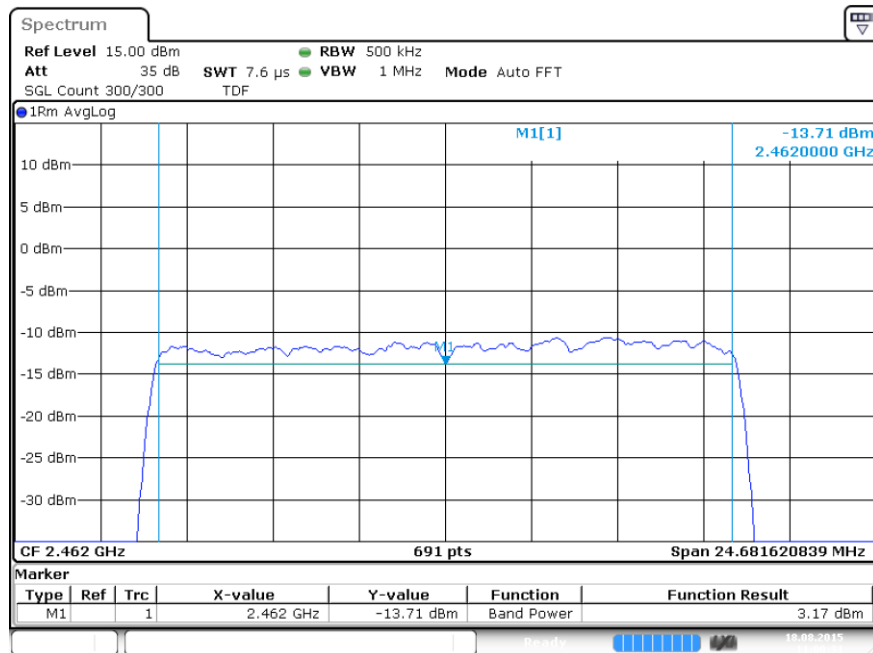
### 5.2.7 Test results Output power IEEE 802.11n

### IEEE 802.11n (12 Mbps, channel 1) Maximum conducted Output power.



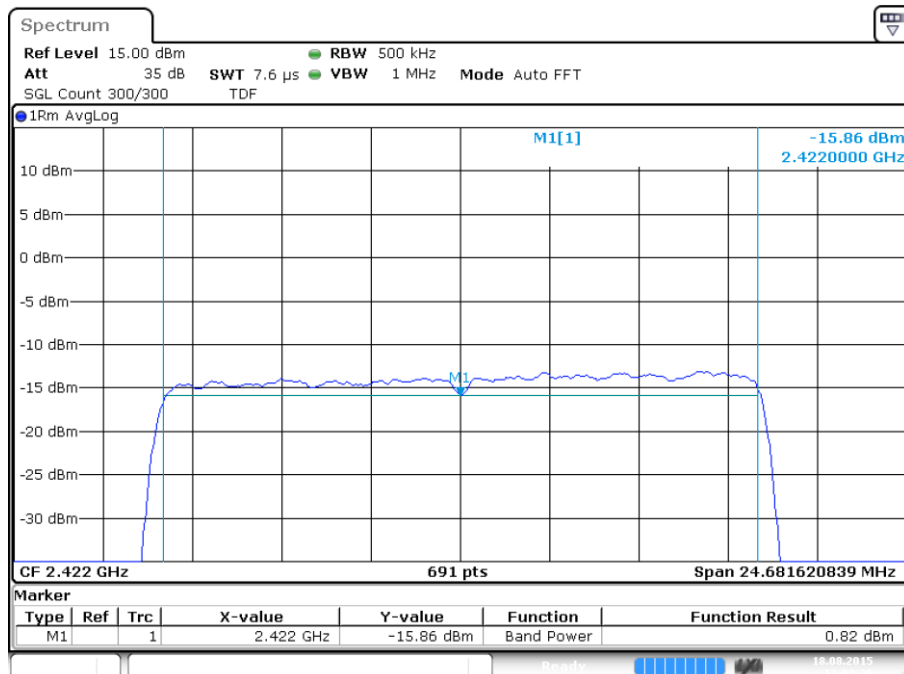
IEEE802\_11n\_12M, channel: 1 : Maximum Peak conducted output  
power  
Date: 18.AUG.2015 10:57:44

### IEEE 802.11n (12 Mbps, channel 11) Maximum conducted Output power.



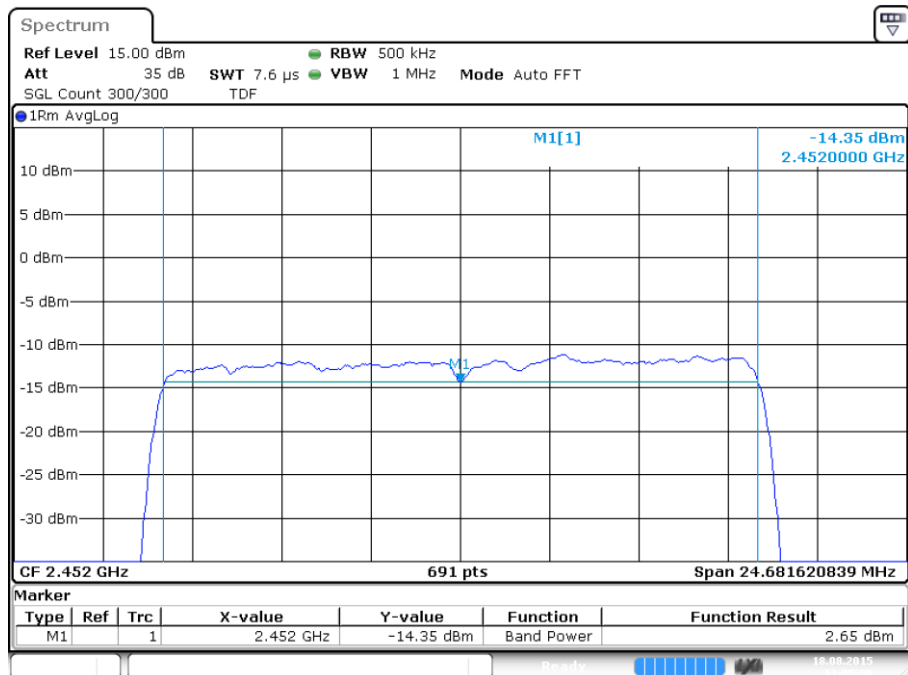
IEEE802\_11n\_12M, channel: 11 : Maximum Peak conducted output power  
Date: 18.AUG.2015 11:00:31

### IEEE 802.11n (36 Mbps, channel 3) Maximum conducted Output power.



IEEE802\_11n\_36M, channel: 3 : Maximum conducted output power  
Date: 18.AUG.2015 11:02:26

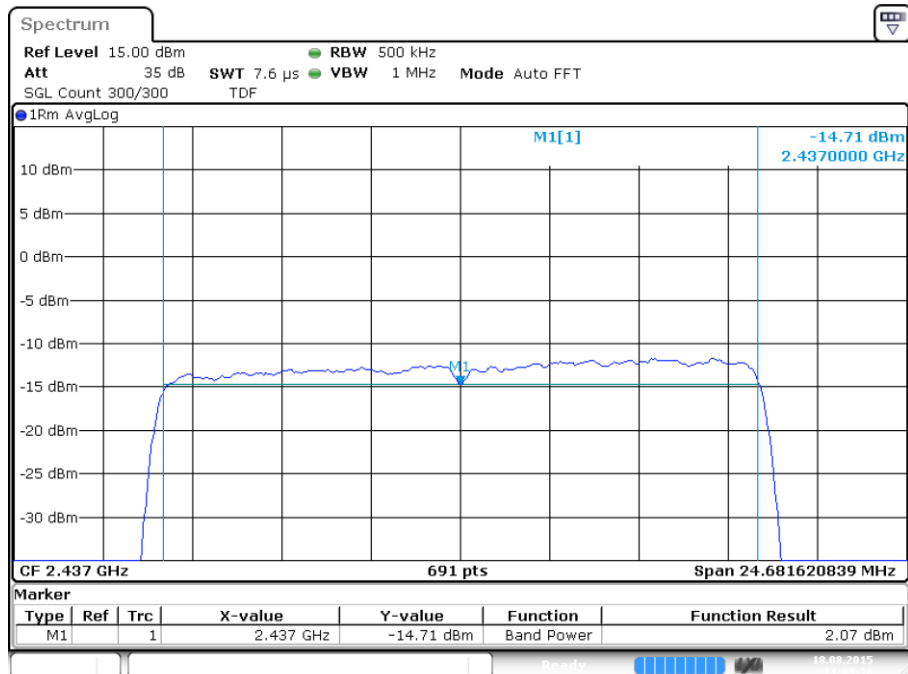
### IEEE 802.11n (36 Mbps, channel 9) Maximum conducted Output power.



IEEE802\_11n\_36M, channel: 9 : Maximum conducted output power

Date: 18.AUG.2015 11:05:06

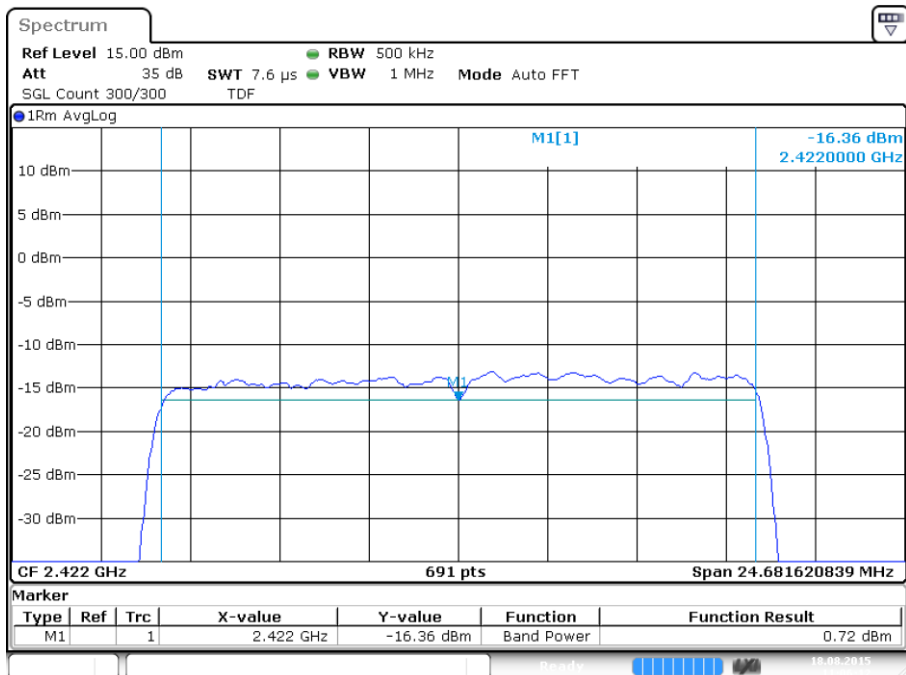
### IEEE 802.11n (36 Mbps, channel 6) Maximum conducted Output power.



IEEE802\_11n\_36M, channel: 6 : Maximum conducted output power

Date: 18.AUG.2015 11:03:38

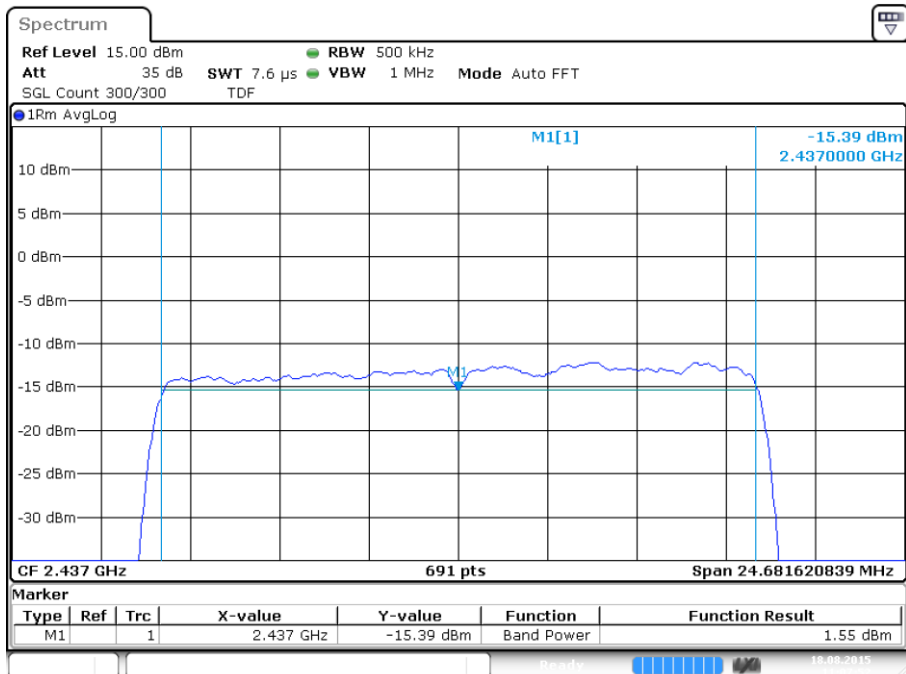
### IEEE 802.11n (54 Mbps, channel 3) Maximum conducted Output power.



IEEE802\_11n\_54M, channel: 3 : Maximum conducted output power

Date: 18.AUG.2015 11:06:12

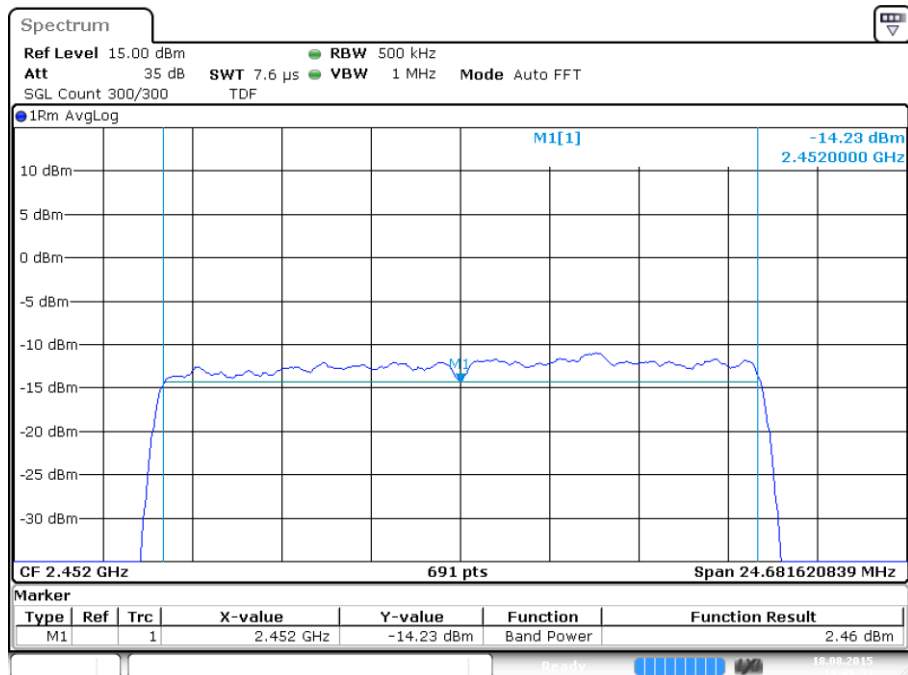
### IEEE 802.11n (54 Mbps, channel 6) Maximum conducted Output power.



IEEE802\_11n\_54M, channel: 6 : Maximum conducted output power

Date: 18.AUG.2015 11:07:53

### IEEE 802.11n (54 Mbps, channel 9) Maximum conducted Output power.



IEEE802\_11n\_54M, channel: 9 : Maximum conducted output power

Date: 18.AUG.2015 11:09:33

## **5.3 Measurement of Power Spectral Density**

### **5.3.1 Limit**

The peak power spectral density shall not be greater than 8 dBm in any 3 kHz band at any time interval of continuous transmission.

### **5.3.2 Measuring instruments**

The measuring instruments are listed in chapter 3.4 of this report.

### **5.3.3 Test setup**

As shown in chapter 3.2 of this report.

### **5.3.4 Test procedure**

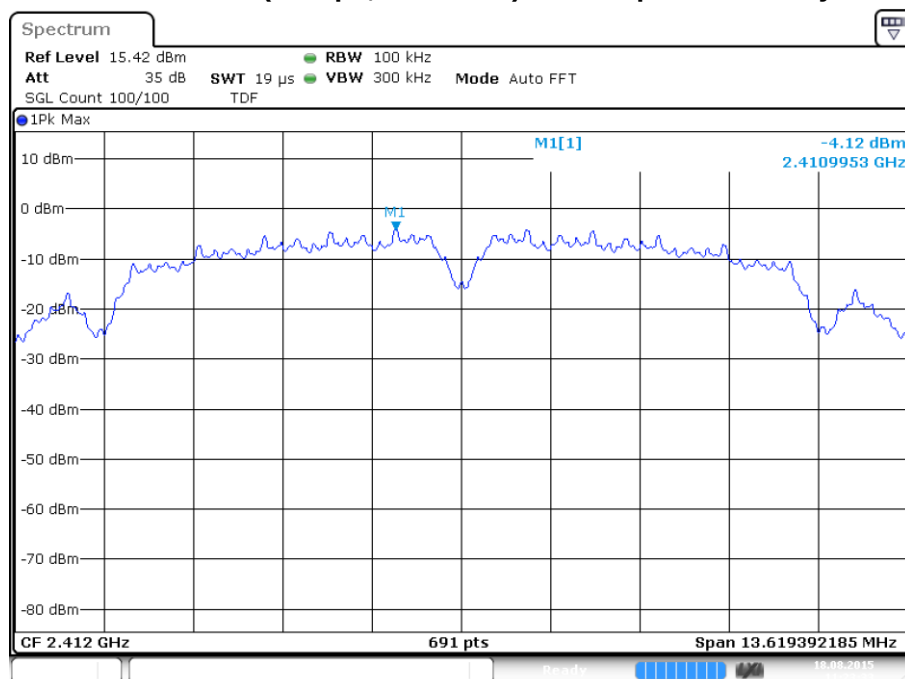
1. The RF Output of EUT was connected to the spectrum analyser by RF cable. The path loss was compensated to the results for each measurement. This is done by utilizing the path compensation of the cable within the Transducer table of the Spectrum analyser.
2. EUT is configured by utilizing the build in SW application provided by Device manufacturer. The EUT is set to transmit by its maximum power level and is enabled to transmit continuously.
3. Measurement is done by Spectrum analyser. Which is configured as following:  
RBW = 100 kHz  
Video BW = 300 kHz which is equal or larger than 3x RBW.  
Detector = Peak, Sweep time = auto couple, Trace mode = Max hold, Allowing trace to fully be stabilized. Maximum power level is detected by peak marker function of the spectrum analyser.
4. Test results are recorded into a log file.

### 5.3.5 Test results of Power spectral density

| Technology standard                    | Data rate [Mbps] | Channel No. | Power spectral density [dBm] |
|----------------------------------------|------------------|-------------|------------------------------|
| Power spectral Density Peak Methode    |                  |             |                              |
| IEEE802.11b                            | 1                | 1           | -4.12                        |
| IEEE802.11b                            | 1                | 6           | -2.15                        |
| IEEE802.11b                            | 1                | 11          | -0.5                         |
| Power spectral Density Avarage Methode |                  |             |                              |
| IEEE802.11g                            | 6                | 1           | -18.07                       |
| IEEE802.11g                            | 6                | 6           | -16.09                       |
| IEEE802.11g                            | 6                | 11          | -15.51                       |
| IEEE802.11n (20)                       | 12               | 1           | -18.46                       |
| IEEE802.11n (20)                       | 12               | 6           | -16.33                       |
| IEEE802.11n (20)                       | 12               | 11          | -15.52                       |
| IEEE802.11n (20)                       | 36               | 3           | -18.31                       |
| IEEE802.11n (20)                       | 36               | 6           | -16.44                       |
| IEEE802.11n (20)                       | 36               | 9           | -16.18                       |
| IEEE802.11n (20)                       | 54               | 3           | -18.23                       |
| IEEE802.11n (20)                       | 54               | 6           | -17.01                       |
| IEEE802.11n (20)                       | 54               | 9           | -16.27                       |
| Uncertainty                            | ±0.63 dB         |             |                              |

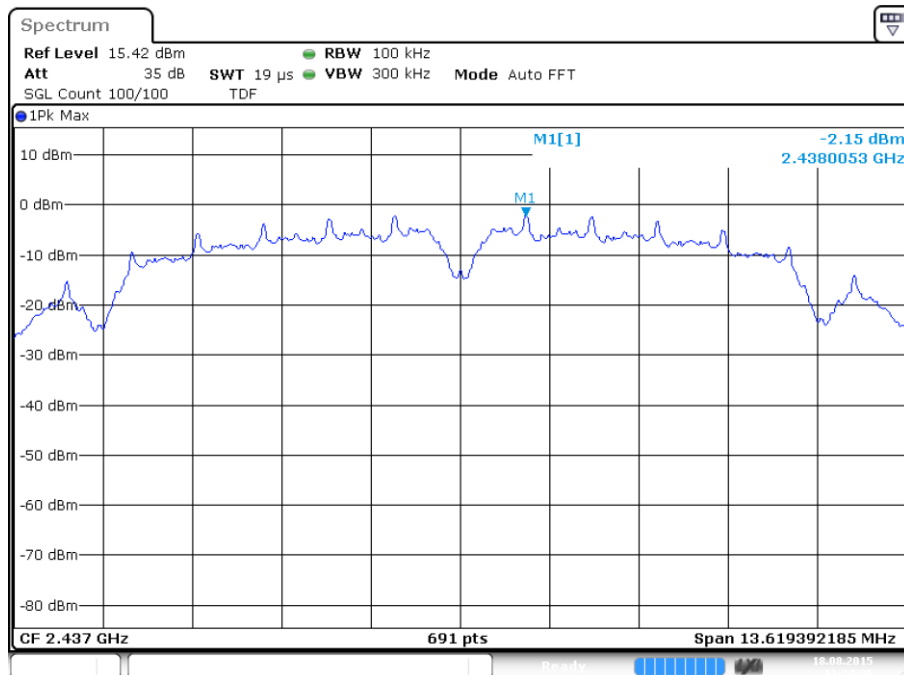
### 5.3.6 Test results IEEE 802.11b

IEEE 802.11b (1 Mbps, channel 1) Power spectral density.



IEEE802\_11b\_DBPSK\_1M, 1 : Power spectral density  
Date: 18.AUG.2015 11:23:33

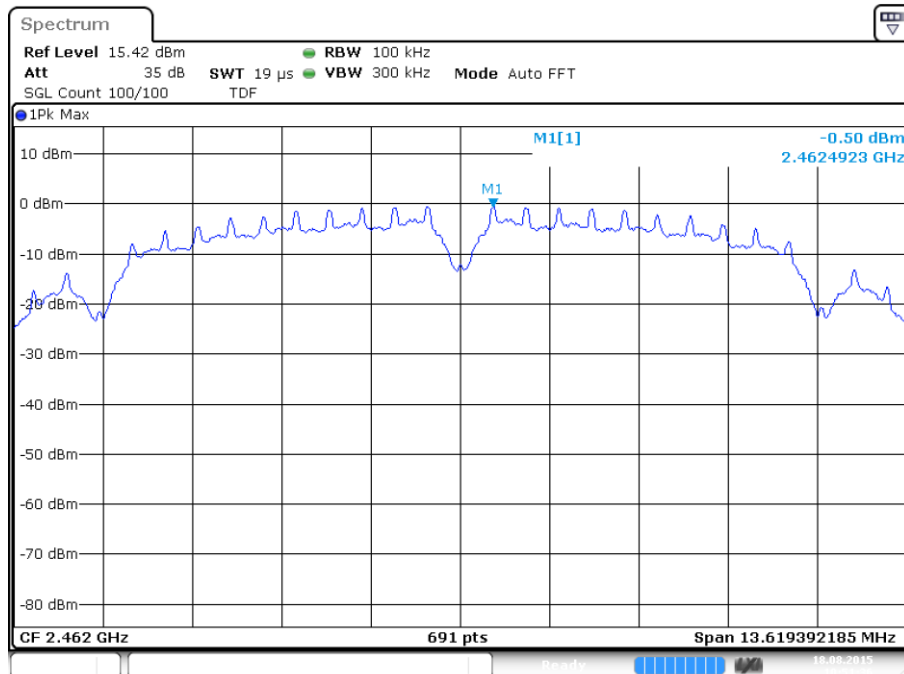
### IEEE 802.11b (1 Mbps, channel 6) Power spectral density.



IEEE802\_11b\_DBPSK\_1M,6 : Power spectral density

Date: 18.AUG.2015 11:24:26

### IEEE 802.11b (1 Mbps, channel 11) Power spectral density.

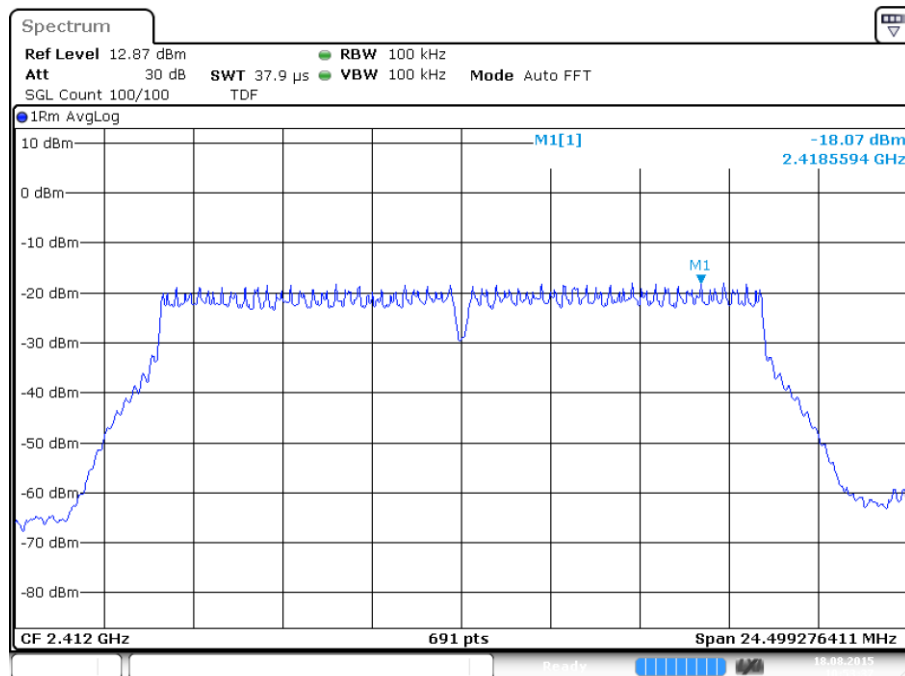


IEEE802\_11b\_DBPSK\_1M,11 : Power spectral density

Date: 18.AUG.2015 10:51:36

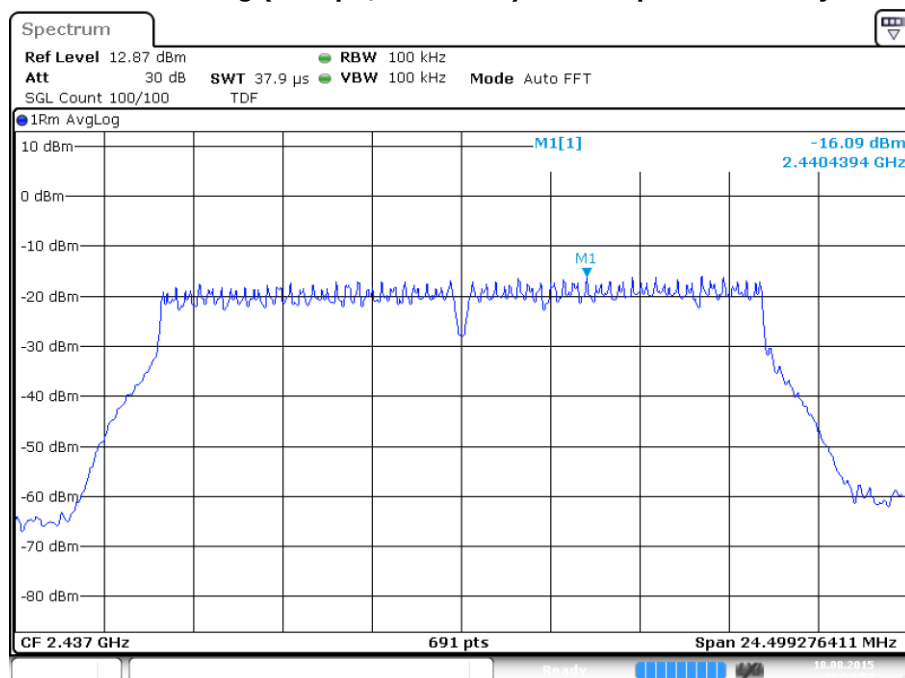
## Results based on the Avarage power density measurements:

### IEEE 802.11g (6 Mbps, channel 1) Power spectral density



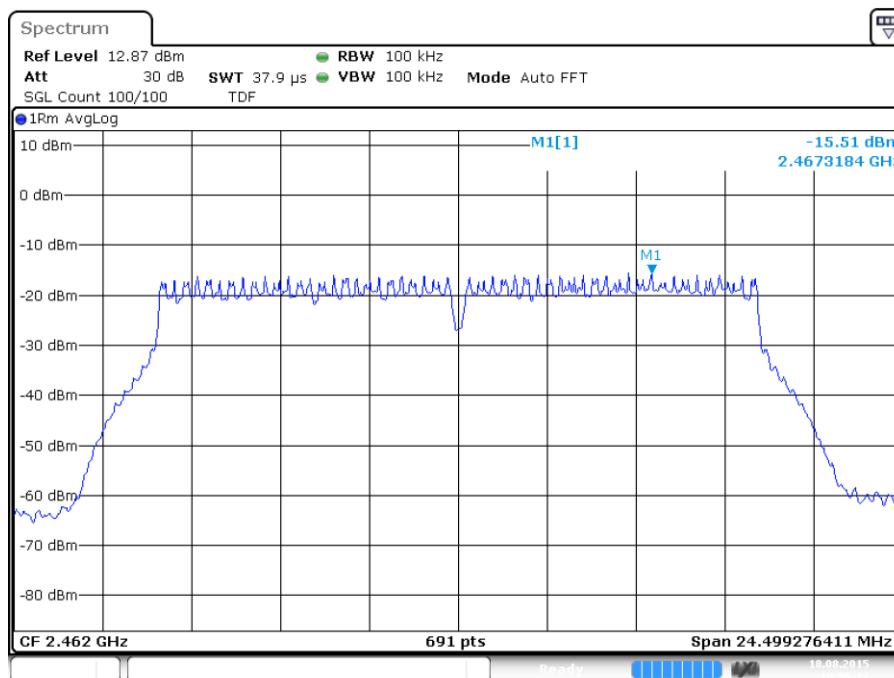
IEEE802\_11g\_OFDM\_6M, channel: 1 : Power spectral density  
 Date: 18.AUG.2015 10:53:37

### IEEE 802.11g (6 Mbps, channel 6) Power spectral density.



IEEE802\_11g\_OFDM\_6M, channel: 6 : Power spectral density  
 Date: 18.AUG.2015 10:54:57

### IEEE 802.11b (6 Mbps, channel 11) Power spectral density.

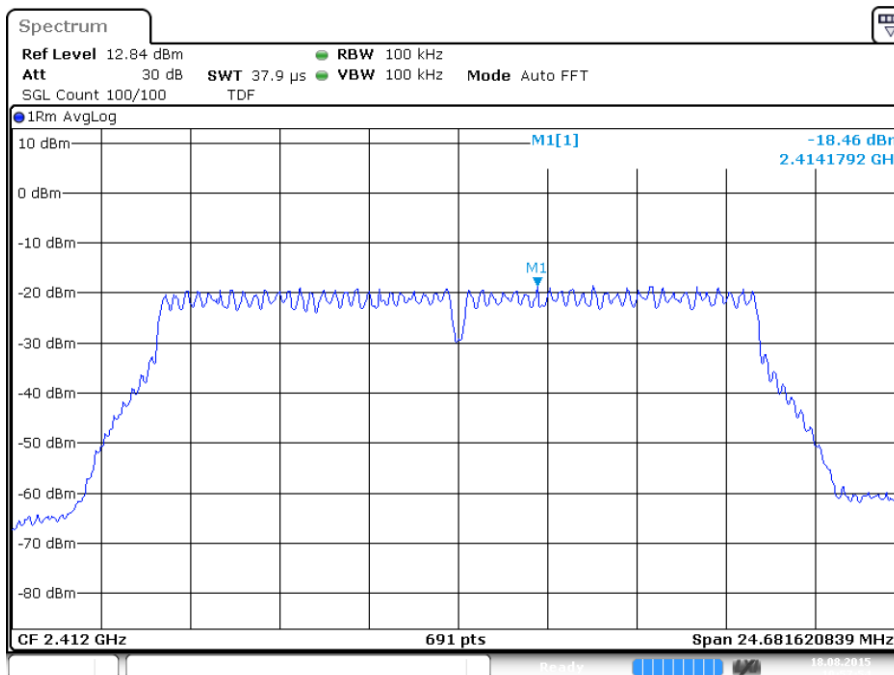


IEEE802\_11g\_OFDM\_6M, channel: 11 : Power spectral density

Date: 18.AUG.2015 10:56:18

### 5.3.7 Test results IEEE 802.11n

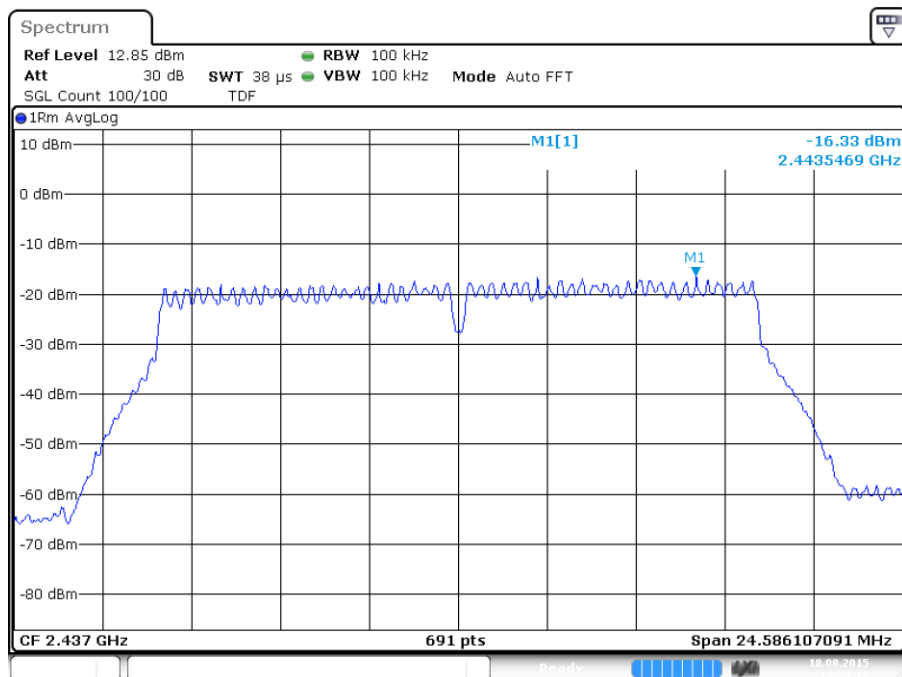
### IEEE 802.11n (12 Mbps, channel 1) Power spectral density.



IEEE802\_11n\_12M, channel: 1 : Power spectral density

Date: 18.AUG.2015 10:57:54

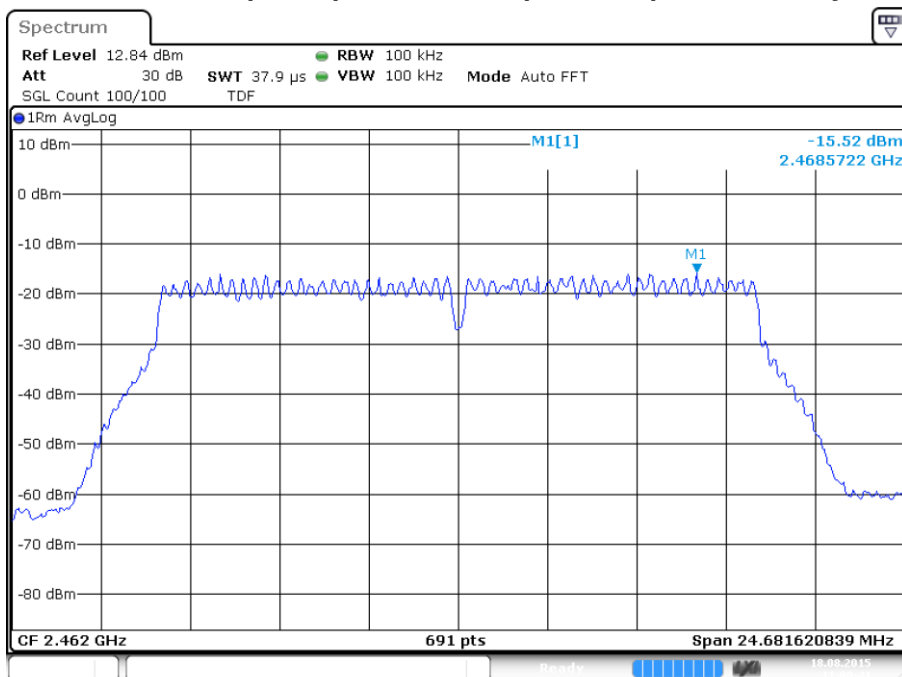
### IEEE 802.11n (12 Mbps, channel 6) Power spectral density.



IEEE802\_11n\_12M, channel: 6 : Power spectral density

Date: 18.AUG.2015 10:59:10

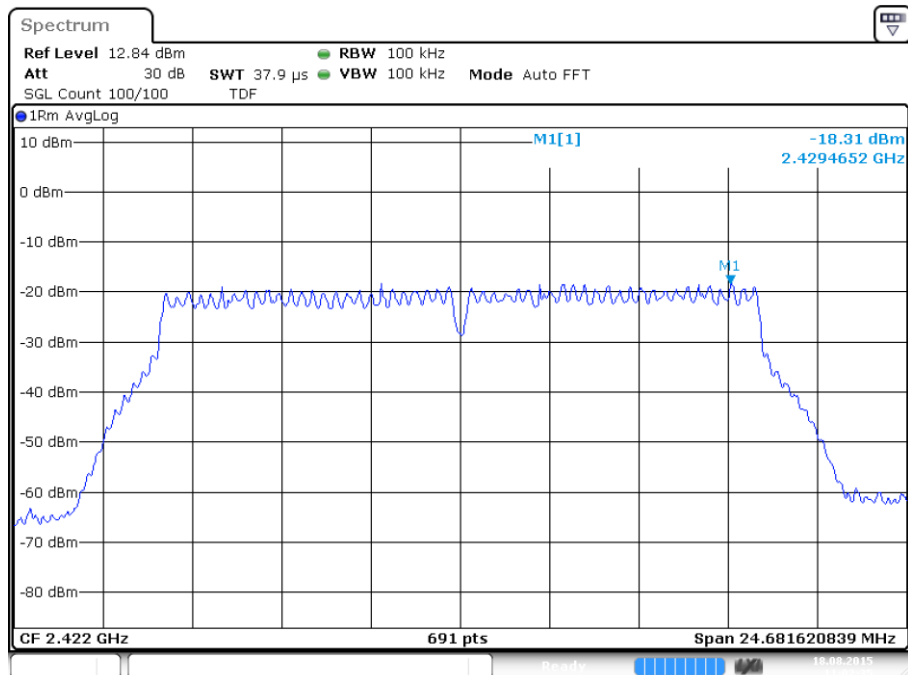
### IEEE 802.11n (12 Mbps, channel 11) Power spectral density.



IEEE802\_11n\_12M, channel: 11 : Power spectral density

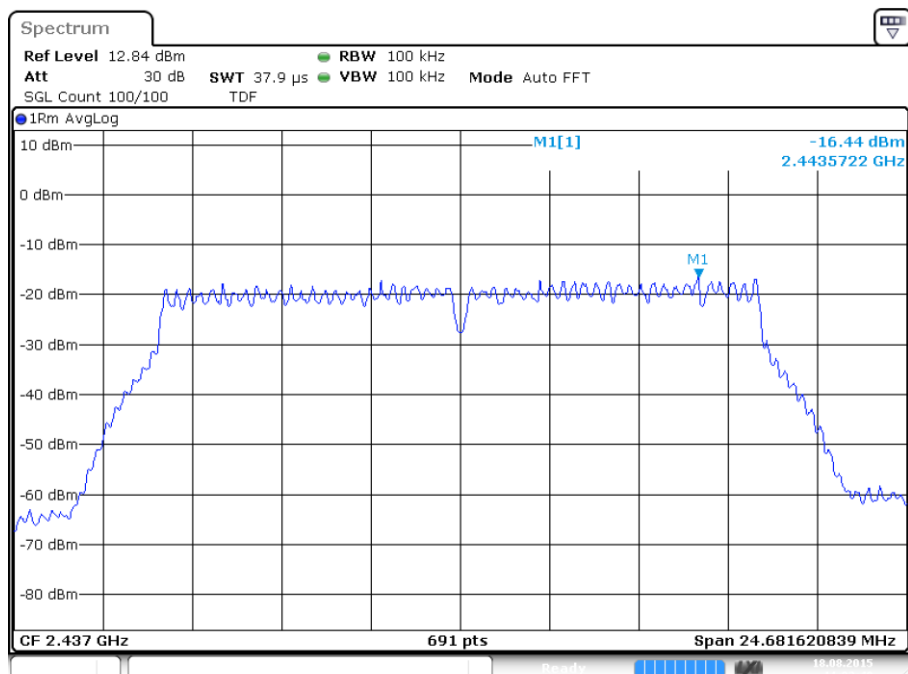
Date: 18.AUG.2015 11:00:41

### IEEE 802.11n (36 Mbps, channel 3) Power spectral density.



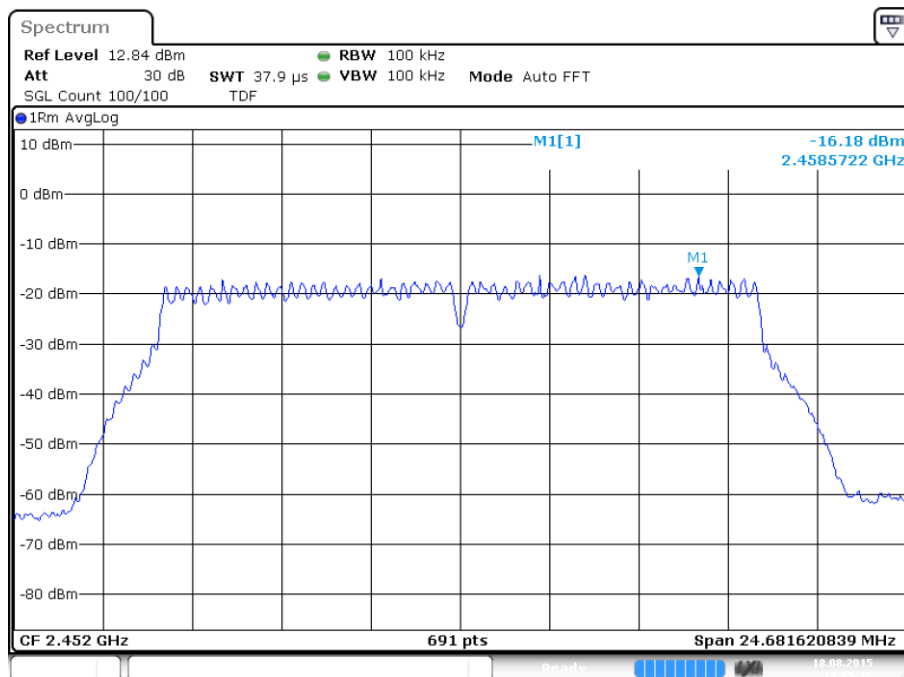
IEEE802\_11n\_36M, channel: 3 : Power spectral density  
 Date: 18.AUG.2015 11:02:35

### IEEE 802.11n (36 Mbps, channel 6) Power spectral density.



IEEE802\_11n\_36M, channel: 6 : Power spectral density  
 Date: 18.AUG.2015 11:03:48

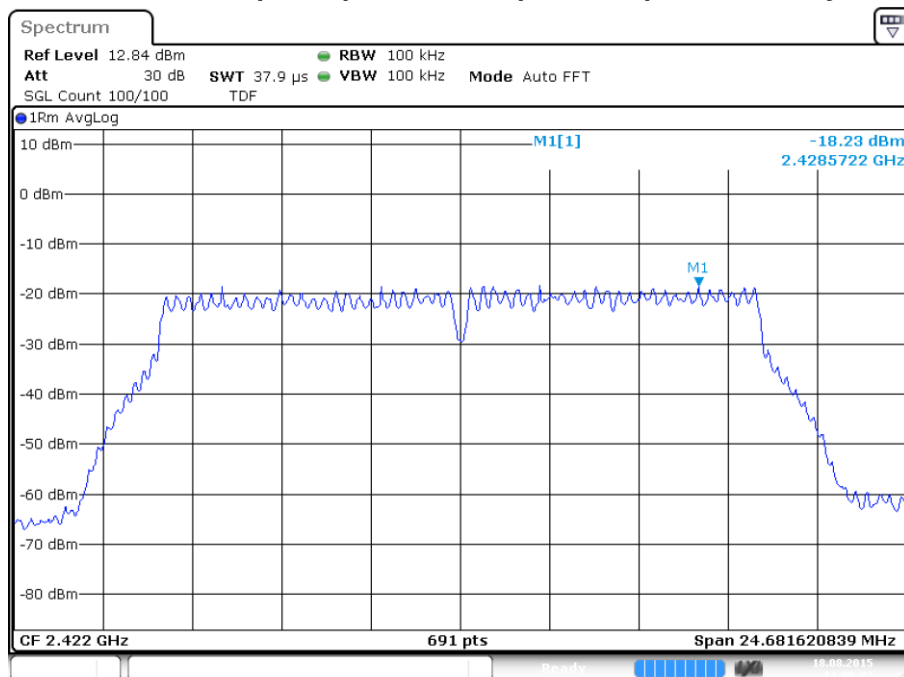
### IEEE 802.11n (36 Mbps, channel 9) Power spectral density.



IEEE802\_11n\_36M, channel: 9 : Power spectral density

Date: 18.AUG.2015 11:05:16

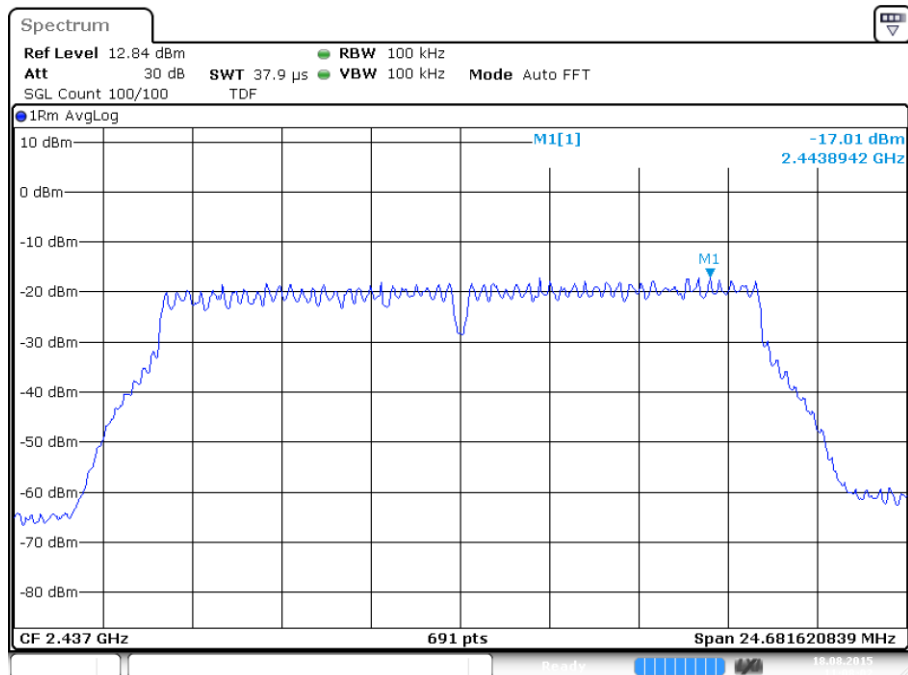
### IEEE 802.11n (54 Mbps, channel 3) Power spectral density.



IEEE802\_11n\_54M, channel: 3 : Power spectral density

Date: 18.AUG.2015 11:06:22

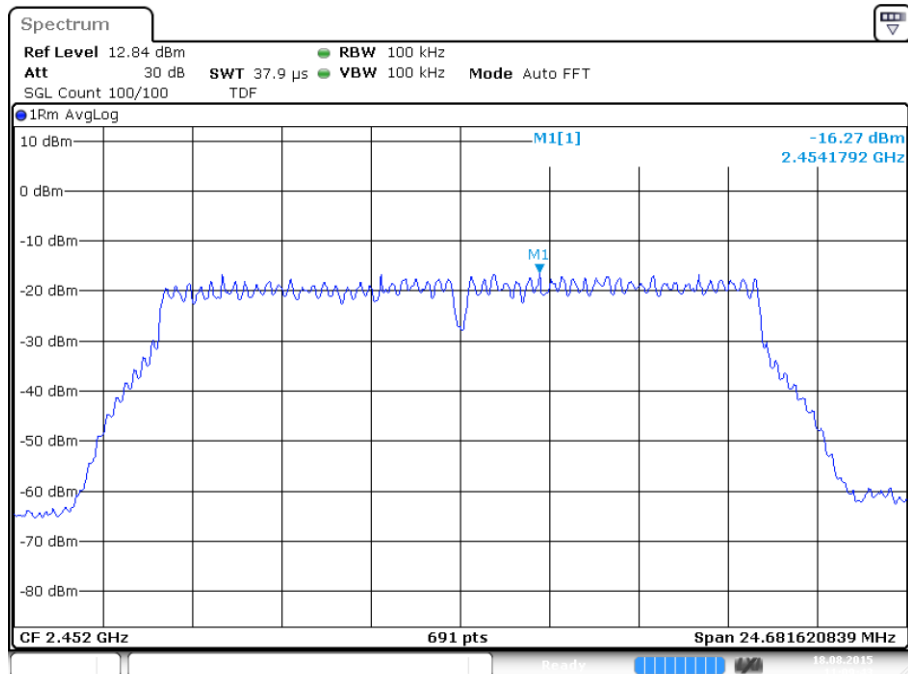
### IEEE 802.11n (54 Mbps, channel 6) Power spectral density.



IEEE802\_11n\_54M, channel: 6 : Power spectral density

Date: 18.AUG.2015 11:08:02

### IEEE 802.11n (54 Mbps, channel 9) Power spectral density.



IEEE802\_11n\_54M, channel: 9 : Power spectral density

Date: 18.AUG.2015 11:09:43

## 5.4 99% Occupied Bandwidth

### 5.4.1 Limit

According to FCC part 2, §2.1049.

### 5.4.2 Measuring instruments

The measuring instruments are listed in chapter 3.4 of this report.

### 5.4.3 Test setup

As shown in chapter 3.2 of this report.

### 5.4.4 Test procedure

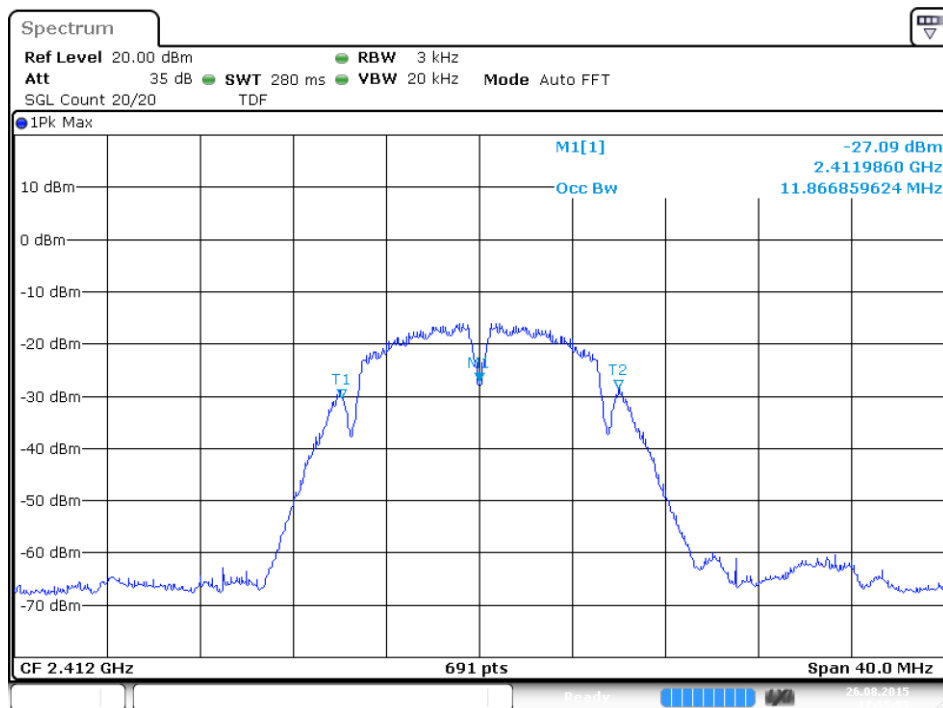
The following procedure is used for measuring (99 %) power bandwidth:

1. Set center frequency to the nominal EUT channel center frequency.
2. Set span = 1.5 times to 5.0 times the OBW.
3. Set VBW  $\geq 3 \cdot$  RBW
4. Video averaging is not permitted. Where practical, a sample detection and single sweep mode shall be used. Otherwise, peak detection and max hold mode (until the trace stabilizes) shall be used.

### 5.4.5 Test results of 99% OBW

| Tech. Std.  | Channel Number | Frequency [MHz] | Data rate [mbps] | 99% OBW [MHz] |
|-------------|----------------|-----------------|------------------|---------------|
| IEEE802.11b | 1              | 2412            | 1                | 11.86686      |
| IEEE802.11b | 6              | 2437            | 1                | 11.80897      |
| IEEE802.11b | 11             | 2462            | 1                | 11.80897      |
| IEEE802.11g | 1              | 2412            | 6                | 16.43994      |
| IEEE802.11g | 6              | 2437            | 6                | 16.49783      |
| IEEE802.11g | 11             | 2462            | 6                | 16.43994      |
| IEEE802.11n | 1              | 2412            | 12               | 16.43994      |
| IEEE802.11n | 6              | 2437            | 12               | 16.43994      |
| IEEE802.11n | 11             | 2462            | 12               | 16.43994      |
| Uncertainty | $\pm 18.2$ kHz |                 |                  |               |

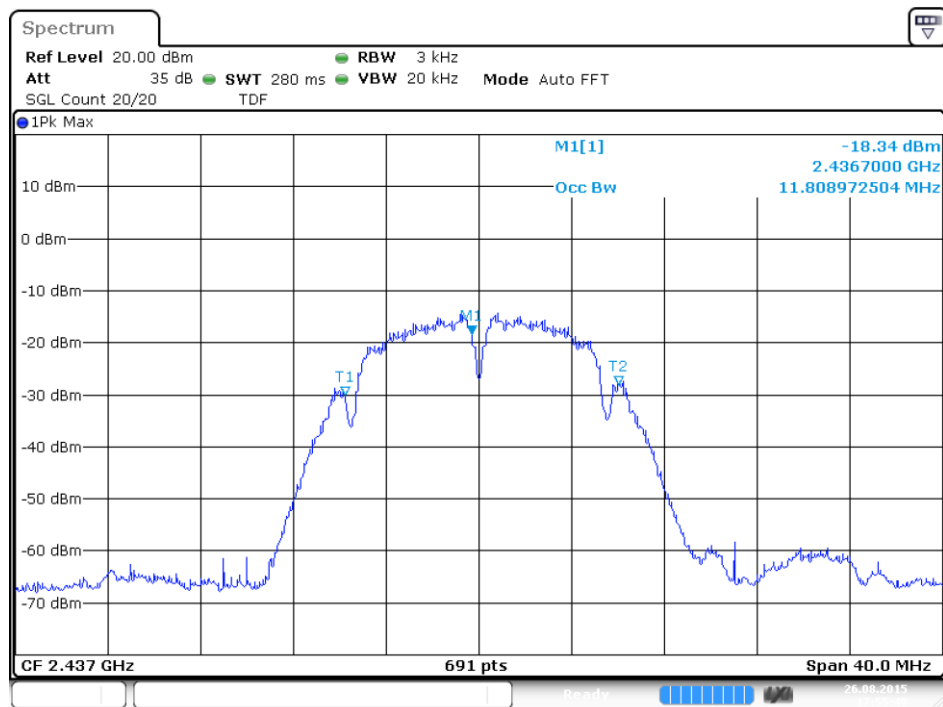
### IEEE 802.11b (1 Mbps, channel 1) Occupied bandwidth.



IEEE802\_11 Channel: 1 : Measure Occupied Bandwidth

Date: 26.AUG.2015 17:55:09

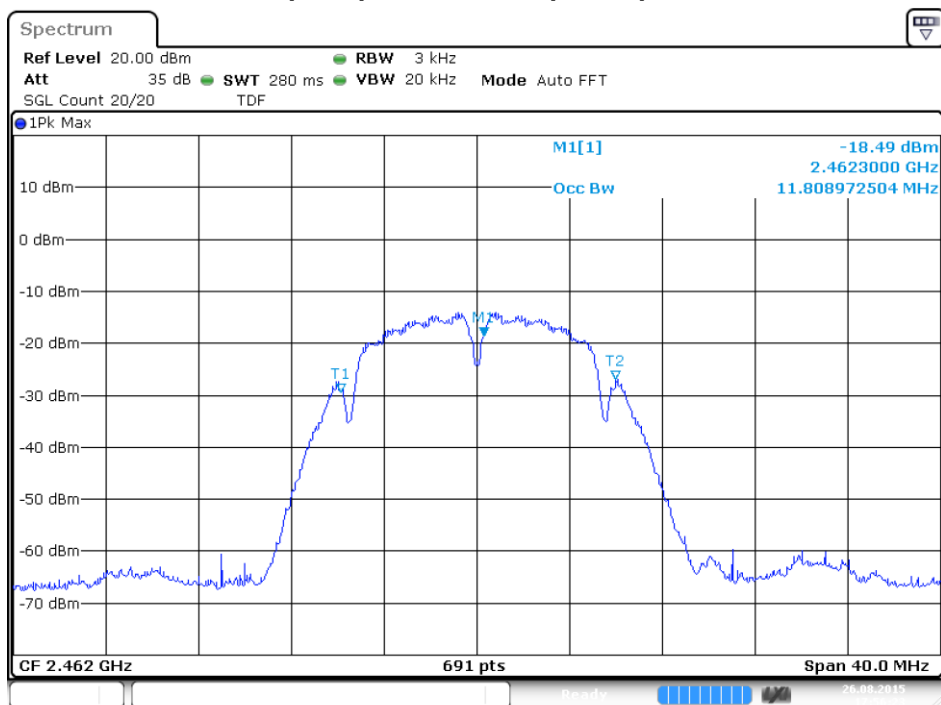
### IEEE 802.11b (1 Mbps, channel 6) Occupied bandwidth.



IEEE802\_11 Channel: 6 : Measure Occupied Bandwidth

Date: 26.AUG.2015 17:55:49

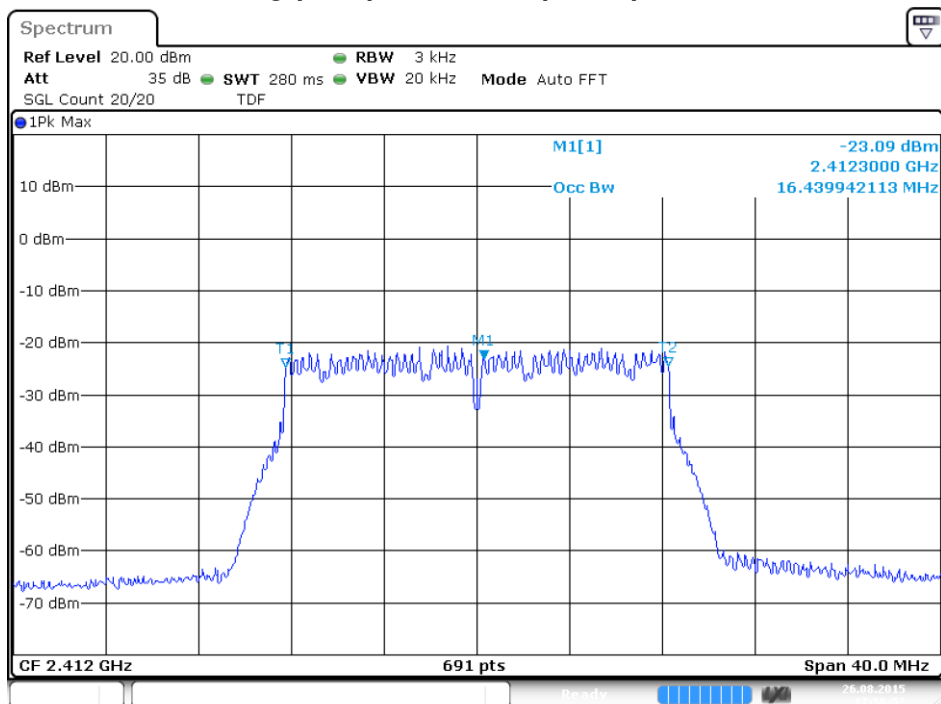
### IEEE 802.11b (6 Mbps, channel 11) Occupied bandwidth.



IEEE802\_11 Channel: 11 : Measure Occupied Bandwidth

Date: 26.AUG.2015 17:56:23

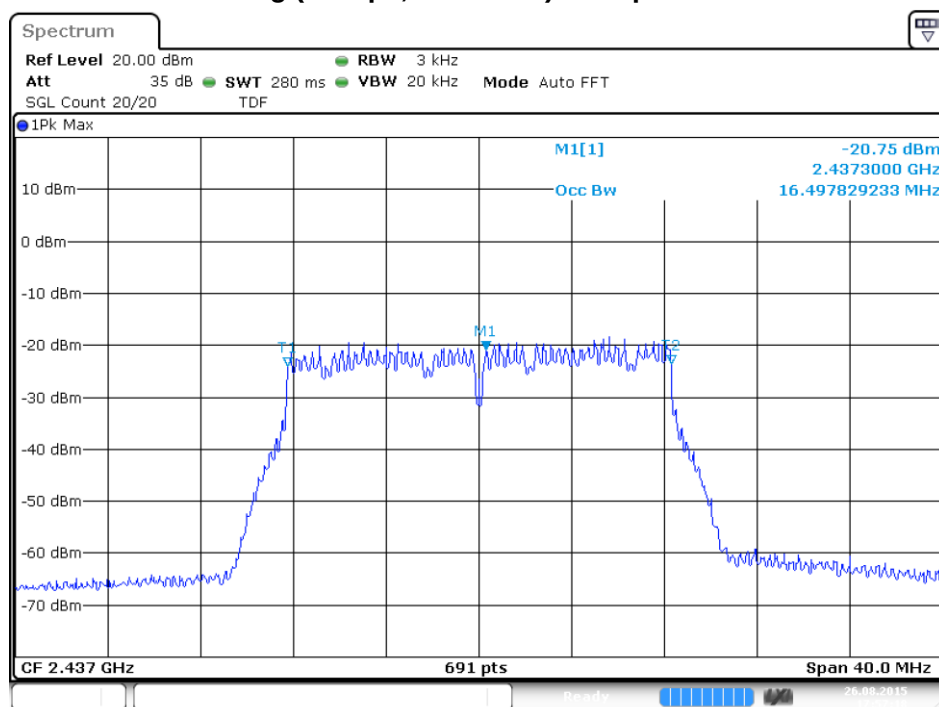
### IEEE 802.11g (6 Mbps, channel 1) Occupied bandwidth.



IEEE802\_11 Channel: 1 : Measure Occupied Bandwidth

Date: 26.AUG.2015 17:56:52

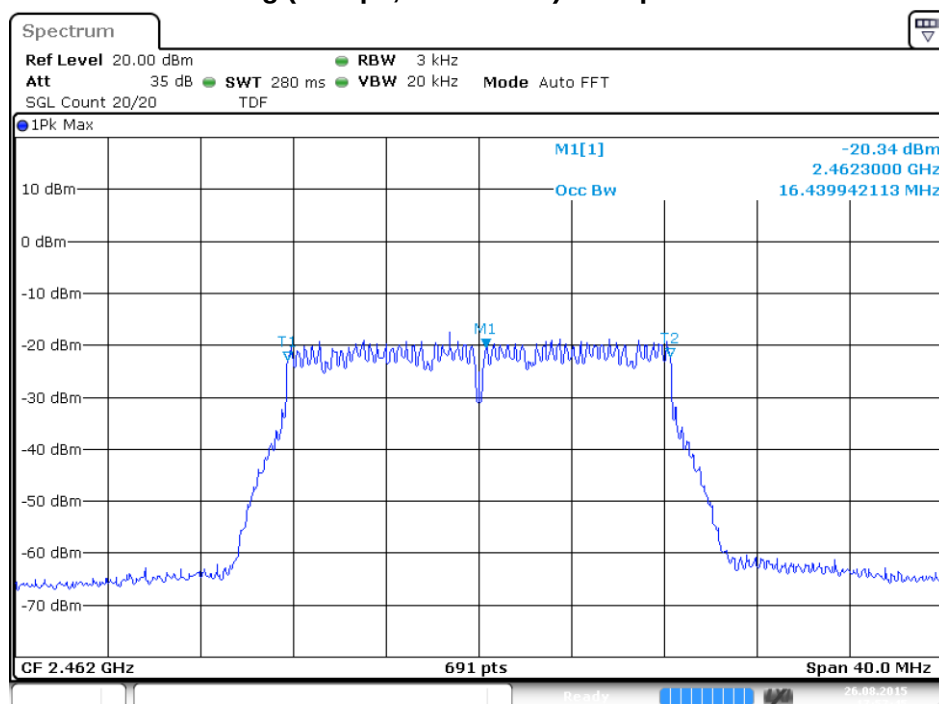
### IEEE 802.11g (6 Mbps, channel 6) Occupied bandwidth.



IEEE802\_11 Channel: 6 : Measure Occupied Bandwidth

Date: 26.AUG.2015 17:57:18

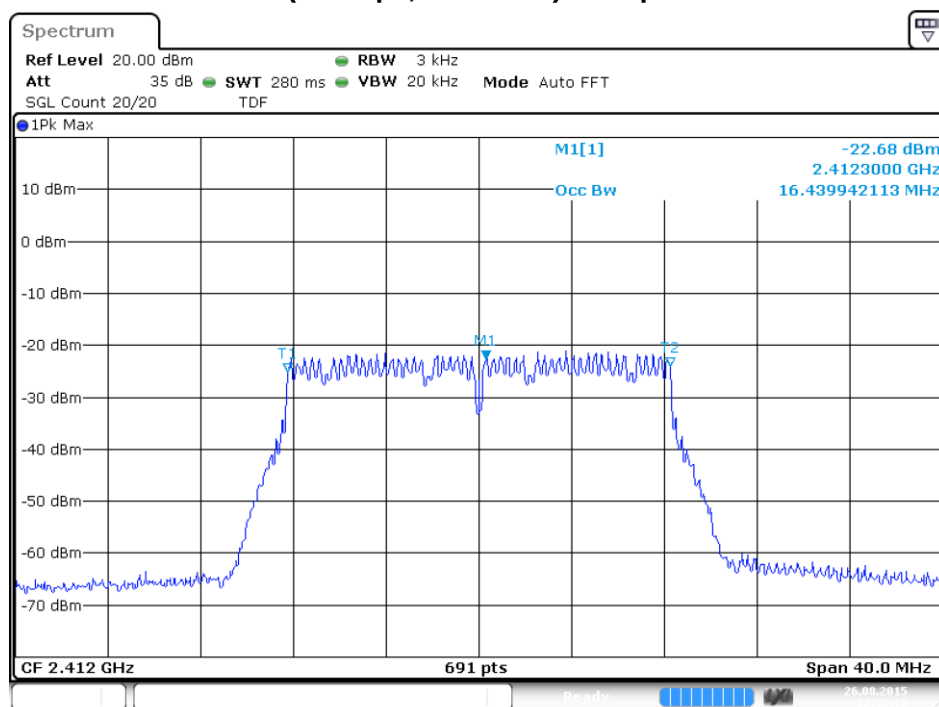
### IEEE 802.11g (6 Mbps, channel 11) Occupied bandwidth.



IEEE802\_11 Channel: 11 : Measure Occupied Bandwidth

Date: 26.AUG.2015 17:57:45

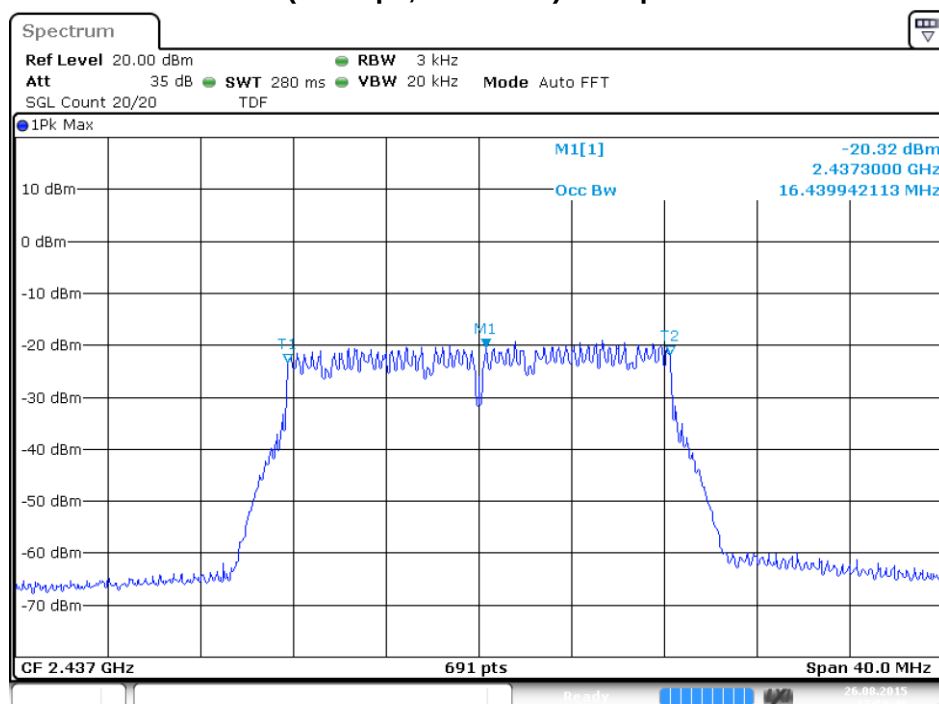
### IEEE 802.11n (12 Mbps, channel 1) Occupied bandwidth.



IEEE802\_11 Channel: 1 : Measure Occupied Bandwidth

Date: 26.AUG.2015 17:58:18

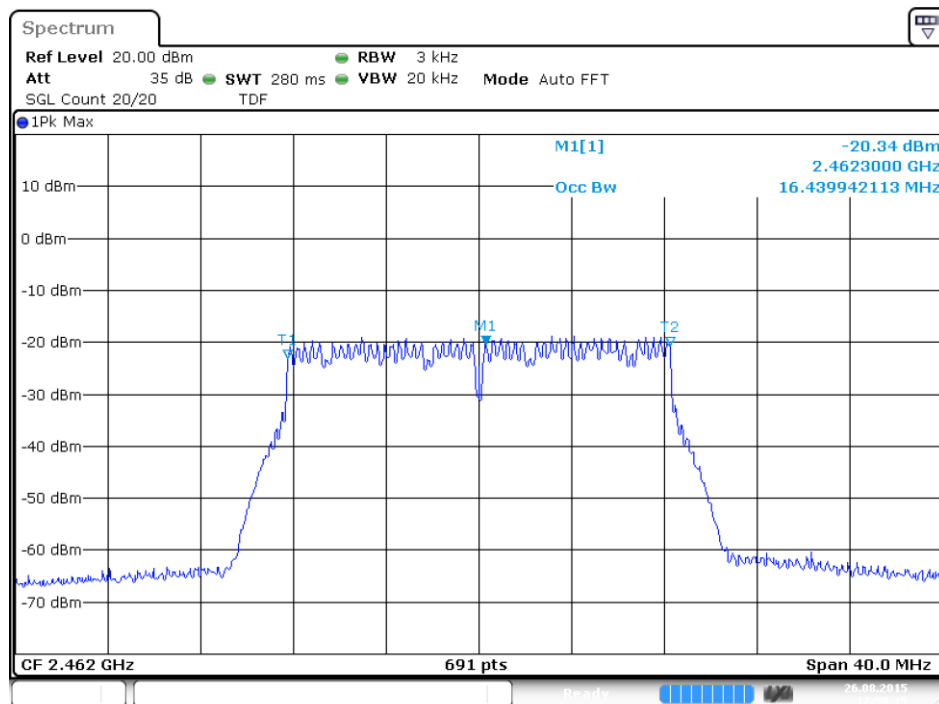
### IEEE 802.11n (12 Mbps, channel 6) Occupied bandwidth.



IEEE802\_11 Channel: 6 : Measure Occupied Bandwidth

Date: 26.AUG.2015 17:58:48

### IEEE 802.11n (12 Mbps, channel 11) Occupied bandwidth.



IEEE802\_11 Channel: 11 : Measure Occupied Bandwidth  
 Date: 26.AUG.2015 17:59:14

## 5.5 Spurious emissions

### 5.5.1 Limit

In any 100 kHz bandwidth outside the operating frequency band, the RF power shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either a RF conducted or a radiated measurement.

### 5.5.2 Measuring instruments

The measuring instruments are listed in chapter 3.4 of this report.

### 5.5.3 Test setup

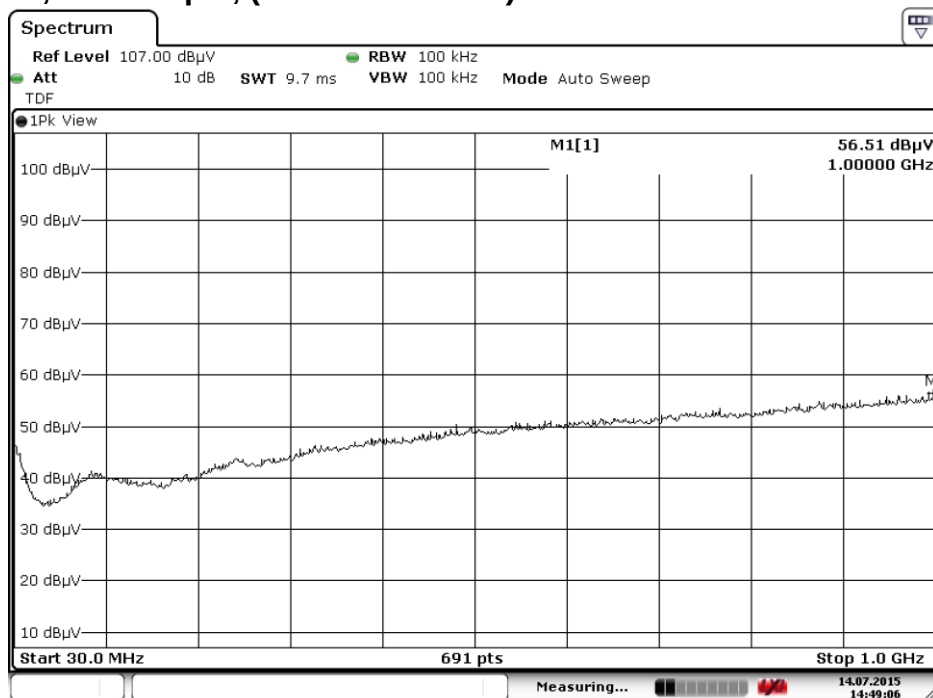
As shown in chapter 3.3 of this report.

### 5.5.4 Test procedure

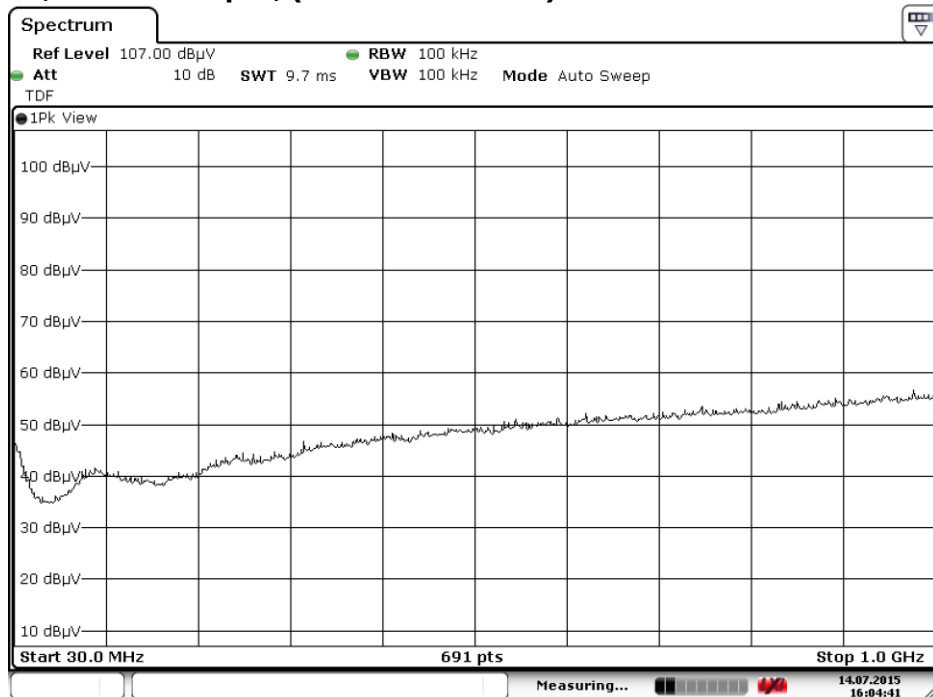
According to KDB Publication 558074 V02r02, sections 11.3 and 12.1

### 5.5.5 Test results IEEE 802.11n (54 Mbps)

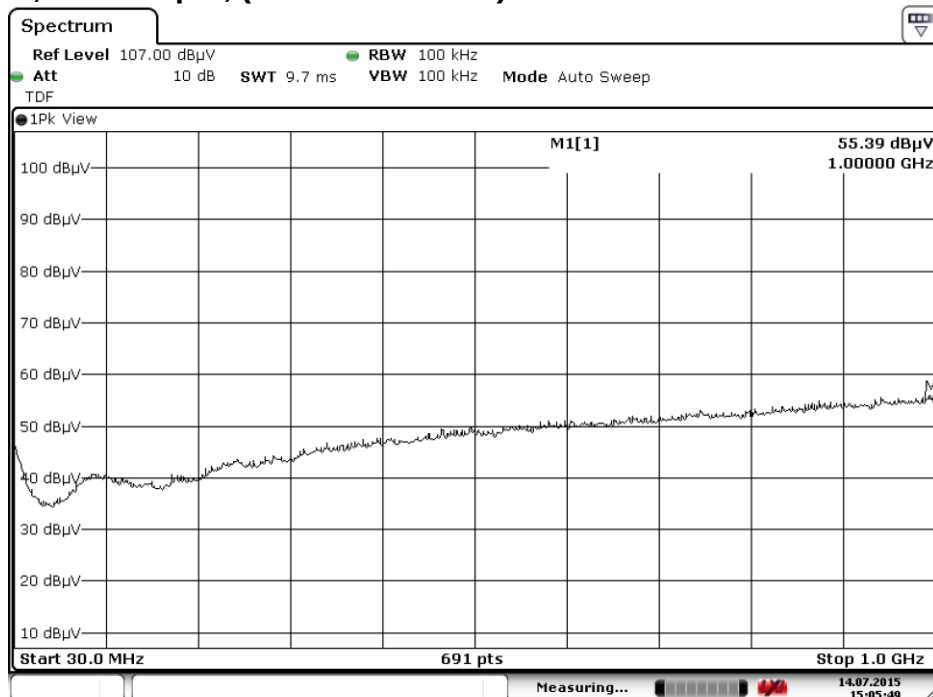
#### 1) Ch. Low, Vertical pol, ( $0.03 < F < 1 \text{ GHz}$ )



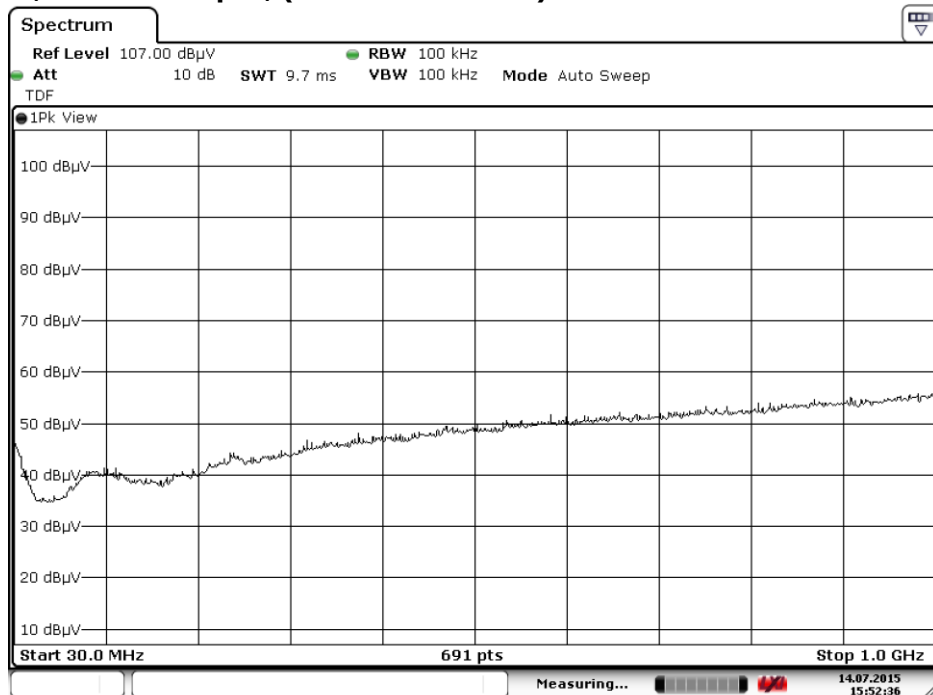
## 2) Ch. Low, Horizontal pol, ( $0.03 < F < 1$ GHz)



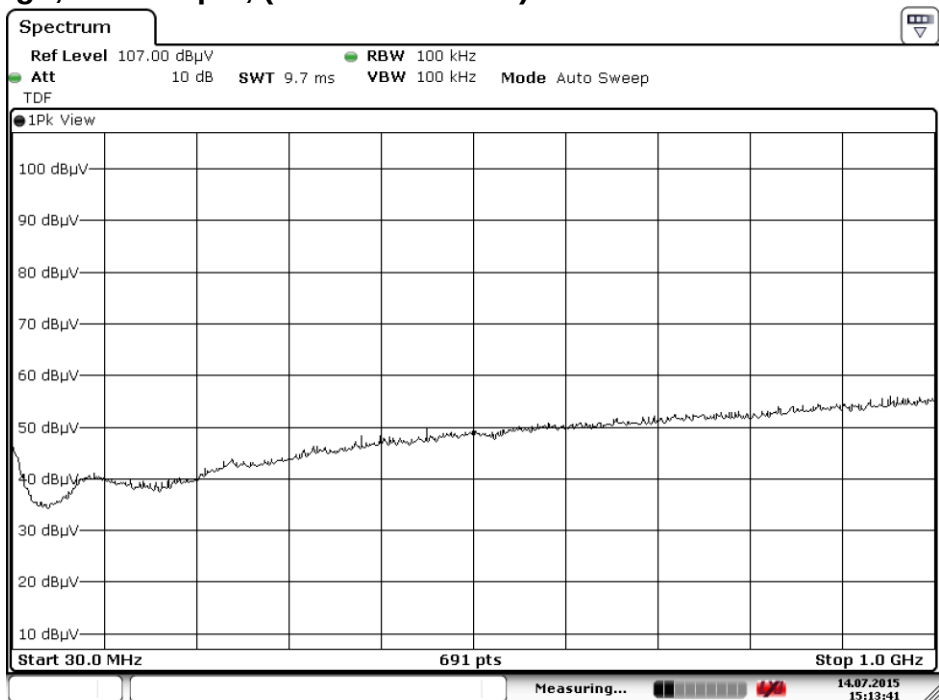
## 3) Ch. Mid, Vertical pol, ( $0.03 < F < 1$ GHz)



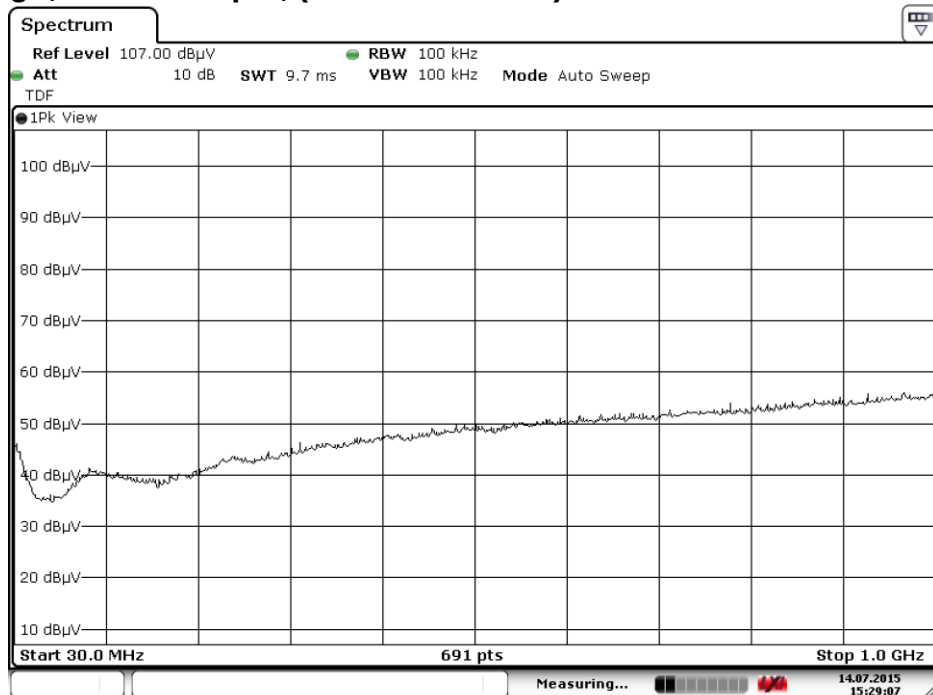
#### 4) Ch. Mid, Horizontal pol, ( $0.03 < F < 1$ GHz)



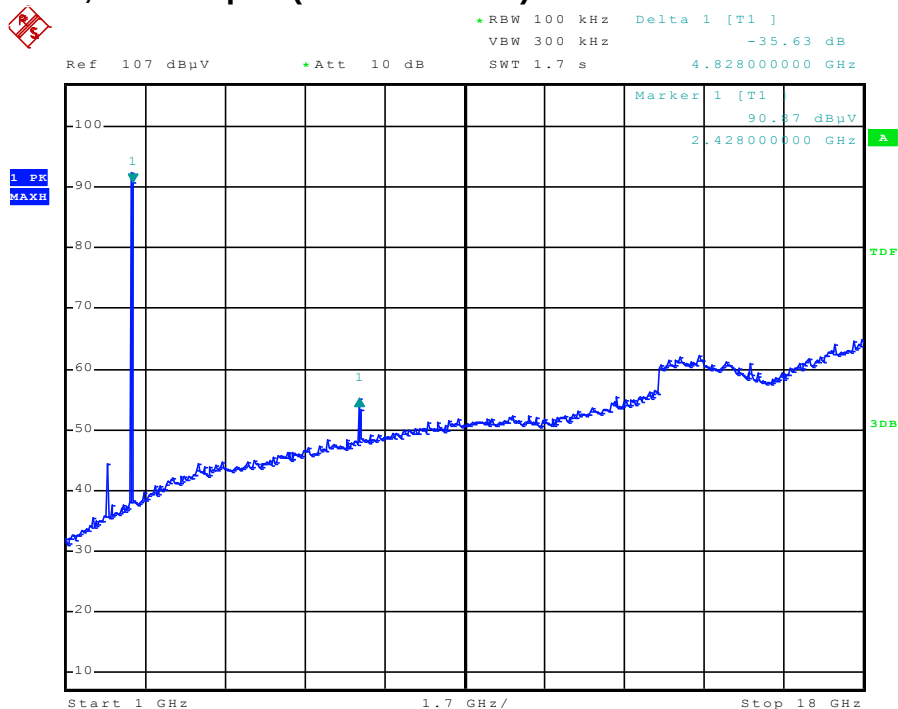
#### 5) Ch. High, Vertical pol, ( $0.03 < F < 1$ GHz)



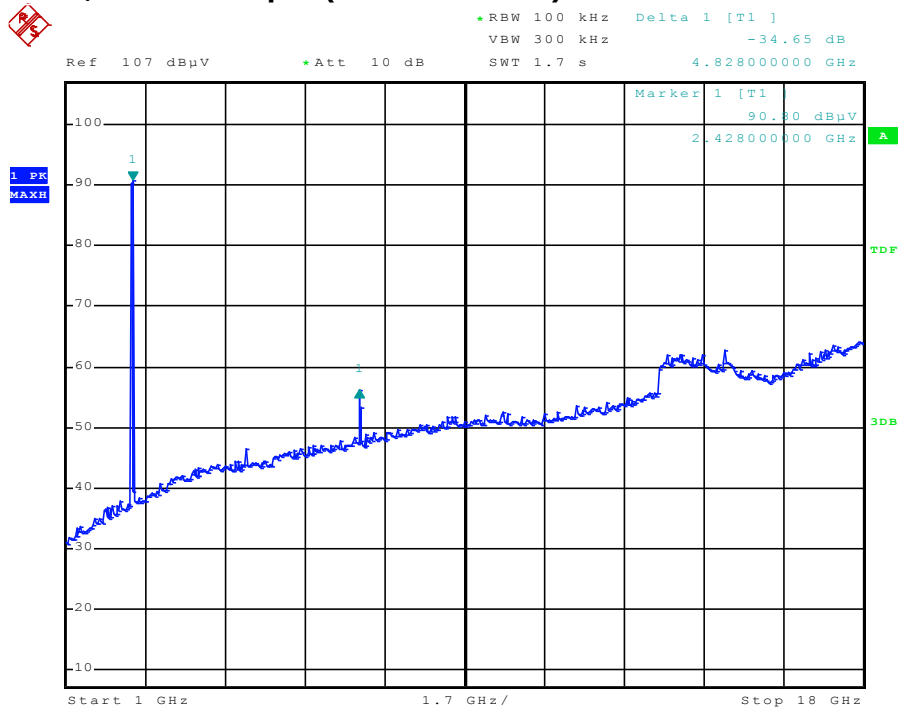
## 6) Ch. High, Horizontal pol, ( $0.03 < F < 1$ GHz)



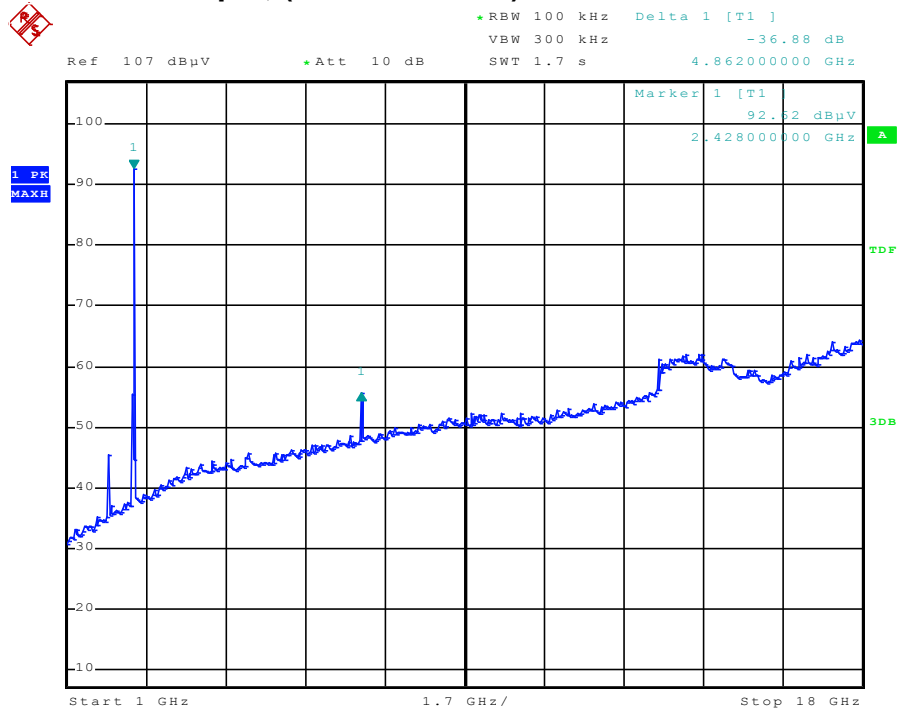
## 7) Ch. Low, Vertical pol ( $1 \leq F < 18$ GHz)



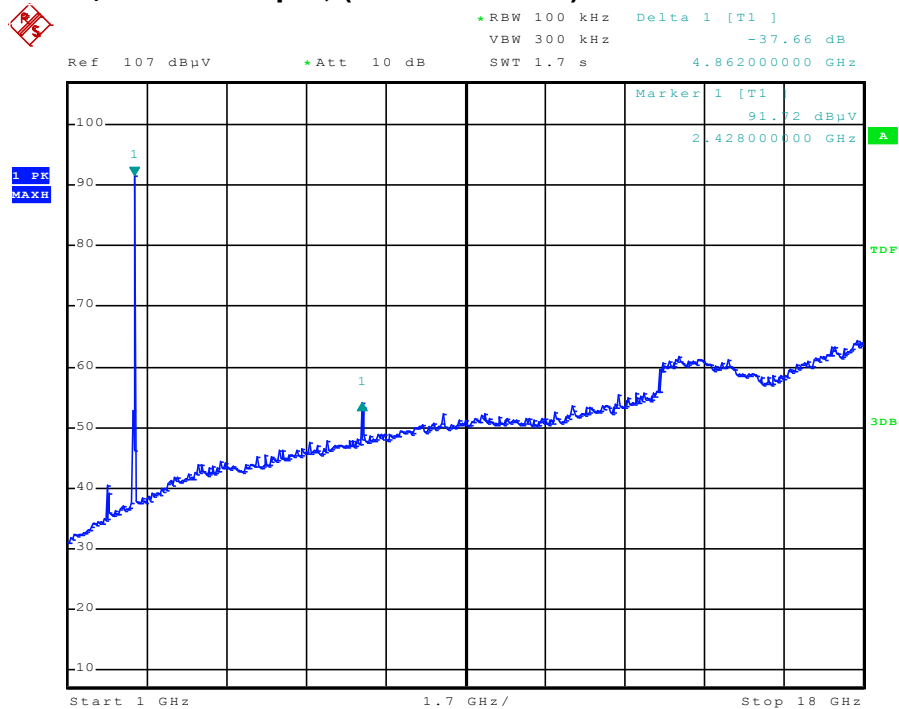
## 8) Ch. Low, Horizontal pol ( $1 \leq F < 18$ GHz)



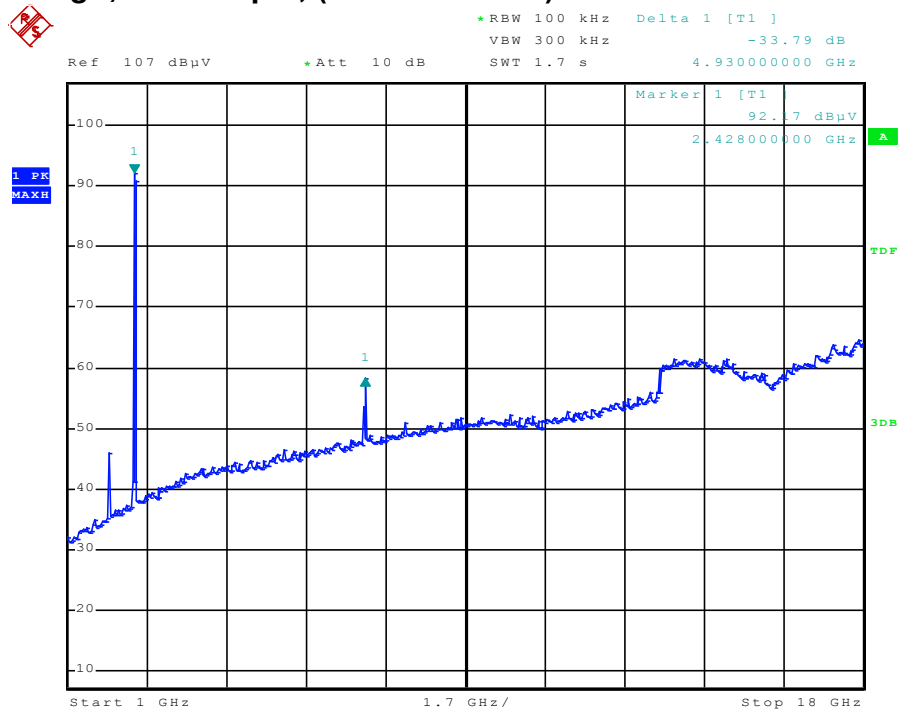
## 9) Ch. Mid, Vertical pol, ( $1 \leq F < 18$ GHz)



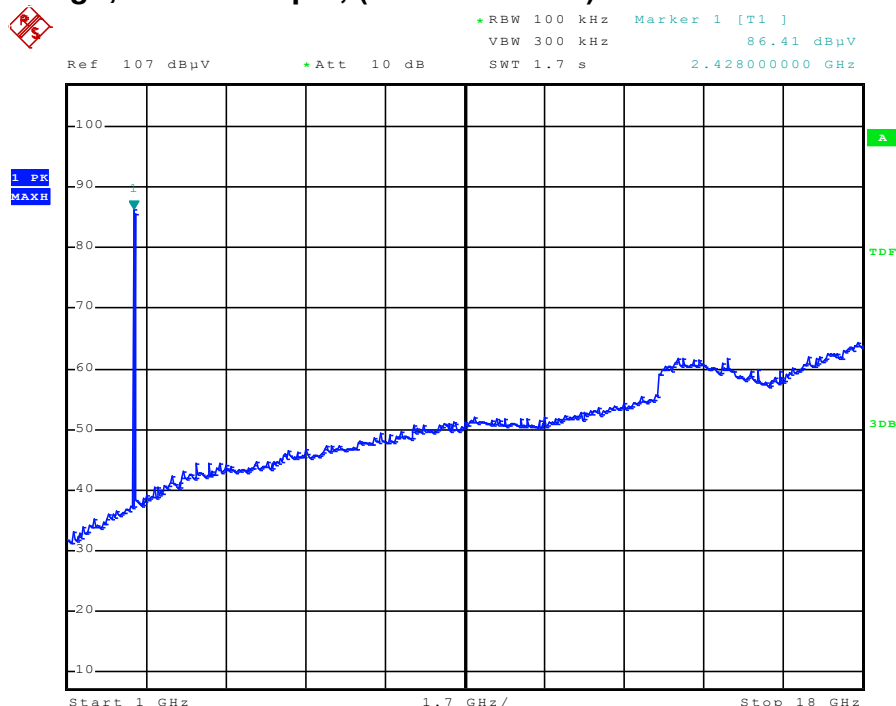
## 10) Ch. Mid, Horizontal pol, ( $1 \leq F < 18$ GHz)



## 11) Ch. High, Vertical pol, ( $1 \leq F < 18$ GHz)



## 12) Ch. High, Horizontal pol, ( $1 \leq F < 18$ GHz)



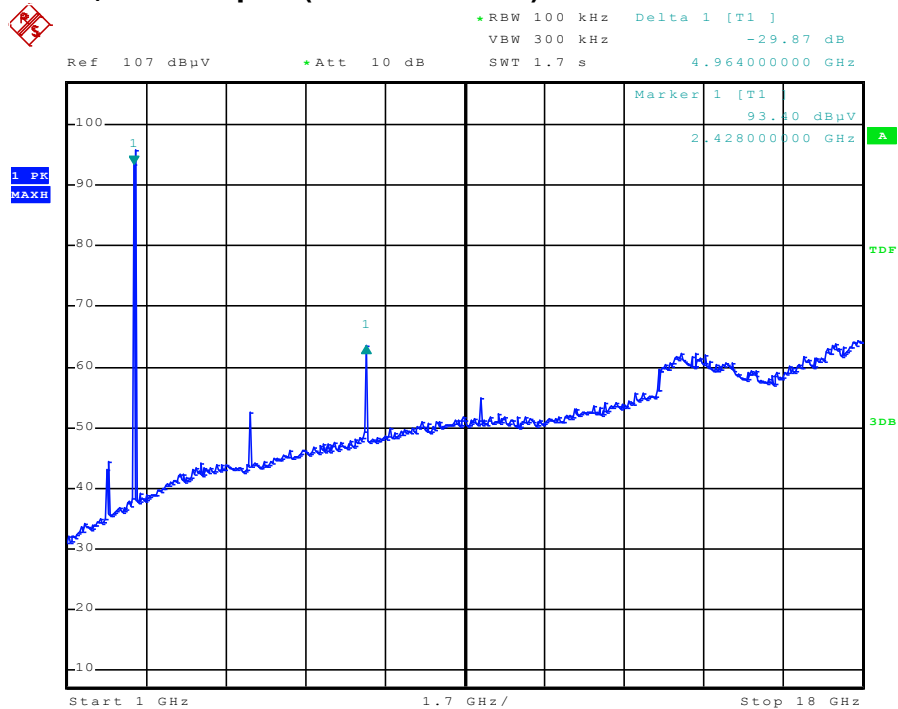
## 13) All channels, horizontal and vertical polarizations ( $18 \leq F < 26$ GHz)

Since no emissions higher than on the third harmonic frequency are found, as shown in the preceding graphs, measurements in the frequency range 18 to 26 GHz were considered not necessary. To confirm this an conducted pre-scan has been done, which can be seen in the plots on page 56.

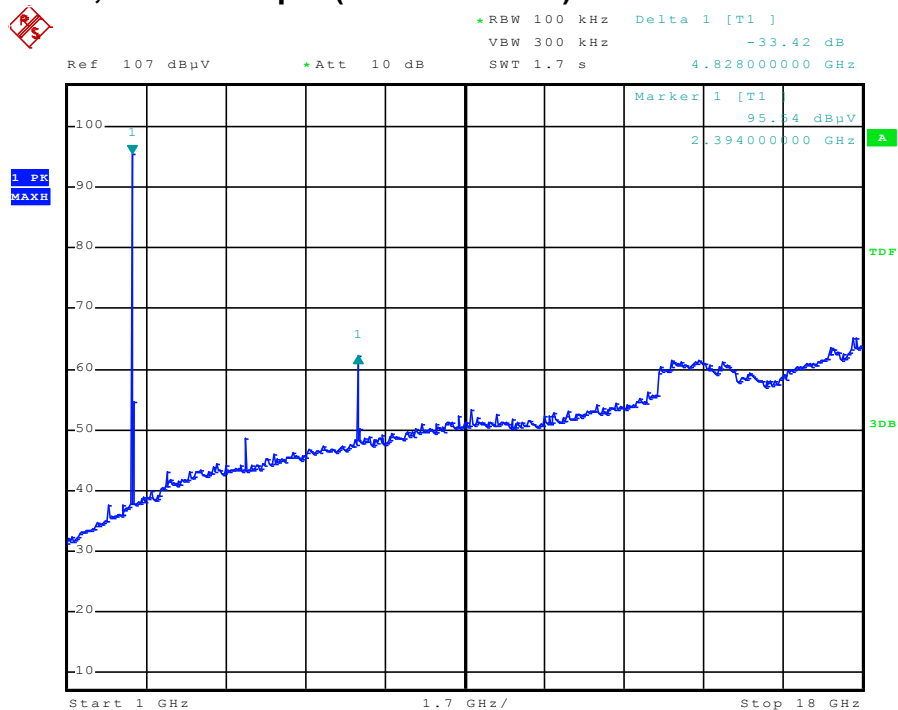
### 5.5.6 Test results IEEE 802.11b (1 Mbps)

- 1) Ch. Low, Vertical pol, ( $0.03 < F < 1$  GHz)  
See plot in 5.5.5.1
- 2) Ch. Low, Horizontal pol, ( $0.03 < F < 1$  GHz)  
See plot in 5.5.5.2
- 3) Ch. Mid, Vertical pol, ( $0.03 < F < 1$  GHz)  
See plot in 5.5.5.3
- 4) Ch. Mid, Horizontal pol, ( $0.03 < F < 1$  GHz)  
See plot in 5.5.5.4
- 5) Ch. High, Vertical pol, ( $0.03 < F < 1$  GHz)  
See plot in 5.5.5.5
- 6) Ch. High, Horizontal pol, ( $0.03 < F < 1$  GHz)  
See plot in 5.5.5.6

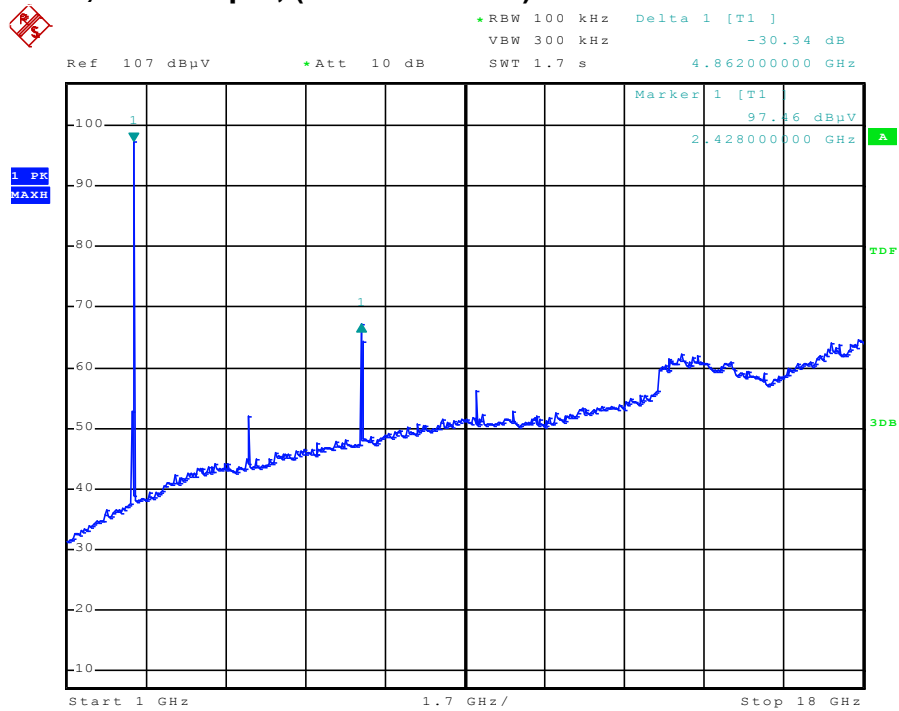
## 7) Ch. Low, Vertical pol ( $1 \leq F < 18$ GHz)



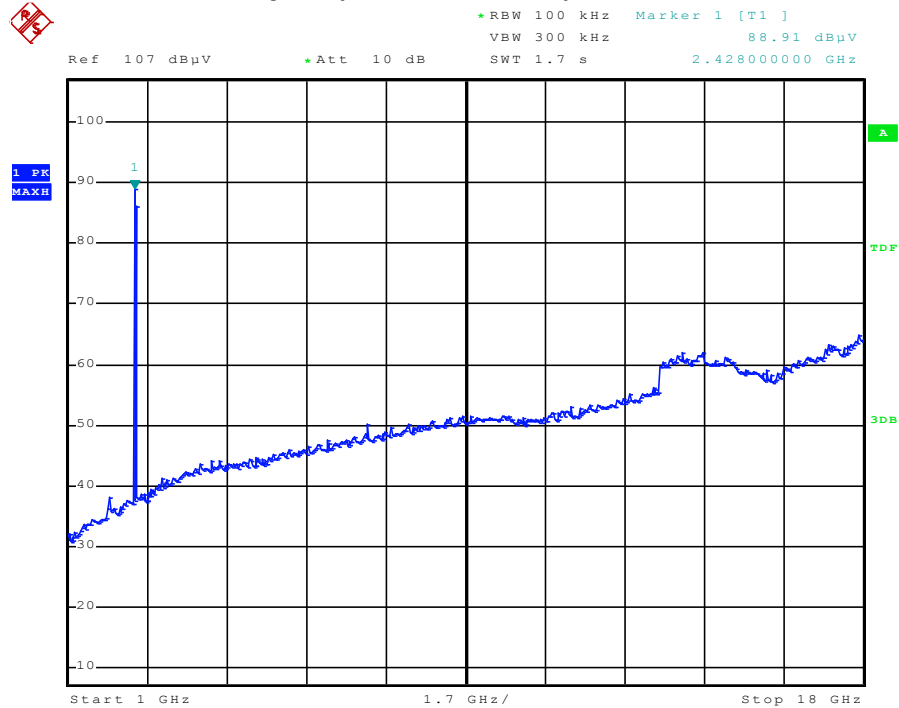
## 8) Ch. Low, Horizontal pol ( $1 \leq F < 18$ GHz)



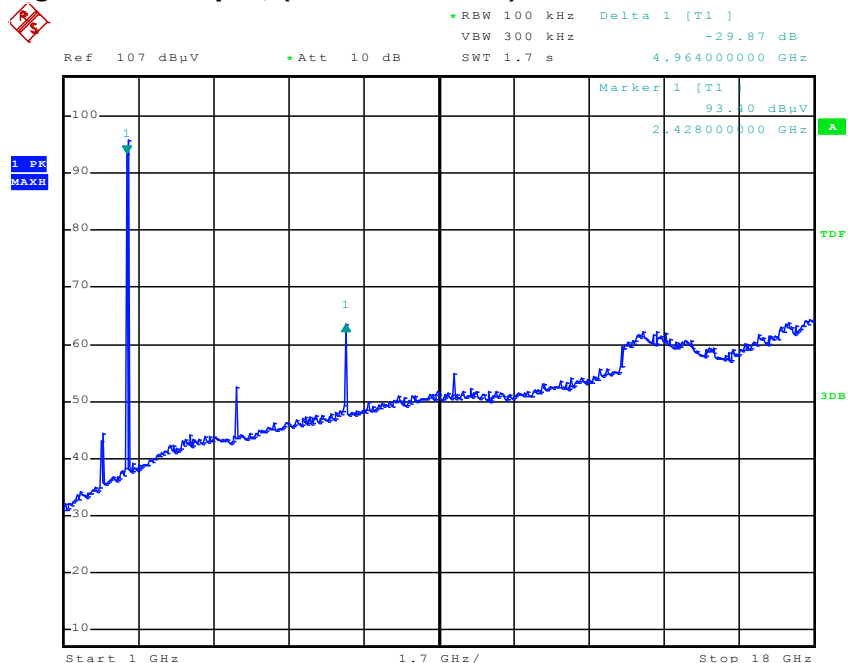
## 9) Ch. Mid, Vertical pol, ( $1 \leq F < 18$ GHz)



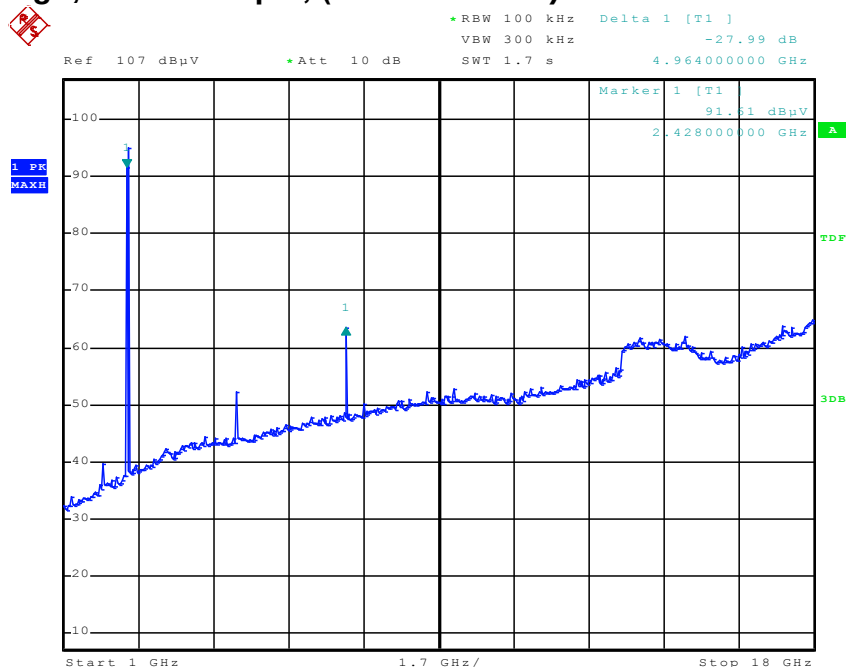
## 10) Ch. Mid, Horizontal pol, ( $1 \leq F < 18$ GHz)



### 11)Ch. High, Vertical pol, ( $1 \leq F < 18$ GHz)



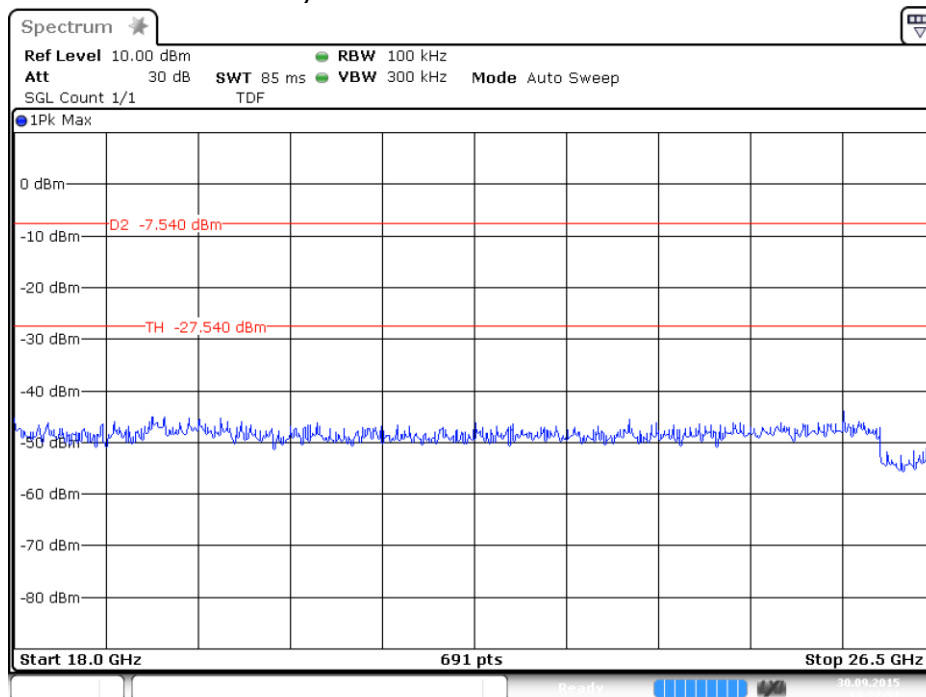
### 12)Ch. High, Horizontal pol, ( $1 \leq F < 18$ GHz)



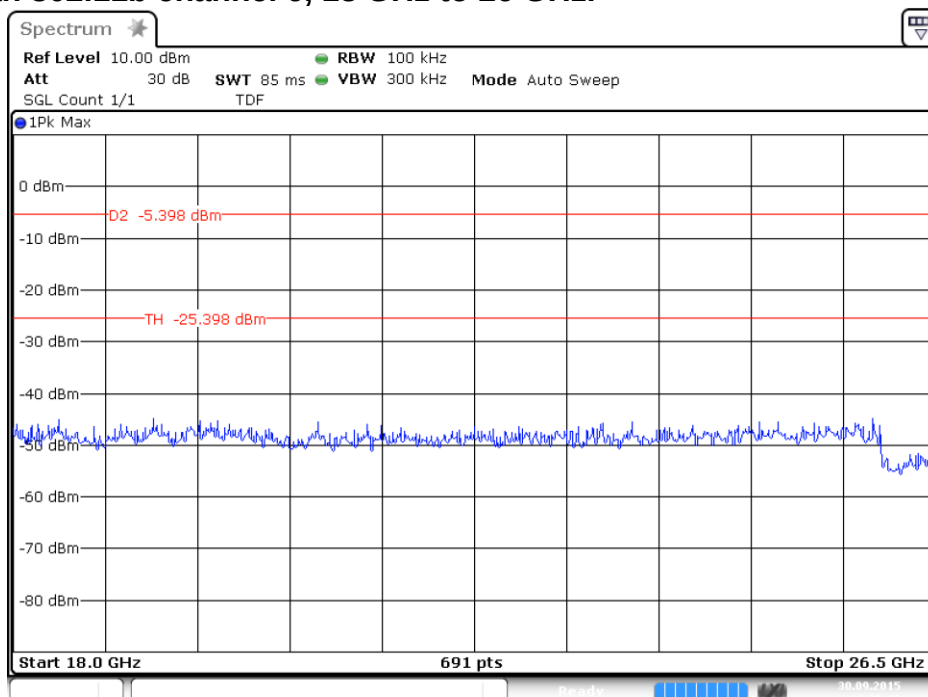
### 13)All channels, horizontal and vertical polarizations ( $18 \leq F < 26$ GHz)

Since no emissions higher than on the third harmonic frequency are found, as shown in the preceding graphs, measurements in the frequency range 18 to 26 GHz were considered not necessary. To confirm this, an conducted pre-scan has been done, which can be seen in the plot on the next page.

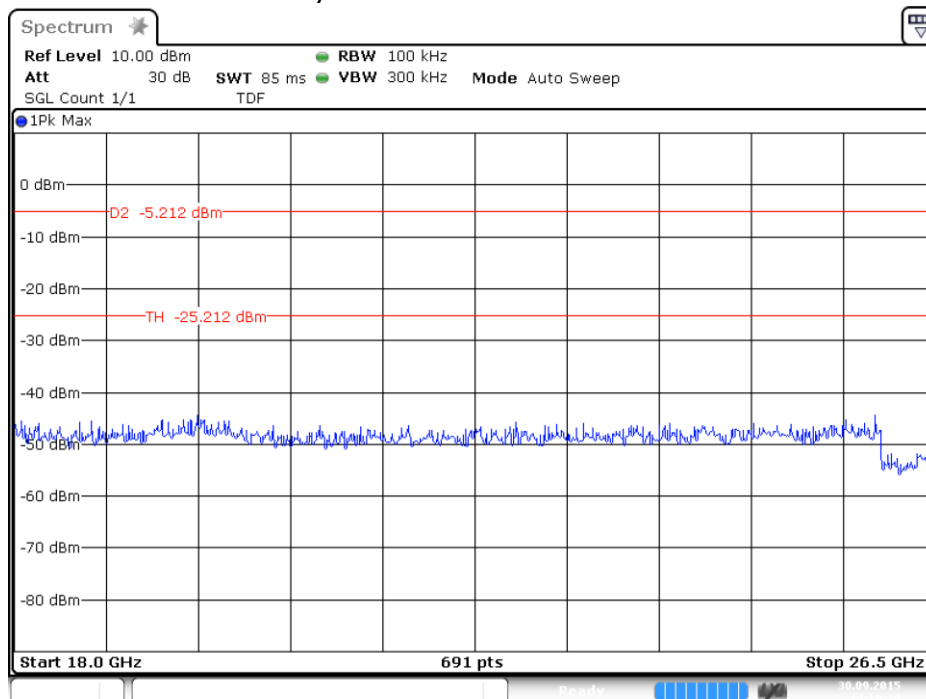
#### 14)Pre-scan 802.11b channel 1, 18 GHz to 26 GHz.



#### 15)Pre-scan 802.11b channel 6, 18 GHz to 26 GHz.



## 16)Pre-scan 802.11b channel 11, 18 GHz to 26 GHz



### Band edge

Since no Spurious emissions are found, as shown in the preceding graphs, band edge measurements were considered not to be necessary and therefore omitted.

### Measument uncertainty:

| Horizontal Polarization |        |
|-------------------------|--------|
| 30 – 200 MHz            | 4.5 dB |
| 200 – 1000 MHz          | 3.6 dB |
| 1000 – 18000 MHz        | 5.7 dB |
| Vertical Polarization   |        |
| 30 – 200 MHz            | 5.4 dB |
| 200 – 1000 MHz          | 4.6 dB |
| 1000 – 18000 MHz        | 5.7 dB |

## 5.6 AC Conducted Emission Measurement

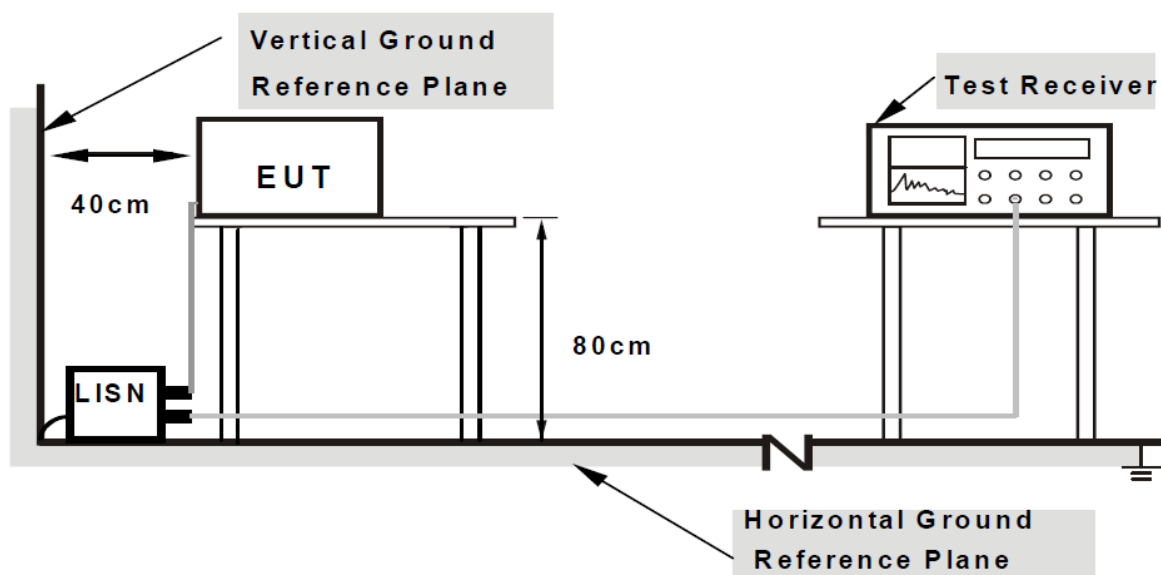
### 5.6.1 Limit

According to FCC part 15C §15.207

### 5.6.2 Measuring instruments

The measuring instruments are listed at the section 3.4 of this report.

### 5.6.3 Test setup

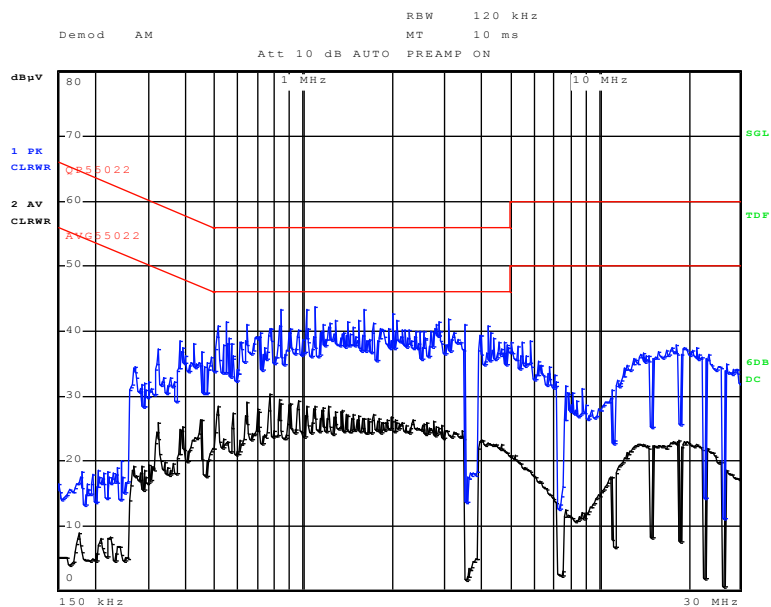


### 5.6.4 Test procedure

1. The EUT was placed 0.4 meters from the conducting wall of the shielded room with EUT being connected to the power mains through a line impedance stabilization network (LISN). Other support units were connected to the power mains through another LISN. The two LISNs provide 50 ohm/50  $\mu$ H of coupling impedance for the measuring instrument.
2. Both lines of the power mains connected to the EUT were checked for maximum conducted interference.
3. The Frequency range from 150 kHz to 30 MHz was searched. Emission levels under (Limit -20 dB) were not recorded.
4. All modes of operation were investigated and worst-case emissions are reported.

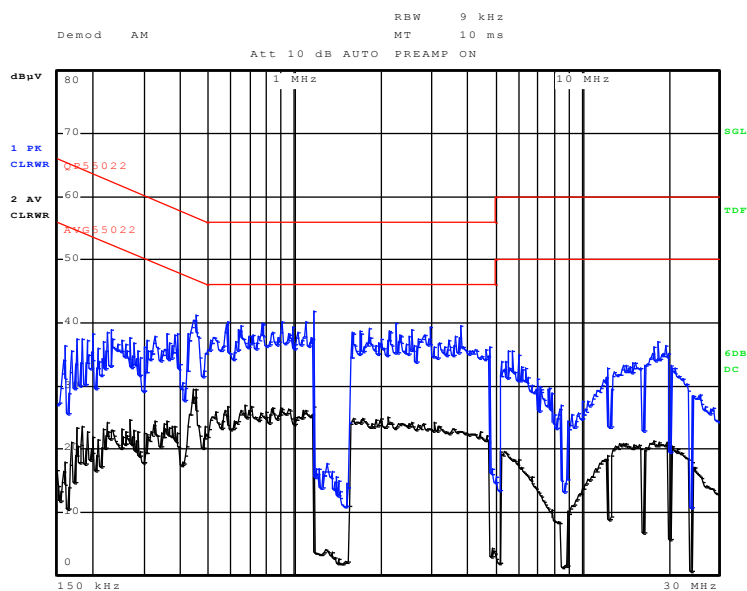
## 5.6.5 Test results for the USB Travel Charger

### Neutral:



Date: 14.JUL.2015 09:38:10

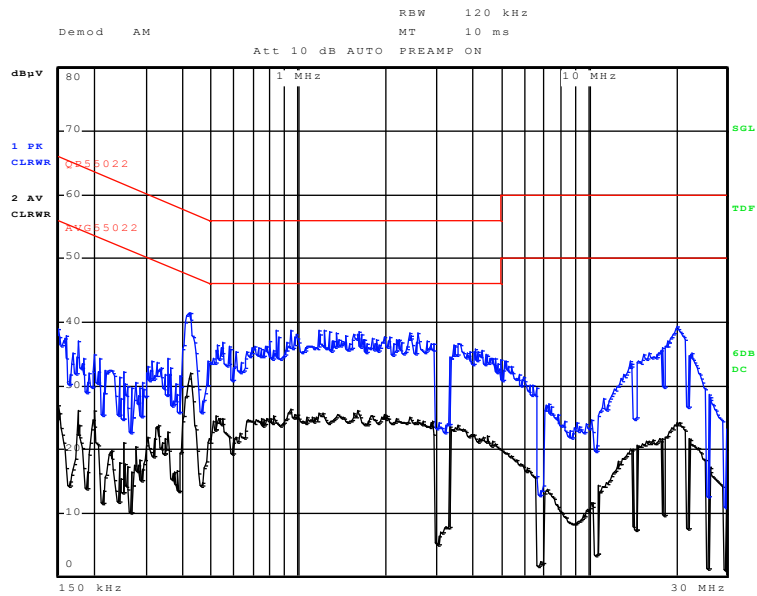
### Phase:



Date: 14.JUL.2015 09:40:34

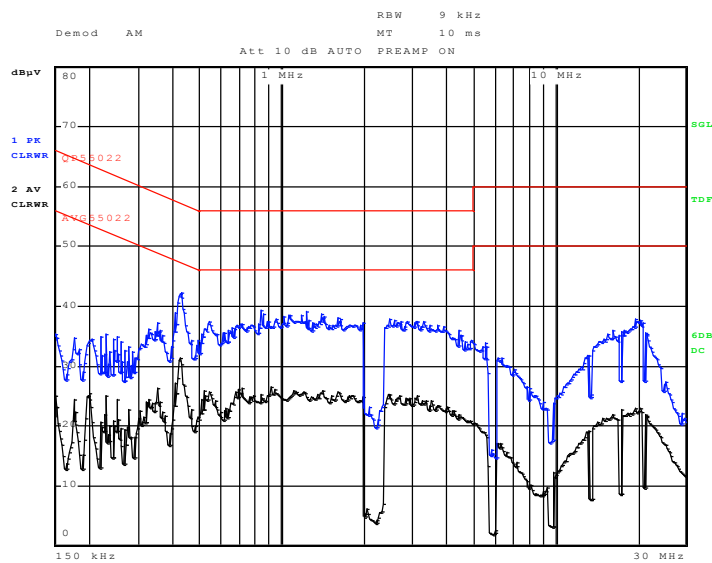
## 5.6.6 Test results for BC\_EX\_SM14\_USB\_Cable-1

Neutral:



Date: 14.JUL.2015 15:59:29

Phase:



Date: 14.JUL.2015 16:02:01

## **5.7 Antenna Requirement**

According to FCC 15.03, an intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this section. The manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited. This requirement does not apply to carrier current devices or to devices operated under the provisions of sections 15.211, 15.213, 15.217, 15.219 or 15.221. Further, this requirement does not apply to intentional radiators that must be professionally installed, such as perimeter protection systems and some field disturbance sensors, or to other intentional radiators which, in accordance with section 15.31(d), must be measured at the installation site. However, the installer shall be responsible for ensuring that the proper antenna is employed so that the limits in this part are not exceeded.

### **5.7.1 Test results**

This product has permanent antenna, fulfilling the requirement of this section.

**This is the last page of this test report.**