

**TEST REPORT**

**Report Number: 3131941MPK-001**

**Project Number: 3131941**

**September 19, 2007**

**Testing performed on the**

**Holm (ADSL2+ Wireless Residential Gateway)**

**Model Number: 3347-02**

**FCC ID: GZ53347**

**IC ID: 2525A-3347**

**to**

**FCC Part 15 Subpart C (15.247)**

**RSS-210 Annex 8**

**for**

**Netopia Inc.**



A2LA Certificate Number: 1755-01

**Test Performed by:**

Intertek Testing Services  
1365 Adams Court  
Menlo Park, CA 94025

**Test Authorized by:**

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## TABLE OF CONTENTS

|            |                                                                             |          |
|------------|-----------------------------------------------------------------------------|----------|
| <b>1.0</b> | <b>Summary of Tests .....</b>                                               | <b>4</b> |
| <b>2.0</b> | <b>General Description .....</b>                                            | <b>5</b> |
| 2.1        | Product Description .....                                                   | 5        |
| 2.2        | Related Submittal(s) Grants .....                                           | 5        |
| 2.3        | Test Methodology .....                                                      | 6        |
| 2.4        | Test Facility .....                                                         | 6        |
| <b>3.0</b> | <b>System Test Configuration.....</b>                                       | <b>7</b> |
| 3.1        | Support Equipment .....                                                     | 7        |
| 3.2        | Block Diagram of Test Setup.....                                            | 7        |
| 3.3        | Justification .....                                                         | 8        |
| 3.4        | Mode of Operation During Test.....                                          | 8        |
| 3.5        | Modifications Required for Compliance .....                                 | 8        |
| 3.6        | Additions, deviations and exclusions from standards.....                    | 8        |
| <b>4.0</b> | <b>Measurement Results.....</b>                                             | <b>9</b> |
| 4.1        | Maximum Conducted Output Power at Antenna Terminals,.....                   | 9        |
| 4.1.1      | Requirement.....                                                            | 9        |
| 4.1.2      | Procedure .....                                                             | 9        |
| 4.1.3      | Test Result .....                                                           | 9        |
| 4.2        | 6-dB RF Bandwidth, .....                                                    | 19       |
| 4.2.1      | Requirement.....                                                            | 19       |
| 4.2.2      | Procedure .....                                                             | 19       |
| 4.2.3      | Test Result .....                                                           | 19       |
| 4.3        | Power Spectral Density.....                                                 | 29       |
| 4.3.1      | Requirement.....                                                            | 29       |
| 4.3.2      | Procedure .....                                                             | 29       |
| 4.3.3      | Test Result .....                                                           | 29       |
| 4.4        | Out-of-Band Conducted Emissions, .....                                      | 36       |
| 4.4.1      | Requirement.....                                                            | 36       |
| 4.4.2      | Procedure .....                                                             | 36       |
| 4.4.3      | Test Result .....                                                           | 36       |
| 4.5        | Out of Band Radiated Emissions (except emissions in restricted bands) ..... | 57       |
| 4.5.1      | Procedure .....                                                             | 57       |
| 4.5.2      | Test Result .....                                                           | 57       |
| 4.6        | Transmitter Radiated Emissions in Restricted Bands, .....                   | 58       |
| 4.6.1      | Requirement.....                                                            | 58       |
| 4.6.2      | Procedure .....                                                             | 58       |
| 4.6.3      | Field Strength Calculation .....                                            | 58       |
| 4.6.4      | Test Result – bands: 2483.5 – 2500 MHz and 2310 – 2390 MHz.....             | 59       |
| 4.6.5      | Test Result - other restricted bands.....                                   | 80       |
| 4.7        | Radiated Emissions from Receiver and digital part.....                      | 82       |
| 4.7.1      | Limit .....                                                                 | 82       |
| 4.7.3      | Test Result .....                                                           | 82       |

|            |                                                                 |           |
|------------|-----------------------------------------------------------------|-----------|
| 4.8        | AC Line Conducted Emission, .....                               | 85        |
| 4.8.1      | Procedure .....                                                 | 85        |
| 4.8.2      | Test Result .....                                               | 85        |
| 4.9        | Radiation exposure evaluation.....                              | 90        |
| <b>5.0</b> | <b>List of Test Equipment .....</b>                             | <b>91</b> |
| <b>6.0</b> | <b>Document History .....</b>                                   | <b>92</b> |
|            | <b>Appendix A – 26-dB Bandwidth and Occupied Bandwidth.....</b> | <b>93</b> |

## 1.0 Summary of Tests

**FCC ID: GZ53347**

**IC ID: 2525A-3347**

| TEST                                                                                | REFERENCE<br>FCC Part 15 C   | REFERENCE<br>RSS-210 Annex 8 | RESULTS                                                                       |
|-------------------------------------------------------------------------------------|------------------------------|------------------------------|-------------------------------------------------------------------------------|
| <b>RF output power</b>                                                              | 15.247(b)                    | A8.4                         | Complies                                                                      |
| <b>6 dB Bandwidth</b>                                                               | 15.247(a)(2)                 | A8.2(1)                      | Complies                                                                      |
| <b>Power Density</b>                                                                | 15.247(d)                    | A8.2(2)                      | Complies                                                                      |
| <b>Out of Band Antenna<br/>Conducted Emission</b>                                   | 15.247(c)                    | A8.5                         | Complies                                                                      |
| <b>Out of Band Radiated Emission<br/>(except emissions in restricted<br/>bands)</b> | 15.247(c)                    | A8.5                         | Not performed. The EUT<br>passed out-of-band<br>antenna conducted<br>emission |
| <b>Radiated Emission in Restricted<br/>Bands</b>                                    | 15.247(c),<br>15.209, 15.205 | A8.5                         | Complies                                                                      |
| <b>AC Conducted Emission</b>                                                        | 15.207                       | RSS-Gen                      | Complies                                                                      |
| <b>Radiated Emission from Digital<br/>Part and Receiver</b>                         | 15.109                       | RSS-Gen                      | Complies.                                                                     |
| <b>Antenna Requirement</b>                                                          | 15.203                       | RSS-Gen                      | Complies. Antenna is<br>integral part of the EUT                              |

## 2.0 General Description

### 2.1 Product Description

The Equipment Under Test (EUT), model 3347-02, is an ADSL2+ Wireless Residential Gateway. It provides the ADSL Wide Area Network Interface, as well as four 10/100BASE-T Ethernet interfaces and an IEEE 802.11b/g wireless interface operating at 2.4 GHz.

Overview of the Equipment under Test:

|                                                           |                                                                                                                                                                                                                                                                                                               |
|-----------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Applicant</b>                                          | Netopia Inc.                                                                                                                                                                                                                                                                                                  |
| <b>Model No.</b>                                          | 3347-02                                                                                                                                                                                                                                                                                                       |
| <b>FCC Identifier</b>                                     | GZ53347                                                                                                                                                                                                                                                                                                       |
| <b>IC Identifier</b>                                      | 2525A-3347                                                                                                                                                                                                                                                                                                    |
| <b>Use of Product</b>                                     | ADSL2+ Wireless Residential Gateway                                                                                                                                                                                                                                                                           |
| <b>Manufacturer &amp; Model of Spread Spectrum Module</b> | Netopia Inc.                                                                                                                                                                                                                                                                                                  |
| <b>Modulation Technique</b>                               | DSSS (802.11b), OFDM (802.11g)                                                                                                                                                                                                                                                                                |
| <b>Rated RF Output</b>                                    | 400 mW (average)                                                                                                                                                                                                                                                                                              |
| <b>Frequency Range</b>                                    | 2412 – 2462 MHz                                                                                                                                                                                                                                                                                               |
| <b>Type of modulation</b>                                 | DBPSK, DQPSK, CCK, 16QAM, 64QAM                                                                                                                                                                                                                                                                               |
| <b>Number of Channel(s)</b>                               | 11                                                                                                                                                                                                                                                                                                            |
| <b>Antenna(s) &amp; Gain,</b>                             | Type: Centurion dipole with a right angle male MMCX connector.<br>Max Gain: -2dBi.                                                                                                                                                                                                                            |
| <b>Antenna Requirement</b>                                | The EUT does not have an external antenna connector                                                                                                                                                                                                                                                           |
| <b>Manufacturer Name &amp; Address</b>                    | Benchmark Electronics Thailand PCL<br>94 Moo 1 High-Tech Ind Est, Banlane Bang Pa-in<br>Ayudhaya, Thailand, 13160<br>contact: Watcharin Uthaitan (program manager)<br>email: <a href="mailto:Watcharin.Uthaitan@bench.com">Watcharin.Uthaitan@bench.com</a><br>phone: 011 663 535 0890, fax: 011 663 535 0945 |

**EUT receive date:** January 20, 2007

**EUT receive condition:** The EUT was received in good condition with no apparent damage.

**Test start date:** January 24, 2006

**Test completion date:** September 18, 2007

The test results in this report pertain only to the item tested.

### 2.2 Related Submittal(s) Grants

None

## 2.3 Test Methodology

Antenna conducted measurements were performed according to the procedure "Measurement of Digital Transmission Systems Operating under Section 15.247".

Both AC mains line-conducted and radiated emissions measurements were performed according to the procedures in ANSI C63.4 (2003). Radiated tests were performed at an antenna to EUT distance of 3 meters, unless stated otherwise in the "**Data Sheet**" of this Application.

All other measurements were made in accordance with the procedures in part 2 of CFR 47.

## 2.4 Test Facility

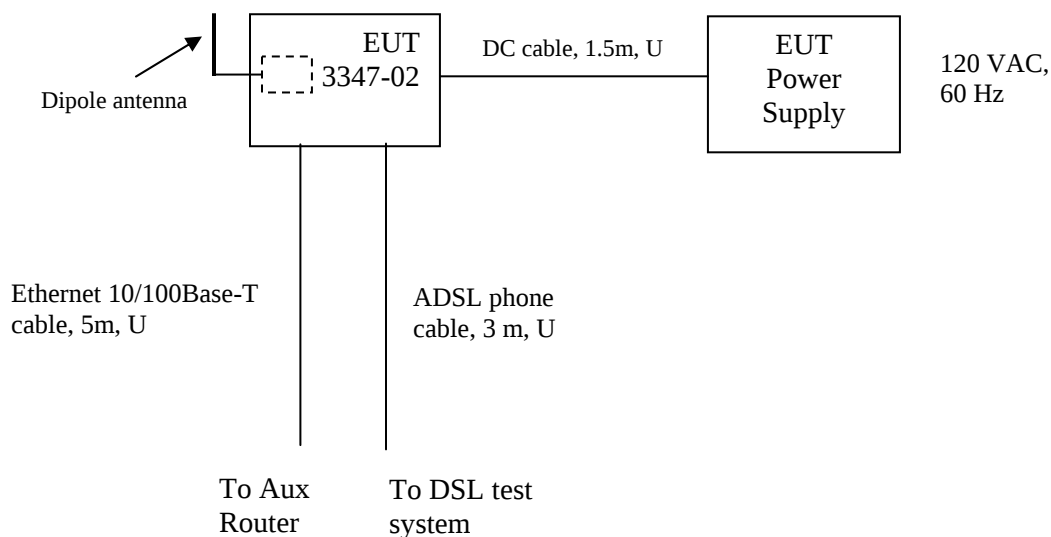
The open area test site and conducted measurement facility used to collect the radiated data is site 1 (10-m semi-anechoic chamber). This test facility and site measurement data have been fully placed on file with the FCC, IC and A2LA accredited.

### 3.0 System Test Configuration

#### 3.1 Support Equipment

| Description                  | Model No.      | Serial No.  |
|------------------------------|----------------|-------------|
| Veritas 2000 DSL Test System | ADS-00600 4003 | P3806008    |
| Netopia Auxiliary Router     | Not Labeled    | Not Labeled |

#### 3.2 Block Diagram of Test Setup



Power Supply: CUI Inc., model: 48-12-1000D

|                                              |                                                        |
|----------------------------------------------|--------------------------------------------------------|
| <b>S</b> = Shielded<br><b>U</b> = Unshielded | <b>F</b> = With Ferrite<br><b>m</b> = Length in Meters |
|----------------------------------------------|--------------------------------------------------------|

### 3.3 Justification

For emission testing, the equipment under test (EUT) was configured for testing in a typical fashion (as a customer would normally use it).

Preliminary testing was performed for all modulation/data rate modes. The following modes were selected for final measurements: CCK 11 Mbps – for 802.11b; OFDM 9 Mbps and 54 Mbps – for 802.11g.

As declared by the Applicant, the transmitter operates with the Duty Cycle of 40% in normal operation. Therefore, the Duty Cycle Correction Factor was taken into account for spurious radiated emissions.

### 3.4 Mode of Operation During Test

During testing, the transmitter was setup to transmit continuously at maximum RF power on low, middle and high channels.

### 3.5 Modifications Required for Compliance

Intertek installed no modifications during compliance testing in order to bring the product into compliance (Please note that this does not include changes made specifically by Netopia prior to compliance testing)

### 3.6 Additions, deviations and exclusions from standards

No additions, deviations or exclusions from the standard were made.

## 4.0 Measurement Results

### 4.1 Maximum Conducted Output Power at Antenna Terminals, FCC Rule 15.247(b)

#### 4.1.1 Requirement

For antennas with gains of 6 dBi or less, maximum allowed transmitter output is 1 watt (+30 dBm).  
For antennas with gains greater than 6 dBi, transmitter output level must be decreased by an amount equal to (GAIN - 6) dBm.

#### 4.1.2 Procedure

The antenna port of the EUT was connected to the input of a spectrum analyzer to measure the Average Transmitter Output Power.

For conducted power measurement for FCC Part 15C testing, the procedure “**Measurement of Digital Transmission Systems Operating under Section 15.247**” is used. In particular – the **Power Output Option 2, Method #1**, - spectral trace averaging and sum the power across the 26-dB bandwidth of the signal.

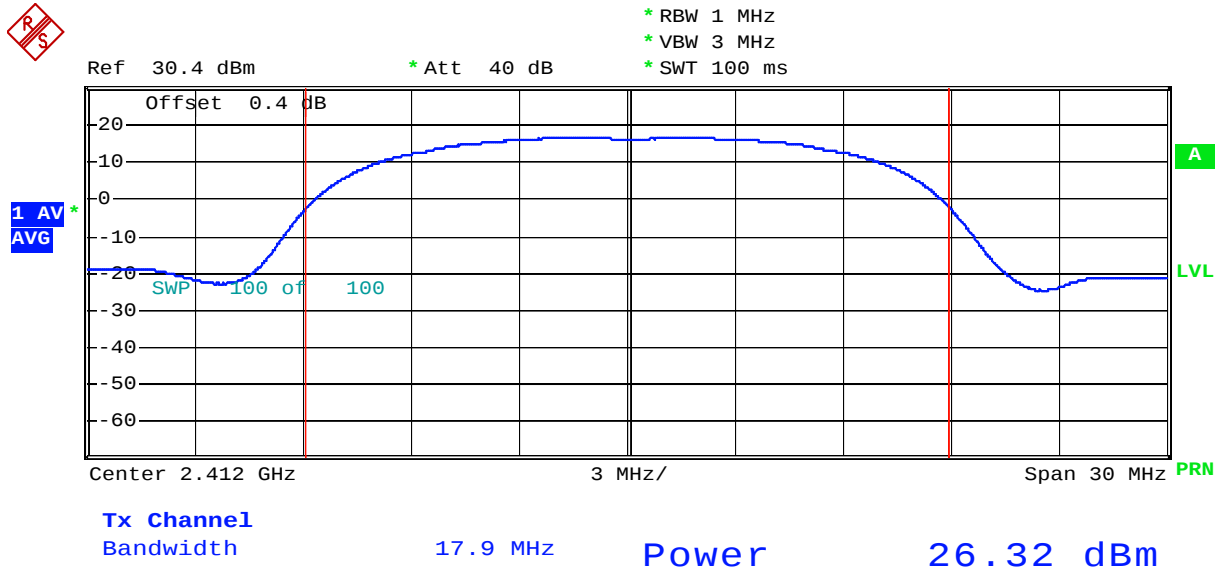
The 26-dB bandwidth was measured and recorded (see the graphs in Appendix A). Then the average power was measured by using a spectrum analyzer build-in facility for “channel power” measurement. Cable loss correction was added to the reading to obtain power at the EUT antenna terminals.

#### 4.1.3 Test Result

The results are presented on the following plots 1.1 – 1.9 and summarized in the table below.

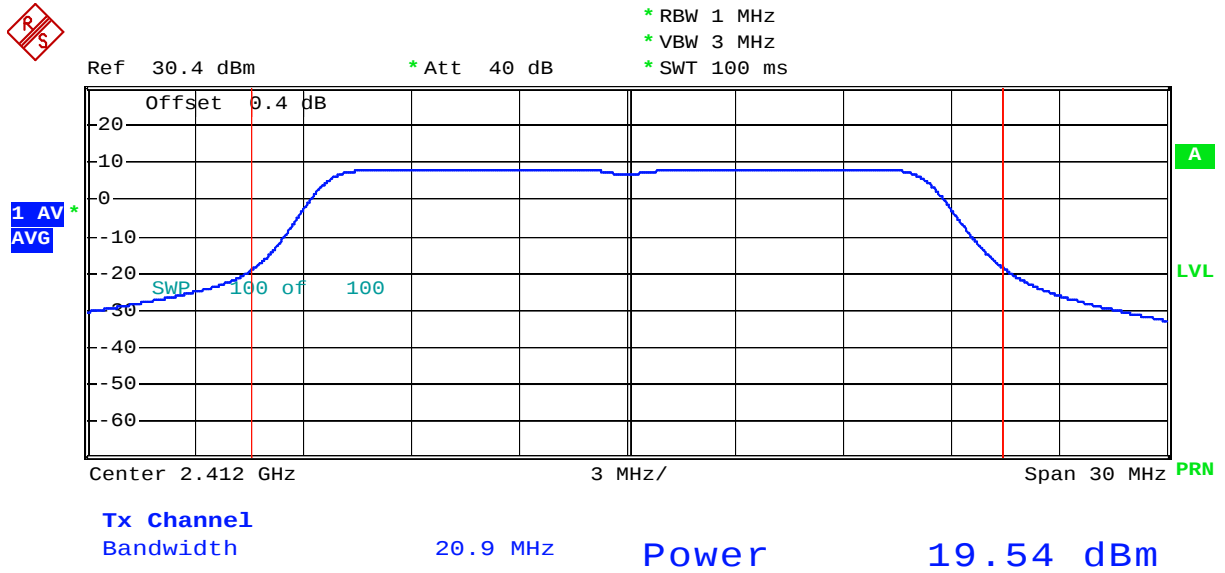
| Channel | Frequency<br>MHz | Standard | Date rate<br>Mbps | 26-dB<br>Bandwidth<br>MHz | Conducted power<br>(average)<br>dBm | Conducted<br>power Limit<br>dBm | Margin<br>dB | Plot |
|---------|------------------|----------|-------------------|---------------------------|-------------------------------------|---------------------------------|--------------|------|
| 1       | 2412             | 802.11b  | 11                | 17.9                      | 26.3                                | 30.0                            | -3.7         | 1.1  |
| 1       | 2412             | 802.11g  | 9                 | 20.9                      | 19.5                                | 30.0                            | -7.5         | 1.2  |
| 1       | 2412             | 802.11g  | 54                | 20.3                      | 19.2                                | 30.0                            | -6.9         | 1.3  |
| 6       | 2437             | 802.11b  | 11                | 17.9                      | 26.3                                | 30.0                            | -3.7         | 1.4  |
| 6       | 2437             | 802.11g  | 9                 | 27.8                      | 25.9                                | 30.0                            | -4.1         | 1.5  |
| 6       | 2437             | 802.11g  | 54                | 20.8                      | 23.3                                | 30.0                            | -6.7         | 1.6  |
| 11      | 2462             | 802.11b  | 11                | 17.9                      | 25.9                                | 30.0                            | -3.6         | 1.7  |
| 11      | 2462             | 802.11g  | 9                 | 21.8                      | 21.0                                | 30.0                            | -7.2         | 1.8  |
| 11      | 2462             | 802.11g  | 54                | 20.4                      | 20.5                                | 30.0                            | -7.4         | 1.9  |

Plot 1.1



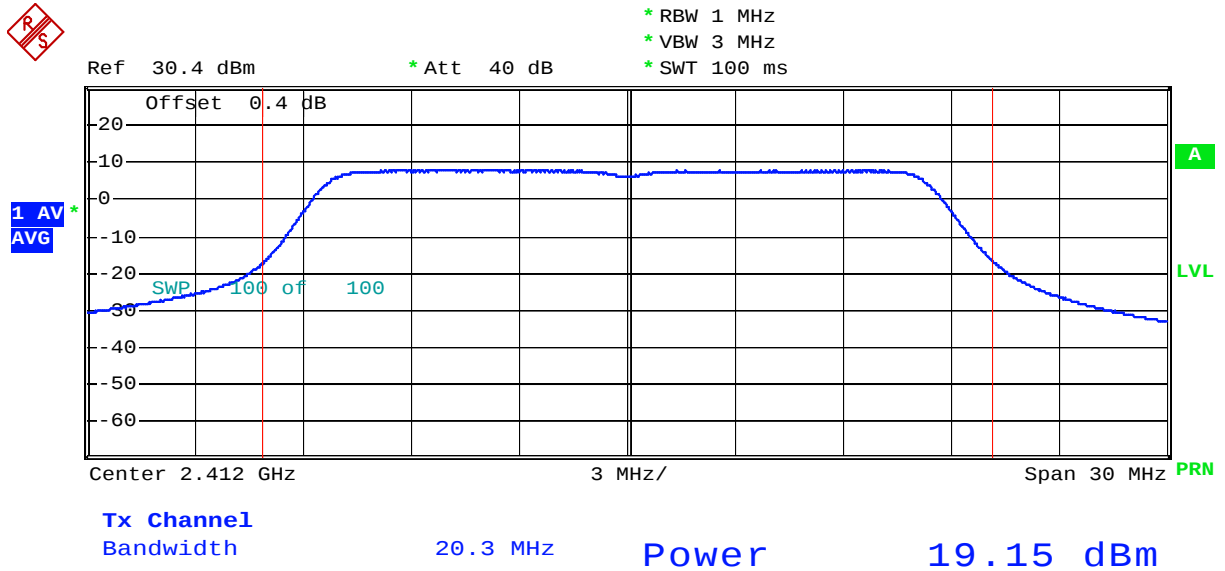
Comment: Power, Ch 1, CCK 11 Mbps  
Date: 30.JAN.2007 12:37:12

Plot 1.2



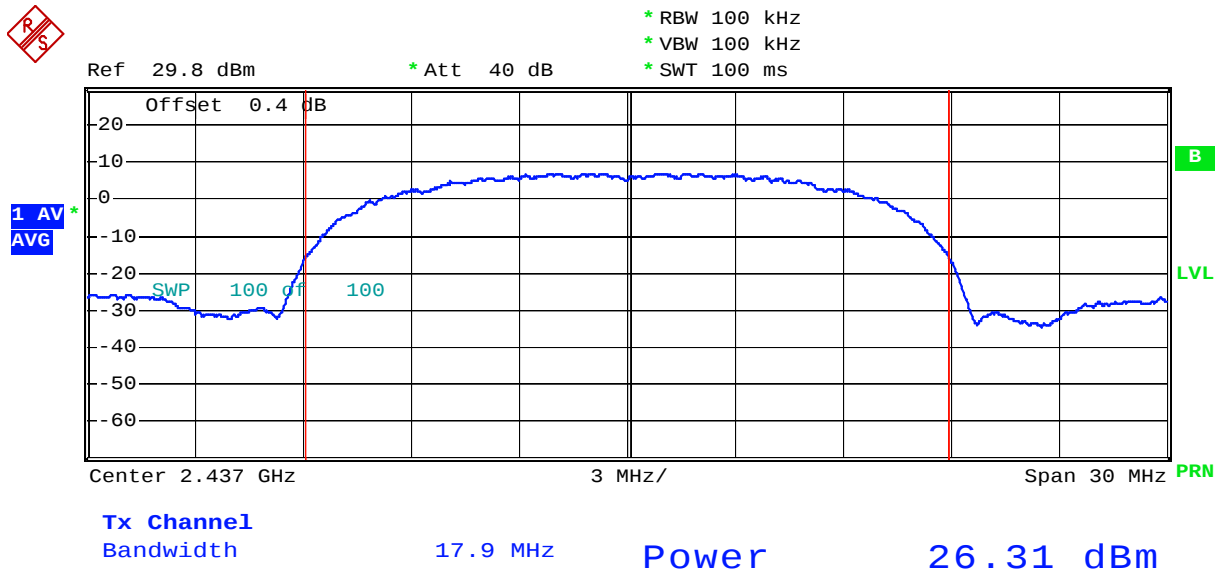
Comment: Power, Ch 1, OFDM 9 Mbps  
Date: 30.JAN.2007 12:39:45

Plot 1.3



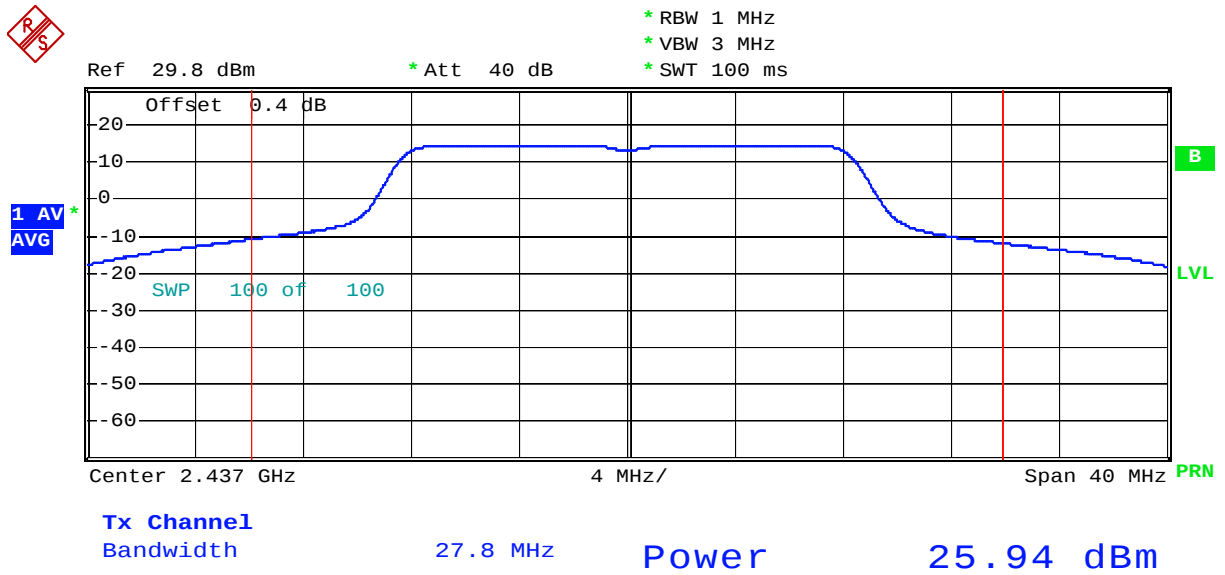
Comment: Power, Ch 1, OFDM 54 Mbps  
Date: 30.JAN.2007 12:41:22

Plot 1.4



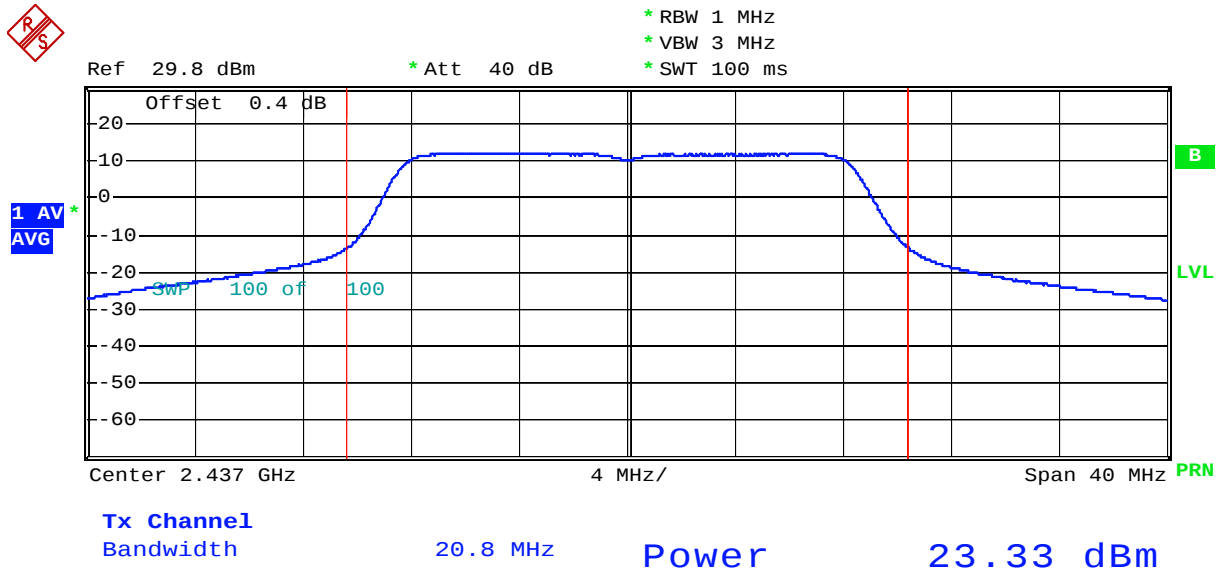
Comment: Power, Ch 6, CCK 11 Mbps  
Date: 25.JAN.2007 13:52:45

Plot 1.5



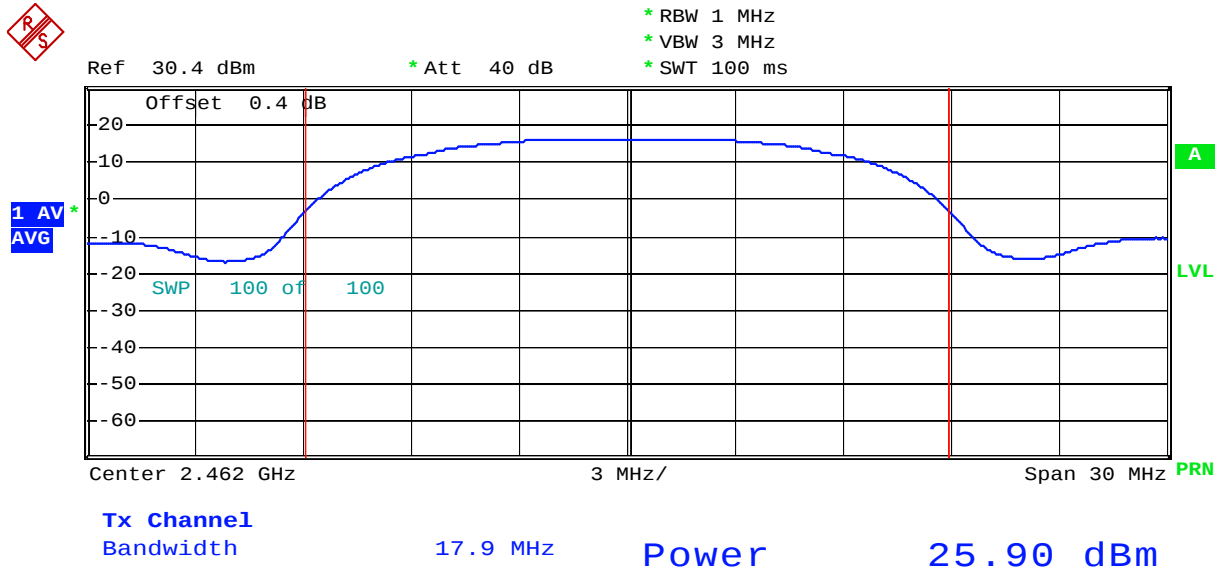
Comment: Power, Ch 6, OFDM 9 Mbps  
Date: 25.JAN.2007 12:36:30

Plot 1.6



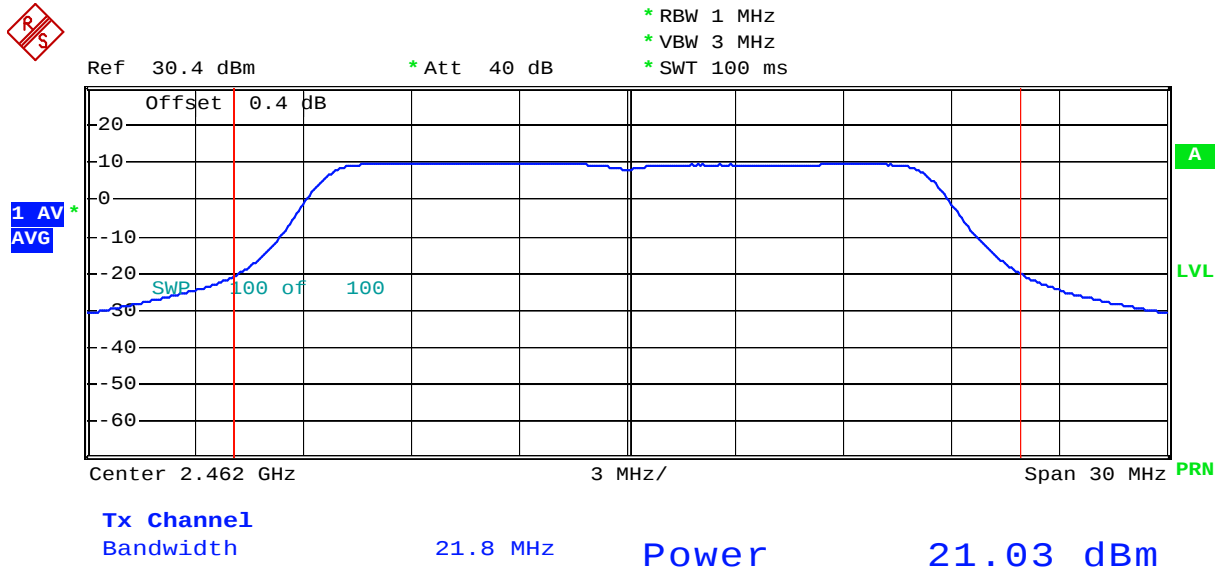
Comment: Power, Ch 6, OFDM 54 Mbps  
Date: 25.JAN.2007 13:05:02

Plot 1.7



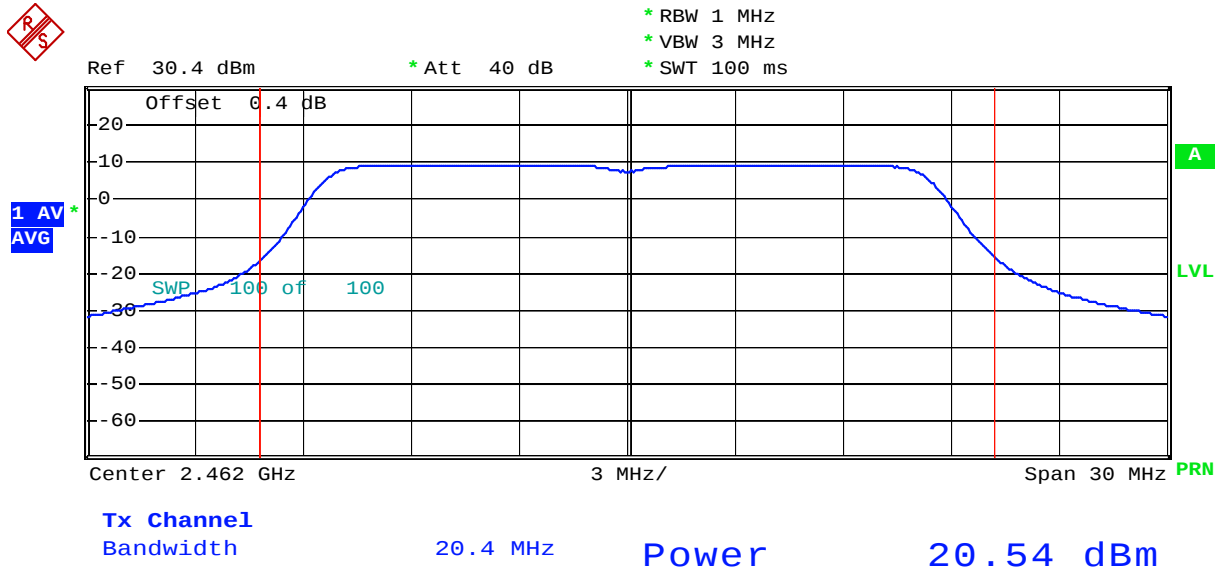
Comment: Power, Ch 11, CCK 11 Mbps  
Date: 30.JAN.2007 12:14:47

Plot 1.8



Comment: Power, Ch 11, OFDM 9 Mbps  
 Date: 30.JAN.2007 12:25:40

Plot 1.9



Comment: Power, Ch 11, OFDM 54 Mbps  
Date: 30.JAN.2007 12:27:36

## 4.2 6-dB RF Bandwidth, FCC Rule 15.247(a)(2)

### 4.2.1 Requirement

The minimum 6-dB bandwidth shall be at least 500 kHz

### 4.2.2 Procedure

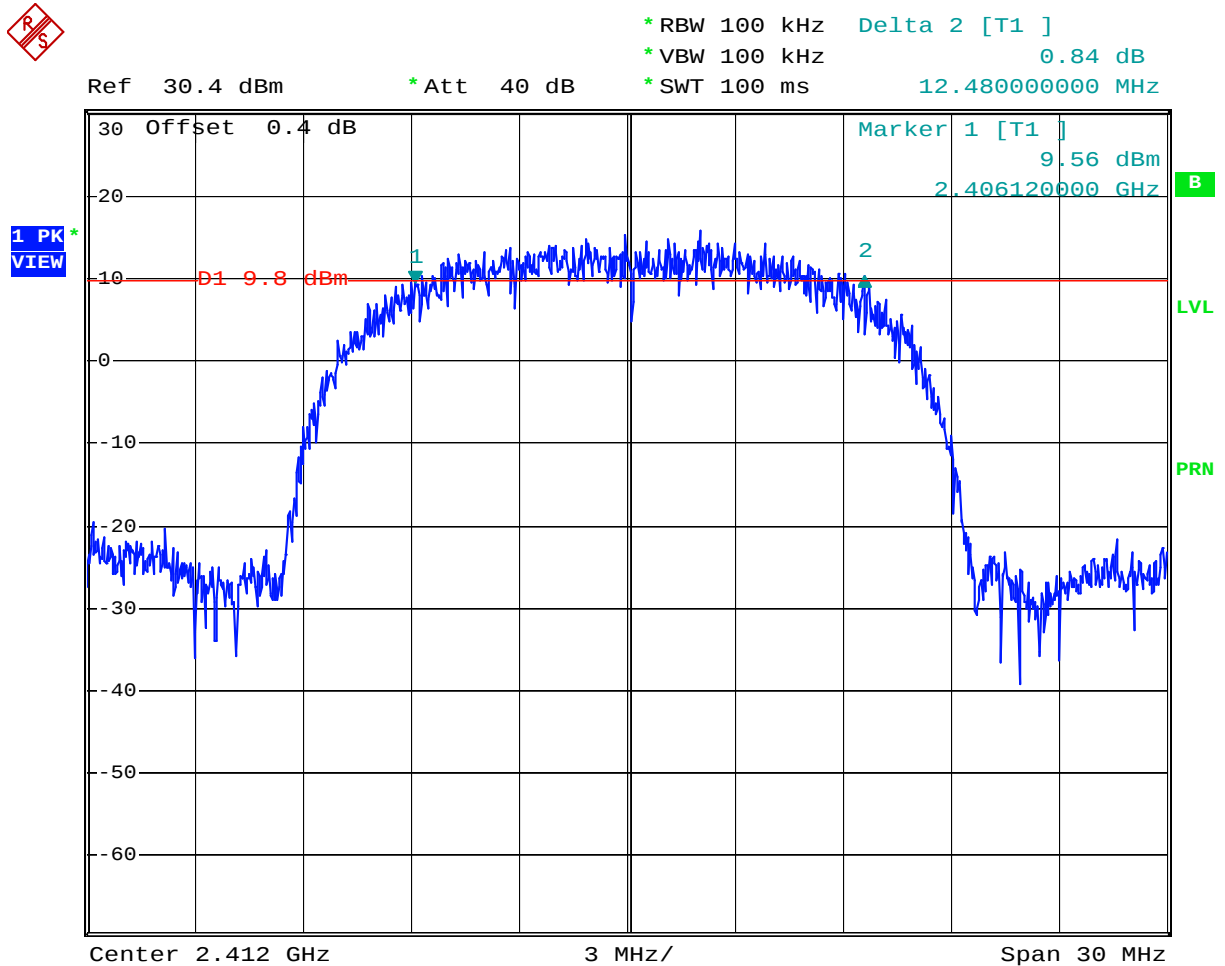
The antenna port of the EUT was connected to the input of a spectrum analyzer. Analyzer RES BW was set to 100 kHz. For each RF output channel investigated, the spectrum analyzer center frequency was set to the channel carrier. A PEAK output reading was taken, a DISPLAY line was drawn 6 dB lower than PEAK level. The 6-dB bandwidth was determined from where the channel output spectrum intersected the display line.

### 4.2.3 Test Result

The results are presented on the following plots 2.1 – 2.9 and summarized in the table below.

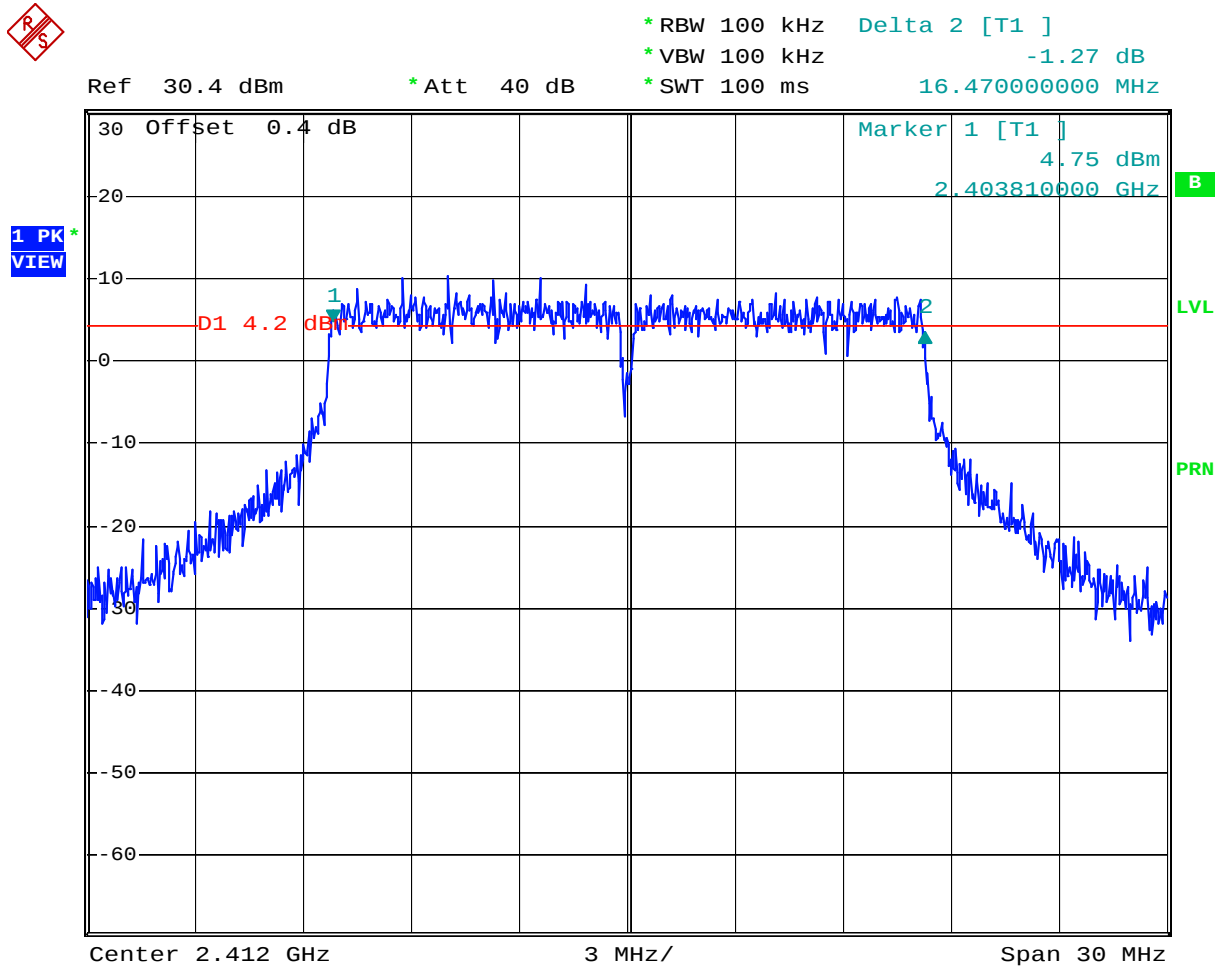
| Channel | Frequency<br>MHz | Standard | Date rate<br>Mbps | 6-dB Bandwidth<br>MHz | Plot |
|---------|------------------|----------|-------------------|-----------------------|------|
| 1       | 2412             | 802.11b  | 11                | 12.5                  | 2.1  |
| 1       | 2412             | 802.11g  | 9                 | 16.5                  | 2.2  |
| 1       | 2412             | 802.11g  | 54                | 16.5                  | 2.3  |
| 6       | 2437             | 802.11b  | 11                | 12.5                  | 2.4  |
| 6       | 2437             | 802.11g  | 9                 | 16.6                  | 2.5  |
| 6       | 2437             | 802.11g  | 54                | 16.5                  | 2.6  |
| 11      | 2462             | 802.11b  | 11                | 12.5                  | 2.7  |
| 11      | 2462             | 802.11g  | 9                 | 16.5                  | 2.8  |
| 11      | 2462             | 802.11g  | 54                | 16.5                  | 2.9  |

Plot 2.1



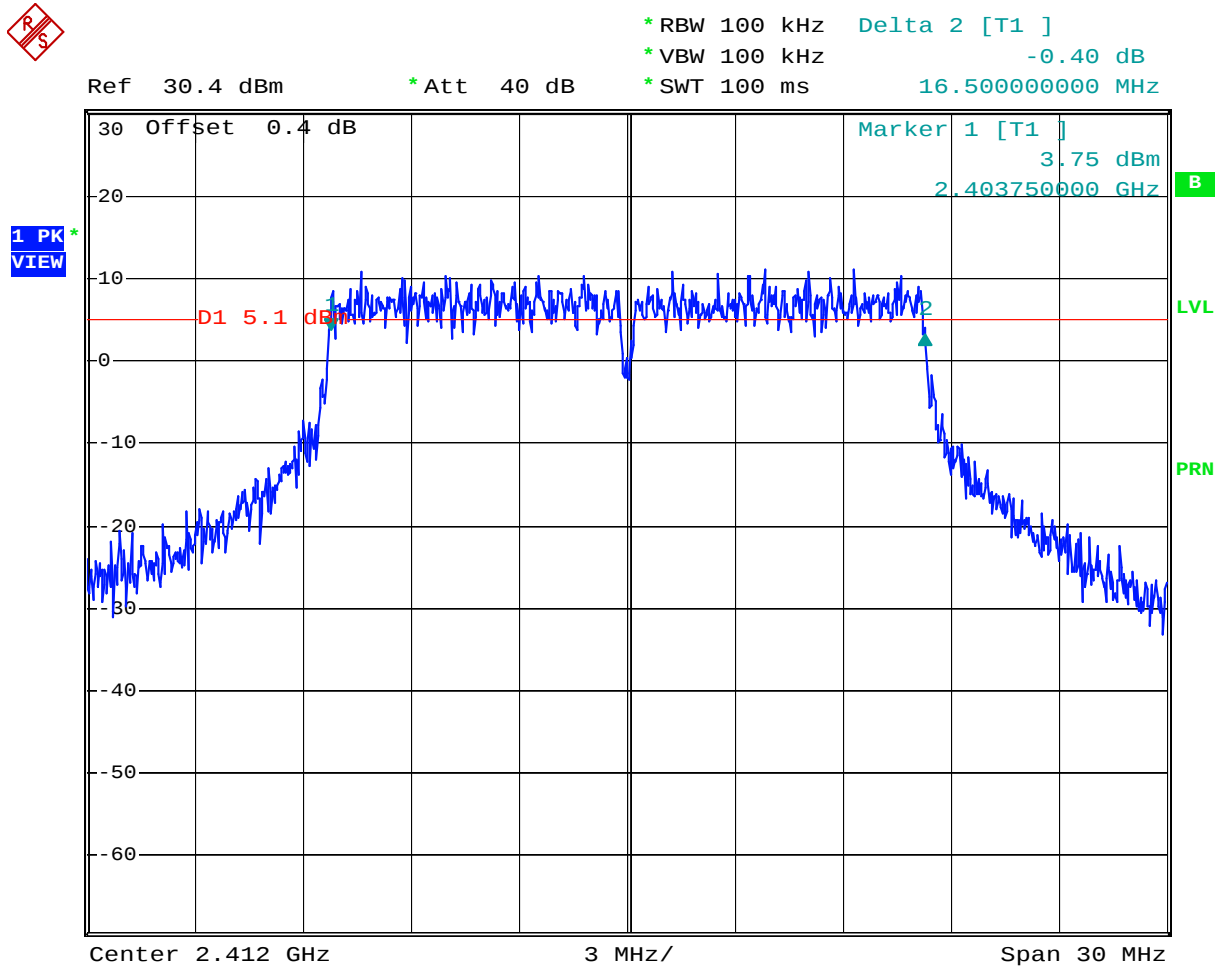
Comment: 6-dB bandwidth, Ch 1, CCK 11 Mbps  
 Date: 26.JAN.2007 19:38:20

Plot 2.2



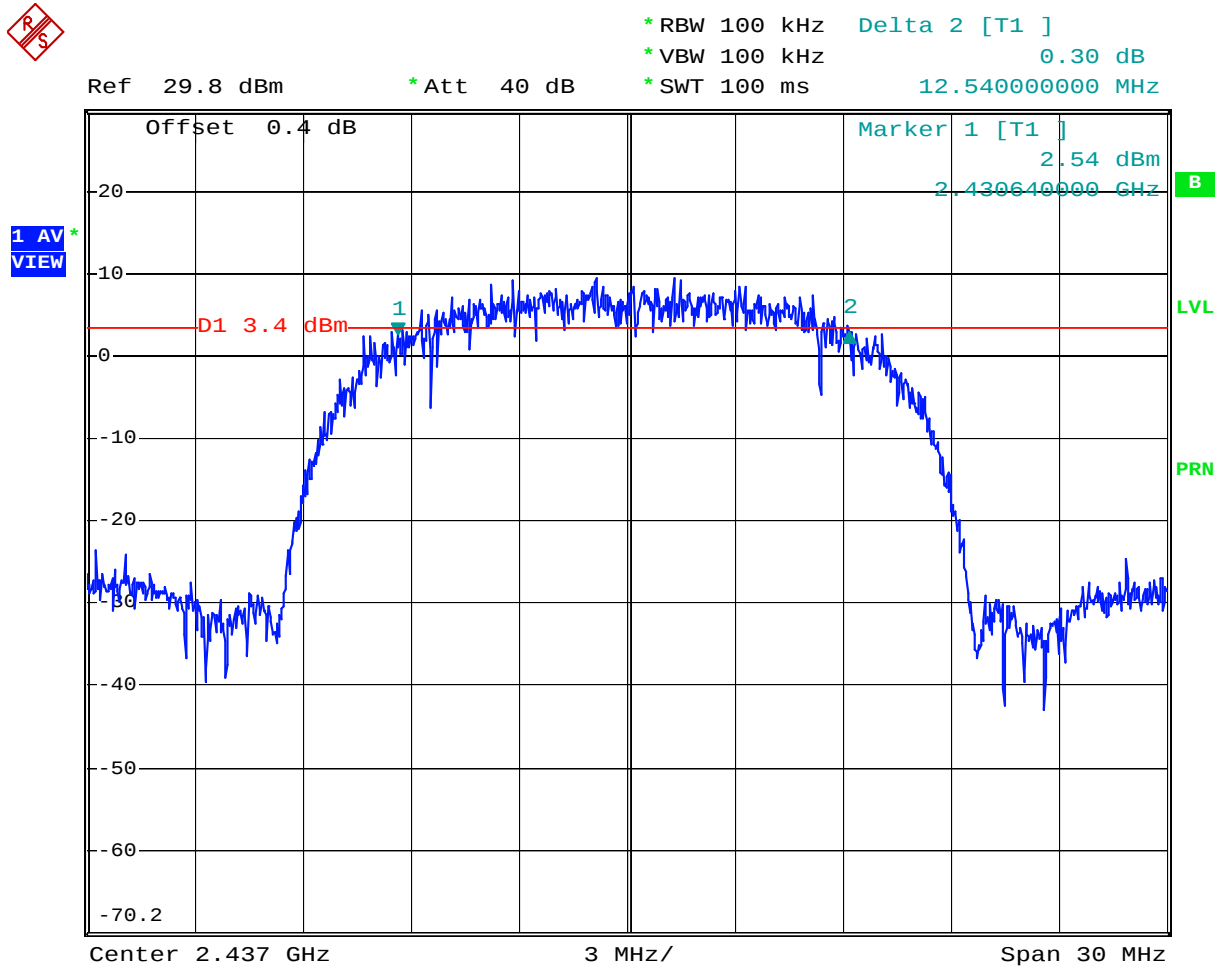
Comment: 6-dB bandwidth, Ch 1, OFDM 9 Mbps  
 Date: 26.JAN.2007 19:46:43

Plot 2.3



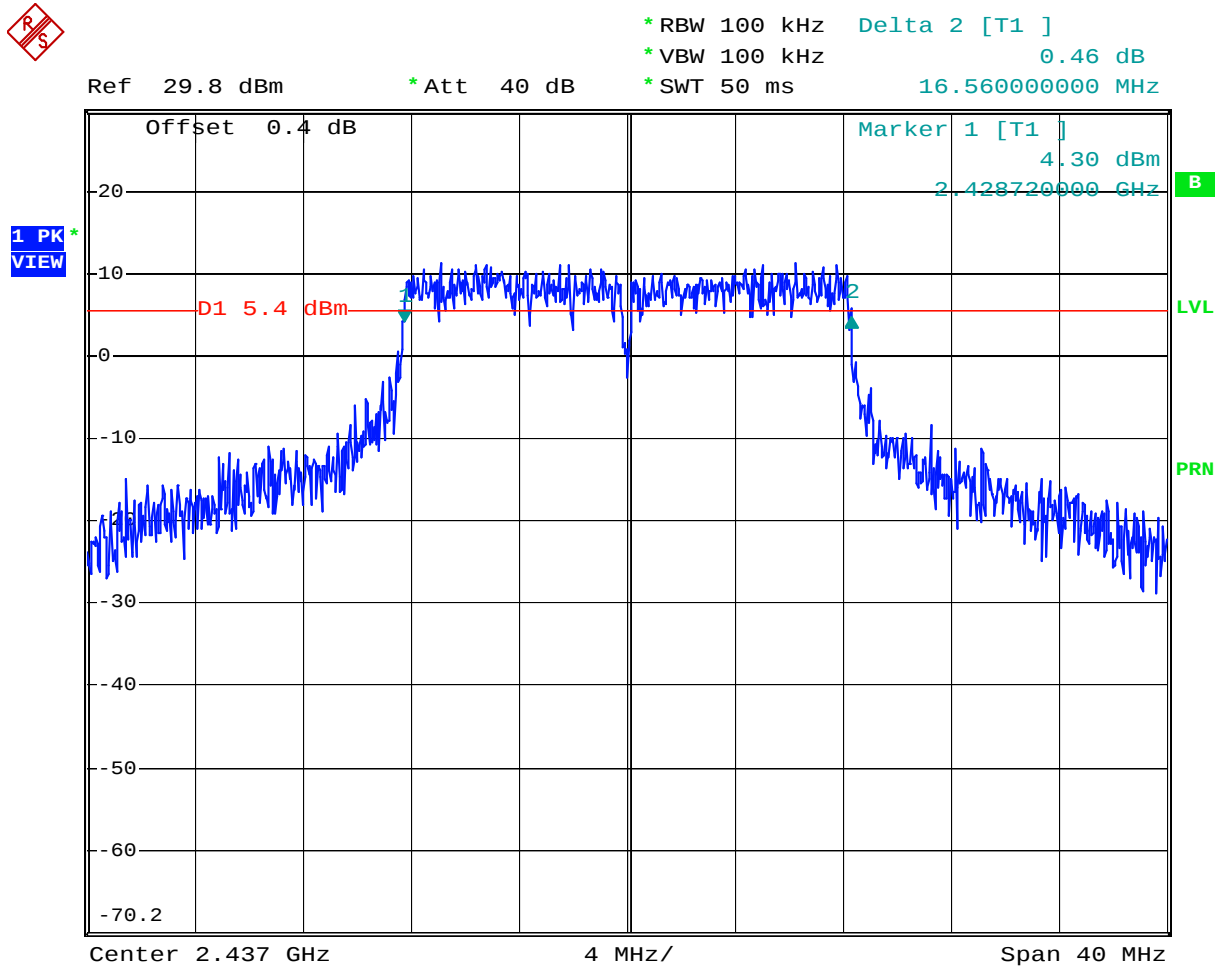
Comment: 6-dB bandwidth, Ch 1, OFDM 54 Mbps  
 Date: 26.JAN.2007 20:01:40

Plot 2.4



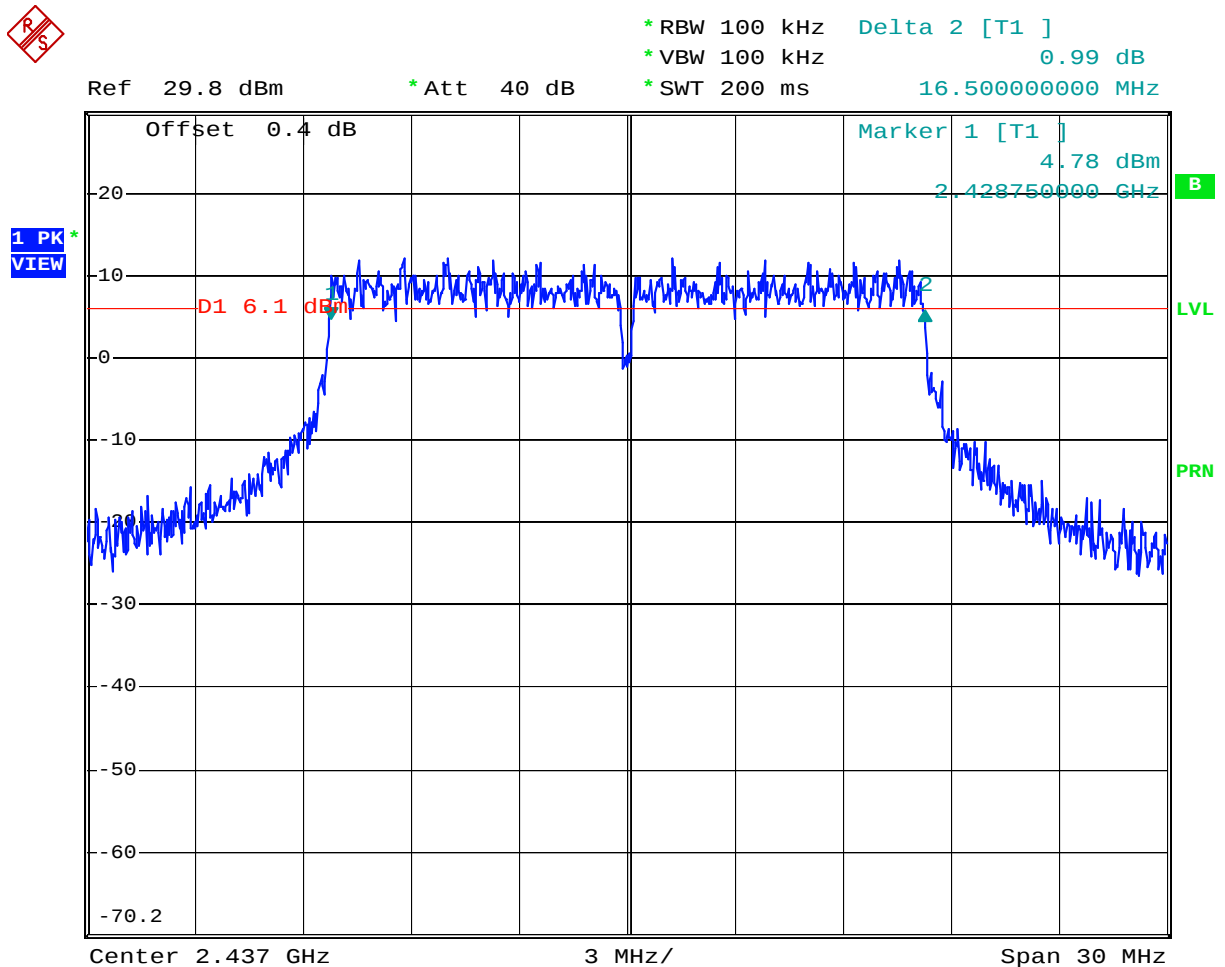
Comment: 6-dB bandwidth, Ch 6, CCK 11 Mbps  
 Date: 25.JAN.2007 13:16:13

Plot 2.5



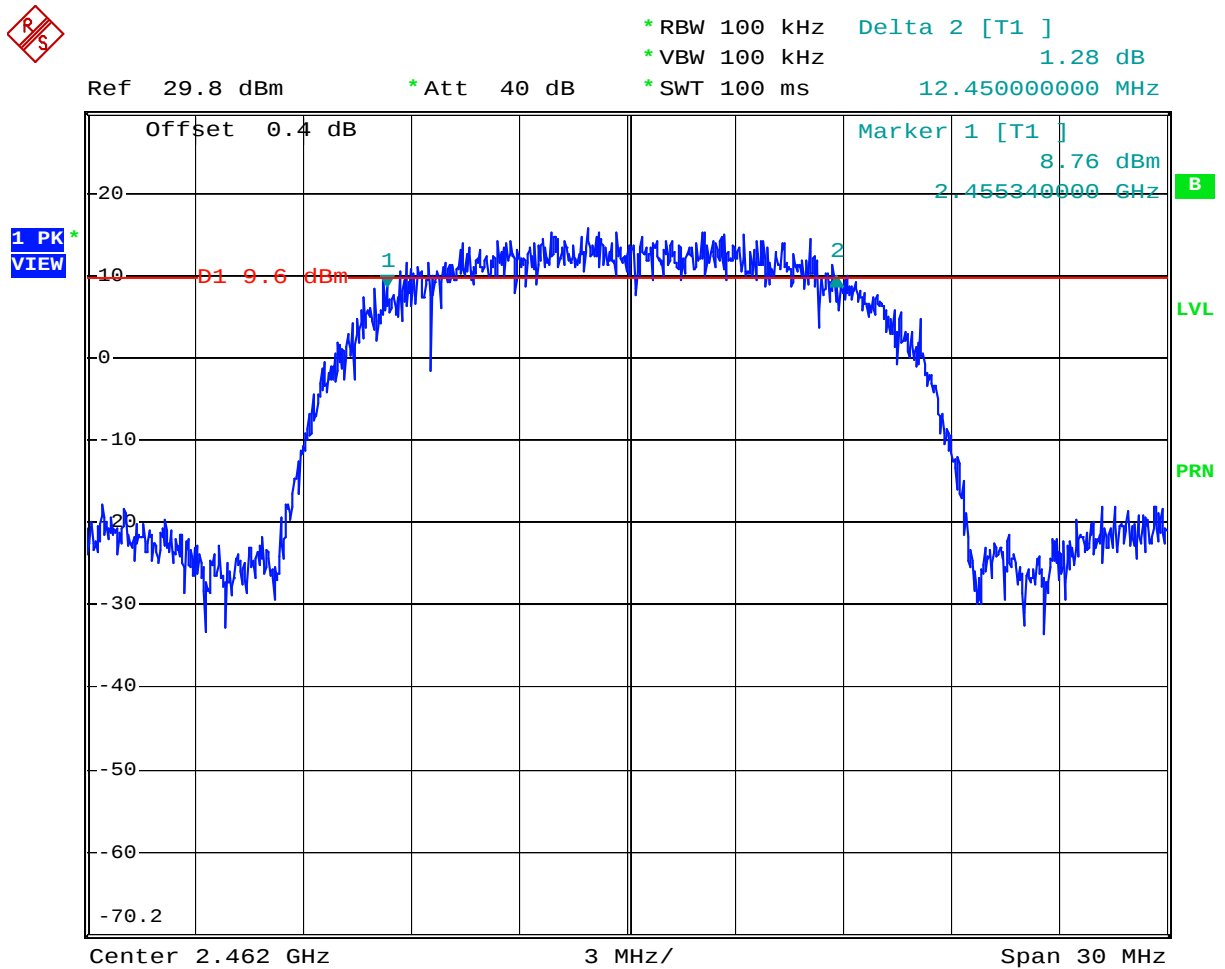
Comment: 6-dB bandwidth, Ch 6, OFDM 9 Mbps  
 Date: 24.JAN.2007 20:25:14

Plot 2.6



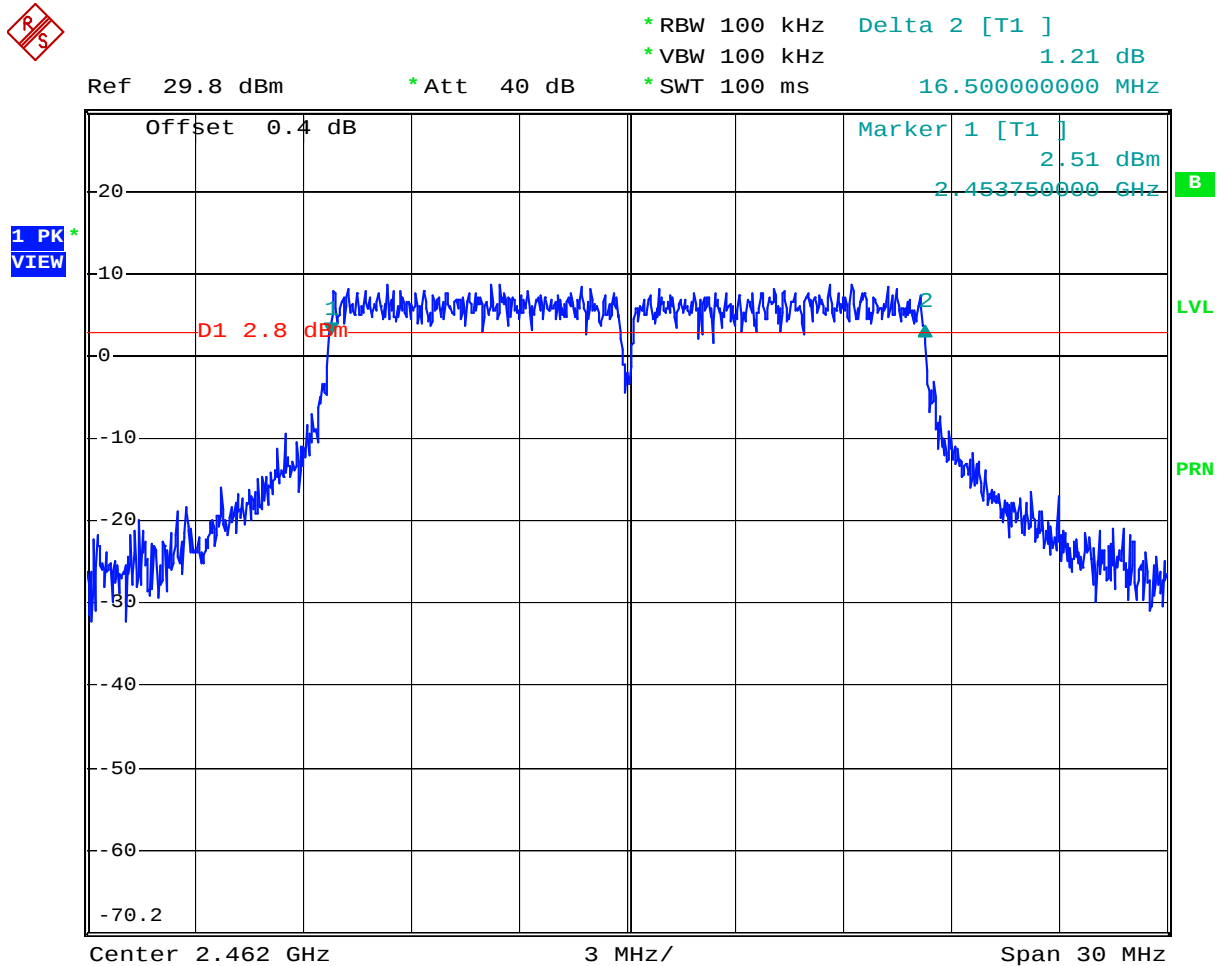
Comment: 6-dB bandwidth, Ch 6, OFDM 54 Mbps  
 Date: 24.JAN.2007 19:23:54

Plot 2.7



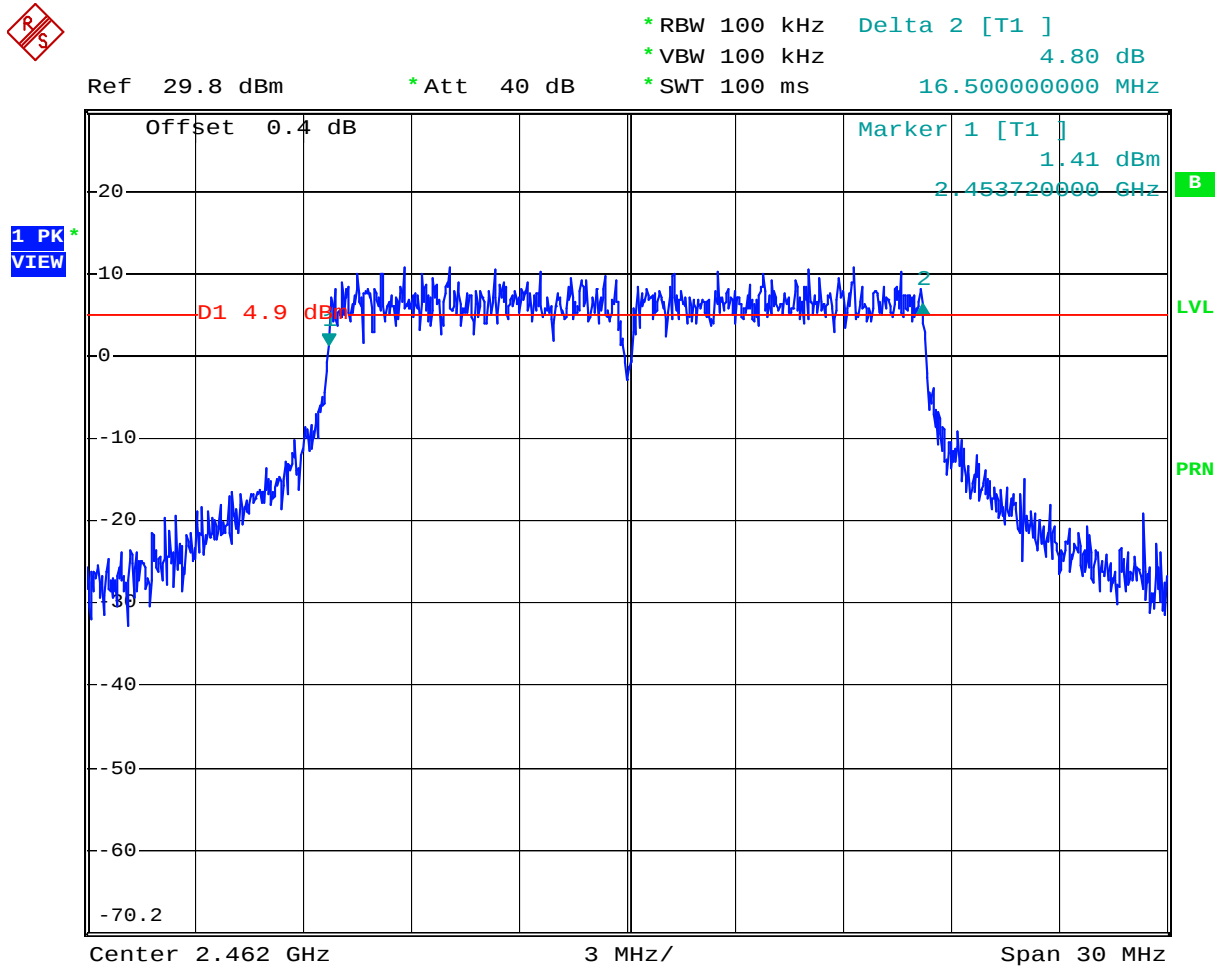
Comment: 6-dB bandwidth, Ch 11, CCK 11 Mbps  
 Date: 26.JAN.2007 13:21:52

Plot 2.8



Comment: 6-dB bandwidth, Ch 11, OFDM 9 Mbps  
 Date: 26.JAN.2007 13:19:05

Plot 2.9



Comment: 6-dB bandwidth, Ch 11, OFDM 54 Mbps  
 Date: 25.JAN.2007 14:12:39

#### 4.3 Power Spectral Density FCC Rule 15.247(d)

##### 4.3.1 Requirement

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

##### 4.3.2 Procedure

The antenna port of the EUT was connected to the input of a spectrum analyzer to measure the Average Transmitter Output Power.

For conducted power measurement for FCC Part 15C testing, the procedure “**Measurement of Digital Transmission Systems Operating under Section 15.247**” is used. In particular – the **PSD Option 2**, - sample detector and spectral trace averaging.

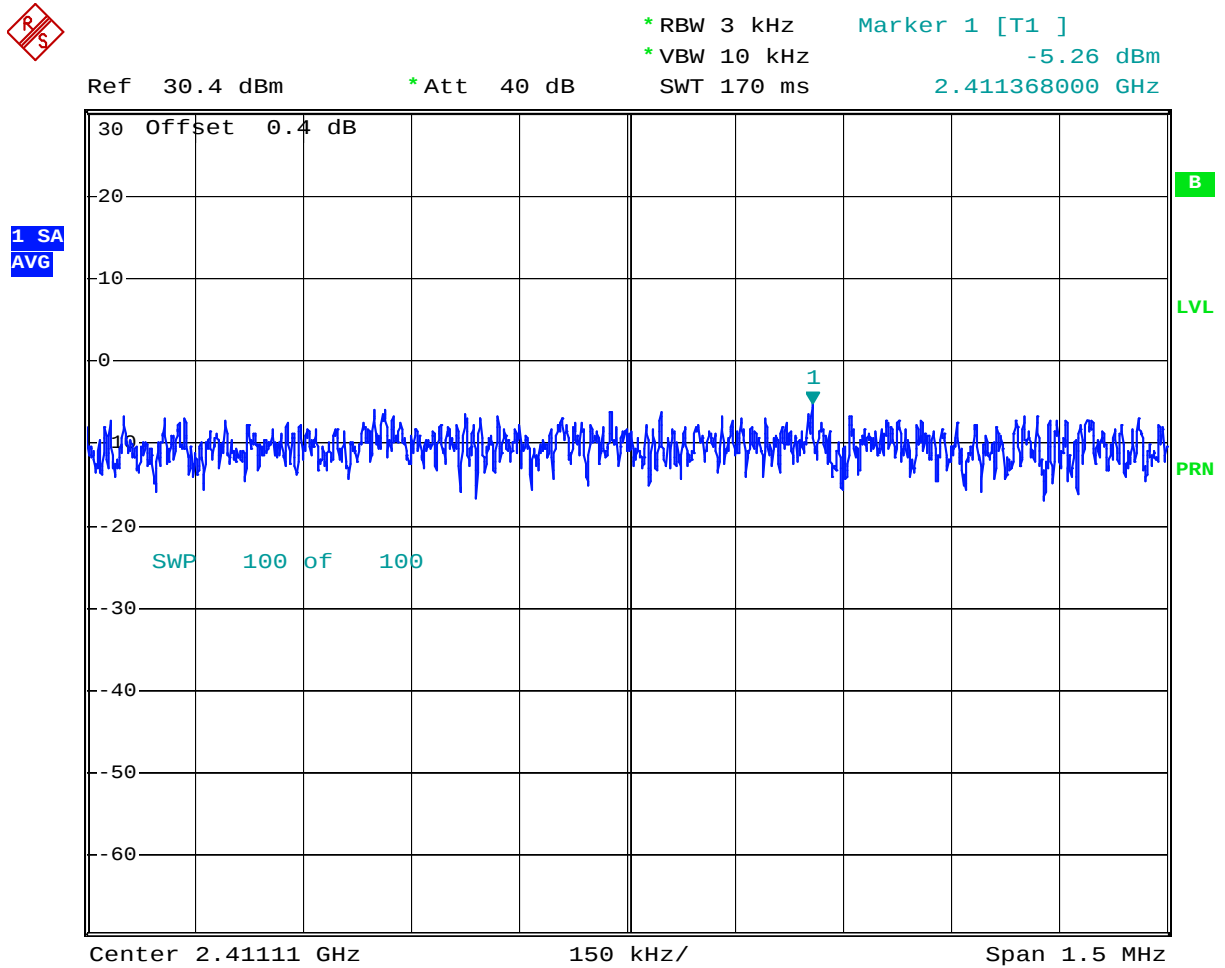
##### 4.3.3 Test Result

The results are presented on the following plots 3.1 – 3.6 and summarized in the table below.

| Channel | Frequency<br>MHz | Standard | Date rate<br>Mbps | PSD<br>(average)<br>dBm | PSD Limit<br>dBm | Margin<br>dB | Plot |
|---------|------------------|----------|-------------------|-------------------------|------------------|--------------|------|
| 1       | 2412             | 802.11b  | 11                | -5.3                    | 8.0              | -13.3        | 3.1  |
| 1       | 2412             | 802.11g  | 9                 | -13.5                   | 8.0              | -21.5        | 3.2  |
| 6       | 2437             | 802.11b  | 11                | -4.7                    | 8.0              | -12.7        | 3.3  |
| 6       | 2437             | 802.11g  | 9                 | -11.4                   | 8.0              | -19.4        | 3.4  |
| 11      | 2462             | 802.11b  | 11                | -5.2                    | 8.0              | -13.2        | 3.5  |
| 11      | 2462             | 802.11g  | 9                 | -12.2                   | 8.0              | -20.2        | 3.6  |

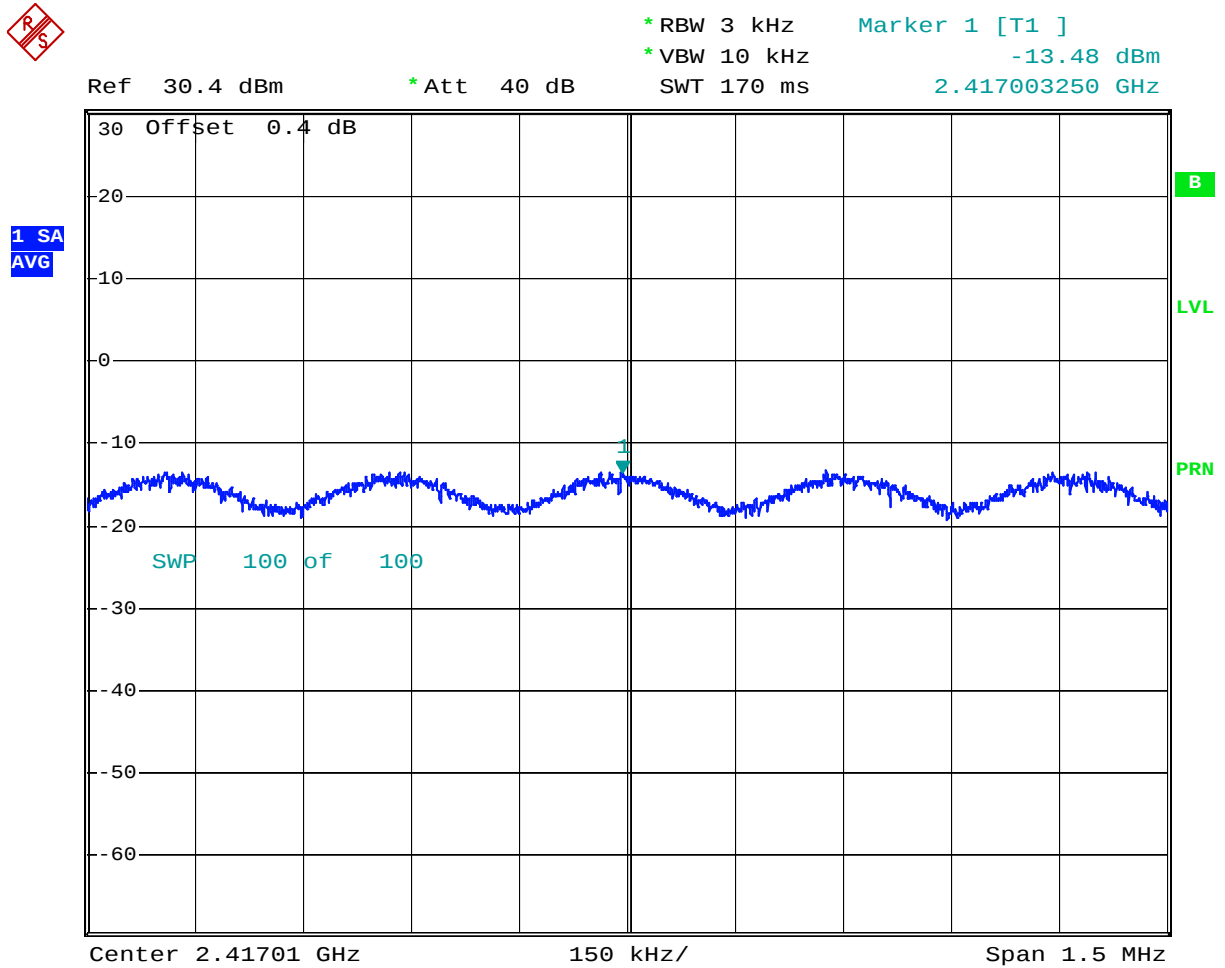
The EUT passed by 12.7 dB

Plot 3.1



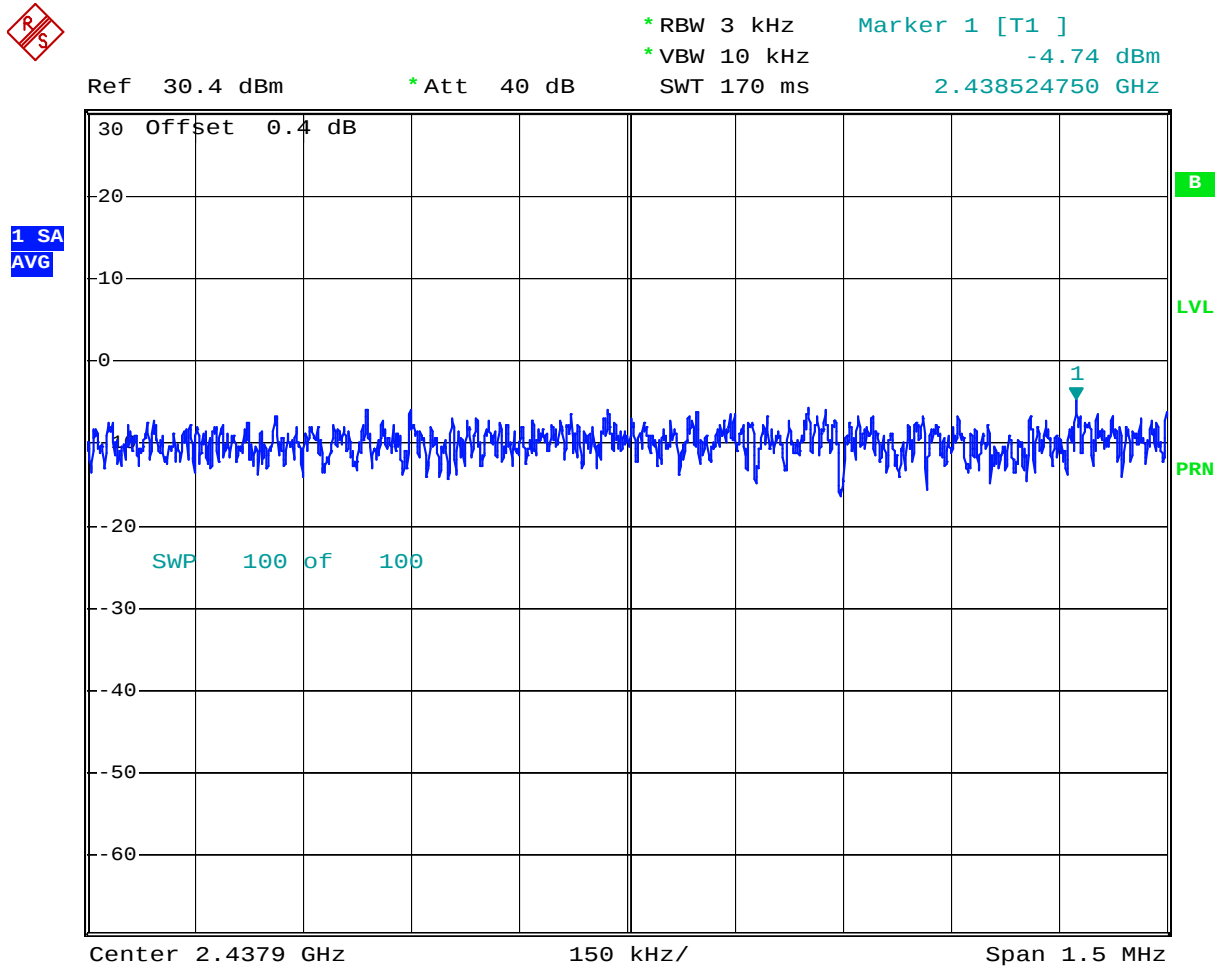
Comment: PSD, Ch 1, CCK 11 Mbps  
 Date: 26.JAN.2007 21:41:31

Plot 3.2



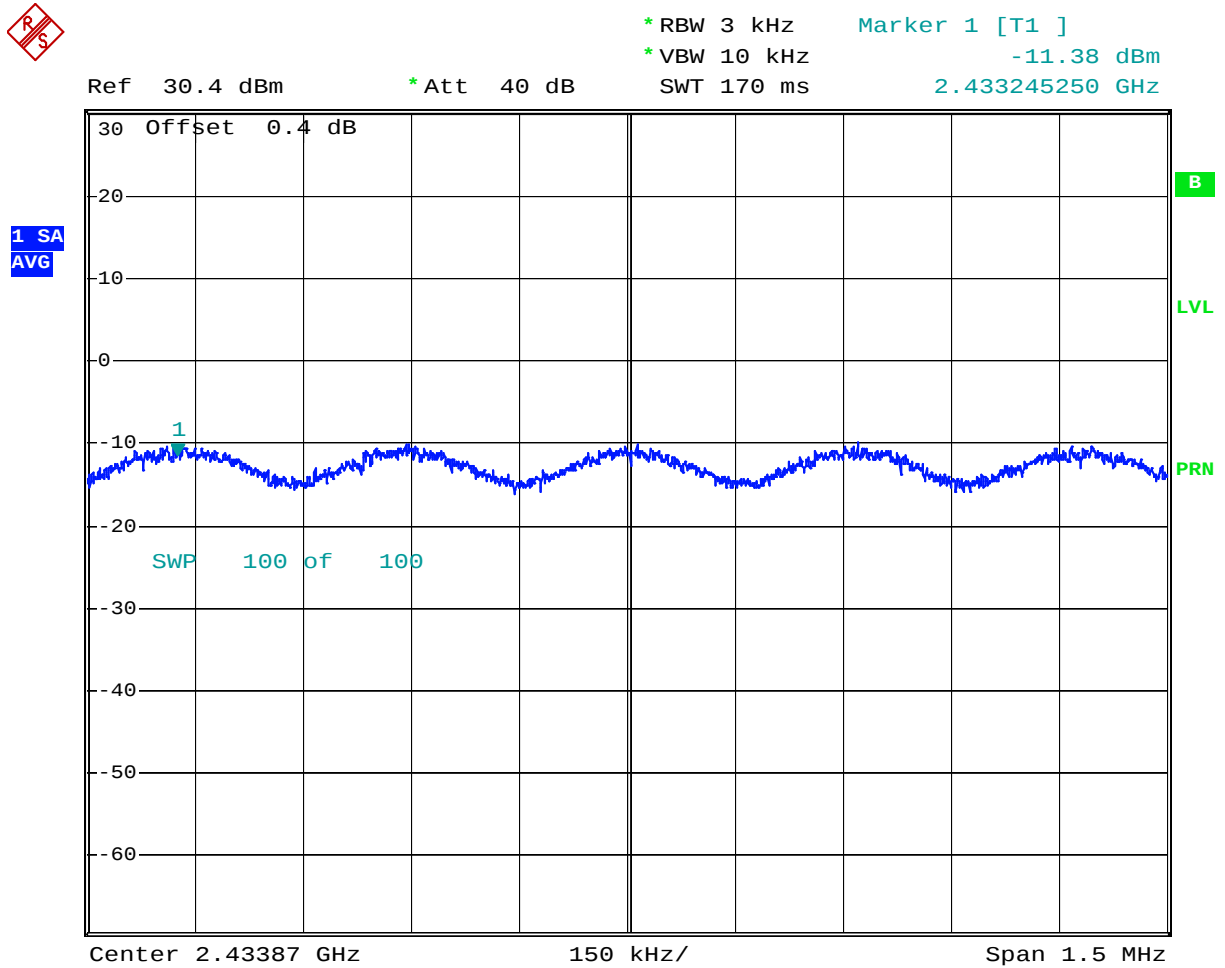
Comment: PSD, Ch 1, OFDM 9 Mbps  
Date: 26.JAN.2007 21:44:06

Plot 3.3



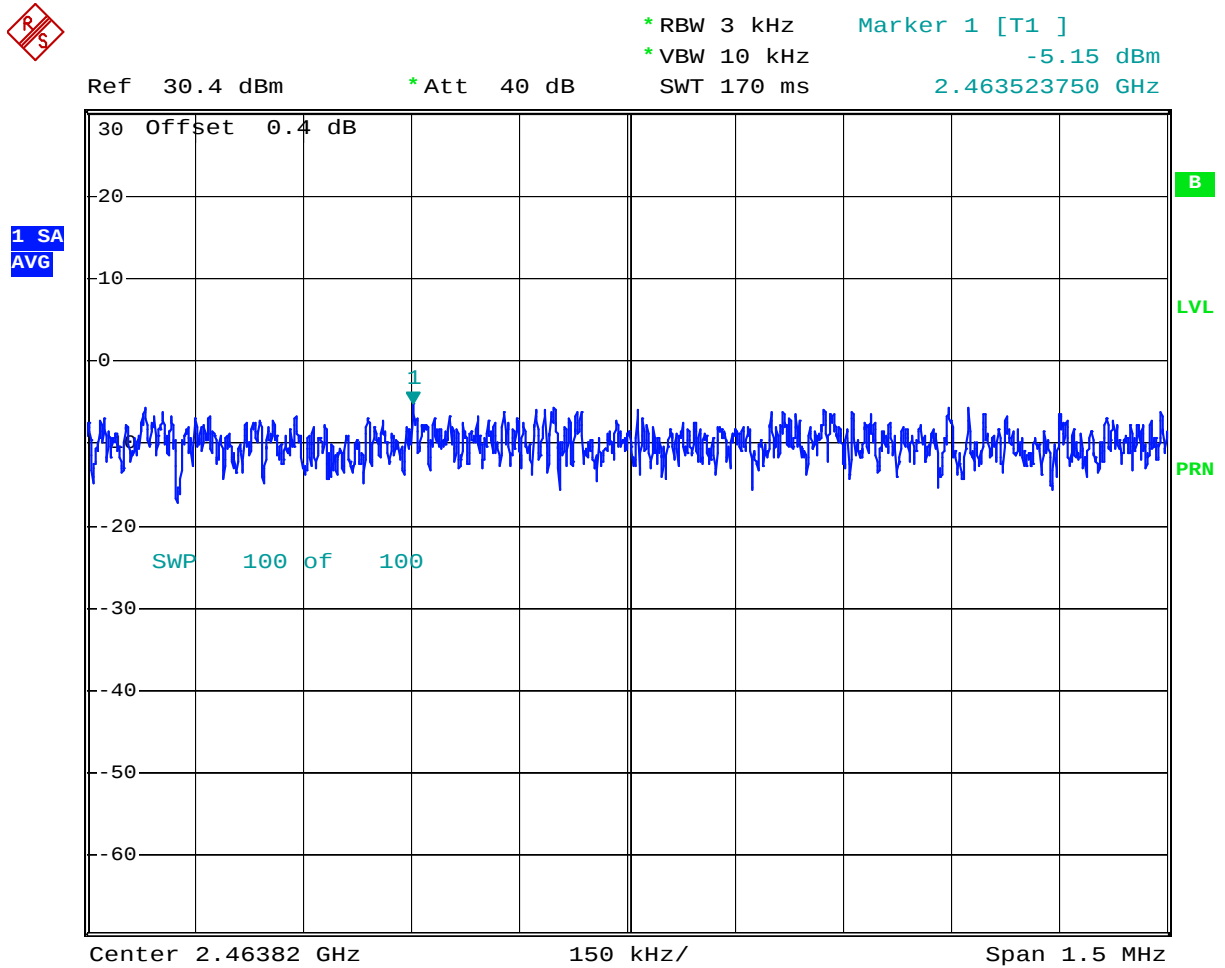
Comment: PSD, Ch 6, CCK 11 Mbps  
 Date: 26.JAN.2007 21:39:32

Plot 3.4



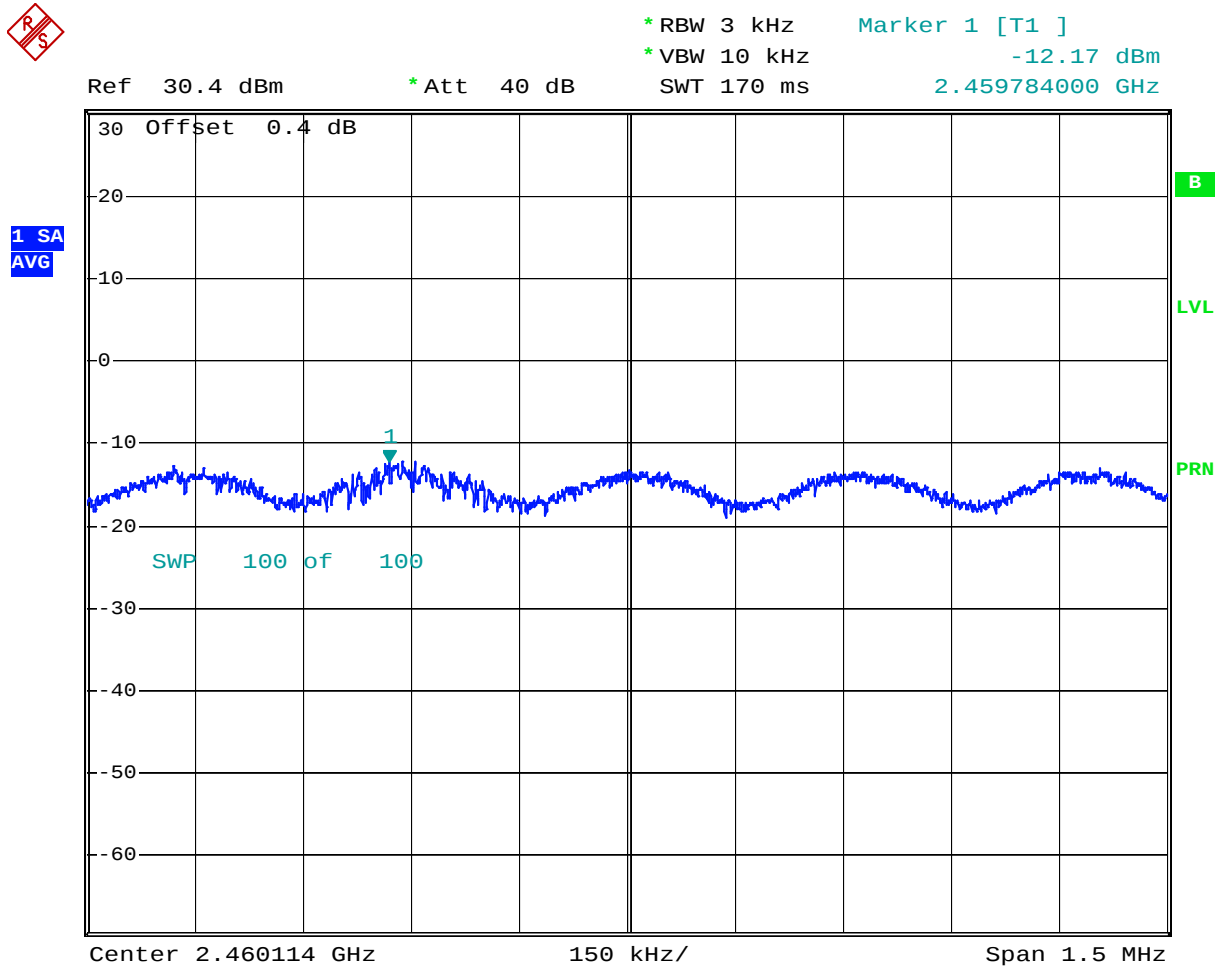
Comment: PSD, Ch 6, OFDM 9 Mbps  
 Date: 26.JAN.2007 21:37:04

Plot 3.5



Comment: PSD, Ch 11, CCK 11 Mbps  
 Date: 26.JAN.2007 21:29:13

Plot 3.6



Comment: PSD, Ch 11, OFDM 9 Mbps  
Date: 26.JAN.2007 21:33:34

#### 4.4 Out-of-Band Conducted Emissions, FCC Rule 15.247(c)

##### 4.4.1 Requirement

In any 100 kHz bandwidths outside the EUT pass-band, the RF power shall be at least 30 dB below that of the maximum in-band 100 kHz emissions.

##### 4.4.2 Procedure

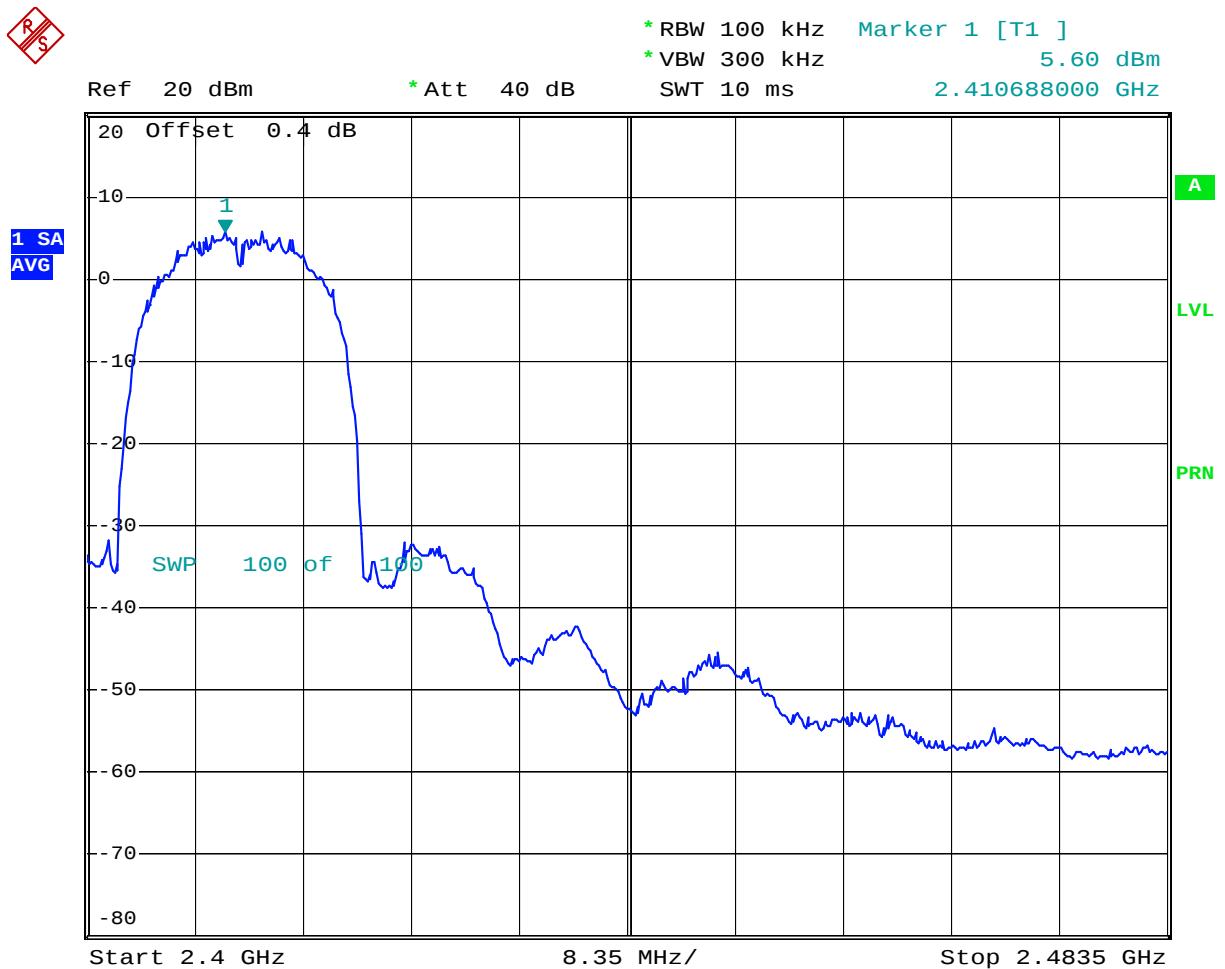
A spectrum analyzer was connected to the antenna port of the transmitter. Analyzer Resolution Bandwidth was set to 100 kHz. For each channel investigated, the in-band and out-of-band emission measurements were performed using a ample detector and averaging over 100 traces. The out-of-band emissions were measured from 30 MHz to 25 GHz.

##### 4.4.3 Test Result

Refer to the table below and plots. The worst-case attenuation is 33.5 dB (see plots 4.2 and 4.6).

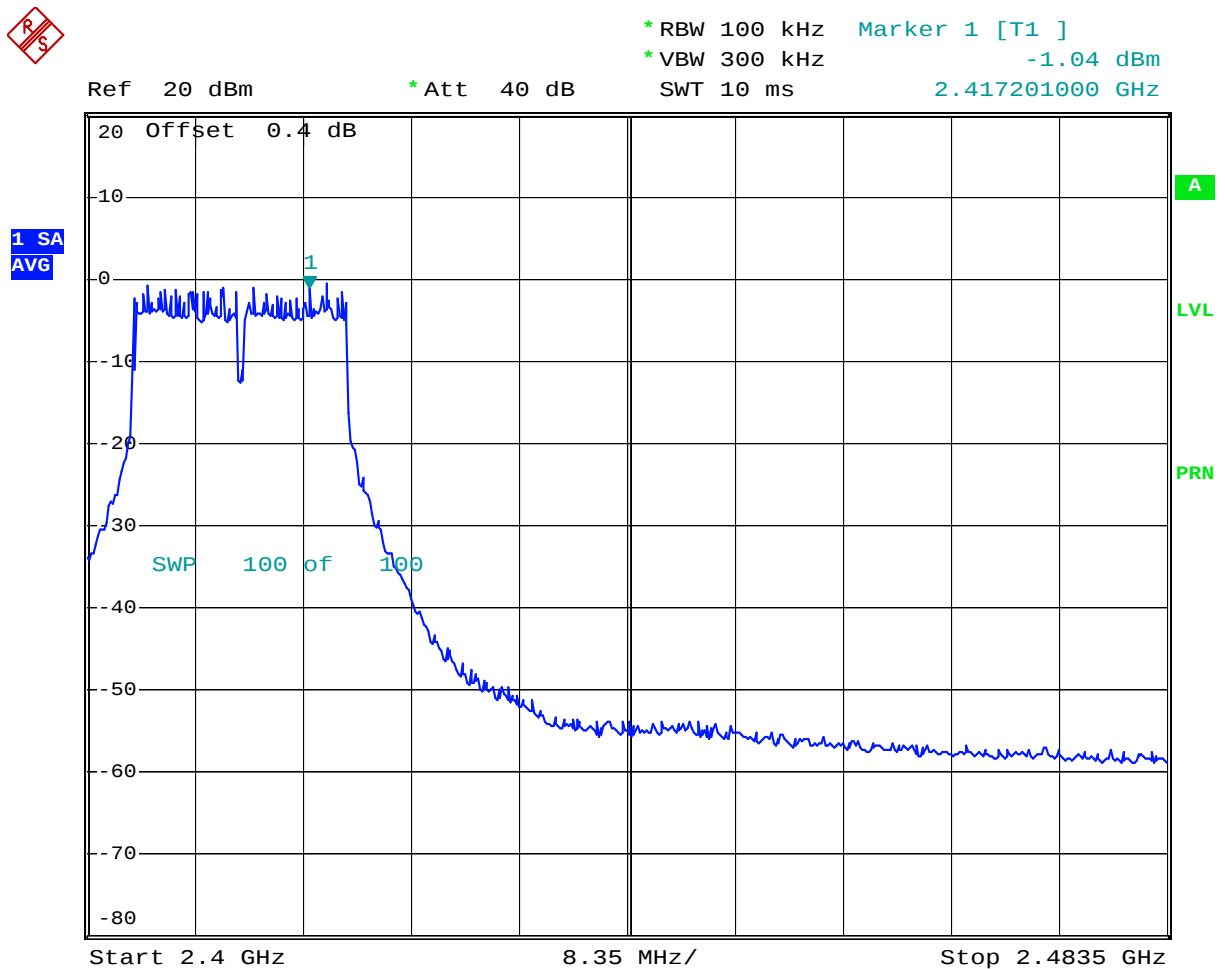
| Frequency (MHz) | Channel | Standard | Data rate Mbps | Description               | Plot |
|-----------------|---------|----------|----------------|---------------------------|------|
| 2412            | 1       | 802.11b  | 11             | In-band                   | 4.1  |
|                 | 1       | 802.11g  | 9              | In-band                   | 4.2  |
|                 | 1       | 802.11g  | 54             | In-band                   | 4.3  |
|                 | 1       | 802.11b  | 11             | Scan 30 MHz – 2.4 GHz     | 4.4  |
|                 | 1       | 802.11b  | 11             | Scan 2.4835 GHz – 25 GHz  | 4.5  |
|                 | 1       | 802.11g  | 9              | Scan 30 MHz – 2.4 GHz     | 4.6  |
|                 | 1       | 802.11g  | 9              | Scan 2.4835 GHz – 25 GHz  | 4.7  |
| 2437            | 6       | 802.11b  | 11             | In-band                   | 4.8  |
|                 | 6       | 802.11g  | 9              | In-band                   | 4.9  |
|                 | 6       | 802.11b  | 11             | Scan 30 MHz – 2.4 GHz     | 4.10 |
|                 | 6       | 802.11b  | 11             | Scan 2.4835 GHz – 25 GHz  | 4.11 |
| 2462            | 11      | 802.11b  | 11             | In-band                   | 4.12 |
|                 | 11      | 802.11g  | 9              | In-band                   | 4.13 |
|                 | 11      | 802.11g  | 54             | In-band                   | 4.14 |
|                 | 11      | 802.11b  | 11             | Scan 30 MHz – 2.4 GHz     | 4.15 |
|                 | 11      | 802.11b  | 11             | Scan 2.4835 GHz – 25 GHz  | 4.16 |
|                 | 11      | 802.11g  | 9              | Scan 30 MHz – 2.4 GHz     | 4.17 |
|                 | 11      | 802.11g  | 9              | Scan 2.4 GHz – 2.4835 GHz | 4.18 |
|                 | 11      | 802.11g  | 54             | Scan 30 MHz – 2.4 GHz     | 4.19 |
|                 | 11      | 802.11g  | 54             | Scan 2.4835 GHz – 25 GHz  | 4.20 |

Plot 4.1



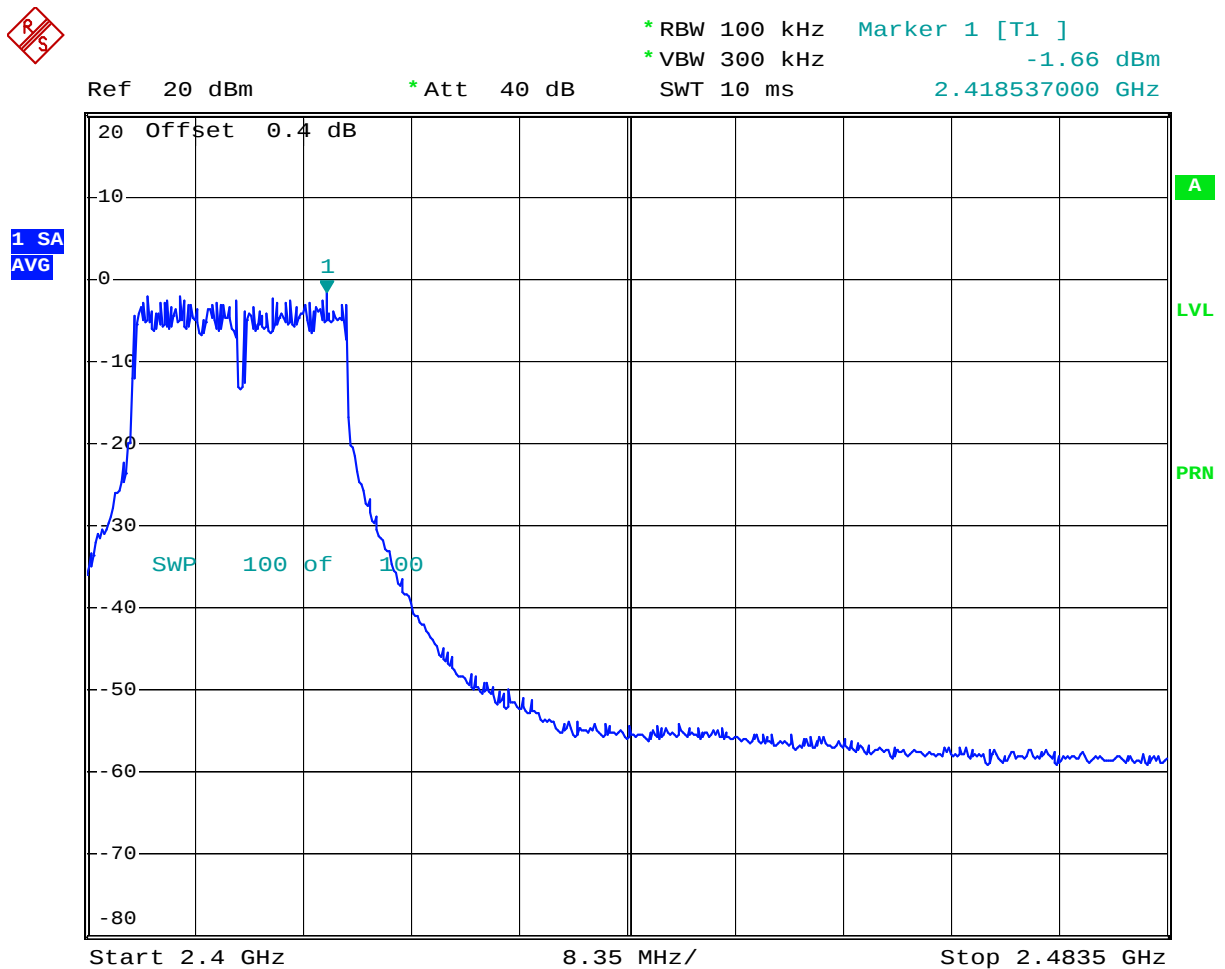
Comment: In-band conducted, Ch 1, CCK 11 Mbps  
 Date: 30.JAN.2007 13:57:41

Plot 4.2



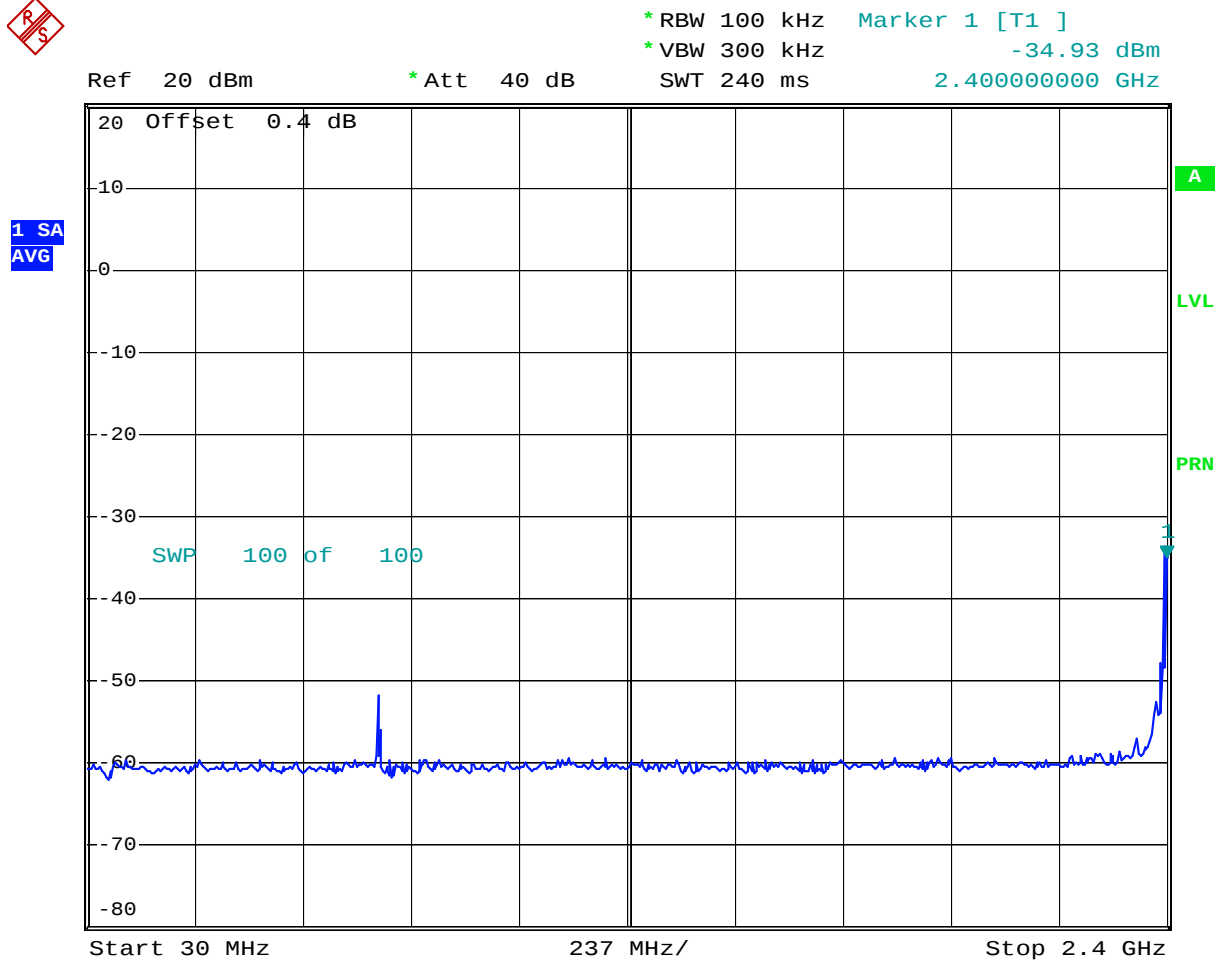
Comment: In-band conducted, Ch 1, OFDM 9 Mbps  
 Date: 30.JAN.2007 13:47:41

Plot 4.3



Comment: In-band conducted, Ch 1, OFDM 54 Mbps  
 Date: 30.JAN.2007 13:59:32

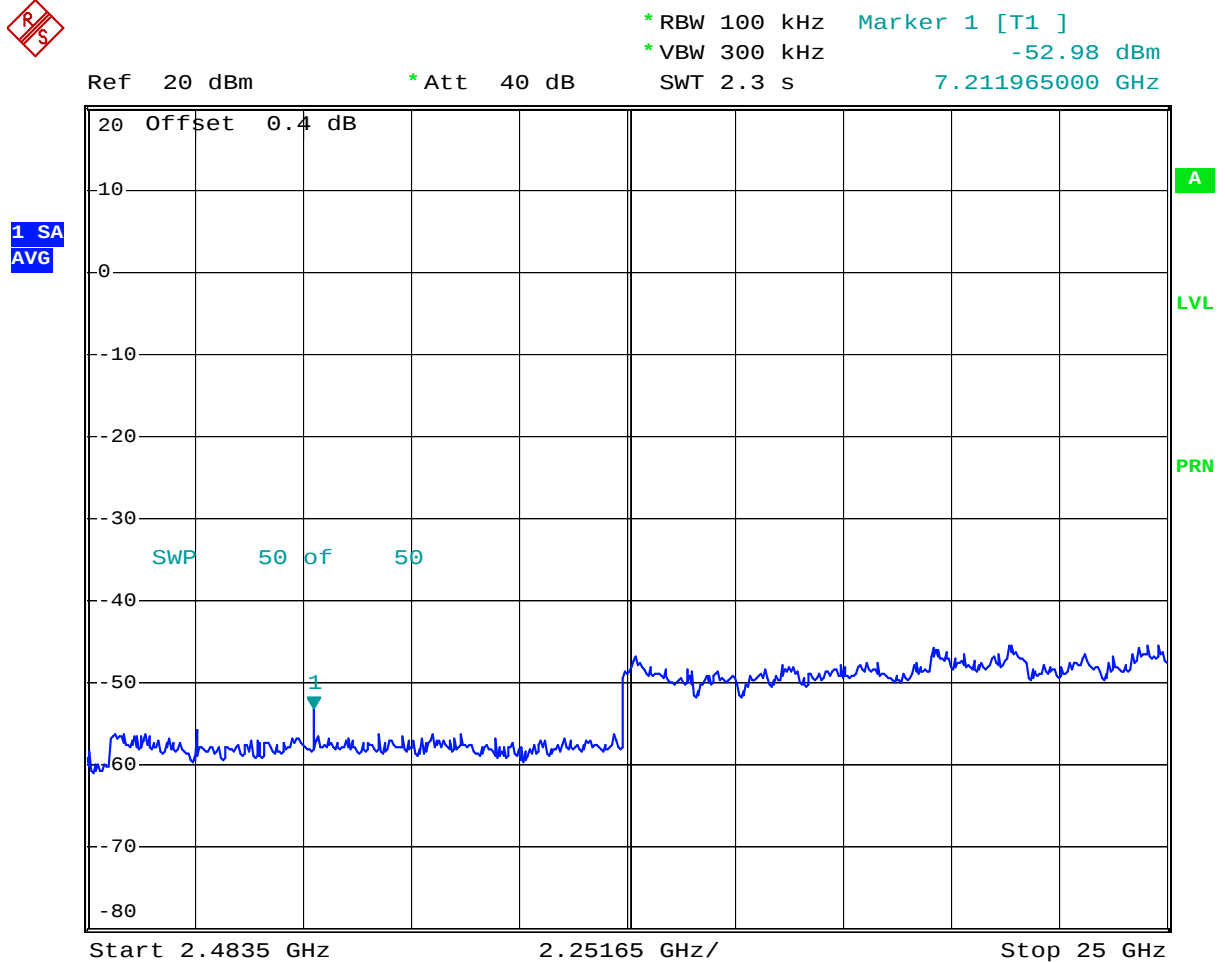
Plot 4.4



Comment: Spurious conducted, Ch 1, CCK 11 Mbps

Date: 30.JAN.2007 16:37:01

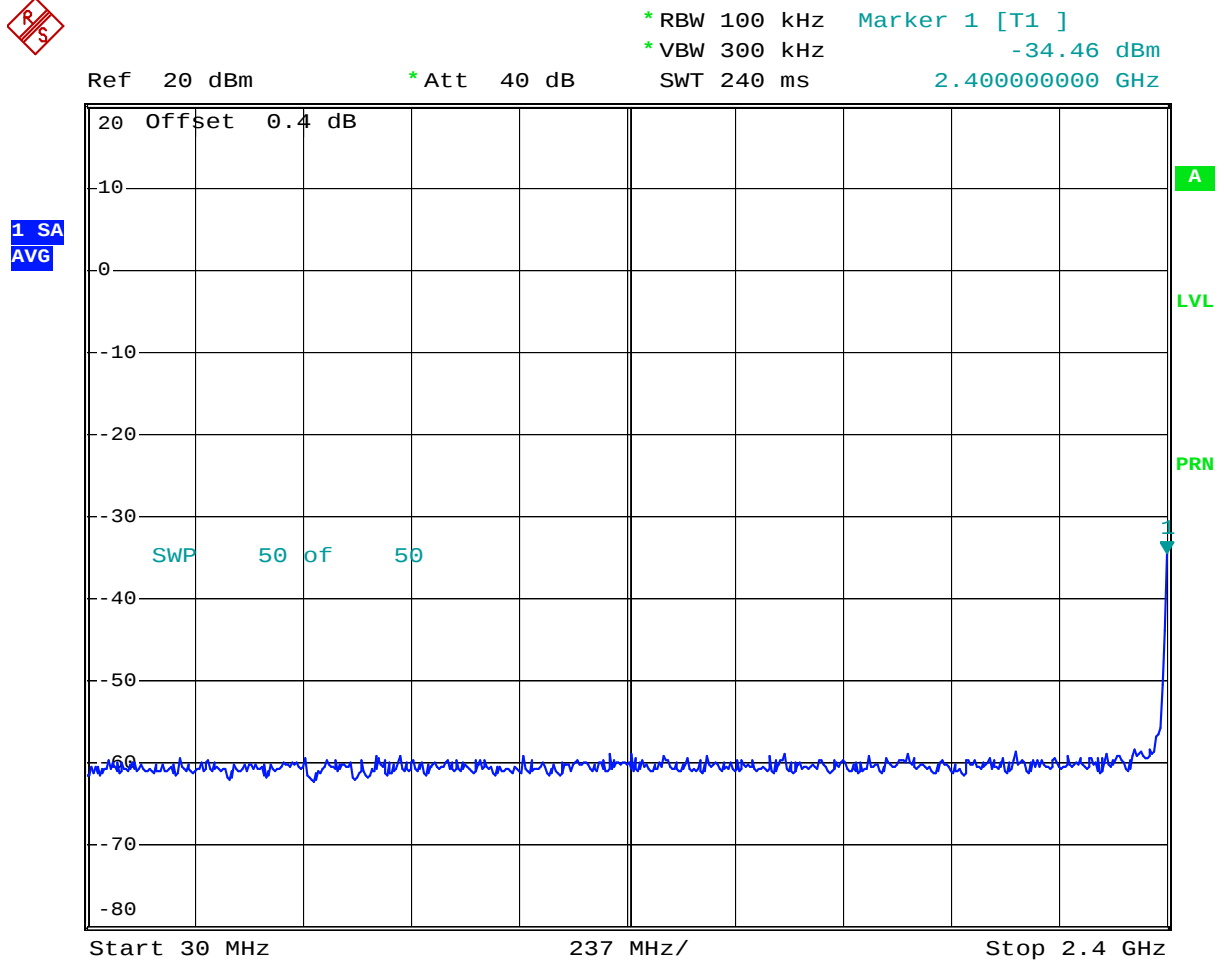
Plot 4.5



Comment: Spurious conducted, Ch 1, CCK 11 Mbps

Date: 30.JAN.2007 16:01:49

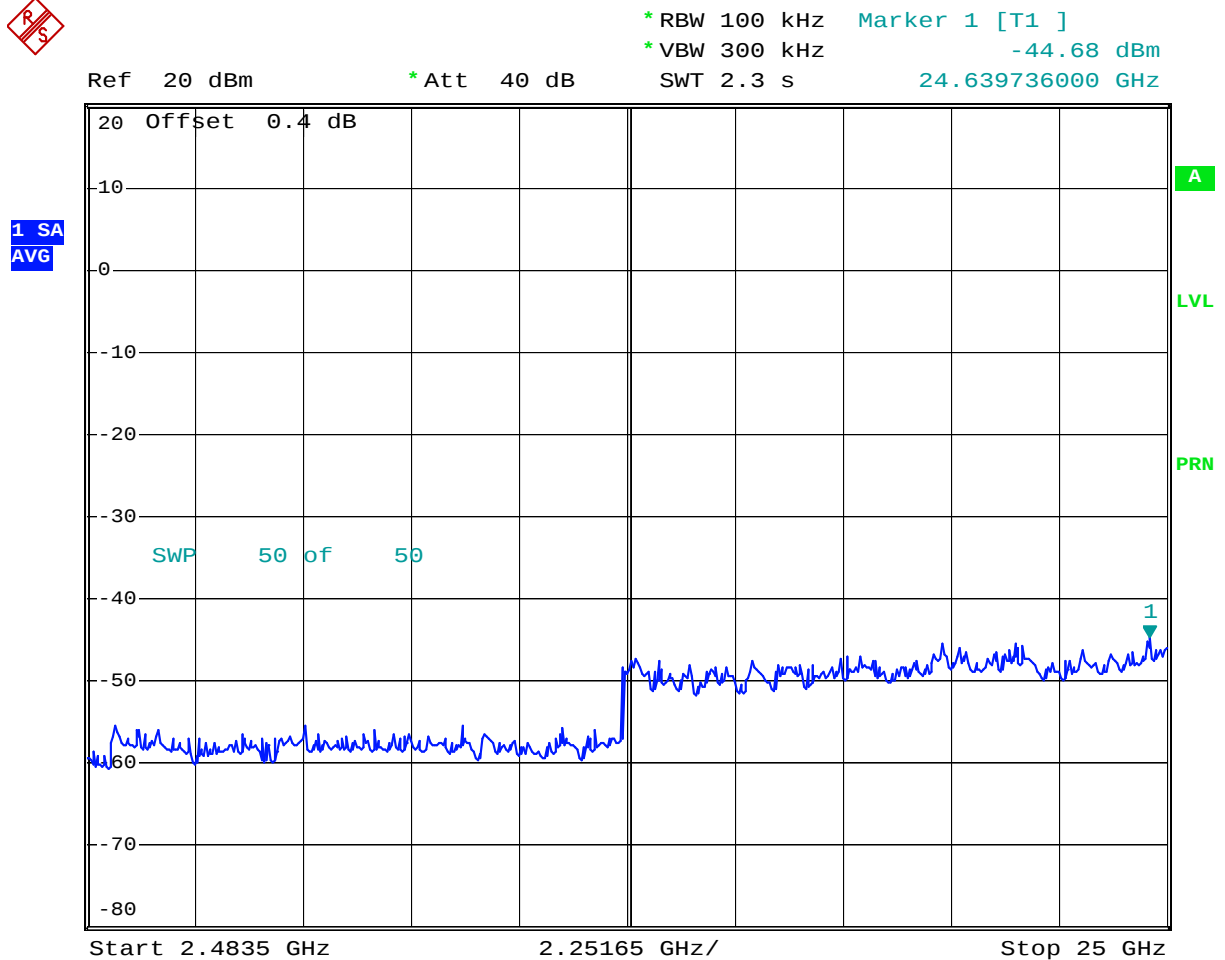
Plot 4.6



Comment: Spurious conducted, Ch 1, OFDM 9 Mbps

Date: 30.JAN.2007 16:06:22

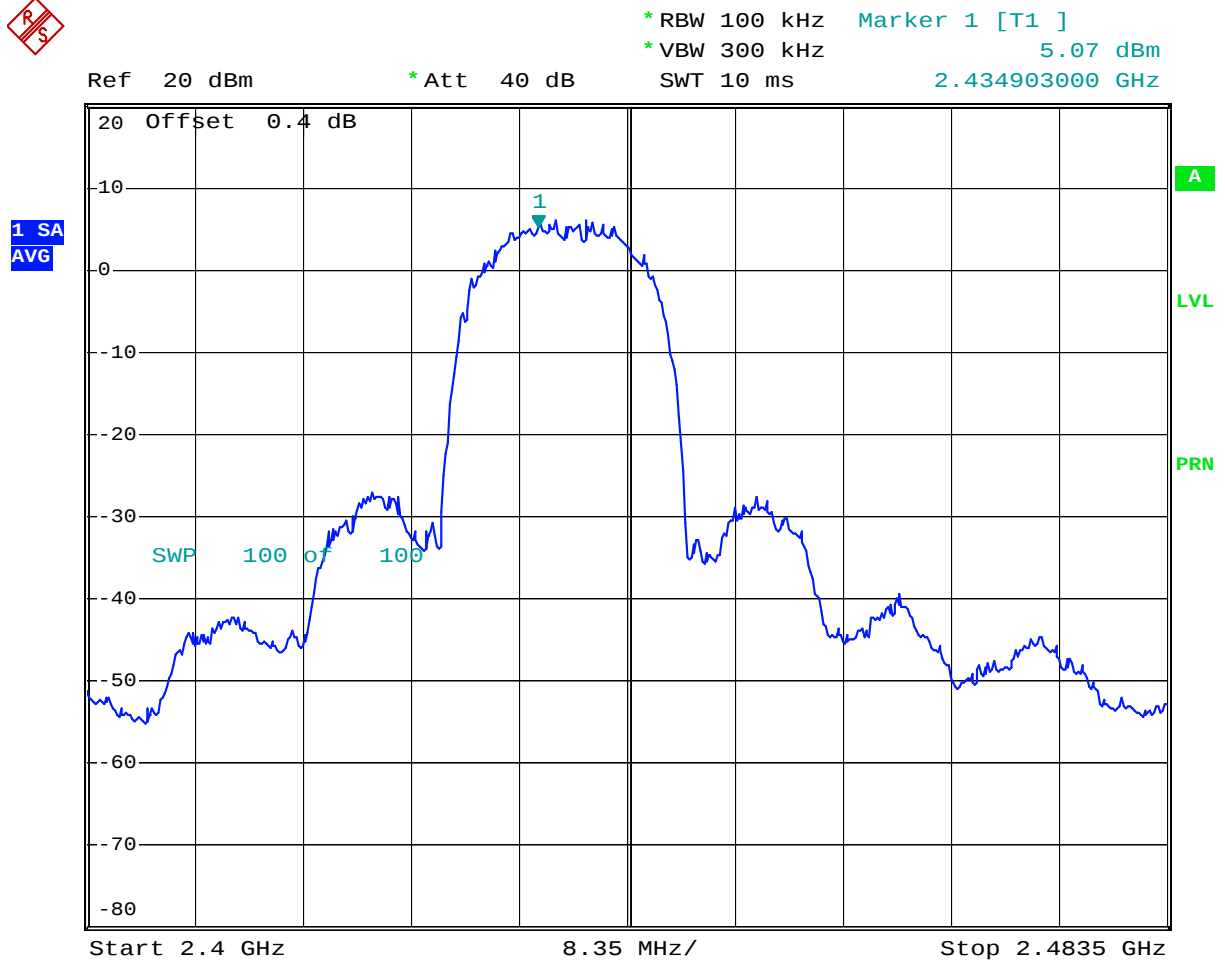
Plot 4.7



Comment: Spurious conducted, Ch 1, OFDM 9 Mbps

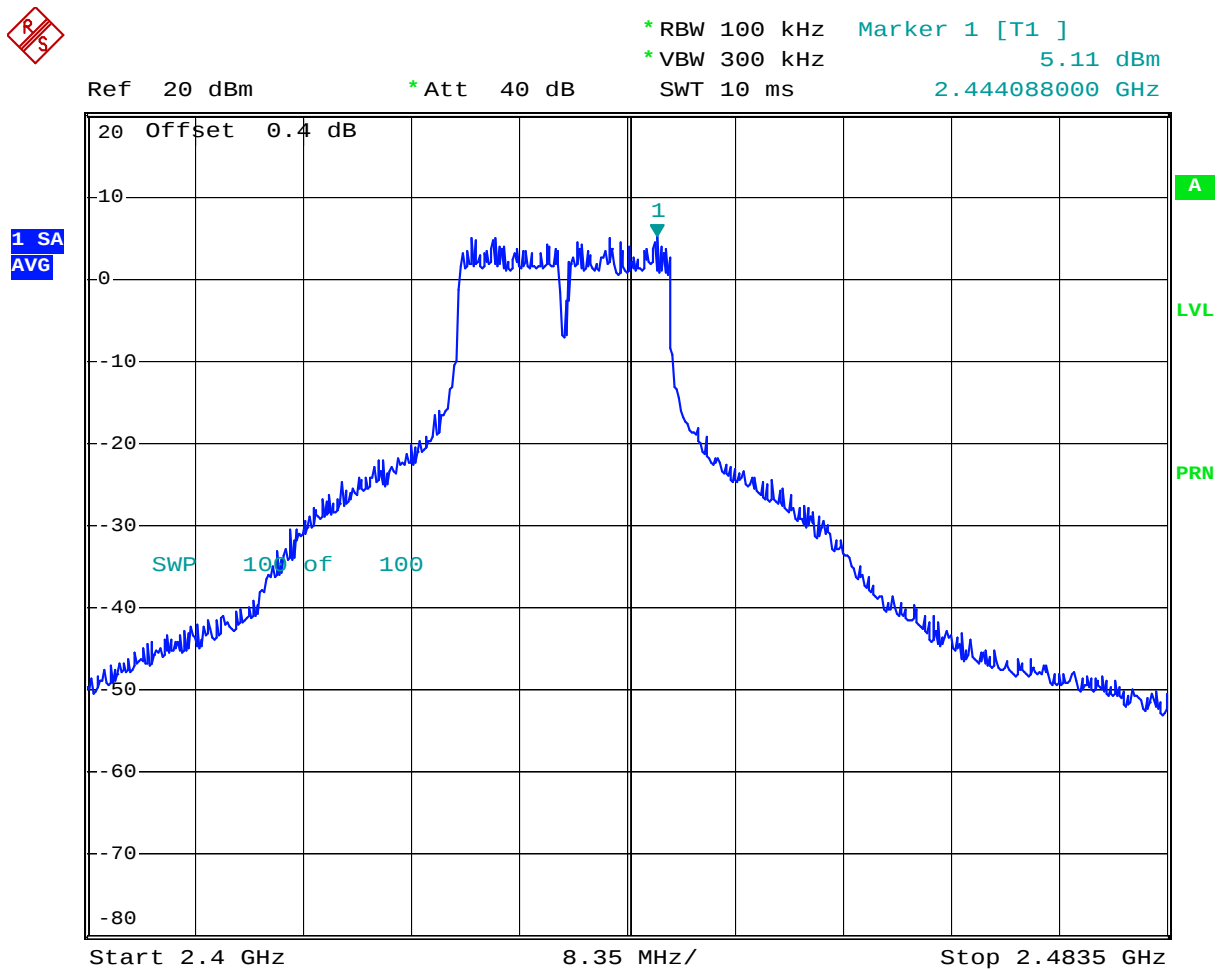
Date: 30.JAN.2007 16:05:26

Plot 4.8



Comment: In-band conducted, Ch 6, CCK 11 Mbps  
 Date: 30.JAN.2007 13:56:18

Plot 4.9



Comment: In-band conducted, Ch 6, OFDM 9 Mbps  
 Date: 30.JAN.2007 13:51:16

Plot 4.10

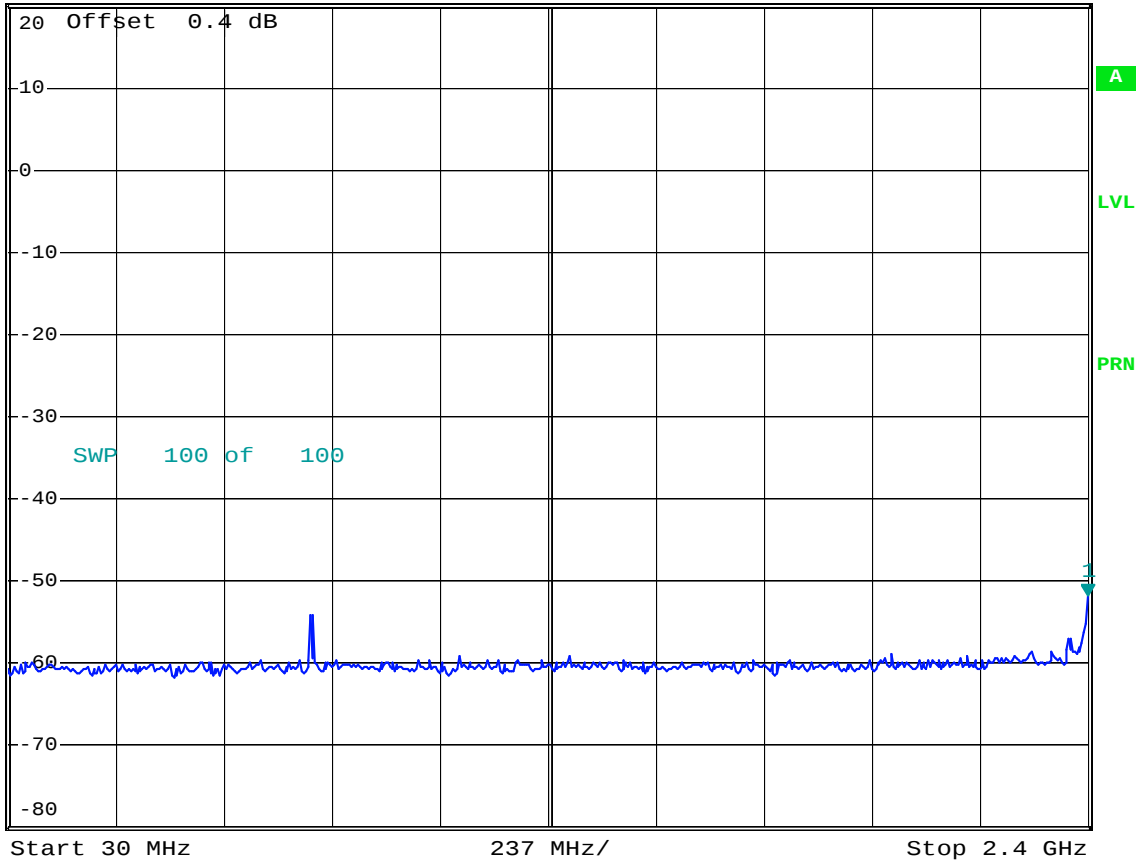


\* RBW 100 kHz    Marker 1 [T1 ]  
 \* VBW 300 kHz    -51.88 dBm  
 SWT 240 ms    2.400000000 GHz

Ref 20 dBm

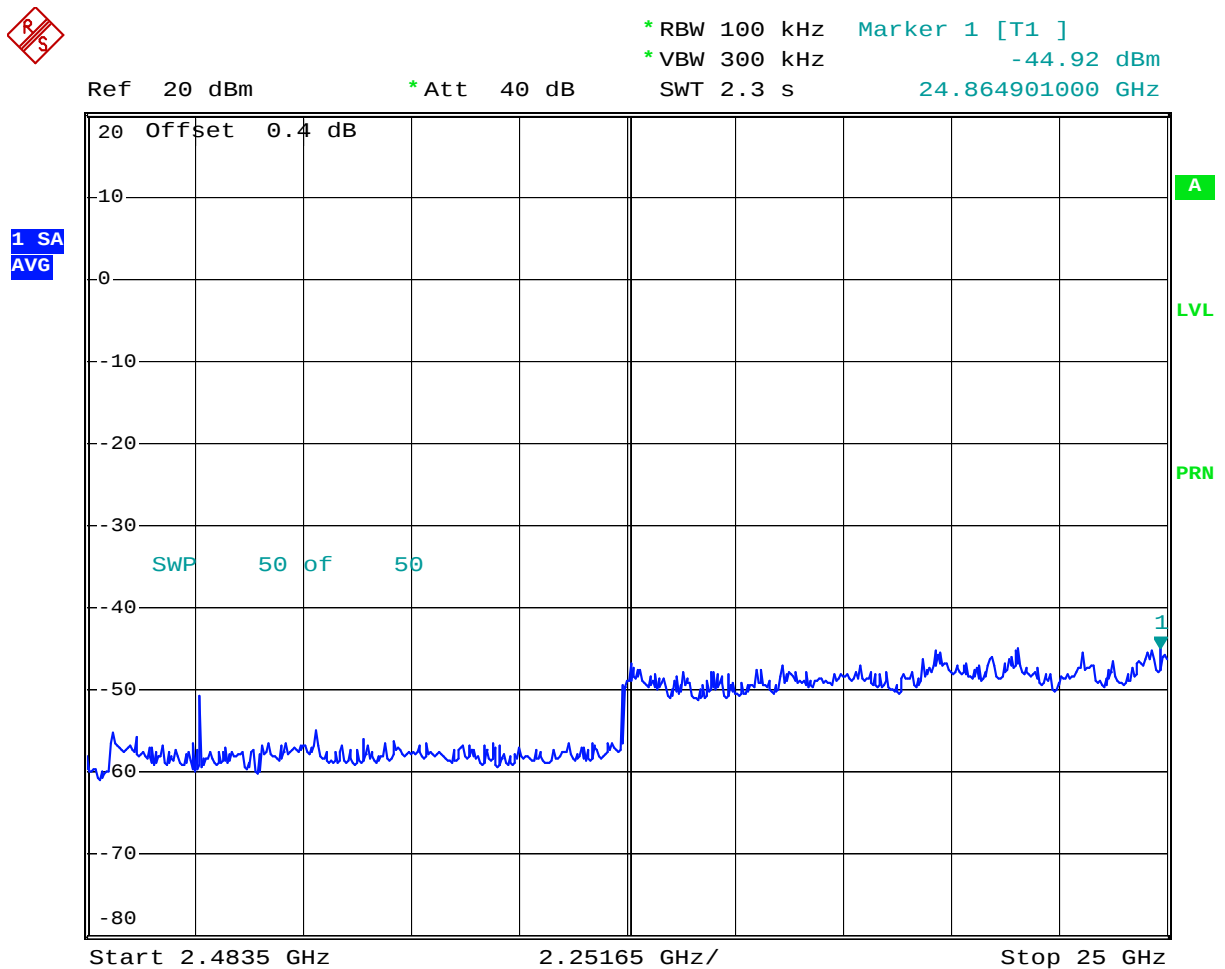
\* Att 40 dB

1 SA  
 AVG



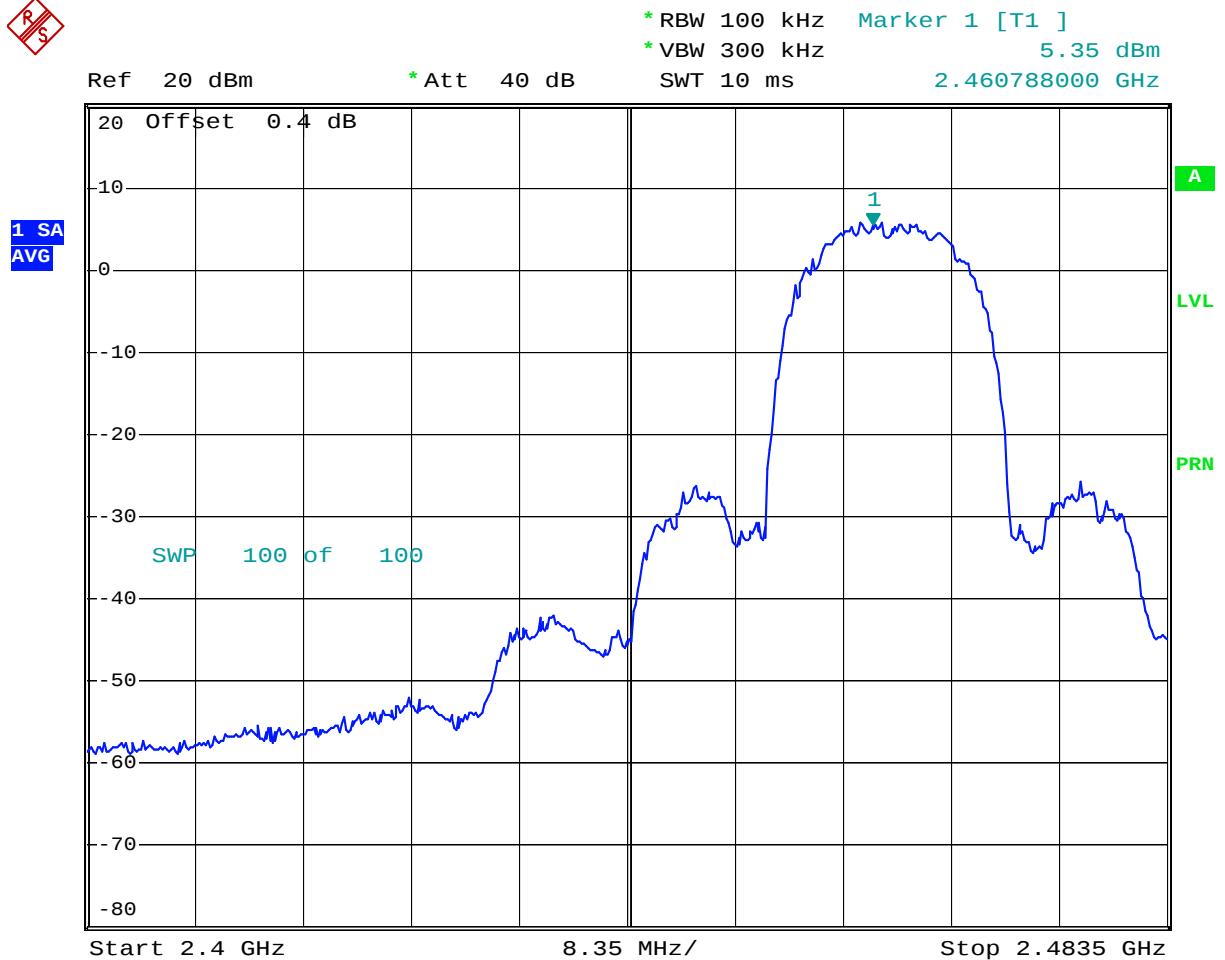
Comment: Spurious conducted, Ch 6, CCK 11 Mbps  
 Date: 30.JAN.2007 14:48:17

Plot 4.11



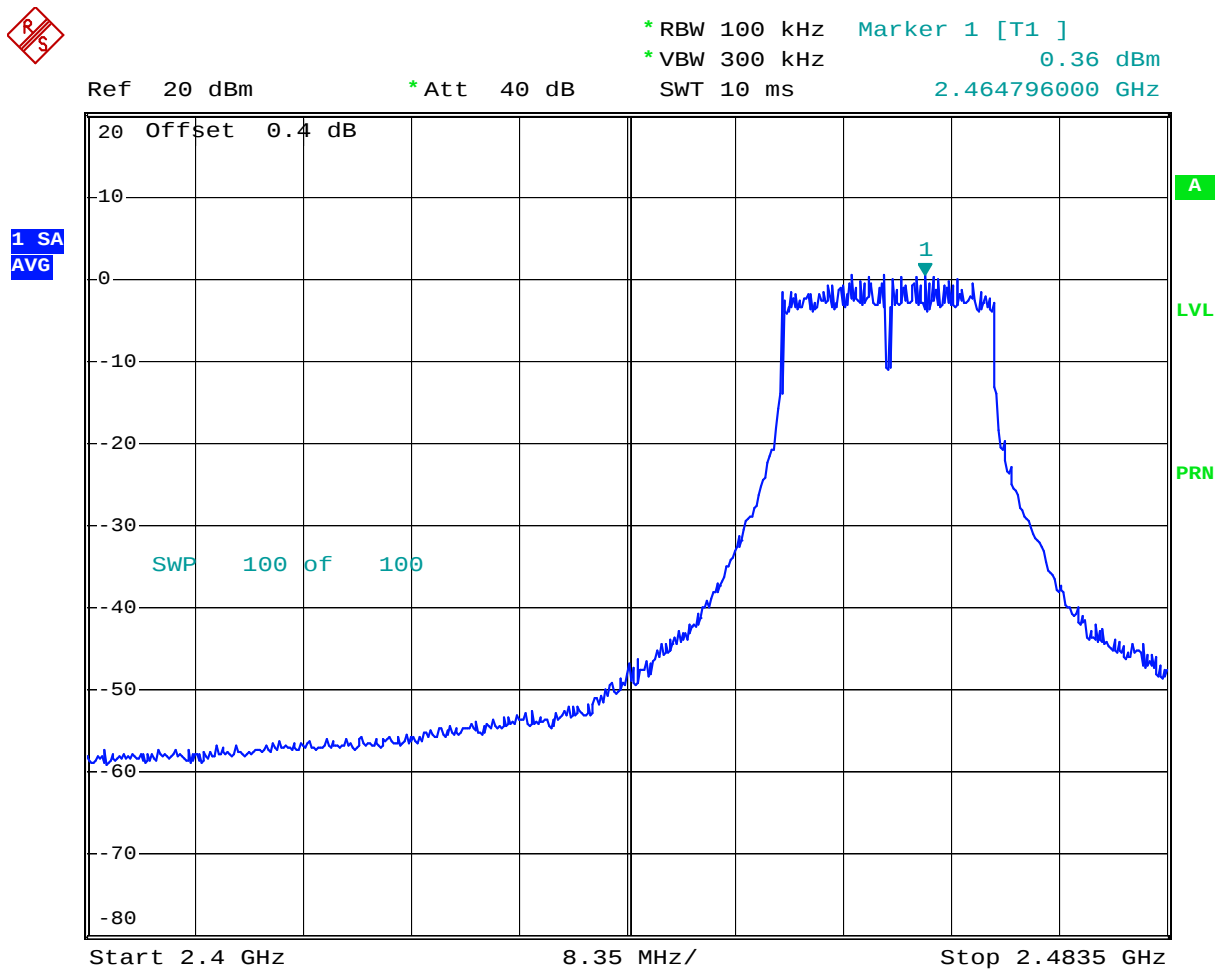
Comment: Spurious conducted, Ch 6, CCK 11 Mbps  
 Date: 30.JAN.2007 14:52:54

Plot 4.12



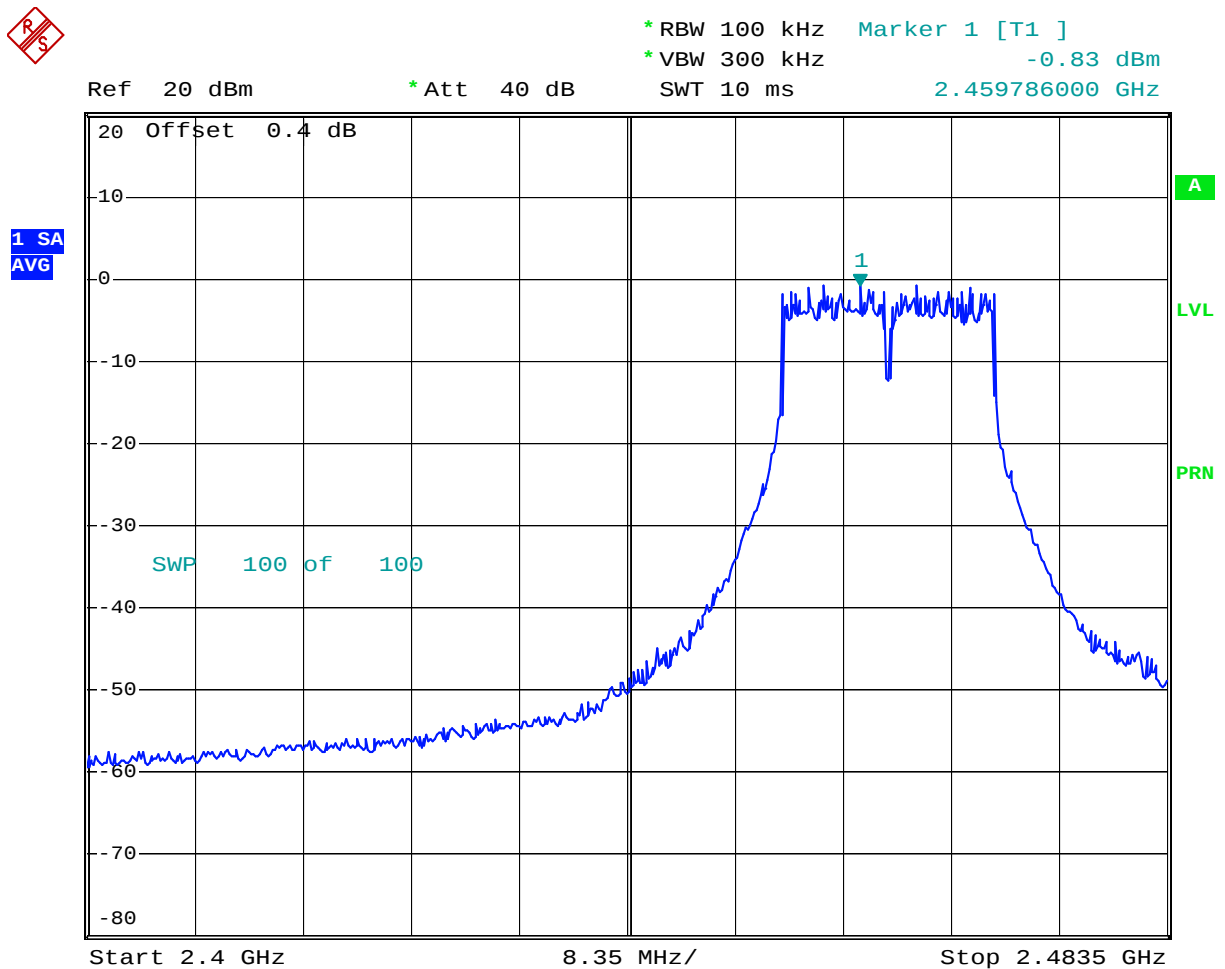
Comment: In-band conducted, Ch 11, CCK 11 Mbps  
Date: 30.JAN.2007 13:54:39

Plot 4.13



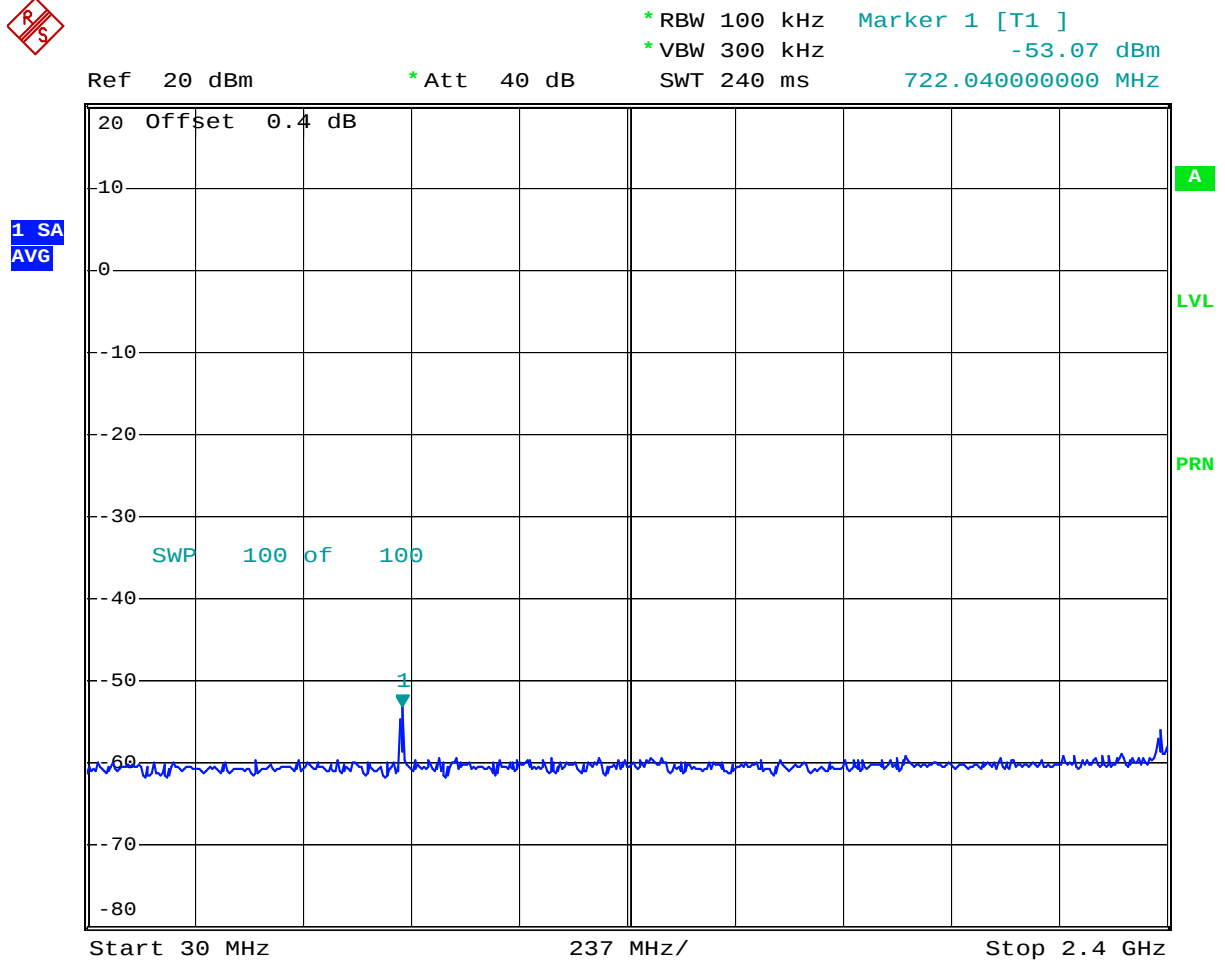
Comment: In-band conducted, Ch 11, OFDM 9 Mbps  
 Date: 30.JAN.2007 13:52:45

Plot 4.14



Comment: In-band conducted, Ch 11, OFDM 54 Mbps  
 Date: 30.JAN.2007 14:02:36

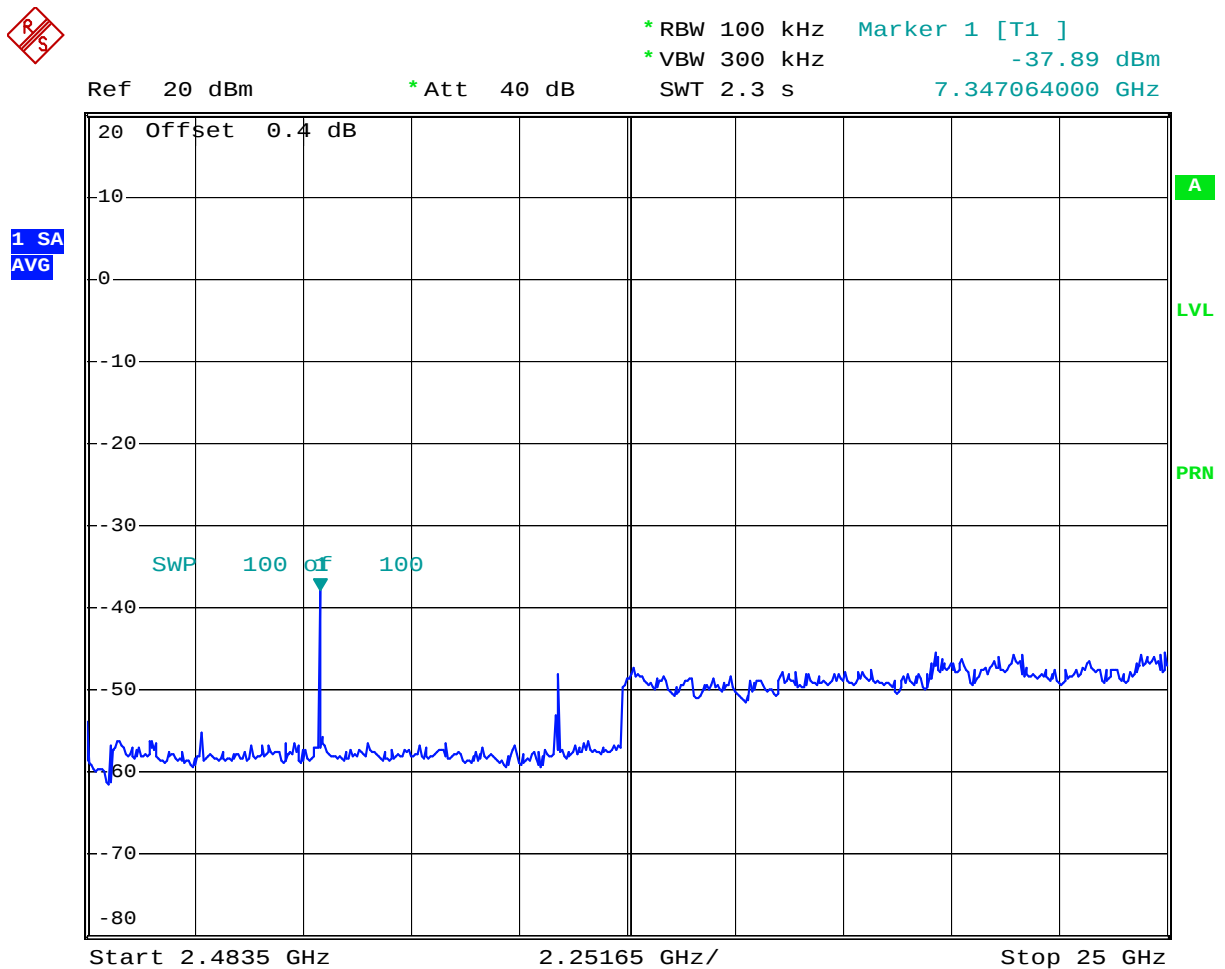
Plot 4.15



Comment: Spurious conducted, Ch 11, CCK 11 Mbps

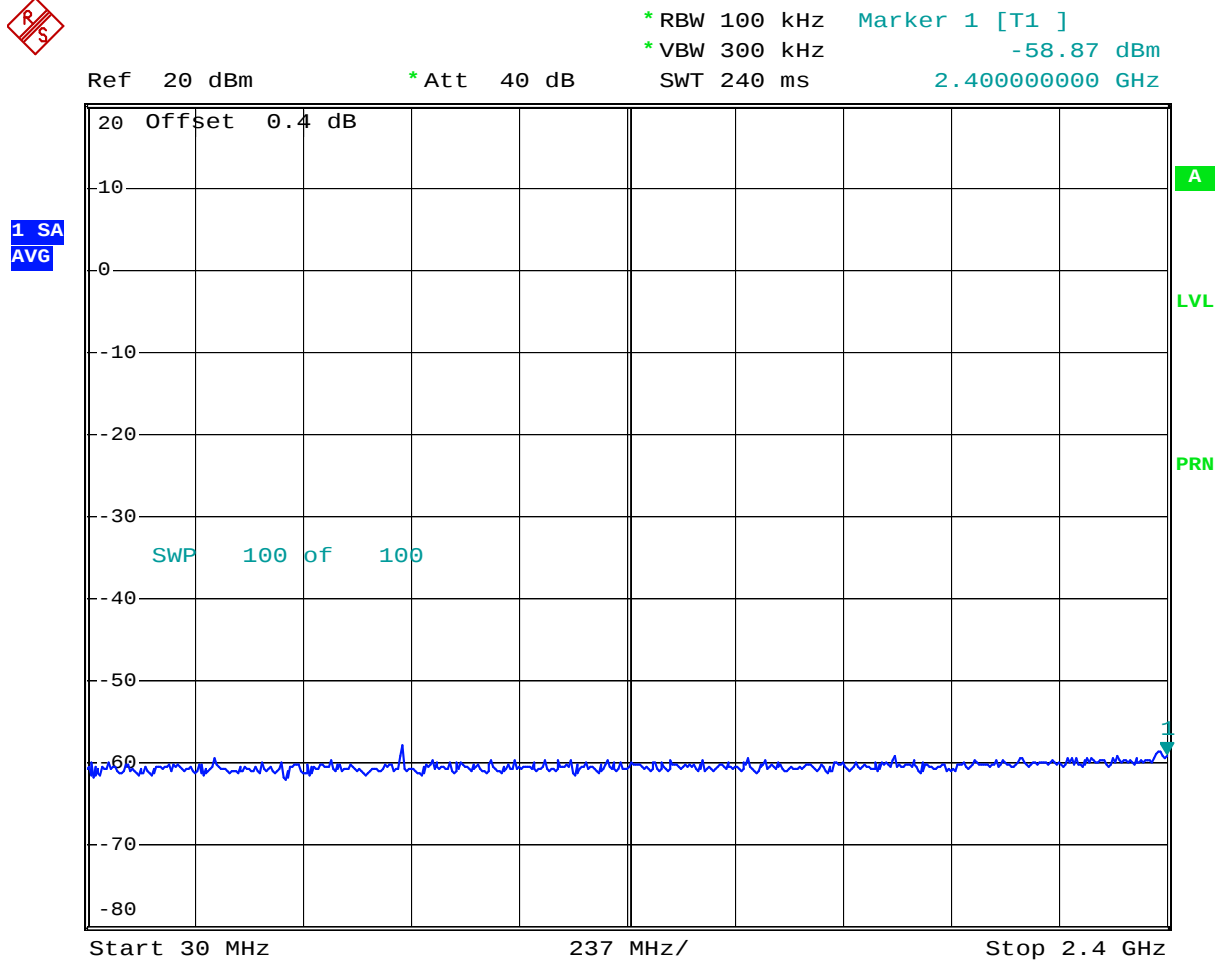
Date: 30.JAN.2007 14:10:50

Plot 4.16



Comment: Spurious conducted, Ch 11, CCK 11 Mbps  
 Date: 30.JAN.2007 14:16:46

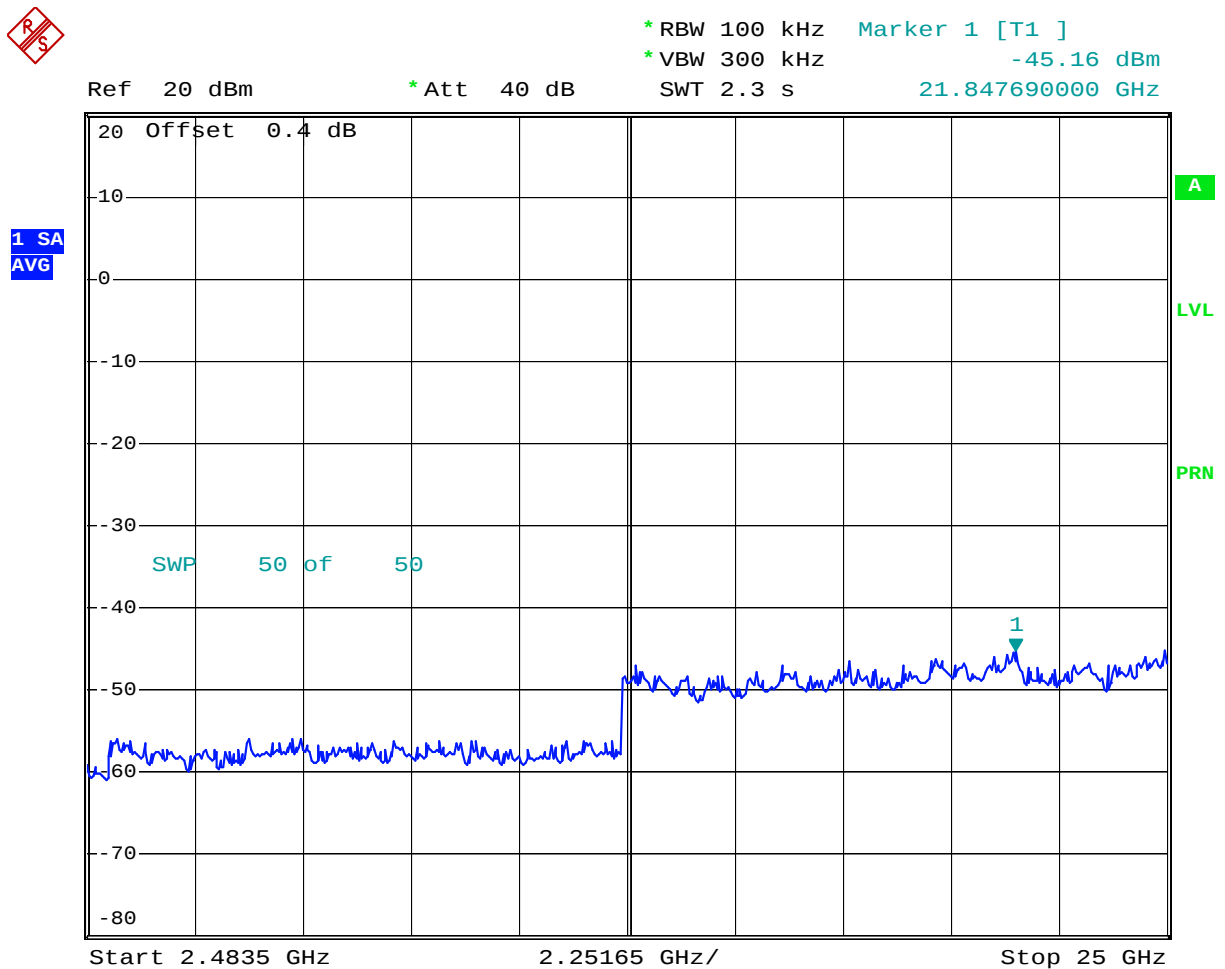
Plot 4.17



Comment: Spurious conducted, Ch 11, OFDM 9 Mbps

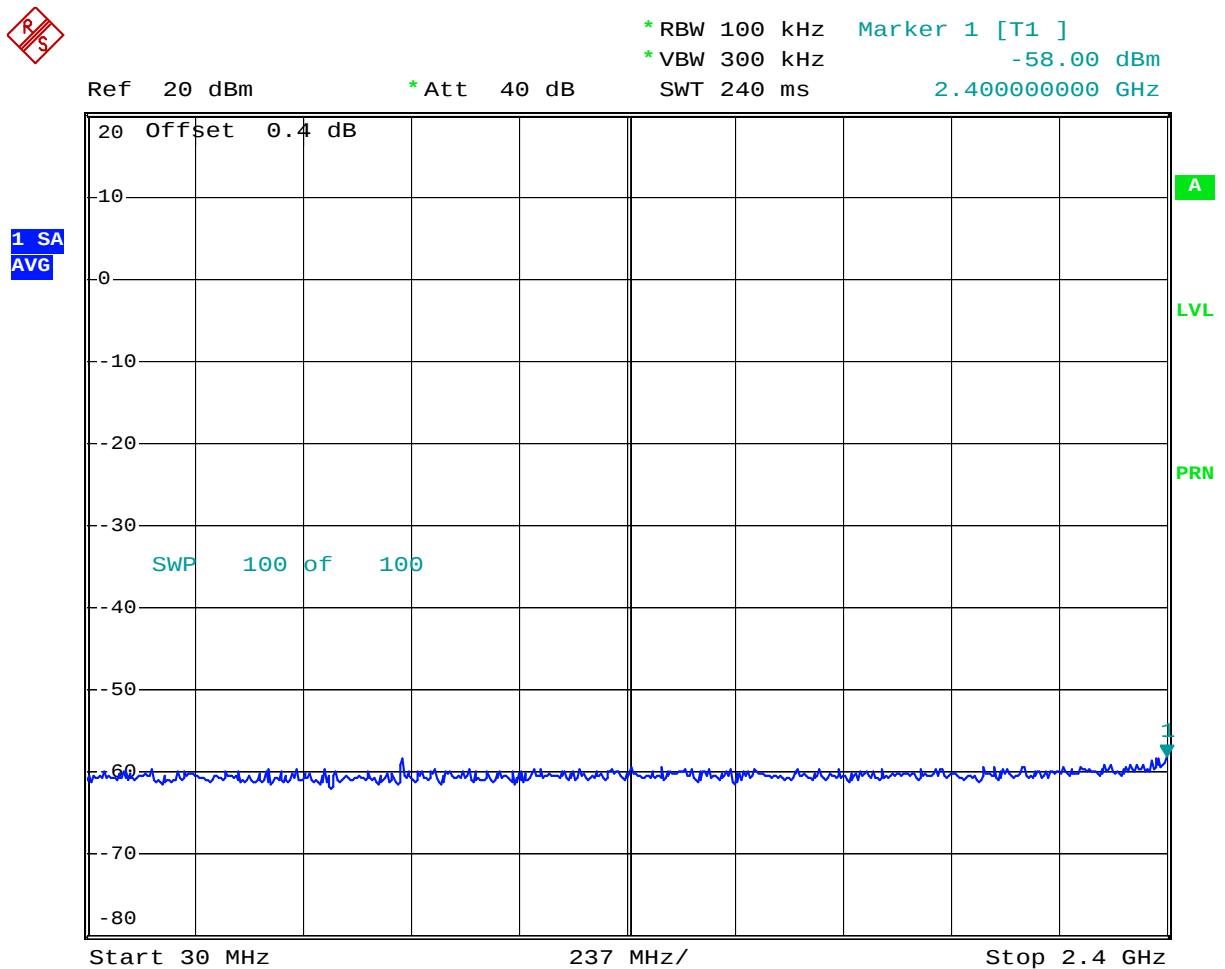
Date: 30.JAN.2007 14:08:53

Plot 4.18



Comment: Spurious conducted, Ch 11, OFDM 9 Mbps  
 Date: 30.JAN.2007 14:21:52

Plot 4.19

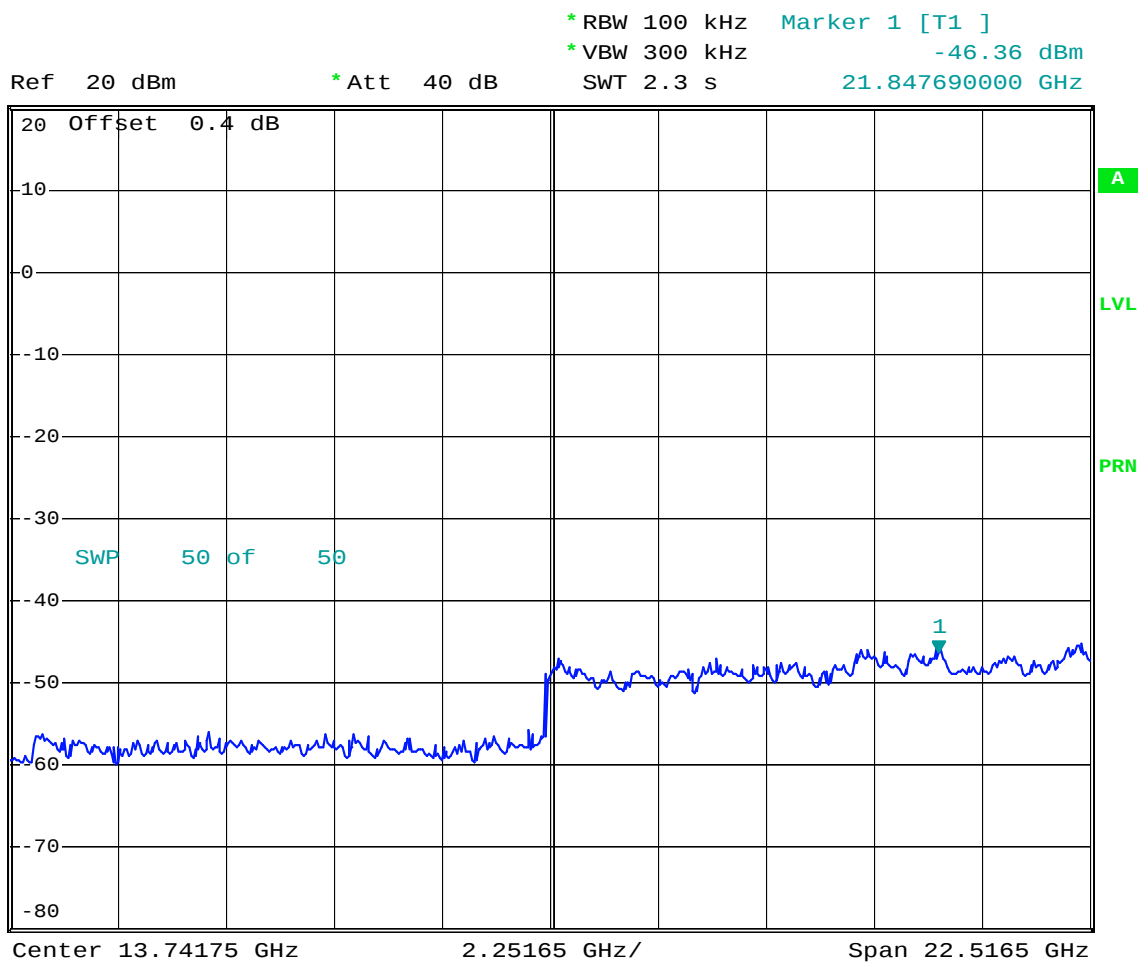


Comment: Spurious conducted, Ch 11, OFDM 54 Mbps  
 Date: 30.JAN.2007 14:05:33

Plot 4.20



1 SA  
AVG



Comment: Spurious conducted, Ch 11, OFDM 54 Mbps  
 Date: 30.JAN.2007 14:28:49

#### 4.5 Out of Band Radiated Emissions (except emissions in restricted bands) FCC Rule 15.247(c)

##### 4.5.1 Procedure

For out of band radiated emissions (except for frequencies in restricted bands) that are close to or that exceed the 20 dB attenuation requirement described in the specification, radiated measurements were performed at a 3 m separation distance to determine whether these emissions complied with the general radiated emission requirement.

##### 4.5.2 Test Result

Test was not performed, the EUT passed out-of-band antenna conducted emission test.

#### 4.6 Transmitter Radiated Emissions in Restricted Bands, FCC Rule 15.247(c), 15.209, 15.205

##### 4.6.1 Requirement

Radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a) (see §15.205(c)).

##### 4.6.2 Procedure

Radiated emission measurements were performed from 30 MHz to 25,000 MHz. Spectrum Analyzer Resolution Bandwidth is 100 kHz or greater for frequencies 30 MHz to 1000 MHz, 1 MHz - for frequencies above 1000 MHz.

The EUT is placed on a plastic turntable. If the EUT attaches to peripherals, they are connected and operational (as typical as possible). During testing, all cables were manipulated to produce worst-case emissions. The signal is maximized through rotation. The antenna height and polarization are varied during the search for maximum signal level. The antenna height is varied from 1 to 4 meters.

Radiated emissions are taken at three meters unless the signal level is too low for measurement at that distance. If necessary, a pre-amplifier is used and/or the test is conducted at a closer distance. All readings are extrapolated back to the equivalent three-meter reading using inverse scaling with distance.

Data is included of the worst-case configuration (the configuration which resulted in the highest emission levels).

##### 4.6.3 Field Strength Calculation

The field strength is calculated by adding the Antenna Factor and Cable Factor, and subtracting the Amplifier Gain (if any) from the measured reading. The basic equation with a sample calculation is as follows:

$FS = RA + AF + CF - AG$ ; if measurement is performed at a distance other than specified in the rule, a Distance Correction Factor (DCF) shall be added.

Where  $FS$  = Field Strength in  $dB(\mu V/m)$

$RA$  = Receiver Amplitude (including preamplifier) in  $dB(\mu V)$ ;  $AF$  = Antenna Factor in  $dB(1/m)$

$CF$  = Cable Attenuation Factor in  $dB$ ;  $AG$  = Amplifier Gain in  $dB$

Assume a receiver reading of 52.0  $dB(\mu V)$  is obtained. The antennas factor of 7.4  $dB(1/m)$  and cable factor of 1.6  $dB$  is added. The amplifier gain of 29  $dB$  is subtracted, giving field strength of 32  $dB(\mu V/m)$ . This value in  $dB(\mu V/m)$  was converted to its corresponding level in  $\mu V/m$ .

$RA = 52.0 \text{ dB}(\mu V)$

$AF = 7.4 \text{ dB}(1/m)$

$CF = 1.6 \text{ dB}$

$AG = 29.0 \text{ dB}$

$FS = 52.0 + 7.4 + 1.6 - 29.0 = 32 \text{ dB}(\mu V/m)$ .

Level in  $\mu V/m$  = Common Antilogarithm  $[(32 \text{ dB}\mu V/m)/20] = 39.8 \mu V/m$ .

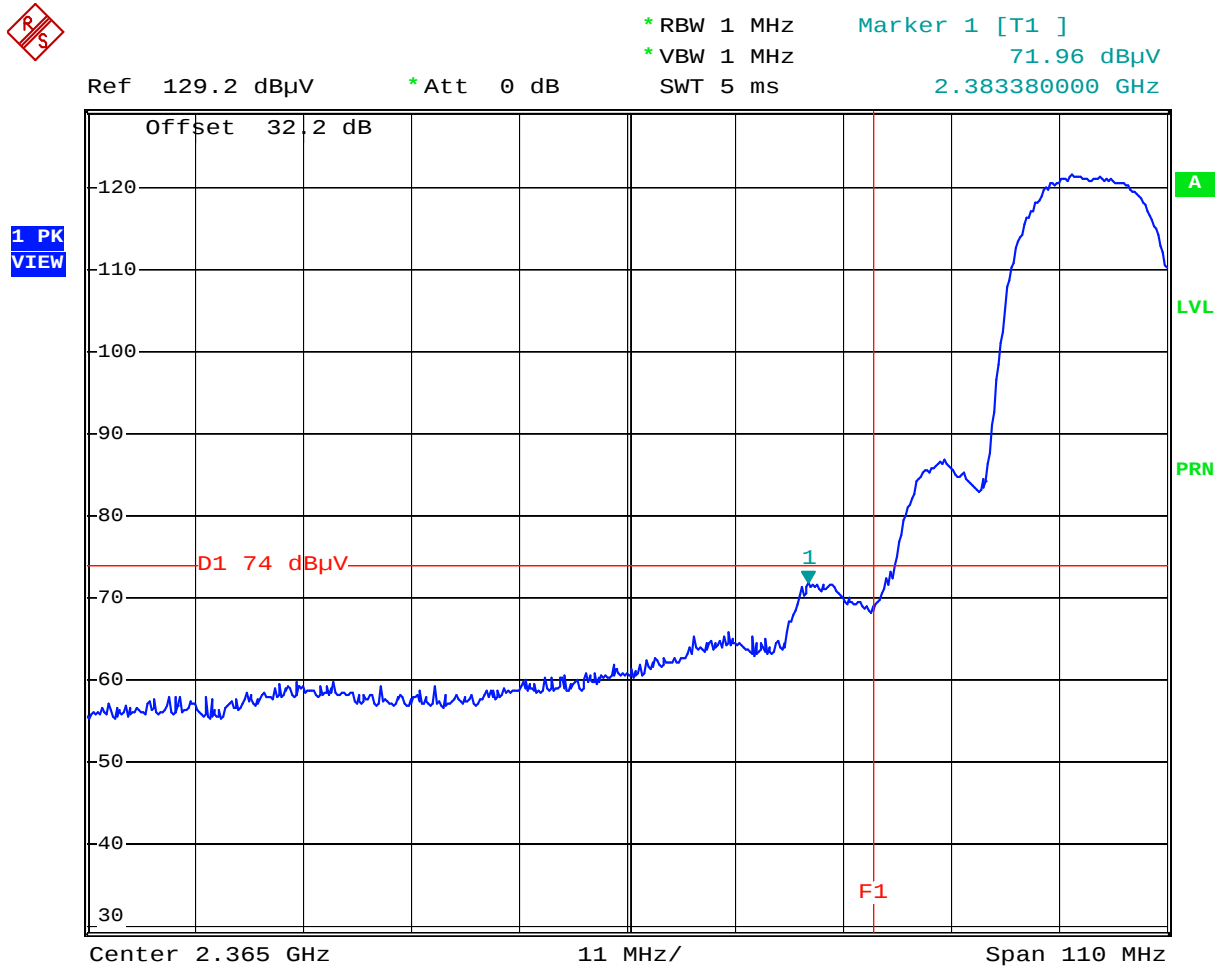
#### 4.6.4 Test Result – bands: 2483.5 – 2500 MHz and 2310 – 2390 MHz

On the following graphs 6.1 – 6.16, the antenna factor, cable loss and duty cycle correction factor of 8 dB are included in the spectrum analyzer reference level OFFSET. Therefore, the Marker Reading shows the Field Strength at 3m distance.

In addition, Field Strength measurements were performed for channel 2 and channel 10.

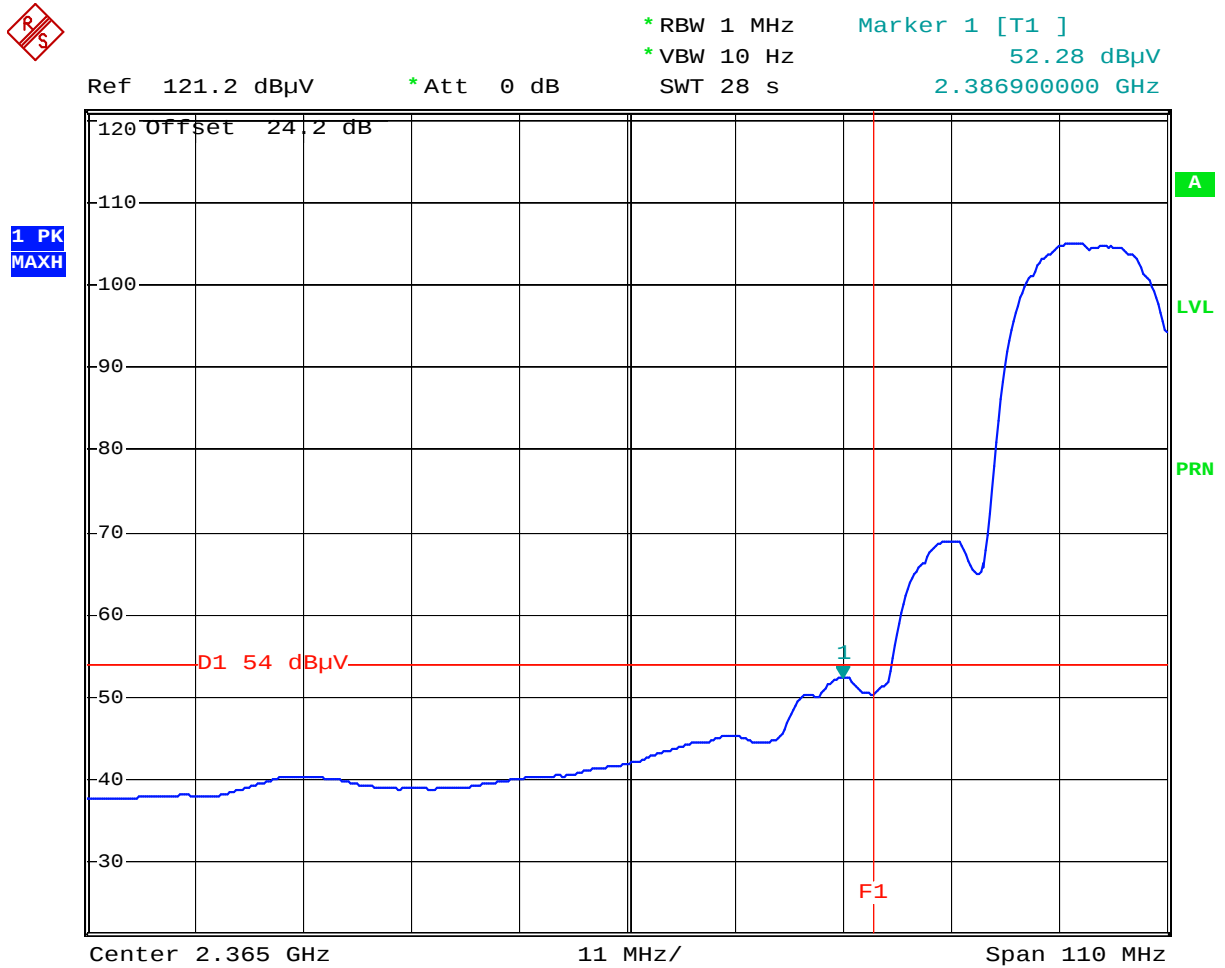
The EUT passed the test by 0.54 dB (Peak) & 1.72 dB (Average)

Plot 6.1



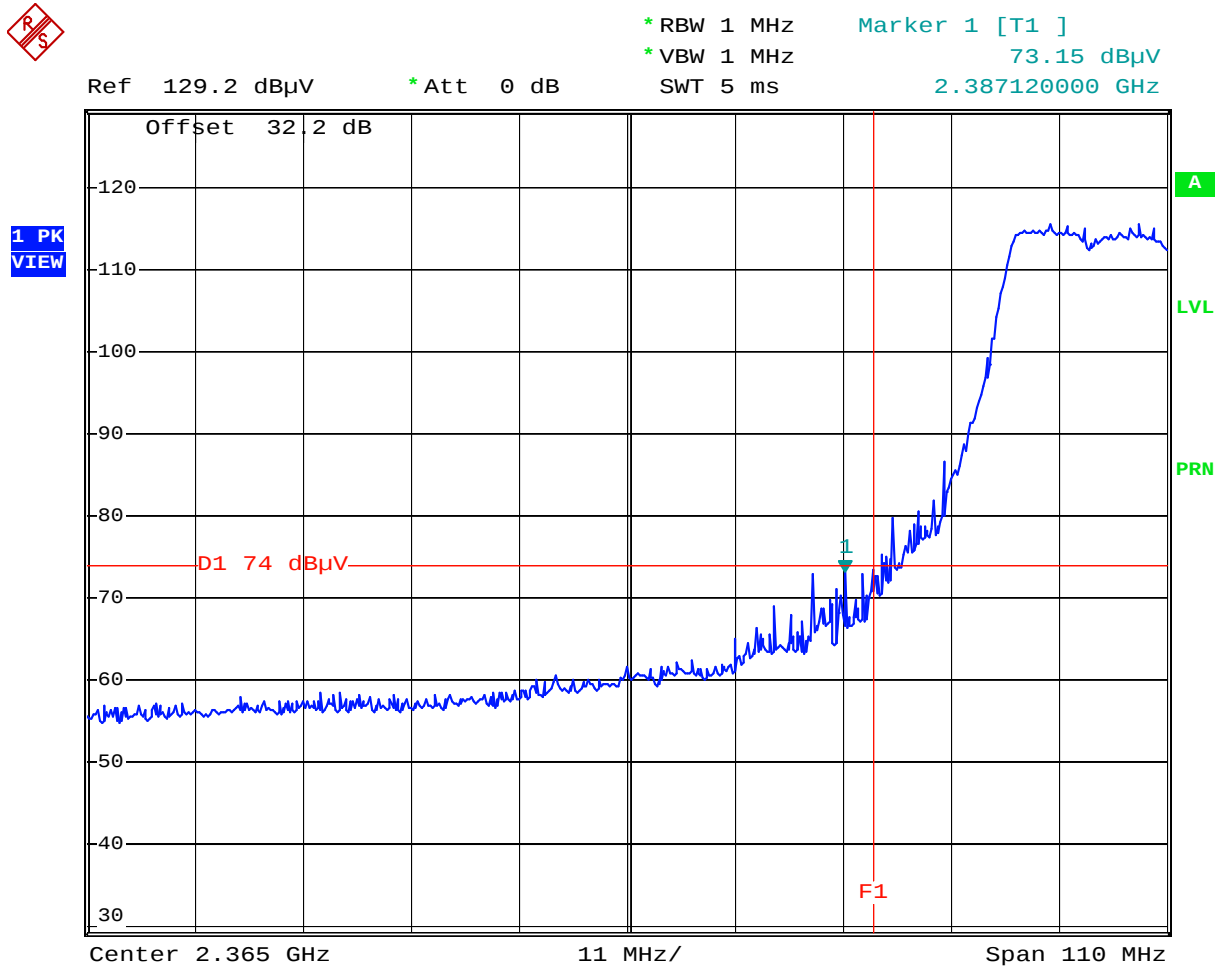
Comment: Bandedge, Ch 1, CCK 11 Mbps Peak  
Date: 29.JAN.2007 22:14:39

Plot 6.2



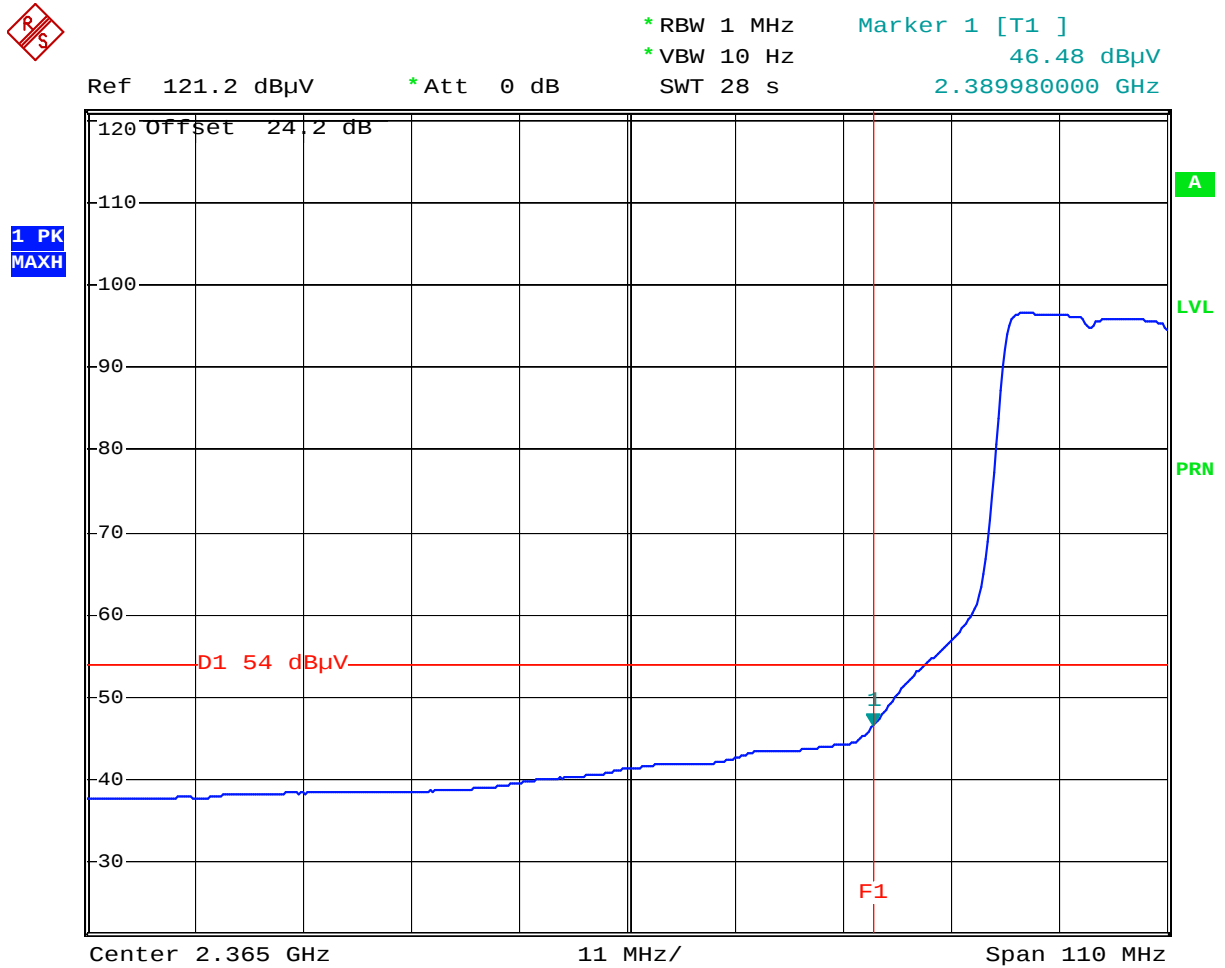
Comment: Bandedge, Ch 1, CCK 11 Mbps Average  
 Date: 29.JAN.2007 22:16:42

Plot 6.3



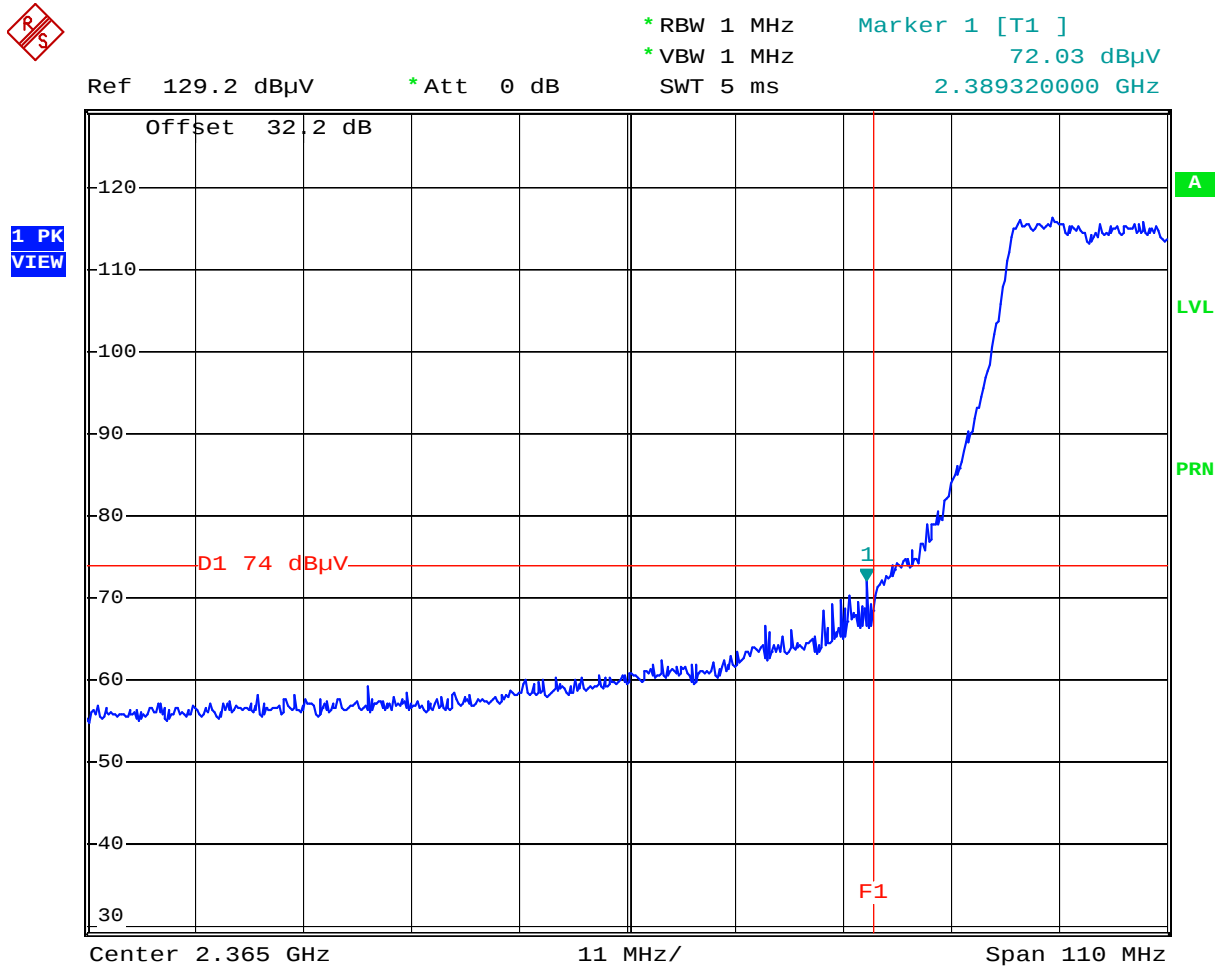
Comment: Bandedge, Ch 1, OFDM 9 Mbps Peak  
Date: 29.JAN.2007 22:05:47

Plot 6.4



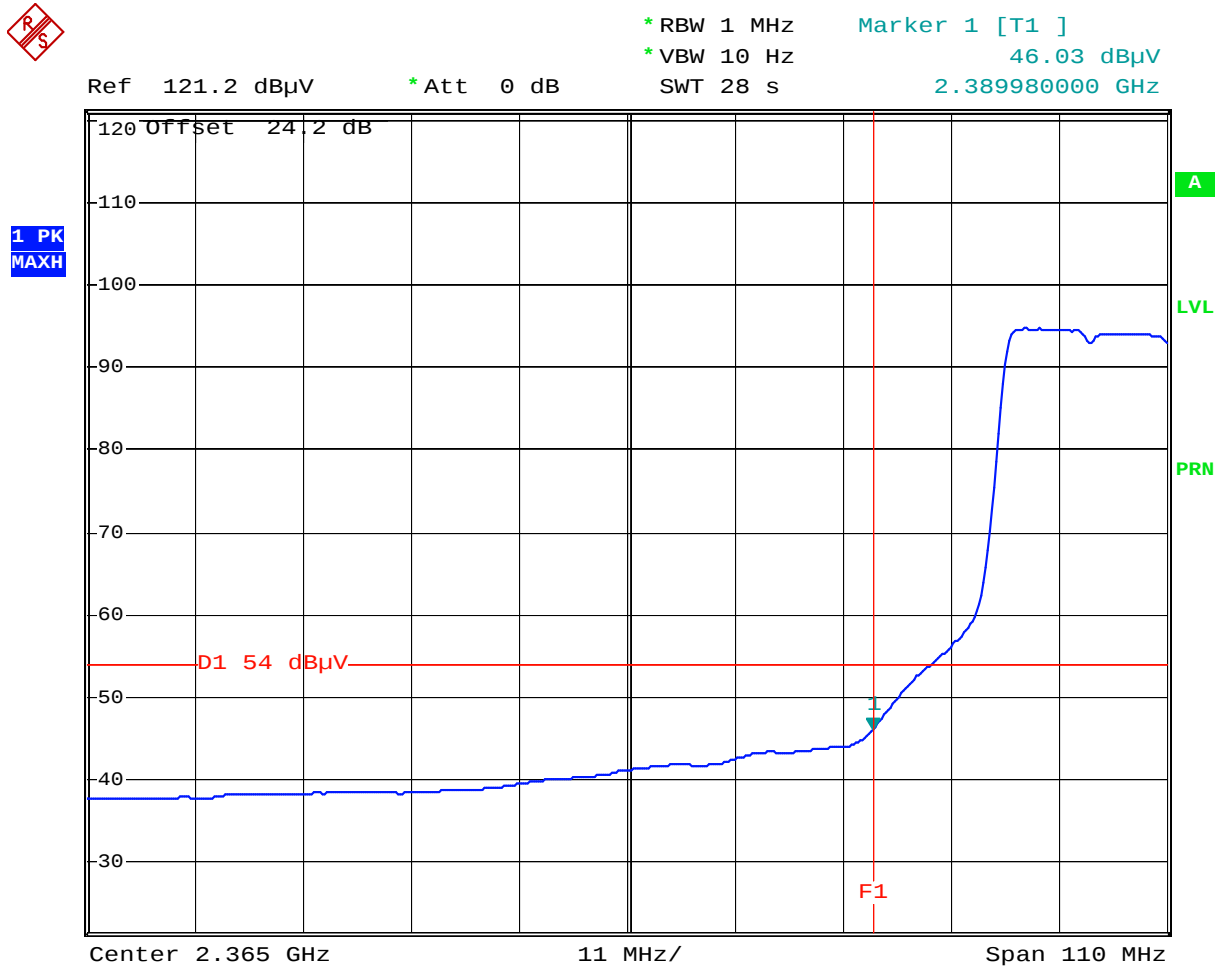
Comment: Bandedge, Ch 1, OFDM 9 Mbps Average  
Date: 29.JAN.2007 22:07:31

Plot 6.5



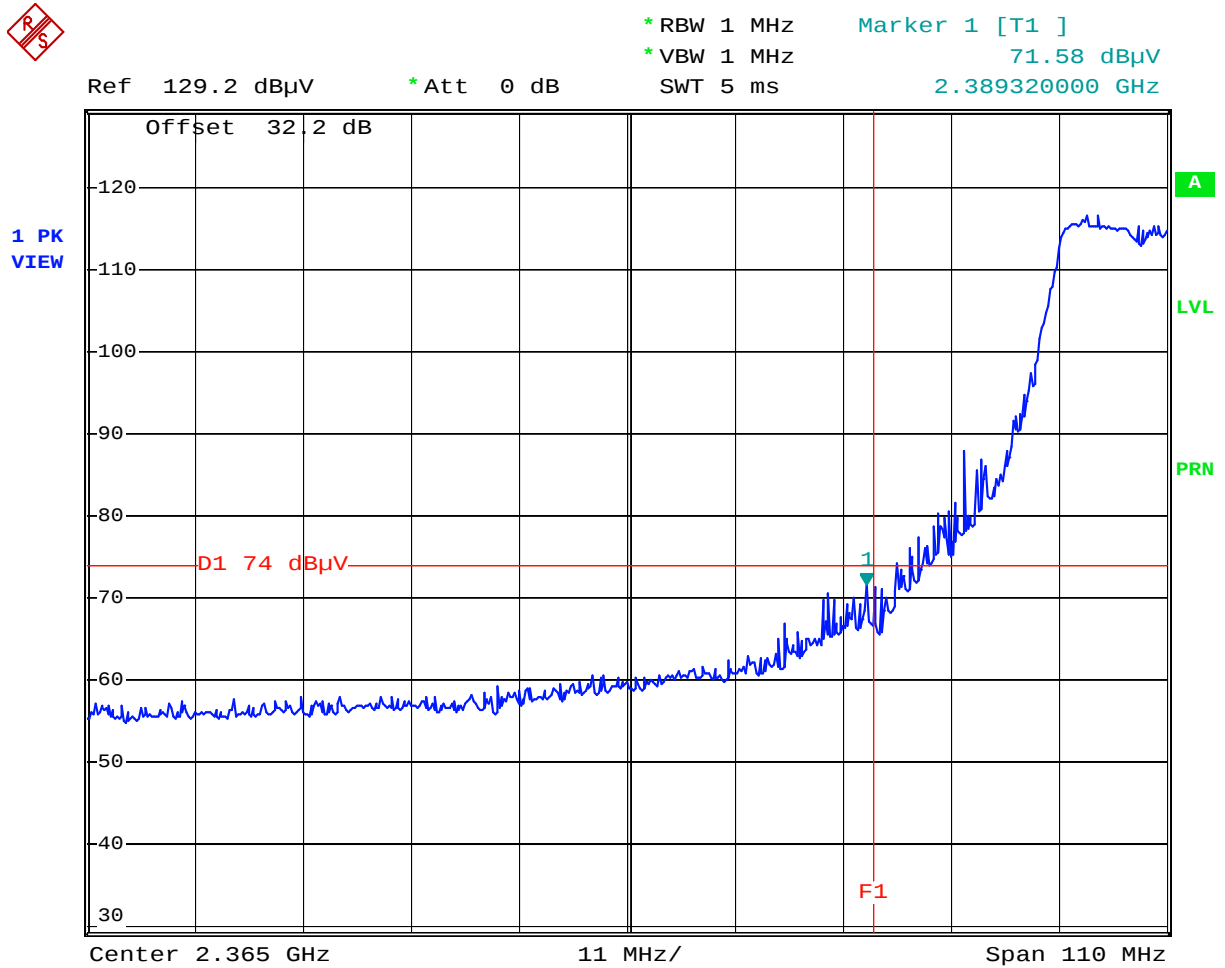
Comment: Bandedge, Ch 1, OFDM 54 Mbps Peak  
Date: 29.JAN.2007 22:10:13

Plot 6.6



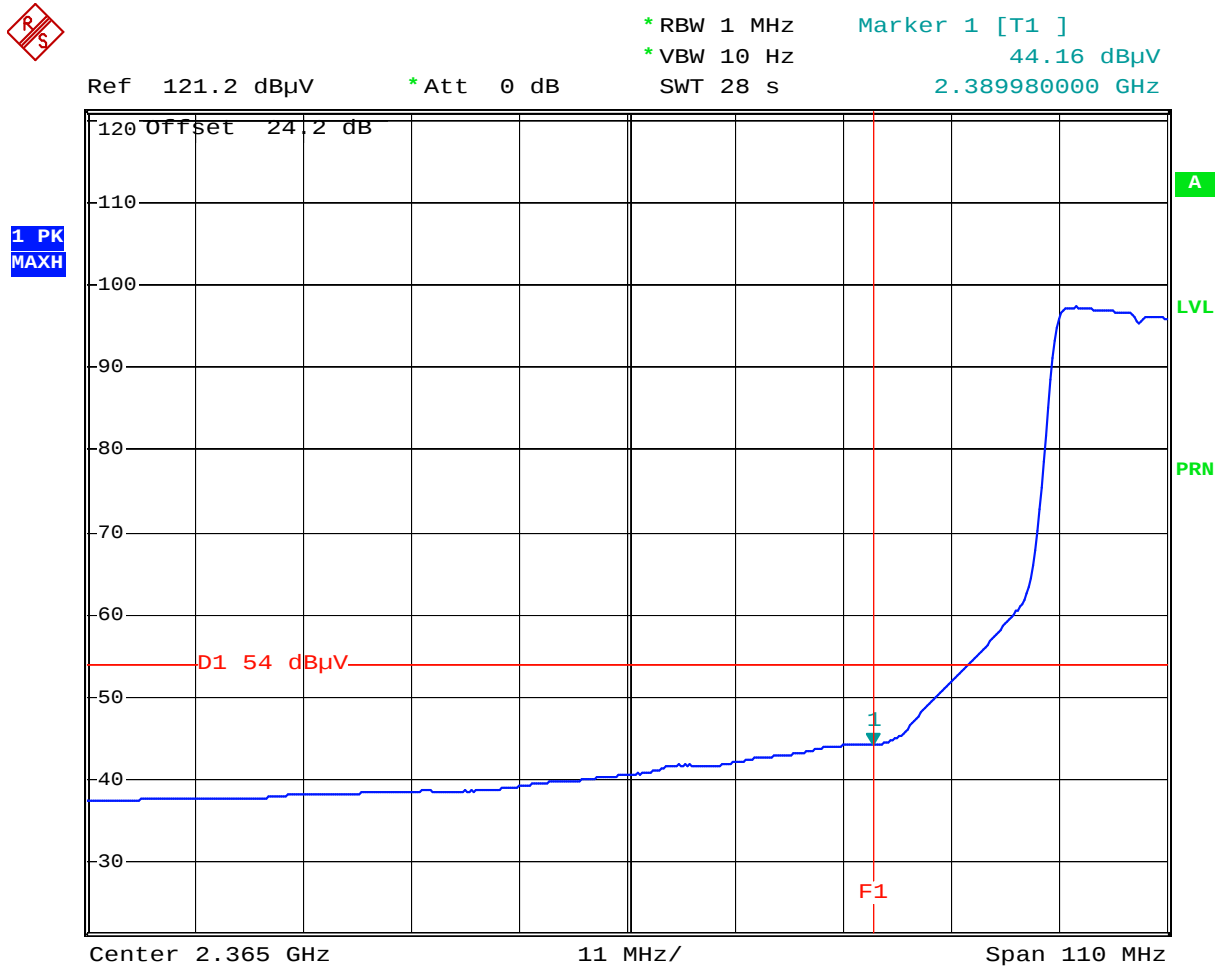
Comment: Bandedge, Ch 1, OFDM 54 Mbps Average  
Date: 29.JAN.2007 22:11:53

Plot 6.7



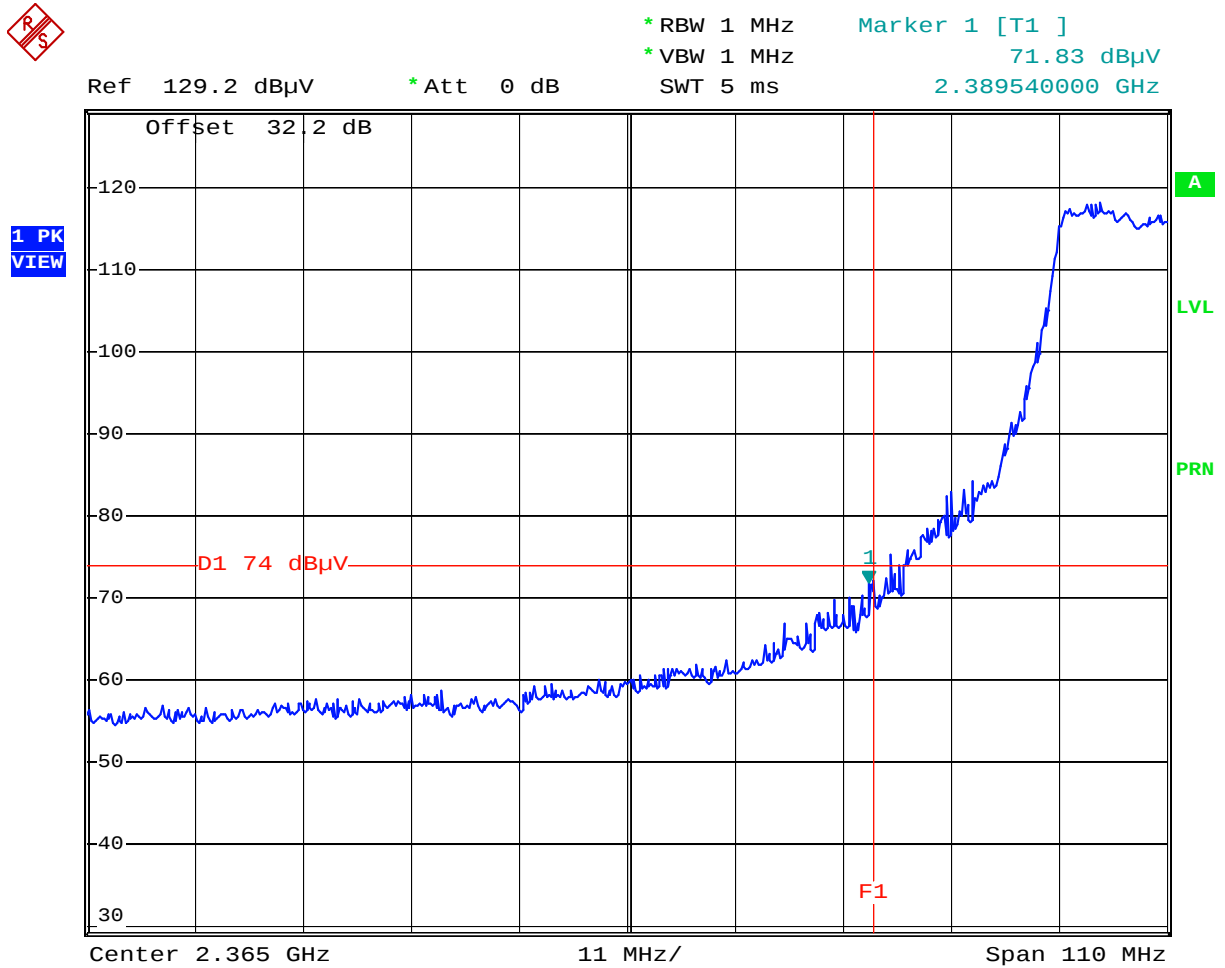
Comment: Bandedge, Ch 2, OFDM 9 Mbps Peak  
 Date: 29.JAN.2007 22:24:08

Plot 6.8



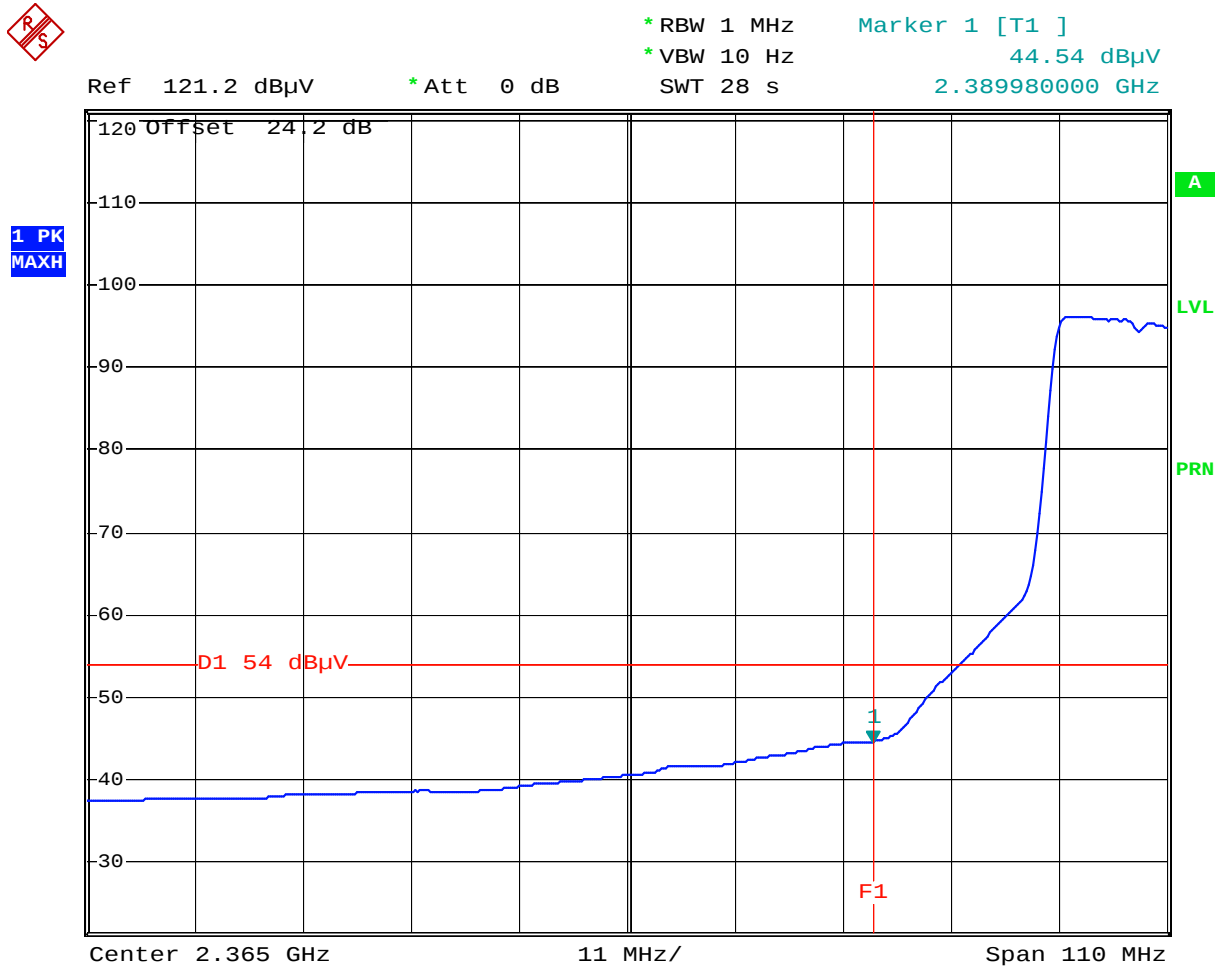
Comment: Bandedge, Ch 2, OFDM 9 Mbps Average  
Date: 29.JAN.2007 22:25:59

Plot 6.9



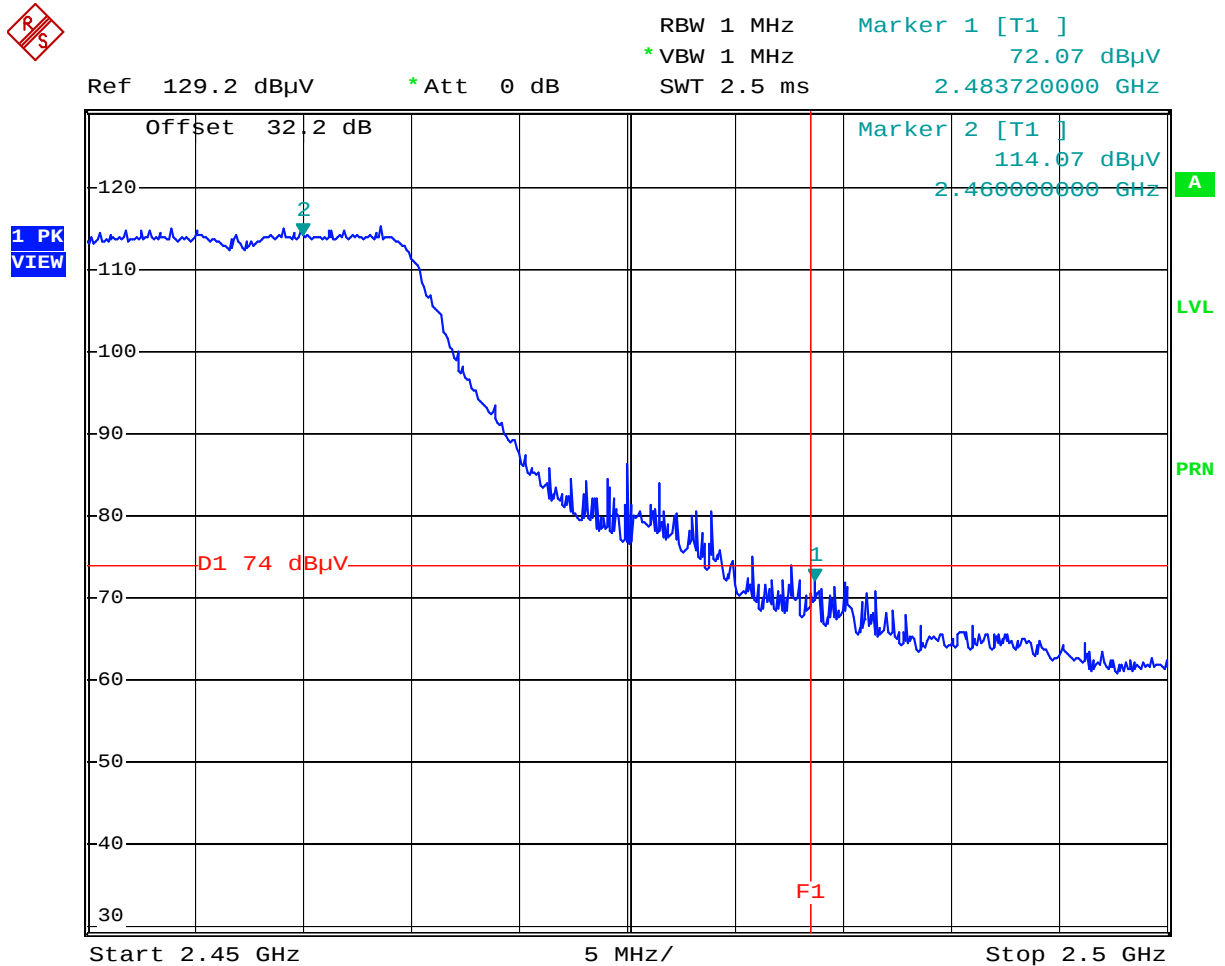
Comment: Bandedge, Ch 2, OFDM 54 Mbps Peak  
Date: 29.JAN.2007 22:28:41

Plot 6.10



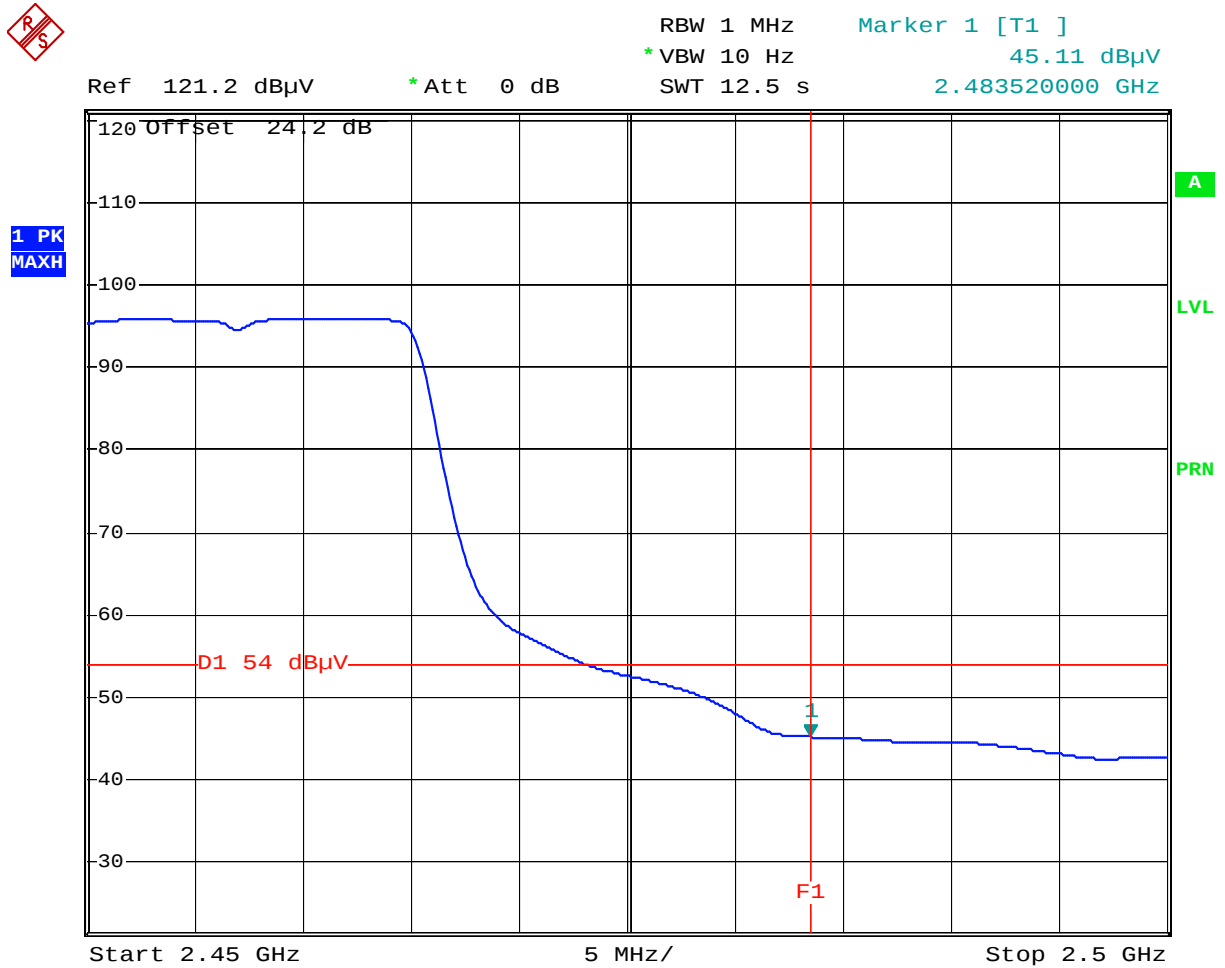
Comment: Bandedge, Ch 2, OFDM 54 Mbps Average  
Date: 29.JAN.2007 22:30:12

Plot 6.11



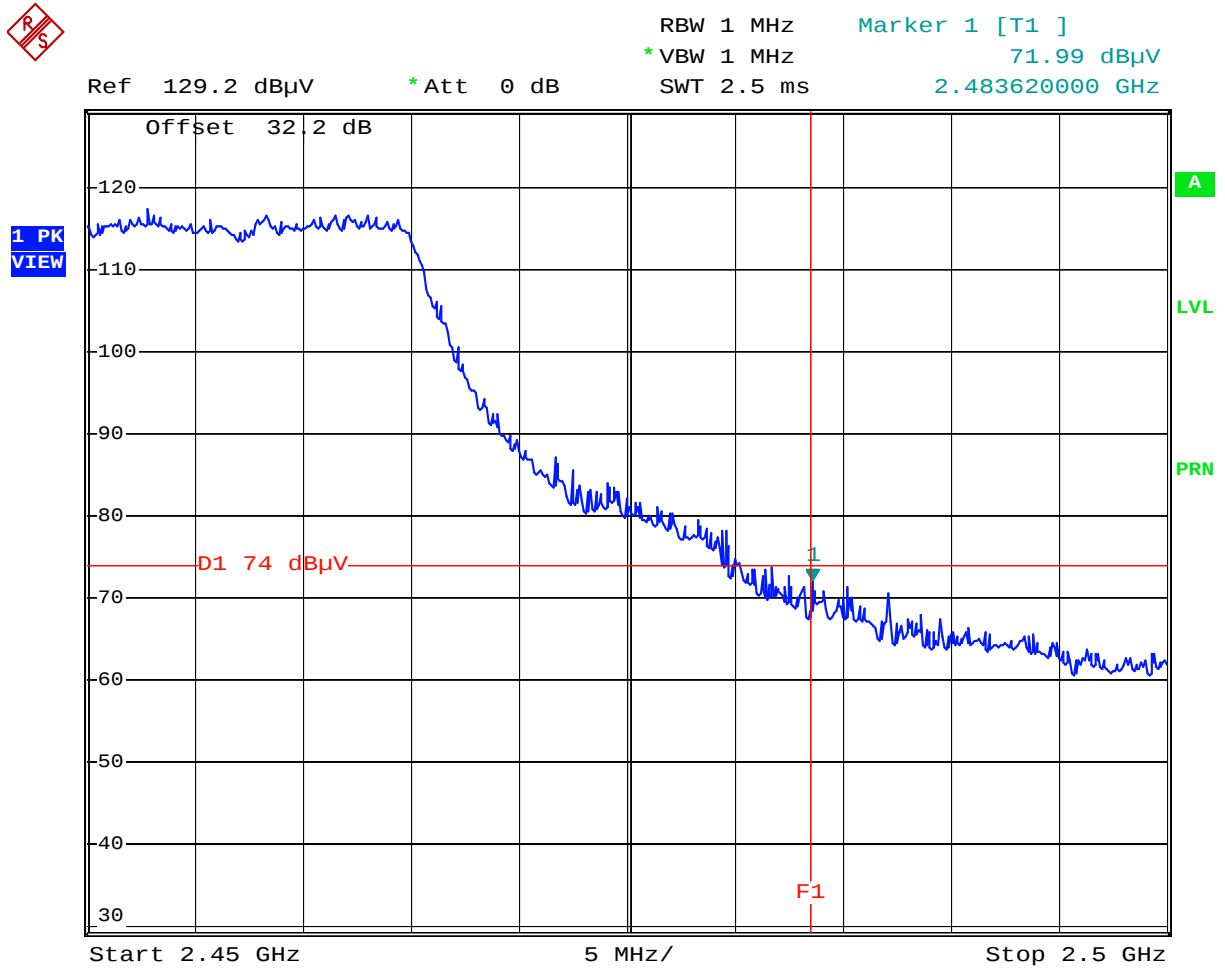
Comment: Bandedge, Ch 10, OFDM 9 Mbps Peak  
Date: 29.JAN.2007 21:35:19

Plot 6.12



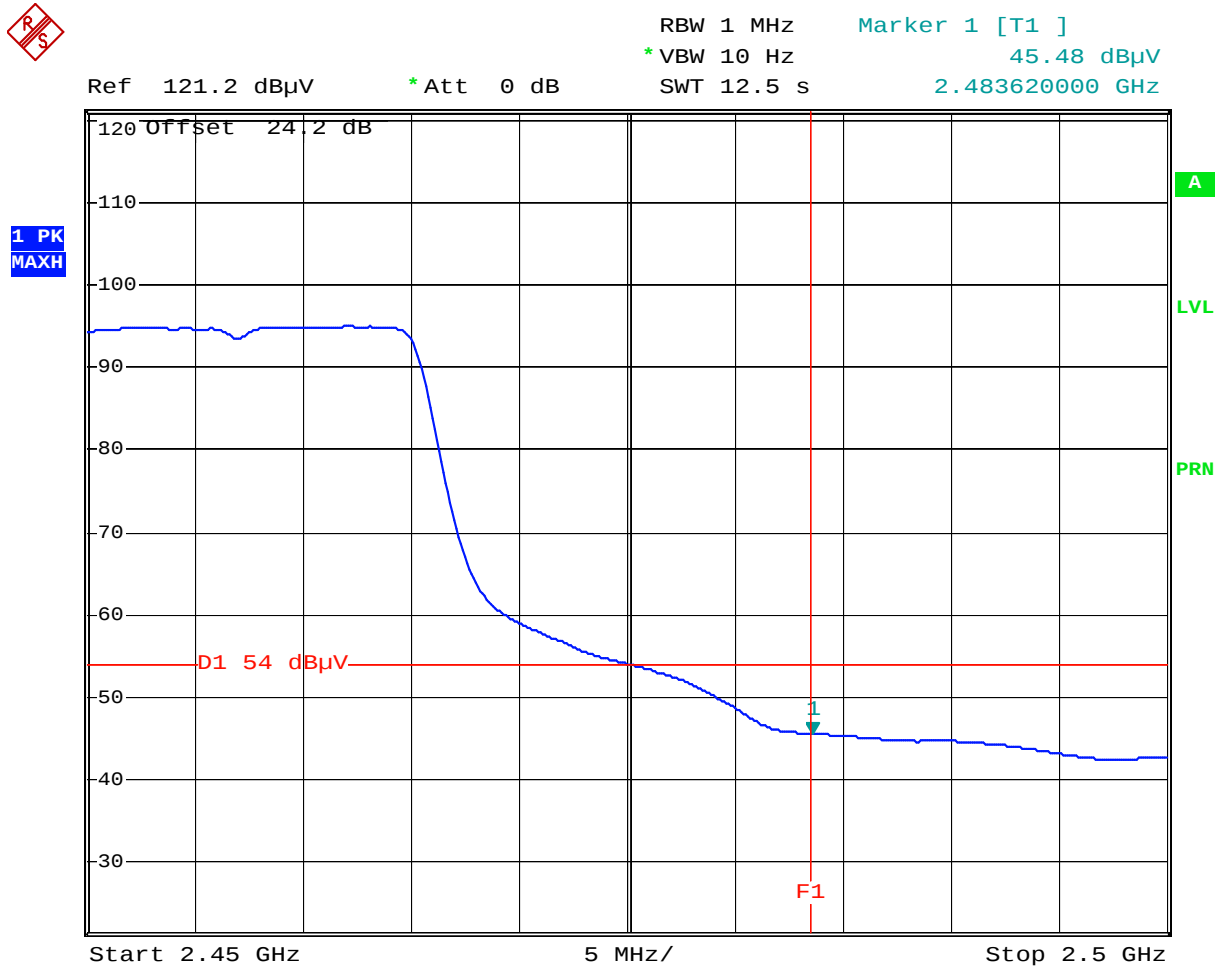
Comment: Bandedge, Ch 10, OFDM 9 Mbps Average  
 Date: 29.JAN.2007 21:37:17

Plot 6.13



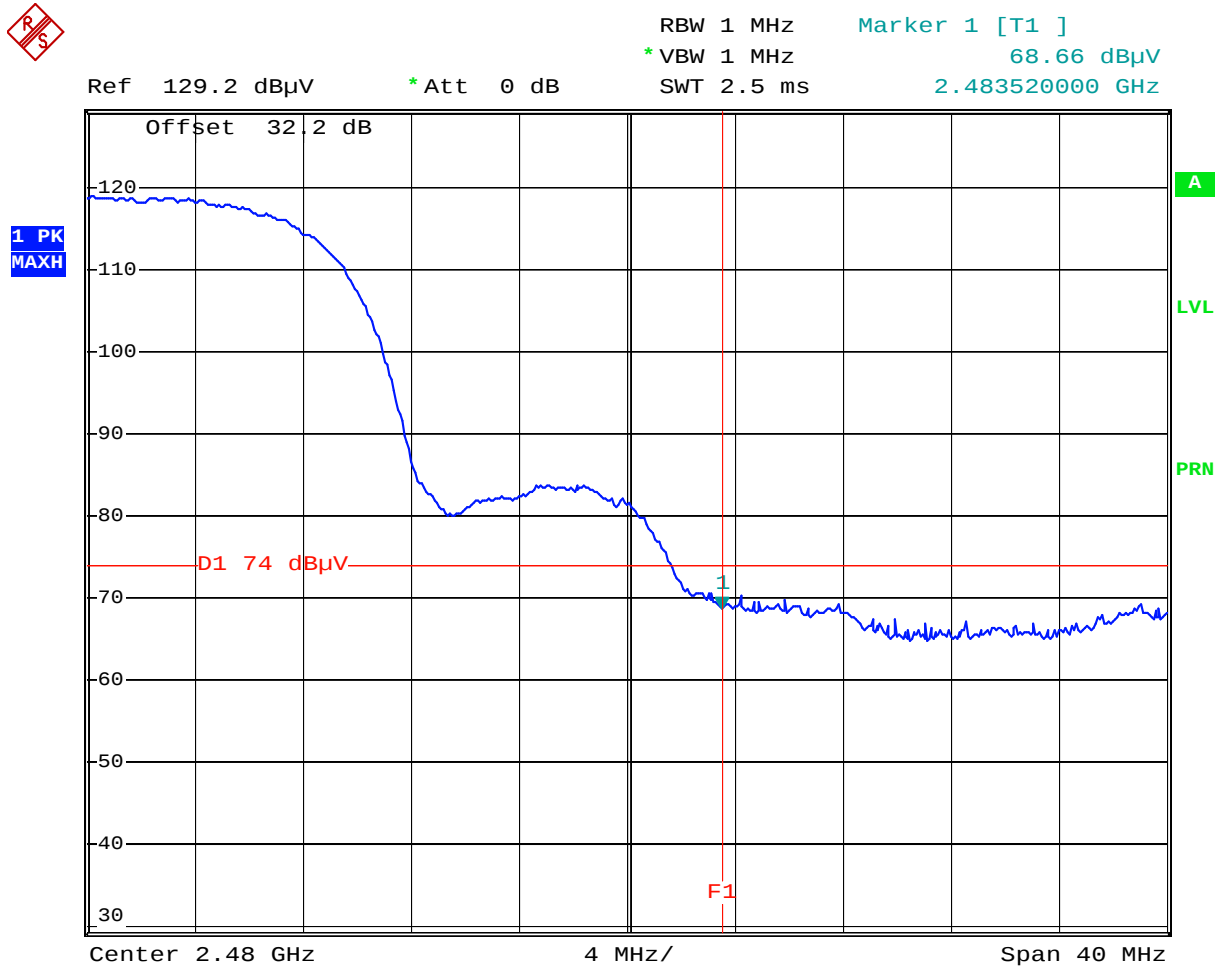
Comment: Bandedge, Ch 10, OFDM 54 Mbps Peak  
 Date: 29.JAN.2007 21:53:16

Plot 6.14



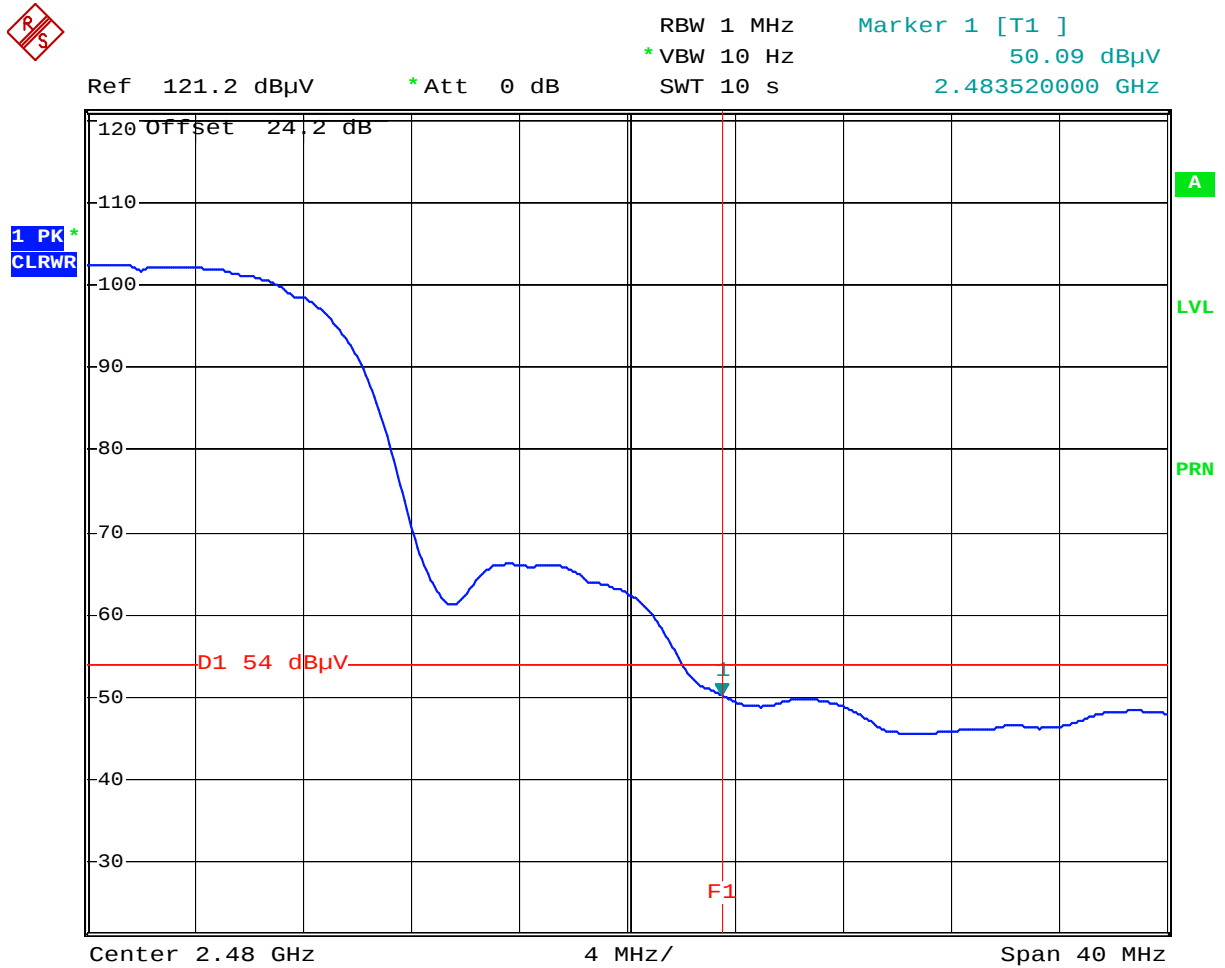
Comment: Bandedge, Ch 10, OFDM 54 Mbps Average  
 Date: 29.JAN.2007 21:54:49

Plot 6.15



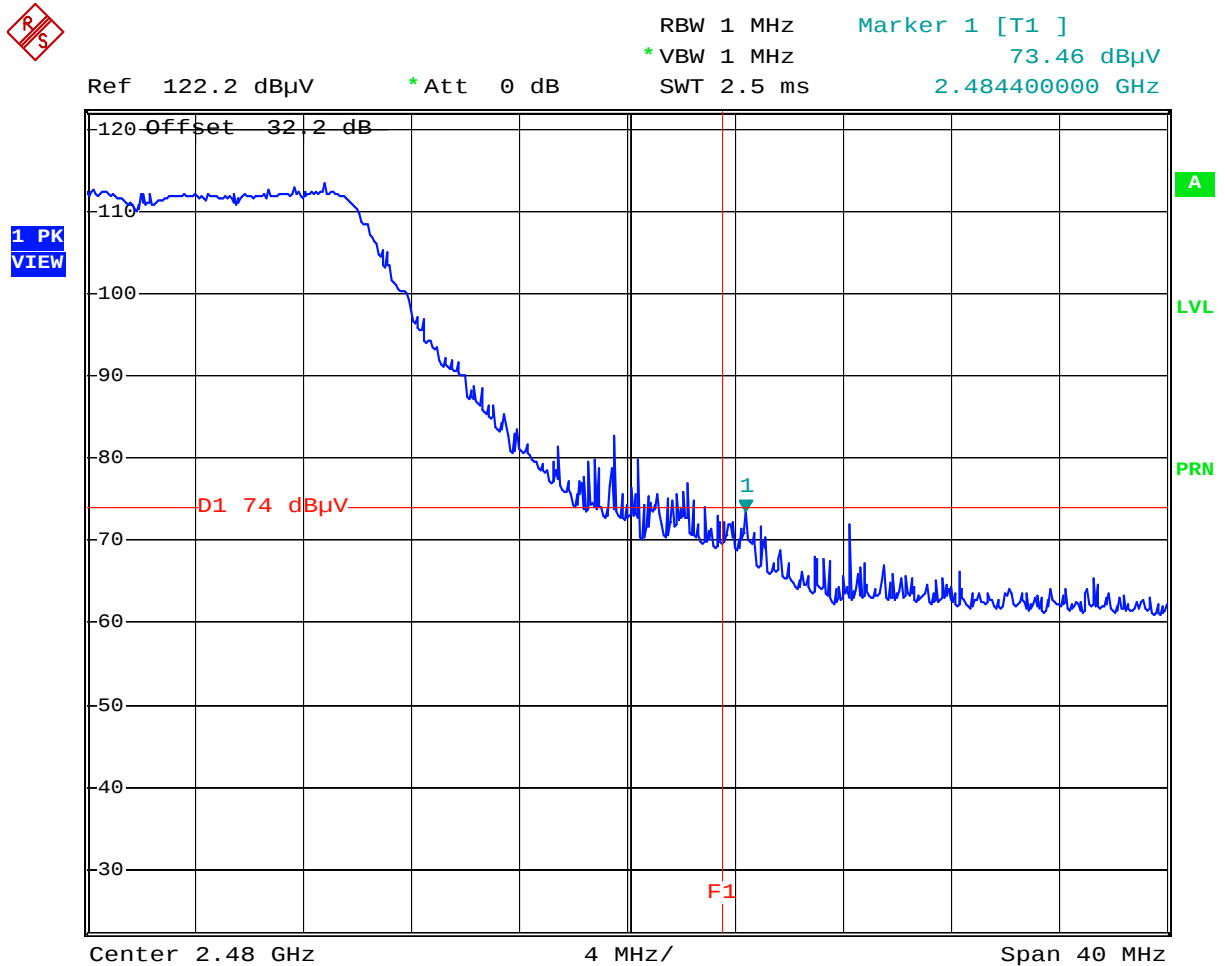
Comment: Bandedge, Ch 11, CCK 11 Mbps Peak  
 Date: 29.JAN.2007 21:05:41

Plot 6.16



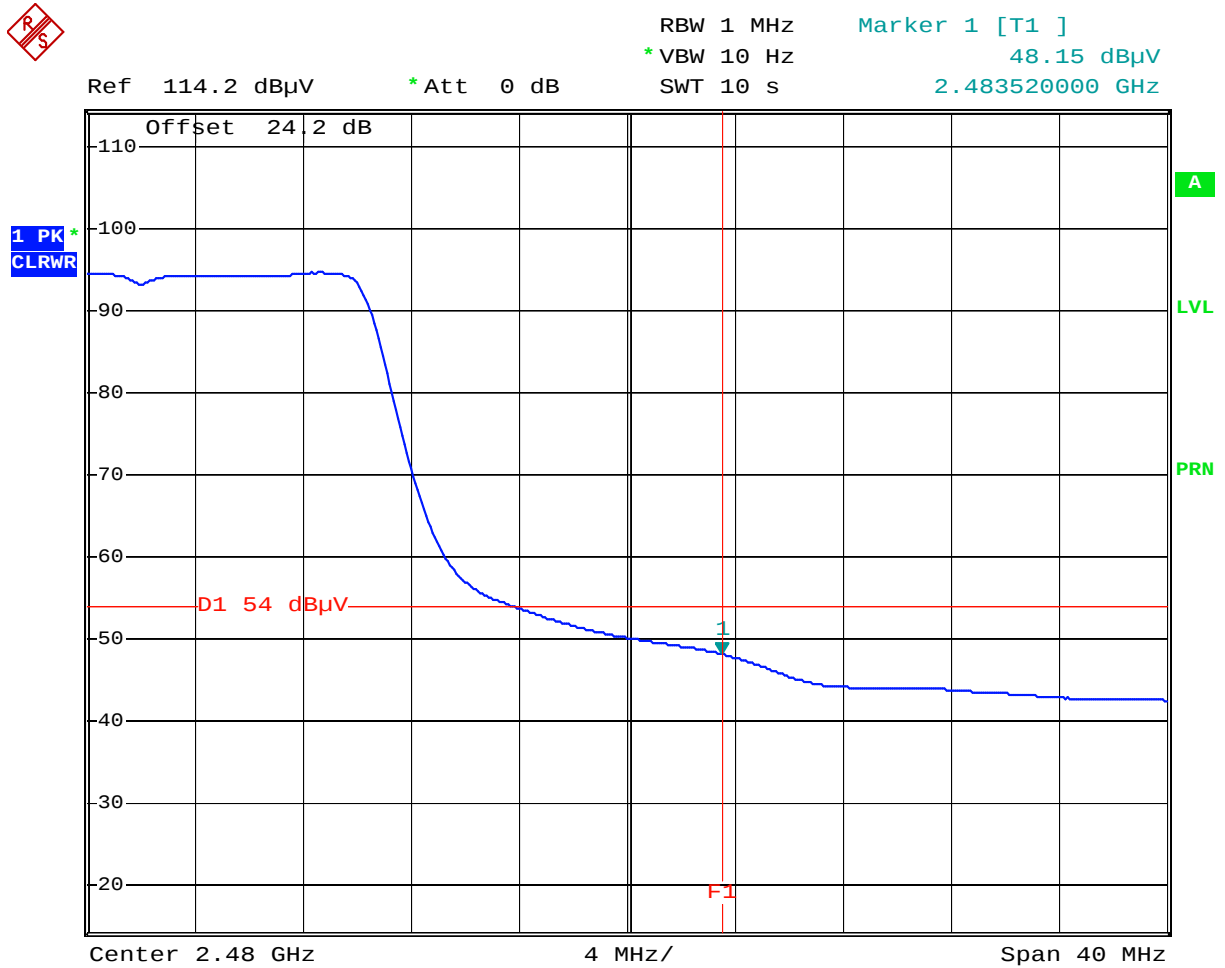
Comment: Bandedge, Ch 11, CCK 11 Mbps Average  
Date: 29.JAN.2007 21:07:21

Plot 6.17



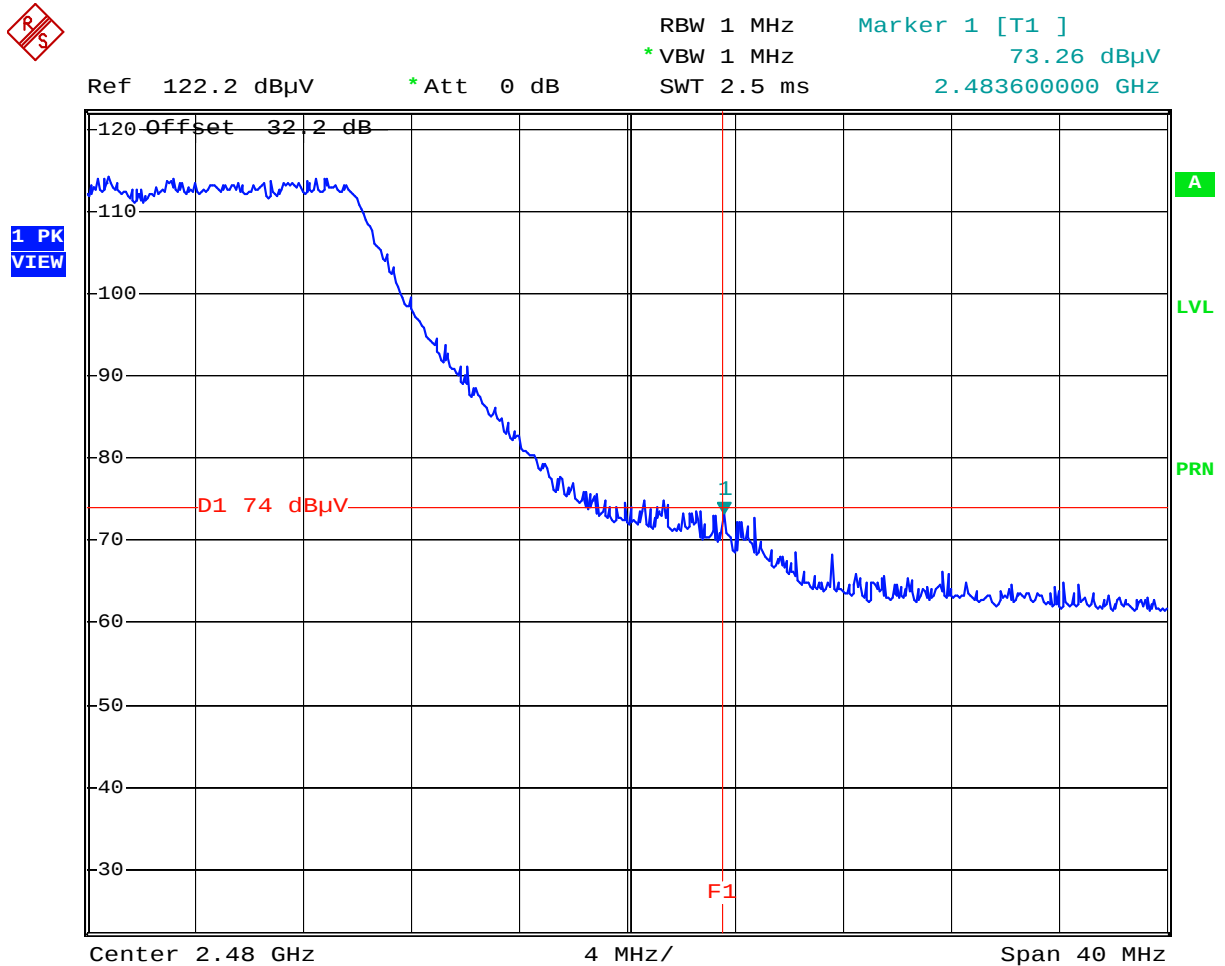
Comment: Bandedge, Ch 11, OFDM 9 Mbps Peak  
 Date: 29.JAN.2007 20:49:44

Plot 6.18



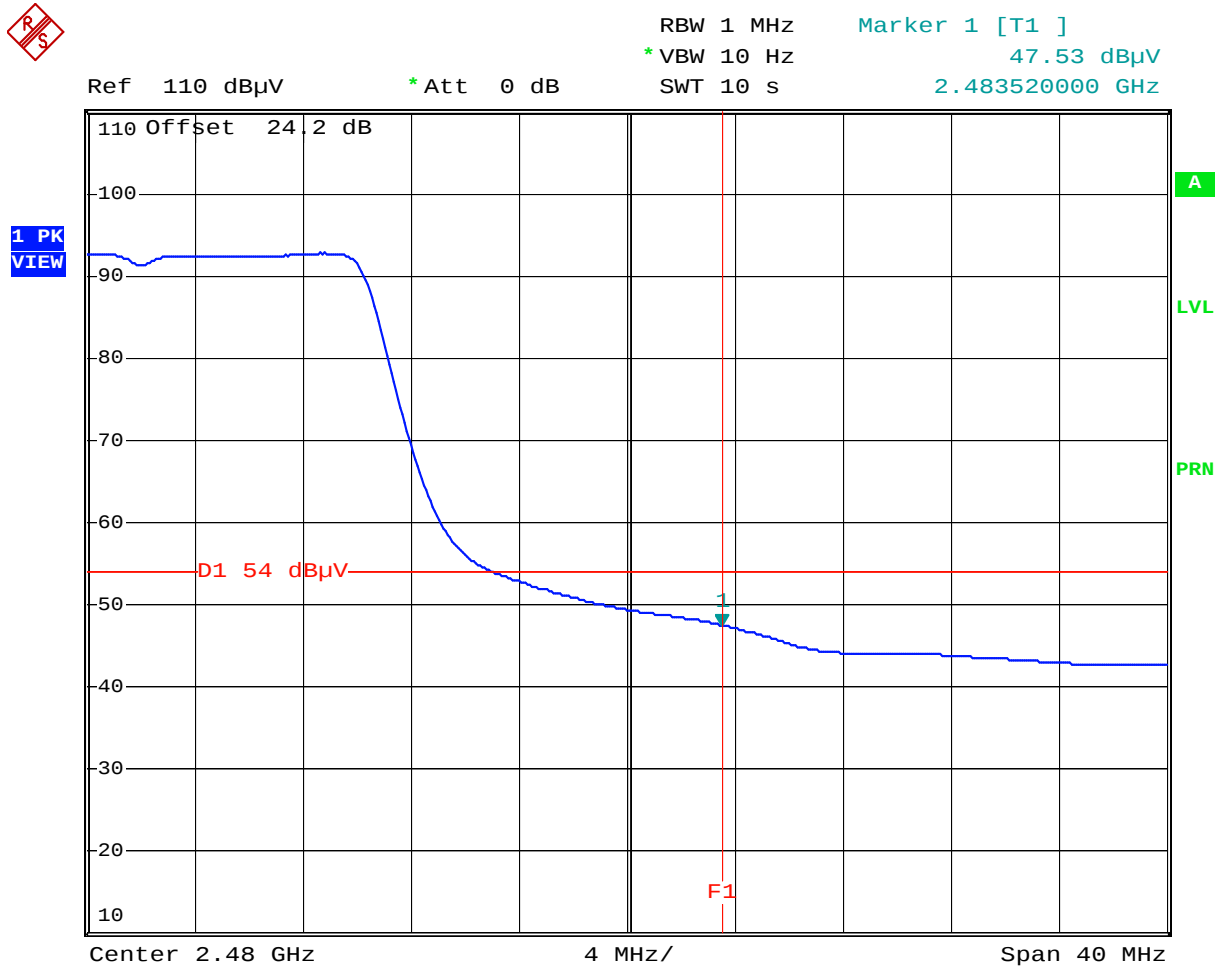
Comment: Bandedge, Ch 11, OFDM 9 Mbps Average  
Date: 29.JAN.2007 20:52:55

Plot 6.19



Comment: Bandedge, Ch 11, OFDM 54 Mbps Peak  
Date: 29.JAN.2007 20:59:20

Plot 6.20



Comment: Bandedge, Ch 11, OFDM 54 Mbps Average  
 Date: 29.JAN.2007 21:01:52

#### 4.6.5 Test Result - other restricted bands

The data on the following pages list the significant emission frequencies, the limit and the margin of compliance for the worst-case configuration.

|                |                           |
|----------------|---------------------------|
| <b>Results</b> | <b>Complies by 0.4 dB</b> |
|----------------|---------------------------|

|                      |                     |
|----------------------|---------------------|
| Temperature: 20.0 C  | Company: Netopia    |
| Humidity: 50.0 %     | Model: 3347-2, Holm |
| Date: March 19, 2007 | KK/DC               |
| Data rate: 9 Mbps    |                     |

Measured at 1m

| Frequency<br>MHz        | Polarity | Detector | SA reading<br>dB(μV) | AG**<br>dB | Ant factor<br>dB(1/m) | DCF<br>dB | Field Strength<br>dB(μV/m) | Limit<br>dB(μV/m) | Margin<br>dB |
|-------------------------|----------|----------|----------------------|------------|-----------------------|-----------|----------------------------|-------------------|--------------|
| <b>Ch: 1, 2412 MHz</b>  |          |          |                      |            |                       |           |                            |                   |              |
| 4824.0                  | V        | Pk       | 46.3                 | 31.2       | 33.7                  | -9.5      | 39.3                       | 74.0              | -34.7        |
| 4824.0                  | V        | Av       | 37.7                 | 31.2       | 33.7                  | -9.5      | 30.7                       | 54.0              | -23.3        |
| 7236.0                  | V        | Pk       | 49.1                 | 27.5       | 36.4                  | -9.5      | 48.5                       | 74.0              | -25.5        |
| 7236.0                  | V        | Av       | 31.3                 | 27.5       | 36.4                  | -9.5      | 40.2                       | 54.0              | -13.8        |
| <b>Ch: 11, 2462 MHz</b> |          |          |                      |            |                       |           |                            |                   |              |
| 4924.0                  | V        | Pk       | 46.6                 | 31.2       | 33.9                  | -9.5      | 39.8                       | 74.0              | -34.2        |
| 4924.0                  | V        | Av       | 36.3                 | 31.2       | 33.9                  | -9.5      | 29.5                       | 54.0              | -24.5        |
| 7386.0                  | V        | Pk       | 53.1                 | 29.0       | 36.7                  | -9.5      | 51.3                       | 74.0              | -22.7        |
| 7386.0                  | V        | Av       | 34.4                 | 29.0       | 36.7                  | -9.5      | 32.6                       | 54.0              | -21.4        |

Measured at 3m

| Frequency<br>MHz       | Polarity | Detector | SA reading<br>dB(μV) | AG**<br>dB | Ant factor<br>dB(1/m) | Duty<br>Cycle<br>dB | Field Strength<br>dB(μV/m) | Limit<br>dB(μV/m) | Margin<br>dB |
|------------------------|----------|----------|----------------------|------------|-----------------------|---------------------|----------------------------|-------------------|--------------|
| <b>Ch: 6, 2437 MHz</b> |          |          |                      |            |                       |                     |                            |                   |              |
| 4874.0                 | V        | Pk       | 65.5                 | 31.4       | 36.5                  | -                   | 70.6                       | 74.0              | -3.4         |
| 4874.0                 | V        | Av       | 56.5                 | 31.4       | 36.5                  | -8                  | 53.6                       | 54.0              | -0.4         |
| 7311.0                 | V        | Pk       | 55.1                 | 28.2       | 36.5                  | -                   | 63.4                       | 74.0              | -10.6        |
| 7311.0                 | V        | Av       | 40.0                 | 28.2       | 36.5                  | -8                  | 40.3                       | 54.0              | -13.7        |

\*\*AG – Amplifier Gain includes Cable Attenuation Factor.

All other emissions not reported are at least 10 dB below the limit.

#### 4.7 Radiated Emissions from Receiver and digital part FCC Rule 15.109

##### 4.7.1 Limit

**Table 5-2 Radiated Disturbance Limit for EN 55022 \***

| Radiated Emission Limits at 10 meters |                                         |
|---------------------------------------|-----------------------------------------|
| Frequency<br>(MHz)                    | Class B Quasi-Peak limits,<br>dB (μV/m) |
| 30 to 230                             | 30                                      |
| 230 to 1000                           | 37                                      |

\* According to FCC 15.109(g), EN55022 Limit may be used

##### 4.7.2 Procedure

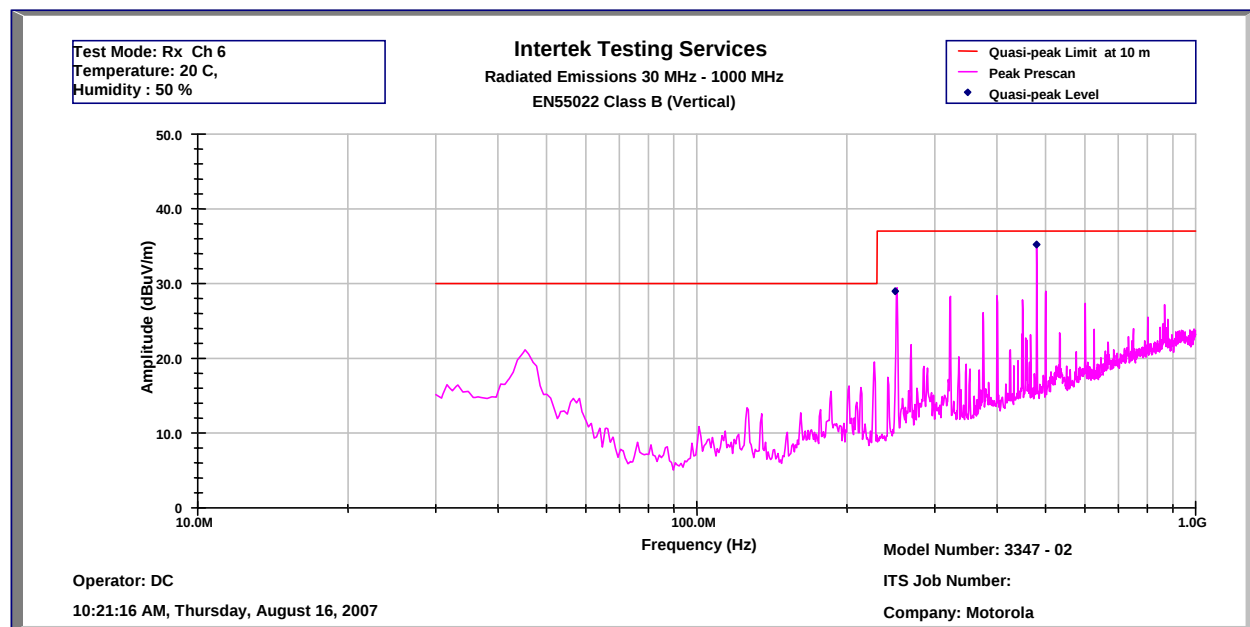
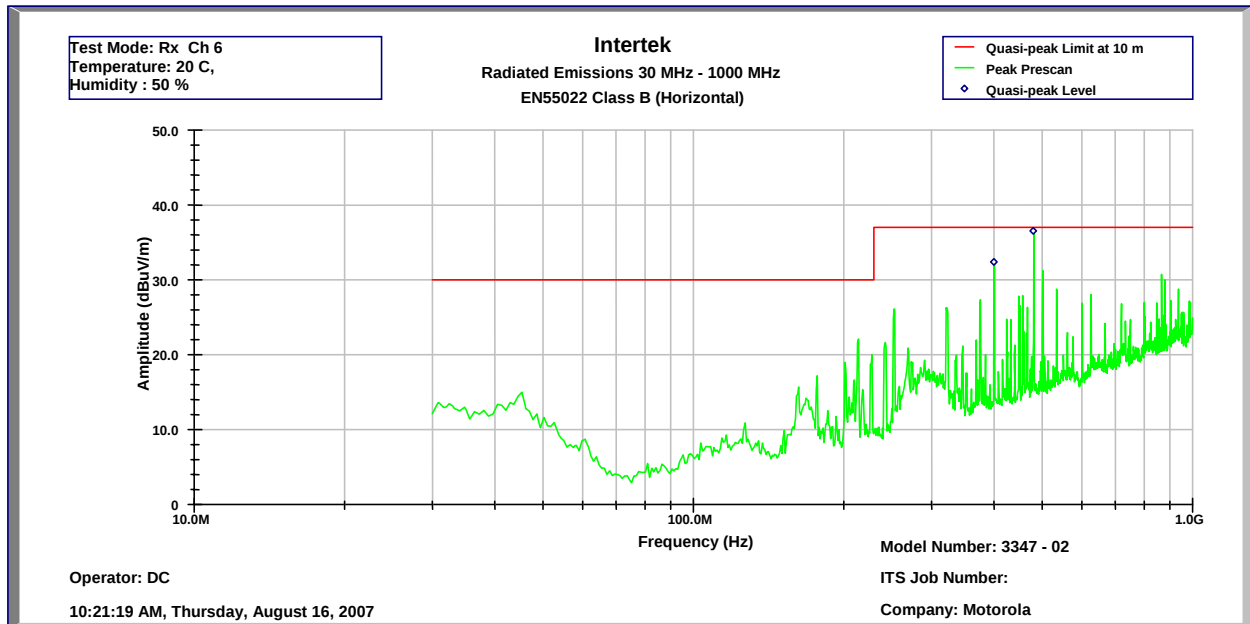
See sections 4.6.2 and 4.6.3

##### 4.7.3 Test Result

The data on the following pages list the significant emission frequencies, the limit and the margin of compliance for the worst-case configuration.

|                |                           |
|----------------|---------------------------|
| <b>Results</b> | <b>Complies by 0.5 dB</b> |
|----------------|---------------------------|

## Receiving mode, Channel 6



## Receiving mode

Intertek

Radiated Emissions 30 MHz - 1000 MHz

EN55022 Class B (QP-Horizontal)

Operator: DC

Model Number: 3347 - 02

10:21:19 AM, Thursday, August 16, 2007

Company: Motorola

| Frequency | Quasi Pk FS | Limit@10m | Margin | RA     | CF  | AG   | AF      |
|-----------|-------------|-----------|--------|--------|-----|------|---------|
| MHz       | dB(uV/m)    | dB(uV/m)  | dB     | dB(uV) | dB  | dB   | dB(1/m) |
| 399.998   | 32,4        | 37,0      | -4,6   | 42,7   | 6,0 | 31,2 | 14,9    |
| 479.997   | 36,5        | 37,0      | -0,5   | 44,4   | 6,2 | 31,2 | 17,1    |

Test Mode: Rx Ch 6

Temperature: 20 C,

Humidity : 50 %

Intertek Testing Services

Radiated Emissions 30 MHz - 1000 MHz

EN55022 Class B (QP-Vertical)

Operator: DC

Model Number: 3347 - 02

10:21:16 AM, Thursday, August 16, 2007

Company: Motorola

| Frequency | Quasi Pk FS | Limit@10m | Margin | RA     | CF  | AG   | AF      |
|-----------|-------------|-----------|--------|--------|-----|------|---------|
| MHz       | dB(uV/m)    | dB(uV/m)  | dB     | dB(uV) | dB  | dB   | dB(1/m) |
| 249.996   | 28,9        | 37,0      | -8,1   | 42,8   | 5,1 | 31,2 | 12,2    |
| 479.997   | 35,2        | 37,0      | -1,8   | 43,2   | 6,2 | 31,2 | 17,0    |

Test Mode: Rx Ch 6

Temperature: 20 C,

Humidity : 50 %

#### 4.8 AC Line Conducted Emission, FCC Rule 15.207

##### 4.8.1 Procedure

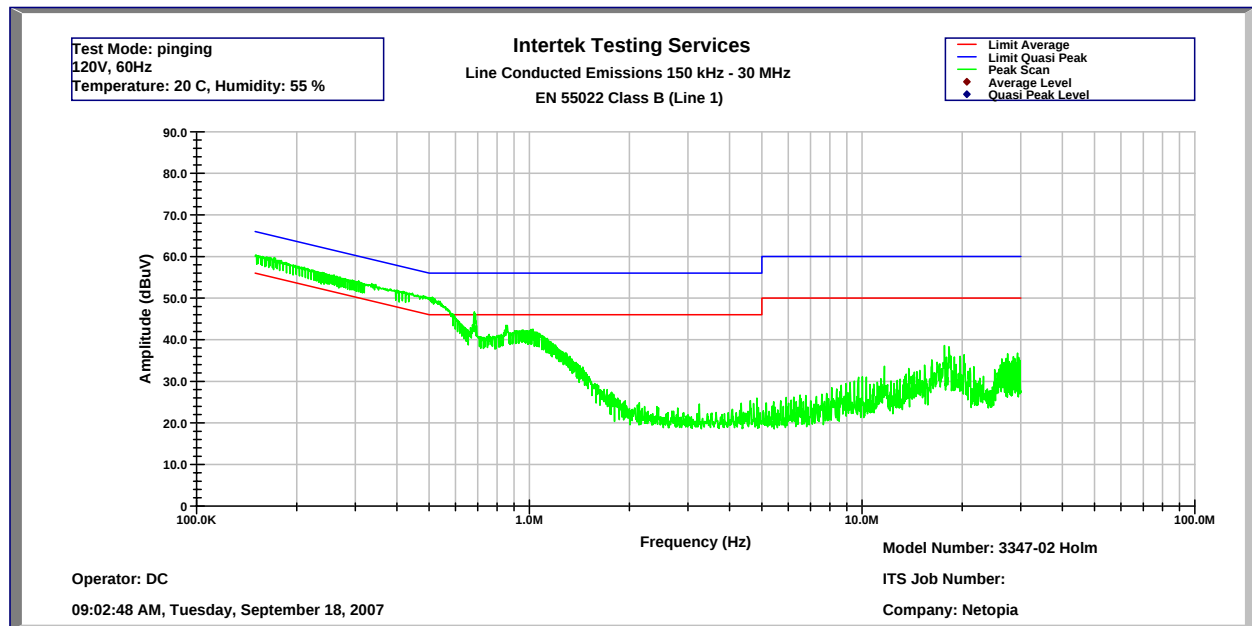
AC line conducted emission test was performed according the ANSI C63.4 standard. The EUT was connected to AC Line through the LISN.

##### 4.8.2 Test Result

For the test result, see attached plots 8.1, 8.2.

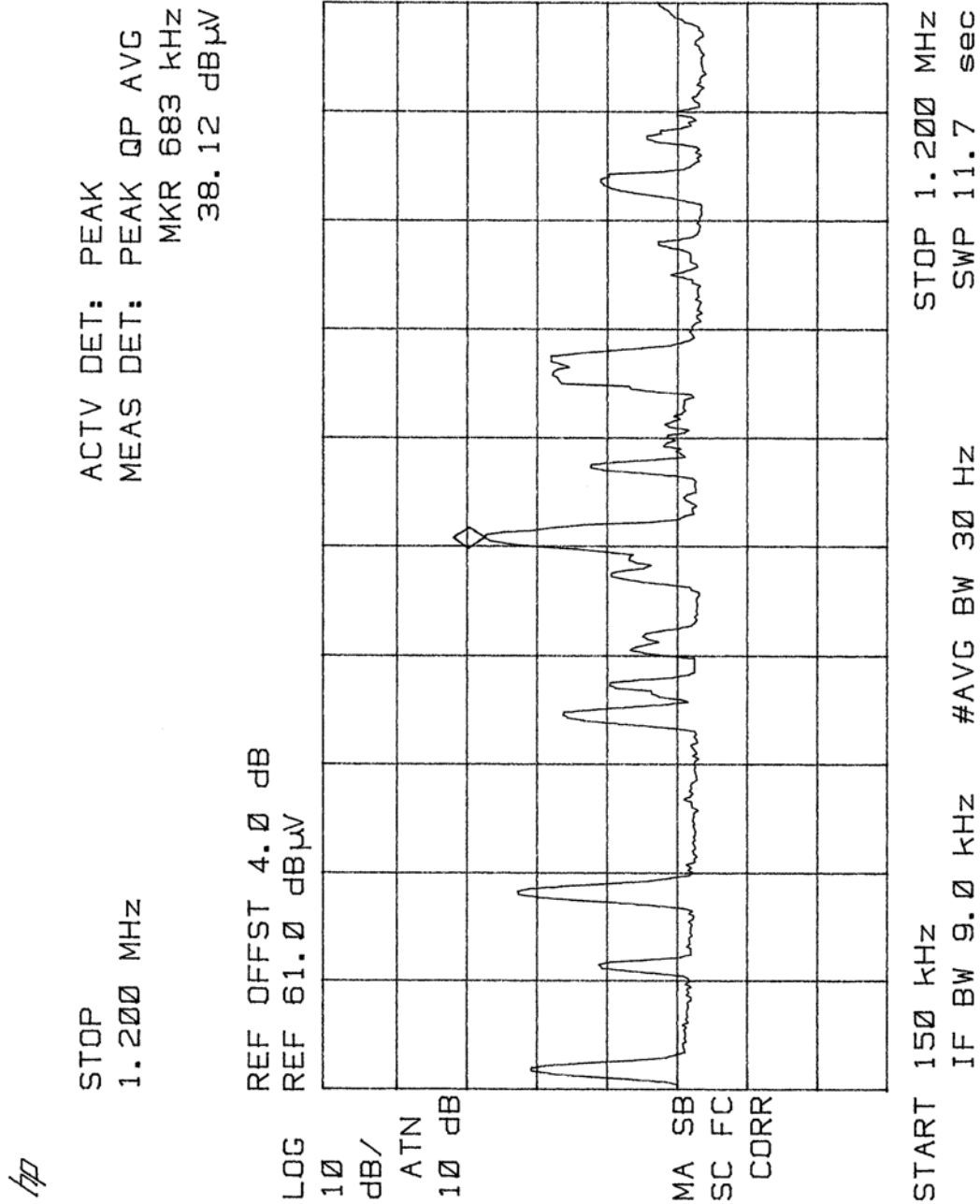
|                |                           |
|----------------|---------------------------|
| <b>Results</b> | <b>Complies by 7.9 dB</b> |
|----------------|---------------------------|

Plot 8.1

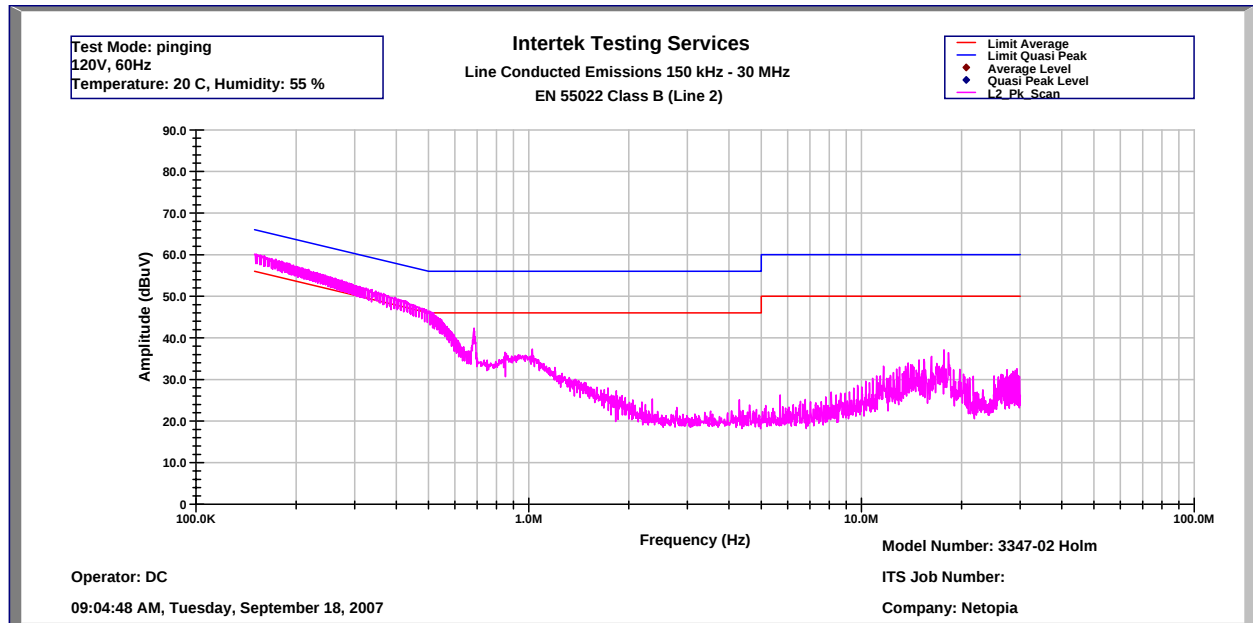


Plot 8.1.a

Average level, Line 1

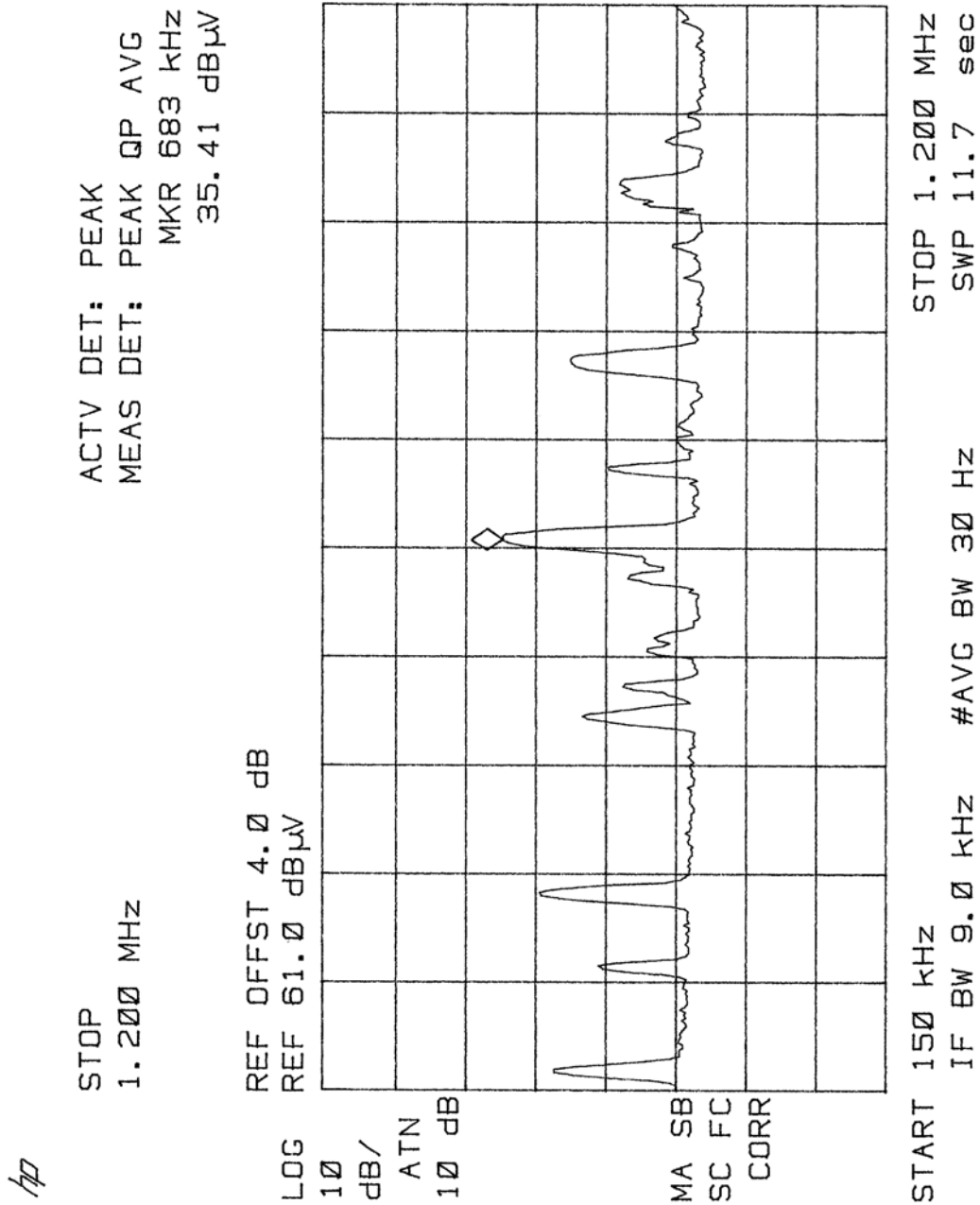


Plot 8.2



Plot 8.2.a

Average level, Line 2



#### 4.9 Radiation exposure evaluation

The **3347-02** is a Wireless ADSL Router. It is desktop or wall-mounted device used with AC power adapter in mobile application, at least 20 cm from any body part of the user or nearby persons.

The maximum conducted average power is 26.0 dBm, antenna is fix-mounted, -2 dBi gain (maximum). Therefore, to comply with RF Exposure Requirement, the MPE is calculated.

The maximum Average EIRP calculated is 0.251 W. The Power Density can be calculated using the formula

$$S = \text{EIRP} / 4\pi D^2$$

Where: S is Power Density in  $\text{W/m}^2$   
D is the distance from the antenna.

At distance of 0.2 m,  $S = 0.5 \text{ W/m}^2$  which is below MPE Limit of  $10 \text{ W/m}^2$

## 5.0 List of Test Equipment

Measurement equipment used for emission compliance testing utilized the equipment on the following list:

| Equipment                               | Manufacturer     | Model/Type           | Serial #                 | Cal Int | Cal Due |
|-----------------------------------------|------------------|----------------------|--------------------------|---------|---------|
| RF Filter Section                       | Hewlett Packard  | 85460A               | 3448A00267               | 12      | 9/11/07 |
| EMI Receiver                            | Hewlett Packard  | 8546A                | 3710A00373               | 12      | 9/11/07 |
| EMI Receiver                            | Rhode-Schwarz    | FSP-40               | 100030                   | 12      | 9/12/07 |
| Spectrum Analyzer<br>w/85650 QP Adapter | Hewlett Packard  | 8566B/<br>85650A     | 2416A00317<br>2521A01021 | 12      | 6/11/08 |
| BI-Log Antenna                          | Antenna Research | LPB-2513/A           | 1154                     | 12      | 8/29/07 |
| Horn Antenna                            | EMCO             | 3115                 | 8812-3049                | 12      | 7/13/08 |
| Horn Antenna                            | EMCO             | 3160-09              | Not Labeled              | #       | #       |
| Pre-Amplifier                           | Sonoma Inst.     | 310                  | 185634                   | 12      | 8/20/07 |
| Pre-Amplifier                           | Miteq            | AMF-4D-001180-24-10P | 799159                   | 12      | 7/16/08 |
| LISN                                    | FCC              | FCC-LISN-50-50-M-H   | 2012                     | 12      | 8/02/08 |

# No Calibration required

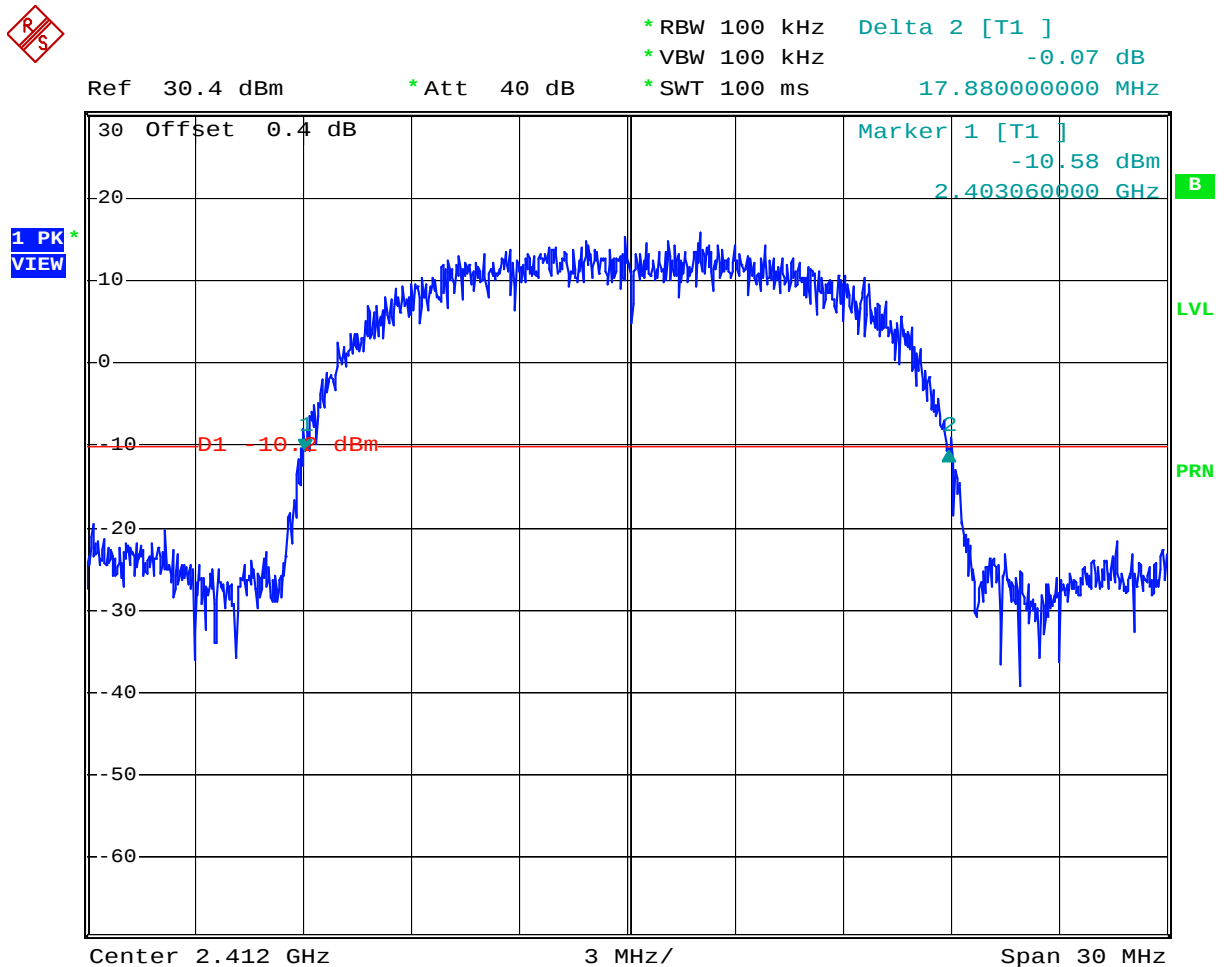
## 6.0 Document History

| Revision/<br>Job Number | Writer<br>Initials | Date               | Change            |
|-------------------------|--------------------|--------------------|-------------------|
| 1.0 / 3131941           | DC                 | September 19, 2007 | Original document |
|                         |                    |                    |                   |
|                         |                    |                    |                   |
|                         |                    |                    |                   |
|                         |                    |                    |                   |
|                         |                    |                    |                   |

## Appendix A – 26-dB Bandwidth and Occupied Bandwidth

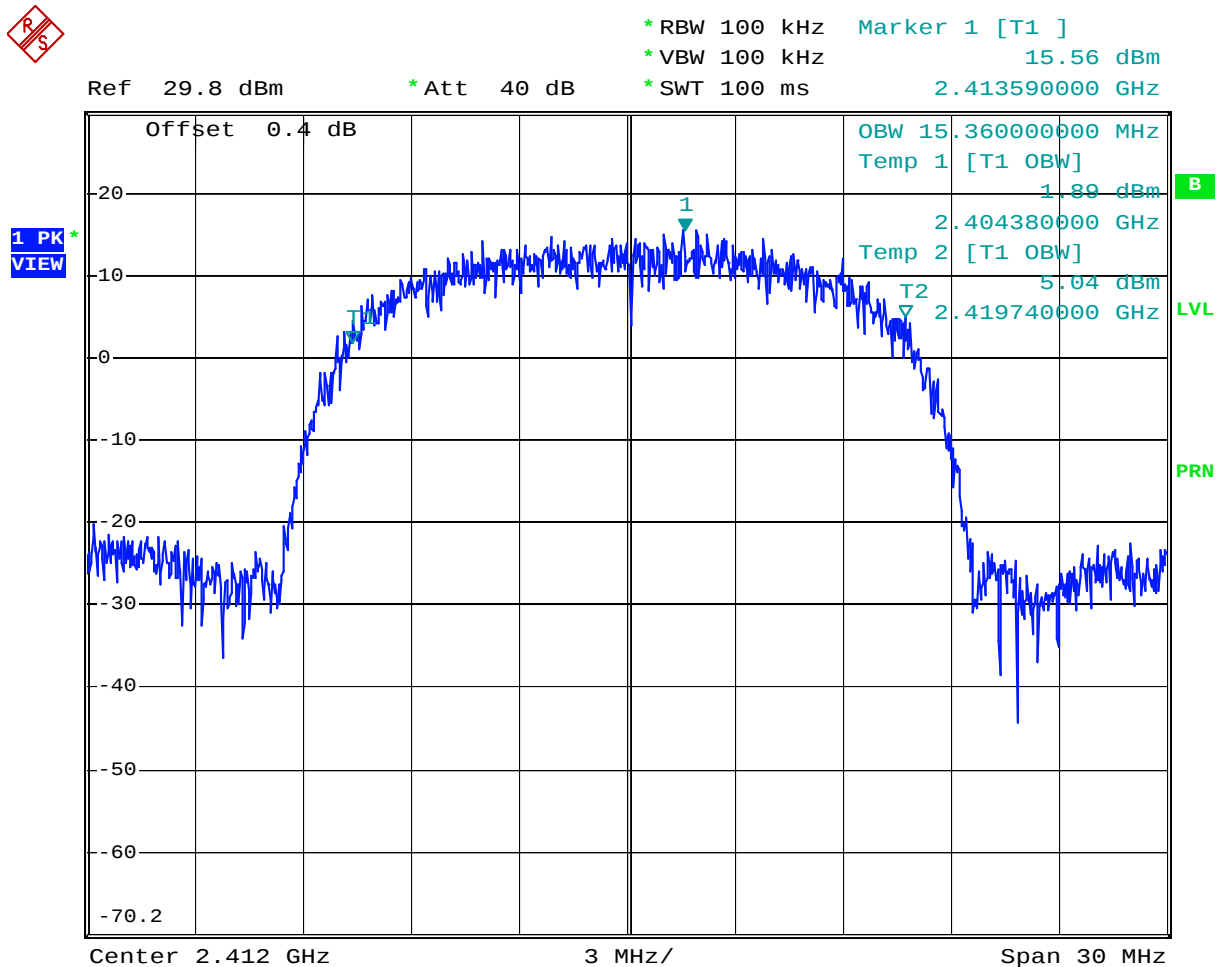
| Channel | Frequency MHz | Standard | Data rate Mbps | 26-dB Bandwidth MHz | Occupied Bandwidth MHz | Plot     |
|---------|---------------|----------|----------------|---------------------|------------------------|----------|
| 1       | 2412          | 802.11b  | 11             | 17.9                | 15.4                   | A1, A2   |
| 1       | 2412          | 802.11g  | 9              | 20.9                | 16.5                   | A3, A4   |
| 1       | 2412          | 802.11g  | 54             | 20.3                | 16.5                   | A5, A6   |
| 6       | 2437          | 802.11b  | 11             | 17.9                | 15.3                   | A7, A8   |
| 6       | 2437          | 802.11g  | 9              | 27.8                | 16.8                   | A9, A10  |
| 6       | 2437          | 802.11g  | 54             | 20.8                | 16.5                   | A11, A12 |
| 11      | 2462          | 802.11b  | 11             | 17.9                | 15.4                   | A13, A14 |
| 11      | 2462          | 802.11g  | 9              | 21.8                | 16.5                   | A15, A16 |
| 11      | 2462          | 802.11g  | 54             | 20.4                | 16.5                   | A17, A18 |

Plot A1



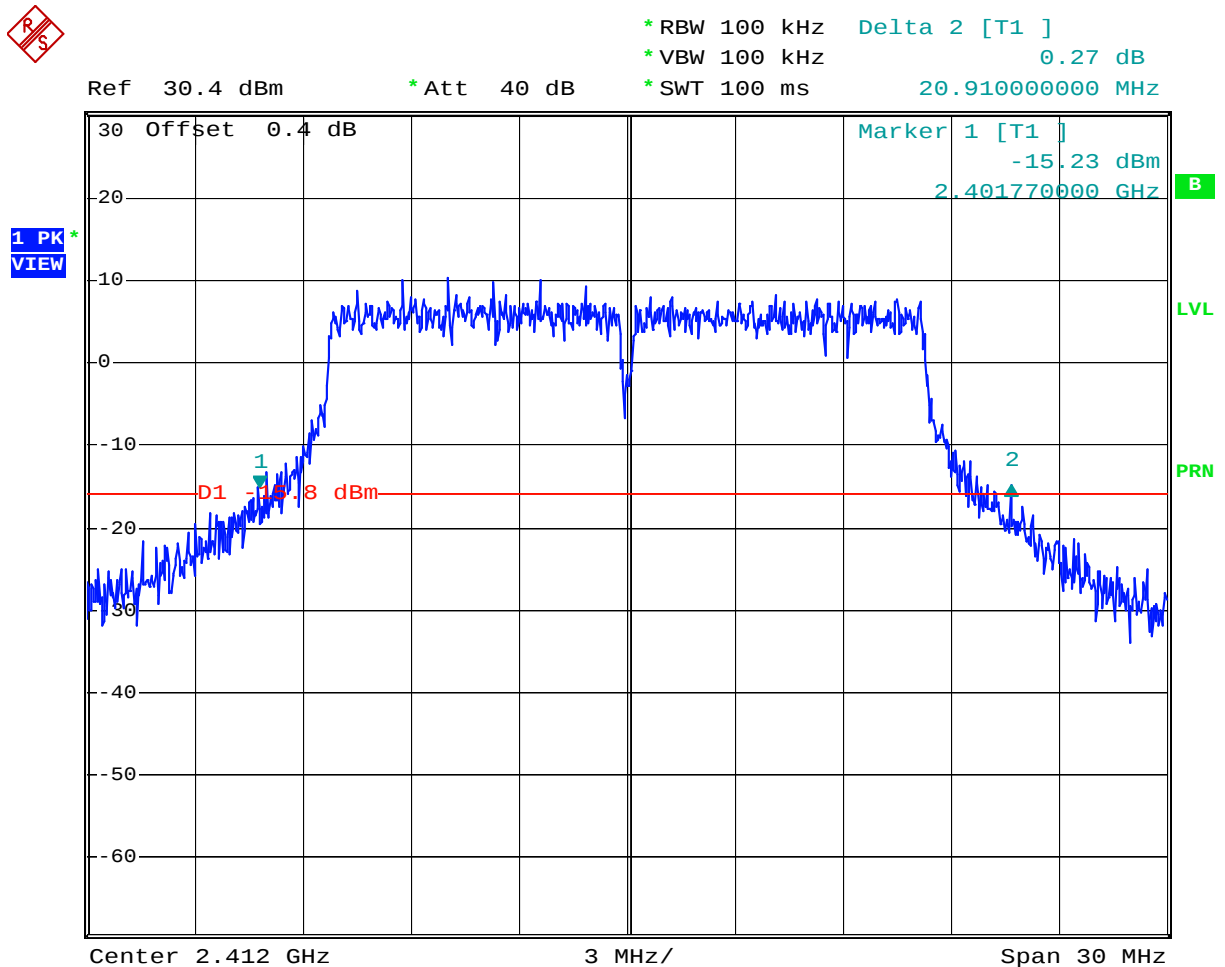
Comment: 26-dB bandwidth, Ch 1, CCK 11 Mbps  
 Date: 26.JAN.2007 19:40:19

Plot A2



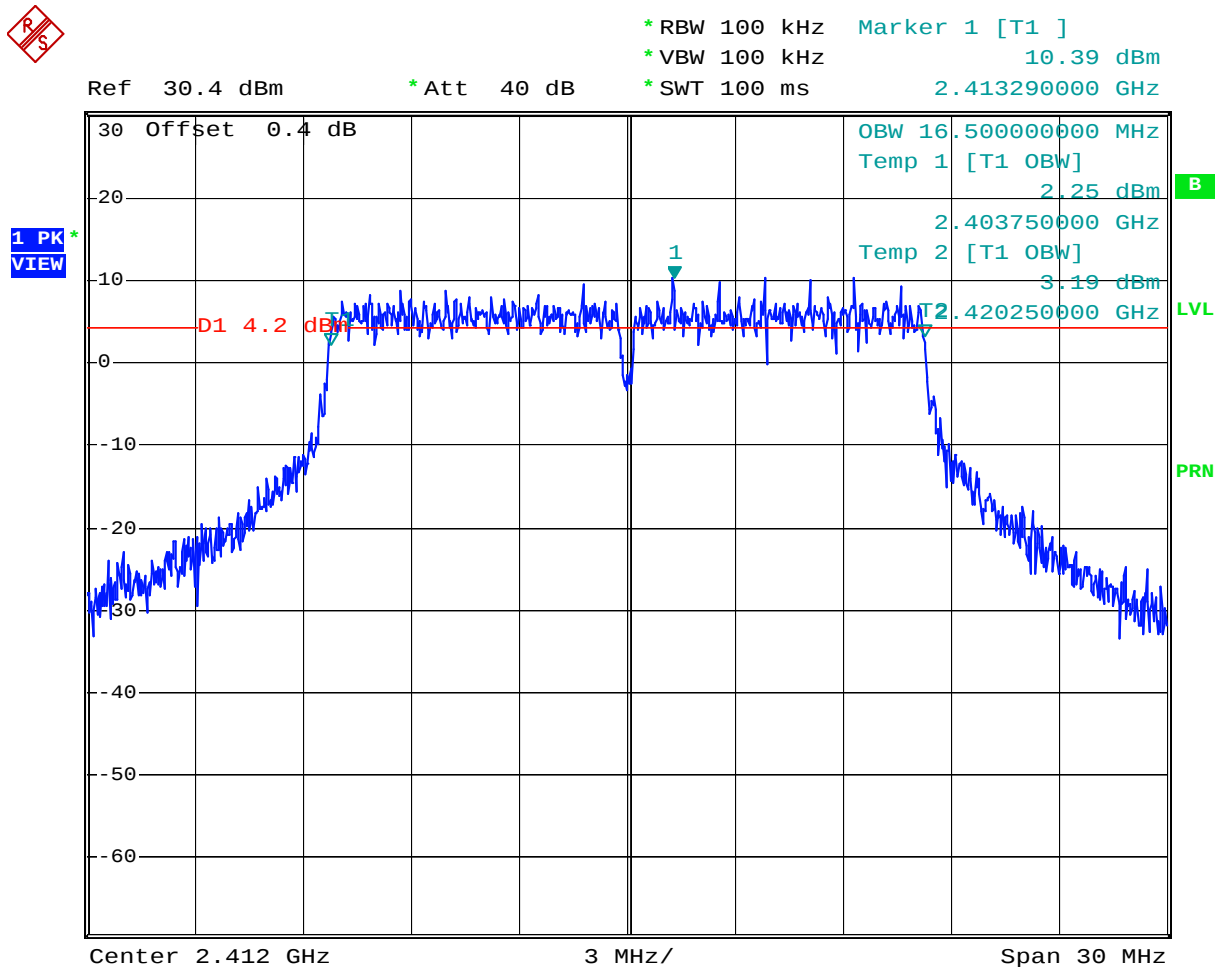
Comment: Occupied bandwidth, Ch 1, CCK 11 Mbps  
Date: 26.JAN.2007 13:28:26

Plot A3



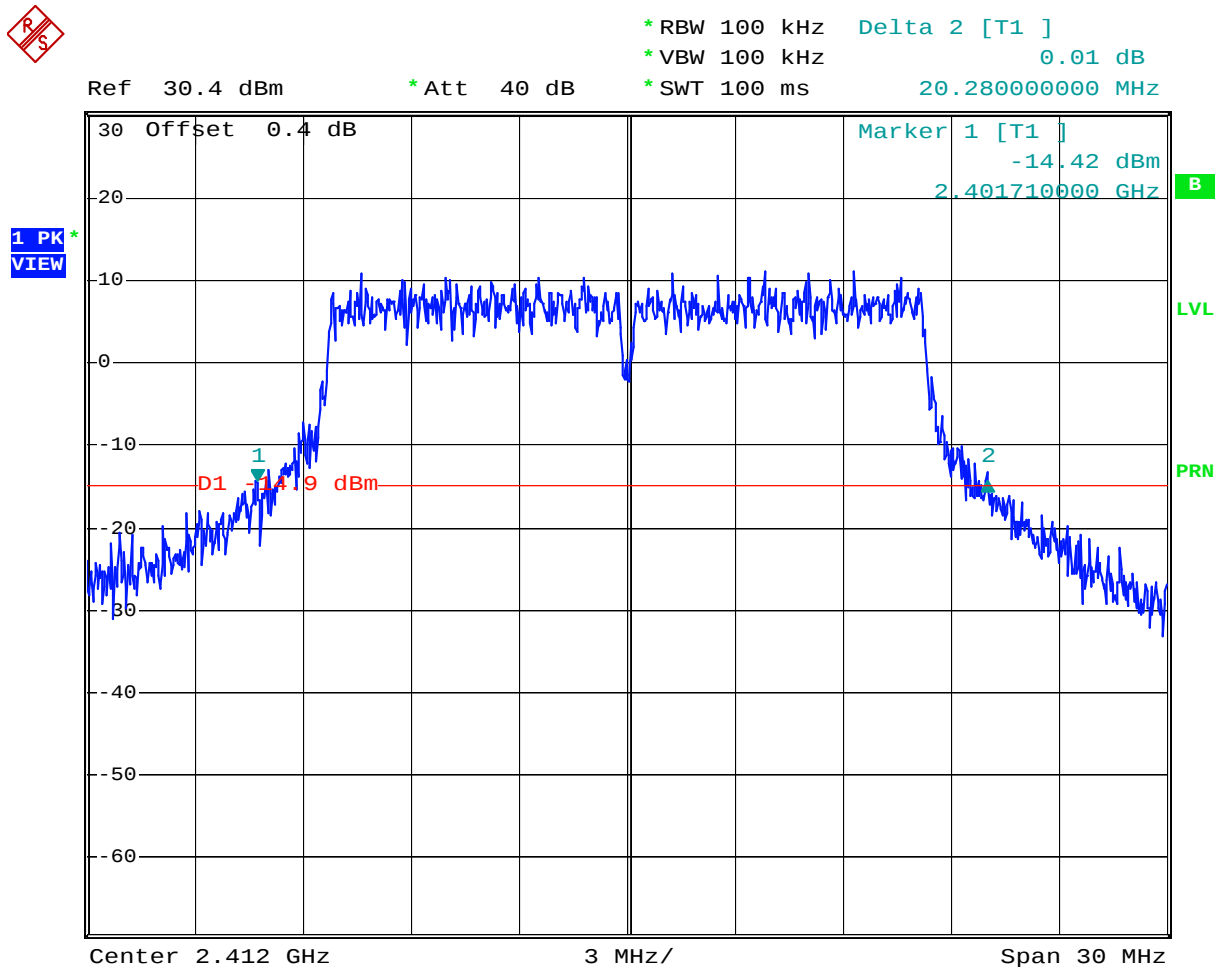
Comment: 26-dB bandwidth, Ch 1, OFDM 9 Mbps  
 Date: 26.JAN.2007 19:44:58

Plot A4



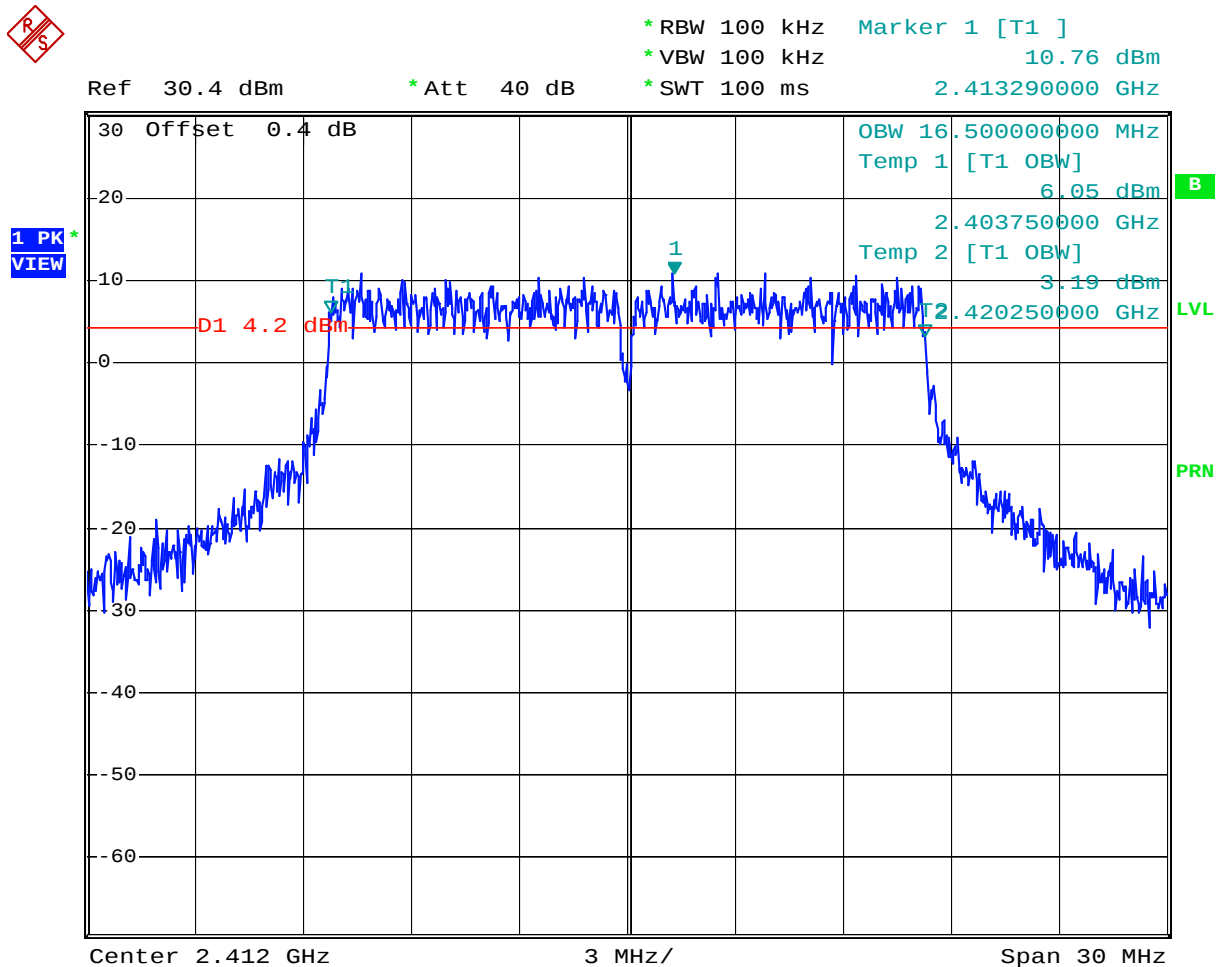
Comment: Occupied bandwidth, Ch 1, OFDM 9 Mbps  
Date: 26.JAN.2007 19:48:02

Plot A5



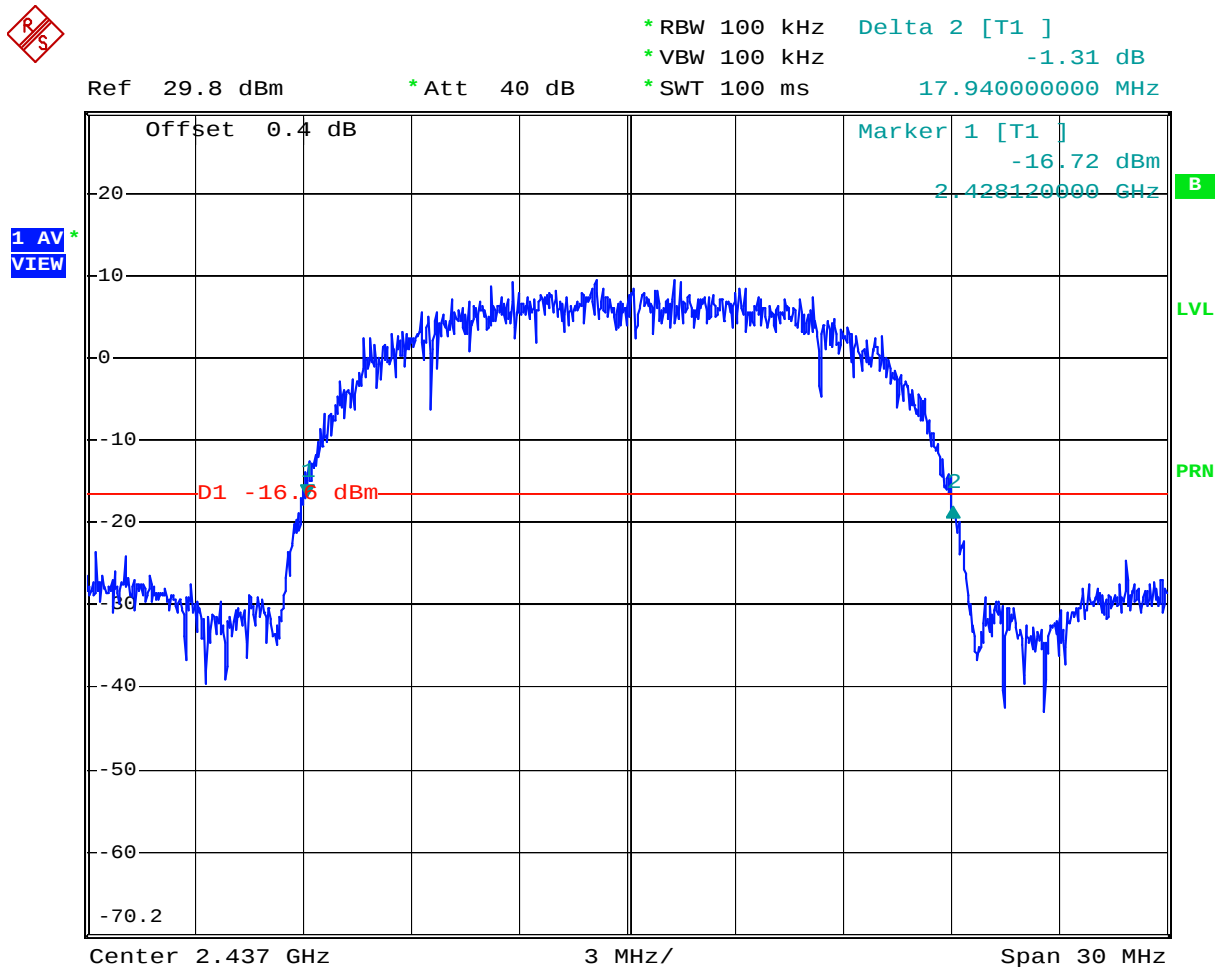
Comment: 26-dB bandwidth, Ch 1, OFDM 54 Mbps  
 Date: 26.JAN.2007 20:03:07

Plot A6



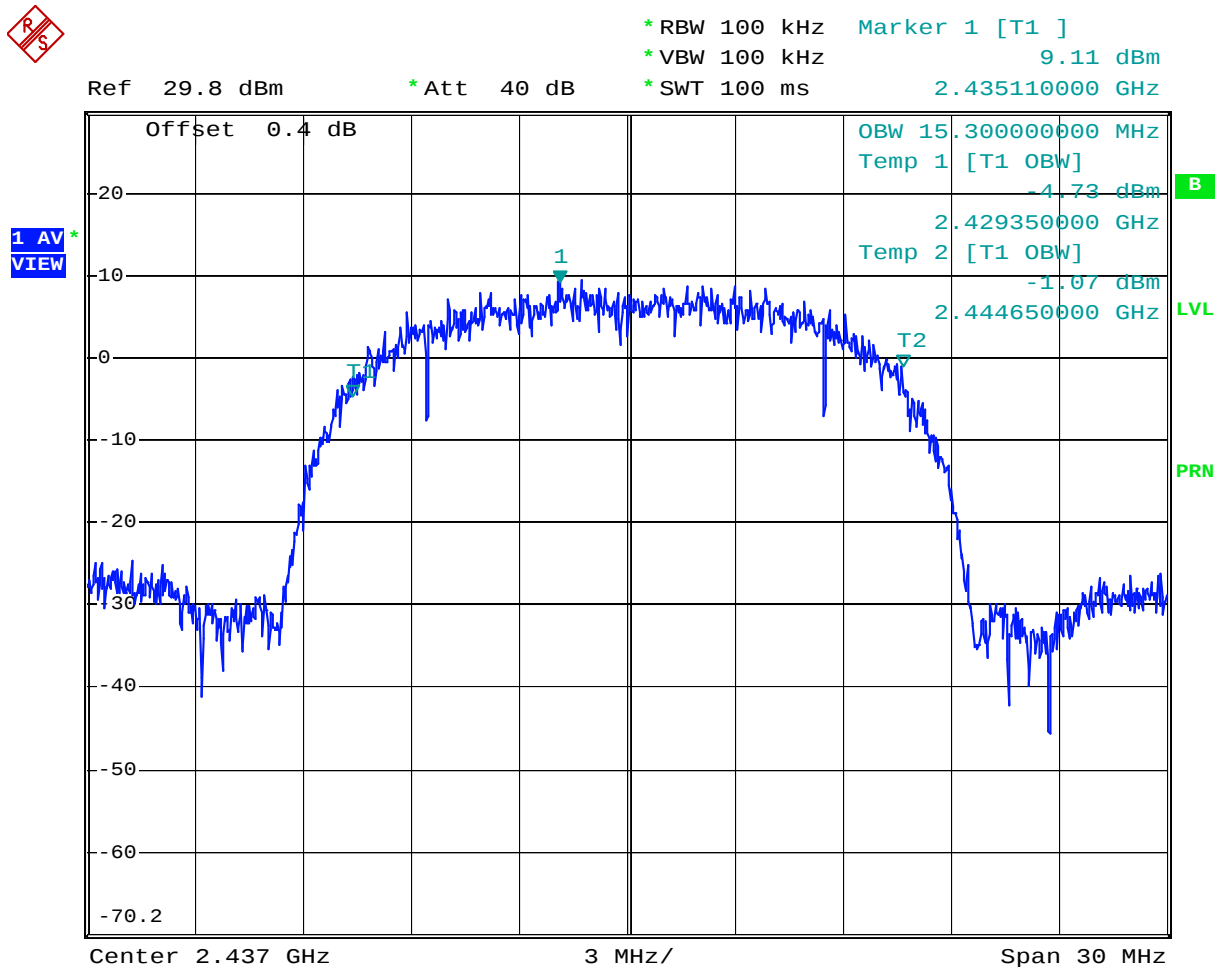
Comment: Occupied bandwidth, Ch 1, OFDM 54 Mbps  
Date: 26.JAN.2007 19:49:30

Plot A7



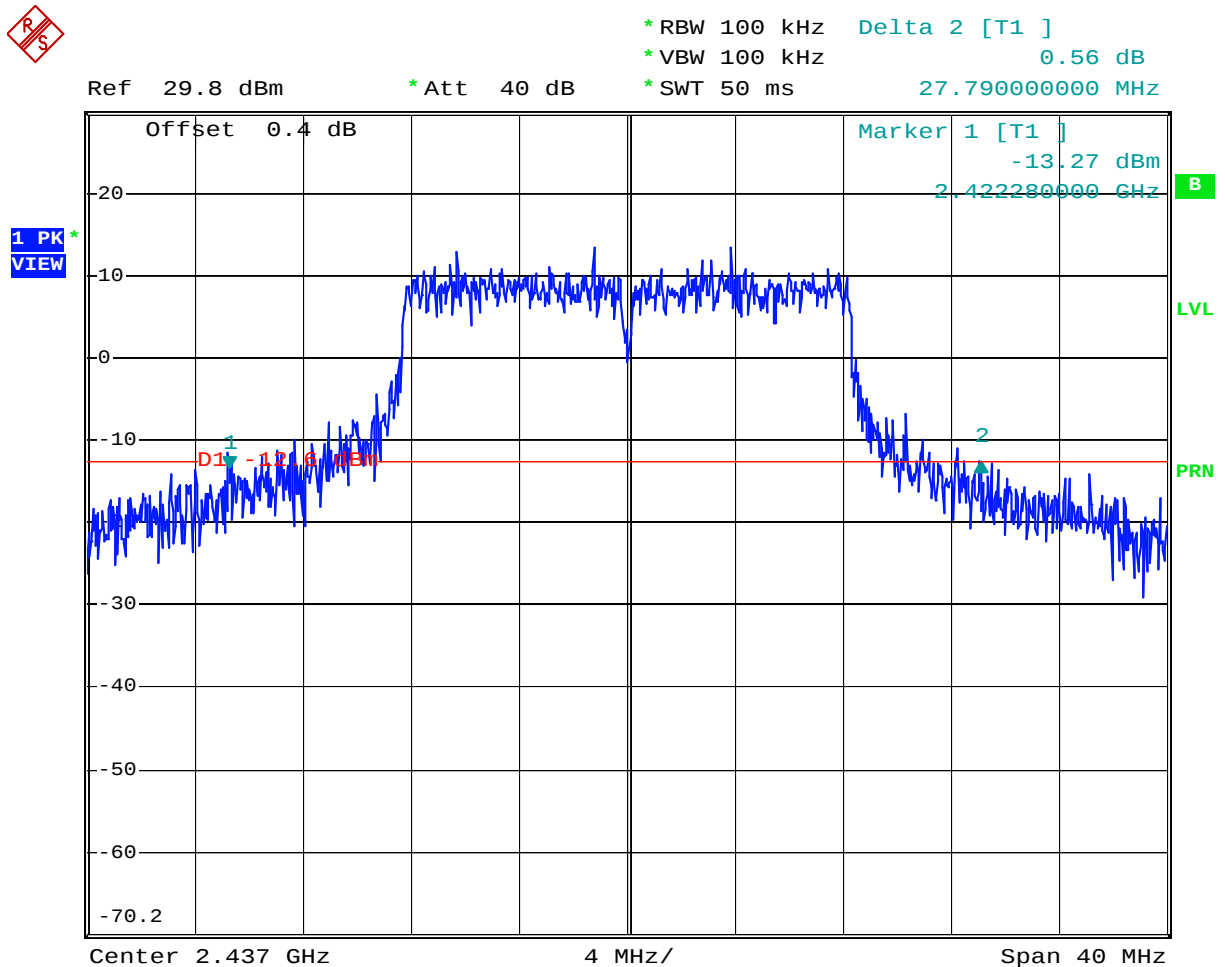
Comment: 26-dB bandwidth, Ch 6, CCK 11 Mbps  
 Date: 25.JAN.2007 13:13:04

Plot A8



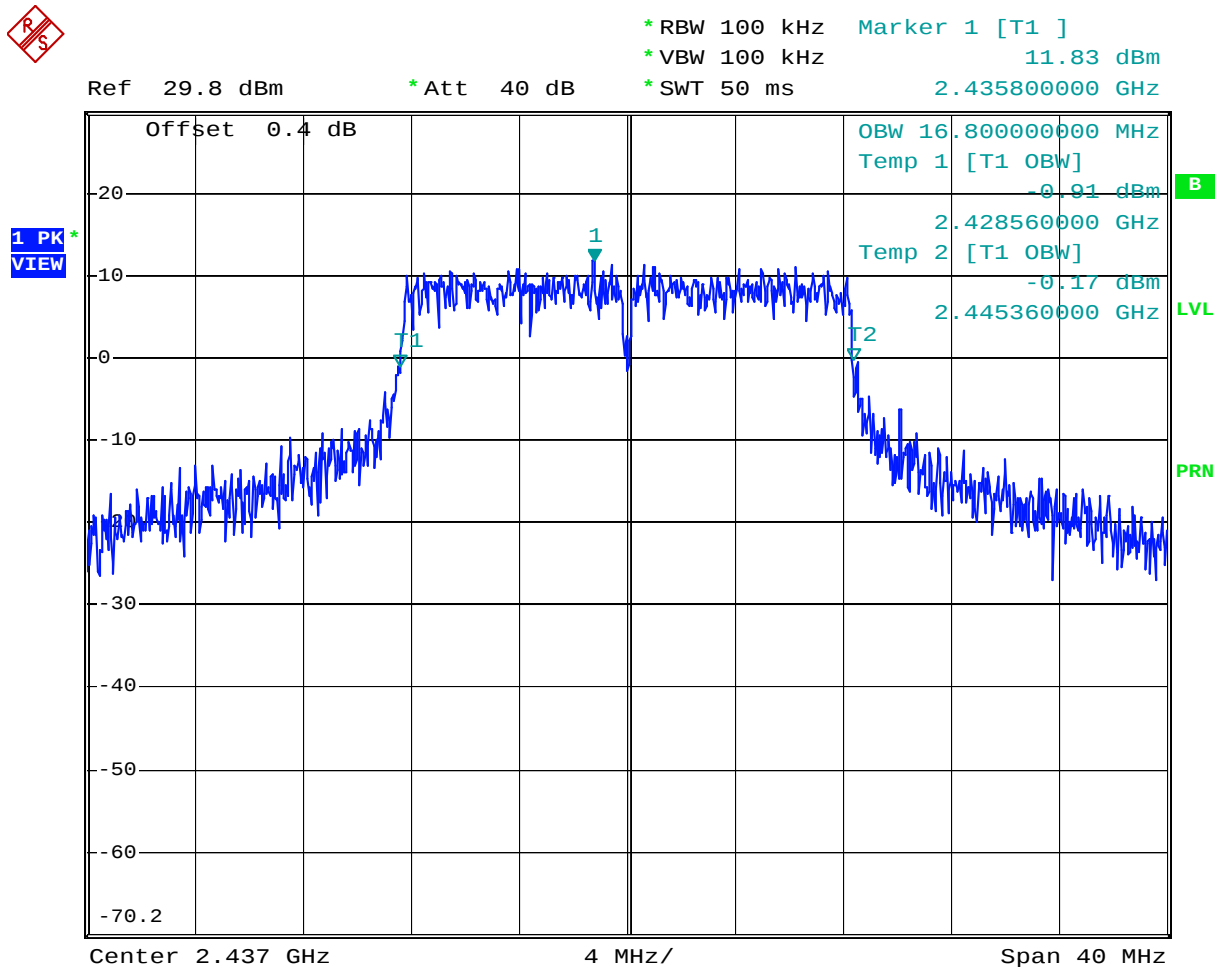
Comment: Occupied bandwidth, Ch 6, CCK 11 Mbps  
Date: 25.JAN.2007 13:19:19

Plot A9



Comment: 26-dB bandwidth, Ch 6, OFDM 9 Mbps  
 Date: 24.JAN.2007 19:42:39

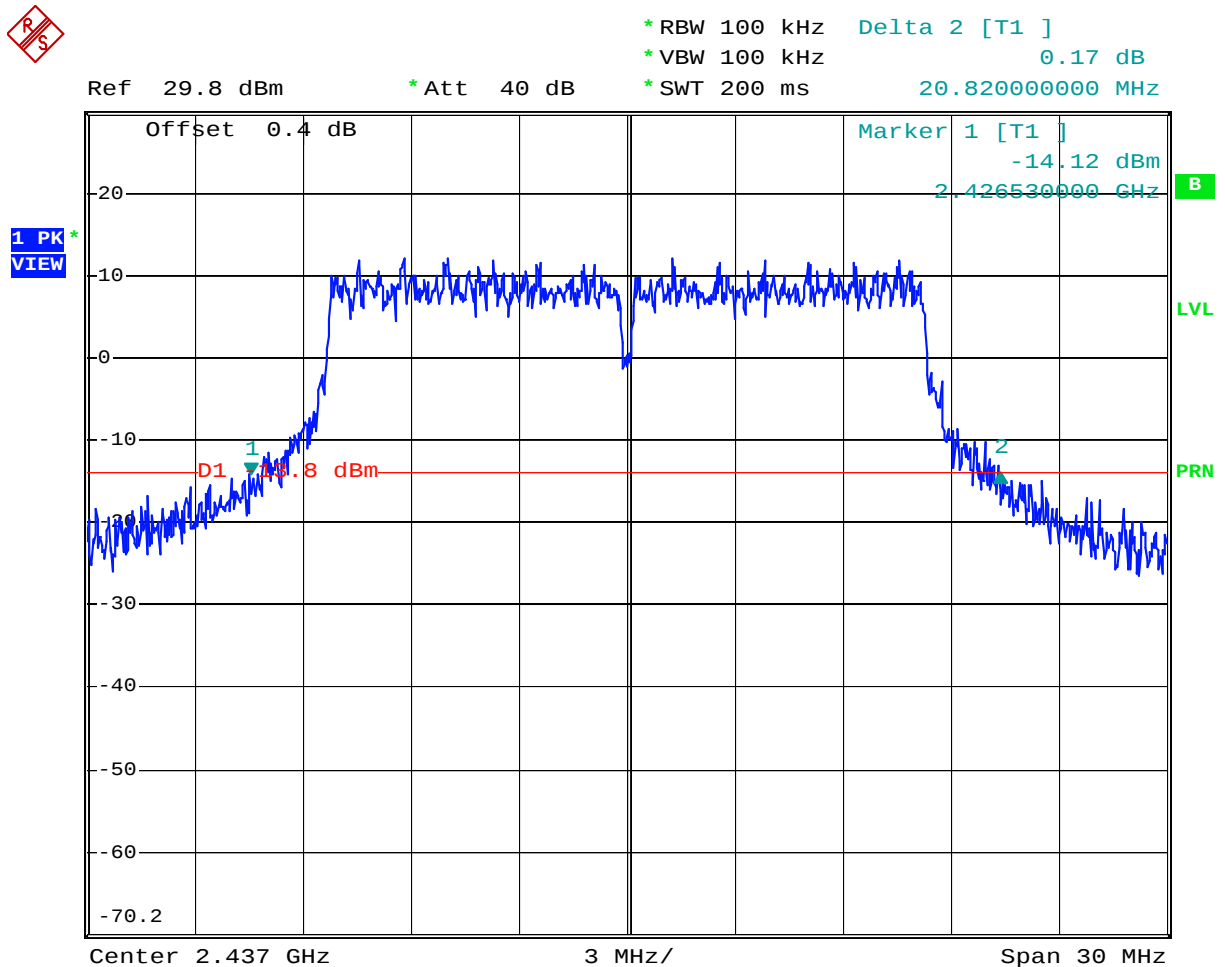
Plot A10



Comment: Occupied bandwidth, Ch 6, OFDM 9 Mbps

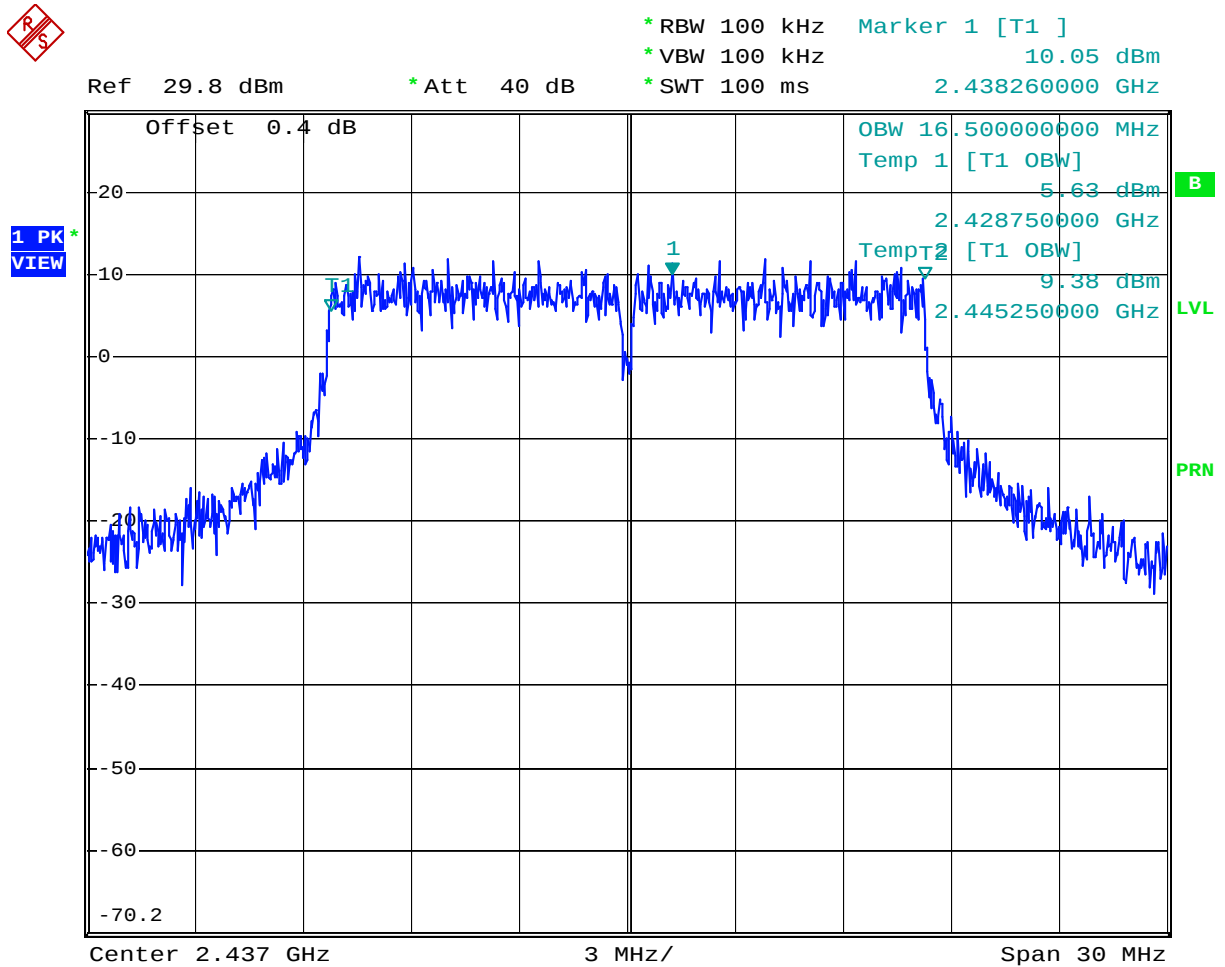
Date: 24.JAN.2007 20:14:50

Plot A11



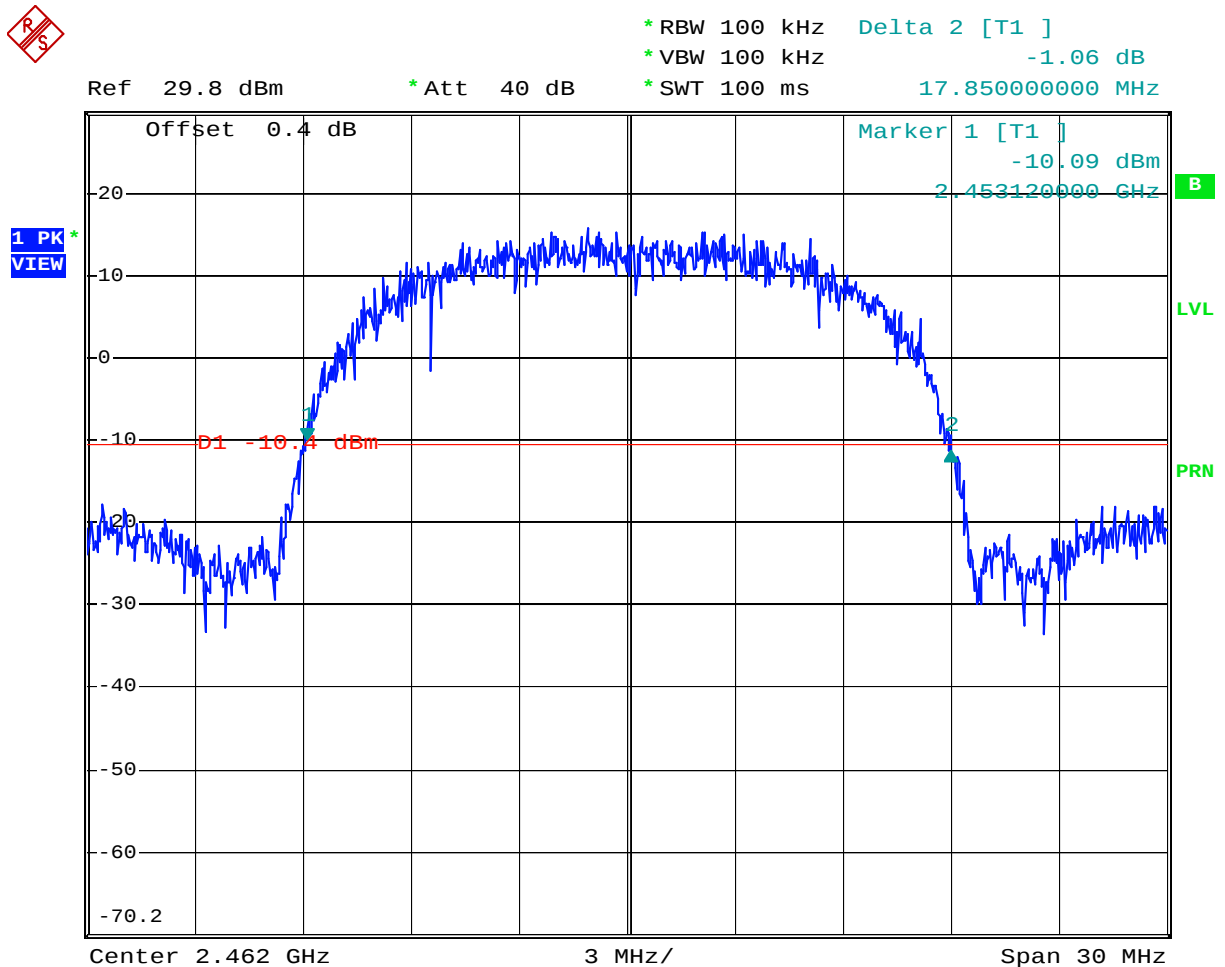
Comment: 26-dB bandwidth, Ch 6, OFDM 54 Mbps  
Date: 24.JAN.2007 19:21:26

Plot A12



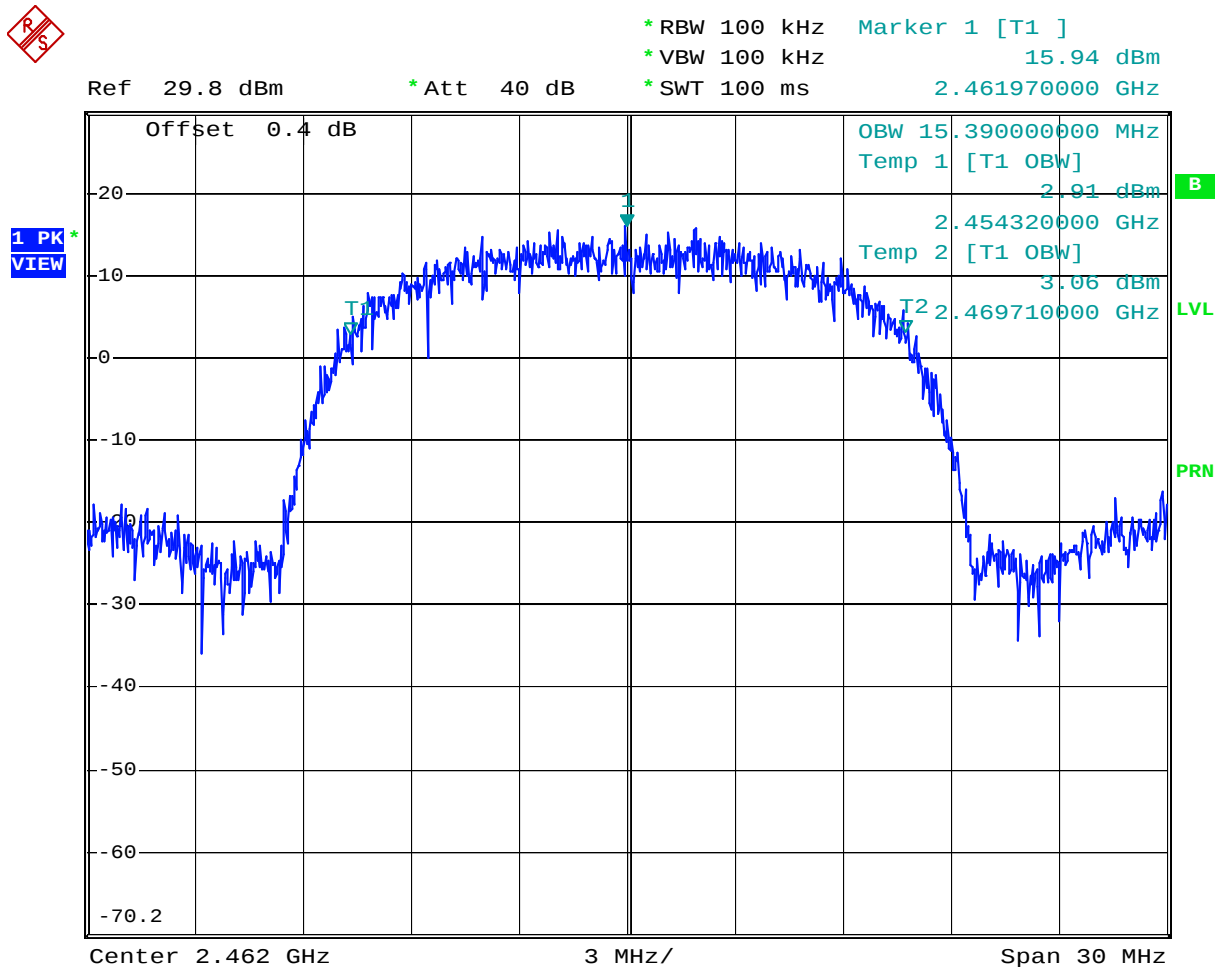
Comment: Occupied bandwidth, Ch 6, OFDM 54 Mbps  
 Date: 25.JAN.2007 14:00:26

Plot A13



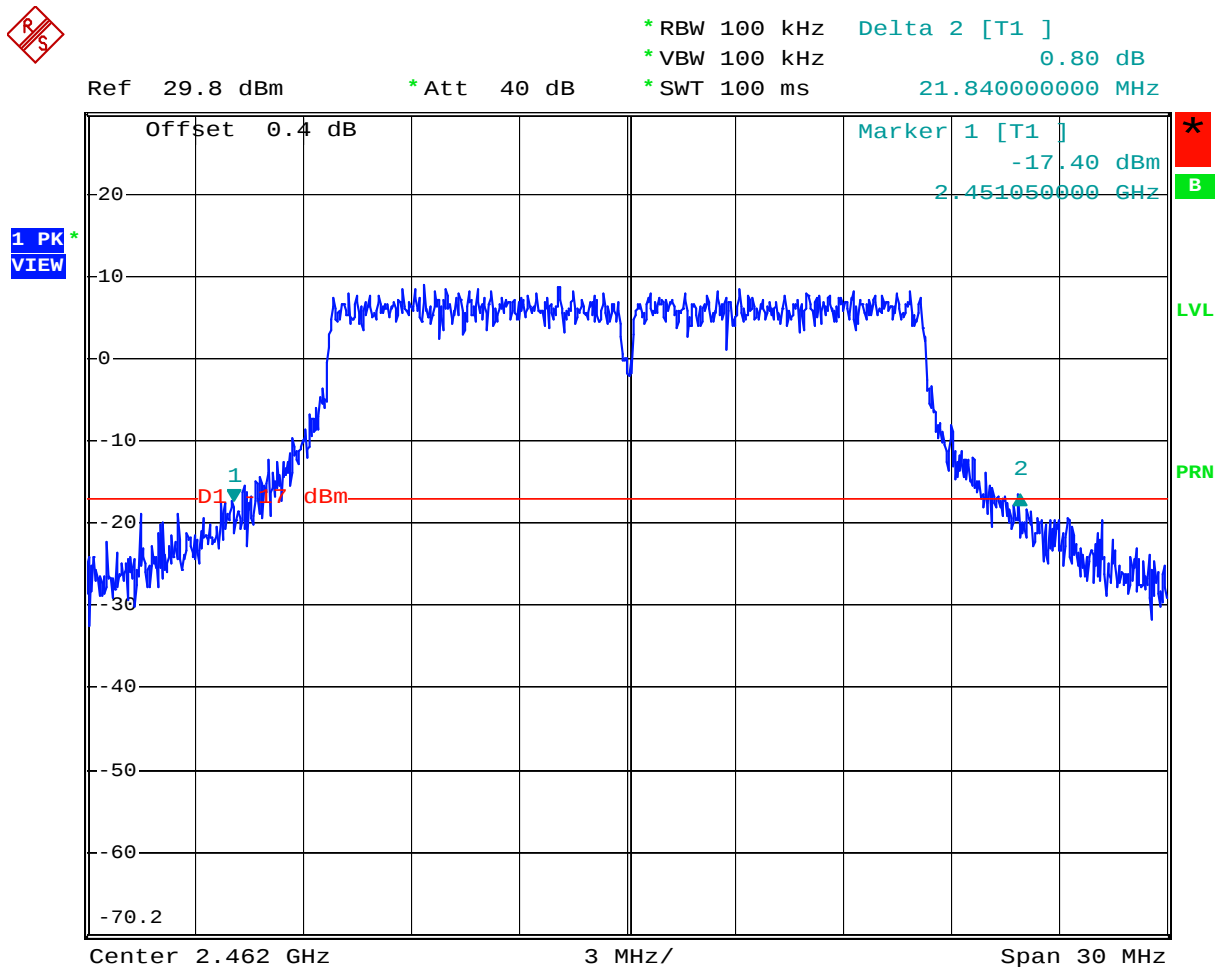
Comment: 26-dB bandwidth, Ch 11, CCK 11 Mbps  
 Date: 26.JAN.2007 13:23:22

Plot A14



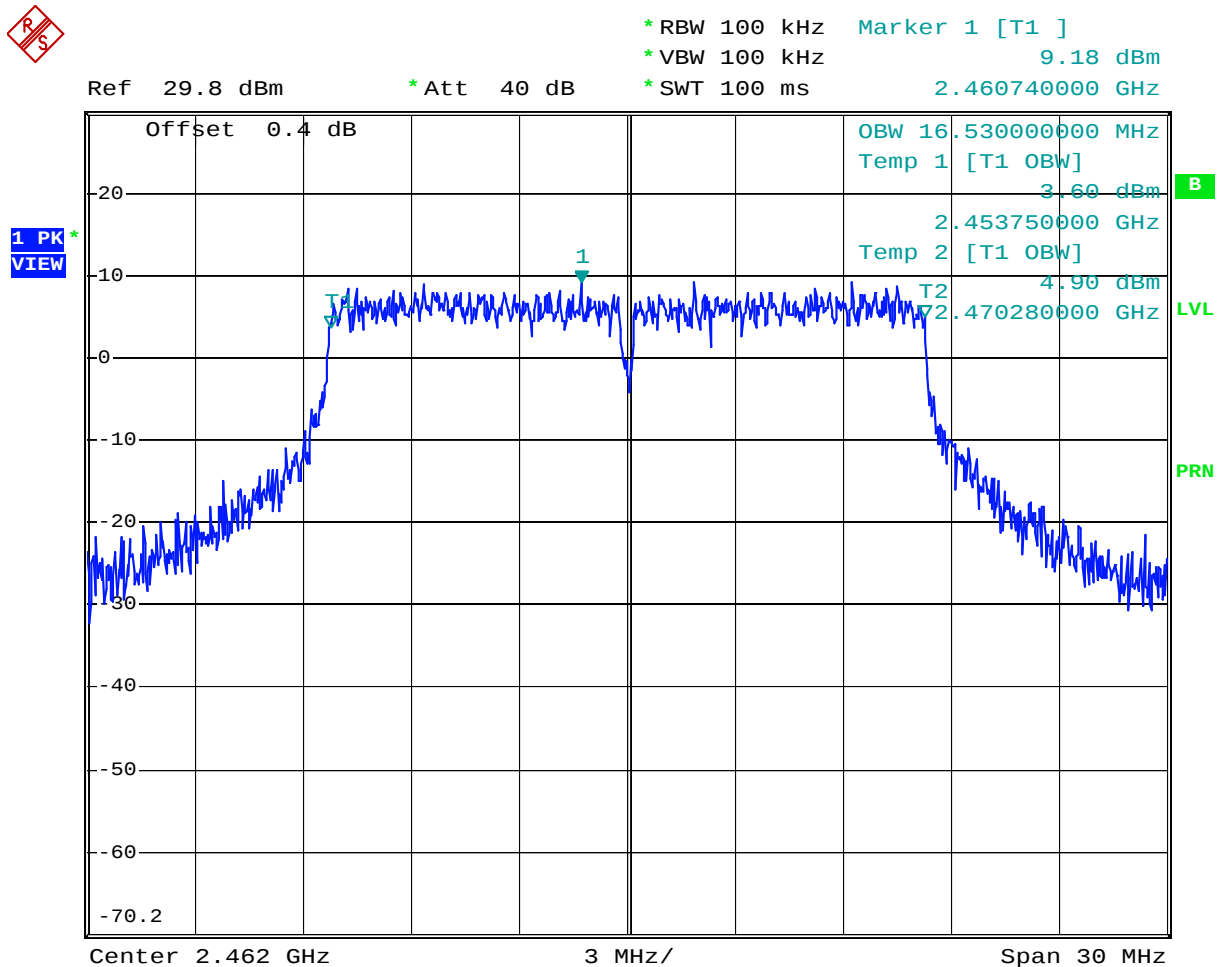
Comment: Occupied bandwidth, Ch 11, CCK 11 Mbps  
 Date: 26.JAN.2007 13:24:45

Plot A15



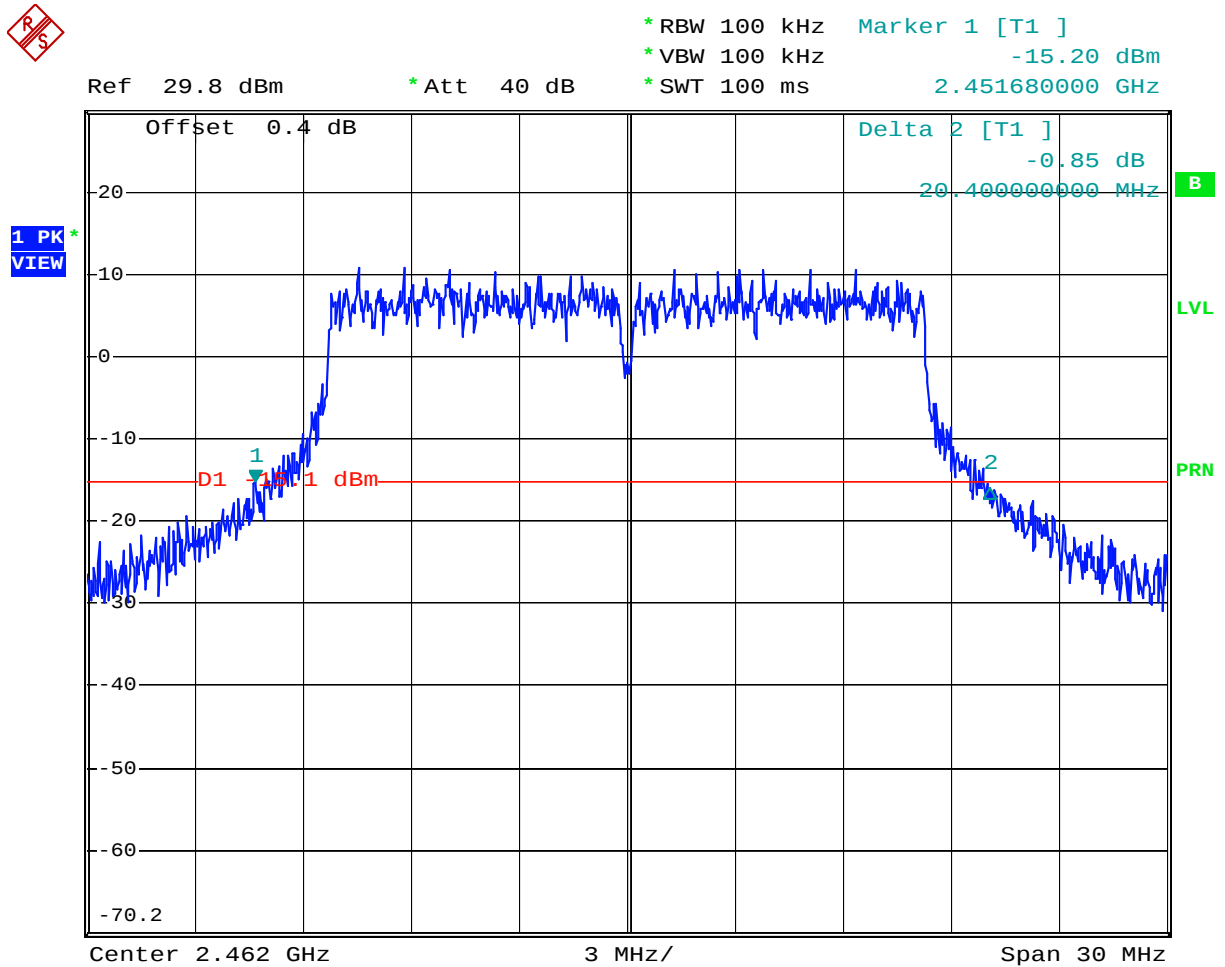
Comment: 26-dB bandwidth, Ch 11, OFDM 9 Mbps  
 Date: 26.JAN.2007 13:12:38

Plot A16



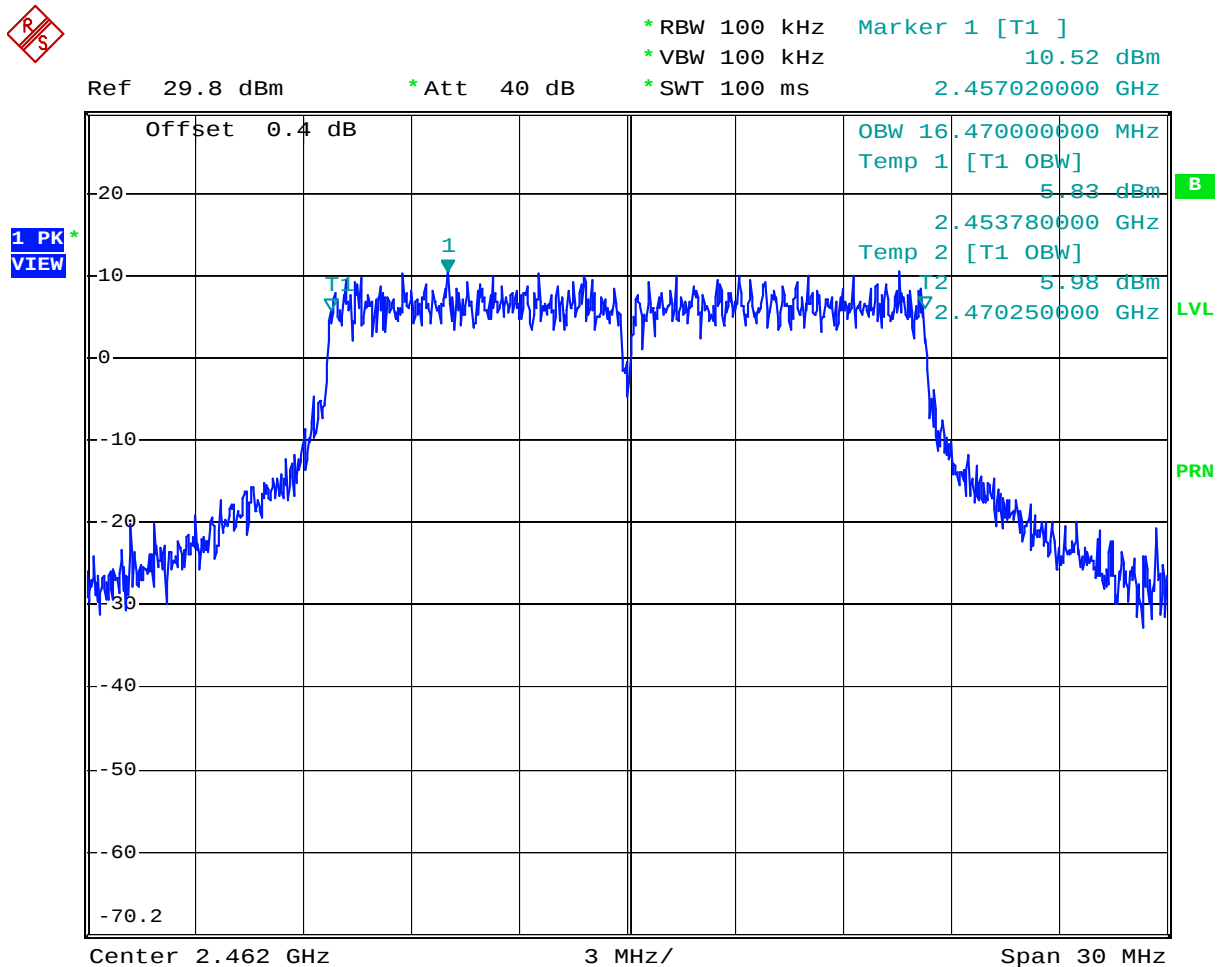
Comment: Occupied bandwidth, Ch 11, OFDM 9 Mbps  
Date: 26.JAN.2007 13:17:26

Plot A17



Comment: 26-dB bandwidth, Ch 11, OFDM 54 Mbps  
Date: 25.JAN.2007 14:15:39

Plot A18



Comment: Occupied bandwidth, Ch 11, OFDM 54 Mbps  
 Date: 25.JAN.2007 14:09:41