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# Report On

FCC and Industry Canada Testing of the
Ericsson RRUS 01 B2 / KRC 118 74/2

COMMERCIAL-IN-CONFIDENCE

FCC ID: TA8AKRC11874-2
IC ID: 287AB-AS118742

**Document 75926460 Report 01 Issue 1** **July 2014**

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**REPORT ON** FCC and Industry Canada Testing of the Ericsson RRUS 01 B2 / KRC 118 74/2

Document 75926460 Report 01 Issue 1

July 2014

**PREPARED FOR**

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**APPROVED BY**

**S Bennett**
Authorised Signatory

**DATED** 2 July 2014

ENGINEERING STATEMENT

The measurements shown in this report were made in accordance with the procedures described on test pages. All reported testing was carried out on a sample equipment to demonstrate compliance with FCC CFR 47: Part 24 and Industry Canada RSS-133. The sample tested was found to comply with the requirements defined in the applied rules.

Test Engineer(s);

G Zhao X Zhang

Product Service

**CONTENTS**

Product Service

**SECTION 1**

**REPORT SUMMARY**

FCC and Industry Canada Testing of the
Ericsson RRUS 01 B2 / KRC 118 74/2

Product Service

## 1.1 INTRODUCTION

The information contained in this report is intended to show verification of the Ericsson RRUS 01 B2 / KRC 118 74/2 to the requirements of FCC CFR 47 Part 24 and Industry Canada RSS-133.

Testing was carried out in support of a C2PC application for Grant of RRUS 01 B2 / KRC 118 74/2 to include LTE mode.

| | |
|---|---|
| Objective | To perform FCC and Industry Canada Testing to determine the Equipment Under Test's (EUT's) compliance with the Test Specification, for the series of tests carried out. |
| Manufacturer | Ericsson AB |
| Product Name | RRUS 01 B2 |
| Part Number | KRC 118 74/2 |
| IC Model Number | AS118742 |
| Serial Number(s) | D165426806, CB4S938194 |
| LTE Software Version | CXP102051/19 Rev R30H |
| PIS Software Version | CXP9013268/6 Rev R51MA |
| Hardware Version | R1F |
| Number of Samples Tested | 2 |
| Test Specification/Issue/Date | FCC CFR 47 Part 24: 2013<br>Industry Canada RSS-133 issue 6: 2013 |
| Incoming Release<br>Date | Declaration of Build Status<br>11 April 2014 |
| Order Number<br>Date | PTP<br>09 April 2014 |
| Start of Test | 11 April 2014 |
| Finish of Test | 24 June 2014 |
| Name of Engineer(s) | G Zhao<br>X Zhang |
| Related Document(s) | ANSI C63.4: 2009<br>ANSI/TIA-603-C-2004<br>FCC CFR 47 Part 2: 2013<br>Industry Canada RSS-GEN Issue 3: 2010<br>Industry Canada SRSP510 Issue 5: 2009 |

Product Service

## 1.2 BRIEF SUMMARY OF RESULTS

A brief summary of results in accordance with FCC CFR 47 Part 24 and Industry Canada RSS-133, is shown below.

| Configuration 1 – Remote Radio Equipment | | | | | | | |
|---|---|---|---|---|---|---|---|
| Section | Spec Clause | | Test Description | Mode | Mod State | Result | Comments |
| | FCC Part 2 and 24 | RSS-133 and RSS-GEN | | | | | |
| | 24.232 (a) | 6.4 | Effective Radiated Power | 1930.7MHz (1.4MHz OBW) / 1940.0MHz (20.0MHz OBW) | | N/A | No integral antenna. |
| | | | | 1960.0MHz (1.4MHz, 3.0MHz, 5.0MHz, 10.0MHz, 15.0MHz, 20.0MHz OBW) | | N/A | |
| | | | | 1989.3MHz (1.4MHz OBW) / 1980.0MHz (20.0MHz OBW) | | N/A | |
| | | | | 1930.7MHz + 1944.3MHz (1.4MHz OBW) / 1935.0MHz + 1945.0MHz (10MHz OBW) | | N/A | |
| | | | | 1953.2MHz + 1966.8MHz (1.4MHz OBW) / 1951.5MHz + 1968.5MHz (3.0MHz OBW) / 1952.5MHz + 1967.5MHz (5.0MHz OBW) / 1955.0MHz + 1965.0MHz (10MHz OBW) | | N/A | |
| | | | | 1975.7MHz + 1989.3MHz (1.4MHz OBW) / 1975.0MHz + 1985.0MHz (10MHz OBW) | | N/A | |
| 2.1 | 2.1046, 24.232 (a) | 6.4 | RF Output Power - Conducted | 1930.7MHz (1.4MHz OBW) / 1940.0MHz (20.0MHz OBW) | 0 | Pass | - |
| | | | | 1960.0MHz (1.4MHz, 3.0MHz, 5.0MHz, 10.0MHz, 15.0MHz, 20.0MHz OBW) | 0 | Pass | |
| | | | | 1989.3MHz (1.4MHz OBW) / 1980.0MHz (20.0MHz OBW) | 0 | Pass | |
| | | | | 1930.7MHz + 1944.3MHz (1.4MHz OBW) / 1935.0MHz + 1945.0MHz (10MHz OBW) | 0 | Pass | |
| | | | | 1953.2MHz + 1966.8MHz (1.4MHz OBW) / 1951.5MHz + 1968.5MHz (3.0MHz OBW) / 1952.5MHz + 1967.5MHz (5.0MHz OBW) / 1955.0MHz + 1965.0MHz (10MHz OBW) | 0 | Pass | |
| | | | | 1975.7MHz + 1989.3MHz (1.4MHz OBW) / 1975.0MHz + 1985.0MHz (10MHz OBW) | 0 | Pass | |

Product Service

| Configuration 1 – Remote Radio Equipment | | | | | | | |
|---|---|---|---|---|---|---|---|
| Section | Spec Clause | | Test Description | Mode | Mod State | Result | Comments |
| | FCC Part 2 and 24 | RSS-133 and RSS-GEN | | | | | |
| 2.2 | 24.232 (d) | 6.4 | Peak – Average Ratio | 1930.7MHz (1.4MHz OBW) / 1940.0MHz (20.0MHz OBW) | 0 | Pass | - |
| | | | | 1960.0MHz (1.4MHz, 3.0MHz, 5.0MHz, 10.0MHz, 15.0MHz, 20.0MHz OBW) | 0 | Pass | |
| | | | | 1989.3MHz (1.4MHz OBW) / 1980.0MHz (20.0MHz OBW) | 0 | Pass | |
| | | | | 1930.7MHz + 1944.3MHz (1.4MHz OBW) / 1935.0MHz + 1945.0MHz (10MHz OBW) | 0 | Pass | |
| | | | | 1953.2MHz + 1966.8MHz (1.4MHz OBW) / 1951.5MHz + 1968.5MHz (3.0MHz OBW) / 1952.5MHz + 1967.5MHz (5.0MHz OBW) / 1955.0MHz + 1965.0MHz (10MHz OBW) | 0 | Pass | |
| | | | | 1975.7MHz + 1989.3MHz (1.4MHz OBW) / 1975.0MHz + 1985.0MHz (10MHz OBW) | 0 | Pass | |
| 2.3 | 2.1047 (d) | 6.2 | Modulation Characteristics | 1960.0MHz (3.0MHz OBW) | 0 | Pass | - |
| 2.4 | 2.1049, 24.238 (b) | RSS-Gen 4.6.1 | Occupied Bandwidth | 1930.7MHz (1.4MHz OBW) / 1940.0MHz (20.0MHz OBW) | 0 | Pass | - |
| | | | | 1960.0MHz (1.4MHz, 3.0MHz, 5.0MHz, 10.0MHz, 15.0MHz, 20.0MHz OBW) | 0 | Pass | |
| | | | | 1989.3MHz (1.4MHz OBW) / 1980.0MHz (20.0MHz OBW) | 0 | Pass | |
| 2.5 | 2.1051, 24.238 (b) | 6.5 | Spurious Emissions at Antenna Terminals (±1MHz) | 1930.7MHz (1.4MHz OBW) / 1931.5MHz (3.0MHz OBW) 1932.5MHz (5.0MHz OBW) / 1935.0MHz (10.0MHz OBW) 1937.5MHz (15.0MHz OBW) / 1940.0MHz (20.0MHz OBW) | 0 | Pass | - |
| | | | | 1989.3MHz (1.4MHz OBW) / 1988.5MHz (3.0MHz OBW) 1987.5MHz (5.0MHz OBW) / 1985.0MHz (10.0MHz OBW) 1982.5MHz (15.0MHz OBW) / 1980.0MHz (20.0MHz OBW) | 0 | Pass | |
| | | | | 1930.7MHz + 1944.3MHz (1.4MHz OBW) / 1931.5MHz + 1948.5MHz (3MHz OBW) / 1932.5MHz + 1947.5MHz (5MHz OBW) / 1935.0MHz + 1945.0MHz (10MHz OBW) | 0 | Pass | |
| | | | | 1975.7MHz + 1989.3MHz (1.4MHz OBW) / 1971.5MHz + 1988.5MHz (3MHz OBW) / 1972.5MHz + 1987.5MHz (5MHz OBW) / 1975.0MHz + 1985.0MHz (10MHz OBW) | 0 | Pass | |

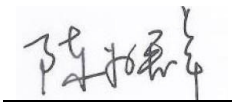
| Configuration 1 – Remote Radio Equipment | | | | | | | |
|---|---|---|---|---|---|---|---|
| Section | Spec Clause | | Test Description | Mode | Mod State | Result | Comments |
| | FCC Part 2 and 24 | RSS-133 and RSS-GEN | | | | | |
| 2.6 | 2.1053, 24.238 (a) | 6.5 | Radiated Spurious Emissions | 1930.7MHz (1.4MHz OBW) | 0 | Pass | - |
| | | | | 1960.0MHz (1.4MHz, 3.0MHz, 5.0MHz, 10.0MHz, 15.0MHz, 20.0MHz OBW) | 0 | Pass | |
| | | | | 1989.3MHz (1.4MHz OBW) | 0 | Pass | |
| | | | | 1953.2MHz + 1966.8MHz (1.4MHz OBW) | 0 | Pass | |
| 2.7 | 2.1051, 24.238 (a) | 6.5 | Conducted Spurious Emissions | 1930.7MHz (1.4MHz OBW) | 0 | Pass | - |
| | | | | 1960.0MHz (1.4MHz OBW) | 0 | Pass | |
| | | | | 1989.3MHz (1.4MHz OBW) | 0 | Pass | |
| | | | | 1930.7MHz + 1944.3MHz (1.4MHz OBW) / 1931.5MHz + 1948.5MHz (3.0MHz OBW) / 1946.1MHz + 1963.1MHz (3.0MHz OBW) | 0 | Pass | |
| | | | | 1953.2MHz + 1966.8MHz (1.4MHz OBW) / 1951.5MHz + 1968.5MHz (3.0MHz OBW) | 0 | Pass | |
| | | | | 1975.7MHz + 1989.3MHz (1.4MHz OBW) / 1971.5MHz + 1988.5MHz (3.0MHz OBW) / 1956.9MHz + 1973.9MHz (3.0MHz OBW) | 0 | Pass | |
| 2.8 | 2.1055, 24.235 | 6.3 | Frequency Stability Under Temperature Variations | 1960.0MHz (3.0MHz OBW) | 0 | Pass | - |
| 2.9 | 2.1055, 24.235 | 6.3 | Frequency Stability Under Voltage Variations | 1960.0MHz (3.0MHz OBW) | 0 | Pass | - |

N/A – Not Applicable

Product Service

## 1.3 DECLARATION OF BUILD STATUS

| MAIN EUT | |
|---|---|
| **MANUFACTURING DESCRIPTION** | Remote Radio Equipment |
| **MANUFACTURER** | Ericsson AB |
| **PRODUCT NAME** | RRUS 01 B2 |
| **PART NUMBER** | KRC 118 74/2 |
| **IC Model Number** | AS118742 |
| **SERIAL NUMBER** | D165426806, CB4S938194 |
| **HARDWARE VERSION** | R1F |
| **LTE SOFTWARE** | CXP102051/19 Rev R30H |
| **PIS SOFTWARE** | CXP9013268/6 Rev R51MA |
| **TRANSMITTER OPERATING RANGE** | TX: 1930MHz - 1990MHz<br>RX: 1850MHz - 1910MHz |
| **MODULATIONS** | QPSK, 16QAM, 64QAM |
| **NUMBER OF CARRIERS** | Maximum 2 carriers |
| **ITU DESIGNATION OF EMISSION** | 1M40F9W, 3M00F9W, 5M00F9W, 10M0F9W, 15M0F9W, 20M0F9W |
| **OUTPUT POWER (RMS) (W or dBm)** | Single Carrier: 1x 49.0dBm per port (1 x 80W per port)<br>Multi Carrier(x 2): 2 x 46.0dBm per port (2 x 40W per port ) |
| **OUTPUT POWER TOLERANCE** | ± 1.0dB |
| **INSTANTANEOUS BANDWIDTH** | 15MHz for 1.4MHz OBW<br>20MHz for 3MHz, 5MHz, 10MHz, 15MHz and 20MHz OBW |
| **CHANNEL BANDWIDTH** | Single carrier supports 1.4MHz, 3MHz, 5MHz, 10MHz, 15MHz and 20MHz<br>Multi carrier supports1.4MHz, 3MHz, 5MHz and 10MHz according to 3GPP TS 36.141 |
| **ANTENNA** | No dedicated antenna, handled during licensing |
| **NUMBER OF ANTENNA PORTS** | Non-MIMO: 1TX/RX port and 1RX port<br>MIMO 2 x 2: 2TX/RX ports and 2RX ports are supported by combining two Radio Units. |
| **SUPPORTED CONFIGURATION** | Single carrier or Multi Carrier. Both RF chains are identical. |
| **FCC ID** | TA8AKRC11874-2 |
| **IC ID** | 287AB-AS118742 |
| **TECHNICAL DESCRIPTION (a brief description of the intended use and operation)** | The equipment is the Radio Part of LTE Base Station. |

**Signature** 

**Date** 15 April 2014

**D of B S Serial No** 75926460/01

No responsibility will be accepted by TÜV SÜD Product Service as to the accuracy of the information declared in this document by the manufacturer.

Product Service

## 1.4 PRODUCT INFORMATION

### 1.4.1 Technical Description

The Equipment Under Test (EUT) RRUS 01 B2 / KRC 118 74/2 is an Ericsson Remote Radio Equipment working in the public mobile service 1900MHz band which operates in LTE mode. The RRUS 01 B2 / KRC 118 74/2 operates from a -48V DC supply.

The Equipment Under Test (EUT) is shown in the photograph below. A full technical description can be found in the Manufacturers documentation.

Equipment Under Test

Product Service

### 1.4.2 Test Configuration

Configuration 1: Remote Radio Equipment

The EUT was configured in accordance with FCC CFR 47 Part 24 and Industry Canada RSS-133.

The RRUS 01 B2 / KRC 118 74/2 supports Test Models E-TM1.1, E-TM3.2 and E-TM3.1 at 1900MHz defined in 3GPP TS 36.141. Test Model E-TM1.1 is used to represent QPSK modulation only, Test Model E-TM3.2 is used to represent 16QAM modulation, and Test Model E-TM3.1 is used to represent 64QAM modulation.

By combining two EUTs together, the EUTs were configured to transmit in 1900MHz MIMO mode with two TX/RX ports(RF A1, RF A2) and two RX ports(RF B1, RF B2). MIMO mode was selected as the worst configuration.

The RF Output Power was tested on both TX/RX output connectors RF A1 and RF A2, all other TX measurements were performed on the combined TX/RX output connector RF A1 of the EUT as the representative port.

The complete testing was performed with the EUT transmitting at maximum RF power unless otherwise stated.

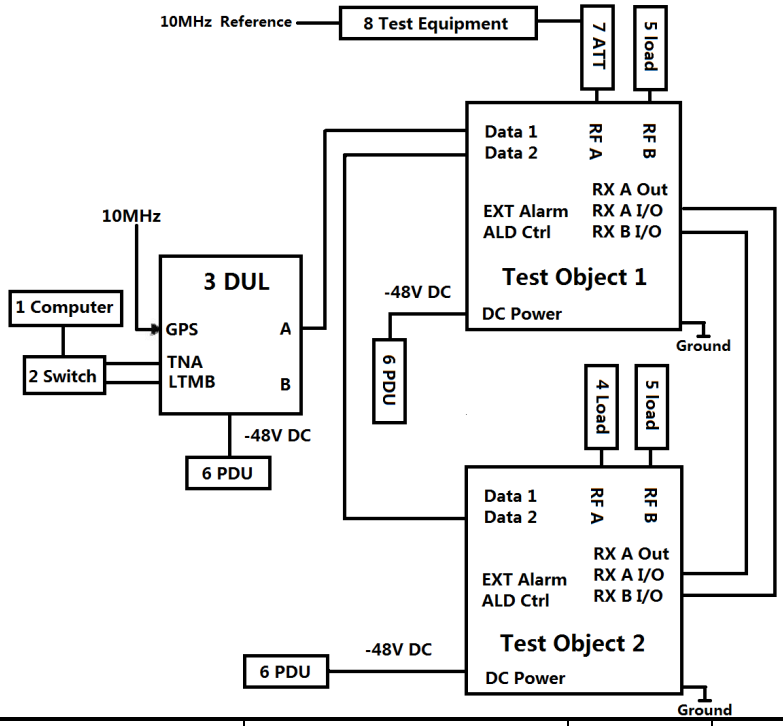
The settings below were found to be representative for all modes when several settings, with different modulations and number of carriers, were tested to find the worst case settings. After the measured results were compared, the following settings were used for all measurements unless otherwise noted:

- Single Carrier: Test Model E-TM1.1 in channel bandwidth 1.4MHz.
- Multi Carrier (x2): Test Model E-TM1.1 in channel bandwidth 1.4MHz.

The EUT was powered by a -48V DC Power supply.

Product Service

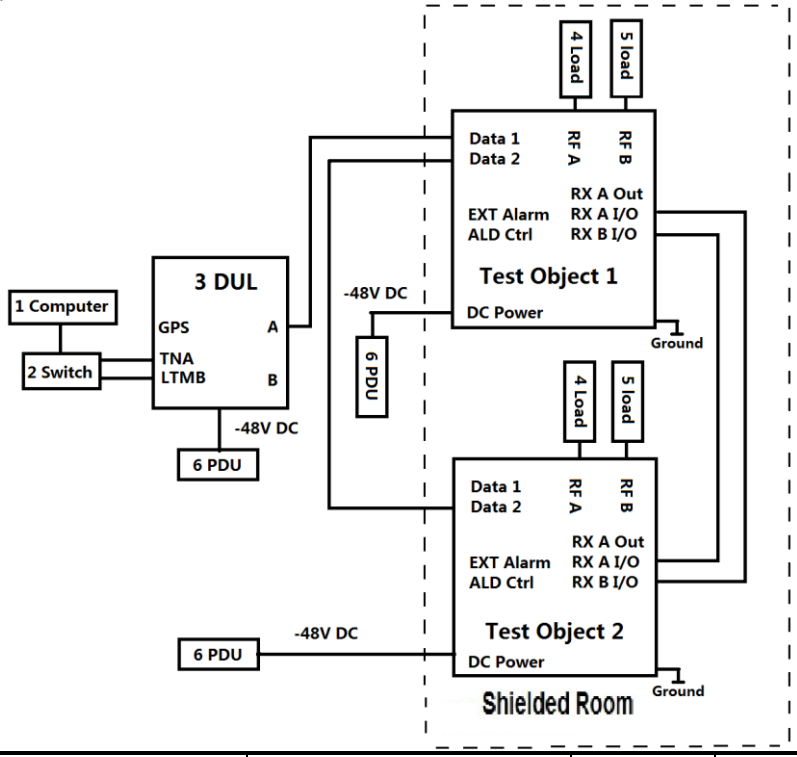
**Test Setup, Conducted Measurement:**




| Product Name | Product Number | Version | Serial Number |
|---|---|---|---|
| RRUS 01 B2 | KRC 118 74/2 | R1F | D165426806 |
| RRUS 01 B2 | KRC 118 74/2 | R1F | CB4S938194 |

| No. | Auxiliary Equipment | Part Number / Model Type | Version | Serial Number |
|---|---|---|---|---|
| 1 | Computer | HP EliteBook 8460p | -- | AP523464 |
| 2 | Switch | TL-SF1008+ | -- | 11936826484 |
| 3 | RBS 6601 | BFL 901 009/1 | -- | -- |
| | DUL 20 01 | KDU 137 533/4 | R1C | CB4H451296 |
| | SUP 6601 | 1/BFL 901 009/1 | R3B | BR81005675 |
| 4 | Load | TF100 | -- | 09121648 |
| 5 | Load | TFE5-3 | -- | 090323176 |
| | Load | TFE5-3 | -- | 090323220 |
| 6 | Power Supply | DH1716-5D | -- | 2008040031 |
| | Power Supply | DH1716-5D | -- | 2008040050 |
| | Power Supply | DH1716A-9 | -- | ETE/L676 |
| 7 | 40dB Attenuator | 66-40-33 | -- | CD4019 |
| 8 | Power Meter | Rohde & Schwarz NRP2 | -- | 101283 |
| | Power Sensor | Rohde & Schwarz NRP-Z51 | -- | 102310 |
| | Spectrum Analyzer | FSQ26 | -- | 100253 |

**Test Setup, Radiated Measurement:**




| Product Name | Product Number | Version | Serial Number |
|---|---|---|---|
| RRUS 01 B2 | KRC 118 74/2 | R1F | D165426806 |
| RRUS 01 B2 | KRC 118 74/2 | R1F | CB4S938194 |

| No. | Auxiliary Equipment | Part Number / Model Type | Version | Serial Number |
|---|---|---|---|---|
| 1 | Computer | HP EliteBook 8460p | -- | AP523464 |
| 2 | Switch | TL-SF1008+ | -- | 11936826484 |
| 3 | RBS 6601 | BFL 901 009/1 | -- | -- |
| | DUL 20 01 | KDU 137 533/4 | R1C | CB4H451296 |
| | SUP 6601 | 1/BFL 901 009/1 | R3B | BR81005675 |
| 4 | Load | TF100 | -- | 09121648 |
| | Load | TF100 | -- | 09121605 |
| 5 | Load | TFE5-3 | -- | 090323176 |
| | Load | TFE5-3 | -- | 090323220 |
| 6 | Power Supply | DH1716-5D | -- | 2008040031 |
| | Power Supply | DH1716-5D | -- | 2008040050 |
| | Power Supply | DH1716A-9 | -- | ETE/L676 |

Product Service

### 1.4.3 Modes of Operation

Modes of operation of each EUT during testing were as follows:

**Single Carrier** :

Bottom Channel :

Mode 1 - 1.4 : EARFCN 607: 1930.7MHz (1.4MHz Bandwidth)

Mode 1 - 3 : EARFCN 615: 1931.5MHz (3.0MHz Bandwidth)

Mode 1 - 5 : EARFCN 625: 1932.5MHz (5.0MHz Bandwidth)

Mode 1 - 10 : EARFCN 650: 1935.0MHz (10.0MHz Bandwidth)

Mode 1 - 15 : EARFCN 675: 1937.5MHz (15.0MHz Bandwidth)

Mode 1 - 20 : EARFCN 700: 1940.0MHz (20.0MHz Bandwidth)

Middle Channel :

Mode 2 : EARFCN 900: 1960.0MHz (1.4MHz, 3MHz, 5MHz, 10MHz, 15MHz and 20MHz Bandwidth)

Top Channel :

Mode 3 - 1.4 : EARFCN 1193: 1989.3MHz (1.4MHz Bandwidth)

Mode 3 - 3 : EARFCN 1185: 1988.5MHz (3.0MHz Bandwidth)

Mode 3 - 5 : EARFCN 1175: 1987.5MHz (5.0MHz Bandwidth)

Mode 3 - 10 : EARFCN 1150: 1985.0MHz (10.0MHz Bandwidth)

Mode 3 - 15 : EARFCN 1125: 1982.5MHz (15.0MHz Bandwidth)

Mode 3 - 20 : EARFCN 1100: 1980.0MHz (20.0MHz Bandwidth)

**Multi Carrier (x2):**

Bottom Channel :

Mode 4 - 1.4 : EARFCN 607 + 743: 1930.7MHz + 1944.3MHz (1.4MHz Bandwidth)

Mode 4 - 3 : EARFCN 615 + 785: 1931.5MHz + 1948.5MHz (3.0MHz Bandwidth)

Mode 4 - 5 : EARFCN 625 + 775: 1932.5MHz + 1947.5MHz (5.0MHz Bandwidth)

Mode 4 - 10 : EARFCN 650 + 750: 1935.0MHz + 1945.0MHz (10.0MHz Bandwidth)

Mode 4' - 3 : EARFCN 761 + 931: 1946.1MHz + 1963.1MHz (3.0MHz Bandwidth)

Middle Channel :

Mode 5 - 1.4 : EARFCN 832 + 968: 1953.2MHz + 1966.8MHz (1.4MHz Bandwidth)

Mode 5 - 3 : EARFCN 815 + 985: 1951.5MHz + 1968.5MHz (3.0MHz Bandwidth)

Mode 5 - 5 : EARFCN 825 + 975: 1952.5MHz + 1967.5MHz (5.0MHz Bandwidth)

Mode 5 - 10 : EARFCN 850 + 950: 1955.0MHz + 1965.0MHz (10.0MHz Bandwidth)

Top Channel :

Mode 6 - 1.4 : EARFCN 1057 + 1193: 1975.7MHz + 1989.3MHz (1.4MHz Bandwidth)

Mode 6 - 3 : EARFCN 1015 + 1185: 1971.5MHz + 1988.5MHz (3.0MHz Bandwidth)

Mode 6 - 5 : EARFCN 1025 + 1175: 1972.5MHz + 1987.5MHz (5.0MHz Bandwidth)

Mode 6 - 10 : EARFCN 1050 + 1150: 1975.0MHz + 1985.0MHz (10.0MHz Bandwidth)

Mode 6' - 3 : EARFCN 869 + 1039: 1956.9MHz + 1973.9MHz (3.0MHz Bandwidth)

Information on the specific test modes utilised are detailed in the test procedure for each individual test.

## 1.5 TEST CONDITIONS

For all tests, the EUT was set up in accordance with the relevant test standard and to represent typical operating conditions. Tests were applied with the EUT situated in a shielded enclosure, test laboratories or an open test area as appropriate.

The EUT was powered from a -48V DC supply.

## 1.6 DEVIATIONS FROM THE STANDARD

No deviations from the applicable test standards or test plan were made during testing.

## 1.7 MODIFICATION RECORD

Mode State 0 - No modifications were made to the EUT during testing.

## 1.8 ALTERNATIVE TEST SITE

Under our group UKAS Accreditation, TÜV SÜD Product Service conducted the following tests at Ericsson in Beijing, China:

- RF Output Power – Conducted
- Peak - Average Ratio
- Modulation Characteristics
- Occupied Bandwidth
- Spurious Emissions at Antenna Terminals (±1MHz)
- Conducted Spurious Emissions
- Frequency Stability

Only Radiated Spurious Emissions testing has been performed under the following site registrations:

FCC Accreditation 910917:
The State Radio Monitoring Centre, No.80 Beilishi Road Xicheng District Beijing, China.

Industry Canada Accreditation 7308A-1:
The State Radio Monitoring Centre, No.80 Beilishi Road Xicheng District Beijing, China.

Product Service

**SECTION 2**

**TEST DETAILS**

FCC and Industry Canada Testing of the
Ericsson RRUS 01 B2 / KRC 118 74/2

## 2.1 RF OUTPUT POWER - CONDUCTED

### 2.1.1 Specification Reference

FCC CFR 47 Part 2, Clause 2.1046
FCC CFR 47 Part 24, Clause 24.232 (a)
Industry Canada RSS-133, Clause 6.4

### 2.1.2 Equipment Under Test

RRUS 01 B2 / KRC 118 74/2, S/N: D165426806, CB4S938194

### 2.1.3 Date of Test and Modification State

11 April to 26 May 2014 – Modification State 0

### 2.1.4 Test Equipment Used

The major items of test equipment used for the below tests are identified in Section 3.1.

### 2.1.5 Test Method and Operating Modes

The test was applied in accordance with the test method requirements of FCC CFR 47 Part 2 and Part 24 and Industry Canada RSS-133.

Using a power meter and attenuator(s), the output power of the EUT was measured at the antenna terminal. The carrier power was measured with E-TM1.1, E-TM3.2 and E-TM3.1 test models. The average power spectral density was measured using the spectrume analyzer.

Since the EUTs transmit on two antennas simultaneously in the same frequency range, i.e, TX MIMO mode, using the Measure-and-Sum approach, the output power at both antennas RF A1 and RF A2 were tested and the total power were then summed mathematically in linear power units according to FCC KDB 662911 D01 Multiple Transmitter Output v02r01.

The path loss was measured and entered to the power meter as a reference level offset to get the output power value directly.

The test was performed with the EUT in the following configurations and modes of operation:

Configuration 1
- Mode 1 - 1.4, Mode 1 - 20
- Mode 2 (1.4MHz, 3.0MHz, 5.0MHz, 10.0MHz, 15.0MHz, 20.0MHz OBW)
- Mode 3 - 1.4, Mode 3 - 20
- Mode 4 - 1.4, Mode 4 - 10
- Mode 5 - 1.4, Mode 5 - 3, Mode 5 - 5, Mode 5 - 10
- Mode 6 - 1.4, Mode 6 - 10

Product Service

### 2.1.6 Environmental Conditions

Ambient Temperature 22.0 – 28.5°C

Relative Humidity 41.0 – 65.0%

### 2.1.7 Test Results

For the period of test the EUT met the requirements of FCC CFR 47 Part 2 and Part 24 and Industry Canada RSS-133 for RF Output Power.

The test results are shown below

**Single Carrier**

**Declarative Maximum Output power:**

**Bottom and Top Channel of 1.4MHz, 3MHz, 5MHz : 48.50dBm per port**
**Bottom and Top Channel of 10MHz, 15MHz, 20MHz : 49.00dBm per port**
**Middle Channel of 1.4MHz, 3MHz, 5MHz, 10MHz, 15MHz, 20MHz : 49.00dBm per port**

**E-TM1.1: 1.4MHz Bandwidth**

Configuration 1 - Mode 1 - 1.4, Mode 2 and Mode 3 - 1.4

| EARFCN | Frequency (MHz) | Result (RMS) | | | | | | *Total (dBm) RMS | *Total (W) RMS |
|---|---|---|---|---|---|---|---|---|---|
| | | RF A1 | | | RF A2 | | | | |
| | | dBm | W | dBm/MHz | dBm | W | dBm/MHz | | |
| 607 (Bottom) | 1930.7 | 48.14 | 65.16 | 46.75 | 48.15 | 65.31 | 46.73 | 51.16 | 130.47 |
| 900 (Middle) | 1960.0 | 48.70 | 74.13 | 47.29 | 48.62 | 72.78 | 47.24 | 51.67 | 146.91 |
| 1193 (Top) | 1989.3 | 48.18 | 65.77 | 46.63 | 48.00 | 63.10 | 46.49 | 51.10 | 128.87 |

**E-TM1.1: 20.0MHz Bandwidth**

Configuration 1 - Mode 1 - 20, Mode 2 and Mode 3 - 20

| EARFCN | Frequency (MHz) | Result (RMS) | | | | | | *Total (dBm) RMS | *Total (W) RMS |
|---|---|---|---|---|---|---|---|---|---|
| | | RF A1 | | | RF A2 | | | | |
| | | dBm | W | dBm/MHz | dBm | W | dBm/MHz | | |
| 700 (Bottom) | 1940.0 | 48.73 | 74.64 | 36.42 | 48.64 | 73.11 | 36.40 | 51.70 | 147.75 |
| 900 (Middle) | 1960.0 | 48.79 | 75.68 | 36.43 | 48.68 | 73.79 | 36.28 | 51.75 | 149.47 |
| 1100 (Top) | 1980.0 | 48.79 | 75.68 | 36.43 | 48.69 | 73.96 | 36.29 | 51.75 | 149.64 |

**E-TM1.1: 3.0MHz, 5.0MHz, 10.0MHz and 15.0MHz Bandwidth**

Configuration 1 - Mode 2

| EARFCN | BW Config (MHz) | Result (RMS) | | | | | | *Total (dBm) RMS | *Total (W) RMS |
|---|---|---|---|---|---|---|---|---|---|
| | | RF A1 | | | RF A2 | | | | |
| | | dBm | W | dBm/MHz | dBm | W | dBm/MHz | | |
| 900 (Middle) / 1960.0 | 3.0 | 48.82 | 76.21 | 44.54 | 48.70 | 74.13 | 44.35 | 51.77 | 150.34 |
| | 5.0 | 48.81 | 76.03 | 42.37 | 48.69 | 73.96 | 42.25 | 51.76 | 149.99 |
| | 10.0 | 48.81 | 76.03 | 39.48 | 48.71 | 74.30 | 39.42 | 51.77 | 150.33 |
| | 15.0 | 48.79 | 75.68 | 37.62 | 48.68 | 73.79 | 37.55 | 51.75 | 149.47 |

**E-TM3.2 and E-TM3.1: 1.4MHz Bandwidth**

Configuration 1 - Mode 2

| EARFCN / Frequency (MHz) | Test Model | Result (RMS) | | | | | | *Total (dBm) RMS | *Total (W) RMS |
|---|---|---|---|---|---|---|---|---|---|
| | | RF A1 | | | RF A2 | | | | |
| | | dBm | W | dBm/MHz | dBm | W | dBm/MHz | | |
| 900 (Middle) / 1960.0 | E-TM3.2 | 48.71 | 74.30 | 47.22 | 48.62 | 72.78 | 47.02 | 51.68 | 147.08 |
| | E-TM3.1 | 48.67 | 73.62 | 47.20 | 48.59 | 72.28 | 46.97 | 51.64 | 145.90 |

**E-TM3.2 and E-TM3.1: 20.0MHz Bandwidth**

Configuration 1 - Mode 2

| EARFCN / Frequency (MHz) | Test Model | Result (RMS) | | | | | | *Total (dBm) RMS | *Total (W) RMS |
|---|---|---|---|---|---|---|---|---|---|
| | | RF A1 | | | RF A2 | | | | |
| | | dBm | W | dBm/MHz | dBm | W | dBm/MHz | | |
| 900 (Middle) / 1960.0 | E-TM3.2 | 48.76 | 75.16 | 36.71 | 48.64 | 73.11 | 36.64 | 51.71 | 148.27 |
| | E-TM3.1 | 48.79 | 75.68 | 36.38 | 48.68 | 73.79 | 36.29 | 51.75 | 149.47 |

**Multi Carrier (x2)**

**1.4MHz: 48.60dBm per port**
**3MHz: 48.90dBm per port**
**5MHz, 10MHz : 48.80dBm per port**

**E-TM1.1: 1.4MHz Bandwidth**

Configuration 1 - Mode 4 - 1.4, Mode 5 - 1.4 and Mode 6 - 1.4

| EARFCN | Frequency (MHz) | RF A1 | | RF A2 | | *Total (dBm) RMS | *Total (W) RMS |
|---|---|---|---|---|---|---|---|
| | | Result (dBm) RMS | Result (W) RMS | Result (dBm) RMS | Result (W) RMS | | |
| 607 + 743 (Bottom) | 1930.7 + 1944.3 | 48.28 | 67.30 | 48.13 | 65.01 | 51.22 | 132.31 |
| 832 + 968 (Middle) | 1953.2 + 1966.8 | 48.23 | 66.53 | 48.13 | 65.01 | 51.19 | 131.54 |
| 1057 + 1193 (Top) | 1975.7 + 1989.3 | 48.46 | 70.15 | 48.10 | 64.57 | 51.29 | 134.72 |

**E-TM1.1: 10.0MHz Bandwidth**

Configuration 1 - Mode 4 - 10, Mode 5 - 10 and Mode 6 - 10

| EARFCN | Frequency (MHz) | RF A1 | | RF A2 | | *Total (dBm) RMS | *Total (W) RMS |
|---|---|---|---|---|---|---|---|
| | | Result (dBm) RMS | Result (W) RMS | Result (dBm) RMS | Result (W) RMS | | |
| 650 + 750 (Bottom) | 1935.0 + 1945.0 | 48.56 | 71.78 | 48.47 | 70.31 | 51.53 | 142.09 |
| 850 + 950 (Middle) | 1955.0 + 1965.0 | 48.59 | 72.28 | 48.47 | 70.31 | 51.54 | 142.59 |
| 1050 + 1150 (Top) | 1975.0 + 1985.0 | 48.61 | 72.61 | 48.50 | 70.79 | 51.57 | 143.40 |

**E-TM1.1: 3.0MHz and 5.0MHz Bandwidth**

Configuration 1 - Mode 5 - 3 and Mode 5 - 5

| EARFCN / Frequency (MHz) | BW Config (MHz) | RF A1 | | RF A2 | | *Total (dBm) RMS | *Total (W) RMS |
|---|---|---|---|---|---|---|---|
| | | Result (dBm) RMS | Result (W) RMS | Result (dBm) RMS | Result (W) RMS | | |
| 815 + 985 / 1951.5 + 1968.5 (Middle) | 3.0 | 48.66 | 73.45 | 48.52 | 71.12 | 51.60 | 144.57 |
| 825 + 975 / 1952.5 + 1967.5 (Middle) | 5.0 | 48.59 | 72.28 | 48.42 | 69.50 | 51.52 | 141.78 |

Product Service

**E-TM3.2: 1.4MHz and 10.0MHz Bandwidth**

Configuration 1 - Mode 5 - 1.4 and Mode 5 - 10

| EARFCN / Frequency (MHz) | BW Config (MHz) | RF A1 | | RF A2 | | *Total (dBm) RMS | *Total (W) RMS |
|---|---|---|---|---|---|---|---|
| | | Result (dBm) RMS | Result (W) RMS | Result (dBm) RMS | Result (W) RMS | | |
| 832 + 968/ 1953.2 + 1966.8 (Middle) | 1.4 | 48.22 | 66.37 | 48.11 | 64.71 | 51.18 | 131.08 |
| 850 + 950 / 1955.0 + 1965.0 (Middle) | 10.0 | 48.56 | 71.78 | 48.40 | 69.18 | 51.49 | 140.96 |

**E-TM3.1: 1.4MHz and 10.0MHz Bandwidth**

Configuration 1 - Mode 5 - 1.4 and Mode 5 - 10

| EARFCN / Frequency (MHz) | BW Config (MHz) | RF A1 | | RF A2 | | *Total (dBm) RMS | *Total (W) RMS |
|---|---|---|---|---|---|---|---|
| | | Result (dBm) RMS | Result (W) RMS | Result (dBm) RMS | Result (W) RMS | | |
| 832 + 968/ 1953.2 + 1966.8 (Middle) | 1.4 | 48.18 | 65.77 | 48.10 | 64.57 | 51.15 | 130.34 |
| 850 + 950 / 1955.0 + 1965.0 (Middle) | 10.0 | 48.59 | 72.28 | 48.46 | 70.15 | 51.54 | 142.43 |

Note *:

Two transmitters output power were summed up according to FCC KDB662911 D01 Multiple Transmitter Output v02r01 for MIMO mode.

This unit is tested without antenna. ERP/EIRP compliance is addressed at the time of licensing, as required by the responsible FCC/IC Bureau(s). Licensees are required to take into account maximum allowed antenna gain used in combination with above power settings to prevent the radiated output power to exceed the limits.

| | |
|---|---|
| Limit | FCC: ≤1640W/MHz or ≤+62.15dBm/MHz<br>IC: ≤100W or ≤+50dBm |

Remarks

The total output power of the EUT does not exceed 1640W/MHz or 62.15dBm/MHz, and the output power per transmitter does not exceed 100W or 50dBm at the measured frequencies.

## 2.2 PEAK – AVERAGE RATIO

### 2.2.1 Specification Reference

FCC CFR 47 Part 24, Clause 24.232 (d)
Industry Canada RSS-133, Clause 6.4

### 2.2.2 Equipment Under Test

RRUS 01 B2 / KRC 118 74/2, S/N: D165426806, CB4S938194

### 2.2.3 Date of Test and Modification State

11 April to 26 May 2014 – Modification State 0

### 2.2.4 Test Equipment Used

The major items of test equipment used for the below tests are identified in Section 3.1.

### 2.2.5 Test Method and Operating Modes

The test was applied in accordance with the test method requirements of FCC CFR 47 Part 24 and Industry Canada RSS-133.

A peak to average ratio measurement is performed at the conducted port of the EUT. The spectrum analyzers Complementary Cumulative Distribution Function (CCDF) measurement profile is used to determined the largest deviation between the average and the peak power of the EUT in given bandwidth. The CCDF curve shows how much time the peak waveform spends at or above a given average power level. The percent of time the signal spends at or above the level defines the probability for that particular power level.

The measurements were performed on the combined output connector RF A1. Limited complementary measurements were done at the output connector RF A2 to verify identical performance for both transmitter chains in MIMO mode, but only the results of RF A1 as the reprentative were shown as below.

The spectrum analyzer measurement bandwidth was set 50MHz for single and multi carrier, and the path loss measured was entered as a reference level offset.

The test was performed with the EUT in the following configurations and modes of operation:

Configuration 1
- Mode 1 - 1.4, Mode 1 - 20
- Mode 2 (1.4MHz, 3.0MHz, 5.0MHz, 10.0MHz, 15.0MHz, 20.0MHz OBW)
- Mode 3 - 1.4, Mode 3 - 20
- Mode 4 - 1.4, Mode 4 - 10
- Mode 5 - 1.4, Mode 5 - 3, Mode 5 - 5, Mode 5 - 10
- Mode 6 - 1.4, Mode 6 - 10

Product Service

### 2.2.6 Environmental Conditions

| | |
|---|---|
| Ambient Temperature | 22.0 – 28.5°C |
| Relative Humidity | 41.0 – 65.0% |

### 2.2.7 Test Results

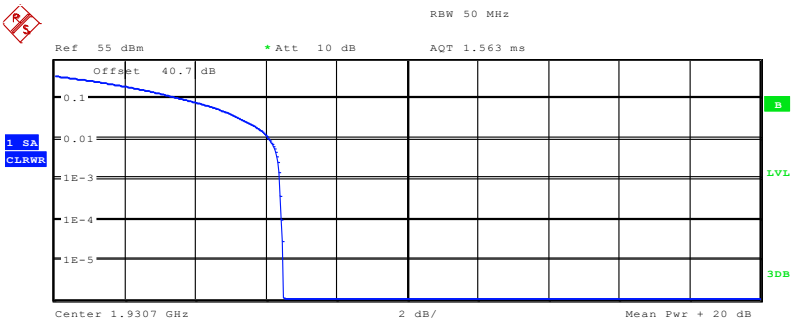
For the period of test the EUT met the requirements of FCC CFR 47 Part 24 and Industry Canada RSS-133 for Peak – Average Ratio.

The test results are shown below.

**Single Carrier**

**Configuration 1 - Mode 1 - 1.4**

E-TM1.1: 1.4MHz Bandwidth



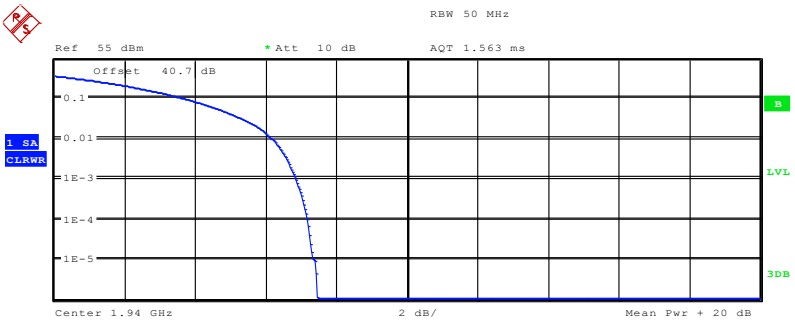

Complementary Cumulative Distribution Function
NOF samples: 100000, Usable BW: 37.9MHz

| | Trace 1 |
|---|---|
| Mean | 48.27 dBm |
| Peak | 54.74 dBm |
| Crest | 6.48 dB |
| 10 % | 3.69 dB |
| 1 % | 6.09 dB |
| .1 % | 6.38 dB |
| .01 % | 6.44 dB |

Date: 14.APR.2014 14:00:57

## Configuration 1 - Mode 1 - 20

E-TM1.1: 20.0MHz Bandwidth



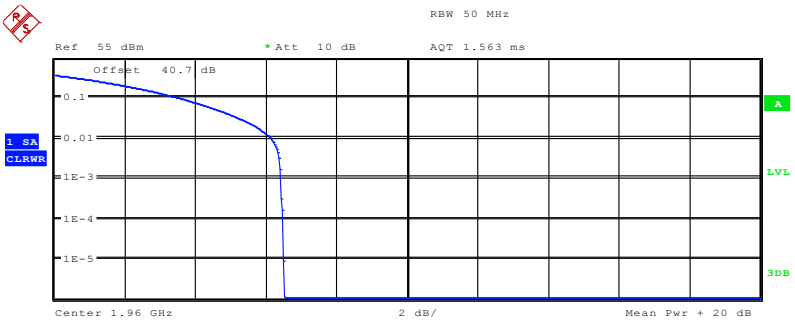

Complementary Cumulative Distribution Function
NOF samples: 100000, Usable BW: 37.9MHz

| | Trace 1 |
|---|---|
| Mean | 48.69 dBm |
| Peak | 56.14 dBm |
| Crest | 7.45 dB |
| 10 % | 3.72 dB |
| 1 % | 6.15 dB |
| .1 % | 6.86 dB |
| .01 % | 7.18 dB |

Date: 14.APR.2014 16:21:20

## Configuration 1 - Mode 2

E-TM1.1: 1.4MHz Bandwidth

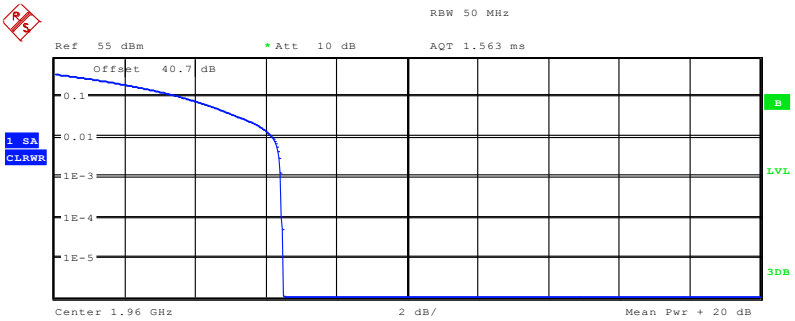



Complementary Cumulative Distribution Function
NOF samples: 100000, Usable BW: 37.9MHz

| | Trace 1 |
|---|---|
| Mean | 48.67 dBm |
| Peak | 55.16 dBm |
| Crest | 6.50 dB |
| 10 % | 3.59 dB |
| 1 % | 6.12 dB |
| .1 % | 6.41 dB |
| .01 % | 6.47 dB |

Date: 11.APR.2014 15:41:31

## E-TM3.2: 1.4MHz Bandwidth

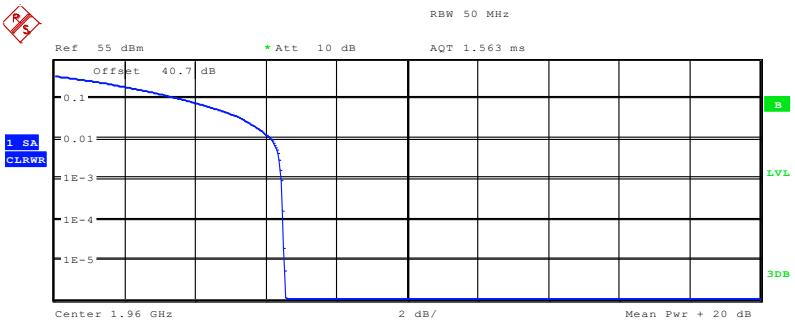



**Complementary Cumulative Distribution Function**
**NOF samples: 100000, Usable BW: 37.9MHz**

| | Trace 1 |
|---|---|
| Mean | 48.74 dBm |
| Peak | 55.24 dBm |
| Crest | 6.49 dB |
| 10 % | 3.65 dB |
| 1 % | 6.19 dB |
| .1 % | 6.41 dB |
| .01 % | 6.44 dB |

Date: 11.APR.2014 17:44:14

## E-TM3.1: 1.4MHz Bandwidth



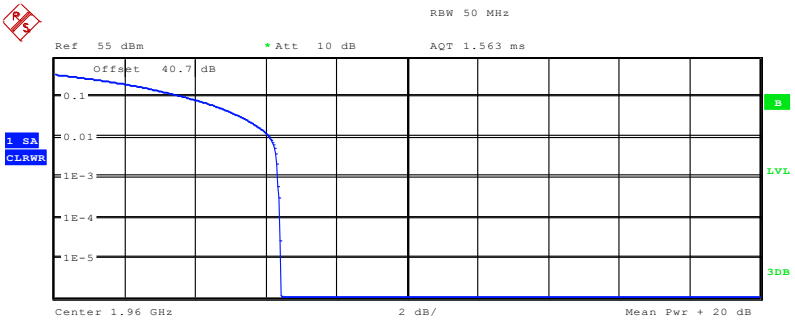

**Complementary Cumulative Distribution Function**
**NOF samples: 100000, Usable BW: 37.9MHz**

| | Trace 1 |
|---|---|
| Mean | 48.62 dBm |
| Peak | 55.16 dBm |
| Crest | 6.54 dB |
| 10 % | 3.62 dB |
| 1 % | 6.12 dB |
| .1 % | 6.44 dB |
| .01 % | 6.47 dB |

Date: 11.APR.2014 16:38:45

Product Service

## E-TM1.1: 3.0MHz Bandwidth

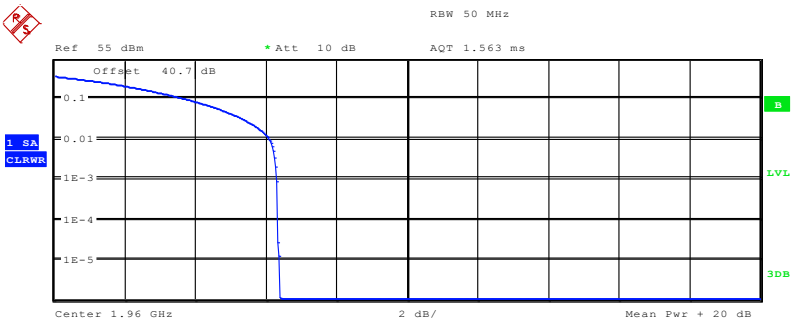



**Complementary Cumulative Distribution Function**
**NOF samples: 100000, Usable BW: 37.9MHz**

| | Trace 1 |
|---|---|
| Mean | 48.83 dBm |
| Peak | 55.24 dBm |
| Crest | 6.40 dB |
| 10 % | 3.75 dB |
| 1 % | 6.09 dB |
| .1 % | 6.35 dB |
| .01 % | 6.41 dB |

Date: 11.APR.2014 18:07:01

## E-TM1.1: 5.0MHz Bandwidth

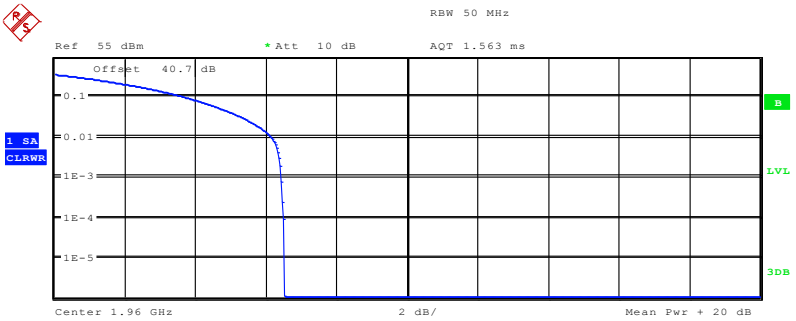



**Complementary Cumulative Distribution Function**
**NOF samples: 100000, Usable BW: 37.9MHz**

| | Trace 1 |
|---|---|
| Mean | 48.91 dBm |
| Peak | 55.31 dBm |
| Crest | 6.40 dB |
| 10 % | 3.75 dB |
| 1 % | 6.09 dB |
| .1 % | 6.31 dB |
| .01 % | 6.35 dB |

Date: 11.APR.2014 18:08:36

## E-TM1.1: 10.0MHz Bandwidth

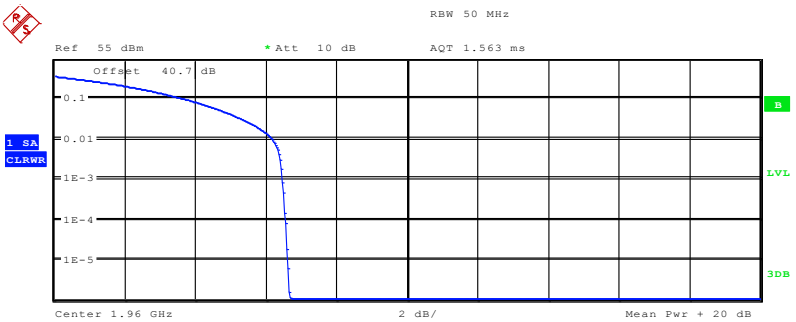



**Complementary Cumulative Distribution Function**
**NOF samples: 100000, Usable BW: 37.9MHz**

| | Trace 1 |
|---|---|
| Mean | 48.86 dBm |
| Peak | 55.38 dBm |
| Crest | 6.51 dB |
| 10 % | 3.75 dB |
| 1 % | 6.15 dB |
| .1 % | 6.44 dB |
| .01 % | 6.51 dB |

Date: 14.APR.2014 12:26:29

## E-TM1.1: 15.0MHz Bandwidth



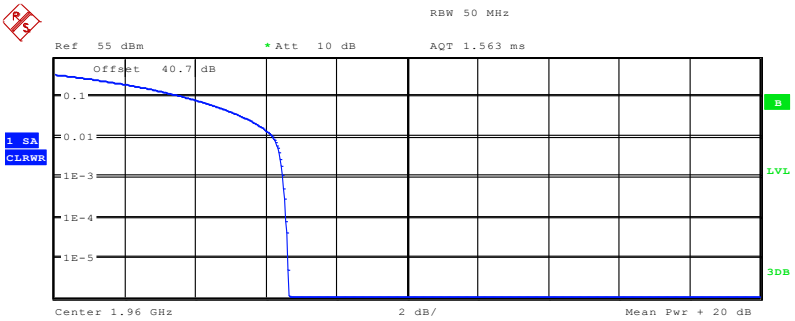

**Complementary Cumulative Distribution Function**
**NOF samples: 100000, Usable BW: 37.9MHz**

| | Trace 1 |
|---|---|
| Mean | 48.85 dBm |
| Peak | 55.52 dBm |
| Crest | 6.67 dB |
| 10 % | 3.72 dB |
| 1 % | 6.15 dB |
| .1 % | 6.47 dB |
| .01 % | 6.57 dB |

Date: 14.APR.2014 11:51:45

Product Service

## E-TM1.1: 20.0MHz Bandwidth

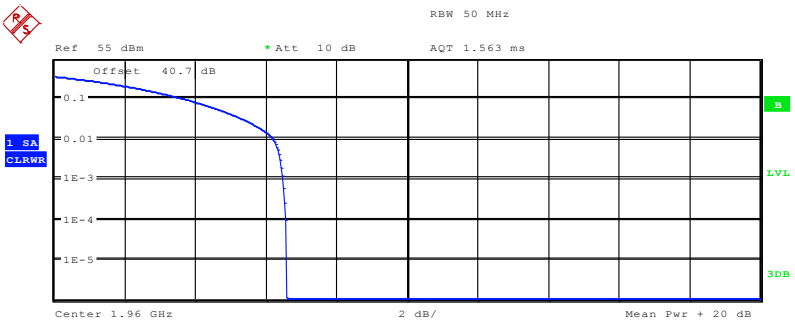



**Complementary Cumulative Distribution Function**
**NOF samples: 100000, Usable BW: 37.9MHz**

| | Trace 1 |
|---|---|
| Mean | 48.89 dBm |
| Peak | 55.52 dBm |
| Crest | 6.63 dB |
| 10 % | 3.75 dB |
| 1 % | 6.19 dB |
| .1 % | 6.47 dB |
| .01 % | 6.57 dB |

Date: 14.APR.2014 10:47:32

## E-TM3.2: 20MHz Bandwidth

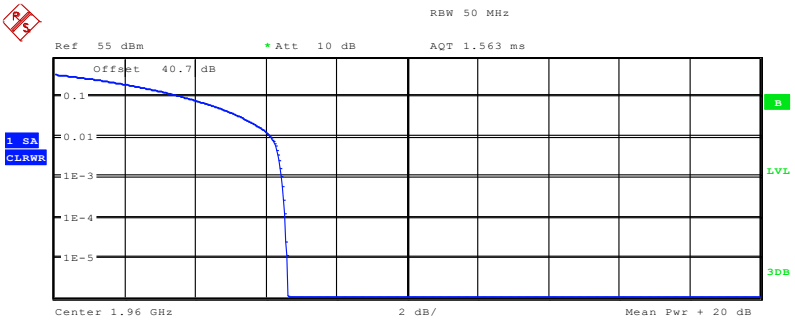



**Complementary Cumulative Distribution Function**
**NOF samples: 100000, Usable BW: 37.9MHz**

| | Trace 1 |
|---|---|
| Mean | 48.73 dBm |
| Peak | 55.31 dBm |
| Crest | 6.58 dB |
| 10 % | 3.72 dB |
| 1 % | 6.19 dB |
| .1 % | 6.47 dB |
| .01 % | 6.57 dB |

Date: 14.APR.2014 11:33:33

E-TM3.1: 20MHz Bandwidth



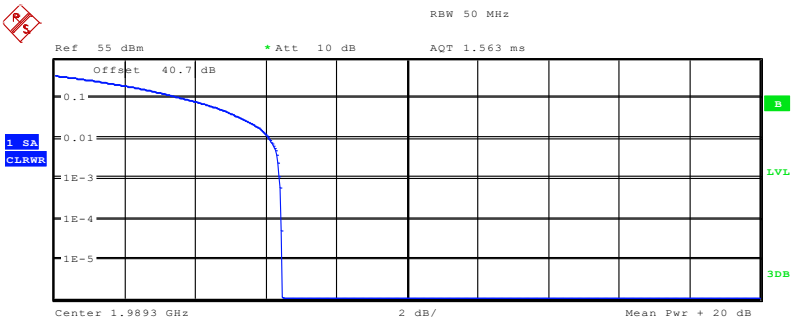

Complementary Cumulative Distribution Function
NOF samples: 100000, Usable BW: 37.9MHz

| | Trace 1 |
|---|---|
| Mean | 48.83 dBm |
| Peak | 55.45 dBm |
| Crest | 6.62 dB |
| 10 % | 3.72 dB |
| 1 % | 6.12 dB |
| .1 % | 6.44 dB |
| .01 % | 6.54 dB |

Date: 14.APR.2014 11:21:44

## Configuration 1 - Mode 3 - 1.4

E-TM1.1: 1.4MHz Bandwidth




Complementary Cumulative Distribution Function
NOF samples: 100000, Usable BW: 37.9MHz

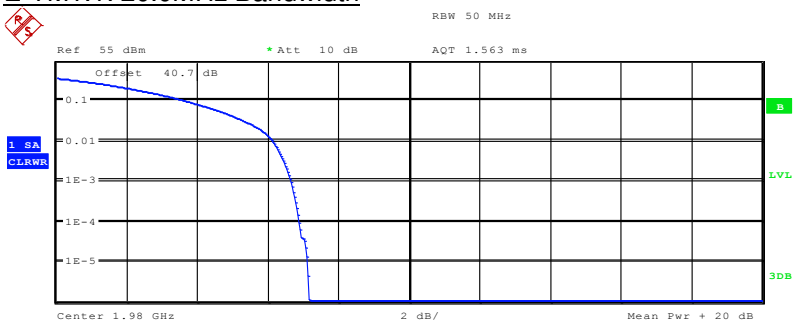
| | Trace 1 |
|---|---|
| Mean | 48.16 dBm |
| Peak | 54.60 dBm |
| Crest | 6.44 dB |
| 10 % | 3.72 dB |
| 1 % | 6.09 dB |
| .1 % | 6.38 dB |
| .01 % | 6.44 dB |

Date: 14.APR.2014 15:14:41

Product Service

## Configuration 1 - Mode 3 - 20

E-TM1.1: 20.0MHz Bandwidth




Complementary Cumulative Distribution Function
NOF samples: 100000, Usable BW: 37.9MHz

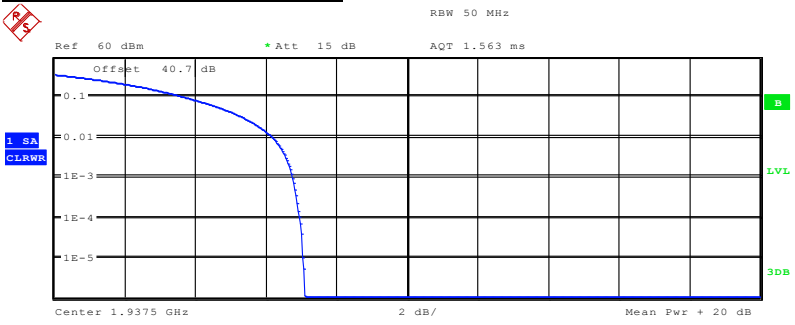
| | Trace 1 |
|---|---|
| Mean | 48.81 dBm |
| Peak | 55.96 dBm |
| Crest | 7.15 dB |
| 10 % | 3.72 dB |
| 1 % | 6.12 dB |
| .1 % | 6.67 dB |
| .01 % | 6.89 dB |

Date: 14.APR.2014 15:53:21

## Multi Carrier (x2)

## Configuration 1 - Mode 4 - 1.4

E-TM1.1: 1.4MHz Bandwidth




Complementary Cumulative Distribution Function
NOF samples: 100000, Usable BW: 37.9MHz

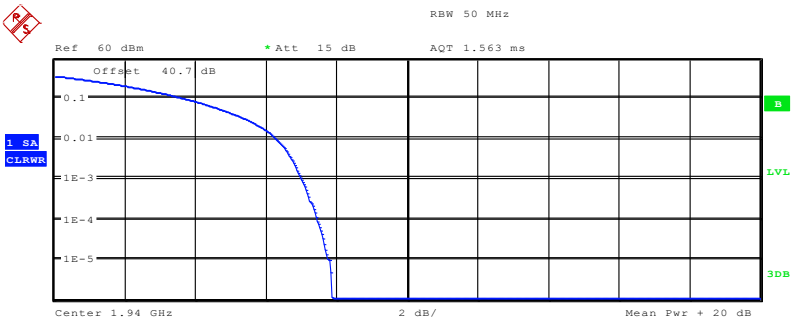
| | Trace 1 |
|---|---|
| Mean | 48.40 dBm |
| Peak | 55.51 dBm |
| Crest | 7.11 dB |
| 10 % | 3.75 dB |
| 1 % | 6.15 dB |
| .1 % | 6.76 dB |
| .01 % | 6.96 dB |

Date: 26.MAY.2014 14:00:17

Product Service

## Configuration 1 - Mode 4 - 10

E-TM1.1: 10MHz Bandwidth



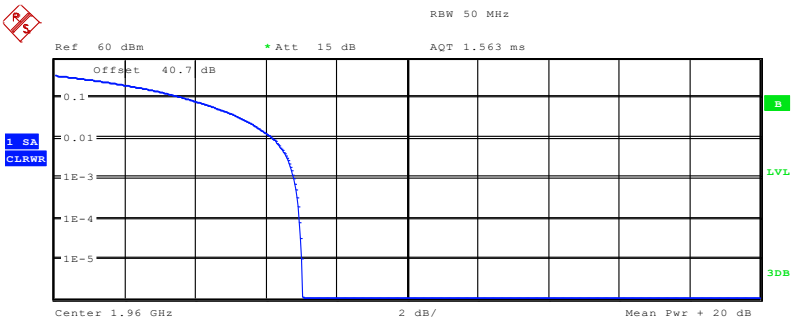

Complementary Cumulative Distribution Function
NOF samples: 100000, Usable BW: 37.9MHz

| | Trace 1 |
|---|---|
| Mean | 48.71 dBm |
| Peak | 56.58 dBm |
| Crest | 7.87 dB |
| 10 % | 3.75 dB |
| 1 % | 6.28 dB |
| .1 % | 6.99 dB |
| .01 % | 7.44 dB |

Date: 26.MAY.2014 15:25:03

## Configuration 1 - Mode 5 - 1.4

E-TM1.1: 1.4MHz Bandwidth

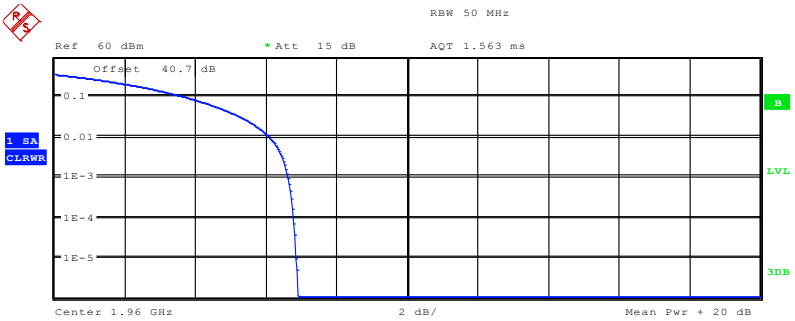



Complementary Cumulative Distribution Function
NOF samples: 100000, Usable BW: 37.9MHz

| | Trace 1 |
|---|---|
| Mean | 48.36 dBm |
| Peak | 55.38 dBm |
| Crest | 7.02 dB |
| 10 % | 3.75 dB |
| 1 % | 6.19 dB |
| .1 % | 6.79 dB |
| .01 % | 6.96 dB |

Date: 26.MAY.2014 14:05:06

## E-TM3.2: 1.4MHz Bandwidth

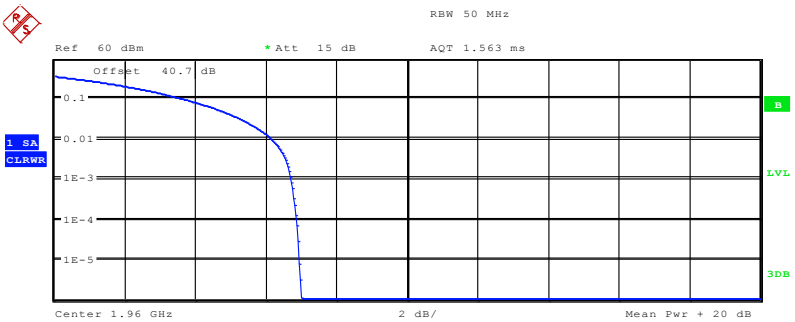



**Complementary Cumulative Distribution Function**
**NOF samples: 100000, Usable BW: 37.9MHz**

| | Trace 1 |
|---|---|
| Mean | 48.47 dBm |
| Peak | 55.38 dBm |
| Crest | 6.91 dB |
| 10 % | 3.75 dB |
| 1 % | 6.09 dB |
| .1 % | 6.63 dB |
| .01 % | 6.79 dB |

Date: 26.MAY.2014 14:23:32

## E-TM3.1: 1.4MHz Bandwidth



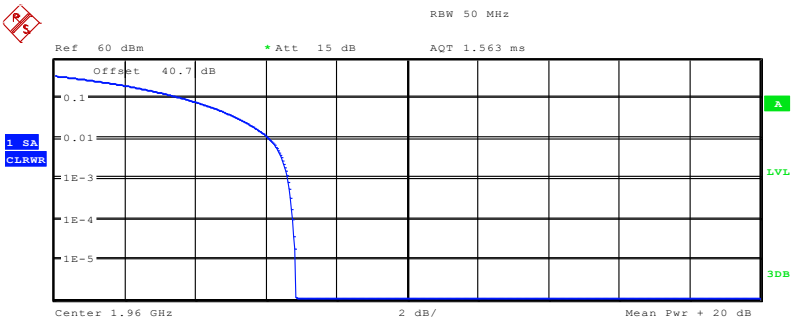

**Complementary Cumulative Distribution Function**
**NOF samples: 100000, Usable BW: 37.9MHz**

| | Trace 1 |
|---|---|
| Mean | 48.38 dBm |
| Peak | 55.38 dBm |
| Crest | 7.00 dB |
| 10 % | 3.69 dB |
| 1 % | 6.15 dB |
| .1 % | 6.70 dB |
| .01 % | 6.86 dB |

Date: 26.MAY.2014 14:22:30

## Configuration 1 - Mode 5 - 3

E-TM1.1: 3MHz Bandwidth



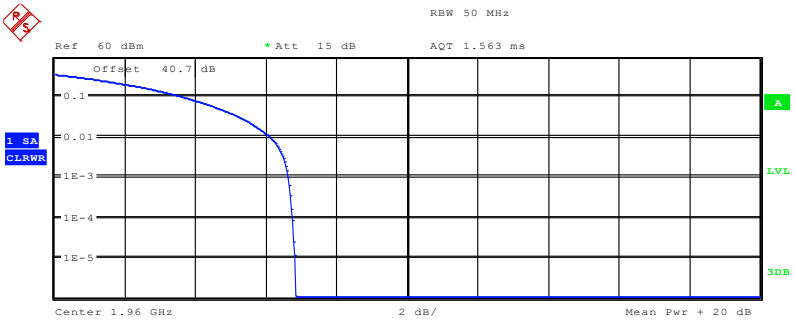

Complementary Cumulative Distribution Function
NOF samples: 100000, Usable BW: 37.9MHz

| | Trace 1 |
|---|---|
| Mean | 48.75 dBm |
| Peak | 55.59 dBm |
| Crest | 6.85 dB |
| 10 % | 3.72 dB |
| 1 % | 6.09 dB |
| .1 % | 6.63 dB |
| .01 % | 6.76 dB |

Date: 23.MAY.2014 15:00:24

## Configuration 1 - Mode 5 - 5

E-TM1.1: 5MHz Bandwidth



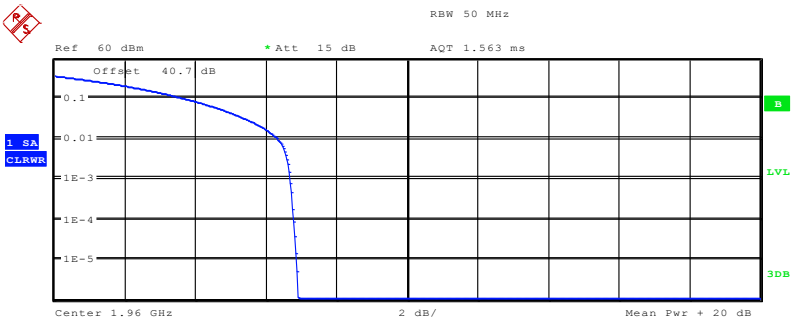

Complementary Cumulative Distribution Function
NOF samples: 100000, Usable BW: 37.9MHz

| | Trace 1 |
|---|---|
| Mean | 48.68 dBm |
| Peak | 55.52 dBm |
| Crest | 6.84 dB |
| 10 % | 3.69 dB |
| 1 % | 6.12 dB |
| .1 % | 6.63 dB |
| .01 % | 6.76 dB |

Date: 23.MAY.2014 16:41:45

## Configuration 1 - Mode 5 - 10

### E-TM1.1: 10MHz Bandwidth

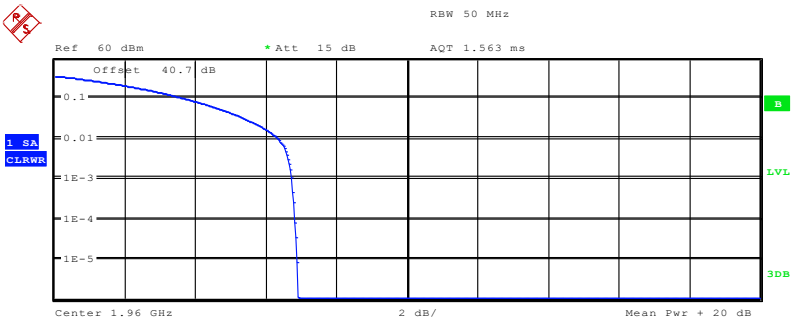



Complementary Cumulative Distribution Function
NOF samples: 100000, Usable BW: 37.9MHz

| | Trace 1 |
|---|---|
| Mean | 48.70 dBm |
| Peak | 55.59 dBm |
| Crest | 6.90 dB |
| 10 % | 3.75 dB |
| 1 % | 6.31 dB |
| .1 % | 6.70 dB |
| .01 % | 6.79 dB |

Date: 26.MAY.2014 15:05:02

### E-TM3.2: 10MHz Bandwidth

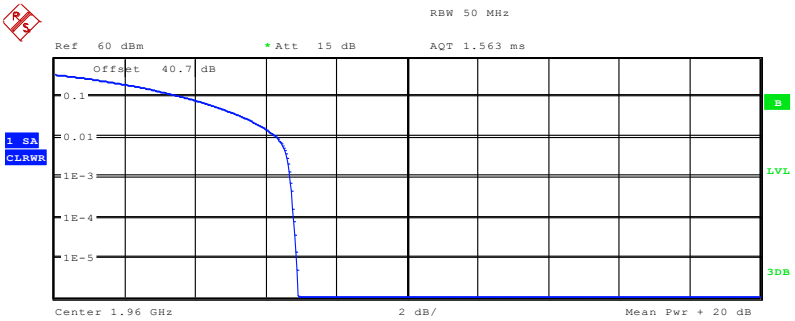



Complementary Cumulative Distribution Function
NOF samples: 100000, Usable BW: 37.9MHz

| | Trace 1 |
|---|---|
| Mean | 48.70 dBm |
| Peak | 55.59 dBm |
| Crest | 6.89 dB |
| 10 % | 3.72 dB |
| 1 % | 6.31 dB |
| .1 % | 6.73 dB |
| .01 % | 6.83 dB |

Date: 26.MAY.2014 15:33:38

E-TM3.1: 10MHz Bandwidth



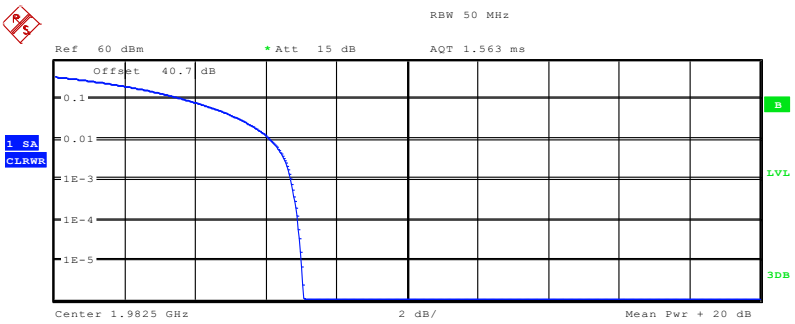

Complementary Cumulative Distribution Function
NOF samples: 100000, Usable BW: 37.9MHz

| | Trace 1 |
|---|---|
| Mean | 48.70 dBm |
| Peak | 55.59 dBm |
| Crest | 6.90 dB |
| 10 % | 3.69 dB |
| 1 % | 6.28 dB |
| .1 % | 6.70 dB |
| .01 % | 6.79 dB |

Date: 26.MAY.2014 15:06:10

## Configuration 1 - Mode 6 - 1.4

E-TM1.1: 1.4MHz Bandwidth




Complementary Cumulative Distribution Function
NOF samples: 100000, Usable BW: 37.9MHz

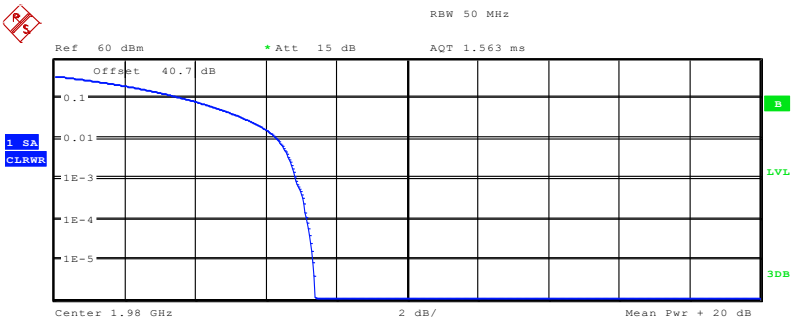
| | Trace 1 |
|---|---|
| Mean | 48.52 dBm |
| Peak | 55.58 dBm |
| Crest | 7.06 dB |
| 10 % | 3.75 dB |
| 1 % | 6.12 dB |
| .1 % | 6.70 dB |
| .01 % | 6.89 dB |

Date: 26.MAY.2014 12:19:41

Product Service

**Configuration 1 - Mode 6 - 10**

E-TM1.1: 10MHz Bandwidth




Complementary Cumulative Distribution Function
NOF samples: 100000, Usable BW: 37.9MHz

| | Trace 1 |
|---|---|
| Mean | 48.74 dBm |
| Peak | 56.13 dBm |
| Crest | 7.39 dB |
| 10 % | 3.72 dB |
| 1 % | 6.28 dB |
| .1 % | 6.86 dB |
| .01 % | 7.15 dB |

Date: 26.MAY.2014 15:36:40

| | |
|---|---|
| Limit | 13dB |

Remarks

The Peak – Average ratio does not exceed 13dB at the measured frequencies.

## 2.3 MODULATION CHARACTERISTICS

### 2.3.1 Specification Reference

FCC CFR 47 Part 2, Clause 2.1047 (d)
Industry Canada RSS-133, Clause 6.2

### 2.3.2 Equipment Under Test

RRUS 01 B2 / KRC 118 74/2, S/N: D165426806, CB4S938194

### 2.3.3 Date of Test and Modification State

14 June 2014 – Modification State 0

### 2.3.4 Test Method and Operating Modes

The test was applied in accordance with the test method requirements of FCC CFR 47 Part 2 and Industry Canada RSS-133.

Connect the TX output connector RF A1 to a spectrum analyzer with an attenuator. The other connector RF A2 was connected to match load. The EUT was controlled to transmit maximum power. Measure and record the constellation of the EUT by the spectrum analyzer.

The EUT supports QPSK, 16QAM and 64QAM modulations and was tested in 3.0MHz Bandwith.

The test was performed with the EUT in the following configuration and mode of operation:

Configuration 1 - Mode 2 (3.0MHz OBW)

### 2.3.5 Environmental Conditions

| | |
|---|---|
| Ambient Temperature | 22.0 – 28.5°C |
| Relative Humidity | 41.0 – 65.0% |

Product Service

### 2.3.6 Test Results

For the period of test the EUT met the requirements of FCC CFR 47 Part 2 and Industry Canada RSS-133 for Modulation Characteristics.

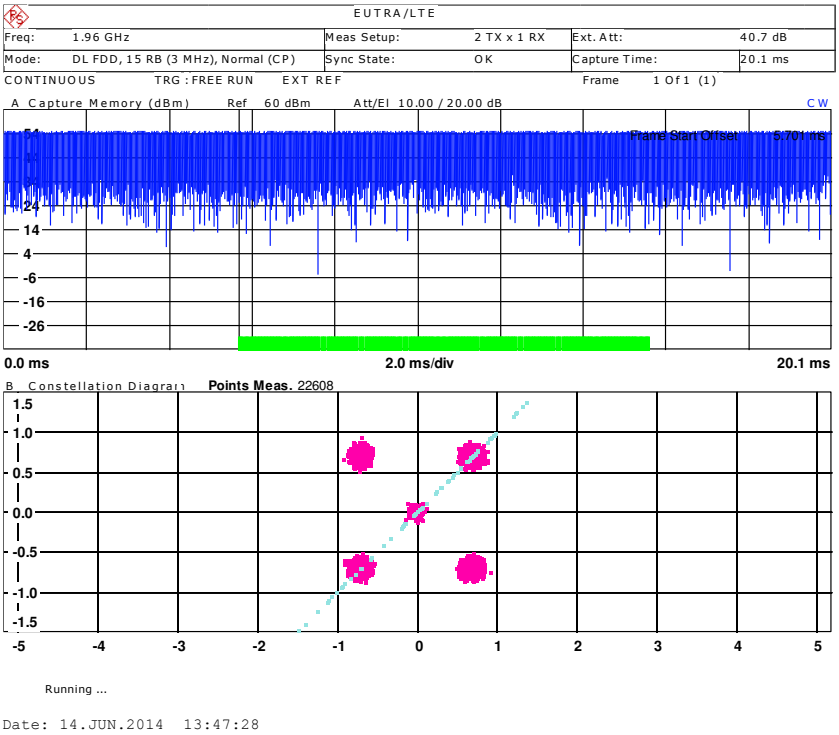
The test results are shown below

**Single Carrier**

**Configuration 1 - Mode 2**

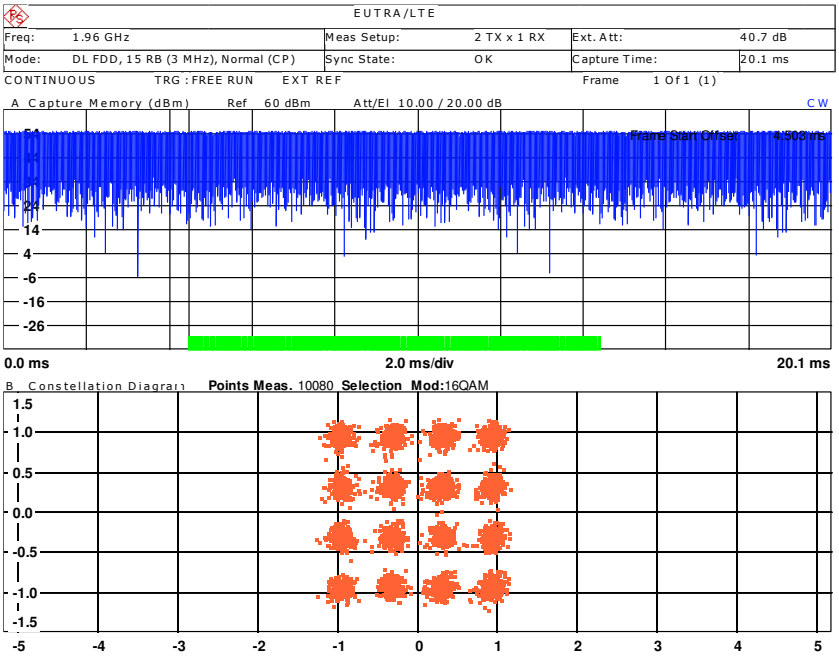
**3.0MHz Bandwidth**

E-TM1.1: EUT transmitting with QPSK modulation:



Product Service

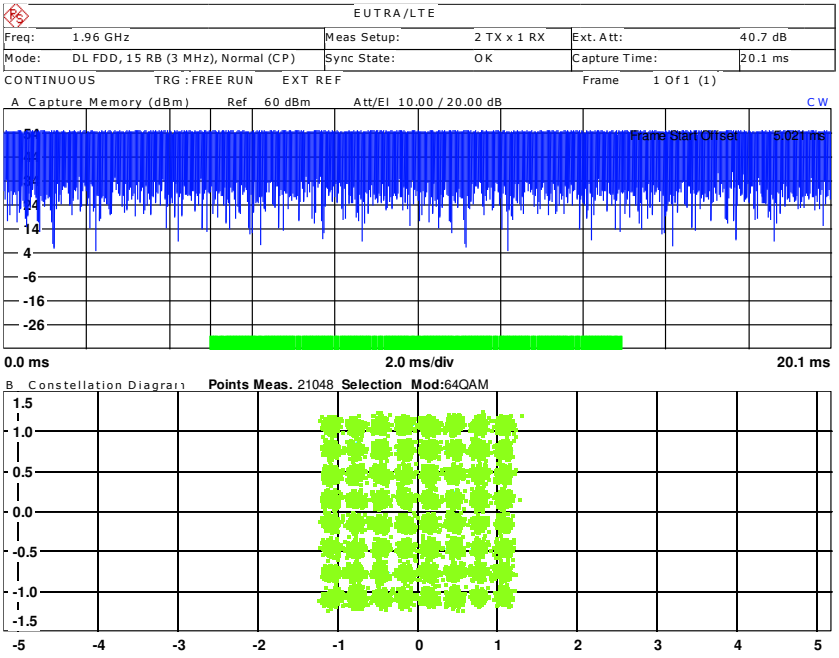
E-TM3.2: EUT transmitting with 16QAM modulation:




Running ...

Date: 14.JUN.2014 13:48:04

E-TM3.1: EUT transmitting with 64QAM modulation:




Running ...

Date: 14.JUN.2014 13:49:12

## 2.4 OCCUPIED BANDWIDTH

### 2.4.1 Specification Reference

FCC CFR 47 Part 2, Clause 2.1049
FCC CFR 47 Part 24, Clause 24.238 (b)
Industry Canada RSS-GEN, Clause 4.6.1

### 2.4.2 Equipment Under Test

RRUS 01 B2 / KRC 118 74/2, S/N: D165426806, CB4S938194

### 2.4.3 Date of Test and Modification State

11 and 14 April 2014 – Modification State 0

### 2.4.4 Test Equipment Used

The major items of test equipment used for the below tests are identified in Section 3.1.

### 2.4.5 Test Method and Operating Modes

The test was applied in accordance with the test method requirements of FCC CFR 47 Part 2 and Part 24 and Industry Canada RSS-GEN.

The EUT was set to transmit at maximum power and testing was carried out on Bottom, Middle and Top Channels. Using the Occupied Bandwidth measurement function in the Spectrum Analyser, the 26dB bandwidth was measured in accordance with FCC KDB 971168 D01 Power Meas License Digital Systems v02r01 Clause 4.1. In addition, measurements of 99% occupied bandwidths were made in accordance with Industry Canada RSS-GEN Clause 4.6.1. The RBW was configured to 1% of the theoretical channel bandwidth, meeting the requirement of being between 1 to 5% of the Occupied Bandwidth described in the KDB aforementioned.

The test was performed with the EUT in the following configurations and modes of operation:

Configuration 1 - Mode 1 - 1.4, Mode 1 - 20
- Mode 2(1.4MHz, 3.0MHz, 5.0MHz, 10.0MHz, 15.0MHz, 20.0MHz OBW)
- Mode 3 - 1.4, Mode 3 - 20

### 2.4.6 Environmental Conditions

| | |
|---|---|
| Ambient Temperature | 22.0 – 28.5°C |
| Relative Humidity | 41.0 – 65.0% |

Product Service

### 2.4.7 Test Results

For the period of test the EUT met the requirements of FCC CFR 47 Part 2 and Part 24 and Industry Canada RSS-GEN for Occupied Bandwidth.

The test results are shown below

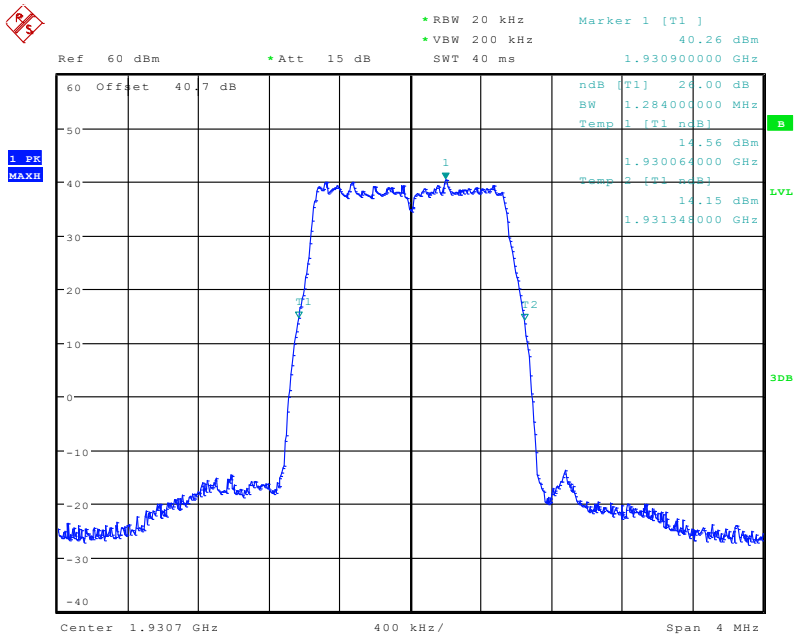
| Test Model | BW configuration (MHz) | Frequency (MHz) / Channel | -26dB Occupied Bandwidth (MHz) | 99% Occupied Bandwidth (MHz) |
|---|---|---|---|---|
| E-TM1.1 | 1.4 | 1930.7 (Bottom) | 1.28 | 1.09 |
| | 20.0 | 1940.0 (Bottom) | 18.70 | 17.90 |
| | | | | |
| | 1.4 | 1960.0 (Middle) | 1.28 | 1.09 |
| | 3.0 | 1960.0 (Middle) | 2.91 | 2.68 |
| | 5.0 | 1960.0 (Middle) | 4.83 | 4.47 |
| | 10.0 | 1960.0 (Middle) | 9.40 | 8.95 |
| | 15.0 | 1960.0 (Middle) | 14.16 | 13.44 |
| | 20.0 | 1960.0 (Middle) | 18.75 | 17.95 |
| | | | | |
| | 1.4 | 1989.3 (Top) | 1.28 | 1.09 |
| | 20.0 | 1980.0 (Top) | 18.70 | 17.90 |
| | | | | |
| E-TM3.2 | 1.4 | 1960.0 (Middle) | 1.27 | 1.09 |
| | 20.0 | 1960.0 (Middle) | 18.70 | 17.85 |
| | | | | |
| E-TM3.1 | 1.4 | 1960.0 (Middle) | 1.26 | 1.09 |
| | 20.0 | 1960.0 (Middle) | 18.70 | 17.90 |

Product Service

## E-TM1.1

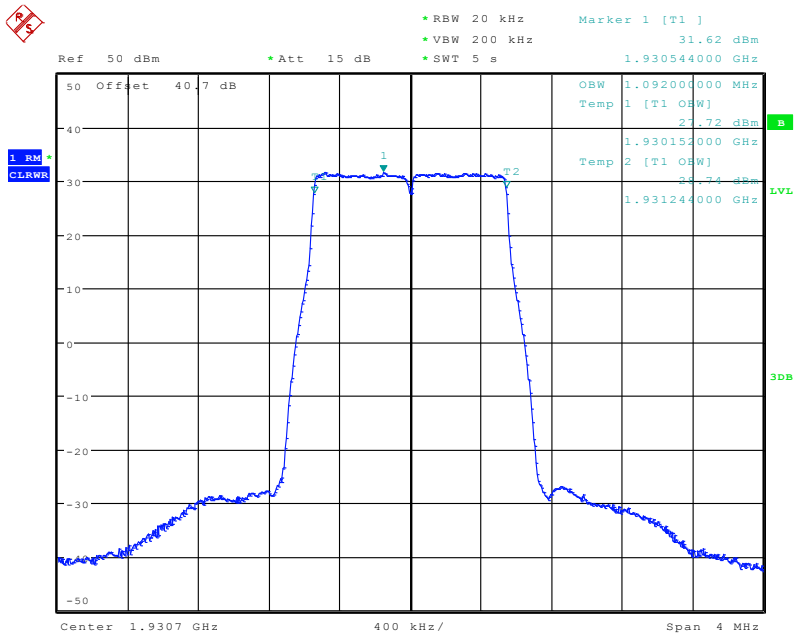
## Configuration 1 - Mode 1 - 1.4

-26dB Occupied Bandwidth of 1.4MHz Bandwidth




Date: 14.APR.2014 14:41:30

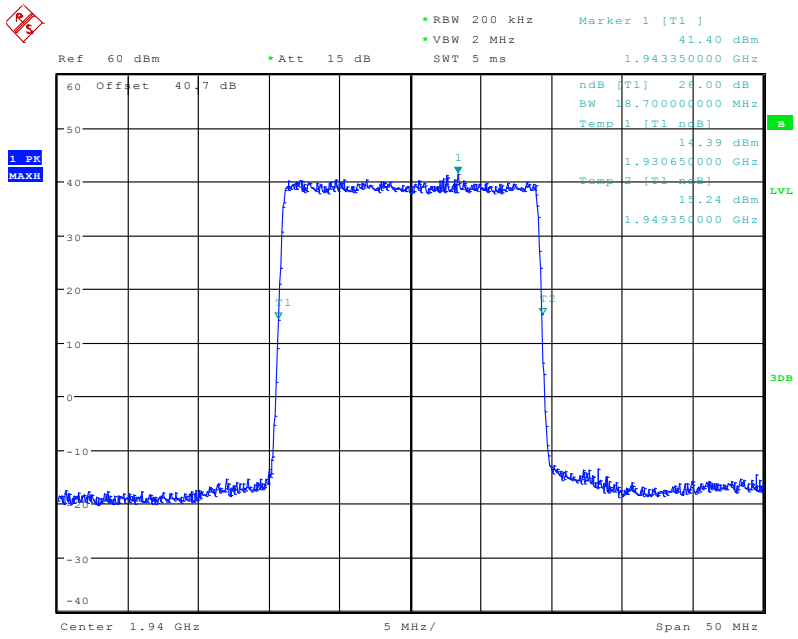
99% Occupied Bandwidth of 1.4MHz Bandwidth




Date: 14.APR.2014 14:39:41

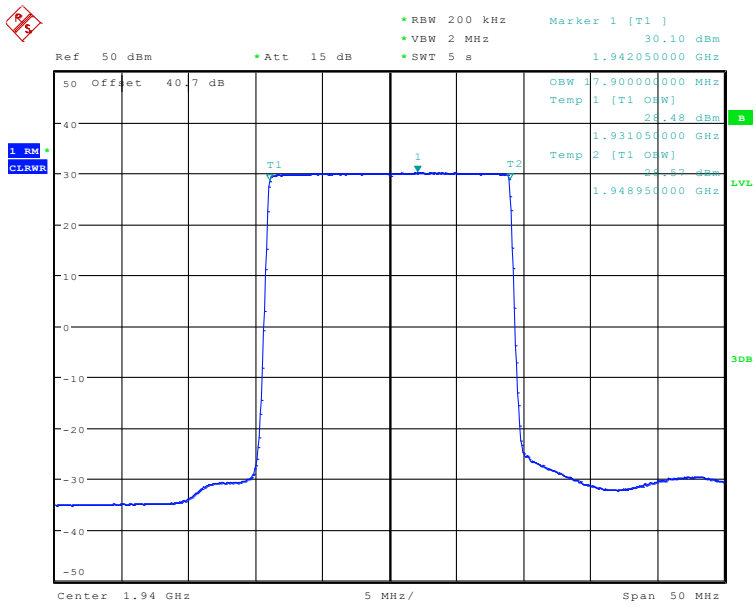
## Configuration 1 - Mode 1 - 20

-26dB Occupied Bandwidth of 20.0MHz Bandwidth




Date: 14.APR.2014 15:47:19

99% Occupied Bandwidth of 20.0MHz Bandwidth

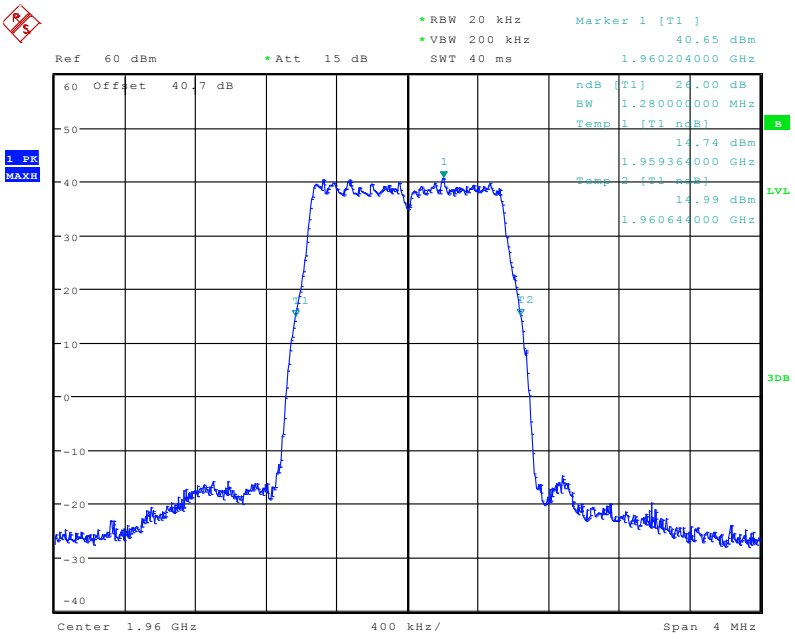



Date: 14.APR.2014 15:46:00

Product Service

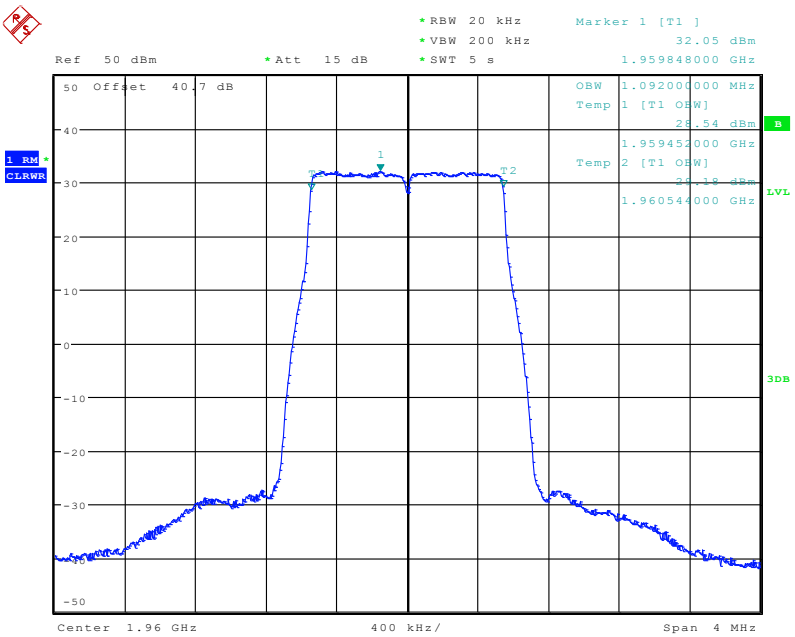
## Configuration 1 - Mode 2

-26dB Occupied Bandwidth of 1.4MHz Bandwidth



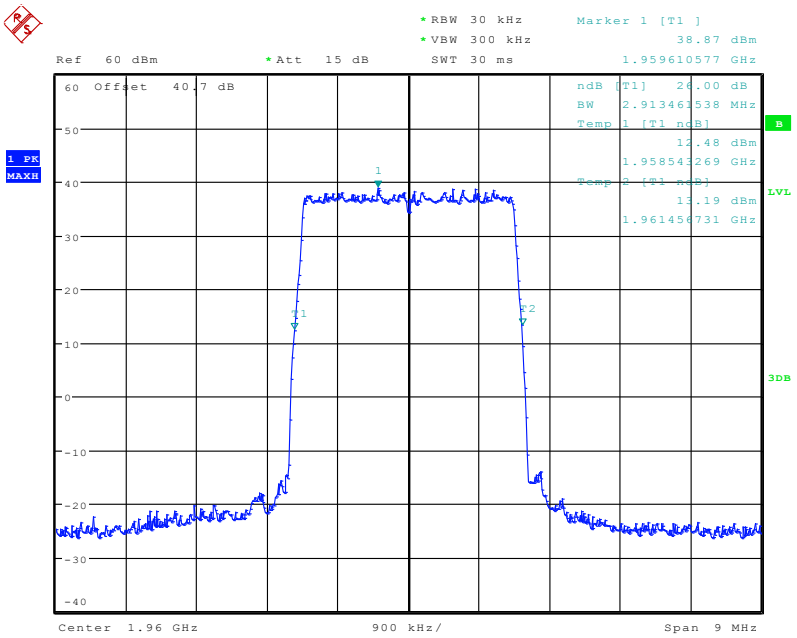

Date: 14.APR.2014 16:49:02

99% Occupied Bandwidth of 1.4MHz Bandwidth



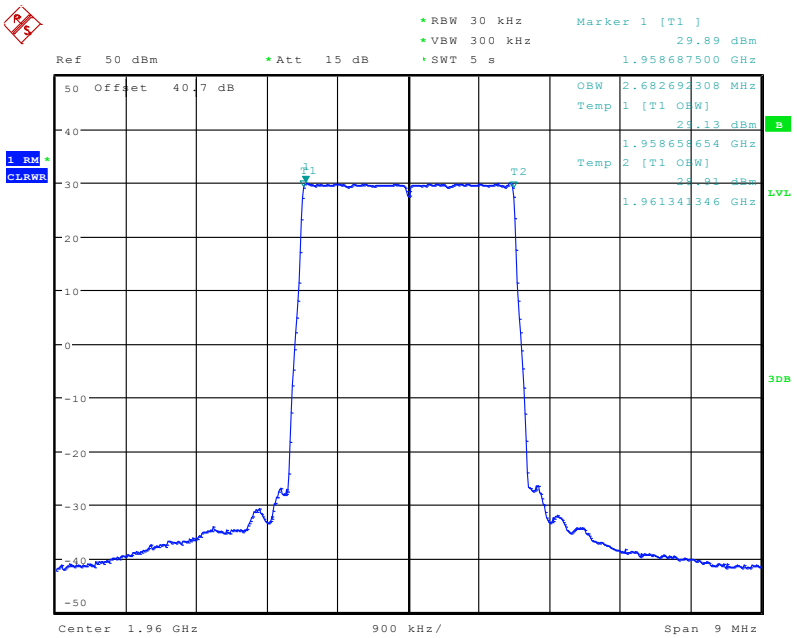

Date: 14.APR.2014 16:49:53

## -26dB Occupied Bandwidth of 3.0MHz Bandwidth




Date: 11.APR.2014 18:06:09

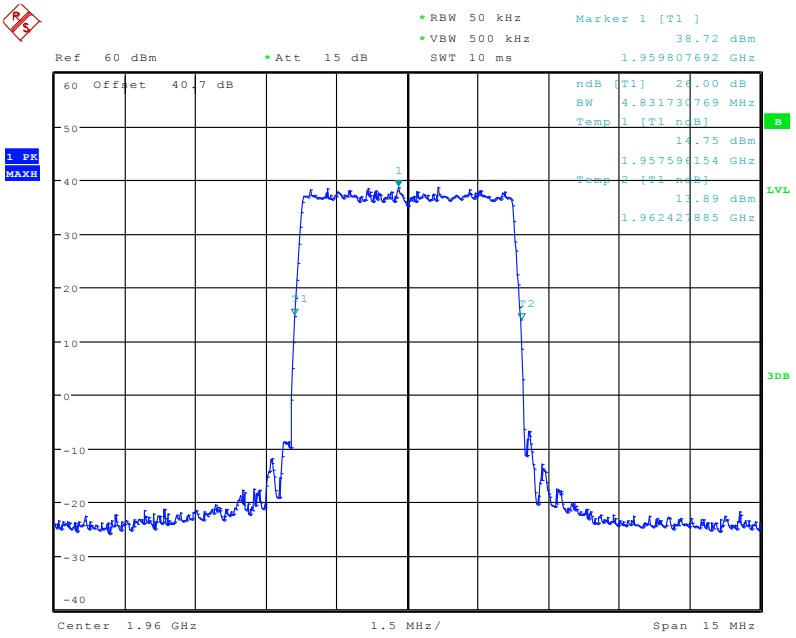
## 99% Occupied Bandwidth of 3.0MHz Bandwidth




Date: 11.APR.2014 18:04:42

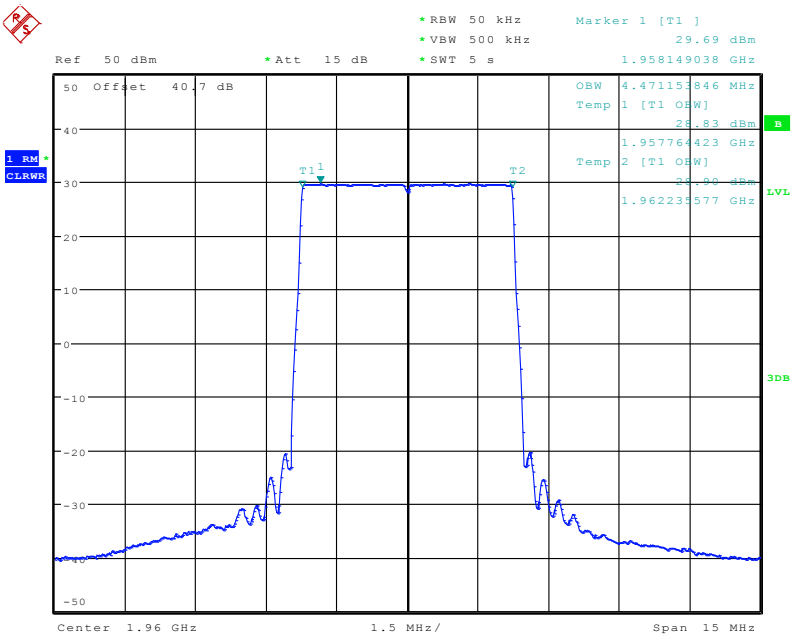
Product Service

## -26dB Occupied Bandwidth of 5.0MHz Bandwidth




Date: 11.APR.2014 18:10:06

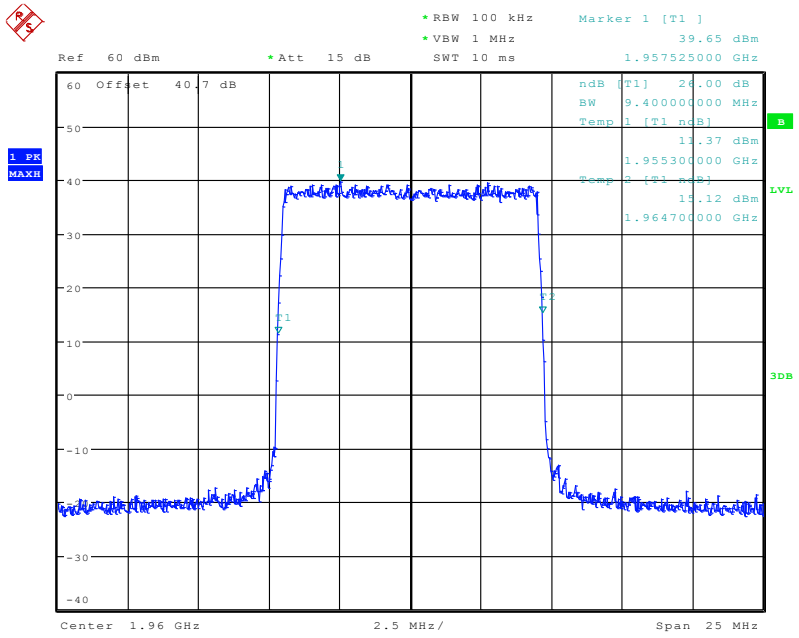
## 99% Occupied Bandwidth of 5.0MHz Bandwidth



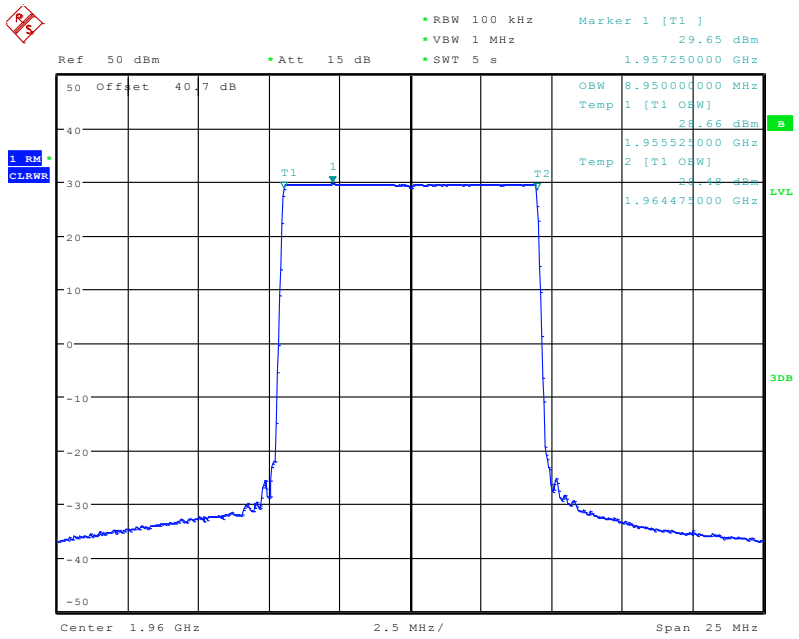

Date: 11.APR.2014 18:11:16

Product Service

## -26dB Occupied Bandwidth of 10.0MHz Bandwidth

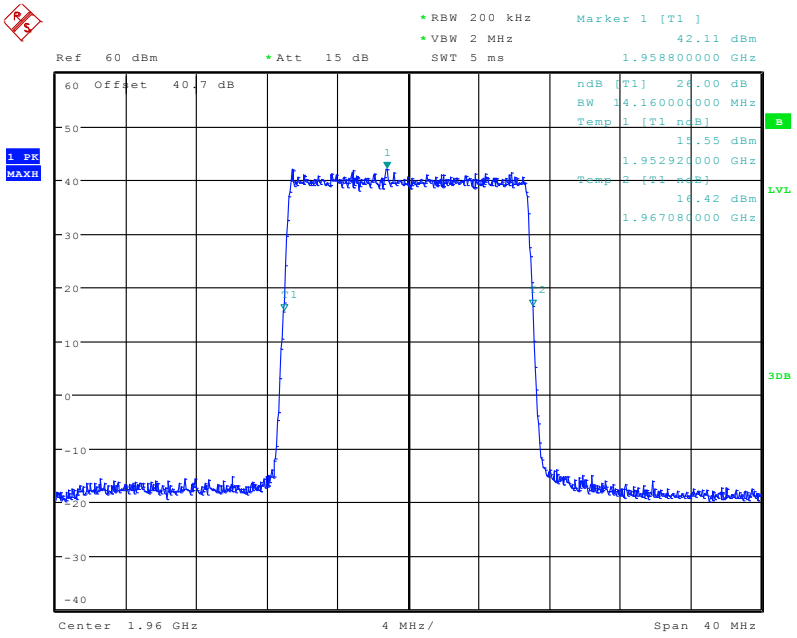



## 99% Occupied Bandwidth of 10.0MHz Bandwidth



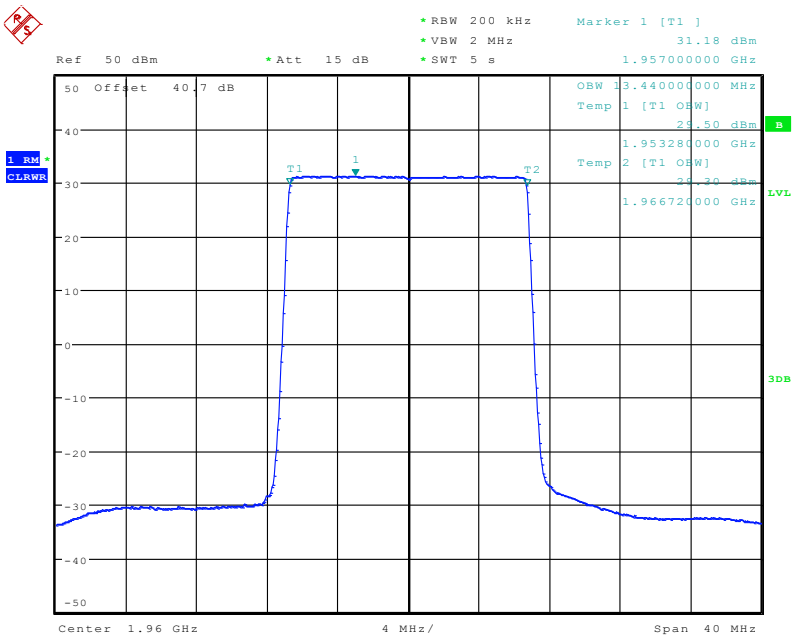
Product Service

## -26dB Occupied Bandwidth of 15.0MHz Bandwidth



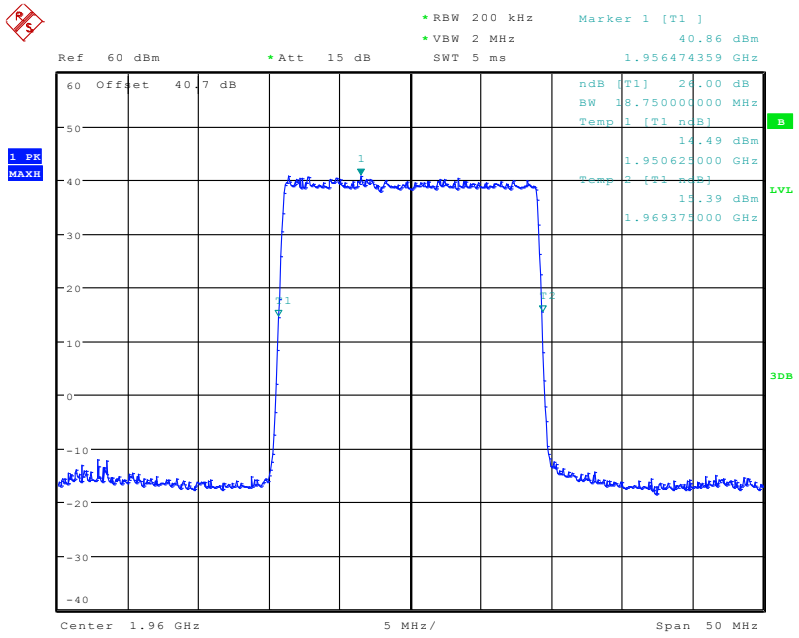

Date: 14.APR.2014 11:57:26

## 99% Occupied Bandwidth of 15.0MHz Bandwidth

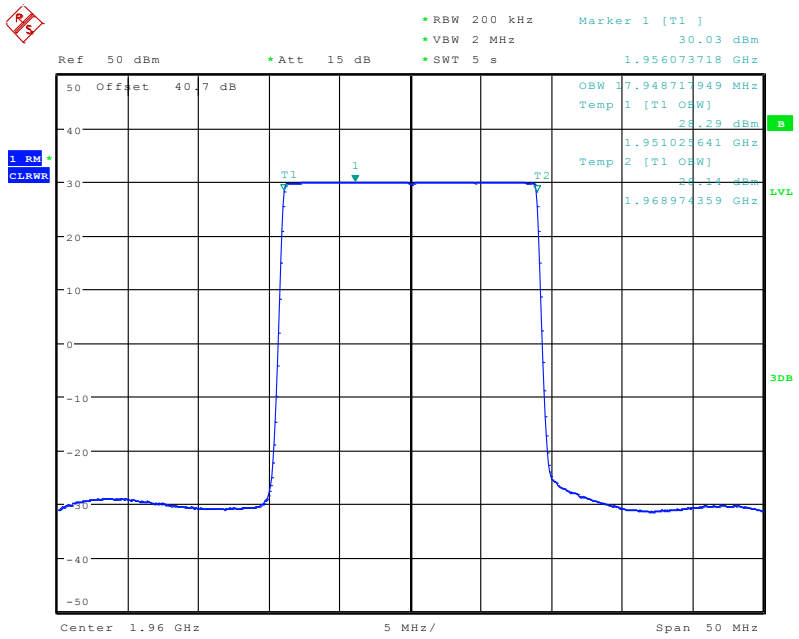



Date: 14.APR.2014 11:58:42

## -26dB Occupied Bandwidth of 20.0MHz Bandwidth



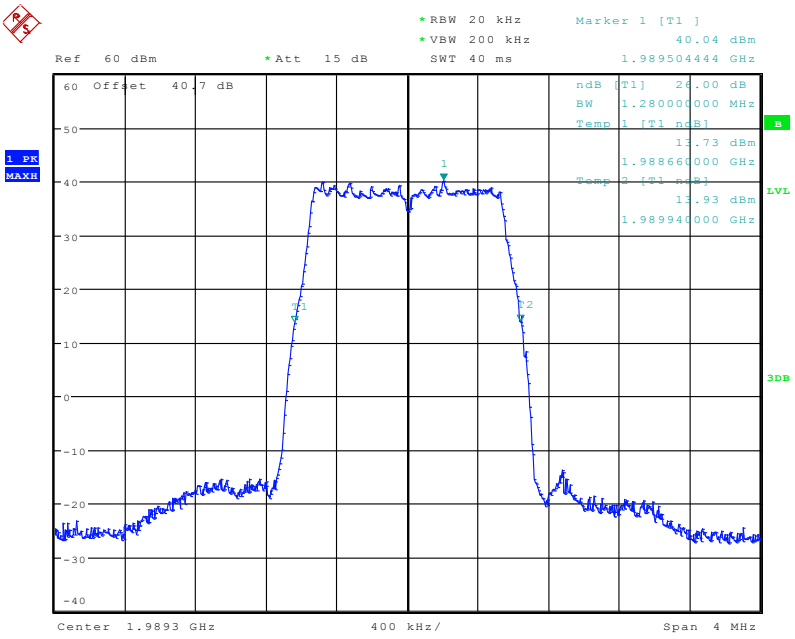

## 99% Occupied Bandwidth of 20.0MHz Bandwidth



Product Service

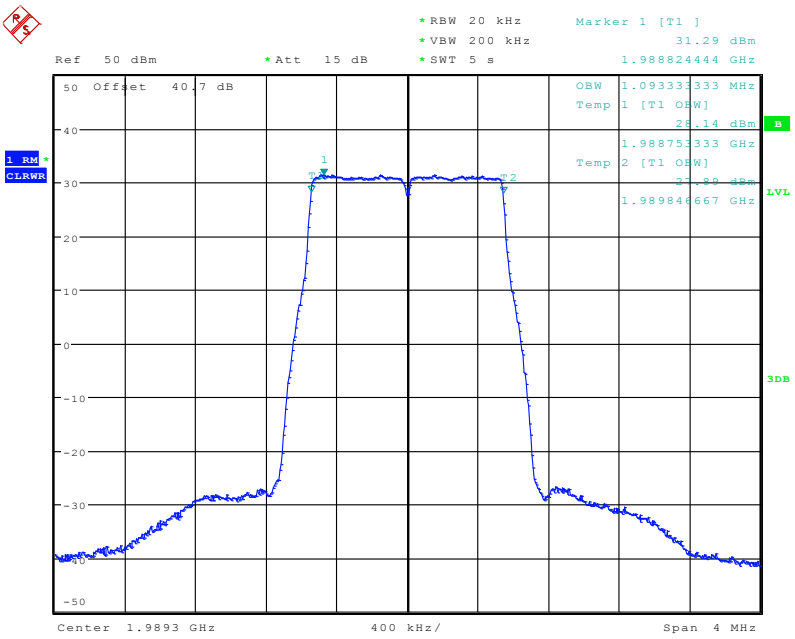
## Configuration 1 - Mode 3 - 1.4

-26dB Occupied Bandwidth of 1.4MHz Bandwidth




Date: 14.APR.2014 15:02:14

99% Occupied Bandwidth of 1.4MHz Bandwidth

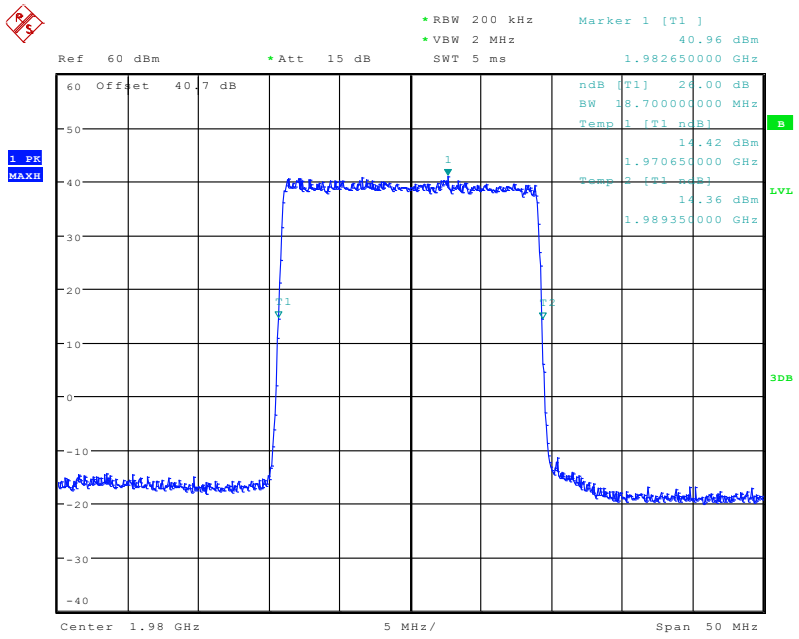



Date: 14.APR.2014 15:00:59

Product Service

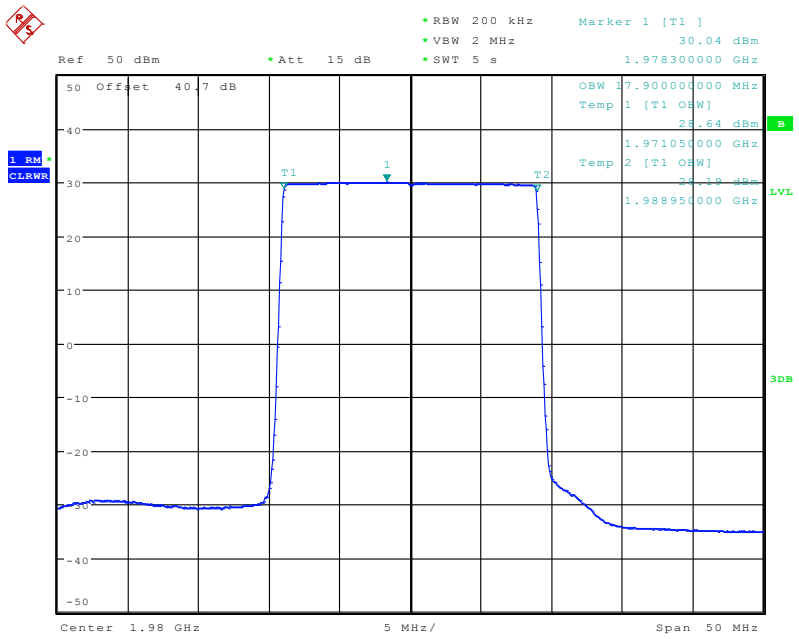
## Configuration 1 - Mode 3 - 20

-26dB Occupied Bandwidth of 20.0MHz Bandwidth




Date: 14.APR.2014 15:55:07

99% Occupied Bandwidth of 20.0MHz Bandwidth



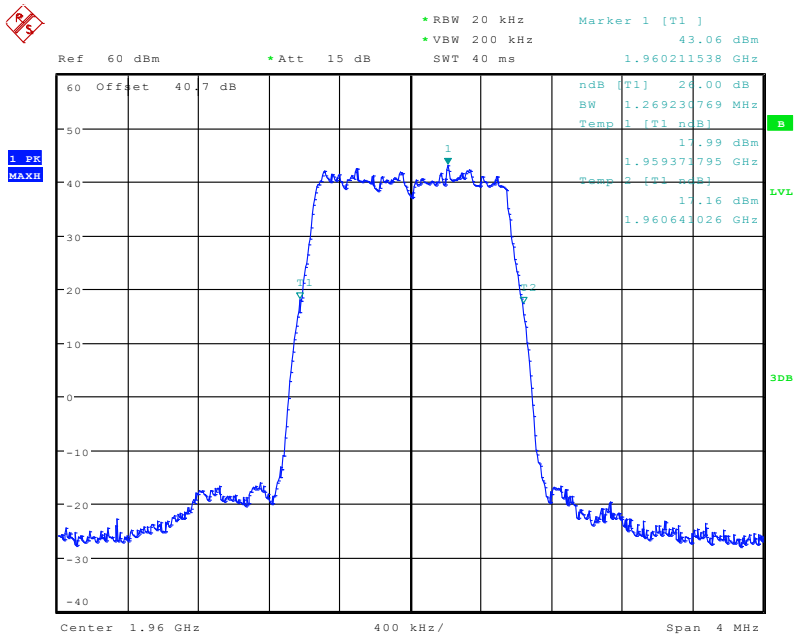

Date: 14.APR.2014 15:55:40

Product Service

## E-TM3.2

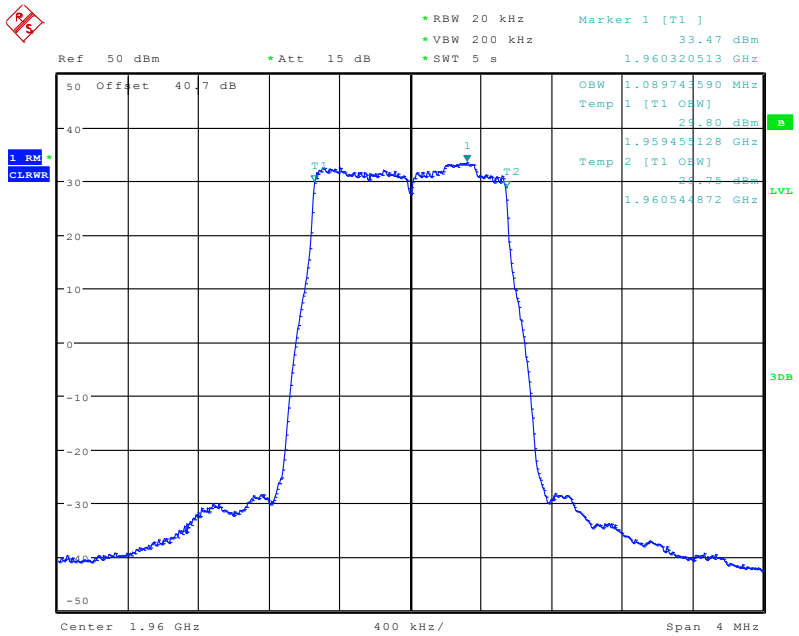
## Configuration 1 - Mode 2

-26dB Occupied Bandwidth of 1.4MHz Bandwidth




Date: 11.APR.2014 17:42:03

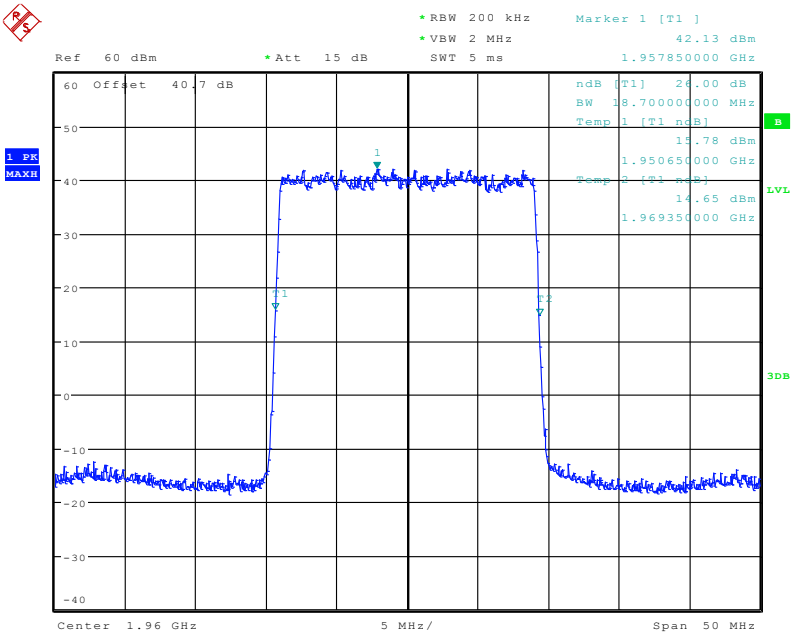
99% Occupied Bandwidth of 1.4MHz Bandwidth



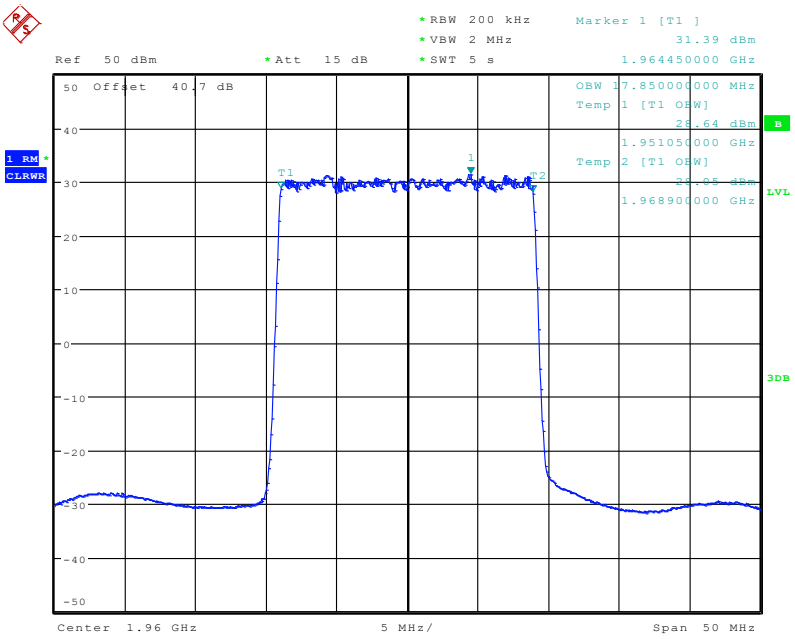

Date: 11.APR.2014 17:43:10

Product Service

## -26dB Occupied Bandwidth of 20.0MHz Bandwidth




## 99% Occupied Bandwidth of 20.0MHz Bandwidth

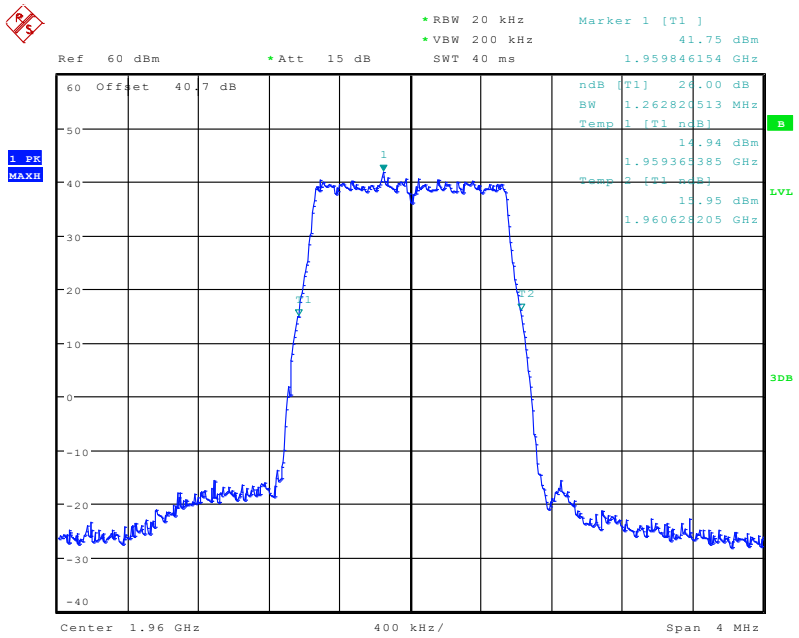


Product Service

## E-TM3.1

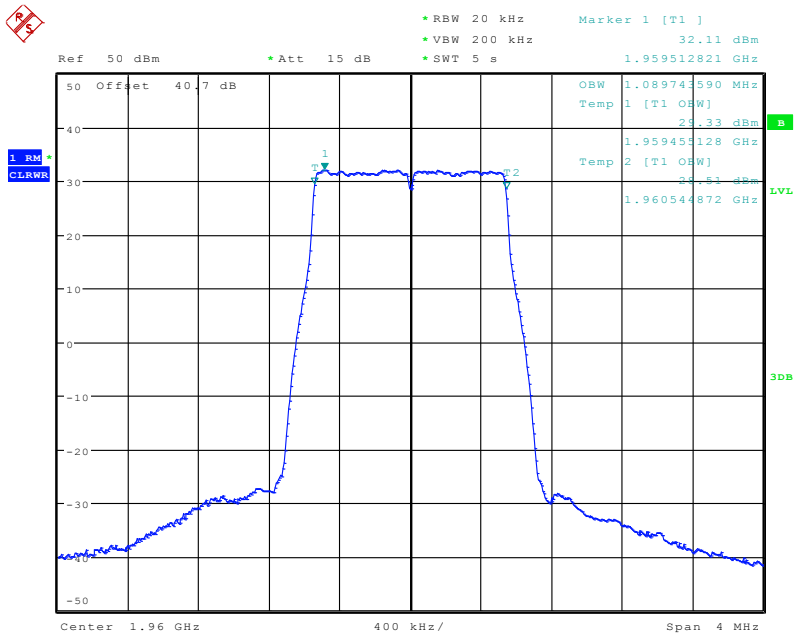
## Configuration 1 - Mode 2

-26dB Occupied Bandwidth of 1.4MHz Bandwidth




Date: 11.APR.2014 16:43:05

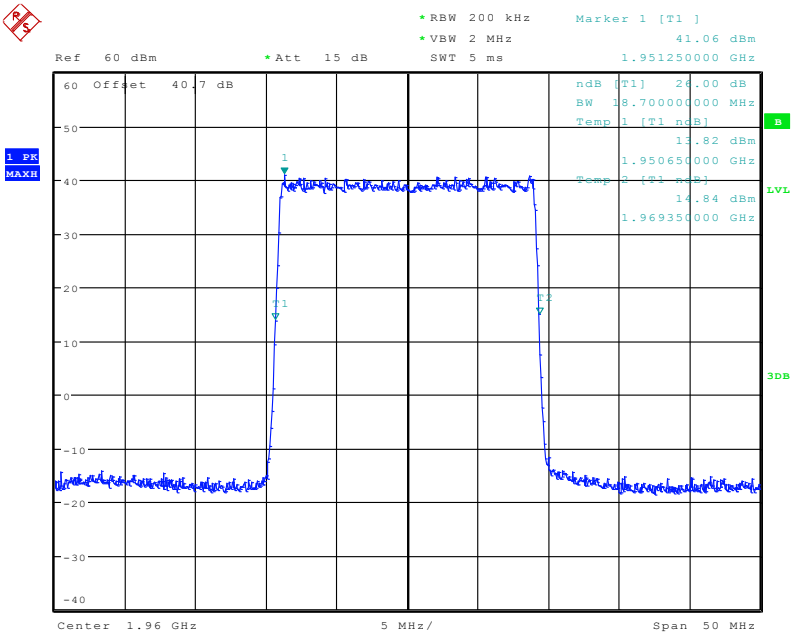
99% Occupied Bandwidth of 1.4MHz Bandwidth



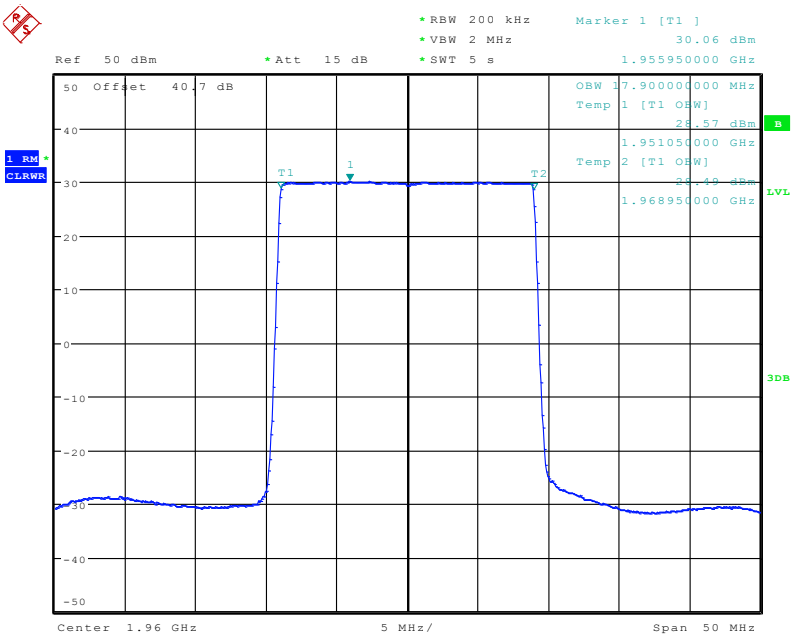

Date: 11.APR.2014 16:40:58

Product Service

## -26dB Occupied Bandwidth of 20.0MHz Bandwidth




## 99% Occupied Bandwidth of 20.0MHz Bandwidth



## 2.5 SPURIOUS EMISSIONS AT ANTENNA TERMINALS (±1MHz)

### 2.5.1 Specification Reference

FCC CFR 47 Part 2, Clause 2.1051
FCC CFR 47 Part 24, Clause 24.238 (b)
Industry Canada RSS-133, Clause 6.5

### 2.5.2 Equipment Under Test

RRUS 01 B2 / KRC 118 74/2, S/N: D165426806, CB4S938194

### 2.5.3 Date of Test and Modification State

14 April and 23 May 2014 – Modification State 0

### 2.5.4 Test Equipment Used

The major items of test equipment used for the below tests are identified in Section 3.1.

### 2.5.5 Test Method and Operating Modes

The test was applied in accordance with the test method requirements of FCC CFR 47 Part 2 and Part 24 and Industry Canada RSS-133.

In accordance with 24.238(b), at least 1% of the emission bandwith should be used for the frequencies offset up to 1MHz away from the block edge, and a RBW of 1MHz for measurements of emissions > 1MHz away from the band edges. For 1.4MHz and 3MHz OBW of LTE single carrier, a resolution bandwidth of 10kHz wase used to the frequencies up to1MHz away from the block edge, and the resolution bandwidths for all the other bandwidths were shown in section 2.5.7. As 10kHz is <1% of the emission bandwith(the emission bandwidths of 1.3MHz for 1.4MHz OBW and 2.9MHz for 3MHz OBW were used), to compensate for the reduced measurement bandwidth, at the frequency range up to 1MHz away from the band edges, the limit was adjusted from -13dBm to -14.14dBm for LTE single carrier with 1.4MHz OBW, and from -13dBm to -17.62dBm for LTE single carrier with 3MHz OBW. A resolution bandwidth of 100kHz was used for measurements of emissions > 1MHz away from the band edges. To compensate for the reduced measurement bandwidth, at the frequency range > 1MHz away from the band edges, the limit was adjusted from -13dBm to -23dBm. Spectrum analyser detector was set as RMS.

The limit was adjusted with a correction of -3dB [10Log(2)] by using the Measure and Add 10Log(N) dB technique according to FCC KDB662911 D01 Multiple Transmitter Output v02r01 accounting for simultaneous transmission from antenna ports RF A1 and RF A2.

The measurements were performed on the combined output connector RF A1. Limited complementary measurement were done at the output connector RF A2 to verify identical performance for both transmitter chains, but only the results of RF A1 as reprentative were shown as below.

The EUT was tested at it's maximum power level.The path loss measured and entered as a reference level offset.

The test was performed with the EUT in the following configurations and modes of operation as the worst cases:

Configuration 1 - Mode 1 - 1.4, Mode 1 - 3, Mode 1 - 5, Mode 1 - 10, Mode 1 - 15, Mode 1 - 20
- Mode 3 - 1.4, Mode 3 - 3, Mode 3 - 5, Mode 3 - 10, Mode 3 - 15, Mode 3 - 20
- Mode 4 - 1.4, Mode 4 - 3, Mode 4 - 5, Mode 4 - 10
- Mode 6 - 1.4, Mode 6 - 3, Mode 6 - 5, Mode 6 - 10

### 2.5.6 Environmental Conditions

Ambient Temperature 22.0 – 28.5°C

Relative Humidity 41.0 – 65.0%

### 2.5.7 Test Results

For the period of test the EUT met the requirements of FCC CFR 47 Part 2 and Part 24 and Industry Canada RSS-133 for Spurious Emissions Antenna Terminals (±1MHz).

The below frequencies of the EUT were tested against along with the tested channels.

**Single Carrier**

**ETM1.1**

Bandwidth: 1.4MHz

Configuration 1 - Mode 1 -1.4 and Mode 3 - 1.4

| Band Edge Frequency | Bottom<br>1930 MHz | Top<br>1990 MHz | RBW / VBW<br>(Hz) | Limit<br>(dBm) |
|---|---|---|---|---|
| Edge Test with 1.4MHz Bandwidth<br>Channel No./Frequencies | Channel: 607<br>Frequency: 1930.7 MHz | Channel: 1193<br>Frequency: 1989.3 MHz | 10k /100k | -17.14 |

Bandwidth: 3.0MHz

Configuration 1 - Mode 1 - 3 and Mode 3 - 3

| Band Edge Frequency | Bottom<br>1930 MHz | Top<br>1990 MHz | RBW / VBW<br>(Hz) | Limit<br>(dBm) |
|---|---|---|---|---|
| Edge Test with 3.0MHz Bandwidth<br>Channel No./Frequencies | Channel: 615<br>Frequency: 1931.5 MHz | Channel: 1185<br>Frequency: 1988.5MHz | 10k /100k | -20.62 |

Bandwidth: 5.0MHz

Configuration 1 - Mode 1 - 5 and Mode 3 - 5

| Band Edge Frequency | Bottom<br>1930 MHz | Top<br>1990 MHz | RBW / VBW<br>(Hz) | Limit<br>(dBm) |
|---|---|---|---|---|
| Edge Test with 5.0MHz Bandwidth<br>Channel No./Frequencies | Channel: 625<br>Frequency: 1932.5 MHz | Channel: 1175<br>Frequency: 1987.5 MHz | 50k / 500k | -16.00 |

Bandwidth: 10.0MHz

Configuration 1 - Mode 1 - 10 and Mode 3 - 10

| Band Edge Frequency | Bottom<br>1930 MHz | Top<br>1990 MHz | RBW / VBW<br>(Hz) | Limit<br>(dBm) |
|---|---|---|---|---|
| Edge Test with 10.0MHz Bandwidth<br>Channel No./Frequencies | Channel: 650<br>Frequency: 1935.0 MHz | Channel: 1150<br>Frequency: 1985.0 MHz | 100k / 1M | -16.00 |

Bandwidth: 15.0MHz

Configuration 1 - Mode 1 - 15 and Mode 3 - 15

| Band Edge Frequency | Bottom<br>1930 MHz | Top<br>1990 MHz | RBW / VBW<br>(Hz) | Limit<br>(dBm) |
|---|---|---|---|---|
| Edge Test with 15.0MHz Bandwidth<br>Channel No./Frequencies | Channel: 675<br>Frequency: 1937.5 MHz | Channel: 1125<br>Frequency: 1982.5 MHz | 200k / 2M | -16.00 |

Bandwidth: 20.0MHz

Configuration 1 - Mode 1 - 20 and Mode 3 - 20

| Band Edge Frequency | Bottom<br>1930 MHz | Top<br>1990 MHz | RBW / VBW<br>(Hz) | Limit<br>(dBm) |
|---|---|---|---|---|
| Edge Test with 20.0MHz Bandwidth<br>Channel No./Frequencies | Channel: 700<br>Frequency: 1940.0 MHz | Channel: 1100<br>Frequency: 1980.0 MHz | 200k / 2M | -16.00 |

**ETM3.2**

Bandwidth: 1.4MHz

Configuration 1 - Mode 1 -1.4 and Mode 3 - 1.4

| Band Edge Frequency | Bottom<br>1930 MHz | Top<br>1990 MHz | RBW / VBW<br>(Hz) | Limit<br>(dBm) |
|---|---|---|---|---|
| Edge Test with 1.4MHz Bandwidth<br>Channel No./Frequencies | Channel: 607<br>Frequency: 1930.7 MHz | Channel: 1193<br>Frequency: 1989.3 MHz | 10k /100k | -17.14 |

Bandwidth: 3.0MHz

Configuration 1 - Mode 1 - 3 and Mode 3 - 3

| Band Edge Frequency | Bottom<br>1930 MHz | Top<br>1990 MHz | RBW / VBW<br>(Hz) | Limit<br>(dBm) |
|---|---|---|---|---|
| Edge Test with 3.0MHz Bandwidth<br>Channel No./Frequencies | Channel: 615<br>Frequency: 1931.5 MHz | Channel: 1185<br>Frequency: 1988.5MHz | 10k /100k | -20.62 |

Product Service

**ETM3.1**

Bandwidth: 1.4MHz

Configuration 1 - Mode 1 -1.4 and Mode 3 - 1.4

| Band Edge Frequency | Bottom<br>1930 MHz | Top<br>1990 MHz | RBW / VBW<br>(Hz) | Limit<br>(dBm) |
|---|---|---|---|---|
| Edge Test with 1.4MHz Bandwidth<br>Channel No./Frequencies | Channel: 607<br>Frequency: 1930.7 MHz | Channel: 1193<br>Frequency: 1989.3 MHz | 10k /100k | -17.14 |

Bandwidth: 3.0MHz

Configuration 1 - Mode 1 - 3 and Mode 3 - 3

| Band Edge Frequency | Bottom<br>1930 MHz | Top<br>1990 MHz | RBW / VBW<br>(Hz) | Limit<br>(dBm) |
|---|---|---|---|---|
| Edge Test with 3.0MHz Bandwidth<br>Channel No./Frequencies | Channel: 615<br>Frequency: 1931.5 MHz | Channel: 1185<br>Frequency: 1988.5MHz | 10k /100k | -20.62 |

**Multi Carrier (x2)**

**ETM1.1**

Bandwidth: 1.4MHz

Configuration 1 - Mode 4 - 1.4 and Mode 6 - 1.4

| Band Edge Frequency | Bottom<br>1930 MHz | Top<br>1990 MHz | RBW / VBW<br>(Hz) | Limit<br>(dBm) |
|---|---|---|---|---|
| Edge Test with 1.4MHz Bandwidth<br>Channel No./Frequencies | Channel: 607 + 743<br>Frequency: 1930.7MHz + 1944.3 MHz | Channel: 1057 + 1193<br>Frequency: 1975.7 MHz + 1989.3MHz | 20k / 200k | -16.0 |

Bandwidth: 3.0MHz

Configuration 1 - Mode 4 - 3 and Mode 6 - 3

| Band Edge Frequency | Bottom<br>1930 MHz | Top<br>1990 MHz | RBW / VBW<br>(Hz) | Limit<br>(dBm) |
|---|---|---|---|---|
| Edge Test with 3.0MHz Bandwidth<br>Channel No./Frequencies | Channel: 615 + 785<br>Frequency: 1931.5MHz + 1948.5 MHz | Channel: 1015 + 1185<br>Frequency: 1971.5MHz + 1988.5MHz | 30k / 300k | -16.0 |

Bandwidth: 5.0MHz

Configuration 1 - Mode 4 - 5 and Mode 6 - 5

| Band Edge Frequency | Bottom<br>1930 MHz | Top<br>1990 MHz | RBW / VBW<br>(Hz) | Limit<br>(dBm) |
|---|---|---|---|---|
| Edge Test with 5.0MHz Bandwidth<br>Channel No./Frequencies | Channel: 625 + 775<br>Frequency: 1932.5 MHz + 1947.5 MHz | Channel: 1025 + 1175<br>Frequency: 1972.5MHz + 1987.5MHz | 50k / 500k | -16.0 |

Bandwidth: 10MHz

Configuration 1 - Mode4 - 10 and Mode 6 - 10

| Band Edge Frequency | Bottom<br>1930 MHz | Top<br>1990 MHz | RBW / VBW<br>(Hz) | Limit<br>(dBm) |
|---|---|---|---|---|
| Edge Test with 10.0MHz Bandwidth<br>Channel No./Frequencies | Channel: 650 + 750<br>Frequency: 1935.0 MHz +1945.0 MHz | Channel: 1050+ 1150<br>Frequency: 1975.0MHz + 1985.0MHz | 100k / 1M | -16.0 |

**ETM3.2**

Bandwidth: 3.0MHz

Configuration 1 - Mode 4 - 3 and Mode 6 - 3

| Band Edge Frequency | Bottom<br>1930 MHz | Top<br>1990 MHz | RBW / VBW<br>(Hz) | Limit<br>(dBm) |
|---|---|---|---|---|
| Edge Test with 3.0MHz Bandwidth<br>Channel No./Frequencies | Channel: 615 + 785<br>Frequency: 1931.5MHz + 1948.5 MHz | Channel: 1015 + 1185<br>Frequency: 1971.5MHz + 1988.5MHz | 30k / 300k | -16.0 |

**ETM3.1**

Bandwidth: 3.0MHz

Configuration 1 - Mode 4 - 3 and Mode 6 - 3

| Band Edge Frequency | Bottom<br>1930 MHz | Top<br>1990 MHz | RBW / VBW<br>(Hz) | Limit<br>(dBm) |
|---|---|---|---|---|
| Edge Test with 3.0MHz Bandwidth<br>Channel No./Frequencies | Channel: 615 + 785<br>Frequency: 1931.5MHz + 1948.5 MHz | Channel: 1015 + 1185<br>Frequency: 1971.5MHz + 1988.5MHz | 30k / 300k | -16.0 |

The channels shown in the table above are the minimum and maximum channels that can be used in the authorised frequency ranges to maintain compliance. Channels used outside of those stated and power levels used beyond those stated in the table exceed the specification limits, thus they cannot be used.

The channels outside of those shown in the table above were not tested at lower power levels to determine a level at which compliance would be achieved. Therefore, to maintain compliance, only the channels shown in the table above shall be used.

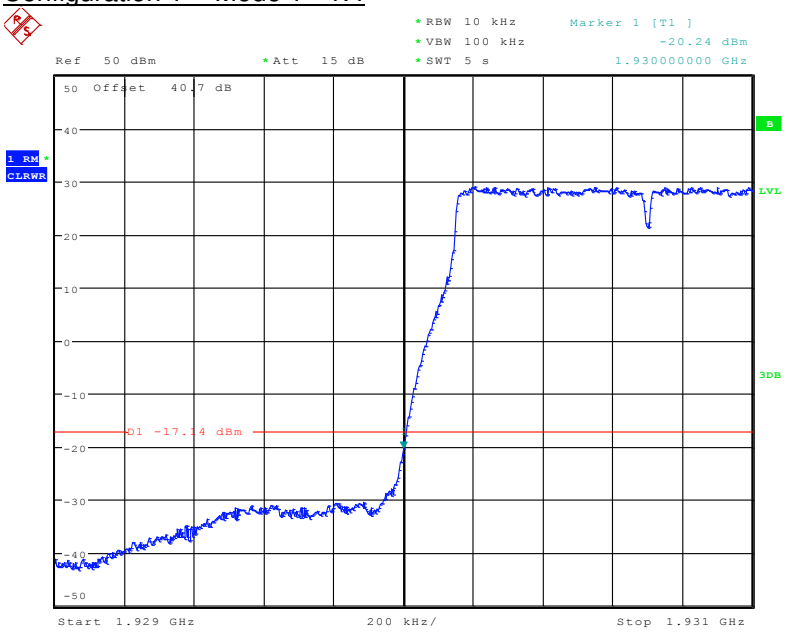
The test results are shown below

**Single Carrier**

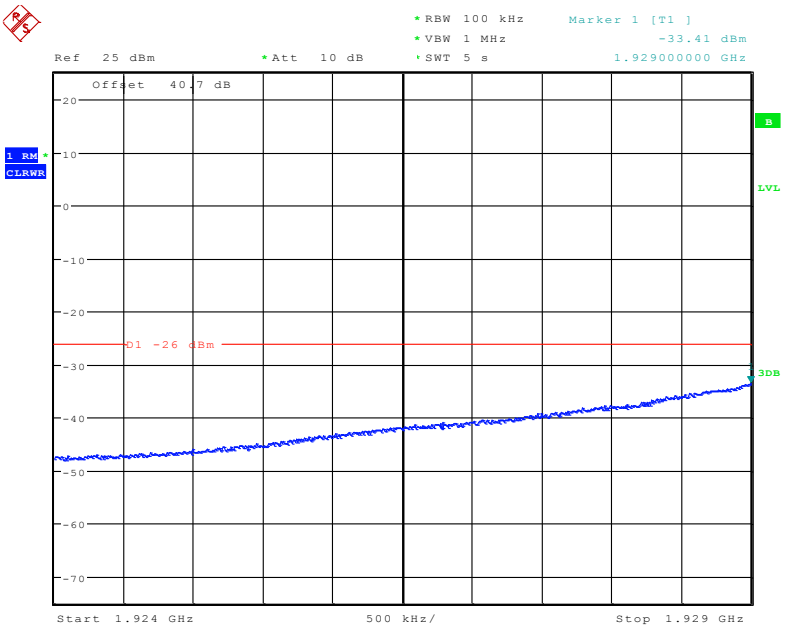
**E-TM1.1**

**1.4MHz Bandwidth**

Configuration 1 - Mode 1 - 1.4



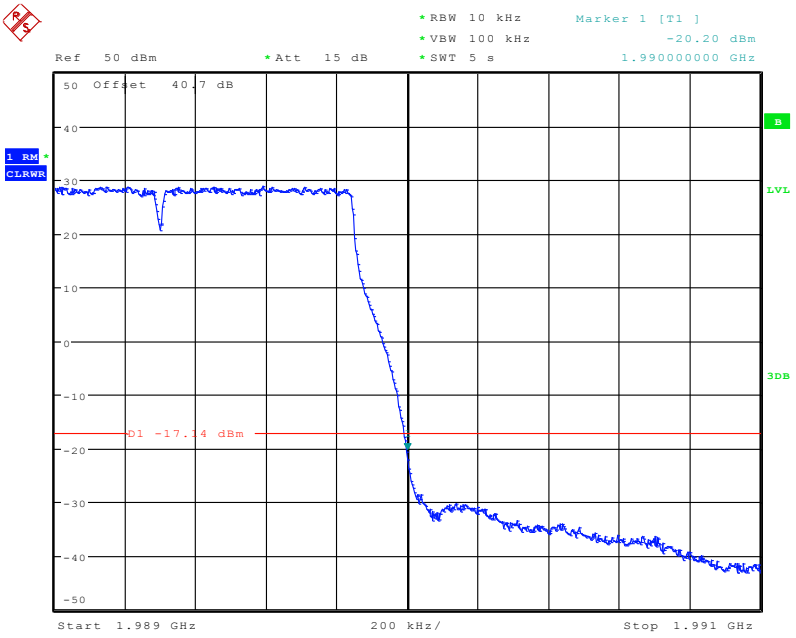

Date: 14.APR.2014 14:17:12



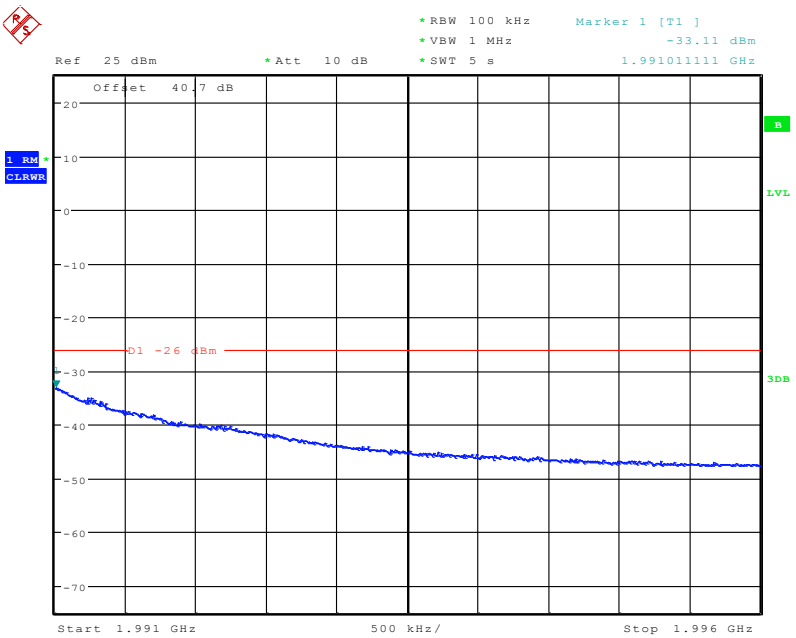

Date: 14.APR.2014 14:22:42

Product Service

Configuration 1 - Mode 3 - 1.4




Date: 14.APR.2014 15:18:49

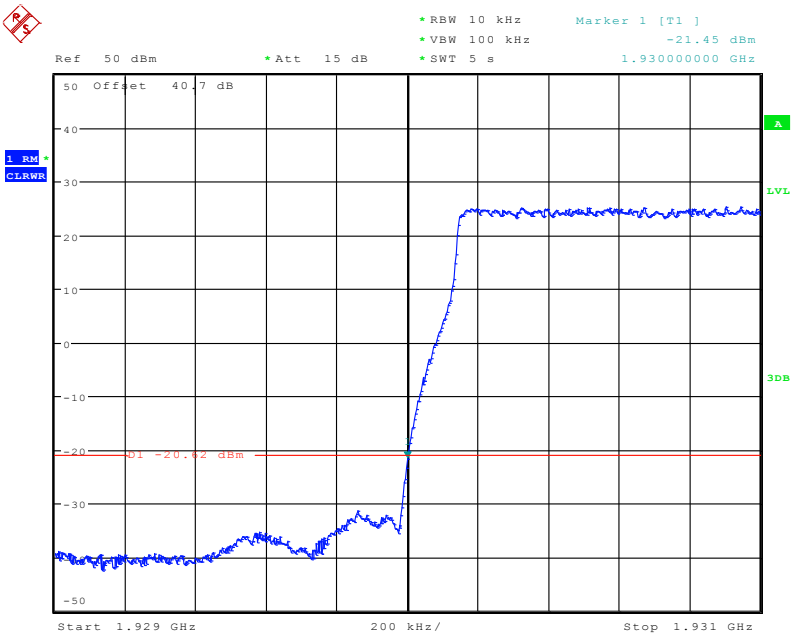



Date: 14.APR.2014 15:20:11

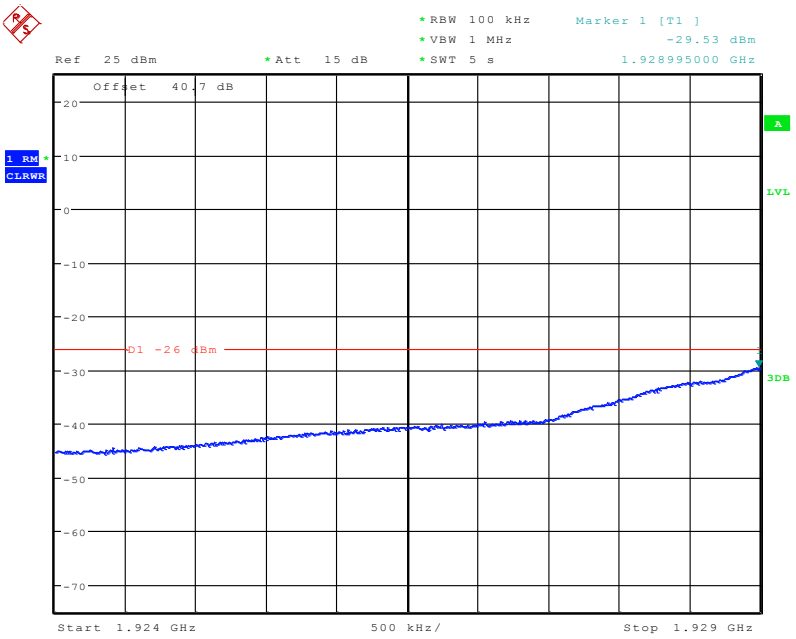
Product Service

## 3.0MHz Bandwidth

Configuration 1 - Mode 1 - 3

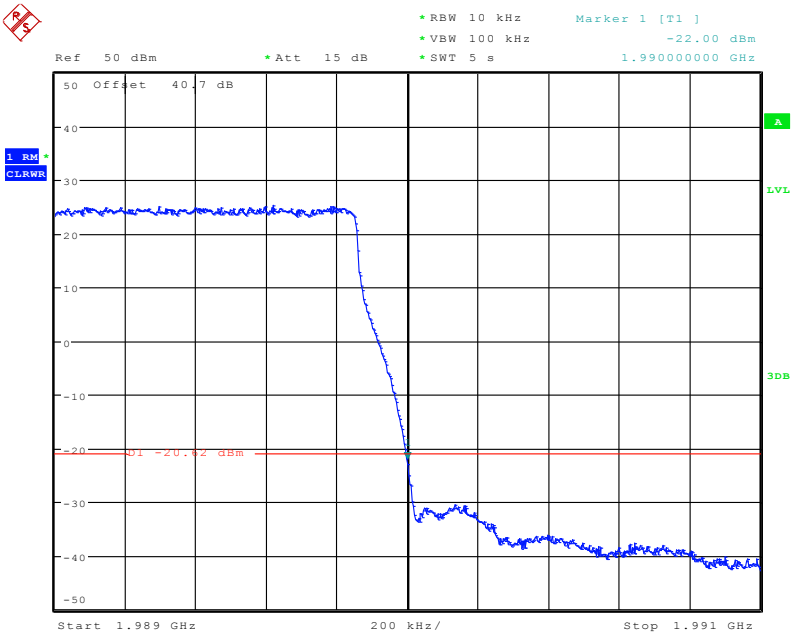



Date: 14.APR.2014 17:37:21

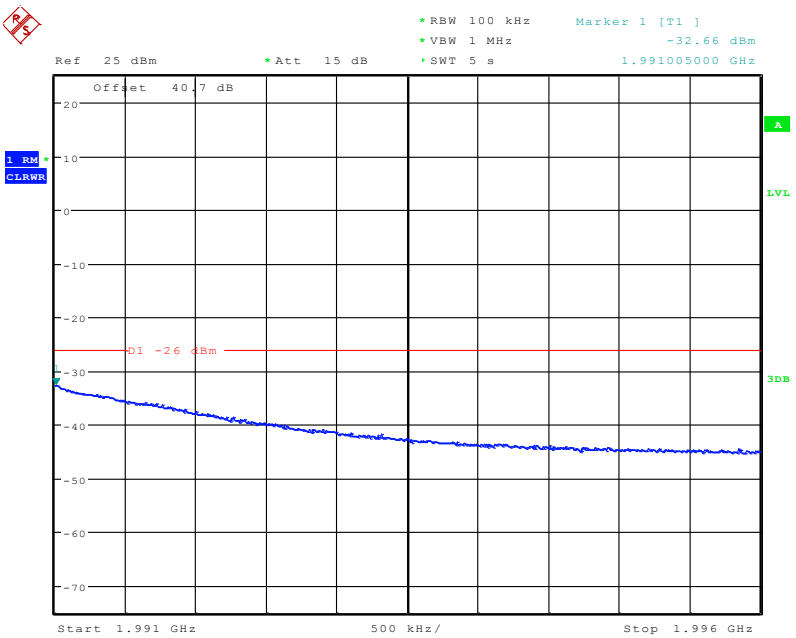



Date: 14.APR.2014 17:38:22

Configuration 1 - Mode 3 - 3




Date: 14.APR.2014 17:25:52

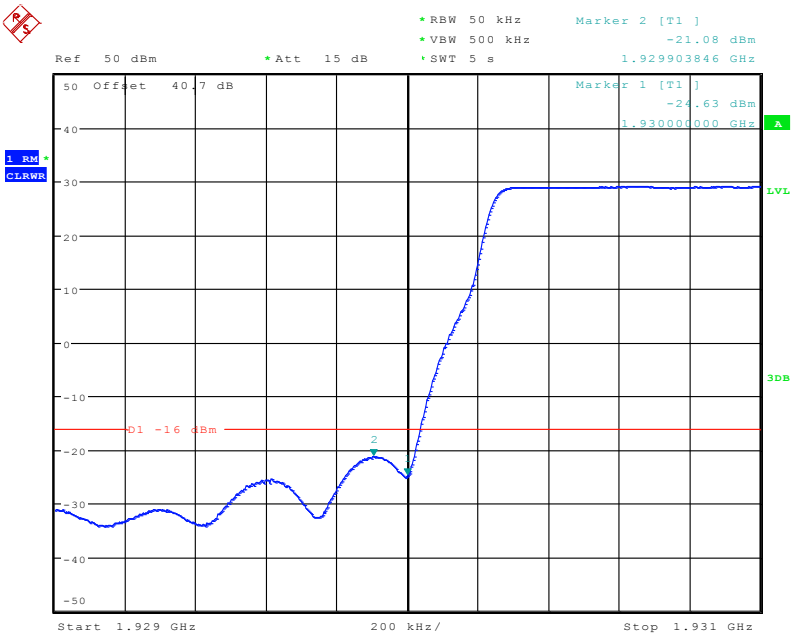



Date: 14.APR.2014 17:25:03

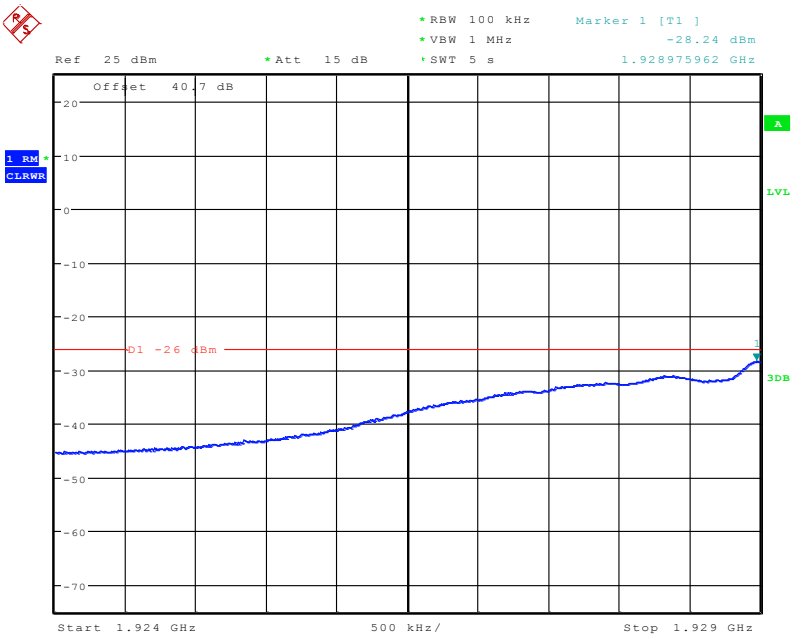
Product Service

## 5.0MHz Bandwidth

Configuration 1 - Mode 1 - 5

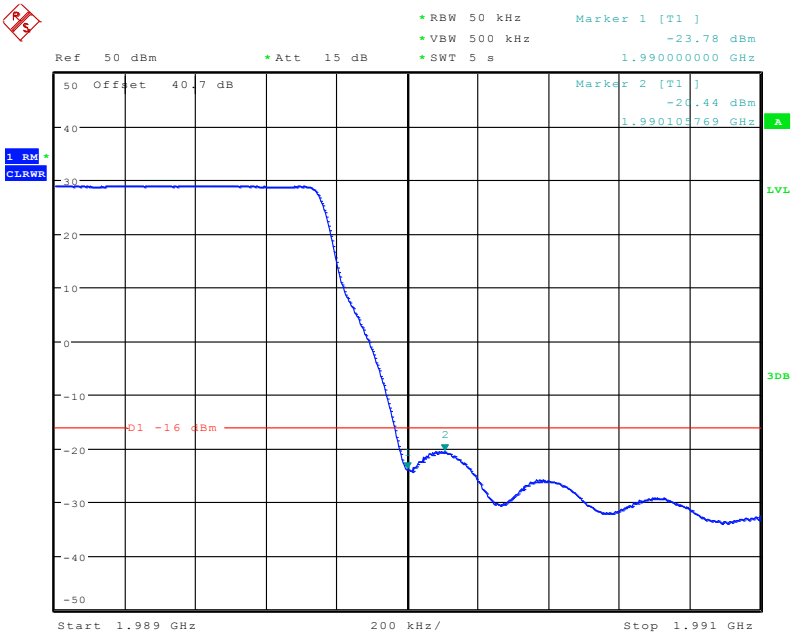



Date: 14.APR.2014 17:53:36

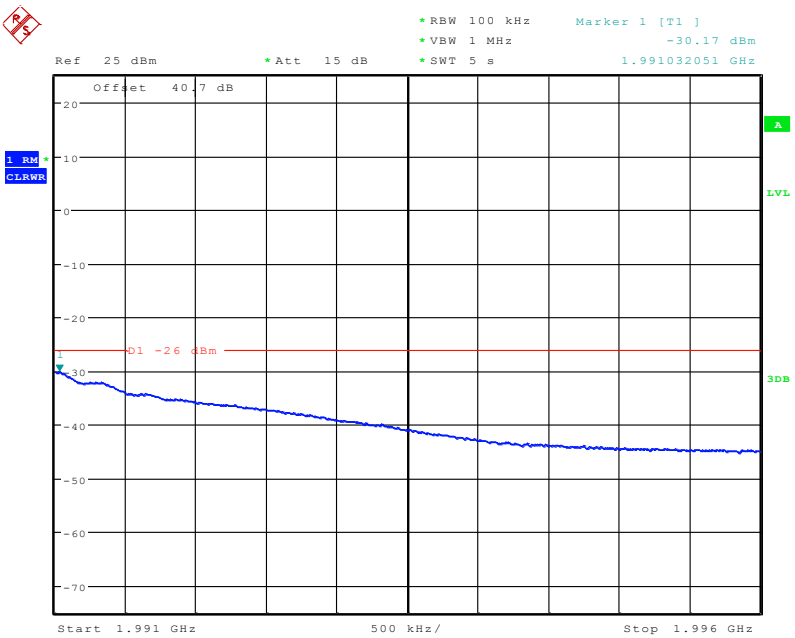



Date: 14.APR.2014 17:55:03

Configuration 1 - Mode 3 - 5




Date: 14.APR.2014 17:59:13

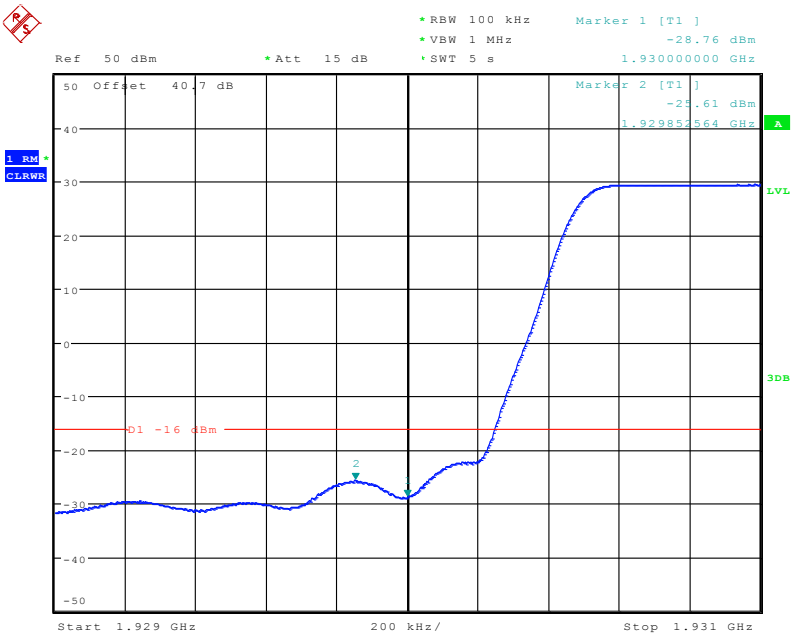



Date: 14.APR.2014 17:57:06

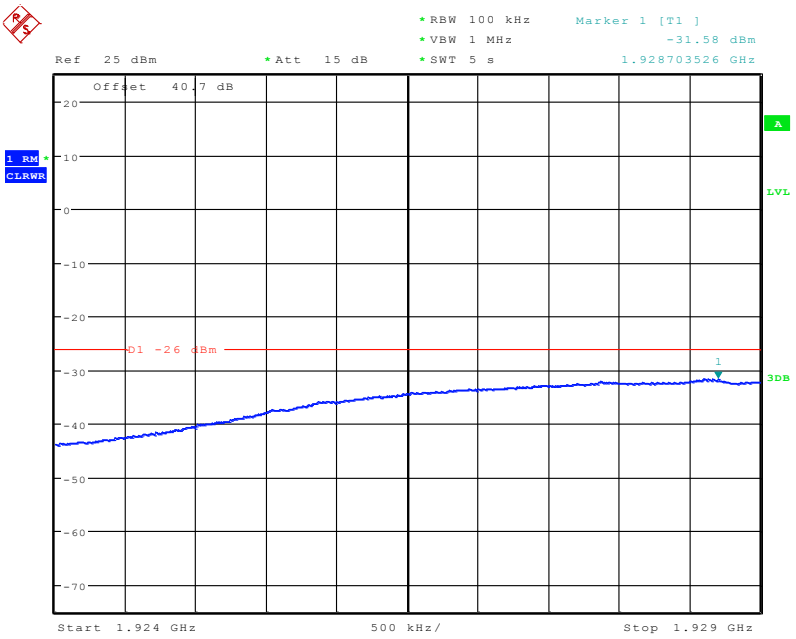
Product Service

## 10.0MHz Bandwidth

Configuration 1 - Mode 1 - 10

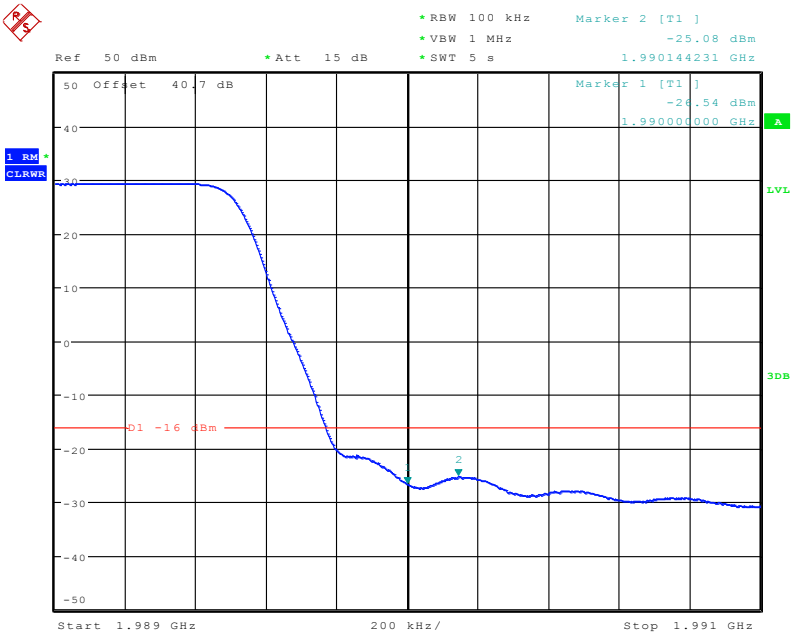



Date: 14.APR.2014 18:17:47

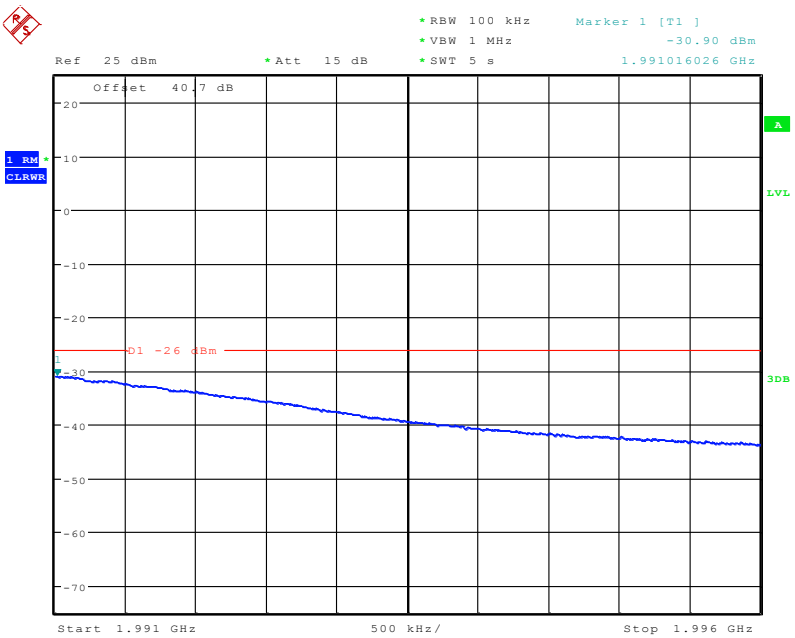



Date: 14.APR.2014 18:18:46

Configuration 1 - Mode 3 - 10




Date: 14.APR.2014 18:21:12

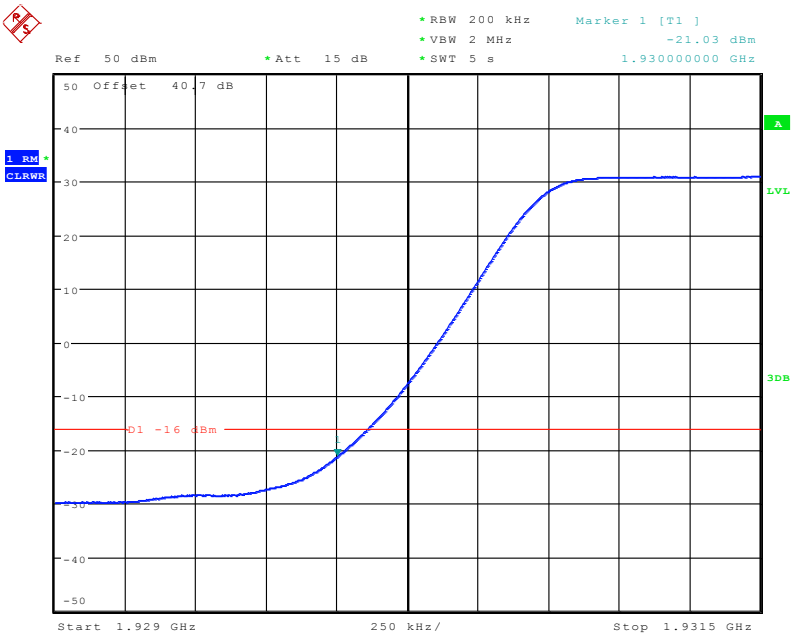



Date: 14.APR.2014 18:19:47

Product Service

## 15.0MHz Bandwidth

Configuration 1 - Mode 1 - 15

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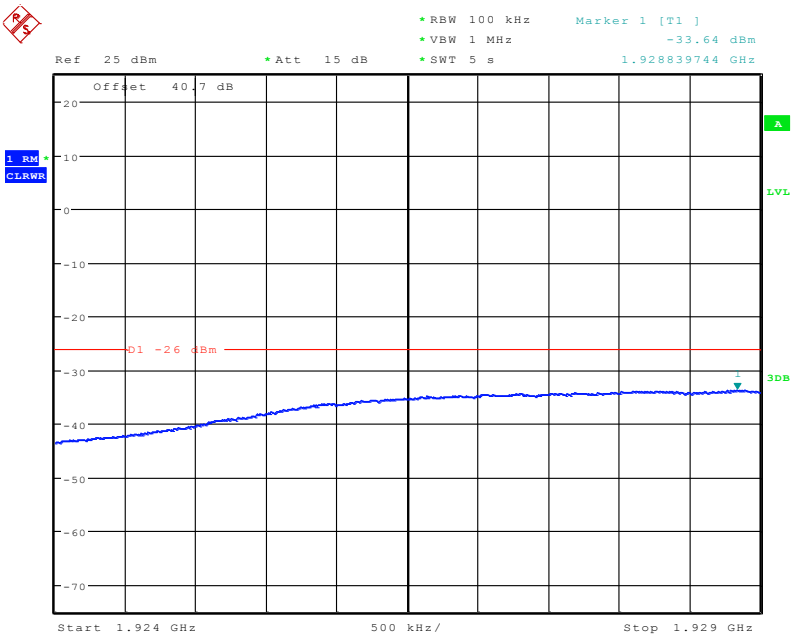
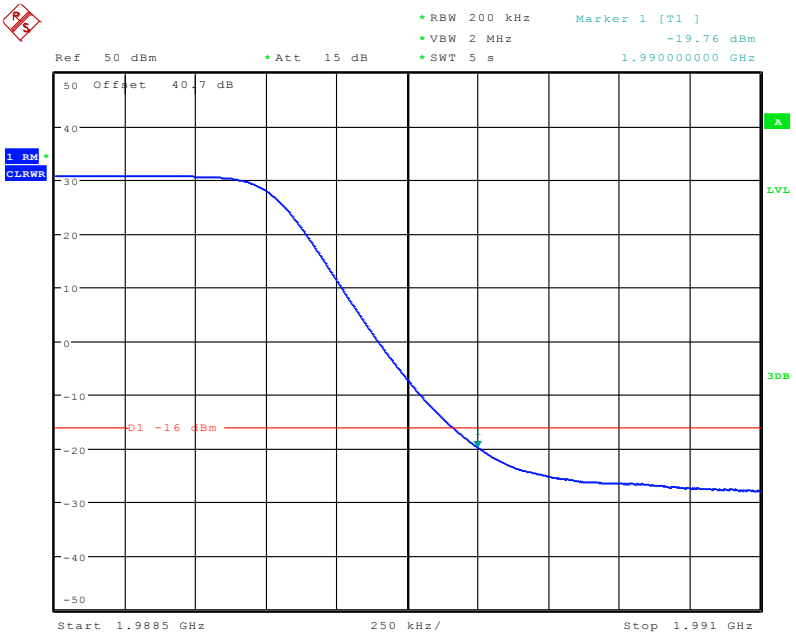


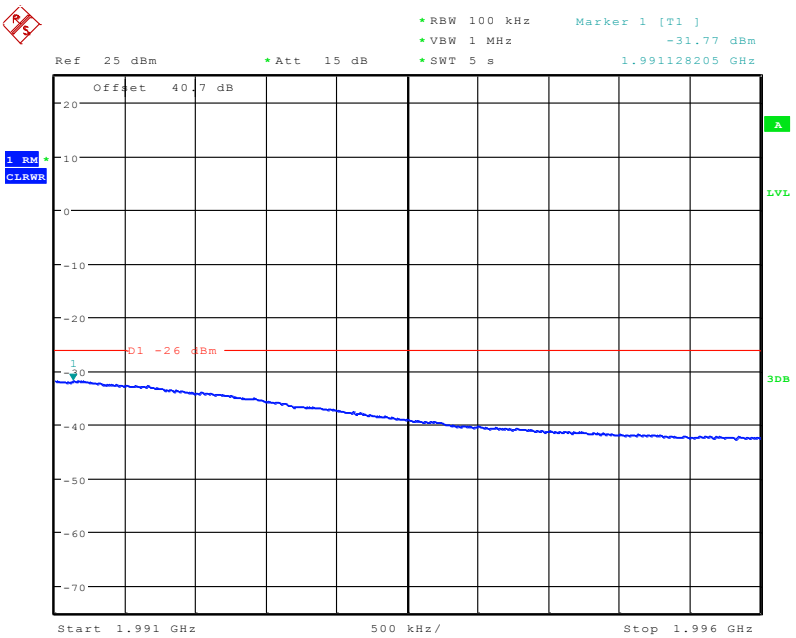

Date: 14.APR.2014 18:33:00

Product Service

Configuration 1 - Mode 3 - 15



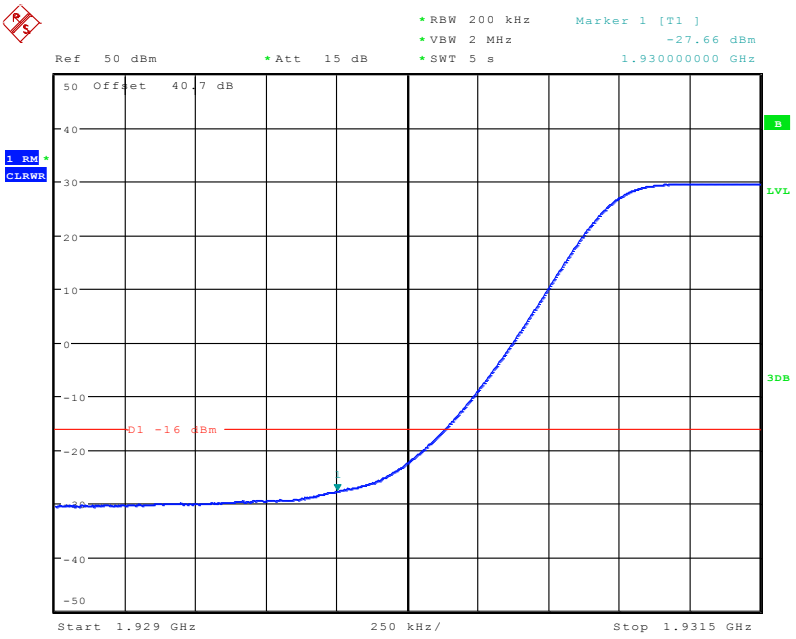

Date: 14.APR.2014 18:28:07



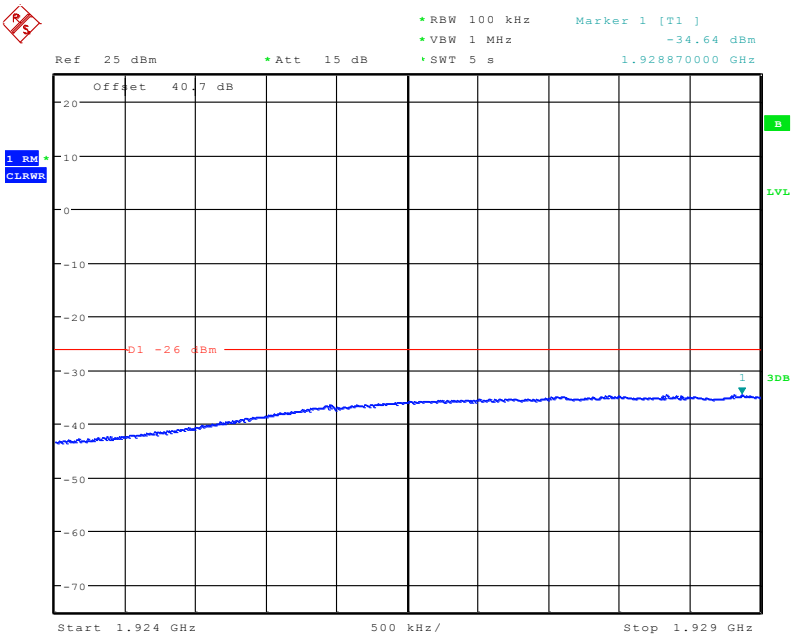

Date: 14.APR.2014 18:29:39

## 20.0MHz Bandwidth

Configuration 1 - Mode 1 - 20

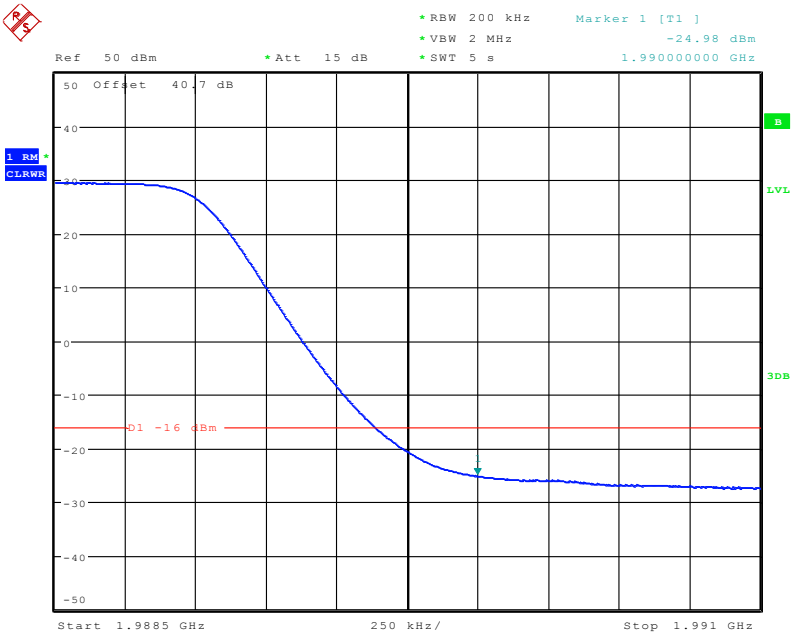



Date: 14.APR.2014 15:38:27

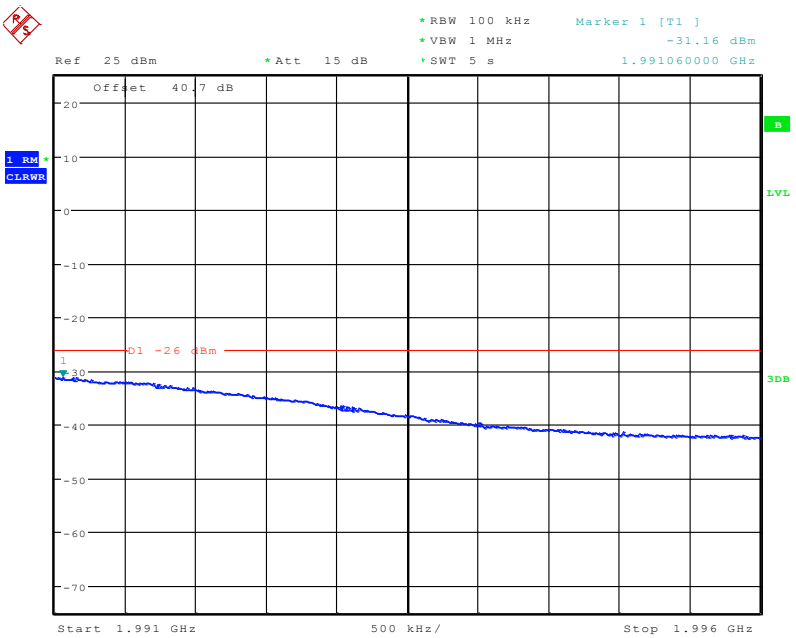



Date: 14.APR.2014 15:36:59

Configuration 1 - Mode 3 - 20




Date: 14.APR.2014 15:58:14



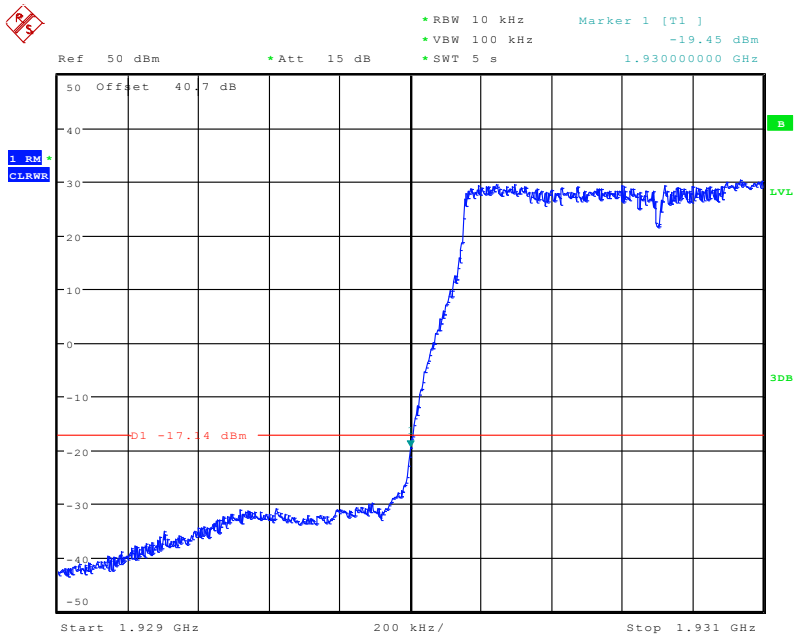

Date: 14.APR.2014 16:01:11

Product Service

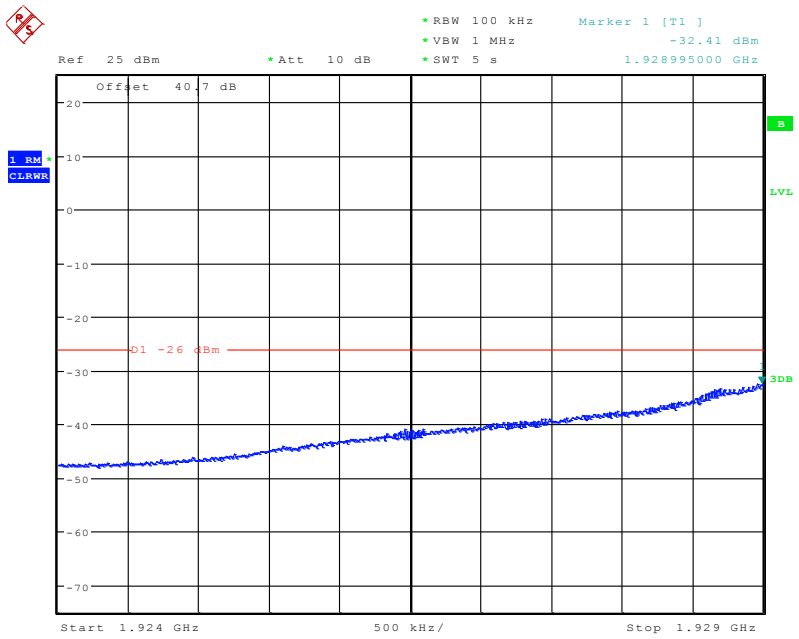
## E-TM3.2

## 1.4MHz Bandwidth

Configuration 1 - Mode 1 - 1.4

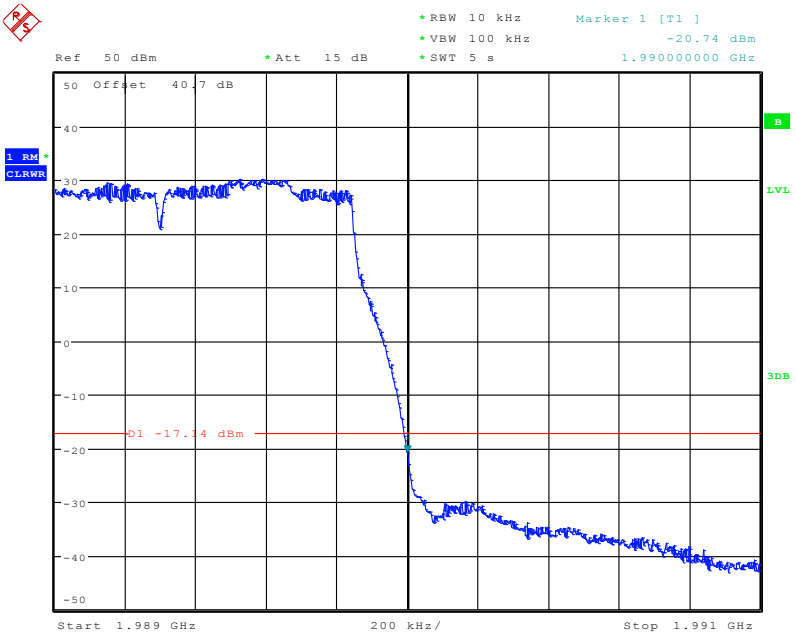



Date: 14.APR.2014 14:52:47

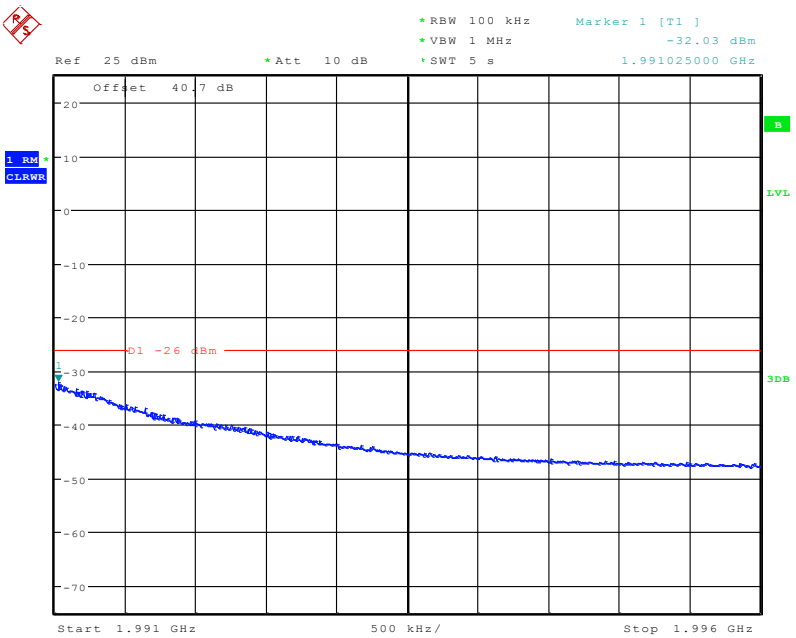



Date: 14.APR.2014 14:50:05

Configuration 1 - Mode 3 - 1.4




Date: 14.APR.2014 15:32:16

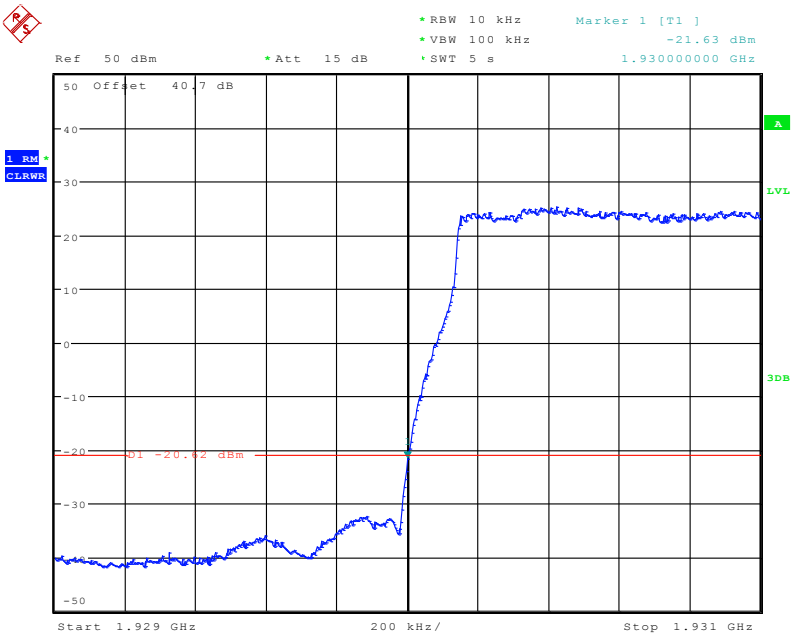



Date: 14.APR.2014 15:33:05

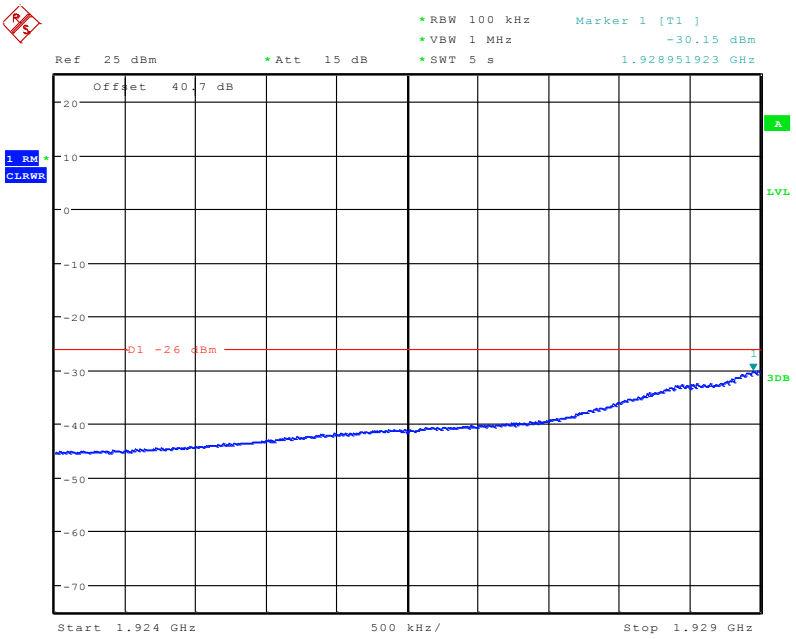
Product Service

## 3.0MHz Bandwidth

Configuration 1 - Mode 1 - 3

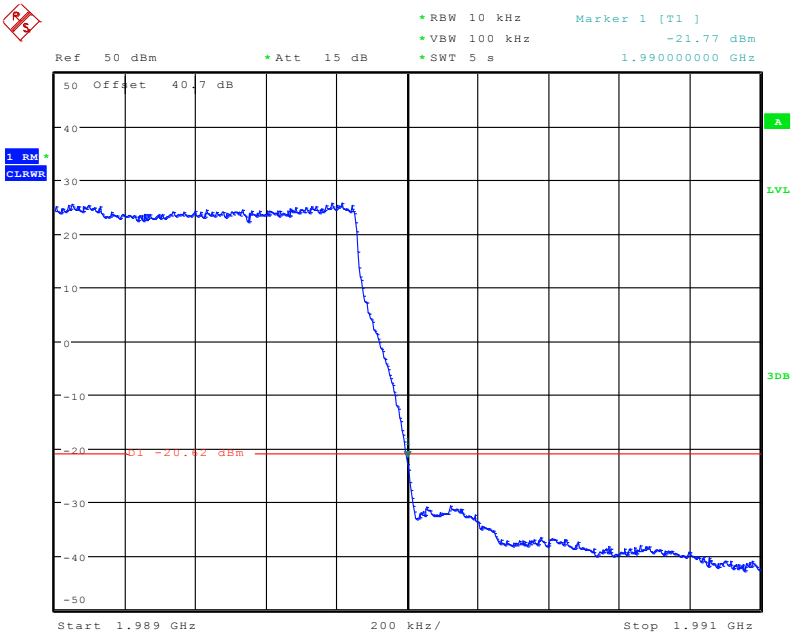



Date: 14.APR.2014 17:42:31

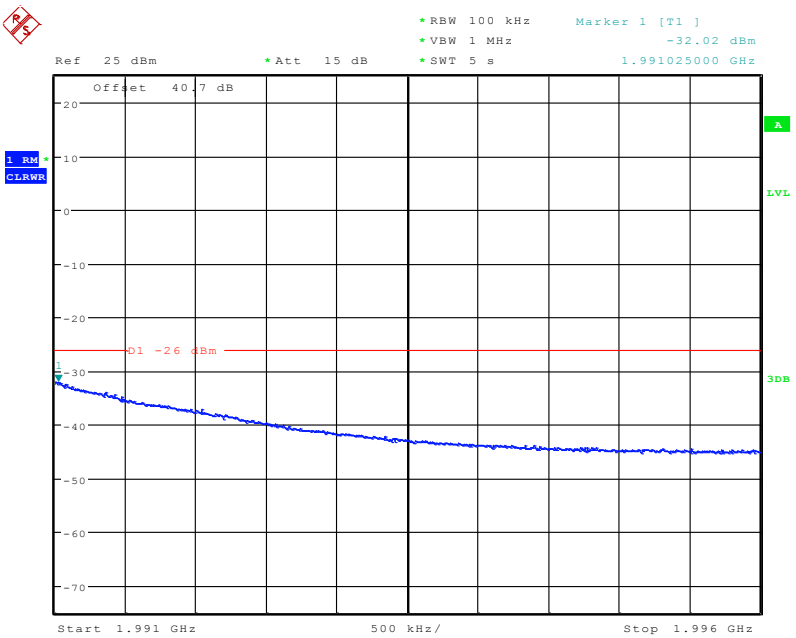



Date: 14.APR.2014 17:43:32

Configuration 1 - Mode 3 - 3




Date: 14.APR.2014 17:44:40



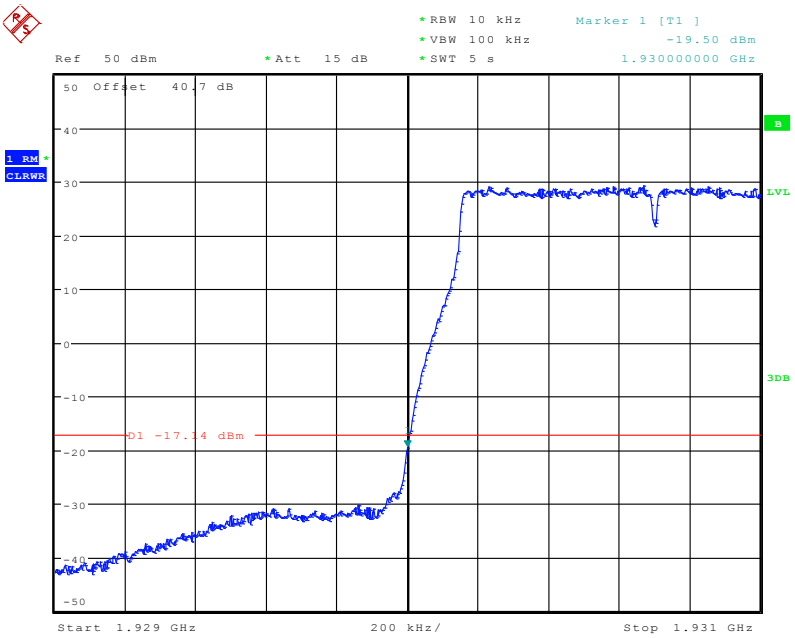

Date: 14.APR.2014 17:29:17

Product Service

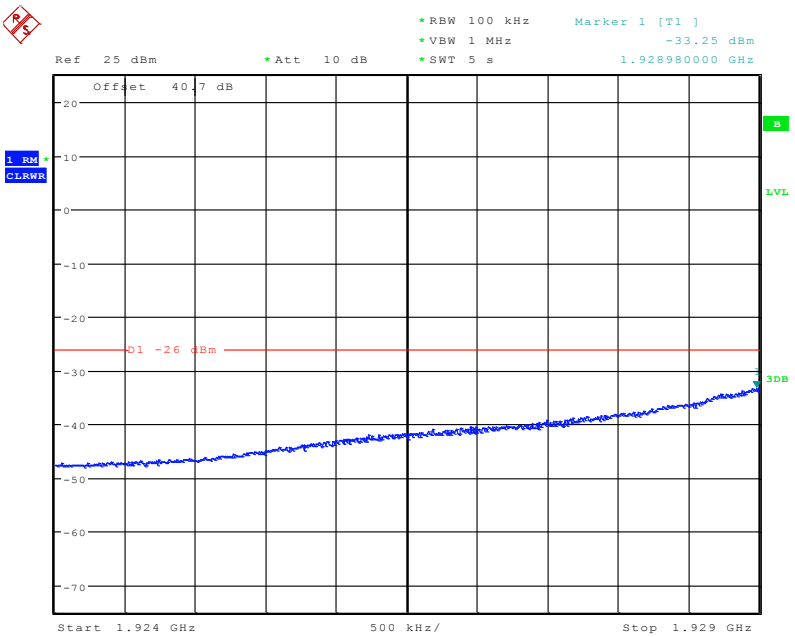
## E-TM3.1

## 1.4MHz Bandwidth

Configuration 1 - Mode 1 - 1.4

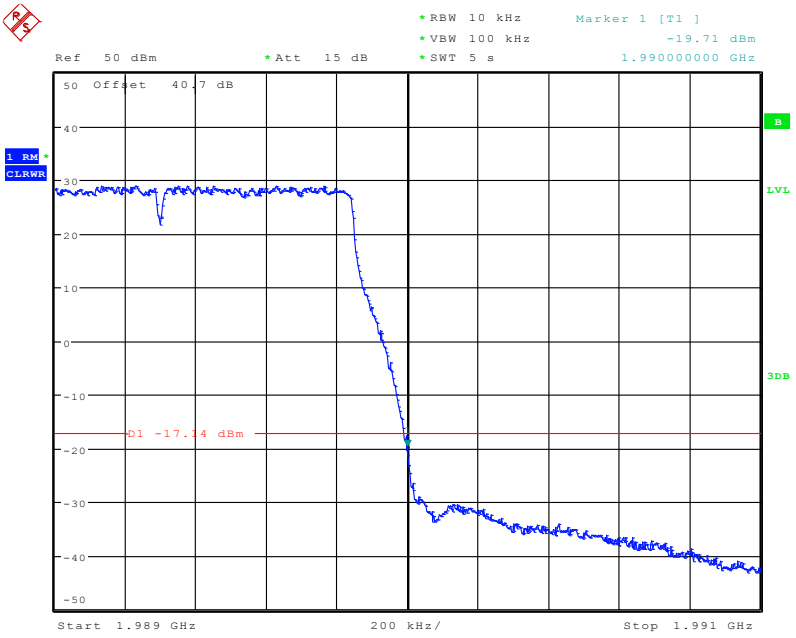



Date: 14.APR.2014 14:48:11




Date: 14.APR.2014 14:48:58

Configuration 1 - Mode 3 - 1.4

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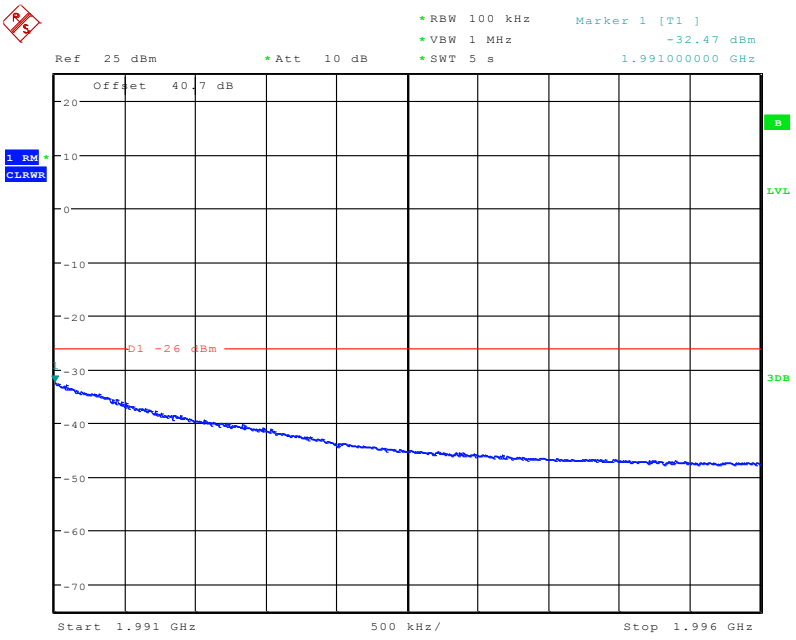
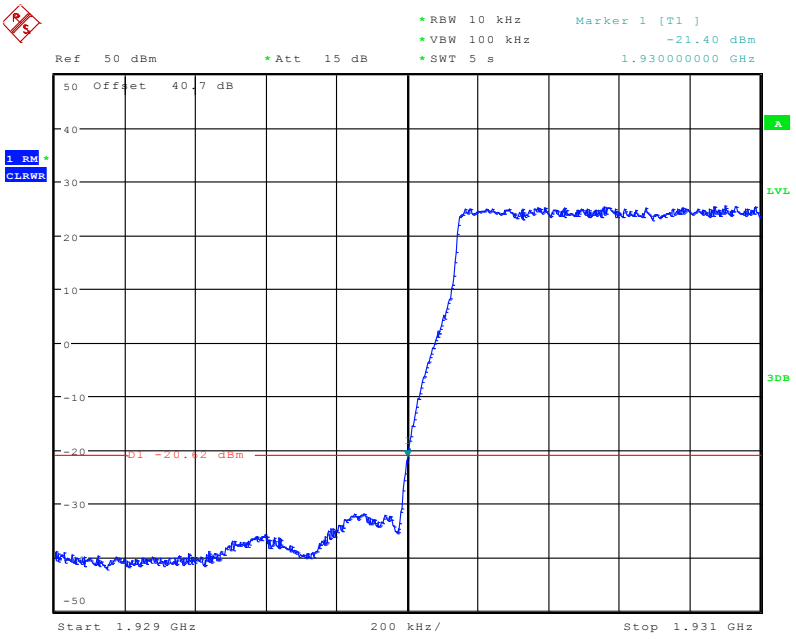



Date: 14.APR.2014 15:28:19

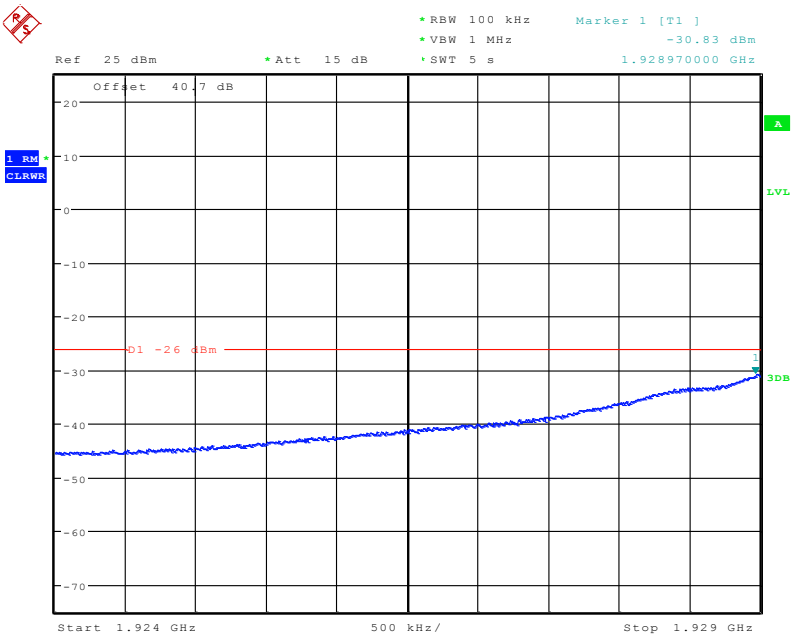
Product Service

## 3.0MHz Bandwidth

Configuration 1 - Mode 1 - 3

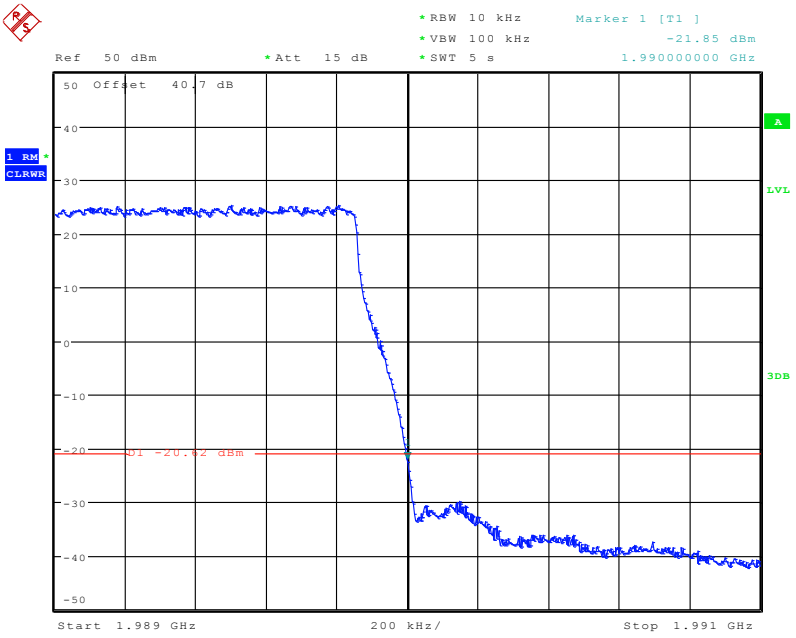



Date: 14.APR.2014 17:40:33

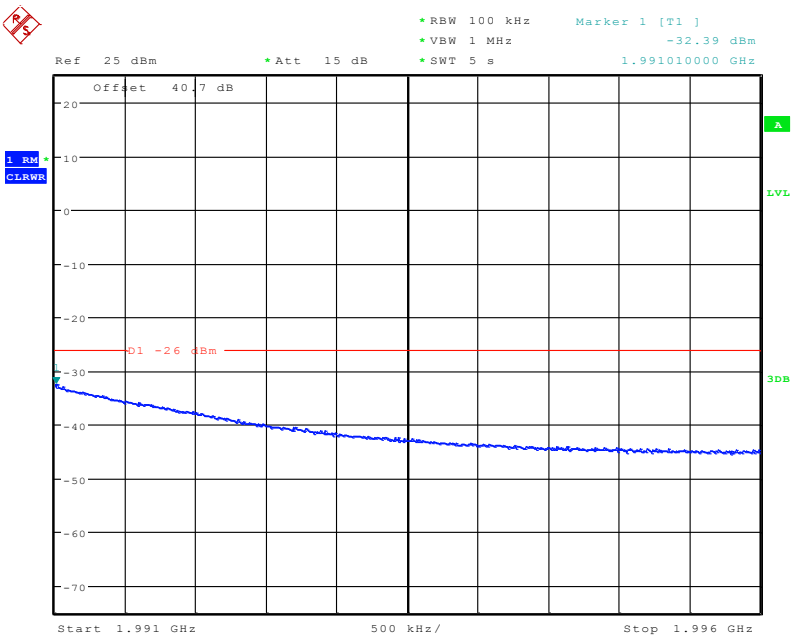



Date: 14.APR.2014 17:12:01

Configuration 1 - Mode 3 - 3




Date: 14.APR.2014 17:27:25



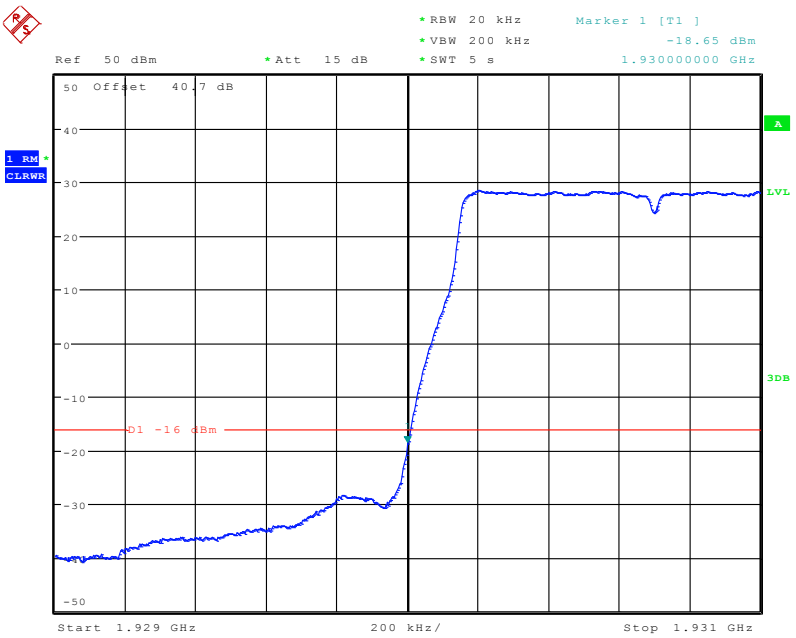

Date: 14.APR.2014 17:28:42

**Multi Carrier (x2)**

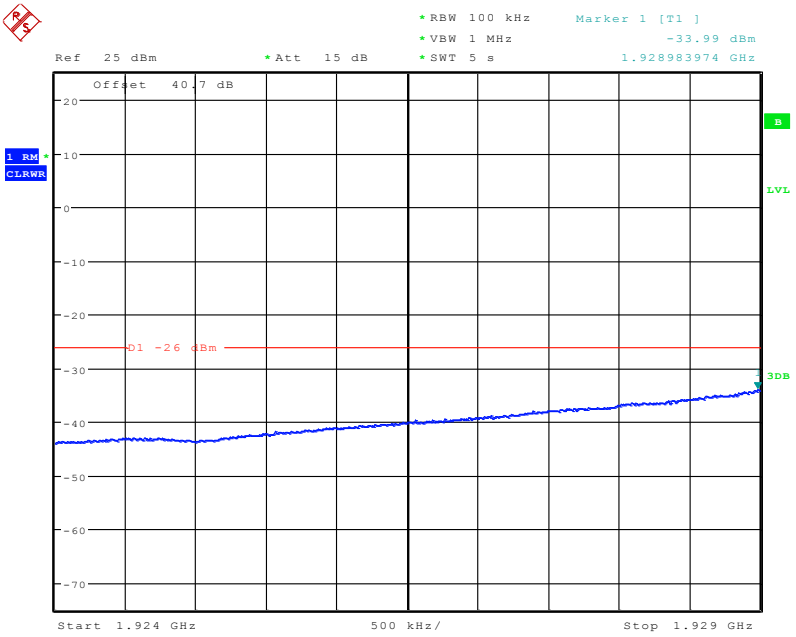
**E-TM1.1**

**1.4MHz Bandwidth**

Configuration 1 - Mode 4 - 1.4

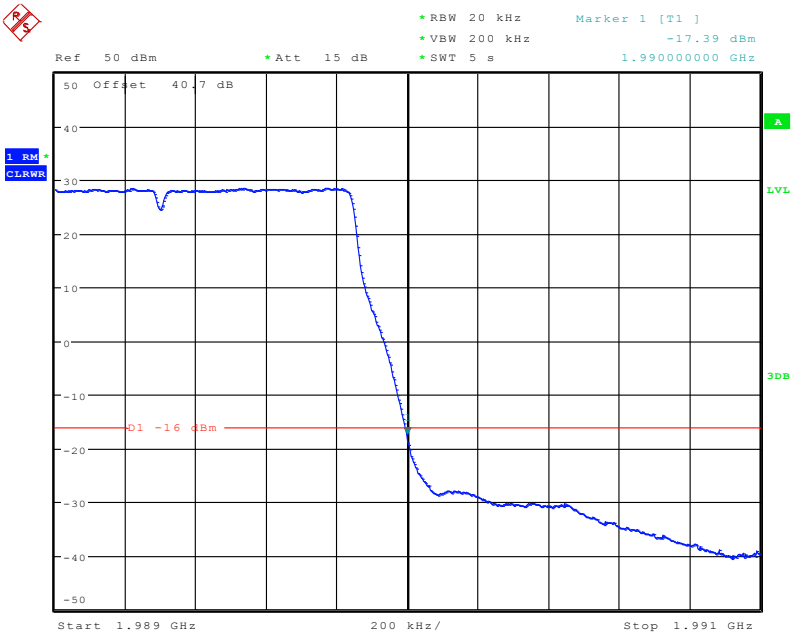



Date: 23.MAY.2014 17:41:46

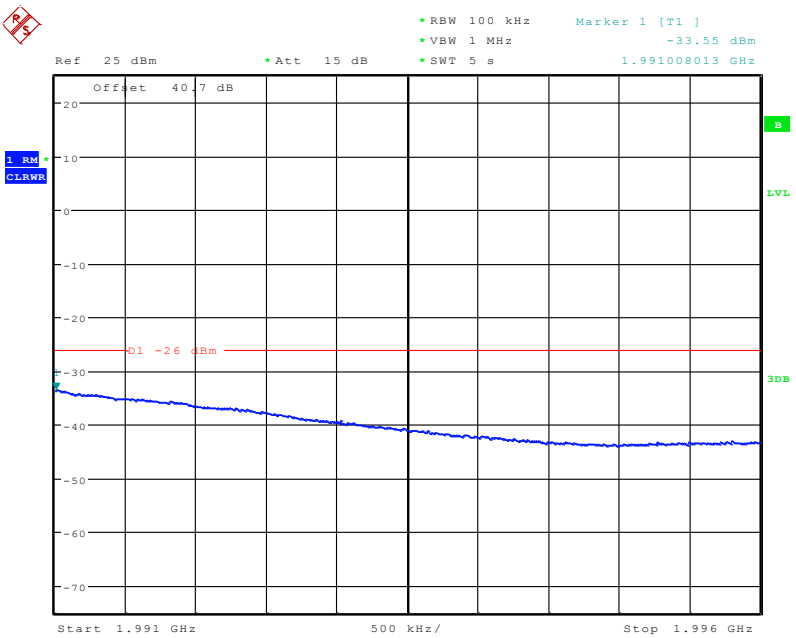



Date: 23.MAY.2014 17:42:54

Configuration 1 - Mode 6 - 1.4




Date: 23.MAY.2014 17:33:47

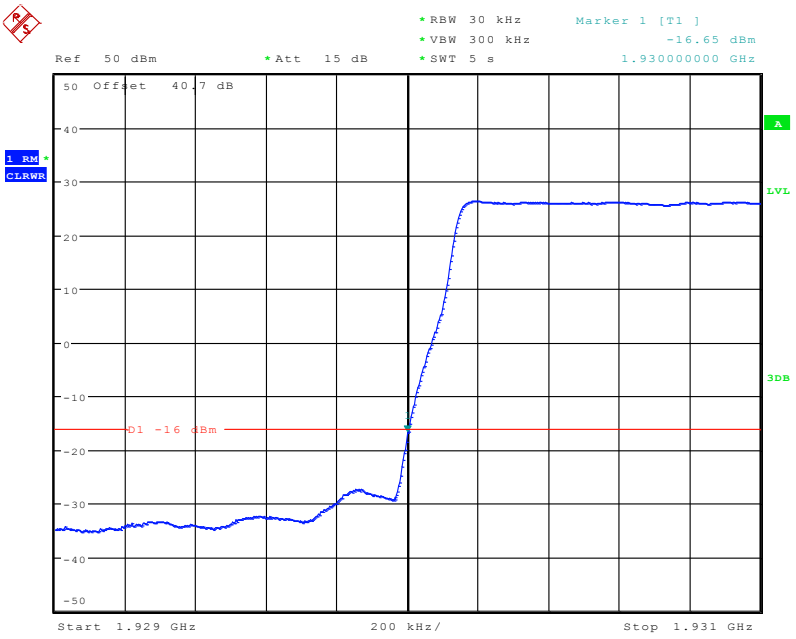



Date: 23.MAY.2014 17:32:48

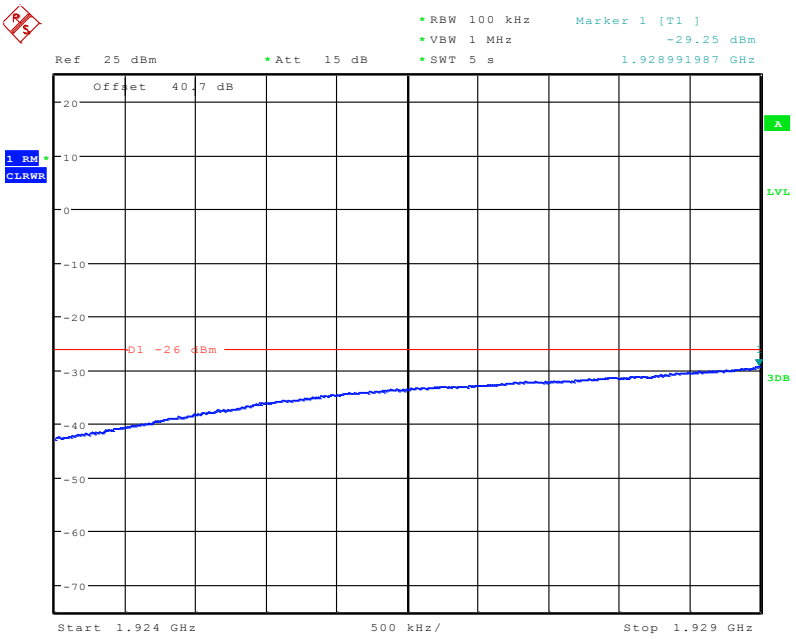
Product Service

## 3.0MHz Bandwidth

Configuration 1 - Mode 4 - 3

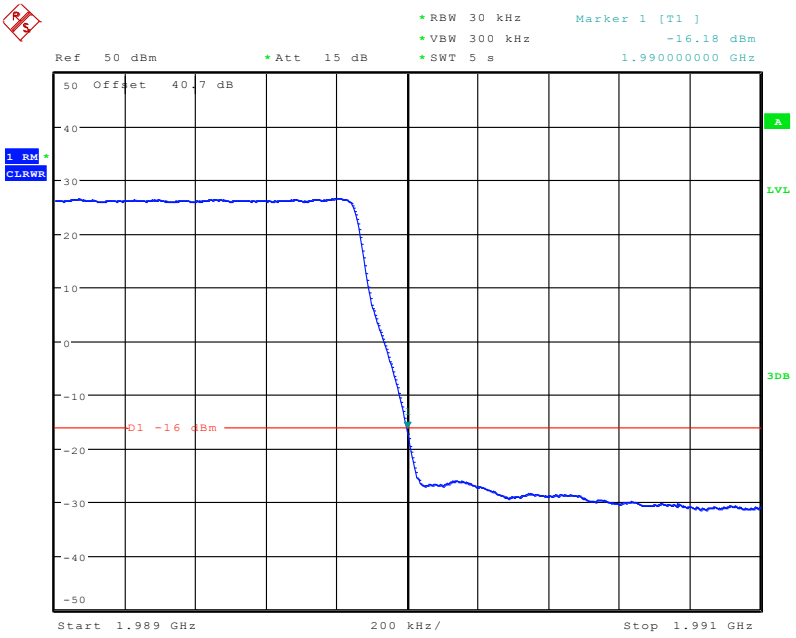



Date: 23.MAY.2014 11:23:32

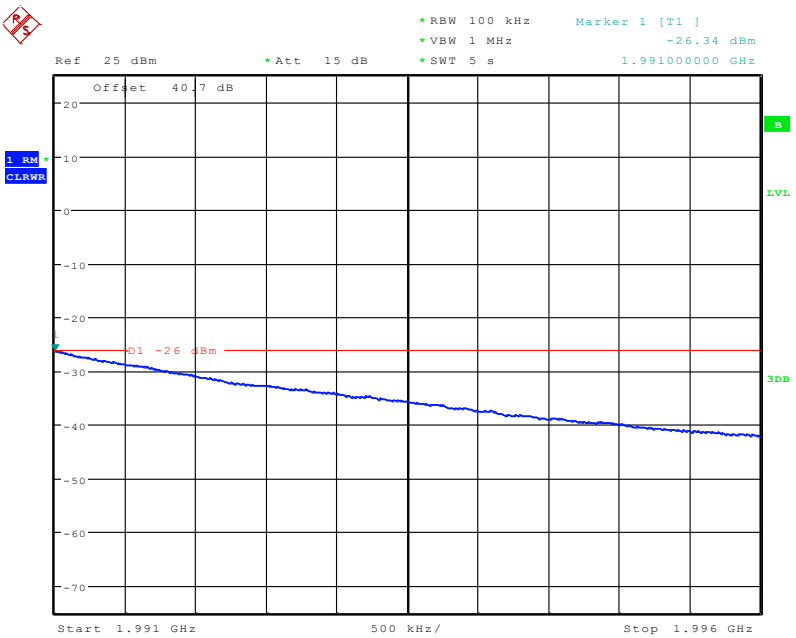



Date: 23.MAY.2014 11:29:19

Configuration 1 - Mode 6 - 3




Date: 23.MAY.2014 14:07:17

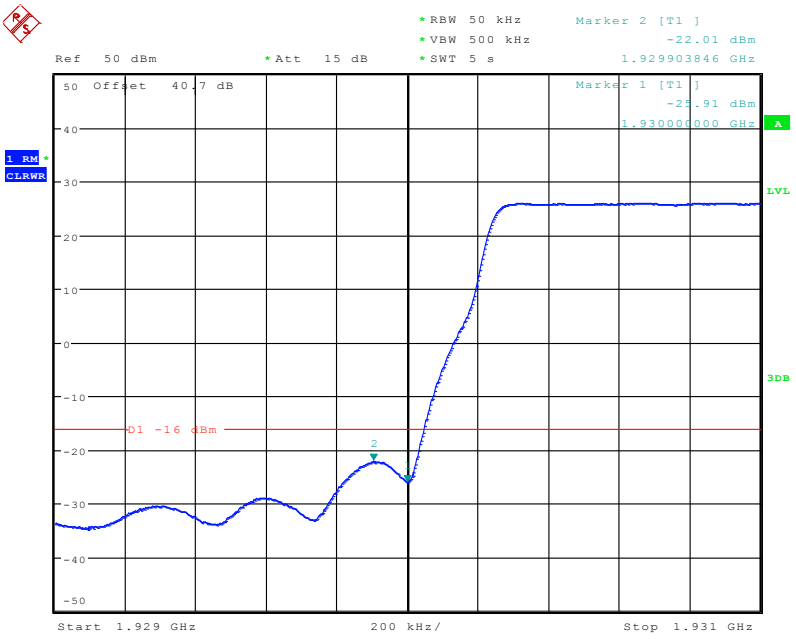



Date: 23.MAY.2014 14:07:47

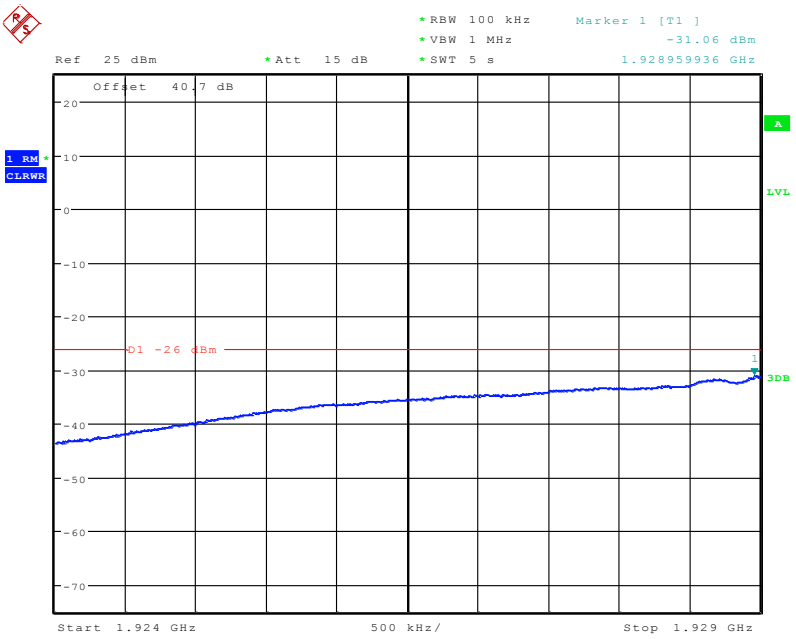
Product Service

## 5.0MHz Bandwidth

Configuration 1 - Mode 4 - 5

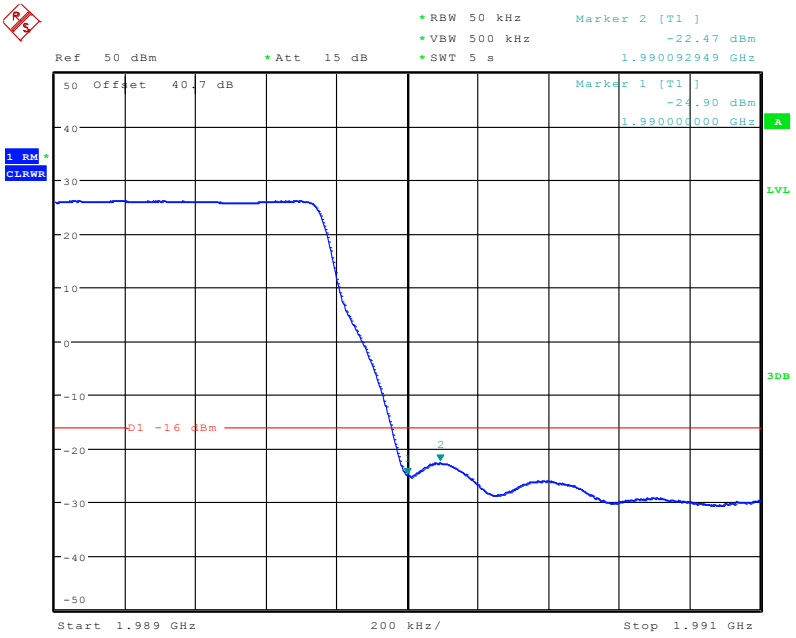



Date: 23.MAY.2014 16:10:21

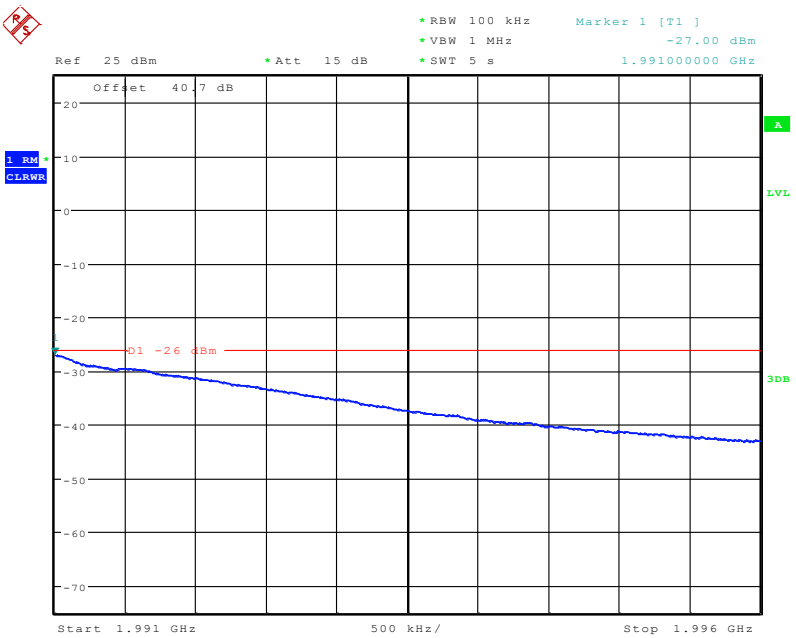



Date: 23.MAY.2014 16:11:59

Configuration 1 - Mode 6 - 5



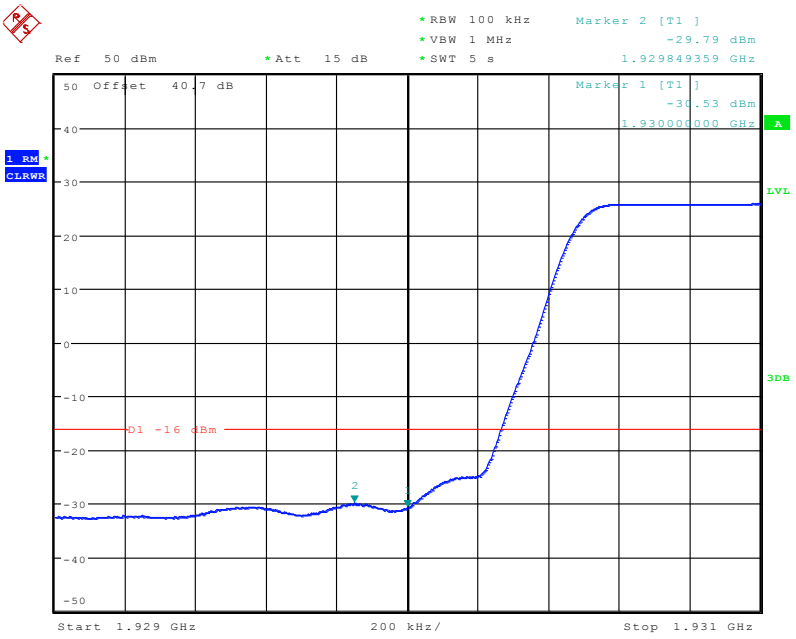

Date: 23.MAY.2014 15:32:32



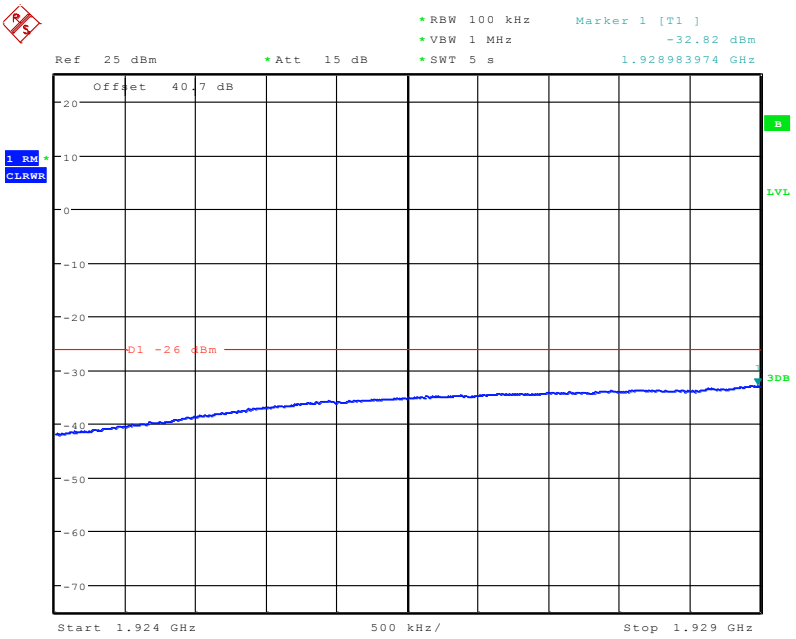

Date: 23.MAY.2014 15:34:20

## 10.0MHz Bandwidth

Configuration 1 - Mode 4 - 10

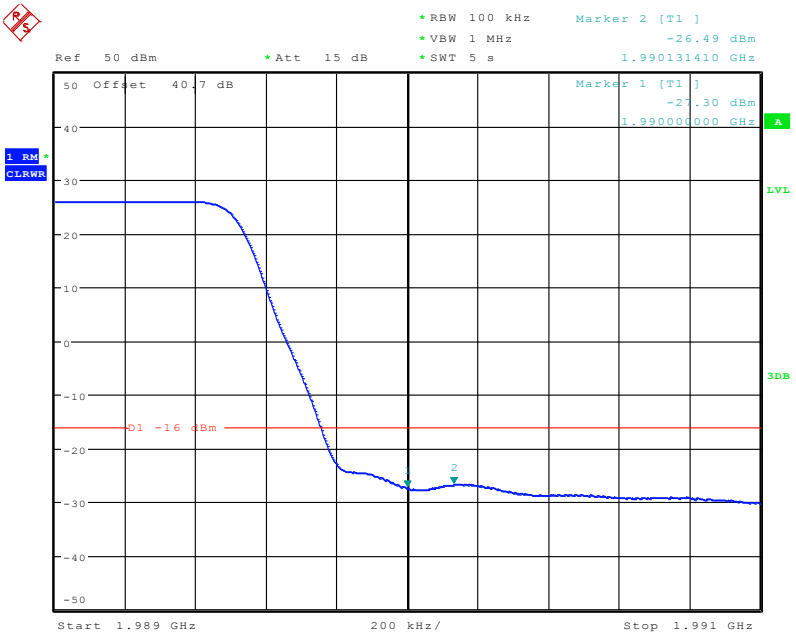



Date: 23.MAY.2014 17:53:24

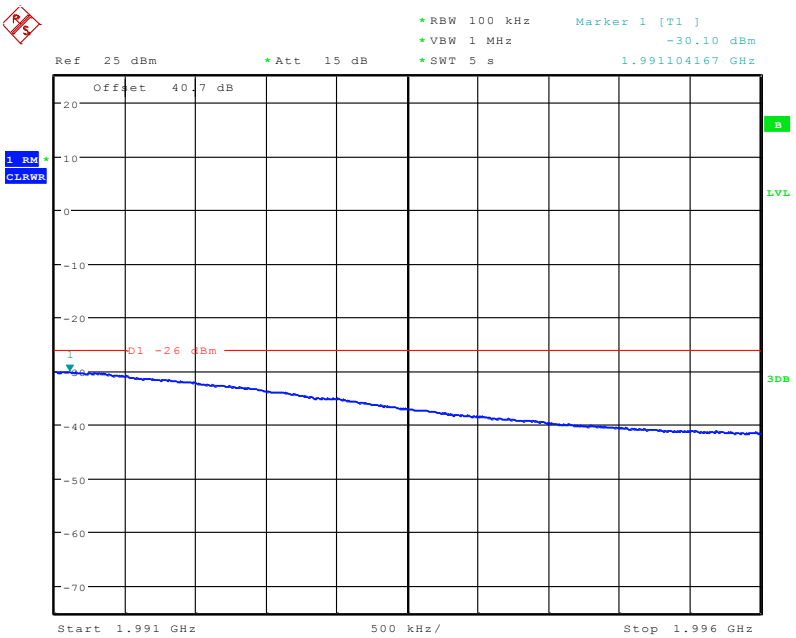



Date: 23.MAY.2014 17:52:48

Configuration 1 - Mode 6 - 10




Date: 23.MAY.2014 17:56:19



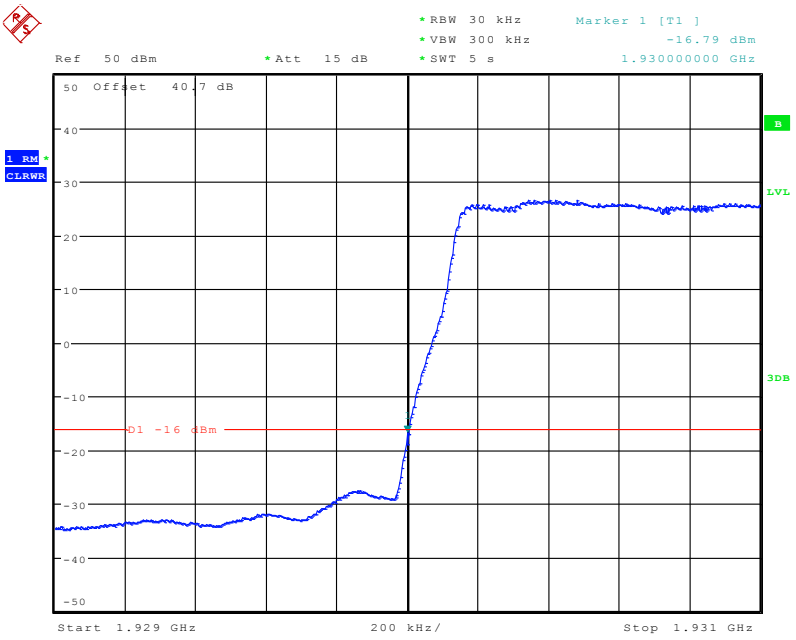

Date: 23.MAY.2014 17:55:04

Product Service

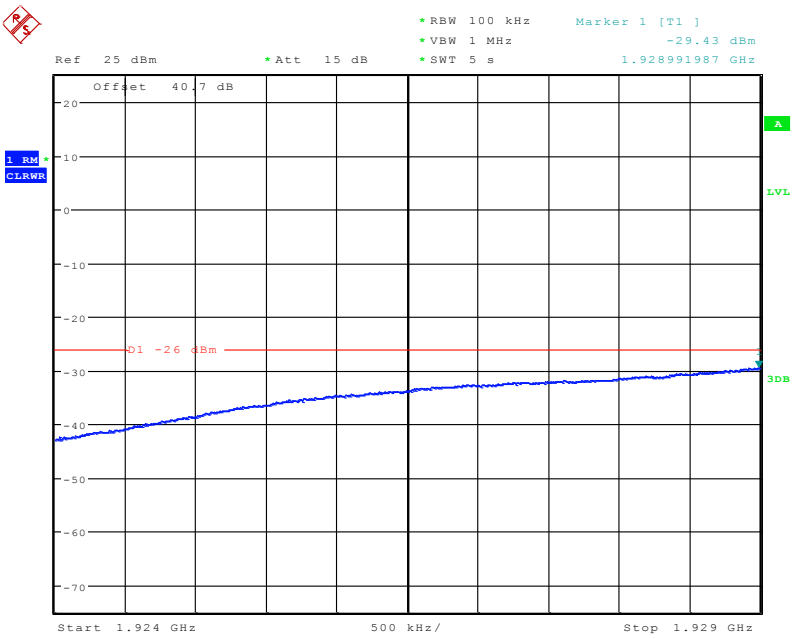
## E-TM3.2

## 3.0MHz Bandwidth

Configuration 1 - Mode 4 - 3

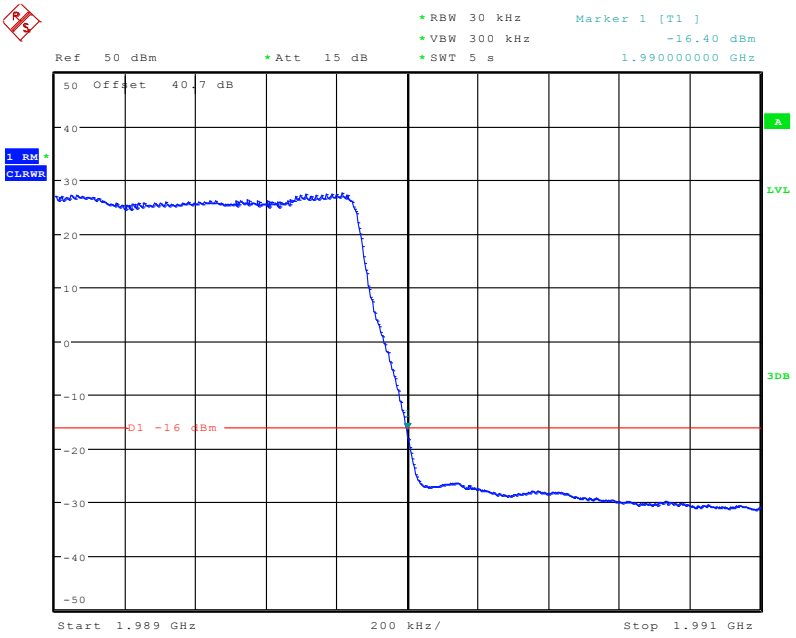



Date: 23.MAY.2014 11:36:34

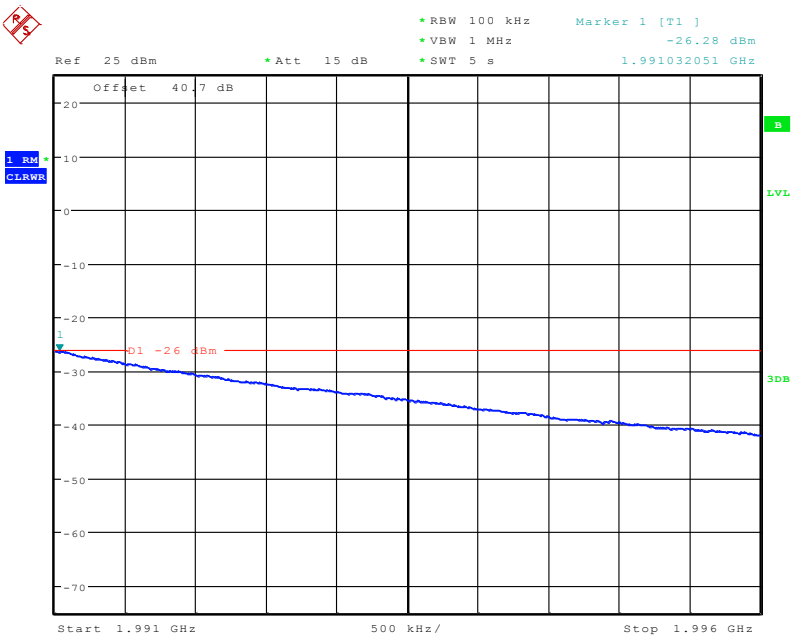



Date: 23.MAY.2014 11:37:02

Configuration 1 - Mode 6 - 3




Date: 23.MAY.2014 14:10:54



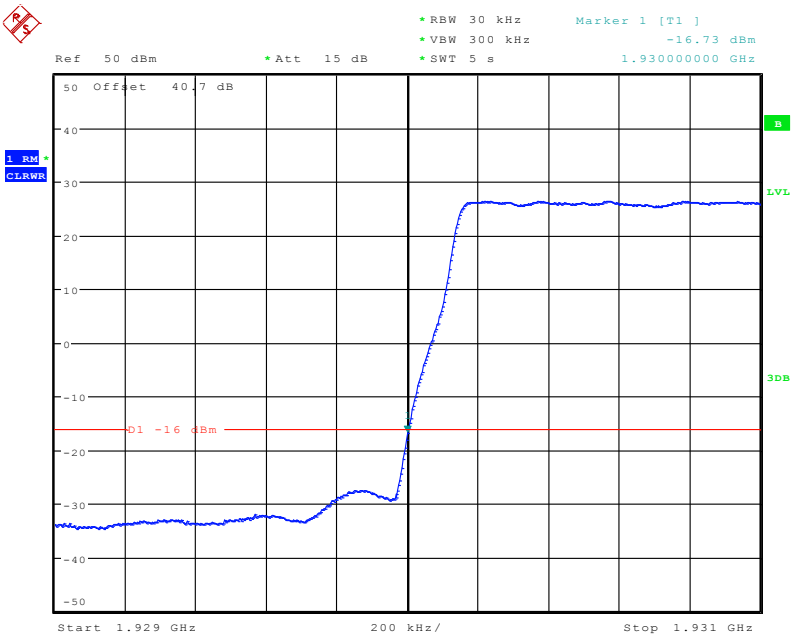

Date: 23.MAY.2014 14:12:15

Product Service

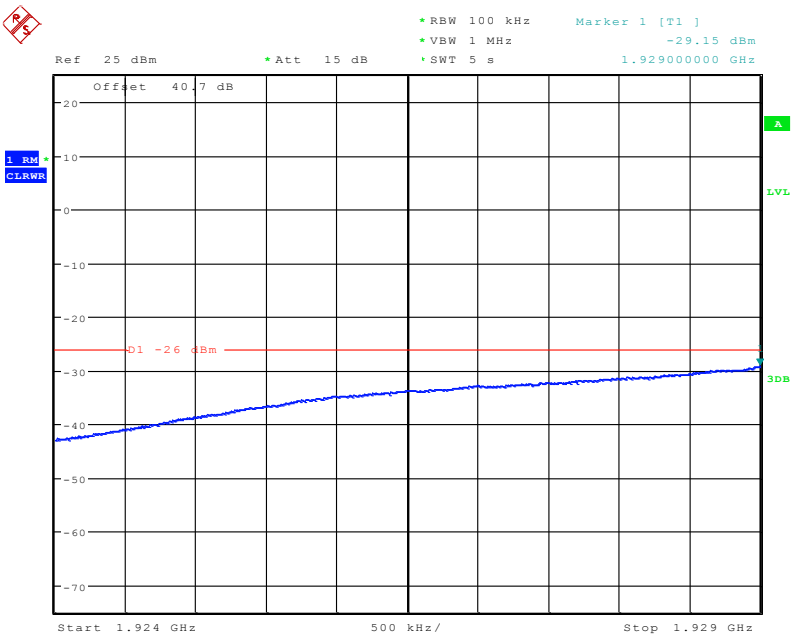
## E-TM3.1

## 3.0MHz Bandwidth

Configuration 1 - Mode 4 - 3

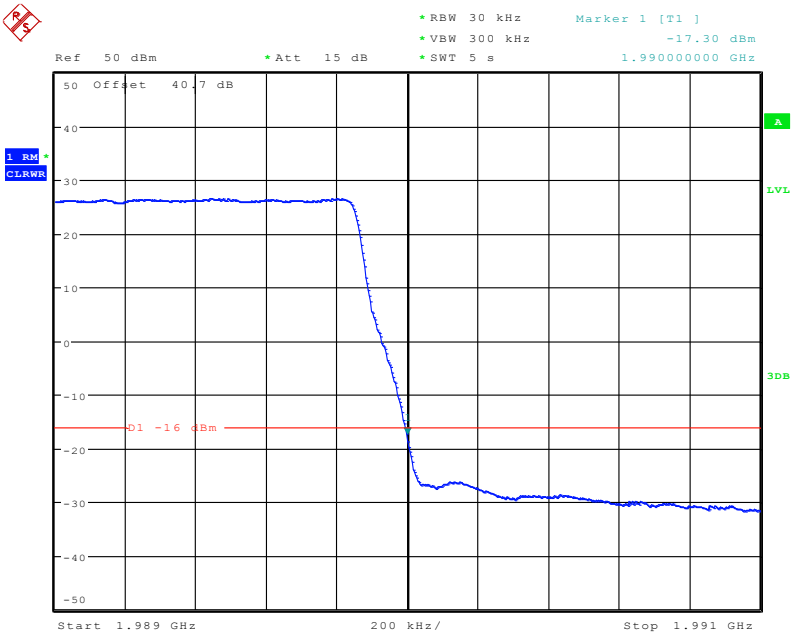



Date: 23.MAY.2014 11:34:35

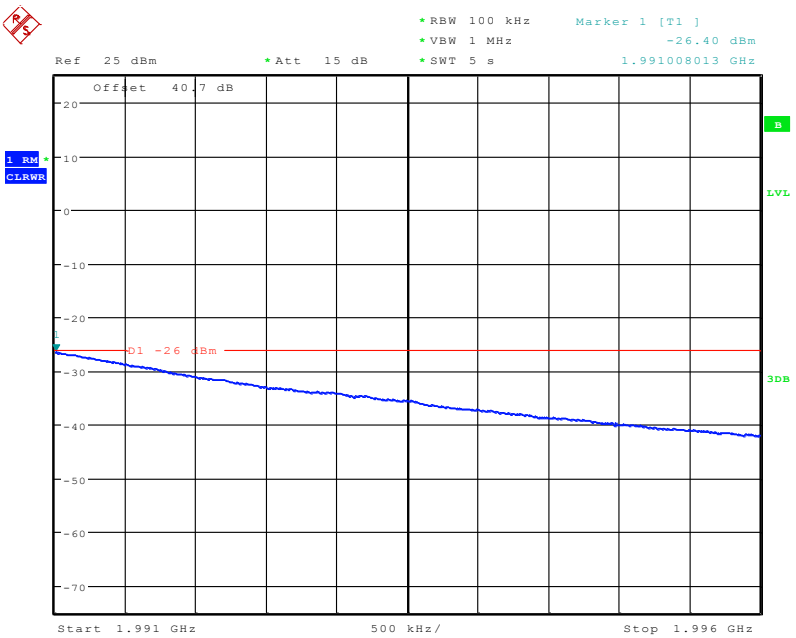



Date: 23.MAY.2014 11:32:05

Configuration 1 - Mode 6 - 3




Date: 23.MAY.2014 14:09:57




Date: 23.MAY.2014 14:09:17

Limit

The power of any emission outside the frequency band shall be attenuated below the transmitter power (P) by at least 43 + 10logP dB.

## 2.6 RADIATED SPURIOUS EMISSIONS

### 2.6.1 Specification Reference

FCC CFR 47 Part 2, Clause 2.1053
FCC CFR 47 Part 24, Clause 24.238 (a)
Industry Canada RSS-133, Clause 6.5

### 2.6.2 Equipment Under Test

RRUS 01 B2 / KRC 118 74/2, S/N: D165426806, CB4S938194

### 2.6.3 Date of Test and Modification State

20 and 24 June 2014 – Modification State 0

### 2.6.4 Test Equipment Used

The major items of test equipment used for the below tests are identified in Section 3.1.

### 2.6.5 Test Method and Operating Modes

The test was applied in accordance with the test method requirements of FCC CFR 47 Part 2 and Part 24 and Industry Canada RSS-133 and ANSI/TIA-603-C-2004.

A preliminary profile of the Spurious Radiated Emissions was obtained by operating the EUT on a remotely controlled turntable within the chamber. Measurements of emissions from the EUT were obtained with the measurement antenna in both horizontal and vertical polarisations.

The measurement of radiated spurious emissions in the frequency range 30MHz to 20GHz was performed using a peak detector and a resolution bandwidth of 1MHz which satisfied the minimum measurement bandwidth requirement of 1MHz as the worst case.

The EUTs were measured with the antenna height varied between 1 and 4 m with the turntable rotated between 0 and 360 degrees. The emission of any frequencies within 10dB of the limit were measured with the substitution method used according to the standard.

The measurements were performed at a 3m distance unless otherwise stated.

The limits for Spurious Emissions have been calculated, as shown below using the following formula:

Field Strength of Carrier - (43 + 10Log (P)) dB

Where:
Field Strength is measured in dBµV/m
P is measured Transmitter Power in Watts

Product Service

**Determination of Spurious Emission Limit**

As the EUT does not have an integral antenna, the field strength of the carrier has been calculated assuming that the power is to be fed to a half-wave tuned dipole as per 2.1053 (a).

$E_{(v/m)}=(30 \times G_i \times P_o)^{0.5} / d$

Where $G_i$ is the antenna gain of ideal half-wave dipoles,
$P_o$ is the power out of the transceiver in W,
d is the measurement distance in meters.

Therefore at 3m measurement distance the field strength using the lowest transceiver output power would be:

$E_{(v/m)}=(30 \times 1.64 \times 63.10)^{0.5} / 3 = 18.57V/m = 145.38dB\mu V/m$

As per 24.238 (a)the spurious emission must be attenuated by 43 + 10log ($P_o$) dB this gives:

43 + 10log(63.10) = 61.00dB

Therefore the limit at 3m measurement distance is:

145.38 – 61.00 = 84.4 dBµV/m

This limit has been used to determine Pass or Fail for the harmonics measured and detailed in the following results.

The test was performed with the EUT operating on all modes in section 1.4.3 and record the result of the following configurations and modes of operation for worst case:

Configuration 1 - Mode 1 - 1.4
- Mode 2 (1.4MHz, 3.0MHz, 5.0MHz, 10.0MHz, 15.0MHz, 20.0MHz OBW)
- Mode 3 - 1.4
- Mode 6 - 1.4

### 2.6.6 Environmental Conditions

| | |
|---|---|
| Ambient Temperature | 22.0 – 28.5°C |
| Relative Humidity | 41.0 – 65.0% |

### 2.6.7 Test Results

For the period of test the EUT met the requirements of FCC CFR 47 Part 2 & Part 24 and Industry Canada RSS-133 for Radiated Spurious Emissions.

The test results are shown below

Note: Only the worst case results plots have been included as other emissions are greater than 20dB below the limit. A set of plots have been included to show the measurement system noise floor.

Product Service

**Single Carrier**

**E-TM1.1**

**1.4MHz Bandwidth**

Configuration 1 - Mode 2

No emissions were detected within 20dB of the limit.

**3.0MHz Bandwidth**

Configuration 1 - Mode 2

No emissions were detected within 20dB of the limit.

**5.0MHz Bandwidth**

Configuration 1 - Mode 2

No emissions were detected within 20dB of the limit.

**10.0MHz Bandwidth**

Configuration 1 - Mode 2

No emissions were detected within 20dB of the limit.

**15.0MHz Bandwidth**

Configuration 1 - Mode 2

No emissions were detected within 20dB of the limit.

**20.0MHz Bandwidth**

Configuration 1 - Mode 2

No emissions were detected within 20dB of the limit.

**E-TM3.2**

**1.4MHz Bandwidth**

Configuration 1 - Mode 2

No emissions were detected within 20dB of the limit.

**E-TM3.1**

**1.4MHz Bandwidth**

Configuration 1 - Mode 1

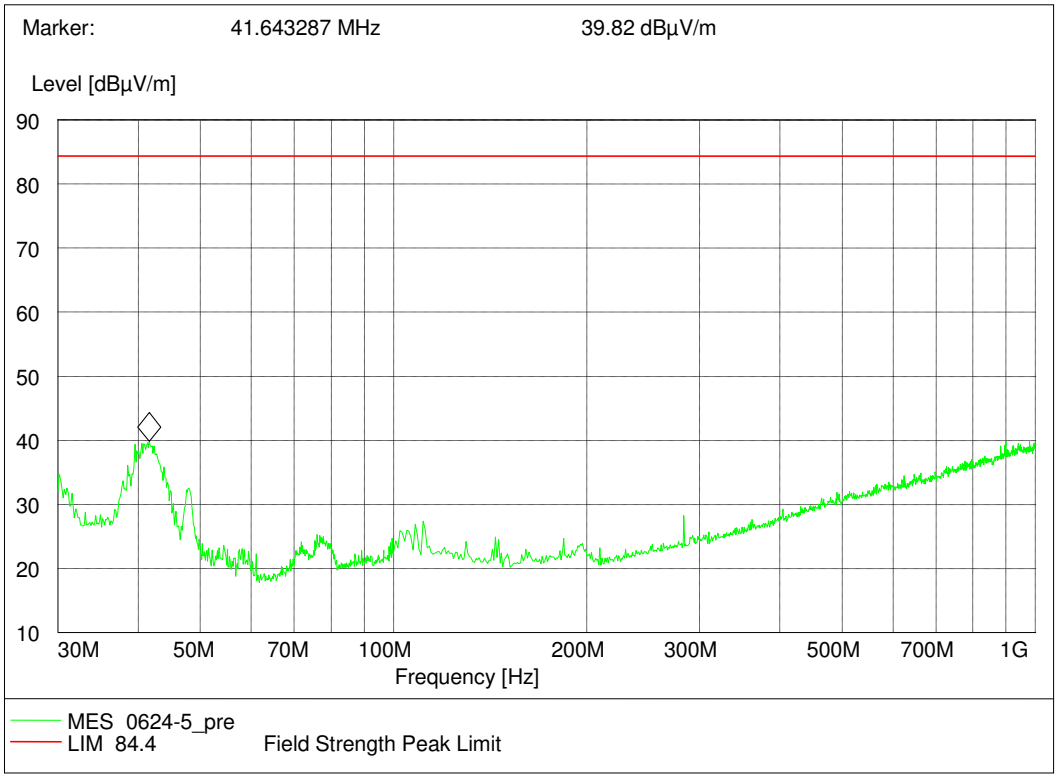
No emissions were detected within 20dB of the limit.

Configuration 1 - Mode 2

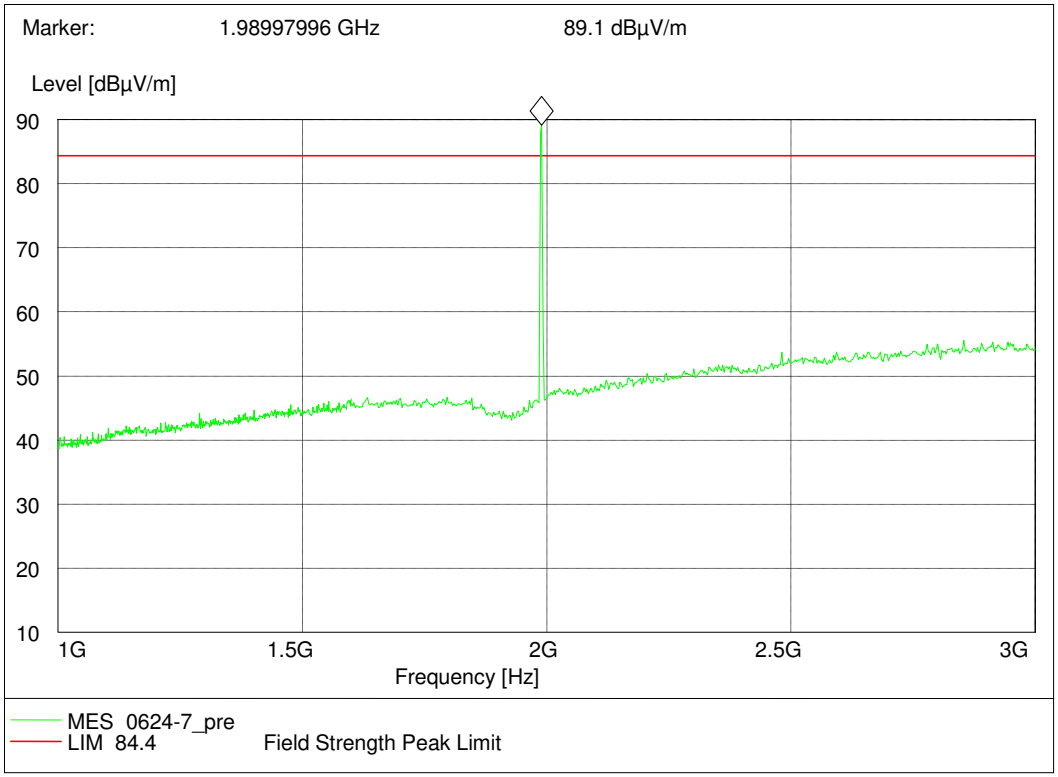
No emissions were detected within 20dB of the limit.

Configuration 1 - Mode 3

30MHz – 1GHz

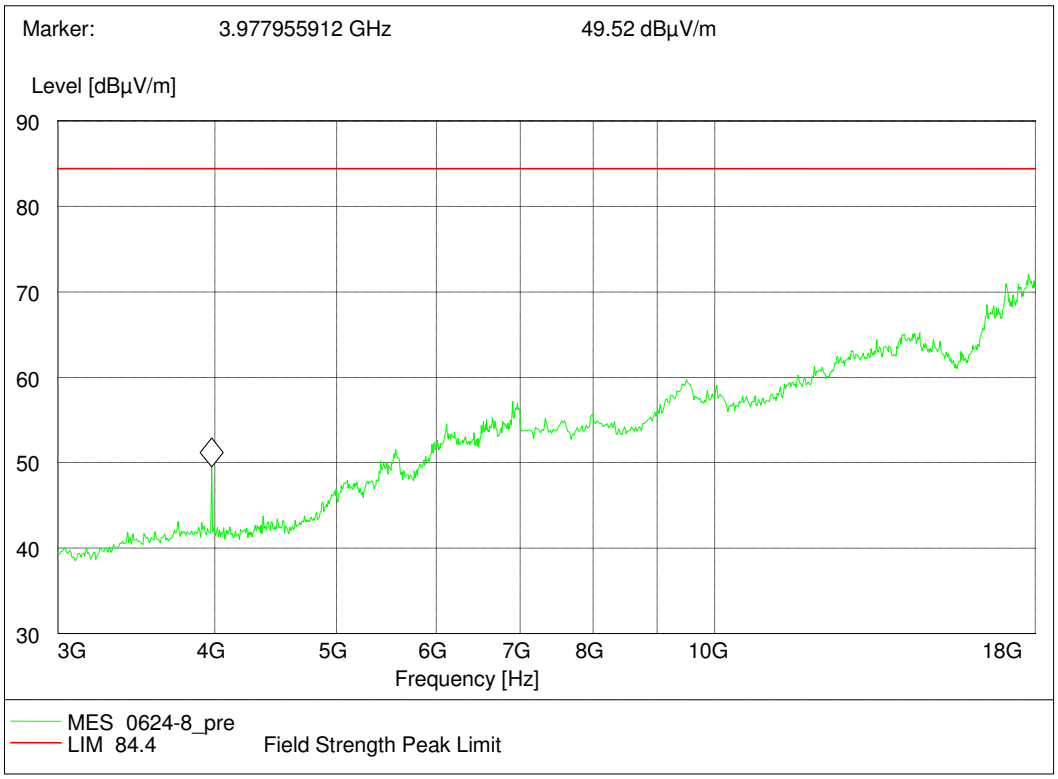


1GHz – 3GHz

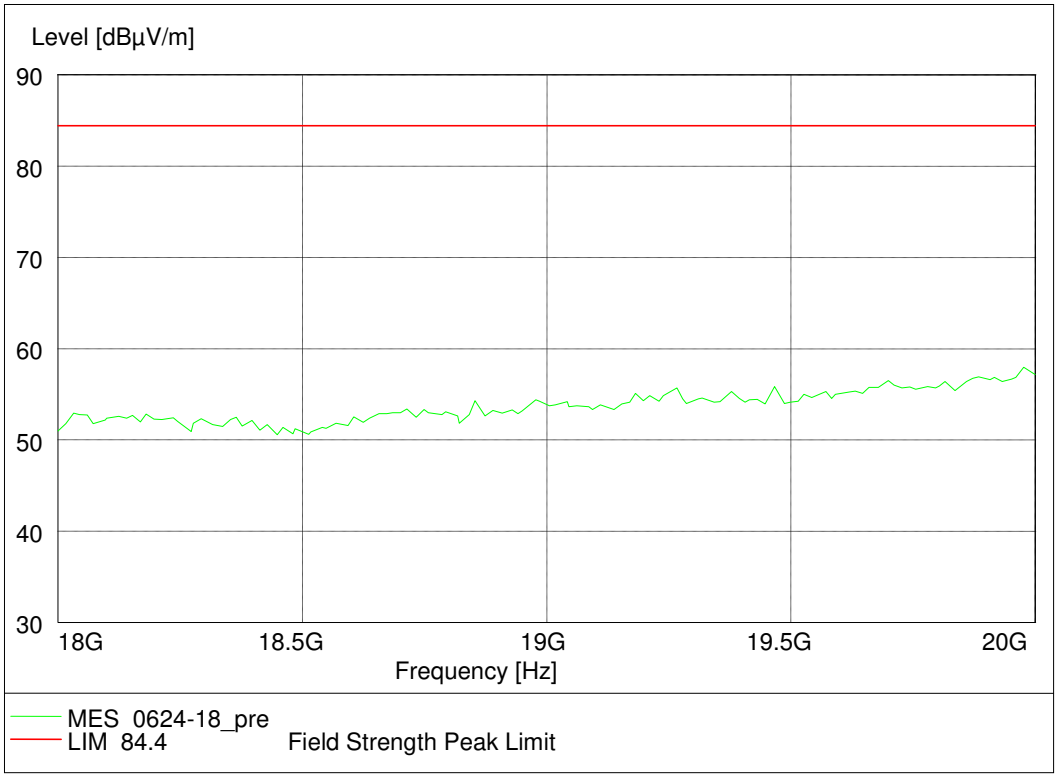



Note: The emission beyond the limit is the operating frequency.

3GHz – 18GHz



18GHz – 20GHz




**Multi Carrier (x2)**

**E-TM1.1**

**1.4MHz Bandwidth**

Configuration 1 - Mode 6

No emissions were detected within 20dB of the limit.

| | |
|---|---|
| Limit | -13dBm / 84.4dBµV/m |

Remarks

The EUT does not exceed -13dBm / 84.4dBµV/m at the measured frequencies.

Product Service

## 2.7 CONDUCTED SPURIOUS EMISSIONS

### 2.7.1 Specification Reference

FCC CFR 47 Part 2, Clause 2.1051
FCC CFR 47 Part 24, Clause 24.238 (a)
Industry Canada RSS-133, Clause 6.5

### 2.7.2 Equipment Under Test

RRUS 01 B2 / KRC 118 74/2, S/N: D165426806, CB4S938194

### 2.7.3 Date of Test and Modification State

11 April to 26 May 2014 – Modification State 0

### 2.7.4 Test Equipment Used

The major items of test equipment used for the below tests are identified in Section 3.1.

### 2.7.5 Test Method and Operating Modes

The test was applied in accordance with the test method requirements of FCC CFR 47 Part 2 and Part 24 and Industry Canada RSS-133.

In accordance with FCC CFR 47 Part 24, Clause 24.238(a), any emissions outside a licensee's frequency band(s) of operation shall be attenuated below the transmitter power (P) within the licensed band(s) of operation, measured in watts, by at least 43 + 10 log (P) dB. The measurements were performed on the output connector RF A1. Limited complementary measurement were done at output connector RF A2 to verify identical performance for both transmitter chains. The EUT was set to transmit on maximum power. The transmitter output was attenuated using an attenuator and the frequency spectrum investigated from 9kHz to 20GHz. The EUT was tested on Bottom, Middle and Top channels and just E-TM1.1 test model for single carrier and multi carrier configurations was selected as the representative modes. The resolution was set to 1MHz for 9kHz to 20GHz thus meeting the requirements of FCC CFR 47 Part 24, Clause 24.238 (b) and Industry Canada RSS-133, Clause 6.5. The spectrum analyser detector was set to peak and trace was kept on Max Hold as worst case.

The limit was adjusted with a correction of -3dB [10Log(2)] by using the Measure and Add 10Log(N) dB technique according to FCC KDB662911 D01 Multiple Transmitter Output v02r01 accounting for simultaneous transmission from antenna ports RF A1 and RF A2.

The maximum path loss across the measurement band was used as the reference level offset to ensure worst case.

Measurements were made up to the $10^{th}$ harmonic of the highest carrier frequency at least.

The test was performed with the EUT in the following configurations and modes of operation:

Configuration 1
- Mode 1 - 1.4
- Mode 2 (1.4MHz OBW)
- Mode 3 - 1.4
- Mode 4 - 1.4, Mode 4 - 3
- Mode 4' - 3
- Mode 5 - 1.4, Mode 5 - 3
- Mode 6 - 1.4, Mode 6 - 3
- Mode 6' - 3

### 2.7.6 Environmental Conditions

| | |
|---|---|
| Ambient Temperature | 22.0 – 28.5°C |
| Relative Humidity | 41.0 – 65.0% |

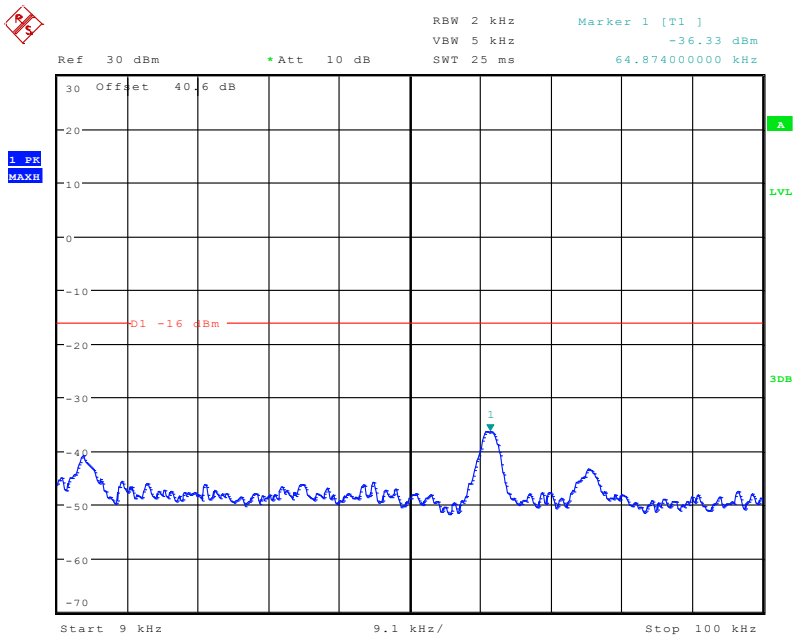
### 2.7.7 Test Results

For the period of test the EUT met the requirements of FCC CFR 47 Part 2 and Part 24 and Industry Canada RSS-133 for Conducted Spurious Emissions.

The test results are shown below

Remark:

The emissions at 9kHz on the plots was not generated by the test object. A complementary measurement with a smaller span showed that it was related to the LO feedthrough.



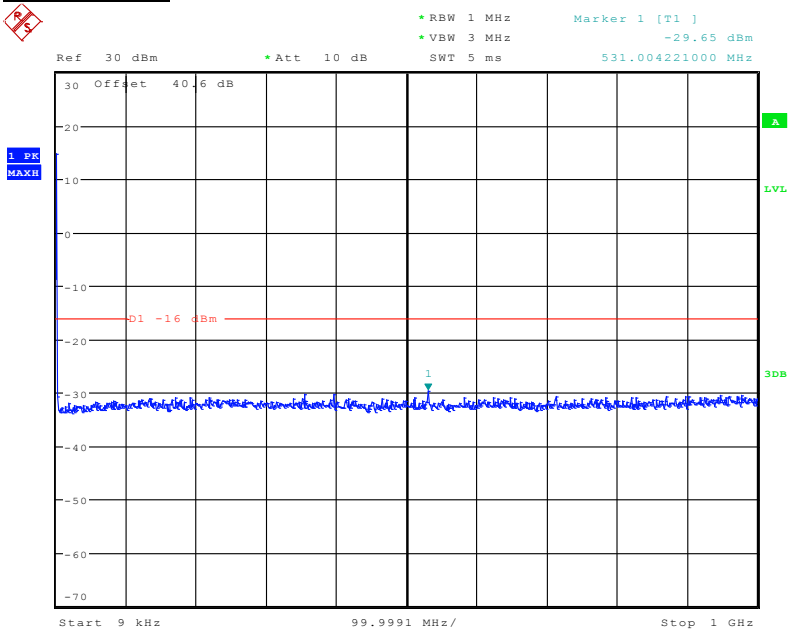
Product Service

**Single Carrier**

**E-TM1.1 - 1.4MHz Bandwidth**

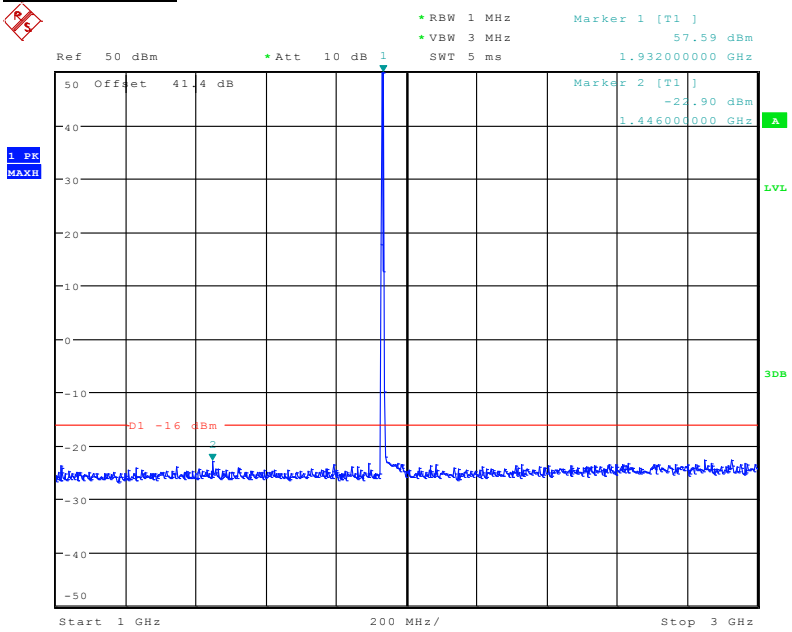
Configuration 1 - Mode 1 - 1.4

9kHz to 1GHz




Date: 14.APR.2014 14:29:55

1GHz to 3GHz

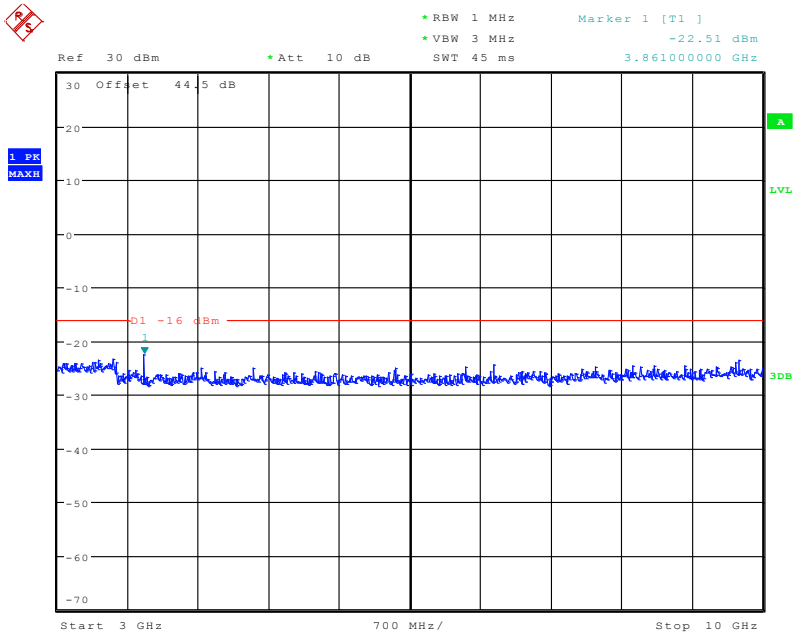



Date: 14.APR.2014 14:27:19

Note: The emission beyond the limit is the operating frequency.

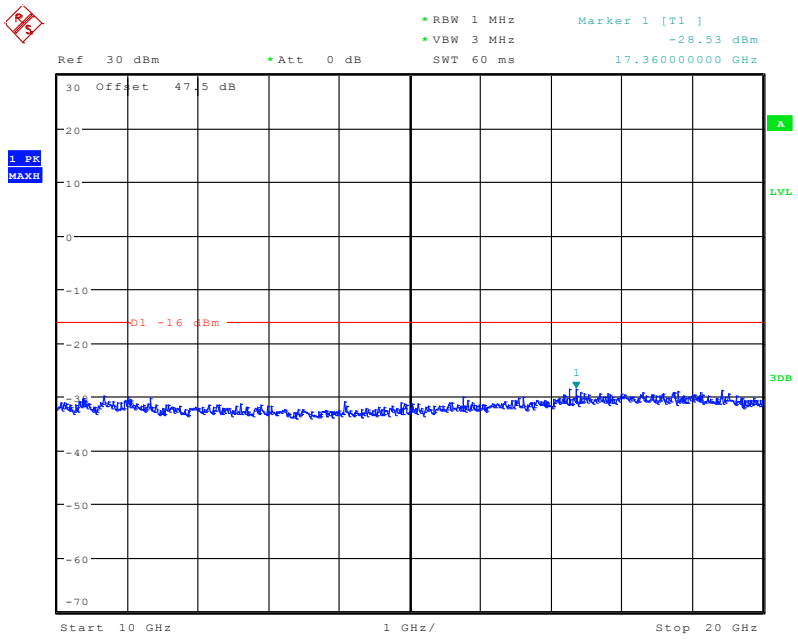
Product Service

## 3GHz to 10GHz




Date: 14.APR.2014 14:26:06

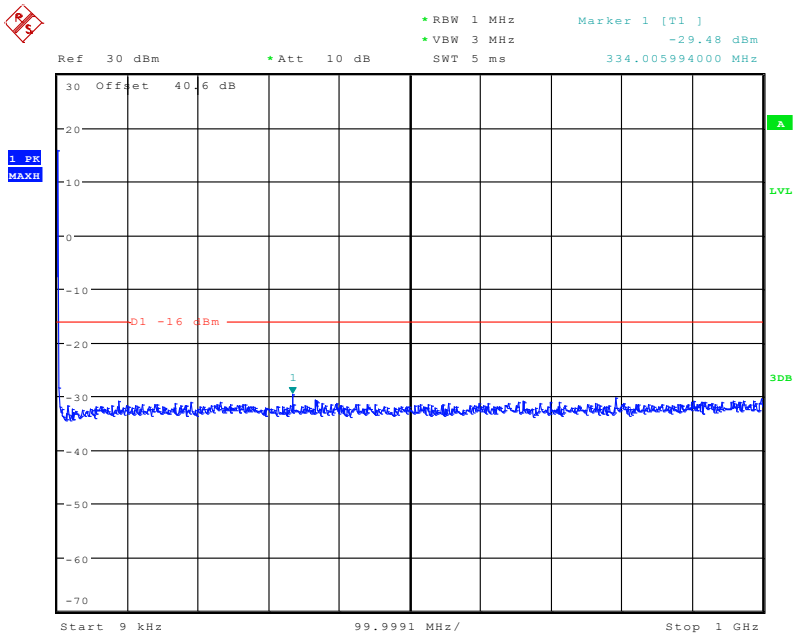
## 10GHz to 20GHz




Date: 14.APR.2014 14:23:49

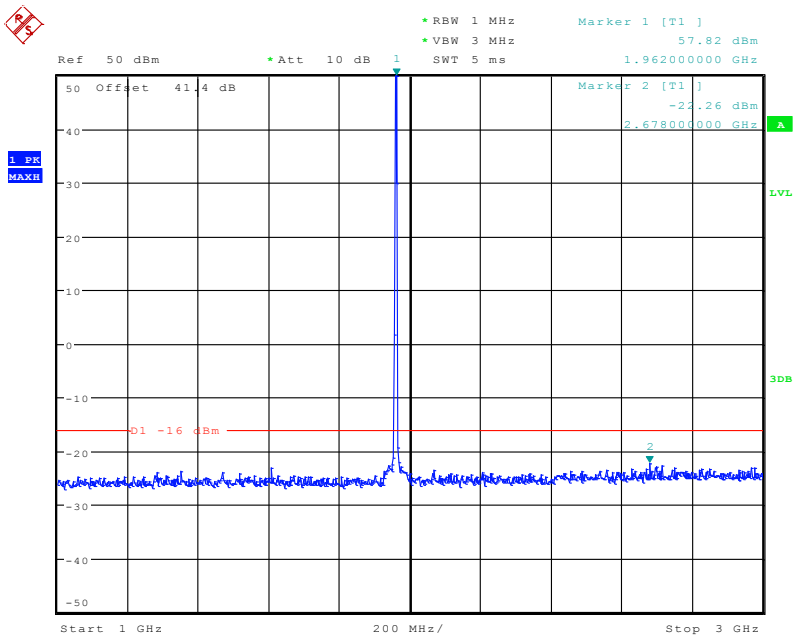
Configuration 1 - Mode 2 - 1.4

9kHz to 1GHz




Date: 11.APR.2014 17:53:07

1GHz to 3GHz

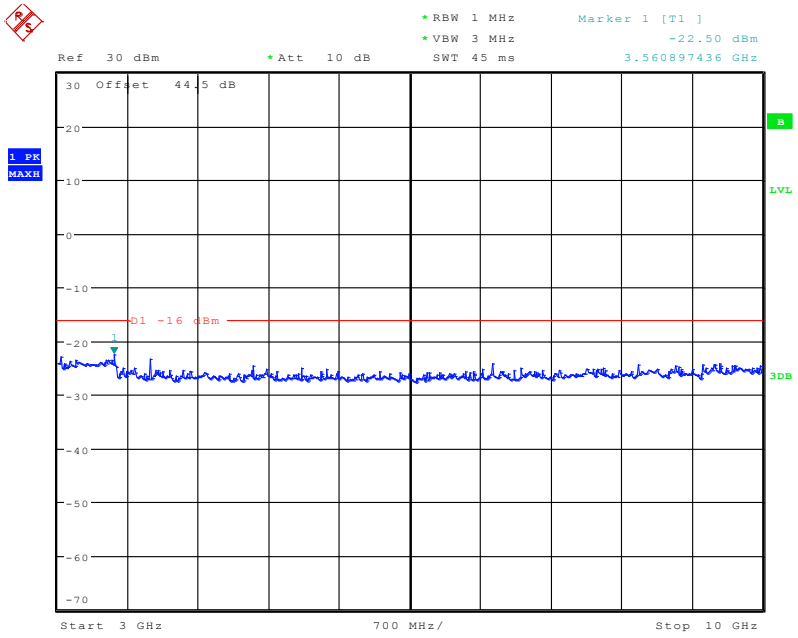



Date: 11.APR.2014 17:52:04

Note: The emission beyond the limit is the operating frequency.

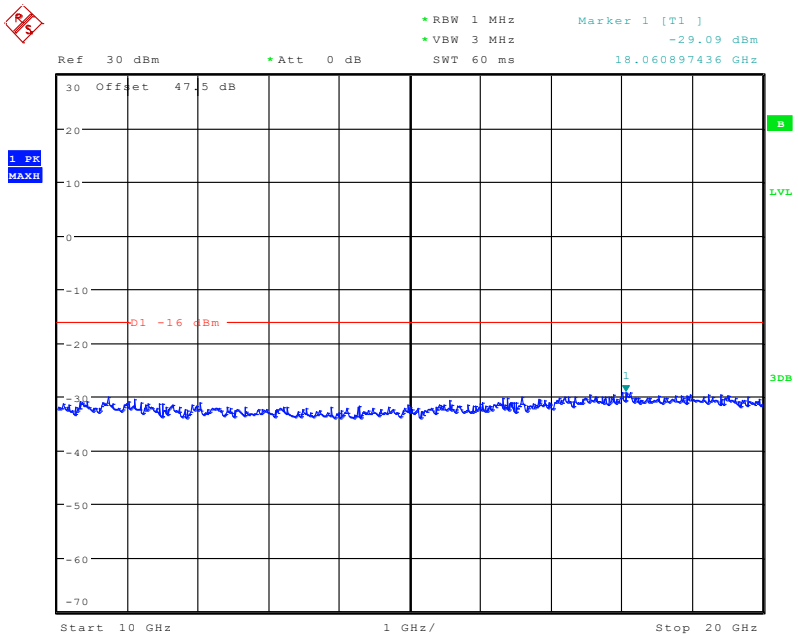
Product Service

## 3GHz to 10GHz




Date: 11.APR.2014 16:13:19

## 10GHz to 20GHz

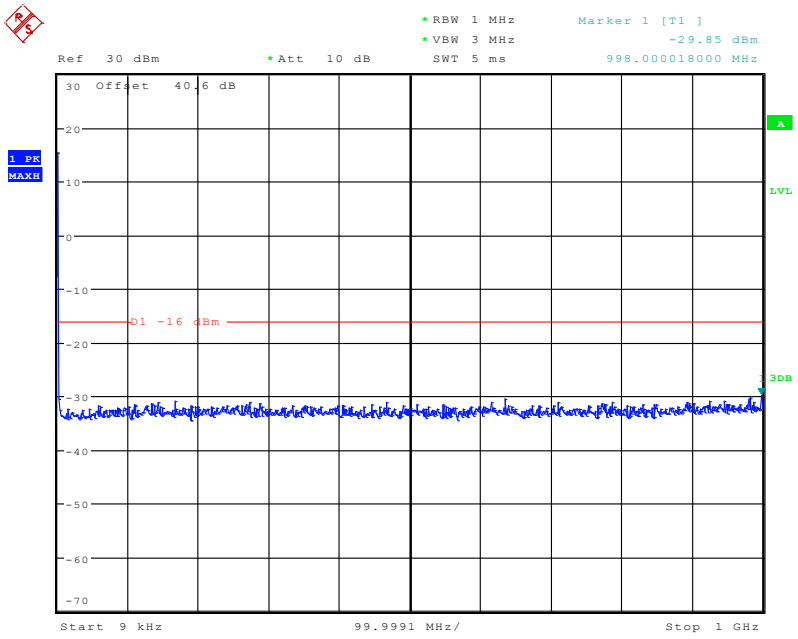



Date: 11.APR.2014 16:08:49

Product Service

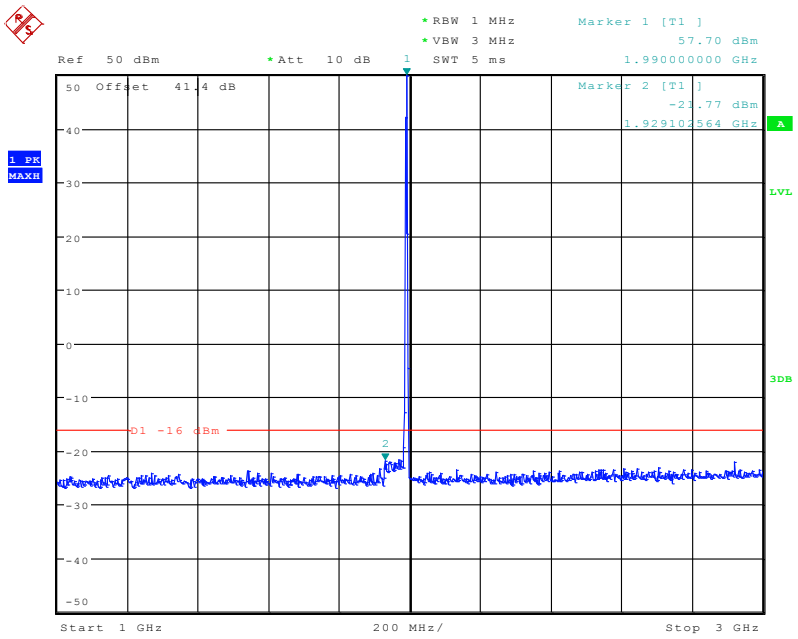
Configuration 1 - Mode 3 - 1.4

9kHz to 1GHz




Date: 14.APR.2014 15:21:26

1GHz to 3GHz

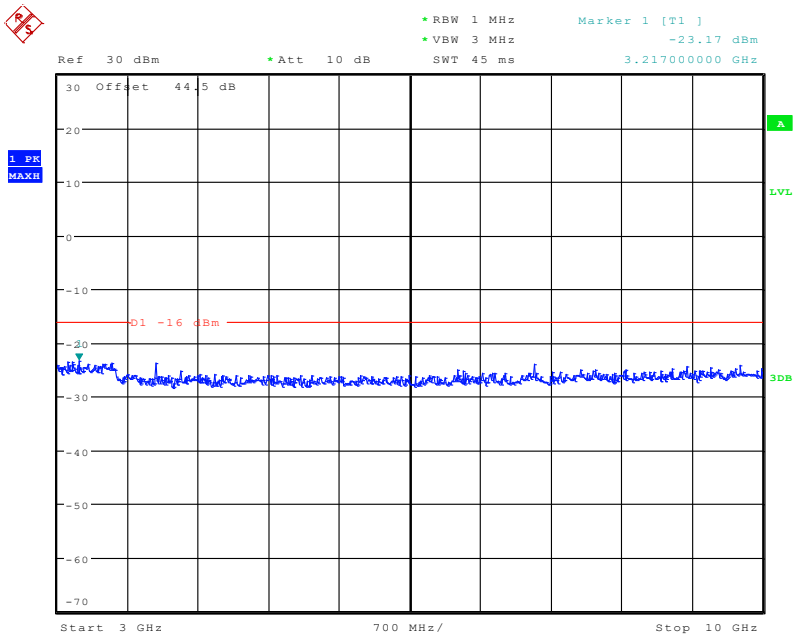



Date: 14.APR.2014 15:22:42

Note: The emission beyond the limit is the operating frequency.

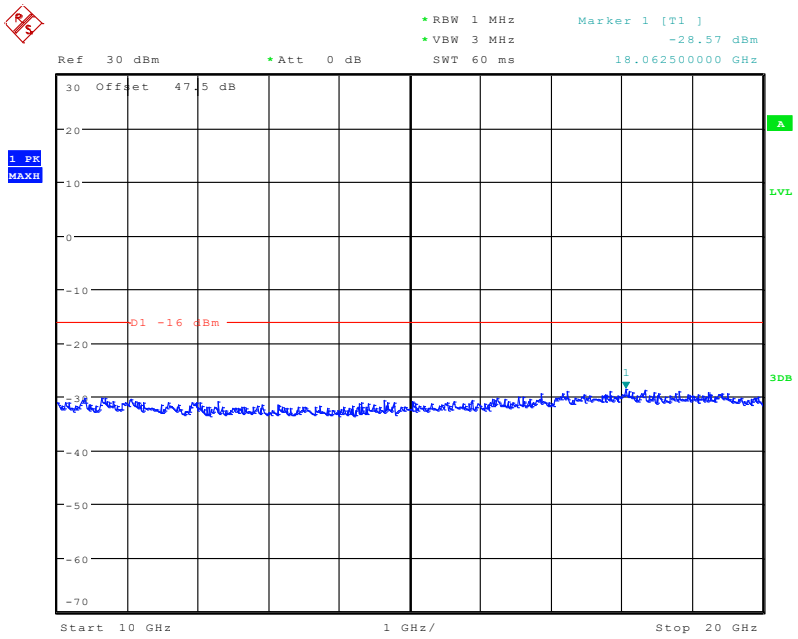
Product Service

## 3GHz to 10GHz




Date: 14.APR.2014 15:23:30

## 10GHz to 20GHz



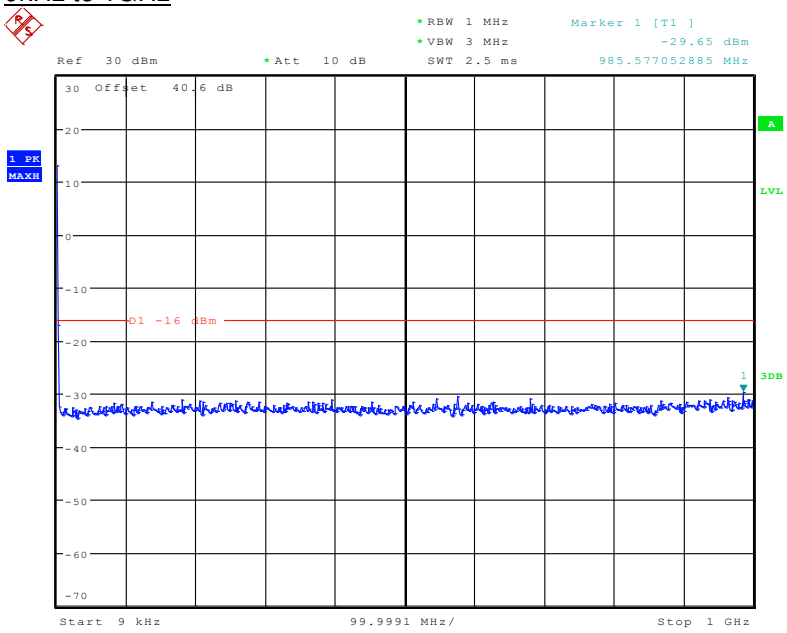

Date: 14.APR.2014 15:25:08

**Multi Carrier (x2)**

**E-TM1.1 - 1.4MHz Bandwidth**

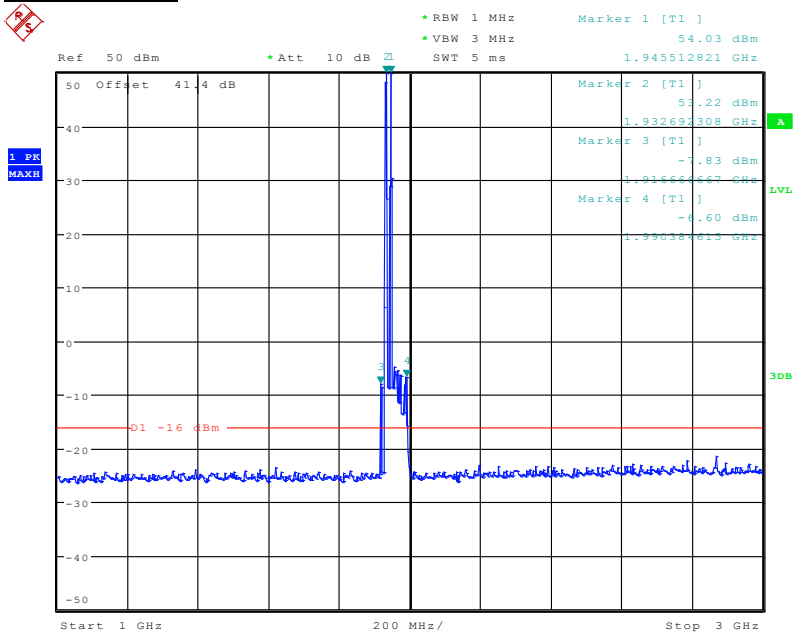
Configuration 1 - Mode 4 - 1.4

9kHz to 1GHz



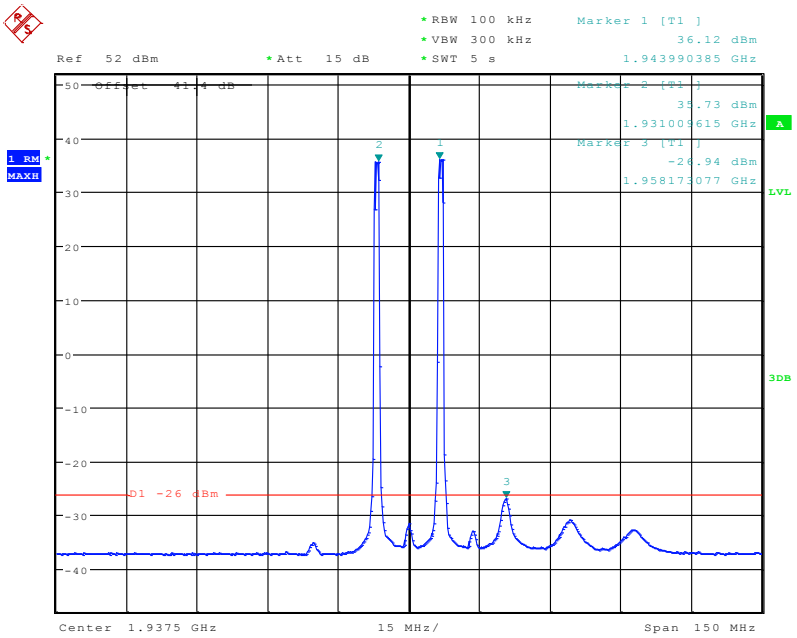

Date: 26.MAY.2014 13:52:32

1GHz to 3GHz




Date: 26.MAY.2014 13:54:28

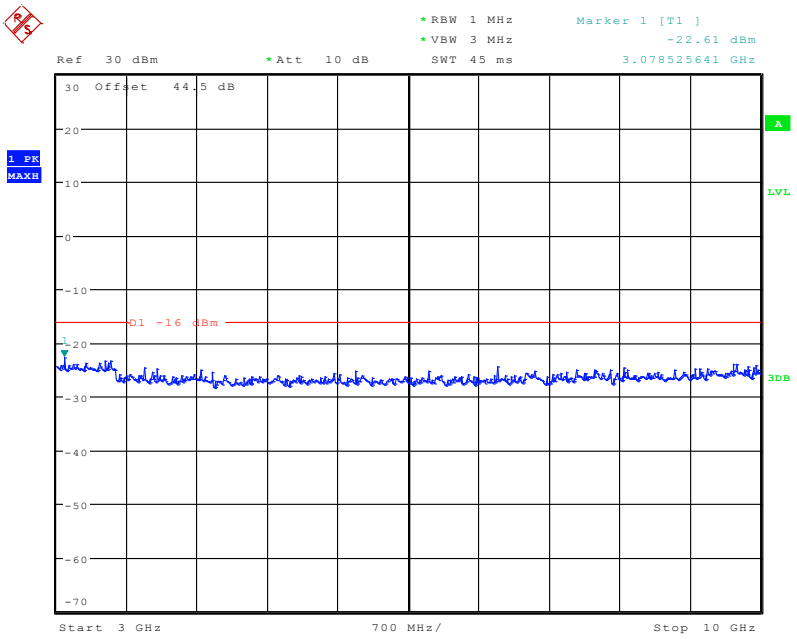
Note: The emissions above the limit are measured in a smaller bandwidth and using a RMS detector, see the plot on page 108 of 137.




Date: 26.MAY.2014 13:55:59

Note: The limit has been tightened by 10dB to account for the reduction in measurement bandwidth.

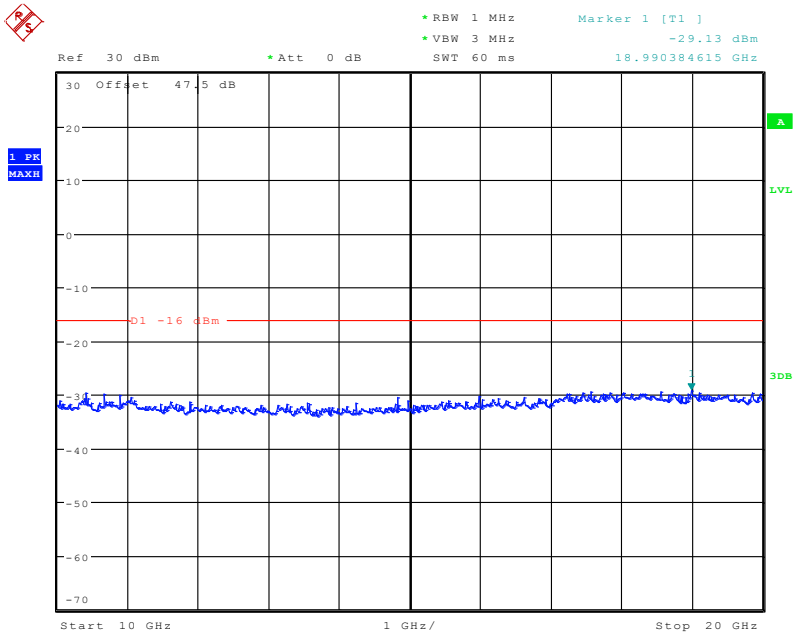
3GHz to 10GHz




Date: 26.MAY.2014 13:57:45

Product Service

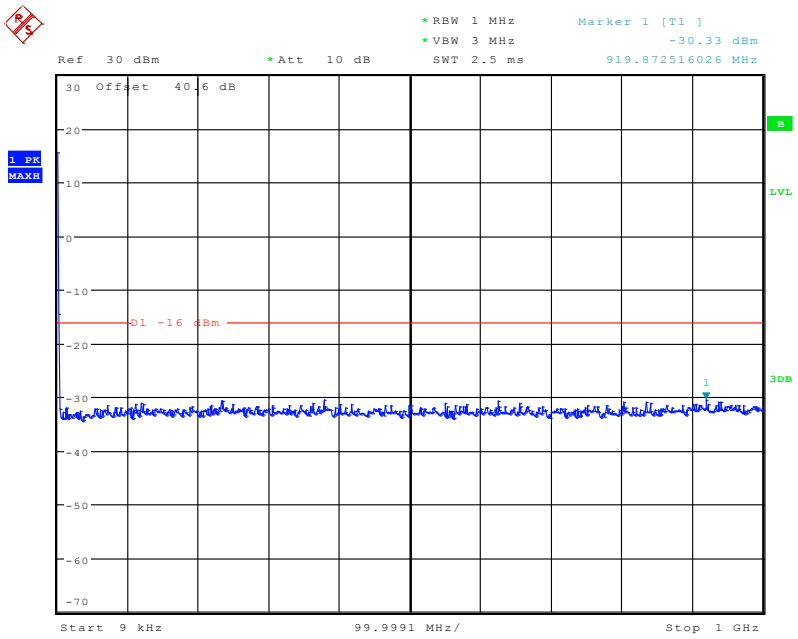
10GHz to 20GHz




Date: 26.MAY.2014 13:58:33

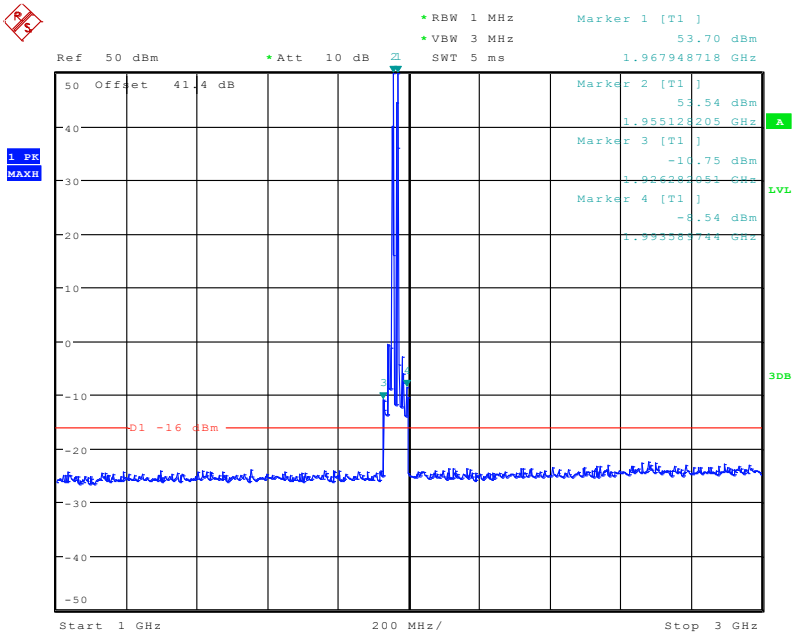
Configuration 1 - Mode 5 - 1.4

9kHz to 1GHz



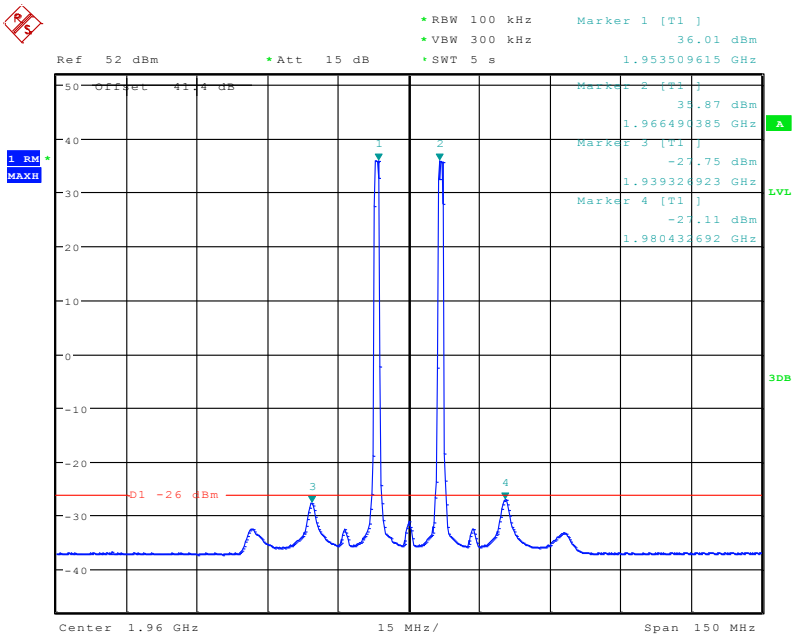

Date: 26.MAY.2014 14:29:40

1GHz to 3GHz




Date: 26.MAY.2014 14:12:05

Note: The emissions above the limit are measured in a smaller bandwidth and using a RMS detector, see the plot below.

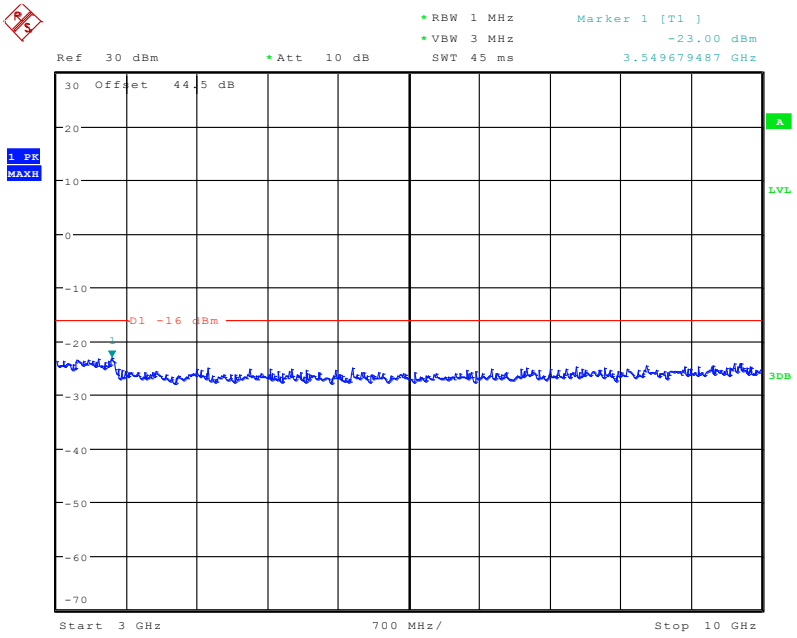



Date: 26.MAY.2014 14:16:43

Note: The limit has been tightened by 10dB to account for the reduction in measurement bandwidth.

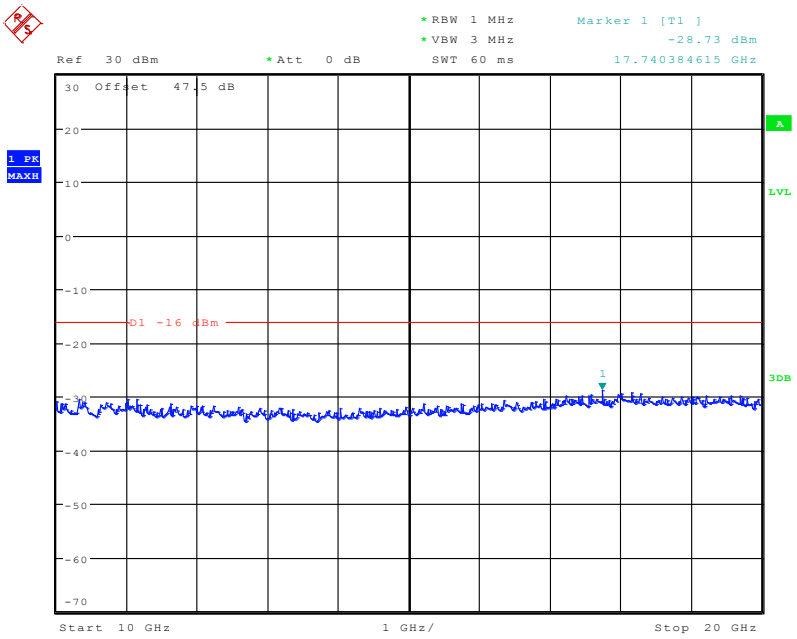
Product Service

## 3GHz to 10GHz




Date: 26.MAY.2014 14:07:02

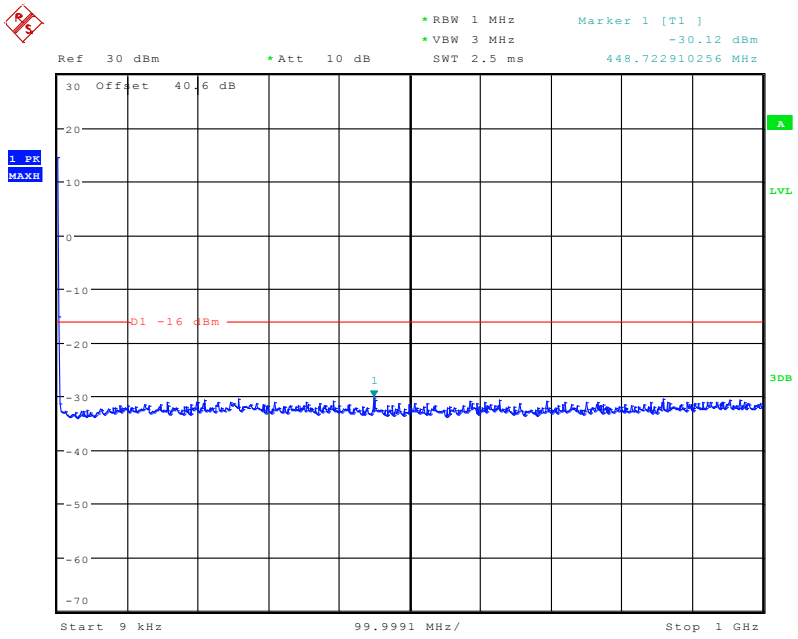
## 10GHz to 20GHz




Date: 26.MAY.2014 14:05:47

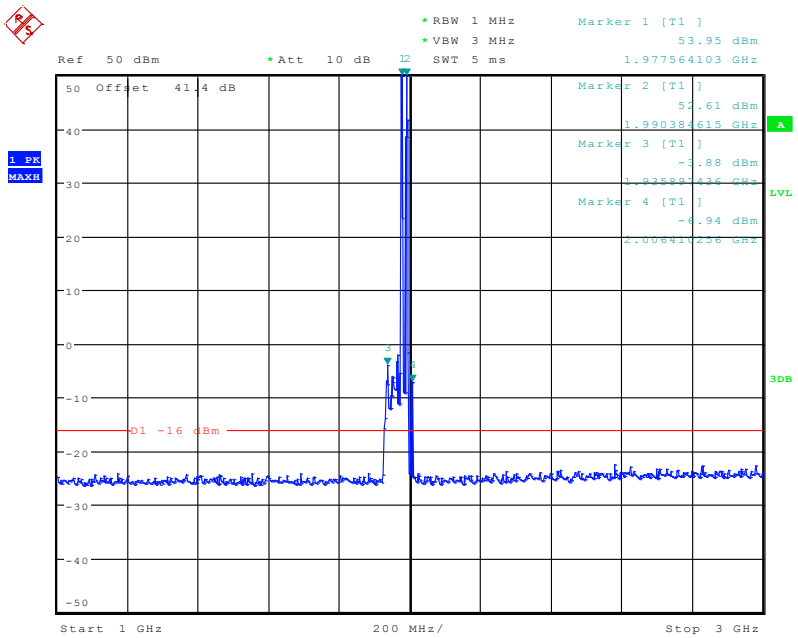
Configuration 1 - Mode 6 - 1.4

9kHz to 1GHz



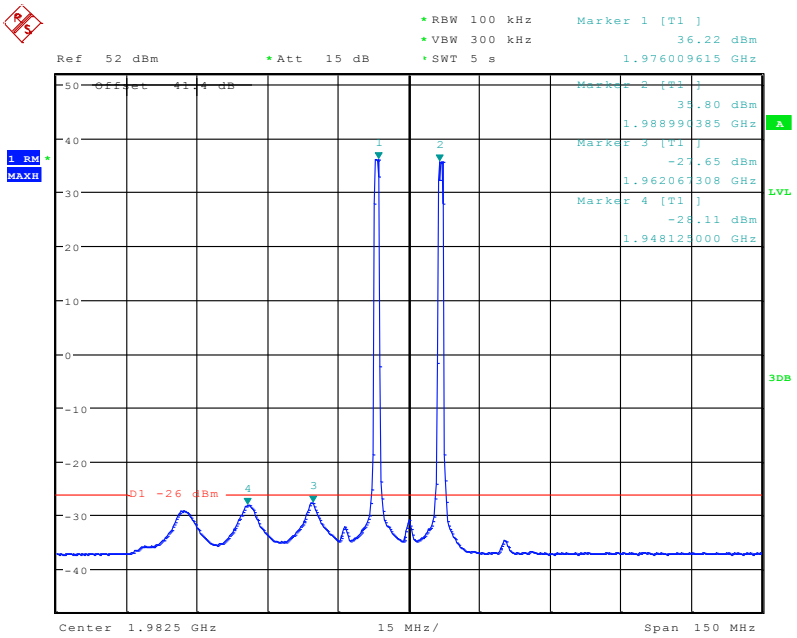

Date: 26.MAY.2014 12:15:23

1GHz to 3GHz




Date: 26.MAY.2014 12:21:09

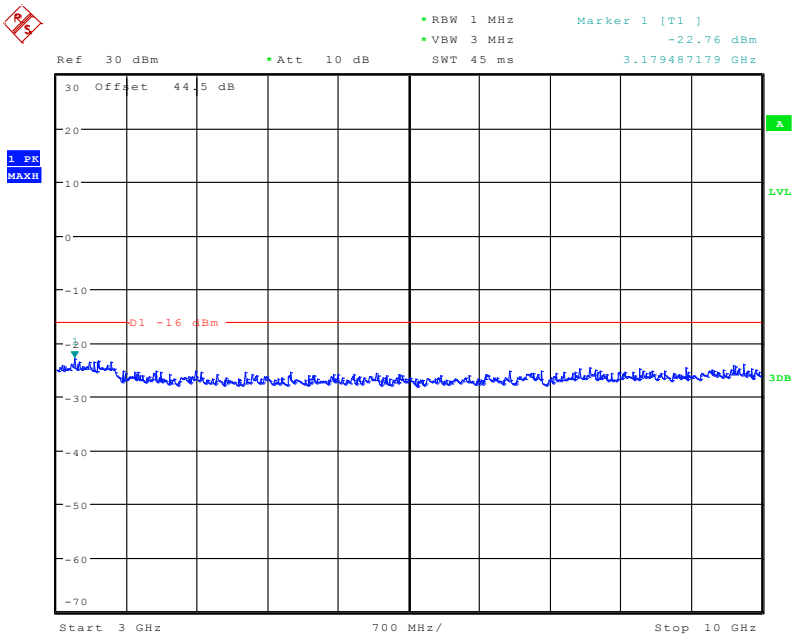
Note: The emissions above the limit are measured in a smaller bandwidth and using a RMS detector, see the plot on page 113 of 137.




Date: 26.MAY.2014 12:22:23

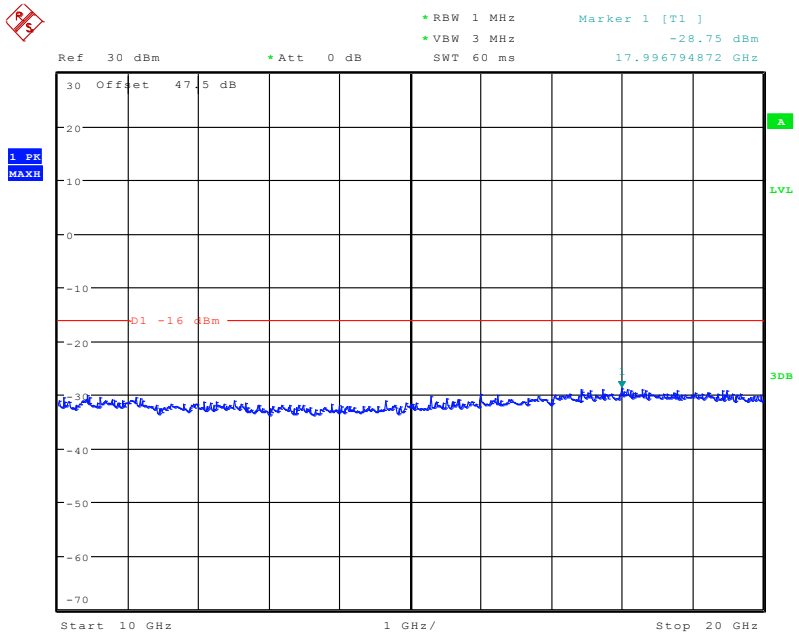
Note: The limit has been tightened by 10dB to account for the reduction in measurement bandwidth.

3GHz to 10GHz




Date: 26.MAY.2014 12:23:31

10GHz to 20GHz

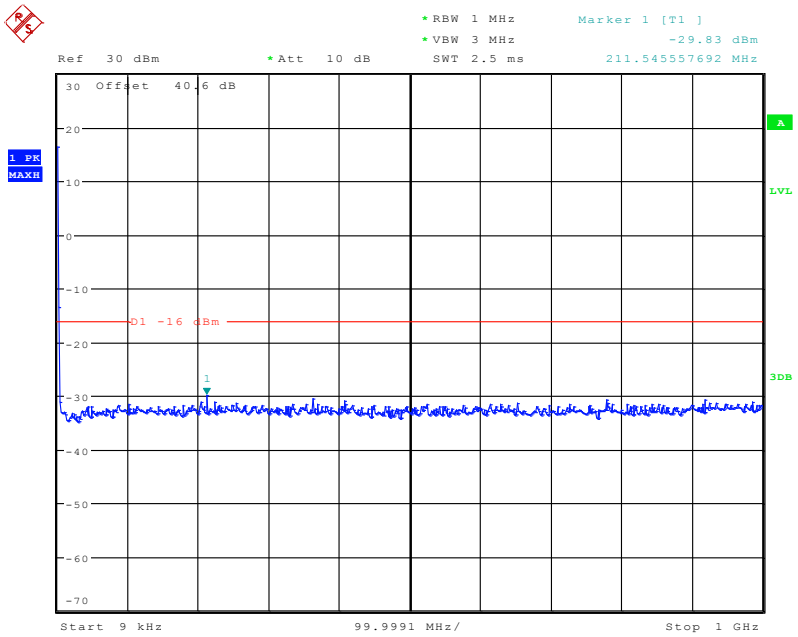



Date: 26.MAY.2014 12:25:04

## E-TM1.1 - 3MHz Bandwidth

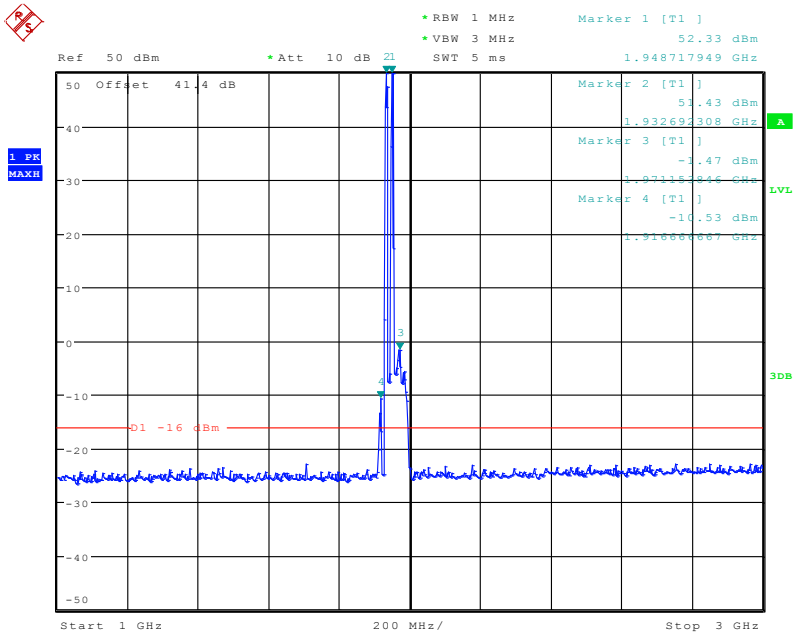
Configuration 1 - Mode 4 - 3

9kHz to 1GHz



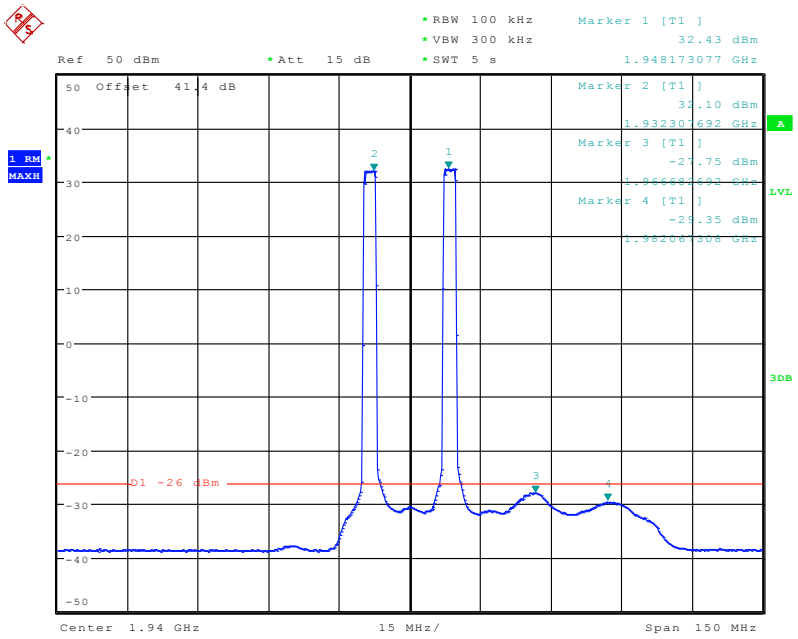

Date: 23.MAY.2014 12:06:39

1GHz to 3GHz




Date: 23.MAY.2014 11:46:51

Note: The emissions above the limit are measured in a smaller bandwidth and using a RMS detector, see the plot below.

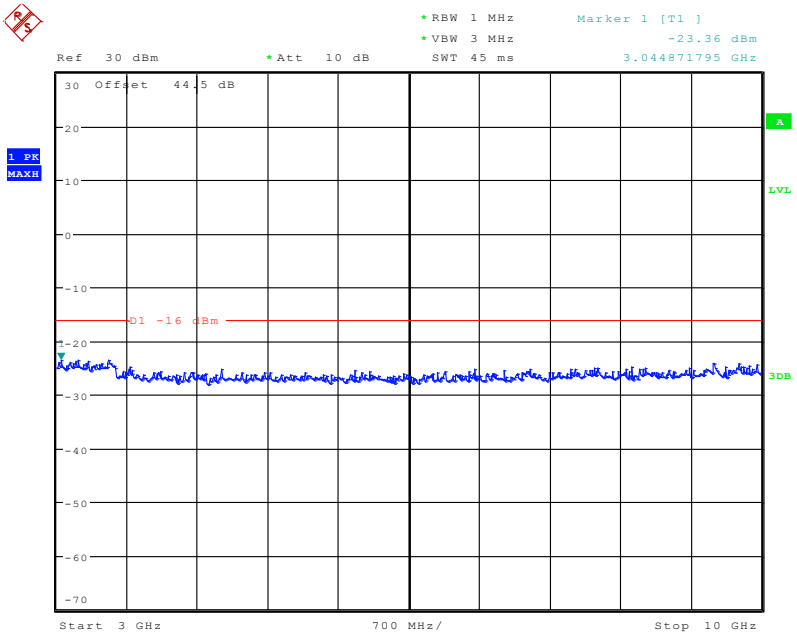



Date: 26.MAY.2014 14:39:49

Note: The limit has been tightened by 10dB to account for the reduction in measurement bandwidth.

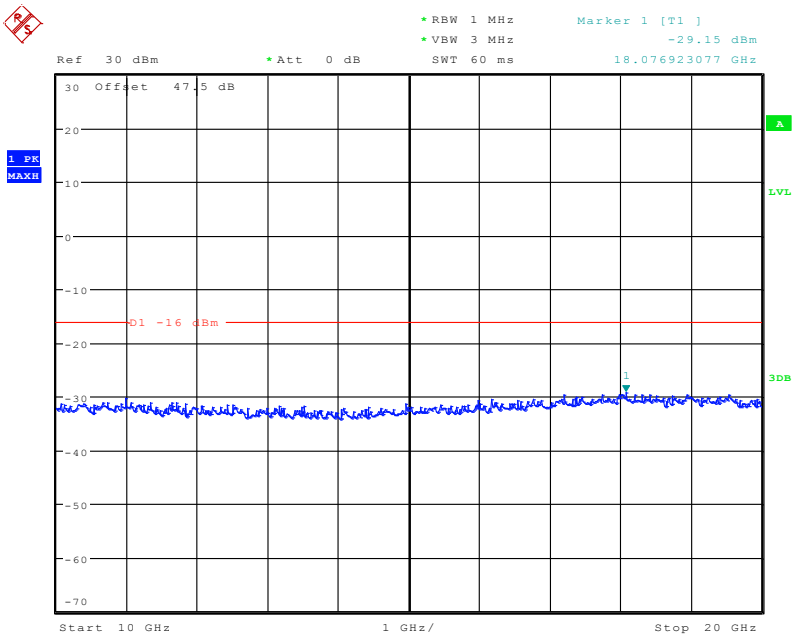
Product Service

## 3GHz to 10GHz




Date: 23.MAY.2014 11:49:34

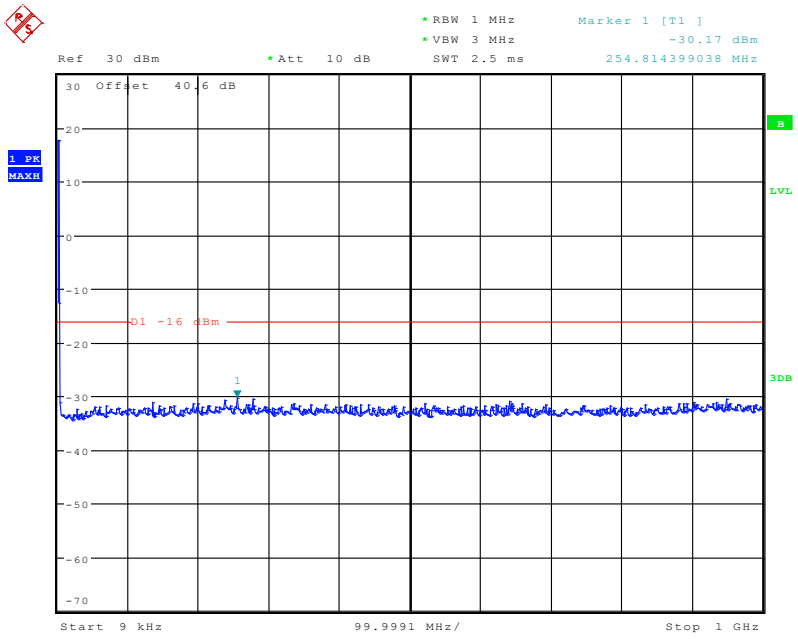
## 10GHz to 20GHz




Date: 23.MAY.2014 11:50:26

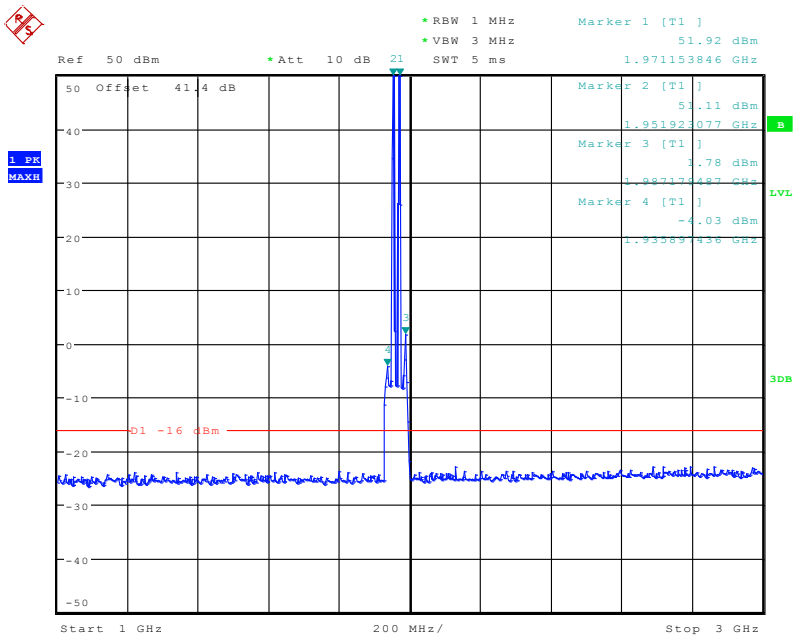
Configuration 1 - Mode 5 - 3

9kHz to 1GHz



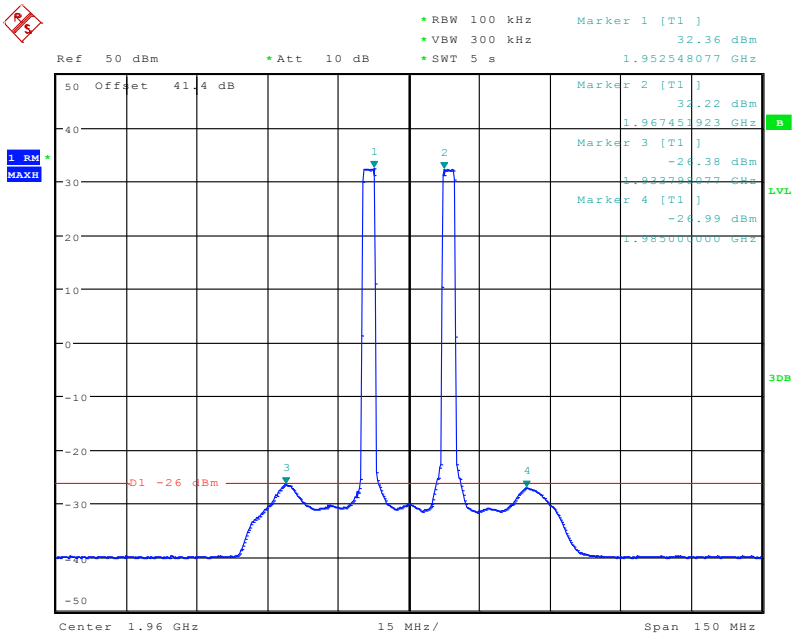

Date: 23.MAY.2014 14:50:10

1GHz to 3GHz




Date: 23.MAY.2014 14:53:04

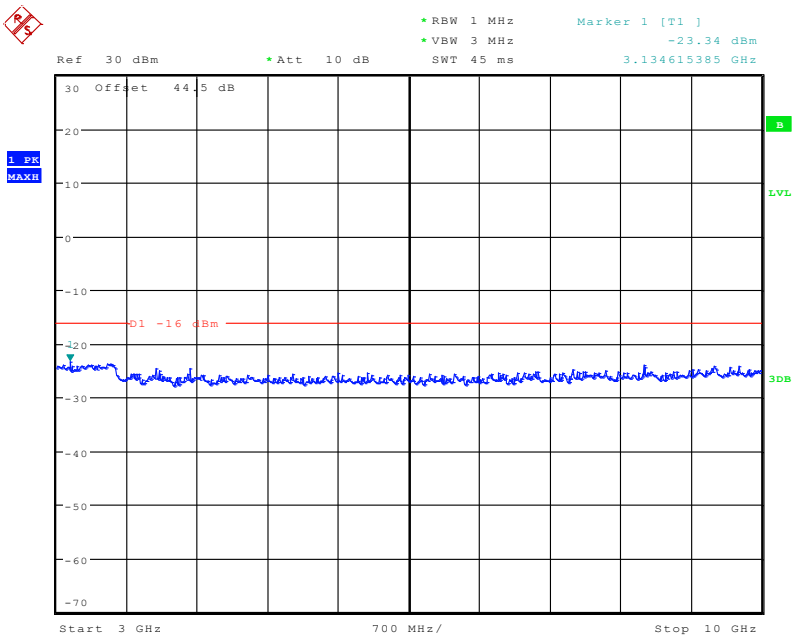
Note: The emissions above the limit are measured in a smaller bandwidth and using a RMS detector, see the plot on page 118 of 137.




Date: 23.MAY.2014 14:54:12

Note: The limit has been tightened by 10dB to account for the reduction in measurement bandwidth.

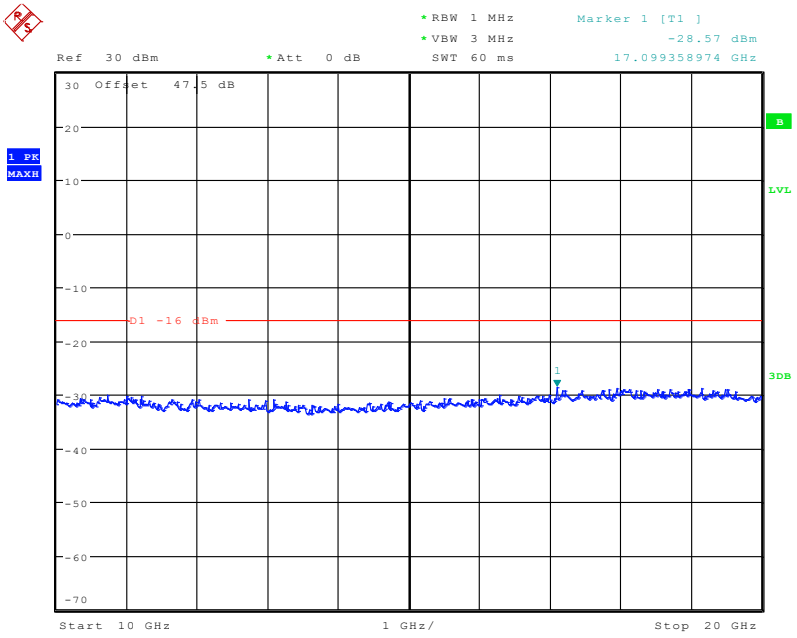
3GHz to 10GHz




Date: 23.MAY.2014 14:56:12

Product Service

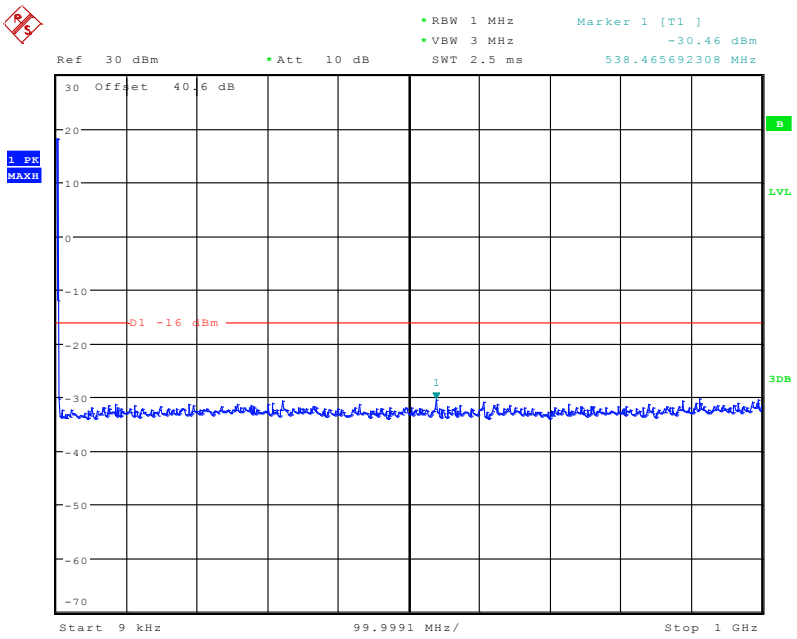
10GHz to 20GHz




Date: 23.MAY.2014 14:57:36

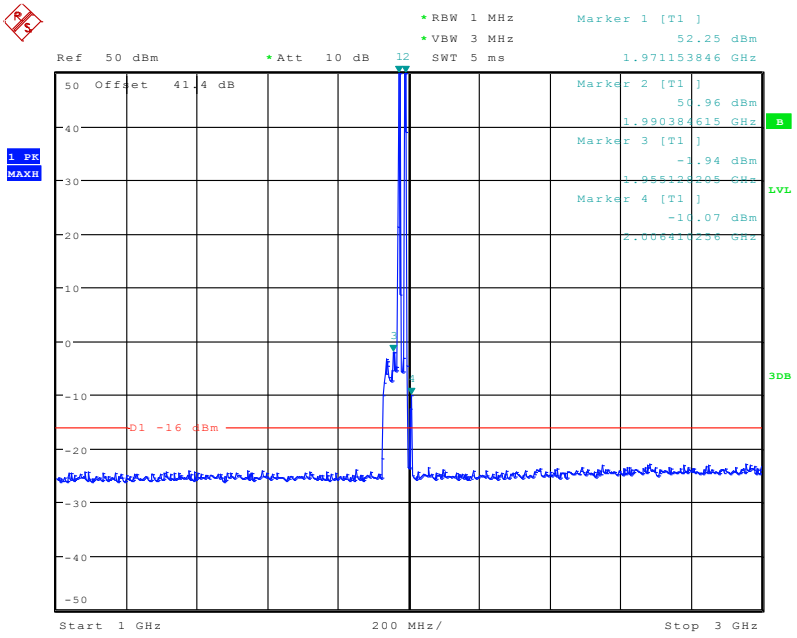
Configuration 1 - Mode 6 - 3

9kHz to 1GHz



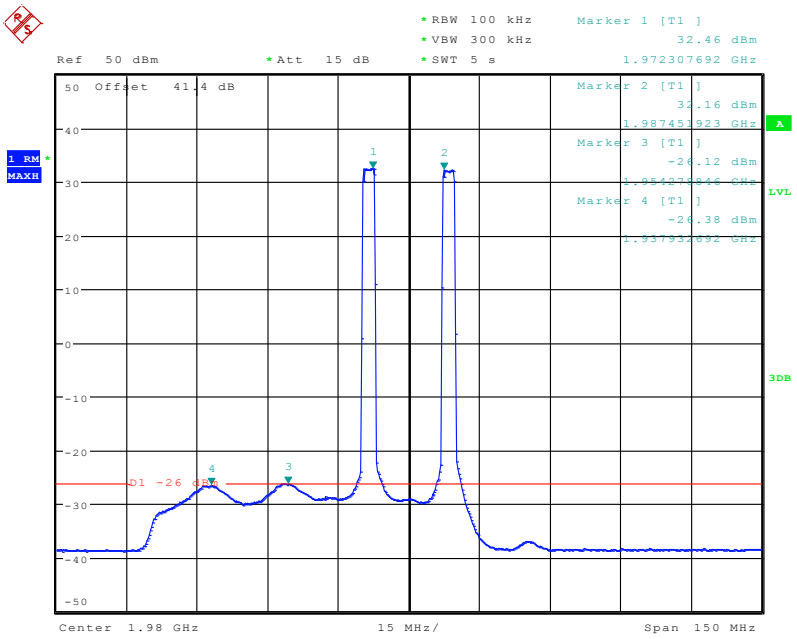

Date: 23.MAY.2014 14:30:31

1GHz to 3GHz




Date: 23.MAY.2014 14:24:17

Note: The emissions above the limit are measured in a smaller bandwidth and using a RMS detector, see the plot below.

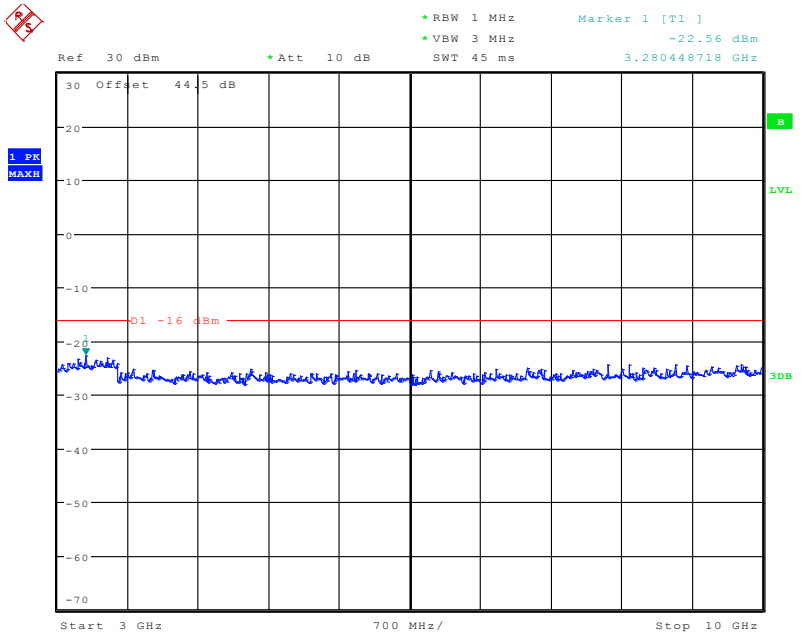



Date: 26.MAY.2014 14:42:31

Note: The limit has been tightened by 10dB to account for the reduction in measurement bandwidth.

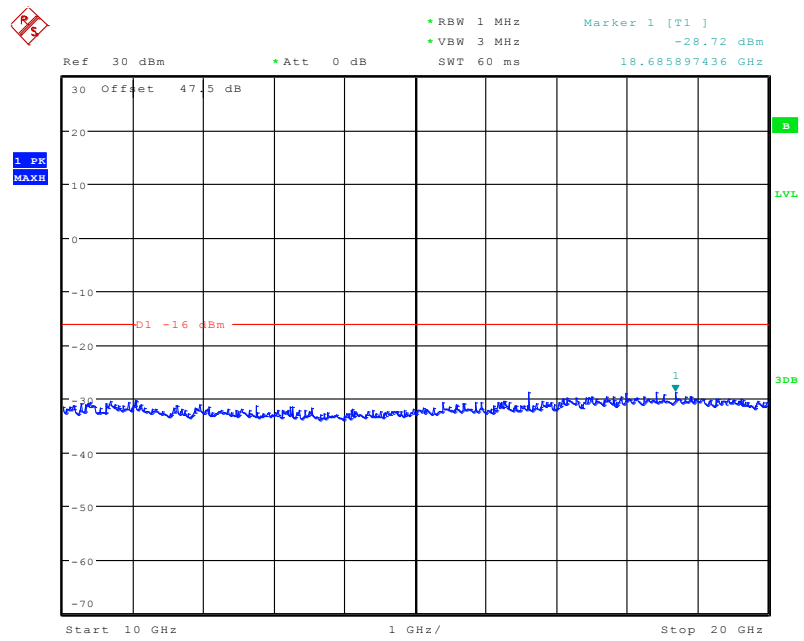
Product Service

## 3GHz to 10GHz




Date: 23.MAY.2014 14:28:34

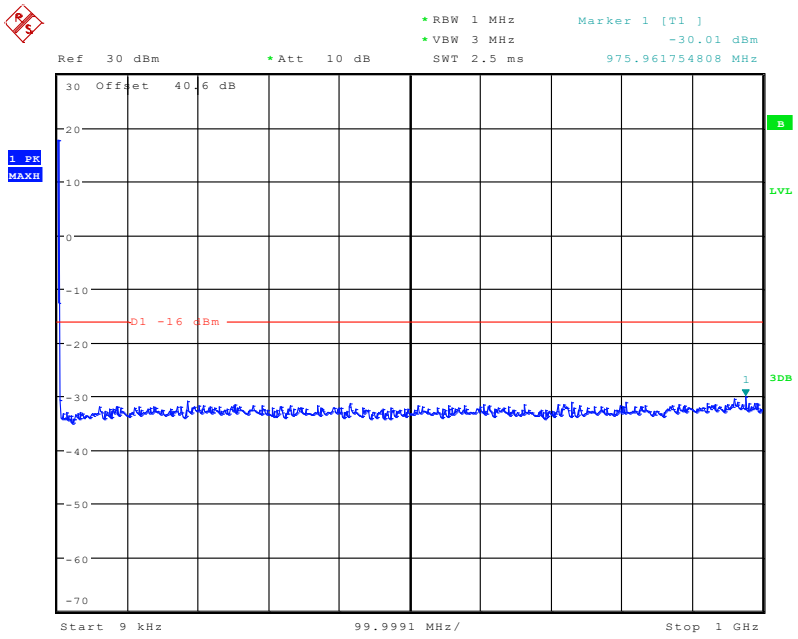
## 10GHz to 20GHz




Date: 23.MAY.2014 14:29:29

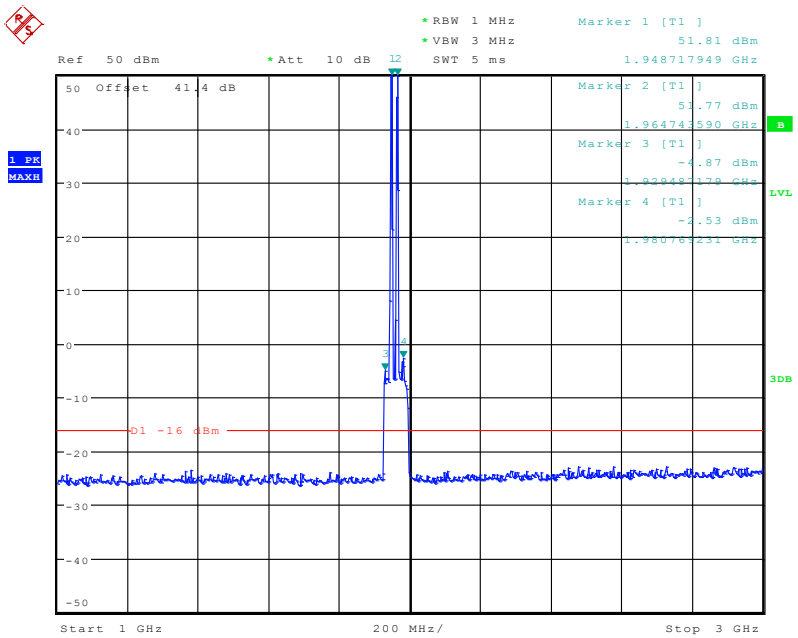
Configuration 1 - Mode 4' - 3

9kHz to 1GHz



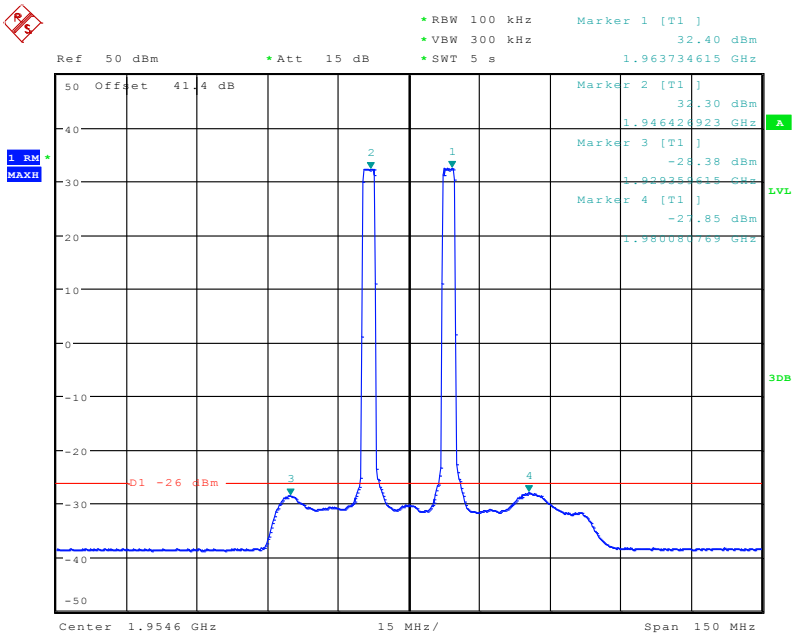

Date: 23.MAY.2014 14:49:18

1GHz to 3GHz




Date: 23.MAY.2014 14:45:24

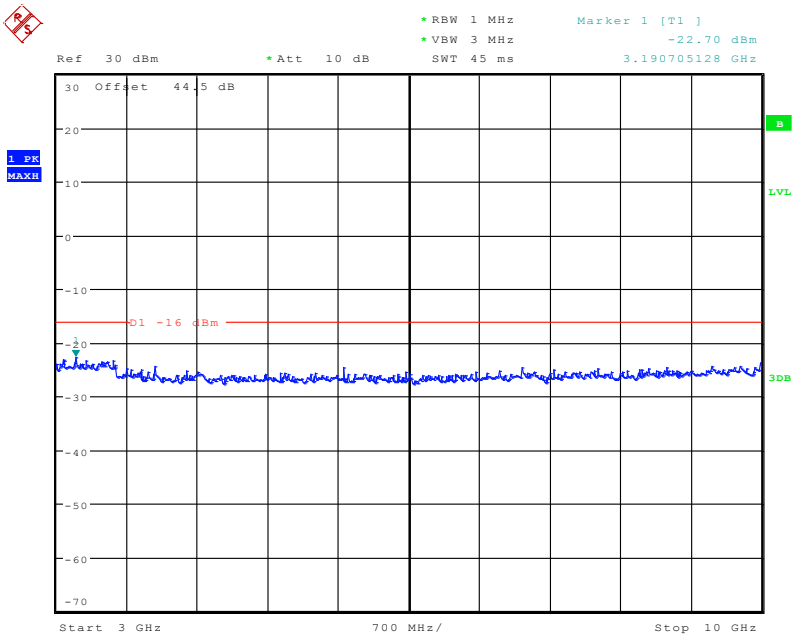
Note: The emissions above the limit are measured in a smaller bandwidth and using a RMS detector, see the plot on page 123 of 137.




Date: 26.MAY.2014 14:46:32

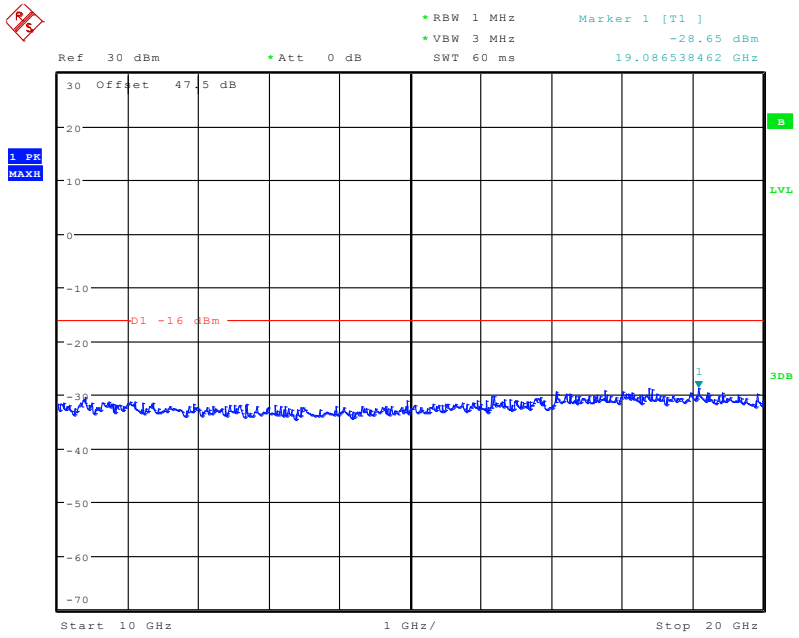
Note: The limit has been tightened by 10dB to account for the reduction in measurement bandwidth.

3GHz to 10GHz




Date: 23.MAY.2014 14:44:04

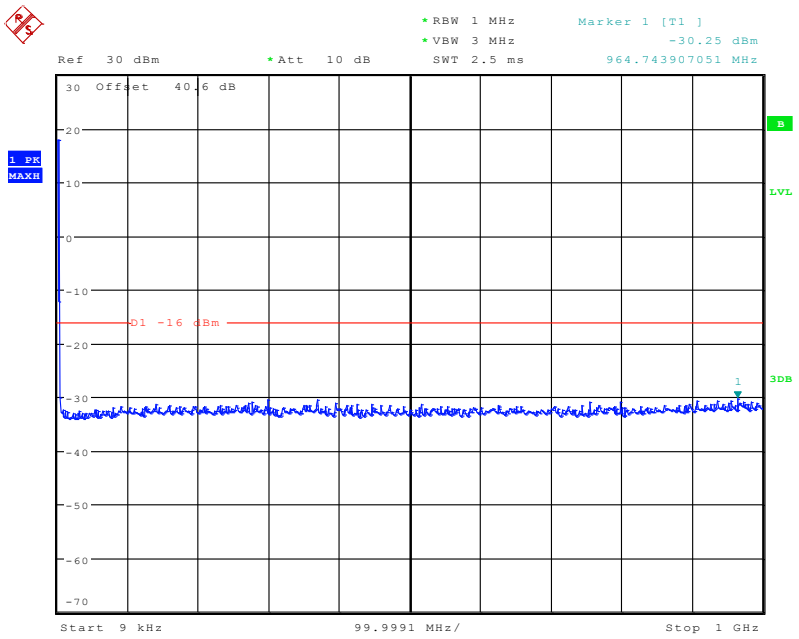
10GHz to 20GHz




Date: 23.MAY.2014 14:42:48

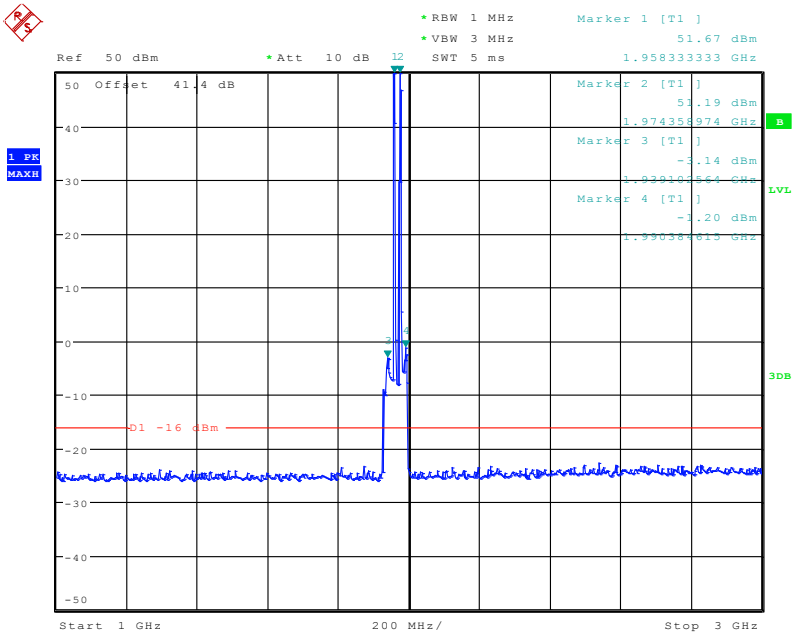
Configuration 1 - Mode 6' - 3

9kHz to 1GHz



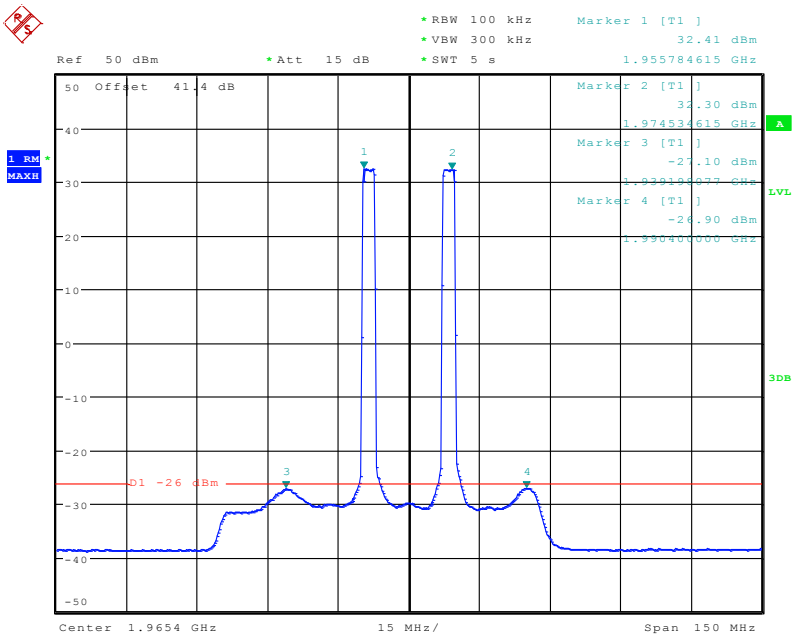

Date: 23.MAY.2014 14:31:27

1GHz to 3GHz




Date: 23.MAY.2014 14:33:08

Note: The emissions above the limit are measured in a smaller bandwidth and using a RMS detector, see the plot below.

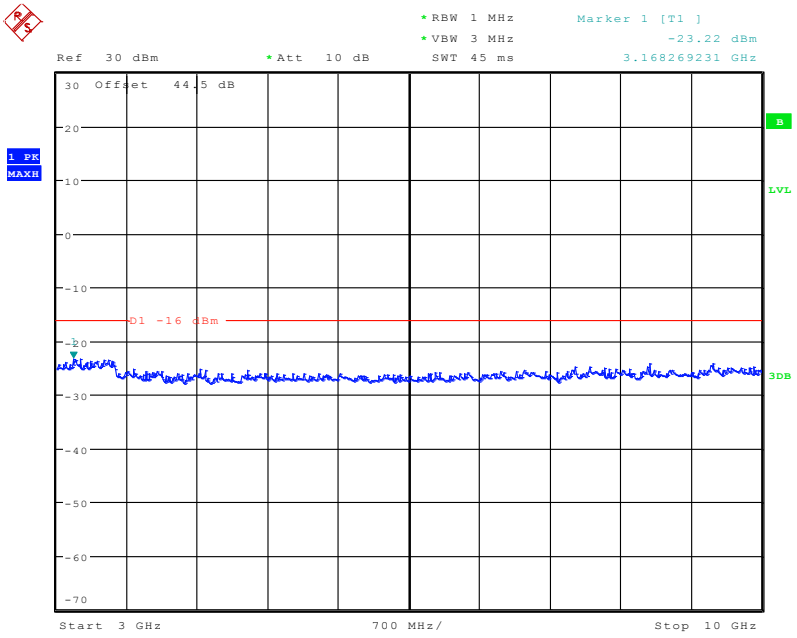



Date: 26.MAY.2014 14:48:26

Note: The limit has been tightened by 10dB to account for the reduction in measurement bandwidth.

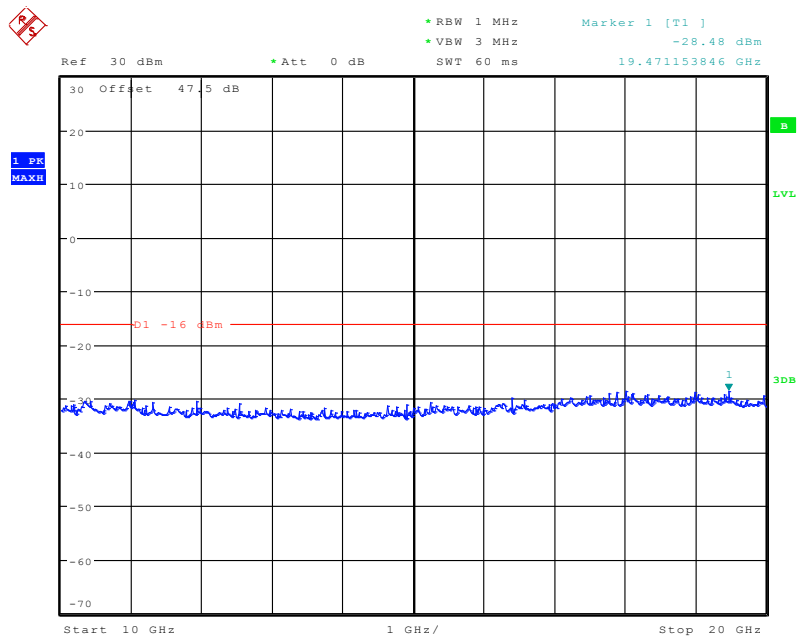
Product Service

## 3GHz to 10GHz




Date: 23.MAY.2014 14:39:09

## 10GHz to 20GHz




Date: 23.MAY.2014 14:40:07

Limit

The power of any emission outside the frequency band shall be attenuated below the transmitter power (P) by at least 43 + 10logP dB.

Remarks

The EUT does not exceed -16dBm at the frequency range of 9kHz to 20GHz.

## 2.8 FREQUENCY STABILITY UNDER TEMPERATURE VARIATIONS

### 2.8.1 Specification Reference

FCC CFR 47 Part 2, Clause 2.1055
FCC CFR 47 Part 24, Clause 24.235
Industry Canada RSS-133, Clause 6.3

### 2.8.2 Equipment Under Test

RRUS 01 B2 / KRC 118 74/2, S/N: D165426806, CB4S938194

### 2.8.3 Date of Test and Modification State

04 and 05 June 2014 – Modification State 0

### 2.8.4 Test Equipment Used

The major items of test equipment used for the below tests are identified in Section 3.1.

### 2.8.5 Test Method and Operating Modes

The test was applied in accordance with the test method requirements of FCC CFR 47 Part 2 and Part 24 and Industry Canada RSS-133.

The EUT was set to transmit on maximum power. A Spectrum Analyser was used to measure the frequency error. The temperature was adjusted between -30ºC and +50ºC in 10º steps as per 2.1055.

The test was performed with the EUT in the following configuration and mode of operation:

Configuration 1 - Mode 2 (3.0MHz OBW)

### 2.8.6 Environmental Conditions

| | |
|---|---|
| Ambient Temperature | 22.0 – 28.5°C |
| Relative Humidity | 41.0 – 65.0% |

Product Service

### 2.8.7 Test Results

For the period of test the EUT met the requirements of FCC CFR 47 Part 2 and Part 24 and Industry Canada RSS-133 for Frequency Stability Under Temperature Variations.

The test results are shown below

Power Supply: -48V DC

**Single Carrier**

**E-TM1.1 - 3.0MHz**

Configuration 1 - Mode 2

| Temperature Interval (ºC) | Deviation (Hz) |
|---|---|
| -30 | +18.20 |
| -20 | +17.76 |
| -10 | +17.81 |
| 0 | +18.63 |
| +10 | +17.74 |
| **+20** | **+19.81** |
| +30 | +18.01 |
| +40 | +18.77 |
| +50 | +20.09 |

| Limit | ± (0.05 ppm + 12 Hz) or ± 110 Hz* |
|---|---|

Remarks

* Limit according to 3GPP TS 36.141 V11.6.1.

The frequency stability of the EUT is sufficient to keep it within the authorised frequency ranges at any temperature interval across the measured range.

## 2.9 FREQUENCY STABILITY UNDER VOLTAGE VARIATIONS

### 2.9.1 Specification Reference

FCC CFR 47 Part 2, Clause 2.1055
FCC CFR 47 Part 24, Clause 24.235
Industry Canada RSS-133, Clause 6.3

### 2.9.2 Equipment Under Test

RRUS 01 B2 / KRC 118 74/2, S/N: D165426806, CB4S938194

### 2.9.3 Date of Test and Modification State

04 June 2014 – Modification State 0

### 2.9.4 Test Equipment Used

The major items of test equipment used for the below tests are identified in Section 3.1.

### 2.9.5 Test Method and Operating Modes

The test was applied in accordance with the test method requirements of FCC CFR 47 Part 2 and Part 24 and Industry Canada RSS-133.

The EUT was set to transmit on maximum power. A Spectrum Analyser was used to measure the frequency error. The supplied voltage was varied from 85 to 115 percent of the nominal value.

The test was performed with the EUT in the following configuration and mode of operation:

Configuration 1 - Mode 2 (3.0MHz OBW)

### 2.9.6 Environmental Conditions

| | |
|---|---|
| Ambient Temperature | 22.0 – 28.5°C |
| Relative Humidity | 41.0 – 65.0% |

Product Service

### 2.9.7 Test Results

For the period of test the EUT met the requirements of FCC CFR 47 Part 2 and Part 24 and Industry Canada RSS-133 for Frequency Stability Under Voltage Variations.

The test results are shown below

Temperature: 20°C

**Single Carrier**

**E-TM1.1 - 3.0MHz**

Configuration 1 - Mode 2

| DC Voltage (V) | Deviation (Hz) |
|---|---|
| -40.8 | +20.08 |
| **-48.0** | **+19.81** |
| -55.2 | +17.82 |

| Limit | ± (0.05 ppm + 12 Hz) or ± 110 Hz* |
|---|---|

Remarks

* Limit according to 3GPP TS 36.141 V11.6.1.

The frequency stability of the EUT is sufficient to keep it within the authorised frequency ranges under voltage variations across the measured range.

Product Service

**SECTION 3**

**TEST EQUIPMENT USED**

Product Service

## 3.1 TEST EQUIPMENT USED

List of absolute measuring and other principal items of test equipment.

| Instrument | Manufacturer | Type No. | Serial No. | Calibration Period (months) | Calibration Due |
|---|---|---|---|---|---|
| **Section 2.1, 2.2, 2.3, 2.4, 2.5, 2.7 – Maximum Conducted Output Power, Peak – Average Ratio, Modulation Characteristics, Occupied Bandwidth, Spurious Emissions at Antenna Terminals (±1MHz), Conducted Spurious Emissions.** | | | | | |
| Spectrum Analyser | Rohde & Schwarz | FSQ26 | 100253 | 12 | 04-Aug-2014 |
| Power Meter | Rohde & Schwarz | NRP2 | 101283 | 12 | 04-Aug-2014 |
| Power Sensor | Rohde & Schwarz | NRP-Z51 | 102310 | 12 | 04-Aug-2014 |
| Network Analyzer | Agilent | 8720D | US36140166 | 12 | 26-Sep-2014 |
| 40dB Attenuator | Aeroflex / Weinschel | 66-40-33 | CD4019 | - | O/P MON |
| Pass Filter | K&L | ULK 904 098/2 | 16 | - | O/P MON |
| Load | Shanghai Huaxiang | TF100 | 09121648 | - | O/P MON |
| Load | Shanghai Huaxiang | TFE5-3 | 090323176 | - | O/P MON |
| Load | Shanghai Huaxiang | TFE5-3 | 090323220 | - | O/P MON |
| Power Supply | Dahua | DH1716-5D | 2008040031 | - | O/P MON |
| Power Supply | Dahua | DH1716-5D | 2008040050 | - | O/P MON |
| Digital Multimeter | FLUKE | 179 | 91820401 | 12 | 24-Dec-2014 |
| Thermo-hygrometer | AZ Instruments | 8705 | 9151665 | 12 | 12-Dec-2014 |
| **Section 2.6 – Radiated Spurious Emissions** | | | | | |
| Load | Shanghai Huaxiang | TF100 | 09121648 | - | O/P MON |
| Load | Shanghai Huaxiang | TF100 | 09121605 | - | O/P MON |
| Load | Shanghai Huaxiang | TFE5-3 | 090323176 | - | O/P MON |
| Load | Shanghai Huaxiang | TFE5-3 | 090323220 | - | O/P MON |
| EMI Receiver | Rohde & Schwarz | ESI 40 | 100015 | 12 | 19-Aug-2014 |
| Ultra log test antenna | Rohde & Schwarz | HL562 | 100167 | 12 | 19-Aug-2014 |
| Double-Ridged Waveguide Horn Antenna | Rohde & Schwarz | HF 906 | 100029 | 12 | 19-Aug-2014 |
| Pyramidal Horn Antenna | EMCO | 3160-09 | - | - | - |
| Antenna master | Frankonia | MA 260 | - | 12 | 19-Aug-2014 |
| Relay Switch Unit | Rohde & Schwarz | 331.1601.31 | 338965002 | - | TU |
| Semi Anechoic Chamber | Frankonia | 23.18m×16.88 m×9.60m | - | 12 | 19-Aug-2014 |
| Power Supply | Dahua | DH1716-5D | 2008040031 | - | O/P MON |
| Power Supply | Dahua | DH1716-5D | 2008040050 | - | O/P MON |
| Digital Multimeter | FLUKE | 179 | 91820401 | 12 | 24-Dec-2014 |
| Thermo-hygrometer | AZ Instruments | 8705 | 9151665 | 12 | 12-Dec-2014 |

| Section 2.8 and 2.9 – Frequency Stability Under Temperature and Voltage Variations | | | | | |
|---|---|---|---|---|---|
| Spectrum Analyser | Rohde & Schwarz | FSQ26 | 100253 | 12 | 04-Aug-2014 |
| 40dB Attenuator | Aeroflex / Weinschel | 66-40-33 | CD4019 | - | O/P MON |
| Load | Shanghai Huaxiang | TF100 | 09121648 | - | O/P MON |
| Load | Shanghai Huaxiang | TF100 | 09121605 | - | O/P MON |
| Load | Shanghai Huaxiang | TFE5-3 | 090323176 | - | O/P MON |
| Load | Shanghai Huaxiang | TFE5-3 | 090323220 | - | O/P MON |
| Temperature Chamber | ZUNDAR | ZT1000 | 10080064 | - | O/P MON |
| Power Supply | Dahua | DH1716-5D | 2008040031 | - | O/P MON |
| Power Supply | Dahua | DH1716-5D | 2008040050 | - | O/P MON |
| Digital Multimeter | FLUKE | 179 | 91820401 | 12 | 24-Dec-2014 |
| Thermo-hygrometer | AZ Instruments | 8705 | 9151665 | 12 | 12-Dec-2014 |

O/P MON Output monitored with calibration equipment
TU Traceability Unscheduled

## 3.2 MEASUREMENT UNCERTAINTY

For a 95% confidence level, the measurement uncertainties for defined systems are:-

| Test Discipline | Frequency / Parameter | MU |
|---|---|---|
| Conducted RF Output Power | 30MHz to 10GHz Amplitude | 0.5dB* |
| Conducted Emissions | 30MHz to 40GHz Amplitude | 3.0dB* |
| Frequency Stability | | $<1x10^{-7}$ |
| Radiated Emissions, Bilog Antenna, AOATS | 30MHz to 1GHz Amplitude | 5.1dB* |
| Radiated Emissions, Horn Antenna, AOATS | 1GHz to 40GHz Amplitude | 6.3dB* |
| Worst case error for both Time and Frequency measurement 12 parts in $10^6$ | | |

* In accordance with CISPR 16-4

Product Service

## SECTION 4

## ACCREDITATION, DISCLAIMERS AND COPYRIGHT

## 4.1 ACCREDITATION, DISCLAIMERS AND COPYRIGHT

This report relates only to the actual item/items tested.

Our UKAS Accreditation does not cover opinions and interpretations and any expressed are outside the scope of our UKAS Accreditation.

Results of tests not covered by our UKAS Accreditation Schedule are marked NUA (Not UKAS Accredited).