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# INDUSTRY CANADA RSS-131 AND FCC PART 22H AND PART 24E TEST REPORT

| | |
|---|---|
| **Applicant** | WILSON ELECTRONICS, INC. |
| **Address** | 3301 E. DESERET DRIVE<br>ST. GEORGE UTAH 84790 USA |
| **FCC ID** | PWO276215 |
| **IC Label** | IC: 4726A-276215 |
| **Model Number** | 276215 |
| **Product Description** | BIDIRECTIONAL BOOSTER |
| **Date Sample Received** | 10/5/2011 |
| **Date Tested** | 10/7/2011 |
| **Tested By** | Nam Nguyen |
| **Approved By** | Mario de Aranzeta |
| **Report No.** | 2304AT11TestReport.doc |
| **Test Results** | ☒ PASS ☐ FAIL |



ACCREDITED
Test Certificate #0955-01

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## ATTESTATION STATEMENT

**Summary**

The device under test does:
☒ fulfill the general approval requirements as identified in this test report
☐ not fulfill the general approval requirements as identified in this test report

This equipment has been tested in accordance with the standards identified in this test report. To the best of my knowledge and belief, these tests were performed using the measurement procedures described in this report. All instrumentation and accessories used to test products for compliance to the indicated standards are calibrated regularly in accordance with ISO 17025:2005 requirements.

ACCREDITED
Certificate # 0955-01

I attest that the necessary measurements were made, under my supervision, at TIMCO ENGINEERING, INC. located at 849 N.W. State Road 45, Newberry, Florida 32669.

Authorized Signatory Name: Mario de Aranzeta

Signature:

Function: Engineer

Date: 10/21/2011

## REPORT SUMMARY

| | |
|---|---|
| Disclaimer | The test results relate only to the items tested. |
| Report Purpose | To demonstrate the DUT comply with FCC Part 22H and Pt 24 and Industry Canada RS-131 requirements for a dual band signal amplifier. |
| Applicable Rule Part(s) | Pt 22, Pt 24, Pt 15.109, RSS-131 |
| Test Procedure(s) | ANSI/TIA-603-C: 2004 |

## TEST ENVIRONMENT

| | |
|---|---|
| Test Facilities | All required tests were performed by Timco Engineering Inc. that is located at 849 NW State Road 45 Newberry, FL 32669. |
| Test Conditions | Temperature: 26°C Relative Humidity: 50% |

## TEST SETUP

| | |
|---|---|
| Deviation to the rules | There was no deviation from the test standards. |
| Modification to the DUT | No modification was made to the DUT. |
| Test Exercise (e.g. software description, test signal, etc.) | The DUT was placed in continuous transmit mode of operation. |

## DEVICE UNDER TEST INFORMATION

| | |
|---|---|
| **Manufactured by** | WILSON ELECTRONICS, INC. |
| **DUT Description** | BIDIRECTIONAL BOOSTER |
| **FCC ID** | PWO276215 |
| **IC Label** | IC: 4726A-276215 |
| **Model Name** | 276215 |
| **Operating Frequency** | Uplink 824 – 849 MHz<br>Downlink 869 – 894 MHz<br>Uplink 1850 – 1910 MHz<br>Downlink 1930 – 1990 MHz |
| **Emission Designators** | F9W (CDMA & WCDMA), GXW (GSM), F1D (AMPS), G7W (EDGE) |
| **Modulation(s)** | CDMA, WCDMA, GSM, EDGE, FM, HSPA, EVDO, LTE |
| **User Power Range & Control** | |
| **Test Item** | Pre-Production |
| **DC Voltage and Current into final amplifier** | Uplink: Vcc = 3.6 Vdc, 0.01A<br>Downlink: Vcc= 4.5 Vdc, 1.00A |
| **Type of Equipment** | Fixed |

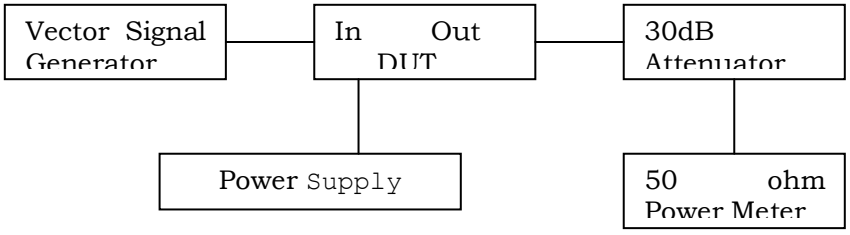
## EQUIPMENT LIST

| Device | Manufacturer | Model | Serial Number | Cal/Char Date | Due Date |
|---|---|---|---|---|---|
| 3-Meter Semi-Anechoic Chamber | Panashield | N/A | N/A | Listed 5/10/10 | 5/10/12 |
| AC Voltmeter | HP | 400FL | 2213A14499 | CAL 6/12/11 | 6/12/13 |
| Antenna: Active Loop | ETS-Lindgren | 6502 | 00062529 | CAL 9/23/10 | 9/23/12 |
| Antenna: Passive Loop | EMC Test Systems | EMCO 6512 | 9706-1211 | CAL. 10/1/09 | 10/2/11 |
| Frequency Counter | HP | 5385A | 2730A03025 | CAL 8/17/11 | 8/17/13 |
| Hygro-Thermometer | Extech | 445703 | 0602 | CAL 6/15/11 | 6/15/13 |
| Modulation Analyzer | HP | 8901A | 3435A06868 | CAL 7/18/11 | 7/18/13 |
| Digital Multimeter | Fluke | FLUKE-77 | 35053830 | CAL 9/9/11 | 9/9/13 |
| Analyzer Tan Tower Preamplifier | HP | 8449B-H02 | 3008A00372 | CAL 11/21/09 | 11/21/11 |
| Analyzer Tan Tower Quasi-Peak Adapter | HP | 85650A | 3303A01690 | CAL 11/22/09 | 11/22/11 |
| Analyzer Tan Tower RF Preselector | HP | 85685A | 3221A01400 | CAL 11/21/09 | 11/21/11 |
| Analyzer Tan Tower Spectrum Analyzer | HP | 8566B Opt 462 | 3138A07786 3144A20661 | CAL 11/24/09 | 11/24/11 |
| Temperature Chamber | Tenney Engineering | TTRC | 11717-7 | CHAR 4/25/10 | 4/25/12 |
| Antenna | ETS | 3117 | 41534 | 9/22/2010 | 9/22/2012 |
| Antenna | Electro metrics | LPA-25 | 1122 | 5/04/2011 | 5/04/2013 |
| Antenna | Electro metrics | BIA-25 | 1171 | 1/15/2010 | 1/15/2012 |

## TEST PROCEDURE

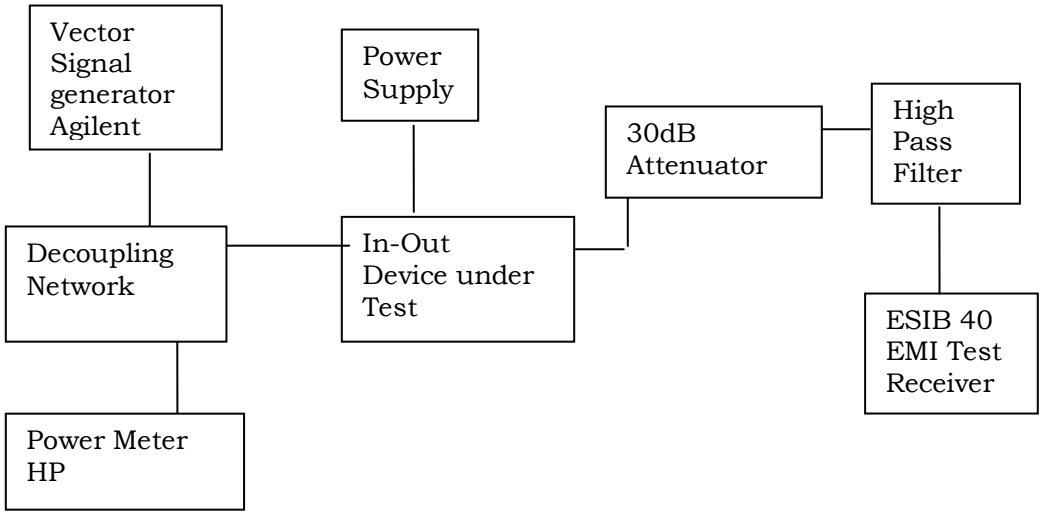
**RF Power Output**
RF power is measured by connecting a 50-ohm, resistive wattmeter to the RF output connector. With a nominal voltage and the amplifier properly adjusted the RF output measures.

RF Output Power Test Setup Diagram




**Input/Output Modulated Amplitude Comparison And Band-Edges Compliance**
On the following plot, the reference level was calibrated using a resolution bandwidth wider than the emission bandwidth. First the gain was measured for the maximum output power. Then for each frequency and type of modulation, an attenuation equals to the gain of the amplifier was added on the measurement side of the amplifier, as to overlay the input versus output modulated envelope.

Test Setup Diagram

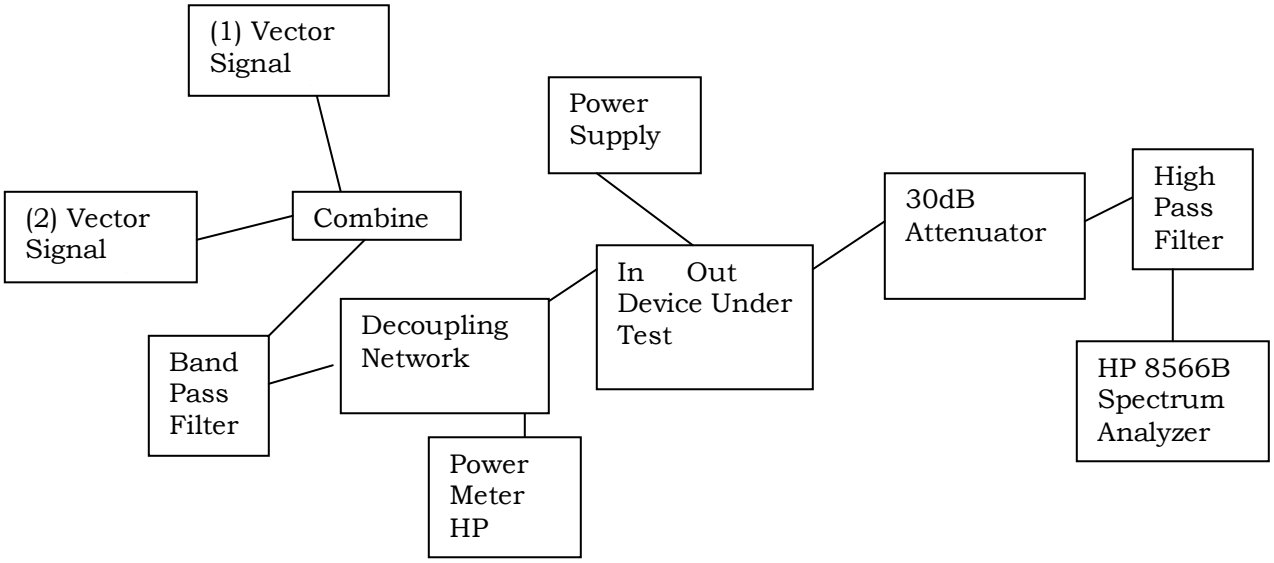



[Continued]

**Intermodulation Product Spurious Emissions**
The procedure used was ANSI/TIA-603-C: 2004. The spectrum was scanned from 9kHz to at least the tenth harmonic of the fundamental using a HP 8566B spectrum analyzer.

The modulation type was tested using the two-tone / three tone test method. The input power to the amplifier was set at maximum drive level by combining the two tones. The two tones were chosen in such a way (1) the third order intermodulation product frequencies are located within the pass band of the DUT and (2) they produce the worst-case emissions out of band.

Setup Diagram

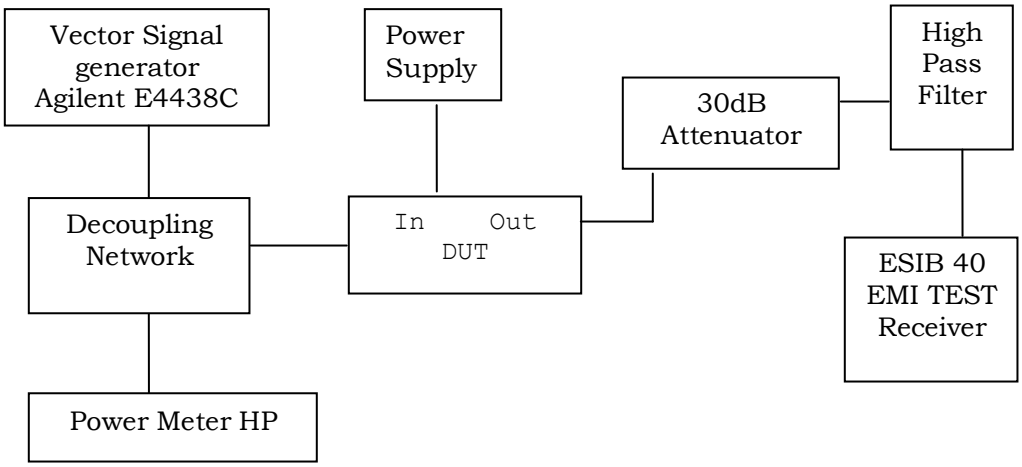



**Spurious Emissions at Antenna Terminals**
The procedure used was ANSI/TIA-603-C: 2004. The spectrum was scanned from 9kHz to at least the tenth harmonic of the fundamental using a HP model 8566B spectrum analyzer.

Data on the following page shows the level of conducted spurious responses. For analog modulation, the carrier was modulated 100% using a 2500 Hz tone. For digital modulation, the carrier is modulated to its maximum extent. The spectrum was scanned from 9 kHz to at least the 10th harmonic of the fundamental. The measurements were made in accordance with standard ANSI/TIA-603-C: 2004. The maximum input power was set for each test.

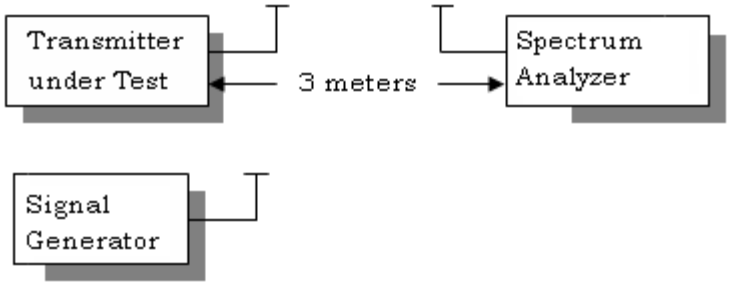
[Continued]

Conducted Spurious Emissions Test Setup Diagram




**Radiated Spurious Emissions**
The spectrum was scanned from 30 MHz to at least the tenth harmonic of the fundamental. The CW signal was used to perform this test. This test was conducted per ANSI/TIA-603-C: 2004 using the substitution method.

Radiated Spurious Emissions Test Setup Diagram




Equipment placed 80 cm above ground on a rotating table platform.

**RF POWER OUTPUT**

**Rule Part(s) No.:** Pt 2.1046(a)

**Requirements:** Pt 2.1046(a)

**Test Result:** As the following table indicates. Notes: the maximum power output value was obtained with CDMA modulation at 1868MHz and 1940MHz.

Test Data Table 1 – Output Power – CDMA 1900 – Uplink/Downlink

| Tuned Frequency (MHz) | Power Input (dBm) | Power Output (dBm) | Power Output (mW) | Tuned Frequency (MHz) | Power Input (dBm) | Power Output (dBm) | Power Output (mW) |
|---|---|---|---|---|---|---|---|
| 1851.25 | -28.2 | -2.8 | 0.5 | 1931.25 | 4.7 | 29.4 | 871 |
| 1880.00 | -28.0 | -2.0 | 0.6 | 1960.00 | 3.9 | 30.5 | 1122 |
| 1908.75 | -27.6 | -2.9 | 0.5 | 1988.75 | 3.8 | 29.8 | 955 |

Test Data Table 2 – Output Power – EDGE 1900 – Uplink/Downlink

| Tuned Frequency (MHz) | Power Input (dBm) | Power Output (dBm) | Power Output (mW) | Tuned Frequency (MHz) | Power Input (dBm) | Power Output (dBm) | Power Output (mW) |
|---|---|---|---|---|---|---|---|
| 1850.20 | -22.0 | -5.9 | 0.3 | 1930.20 | 7.7 | 25.5 | 355 |
| 1880.00 | -22.5 | -4.7 | 0.3 | 1960.00 | 7.5 | 25.8 | 380 |
| 1909.80 | -22.0 | -6.4 | 0.3 | 1989.80 | 6.3 | 25.4 | 347 |

Test Data Table 3 – Output Power – GSM 1900 – Uplink/Downlink

| Tuned Frequency (MHz) | Power Input (dBm) | Power Output (dBm) | Power Output (mW) | Tuned Frequency (MHz) | Power Input (dBm) | Power Output (dBm) | Power Output (mW) |
|---|---|---|---|---|---|---|---|
| 1850.20 | -22.8 | -6.7 | 0.2 | 1930.20 | 8.6 | 25.5 | 355 |
| 1880.00 | -22.7 | -5.4 | 0.3 | 1960.00 | 7.5 | 25.4 | 347 |
| 1909.80 | -22.1 | -7.1 | 0.2 | 1989.80 | 6.7 | 25.3 | 339 |

Test Data Table 4 – Output Power – WCDMA 1900 – Uplink/Downlink

| Tuned Frequency (MHz) | Power Input (dBm) | Power Output (dBm) | Power Output (mW) | Tuned Frequency (MHz) | Power Input (dBm) | Power Output (dBm) | Power Output (mW) |
|---|---|---|---|---|---|---|---|
| 1852.75 | -30.0 | -3.0 | 0.5 | 1932.75 | 2.4 | 29.0 | 794 |
| 1880.00 | -29.7 | -2.1 | 0.6 | 1960.00 | 1.6 | 29.9 | 977 |
| 1907.25 | -29.6 | -3.4 | 0.6 | 1987.25 | 1.4 | 29.5 | 891 |

[Continued]

Test Data Table 5 – Output Power – LTE 1900 – Uplink/Downlink

| Tuned Frequency (MHz) | Power Input (dBm) | Power Output (dBm) | Power Output (mW) | Tuned Frequency (MHz) | Power Input (dBm) | Power Output (dBm) | Power Output (mW) |
|---|---|---|---|---|---|---|---|
| 1860.50 | -27.9 | -3.6 | 0.4 | 1940.50 | 0.4 | 28.8 | 759 |
| 1880.00 | -28.5 | -3.5 | 0.5 | 1960.00 | 0.9 | 28.5 | 708 |
| 1899.50 | -28.4 | -3.3 | 0.5 | 1979.50 | -0.1 | 29.3 | 851 |

Test Data Table 6 – Output Power – CDMA 800 – Uplink/Downlink

| Tuned Frequency (MHz) | Power Input (dBm) | Power Output (dBm) | Power Output (mW) | Tuned Frequency (MHz) | Power Input (dBm) | Power Output (dBm) | Power Output (mW) |
|---|---|---|---|---|---|---|---|
| 825.25 | -29.7 | -4.3 | 0.4 | 870.25 | 2.1 | 29.6 | 912 |
| 836.50 | -29.0 | -3.7 | 0.4 | 881.50 | 1.9 | 30.2 | 1047 |
| 847.75 | -29.4 | -5.0 | 0.3 | 892.75 | 1.4 | 29.8 | 955 |

Test Data Table 7 – Output Power – EDGE 800 – Uplink/Downlink

| Tuned Frequency (MHz) | Power Input (dBm) | Power Output (dBm) | Power Output (mW) | Tuned Frequency (MHz) | Power Input (dBm) | Power Output (dBm) | Power Output (mW) |
|---|---|---|---|---|---|---|---|
| 824.20 | -23.4 | -6.4 | 0.2 | 869.20 | 3.4 | 24.5 | 282 |
| 836.50 | -23.4 | -6.1 | 0.2 | 881.50 | 4.3 | 24.5 | 282 |
| 844.80 | -22.5 | -7.1 | 0.2 | 893.80 | 3.4 | 24.7 | 295 |

Test Data Table 8 – Output Power – GSM 800 – Uplink/Downlink

| Tuned Frequency (MHz) | Power Input (dBm) | Power Output (dBm) | Power Output (mW) | Tuned Frequency (MHz) | Power Input (dBm) | Power Output (dBm) | Power Output (mW) |
|---|---|---|---|---|---|---|---|
| 824.20 | -23.1 | -6.9 | 0.2 | 869.20 | 5.6 | 24.5 | 282 |
| 836.50 | -22.9 | -6.5 | 0.2 | 881.50 | 5.9 | 24.5 | 282 |
| 848.80 | -23.7 | -8.4 | 0.1 | 893.80 | 5.6 | 24.7 | 295 |

Test Data Table 9 – Output Power – WCDMA 800 – Uplink/Downlink

| Tuned Frequency (MHz) | Power Input (dBm) | Power Output (dBm) | Power Output (mW) | Tuned Frequency (MHz) | Power Input (dBm) | Power Output (dBm) | Power Output (mW) |
|---|---|---|---|---|---|---|---|
| 826.75 | -31.0 | -4.4 | 0.4 | 871.80 | -1.2 | 28.7 | 741 |
| 836.50 | -31.6 | -4.1 | 0.4 | 881.50 | -0.1 | 29.1 | 813 |
| 846.25 | -31.1 | -4.2 | 0.4 | 891.20 | -0.8 | 28.7 | 741 |

[Continued]

Test Data Table 10 – Output Power – LTE 800 – Uplink/Downlink

| Tuned Frequency (MHz) | Power Input (dBm) | Power Output (dBm) | Power Output (mW) |
|---|---|---|---|
| 834.500 | -28.9 | -3.8 | 0.4 |
| 836.500 | -28.5 | -4.0 | 0.4 |
| 838.500 | -28.3 | -3.9 | 0.4 |

| Tuned Frequency (MHz) | Power Input (dBm) | Power Output (dBm) | Power Output (mW) |
|---|---|---|---|
| 879.500 | -1.1 | 29.5 | 891 |
| 881.500 | -1.1 | 29.2 | 832 |
| 883.500 | -0.9 | 29.3 | 851 |

## INPUT/OUTPUT MODULATED AMPLITUDE COMPARISON AND BAND-EDGES COMPLIANCE

**Rule Parts No.:** Pt 2.1049, Pt 2.1051, 22H, 24E

**Requirements:** The power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least 43 + 10 log(P) dB.

**Test Data:** The DUT meets the requirements.

Bandedge compliance: Measurements were performed in accordance with Part 24.238

The Reference level on the following plots was calibrated using a 3MHz RBW=VBW.

Compensating for RBW (1%) using 10 log (12.5/3) = 6.2 dB we get the following amplitudes at the bandedge:

Test Data Table 11 – CDMA 1900 – Uplink/Downlink

| Channel (MHz) | Bandedge Frequency (MHz) | Amplitude bandedge (dBm) | Limit (dBm) | Margin (dB) |
|---|---|---|---|---|
| 1851.25 | 1849.95 | -50.45 | -13 | 37.45 |
| 1908.75 | 1910 | -52.5 | -13 | 39.5 |
| 1931.25 | 1929.93 | -19.54 | -13 | 6.54 |
| 1988.75 | 1990.05 | -20.94 | -13 | 7.94 |

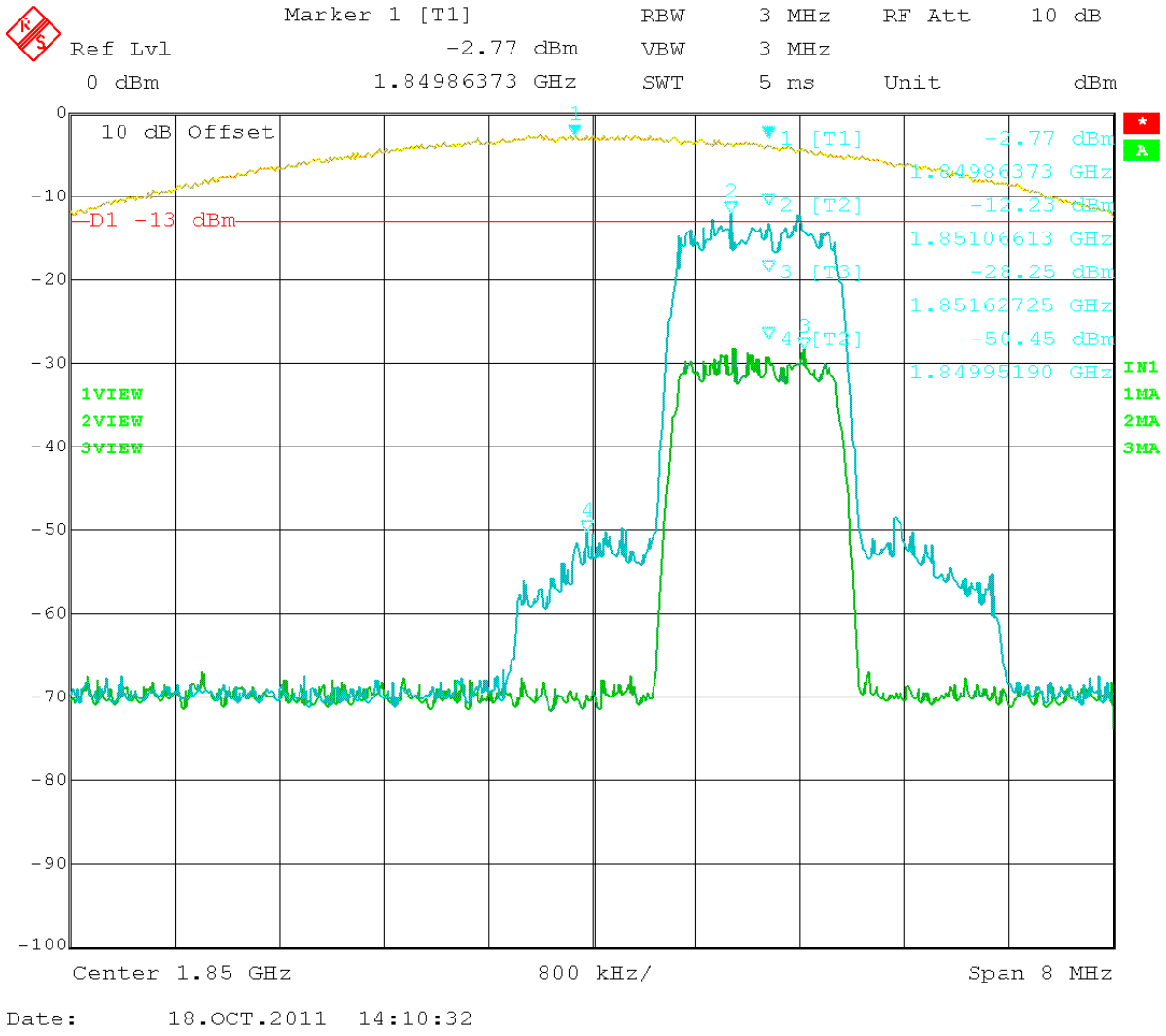



Figure 1: CDMA – In vs. Out 1851.25MHz

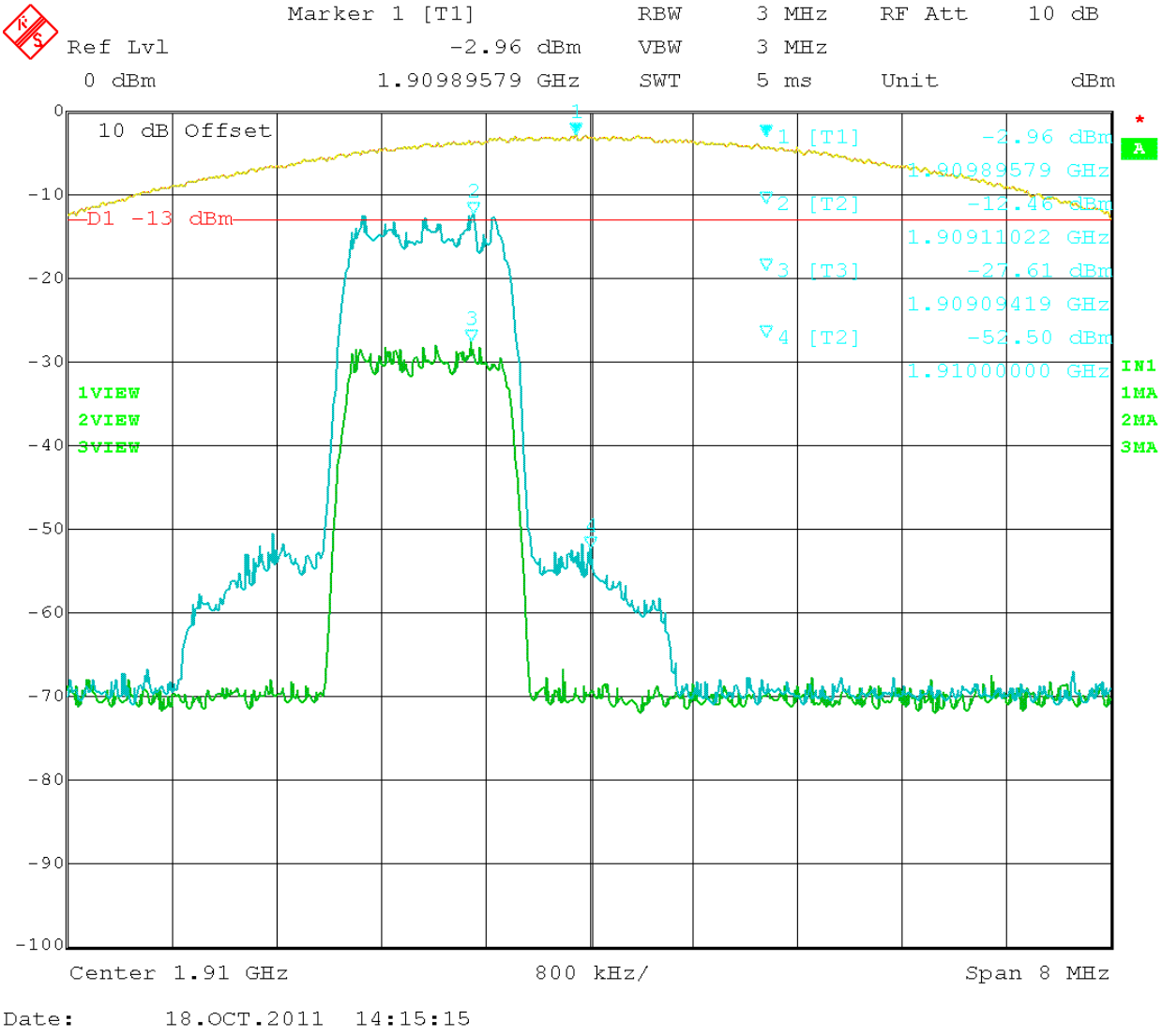



Figure 2: CDMA – In vs. Out 1908.75MHz

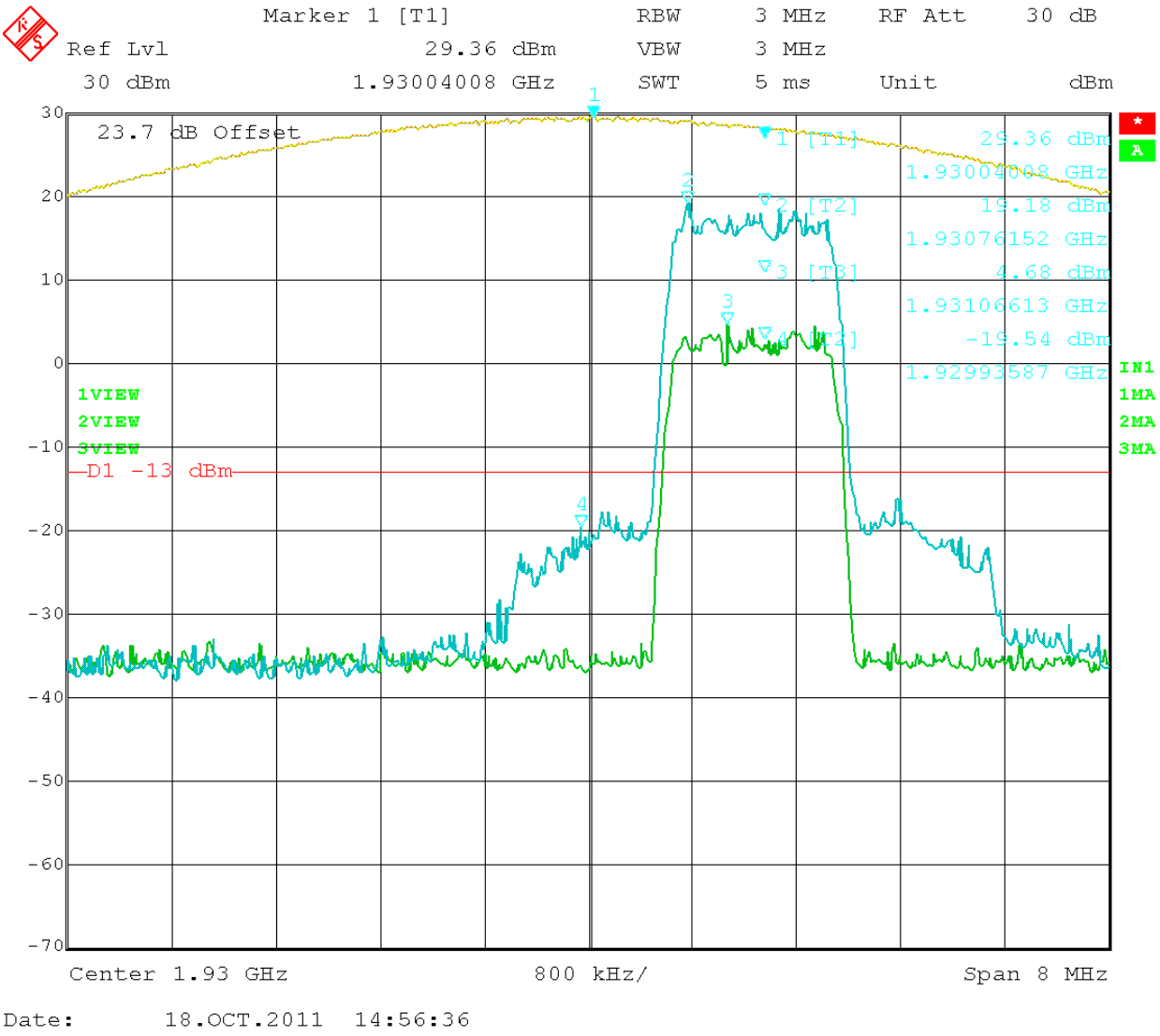



Figure 3: CDMA – In vs. Out 1931.25MHz

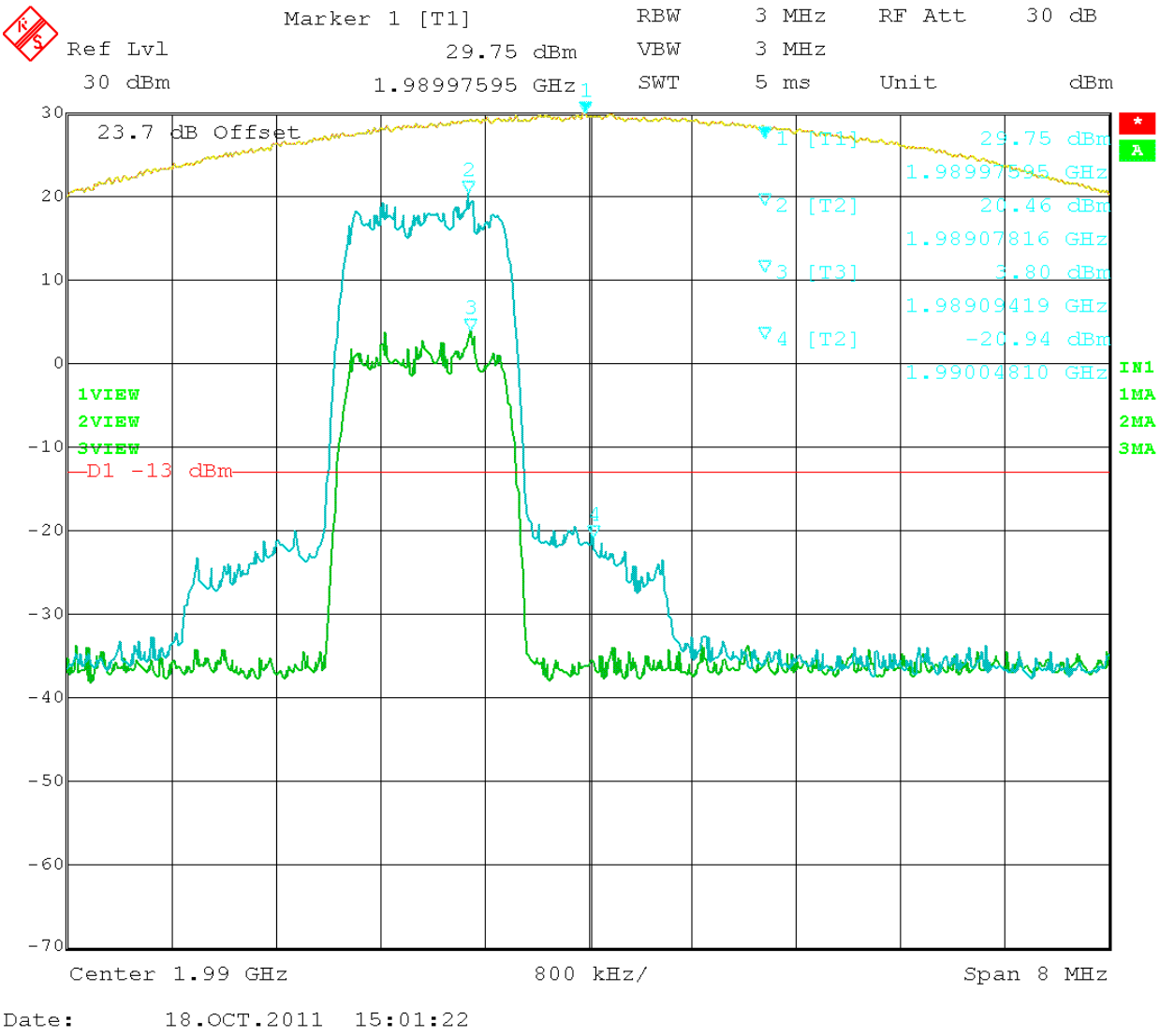



Figure 4: CDMA – In vs. Out 1988.75MHz

Test Data Table 12– WCDMA 1900 – Uplink/Downlink

| Channel (MHz) | Bandedge Frequency (MHz) | Amplitude bandedge (dBm) | Limit (dBm) | Margin (dB) |
|---|---|---|---|---|
| 1852.75 | 1849.96 | -48.73 | -13 | 35.73 |
| 1907.25 | 1910.02 | -52.59 | -13 | 39.59 |
| 1932.75 | 1929.96 | -16.74 | -13 | 3.74 |
| 1987.25 | 1990.12 | -17.55 | -13 | 4.55 |

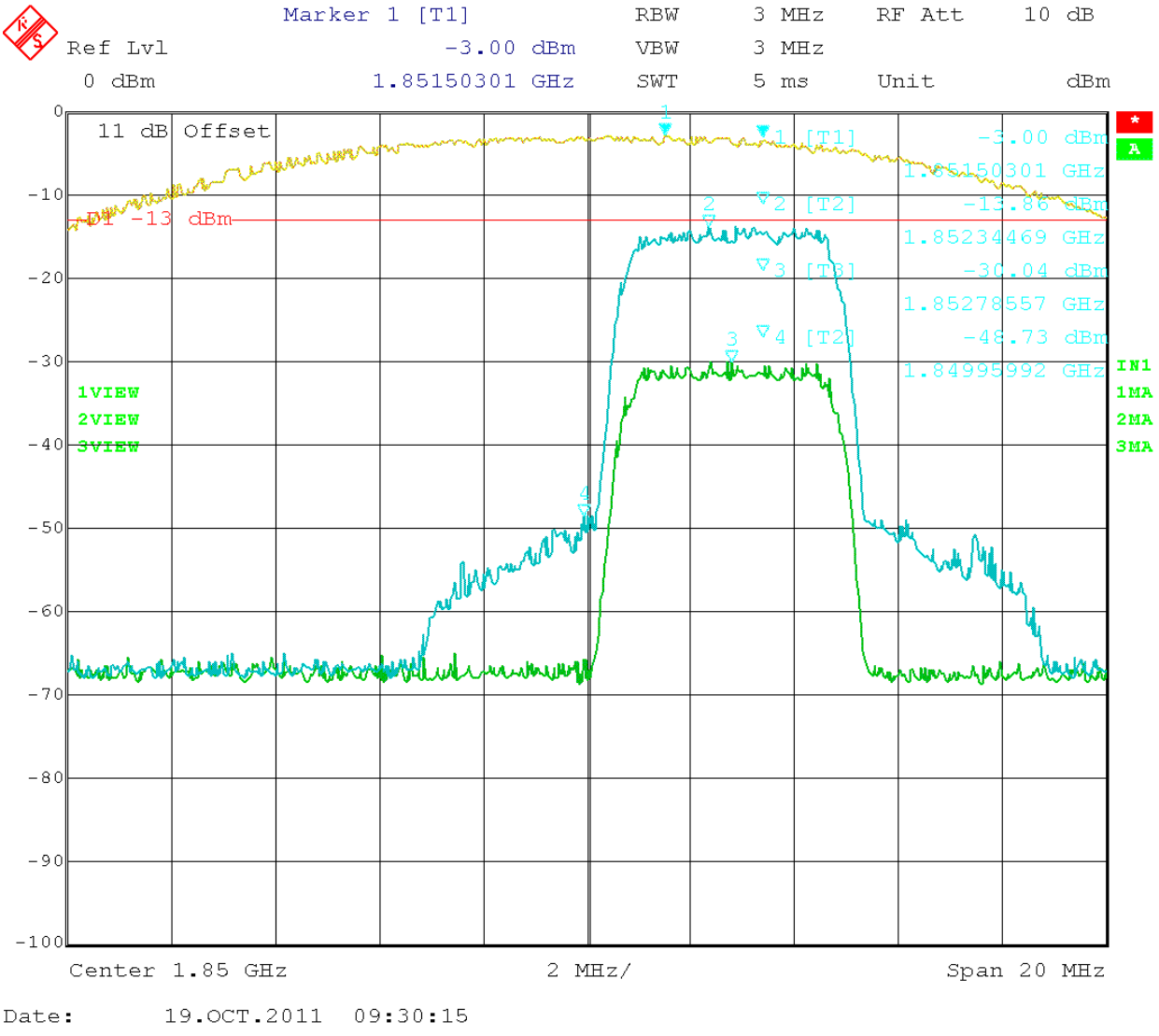



Figure 5: WCDMA – In vs. Out 1852.50 MHz

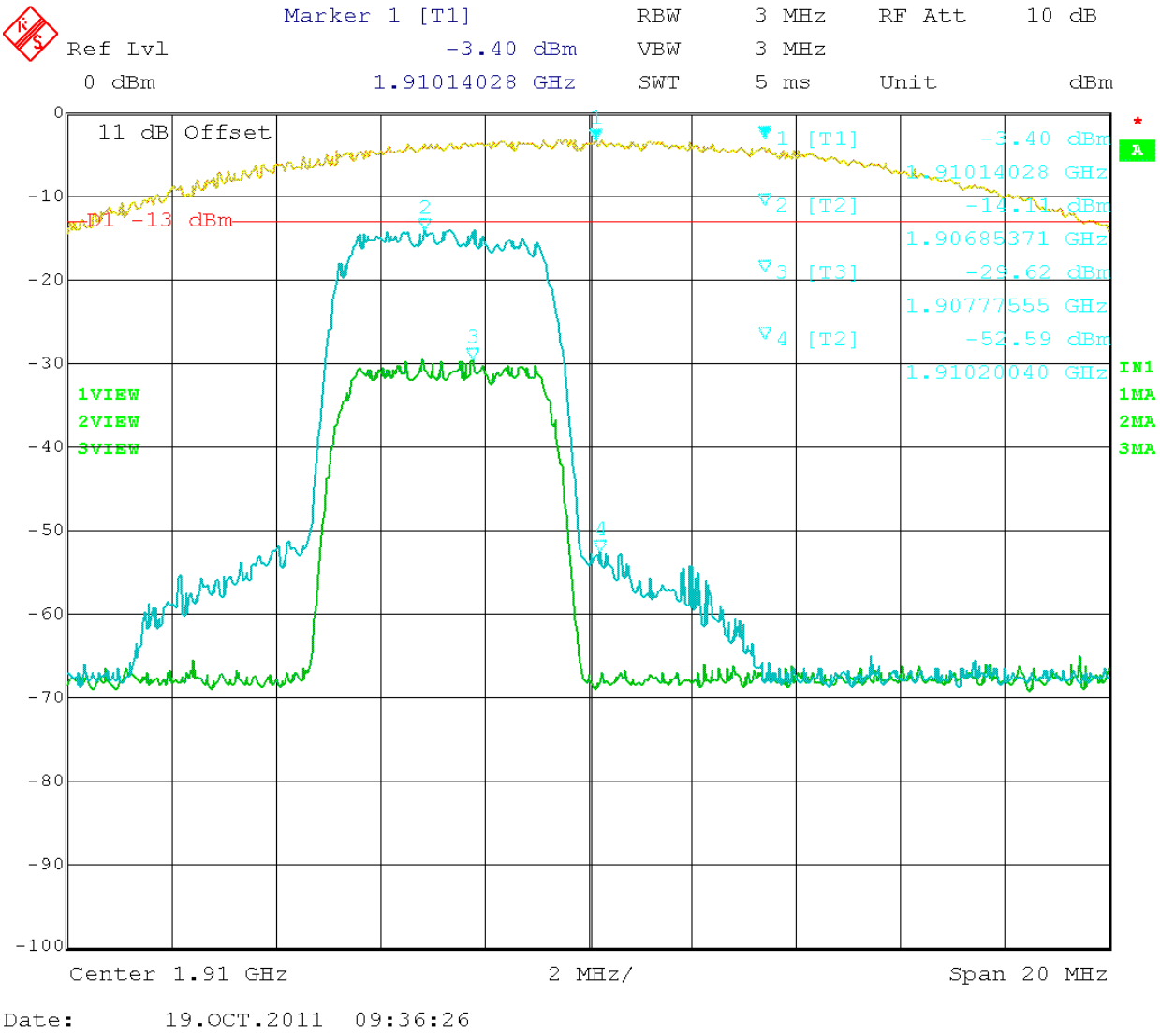



Figure 6: WCDMA – In vs. Out 1907.50 MHz

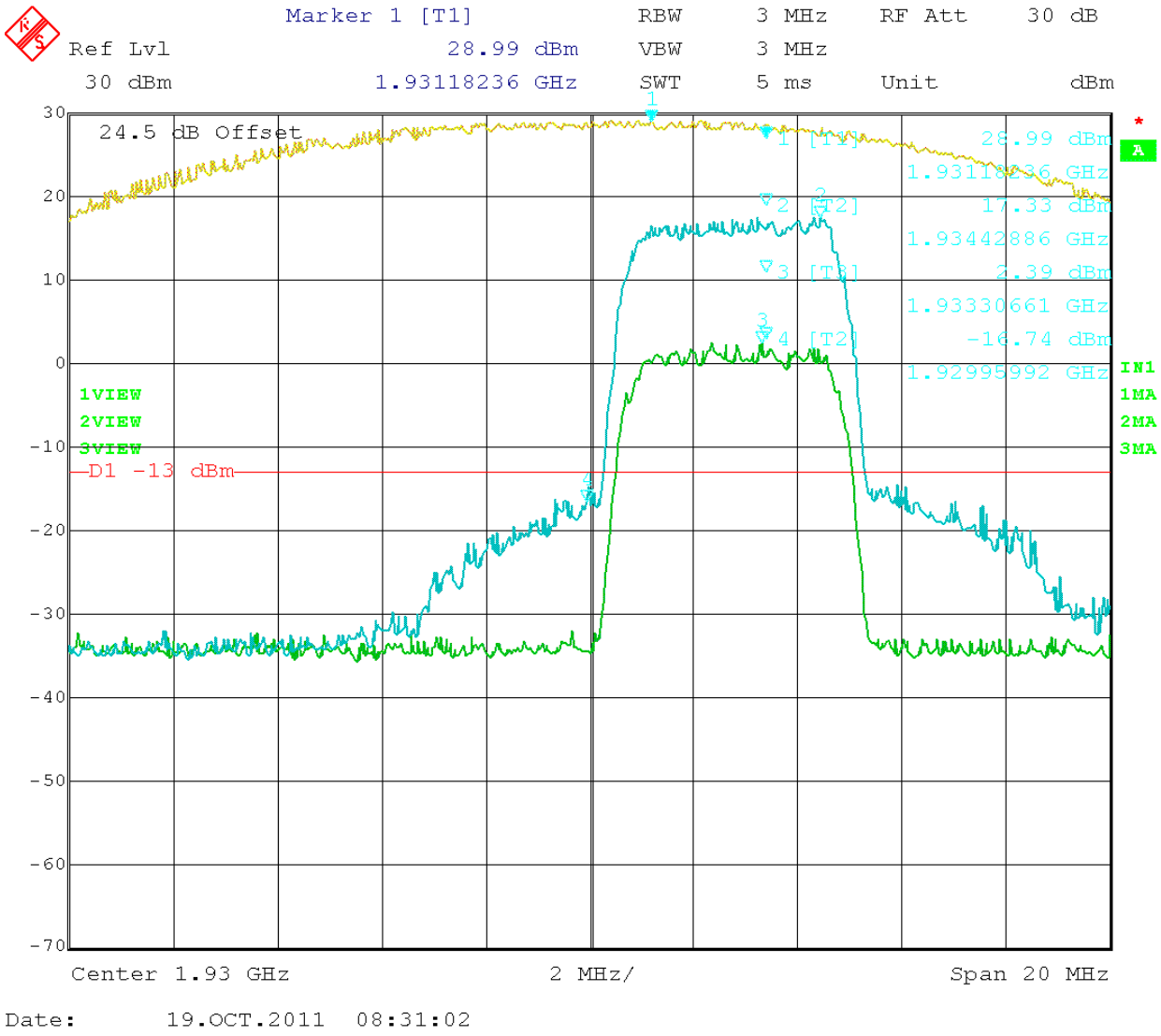



Figure 7: WCDMA – In vs. Out 1932.50 MHz

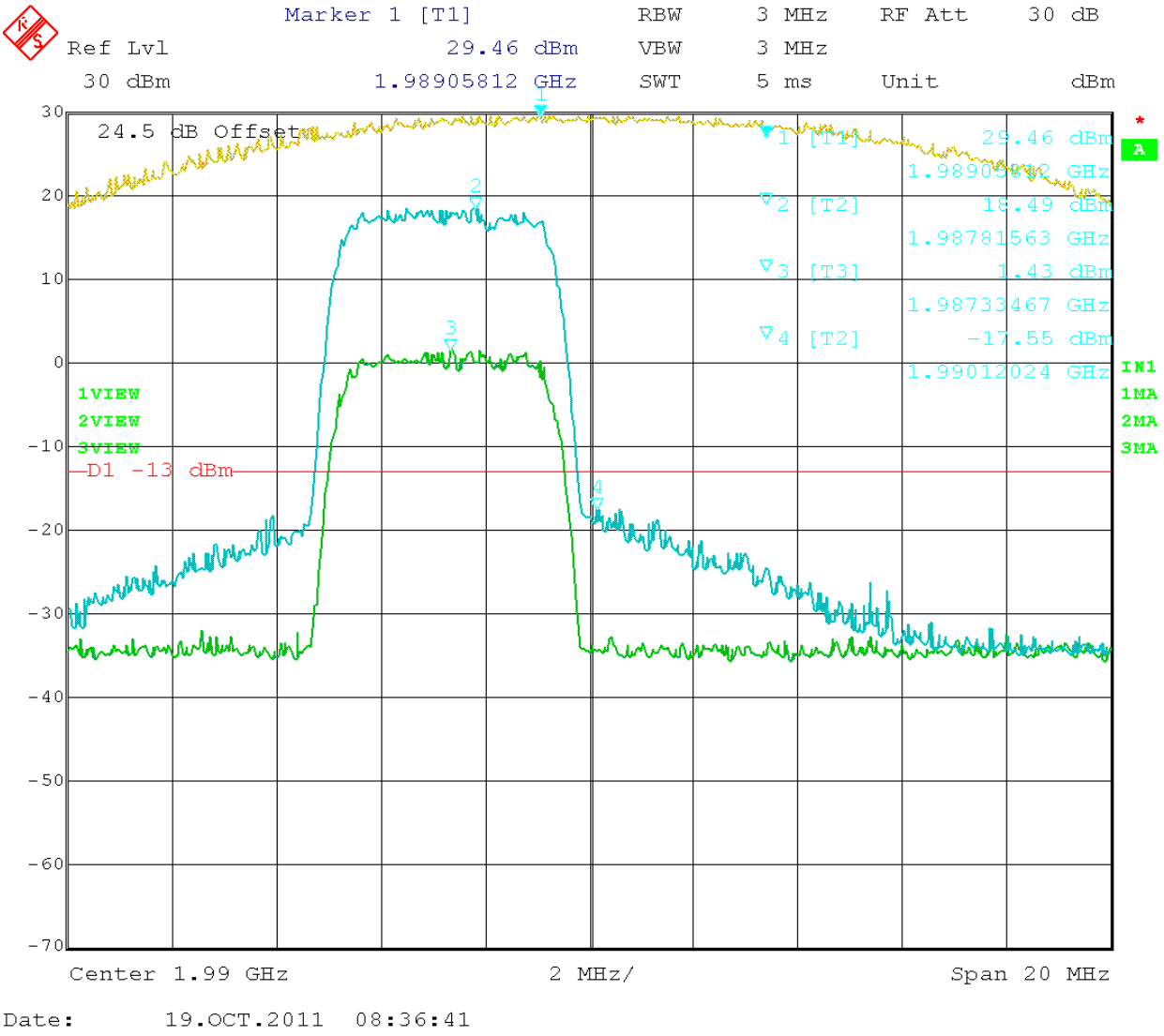



Figure 8: WCDMA – In vs. Out 1977.50 MHz

Test Data Table 13 – LTE 1900 – Uplink/Downlink

| Channel (MHz) | Band-edge Frequency (MHz) | Amplitude level at the band-edge (dBm) | Limit (dBm) | Margin (dB) |
|---|---|---|---|---|
| 1860.5 | 1849.20 | -40.59 | -13 | 27.59 |
| 1899.5 | 1910.32 | -44.08 | -13 | 31.08 |
| 1940.5 | 1929.04 | -16.57 | -13 | 3.57 |
| 1979.5 | 1991.92 | -14.91 | -13 | 1.91 |

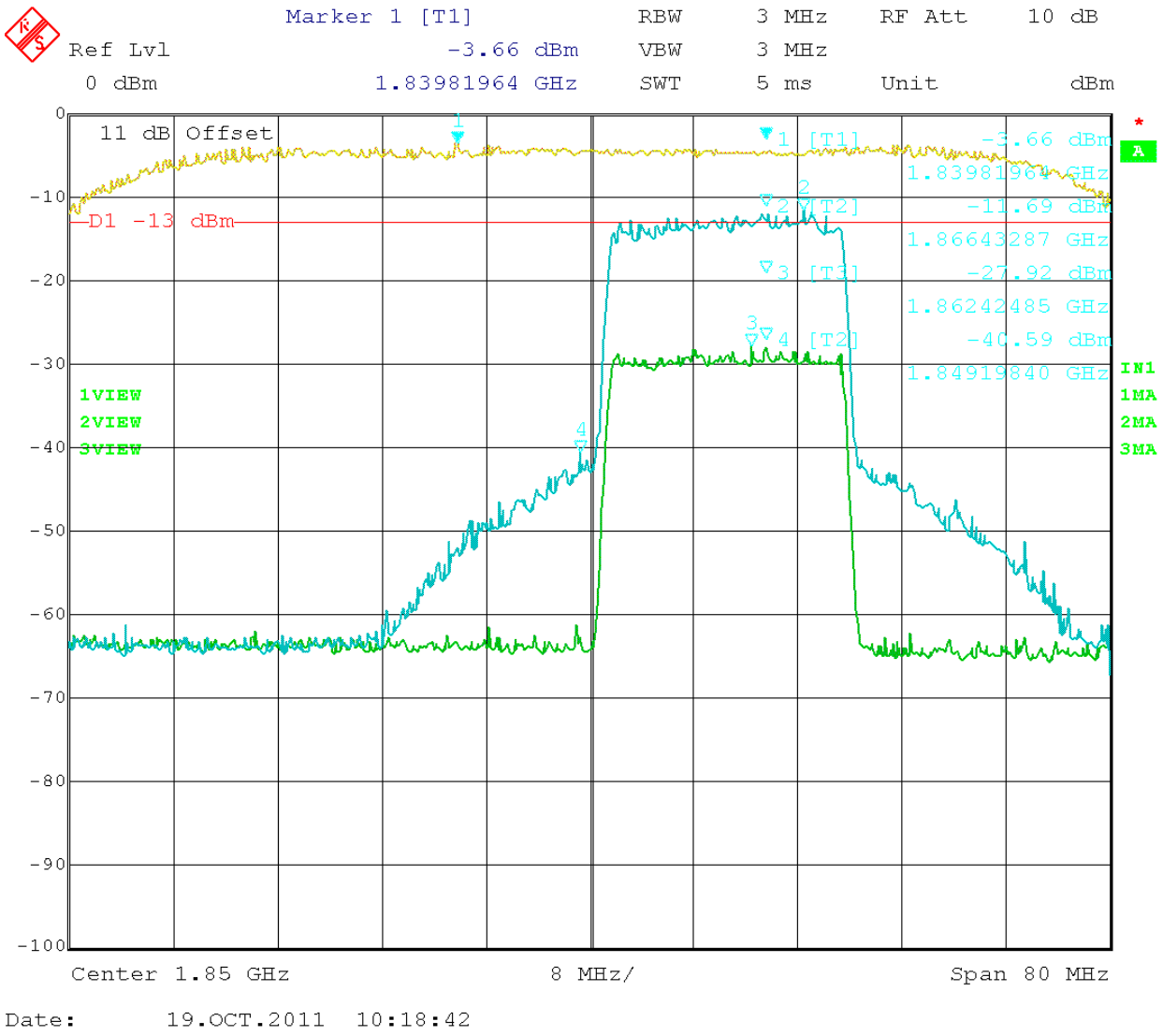



Figure 9: LTE – In vs. Out 1860.50MHz

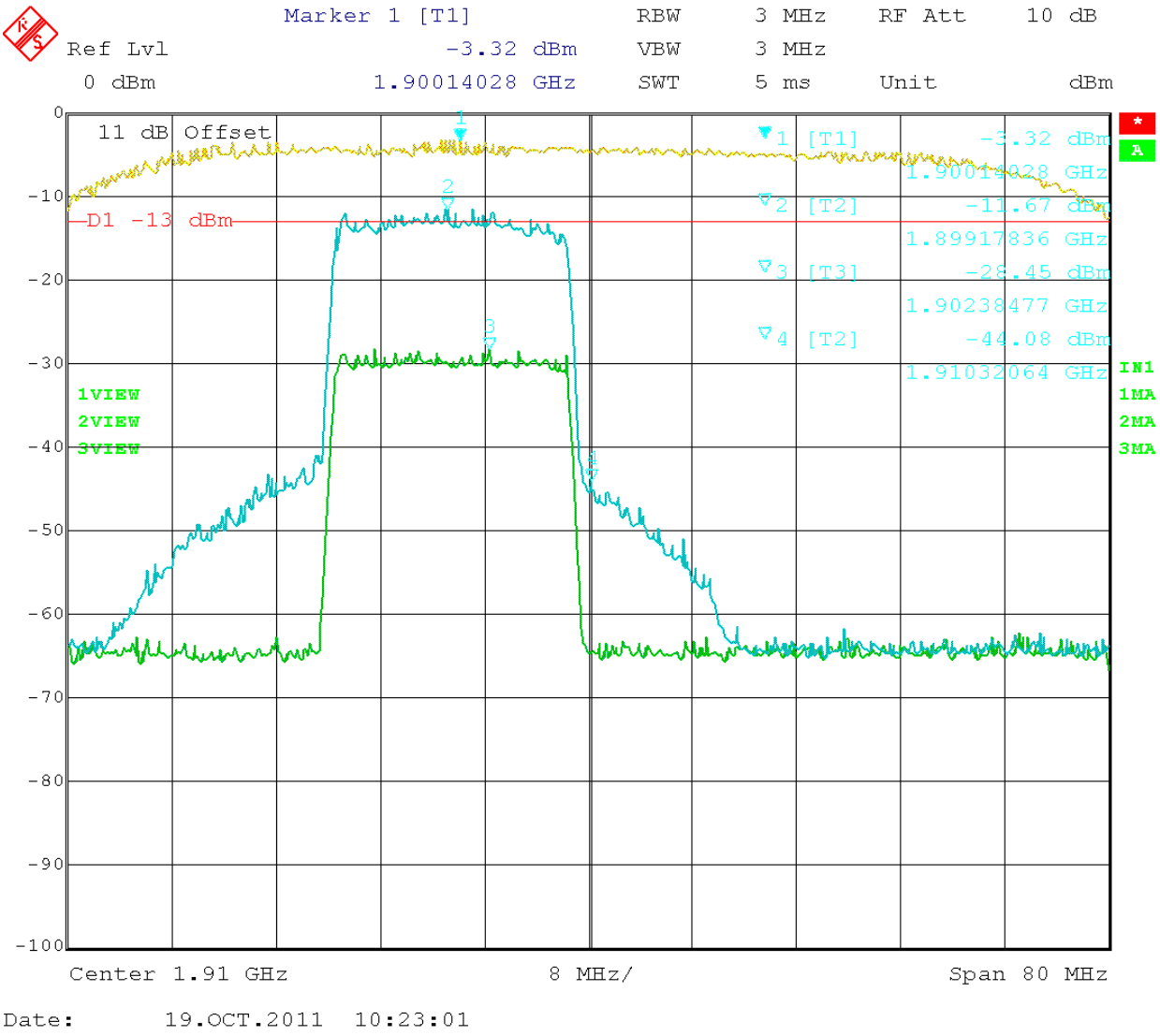



Figure 10: LTE – In vs. Out 1899.50MHz

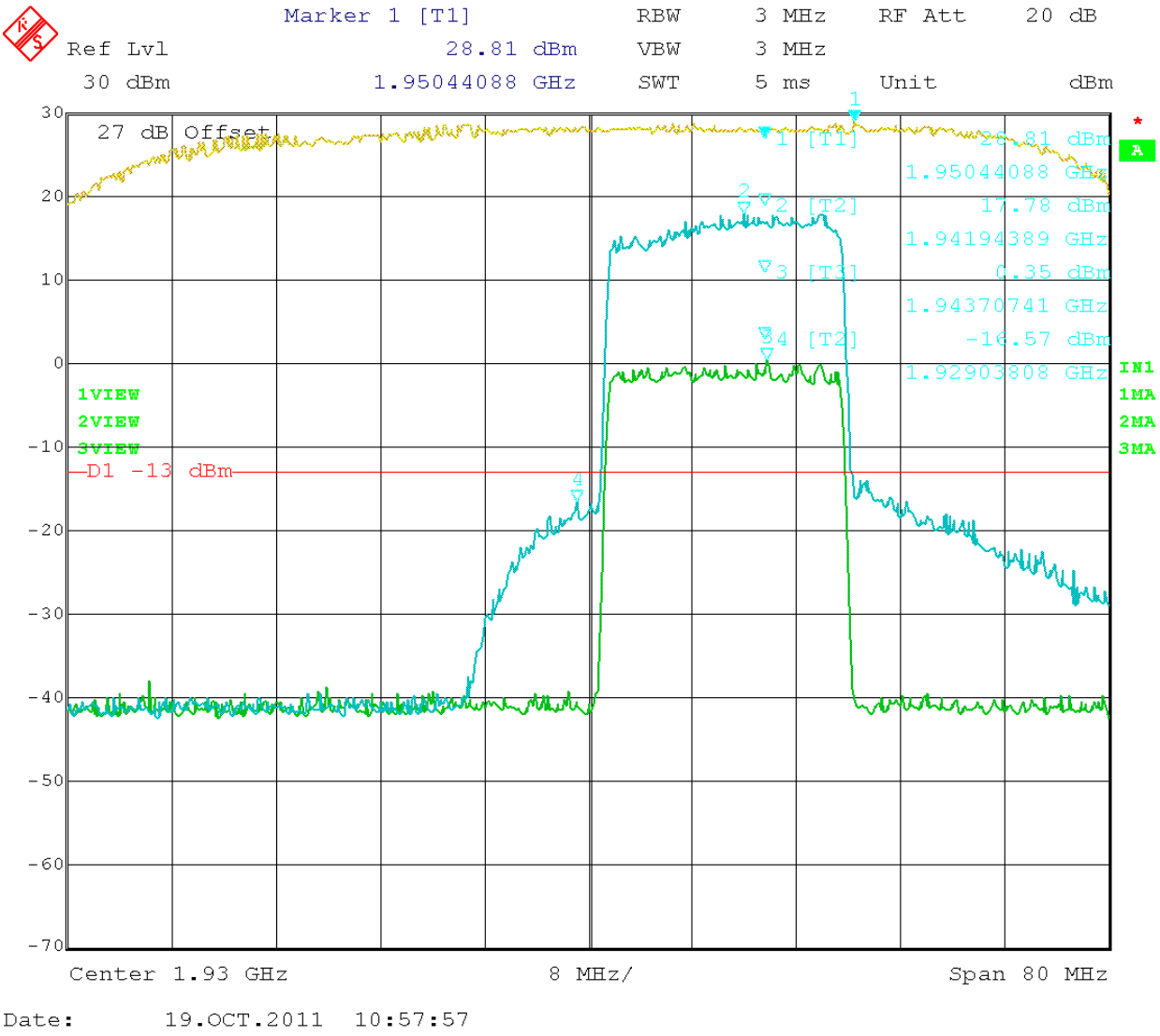



Figure 11: LTE – In vs. Out 1940.50MHz

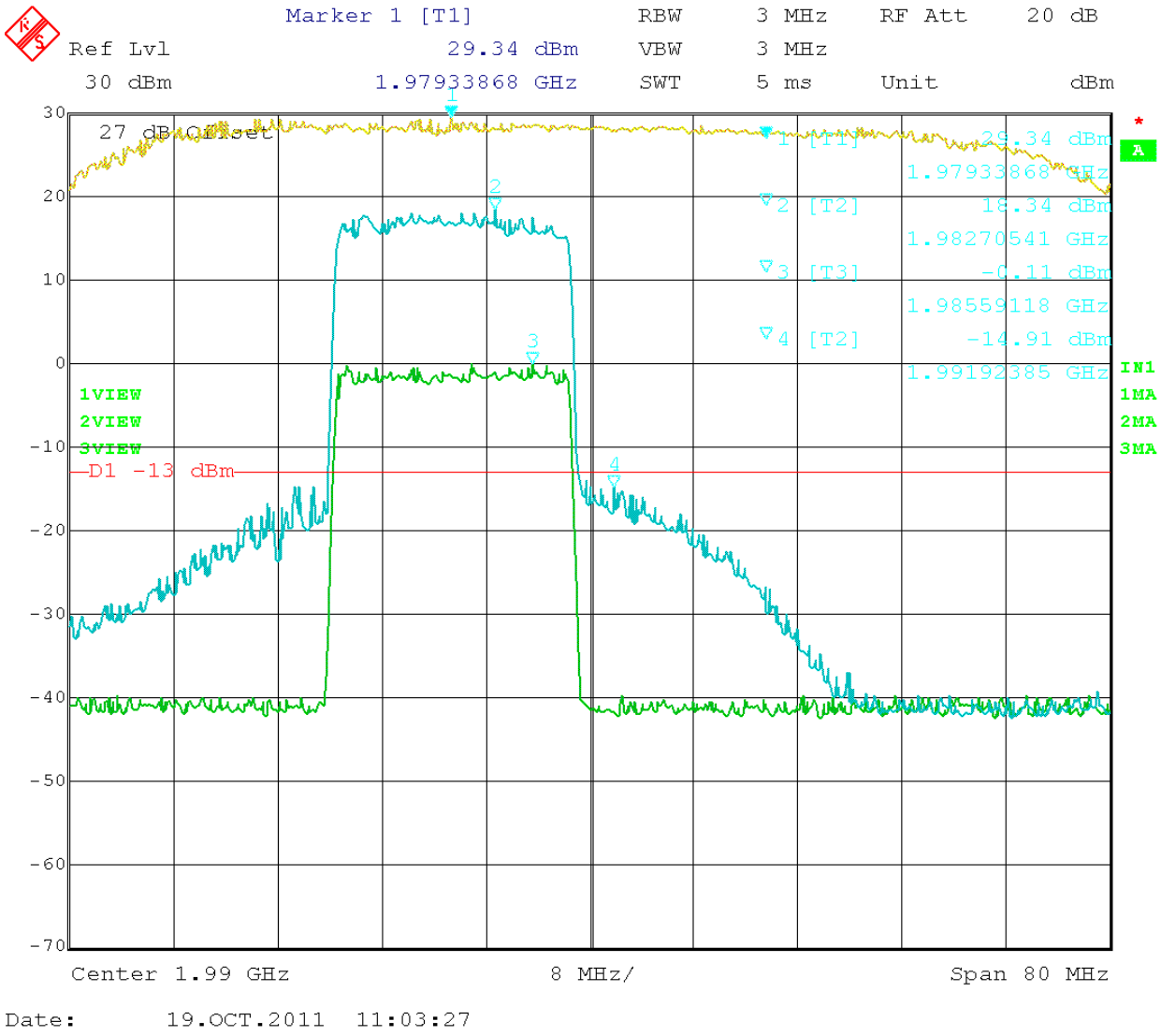



Figure 12: LTE – In vs. Out 1979.50MHz

Test Data Table 14 – EDGE 1900 – Uplink/Downlink

| Channel (MHz) | Band-edge Frequency (MHz) | Amplitude level at the band-edge (dBm) | Limit (dBm) | Margin (dB) |
|---|---|---|---|---|
| 1850.2 | 1850 | -38.9 | -13 | 25.9 |
| 1909.8 | 1910 | -37.69 | -13 | 24.69 |
| 1930.2 | 1929.98 | -14.31 | -13 | 1.31 |
| 1989.8 | 1990.02 | -15.79 | -13 | 2.79 |

The Reference level on the following plots was calibrated using a 3MHz RBW=VBW.

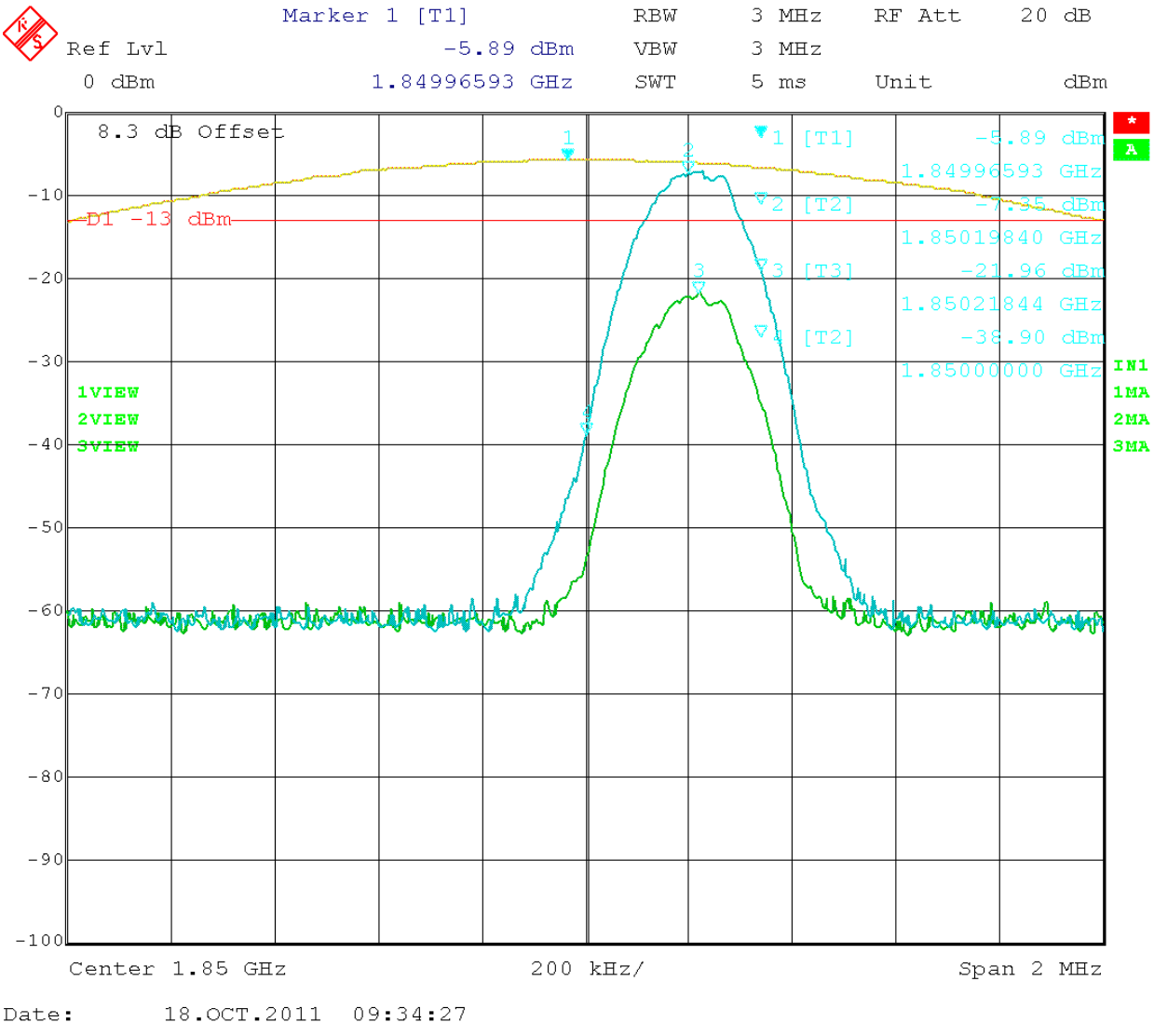



Figure 13: EDGE – In vs. Out 1850.20MHz

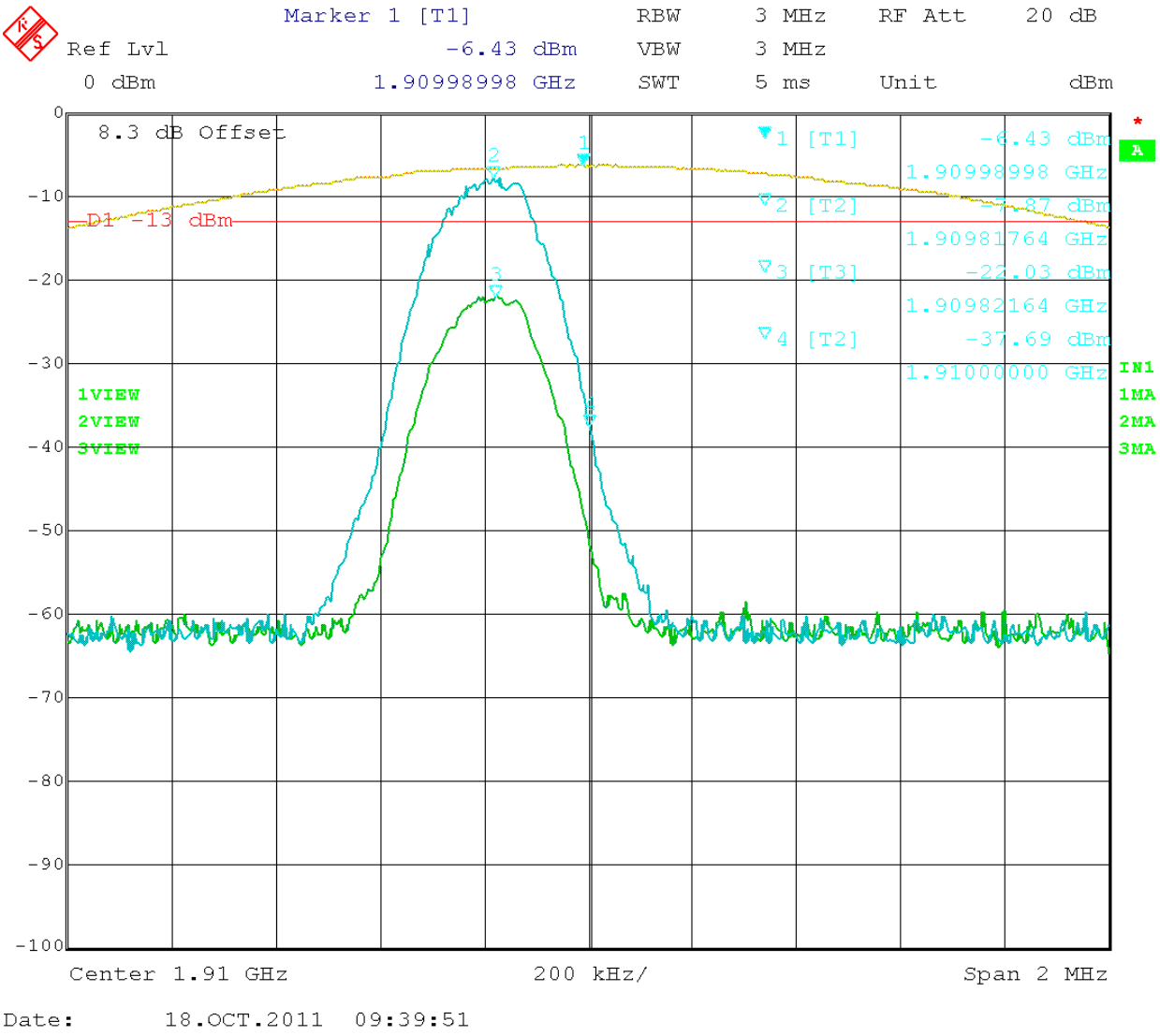



Figure 14: EDGE – In vs. Out 1909.80MHz

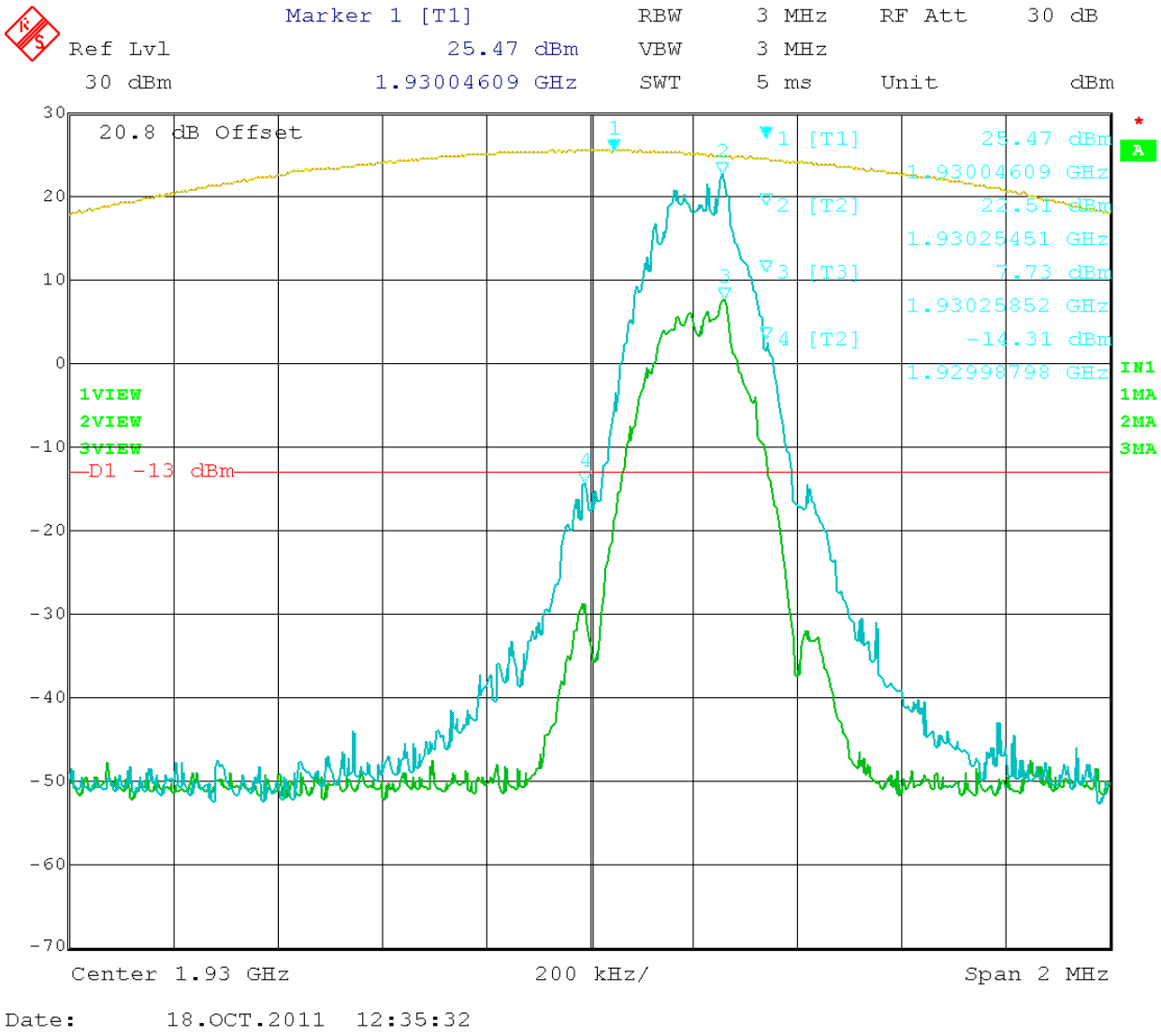



Figure 15: EDGE – In vs. Out 1930.20MHz

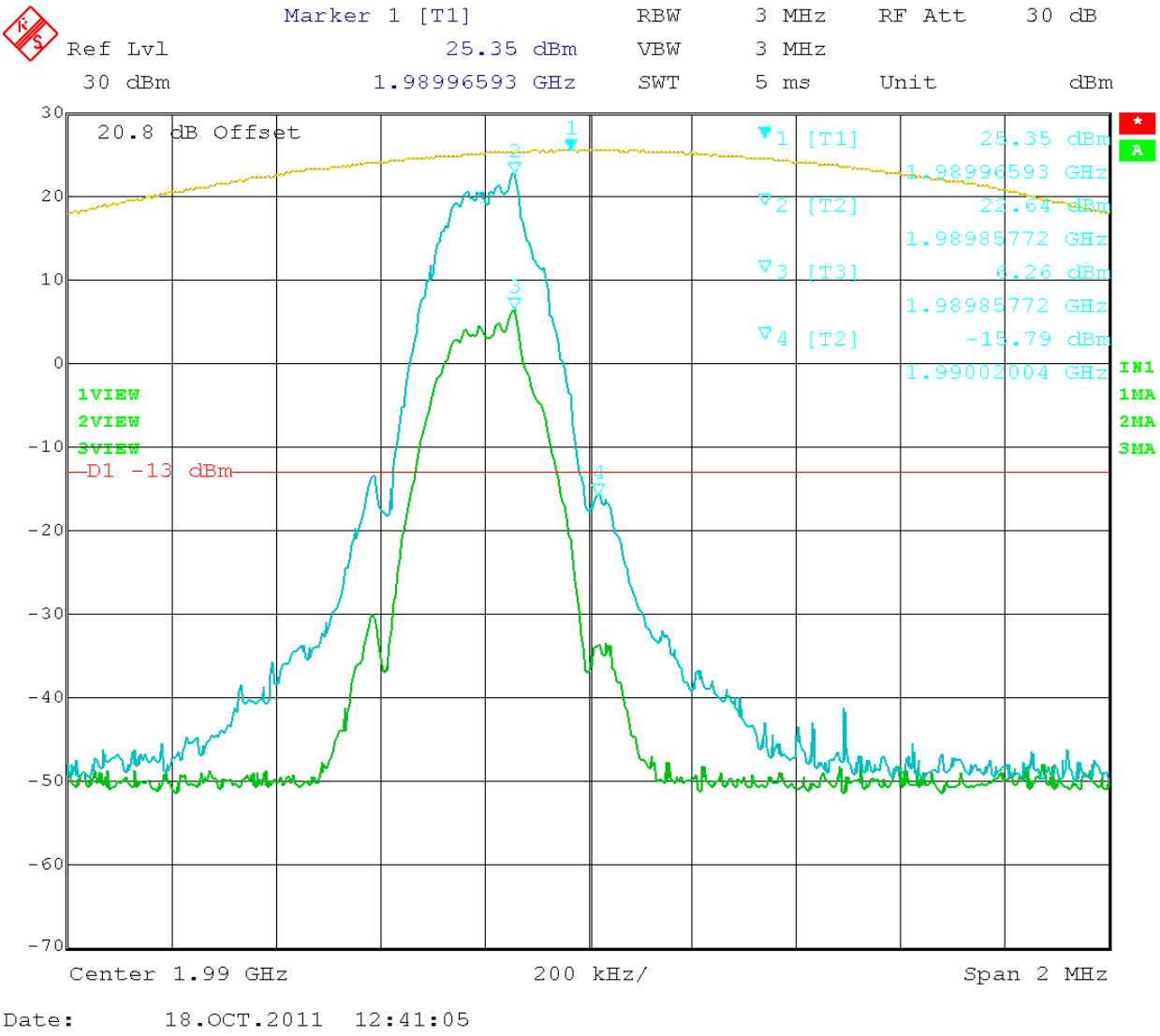



Figure 16: EDGE – In vs. Out 1989.80MHz

Test Data Table 15 –GSM 1900 – Uplink/Downlink

| Channel (MHz) | Band-edge Frequency (MHz) | Amplitude level at the band-edge (dBm) | Limit (dBm) | Margin (dB) |
|---|---|---|---|---|
| 1850.2 | 1850.00 | -43.1 | -13 | 30.1 |
| 1909.8 | 1910.00 | -44.49 | -13 | 31.49 |
| 1930.2 | 1930.00 | -13.84 | -13 | 0.84 |
| 1989.8 | 1990.00 | -14.7 | -13 | 1.7 |

The Reference level on the following plots was calibrated using a 3MHz RBW=VBW.

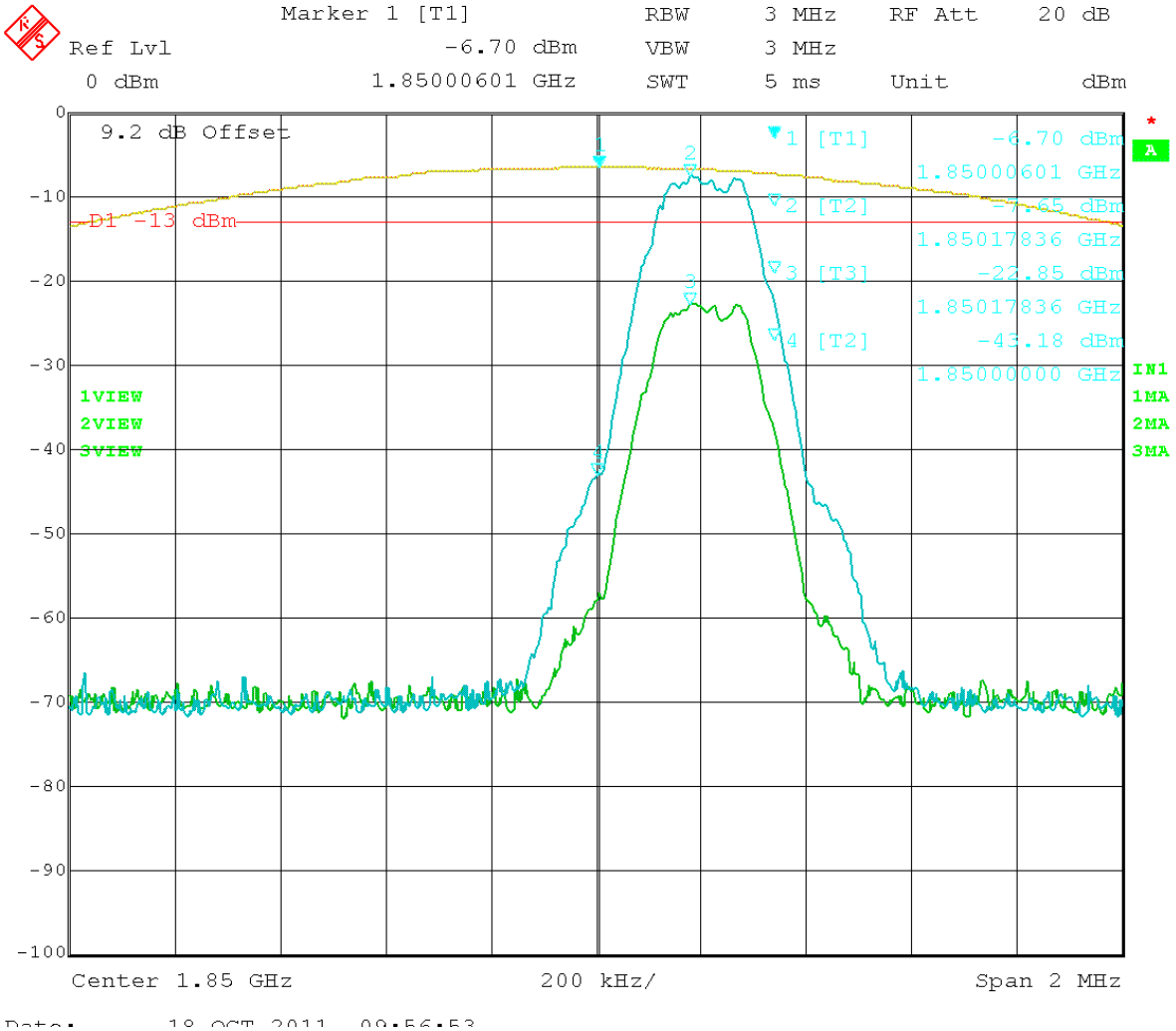



Figure 17: GSM – In vs. Out 1850.20MHz

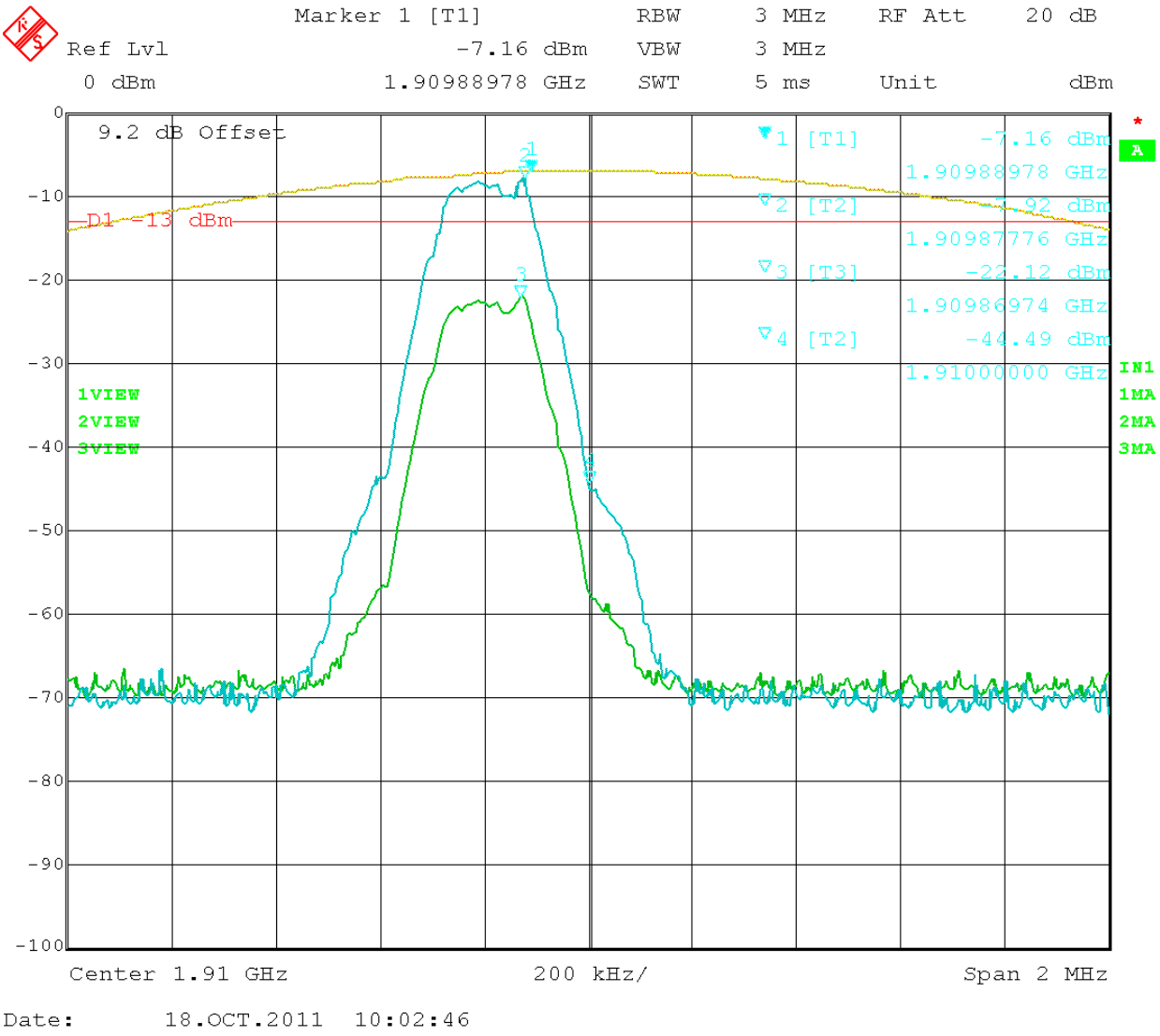



Figure 18: GSM – In vs. Out 1909.80MHz

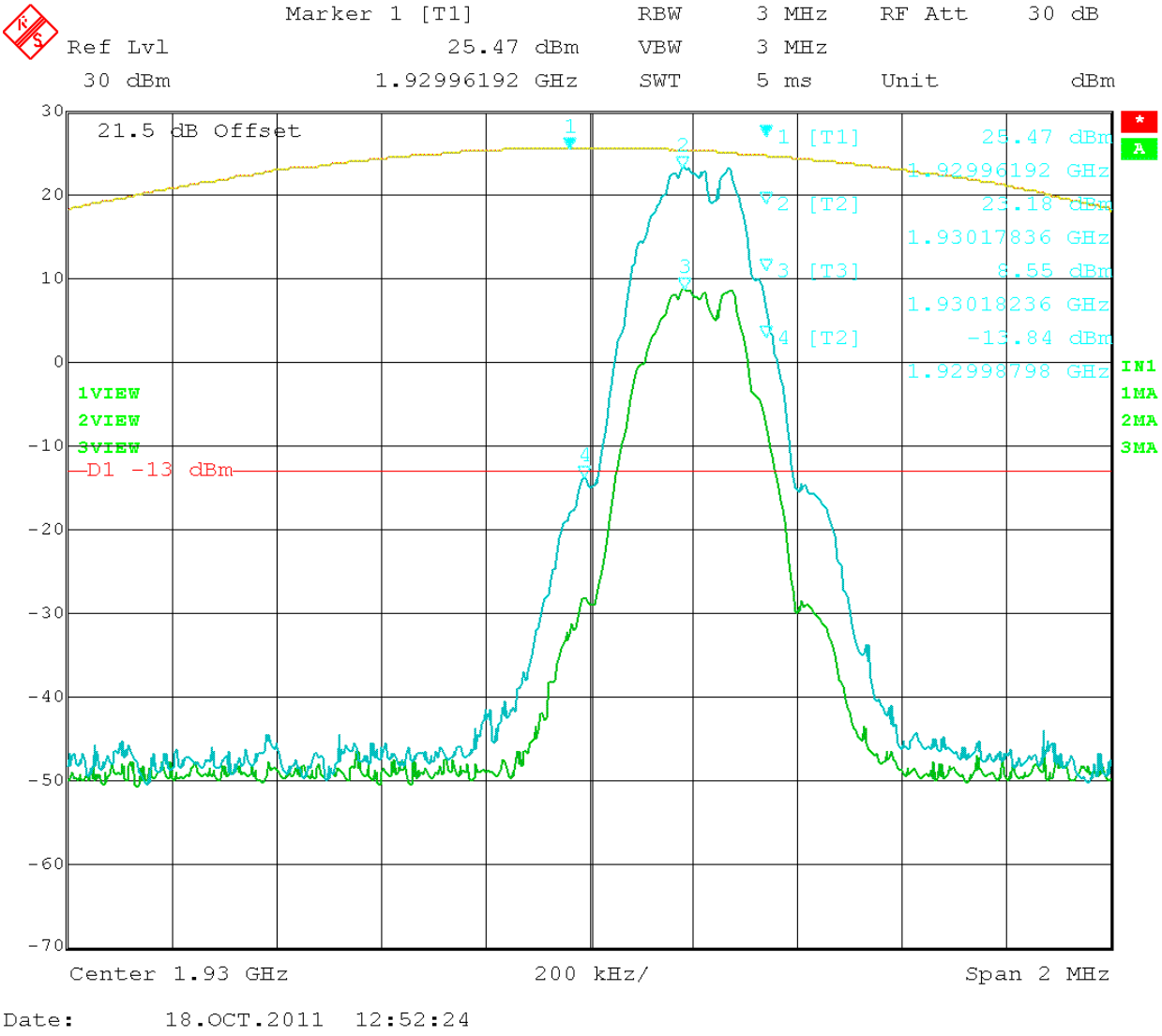



Figure 19: GSM – In vs. Out 1930.20MHz

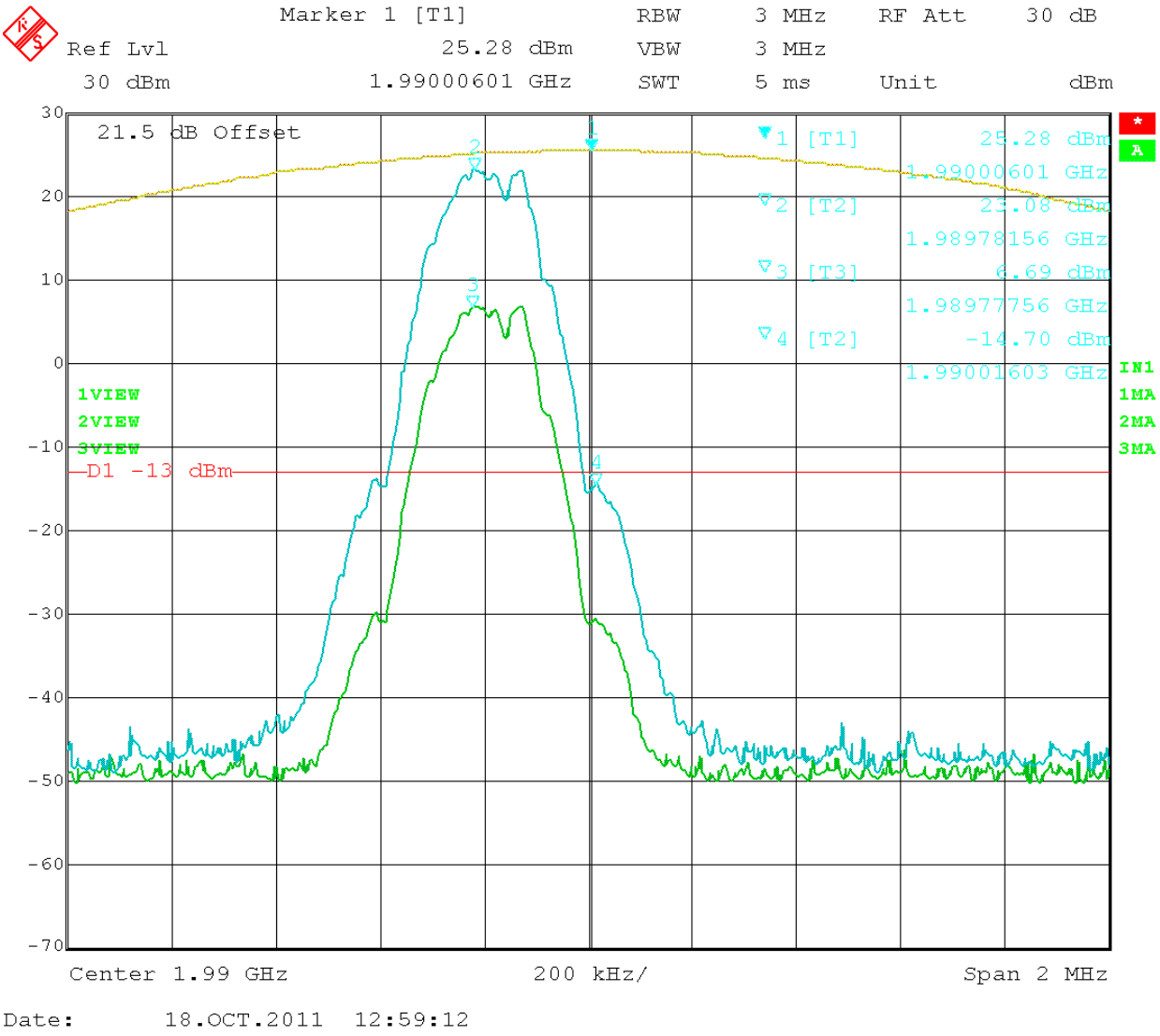



Figure 20: GSM – In vs. Out 1989.80MHz

Compensating for RBW (1%) using 10 log (12.5/3) = 6.2 dB we get the following amplitudes at the bandedge:

Test Data Table 16 – CDMA 800 – Uplink/Downlink

| Channel (MHz) | Bandedge Frequency (MHz) | Amplitude level at the band-edge (dBm) | Limit (dBm) | Margin (dB) |
|---|---|---|---|---|
| 825.25 | 823.97 | -51.09 | -13 | 38.09 |
| 847.75 | 849.08 | -54.29 | -13 | 41.29 |
| 870.25 | 868.92 | -22.71 | -13 | 9.71 |
| 888.75 | 894.26 | -25.88 | -13 | 12.88 |

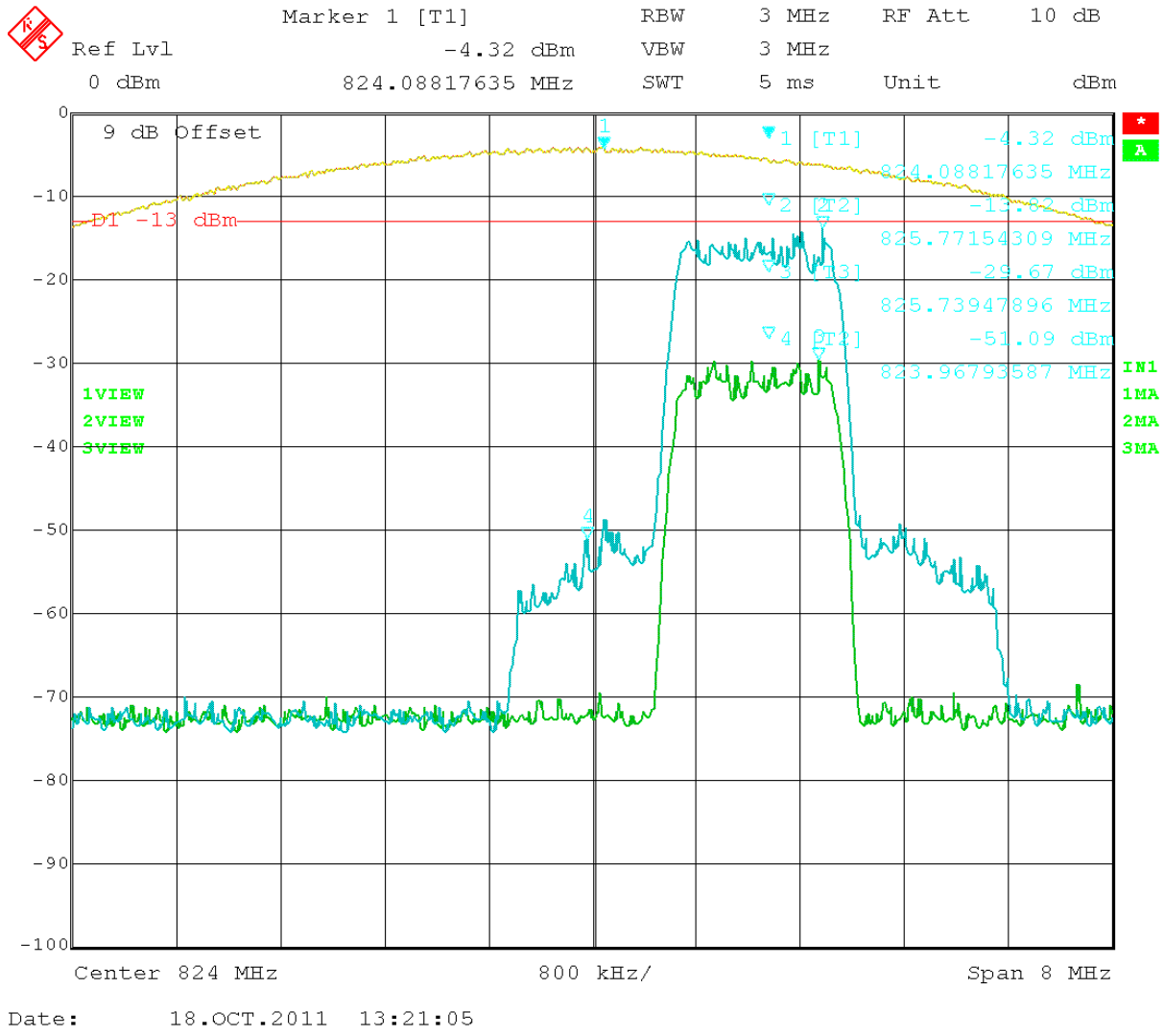



Figure 21: CDMA – In vs. Out 825.25MHz

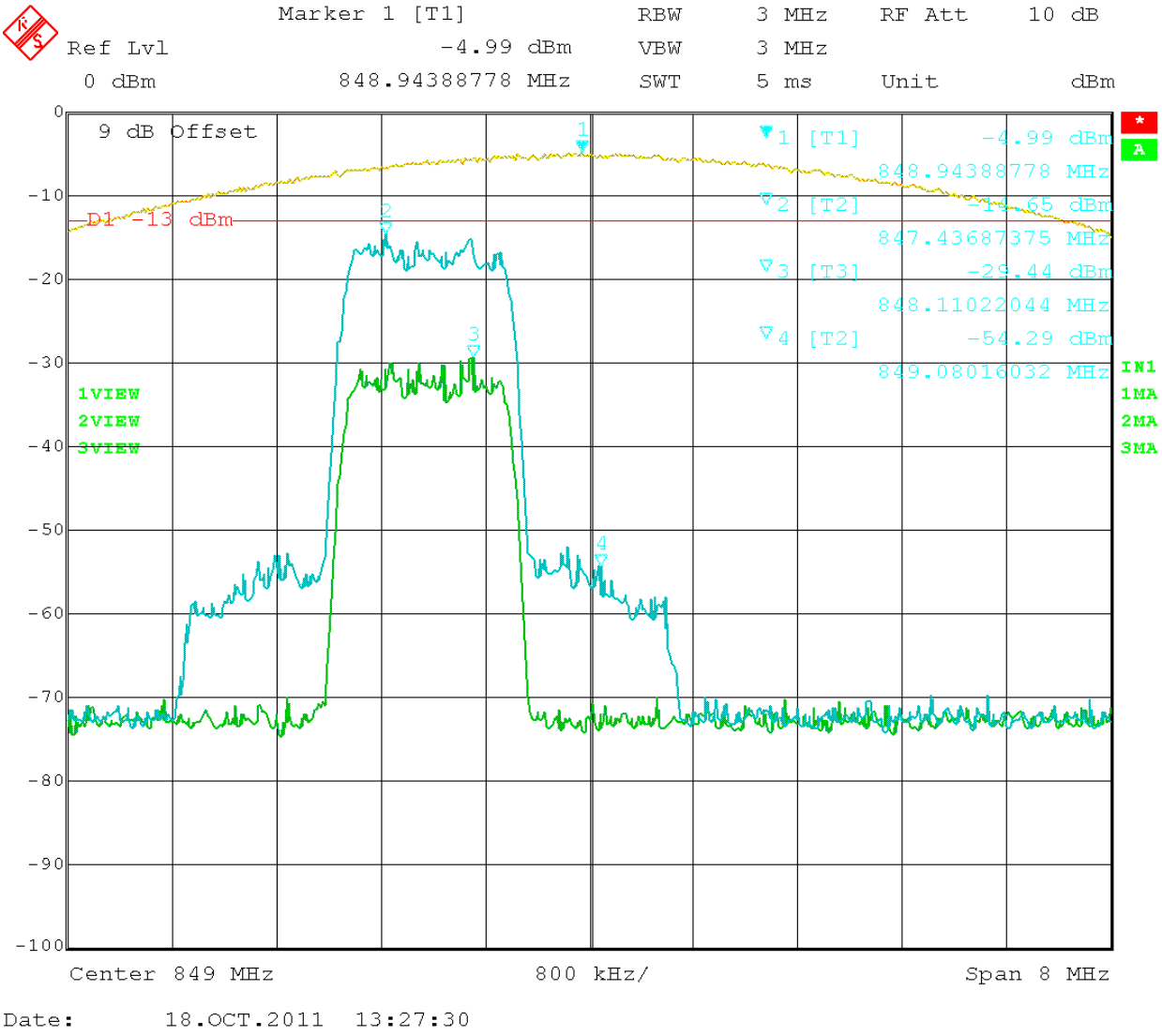



Figure 22: CDMA – In vs. Out 847.75 MHz

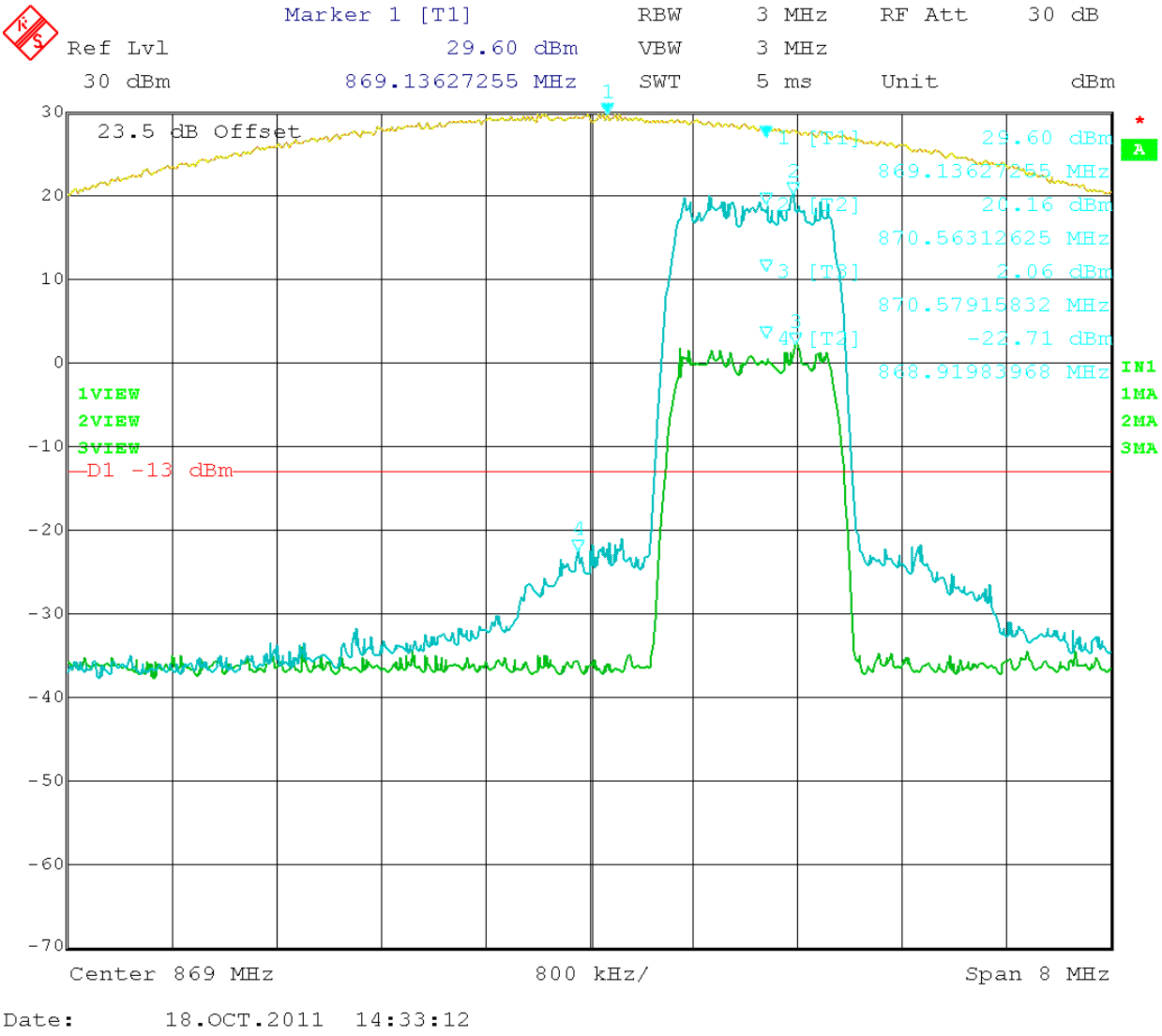



Figure 23: CDMA – In vs. Out 870.25 MHz

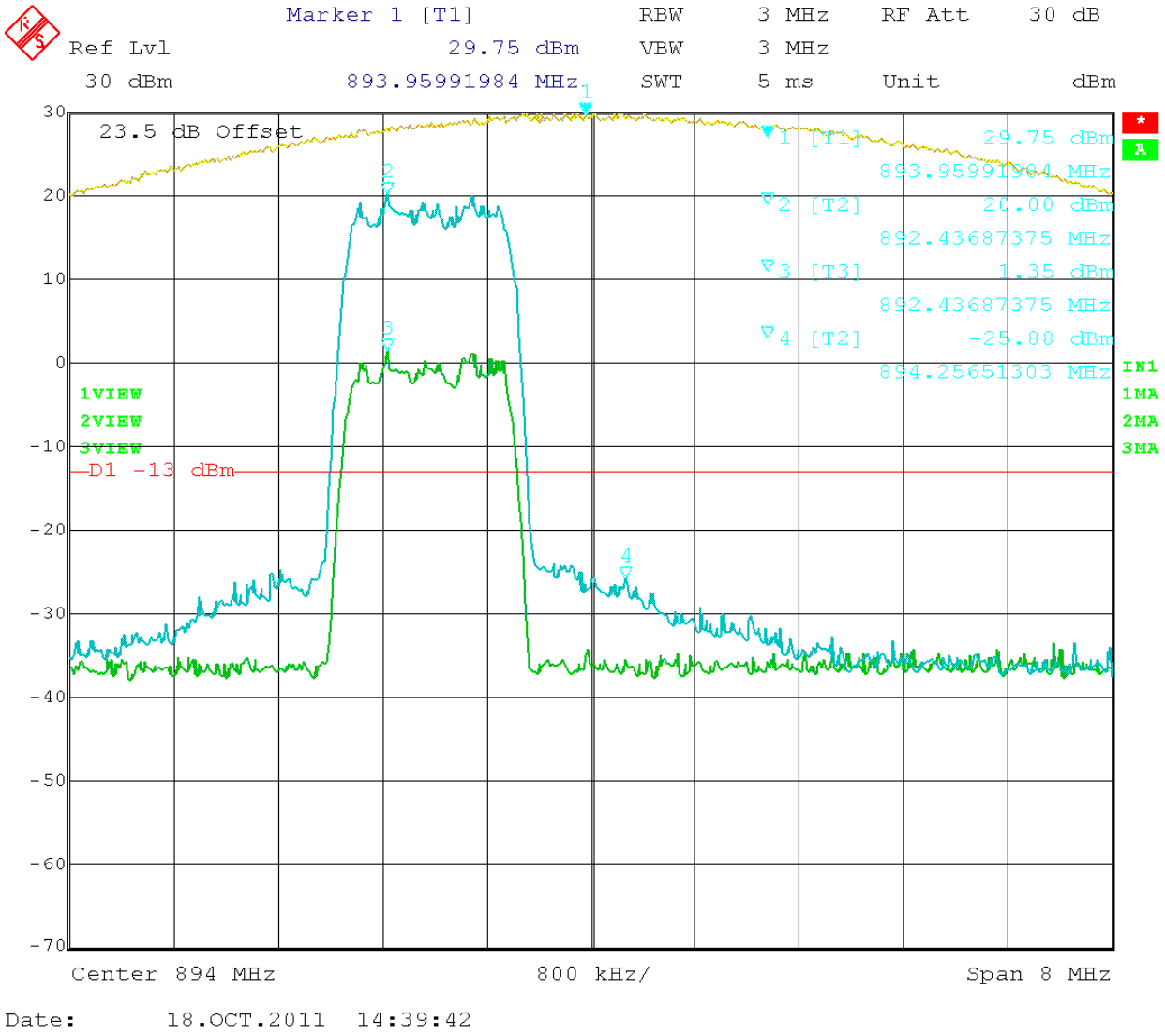



Figure 24: CDMA – In vs. Out 892.75 MHz

Test Data Table 17 – WCDMA 800 – Uplink/Downlink

| Channel (MHz) | Bandedge Frequency (MHz) | Amplitude level at the band-edge (dBm) | Limit (dBm) | Margin (dB) |
|---|---|---|---|---|
| 826.75 | 824.00 | -46.84 | -13 | 33.84 |
| 846.25 | 849.04 | -48.24 | -13 | 35.24 |
| 871.75 | 869.00 | -20.74 | -13 | 7.74 |
| 891.25 | 894.00 | -21.89 | -13 | 8.89 |

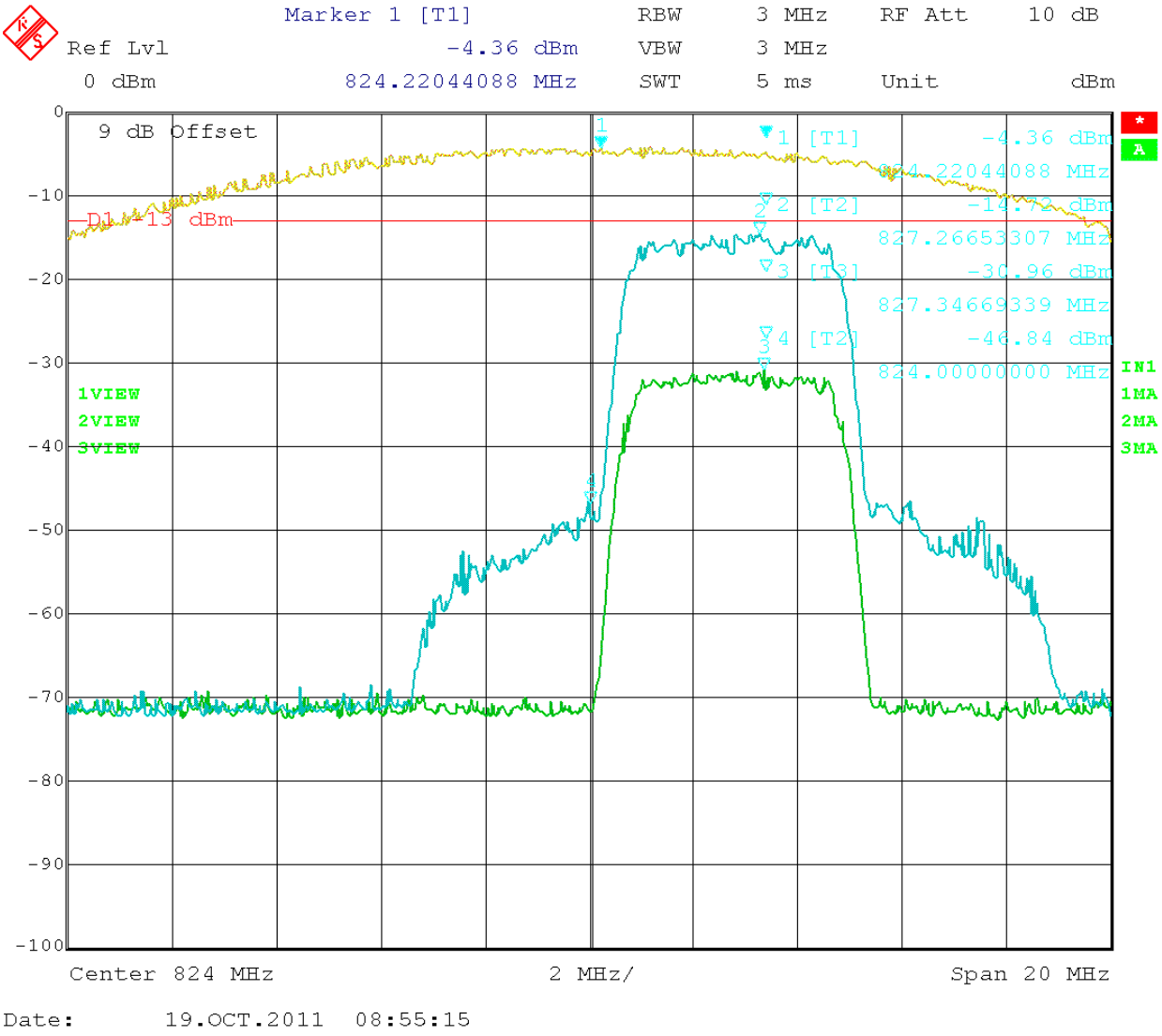



Figure 25: WCDMA – In vs. Out 826.50 MHz

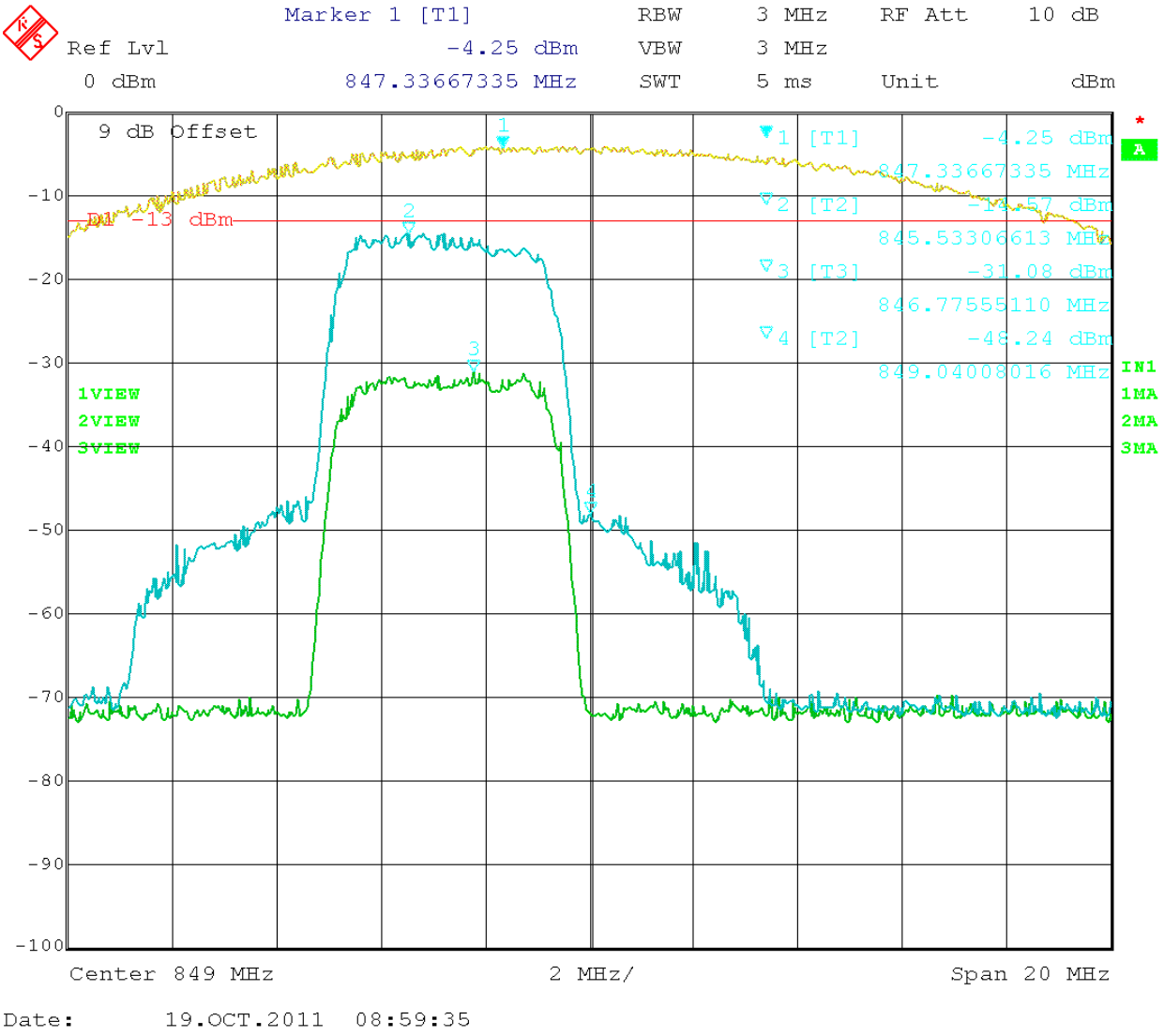



Figure 26: WCDMA – In vs. Out 846.50 MHz

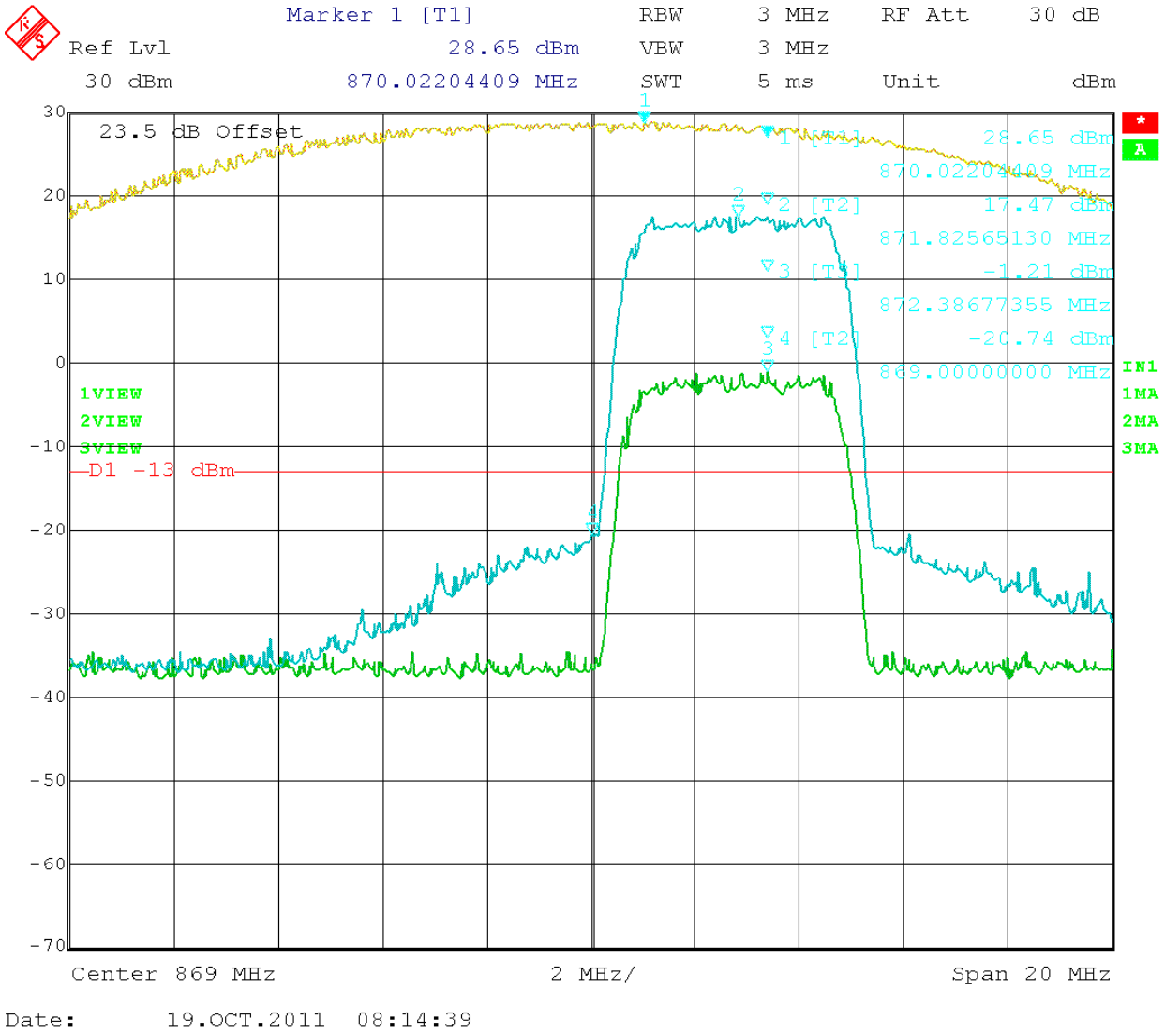



Figure 27: WCDMA – In vs. Out 871.50 MHz

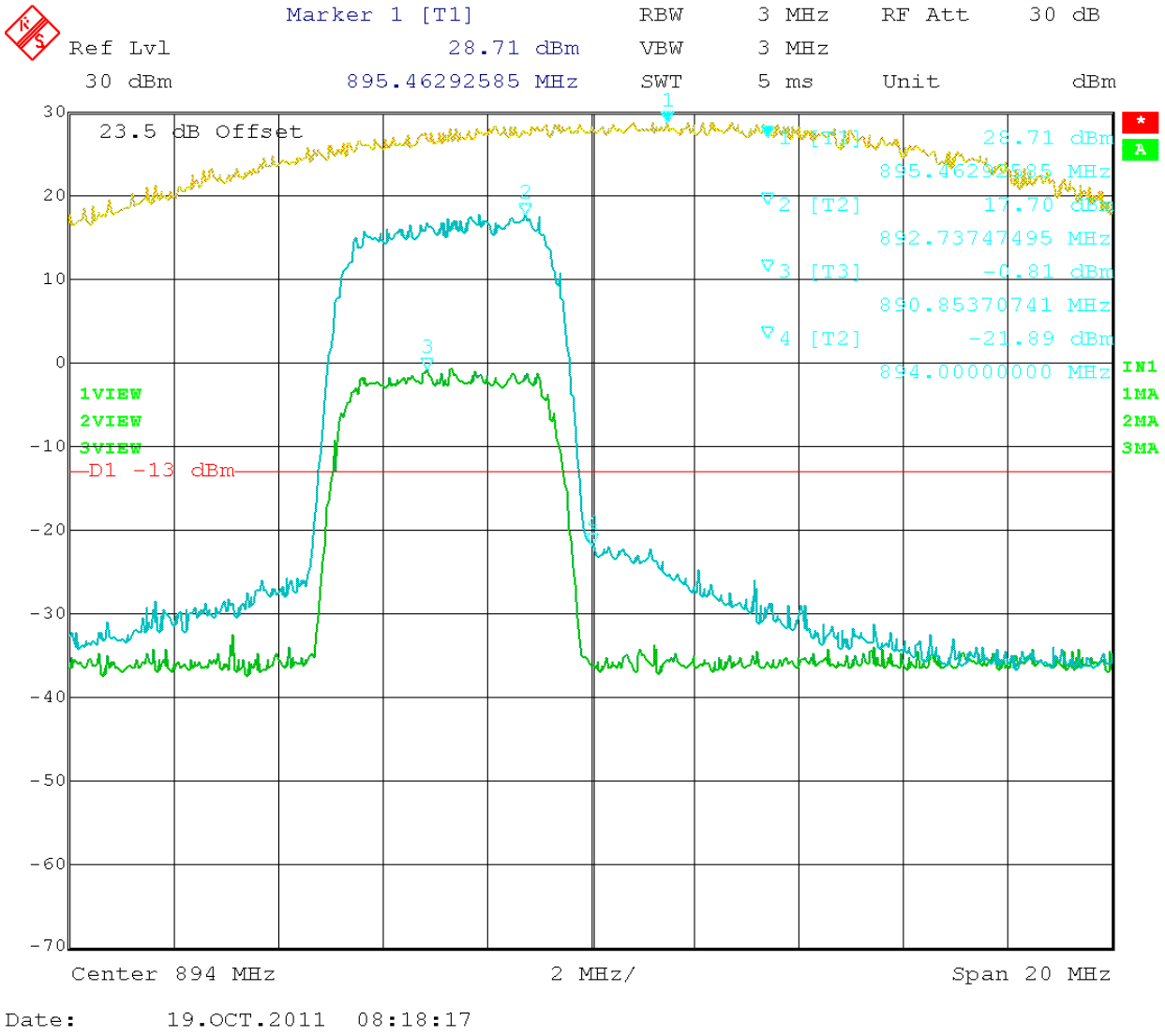



Figure 28: WCDMA – In vs. Out 893.50 MHz

Test Data Table 17 – LTE 800 – Uplink/Downlink

| Channel (MHz) | Bandedge Frequency (MHz) | Amplitude level at the band-edge (dBm) | Limit (dBm) | Margin (dB) |
|---|---|---|---|---|
| 834.5 | 824 | -39.40 | -13 | 26.4 |
| 838.5 | 849.8 | -40.50 | -13 | 27.5 |
| 879.5 | 867.56 | -15.11 | -13 | 2.11 |
| 883.5 | 894.64 | -17.31 | -13 | 4.31 |

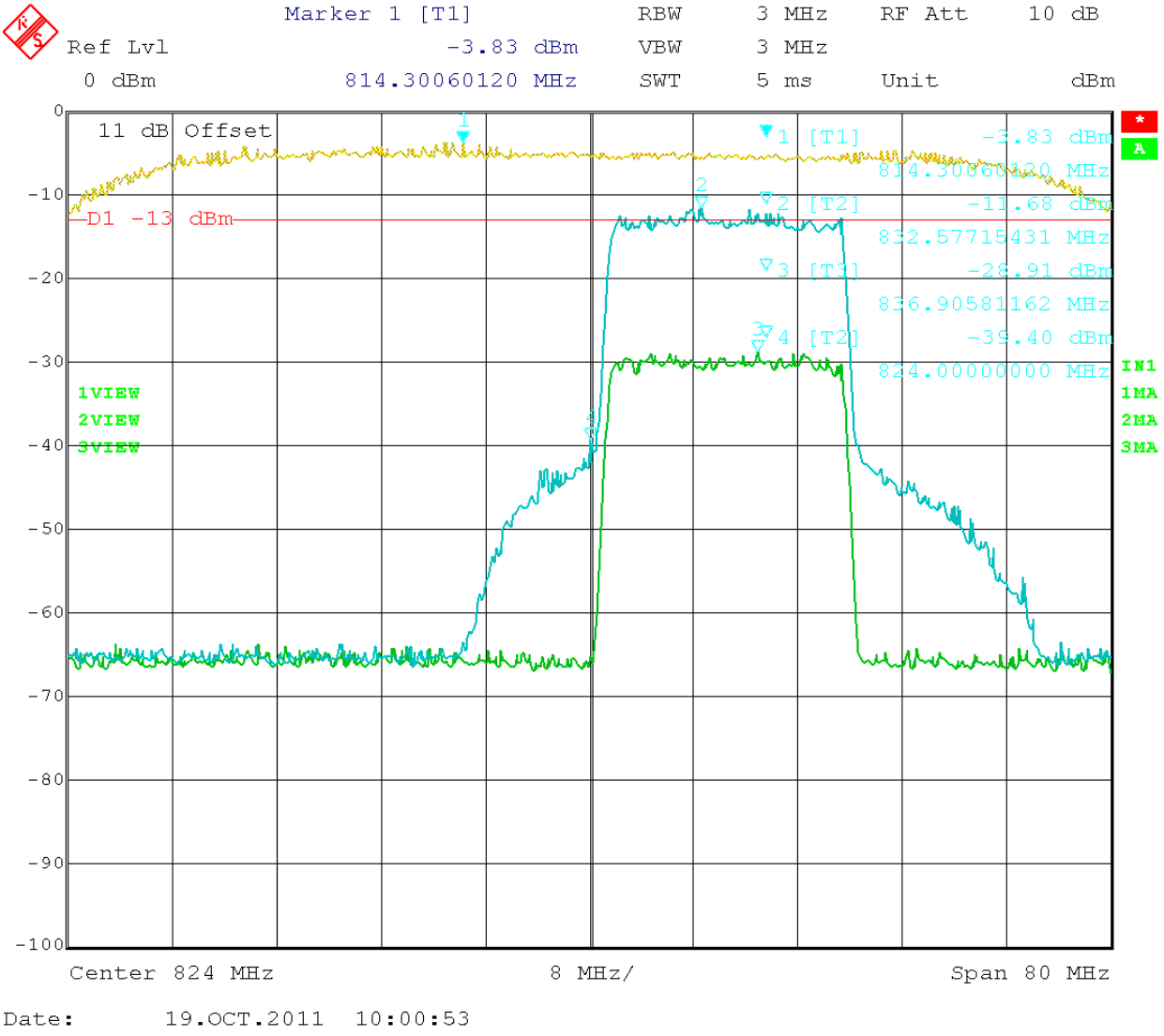



Figure 29: LTE – In vs. Out 834.50 MHz

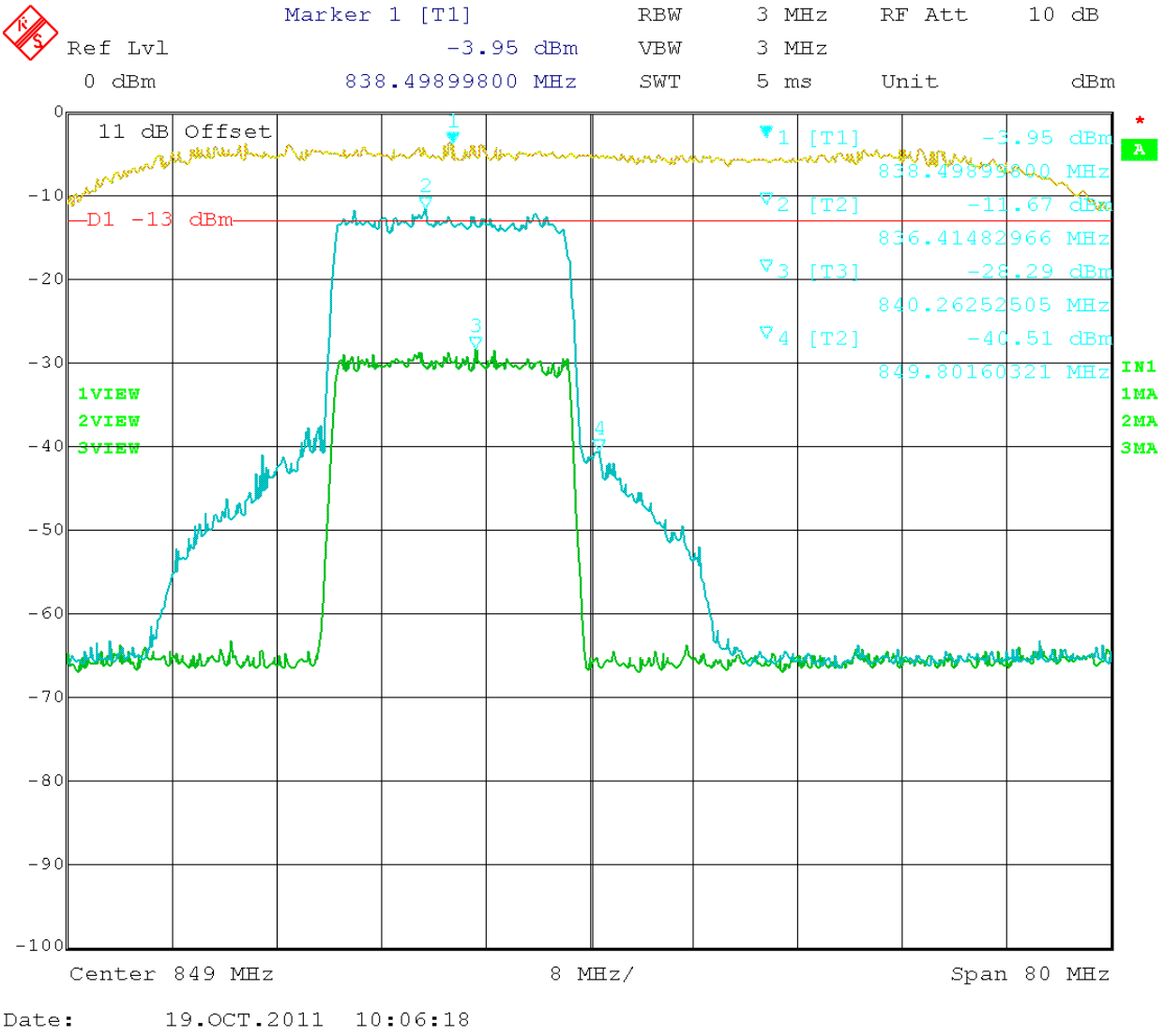



Figure 29: LTE – In vs. Out 838.50 MHz

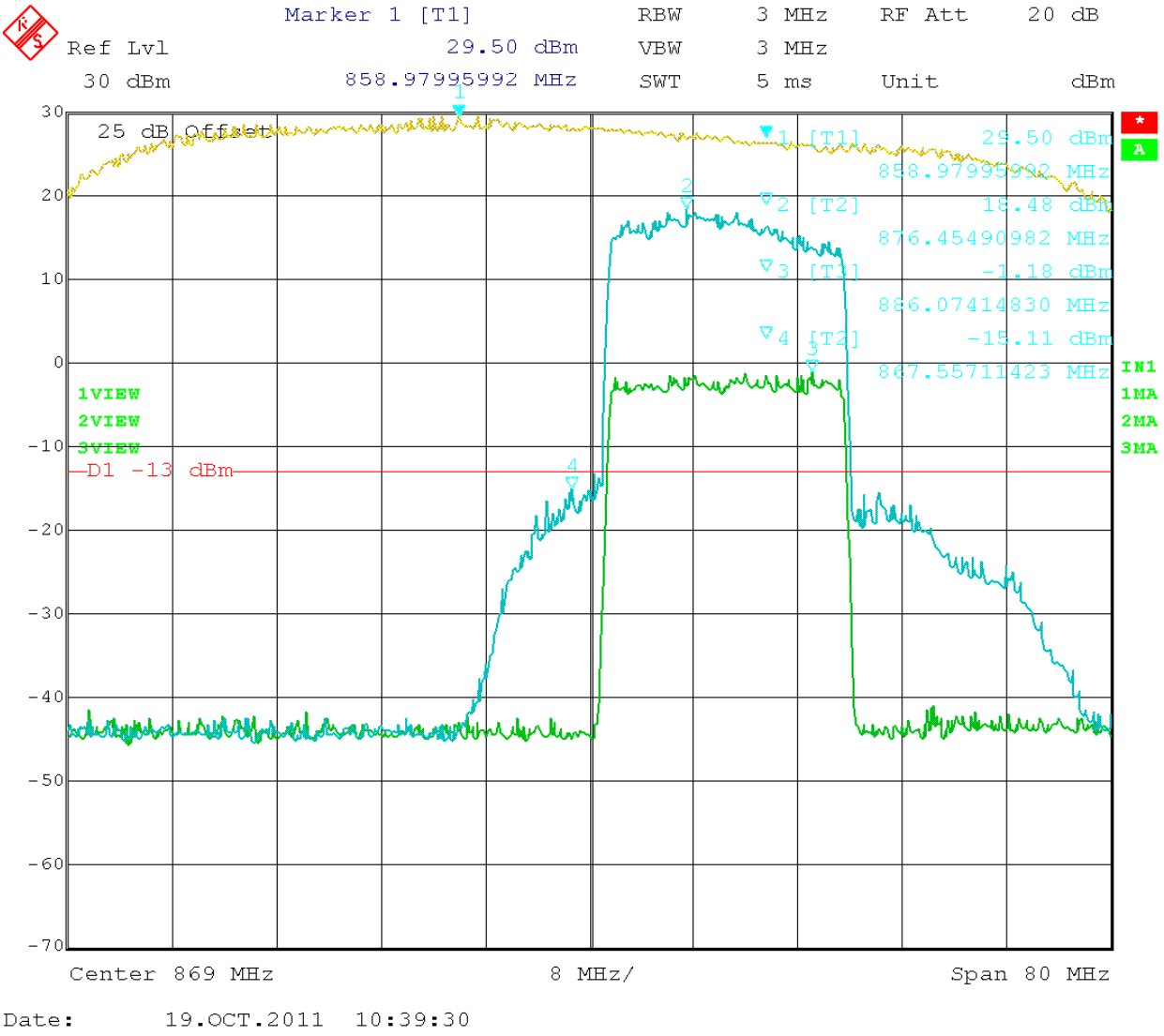



Figure 29: LTE – In vs. Out 879.50 MHz

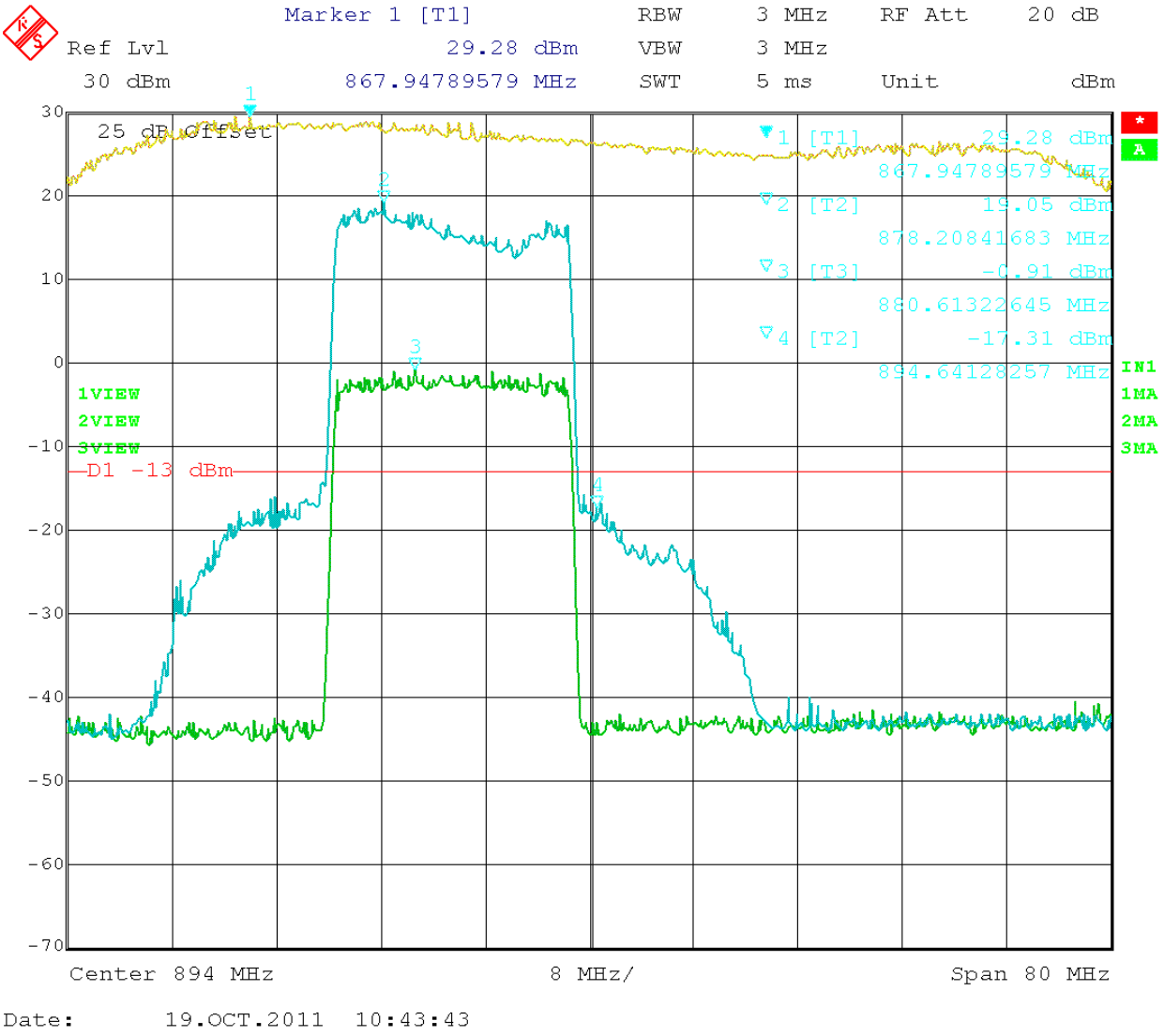



Figure 29: LTE – In vs. Out 883.50 MHz

Test Data Table 18 – EDGE 800 – Uplink/Downlink

| Channel (MHz) | Band-edge Frequency (MHz) | Amplitude level at the band-edge (dBm) | Limit (dBm) | Margin (dB) |
|---|---|---|---|---|
| 824.2 | 824.00 | -39.41 | -13 | 26.41 |
| 848.8 | 849.00 | -35.8 | -13 | 22.8 |
| 869.2 | 868.99 | -18.38 | -13 | 5.38 |
| 893.8 | 894.00 | -14.06 | -13 | 1.06 |

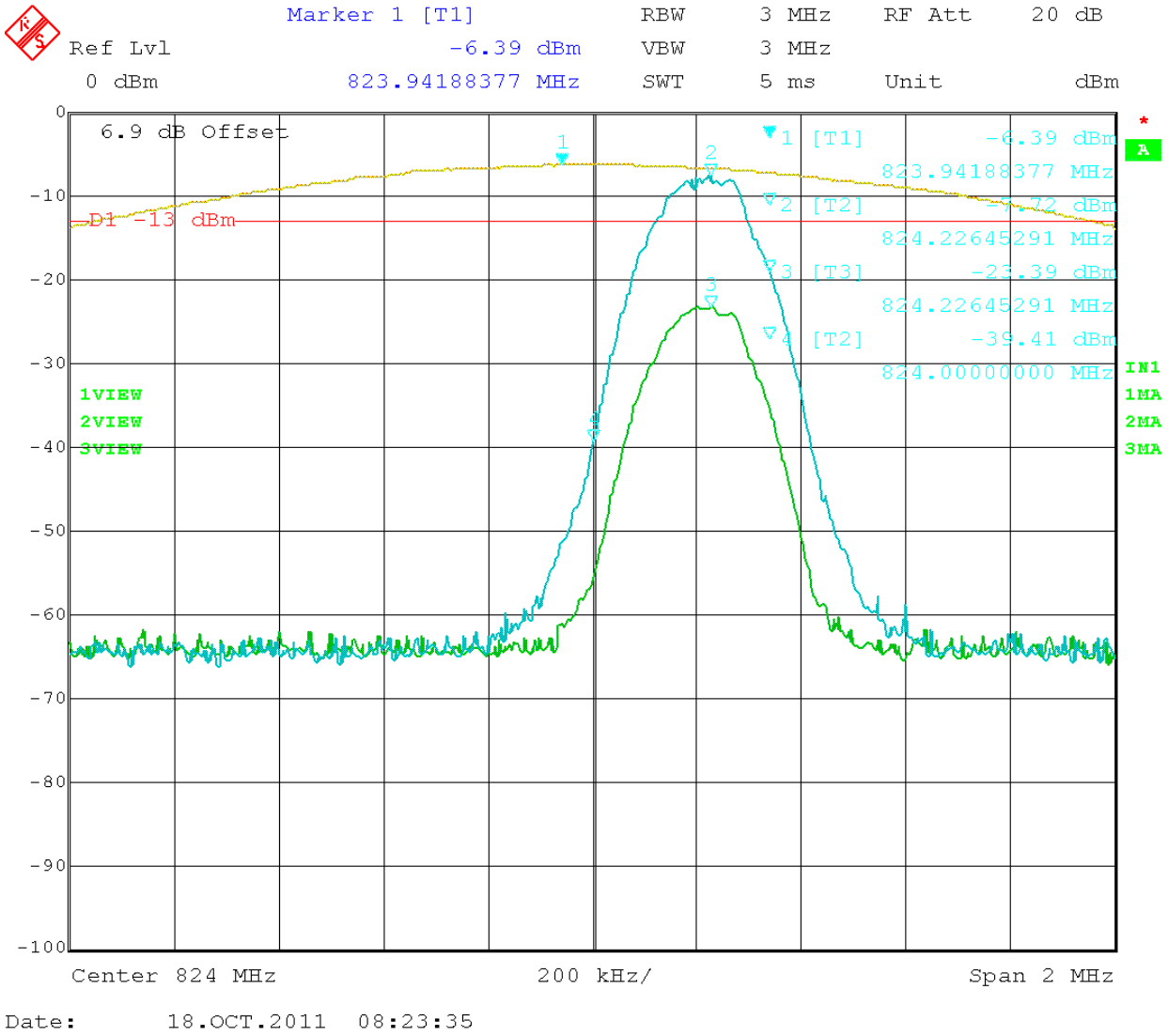



Figure 29: EDGE – In vs. Out 824.20 MHz

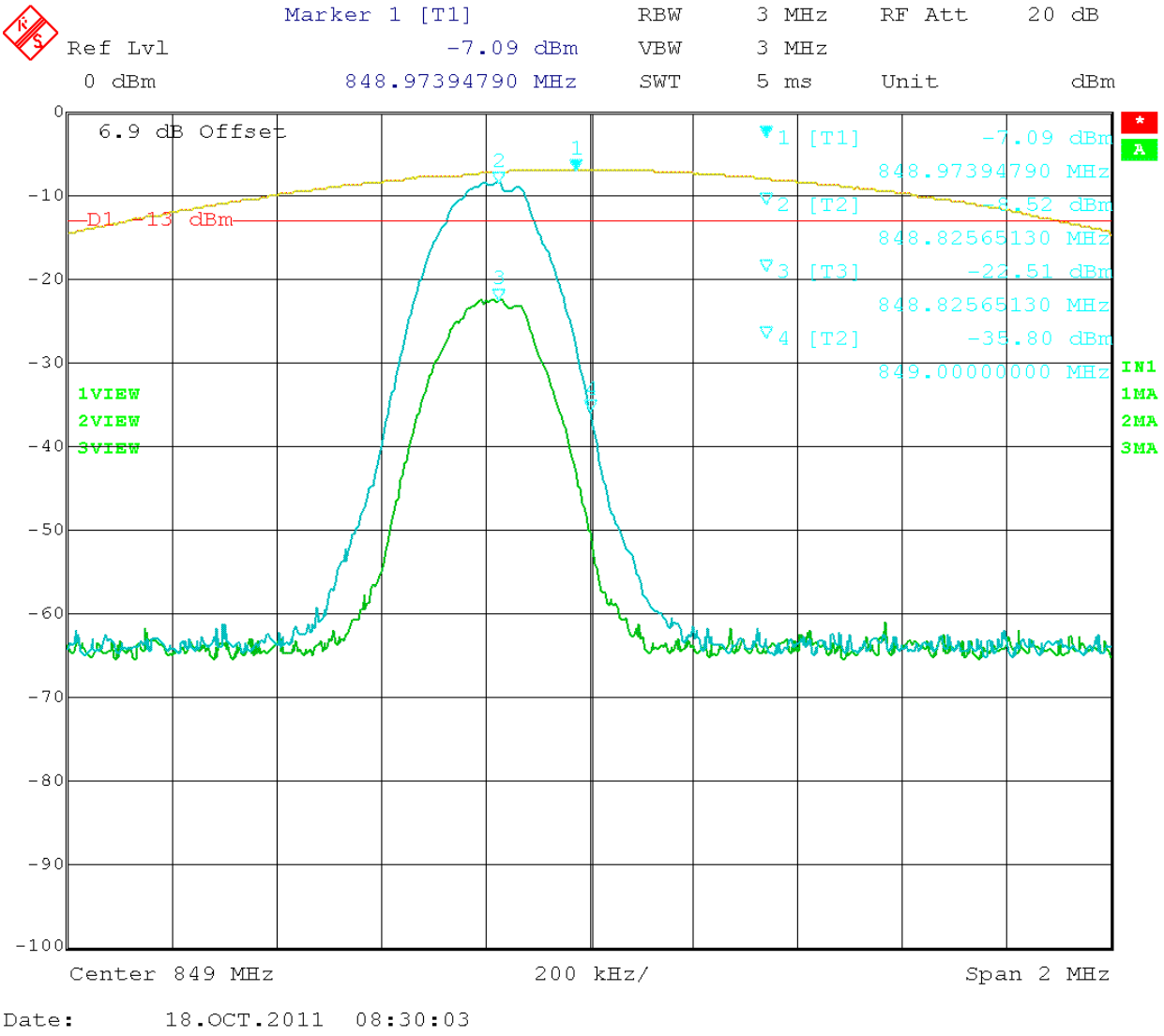



Figure 30: EDGE – In vs. Out 848.80 MHz

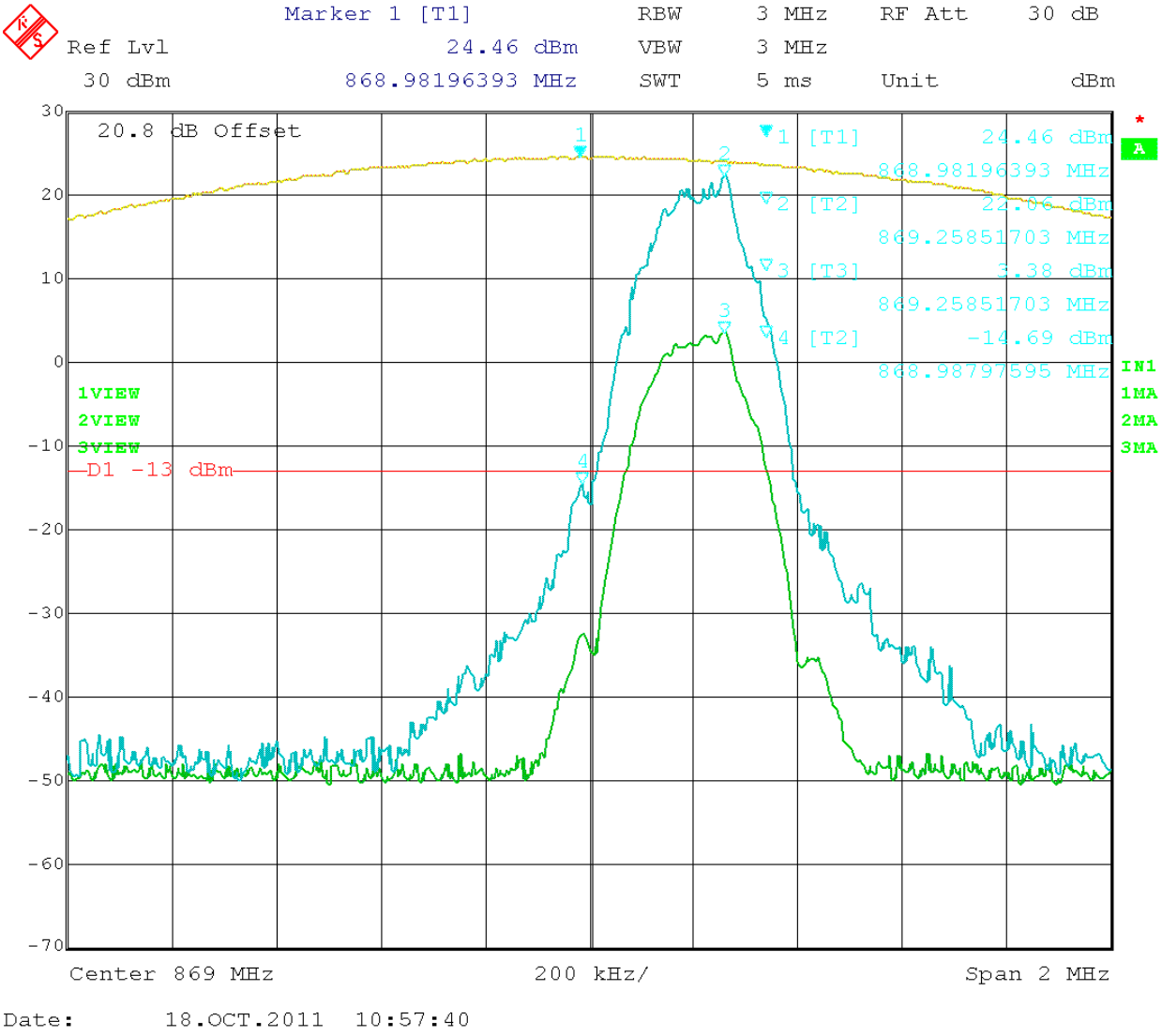



Figure 31: EDGE – In vs. Out 869.20 MHz

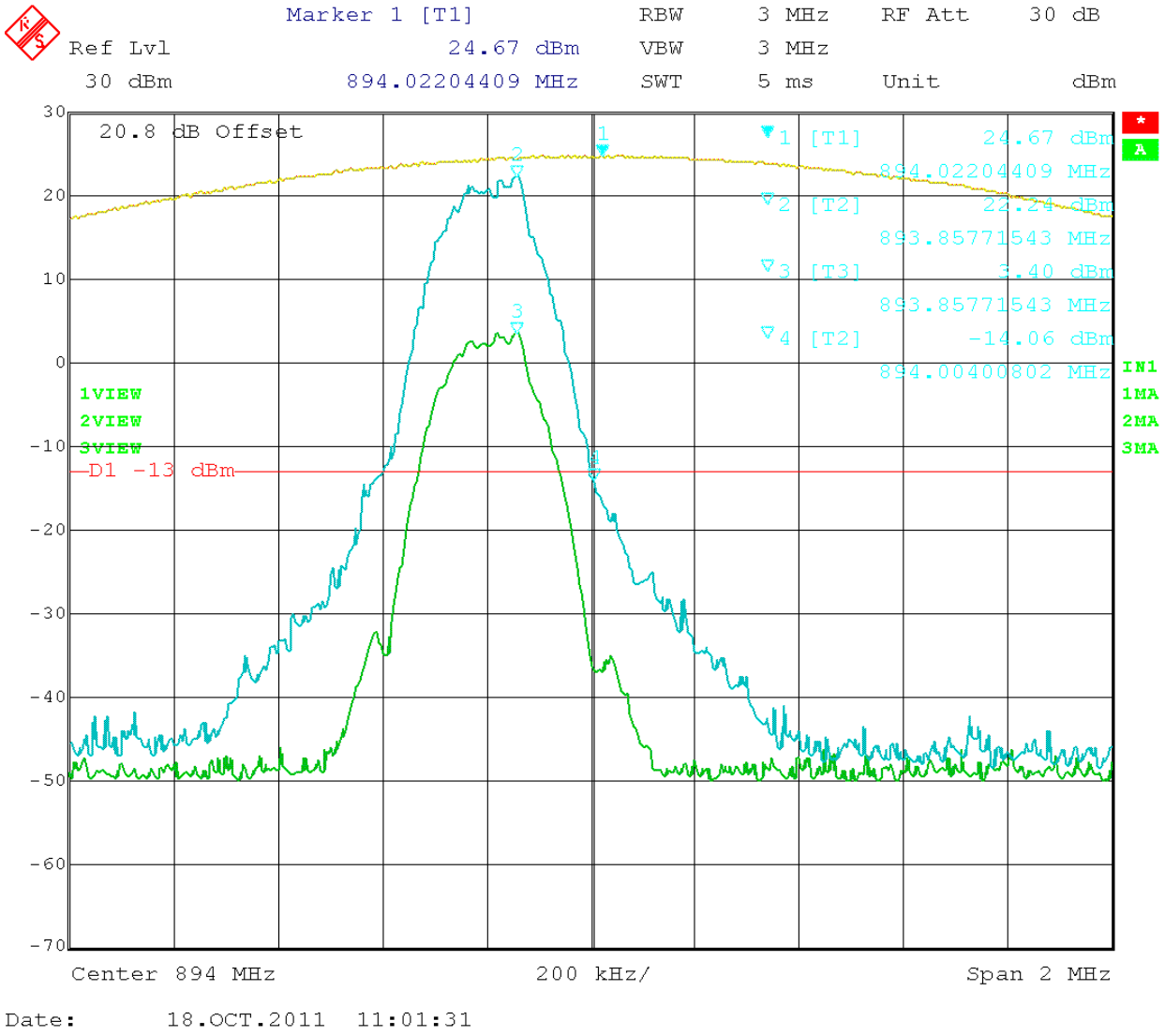



Figure 32: EDGE – In vs. Out 893.80 MHz

Test Data Table 19 – GSM 800 – Uplink/Downlink

| Channel (MHz) | Band-edge Frequency (MHz) | Amplitude level at the band-edge (dBm) | Limit (dBm) | Margin (dB) |
|---|---|---|---|---|
| 824.2 | 824 | -38.83 | -13 | 25.83 |
| 844.8 | 849 | -45.17 | -13 | 32.17 |
| 869.2 | 868.99 | -14.82 | -13 | 1.82 |
| 893.8 | 894.02 | -16.22 | -13 | 3.22 |

The Reference level on the following plots was calibrated using a 3MHz RBW=VBW.

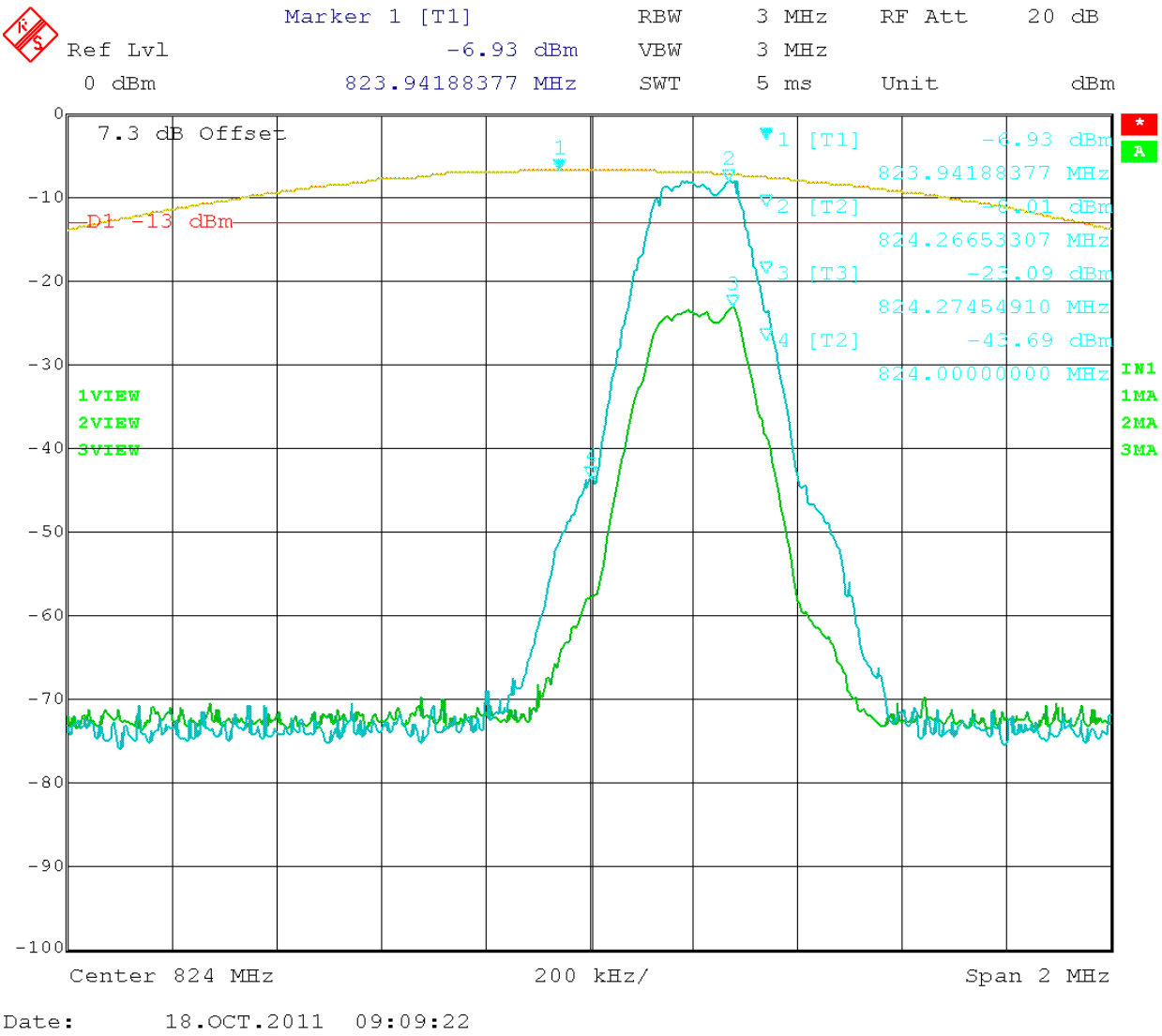



Figure 33: GSM – In vs. Out 824.2 MHz

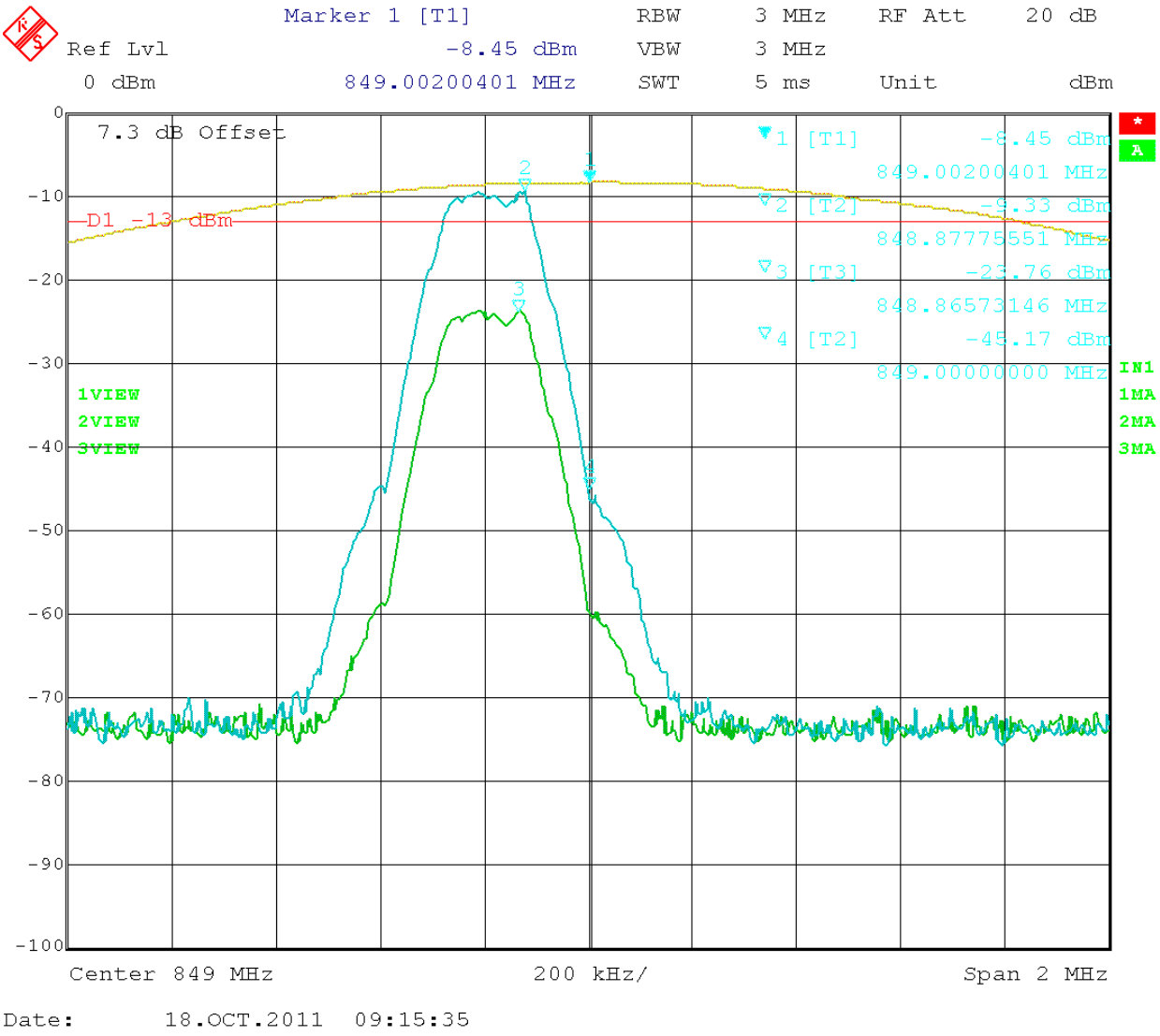



Figure 34: GSM – In vs. Out 848.8 MHz

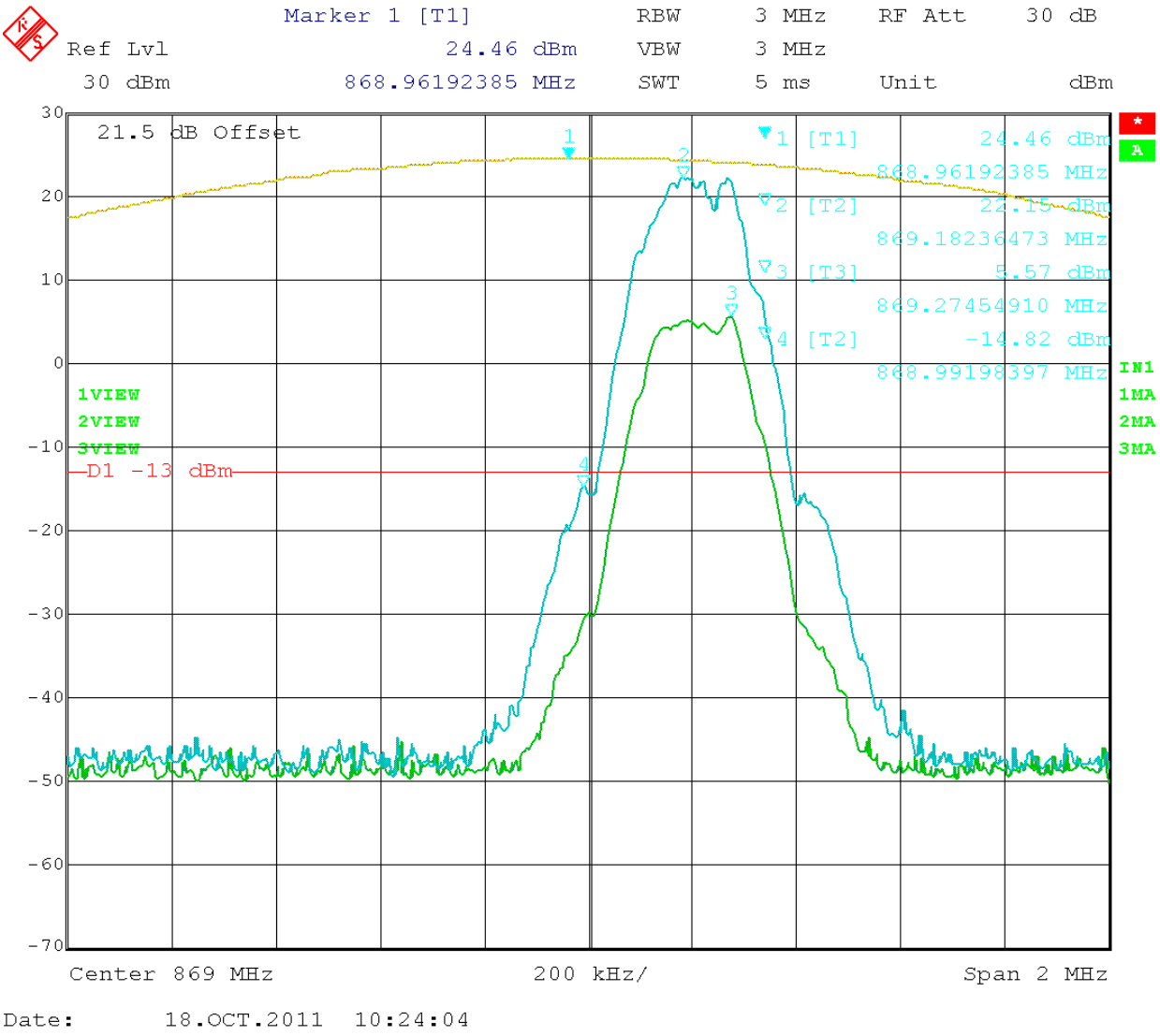



Figure 35: GSM – In vs. Out 869.2MHz

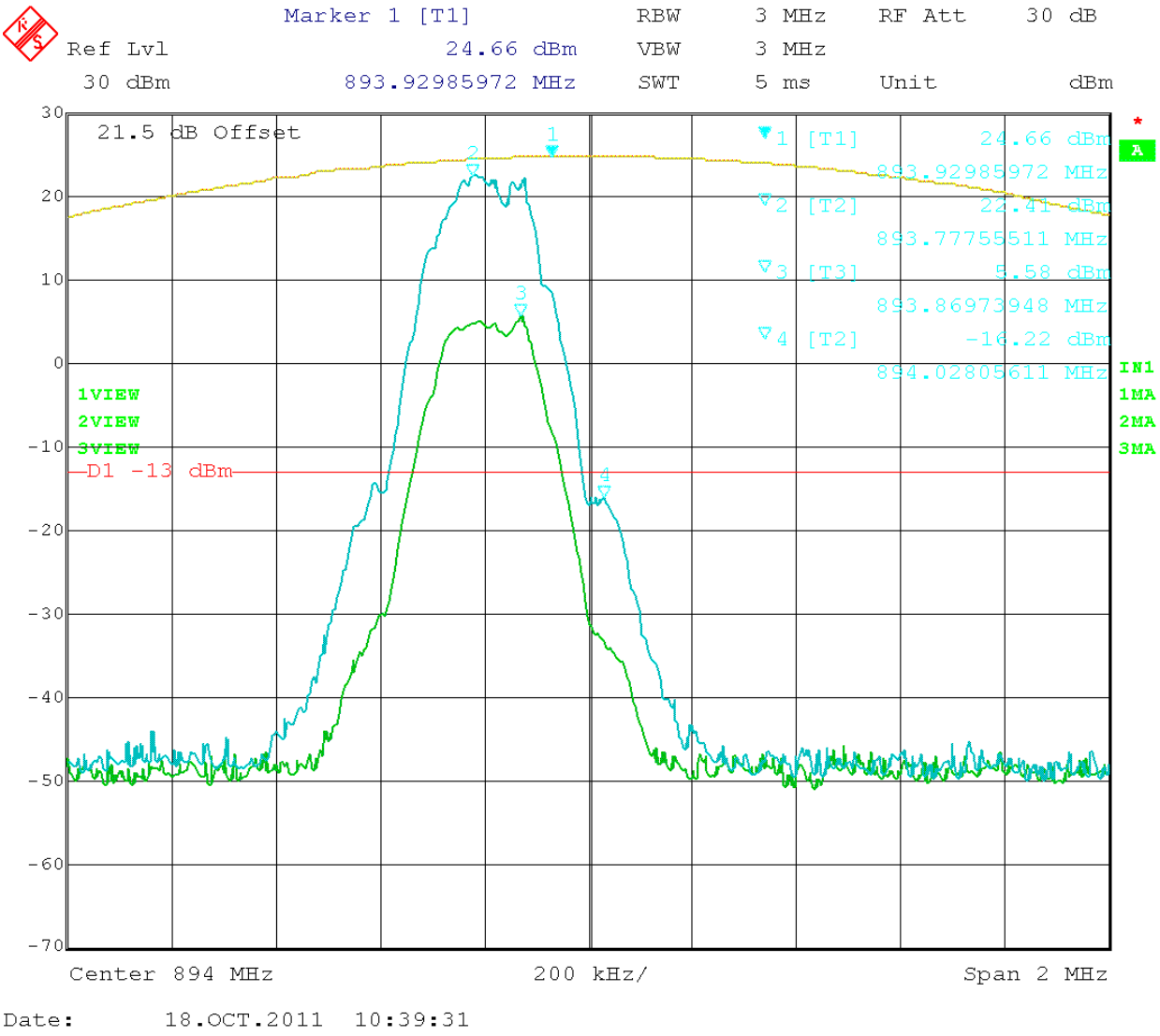



Figure 36: GSM – In vs. Out 893.8MHz

## INTERMODULATION PRODUCT SPURIOUS EMISSIONS

Rule Parts No.: Pt 2.1051

**Requirements:** Emissions must be 43 + 10 log (Po) dB below the mean power output of the transmitter or below the –13dBm

All the modulation types were tested using the three tone test method. A CW signal was use instead of GSM and EDGE modulations. EDGE and GSM provided the same test results and only GSM data are presented in this report. The input power to the amplifier was set at maximum drive level by combining the three tones. The three tones were chosen in such a way (1)the third order intermodulation product frequencies are located within the pass band of the DUT and (2) they produce the worst-case emissions out of band.

**Test Data:** The DUT appears to meet the requirements.

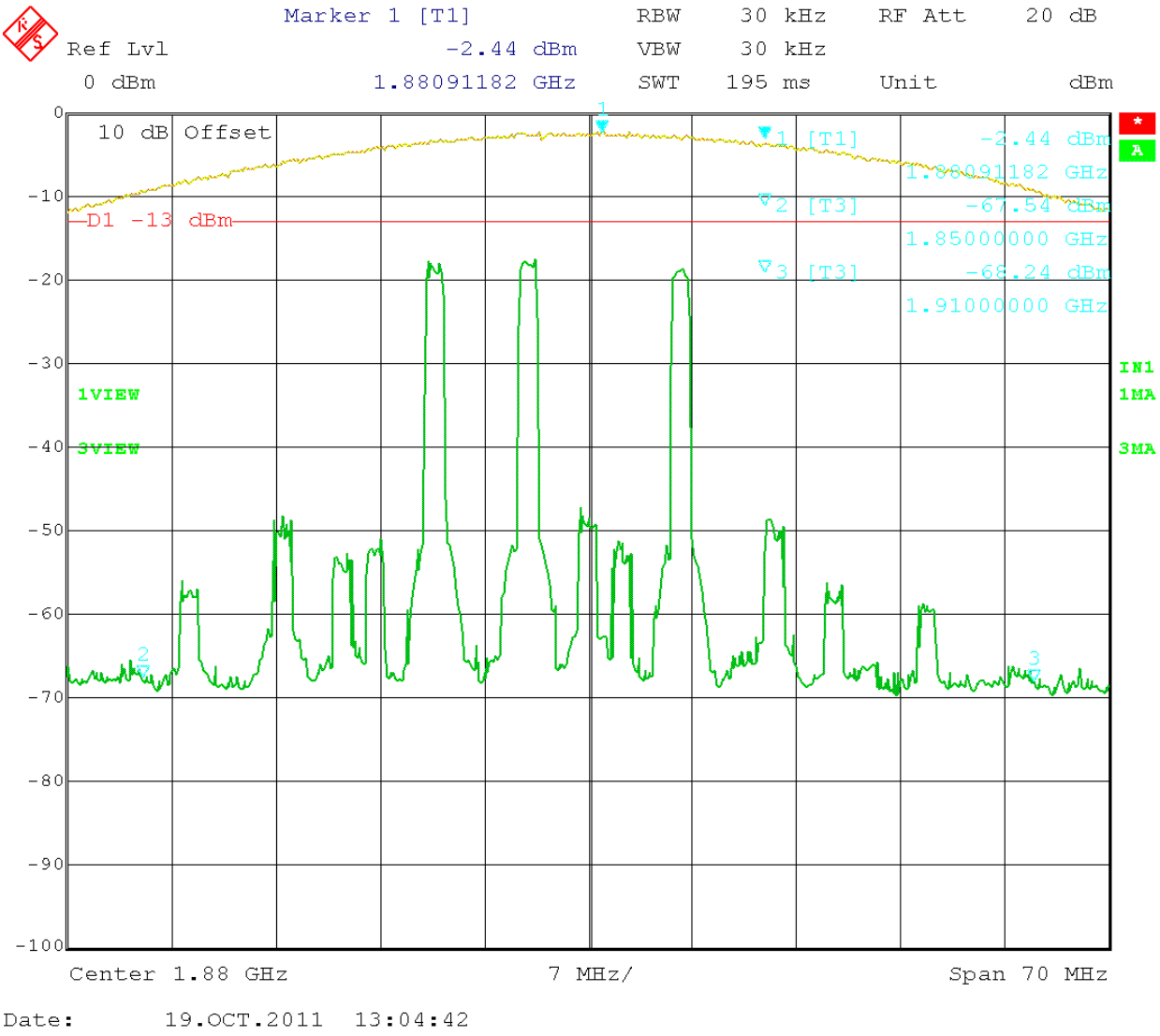



Figure 34: CDMA 3 tones intermodulation - (1850 – 1910) MHz.

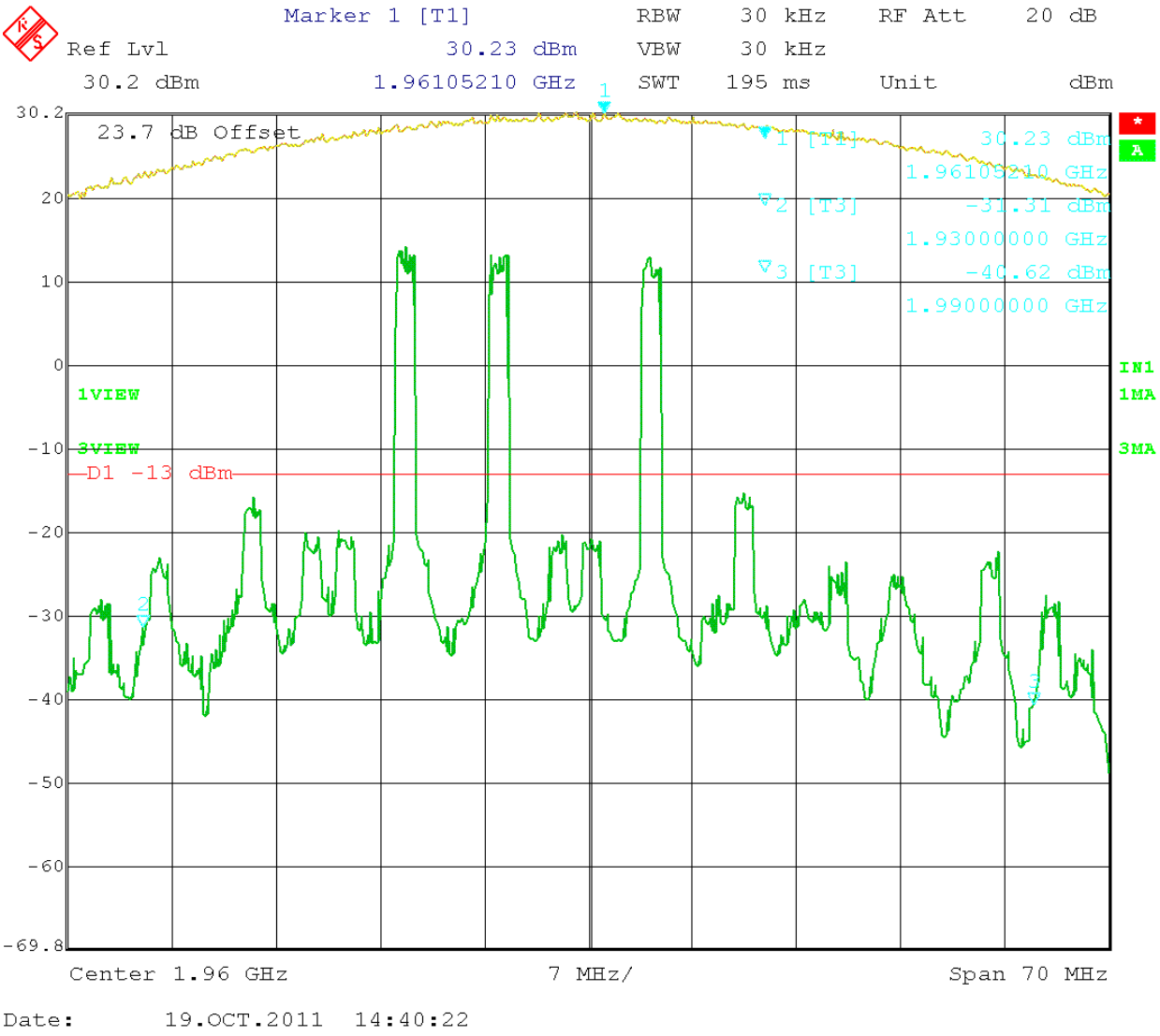



Figure 35: CDMA 3 tones intermodulation - (1930 – 1990) MHz.

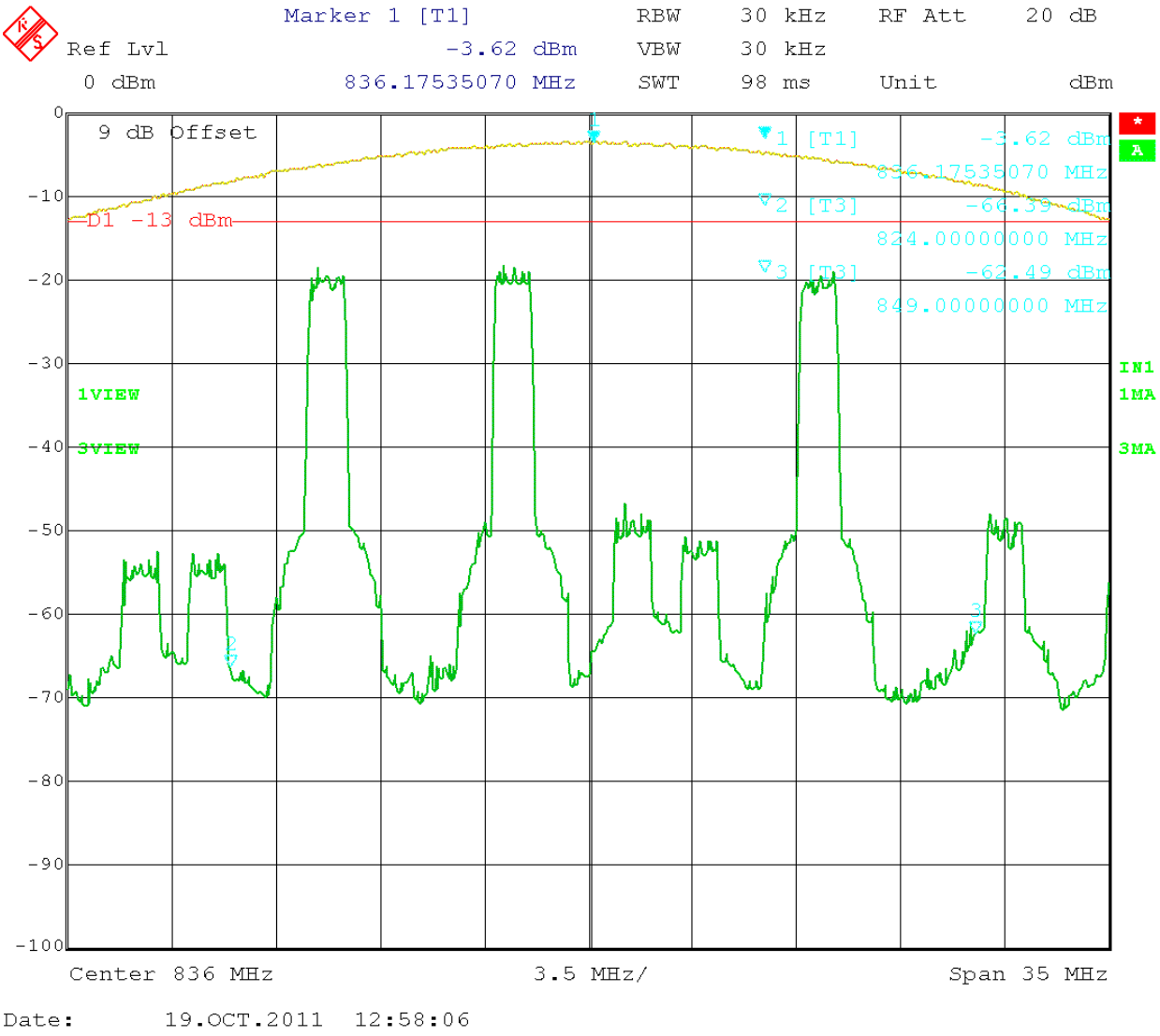



Figure 36: CDMA 3 tones intermodulation – (824 – 849) MHz.

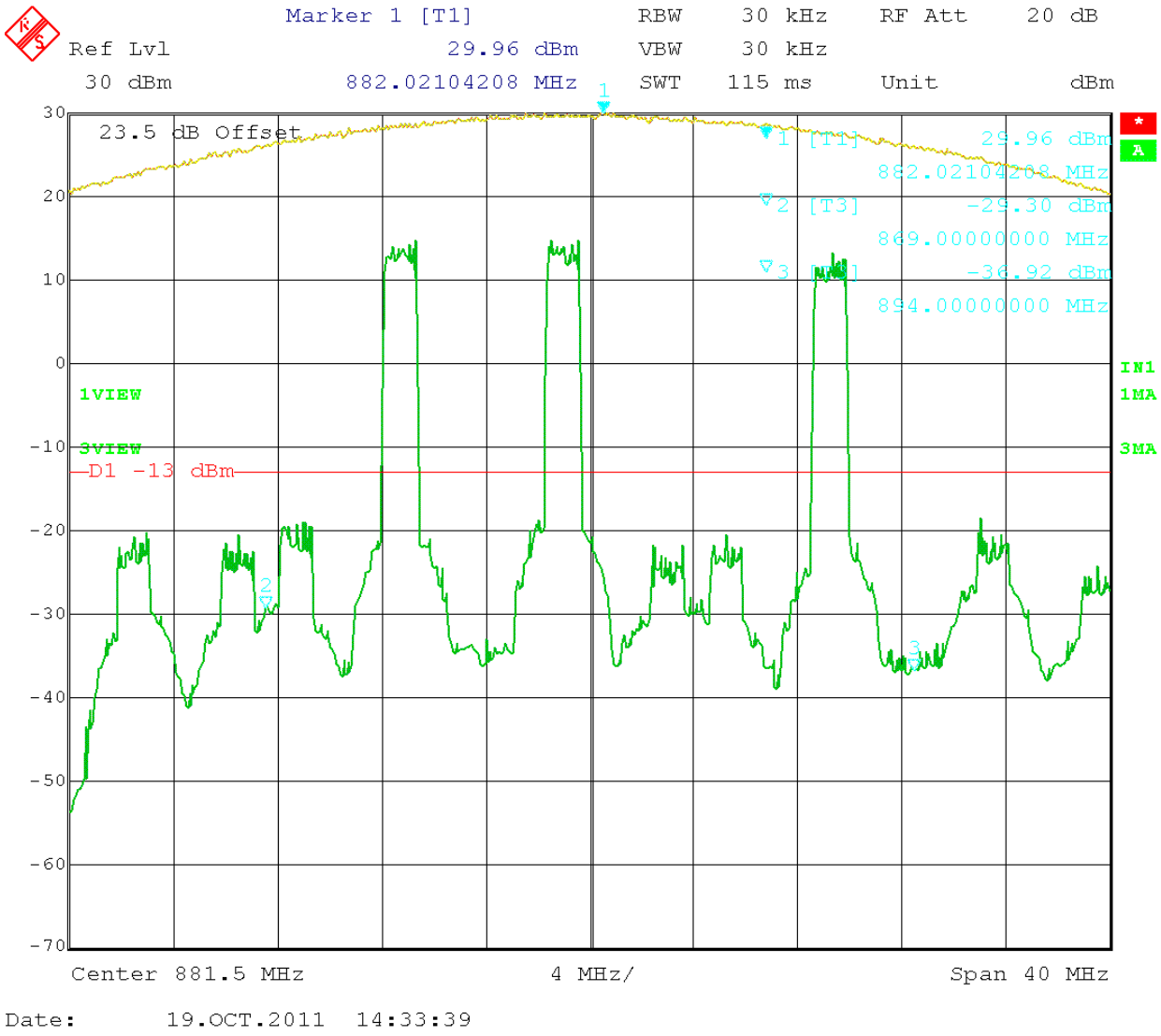



Figure 37: CDMA 3 tones intermodulation - (869 – 894) MHz.

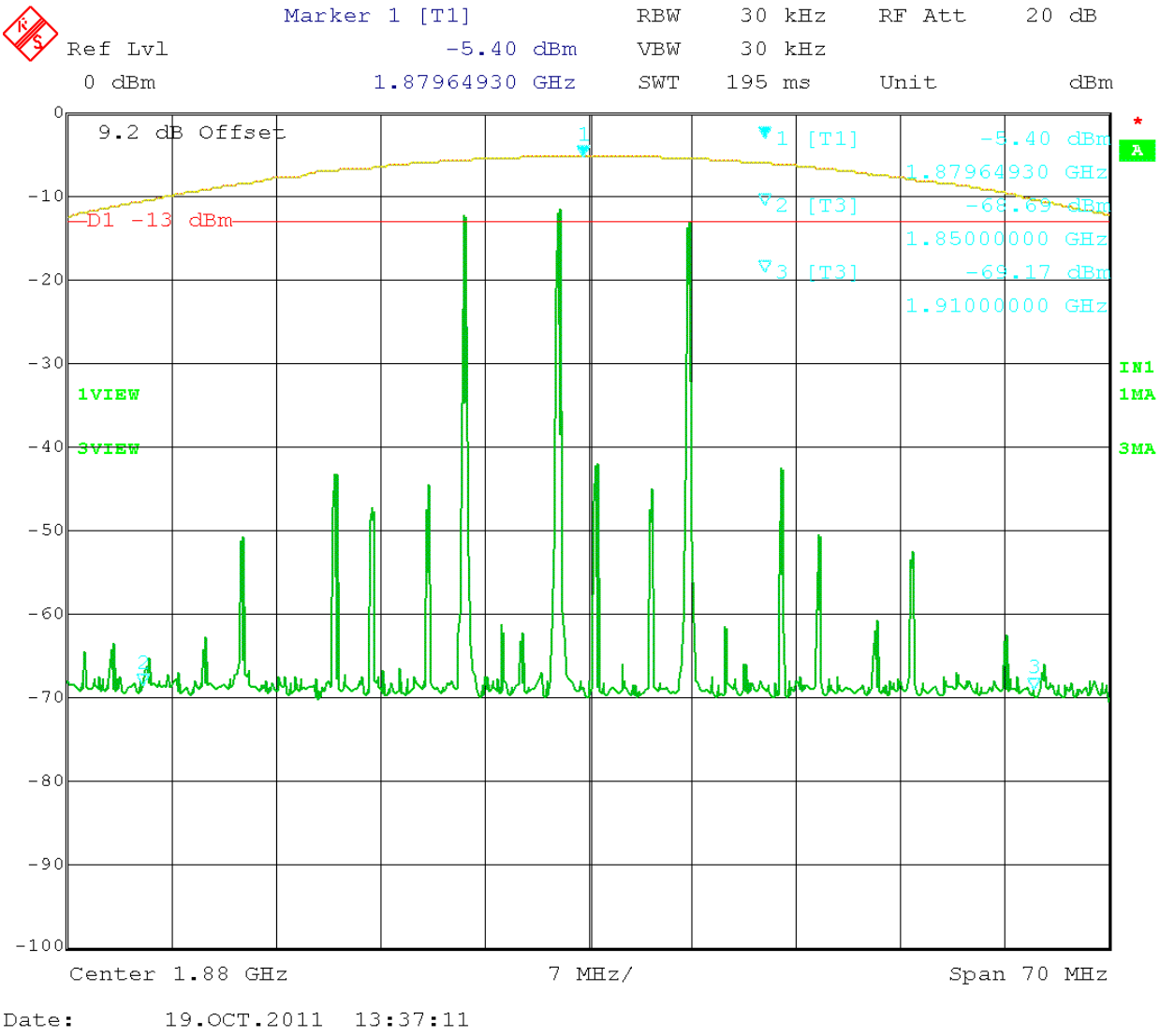



Figure 38: GSM 3 tones intermodulation - (1850 – 1910) MHz

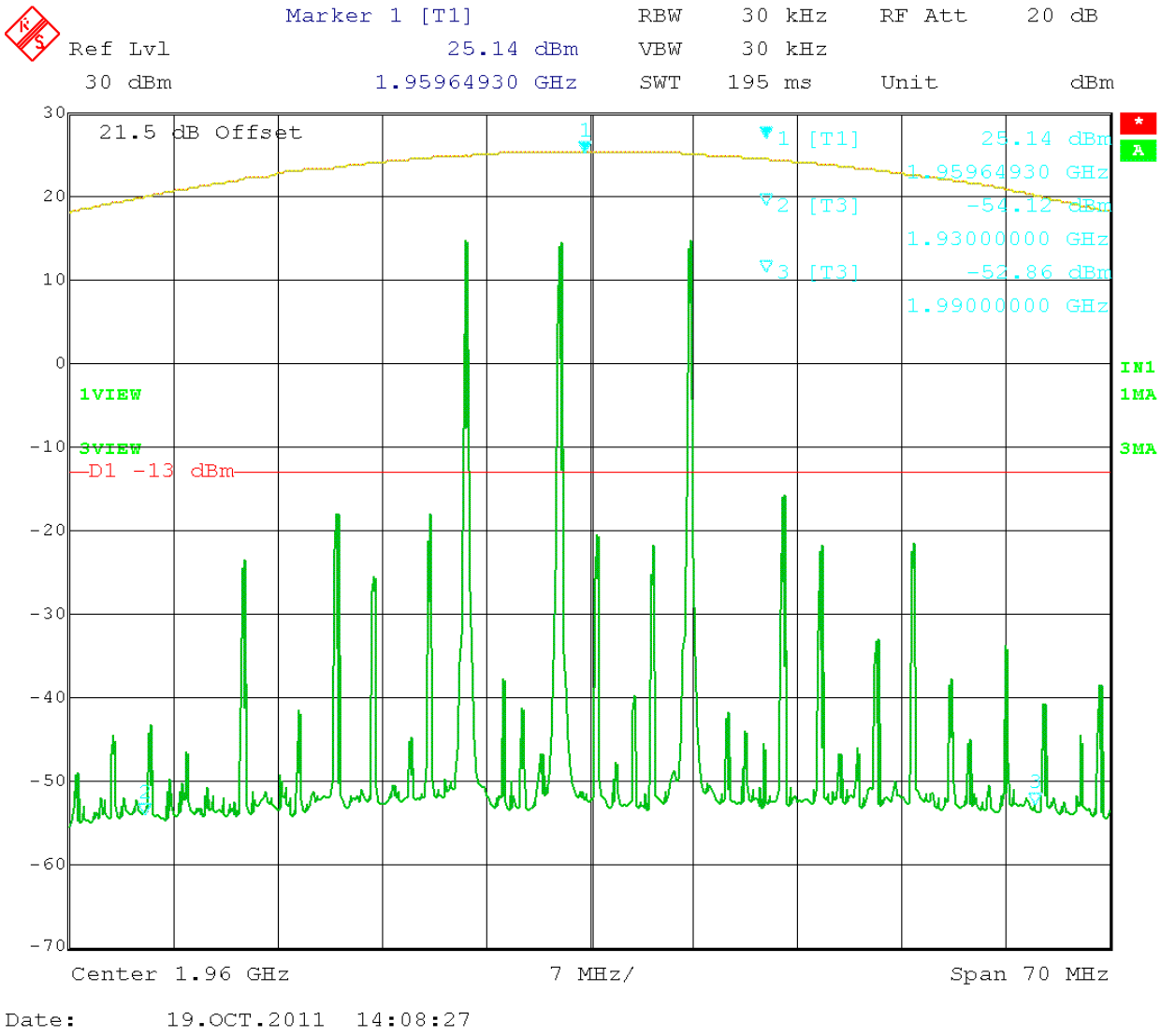



Figure 39: GSM 3 tones intermodulation - (1930 – 1990) MHz

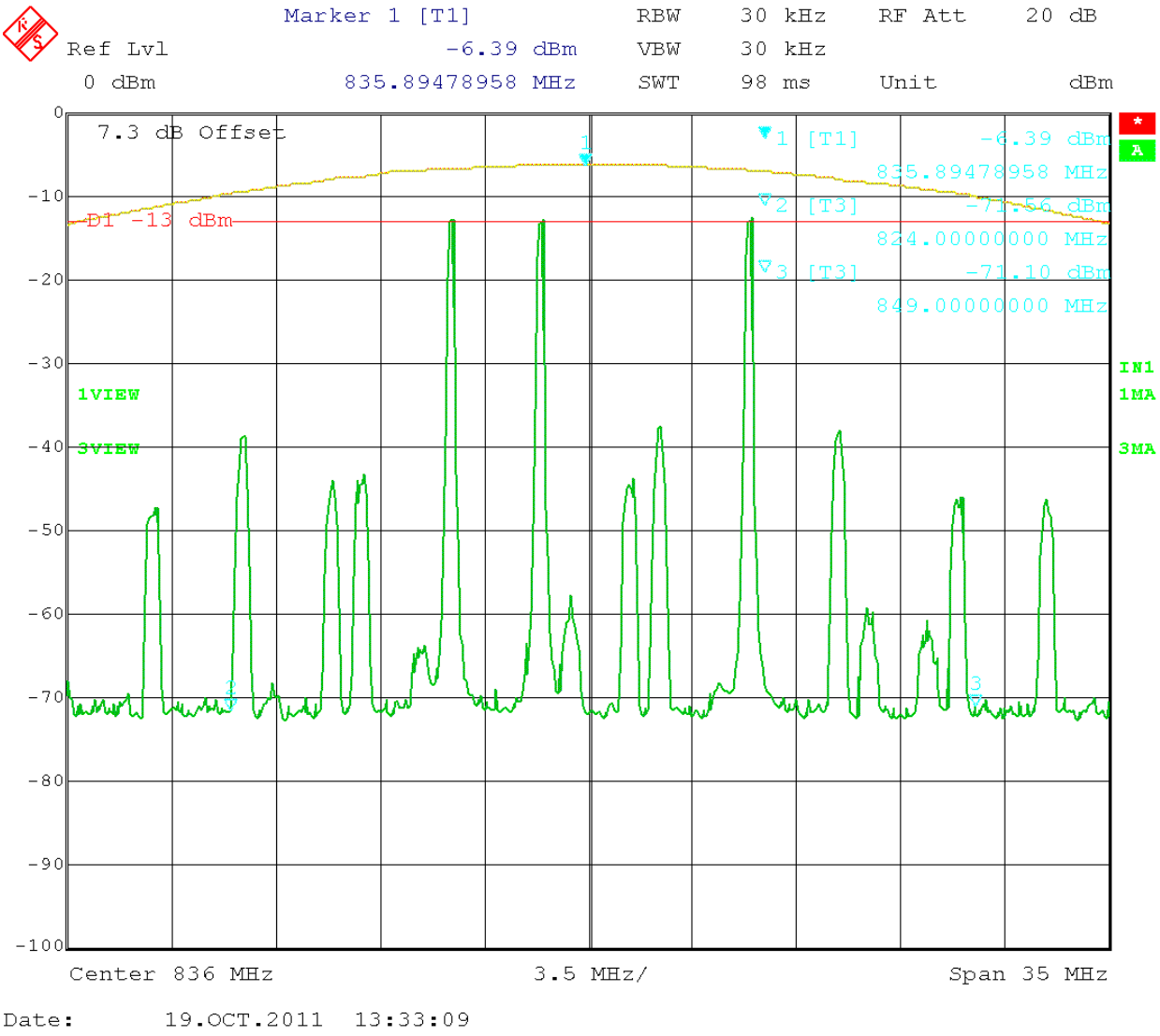



Figure 40: GSM 3 tones intermodulation - (824 – 849) MHz

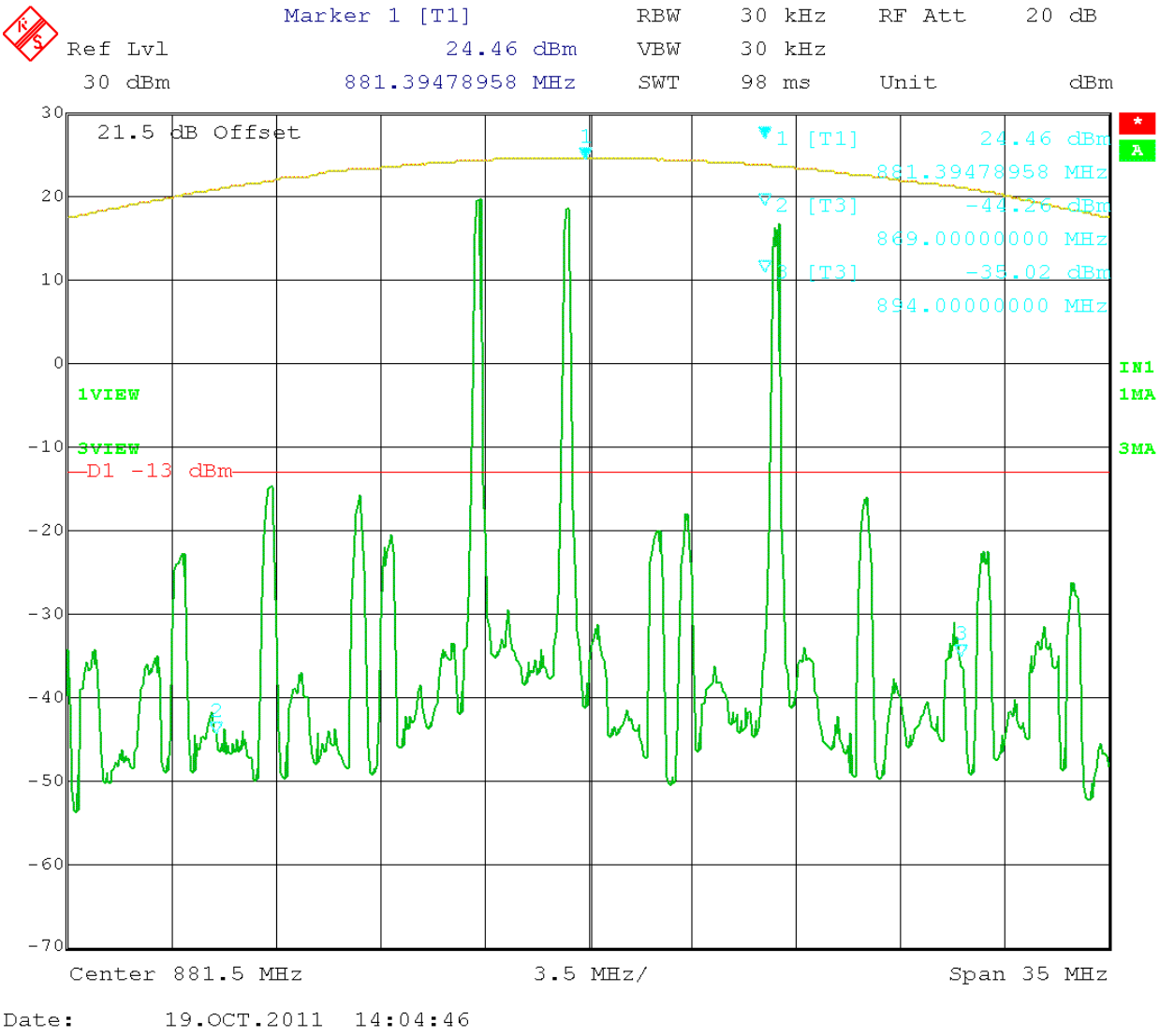



Figure 41: GSM 3 tones intermodulation - (869 – 894) MHz

## SPURIOUS EMISSIONS AT ANTENNA TERMINALS

**Rule Parts No.:** Pt 2.1051

**Requirements:** Emissions must be 43 +10log (Po) dB below the mean power output of the transmitter:

1850 – 1910 MHz: 43 + 10log (0.01) = 23 dBc
1930 – 1990 MHz: 43 + 10log (1.00) = 43 dBc

**Test Result:** The DUT appears to meet the requirements.

Test Data Table 20 – Conducted Emissions – CDMA 1900 – Uplink

| Emission Frequency MHz | dB Below Carrier (dBc) | Emission Frequency MHz | dB Below Carrier (dBc) | Emission Frequency MHz | dB Below Carrier (dBc) |
|---|---|---|---|---|---|
| 1851.25 | | 1880.00 | | 1908.75 | |
| 3702.50 | 47.9 | 3760.00 | 51.8 | 3817.50 | 43.5 |
| 5553.75 | 58.4 | 5640.00 | 58.7 | 5726.25 | 59.0 |
| 7405.00 | 59.3 | 7520.00 | 59.7 | 7635.00 | 58.8 |
| 9256.25 | 59.7 | 9400.00 | 60.8 | 9543.75 | 59.0 |
| 11107.50 | NF | 11280.00 | NF | 11452.50 | NF |
| 12958.75 | NF | 13160.00 | NF | 13361.25 | NF |
| 14810.00 | NF | 15040.00 | NF | 15270.00 | NF |
| 16661.25 | NF | 16920.00 | NF | 17178.75 | NF |
| 18512.50 | NF | 18800.00 | NF | 19087.50 | NF |

Test Data Table 21 – Conducted Emissions – CDMA 1900 – Downlink

| Emission Frequency MHz | dB Below Carrier (dBc) | Emission Frequency MHz | dB Below Carrier (dBc) | Emission Frequency MHz | DB Below Carrier (dBc) |
|---|---|---|---|---|---|
| 1931.25 | | 1960.00 | | 1988.75 | |
| 3862.50 | 61.0 | 3920.00 | 54.6 | 3977.50 | 57.9 |
| 5793.75 | 79.8 | 5880.00 | 80.3 | 5966.25 | 80.4 |
| 7725.00 | 80.7 | 7840.00 | 81.3 | 7955.00 | 81.8 |
| 9656.25 | 80.1 | 9800.00 | 81.6 | 9943.75 | 81.7 |
| 11587.50 | NF | 11760.00 | NF | 11932.50 | NF |
| 13518.75 | NF | 13720.00 | NF | 13921.25 | NF |
| 15450.00 | NF | 15680.00 | NF | 15910.00 | NF |
| 17381.25 | NF | 17640.00 | NF | 17898.75 | NF |
| 19312.50 | NF | 19600.00 | NF | 19887.50 | NF |

Test Data Table 22 – Conducted Emissions – GSM 1900 - Uplink

| Emission Frequency MHz | dB Below Carrier (dBc) | Emission Frequency MHz | dB Below Carrier (dBc) | Emission Frequency MHz | dB Below Carrier (dBc) |
|---|---|---|---|---|---|
| 1850.20 | | 1880.00 | | 1909.80 | |
| 3700.40 | 52.1 | 3760.00 | 54.8 | 3819.60 | 49.3 |
| 5550.60 | 61.4 | 5640.00 | 61.0 | 5729.40 | 60.7 |
| 7400.80 | 61.1 | 7520.00 | 60.9 | 7639.20 | 60.2 |
| 9251.00 | 62.3 | 9400.00 | 62.1 | 9549.00 | 61.2 |
| 11101.20 | NF | 11280.00 | NF | 11458.80 | NF |
| 12951.40 | NF | 13160.00 | NF | 13368.60 | NF |
| 14801.60 | NF | 15040.00 | NF | 15278.40 | NF |
| 16651.80 | NF | 16920.00 | NF | 17188.20 | NF |
| 18502.00 | NF | 18800.00 | NF | 19098.00 | NF |

Test Data Table 23 – Conducted Emissions – GSM 1900 - Downlink

| Emission Frequency MHz | dB Below Carrier (dBc) | Emission Frequency MHz | dB Below Carrier (dBc) | Emission Frequency MHz | dB Below Carrier (dBc) |
|---|---|---|---|---|---|
| 1930.20 | | 1960.00 | | 1989.80 | |
| 3860.40 | 64.2 | 3920.00 | 55.9 | 3979.60 | 62.7 |
| 5790.60 | 83.5 | 5880.00 | 83.0 | 5969.40 | 82.7 |
| 7720.80 | 84.7 | 7840.00 | 83.7 | 7959.20 | 84.0 |
| 9651.00 | 84.0 | 9800.00 | 85.0 | 9949.00 | 84.2 |
| 11581.20 | NF | 11760.00 | NF | 11938.80 | NF |
| 13511.40 | NF | 13720.00 | NF | 13928.60 | NF |
| 15441.60 | NF | 15680.00 | NF | 15918.40 | NF |
| 17371.80 | NF | 17640.00 | NF | 17908.20 | NF |
| 19302.00 | NF | 19600.00 | NF | 19898.00 | NF |

Test Data Table 24 – Conducted Emissions – CDMA 800 - Uplink

| Emission Frequency MHz | dB Below Carrier (dBc) | Emission Frequency MHz | dB Below Carrier (dBc) | Emission Frequency MHz | dB Below Carrier (dBc) |
|---|---|---|---|---|---|
| 825.25 | | 836.50 | | 847.75 | |
| 1650.50 | 53.3 | 1673.00 | 52.5 | 1695.50 | 51.6 |
| 2475.75 | 60.1 | 2509.50 | 60.8 | 2543.25 | 60.2 |
| 3301.00 | 60.7 | 3346.00 | 61.0 | 3391.00 | 60.0 |
| 4126.25 | 61.0 | 4182.50 | 61.3 | 4238.75 | 59.6 |
| 4951.50 | NF | 5019.00 | NF | 5086.50 | NF |
| 5776.75 | NF | 5855.50 | NF | 5934.25 | NF |
| 6602.00 | NF | 6692.00 | NF | 6782.00 | NF |
| 7427.25 | NF | 7528.50 | NF | 7629.75 | NF |
| 8252.50 | NF | 8365.00 | NF | 8477.50 | NF |

Test Data Table 25 – Conducted Emissions – CDMA 800 - Downlink

| Emission Frequency MHz | dB Below Carrier (dBc) | Emission Frequency MHz | dB Below Carrier (dBc) | Emission Frequency MHz | dB Below Carrier (dBc) |
|---|---|---|---|---|---|
| 870.25 | | 881.50 | | 892.75 | |
| 1740.50 | 58.6 | 1763.00 | 58.7 | 1785.50 | 60.9 |
| 2610.75 | 72.3 | 2644.50 | 72.9 | 2678.25 | 72.4 |
| 3481.00 | 84.4 | 3526.00 | 82.0 | 3571.00 | 84.9 |
| 4351.25 | 84.8 | 4407.50 | 85.1 | 4463.75 | 84.3 |
| 5221.50 | 83.7 | 5289.00 | 84.6 | 5356.50 | 84.1 |
| 6091.75 | NF | 6170.50 | NF | 6249.25 | NF |
| 6962.00 | NF | 7052.00 | NF | 7142.00 | NF |
| 7832.25 | NF | 7933.50 | NF | 8034.75 | NF |
| 8702.50 | NF | 8815.00 | NF | 8927.50 | NF |

Test Data Table 26 – Conducted Emissions – GSM 800 – Uplink

| Emission Frequency MHz | dB Below Carrier (dBc) | Emission Frequency MHz | dB Below Carrier (dBc) | Emission Frequency MHz | dB Below Carrier (dBc) |
|---|---|---|---|---|---|
| 824.20 | | 836.50 | | 848.80 | |
| 1648.40 | 54.7 | 1673.00 | 54.3 | 1697.60 | 54.0 |
| 2472.60 | 60.7 | 2509.50 | 61.1 | 2546.40 | 60.7 |
| 3296.80 | 62.2 | 3346.00 | 62.6 | 3395.20 | 60.3 |
| 4121.00 | 62.8 | 4182.50 | 63.3 | 4244.00 | 61.7 |
| 4945.20 | NF | 5019.00 | NF | 5092.80 | NF |
| 5769.40 | NF | 5855.50 | NF | 5941.60 | NF |
| 6593.60 | NF | 6692.00 | NF | 6790.40 | NF |
| 7417.80 | NF | 7528.50 | NF | 7639.20 | NF |
| 8242.00 | NF | 8365.00 | NF | 8488.00 | NF |

Test Data Table 27 – Conducted Emissions – GSM 800 - Downlink

| Emission Frequency MHz | dB Below Carrier (dBc) | Emission Frequency MHz | dB Below Carrier (dBc) | Emission Frequency MHz | dB Below Carrier (dBc) |
|---|---|---|---|---|---|
| 869.20 | | 881.50 | | 893.80 | |
| 1738.40 | 63.1 | 1763.00 | 61.6 | 1787.60 | 64.4 |
| 2607.60 | 75.0 | 2644.50 | 76.3 | 2681.40 | 76.3 |
| 3476.80 | 85.7 | 3526.00 | 83.3 | 3575.20 | 87.8 |
| 4346.00 | 85.2 | 4407.50 | 85.1 | 4469.00 | 86.0 |
| 5215.20 | 85.5 | 5289.00 | 85.5 | 5362.80 | 85.3 |
| 6084.40 | NF | 6170.50 | NF | 6256.60 | NF |
| 6953.60 | NF | 7052.00 | NF | 7150.40 | NF |
| 7822.80 | NF | 7933.50 | NF | 8044.20 | NF |
| 8692.00 | NF | 8815.00 | NF | 8938.00 | NF |

## OUT OF BAND REJECTION: FREQUENCY RESPONSE

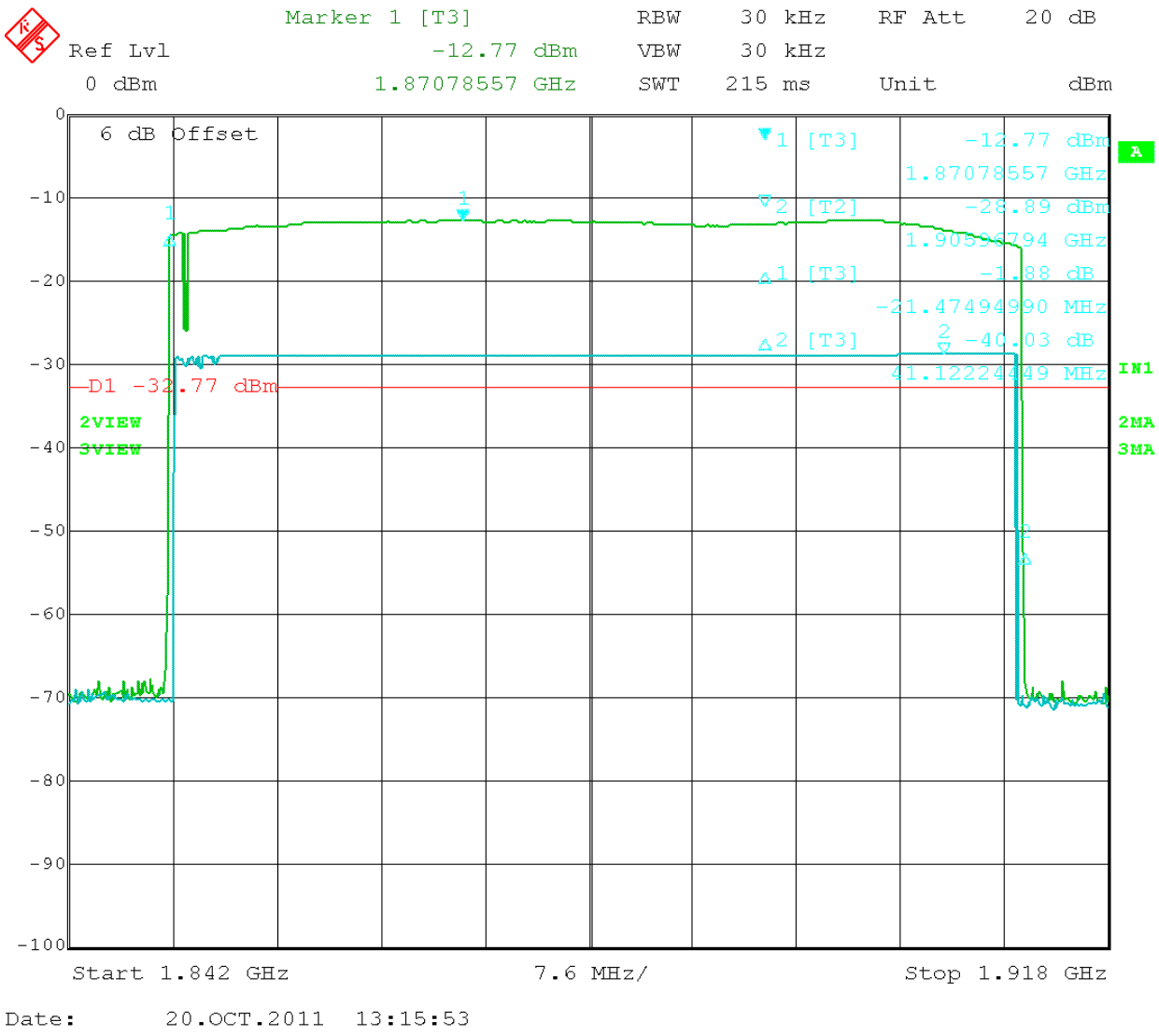



Figure 42. Frequency response (1850 – 1910) MHz band

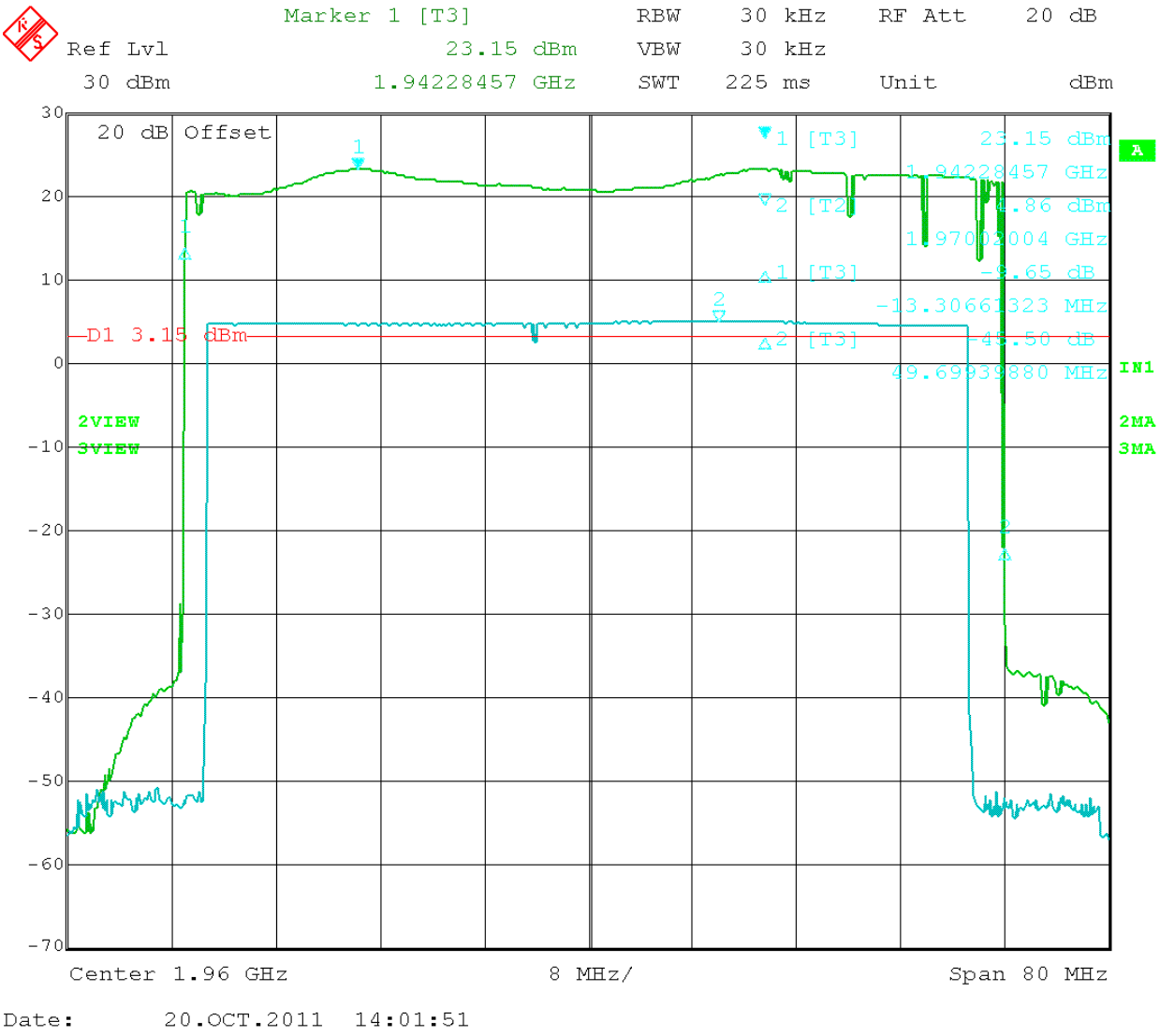



Figure 43. Frequency response (1930 – 1990) MHz band

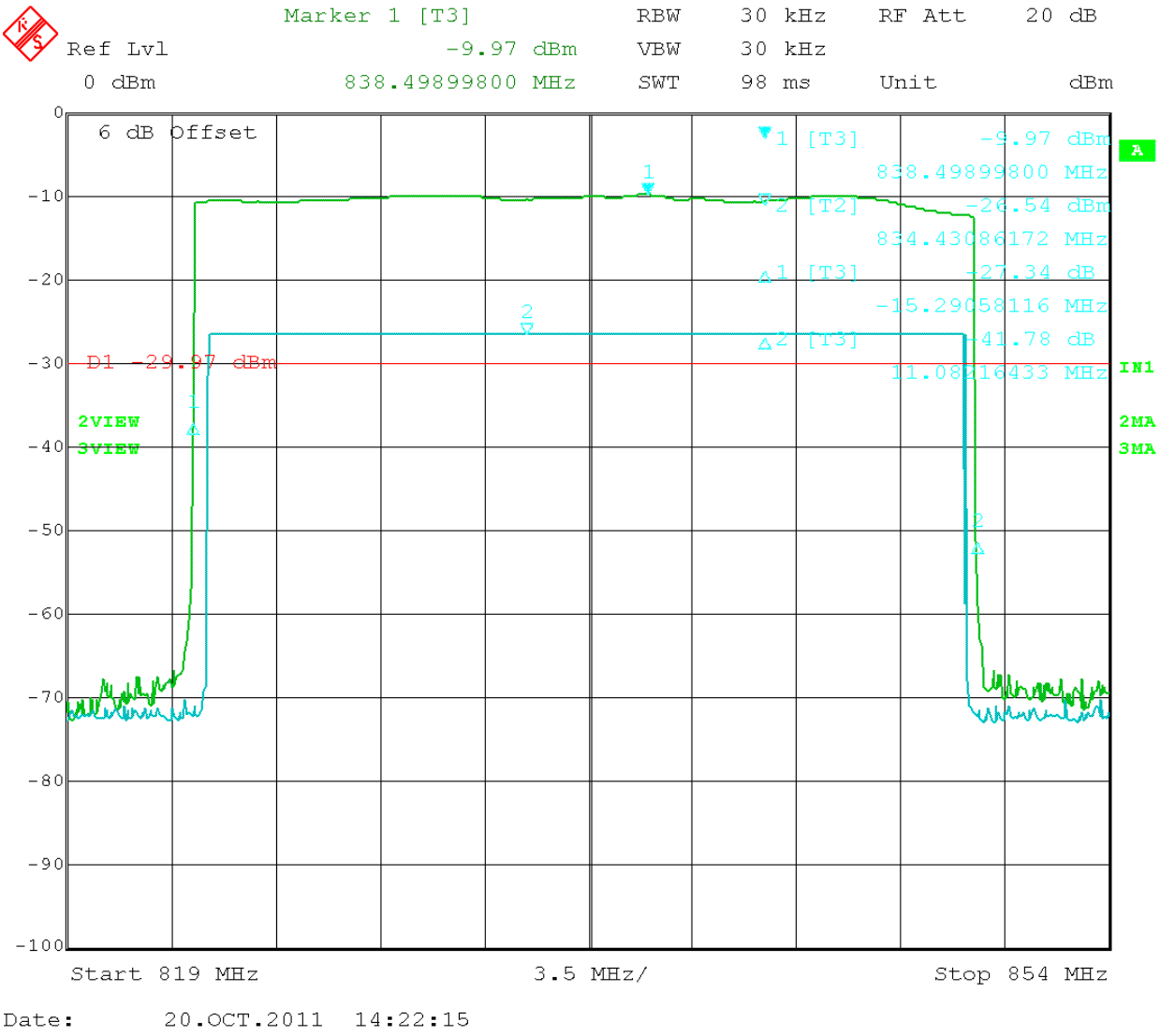



Figure 44. Frequency response (824 – 849) MHz band

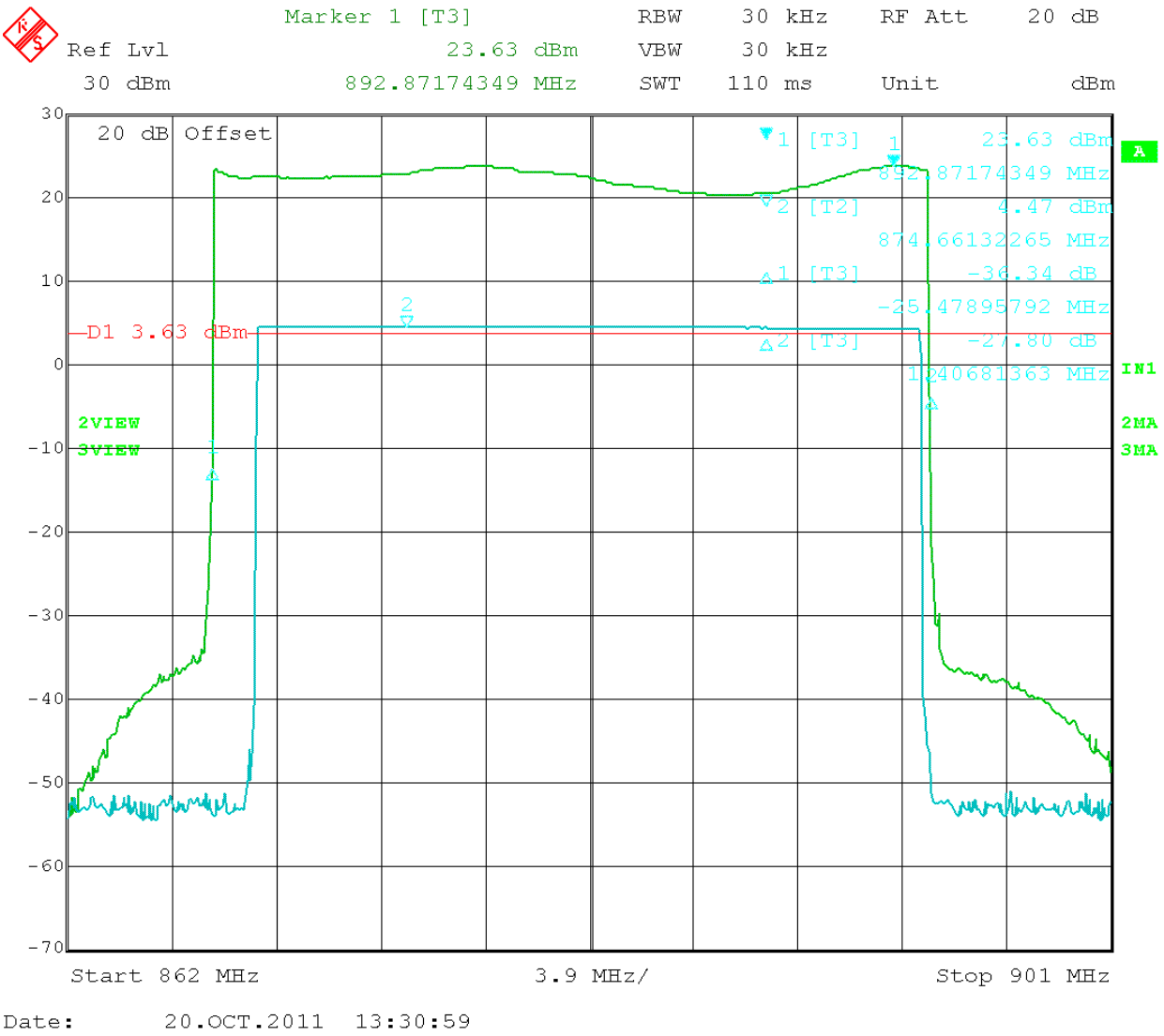



Figure 45. Frequency response (869 – 894) MHz band

## FIELD STRENGTH OF SPURIOUS EMISSIONS

**Rule Parts No.:** Pt 2.1053

**Requirements:** Emissions must be 43+10log(Po) dB below the mean power output of the amplifier:

43 + 10log(0.01) = 23 dB
43 + 10log(1.00) = 43 dB

**Test Result:** The test data indicates the DUT meets the requirements

Test Data Table 28 – Radiated Emissions – CW (800 MHz) – Uplink /Downlink

| Emission Frequency MHz | Ant. Polarity | dB Below Carrier (dBc) |
|---|---|---|
| 836.50 | 0 | 0 |
| 1673.00 | V | 70.6 |
| 2509.50 | V | 66.6 |
| 3346.00 | V | 64.5 |
| 4182.50 | V | 64.2 |
| 5019.00 | V | 65.1 |
| 5855.50 | H/V | NF |
| 6692.00 | H/V | NF |
| 7528.50 | H/V | NF |
| 8365.00 | H/V | NF |

| Emission Frequency MHz | Ant. Polarity | dB Below Carrier (dBc) |
|---|---|---|
| 881.50 | 0 | 0 |
| 1763.00 | V | 76.0 |
| 2644.50 | V | 80.5 |
| 3526.00 | V | 80.4 |
| 4407.50 | V | 81.9 |
| 5289.00 | V | 83.9 |
| 6170.50 | H/V | NF |
| 7052.00 | H/V | NF |
| 7933.50 | H/V | NF |
| 8815.00 | H/V | NF |

[Continued]

Test Data Table 29 – Radiated Emissions – CW (1900 MHz) – Uplink /Downlink

| Emission Frequency MHz | Ant. Polarity | dB Below Carrier (dBc) |
|---|---|---|
| 1880.00 | 0 | 0 |
| 3760.00 | V | 88.4 |
| 5640.00 | V | 81.2 |
| 7520.00 | V | 83.8 |
| 9400.00 | V | 80.8 |
| 11280.00 | H/V | NF |
| 13160.00 | H/V | NF |
| 15040.00 | H/V | NF |
| 16920.00 | H/V | NF |
| 18800.00 | H/V | NF |

| Emission Frequency MHz | Ant. Polarity | dB Below Carrier (dBc) |
|---|---|---|
| 1960.00 | 0 | 0 |
| 3920.00 | V | 71.7 |
| 5880.00 | V | 80.3 |
| 7840.00 | V | 80.9 |
| 9800.00 | V | 70.5 |
| 11760.00 | H/V | NF |
| 13720.00 | H/V | NF |
| 15680.00 | H/V | NF |
| 17640.00 | H/V | NF |
| 19600.00 | H/V | NF |

Notes: *No other emissions were found up to the 10th harmonics - NOISE FLOOR

## MEAN OUTPUT POWER FOR MULTI-CHANNEL ENHANCER (FOR IC ONLY)

**Rule Part(s) No.:** RSS-131 Issue 2 Para.4.3.1

**Requirements:** For enhancers rated 500 watts or less: Raise the input level to the DUT until the greater level of the intermodulation products at the enhancer output terminals, Po3 or Po4, equals -43 dBW.

For enhancers rated over 500 watts: Raise the input level to the DUT until the greater level of the intermodulation products at the enhancer output terminals, Po3 or Po4, is 67 dB below the level of either output tone level, Po1 or Po2.

Record all signal levels and their frequencies. Calculate the mean output power (Pmean) under this testing condition using Pmean = Po1 + 3 dB.

**Test Result:** As the following table indicates.

Test Data Table 30 – Mean Power (Down link)

| Channel | Freq (MHz) | dBm | dBW |
|---|---|---|---|
| F1 | 879.922 | 19.3 | |
| F2 | 884.130 | 19.3 | |
| F3 | 875.713 | -13.3 | |
| F4 | 888.339 | -13.1 | |
| | | 22.34 | -7.66 |
| F1 | 1952.916 | 18.0 | |
| F2 | 1968.206 | 17.7 | |
| F3 | 1937.766 | -13.2 | |
| F4 | 1983.357 | -13.2 | |
| | | 20.96 | -9.04 |

Test Data Table 31 – Mean Power (Up link)

| Channel | Freq (MHz) | dBm | dBW |
|---|---|---|---|
| F1 | 833.074 | -13.6 | |
| F2 | 837.162 | -14.4 | |
| F3 | 828.905 | -43.5 | |
| F4 | 841.251 | -43.5 | |
| | | -10.55 | -40.55 |
| F1 | 1874.088 | -12.4 | |
| F2 | 1881.303 | -12.9 | |
| F3 | 1866.874 | -43.2 | |
| F4 | 1888.317 | -43.6 | |
| | | -9.42 | -39.42 |

## PASSBAND GAIN AND BANDWIDTH (FOR IC ONLY)

**Rule Part No.:** RSS-131 Issue 2 Para 4.2

**Requirements:** RSS-131 Issue 2 Para 4.2

**Test Data:** See plots

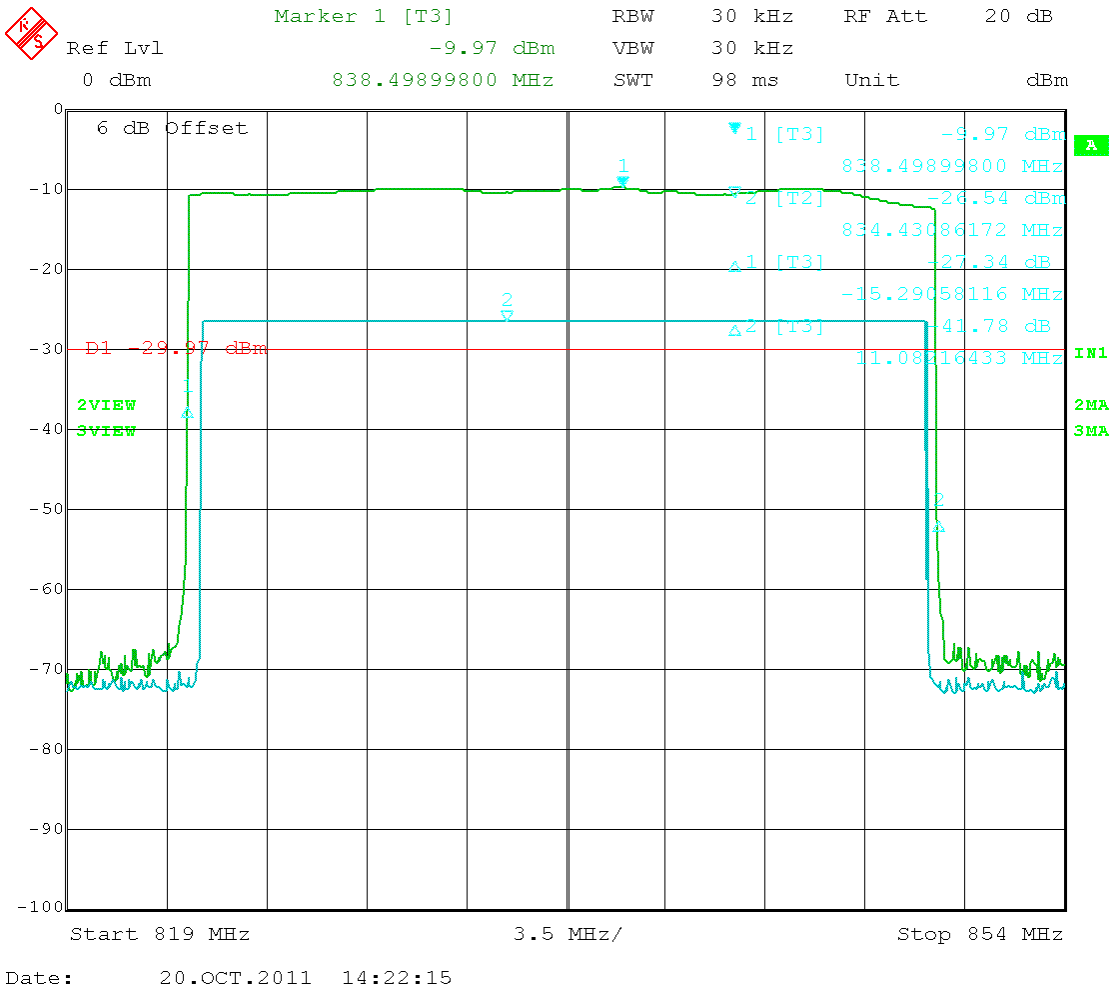



Figure 46: 20 dB Bandwidth (uplink 800 MHz)

| | |
|---|---|
| Input | -26.54 dBm |
| Output | -9.97 dBm |
| Pass Band Gain | 16.57 |

20 dB Bandwidth: (15.29+11.08) MHz = 26.37 MHz

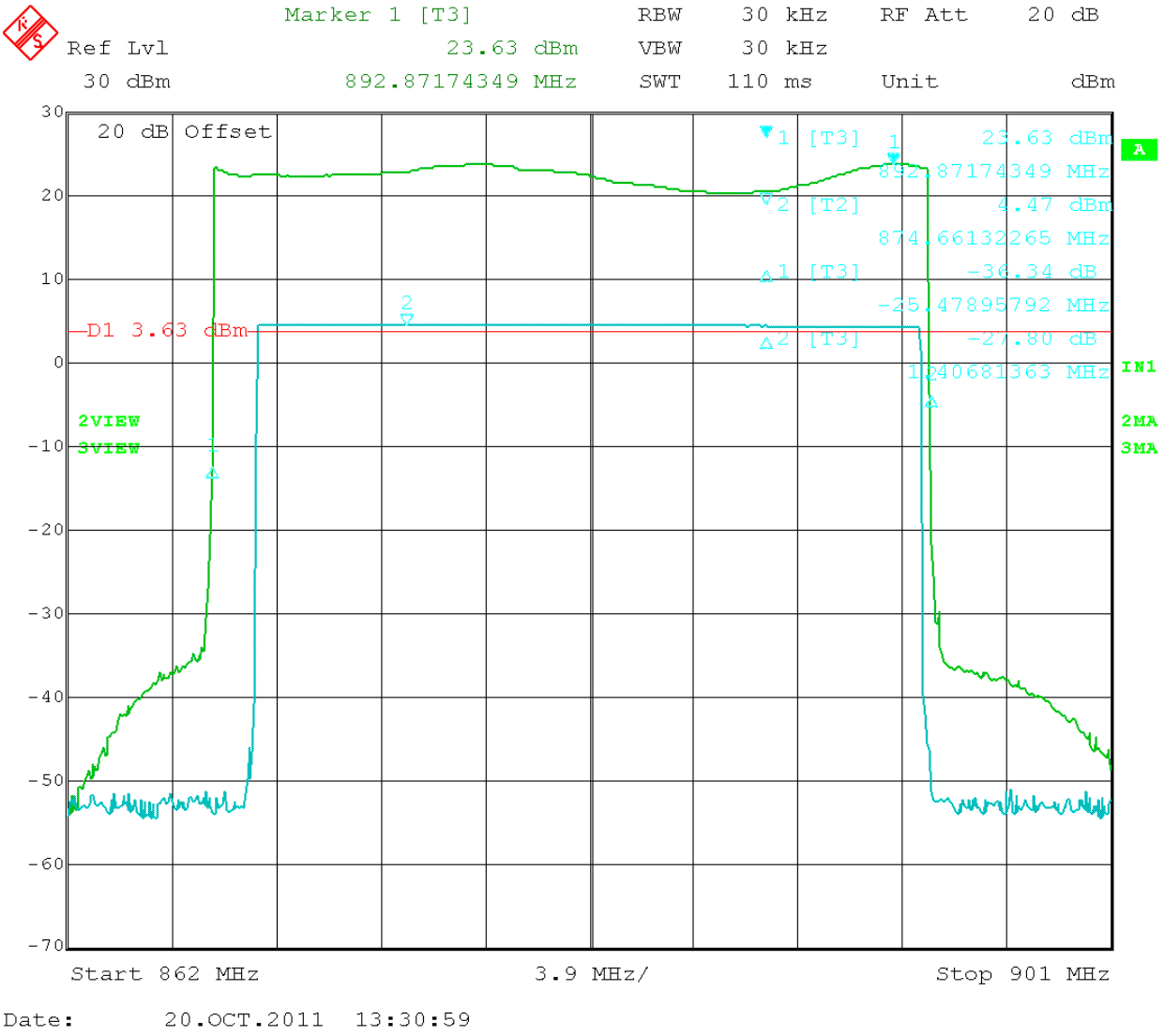



Figure 48: 20 dB Bandwidth (down link 800 MHz)

| | |
|---|---|
| Input | 4.47 dBm |
| Output | 23.63 dBm |
| Pass Band Gain | 19.16 |

20 dB Bandwidth: (25.48+1.41) MHz = 28.89 MHz

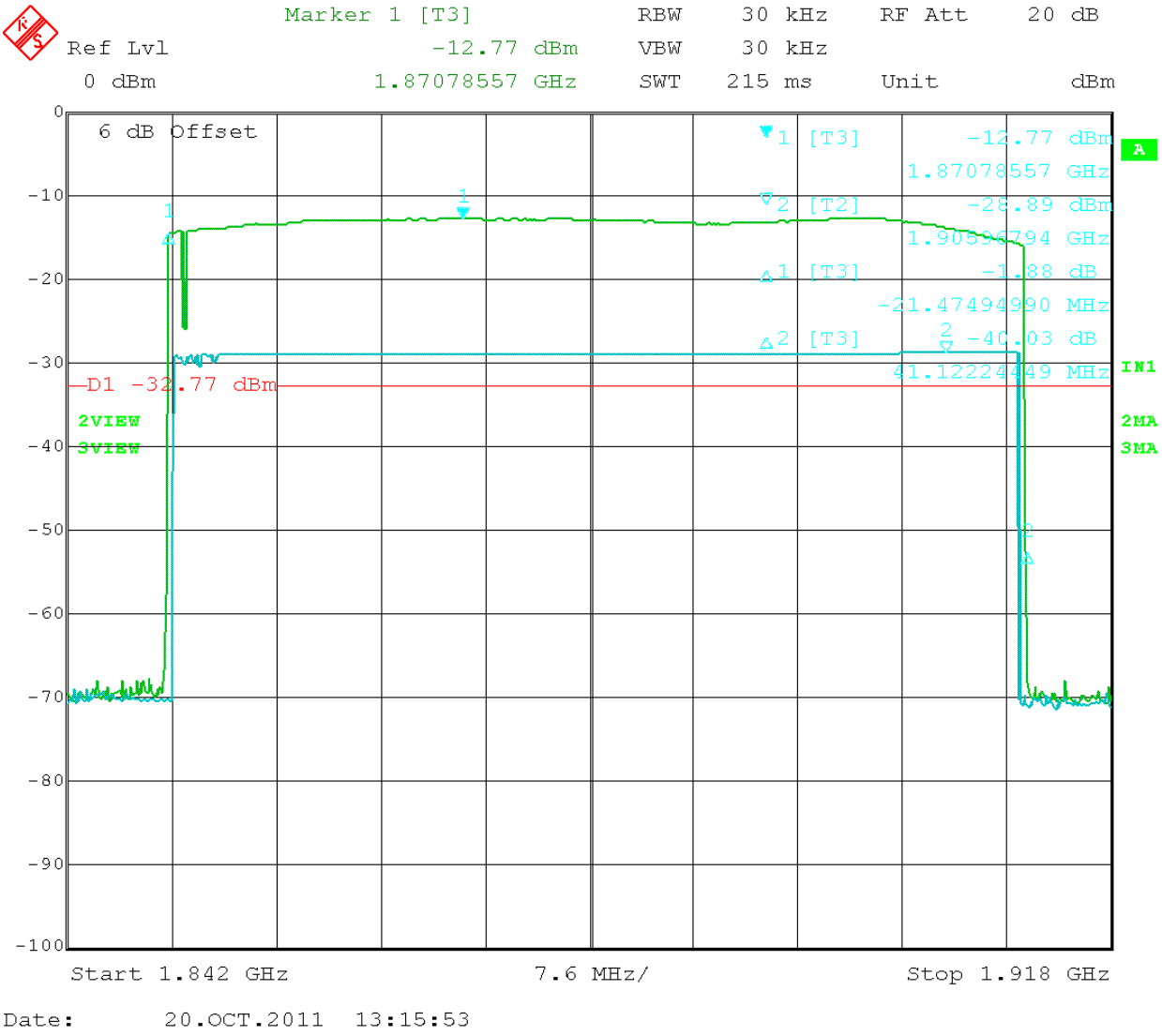



Figure 50: 20 dB Bandwidth (uplink 1900 MHz)

| | |
|---|---|
| Input | -28.89 dBm |
| Output | -12.77 dBm |
| Pass Band Gain | 16.12 |

20 dB Bandwidth: (21.47+41.12) MHz = 62.59 MHz

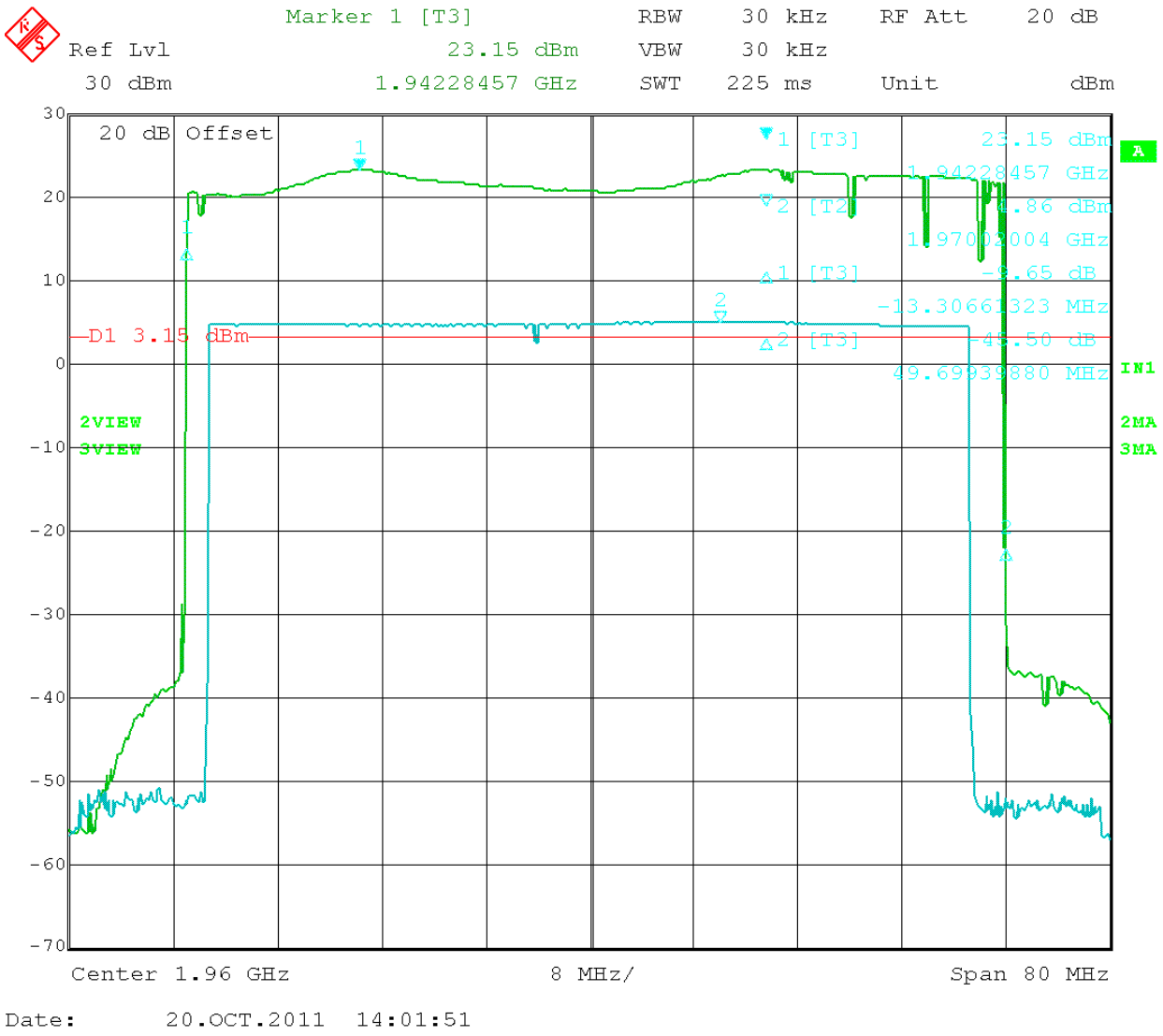



Figure 53: Passband Gain and Bandwidth (downlink 1900 MHz)

| | |
|---|---|
| Input | 4.86 dBm |
| Output | 23.15 dBm |
| Pass Band Gain | 18.29 |

20 dB Bandwidth: (13.31+49.7) MHz = 63.01 MHz