



# FCC/IC Test Report

**FOR:**

**Model Name: A1337  
iPad  
FCC ID: BCG-E2328A  
IC ID: 579C-E2328A  
47 CFR Part 15.407  
IC RSS-210 Issue 7**

**TEST REPORT #: EMC\_APPLE\_055\_15.407\_28A\_Rev4  
DATE: 2010-04-09**



**FCC listed  
A2LA Accredited  
IC recognized #  
3462B**

**CETECOM Inc.**

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Board of Directors: Dr. Harald Ansorge, Dr. Klaus Matkey, Hans Peter May



**TABLE OF CONTENTS**

|          |  |          |
|----------|--|----------|
| <b>1</b> | <b>Assessment</b>  | <b>4</b> |
| <b>2</b> | <b>Administrative Data</b>   | <b>5</b> |
| 2.1      | Identification of the Testing Laboratory Issuing the EMC Test Report | 5        |
| 2.2      | Identification of the Client   | 5        |
| 2.3      | Identification of the Manufacturer                                   | 5        |
| <b>3</b> | <b>Equipment under Test (EUT)</b>                                    | <b>6</b> |
| 3.1      | Specification of the Equipment under Test                            | 6        |
| 3.2      | Identification of the Equipment Under Test (EUT)                     | 7        |
| 3.3      | Identification of Accessory equipment                                | 7        |
| <b>4</b> | <b>Subject Of Investigation</b>                                      | <b>8</b> |
| <b>5</b> | <b>Measurements</b>  | <b>9</b> |
| 5.1      | Radiated Measurement Procedure                                       | 9        |
| 5.2      | Conducted Measurement Procedure                                      | 12       |
| 5.3      | Maximum Peak Output Power  | 13       |
| 5.3.1    | Limits: § 15.407   | 13       |
| 5.3.2    | Test Conditions:   | 13       |
| 5.3.3    | Test Result:   | 13       |
| 5.4      | Restricted Band Edge Compliance                                      | 15       |
| 5.4.1    | Limits: § 15.205   | 15       |
| 5.4.2    | Test Data/plots:   | 16       |
| 5.5      | Occupied Bandwidth   | 24       |
| 5.5.1    | Limits:  | 24       |
| 5.5.2    | Test Result:   | 24       |
| 5.5.3    | Plots  | 25       |
| 5.6      | Peak Power Spectral Density  | 43       |
| 5.6.1    | Limits:  | 43       |
| 5.6.2    | Results  | 43       |
| 5.7      | Peak Excursion   | 62       |
| 5.7.1    | Limit  | 62       |
| 5.7.2    | Results  | 62       |
| 5.8      | Transmitter Spurious Emissions- Conducted                            | 81       |
| 5.8.1    | Limits: § 15.407 (b)   | 81       |
| 5.8.2    | Test data/ plots:  | 81       |
| 5.8.3    | Test data/ plots:  | 82       |
| 5.9      | Transmitter Spurious Emissions- Radiated                             | 92       |
| 5.9.1    | Limits: § 15.205   | 92       |
| 5.9.2    | Limits: § 15.209   | 93       |
| 5.9.3    | Limits: § 15.209   | 93       |
| 5.9.4    | Test Result:   | 93       |



|             |  |            |
|-------------|--|------------|
| 5.9.5       | Test data/ plots:                                    | 94         |
| <b>5.10</b> | <b>Receiver Spurious Emissions- Radiated</b>         | <b>119</b> |
| 5.10.1      | Limits: §15.109                                      | 119        |
| 5.10.2      | Test Result:   | 119        |
| 5.10.3      | Test data/ plots:                                    | 120        |
| <b>5.11</b> | <b>AC Power Line Conducted Emissions</b>             | <b>122</b> |
| 5.11.1      | Limits: §15.107/15.207                               | 122        |
| 5.11.2      | Test Result:   | 122        |
| 5.11.3      | Test data/ plots:                                    | 123        |
| <b>6</b>    | <b>Dynamic Frequency Selection</b>                   | <b>125</b> |
| <b>6.1</b>  | <b>Channel Move Time</b>                             | <b>125</b> |
| 6.1.1       | Limits   | 125        |
| 6.1.2       | Results  | 125        |
| <b>6.2</b>  | <b>Channel Closing Time</b>                          | <b>126</b> |
| 6.2.1       | Limits   | 126        |
| 6.2.2       | Results  | 126        |
| <b>6.3</b>  | <b>30 Minute Beacon Test</b>                         | <b>127</b> |
| 6.3.1       | Limits   | 127        |
| 6.3.2       | Results  | 127        |
| <b>7</b>    | <b>Test Equipment and Ancillaries used for tests</b> | <b>128</b> |
| <b>8</b>    | <b>BLOCK DIAGRAMS</b>                                | <b>129</b> |
| <b>9</b>    | <b>Revision History</b>                              | <b>131</b> |



**1 Assessment**

The following is in compliance with the applicable criteria specified in FCC rules Parts 15.407 of Title 47 of the Code of Federal Regulations and Industry Canada Standards RSS 210 Issue 7.

| Company    | Description     | Model # |
|------------|-----------------|---------|
| Apple Inc. | Tablet Computer | A1337   |

**Responsible for Testing Laboratory:**

| 2010-04-09 | Compliance | Heiko Strehlow<br>(Director) |           |
|------------|------------|------------------------------|-----------|
| Date       | Section    | Name                         | Signature |

**Responsible for the Report:**

| 2010-04-09 | Compliance | Marc Douat<br>(Test Lab Manager) |           |
|------------|------------|----------------------------------|-----------|
| Date       | Section    | Name                             | Signature |

The test results of this test report relate exclusively to the test item specified in Section 3. CETECOM Inc. USA does not assume responsibility for any conclusions and generalizations drawn from the test results with regard to other specimens or samples of the type of the equipment represented by the test item. The test report may only be reproduced or published in full. Reproduction or publication of extracts from the report requires the prior written approval of the CETECOM Inc USA.



## 2 Administrative Data

### 2.1 Identification of the Testing Laboratory Issuing the EMC Test Report

|                                      |  |
|--------------------------------------|--|
| <b>Company Name:</b>                 | CETECOM Inc.   |
| <b>Department:</b>                   | Compliance   |
| <b>Address:</b>                      | 411 Dixon Landing Road<br>Milpitas, CA 95035<br>U.S.A. |
| <b>Telephone:</b>                    | +1 (408) 586 6200                                      |
| <b>Fax:</b>                          | +1 (408) 586 6299                                      |
| <b>Responsible Test Lab Manager:</b> | Heiko Strehlow   |
| <b>Responsible Project Leader:</b>   | Marc Douat   |

### 2.2 Identification of the Client

|                          |  |
|--------------------------|--|
| <b>Applicant's Name:</b> | Apple Inc.   |
| <b>Street Address:</b>   | 1 Infinite Loop Mail Stop26A                             |
| <b>City/Zip Code</b>     | Cupertino, California 95014                              |
| <b>Country</b>           | USA  |
| <b>Contact Person:</b>   | Bob Steinfeld  |
| <b>Phone No.</b>         | 408-974-2618   |
| <b>Fax:</b>              | 408-862-5061   |
| <b>e-mail:</b>           | <a href="mailto:steinfe@apple.com">steinfe@apple.com</a> |

### 2.3 Identification of the Manufacturer

Same as above applicant.



**3 Equipment under Test (EUT)**

**3.1 Specification of the Equipment under Test**

|                                  |   |
|----------------------------------|---|
| <b>Marketing Name:</b>           | iPad  |
| <b>Model No:</b>                 | A1337   |
| <b>Product Type:</b>             | Tablet Computer   |
| <b>Hardware Revision :</b>       | A   |
| <b>Software Revision :</b>       | 06.12.50 (7B293)  |
| <b>FCC-ID:</b>                   | BCG-E2328A  |
| <b>IC-ID :</b>                   | 579C-E2328A   |
| <b>Frequency:</b>                | 5150-5250MHz, 5250-5350MHz, 5470-5725MHz  |
| <b>Type(s) of Modulation:</b>    | OFDM with BPSK, QPSK, 16QAM, 64QAM  |
| <b>Antenna Tx0:</b>              | Type: PIFA<br>5150 – 5250 MHz: 3.8 dBi<br>5250 – 5350 MHz: 3.7 dBi<br>5470 – 5725 MHz: 2.9 dBi  |
| <b>Antenna Tx1:</b>              | Type: Patch<br>5150 – 5250 MHz: 6.0 dBi<br>5250 – 5350 MHz: 5.9 dBi<br>5470 – 5725 MHz: 4.3 dBi   |
| <b>Equipment Classification:</b> | <input type="checkbox"/> Fixed <input type="checkbox"/> Vehicular <input checked="" type="checkbox"/> Portable<br><input type="checkbox"/> Module |
| <b>Power Supply:</b>             | 4.2 VDC battery, 110VAC Adapter   |
| <b>Temperature Range:</b>        | 0°C to 35°C   |



**3.2 Identification of the Equipment Under Test (EUT)**

| EUT # | Serial Number | HW Version | SW Version       |
|-------|---------------|------------|------------------|
| 1     | YM950003DYW   | A          | 06.12.50 (7B293) |

**3.3 Identification of Accessory equipment**

| AE # | Type                  | Manufacturer             | Model          |
|------|-----------------------|--------------------------|----------------|
| 1    | 10W USB Power Adapter | Foxlink Technology, Ltd. | A1357 W010A051 |

#### **4 Subject Of Investigation**

The objective of the measurements done by Cetecom Inc. was to measure the performance of the EUT as specified by requirements listed in FCC rules Part 15.407 of Title 47 of the Code of Federal Regulations and Industry Canada rules RSS-210 Issue 7.

This test report is to support a request for new equipment authorization under the FCC ID BCG-E2328A and IC ID 579C-E2328A.

Radiated measurements were performed on the product referred to in Section 3 as EUT, conducted measurements were performed on the radio installed on a test fixture. This test report contains full radiated and conducted testing results as per FCC15.407.

Low, mid and high channels and all modes were tested. All data in this report shows the worst case between horizontal and vertical polarization measurements.

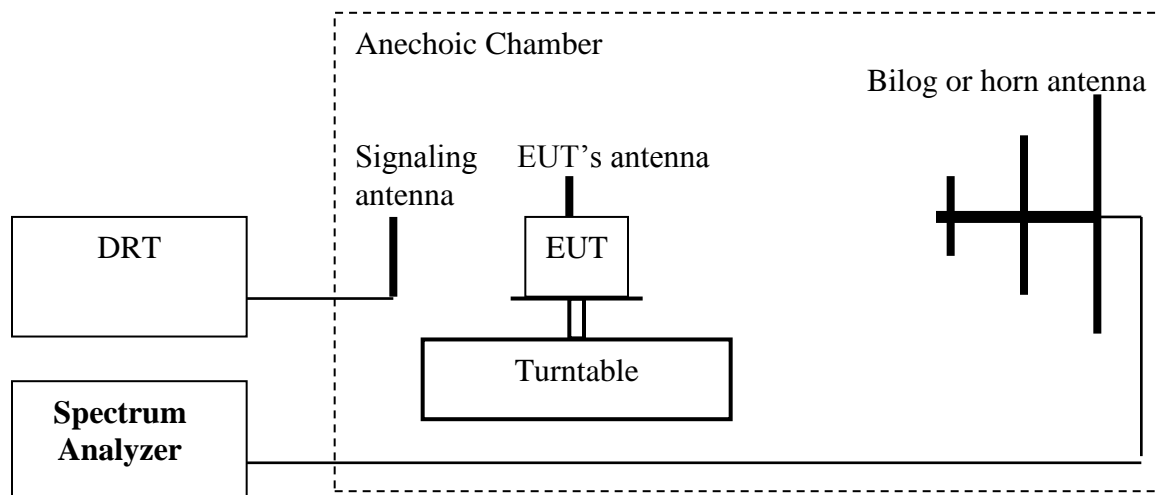
The device has transmit diversity but does not transmit simultaneously on both antennas.



## 5 Measurements

### 5.1 Radiated Measurement Procedure

Ref: TIA-603C 2004 -2.2.17.2 Effective Radiated Power (ERP) or Effective Isotropic Radiated Power (EIRP)



1. Connect the equipment as shown in the above diagram with the EUT's antenna in a vertical orientation.
2. Adjust the settings of the Digital RadioCommunication Tester (DRT) to set the EUT to its maximum power at the required channel.
3. Set the spectrum analyzer to the channel frequency. Set the analyzer to measure peak hold with the required settings.
4. Rotate the EUT 360°. Record the peak level in dBm (**LVL**).
5. Replace the EUT with a vertically polarized half wave dipole or known gain antenna. The center of the antenna should be at the same location as the center of the EUT's antenna.
6. Connect the antenna to a signal generator with known output power and record the path loss in dB (**LOSS**). **LOSS** = Generator Output Power (dBm) – Analyzer reading (dBm).
7. Determine the ERP using the following equation:  
**ERP** (dBm) = **LVL** (dBm) + **LOSS** (dB)
8. Determine the EIRP using the following equation:  
**EIRP** (dBm) = **ERP** (dBm) + 2.14 (dB)
9. Measurements are to be performed with the EUT set to the low, middle and high channels.  
**Spectrum analyzer settings: RBW=VBW=10MHz**

### **ANSI C63.4 Section 8.3.1.1: Exploratory radiated emission measurements**

Exploratory radiated measurements shall be performed at the measurement distance or at a closer distance than that specified for compliance to determine the emission characteristics of the EUT. At near distances, for EUTs of comparably small size, it is relatively easy to determine the spectrum signature of the EUT and, if applicable, the EUT configuration that produces the maximum level of emissions. A shielded room may be used for exploratory testing, but may have anomalies that can lead to significant errors in amplitude measurements.

Broadband antennas and a spectrum analyzer or a radio-noise meter with a panoramic display are often useful in this type of testing. It is recommended that either a headset or loudspeaker be connected as an aid in detecting ambient signals and finding frequencies of significant emission from the EUT when the exploratory and final testing is performed in an OATS with strong ambient signals. Caution should be taken if either antenna height between 1 and 4 meters or EUT azimuth is not fully explored. Not fully exploring these parameters during exploratory testing may require complete testing at the OATS or semi-anechoic chamber when the final full spectrum testing is conducted.

The EUT should be set up in its typical configuration and arrangement, and operated in its various modes. For tabletop systems, cables or wires should be manipulated within the range of likely arrangements. For floor-standing equipment, the cables or wires should be located in the same manner as the user would install them and no further manipulation is made. For combination EUTs, the tabletop and floor-standing portions of the EUT shall follow the procedures for their respective setups and cable manipulation. If the manner of cable installation is not known, or if it changes with each installation, cables or wires for floor-standing equipment shall be manipulated to the extent possible to produce the maximum level of emissions.

For each mode of operation required to be tested, the frequency spectrum shall be monitored. Variations in antenna height between 1 and 4 m, antenna polarization, EUT azimuth, and cable or wire placement (each variable within bounds specified elsewhere) shall be explored to produce the emission that has the highest amplitude relative to the limit. A step-by-step technique for determining this emission can be found in Annex C.

When measuring emissions above 1 GHz, the frequencies of maximum emission shall be determined by manually positioning the antenna close to the EUT and by moving the antenna over all sides of the EUT while observing a spectral display. It will be advantageous to have prior knowledge of the frequencies of emissions above 1 GHz. If the EUT is a device with dimensions approximately equal to that of the measurement antenna beamwidth, the measurement antenna shall be aligned with the EUT.

### **ANSI C63.4 Section 8.3.1.2: Final radiated emission measurements**

Based on the measurement results in 8.3.1.1, the one EUT, cable and wire arrangement, and mode of operation that produces the emission that has the highest amplitude relative to the limit is selected for the final measurement. The final measurement is then performed on a site meeting the requirements of 5.3, 5.4, or 5.5 as appropriate without variation of the EUT arrangement or EUT mode of operation. If the EUT is relocated from an exploratory test site to a final test site, the highest emission shall be remaximized at the final test location before final radiated emissions measurements are performed. However, antenna height and polarity and EUT azimuth are to be varied. In addition, the full frequency spectrum (for the range to be checked for meeting compliance) shall be investigated.

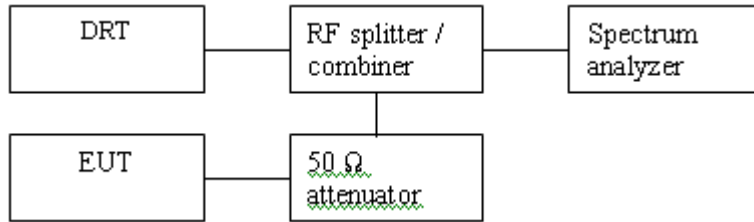
This investigation is performed with the EUT rotated 360°, the antenna height scanned between 1 m and 4 m, and the antenna rotated to repeat the measurements for both the horizontal and vertical antenna polarizations. During the full frequency spectrum investigation, particular focus should be made on those frequencies found in exploratory testing that were used to find the final test configuration, mode of operation, and arrangement (associated with achieving the least margin with respect to the limit). This full spectrum test constitutes the compliance measurement.

For measurements above 1 GHz, use the cable, EUT arrangement, and mode of operation determined in the exploratory testing to produce the emission that has the highest amplitude relative to the limit. Place the measurement antenna away from each area of the EUT determined to be a source of emissions at the specified measurement distance, while keeping the antenna in the “cone of radiation” from that area and pointed at the area both in azimuth and elevation, with polarization oriented for maximum response. The antenna may have to be higher or lower than the EUT, depending on the EUT’s size and mounting height, but the antenna should be restricted to a range of heights of from 1 m to 4 m above the ground or reference ground plane. If the transmission line for the measurement antenna restricts its range of height and polarization, the steps needed to ensure the correct measurement of the maximum emissions, shall be described in detail in the report of measurements. Data collected shall satisfy the report requirements of Clause 10.

### **NOTES**

- 1— Where limits are specified by agencies for both average and peak (or quasi-peak) detection, if the peak (or quasi-peak) measured value complies with the average limit, it is unnecessary to perform an average measurement.
- 2—Use of waveguide and flexible waveguide may be necessary at frequencies above 10 GHz to achieve usable signal-to noise ratios at required measurement distances. If so, it may be necessary to restrict the height search of the antenna, and special care should be taken to ensure that maximum emissions are correctly measured.
- 3—All presently known devices causing emissions above 10 GHz are physically small compared with the beam-widths of typical horn antennas used for EMC measurements. For such EUTs and frequencies, it may be preferable to vary the height and polarization of the EUT instead of the receiving antenna to maximize the measured emissions.

## 5.2 Conducted Measurement Procedure



1. Connect the equipment as shown in the above diagram.
2. Adjust the settings of the Digital RadioCommunication Tester (DRT) to set the EUT to its maximum power at the required channel.
3. Measurements are to be performed with the EUT set to the low, middle and high channels.



**5.3 Maximum Peak Output Power**

**5.3.1 Limits: §15.407**

Conducted Output Power is defined as the following (reduced if directional gain > 6dBi):

- Sub-band 1: 5150-5250MHz: 15.407(a)(1): 50mW or 4dBm + 10log(B),
- Sub-band 2: 5250-5350MHz: 15.407(a)(2): 250mW or 11dBm + 10log(B)
- Sub-band 3: 5470-5725MHz: 15.407(a)(2): 250mW or 11dBm + 10log(B)

B is the 26-dB emission bandwidth in MHz.

EIRP limit = Conducted Limit + 6dB.

**5.3.2 Test Conditions:**

Tnom: 21°C; Vnom

**5.3.3 Test Result:**

EIRP = conducted output power + antenna gain

| Max Peak Output Power – EIRP (dBm) |         |      |      |      |      |
|------------------------------------|---------|------|------|------|------|
| Frequency (MHz)                    | Channel | Tx0  |      | Tx1  |      |
|                                    |         | a    | HT20 | a    | HT20 |
| 5180                               | 36      | 20.7 | 20.7 | 18.7 | 18.9 |
| 5200                               | 40      | 20.7 | 20.7 | 19.1 | 19.2 |
| 5240                               | 48      | 20.5 | 20.8 | 19.5 | 19.7 |
| 5260                               | 52      | 22.3 | 21.9 | 19.2 | 19   |
| 5300                               | 60      | 22.4 | 21.8 | 19.7 | 19.3 |
| 5320                               | 64      | 20.9 | 21.8 | 19.8 | 19.6 |
| 5500                               | 100     | 21.7 | 21.9 | 19.3 | 19.8 |
| 5600                               | 120     | 22   | 22.7 | 19.9 | 20.1 |
| 5700                               | 140     | 22   | 22.8 | 19.8 | 19.8 |
| Measurement Uncertainty: ±0.5dB    |         |      |      |      |      |



UNII power method 2 was used

| <b>Max Peak Output Power – Conducted (dBm)</b> |                |            |             |            |             |
|--|----------------|------------|-------------|------------|-------------|
| <b>Frequency (MHz)</b>                         | <b>Channel</b> | <b>Tx0</b> |             | <b>Tx1</b> |             |
|  |                | <b>a</b>   | <b>HT20</b> | <b>a</b>   | <b>HT20</b> |
| <b>5180</b>                                    | <b>36</b>      | 16.9       | 16.9        | 12.7       | 12.9        |
| <b>5200</b>                                    | <b>40</b>      | 16.9       | 16.9        | 13.1       | 13.2        |
| <b>5240</b>                                    | <b>48</b>      | 16.7       | 17          | 13.5       | 13.7        |
| <b>5260</b>                                    | <b>52</b>      | 18.6       | 18.2        | 13.3       | 13.1        |
| <b>5300</b>                                    | <b>60</b>      | 18.7       | 18.1        | 13.8       | 13.4        |
| <b>5320</b>                                    | <b>64</b>      | 17.2       | 18.1        | 13.9       | 13.7        |
| <b>5500</b>                                    | <b>100</b>     | 18.8       | 19          | 15         | 15.5        |
| <b>5600</b>                                    | <b>120</b>     | 19.1       | 19.8        | 15.6       | 15.8        |
| <b>5700</b>                                    | <b>140</b>     | 19.1       | 19.9        | 15.5       | 15.5        |
| <b>Measurement Uncertainty: ±0.5dB</b>         |                |            |             |            |             |



**5.4 Restricted Band Edge Compliance**

**5.4.1 Limits: §15.205**

2010 Except as shown in paragraph (d) of this section, only spurious emissions are permitted in any of the frequency bands listed below:

| MHz                 | MHz                   | MHz             | GHz              |
|---------------------|-----------------------|-----------------|------------------|
| 0.090 - 0.110       | 16.42 - 16.423        | 399.9 - 410     | 4.5 - 5.15       |
| 0.495 - 0.505       | 16.69475 - 16.69525   | 608 - 614       | 5.35 - 5.46      |
| 2.1735 - 2.1905     | 16.80425 - 16.80475   | 960 - 1240      | 7.25 - 7.75      |
| 4.125 - 4.128       | 25.5 - 25.67          | 1300 - 1427     | 8.025 - 8.5      |
| 4.17725 - 4.17775   | 37.5 - 38.25          | 1435 - 1626.5   | 9.0 - 9.2        |
| 4.20725 - 4.20775   | 73 - 74.6             | 1645.5 - 1646.5 | 9.3 - 9.5        |
| 6.215 - 6.218       | 74.8 - 75.2           | 1660 - 1710     | 10.6 - 12.7      |
| 6.26775 - 6.26825   | 108 - 121.94          | 1718.8 - 1722.2 | 13.25 - 13.4     |
| 6.31175 - 6.31225   | 123 - 138             | 2200 - 2300     | 14.47 - 14.5     |
| 8.291 - 8.294       | 149.9 - 150.05        | 2310 - 2390     | 15.35 - 16.2     |
| 8.362 - 8.366       | 156.52475 - 156.52525 | 2483.5 - 2500   | 17.7 - 21.4      |
| 8.37625 - 8.38675   | 156.7 - 156.9         | 2690 - 2900     | 22.01 - 23.12    |
| 8.41425 - 8.41475   | 162.0125 - 167.17     | 3260 - 3267     | 23.6 - 24.0      |
| 12.29 - 12.293      | 167.72 - 173.2        | 3332 - 3339     | 31.2 - 31.8      |
| 12.51975 - 12.52025 | 240 - 285             | 3345.8 - 3358   | 36.43 - 36.5     |
| 12.57675 - 12.57725 | 322 - 335.4           | 3600 - 4400     | ( <sup>2</sup> ) |
| 13.36 - 13.41       |                       |                 |                  |

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator 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 an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in §15.209(a) is not required. In addition, 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)).

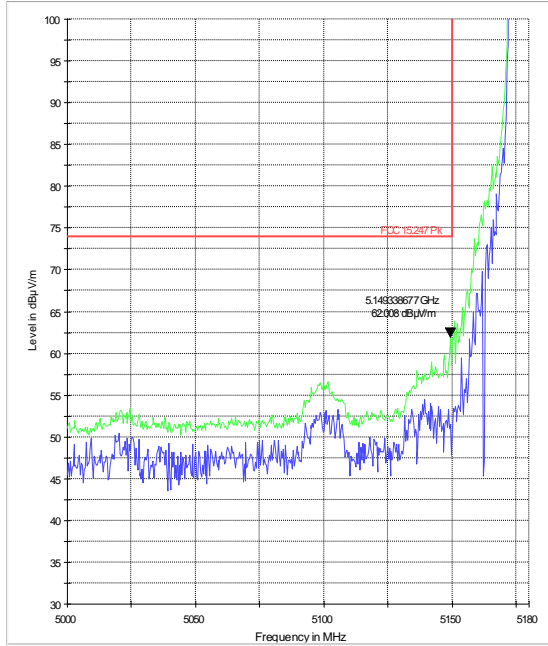
\*PEAK LIMIT= 74dBµV/m  
 \*AVG. LIMIT= 54dBµV/m

Bandedge measurements were also performed with Bluetooth transmitting on the same antenna



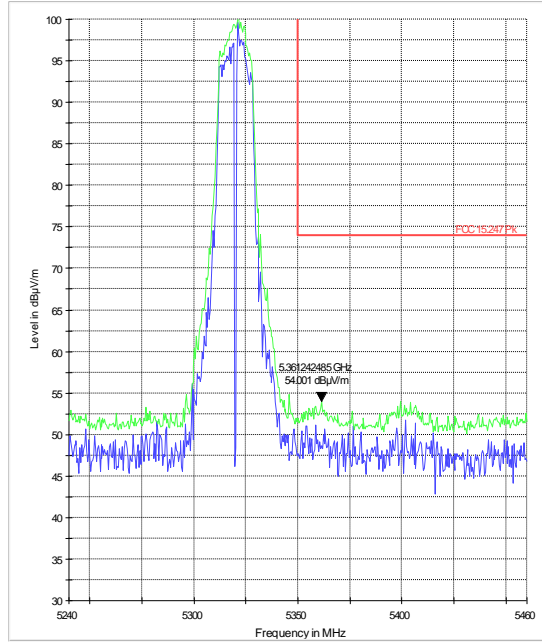
**5.4.2 Test Data/plots:**  
**Tx0 802.11a Bandedge Pk**

FCC 15.407.5.15LBE Pk 3m



MxPeak-QarWite MxPeak-MxHdd FCC 15.247 Pk

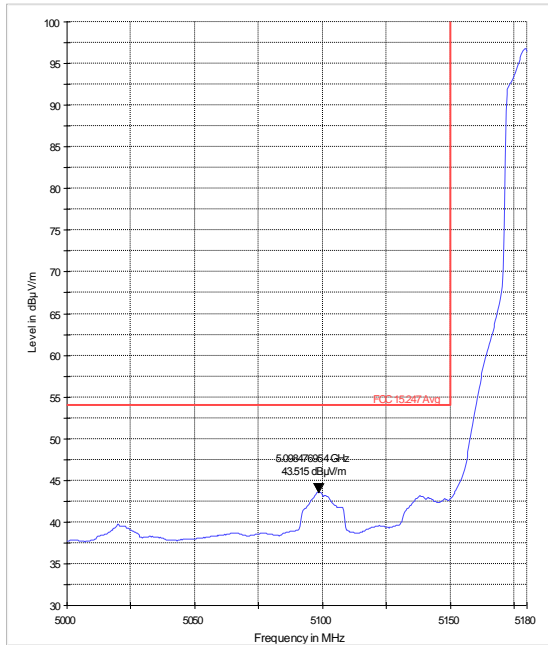
FCC 15.407.5.35HBE Pk 3m



MxPeak-QarWite MxPeak-MxHdd FCC 15.247 Pk

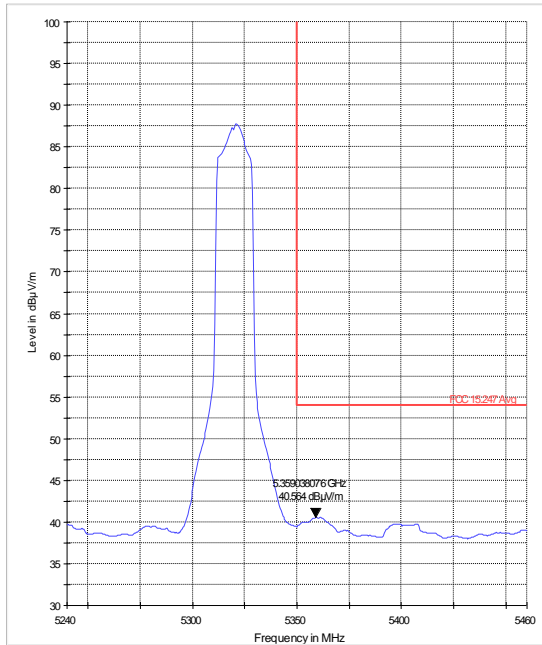
**Tx0 802.11a Bandedge Avg**

FCC 15.407.5.15LBE Avg 3m



MxPeak-MxHdd FCC 15.247 Avg

FCC 15.407.5.35HBE Avg 3m



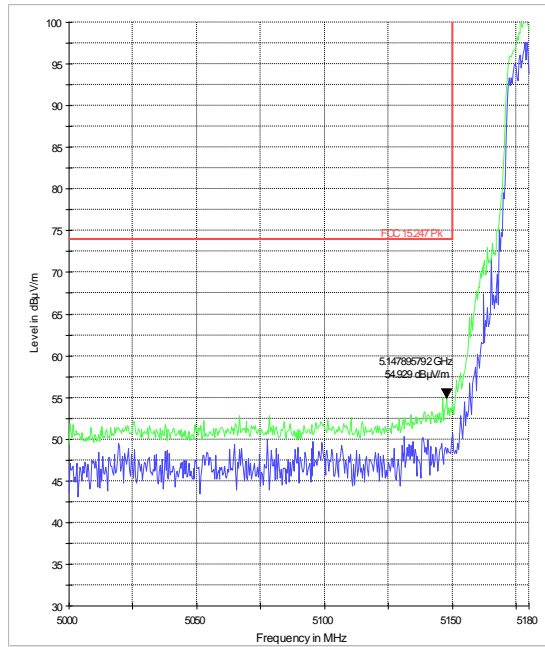
MxPeak-MxHdd FCC 15.247 Avg



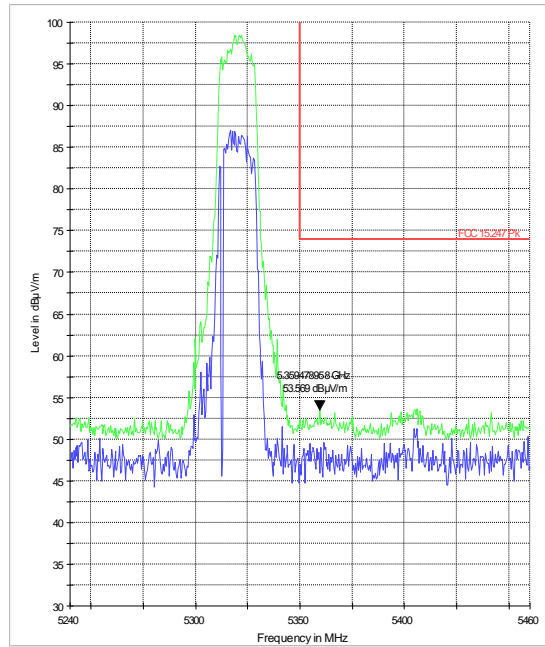


### Tx0 802.11 HT20 Bandedge Pk

FCC 15.407 5.15LBE Pk 3m



FCC 15.407 5.35HBE Pk 3m

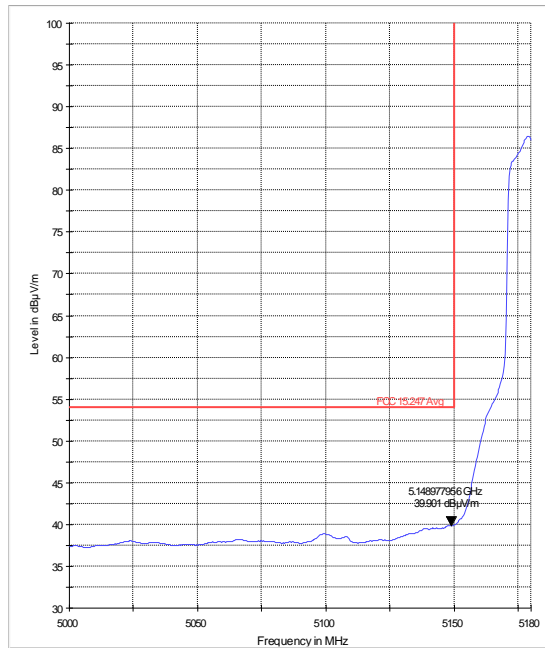


— MbRsk-ClearWide — MbRsk-MbHd — FCC 15.247 Pk

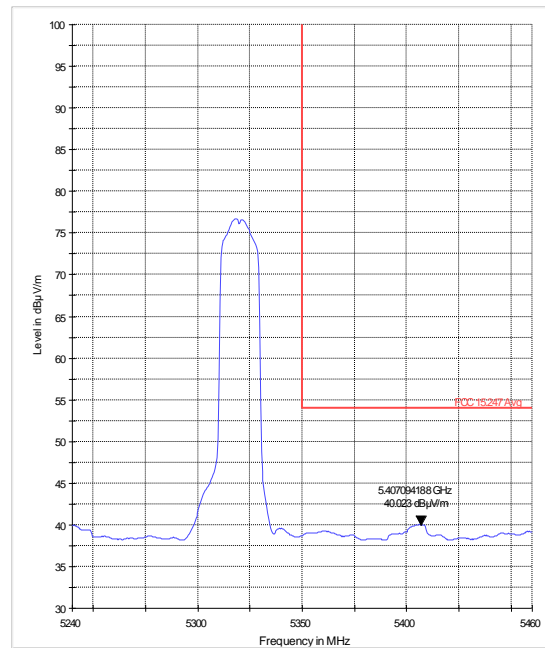
— MbRsk-ClearWide — MbRsk-MbHd — FCC 15.247 Pk

### Tx0 802.11 HT20 Bandedge Avg

FCC 15.407 5.15LBE Avg 3m



FCC 15.407 5.35HBE Avg 3m



— MbRsk-MbHd — FCC 15.247 Avg

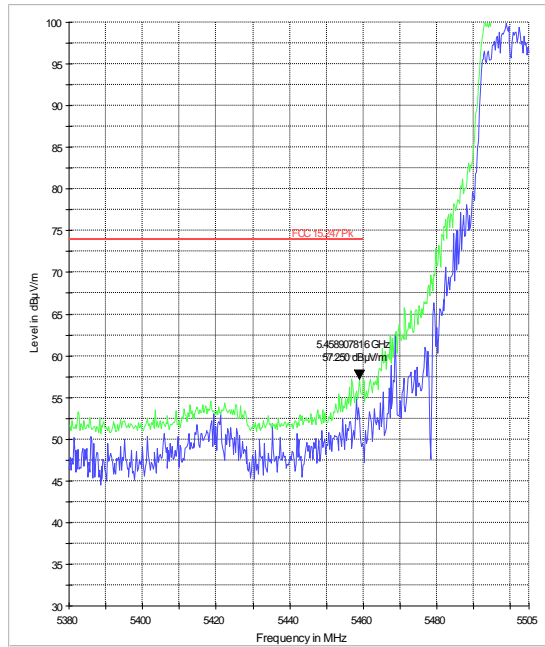
— MbRsk-MbHd — FCC 15.247 Avg



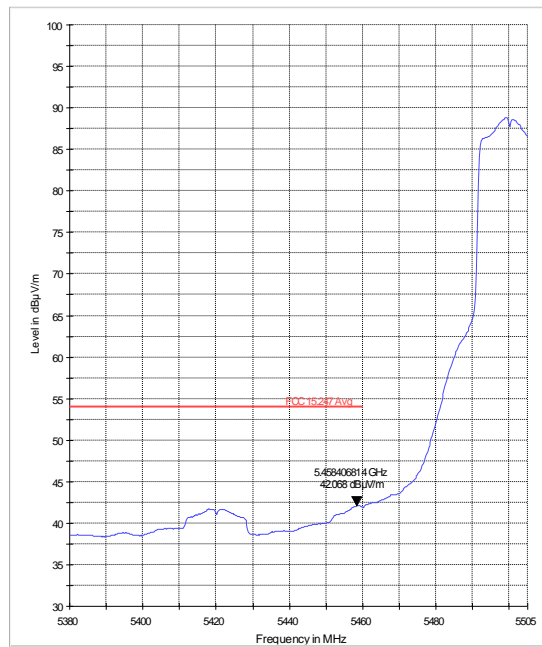
**Tx0 802.11a Band 3 Bandedge Pk / Avg**

FCC 15.407 5.46 LBE Pk 3m

FCC 15.407 5.46 LBE Avg 3m



MaPsk-QamVite MaPsk-MbHd FCC 15.247 Pk

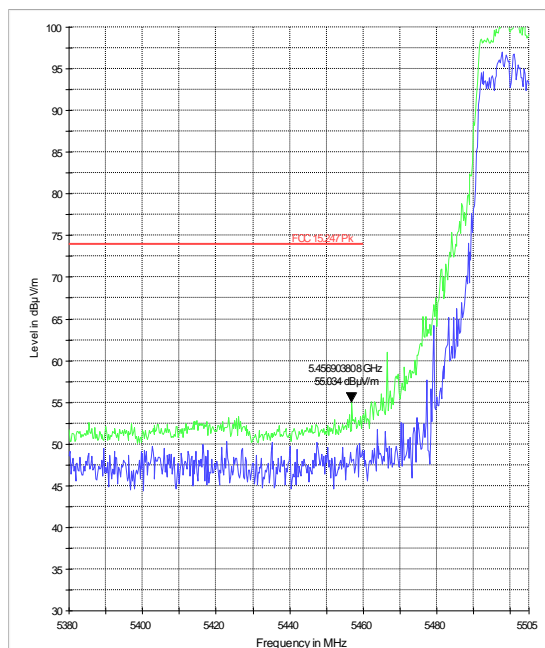


MaPsk-MbHd FCC 15.247 Avg

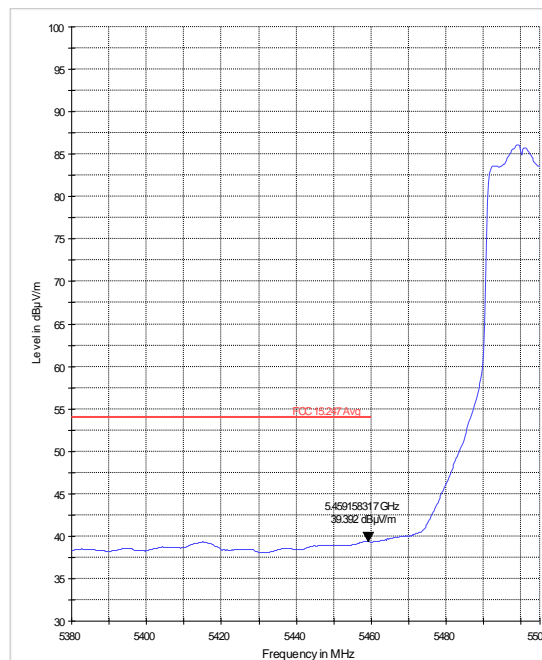
**Tx0 802.11 HT20 Band 3 Bandedge Pk / Avg**

FCC 15.407 5.46 LBE Pk 3m

FCC 15.407 5.46 LBE Avg 3m



MaPsk-QamVite MaPsk-MbHd FCC 15.247 Pk

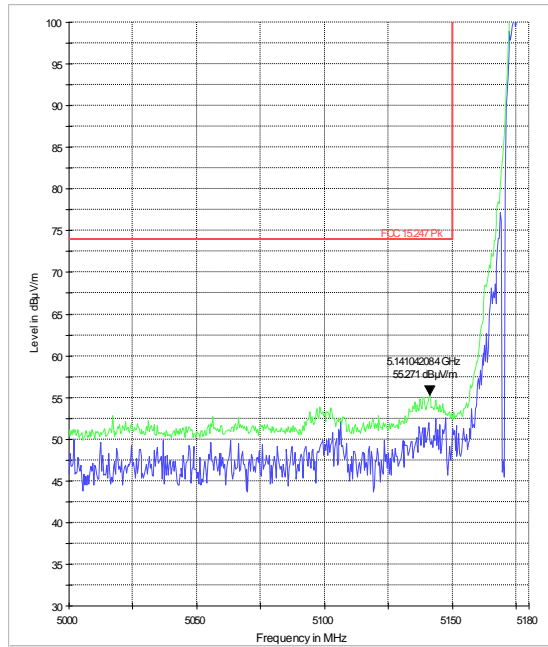


MaPsk-MbHd FCC 15.247 Avg



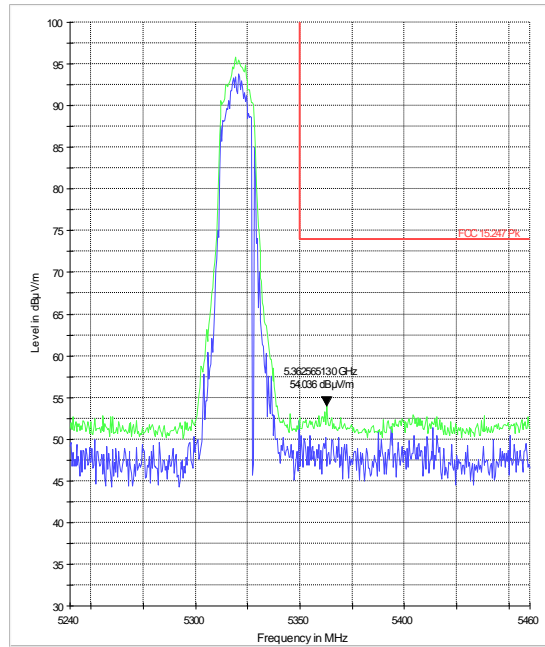
**Tx1 802.11a Bandedge Pk**

FCC 15.407 5.15 LBE Pk 3m



— MxPsk-QamWite — MxPsk-MxHdd — FCC 15.247 Pk

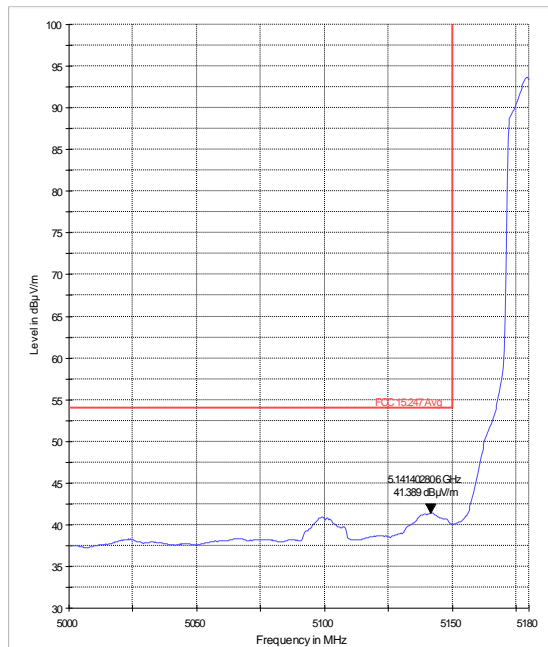
FCC 15.407 5.35 HBE Pk 3m



— MxPsk-QamWite — MxPsk-MxHdd — FCC 15.247 Pk

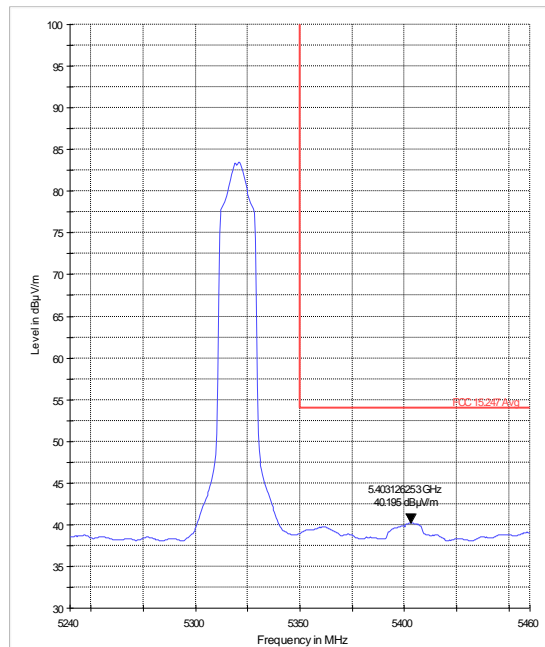
**Tx1 802.11a Bandedge Avg**

FCC 15.407 5.15 LBE Avg 3m



— MxPsk-MxHdd — FCC 15.247 Avg

FCC 15.407 5.35 HBE Avg 3m

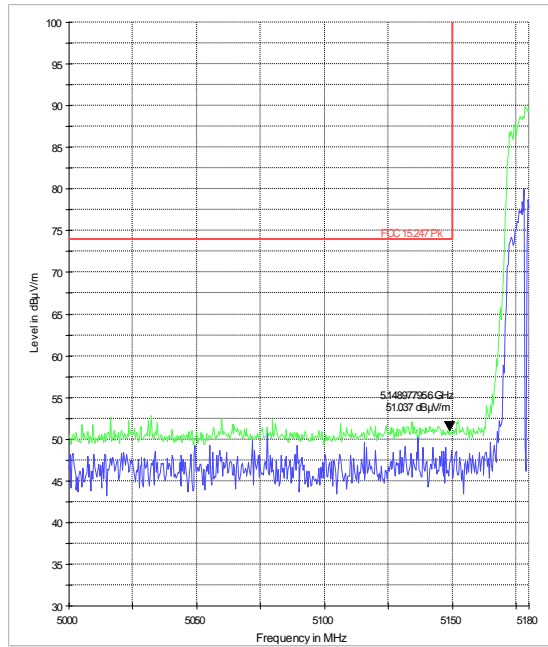


— MxPsk-MxHdd — FCC 15.247 Avg

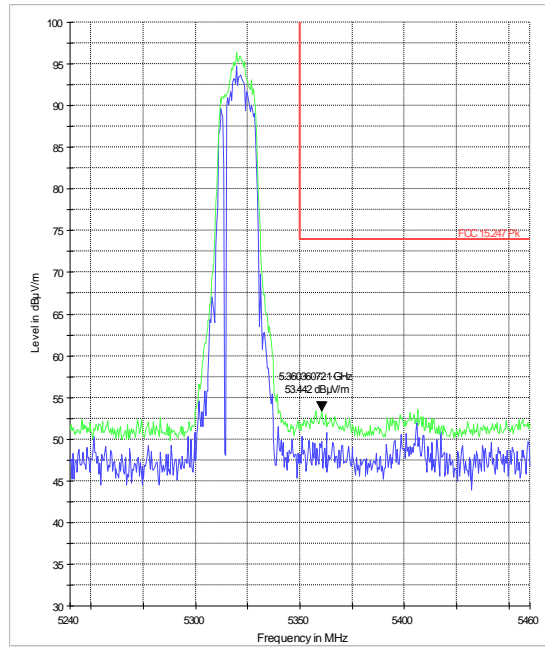


**Tx1 802.11 HT20 Bandedge Pk**

FCC 15.407 5.15LBE Pk 3m



FCC 15.407 5.35HBE Pk 3m

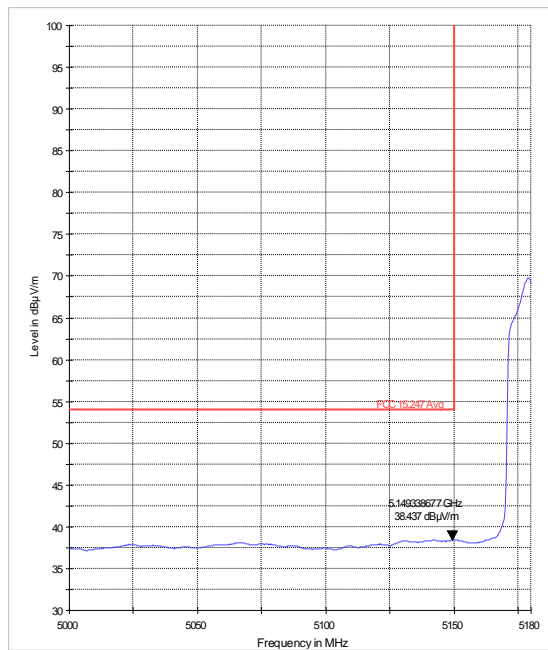


MxPsk-QamWife MxPsk-MxHdd FCC 15.247 Pk

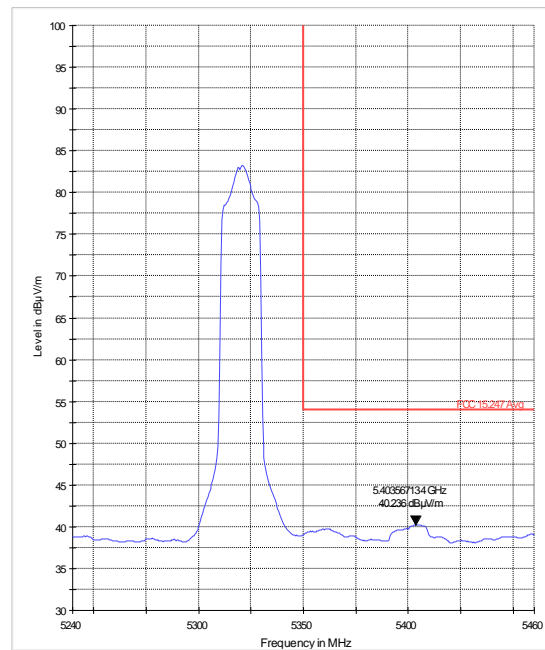
MxPsk-QamWife MxPsk-MxHdd FCC 15.247 Pk

**Tx1 802.11 HT20 Bandedge Avg**

FCC 15.407 5.15LBE Avg 3m



FCC 15.407 5.35HBE Avg 3m



MxPsk-MxHdd FCC 15.247 Avg

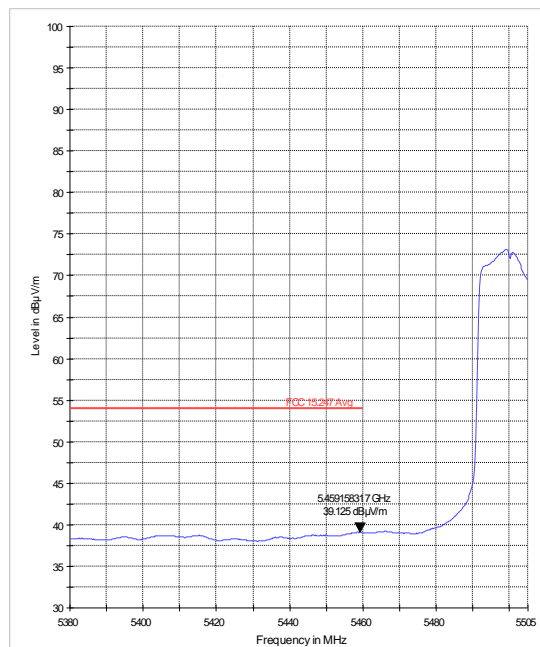
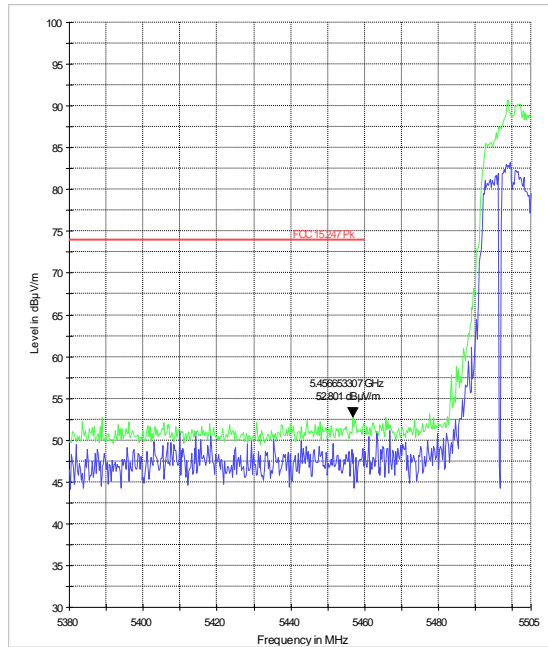
MxPsk-MxHdd FCC 15.247 Avg



**Tx1 802.11a Band 3 Bandedge Pk / Avg**

FCC 15.407 5.46 LBE Pk 3m

FCC 15.407 5.46 LBE Avg 3m



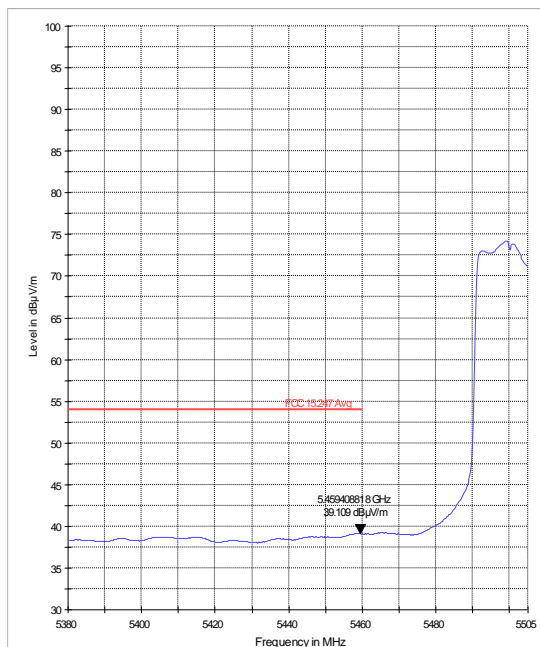
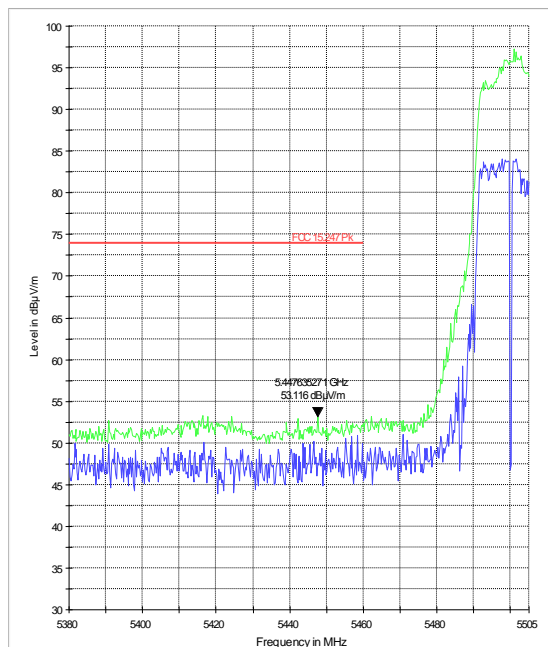
— MbPeak-QarWite — MbPeak-MbHdd — FCC 15.247 Pk

— MbPeak-MbHdd — FCC 15.247 Avg

**Tx1 802.11 HT20 Band 3 Bandedge Pk / Avg**

FCC 15.407 5.46 LBE Pk 3m

FCC 15.407 5.46 LBE Avg 3m



— MbPeak-QarWite — MbPeak-MbHdd — FCC 15.247 Pk

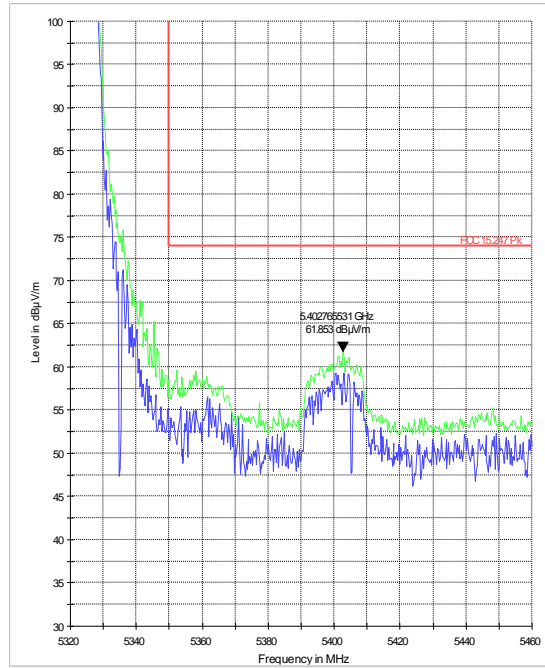
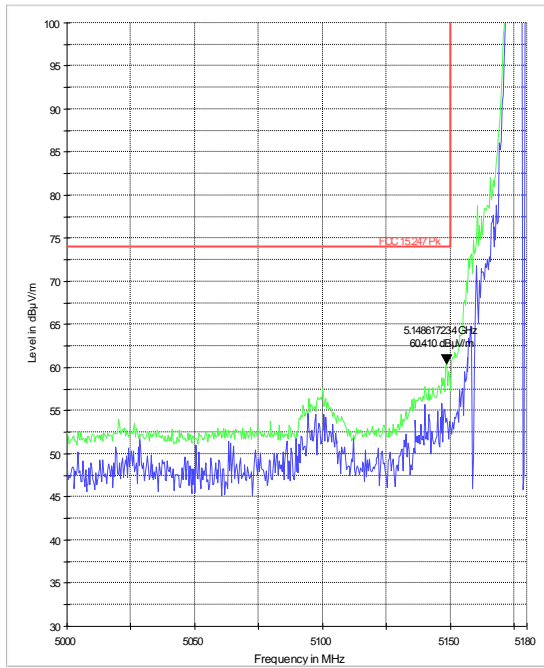
— MbPeak-MbHdd — FCC 15.247 Avg



**Simultaneous Transmission Tx0 802.11a Bluetooth Ch39 Bandedge Pk**

FCC 15.407 5.15 LBE Pk 3m

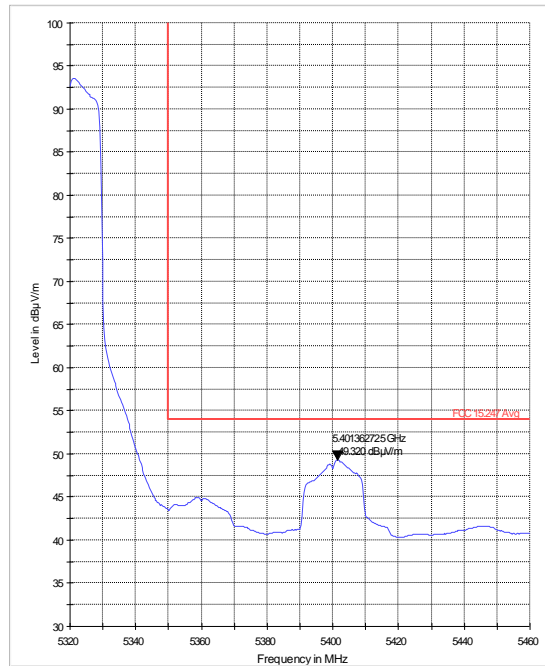
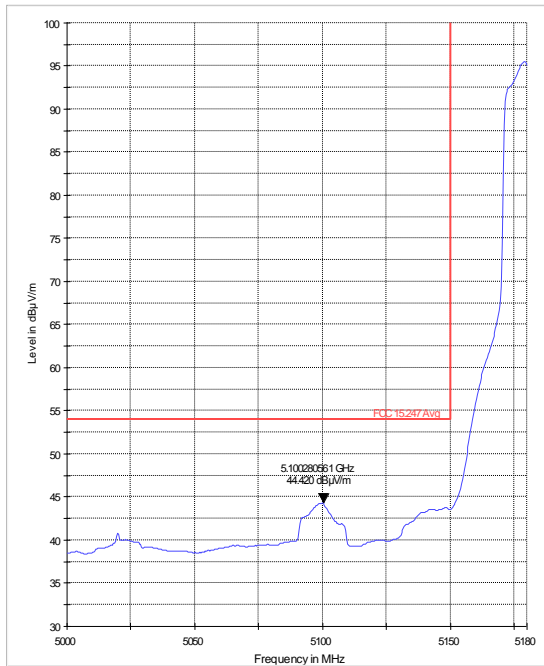
FCC 15.407 5.35 HBE Pk 3m



**Simultaneous Transmission Tx0 802.11a Bluetooth Ch39 Bandedge Avg**

FCC 15.407 5.15 LBE Avg 3m

FCC 15.407 5.35 HBE Avg 3m

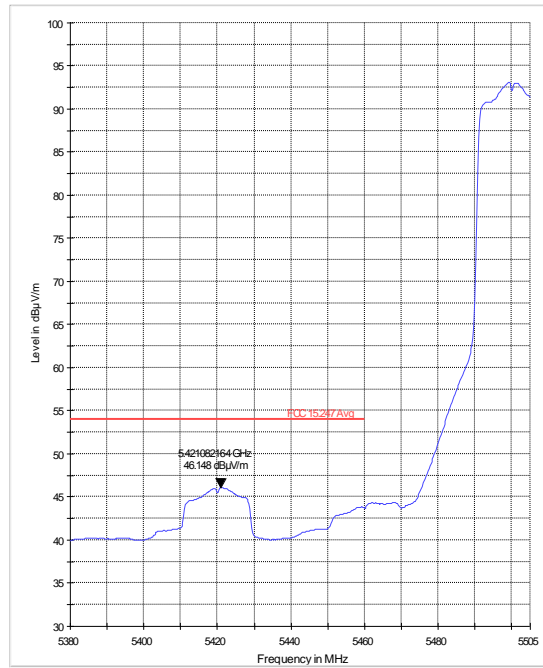
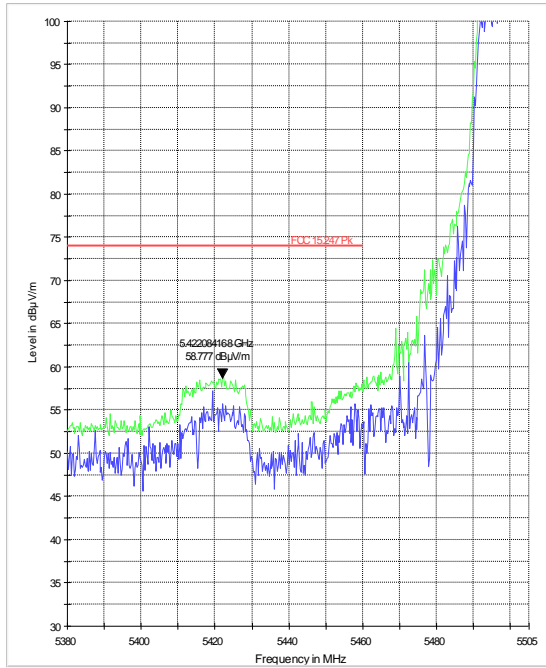




Simultaneous Transmission Tx0 802.11a Bluetooth Ch39 Band 3 Bandedge Pk / Avg

FCC 15.407 5.46 LBE Pk 3m

FCC 15.407 5.46 LBE Avg 3m





**5.5 Occupied Bandwidth**

**5.5.1 Limits:**

None.

**5.5.2 Test Result:**

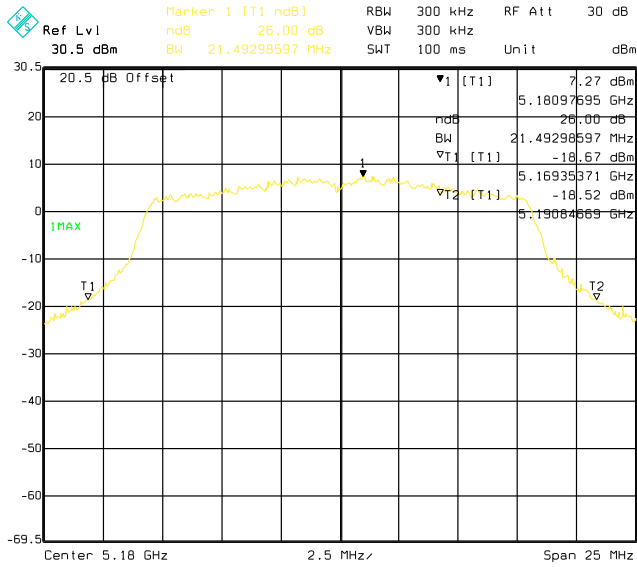
| Occupied Bandwidth (MHz)           |         |       |       |       |       |       |       |       |       |
|------------------------------------|---------|-------|-------|-------|-------|-------|-------|-------|-------|
| Frequency (MHz)                    | Channel | Tx0   |       |       |       | Tx1   |       |       |       |
|                                    |         | a     |       | HT20  |       | a     |       | HT20  |       |
|                                    |         | 26 dB | 99%   | 26 dB | 99%   | 26 dB | 99%   | 26 dB | 99%   |
| 5180                               | 36      | 21.49 | 16.53 | 22.95 | 17.79 | 21.19 | 16.58 | 23.15 | 17.79 |
| 5200                               | 40      | 21.19 | 16.53 | 22.55 | 17.74 | 21.54 | 16.53 | 22.44 | 17.74 |
| 5240                               | 48      | 21.49 | 16.58 | 22.65 | 17.79 | 21.44 | 16.53 | 22.8  | 17.79 |
| 5260                               | 52      | 21.59 | 16.53 | 22.9  | 17.79 | 21.19 | 16.58 | 23.19 | 17.79 |
| 5300                               | 60      | 21.04 | 16.53 | 22.6  | 17.74 | 21.04 | 16.53 | 22.6  | 17.79 |
| 5320                               | 64      | 21.29 | 16.53 | 22.8  | 17.74 | 21.04 | 16.53 | 22.85 | 17.74 |
| 5500                               | 100     | 21.24 | 16.53 | 22.49 | 17.79 | 21.19 | 16.53 | 22.44 | 17.79 |
| 5600                               | 120     | 21.24 | 16.53 | 22.75 | 17.79 | 21.69 | 16.53 | 22.7  | 17.79 |
| 5700                               | 140     | 21.39 | 16.53 | 22.65 | 17.79 | 21.34 | 16.53 | 22.34 | 17.79 |
| Measurement Uncertainty: ±0.01 MHz |         |       |       |       |       |       |       |       |       |



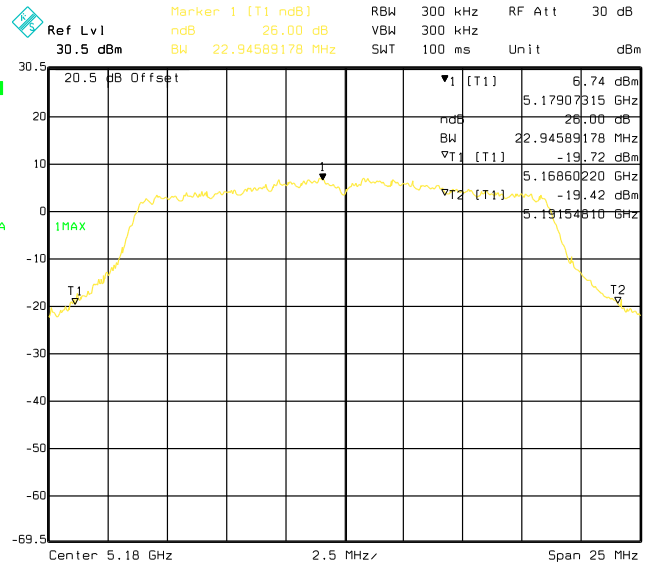


5.5.3 Plots

26bw tx0 ch36 a / n

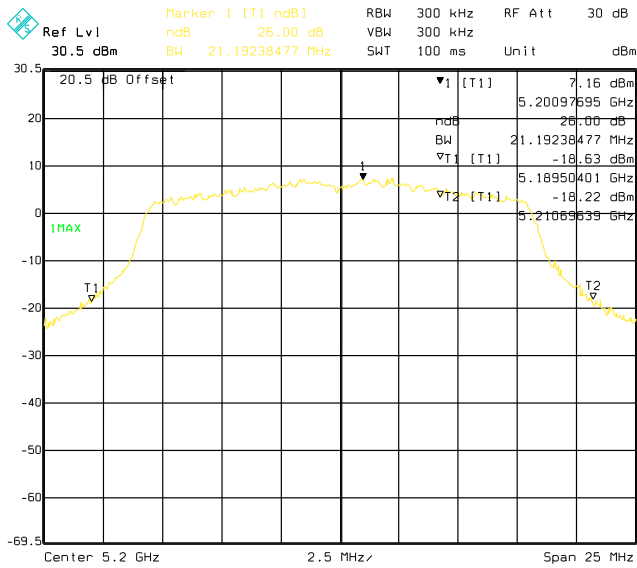


Date: 21.DEC.2009 14:20:16

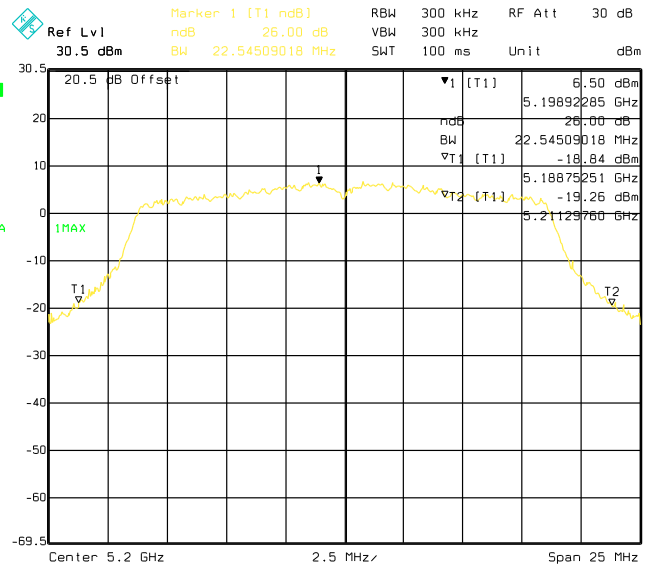


Date: 21.DEC.2009 14:42:55

26bw tx0 ch40 a / n



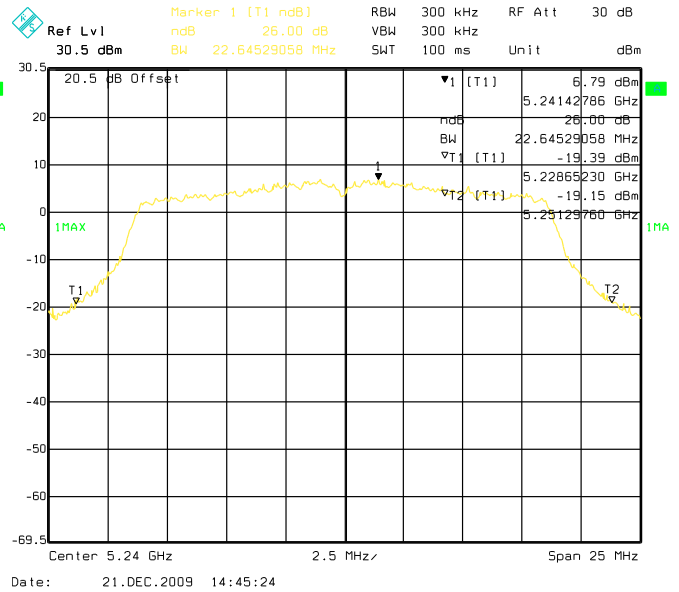
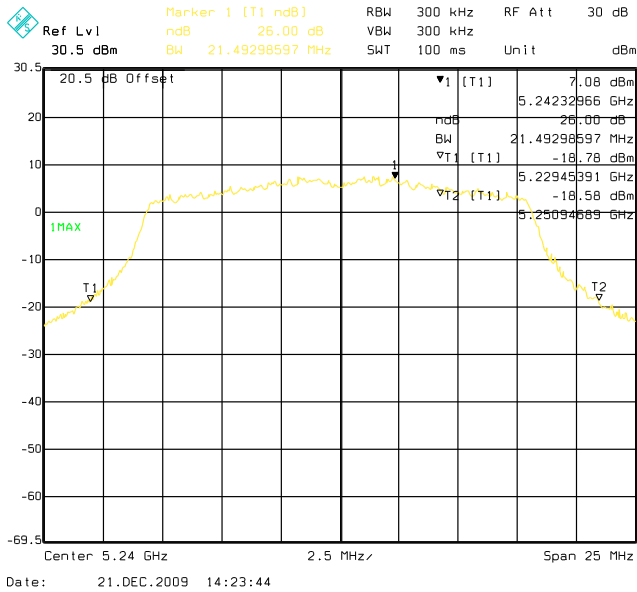
Date: 21.DEC.2009 14:21:49



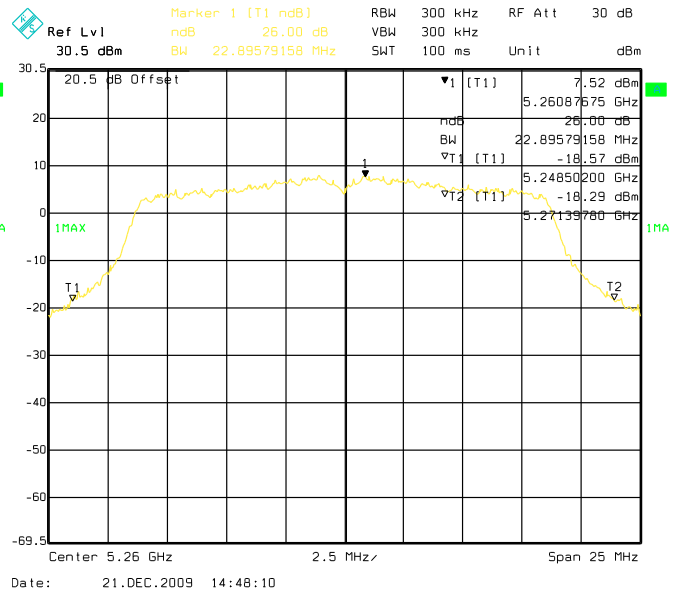
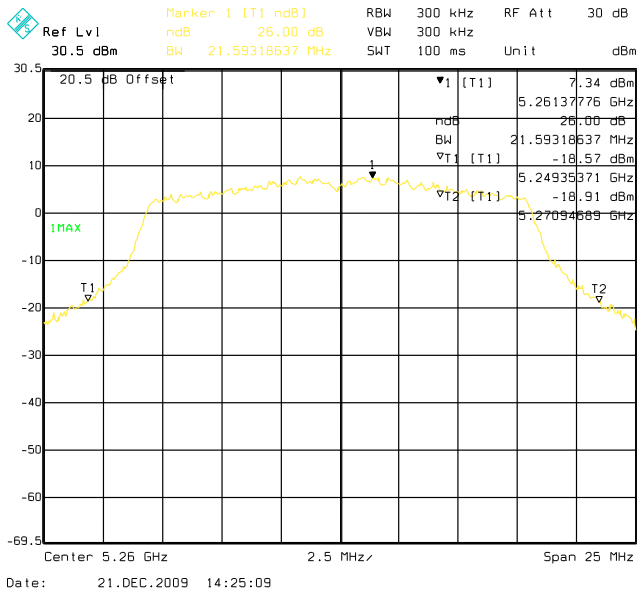
Date: 21.DEC.2009 14:44:11



26bw tx0 ch48 a / n



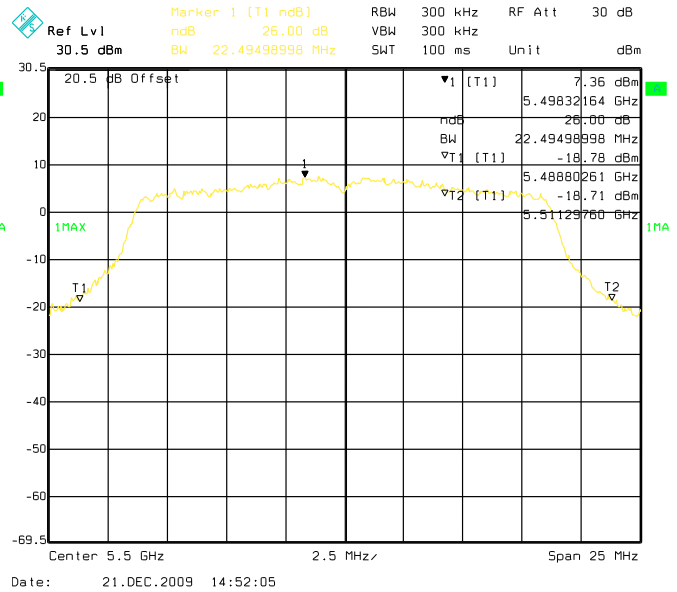
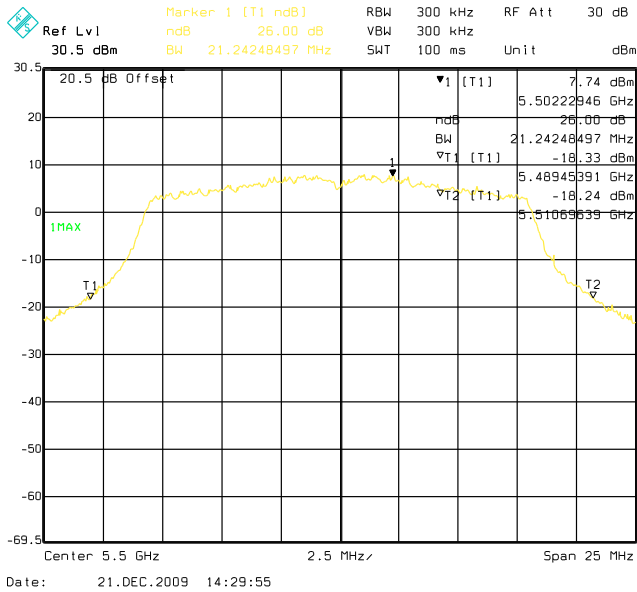
26bw tx0 ch52 a / n



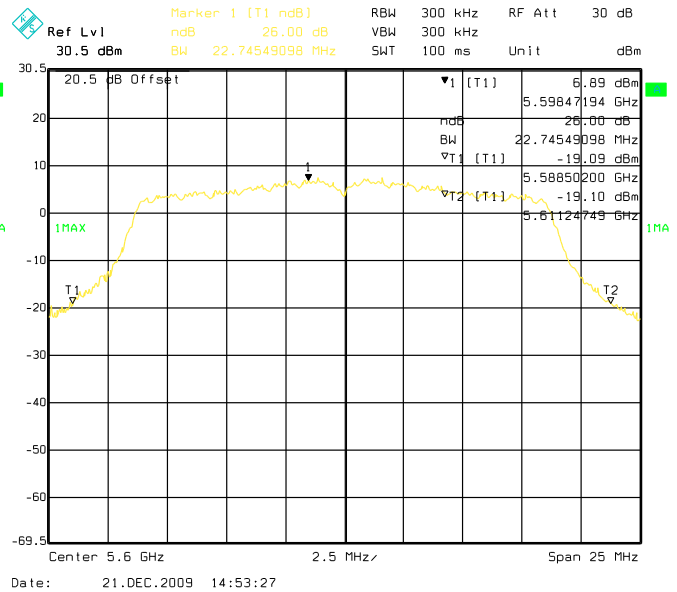
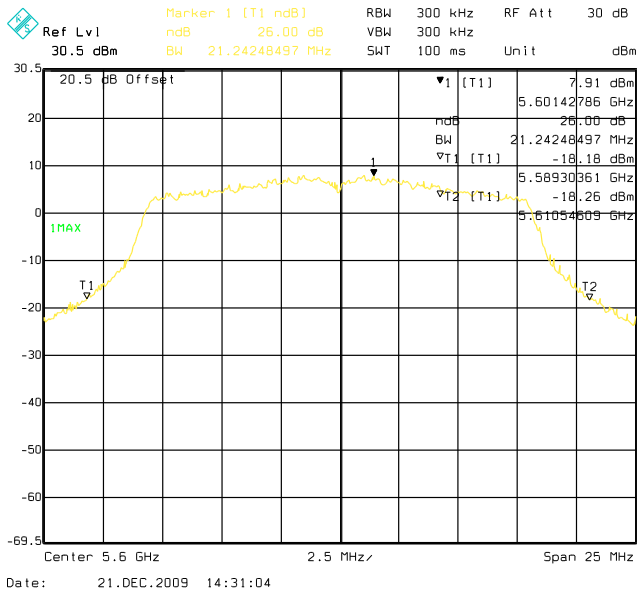




26bw tx0 ch100 a / n

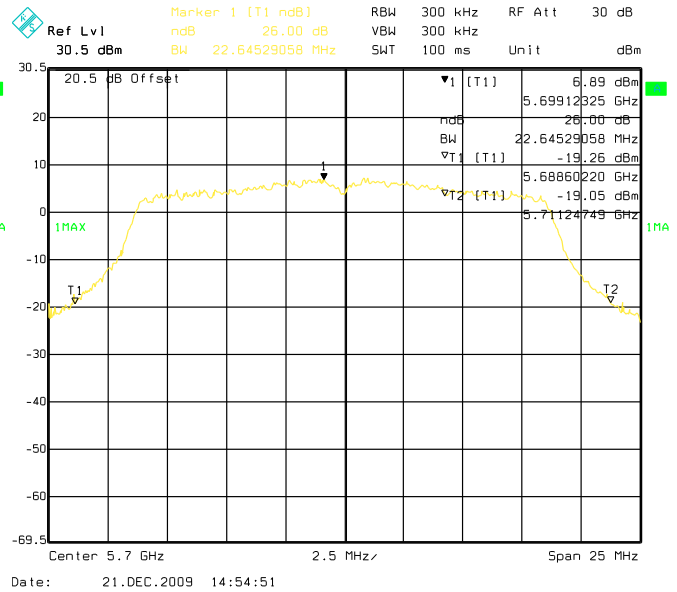
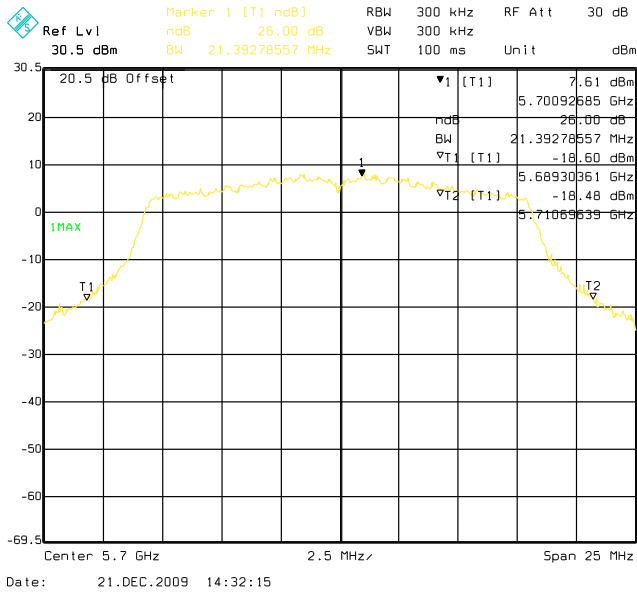


26bw tx0 ch120 a / n

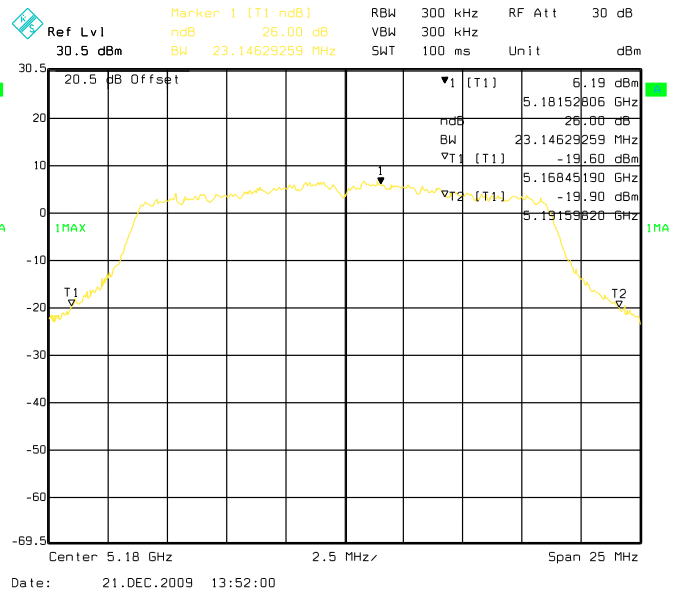
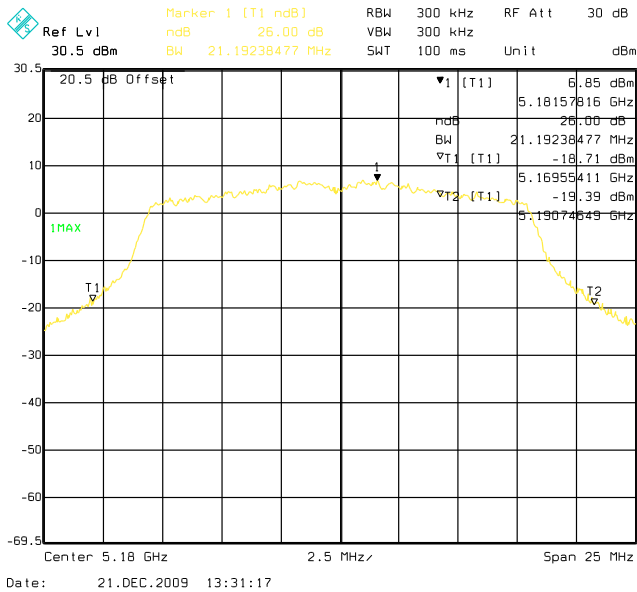




26bw tx0 ch140 a / n

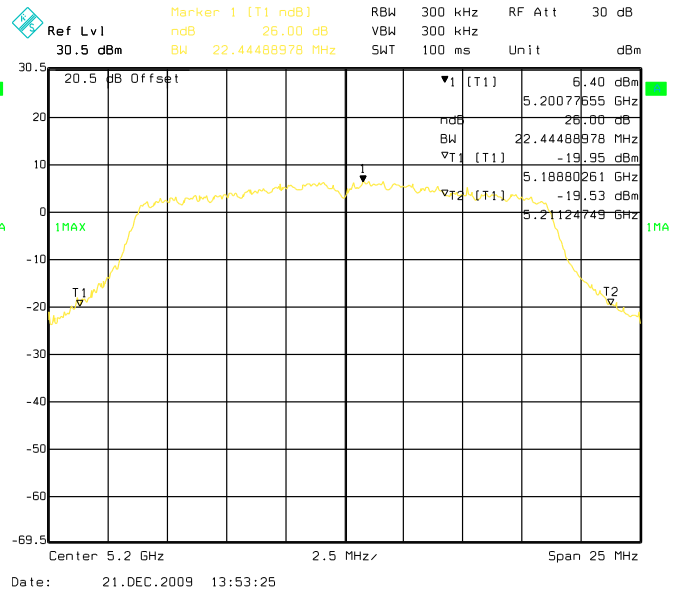
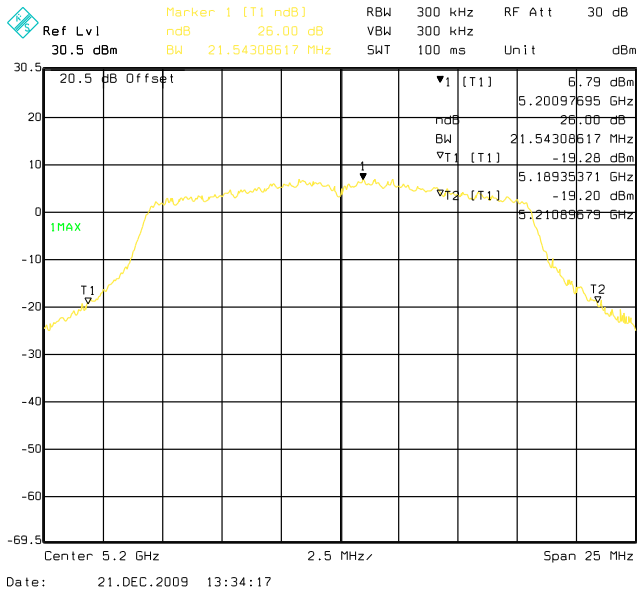


26bw tx1 ch36 a / n

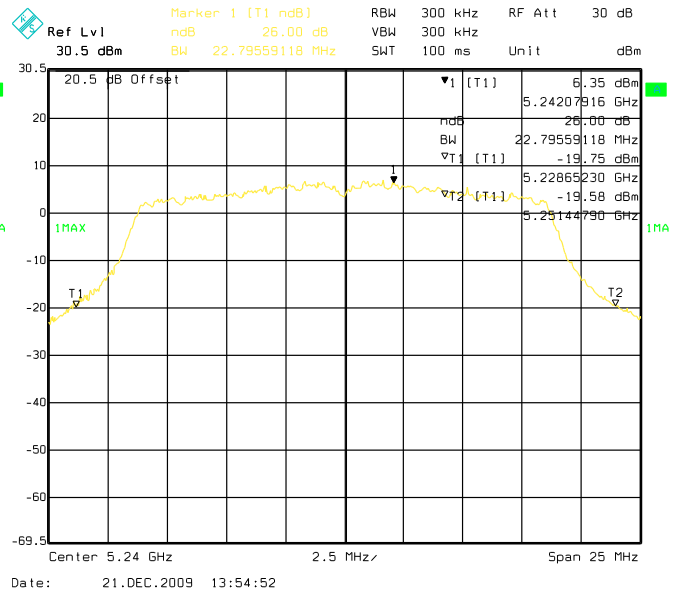
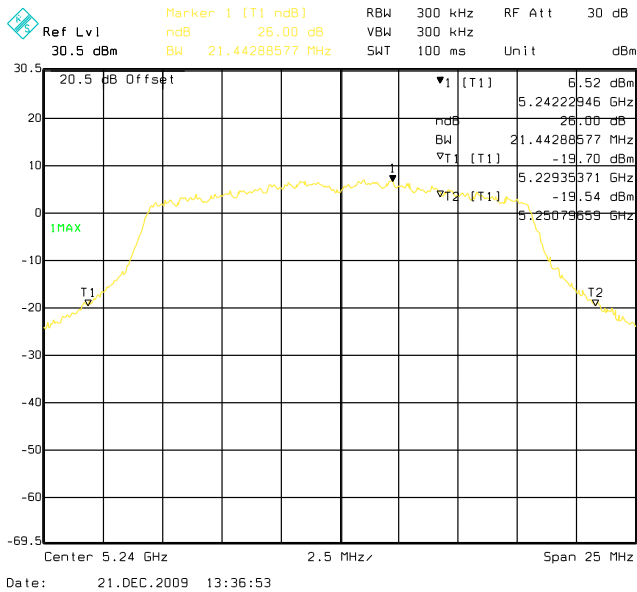




26bw tx1 ch40 a / n

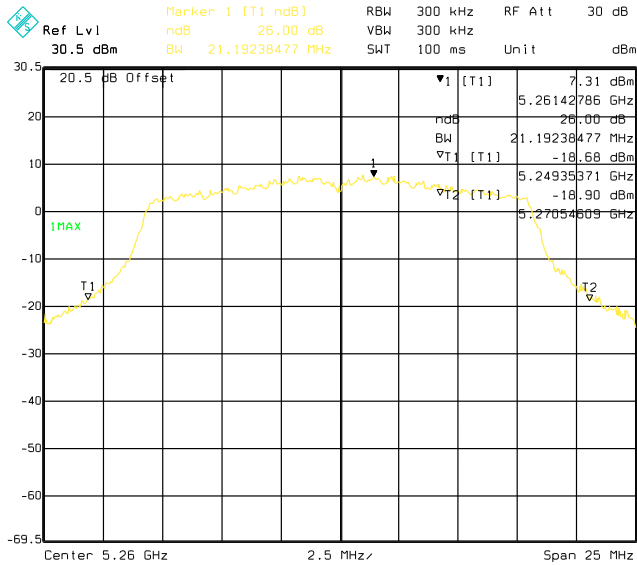


26bw tx1 ch48 a / n

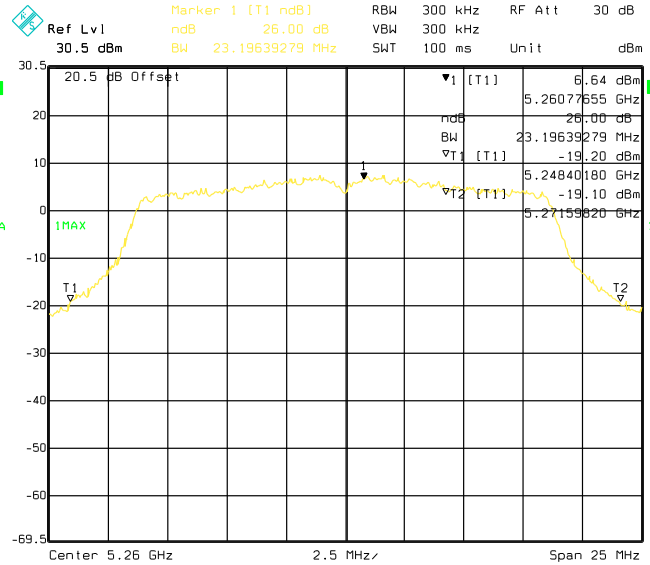




26bw tx1 ch52 a / n

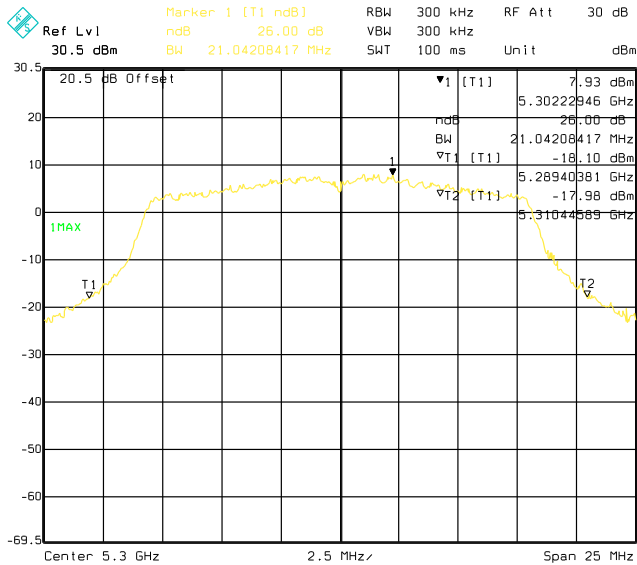


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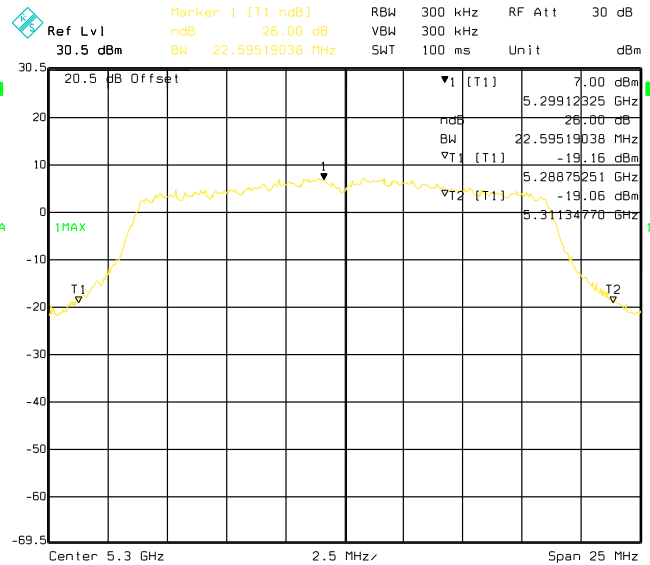


Date: 21.DEC.2009 13:56:19

26bw tx1 ch60 a / n



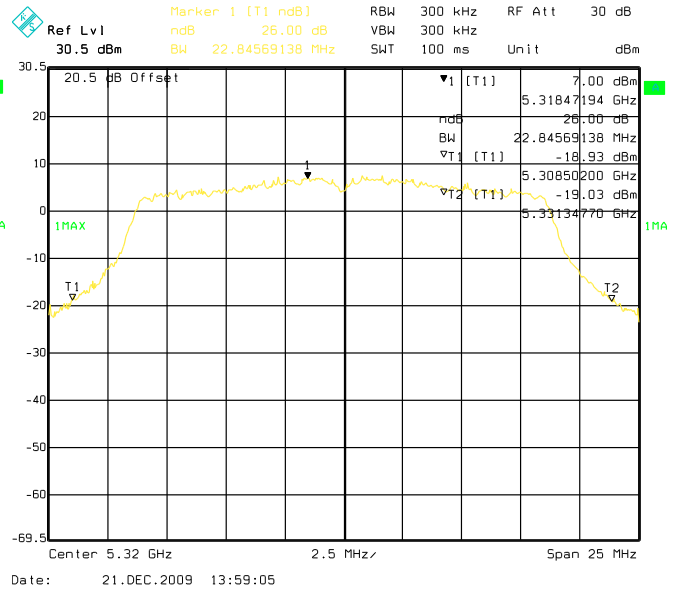
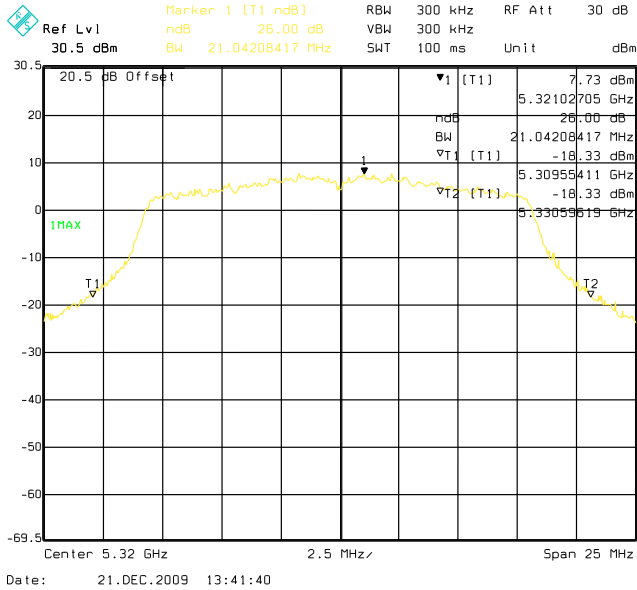
Date: 21.DEC.2009 13:40:05



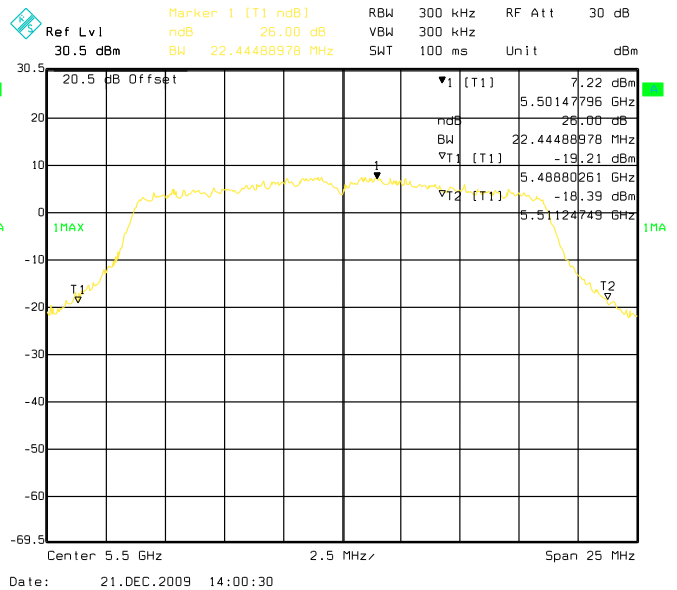
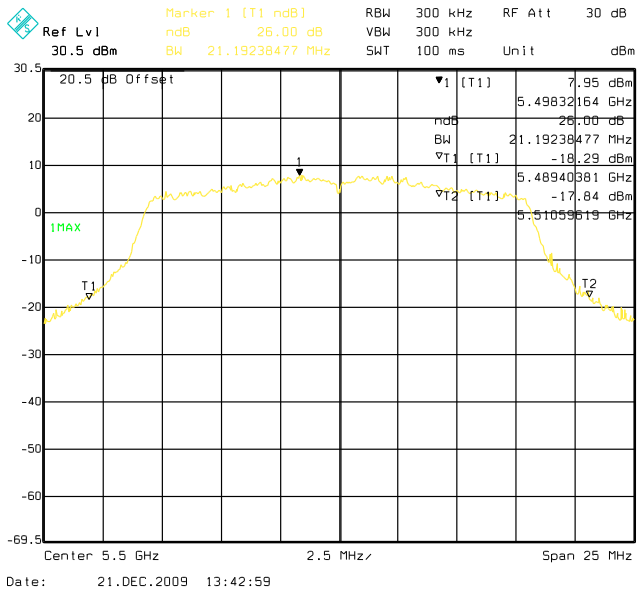
Date: 21.DEC.2009 13:57:49



26bw tx1 ch64 a / n



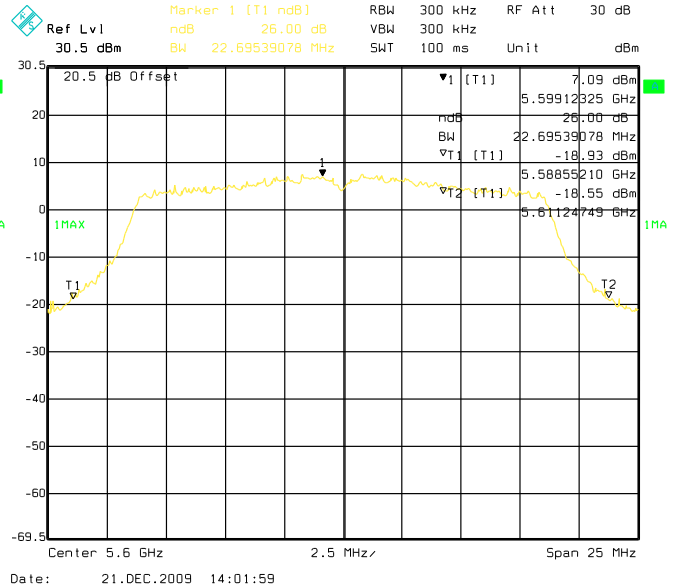
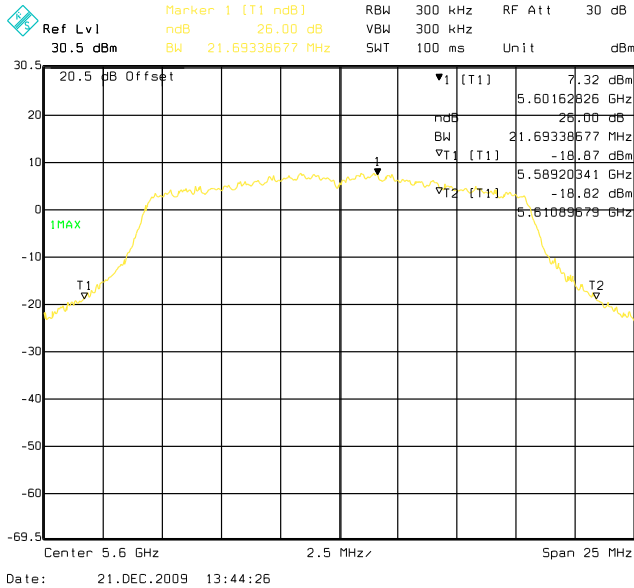
26bw tx1 ch100 a / n



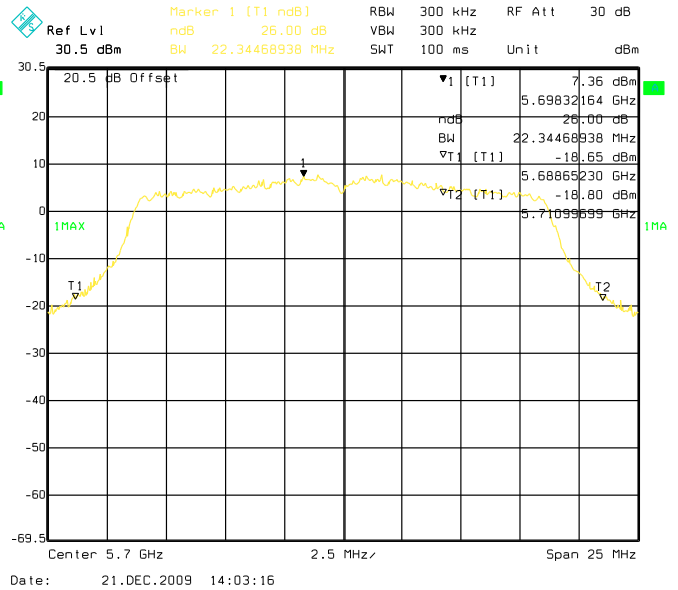
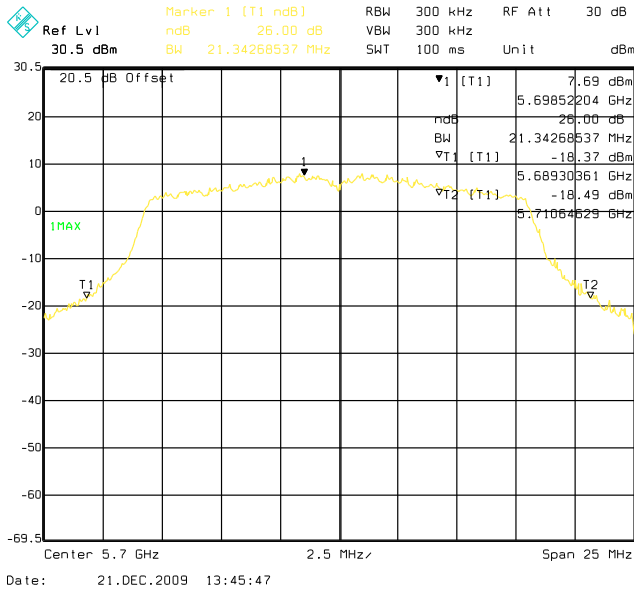




26bw tx1 ch120 a/ n

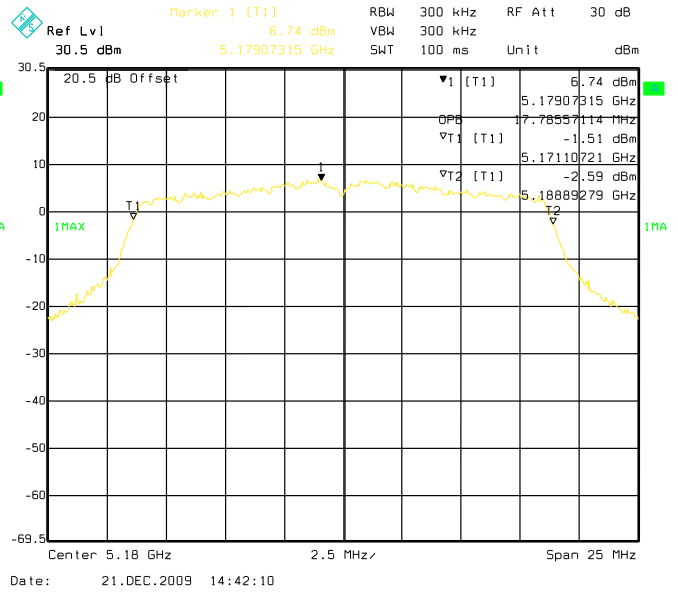
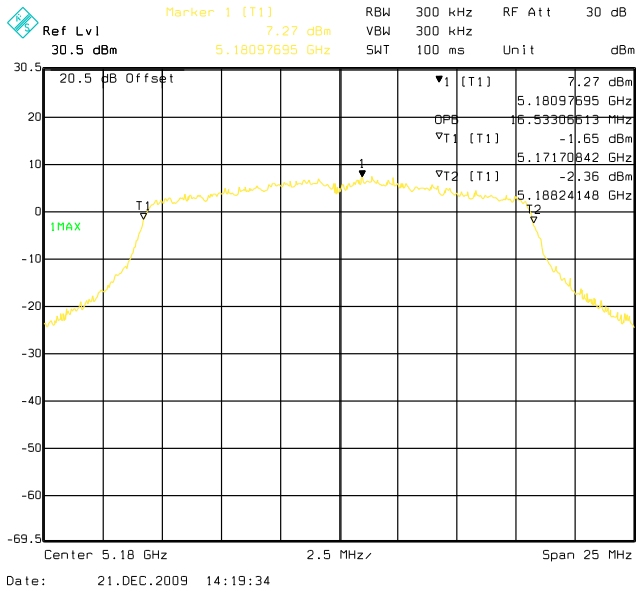


26bw tx1 ch140 a/ n

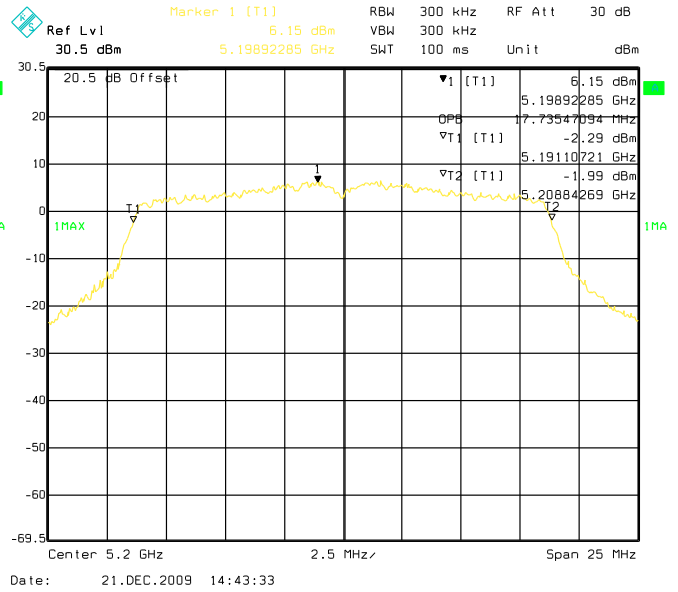
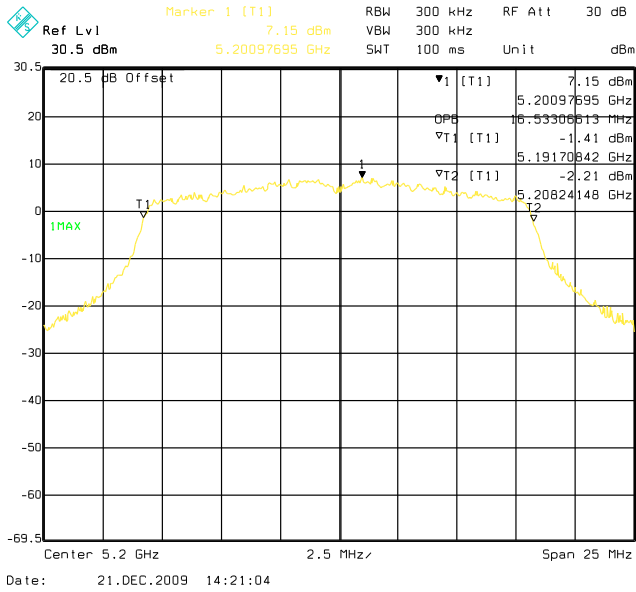




OBW tx0 ch36 a / n

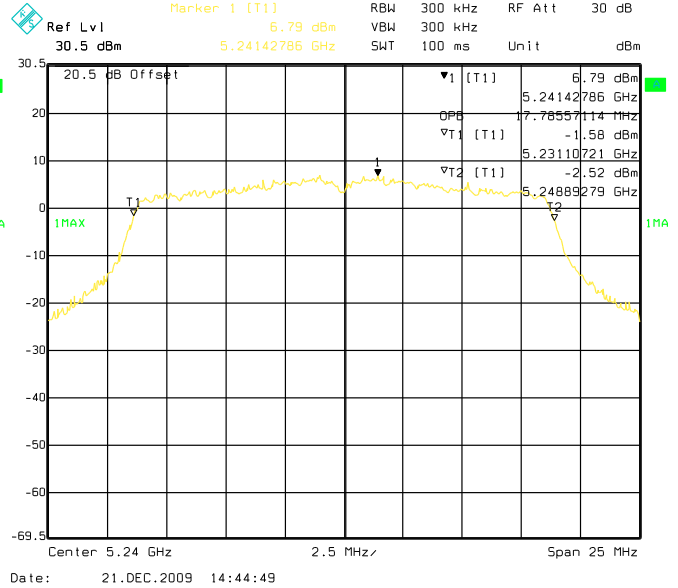
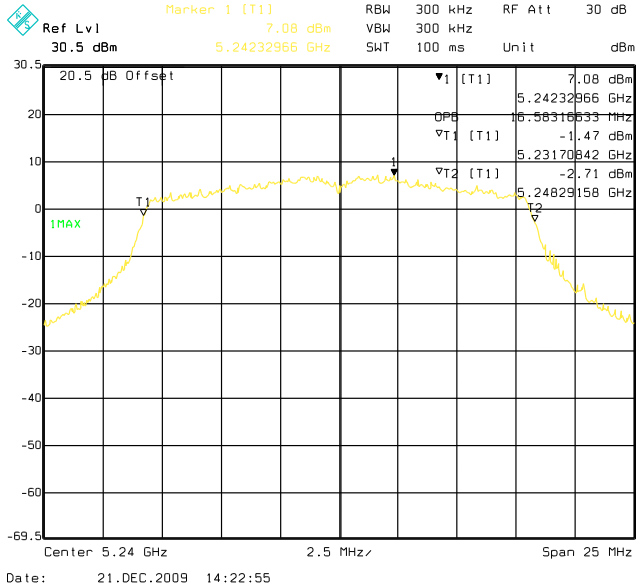


OBW tx0 ch40 a / n

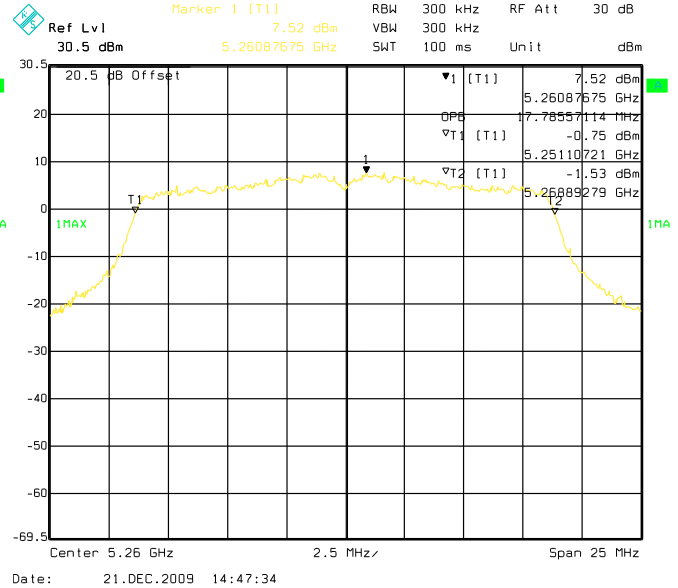
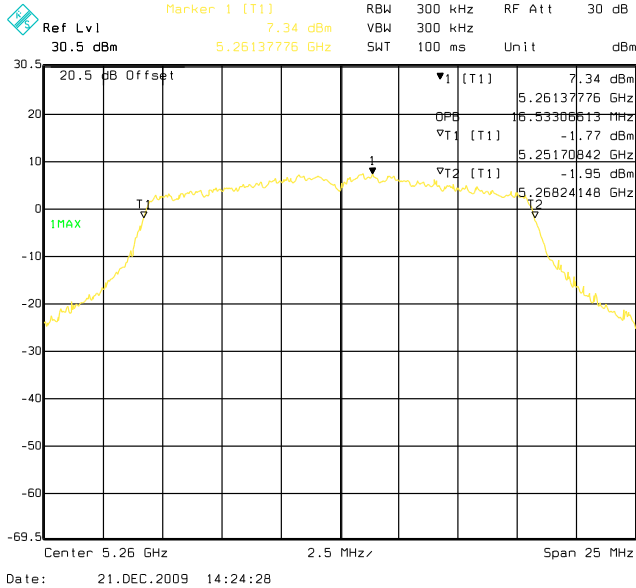




OBW tx0 ch48 a / n

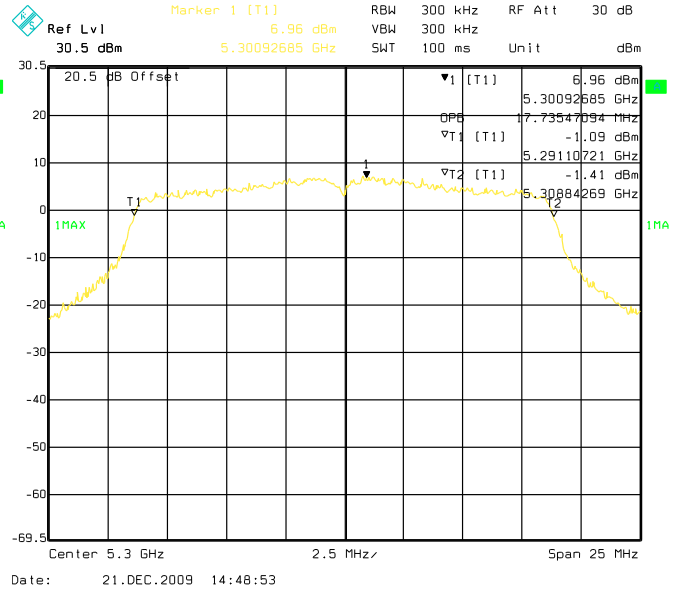
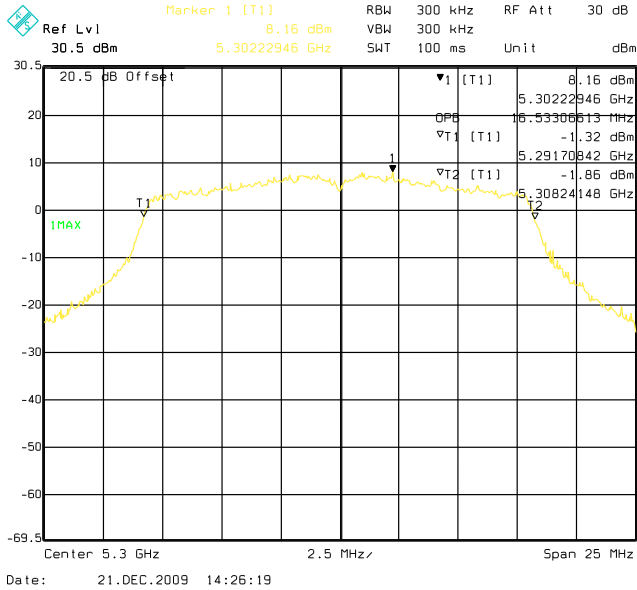


OBW tx0 ch52 a / n

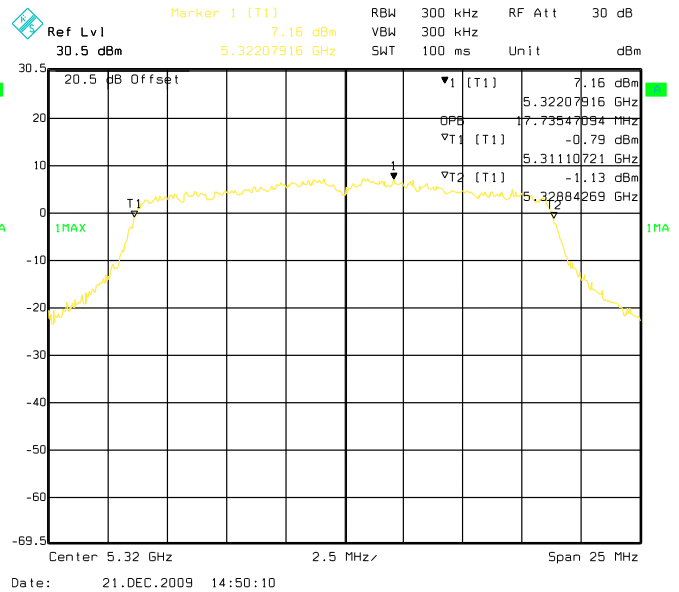
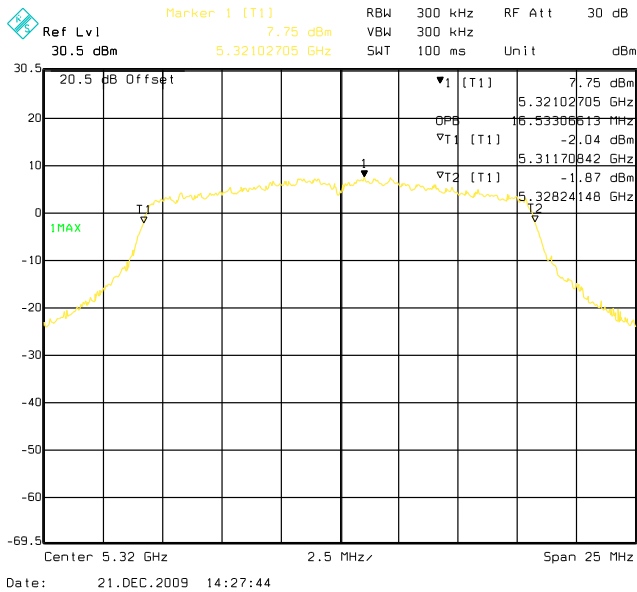




OBW tx0 ch60 a / n

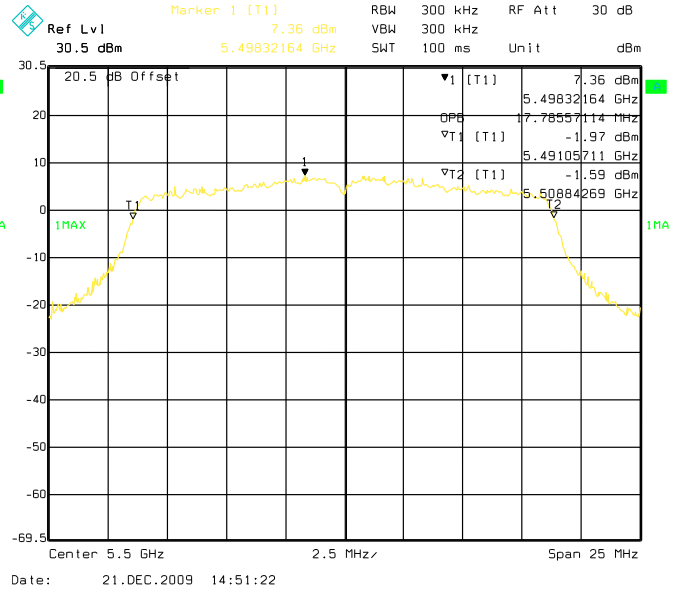
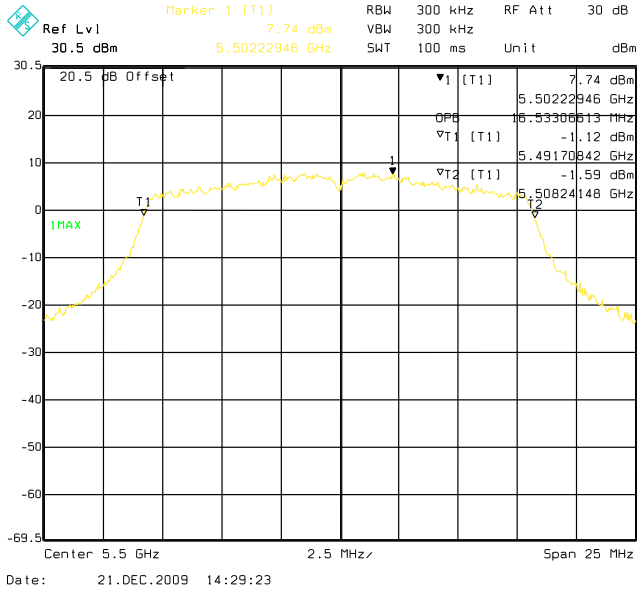


OBW tx0 ch64 a / n

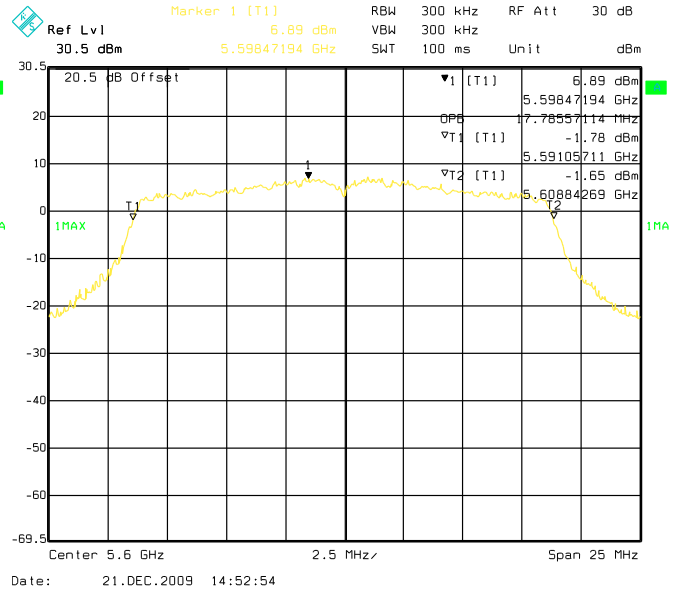
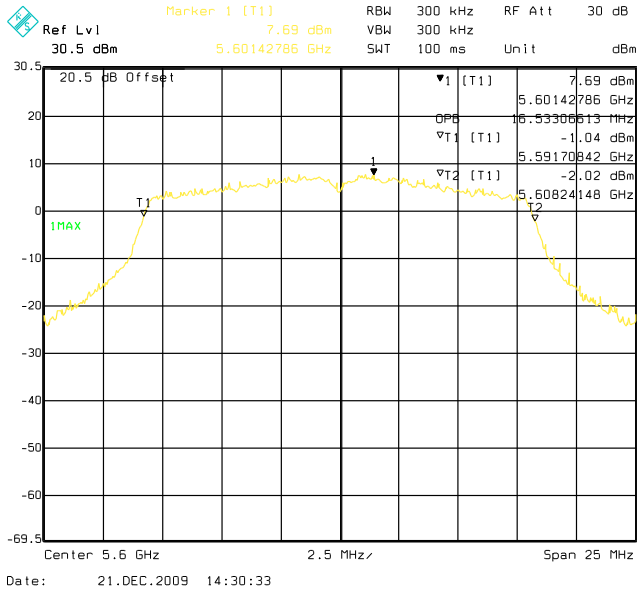




OBW tx0 ch100 a / n

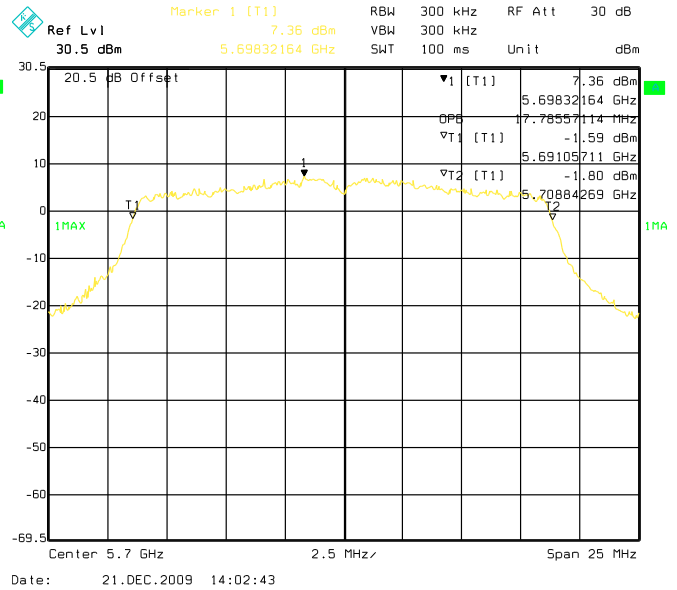
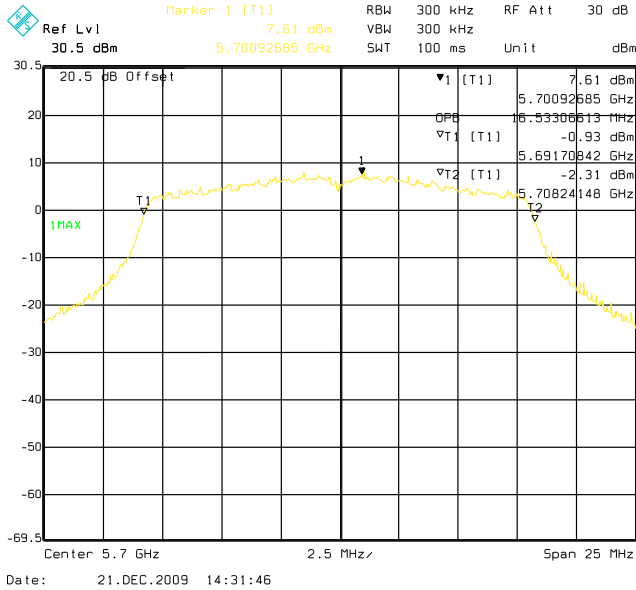


OBW tx0 ch120 a / n

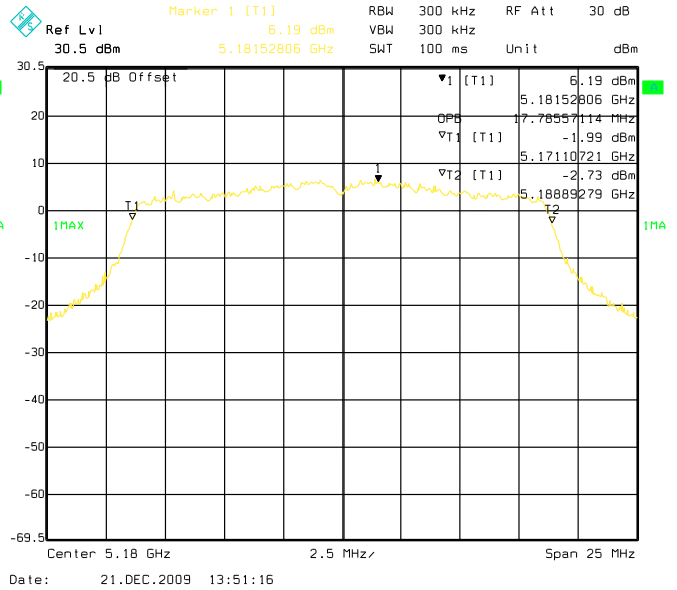
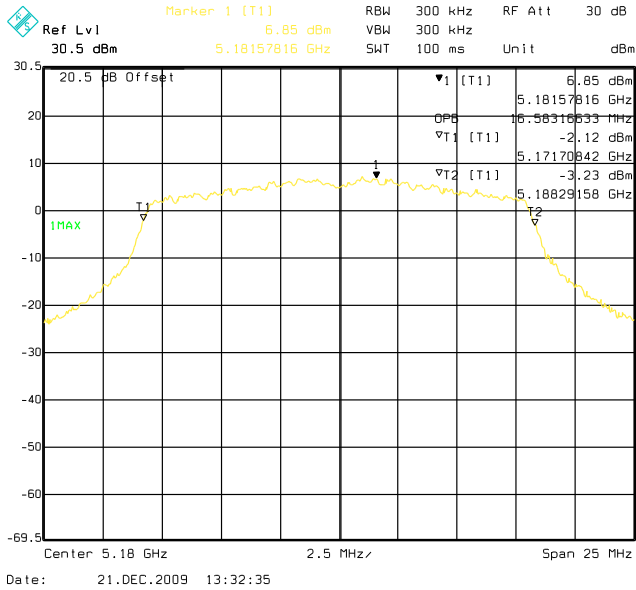




OBW tx0 ch140 a / n

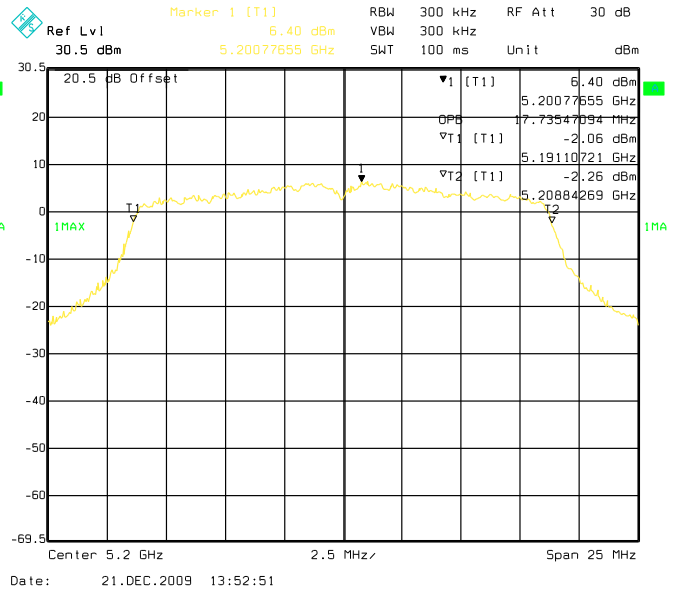
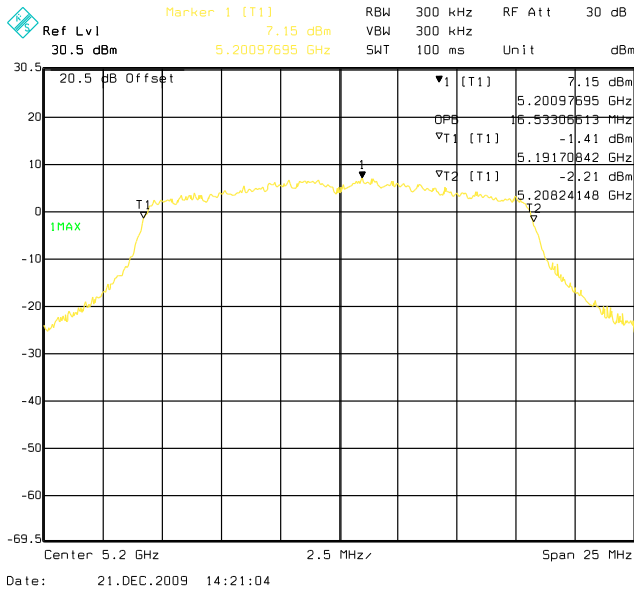


OBW tx1 ch36 a / n

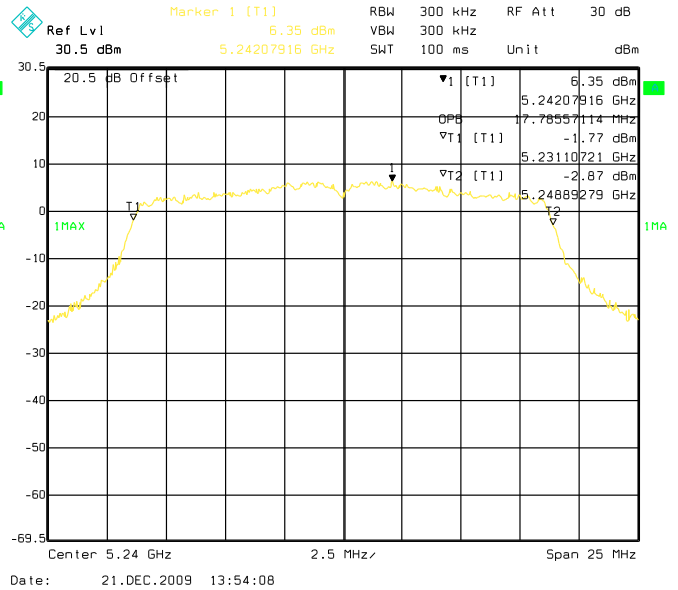
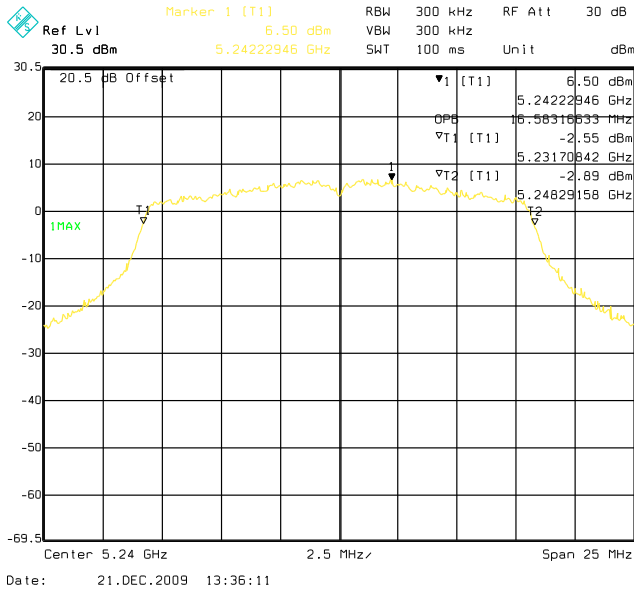




OBW tx1 ch40 a / n

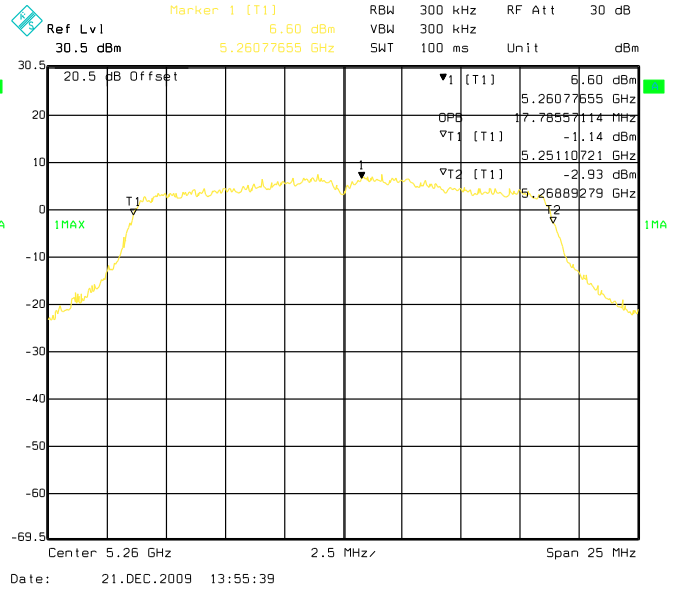
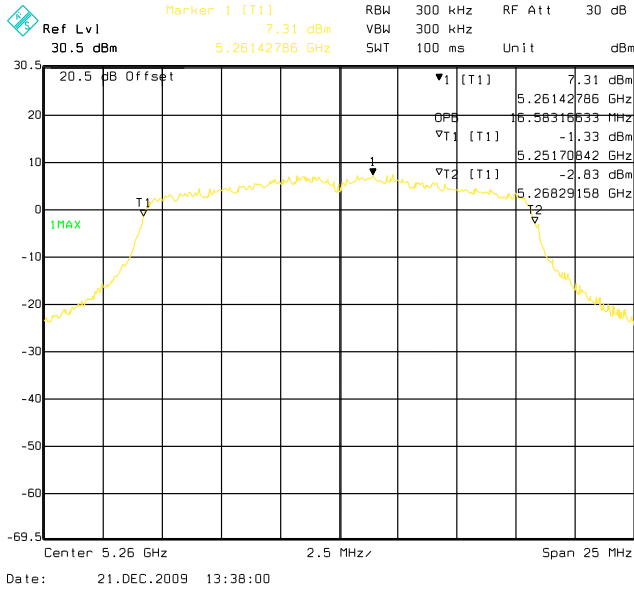


OBW tx1 ch48 a / n

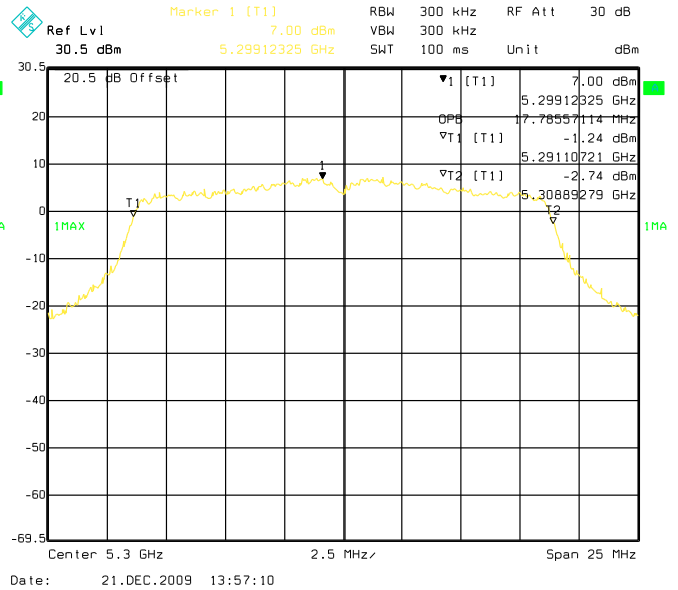
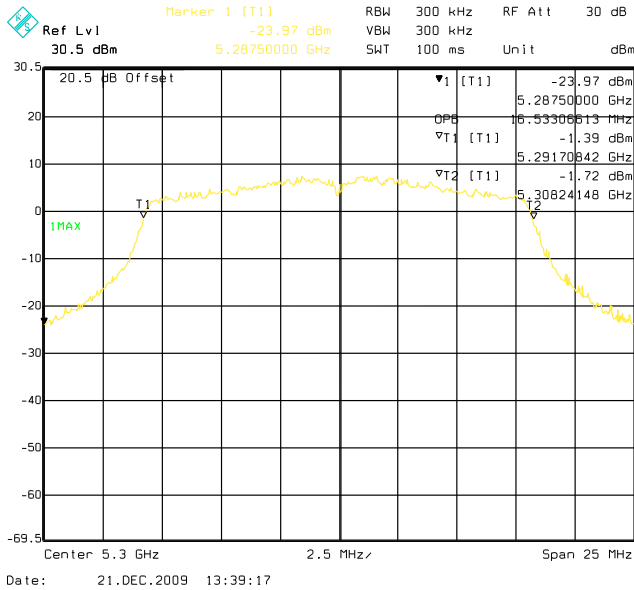




OBW tx1 ch52 a / n



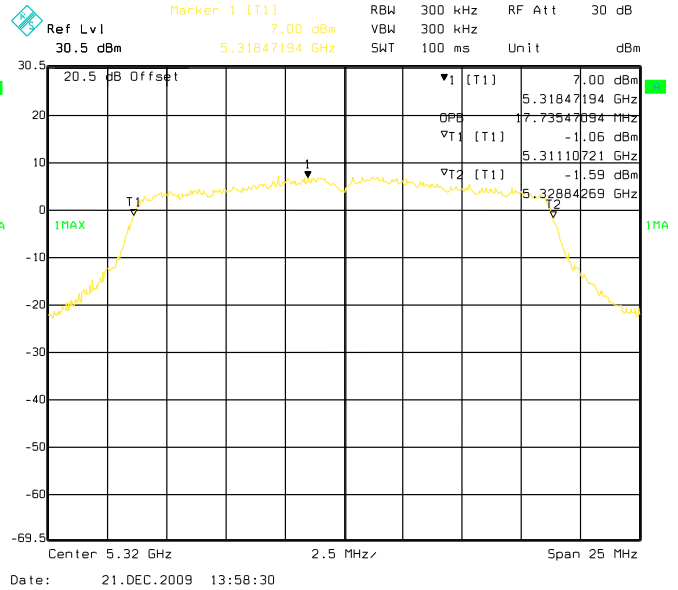
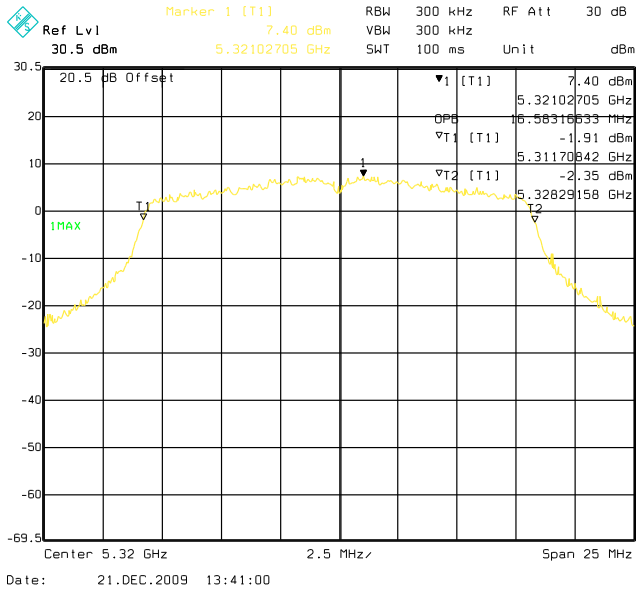
OBW tx1 ch60 a / n



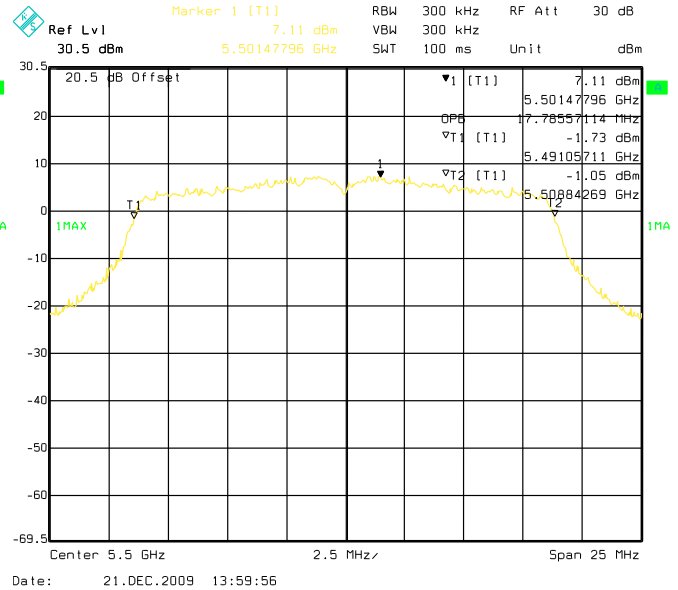
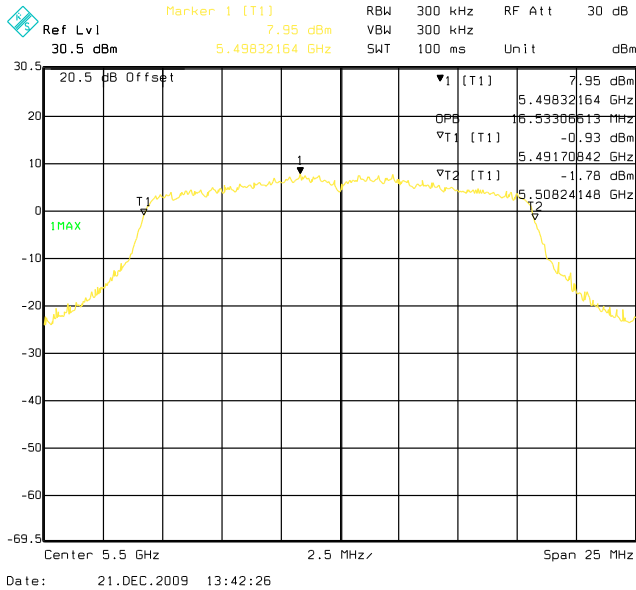




OBW tx1 ch64 a / n

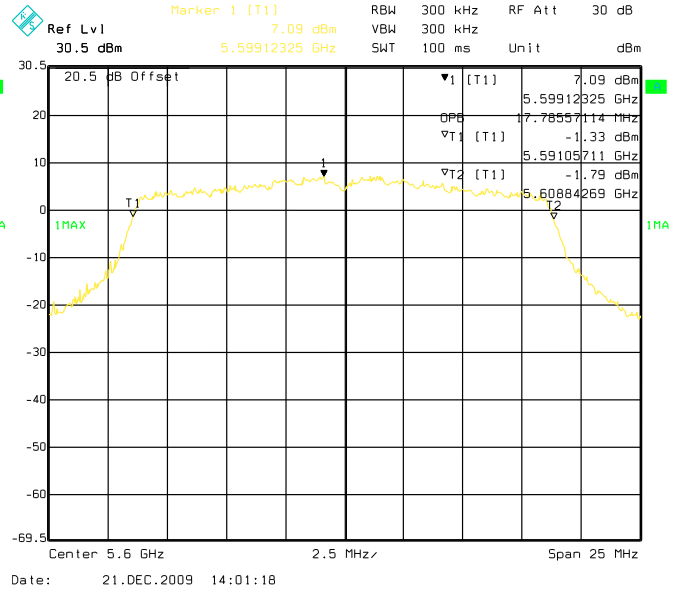
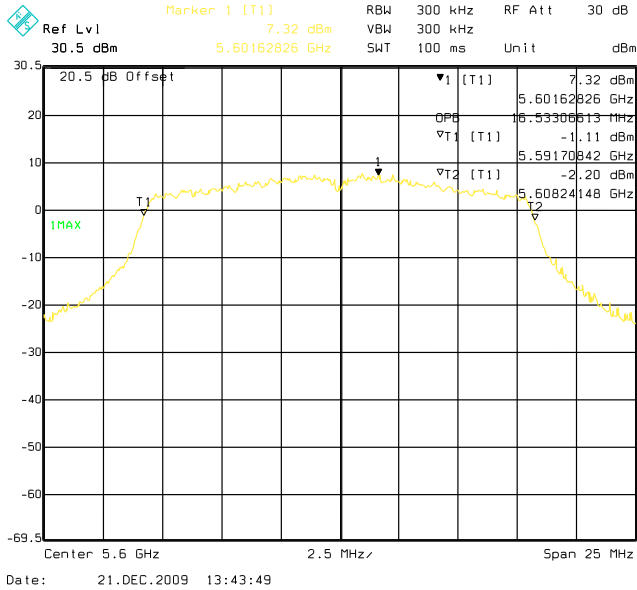


OBW tx1 ch100 a / n

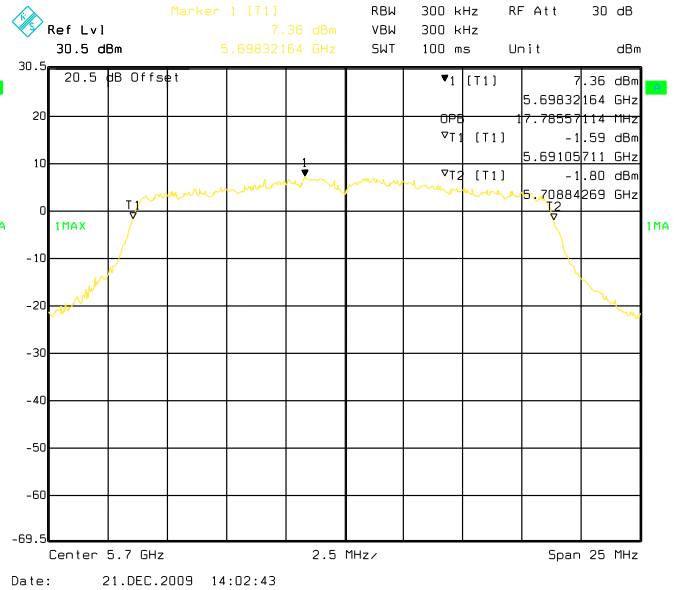
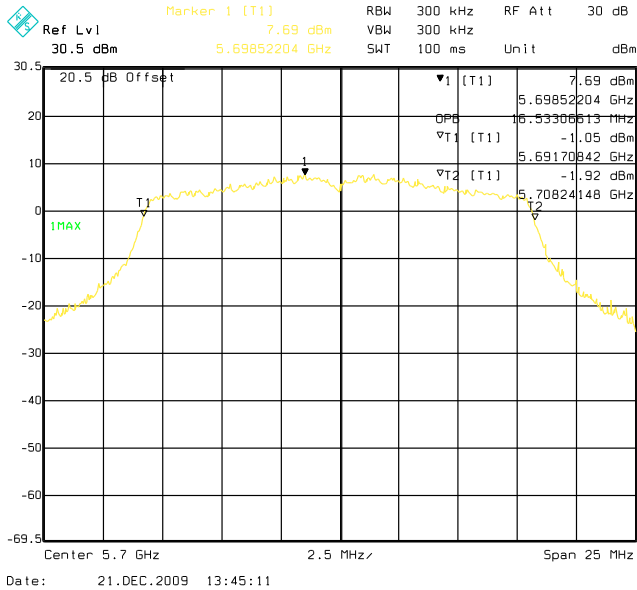




OBW tx1 ch120 a / n



OBW tx1 ch140 a / n





**5.6 Peak Power Spectral Density**

**5.6.1 Limits:**

Sub-band 1: 5150-5250MHz 15.407(a) (1): 4dBm in any 1-MHz band  
 Sub-band 2: 5250-5350MHz 15.407(a) (2): 11dBm in any 1-MHz band  
 Sub-band 3: 5470-5725MHz 15.407(a) (2): 11dBm in any 1-MHz band

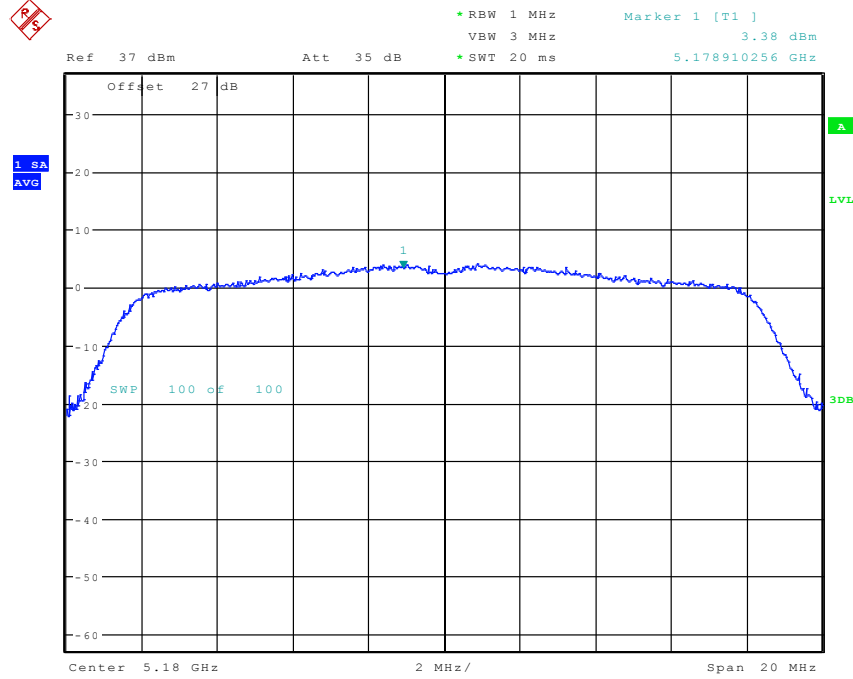
**5.6.2 Results**

Method 2 specified in FCC public knowledge DA-02-2138A1 was used.

| Peak Power Spectral Density (dBm) |         |      |      |      |       |
|-----------------------------------|---------|------|------|------|-------|
| Frequency (MHz)                   | Channel | Tx0  |      | Tx1  |       |
|                                   |         | a    | HT20 | a    | HT20  |
| 5180                              | 36      | 3.38 | 3.66 | 1.06 | 0.57  |
| 5200                              | 40      | 3.81 | 3.57 | 1.49 | 0.67  |
| 5240                              | 48      | 3.9  | 3.77 | 0.69 | 1.4   |
| 5260                              | 52      | 5.95 | 5.49 | 0.77 | -0.03 |
| 5300                              | 60      | 5.97 | 4.73 | 0.99 | 0.54  |
| 5320                              | 64      | 5.05 | 4.85 | 1.69 | 0.63  |
| 5500                              | 100     | 6.08 | 4.68 | 3.26 | 3.43  |
| 5600                              | 120     | 7.19 | 5.68 | 4.74 | 3.6   |
| 5700                              | 140     | 7.62 | 6.34 | 4.03 | 3.32  |

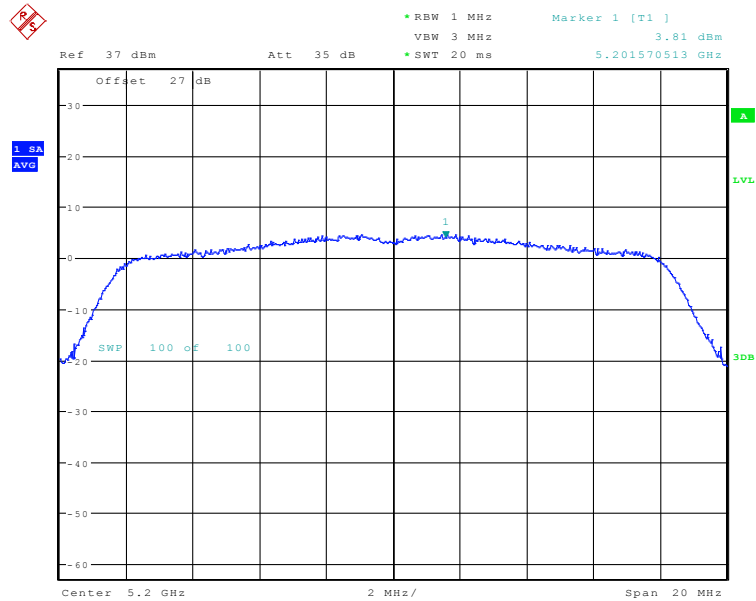


Tx0 802.11a Ch36



Date: 6.JAN.2010 11:48:12

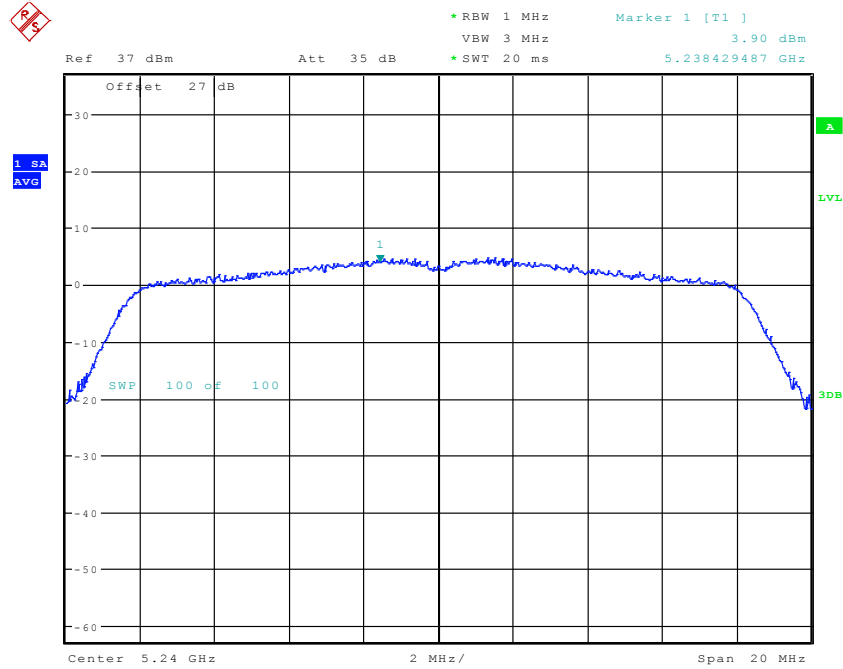
Tx0 802.11a Ch40



Date: 6.JAN.2010 11:50:01

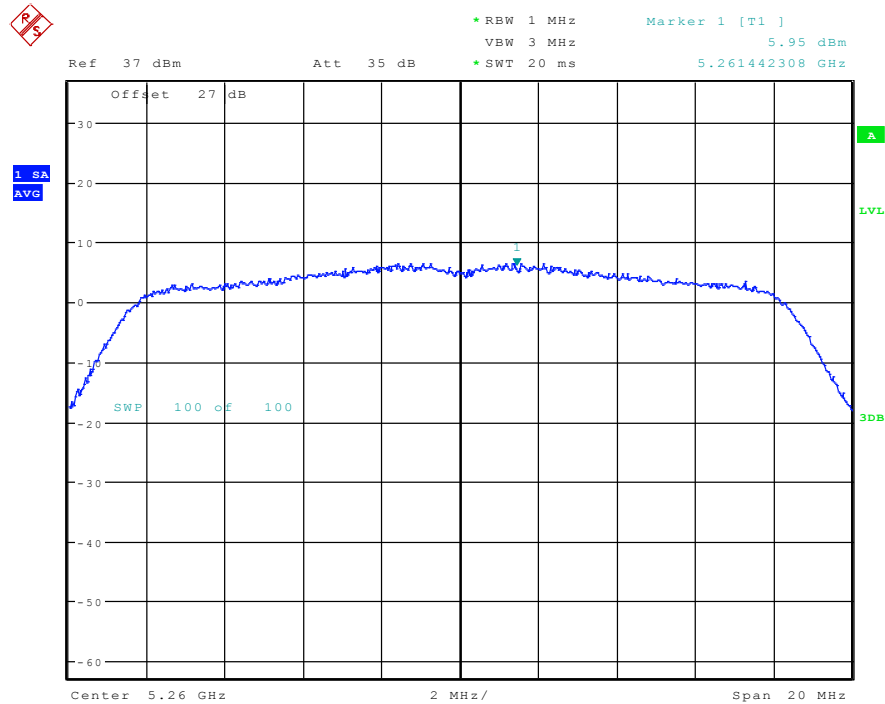


Tx0 802.11a Ch48



Date: 6.JAN.2010 11:53:41

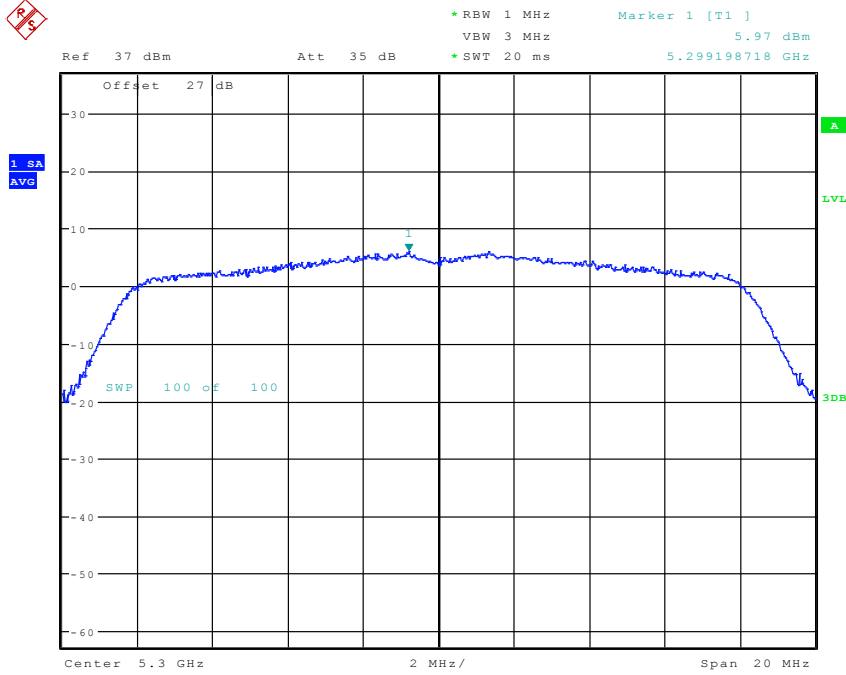
Tx0 802.11a Ch52



Date: 6.JAN.2010 12:34:49

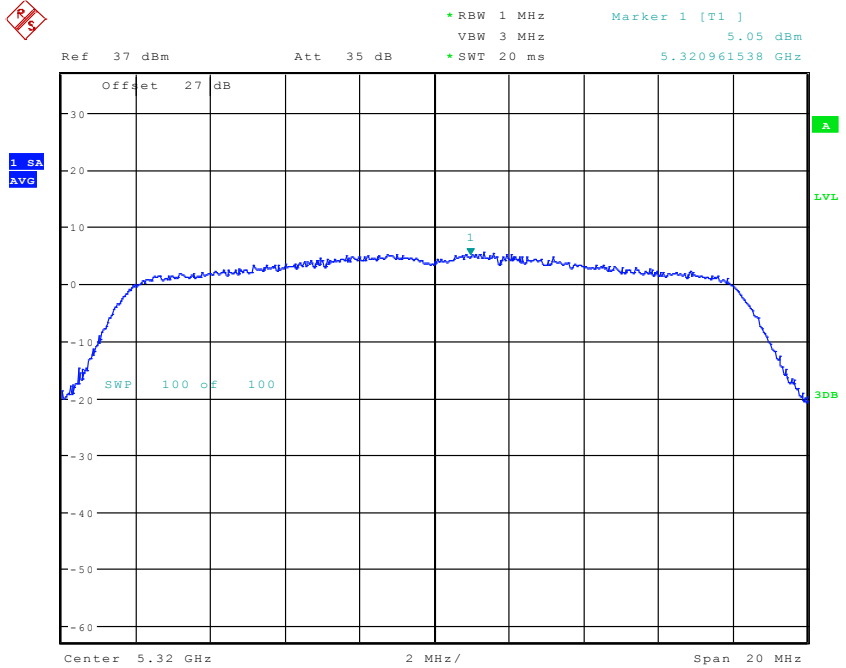


Tx0 802.11a Ch60



Date: 6.JAN.2010 12:38:57

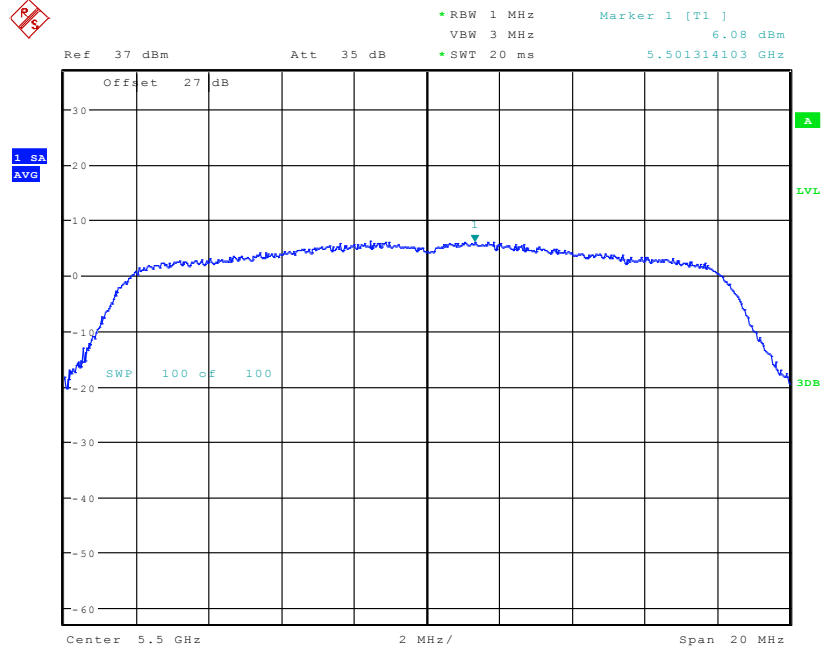
Tx0 802.11a Ch64



Date: 6.JAN.2010 12:39:58

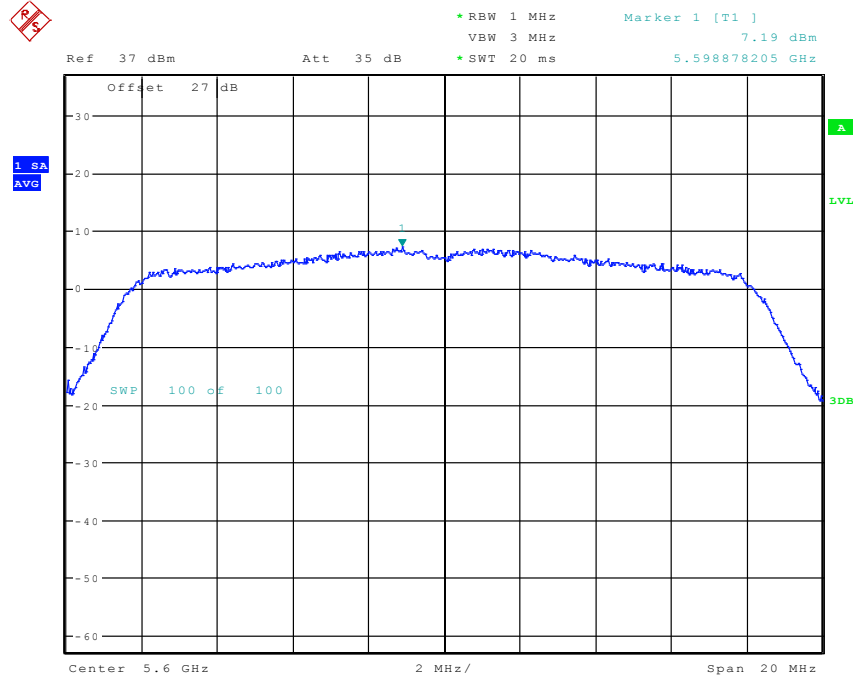


Tx0 802.11a Ch100



Date: 6.JAN.2010 12:41:44

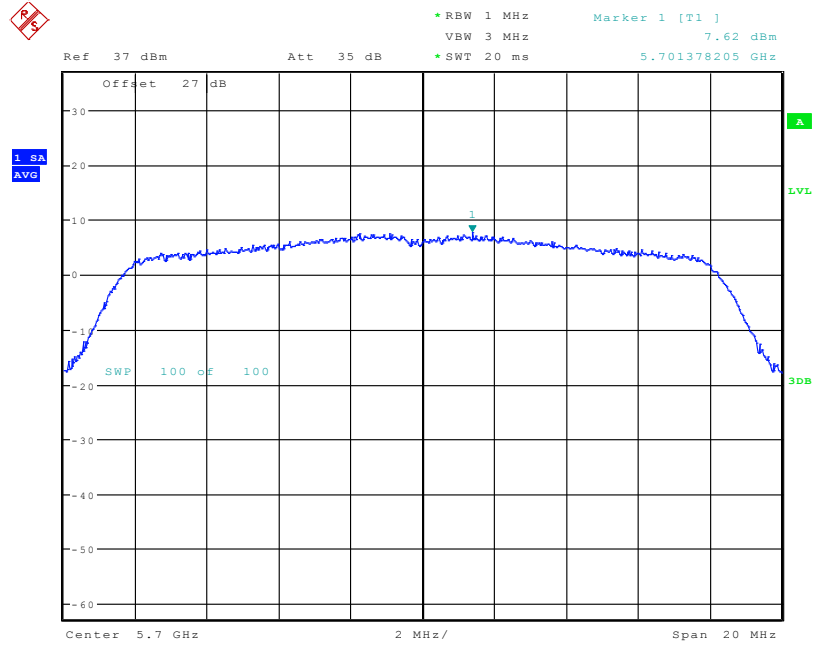
Tx0 802.11a Ch120



Date: 6.JAN.2010 12:42:55

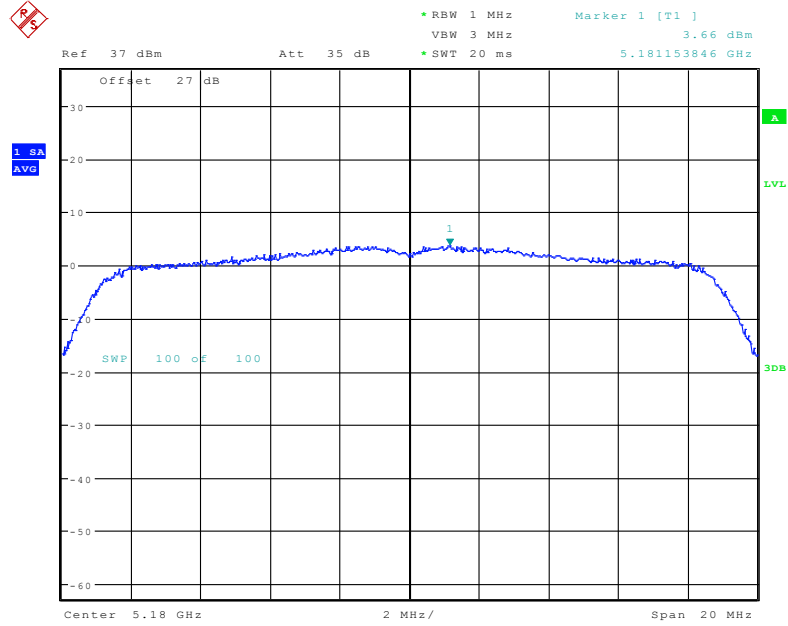


Tx0 802.11a Ch140



Date: 6.JAN.2010 12:44:38

Tx0 802.11n Ch36

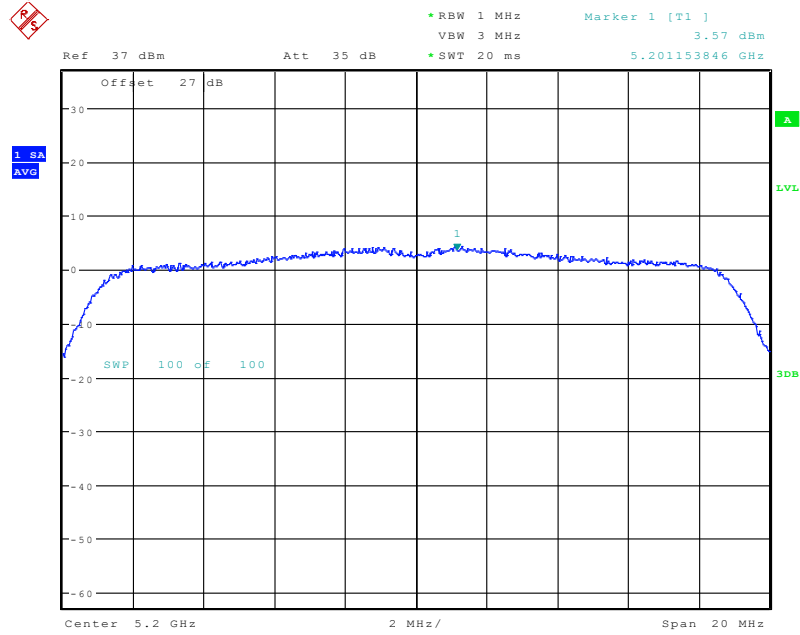


Date: 6.JAN.2010 11:48:58



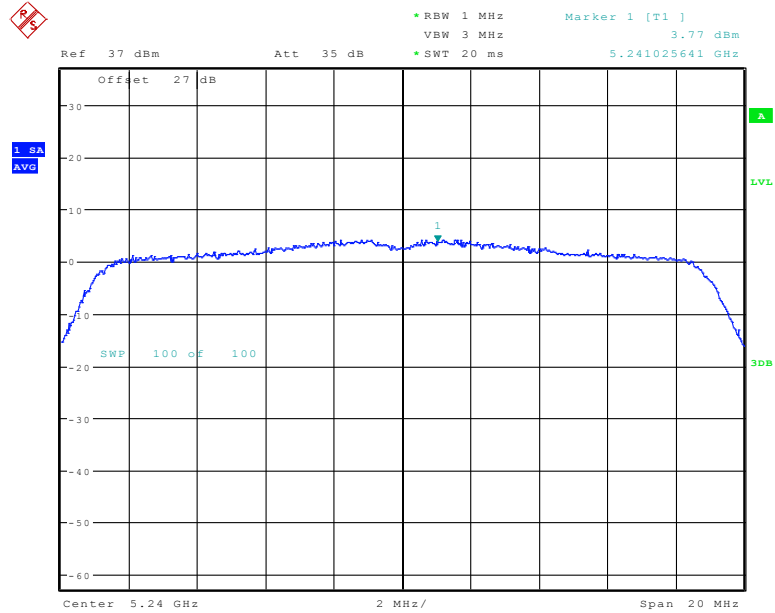


Tx0 802.11n Ch40



Date: 6.JAN.2010 11:50:40

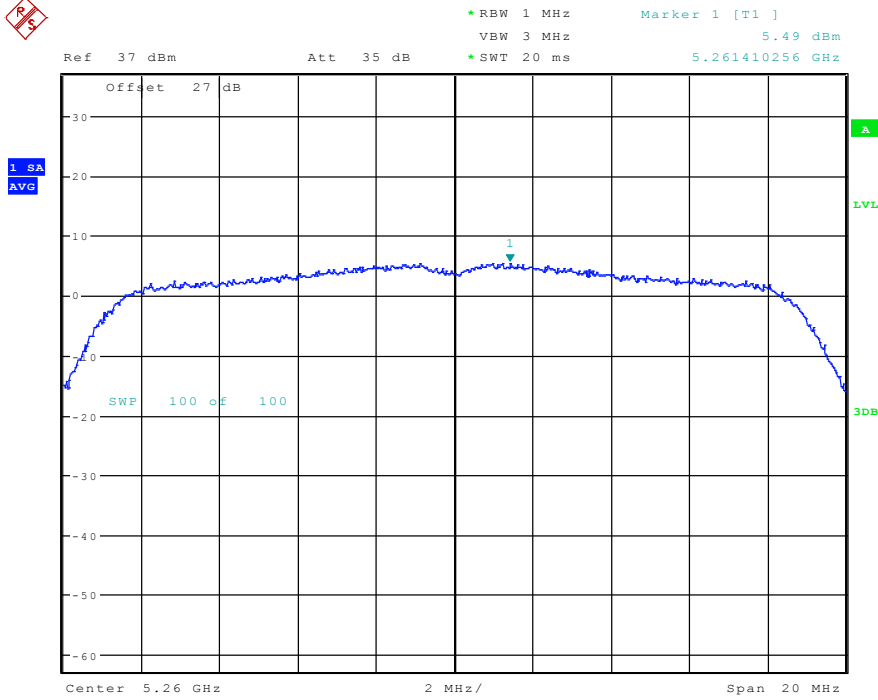
Tx0 802.11n Ch48



Date: 6.JAN.2010 11:56:43

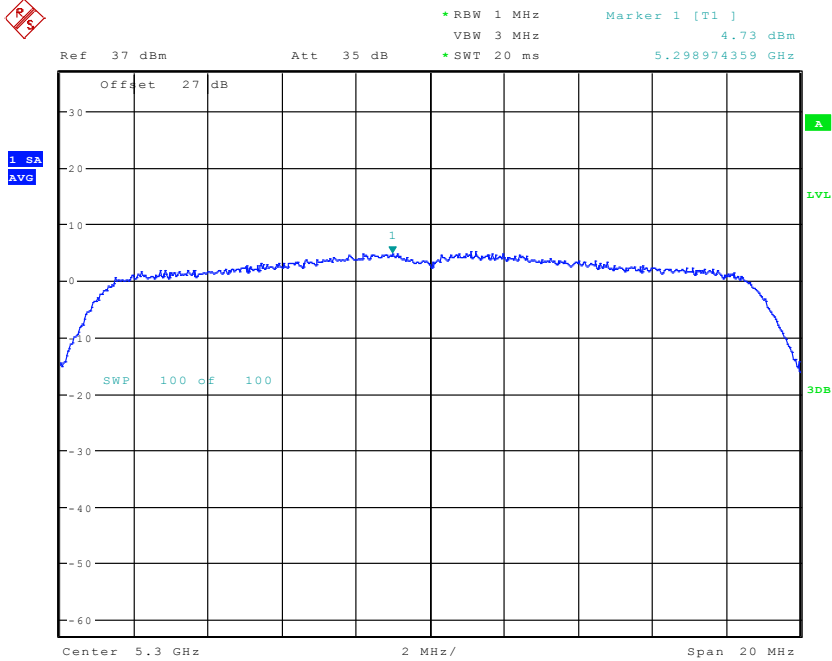


Tx0 802.11n Ch52



Date: 6.JAN.2010 12:38:09

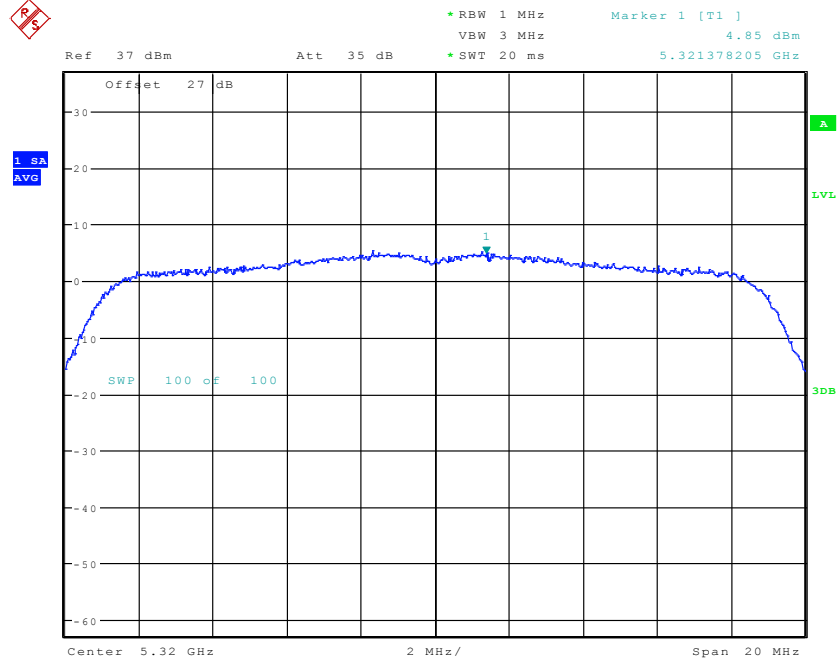
Tx0 802.11n Ch60



Date: 6.JAN.2010 12:39:24

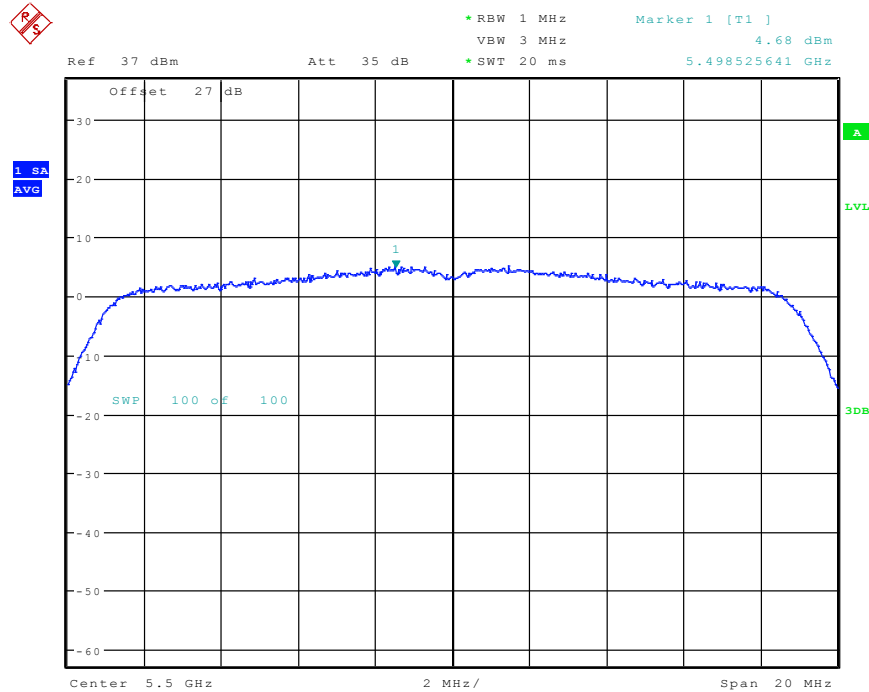


Tx0 802.11n Ch64



Date: 6.JAN.2010 12:40:47

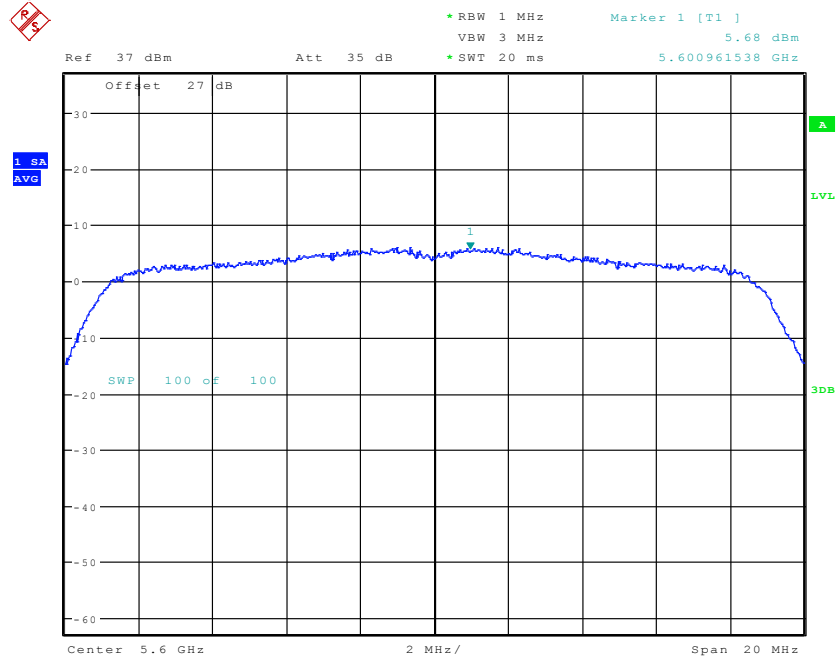
Tx0 802.11n Ch100



Date: 6.JAN.2010 12:42:18

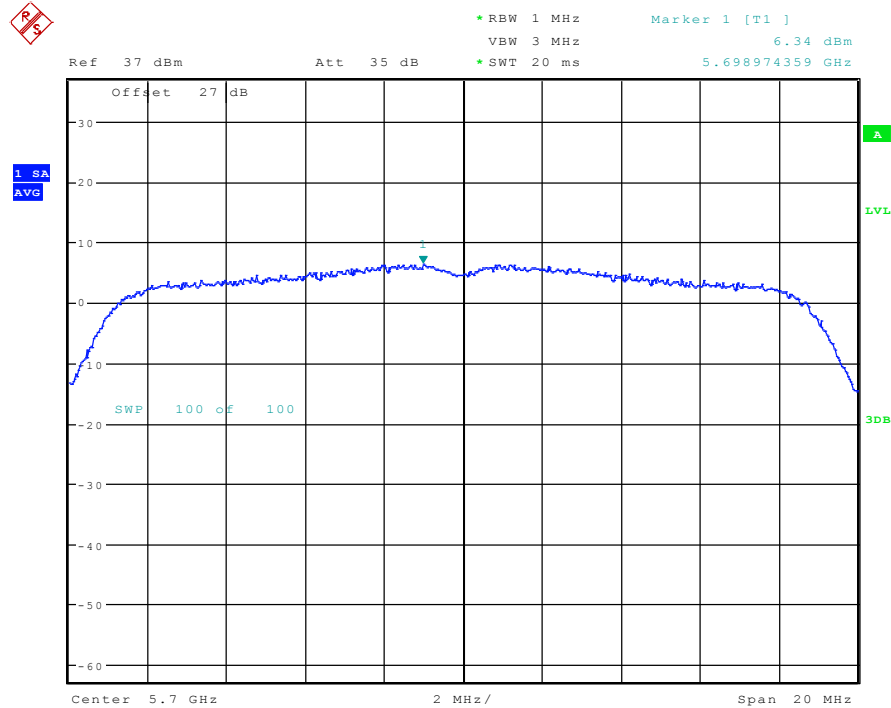


Tx0 802.11n Ch120



Date: 6.JAN.2010 12:43:40

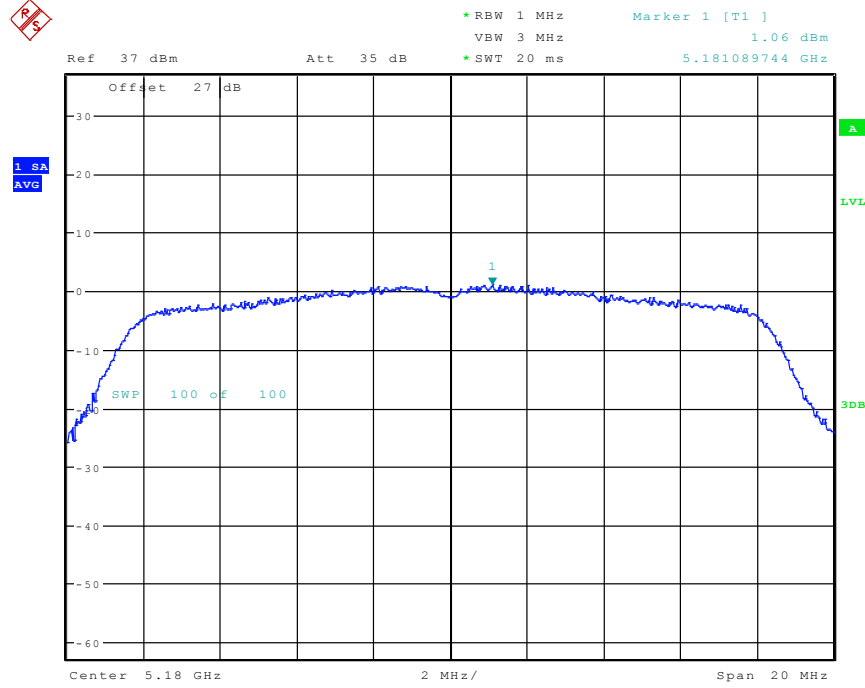
Tx0 802.11n Ch140



Date: 6.JAN.2010 12:45:06

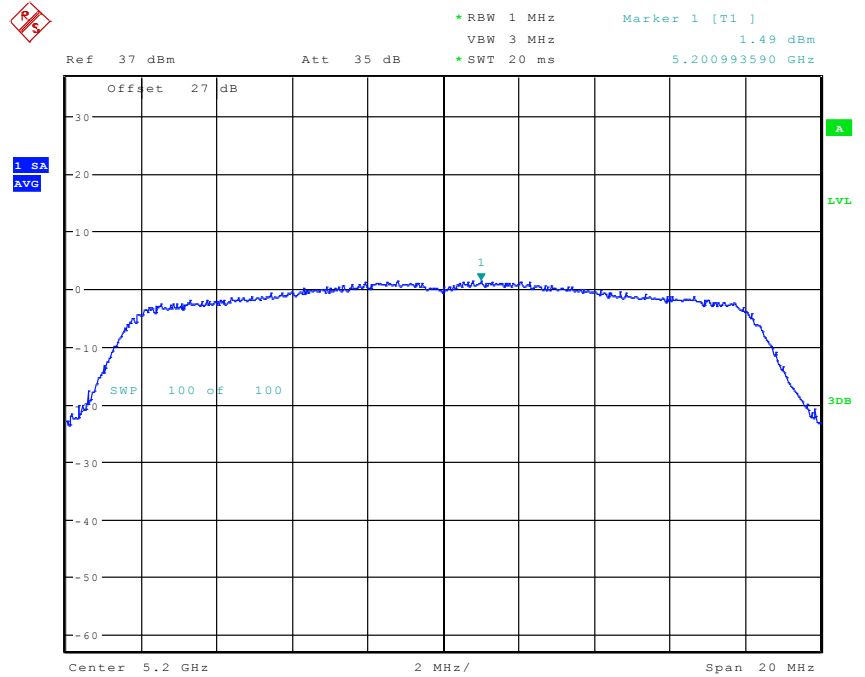


Tx1 802.11a Ch36



Date: 6.JAN.2010 11:25:31

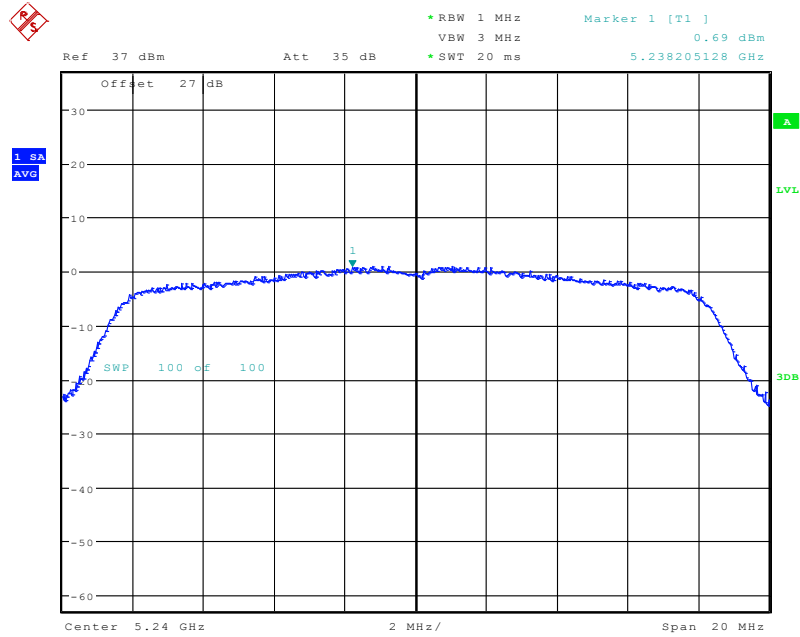
Tx1 802.11a Ch40



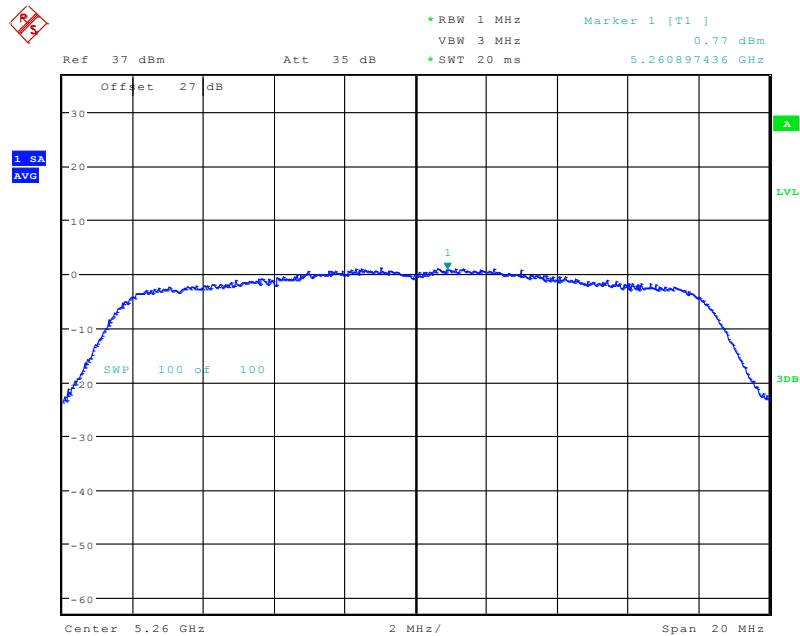
Date: 6.JAN.2010 11:26:53



Tx1 802.11a Ch48



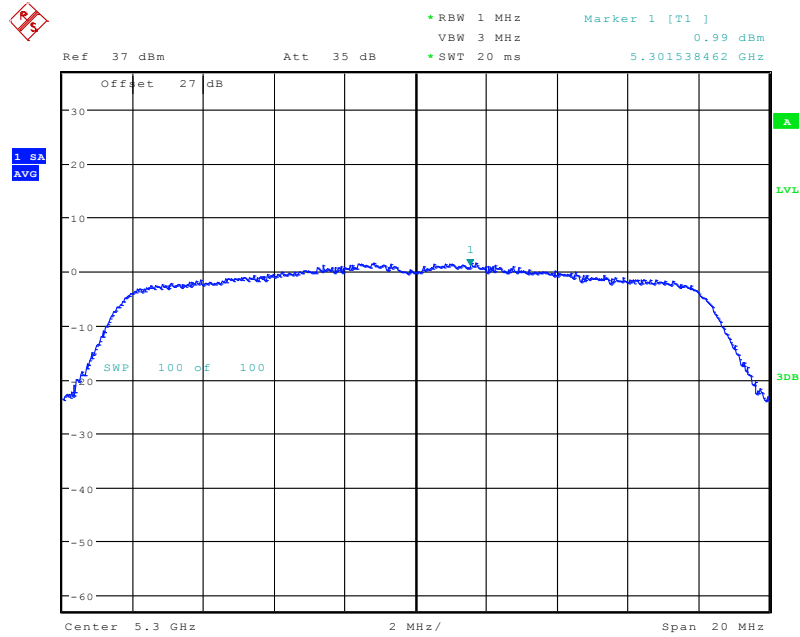
Date: 6.JAN.2010 11:28:23  
Tx1 802.11a Ch52



Date: 6.JAN.2010 11:20:41

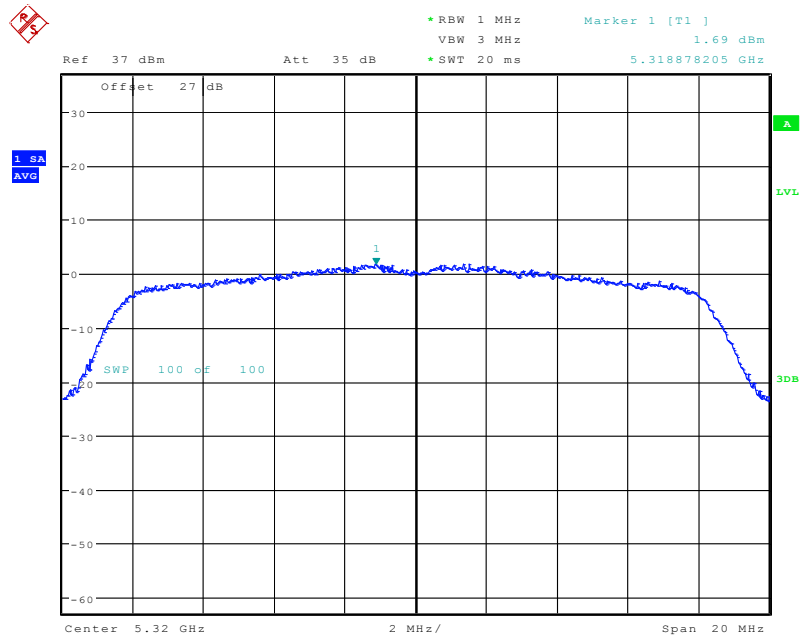


Tx1 802.11a Ch60



Date: 6..JAN.2010 11:21:45

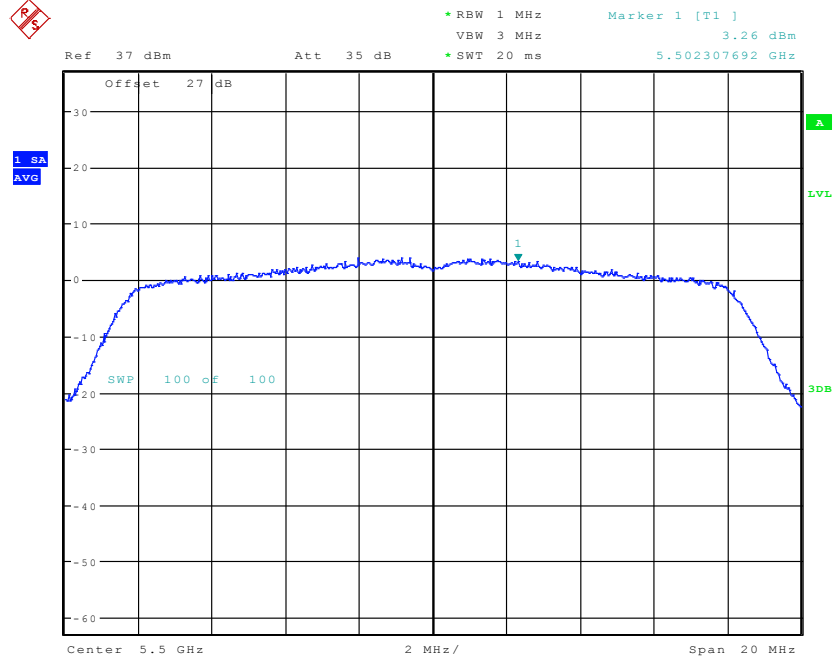
Tx1 802.11a Ch64



Date: 6..JAN.2010 11:24:37

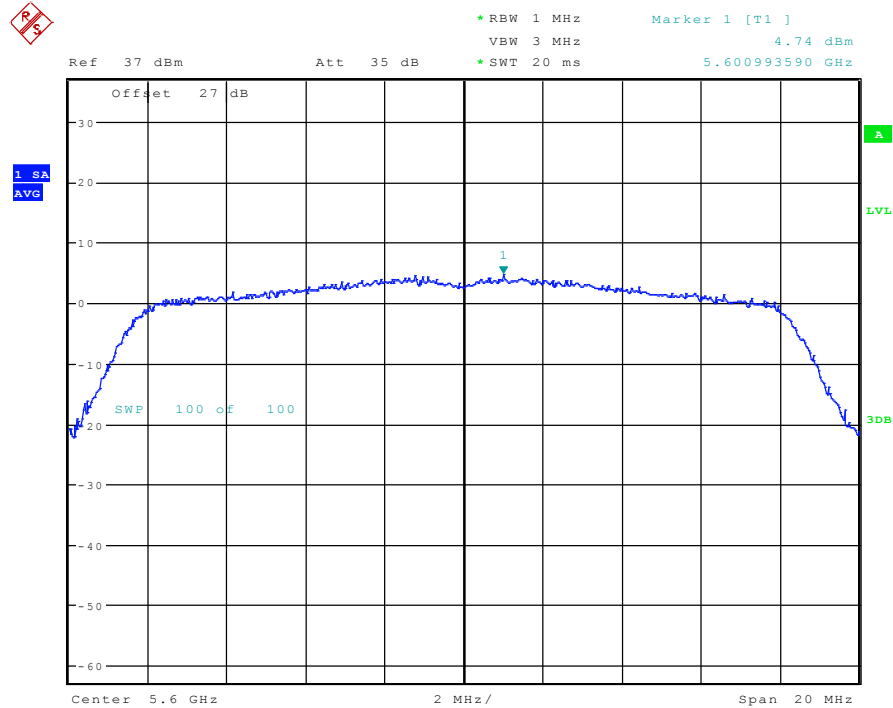


Tx1 802.11a Ch100



Date: 6.JAN.2010 11:30:18

Tx1 802.11a Ch120

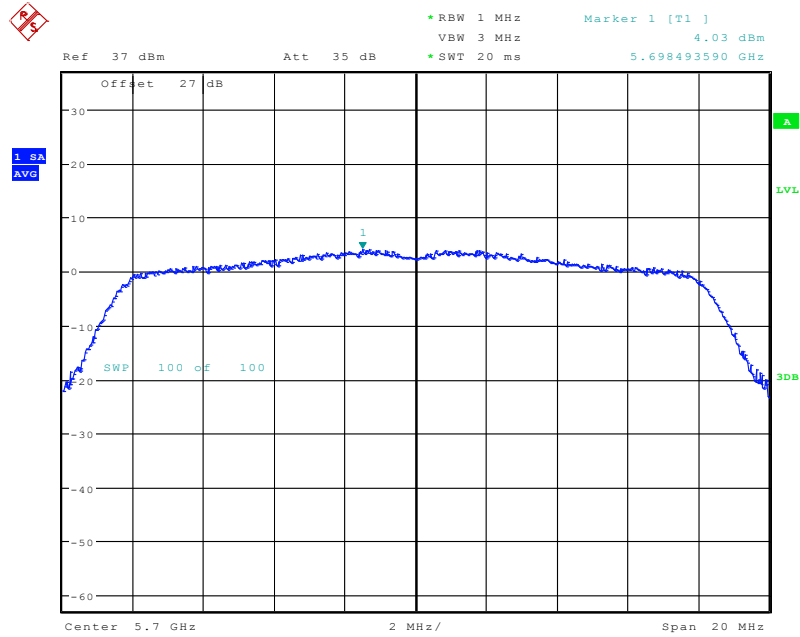


Date: 6.JAN.2010 11:31:41



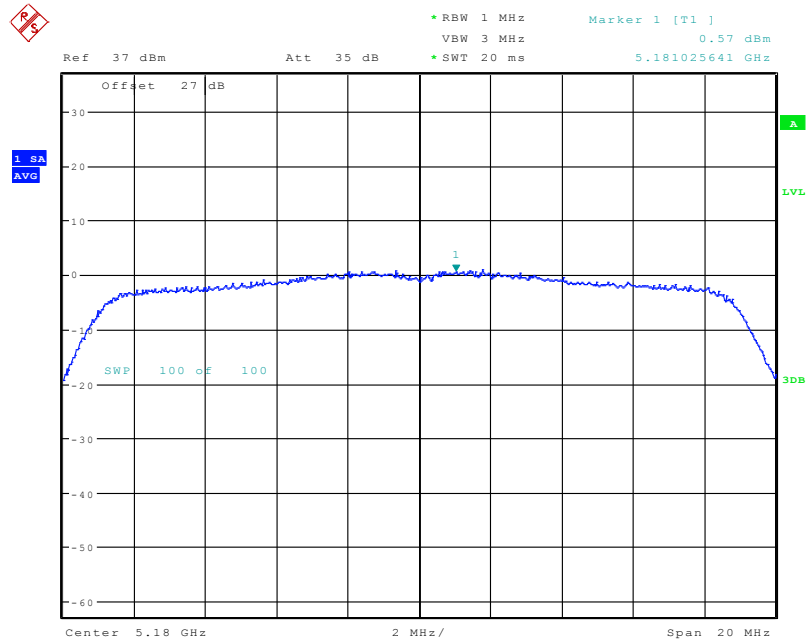


Tx1 802.11a Ch140



Date: 6.JAN.2010 11:33:18

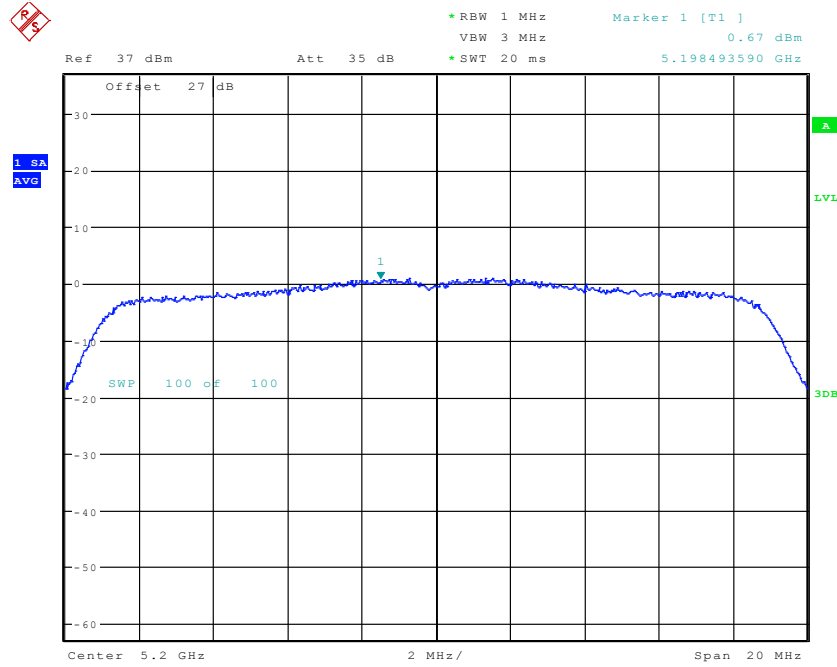
Tx1 802.11n Ch36



Date: 6.JAN.2010 11:26:00

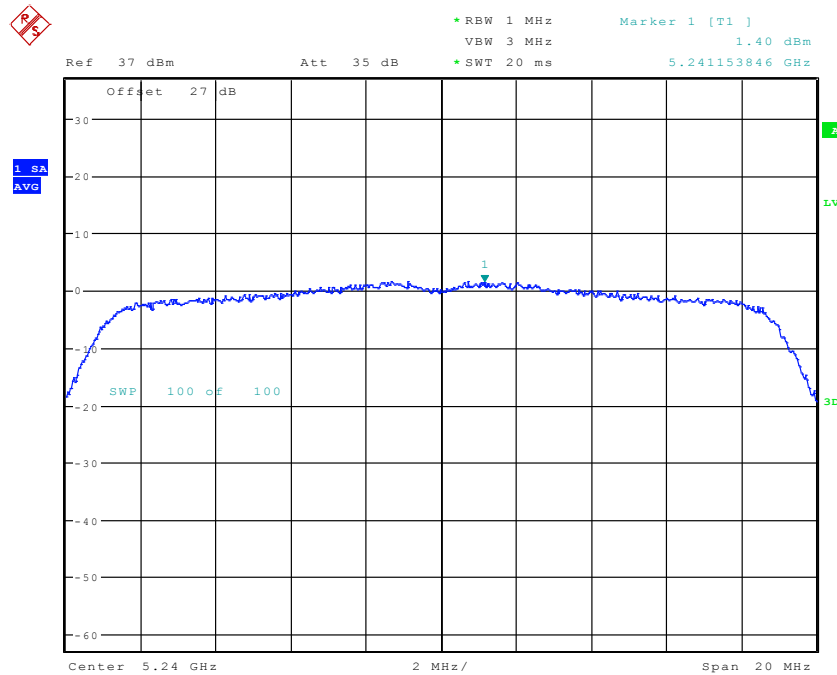


Tx1 802.11n Ch40



Date: 6.JAN.2010 11:27:26

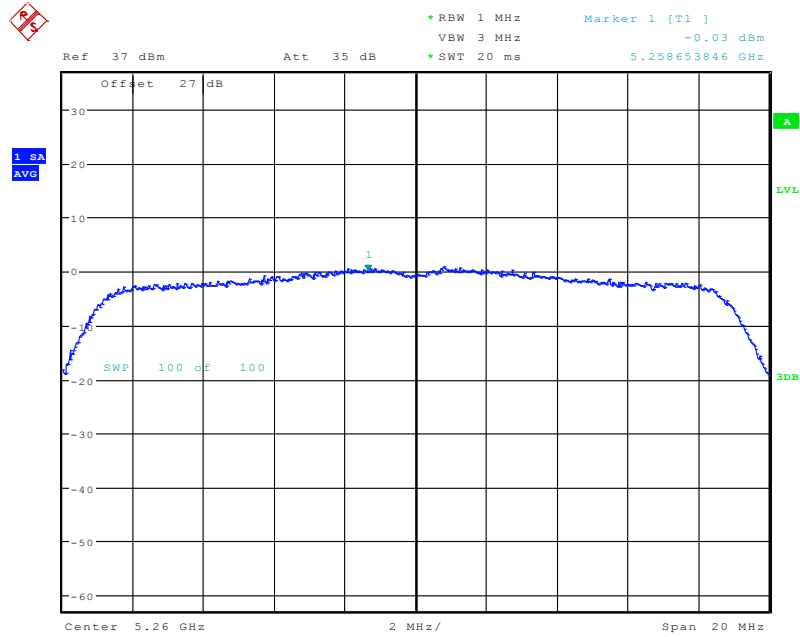
Tx1 802.11n Ch48



Date: 6.JAN.2010 11:28:59

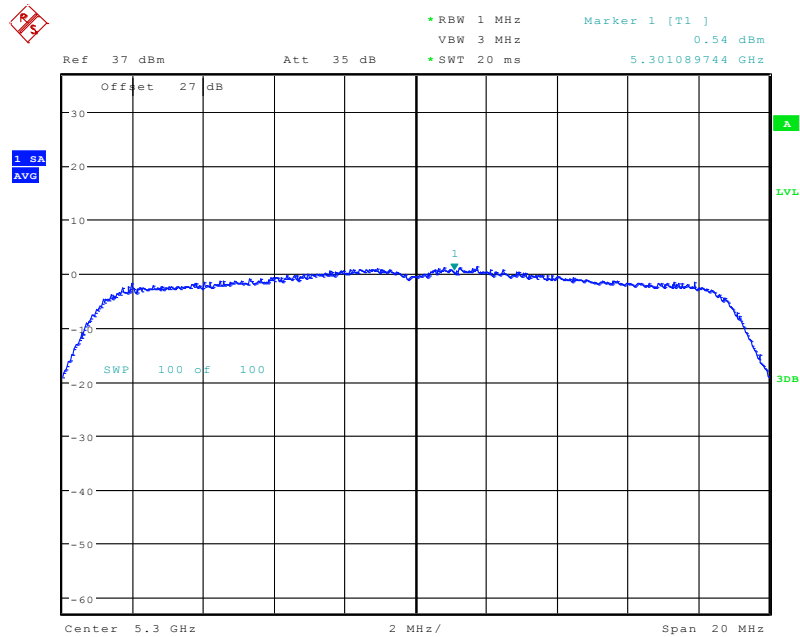


Tx1 802.11n Ch52



Date: 6..JAN.2010 11:18:41

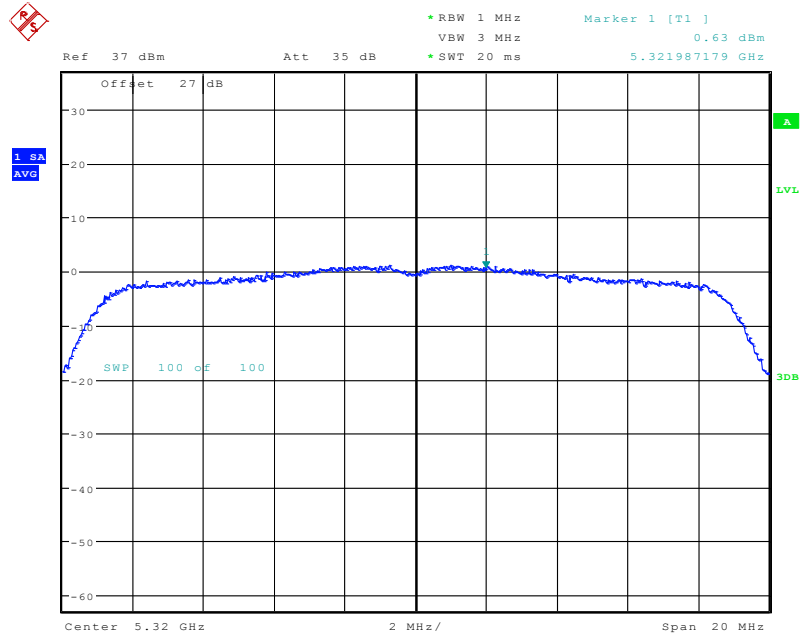
Tx1 802.11n Ch60



Date: 6..JAN.2010 11:22:17

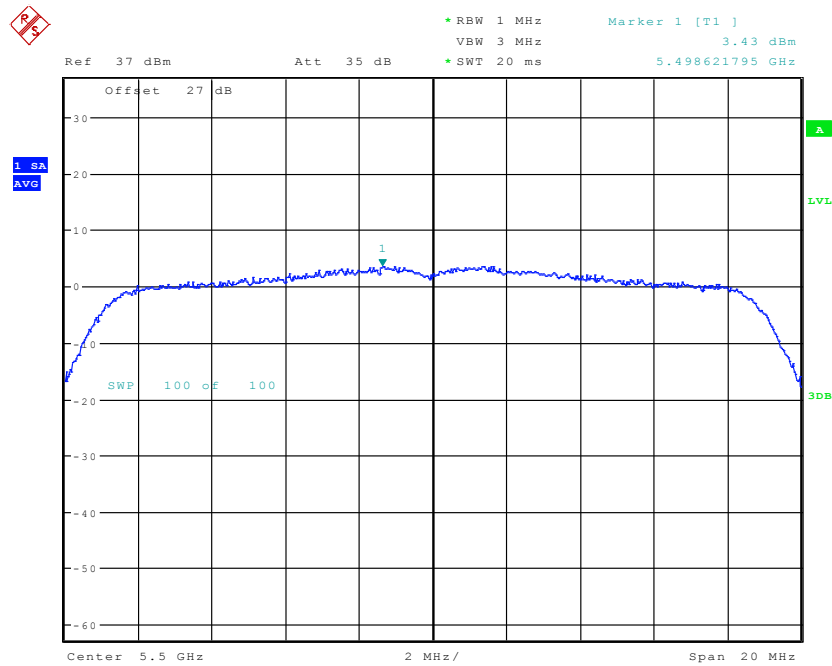


Tx1 802.11n Ch64



Date: 6.JAN.2010 11:23:18

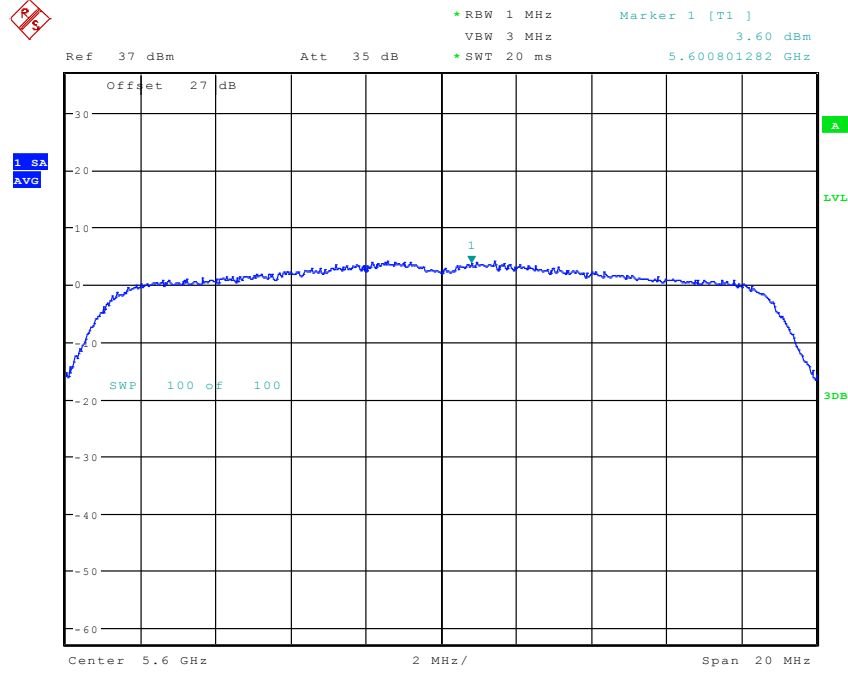
Tx1 802.11n Ch100



Date: 6.JAN.2010 11:30:51

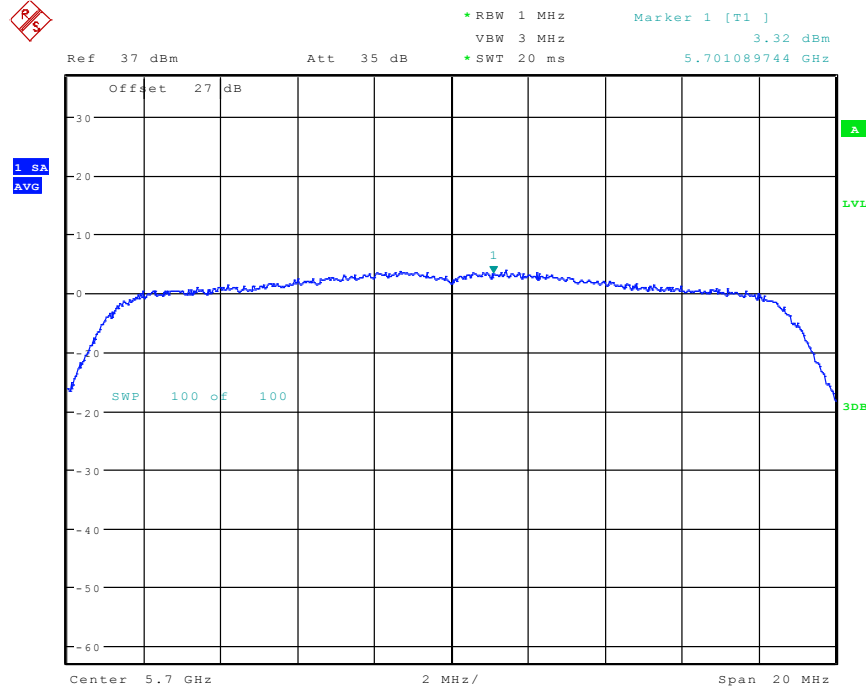


Tx1 802.11n Ch120



Date: 6.JAN.2010 11:32:18

Tx1 802.11n Ch140



Date: 6.JAN.2010 11:33:48



**5.7 Peak Excursion**

**5.7.1 Limit**

FCC15.407 (A)(6): The ratio of the peak excursion of the modulation envelope (measured using a peak hold function) to the maximum conducted output power (measured as specified above) shall not exceed 13 dB across any 1 MHz bandwidth or the emission bandwidth whichever is less.

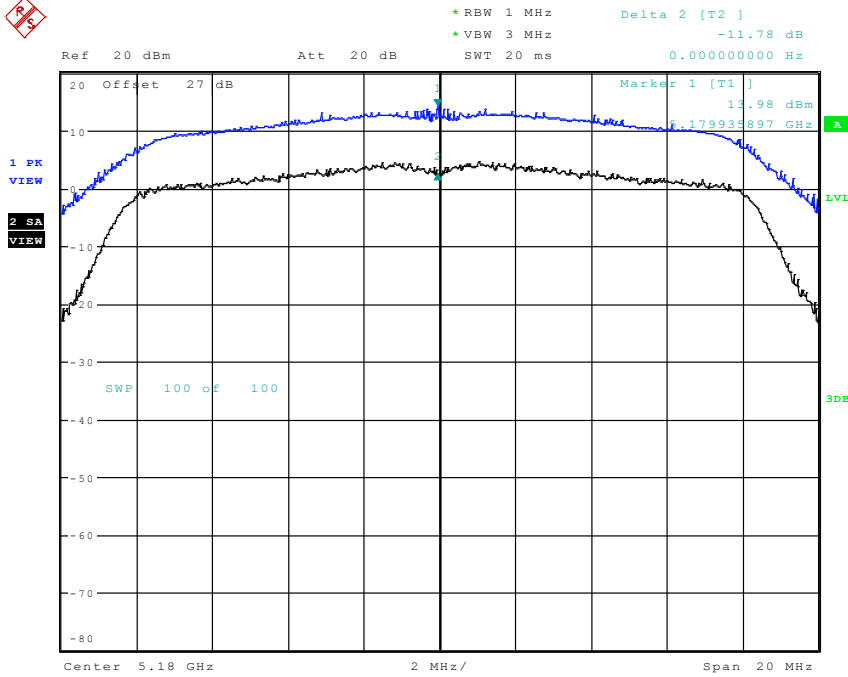
**5.7.2 Results**

The peak conducted power is measured with a spectrum analyzer and method 2 specified in FCC public knowledge DA-02-2138A1.

| Peak Excursion (dB) |         |       |       |       |       |
|---------------------|---------|-------|-------|-------|-------|
| Frequency (MHz)     | Channel | Tx0   |       | Tx1   |       |
|                     |         | a     | HT20  | a     | HT20  |
| 5180                | 36      | 11.78 | 9.75  | 11.5  | 9.27  |
| 5200                | 40      | 8.96  | 10.48 | 10.59 | 10.38 |
| 5240                | 48      | 10.31 | 11.27 | 9.56  | 10.02 |
| 5260                | 52      | 9.1   | 9.9   | 10.88 | 10.99 |
| 5300                | 60      | 10.18 | 11.14 | 10.92 | 10.82 |
| 5320                | 64      | 9.89  | 9.94  | 11.41 | 10.32 |
| 5500                | 100     | 10.82 | 10.3  | 11.42 | 10.39 |
| 5600                | 120     | 10.83 | 11.19 | 10.01 | 10.22 |
| 5700                | 140     | 10.55 | 10.41 | 9.56  | 9.53  |

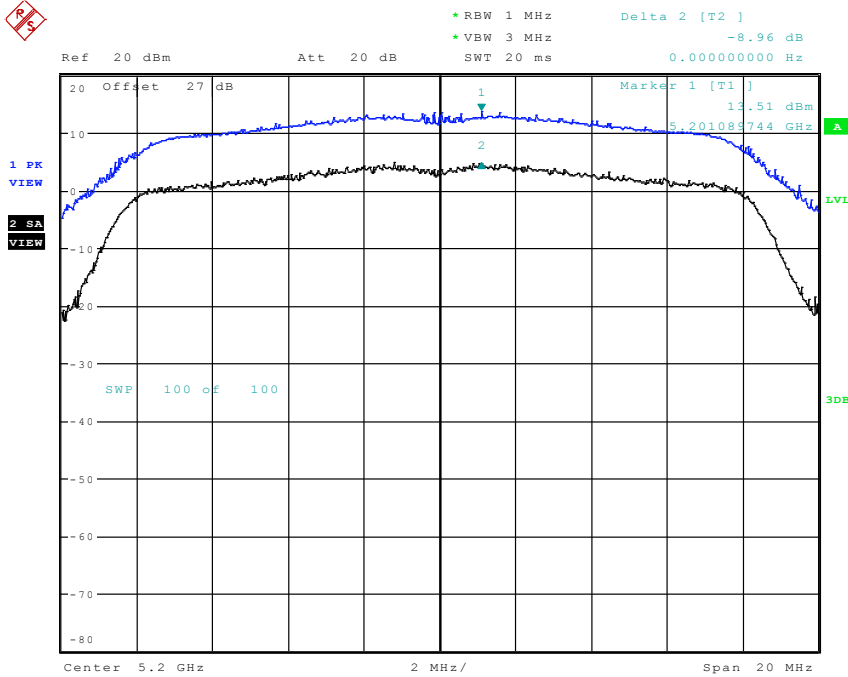


Tx0 802.11a Ch36



Date: 6.JAN.2010 15:19:53

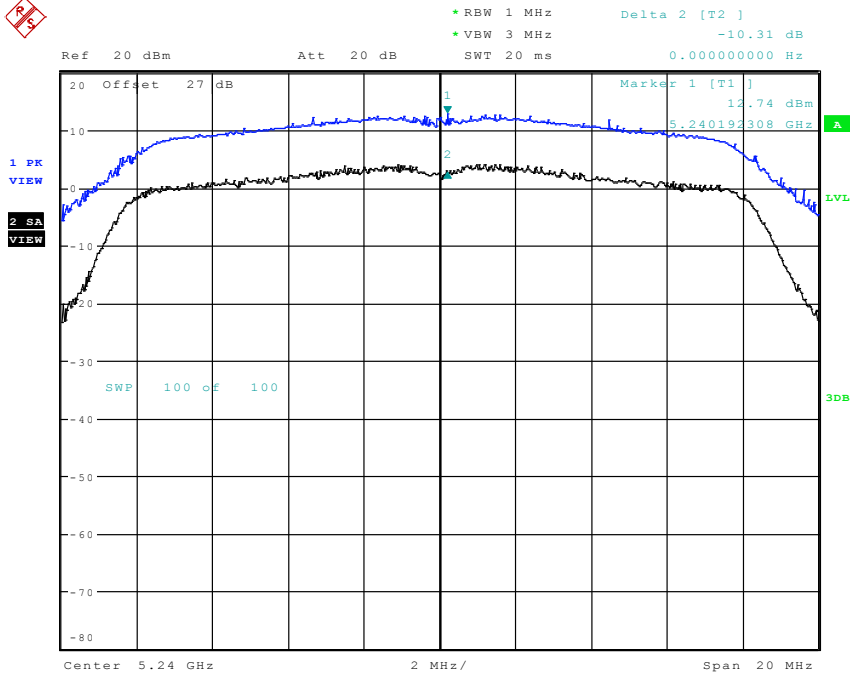
Tx0 802.11a Ch40



Date: 6.JAN.2010 15:22:22

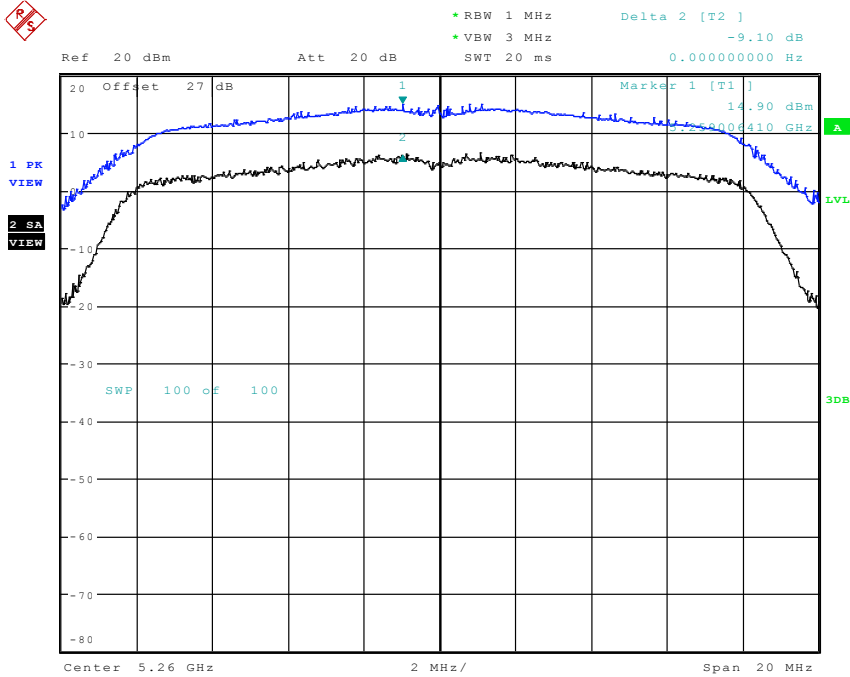


Tx0 802.11a Ch48



Date: 6.JAN.2010 15:25:03

Tx0 802.11a Ch52

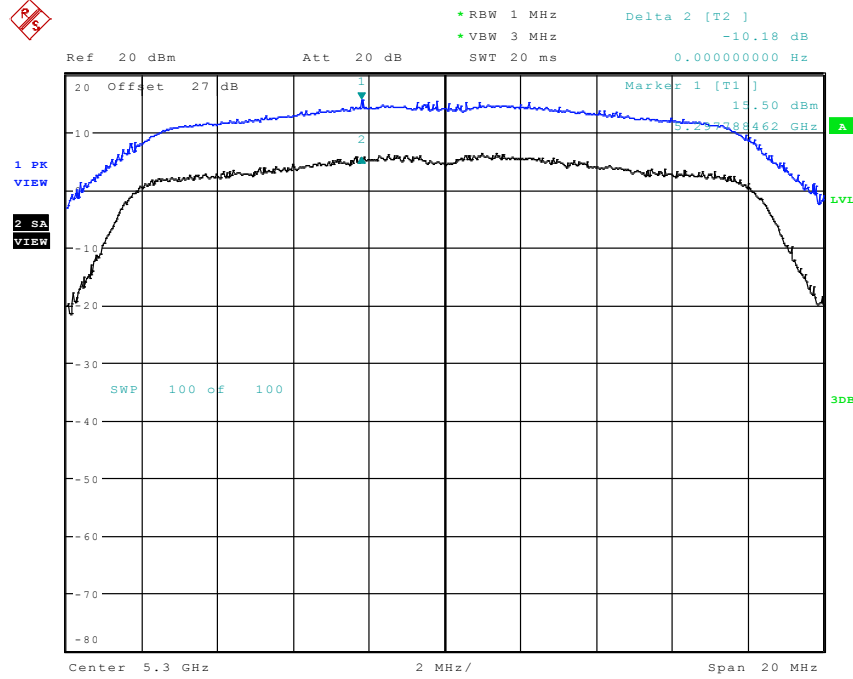


Date: 6.JAN.2010 15:26:56



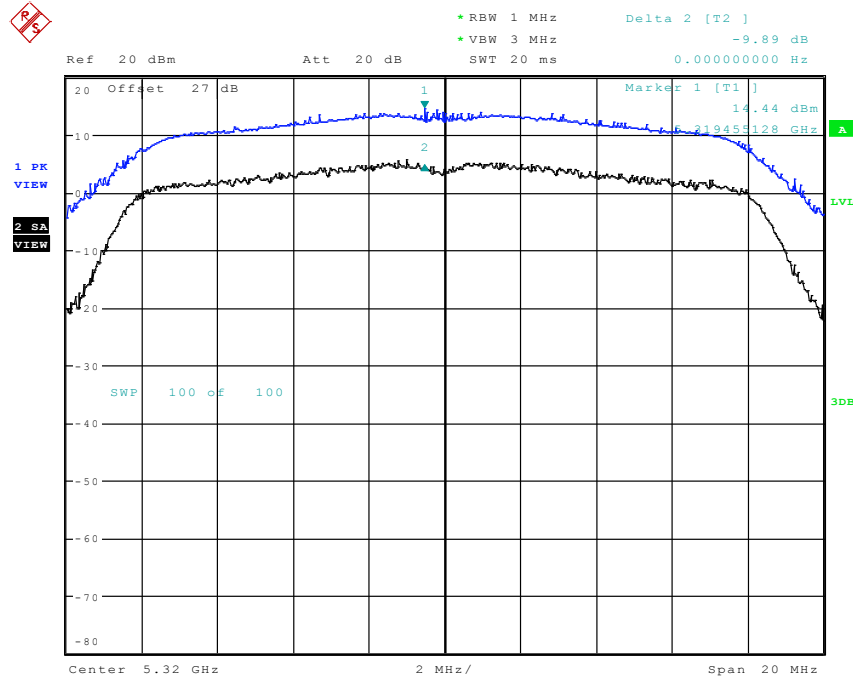


Tx0 802.11a Ch60



Date: 6.JAN.2010 15:29:07

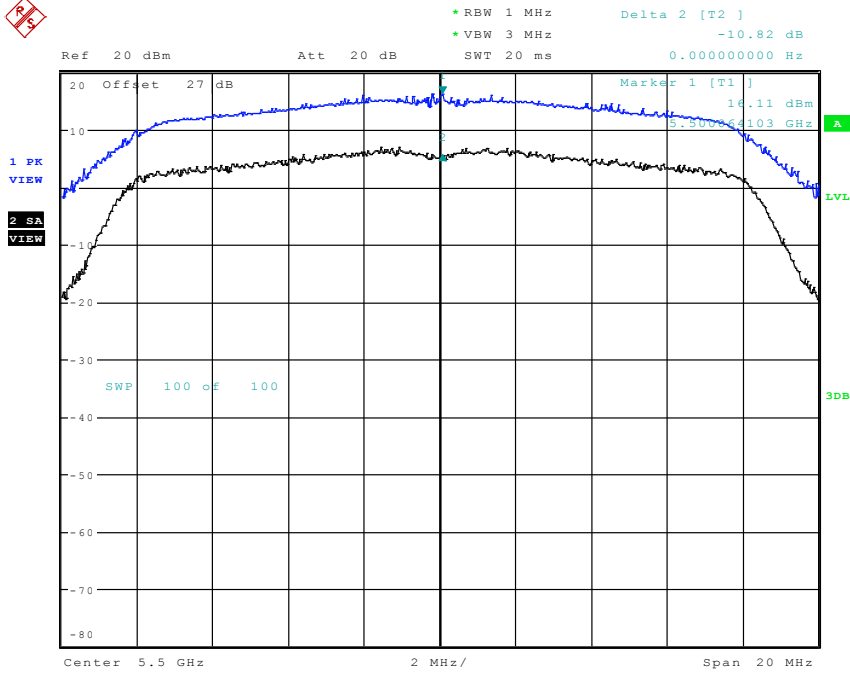
Tx0 802.11a Ch64



Date: 6.JAN.2010 15:30:43

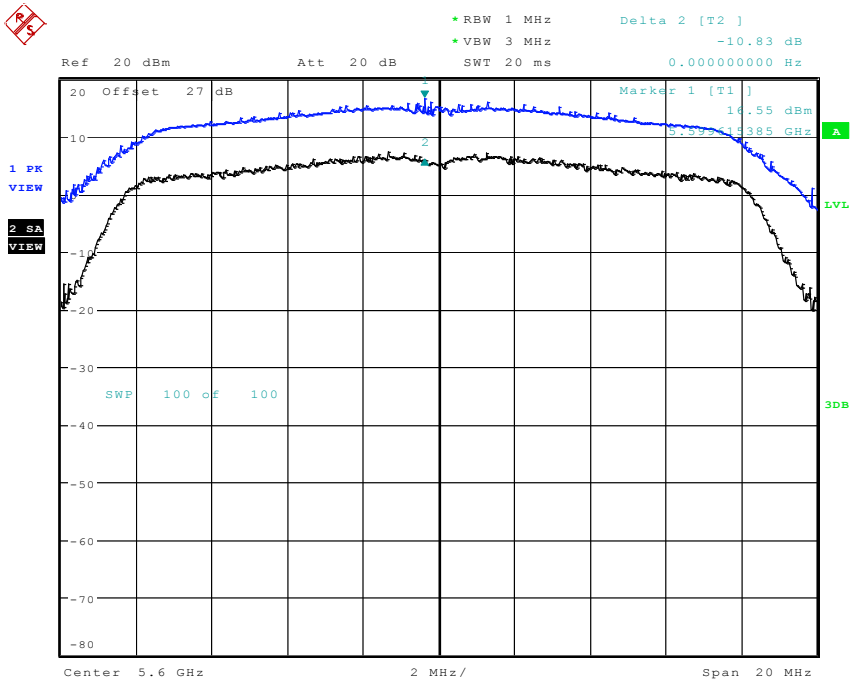


Tx0 802.11a Ch100



Date: 6.JAN.2010 15:32:32

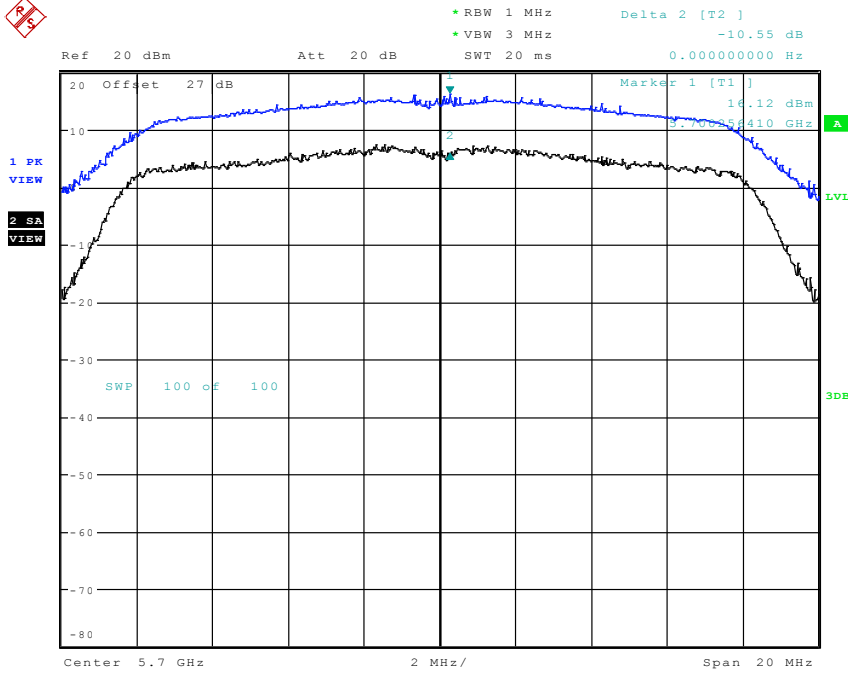
Tx0 802.11a Ch120



Date: 6.JAN.2010 15:34:17

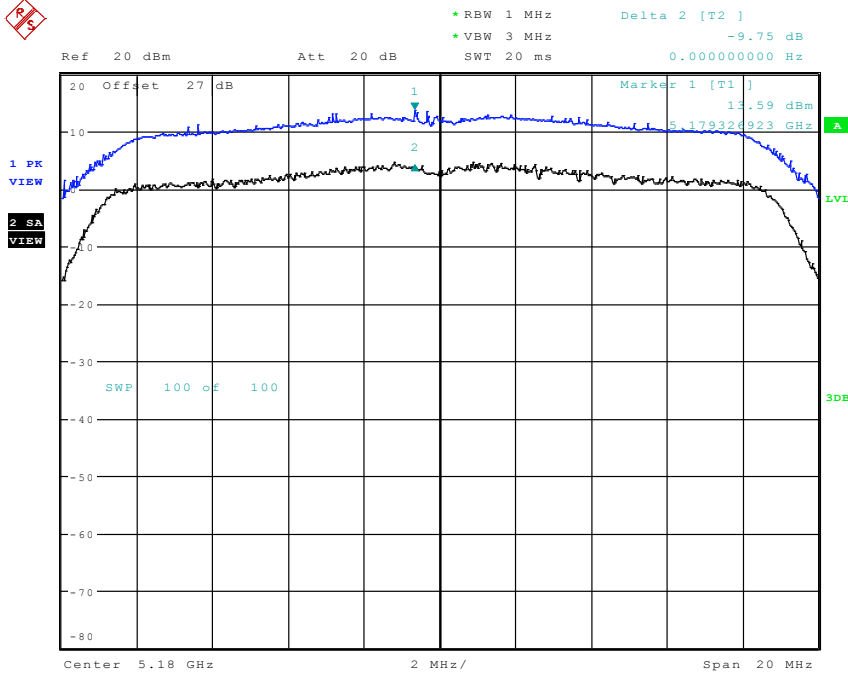


Tx0 802.11a Ch140



Date: 6.JAN.2010 15:38:15

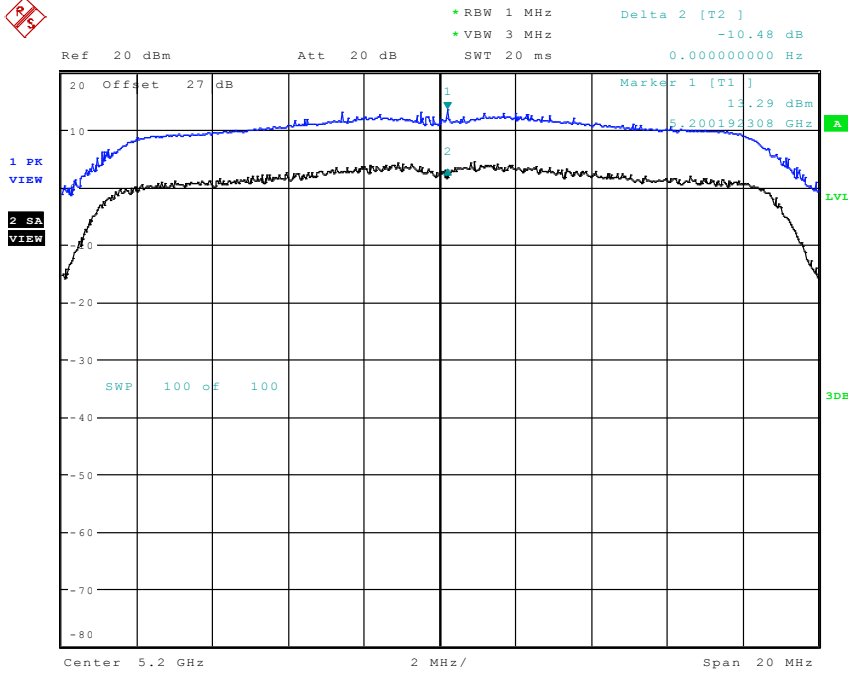
Tx0 802.11n Ch36



Date: 6.JAN.2010 15:21:00

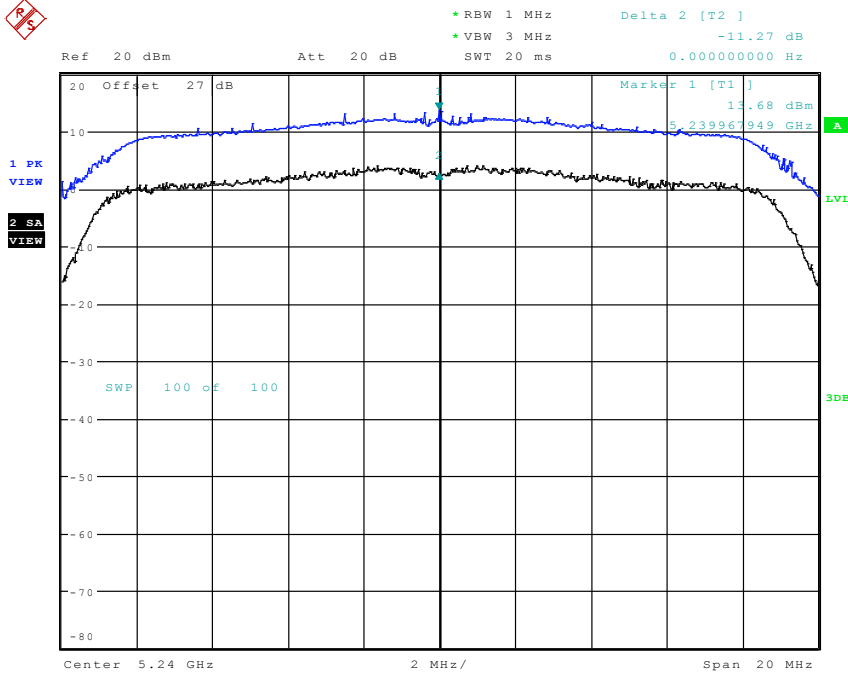


Tx0 802.11n Ch40



Date: 6.JAN.2010 15:23:17

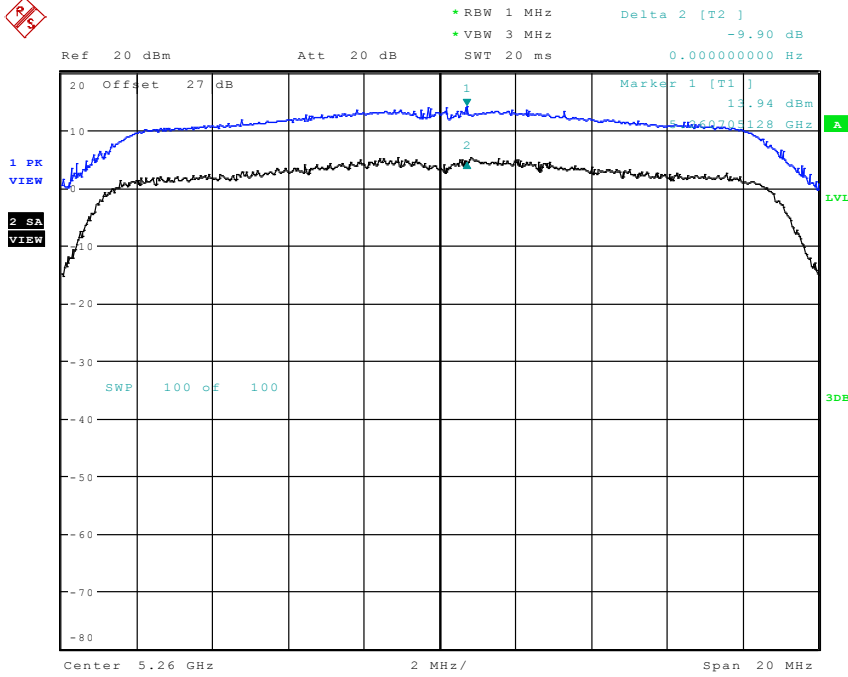
Tx0 802.11n Ch48



Date: 6.JAN.2010 15:25:53

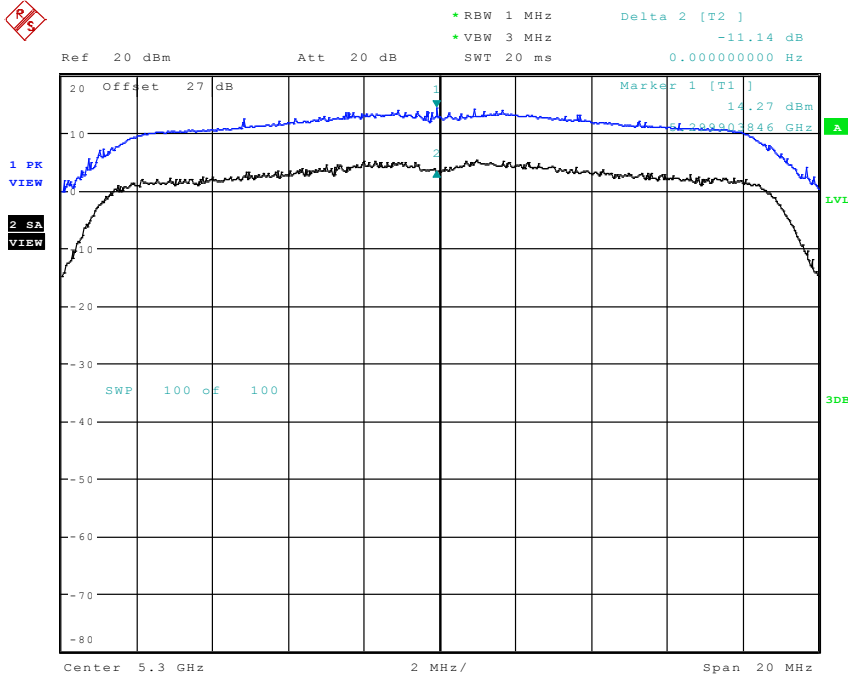


Tx0 802.11n Ch52



Date: 6.JAN.2010 15:28:07

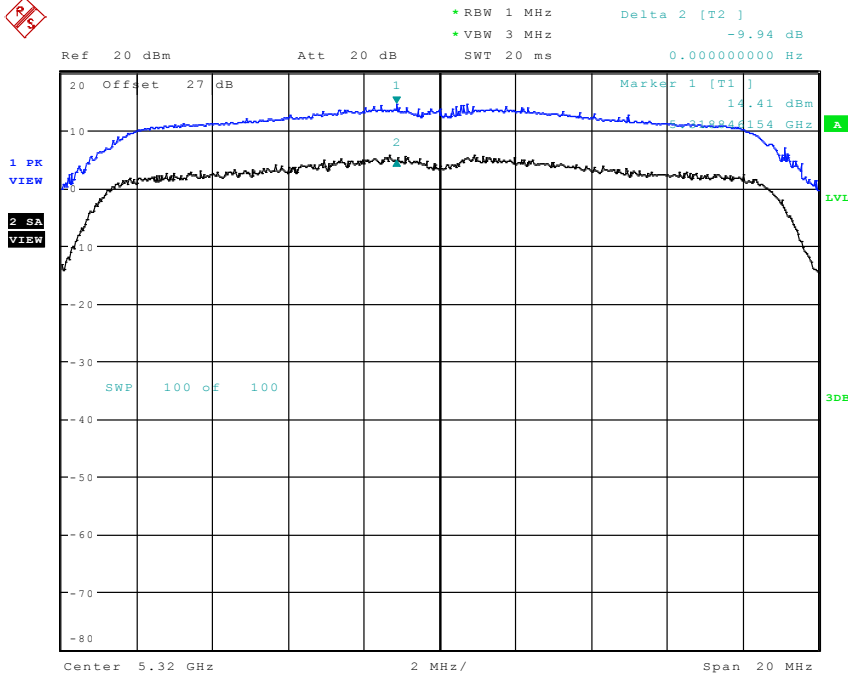
Tx0 802.11n Ch60



Date: 6.JAN.2010 15:29:57

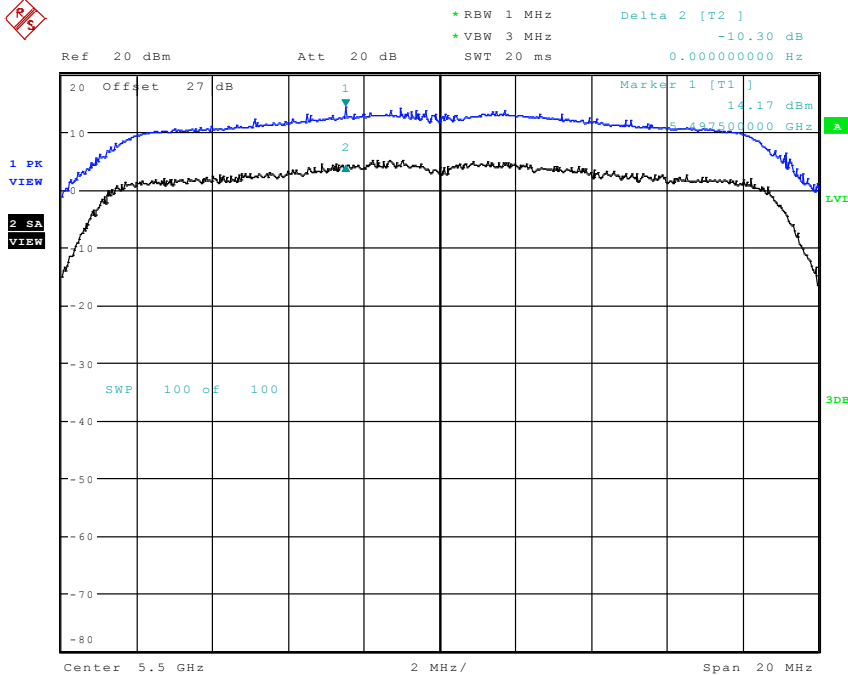


Tx0 802.11n Ch64



Date: 6.JAN.2010 15:31:31

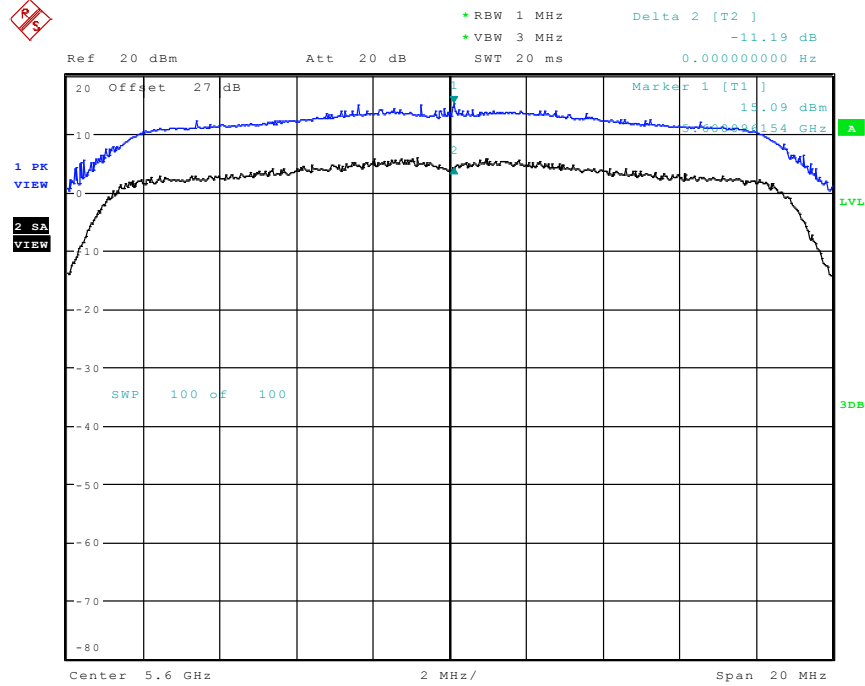
Tx0 802.11n Ch100



Date: 6.JAN.2010 15:37:20

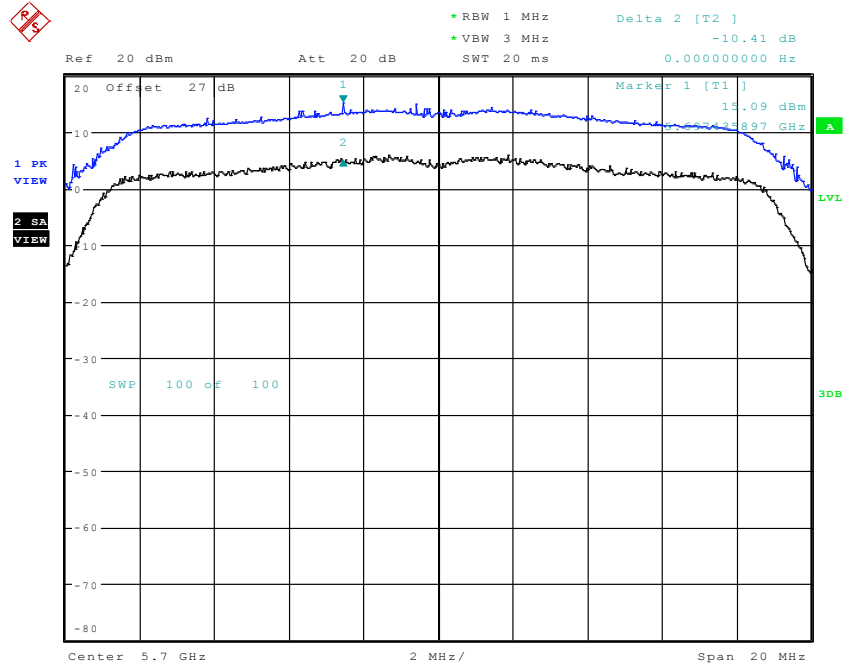


Tx0 802.11n Ch120



Date: 6.JAN.2010 15:35:27

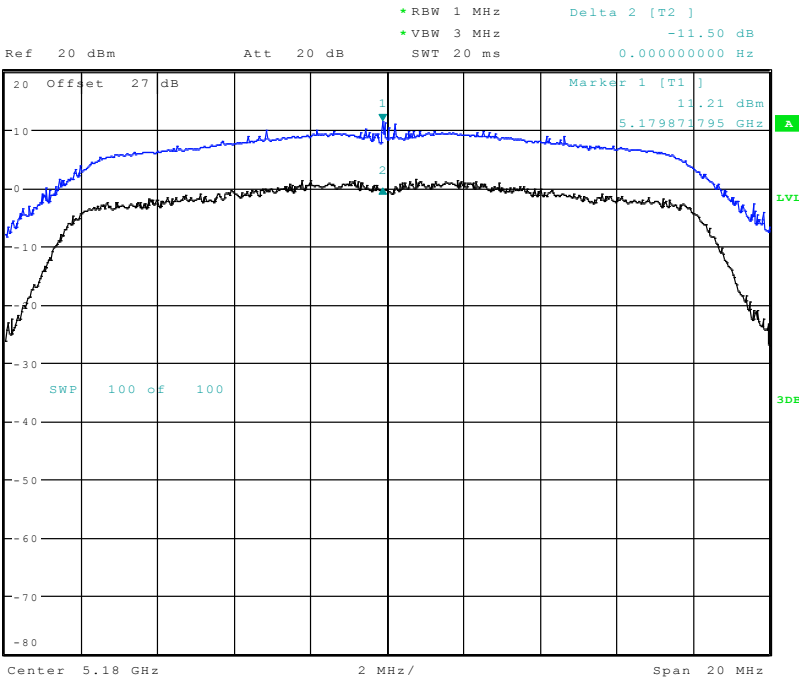
Tx0 802.11n Ch140



Date: 6.JAN.2010 15:39:15

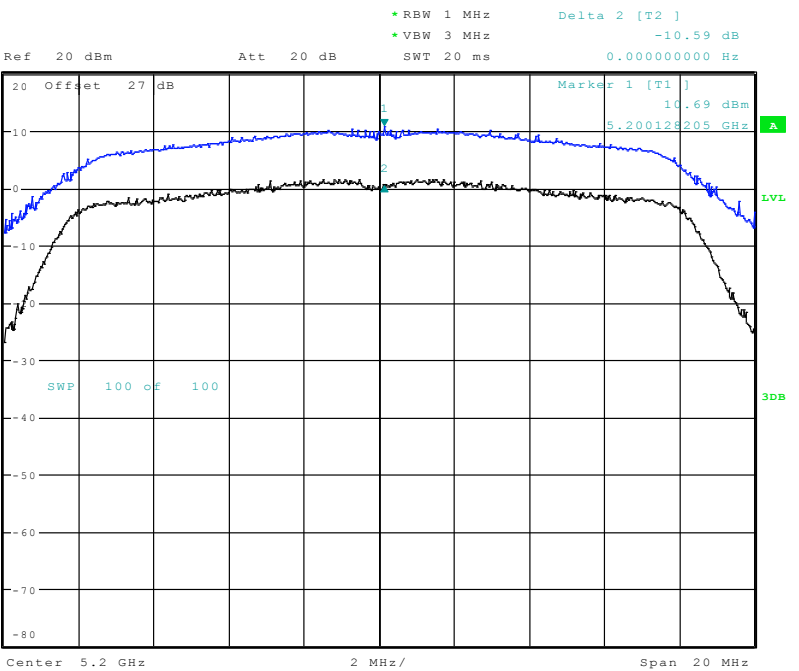


Tx1 802.11a Ch36



Date: 6.JAN.2010 14:49:37

Tx1 802.11a Ch40

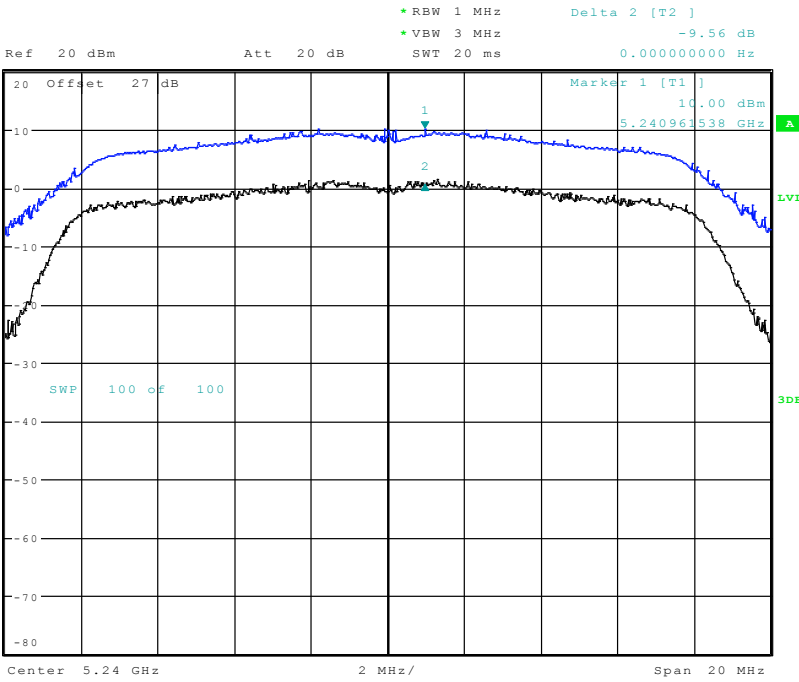


Date: 6.JAN.2010 14:53:39



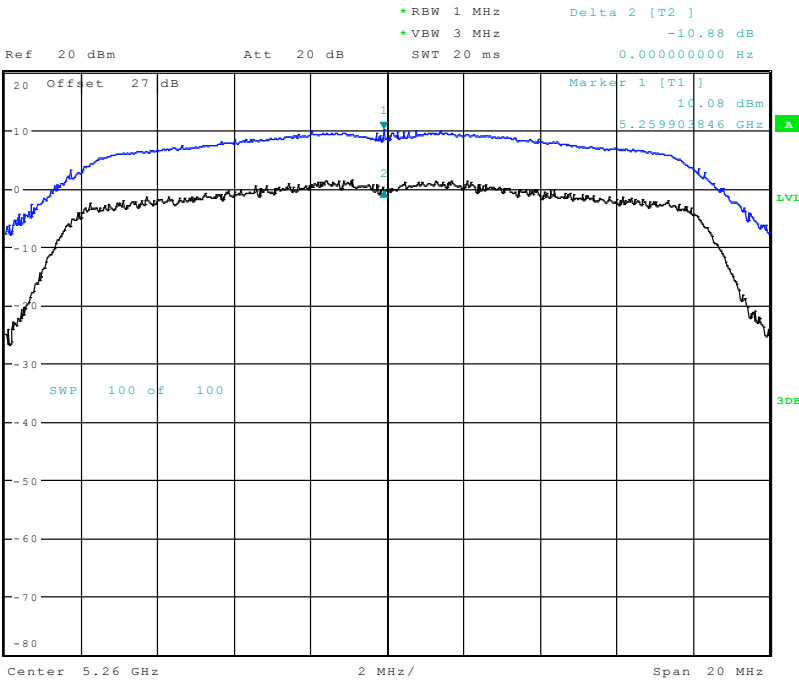


Tx1 802.11a Ch48



Date: 6.JAN.2010 15:00:35

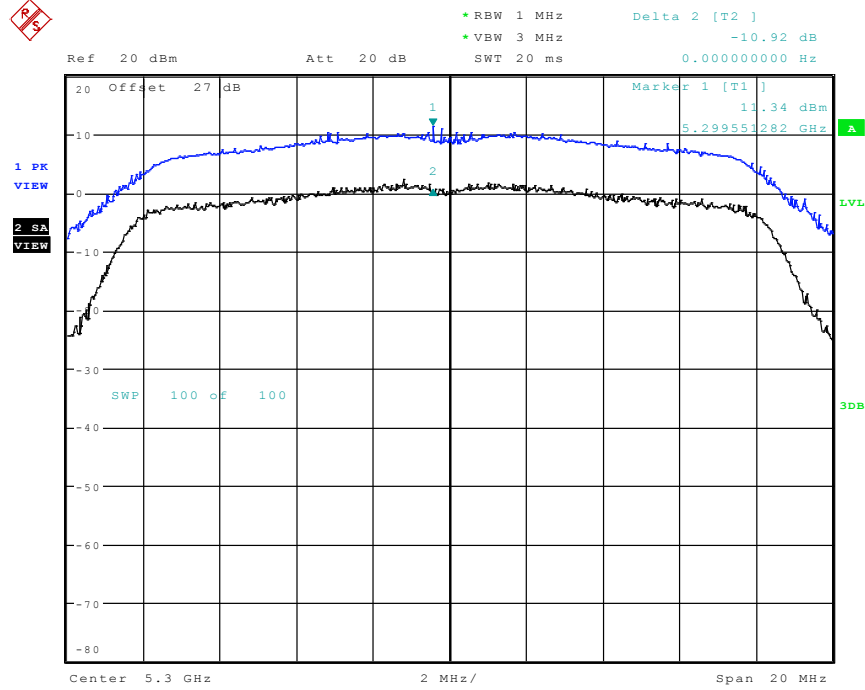
Tx1 802.11a Ch52



Date: 6.JAN.2010 15:01:59

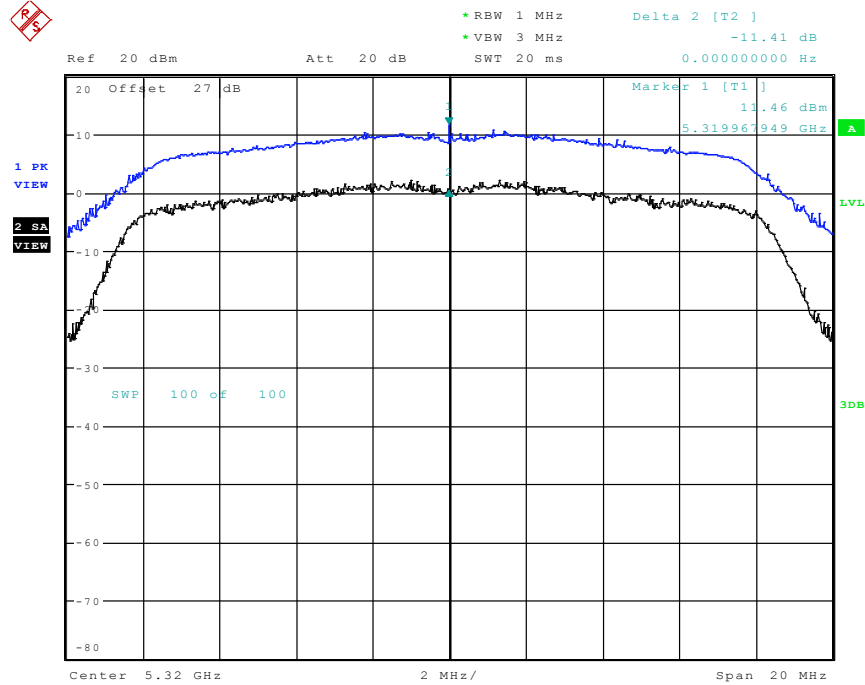


Tx1 802.11a Ch60



Date: 6.JAN.2010 15:04:19

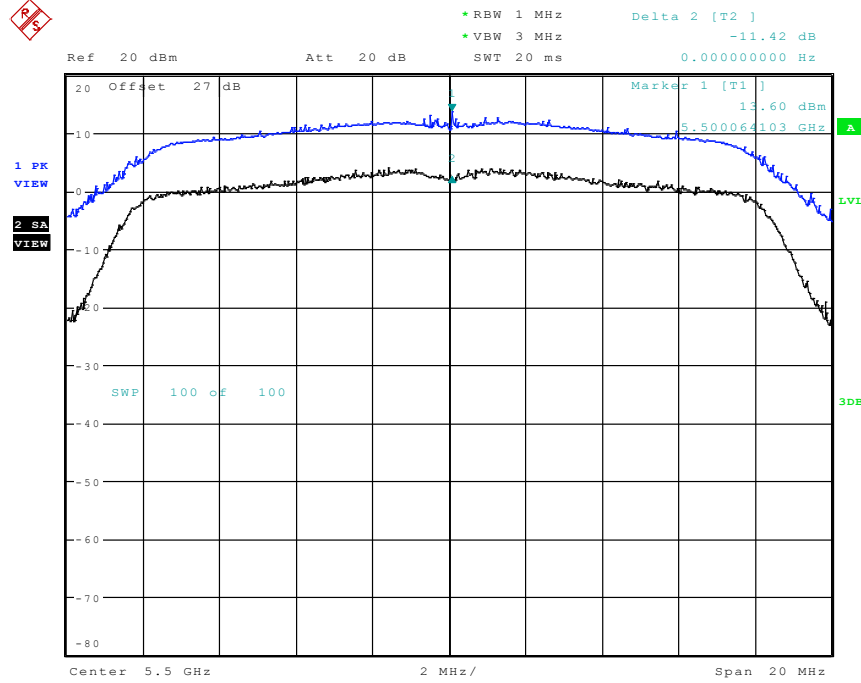
Tx1 802.11a Ch64



Date: 6.JAN.2010 15:07:31

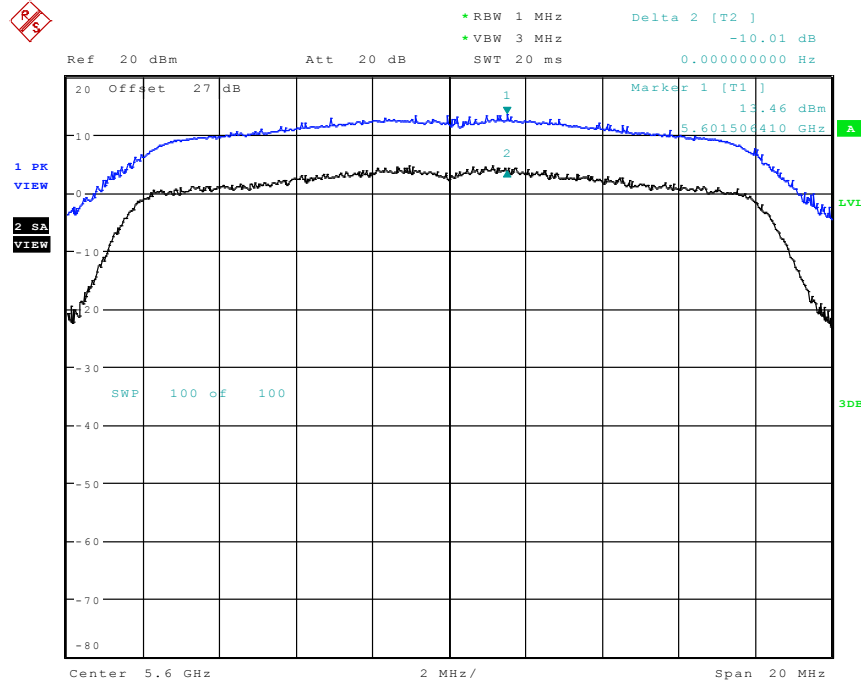


Tx1 802.11a Ch100



Date: 6.JAN.2010 15:11:18

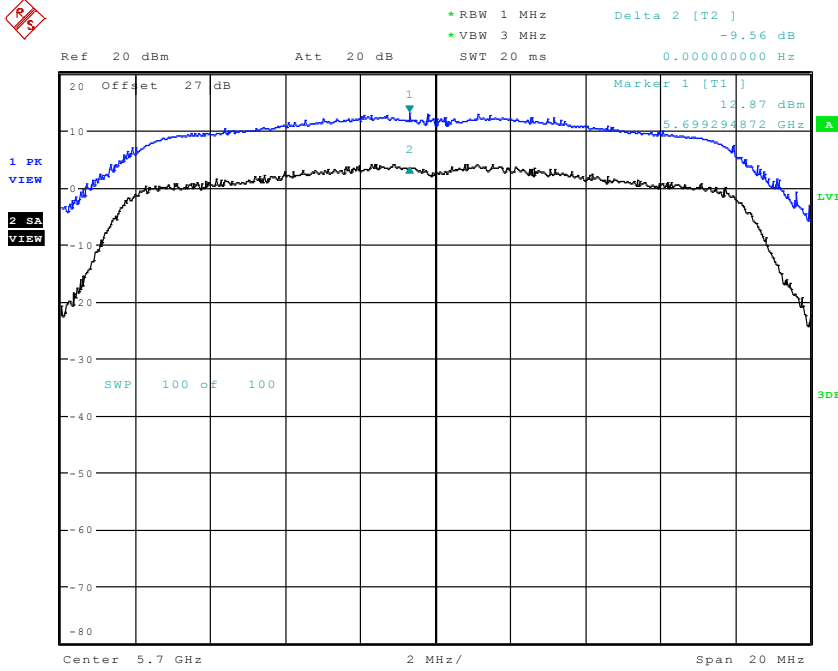
Tx1 802.11a Ch120



Date: 6.JAN.2010 15:13:01

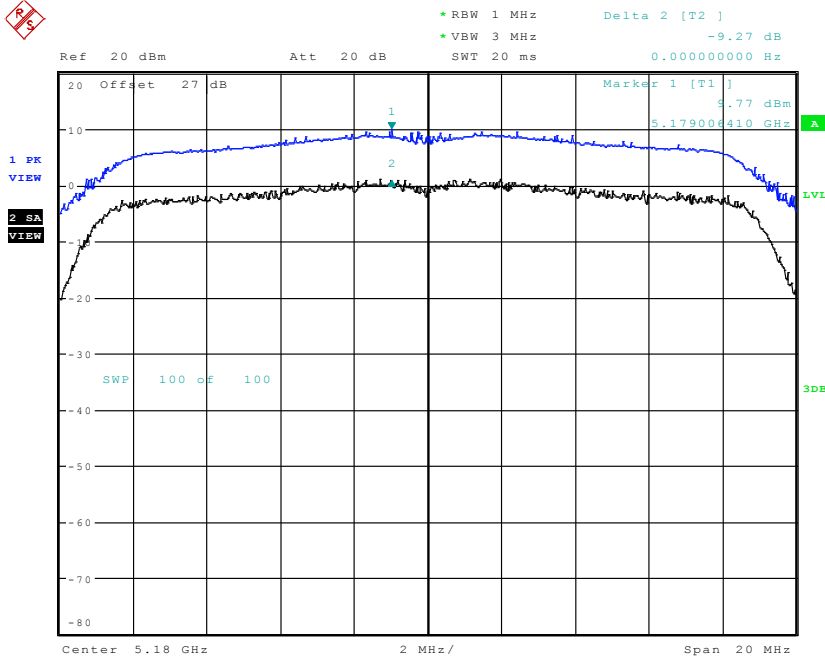


Tx1 802.11a Ch140



Date: 6.JAN.2010 15:17:12

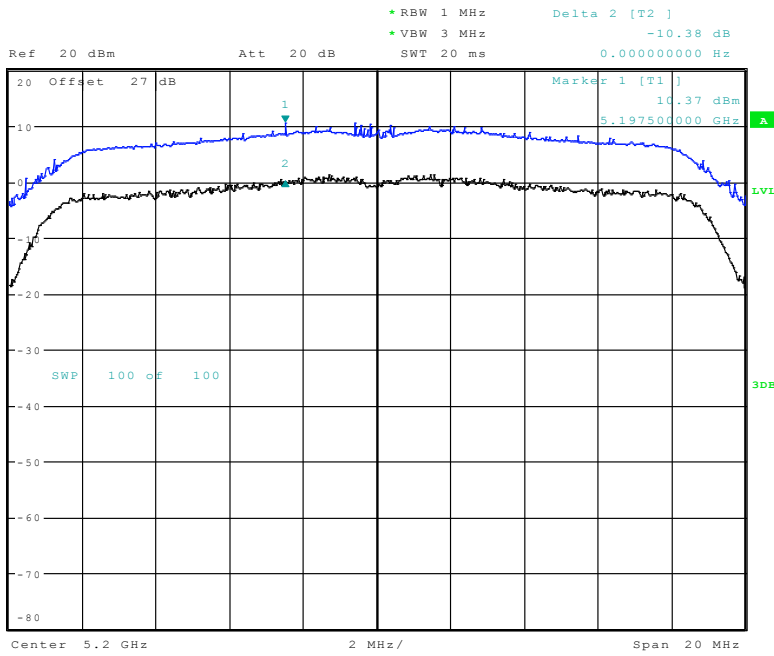
Tx1 802.11n Ch36



Date: 6.JAN.2010 14:51:47

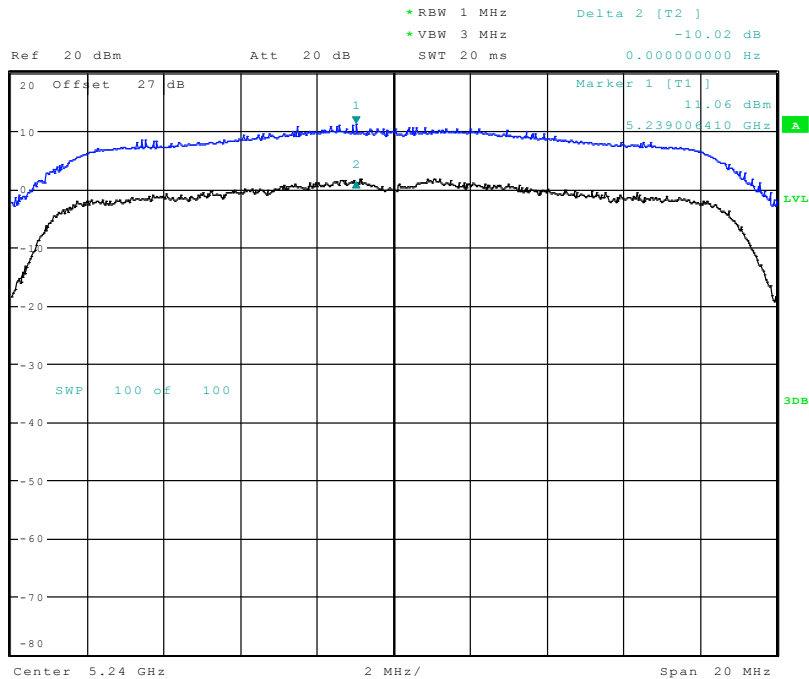


Tx1 802.11n Ch40



Date: 6.JAN.2010 14:55:05

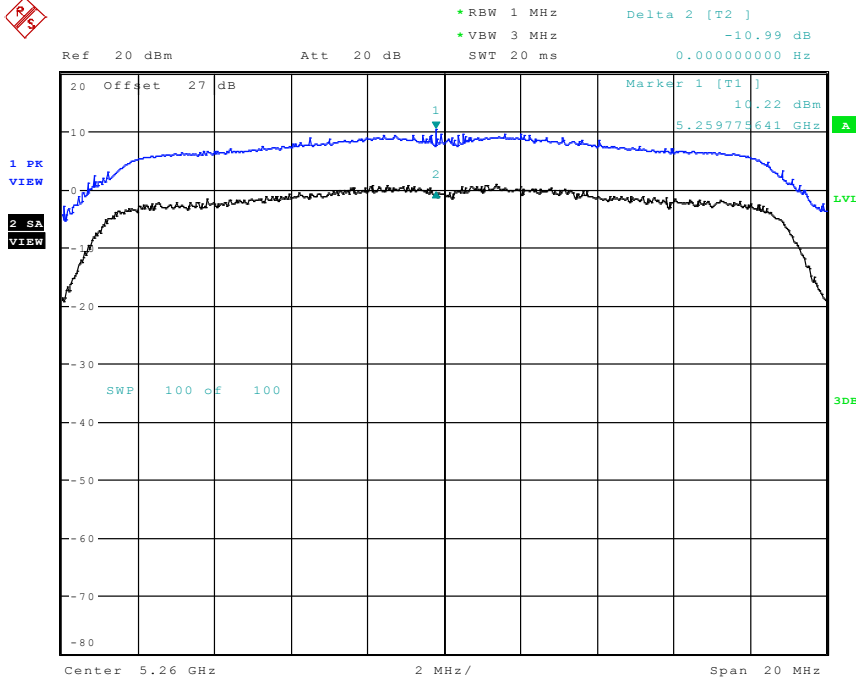
Tx1 802.11n Ch48



Date: 6.JAN.2010 14:58:43

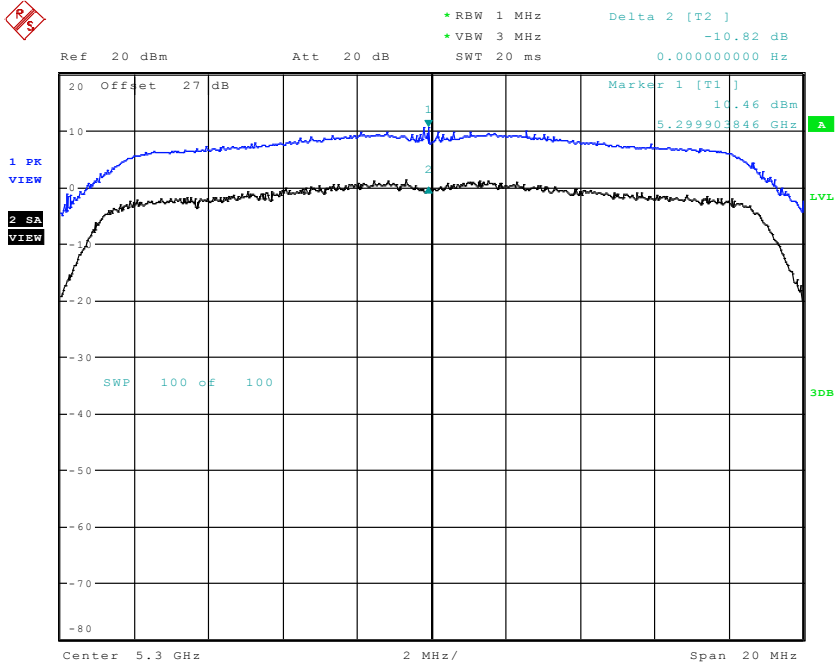


Tx1 802.11n Ch52



Date: 6.JAN.2010 15:02:58

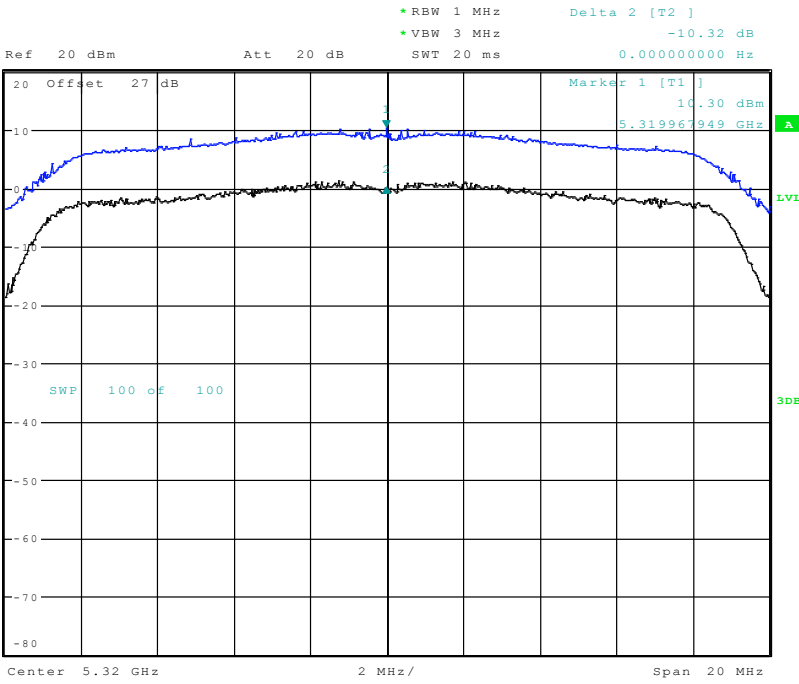
Tx1 802.11n Ch60



Date: 6.JAN.2010 15:06:10

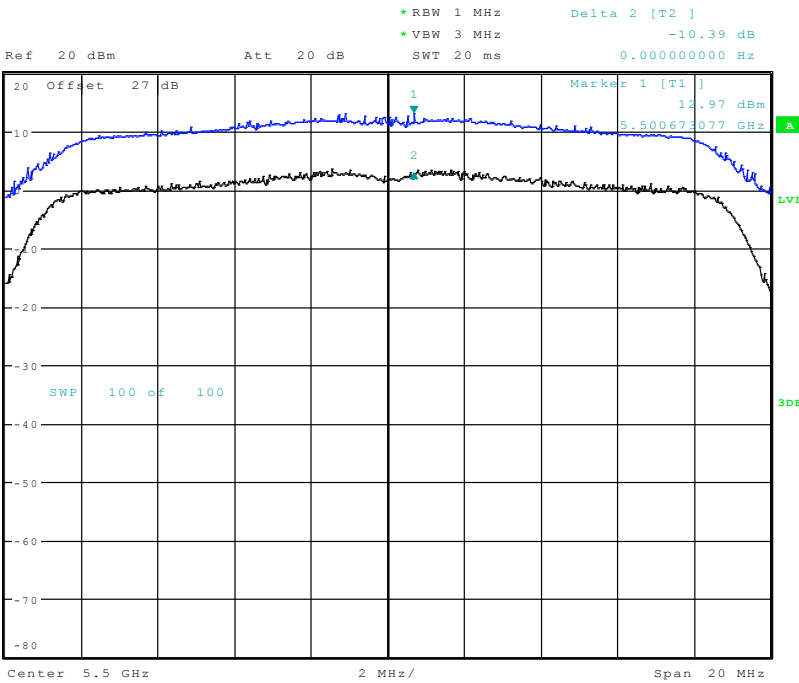


Tx1 802.11n Ch64



Date: 6.JAN.2010 15:08:33

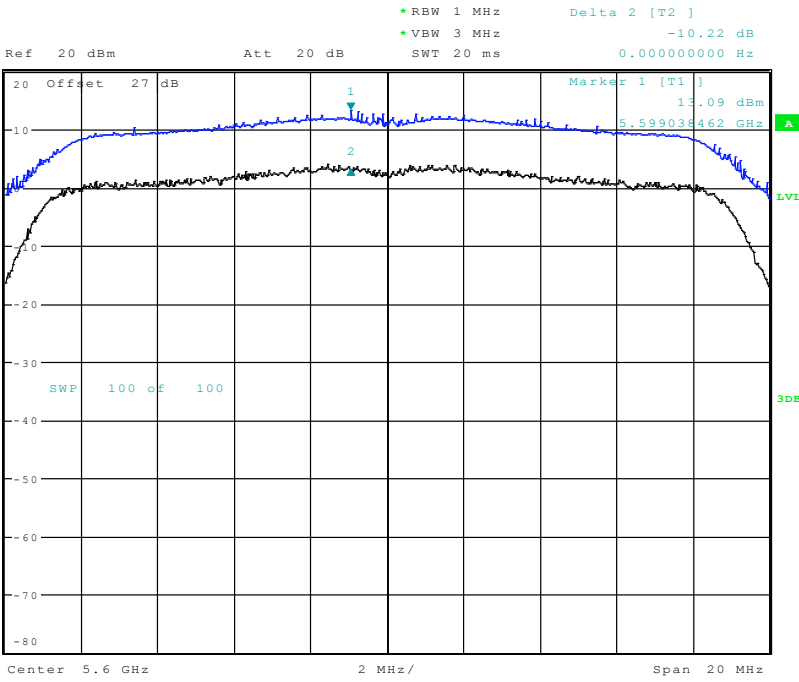
Tx1 802.11n Ch100



Date: 6.JAN.2010 15:16:15

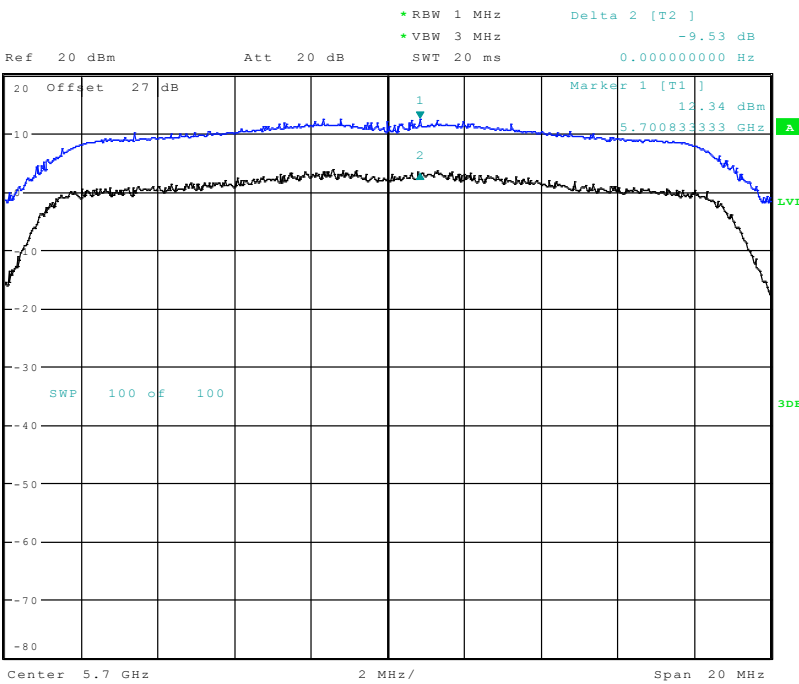


Tx1 802.11n Ch120



Date: 6.JAN.2010 15:14:23

Tx1 802.11n Ch140



Date: 6.JAN.2010 15:17:56





**5.8 Transmitter Spurious Emissions- Conducted**

**5.8.1 Limits: § 15.407 (b)**  
 -27 dBm / MHz EIRP

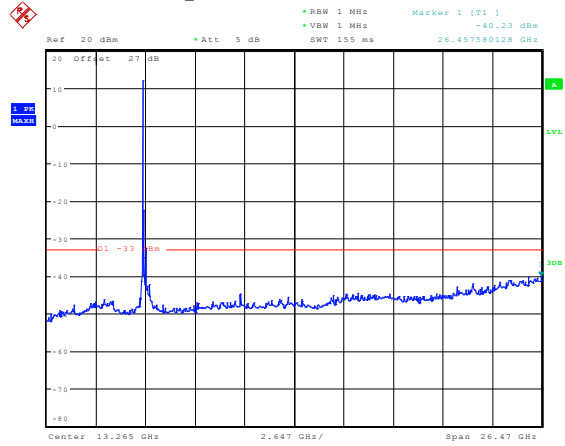
**5.8.2 Test data/ plots:**

| Conducted Spurious Emissions |         |      |      |      |      |
|------------------------------|---------|------|------|------|------|
| Frequency (MHz)              | Channel | Tx0  |      | Tx1  |      |
|                              |         | a    | HT20 | a    | HT20 |
| 5180                         | 36      | Pass | Pass | Pass | Pass |
| 5200                         | 40      | Pass | Pass | Pass | Pass |
| 5240                         | 48      | Pass | Pass | Pass | Pass |
| 5260                         | 52      | Pass | Pass | Pass | Pass |
| 5300                         | 60      | Pass | Pass | Pass | Pass |
| 5320                         | 64      | Pass | Pass | Pass | Pass |
| 5500                         | 100     | Pass | Pass | Pass | Pass |
| 5600                         | 120     | Pass | Pass | Pass | Pass |
| 5700                         | 140     | Pass | Pass | Pass | Pass |

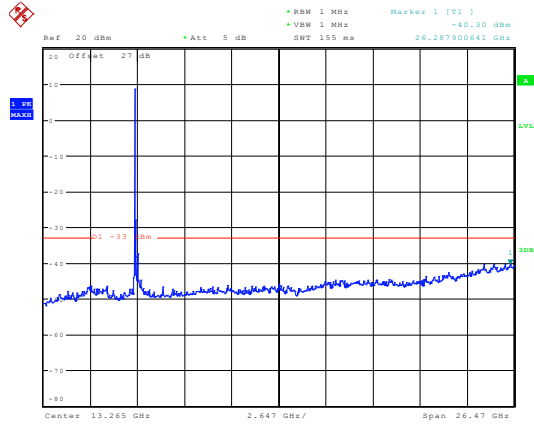


5.8.3 Test data/ plots:

Conducted Spurious Emission 5180MHz 802.11a Tx0 / Tx1

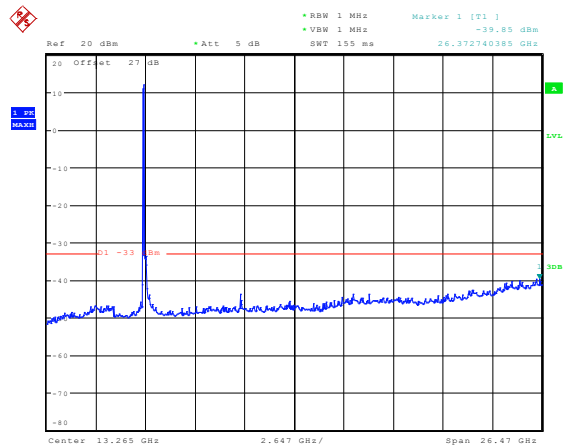


Date: 7.JAN.2010 09:06:52

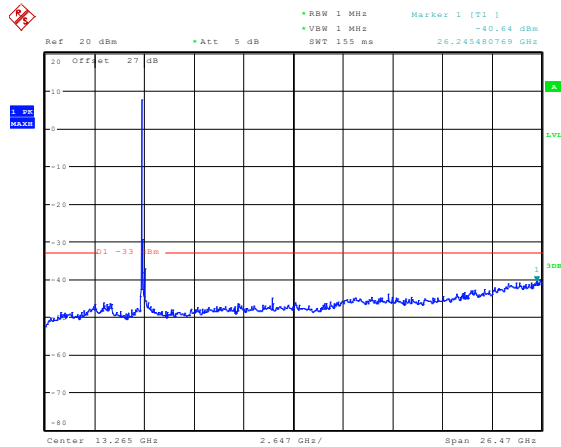


Date: 7.JAN.2010 10:41:32

Conducted Spurious Emission 5180MHz 802.11 HT20 Tx0 / Tx1



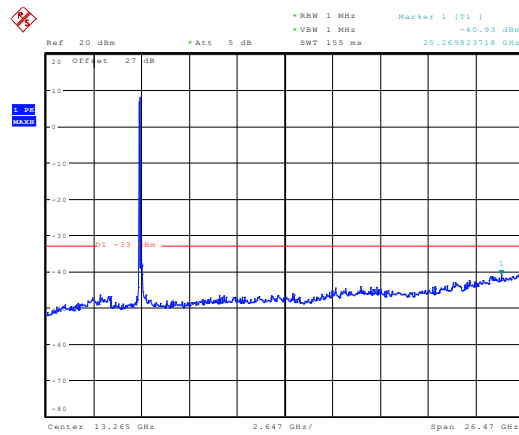
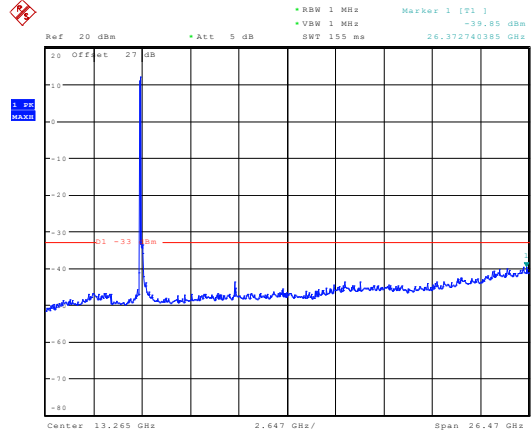
Date: 7.JAN.2010 09:11:30



Date: 7.JAN.2010 10:42:27



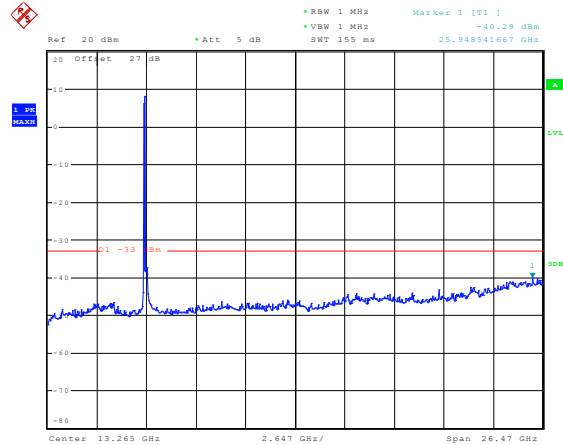
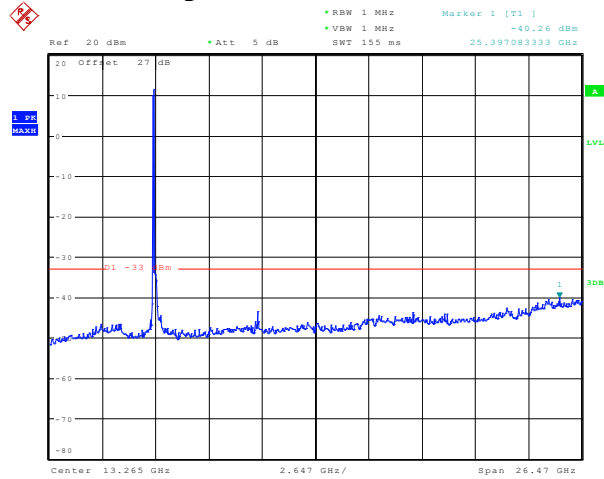
### Conducted Spurious Emission 5200MHz 802.11a Tx0 / Tx1



Date: 7.JAN.2010 09:11:30

Date: 7.JAN.2010 10:43:09

### Conducted Spurious Emission 5200MHz 802.11 HT20 Tx0 / Tx1

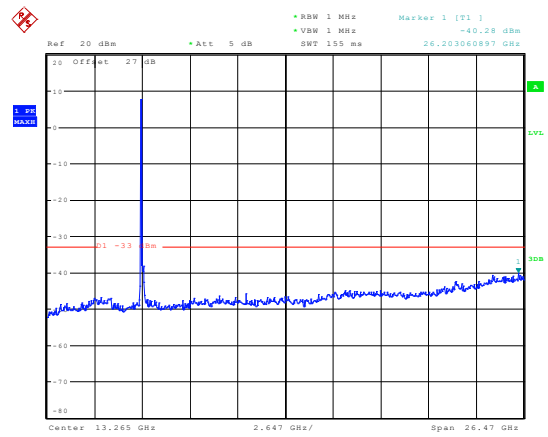
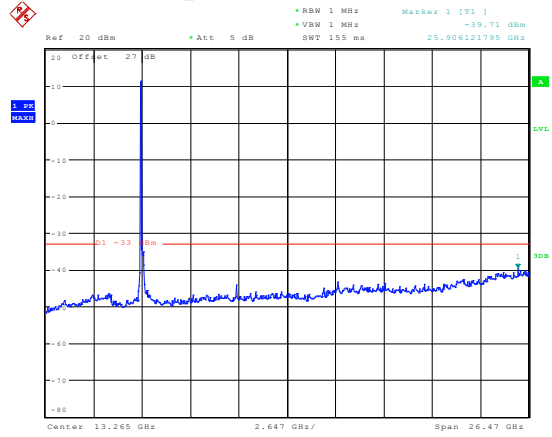


Date: 7.JAN.2010 09:14:22

Date: 7.JAN.2010 10:43:55



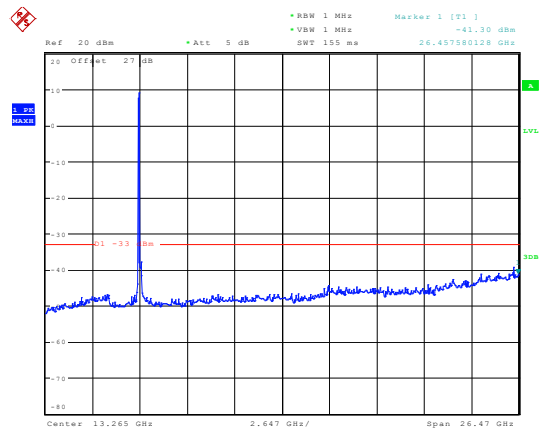
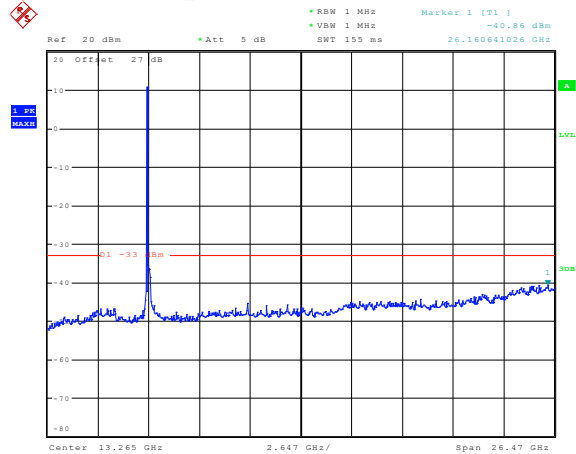
### Conducted Spurious Emission 5240MHz 802.11a Tx0 / Tx1



Date: 7.JAN.2010 09:15:56

Date: 7.JAN.2010 10:44:37

### Conducted Spurious Emission 5240MHz 802.11 HT20 Tx0 / Tx1

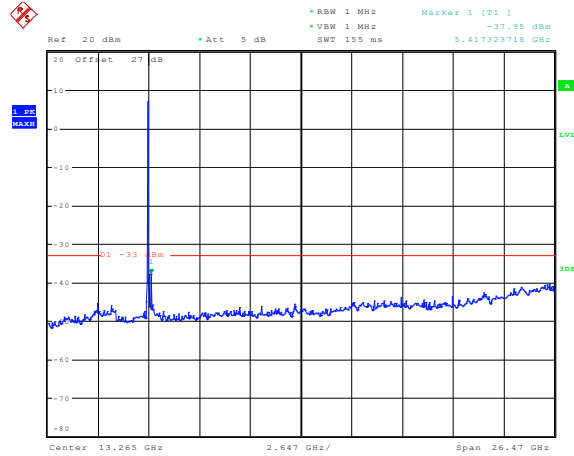
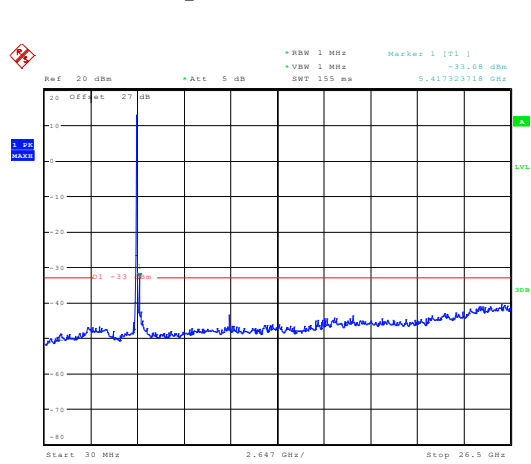


Date: 7.JAN.2010 09:16:41

Date: 7.JAN.2010 10:45:09



**Conducted Spurious Emission 5260MHz 802.11a Tx0 / Tx1**

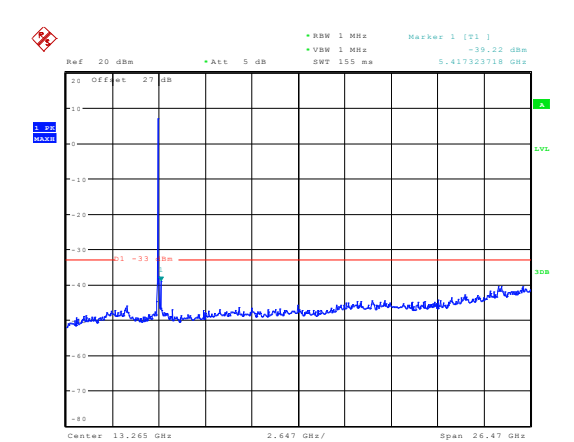
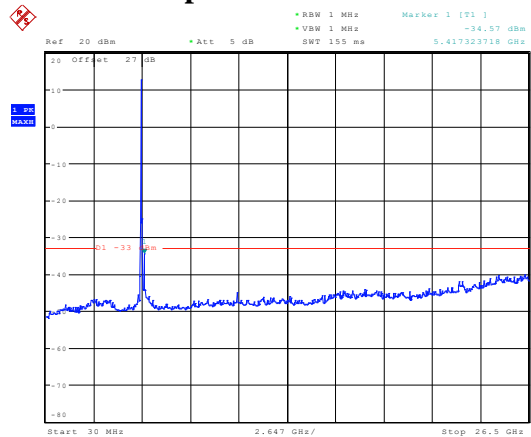


Date: 7.JAN.2010 09:40:46

Date: 7.JAN.2010 10:45:45

**Note -41.34 dBm avg at 5.417 GHz**

**Conducted Spurious Emission 5260MHz 802.11 HT20 Tx0 / Tx1**

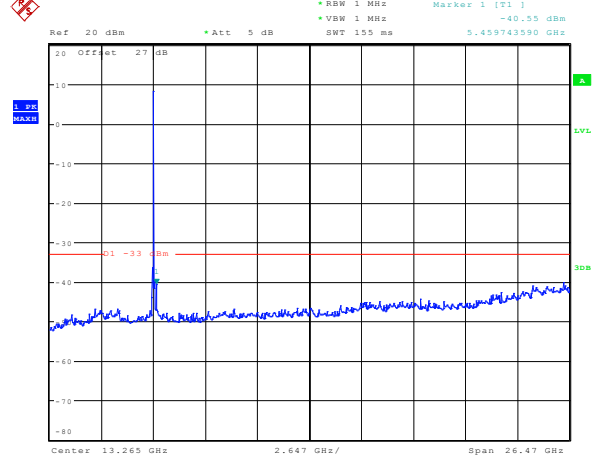
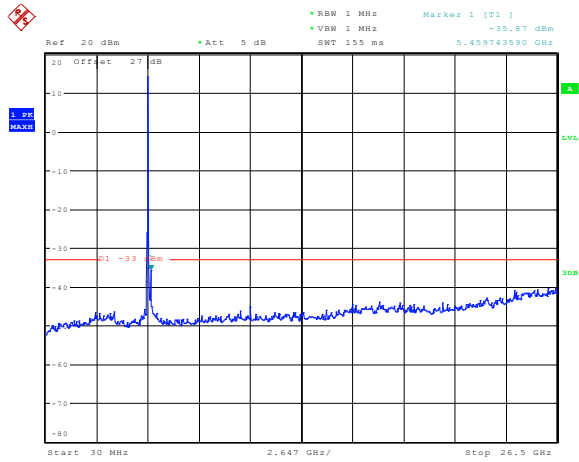


Date: 7.JAN.2010 09:44:32

Date: 7.JAN.2010 10:46:14



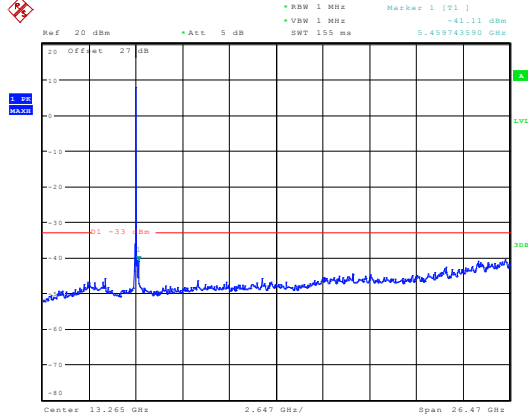
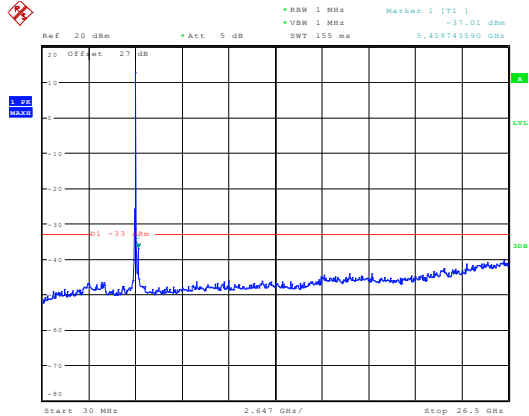
### Conducted Spurious Emission 5300MHz 802.11a Tx0 / Tx1



Date: 7.JAN.2010 09:45:29

Date: 7.JAN.2010 10:46:52

### Conducted Spurious Emission 5300MHz 802.11 HT20 Tx0 / Tx1

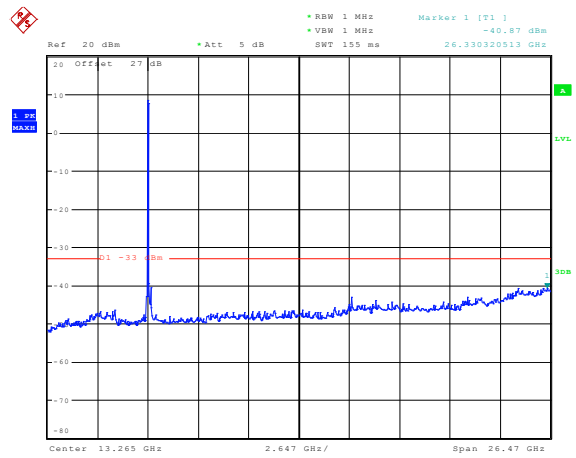
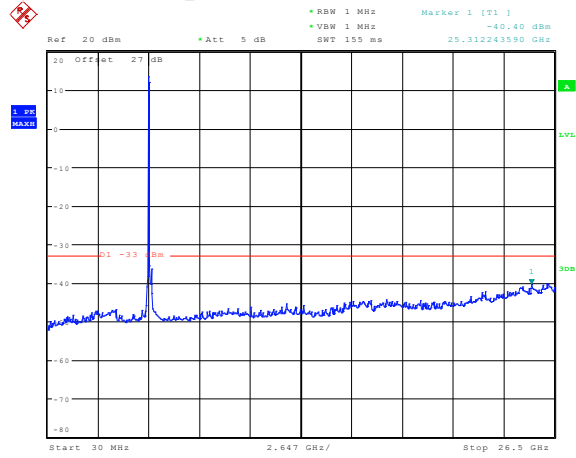


Date: 7.JAN.2010 09:46:25

Date: 7.JAN.2010 10:47:17



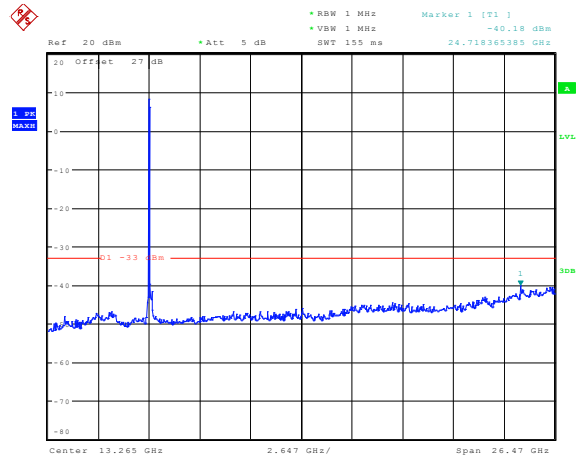
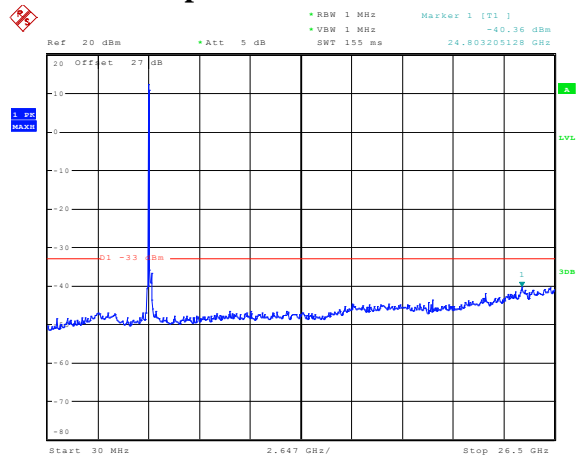
### Conducted Spurious Emission 5320MHz 802.11a Tx0 / Tx1



Date: 7.JAN.2010 09:38:45

Date: 7.JAN.2010 10:48:02

### Conducted Spurious Emission 5320MHz 802.11 HT20 Tx0 / Tx1

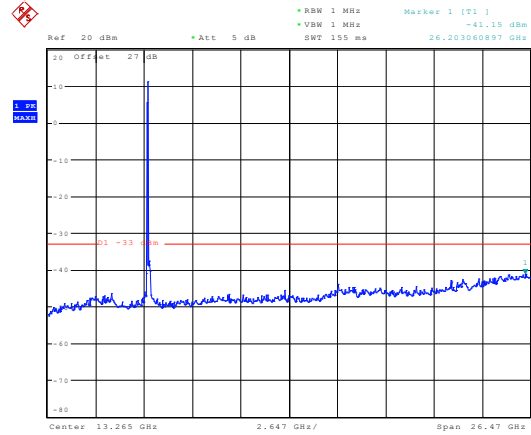
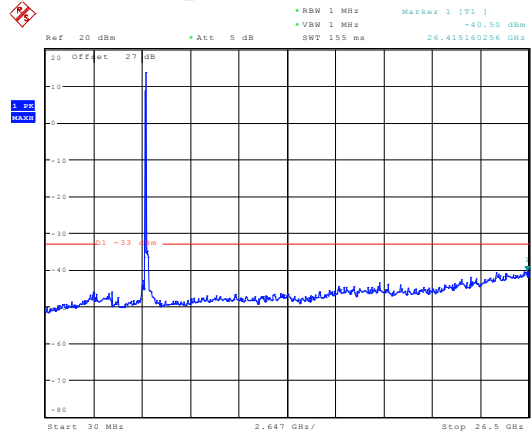


Date: 7.JAN.2010 09:39:56

Date: 7.JAN.2010 10:48:29



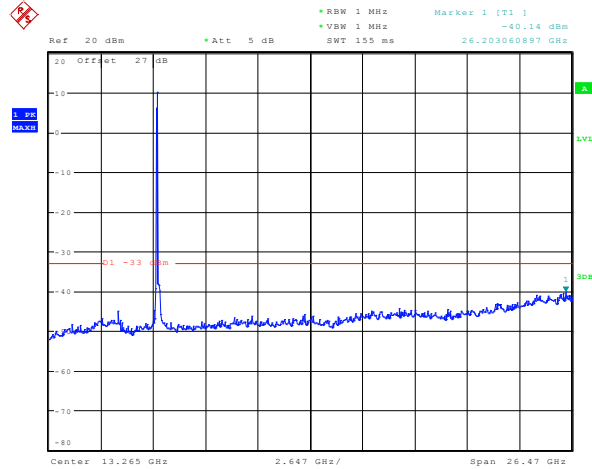
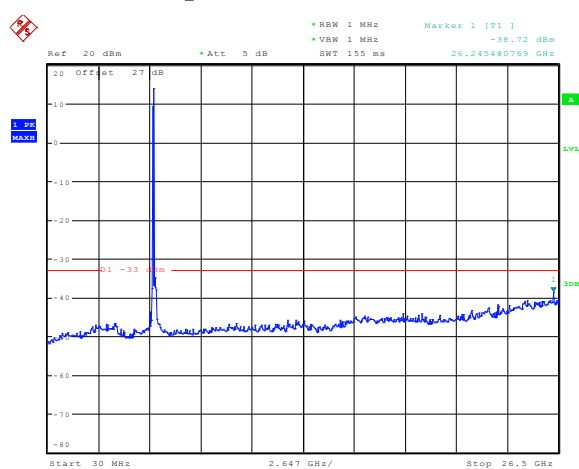
### Conducted Spurious Emission 5500MHz 802.11a Tx0 / Tx1



Date: 7.JAN.2010 09:47:47

Date: 7.JAN.2010 10:49:30

### Conducted Spurious Emission 5500MHz 802.11 HT20 Tx0 / Tx1



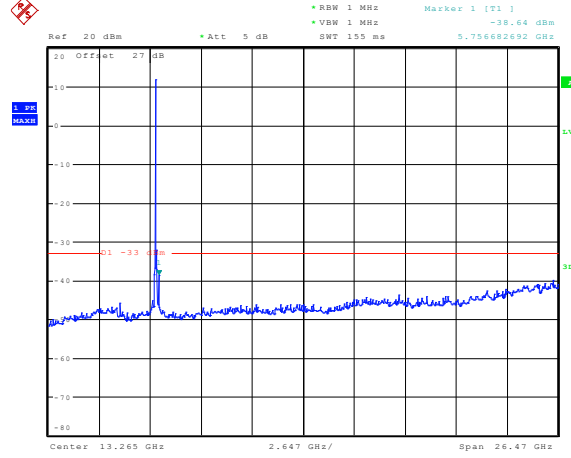
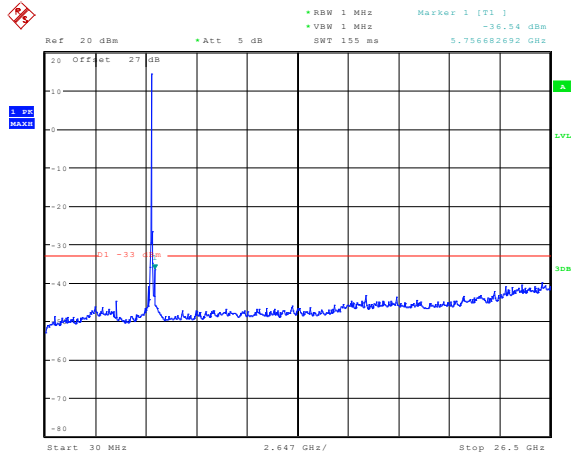
Date: 7.JAN.2010 09:48:34

Date: 7.JAN.2010 10:50:10



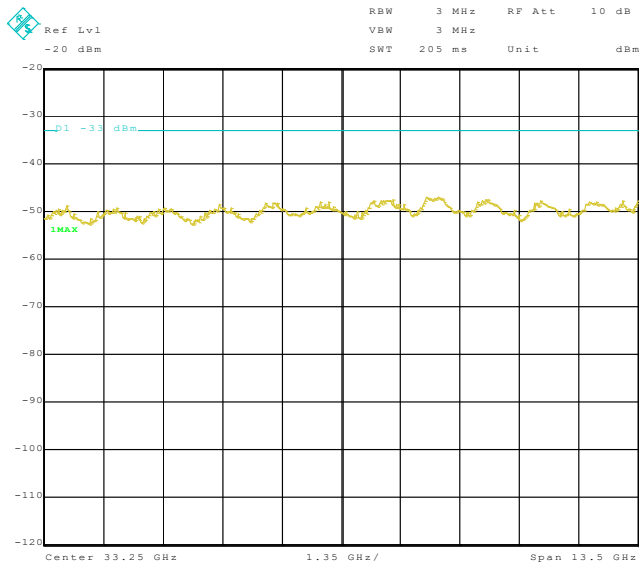


**Conducted Spurious Emission 5600MHz 802.11a Tx0 / Tx1**

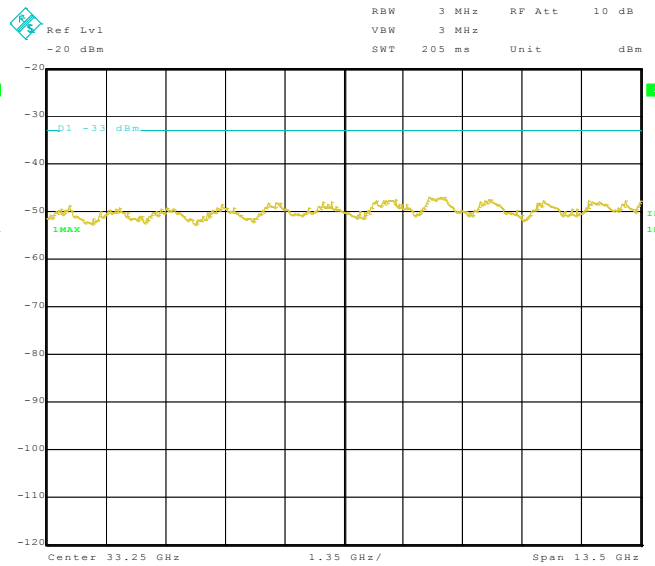


Date: 7.JAN.2010 09:49:37

Date: 7.JAN.2010 10:50:58



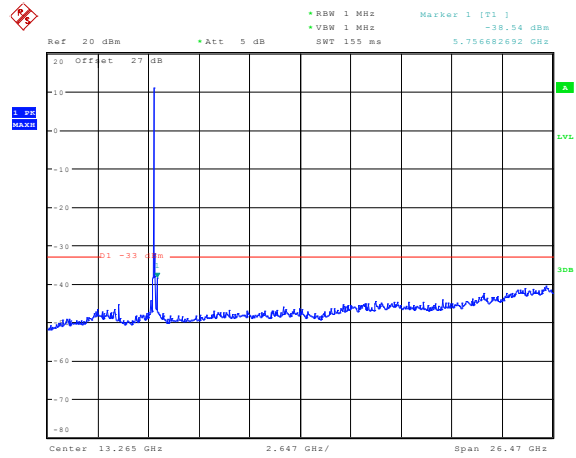
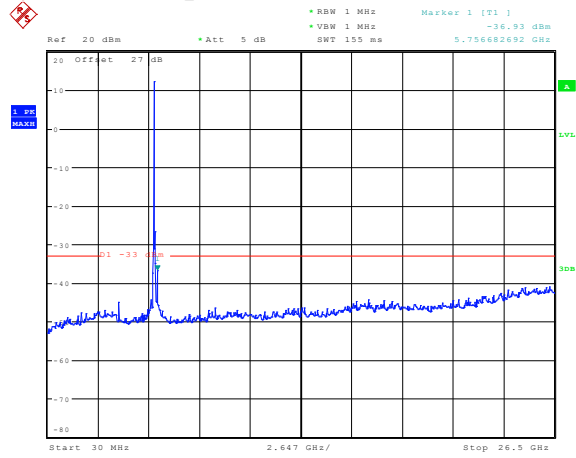
Date: 7.JAN.2010 13:43:29



Date: 7.JAN.2010 13:43:43



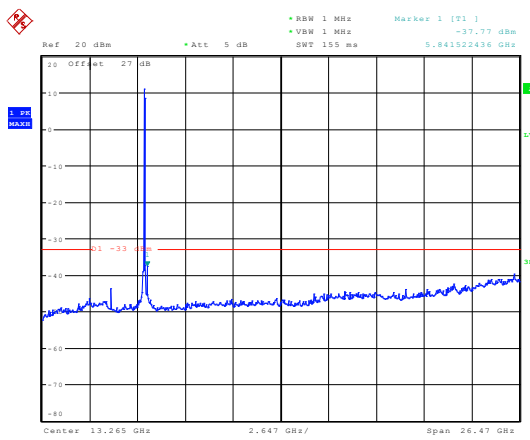
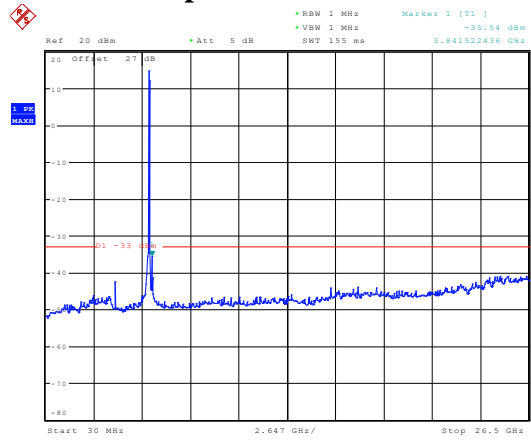
### Conducted Spurious Emission 5600MHz 802.11 HT20 Tx0 / Tx1



Date: 7.JAN.2010 09:50:11

Date: 7.JAN.2010 10:51:24

### Conducted Spurious Emission 5700MHz 802.11a Tx0 / Tx1

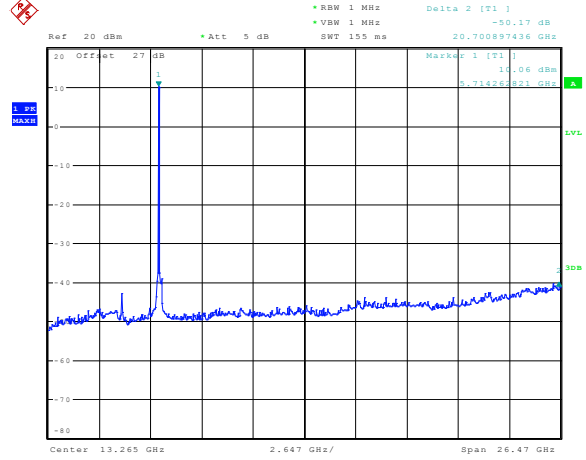
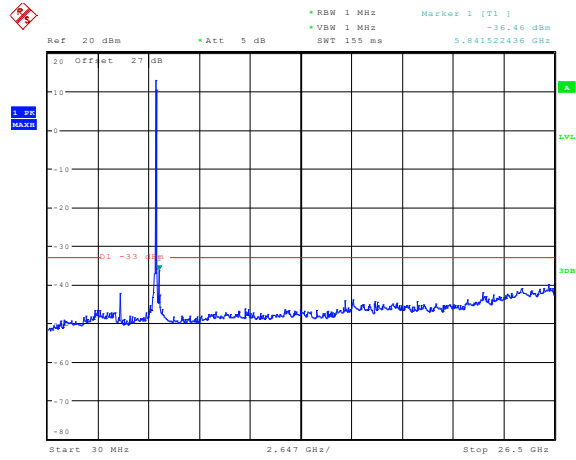


Date: 7.JAN.2010 09:50:57

Date: 7.JAN.2010 10:52:03



### Conducted Spurious Emission 5700MHz 802.11 HT20 Tx0 / Tx1



Date: 7.JAN.2010 09:51:35

Date: 7.JAN.2010 10:54:04



**5.9 Transmitter Spurious Emissions- Radiated**

**5.9.1 Limits: §15.205**

2010 Except as shown in paragraph (d) of this section, only spurious emissions are permitted in any of the frequency bands listed below:

| MHz                 | MHz                   | MHz             | GHz              |
|---------------------|-----------------------|-----------------|------------------|
| 0.090 - 0.110       | 16.42 - 16.423        | 399.9 - 410     | 4.5 - 5.15       |
| 0.495 - 0.505       | 16.69475 - 16.69525   | 608 - 614       | 5.35 - 5.46      |
| 2.1735 - 2.1905     | 16.80425 - 16.80475   | 960 - 1240      | 7.25 - 7.75      |
| 4.125 - 4.128       | 25.5 - 25.67          | 1300 - 1427     | 8.025 - 8.5      |
| 4.17725 - 4.17775   | 37.5 - 38.25          | 1435 - 1626.5   | 9.0 - 9.2        |
| 4.20725 - 4.20775   | 73 - 74.6             | 1645.5 - 1646.5 | 9.3 - 9.5        |
| 6.215 - 6.218       | 74.8 - 75.2           | 1660 - 1710     | 10.6 - 12.7      |
| 6.26775 - 6.26825   | 108 - 121.94          | 1718.8 - 1722.2 | 13.25 - 13.4     |
| 6.31175 - 6.31225   | 123 - 138             | 2200 - 2300     | 14.47 - 14.5     |
| 8.291 - 8.294       | 149.9 - 150.05        | 2310 - 2390     | 15.35 - 16.2     |
| 8.362 - 8.366       | 156.52475 - 156.52525 | 2483.5 - 2500   | 17.7 - 21.4      |
| 8.37625 - 8.38675   | 156.7 - 156.9         | 2690 - 2900     | 22.01 - 23.12    |
| 8.41425 - 8.41475   | 162.0125 - 167.17     | 3260 - 3267     | 23.6 - 24.0      |
| 12.29 - 12.293      | 167.72 - 173.2        | 3332 - 3339     | 31.2 - 31.8      |
| 12.51975 - 12.52025 | 240 - 285             | 3345.8 - 3358   | 36.43 - 36.5     |
| 12.57675 - 12.57725 | 322 - 335.4           | 3600 - 4400     | ( <sup>2</sup> ) |
| 13.36 - 13.41       |                       |                 |                  |

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator 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 an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. In addition, 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)).

\*PEAK LIMIT= 74dBµV/m  
 \*AVG. LIMIT= 54dBµV/m



**5.9.2 Limits: §15.209**

(For measurement distance of 3m)

| Frequency of emission (MHz) | Field strength ( $\mu\text{V/m}$ ) |
|-----------------------------|------------------------------------|
| 30–88                       | 100 (40dB $\mu\text{V/m}$ )        |
| 88–216                      | 150 (43.5 dB $\mu\text{V/m}$ )     |
| 216–960                     | 200 (46 dB $\mu\text{V/m}$ )       |
| Above 960                   | 500 (54 dB $\mu\text{V/m}$ )       |

**NOTE:**

2010 The radiated emissions were done with different settings, using the relevant pre-amplifiers for the relevant frequency ranges. This is the reason that the graphs show different noise levels. In the range between 3 and 25 GHz very short cable connections to the antenna was used to minimize the noise level.

2. All measurements are done in Peak mode using an Average limit, unless specified within the plots.

**5.9.3 Limits: §15.209**

| Frequency of emission (MHz) | Field strength ( $\mu\text{V/m}$ ) | Measurement Distance (m) |
|-----------------------------|------------------------------------|--------------------------|
| 0.009–0.490                 | 2400/F(kHz)                        | 300                      |
| 0.490–1.705                 | 24000/F(kHz)                       | 30                       |
| 1.705–30.0                  | 30                                 | 30                       |

**5.9.4 Test Result:**

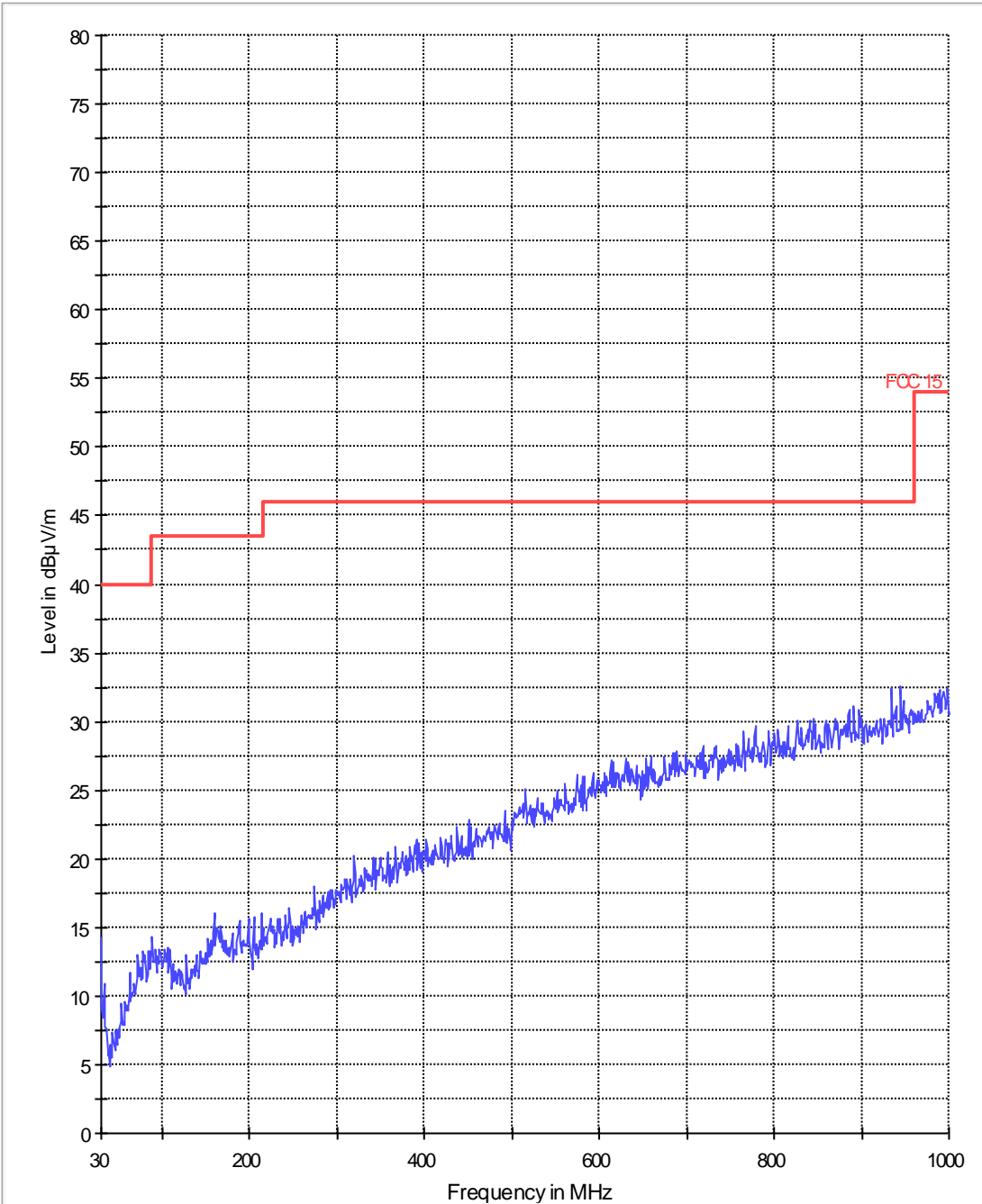
No significant emissions measurable. Plots reported here represent the worse case emissions, and both Horizontal and Vertical polarizations. 802.11a represents worst case.



5.9.5 Test data/ plots:

NOTE – Worst case plot for all channels and modes.

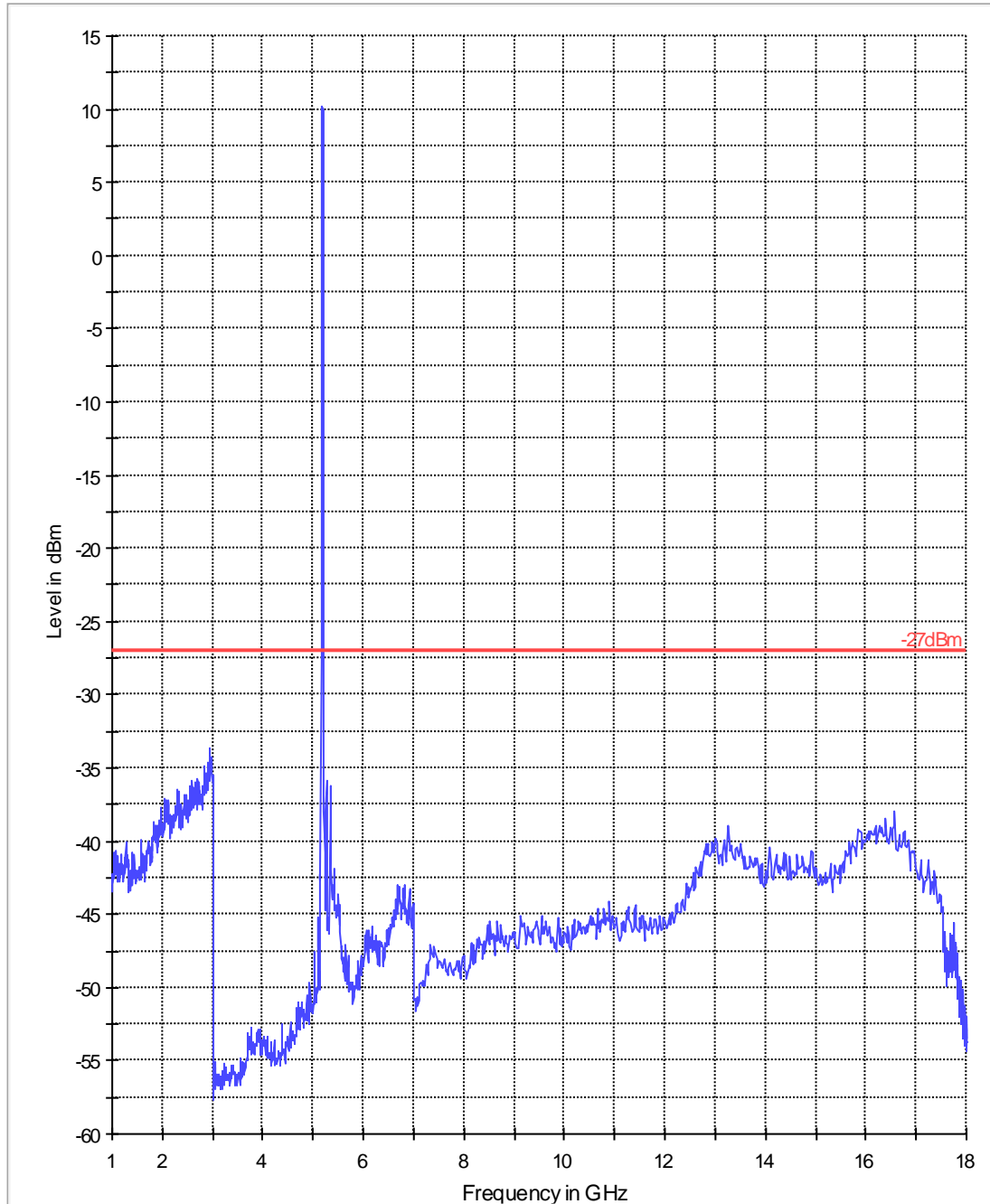
FCC 15.30-1000MHz





# Tx1 1-18 a ch36

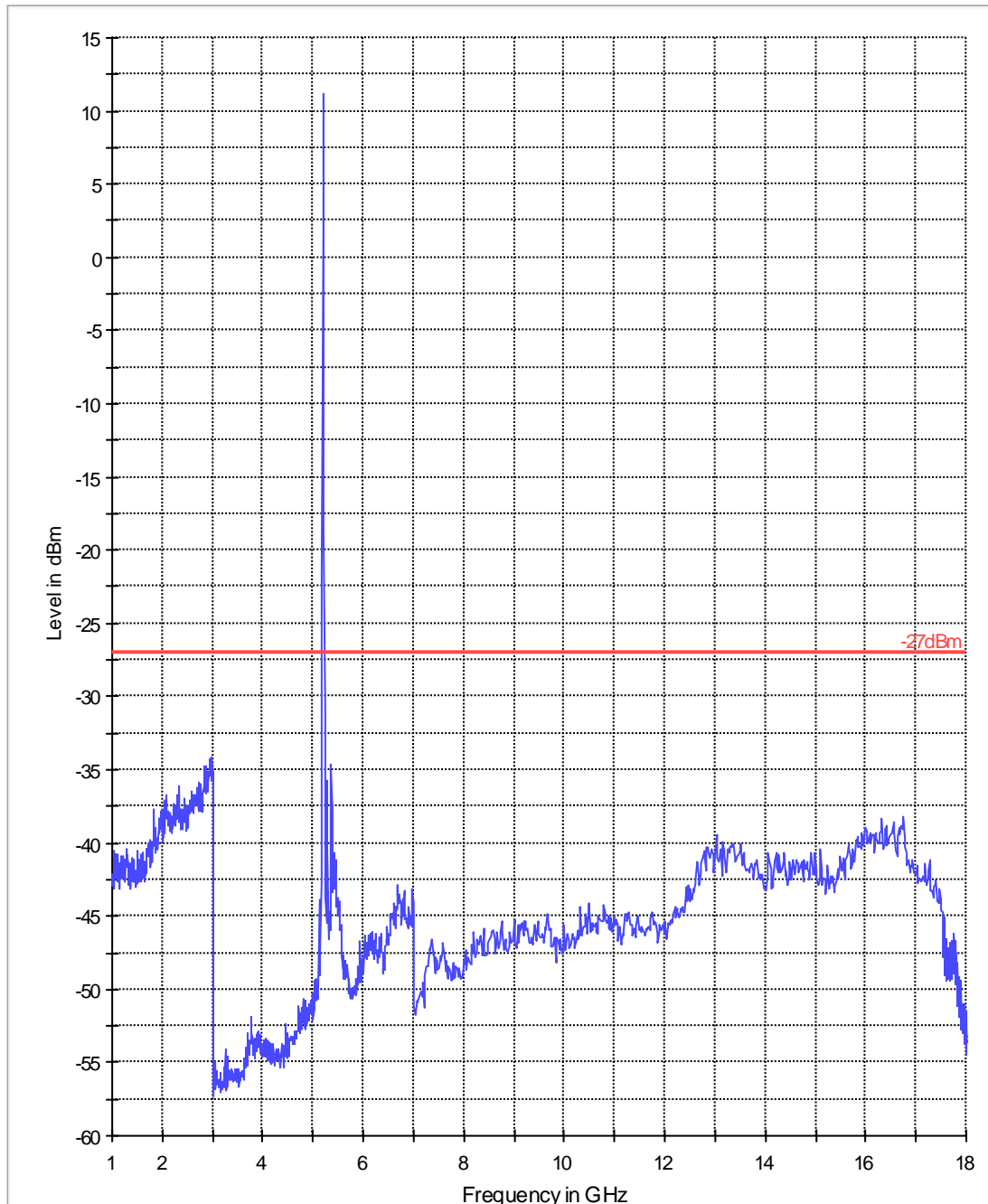
FCC 15.407 1-18GHz





# Tx1 1-18 a ch40

FCC 15.407 1-18GHz

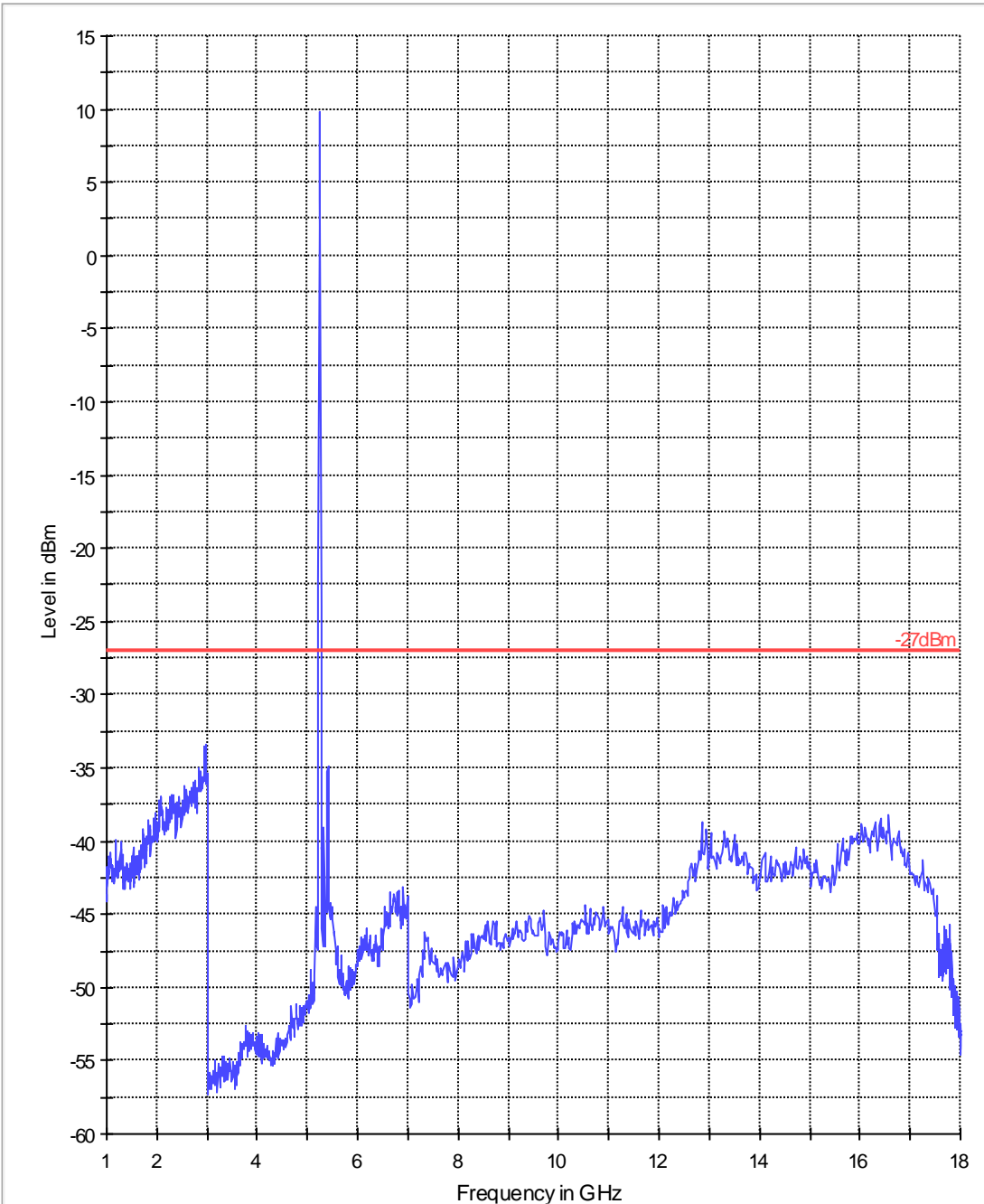






# Tx1 1-18 a ch48

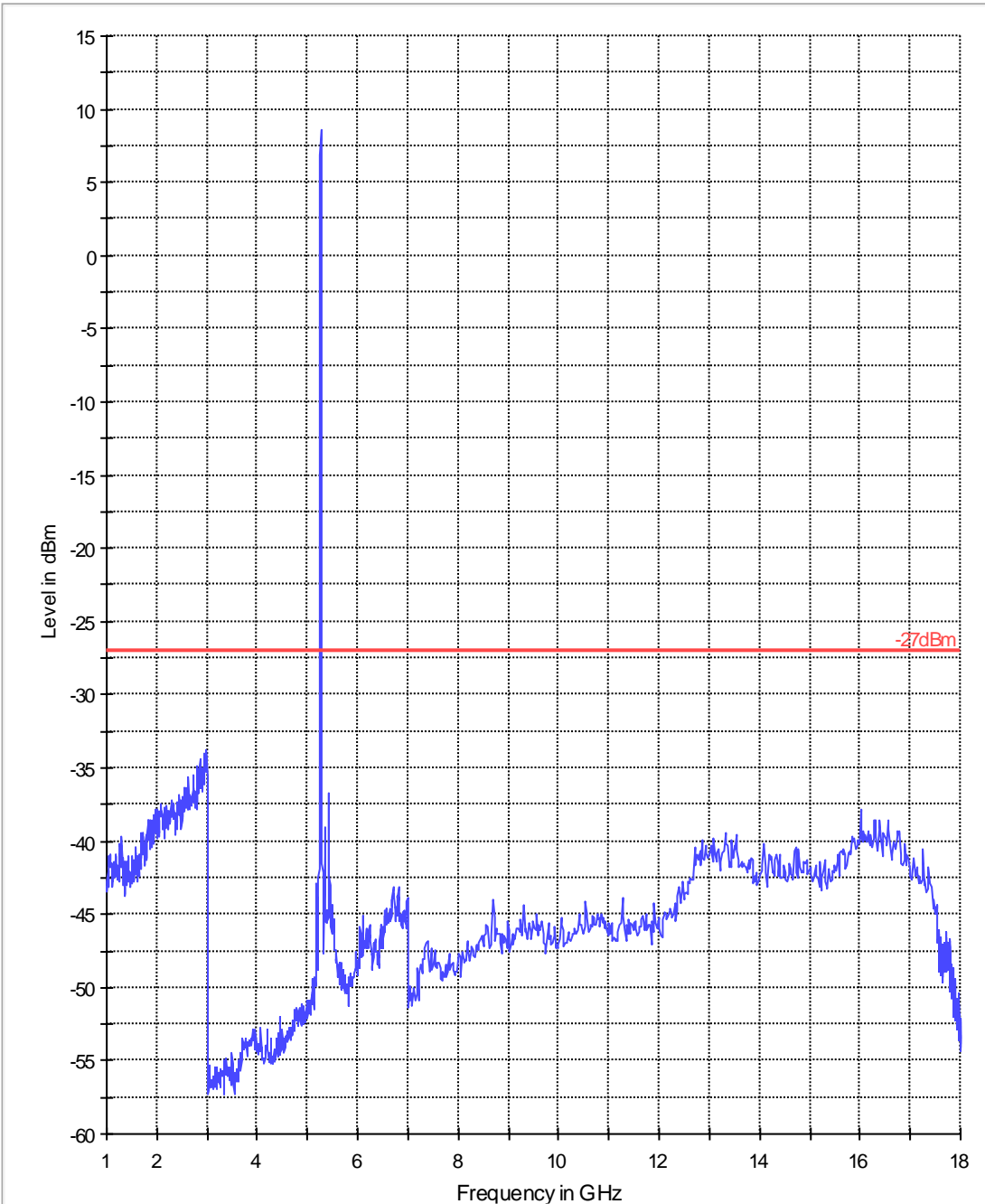
FCC 15.407 1-18GHz





# Tx1 1-18 a ch52

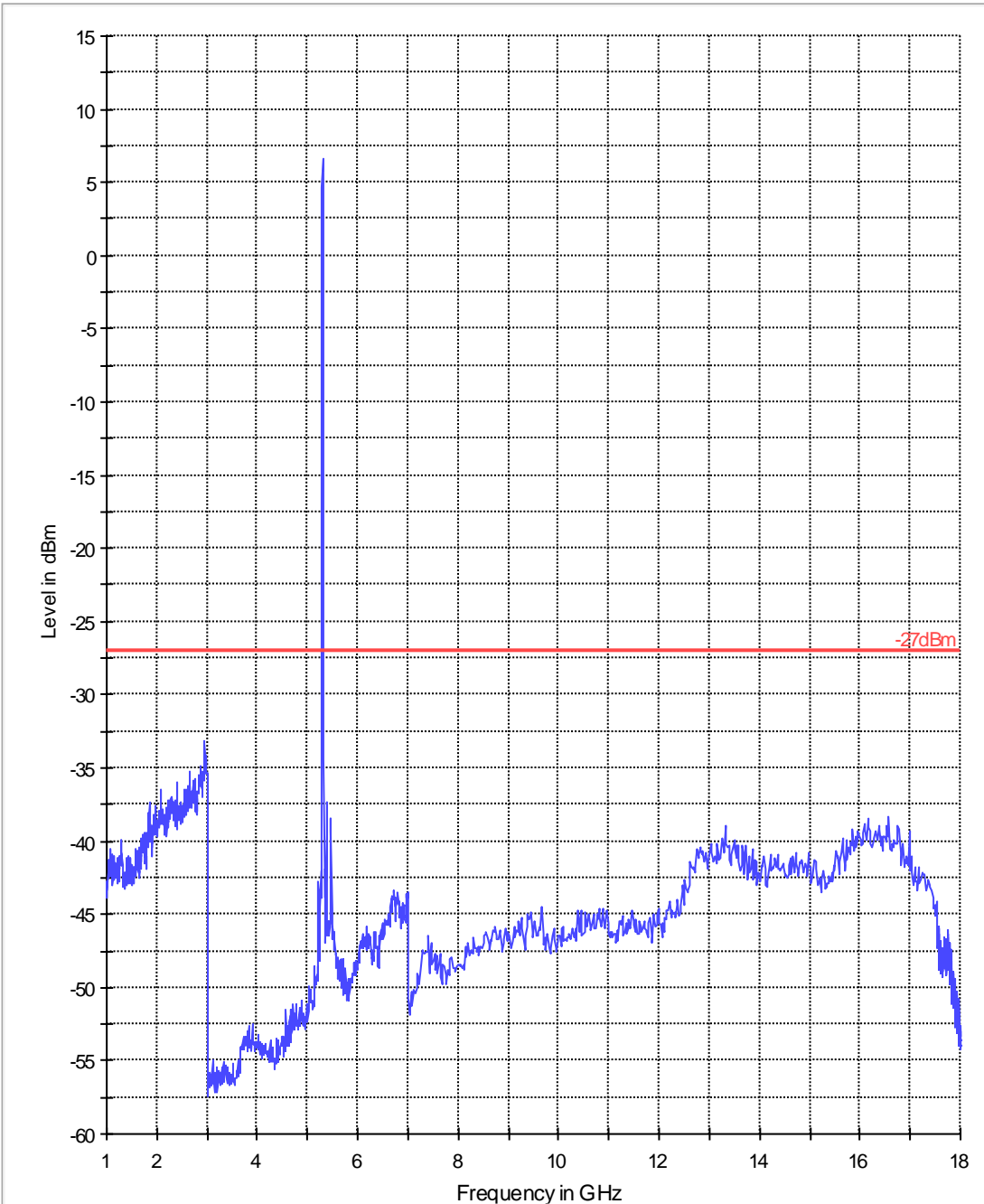
FCC 15.407 1-18GHz





# Tx1 1-18 a ch60

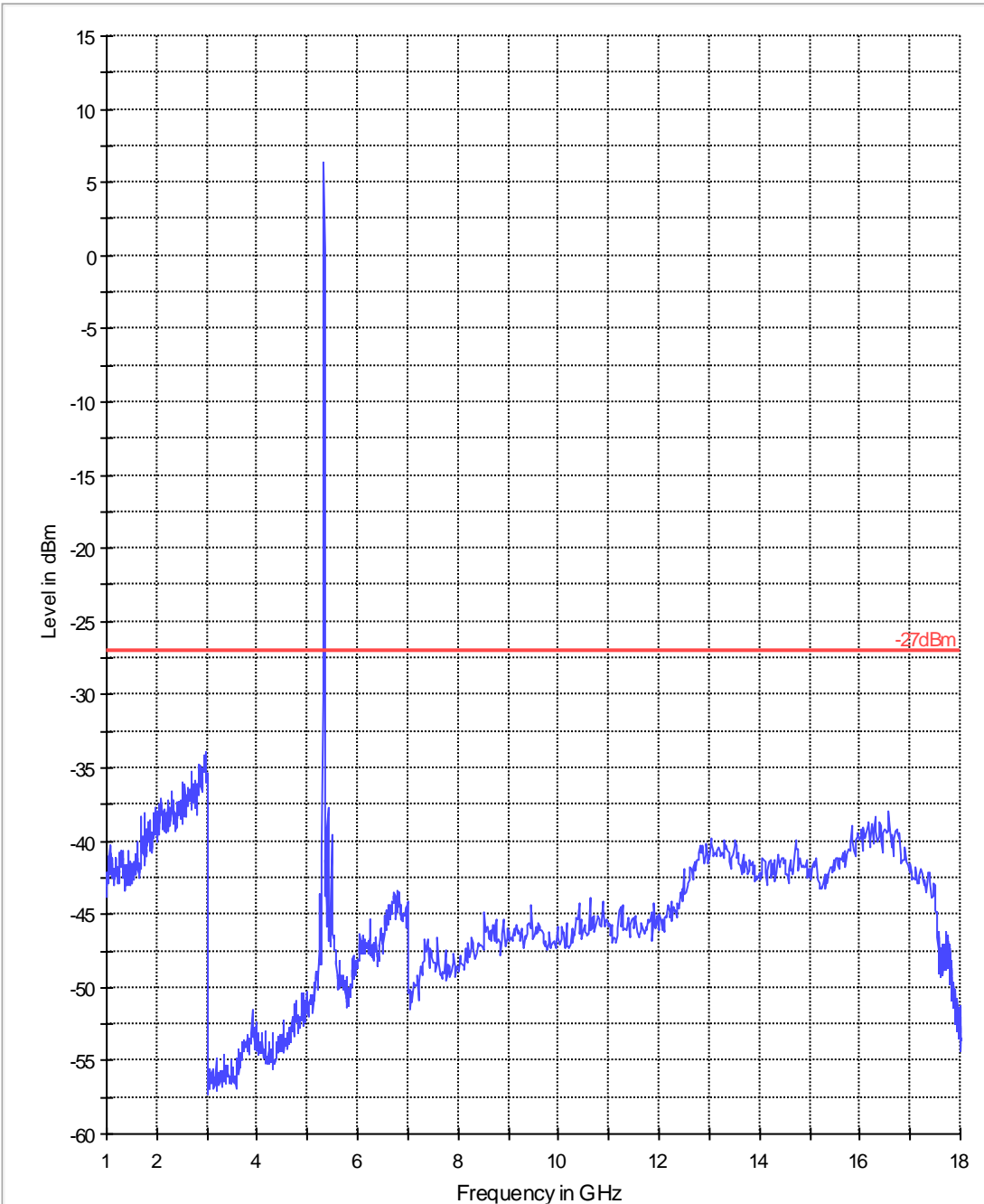
FCC 15.407 1-18GHz





# Tx1 1-18 a ch64

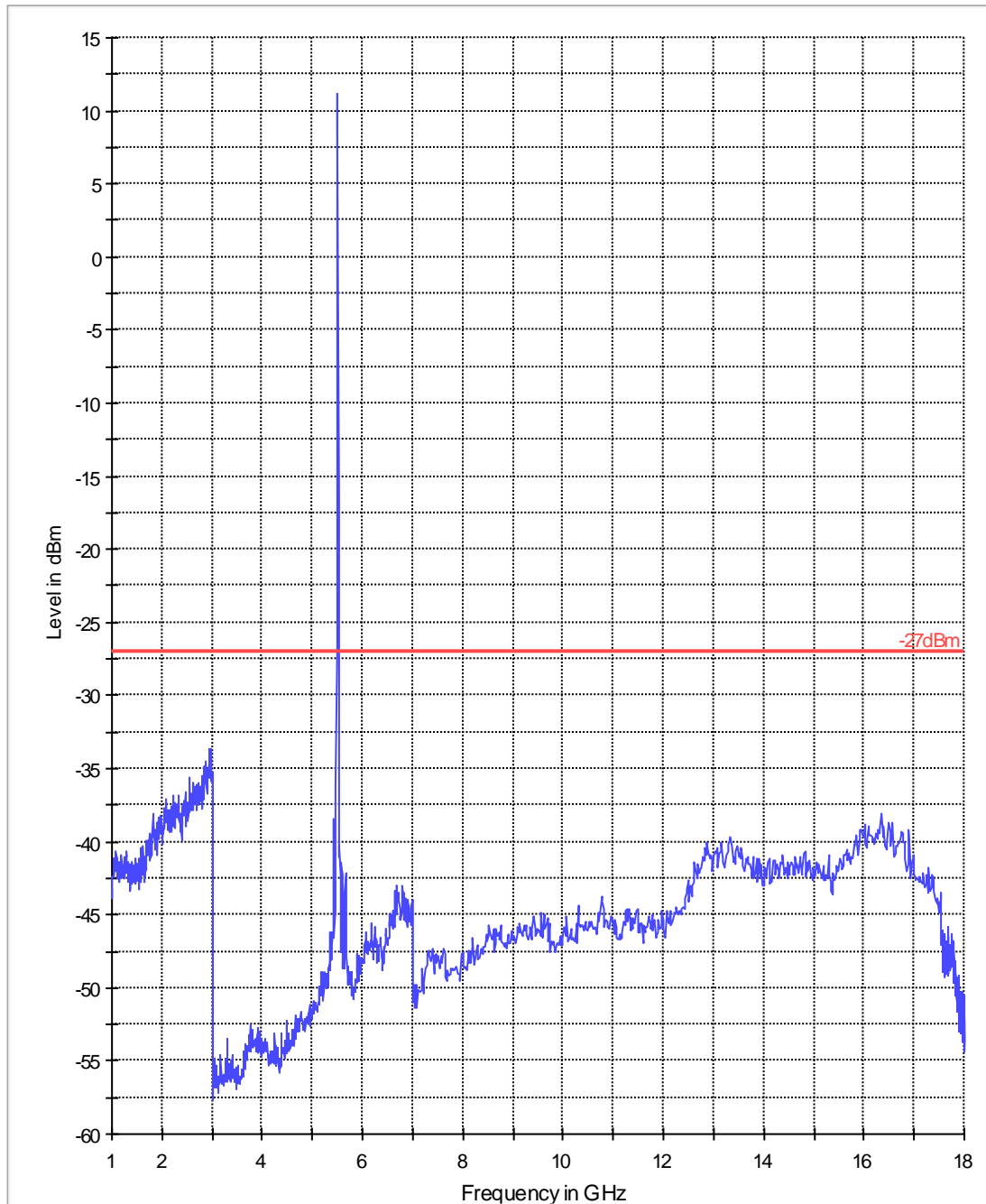
FCC 15.407 1-18GHz





# Tx1 1-18 a ch100

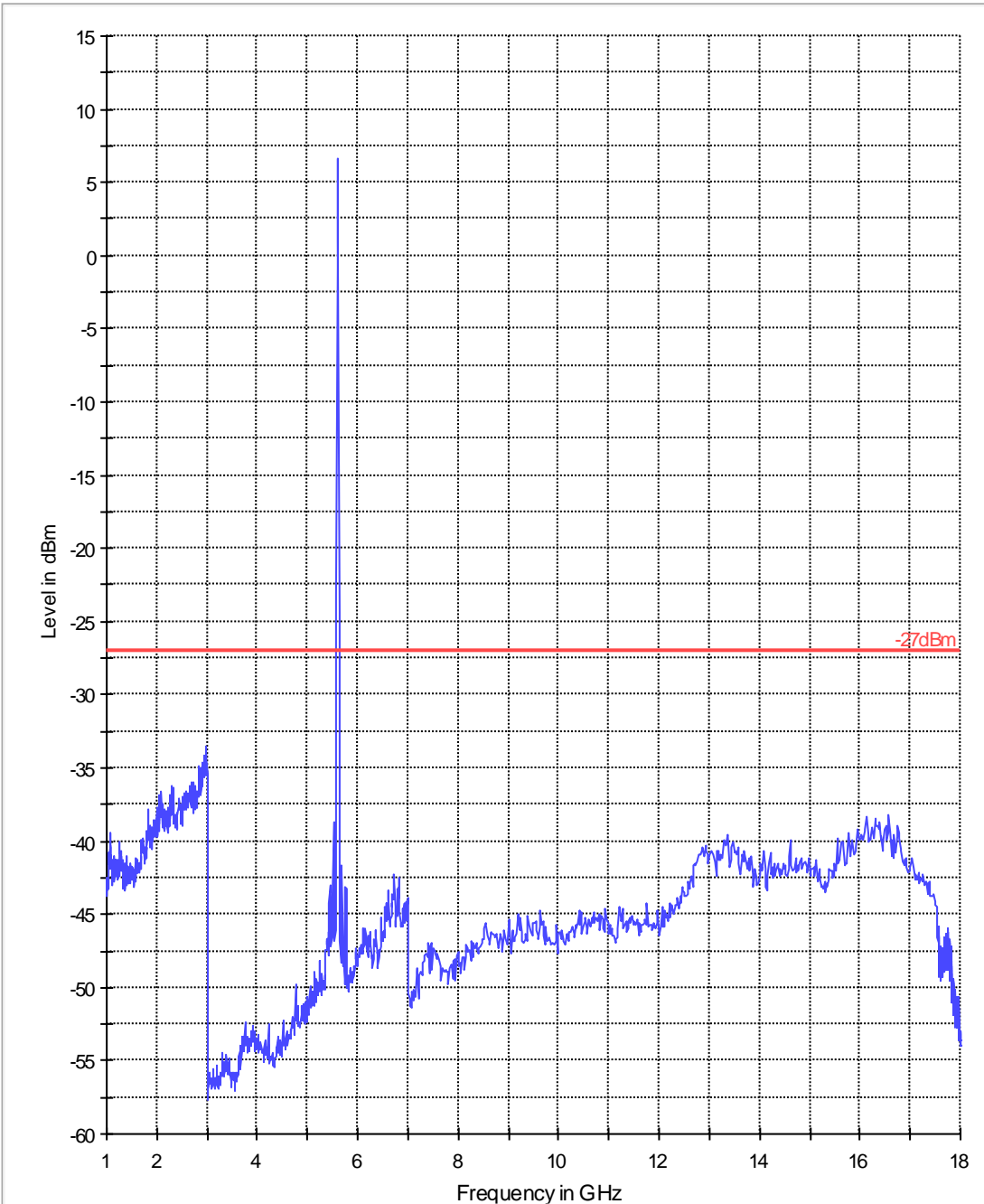
FCC 15.407 1-18GHz





# Tx1 1-18 a ch120

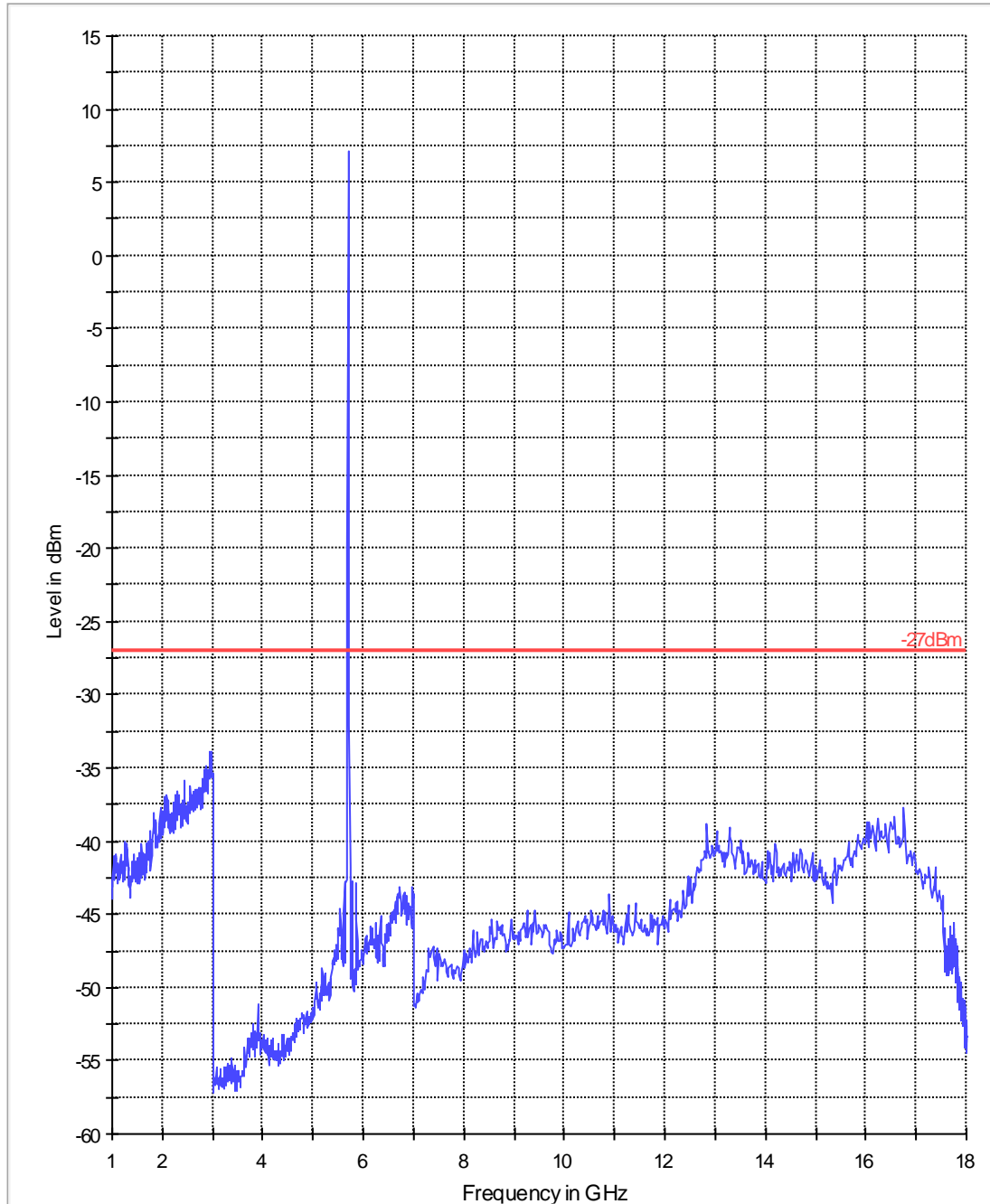
FCC 15.407 1-18GHz





# Tx1 1-18 a ch140

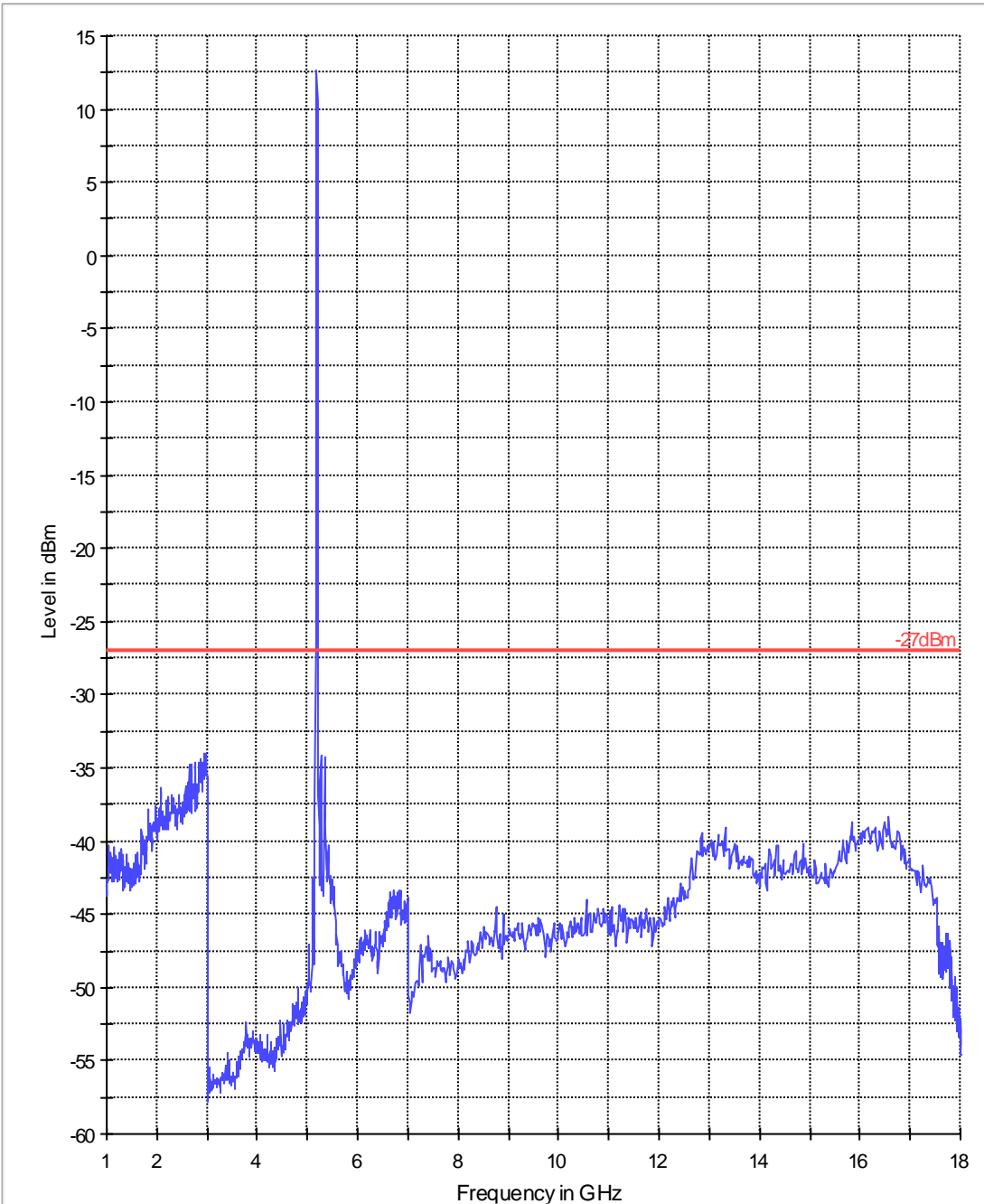
FCC 15.407 1-18GHz





# Tx0 1-18 a ch36

FCC 15.407 1-18GHz

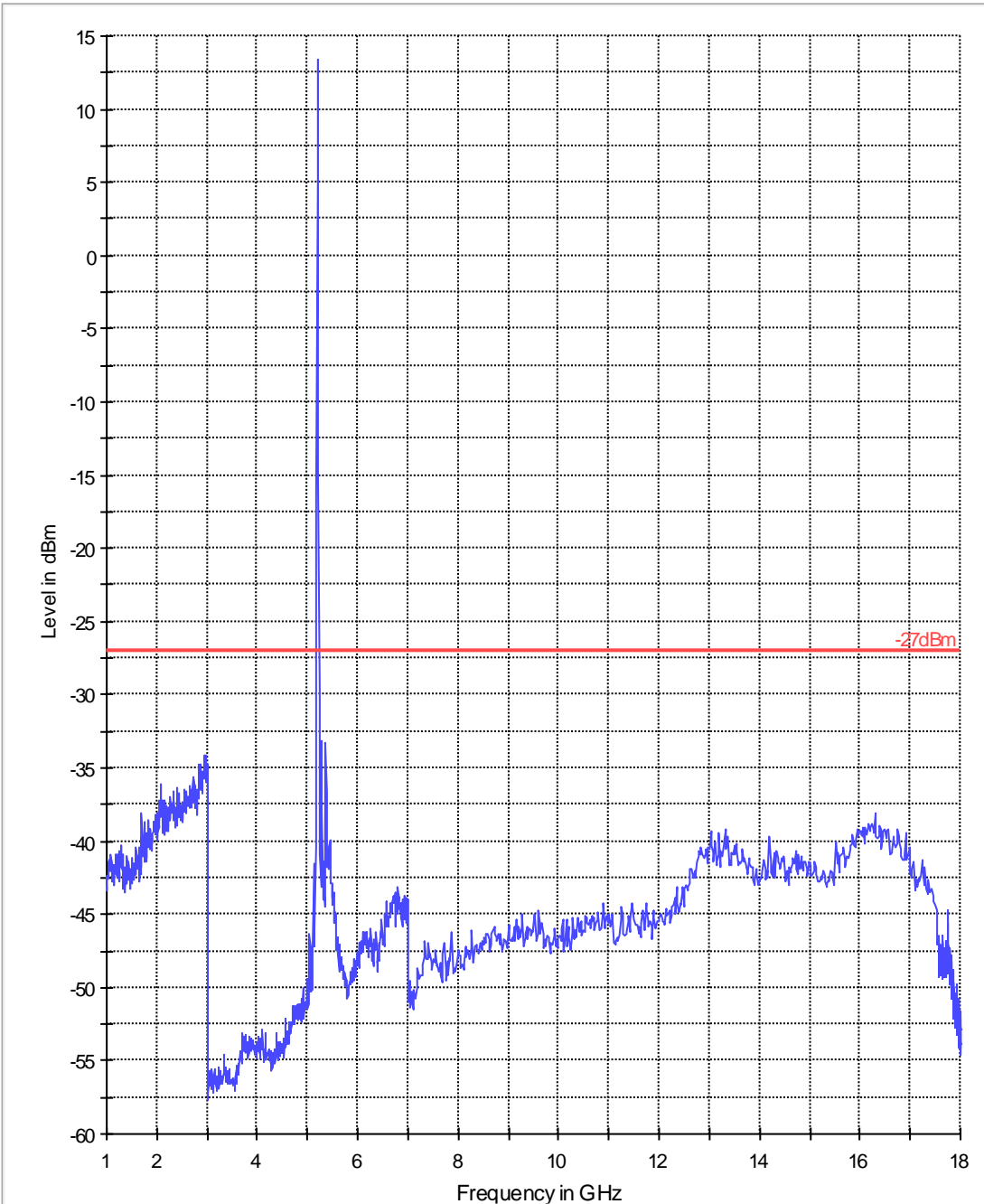






# Tx0 1-18 a ch40

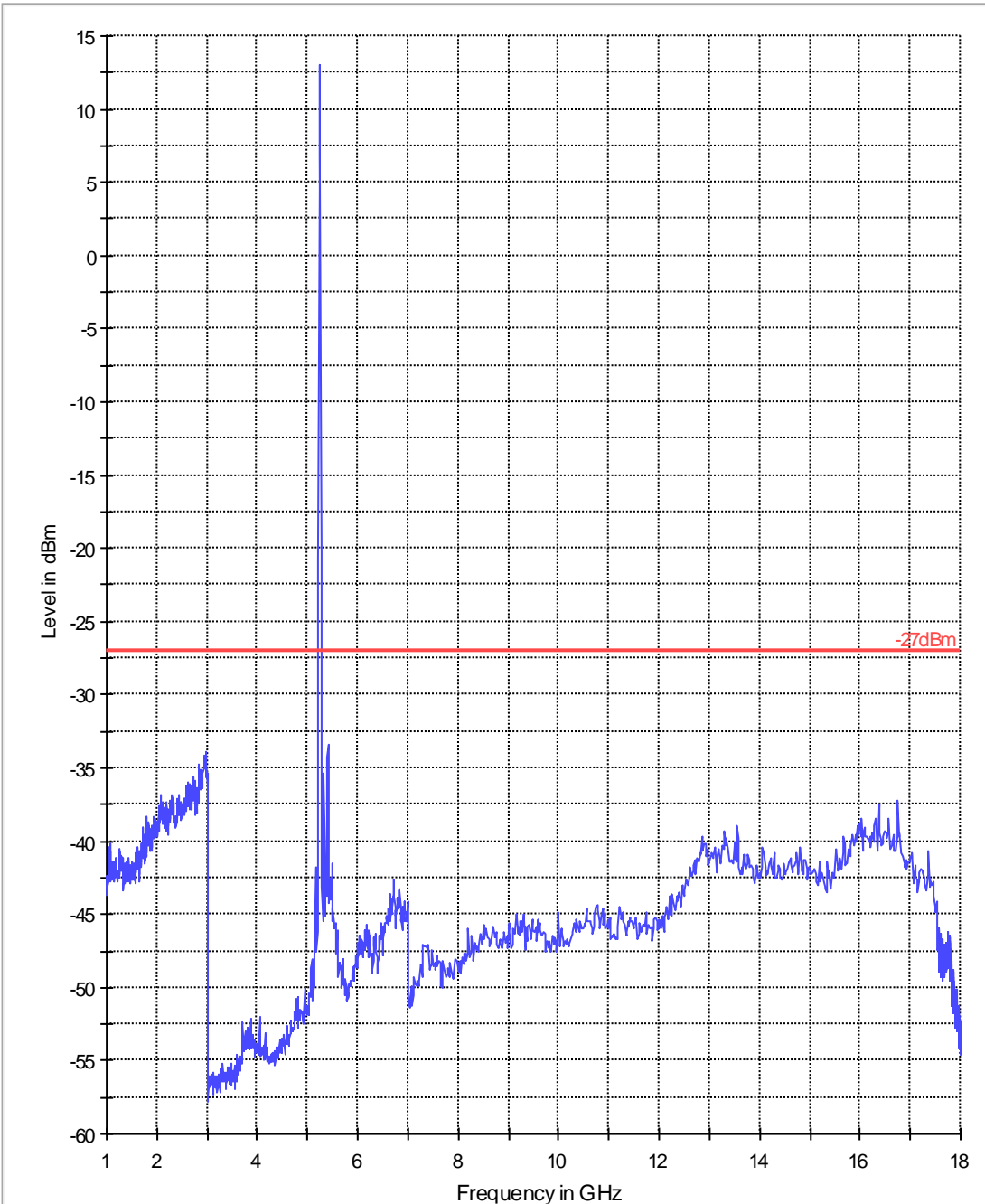
FCC 15.407 1-18GHz





# Tx0 1-18 a ch48

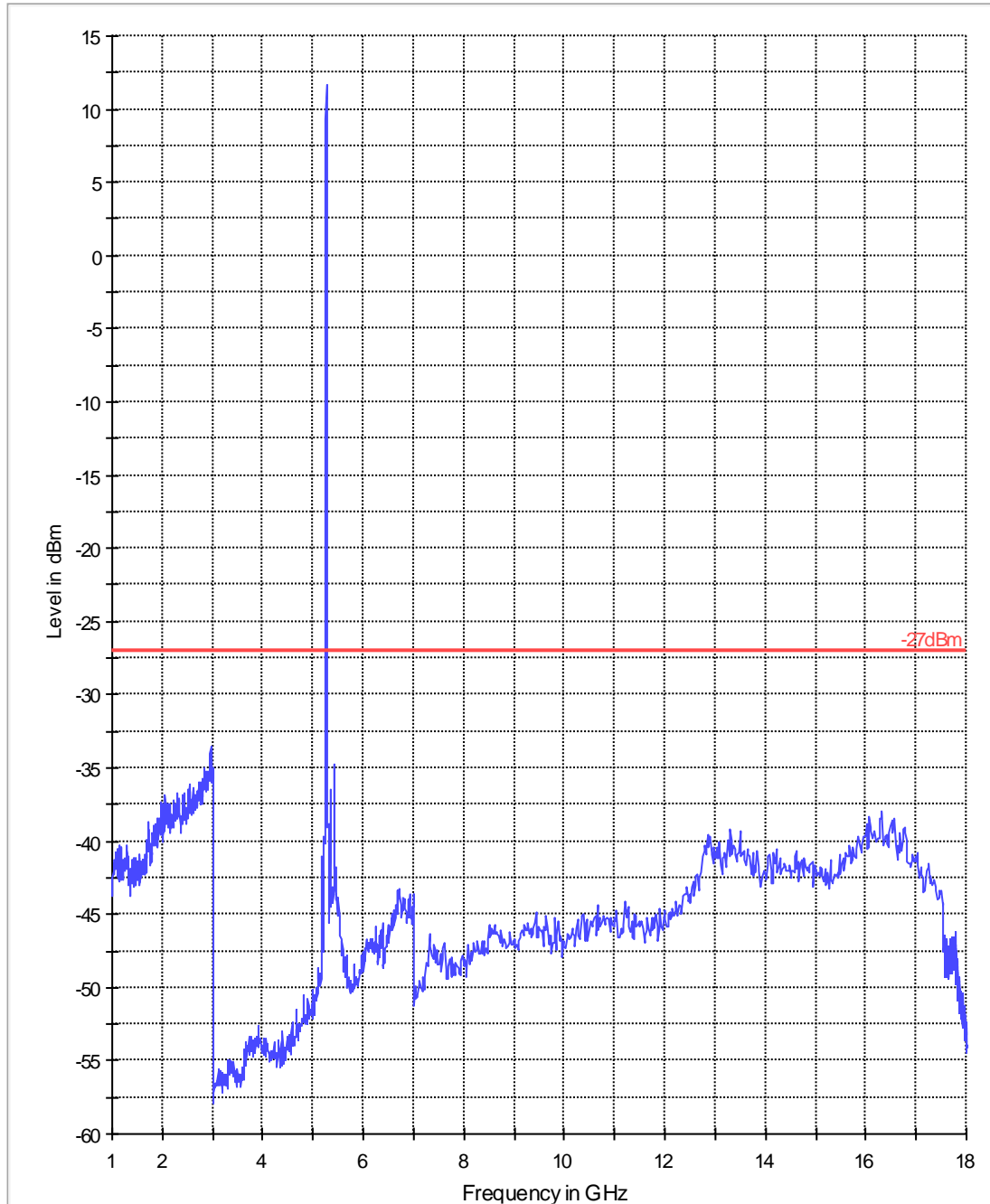
FCC 15.407 1-18GHz





# Tx0 1-18 a ch52

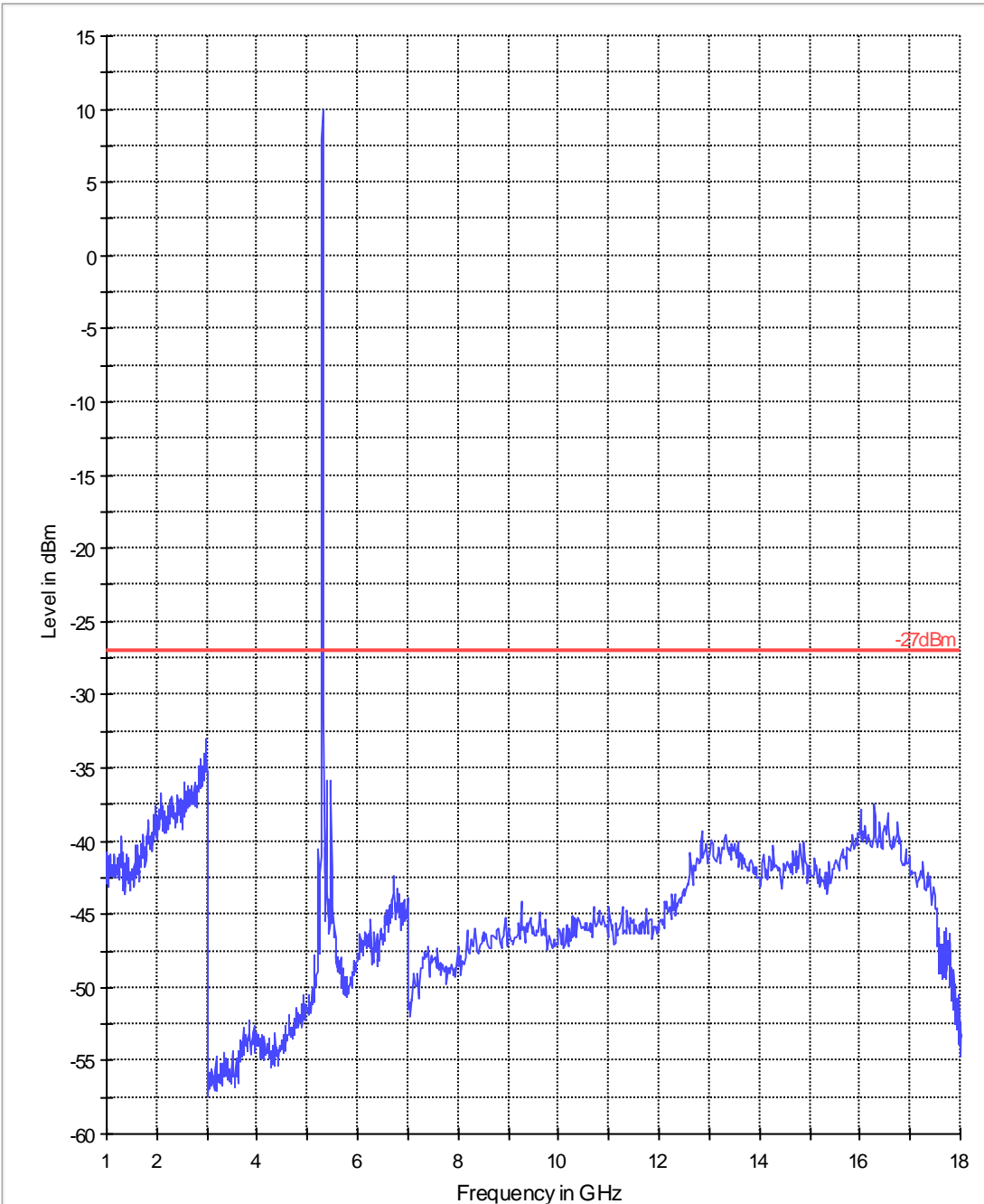
FCC 15.407 1-18GHz





# Tx0 1-18 a ch60

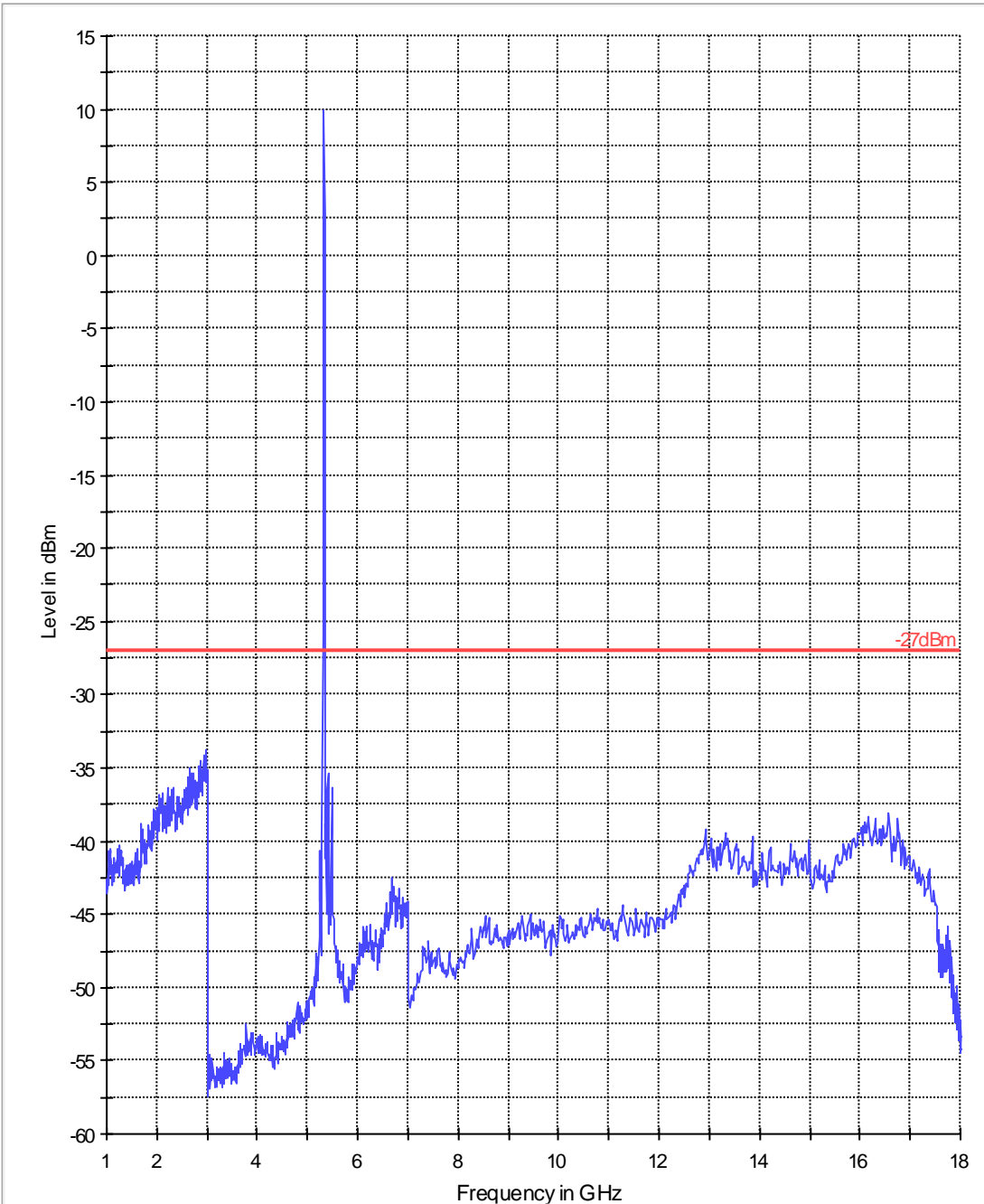
FCC 15.407 1-18GHz





# Tx0 1-18 a ch64

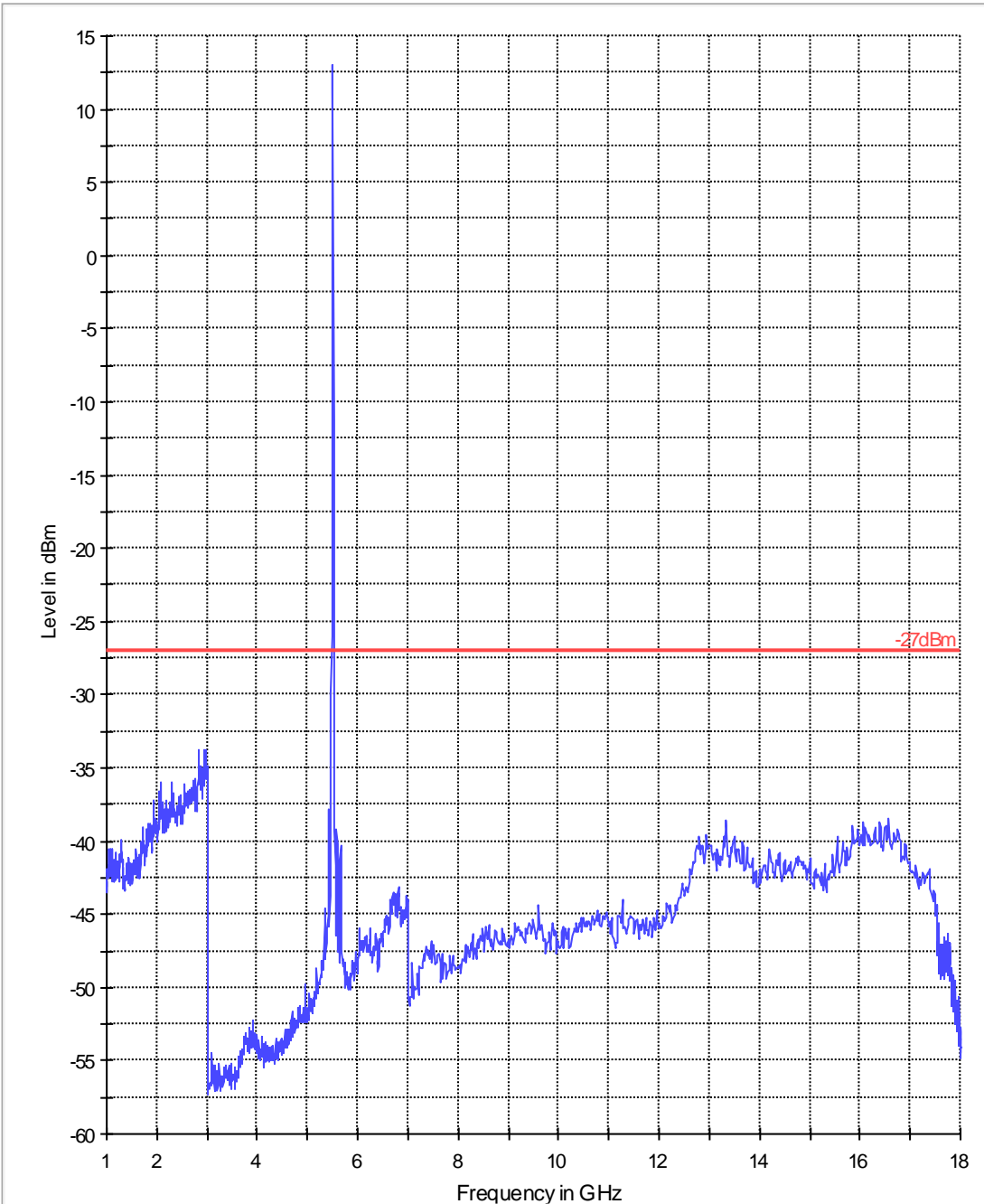
FCC 15.407 1-18GHz





# Tx0 1-18 a ch100

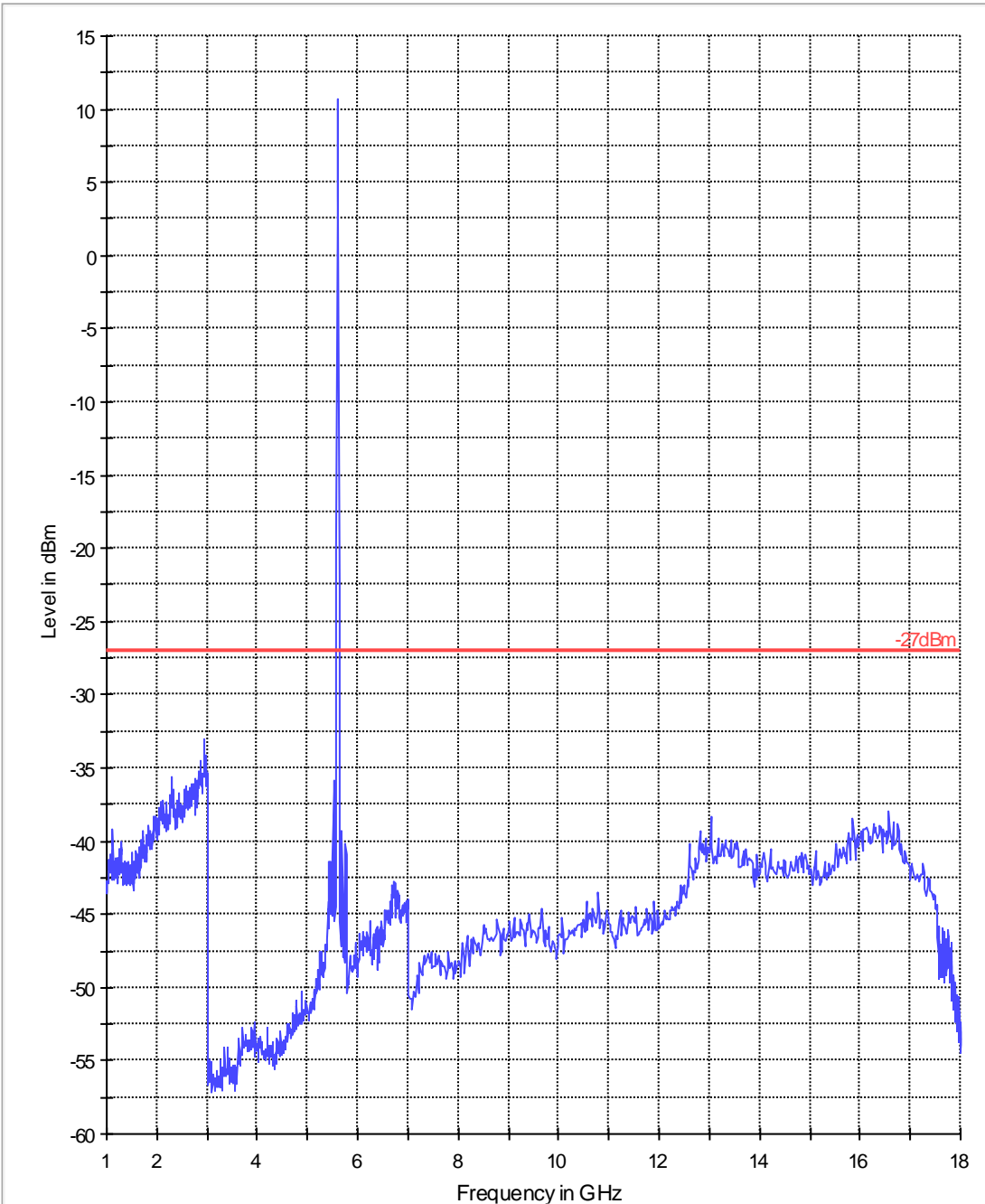
FCC 15.407 1-18GHz





# Tx0 1-18 a ch120

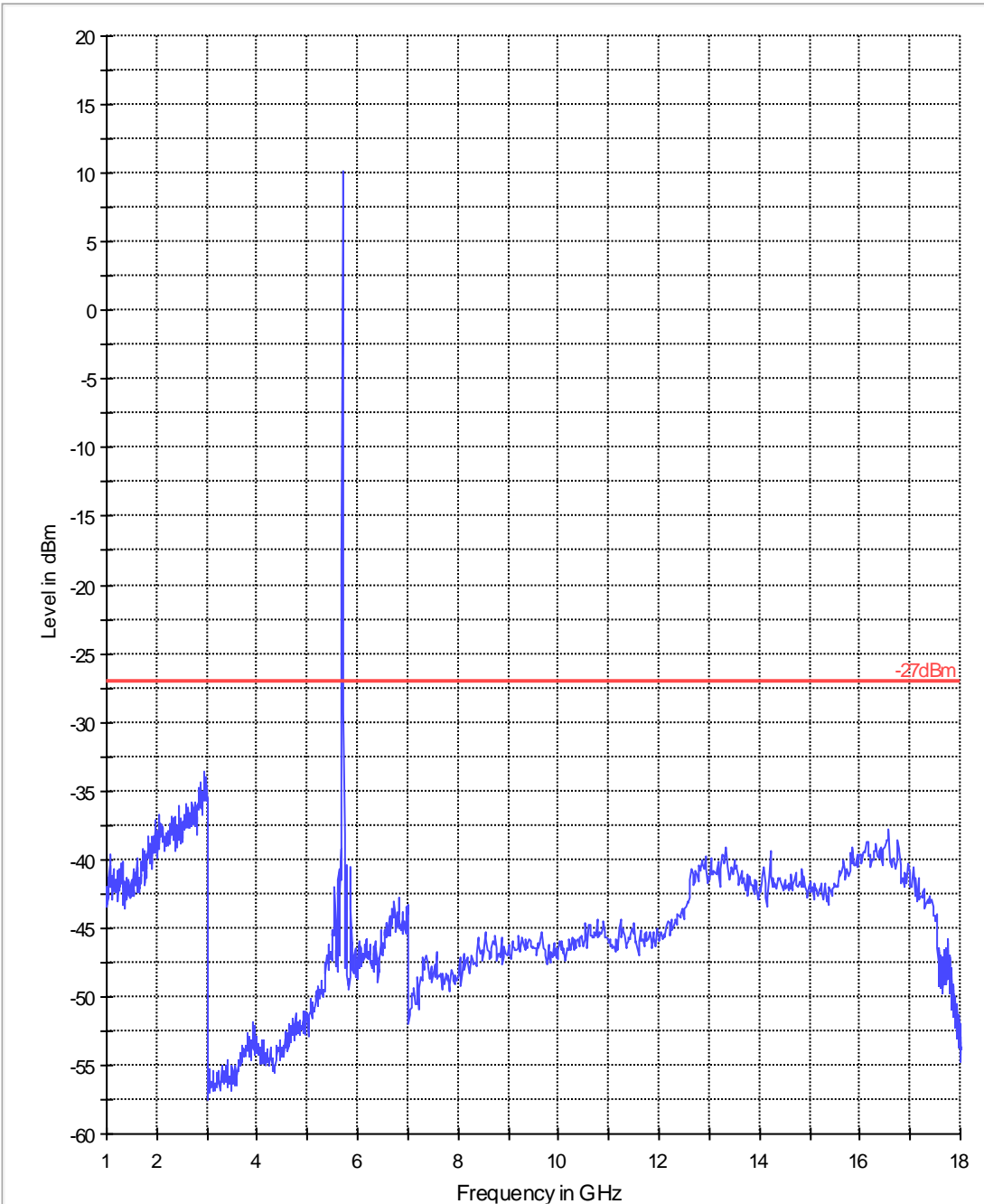
FCC 15.407 1-18GHz





# Tx0 1-18 a ch140

FCC 15.407 1-18GHz

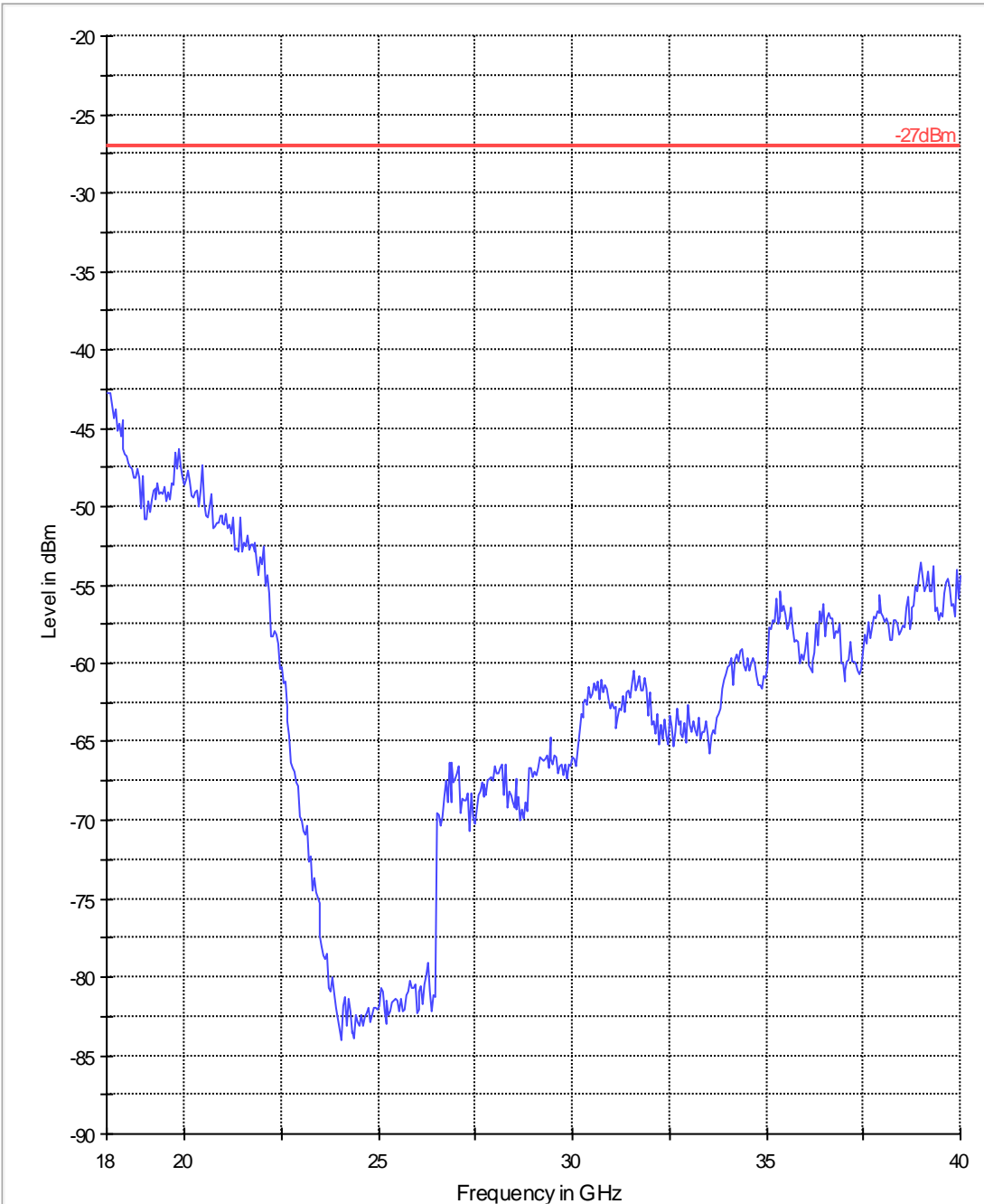






# Tx0 18-40 a ch40

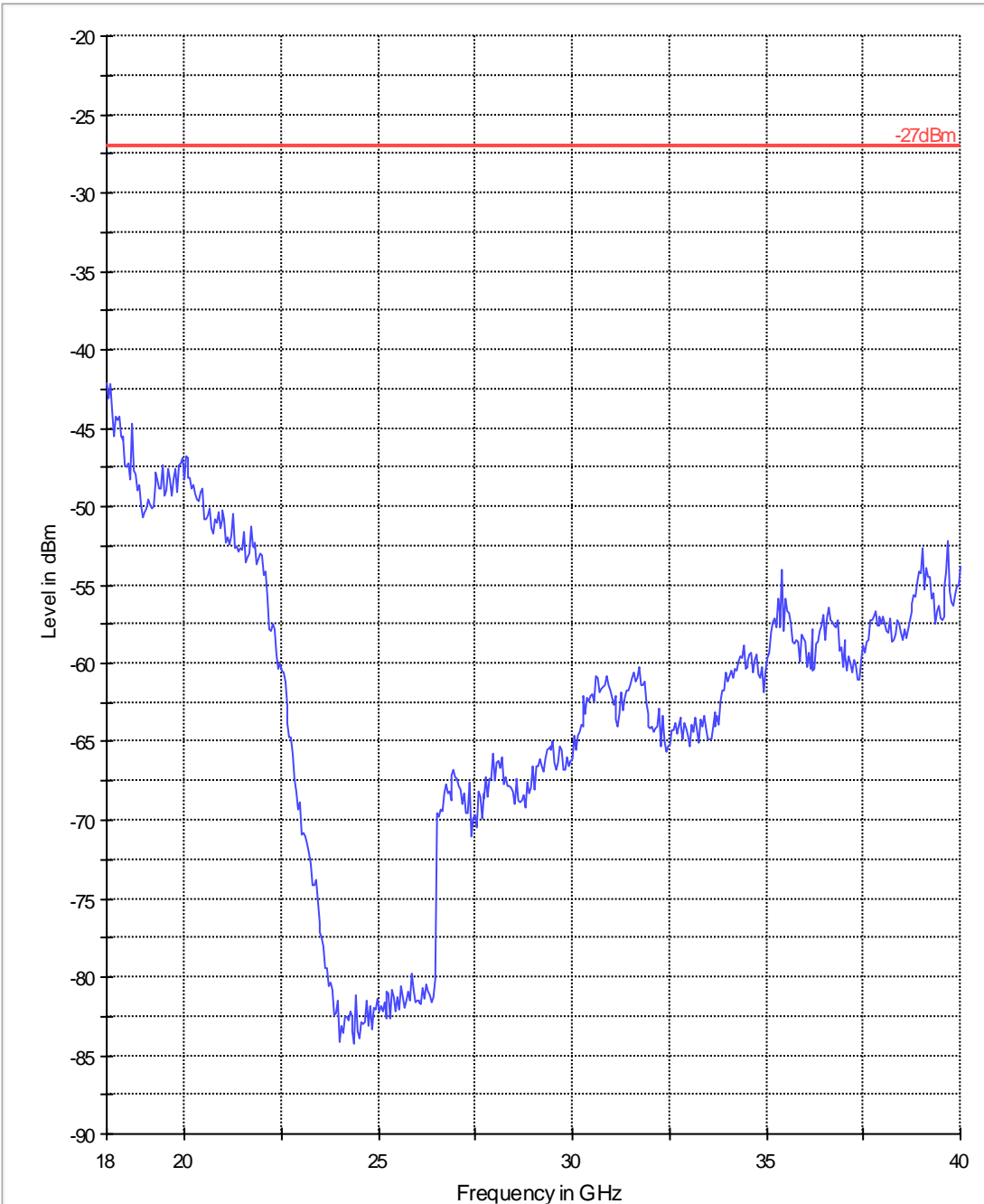
FCC 15.407 18-40GHzm





# Tx0 18-40 a ch60

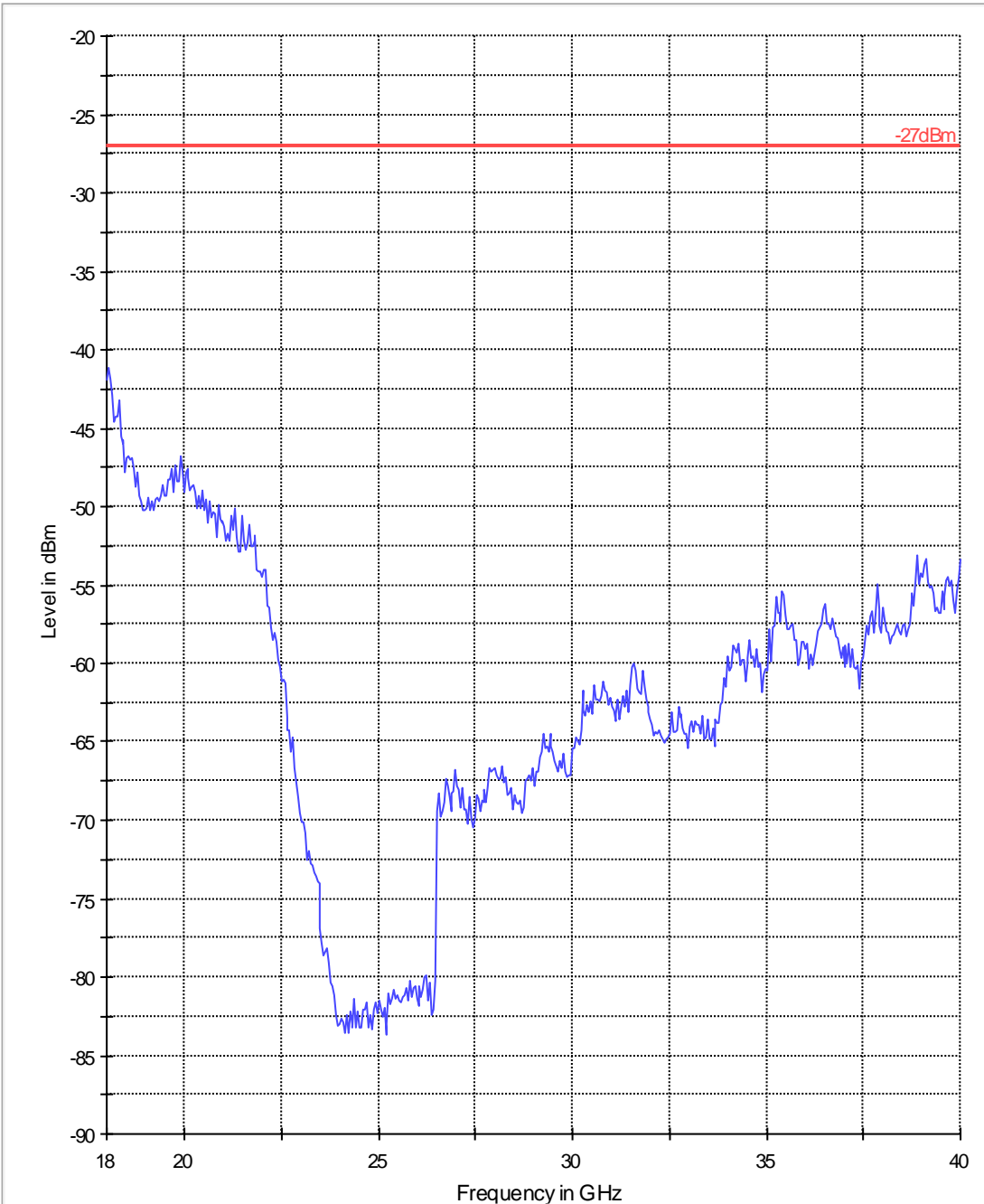
FCC 15.407 18-40GHzm





# Tx0 18-40 a ch120

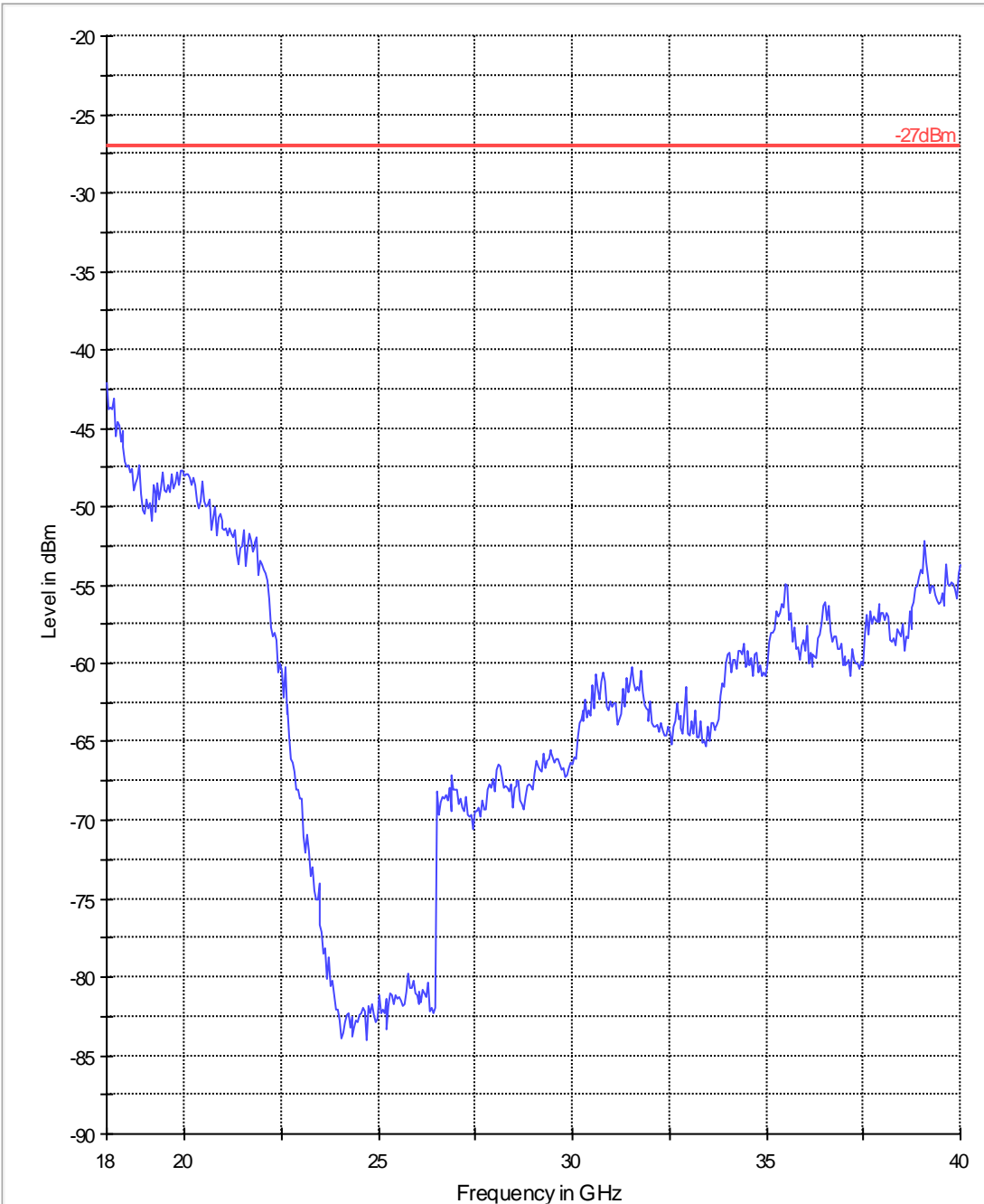
FCC 15.407 18-40GHzm





# Tx1 18-40 a ch40

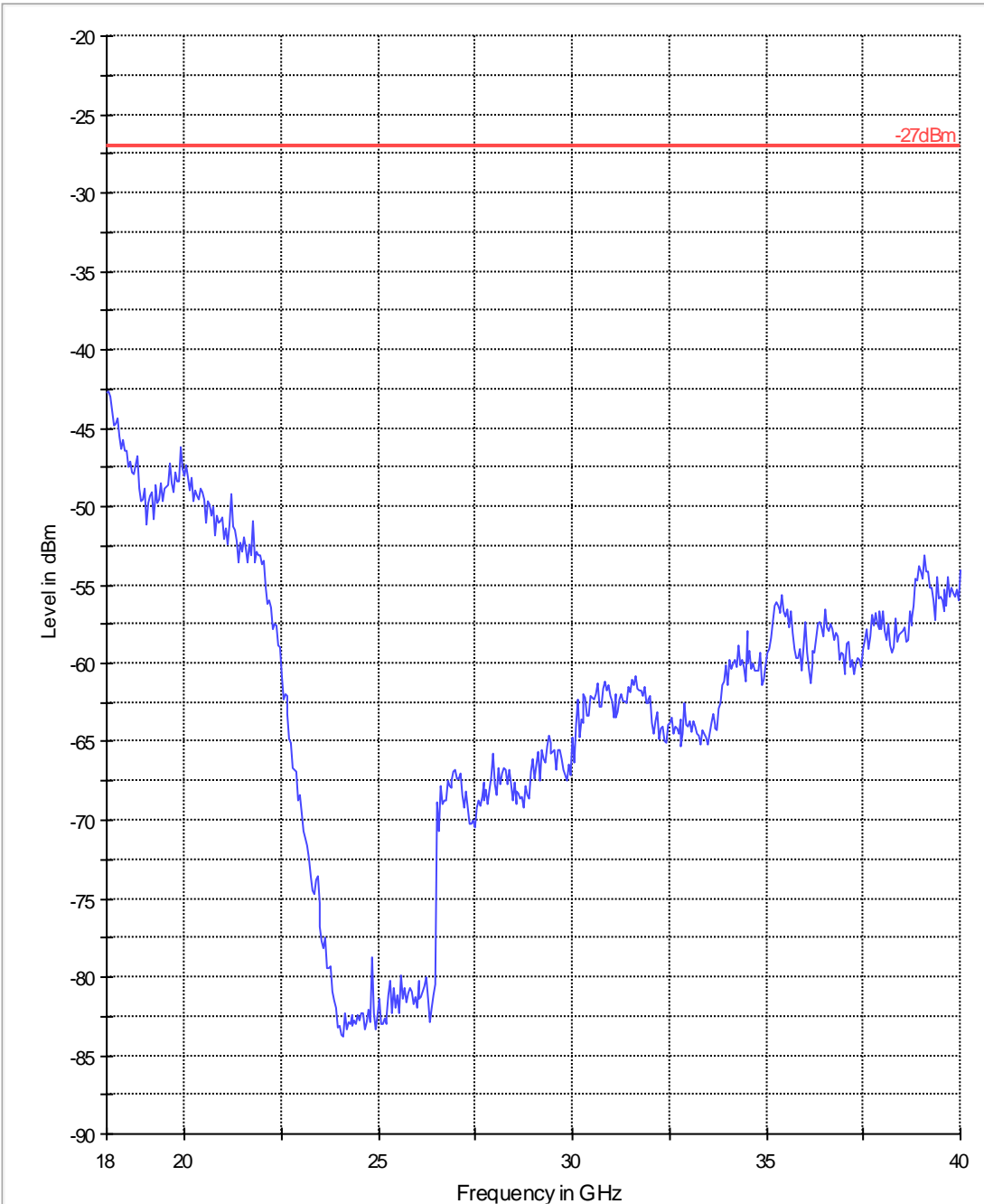
FCC 15.407 18-40GHzm





# Tx1 18-40 a ch60

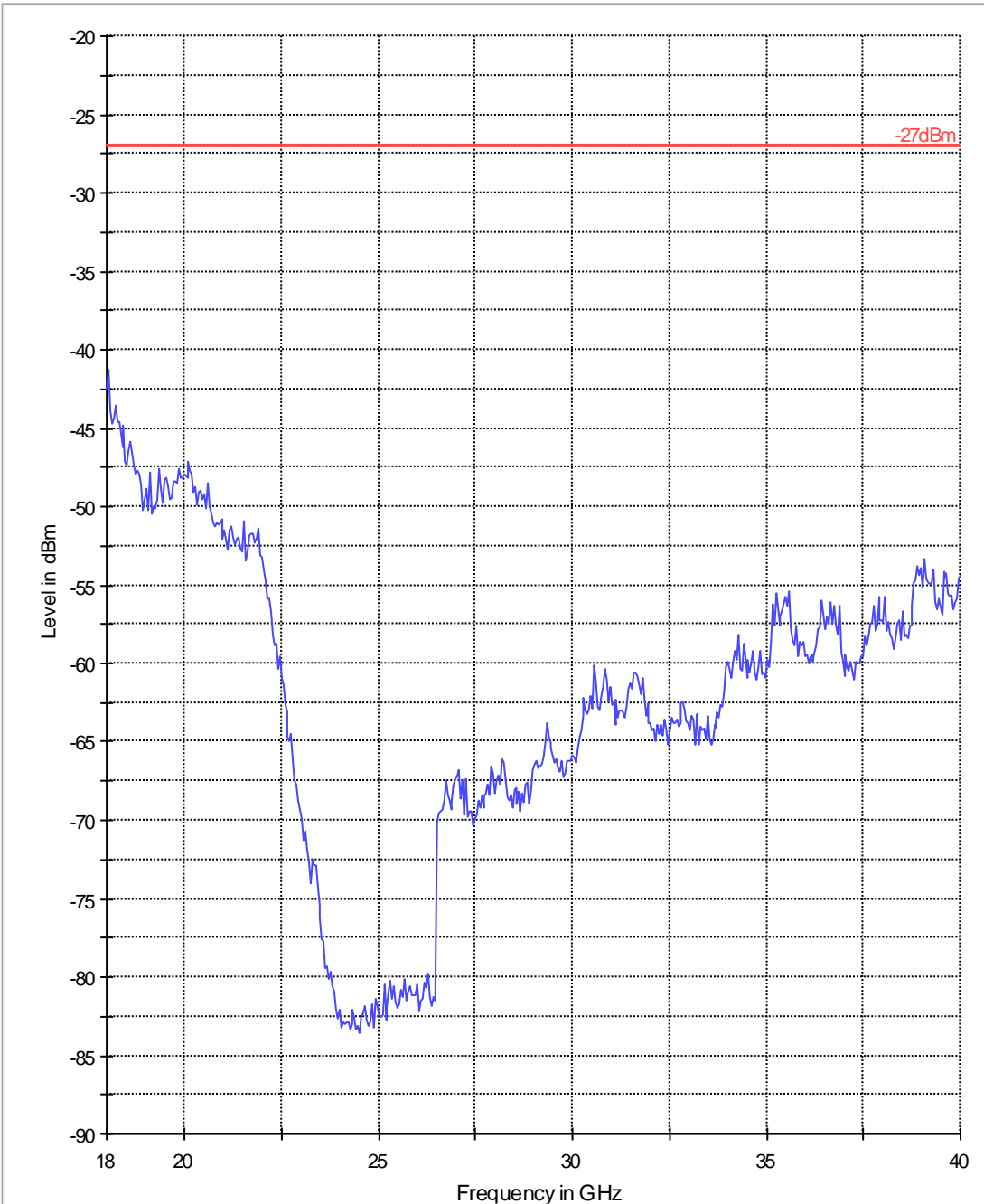
FCC 15.407 18-40GHzm





# Tx1 18-40 a ch120

FCC 15.407 18-40GHzm





## 5.10 Receiver Spurious Emissions- Radiated

### 5.10.1 Limits: §15.109

| Frequency of emission (MHz) | Field strength ( $\mu\text{V/m}$ ) | Measurement Distance (m) |
|-----------------------------|------------------------------------|--------------------------|
| 0.009–0.490                 | 2400/F(kHz)                        | 300                      |
| 0.490–1.705                 | 24000/F(kHz)                       | 30                       |
| 1.705–30.0                  | 30                                 | 30                       |
| 30–88                       | 100 (40dB $\mu\text{V/m}$ )        | 3                        |
| 88–216                      | 150 (43.5 dB $\mu\text{V/m}$ )     | 3                        |
| 216–960                     | 200 (46 dB $\mu\text{V/m}$ )       | 3                        |
| Above 960                   | 500 (54 dB $\mu\text{V/m}$ )       | 3                        |

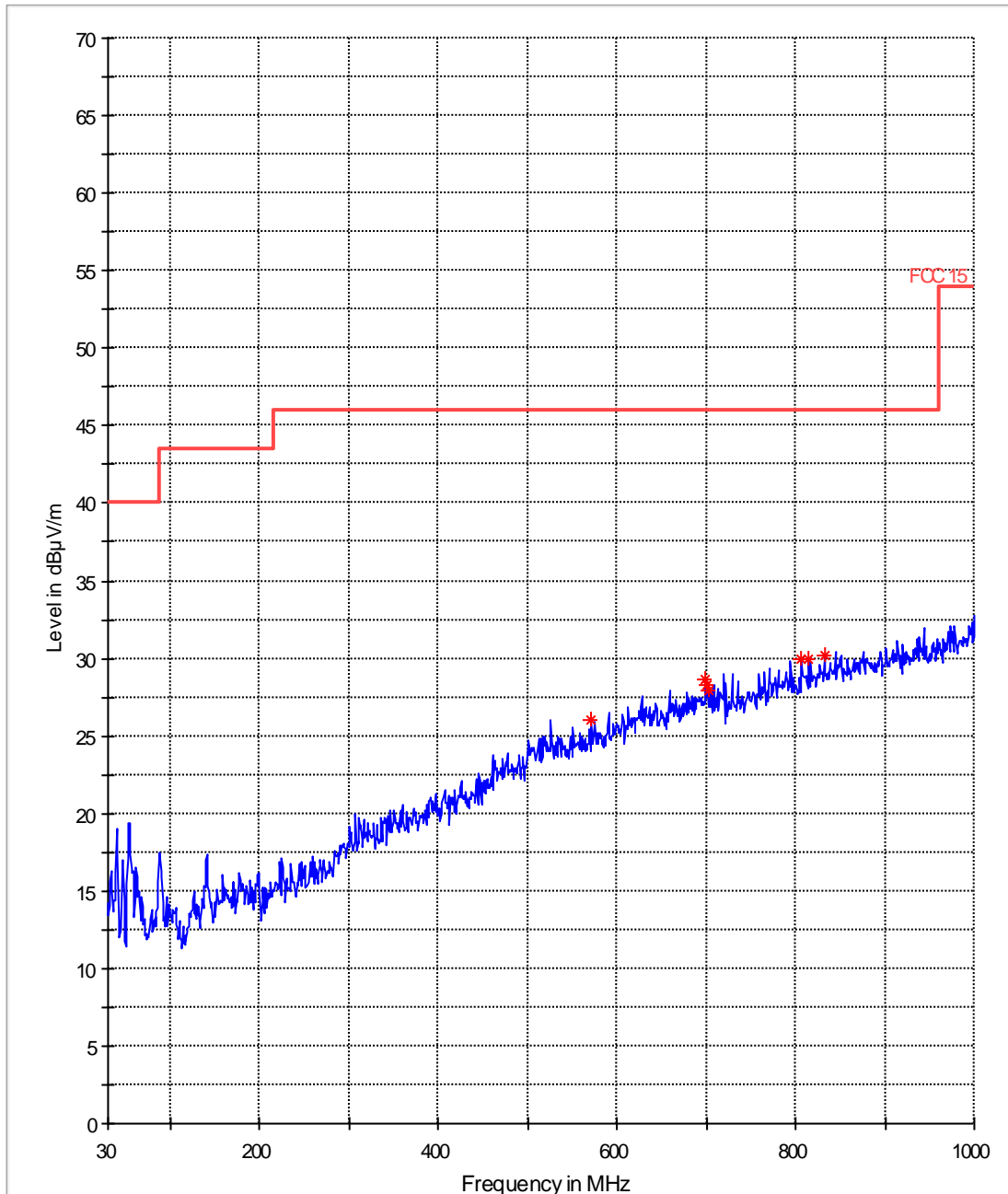
### 5.10.2 Test Result:

Plots reported here represent the worse case emissions.

5.10.3 Test data/ plots:

# idle 30-1

FCC 15 30-1000MHz



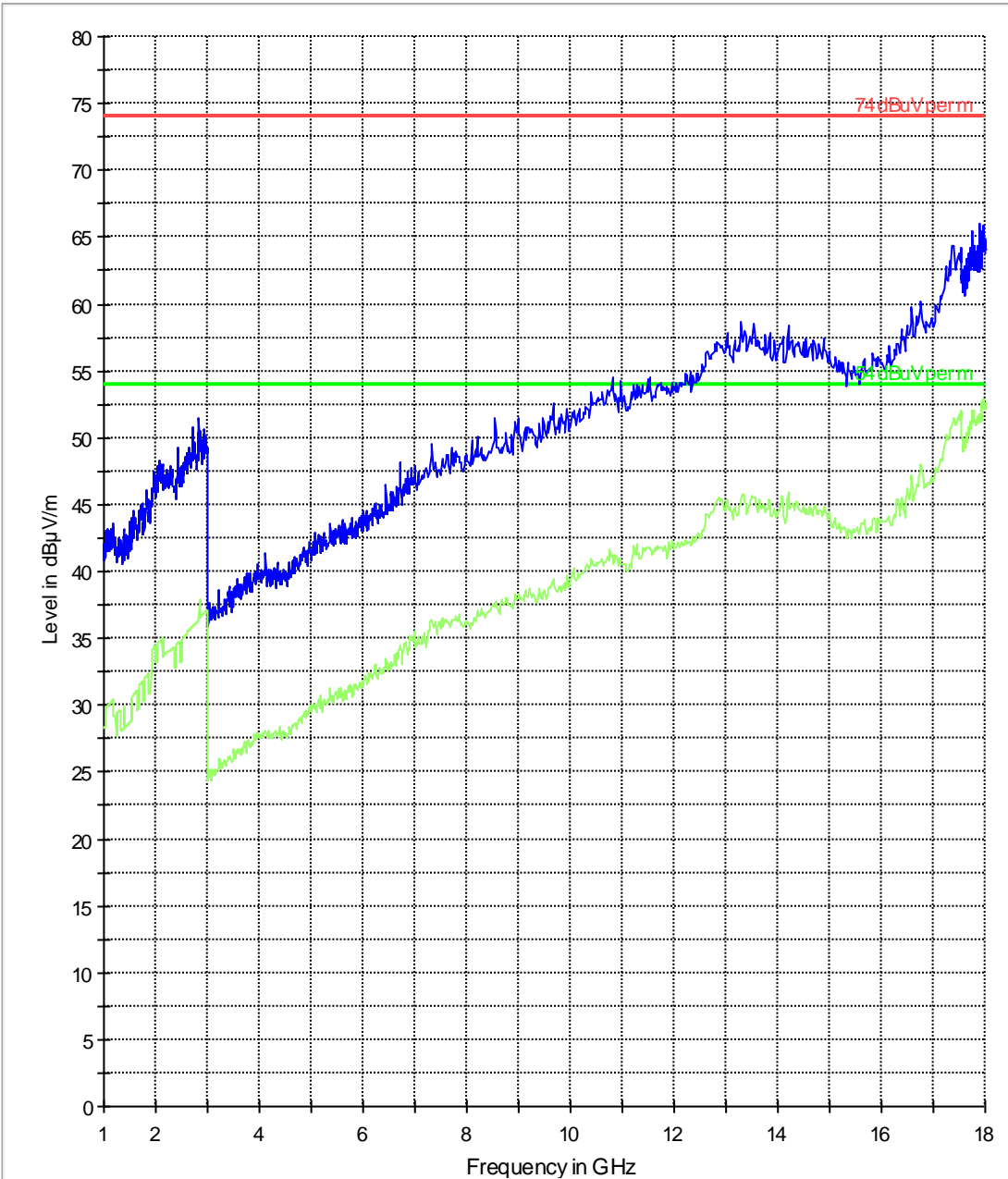
— FCC 15 Limit Line      — Review Result 1      \* Data Reduction 1 [1]





# idle 1-18

FCC 15.1-18GHz



74 dBuV per mLimitLine  
54 dBuV per mLimitLine  
PreviewResult 1  
PreviewResult 2



**5.11 AC Power Line Conducted Emissions**

**5.11.1 Limits: §15.107/15.207**

2010 Except as shown in paragraphs (b) and (c) of this section, for an intentional radiator that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies, within the band 150 kHz to 30 MHz, shall not exceed the limits in the following table, as measured using a 50  $\mu$ H/50 ohms line impedance stabilization network (LISN). Compliance with the provisions of this paragraph shall be based on the measurement of the radio frequency voltage between each power line and ground at the power terminal. The lower limit applies at the boundary between the frequency ranges.

| Frequency of emission (MHz) | Conducted limit (dB $\mu$ V) |           |
|-----------------------------|------------------------------|-----------|
|                             | Quasi-peak                   | Average   |
| 0.15–0.5                    | 66 to 56*                    | 56 to 46* |
| 0.5–5                       | 56                           | 46        |
| 5–30                        | 60                           | 50        |

\*Decreases with the logarithm of the frequency.

Analyzer Settings: RBW = 10KHz; VBW = 10KHz

**5.11.2 Test Result:**

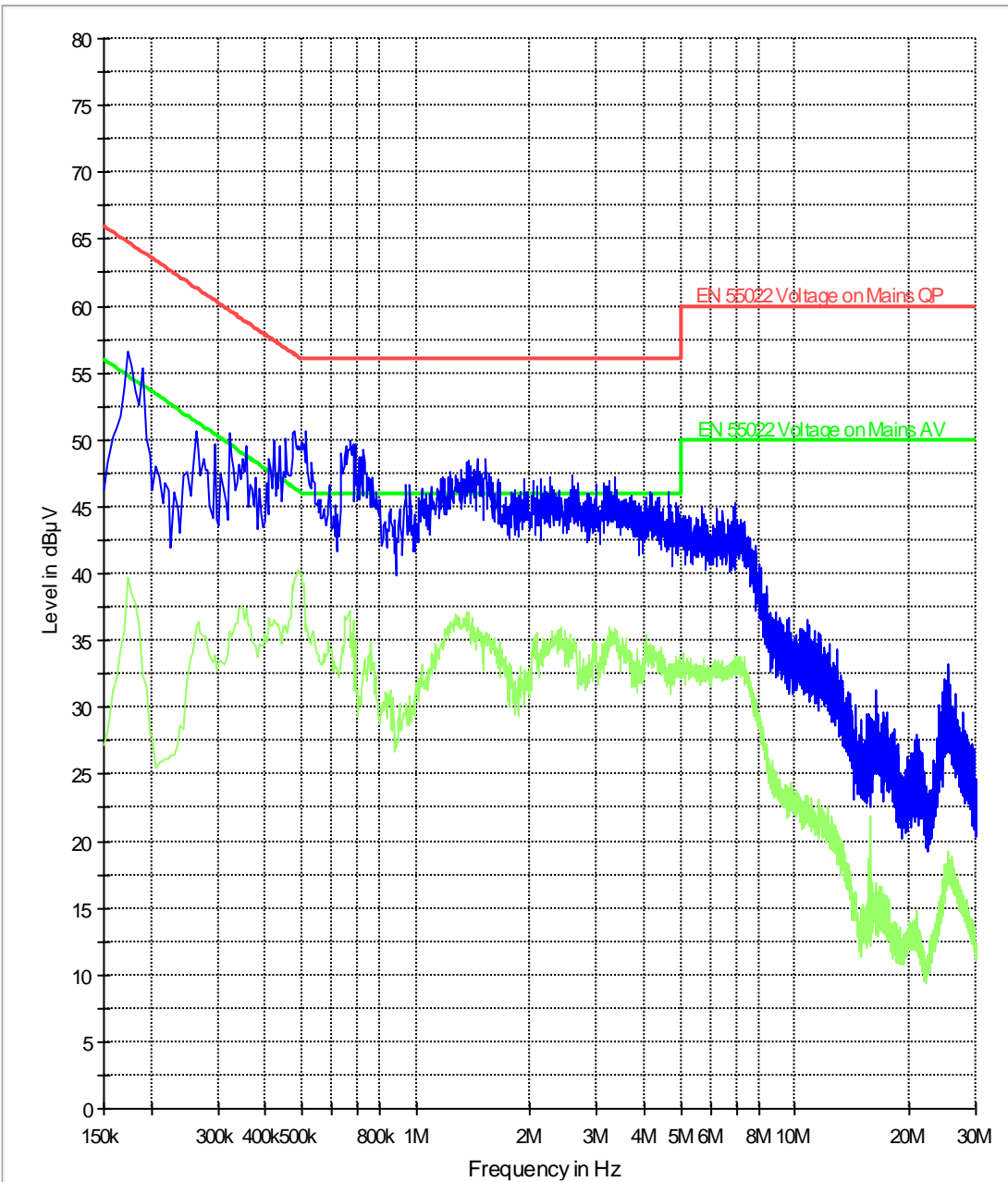
No significant emissions measurable. Plots reported here represent the worse case emissions.



5.11.3 Test data/ plots:

TX Mode- Line & Neutral

CISPR22 Mains Conducted



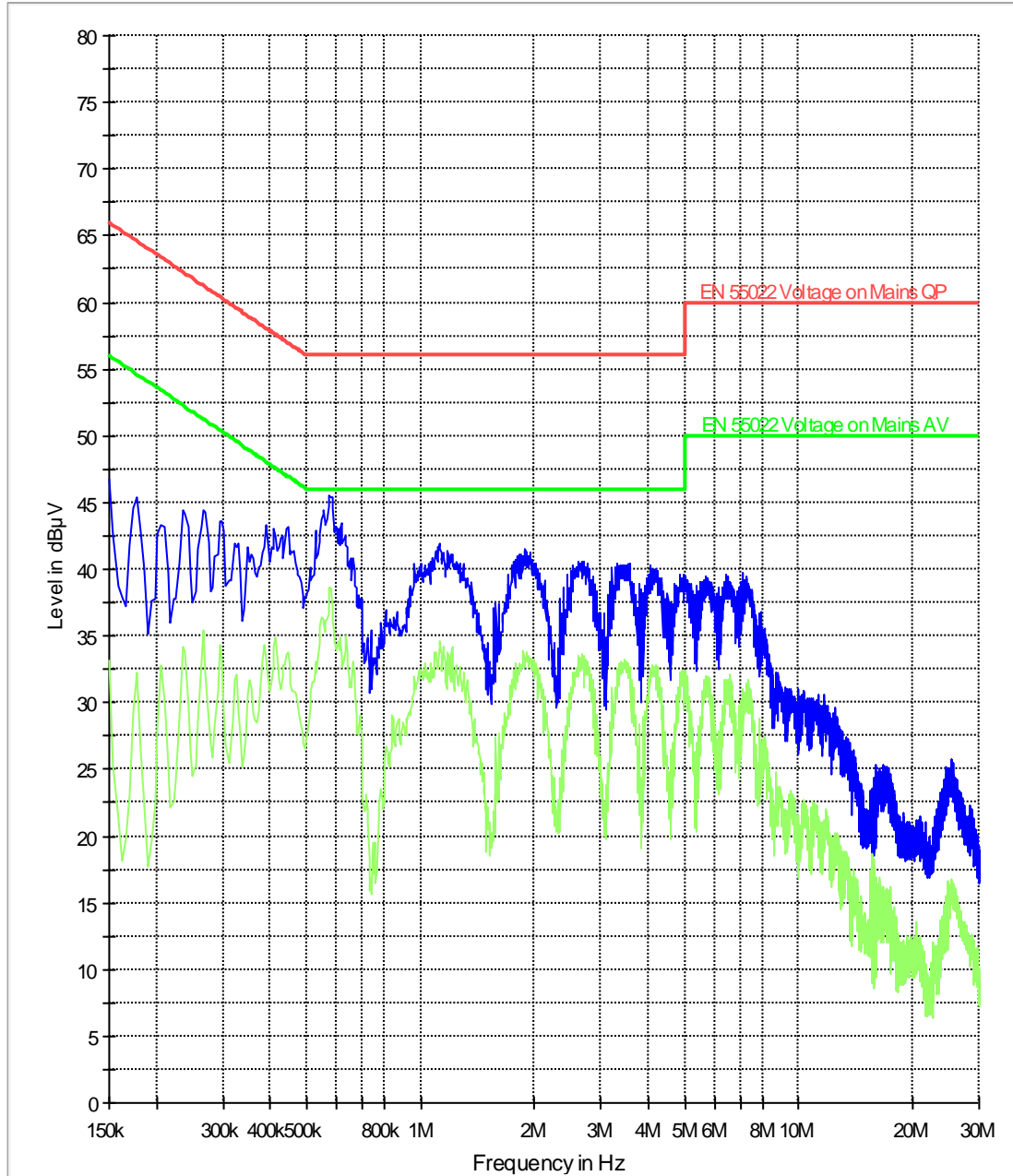
EN 55022 Voltage on Mains QP Limit Line  
Preview Result 1

EN 55022 Voltage on Mains AV Limit Line  
Preview Result 2



### RX Mode- Line & Neutral

CISPR22 Mains Conducted



EN 55022 Voltage on Mains QP Limit Line  
Preview Result 1

EN 55022 Voltage on Mains AV Limit Line  
Preview Result 2



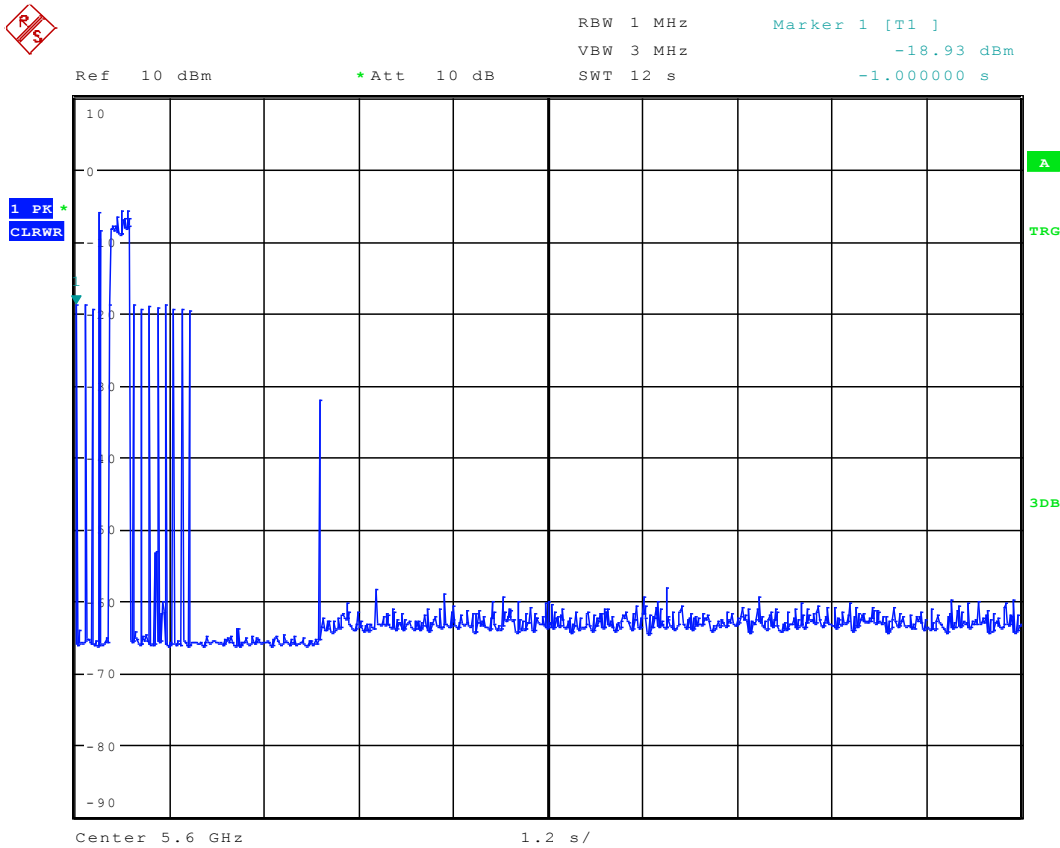
## 6 Dynamic Frequency Selection

### 6.1 Channel Move Time

#### 6.1.1 Limits

Channel must move within 10 seconds

#### 6.1.2 Results



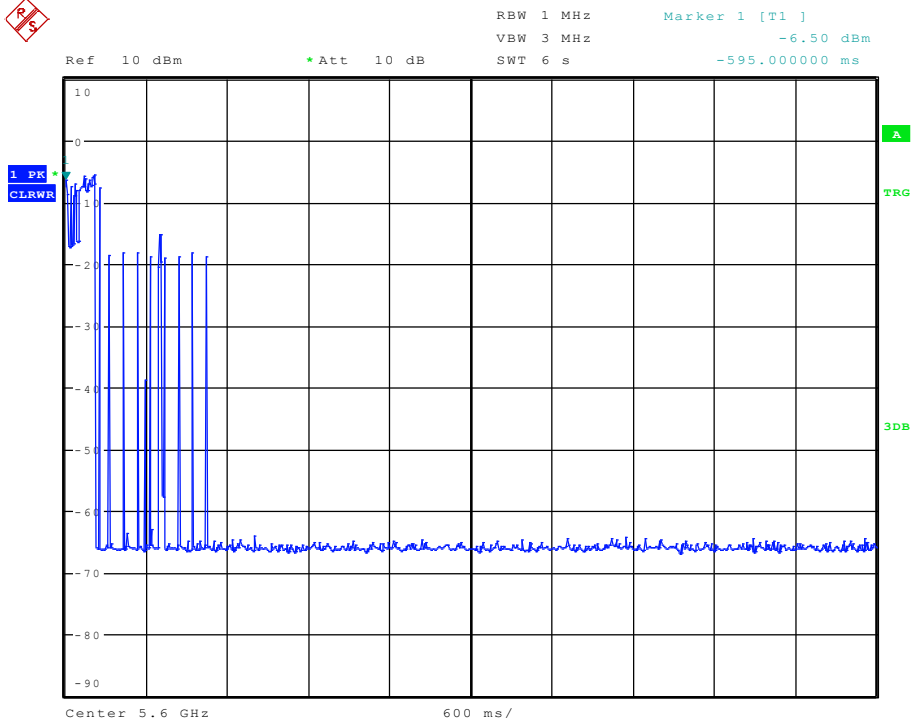


## 6.2 Channel Closing Time

### 6.2.1 Limits

Closing time must be less than 200ms + and aggregate of 60 ms over the remaining 10 second period

### 6.2.2 Results



Date: 13.JAN.2010 16:17:22

|                             |         |
|-----------------------------|---------|
| Analyzer Total bins         | 625     |
| # of Bins                   | 562.50  |
| Analyzer Sweep (s)          | 6.00    |
| Analyzer (ms)               | 6,000.0 |
| Transmission Time (seconds) | 5.400   |
| Transmission Time (ms)      | 5,400.0 |
| Dwell time per bin (second) | 0.00960 |
| Dwell time per bin (ms)     | 9.60000 |
| Number of bins with WLAN Tx | 3.0     |
| Aggregate (seconds)         | 0.0288  |
| Aggregate (ms)              | 28.8    |



### 6.3 30 Minute Beacon Test

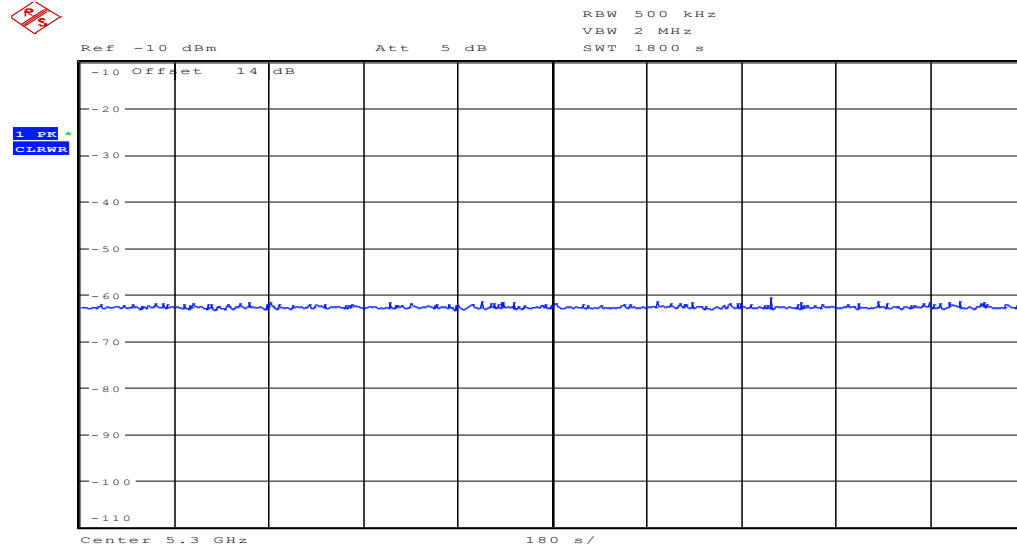
#### 6.3.1 Limits

Client cannot transmit beacons

#### 6.3.2 Results

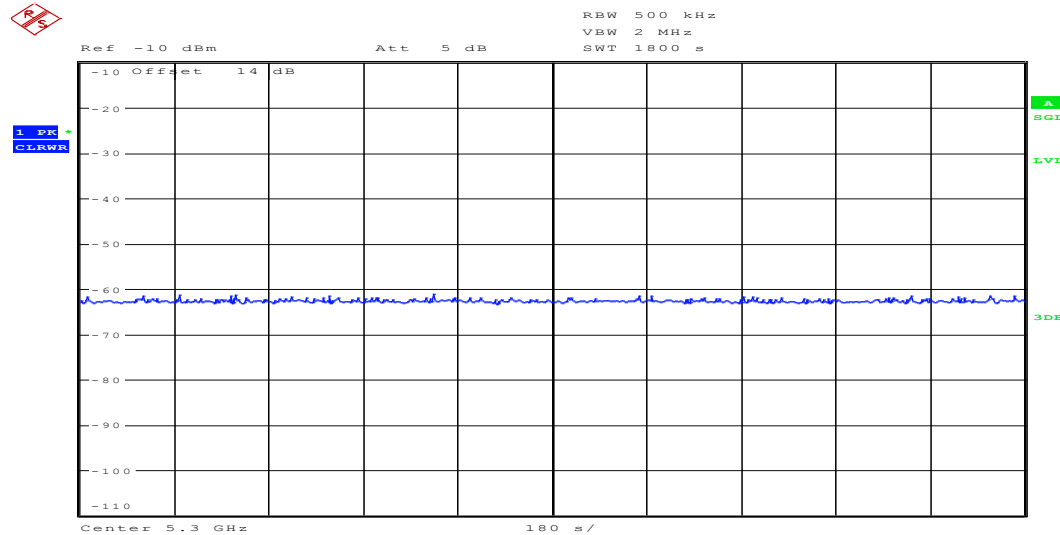
Spectrum Analyzer was set to a sweep time of 30 minutes. During that time no emissions were observed.

Tx0



Date: 26.JAN.2010 13:18:03

Tx1



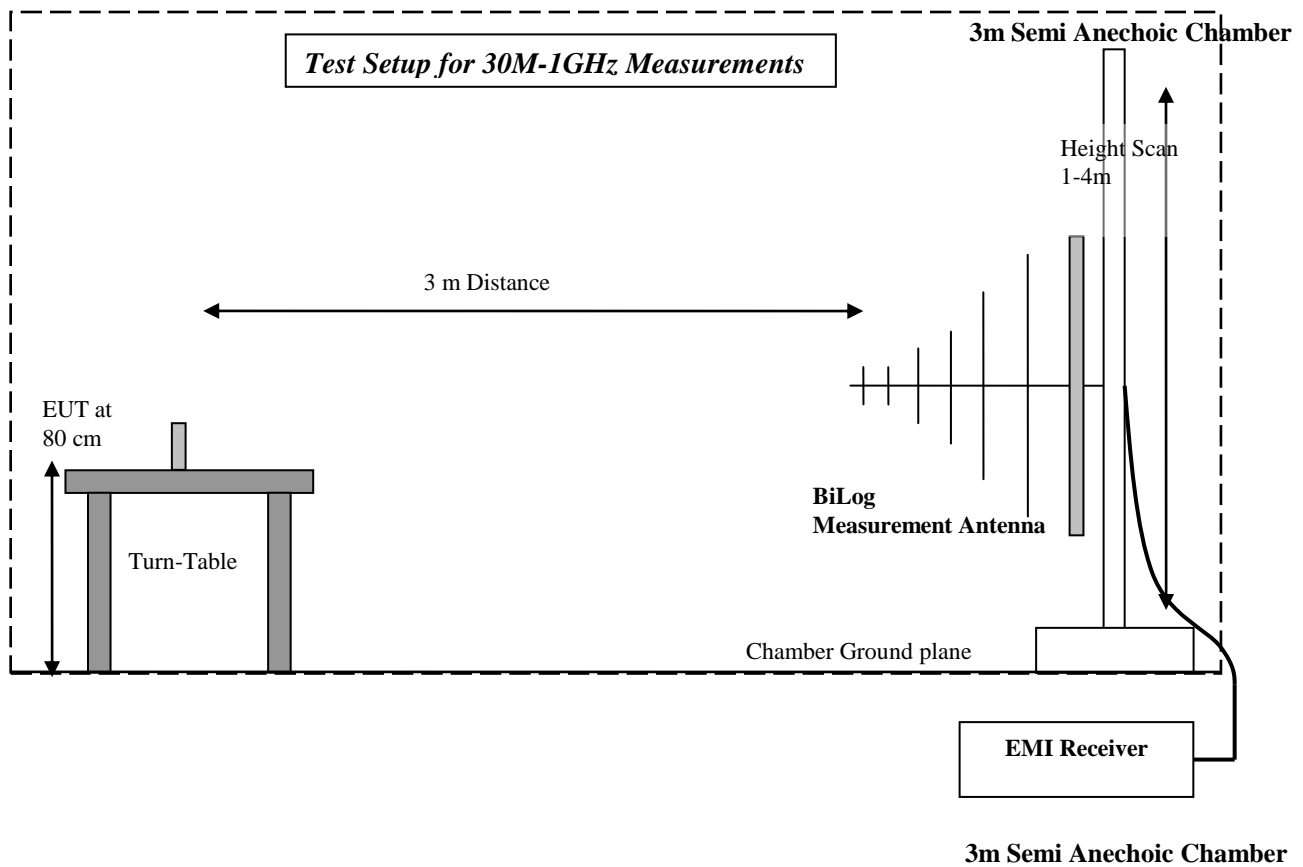
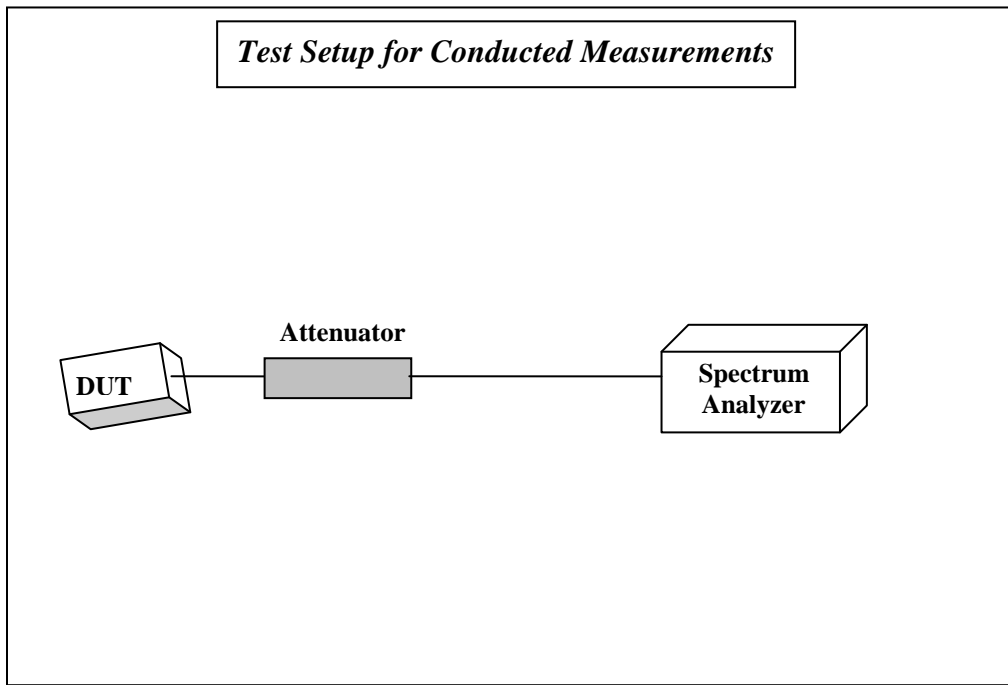
Date: 26.JAN.2010 13:51:16

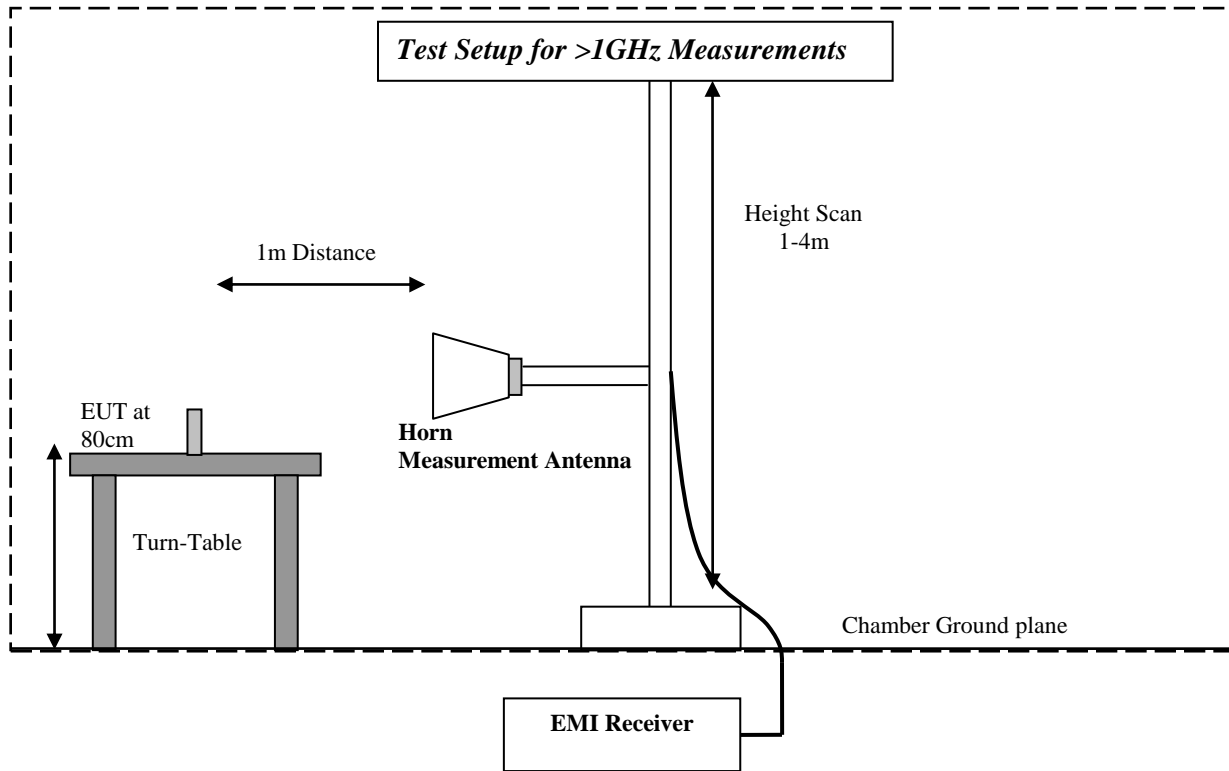
## 7 Test Equipment and Ancillaries used for tests

| No | Instrument/Ancillary         | Type         | Manufacturer    | Serial No.   | Cal Due   | Interval |
|----|------------------------------|--------------|-----------------|--------------|-----------|----------|
| 01 | Spectrum Analyzer            | ESIB 40      | Rohde & Schwarz | 100107       | May 2010  | 1 year   |
| 02 | Spectrum Analyzer            | FSEM 30      | Rohde & Schwarz | 100017       | May 2010  | 1 year   |
| 03 | Signal Generator             | SMY02        | Rohde & Schwarz | 836878/011   | May 2010  | 1 year   |
| 04 | Power-Meter                  | NRVD         | Rohde & Schwarz | 0857.8008.02 | May 2010  | 1 year   |
| 05 | Biconilog Antenna            | 3141         | EMCO            | 0005-1186    | June 2010 | 1 year   |
| 06 | Horn Antenna (1-18GHz)       | SAS-200/571  | AH Systems      | 325          | June 2010 | 1 year   |
| 07 | Horn Antenna (18-26.5GHz)    | 3160-09      | EMCO            | 1240         | June 2010 | 1 year   |
| 08 | Power Splitter               | 11667B       | Hewlett Packard | 645348       | n/a       | n/a      |
| 09 | Climatic Chamber             | VT4004       | Voltsch         | G1115        | May 2010  | 1 year   |
| 10 | High Pass Filter             | 5HC2700      | Trilithic Inc.  | 9926013      | n/a       | n/a      |
| 11 | High Pass Filter             | 4HC1600      | Trilithic Inc.  | 9922307      | n/a       | n/a      |
| 12 | Pre-Amplifier                | JS4-00102600 | Miteq           | 00616        | May 2010  | 1 year   |
| 13 | Power Sensor                 | URV5-Z2      | Rohde & Schwarz | DE30807      | May 2010  | 1 year   |
| 14 | Digital Radio Comm. Tester   | CMD-55       | Rohde & Schwarz | 847958/008   | May 2010  | 1 year   |
| 15 | Universal Radio Comm. Tester | CMU 200      | Rohde & Schwarz | 832221/06    | May 2010  | 1 year   |
| 16 | LISN                         | ESH3-Z5      | Rohde & Schwarz | 836679/003   | May 2010  | 1 year   |
| 17 | Loop Antenna                 | 6512         | EMCO            | 00049838     | July 2010 | 2 years  |



### 8 BLOCK DIAGRAMS





**9 Revision History**

| <b>Date</b> | <b>Report Name</b>            | <b>Changes to report</b>   | <b>Report prepared by</b> |
|-------------|-------------------------------|--|---------------------------|
| 2010-02-17  | EMC_APPLE_055_15.407_28A      | Original   | Marc                      |
| 2010-03-09  | EMC_APPLE_055_15.407_28A_Rev1 | Updated plots for bandwidth, PPSD and Peak excursion. Added H/V statement. Updated modulation types. Updated RSE plots. Added 40GHz conducted spurious emission. Added simultaneous transmission bandedge plots. | Marc                      |
| 2010-03-11  | EMC_APPLE_055_15.407_28A_Rev2 | Updated radiated measurement procedure   | Marc                      |
| 2010-04-08  | EMC_APPLE_055_15.407_28A_Rev3 | Updated receiver plot 30-1   | Marc                      |
| 2010-04-09  | EMC_APPLE_055_15.407_28A_Rev4 | Updated receiver plot 1-18   | Marc                      |